

JOURNAL OF

# CHROMATOGRAPHY

INTERNATIONAL JOURNAL ON CHROMATOGRAPHY, ELECTROPHORESIS AND RELATED METHODS

## EDITORS

R. W. Giese (Boston, MA)

J. K. Haken (Kensington, N.S.W.)

K. Macek (Prague)

L. R. Snyder (Orinda, CA)

EDITOR, SYMPOSIUM VOLUMES, E. Heftmann (Orinda, CA)

## EDITORIAL BOARD

D. W. Armstrong (Rolla, MO)

W. A. Aue (Halifax)

P. Boček (Brno)

A. A. Boulton (Saskatoon)

P. W. Carr (Minneapolis, MN)

N. H. C. Cooke (San Ramon, CA)

V. A. Davankov (Moscow)

Z. Deyl (Prague)

S. Dilli (Kensington, N.S.W.)

H. Engelhardt (Saarbrücken)

F. Erni (Basle)

M. B. Evans (Hatfield)

J. L. Glajch (N. Billerica, MA)

G. A. Guiochon (Knoxville, TN)

P. R. Haddad (Kensington, N.S.W.)

I. M. Hais (Hradec Králové)

W. S. Hancock (San Francisco, CA)

S. Hjertén (Uppsala)

Cs. Horváth (New Haven, CT)

J. F. K. Huber (Vienna)

K.-P. Hupe (Waldbronn)

T. W. Hutchens (Houston, TX)

J. Janák (Brno)

P. Jandera (Pardubice)

B. L. Karger (Boston, MA)

E. sz. Kováts (Lausanne)

A. J. P. Martin (Cambridge)

L. W. McLaughlin (Chestnut Hill, MA)

R. P. Patience (Sunbury-on-Thames)

J. D. Pearson (Kalamazoo, MI)

H. Poppe (Amsterdam)

F. E. Regnier (West Lafayette, IN)

P. G. Righetti (Milan)

P. Schoenmakers (Eindhoven)

G. Schomburg (Mülheim/Ruhr)

R. Schwarzenbach (Dübendorf)

R. E. Shoup (West Lafayette, IN)

A. M. Sioffici (Marseille)

D. J. Strydom (Boston, MA)

K. K. Unger (Mainz)

J. T. Watson (East Lansing, MI)

B. D. Westerlund (Uppsala)

## EDITORS, BIBLIOGRAPHY SECTION

Z. Deyl (Prague), J. Janák (Brno), V. Schwarz (Prague), K. Macek (Prague)

ELSEVIER

## JOURNAL OF CHROMATOGRAPHY

**Scope.** The *Journal of Chromatography* publishes papers on all aspects of chromatography, electrophoresis and related methods. Contributions consist mainly of research papers dealing with chromatographic theory, instrumental development and their applications. The section *Biomedical Applications*, which is under separate editorship, deals with the following aspects: developments in and applications of chromatographic and electrophoretic techniques related to clinical diagnosis or alterations during medical treatment; screening and profiling of body fluids or tissues with special reference to metabolic disorders; results from basic medical research with direct consequences in clinical practice; drug level monitoring and pharmacokinetic studies; clinical toxicology; analytical studies in occupational medicine.

**Submission of Papers.** Papers in English, French and German may be submitted, in three copies. Manuscripts should be submitted to: The Editor of *Journal of Chromatography*, P.O. Box 681, 1000 AR Amsterdam, The Netherlands, or to: The Editor of *Journal of Chromatography, Biomedical Applications*, P.O. Box 681, 1000 AR Amsterdam, The Netherlands. Review articles are invited or proposed by letter to the Editors. An outline of the proposed review should first be forwarded to the Editors for preliminary discussion prior to preparation. Submission of an article is understood to imply that the article is original and unpublished and is not being considered for publication elsewhere. For copyright regulations, see below.

**Subscription Orders.** Subscription orders should be sent to: Elsevier Science Publishers B.V., P.O. Box 211, 1000 AE Amsterdam, The Netherlands, Tel. 5803 911, Telex 18582 ESPA NL. The *Journal of Chromatography* and the *Biomedical Applications* section can be subscribed to separately.

**Publication.** The *Journal of Chromatography* (incl. *Biomedical Applications*) has 37 volumes in 1989. The subscription prices for 1989 are:

*J. Chromatogr. + Biomed. Appl.* (Vols. 461–497):

Dfl. 6475.00 plus Dfl. 999.00 (p.p.h.) (total ca. US\$ 3428.50)

*J. Chromatogr.* only (Vols. 461–486):

Dfl. 5200.00 plus Dfl. 702.00 (p.p.h.) (total ca. US\$ 2707.25)

*Biomed. Appl.* only (Vols. 487–497):

Dfl. 2200.00 plus Dfl. 297.00 (p.p.h.) (total ca. US\$ 1145.50).

Our p.p.h. (postage, package and handling) charge includes surface delivery of all issues, except to subscribers in Argentina, Australia, Brasil, Canada, China, Hong Kong, India, Israel, Malaysia, Mexico, New Zealand, Pakistan, Singapore, South Africa, South Korea, Taiwan, Thailand and the U.S.A. who receive all issues by air delivery (S.A.L. — Surface Air Lifted) at no extra cost. For Japan, air delivery requires 50% additional charge; for all other countries airmail and S.A.L. charges are available upon request. Back volumes of the *Journal of Chromatography* (Vols. 1–460) are available at Dfl. 195.00 (plus postage). Claims for missing issues will be honoured, free of charge, within three months after publication of the issue. Customers in the U.S.A. and Canada wishing information on this and other Elsevier journals, please contact Journal Information Center, Elsevier Science Publishing Co. Inc., 655 Avenue of the Americas, New York, NY 10010, Tel. (212) 633-3750.

**Abstracts/Contents Lists** published in Analytical Abstracts, ASCA, Biochemical Abstracts, Biological Abstracts, Chemical Abstracts, Chemical Titles, Chromatography Abstracts, Clinical Chemistry Lookout, Current Contents/Physical, Chemical & Earth Sciences, Current Contents/Life Sciences, Deep-Sea Research/Part B: Oceanographic Literature Review, Excerpta Medica, Index Medicus, Mass Spectrometry Bulletin, PASCAL-CNRS, Pharmaceutical Abstracts, Referativnyi Zhurnal, Science Citation Index and Trends in Biotechnology.

**See inside back cover** for Publication Schedule, Information for Authors and information on Advertisements.

© ELSEVIER SCIENCE PUBLISHERS B.V. — 1989

0021-9673/89/\$03.50

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of the publisher, Elsevier Science Publishers B.V., P.O. Box 330, 1000 AH Amsterdam, The Netherlands.

Upon acceptance of an article by the journal, the author(s) will be asked to transfer copyright of the article to the publisher. The transfer will ensure the widest possible dissemination of information.

Submission of an article for publication entails the authors' irrevocable and exclusive authorization of the publisher to collect any sums or considerations for copying or reproduction payable by third parties (as mentioned in article 17 paragraph 2 of the Dutch Copyright Act of 1912 and the Royal Decree of June 20, 1974 (S. 351) pursuant to article 16 b of the Dutch Copyright Act of 1912) and/or to act in or out of Court in connection therewith.

**Special regulations for readers in the U.S.A.** This journal has been registered with the Copyright Clearance Center, Inc. Consent is given for copying of articles for personal or internal use, or for the personal use of specific clients. This consent is given on the condition that the copier pays through the Center the per-copy fee stated in the code on the first page of each article for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law. The appropriate fee should be forwarded with a copy of the first page of the article to the Copyright Clearance Center, Inc., 27 Congress Street, Salem, MA 01970, U.S.A. If no code appears in an article, the author has not given broad consent to copy and permission to copy must be obtained directly from the author. All articles published prior to 1980 may be copied for a per-copy fee of US\$ 2.25, also payable through the Center. This consent does not extend to other kinds of copying, such as for general distribution, resale, advertising and promotion purposes, or for creating new collective works. Special written permission must be obtained from the publisher for such copying.

No responsibility is assumed by the Publisher for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions or ideas contained in the materials herein. Because of rapid advances in the medical sciences, the Publisher recommends that independent verification of diagnoses and drug dosages should be made. Although all advertising material is expected to conform to ethical (medical) standards, inclusion in this publication does not constitute a guarantee or endorsement of the quality or value of such product or of the claims made of it by its manufacturer.

This issue is printed on acid-free paper.

CONTENTS

*Bibliography Section*

Liquid Column Chromatography . . . . .	B565
Gas Chromatography . . . . .	B628
Planar Chromatography . . . . .	B662
Electrophoresis . . . . .	B677

# Electronic Absorption Spectra of Radical Ions

by **Tadamasa Shida**, *Dept. of Chemistry, Faculty of Science, Kyoto University, Kyoto, Japan*

(Physical Sciences Data, 34)

Rapid growth in research activities related directly and indirectly to chemical intermediates has increased the demand for dependable spectral information on radical ions. Such information is needed for identifying newly-produced intermediates under various experimental conditions such as laser photolysis, pulse radiolysis, irradiation with synchrotron radiation, electron bombardment, electrolysis, chemical reactions involving electron transfer, and so on. This new, large-format handbook represents the first comprehensive compilation of electronic absorption spectra of radical cations and anions. Most radical ions are difficult to produce by conventional methods and their highly reactive character makes their detection and measurement of their spectra difficult. However, the author of this book has employed a unique technique - a combination of matrix isolation and radiolytic methods - which has enabled him to record

more than seven hundred spectra - most of which have not been reported before. In addition, approximate extinction coefficients are provided for many radical ions.

As dependable spectral information is required in many fields of chemistry, this work will be a useful databook for those working in physical and physical organic chemistry, molecular spectroscopy, photochemistry, radiation chemistry, electrochemistry, laser photolysis, analytical chemistry and quantum chemistry.

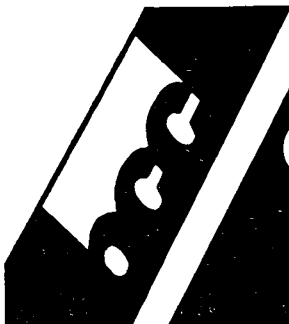
*Contents:* **1. General Background and Methodology.** Introduction. Principles of the method. Miscellaneous excerpted from the observed spectra. Experimental. **2. Spectral Data.** General remarks. Spectral charts. **3. Comments on Each Spectrum.** References. Subject Index. Molecular Formula Index.

1988 xiv + 446 pages  
US\$ 242.00 / Dfl. 460.00  
ISBN 0-444-43035-0



**ELSEVIER SCIENCE PUBLISHERS**

P.O. Box 211, 1000 AE Amsterdam, The Netherlands  
P.O. Box 882, Madison Square Station, New York, NY 10159, USA



# BUSINESS OPPORTUNITY REPORTS

BUSINESS COMMUNICATIONS COMPANY, INC.

## Industry Research Studies and Technical-Market Analyses of Membrane & Separations and Biotechnology

### JCC-080 CHROMATOGRAPHY

As large scale purification processes become increasingly important, so will the role of chromatography in their development. This BCC report is a technical-market guide for chromatography manufacturers, suppliers, investors, planners and users. It examines the chromatography market in terms of existing and new separation techniques, chromatographs and materials. GC, LC, HPLC, TLC, IonLC and GPC are covered in an in-depth look at the technologies, materials, markets, manufacturers and competition - both domestic and foreign. The study also looks into the newly emerging affinity chromatography techniques, evaluates and forecasts their applications potential, future availability and market impact.

Published November 1988 150 pages Price: \$1950.00

### JCC-046R MEMBRANE MICROFILTRATION

Improved filter technology, legislation requiring waste clean-up, and the possibility of economic advantages in reclaiming certain by-products or starting materials have worked in favor of developing high-tech filtration markets. BCC report analyzes the markets, technology and companies involved in high-tech filtration. Stand-alone applications and materials examined include those used for the biotechnology/biomedical industry, the ethical drug market, the semiconductor/electronic applications market, chemicals and other fluid processing, processed foods & beverages market, and environmental and waste clean-up. An industry sector that uses or needs pure and/or particulate-free liquids, discharges waste materials or is involved in biotechnology is a potential high-tech filtration market.

Published July 1988 160 pages Price: \$1950.00

### JCGB-112 INORGANIC MEMBRANES

This exciting, new, improved group of materials is being investigated by major materials companies worldwide. BCC report analyzes the new developments and technologies that make it all possible. It estimates markets and reviews fabrication techniques for materials such as inorganic dynamic membranes; ceramic, glass, and ceramic-like membranes; alumina; and surface modifications for microfiltration and ultrafiltration. The companies involved, the important research, current and new applications and the advantages and disadvantages of these new materials are discussed in detail.

Published April 1989 Price: \$2450.00

### JCC-107 ADVANCED NOVEL SEPARATIONS

Novel separations are on the cutting edge of separations technology. Although many have yet to be commercialized, they offer new and innovative approaches that will improve separation efficiencies and reduce costs. BCC report examines technologies such as adsorption, supercritical and solvents, and capillary zone electrophoresis; analyzes their applications and markets; assesses the opportunities they offer; and investigates the activities of the manufacturers currently involved.

Published July 1989 76 pages Price: \$1750.00

### JCC-040R NEEDS OF THE BIOTECHNOLOGY INDUSTRY FOR CHEMICALS, EQUIPMENT & INSTRUMENTATION

With this study BCC presents a broad and thorough analysis of the \$2 billion supply market for biotechnology. The report analyzes the overall state of the biotechnology industry and market pointing to key technologies, buying criteria, and opportunities for suppliers of chemicals, equipment and instrumentation; looks at the lab chemical marketplace; assesses equipment and instrumentation needs discussing the economics of rapidly proliferating products and systematically evaluating some 25 product groups; reviews the role of the various players in this market with descriptions of product offerings; analyzes European and Asian markets for equipment and instrumentation with purchasing and funding data; and identifies signs of increased international marketing and efforts in the U.S.

Published April 1989 328 pages Price: \$2450.00

### JCC-061 SCALE-UP IN BIOTECHNOLOGY

Who is carrying out biotechnological scale-up? What are the most promising scale-up routes for new biotech products? What will the impact be? Who will win, who will lose? These are just a few of the questions this BCC comprehensive report answers in analyzing the current and planned efforts directed at commercializing biotechnology. Competition between different production methods, new products needed for scale-up, market for equipment and instrumentation, cost-effective manufacturing processes for biotechnological products are examined.

Published March 1987 240 pages Price: \$1950.00

**Plus:** Custom Studies, Conferences, Newsletters, Focus Groups  
**CALL, WRITE OR FAX**



**Business Communications Company, Inc.**

25 Van Zant Street, Norwalk, CT 06855 U.S.A.

Phone: (203) 853-4266 • FAX: (203) 853-0348 • TELEX: 6502934929 (via WUI)

---

---

# JOURNAL OF ANALYTICAL AND APPLIED PYROLYSIS

**Editor: H.-R. SCHULTEN**

*Fachhochschule Fresenius, Wiesbaden, FRG*

**Associate Editor: R.P. LATTIMER**

*The BF Goodrich Company, Brecksville, OH, USA*

---

The international *Journal of Analytical and Applied Pyrolysis* is devoted to the publication of qualitative and quantitative results relating to:

- Controlled thermal degradation and pyrolysis of technical and biological macromolecules;
- Environmental, geochemical, biological and medical applications of analytical pyrolysis;
- Basic studies in high temperature chemistry, reaction kinetics and pyrolysis mechanisms;
- Pyrolysis investigations of energy related problems, fingerprinting of fossil and synthetic fuels, coal extraction and liquefaction products.

The scope of the journal includes:

- Fundamental investigations of pyrolysis processes by chemical, physical and physicochemical methods.
- Structural analysis and fingerprinting of synthetic and natural poly-

mers or products of high molecular weight.

- Technical developments and new instrumentation for pyrolysis techniques in combination with various chromatographic or spectrometric methods with special attention given to automation, optimization and standardization.
- Computer handling and processing of pyrolysis data, including library filing and retrieval techniques, as well as computer matching and advanced pattern recognition techniques.

**Abstracted/Indexed in:**

Analytical Abstracts, Biological Abstracts, Chemical Abstracts, Current Contents/Physical, Chemical & Earth Sciences, Mass Spectrometry Bulletin, Science Citation Index

**Subscription Information:**

1989: Vols. 15 & 16 (8 issues)  
US\$ 357.00 / Dfl. 714.00 including postage  
ISSN 0165-2370



*For a free sample copy write to:*

**ELSEVIER SCIENCE PUBLISHERS**

P.O. Box 211, 1000 AE Amsterdam, The Netherlands

P.O. Box 882, Madison Square Station, New York, NY 10159, USA











## Bibliography Section

---

### Liquid Column Chromatography

#### 1. REVIEWS AND BOOKS

- 3997 Bergold, A.F., Muller, A.J., Hanggi, D.A. and Carr, P.W.: High-performance affinity chromatography. *High-Perform. Liq. Chromatogr.*, 5 (1988) 95-209; *C.A.*, 110 (1989) 199630y - a review with 292 refs.
- 3998 Dorsy, J.G.: Micellar liquid chromatography. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 235-244; *C.A.*, 110 (1989) 185202y - a review with 28 refs.
- 3999 Dirsey, J.G. and Dill, K.A.: The molecular mechanism of retention in reversed-phase liquid chromatography. *Chem. Rev.*, 89 (1989) 331-346; *C.A.*, 110 (1989) 160791b - a review with 125 refs.
- 4000 Frenz, J. and Horvath, C.: High-performance displacement chromatography. *High-Perform. Liq. Chromatogr.*, 5 (1988) 211-314; *C.A.*, 110 (1989) 199631z - a review with 189 refs.
- 4001 Giddings, J.C., Grushka, E. and Brown, P.R. (Editors): *Advances in Chromatography*. Marcel Dekker, New York, 1989, 371 p.; *C.A.*, 110 (1989) 219724n.
- 4002 Grushka, E. (Editor): *Chromatographic Science Series: Preparative-Scale Chromatography*. Marcel Dekker, Vol. 46, New York, 1989, 324 p.; *C.A.*, 110 (1989) 219727r.
- 4003 Gupta, R.N.: *CRC Handbook of Chromatography*, Vol. 6. CRC Press, Boca Raton, 1988, 448 p.; *C.A.*, 110 (1989) 179639e.
- 4004 Hatano, H. and Hanai, T.: *Experiments on High-Performance Liquid Chromatography*. New Ed., Kagaku Dojin Publishing Co., Kyoto, 1988, 338 p.; *C.A.*, 110 (1989) 204761y.
- 4005 Kirschbaum, J.J. and Noroski, J.E.: Simple high-performance liquid chromatographic methods for resolving complex mixtures. *TrAC*, 8 (1989) 166-171 - a review with 18 refs.
- 4006 McLaughlin, L.W.: Mixed-mode chromatography of nucleic acids. *Chem. Rev.*, 89 (1989) 309-319; *C.A.*, 110 (1989) 150622h - a review with 77 refs.
- 4007 Nambara, T. and Ikekawa, N. (Editors): *Recent High Performance Liquid Chromatography: Theory*. Hirokawa Publishing Co., Tokyo, 1988, 354 p.; *C.A.*, 110 (1989) 224618k.
- 4008 Oliver, R.W.A. (Editor): *HPLC of Macromolecules: a Practical Approach*. IRL Press, Oxford, 1989, 236 p.; *C.A.*, 110 (1989) 169796q.
- 4009 Ruthven, D.M. and Ching, C.B.: Countercurrent chromatographic separation processes. In: Li, N.N. and Strathmann, H. (Editors), *Sep. Technol., Proc. Eng. Found. Conf., 2nd 1987*, Engineering Foundation, New York, 1988, pp. 488-513; *C.A.*, 110 (1989) 175688x - a review with 62 refs.
- 4010 Unger, K.K., Janzen, R., Jilge, G., Lork, K.D. and Anspach, B.: Bonded silica phases for the separation of biopolymers by means of column liquid chromatography. *High-Perform. Liq. Chromatogr.*, 5 (1988) 1-93; *C.A.*, 110 (1989) 227852t - a review with 300 refs.
- 4011 Wagner, J. and Macek, K. (Editors): *Tenth International Symposium on Biomedical Applications of Chromatography and Electrophoresis*. *J. Chromatogr., Spec. Vol.* 434, No. 2, Elsevier, Amsterdam, 1988, 151 p.
- See also 4014, 4030, 4051, 4053, 4059, 4067, 4078, 4111 - 4115, 4117, 4123, 4124, 4128, 4130, 4134, 4136, 4141, 4147, 4264, 4284, 4286, 4307, 4361, 4379, 4380, 4477, 4478, 4512, 4636, 4683, 4706, 4730, 4735, 4753, 4823, 4824, 4827, 4830, 4831, 4833, 4835, 4840, 4847, 4874, 4913, 4955, 4960, 4980.

## 2. FUNDAMENTALS, THEORY AND GENERAL

## 2a. General

- 4012 Berezkin, V.G.: Biography of Mikhail Semenovich Tswett and translation of Tswett's preliminary communication on a new category of adsorption phenomena. *Chem. Rev.*, 89 (1989) 279-285; *C.A.*, 110 (1989) 153317y.
- 4013 Guha, O.K.: On some nomenclature in chromatography. *J. Chromatogr.*, 471 (1989) 447-448.
- 4014 Nurok, D.: Strategies for optimizing the mobile phase in planar chromatography. *Chem. Rev.*, 89 (1989) 363-375; *C.A.*, 110 (1989) 165254p - a review with 94 refs.
- 4015 Pandey, R.N.: Detailed study of the influence of experimental conditions on retention time in size exclusion chromatography of bitumens/heavy oils/asphaltenes. Final report. *Report*, GCLL-8710, MICROLOG-88-03145, 1987, 116 p. Avail. Energy, Mines Res. Can. 555 Booth St., Ottawa, Ont., Ca., K1A 0G1; *C.A.*, 110 (1989) 176345v.
- 4016 Phillips, C.S.G.: Chromatography and the discovery process. *J. Chromatogr.*, 468 (1989) 35-42.
- 4017 Sluyterman, L.A.E. and Kooistra, C.: Ten years of chromatofocusing: a discussion. *J. Chromatogr.*, 470 (1989) 317-326.
- 4018 Whelpton, R. and Hurst, P.R.: Solid-phase extraction: personal experiences. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 289-294; *C.A.*, 110 (1989) 204879t.

See also 4000, 4030, 4085.

## 2b. Thermodynamics and theoretical relationships

- 4019 Berthod, A., Chartier, F. and Rocca, J.L.: Contribution of longitudinal diffusion to band broadening in liquid chromatography. *J. Chromatogr.*, 469 (1989) 53-65.
- 4020 Borowko, M.: Retention of rod-like solutes in a nonideal multicomponent mixed solvent. *J. Chem. Soc. Faraday Trans. 1*, 85 (1989) 343-348; *C.A.*, 110 (1989) 219654q.
- 4021 Eltekova, N.A. and Eltekov, Yu.A.: Physico-chemical applications of HPLC. *Chromatographia*, 27 (1989) 633-638.
- 4022 Golshan-Shirazi, S. and Guiochon, G.: Analytical solution for the ideal model of chromatography in the case of a pulse of a binary mixture with competitive Langmuir isotherm. *J. Phys. Chem.*, 93 (1989) 4143-4157; *C.A.*, 110 (1989) 219667w.
- 4023 Kowalska, T.: Physico-chemical modelling of solute retention in reversed-phase HPLC with methanol-water mobile phase. *Chromatographia*, 27 (1989) 628-630.
- 4024 Lin, B., Golshan-Shirazi, S. and Guiochon, G.: Effect of mass transfer coefficient on the elution profile in nonlinear chromatography. *J. Phys. Chem.*, 93 (1989) 3363-3368; *C.A.*, 110 (1989) 160888p.
- 4025 Nowakowski, R.: (Numerical calculations for the separation of substances in preparative liquid chromatography). *Chem. Anal. (Warsaw)*, 33 (1988) 259-270; *C.A.*, 110 (1989) 175746q.
- 4026 Plicka, J., Svoboda, V., Kleinmann, I. and Uhlirova, A.: Mathematical modelling of the peak in liquid chromatography. *J. Chromatogr.*, 469 (1989) 29-42.
- 4027 Smith, H.K. and Switzer, W.L.: An improved chromatographic response function for use with automated HPLC optimization methods. *J. Chromatogr. Sci.*, 27 (1989) 244-248.

For additional information see:  
*C.A.*, 110 (1989) 199782z.

See also 4707.

## 2c. Relationship between structure and chromatographic behaviour

See 3999, 4145, 4186, 4212, 4707.

## 2d. Measurement of physico-chemical and related values

- 4028 El Tayar, N., Marston, A., Bechalany, A., Hostettmann, K. and Testa, B.: Use of centrifugal partition chromatography for assessing partition coefficients in various solvent systems. *J. Chromatogr.*, 469 (1989) 91-99.
- 4029 Furr, H.C.: Calculation of chromatographic dead times and retention indices with the aid of a computer program in BASIC. *J. Chromatogr. Sci.*, 27 (1989) 216-220.
- 4030 Lin, R.: (Application and development of the coupling technique of catalytic kinetic analysis with chromatographic analysis). *Sepu*, 6 (1988) 212-215; *C.A.*, 110 (1989) 184944e - a review with 47 refs.
- 4031 Lin, Y.S. and Ma, Y.H.: A comparative chromatographic study of liquid adsorption and diffusion in microporous and macroporous adsorbent. *Ind. Eng. Chem. Res.*, 28 (1989) 622-630; *C.A.*, 110 (1989) 195477f.
- 4032 Weber, S.G.: Theoretical and experimental studies of electrostatic effects in reversed-phase liquid chromatography. *Talanta*, 36 (1989) 99-106; *C.A.*, 110 (1989) 199811h.

For additional information see:

*C.A.*, 110 (1989) 174129d, 193730j, 193853b, 204826y, 213815w.

See also 4021, 4464, 4466, 4815, 4818, 4819, 4998.

## 3. GENERAL TECHNIQUES

## 3a. Apparatus and accessories

- 4033 Allington, R.W. and Jones, J.N.: Chromatographic system. *Eur. Pat. Appl. EP 299,396* (Cl. G01N30/34), 18 Jan. 1989, US Appl. 73,079, 13 Jul. 1987; 20 pp.; *C.A.*, 110 (1989) 195311x.
- 4034 Bakalyar, S.R., Olsen, K., Spruce, B. and Bragg, B.G.: Practical considerations in making column connections in HPLC. *LC-GC*, 6 (1988) 876-882; *C.A.*, 110 (1989) 165274v.
- 4035 Boos, K.S., Wilmers, B., Lintelmann, J. and Sauerbrey, R.: Bioanalytical dual-column HPLC-systems. *Fresenius' Z. Anal. Chem.*, 333 (1989) 739.
- 4036 Dubots, P., Le Mehaute, A., Legat, D., Cottevieuille, D., Bottini, G., Tondeur, D. and Cintre, M.: Chromatographic separation - fiber device for fluids. *Eur. Pat. Appl. EP 301,948* (Cl. G01N30/60), 01 Feb. 1989, FR Appl. 87/10,551, 24 Jul. 1987; 7 pp.; *C.A.*, 110 (1989) 204849h.
- 4037 Ebel, S.: Vollautomatische rechnergesteuerte Betriebsmessplätze - Betriebssicherheit und erreichbare Präzision. *Fat Sci. Technol.*, 91 (1989) 505-510.
- 4038 Heffner, P.: Chromatographiedatenerfassung und -auswertung mehrerer Messplätze auf PC-Ebene. *Fat Sci. Technol.*, 91 (1989) 540-542.
- 4039 Henrich, L.T., van den Driest, P.J., Mussche, P., Lammerts van Bueren, L.G.D. and Ritchie, H.J.: A new stationary phase for the analysis of polyaromatic hydrocarbons. *Proc.-Water Qual. Technol. Conf. 1987*, 15 (1988) 213-217; *C.A.*, 110 (1989) 224724s.
- 4040 Klawiter, J.: The principle of control of fraction collector using the method of characteristic points. *Chem. Anal. (Warsaw)*, 33 (1988) 299-304; *C.A.*, 110 (1989) 175747r.
- 4041 Lacey, R.F.: Baseline correction for chromatography. *Eur. Pat. Appl. EP 299,652* (Cl. G06F15/20), 18 Jan. 1989, US Appl. 73,609, 15 Jul. 1987; 9 pp.; *C.A.*, 110 (1989) 224802r.
- 4042 Lurie, I.S.: On-line coupled HPLC-capillary SFC. *LC-GC*, 6 (1988) 1066-1067; *C.A.*, 110 (1989) 185091m.
- 4043 Podolak, M., Horanek, I., Polacek, B. and Zezulka, A.: (Needle valve for high-efficiency liquid chromatographs). *Czech. Pat. CS 250,308* (Cl. G01N30/20), 15 May 1988, Appl. 85/614, 29 Jan. 1985; 3 pp.; *C.A.*, 110 (1989) 224642p.
- 4044 Schneider, H.-J.: A personal chromatograph for automated method evaluation. *Fat Sci. Technol.*, 91 (1989) 494-496.
- 4045 Thiele, H.: "ChromStar" - Ein vielseitiges Datensystem für die Chromatographie. *Fat Sci. Technol.*, 91 (1989) 510-517.

- 4046 Vigdergauz, M.S., Glotko, V.G., Arutyunov, Yu.I. and Khalitov, D.M.: (Apparatus for recording chromatograms). *U.S.S.R. Pat.* SU 1,449,898 (Cl. GO1N30/88), 07 Jan. 1989, Appl. 4,287,558, 21 Jul. 1987; *C.A.*, 110 (1989) 165241g.
- 4047 Ziegler, E. and Schomburg, G.: Chromatographische Datenverarbeitung mit CHROMDAT und COLACHROM. *Fat Sci. Technol.*, 91 (1989) 534-540.

For additional information see:

*C.A.*, 110 (1989) 165139e, 165261p, 168855w, 185047b, 185054b, 224656w, 224758f, 224762e.

See also 4125, 4129, 4131.

### 3b. Detectors and detection reagents

- 4048 Barker, T. and Brown, S.D.: Resolution of a coeluting chromatographic pair using Kalman filtering. *J. Chromatogr.*, 469 (1989) 77-90.
- 4049 Birks, J.W. and Shellum, C.L.: Improving detection limits of UV-visible absorbing compounds in high-performance liquid chromatography using a singlet oxygen trap. *U.S. Pat.* US 4,806,485 (Cl. 436-140; GO1N30/14), 21 Feb. 1989, Appl. 19,880, 27 Feb. 1987; 14 pp.; *C.A.*, 110 (1989) 224785n.
- 4050 Bridge, T.P., Williams, M.H. and Fell, A.F.: An expert system approach to eluent optimisation in reverse-phase liquid chromatography with multichannel detection. *J. Liq. Chromatogr.*, 12 (1989) 23-34.
- 4051 Brinkman, U.A.T., de Jong, G.J. and Gooijer, C.: The use of fluorescence and chemiluminescence techniques for sensitive and selective detection in HPLC. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 321-338; *C.A.*, 110 (1989) 204881n - a review with 70 refs.
- 4052 Budrevich, A.G. and Saidov, S.M.: (Chromatographic model of the formation of an adsorption profile during molecular-beam epitaxy with a two-component beam). *Dokl. Akad. Nauk UzSSR*, (1988) 26-28; *C.A.*, 110 (1989) 160842u.
- 4053 Buening-Pfaue, H.: (Electrochemical detection (and UV-detection) by HPLC for pharmaceutical identification). *Lebensmittelchem., Lebensmittelqual.*, 13 (1988) 76-92; *C.A.*, 110 (1989) 219156d - a review with 13 refs.
- 4054 Chevret, J.P., Ursem, M., Salzmann, J.P. and Vannoort, R.W.: Ultra-sensitive UV detection in micro separation. *J. High Resolut. Chromatogr.*, 12 (1989) 278-281.
- 4055 De Ruig, W.G., Stephany, R.W. and Dijkstra, G.: Criteria for the detection of analytes in test samples. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 487-490.
- 4056 Diaz Marot, A., Monfort Tort, E., Comellas Riera, L. and Gassiot Matas, M.: (Application of dansyl chloride and 1-fluoro-2,4-dinitrobenzene to HPLC). *Afinidad*, 45 (1988) 401-406; *C.A.*, 110 (1989) 165292z.
- 4057 Havner, G., Pannell, D.K. and Tarter, J.G.: The detection of organic acids in a non-oxidation mode using an amperometric detector. *J. Liq. Chromatogr.*, 12 (1989) 299-305.
- 4058 Hoffmann, S., Norli, H.R. and Greibrokk, T.: Improved signal to noise ratios of the laser light-scattering detector with packed fused silica columns. *J. High Resolut. Chromatogr.*, 12 (1988) 260-264.
- 4059 Horvai, G., Pal, F., Niegreis, Z., Toth, K. and Pungor, E.: The electrochemical detectors in ion chromatography. *LC-GC*, 6 (1988) 1058-1064; *C.A.*, 110 (1989) 165099s - a review with 48 refs.
- 4060 Idei, M., Pajor, A., Guoth, J. and Menyhart, J.: Biological detectors in liquid chromatography. *J. Chromatogr.*, 490 (1989) 247-261.
- 4061 Janecek, M. and Slais, K.: Simultaneous photometric and conductivity detection for microcolumn liquid chromatography. *J. Chromatogr.*, 471 (1989) 303-309.
- 4062 Lafosse, M., Herbreteau, B., Dreux, M. and Morin-Allory, L.: Controle de certains systemes de chromatographie liquide haute performance à l'aide d'un détecteur évaporatif à diffusion de lumière. *J. Chromatogr.*, 472 (1989) 209-218.
- 4063 Strasters, J.K., Billiet, H.A.H., de Galan, L., Vandeginste, B.G.M. and Kateman, G.: Automated peak recognition from photodiode array spectra in liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 3-22.
- 4064 Takeuchi, T., Asano, T. and Ishii, D.: Mass detection limits achieved with a commercially available fluorimeter in micro high-performance liquid chromatography. *J. Chromatogr.*, 471 (1989) 297-302.
- 4065 Toyo'oka, T., Suzuki, T., Saito, Y., Uzu, S. and Imai, K.: Fluorogenic reagent for thiols: 4-(N,N-dimethyl-aminosulphonyl)-7-fluoro-2,1,3-benzoxadiazole. *Analyst (London)*, 114 (1989) 413-419.

- 4066 Tsuda, T. and Noda, H.: Effect of the position of the laser beam focal point on a capillary flow-through cell on the signal-to-noise ratio for a fluorimetric detector in capillary column liquid chromatography. *J. Chromatogr.*, 471 (1989) 311-319.
- 4067 Yeung, E.S.: Indirect detection methods: looking for what is not there. *Acc. Chem. Res.*, 22 (1989) 125-130; *C.A.*, 110 (1989) 165255q - a review with 34 refs.

For additional information see:

*C.A.*, 110 (1989) 185094q, 204683z, 204726r, 204772c, 224517b.

See also 4268, 4334, 4341, 4354, 4718, 4792, 4801, 4830, 4890, 5004.

*3c. Sorbents, carriers, column and layer performance, packing procedures*

- 4068 Abe, M., Wang, P., Chitrakar, R. and Tsuji, M.: Synthetic inorganic ion-exchange materials. Part XLIX. Adsorption and desorption behaviour of heavy metal ions on hydrated titanium dioxide. *Analyst (London)*, 114 (1989) 435-443.
- 4069 Akapo, S.O., Furst, A., Khong, T.M. and Simpson, C.F.: Chromatographic evaluation of oligomeric C<sub>8</sub> reversed phases for use in high-performance liquid chromatography. *J. Chromatogr.*, 471 (1989) 283-296.
- 4070 Akhrem, A.A. and Drozhdenyuk, A.P.: Calcium tartrate gel. *Anal. Biochem.*, 179 (1989) 86-89.
- 4071 Arnold, E.N., Lillie, T.S. and Beesley, T.E.: Molecular modeling of cyclodextrin-guest molecule interactions. *J. Liq. Chromatogr.*, 12 (1989) 337-343.
- 4072 Atamna, I.Z., Muschick, G.M. and Issaq, H.J.: The effect of column diameter on HPLC separations using constant length columns. *J. Liq. Chromatogr.*, 12 (1989) 285-298.
- 4073 Bartha, A., Billiet, H.A.H. and de Galan, L.: The evaluation and sequential use of resolution based criteria in the optimization of the separation of a limited subset of components by HPLC. *J. Liq. Chromatogr.*, 12 (1989) 173-197.
- 4074 Bassler, B.J. and Hartwick, R.A.: The application of porous graphitic carbon as an HPLC stationary phase. *J. Chromatogr. Sci.*, 27 (1989) 162-165.
- 4075 Bechalany, A., R thlisberger, T., el Tayar, N. and Testa, B.: Comparison of various non-polar stationary phases used for assessing lipophilicity. *J. Chromatogr.*, 473 (1989) 115-124.
- 4076 Carles, M., Neige, R., Niemann, C., Michel, A., Bert, M., Bodrero, S. and Guyot, A.: Chromatographic separation especially of isotopes or ions, with graft-coated ion-exchange resin, and suitable resins. *Eur. Pat. Appl. EP 297, 994 (Cl. B01D59/30)*, 04 Jan. 1989, FR Appl. 87/9,485, 03 Jul. 1987; 17 pp.; *C.A.*, 110 (1989) 201247z.
- 4077 Coenegracht, P.M.J., Smilde, A.K. and Knevelman, A.: Performance characterization of multi-solvent mobile phase systems in RP-HPLC by multi-criteria decision making illustrated by the comparison of ternary and quaternary solvent systems. *J. Liq. Chromatogr.*, 12 (1989) 77-94.
- 4078 Crane, L.J. and Henry, M.P.: (Requirements for the manufacture of chromatographic carriers based on silica gel). *Chem. Labor. Betr.*, 40 (1989) 2-3; *C.A.*, 110 (1989) 154814v - a review with 6 refs.
- 4079 Engelhardt, H., L w, H., Eberhardt, W. and Mauss, M.: Polymer encapsulated stationary phases: advantages, properties and selectivities. *Chromatographia*, 27 (1989) 535-543.
- 4080 Fornstedt, N. and Porath, J.: Sulphated Sepharose - a strong cation exchanger. *J. Chromatogr.*, 472 (1989) 261-264.
- 4081 Galinskii, A.A. and Galich, P.N.: Rapid chromatographic method to determine surface concentration of hydroxyl groups on silicon and aluminium oxides using dimethylzinc. *React. Kinet. Catal. Lett.*, 38 (1989) 281-287; *C.A.*, 110 (1989) 180089g.
- 4082 Hansen, S.H., Heboe, P. and Thomsen, M.: Dynamically modified silica and its applications in drug control and drug metabolism studies. *Saengyak Hakhoechi*, 19 (1988) 217-227; *C.A.*, 110 (1989) 219158f.
- 4083 Heilmann, S.M., Rasmussen, J.K., Krepski, L.R., Milbrath, D.S. and Coleman, P.L.: Variable crosslinked azlactone-functional polymer beads, their preparation, and their adducts. *PCT Int. Pat. Appl. WO 88 07,062 (Cl. C08F220/58)*, 22 Sep. 1988, US Appl. 25,605, 13 Mar. 1987; 43 pp.; *C.A.*, 110 (1989) 155466v.

- 4084 Hirukawa, M. and Hanai, T.: Selectivity of an octadecyl-modified vinyl alcohol copolymer gel for the retention of polar compounds. *J. Chromatogr.*, 468 (1989) 191-199.
- 4085 Hoffman, N. and Rahman, A.: Computation of band shape for strong injection solvent and weak mobile phase combinations in liquid chromatography. *J. Chromatogr.*, 473 (1989) 260-266.
- 4086 Jandera, P.: Predictive optimization of gradient-elution liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 117-137.
- 4087 Kawahara, T.: Application of sulfated polysaccharide gel for affinity chromatography. *Res. Discl.*, 298 (1989) 100-101; *C.A.*, 110 (1989) 227902j.
- 4088 Kraak, J.C., Oostervink, R., Poppe, H., Esser, U. and Unger, K.K.: Hydrodynamic chromatography of macromolecules on 2  $\mu$ m non-porous spherical silica gel packings. *Chromatographia*, 27 (1989) 585-590.
- 4089 Lankmayr, E.P., Wegscheider, W. and Budna, K.W.: Global optimization of HPLC separations. *J. Liq. Chromatogr.*, 12 (1989) 35-58.
- 4090 Loos-Neskovic, C. and Fedoroff, M.: Fixation mechanisms of cesium on nickel and zinc ferrocyanides. *Solvent Extr. Ion Exch.*, 7 (1989) 131-158; *C.A.*, 110 (1989) 219666v.
- 4091 Mama, J.E., Fell, A.F. and Clark, B.J.: Pharmaceutical applications of porous graphitic carbon in HPLC. *Anal. Proc. (London)*, 26 (1989) 71-73; *C.A.*, 110 (1989) 160437r.
- 4092 Nyiredy, S., Dallenbach-Toelke, K. and Sticher, O.: Correlation and prediction of the  $k'$  values for mobile phase optimization in HPLC. *J. Liq. Chromatogr.*, 12 (1989) 95-116.
- 4093 Nystroem, M., Herrman, W. and Larsson, B.: Silica particles, their preparation and use as chromatographic packing and in catalysts. *Eur. Pat. Appl. EP 298,062* (Cl. CO1B33/16), 04 Jan. 1989, SE Appl. 87/2,685, 29 Jun. 1987; 10 pp.; *C.A.*, 110 (1989) 157129m.
- 4094 Pastyr, J., Petrus, L. and Antal, M.: (Preparation and uses of 3-amino-2-hydroxypropyl cellulose). *Czech. Pat. CS 252,999* (Cl. CO8B11/08), 15 Oct. 1988, Appl. 86/775, 04 Feb. 1986; 2 pp.; *C.A.*, 110 (1989) 194937u.
- 4095 Pesek, J. and Cash, T.: A chemically bonded liquid crystal as a stationary phase for high performance liquid chromatography. Synthesis on silica *via* an organochlorosilane pathway. *Chromatographia*, 27 (1989) 559-564.
- 4096 Petrovic, S.M. and Lomic, S.: Selectivity in reversed-phase liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 59-75.
- 4097 Pflleiderer, B. and Bayer, E.: Silanediol groups of the silica gel nucleosil: active sites involved in the chromatographic behaviour of bases. *J. Chromatogr.*, 468 (1989) 67-71.
- 4098 Presecan, E., Porumb, H. and Lascu, I.: Simple method for the preparation of spherical agarose and composite gel particles. *J. Chromatogr.*, 469 (1989) 396-398.
- 4099 Proctor, A. and Snyder, H.E.: Regeneration of silicic acid following adsorption of soybean oil pigments. *J. Am. Oil Chem. Soc.*, 66 (1989) 593-594.
- 4100 Scott, R.P.: Contemporary liquid chromatography column design. *J. Chromatogr.*, 468 (1989) 99-114.
- 4101 Siouffi, A.M.: Unusual phases for liquid chromatography. In: Pick, J. and Vajda, J. (Editors), *Proc. Int. Conf. Biochem. Sep., 2nd*, Hungarian Biochemical Society, Budapest, 1988, pp. 313-332; *C.A.*, 110 (1989) 219422n - a review with 53 refs.
- 4102 Slais, K.: Sample-induced internal gradient of ionic strength in ion-exclusion microcolumn liquid chromatography. *J. Chromatogr.*, 469 (1989) 223-229.
- 4103 Smith, M.A. and Gillespie, P.C.: Ionization of DEAE-cellulose. Dependence of pK on ionic strength. *J. Chromatogr.*, 469 (1989) 111-120.
- 4104 Stalcup, A.M., Martire, D.E., Sander, L.C. and Wise, S.A.: Synthesis and characterization of novel bonded phases for reversed-phase liquid chromatography. *Chromatographia*, 27 (1989) 405-411.
- 4105 Suprinowicz, Z., Dawidowicz, A.L. and Lodkowski, R.: (Chromatographic column packing). *Pol. Pat. PL 142,838* (Cl. B01D15/08), 31 Mar. 1988, Appl. 249,054, 01 Aug. 1984; 3 pp.; *C.A.*, 110 (1989) 195637h.
- 4106 Trojanowicz, M., Pobozy, E. and Meyerhoff, M.E.: Direct and replacement ion chromatography with potentiometric detection using a silver/silver bromide electrode. *Anal. Chim. Acta*, 222 (1989) 109-119.



- 4107 Yokono, T., Nakahara, M., Makino, K. and Sanada, Y.: Application of carbon microbeads for column packing for high-performance liquid chromatography. *J. Mater. Sci. Lett.*, 7 (1988) 864-866; *C.A.*, 110 (1989) 185088r.
- 4108 Yu, L.W. and Hartwick, R.A.: Zwitterionic stationary phases in HPLC. *J. Chromatogr. Sci.*, 27 (1989) 176-185.
- 4109 Yuki, Y. and Ichida, A.: Stationary phases for resolution of optical isomers by liquid chromatography. *PCT Int. Appl. Pat.* WO 85 00,661 (Cl. GO1N31/08), 14 Feb. 1985, JP Appl. 83/132,361, 20 Jul. 1983; 38 pp.; *C.A.*, 110 (1989) 219733q.

For additional information see:

*C.A.*, 110 (1989) 150937q, 165279a, 188920s, 188921t, 188949h, 188950b, 204775f, 204820s, 208923a, 208927e, 208928f, 215590t, 224670w, 224671x, 224731s, 227933v.

See also 4031, 3050, 4063, 4183, 4404, 4429, 4900, 5001, 5002.

### 3d. Quantitative analysis

- 4110 Asshauer, J.: Quantitative chromatography: demand and reality. *Fresenius' Z. Anal. Chem.*, 333 (1989) 727-728.

### 3e. Preparative scale chromatography

- 4111 Colin, H.: Preparative liquid chromatography. *Chem. Anal.*, 98 (High Perform. Liq. Chromatogr.) (1989) 415-478; *C.A.*, 110 (1989) 230729p - a review with 147 refs.
- 4112 Kowalczyk, J.S., Gazda, K., Kaminski, M. and Klawiter, J.: (Preparative and industrial scale chromatography). *Chem. Anal. (Warsaw)*, 33 (1988) 237-257; *C.A.*, 110 (1989) 175708d - a review with 36 refs.
- 4113 Munsinger, R.: A preparative LC system. *Am. Lab. (Fairfield)*, 20 (1988) 146-147; *C.A.*, 110 (1989) 191858h - a review with no refs.
- 4114 Sakamoto, K.: Separation and purification of liquid chromatography. 2. Column engineering. *Bio. Ind.*, 4 (1987) 751-758; *C.A.*, 110 (1989) 208598y - a review with 7 refs.

See also 4002, 4025, 4843, 4973, 4974.

### 3f. Programmed temperature, pressure, vapors, gradients

- 4115 Berry, V.V. and Schwartz, H.E.: Gradients in microbore LC: techniques and applications. *Chromatogr. Sci.*, 45 (1989) 67-116; *C.A.*, 110 (1989) 215363w - a review with 74 refs.
- 4116 Buck, C.F. and Tomellini, S.A.: Calculation of solute retention for pH gradient elution HPLC experiments using single and coupled columns. *J. Chromatogr. Sci.*, 27 (1989) 166-171.

For additional information see:

*C.A.*, 110 (1989) 204830v.

See also 4383, 4467.

### 3g. High performance procedures

- 4117 Litters, N. and Schmelzeisen-Redeker, G.: (Experience with fast HPLC in the analytical routine laboratory). *GIT Fachz. Lab.*, 33 (1989) 81-83; *C.A.*, 110 (1989) 224708q - a review with 2 refs.

See also 4044.

## 4. SPECIAL TECHNIQUES

## 4a. Automation and computerization

- 4118 Flurer, R.A. and Busch, K.L.: A data system for imaging organic analysis with a secondary ion mass spectrometer. *Anal. Instrum. (N.Y.)*, 17 (1988) 255-276; *C.A.*, 110 (1989) 165263r.
- 4119 Funasaki, N., Hada, S. and Neya, S.: Computer simulations of gel filtration chromatograms of rapidly self-associating systems. *Bull. Chem. Soc. Jpn.*, 62 (1989) 380-385; *C.A.*, 110 (1989) 199797h.
- 4120 Head, M. and Smith, K.: A network data acquisition system. *Am. Lab. (Fairfield)*, 20 (1988) 62-66; *C.A.*, 110 (1989) 165120s.
- 4121 Snowdon, P.J.: LIMS in the pesticide residue laboratory. *Anal. Proc.*, 26 (1989) 100-102; *C.A.*, 110 (1989) 207681h.
- 4122 Tamura, H. and Sugisawa, H.: (Calculation program of Kovats retention index values based on those of known compounds). *Nippon Shokuhin Kogyo Gakkaishi*, 36 (1989) 148-151; *C.A.*, 110 (1989) 211713n.

For additional information see:

*C.A.*, 110 (1989) 185057e, 195608z, 224735w.

See also 4027, 4029, 4037, 4038, 4044 - 4047, 4063, 4383, 4421, 4580, 4700, 4775, 4820, 4821, 4957.

## 4b. Combination of various chromatographic techniques

- 4123 Davies, I.L., Markides, K.E., Lee, M.L., Raynor, M.W. and Bartle, K.D.: Applications of coupled LC-GC: a review. *J. High Resolut. Chromatogr.*, 12 (1989) 193-207 - a review with 94 refs.
- 4124 Grob, K.: On-line coupled high-performance liquid chromatography-gas chromatography. *TrAC*, 8 (1989) 162-166 - a review with 17 refs.
- 4125 Hofstraat, J.W., Griffioen, S., van de Nesse, R.J., Brinkman, U.A.T., Gooijer, C. and Velthorst, N.H.: Coupling of narrow-bore column liquid chromatography and thin-layer chromatography. Interface optimization and characteristics for normal-phase liquid chromatography. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 220-226; *C.A.*, 110 (1989) 185083k.
- 4126 Riekkola, M.-L.: Applications of on-line coupled liquid chromatography-gas chromatography. *J. Chromatogr.*, 473 (1989) 315-323.

See also 4042, 4789, 4790, 4849.

## 4c. Combination with other physico-chemical techniques (MS, IR etc.)

- 4127 Barefoot, A.C. and Reiser, R.W.: Packed capillary liquid chromatography/mass spectrometry using a moving belt interface. *Biomed. Environ. Mass Spectrom.*, 18 (1989) 77-82; *C.A.*, 110 (1989) 150871p.
- 4128 Bruins, A.P.: LC-MS and LC-MS-MS for biomedical analyses. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 339-351; *C.A.*, 110 (1989) 204882p - a review with 31 refs.
- 4129 Gagel, J.J. and Biemann, K.: The continuous infrared spectroscopic analysis of reversed phase liquid chromatography separations. *Microchim. Acta* 1987, 2 (1988) 185-187; *C.A.*, 110 (1989) 165278z.
- 4130 Hamada, H. and Aoyama, T.: Liquid chromatography-mass spectrometer. Analysis of physiologically active substances. *Gendai Kagaku*, 216 (1989) 36-41; *C.A.*, 110 (1989) 227850r - a review with 5 refs.
- 4131 Levi, P.: (HPLC/mass spectrometry coupling by a particle beam interface). *Analusis*, 16 (1988) 47-50; *C.A.*, 110 (1989) 224717s.
- 4132 Robertson, R.M., de Haseh, J.A. and Browner, R.F.: Magic-LC/FT-IR spectrometry. *Microchim. Acta* 1987, 2 (1988) 199-202; *C.A.*, 110 (1989) 165265t.
- 4133 Verheij, E.R., Reewijk, H.J.E.M., Niessen, W.M.A., Tjaden, R.U., van der Greef, J., Verheij, E.R., Lavos, G.F. and van der Greef, J.: Phase-system switching: a new approach in liquid chromatography/mass spectrometry coupling. *Biomed. Environ. Mass Spectrom.*, 16 (1988) 393-397; *C.A.*, 110 (1989) 165266u.

- 4134 Voyksner, R.D.: HPLC/mass spectrometry. *Chem. Anal.*, 100 (Anal. Aspects Drug Test.) (1989) 173-202; *C.A.*, 110 (1989) 226660s - a review with 102 refs.

See also 4178, 4288, 4322, 4343, 4346, 4716, 4769, 4785, 4843, 4871, 4940.

#### 4d. Affinity chromatography

- 4135 Josic, D., Reuter, W. and Kraemer, D.M.: The application of immobilized affinity ligands in high-performance liquid chromatography. *Angew. Makromol. Chem.*, (1989) 166-256; *C.A.*, 110 (1989) 208688c.
- 4136 Li, H.: (HPLAC and its application in separation and purification of the enzymes). *Shengwu Huaaxue Yu Shengwu Wuli Jinzhan*, 15 (1988) 428-432; *C.A.*, 110 (1989) 188152t - a review with 24 refs.
- 4137 Moriya, K., Tanizawa, K. and Kanaoka, Y.: Schiff base copper(II) chelate as a tool for intermolecular cross-linking and immobilization of protein. *Biochem. Biophys. Res. Commun.*, 161 (1989) 52-58.
- 4138 Walzel, H., Brock, J., Franz, H. and Ziska, P.: Detection and quantification of ligand leakage from lectin affinity columns. *Biomed. Biochim. Acta*, 48 (1989) 221-226; *C.A.*, 110 (1989) 208699g.

For additional information see:

*C.A.*, 110 (1989) 150939s, 169528d, 188923v, 208921y, 208929g.

See also 3997, 4226, 4460, 4468, 4509, 4528, 4620.

#### 4f. Trace analysis and preseparation techniques

See 4964, 4980.

#### 4g. Separation of enantiomers

- 4139 Andersson, S. and Allenmark, S.: Influence of amphiphilic mobile phase additives upon the direct liquid chromatographic optical resolution by means of BSA-based chiral sorbents. *J. Liq. Chromatogr.*, 12 (1989) 345-357.
- 4140 Däppen, R., Karfunkel, H.R. and Leusen, F.J.J.:  $\pi$ -Acceptor amide group for liquid chromatographic chiral separations with special emphasis on the 3,5-dinitrobenzoyl amide. *J. Chromatogr.*, 469 (1989) 101-110.
- 4141 Davankov, V.A.: Separation of enantiomeric compounds using chiral HPLC systems. A brief review of general principles, advances, and development trends. *Chromatographia*, 27 (1989) 475-482 - a review with 78 refs.
- 4142 Husain, P.A., Colbert, J.E., Sirimanne, S.R., VanDerveer, D.G., Herman, H.H. and May, S.W.: N-Succinimidyl methoxyphenylacetic acid ester, an amine-directed chiral derivatizing reagent suitable for enzymatic scale resolutions. *Anal. Biochem.*, 178 (1989) 177-183.
- 4143 Katoh, H., Ishida, T., Baba, Y. and Kiniwa, H.: Optical resolution of amino acids, peptides and hydroxycarboxylic acids using a new chiral column for ligand-exchange chromatography. *J. Chromatogr.*, 473 (1989) 241-250.
- 4144 Lam, S., Malikin, G., Murphy, M., Freundlich, L. and Karmen, A.: Confirming chiral high-performance liquid chromatographic separations with stereospecific enzymes. *J. Chromatogr.*, 468 (1989) 359-364.
- 4145 Lindner, W.: Liquid chromatographic separation of enantiomers. *Fresenius' Z. Anal. Chem.*, 333 (1989) 730.
- 4146 Pirkle, W.H. and McCune, J.E.: Discussion of a controversial chiral recognition model. *J. Chromatogr.*, 469 (1989) 67-75.
- 4147 Pirkle, W.H. and Pochapsky, T.C.: Considerations of chiral recognition relevant to the liquid chromatography separation of enantiomers; *C.A.*, 110 (1989) 165253n - a review with 130 refs.
- 4148 Shin, C.G., Kisuno, A. and Yonezawa, Y.: Syntheses and separations of diastereomers of protected  $\Delta^1$ -,  $\Delta^2$ - and  $\Delta^3$ -dehydrotripeptides. *Chem. Lett.*, (1988) 1469-1472; *C.A.*, 110 (1989) 154858n.

- 4149 Tanaka, M., Shono, T., Zhu, Y. and Kawaguchi, Y.: Liquid chromatographic separation of racemates on acetylated or carbamoylated  $\beta$ -cyclodextrin-bonded stationary phases. *J. Chromatogr.*, 469 (1989) 429-433.

For additional information see:

*C.A.*, 110 (1989) 232021a.

- See also 4091, 4109, 4161, 4189, 4191, 4214, 4263, 4264, 4271, 4273, 4284, 4325, 4344, 4376, 4378, 4382, 4386, 4395, 4678, 4832, 4909, 4939, 4942.

#### 4h. Other special techniques

- 4150 Alekandrov, M.L., Gotlib, V.A., Kovarov, N.N. and Shevkunov, V.V.: Method of determining the composition of a substance in microcolumn liquid chromatography. *PCT Int. Appl. Pat.* WO 88 10,426 (Cl. G01N30/34), 29 Dec. 1988, Appl. 87/SU69, 16 Jun. 1987; 13 pp.; *C.A.*, 110 (1989) 224677d.
- 4151 Giddings, J.C.: Field-flow fractionation of macromolecules. *J. Chromatogr.*, 470 (1989) 327-335.

For additional information see:

*C.A.*, 110 (1989) 185092n.

- See also 4009, 4028, 4042.

## 5. HYDROCARBONS AND HALOGEN DERIVATIVES

### 5a. Aliphatic hydrocarbons

- 4152 Eic, M. and Ruthven, D.M.: Diffusion of linear paraffins and cyclohexane in NaX and 5A zeolite crystals. (Erratum to document cited in *C.A.*, 110 (1989) 13993r). *Zeolites*, 9 (1989) 164; *C.A.*, 110 (1989) 160883h.

### 5b. Cyclic hydrocarbons

- 4153 Garrigues, P., Radke, M., Druetz, O., Willsch, H. and Bellocq, J.: Reversed-phase liquid chromatographic retention behaviour of dimethylphenanthrene isomers. *J. Chromatogr.*, 473 (1989) 207-213.
- 4154 Machovic, V., Lang, I., Vavrecka, P. and Pech, P.: (Chemical structure of the heavy fraction of synthetic petroleum from Soviet coal). *Ropa, Uhlie*, 31 (1989) 122-124; *C.A.*, 110 (1989) 196110t.
- 4155 Niles, R. and Tan, Y.L.: Determination of polynuclear aromatic hydrocarbons and mononitrated derivatives in air and diesel particulates. *Anal. Chim. Acta*, 221 (1989) 53-63.
- 4156 Palmentier, J.-P.F., Britten, A.J., Charbonneau, G.M. and Karasek, F.W.: Determination of polycyclic aromatic hydrocarbons in lubricating oil base sticks using high-performance liquid chromatography and gas chromatography-mass spectrometry. *J. Chromatogr.*, 469 (1989) 241-251.
- 4157 Schilhabel, J., Winkeler, H.D. and Levsen, K.: Analysis of polycyclic aromatic hydrocarbons in diesel particulate extracts by high performance liquid chromatography (HPLC). *Fresenius' Z. Anal. Chem.*, 333 (1989) 748.

For additional information see:

*C.A.*, 110 (1989) 212288q, 218147q.

- See also 4079, 4095, 4152, 4276, 4709.

### 5c. Halogen derivatives

- 4158 Fischer, R. and Ballschmiter, K.: Relationship between experimentally determined vapour pressures and retention times of PCB on a 50% *n*-octyl-methylpolysiloxane stationary phase. *Fresenius' Z. Anal. Chem.*, 333 (1989) 731-732.

## 5d. Complex hydrocarbon mixtures

- 4159 Vazhnik, E.Ya., Lebedev, S.R., Zrellov, V.N. and Krasnaya, L.V.: (Chromatographic determination of the group hydrocarbon composition of automobile gasoline). *Khim. Tekhnol. Topl. Maseł*, (1989) 33-34; *C.A.*, 110 (1989) 157275f.

See also 4015.

## 6. ALCOHOLS

- 4160 Byczkowski, J.Z. and Kulkarni, A.P.: Lipoxygenase-catalyzed epoxidation of benzo[*a*]pyrene-7,8-dihydrodiol. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1199-1205.
- 4161 Itabashi, Y., Takagi, T. and Tsuda, T.: High-performance liquid chromatographic separation of alkane-1,2-diol enantiomers on a chiral slurry-packed capillary column. *J. Chromatogr.*, 472 (1989) 271-276.

See also 4079, 4360.

## 7. PHENOLS

- 4162 Annapurani, T.K.: HPLC analysis of certain phenols and phenolic acids from plants. *Curr. Sci.*, 58 (1989) 190-191; *C.A.*, 110 (1989) 188659p.
- 4163 Descombes, A.A. and Haerdi, W.: (Preconcentration of organic compounds on an iron (III)-loaded 8-hydroxyquinoline-silica chromatographic catechol and its derivatives). *Chimia*, 42 (1989) 301-303; *C.A.*, 110 (1989) 212255b.
- 4164 Janda, V. and van Langenhove, H.: Determination of chlorophenols in water by direct acetylation and solid-phase extraction. *J. Chromatogr.*, 472 (1989) 327-330.
- 4165 Tyman, J.H.P., Johnson, R.A., Muir, M. and Rokhgar, R.: The extraction of natural cashew nut-shell liquid from the cashew nut (*Anacardium occidentale*). *J. Am. Oil Chem. Soc.*, 66 (1989) 553-557.
- 4166 Verhaar, L.A.T., Meuldijk, J. and van der Wiele, K.: High-performance liquid chromatography of mixtures of catechol and its reaction products with glyoxylic acid. *J. Chromatogr.*, 472 (1989) 381-388.

For additional information see:

*C.A.*, 110 (1989) 205928v, 208677y.

See also 4071, 4074, 4079, 4108.

## 8. SUBSTANCES CONTAINING HETEROCYCLIC OXYGEN

See 4855.

## 8a. Flavonoids

- 4167 Cisowski, W.: (Analysis of flavonoids from *Levisticum officinale* herb by high-performance liquid chromatography). *Acta Pol. Pharm.*, 45 (1988) 441-444; *C.A.*, 110 (1989) 199298w.
- 4168 Pietrogrande, M.C., Bighi, C., Blo, G., Kahie, Y.D., Reschiglian, P. and Dondi, F.: Retention behaviour of selected flavonoid compounds in NP-HPLC. *Chromatographia*, 27 (1989) 625-627.
- 4169 Pietta, P.G., Mauri, P.L., Manera, E., Ceva, P.L. and Rava, A.: An improved HPLC determination of flavonoids in medicinal plant extracts. *Chromatographia*, 27 (1989) 509-512.
- 4170 Wald, B. and Galensa, R.: (Detection of adulteration of apple and pear juice). *Z. Lebensm.-Unters. Forsch.*, 188 (1989) 107-114; *C.A.*, 110 (1989) 230254e.

*8b. Aflatoxins and other mycotoxins*

- 4171 Abramson, D. and Thorsteinson, T.: Determination of sterigmatocystin in barley by acetylation and liquid chromatography. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 342-344.
- 4172 Bauer, S., Schindler, D. and Krull, J.: (Standardizable test method for the determination of aflatoxin M<sub>1</sub> in milk and milk products). *Nahrung*, 33 (1989) 217-219; *C.A.*, 110 (1989) 230266k.
- 4173 Beaver, R.W.: Determination of aflatoxins in corn and peanuts using HPLC. *Arch. Environ. Contam. Toxicol.*, 18 (1989) 315-318; *C.A.*, 110 (1989) 191320b.
- 4174 Billington, J.A. and Hsieh, D.P.H.: Purification and analysis of versiconal hemiacetal acetate and versicolorin A using low-pressure liquid chromatography and high-performance liquid chromatography. *J. Agric. Food Chem.*, 37 (1989) 676-679.
- 4175 Chamkase, N., Cobb, W.Y., Latimer, G.W., Salinas, C. and Clement, B.A.: Liquid chromatographic determination of aflatoxins, ochratoxin A, and zearalenone in grains, oilseeds, and animal feeds by post-column derivatization and on-line sample cleanup. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 336-341.
- 4176 Hutchins, J.E., Lee, Y.J., Tyczkowska, K. and Hagler, R.M., Jr.: Evaluation of silica cartridge purification and hemiacetal formation for liquid chromatographic determination of aflatoxins in corn. *Arch. Environ. Contam. Toxicol.*, 18 (1989) 319-326; *C.A.*, 110 (1989) 191355s.
- 4177 Jewers, K., John, A.E. and Blunden, G.: Assessment of mitability of the florisisil and CB clean-up procedures for determining aflatoxin levels in sorghum by bidirectional HPLC. *Chromatographia*, 27 (1989) 617-621.
- 4178 Krishnamurthy, T., Beck, D.J., Isensee, R.K. and Jarvis, B.B.: Mass spectral investigations on trichothecene mycotoxins. VII. Liquid chromatographic-thermospray mass spectrometric analysis of macrocyclic trichothecenes. *J. Chromatogr.*, 469 (1989) 209-222.
- 4179 Leitao, J., De Saint Blanquat, G., Bailly, J.R. and Paillas, C.: (Quantitation by liquid chromatography of some mycotoxins of significance in food and feed). *Bio-Sciences*, 7 (1988) 3-7; *C.A.*, 110 (1989) 211122u.
- 4180 Palmisano, F., Zamboni, P.G., Visconti, A. and Bottalico, A.: Determination of *Alternaria* mycotoxins in food-stuffs by gradient elution liquid chromatography with electrochemical detection. *Chromatographia*, 27 (1989) 425-430.
- 4181 Peterson, R.E., Shannon, G.M. and Shotwell, O.L.: Purification of cyclopiazonic acid by liquid chromatography. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 332-335.
- 4182 Ramakrishna, Y., Sashidhar, R.B. and Bhat, R.V.: Minicolumn technique for the detection of deoxynivalenol in agricultural commodities. *Bull. Environ. Contam. Toxicol.*, 42 (1989) 167-171; *C.A.*, 110 (1989) 113312m.

For additional information see:

*C.A.*, 110 (1989) 191374x.

*8c. Other compounds with heterocyclic oxygen (including tannins)*

- 4183 Vuorela, H. and Lehtonen, P.: Study of HPLC retention behaviour of furocoumarins in *Peucedanum palustre* with reference to solvent selectivity and molecular connectivity. *J. Liq. Chromatogr.*, 12 (1989) 221-234.
- 4184 Zogg, G.C., Nyiredy, S. and Sticher, O.: Preparative medium pressure liquid chromatographic (MPLC) and semipreparative HPLC separation of furocoumarin isomers. *Chromatographia*, 27 (1989) 591-595.
- 4185 Zogg, G.C., Nyiredy, S. and Sticher, O.: Apiaceenwurzeln. Qualitative und quantitative Furanocoumarinbestimmung in Apiaceenwurzeln. *Dtsch. Apoth.-Ztg.*, 129 (1989) 717-722.

For additional information see:

*C.A.*, 110 (1989) 150940k, 171875h, 187375f.

See also 4826.

## 9. OXO COMPOUNDS, ETHERS, EPOXIDES AND QUINONES

- 4186 Bacher, R. and Ballschmiter, K.: Adsorption liquid chromatography of PCDD and PCDF on the polyphenol-phase: unique structural effects. *Fresenius' Z. Anal. Chem.*, 333 (1989) 732-733.
- 4187 Bonaga, G., Chiavari, G. and Verardo, G.: Gas chromatographic/mass spectrometric analysis of azines. *Chromatographia*, 27 (1989) 596-600.
- 4188 Cheynier, V., Rigaud, J. and Moutounet, M.: High-performance liquid chromatographic determination of the free *o*-quinones of *trans*-caffeoyltartaric acid, 2-S-glutathionylcaffeoyltartaric acid and catechin in grape must. *J. Chromatogr.*, 472 (1989) 428-432.
- 4189 Hyun, M.H., Park, Y.W. and Baik, I.K.: Liquid chromatographic resolution of racemic ketones as their oxime (3,5-dinitrophenyl) carbamates on a chiral stationary phase. *Tetrahedron Lett.*, 29 (1988) 4735-4738; *C.A.*, 110 (1989) 231007p.
- 4190 Katoh, S. and Satoh, K.: Prenylquinones. *Methods Enzymol.*, 167 (Cyanobacteria) (1988) 269-271; *C.A.*, 110 (1989) 108683x.
- 4191 Mash, E.A. and Hemperly, S.B.: Homochiral ketals in organic synthesis. Simple chromatographic resolution of diastereometric  $\alpha$ -hydroxycycloalkanone ketals. *Tetrahedron Lett.*, 29 (1988) 4035-4038; *C.A.*, 110 (1989) 172618p.
- 4192 Takayanagi, M., Goto, S., Kokubo, Y., Suzuki, M. and Yashiro, T.: Determination of acetaldehyde in human blood by high-performance liquid chromatography using fluorometry. *Chem. Pharm. Bull.*, 37 (1989) 200-201.
- 4193 Tashima, T., Kawakami, U., Harada, M., Imai, M., Satoh, N., Nakagawa, T. and Tanaka, H.: Polymerization reaction in aqueous solution of glutaraldehyde containing trioxane-type oligomers under sterilizing conditions. *Chem. Pharm. Bull.*, 37 (1989) 377-381.

See also 4079, 4160, 4276, 4702, 4802, 4810.

## 10. CARBOHYDRATES

## 10a. Mono and oligosaccharides. Structural studies

- 4194 Badet, J. and Jeanloz, R.W.: Isolation and partial purification of lipid-linked oligosaccharides from calf pancreas. *Carbohydr. Res.*, 178 (1988) 49-65; *C.A.*, 110 (1989) 188837v.
- 4195 Buckee, G.K. and Baker, C.D.: Estimation of fermentable carbohydrates - collaborative trial. *J. Inst. Brew.*, 95 (1989) 111-114; *C.A.*, 110 (1989) 210839w.
- 4196 Buetikoper, U., Baumann, E. and Bosset, J.O.: (An improved HPLC method for the Determination of sorbic acid in some dairy products with special reference to analytical artifacts). *Mitt. Geb. Lebensmittelunters. Hyg.*, 79 (1989) 392-405; *C.A.*, 110 (1989) 211067e.
- 4197 D'Arcy, S.M., Donoghue, C.M., Koeleman, C.A.M., van den Eijnden, D.H. and Savage, A.V.: Determination of the structure of a novel acidic oligosaccharide with blood-group activity isolated from bovine submaxillary-gland mucin. *Biochem. J.*, 260 (1989) 389-393.
- 4198 Freeze, H.H., Willies, L., Hamilton, S. and Koza-Taylor, P.: Two mutants of *Dictyostelium discoideum* that lack a sulfated carbohydrate antigenic determinant synthesize a truncated lipid-linked precursor of N-linked oligosaccharides. *J. Biol. Chem.*, 264 (1989) 5653-5659.
- 4199 Gu, J., Taniguchi, Y., Matsuda, T. and Nakamura, R.: HPLC analysis of fluorescence-labeled oligosaccharides administered into rat stomach. *Agric. Biol. Chem.*, 53 (1989) 855-857; *C.A.*, 110 (1989) 208696d.
- 4200 Gyves, P.W., Gesundheit, N., Stannard, B.S., DeCherney, G.S. and Weintraub, B.D.: Alterations in the glycosylation of secreted thyrotropin during ontogenesis. Analysis of sialylated and sulfated oligosaccharides. *J. Biol. Chem.*, 264 (1989) 6104-6110.
- 4201 Hall, N.A. and Patrick, A.D.: A high-performance liquid chromatography method for the analysis of picomole amounts of oligosaccharides. *Anal. Biochem.*, 178 (1989) 378-384.

- 4202 Huang, T. and Kissinger, P.T.: Enzyme-mediated LCEC determination of glucose in serum, foods, and *in vivo* microdialysates. *Curr. Sep.*, 9 (1989) 9-13; *C.A.*, 110 (1989) 227919v.
- 4203 Kaartinen, V. and Mononen, I.: Analysis of aspartylglucosamine at the picomole level by high-performance liquid chromatography. *J. Chromatogr.*, 490 (1989) 293-299.
- 4204 Kennedy, J.F., Stevenson, D.L. and White, C.A.: GPC separation and identification of starch-related oligosaccharides containing more than one type of glycosidic linkage. *Starch/Staerke*, 41 (1989) 72-77; *C.A.*, 110 (1989) 150728x.
- 4205 Lauro, P.N., Craven, P.A. and DeRubertis, F.R.: Two-step high-performance liquid chromatography method for the determination of myo-inositol and sorbitol. *Anal. Biochem.*, 178 (1989) 331-335.
- 4206 Maness, N.O. and Mort, A.J.: Separation and quantitation of galacturonic acid oligomers from 3 to over 24 residues in length by anion-exchange high-performance liquid chromatography. *Anal. Biochem.*, 178 (1989) 248-254.
- 4207 Pierce-Cretel, A., Decottignies, J.-P., Wieruszkeski, J.-M., Strecker, G., Montreuil, J. and Spik, G.: Primary structure of twenty three neutral and monosialylated oligosaccharides O-glycosidically linked to the human secretory immunoglobulin A hinge region determined by a combination of permethylation analysis and 400-MHz <sup>1</sup>H-NMR spectroscopy. *Eur. J. Biochem.*, 182 (1989) 457-476.
- 4208 Pollman, R.M.: Ion chromatographic determination of lactose, galactose, and dextrose in grated cheese using pulsed amperometric detection. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 425-428.
- 4209 Ramm-Schmidt, L.H.: Ion exchange for desugaring of mollasses and byproduct isolation. *Sugar Ser.*, 9 (1988) 111-126; *C.A.*, 110 (1989) 194986j.
- 4210 Reutter, M. and Eichner, K.: (Separation and determination of Amadori Compounds by high pressure liquid chromatography and post-column reaction). *Z. Lebensm.-Unters. Forsch.*, 188 (1989) 28-35; *C.A.*, 110 (1989) 211066d.
- 4211 Sasaki, K., Hicks, K.B. and Nagahashi, G.: Separation of eight inositol isomers by liquid chromatography under pressure using a calcium-form, cation-exchange column. *Carbohydr. Res.*, 183 (1988) 1-9; *C.A.*, 110 (1989) 193260f.
- 4212 Shimada, E. and Matsumura, G.: Determination of stokes radii of hyaluronate oligosaccharides by Sephadex gel chromatography. *J. Chromatogr.*, 472 (1989) 145-154.
- 4213 Soundararajan, S., Badawi, M., Kohlrust, M.C. and Hageman, J.H.: Boronic acids for affinity chromatography/spectral methods for determinations of ionization and diol-binding constants. *Anal. Biochem.*, 178 (1989) 125-134.
- 4214 Tsukamoto, S., Kaneko, K. and Hayashi, K.: A method to identify the absolute configuration of rhamnose, lyxose, and 2,6-dideoxy sugars, cymarose, oleandrose, diginose and digitoxose, using a chiral high-performance liquid chromatography (HPLC) column. *Chem. Pharm. Bull.*, 37 (1989) 637-641.
- 4215 Van Biljon, P.L. and Olivier, S.P.: Determination of sugars in polysaccharide hydrolysates by anion-exchange chromatography. *J. Chromatogr.*, 473 (1989) 305-309.
- 4216 Yokota, A. and Hasegawa, T.: The analysis of madurose, an actinomycete whole-cell sugar, by HPLC after enzymic treatment. *J. Gen. Appl. Microbiol.*, 34 (1988) 445-449; *C.A.*, 110 (1989) 169542d.

For additional information see:

*C.A.*, 110 (1989) 160441n, 171853x, 191352p, 224756d.

See also 4217, 4237, 4242, 4442, 4596.

#### 10b. Polysaccharides, mucopolysaccharides, lipopolysaccharides

- 4217 Baubichon-Cortay, H., Broquet, P., George, P. and Louisot, P.: Evidence for an O-glycan sialylation system in brain. Characterization of a  $\beta$ -galactoside  $\alpha$ 2,3-sialyltransferase from rat brain regulating the expression of an  $\alpha$ -N-acetyl-galactosamine  $\alpha$ 2,6-sialyltransferase activity. *Eur. J. Biochem.*, 182 (1989) 257-265.
- 4218 Fishman, M.L., Gillespie, D.T., Sondey, S.M. and Barford, R.A.: Characterization of pectins by size exclusion chromatography in conjunction with viscosity detection. *J. Agric. Food Chem.*, 37 (1989) 584-591.



- 4219 Haginaka, J., Nishimura, Y., Wakai, J., Yasuda, H., Koizumi, K. and Nomura, T.: Determination of cyclodextrins and branched cyclodextrins by reversed-phase chromatography with pulsed amperometric detection and a membrane reactor. *Anal. Biochem.*, 179 (1989) 336-340.
- 4220 Hara, S., Yamaguchi, M., Takemori, Y., Furuhashi, K., Ogura, H. and Nakamura, M.: Determination of mono-O-acetylated N-acetylneuraminic acids in human and rat sera by fluorometric high-performance liquid chromatography. *Anal. Biochem.*, 179 (1989) 162-166.
- 4221 Hicks, K.B.: Isolation of oligomeric fragments of chitin by preparative high-performance liquid chromatography. *Methods Enzymol.*, 161 (Biomass, Pt. B) (1988) 410-416; *C.A.*, 110 (1989) 208684y.
- 4222 Kamath, N.D., Bhide, S.V. and Kale, N.R.: Separation of the components of starch based on the adsorption of the 1-butanol-amylose complex during column chromatography on cellulose. *Carbohydr. Res.*, 186 (1989) 131-139; *C.A.*, 110 (1989) 215077f.
- 4223 Kokenyesi, R. and Woessner, J.F., Jr.: Purification and characterization of a small dermatan sulphate proteoglycan implicated in the dilatation of the rat uterine cervix. *Biochem. J.*, 260 (1989) 413-419.
- 4224 Kurtzhals, P., Larsen, C. and Johansen, M.: High-performance size-exclusion chromatographic procedure for the determination of fluoresceinyl isothiocyanate dextrans of various molecular masses in biological media. *J. Chromatogr.*, 491 (1989) 117-127.
- 4225 Morris, A.J., Dexter, T.M. and Gallagher, J.T.: Metabolic properties of a homogeneous proteoglycan of a haemopoietic stem cell line, FDCP-mix. *Biochem. J.*, 260 (1989) 479-486.
- 4226 Rendleman, J.A.: Separation of cyclodextrins by affinity chromatography. *U.S. Pat. Appl.* US 159,990, 15 Oct. 1988, Appl. 24 Feb. 1988; 19 pp.; Avail. NTIS Order No. PAT-6-159 990; *C.A.*, 110 (1989) 156398m.
- 4227 Saari, H., Konttinen, Y.T. and Santavirta, S.: Synovial fluid hyaluronate: a study using HPLC with size exclusion column. *Med. Sci. Res.*, 17 (1989) 99-101; *C.A.*, 110 (1989) 169541c.
- 4228 Thornton, D.J., Morris, H.G., Cockin, G.H., Huckerby, T.N., Nieduszynski, I.A., Carlstedt, I., Hardingham, T.E. and Ratcliffe, A.: Structural and immunological studies of keratan sulphates from mature bovine articular cartilage. *Biochem. J.*, 260 (1989) 277-282.
- 4229 Tyler, J.A.: Insulin-like growth factor 1 can decrease degradation and promote synthesis of proteoglycan in cartilage exposed to cytokines. *Biochem. J.*, 260 (1989) 543-548.
- 4230 Yurin, O.A., Chlenov, M.A., Adrianova, Yu.I., Maloletneva, O.Yu. and Dombrovskii, V.A.: (Analysis of ethoxylated starch using high-performance liquid chromatography). *Khim.-Farm. Zh.*, 23 (1989) 97-101; *C.A.*, 110 (1989) 175429p.

See also 4197.

#### 10c. Glycoproteins and their components

- 4231 Badia, M. and Querol, E.: Detection and purification of bovine herpes virus 1 glycoproteins by lectin affinity. *J. Virol. Methods*, 22 (1988) 23-29; *C.A.*, 110 (1989) 150868t.
- 4232 Campbell, M.A., Handley, C.J. and D'Souza, S.E.: Turnover of proteoglycans in articular-cartilage cultures. Characterization of proteoglycans released into the medium. *Biochem. J.*, 259 (1989) 21-25.
- 4233 Datta, T.K., Basu, P.S., Datta, P.K. and Banerjee, A.: Purification of a unique glycoprotein that enhances phenol oxidase activity in scorpion (*Heterometrus bengalensis*) haemolymph. *Biochem. J.*, 260 (1989) 525-529.
- 4234 De Arruda, M.V., Colli, W. and Zingales, B.: Terminal  $\beta$ -D-galactofuranosyl epitopes recognized by antibodies that inhibit *Trypanosoma cruzi* internalization into mammalian cells. *Eur. J. Biochem.*, 182 (1989) 413-421.
- 4235 Fellegvari, I., Valko, K., Varadi, G., Bauer, P. and Kramer, M.: Purification of human chorionic gonadotropin hormone by anion-exchange high-performance liquid chromatography. *Chromatographia*, 27 (1989) 601-604.
- 4236 Gries, A., Nimpf, J., Wurm, H., Kostner, G.M. and Kenner, T.: Characterization of isoelectric subspecies of asialo- $\beta_2$ -glycoprotein I. *Biochem. J.*, 260 (1989) 531-534.

- 4237 Holst, O., Christoffel, V., Fründ, R., Moll, H. and Sumper, M.: A phosphodiester bridge between two arabinose residues as a structural element of an extracellular glycoprotein of *Volvox carterii*. *Eur. J. Biochem.*, 181 (1989) 345-350.
- 4238 Jackson, S.P. and Tjian, R.: Purification and analysis of RNA polymerase II transcription factors by using wheat germ agglutinin affinity chromatography. *Proc. Natl. Acad. Sci. U.S.A.*, 86 (1989) 1781-1785; *C.A.*, 110 (1989) 208039s.
- 4239 Kawashima, H., Tomaru, A., Yamamoto, K., Tsuji, T. and Osawa, T.: Monoclonal antibodies against human platelet membrane glycoprotein IIIa and collagen-induced platelet activation. *Chem. Pharm. Bull.*, 37 (1989) 397-403.
- 4240 Mantle, M. and Stewart, G.: Intestinal mucins from normal subjects and patients with cystic fibrosis. Variable contents of the disulphide-bound 118 kDa glycoprotein and different reactivities with an anti-(118 kDa glycoprotein) antibody. *Biochem. J.*, 259 (1989) 243-253.
- 4241 McGregor, J.L., Catimel, B., Parmentier, S., Clezardin, P., Dechavanne, M. and Leung, L.L.K.: Rapid purification and partial characterization of human platelet glycoprotein IIb. Interaction with thrombospondin and its role in platelet aggregation. *J. Biol. Chem.*, 264 (1989) 501-506.
- 4242 Merlu, B., Neel, D., Goussault, Y. and Charron, D.J.: Glycosylation of human leukocyte locus A molecules in dependent on the cell type. *Eur. J. Biochem.*, 181 (1989) 755-760.
- 4243 Rabouille, C., Aon, M.A. and Thomas, D.: Interactions involved in ovomucin gel-forming properties: a rheological-biochemical approach. *Arch. Biochem. Biophys.*, 270 (1989) 495-503.
- 4244 Sandy, J.D. and Plaas, A.H.K.: Studies on the hyaluronate binding properties of newly synthesized proteoglycans purified from articular chondrocyte cultures. *Arch. Biochem. Biophys.*, 271 (1989) 300-314.
- 4245 Santer, U.V., DeSantis, R., Hard, K.J., van Kuik, J.A., Vliegenthart, J.F.G., Won, B. and Glick, M.C.: N-Linked oligosaccharide changes with oncogenic transformation require sialylation of multiantennae. *Eur. J. Biochem.*, 181 (1989) 249-260.
- 4246 Shimamoto, C., Deshmukh, G.D., Rigot, W.L. and Boland, C.R.: Analysis of cancer-associated colonic mucin by ion-exchange chromatography: evidence for a mucin species of lower molecular charge and weight in cancer. *Biochim. Biophys. Acta*, 991 (1989) 284-295.
- 4247 Suzuki, T. and Mori, K.: A galactose-specific lectin from the hemolymph of the pearl oyster, *Pinctada fucata Martensii*. *Comp. Biochem. Physiol.*, B: *Comp. Biochem.*, 92B (1989) 455-462; *C.A.*, 110 (1989) 208690x.
- 4248 Takeda, T., Sawaki, M., Ogiwara, Y. and Shibata, S.: The structure of nephritogenoside. *Chem. Pharm. Bull.*, 37 (1989) 54-56.
- 4249 Tetaert, D., Hublart, M., Gomes, V., Boersma, A. and Degand, P.: Reversed phase HPLC of different membrane-bound variant surface glycoprotein preparations from *Trypanosoma brucei brucei*. *Biomed. Chromatogr.*, 3 (1989) 53-57.
- 4250 Wakui, H., Kobayashi, R., Itoh, H., Imai, H., Nakamoto, Y. and Miura, A.B.: High-yield purification of the complex-forming glycoprotein in urine from normal and abnormal subjects. *Clin. Chem. (Wisnton-Salem)*, 35 (1989) 577-581.
- 4251 Yao, K., Ubuka, T., Masuoka, N., Kinuta, M. and Ikeda, T.: Direct determination of bound sialic acids in sialoglycoproteins by acidic ninhydrin reaction. *Anal. Biochem.*, 179 (1989) 332-335.

See also 4502, 4503, 4554.

## 11. ORGANIC ACIDS AND LIPIDS

### 11a. Organic acids and simple esters

- 4252 Abidi, S.L.: Reversed-phase high-performance liquid chromatography of unsubstituted aminobenzoic acids. *J. Liq. Chromatogr.*, 12 (1989) 595-611.
- 4253 Beebe, J.M., Brown, P.R. and Turcotte, J.G.: Analytical-scale high-performance liquid chromatography of omega-3 fatty acid esters derived from fish oils. *J. Chromatogr.*, 468 (1989) 225-233.
- 4254 Christie, W.W. and McG. Breckenridge, G.H.: Separation of *cis* and *trans* isomers of unsaturated fatty acids by high-performance liquid chromatography in the silver ion mode. *J. Chromatogr.*, 469 (1989) 261-269.

- 4255 Danilowicz, R.M., Reed, G., Germolec, D.R., Luster, M.I., Tomer, K.B., Curtis, J.F., Higuchi, T. and Eling, T.E.: 12S,19- and 12S,20-Dihydroxyeicosanoids: novel 12S-hydroxy-5,8-*cis*-10-*trans*-14-*cis*-eicosatetraenoic acid metabolites formed by hydroxylation and reduction in murine lymphocytes. *Anal. Biochem. Biophys.*, 271 (1989) 72-83.
- 4256 Dunemann, L.: Automated determination of carboxylic acids in biological and geochemical samples by means of a chemical reaction detector. *Anal. Chim. Acta*, 221 (1989) 19-26.
- 4257 Fatica, M.G.: HPLC determination of long chain saturated fatty acids in tall oil rosin. *J. Am. Oil Chem. Soc.*, 66 (1989) 572-575.
- 4258 Gasking, A.L., Edwards, W.T.E., Hobson-Frohock, A., Elia, M. and Livesey, G.: Quantitative HPLC analysis of branched-chain 2-keto acids in biological samples. *Methods Enzymol.*, 166 (Branched Chain Amino Acids) (1988) 20-27; *C.A.*, 110 (1989) 188668r.
- 4259 Gennaro, M.C. and Bertolo, P.L.: Determination of the principal anionic components in wines and soft drinks, by ion interaction reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 472 (1989) 433-440.
- 4260 Gey, M.: (Analysis of organic acids on HPLC glass columns packed with DEAE-Si 100 polyol). *Z. Chem.*, 28 (1988) 377-378; *C.A.*, 110 (1989) 230049s.
- 4261 Guoliang, Z., Zhiguang, L. and Zilin, J.: Influence of sample concentration on the elution of monocarboxylic acid in ion-exclusion chromatography. *Fresenius' Z. Anal. Chem.*, 333 (1989) 741.
- 4262 Holtzman, M.J., Pentland, A., Baenziger, N.L. and Hansbrough, J.R.: Heterogeneity of cellular expression of arachidonate 15-lipoxygenase: implications for biological activity. *Biochim. Biophys. Acta*, 1003 (1989) 204-208.
- 4263 Huffer, M. and Schreier, P.: Analytical resolution of 4(5)-alkylated  $\gamma(\delta)$ -lactones by high-performance liquid chromatography on a silica-bonded chiral polyacrylamide sorbent. Chromatographic characterization of a stationary phase. *J. Chromatogr.*, 469 (1989) 137-141.
- 4264 Hutt, A.J. and Caldwell, J.: Enantiomeric analysis of 2-phenylpropionic acid NSAID's in biological fluids by HPLC. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 115-125; *C.A.*, 110 (1989) 185198b - a review with 26 refs.
- 4265 Jones, W.R., Jandik, P. and Swartz, M.T.: Automated dual column coupled system for simultaneous determination of carboxylic acids and inorganic anions. *J. Chromatogr.*, 473 (1989) 171-188.
- 4266 Kim, M.R. and Sok, D.E.: Formation of 6,13-dihydroxyoctadecatrienoic acid isomers from  $\gamma$ -linolenic acid. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1154-1160.
- 4267 Kozukue, E., Tsuchida, H. and Mizuno, S.: (Physiological and biochemical studies of bamboo shoots. VI. Determination of homogentisic acid in bamboo shoots by column chromatography on Sephadex G-10 and reversed-phase HPLC). *Engei Gakkai Zasshi*, 57 (1988) 549-554; *C.A.*, 110 (1989) 169546h.
- 4268 Narita, S. and Kitagawa, T.: Application of fluorescent triazoles to analytical chemistry. II. Fluorescent derivatization of carboxylic acids. *Chem. Pharm. Bull.*, 37 (1989) 831-833.
- 4269 Nilve, G., Audunsson, G. and Jönsson, J.A.: Sample preparation by means of a supported liquid membrane for the determination of chlorophenoxyalkanoic acids. *J. Chromatogr.*, 471 (1989) 151-160.
- 4270 Pahuja, S.L. and Hochberg, R.B.: A comparison of the fatty acid esters of estradiol and corticosterone synthesized by tissues of the rat. *J. Biol. Chem.*, 264 (1989) 3216-3222.
- 4271 Pirkle, W.H. and McCune, J.E.: Improved chiral stationary phase for the separation of the enantiomers of chiral acids as their anilide derivatives. *J. Chromatogr.*, 471 (1989) 271-281.
- 4272 Powell, W.S. and Gravelle, F.: Metabolism of leukotriene B<sub>4</sub> to dihydro and dihydro-oxo-products by porcine leukocytes. *J. Biol. Chem.*, 264 (1989) 5364-5369.
- 4273 Russell, J.W.: Resolution of enantiomers of 2-(4-aryloxyphenoxy)propionic acid by liquid chromatography with a chiral eluent. *U.S. Pat.* US 4,786,732 (Cl. 544-354; C07D241/36), 22 Nov. 1988, Appl. 81,515, 05 Aug. 1987; 5 pp.; *C.A.*, 110 (1989) 185116y.
- 4274 Simon, T.C., Makheja, A.N. and Bailey, J.M.: Formation of 15-hydroxyeicosatetraenoic acid (15-HETE) as the predominant eicosanoid in aortas from Watanabe heritable hyperlipidemic and cholesterol-fed rabbits. *Atherosclerosis*, 75 (1989) 31-38; *C.A.*, 110 (1989) 190259b.

- 4275 Winkeler, H.D. and Levsen, K.: Low molecular weight organic acids in rain water. *Fresenius' Z. Anal. Chem.*, 333 (1989) 716.
- 4276 Zein, A. and Baerns, M.: Separation of the oxidation products of polycyclic aromatic hydrocarbons by reversed-phase HPLC combined with ion-pairing and ion-suppression techniques. *J. Chromatogr. Sci.*, 27 (1989) 249-258.

For additional information see:

C.A., 110 (1989) 160190e, 179238y, 179620s, 185095r, 191349t, 212138r, 230078a, 230258j.

See also 4071, 4079, 4143, 4165, 4166, 4188, 4282, 4289, 4331, 4813.

#### 11b. Prostaglandins

- 4277 Amin, M.: Simultaneous determination of prostaglandins (PG) E<sub>2</sub>, A<sub>2</sub> and B<sub>2</sub> and stability studies of PGE<sub>2</sub> in pharmaceutical preparations by ion-pair reversed-phase HPLC. *Pharm. Acta Helv.*, 64 (1989) 45-50; C.A., 110 (1989) 160447u.
- 4278 Feely, W.F., Dorman, R.V. and Shmukler, H.W.: Normal phase high-performance liquid chromatography of some prostaglandin B<sub>1</sub> derivatives. *J. Liq. Chromatogr.*, 12 (1989) 515-527.
- 4279 Hecker, M., Brüne, B., Decker, K. and Ullrich, V.: The sulfhydryl reagent thimerosal elicits human platelet aggregation by mobilization of intracellular calcium and secondary prostaglandin endoperoxide formation. *Biochem. Biophys. Res. Commun.*, 159 (1989) 961-968.
- 4280 Kikawa, Y., Nakai, A., Shigematsu, Y., Sudo, M., Suehiro, Y. and Hirao, T.: Rapid and simple assay method to study the content and the biosynthesis of peptide leukotrienes in whole blood. *J. Chromatogr.*, 491 (1989) 193-199.
- 4281 Mansuy, D., Boucher, J.L., Delaforge, M. and Leclaire, J.: Hydroxylation of leukotriene B<sub>4</sub> in leukocytes from various species: identification of a metabolite to authentic 5S,12R,19-trihydroxy-6Z,8E,10E,14Z-eicosatetraenoic acid and relative importance of 19- and 20-hydroxylations. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1283-1289.
- 4282 Nicolaou, K.C., Marron, B.E., Veale, C.A., Webber, S.E., Dahlen, S.E., Samuelsson, B. and Serhan, C.N.: Identification of a novel 7-*cis*-11-*trans*-lipoxin A<sub>4</sub> generated by human neutrophils: total synthesis, spasmogenic activities and comparison with other geometric isomers of lipoxins A<sub>4</sub> and B<sub>4</sub>. *Biochim. Biophys. Acta*, 1003 (1989) 44-53.
- 4283 Pettitt, T.R., Rowley, A.F. and Barrow, S.E.: Synthesis of leukotriene B and other conjugated triene lipoxigenase products by blood cells of the rainbow trout, *Salmo gairdneri*. *Biochim. Biophys. Acta*, 1003 (1989) 1-8.
- 4284 Robinson, C.: The use of HPLC in studies of the stereoselective metabolism of prostaglandin D<sub>2</sub>. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 3-13; C.A., 110 (1989) 205854t - a review with 19 refs.

For additional information see:

C.A., 110 (1989) 225614t.

#### 11c. Lipids and their constituents

- 4285 Büning-Pfaue, H., Eggert, R. and Bartsch, A.: Vergleich von Milchlipiden aus der Kristallisationsfraktionierung und einem kontinuierlichen Fraktionierungsverfahren mittels überkritischem Kohlendioxid. *Fat Sci. Technol.*, 91 (1989) 92-99.
- 4286 Celaa, M.V., Corzo, N. and Barron, L.J.R.: (Extraction, purification and chromatographic analysis of triglycerides). *Aliment., Equipos Tecnol.*, 8 (1989) 247-254; C.A., 110 (1989) 227869d - a review with 92 refs.
- 4287 Choe, H.-G., Wiegand, R.D. and Anderson, R.E.: Quantitative analysis of retina glycerolipid molecular species acetylated by acetolysis. *J. Lipid Res.*, 30 (1989) 454-457.
- 4288 Gottfries, J., Davidsson, P., Mansson, J.-E. and Svennerholm, L.: High-performance liquid chromatographic separation of gangliosides, combined with immunological detection and fast atom bombardment mass spectrometric characterization. *J. Chromatogr.*, 490 (1989) 263-274.
- 4289 Green, F.A.: Lipoxigenase activities of the epithelial cells of the human buccal cavity. *Biochem. Biophys. Res. Commun.*, 160 (1989) 545-551.

- 4290 Gutierrez, F., Albi, M.A., Palma, R., Rios, J.J. and Olias, J.M.: Bitter taste of virgin olive oil: correlation of sensory evaluation and instrumental HPLC analysis. *J. Food Sci.*, 54 (1989) 68-70; *C.A.*, 110 (1989) 171849c.
- 4291 Homan, R. and Pownall, H.J.: High-performance liquid chromatographic analysis of acylated lipids containing pyrene fatty acids. *Anal. Biochem.*, 178 (1989) 166-171.
- 4292 Juneja, L.R., Yamane, T. and Shimizu, S.: Enzymatic method of increasing phosphatidylcholine content of lecithin. *J. Am. Oil Chem. Soc.*, 66 (1989) 714-717.
- 4293 Kadowaki, H., Rys-Sikora, K.E. and Koff, R.S.: Separation of derivatized glycosphingolipids into individual molecular species by high performance liquid chromatography. *J. Lipid Res.*, 30 (1989) 616-627.
- 4294 Lee, T.J. and Smith, B.F.: Bovine gallbladder mucin promotes cholesterol crystal nucleation form cholesterol - transporting vesicles in supersaturated model bile. *J. Lipid Res.*, 30 (1989) 491-498.
- 4295 Martin, E., Duret, M. and Vogel, J.: (Determination of mono- and diglycerides by high-performance liquid chromatography (HPLC)). *Mitt. Geb. Lebensmittelunters. Hyg.*, 79 (1989) 406-412; *C.A.*, 110 (1989) 211070a.
- 4296 Mouillac, B., Balestre, M.-N. and Guillon, G.: Transient inositol (1,4,5) trisphosphate accumulation under vasopressin stimulation in WRK<sub>1</sub> cells: correlation with intracellular calcium mobilization. *Biochem. Biophys. Res. Commun.*, 159 (1989) 953-960.
- 4297 Ramesha, C.S., Pickett, W.C. and Murthy, D.V.K.: Sensitive method for the analysis of phospholipid subclasses and molecular species as 1-anthroyl derivatives of their diglycerides. *J. Chromatogr.*, 491 (1989) 37-48.
- 4298 Sato, K., Arishima, T., Wang, Z.H., Ojima, K., Sagi, N. and Mori, H.: Polymorphism of POP and SOS. I. Occurrence and polymorphism transformation. *J. Am. Oil Chem. Soc.*, 66 (1989) 664-674.
- 4299 Scarim, J., Ghanbari, H., Taylor, V. and Menon, G.: Determination of phosphatidylcholine and disaturated phosphatidylcholine content in lung surfactant by high performance liquid chromatography. *J. Lipid Res.*, 30 (1989) 607-611.
- 4300 Seewald, M. and Eichinger, H.M.: Separation of major phospholipid classes by high-performance liquid chromatography and subsequent analysis of phospholipid-bound fatty acids using gas chromatography. *J. Chromatogr.*, 469 (1989) 271-280.
- 4301 Senn, H.-J., Orth, M., Fitzke, E., Wieland, H. and Gerok, W.: Gangliosides in normal human serum. Concentration, pattern and transport by lipoproteins. *Eur. J. Biochem.*, 181 (1989) 657-662.
- 4302 Steinbrecher, U.P. and Pritchard, P.H.: Hydrolysis of phosphatidylcholine during LDL oxidation is mediated by platelet-activating factor acetylhydrolase. *J. Lipid Res.*, 30 (1989) 305-315.
- 4303 Stephens, L., Hawkins, P.T. and Downes, C.P.: Metabolic and structural evidence for the existence of a third species of polyphosphoinositide in cell: D-phosphatidyl-myo-inositol 3-phosphate. *Biochem. J.*, 259 (1989) 267-276.
- 4304 Subbaiah, P.V. and Pritchard, P.H.: Molecular species of phosphatidylcholine in familial lecithin-cholesterol acyltransferase deficiency: effect of enzyme supplementation. *Biochim. Biophys. Acta*, 1003 (1989) 145-150.
- 4305 Sun, G.Y. and Lin, T.N.: Time course for labeling of brain membrane phosphoinositides and other phospholipids after intracerebral injection of [<sup>32</sup>P]-ATP. Evaluation by an improved HPTLC procedure. *Life Sci.*, 44 (1989) 689-696; *C.A.*, 110 (1989) 169540b.
- 4306 Weber, K., Schulte, E. and Thier, H.-P.: Vergleich des Triglyceridmusters von Human - milch und Säuglingsnahrungen. *Fat Sci. Technol.*, 91 (1989) 113-115.
- 4307 Wojtusik, M.J., Brown, P.R. and Turcotte, J.G.: Separation and detection of triacylglycerols by high-performance liquid chromatography. *Chem. Rev.*, 89 (1989) 397-406; *C.A.*, 110 (1989) 165250j - a review with 138 refs.
- 4308 Yamaguchi, M., Hara, S., Takemori, Y. and Nakamura, M.: HPLC of monosialo-gangliosides in human plasma with fluorescence detection. *Anal. Sci.*, 5 (1989) 35-38; *C.A.*, 110 (1989) 150722r.
- 4309 Zinnen, H.A.: Process for separating mono-, di- and triglycerides. *U.S. Pat.* US 4,797,233 (Cl. 260-428.5; C11C1/8), 10 Jan. 1989, Appl. 898,300, 20 Aug. 1986; 21 pp.; *C.A.*, 110 (1989) 215573q.

For additional information see:

*C.A.*, 110 (1989) 169533b, 169554j, 169560h, 208926d.

See also 4099.

## 11d. Lipoproteins and their constituents

- 4310 Cheung, M.C. and Wolf, A.C.: *In vitro* transformation of apoA-I-containing lipoprotein subpopulations: role of lecithin:cholesterol acyltransferase and apoB-containing lipoproteins. *J. Lipid Res.*, 30 (1989) 499-509.
- 4311 Chino, H., Kiyomoto, Y. and Takahashi, K.: *In vitro* study of the action of adipokinetic hormone in locusts. *J. Lipid Res.*, 30 (1989) 571-578.
- 4312 Eastman, S., Wilschut, J., Cullis, P.R. and Hope, M.J.: Intervesicular exchange of lipids with weak acid and weak base characteristics: influence of trans-membrane pH gradients. *Biochim. Biophys. Acta*, 981 (1989) 178-184.
- 4313 Marzetta, C.A., Johnson, F.L., Zech, L.A., Foster, D.M. and Rudel, L.L.: Metabolic behavior of hepatic VLDL and plasma LDL apoB-100 in African green monkeys. *J. Lipid Res.*, 30 (1989) 357-370.
- 4314 Maurice, R., Marcel, Y.L., Innerarity, T.L. and Milne, R.W.: A potential complication in the use of monoclonal antibodies: inhibition of apoB-mediated receptor binding by an anti-apoE antibody. *J. Lipid Res.*, 30 (1989) 587-596.
- 4315 Rye, K.-A.: Interaction of the high density lipoprotein conversion factor with recombinant discoidal complexes of egg phosphatidylcholine, free cholesterol, and apolipoprotein A-I. *J. Lipid Res.*, 30 (1989) 335-346.

See also 4302, 4626.

## 13. STEROIDS

- 4316 Iwata, J. and Suga, T.: Direct determination of four sulfates and seven glucuronides of 17-oxosteroids in urine by fluorescence "high-performance" liquid chromatography. *Clin. Chem. (Winston-Salem)*, 35 (1989) 794-799.
- 4317 Nicolas, A. and Leroy, P.: New chromatographic methods for *in vitro* glucuronidation studies. *Inst. Natl. Sante Rech. Med., (Colloq.)*, 173 (Cell. Mol. Aspects Glucuronidation) (1988) 201-209; *C.A.*, 110 (1989) 188656k.

See also 4074.

## 13a. Pregnane and androstane derivatives

- 4318 De Brabander, H.F., Vanhee, P., van Hoye, S. and Verbeke, R.: Improved chromatographic clean-up of anabolic in bovine urine. *J. Planar. Chromatogr.-Mod. TLC*, 2 (1989) 33-38; *C.A.*, 110 (1989) 166236w.
- 4319 Huang, J.X. and Guiochon, G.: Competitive adsorption behavior in HPLC: *cis*- and *trans*-androsterone on silica. *J. Colloid Interface Sci.*, 128 (1989) 577-591; *C.A.*, 110 (1989) 180038q.
- 4320 Osman, R.A., Andria, M.L., Jones, A.D. and Meizel, S.: Steroid induced exocytosis: the human sperm acrosome reaction. *Biochem. Biophys. Res. Commun.*, 160 (1989) 828-833.
- 4321 Rahman, A. and Hoffman, N.E.: Determination of danazol in plasma by high performance liquid chromatography. *Anal. Lett.*, 22 (1989) 377-386.
- 4322 Shah, S., Ashraf-Khorassani, M. and Taylor, L.T.: Normal-phase liquid and supercritical-fluid chromatographic separations of steroids with Fourier-transform infrared spectrometric detection. *Chromatographia*, 27 (1989) 441-448.
- 4323 Tu, Y.-H. and Allen, L.V., Jr.: *In vitro* iontophoretic studies using a synthetic membrane. *J. Pharm. Sci.*, 78 (1989) 211-213.

For additional information see:  
*C.A.*, 110 (1989) 166238y.

See also 4826.

## 13b. Estrogens

For additional information see:  
*C.A.*, 110 (1989) 173558f.

## 13c. Sterols

- 4324 Grob, K., Lanfranchi, M. and Mariani, C.: Determination of free and esterified sterols and of wax esters in oils and fats by coupled liquid chromatography-gas chromatography. *J. Chromatogr.*, 471 (1989) 397-405.
- 4325 Ikekawa, N., Fujimoto, Y., Kadota, S. and Kikuchi, T.: Effective separation of sterol C-24 epimers. *J. Chromatogr.*, 468 (1989) 91-98.
- 4326 Krylov, Yu.F., Krynetskii, E.Yu., Prokhorov, B.S. and Oretskaya, T.S.: (Multi-dimensional HPLC with UV detection of plant sterols). *Khim. Prir. Soedin.*, (1988) 831-836; *C.A.*, 110 (1989) 188661h.
- 4327 Nourooz-Zadeh, J. and Appelqvist, L.A.: Cholesterol oxides in Swedish food and food ingredients: lard and bacon. *J. Am. Oil Chem. Soc.*, 66 (1989) 586-592.
- 4328 Peacock, G.A. and Goosey, M.W.: Separation of fungal sterols by normal-phase high-performance liquid chromatography. Application to the evaluation of ergosterol biosynthesis inhibitors. *J. Chromatogr.*, 469 (1989) 293-304.
- 4329 Popjak, G., Meenan, A., Parish, E.J. and Nes, W.D.: Inhibition of cholesterol synthesis and cell growth by 24(R,S),25-iminolanosterol and triparanol in cultured rat hepatoma cells. *J. Biol. Chem.*, 264 (1989) 6230-6238.
- 4330 Schwadorf, K. and Müller, H.-M.: Determination of ergosterol in cereals, mixed feed components, and mixed feeds by liquid chromatography. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 457-462.
- 4331 Seitz, L.M.: Stanol and sterol esters of ferulic and *p*-coumaric acids in wheat, corn, rye and triticale. *J. Agric. Food Chem.*, 37 (1989) 662-667.
- 4332 Sonoda, Y., Sekigawa, Y. and Sato, Y.: Metabolism of 24,25-dihydrolanosterol analogs by partially purified cytochrome P-450<sub>14DM</sub> from rat liver microsomes. *Chem. Pharm. Bull.*, 37 (1989) 718-722.

See also 4294, 4336.

## 13d. Bile acids and alcohols

- 4333 Campbell, G.R., Odling-Smee, W. and Irvine, G.B.: Comparison of methods for detection of bile acids and their conjugates in serum after analysis by HPLC. *Biochem. Soc. Trans.*, 17 (1989) 374-375; *C.A.*, 110 (1989) 188692u.
- 4334 Campbell, G.R., Odling-Smee, G.W., Rowlands, B.J. and Irvine, G.B.: Determination of bile acids and their conjugates in serum by HPLC using immobilized 3 $\alpha$ -hydroxysteroid dehydrogenase for detection. *Biomed. Chromatogr.*, 3 (1989) 75-78.
- 4335 Goto, J., Shao, G., Miura, H. and Nambara, T.: Studies on steroids. CCXLII. Separation of C-25 epimers of 5 $\beta$ -cholestanic acids by HPLC with precolumn fluorescence labeling. *Anal. Sci.*, 5 (1989) 19-22; *C.A.*, 110 (1989) 188657m.
- 4336 Karlaganis, G., Bradley, S.E., Boyer, J.L., Batta, A.K., Salen, G., Eggestad, B. and Sjövall, J.: A bile alcohol sulfate as a major component in the bile of the small skate (*Raja erinacea*). *J. Lipid Res.*, 30 (1989) 317-322.
- 4337 Labbe, D., Gerhardt, M.F., Myara, A., Vercambre, C. and Trivin, F.: High-performance liquid chromatographic determination of tauro- and glyco-conjugated bile acids in human serum. *J. Chromatogr.*, 490 (1989) 275-284.
- 4338 Shimada, K., Komine, Y. and Oe, T.: Chromatographic behavior of bile acids using cyclodextrin in mobile phase of high performance liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 491-500.
- 4339 Une, M., Tsujimura, K., Kihira, K. and Hoshita, T.: Identification of (22R)-3 $\alpha$ ,7 $\alpha$ ,12 $\alpha$ ,22- and (23R)-3 $\alpha$ ,7 $\alpha$ ,12 $\alpha$ ,23-tetrahydroxy-5 $\beta$ -cholestanic acids in urine from a patient with Zellweger's syndrome. *J. Lipid Res.*, 30 (1989) 541-547.

For additional information see:  
*C.A.*, 110 (1989) 199296u.

## 13e. Ecdysones and other insect steroid hormones

- 4340 Howarth, O.W., Thompson, M.J. and Rees, H.H.: Reaction of 3-dehydroecdysone with certain NMR solvents. *Biochem. J.*, 259 (1989) 299-302.

*13f. Other steroids*

- 4341 Gamoh, K. and Takatsuto, S.: A boronic acid derivative as a highly sensitive fluorescence derivatization reagent for brassinosteroids in liquid chromatography. *Anal. Chim. Acta*, 222 (1989) 201-204.
- 4342 Gamoh, K., Omote, K., Okamoto, N. and Takatsuto, S.: High-performance liquid chromatography of brassinosteroids in plants with derivatization using 9-phenanthreneboronic acid. *J. Chromatogr.*, 469 (1989) 424-428.

For additional information see:  
*C.A.*, 110 (1989) 166217r.

## 14. STEROID GLYCOSIDES AND SAPONINS

- 4343 Hattori, M., Kawata, Y., Kakiuchi, N., Matsuura, K. and Namba, T.: Application of liquid chromatography-mass spectrometry to the qualitative analysis of saponins (I). *Shoyakugaku Zasshi*, 42 (1988) 228-235; *C.A.*, 110 (1989) 160438s.
- 4344 Young, H.S., Park, J.C. and Choi, J.S.: Analytical separation of isomeric saponins by LC/MS (liquid chromatography/mass spectrometry). *Saengyak Hakhoehi*, 19 (1988) 248-250; *C.A.*, 110 (1989) 199297v.

For additional information see:  
*C.A.*, 110 (1989) 147849g.

## 15. TERPENES AND OTHER VOLATILE AROMATIC COMPOUNDS

*15a. Terpenes*

- 4345 Pekic, B., Slavica, B. and Lepojevic, Z.: (Determination and preparative isolation of chamazulene from essential oil of chamomile). *Arch. Pharm.*, 38 (1988) 177-182; *C.A.*, 110 (1989) 219166g.
- 4346 Pieters, L.A.C. and Vlietinck, A.J.: Vacuum liquid chromatography and quantitative proton NMR spectroscopy of tumor-promoting diterpene esters. *J. Nat. Prod.*, 52 (1989) 186-190; *C.A.*, 110 (1989) 207295k.

For additional information see:  
*C.A.*, 110 (1989) 173590k.

See also 4317.

*15b. Essential oils*

See 4345.

## 16. NITRO AND NITROSO COMPOUNDS

- 4347 Laurensen, J.J. and Nouws, J.F.M.: Simultaneous determination of nitrofuran derivatives in various animal substrates by high-performance liquid chromatography. *J. Chromatogr.*, 472 (1989) 321-326.

See also 4071, 4718.



## 17. AMINES, AMIDES AND RELATED NITROGEN COMPOUNDS

## 17a. Amines and polyamines

- 4348 Krasikov, V.D., Nesterov, V.V., Vilenchik, L.Z., Belen'kii, B.G., Sklizkova, V.P., Kudryavtsev, V.V. and Koton, M.M.: (Method for determination of aromatic amines and nitro and halo derivatives by reversed-phase liquid chromatography). *U.S.S.R. Pat.* SU 1,453,320 (Cl. GOIN30/00), 23 Jan. 1989, Appl. 4,282,498, 01 Jun. 1987; *C.A.*, 110 (1989) 224783k.
- 4349 Lin, C., Mihal, K.A. and Krueger, R.J.: N-Iodoacetyltyramine: preparation and use in  $^{125}\text{I}$  labeling by alkylation of sulfhydryl groups. *Anal. Biochem.*, 179 (1989) 389-395.
- 4350 Meyer, E. and Engelhardt, H.: Influence of residual silanol groups on the separation and asymmetry of basic compounds in RP-HPLC. *Fresenius' Z. Anal. Chem.*, 333 (1989) 734.
- 4351 Mower, H.F., Bhagavan, N.V., Pontius, E.B. and McDermott, J.F.: Tyramine content of Asian and Pacific foods determined by high performance liquid chromatography. *Food Chem.*, 31 (1989) 251-257; *C.A.*, 110 (1989) 191346q.
- 4352 Slocum, R.D., Flores, H.E., Galston, A.W. and Weinstein, L.H.: Improved method for HPLC analysis of polyamines, agmatine and aromatic monoamines in plant tissue. *Plant Physiol.*, 89 (1989) 512-517; *C.A.*, 110 (1989) 150727w.
- 4353 Streeter, A.J., Nims, R.W., Hrabie, J.A., Heur, Y. and Keefer, L.K.: Sex differences in the single-dose toxicokinetics of N-nitrosomethyl(2-hydroxyethyl)amine in the rat. *Cancer Res.*, 49 (1989) 1783-1789.
- 4354 Takadate, A., Yagashiro, I., Irikura, M., Fujino, H. and Goya, S.: 3-(7-Methoxycoumarin-3-carbonyl)- and 3-(7-dimethylaminocoumarin-3-carbonyl)-2-oxazolones as new fluorescent labeling reagents for high-performance liquid chromatography. *Chem. Pharm. Bull.*, 37 (1989) 373-376.
- 4355 Van Huysse, J.W., Bowsher, R.R., Willis, L.R. and Henry, D.P.: The simultaneous measurement of multiple urinary arylalkylamines. *Biol. Amines*, 6 (1989) 279-288; *C.A.*, 110 (1989) 225611q.
- 4356 Yerokun, T., Kirilin, W.G., Trinidad, A., Ferguson, R.J. and Ogolla, F., Andrews, A.F., Brady, P.K. and Hein, D.W.: Identification and kinetic characterization of acetylator genotype-dependent and -independent arylamine carcinogen N-acetyltransferases in hamster bladder cytosol. *Drug Metab. Disp.*, 17 (1989) 231-237.

See also 4079, 4603.

## 17b. Catecholamines and their metabolites

- 4357 Blandina, P., Knott, P.J., Leung, L.K.H. and Green, J.P.: Stimulation of histamine  $\text{H}_2$  receptor in rat hypothalamus releases endogenous norepinephrine. *J. Pharmacol. Exp. Ther.*, 249 (1989) 44-51.
- 4358 Gerhardt, G.A., Drebing, C.J. and Freedman, R.: Measurement of plasma free catecholamines and their metabolites by high-pressure liquid chromatography with electrochemical detection. *Neurol. Neurobiol.*, 42C (Probr. Catecholamine Res., Pt. C) (1988) 189-196; *C.A.*, 110 (1989) 205801y.
- 4359 Hall, M.E., Hoffer, B.J. and Gerhardt, G.A.: Rapid and sensitive determination of catecholamines in small tissue samples by HPLC coupled with dual-electrode coulometric electrochemical detection. *LC-GC*, 7 (1989) 258-265; *C.A.*, 110 (1989) 225594m.
- 4360 Heal, D.J., Prow, M.R. and Buckett, W.R.: Measurement of 3-methoxy-4-hydroxyphenylglycol in mouse brain by HPLC with electrochemical detection, as an index of noradrenaline utilization and presynaptic  $\alpha_2$ -adrenoceptor function. *Br. J. Pharmacol.*, 96 (1989) 547-556; *C.A.*, 110 (1989) 148013s.
- 4361 Ohkura, Y. and Nohta, H.: (Measurement of physiologically active amine). *Rinsho Kensa*, 32 (1988) 1522-1527; *C.A.*, 110 (1989) 147926e - a review with 21 refs.

- 4362 Rutenfranz, J., Ottmann, W., Neidhart, B. and Brockmann, W.: Comparison of two analytical procedures for the determination of free urinary catecholamines under the demands of shiftwork experiments. *Int. Arch. Occup. Environ. Health*, 61 (1988) 89-93; *C.A.*, 110 (1989) 147989c.

For additional information see:  
*C.A.*, 110 (1989) 228076e.

See also 4108, 4704.

17c. *Urea and guanidine derivatives*

- 4363 Gordon, B.H., Richards, R.P., Hiley, M.P., Gray, A.J., Ings, R.M.J. and Campbell, D.B.: A new method for the measurement of nitrosoureas in plasma: an HPLC procedure for the measurement of fotemustine kinetics. *Xenobiotica*, 19 (1989) 329-339; *C.A.*, 110 (1989) 204970r.

17d. *Other amine derivatives and amides (excluding peptides)*

- 4364 Ahuja, S., Thompson, G. and Smith, J.: Trace/ultratrace analyses of unstable compounds. Investigations on hydrazobenzene and azobenzene. *J. Chromatogr.*, 471 (1989) 443-446.
- 4365 Furuya, H., Shimizu, T., Hatano, M. and Fujii-Kuriyama, Y.: Mutations at the distal and proximal sites of cytochrome P-450<sub>d</sub> changed regio-specificity of acetanilide hydroxylations. *Biochem. Biophys. Res. Commun.*, 160 (1989) 669-676.
- 4366 Hadley, M. and Draper, H.H.: Identification of N-(2-propenal)ethanolamine as a urinary metabolite of malondialdehyde. *Free Radical Biol. Med.*, 6 (1989) 49-52; *C.A.*, 110 (1989) 150691e.
- 4367 Robb, S., Packman, L.C. and Evans, P.D.: Isolation, primary structure and bioactivity of SchistoFLRF-amide, a FMRF-amide-like neuropeptide from the locust *Schistocerca gregaria*. *Biochem. Biophys. Res. Commun.*, 160 (1989) 850-856.
- 4368 Schreyer, M., Domke, W.-D. and Stini, S.: HPLC determination of the isomeric ratios of diphenylmethane diisocyanate in modified isocyanates. *J. Chromatogr. Sci.*, 27 (1989) 262-266.

18. AMINO ACIDS AND PEPTIDES; CHEMICAL STRUCTURE OF PROTEINS

18a. *Amino acids and their derivatives*

- 4369 Aberhart, D.J.: HPLC separation of  $\alpha$ - and  $\beta$ -leucine. *Methods Enzymol.*, 166 (Branched Chain Amino Acids) (1988) 17-19; *C.A.*, 110 (1989) 188667q.
- 4370 Ageola, O., Buchanan-Smith, J.G. and Early, R.J.: Gas and high-performance liquid chromatographic analyses of amino acids in soybean meal, corn and triticale. *J. Food Biochem.*, 12 (1988) 171-181; *C.A.*, 110 (1989) 211046x.
- 4371 Bartlett, K. and Causey, A.G.: Radiochemical HPLC methods for the study of branched-chain amino acid metabolism. *Methods Enzymol.*, 166 (Branched Chain Amino Acids) (1988) 79-92; *C.A.*, 110 (1989) 188671m.
- 4372 Blankenship, D.T., Krivanek, M.A., Ackermann, B.L. and Cardin, A.D.: High-sensitivity amino acid analysis by derivatization with *o*-phthalaldehyde and 9-fluorenylmethyl chloroformate using fluorescence detection: applications in protein structure determination. *Anal. Biochem.*, 178 (1989) 227-232.
- 4373 Canepa, A., Pfrumo, F., Carrea, A., Sanguineti, A., Piccardo, M.T. and Gusmano, R.: Measurement of free amino acids in polymorphonuclear leukocytes by high-performance liquid chromatography. *J. Chromatogr.*, 491 (1989) 200-208.
- 4374 Chase, G.W., Jr., Landen, W.O., Jr., Gelbaum, L.T. and Soliman, A.-G.M.: Ion-exchange chromatographic determination of hypoglycin A and canned ackee fruit. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 374-377.
- 4375 Costa, M., Pecci, L., Pensa, B., Fontana, M. and Cavallini, D.: High-performance liquid chromatography of cystathionine, lanthionine and aminoethylcysteine using *o*-phthalaldehyde precolumn derivatization. *J. Chromatogr.*, 490 (1989) 404-410.

- 4376 Dalgaard, L., Hansen, J.J. and Pedersen, J.L.: Resolution and binding site determination of D,L-thyroxine by high-performance liquid chromatography using immobilized albumin as chiral stationary phase. Determination of the optical purity of thyroxine in tablets. *J. Pharm. Biomed. Anal.*, 7 (1989) 361-368.
- 4377 Duchateau, A., Crombach, M., Kamphuis, J., Boesten, W.H.J., Schoemaker, H.E. and Meijer, E.M.: Determination of the enantiomers of  $\alpha$ -H- $\alpha$ -amino acids,  $\alpha$ -alkyl- $\alpha$ -amino acids and the corresponding acid amides by high-performance liquid chromatography. *J. Chromatogr.*, 471 (1989) 263-270.
- 4378 Euerby, M.R., Partridge, L.Z. and Nunn, P.B.: Resolution of neuroactive non-protein amino acid enantiomers by high-performance liquid chromatography utilising pre-column derivatisation with *o*-phthaldialdehyde-chain thiols. Application to 2-amino- $\omega$ -phosphonoalkanoic acid homologues and  $\alpha$ -amino- $\beta$ -N-methylaminopropanoic acid ( $\beta$ -methylaminoalanine). *J. Chromatogr.*, 469 (1989) 412-419.
- 4379 Fahey, R.C.: Methods for determination of glutathione and derivatives using HPLC. *Coenzymes Cofactors*, 3 (Glutathione; Chem., Biochem. Med. Aspects, Pt. A) (1989) 303-337; *C.A.*, 110 (1989) 168738k - a review with 143 refs.
- 4380 Garcia Alvarez-Coque, M.C., Medina Hernandez, M.J., Villanueva Camanas, R.M. and Mongay Fernandez, C.: Formation and instability of *o*-phthalaldehyde derivatives of amino acids. *Anal. Biochem.*, 178 (1989) 1-7.
- 4381 Jacobsen, D.W., Gatautis, V.J. and Green, R.: Determination of plasma homocysteine by high-performance liquid chromatography with fluorescence detection. *Anal. Biochem.*, 178 (1989) 208-214.
- 4382 Jin, R. and He, B.: Chiral polymers and optical resolution: investigation of the mechanism of ligand exchange for resolution of DL-amino acids. *J. Liq. Chromatogr.*, 12 (1989) 501-513.
- 4383 Jinno, K. and Yamagami, M.: Simultaneous flow rate and temperature programming based on computer-assisted retention for the separation of PTH-amino acids in reversed-phase microcolumn liquid chromatography. *Chromatographia*, 27 (1989) 417-424.
- 4384 Johanni, M., Hofmann, P. and Leistner, E.: Origin of *p*-aminobenzoic acid from chorismic rather than iso-chorismic acid in *Enterobacter aerogenes* and *Streptomyces* species. *Arch. Biochem. Biophys.*, 271 (1989) 495-501.
- 4385 Kajander, E.O., Pajula, R.-L., Harvima, R.J. and Eloranta, T.O.: Synthesis and analysis of selenomethionine metabolites. *Anal. Biochem.*, 179 (1989) 396-400.
- 4386 Keller, J.W. and Niwa, K.: Milligram-scale separation of optical isomers of 2-pentafluoroethylalanine and 2-trifluoromethylalanine by medium-performance reversed-phase chromatography. *J. Chromatogr.*, 469 (1989) 434-439.
- 4387 Kisby, G.E., Roy, D.N. and Spencer, P.S.: Determination of  $\beta$ -N-methylamino-L-alanine in plant (*Cycas circinalis* L.) and animal tissue by precolumn derivatization with 9-fluorenylmethyl chloroformate and reversed-phase HPLC. *J. Neurosci. Methods*, 26 (1988) 45-54; *C.A.*, 110 (1989) 149231y.
- 4388 Kochhar, S. and Christen, P.: Amino acid analysis by high-performance liquid chromatography after derivatization with 1-fluoro-2,4-dinitrophenyl-5-L-alanine amide. *Anal. Biochem.*, 178 (1989) 17-21.
- 4389 Lunte, S.M., Mohabbat, T., Wong, O.S. and Kuwana, T.: Determination of desmosine, isodesmosine, and other amino acids by liquid chromatography with electrochemical detection following precolumn derivatization with naphthalenedialdehyde/cyanide. *Anal. Biochem.*, 178 (1989) 202-207.
- 4390 Miller, E.L., Juritz, J.M., Barlow, S.M. and Jacobus, P.H.: Accuracy of amino acid analysis of fish meals by ion-exchange and gas chromatography. *J. Sci. Food Agric.*, 47 (1989) 293-310; *C.A.*, 110 (1989) 230273k.
- 4391 Mori, H., Morikawa, S., Taniguchi, S., Fujii, K., Fujiwara, M., Fujiwara, M. and Hosaka, K.: Interrelationship between  $\text{Ca}^{2+}$ -dependent phospholipid base-exchange reaction and phospholipase D-like activity in bovine retina. *Biochim. Biophys. Acta*, 1003 (1989) 98-107.
- 4392 Moro, L., Battista, C., Modricky, C., Rovis, D., de Bernard, B., Traldi, P., Lubrano, G. and Marotti, F.: High-performance liquid chromatographic preparation of galactosyl-hydroxylysine, a specific bone collagen marker. *J. Chromatogr.*, 490 (1989) 285-292.
- 4393 Murai, S., Nagahama, H., Saito, H., Miyate, H., Masuda, Y. and Itoh, T.: Very rapid assay of gamma-aminobutyric acid in mouse brain regions within 3 minutes by HPLC with electrochemical detection. *J. Pharmacol. Methods*, 21 (1989) 115-121; *C.A.*, 110 (1989) 225596p.

- 4394 Ohmiya, Y., Suzuki, S. and Kondo, Y.: Isolation and characterization of hagfish thyroid iodoprotein by its non-thyroglobulin nature, very high iodine and carbohydrate contents and low hormone/iodine ratio. *Eur. J. Biochem.*, 182 (1989) 11-18.
- 4395 O'Shannessy, D.J., Ekberg, B., Andersson, L.I. and Mosbach, K.: Recent advances in the preparation and use of molecularly imprinted polymers for enantiomeric resolution of amino acid derivatives. *J. Chromatogr.*, 470 (1989) 391-399.
- 4396 Qureshi, G.A., Qureshi, A.R. and Bergström, J.: Quantitation of free amino acids in plasma and muscle samples in healthy subjects and uremic patients by high-performance liquid chromatography and fluorescence detection. *J. Pharm. Biomed. Anal.*, 7 (1989) 377-384.
- 4397 Schalinske, K.L. and Steele, R.D.: Quantitation of carbon flow through the hepatic folate-dependent one-carbon pool in rats. *Arch. Biochem. Biophys.*, 271 (1989) 49-55.
- 4398 Shimada, K., Kawai, Y., Oe, T. and Nambara, T.: Determination of amino acids by high-performance with electrochemical detection using ferrocene derivatization reagents. *J. Liq. Chromatogr.*, 12 (1989) 359-371.
- 4399 Stocchi, V., Piccoli, G., Magnani, M., Palma, F., Biagiarelli, B. and Cucchiaroni, L.: Reversed-phase high-performance liquid chromatography separation of dimethylaminoazobenzene sulfonyl- and dimethylaminoazobenzene thiohydantoin-amino acid derivatives for amino acid analysis and microsequencing studies at the picomole level. *Anal. Biochem.*, 178 (1989) 107-117.
- 4400 Strang, C.J., Henson, E., Okamoto, Y., Paz, M.A. and Gallop, P.M.: Separation and determination of  $\alpha$ -amino acids by boroxazolidone formation. *Anal. Biochem.*, 178 (1989) 276-286.
- 4401 Tomokuni, K., Ichiba, M., Hirai, Y., Sugimoto, K., Yoshida, T. and Hirata, M.: Comparison between the fluorometric HPLC method and the conventional method for determining urinary  $\delta$ -aminolevulinic acid and coproporphyrin as indices of lead exposure. *Int. Arch. Occup. Environ. Health*, 61 (1988) 153-156; *C.A.*, 110 (1989) 149232z.
- 4402 Tous, G.I., Fausnaugh, J.L., Akinyosoye, O., Lackland, H., Winter-Cash, P., Vitorica, F.J. and Stein, S.: Amino acid analysis on polyvinylidene difluoride membranes. *Anal. Biochem.*, 179 (1989) 50-55.
- 4403 Tsuboi, S. and Okada, Y.: Amino acids and peptides. XXIII. Synthesis of  $N^{\alpha}$ -protected amino acid 6-chloro-2-pyridyl esters and their evaluation for peptide synthesis. *Chem. Pharm. Bull.*, 37 (1989) 46-49.
- 4404 Ziegler, S.J. and Sticher, O.: Optimization of the mobile phase for HPLC separation of S-alk(en)yl-L-cysteine derivatives and their corresponding sulfoxide isomers. *J. Liq. Chromatogr.*, 12 (1989) 199-220.

For additional information see:

*C.A.*, 110 (1989) 152881r, 208900r, 227942x, 228149f, 232067v.

See also 4071, 4108, 4141, 4143, 4545, 4584, 4682.

#### 18b. Peptides and peptidic and proteinous hormones

- 4405 Adams, M.L. and Cicero, T.J.: The ontogeny of immunoreactive  $\beta$ -endorphin and  $\beta$ -lipotropin in the rat ovary. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1171-1176.
- 4406 Araki, F., Nakamura, H., Nojima, N., Tsukumo, K. and Sakamoto, S.: Stability of recombinant human epidermal growth factor in various solutions. *Chem. Pharm. Bull.*, 37 (1989) 404-406.
- 4407 Bosserhoff, A., Wallach, J. and Frank, R.W.: Micropreparative separation of peptides derived from sodium dodecyl sulphate-solubilized proteins. *J. Chromatogr.*, 473 (1989) 71-77.
- 4408 Dörner, T., Gagelmann, M., Hock, D., Herbst, F. and Forssmann, W.-G.: Separation of synthetic cardiodilatin/atrial natriuretic factor and related peptides by reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 490 (1989) 411-417.
- 4409 Fassina, G., Lebl, M. and Chaiken, I.M.: Screening the recognition properties of peptide hormone sequence mutants by analytical high performance liquid affinity chromatography on immobilized neurophysin. *Collet. Czech. Chem. Commun.*, 53 (1988) 2627-2636; *C.A.*, 110 (1989) 147994a.

- 4410 Fiedler, F. and Geiger, R.: Separation of kinins by high-performance liquid chromatography. *Methods Enzymol.*, 163 (Immunochem. Tech., Pt. M) (1988) 257-262; *C.A.*, 110 (1989) 205921n.
- 4411 Fink, J., Merrifield, R.B., Boman, A. and Boman, H.G.: The chemical synthesis of cecropin D and an analog with enhanced antibacterial activity. *J. Biol. Chem.*, 264 (1989) 6260-6267.
- 4412 Fransson, B., Grehn, L. and Ragnarsson, U.: Liquid chromatographic separation of acidic phosphoserine peptides on macroporous copoly(styrene-divinylbenzene) using amines to regulate retention. *J. Chromatogr.*, 473 (1989) 63-69.
- 4413 Gierse, J.K., Olins, P.O., Devine, C.S., Marlay, J.D., Obukowicz, M.G., Mortensen, L.H., McMahon, E.G., Blaine, E.H. and Seetharam, R.: Expression, purification, and *in vivo* activity of atrial natriuretic factor prohormone produced in *Escherichia coli*. *Arch. Biochem. Biophys.*, 271 (1989) 441-446.
- 4414 Gossen, D., Vandermeers, A., Vandermeers-Piret, M.C., Rathe, J., Cauvin, A., Robberecht, P. and Christophe, J.: Isolation and primary structure of rat secretin. *Biochem Biophys. Res. Commun.*, 160 (1989) 862-867.
- 4415 Gross, D., Skuorak, A., Hendrick, G., Weir, G., Villa-Komaroff, L. and Halban, P.: Oxidation of rat insulin II, but not I, leads to anomalous elution profiles upon HPLC analysis of insulin-related peptides. *FEBS Lett.*, 241 (1988) 205-208; *C.A.*, 110 (1989) 166258e.
- 4416 Gupta, S., Roberts, D.W. and Renwick, J.A.A.: Preparative isolation of destruxins from *Metarhizium anisopliae* by high-performance liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 383-395.
- 4417 Hayashi, T., Sakamoto, S., Shikanabe, M., Wada, I. and Yoshida, H.: HPLC analysis of human epidermal growth factor using immunoaffinity precolumn. I. Optimization of immunoaffinity column. *Chromatographia*, 27 (1989) 569-573.
- 4418 Hayashi, T., Sakamoto, S., Wada, I. and Yoshida, H.: HPLC analysis of human epidermal growth factor using immunoaffinity precolumn. II. Determination of hEGFs in biological fluids. *Chromatographia*, 27 (1989) 574-580.
- 4419 Higa, T. and Desiderio, D.M.: Optimizing recovery of peptides from an octadecylsilyl (ODS) cartridge. *Int. J. Pept. Protein Res.*, 33 (1989) 250-255; *C.A.*, 110 (1989) 225613s.
- 4420 Janssen, P.S., van Nispen, J.W., van Zeeland, M.J.M. and Melgers, P.A.T.A.: Complementary information from isotachopheresis and high-performance liquid chromatography in peptide analysis. *J. Chromatogr.*, 470 (1989) 171-183.
- 4421 Kagedal, B., Källberg, M., Arstrand, K. and Hansson, C.: Automated high-performance liquid chromatographic determination of 5'-S-cysteinyl-3,4-dihydroxy-phenylalanine in urine. *J. Chromatogr.*, 473 (1989) 359-370.
- 4422 Kamatani, Y., Minakata, H., Kenny, P.T.M., Iwashita, T., Watanabe, K., Funase, K., Sun, X.P., Yongsiri, A., Kim, K.H., Novales-Li, P., Novales, E.T., Kanapi, C.G., Takeuchi, H. and Nomoto, K.: Achatin-I, an endogenous neuroexcitatory tetrapeptide from *Achatina fulica* Férussac containing a D-amino acid residue. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1015-1020.
- 4423 Kison, R., Meyer, H.E. and Schoner, W.: Characterization of a cysteine-containing peptide after affinity labelling of  $Ca^{2+}$ -ATPase of sarcoplasmic reticulum with the disulfide of 3'(2')-O-biotinyl-thioinosine triphosphate. *Eur. J. Biochem.*, 181 (1989) 503-511.
- 4424 Kitamura, K., Tanaka, T., Kato, J., Eto, T. and Tanaka, K.: Regional distribution of immunoreactive endothelin in porcine tissue: abundance in inner medulla of kidney. *Biochem. Biophys. Res. Commun.*, 161 (1989) 348-352.
- 4425 Li, K.W., Geraerts, W.P.M., van Elk, R. and Joosse, J.: Dot immunobinding assay of high-performance liquid chromatographic fractions on poly(vinylidene difluoride) membranes. *J. Chromatogr.*, 472 (1989) 445-446.
- 4426 Lo, L.-C., Chen, S.-T., Wu, S.-H. and Wang, K.-T.: Separation of diastereomers of protected dipeptides by normal-phase high-performance liquid chromatography. *J. Chromatogr.*, 472 (1989) 336-339.
- 4427 Maeda, M., Kawasaki, K., Watanabe, J. and Kaneto, H.: Amino acids and peptides. X. Leu-Enkephalin analogues containing a fluorinated aromatic amino acid. *Chem. Pharm. Bull.*, 37 (1989) 826-828.
- 4428 Maisano, F., Testori, S.V. and Grandi, G.: Immobilized metal-ion affinity chromatography of human growth hormone. *J. Chromatogr.*, 472 (1989) 422-427.
- 4429 Mant, C.T. and Hodges, R.S.: Optimization of peptide separations in high-performance liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 139-172.
- 4430 Mayer, H. and Kukoschke, K.-G.: Purification and characterization of a growth factor from porcine bone. *Eur. J. Biochem.*, 181 (1989) 409-415.

- 4431 Naruse, M., Naruse, K., Kurimoto, F., Horiuchi, J., Tsuchiya, K., Kawana, M., Kato, Y., Zeng, Z.-P., Sakurai, H., Demura, H. and Shizume, K.: Radioimmunoassay for endothelin and immunoreactive endothelin in culture medium of bovine endothelial cells. *Biochem. Biophys. Res. Commun.*, 160 (1989) 662-668.
- 4432 Nguyen, T.-T., de Léan, A. and Ong, H.: Bidimensional reversed-phase high-pressure liquid chromatography analysis of cultured cell neuropeptides: application to atrial natriuretic factor. *Anal. Biochem.*, 179 (1989) 24-27.
- 4433 Ohno, M., Kai, M. and Ohkura, Y.: High-performance liquid chromatographic determination of substance P-like arginine-containing peptide in rat brain by on-line post-column fluorescence derivatization with benzoin. *J. Chromatogr.*, 490 (1989) 301-310.
- 4434 Ohsawa, H., Kanatsuka, A., Yamaguchi, T., Makino, H. and Yoshida, S.: Islet amyloid polypeptide inhibits glucose-stimulated insulin secretion from isolated rat pancreatic islets. *Biochem. Biophys. Res. Commun.*, 160 (1989) 961-967.
- 4435 Ohta, N., Burke, G.T. and Katsoyannis, P.G.: A biologically active insulin analogue with modification in the A<sup>2</sup> position. [2-Valine-A] sheep insulin. *Chem. Pharm. Bull.*, 37 (1989) 670-674.
- 4436 Pauwels, S., Najdovski, T., Dimaline, R., Lee, C.M. and Deschodt-Lanckman, M.: Degradation of human gastrin and CCK by endopeptidase 24.11: differential behaviour of the sulphated and unsulphated peptides. *Biochim. Biophys. Acta*, 996 (1989) 82-88.
- 4437 Quinkler, W., Maasberg, M., Bernotat-Danielowski, S., Lütke, N., Sharma, H.S. and Schaper, W.: Isolation of heparin-binding growth factors from bovine, porcine and canine hearts. *Eur. J. Biochem.*, 181 (1989) 67-73.
- 4438 Seyer, J.M., Hasty, K.A. and Kang, A.H.: Covalent structure of collagen. Amino acid sequence of an arthritogenic cyanogen bromide peptide from type II collagen of bovine cartilage. *Eur. J. Biochem.*, 181 (1989) 159-173.
- 4439 Shigeno, C., Hiraki, Y., Keutmann, H.T., Stern, A.M., Potts, J.T., Jr. and Segre, G.V.: Preparation of a photoreactive analog of parathyroid [Nle<sup>8</sup>,Lys(N-ε-4-azido-2-nitrophenyl)<sup>13</sup>,Nle<sup>18</sup>,Tyr<sup>34</sup>]bovine parathyroid hormone-(1-34)NH<sub>2</sub>, a selective, high-affinity ligand for characterization of parathyroid hormone receptors. *Anal. Biochem.*, 179 (1989) 268-273.
- 4440 Smith, G.D., Christensen, J.R., Rideout, J.M. and Peters, T.J.: Hepatic processing of insulin. Characterization of differential inhibition by weak bases. *Eur. J. Biochem.*, 181 (1989) 287-294.
- 4441 Tsuboi, S., Kishimoto, S. and Ohmori, S.: S-(2-carboxypropyl)glutathione in vegetables of Liliiflorae. *J. Agric. Food Chem.*, 37 (1989) 611-615.
- 4442 Utsumi, J., Mizuno, Y., Hosoi, K., Okano, K., Sawada, R., Kajitani, M., Sakai, I., Naruto, M. and Shimizu, H.: Characterization of four different mammalian-cell-derived recombinant human interferon-β1s. Identical polypeptides and non-identical carbohydrate moieties compared to natural ones. *Eur. J. Biochem.*, 181 (1989) 545-553.
- 4443 Van Damme, J., van Beeumen, J., Conings, R., Decock, B. and Billiau, A.: Purification of granulocyte chemotactic peptide/interleukin-8 reveals N-terminal sequence heterogeneity similar to that of β-thromboglobulin. *Eur. J. Biochem.*, 181 (1989) 337-344.
- 4444 White, R.L., DeMarco, A.C., Shapiro, S., Vining, L.C. and Wolfe, S.: Measurement of δ-(L-α-aminoadipyl)-L-cysteinyl-D-valine synthetase activity in *Streptomyces clavuligerus* by high-performance liquid chromatography after precolumn derivatization with o-phthalaldehyde. *Anal. Biochem.*, 178 (1989) 399-403.
- 4445 Wille, B.: A preparation of melittin depleted of phospholipase A<sub>2</sub> by ion exchange chromatography in denaturing solvents. *Anal. Biochem.*, 178 (1989) 118-120.
- 4446 Wu, S.V., Chew, P., Ho, F.-J., Walsh, J.H., Wong, H., Lee, T.D., Davis, M.T., Shively, J.E. and Reeve, J.R., Jr.: Characterization of the carboxyl terminal flanking peptide of rat progastrin. *Biochem. Biophys. Res. Commun.*, 161 (1989) 69-74.

For additional information see:

C.A., 110 (1989) 204842a, 208695c.

See also 4108, 4143, 4148, 4367, 4403, 4541, 4567, 4594, 4644, 4656.

## 18c. Elucidation of structure of proteins and enzymes

- 4447 Akama, K., Oka, S., Tobita, T. and Hayashi, H.: Changes in chromatin structure of boar late spermatids to mature spermatozoa by using modification with dansyl chloride. *Biochim. Biophys. Acta*, 1008 (1989) 198-202.
- 4448 Giordano, P.C. and Bernini, L.F.: Advantages of combined fingerprint and HPLC techniques in protein analysis. *Chromatogram*, 9 (1988) 8-11; *C.A.*, 110 (1989) 150700g.
- 4449 Higashimoto, Y., Himeno, S., Shinomura, Y., Nagao, K., Tamura, T. and Tarui, S.: Purification and structural determination of urinary NH<sub>2</sub>-terminal big gastrin fragments. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1364-1370.
- 4450 Jeffery, J., Wood, I., Macleod, A., Jeffery, R. and Jörnvall, H.: Glucose-6-phosphate dehydrogenase. Characterization of a reactive lysine residue in the *Pichia Jadinii* enzyme reveals a limited structural variation in a functionally significant segment. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1290-1295.
- 4451 Lemieux, L. and Amiot, J.: Application of reversed-phase high-performance liquid chromatography to the separation of peptides from phosphorylated and dephosphorylated casein hydrolysates. *J. Chromatogr.*, 473 (1989) 189-206.
- 4452 Leszyk, J., Mornet, D., Audemard, E. and Collins, J.H.: Amino acid sequence of a 15 kilodalton actin-binding fragment of turkey gizzard caldesmon: similarity with dystrophin, tropomyosin and the tropomyosin-binding region of troponin T. *Biochem. Biophys. Res. Commun.*, 160 (1989) 210-216.
- 4453 Leszyk, J., Mornet, D., Audemard, E. and Collins, J.H.: Caldesmon structure and function: sequence analysis of a 35 kilodalton actin- and calmodulin-binding fragment from the C-terminus of the turkey gizzard protein. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1371-1378.
- 4454 Nedsar, S., Humbert, G., Aubert, F., le Deaut, J.Y. and Linden, G.: Separation and identification of products from hydrolysis by chymosin of immobilized B-chain insulin and kappa-casein. *Colloq. INSERM*, 174 (Forum Pept., 2nd, 1988) (1989) 81-84; *C.A.*, 110 (1989) 227631v.
- 4455 Poll, D.J. and Harding, D.R.: Formic acid as a milder alternative to trifluoroacetic acid and phosphoric acid in two-dimensional peptide mapping. *J. Chromatogr.*, 469 (1989) 231-239.
- 4456 Seyer, J.M. and Kang, A.H.: Covalent structure of collagen: amino acid sequence of three cyanogen bromide-derived peptides from human  $\alpha 1(V)$  collagen chain. *Arch. Biochem. Biophys.*, 271 (1989) 120-129.
- 4457 Silliman, C.C. and Sturgill, T.W.: Phosphorylation of microtubule-associated protein 2 by MAP kinase primarily involves the projection domain. *Biochem. Biophys. Res. Commun.*, 160 (1989) 993-998.
- 4458 Sommer, A., Moscatelli, D. and Rifkin, D.B.: An amino-terminally extended and post-translationally modified form of a 25 kDa basic fibroblast growth factor. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1267-1274.
- 4459 Walz, A. and Baggiolini, M.: A novel cleavage product of  $\beta$ -thromboglobulin formed in cultures of stimulated mononuclear cells activates human neutrophils. *Biochem. Biophys. Res. Commun.*, 159 (1989) 969-975.

## 19. PROTEINS

## 19a. General techniques

- 4460 Anspach, F.B., Wirth, H.-J., Unger, K.K., Stantor, P., Davies, J.R. and Hearn, M.T.W.: High-performance liquid affinity chromatography with phenylboronic acid, benzamidine, tri-L-alanine, and concanavalin A immobilized on 3-isothiocyanatopropyltriethoxysilane-activated nonporous monodisperse silicas. *Anal. Biochem.*, 179 (1989) 171-181.
- 4461 Antonini, A., Ceresa, G., Fratucello, F. and Zanotti, F.: (Preparation and quality control of protein derivatives by gel permeation chromatography). *Cosmet. Toiletries, Ed. Ital.*, 9 (1988) 47-57; *C.A.*, 110 (1989) 179230q.
- 4462 Bennett, H.P.J. and James, S.: A trace-enrichment technique for the loading of gel-permeation high-performance liquid chromatography columns. *Anal. Biochem.*, 179 (1989) 222-228.

- 4463 Bhusan, R. and Reddy, K.R.N.: A simple approach to recovery of proteins from polyacrylamide gel electrophoresis rods. *J. Liq. Chromatogr.*, 12 (1989) 529-533.
- 4464 Cabre, F., Canela, E.I. and Canela, M.A.: Accuracy and precision in the determination of Stokes radii and molecular masses of proteins by gel filtration chromatography. *J. Chromatogr.*, 472 (1989) 347-356.
- 4465 Dong, M.W., Gant, J.R. and Larsen, B.R.: Advances in fast reversed-phase chromatography of proteins. *BioChromatography*, 4 (1989) 19-34; *C.A.*, 110 (1989) 227909s.
- 4466 Dubin, P.L. and Principi, J.M.: Failure of universal calibration for size-exclusion chromatography of rodlike macromolecules vs. random coils and globular proteins. *Macromolecules*, 22 (1989) 1891-1896; *C.A.*, 110 (1989) 188645f.
- 4467 Goto, M., Takahashi, Y. and Goto, S.: Protein separation technique with dynamic equilibrium gradient induced by counteracting chromatography and electrophoresis. *J. Chem. Eng. Jpn.*, 22 (1989) 109-113; *C.A.*, 110 (1989) 215400f.
- 4468 Hemdan, E.S., Zhao, Y., Sulkowski, E. and Porath, J.: Surface topography of histidine residues: a facile probe by immobilized metal ion affinity chromatography. *Proc. Natl. Acad. Sci. U.S.A.*, 86 (1989) 1811-1815; *C.A.*, 110 (1989) 188678u.
- 4469 Hjerten, S., Liao, J.-L. and Zhang, R.: High-performance liquid chromatography on continuous polymer beds. *J. Chromatogr.*, 473 (1989) 273-275.
- 4470 Kabzinski, A.K.M. and Parysczak, T.: Problems of applying covalent chromatography in distribution of multithiol proteins and peptides using metallothioneins as example. *Chem. Anal.*, 33 (1988) 427-435; *C.A.*, 110 (1989) 227924t.
- 4471 Melander, W.R., El Rassi, Z. and Horvath, C.: Interplay of hydrophobic and electrostatic interactions in biopolymer chromatography. Effect of salts on the retention of proteins. *J. Chromatogr.*, 469 (1989) 3-27.
- 4472 Regnier, F.E.: High-performance liquid chromatography (HPLC) of proteins. *Fresenius' Z. Anal. Chem.*, 333 (1989) 728.
- 4473 Sugii, A., Harada, K., Nishimura, K., Hanaoka, R. and Masuda, S.: High-performance liquid chromatography of proteins on N-methylpyridinium polymer columns. *J. Chromatogr.*, 472 (1989) 357-364.
- 4474 Szepesy, L. and Horvath, C.: Hydrophobic interaction chromatography of proteins. In: Pick, J. and Vajda, J. (Editors), *Proc. Int. Conf. Biochem. Sep.*, 2nd, Hungarian Biochemical Society, Budapest, 1988, pp. 333-334; *C.A.*, 110 (1989) 219673v.
- 4475 Vanfleteren, J.R.: Sequential sodium dodecyl sulfate-polyacrylamide gel electrophoresis and reversed-phase chromatography of unfolded proteins. *Anal. Biochem.*, 178 (1989) 385-390.
- 4476 Watson, E. and Kenney, W.C.: Hydrophobic retention of proteins using high-performance size-exclusion chromatography. *Biotechnol. Appl. Biochem.*, 10 (1988) 551-554; *C.A.*, 110 (1989) 188646g.
- 4477 Yamamoto, S., Nakanishi, K. and Matsuno, R.: *Chromatographic Science Series: Ion-Exchange Chromatography of Proteins*, Vol. 43, Marcel Dekker, New York, 1988, 401 p.; *C.A.*, 110 (1989) 228126w.
- 4478 Yao, Z.: (Liquid chromatography in biotechnology downstream processing). *Sepu*, 7 (1989) 15-18; *C.A.*, 110 (1989) 191107n - a review with 20 refs.

For additional information see:

*C.A.*, 110 (1989) 208628h, 208925c, 227937z.

See also 4088.

19b. *Proteins of cells, viruses and subcellular particles*

- 4479 Ainsworth, A.J., Pote, L., Haney, J. and Brown, N.J.: Column chromatographic characterization of cytoplasmic proteins in *Eimeria maxima* oocysts from chickens. *Am. J. Vet. Res.*, 50 (1989) 173-175; *C.A.*, 110 (1989) 150696k.
- 4480 Blat, C., Bohlen, P., Villaudy, J., Chatelain, G., Golde, A. and Harel, L.: Isolation and amino-terminal sequence of a novel cellular growth inhibitor (inhibitory diffusible factor 45) secreted by 3T3 fibroblasts. *J. Biol. Chem.*, 264 (1989) 6021-6024.
- 4481 Cooperman, B.S., Weitzmann, C.J. and Buck, M.A.: Reversed-phase HPLC of ribosomal proteins. *Methods Enzymol.*, 164 (Ribosomes) (1988) 523-532; *C.A.*, 110 (1989) 188672n.



- 4482 Kamp, R.M. and Wittmann-Liebold, B.: Ribosomal proteins from archaeobacteria: HPLC purification for microsequence analysis. *Methods Enzymol.*, 164 (Ribosomes) (1988) 542-571; *C.A.*, 110 (1989) 188674q.
- 4483 Nokubo, M., Ohta, M., Kitani, K. and Zs.-Nagy, I.: Identification of protein-bound riboflavin in rat hepatocyte plasma membrane as a source of autofluorescence. *Biochim. Biophys. Acta*, 981 (1989) 303-308.
- 4484 Ohtaki, T., Wakamatsu, K., Mori, M., Ishibashi, Y. and Yasuhara, T.: Purification of acidic fibroblast growth factor from bovine omentum. *Biochem. Biophys. Res. Commun.*, 161 (1989) 169-175.
- 4485 Sanchez, R.A. and Charlier, J.E.: Effect of stress conditions on *Escherichia coli* outer and inner membranes, separated by Sephacryl S-500 chromatography. *Anal. Biochem.*, 179 (1989) 202-205.
- 4486 Suryanarayana, S., Rao, N.A., Murthy, M.R.N. and Savithri, H.S.: Primary structure of belladonna mottle virus coat protein. *J. Biol. Chem.*, 264 (1989) 6273-6279.

See also 4231.

#### 19c. Proteins synthesized by genetic manipulation

- 4487 Bloom, J.W., Wong, M.F. and Mitra, G.: Detection and reduction of protein A contamination in immobilized protein A purified monoclonal antibody preparations. *J. Immunol. Methods*, 117 (1989) 83-89; *C.A.*, 110 (1989) 190560t.
- 4488 Crane, L.J.: Purification of monoclonal antibodies by high-performance ion-exchange chromatography. *Immunol. Ser.*, 33 (Monoclonal Antibody Prod. Tech. Appl.) (1987) 139-171; *C.A.*, 110 (1989) 190521f.
- 4489 Stocks, S.J. and Brooks, D.E.: Production and isolation of large quantities of monoclonal antibody using serum-free medium and fast protein liquid chromatography. *Hybridoma*, 8 (1989) 241-247; *C.A.*, 110 (1989) 191222w.

For additional information see:

*C.A.*, 110 (1989) 207235r, 187341s, 188212n.

See also 4493.

#### 19d. Microbial and plant proteins

- 4490 Hanemaaijer, R., Westphal, A.H., Berg, A., van Dongen, W., de Kok, A. and Veeger, C.: The gene encoding dihydrolipoyl transacetylase from *Azotobacter vinelandii*. Expression in *Escherichia coli* and activation and isolation of the protein. *Eur. J. Biochem.*, 181 (1989) 47-53.
- 4491 Kamo, M., Tsugita, A., Wiessner, C., Wedel, N., Bartling, D., Herrmann, R.G., Aguilar, F., Gardet-Salvi, L. and Schurmann, P.: Primary structure of spinach-chloroplast thioredoxin f. Protein sequence and analysis of complete cDNA clones for spinach-chloroplast thioredoxin f. *Eur. J. Biochem.*, 182 (1989) 315-322.
- 4492 Murugesu, V. and Basha, S.M.: Effect of salt concentration and duration of boiling on peanut seed composition. *J. Agric. Food Chem.*, 37 (1989) 756-760.
- 4493 Riehl-Bellon, N., Carvallo, D., Acker, M., van Dorsselaer, A., Marquet, M., Loison, G., Lemoine, Y., Brown, S.W., Courtney, M. and Roitsch, C.: Purification and biochemical characterization of recombinant hirudin produced by *Saccharomyces cerevisiae*. *Biochemistry*, 28 (1989) 2941-2949.
- 4494 Safarik, I.: Detection of proteinase inhibitors in fractions after liquid chromatography. *Anal. Biochem.*, 179 (1989) 349-351.
- 4495 Sapirstein, H.D., Scanlon, M.G. and Bushuk, W.: Normalisation of high-performance liquid chromatography peak retention times for computerised comparison of wheat prolamins chromatograms. *J. Chromatogr.*, 469 (1989) 127-135.
- 4496 Schmitt, M. and Radler, F.: Purification of yeast killer toxin KT28 by receptor-mediated affinity chromatography. *J. Chromatogr.*, 469 (1989) 448-452.
- 4497 Scully, G.M. and Sonsidine, P.J.: Purification of protein A by ion-exchange chromatography. *Biochem. Soc. Trans.*, 17 (1989) 396-397; *C.A.*, 110 (1989) 188693v.
- 4498 Strickler, M.P., Neill, R.J., Stone, M.J., Hunt, R.E., Brinkley, W. and Gemski, P.: Rapid purification of staphylococcal enterotoxin B by high-pressure liquid chromatography. *J. Clin. Microbiol.*, 27 (1989) 1031-1035; *C.A.*, 110 (1989) 226701f.

- 4499 Videira, A. and Werner, S.: Assembly kinetics and identification of precursor proteins of complex I from *Neurospora crassa*. *Eur. J. Biochem.*, 181 (1989) 493-502.
- 4500 Wieser, H., Seilmeier, W. and Belitz, H.D.: Reversed-phase high-performance liquid chromatography of ethanol-soluble and ethanol-insoluble reduced glutenin fractions. *Cereal Chem.*, 66 (1989) 38-41; *C.A.*, 110 (1989) 191392b.

For additional information see:

*C.A.*, 110 (1989) 169148e, 210423f, 227936y, 229687s.

*19e. Proteins of blood, serum and blood cells*

- 4501 Alfthan, H. and Stenman, U.-H.: Purification of labelled antibodies by hydrophobic interaction chromatography. *J. Chromatogr.*, 470 (1989) 385-389.
- 4502 Arnaud, P., Miribel, L. and Emerson, D.L.:  $\alpha_2$ -HS-Glycoprotein. *Methods Enzymol.*, 163 (Immunochem. Tech., Pt. M) (1988) 431-441; *C.A.*, 110 (1989) 188858c.
- 4503 Arnaud, P., Miribel, L. and Roux, A.F.:  $\alpha_1$ -Acid glycoprotein. *Methods Enzymol.*, 163 (Immunochem. Tech., Pt. M) (1988) 418-430; *C.A.*, 110 (1989) 188857b.
- 4504 Berry, S., Dawicki, D.D., Agarwal, K.C. and Steiner, M.: The role of microtubules in platelet secretory release. *Biochim. Biophys. Acta*, 1012 (1989) 46-56.
- 4505 Burnouf, T.: (Chromatographic purification of  $\alpha_1$ -antitrypsin from human plasma cryoprecipitate fractions for medicaments). *Fr. Demande Pat.* FR 2,610,633 (Cl. CO7K15/14), 12 Aug. 1988, Appl. 87/1,403, 05 Feb. 1987; 8 pp.; *C.A.*, 110 (1989) 219067a.
- 4506 Hawiger, J., Kloczewiak, M., Bednarek, M.A. and Timmons, S.: Platelet receptor recognition domains on the  $\alpha$  chain of human fibrinogen: structure-function analysis. *Biochemistry*, 28 (1989) 2909-2914.
- 4507 Iino, S.: (Separation and purification of monoclonal antibody by hydroxyapatite packed column). *Bio Ind.*, 5 (1988) 903-909; *C.A.*, 110 (1989) 152321h.
- 4508 Kumar, A. and Pattabiraman, T.N.: Elimination of factors interfering in the estimation of serum glycosylated albumin. *Indian J. Biochem. Biophys.*, 25 (1988) 703-707; *C.A.*, 110 (1989) 150721q.
- 4509 Liu, F. and Chen, H.: Purification of avidin with affinity chromatography on 2-aminobiotin-AH-Sepharose 4B. *J. Med. Coll. PLA*, 3 (1988) 157-160; *C.A.*, 110 (1989) 188648j.
- 4510 Minchiotti, L., Galliano, M., Iadarola, P., Meloni, M.L., Ferri, G., Porta, F. and Castellani, A.A.: The molecular defect in a COOH-terminal-modified and shortened mutant of human serum albumin. *J. Biol. Chem.*, 264 (1989) 3385-3389.
- 4511 Moreau, T., Gutman, N., Faucher, D. and Gauthier, F.: Limited proteolysis of T-kininogen (thiostatin). Release of comparable fragments by different endopeptidases. *J. Biol. Chem.*, 264 (1989) 4298-4303.
- 4512 Nau, D.R.: Chromatographic methods for antibody purification and analysis. *BioChromatography*, 4 (1989) 4-18; *C.A.*, 110 (1989) 152315j - a review with 92 refs.
- 4513 Pavliak, V., Kery, V., Tihlarik, K. and Sandula, J.: Affinity chromatography of anti-mannan antibodies on mannan-acrylamide copolymers. *J. Chromatogr.*, 490 (1989) 418-423.
- 4514 Saint-Blancard, J., Tusch, D., Allary, M., Hereil, S. and Boschetti, E.: (Isolation of human plasma immunoglobulins G by Cohn's method and chromatography in tandem). *Bio-Sciences*, 7 (1988) 41-44; *C.A.*, 110 (1989) 210424g.
- 4515 Suzuki, T., Takagi, T. and Ohta, S.: Primary structure of a dimeric haemoglobin from the deep-sea cold-seep clam *Calyptogena soyocae*. *Biochem. J.*, 260 (1989) 177-182.
- 4516 Tamura, K., Kobayashi, M., Ishii, Y., Tamura, T., Hashimoto, K., Nakamura, S., Niwa, M. and Zapf, J.: Primary structure of rat insulin-like growth factor-I and its biological activities. *J. Biol. Chem.*, 264 (1989) 5616-5621.
- 4517 Weinstein, R.E.: Immunoaffinity purification of factor VIII. *Ann. Clin. Lab. Sci.*, 19 (1989) 84-91; *C.A.*, 110 (1989) 198998n.

For additional information see:

*C.A.*, 110 (1989) 150903a, 171298x, 190586f, 191085d, 208888t, 227425f.

See also 4487, 4489, 4562.

19f. *Structural and muscle proteins*

- 4518 Hayashi, K., Yamada, S., Kanda, K., Kimizuka, F., Kato, I. and Sobue, K.: 35 kDa Fragment of h-caldesmon conserves two consensus sequences of the tropomyosin-binding domain in troponin T. *Biochem. Biophys. Res. Commun.*, 161 (1989) 38-45.
- 4519 Lema, M.J., Pluskal, M.G. and Allen, P.D.: High-performance ion-exchange chromatography of myosin using a DEAE-5PW column. *J. Chromatogr.*, 491 (1989) 61-68.
- 4520 Mahmood, R., Elzinga, M. and Yount, R.G.: Serine-324 of myosin's heavy chain is photoaffinity-labeled by 3'(2')-O-(4-benzoylbenzoyl)adenosine triphosphate. *Biochemistry*, 28 (1989) 3989-3995.
- 4521 Neame, P.J., Choi, H.U. and Rosenberg, L.C.: The isolation and primary structure of a 22-kDa extracellular matrix protein from bovine skin. *J. Biol. Chem.*, 264 (1989) 5474-5479.
- 4522 Ogata, Y., Shimokawa, H. and Sasaki, S.: Purification, characterization, and biosynthesis of bovine enamelin. *Calcif. Tissue Int.*, 43 (1988) 389-399; *C.A.*, 110 (1989) 150866r.

19g. *Protamines, histones and other chromosomal proteins*

- 4523 Kurochkina, L.P. and Kolomijtseva, G.Ya.: Isolation of modified histone H3 from ultraviolet-irradiated deoxyribonucleoprotein by reversed-phase high-performance liquid chromatography. *Anal. Biochem.*, 178 (1989) 88-92.
- 4524 Lindner, H., Wesierska-Gadek, J., Helliger, W., Puschendorf, B. and Sauermann, G.: Identification of ADP-ribosylated histones by the combined use of high-performance liquid chromatography and electrophoresis. *J. Chromatogr.*, 472 (1989) 243-249.

19h. *Chromoproteins and metalloproteins*

- 4525 Adam, Z. and Malkin, R.: On the interaction between cytochrome f and plastocyanin. *Biochim. Biophys. Acta*, 975 (1989) 158-163.
- 4526 Matsuura, M.S.A., Fushitani, K. and Riggs, A.F.: The amino acid sequences of the  $\alpha$  and  $\beta$  chains of hemoglobin from the snake, *Liophis miliaris*. *J. Biol. Chem.*, 264 (1989) 5515-5521.
- 4527 Ohmori, D., Hasumi, H., Yamakura, F., Murakami, M., Fujisawa, K., Taneoka, Y. and Yamamura, T.: Studies on the molecular structure of spinach ferredoxin. I. Comparison of two molecular species of ferredoxin. *Biochim. Biophys. Acta*, 996 (1989) 166-172.
- 4528 Reid, T.S. and Gisich, D.J.: Determination of glycosylated and nonglycosylated hemoglobins, using a fast affinity boronate HPLC column. *J. High Resolut. Chromatogr.*, 12 (1989) 249-250.
- 4529 Yamaguchi, T., Hayakawa, T., Kaneda, M., Kakinuma, K. and Yoshikawa, A.: Purification and some properties of the small subunit of cytochrome b<sub>558</sub> from human neutrophils. *J. Biol. Chem.*, 264 (1989) 112-118.

See also 4470.

19i. *Proteins of glands, gland products and various zymogens (including milk proteins)*

- 4530 Baba, T., Michikawa, Y., Kashiwabara, S.-i. and Arai, Y.: Proacrosin activation in the presence of a 32-kDa protein from boar spermatozoa. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1026-1032.
- 4531 Kem, W.R., Patten, B., Pennington, M.W., Price, D.A. and Dunn, B.M.: Isolation, characterization, and amino acid sequence of a polypeptide neurotoxin occurring in the sea anemone *Stichodactyla helianthus*. *Biochemistry*, 28 (1989) 3483-3489.
- 4532 Kharrat, R., Darbon, H., Rochat, H. and Granier, C.: Structure/activity relationships of scorpion  $\alpha$ -toxins. Multiple residues contribute to the interaction with receptors. *Eur. J. Biochem.*, 181 (1989) 381-390.
- 4533 Kunz, C. and Lonnerdal, B.: Human milk proteins: separation of whey proteins and their analysis by polyacrylamide gel electrophoresis, fast protein liquid chromatography (FPLC) gel filtration, and anion-exchange chromatography. *Am. J. Clin. Nutr.*, 49 (1989) 464-470; *C.A.*, 110 (1989) 191345p.
- 4534 Liu, C.-S., Hsiao, P.-W., Chang, C.-S., Tzeng, M.-C. and Lo, T.-B.: Unusual amino acid sequence of fasciatoxin, a weak reversibly acting neurotoxin in the venom of the banded brait, *Bungarus fasciatus*. *Biochem. J.*, 259 (1989) 153-158.

- 4535 Simon, J.-P., Bader, M.-F. and Aunis, D.: Effect of secretagogues on chromogranin A synthesis in bovine cultured chromaffin cells. Possible regulation by protein kinase C. *Biochem. J.*, 260 (1989) 915-922.
- 4536 Tieche, J.-M. and Leonora, J.: Biological and chemical evidence for the existence of a porcine hypothalamic parotid hormone-releasing factor. *Biochem. Biophys. Res. Commun.*, 159 (1989) 899-906.

19j. *Proteins of brain, cerebrospinal fluid and eye*

- 4537 Hara-Yokoyama, M. and Furuyama, S.: An endogenous inhibitor of the ADP-ribosylation of GTP-binding proteins by pertussis toxin is present in bovine brain. *Biochem. Biophys. Res. Commun.*, 160 (1989) 67-71.
- 4538 Sassa, T., Richter, W.W., Uda, N., Suganuma, M., Suburi, H., Yoshizawa, S., Hirota, M. and Fujiki, H.: Apparent "activation" of protein kinases by okadaic acid class tumor promoters. *Biochem. Biophys. Res. Commun.*, 159 (1989) 939-944.

See also 4425.

19k. *Proteins of neoplastic tissue and transformed cells*

- 4539 Ferris, R. and Laird, W.J.: Method of purifying toxin conjugates using hydrophobic interaction chromatography. *Eur. Pat. Appl.* EP 263,526 (Cl. C07K3/20), 13 Apr. 1988, US Appl. 917,467, 10 Oct. 1986, 7 pp.; *C.A.*, 110 (1989) 210797f.
- 4540 Mori, M., Yamaguchi, K. and Abe, K.: Purification of a lipoprotein lipase-inhibiting protein produced by a melanoma cell line associated with cancer cachexia. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1085-1092.

19l. *Specific binding and receptor proteins*

- 4541 Alexander, D., Goris, J., Marais, R., Rothbard, J., Merlevede, W. and Crumpton, M.J.: Dephosphorylation of the human T lymphocyte CD3 antigen. *Eur. J. Biochem.*, 181 (1989) 55-65.
- 4542 Burri, B.J. and Kutnink, M.A.: Liquid-chromatographic assay for free and transthyretin-bound retinol-binding protein in serum from normal humans. *Clin. Chem. (Winston-Salem)*, 35 (1989) 582-586.
- 4543 DeGasperi, R., Li, Y.-T. and Li, S.-C.: Isolation and characterization of an activator protein for the hydrolysis of ganglioside GM<sub>2</sub> from the roe of striped mullet (*Mugil cephalus*). *Biochem. J.*, 260 (1989) 777-783.
- 4544 Kellaris, K.V. and Ware, D.K.: Assessment of the number of free cysteines and isolation and identification of cystine-containing peptides from acetylcholine receptor. *Biochemistry*, 28 (1989) 3469-3482.
- 4545 Leyh-Bouille, M., van Beeumen, J., Renier-Pirlot, S., Joris, B., Nguyen-Distèche, M. and Ghuysen, J.-M.: The *Streptomyces* K15 DD-peptidase/penicillin-binding protein. Active site and sequence of the N-terminal region. *Biochem. J.*, 260 (1989) 601-604.
- 4546 Lipson, K.E., Kolhatkar, A.A. and Donner, D.B.: Alkylation, reduction, solubilization and enrichment of binding activity do not impair the ability of insulin receptors to convert from a rapid- into a slow-dissociating state. *Biochem. J.*, 259 (1989) 871-878.
- 4547 Mazella, J., Chabry, J., Zsurger, N. and Vincent, J.-P.: Purification of the neurotensin receptor from mouse brain by affinity chromatography. *J. Biol. Chem.*, 264 (1989) 5559-5563.
- 4548 Newton, D.L. and Klee, C.B.: Phenothiazine-binding and attachment sites of CAPP<sub>1</sub>-calmodulin. *Biochemistry*, 28 (1989) 3750-3757.
- 4549 Ota, I.M. and Clarke, S.: Calcium affects the spontaneous degradation of aspartyl/asparaginyl residues in calmodulin. *Biochemistry*, 28 (1989) 4020-4027.
- 4550 Ota, I.M. and Clarke, S.: Enzymatic methylation of L-isoaspartyl residues derived from aspartyl residues in affinity-purified calmodulin. The role of conformational flexibility in spontaneous isoaspartyl formation. *J. Biol. Chem.*, 264 (1989) 54-60.
- 4551 Polakis, P.G., Evans, T. and Snyderman, R.: Multiple chromatographic forms of the formylpeptide chemoattractant receptor and their relationship to GTP-binding proteins. *Biochem. Biophys. Res. Commun.*, 161 (1989) 276-283.

- 4552 Schaefer, W.H., Kakkad, B., Crow, J.A., Blair, I.A. and Ong, D.E.: Purification, primary structure characterization, and cellular distribution of two forms of cellular retinol-binding protein, type II from adult rat small intestine. *J. Biol. Chem.*, 264 (1989) 4212-4221.
- 4553 Sheridan, P.L., Evans, R.M. and Horwitz, K.B.: Phosphotryptic peptide analysis of human progesterone receptors. New phosphorylated sites formed in nuclei after hormone treatment. *J. Biol. Chem.*, 264 (1989) 6520-6528.
- 4554 Shet, M.S. and Madaiah, M.: A lectin from the thigh muscle of *Rana tigerina*. *Biochim. Biophys. Acta*, 991 (1989) 465-469.
- 4555 Takahashi, M., Shiraishi, T. and Shimizu, R.: (Use of herbicide - affinity chromatography to isolate the herbicide binding proteins in chloroplast membranes). *Bio Ind.*, 6 (1989) 150-158; *C.A.*, 110 (1989) 208701b.
- 4556 Trinidad, A., Kirilin, W.G., Ogolla, F., Andrews, A.F., Yerokun, T., Ferguson, R.J., Brady, P.K. and Hein, D.W.: Kinetic characterization of acetylator genotype-dependent and -independent N-acetyltransferase isozymes in homozygous rapid and slow acetylator inbred hamster liver cytosol. *Drug Metab. Disp.*, 17 (1989) 238-247.
- 4557 Wendland, M., Hille, A., Nagel, G., Waheed, A., von Figura, K. and Pohlmann, R.: Synthesis of a truncated  $M_r$  46000 mannose 6-phosphate receptor that is secreted and retains ligand binding. *Biochem. J.*, 260 (1989) 201-206.
- 4558 Wu, C., Tsai, C. and Wilson, S.: Affinity chromatography of sequence-specific DNA-binding proteins. *Genet. Eng.*, 10 (1988) 67-74; *C.A.*, 110 (1989) 227914q.

For additional information see:

*C.A.*, 110 (1989) 169745x, 227918u, 227935x, 230016d.

See also 4247, 4686.

#### 19n. Other proteins

- 4559 Huggins, J.P., Cook, E.A., Piggott, J.R., Mattinsley, T.J. and England, P.J.: Phospholamban is a good substrate for cyclic GMP-dependent protein kinase *in vitro*, but not in intact cardiac or smooth muscle. *Biochem. J.*, 260 (1989) 829-835.
- 4560 Lappi, D.A., Martineau, D. and Baird, A.: Biological and chemical characterization of basic FGF-saporin mitotoxin. *Biochem. Biophys. Res. Commun.*, 160 (1989) 917-923.
- 4561 Murakami, Y., Matsufuji, S., Nishiyama, M. and Hayashi, S.-i.: Properties and fluctuations *in vivo* of rat liver antizyme inhibitor. *Biochem. J.*, 259 (1989) 839-845.
- 4562 Raynes, J.G. and McAdam, K.P.W.J.: Purification of amyloid A protein. *Biochem. Soc. Trans.*, 17 (1989) 345; *C.A.*, 110 (1989) 188691t.
- 4563 Sugino, K., Nakamura, T., Tako, K., Titani, K., Miyamoto, K., Hasegawa, Y., Igarashi, M. and Sugino, H.: Inhibin alpha-subunit monomer is present in bovine follicular fluid. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1323-1329.

For additional information see:

*C.A.*, 110 (1989) 170975d.

## 20. ENZYMES AND ENZYME ACTIVITY ESTIMATION

- 4564 Huang, S.Y. and Lee, W.S.: Performance of enzyme separation and purification by improved simulated-moving-bed chromatography. *Ann. N.Y. Acad. Sci.*, 542 (Enzyme Eng. 9) (1988) 185-191; *C.A.*, 110 (1989) 227558b.

#### 20a. Oxidoreductases

- 4565 Biondi, P.A., Secchi, C., Negri, A., Tedeschi, G. and Ronchi, S.: Improved high-performance liquid chromatographic determination of diamine oxidase activity. *J. Chromatogr.*, 491 (1989) 209-214.
- 4566 Bogard, M., Camadro, J.-M., Nordmann, Y. and Labbe, P.: Purification and properties of mouse liver coproporphyrinogen oxidase. *Eur. J. Biochem.*, 181 (1989) 417-421.

- 4567 Buse, G., Hensel, S. and Fee, J.A.: Evidence for cytochrome oxidase subunit I and a cytochrome c - subunit II fused protein in the cytochrome  $c_{1aa3}$  of *Thermus thermophilus*. How old is cytochrome oxidase? *Eur. J. Biochem.*, 181 (1989) 261-268.
- 4568 Cammack, R., Bagyinka, C. and Kovacs, K.L.: Spectroscopic characterization of the nickel and iron-sulphur clusters of hydrogenase from the purple photosynthetic bacterium *Thiocapsa roseopersicina*. 1. Electron spin resonance spectroscopy. *Eur. J. Biochem.*, 182 (1989) 357-362.
- 4569 DeWolf, W.E., Jr., Chambers, P.A., Southan, C., Saunders, D. and Kruse, L.I.: Inactivation of dopamine  $\beta$ -hydroxylase by  $\beta$ -ethynyltyramine: kinetic characterization and covalent modification of an active site peptide. *Biochemistry*, 28 (1989) 3833-3842.
- 4570 Jetten, M.S.M., Stams, A.J.M. and Zehnder, A.J.B.: Purification and characterization of an oxygen-stable carbon monoxide dehydrogenase of *Methanotrix soehngentii*. *Eur. J. Biochem.*, 181 (1989) 437-441.
- 4571 Kawasaki, N., Tanimoto, T. and Tanaka, A.: Characterization of aldose reductase and aldehyde reductase from rat testis. *Biochim. Biophys. Acta*, 996 (1989) 30-36.
- 4572 Kelce, W.R. and Gansam, V.K.: Radiometric quantitation of  $\Delta^4$ -3-ketosteroid-5 $\alpha$ -oxidoreductase utilizing HPLC. *Steroids*, 52 (1988) 217-235; *C.A.*, 110 (1989) 168802b.
- 4573 Kurys, G., Ambroziak, W. and Pietruszko, R.: Human aldehyde dehydrogenase. Purification and characterization of a third isozyme with low  $K_m$  for  $\gamma$ -aminobutyraldehyde. *J. Biol. Chem.*, 264 (1989) 4715-4721.
- 4574 Langbakk, B. and Flatmark, T.: Lactoperoxidase from human colostrum. *Biochem. J.*, 259 (1989) 627-631.
- 4575 Nunn, D.N., Day, D. and Anthony, C.: The second subunit of methanol dehydrogenase of *Methylobacterium extorquens* AM1. *Biochem. J.*, 260 (1989) 857-862.
- 4576 Poole, R.C. and Halestrap, A.P.: Purification of aldehyde dehydrogenase from rat liver mitochondria by  $\alpha$ -cyanocinnamate affinity chromatography. *Biochem. J.*, 259 (1989) 105-110.
- 4577 Rietjens, I.M.C.M., Ancher, L.J. and Veeger, C.: On the role of phospholipids in the reconstituted cytochrome P-450 system. A model study using dilauroyl and distearoyl glycerophosphocholine. *Eur. J. Biochem.*, 181 (1989) 309-316.
- 4578 Schallreuter, K.U. and Wood, J.M.: The stereospecific suicide inhibition of human melanoma thioredoxin reductase by 13-*cis*-retinoic acid. *Biochem. Biophys. Res. Commun.*, 160 (1989) 573-579.
- 4579 Sugden, D., Grady, R., Jr. and Mefford, I.N.: Measurement of tryptophan hydroxylase activity in rat pineal glands and pinealocytes using an HPLC assay with electrochemical detection. *J. Pineal Res.*, 6 (1989) 285-292; *C.A.*, 110 (1989) 168800z.
- 4580 Takahashi, K., Taniguchi, S., Kuroishi, T., Yasuda, K. and Sano, T.: Automated micro stopped-flow/continuous-flow apparatus for serial measurement of enzyme reactions and its application as a real-time analyser for column chromatography. *Anal. Chim. Acta*, 220 (1989) 13-21.
- 4581 Trower, M.K., Buckland, R.M. and Griffin, M.: Characterization of an FMN-containing cyclohexanone monooxygenase from a cyclohexane-grown *Xanthobacter* sp. *Eur. J. Biochem.*, 181 (1989) 199-206.
- 4582 Tsuji, H., Ogawa, T., Bando, N. and Sasaoka, K.: Stereospecificity of NAD(P)H oxidation catalyzed by 4-aminobenzoate hydroxylase from *Agaricus bisporus*. *Biochim. Biophys. Acta*, 991 (1989) 380-382.
- 4583 Weretilnyk, E.A. and Hanson, A.D.: Betaine aldehyde dehydrogenase from spinach leaves: purification, *in vitro* translation of the mRNA, and regulation by salinity. *Arch. Biochem. Biophys.*, 271 (1989) 56-63.
- 4584 Weyler, W.: Monoamine oxidase A from human placenta and monoamine oxidase B from bovine liver both have one FAD per subunit. *Biochem. J.*, 260 (1989) 725-729.
- 4585 Zaborosch, C., Schneider, K., Schlegel, H.G. and Kratzin, H.: Comparison of the  $\text{NH}_2$ -terminal amino acid sequences of the four non-identical subunits of the NAD-linked hydrogenases from *Nocardia opaca* 1b and *Alcaligenes eutrophus* H16. *Eur. J. Biochem.*, 181 (1989) 175-180.

- 4586 Zhou, J.-Z. and Thorpe, C.: Inactivation of two-electron reduced medium chain acyl-CoA dehydrogenase by 2-octynoyl-CoA. *Arch. Biochem. Biophys.*, 271 (1989) 261-269.

For additional information see:  
*C.A.*, 110 (1989) 188216s, 227748p.

See also 4686.

20b. *Transferases (excluding E.C. 2.7.-.-)*

- 4587 Barnes, S., Buchina, E.S., King, R.J., McBurnett, T. and Taylor, K.B.: Bile acid sulfotransferase I from rat liver sulfates bile acids and 3-hydroxy steroids: purification, N-terminal amino acid sequence and kinetic properties. *J. Lipid Res.*, 30 (1989) 529-540.
- 4588 Corrigall, A.V., Bhargava, M.M., Ivanetich, K.M., Ehlers, M.R.W. and Kirsch, R.E.: Site-directed inactivation of human lung acidic glutathione S-transferase by 1-chloro-2,4-dinitrobenzene in the absence of glutathione. *Biochim. Biophys. Acta*, 991 (1989) 399-404.
- 4589 Eaton, D.L. and Stapleton, P.L.: Simultaneous determination of cytosolic glutathione S-transferase and microsomal epoxide hydrolase activity toward benzo[*a*]pyrene-4,5-oxide by high-performance liquid chromatography. *Anal. Biochem.*, 178 (1989) 153-158.
- 4590 Falany, C.N., Vazquez, M.E. and Kalb, J.M.: Purification and characterization of human liver dehydroepiandrosterone sulphotransferase. *Biochem. J.*, 260 (1989) 641-646.
- 4591 Haselbeck, A.: Purification of GDP mannose:dolichyl-phosphate O- $\beta$ -D-mannosyl-transferase from *Saccharomyces cerevisiae*. *Eur. J. Biochem.*, 181 (1989) 663-668.
- 4592 Jain, J.C., Reed, D.W., Groot Wassink, J.W.D. and Underhill, E.W.: A radioassay of enzymes catalyzing the glucosylation and sulfation steps of glucosinolate biosynthesis in *Brassica* species. *Anal. Biochem.*, 178 (1989) 137-140.
- 4593 Kajander, E.O., Kauppinen, L.I., Pajula, R.-L., Karkola, K. and Eloranta, T.O.: Purification and partial characterization of human polyamine synthases. *Biochem. J.*, 259 (1989) 879-886.
- 4594 Kim, Y.T. and Churchich, J.E.: Sequence of the cysteinyl-containing peptides of 4-aminobutyrate aminotransferase. Identification of sulfhydryl residues involved in intersubunit linkage. *Eur. J. Biochem.*, 181 (1989) 397-401.
- 4595 Kispert, A., Meyer, D.J., Lalor, E., Coles, B. and Ketterer, B.: Purification and characterization of a labile rat glutathione transferase of the Mu class. *Biochem. J.*, 260 (1989) 789-793.
- 4596 Koenderman, A.H.L., Koppen, P.L., Koeleman, C.A.M. and van den Eijnden, D.H.: N-Acetylglucosaminyltransferase III, IV and V activities in Novikoff ascites tumour cells, mouse lymphoma cells and hen oviduct. Application of a sensitive and specific assay by use of high-performance liquid chromatography. *Eur. J. Biochem.*, 181 (1989) 651-655.
- 4597 Meyer, D.J., Lalor, E., Coles, B., Kispert, A., Alin, P., Mannervik, B. and Ketterer, B.: Single-step purification and HPLC analysis of glutathione transferase 8-8 in rat tissues. *Biochem. J.*, 260 (1989) 785-788.
- 4598 Queen, S.A., Vander Jagt, D.L. and Reyes, P.: Characterization of adenine phosphoribosyltransferase from the human malaria parasite, *Plasmodium falciparum*. *Biochim. Biophys. Acta*, 996 (1989) 160-165.
- 4599 Sanjanwala, M., Sun, G.Y. and MacQuarrie, R.A.: Purification and kinetic properties of lysophosphatidylinositol acyltransferase from bovine heart muscle microsomes and comparison with lysophosphatidylcholine acyltransferase. *Arch. Biochem. Biophys.*, 271 (1989) 407-413.
- 4600 Schultz, E., Nissinen, E. and Kaakkola, S.: Determination of catechol-O-methyltransferase activity in erythrocytes by high performance liquid chromatography with electrochemical detection. *Biomed. Chromatogr.*, 3 (1989) 64-67.
- 4601 Sundaram, R.S., Szumlanski, C., Otterness, D., van Loon, J.A. and Weinshilboum, R.M.: Human intestinal phenol sulfotransferase: assay conditions, activity levels and partial purification of the thermolabile form. *Drug Metab. Disp.*, 17 (1989) 255-264.
- 4602 Takeyama, N., Matsuo, N., Takagi, D. and Tanaka, T.: Determination of overt carnitine palmitoyltransferase by reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 491 (1989) 69-76.

- 4603 Witttich, R.-M. and Walter, R.D.: A novel type of putrescine (diamine)-acetylating enzyme from the nematode *Ascaris suum*. *Biochem. J.*, 260 (1989) 265-269.

For additional information see:  
*C.A.*, 110 (1989) 173747s.

See also 4217, 4356, 4556.

20c. *Transferases transferring phosphorus containing groups (E.C. 2.7.-)*

- 4604 Boutin, J.A., Ernould, A.-P., Genton, A. and Cudennec, C.A.: Partial purification and characterization of a new p36/40 tyrosine protein kinase from HL-60. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1203-1211.
- 4605 Buechler, J.A., Vedvick, T.A. and Taylor, S.S.: Differential labeling of the catalytic subunit of cAMP-dependent protein kinase with acetic anhydride: substrate-induced conformational changes. *Biochemistry*, 28 (1989) 3018-3024.
- 4606 Cazaubon, S., Marais, R., Parker, P. and Strosberg, A.D.: Monoclonal antibodies to protein kinase C $\gamma$ . Functional relationship between epitopes and cofactor binding sites. *Eur. J. Biochem.*, 182 (1989) 401-406.
- 4607 Chaudhry, P.S. and Casillas, E.R.: Casein kinase II activity and polyamine-stimulated protein phosphorylation of cytosolic and plasma membrane proteins in bovine sperm. *Arch. Biochem. Biophys.*, 271 (1989) 98-106.
- 4608 Cooper, D.R., Watson, J.E., Acevedo-Duncan, M., Pollet, R.J., Standaert, M.L. and Farese, R.V.: Retention of specific protein kinase C isozymes following chronic phorbol ester treatment in BC3H-1 myocytes. *Biochem. Biophys. Res. Commun.*, 161 (1989) 327-334.
- 4609 Edwards, R.J., Carter, N.D., Jeffery, S. and Yates, S.: Purification of human muscle phosphoglycerate mutase by fast protein liquid chromatography based on hydrophobic interactions. *J. Chromatogr.*, 490 (1989) 424-431.
- 4610 Guasch, A., Barman, T., Travers, F. and Cuchillo, C.M.: Coupling of proteolytic quenching and high-performance liquid chromatography to enzyme reactions. Application to bovine pancreatic ribonuclease. *J. Chromatogr.*, 473 (1989) 281-286.
- 4611 Jimenez, B., Pestana, A. and Fernandez-Renart, M.: A phospholipid-stimulated protein kinase from *Dictyostelium discoideum*. *Biochem. J.*, 260 (1989) 557-561.
- 4612 Li, Y.-S., Porter, F.D., Hoffman, R.M. and Deuel, T.F.: Separation and identification of two phosphatidylinositol 4-kinase activities in bovine uterus. *Biochem. Biophys. Res. Commun.*, 160 (1989) 202-209.
- 4613 Marais, R.M. and Parker, P.J.: Purification and characterization of bovine brain protein kinase C isotypes  $\alpha$ ,  $\beta$  and  $\gamma$ . *Eur. J. Biochem.*, 182 (1989) 129-137.
- 4614 Salvarrey, M.S., Cannata, J.J.B. and Cazzulo, J.J.: Phosphoenolpyruvate carboxykinase from the moderate halophile *Vibrio costicola*. Purification, physicochemical properties and the effect of univalent-cation salts. *Biochem. J.*, 260 (1989) 221-230.

For additional information see:  
*C.A.*, 110 (1989) 227465u.

20d. *Hydrolases, acting on ester bonds (E.C. 3.1.-.-)*

- 4615 Andres, J.L. and Maller, J.L.: Purification and characterization of a novel protein phosphatase highly specific for ribosomal protein S6. *J. Biol. Chem.*, 264 (1989) 151-156.
- 4616 Bailly, V. and Verly, W.G.: The multiple activities of *Escherichia coli* endonuclease IV and the extreme lability of 5'-terminal base-free deoxyribose 5'-phosphates. *Biochem. J.*, 259 (1989) 761-768.
- 4617 Cannistraro, V.J. and Kennell, D.: Purification and characterization of ribonuclease M and mRNA degradation in *Escherichia coli*. *Eur. J. Biochem.*, 181 (1989) 363-370.
- 4618 Erneux, C., Lemos, M., Verjans, B., Vanderhaeghen, P., Delvaux, A. and Dumont, J.E.: Soluble and particulate Ins(1,4,5)P $_3$ /Ins(1,3,4,5)P $_4$  5-phosphatase in bovine brain. *Eur. J. Biochem.*, 181 (1989) 317-322.
- 4619 Freeman, C. and Hopwood, J.J.: Human liver glucuronate 2-sulphatase. Purification, characterization and catalytical properties. *Biochem. J.*, 259 (1989) 209-216.



- 4620 Gisch, D.J., Reid, T.S., Swan, J.S. and Cheng, J.: Rapid analytical and preparative affinity chromatography, using resin-bound heparin to resolve bile salt stimulated lipase from human milk whey. *J. High Resolut. Chromatogr.*, 12 (1989) 258-260.
- 4621 Ikeda, Y., Takagi, A. and Yamamoto, A.: Purification and characterization of lipoprotein lipase and hepatic triglyceride lipase from human postheparin plasma: production of monospecific antibody to the individual lipase. *Biochim. Biophys. Acta*, 1003 (1989) 254-269.
- 4622 Kramer, R.M., Hession, C., Johansen, B., Hayes, G., McGray, P., Chow, E.P., Tizard, R. and Pepinsky, R.B.: Structure and properties of a human non-pancreatic phospholipase A<sub>2</sub>. *J. Biol. Chem.*, 264 (1989) 5768-5775.
- 4623 Lindner, N.M., Jeffcoat, R. and Lowe, C.R.: Design and applications of biomimetic anthraquinone dyes. Purification of calf intestinal alkaline phosphatase with immobilised terminal ring analogues of C.I. Reactive Blue 2. *J. Chromatogr.*, 473 (1989) 227-240.
- 4624 Löffler, B.-M. and Kunze, H.: Biospecific dye-binding and hydrophobic interaction chromatography as tools for high yield preparation of purified phospholipase A<sub>1</sub> from rat liver. *Biochim. Biophys. Acta*, 1003 (1989) 225-231.
- 4625 Nilsson, S., Holm, C. and Belfrage, P.: Rapid purification of detergent-solubilized bovine hormone-sensitive lipase by high performance hydrophobic interaction chromatography. *Biomed. Chromatogr.*, 3 (1989) 82-87.
- 4626 Steinbrecher, U.P. and Pritchard, P.H.: Hydrolysis of phosphatidylcholine during LDL oxidation is mediated by platelet-activating factor acetylhydrolase. *J. Lipid Res.*, 30 (1989) 305-315.
- 4627 Warren, W. and Merion, M.: Rapid HPLC purification of a restriction enzyme from *Sphaerotilus* sp. *BioChromatography*, 3 (1988) 225-230; *C.A.*, 110 (1989) 110580m.
- 4628 Whalen, M.M. and Bitensky, M.W.: Comparison of the phosphodiesterase inhibitory subunit interactions of frog and bovine rod outer segments. *Biochem. J.*, 259 (1989) 13-19.

See also 4302, 4684.

20e. *Hydrolases, acting on glycosyl compounds (E.C. 3.2.-.-)*

- 4629 Choy, F.Y.M.: Purification of lysosomal membrane-bound glucocerebrosidase from human cultured fibroblasts using high-performance liquid chromatography. *Anal. Biochem.*, 179 (1989) 312-318.
- 4630 Clements, P.R., Brooks, D.A., McCourt, P.A.G. and Hopwood, J.J.: Immunopurification and characterization of human  $\alpha$ -L-iduronidase with the use of monoclonal antibodies. *Biochem. J.*, 259 (1989) 199-208.
- 4631 Fontana, J.D., Gebara, M., Blumel, M., Schneider, H., Mackenzie, C.R. and Jonson, K.G.:  $\alpha$ -4-O-Methyl-D-glucuronidase component of xylanolytic complexes. *Methods Enzymol.*, 160 (Biomass, Pt. A) (1988) 560-571; *C.A.*, 110 (1989) 168771r.
- 4632 Forsee, W.T., Palmer, C.F. and Schutzbach, J.S.: Purification and characterization of an  $\alpha$ -1,2-mannosidase involved in processing asparagine-linked oligosaccharides. *J. Biol. Chem.*, 264 (1989) 3869-3876.
- 4633 Henson, C.A. and Stone, J.M.: Rapid high-performance liquid chromatographic separation of barley malt  $\alpha$ -amylase on cyclobond columns. *J. Chromatogr.*, 469 (1989) 361-367.
- 4634 Lieser, M., Harms, E., Kern, H., Bach, G. and Cantz, M.: Ganglioside GM3 sialidase activity in fibroblasts of normal individuals and of patients with sialidosis and mucopolidosis IV. Subcellular distribution and some properties. *Biochem. J.*, 260 (1989) 69-74.

For additional information see:

*C.A.*, 110 (1989) 168841p, 168983m, 188190d.

20f. *Other hydrolases*

- 4635 Archambault, de Vencay, J.: Méthionyl-tRNA synthétase du germe de blé. Effect d'une protéase endogène et corrélations entre caractéristiques structurales et propriétés catalytiques. *Eur. J. Biochem.*, 182 (1989) 37-43.
- 4636 Barthomeuf, C.: Application of enzyme purification processes to proteolytic enzymes. *J. Chromatogr.*, 473 (1989) 1-26 - a review with 276 refs.

- 4637 Bridges, M., Mahey, R., Lau, W., Hampong, M. and Katz, S.: Purification of calcium ATPase from rat pancreatic acinar plasma membranes using calmodulin-affinity chromatography. *Adv. Exp. Med. Biol.*, 232 (1988) 83-85; *C.A.*, 110 (1989) 168998v.
- 4638 Dallas, P., Rekkas, D. and Choulis, N.H.: HPLC determination of serratiopeptidase in biological fluids. *Pharmazie*, 44 (1989) 297.
- 4639 Huang, S.Y. and Lin, C.H.: Separation and purification of porcine pancreatic enzymes by serial operation of ion-exchange and affinity column. *Chromatographia*, 27 (1989) 449-454.
- 4640 Jacobson, K.B. and Manos, R.E.: Effects of sepiapterin and 6-acetyldihydrohomopterin on the guanosine triphosphate cyclohydrolase I of mouse, rat and the fruit-fly *Drosophila*. *Biochem. J.*, 260 (1989) 135-141.
- 4641 Kautz, J. and Schnackerz, K.D.: Purification and properties of 5,6-dihydropyrimidine amidohydrolase from calf liver. *Eur. J. Biochem.*, 181 (1989) 431-435.
- 4642 Khurana, A.L. and Ho, C.-T.: High performance liquid affinity chromatographic resolution of trypsins on soybean trypsin inhibitor bonded phase. *J. Liq. Chromatogr.*, 12 (1989) 563-570.
- 4643 Kobayashi, M., Nagasawa, T. and Yamada, H.: Nitrilase of *Rhodococcus rhodochreus* J1. Purification and characterization. *Eur. J. Biochem.*, 182 (1989) 349-356.
- 4644 Louis, J.M., Wondrak, E.M., Copeland, T.D., Smith, C.A.D., Mora, P.T. and Oroszlan, S.: Chemical synthesis and expression of the HIV-1 protease gene in *E. coli*. *Biochem. Biophys. Res. Commun.*, 159 (1989) 87-94.
- 4645 Mäkinen, P.-L., Clewell, D.B., An, F. and Mäkinen, K.K.: Purification and substrate specificity of a strongly hydrophobic extracellular metalloendopeptidase ("gelatinase") from *Streptococcus faecalis* (strain OG1-10). *J. Biol. Chem.*, 264 (1989) 3325-3334.
- 4646 Norman, J.A., Little, D., Free, C.A., Dejneka, T., Weber, H. and Ryono, D.E.: Affinity purification of endothia protease with a novel renin inhibitor, SQ 32,970. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1-7.
- 4647 Prescott, M., Milne, A.D. and McLennan, A.G.: Characterization of the bis(5'-nucleosidyl)tetraphosphate pyrophosphohydrolase from encysted embryos of the bovine shrimp *Artemia*. *Biochem. J.*, 259 (1989) 831-838.
- 4648 Tollersrud, O.K. and Aronson, N.N., Jr.: Purification and characterization of rat liver glycosylasparaginase. *Biochem. J.*, 260 (1989) 101-108.
- 4649 Tsunasawa, S., Masaki, T., Hirose, M., Soejima, M. and Sakiyama, F.: The primary structure and structural characteristics of *Achromobacter lyticus* protease I, a lysine-specific serine protease. *J. Biol. Chem.*, 264 (1989) 3832-3839.
- 4650 Yamasaki, Y. and Kato, Y.: Analysis of urokinase by HPLC. *J. High Resolut. Chromatogr.*, 12 (1989) 256-257.

For additional information see:

*C.A.*, 110 (1989) 188306w, 208267q, 208505r.

See also 4438, 4589.

#### 20g. Lyases

- 4651 Flamingi, F., Marmiroli, S., Caldarera, C.M. and Guarnieri, C.: Involvement of thiol transferase- and thioredoxin-dependent systems in the protection of "essential" thiol groups of ornithine decarboxylase. *Biochem. J.*, 259 (1989) 111-115.
- 4652 Jang, S., Cheesbrough, T.M. and Kolattukudy, P.E.: Molecular cloning, nucleotide sequence, and tissue distribution of malonyl-CoA decarboxylase. *J. Biol. Chem.*, 264 (1989) 3500-3505.
- 4653 Jung, H., Jung, K. and Kleber, H.-P.: Purification properties of carnitine dehydratase from *Escherichia coli* - a new enzyme of carnitine metabolism. *Biochim. Biophys. Acta*, 1003 (1989) 270-276.

- 4654 Kochhar, S., Mehta, P.K. and Christen, P.: Assay for aliphatic amino acid decarboxylases by high-performance liquid chromatography. *Anal. Biochem.*, 179 (1989) 182-185.

For additional information see:  
C.A., 110 (1989) 208281q.

See also 4722.

#### 20h. Isomerases

- 4655 Feth, F., Wagner, R., Baydoun, H. and Wagner, K.G.: Enzyme assay for L-myoinositol 1-phosphate synthetase based on high-performance liquid chromatography of benzoylated inositol. *Anal. Biochem.*, 178 (1989) 135-136.
- 4656 Marsh, E.N., McKie, N., Davis, N.K. and Leadlay, P.F.: Cloning and structural characterization of the genes coding for adenosylcobalamin-dependent methylmalonyl-CoA mutase from *Propionibacterium shermanii*. *Biochem. J.*, 260 (1989) 345-352.

#### 20i. Ligases

- 4657 Desai, S.D., Pasupathy, K., Chetty, K.G. and Pradhan, D.S.: Evidence for the presence of DNA primase in mitochondria of *Saccharomyces cerevisiae*. *Biochem. Biophys. Res. Commun.*, 160 (1989) 525-534.
- 4658 Reichsteiner, T. and Leisinger, T.: Purification of isoleucyl-tRNA synthetase from *Methanobacterium thermoautotrophicum* by pseudomonic acid affinity chromatography. *Eur. J. Biochem.*, 181 (1989) 41-46.
- 4659 Smolyaninov, V.V., Kalyuzhnaya, A.P., Shekhvatova, G.V., Svyatukhina, N.V. and Mansygin, Yu.A.: (Production of highly-purified T4 DNA ligase by means of monoclonal antibodies). *Biotekhnologiya*, 4 (1988) 757-758; C.A., 110 (1989) 168834p.

### 21. PURINES, PYRIMIDINES, NUCLEIC ACIDS AND THEIR CONSTITUENTS

#### 21a. Purines, pyrimidines, nucleosides, nucleotides

- 4660 Berger, G., Girault, G. and Galmiche, J.-M.: Study of the simultaneous binding of ADP and ATP on coupling factor CF1 by a modification of the Hummel and Dreyer method. *J. Liq. Chromatogr.*, 12 (1989) 535-551.
- 4661 Gehrke, C.W. and Kuo, K.C.: Ribonucleoside analysis by reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 471 (1989) 3-36.
- 4662 Gerber, L.A. and Stutzenberger, F.: Measurement of cAMP in *Thermospora curvata* by anion exchange HPLC. *J. Microbiol. Methods*, 9 (1989) 41-49; C.A., 110 (1989) 150697m.
- 4663 Ghosh, S.S., Kao, P.M. and Kwoh, D.Y.: Synthesis of 5'-oligonucleotide hydrazide derivatives and their use in preparation of enzyme-nucleic acid hybridization probes. *Anal. Biochem.*, 178 (1989) 43-51.
- 4664 Kawase, Y., Iwai, S. and Ohtsuka, E.: Synthesis and thermal stability of dodecadeoxyribonucleotides containing deoxyinosine pairing with four major bases. *Chem. Pharm. Bull.*, 37 (1989) 599-601.
- 4665 Kindberg, C.G., Riley, C.M., Stobaugh, J.F. and Slavik, M.: Analysis of 5-fluorouracil in plasma by precolumn derivatization with 4-bromomethyl-7-methoxycoumarin, followed by multi-dimensional high-performance liquid chromatography. *J. Chromatogr.*, 473 (1989) 431-444.
- 4666 Lipschitz, C., Irth, H., de Jong, G.J., Brinkman, U.A.T. and Frei, R.W.: Trace enrichment of pyrimidine nucleobases, 5-fluorouracil and bromacil on a silver-loaded thiol stationary phase with on-line reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 471 (1989) 321-334.
- 4667 Litt, M.R., Potter, J.J., Mezey, E. and Mitchell, M.C.: Analysis of pyridine dinucleotides in cultured rat hepatocytes by high-performance liquid chromatography. *Anal. Biochem.*, 179 (1989) 34-36.

- 4668 Magnani, M., Rossi, L., Bianchi, M., Cucchiaroni, L. and Stocchi, V.: Reversed-phase liquid chromatographic determination of 2',3'-dideoxycytidine in human blood samples. *J. Chromatogr.*, 491 (1989) 215-220.
- 4669 Montaldo, P.G. and D'Incalci, M.: High-performance liquid chromatographic determination of 5-bromodeoxyuridine in human plasma. *J. Chromatogr.*, 491 (1989) 129-138.
- 4670 Mörkofler-Zwez, S. and Walter, P.: Binding of ADP to rat liver cytosolic proteins and its influence on the ratio of free ATP/free ADP. *Biochem. J.*, 259 (1989) 117-124.
- 4671 Munholland, J.M., Bright, K.A. and Nazar, R.N.: Use of a volatile buffer system in ion-exchange high-performance liquid chromatography of oligonucleotides. *Anal. Biochem.*, 178 (1989) 320-323.
- 4672 Nagae, S., Miyamoto, T., Inaki, Y. and Takemoto, K.: Functional monomers and polymers. CLXXIII. Immobilization of nucleic acid bases on silica gel and application to HPLC for selective separation of nucleosides. *Polym. J.*, 21 (1989) 19-33; *C.A.*, 110 (1989) 193309d.
- 4673 Pekic, B., Slavica, B. and Zekovic, Z.: High-performance liquid chromatographic determination of uric acid in feces of egg-laying hens. *Chromatographia*, 27 (1989) 467-468.
- 4674 Prokudin, V.Yu. Tikhonov, Yu.V., Pimenov, A.M., Demin, V.F. and Toguzov, R.T.: Determination of oxypurine compounds in erythrocytes of newborn infants with perinatal hypoxia using ion-pairing HPLC. *Chromatogram*, 9 (1988) 2-3; *C.A.*, 110 (1989) 150698n.
- 4675 Pruess-Schwartz, D., Nimesheim, A. and Marnett, L.J.: Peroxyl radical- and cytochrome P-450-dependent metabolic activation of (+)-7,8-dihydroxy-7,8-dihydrobenzo[*a*]pyrene in mouse skin *in vitro* and *in vivo*. *Cancer Res.*, 264 (1989) 1723-1737.
- 4676 Ramsey, R.S., Chan, V.W., Dittmar, B.M. and Row, K.H.: Retention modification of nucleic acid constituents in reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 468 (1989) 167-179.
- 4677 Satoh, S. and Yang, S.F.: Specificity of S-adenosyl-L-methionine in the inactivation and the labeling of 1-aminocyclopropane-1-carboxylate synthase isolated from tomato fruits. *Arch. Biochem. Biophys.*, 271 (1989) 107-112.
- 4678 Weinfeld, M., Drake, A.F., Kuroda, R. and Livingston, D.C.: Isolation and characterization of the diastereoisomers of a series of phosphate-ethylated dinucleoside monophosphates. *Anal. Biochem.*, 178 (1989) 93-101.
- 4679 Werner, A., Schneider, W., Siems, W., Grune, T. and Schreiber, C.: Ion-pair reversed phase HPLC determination of nucleotides, nucleosides and nucleobases - application to nucleotide metabolism in hepatocytes. *Chromatographia*, 27 (1989) 639-643.
- 4680 Werner, A., Siems, W., Kowalewski, J. and Gerber, G.: Interrelationships between purine nucleotide degradation and radical formation during intestinal ischaemia and reperfusion: an application of ion-pair high-performance liquid chromatography of nucleotides, nucleosides and nucleobases. *J. Chromatogr.*, 491 (1989) 77-88.
- 4681 Zamboni, M., Brigotti, M., Rambelli, F., Zontanaro, L. and Sperti, S.: High-pressure-liquid-chromatographic and fluorimetric methods for the determination of adenine released from ribosomes by ricin and gelonin. *Biochem. J.*, 259 (1989) 639-643.
- 4682 Zeisel, S.H., Zola, T., daCosta, K.-A. and Pomfret, E.A.: Effect of choline deficiency on S-adenosylmethionine and methionine concentrations in rat liver. *Biochem. J.*, 259 (1989) 725-729.

For additional information see:

*C.A.*, 110 (1989) 169532a, 188663k, 208686a.

See also 4724.

#### 21b. Nucleic acids, RNA

- 4683 Sawai, H.: High performance liquid chromatography of nucleic acids. *Rinsho Kensa*, 32 (1988) 1636-1643; *C.A.*, 110 (1989) 208606z - a review with 15 refs.

*21c. Nucleic acids, DNA*

- 4684 Bailly, V., Sente, B. and Verly, W.G.: Bacteriophage-T4 and *Micrococcus luteus* UV endonucleases are not endonucleases but  $\beta$ -elimination and sometimes  $\beta\delta$ -elimination catalysts. *Biochem. J.*, 259 (1989) 751-759.
- 4685 Hansen, J.C. and Rickett, H.: Large-scale purification of plasmid insert DNA sequences using low-percentage agarose exclusion chromatography. *Anal. Biochem.*, 179 (1989) 167-170.
- 4686 Kaiserman, H.B., Odenwald, W.F., Stowers, D.J., Poll, E.H.A. and Benbow, R.M.: A major single-stranded DNA binding protein from ovaries of the frog. *Xenopus laevis*, is lactate dehydrogenase. *Biochim. Biophys. Acta*, 1008 (1989) 23-30.
- 4687 Nerion, M. and Warren, W.: Purification of supercoiled plasmids from crude cell lysates using high performance anion exchange chromatography. *BioTechniques*, 7 (1989) 60-67; *C.A.*, 110 (1989) 227901h.

For additional information see:

*C.A.*, 110 (1989) 150893x, 150938r.

See also 4683.

*21e. Structural studies on DNA and DNA mapping*

- 4688 Hirabayashi, J. and Kasai, K.-I.: Size-dependent, chromatographic separation of double-stranded DNA which is not based on gel permeation mode. *Anal. Biochem.*, 178 (1989) 336-341.

## 22. ALKALOIDS

- 4689 Brodzinska, D.: (Application of ion-exchange column chromatography in spectrofluorimetric method of morphine determination in urine). *Chem. Anal.*, 33 (1988) 383-388; *C.A.*, 110 (1989) 185261s.
- 4690 El-Sayed, Y.M. and Islam, S.I.: HPLC analysis of theophylline in serum and its use in therapeutic drug monitoring. *J. Clin. Pharm. Ther.*, 14 (1989) 35-43; *C.A.*, 110 (1989) 185254s.
- 4691 Kaplan, G.B., Greenblatt, D.J., Leduc, B.W., Thompson, M.L. and Shader, R.I.: Relationship of plasma and brain concentrations of caffeine and metabolites to benzodiazepine receptor binding and locomotor activity. *J. Pharmacol. Exp. Ther.*, 248 (1989) 1078-1083.
- 4692 Kishimoto, I., Tanigawara, Y., Okumura, K. and Hori, R.: Blood oxygen tension-related change of theophylline clearance in experimental hypoxemia. *J. Pharmacol. Exp. Ther.*, 248 (1989) 1237-1242.
- 4693 Nagel, S. and Eigendorf, H.-G.: Theophyllinbestimmung aus Kapillarblut bei Säuglingen. *Pharmazie*, 44 (1989) 228-229.
- 4694 Sarg, T.M., El-Domiaty, M.M., Bishr, M.M., Salama, O.M. and El-Gindy, A.R.: Thin-layer chromatographic scanner, spectrophotometric and high-performance liquid chromatographic methods for the determination of colchicine. *Analyst (London)*, 114 (1989) 575-578.
- 4695 Suzuki, Y., Uematsu, T., Mizuno, A., Fujii, K. and Nakashima, M.: Determination of caffeine in saliva by HPLC: new sampling method for saliva using filter paper. *Ther. Drug Monit.*, 11 (1989) 88-92; *C.A.*, 110 (1989) 147010b.
- 4696 Tan, T., Kuramoto, M., Takahashi, T., Nakamura, H., Nakanishi, Y., Imasato, Y. and Yoshimura, H.: Characteristics of the gastrointestinal absorption of morphine in rats. *Chem. Pharm. Bull.*, 37 (1989) 168-173.
- 4697 Teshima, D., Ikeda, K., Shimomura, K. and Aoyama, T.: Simultaneous determination of emetine and cephaeline in ipecac syrup. *Chem. Pharm. Bull.*, 37 (1989) 197-199.
- 4698 Vendrig, D.E.M.M., Mekking, A., Teeuwsen, J. and Holthuis, J.J.M.: The stability of antineoplastic vinca alkaloids in plasma and urine. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 283-288; *C.A.*, 110 (1989) 204965t.

For additional information see:

*C.A.*, 110 (1989) 179601m, 179606s, 218940t, 219162c, 219163d.

See also 4711, 4755, 4829, 4843.

## 23. OTHER SUBSTANCES CONTAINING HETEROCYCLIC NITROGEN

## 23a. Porphyrins and other pyrroles

- 4699 Jacob, K., Egeler, E., Neumeier, D. and Knedel, M.: Isocratic ion-pair high-performance liquid chromatographic methods for the determination of uroporphyrin and coproporphyrin type II and IV isomers in human urine. *J. Chromatogr.*, 468 (1989) 329-338.
- 4700 Kaur, S., Gill, J.P., Evershed, R.P., Eglinton, G. and Maxwell, J.R.: Computerised gas chromatographic-mass spectrometric and high-performance liquid chromatographic analysis of sedimentary benzoporphyrins. *J. Chromatogr.*, 473 (1989) 135-151.
- 4701 Pandey, R.K. and Dougherty, T.J.: Syntheses and photosensitizing activity of porphyrins joined with ester linkages. *Cancer Res.*, 49 (1989) 2042-2047.
- 4702 Peltonen, K., Kostianen, R. and Savolainen, H.: Chromatographic analysis, isolation and partial characterization of two photocatalysed reaction products of haem and quinone. *J. Chromatogr.*, 490 (1989) 311-318.

For additional information see:  
*C.A.*, 110 (1989) 179588n.

See also 4401.

## 23b. Bile pigments

- 4703 Sugi, K., Inoue, M. and Morino, Y.: Degradation of plasma bilirubin by a bilirubin oxidase derivative which has a relatively long half-life in the circulation. *Biochim. Biophys. Acta*, 991 (1989) 405-409.

## 23c. Indole derivatives

- 4704 Duchateau, A.L.: Quantitative determination of serotonin and 5-hydroxyindole-acetic acid in brain tissue by gas chromatography/mass spectrometry and high pressure liquid chromatography: electrochemistry detection. *Avail. Univ. Microfilm Int.*, Order No. DA8806471, 1986, 236 pp.; *C.A.*, 110 (1989) 225615u.
- 4705 Martin, F. and Aldegunde, M.: Simple high-performance liquid chromatographic method with electrochemical detection for the determination of indoleamines in tissue and plasma. *J. Chromatogr.*, 491 (1989) 221-225.
- 4706 Pavel, S.: Analysis of eumelanin-related indolic compounds. *TrAC*, 8 (1989) 177-183 - a review with 15 refs.

## 23d. Pyridine derivatives

- 4707 Lafleur, A.L. and Wornat, M.J.: Multimode retention behavior of azaarenes in size exclusion chromatography with poly(divinylbenzene). *Anal. Lett.*, 22 (1989) 493-506.

## 23e. Other N-heterocyclic compounds

- 4708 Coppi, S. and Betti, A.: Liquid chromatographic separation and behaviour of some triazines on styrene-divinylbenzene columns. *J. Chromatogr.*, 472 (1989) 406-410.
- 4709 Ogata, M. and Taguchi, T.: Simultaneous determination of urinary creatinine and metabolites of toluene, xylene, styrene, ethylbenzene and phenol by automated HPLC. *Int. Arch. Occup. Environ. Health*, 61 (1988) 131-140; *C.A.*, 110 (1989) 150690d.
- 4710 Pawelczyk, E. and Smilowski, B.: Analysis of drug decomposition products. XXXIX. Use of colorimetry and high-performance liquid chromatography in the determination and stability evaluation of 2-pyrrolidone. *Acta Pol. Pharm.*, 45 (1988) 252-258; *C.A.*, 110 (1989) 160479f.
- 4711 Pietrogrande, M.C., Dondi, F., Borea, P.A. and Bigli, C.: Retention behaviour of  $\beta$ -carbolines in normal-phase chromatography. Silica and amino phases in high-performance and thin-layer chromatography. *J. Chromatogr.*, 471 (1989) 407-419.

- 4712 Sagara, K., Ojima, M., Suto, K. and Yoshida, T.: Quantitative determination of allantoin in *Dioscorea rhizome* and an Oriental pharmaceutical preparation, Hachimi-Gan, by high-performance liquid chromatography. *Planta Med.*, 55 (1989) 93; *C.A.*, 110 (1989) 219181h.
- 4713 Saito, K., Horie, M., Hoshino, Y., Nose, N., Nakazawa, H. and Fujita, M.: Determination of diketopiperazine in soft drinks by high-performance liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 571-582.
- 4714 Uchida, K., Mitsui, M. and Kawakishi, S.: Monooxygenation of N-acetylhistamine mediated by L-ascorbate. *Biochim. Biophys. Acta*, 991 (1989) 377-379.

See also 4187.

#### 24. ORGANIC SULPHUR COMPOUNDS

- 4715 Fahey, R.C. and Newton, G.L.: Determination of low molecular weight thiols using monobromobimane fluorescent labeling and HPLC. *NASA Contract. Rep. 1988*, NASA-CR-182932, NAS 126: 182932, 19 pp.; *C.A.*, 110 (1989) 150693g.
- 4716 Heeremans, C.E.M., van der Hoeven, R.A.M., Niessen, W.M.A., Vuik, J., de Vos, R. and van der Greef, J.: Specific screening methods for glucosinolates in sprout extracts using on-line thermospray liquid chromatography-tandem mass spectrometry. *J. Chromatogr.*, 472 (1989) 219-229.
- 4717 Matissek, R., Nagorka, R., Daase, M. and Wengatz, I.: Analysis of methylisothiazolones by ion pair high-performance liquid chromatography after precolumn derivatisation. Part II. Determination of 2-methyl-3(H)-isothiazolone and 5-chloro-2-methyl-3(2H)-isothiazolone in cosmetics. *Fresenius' Z. Anal. Chem.*, 333 (1989) 806-809.
- 4718 Sen, N.P., Seaman, S.W., Baddoo, P.A. and Weber, D.: Determination and occurrence of 2-(hydroxymethyl)-N-nitrosothiazolidine in fried bacon and other cured meat products. *J. Agric. Food Chem.*, 37 (1989) 717-721.
- 4719 Sliwiok, J., Kus, P. and Sajewicz, M.: Some data on the thin-layer and high-performance liquid chromatographic separation of some dithia[3.3]phanes. *J. Chromatogr.*, 472 (1989) 314-317.
- 4720 Toyo'oka, T., Uchiyama, S. and Saito, Y.: Effect of  $\gamma$ -irradiation on thiol compounds in grapefruit. *J. Agric. Food Chem.*, 37 (1989) 769-775.

For additional information see:

*C.A.*, 110 (1989) 152874r, 224747b, 230267m.

See also 4065, 4187, 4836.

#### 25. ORGANIC PHOSPHORUS COMPOUNDS (INCLUDING SUGAR PHOSPHATES)

- 4721 Daley-Yates, P., Gifford, L.A. and Hoggarth, C.R.: Assay of 1-hydroxy-3-amino-propylidene-1,1-bisphosphonate and related bisphosphonates in human urine and plasma by high-performance ion chromatography. *J. Chromatogr.*, 490 (1989) 329-338.
- 4722 Gutteridge, S., Reddy, G.S. and Lorimer, G.: The synthesis and purification of 2'-carboxy-D-arabinitol 1-phosphate, a natural inhibitor of ribulose 1,5-bisphosphate carboxylase, investigated by  $^{31}\text{P}$  NMR. *Biochem. J.*, 260 (1989) 711-716.
- 4723 Nakamura, T., Hatori, Y., Yamada, K., Ikeda, M. and Yuzuriha, T.: A high-performance liquid chromatographic method for the determination of polyphospho-inositides in brain. *Anal. Biochem.*, 179 (1989) 127-130.
- 4724 Sulpice, J.-C., Gascard, P., Journet, E., Rendu, F., Renard, D., Pogglioli, J. and Giraud, F.: The separation of [ $^{32}\text{P}$ ]inositol phosphates by ion-pair chromatography: optimization of the method and biological applications. *Anal. Biochem.*, 179 (1989) 90-97.
- 4725 Taylor, C.W., Berridge, M.J., Cooke, A.M. and Potter, B.V.L.: Inositol 1,4,5-triphosphorothioate, a stable analogue of inositol triphosphate which mobilizes intracellular calcium. *Biochem. J.*, 259 (1989) 645-650.

- 4726 Terao, J.: Stabilization of phosphatidylethanolamine hydroperoxides in human plasma. *Biochim. Biophys. Acta*, 1003 (1989) 221-224.
- 4727 Tschäbumin, G., Fischer, P. and Schwedt, G.: Zur Analytik von Polymethylenphosphonsäuren. I. Ionen-chromatographie von Organophosphonsäuren. *Fresenius' Z. Anal. Chem.*, 333 (1989) 111-116.
- 4728 Tschäbumin, G., Fischer, P. and Schwedt, G.: Zur Analytik von Polymethylenphosphonsäuren. II. Post-column-Derivatisierung nach Ionen-chromatografischer Trennung (1). *Fresenius' Z. Anal. Chem.*, 333 (1989) 117-122.
- 4729 Tschäbumin, G., Fischer, P. and Schwedt, G.: Zur Analytik von Polymethylenphosphonsäuren. III. Untersuchung zur Stabilität von Ethylendiamintetramethylenphosphonsäure. *Fresenius' Z. Anal. Chem.*, 333 (1989) 123-128.

For additional information see:

*C.A.*, 110 (1989) 171869j, 193325f.

See also 4296, 4304, 4312.

## 26. ORGANOMETALLIC AND RELATED COMPOUNDS

### 26a. Organometallic compounds

- 4730 Casoli, A., Mangia, A., Predieri, G., Sappa, E. and Volante, M.: Applications of HPLC to metal carbonyl and cluster chemistry. *Chem. Rev.*, 89 (1989) 407-418; *C.A.*, 110 (1989) 154336r - a review with 68 refs.
- 4731 Parkin, J.E.: High-performance liquid chromatography of mercury and phenylmercury as the N-disubstituted dithiocarbamate complexes. *J. Chromatogr.*, 472 (1989) 401-405.
- 4732 Zheng, O., Jiang, W. and Qi, X.L.: A method for the indirect determination of trace bound selenomethionine in plants and some biological materials. *Anal. Biochem.*, 178 (1989) 77-81.

### 26b. Boranes, silanes and related non-metallic compounds

- 4733 Kohn, E. and Chisum, M.E.: Determination of functional groups in molecular components of poly(dimethylsiloxanes). *Los Alamos Natl. Lab.*, (Rep.) LA (U.S.), LA-11304-C (1988) 142-173; *C.A.*, 110 (1989) 155158w.

### 26c. Coordination compounds

- 4734 Pettit, W.A., Swalles, B.K. and Petterson, R.E.: Isocratic reversed-phase high-performance liquid chromatographic assay for a cryptand-cryptate-free metal ion system. *J. Chromatogr.*, 469 (1989) 440-443.

See also 4386, 4731.

## 27. VITAMINS AND VARIOUS GROWTH REGULATORS (NON-PEPTIDIC)

- 4735 Ball, G.F.M.: Applications of HPLC to the determination of fat-soluble vitamins in foods and animal feeds (a review 1977-87). *J. Micronutr. Anal.*, 4 (1988) 255-283; *C.A.*, 110 (1989) 171828v - a review with 85 refs.
- 4736 Beaulieu, N., Curran, N.M., Gagné, C., Gravelle, M. and Lovering, E.G.: Liquid chromatographic methods for vitamins A and D in multivitamin-mineral formulations. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 247-254.
- 4737 Bekhof, S.J. and van den Bedem, J.W.: Study of the determination of vitamin D in fortified milk, milk powder and infant formula by HPLC using a column switching technique. *Neth. Milk Dairy J.*, 42 (1988) 423-435; *C.A.*, 110 (1989) 211043u.
- 4738 Billedeau, S.M.: Fluorimetric determination of vitamin K<sub>3</sub> (menadione sodium bisulfite) in synthetic animal feed by high-performance liquid chromatography using a post-column zinc reducer. *J. Chromatogr.*, 472 (1989) 371-379.



- 4739 Blaskovits, A., Urmos, I., Gampe, L. and Borvendeg, J.: (Comparative study of vitamin A determination methods in biological samples). *Kiserl. Orvostud.*, 40 (1988) 341-344; *C.A.*, 110 (1989) 150879x.
- 4740 Brunnekreeft, J.W.I., Eldhof, H. and Gerrits, J.: Optimized determination of thiochrome derivatives of thiamine and thiamine phosphates in whole blood by reversed-phase liquid chromatography with precolumn derivatization. *J. Chromatogr.*, 491 (1989) 89-96.
- 4741 Celardo, A., Bortolotti, A., Benfenati, E. and Bonati, M.: Measurement of vitamin E in premature infants by reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 490 (1989) 432-438.
- 4742 Clough, R.C., Barnum, S.R. and Jaworski, J.G.: Synthesis of radiolabeled acetyl-coenzyme A from sodium acetate. *Anal. Biochem.*, 176 (1989) 82-84.
- 4743 Coburn, S.P., Mahuren, J.D., Kennedy, M.S., Schaltenbrand, W.E., Sampson, D.A., O'Connor, D.K., Snyder, D.L. and Westmann, B.S.:  $B_6$  Vitamer content of rat tissues measured by isotope tracer and chromatographic methods. *BioFactors*, 1 (1988) 307-312; *C.A.*, 110 (1989) 188878j.
- 4744 Coverly, S.C. and Macrae, R.: Determination of vitamin A in milk products by HPLC with automated on-line sample preparation. *J. Micronutr. Anal.*, 5 (1989) 15-23; *C.A.*, 110 (1989) 211055z.
- 4745 Eisenga, B.H., Collins, T.D. and McMartin, K.E.: Differential effects of acute ethanol on urinary excretion of folate derivatives in the rat. *J. Pharmacol. Exp. Ther.*, 248 (1989) 916-922.
- 4746 Felton, S.P. and Halver, J.E.: Separation of three commercial forms of vitamin C (ascorbic acid, ascorbic-2-sulfate and ascorbate-2-polyphosphate) by HPLC. *Proc. Soc. Exp. Biol. Med.*, 190 (1989) 217-218; *C.A.*, 110 (1989) 152892v.
- 4747 Guillaumont, M., Leclercq, M., Gosselet, H., Makala, K. and Vignal, B.: HPLC determination of serum vitamin  $K_1$  by fluorometric detection after post-column electrochemical reduction. *J. Micronutr. Anal.*, 4 (1988) 285-294; *C.A.*, 110 (1989) 169534c.
- 4748 Gupta, A.K., Sexton, R.C. and Rudney, H.: Effect of vitamin  $D_3$  derivatives of cholesterol synthesis and HMG-CoA reductase activity in cultured cells. *J. Lipid Res.*, 30 (1989) 379-386.
- 4749 Kimura, T., Fukui, E., Kageyu, A., Kurohara, H., Kurosaki, Y., Nakayama, T., Morita, Y., Shibusawa, K., Ohsawa, S. and Takeda, Y.: Enhancement of oral bioavailability of d- $\alpha$ -tocopherol acetate by lecithin-dispersed aqueous preparation containing medium-chain triglycerides in rats. *Chem. Pharm. Bull.*, 37 (1989) 439-441.
- 4750 King, M.T., Reiss, P.D. and Cornell, N.W.: Determination of short-chain coenzyme A compounds by reversed-phase HPLC. *Methods Enzymol.*, 166 (Branched Chain Amino Acids) (1988) 70-79; *C.A.*, 110 (1989) 188670k.
- 4751 Kocsi, E. and Fekete, J.: (Determination of vitamin  $B_1$  and vitamin  $B_2$  in premixes by ion-pair HPLC). *Magy. Kem. Foly.*, 94 (1988) 505-510; *C.A.*, 110 (1989) 211057b.
- 4752 Lai, M.-T., Lin, W.-M., Chu, Y.-H., Chen, S.-L.Y., Kong, K.-S. and Chen, C.-W.: The mechanism of color reversion in soybean salad oil. *J. Am. Oil Chem. Soc.*, 66 (1989) 565-571.
- 4753 Lowes, S. and Rose, M.E.: Analytical procedures for determining acylcarnitines in biological fluids. *TrAC*, 8 (1989) 184-188 - a review with 54 refs.
- 4754 Lucock, M.D., Hartley, R. and Smithells, R.W.: A rapid and specific HPLC-electrochemical method for the determination of endogenous 5-methyltetrahydrofolic acid in plasma using solid phase sample preparation with internal standardization. *Biomed. Chromatogr.*, 3 (1989) 58-63.
- 4755 Maeda, Y., Yamamoto, M., Owada, K., Sato, S., Masui, T. and Nakazawa, H.: Simultaneous liquid chromatographic determination of water-soluble vitamins, caffeine, and preservative in oral liquid tonics. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 244-247.
- 4756 Masuda, S., Okano, T., Hamana, N., Morita, Y. and Kobayashi, T.: Determination of 25-hydroxyvitamin D bound to vitamin D-binding protein in human plasma. *J. Micronutr. Anal.*, 5 (1989) 63-76; *C.A.*, 110 (1989) 188676s.
- 4757 Moussa, F., Dufour, L., Didry, J.R. and Aymard, P.: Determination of trans-phyllquinone in children's serum. *Clin. Chem. (Winston-Salem)*, 35 (1989) 874-878.
- 4758 Popp, J.L., Berliner, C. and Bentley, R.: Vitamin K (menaquinone) biosynthesis in bacteria: high-performance liquid chromatographic assay of the overall synthesis of o-succinylbenzoic acid and of 2-succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylic acid synthase. *Anal. Biochem.*, 178 (1989) 306-310.

- 4759 Rees, D.I.: Determination of nicotinamide and pyridoxine in fortified food products by HPLC. *J. Micronutr. Anal.*, 5 (1989) 53-61; *C.A.*, 110 (1989) 211056a.
- 4760 Shephard, G.S., van der Westhuizen, L. and Labadarios, D.: Analysis of vitamin B<sub>6</sub> vitamers in human tissue by cation-exchange high-performance liquid chromatography. *J. Chromatogr.*, 491 (1989) 226-234.
- 4761 Wang, G., Root, M.M., Ye, X., Chen, J. and Campbell, T.C.: Routine assay of plasma carotenes by HPLC with an internal standard. *J. Micronutr. Anal.*, 5 (1989) 3-14; *C.A.*, 110 (1989) 188675r.

For additional information see:

*C.A.*, 110 (1989) 152876t, 169547j, 171856c, 185236n, 188658n, 191350m, 191351n, 191379c, 211119y, 219213v, 230262f.

See also 4807.

## 28. ANTIBIOTICS

- 4762 Agarwal, V.K.: High performance liquid chromatographic determination of gentamycin in animal tissue. *J. Liq. Chromatogr.*, 12 (1989) 613-628.
- 4763 Blanchflower, W.J., McCracken, R.J. and Rice, D.A.: Determination of chlor-tetracycline residues in tissues using high performance liquid chromatography. *Analyst (London)*, 114 (1989) 421-423.
- 4764 Boeck, L.D., Fukuda, D.S., Abbott, B.J. and Debono, M.: Deacylation of echinocandin B by *Actinoplanes utahensis*. *J. Antibiot.*, 42 (1989) 382-388.
- 4765 Borghi, A., Antonini, P., Zanol, M., Ferrari, P., Zerilli, L.F. and Lancini, G.C.: Isolation and structure determination of two new analogs of teicoplanin, a glycopeptide antibiotic. *J. Antibiot.*, 42 (1989) 361-366.
- 4766 Chen, T.S. and Inamine, E.S.: Studies on the biosynthesis of avermectins. *Arch. Biochem. Biophys.*, 270 (1989) 521-525.
- 4767 Coleman, M.R.: Improved turbidimetric assay of tylosin in premix and animal feeds not containing urea. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 454-456.
- 4768 Dimenna, G.P., Lyon, F.S., Thompson, F.M., Creegan, J.A. and Wright, G.J.: Effect of antibiotic combination, dosing period, dose vehicle, and assay method on salinomycin residue levels and their ionophoricity in chicken tissues. *J. Agric. Food Chem.*, 37 (1989) 668-676.
- 4769 Evtushenko, N.S., Kudryavtseva, M.P. and Klyuev, N.A.: (Mass spectrometric identification of amino group-derivatized aminoglycoside antibiotics). *Farmatsiya (Moscow)*, 38 (1989) 34-36; *C.A.*, 110 (1989) 160454u.
- 4770 Fujimoto, T., Tawa, R. and Hirose, S.: Determination of sisomicin in eluate from dried blood spot on filter paper disc for monitoring of blood level in rat, by reversed-phase high-performance liquid chromatography after pre-column fluorimetric derivatization. *Chem. Pharm. Bull.*, 37 (1989) 174-176.
- 4771 Hayward, D.S., Zimmerman, S.R. and Jenke, D.R.: Drug stability testing by monitoring drug and degradate levels by liquid chromatography. *J. Chromatogr. Sci.*, 27 (1989) 235-239.
- 4772 Johnson, N.A.: Determination of maduramycin by liquid chromatography with atomic absorption spectrometric detection. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 235-237.
- 4773 Khan, N.H., Roets, E., Hoogmartens, J. and Vanderhaeghe, H.: Quantitative analysis of chlortetracycline and related substances by high-performance liquid chromatography. *J. Pharm. Biomed. Anal.*, 7 (1989) 339-353.
- 4774 Kondo, F., Morikawa, S. and Tateyama, S.: Simultaneous determination of six tetracyclines in bovine tissue and urine by reverse-phase high-performance liquid chromatography. *J. Food Prot.*, 52 (1989) 41-44; *C.A.*, 110 (1989) 165402k.
- 4775 LeDuc, B.W., Greenblatt, D.J. and Friedman, H.: Automated high-performance liquid chromatographic analysis of tetracycline in urine. *J. Chromatogr.*, 490 (1989) 474-477.
- 4776 Marunaka, T., Matsushima, E., Minami, Y., Azuma, R., Yoshida, K.-i. and Umeno, Y.: Acidic degradation of cefodizime (THR-221) and structural elucidation of the products. I. *Chem. Pharm. Bull.*, 37 (1989) 367-372.

- 4777 Nakagawa, T., Oda, Y., Shibukawa, A., Fukuda, H. and Tanaka, H.: Electrokinetic chromatography for drug analysis. Separation and determination of cefpiramide in human plasma. *Chem. Pharm. Bull.*, 37 (1989) 707-711.
- 4778 Saito, K., Horie, M., Hoshino, Y., Nose, N. and Nakazawa, H.: High-performance liquid chromatographic determination of virginiamycin in premixes and feeds. *J. Liq. Chromatogr.*, 12 (1989) 373-381.
- 4779 Schüller, F., Benz, R. and Sahl, H.-G.: The peptide antibiotic subtilin acts by formation of voltage-dependent multi-state pores in bacterial and artificial membranes. *Eur. J. Biochem.*, 182 (1989) 181-186.
- 4780 Van Schepdael, A.: (Identification of ampicillin esters by liquid chromatography). *Farm. Tijdschr. Belg.*, 65 (1988) 136; *C.A.*, 110 (1989) 160460t.
- 4781 Wang, C.P., Hartman, N.R., Venkataramanan, R., Jardine, I., Lin, F.-T., Knapp, J.E., Starzl, T.E. and Burckart, G.J.: Isolation of 10 cyclosporine metabolites from human bile. *Drug Metab. Disp.*, 17 (1989) 292-296.

For additional information see:

*C.A.*, 110 (1989) 165399q, 171868h, 185264v, 191386c, 230256g.

See also 4074, 4108, 4918, 4920.

## 29. INSECTICIDES, PESTICIDES AND OTHER AGROCHEMICALS

### 29a. Chlorinated insecticides

See 4784.

### 29b. Phosphorus insecticides

- 4782 Manes Vinuesa, J., Molto Cortes, J.C., Igualada Canas, C. and Font Perez, G.: Isolation and concentration of organophosphorus pesticides from water using a C<sub>18</sub> reversed phase. *J. Chromatogr.*, 472 (1989) 365-370.
- 4783 Singh, R.: Simultaneous determination of fenomiphos, its sulphoxide and sulphone in water by high performance liquid chromatography. *Analyst (London)*, 114 (1989) 425-427.
- 4784 Venant, A., Borrel, S., Mallet, J. and van Neste, E.: Gel permeation chromatography as a method for the simultaneous clean up of organochlorine, organophosphate and polychlorinated biphenyl residues in fat extracts. *Analisis*, 17 (1989) 64-66; *C.A.*, 110 (1989) 152906c.

### 29d. Herbicides

- 4785 Barcelo, D.: Effect of ammonium formate as ionizing additive in thermospray liquid chromatography-mass spectrometry for the determination of triazine, phenylurea and chlorinated phenoxyacetic acid herbicides. *Org. Mass Spectrom.*, 24 (1989) 219-224; *C.A.*, 110 (1989) 227052g.
- 4786 Bartels, M.J. and Smith, F.A.: Stereochemical inversion of haloxyfop in the Fischer 344 rat. *Drug Metab. Disp.*, 17 (1989) 286-291.
- 4787 Cabras, P., Spanedda, L., Pellecchia, M. and Gennari, M.: High-performance liquid chromatographic determination of the herbicide terbutylazine and its dealkylated metabolites in soil. *J. Chromatogr.*, 472 (1989) 411-415.
- 4788 Fröhlich, D. and Meier, W.: HPLC determination of triazines in water samples in the ppt-range by on-column trace enrichment. *J. High Resolut. Chromatogr.*, 12 (1989) 340-342.
- 4789 Grob, K., Jr. and Li, Z.: Coupled reversed-phase liquid chromatography-capillary gas chromatography for the determination of atrazine in water. *J. Chromatogr.*, 473 (1989) 423-430.
- 4790 Häkkinen, V.M.A., Brob, K., Jr. and Bürki, C.: Analysis of dicamba in tobacco by on-line coupled liquid chromatography-gas chromatography. *J. Chromatogr.*, 473 (1989) 353-358.
- 4791 Hershberger, L.W. and Brennan, D.E.: Metsulfuron methyl. *Anal. Methods Pestic. Plant Growth Regul.*, 16 (1988) 83-103; *C.A.*, 110 (1989) 227047j.
- 4792 Schüssler, W.: Automatic measurement of some common herbicides by LC using simultaneous UV detection and electrochemical detection in series. *Chromatographia*, 27 (1989) 431-435.

- 4793 Slates, R.V. and Watson, M.W.: Chlorsulfuron. *Anal. Methods Pestic. Plant Growth Regul.*, 16 /1877( 53-67; C.A., 110 (1989) 227046h.
- 4794 Thompson, D.G., Cowell, J.E., Daniels, R.J., Staznik, B. and MacDonald, L.M.: Liquid chromatographic method for quantitation of glyphosate and metabolite residues in organic and mineral soils, stream sediments, and hardwood foliage. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 355-360.
- 4795 Worobey, B.L. and Shields, J.B.: Determination of fluazifop-butyl and fluazifop acid in soybeans and soybean oil using liquid chromatography with oxidative amperometric detection. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 368-371.

For additional information see:  
C.A., 110 (1989) 187713q.

See also 4834.

### 29e. Fungicides

- 4796 López, L.F., López, A.G. and Riba, M.V.: HPLC method for simultaneous determination of fungicides: carbendazim, metalaxyl, folpet, and propiconazole in must and wine. *J. Agric. Food Chem.*, 37 (1989) 684-687.
- 4797 Newsome, W.H. and Collins, P.: Multiresidue method for fungicide residues in fruit and vegetables. *J. Chromatogr.*, 472 (1989) 416-421.

### 29f. Other types of pesticides and various agrochemicals

- 4798 Dubelman, S.: Glyphosate. *Anal. Methods Pestic. Plant Growth Regul.*, 16 (1988) 69-82; C.A., 110 (1989) 207668j.
- 4799 Horsham, M.A., Class, T.J., Johnston, J.J. and Casida, J.E.: Metabolites of the prototype insecticide (2E,4E)-N-isobutyl-6-phenylhexa-2,4-dienamide. 1. Synthesis, chromatography, spectroscopy and biological activity. *J. Agric. Food Chem.*, 37 (1989) 777-781.
- 4800 Johnston, J.J., Horsham, M.A., Class, T.J. and Casida, J.E.: Metabolites of the prototype insecticide (2E,4E)-N-isobutyl-6-phenylhexa-2,4-dienamide. 2. Formation in mouse and rat liver microsomal systems, rat hepatocytes and houseflies. *J. Agric. Food Chem.*, 37 (1989) 781-786.
- 4801 Ngoviwatchai, A.: Application of pulsed amperometric detection of reversed phase HPLC of some sulfur-containing pesticides. *Avail. Univ. Microfilm Int.*, Order No. DA8825425, 1988, 224 pp.; C.A., 110 (1989) 227053h.
- 4802 Parisi, G., Buglione, J.A. and Mascia, F.: (High pressure liquid chromatography of warfarin in the plasma of Sprague-Dawley rats). *Boll. Soc. Nat. Napoli*, 95 (1986, Pub. 1988) 155-159; C.A., 110 (1989) 168006v.

For additional information see:  
C.A., 110 (1989) 207682j.

See also 4416, 4955.

## 30. SYNTHETIC AND NATURAL DYES

### 30a. Synthetic dyes

- 4803 Vora, M.M.: Chromatography of rhodamine 123 and rhodamine 110 on reverse-phase liquid chromatographic column. *J. Liq. Chromatogr.*, 12 (1989) 583-593.

### 30b. Chloroplast and other natural pigments

- 4804 Aitzetmüller, K.: Chlorophyll - Abbauprodukte in pflanzlichen Ölen. *Fat Sci. Technol.*, 91 (1989) 99-105.
- 4805 Daood, H.G., Czinkotai, B., Hoshcke, A. and Biacs, P.: High-performance liquid chromatography of chlorophylls and carotenoids from vegetables. *J. Chromatogr.*, 472 (1989) 296-302.

- 4806 Francis, G.W. and Isaksen, M.: Droplet counter current chromatography of the carotenoids of parsley *Petroselinum crispum*. *Chromatographia*, 27 (1989) 549-551.
- 4807 Heinonen, M.I., Ollilainen, V., Linkola, E.K., Varo, P.T. and Koivistoinen, P.E.: Carotenoids in finnish foods: vegetables, fruits and berries. *J. Agric. Food Chem.*, 37 (1989) 655-659.
- 4808 Hu, L. and Xu, D.: HPLC separation and characterization of chlorin derivatives with intact ring V from acid degradation products of silkworm excrement crude chlorophyll mixture. *Biomed. Chromatogr.*, 3 (1989) 72-74.
- 4809 Inoue, H., Furuya, K., Watanabe, K., Tanaka, K., Shirai, T. and Miyoshi, E.: Separation and determination of copper(II) chlorophylls by reversed-phase high-performance liquid chromatography. *Anal. Sci.*, 4 (1988) 599-603; *C.A.*, 110 (1989) 156088k.
- 4810 Jalón, M., Pena, M.J. and Rivas, J.C.: Liquid chromatographic determination of carminic acid in yogurt. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 231-234.
- 4811 Kishida, M., Baker, B.I. and Eberle, A.N.: The measurement of melanin - concentration hormone in trout blood. *Gen. Comp. Endocrinol.*, 74 (1989) 221-229; *C.A.*, 110 (1989) 188897q.
- 4812 Lantukh, G.V., Popovich, G.M., Tulyupa, F.M. and Vasil'ev, N.G.: (Use of gel chromatography and IR spectroscopy to study the functional groups of products of the acid hydrolysis of humic acids). *Khim. Tekhnol. Vody*, 10 (1988) 536-538; *C.A.*, 110 (1989) 176453d.

For additional information see:  
*C.A.*, 110 (1989) 194629v.

### 31. PLASTICS AND THEIR INTERMEDIATES

- 4813 Begley, T.H. and Hollifield, H.C.: Liquid chromatographic determination of residual reactants and reaction by-products in polyethylene terephthalate. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 468-470.
- 4814 Dawkins, J.V. and Montenegro, A.M.C.: Coupled column chromatography for copolymer characterization. *Br. Polym. J.*, 21 (1989) 31-36; *C.A.*, 110 (1989) 213807v.
- 4815 Gloeckner, G., Stejskal, J. and Kratochvil, P.: Chromatographic cross-fractionation of statistical copolymers of styrene and 2-methoxyethyl methacrylate. *Makromol. Chem.*, 190 (1989) 427-435; *C.A.*, 110 (1989) 155162t.
- 4816 Mori, S.: Aqueous size-exclusion chromatography of anionic and non-ionic water-soluble polymers on silica gel with bonded hydrophilic groups. *J. Chromatogr.*, 471 (1989) 367-374.
- 4817 Mori, S.: Separation mechanism of copolymers from styrene and methyl methacrylate according to composition by liquid adsorption chromatography. *J. Liq. Chromatogr.*, 12 (1989) 323-336.
- 4818 Sokolov, M.I., Granovskaya, G.L., Kovtunenkov, L.V. and Glukhovskoi, V.S.: (Use of gel-permeation chromatography in the analysis of elastomers prepared in emulsion and in solution). *Kauch. Rezina*, (1989) 31-34; *C.A.*, 110 (1989) 155896k.
- 4819 Tsitsilianis, C., Mitsiani, C. and Dondos, A.: An indirect gel permeation chromatography calibration method for the low-molecular-weight region. *J. Polym. Sci., Part B: Polym. Phys.*, 27 (1989) 763-773; *C.A.*, 110 (1989) 213813u.

For additional information see:  
*C.A.*, 110 (1989) 155156u, 155159x, 213814v.

See also 4088.

### 32. DRUG ANALYSIS

#### 32a. Drug analysis, general techniques

- 4820 Aronson, B., Faber, P. and Raya, M.: Comparison of dissolution rate release profiles using an automated dissolution/HPLC system. *Am. Clin. Lab.*, 8 (1989) 17-20; *C.A.*, 110 (1989) 199067v.

- 4821 Aronson, B., Faber, P. and Raya, M.: Comparison of dissolution rate release profiles using an automated dissolution/HPLC system. *Am. Lab. (Fairfield)*, 21 (1989) 32-38; *C.A.*, 110 (1989) 199078z.
- 4822 Binder, S.R., Regalia, M., Biaggi-McEachern, M. and Mazhar, M.: Automated liquid chromatographic analysis of drugs in urine by on-line sample cleanup and isocratic multi-column separation. *J. Chromatogr.*, 473 (1989) 325-341.
- 4823 Haginaka, J.: (Recent progress in HPLC analysis of a drug and its metabolites. Direct injection of biological samples). *Mukogawa Joshi Daigaku Kiyo, Yakuqaku Hen*, 35 (1987) 571-579; *C.A.*, 110 (1989) 146923q - a review with 39 refs.
- 4824 Hill, D.W. and Langner, K.J.: Screening with HPLC. *Chem. Anal.*, 100 (Anal. Aspects Drug Test.) (1989) 129-148; *C.A.*, 110 (1989) 226658x - a review with 38 refs.
- 4825 Kelly, M.T., Smyth, M.R. and Dadgar, D.: Retention characteristics in high-performance liquid chromatography of basic drugs and plasma extracts on an alumina column. *J. Chromatogr.*, 473 (1989) 53-62.
- 4826 Koehler, H., Larocque, L. and Sved, S.: Use of liquid chromatography in the synthesis of isoluminol-labelled medroxyprogesterone acetate and zeranol. *J. Chromatogr.*, 469 (1989) 305-315.
- 4827 Lammers, N., de Bree, H., Groen, C.P., Ruijten, H.M. and de Jong, B.J.: The determination of drug protein binding by HPLC using a chemically bonded bovine-albumin stationary phase. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 301-303; *C.A.*, 110 (1989) 204880m - a review with 7 refs.
- 4828 Lecaillon, J.B., Souppart, C., Dubois, J.P. and Delacroix, A.: The routine use, and column-stability implications, of several column-switching HPLC methods for determining drugs in plasma and urine. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 225-233; *C.A.*, 110 (1989) 204962q.
- 4829 O'Connor, E.F., Cheng, S.W.T. and North, W.G.: Simultaneous extraction and chromatographic analysis of morphine, dilaudid, naltrexone and naloxone in biological fluids by high-performance liquid chromatography with electrochemical detection. *J. Chromatogr.*, 491 (1989) 240-247.
- 4830 Petz, M.: (Use of fluorescence detection in HPLC analysis: principles, pre- and post-column derivatization of pharmaceuticals). *Lebensmittelchem., Lebensmittelqual.*, 13 (1988) 93-122; *C.A.*, 110 (1989) 219157e - a review with 50 refs.
- 4831 Pinkerton, T.C.: Analysis of drugs in biological fluids by direct injection onto ISRP columns. *Am. Clin. Lab.*, 8 (1989) 32-37; *C.A.*, 110 (1989) 204894u - a review with 16 refs.
- 4832 Walhagen, A. and Edholm, L.-E.: Coupled-column chromatography on immobilized protein phases for direct separation and determination of drug enantiomers in plasma. *J. Chromatogr.*, 473 (1989) 371-379.
- 4833 Wong, S.H.Y.: Microcolumn and direct-sample-analysis liquid chromatography. *Chem. Anal.*, 100 (Anal. Aspects Drug Test.) (1989) 149-171; *C.A.*, 110 (1989) 226659y - a review with 53 refs.

See also 4053, 4082.

### 32b. Antirheumatics and antiinflammatory drugs

- 4834 Blessington, B., Crabb, N., Karkce, S. and Northage, A.: Chromatographic approaches to the quality control of chiral proprionate anti-inflammatory drugs and herbicides. *J. Chromatogr.*, 469 (1989) 183-190.
- 4835 Bye, A., Adams, W. and Kaiser, D.: Analytical approaches adopted during the development of flurbiprofen. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 97-105; *C.A.*, 110 (1989) 185196z - a review with 7 refs.
- 4836 Chungi, V.S., Rekhi, G.S. and Shargel, L.: A simple and rapid liquid chromatographic method for the determination of major metabolites of sulfasalazine in biological fluids. *J. Pharm. Sci.*, 78 (1989) 235-238.
- 4837 Geisslinger, G., Dietzel, K., Loew, D., Schuster, O., Rau, G., Lachmann, G. and Brune, K.: High-performance liquid chromatographic determination of ibuprofen, its metabolites and enantiomers in biological fluids. *J. Chromatogr.*, 491 (1989) 139-149.
- 4838 Grandjean, D., Beolor, J.C., Quincon, M.T. and Savel, E.: Automated robotic extraction and subsequent analysis of diclofenac in plasma samples. *J. Pharm. Sci.*, 78 (1989) 247-249.

- 4839 Loewen, G.R., Macdonald, J.I. and Verbeeck, R.K.: High-performance liquid chromatographic method for the simultaneous quantitation of diflunisal and its glucuronide and sulfate conjugates in human urine. *J. Pharm. Sci.*, 78 (1989) 250-255.
- 4840 McElroy, J.C.: HPLC analysis of anti-inflammatory agents (non-steroidal and steroidal). *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 87-95; *C.A.*, 110 (1989) 185195y - a review with 26 refs.
- 4841 Ogiso, T., Ito, Y., Iwaki, M. and Atago, H.: A pharmacokinetic model for the percutaneous absorption of indomethacin and the prediction of drug disposition kinetics. *J. Pharm. Sci.*, 78 (1989) 319-323.
- 4842 Shibukawa, A., Nakagawa, T., Nishimura, N., Miyake, M. and Tanaka, H.: Determination of free drug in protein binding equilibrium by high-performance frontal analysis using internal-surface reversed-phase silica support. *Chem. Pharm. Bull.*, 37 (1989) 702-706.

For additional information see:  
*C.A.*, 110 (1989) 224911a.

See also 4848.

### 32c. Autonomic and cardiovascular drugs

- 4843 Bryce, T.A., Chamberlain, J., Hillbeck, D. and Macdonald, C.M.: Metabolism and pharmacokinetics of <sup>14</sup>C-pentoxifylline in healthy volunteers. *Arzneim.-Forsch.*, 39 (1989) 512-517.
- 4844 Caille, G., Dube, L.M., Theoret, Y., Varin, F., Mousseau, N. and McGillveray, I.J.: Stability study of diltiazem and two of its metabolites using a HPLC method. *BioPharm. Drug Dispos.*, 10 (1989) 107-114; *C.A.*, 110 (1989) 147012d.
- 4845 Chong, S. and Fung, H.-L.: Kinetic mechanisms for the concentration dependency of *in vitro* degradation of nitroglycerin and glyceryl dinitrates in human blood: metabolite inhibition or cosubstrate depletion? *J. Pharm. Sci.*, 78 (1989) 295-302.
- 4846 Colin, P. and Scherer, E.: Simple high performance liquid chromatography determination of captopril in human plasma and cerebrospinal fluid. *J. Liq. Chromatogr.*, 12 (1989) 629-643.
- 4847 Degen, P.H.: The assay of hydralazine: a review. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 193-200; *C.A.*, 110 (1989) 224805u - a review with 32 refs.
- 4848 Diana, F.J., Veronich, K. and Kapoor, A.L.: Binding of nonsteroidal anti-inflammatory agents and their effect on binding of racemic warfarin and its enantiomers to human serum albumin. *J. Pharm. Sci.*, 78 (1989) 195-199.
- 4849 Gianesello, V., Brenn, E., Figini, G. and Gazzaniga, A.: Determination by coupled high-performance liquid chromatography-gas chromatography of the  $\beta$ -blocker levoprolol in plasma following ophthalmic administration. *J. Chromatogr.*, 473 (1989) 343-352.
- 4850 Kudoh, S. and Nakamura, H.: Determination of antihypertensive agent cromakalim in human plasma by HPLC employing a column-switching technique. *Anal. Sci.*, 5 (1989) 39-42; *C.A.*, 110 (1989) 147038s.
- 4851 Lacroix, P.M., Beaulieu, N., Cyr, T.D. and Lovering, E.G.: High-performance liquid chromatography method for assay of diltiazem hydrochloride and its related compounds in bulk drug and finished tablets. *J. Pharm. Sci.*, 78 (1989) 243-246.
- 4852 Machin, M.A., Idoate, M.A., Mangués, R., Castro, I., Martínez, C. and Giraldez, J.: Determination of stiripentol in plasma by HPLC). *Rev. Asoc. Esp. Farm. Hosp.*, 12 (1988) 197-201; *C.A.*, 110 (1989) 224891u.
- 4853 Malikin, G., Murphy, M. and Lam, S.: Assay of flecainide in serum by high-performance liquid chromatography after microscale protein precipitation. *Ther. Drug Monit.*, 11 (1989) 210-213; *C.A.*, 110 (1989) 165407r.
- 4854 Munafò, A. and Biollaz, J.: High-performance liquid chromatographic assay with fluorometric detection for flecainide and its major metabolites in urine and serum. *J. Chromatogr.*, 490 (1989) 450-457.
- 4855 Rizzo, J.D. and Davis, P.J.: Microbial models of mammalian metabolism: conversion of warfarin to 4'-hydroxywarfarin using *Cunninghamella bairiieri*. *J. Pharm. Sci.*, 78 (1989) 183-189.

- 4856 Rognerud, C.L. and Ou, C.-N.: Concurrent measurement of flecainide acetate and propranolol by normal-phase high-performance liquid chromatography. *Clin. Chem. (Winston-Salem)*, 35 (1989) 857-860.
- 4857 Rustum, A.M.: Determination of diltiazem in human whole blood and plasma by high-performance liquid chromatography using a polymeric reversed-phase column and utilizing a salting-out extraction procedure. *J. Chromatogr.*, 490 (1989) 365-375.
- 4858 Sambhi, M.P., Kannan, R., Thananopavarn, C., Oockhtens, M. and Gudenzi, M.: Therapeutic tolerance, hemodynamic effects, and oral dose kinetics of dilazep dihydrochloride in hypertensive patients. *J. Pharm. Sci.*, 78 (1989) 281-284.
- 4859 Selinger, K. and Crawhall, J.C.: Determination of encainide and its metabolites by high-performance liquid chromatography. *J. Pharm. Biomed. Anal.*, 7 (1989) 355-359.
- 4860 Signoretti, E.C., D'Arpino, C. and la Torre, F.: Determination by high-performance liquid chromatography of clenbuterol in commercial syrup formulations. *J. Chromatogr.*, 473 (1989) 301-304.
- 4861 Starkey, B.J., Green, A.J.E. and Mould, G.P.: The determination of plasma amiodarone and deethylamiodarone by HPLC. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 185-191; *C.A.*, 110 (1989) 204960n.
- 4862 Verrijk, R., van Rooij, H.H., Wemer, J. and Porsius, A.J.: High-performance liquid chromatographic determination of milrinone in biological tissues and fluids. *J. Chromatogr.*, 491 (1989) 265-268.
- 4863 Woestenborghs, R., Embrechts, L. and Heykants, J.: HPLC-fluorescence method for the determination of the new  $\beta_1$ -adrenoreceptor blocking agent nebivolol in human plasma. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 215-216; *C.A.*, 110 (1989) 224873q.
- 4864 Woestenborghs, R., Timmerman, P., van Peer, A. and Heykants, J.: The use of stable-isotope methodology in pharmacokinetic studies involving flunarizine. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 149-155; *C.A.*, 110 (1989) 204959u.
- 4865 Wong, Y.M.J. and Davis, P.J.: Analysis of warfarin and its metabolites by reversed-phase ion-pair liquid chromatography with fluorescence detection. *J. Chromatogr.*, 469 (1989) 281-291.
- 4866 Woodward, A.J., Lewis, P.A., Maddock, J. and Donnell, D.: Determination of nefopam and its demethyl metabolite in biological fluids by paired-ion RP-HPLC. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 245-250; *C.A.*, 110 (1989) 204963r.
- 4867 Yang, J.M., Chan, K. and Jiang, W.D.: Improved column liquid chromatographic method for the determination of moricizine in plasma or serum. *J. Chromatogr.*, 490 (1989) 458-463.

For additional information see:

*C.A.*, 110 (1989) 165421r, 179622u, 185262t.

See also 4692, 4842.

### 32d. Central nervous system drugs

- 4868 Abuirjeie, M.A., Abdel-Hamid, M.E. and Ibrahim, E.-S.A.: Simultaneous high-performance liquid chromatographic assay of acetaminophen, acetylsalicylic acid, caffeine, and *d*-propoxyphene hydrochloride. *Anal. Lett.*, 22 (1989) 365-375.
- 4869 Al-Khamis, K.I.: Rapid determination of bupropion in human plasma by high-performance liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 645-655.
- 4870 Biagi, G.L., Pietrogrande, M.C., Barbaro, A.M., Guerra, M.C. and Borea, P.A.: Study of the lipophilic character of a series of  $\beta$ -carbolines. *J. Chromatogr.*, 469 (1989) 121-126.
- 4871 Blake, T.J.A. and Beattie, I.G.: The structure elucidation of drug metabolites using thermospray LC-MS and LC-MS-MS. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 353-359; *C.A.*, 110 (1989) 224874r.
- 4872 Bologna, M., Biordi, L., Napolitano, T. and Carlucci, G.: Study of plasma, urine and gastric juice concentrations of famotidine using HPLC. *Int. J. Clin. Pharmacol. Res.*, 8 (1988) 335-340; *C.A.*, 110 (1989) 33251a.
- 4873 Boukhabza, A., Lugnier, A.A.J., Kintz, P., Tracqui, A., Mangin, P. and Chaumont, A.J.: High-performance liquid chromatographic determination of bromazepam in human plasma. *Analyst (London)*, 114 (1989) 639-641.



- 4874 Chagonda, L.F.S. and Millership, J.S.: The determination of chlorpromazine, related impurities and degradation products in pharmaceutical dosage forms. *J. Pharm. Biomed. Anal.*, 7 (1989) 271-278 - a review with 44 refs.
- 4875 Diaz-Marot, A., Puigdellivol, E., Salvatella, C., Comellas, L. and Gassiot, M.: Determination of buspirone and 1-(2-pyrimidinyl)piperazine in plasma samples by high-performance liquid chromatography. *J. Chromatogr.*, 490 (1989) 470-473.
- 4876 Ebling, W.F., Mills-Williams, L., Harapat, S.R. and Stanski, D.R.: High-performance liquid chromatographic method for determining thiopental concentrations in twelve rat tissues: application to physiologic modeling of disposition of barbiturate. *J. Chromatogr.*, 490 (1989) 339-353.
- 4877 Galan-Valiente, J., Soto-Otero, R. and Sierra-Marcuno, G.: Simultaneous measurement of ethosuximide and phenobarbital in brain tissue, serum and urine by HPLC. *Biomed. Chromatogr.*, 3 (1989) 49-52.
- 4878 Garrigou-Gadenne, D.; Burke, J.T., Durand, A., Depoortere, H., Thénot, J.P. and Morselli, P.L.: Pharmacokinetics, brain distribution and pharmaco-electro-corticographic profile of zolpidem, a new hypnotic, in the rat. *J. Pharmacol. Exp. Ther.*, 248 (1989) 1283-1288.
- 4879 Gazdzik, W.R., Podlesny, J. and Filipek, M.: HPLC method for simultaneous determination of clobazam and N-desmethylclobazam in human serum, rat serum and rat brain homogenates. *Biomed. Chromatogr.*, 3 (1989) 79-81.
- 4880 Hoffman, D.W., Shillcutt, S.D. and Edkins, R.D.: Measurement of blood levels of neuroleptics and metabolites by combined HPLC-radioreceptor for D<sub>2</sub> and sigma sites. *Biochem. Pharmacol.*, 38 (1989) 831-836; *C.A.*, 110 (1989) 185259x.
- 4881 Humpel, C., Haring, C. and Sarica, A.: Rapid and sensitive determination of clozapine in human plasma using high-performance liquid chromatography and amperometric detection. *J. Chromatogr.*, 491 (1989) 235-239.
- 4882 Kelly, M.W., Perry, P.J., Holstad, S.G. and Garvey, M.J.: Serum fluoxetine and norfluoxetine concentrations and antidepressant response. *Ther. Drug Monit.*, 11 (1989) 165-170; *C.A.*, 110 (1989) 147076c.
- 4883 Lindberg, C., Roos, C., Tunek, A. and Svensson, L.A.: Metabolism of bambuterol in rat liver microsomes: identification of hydroxylated and demethylated products by liquid chromatography mass spectrometry. *Drug Metab. Disp.*, 17 (1989) 311-322.
- 4884 Menon, S.K., Burchett, M.K. and Joseph, J.C.: High performance liquid chromatographic assay of hydromorphone hydrochloride injection. *J. Liq. Chromatogr.*, 12 (1989) 657-671.
- 4885 Monkman, S.C., Armstrong, R., Flanagan, R.J., Holt, D.W. and Rosevear, S.: High performance liquid chromatographic measurement of lignocaine in tissue samples following transabdominal placental biopsy. *Biomed. Chromatogr.*, 3 (1989) 88-91.
- 4886 Nicot, G., Lachatre, G., Terrier, G., Gonnet, C., Rocca, J.L., Desroches, R. and Lansade, A.: Simultaneous determination of plasma floctafenin and its major metabolites by high-performance liquid chromatography: preliminary observations in children. *Ther. Drug Monit.*, 11 (1989) 67-72; *C.A.*, 110 (1989) 127904t.
- 4887 Noggle, F.T., Jr., Clark, C.R. and DeRuiter, J.: Liquid chromatographic and mass spectral analysis of 1-(3,4-methylenedioxyphenyl)-3-butamines, homologues of 3,4-methylenedioxyamphetamines. *J. Chromatogr. Sci.*, 27 (1989) 240-243.
- 4888 Ogiso, T., Ito, Y., Iwaki, M. and Yamamoto, Y.: Percutaneous absorption of clonazepam in rabbit. *Chem. Pharm. Bull.*, 37 (1989) 442-445.
- 4889 Selinger, K., Lebel, G., Hill, H.M. and Discenza, C.: High-performance liquid chromatographic method for the analysis of bantzopine in human plasma. *J. Chromatogr.*, 491 (1989) 248-252.
- 4890 Shah, S. and Taylor, L.T.: Application of on-line reversed-phase HPLC with Fourier-transform infrared detection for analysis of analgesics. *LC-GC*, 7 (1989) 340-346; *C.A.*, 110 (1989) 199318c.
- 4891 Sibilev, O.V., Egorov, A.E., Arzamastsev, A.P. and Prokof'eva, V.I.: (Separation of 10-alkylaminophenothiazine drugs and by products of their synthesis by HPLC). *Farm. Zh. (Kiev)*, (1989) 40-42; *C.A.*, 110 (1989) 179613s.
- 4892 Smilowski, B.: Über die Stabilität von 2-Pyrrolidinon-Derivaten. 4. Mitt.: Zur Analytik und Stabilität von Dupracetam. *Pharmazie*, 44 (1989) 272-273.
- 4893 Soto-Otero, R., Mendez-Alvarez, E., Sierra-Paredes, G., Galan-Valiente, J., Aguilar-Veiga, E. and Sierra-Marcuno, G.: Simultaneous determination of the two components of picrotoxin in serum by reversed-phase high-performance liquid chromatography with application to a pharmacokinetic study in rats. *J. Pharm. Biomed. Anal.*, 7 (1989) 369-375.

- 4894 Stewart, J.T. and Quinn, K.D.: High performance liquid chromatographic determination of physostigmine and its degradation products in pharmaceutical dosage forms. *J. Liq. Chromatogr.*, 12 (1989) 673-683.
- 4895 Szumilo, H. and Przyborowska, M.: Determination of perazine in blood and pharmaceuticals by high performance liquid chromatography. *Chem. Anal.*, 33 (1988) 321-326; *C.A.*, 110 (1989) 204977y.
- 4896 Vezzani, A., Serafini, R., Stasi, M.A., Caccia, S., Tridico, R.V., Conti, T. and Samanin, R.: Kinetics of MK-801 and its effect on quinolinic acid-induced seizures and neurotoxicity in rats. *J. Pharmacol. Exp. Ther.*, 249 (1989) 278-283.
- 4897 Vistelle, R., Lamiabile, D. and Zinzou, M.: Simple high-performance liquid chromatographic method for the measurement of tolloxatone in rabbit cerebrospinal fluid and plasma. *J. Chromatogr.*, 490 (1989) 387-394.
- 4898 Wall, G.M. and Baker, J.K.: Determination of baclofen and  $\alpha$ -baclofen in rat liver homogenate and human urine using solid-phase extraction, *o*-phthalaldehyde-*tert*-butyl thiol derivatization and high-performance liquid chromatography with amperometric detection. *J. Chromatogr.*, 491 (1989) 151-162.
- 4899 Wang, D.P., Tu, Y.H. and Allen, L.V., Jr.: High-performance liquid chromatographic determination of phenylephrine hydrochloride, tetracaine hydrochloride and chlorobutanol in pharmaceutical dosage forms. *Chung-hua Yao Hsueh Tsa Chih*, 40 (1988) 143-150; *C.A.*, 110 (1989) 160469c.

For additional information see:

*C.A.*, 110 (1989)147011c, 224892v.

See also 4691, 4842, 4866, 4948.

32e. Chemotherapeutics (except cytostatics and antibiotics)

- 4900 Ahmed, A.-E.H.N. and El-Gizawy, S.M.: Chemically bonded cyclodextrin stationary phase for the high-performance liquid chromatographic separation and determination of sulphonamides. *Analyst (London)*, 114 (1989) 571-573.
- 4901 Baskerville, A.J., Felmingham, D. and Gruneberg, R.N.: A HPLC method for the determination of FCE 22101, a novel penem antimicrobial, in serum. *Drugs Exp. Clin. Res.*, 14 (1988) 645-648; *C.A.*, 110 (1989) 165419w.
- 4902 Berridge, J.C.: Analysis of tioconazole using high-performance liquid chromatography with a porous graphitic carbon column. *J. Chromatogr.*, 449 (1988) 317-321.
- 4903 Chiu, S.-H.L., Baylis, F.P., Green, M., Halley, B.A. and Bodden, R.M.: Depletion of [ $^{14}$ C]clorsulon in cows' milk. *J. Agric. Food Chem.*, 37 (1989) 819-823.
- 4904 Estadieu, M., Durand, A., Uiala, A., Rop, P.P., Fornaris, M. and Quicke, J.: A rapid HPLC procedure for the simultaneous determination of chloroquine, monodeethylchloroquine, diazepam, and nordiazepam in blood. *J. Anal. Toxicol.*, 13 (1989) 89-93; *C.A.*, 110 (1989) 165430t.
- 4905 Granich, G.G., Krogstad, D.J., Connor, J.D., Desrochers, K.L. and Sherwood, C.: HPLC assay for ribavirin and comparison of the HPLC assay with radioimmunoassay. *Antimicrob. Agents Chemother.*, 33 (1989) 311-315; *C.A.*, 110 (1989) 165410m.
- 4906 Kees, F., Naber, K.G., Meyer, G.P. and Grobecker, H.: Pharmacokinetics of ciprofloxacin in elderly patients. *Arzneim.-Forsch.*, 39 (1989) 523-527.
- 4907 Kim, E.J., Lee, H.S., Zee, O.P. and Lee, S.T.: A sensitive and simplified HPLC analysis for the determination of fluconazole in human plasma. *Arch. Pharmacol. Res.*, 11 (1988) 250-252; *C.A.*, 110 (1989) 68880g.
- 4908 Klimes, J., Mokry, M. and Zahradnicek, M.: (HPLC quantification of sulfadimidine in the dosage form and the methodology for the analysis of decomposition products). *Cesk. Farm.*, 38 (1989) 6-18; *C.A.*, 110 (1989) 179627z.
- 4909 Lienne, M., Caude, M., Rosset, R. and Tambute, A.: Direct resolution of anthelmintic drug enantiomers on Chiral-AGP protein-bonded chiral stationary phase. *J. Chromatogr.*, 472 (1989) 265-270.
- 4910 Pos, P.P.R., Grimaldi, F. and Viala, A.: A rapid method for the determination of chloroquine and monodeethylchloroquine in blood by HPLC. *J. Toxicol. Clin. Exp.*, 8 (1988) 253-262; *C.A.*, 110 (1989) 204982w.
- 4911 Schatz, F. and Haberl, H.: Analytical methods for the determination of terbinafine and its metabolites in human plasma, Milk and urine. *Arzneim.-Forsch.*, 39 (1989) 527-532.
- 4912 Solomon, B.P.: Determination of azidodeoxythymidine (AZT) in serum. *Curr. Sep.*, 9 (1989) 35-36; *C.A.*, 110 (1989) 204952m.

- 4913 Tomaskova, V.: (HPLC analysis of antibacterial agents of the quinolone group and their metabolites). *Farm. Obz.*, 58 (1989) 21-29; *C.A.*, 110 (1989) 146999u - a review with 46 refs.
- 4914 Tyler, T.A. and Genzale, J.A.: Liquid chromatographic determination of miconazole nitrate in creams and suppositories. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 442-444.
- 4915 Underberg, W.J.M., Underberg-Chitoe, U.K., Bekers, O., Meenhorst, P.L. and Beijnen, J.H.: A rapid, simple and accurate method for the bialysis of zidovudine. *Int. J. Pharm.*, 50 (1989) 175-179; *C.A.*, 110 (1989) 165422s.
- 4916 Valadez-Salazar, A., Guiscafre-Gallardo, H., Sanchez-Garcia, S. and Munoz, O.: Detection of furazolidone in human biological fluids by HPLC. *J. Antimicrob. Chemother.*, 23 (1989) 589-595; *C.A.*, 110 (1989) 224915e.
- 4917 Weber, J.D. and Smedley, M.D.: Liquid chromatographic determination of sulfamethazine in milk. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 445-447.
- 4918 Yamashita, K., Ohta, R., Yamaguchi, K., Aoki, I., Maeda, K., Fugono, T. and Yashiki, T.: (HPLC determination of cefotiam hexetil and its metabolites in human biological samples). *Chemotherapy (Suppl. 6)*, 36 (1988) 116-126; *C.A.*, 110 (1989) 147052s.

For additional information see:

*C.A.*, 110 (1989) 147036q, 165381c, 179225s.

See also 4193, 4836.

### 32f. Cytostatics

- 4919 Baldew, G.S., Volkens, K.J., de Goeij, J.J.M. and Vermeulen, N.P.E.: Determination of cisplatin and related platinum complexes in plasma ultrafiltrate and urine by high-performance liquid chromatography with on-line radioactivity detection. *J. Chromatogr.*, 491 (1989) 163-174.
- 4920 Chabot, G.G., Pazdur, R., Valeriote, F.A. and Baker, L.H.: Pharmacokinetics and toxicity of continuous infusion amphotericin B in cancer patients. *J. Pharm. Sci.*, 78 (1989) 307-310.
- 4921 Graham, M.A., Newell, D.R. and Calvert, A.H.: Determination of the anthrapyrazole anticancer drug CI-941 in plasma and urine by solid-phase extraction and high-performance liquid chromatography. *J. Chromatogr.*, 491 (1989) 253-261.
- 4922 Kikuta, C. and Schmid, R.: Specific high-performance liquid chromatographic analysis of tamoxifen and its major metabolites by "on-line" extraction and post-column photochemical reaction. *J. Pharm. Biomed. Anal.*, 7 (1989) 329-337.
- 4923 Lien, E.A., Solheim, E., Lea, O.A., Lundgren, S., Kvinnsland, S. and Ueland, P.M.: Distribution of 4-hydroxy-N-desmethyltamoxifen and other tamoxifen metabolites in human biological fluids during tamoxifen treatment. *Cancer Res.*, 49 (1989) 2175-2183.
- 4924 Oppitz, M.M., Musch, E., Malek, M., Rieb, H.P., von Unruh, G.E., Loos, U. and Muehlenbruch, B.: Studies on the pharmacokinetics of chlorambucil and prednimustine in patients using a new HPLC assay. *Cancer Chemother. Pharmacol.*, 23 (1989) 208-212; *C.A.*, 110 (1989) 224924g.
- 4925 Pettit, G.R., Kaman, Y., Schaufelberger, D., Herald, C.L., Blumberg, P.M. and May, S.W.: High performance liquid chromatographic separation of bryostatins 1-12. *J. Liq. Chromatogr.*, 12 (1989) 553-561.
- 4926 Schaefer, H.G. and Rohdewald, P.: Determination of the alkyl lysophospholipid derivative ET-18-OCH<sub>3</sub>, a new antineoplastic drug, in plasma. *Clin. Chem. (Winston-Salem)*, 35 (1989) 821-823.
- 4927 Schwaller, M.-A., Aubard, J., Auclair, C., Paoletti, C. and Dodin, G.: The GC base-pair preference of 2-N-methyl 9-hydroxyellipticinium. *Eur. J. Biochem.*, 181 (1989) 129-134.
- 4928 Weir, P.J., Ireland, D.S. and Moledina, A.: Analysis of tamoxifen isomers in tablet preparations by high-performance liquid chromatography. *J. Pharm. Biomed. Anal.*, 7 (1989) 393-396.
- 4929 Yoshikawa, H., Nakao, Y., Takada, K., Muranishi, S., Wada, R., Tabata, Y., Hyon, S.-H. and Ikada, Y.: Targeted and sustained delivery of aclarubicin to lymphatics by lactic acid-oligomer microsphere in rat. *Chem. Pharm. Bull.*, 37 (1989) 802-804.

See also 4669, 4698, 4912.

## 32g. Other drug categories

- 4930 Csillag, K., Vereczkey, L. and Gachalyi, B.: Simple high-performance liquid chromatographic method for the determination of tolbutamide and its metabolites in human plasma and urine using photodiode-array detection. *J. Chromatogr.*, 490 (1989) 355-363.
- 4931 De Kruijf, N., Schouten, A., Rijk, M.A.H. and Pranoto-Soetardhi, L.A.: Determination of preservatives in cosmetic products. II. High-performance liquid chromatographic identification. *J. Chromatogr.*, 469 (1989) 317-328.
- 4932 Dorr, M.B. and Pollack, G.M.: Specific assay for the quantitation of indocyanine green in rat plasma using high-performance liquid chromatography with fluorescence detection. *J. Pharm. Sci.*, 78 (1989) 328-333.
- 4933 Flores-Murrieta, F.J., Hoyo-Vadillo, C., Hong, E. and Castaneda-Hernandez, G.: Assay of ambroxol in human plasma by high-performance liquid chromatography with amperometric detection. *J. Chromatogr.*, 490 (1989) 464-469.
- 4934 Hansen, S.H.: Simple and rapid method for the simultaneous determination of the eight main metabolites and conjugates of sulphasalazine in human plasma, urine and faeces using dynamically modified silica. *J. Chromatogr.*, 491 (1989) 175-185.
- 4935 Mangold, D.J., Miller, M.A., Huelle, B.K., Sanchez-Barona, D.O.T., Swynnerton, N.F., Fleckenstein, L. and Ludden, T.M.: Disposition of the radioprotector ethiofos in the rhesus monkey. Influence of route of administration. *Drug Metab. Disp.*, 17 (1989) 304-310.
- 4936 Mourier, P.A.: (Determination of propantheline bromide and its impurities by liquid chromatography). *Analisis*, 17 (1989) 67-69; *C.A.*, 110 (1989) 179611q.
- 4937 Rychener, M. and Steiger, W.: (Purification, glucose-6-phosphate dehydrogenase inhibition, and HPLC analysis of four 1,8-dihydroxyanthrones). *Pharm. Acta Helv.*, 64 (1989) 8-15; *C.A.*, 110 (1989) 179592j.
- 4938 Saffar, F. and Aiache, J.M.: (Assay of tolbutamide in human serum by HPLC). *Analisis*, 17 (1989) 29-33; *C.A.*, 110 (1989) 165417u.
- 4939 Sato, Y., Nishikawa, M. and Shinkai, H.: Analysis of enantiomers of a new antidiabetic agent in plasma by high-performance liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 445-455.
- 4940 Schwarzenbach, R. and Schmid, J.P.: Determination of N-nitrosodiethanolamine in cosmetics. High-performance liquid chromatography and gas chromatography-mass spectrometry as alternative methods to chemiluminescence detection. *J. Chromatogr.*, 472 (1989) 231-242.
- 4941 Sentel, K.B., Clos, J.F. and Dorsey, J.G.: A practical approach to direct injection of untreated physiological fluids with micellar liquid chromatography: determination of bumetanide. *BioChromatography*, 4 (1989) 35-40; *C.A.*, 110 (1989) 165414r.
- 4942 Shinkai, H., Nashikawa, M. and Sato, Y.: Separation of a new antidiabetic agent N-(trans-4-isopropylcyclohexylcarbonyl)-D-phenylalanine, and its isomers by chiral high-performance liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 457-464.
- 4943 Vane, F.M., Bugge, C.J.L. and Rodriguez, L.C.: Identification of etretinate metabolites in human bile. *Drug Metab. Disp.*, 17 (1989) 275-279.
- 4944 Vane, F.M., Bugge, C.J.L. and Rodriguez, J.C.: Identification of etretinate metabolites in human blood. *Drug Metab. Disp.*, 17 (1989) 280-285.
- 4945 Wannerberg, O., Persson, P. and Lindroth, P.: Analysis of bambuterol hydrochloride chemical reference substance and tablets by liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 465-478.
- 4946 Zhong, W.Z. and Lakings, D.B.: Determination of pioglitazone in dog serum using solid-phase extraction and high-performance liquid chromatography with ultraviolet (229 nm) detection. *J. Chromatogr.*, 490 (1989) 377-385.

For additional information see:  
*C.A.*, 110 (1989) 165443z.

See also 4638, 4766, 4781, 4899.

32h. *Toxicological and forensic applications*

- 4947 Bedard, P.R. and Cotton, M.L.: HPLC assay of a leukotriene D<sub>4</sub> antagonist in pharmaceutical preparations and biological samples with UV and fluorescence detection. *J. Liq. Chromatogr.*, 12 (1989) 307-322.
- 4948 Noggle, F.T., Jr., Clark, C.R. and Deruiter, J.: Liquid chromatographic and mass spectral analysis of 1-(3,4-methylenedioxyphenyl)-1-ethanamines: homologues of 3,4-methylenedioxyamphetamines. *J. Liq. Chromatogr.*, 12 (1989) 431-444.
- 4949 Rouyer-Fessard, P., Plassa, F., Blouquit, Y., Vidaud, M., Vernavides, L., Mibashan, R.S., Bellingham, A. and Beuzard, Y.: Prenatal diagnosis of hemoglobinopathies by ion exchange HPLC of hemoglobins. *Prenatal Diagn.*, 9 (1989) 19-26; *C.A.*, 110 (1989) 150709s.
- 4950 Shanker, V., Demodaran, C. and Sekharan, P.C.: Barbiturate analysis in tissue by enzymic digestion and high-performance liquid chromatography. *Forensic Sci. Int.*, 40 (1989) 45-55; *C.A.*, 110 (1989) 207330t.
- 4951 Titova, A.V.: (Chemicoforensic analytical techniques for isolating toxic organic compounds from biological material). *Farmatsiya*, 38 (1989) 80-83; *C.A.*, 110 (1989) 149211s - a review with 80 refs.

For additional information see:

*C.A.*, 110 (1989) 167675a, 224918h.

See also 4709, 4871.

32i. *Plant extracts*

- 4952 Chalchat, J.C., Garry, R.P. and Michet, A.: (Determination of capsaicin and dihydrocapsaicin in capsicum juices). *Parfums, Cosmet., Aromes*, 84 (1988) 69-75; *C.A.*, 110 (1989) 211120s.
- 4953 Chen, C.M., Lin, H.H. and Liou, C.M.: Quantitative determination of higenamine in *Aconitum*, *Asiasarum*, *Annona* and *Nelumbo* by high-performance liquid chromatography. *Chung-hua Yao Hsueh Tsa Chih*, 40 (1988) 217-225; *C.A.*, 110 (1989) 219170d.
- 4954 Kollmann, A., Rouxel, T. and Bousquet, J.-F.: Efficient clean up of non-aqueous plant extracts using reversed-phase cartridges. Applications to the determination of phytoalexins from *Brassica* sp. by high-performance liquid chromatography. *J. Chromatogr.*, 473 (1989) 293-300.
- 4955 Papadopoulou-Mourkidou, E.: Recent advances in pyrethroid determination. *Anal. Methods Pestic. Plant Growth Regul.*, 16 (1988) 179-206; *C.A.*, 110 (1989) 207670d.
- 4956 Verzele, M., van Damme, F. and Schuddinck, G.: Quantitative microscale liquid chromatography of piperine in pepper and pepper extracts. *J. Chromatogr.*, 471 (1989) 335-346.

For additional information see:

*C.A.*, 110 (1989) 179595n, 179640y, 191348s, 199301s.

See also 4167, 4149, 4712.

## 33. CLINICO-CHEMICAL APPLICATIONS

33a. *General papers and reviews*

- 4957 Jellum, E., Thoresen, O., Horn, L., Seip, R., Nilsen, E., Kvittingen, E.A. and Stokke, O.: Advances in the use of computerized gas chromatography-mass spectrometry and high-performance liquid chromatography with rapid scanning detection for clinical diagnosis. *J. Chromatogr.*, 468 (1989) 43-53.

33b. *Complex mixtures and profiling (single compounds by cross ref. only)*

- 4958 Cesal, M.: (Ion-exchange chromatography and polarography of serum in diagnosis of cancer and inflammatory disease). *Czech. Pat.* CS 238,020 (Cl. G01N33/48) 15 Oct. 1987, Appl. 82/6,702, 20 Sep. 1982, 5 pp.; *C.A.*, 110 (1989) 150951q.

- 4959 Hannedouchet, T., Laude, D., Dechaux, M., Gruenfeld, J.P. and Elghozi, J.L.: Plasma-5-hydroxyindoleacetic acid as an endogenous index of renal plasma flow. *Kidney Int.*, 35 (1989) 95-98; *C.A.*, 110 (1989) 150695j.

See also 4202, 4240, 4316, 4334, 4339, 4396, 4417, 4418, 4600, 4634, 4674, 4706, 4753, 4754, 4757, 4949, 4983, 4989.

#### 34. FOOD ANALYSIS

##### 34a. General papers and reviews

- 4960 Hishijima, M.: (HPLC determination of food additives in various foods). *Bunseki*, (1989) 137-144; *C.A.*, 110 (1989) 211024p - a review with 64 refs.

##### 34b. Complex mixtures (single compounds by cross ref. only)

- 4961 Khurana, A.L. and Ho, C.-T.: HPLC analysis of nonvolatile flavor components in Tamarind (*Tamarindus Indica* L.). *J. Liq. Chromatogr.*, 12 (1989) 419-430.
- 4962 Larsson, B.K., Pyysalo, H. and Sauri, M.: Class separation of mutagenic polycyclic organic material in grilled and smoked foods. *Z. Lebensm.-Unters. Forsch.*, 187 (1989) 546-551; *C.A.*, 110 (1989) 191361r.
- 4963 Lukes, B.K., McDaniel, M.R. and Deinzer, M.L.: Isolation of aroma components from beer, wort and malt by combined sensory and analytical-instrumental techniques. *Proc. Conv.-Inst. Brew.*, 20 (1988) 105-108; *C.A.*, 110 (1989) 230063s.

For additional information see:

*C.A.*, 110 (1989) 191378b, 191381x, 211064b.

See also 4170, 4172, 4175, 4180, 4202, 4259, 4263, 4290, 4330, 4370, 4390, 4713, 4718, 4720, 4735, 4737, 4744, 4746, 4751, 4759, 4774, 4784, 4796, 4807, 4917, 4972, 4982, 5000.

#### 35. ENVIRONMENTAL ANALYSIS

##### 35a. General papers and reviews

- 4964 Lopez-Avila, V., Milanes, J., Dodhiwala, N.S. and Beckert, W.F.: Cleanup of environmental sample extracts using Florisil solid-phase extraction cartridges. *J. Chromatogr. Sci.*, 27 (1989) 209-215.
- 4965 Van't Klooster, H.A.: Chemometrics in environmental analytical chemistry. *Comm. Eur. Communities*, (Rep.) EUR 1988, EUR 11350, Org. Micropollut. Aquat. Environ., 416-429; *C.A.*, 110 (1989) 185079p.

For additional information see:

*C.A.*, 110 (1989) 185111t.

##### 35b. Air pollution (complex mixtures; single components by cross ref. only)

See 4039, 4977.

##### 35c. Water pollution (complex mixtures; single compounds by cross ref. only)

- 4966 Albertsson, S.E.: Ion-chromatographic method for determination of small amounts of at least one ion in highly purified water. *Swed. Pat.* SE 456,612 (Cl. G01N30/02), 17 Oct. 1988, Appl. 87/810, 26 Feb. 1987; 8 pp.; *C.A.*, 110 (1989) 185067h.
- 4967 Goettlein, A. and Schierl, R.: (Peak grouping as an integration method for reversed-phase HPLC spectra of water-soluble soil organics). *Vom Wasser*, 71 (1988) 173-178; *C.A.*, 110 (1989) 153280f.

See also 4039, 4164, 4275, 4783, 4788, 4969.

*35d. Soil pollution (complex mixtures; single compounds by cross ref. only)*

See 4794.

## 36. SOME TECHNICAL PRODUCTS AND COMPLEX MIXTURES

*36a. Surfactants*

- 4968 Itsikson, L.B., Platova, A.I. and Kheifits, L.A.: (HPLC of pentaerythritol laurates). *Zh. Anal. Khim.*, 44 (1989) 540-543; *C.A.*, 110 (1989) 218764p.
- 4969 Sithole, B.B. and Allen, L.H.: Determination of nonionic nonylphenol ethoxylate surfactants in pulp and paper mill process samples by spectrophotometry and liquid chromatography. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 273-276.

*36b. Antioxidants and preservatives*

- 4970 Bernardo, P., Anna, R., Zapata, V., Antonio, J. and Oteyza de Guerrero, M.: (Analysis of antioxidant additives for lubricants by high-performance liquid chromatography). *Rev. Tec. INTEVEP*, 8 (1988) 59-68; *C.A.*, 110 (1989) 176330m.
- 4971 Hashizume, K., Toda, C., Yasui, T. and Nagano, H.: Determination of butylated hydroxyanisole and butylated hydroxytoluene in oily foods and dried fish by HPLC. *Eisei Kagaku*, 34 (1988) 550-554; *C.A.*, 110 (1989) 171855b.
- 4972 Page, B.D. and Charbonneau, C.F.: Liquid chromatographic determination of seven antioxidants in dry food. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 259-265.

See also 4755.

*36c. Various technical products*

- 4973 Desbene, P.L., Lambert, D., Basselier, J.J. and Boulet, R.: (Analytical study of petroleum heavy ends). *Analusis*, 16 (1988) 478-483; *C.A.*, 110 (1989) 157324w.
- 4974 Perry, M.B., Cillo, D.L. and Barrage, T.C.: Characterization of coal reaction products using preparative-scale liquid chromatography and automated thin-layer chromatography. *Prepr.-Am. Chem. Soc., Div. Pet. Chem.*, 34 (1989) 229-235; *C.A.*, 110 (1989) 216080p.
- 4975 Rhemrev-Boom, M.M. and Hammers, W.E.: Application of reversed-phase high-performance liquid chromatography in photographic science and technology. *J. Photogr. Sci.*, 36 (1988) 53-56; *C.A.*, 110 (1989) 182732k.

For additional information see:

*C.A.*, 110 (1989) 156322g, 215113q.

See also 4015, 4970, 4981.

*36d. Complex mixtures and unidentified compounds*

- 4976 Di Julio, D., Hinds, T.R. and Vincenzi, F.F.: Inhibition of basal and calmodulin-activated  $\text{Ca}^{2+}$ -pump ATPase by fractionated compound 48/80. *Biochim. Biophys. Acta*, 981 (1989) 337-342.

For additional information see:

*C.A.*, 110 (1989) 228152b.

See also 4154.

## 38. INORGANIC COMPOUNDS

## 38a. Cations

- 4977 Bächmann, K., Blaskowitz, K.-H. and Pohl, S.: Chromatographic determination of cations in atmospheric samples. *Fresenius' Z. Anal. Chem.*, 333 (1989) 704.
- 4978 Cassidy, R.M. and Chauvel, C.: Modern liquid chromatographic techniques for the separation of neodymium and strontium for isotopic analyses. *Chem. Geol.*, 74 (1989) 189-200; *C.A.*, 110 (1989) 165138d.
- 4979 Dunemann, L. and Reinecke, H.: Changes of the distribution patterns of metals in chromatographic processes after spiking of samples. *Fresenius' Z. Anal. Chem.*, 333 (1989) 737-738.
- 4980 Ebdon, L. and Hill, S.: Combined high performance liquid chromatography-atomic spectroscopy for trace metal speciation. In: Creaser, C.S. and Davis, A.M.C.R. (Editors), *Anal. Appl. Spectrosc.*, (Proc. Int. Conf.) 1987, Soc. Chem., London, 1988, pp. 355-366; *C.A.*, 110 (1989) 224493r - a review with 14 refs.
- 4981 Fischer, C.H., Lilie, J., Weller, H., Katsikas, L. and Henglein, A.: Photochemistry of colloidal semiconductors. 29. Fractionation of cadmium sulphide sols of small particles by exclusion chromatography. *Ber. Bunsen-Ges. Phys. Chem.*, 93 (1989) 61-64; *C.A.*, 110 (1989) 160900m.
- 4982 Gisch, D.J., Nolan, L.A. and Parry, R.C.: Analysis of foodstuffs for sodium content using solid phase extraction and high performance cation-exchange chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 333-335.
- 4983 Gower, J., Healing, G. and Green, C.: Measurement by HPLC of desferrioxamine-available iron in rabbit kidneys to assess the effect of ischemia on the distribution of iron within the total pool. *Free Radical Res. Commun.*, 5 (1989) 291-299; *C.A.*, 110 (1989) 169551f.
- 4984 Grootveld, M., Bell, J.D., Halliwell, B., Aruoma, O.I., Bomford, A. and Sadler, P.J.: Non-transferrin-bound iron in plasma or serum from patients with idiopathic hemochromatosis. Characterization by high performance liquid chromatography and nuclear magnetic resonance spectroscopy. *J. Biol. Chem.*, 264 (1989) 4417-4422.
- 4985 Hamilton, V.T., Spall, W.D., Smith, B.F. and Peterson, E.J.: Quantitative analysis of thorium in plutonium using reversed-phase liquid chromatography and spectrophotometric detection. *J. Chromatogr.*, 469 (1989) 369-377.
- 4986 Jia, G., Testa, C., Desideri, D. and Meli, M.A.: Extraction-chromatographic method for the determination of plutonium-239,240 and plutonium-238 in soils with high natural radioactivity. *Anal. Chim. Acta*, 220 (1989) 103-110.
- 4987 Jones, P. and Schwedt, G.: Ion chromatography of chloro complexes of the platinum group metals and gold using bonded phase silica substrates. *Anal. Chim. Acta*, 220 (1989) 195-205.
- 4988 Kauffman, G.B., Adams, M.L. and Tuttle, T.R., Jr.: The separation of cobalt from nickel by anion exchange chromatography. *J. Chem. Educ.*, 66 (1989) 166-167; *C.A.*, 110 (1989) 153356k.
- 4989 Kobayashi, R. and Imaizumi, K.: Determination of antimony in urine by graphite furnace atomic absorption spectrometry after ion exchange separation and solvent extraction. *Anal. Sci.*, 5 (1989) 61-64; *C.A.*, 110 (1989) 149241b.
- 4990 Kocjan, R. and Przeszlakowski, S.: Retention of heavy metals and their separation on silica gel modified with calconcarboxylic acid. *Sep. Sci. Technol.*, 24 (1989) 291-301; *C.A.*, 110 (1989) 184967q.
- 4991 Nonidez, W.K. and Samanifar, M.: The separation of 12-molybdophosphoric acid from 12-molybdosilicic acid by reverse-phase liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 397-418.
- 4992 Sato, H.: Isocratic elution of sodium, ammonium, potassium, magnesium and calcium ions by ion-exchange chromatography. *J. Chromatogr.*, 469 (1989) 339-349.
- 4993 Schimmel, H. and Ballaschmitter, K.: The influence of different substituents on the chemical and chromatographic behaviour of metal 1,2-diketo-bis(thiosemicarbazones). *Fresenius' Z. Anal. Chem.*, 333 (1989) 735.
- 4994 Schulze, G. and Elsholz, O.: On-line break-through test for ion-exchange micro-columns using flow injection potentiometric stripping analysis. *Fresenius' Z. Anal. Chem.*, 333 (1989) 740.
- 4995 Shijo, Y., Saitoh, A. and Suzuki, K.: Separation of aluminium(III), cooper(III), gallium(III), and iron(III) as 8-hydroxyquinoline-5-sulphonic acid complexes by high-performance liquid chromatography. *Chem. Lett.*, (1989) 181-184; *C.A.*, 110 (1989) 184970k.



- 4996 Trojanowicz, M. and Meyerhoff, M.E.: Replacement ion chromatography with potentiometric detection using a potassium-selective membrane electrode. *Anal. Chim. Acta*, 222 (1989) 95-107.

For additional information see:

C.A., 110 (1989) 152693f, 165210w, 185023r, 185028w, 204793k, 224688h.

See also 4068, 4731.

### 38b. Anions

- 4997 Chauret, N. and Hubert, J.: Characterization of indirect photometry for the determination of inorganic anions in natural water by ion chromatography. *J. Chromatogr.*, 469 (1989) 329-338.
- 4998 Fitzgerald, J.J., Hoffman, J.A. and Nebo, C.O.: Application of gel filtration chromatography to the study of aqueous silicate complexes. *J. Chromatogr. Sci.*, 27 (1989) 186-192.
- 4999 Furuya, K., Hatano, H., Inoue, H. and Shirai, T.: Separation and determination of nitrite ion by affinity chromatography with cyano(pheophytinato a)cobalt(III) charged column. *Chromatographia*, 27 (1989) 461-464.
- 5000 Kim, H.-J.: Comparison of ion exclusion chromatographic method with the Monier-Williams method for determination of total sulfite in foods. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 266-272.
- 5001 Lim, C.K.: Electronic interaction chromatography on porous graphitic carbon. Separation of [<sup>99m</sup>Tc] pertechnetate and perhenate anions. *Biomed. Chromatogr.*, 3 (1989) 92-93.
- 5002 Nath, K.V.S. and Tandon, S.N.: Anion exchange behaviour of hydrous titanium oxide and its use for column separations. *Chromatographia*, 27 (1989) 472-474.
- 5003 Wiedenauer, M., Schmidtke, I., Kübler, A., Hofmann, H., Hoffmann, P. and Lieser, K.H.: Application of ion chromatography for speciation analysis of natural water samples. *Fresenius' Z. Anal. Chem.*, 333 (1989) 749-750.

For additional information see:

C.A., 110 (1989) 204746x, 211099s, 224580s, 224609h.

See also 4106, 4259, 4265, 4996.

### 39. RADIOACTIVE AND OTHER ISOTOPE COMPOUNDS

- 5004 Karmen, A., Malikin, G. and Lam, S.: Highly sensitive on-line radioassay of high-performance liquid chromatographic effluents. *J. Chromatogr.*, 468 (1989) 279-288.
- 5005 Scott, R.B., Schofield, P.J., Deutsch, E.A. and Heineman, W.R.: Chromatographic characterization of electrochemically generated technetium-HEDP skeletal imaging agents. *Talanta*, 36 (1989) 285-292; C.A., 110 (1989) 199163y.

For additional information see:

C.A., 110 (1989) 162016b.

See also 4076, 4090, 4935, 4978, 4986, 5001.

## Gas Chromatography

### 1. REVIEWS AND BOOKS

- 2004 Berezkin, V.G.: Biography of Mikhail Semenovich Tswett and translation of Tswett's preliminary communication on a new category of adsorption phenomena. *Chem. Rev.*, 89 (1989) 279-286.
- 2005 Berezkin, V.G. and Volkov, S.M.: Capillary gas adsorption chromatography. *Chem. Rev.*, 89 (1989) 287-308 - a review with 114 refs.
- 2006 Brettell, T.A. and Saferstein, R.: Forensic science. *Anal. Chem.*, 61, No. 12 (1989) 95R-105R.
- 2007 Ettre, L.S.: 1963-1988: Twenty-five years of International Symposia on Advances in Chromatography. *J. Chromatogr.*, 468 (1989) 1-34.
- 2008 Jackson, L.L., McKown, D.M., Taggart, J.E., Jr., Lamothe, P.J. and Lichte, F.E.: Geological and inorganic materials. *Anal. Chem.*, 61, No. 12 (1989) 109R-128R.
- 2009 Sherma, J.: Pesticides. *Anal. Chem.*, 61, No. 12 (1989) 153R-165R.
- See also 2027, 2032, 2089, 2118, 2145, 2233, 2242, 2253, 2257, 2293, 2296, 2309, 2319, 2321, 2324, 2370, 2384, 2456, 2471, 2486, 2495, 2502.

### 2. FUNDAMENTALS, THEORY AND GENERAL

#### 2a. General

- 2010 Apps, P.J. and Pretorius, V.: Comparison between the conditions for solute focussing by the static and dynamic solvent effects under ideal conditions. *J. Chromatogr.*, 471 (1989) 81-89.
- 2011 Bemgard, A. and Blomberg, L.: Some factors affecting the precision in the determination of retention indices on polar capillary columns for gas chromatography. *J. Chromatogr.*, 473 (1989) 37-52.
- 2012 Clifford, A.A.: Theory of open-tube chromatography: An exact proof of Golay's equations. *J. Chromatogr.*, 471 (1989) 61-69.
- 2013 Eikens, D.I. and Carr, P.W.: Application of the equation of error propagation to obtaining nonstochastic estimates for the reproducibility of chromatographic peak moments. *Anal. Chem.*, 61 (1989) 1058-1062.
- 2014 Martire, D.E.: Application of a unified molecular theory to gas-liquid chromatography. *J. Chromatogr.*, 471 (1989) 71-80.
- 2015 Muchnik, V.L. and Shaevich, A.V.: (Ways of improving chromatographic identification based on the use of reference retention data and of reference materials). *Zh. Anal. Khim.*, 44 (1989) 707-711.
- 2016 Olive, J., Grimalt, J.O. and Iturriaga, H.: Resolution of overlapping peaks in gas and liquid chromatography. Evaluation of different statistical and empirical methods. *Anal. Chim. Acta*, 219 (1989) 257-272.
- 2017 Said, A.S., Tabarak, M.H. and Dadkhah, A.A.: Retention relationships in chromatography - derivation of a general equation. *J. High Resolut. Chromatogr.*, 12 (1989) 342-345.
- 2018 Shaevich, A.B. and Muchnik, V.L.: (Metrological peculiarities of chromatographic identification using reference materials). *Zh. Anal. Khim.*, 44 (1989) 481-492.
- 2019 Vigdergauz, M.S., Petrova, E.I. and Shatskii, S.Va.: (Estimation of errors in chromatographic retention measurements). *Zh. Anal. Khim.*, 44 (1989) 712-720.

See also 2175.

*2b. Thermodynamics and theoretical relationships*

- 2020 Kersten, B.R., Poole, S.K. and Poole, C.F.: Thermodynamic approach to the practical characterization of solvent strength and selectivity of commonly used stationary phases in gas chromatography. *J. Chromatogr.*, 468 (1989) 235-260.
- 2021 Poole, S.K., Kersten, B.R. and Poole, C.F.: Comparison of solvent models for characterizing stationary phase selectivity in gas chromatography. *J. Chromatogr.*, 471 (1989) 91-103.
- 2022 Tan Liyang: (Precise calculation of theoretical plate number required for gas chromatography separation - a probabilistic model of nonlinear adsorption/partition processes). *Beijing Gongye Daxue Xuebao*, 14, No. 3 (1988) 25-32; *C.A.*, 110 (1989) 224715q.

*2c. Relationship between structure and chromatographic behaviour*

- 2023 Chen Shiyan, Li Suxian and Chang Jialin: (Determination of gas chromatographic dead-time  $t_M$  and its effect on retention index). *Sepu*, 7 (1989) 80-83.
- 2024 Dimov, N. and Mekenyan, O.: Quantitative relationships between the structure of alkylbenzenes and their gas chromatographic retention on stationary phases with different polarity. *J. Chromatogr.*, 471 (1989) 227-236.
- 2025 Evans, M.B. and Haken, J.K.: Dispersion and selectivity indices in gas chromatography. Part II. Studies of homologous carbonyl and carboxyl compounds. *J. Chromatogr.*, 471 (1989) 217-226.
- 2026 Evans, M.B. and Haken, J.K.: Dispersion and selectivity indices in gas chromatography IV. Chlorinated aromatic compounds. *J. Chromatogr.*, 468 (1989) 373-382.
- 2027 Evans, M.B. and Haken, J.K.: Recent developments in the gas chromatographic retention index scheme. *J. Chromatogr.*, 472 (1989) 93-127 - a review with 363 refs.
- 2028 Fischer, R. and Ballschmiter, K.: Relationship between experimentally determined vapour pressure and retention times of PCB on a 50% *n*-octyl-methyl-polysiloxane stationary phase. *Fresenius' Z. Anal. Chem.*, 333 (1989) 731-732.
- 2029 Fu Ruonong, Xin Baomin, Zhang Yingchao, Zhang Aiqin and Zhu Hesun: (Retention behavior of polycyclic aromatic hydrocarbons on liquid crystalline polymer stationary phases). *Fenxi Ceshi Tongbao*, 7, No. 4 (1988) 7-11; *C.A.*, 110 (1989) 224732t.
- 2030 Görgenyi, M., Fekete, Z. and Seres, L.: Estimation and prediction of the retention indices of selected *trans*-diazenes. *Chromatographia*, 27 (1989) 581-584 - retention indices for 14 diazenes.
- 2031 Guan, Y., Kiraly, J. and Rijks, J.A.: Interactive retention index database for compound identification in temperature-programmed capillary gas chromatography. *J. Chromatogr.*, 472 (1989) 129-143.
- 2032 Hanai, T. and Hong Cai: Structure-retention correlation in CGC. *J. High Resolut. Chromatogr.*, 12 (1989) 327-332 - retention indexes for 60 compounds.
- 2033 Maurer, T., Welsch, T. and Engewald, W.: Non-linearity of the plot of  $\log(\text{adjusted retention time})$  versus carbon number for *n*-alkanes in series-coupled gas chromatographic columns. *J. Chromatogr.*, 471 (1989) 245-249.
- 2034 Misharina, T.A. and Golovnya, R.V.: (Regularities of retention of a pseudo-homologous series of dialkylpolysulfides in capillary gas chromatography). *Zh. Anal. Khim.*, 44 (1989) 514-519.
- 2035 Tarjan, G., Nyiredy, S., Györ, M., Lombosi, E.R., Lombosi, T.S., Budahegyi, M.V., Meszaros, S.Y. and Takacs, J.M.: Thirtieth anniversary of the retention index according to Kovats in gas liquid chromatography. *J. Chromatogr.*, 472 (1989) 1-92.
- 2036 Zhang Yukui, Zou Hanfa, Bao Miansheng, Ding Lifu and Lu Peichang: (Further investigation of the linear relationship between  $\sigma, \tau$  and retention values). *Sepu*, 7 (1989) 70-74.

See also 2015, 2051, 2116, 2240.

*2d. Measurement of physico-chemical and related values*

- 2037 Arkhipova, E.Yu., Dimitrov, L.D., Kalashnikova, E.V., Petrova, R.S. and Shcherbakova, K.D.: (Chromatoscopic investigation of the molecular structure of cyclobutane). *Zh. Fiz. Khim.*, 63 (1989) 1133-1136.
- 2038 Ashraf, S.M., Rajiah, A., Krishna, M.R. and Rao, M.B.: Limiting activity coefficients of aliphatic alcohols in phthalates. *J. Chromatogr.*, 472 (1989) 163-174.
- 2039 Bhagat, S.D.: Gas chromatographic characterization of some phosphate esters and correlation of polarity criterion. *J. Chromatogr. Sci.*, 27 (1989) 225-230.
- 2040 Bruning, I.M.R.D.: Polarity of crude oil. *Brit. UK Pat. Appl. GB 2,207,246* (Cl. G01N30/02), 25 Jan. 1989, BR Appl. 87/3,790, 21 Jul. 1987; 18 pp.; *C.A.*, 110 (1989) 216107c.
- 2041 Chernoplekova, V.A., Korol, A.N. and Polkanov, M.A.: (Molar solution heats of allylbenzene and its derivatives measured by gas-liquid chromatographic method). *Zh. Fiz. Khim.*, 63 (1989) 791-793.
- 2042 Coca, J., Medina, I. and Langer, S.H.: Thermodynamic properties of solution by gas chromatography using a liquid crystal as solvent: cholesteryl myristate. *Liq. Cryst.*, 4 (1989) 175-180; *C.A.*, 110 (1989) 180375x.
- 2043 Dyagileva, L.M., Tsyganova, E.I. and Aleksandrov, Yu.A.: (Gas chromatographic study of heterogeneous catalytic decay and adsorption of diisopropylnickelocene). *Kinet. Katal.*, 29 (1988) 1264-1266; *C.A.*, 110 (1989) 213053w.
- 2044 Ermolin, A.N., Gerko, V.I. and Tarasenko, U.A.: (Application of an inverse gas chromatography method for the determination of sorption-diffusion parameters in the "vapor-polymer" systems). *Dokl. Akad. Nauk SSSR*, 304 (1989) 1173-1177.
- 2045 Furton, K.G., Furnell, J.H. and Stedman, G.: Stability constants of hydracid-tributyl phosphate complexes in alkane solution: Hydrochloric acid and hydrogen cyanide. *J. Chromatogr.*, 468 (1989) 73-89.
- 2046 Ghosh, A.K. and Kevan, L.: Evidence for migration of palladium species during ethylene dimerization of palladium-exchanged Na-Y and Ca-Y zeolites studied by gas chromatography correlated with electron spin resonance and electron spin-echo modulation spectroscopies. *J. Phys. Chem.*, 93 (1989) 3747-3753.
- 2047 Grigoreva, D.N., Golovnya, R.V., Syomina, L.A. and Samusenko, A.L.: (Applicability of the universal equation in capillary GC for calculation of the retention indices and boiling points for the members of O-, N-, and S-containing homologous series). *Izv. Akad. Nauk SSSR*, (1989) 301-306.
- 2048 Itsuki, H., Shigeta, H. and Terasawa, S.: GLC determination of partial molar free energies at infinite dilution for simple organic solutes in moderately volatile solvents. *Chromatographia*, 27 (1989) 359-363.
- 2049 Kaposos, J., Katsanos, N.A. and Nlotis, A.: Physicochemical quantities in catalytic reactions measured simultaneously by gas chromatography. *Chromatographia*, 27 (1989) 333-339.
- 2050 Katsanos, N.A. and Vassilakos, C.: New method for measuring obstructive factors and porosity using gas chromatographic instrumentation. *J. Chromatogr.*, 471 (1989) 123-137.
- 2051 Kuningas, K., Rang, S. and Kailas, T.: Gas-chromatographic study of the thermodynamic properties of systems containing linear alkenes and alkynes. *Chromatographia*, 27 (1989) 544-548.
- 2052 Lyne, P.M. and Phillips, C.S.G.: Isomerisation of propyne to propadiene. Studies by gas chromatography. *J. Chromatogr.*, 471 (1989) 145-150.
- 2053 Meusinger, J., Moesch, A. and Steinberg, K.H.: (Conversion of *n*-heptane on reforming catalysts in an integral pressure reactor online with a capillary gas chromatograph). *Chem. Tech. (Leipzig)*, 41 (1989) 76-77.
- 2054 Milonjic, S.K., Ceranic, T.S. and Petkovic, M.D.: A gas chromatographic study of the adsorption of organics on thermally treated clinoptibole. *Chromatographia*, 27 (1989) 306-310.
- 2055 Pirogov, A.I. and Kodabakas, N.: (Density and formation mechanism of nematic solutions of aromatic C<sub>6</sub>H<sub>10</sub> hydrocarbons in *p*-ethoxybenzylidene-*p'*-butyl-aniline). *Zh. Fiz. Khim.*, 63 (1989) 368-372.
- 2056 Poole, S.K., Shetty, P.H. and Poole, C.F.: Chromatographic and spectroscopic studies of the solvent properties of a new series of room temperature liquid tetraalkylammonium sulfonates. *Anal. Chim. Acta*, 218 (1989) 241-264.
- 2057 Sidqi, M., Balard, H., Papirer, E., Tuel, A., Hommel, H. and Legrand, A.P.: Study of modified silicas by inverse gas chromatography. Influence of chain length on the conformation of *n*-alcohols grafted on a pyrogenic silica. *Chromatographia*, 27 (1989) 311-315.

- 2058 Velazquez, A., Leonard, J. and Cote, J.-E.: Surface free energy of silane-covered materials measured by gas chromatography. *Chromatographia*, 27 (1989) 455-460.
- 2059 Wei Junling, Li Jiangyong and Han Qingping: (A study of thermodynamic properties of organic solvent-PET (polyethylene terephthalate) systems). *Sepu*, 7 (1989) 83-86.
- 2060 Wu, H.T. and Yang, R.Y.K.: Measurement of effective diffusivities of gases in microporous coal chars by nonisobaric pulse gas chromatography. *AIChE Symp. Ser.*, 84 (1988) 65-72; *C.A.*, 110 (1989) 176417v.
- 2061 Zhang Xinyu and Zhang Huimin: (Method for determining the weight calibration factor of unpurified compounds). *Jinan Lityi Xuebao*, No. 3 (1988) 52-56; *C.A.*, 110 (1989) 224716r.

See also 2028, 2102, 2131, 2188, 2195, 2261, 2304, 2305, 2317, 2321.

### 3. GENERAL TECHNIQUES

#### 3a. Apparatus and accessories

- 2062 Cook, L. and Rooney, T.: An advanced computing integrator for chromatography. *Int. Lab.*, 19, No. 5 (1989) 24-31.
- 2063 Daigle, E.L.: Water vapor addition for gas chromatography, and gas chromatographs. *U.S. Pat.* US 4,806,315 (Cl. 422-89; G01N30/02) 21 Feb. 1989, Appl. 69,070, 2 Jul. 1987; 10 pp.; *C.A.*, 110 (1989) 224684d.
- 2064 Eicker, H. and Springmann, W.: (Method and apparatus for measurement of low concentration of combustible gas components in mine damp). *Ger. Offen. Pat.* DE 3,716,992 (Cl. G01N30/02), 17 Nov. 1988, DE Appl. 3,714,410, 30 Apr. 1987; 7 pp.; *C.A.*, 110 (1989) 176554n.
- 2065 Gerstel, E.: (High-speed gas or super-critical fluid chromatographs). *Ger. Offen. Pat.* DE 3,729,775 (Cl. G01N30/60), 16 Mar. 1989, Appl. 7 Sep. 1987; 4 pp.; *C.A.*, 110 (1989) 241880g.
- 2066 Grob, K. and Gurtner, C.: Cleaning the outer needle wall of syringes. *J. High Resolut. Chromatogr.*, 12 (1989) 335-336.
- 2067 Kumar, M.L.: Chromatographic separation method and associated apparatus. *U.S. Pat.* US 4,814,089 (Cl. 210-659; B01D15/08) 21 Mar. 1989, Appl. 157,020, 17 Feb. 1988; 10 pp.; *C.A.*, 110 (1989) 224776k.
- 2068 Li Hongsheng: (Introduction to the series accessories of capillary gas chromatograph). *Sepu*, 7 (1989) 124 and 116.
- 2069 Liu Zaiyou and Phillips, J.B.: Sample introduction into a 5- $\mu$ m i.d. capillary gas chromatography column using an on-column thermal desorption modulator. *J. Microcolumn. Separ.*, 1 (1989) 159-162.
- 2070 Ogino, H., Suzuki, T. and Aomura, Y.: Simple modification to compensate for the baseline variation due to the introduction of a reduced-pressure gas sample into a gas chromatograph. *J. Chromatogr.*, 472 (1989) 389-392.
- 2071 Pozhidaev, V.M., Korolev, A.A. and Berezkin, V.G.: (Unit for sampling in the capillary column for analysis of polycyclic aromatic hydrocarbons). *Zavod. Lab.*, 89, No. 3 (1989) 26-28.
- 2072 Pribat, D., Perret, J., Rouffy, J.C. and Velasco, G.: (Method for producing microcavities and use in an electrochemical sensor and in a gas chromatograph). *Eur. Pat. Appl.* EP 309,334 (Cl. G01N27/56), 29 Mar. 1989, FR Appl. 87/13,058, 22 Sep. 1987; 18 pp.; *C.A.*, 110 (1989) 185115x.
- 2073 Ratfisch, W.: (Method and device for automatic regulation of the initial temperature in process gas chromatographs). *Ger. Offen. Pat.* DE 3,716,386 (Cl. G01N30/54), 24 Nov. 1988, Appl. 15 May 1987; 4 pp.; *C.A.*, 110 (1989) 204847f.
- 2074 Soleta, D.D.: On-line headspace gas chromatography. *Am. Lab. (Fairfield)*, 21, No. 5 (1989) 21-24.

See also 2149, 2177, 2179, 2190, 2192, 2219, 2249.

## 3b. Detectors and detection reagents

- 2075 Ash, P.W., Barnett, N.W., Ebdon, L. and Rowley, S.J.: Configuration and optimization of semiconductor gas sensors as gas chromatographic detectors. *Anal. Chim. Acta*, 216 (1989) 147-161.
- 2076 Collings, N., Dinsdale, S. and Willey, J.: Hydrocarbon flame ionization detector for determining unburned hydrocarbons in exhaust gases. *PCT Int. Pat. Appl.* WO 89 01,149 (Cl. G01N27/62), 9 Feb. 1989, GB Appl. 87/18,332, 3 Aug. 1987; 29 pp.; *C.A.*, 110 (1989) 236532r.
- 2077 Costanzo, R.B. and Barry, E.F.: Gas chromatographic detection of selected organochlorine species using an alternating current plasma detector. *J. Chromatogr.*, 467 (1989) 373-384.
- 2078 Costanzo, R.B. and Barry, E.F.: Simplex optimization of the alternating-current plasma detector for gas chromatography. *Appl. Spectrosc.*, 42 (1988) 1387-1393.
- 2079 Driscoll, J.N. and Berger, A.W.: Improved flame photometric detector for the analysis of sulfur compounds by gas chromatography. *J. Chromatogr.*, 468 (1989) 303-308.
- 2080 Hall, R.C.: Photoionization detector for gas chromatographs. *U.S. Pat.* US 4,804,846 (Cl. 250-379; H01J27/24), 14 Feb. 1989, Appl. 128,644, 4 Dec. 1987; 7 pp.; *C.A.*, 110 (1989) 224770d.
- 2081 Hirose, H.: Mass spectrometric apparatus for effluents from gas and liquid chromatographs. *U.S. Pat.* US 4,808,819 (Cl. 250-288; B01D59/44) 28 Feb. 1989, JP Appl. 87/23,310, 3 Feb. 1987; 6 pp.; *C.A.*, 110 (1989) 224775j.
- 2082 Lagesson, V. and Newman, J.M.: Microcolumn gas chromatography with ultraviolet detection and identification using a photodiode array spectrophotometer. *Anal. Chem.*, 61 (1989) 1249-1252.
- 2083 Lasa, J. and Sliwka, I.: Some comments on the "space charge" model of electron-capture detector. *Chromatographia*, 27 (1989) 499-508.
- 2084 Liu Fengling and Sun Xunyun: (Quick survey of lifetime of thermionic source in nitrogen-phosphorus detector with APPLE II computer). *Sepu*, 7 (1989) 101-104.
- 2085 Matucha, M.: Radioactivity detection in capillary gas chromatography of  $^3\text{H}$ - and  $^{14}\text{C}$ -labelled compounds. *Chromatographia*, 27 (1989) 552-558.
- 2086 Popp, P., Arnold, G., Mothes, S., Roebel, T., Martini, L. and Stark, B.: (Device for detection of electronegative substances in gases based on photo-ionization in combination with gas chromatography). *Ger. (East) Pat.* DD 259,257 (Cl. G01N21/33) 17 Aug. 1988, Appl. 301,131, 26 Mar. 1987; 4 pp.; *C.A.*, 110 (1989) 224760a.
- 2087 Ramus, T.L. and Thomas, L.C.: Factorial optimization for flows in the Hall electrolytic conductivity detector. *J. Chromatogr.*, 473 (1989) 27-35.
- 2088 Schmid, B., Andersson, J.T. and Ballschmiter, K.: Sulfur selective detection in gas chromatography with a microwave-induced plasma detector. *Fresenius' Z. Anal. Chem.*, 333 (1989) 765-766.
- 2089 Shlyakhov, A.F.: (Application of photoionization detector in gas chromatographic analysis. A review). *Zavod. Lab.*, 89, No. 2 (1989) 1-12 - a review with 88 refs.
- 2090 Shmidel, E.B., Sheftelevich, Y.L., Khokhlov, V.N., Belkind, M.I., Sterkhov, N.V., Varivonchik, E.A., Shekhtman, R.I. and Chernov, A.M.: (Ionization detector for gas chromatographs). *U.S.S.R. Pat.* SU 1,458,795 (Cl. G01N27/62), 15 Feb. 1989, Appl. 4,261,518, 12 Jun. 1987; *C.A.*, 110 (1989) 241878n.
- 2091 Steinhüller, D. and Straub, H.: Der Heliumionisationsdetektor für die Ultraspurenanalytik von Reinstgasen. *LaborPraxis*, 13 (1989) 416-419.
- 2092 Uden, P.C., Yoo Young, Wang Tao and Cheng Zuben: Element-selective gas chromatographic detection by atomic plasma emission spectroscopy. *J. Chromatogr.*, 468 (1989) 319-328.
- 2093 Wentworth, W.E., Limerio, T., Batten, C.F. and Chen, E.C.M.: Non-radioactive electron-capture detector for gas chromatography. *J. Chromatogr.*, 468 (1989) 215-224.

See also 2135, 2150, 2158, 2187, 2191, 2195, 2274, 2276, 2292, 2440, 2515.

## 3c. Sorbents, carriers, column and layer performance, packing procedures

- 2094 Abe, I., Kameyama, K. and Wasa, T.: A simple and versatile end-sealing for static coating of wide-bore glass capillaries. *Chromatographia*, 27 (1989) 631-632.
- 2095 Betz, W.R. and Supina, W.R.: Determination of the chromatographic performance characteristics of several graphitized carbon blacks. *J. Chromatogr.*, 471 (1989) 105-112.
- 2096 Blum, W. and Eglinton, G.: Preparation of high temperature stable glass capillary columns coated with PS-090 (20% diphenyl substituted CH<sub>3</sub>O-terminated polysiloxane) a selective stationary phase to the direct analysis of metal-porphyrin complexes. *J. High Resolut. Chromatogr.*, 12 (1989) 290-293.
- 2097 Brunner, F., Crescentini, G., Mangani, F. and Lattanzi, L.: New perspectives in capillary chromatography. *J. Chromatogr.*, 473 (1989) 93-101.
- 2098 Carmi, J., Sotack, G. and McNair, M.: Simple method to prepare non-polar wide-bore columns for gas chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 431-432.
- 2099 Dawes, P. and Cumbers, M.: Capillary columns designed for high temperature GC. *Am. Lab. (Fairfield)*, 21, No. 5 (1989) 102-111.
- 2100 Farkas, P., Sojak, L., Kovac, M. and Janak, J.: Interface adsorption and reproducibility of retention indices in glass capillary columns with dimethyl-polysiloxane stationary phases cross-linked by  $\gamma$ -irradiation. *J. Chromatogr.*, 471 (1989) 251-261.
- 2101 Green, L.S. and Bertsch, W.: Characteristics of glass based packings as a support in chromatography. *J. Chromatogr.*, 471 (1989) 113-122.
- 2102 Hradil, J., Svec, F., Platonova, N.P., Belyakova, L.D. and Marousek, V.: Gas chromatographic and sorption properties of macroporous methacrylate copolymers. *J. Chromatogr.*, 469 (1989) 143-152.
- 2103 Janak, K., Horka, M. and Tesarik, K.: Effect of repeated cross-linking of SE-54 stationary phase film on the chromatographic properties of capillary columns. *J. Chromatogr.*, 471 (1989) 237-244.
- 2104 Janini, G.M., Muschik, G.M. and Fox, S.D.: Comparison of the gas-chromatographic properties of mesomorphic polymeric stationary phases. *Chromatographia*, 27 (1989) 436-440.
- 2105 Jin Yonghao, Fu Ruonong and Huang Zaifu: Use of crown ethers in gas chromatography. *J. Chromatogr.*, 469 (1989) 153-159.
- 2106 Juvancz, Z., Pulsipher, M.A., Tarbet, B.J., Schirmer, M.M., Johnson, R.S., Markides, K.E., Bradshaw, J.S. and Lee, M.L.: New cyanophenyl-containing polysiloxane stationary phases for capillary column gas chromatography. *J. Microcolumn. Separ.*, 1 (1989) 142-149.
- 2107 Koenig, W.A., Lutz, S., Mischnick-Luebbecke, P., Brassat, B., von der Bey, E. and Wenz, G.: Modified cyclodextrins - a new generation of chiral stationary phases for capillary gas chromatography. *Starch/Staerke*, 40 (1988) 472-476; *C.A.*, 110 (1989) 224726u.
- 2108 Kohoutkova, A., Smolkova-Keulemansova, E. and Feltl, L.: Use of gas chromatography for a study of crown ethers. *J. Chromatogr.*, 471 (1989) 139-144.
- 2109 Mal'tsev, V.V., Khabarov, V.B., Volkova, L.D. and Chernyshova, E.I.: (Sorbent for gas-liquid chromatography). *U.S.S.R. Pat.* SU 1,458,810 (Cl G01N30/48), 15 Feb. 1989, Appl. 4,147,809, 17 Nov. 1986; *C.A.*, 110 (1989) 224657x.
- 2110 Matisova, E., Kovacicova, E., Garaj, J. and Kraus, G.: Optimization of the separation of multicomponent mixtures by HRCGC. *Chromatographia*, 27 (1989) 494-498.
- 2111 Min Xiang and Bruner, F.: Wall-coated adsorbent open-tubular fused-silica columns for the separation of complex pyrolysis products. *J. Chromatogr.*, 468 (1989) 365-372.
- 2112 Mohnke, M. and Heybey, J.: Gas-solid chromatography on open tubular columns: An isotope effect. *J. Chromatogr.*, 471 (1989) 37-53.
- 2113 Morabito, P.L., Hiller, J.F. and McCabe, T.: A method for automated large volume on-column injection capillary gas chromatography with solvent diversion. *J. High Resolut. Chromatogr.*, 12 (1989) 347-349.
- 2114 Panina, L.I., Sakodinskii, K.I. and Terekhova, G.P.: Gas chromatography on macroporous sulfonated cation exchangers. *Chromatographia*, 27 (1989) 644-648.
- 2115 Pakhomov, V.P., Lyatiev, G.G. and Mikhaleva, I.M.: (Utilization of Antifom-silane as stationary liquid phase for separation of oxygen-containing organic substances by gas-liquid chromatography). *Zh. Anal. Khim.*, 44 (1989) 520-524.

- 2116 Pomaville, R.M. and Poole, C.F.: Changes in retention and polarity accompanying the replacement of hydrogen by fluorine in tetraalkylammonium alkyl- and arylsulfonate salts used as stationary phases in gas chromatography. *J. Chromatogr.*, 468 (1989) 261-278.
- 2117 Prikhod'ko, N.S., Koval'chuk, B.V., Nazarishin, V.M. and Boeva, V.I.: (Gas chromatography column). *U.S.S.R. Pat.* SU 1,458,811 (Cl. G01N30/60), 15 Feb. 1989, Appl. 4,281,195, 10 Jul. 1987; *C.A.*, 110 (1989) 224768j.
- 2118 Sandra, P.: Resolution - column efficiency. *J. High Resolut. Chromatogr.*, 12 (1989) 273-277.
- 2119 Singliar, M., Sopkova, A. and Rubanec, J.: (Modification of sorption properties of tetracyanocomplex clathrates as stationary phases in gas chromatography). *Czech. Pat.* CS 251,957 (Cl. B01D53/02), 15 Sep. 1988, Appl. 84/7,881, 17 Oct. 1984; 4 pp.; *C.A.*, 110 (1989) 234048p.
- 2120 Springston, S.R. and Dezaro, D.A.: Non-extractable stationary phases for gas chromatography cross-linked by exposure to low-temperature plasma. *J. Chromatogr.*, 473 (1989) 79-92.
- 2121 Strasburg, R.F., Scott, D.M. and Fritz, J.S.: Measurement of column dead time in capillary gas chromatography. *Anal. Chim. Acta*, 215 (1988) 311-316.
- 2122 Surowiec, K. and Rayss, J.: The properties of poly(ethylene glycol) 20M layer on the surface of a silanized support. *Chromatographia*, 27 (1989) 412-416.
- 2123 Tang Quiglin and Wu Caiying: (A new method to deactivate diatomaceous earth support). *Sepu*, 7 (1989) 86-88.
- 2124 Tarbet, B.J., Bradshaw, J.S., Johnson, D.F., Fenlinson, A.C., Rouse, C.A., Jones, K., Sumpter, S.R., Huang, E.C., Jouvancz, Z., Markides, K.E. and Lee, M.L.: Synthesis and structural considerations of oligoethylene oxide-containing polysiloxane stationary phases in capillary gas and supercritical-fluid chromatography. *J. Chromatogr.*, 473 (1989) 103-113.
- 2125 Vigdergauz, M.S., Pozhidaev, V.M., Esin, M.S. and Belyaev, N.F.: (Gas-chromatographic method for determination of isomers of organic compounds). *U.S.S.R. Pat.* SU 1,458,806 (Cl. G01N30/02), 15 Feb. 1989, Appl. 4,283,928, 27 May 1987; *C.A.*, 110 (1989) 224788r.
- 2126 Wasiak, W.: Triphenylphosphine complexes of rhodium(I) and ruthenium(II) as modifiers in gas-solid chromatography. *Chem. Anal. (Warsaw)*, 33 (1988) 573-580.
- 2127 Wasiak, W. and Szczepaniak, W.: Investigation of high temperature-treated chemically bonded polymetalophenylsiloxanes by complexation gas chromatography. *Chem. Anal. (Warsaw)*, 33 (1988) 607-615 - many retention data.
- 2128 Wasiak, W., Urbaniak, W. and Szczepaniak, W.: (Method of obtaining a packing for gas chromatography). *Pol. Pat.* PL 140,532 (Cl. B01J20/26), 30 May 1987, Appl. 246,727, 15 Mar. 1984; 13 pp.; *C.A.*, 110 (1989) 204850b.
- 2129 Witkiewicz, Z. and Rudnicka, I.: Polymeric liquid-crystalline stationary phases. *Chem. Anal. (Warsaw)*, 33 (1988) 457-470.
- 2130 Yablokova, E.P., Gavrulina, L.Ya., Berezkin, V.G. and Emelyanova, O.A.: (Influence of extra-column sample dilution by carrier gas on the sensitivity and duration of gas chromatographic analysis). *Zh. Anal. Khim.*, 44 (1989) 909-915.
- 2131 Zheivot, V.I., Shalaeva, M.E., Gavrilov, V.Yu., Felonov, V.B., Ovsyannikova, I.A. and Malakhov, V.V.: Intermolecular interactions in the sorbate-modified graphitized thermal carbon black system. *J. Chromatogr.*, 472 (1989) 155-161.
- See also 2020, 2056, 2059, 2171, 2172, 2180, 2181, 2183, 2185, 2191, 2197, 2511.

### 3d. Quantitative analysis

- 2132 Asshauer, J.: Quantitative chromatography: demands and reality. *Fresenius' Z. Anal. Chem.*, 333 (1989) 727-728.
- 2133 Lindsey, A.S. and Wagstaffe, P.J.: Production and certification of ten high-purity polychlorinated biphenyls as reference materials. *Analyst (London)*, 114 (1989) 553-557.
- 2134 Tarasov, V.I.: (About the possibility of random error reduction in quantitative calculations in gas chromatography). *Zavod. Lab.*, 89, No. 4 (1989) 25-26.



- 2135 Van Es, A., Cramers, C. and Rijks, J.: Detection limits of thermal conductivity and photoionization detectors in high speed narrow bore CGC. *J. High Resolut. Chromatogr.*, 12 (1989) 303-307.

See also 2385, 2395.

3e. Preparative scale chromatography

- 2136 Cheh, C.H.: Large scale gas chromatographic demonstration system for hydrogen isotope separation. *Fusion Technol.*, 14, Pt. 2A (1988) 567-571; *C.A.*, 110 (1989) 181186y.

3f. Programmed temperature, pressure, vapors, gradients

- 2137 Chen Jianping, Feng Kunlin and Lei Linagjun: (Improvement of the function of temperature programming of Varian 3700 gas chromatograph with monolithic computer). *Sepu*, 7 (1989) 117.

See also 2031.

4. SPECIAL TECHNIQUES

4a. Automation and computerization

- 2138 Feiler, D., Nagel, M., Stottmeister, E., Hermenau, H., Hendel, P. and Dobberkau, H.J.: Interpretation of complex capillary chromatograms by means of structural pattern recognition algorithms using fuzzy theory. *Chemom. Intell. Lab. Syst.*, 4 (1988) 231-237.
- 2139 Furr, H.C.: Calculation of chromatographic dead times and retention indices with the aid of a computer program in BASIC. *J. Chromatogr. Sci.*, 27 (1989) 216-220.
- 2140 Huang Hongxin, Liang Xinmiao, Zhang Yukui and Lu Peichang: (The development of universal data handling system in chromatography on IBM-PC/XT). *Sepu*, 7 (1989) 65-69.
- 2141 Klipatrick, I.C.: Software for chromatographic data analysis. *Int. Lab.*, 19, No. 5 (1989) 18-22.
- 2142 Krupcik, J., Repka, D., Hevesi, T., Benicka, E. and Garaj, J.: On the use of sequential simplex procedure for optimization of basic parameters influencing temperature in LTPGC analysis of multicomponent samples. *Chromatographia*, 27 (1989) 367-370.

See also 2062, 2147, 2148.

4b. Combination of various chromatographic techniques

- 2143 Grob, K.: On-line coupled high-performance liquid chromatography-gas chromatography. *TrAC*, 8 (1989) 162-166.
- 2144 Grob, K., Schmarr, H.-G. and Mosandl, A.: Early solvent vapor exit in GC for coupled LC-GC involving concurrent eluent evaporation. *J. High Resolut. Chromatogr.*, 12 (1989) 375-382.
- 2145 Poole, C.F. and Poole, S.K.: Recent advances in chromatography. *Anal. Chim. Acta*, 216 (1989) 109-146.
- 2146 Yocklovich, S.G., Sarnar, S.F. and Levy, E.J.: A process application of SF extraction and chromatography. *Am. Lab. (Fairfield)*, 21, No. 5 (1989) 26-32.

See also 2007, 2013, 2016, 2056, 2065, 2132, 2141, 2170, 2214, 2227, 2228, 2232, 2238, 2243, 2245, 2246, 2270, 2303, 2328, 2333, 2366, 2381, 2410, 2412, 2448, 2453, 2462, 2480, 2489, 2497.

*4c. Combination with other physico-chemical techniques (MS, IR etc.)*

- 2147 Amano, H., Ichikawa, M. and Takada, I.: (Computer aided analysis for pyrolysis gas chromatogram and thermogravimetric data). *Bunseki Kagaku*, 38 (1989) T69-T74.
- 2148 Bjerga, J.M. and Small, G.W.: Reconstruction of gas chromatograms from digitally filtered Fourier transform infrared interferograms. *Anal. Chem.*, 61 (1989) 1073-1079.
- 2149 Blau, D.A.: Electron-emission filament cutoff for gas chromatography - mass spectrometry systems. *U.S. Pat.* US 4,808,820 (Cl. 250-281; B01D59/44), 28 Feb. 1989, Appl. 99,935, 23 Sep. 1987, 6 pp.; *C.A.*, 110 (1989) 224774h.
- 2150 Firor, R.L.: Multielement detection using GC-atomic emission spectroscopy. *Am. Lab. (Fairfield)*, 21, No. 5 (1989) 40-48.
- 2151 Hawthorne, S.B. and Miller, D.J.: Supercritical-fluid chromatography-mass spectrometry of polycyclic aromatic hydrocarbons with a simple capillary direct interface. *J. Chromatogr.*, 468 (1989) 115-125.
- 2152 Herres, W.: Capillary gas chromatography - Fourier transform infrared spectroscopy: theory and applications. *Fresenius' Z. Anal. Chem.*, 333 (1989) 754.
- 2153 Korte, E.H.: Compatibility of chromatography and molecular spectroscopy. *Fresenius' Z. Anal. Chem.*, 333 (1989) 753.
- 2154 Krygsman, P.H., Towner, R.A. and Haire, D.L.: Enhanced recognition of spin trapped radicals in complex mixtures: Deuterated nitronyl adducts providing a gas chromatographic/mass spectrometric marker. *Anal. Lett.*, 22 (1989) 1009-1020.
- 2155 Leis, F.: Coupled methods in analytical atomic spectroscopy. *Fresenius' Z. Anal. Chem.*, 333 (1989) 755.
- 2156 Rau, A. and Görtz, H.: Optimization in headspace GC/FTIR. *Fresenius' Z. Anal. Chem.*, 333 (1989) 758.

See also 2046, 2056, 2082, 2207, 2243, 2275, 2276, 2282, 2326, 2328, 2358, 2366, 2410, 2487, 2494, 2496, 2505.

*4e. Functional analysis*

- 2157 Mogilevich, I.M., Mal'tseva, L.E., Pirozhnaya, L.N., Pochtar, M.V., Nikitina, S.G. and Vahchuk, A.V.: (Gas-chromatographic method for determination of active oxygen in peroxides). *U.S.S.R. Pat.* SU 1,458,763 (Cl. G01N1/28), 15 Feb. 1989, Appl. 4,091,195, 14 Jul. 1986; *C.A.*, 110 (1989) 224786p.
- 2158 Sullivan, J.J. and Quimby, B.D.: Detection of C, H, N, and O in capillary gas chromatography by atomic emission. *J. High Resolut. Chromatogr.*, 12 (1989) 282-286.

See also 2088, 2173, 2208, 2315, 2364.

*4f. Trace analysis and preseparation techniques*

- 2159 Baumeister, W., Zens, B. and Vierle, O.: Simplified clean-up procedure for the PAH profile analysis of suspended particulate matter, diesel engine exhaust, and soil extracts by use of commercial solid phase extraction columns. *Fresenius' Z. Anal. Chem.*, 333 (1989) 710-711.
- 2160 Bicchi, C., D'Amato, A., David, F. and Sandra, P.: Capturing of volatiles emitted by living plants by means of thick film open tubular traps. *J. High Resolut. Chromatogr.*, 12 (1989) 316-321.
- 2161 Blomberg, S. and Roeraade, J.: Concentration of volatile organic compounds from solvents by sustained chromatographic evaporation. *J. High Resolut. Chromatogr.*, 12 (1989) 294-299.
- 2162 Lanzerstorfer, C. and Puxbaum, H.: Membrane focusing - a new injection method for capillary gas chromatography. *Anal. Lett.*, 22 (1989) 1375-1387.
- 2163 Thomas, C.L.P. and Alder, J.F.: Annular denuder tube preconcentration for nitrobenzene determination by gas chromatography with electron-capture detection. *Anal. Chim. Acta*, 217 (1989) 289-301.

See also 2074, 2113, 2133, 2202, 2306, 2354, 2383, 2385, 2387, 2409, 2416, 2417, 2435, 2436, 2438, 2439, 2443, 2444, 2450, 2452, 2455, 2464, 2493.

*4g. Separation of enantiomers*

- 2164 Blessington, B., Crabb, N., Karkee, S. and Northage, A.: Chromatographic approaches to the quality control of chiral propionate anti-inflammatory drugs and herbicides. *J. Chromatogr.*, 469 (1989) 183-190.
- 2165 Brooks, C.J.W., Cole, W.J. and Brindle, P.A.: Characterization of products formed by condensations of primary amines with polygodial, and their scope for enantiomer analyses. *J. Chromatogr.*, 468 (1989) 201-213.
- 2166 Büyüktimkin, N., Keller, F. and Schunack, W.: Gas-liquid chromatographic resolution of some racemic synthons for lamtidine analogous histamine H<sub>2</sub>-receptor antagonists *via* diastereomeric amides of (1S)-(-)-camphanic acid. *J. Chromatogr.*, 467 (1989) 402-405.
- 2167 Davies, B.E.: Development of a chiral capillary GC method for the quantitation of the enantiomers of cromakalim in biological fluids. *Methodol. Surv. Biochem. Anal.*, 18 (1988) 179-183; *C.A.*, 110 (1989) 224872p.
- 2168 Fitzgerald, R.L., Blanke, R.V., Glennon, R.A., Yousif, M.Y., Rosecrans, J.A. and Poklis, A.: Determination of 3,4-methylenedioxyamphetamine and 3,4-methylenedioxymethamphetamine enantiomers in whole blood. *J. Chromatogr.*, 490 (1989) 59-69.
- 2169 Koenig, W.A., Mischnick-Luebbecke, P., Brassat, B. and Lutz, S.: Improved gas chromatographic separation of enantiomeric carbohydrate derivatives using a new chiral stationary phase. *Carbohydr. Res.*, 183 (1988) 11-17; *C.A.*, 110 (1989) 193261g.
- 2170 Macaudiere, P., Lienne, M., Caude, M., Rosset, R. and Tambute, A.: Resolution of  $\pi$ -acid racemates on  $\pi$ -acid chiral stationary phases in normal-phase liquid and subcritical fluid chromatographic modes. A unique reversal of elution order on changing the nature of the achiral modifier. *J. Chromatogr.*, 467 (1989) 357-372.
- 2171 Novotny, H.-P., Schmalzing, D., Wistuba, D. and Schurig, V.: Extending the scope of enantiomer separation on diluted methylated  $\beta$ -cyclodextrin derivatives by high-resolution gas chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 383-393.
- 2172 Saporovskaya, M.B., Volkova, M.M. and Pavlov, V.A.: (Synthesis and characteristics of a diamide polysiloxane chiral phase for GLC analysis of enantiomeric purity of amino acids). *Zh. Anal. Khim.*, 44 (1989) 525-528.

See also 2107.

*4h. Other special techniques*

- 2173 Bechemin, C., Delmas, D. and Garet, M.J.: Improvement of a carbon-nitrogen elemental analyser for marine samples collected on glass-fibre filters. *J. Chromatogr.*, 469 (1989) 399-402.
- 2174 Dossi, C. and Fusi, A.: Temperature programmed decomposition studies. High-sensitivity determination of carbon monoxide, carbon dioxide and methane by gas chromatography. *Anal. Chim. Acta*, 217 (1989) 197-201.
- 2175 Vitenberg, A.G. and Ioffe, B.V.: Basic equations in continuous gas extraction and their application to headspace analysis. *J. Chromatogr.*, 471 (1989) 55-60.
- 2176 Zou Renjun, Lou Qionkun, Zhang Bingchang, Cui Hongwu, Niu Fenghui and Liu Haicai: Advances in pyrolysis in combination with chromatographic and computer techniques. *J. Anal. Appl. Pyrolysis*, 15 (1989) 383-392.

*4i. Supercritical fluid chromatography*

- 2177 Anton, K., Pericles, N. and Widmer, H.W.: Capillary column SFC instrumentation based on piston pumps with a programmable back-pressure regulator for on-line mixing of mobile phases. *J. High Resolut. Chromatogr.*, 12 (1989) 394-399.
- 2178 Bartle, K.D., Boddington, T., Clifford, A.A. and Shilstone, G.F.: Effect of pressure drop across the column on average densities and capacity factors in supercritical fluid chromatography. *J. Chromatogr.*, 471 (1989) 347-355.
- 2179 Berg, B.E. and Greibrokk, T.: The solvent venting injection technique in capillary supercritical fluid chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 322-326.

- 2180 Chang Huey-Ching, Markides, K.E., Bradshaw, J.S. and Lee, M.L.: Separation of steroid isomers using a liquid crystalline polysiloxane stationary phase in capillary supercritical fluid chromatography. *J. Microcolumn. Separ.*, 1 (1989) 131-135.
- 2181 Dean, T.A. and Poole, C.F.: Some practical aspects of column design for packed-column supercritical-fluid chromatography. *J. Chromatogr.*, 468 (1989) 127-144.
- 2182 Fields, S.M., Grether, H.J. and Grolimund, K.: Analysis of organic isocyanates using capillary supercritical-fluid chromatography. *J. Chromatogr.*, 472 (1989) 175-195.
- 2183 Fields, S.M. and Grolimund, K.: Evaluation of supercritical sulfur hexafluoride as a mobile phase for polar and non-polar compounds. *J. Chromatogr.*, 472 (1989) 197-208.
- 2184 Gemmel, B., Lorenschat, B. and Schmitz, F.P.: Separation of oligomers of medium polarity by packed column supercritical fluid chromatography. *Chromatographia*, 27 (1989) 605-610.
- 2185 Griest, W.H., Guzman, C. and Dekker, M.: Packed-column supercritical fluid chromatographic separation of highly explosive compounds. *J. Chromatogr.*, 467 (1989) 423-429.
- 2186 Huston, C.K., Jr. and Bernhard, R.A.: Flow characteristics of supercritical carbon dioxide through an integrally restricted capillary. *J. Chromatogr. Sci.*, 27 (1989) 231-234.
- 2187 Jinno, K., Kuwajima, M. and Masuda, K.: A UV spectral data base system for polycyclic aromatic hydrocarbons. *Lab. Microcomput.*, 7 (1988) 52-55; *C.A.*, 110 (1989) 204808u.
- 2188 Lochmüller, C.H. and Mink, L.P.: Adsorption isotherms on silica for methanol and 1-hexanol modifiers from supercritical carbon dioxide. *J. Chromatogr.*, 471 (1989) 357-366.
- 2189 Raynie, D.E. and Lee, M.L.: Addendum to "A method for the preparation of binary mobile phase mixtures for capillary supercritical fluid chromatography". *J. High Resolut. Chromatogr.*, 12 (1989) 405.
- 2190 Raynie, D.E., Markides, K.E., Lee, M.L. and Goates, S.R.: Back-pressure regulated restrictor for flow control in capillary supercritical fluid chromatography. *Anal. Chem.*, 61 (1989) 1178-1181.
- 2191 Raynor, M.W., Shilstone, G.F., Bartle, K.D., Clifford, A.A., Cleary, M. and Cook, B.W.: Use of xenon as a mobile phase for on-line capillary supercritical fluid chromatography-Fourier transform infrared spectrometry. *J. High Resolut. Chromatogr.*, 12 (1989) 300-302.
- 2192 Saito, M. and Yamauchi, Y.: Recycle chromatograph with supercritical fluid. *Eur. Pat. Appl. EP 309,380 (Cl. B01D15/08)*, 29 Mar. 1989, JP Appl. 87/240,360, 25 Sep. 1987; 12 pp.; *C.A.*, 110 (1989) 241885n.
- 2193 Strubinger, J.R. and Parcher, J.F.: Surface excess (Gibbs) adsorption isotherms of supercritical carbon dioxide on octadecyl-bonded silica stationary phases. *Anal. Chem.*, 61 (1989) 951-955.
- 2194 Tavana, A., Chang, J., Randolph, A.D. and Rodriguez, N.: Scanning of cosolvents for supercritical fluids solubilization of organics. *AIChE J.*, 35 (1989) 645-648; *C.A.*, 110 (1989) 195390x.
- 2195 Yonker, C.R. and Smith, R.D.: Stationary phase in capillary supercritical fluid chromatography. *Anal. Chem.*, 61 (1989) 1348-1353.
- See also 2065, 2067, 2124, 2145, 2146, 2151, 2170, 2216, 2243, 2283, 2434, 2448, 2464.

## 5. HYDROCARBONS AND HALOGEN DERIVATIVES

### 5a. Aliphatic hydrocarbons

- 2196 Safina, L.R., Pozdnyak, T.I., Lisitsyn, L.M., Kiseleva, E.V. and Kovalev, G.I.: (Selective gas chromatographic determination of trace amounts of unsaturated and aromatic hydrocarbons in complex mixtures). *Zh. Anal. Khim.*, 44 (1989) 916-927.

See also 2031, 2051, 2052, 2126, 2376, 2504.

*5b. Cyclic hydrocarbons*

2197 Janini, G.M. and Filfil, N.T.: Optimization of the gas chromatographic separation of five-membered ring polyarenes with an admixed BPhBT liquid crystal-Dexsil 300 stationary phase. *J. Chromatogr.*, 469 (1989) 43-51.

See also 2024, 2029, 2031, 2071, 2076, 2104, 2110, 2129, 2151, 2187, 2322, 2411, 2414, 2433, 2436, 2438, 2449, 2469, 2475, 2489.

*5c. Halogen derivatives*

2198 Milchert, E., Myszkowski, J., Pazdziuch, W. and Osiewicz, B.: (Chromatographic determination of halogenated organics of the production of vinyl chloride). *Chem. Anal. (Warsaw)*, 33 (1988) 589-595.

See also 2026, 2028, 2077, 2133, 2174, 2290, 2433, 2436, 2437, 2443, 2451, 2459, 2460, 2462.

*5d. Complex hydrocarbon mixtures*

2199 Meusinger, J., Möscher, A. and Steinberg, K.-H.: Umsetzung von *n*-Heptan an Reformierkatalysatoren in einem Labordruckreaktor mit on-line gekoppelter Kapillargaschromatographie. *Chem. Tech. (Leipzig)*, 41 (1989) 76-77.

See also 2053, 2480, 2486, 2503.

## 6. ALCOHOLS

2200 Owada, K.: (Rapid determination of ethanol by gas chromatography). *Gijyutsu Joho - Shizuoka-ken Eisei Kankyo Senta*, 6, No. 2 (1988) 1-3; *C.A.*, 110 (1989) 169553h.

2201 Pokutsa, A.P., Timokhin, V.I. and Suprun, V.Ya.: (Determination of cyclohexanol and cyclohexanon in presence of cyclohexyl hydroperoxide by gas-liquid chromatography). *Zh. Anal. Khim.*, 44 (1989) 570-572.

2202 Takagi, K.: (Ethanol assay using samples in microquantities with the head-space gas liquid equilibration method). *Wakayama Igaku*, 39 (1988) 489-496; *C.A.*, 110 (1989) 167636p.

See also 2038, 2171, 2362, 2377, 2436.

## 7. PHENOLS

2203 Pozhidaev, V.M., Sablukova, I.V. and Shornikova, N.P.: (Technique for the gas chromatographic identification of phenols in tobacco smoke). *Gig. Sanit.*, No. 2 (1989) 50-52; *C.A.*, 110 (1989) 209508f.

See also 2294, 2323, 2390, 2394, 2455, 2470, 2474, 2501.

## 8. SUBSTANCES CONTAINING HETEROCYCLIC OXYGEN

*8a. Flavonoids*

2204 Greenaway, W., May, J. and Whatley, F.R.: Flavonoid aglycones identified by gas chromatography-mass spectrometry in bud exudate of *Populus balsamifera*. *J. Chromatogr.*, 472 (1989) 393-400.

*8c. Other compounds with heterocyclic oxygen (including tannins)*

- 2205 Korhonen, I.O.O. and Mäntykoski, K.M.: Gas-liquid chromatographic analyses. XLIX. Polychlorinated dibenzo-*p*-dioxins and dibenzofurans on low polarity NB-54 and NB-1701 capillary columns. *J. Chromatogr.*, 473 (1989) 153-160.
- 2206 Riehle, U. and Ballschmiter, K.: Improved congener-specific separation of 2,3,7,8-type polychlorodibenzodioxins (PCDD) and -dibenzofurans (PCDF) by column coupling in gas chromatography. *Fresenius' Z. Anal. Chem.*, 333 (1989) 744-745.
- 2207 Zacharewski, T., Safe, L., Safe, S., Chittim, B., DeVault, D., Wiberg, K., Bergqvist, P.A. and Rappe, C.: Comparative analysis of polychlorinated dibenzo-*p*-dioxin and dibenzofuran congeners in Great Lakes fish extracts by gas chromatography-mass spectrometry and *in vitro* enzyme induction activities. *Environ. Sci. Technol.*, 23 (1989) 730-735; *C.A.*, 110 (1989) 218621q.

See also 2171, 2266, 2395, 2464, 2474.

## 9. OXO COMPOUNDS, ETHERS, EPOXIDES AND QUINONES

- 2208 Attygalle, A.B., Zlatkis, A. and Middleditch, B.S.: Derivatization with 1,1-dimethylhydrazine for identification of carbonyl compounds resulting from ozonolysis. *J. Chromatogr.*, 472 (1989) 284-289.
- 2209 Gollop, N., Barak, Z. and Chipman, D.M.: Assay of products of acetolactate synthase. *Methods Enzymol.*, 166 (1988) 234-240; *C.A.*, 110 (1989) 168809j.

See also 2025, 2201, 2377, 2386, 2402, 2441, 2493.

## 10. CARBOHYDRATES

*10a. Mono and oligosaccharides. Structural studies*

- 2210 Eades, D.M., Williamson, J.R. and Sherman, W.R.: Rapid analysis of sorbitol, galactitol, mannitol and myoinositol mixtures from biological sources. *J. Chromatogr.*, 490 (1989) 1-8.
- 2211 Garcia-Raso, A., Fernandez-Diaz, M., Paez, M.I., Sanz, J. and Martinez-Castro, I.: Gas chromatographic retention of carbohydrate trimethylsilyl ethers. III. Kethexoses. *J. Chromatogr.*, 471 (1989) 205-216.
- 2212 Rubino, F.M.: Silylaldonitrile derivatives for the determination of sugars by gas chromatography-mass spectrometry. *J. Chromatogr.*, 473 (1989) 125-133.

See also 2169.

*10b. Polysaccharides, mucopolysaccharides, lipopolysaccharides*

- 2213 Sonnesson, A., Larsson, L. and Jimenez, J.: Two-dimensional gas chromatography with electron capture detection used in the determination of specific peptidoglycan and lipopolysaccharide constituents of Gram-negative bacteria in infected human urine. *J. Chromatogr.*, 490 (1989) 71-79.

## 11. ORGANIC ACIDS AND LIPIDS

*11a. Organic acids and simple esters*

- 2214 Christie, W.W. and Breckenridge, G.H.McG.: Separation of *cis* and *trans* isomers of unsaturated fatty acids by high-performance liquid chromatography in the silver ion mode. *J. Chromatogr.*, 469 (1989) 261-269.

- 2215 Cookson, B., Talsania, H., Chinn, S. and Phillips, I.: A qualitative and quantitative study of the cellular fatty acids of "*Streptococcus milleri*" with capillary gas chromatography. *J. Gen. Microbiol.*, 135 (1989) 831-838; *C.A.*, 110 (1989) 228287z.
- 2216 Görner, T. and Perrut, M.: Separation of unsaturated fatty acid methyl esters by supercritical fluid chromatography on a silica column. *LC-GC Int.*, 2, No. 7 (1989) 36-39.
- 2217 Harris, H.M., Applegarth, D.A., Clarke, L.A. and Wong, J.: Phytanic acid, pristanic acid, and very-long-chain fatty acid methyl esters measured simultaneously by capillary gas chromatography. *Clin. Chem. (Winston-Salem)*, 35 (1989) 703-704.
- 2218 Holzer, G., Bourne, T.F. and Bertsch, W.: Analysis of *in situ* methylated microbial fatty acid constituents by Curie-point pyrolysis-gas chromatography-mass spectrometry. *J. Chromatogr.*, 468 (1989) 181-190.
- 2219 Horman, I., Traitler, H. and Aeschlimann, J.: A fatty acid methyl ester (FAMES) analyzer. *J. High Resolut. Chromatogr.*, 12 (1989) 308-315.
- 2220 Kim, K.R., Hahn, M.K., Zlatkis, A., Horning, E. and Middleditch, B.S.: Simultaneous gas chromatography of volatile and nonvolatile carboxylic acids as *tert.*-butyldimethylsilyl derivatives. *J. Chromatogr.*, 468 (1989) 289-301.
- 2221 Li Jingmin and Wang Jingping: (Analysis of fatty acids by gas-liquid chromatography on mixed stationary phase). *Sepeu*, 7 (1989) 100-101.
- 2222 Pace-Asciak, C.R.: One-step rapid extractive methylation of plasma non-esterified fatty acids for gas chromatographic analysis. *J. Lipid Res.*, 30 (1989) 451-454; *C.A.*, 110 (1989) 169793m.
- 2223 Pastushenko, V.G. and Krivolapov, S.S.: (Determination of aliphatic mono- and dicarboxylic acids by gas chromatography). *Zh. Anal. Khim.*, 44 (1989) 536-539.
- 2224 Perl Molnar, I., Morvai, M. and Szakacs Pinter, M.: (Gas chromatographic analysis for isocitric acid in the presence of citric acid). *Magy. Kem. Foly.*, 94 (1988) 520-523; *C.A.*, 110 (1989) 191338p.
- 2225 Pratt, K.J., Carles, C., Carne, T.J., Danson, M.J. and Stevenson, K.J.: Detection of bacterial lipoleic acid. A modified gas-chromatographic-mass-spectrometric procedure. *Biochem. J.*, 258 (1989) 749-754; *C.A.*, 110 (1989) 169778k.
- 2226 Prell, G.D. and Morrishow, A.M.: Altered retention of derivatives of *tele*-methylimidazolacetic acid in acid-hydrolyzed samples of brain measured by capillary gas chromatography and mass spectrometry. *J. Chromatogr.*, 472 (1989) 256-260.
- 2227 Rezancka, T., Koza, T., Kysilka, R., Viden, I. and Wurst, M.: Reversed-phase liquid chromatography for enrichment of very-long-chain fatty acids and their identification by gas chromatography-mass spectrometry. *J. Chromatogr.*, 472 (1989) 290-295.
- 2228 Seewald, M. and Eichinger, H.M.: Separation of major phospholipid classes by high-performance liquid chromatography and subsequent analysis of phospholipid-bound fatty acids using gas chromatography. *J. Chromatogr.*, 469 (1989) 271-280.
- 2229 Singliar, M., Macho, M., Gasparovicova, E. and Stresinkova, D.: (Qualitative analysis of alkyl phenyl urethanes by gas chromatography and high performance liquid chromatography). *Chem. Prum.*, 39 (1989) 254-257.
- 2230 Whyte, J.N.C.: Fatty acid profiles from direct methanolysis of lipids in tissue of cultured species. *Aquaculture*, 75 (1988) 193-203; *C.A.*, 110 (1989) 169545g.
- 2231 Zhang, J.Y., Yu, Q.T., Huang, Z.H., Wang, H.Y. and Yu, X.J.: New keto-acids from the kernel oil of *Pseudobombax elliptica* by GC-MS of the 4,4-dimethyl-oxazoline derivatives. *Chem. Ser.*, 28 (1988) 353-356; *C.A.*, 110 (1989) 209321q.
- See also 2025, 2213, 2250, 2274, 2348, 2355, 2359, 2361, 2365, 2367, 2369, 2371, 2374, 2375, 2393, 2404, 2439.

#### 11b. Prostaglandins

- 2232 Fauler, J., Marx, K.H. and Kaever, V.: Identification of a new metabolite of leukotriene B<sub>4</sub> by RP-HPLC and GC-MS analysis. *Methodol. Surv. Biochem. Anal.*, 18 (1988) 37-41; *C.A.*, 110 (1989) 225999x.

- 2233 Froelich, J.C., Marx, K.H., Bippi, H., Fauler, J., Rosenkranz, B. and Foerstermann, U.: Analysis of eicosanoids by GC-MS/MS. *Methodol. Surv. Biochem. Anal.*, 18 (1988) 15-21; *C.A.*, 110 (1989) 225506j - a review with 17 refs.
- 2234 Ishibashi, M., Watanabe, K., Oyama, Y., Mizugaki, M. and Harima, N.: Dimethylisopropylsilyl ether derivative in gas chromatography/mass spectrometry of 2,3-dinor-6-keto-prostaglandin F<sub>1a</sub>. *Chem. Pharm. Bull.*, 37 (1989) 539-541; *C.A.*, 110 (1989) 205927u.
- 2235 Watanabe, K., Ishibashi, M., Harima, N. and Krolik, S.: Diethylhydrogensilyl-cyclic diethylsilylene derivatives in gas chromatography/mass spectrometry of prostanoids. IV. 11-Dehydrothromboxane B<sub>2</sub>. *Chem. Pharm. Bull.*, 37 (1989) 140-144; *C.A.*, 110 (1989) 166222p.
- 2236 Watanabe, K., Yamashita, K., Ishibashi, M., Hayashi, Y., Yamamoto, S. and Miyazaki, H.: Microdetermination of 11-dehydrothromboxane B<sub>2</sub> in human urine by gas chromatography-selected-ion monitoring. *J. Chromatogr.*, 468 (1989) 383-394.
- 2237 Weber, C., Belsner, K., Osikowska-Evers, B., Luhmann, I. and Hoeller, M.: Quantitative determination of several prostaglandins and thromboxane B<sub>2</sub> in the isolated perfused rat brain. *Methodol. Surv. Biochem. Anal.*, 18 (1988) 23-27; *C.A.*, 110 (1989) 225598r.

#### 11c. Lipids and their constituents

- 2238 Logan, R.I., Rivett, D.E., Tucker, D.J. and Hudson, A.H.F.: Analysis of the intercellular and membrane lipids of wool and other animal fibers. *Text. Res. J.*, 59 (1989) 109-113; *C.A.*, 110 (1989) 194517g.
- 2239 Myher, J.J. and Kuksis, A.: Relative gas-liquid chromatographic retention factors of trimethylsilyl ethers of diradylglycerols on polar capillary columns. *J. Chromatogr.*, 471 (1989) 187-204.

See also 2179, 2228, 2368, 2382, 2392.

#### 12. ORGANIC PEROXIDES

- 2240 Cafferata, L.F.R., Canizo, A.I. and Eyler, G.N.: Effect of molecular structure on the retention parameters of cyclic ketone diperoxides in different stationary phases. *J. High Resolut. Chromatogr.*, 12 (1989) 423-425.

See also 2157, 2201, 2310.

#### 13. STEROIDS

##### 13a. Pregnane and androstane derivatives

- 2241 Gerhardt, K., Ludwig-Koehn, H., Henning, H.V., Remberg, G. and Zeeck, A.: Identification of estrogen metabolites in human urine by capillary gas chromatography and mass spectrometry. *Biomed. Environ. Mass Spectrom.*, 18 (1989) 87-95; *C.A.*, 110 (1989) 166220m.
- 2242 Sample, R.H.B. and Baenziger, J.C.: Gas chromatography/mass spectrometry screening for anabolic steroids. *Chem. Anal.*, 100 (1989) 247-272; *C.A.*, 110 (1989) 226662u.
- 2243 Shah, S., Ashraf-Khorassani, M. and Taylor, L.T.: Normal-phase liquid and supercritical-fluid chromatographic separations of steroids with Fourier-transform infrared spectrometric detection. *Chromatographia*, 27 (1989) 441-448.

See also 2180, 2378.



## 13b. Estrogens

- 2244 Dehennin, L.: Estradiol determined in plasma by gas chromatography-mass spectrometry with selected ion monitoring of mixed silyl ether-perfluoroacyl ester derivatives and use of various stable-isotope-labeled internal standards. *Clin. Chem. (Winston-Salem)*, 35 (1989) 532-536.

## 13c. Sterols

- 2245 Ikekawa, N., Fujimoto, Y., Kadota, S. and Kikuchi, T.: Effective separation of sterol C-24 epimers. *J. Chromatogr.*, 468 (1989) 91-98.
- 2246 Peacock, G.A. and Goosey, M.W.: Separation of fungal sterols by normal-phase high-performance liquid chromatography. Application to the evaluation of ergosterol biosynthesis inhibitors. *J. Chromatogr.*, 469 (1989) 293-304.
- 2247 Takatsuto, S. and Omote, K.: Analysis of phytosterols in the pollen of *Vicia faba* L. by gas chromatography-mass spectrometry. *Agric. Biol. Chem.*, 53 (1989) 259-261; *C.A.*, 110 (1989) 209319v.

See also 2250, 2399, 2423.

## 15. TERPENES AND OTHER VOLATILE AROMATIC COMPOUNDS

## 15a. Terpenes

See 2357.

## 15b. Essential oils

- 2248 Andrawes, F., Changm, T. and Schreier, R.: Analysis of volatiles in tall oil by gas chromatography, flame-photometric detection, flame-ionization detection and mass spectrometry. *J. Chromatogr.*, 468 (1989) 145-155.
- 2249 D'Amato, A., Bicchi, C. and Galli, M.: The use of three way press-fit connectors (Y connectors) on the analysis of essential oils. *J. High Resolut. Chromatogr.*, 12 (1989) 349-352.
- 2250 Guerra Hernandez, E., Lopez Martinez, M. del Carmen and Garcia Villanova, R.: Determination by gas chromatography of fatty acids, sterols, and terpenes in the berries of the species *Juniperus oxycedrus* L., *J. thurifera* L., and *J. sabina* L. *Afinidad*, 45 (1988) 529-534; *C.A.*, 110 (1989) 209320p.
- 2251 Niemela, K.: GLC-MS studies on pine kraft liquors. Part IV. The formation of 2-hydroxy-2-cyclopenten-1-ones from polysaccharides during kraft pulping of pine wood. *Carbohydr. Res.*, 184 (1988) 131-137; *C.A.*, 110 (1989) 97414p.
- 2252 Pino, J., Rosado, A. and Baluja, R.: Analysis of orange and grapefruits aqueous essences using GC-MS system. *Rev. Cubana Quim.*, 4, No. 1 (1988) 1-6; *C.A.*, 110 (1989) 191334j.
- 2253 Schreier, P.: On-line coupled HRGC techniques for flavor analysis. *Naturwiss., Tech.*, No. 2 (1988) 23-42; *C.A.*, 110 (1989) 230217v.
- 2254 Wu Qiao and Qiu Ningying: (Determination of camphor and menthol in Jiuxin oil by GC/FTIR). *Zhongguo Yaoke Daxue Xuebao*, 20, No. 1 (1989) 13-17; *C.A.*, 110 (1989) 199295t.
- 2255 Zang Youwei, Ma Bingru, Yang Ling and Liu Shuying: (GC-MS analysis of essential oils in *Schizonepeta multifida* spikes). *Baiqiuen Yike Daxue Xuebao*, 14 (1988) 418-420; *C.A.*, 110 (1989) 218766r.

See also 2160, 2422, 2502.

## 16. NITRO AND NITROSO COMPOUNDS

See 2163, 2185, 2360, 2433, 2445, 2458, 2497.

## 17. AMINES, AMIDES AND RELATED NITROGEN COMPOUNDS

17a. *Amines and polyamines*

- 2256 Calvo, M.B., Pedraz, J.L. and Dominguez-Gil, A.: Determination of low concentration of dibenzylamine in human plasma and urine by gas chromatography with a nitrogen-phosphorus detector. *J. Chromatogr.*, 490 (1989) 206-212.
- 2257 Terenina, M.V., Golovnya, R.V. and Zhuravleva, I.L.: (Volatile nitrogen-containing bases in metabolic products of microorganisms). *Zh. Anal. Khim.*, 44 (1989) 773-793 - a review with 94 refs.
- 2258 Zhao Qianxue and Bao Zhicheng: (Gas chromatographic method for determination of trace aromatic amines). *Zhongguo Huanjing Kexue*, 8, No. 4 (1988) 73-76; *C.A.*, 110 (1989) 179153s.

See also 2165.

17b. *Catecholamines and their metabolites*

- 2259 Shafi, N., Midgley, J.M., Watson, D.G., Smail, G.A., Strang, R. and MacFralane, R.G.: Analysis of biogenic amines in the brain of the American cockroach (*Periplaneta americana*) by gas chromatography - negative ion chemical ionisation mass spectrometry. *J. Chromatogr.*, 490 (1989) 9-19.
- 2260 Yamamoto, T., Takano, R., Egashira, T., Yamanaka, Y. and Terada, M.: Simultaneous determination of methamphetamine and its metabolites in monkey urine by gas chromatography/mass spectrometry with selected ion monitoring. *J. Anal. Toxicol.*, 13 (1989) 117-119; *C.A.*, 110 (1989) 167649v.

17c. *Urea and guanidine derivatives*

See 2182.

17d. *Other amine derivatives and amides (excluding peptides)*

- 2261 Delalu, H. and Marchand, A.: Analyse par chromatographie en phase gazeuse de melanges contenant de la chloramine. Application a l'etude de cinetiques reactionnelles. *Analusis*, 17 (1989) 205-208.
- 2262 Okamoto, Y., Ohashi, N., Tsuchiya, Y. and Sasano, H.: (Studies on environmental safety of chemicals. I. Determination of oleamide and stearamide in the environment by capillary gas chromatography). *Kenkyu Nenpo - Tokyo-toritsu Eisei Kenkyusho*, (1988) 277-279; *C.A.*, 110 (1989) 179151q.

See also 2229, 2457.

## 18. AMINO ACIDS AND PEPTIDES; CHEMICAL STRUCTURE OF PROTEINS

18a. *Amino acids and their derivatives*

- 2263 Brückner, H., Nuber, K. and Reinecke, C.: Chromatographic detection of bioactive Aib-peptides in molds of the genus *Stilbella*. *Presentius' Z. Anal. Chem.*, 333 (1989) 777-778.
- 2264 Grubb, M.F. and Callery, P.S.: Derivatization of N-methyl and cyclic amino acids with dimethylformamide dimethyl acetal. *J. Chromatogr.*, 469 (1989) 191-196.

See also 2172, 2213, 2281, 2396, 2412.

18b. *Peptides and peptidic and proteinous hormones*

See 2263.

## 19. PROTEINS

19a. *General techniques*

See 2364.

19b. *Proteins of cells, viruses and subcellular particles*

See 2507.

## 20. ENZYMES AND ENZYME ACTIVITY ESTIMATION

20b. *Transferases (excluding E.C. 2.7.-.-)*

See 2370.

## 21. PURINES, PYRIMIDINES, NUCLEIC ACIDS AND THEIR CONSTITUENTS

21a. *Purines, pyrimidines, nucleosides, nucleotides*

2265 Stillwell, W.G., Xu Hou Xiao, Adkins, J.A., Wishnok, J.S. and Tannenbaum, S.R.: Analysis of methylated and oxidized purines in urine by capillary gas chromatography-mass spectrometry. *Chem. Res. Toxicol.*, 2 (1989) 94-99; *C.A.*, 110 (1989) 167609g.

## 22. ALKALOIDS

2266 Bicchi, C., Caniato, R., Tabacchi, R. and Tsoupras, G.: Capillary gas chromatography/positive and negative ion chemical ionization mass spectrometry on pyrrolizidine alkaloids of *Senecio inaequidens* using ammonia and hydroxyl ions as the reagent species. *J. Nat. Prod.*, 52 (1989) 32-41; *C.A.*, 110 (1989) 209298n.

2267 Bicchi, C., Rubiolo, P. and Frantini, C.: Capillary gas chromatography-Fourier transform infrared spectroscopy of pyrrolizidine alkaloids of *Senecio inaequidens* DC. *J. Chromatogr.*, 473 (1989) 161-170.

2268 Kintz, P., Tracqui, A., Mangin, P., Lugnier, A. and Chaumont, A.: Subnanogram GC/NPD method for the determination of sparteine in biological fluids. *Methods Find. Exp. Clin. Pharmacol.*, 11 (1989) 115-118; *C.A.*, 110 (1989) 165415s.

2269 Schuberth, J. and Schuberth, J.: Gas chromatographic-mass spectrometric determination of morphine, codeine and 6-monoacetylmorphine in blood extracted by solid phase. *J. Chromatogr.*, 490 (1989) 444-449.

See also 2363.

## 23. OTHER SUBSTANCES CONTAINING HETEROCYCLIC NITROGEN

23a. *Porphyrins and other pyrroles*

2270 Kaur, S., Gill, J.P., Evershed, R.P., Eglinton, G. and Maxwell, J.R.: Computerized gas chromatographic-mass spectrometric and high-performance liquid chromatographic analysis of sedimentary benzoporphyrins. *J. Chromatogr.*, 473 (1989) 135-151.

See also 2096.

*23e. Other N-heterocyclic compounds*

2271 Bonaga, G., Chiavari, G. and Verardo, G.: Gas chromatographic-mass spectrometric analysis of azines. *Chromatographia*, 27 (1989) 596-600.

See also 2166, 2226, 2372, 2373, 2463.

## 24. ORGANIC SULPHUR COMPOUNDS

2272 Kataoka, H., Okazaki, T. and Makita, M.: Gas chromatographic analysis of sulphonic acids as their sulphonamide derivatives. *J. Chromatogr.*, 473 (1989) 276-280.

2273 Kononov, A.V., Shkaraputa, L.N., Sidorenko, V.M., Polyakov, A.D. and Danilenko, V.V.: (Identification of ingredients during amination of 3-thiolen, 1,1-dioxide). *Neftepererab. Neftekhim. (Kiev)*, 35 (1988) 53-55; *C.A.*, 110 (1989) 185103s.

2274 Okazaki, T., Kataoka, H., Muroi, N. and Makita, M.: (Determination of linear-alkylbenzenesulfonate by GC with flame photometric detection). *Bunseki Kagaku*, 38 (1989) 312-315.

See also 2034, 2079, 2088, 2345, 2364, 2489, 2499.

## 25. ORGANIC PHOSPHORUS COMPOUNDS (INCLUDING SUGAR PHOSPHATES)

2275 Ellington, J.J., Collette, T.W. and Payne, W.D.: GC/FT-IR analysis of thermally labile compound tris(2,3-dibromopropyl)phosphate. *J. High Resolut. Chromatogr.*, 12 (1989) 337-340.

See also 2039.

## 26. ORGANOMETALLIC AND RELATED COMPOUNDS

*26a. Organometallic compounds*

2276 Jiang Gui-Bin, Ni Zhe-Ming, Wang Shun-Rong and Han Heng-Bin: Organic mercury speciation in fish by capillary gas chromatography interfaced with atomic absorption spectroscopy. *Fresenius' Z. Anal. Chem.*, 334 (1989) 27-30.

See also 2043, 2401, 2421, 2442, 2447.

*26b. Boranes, silanes and related non-metallic compounds*

2277 Ouyang Zheng and Wu Jiang: The determination of selenomethionine in selenium yeast by cyanogen bromide gas chromatography. *Biomed. Chromatogr.*, 2 (1988) 258-259; *C.A.*, 110 (1989) 169527c.

2278 Soto-Garrido, D.G., Sherwood, A.G. and Bell, T.N.: Separation and quantification of the ethylfluoro and the dimethylfluoromethyl derivatives from their parent silicon compounds by gas chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 430-431.

See also 2485.

*26c. Coordination compounds*

2279 Bol'shova, T.A. and Shapovalova, E.N.: (Determination of nickel and zinc diisopropyl dithiophosphates by gas-liquid chromatography). *Vestn. Mosk. Univ., Ser. 2: Khim.*, 29 (1988) 371-376; *C.A.*, 110 (1989) 241688a.

- 2280 Khuhawar, M.Y. and Talpur, A.K.: Gas chromatographic separation of copper(II), nickel(II), and palladium(II) complexes of meso- and DL-bis(isopropanoyl-acetone)stilbenediimine. *J. Chem. Soc. Pak.*, 10 (1988) 373-380; *C.A.*, 110 (1989) 184964m.
- 2281 Maslowska, J. and Starzynski, S.: (Optimization of separation conditions of metalacetylacetonates by GC). *Chem. Anal. (Warsaw)*, 33 (1988) 335-342.
- 2282 Yanagisawa, M., Itoh, A. and Kitagawa, K.: Gas chromatographic separation of C from matrix compounds in separative column atomizer for atomic absorption spectrometry. *Bunko Kenkyu*, 37 (1988) 446-451; *C.A.*, 110 (1989) 207303m.

See also 2096, 2358.

## 27. VITAMINS AND VARIOUS GROWTH REGULATORS (NON-PEPTIDIC)

- 2283 Nakano, K. and Adachi, Y.: (Separation of vitamin K<sub>2</sub> isomers by supercritical fluid chromatography using organic solvents). *Jpn. Kokai Tokkyo Koho Pat.* JP 62,292,744 (87,292,744) (Cl.C07C50/14), 19 Dec. 1987, Appl. 86/133,750, 11 Jun. 1986; 3 pp.; *C.A.*, 110 (1989) 173501g.
- 2284 Norris, F.A., Jordan, E.G. and Guardigli, A.: Ethoprop. *Anal. Methods Pestic. Plant Growth Regul.*, 16 (1988) 3-20; *C.A.*, 110 (1989) 168070m.

## 28. ANTIBIOTICS

- 2285 Cortani, G.: (Solvent residues in water-soluble penicillin salts). *Lab. 2000*, 2, No. 3 (1988) 36-38; *C.A.*, 110 (1989) 219220v.
- 2286 Liu Qiyi, Lin Jinlong and Zhang Jing: (Gas chromatographic analysis of the side chain of rifapentine). *Kangshengsu*, 13 (1988) 365-368; *C.A.*, 110 (1989) 179607t.
- 2287 Tico Grau, J.R., Del Pozo Carrascosa, A., Salazar Macian, R. and Alonso Ciriza, S.: (Determination of residual solvents in pharmaceutical raw materials: application to lyophilized sodium amoxicillin). *Cienc. Ind. Farm.*, 7 (1988) 325-330; *C.A.*, 110 (1989) 219171e.

See also 2330, 2385.

## 29. INSECTICIDES, PESTICIDES AND OTHER AGROCHEMICALS

### 39a. Chlorinated insecticides

- 2288 Buchert, H., Class, T. and Ballschmitter, K.: High-resolution gas chromatography of technical chlordane with electron capture- and mass selective detection. *Fresenius' Z. Anal. Chem.*, 333 (1989) 211-217.
- 2289 Pluta, J.: Studies on concentration of halogen derivatives in herbal products from various regions of Poland. *Pharmazie*, 44 (1989) 222-224; *C.A.*, 110 (1989) 237226f.
- 2290 Scott, B.F. and Onuska, F.I.: Analysis for polychlorinated biphenyls by dual capillary column gas chromatography. *J. Microcolumn Separ.*, 1 (1989) 119-124.

See also 2133, 2387, 2398, 2417, 2425, 2426, 2452, 2474.

### 29b. Phosphorus insecticides

- 2291 Nagami, H., Uno, M., Onji, Y., Tanaka, T. and Yamazoe, Y.: (Analytical method for determination of organophosphorus insecticides for termite control in indoor air). *Nara-ken Eisei Kenkyusho Nenpo*, No. 22 (1987) 93-97; *C.A.*, 110 (1989) 187652u.

See also 2428.

29c. *Carbamates*

- 2292 Segundo, Dario, S.: (Comparative study of detection systems for carbamates and thiocarbamates separated by gas chromatography). *Afinidad*, 45 (1988) 457-461; *C.A.*, 110 (1989) 224737y.
- 2293 Tatarkovicova, V.: (Determination of carbamates by gas chromatography). *Chem. Lett.*, 83 (1989) 352-371 - a review with 103 refs.

See also 2400, 2418, 2430.

29d. *Herbicides*

- 2294 Fast, D.M., Reddy, V.V., Ashley, D.L. and Holler, J.S.: Application of analytical standards in method development: selected chlorinated phenols and herbicides. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 378-383.
- 2295 Tsunoda, N. and Ootsuru, O.: (Detection and confirmation of paraquat and diquat by capillary gas chromatography/mass spectrometry and capillary gas chromatography/Fourier transform infrared spectrometry). *Eisei Kagaku*, 35 (1989) 73-79; *C.A.*, 110 (1989) 207687q.

See also 2164, 2424, 2446, 2465.

29e. *Fungicides*

- 2296 Woestenborghs, R., Michielsens, L., Pauwels, C., Van Leemput, L. and Heykants, J.: A review of methods for the residue analysis of the fungicide imazalil. *Meded. Fac. Landbouwet., Rijksuniv. Gent*, 53, No. 3B (1988) 1425-1432; *C.A.*, 110 (1989) 187649y.

See also 2415.

29f. *Other types of pesticides and various agrochemicals*

- 2297 Class, T.J. and Casida, J.E.: HRGC-MS studies on the microsomal oxidase metabolites of the pyrethroid insecticide S-bioallethrin. *Fresenius' Z. Anal. Chem.*, 333 (1989) 743-744.
- 2298 Cox, C.L., Timmons, L.L. and Ridlen, R.L.: Capillary gas chromatographic analysis of trichlorfon in dosed feed formulations. *J. Anal. Toxicol.*, 13 (1989) 84-88; *C.A.*, 110 (1989) 171877k.

See also 2389, 2397, 2408, 2421, 2454, 2461.

## 31. PLASTICS AND THEIR INTERMEDIATES

- 2299 Adler, B., Metzner, K., Seiffarth, J. and Wille, J.: (Data for polymer identification by means of pyrolysis gas chromatography). *Plaste Kautsch.*, 36 (1989) 8-9; *C.A.*, 110 (1989) 213816x.
- 2300 Blazso, M., Jakab, E., Szekely, T., Flage, B. and Schulten, H.R.: Pyrolysis-gas chromatography mass spectrometry and field ionization mass spectrometry of polyquinones. *J. Polym. Sci., Part A: Polym. Chem.*, 27 (1989) 1027-1043; *C.A.*, 110 (1989) 174126a.
- 2301 Burfield, D.R., Eng, A.H. and Loi, P.S.T.: Investigation of an indirect GC method for the determination of water content of rubbers. *Br. Polym. J.*, 21 (1989) 77-80; *C.A.*, 110 (1989) 174881t.
- 2302 Chappell, P.J.C. and Williams, D.R.: Determination of poly(*p*-phenyleneterephthalamide) fiber surface cleanliness by inverse gas chromatography. *J. Colloid Interface Sci.*, 128 (1989) 450-457; *C.A.*, 110 (1989) 175022a.
- 2303 Cortes, H.J., Juwett, G.L., Pfeiffer, C.D., Martin, S. and Smith, C.: Multi-dimensional chromatography using on-line microcolumn liquid chromatography and pyrolysis gas chromatography for polymer characterization. *Anal. Chem.*, 61 (1989) 961-965.

- 2304 Edelman, A. and Fradet, A.: Inverse gas chromatography study of some alkyl trinitrate-polymer systems. *Polymer*, 30 (1989) 324-326; *C.A.*, 110 (1989) 174168r.
- 2305 Farina, M., Di Silvestro, G. and Sozzani, P.: Determination of the reinitiation constants and other kinetic parameters of free-radical polymerization by gas chromatography/mass spectrometry. *Makromol. Chem.*, 190 (1989) 213-222; *C.A.*, 110 (1989) 173832r.
- 2306 Hagman, A. and Jacobsson, S.: Theoretical model for quantitative determination of volatile compounds in polymers by dynamic headspace sampling. *Anal. Chem.*, 61 (1989) 1202-1207.
- 2307 Hammond, T. and Lehrle, R.S.: Pyrolysis GLC (gas-liquid chromatography) applied to composition analysis, general characterization and the detailed specification of polymers. *Br. Polym. J.*, 21 (1989) 23-30; *C.A.*, 110 (1989) 213707n.
- 2308 Hou Canshu, Chen Yongrong and Lin Xudong: (Studies on degradation mechanism of poly(*p*-phenylene sulfide/sulfone) and *p*-phenylene sulfide/sulfone block copolymer by carbon dioxide laser pyrolysis gas chromatography). *Sichuan Daxue Xuebao, Ziran Kexueban*, 25 (1988) 352-355; *C.A.*, 110 (1989) 213536f.
- 2309 Krishen, A.: Rubber. *Anal. Chem.*, 61, No. 12 (1989) 238R-243R.
- 2310 Maltseva, L.E., Konpleva, M.M., Nikitina, S.S., Klopova, A.V. and Makeeva, N.M.: (Gas chromatographic determination of water in diacylperoxides originating in production of polymeric plastics). *Zavod. Lab.*, 89, No. 3 (1989) 15-17.
- 2311 Maltseva, L.E., Popova, G.S., Makeeva, N.M. and Konopleva, N.M.: (Use of commercial gas chromatographic apparatus for the study of extraction of volatile compounds from polymers). *Zavod. Lab.*, 29, No. 4 (1989) 24-25.
- 2312 Nagata, M. and Kishioka, Y.: (Determination of additives in polyolefines by capillary GC). *Bunseki Kagaku*, 38 (1989) T75-T80.
- 2313 Nobuhira, K. and Hirayanagi, S.: (Identification of rubbers and other high polymers by pyrolysis high-resolution gas chromatography). *Nippon Gomu Kyokaiishi*, 62 (1989) 77-83; *C.A.*, 110 (1989) 232944d.
- 2314 Ohtani, H., Ishiguro, S., Tanaka, M. and Tsuge, S.: Characterization of polymerization reagents incorporated into poly(methyl methacrylate) chains by pyrolysis-gas chromatography. *Polym. J. (Tokyo)*, 21 (1989) 41-48; *C.A.*, 110 (1989) 174124y.
- 2315 Ohtani, H., Tanaka, M. and Tsuge, S.: Pyrolysis-gas chromatographic study of end groups in poly(methyl methacrylate) radically polymerized in toluene solution with benzoyl peroxide as initiator. *J. Anal. Appl. Pyrolysis*, 15 (1989) 167-174.
- 2316 Price, G.J. and Agravat, A.: Determination of phase separation in polymer blends using gas chromatography. *Polym. Commun.*, 30 (1989) 89-92; *C.A.*, 110 (1989) 213925g.
- 2317 Sanchez, I.C.: Relationships between polymer interaction parameters. *Polymer*, 30 (1989) 471-475; *C.A.*, 110 (1989) 213929m.
- 2318 Smistad, G., Waaler, T. and Roksvaag, P.O.: Determination by gas-liquid chromatography of trace amounts of soft poly(vinyl chloride) plastic additives in aqueous solutions. II. Di(2-ethylhexyl)phthalate, epoxidized vegetable oils and stearates. *Acta Pharm. Nord.*, 1 (1989) 9-16; *C.A.*, 110 (1989) 237223c.
- 2319 Smith, C.G., Nyquist, R.A., Martin, S.J., Mahle, N.H., Smith, P.B. and Pasztor, A.J., Jr.: Analysis of synthetic polymers. *Anal. Chem.*, 61, No. 12 (1989) 214R-238R.
- 2320 Sotnikov, E.E. and Rastyannikov, E.G.: (Identification of volatile products during direct vapor-phase analysis of polymers). *Plast. Massy*, No. 2 (1989) 71-74; *C.A.*, 110 (1989) 193725m.
- 2321 Vilcu, R. and Leca, M.: Thermodynamic characterization of polymers by chromatography with gas mobile phase. *Rev. Roum. Chim.*, 34 (1989) 387-395; *C.A.*, 110 (1989) 213709q - a review with 29 refs.
- 2322 Wong, M.K., Gan, L.M., Koh, L.L. and Ng, K.H.: Toluene solvent system for the head space gas chromatographic determination of styrene monomer in polystyrene. *Anal. Chim. Acta*, 218 (1989) 345-350.
- 2323 Zadymon, V.V., Shevtsov, V.K. and Smirnov, V.A.: (Separation and identification of low molecular weight components of resols by combined chromatography-mass spectrometry). *Zh. Anal. Khim.*, 44 (1989) 544-550.

See also 2044, 2147, 2184, 2466, 2472, 2482.

## 32. DRUG ANALYSIS

## 32a. Drug analysis, general techniques

- 2324 Deutsch, D.G.: Gas chromatography/mass spectrometry using tabletop instruments. *Chem. Anal.*, 100 (1989) 87-128; *C.A.*, 110 (1989) 226657w - a review with 50 refs.
- 2325 Foust, D.W. and Bergen, M.S.: Analysis of solvent residues in pharmaceutical bulk drugs by wall-coated open tubular gas chromatography. *J. Chromatogr.*, 469 (1989) 161-173.
- 2326 Garland, W.A., Crews, T., Brown, S.V. and Fukuda, E.K.: Comparison of manual and exponentially modified gaussian based methods for the determination of the peak heights of selected-ion current profiles acquired in a mass spectral drug assay. *J. Chromatogr.*, 472 (1989) 250-255.
- 2327 Gilpin, R.K. and Pachla, L.A.: Pharmaceuticals and related drugs. *Anal. Chem.*, 61, No. 12 (1989) 191R-214R.
- 2328 Kock, R., Delvoux, B., Tillmanns, U. and Greiling, H.: A candidate reference method for the determination of uric acid in serum based on high performance liquid chromatography, compared with an isotope dilution-gas chromatography-mass spectrometer method. *J. Clin. Chem. Clin. Biochem.*, 27 (1989) 157-162; *C.A.*, 110 (1989) 227920p.
- 2329 Krzek, J. and Bielska, A.: (Determination of ethyl ether and cloral hydrate in prescription drug forms by gas chromatography). *Farm. Pol.*, 44 (1988) 534-537; *C.A.*, 110 (1989) 219199v.
- 2330 Wang Zuofeng, Tang Qizhao and Zhang Puhai: (Investigation of the influence of excipients on the stability of sodium oxacillin by pyrolysis gas chromatography). *Zhongguo Yaoke Daxue Xuebao*, 20 (1989) 10-12; *C.A.*, 110 (1989) 199063r.

## 32b. Antirheumatics and antiinflammatory drugs

- 2331 Sastry, C.S., Rao, A.R.M., Murthy, A.G.K. and Krishna, C.V.S.S.V.G.: GLC microdetermination of indomethacin in capsules. *Indian Drugs*, 26 (1989) 301-304; *C.A.*, 110 (1989) 219203s.

See also 2164, 2360.

## 32c. Autonomic and cardiovascular drugs

- 2332 Ascalone, V., Dalbo, L., Deschamps, N. and Guinebault, P.: Determination of the GABAergic antidepressant drug fengabine and some of its metabolites in plasma by capillary gas chromatography with electron-capture detection. *J. Chromatogr.*, 490 (1989) 81-90.
- 2333 Beresford, A.P., Macrae, P.V., Alker, D. and Kobylecki, R.J.: Biotransformation of amlodipine. Identification and synthesis of metabolites found in rat, dog and human urine. Confirmation of structures by gas chromatography-mass spectrometry and liquid chromatography-mass spectrometry. *Arzneim. Forsch.*, 39 (1989) 201-209; *C.A.*, 110 (1989) 185268z.
- 2334 Esteve, M.H., Aldoma, G.E., Rodi, R.D., Luque, G.I. and Fernandez, C.V.: Chromatographic purity study in synthetic drugs: Buflomedil hydrochloride. *J. High Resolut. Chromatogr.*, 12 (1989) 416-419.
- 2335 Fay, L., Michel, G., Goupit, P., Harpey, C. and Prost, M.: Determination of trimetazidine in biological fluids by gas chromatography-mass spectrometry. *J. Chromatogr.*, 490 (1989) 198-205.
- 2336 Rofi, R.D. and Aldoma, G.E.: Detection and identification by capillary GC-FID and GC-MS of  $\beta$ -blocking agents. *J. High Resolut. Chromatogr.*, 12 (1989) 42E-430.
- 2337 Van der Stel, D.J.K., Brockhoff, O.A.M. and de Bree, H.: An assay for idaverine in plasma and urine at picogram level. *Methodol. Surv. Biochem. Anal.*, 18 (1988) 251-255; *C.A.*, 110 (1989) 204964s.



## 32d. Central nervous system drugs

- 2338 Bun, H., Dechamp, C., Coassolo, P. and Cano, J.P.: The determination by means of capillary gas chromatography of the benzodiazepines - clobazam, clonazepam, diazepam, and nitrazepam - and their principal metabolites currently used in the treatment of epilepsy. *Anal. Lett.*, 22 (198) 897-913.
- 2339 Chappay, O., Galliot, M. and Bourdon, R.: (Analysis of chlormezanone in biological fluids by gas chromatography). *J. Toxicol. Clin. Exp.*, 8 (1988) 263-271; *C.A.*, 110 (1989) 204983x.
- 2340 Koves, E.M. and Yen, B.: The use of gas chromatography/negative ion chemical ionization mass spectrometry for the determination of lorazepam in whole blood. *J. Anal. Toxicol.*, 13 (1989) 69-72; *C.A.*, 110 (1989) 167645r.

See also 2168.

## 32e. Chemotherapeutics (except cytostatics and antibiotics)

- 2341 Hethelyi, E., Tetenyi, P., Kaposi, P., Danos, B., Kernoczi, Z. and Buki, G.: GC/MS investigation of antimicrobial and repellent compounds. *Herba Hung.*, 27 (1988) 89-105; *C.A.*, 110 (1989) 141367b.
- 2342 Ray, A.C., Murphy, M.J., DuVall, M.D. and Reagor, J.C.: Determination of brodifacoum and bromadiolone residues in rodent and canine liver. *Am. J. Vet. Res.*, 50 (1989) 546-550; *C.A.*, 110 (1989) 187389p.
- 2343 Sadana, G.S. and Gaonkar, M.V.: Simultaneous GLC determination of diloxane furoate and tinidazole in pharmaceutical dosage forms. *Indian Drugs*, 26 (1989) 241-246; *C.A.*, 110 (1989) 179629b.
- 2344 Terada, T., Sakata, C., Ishibashi, K., Tsuchiya, T., Noguchi, H., Sugiyama, A., Nonoyama, S., Nakashima, M. and Kanamaru, M.: Gas chromatographic assay and disposition of 6-chloro-2-pyridylmethyl nitrate, a new antianginal drug, in healthy volunteers. *J. Pharm. Sci.*, 78 (1989) 206-210; *C.A.*, 110 (1989) 165431u.
- 2345 Wang Zhihua, Hong Xiaokun, Qian Wenjing, Hu Chunxian and Wang Yiren: (Serum concentration, tissue distribution and bioavailability of allicin in rabbits by GC-analysis). *Zhongcaoyao*, 19 (1988) 540-559; *C.A.*, 110 (1989) 179382r.

See also 2385.

## 32g. Other drug categories

- 2346 Rao, G.R., Rao, P.J. and Khadgapathi, P.: Estimation of timolol maleate in its opthalmic solution by a gas chromatographic method. *Indian Drugs*, 26 (1989) 231-233; *C.A.*, 110 (1989) 199315z.

See also 2289.

## 32h. Toxicological and forensic applications

- 2347 Dehaan, J.D. and Bonarius, K.: Pyrolysis products of structure fires. *J. Forensic Sci. Soc.*, 28 (1988) 299-309; *C.A.*, 110 (1989) 167641m.
- 2348 Fraser, A.D. and MacNeil, W.: Gas chromatographic analysis of methyl formate and application in methanol poisoning cases. *J. Anal. Toxicol.*, 13 (1989) 73-76; *C.A.*, 110 (1989) 167646s.
- 2349 Fujita, Y., Nakayama, M., Kanbara, K., Nakayama, N., Mitsuo, N., Matsumoto, H. and Satoh, T.: (Forensic chemical study on human hair. II. Identification of brand of women's hair care products by remaining components on human hair). *Eisei Kagaku*, 35 (1989) 36-48; *C.A.*, 110 (1989) 226718s.
- 2350 Kaferstein, H., Sticht, G. and Staak, M.: (Immunochemical and gas chromatographic/mass spectrometric results by cannabinoid demonstration in urine). *Labor.-Med.*, 12 (1989) 40-41; *C.A.*, 110 (1989) 226723q.
- 2351 Kukac, B., Sarsunova, M., Perina, Z., Michalkova, A., Hrivnak, J. and Berankova, H.: (Capillary gas-chromatographic identification and spectrophotometric and spectrofluorimetric determination of traces of phthalate in dialyzate concentrates, dialyzate solutions and in water as well as determination of their diffusion properties). *Pharmazie*, 44 (1989) 31-33; *C.A.*, 110 (1989) 179496f.

- 2352 Maseda, C., Matsubara, K. and Shiono, H.: Improved gas chromatography with electron-capture detection using a reaction pre-column for the determination of blood cyanide: A higher content in the left ventricle of fire victims. *J. Chromatogr.*, 490 (1989) 319-327.
- 2353 Ray, A.C., Kyle, A.L.G., Murphy, M.H.J. and Reagor, J.C.: Etiologic agents, incidence, and improved diagnostic methods of cantharidin toxicosis in horses. *Am. J. Vet. Res.*, 50 (1989) 189-191; *C.A.*, 110 (1989) 129965n.
- 2354 Singh, A.K., Ashraf, M., Granley, K., Mishra, U., Rao, M.M. and Gordon, B.: Screening and confirmation of drugs in horse urine by using a simple column extraction procedure. *J. Chromatogr.*, 473 (1989) 215-226.

See also 2006, 2242, 2269, 2340.

### 32i. Plant extracts

- 2355 Greenaway, W., Scaysbrook, T. and Whitley, F.R.: Phenolic analysis of bud oxudate of *Populus lasiocarpa* by GC/MS. *Phytochemistry*, 27 (1988) 3513-3515; *C.A.*, 110 (1989) 92090v.
- 2356 Sur, S.V., Tulyupa, F.M. and Sur, L.I.: (Gas-chromatographic determination of main active substances in infusions of essential oil-containing plant raw materials). *Farm. Zh. (Kiev)*, No. 2 (1989) 58-64; *C.A.*, 110 (1989) 219189s.
- 2357 Svendsen, A.B. and Merckx, I.J.M.: Occurrence of glycosidic bound volatile compounds in plants. Part III. A simple method for screening of fresh plant material for glycosidic bound volatile compounds. *Planta Med.*, 55 (1989) 38-40; *C.A.*, 110 (1989) 227938a.

### 33. CLINICO-CHEMICAL APPLICATIONS

#### 33b. Complex mixtures and profiling (single compounds by cross ref. only)

- 2358 Aggarwal, S.K., Kinter, M., Wills, M.R., Savory, J. and Heorld, D.A.: Isotope dilution gas chromatography/mass spectrometry for the determination of nickel in biological materials. *Anal. Chem.*, 61 (1989) 1099-1103.
- 2359 Crowell, P.L., Miller, R.H. and Harper, A.E.: Measurement of plasma and tissue levels of branched-chain  $\alpha$ -keto acids by gas-liquid chromatography. *Methods Enzymol.*, 166 (1988) 39-46; *C.A.*, 110 (1989) 188669s.
- 2360 Curry, S.H. and Kwon, H.R.: Assay of nitroglycerin and metabolites by capillary GC. *Methodol. Surv. Biochem. Anal.*, 18 (1988) 213-214; *C.A.*, 110 (1989) 224806v.
- 2361 Groeseneken, D., Veulemans, H., Masschelein, R. and van Vlem, E.: An improved method for the determination in urine of alkoxyacetic acids. *Int. Arch. Occup. Environ. Health*, 61 (1989) 249-254; *C.A.*, 110 (1989) 167635n.
- 2362 Haga, H. and Nakajima, T.: Determination of polyol profiles in human urine by capillary gas chromatography. *Biomed. Chromatogr.*, 3 (1989) 68-71.
- 2363 Hammes, W., Bittner, J. and Müller, R.F.: Simultaneous determination of nicotine and conitine in plasma by capillary gas liquid chromatography with nitrogen-selective detection. *Fressenius' Z. Anal. Chem.*, 333 (1989) 745-746.
- 2364 Hannestad, U., Margheri, S. and Sörbo, B.: A sensitive gas chromatographic method for determination of protein-associated sulfur. *Anal. Biochem.*, 178 (1989) 394-398.
- 2365 Hoffmann, G., Aramaki, S., Blum-Hoffmann, E., Nyhan, W.L. and Sweetman, L.: Quantitative analysis for organic acids in biological samples: batch isolation followed by gas chromatographic-mass spectrometric analysis. *Clin. Chem. (Winston-Salem)*, 35 (1989) 587-595.
- 2366 Jellum, E., Thoresen, O., Horn, L., Seip, R., Nilsen, E., Kvittingen, E.A. and Stokke, O.: Advances in the use of computerized gas chromatography-mass spectrometry and high-performance liquid chromatography with rapid scanning detection for clinical diagnosis. *J. Chromatogr.*, 468 (1989) 43-53.
- 2367 Khandelwal, J.K., Prell, G.D., Morrishow, A.M. and Green, J.P.: Presence and measurement of imidazoleacetic acid, a  $\gamma$ -aminobutyric acid agonist, in rat brain and human cerebrospinal fluid. *J. Neurochem.*, 52 (1989) 1107-1113; *C.A.*, 110 (1989) 166251x.

- 2368 Kovaleva, E.S., Orlov, O.N., Bogdanova, E.D., Belyaev, B.S., Tsutsulkovskaya, M.Ya., Orlova, V.A., Prilipko, L.L. and Erin, A.N.: (Gas chromatographic study of lipid peroxidation in patients with endogenic psychoses). *Zh. Nevropatol. Psikhiatr. im. S.S. Korsakova*, 89 (1989) 99-103; *C.A.*, 110 (1989) 169531z.
- 2369 Liebich, H.M., Dotzauer, A. and Tetschner, B.: Gas chromatographic determination of oxo- and hydroxycarboxylic acids in serum and urine of diabetic and normal subjects. *J. Chromatogr.*, 468 (1989) 157-165.
- 2370 Lowes, S. and Rose, M.E.: Analytical procedures for determining acylcarnitines in biological fluids. *TrAC*, 6 (1989) 184-188.
- 2371 Mirimskii, A.S., Milova, O.G., Roslyi, I.M., Ermak, T.N., Vengerov, Yu.Ya., Koyudenko, L.G., Degtyareva, I.V., Sidakov, B.M. and Linberg, L.F.: (Diagnosis of some infectious diseases using computer based analysis of gas chromatographic profiles of blood serum lipids). *Vopr. Med. Khim.*, 35 (1989) 115-120; *C.A.*, 110 (1989) 188891h.
- 2372 Murray, S., Gooderham, N.J., Boobis, A.R. and Davies, D.S.: Detection and measurement of MeIQx in human urine after ingestion of a cooked meat meal. *Carcinogenesis (London)*, 10 (1989) 763-765; *C.A.*, 110 (1989) 230320y.
- 2373 Payne, N.A., Zirrolli, J.A. and Gerber, J.G.: Analysis of histamine and N-methylhistamine in plasma by gas chromatography-negative ion-chemical ionization mass spectrometry. *Anal. Biochem.*, 178 (1989) 414-420.
- 2374 Pfäffli, P., Savolainen, H. and Keskinen, H.: Determination of carboxylic acids in biological samples as their trichloroethyl esters by gas chromatography. *Chromatographia*, 27 (1989) 483-488.
- 2375 Rettenmeier, A.W., Howald, W.N., Levy, R.H., Witek, D.J., Gordon, W.P., Porubek, D.J. and Baillie, T.A.: Quantitative metabolic profiling of valproic acid in humans using automated gas chromatographic/mass spectrometric techniques. *Biomed. Environ. Mass Spectrom.*, 18 (1989) 192-199; *C.A.*, 110 (1989) 185233j.
- 2376 Röper, J. and Kochen, W.: Detection of volatile hydrocarbons in human breath by megabore capillary gas chromatography in the low ppb range. *Fresenius' Z. Anal. Chem.*, 333 (1989) 747.
- 2377 Savich, V.I., Skachko, Z.M. and Valladares, K.A.: (Gas chromatographic method of simultaneous determination of ethanol and acetaldehyde in cadaveric blood). *Zdravookht. Beloruss.*, No. 2 (1989) 25-27; *C.A.*, 110 (1989) 207333w.
- 2378 Shapiro, M.S., Zelefsky, S., Chayen, R. and Werber, M.M.: Fractionation of urinary 17-ketosteroids by gas chromatography: a neglected procedure in the assessment of hyperandrogenicity in the hirsute female. *J. Clin. Chem. Clin. Biochem.*, 27 (1989) 27-31; *C.A.*, 110 (1989) 166318z.
- 2379 Van Berkel, M.P., de Bree, H. and Sierat, K.: Quantitative analysis of flesinoxan in plasma and urine at the pg/ml level using GC-ECD. *Methodol. Surv. Biochem. Anal.*, 18 (1988) 209-212; *C.A.*, 110 (1989) 204961p.
- 2380 Zhu Zhengmei, Li Ruixiang, Cui Zhaochun, Zhou Liangmo and Huang Mingxian: Composition analysis of the three main gangliosides from adult human myometrium by a rapid capillary gas chromatographic method. *Biomed. Chromatogr.*, 3 (1989) 29-31; *C.A.*, 110 (1989) 169537f.

## 34. FOOD ANALYSIS

## 34b. Complex mixtures (single compounds by cross ref. only)

- 2381 Adeola, O., Buchanan-Smith, J.G. and Early, R.J.: Gas and high-performance liquid chromatographic analyses of amino acids in soybean meal, corn and triticale. *J. Food Biochem.*, 12 (1988) 171-181; *C.A.*, 110 (1989) 211046x.
- 2382 Almarcha Morell, A. and Duquet, D.: (Use of high-resolution gas chromatography for the analysis of triglycerides in fats and oils). *Tec. Lab.*, 11 (1988) 108-111; *C.A.*, 110 (1989) 191332g.
- 2383 Ang, C.Y.W. and Young, L.L.: Rapid headspace gas chromatographic method for assessment of oxidative stability of cooked chicken meat. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 277-281.
- 2384 Athanasios, A.K., Gross, A.F. and Given, P.S., Jr.: *Food. Anal. Chem.*, 61, No. 12 (1989) 45R-64R.

- 2385 Balizs, G. and Arnold, D.: Reference standards for residue analysis of chloramphenicol in meat and milk: a critical study. *Chromatographia*, 27 (1989) 489-493.
- 2386 Barker, R.L., Pipasts, P. and Gracey, D.E.F.: Examination of beer carbonyls as their oximes by gas chromatography-mass spectrometry. *J. Am. Soc. Brew. Chem.*, 47 (1989) 9-14; *C.A.*, 110 (1989) 171706d.
- 2387 Beldomenico, H.R., Garcia, S.R. and de Jesus, J.J.: Screening multiresidue determination of organochlorine pesticides in foods. Part I. Alumina microcolumn cleanup of fat. *J. High Resolut. Chromatogr.*, 12 (1989) 411-412.
- 2388 Brunke, E.J., Mair, P. and Hammerschmidt, F.J.: Volatile from naranjilla fruit (*Solanum quitense* Lam.). GC/MS analysis and sensory evaluation using sniffing GC. *J. Agric. Food Chem.*, 37 (1989) 746-748.
- 2389 Cairns, T., Siegmund, E.G., Chiu Kin, S. and Nelson, R.: Residue characterization of triadimefon in grapes by gas chromatography and mass spectrometry/mass spectrometry. *Biomed. Environ. Mass Spectrom.*, 18 (1989) 110-115; *C.A.*, 110 (1989) 171851x.
- 2390 Chatonnet, P. and Boidron, J.N.: (Volatile phenols analysis in wines by gas chromatography). *Sci. Aliments*, 8 (1988) 479-488; *C.A.*, 110 (1989) 230062r.
- 2391 Craig, J.I.: A comparison of the headspace volatiles of kiwi fruit wine with those of wine of *Vitis vinifera* variety Mueller-Thurgau. *Am. J. Enol. Vitic.*, 39 (1988) 321-324; *C.A.*, 110 (1989) 113119d.
- 2392 Dahmer, M.L., Fleming, P.D., Collins, G.B. and Hildebrand, D.F.: A rapid screening technique for determining the lipid composition of soybean seeds. *J. Am. Oil Chem. Soc.*, 66 (1989) 543-548.
- 2393 De Man, L., de Man, J.M. and Blackman, B.: Physical and textural evaluation of some shortenings and margarines. *J. Am. Oil Chem. Soc.*, 66 (1989) 128-132.
- 2394 Donhauser, S., Narziss, L., Glas, K., Miedaner, H., Nitzsche, F. and Schneider, F.: (Two rapid methods for the determination of neutral phenols in beer). *Monatsschr. Brauwiss.*, 42 (1989) 88-91; *C.A.*, 110 (1989) 230056s.
- 2395 Fehringer, N.V., Walters, S.M. and Niemann, R.A.: Determination of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in fish, using electron capture gas chromatography with confirmation by mass spectrometry: interlaboratory study. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 394-398.
- 2396 Ferrari, G. and Hory, C.: (Determination of amino acids in wines and musts by gas-liquid chromatography on macrobore column). *Compt. Rend. Vigne Vin*, 22 (1988) 299-303; *C.A.*, 110 (1989) 230072u.
- 2397 Fuerst, P., Fuerst, C. and Groebel, W.: (Gas chromatographic/mass spectrometric determination of clenbuterol in foods, feeds, and urine). *Dtsch. Lebensm.-Rundsch.*, 85 (1989) 35-39; *C.A.*, 110 (1989) 211092j.
- 2398 Greve, P.A. and Hogendoorn, E.A.: Determination of triforine in chicory, carrot, red beet, Brussels sprout, white cabbage and kale after conversion to chloroform. *Meded. Fac. Landbouwwet., Rijksuniv. Gent*, 53, No. 3B (1988) 1531-1533; *C.A.*, 110 (1989) 211065c.
- 2399 Grob, K., Lanfranchi, M. and Mariani, C.: Determination of free and esterified sterols and of wax esters in oils and fats by coupled liquid chromatography-gas chromatography. *J. Chromatogr.*, 471 (1989) 397-405.
- 2400 Hartman, T.G. and Rosen, R.T.: Determination of ethyl carbamate in commercial protein-based condiment sauces by gas chromatography-mass spectrometry. *J. Food Saf.*, 9 (1989) 173-182; *C.A.*, 110 (1989) 191347r.
- 2401 Ikebe, K., Nishimune, T. and Tanaka, R.: (Determination of tributyltin compounds in fish by gas chromatography using an electron capture detector). *Osaka-furitsu Koshu Eisei Kenkyusho Kenkyu Hokoku, Shokuhin Eisei Hen*, No. 19 (1988) 25-29; *C.A.*, 110 (1989) 230260d.
- 2402 Jensen, K.G.: Determination of ethylene oxide residues in processed food products by gas-liquid chromatography after derivatization. *Z. Lebensm. Unters. Forsch.*, 187 (1988) 535-540; *C.A.*, 110 (1989) 211071b.
- 2403 Kallio, H., Leino, M. and Salorinne, L.: Analysis of the headspace of food-stuffs near room temperature. *J. High Resolut. Chromatogr.*, 12 (1989) 174-177.
- 2404 Kataoka, H., Tamura, K., Maeda, M. and Makita, M.: (Gas chromatographic determination of orotic acid by extractive alkylation). *Bunseki Kagaku*, 38 (1989) 327-330.
- 2405 Kim Poongzag, Hong Sah Mun and Oguri Naoki: (Studies on the fingerprints by the thermal degradation of fats with pyrolysis gas chromatography/mass spectrometry). *Taehan Hwahakhoe Chi*, 33 (1989) 143-146; *C.A.*, 110 (1989) 191335k.

- 2406 Koch, H.P. and Jaeger, W.: (Garlic. Allicin release from fresh and dried garlic and products thereof). *Dtsch. Apoth. Ztg.*, 129 (1989) 273-276; *C.A.*, 110 (1989) 219160a.
- 2407 Lakszner, K., Szepesy, L., Toth, M. and Bezeczky, G.: Determination of beer flavor on immobilized thick film capillary columns. *Monatsschr. Brauwiss.*, 42 (1989) 92-94; *C.A.*, 110 (1989) 210882e.
- 2408 Lenicek, J., Sekyra, M. and Citkova, M.: (Determination of residues of synthetic pyrethroids in vegetables and fruit). *Cesk. Hyg.*, 34 (1989) 28-38; *C.A.*, 110 (1989) 211096p.
- 2409 Li Yuanqing and Li Jinyan: (Use of headspace collection and activated charcoal column for the concentration of organic substances of vinegar and soy sauce for gas chromatographic analysis). *Zhongguo Niangzao*, No. 6 (1988) 20-24; *C.A.*, 110 (1989) 191382y.
- 2410 McDonald, R.E., Armstrong, D.J. and Kreishman, G.P.: Identification of *trans*-diene isomers in hydrogenated soybean oil by gas chromatography, silver nitrate thin-layer chromatography, and carbon-13 NMR spectroscopy. *J. Agric. Food Chem.*, 37 (1989) 637-642.
- 2411 Meier, P. and Aubort, J.D.: Polycyclic aromatic hydrocarbons in dried mushrooms. *Mitt. Geb. Lebensmittelunters. Hyg.*, 79 (1989) 433-439; *C.A.*, 110 (1989) 211069g.
- 2412 Miller, E.L., Juritz, J.M., Barlow, S.M. and Wessels, J.P.H.: Accuracy of amino acid analysis of fish meals by ion-exchange and gas chromatography. *J. Sci. Food Agric.*, 47 (1989) 293-310; *C.A.*, 110 (1989) 230273k.
- 2413 Moreno, L.R., and de la Vega, P.I.: Headspace gas chromatographic analysis of sulfur dioxide in beer. *J. Am. Soc. Brew. Chem.*, 47 (1989) 6-9; *C.A.*, 110 (1989) 171705c.
- 2414 Nagaichuk, V.V., Kurganova, G.V., Bublevskii, I.M. and Belen'kaya, N.M.: (Determination of styrene). *Pishch. Prom-st. (Moscow)*, No. 2 (1989) 63-64; *C.A.*, 110 (1989) 171876j.
- 2415 Newsome, W.H. and Collins, P.: Multiresidue method for fungicide residues in fruit and vegetables. *J. Chromatogr.*, 472 (1989) 416-421.
- 2416 Nitz, S., Kollmannsberger, H. and Drawert, F.: Determination of sensorial active trace compounds by multi-dimensional gas chromatography combined with different enrichment techniques. *J. Chromatogr.*, 471 (1989) 173-185.
- 2417 Onuska, F.I. and Terry, K.A.: Quantitative high-resolution gas chromatography and mass spectrometry of toxaphene residues in fish samples. *J. Chromatogr.*, 471 (1989) 161-171.
- 2418 Pelegri, R., Beltran, V., Coscolla, R. and Cunat, P., II: (Determination of ethylenethiourea residues as an index of ethylene bisdithiocarbamate contamination in agricultural products). *Rev. Agroquim. Tecnol. Aliment.*, 28 (1988) 415-420; *C.A.*, 110 (1989) 211105r.
- 2419 Schwendig, P. and Thier, H.P.: (Identification and quantitation of methyl cellulose in the presence of natural thickeners in foods). *Z. Lebensm. Unters. Forsch.*, 188 (1989) 1-6; *C.A.*, 110 (1989) 191359w.
- 2420 Shatirishvili, I.S.: Application of correlation chromatography to the investigation of biopolymers in wines. *J. Chromatogr.*, 469 (1989) 420-423.
- 2421 Shushonova, A.F., Kutsovskaya, V.V., Skovorodina, M.V. and Makin, G.I.: (Determination of residual amounts of organotin pesticides in agricultural products by gas-liquid chromatography). *Zh. Anal. Khim.*, 44 (1989) 745-748.
- 2422 Silwar, R.: Gas chromatographic-mass spectrometric investigation of cocoa aroma. Quantitative determination of steam-volatile aroma constituents. *Cafe, Cacao, The*, 32 (1988) 243-250; *C.A.*, 110 (1989) 230424k.
- 2423 Sinnaeve, G., Godin, F., Guyot, A. and Sadini, V.: (Tracing butter by using stigmaterol). *Bull. Rech. Agron. Gembloux*, 23 (1988) 377-389; *C.A.*, 110 (1989) 230265j.
- 2424 Steinwandter, H.: Contribution to the analysis of chlorophenoxy acids I. A simple method for the determination of five chlorophenoxyalkane carboxylic acids in cereals. *Fresenius' Z. Anal. Chem.*, 334 (1989) 133-135.
- 2425 Tonogai, Y., Hasegawa, Y., Nakamura, Y., Fujino, S. and Ito, Y.: Simultaneous determination of ten kinds of organochlorine insecticides in beef by gas chromatography. *J. Food Prot.*, 52 (1989) 92-95; *C.A.*, 110 (1989) 211059d.
- 2426 Tsuzuki, H., Chikamoto, T., Adachi, T., Fujita, K. and Tokitake, M.: (Determination of chlordanes in fish and shellfish by capillary gas chromatography). *Kyoto-fu Eisei Kogai Kenkyusho Nempo*, 33 (1988) 22-29; *C.A.*, 110 (1989) 191377a.

- 2427 Van der Schee, H.A., Kennedy, W.B.H., Bouwknecht, J.P. and Hittenhausen-Gelderblom, R.: A case of cognac adulteration. *Z. Lebensm. Unters. Forsch.*, 188 (1989) 11-15; *C.A.*, 110 (1989) 171702z.
- 2428 Van Rillaer, W. and Beernaert, H.: Determination of residual bromopropylate and coumaphos and honey and honeycomb by capillary gas chromatography. *Z. Lebensm. Unters. Forsch.*, 188 (1989) 135-137; *C.A.*, 110 (1989) 211108u.
- 2429 Werkhoff, P., Bretschneider, W., Herrman, H.-J. and Schreier, K.: Fortschritte in der Aromastoffanalytik (3). *LaborPraxis*, 13 (1989) 514-518.
- 2430 Yoshizawa, K. and Takahashi, K.: (A simplified method for determination of ethyl carbamate in sake). *Nippon Jozo Kyokaiishi*, 84 (1989) 192-194; *C.A.*, 110 (1989) 210844u.

See also 2276, 2468.

## 25. ENVIRONMENTAL ANALYSIS

### 35a. General papers and reviews

- 2431 Fox, D.L.: Air pollution. *Anal. Chem.*, 61, No. 12 (1989) 1R-13R.
- 2432 Langhorst, M.L. and Coyne, L.B.: Industrial hygiene. *Anal. Chem.*, 61, No. 12 (1989) 128R-142R.
- 2433 Lindsey, A.S., Belliaro, J.J. and Wagstaffe, P.J.: Utilisation of certified reference materials in monitoring common environmental pollutants PAHs, Nitro-PAHs, PCBs. *Fresenius' Z. Anal. Chem.*, 333 (1989) 599-606 - a review with 83 refs.
- 2434 Lohleit, M. and Bächmann, K.: Potential of supercritical fluid chromatography and supercritical fluid extraction in atmospheric chemistry. *Fresenius' Z. Anal. Chem.*, 333 (1989) 717-718.
- 2435 Walling, J.F.: Membership values as indicators of complications in chromatography. *J. Chromatogr.*; 473 (1989) 267-272.

### 35b. Air pollution (complex mixtures; single compounds by cross ref. only)

- 2436 Asai, K., Goto, M., Watanabe, S. and Ishii, D.: (Simultaneous determination method for organic solvent vapor mixtures in the work place atmosphere by capillary GC following on-column cold trap preconcentration). *Bunseki Kagaku*, 38 (1989) 218-223.
- 2437 Bächmann, K., Bukatsch, H., Polzer, J. and Scharf, J.: Determination of decomposition products of chlorinated hydrocarbons. *Fresenius' Z. Anal. Chem.*, 333 (1989) 714.
- 2438 Chen Chuliang, Lin Fuyun, Zhou Qinbin, Guo Wenkui and Zhou Zikang: (Thermal desorption gas chromatography for determination of atmospheric benzene, toluene, and xylene). *Shanghai Yike Daxue Xuebao*, 15 (1988) 337-341; *C.A.*, 110 (1989) 236434k.
- 2439 Gaid, V.S. and Jedrzejczak, K.: Gas chromatographic determination of ethyl 2-cyanoacrylate in the workplace environment. *Analyst (London)*, 114 (1989) 567-569.
- 2440 Kim Man Guo, Yagawa, K., Inoue, H. and Shirai, T.: (Determination of tire treaded in urban airborne particulate matter by pyrolysis-GC with flame photometric detection). *Bunseki Kagaku*, 38 (1989) 233-238.
- 2441 Langelaan, F.C.G.M. and Nielen, M.W.F.: Determination of trace levels of chloromethyl-methylether and bis chloromethyl ether in air. *Int. J. Environ. Anal. Chem.*, 36 (1989) 27-34.
- 2442 Metcalfe, P.J.: Organolead compounds in the atmosphere. *Anal. Proc.*, 26 (1989) 134-136.
- 2443 Mitura, H.: A collecting and analysing system for the determination of chlorinated hydrocarbons in working place atmosphere. *Fresenius' Z. Anal. Chem.*, 333 (1989) 711-712.
- 2444 Morgan, E.D. and Bradley, N.: Method for analysis of dilute vapours in flue gases and working atmospheres. *J. Chromatogr.*, 468 (1989) 339-344.

- 2445 Schilhabel, J. and Lensen, K.: Identification of nitrated polycyclic hydrocarbons in diesel particulate extracts by negative ion chemical ionization and tandem mass spectrometry. *Fresenius' Z. Anal. Chem.*, 333 (1989) 800-805.

See also 2159, 2291.

35c. *Water pollution (complex mixtures; single compounds by cross ref. only)*

- 2446 Ahmed Abdul, W., Mallet, V.N. and Bertrand, M.J.: Determination of acidic herbicides and related compounds in water and soil by capillary gas chromatography using a nitrogen-phosphorus detector. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 365-367.
- 2447 Berman, S.S., Siu, K.W.M., Maxwell, P.S., Beuchamin, D. and Clancy, U.P.: Marine biological preference materials for methylmercury: analytical methodologies used in artification. *Fresenius' Z. Anal. Chem.*, 333 (1989) 641-644.
- 2448 Borra, C., Andreolini, F. and Novotny, M.: Use of capillary supercritical fluid chromatography and microcolumn liquid chromatography for the determination of nonvolatile organics in aqueous environmental samples. *Anal. Chem.*, 61 (1989) 1208-1210.
- 2449 Buchert, H., Krämer, W. and Ballschmiter, K.: The pattern of polychlorobiphenyls (PCB) in the water column of the North Atlantic. *Fresenius' Z. Anal. Chem.*, 333 (1989) 712-713.
- 2450 Choma, I., Mardarowicz, M., Surowiec, K. and Suprunowicz, Z.: (Applying solid phase extraction tube with chemically bonded phase for quantitative determination of petrol products in water by means of gas chromatography). *Chem. Anal. (Warsaw)*, 33 (1988) 437-444.
- 2451 Doering, C.E. and Schroeter, P.H.: (Studies of the enrichment and determination of trace epichlorohydrin concentrations in water). *Acta Hydrochim. Hydrobiol.*, 17 (1989) 3-8; *C.A.*, 110 (1989) 198816b.
- 2452 Gawdzik, J.: (Preconcentration of traces of organochlorine pesticides from water on small columns with chemically bonded apolar phases). *Chem. Anal. (Warsaw)*, 33 (1988) 445-456.
- 2453 Goutx, M.M.: Particulate lipid survey in the Bedford Basin (Nova Scotia) using thin-layer chromatography with flame ionization detection. Comparison of hydrocarbons data with gas chromatography analyses. *Mar. Environ. Res.*, 26 (1988) 83-95; *C.A.*, 110 (1989) 179081s.
- 2454 Huang, L.Q.: Simultaneous determination of alachlor, metolachlor, atrazine, and simazine in water and soil by isotope dilution gas chromatography/mass spectrometry. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 349-354.
- 2455 Janda, V. and van Langenhove, H.: Determination of chlorophenols in water by direct acetylation and solid-phase extraction. *J. Chromatogr.*, 472 (1989) 327-330.
- 2456 MacCarthy, P., Klusman, R.W. and Rice, J.A.: Water analysis. *Anal. Chem.*, 61 No. 12 (1989) 269R-304R.
- 2457 Maksimovich, N.P., Kruchinina, A.A., Maktaz, E.D., Botvinova, L.E. and Gubina, T.B.: (Gas chromatographic method for the determination of dicyclohexylamine phosphate and dicyclohexylamine chromate in water). *Gig. Sanit.*, No. 1 (1989) 37-38; *C.A.*, 110 (1989) 179155u.
- 2458 Patil, S.S. and Shinde, V.M.: Gas chromatographic studies on the biodegradation of nitrobenzene and 2,4-dinitrophenol in the nitrobenzene plant wastewater. *Environ. Pollut.*, 57 (1989) 235-250; *C.A.*, 110 (1989) 198563s.
- 2459 Subra, P., Hennion, M.-C. and Rosset, R.: Analyse de la matiere organique contenue dans des eaux de distribution par les methodes chromatographiques. *Analisis*, 17 (1989) 163-184.
- 2460 Thoma, J.: Analyse flüchtiger organischer Chemikalien in Trinkwasser. *LaborPraxis*, 13 (1989) 506-509.

See also 2262.

35d. *Soil pollution (complex mixtures; single compounds by cross ref. only)*

- 2461 Getzin, L.W., Cogger, C.G. and Bristow, P.R.: Simultaneous gas chromatographic determination of carbofuran, metalaxyl, and simazine in soils. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 361-364.

- 2462 Lopez-Avila, V., Milanés, J., Dodhiwala, N.S. and Beckert, W.F.: Cleanup of environmental sample extracts using Florisil solid-phase extraction cartridges. *J. Chromatogr. Sci.*, 27 (1989) 209-215.
- 2463 Onuska, F.I. and Terry, K.A.: Identification and quantitative analysis of nitrogen-containing polycyclic aromatic hydrocarbons in sediments. *J. High Resolut. Chromatogr.*, 12 (1989) 362-367.
- 2464 Onuska, F.I. and Terry, K.A.: Supercritical fluid extraction of 2,3,7,8-tetra-chlorodibenzo-*p*-dioxin from sediment samples. *J. High Resolut. Chromatogr.*, 12 (1989) 357-361.
- 2465 Tsukioka, T. and Murakami, T.: Capillary gas chromatographic-mass spectrometric determination of acid herbicides in soils and sediments. *J. Chromatogr.*, 469 (1989) 351-359.

See also 2159, 2262, 2446, 2454.

### 36. SOME TECHNICAL PRODUCTS AND COMPLEX MIXTURES

#### 36a. Surfactants

- 2466 Szymanowski, J., Kusz, P., Dziwinski, E., Szewczyk, H. and Pyzalski, K.: Degradation and analysis of polyoxyethylene monoalkyl ethers in the presence of acetyl chloride and ferric chloride. *J. Chromatogr.*, 469 (1989) 197-208.
- 2467 Ventura, F., Figueras, A., Caixach, J., Espadaler, I., Nomero, J., Guardiola, J. and Rivera, J.: Characterization of polyethoxylated surfactants and their brominated derivatives formed at the water treatment plant of Barcelona by GC/MS and FAB mass spectrometry. *Water Res.*, 22 (1988) 1211-1217; *C.A.*, 110 (1989) 101299z.

See also 2274.

#### 36b. Antioxidants and preservatives

- 2468 Smistad, G., Waaler, T. and Roksvaag, P.O.: Determination by gas-liquid chromatography of trace amounts of soft poly(vinyl chloride) plastic additives in aqueous solutions. I. Epoxidized vegetable oils. *Acta Pharm. Nord.*, 1 (1989) 1-8; *C.A.*, 110 (1989) 219223y.

See also 2312, 2318, 2470, 2474.

#### 36c. Various technical products

- 2469 Alvarez, R., Barriocanal, C., Canga, C.S., Canga, J.S., Diez, M.A., Gayol, O.M. and Miyar, E.A.: Coke oven gas control by on-line gas chromatography. *Chromatographia*, 27 (1989) 611-616.
- 2470 Amemiya, T., Ikeda, K., Kishimoto, K., Ito, K., Suzuki, S., Kan, T., Nakamura, H. and Watanabe, Y.: (Gas chromatographic method for determination of chloroxylenol used as a preservative in cosmetics). *Kenkyu Nenpo - Tokyo-toritsu Eisei Kenkyusho*, (1988) 83-86; *C.A.*, 110 (1989) 179226t.
- 2471 Anderson, D.G.: Coatings. *Anal. Chem.*, 61, No. 12 (1989) 33R-45R.
- 2472 Bates, J.W., Allinson, T. and Bal, T.S.: Capillary pyrolysis gas chromatography: a system employing a Curie point pyrolyzer and a stationary phase of intermediate polarity for the analysis of paint resins and polymers. *Forensic Sci. Int.*, 40 (1989) 25-43; *C.A.*, 110 (1989) 207329z.
- 2473 Chiavari, G., Francisco, O., Galletti, G.C., Piccaglia, R. and Zdrasil, F.: Characterization by pyrolysis-gas chromatography of wheat straw fermented with white rot fungus *Stropharia rugosoannulata*. *J. Anal. Appl. Pyrolysis*, 15 (1989) 129-136.
- 2474 Chistmann, W., Klöppel, K.D., Knoth, W., Partscht, H. and Rotard, W.: Polychlorinated dibenzodioxins/-furans, phenols and lindan with pentachlorophenol containing wood preserving materials. *Fresenius' Z. Anal. Chem.*, 333 (1989) 724-725.



- 2475 Dibben, M.J., Thomas, T.C. and Anderson, M.P.: Is benzene a problem in fuel operations? A new analytical method to overcome potential interferences in the present method. *LC-GC Int.*, 2, No. 6 (1989) 54-58.
- 2476 Glover, C.J. and Bullin, J.A.: Identification of heavy residual oils by GC and GC-MS. *J. Environ. Sci. Health*, A24 (1989) 57-75; *C.A.*, 110 (1989) 236828s.
- 2477 Greiner-Loustalot, M.F., Borthomieu, Y. and Grenier, P.: Surface of carbon fibers characterized by inverse gas chromatography. *Surf. Interface Anal.*, 14 (1989) 187-193; *C.A.*, 110 (1989) 214120c.
- 2478 Hardin, I.R. and Wang Xiao Quan: The use of pyrolysis-gas chromatography in textiles as an identification method. *Text. Chem. Color.*, 21 (1989) 29-32; *C.A.*, 110 (1989) 175012x.
- 2479 Hardt, R. and Baltes, W.: Analysis of caramel colours. Curie-point pyrolysis-high-resolution gas chromatography/mass spectrometry and simulation of pyrolysis-mass spectrometry. *J. Anal. Appl. Pyrolysis*, 15 (1989) 159-166.
- 2480 Lancas, F.M., Carrilho, E., Deane, G.H.N. and Camilo, M.C.F.: Group-type fractionation of petroleum and alternative fuels by column liquid chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 368-371.
- 2481 Liu Bo, Chen Silei and Fang Xusheng: (Indirect determination of the residual monomer level in acrylic melamine paint. II. Determination of BA in acrylic resin using chemical analysis with GC result as a reference). *Tuliao Gongye*, No. 5 (1988) 43-45; *C.A.*, 110 (1989) 232483c.
- 2482 Liu Pin, Liu Huaibin and Li Qiongyao: (Determination of the chemical composition of tires by capillary pyrolysis gas chromatography/FTIR). *Fenxi Huaxue*, 16 (1988) 801-805; *C.A.*, 110 (1989) 174907f.
- 2483 Liu Yannan, Wu Lijun, Li Xian, He Sihuang, Wang Zhongcheng, Liu Jianming and Song Anquan: (Quantitative determination of muscone and androstanes in natural musk and its injection). *Shenyang Yaoxueyuan Xuebao*, 6, No. 1 (1989) 36-40; *C.A.*, 110 (1989) 199299x.
- 2484 Matveichuk, L.S., Bakhtizina, R.Z., Kudasheva, F.K. and Berg, G.A.: (Inverse gas chromatography study of petroleum pitches). *Khim. Tverd. Topl. (Moscow)*, No. 2 (1989) 95-97; *C.A.*, 110 (1989) 234347k.
- 2485 Matyash, Y.I. and Ivakhnenko, Z.N.: (Chromatographic method for determination of silicone oil traces in gaseous helium). *Khim. Neft. Mashinostr.*, No. 6 (1988) 29-30; *C.A.*, 110 (1989) 185102r.
- 2486 McManus, T.R., Sutton, D., Thomas, J.V., Trocino, R.J., Couper, J.R., Pratt, W., Fabec, J.L., Ringen, S.G. and Lintelmann, K.A.: Petroleum. *Anal. Chem.*, 61 No. 12 (1989) 165R-191R.
- 2487 Miller, D.J. and Hawthorne, S.B.: Identification of heteroaromatic compounds in coal liquefaction and fasication products by deuterated reagent chemical ionization mass spectrometry. *Fuel*, 68 (1989) 105-110; *C.A.*, 110 (1989) 79039r.
- 2488 Nakamura, Y., Kaneko, M., Mori, K., Kan, T., Suzuki, S. and Watanabe, Y.: (Hygienic chemical studies on household necessities. XXIV. Determination of N,N-diethyl-m-toluamide, Diazinon and octachlorodipropyl ether used as mothproofing agent in commercial carpet products by gas chromatography). *Kenkyu Nonpo - Tokkyo-toritsu Eisei Kenkyusho*, No. 39 (1989) 73-77; *C.A.*, 110 (1989) 214611p.
- 2489 Palmentier, J.P.F., Britten, A.J., Charbonneau, G.M. and Karasek, F.W.: Determination of polycyclic aromatic hydrocarbons in lubricating oil base stocks using high-performance liquid chromatography and gas chromatography-mass spectrometry. *J. Chromatogr.*, 469 (1989) 241-251.
- 2490 Pattinson, S.J. and Wilkins, J.P.G.: Investigation by gas chromatography-mass spectrometry of potential contamination incurred by the use of crim-cap vial closures. *Analyst (London)*, 115 (1989) 429-434.
- 2491 Pinchugov, V.N., Buchneva, N.N. and Gul'nyashkina, T.S.: (Determination of the composition of coal-tar absorption oil by a chromatographic method). *Koks Khim.*, No. 3 (1989) 40-42; *C.A.*, 110 (1989) 234421e.
- 2492 Revel'skii, I.A., Karavaeva, V.G., Kurochkin, V.K., Bokarev, V.A., Khlebnikov, V.B., Zirko, B.I. and Kostyanovskii, R.G.: (Method for gas chromatographic analysis with increased accuracy for highly pure substances). *U.S.S.R. Pat. SU 1,441, 301 (Cl.G01N30/06)*, 30 Nov. 1988, Appl. 4,119,127, 16 Sep. 1986; *C.A.*, 110 (1989) 224779p.

- 2493 Russo, M.V.: Headspace gas chromatographic analysis for the determination of traces of ethylene oxide in sterilized materials. *Chromatographia*, 27 (1989) 469-471.
- 2494 Scheijen, M.A. and Boon, J.J.: Characterization of tobacco lignin preparations by Curie-point pyrolysis-mass spectrometry and Curie-point pyrolysis-high-resolution gas chromatography/mass spectrometry. *J. Anal. Appl. Pyrolysis*, 15 (1989) 97-120.
- 2495 Schultz, H., Wells, A.W., Frommell, E.A. and Hough, M.R.: Solid and gaseous fuels. *Anal. Chem.*, 61, No. 12 (1989) 84R-95R.
- 2496 Schulz, J.: Analysis of oxygenated compounds in motor gasoline by HRGC/FTIR/MS. *Fresenius' Z. Anal. Chem.*, 333 (1989) 759-760.
- 2497 Schwarzenbach, R. and Schmid, J.P.: Determination of N-nitrosodiethanolamine in cosmetics. High-performance liquid chromatography and gas chromatography-mass spectrometry as alternative methods to chemiluminescence detection. *J. Chromatogr.*, 472 (1989) 231-242.
- 2498 Shimono, T. and Kyogoku, Y.: Analysis of clothing materials by pyrolysis-gas chromatography. II. Analysis by pyrolysis-gas chromatography with a capillary column. *Teikoku Gakuen Kiyo*, No. 14 (1988) 21-27; *C.A.*, 110 (1989) 233029w.
- 2499 Sung, N.J. and Johnson, S.J.: Determination of the total amount sulfur in petroleum fractions by capillary gas chromatography in combination with cold trapping and a total sulfur analyzer. *J. Chromatogr.*, 468 (1989) 345-358.
- 2500 Suzuki, S., Sakai, M., Mori, K., Nakamura, Y. and Watanabe, Y.: (Gas chromatographic analysis of *n*-dodecylguanidine hydrochloride used as sanitary finishing agent in fabrics). *Eisei Kagaku*, 34 (1988) 225-230; *C.A.*, 110 (1989) 214618w.
- 2501 Thring, R.W., Chornet, E. and Overend, R.P.: Analysis of phenols from lignin depolymerization by capillary gas chromatography. *J. Chromatogr.*, 467 (1989) 441-446.
- 2502 Werkhoff, P., Bretschneider, W., Herrmann, H.-J. and Schreiber, K.: Fortschritte in der Aromaanalytik (2). Headspace-Techniken. *LaborPraxis*, 11 (1989) 426-230 - review with 43 refs.
- 2503 Xu Yaxian: (Capillary gas chromatographic analysis of the individual hydrocarbons in cat cracker gasoline boiling below-100°C). *Sepu*, 7 (1989) 88-92 - Kovats indices for 123 hydrocarbons.
- 2504 Zanozina, I.I., Diskina, D.E., Shabalina, T.N. and Vigdergauz, M.S.: (Gas-chromatographic determination of *n*-paraffins in petroleum products). *Neftepererab. Neftekhim. (Moscow)*, No. 3 (1989) 28-30; *C.A.*, 110 (1989) 196005n.

See also 2199, 2203, 2238, 2285, 2288, 2289, 2309, 2419, 2444, 2505.

36d. *Complex mixtures and unidentified compounds*

- 2505 Olson, E.S. and Diehl, J.W.: Characterization of coal liquefaction products by gas chromatography-Fourier transform infrared spectroscopy-mass spectrometry. *J. Chromatogr.*, 468 (1989) 309-317.

See also 2111, 2154, 2469, 2476.

37. CELLS, CELLULAR PARTICLES AND SUPRAMOLECULAR STRUCTURES

- 2506 Papa, G., Balbi, P. and Audisio, G.: Characterization of *Agaricales* spores by pyrolysis-capillary gas chromatography and pyrolysis gas chromatography/mass spectrometry. *J. Anal. Appl. Pyrolysis*, 15 (1989) 137-158.
- 2507 Zhu Xiangmin and Li Rongsen: (Analyses of crystal proteins from *Bacillus thuringiensis* by pyrolysis gas-liquid chromatography). *Weishengwuxue Tongbao*, 15 (1988) 200-205; *C.A.*, 110 (1989) 168004t.

See also 2215, 2218, 2225, 2230, 2238, 2257, 2263, 2280, 2473.

## 38. INORGANIC COMPOUNDS

## 38b. Anions

- 2508 Yamamoto, G., Yoshitake, K., Kimura, T. and Ando, T.: (Gas chromatographic microanalysis for fluoride using nine silyl extractants). *Koku Eisei Gakkai Zasshi*, 38 (1988) 482-483; *C.A.*, 110 (1989) 224563p.

## 38c. Permanent and rare gases

- 2509 Botter, F., Gowman, J., Hemmerich, J.L., Hircq, B., Lasser, R., Leger, D., Tistchenko, S. and Tschudin, M.: The gas chromatographic isotope separation system for the JET active gas handling plant. *Fusion Technol.*, 14, Pt. 2A (1988) 562-566; *C.A.*, 110 (1989) 181185x.
- 2510 Fuchs, P.: Fast analysis of Ar, O<sub>2</sub>, CH<sub>4</sub>, CO and CO<sub>2</sub> with capillary gas chromatography. *Fresenius' Z. Anal. Chem.*, 333 (1989) 738.
- 2511 Maroulis, P.J. and Coe, C.G.: Calcium chabazite adsorbent for the gas chromatographic separation of trace argon-oxygen mixtures. *Anal. Chem.*, 61 (1989) 1112-1117.
- 2512 Vogd, R., Ringel, H., Hackfort, H., Schober, T. and Dieker, C.: Gas chromatographic separation of hydrogen isotopes on molecular sieves. *Fusion Technol.*, 14, Pt. 2A (1988) 574-578; *C.A.*, 110 (1989) 181187z.

See also 2091, 2112, 2136, 2174.

## 38b. Volatile inorganic compounds

- 2513 Clark, P.D. and Lesage, K.L.: Quantitative determination of elemental sulfur in hydrocarbons, soils, and other materials. *J. Chromatogr. Sci.*, 27 (1989) 259-261.
- 2514 Dix, K.D., Sakkinen, P.A. and Fritz, J.S.: Gas chromatographic determination of water using 2,2-dimethoxypropane and a solid acid catalyst. *Anal. Chem.*, 61 (1989) 1325-1327.

See also 2045, 2174, 2301, 2310, 2352, 2413, 2510.

## 39. RADIOACTIVE AND OTHER ISOTOPE COMPOUNDS

- 2515 Akira, K. and Baba, S.: Radio-gas chromatography on wide-bore capillary columns equipped with a synchronized accumulating radioisotope detector. *J. Chromatogr.*, 490 (1989) 21-31.
- 2516 Hall, K., Freedman, P.A., Jumeau, E.J., Guilluy, R. and Pachiaudi, C.: Method and apparatus for the determination of isotopic composition. *Eur. Pat. Appl.* EP 306,333 (ClG01N30/84), 8 Mar. 1989, GB Appl. 87/20,586, 2 Sep. 1987; 9 pp.; *C.A.*, 110 (1989) 224659z.
- 2517 Tanase, M., Kurosawa, K., Fujie, M., Sugai, H., Okane, S. and Kato, M.: Radiogas-chromatographic determination of chemical and isotopic purity of tritium gas in tritium production. *Fusion Technol.*, 14, Pt. 2B (1988) 1090-1095; *C.A.*, 110 (1989) 204758c.

See also 2085, 2112, 2136, 2509, 2512.

## Planar Chromatography

### 1. REVIEWS AND BOOKS

- 860 Lin, R.: (Application and development of the coupling technique of catalytic kinetic analysis with chromatographic analysis). *Sepu*, 6 (1988) 212-215; *C.A.*, 110 (1989) 184944e - a review with 47 refs.
- 861 Poole, C.F.: Band broadening and the plate height equation in thin-layer chromatography. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 373-376; *C.A.*, 110 (1989) 179873b - a review with 12 refs.
- 862 Roger, L.B.: Analytical separations: two decades of explosive growth. *Am. Lab. (Fairfield)*, 20, No. 10 (1988) 29-32; *C.A.*, 110 (1989) 165094m - a review.
- 863 Smith, R.M.: *Gas and Liquid Chromatography in Analytical Chemistry*, Wiley, Chichester, 1988, XIV + 402 p.
- 864 Wilson, I.D.: Advances in instrumentalized TLC. *Methodol. Surv. Biochem. Anal.*, 18 (1988) 313-320; *C.A.*, 110 (1989) 204967v - a review with 12 refs.
- 865 Zhao, T.: (Micellar thin-layer chromatography and its applications). *Sepu*, 6 (1988) 209-211; *C.A.*, 110 (1989) 204805r - a review.

See also 866, 873-875, 879, 953, 955, 974, 989.

### 2. FUNDAMENTALS, THEORY AND GENERAL

#### 2b. Thermodynamics and theoretical relationships

- 866 Nurok, D.: Strategies for optimizing the mobile phase in planar chromatography. *Chem. Rev.*, 89 (1989) 363-375; *C.A.*, 110 (1989) 165254p - a review with 94 refs.
- 867 Poole, C.F.: Solvent migration through porous layers. *J. Planar Chromatogr.-Mod. TLC*, 2 (1989) 95-98; *C.A.*, 110 (1989) 199804h.

See also 861, 940.

### 3. GENERAL TECHNIQUES

#### 3a. Apparatus and accessories

- 868 Bolotov, S.L. and Levitskii, A.: The reconstruction effect in planar chromatography for bands applied to the dry layer. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 325-328; *C.A.*, 110 (1989) 199793d.
- 869 Wan, H.: Large-volume spotting apparatus and its application to the semi-quantitative determination of organochlorine pesticides in tea. *J. Chromatogr.*, 469 (1989) 403-405.

#### 3b. Detectors and detection reagents

- 870 Brown, G.N., Birks, J.W. and Koval, C.A.: On-plate electrochemical detection for thin-layer chromatography. *Anal. Lett.*, 22 (1989) 507-518.
- 871 De Ruig, W.G., Stephany, R.W. and Dijkstra, G.: Criteria for the detection of analytes in test samples. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 487-490.
- 872 Ling, B.L., Baeyens, W.R.G., Marysael, H. and Stragier, K.: Influence of gases on the HPTLC determination of some fluorescent fluorobenzoxadiazole-thiol derivatives. *J. High Resolut. Chromatogr.*, 12 (1989) 345-347.
- 873 Witkiewicz, Z.: Application of liquid crystals in chromatography. *J. Chromatogr.*, 466 (1989) 37-87 - a review with 274 refs.
- 874 Yeung, E.S.: Indirect detection methods: looking for what is not there. *Acc. Chem. Res.*, 22, No. 4 (1989) 125-130; *C.A.*, 110 (1989) 165255q - a review with 34 refs.

*3c. Sorbents, carriers, column and layer performance, packing procedures*

- 875 Grassini-Strazza, G., Carunchio, V. and Girelli, A.M.: Flat-bed chromatography on impregnated layers. *J. Chromatogr.*, 466 (1989) 1-35 - a review with 293 refs.
- 876 Lepri, L., Coas, V. and Desideri, P.G.: Planar chromatography of nitrogen-containing organic compounds on silica coated with ammonium tungstophosphate. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 170-173; *C.A.*, 110 (1989) 204823v.
- 877 Rozylo, J.K., Gwis-Chomicz, D. and Malinowska, I.: Chitin - a new natural stationary phase in chromatography. *Symp. Biol. Hung.*, 37 (Chromatography '87) (1988) 329-344; *C.A.*, 110 (1989) 185090k.
- 878 Wilken, J.: Laufmittelsynergismus in der Dünnschicht-Chromatographie. *Fresenius' Z. Anal. Chem.*, 333 (1989) 742.

*3d. Quantitative analysis*

- 879 Baeyens, W.R.G. and Ling, B.L.: Thin-layer chromatography applications with fluorodensitometric detection. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 198-213; *C.A.*, 110 (1989) 165251k - a review.
- 880 Walash, M.I., Salama, O.M. and Bishr, M.M.: Use of absorbance ratios in densitometric measurements for the characterization and identification of natural products of pharmacological interest. *J. Chromatogr.*, 469 (1989) 390-395.

## 4. SPECIAL TECHNIQUES

*4b. Combination of various chromatographic techniques*

- 881 Golkiewicz, W. and Markowski, W.: (A method for the determination of retention times in HPLC from TLC data). *Pr. Nauk Inst. Chem. Nieorg. Metal. Pierwiastkow Rzadkich Politech. Wroclaw*, 58 (1988) 146-149; *C.A.*, 110 (1989) 204826y.
- 882 Hofstraat, J.W., Griffioen, S., van de Nesse, R.J., Brinkman, U.A.T., Gooijer, C. and Velthorst, N.H.: Coupling of narrow-bore column liquid chromatography and thin-layer chromatography. Interface optimization and characteristics for normal-phase liquid chromatography. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 220-226; *C.A.*, 110 (1989) 185083k.

See also 866, 1010.

*4c. Combination with other physico-chemical techniques (MS, IR etc.)*

- 883 Finney, R.W. and Read, H.: Laser microprobe mass spectrometry of selected compounds directly from normal phase high-performance thin-layer plates. *J. Chromatogr.*, 471 (1989) 389-396.

*4g. Separation of enantiomers*

- 884 Brunner, C.A. and Wainer, I.: Direct stereochemical resolution of enantiomeric amides via thin-layer chromatography on a covalently bonded chiral stationary phase. *J. Chromatogr.*, 472 (1989) 277-283.
- 885 Kuhn, A.O., Lederer, M. and Sinibaldi, M.: Adsorption chromatography on cellulose. IV. Separation of D- and L-tryptophan and D- and L-methyltryptophan on cellulose with aqueous solvents. *J. Chromatogr.*, 469 (1989) 253-260.

*4h. Other special techniques*

- 886 Tyihák, E., Mincsovcics, E. and Székely, T.J.: Overpressured multi-layer chromatography. *J. Chromatogr.*, 471 (1989) 375-388.

See also 866, 893, 971, 1020.

## 5. HYDROCARBONS AND HALOGEN DERIVATIVES

5b. *Cyclic hydrocarbons*

See 873.

## 7. PHENOLS

887 Tyman, J.H.P., Johnson, R.A., Muir, M. and Rokhgar, R.: The extraction of natural cashew nut-shell liquid from the cashew nut (*Anacardium occidentale*). *J. Am. Oil Chem. Soc.*, 66 (1989) 553-557.

888 Wende, P., Bernhardt, F.-H. and Pflieger, K.: Substrate-modulated reactions of putidamonooxin. The nature of the active oxygen species formed and its reaction mechanism. *Eur. J. Biochem.*, 181 (1989) 189-197.

See also 911.

## 8. SUBSTANCES CONTAINING HETEROCYCLIC OXYGEN

8a. *Flavonoids*

889 Heimler, D. and Boddi, V.: Cluster analysis in the comparison of two-dimensional chromatograms. *J. Chromatogr.*, 466 (1989) 371-378.

See also 880.

8b. *Aflatoxins and other mycotoxins*

890 Abramson, D., Thorsteinson, T. and Forest, D.: Chromatography of mycotoxins on precoated reverse-phase thin-layer plates. *Arch. Environ. Contam. Toxicol.*, 18 (1989) 327-330; *C.A.*, 110 (1989) 191356t.

891 Bauer, S., Schindler, D. and Kroll, J.: (Standardizable test method for the determination of aflatoxin M<sub>1</sub> in milk and milk products. *Nahrung*, 33 (1989) 217-219; *C.A.*, 110 (1989) 230266k.

892 Jewers, K., John, A.E. and Blunden, G.: Assessment of mitability of the florisil and CB clean-up procedures for determining aflatoxin levels in sorghum by bidirectional HPTLC. *Chromatographia*, 27 (1989) 617-621.

8c. *Other compounds with heterocyclic oxygen (including tannins)*

893 Zogg, G.C., Nyiredy, S. and Sticher, O.: Preparative medium pressure liquid chromatographic (MPLC) and semipreparative HPLC separation of furocoumarin isomers. *Chromatographia*, 27 (1989) 591-595.

894 Zogg, G.C., Nyiredy, S. and Sticher, O.: Apiaceenwurzeln. Qualitative und quantitative Furanocoumarinbestimmung in Apiaceenwurzeln. *Dtsch. Apoth.-Ztg.*, 129 (1989) 717-722.

See also 911, 1001, 1025.

## 9. OXO COMPOUNDS, ETHERS, EPOXIDES AND QUINONES

895 Liu, Y., Wu, L., Li, X., He, S., Wang, Z., Liu, J. and Song, A.: (Quantitative determination of muscone and androstanes in natural musk and its injection). *Shenyang Yaocxueyuan Xuebao*, 6, No. 1 (1989) 36-40; *C.A.*, 110 (1989) 199299x.

896 Ma, X., Chen, Y. and Hui, R.: Analysis of anthraquinones in *Rheum Franaenbachii* Münt (Rhubarb) by thin-layer chromatography. *Chromatographia*, 27 (1989) 465-466.

See also 880, 1025.

## 10. CARBOHYDRATES

## 10a. Mono and oligosaccharides. Structural studies

- 897 Baubichon-Cortay, H., Broquet, P., George, P. and Louisot, P.: Evidence for an O-glycan sialylation system in brain. Characterization of a  $\beta$ -galactoside  $\alpha$ 2,3-sialyltransferase from rat brain regulating the expression of an  $\alpha$ -N-acetyl-galactosamine  $\alpha$ 2,6-sialyltransferase activity. *Eur. J. Biochem.*, 182 (1989) 257-265.
- 898 Cenci di Bello, I., Fleet, G., Namgoong, S.K., Tadano, K.-I. and Winchester, B.: Structure-activity relationship of swainsonine. Inhibitor of human  $\alpha$ -mannosidases by swainsonine analogues. *Biochem. J.*, 259 (1989) 855-861.
- 899 Dudkina, M.M., Kotel'nikova, N.E., Gankina, E.S., Malakhova, I.I. and Petropavlovskii, G.A.: (Determination of sugars in microcrystalline cellulose by using thin-layer chromatography). *Khim. Prir. Soedin.*, (1988) 869-870; *C.A.*, 110 (1989) 160450q.
- 900 Holst, O., Christoffel, V., Fründ, R., Moll, H. and Sumper, M.: A phosphodiester bridge between two arabinose residues as a structural element of an extracellular glycoprotein of *Volvox carterii*. *Eur. J. Biochem.*, 181 (1989) 345-350.
- 901 Pierce-Créteil, A., Decottignies, J.-P., Wieruszkeski, J.-M., Strecker, G., Montreuil, J. and Spik, G.: Primary structure of twenty three neutral and monosilylated oligosaccharides O-glycosidically linked to the human secretory immunoglobulin A hinge region determined by a combination of permethylation analysis and 400-MHz  $^1\text{H-NMR}$  spectroscopy. *Eur. J. Biochem.*, 182 (1989) 457-476.

See also 917, 961, 979.

## 10b. Polysaccharides, mucopolysaccharides, lipopolysaccharides

- 902 Morris, A.J., Dexter, T.M. and Gallagher, J.T.: Metabolic properties of a homogeneous proteoglycan of a haemopoietic stem cell line, FDCP-mix. *Biochem. J.*, 260 (1989) 479-486.

## 11. ORGANIC ACIDS AND LIPIDS

## 11a. Organic acids and simple esters

- 903 Chandrasekhara Rao, T., Kale, V., Vijayalakshmi, P., Gangadhar, A., Subbarao, R. and Lakshminarayana, G.: Chromatographic methods for the determination of monomer, dimer, and trimer fractions in dimer fatty acids. *J. Chromatogr.*, 466 (1989) 403-406.
- 904 Dabral, S.K., Singh Muktawat, K.P. and Rawat, J.P.: Ion-exchange chromatographic studies of some physiologically important organic acids on impregnated papers. *Anal. Lett.*, 22 (1989) 61-69.
- 905 Hasan, A., Waterman, P. and Iftikhar, N.: The use of new chromatographic techniques for the isolation and purification of phenolic acids from *Indigofera heterantha*. *J. Chromatogr.*, 466 (1989) 399-402.
- 906 Ishigami, Y. and Machida, H.: Vesicles from sucrose fatty acid esters. *J. Am. Oil Chem. Soc.*, 66 (1989) 599-603.
- 907 Lacave, C., Laneelle, M.-A., Daffe, M., Montrozier, H. and Laneelle, G.: Mycolic acid metabolic filiation and location in *Mycobacterium aurum* and *Mycobacterium phlei*. *Eur. J. Biochem.*, 181 (1989) 459-466.
- 908 McDonald, R.E., Armstrong, D.J. and Kreishman, G.P.: Identification of trans-diene isomers in hydrogenated soybean oil by gas chromatography, silver nitrate thin-layer chromatography, and  $^{13}\text{C}$  NMR spectroscopy. *J. Agric. Food Chem.*, 37 (1989) 637-642.
- 909 Rezanka, T., Koza, T., Kysilka, R., Viden, I. and Wurst, M.: Reversed-phase liquid chromatography for enrichment of very-long-chain fatty acids and their identification by gas chromatography-mass spectrometry. *J. Chromatogr.*, 472 (1989) 290-295.

- 910 Spaethe, S.M., Hsueh, W. and Needleman, P.: Pharmacological manipulation of inflammation in rabbit hydronephrosis: effects of a combined cyclooxygenase/lipoxygenase inhibitor ethoxyquin, a thromboxane synthase inhibitor RS-5186 and a PAF antagonist L-659,989. *J. Pharmacol. Exp. Ther.*, 248 (1989) 1308-1316.
- 911 Yoshida, T., Hatano, T. and Okuda, T.: Chromatography of tannins. IV. Separation of labile oligomeric hydrolysable tannins and related polyphenols by centrifugal partition chromatography. *J. Chromatogr.*, 467 (1989) 139-147.

See also 883, 934, 956, 965, 1025.

#### 11b. Prostaglandins

See 910.

#### 11c. Lipids and their constituents

- 912 Alban, C., Joyard, J. and Douce, R.: Comparison of glycerolipid biosynthesis in non-green plastids from sycamore (*Acer pseudoplatanus*) cells and cauliflower (*Brassica oleracea*) buds. *Biochem. J.*, 259 (1989) 775-783.
- 913 Banfic, H. and Gatalica, Z.: Plasma from uninephrectomized rats stimulates phospholipid methylation and arachidonic acid release in renal-cortical slices. *Biochem. J.*, 260 (1989) 365-369.
- 914 Chino, H., Kiyomoto, Y. and Takahashi, K.: *In vitro* study of the action of adipokinetic hormone in locusts. *J. Lipid Res.*, 30 (1989) 571-578.
- 915 Choe, H.-G., Wiegand, R.D. and Anderson, R.E.: Quantitative analysis of retina glycerolipid molecular species acetylated by acetolysis. *J. Lipid Res.*, 30 (1989) 454-457.
- 916 Chou, D.K.H., Dodd, J., Jessell, T.M., Costello, C.E. and Jungalwala, F.B.: Identification of  $\alpha$ -galactose ( $\alpha$ -fucose)-asialo-G<sub>M1</sub> glycolipid expressed by subsets of rat dorsal root ganglion neurons. *J. Biol. Chem.*, 264 (1989) 3409-3415.
- 917 DeGasperi, R., Li, Y.-T. and Li, S.-C.: Isolation and characterization of an activator protein for the hydrolysis of ganglioside G<sub>M2</sub> from the roe of striped mullet (*Mugil cephalus*). *Biochem. J.*, 260 (1989) 777-783.
- 918 Di Biase, A., Salvati, S. and Serlupi Crescenzi, G.: Analysis of brain and myelin lipids by high-performance thin layer chromatography and densitometry. *Neurochem. Res.*, 14 (1989) 153-156; *C.A.*, 110 (1989) 188687w.
- 919 Dzavadov, A.K.: (Phospholipid measurements by thin-layer chromatography followed by densitometry). *Lab. Delo*, No. 2 (1989) 28-29; *C.A.*, 110 (1989) 169557n.
- 920 Gillespie, C.S., Wilson, R., Davidson, A. and Brophy, P.J.: Characterization of a cytoskeletal matrix associated with myelin from rat brain. *Biochem. J.*, 260 (1989) 689-696.
- 921 Grubauer, G., Elias, P.M. and Feingold, K.R.: Transepidermal water loss: the signal for recovery of barrier structure and function. *J. Lipid Res.*, 30 (1989) 323-333.
- 922 Holmsen, H., Male, R., Rongved, S., Langeland, N. and Lillehaug, J.: Platelet-derived-growth-factor-stimulated heterogeneous polyphosphoinositide metabolism and phosphate uptake in C3H fibroblasts. *Biochem. J.*, 260 (1989) 589-592.
- 923 Hoskins, J.A. and Evans, C.E.: Measurement of intracellular diacylglycerols by acetylation and thin-layer chromatography. *J. Chromatogr.*, 490 (1989) 439-443.
- 924 Kam, N.T.P., Albright, E., Mathur, S.N. and Field, F.J.: Inhibition of acylcoenzyme A:cholesterol acyltransferase activity in CaCo-2 cells results in intracellular triglyceride accumulation. *J. Lipid Res.*, 30 (1989) 371-377.
- 925 Kyogashima, M., Ginsburg, V. and Krivan, H.C.: *Escherichia coli* K99 binds to N-glycolylsialoparagloboside and N-glycolyl-GM3 found in piglet small intestine. *Arch. Biochem. Biophys.*, 270 (1989) 391-397.
- 926 Minnich, A., Nordestgaard, B.G. and Zilversmit, D.B.: A novel explanation for the reduced LDL cholesterol in severe hypertriglyceridemia. *J. Lipid Res.*, 30 (1989) 347-355.
- 927 Molina, M.T., Vázquez, C.M. and Ruiz-Gutierrez, V.: Changes in both acyl-CoA:cholesterol acyltransferase activity and microsomal lipid composition in rat liver induced by distal-small-bowel resection. *Biochem. J.*, 260 (1989) 115-119.
- 928 Mukhamedova, Kh.S., Tolibaev, I. and Glushenkova, A.I.: (Purification of total phospho- and phosphonolipids from seeds of cotton and kenaf). *Khim. Prir. Soedin.*, (1988) 785-788; *C.A.*, 110 (1989) 169550e.



- 929 Múthing, J., Schwinger, B., Peter-Katalinic, J., Egge, H. and Múhlrad, P.F.: Gangliosides of murine T lymphocyte subpopulations. *Biochemistry*, 28 (1989) 2923-2929.
- 930 Pfannkuche, H.-J., Kaever, V., Gemsa, D. and Resch, K.: Regulation of prostaglandin synthesis by protein kinase C in mouse peritoneal macrophages. *Biochem. J.*, 260 (1989) 471-478.
- 931 Robinson, B.S., Yao, Z., Baisted, D.J. and Vance, D.E.: Lysophosphatidylcholine metabolism and lipoprotein secretion by cultured rat hepatocytes deficient in choline. *Biochem. J.*, 260 (1989) 207-214.
- 932 Senn, H.-J., Orth, M., Fitzke, E., Wieland, H. and Gerok, W.: Gangliosides in normal human serum. Concentration, pattern and transport by lipoproteins. *Eur. J. Biochem.*, 181 (1989) 657-662.
- 933 Steinbrecher, U.P. and Pritchard, P.H.: Hydrolysis of phosphatidylcholine during LDL oxidation is mediated by platelet-activating factor acetylhydrolase. *J. Lipid Res.*, 30 (1989) 305-315.
- 934 Street, J.M., Johnson, D.W., Singh, H. and Poulos, A.: Metabolism of saturated and polyunsaturated fatty acids by normal and Zellweger syndrome skin fibroblasts. *Biochem. J.*, 260 (1989) 647-655.
- 935 Tetaert, D., Hublart, M., Gomes, V., Boersma, A. and Degand, P.: Reversed phase HPLC of different membrane-bound variant surface glycoprotein preparations from *Trypanosoma brucei brucei*. *Biomed. Chromatogr.*, 3 (1989) 53-57.
- 936 Van Veldhoven, P.P., Foglesong, R.J. and Bell, R.M.: A facile enzymatic synthesis of sphingosine-1-phosphate and dihydrosphingosine-1-phosphate. *J. Lipid Res.*, 30 (1989) 611-616.
- 937 Xue, Y. and Wang, Y.: (Qualitative analysis of the glycolipid by the two-step-developed TLC). *Weishengwu Xuebao*, 29, No. 1 (1989) 75-77; *C.A.*, 110 (1989) 188681q.

### 13. STEROIDS

#### 13a. Pregnane and androstane derivatives

- 938 Amin, M.: Quantitative thin-layer chromatographic analysis of dehydroepiandrosterone enanthate and estradiol valerate in pharmaceutical preparations and blood. *Pharm. Ind.*, 51, No. 1 (1989) 109-112; *C.A.*, 110 (1989) 199311v.
- 939 Bawarshi-Nassar, R.N., Hussain, A.A. and Crooks, P.A.: Nasal absorption and metabolism of progesterone and 17 $\beta$ -estradiol in the rat. *Drug Metab. Disp.*, 17 (1989) 248-254.
- 940 Lamparczyk, H., Ochocka, R.J. and Zarzycki, P.: Evidence for electrostatic interactions of steroids in thin-layer chromatography. *Chromatographia*, 27 (1989) 565-568.
- 941 Metwally, M.E.S. and Honigberg, I.L.: Induced fluorescence on thin-layer chromatographic plates. I: Structure identification of fluorophores of methyl-testosterone. *J. Planar Chromatogr.-Mod. TLC*, 2 (1989) 83-85; *C.A.*, 110 (1989) 225593k.
- 942 Yu, B., Guo, X. and Tu, G.: (HPTLC determination of the androgens in musk). *Yaoux Fenxi Zazhi*, 8 (1989) 337-340; *C.A.*, 110 (1989) 198890w.

See also 895.

#### 13b. Estrogens

See 938-940.

#### 13c. Sterols

- 943 Gupta, A.K., Sexton, R.C. and Rudney, H.: Effect of vitamin D<sub>3</sub> derivatives on cholesterol synthesis and HMG-CoA reductase activity in cultured cells. *J. Lipid Res.*, 30 (1989) 379-386.
- 944 Nourooz-Zadeh, J. and Appelqvist, L.A.: Cholesterol oxides in swedish food and food ingredients: lard and bacon. *J. Am. Oil Chem. Soc.*, 66 (1989) 586-592.

- 945 Rejskova, D. and Hradec, J.: Chromatographic determination of cholesteryl esters synthesized *in vitro*. *J. Chromatogr.*, 466 (1989) 446-448.

See also 926, 927, 940.

13d. *Bile acids and alcohols*

- 946 Karlaganis, G., Bradley, S.E., Boyer, J.L., Batta, A.K., Salen, G., Eggestad, B. and Sjövall, J.: A bile alcohol sulfate as a major component in the bile of the small skate (*Raja erinacea*). *J. Lipid Res.*, 30 (1989) 317-322.

13f. *Other steroids*

- 947 Gamoh, K., Omote, K., Okamoto, N. and Takatsuto, S.: High-performance liquid chromatography of brassinosteroids in plants with derivatization using 9-phenanthreneboronic acid. *J. Chromatogr.*, 469 (1989) 424-428.

14. STEROID GLYCOSIDES AND SAPONINS

- 948 Kundu, A.K. and Sharma, A.K.: A rapid screening technique for detection of diosgenin through *in situ* cytophotometry. *Stain Technol.*, 63 (1988) 369-372; *C.A.*, 110 (1989) 199291p.
- 949 Kuwahara, N., Kawanishi, F., Komiya, T. and Oshio, H.: Dammarane saponins of *Gynostemma pentaphyllum* Makino and isolation of malonylginsenosides-Rb<sub>1</sub>, -Rd and malonylgyppenoside v. *Chem. Pharm. Bull.*, 37 (1989) 135-139.

15. TERPENES AND OTHER VOLATILE AROMATIC COMPOUNDS

15a. *Terpenes*

- 950 Beck, C.W., Smart, C.J. and Ossenkop, D.J.: Residues and linings in ancient Mediterranean transport amphoras. *Adv. Chem. Ser.*, 220 (1989) 369-380; *C.A.*, 110 (1989) 211630h.
- 951 Hitchcock, C.A., Brown, S.B., Evans, E.G.V. and Adams, D.J.: Cytochrome P-450 dependent 14-demethylation of lanosterol in *Candida albicans*. *Biochem. J.*, 260 (1989) 549-556.
- 952 Rahier, A., Taton, M. and Benveniste, P.: Cycloeucaleanol-obtusifoliol isomerase. Structural requirements for transformation or binding of substrates and inhibitors. *Eur. J. Biochem.*, 181 (1989) 615-626.

See also 880, 1024.

15c. *Bitter substances*

See 1024.

17. AMINES, AMIDES AND RELATED NITROGEN COMPOUNDS

17a. *Amines and polyamines*

- 953 Davis, B.A.: Biogenic amines and their metabolites in body fluids of normal, psychiatric and neurological subjects. *J. Chromatogr.*, 466 (1989) 89-218 - a review with 972 refs.

See also 870, 884, 886.

17b. *Catecholamines and their metabolites*

See 953.

## 17d. Other amine derivatives and amides (excluding peptides)

See 884.

## 18. AMINO ACIDS AND PEPTIDES; CHEMICAL STRUCTURE OF PROTEINS

## 18a. Amino acids and their derivatives

- 954 Duez, P., Chamart, S., Hanocq, M. and Sawadogo, M.: Determination of cucurbitin in *Cucurbita* spp. seeds by HPTLC-densitometry and HPLC. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 313-316; *C.A.*, 110 (1989) 169543e.
- 955 Lowes, S. and Rose, M.E.: Analytical procedures for determining acylcarnitines in biological fluids. *TrAC*, 8 (1989) 184-188 - a review with 54 refs.
- 956 Nagao, A. and Kito, M.: Synthesis of O-acyl-L-homoserine by lipase. *J. Am. Oil Chem. Soc.*, 66 (1989) 710-713.

See also 876, 877, 885, 886, 960.

## 18b. Peptides and peptidic and proteinous hormones

- 957 Tritsch, D., Eiler-Samama, B., Svircevic, J., Albrecht, A.-M., Brantlant, G. and Biellmann, J.-F.: 4-Chloroacetylpyridine adenine dinucleotide. A highly reactive and chromophoric affinity label of glyceraldehyde-3-phosphate dehydrogenase from sturgeon. *Eur. J. Biochem.*, 181 (1989) 215-222.

See also 876, 959.

## 18c. Elucidation of structure of proteins and enzymes

- 958 Berghem, N. and Carlsson, U.: Some new by-products in primary structure analysis with dimethylaminoazobenzene isothiocyanate as an aid in the thin-layer chromatographic identification of residues. *J. Chromatogr.*, 472 (1989) 318-320.
- 959 Kladnitskaya, G.V., Valueva, T.A., Cherednikova, T.V. and Mosolov, V.V.: (Multiple forms of the trypsin inhibitor from honey locust (*Gleditsia triacanthos* L.) seeds). *Biokhimiya (Moscow)*, 54 (1989) 593-600.
- 960 Voskoboinikova, N.E., Dunaevsky, Ya.E., Belozersky, M.A. and Rudenskaya, G.N.: (The specificity of action of buckwheat seed metalloproteinase towards protein substrates). *Biokhimiya (Moscow)*, 54 (1989) 676-680.

## 21. PURINES, PYRIMIDINES, NUCLEIC ACIDS AND THEIR CONSTITUENTS

## 21a. Purines, pyrimidines, nucleosides, nucleotides

- 961 Ram, P.A., Fung, M., Millette, C.F. and Armant, D.R.: Thin-layer chromatographic method for the determination of glycosyltransferase activity. *Anal. Biochem.*, 178 (1989) 421-426.
- 962 Trower, M.K., Buckland, R.M. and Griffin, M.: Characterization of an FMN-containing cyclohexanone monooxygenase from a cyclohexane-brown *Xanthobacter* sp. *Eur. J. Biochem.*, 181 (1989) 199-206.
- 963 Ebner, T., Meese, C.O. and Eichelbaum, M.: Thin-layer chromatographic screening test for polymorphic sparteine oxidation. *Ther. Drug Monit.*, 11 (1989) 214-216; *C.A.*, 110 (1989) 165408s.
- 964 Feng, Y. and Xu, K.: (Extraction and isolation of jatrorrhizine chloride from the mother liquor of preparation of berberine chloride). *Zhongguo Zhongyao Zazhi*, 14, No. 1 (1989) 29-30; *C.A.*, 110 (1989) 179348j.
- 965 Friedman, M., Dao, L. and Gumbmann, M.R.: Ergot alkaloid and chlorogenic acid content in different varieties of morning-glory (*Ipomoea* spp.) seeds. *J. Agric. Food Chem.*, 37 (1989) 708-712.
- 966 Kogan, M.J., Pierson, D.J., Durkin, M.M. and Willson, N.J.: Thin-layer chromatography of benzoylecgonine: a rapid qualitative method for confirming the EMIT Urine Cocaine Metabolite Assays. *J. Chromatogr.*, 490 (1989) 236-242.

- 967 Lin, N.: (Determination of sinomenine in plasma by thin-layer chromatography). *Sepu*, 7 (1989) 54-56; *C.A.*, 110 (1989) 185252q.
- 968 Pietrogrande, M.C., Dondi, F., Borea, P.A. and Bigli, C.: Retention behaviour of  $\beta$ -carbolines in normal-phase chromatography. Silica and amino phases in high-performance and thin-layer chromatography. *J. Chromatogr.*, 471 (1989) 407-420.
- 969 Sarg, T.M., El-Domiaty, M.M., Bishr, M.M., Salama, O.M. and El-Gindy, A.R.: Thin-layer chromatographic scanner, spectrophotometric and high-performance liquid chromatographic methods for the determination of colchicine. *Analyst (London)*, 114 (1989) 575-578.
- 970 Yang, S. and Li, S.: (Determination of oxymatrine in foxtail-like sophora (*Sophora alopecuroides*) by TLC-densitometry internal standard method). *Zhongcaoyao*, 19 (1988) 542-543; *C.A.*, 110 (1989) 199287s.

See also 876, 880, 978, 997.

## 23. OTHER SUBSTANCES CONTAINING HETEROCYCLIC NITROGEN

### 23a. Porphyrins and other pyrroles

- 971 Detolle, S., Postaire, E., Prognon, P., Likforman, J. and Pradeau, D.: Application of overpressured layer chromatography in drug analysis. Study of components of hematoporphyrin derivative. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 371-372; *C.A.*, 110 (1989) 160448v.
- 972 Wang, S. and Long, S.: (Chromatographic separation of components in hematoporphyrin derivatives). *Fenxi Huaxue*, 16 (1988) 769-773; *C.A.*, 110 (1989) 179588n.

### 23c. Indole derivatives

- 973 Biagi, G.L., Pietrogrande, M.C., Barbaro, A.M., Guerra, M.C., Borea, P.A. and Cantelli Forti, G.: Study of the lipophilic character of a series of  $\beta$ -carbolines. *J. Chromatogr.*, 469 (1989) 121-126.
- 974 Pavel, S.: Analysis of eumelanin-related indolic compounds. *TrAC*, 8 (1989) 177-183 - a review with 15 refs.

See also 953, 968.

### 23e. Other N-heterocyclic compounds

- 975 Bunyatyan, Yu.A. and Petrosyan, M.S.: (Quantitative analysis of pyrazole derivatives in biosphere by TLC). *U.S.S.R. Pat.* SU 1,436,065 (Cl. GO1N30/90), 07 Nov. 1988, Appl. 4,221,245, 03 Apr. 1987; *C.A.*, 110 (1989) 208930a.

See also 1020.

## 24. ORGANIC SULPHUR COMPOUNDS

- 976 Sliwiok, J., Kus, P. and Sajewicz, M.: Some data on thin-layer and high-performance liquid chromatographic separation of some dithia[3.3]phanes. *J. Chromatogr.*, 472 (1989) 314-317.

See also 872.

## 25. ORGANIC PHOSPHORUS COMPOUNDS (INCLUDING SUGAR PHOSPHATES)

- 977 Bailly, V., Sente, B. and Verly, W.G.: Bacteriophage-T4 and *Micrococcus luteus* UV endonucleases are not endonucleases but  $\beta$ -elimination and sometimes  $\beta\delta$ -elimination catalysts. *Biochem. J.*, 259 (1989) 751-759.

- 978 Kison, R., Meyer, H.E. and Schoner, W.: Characterization of a cysteine-containing peptide after affinity labelling of  $\text{Ca}^{2+}$ -ATPase of sarcoplasmic reticulum with the disulfide of 3'(2')-O-biotinyl-thioinosine triphosphate. *Eur. J. Biochem.*, 181 (1989) 503-511.
- 979 Naftalin, R.J. and Rist, R.J.: Evidence that activation of 2-deoxy-D-glycose transport in rat thymocyte suspensions results from enhanced coupling between transport and hexokinase activity. *Biochem. J.*, 260 (1989) 143-152.
- 980 Radicke, J., Hartung, J., Pommer, U. und Böhlend, H.: Einsatz der Hochleistungs-flüssigkeitschromatographie bei der Untersuchung der metallionkatalysierten Methanolyse des Phosphorsäurephenylesterdiamids. *J. Chromatogr.*, 467 (1989) 304-308.

See also 900.

## 26. ORGANOMETALLIC AND RELATED COMPOUNDS

### 26c. Coordination compounds

- 981 Ray, R.K., Bandyopadhyay, M.K. and Kauffman, G.B.: Chromatographic studies of metal complexes. V. Thin-layer chromatography of some octahedral cobalt(III) and nickel(II) complexes. *J. Chromatogr.*, 469 (1989) 383-389.
- 982 Vuckovic, G., Juranic, N., Radanovic, D.J. and Celap, M.B.: Effect of the central ion of octahedral transition metal complexes on their thin-layer chromatographic  $R_F$  values. *J. Chromatogr.*, 466 (1989) 227-232.

## 27. VITAMINS AND VARIOUS GROWTH REGULATORS (NON-PEPTIDIC)

- 983 Böhmer, A., Müller, A., Passarge, M., Liebs, P., Honeck, H. and Müller, H.-G.: A novel l-glutamate oxidase from *Streptomyces endus*. Purification and properties. *Eur. J. Biochem.*, 182 (1989) 327-332.
- 984 Klosi, R.: (Application of thin-layer chromatography on the determination of vitamin D products in solution during accelerated aging). *Rev. Mjekesore*, No. 5 (1988) 73-75; *C.A.*, 110 (1989) 179402x.
- 985 Kurfürst, M., Macheroux, P., Ghisla, S. and Hastings, J.W.: Bioluminescence emission of bacterial luciferase with 1-deaza-FMN. Evidence for the noninvolvement of N(1)-protonated flavin species as emitters. *Eur. J. Biochem.*, 181 (1989) 453-457.

## 28. ANTIBIOTICS

- 986 Dimenna, G.P., Lyon, F.S., Thompson, F.M., Creegan, J.A. and Wright, G.J.: Effect of antibiotic combination, dosing period, dose vehicle, and assay method on salinomycin residue levels and their ionophoricity in chicken tissues. *J. Agric. Food Chem.*, 37 (1989) 668-676.
- 987 Toh, Y., Yamamoto, M., Endo, H., Misumi, Y. and Ikehara, Y.: Isolation and characterization of arat liver alkaline phosphatase gene. A single gene with two promoters. *Eur. J. Biochem.*, 182 (1989) 231-237.
- 988 Van Schepdael, A.: (Identification of ampicillin esters by liquid chromatography). *Farm. Tijdschr. Belg.*, 65 (1988) 136; *C.A.*, 110 (1989) 160460t.

See also 876.

## 29. INSECTICIDES, PESTICIDES AND OTHER AGROCHEMICALS

989 Sherma, J. (Editor): *Analytical Methods for Pesticides and Plant Growth Regulators. Specific Applications*, Vol. XVI, Academic Press, N. York, 1988, 268 p.

See also 873.

*29a. Chlorinated insecticides*

990 Guirguis, M.J., Cahill, W.P. and Street, K.W., Jr.: Separation of chlordane residues from Aroclor 1248, 1254 and 1260 and soil degradation products. *Anal. Lett.*, 22 (1989) 457-467.

See also 869.

*29b. Phosphorus insecticides*

991 Barbina, T.M., de Paoli, M. and Spessotto, C.: The determination of coumaphos residues in honey by HPTLC with *in-situ* fluorimetry. *Pestic. Sci.*, 25, No. 1 (1989) 11-15; *C.A.*, 110 (1989) 171858e.

See also 869.

*29d. Herbicides*

992 Woodward, M.D., Stearns, S.M. and Lee, P.W.: Metabolic fate of cinmethylin in goat. *J. Agric. Food Chem.*, 37 (1989) 787-791.

*29e. Fungicides*

See 1017.

*29f. Other types of pesticides and various agrochemicals*

993 Christopher, R.J., Ivie, G.W., Beier, R.C. and Jenkins, W.L.: Metabolism of *cis*- and *trans*-resmethrin in laying hens. *J. Agric. Food Chem.*, 37 (1989) 800-808.

994 Khazanchi, R. and Handa, S.K.: Detection and separation of fenpropathrin, flucythrinate, fluvalinate and PP 321 by thin-layer chromatography. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 512-514.

## 30. SYNTHETIC AND NATURAL DYES

*30a. Synthetic dyes*

995 Xu, X., Kong, Z. and Bai, X.: (The identification of official food pigments in coated tablets). *Shenyang Yaowxueyuan Xuebao*, 6, No. 1 (1989) 46-78; *C.A.*, 110 (1989) 199300r.

See also 877.

## 31. PLASTICS AND THEIR INTERMEDIATES

996 Tacx, J.C.J.F. and German, A.L.: Study of the feasibility of TLC/FID (flame ionization detection) to reveal chemical composition distributions of copolymers obtained by emulsion processes. *J. Polym. Sci., Part A: Polym. Chem.*, 27 (1989) 817-827; *C.A.*, 110 (1989) 174125z.

## 32. DRUG ANALYSIS

## 32a. Drug analysis, general techniques

- 997 Jarzabinski, J. and Gryz, K.: (Application of densitometric measurements in the determination of active substances in crude drugs. XV. Preparations containing organic bases or their salts). *Acta Pol. Pharm.*, 45 (1988) 422-427; *C.A.*, 110 (1989) 199319d.

## 32b. Antirheumatics and antiinflammatory drugs

- 998 Glisovic, L., Agbaba, D., Popovic, R. and Zgradic, I.: Densitometric determination of ketoprofen in synovial fluid. *Pharmazie*, 44 (1989) 298-299.
- 999 Guneri, T. and Kirilmaz, L.: Determination of oxolamine phosphate and oxolamine citrate in syrups. *Acta Pharm. Turc.*, 30 (1988) 157-160; *C.A.*, 110 (1989) 179610p.
- 1000 Quaglia, M.G., Capitani, F., Nocilli, F. and Grande, M.: Quantitative determination of piroxicam and its impurities by HPTLC spectrodensitometry. *Pharm. Acta Helv.*, 64 (1989) 86-89; *C.A.*, 110 (1989) 199314y.

See also 884, 997, 1021.

## 32c. Autonomic and cardiovascular drugs

- 1001 Rizzo, J.D. and Davis, P.J.: Microbial models of mammalian metabolism: conversion of warfarin to 4'-hydroxywarfarin using *Cunninghamella bainieri*. *J. Pharm. Sci.*, 78 (1989) 183-189.

## 32d. Central nervous system drugs

- 1002 Cabo, J., Gamez, M.J. and Jimenez, J.: (Detection of neuroleptics in urine. I. Phenothiazines). *Ars Pharm.*, 29, No. 1 (1988) 51-56; *C.A.*, 110 (1989) 224895y.
- 1003 Cabo, J., Gamez, M.J. and Jimenez, J.: (Detection of neuroleptics in urine. II. Non-phenothiazines). *Ars Pharm.*, 29, No. 1 (1988) 67-69; *C.A.*, 110 (1989) 224896z.
- 1004 Camacho Sanchez, M.A., Sanz Saiz, M.P. and Torres Suarez, A.I.: (Determination of diazepam and its metabolites in urine samples). *Farm. Clin.*, 5 (1988) 774-782; *C.A.*, 110 (1989) 224899c.
- 1005 Dunckova, E., Cizmarik, J. and Springer, V.: (UV Spectrophotometric determination of heptacaine chloride and some of its metabolites following their separation and isolation by thin layer chromatography). *Farm. Obz.*, 58 (1989) 55-60; *C.A.*, 110 (1989) 185238q.
- 1006 Misztal, G., Przyborowski, L. and Smajkiewicz, A.: Analysis of psychotropic drugs in blood. I. Chromatographic separation and spectrophotometric determination of butyrophenones. *Chem. Anal. (Warsaw)*, 33 (1988) 149-153; *C.A.*, 110 (1989) 165401j.
- 1007 Prokof'eva, V.I., Nechaeva, E.B., Vasina, V.V., Vasil'ev, A.P. and Dashbalyn, Ts.: (Identification of 10-acyl derivatives of phenothiazine by potassium bromate oxidation in acid medium). *Farmatsiya (Moscow)*, 38, No. 1 (1989) 40-42; *C.A.*, 110 (1989) 160472y.
- 1008 Smilowski, B.: Über die Stabilität von 2-Pyrrolidinon-Derivaten. 4. Mitt.: Zur Analytik und Stabilität von Dupracetam. *Pharmazie*, 44 (1989) 272-273.
- 1009 Tomankova, H. and Vasatova, M.: Densitometrische Bestimmung von Propyphenazon, Paracetamol, Guajacolglycerinether, Coffein und Acetylsalicylsäure in analgetisch-antipyretischen Präparaten auf Dünnschichtchromatogrammen. *Pharmazie*, 44 (1989) 197-198.

See also 968, 973, 997, 1000, 1021.

## 32e. Chemotherapeutics (except cytostatics and antibiotics)

- 1010 Al-Sayegh, A.J. and Lyle, S.J.: Pyrolysis-gas chromatography of separated zones on thin-layer chromatograms. IV. Application to the determination of some sulfonamide drugs. *J. Anal. Appl. Pyrolysis*, 14 (1989) 323-330; *C.A.*, 110 (1989) 160476c.
- 1011 Bessonova, N.I., Sokolova, L.F. and Guseva, L.N.: (Production and analysis of ophthalmic drops containing sodium salts of norsulfazole and sulfapyridazine). *Farmatsiya (Moscow)*, 38, No. 1 (1989) 54-58; *C.A.*, 110 (1989) 179373p.
- 1012 Craig, J.C., Gruenke, L.D., North-Root, H. and Corbin, N.C.: Synthesis and hydrolytic behavior of the sulfate conjugate of 2'-hydroxy-3,4,4'-trichloro-carbanilide. *Drug Metab. Disp.*, 17 (1989) 345-347.
- 1013 Ertan, G., Guneri, T. and Karasulu, E.: Identification and spectrophotometric determination of nitrofurazone in urine. *Acta Pharm. Turc.*, 30 (1988) 193-197; *C.A.*, 110 (1989) 185237p.
- 1014 Jain, A.K., Gupta, V.K., Gupta, R. and Kumar, A.: TLC separation of some sulfa drugs on pyridinium tungstoarsenate impregnated layers. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 367-368; *C.A.*, 110 (1989) 160466z.
- 1015 Nakano, M., Nakajima, Y., Iwatani, K., Ikenishi, Y., Nakagawa, Y. and Sugeno, K.: Metabolism of the antimycotic agent, croconazole, in rabbits. *Drug Metab. Disp.*, 17 (1989) 323-329.
- 1016 Owoyale, J.A. and Elmarakby, Z.S.: Effect of sunlight, ultraviolet irradiation and heat on proguanil. *Int. J. Pharm.*, 50 (1989) 219-221; *C.A.*, 110 (1989) 179399b.
- 1017 Reuvers, T.B.A., Ortiz, G., Ramos, M. and de Pozuelo, M.M.: Rapid high-performance liquid chromatographic method for the determination of bencetonium chloride residues in fish products; confirmation by thin-layer chromatography. *J. Chromatogr.*, 467 (1989) 321-326.
- 1018 Taguchi, S. and Fukushima, S.: (Studies on the rapid detection of sulfa drugs in swine meat by HPTLC (high-performance thin-layer chromatography)). *Osaka-Furitsu Koshu Eisei Kenkyusho Kenkyu Hokoku, Shokuhin Eisei Hen*, 19 (1988) 47-49; *C.A.*, 110 (1989) 230261e.

## 32f. Cytostatics

- 1019 Schwaller, M.-A., Aubard, J., Auclair, C., Paoletti, C. and Dodin, G.: The GC base-pair preference of 2-N-methyl-9-hydroxyellipticinium. *Eur. J. Biochem.*, 181 (1989) 129-134.

## 32g. Other drug categories

- 1020 Kovacs-Hadany, K. and Kovacs, A.: Reversed-phase chromatography of novel biologically effective aminoacridine-N-glycosides by OPLC. *J. Chromatogr. Sci.*, 27 (1989) 221-224.

See also 1021.

## 32h. Toxicological and forensic applications

See 1022, 1032.

## 32i. Plant extracts

- 1021 By, A., Ethier, J.C., Lauriault, G., LeBelle, M., Lodge, B.A., Savard, C., Sy, W.W. and Wilson, W.L.: Traditional oriental medicines. I. Black Pearl: identification and chromatographic determination of some undeclared medicinal ingredients. *J. Chromatogr.*, 469 (1989) 406-411.
- 1022 Dextraze, P., Griffiths, W.C., Camara, P., Audette, L. and Rosner, M.: Comparison of fluorescence polarization immunoassay, enzyme immunoassay, and thin-layer chromatography for urine cannabinoid screening. Effects of analyte adsorption and vigorous mixing of specimen on detectability. *Ann. Clin. Lab. Sci.*, 19 (1989) 133-138; *C.A.*, 110 (1989) 187396p.



- 1023 Solov'eva, A.G., Petukhova, T.V. and Greshnykh, R.D.: (Analysis and standardization of *Eleutherococcus* roots and rhizomes and liquid extracts according to the content of biologically active compounds). *Farmatsiya (Moscow)*, 38, No. 1 (1989) 25-27; *C.A.*, 110 (1989) 199285q.
- 1024 Wang, Y. and Lou, Z.: (TLC identification of Chinese traditional drug "Qinjiu", roots of *Gentiana macrophylla* and allied species). *Yaowu Fenxi Zazhi*, 8 (1988) 348-349; *C.A.*, 110 (1989) 160443q.
- 1025 Zhang, Q.W. and Zhang, Y.Z.: (Determination of choleric constituents in *Artemisia scoparia* Waldst. et Kit. by TLC-densitometry). *Yaoxue Xuebao*, 24 No. 1 (1989) 43-47; *C.A.*, 110 (1989) 179600k.

See also 880, 947.

### 33. CLINICO-CHEMICAL APPLICATIONS

33b. *Complex mixtures and profiling (single compounds by cross ref. only)*

See 898, 955, 974.

### 34. FOOD ANALYSIS

34b. *Complex mixtures (single compounds by cross ref. only)*

See 944, 1018, 1033.

### 35. ENVIRONMENTAL ANALYSIS

35b. *Air pollution (complex mixtures; single compounds by cross ref. only)*

See 975.

35c. *Water pollution (complex mixtures; single compounds by cross ref. only)*

See 1028.

35d. *Soil pollution (complex mixtures; single compounds by cross ref. only)*

See 990.

### 36. SOME TECHNICAL PRODUCTS AND COMPLEX MIXTURES

36a. *Surfactants*

See 883, 1017.

36b. *Antioxidants and preservatives*

- 1026 Porter, W.L., Black, E.D. and Drolet, A.M.: Use of polyamide oxidative fluorescence test on lipid emulsions: contrast in relative effectiveness of antioxidants in bulk versus dispersed systems. *J. Agric. Food Chem.*, 37 (1989) 615-624.

## 38. INORGANIC COMPOUNDS

## 38a. Cations

- 1027 Bardin, V.V., Krauklish, I.V., Leont'eva, L.B., Mokhov, A.A. and Tselinskii, I.V.: (Method for determination of aluminium and manganese in mixtures by paper chromatography). *U.S.S.R. Pat.* SU 1,453,323 (Cl. GO1N30/90), 23 Jan. 1989, Appl. 4,241,322, 17 Mar. 1987; *C.A.*, 110 (1989) 204802n.
- 1028 Kataeva, S.E. and Arkhipenko, L.S.: (Comparative assessment of two procedures for lead determination in water). *Gig. Sanit.*, No. 2 (1989) 52-53; *C.A.*, 110 (1989) 160103d.
- 1029 Ma Guozhong: (Determination of gold, antimony, selenium, arsenic, thallium, and bismuth in rocks and minerals by paper chromatography). *Sepu*, 6 (1988) 251-252; *C.A.*, 110 (1989) 165226f.
- 1030 Ren, S., Hu, Z., Jia, X. and Zheng, J.: (Thin-layer chromatographic separation of noble metals). *Sepu*, 6 (1988) 253-254; *C.A.*, 110 (1989) 184969s.
- 1031 Wang, J. and Hu, Z.: (Study of mono(2-ethylhexyl)phosphate system in thin-layer chromatographic separation of rare earth elements). *Fenzi Huaxue*, 16 (1988) 740-745; *C.A.*, 110 (1989) 104690z.

See also 981, 982.

## 38b. Anions

- 1032 Bhagyalakshmi, K. and Kumar, N.V.N.: Simple, rapid, and portable chromatographic tetrazolium reduction method for detection of potassium cyanide in medicinal drugs and confectionery. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 429-431.
- 1033 Volynets, M.P. and Dubrova, T.V.: (Rapid determination of nitrate ions in vegetable juices by using thin-layer chromatography). *Zh. Anal. Khim.*, 44 (1989) 320-323; *C.A.*, 110 (1989) 211062z.

## 39. RADIOACTIVE AND OTHER ISOTOPE COMPOUNDS

- 1034 Lucher, L.A. and Lego, T.: Use of the water-soluble fluor sodium salicylate for fluorographic detection of tritium in thin-layer chromatograms and nitro-cellulose blots. *Anal. Biochem.*, 178 (1989) 327-330.
- 1035 Potapova, Z.M., Krylova, A.Yu. and Kharlamov, V.T.: (Reduction of sodium pertechnetate-<sup>99</sup>Tc by stannous chloride). *Khim.-Farm. Zh.*, 23 (1989) 243-245; *C.A.*, 110 (1989) 179635a.

See also 923.

## Electrophoresis

### 1. REVIEWS AND BOOKS

- 1635 Chrambach, A., Dunn, M.J. and Radola, B.J. (Editors): *Advances in Electrophoresis*, Vol. 2. VCH, Weinheim, 1988, 456 p.; *C.A.*, 110 (1989) 219725p.
- 1636 Roger, L.B.: Analytical separations: two decades of explosive growth. *Am. Lab. (Fairfield)*, 20 (1988) 29-32; *C.A.*, 110 (1989) 165094m - a review with 7 refs.

See also 1642, 1657, 1660, 1713, 2091.

### 2. FUNDAMENTALS, THEORY AND GENERAL

#### 2a. General

- 1637 Cherbit, G., Albayaty, N. and Vekhoff, H.: Laser modification of the electrophoretic mobility. *Inst. Phys. Conf. Ser.*, 94 (Reson. Ioniz. Spectrosc. 1988) (1989) 319-322; *C.A.*, 110 (1989) 169747z.
- 1638 Clifton, M.J. and Marsal, O.: Heat transfer design of an electrophoresis experiment. *Acta Astronaut.*, 19 (1989) 99-103; *C.A.*, 110 (1989) 219670s.
- 1639 Wronski, M.: Influence of the cellulose content of cellulose gels on the electrophoretic mobility. *J. Chromatogr.*, 469 (1989) 378-382.

See also 1636.

#### 2b. Thermodynamics and theoretical relationships

- 1640 Mishchuk, N.A., Babich, Ya.A. and Baran, A.A.: (The second-order electrophoresis of ion-exchange fibers). *Ukr. Khim. Zh.*, 54 (1988) 1273-1277; *C.A.*, 110 (1989) 199800d.
- 1641 Rhodes, P.H., Snyder, R.S. and Roberts, G.O.: Electrohydrodynamic distortion of sample streams in continuous flow electrophoresis. *J. Colloid Interface Sci.*, 129 (1989) 78-90; *C.A.*, 110 (1989) 160910q.

See also 1670, 1682.

#### 2d. Measurement of physico chemical and related values

- 1642 Pospichal, J., Gebauer, P. and Bocek, P.: Measurement of mobilities and dissociation constant by capillary isotachopheresis. *Chem. Rev.*, 89 (1989) 419-430; *C.A.*, 110 (1989) 165098r - a review with with 35 refs.
- 1643 Zhu, A. and Liu, J.: (Measurement of electroendosmosis in capillary zone electrophoresis (CZEP).) *Fenxi Huaxue*, 16 (1988) 17-20; *C.A.*, 110 (1989) 165259u.

See also 2143.

### 3. GENERAL TECHNIQUES

#### 3a. Apparatus and accessories

- 1644 Bellomy, G.R. and Record, M.T., Jr.: A method for horizontal polyacrylamide slab gel electrophoresis. *BioTechniques*, 7 (1989) 16-21; *C.A.*, 110 (1989) 169657v.

- 1645 Danby, P.C., Danby, H.C. and Hungerman, E.R.: (Gel-electrophoresis system). *Ger. Offen. Pat.* DE 3,814,278 (Cl. B01D57/02), 10 Nov. 1988, US Appl. 43,212, 27 Apr. 1987; 20 pp.; *C.A.*, 110 (1989) 199836v.
- 1646 Guevara, J.G., Jr.: (Gel electrophoresis apparatus). *Ger. Offen. Pat.* DE 3,726,403 (Cl. B01D57/02), 18 Feb. 1988, US Appl. 894,886, 08 Aug. 1986, 11 pp.; *C.A.*, 110 (1989) 208908z.
- 1647 Hellman, R.R., Jr.: Locable, rotating electrophoresis device. *U.S. Pat.* US 4,800,010 (Cl. 204-299R; G01N27/26), 24 Jan. 1989, Appl. 187,117, 28 Apr. 1988; 18 pp.; *C.A.*, 110 (1989) 199837w.
- 1648 Hellman, R.R., Jr.: Gel plate assembly for electrophoresis. *U.S. Pat.* US 4,802,969 (Cl. 204-299R; G01N27/26), 07 Feb. 1989, Appl. 187,668, 28 Apr. 1988; 9 pp.; *C.A.*, 110 (1989) 224761b.
- 1649 Imai, K., Tokinaga, D., Kobayashi, T., Yasuda, K., Nagai, K. and Takahashi, S.: (Apparatus for immunoelectrophoresis and its use for antigen determination). *Jpn Kokai Tokkyo Koho Pat.* JP 63,118,660 (88,118,660) (Cl. G01N33/561), 23 May 1988, Appl. 86/264,056, 07 Nov. 1986, 4 pp.; *C.A.*, 110 (1989) 188912r.
- 1650 Jordan, B., Emelina, R., Cagna, A. and Lauguin, G.: Method and apparatus for the electrophoresis of very big macromolecules. *Eur. Pat. Appl.* EP 307,332 (Cl. G01N27/26), 15 Mar. 1989, FR Appl. 87/12,470, 07 Sep. 1987; 7 pp.; *C.A.*, 110 (1989) 180065w.
- 1651 Kessler, R., Manz, H.J. and Szekely, G.: Use of free-flow electrophoresis for the purification of components separated by ion-pair chromatography. *J. Chromatogr.*, 469 (1989) 444-447.
- 1652 Martsulevich, N.A., Gomolitskii, V.N., Chesnokov, Yu.G. and Smirnov, N.N.: (Hydrodynamics of membrane apparatus with hollow fibers). *Zh. Prikl. Khim. (Leningrad)*, 62 (1989) 578-580; *C.A.*, 110 (1989) 195530r.
- 1653 Paas-link, A.: (Arrangement and method for liquid-free electrophoresis). *Ger. Offen. Pat.* DE 3,713,473 (Cl. B01D57/02), 10 Nov. 1988, Appl. 22 Apr. 1987, 4 pp.; *C.A.*, 110 (1989) 188932x.
- 1654 Sarrine, R.J., Garsee, H.A., Kelley, C.D. and Guadagno, P.A.: Automatic electrophoresis apparatus and method. *U.S. Pat.* US 4,810,348 (204-299R; G01N27/28), 07 Mar. 1989, Appl. 26,465, 16 Mar. 1987; 33 pp.; *C.A.*, 110 (1989) 224771e.
- 1655 Sohn, C.H., Blessum, C.R. and Gage, S.C.: Cooled cell for electrophoresis. *PCT Int. Appl. Pat.* WO 89 00, 688 (Cl. G01N27/26), 26 Jan. 1989, US Appl. 74,743, 17 Jul. 1987; 19 pp.; *C.A.*, 110 (1989) 224765f.
- 1656 Ziegler, A. and Geiger, K.H.: (Apparatus and method for electrophoretic separation of macromolecules). *Ger. Pat.* DE 3,715,170 (Cl. B01D57/02), 21 Jul. 1988, Appl. 07 May 1987, 6 pp.; *C.A.*, 110 (1989) 188931w.

See also 1661, 2065, 2102.

### 3b. Detection procedures and detectors

- 1657 Dovichi, N.J.: Pushing back the limits of detection. *Chem. Br.*, 24 (1988) 895-898; *C.A.*, 110 (1989) 204647r - a review with 19 refs.
- 1658 Foret, F., Fanali, S., Ossicini, L. and Bocek, P.: Indirect photometric detection in capillary zone electrophoresis. *J. Chromatogr.*, 470 (1989) 299-308.
- 1659 Splittherber, A.G. and Sohl, J.: Nonlinearity in protein assays by the Coomassie Blue dye-binding method. *Anal. Biochem.*, 179 (1989) 198-201.
- 1660 Yeung, E.S.: Indirect detection methods: looking for what is not there. *Acc. Chem. Res.*, 22 (1989) 125-130; *C.A.*, 110 (1989) 165255q - a review with 34 refs.

See also 1742, 1756, 1861, 1963, 1985, 2159.

### 3c. Electrophoresis in stabilized media

- 1661 Hurd, S.M. and Kouri, R.F.: Method and apparatus for molding thin gel electrophoresis slabs horizontally with integrally molded large volume sample wells. *U.S. Pat.* US 4,795,541 (Cl. 204-299R; G01N27/28), 03 Jan. 1989, Appl. 51,761, 20 May 1987, 7 pp.; *C.A.*, 110 (1989) 188933y.

- 1662 Lazareva, T.G., Savastenko, G.N., Vishnyakova, Z.P. and Ermolenko, I.N.: (Film medium for electrophoretic analysis). *U.S.S.R. Pat.* SU 1,453,304 (Cl. G01N27/56), 23 Jan. 1989, Appl. 4,266,787, 23 Jun. 1987; *C.A.*, 110 (1989) 204784h.
- 1663 Tezuka, S.: Method of making electrophoresis sheet. *U.S. Pat.* US 4,810,341 (Cl. 204-182.8; G01N27/28), 07 Mar. 1989, JP Appl. 86/63,373, 20 Mar. 1986; 9 pp.; *C.A.*, 110 (1989) 224772f.
- 1664 Vecherau, A.: Transparency of nitrocellulose membranes with Triton X-114. *Electrophoresis (Weinheim)*, 10 (1989) 524-527.

See also 1760.

#### 4. SPECIAL TECHNIQUES

##### 4a. Combination of electrophoretic techniques with chromatography

See 1755.

##### 4b. Preparative and continuous procedures

See 1742.

##### 4c. Isoelectric focusing

- 1665 Ambler, J.: Isoelectric focusing on cellulose acetate membranes: An up-date on materials and methods. *Electrophoresis (Weinheim)*, 10 (1989) 520-523.
- 1666 Bier, M., Twitty, G.E. and Sloan, J.E.: Recycling isoelectric focusing and isotachopheresis. *J. Chromatogr.*, 470 (1989) 369-376.
- 1667 Klein, H. and Stiefel, K.: Repel-Silane induced alteration of group specific component subtypes using LKB Immobiline Dry Plates. *Electrophoresis (Weinheim)*, 10 (1989) 537.
- 1668 Kobayashi, S.: (Agarose gel isoelectric focusing. Electroendosmotic liquid flow in agarose gel). *Seibutsu Butsuri Kagaku*, 33 (1989) 1-7; *C.A.*, 110 (1989) 208627g.

See also 1694, 1697, 1717, 1751, 1865, 1897, 1953, 1979.

##### 4d. Isotachopheresis

- 1669 Acevedo, F.: Isotachopheresis of proteins. *J. Chromatogr.*, 470 (1989) 407-414.
- 1670 Beckers, J.L. and Everaerts, F.M.: Determination of the specific zone resistance and calculation of the response factor in isotachopheresis. *J. Chromatogr.*, 470 (1989) 277-287.
- 1671 Gebauer, P., Krivankova, L. and Bocek, P.: Inverse electrolyte systems in isotachopheresis. Impact of the terminating electrolyte on the migrating zones in cationic analysis. *J. Chromatogr.*, 470 (1989) 3-20.
- 1672 Hirokawa, T., Nakahara, K. and Kiso, Y.: Separation process in isotachopheresis. III. Transient state models for a three-component system. *J. Chromatogr.*, 470 (1989) 21-41.
- 1673 Jelinek, I., Smopek, J., Dian, J. and Smolkova-Keulemansova, E.: Concept of effective and non-effective inclusion complex formation in isotachopheresis. *J. Chromatogr.*, 470 (1989) 113-121.
- 1674 Jokl, V., Vitkovic, B. and Polasek, M.: Phase-heterogeneous zones in capillary isotachopheresis of low-solubility bases. *J. Chromatogr.*, 470 (1989) 263-275.
- 1675 Kaniansky, D., Marak, J., Rajec, P., Svec, A., Koval, M., Lucka, M. and Sabanos, G.: On-column radiometric detector for capillary isotachopheresis and its use in the analysis of <sup>14</sup>C-labelled constituents. *J. Chromatogr.*, 470 (1989) 139-153.
- 1676 Wanders, B.J., Lemmens, A.A.G., Everaerts, F.M. and Gladdines, M.M.: Data acquisition in capillary isotachopheresis. *J. Chromatogr.*, 470 (1989) 79-88.

See also 1642, 1666, 1684, 1710, 1711, 1730, 1737, 1738, 1743, 1763, 2036, 2140, 2141, 2144, 2146, 2149, 2158, 2159, 2160.

*4e. Two dimensional electrophoresis*

- 1677 Garrels, J.I.: The QUEST system for quantitative analysis of two-dimensional gels. *J. Biol. Chem.*, 264 (1989) 5269-5282.
- 1678 Garrels, J.I. and Franza, B.R., Jr.: The REF52 protein database. Methods of database construction and analysis using the QUEST system and characterizations of protein patterns from proliferating and quiescent REF52 cells. *J. Biol. Chem.*, 264 (1989) 5283-5298.
- 1679 Snopek, J., Jelinek, I. and Smolkova-Keulemansova, E.: Use of cyclodextrins in isotachopheresis. VIII. Two-dimensional chiral separation in isotachopheresis. *J. Chromatogr.*, 472 (1989) 308-313.
- See also 1692, 1732, 1778, 1782, 1784, 1785, 1793, 1816, 1829, 1855, 1857, 1858, 1863, 1896, 1907-1909.

*4g. Other special techniques*

- 1680 Bocek, P., Deml, M., Pospichal, J. and Sudor, J.: Dynamic programming of pH - a new option in analytical capillary electrophoresis. *J. Chromatogr.*, 470 (1989) 309-312.
- 1681 Chmelik, J. and Janca, J.: (Isoelectric focusing field-flow fractionations - a new method of separation of amphoteric compounds). *Chem. Listy*, 83 (1989) 321-325; *C.A.*, 110 (1989) 188765v.
- 1682 Gas, B., Zuska, J. and Vacik, J.: Measurement of limiting mobilities by capillary isotachopheresis with a constant temperature at the site of detection. *J. Chromatogr.*, 470 (1989) 69-78.
- 1683 Kennidler, E.: (Trends in electromigration methods: High-performance electrophoresis in capillaries). *Oesterr. Chem. Z.*, 89 (1988) 353-358; *C.A.*, 110 (1989) 169483k.
- 1684 Pospichal, J., Deml, M., Gebauer, P. and Bocek, P.: Generation of operational electrolytes for isotachopheresis and capillary zone electrophoresis in a three-pole column. *J. Chromatogr.*, 470 (1989) 43-55.
- 1685 Van de Goor, A.A.A.M., Wanders, B.J. and Everaerts, F.: Modified methods for off- and on-line determination of electroosmosis in capillary electrophoretic separations. *J. Chromatogr.*, 470 (1989) 95-104.
- 1686 Wanders, B.J., van de Goor, A.A.A.M. and Everaerts, F.M.: Methods for on-line determination and control of electroendosmosis in capillary electrochromatography and electrophoresis. *J. Chromatogr.*, 470 (1989) 89-93.
- See also 1658, 1679, 1731, 1734, 1735, 1740, 1746, 1758, 1759, 1766, 2077, 2137, 2155.

## 9. OXO COMPOUNDS, ETHERS, EPOXIDES AND QUINONES

See 2135.

## 10. CARBOHYDRATES

*10a. Mono and oligosaccharides. Structural studies*

- 1687 Gowda, D.C., Margolis, R.U. and Margolis, R.K.: Presence of the HNK-1 epitope on poly(N-acetyllactosaminyl)oligosaccharides and identification of multiple core proteins in the chondroitin sulfate proteoglycans of brain. *Biochemistry*, 28 (1989) 4468-4474.
- 1688 Saku, T. and Furthmayr, H.: Characterization of the major heparan sulfate proteoglycan secreted by bovine aortic endothelial cells in culture. Homology to the large molecular weight molecule of basement membranes. *J. Biol. Chem.*, 264 (1989) 3514-3523.

## 10b. Polysaccharides, mucopolysaccharides, lipopolysaccharides

- 1689 Kutsch, H. and Schleich, C.: Improved colorimetric determination of high-molecular weight hyaluronic acid from synovial fluids. *Fresenius' Z. Anal. Chem.*, 333 (1989) 810-817.

## 10c. Glycoproteins and their components

- 1690 Arnaud, P., Miribel, L. and Emerson, D.L.:  $\alpha_2$ -HS glycoprotein. *Methods Enzymol.*, 163 (Immunochem. Tech., Pt. M) (1988) 431-441; *C.A.*, 110 (1989) 188858c.
- 1691 Arnaud, P., Miribel, L. and Roux, A.F.:  $\alpha_1$ -Acid glycoprotein. *Methods Enzymol.*, 163 (Immunochem. Tech., Pt. M) (1988) 418-430; *C.A.*, 110 (1989) 188857b.
- 1692 Benjamin, T., Niu, C.-H., Parmelee, D.C., Huggett, A.C., Yu, B., Roller, P.P. and Thorgeirsson, S.S.: Direct N-terminal sequence analysis of rat liver plasma membrane glycoproteins separated by two-dimensional polyacrylamide gel electrophoresis. *Electrophoresis (Weinheim)*, 10 (1989) 447-455.
- 1693 Bienz, D. and Clemetson, K.J.: Human platelet glycoprotein Ia. One component is only expressed on the surface of activated platelets and may be a granule constituent. *J. Biol. Chem.*, 264 (1989) 507-514.
- 1694 Emelyanova, O.Yu., Berzhets, V.M., Padyukov, L.N., Sipitsyna, N.E., Taranov, V.A. and Koryakin, E.V.: (Use of isoelectrofocusing for the study of the composition of tick allergens). *Zh. Mikrobiol., Epidemiol. Immunobiol.*, (1989) 89-92; *C.A.*, 110 (1989) 190588h.
- 1695 Heino, J., Ignotz, R.A., Hemler, M.E., Crouse, C. and Massague, J.: Regulation of cell adhesion receptors by transforming growth factor- $\beta$ . Concomitant regulation of integrins that share a common  $\beta_1$  subunit. *J. Biol. Chem.*, 264 (1989) 380-388.
- 1696 Kawashima, H., Tomaru, A., Yamamoto, K., Tsuji, T. and Osawa, T.: Monoclonal antibodies against human platelet membrane glycoprotein IIIa and collagen-induced platelet activation. *Chem. Pharm. Bull.*, 37 (1989) 397-403.
- 1697 Lopez-Rodriguez, I., Montiel, M., Carracedo, A., Rodriguez-Calvo, M., Lareu, M. and Concheiro, L.: Determination of orosomuroid phenotypes by hydrid isoelectric focusing. *J.-Can. Soc. Forensic Sci.*, 21 (1988) 209-212; *C.A.*, 110 (1989) 207-334x.
- 1698 Mantle, M. and Stewart, G.: Intestinal mucins from normal subjects and patients with cystic fibrosis. Variable contents of the disulphide-bound 118 kDa glycoprotein and different reactivities with an anti-(118 kDa glycoprotein) antibody. *Biochem. J.*, 259 (1989) 243-253.
- 1699 Pesanti, E.L. and Shanley, J.D.: Glycoproteins of *Pneumocystis carinii*: characterization by electrophoresis and microscopy. *J. Infect. Dis.*, 158 (1988) 1353-1359; *C.A.*, 110 (1989) 169739y.
- 1700 Ring, D.B., Kassel, J.A., Hsieh-Ma, S.T., Bjorn, M.J., Tringale, F., Eaton, A.M., Reid, S.A., Frankel, A.E. and Nadji, M.: Distribution and physical properties of BCA200, a  $M_r$  200,000 glycoprotein selectively associated with breast cancer. *Cancer Res.*, 49 (1989) 3070-3080.
- 1701 Robinson, L.K., Murrah, V.A., Moyer, M.P. and Rohrbach, D.H.: Characterization of a novel glycoprotein isolated from the basement membrane matrix of the Engelbreth-Holm-Swarm tumor. *J. Biol. Chem.*, 264 (1989) 5141-5147.
- 1702 Sandoval, I.V., Chen, J.W., Yuan, L. and August, J.T.: Lysosomal integral membrane glycoproteins are expressed at high levels in the inclusion bodies of I-cell disease fibroblasts. *Arch. Biochem. Biophys.*, 271 (1989) 157-167.
- 1703 Santoro, S.A. and Lawing, W.J., Jr.: Modulation of an RGDS binding site on the platelet membrane glycoprotein IIb-IIIa complex. *Biochem. Biophys. Res. Commun.*, 160 (1989) 189-195.
- 1704 Stöcker, G., Lückge, J., Greiling, H. and Wägener, C.: Characterization of biotin-labeled proteoglycans by electrophoretic separation on minigels and blotting onto nylon membranes prior and after enzymatic digestion. *Anal. Biochem.*, 179 (1989) 245-250.
- 1705 Taketa, K.: (Application of lectin affinity electrophoresis to analysis of altered sugar chains under pathological conditions). *Rinsho Byori, Rinji Zokan*, (1988) 140-148; *C.A.*, 110 (1989) 169440u.
- 1706 Thompson, K. and Winters, R.: Biochemical analysis of exposed surface glycoproteins of murine mammary epithelial cells. *Biochem. Arch.*, 5 (1989) 19-30; *C.A.*, 110 (1989) 208872h.

- 1707 Wukui, H., Kobayashi, R., Itoh, H., Imai, H., Nakamoto, Y. and Miura, A.B.: High-yield purification of the complex-forming glycoprotein in urine from normal and abnormal subjects. *Clin. Chem. (Winston-Salem)*, 35 (1989) 577-581.
- 1708 Yeo, T.-K., Yeo, K.-T. and Olden, K.: Accumulation of unglycosylated liver secretory glycoproteins in the rough endoplasmic reticulum. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1421-1428.
- 1709 Yoshida, J., Takamura, S. and Suzuki, S.: A simplified method for purification of an antitumor acidic glycoprotein from *Streptococcus pyogenes* (Su strain) by immunoadsorbent chromatography. *J. Antibiot.*, 42 (1989) 448-453.

See also 1853, 1911.

## 11. ORGANIC ACIDS AND LIPIDS

### 11a. Organic acids and simple esters

- 1710 Hutta, M., Simunicova, E., Kaniansky, D., Tkacova, J. and Brtko, J.: Isotachophoretic determination of short-chain fatty acids in drinking water after solid-phase extraction with a carbonaceous sorbent. *J. Chromatogr.*, 470 (1989) 223-233.
- 1711 Kennidler, E., Schwer, C. and Jenner, P.: Isotachopheresis in mixed solvents consisting of water, methanol and dimethyl sulphoxide. III. Influence of the solvent composition on the dissociation constants and mobilities of non- and hydroxy-substituted aliphatic carboxylic acids. *J. Chromatogr.*, 470 (1989) 57-68.

See also 1658.

### 11d. Lipoproteins and their constituents

- 1712 Abbey, M. and Calvert, G.D.: Effects of blocking plasma lipid transfer protein activity in the rabbit. *Biochim. Biophys. Acta*, 1003 (1989) 20-29.
- 1713 Babin, P.J. and Vernier, J.-M.: Plasma lipoproteins in fish. *J. Lipid Res.*, 30 (1989) 467-489.
- 1714 Cheung, M.C. and Wolf, A.C.: *In vitro* transformation of apoA-I-containing lipoprotein subpopulations: role of lecithin: cholesterol acyltransferase and apoB-containing lipoproteins. *J. Lipid Res.*, 30 (1989) 449-509.
- 1715 Chino, H., Kiyomoto, Y. and Takahashi, K.: *In vitro* study of the action of adipokinetic hormone in locusts. *J. Lipid Res.*, 30 (1989) 571-578.
- 1716 Dawson, P.A., Lukaszewski, L.M., Ells, P.F., Malbon, C.C. and Williams, D.L.: Quantification and regulation of apolipoprotein E expression in rat Kupfer cells. *J. Lipid Res.*, 30 (1989) 403-413.
- 1717 Jiang, L., Li, J., Wang, S. and Li, J.: (A method for the simultaneous analysis of the polymorphism of human serum apolipoprotein A-I, C and E by isoelectric focusing). *Zhonghua Yixue Jiaoyan Zazhi*, 11 (1988) 260-262; *C.A.*, 110 (1989) 208838b.
- 1718 Kleinherenbrink-Stins, M.F., Schouten, D., van der Boom, J., Brouwer, A., Knook, D.L. and van Berkel, T.J.C.: Nitrosylated high density lipoprotein is recognized by a scavenger receptor in rat liver. *J. Lipid Res.*, 30 (1989) 511-520.
- 1719 Lombardi, P., Norata, G., Maggi, F.M., Cinti, G., Franco, P., Nicolini, A. and Catapano, A.L.: Assimilation of LDL by experimental tumours in mice. *Biochim. Biophys. Acta*, 1003 (1989) 301-306.
- 1720 Marzetta, C.A., Johnson, F.L., Zech, L.A., Foster, D.M. and Rudel, L.L.: Metabolic behavior of hepatic VLDL and plasma LDL apoB-100 in African green monkeys. *J. Lipid Res.*, 30 (1989) 357-370.
- 1721 Maurice, R., Marcel, Y.L., Innerarity, T.L. and Mione, R.W.: A potential complication in the use of monoclonal antibodies: inhibition of apoB-mediated receptor binding by an anti-apoE antibody. *J. Lipid Res.*, 30 (1989) 587-596.
- 1722 Peitsch, M.C., Kress, A., Lerch, P.G., Morgenthaler, J.-J., Isliker, H. and Heiniger, H.-J.: A purification method for apolipoprotein A-I and A-II. *Anal. Biochem.*, 178 (1989) 301-305.



- 1723 Peynet, J., Letrand, A., Messing, B., Thullier, F. and Rousselet, F.: An alpha slow-moving high-density-lipoprotein subfraction in serum of a patient with radiation enteritis and peritoneal carcinosis. *Clin. Chem. (Winston-Salem)*, 35 (1989) 674-678.
- 1724 Phillips, M.L. and Schumaker, V.N.: Conformation of apolipoprotein B after lipid extraction of low density lipoproteins attached to an electron microscope grid. *J. Lipid Res.*, 30 (1989) 415-422.
- 1725 Rainwater, D. and Lanford, R.E.: Production of lipoprotein(a) by primary baboon hepatocytes. *Biochim. Biophys. Acta*, 1003 (1989) 30-35.
- 1726 Rainwater, D.L., Manis, G.S. and Bandeberg, J.L.: Hereditary and dietary effects on apolipoprotein[a] isoforms and Lp[a] in baboons. *J. Lipid Res.*, 30 (1989) 549-558.
- 1727 Rye, K.-A.: Interaction of the high density lipoprotein conversion factor with recombinant discoidal complexes of egg phosphatidylcholine, free cholesterol, and apolipoprotein A-I. *J. Lipid Res.*, 30 (1989) 335-346.
- 1728 Young, S.G. and Hubl, S.T.: An ApaLi restriction site polymorphism is associated with the MB-19 polymorphism in apolipoprotein B. *J. Lipid Res.*, 30 (1989) 443-449.

## 17. AMINES, AMIDES AND RELATED NITROGEN COMPOUNDS

## 17b. Catecholamines and their metabolites

- 1729 Svistunova, O.I., Lipitskaya, I.Ya., Kiseleva, Z.M. and Titov, V.N.: (Assessment of vanillylmandelic acid excretion by electrophoresis on paper and on cellulose acetate). *Lab. Delo*, (1989) 61-64; *C.A.*, 110 (1989) 188767x.

## 17d. Other amine derivatives and amides (excluding peptides)

- 1730 Fanali, S.: Host-guest complexation in capillary isotachopheresis. II. Determination of aminophenol and diaminobenzene isomers in permanent hair colorants by using capillary isotachopheresis. *J. Chromatogr.*, 470 (1989) 123-129.

## 18. AMINO ACIDS AND PEPTIDES; CHEMICAL STRUCTURE OF PROTEINS

## 18a. Amino acids and their derivatives

- 1731 Bauer, H., Ebner, B. and Wolf, B.: Fully automated high performance capillary zone electrophoresis. *Fresenius' Z. Anal. Chem.*, 333 (1989) 751-752.
- 1732 Dadssi, M., Duclos, B. and Cozzone, A.J.: A peptide substrate for *Escherichia coli* protein kinase activity *in vitro*. *Biochem. Biophys. Res. Commun.*, 160 (1989) 552-558.
- 1733 Dovichi, N.J. and Cheng, Y.F.: Ultramicro amino acid analysis: ranging below attomoles. *Am. Biotechnol. Lab.*, 7 (1989) 10-14; *C.A.*, 110 (1989) 228013g.
- 1734 Gozel, P. and Zare, R.N.: Resolution of DL-amino acids by capillary zone electrophoresis using chiral electrolytes. *ASTM Spec. Tech. Publ.*, 1009 (Prog. Anal. Lumin.) (1988) 41-53; *C.A.*, 110 (1989) 169654s.
- 1735 Liu, J., Cobb, K.A. and Novotny, M.: Separation of precolumn *ortho*-phthalaldehyde-derivatized amino acids by capillary zone electrophoresis with normal and micellar solutions in the presence of organic modifiers. *J. Chromatogr.*, 468 (1989) 55-65.
- 1736 Nishizawa, H., Suzuki, K. and Abe, Y.: Fixation of amino acids and oligopeptides by freeze-drying in polyacrylamide gel electrophoresis. *Electrophoresis (Weinheim)*, 10 (1989) 498-500.
- 1737 Stover, F.S.: Utility of copper-containing electrolytes for isotachopheresis of amino acids. *J. Chromatogr.*, 470 (1989) 131-137.
- 1738 Tsikas, D. and Brunner, G.: Application of capillary isotachopheresis to the analysis of glutathione conjugates. *J. Chromatogr.*, 470 (1989) 191-199.

See also 1658.

18b. *Peptides and peptidic and proteinous hormones*

- 1739 Duffy, V.E., Stockwell, P.A., Warrington, D.M. and Monk, B.C.: Laser excitation of fluorescent-labeled polypeptides in polyacrylamide gels. *Anal. Biochem.*, 179 (1989) 291-298.
- 1740 Grossman, P.D., Colburn, J.C. and Lauer, H.H.: A semiempirical model for the electrophoretic mobilities of peptides in free-solution capillary electrophoresis. *Anal. Biochem.*, 179 (1989) 28-33.
- 1741 Janssen, P.S.L., van Nispen, J.W., van Zeeland, M.J.M. and Melgers, P.A.T.A.: Complementary information from isotachopheresis and high-performance liquid chromatography in peptide analysis. *J. Chromatogr.*, 470 (1989) 171-183.
- 1742 Karkhanis, Y.D.: Improved sensitivity of dabsylated polypeptides after polyacrylamide gel electrophoresis. *Anal. Lett.*, 22 (1989) 339-351.
- 1743 Kasicka, V. and Prusik, Z.: Isotachopheretic analysis of peptides. Selection of electrolyte systems and determination of purity. *J. Chromatogr.*, 470 (1989) 209-221.
- 1744 Meredith, C. and Johnson, M.K.: Species distribution of paraoxon-resistant brain polypeptides radiolabeled with diisopropyl phosphorofluoridate ( $^3\text{H}$ DiPF): electrophoretic assay for the aged polypeptide of ( $^3\text{H}$ )DiPF-labeled neuropathy target esterase. *J. Neurochem.*, 52 (1989) 1248-1252; *C.A.*, 110 (1989) 188196k.
- 1745 Otani, F., Otani, T. and Boime, I.: Effects of adenine nucleotides on chorionicotropin  $\alpha$  and  $\beta$  subunit synthesis. *Biochem. Biophys. Res. Commun.*, 160 (1989) 6-11.
- 1746 Stover, F.S., Haymore, B.L. and McBeath, R.J.: Capillary zone electrophoresis of histidine-containing compounds. *J. Chromatogr.*, 470 (1989) 241-250.

See also 1736, 1815.

18c. *Elucidation of structure of proteins and enzymes*

- 1747 Abdul-Razzak, K.K., Denton, M.L., Cox, D.J. and Reeck, G.R.: Isolation and characterization of folded fragments released by *Staphylococcus aureus* proteinase from the non-histone chromosomal protein HMG-1. *Biochim. Biophys. Acta*, 996 (1989) 125-131.
- 1748 Ogawa, H., Konishi, K. and Fujioka, M.: The peptide sequences near the bound pyridoxal phosphate are conserved in serine dehydratase from rat liver, and threonine dehydratases from yeast and *Escherichia coli*. *Biochim. Biophys. Acta*, 996 (1989) 139-141.
- 1749 Plaxton, W.C. and Moorhead, G.B.G.: Peptide mapping by CNBr fragmentation using a sodium dodecyl sulfate-polyacrylamide minigel system. *Anal. Biochem.*, 178 (1989) 391-393.
- 1750 Prussak, C.E., Almazan, M.T. and Tseng, B.Y.: Peptide production from proteins separated by sodium dodecyl-sulfate polyacrylamide gel electrophoresis. *Anal. Biochem.*, 178 (1989) 233-238.
- 1751 Wajcman, H., Bianchi-Bosisio, A. and Righetti, P.G.: Isoelectric focusing of tryptic peptides from hemoglobin subunits by immobilized pH gradients. *J. Biochem. Biophys. Methods*, 18 (1989) 65-75; *C.A.*, 110 (1989) 228033p.
- 1752 Winograd, E. and Sherman, I.W.: Naturally occurring anti-band 3 autoantibodies recognize a high molecular weight protein on the surface of *Plasmodium falciparum* infected erythrocytes. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1357-1363.

## 19. PROTEINS

19a. *General techniques*

- 1753 Bhushan, R. and Reddy, K.R.N.: A simple approach to recovery of proteins from polyacrylamide gel electrophoresis rods. *J. Liq. Chromatogr.*, 12 (1989) 529-533.
- 1754 Bruin, G.J.M., Chang, J.P., Kuhlman, R.H., Zegers, K., Kraak, J.C. and Poppe, H.: Capillary zone electrophoretic separations of proteins in polyethylene glycol-modified capillaries. *J. Chromatogr.*, 471 (1989) 429-436.

- 1755 Goto, M., Takahashi, Y. and Goto, S.: Protein separation technique with dynamic equilibrium gradient induced by counteracting chromatography and electrophoresis. *J. Chem. Eng. Jpn.*, 22 (1989) 109-113; *C.A.*, 110 (1989) 215400f.
- 1756 Hochstrasser, D.F., Patchornik, A. and Merrill, C.R.: Crosslinking agents for polyacrylamide electrophoretic gels for improved detection of proteins by silver staining. *U.S. Pat. Appl.* US 142,978, 01 Jul. 1988, Appl. 24 Feb. 1988, 26 pp.; *C.A.*, 110 (1989) 208935f.
- 1757 Karey, K.P. and Sirbasku, D.A.: Glutaraldehyde fixation increases retention of low molecular weight proteins (growth factors) transferred to nylon membranes for Western blot analysis. *Anal. Biochem.*, 178 (1989) 255-259.
- 1758 Loo, J.A., Udseth, H.R. and Smith, R.D.: Peptide and protein analysis by electrospray ionization-mass spectrometry and capillary electrophoresis-mass spectrometry. *Anal. Biochem.*, 179 (1989) 404-412.
- 1759 Rose, D.J., Jr.: Instrumentation, detection and surface deactivation in capillary zone electrophoresis. *Avail. Univ. Microfilm Int.*, Order No. DA8823470, 1988, 326 pp.; *C.A.*, 110 (1989) 228030k.
- 1760 Sackett, D.L.: Simple and inexpensive preparation of dried polyacrylamide gels for densitometry and/or storage. *Anal. Biochem.*, 179 (1989) 242-244.
- 1761 Shimao, K.: (Computer simulation of isotachopheresis of protein using carrier ampholyte as spacers). *Seibutsu Butsuri Kagaku*, 32 (1988) 303-308; *C.A.*, 110 (1989) 208767c.
- 1762 Sterne, J.A.C., Price, S.J. and Curtis, M.A.: A method for the refinement of data arising from electrophoresis of biological fluids. *Anal. Biochem.*, 179 (1989) 106-113.
- 1763 Stover, F.S.: Spacer performance in the cationic isotachopheresis of proteins. *J. Chromatogr.*, 470 (1989) 201-208.
- 1764 Vachereay, A.: Luminescent immunodetection of Western-blotted proteins from Coomassie-stained polyacrylamide gel. *Anal. Biochem.*, 179 (1989) 206-208.
- 1765 Vanfleteren, J.R.: Sequential sodium dodecyl sulfate-polyacrylamide gel electrophoresis and reversed-phase chromatography of unfolded proteins. *Anal. Biochem.*, 178 (1989) 385-390.
- 1766 Walbroehl, Y. and Jorgenson, J.W.: Capillary zone electrophoresis for the determination of electrophoretic mobilities and diffusion coefficients of protein. *J. Microcolumn Sep.*, 1 (1989) 41-45; *C.A.*, 110 (1989) 228015j.
- 1767 Yuen, S.W., Chui, A.H., Wilson, K.J. and Yuan, P.M.: Microanalysis of SDS-PAGE electroblotted proteins. *BioTechniques*, 7 (1989) 74-83; *C.A.*, 110 (1989) 188757u.
- 19b. *Proteins of cells, viruses and subcellular particles*
- 1768 Adams, V., Bosch, W., Schlegel, J., Walliman, T. and Brdiczka, D.: Further characterization of contact sites from mitochondria of different tissues: topology of peripheral kinases. *Biochim. Biophys. Acta*, 981 (1989) 213-225.
- 1769 Al-Mahrouq, H.A., McAteer, J.A. and Kempson, S.A.: Cholera toxin action on rabbit renal brush-border membranes inhibits phosphate transport. *Biochim. Biophys. Acta*, 981 (1989) 200-206.
- 1770 Bertolini, J., Guthridge, M. and Hearn, M.T.W.: Rapid chromatographic isolation and immunoblot characterization of immunoreactive fibroblast growth factor-related polypeptides from various tissues. *J. Chromatogr.*, 491 (1989) 49-60.
- 1771 Boulet, D., Poirier, J. and Cote, C.: Studies on the biogenesis of the mammalian ATP synthase complex: isolation and characterization of a full-length cDNA encoding the rat F<sub>1</sub>- $\beta$ -subunit. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1184-1190.
- 1772 Carrascosa, J.M., Ruiz, P., Martinez, C., Pulido, J.A., Satrustegui, J. and Andres, A.: Insulin receptor kinase activity in rat adipocytes is decreased during aging. *Biochem. Biophys. Res. Commun.*, 160 (1989) 303-309.
- 1773 Clague, M.J., Harrison, J.P. and Cherry, R.J.: Cytoskeletal restraints of band 3 rotational mobility in human erythrocyte membranes. *Biochim. Biophys. Acta*, 981 (1989) 43-50.
- 1774 Delcayre, A.X., Fiandino, A., Lyamani, F., Barel, M. and Frade, R.: Enhancement of Epstein-Barr virus: X3d receptor (EBV/C3dR or CR2) and nuclear P120 ribonucleoprotein phosphorylation by specific EBV/3CdR ligands in subcellular fractions of the human B lymphoma cell line, Raji. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1213-1220.

- 1775 Dorval, B.L., Chow, M. and Klibanov, A.M.: Stabilization of poliovirus against heat inactivation. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1177-1183.
- 1776 Drittanti, L.N., Boland, R.L. and de Boland, A.R.: Induction of specific proteins in cultured skeletal muscle cells by 1,25-dihydroxyvitamin D-3. *Biochim. Biophys. Acta*, 1012 (1989) 16-23.
- 1777 Fanciulli, M., Paggi, M.G., Mancini, A., del Carlo, C., Floridi, A., Taylor, S.I. and Perrotti, N.: pp-120: A common endogenous substrate for insulin and IGF-1 receptor-associated tyrosine kinase activity in the highly malignant AS-30D rat hepatoma cells. *Biochem. Biophys. Res. Commun.*, 160 (1989) 168-173.
- 1778 Caczynska, M.: Changes in the proteolytic activity of human erythrocyte membrane during red cell aging. *Biochim. Biophys. Acta*, 981 (1989) 173-177.
- 1779 Gama Sosa, M.A., De Gasperi, R., Fazely, F. and Ruprecht, R.M.: Human cell lines stably expressing HIV env and tat gene products. *Biochem. Biophys. Res. Commun.*, 161 (1989) 305-311.
- 1780 Ghinea, N., Hasu, M. and Popov, D.: Selective radioiodination of the apical and luminal cell surfaces: *in vitro* and *in situ* experiments on vascular endothelial cells with iodogen-coated Sephadex. *Anal. Biochem.*, 179 (1989) 274-279.
- 1781 Ghosh, S., Chevesich, J. and Maitra, U.: Further characterization of eukaryotic initiation factor 5 from rabbit reticulocytes. Immunochemical characterization and phosphorylation by casein kinase II. *J. Biol. Chem.*, 264 (1989) 5134-5140.
- 1782 Graifer, D.M., Babkina, G.T., Matasova, N.B., Vladimirov, S.N., Karpova, G.G. and Vlassov, V.V.: Structural arrangement of tRNA binding sites on *Escherichia coli* ribosomes, as revealed from data on affinity labelling with photoactivatable tRNA derivatives. *Biochim. Biophys. Acta*, 1008 (1989) 146-156.
- 1783 Hazeki, K., Tamoto, K., Tada, M. and Mori, Y.: Possible involvement of a 95-kDa protein phosphorylation in phorbol 12-myristate 13-acetate-induced suppression of zymosan phagocytosis in guinea pig macrophages. *Arch. Biochem. Biophys.*, 270 (1989) 551-559.
- 1784 Honda, K.-i., Hatayama, T. and Yukioka, M.: Common antigenicity of mouse 42°C-specific heat-shock protein with mouse HSP 105. *Biochem. Biophys. Res. Commun.*, 160 (1989) 60-66.
- 1785 Jungblut, P., Zimny-Arndt, U. and Klose, J.: Composition and genetic variability of proteins from nuclear fractions of mouse (DBA/2J and C57BL/6J) liver and brain. *Electrophoresis (Weinheim)*, 10 (1989) 464-472.
- 1786 Karasev, A.V., Miroshnichenko, N.A. and Rozanov, M.N.: Anomalous electrophoretic behavior of the major potato virus X RNA translation product. *J. Virol. Methods*, 23 (1989) 223-227; *C.A.*, 110 (1989) 228017m.
- 1787 Komuniecki, R., McCrury, J., Thissen, J. and Rubin, N.: Electron-transfer flavoprotein from anaerobic *Ascaris suum* mitochondria and its role in NADH-dependent 2-methyl branched-chain enoyl-CoA reduction. *Biochim. Biophys. Acta*, 975 (1989) 127-131.
- 1788 Krieg, J., Olivier, A.R. and Thomas, G.: Analysis of 40S ribosomal protein S6 phosphorylation during the mitogenic response. *Methods Enzymol.*, 164 (Ribosomes) (1988) 575-581; *C.A.*, 110 (1989) 188759w.
- 1789 Kunst, M., Sies, H. and Akerboom, P.M.: S-(4-Azidophenacyl)[<sup>35</sup>S]glutathione photoaffinity labeling of rat liver plasma membrane-associated proteins. *Biochim. Biophys. Acta*, 982 (1989) 15-23.
- 1790 Lang, M.A., Juvonen, R., Jarvinen, P., Honkakoski, P. and Raunio, H.: Mouse liver P450Coh: genetic regulation of the pyrazole-inducible enzyme and comparison with other P450 isoenzymes. *Arch. Biochem. Biophys.*, 271 (1989) 139-148.
- 1791 McPherson, J.M., Sawamura, S.J., Ogawa, Y., Dineley, K., Carrillo, P. and Piez, K.A.: The growth inhibitor of African green monkey (BSC-1) cells is transforming growth factors  $\beta$ 1 and  $\beta$ 2. *Biochemistry*, 28 (1989) 3442-3447.
- 1792 Miccio, M., Baldini, G., Basso, V., Gazzin, B., Lunazzi, G.C., Tiribelli, C. and Sottocasa, G.L.: Bilitranslocase is the protein responsible for the electrogenic movement of sulfobromophthalein in plasma membrane vesicles from rat liver: immunochemical evidence using mono- and poly-clonal antibodies. *Biochim. Biophys. Acta*, 981 (1989) 115-120.
- 1793 Mirabelli, F., Salis, A., Vairetti, M., Bellomo, G., Thor, H. and Orrenius, S.: Cytoskeletal alterations in human platelets exposed to oxidative stress are mediated by oxidative and  $\text{Ca}^{2+}$ -dependent mechanisms. *Arch. Biochem. Biophys.*, 270 (1989) 478-488.
- 1794 Monk, B.C., Montesinos, C., Leonard, K. and Serrano, R.: Sidedness of yeast plasma membrane vesicles and mechanisms of activation of the ATPase by detergents. *Biochim. Biophys. Acta*, 981 (1989) 226-234.

- 1795 Morgan, E.H.: Calcium chelators induce association with the detergent-insoluble cytoskeleton and functional inactivation of the transferrin receptor in reticulocytes. *Biochim. Biophys. Acta*, 981 (1989) 121-129.
- 1796 Oron, L. and Bar-Nun, S.: Simultaneous measurements of rates of protein *de novo* synthesis and its steady-state levels by immunoblotting. *Anal. Biochem.*, 179 (1989) 284-287.
- 1797 Patton, W.F., Dhok, M.R. and Jacobson, B.S.: Identification of *Dictyostelium discoideum* plasma membrane proteins by cell surface labeling and quantitative two-dimensional gel electrophoresis. *Anal. Biochem.*, 179 (1989) 37-49.
- 1798 Price, N.T., Nakielny, S.F., Clark, S.J. and Proud, C.G.: The two forms of the  $\beta$ -subunit of initiation factor-2 from reticulocyte lysates arise from proteolytic degradation. *Biochim. Biophys. Acta*, 1008 (1989) 177-182.
- 1799 Reilly, C.F. and Broski, J.E.: Differential effects of PDGF and PDGF-BB on vascular smooth muscle cells. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1047-1054.
- 1800 Roberts, M.M. and Oroszlan, S.: The preparation and biochemical characterization of intact capsids of equine infectious anemia virus. *Biochem. Biophys. Res. Commun.*, 160 (1989) 486-494.
- 1801 Schmid, C., Ernst, M., Zapf, J. and Froesch, R.: Release of insulin-like growth factor carrier proteins by osteoblasts: stimulation by estradiol and growth hormone. *Biochem. Biophys. Res. Commun.*, 160 (1989) 788-794.
- 1802 Spitalnik, P.F., Spitalnik, S.L., Danley, J.M., Lopez, A.F., Vadas, M.A., Civin, C.I. and Ginsburg, V.: Carbohydrate-specific monoclonal antibodies bind to human granulocytes and stimulate antibody-dependent cellular cytotoxicity. *Arch. Biochem. Biophys.*, 271 (1989) 168-176.
- 1803 Tamoto, K., Tada, M., Hazeki, K., Kakinuma, T. and Mori, Y.: Characterization of a monoclonal antibody to guinea pig peritoneal macrophages that inhibits phagocytosis of unopsonized zymosan: structural and functional similarities of the antigen to human and mouse CR3. *Arch. Biochem. Biophys.*, 270 (1989) 541-550.
- 1804 Vallon, O., Tae, G.-S., Cramer, W.A., Simpson, D., Hoyer-Hansen, G. and Bogorad, L.: Visualization of antibody binding to the photosynthetic membrane: the transmembrane orientation of cytochrome b-559. *Biochim. Biophys. Acta*, 975 (1989) 132-141.
- 1805 Walker, G., Kerrick, W.G.L. and Bourguignon, L.Y.W.: The role of caldesmon in the regulation of receptor capping in mouse T-lymphoma cell. *J. Biol. Chem.*, 264 (1989) 496-500.
- 1806 Wallsten, M., Yang, Q. and Lundahl, P.: Entrapment of lipid vesicles and membrane protein-lipid vesicles in gel bead pores. *Biochim. Biophys. Acta*, 982 (1989) 47-52.
- 1807 Watmough, N.J., Birch-Machin, M.A., Bindoff, L.A., Aynsley-Green, A., Simpson, K., Ragan, C.I., Sherratt, H.S.A. and Turnbull, D.M.: Tissue specific defect of complex I of the mitochondrial respiratory chain. *Biochem. Biophys. Res. Commun.*, 160 (1989) 623-627.
- 1808 Weiss, M., Sekler, I. and Pick, U.: Characterization of soluble and membrane-bound forms of a vanadate-sensitive ATPase from plasma membranes of the halotolerant alga *Dunaliella salina*. *Biochim. Biophys. Acta*, 974 (1989) 254-260.
- 1809 Yoshimura, S., Mizuno, Y., Kimura, K., Yatsunami, K., Fujisawa, J., Tomita, K. and Ichikawa, A.: Prostaglandin D<sub>2</sub> receptor of mastocytoma P-815 cells - possible regulation by phosphorylation and dephosphorylation. *Biochim. Biophys. Acta*, 981 (1989) 69-76.
- 1810 Ziaie, Z. and Kafelides, N.A.: Lithium chloride restores host protein synthesis in herpes simplex virus-infected endothelial cells. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1073-1078.

See also 2051.

#### 19c. Proteins synthesized by genetic manipulation

- 1811 Bruinenberg, P.G., Evers, M., Waterham, H.R., Kuipers, J., Arnberg, A.C. and AB, G.: Cloning and sequencing of the peroxisomal amine oxide gene from *Hansenula polymorpha*. *Biochim. Biophys. Acta*, 1008 (1989) 157-167.
- 1812 Ferguson, B.Q., Friedland, B.K., Hendrickson, E., Strehl, L., Petteway, S.R. and Jonak, G.J.: Chemical synthesis and expression of a gene encoding HIV-1 TAT protein. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1429-1437.

- 1813 Larrick, J.W., Damielsson, L., Brenner, C.A., Abrahamson, M., Fry, K.E. and Borrebaeck, C.A.K.: Rapid cloning of rearranged immunoglobulin genes from human hybridoma cells using mixed primers and the polymerase chain reaction. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1250-1256.
- 1814 Lee, F.S. and Vallee, B.L.: Expression of human placental ribonuclease inhibitor in *Escherichia coli*. *Biochem. Biophys. Res. Commun.*, 160 (1989) 115-120.
- 1815 Warwick, J.M., Wallis, O.C. and Wallis, M.: Cloning, sequence and expression in *Escherichia coli* of cDNA for ovine pregrowth hormone. *Biochim. Biophys. Acta*, 1008 (1989) 247-250.
- 19d. *Microbial and plant proteins*
- 1816 Bon, M.-C.: A two-dimensional electrophoretic procedure for single meristems of different forest species. *Electrophoresis (Weinheim)*, 10 (1989) 530-532.
- 1817 Borbely, G. and Suranyi, G.: Cyanobacterial heat-shock proteins and stress responses. *Methods Enzymol.*, 167 (Cyanobacteria) (1988) 622-629; *C.A.*, 110 (1989) 228084f.
- 1818 Bruneau, S. and Guinet, R.: Rapid identification of medically important yeasts by electrophoretic protein patterns. *FEMS Microbiol. Lett.*, 58 (1989) 329-333; *C.A.*, 110 (1989) 228021h.
- 1819 Crawford, N.A., Droux, M., Kosower, N.S. and Buchanan, B.B.: Evidence for function of the ferredoxin/thioredoxin system in the reductive activation of target enzymes of isolated intact chloroplasts. *Arch. Biochem. Biophys.*, 271 (1989) 223-239.
- 1820 Duhe, R.J. and Selman, B.R.: Studies on the heterogeneity of the soluble chloroplast coupling factor 1: the formation of  $\epsilon$ -deficient isozymes. *Biochim. Biophys. Acta*, 974 (1989) 294-302.
- 1821 Falson, P., Di Pietro, A., Jault, J.-M., Gautheron, D.C. and Boutry, M.: Purification from a yeast mutant of mitochondrial  $F_1$  with modified  $\beta$ -subunit. High affinity for nucleotides and high negative cooperativity of ATPase activity. *Biochim. Biophys. Acta*, 975 (1989) 119-126.
- 1822 Grandori, R., Vai, M., Di Renzo, M.F., Alberthina, L. and Popolo, L.: Identification of a protein cross-reacting with anti-phosphotyrosine antibodies in yeast insoluble cytoplasmic matrices. *Biochem. Biophys. Res. Commun.*, 160 (1989) 887-896.
- 1823 Graybosch, R., Hellmann, G.M., Shaw, J.G., Rhoads, R.E. and Hunt, A.G.: Expression of a potyvirus non-structural protein in transgenic tobacco. *Biochem. Biophys. Res. Commun.*, 160 (1989) 425-432.
- 1824 Hohlfeld, K.: (Electrophoretic detection of gliadin, secalin, hordein and avenin in foods). *Wiss. Z.-K. Marx-Univ. Leipzig, Math.-Naturwiss. Reihe*, 37 (1988) 494-497; *C.A.*, 110 (1989) 171846z.
- 1825 Huber, J.L.A., Huber, S.C. and Nielsen, T.H.: Protein phosphorylation as a mechanism for regulation of spinach leaf sucrose-phosphate synthase activity. *Arch. Biochem. Biophys.*, 270 (1989) 681-690.
- 1826 Hubik, K.: (Polyacrylamide gel electrophoresis of the hordein fraction of barley protein). *Rostl. Vyroba*, 35 (1989) 95-100; *C.A.*, 110 (1989) 208774c.
- 1827 Islam, K.: GTP-induced chloroplast membrane protein phosphorylation and Photosystem II fluorescence changes: evidence for multiple protein kinase activities. *Biochim. Biophys. Acta*, 974 (1989) 261-266.
- 1828 Islam, K.: Thylakoid protein phosphorylation and associated Photosystem II fluorescence changes: a study with the ATP analogue adenosine-5-O-thiotriphosphate (ATP- $\gamma$ -S). *Biochim. Biophys. Acta*, 974 (1989) 267-273.
- 1829 Jackson, P., Urwin, V.E., Torrance, M.R. and Carmen, J.A.: The application of high resolution two-dimensional polyacrylamide gel electrophoresis to the identification and purification of a protein, NG 8.4, present in *Neisseria gonorrhoeae* and the subsequent development of a radioimmunoassay. *Electrophoresis (Weinheim)*, 10 (1989) 456-463.
- 1830 Katoh, S.: Photosystem I and Photosystem II preparation from thermophilic *Synechococcus*. *Methods Enzymol.*, 167 (Cyanobacteria) (1988) 263-269; *C.A.*, 110 (1989) 208772a.
- 1831 Kino, K., Yamashita, A., Yamaoka, K., Watanabe, J., Tanaka, S., Ko, K., Shimizu, K. and Tsunoo, H.: Isolation and characterization of a new immunomodulatory protein, Ling Zhi-8 (LZ-8), from *Ganoderma lucidum*. *J. Biol. Chem.*, 264 (1989) 472-478.

- 1832 Langsetmo, K., Fuchs, J. and Woodward, C.: *Escherichia coli* thioredoxin folds into two compact forms of different stability to urea denaturation. *Biochemistry*, 28 (1989) 3211-3220.
- 1833 Li, Z., Alli, I. and Kermasha, S.: Tryptic hydrolysis (*in vitro*) of crystalline and noncrystalline proteins from *Phaseolus* beans. *J. Agric. Food Chem.*, 37 (1989) 643-647.
- 1834 Murugesu, V. and Basha, S.M.: Effect of salt concentration and duration of boiling on peanut seed composition. *J. Agric. Food Chem.*, 37 (1989) 756-760.
- 1835 Nesterenko, M.V., Gvozdeva, E.L., Mitskevich, L.G. and Mosolov, V.V.: (Localization of the subtilisin-binding center in the molecule of the bi-functional inhibitor from wheat). *Biokhimiya (Moscow)*, 54 (1989) 838-845.
- 1836 Owen, R.J., Morgen, D.D., Costas, M. and Lastovica, A.: Identification of *Campylobacter upsaliensis* and other catalase-negative campylobacters from pediatric blood cultures by numerical analysis of electrophoretic protein patterns. *FEMS Microbiol. Lett.*, 58 (1989) 145-150; *C.A.*, 110 (1989) 228020g.
- 1837 Ramakrishnan, S., Enghlid, J.J., Bryant, H.L., Jr. and Xu, F.-J.: Characterization of a translation inhibitory protein from *Luffa aegyptiaca*. *Biochem. Biophys. Res. Commun.*, 160 (1989) 509-516.
- 1838 Rocque, W.J. and McGroarty, E.J.: Isolation and preliminary characterization of wild-type OmpC porin dimers from *Escherichia coli* K-12. *Biochemistry*, 28 (1989) 3738-3743.
- 1839 Rodrigueq, M.M., Basha, S.M. and Sanders, T.H.: Maturity and roasting of peanuts as related to precursors of roasted flavor. *J. Agric. Food Chem.*, 37 (1989) 760-765.
- 1840 Saborio, J.L., Hernandez, J.M., Narayanswami, S., Wrightsman, R., Palmer, E. and Manning, J.: Isolation and characterization of paraflagellar proteins from *Trypanosoma cruzi*. *J. Biol. Chem.*, 264 (1989) 4071-4075.
- 1841 Scheets, K. and Hedgcoth, C.: Expression of wheat  $\gamma$ -gliadin in *Saccharomyces cerevisiae* from a yeast ADH1 promoter. *J. Agric. Food Chem.*, 37 (1989) 829-833.
- 1842 Shutov, A.D., Pineda, J., Fu, L.T. and Lanh, D.N.: (Effect of pepsin on vetch legumin. Some regularities of seed 11S protein proteolysis related to their structure). *Biokhimiya (Moscow)*, 54 (1989) 827-837.
- 1843 Simpson, D., Vallon, O. and von Wettstein, D.: Freeze-fracture studies on barley plastid membranes. VIII. In *viridis*<sup>-115</sup>, a mutant completely lacking Photosystem II, oxygen evolution enhancer 1 (OEE1) and the  $\alpha$ -subunit of cytochrome b-559 accumulate in appressed thylakoids. *Biochim. Biophys. Acta*, 975 (1989) 164-174.
- 1844 Vainstein, A., Peterson, C.C. and Thornber, J.P.: Light-harvesting pigment-proteins of photosystem I in maize. Subunit composition and biogenesis. *J. Biol. Chem.*, 264 (1989) 4058-4063.
- 1845 Walleczek, J., Redl, B., Stöffler-Meilicke, M. and Stöffler, G.: Protein-protein cross-linking of the 50 S ribosomal subunit of *Escherichia coli* using 2-iminothiolane. Identification of cross-links by immunoblotting techniques. *J. Biol. Chem.*, 264 (1989) 4231-4237.

See also 1804.

19e. *Proteins of blood, serum and blood cells*

- 1846 Alonso, A.: Human alpha-1-antitrypsin subtyping by hybrid isoelectric focusing in miniaturized polyacrylamide gel. *Electrophoresis (Weinheim)*, 10 (1989) 513-519.
- 1847 Barry, E.L.R. and Mosher, D.F.: Factor XIIIa-mediated cross-linking of fibronectin in fibroblast cell layers. Cross-linking of cellular and plasma fibronectin and of amino-terminal fibronectin fragments. *J. Biol. Chem.*, 264 (1989) 4179-4185.
- 1848 Baumann, H.: Electrophoretic analysis of acute-phase plasma proteins. *Methods Enzymol.*, 163 (Immunochem. Tech., Pt. M) (1988) 566-594; *C.A.*, 110 (1989) 169660r.
- 1849 Borth, W. and Luger, T.A.: Identification of  $\alpha_2$ -macroglobulin as a cytokine binding plasma protein. Binding of interleukin-1 $\beta$  to "F" $\alpha_2$ -macroglobulin. *J. Biol. Chem.*, 264 (1989) 5818-5825.
- 1850 Chao, S., Chao, L. and Chao, J.: Sex dimorphism and inflammatory regulation of T-kininogen and T-kininogenase. *Biochim. Biophys. Acta*, 991 (1989) 477-483.

- 1851 Davis, J., Davis, L. and Bennett, V.: Diversity in membrane binding sites of ankyrins. Brain ankyrin, erythrocyte ankyrin, and processed erythrocyte ankyrin associate with distinct sites in kidney microsomes. *J. Biol. Chem.*, 264 (198) 6417-6426.
- 1852 DeMars, D.D., Katzmann, J.A., Kimlinger, T.K., Calore, J.D. and Tracy, R.P.: Simultaneous measurement of total and IgA-conjugated  $\alpha_1$ -microglobulin by a combined immunoenzyme/immunoradiometric assay technique. *Clin. Chem. (Winston-Salem)*, 35 (1989) 766-772.
- 1853 Garnier, G., Davrinche, C. and Charlionet, R.: Heterogeneous nature of human complement factor B: An electrophoretic approach for the analysis of its oligosaccharide chain structure and its physiological breakdown products. *Electrophoresis (Weinheim)*, 10 (1989) 501-512.
- 1854 Herzog, V., Günther, A., Meyer, M. and Belger, B.: Möglichkeiten der Dekontamination von Pankreatin mit  $\gamma$ -Strahlen und chemischen Mitteln. *Pharmazie*, 44 (1989) 204-206.
- 1855 John, H.A. and Purdom, I.F.: Elevated plasma levels of haptoglobin in Duchenne muscular dystrophy: electrophoretic variants in patients with a severe form of the disease. *Electrophoresis (Weinheim)*, 10 (1989) 489-493.
- 1856 Jonas, A., Kezdy, K.E. and Wald, J.H.: Defined apolipoprotein A-I conformations in reconstituted high density lipoprotein discs. *J. Biol. Chem.*, 264 (1989) 4818-4824.
- 1857 Lineberger, B., Dawicki, D.D., Agarwal, K.C., Kessimian, N. and Steiner, M.: Permeabilization of platelets: an investigation of biochemical, ultrastructural and functional aspects. *Biochim. Biophys. Acta*, 1012 (1989) 36-45.
- 1858 Mais, D.E., Yoakim, C., Guindon, Y., Gillard, J.W., Rokach, J. and Halushka, P.V.: Photoaffinity labelling of the human platelet thromboxane  $A_2$ /prostaglandin  $H_2$  receptor. *Biochim. Biophys. Acta*, 1012 (1989) 184-190.
- 1859 Morrison, N.F.J., Nugent, T. and Tozuka, M.: Monoclonal antibodies to human A-I apolipoprotein and characterisation of cyanogen bromide fragments of APOA-I. *Biochim. Biophys. Acta*, 1003 (1989) 84-90.
- 1860 Puri, R.N., Zhou, F., Bradford, H., Hu, C.-J., Colman, R.F. and Colman, R.W.: Thrombin-induced platelet aggregation involves an indirect proteolytic cleavage of aggregin by calpain. *Arch. Biochem. Biophys.*, 271 (1989) 346-358.
- 1861 Segurado, O.G. and Arnaiz-Villena, A.: Simultaneous detection of allotypes in native and activated human C2 by isoelectric focusing and silver staining. *J. Immunol. Methods*, 117 (1989) 9-15; *C.A.*, 110 (1989) 190557x.
- 1862 Sottrup-Jensen, L. and Birkedal-Hansen, H.: Human fibroblast collagenase- $\alpha$ -macroglobulin interactions. Localization of cleavage sites in the bait regions of five mammalian  $\alpha$ -macroglobulins. *J. Biol. Chem.*, 264 (1989) 393-401.
- 1863 Wang, Y., Tan, W., Li, B., Xi, W. and Du, Z.: (Studies on genetic types of serum proteins by micro-scale two-dimensional electrophoresis). *Yichuan*, 10 (1988) 30-32; *C.A.*, 110 (1989) 208775d.
- 1864 Whitefleet-Smith, J., Rosen, E., McLinden, J., Ploplis, V.A., Fraser, M.J., Tomlinson, J.E., McLean, J.W. and Castellino, F.J.: Expression of human plasminogen cDNA in a baculovirus vector-infected insect cell system. *Arch. Biochem. Biophys.*, 271 (1989) 390-399.
- 1865 Whitmore, D.H.: Parvalbumins for calibrating acidic isoelectric focusing gels. *Anal. Biochem.*, 178 (1989) 121-124.

See also 1793, 1939.

#### 19f. Structural and muscle proteins

- 1866 Aletta, J.M., Shelanski, M.L. and Greene, L.A.: Phosphorylation of the peripherin 58-kDa neuronal intermediate filament protein. Regulation by nerve growth factor and other agents. *J. Biol. Chem.*, 264 (1989) 4619-4627.
- 1867 Ardailiou, N., Bellon, G., Nivez, M.-P., Rakatoarison, S. and Ardailiou, R.: Quantification of collagen synthesis by cultured human glomerular cells. *Biochim. Biophys. Acta*, 991 (1989) 445-452.
- 1868 Cavanni, P., Cavallini, P., Ratti, E., Gaviraghi, G. and Libera, L.D.: Caldesmon: anomalous electrophoretic behaviour in polyacrylamide gel. *Biochem. Biophys. Res. Commun.*, 160 (1989) 174-180.
- 1869 Katayama, E., Horiuchi, K.Y. and Chacko, S.: Characteristics of the myosin and tropomyosin binding regions of the smooth muscle caldesmon. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1316-1322.



- 1870 Lehman, W.: 35 kDa Proteins are not components of vertebrate smooth muscle thin filaments. *Biochim. Biophys. Acta*, 996 (1989) 57-61.
- 1871 Lema, M.J., Pluskal, M.G. and Allen, P.D.: High-performance ion-exchange chromatography of myosin using a DEAE-5PW column. *J. Chromatogr.*, 491 (1989) 61-68.
- 1872 Mehta, J.R., Braund, K.G., McKerrell, R.E. and Toivio-Kinnucan, M.: Isoelectric focusing under dissociating conditions for analysis of muscle protein from clinically normal dogs and Labrador Retrievers with hereditary myopathy. *Am. J. Vet. Res.*, 50 (1989) 633-639; *C.A.*, 110 (1989) 229564z.
- 1873 Paralkar, V.M., Nandedkar, A.K.N. and Redii, A.H.: Affinity of osteogenin, an extracellular bone matrix associated protein initiating bone differentiation, for concanavalin A. *Biochem. Biophys. Res. Commun.*, 160 (1989) 419-424.
- 1874 Raghavan, M., Smith, C.K. and Schutt, C.E.: Analytical determination of methylated histidine in proteins: actin methylation. *Anal. Biochem.*, 178 (1989) 194-197.
- 1875 Sihag, R.K. and Nixon, R.A.: *In vivo* phosphorylation of distinct domains of the 70-dilodalton neurofilament subunit involves different protein kinases. *J. Biol. Chem.*, 264 (1989) 457-464.
- 1876 Wu, J.T., Pieper, R.K., Wu, L.H. and Peters, J.L.: Isolation and characterization of myoglobin and its two major isoforms from sheep heart. *Clin. Chem. (Winston-Salem)*, 35 (1989) 778-782.

See also 1776, 1807.

#### 19g. Protamines, histones and other chromosomal proteins

- 1877 Bernues, J. and Querol, E.: Non-random reconstitution of HMG1 and HMG2 in chromatin. Determination of the histone contacts. *Biochim. Biophys. Acta*, 1008 (1989) 52-61.
- 1878 Feeney, R.J., Sauterer, R.A., Feeney, J.L. and Zieve, G.W.: Cytoplasmic assembly and nuclear accumulation of mature small nuclear ribonucleoprotein particles. *J. Biol. Chem.*, 264 (1989) 5776-5783.
- 1879 Krupitza, G. and Cerutti, P.: Poly(ADP-ribosylation) of histones in intact human keratinocytes. *Biochemistry*, 28 (1989) 4054-4060.
- 1880 Kurochkina, L.P. and Kolomijtseva, G.Ya.: Isolation of modified histone H3 from ultraviolet-irradiated deoxyribonucleoprotein by reversed-phase high-performance liquid chromatography. *Anal. Biochem.*, 178 (1989) 88-92.
- 1881 Lindner, H., Wesierska-Gadek, J., Helliger, W., Puschendorf, B. and Sauermann, G.: Identification of ADP-ribosylated histones by the combined use of high-performance liquid chromatography and electrophoresis. *J. Chromatogr.*, 472 (1989) 243-249.
- 1882 Rakowicz, E.M. and Koprowski, H.: Nuclear uptake of monoclonal antibody to a surface glycoprotein and its effect on transcription. *Arch. Biochem. Biophys.*, 271 (1989) 366-379.

See also 1931.

#### 19h. Chromoproteins and metalloproteins

- 1883 Adam, Z. and Malkin, R.: On the interaction between cytochrome f and plastocyanin. *Biochim. Biophys. Acta*, 975 (1989) 158-163.
- 1884 Arlotto, M.P. and Parkinson, A.: Identification of cytochrome P450a (P450IIA1) as the principal testosterone 7 $\alpha$ -hydroxylase in rat liver microsomes and its regulation by thyroid hormones. *Arch. Biochem. Biophys.*, 270 (1989) 458-471.
- 1885 Arlotto, M.P., Greenway, D.J. and Parkinson, A.: Purification of two isozymes of rat liver microsomal cytochrome P450 with testosterone 7 $\alpha$ -hydroxylase activity. *Arch. Biochem. Biophys.*, 270 (1989) 441-457.
- 1886 Ciaccio, P.J. and Halpert, J.R.: Characterization of a phenobarbital-inducible dog liver cytochrome P450 structurally related to rat and human enzymes of the P450IIIA (steroid-inducible) gene subfamily. *Arch. Biochem. Biophys.*, 271 (1989) 284-299.
- 1887 Debrezzeny, M., Bombos, Z., Csizmadia, V., Varkonyi, Z. and Szalontai, B.: Chromophore conformational analysis in phycocyanin and in related chromopeptides by surface enhanced Raman spectroscopy. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1227-1232.

- 1888 Fitch, J., Cannac, V., Meyer, T.E., Cusanovich, M.A., Tollin, G., van Beeumen, J., Rott, M.A. and Donohue, T.J.: Expression of cytochrome  $c_2$  isozyme restores photosynthetic growth of *Rhodobacter sphaeroides* mutants lacking the wild-type cytochrome  $c_2$  gene. *Arch. Biochem. Biophys.*, 271 (1989) 502-507.
- 1889 Laulhere, J.-P., Laboure, A.-M. and Briat, J.-F.: Mechanism of the transition from plant ferritin to phytosiderin. *J. Biol. Chem.*, 264 (1989) 3629-3635.
- 1890 Ohta, K., Kitada, M., Hashizume, T., Komori, M., Ohi, H. and Kamataki, T.: Purification of cytochrome P-450 from polychlorinated biphenyl-treated crab-eating monkeys: high homology to a form of human cytochrome P-450. *Biochim. Biophys. Acta*, 996 (1989) 142-145.
- 1891 Slavickova, A.: Electrophoretic location of epitopes on human transferrin. *Folia Biol.*, 34 (1988) 301-307; *C.A.*, 110 (1989) 188037j.
- 1892 Turko, I.V., Adamovich, T.B., Kirillova, N.M., Usanov, S.A. and Chashchin, V.L.: Cross-linking studies of the cholesterol hydroxylation system from bovine adrenocortical mitochondria. *Biochim. Biophys. Acta*, 996 (1989) 37-42.
- 19i. *Proteins of glands, gland products and various zymogens (including milk proteins)*
- 1893 Bannister, A.J., Divecha, N., Ashmore, M. and McDonald, C.J.: Basic proline-rich proteins of murine parotid glands. Induction of mRNA by isoprenaline and post-secretion processing. *Eur. J. Biochem.*, 181 (1989) 371-379.
- 1894 Deshmukh, A.R., Donker, J.D., Addis, P.B. and Jenness, R.: Cellulose acetate and polyacrylamide gel electrophoresis for quantification of milk protein fractions. *J. Dairy Sci.*, 72 (1989) 12-17; *C.A.*, 110 (1989) 171847a.
- 1895 Errasfa, M., Rothhut, B. and Russo-Marie, F.: Phospholipase A2 inhibitory activity in thymocytes of dexamethasone-treated mice - possible implication of lipocortins. *Biochem. Biophys. Res. Commun.*, 159 (1989) 53-60.
- 1896 Hall, J.C. and Killian, G.J.: Two-dimensional gel electrophoretic analysis of rat sperm membrane interaction with cauda epididymal fluid. *J. Androl.*, 10 (1989) 64-76; *C.A.*, 110 (1989) 169659x.
- 1897 Moio, L., di Luccia, A. and Addeo, F.: Fast isoelectric focusing of milk proteins on small ultrathin polyacrylamide gels containing urea. *Electrophoresis (Weinheim)*, 10 (1989) 533-535.
- 1898 Moore, A., White, T.W., Ensrud, K.M. and Hamilton, D.W.: The major maturation glycoprotein found on rat cauda epididymal sperm surface is linked to the membrane *via* phosphatidylinositol. *Biochem. Biophys. Res. Commun.*, 160 (1989) 460-468.
- 1899 Sabatini, L.M. and Azen, E.A.: Histatins, a family of salivary histidine-rich proteins, are encoded by at least two loci (HIS1 and KIS2). *Biochem. Biophys. Res. Commun.*, 160 (1989) 495-502.
- 1900 Senger, D.R., Ferruzzi, C.A., Papadopoulos, A. and Tenen, D.G.: Purification of a human milk protein closely similar to tumor-secreted phosphoproteins and osteopontin. *Biochim. Biophys. Acta*, 996 (1989) 42-48.
- 1901 Singh, V., Sairam, M.R., Bhargavi, G.N. and Akhras, R.G.: Hormonotoxins. Preparation and characterization of ovine luteinizing hormone-gelolin conjugate. *J. Biol. Chem.*, 264 (1989) 3089-3095.
- See also 1708, 1785, 1789.
- 19j. *Proteins of brain, cerebrospinal fluid and eye*
- 1902 Blanquet, P.R., Patte, C., Fayein, N. and Courtois, Y.: Identification and isolation from bovine epithelial lens cells of two basic fibroblast growth factor receptors that possess bFGF-enhanced phosphorylation activities. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1124-1131.
- 1903 Huc, C., Escurat, M., Djabali, K., Derer, M., Landon, F., Gros, F. and Portier, M.-M.: Phosphorylation of peripherin, an intermediate filament protein, in mouse neuroblastoma NIE 115 cell line and in sympathetic neurons. *Biochem. Biophys. Res. Commun.*, 160 (1989) 772-779.
- 1904 Ozawa, K., Shiba, K. and Arai, M.: (Analysis of cerebrospinal fluid proteins). *Kensa to Gijutsu*, 16 (1988) 1259-1263; *C.A.*, 110 (1989) 169434v.
- 1905 Siddiqui, A.A., Ali, T.Z., Ali, N.M., Khurshid, M. and Waqar, M.A.: Cerebrospinal fluid proteins in meningitis. *Biochem. Soc. Trans.*, 17 (1989) 415-417; *C.A.*, 110 (1989) 188768y.

- 1906 Takio, K., Hasegawa, M., Titani, K. and Ihara, Y.: Identification of  $\beta$  protein precursor in newborn rat brain. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1296-1301.
- 1907 Ungewickell, E. and Oestergaard, L.: Identification of the clathrin assembly protein AP180 in crude calf brain extracts by two-dimensional sodium dodecyl sulfate-polyacrylamide gel electrophoresis. *Anal. Biochem.*, 179 (1989) 352-356.
- 1908 Wiederkehr, F., Büeler, M.R., Wacker, M. and Vonderschmitt, D.J.: Study of human cerebrospinal fluid proteins by size exclusion-high performance liquid chromatography and two-dimensional gel electrophoresis. *Electrophoresis (Weinheim)*, 10 (1989) 480-488.
- 1909 Wiederkehr, F., Wacker, M. and Vonderschmitt, D.J.: Analysis of immune complexes of cerebrospinal fluid by two-dimensional gel electrophoresis. *Electrophoresis (Weinheim)*, 10 (1989) 473-479.

See also 1785, 1851, 2006, 2016.

19k. *Proteins of neoplastic tissue and transformed cells*

- 1910 Boothman, D.A., Bouvard, I. and Hughes, E.N.: Identification and characterization of X-ray-induced proteins in human cells. *Cancer Res.*, 49 (1989) 2871-2878.
- 1911 Fukui, Y., Maru, M., Ohkawara, K.-i., Miyake, T., Osada, Y., Wang, D., Ito, T., Higashi, H., Naiki, M., Wakamiya, N. and Kato, S.: Detection of glycoproteins as tumor-associated Hanganutziu-Deicher antigen in human gastric cancer cell line, NUGC4. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1149-1154.
- 1912 Garrels, J.I. and Franza, B.R., Jr.: Transformation-sensitive and growth-related changes of protein synthesis in REF52 cells. A two-dimensional gel analysis of SV40-, adenovirus-, and Kirsten murine sarcoma virus-transformed rat cells using the REF52 protein database. *J. Biol. Chem.*, 264 (1989) 5299-5312.
- 1913 Li, W. and Chan, J.C.: Secretion, glycosylation, and phosphorylation of rat-specific, transformation-associated proteins in Moloney murine sarcoma virus-transformed rat cells. *Cancer Res.*, 49 (1989) 1746-1751.
- 1914 Noguchi, M., Sakai, T. and Kisiel, W.: Identification and partial purification of a novel tumor-derived protein that induces tissue factor on cultured human endothelial cells. *Biochem. Biophys. Res. Commun.*, 160 (1989) 222-227.
- 1915 Yufu, Y., Nishimura, J., Takahira, H., Ideguchi, H. and Nawata, H.: Down-regulation of a Mr 90,000 heat shock cognate protein during granulocytic differentiation in HL-60 human leukemia cells. *Cancer Res.*, 49 (1989) 2405-2408.

19l. *Specific binding and receptor proteins*

- 1916 Arakaki, R.F., Comi, R.J. and Gorden, P.: Evidence for exogenous substrate phosphorylation and dimer formation by the activated 190 kDa insulin pro-receptor *in vitro*. *Biochem. Biophys. Res. Commun.*, 160 (1989) 296-302.
- 1917 Asselin, J., Phaneuf, S., Watterson, D.M. and Haiech, J.: Metabolically  $^{35}\text{S}$ -labeled recombinant calmodulin as a ligand for the detection of calmodulin-binding proteins. *Anal. Biochem.*, 178 (1989) 141-147.
- 1918 Comerford, J.G., Gibson, J.R., Dawson, A.P. and Gibson, I.: Ras p21 and other G $\alpha$  proteins are detected in mammalian cell lines by [ $\gamma$ - $^{35}\text{S}$ ]GTPYS binding. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1269-1274.
- 1919 Cupo, J.F., Allen, R.A., Jesaitis, A.J. and Bokoch, G.M.: Reconstitution and characterization of the human neutrophil N-formyl peptide receptor and GTP binding proteins in phospholipid vesicles. *Biochim. Biophys. Acta*, 982 (1989) 31-40.
- 1920 Ezak, O., Bono, N., Itakura, H. and Kasahara, M.: Co-localization of a glucose transporter and the insulin receptor of insulin-treated rat adipocytes. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1368-1374.
- 1921 Fliegel, L., Burns, K., Opas, M. and Michalak, M.: The high-affinity calcium binding protein of sarcoplasmic reticulum. Tissue distribution, and homology with calregulin. *Biochim. Biophys. Acta*, 982 (1989) 1-8.

- 1922 Gomez, A.R., Fernandez-Shaw, C., Valdivieso, F. and Mayor, F., Jr.: Chemical modification of the glycine receptor with fluorescein isothiocyanate specifically affects the interaction of glycine with its binding site. *Biochem. Biophys. Res. Commun.*, 160 (1989) 374-381.
- 1923 Harmon, J.M., Smith, A.C. and Elsasser, M.S.: Use of high-resolution two-dimensional gel electrophoresis and affinity labeling to probe glucocorticoid receptor structure and function. *Cancer Res.*, 49 (1989) 2238s-2243s.
- 1924 Hitomi, K., Masuda, S., Ito, K., Ueda, M. and Sasaki, R.: Solubilization and characterization of erythropoietin receptor from transplantable mouse erythroblastic leukemic cells. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1140-1148.
- 1925 Kaplan, G.C., Pillion, D.J., Rutter, W.J., Kim, H. and Barker, P.E.: Insulin receptor overexpression in a human pre-8 acute lymphocytic leukemia cell line with a t(1;9) chromosome translocation near the INSR locus. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1275-1282.
- 1926 Kim, J.W., Matsumoto, N., Komano, H. and Natori, S.: Stage-specific detection of a DNA-binding protein for the storage protein gene of *Sarcophaga peregrina*. *Biochim. Biophys. Acta*, 1008 (1989) 79-84.
- 1927 Kimura, N.: Developmental change and molecular properties of somatostatin receptors in the rat cerebral cortex. *Biochem. Biophys. Res. Commun.*, 160 (1989) 72-78.
- 1928 Krause, K.-H., Chou, M., Thomas, M.A., Sjolund, R.D. and Campbell, K.P.: Plant cells contain calsequestrin. *J. Biol. Chem.*, 264 (1989) 4269-4272.
- 1929 Kubota, H., Hidaka, Y., Ozaki, H., Ito, H., Hitayama, T., Takeda, Y. and Shimonishi, Y.: A long-acting heat-stable enterotoxin analog of enterotoxigenic *Escherichia coli* with a single D-amino acid. *Biochem. Biophys. Res. Commun.*, 161 (1989) 229-235.
- 1930 Lam, S.C.-T., Plow, E.F., D'Souza, S.E., Cheresh, D.A., Frelinger III, A.L. and Ginsberg, M.H.: Isolation and characterization of a platelet membrane protein related to the vitronectin receptor. *J. Biol. Chem.*, 264 (1989) 3742-3749.
- 1931 Lelong, J.-C., Prevost, G., il Lee, K. and Crepin, M.: South Western blot mapping: a procedure for simultaneous characterization of DNA binding proteins and their specific genomic DNA target sites. *Anal. Biochem.*, 179 (1989) 299-303.
- 1932 Nagata, K.-i., Nagao, S. and Nozawa, Y.: Low Mr GTP-binding proteins in human platelets: cyclic AMP-dependent protein kinase phosphorylates m22KG(I) in membrane but not c21KG in cytosol. *Biochem. Biophys. Res. Commun.*, 160 (1989) 235-242.
- 1933 Ocrant, I., Pham, H., Oh, Y. and Rosenfeld, R.G.: Characterization of insulin-like growth factor binding proteins of cultured rat astroglial and neuronal cells. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1316-1322.
- 1934 Perides, G., Lane, W.S., Andrews, D., Dahl, D. and Bignami, A.: Isolation and partial characterization of a glial hyaluronate-binding protein. *J. Biol. Chem.*, 264 (1989) 5981-5987.
- 1935 Polakis, P.G., Snyderman, R. and Evans, T.: Characterization of G25K, a GTP-binding protein containing a novel putative nucleotide binding domain. *Biochem. Biophys. Res. Commun.*, 160 (1989) 25-32.
- 1936 Rieber, M., Urbina, C. and Rieber, M.S.: DNA on membrane receptors: a target for monoclonal anti-DNA antibody induced by a nucleoprotein shed in systemic lupus erythematosus. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1441-1447.
- 1937 Roche, P.C. and Ryan, R.J.: Purification, characterization, and amino-terminal sequence of rat ovarian receptor for luteinizing hormone/human chorionadotropin. *J. Biol. Chem.*, 264 (1989) 4636-4641.
- 1938 Safer, D.: An electrophoretic procedure for detecting proteins that bind actin monomers. *Anal. Biochem.*, 178 (1989) 32-37.
- 1939 Savu, L., Vranckx, R., Maya, M. and Nunez, E.A.: Binding activities of thyroxine binding globulin versus thyroxine binding prealbumin in rat sera: differential modulation by thyroid hormone ligands, oleic acid and pharmacological drugs. *Biochem. Biophys. Res. Commun.*, 159 (1989) 919-926.
- 1940 Thalhofer, H.P., Starz, W., Daum, G., Wurster, B., Harris, B.G. and Hofer, H.W.: Purification and properties of the cyclic 3',5'-AMP-binding protein from the muscle of the nematode *Ascaris suum*. *Arch. Biochem. Biophys.*, 271 (1989) 471-478.
- 1941 Thomas, P.J., Wendelburg, B.E., Venuti, S.E. and Helmkamp, G.M., Jr.: Mature rat testis contains a high molecular weight species of phosphatidylinositol transfer protein. *Biochim. Biophys. Acta*, 982 (1989) 24-30.

- 1942 Walicke, P.A., Feige, J.-J. and Baird, A.: Characterization of the neuronal receptor for basic fibroblast growth factor and comparison to receptors on mesenchymal cells. *J. Biol. Chem.*, 264 (1989) 4120-4126.
- 1943 Wasco, W.M., Kincaid, R.L. and Orr, G.A.: Identification and characterization of calmodulin-binding proteins in mammalian sperm flagella. *J. Biol. Chem.*, 264 (1989) 5104-5111.
- 1944 William, F., Haigler, H.T. and Kraft, A.S.: Lack of phosphorylation of lipocortin I in A431 epidermoid carcinoma cells treated with phorbol esters. *Biochem. Biophys. Res. Commun.*, 160 (1989) 474-479.
- 1945 Xu, J., Richardson, C., Ford, C., Spencer, T., Li-juan, Y., Mackie, G., Hammond, G. and Possmayer, F.: Isolation and characterization of the cDNA for pulmonary surfactant-associated protein-B (SP-B) in the rabbit. *Biochem. Biophys. Res. Commun.*, 160 (1989) 325-332.
- 1946 Young, N.M., Johnston, R.A.Z., Szabo, A.G. and Watson, D.C.: Homology of the D-galactose-specific lectins from *Artocarpus integrifolia* and *Maclura pomifera* and the role of an unusual small polypeptide subunit. *Arch. Biochem. Biophys.*, 270 (1989) 596-603.

See also 1809.

#### 19m. Urinary proteins

- 1947 Fraij, B.M.: Separation and identification of urinary proteins and stone-matrix proteins by mini-slab sodium dodecyl sulfate-polyacrylamide gel electrophoresis. *Clin. Chem. (Winston-Salem)*, 35 (1989) 658-662.

#### 19n. Other proteins

- 1948 Imai, K., Tokinaga, D., Kobayashi, T., Yasuda, K., Nagai, K. and Takahashi, S.: (Electrophoresis immunoassays for multiple component analysis using antibodies immobilized in multilayered media). *Jpn. Kokai Tokkyo Koho Pat.* JP 63 79,071 (88 79,071) (Cl.G01N33/561), 09 Apr. 1988, Appl. 86/223,682, 24 Sep. 1986, 5 pp.; *C.A.*, 110 (1989) 228168m.
- 1949 Bikker, H., van den Berg, F.M., Wolterman, R.A., de Vijlder, J.J.M. and Bolhuis, P.A.: Demonstration of a Sandhoff disease-associated autosomal 50-kb deletion by field inversion gel electrophoresis. *Hum. Genet.*, 81 (1989) 287-288; *C.A.*, 110 (1989) 226410k.

See also 1873.

### 20. ENZYMES AND ENZYME ACTIVITY ESTIMATION

- 1950 Minter, M., Towbin, J., Harter, J. and McCabe, E.R.B.: Enzyme product blot for nondestructive assay of protein catalytic function in polyacrylamide gels. *Anal. Biochem.*, 178 (1989) 22-26.
- 1951 Stasz, T.E., Weeden, N.F. and Harman, G.E.: Methods of isozyme electrophoresis for *Trichoderma* and *Gliocladium* species. *Mycologia*, 80 (1988) 870-874; *C.A.*, 110 (1989) 168707z.
- 1952 Westermeier, R. and Blaicher, M.: (Modern procedures for isoenzyme differentiation). *MTA*, 3 (1988) 917-918; *C.A.*, 110 (1989) 168690p.

#### 20a. Oxidoreductases

- 1953 Adams, J.B. and Ongley, M.H.: The behavior of green bean lipooxygenase on chromatography and isoelectric focusing. *Food Chem.*, 31 (1989) 57-71; *C.A.*, 110 (1989) 168853u.
- 1954 Aksenov, M.Yu., Kapitanov, A.B., Pogoda, T.V. and Archakov, A.I.: (Accumulation of nonactive NADH-oxidase molecules in plasma membranes of ageing cells of *Acholeplasma laidlawii*). *Biokhimiya (Moscow)*, 54 (1989) 857-862.
- 1955 Aronson, B.D., Somerville, R.L., Epperly, B.R. and Dekker, E.E.: The primary structure of *Escherichia coli* L-threonine dehydrogenase. *J. Biol. Chem.*, 264 (1989) 5226-5232.

- 1956 Clay, V.J. and Ragan, C.I.: Biosynthesis and import into the mitochondrion of L-3-glycerophosphate dehydrogenase, and the effect of thyroid hormone deficiency on gene expression. *Biochim. Biophys. Acta*, 975 (1989) 112-118.
- 1957 Del Corso, A., Barsacchi, D., Camici, M., Garland, D. and Mura, U.: Bovine lens aldose reductase: identification of two enzyme forms. *Arch. Biochem. Biophys.*, 270 (1989) 604-610.
- 1958 Guerroui, S., Aubourg, P., Chen, W.W., Hashimoto, T. and Scotto, J.: Molecular analysis of peroxisomal  $\beta$ -oxidation enzymes in infants with peroxisomal disorders indicates heterogeneity of the primary defect. *Biochem. Biophys. Res. Commun.*, 161 (1989) 242-251.
- 1959 Huang, T.-J., Trakshel, G.M. and Maines, M.D.: Multiple forms of biliverdin reductase: modification of the pattern of expression in rat liver by bromobenzene. *Arch. Biochem. Biophys.*, 270 (1989) 513-520.
- 1960 Kalpaxis, D.L. and Giannoulaki, E.E.: Partial characterization of an abnormal lactate dehydrogenase isoenzyme, LDH-1ex, in serum from a patient with hepatocellular carcinoma. *Clin. Chem. (Winston-Salem)*, 35 (1989) 844-848.
- 1961 Launay, J.F., Jellali, A. and Vanier, M.T.: Glyceraldehyde-3-phosphate dehydrogenase is a microtubule binding protein in a human colon tumor cell line. *Biochim. Biophys. Acta*, 996 (1989) 103-109.
- 1962 Oblad, M., Selin, E., Malmström, B., Strid, L., Aasa, R. and Malmström, B.G.: Analytical characterization of cytochrome oxidase preparations with regard to metal and phospholipid contents, peptide composition and catalytic activity. *Biochim. Biophys. Acta*, 975 (1989) 267-270.
- 1963 Seymour, J.L. and Lazarus, R.A.: Native gel activity stain and preparative electrophoretic method for the detection and purification of pyridine nucleotide-linked dehydrogenases. *Anal. Biochem.*, 178 (1989) 243-247.
- 1964 Shirabe, K., Yubusui, T. and Takeshita, M.: Expression of human erythrocyte NADH-cytochrome b<sub>5</sub> reductase as an  $\alpha$ -thrombin-cleavable fused protein in *Escherichia coli*. *Biochim. Biophys. Acta*, 1008 (1989) 189-192.
- 1965 Suzuki, Y., Morita, I., Ishizaki, Y., Yamane, Y. and Murota, S.-i.: Cadmium stimulates prostaglandin E<sub>2</sub> synthesis in osteoblast-like cells, MC3T3-E1. *Biochim. Biophys. Acta*, 1012 (1989) 135-139.

See also 1998.

20b. *Transferases (excluding E.C. 2.7.-.-)*

- 1966 Aniello, F., Branno, M., Geraci, G. and Tosi, L.: Histone-lysine methyltransferase activity from sea-urchin embryo nuclei. Changes in substrate specificity upon purification. *Biochim. Biophys. Acta*, 1008 (1989) 31-38.
- 1967 Barnes, S., Buchina, E.S., King, R.J., Mc Burnett, T. and Taylor, K.B.: Bile acid sulfotransferase I from rat liver sulfates bile acids and 3-hydroxy steroids: purification, N-terminal amino acid sequence and kinetic properties. *J. Lipid Res.*, 30 (1989) 529-540.
- 1968 Carter-Edwards, T., Fung, E. and Snyder, F.F.: Modified GMP-affinity chromatography for the purification of mutant hypoxanthine phosphoribosyltransferase. *Anal. Biochem.*, 178 (1989) 148-152.
- 1969 Ikeda, T., Ubuka, T. and Ishino, K.: Determination of the isoelectric point value of 3-mercaptopyruvate sulfur-transferase and its shift by treatment with oxidized glutathione. *Acta Med. Okayama*, 43 (1989) 1-7; *C.A.*, 110 (1989) 188283m.
- 1970 Paoletti, F., Mocali, A., Marchi, M. and Truschi, F.: Analysis of transketolase and identification of an enzyme variant in human leukocytes. *Biochem. Biophys. Res. Commun.*, 161 (1989) 150-155.
- 1971 Yoshida, I., Koyama, T. and Ogura, K.: Formation of a stable and catalytically active complex of the two essential components of hexaprenyl diphosphate synthase from *Micrococcus luteus* B-P 26. *Biochem. Biophys. Res. Commun.*, 160 (1989) 448-452.

20c. *Transferases transferring phosphorus containing groups (E.C. 2.7.-.-)*

- 1972 Chakravarthy, B.R., Franks, D.J., Whithield, J.F. and Durkin, J.P.: A novel method for measuring protein kinase C activity in a native membrane-associated state. *Biochem. Biophys. Res. Commun.*, 160 (1989) 340-345.

- 1973 Horowitz, J.A., Voulalas, P., Wasco, W., MacLeod, M., Paupard, M.-C. and Orr, G.A.: Biochemical and immunological characterization of the flagellar-associated regulatory subunit of a type II cyclic adenosine 5'-monophosphate-dependent protein kinase. *Arch. Biochem. Biophys.*, 270 (1989) 411-418.
- 1974 Hotz, A., König, N., Taniguchi, H., Chrivia, J.C. and Kinzel, V.: Catalytic subunit of cAMP-dependent protein kinase from bovine heart: several isoforms demonstrated by high resolution focusing in immobilized pH gradient. *Biochem. Biophys. Res. Commun.*, 160 (1989) 596-601.
- 1975 Ling, L.E., Schulz, J.T. and Cantley, L.C.: Characterization and purification of membrane-associated phosphatidylinositol-4-phosphate kinase from human red blood cells. *J. Biol. Chem.*, 264 (1989) 5080-5088.
- 1976 Megow, D.: (Isoelectric focusing of pyruvate kinase mutants). *Z. Klin. Med.*, 44 (1989) 67-70; *C.A.*, 110 (1989) 188195j.
- 1977 Nilsson, A., Thomson, K.S. and Adler, L.: Purification and characterization of glycerol kinase in the salt-tolerant yeast *Debaryomyces hansenii*. *Biochim. Biophys. Acta*, 991 (1989) 296-302.
- 1978 Ramesh, U. and Maeres, C.F.: Footprint of the sigma protein. *Biochem. Biophys. Res. Commun.*, 160 (1989) 121-125.
- 1979 Righetti, P.G., Barzaghi, B., Sarubbi, E., Soffientini, A. and Cassani, G.: Charge heterogeneity of recombinant pro-urokinase and urinary urokinase, as revealed by isoelectric focusing in immobilized pH gradients. *J. Chromatogr.*, 470 (1989) 337-350.
- 1980 Wolcott, R.M. and Colacino, J.M.: Detection of thymidine kinase activity using an assay based on the precipitation of nucleoside monophosphates with lanthanum chloride. *Anal. Biochem.*, 178 (1989) 38-40.
- 1981 Wong, S.W., Syvaaja, J., Tan, Ch., Downey, K.M., So, A.G., Linn, S. and Wang, T.S.-F.: DNA polymerases  $\alpha$  and  $\delta$  are immunologically and structurally distinct. *J. Biol. Chem.*, 264 (1989) 5924-5928.

See also 2029.

20d. *Hydrolases, acting on ester bonds (E.C. 3.1.-.-)*

- 1982 Asahara, H., Wistort, P.M., Bank, J.F., Bakerian, R.H. and Cunningham, R.P.: Purification and characterization of *Escherichia coli* endonuclease III from the cloned *nth* gene. *Biochemistry*, 28 (1989) 4444-4449.
- 1983 Cohen, P.T.W., Schelling, D.L., da Cruz e Silva, O.B., Barker, H.M. and Cohen, P.: The major type-1 protein phosphatase catalytic subunits are the same gene products in rabbit skeletal muscle and rabbit liver. *Biochim. Biophys. Acta*, 1008 (1989) 125-128.
- 1984 Ikeda, Y., Takagi, A. and Yamamoto, A.: Purification and characterization of lipoprotein lipase and hepatic triglyceride lipase from human postheparin plasma: production of monospecific antibody to the individual lipase. *Biochim. Biophys. Acta*, 1003 (1989) 254-269.
- 1985 Kanellis, A.K., Solomos, T. and Mattoo, A.K.: Visualization of acid phosphatase activity on nitrocellulose filters following electroblotting of polyacrylamide gels. *Anal. Biochem.*, 179 (1989) 194-197.
- 1986 Okabe, A., Shimizu, T. and Hayashi, H.: Cloning and sequencing of a phospholipase C gene of *Clostridium perfringens*. *Biochem. Biophys. Res. Commun.*, 160 (1989) 33-39.
- 1987 Quintern, L.E., Zenk, T.S. and Sandhoff, K.: The urine from patients with peritonitis as a rich source for purifying human acid sphingomyelinase and other lysosomal enzymes. *Biochim. Biophys. Acta*, 1003 (1989) 12-124.
- 1988 Rosalki, S.B. and Foo, A.Y.: Alkaline phosphatase of possible renal origin identified in plasma after colchicine overdose. *Clin. Chem. (Winston-Salem)*, 35 (1989) 702-703.
- 1989 Rosalki, S.B. and Foo, A.Y.: An alkaline phosphatase isoenzyme mystery: a challenge to the reader. *Clin. Chem. (Winston-Salem)*, 35 (1989) 707-708.
- 1990 Semenkovich, C.F., Chen, S.-H., Wims, M., Luc, C.-C., Li, W.-H. and Chan, L.: Lipoprotein lipase and hepatic lipase mRNA tissue specific expression, developmental regulation, and evolution. *J. Lipid Res.*, 30 (1989) 423-431.
- 1991 Toh, Y., Yamamoto, M., Endo, H., Misumi, Y. and Ikehara, Y.: Isolation and characterization of a rat liver alkaline phosphatase gene. A single gene with two promoters. *Eur. J. Biochem.*, 182 (1989) 231-237.

20e. *Hydrolases, acting on glycosyl compounds (E.C. 3.2.-)*

- 1992 Audy, P., Grenier, J. and Asselin, A.: Lysozyme activity in animal extracts after sodium dodecyl sulfate-polyacrylamide gel electrophoresis. *Comp. Biochem. Physiol., B: Compl. Biochem.*, 92B (1989) 523-527; *C.A.*, 110 (1989) 188199p.
- 1993 Bjerrum, O.J. and Heegaard, N.H.H.: Has immunoblotting replaced electroimmuno-precipitation? Examples from the analysis of autoantigens and transglutaminase-induced polymers of the human erythrocyte membrane. *J. Chromatogr.*, 470 (1989) 251-267.
- 1994 Cote, F., Letarte, J., Grenier, J., Trudel, J. and Asselin, A.: Detection of  $\beta$ -1,3-glucanase activity after native polyacrylamide gel electrophoresis: application to tobacco pathogenesis-related proteins. *Electrophoresis (Weinheim)*, 10 (1989) 527-529.
- 1995 Fontana, J.D., Gebara, M., Blumel, M., Schneider, H., MacKenzie, C.R. and Johnson, K.G.:  $\alpha$ -4-O-methyl-D-glucuronidase component of xylanolytic complexes. *Methods Enzymol.*, 160 (Biomass, Pt. A) (1988) 560-571; *C.A.*, 110 (1989) 168771r.
- 1996 Hackett, T.J. and McHale, A.P.: Production of exocellobiohydrolase activity by *Talaromyces emersonii* CBS 814.70 during growth on lactose-containing media. *Biochim. Biophys. Acta*, 991 (1989) 248-252.
- 1997 Sata, H., Umeda, M., Kim, C.-H., Taniguchi, H. and Maruyama, Y.: Amylase-pullulanase enzyme produced by *B. circulans* F-2. *Biochim. Biophys. Acta*, 991 (1989) 388-394.
- 1998 Schrattenholz, A.S., Nawroth, T. and Dose, K.: Isolation and partial characterization of a cytochrome-*c* complex from chromophores of the photosynthetic bacterium *Rhodospirillum rubrum* FR1. *Eur. J. Biochem.*, 181 (1989) 689-694.
- 1999 Tofilo, A.P. and Antonov, M.P.: (Method of differential analysis of glomerulonephritis and pyelonephritis by electrophoresis of urinary lysozyme). *U.S.S.R. Pat. SU 1,429,031 (Cl. G01N33/68)*, 07 Oct. 1988, Appl. 4,080,571, 20 Jan. 1986; *C.A.*, 110 (1989) 169818y.
- 2000 Trudel, J. and Asselin, A.: Detection of chitinase activity after polyacrylamide gel electrophoresis. *Anal. Biochem.*, 178 (1989) 362-366.
- 2001 Weth, F., Schroeder, T. and Buxtorf, U.P.: Determination of lysozyme content in eggs and egg products using SDS-gel electrophoresis. *Z. Lebensm.-Unters. Forsch.*, 187 (1988) 541-545; *C.A.*, 110 (1989) 211072c.
- 20f. *Other hydrolases*
- 2002 Burnasheva, S.A., Fain, F.S., Kireeva, I.Yu. and Poglazov, B.F.: (Isolation and investigation of ATPase associated with the cell surface of *T. pyriformis*). *Biokhimiya (Moscow)*, 54 (1989) 788-795.
- 2003 Conner, G.E., Udey, J.A., Pinto, C. and Sola, J.: Nonhuman cells correctly sort and process the human lysosomal enzyme cathepsin D. *Biochemistry*, 28 (1989) 3530-3533.
- 2004 Dahlmann, B., Kuehn, L., Heinrich, P.C., Kirschke, H. and Wiederanders, B.: ATP-activated, high-molecular-mass proteinase-I from rat skeletal muscle is a cysteine proteinase- $\alpha_1$ -macroglobulin complex. *Biochim. Biophys. Acta*, 991 (1989) 253-262.
- 2005 Gurwitz, D., Simon, M.M., Fruty, U. and Cunningham, D.D.: Protease nexin-1 complexes and inhibits T cell serine proteinase-1. *Biochem. Biophys. Res. Commun.*, 161 (1989) 300-304.
- 2006 Kenney, M.C., Chwa, M., Escobar, M. and Brown, D.: Altered gelatinolytic activity by keratoconus corneal cells. *Biochem. Biophys. Res. Commun.*, 161 (1989) 353-357.
- 2007 Koivunen, E.: Detection of trypsin- and chymotrypsin-like proteases using *p*-nitroanilide substrates after sodium dodecyl sulphate polyacrylamide gel electrophoresis. *J. Chromatogr.*, 470 (1989) 401-406.
- 2008 Kuehn, L., Dahlmann, B., Gauthier, F. and Neubauer, H.-P.: High-molecular-mass proteinases in rabbit raticulocytes: the multicatalytic proteinase is an ATP-independent enzyme and ATP-activated proteolysis is in part associated with a cysteine proteinase complexed to  $\alpha_1$ -macroglobulin. *Biochim. Biophys. Acta*, 991 (1989) 263-271.



- 2009 Levin, A.E., Travis, S.M., DeVito, L.D., Park, K.A. and Nelson, D.L.: Purification and characterization of a calcium-dependent ATPase from *Paramecium tetraurelia*. *J. Biol. Chem.*, 264 (1989) 4544-4551.
- 2010 Marzuki, S., Watkins, L.C. and Choo, W.M.: Mitochondrial H<sup>+</sup>-ATPase in mutants of *Saccharomyces cerevisiae* with defective subunit 8 of the enzyme complex. *Biochim. Biophys. Acta*, 975 (1989) 222-230.
- 2011 Nishimura, Y., Kawabata, T., Furuno, K. and Kato, K.: Evidence that aspartic proteinase is involved in the proteolytic processing event of procathepsin L in lysosomes. *Arch. Biochem. Biophys.*, 271 (1989) 400-406.
- 2012 Revina, L.P., Khaidarova, N.V., Rudenskaya, G.N., Grebenshchikov, N.I., Baratova, L.A. and Stepanov, V.M.: (Study of the effect of Glu,Asp-specific proteinase from *Streptomyces thermovulgaris* on peptide and protein substrates. *Biokhimiya (Moscow)*, 54 (1989) 846-850.
- 2013 Siegel, G.J. and Desmond, T.J.: Effects of tetradecyl sulfate on electrophoretic resolution of kidney Na,K-ATPase catalytic subunit isoforms. *J. Biol. Chem.*, 264 (1989) 4751-4754.
- 2014 Slooten, L. and Vandenbranden, S.: Isolation of the proton-translocating F<sub>0</sub>F<sub>1</sub>-ATPase from *Rhodospirillum rubrum* chromatophores, and its functional reconstitution into proteoliposomes. *Biochim. Biophys. Acta*, 975 (1989) 148-157.
- 2015 Sweadner, K.J.: Isozymes of the Na<sup>+</sup>/K<sup>+</sup>-ATPase. *Biochim. Biophys. Acta*, 988 (1989) 185-220 - a review wotj 295 refs.
- 2016 Tanaka, K. and Ichihara, A.: Half-life of proteasomes (multiprotease complexes) in rat liver. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1309-1315.
- 2017 Tollersrud, O.K. and Aronson, N.N., Jr.: Purification and characterization of rat liver glycosylasparaginase. *Biochem. J.*, 260 (1989) 101-108.

See also 1821.

#### 20g. Lyases

- 2018 Crane, D.I., Chen, N. and Masters, C.J.: Evidence that the enoyl-CoA hydratase bifunctional protein of mouse liver peroxisomes is identical with the 70,000 dalton peroxisomal membrane protein. *Biochem. Biophys. Res. Commun.*, 160 (1989) 503-508.
- 2019 Evans, J.L., Quistorff, B. and Witters, L.A.: Zonation of hepatic lipogenic enzymes identified by dual-digitonin-pulse perfusion. *Biochem. J.*, 259 (1989) 821-829.
- 2020 Lougovoi, C.P. and Kyriakidis, D.A.: Interconversion of *Tetrahymena pyriformis* ornithine decarboxylase from inactive to active form by phosphorylation. *Biochim. Biophys. Acta*, 996 (1989) 70-75.
- 2021 Scher, D.S. and Rodwell, V.W.: 3-Hydroxy-3-methylglutaryl coenzyme A lyase from *Pseudomonas mevalonii*. *Biochim. Biophys. Acta*, 1003 (1989) 321-326.

#### 20h. Isomerases

- 2022 Epstein, R.J. and Smith, P.J.: Mitogen-induced topoisomerase II synthesis precedes DNA synthesis in human breast cancer cells. *Biochem. Biophys. Res. Commun.*, 160 (1989) 12-17.
- 2023 Figgitt, D.P., Denyer, S.P., Dewick, P.M., Jackson, D.E. and Williams, P.: Topoisomerase II: a potential target for novel antifungal agents. *Biochem. Biophys. Res. Commun.*, 160 (1989) 257-262.
- 2024 Richard, R.E. and Bogenhagen, D.F.: A high molecular weight topoisomerase I from *Xenopus laevis* ovaries. *J. Biol. Chem.*, 264 (1989) 4704-4709.

#### 20i. Ligases

- 2025 Elizarov, S.M., Vol'fson, A.D. and Motorin, Yu.A.: (Phosphorylation of polypeptides of the high molecular weight aminoacyl-tRNA synthetase complex by associated casein kinase I). *Biokhimiya (Moscow)*, 54 (1989) 774-783.
- 2026 Van Heeke, G. and Schuster, S.M.: Expression of human asparagine synthetase in *Escherichia coli*. *J. Biol. Chem.*, 264 (1989) 5503-5509.

See also 2019.

20j. *Complex mixtures and incompletely identified enzymes*

- 2027 Cheek, W.D. and Appling, D.R.: Purification, immunoassay, and tissue distribution of rat C<sub>1</sub>-tetrahydrofolate synthase. *Arch. Biochem. Biophys.*, 270 (1989) 504-512.
- 2028 Lepage, T. and Gache, C.: Purification and characterization of the sea urchin embryo hatching enzyme. *J. Biol. Chem.*, 264 (1989) 4787-4793.
- 2029 Marie, I., Galabru, J., Svab, J. and Hovanessian, A.G.: Preparation and characterization of polyclonal antibodies specific for the 69 and 100 k-dalton forms of human 2-5S synthetase. *Biochem. Biophys. Res. Commun.*, 160 (1989) 580-587.
- 2030 Meyer, R. and Pistorius, E.K.: Partial characterization of an arginine-metabolizing enzyme from the thermophilic cyanobacterium *Synechococcus* sp. *Biochim. Biophys. Acta*, 975 (1989) 80-87.
- 2031 Nishimura, C., Suzuki, H., Tanaka, N. and Yamaguchi, H.: Intracellular degradation of bleomycin hydrolase in two Chinese hamster cell lines in relation to their peplomycin susceptibility. *Biochim. Biophys. Acta*, 1012 (1989) 29-35.
- 2032 Oizumi, J. and Hayakawa, K.: Biotinidase and lipoamidase in guinea pig livers. *Biochim. Biophys. Acta*, 991 (1989) 410-414.
- 2033 Pescanti, E.L.: Enzymes of *Pneumocystis carinii*: electrophoretic mobility on starch gels. *J. Protozool.*, 36 (1989) 2S-3S; *C.A.*, 110 (1989) 228225c.
- 2034 Reddy, M.K. and Bauer, W.R.: Activation of the vaccinia virus nicking-joining enzyme by trypsinization. *J. Biol. Chem.*, 264 (1989) 443-449.

## 21. PURINES, PYRIMIDINES, NUCLEIC ACIDS AND THEIR CONSTITUENTS

- 2035 Olschwang, S. and Thomas, G.: Temperature gradient increases FIGE resolution. *Nucleic Acids Res.*, 17 (1989) 2363; *C.A.*, 110 (1989) 208776e.

21a. *Purines, pyrimidines, nucleosides, nucleotides*

- 2036 Bruchelt, G., Buedenbender, M., Treumer, J., Niethammer, D. and Schmidt, K.: Investigations on the interferon-induced 2',5'-oligoadenylate system using analytical capillary isotachopheresis. *J. Chromatogr.*, 470 (1989) 185-190.
- 2037 Ghosh, S.S., Kao, P.M. and Kwok, D.Y.: Synthesis of 5'-oligonucleotide hydrazide derivatives and their use in preparation of enzyme-nucleic acid hybridization probes. *Anal. Biochem.*, 178 (1989) 43-51.
- 2038 Igloi, G.L. and Koessel, H.: Affinity electrophoresis for the separation of oligo- and polynucleotides. *Nucleosides nucleotides*, 7 (1988) 639-643; *C.A.*, 110 (1989) 169656u.

See also 1675.

21b. *Nucleic acids, RNA*

- 2039 Bovenberg, R.A.L., Moen, T.C., Jansz, H.S. and Baas, P.D.: *In vitro* splicing analysis of mini-gene constructs of the alternatively processed human calcitonin/ CGRP-I pre-mRNA. *Biochim. Biophys. Acta*, 1008 (1989) 223-233.
- 2040 Cooper, D.A., Stein, J.C., Strielemann, P.J. and Bensadoun, A.: Avian adipose lipoprotein lipase: cDNA sequence and reciprocal regulation of mRNA levels in adipose and heart. *Biochim. Biophys. Acta*, 1008 (1989) 92-101.
- 2041 Delers, F., Mangeney, M., Raffa, D., Vallet-Colom, I., Daveau, M., Tran-Quang, N., Davrinches, C. and Chambaz, J.: Changes in rat liver mRNA for alpha-1-acid-glycoprotein, apolipoprotein E, apolipoprotein B and beta-actin after mouse recombinant tumor necrosis factor injection. *Biochem. Biophys. Res. Commun.*, 161 (1989) 81-88.
- 2042 Dontzova, O.A., Bogdanova, S.L. and Kopylov, A.M.: (Short RNA synthesis from plasmids in *E. coli* cells). *Biokhimiya (Moscow)*, 54 (1989) 870-876.
- 2043 Nowak, R., Siedlecki, J.A., Kaczmarek, L., Zmudzka, B.Z. and Wilson, S.H.: Levels and size complexity of DNA polymerase  $\beta$  mRNA in rat regenerating liver and other organs. *Biochim. Biophys. Acta*, 1008 (1989) 203-207.

- 2044 Peracchia, F., Polentarutti, N., Colotta, F. and Mussoni, L.: Increased expression of urokinase mRNA in bovine aortic endothelial cells treated with propranolol. *Biochem. Biophys. Res. Commun.*, 160 (1989) 977-981.
- 2045 Price, S.R., Tsai, S., Adamik, R., Angus, C.W., Serventi, I.M., Tsuchiya, M., Moss, J. and Vaughan, M.: Expression of G<sub>0</sub> $\alpha$  mRNA and protein in bovine tissues. *Biochemistry*, 28 (1989) 3803-3807.
- 2046 Ratner, D.I., Pentz, W.H. and Pelletier, D.A.: Prespore gene expression in *Dictyostelium* requires concomitant protein synthesis. *Biochim. Biophys. Acta*, 1008 (1989) 71-78.
- 2047 Satoguchi, M., Nasu, N., Yoshida, S., Higuchi, Y., Akizuki, S. and Yamamoto, S.: Mouse and human CD14 (myeloid cell-specific leucine-rich glycoprotein) primary structure deduced from cDNA clones. *Biochim. Biophys. Acta*, 1008 (1989) 213-222.
- 2048 Stackebrandt, E. and Ludwig, W.: 16 S Ribosomal RNA cataloging. *Methods Enzymol.*, 167 (Cyanobacteria) (1988) 132-138; *C.A.*, 110 (1989) 208771z.
- 2049 Tada, M., Fukamizu, A., Seo, M.S., Takahashi, S. and Murakami, K.: Renin expression in the kidney and brain is reciprocally controlled by captopril. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1065-1071.
- 2050 Theissen, G., Richter, A. and Lukaes, N.: Degree of biotinylation in nucleic acids estimated by a gel retardation assay. *Anal. Biochem.*, 179 (1989) 98-105.
- 2051 Vanoni, M., Lotti, M. and Alberghina, L.: Expression of cloned *Saccharomyces diastaticus* glucoamylase under natural and inducible promoters. *Biochim. Biophys. Acta*, 1008 (1989) 168-176.

See also 1716, 1925, 1945, 1949, 1990, 2077, 2082, 2152.

#### 21c. Nucleic acids, DNA

- 2052 Ahlquist, J.A.O., Franklyn, J.A., Sheppard, M.C. and Ramsden, D.B.: Thyroid hormone response elements in pituitary genes. *Biochim. Biophys. Acta*, 1008 (1989) 251-254.
- 2053 Ali, S. and Wallace, R.B.: Enzymatic synthesis of DNA probes complementary to a human variable number tandem repeat locus. *Anal. Biochem.*, 179 (1989) 280-283.
- 2054 Batoulis, J., Pistor, N., Kremer, K. and Frisch, H.L.: Monte Carlo simulation of DNA electrophoresis. *Electrophoresis (Weinheim)*, 10 (1989) 442-446.
- 2055 Birren, B.W., Hood, L. and Lai, E.: Pulsed field gel electrophoresis: Studies of DNA migration made with the programmable, autonomously-controlled electrode electrophoresis system. *Electrophoresis (Weinheim)*, 10 (1989) 302-309.
- 2056 Briata, P., Gherzi, R., Adezati, L. and Cordera, R.: Effect of two different glucose concentrations on insulin receptor mRNA levels in human hepatoma HepG2 cells. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1415-1420.
- 2057 Burmer, G.C., Rabinovitch, P.S. and Loeb, L.A.: Analysis of c-Ki-ras mutations in human colon carcinoma by cell sorting, polymerase chain reaction, and DNA sequencing. *Cancer Res.*, 49 (1989) 2141-2146.
- 2058 Ceglarek, J.A. and Revzin, A.: Studies of DNA-protein interactions by gel electrophoresis. *Electrophoresis (Weinheim)*, 10 (1989) 360-365.
- 2059 Chinchaladze, D.Z., Prangishvili, D.A., Scamrov, A.V., Beabealashvili, R.S., Dyatkina, N.B. and Kravetsky, A.A.: Nucleoside 5'-triphosphates modified at sugar residues as substrates for DNA polymerase from the thermoacidophilic archaeobacterium *Sulfolobus acidocaldarius*. *Biochim. Biophys. Acta*, 1008 (1989) 113-115.
- 2060 Christen, A.A. and Montalbano, B.: An ethidium bromide-agarose plate assay for the nonradioactive detection of cDNA synthesis. *Anal. Biochem.*, 178 (1989) 269-272.
- 2061 Chu, B., Xu, R. and Wang, Z.: Low-field transient electric birefringence of DNA in agarose gels. *Biopolymers*, 27 (1988) 2005-2009; *C.A.*, 110 (1989) 169662t.
- 2062 Chu, G.: Pulsed field electrophoresis in contour-clamped homogeneous electric fields for the resolution of DNA by size or topology. *Electrophoresis (Weinheim)*, 10 (1989) 290-295.
- 2063 Crater, G.D., Gregg, M.R. and Holzwarth, G.: Mobility surfaces for field-inversion gel electrophoresis of linear DNA. *Electrophoresis (Weinheim)*, 10 (1989) 310-315.

- 2064 Dabrowiak, J.C., Kissinger, K. and Goodisman, J.: Quantitative footprinting analysis of drug-DNA interactions: Fe(III) methidium-propyl-EDTA as a probe. *Electrophoresis (Weinheim)*, 10 (1989) 404-412.
- 2065 Denko, N., Giaccia, A., Peters, B. and Stamato, T.D.: An asymmetric field inversion gel electrophoresis method for the separation of large DNA molecules. *Anal. Biochem.*, 178 (1989) 172-176.
- 2066 Ehlen, T. and Dubeau, L.: Detection of ras point mutations by polymerase chain reaction using mutation-specific, inosine-containing oligonucleotide primers. *Biochem. Biophys. Res. Commun.*, 160 (1989) 441-447.
- 2067 Fried, M.G.: Measurement of protein-DNA interaction parameters by electrophoresis mobility shift assay. *Electrophoresis (Weinheim)*, 10 (1989) 366-376.
- 2068 Gaido, M.L. and Strobl, J.S.: Inhibition of rat growth hormone promoter activity by site-specific DNA methylation. *Biochim. Biophys. Acta*, 1008 (1989) 234-242.
- 2069 Gama Sosa, M.A., Hall, J.C., Schneider, K.E., Lukaszewicz, G.C. and Ruprecht, R.M.: Unusual DNA structures at the integration site of an HIV provirus. *Biochem. Biophys. Res. Commun.*, 161 (1989) 134-142.
- 2070 Grinsted, J. and Bennett, P.M.: Preparation and electrophoresis of plasmid DNA. *Methods Microbiol.*, 21 (1988) 129-142; *C.A.*, 110 (1989) 206675x.
- 2071 Hassett, C., Turnblom, S.M., DeAngeles, A. and Omiecinski, C.J.: Rabbit microsomal epoxide hydrolase: isolation and characterization of the xenobiotic metabolizing enzyme cDNA. *Arch. Biochem. Biophys.*, 271 (1989) 380-389.
- 2072 Hightower, R.C. and Santi, D.V.: Migration properties of circular DNAs using orthogonal-field-alternation gel electrophoresis. *Electrophoresis (Weinheim)*, 10 (1989) 283-290.
- 2073 Jenab, S. and Johnson, E.M.: A dual-circular plasmid structure dependent on DNA replication generated in monkey COS7 cells and cell extracts. *Biochem. Biophys. Res. Commun.*, 160 (1989) 53-59.
- 2074 John, D.C.A., Rosamund, J. and Douglas, K.T.: Tight binding of a copper(II) phthalocyanine (Cuprolinic Blue) to DNA. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1256-1262.
- 2075 Juang, J.-K., Huang, H.W., Chen, C.-M. and Liu, H.J.: A new compound, withangulatin A, promotes type II DNA topoisomerase-mediated DNA damage. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1128-1134.
- 2076 Kainz, P. and Kainz, V.: Nick translation of DNA immobilized on nylon membranes. *Anal. Biochem.*, 178 (1989) 260-262.
- 2077 Lai, E., Birren, B.W., Clark, S.M., Simon, M.I. and Hood, L.: Pulsed field gel electrophoresis. *BioTechniques*, 7 (1989) 34-42; *C.A.*, 110 (1989) 188577k.
- 2078 Lanclos, K.D., Michael, S.K., Gu, Y.C., Howard, E.F., Stoming, T.A. and Huisman, T.H.J.: Transient chloramphenicol acetyltransferase expression of the G $\gamma$  globin gene 5'-flanking regions containing substitutions of C-T at position -158, G-A at position -161, and T-A at position -175 in K562 cells. *Biochim. Biophys. Acta*, 1008 (1989) 109-112.
- 2079 Larsen, C.G., Zachariae, C.O.C., Oppenheim, J.J. and Matsushima, K.: Production of monocyte chemotactic and activating factor (MCAF) by human dermal fibroblasts in response to interleukin 1 or tumor necrosis factor. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1403-1408.
- 2080 Le Brun, J.J. Rentier-Delrue, F. and Mercier, L.: A simple method for the preparation of the covalently closed circular form of plasmid DNA. *BioTechniques*, 6 (1988) 837-838; *C.A.*, 110 (1989) 228016k.
- 2081 Leite, L.C.C. and Augusto, O.: DNA alterations induced by the carbon-centered radical derived from the oxidation of 2-phenylethylhydrazine. *Arch. Biochem. Biophys.*, 270 (1989) 560-572.
- 2082 MacConell, W.P.: Electrophoretic procedure for annealing complementary nucleic acid molecules at an increased rate. *U.S. Pat.* US 4,787,963 (Cl. 204-180.1; C12N15/00), 29 Nov. 1988, Appl. 46,652, 04 May 1987, 13 pp.; *C.A.*, 110 (1989) 167546j.
- 2083 Manias, D.A., Ostrow, R.S., McGlennen, R.C., Estensen, R.D. and Faras, A.J.: Characterization of integrated human papillomavirus type 11 DNA in primary and metastatic tumors from a renal transplant recipient. *Cancer Res.*, 49 (1989) 2514-2519.
- 2084 Maniloff, J.: Anomalous values of Mycoplasma genomes sizes determined by pulse-field gel electrophoresis. *Nucleic Acids Res.*, 17 (1989) 1268; *C.A.*, 110 (1989) 188758v.

- 2085 Mann, W. and Jeffery, J.: Isolation of DNA from yeasts. *Anal. Biochem.*, 178 (1989) 82-87.
- 2086 Mitchell, L.G. and Merril, C.R.: Affinity generation of single-stranded DNA for dideoxy sequencing following the polymerase chain reaction. *Anal. Biochem.*, 178 (1989) 239-242.
- 2087 Moraes, C.T., Schon, E., DiMauro, S. and Miranda, A.F.: Heteroplasmy of mitochondrial genomes in clonal cultures from patients with Kearns-Sayre syndrome. *Biochem. Biophys. Res. Commun.*, 160 (1989) 765-771.
- 2088 Nakano, M.M., Butsuya, I. and Ogawara, H.: Expression of the kanamycin resistance gene in a kanamycin-producing strain of *Streptomyces kanamyceticus*. *J. Antibiot.*, 42 (1989) 423-430.
- 2089 Nakano, T. and Suzuki, K.: Genetic cause of a juvenile form of Sandhoff disease. Abnormal splicing of  $\beta$ -hexosaminidase  $\beta$  chain gene transcript due to a point mutation within intron 12. *J. Biol. Chem.*, 264 (1989) 5155-5158.
- 2090 Noolandi, J., Slater, G.W., Lim, H.A. and Viovy, J.L.: Generalized tube model of biased reptation for gel electrophoresis of DNA. *Science*, 243 (1989) 1456-1458; *C.A.*, 110 (1989) 169665w.
- 2091 Olson, M.V.: Separation of large DNA molecules by pulsed-field gel electrophoresis. A review of the basic phenomenology. *J. Chromatogr.*, 470 (1989) 377-383 - a review with 15 refs.
- 2092 Riesner, D., Steger, G., Zimmat, R., Owens, R.A., Wagenhöfer, M., Hillen, W., Vollbach, S. and Henco, K.: Temperature-gradient gel electrophoresis of nucleic acids: analysis of conformational transitions, sequence variations, and protein-nucleic acid interactions. *Electrophoresis (Weinheim)*, 10 (1989) 377-389.
- 2093 Rosenberg, J. and Amrani, D.L.: A rapid method for Southern blot analysis using polyacrylamide gel electrophoresis and vacuum blotting transfer techniques. *BioTechniques*, 7 (1989) 24-28; *C.A.*, 110 (1989) 169513v.
- 2094 Sakamoto, S., Ortaldo, J.R. and Young, H.A.: Analysis of the methylation state of the T cell receptor  $\beta$  chain gene in T cells and large granular lymphocytes. *J. Biol. Chem.*, 264 (1989) 251-258.
- 2095 Seeman, N.C., Chen, J.-H. and Kallenbach, N.R.: Gel electrophoretic analysis of DNA branched junctions. *Electrophoresis (Weinheim)*, 10 (1989) 345-354.
- 2096 Series, J., Cameron, I., Caslake, M., Gaffney, D., Packard, C.J. and Shepherd, J.: The XbaI polymorphism of the apolipoprotein B gene influences the degradation of low density lipoprotein *in vitro*. *Biochim. Biophys. Acta*, 1003 (1989) 183-188.
- 2097 Serwer, P.: Sieving of double-stranded DNA during agarose gel electrophoresis. *Electrophoresis (Weinheim)*, 10 (1989) 327-331.
- 2098 Shi, S. et al.: (Genetic monitoring of inbred rats by electrophoresis technique). *Zhongguo Yixue Kexueyuan Xuebao*, 10 (1988) 311-316; *C.A.*, 110 (1989) 169658w.
- 2099 Slater, G.W. and Noolandi, J.: Effect of nonparallel alternating fields on the mobility of DNA in the biased reptation model of gel electrophoresis. *Electrophoresis (Weinheim)*, 10 (1989) 413-428.
- 2100 Stellwagen, N.C. and Stellwagen, J.: Orientation of DNA and the agarose gel matrix in pulsed electric fields. *Electrophoresis (Weinheim)*, 10 (1989) 332-344.
- 2101 Sturm, J. and Weill, G.: Direct observation of DNA chain orientation and relaxation by electric birefringence: implications for the mechanism of separation during pulsed-field gel electrophoresis. *Phys. Rev. Lett.*, 62 (1989) 1484-1487; *C.A.*, 110 (1989) 169668z.
- 2102 Sutherland, J.C., Emrick, A.B. and Trunk, J.: Separation of chromosomal length DNA molecules: pneumatic apparatus for rotating gels during electrophoresis. *Electrophoresis (Weinheim)*, 10 (1989) 315-317.
- 2103 Takahashi, T., Mitsuda, T. and Okuda, K.: An alternative nonradioactive method for labeling DNA using biotin. *Anal. Biochem.*, 179 (1989) 77-85.
- 2104 Tasseront-de Jong, J., Aker, J., den Dulk, H., van de Putte, P. and Giphart-Gassler, M.: Cytosine methylation in the *ecoRI* site of active and inactive herpesvirus thymidine kinase promoters. *Biochim. Biophys. Acta*, 1008 (1989) 62-70.
- 2105 Taya, Y., Watanabe, K. and Nishimura, S.: Homology between a region of the human retinoblastoma gene and L1 family repetitive sequences. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1061-1066.

- 2106 Viovy, J.L.: Reptation-breathing theory of pulsed electrophoresis: dynamic regimes, antiresonance and symmetry breakdown effects. *Electrophoresis (Weinheim)*, 10 (1989) 429-441.
- 2107 Yamamoto, A., Horai, S. and Yuasa, Y.: Increased level of mitochondrial gene expression in polyps of familial polyposis coli patients. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1100-1106.
- 2108 Yuan, Y. and Reddy, R.: Genes for human U3 small nucleolar RNA contain highly conserved flanking sequences. *Biochim. Biophys. Acta*, 1008 (1989) 14-22.

See also 1728, 2033.

21d. *Structural studies on RNA and RNA mapping*

- 2109 Chung, B.-c., Hu, M.-C., Lai, C.-C. and Lin, C.-H.: The 5'-region of the P450XIA1 (P450 scc) gene contains a basal promoter and an adrenal-specific activating domain. *Biochem. Biophys. Res. Commun.*, 160 (1989) 276-281.
- 2110 Fujii, H., Watanabe, T. and Miyoshi, K.: (Determination of base sequence in nucleic acids by electrophoresis using phosphorescent labels). *Jpn. Kokai Tokkyo Koho Pat.* JP 63,188,763 (88,188,763) (Cl. G01N33/50), 04 Aug. 1988, Appl. 87/21,288, 30 Jan. 1987, 5 pp.; *C.A.*, 110 (1989) 228161d.

21e. *Structural studies on DNA and DNA mapping*

- 2111 Bhasker, C.R., Adler, B.S., Dee, A., John, M.E., Kagimoto, M., Zuber, M.X., Ahlgren, R., Wang, X., Simpson, E.R. and Waterman, M.R.: Structural characterization of the bovine CYP17 (17 $\alpha$ -hydroxylase) gene. *Arch. Biochem. Biophys.*, 271 (1989) 479-487.
- 2112 Blum, M., Baumann, I., Lohrer, H., Rahmsdorf, J. and Herrlich, P.: A promising genomic transfectant into Xeroderma pigmentosum group A with highly amplified mouse DNA and intermediate UV resistance turns revertant. *Biochem. Biophys. Res. Commun.*, 160 (1989) 647-655.
- 2113 Carrano, A.V., Lamerdin, J., Ashworth, L.K., Watkins, B., Branscomb, E., Slezak, T., Raff, M., de Jong, P.J., Keith, D. et al.: A high-resolution, fluorescence-based, semiautomated method for DNA fingerprinting. *Genomics*, 4 (1989) 129-136; *C.A.*, 110 (1989) 228073b.
- 2114 Chen, C.-Z. and Sutherland, J.C.: Gel electrophoresis method for quantitation of gamma ray induced single- and double-strand breaks in DNA irradiated *in vitro*. *Electrophoresis (Weinheim)*, 10 (1989) 318-326.
- 2115 Chetrit, P., Gaudin, V., de Courcel, A. and Vedel, F.: A cross-hybridization method for DNA mapping with photobiotin-labeled probes. *Anal. Biochem.*, 178 (1989) 273-275.
- 2116 Collins, M., Wolf, S.F., Haines, L.L. and Mitsock, L.: The use of denaturing gradient gel electrophoresis to screen for DNA sequence polymorphisms in the human factor VIII gene. *Electrophoresis (Weinheim)*, 10 (1989) 390-396.
- 2117 Cons, B.M.G. and Fox, K.R.: Interaction of mithramycin with metal ions and DNA. *Biochem. Biophys. Res. Commun.*, 160 (1989) 517-524.
- 2118 Darwish, H.M., Krisinger, J. and DeLuca, H.F.: Methylation of the vitamin D-dependent CaBP gene (calbindin 9 Kd) does not mediate tissue or vitamin D regulation. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1281-1289.
- 2119 Diekmann, S.: The migration anomaly of DNA fragments in polyacrylamide gels allows the detection of small sequence-specific DNA structure variations. *Electrophoresis (Weinheim)*, 10 (1989) 354-359.
- 2120 Farrance, I.K. and Ivarie, R.: Synthesis of N<sup>7</sup>-ethyldeoxyguanosine 5'-triphosphate and placement of N<sup>1</sup>-ethylguanine in a specific site in a synthetic oligodeoxyribonucleotide. *Anal. Biochem.*, 179 (1989) 60-65.
- 2121 Gardiner, K. and Patterson, D.: Transverse alternating field electrophoresis and applications to mammalian genome mapping. *Electrophoresis (Weinheim)*, 10 (1989) 296-302.
- 2122 Hanish, J. and McClelland, M.: Controlled partial restriction digestions of DNA by competition with modification methyltransferases. *Anal. Biochem.*, 179 (1989) 357-360.
- 2123 Hubrich-Kühner, K., Buhk, H.-J., Wagner, H., Kröger, H. and Simon, D.: Non-C-G recognition sequences of DNA cytosine-5-methyltransferase from rat liver. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1175-1182.

- 2124 Kitani, T. and Ogawa, M.: (Electrophoresis gel for base sequence determination in DNA). *Jpn. Kokai Tokkyo Koho Pat.* JP 63,150,657 (88,150,657) (Cl.G01N27/26), 23 Jun. 1988, Appl. 86/298,528, 15 Dec. 1986, 13 pp.; *C.A.*, 110 (1989) 169817x.
- 2125 Kwon, B.S., Halaban, R. and Chintamaneni, C.: Molecular basis of mouse Himalayan mutation. *Biochem. Biophys. Res. Commun.*, 161 (1989) 252-260.
- 2126 Nakano, M.M., Kikuchi, T., Mashiko, H. and Ogawara, H.: Analysis of the promoter region of the cloned kanamycin resistance gene (kmr) from *Streptomyces kanamyceticus*. *J. Antibiot.*, 42 (1989) 413-422.
- 2127 Nandabalan, K. and Padayatty, J.D.: Initiation of transcription of rDNA in rice. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1117-1123.
- 2128 Shafer, G.E., Price, M.A. and Tullius, T.D.: Use of the hydroxyl radical and gel electrophoresis to study DNA structure. *Electrophoresis (Weinheim)*, 10 (1989) 397-404.
- 2129 Smith, S.S., Baker, D.J. and Jardines, L.A.: A G4-DNA/B-DNA junction at codon 12 of c-Ha-ras is actively and asymmetrically methylated by DNA (cytosine-5)methyltransferase. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1397-1402.
- 2130 Sugimoto, M., Esaki, N., Tanaka, H. and Soda, K.: A simple and efficient method for the oligonucleotide-directed mutagenesis using plasmid DNA template and phosphorothioate-modified nucleotide. *Anal. Biochem.*, 179 (1989) 309-311.
- 2131 Sutter, T.R. and Loper, J.C.: Disruption of the *Saccharomyces cerevisiae* gene for NADPH-cytochrome P450 reductase causes increased sensitivity to ketoconazole. *Biochem. Biophys. Res. Commun.*, 160 (1989) 1257-1266.
- 2132 Van der Hoorn, F.A. and Nordeen, S.K.: An enhancer in the c-MOS locus binds a nuclear factor 1-like protein. *Biochem. Biophys. Res. Commun.*, 161 (1989) 8-15.
- 2133 Vassetzky, Y.S., Jr., Razin, S.V. and Georgiev, G.P.: DNA fragments which specifically bind to isolated nuclear matrix *in vitro* interact with matrix-associated DNA topoisomerase II. *Biochem. Biophys. Res. Commun.*, 159 (1989) 1263-1268.
- 2134 Wiest, A.: (Pulse-field gel electrophoresis - a method for the separation of very large DNA fragments). *LaborPraxis*, 13 (1989) 196-197; *C.A.*, 110 (1989) 226169p.

See also 2086, 2110.

## 23. OTHER SUBSTANCES CONTAINING HETEROCYCLIC NITROGEN

### 23e. Other N-heterocyclic compounds

- 2135 Roberts, D.W., Ruane, R.J. and Wilson, I.D.: Picolinic acid: a mobile phase additive for improved chromatography of metal-chelating heterocyclic acids and  $\beta$ -diketones. *J. Chromatogr.*, 471 (1989) 437-441.

## 24. ORGANIC SULPHUR COMPOUNDS

- 2136 Gilmore, D.F., Godchaux, W. and Leadbetter, E.R.: Cysteine is not an obligatory intermediate in the biosynthesis of cysteate by *Cytophaga johnsonae*. *Biochem. Biophys. Res. Commun.*, 160 (1989) 535-539.

See also 1738.

## 26. ORGANOMETALLIC AND RELATED COMPOUNDS

### 26c. Coordination compounds

- 2137 Saitoh, T., Hoshino, H. and Yotsuyanagi, T.: Separation of 4-(2-pyridylazo)-resorcinolato metal chelates by micellar electrokinetic capillary chromatography. *J. Chromatogr.*, 469 (1989) 175-181.

- 2138 Tanaka, S., Kaneta, T. and Yoshida, H.: Isotachophoretic separation of cyano complexes of noble metals using ion-pairing equilibrium in water-acetonitrile solvent. *J. Chromatogr.*, 472 (1989) 303-307.

27. VITAMINS AND VARIOUS GROWTH REGULATORS (NON-PEPTIDIC)

See 2157.

28. ANTIBIOTICS

- 2139 Kondo, F. and Hayashi, S.: Improved method for the determination of residual aminoglycoside antibiotics in animal tissues by electrophoresis and bioautography. *J. Food Prot.*, 52 (1989) 96-99; *C.A.*, 110 (1989) 211060x.

29. INSECTICIDES, PESTICIDES AND OTHER AGROCHEMICALS

*29f. Other types of pesticides and various agrochemicals*

- 2140 Dombek, V. and Stransky, Z.: Study of alkaline hydrolysis of the insecticide alphasmethrine by isotachophoretic determination of decomposition products. *J. Chromatogr.*, 470 (1989) 235-240.

30. SYNTHETIC AND NATURAL DYES

*30b. Chloroplast and other natural pigments*

- 2141 Tsuda, T. and Fukuba, H.: (Separation and identification of anthocyanins in food by isotachoelectrophoresis). *Nippon Eiyo, Shokuryo Gakkaishi*, 42 (1989) 79-84; *C.A.*, 110 (1989) 211110p.

31. PLASTICS AND THEIR INTERMEDIATES

- 2142 Pelton, R.H., Pelton, H.M., Morphesis, A. and Rowell, R.L.: Particle sizes and electrophoretic mobilities of poly(N-isopropylacrylamide) latex. *Langmuir*, 5 (1989) 816-818; *C.A.*, 110 (1989) 213853g.
- 2143 Smisek, D.L. and Hoagland, D.A.: Agarose gel electrophoresis of high molecular weight, synthetic polyelectrolytes. *Macromolecules*, 22 (1989) 2270-2277; *C.A.*, 110 (1989) 213801p.

32. DRUG ANALYSIS

*32a. Drug analysis, general techniques*

- 2144 Gladdines, M.M., Reijenga, J.C. and Trieling, R.G., van Thiel, M.J.S. and Everaerts, F.M.: Concept of response factor in capillary isotachopheresis. Determination of drugs in solution for intravenous injection. *J. Chromatogr.*, 470 (1989) 105-112.



*32g. Other drug categories*

2145 Grushka, E. and McCormick, R.M.: Zone broadening due to sample injection in capillary zone electrophoresis. *J. Chromatogr.*, 471 (1989) 421-428.

See also 1754.

*32i. Plant extracts*

2146 Klein, H. and Blasek, K.: (Determination of glycyrrhizin in licorice by isotachophoresis). *Ernaehrung*, 13 (1989) 82-86; *C.A.*, 110 (1989) 211091h.

## 33. CLINICO-CHEMICAL APPLICATIONS

*33b. Complex mixtures and profiling (single compounds by cross ref. only)*

See 1698, 1852, 1976.

## 34. FOOD ANALYSIS

*34a. General papers and reviews*

2147 Klein, H. and Stoya, W.: (The application of isotachophoresis (ionophoresis) in the analysis of food). *Mitt. Geb. Lebensmittelunters. Hyg.*, 79 (1989) 413-432; *C.A.*, 110 (1989) 211004g.

2148 Yamamoto, H. and Okuyama, T.: (Food constituent analyses and electrophoresis). *Nippon Shokuhin Kogyo Gakkaishi*, 36 (1989) 168-176; *C.A.*, 110 (1989) 211011g.

*34b. Complex mixtures (single compounds by cross ref. only)*

See 1824, 1894, 2001, 2141, 2160.

## 35. ENVIRONMENTAL ANALYSIS

*35d. Soil pollution (complex mixtures; single compounds by cross ref. only)*

See 2158.

## 36. SOME TECHNICAL PRODUCTS AND COMPLEX MIXTURES

*36a. Surfactants*

2149 Abe, M., Yamaguchi, T., Nakamae, M., Watanabe, K. and Ogino, K.: (Simultaneous determination of anionic surfactants and inorganic electrolytes by an isotachophoretic method). *Yukagaku*, 37 (1988) 1000-1005; *C.A.*, 110 (1989) 195178j.

*36c. Various technical products*

2150 Wright, B.W., Ross, G.A. and Smith, R.D.: Capillary zone electrophoresis of fuel materials. *Energy Fuels*, 3 (1989) 428-430; *C.A.*, 110 (1989) 215928j.

## 37. CELLS, CELLULAR PARTICLES AND SUPRAMOLECULAR STRUCTURES

- 2151 Hachemi, B.H., Betrencourt, C., Volochine, B., Frenoy, J.-P., Chraïbi, Z., Alfesen, A. and Laviaille, F.: Demonstration of cell-ricin interaction by electrophoretic light scattering. *Electrophoresis (Weinheim)*, 10 (1989) 494-497.
- 2152 Khaustov, V.I., Kazachkov, Yu.A., Korolev, M.B. and Shekoyan, L.A.: (Study of rotaviruses by methods of electron microscopy and RNA polyacrylamide gel electrophoresis). *Vopr. Virusol.*, 33 (1988) 743-745; *C.A.*, 110 (1989) 169742u.
- 2153 Miklavic, S.J. and Ninham, B.W.: Conformation of surface bound polyelectrolytes: I. Implications for cell electrophoresis. *J. Theor. Biol.*, 137 (1989) 71-89; *C.A.*, 110 (1989) 22811fn.
- 2154 Morris, S.A., Hanning, K. and Ungewickell, G.: Rapid purification of clathrin-coated vesicles by free-flow electrophoresis. *Eur. J. Cell Biol.*, 47 (1988) 251-258; *C.A.*, 110 (1989) 169655t.
- 2155 Zhu, A. and Chen, Y.: High-voltage capillary zone electrophoresis of red blood cells. *J. Chromatogr.*, 470 (1989) 251-260.

## 38. INORGANIC COMPOUNDS

## 38a. Cations

- 2156 Ermolenko, I.N., Lazareva, T.G. and Borisenko, E.M.: (Method for electrophoretic analysis of mixtures of metal ions). *U.S.S.R. Pat.* SU 1,448,261 (ClG01N27/26), 30 Dec. 1988, Appl. 4,216,189, 30 Mar. 1987; *C.A.*, 110 (1989) 204791h.
- 2157 Fanali, S., Cristalli, M. and Quanglia, M.G.: Determination of rubidium, sodium, calcium and thiamine in a pharmaceutical preparation by capillary isotachophoresis. *J. Chromatogr.*, 472 (1989) 441-444.
- 2158 Schmid, S., Kördel, W., Klöppel, H. and Klein, W.: Differentiation of Al<sup>3+</sup> and Al species in environmental samples by isotachophoresis. *J. Chromatogr.*, 470 (1989) 289-297.
- 2159 Zelensky, I., Kaniansky, D., Havasi, P., Verheggen, T.P.E.M. and Everaerts, F.M.: Photometric detection of metal cations in capillary isotachophoresis based on complex equilibria. *J. Chromatogr.*, 470 (1989) 155-169.

See also 2138, 2161.

## 38b. Anions

- 2160 Cazabeil, J.M. and Chauvet, S.: (Isotachophoretic determination of sulfates in wines). *Ann. Falsif. Expert. Chim. Toxicol.*, 81 (1988) 441-446; *C.A.*, 110 (1989) 230069y.

See also 2149.

## 39. RADIOACTIVE AND OTHER ISOTOPE COMPOUNDS

- 2161 Doberenz, W., Fischer, S., Pliquett, H., Dreyer, R., Suess, R. and Bruchertseifer, H.: (Electromigration studies of the hydrolysis and formation of citrate complexes of europium- and strontium-ions as model for experiments with the mendeleevium(III) and (II)). *Isotopenpraxis*, 24 (1988) 379-382; *C.A.*, 110 (1989) 181175u.

See also 1675.

## PUBLICATION SCHEDULE FOR 1989

*Journal of Chromatography and Journal of Chromatography, Biomedical Applications*

MONTH	J	F	M	A	M	J	J	A	S	O		
Journal of Chromatography	461 462 463/1	463/2 464/1	464/2 465/1 465/2	466 467/1 467/2	468 469 470/1 470/2	471 472/1 472/2 473/1	473/2 474/1 474/2 475	476 477/1 477/2	478/1 478/2 479/1	The publication schedule for further issues will be published later		
Bibliography Section		486/1		486/2		486/3		486/4				486/5
Biomedical Applications	487/1	487/2	488/1 488/2	489/1 489/2	490/1 490/2	491/1	491/2	492 493/1	493/2 494			495

### INFORMATION FOR AUTHORS

(Detailed *Instructions to Authors* were published in Vol. 478, pp. 453–456. A free reprint can be obtained by application to the publisher, Elsevier Science Publishers B.V., P.O. Box 330, 1000 AH Amsterdam, The Netherlands.)

**Types of Contributions.** The following types of papers are published in the *Journal of Chromatography* and the section on *Biomedical Applications*: Regular research papers (Full-length papers), Notes, Review articles and Letters to the Editor. Notes are usually descriptions of short investigations and reflect the same quality of research as Full-length papers, but should preferably not exceed six printed pages. Letters to the Editor can comment on (parts of) previously published articles, or they can report minor technical improvements of previously published procedures; they should preferably not exceed two printed pages. For review articles, see inside front cover under Submission of Papers.

**Submission.** Every paper must be accompanied by a letter from the senior author, stating that he is submitting the paper for publication in the *Journal of Chromatography*. Please do not send a letter signed by the director of the institute or the professor unless he is one of the authors.

**Manuscripts.** Manuscripts should be typed in double spacing on consecutively numbered pages of uniform size. The manuscript should be preceded by a sheet of manuscript paper carrying the title of the paper and the name and full postal address of the person to whom the proofs are to be sent. Authors of papers in French or German are requested to supply an English translation of the title of the paper. As a rule, papers should be divided into sections, headed by a caption (e.g., Summary, Introduction, Experimental, Results, Discussion, etc.). All illustrations, photographs, tables, etc., should be on separate sheets.

**Introduction.** Every paper must have a concise introduction mentioning what has been done before on the topic described, and stating clearly what is new in the paper now submitted.

**Summary.** Full-length papers and Review articles should have a summary of 50–100 words which clearly and briefly indicates what is new, different and significant. In the case of French or German articles an additional summary in English, headed by an English translation of the title, should also be provided. (Notes and Letters to the Editor are published without a summary.)

**Illustrations.** The figures should be submitted in a form suitable for reproduction, drawn in Indian ink on drawing or tracing paper. Each illustration should have a legend, all the legends being typed (with double spacing) together on a *separate sheet*. If structures are given in the text, the original drawings should be supplied. Coloured illustrations are reproduced at the author's expense, the cost being determined by the number of pages and by the number of colours needed. The written permission of the author and publisher must be obtained for the use of any figure already published. Its source must be indicated in the legend.

**References.** References should be numbered in the order in which they are cited in the text, and listed in numerical sequence on a separate sheet at the end of the article. Please check a recent issue for the layout of the reference list. Abbreviations for the titles of journals should follow the system used by *Chemical Abstracts*. Articles not yet published should be given as "in press" (journal should be specified), "submitted for publication" (journal should be specified), "in preparation" or "personal communication".

**Dispatch.** Before sending the manuscript to the Editor please check that the envelope contains three copies of the paper complete with references, legends and figures. One of the sets of figures must be the originals suitable for direct reproduction. Please also ensure that permission to publish has been obtained from your institute.

**Proofs.** One set of proofs will be sent to the author to be carefully checked for printer's errors. Corrections must be restricted to instances in which the proof is at variance with the manuscript. "Extra corrections" will be inserted at the author's expense.

**Reprints.** Fifty reprints of Full-length papers, Notes and Letters to the Editor will be supplied free of charge. Additional reprints can be ordered by the authors. An order form containing price quotations will be sent to the authors together with the proofs of their article.

**Advertisements.** Advertisement rates are available from the publisher on request. The Editors of the journal accept no responsibility for the contents of the advertisements.

---

# Analytical Artifacts

## GC, MS, HPLC, TLC and PC

by **B.S. MIDDLEDITCH**, *Dept. of Biochemical and Biophysical Sciences, University of Houston, Houston, TX, USA*

(Journal of Chromatography Library, 44)

---

This encyclopaedic catalogue of the pitfalls and problems that all analysts encounter in their work is destined to spend more time on the analyst's workbench than on a library shelf. The author has dedicated the book to "the innumerable scientists who made mistakes, used impure chemicals and solvents, suffered the consequences of unanticipated side-reactions, and were otherwise exposed to mayhem yet were too embarrassed to publish their findings".

Traditionally, the mass spectroscopist or gas chromatographer learnt his trade by participating in a 4-6 year apprenticeship as graduate student and post-doctoral researcher. Generally, no formal training was provided on the things that go wrong, but this information was accumulated by sharing in the experiences of colleagues. Nowadays, many novice scientists simply purchase a computerized instrument, plug it in, and use it. Much time can be wasted in studying and resolving problems due to artifacts and there is also a strong possibility that artifacts will not be recognized as such. For example, most analysts realize that they should use glass rather than plastic containers; but few of them would antici-

pate the possibility of plasticizer residues on glassware washed using detergent from a plastic bottle.

This book is an easy-to-use compendium of problems encountered when using various commonly used analytical techniques. Emphasis is on impurities, by-products, contaminants and other artifacts. A separate entry is provided for each artifact. For specific chemicals, this entry provides the common name, mass spectrum, gas chromatographic data, CAS name and registry number, synonyms and a narrative discussion. More than 1100 entries are included. Mass spectral data are indexed in a 6-peak index (molecular ion, base peak, second peak, third peak) and there are also formula, author and subject indexes. An extensive bibliography contains complete literature citations.

The book is designed to be *used*. It will not only allow experienced analysts to profit from the mistakes of others, but it will also be invaluable to other scientists who use analytical instruments in their work.

1989 xxiv + 1028 pages  
US\$ 241.50 / Dfl. 495.00  
ISBN 0-444-87158-6



**ELSEVIER SCIENCE PUBLISHERS**

P.O. Box 211, 1000 AE Amsterdam, The Netherlands  
P.O. Box 882, Madison Square Station, New York, NY 10159, USA