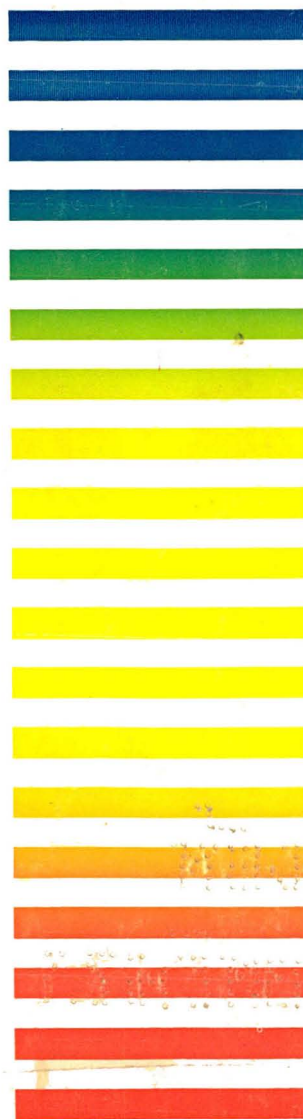
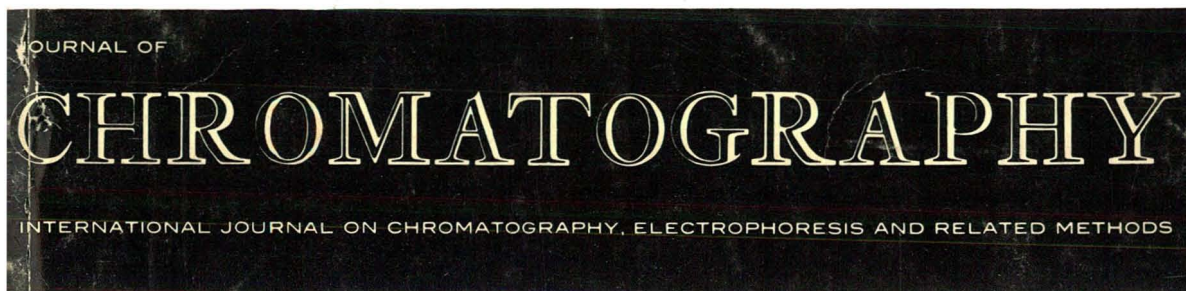




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# Adsorption Engineering

by **Motoyuki Suzuki**, *Institute of Industrial Science,  
University of Tokyo, Tokyo, Japan*

**(Chemical Engineering Monographs, 25)**

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Recent advances in chemical engineering in the fields of adsorption and porous bodies have now made it possible to estimate accurately many of the parameters for the design of adsorption systems. The author of this book has worked on various aspects of adsorption from the viewpoint of basic phenomenology and applications to separation processes in chemical industry and environmental pollution control. He has written this book with the aim of establishing a basic chemical engineering methodology for adsorption process design. Throughout the book, activated carbon is used as the main example of adsorbent in the application of the methodology and principles, although topics on special adsorbent systems are also included to cover modern development of adsorption technology. The general principles are applicable to any adsorption process used in practical systems.

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# Analytical Absorption Spectrophotometry in the Visible and Ultraviolet: The Principles

by L. Sommer, J.E. Purkyne University, Brno, Czechoslovakia

(*Studies in Analytical Chemistry*, 8)

Despite the many competitive analytical techniques, molecular absorption spectrophotometry is still very popular in practice, particularly in biochemical, clinical, organic, agricultural, food and environmental analyses. This is due mainly to the inherent ease and relative simplicity of spectrophotometric procedures and the availability of reliable, highly-automated instruments. Moreover, both the method and its instrumentation have recently undergone considerable development resulting in some new special approaches of spectrophotometry in the ultraviolet (UV) and visible (VIS) regions. Although there are several comprehensive textbooks on UV/VIS spectrophotometry, they tend to describe historical aspects or contain collections of detailed procedures for the determination of analytes and do not reflect sufficiently the present state of the method and stage of development reached.

This new book provides a concise survey of the actual state-of-the-art of UV/VIS spectrophotometry. Special attention is given to problems with the Bouguer-Lambert-Beer law, absorption spectra, present trends in instrumentation, errors in spectrophotometry, evaluation of analyte concentration and calibration, optimization procedures, multi-component

analysis, differential spectrophotometries, problem of blanks, derivative and dual-wavelength spectrophotometry, spectrophotometric titration, the strong relations between complex formation and spectrophotometry, spectrophotometric investigation of complex equilibria and stoichiometry or automation in spectrophotometry. The significance of spectrophotometry in connection with liquid-liquid extraction, reaction kinetics, trace analysis, environmental and clinical analysis is also covered.

The text is supported by tables and figures, and there are numerous references for each topic treated. The book is written for all those who use UV/VIS spectrophotometry in the laboratory and will also be useful to students as supplementary reading.

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## Bibliography Section

### Liquid Column Chromatography

#### 1. REVIEWS AND BOOKS

- 5006 Barker, P.E. and Ganetsos, G.: Continuous chromatographic processes. *NATO ASI Ser., Ser. E*, 158 (1989) 471-490; *C.A.*, 111 (1989) 9386y - a review with 54 refs.
- 5007 Barker, P.E. and Ganetsos, G.: Biochemical reaction and separation in chromatographic columns. *NATO ASI Ser., Ser. E*, 158 Adscript.: Sci. Technol. (1989) 491-504; *C.A.*, 111 (1989) 22070k - a review with 16 refs.
- 5008 Becker, C.: Using chromatography in downstream processing. *Aust. J. Biotechnol.*, 3 (1989) 18-19; *C.A.*, 111 (1989) 22059p - a review with no refs.
- 5009 Cazes, J.: High performance CPC for downstream processing of biomaterials. *Am. Biotechnol. Lab.*, 7 (1989) 17-23; *C.A.*, 111 (1989) 35994q.
- 5010 Grossi, G., Bernagozzi, V., Battistoni, R., Lippi, A., Bargossi, A. and Sprovieri, G.: (Column switching, semiautomation, and full automation in HPLC). *Lab. 2000*, 2 (1988) 46-50; *C.A.*, 111 (1989) 20233s - a review with 5 refs.
- 5011 Guiochon, G. (Editor): *Twelfth International Symposium on Column Liquid Chromatography, Washington, June 19-24, 1988, Pt. II*. *J. Chromatogr.*, Vol. 459, Elsevier, Amsterdam, 1988, 381 p.
- 5012 Jagschies, G.: (Solutions for problems with chromatographic purification sequences). *LaborPraxis*, 13 (1989) 172-176; *C.A.*, 111 (1989) 3423m - a review without refs.
- 5013 Krull, I.S., Mhatre, R. and Stuting, H.H.: Biopolymer determinations by high-performance liquid chromatography with low angle laser light scattering photometry. *TrAC*, 8 (1989) 260-268.
- 5014 Majors, R.E. and Enzweiler, T.: Flash chromatography. *LC-GC*, 6 (1989) 1046-1051; *C.A.*, 111 (1989) 56554m - a review with 3 refs.
- 5015 Sates, V. and Sakhartova, O.V.: (*High-Performance Liquid Chromatography: Principles of a Theory. Methodology. Use in Drug Chemistry*). Zinatne, Riga, 1988, 390 p.; *C.A.*, 111 (1989) 12612z.
- 5016 Zhang, S., Wang, J., Chen, Y. and Zhu, T.: (Application of DCCC technique in separation of glycosides). *Shenyang Yaowuexueyuan Xuebao*, 6 (1989) 144-147; *C.A.*, 111 (1989) 35983k.
- See also 5023, 5055 - 5057, 5060, 5061, 5067, 5068, 5075, 5086, 5089, 5095, 5106, 5110, 5112, 5114 - 5118, 5121, 5123, 5130, 5145, 5169, 5170, 5343, 5413, 5434, 5518, 5719, 5754, 5758, 5846, 5849, 5854, 5857, 5879.

#### 2. FUNDAMENTALS, THEORY AND GENERAL

##### 2a. General

- 5017 Bridge, T.P., Williams, M.H. and Fell, A.F.: Comparative evaluation of methods for assessing peak homogeneity in liquid isocratic reversed-phase chromatography. *Anal. Chim. Acta*, 223 (1989) 175-182.
- 5018 Dubin, P.L. and Principi, J.M.: No previously suggested dimensional parameter controls peak migration in size exclusion chromatography. *Polym. Prepr. (Am. Chem. Soc., Div. Polym. Chem.)*, 30 (1989) 400-401; *C.A.*, 111 (1989) 20281f.
- 5019 Gill, R., Osselton, M.D. and Smith, R.M.: International collaborative study of the retention reproducibility of basic drugs in high-performance liquid chromatography on a silica column with a methanol-ammonium nitrate eluent. *J. Pharm. Biomed. Anal.*, 7 (1989) 447-457.
- 5020 Hayashi, Y. and Matsuda, R.: Modification of the function of mutual information based on information theory and the Kalman filter for chromatographic optimization. *Anal. Chim. Acta*, 222 (1989) 313-322.

- 5021 Jones, W.R. and Jandik, P.: Faster ion chromatography with balanced background conductances. *Res. Dev.*, 30 (1988) 92-98; *C.A.*, 111 (1989) 16783d.
- 5022 Matsuda, R., Hayashi, Y., Ishibashi, M. and Takeda, Y.: Use of a function of mutual information for optimization of mobile-phase composition in reversed-phase liquid chromatography. *Anal. Chim. Acta*, 222 (1989) 301-312.
- 5023 McDowall, R.D.: Sample preparation for biomedical analysis. *J. Chromatogr.*, 492 (1989) 3-58 - a review with 161 refs.
- 5024 Mulholland, M., van Leeuwen, J.A. and Vandeginste, B.: An expert system for designing an intelligent spreadsheet for evaluation of precision of liquid chromatographic methods. *Anal. Chim. Acta*, 223 (1989) 183-192.
- 5025 Nakamura, H., Kinoshita, T. and Kamada, M.: "Between-program injection" technique as a versatile tool for gradient elution. *Anal. Sci.*, 4 (1988) 655-657; *C.A.*, 111 (1989) 16926c.
- 5026 Redmond, M., Brown, S.D. and Wilk, H.R.: Qualitative and quantitative analysis of unresolved responses in liquid chromatography with Fourier transform infrared spectroscopic detection by using the Kalman filter. *Anal. Lett.*, 22 (1989) 963-979.
- 5027 Walters, F.H.: Statistical analysis of multivariate multiple wavelength liquid chromatographic response data. *Anal. Lett.*, 22 (1989) 635-645.

For additional information see:

*C.A.*, 110 (1989) 241854b, 241862c, 241863d;  
111 (1989) 16930z, 16932b.

See also 5034, 5039, 5083, 5100, 5131, 5699.

#### 2b. Thermodynamics and theoretical relationships

- 5028 Berthod, A.: On the use of the Knox equation. I. The fit problem. *J. Liq. Chromatogr.*, 12 (1989) 1169-1185.
- 5029 Berthod, A.: On the use of the Knox equation. II. The efficiency measurement problem. *J. Liq. Chromatogr.*, 12 (1989) 1187-1201.
- 5030 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) 1056-1062.
- 5031 Lin, B., Ma, Z., Golshan-Shirazi, S. and Guiochon, G.: Study of the representation of competitive isotherms and of the intersection between adsorption isotherms. *J. Chromatogr.*, 475 (1989) 1-11.
- 5032 Liang, Y.-Z. and Yu, R.-Q.: Simple algorithm for selection of the optimal sequence of chromatographic columns. *Anal. Chim. Acta*, 222 (1989) 369-372.
- 5033 Macko, T., Soltes, L. and Berek, D.: Pressure jumps due to flow interruptions as source of system peaks in liquid chromatography with mixed eluents. *Chromatographia*, 28 (1989) 189-192.
- 5034 Meira, G.R. and Garcia-Rubio, L.H.: Corrections for instrumental and secondary broadening in the chromatographic analysis of linear copolymers. *J. Liq. Chromatogr.*, 12 (1989) 997-1021.
- 5035 Omorodion, S.N.E. and Hamielec, A.E.: Proposed instrumental spreading shape function (ISF) as applied to size exclusion chromatography (SEC). *J. Liq. Chromatogr.*, 12 (1989) 1131-1154.
- 5036 Omorodion, S.N.E. and Hamielec, A.E.: Evaluation of newly proposed instrumental spreading shape function (ISF). *J. Liq. Chromatogr.*, 12 (1989) 1155-1167.
- 5037 Oscik-Mendyk, B.: Molecular interactions in liquid adsorption chromatography with mixed mobile phase. Solvation of the chromatographed substance in a ternary mobile phase. *Chromatographia*, 28 (1989) 151-156.
- 5038 Prochazka, K., Bednar, B., Tuzar, Z. and Kocirik, M.: Size exclusion of associating systems. II. A model describing the hindered release of solute from the stationary phase. *J. Liq. Chromatogr.*, 12 (1989) 1023-1041.
- 5039 Sentell, K.B. and Dorsey, J.G.: Retention mechanisms in reversed-phase liquid chromatography. Stationary-phase bonding density and partitioning. *Anal. Chem.*, 61 (1989) 930-934.
- 5040 Stahlberg, J. and Almgren, M.: Theory for system peaks in ion pair chromatography and its application to indirect detection. *Anal. Chem.*, 61 (1989) 1109-1112.

See also 5018, 5082, 5083, 5085, 5088, 5404.



*2c. Relationship between structure and chromatographic behavior*

- 5041 Kowalska, T.: Novel prediction of solute retention in NP-HPLC with the alcohol - aliphatic hydrocarbon mobile phases. *J. High Resolut. Chromatogr.*, 12 (1989) 474-476.
- 5042 De Leone, P., Bertran, C.A. and Collins, C.H.: Interpolation curves for identification of perhalogenated compounds separated by reversed-phase HPLC. *J. High Resolut. Chromatogr.*, 12 (1989) 493-495.
- 5043 Smith, R.M. and Burr, C.M.: Retention prediction of analytes in reversed-phase high-performance liquid chromatography based on molecular structure. I. Monosubstituted aromatic compounds. *J. Chromatogr.*, 475 (1989) 57-74.
- 5044 Smith, R.M. and Burr, C.M.: Retention prediction of analytes in reversed-phase high-performance liquid chromatography based on molecular structure. II. Long term reproducibility of capacity factors and retention indices. *J. Chromatogr.*, 475 (1989) 75-83.
- 5045 Smith, R.M., Bale, S.J., Westcott, S.G. and Martin-Smith, M.: Prediction of retention behaviour on modification of the mobile phase in high-performance liquid chromatography using metal ions: 2-aminophenol as a model system. *Analyst (London)*, 114 (1989) 771-776.

See also 5864.

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

- 5046 Blyshak, L.A., Dodson, K.Y., Patonay, G., Warner, I.M. and May, W.E.: Determination of cyclodextrin formation constants using dynamic coupled-column liquid chromatography. *Anal. Chem.*, 61 (1989) 955-960.
- 5047 Cortizo, M.S., Andreetta, H.A. and Figini, R.V.: Molecular characterization of poly(diisopropyl fumarate) by the absolute calibration method in molecular exclusion chromatography (GPC). *J. High Resolut. Chromatogr.*, 12 (1989) 372-374.
- 5048 Khaledi, M.G. and Breyer, E.D.: Quantitation of hydrophobicity with micellar liquid chromatography. *Anal. Chem.*, 61 (1989) 1040-1047.
- 5049 Sorokin, I.H., Andreetta, H. and Figini, R.V.: Absolute size exclusion chromatography - application to random copolymers. *J. High Resolut. Chromatogr.*, 12 (1989) 425-427.
- 5050 Wei, Y., Hsueh, K., Tang, X. and Sun, Y.: Molecular weights of polyaniline and its derivatives. *Polym. Prepr. (Am. Chem. Soc., Div. Polym. Chem.)*, 30 (1989) 226-227; *C.A.*, 111 (1989) 8125a.

For additional information see:

*C.A.*, 111 (1989) 8119b, 8123y, 8183t.

See also 5752.

### 3. GENERAL TECHNIQUES

*3a. Apparatus and accessories*

- 5051 Berry, V., Fay, J. and Pretorius, V.: Low-cost liquid chromatography. I. Weak-eluent sample-loading, sub-microliter samples. *J. Liq. Chromatogr.*, 12 (1989) 1043-1063.
- 5052 Fish, B.B., Carr, R.W. and Aris, R.: The continuous countercurrent moving-bed separator. *AIChE J.*, 35 (1989) 737-745; *C.A.*, 111 (1989) 9411c.
- 5053 Ito, Y., Oka, H. and Slemp, J.L.: Improved high-speed counter-current chromatograph with three multilayer coils connected in series. I. Design of the apparatus and performance of semipreparative columns in 2,4-dinitrophenyl amino acid separation. *J. Chromatogr.*, 475 (1989) 219-227.

- 5054 Kaminski, M., Kandybowicz, B. and Kowalczyk, J.: Maximum volume of a mixer in a device for generation of elution. *Nauchn. Appar.*, 3 (1988) 19-36; *C.A.*, 110 (1989) 233830a.

For additional information see:

- C.A.*, 110 (1989) 233734x, 241792e, 241796j;  
111 (1989) 16847c, 16865g.

See also 5093, 5103.

### 3b. Detectors and detection reagents

- 5055 Baeyens, W.R.G., Nakashima, K., Imai, K., Ling, B.L. and Tsukamoto, Y.: Development of chemiluminescence reactions in biomedical analysis. *J. Pharm. Biomed. Anal.*, 7 (1989) 407-412 - a review with 66 refs.
- 5056 Brinkman, U.A.T., Frei, R.W. and Lingeman, H.: Post-column reactors for sensitive and selective detection in high-performance liquid chromatography: categorization and applications. *J. Chromatogr.*, 492 (1989) 251-298 - a review with 252 refs.
- 5057 De Jong, G.J. and Kwakman, P.J.M.: Chemiluminescence detection for high-performance liquid chromatography of biomedical samples. *J. Chromatogr.*, 492 (1989) 319-343 - a review with 95 refs.
- 5058 Friedrich, O. and Sontag, G.: Dual electrode electrochemical detector for HPLC. Determination of phenolic compounds in distilled alcoholic beverages. *Fresenius' Z. Anal. Chem.*, 334 (1989) 59-63.
- 5059 Galensa, R.: Einsatz eines Enzymreaktors als HPLC-Detektor für die Bestimmung von Lebensmittelinhaltsstoffen. *Chromatographia*, 28 (1989) 95-96.
- 5060 Gergely, A.: A review of the application of chiroptical methods to analytical chemistry. *J. Pharm. Biomed. Anal.*, 7 (1989) 523-541 - a review with 139 refs.
- 5061 Gunasingham, H. and Fleet, B.: Hydrodynamic voltammetry in continuous-flow analysis. *Electroanal. Chem.*, 16 (1988) 89-180; *C.A.*, 111 (1989) 16737s - a review with 298 refs.
- 5062 Lloyd, D.K., Goodall, D.M. and Scrivener, H.: Diode-laser-based optical rotation detector for high-performance liquid chromatography and on-line polarimetric analysis. *Anal. Chem.*, 61 (1989) 1238-1243.
- 5063 Malisch, R.: (Diode array detector in HPLC (simultaneous various wavelength detection, UV spectra); ECD and NFID in GC (specificity, derivatization). *Lebensmittelchem., Lebensmittelqual.*, 13 (Anal. Ruckstaenden Pharmakol. Wirksamer Stoffe) (1988) 123-158; *C.A.*, 111 (1989) 6005n.
- 5064 Oka, H. and Ito, Y.: Improved method for continuous UV monitoring in high-speed counter-current chromatography. *J. Chromatogr.*, 475 (1989) 229-235.
- 5065 Ramstad, T.: Applications of electrosorptive detection in ion chromatography. *Chromatographia*, 28 (1989) 5-8.
- 5066 Ruijten, H.M., Timmerman, B.E. and de Bree, H.: Design of and first experiments with a bioluminescence detector for HPLC. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 397-399; *C.A.*, 111 (1989) 3681u.
- 5067 Schill, G. and Arvidsson, E.: Application of indirect detection methods in biomedical analysis. *J. Chromatogr.*, 492 (1989) 299-318 - a review with 42 refs.
- 5068 Shimada, K., Oe, T. and Nambara, T.: Immobilized enzyme reactors for detection systems in high-performance liquid chromatography. *J. Chromatogr.*, 492 (1989) 345-359 - a review with 54 refs.

See also 5013, 5060, 5128, 5210, 5212, 5277, 5287, 5340, 5474, 5750, 5766, 5806, 5828, 5831, 5840, 5842.

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

- 5069 Alhedai, A., Martire, D.E. and Scott, R.P.W.: Colum "dead volume" in liquid chromatography. *Analyst (London)*, 114 (1989) 869-875.
- 5070 Brehm, G.: (MA7 - a new high quality ion exchanger). *LaborPraxis*, 13 (1989) 292-296; *C.A.*, 111 (1989) 3422k.
- 5071 Drevin, I., Larsson, L. and Johansson, B.-L.: Column performance of Q-Sepharose HP in analytical- and preparative-scale chromatography. *J. Chromatogr.*, 477 (1989) 337-344.

- 5072 Eppert, G., Liebscher, G. and Schinke, I.: Investigations into the chromatographic behaviour of silica gels produced from ester silicates. *Chromatographia*, 28 (1989) 9-14.
- 5073 Gisich, D.J. and Nelson, D.A.: Effects of steric protection on the preparation of silica based strong cation ion-exchange packings. *J. High Resolut. Chromatogr.*, 12 (1989) 478-480.
- 5074 Gisich, D.J., Ludwig, R. and Witting, L.A.: Comparison and characterization of normal and tertiary butyl alkyl bonded phases for reversed phase liquid chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 409-410.
- 5075 Helboe, P., Hansen, S.H. and Thomsen, M.: The use of dynamically modified silica in HPLC as an alternative to chemically bonded materials. *Adv. Chromatogr. (N.Y.)*, 28 (1989) 195-265; *C.A.*, 111 (1989) 12809u - a review with 91 refs.
- 5076 Hradil, J., Svec, F., Aratskova, A.A., Beljakova, L.D., Orlov, V.I. and Yashin, Ya.I.: Ion chromatography on methacrylate ion exchangers. *J. Chromatogr.*, 475 (1989) 209-217.
- 5077 Kennedy, R.T. and Jorgenson, J.W.: Preparation and evaluation of packed capillary liquid chromatography columns with inner diameters from 20 to 50  $\mu$ m. *Anal. Chem.*, 61 (1989) 1128-1135.
- 5078 Ohhira, M., Ohmura, F. and Hanai, T.: Inertness of bonded silica gel packings. *J. Liq. Chromatogr.*, 12 (1989) 1065-1074.
- 5079 Ohmacht, R., Kele, M. and Matus, Z.: Polymer coated stationary phases for liquid chromatography. *Chromatographia*, 28 (1989) 19-23.
- 5080 Tanaka, N., Ebata, T., Hashizume, K., Hosoya, K. and Araki, M.: Polymer-based packing materials with alkyl backbones for reversed-phase liquid chromatography. *J. Chromatogr.*, 775 (1989) 195-208.
- 5081 Tennikova, T.B., Horak, D., Svec, F., Tennikov, M.B., Keveer, E.E. and Belenkii, B.G.: Hydrolyzed macroporous glycidyl methacrylate-ethylene dimethacrylate copolymer with narrow pore size distribution. A novel packing for size-exclusion high-performance liquid chromatography. *J. Chromatogr.*, 475 (1989) 187-194.

For additional information see:

*C.A.*, 110 (1989) 234053m, 234161v, 241829x;  
111 (1989) 3745t, 3746u, 3768c, 16915y, 16916z, 36251g, 36252h.

See also 5088, 5119, 5193, 5280, 5285, 5286, 5414, 5415, 5419, 5420, 5422, 5426, 5524, 5639, 5740, 5856, 5882.

### 3e. Preparative scale chromatography

- 5082 Golshan-Shirazi, S. and Guiochon, G.: Theory of optimization of the experimental conditions of preparative elution using the ideal model of liquid chromatography. *Anal. Chem.*, 61 (1989) 1276-1287.
- 5083 Katti, A. and Guiochon, G.: Optimization of sample size and sample volume in preparative liquid chromatography. *Anal. Chem.*, 61 (1989) 982-990.
- 5084 Saxena, V., Subramanian, K., Saxena, S. and Dunn, M.: Production-scale radial flow chromatography. *BioPharm.*, 2 (1989) 46-50; *C.A.*, 111 (1989) 3493j.

See also 5122, 5413, 5851.

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

For additional information see:

*C.A.*, 110 (1989) 241811k.

See also 5054, 5186.

### 3g. High performance procedures

See 5754.

## 4. SPECIAL TECHNIQUES

## 4a. Automation and computerization

- 5085 Fasanmade, A.A. and Fell, A.F.: Computer-aided time domain differentiation in high-performance liquid chromatography. *Anal. Chem.*, 61 (1989) 720-728.
- 5086 Fouda, H.G.: Robotics in biomedical chromatography and electrophoresis. *J. Chromatogr.*, 492 (1989) 85-108 - a review with 90 refs.
- 5087 Guillemin, C.L.: Software driven instrumentation. Application to on-line process liquid chromatography. *TrAC*, 8 (1989) 273-276.
- 5088 Palamareva, M.D. and Palamarev, H.E.: Microcomputer-aided characterization of mobile phases for normal-phase liquid-solid chromatography based on Snyder's theory and data. *J. Chromatogr.*, 477 (1989) 235-248.
- 5089 Turnell, D.C. and Cooper, J.D.H.: Automation of liquid chromatographic techniques for biomedical analysis. *J. Chromatogr.*, 492 (1989) 59-83 - a review with 43 refs.

See also 5312.

## 4b. Combination of various chromatographic techniques

- 5090 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.
- 5091 Lottspeich, F.: HPLC and electrophoresis - competitors or partners. *Chromatographia*, 28 (1989) 89-91 - a review with 16 refs.
- 5092 Williams, R.A., Macrae, R. and Shepherd, M.J.: Non-aqueous size-exclusion chromatography coupled on-line to reversed-phase high-performance liquid chromatography. Interface development and applications to the analysis of low-molecular-weight contaminants and additives in foods. *J. Chromatogr.*, 477 (1989) 315-325.

See also 5405, 5753, 5805.

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

- 5093 Barefoot, A.C., Reiser, R.W. and Cousins, S.A.: Microcolumn liquid chromatography-mass spectrometry using moving belt and continuous flow fast atom bombardment interfaces. *J. Chromatogr.*, 474 (1989) 39-50.
- 5094 Beattie, I.G. and Blake, T.J.A.: Application of thermospray liquid chromatography-mass spectrometry and liquid chromatography-tandem mass spectrometry for the identification of cynomolgus monkey and human metabolites of SK&F 101468, a dopamine D<sub>2</sub> receptor agonist. *J. Chromatogr.*, 474 (1989) 123-138.
- 5095 Gelpi, E., Ramis, I., Hotter, G., Bioque, G., Bulbena, O. and Rosello, J.: Modern high-performance liquid chromatographic-radioimmunoassay strategies for the study of eicosanoids in biological samples. *J. Chromatogr.*, 492 (1989) 223-250 - a review with 61 refs.
- 5096 Genuit, W. and van Binsbergen, H.: Improving the ion current stability of a thermospray source by improving the control of the vaporizer temperature and solvent flow-rate. *J. Chromatogr.*, 474 (1989) 145-148.
- 5097 Harrison, M.E., Langley, G.J. and Baldwin, M.A.: Effects of repeller position and voltage in thermospray mass spectrometry. *J. Chromatogr.*, 474 (1989) 139-143.
- 5098 Heeremans, C.E.M., van der Hoeven, R.A.M., Niessen, W.M.A., Tjaden, U.R. and van der Greef, J.: Acetic acid cluster ions for tuning and calibration in thermospray liquid chromatography/mass spectrometry. *Org. Mass Spectrom.*, 24 (1989) 109-112; *C.A.*, 110 (1989) 241835w.
- 5099 Heeremans, C.E.M., van der Hoeven, R.A.M., Niessen, W.M.A., Tjaden, U.R. and van der Greef, J.: Development of optimization strategies in thermospray liquid chromatography-mass spectrometry. *J. Chromatogr.*, 474 (1989) 149-162.
- 5100 Kokkonen, P., Niessen, W.M.A., Tjaden, U.R. and van der Greef, J.: Applicability of continuous-flow fast atom bombardment liquid chromatography-mass spectrometry in bioanalysis. Dextromethorphan in plasma. *J. Chromatogr.*, 474 (1989) 59-68.

- 5101 Luijten, W., Damien, G. and Capart, J.: Liquid chromatography-mass spectrometry of trace compounds with a moving-belt interface and multidimensional chromatography. *J. Chromatogr.*, 474 (1989) 265-273.
- 5102 Niessen, W.M.A., van der Hoeven, R.A.M., de Kraa, M.A.G., Heeremans, C.E.M., Tjaden, U.R. and van der Greef, J.: Repeller effects in discharge ionization in combined liquid or supercritical-fluid chromatography-mass spectrometry using a thermospray interface. I. Changes in the reagent gas spectrum. *J. Chromatogr.*, 474 (1989) 113-122.
- 5103 Page, J.A., Beer, M.T. and Lauber, R.: Optimisation of continuous flow fast atom bombardment mass spectrometry for bioanalysis. *J. Chromatogr.*, 474 (1989) 51-58.
- 5104 Pullen, F.S., Ashton, D.S. and Baldwin, M.A.: Corona discharge ionization liquid chromatography-mass spectrometry interface for target compound analyses. *J. Chromatogr.*, 474 (1989) 335-343.
- 5105 Stenhagen, G. and Alborn, H.: Developments of micro liquid chromatography-mass spectrometry with gradient elution. Improvements to obtain less thermal decomposition of labile compounds. *J. Chromatogr.*, 474 (1989) 285-300.
- 5106 Tomer, K.B. and Parker, C.E.: Biochemical applications of liquid chromatography-mass spectrometry. *J. Chromatogr.*, 492 (1989) 189-221 - a review with 142 refs.
- 5107 Van der Greef, J., Niessen, W.M.A. and Tjaden, U.R.: Liquid chromatography-mass spectrometry. The need for a multidimensional approach. *J. Chromatogr.*, 474 (1989) 5-19.
- 5108 Verheij, E.R., la Vos, G.F., Niessen, W.M.A., Tjaden, U.R. and van der Greef, J.: Belt-speed programming, a new technique for peak compression in liquid chromatography-mass spectrometry and supercritical-fluid chromatography-mass spectrometry with moving-belt interfaces. *J. Chromatogr.*, 474 (1989) 275-283.
- 5109 Volk, K.J., Yost, R.A. and Brajter-Toth, A.: Characterization of solution-phase and gas-phase reactions in on-line electrochemistry-thermospray tandem mass spectrometry. *J. Chromatogr.*, 474 (1989) 231-243.

For additional information see:

*C.A.*, 111 (1989) 16925b.

See also 5026, 5139, 5235, 5239, 5277, 5305, 5336, 5388, 5649, 5650, 5705, 5715, 5725-5728, 5778, 5785, 5793, 5795, 5796, 5799, 5877.

#### 4d. Affinity chromatography

- 5110 Coletti-Previero, M.-A. and Previero, A.: Alumina-phosphate complexes for immobilization of biomolecules. *Anal. Biochem.*, 180 (1989) 1-10 - a review with 35 refs.
- 5111 Hubble, J.: A simple model for predicting the performance of affinity chromatography columns. *Biotechnol. Tech.*, 3 (1989) 113-118; *C.A.*, 111 (1989) 20286m.
- 5112 Jaulmes, A. and Vidal-Madjar, C.: Theoretical aspects of quantitative affinity chromatography: an overview. *Adv. Chromatogr. (N.Y.)*, 28 (1989) 1-64; *C.A.*, 111 (1989) 12807s - a review with 85 refs.
- 5113 Moriya, K., Tanizawa, K. and Kanaoka, Y.: Immobilized chymotrypsin by means of Schiff base copper(II)chelate. *Biochem. Biophys. Res. Commun.*, 162 (1989) 408-414.
- 5114 Tsuganezawa, O.: (Affinity purification technique and its application to forensic immunology). *Nippon Hoigaku Zasshi*, 42 (1988) 458-465; *C.A.*, 111 (1989) 2206f - a review with 30 refs.
- 5115 Vijayalakshmi, M.A.: Pseudobiospecific ligand affinity chromatography. *Trends Biotechnol.*, 7 (1989) 71-76; *C.A.*, 111 (1989) 3408k - a review with 44 refs.
- 5116 Winzor, D.J. and de Jersey, J.: Biospecific interactions: their quantitative characterization and use for solute purification. *J. Chromatogr.*, 492 (1989) 377-430 - a review with 178 refs.

See also 5147, 5186, 5478, 5490, 5527, 5538.

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

See 5132, 5136, 5878.

## 4g. Separation of enantiomers

- 5117 Hermansson, J.: Enantiomeric separation of drugs and related compounds based on their interaction with  $\alpha_1$ -acid glycoprotein. *TrAC*, 8 (1989) 251-259 - a review with 34 refs.
- 5118 Okamoto, Y.: (Chromatographic separation of optical isomers). *Petrotech.*, 11 (1988) 1034-1039; *C.A.*, 111 (1989) 38560f.
- 5119 Sallé, M., Tambuté, A. and Bégos, A.: Design and synthesis of a chiral stationary phase containing a benz[de]isoquinolinone skeleton. I. First chromatographic results. *J. Chromatogr.*, 475 (1989) 153-165.

See also 5308, 5312, 5316, 5325, 5326, 5340, 5353, 5517, 5677, 5785, 5803, 5808.

## 4h. Other special techniques

- 5120 Adachi, S., Watanabe, T. and Kohashi, M.: An enzyme reactor based on the difference in migration rate in gel chromatographic columns between enzyme and substrate. *Agric. Biol. Chem.*, 53 (1989) 1597-1602; *C.A.*, 111 (1989) 55811f.
- 5121 Harwell, J.H. and O'Rear, E.A.: Adsorbed surfactant bilayers as two-dimensional solvents: admicellar-enhanced chromatography. *Surfactant Sci. Ser.*, 33 (1989) 155-171; *C.A.*, 110 (1989) 233784p - a review with 28 refs.
- 5122 Lee, Y.W., Cook, C.E., Fang, Q.C. and Ito, Y.: Application of analytical high-speed counter-current chromatography to the isolation of bioactive natural products. *J. Chromatogr.*, 477 (1989) 434-438.
- 5123 Wu, J., Lee, C., Harwell, J.H. and O'Rear, E.A.: Adsorbed surfactant bilayers as two-dimensional solvents: surface modification by thin-film formation. *Surfactant Sci. Ser.*, 33 (1989) 173-203; *C.A.*, 110 (1989) 233785 - a review with 8 refs.

See also 5009, 5052, 5416.

## 5. HYDROCARBONS AND HALOGEN DERIVATIVES

## 5a. Aliphatic hydrocarbons

- 5124 Adler, N., Rak, N. and Sertic-Bionda, K.: The correlation between HPLC parameters and topological indices of alkanes. *Fresenius' Z. Anal. Chem.*, 334 (1989) 136-138.
- 5125 Stevens, K.L. and Witt, S.C.: Separation and identification of labile polyacetylenes by RP-HPLC. *J. Liq. Chromatogr.*, 12 (1989) 1203-1211.
- 5126 Stienlet, D., Vervloessem, A. and Ceulemans, J.: Radiolytic synthesis of high-molecular-weight alkanes for chromatographic characterization and identification purposes. *J. Chromatogr.*, 475 (1989) 247-260.

For additional information see:  
*C.A.*, 111 (1989) 8124z.

## 5b. Cyclic hydrocarbons

- 5127 Khan, W.A., Park, S.S., Gelboin, H.V., Bickers, D.R. and Mukhtar, H.: Epidermal cytochrome P-450: immunochemical characterization of isoform induced by topical application of 3-methylcholanthrene to neonatal rat. *J. Pharmacol. Exp. Ther.*, 249 (1989) 921-927.
- 5128 Kicinski, H.G., Adamek, S. and Kettrup, A.: Trace enrichment and HPLC analysis of polycyclic aromatic hydrocarbons in environmental samples, using solid phase extraction in connection with UV/VIS diode-array and fluorescence detection. *Chromatographia*, 28 (1989) 203-208.
- 5129 Olsson, M., Sander, L.C. and Wise, S.A.: Comparison of liquid chromatographic selectivity for polycyclic aromatic hydrocarbons on cyclodextrin and C<sub>18</sub> bonded phases. *J. Chromatogr.*, 477 (1989) 277-290.
- 5130 Skrbic, B. and Cvejanov, J.: (Identification of polycyclic aromatic hydrocarbons). *Nafta (Zagreb)*, 39 (1988) 561-566; *C.A.*, 111 (1989) 11795z - a review with 34 refs.

- 5131 Takeuchi, T., Matsuno, S. and Ishii, D.: Temperature effects in microcolumn size exclusion chromatography. *J. Liq. Chromatogr.*, 12 (1989) 987-996.

For additional information see:

*C.A.*, 111 (1989) 51813k.

See also 5043, 5044, 5046, 5080, 5124.

*5c. Halogen derivatives*

See 5042, 5126.

*5d. Complex hydrocarbon mixtures*

- 5132 Garrigues, P. and Belloq, J.: Rapid cleanup of natural organic extracts for the recovery of polycyclic aromatic hydrocarbons by solid phase extraction. *J. High Resolut. Chromatogr.*, 12 (1989) 400-403.
- 5133 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.
- 5134 Leite, L.F.M., Camillo, M.C.F., Deane, G.H.W., Brandao, L.M., Cintra, R.H. and Carvalho, J.R.F.: HP-GPC characterization of asphalts. *J. High Resolut. Chromatogr.*, 12 (1989) 498-500.

6. ALCOHOLS

For additional information see:

*C.A.*, 111 (1989) 2558x.

See also 5043, 5044, 5202, 5845.

7. PHENOLS

- 5135 Alber, M., Böhm, H.B., Brodesser, J., Feltes, J., Levsen, K. and Schöler, H.F.: Determination of nitrophenols in rain and snow. *Fresenius' Z. Anal. Chem.*, 334 (1989) 540-545.
- 5136 Korenman, Ya.I., Alymova, A.T. and Raspopova, T.G.: (Preconcentration and separation of trace amounts of phenols from aqueous solutions on columns with octane-TBP mixed stationary phases). *Zh. Anal. Khim.*, 43 (1988) 1680-1683; *C.A.*, 111 (1989) 16920w.
- 5137 Olsen, L.D. and Hurtubise, R.J.: Solvent composition effects on the retention characteristics of aromatic hydroxyl compounds with silica and polar mobile phases and interpretation by the Snyder model. *J. Chromatogr.*, 474 (1989) 347-361.
- 5138 Smith, T.J.: HPLC analysis of free and total gossypol in cottonseed food products and animal organs. *Avail. Univ. Microfilm Int.*, Order No. DA8821417, 1988, 121 pp.; *C.A.*, 111 (1989) 22300k.

For additional information see:

*C.A.*, 111 (1989) 16945h, 22299s.

See also 5037, 5043, 5058, 5845.

8. SUBSTANCES CONTAINING HETEROCYCLIC OXYGEN

*8a. Flavonoids*

- 5139 Games, D.E. and Martinez, F.: Evaluation of the moving belt as an interface for the high-performance liquid chromatographic-mass spectrometric analysis of the flavonoid aglycones. *J. Chromatogr.*, 474 (1989) 372-380.

- 5140 Putman, L.J. and Butler, L.G.: Separation of high molecular weight sorghum procyanidins by high-performance liquid chromatography. *J. Agric. Food Chem.*, 37 (1989) 943-946.
- 5141 Raynal, J. and Moutounet, M.: Intervention of phenolic compounds in plum technology. 2. Mechanisms of anthocyanin degradation. *J. Agric. Food Chem.*, 37 (1989) 1051-1053.
- 5142 Raynal, J., Moutounet, M. and Souquet, J.-M.: Intervention of phenolic compounds in plum technology. 1. Changes during drying. *J. Agric. Food Chem.*, 37 (1989) 1046-1050.
- 5143 Snook, M.E., Widstrom, N.W. and Geldner, R.C.: Reversed-phase high-performance liquid chromatographic procedure for the determination of maysin in corn silks. *J. Chromatogr.*, 477 (1989) 439-447.

For additional information see:  
C.A., 111 (1989) 3505q, 12576r.

See also 5064.

*8b. Aflatoxins and other mycotoxins*

- 5144 Anonymous: Changes in official methods of analysis. Natural poisons. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 189.
- 5145 Betina, V.: Chromatographic methods as tools in the field of mycotoxins. *J. Chromatogr.*, 477 (1989) 187-233 - a review.
- 5146 Cole, R.J., Dorner, J.W., Kirksey, J.M. and Dowell, F.E.: Comparison of visual enzyme-linked immunosorbent assay screening, and HPLC methods in detecting aflatoxin in farmers stock peanut grade samples. *Peanut. Sci.*, 15 (1988) 61-63; C.A., 111 (1989) 55916u.
- 5147 Sharman, M., Patey, A.L. and Gilbert, J.: Application of an immunoaffinity column sample clean-up to the determination of aflatoxin M<sub>1</sub> in cheese. *J. Chromatogr.*, 474 (1989) 457-461.
- 5148 Sydenham, E.W., Thiel, P.G., Marasas, W.F.O. and Nieuwenhuis, J.J.: Occurrence of deoxynivalenol and nivalenol in *Fusarium graminearum* infected undergrade wheat in South Africa. *J. Agric. Food Chem.*, 37 (1989) 921-926.

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

- 5149 Kaack, K.: Semiquantitative spectrophotometric determination of fruit juice adulteration by anthocyanin analysis. *Tidskr. Planteavl.*, 92 (1988) 279-287; C.A., 111 (1989) 22268f.
- 5150 Vuorela, H., Dallenbach-Toelke, K., Nyiredy, S., Hiltunen, R. and Sticher, O.: HPLC analysis of the main furanocoumarins from *Peucedanum palustre*. *Planta Med.*, 55 (1989) 181-184; C.A., 111 (1989) 36047v.
- 5151 Wawrzynowicz, T., Waksmundzka-Hajnos, M. and Bieganska, M.L.: Chromatographic investigations of furocoumarins from *Heracleum* genus fruits. *Chromatographia*, 28 (1989) 161-166.

For additional information see:  
C.A., 111 (1989) 6208f.

See also 5835.

9. OXO COMPOUNDS, ETHERS, EPOXIDES AND QUINONES

- 5152 Burke, W.J., Mattammal, M.B., Marshall, G.L. and Chung, H.: Detection of 3,4-dihydroxyphenylglycolaldehyde in human brain by high-performance liquid chromatography. *Anal. Biochem.*, 180 (1989) 79-84.
- 5153 Chiavari, G., Laghi, M.C. and Torsi, G.: High-performance liquid chromatographic analysis of aldehydes at trace level as their 3-methylbenzothiazolone azine derivatives. *J. Chromatogr.*, 475 (1989) 343-351.
- 5154 Galletti, G.C., Piccaglia, R., Chiavari, G. and Concialini, V.: HPLC/electrochemical detection of lignin phenolics from wheat straw by direct injection of nitrobenzene hydrolysates. *J. Agric. Food Chem.*, 37 (1989) 985-987.



- 5155 Kahan, S.: Liquid chromatographic method for determination of vanillin and related flavor compounds in vanilla extract: collaborative study. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 614-618.
- 5156 Lindh, L.A. and Dahlen, J.A.H.: Hydrogen sulfide and acetaldehyde discharge from a rapeseed extraction plant. *J. Am. Oil Chem. Soc.*, 66 (1989) 972-973.
- 5157 Sugata, S., Ishihara, S., Watanabe (née Tamano), Y., Nagata, Y. and Matsushima, Y.: A chemical model of catechol-O-methyltransferase. Methylation of 3,4-dihydroxybenzaldehyde in aqueous solution. *Chem. Pharm. Bull.*, 37 (1989) 1143-1146.

See also 5043, 5044, 5059, 5196, 5202, 5480, 5855.

## 10. CARBOHYDRATES

### 10a. Mono and oligosaccharides. Structural studies

- 5158 Blanc, M.B., Davis, G.E., Parchet, J.-M. and Viani, R.: Chromatographic profile of carbohydrates in commercial soluble coffees. *J. Agric. Food Chem.*, 37 (1989) 926-930.
- 5159 Brunner, H., Weisshaar, G., Friebohn, H., Mann, H., Baumann, W. and Sieberth, H.-G.: Isolation and identification of sialylcompounds from hemofiltrate. *Chromatographia*, 28 (1989) 59-64.
- 5160 Hanaoka, K., Pritchett, T.J., Takasaki, S., Kochibe, N., Sabesan, S., Paulson, J.C. and Kobata, A.: 4-O-Acetyl-N-acetylneuraminic acid in the N-linked carbohydrate structures of equine and guinea pig  $\alpha_2$ -macroglobulins, potent inhibitors of influenza virus infection. *J. Biol. Chem.*, 264 (1989) 9842-9849.
- 5161 Honda, S., Akao, E., Suzuki, S., Okuda, M., Kakehi, K. and Nakamura, J.: High-performance liquid chromatography of reducing carbohydrates as strongly ultraviolet-absorbing and electrochemically sensitive 1-phenyl-3-methyl-5-pyrazolone derivatives. *Anal. Biochem.*, 180 (1989) 351-357.
- 5162 Jansen, C.: (HPLC of oligosaccharides and monosaccharides from glycoproteins). *Chem. Labor. Betr.*, 40 (1989) 248-252; *C.A.*, 111 (1989) 35986p.
- 5163 Kennington, A.S., Shen, T.-Y. and Romero, G.: A simple procedure for the preparation and purification of the oligosaccharide components of the glycosyl-phosphatidylinositol anchor of membrane proteins. *Anal. Biochem.*, 181 (1989) 1-5.
- 5164 Kol, O., Montreuil, J., Fournet, B., Zalisz, R. and Smets, P.: Separation by high-performance liquid chromatography of oligosaccharides obtained after mild acid hydrolysis of *Klebsiella pneumoniae* O<sub>1</sub>K<sub>2</sub> (NCTC 5055) lipopolysaccharides. *J. Chromatogr.*, 474 (1989) 452-456.
- 5165 Ohtakara, A. and Mitsutomi, M.: Analysis of chitoooligosaccharides and reduced chitoooligosaccharides by HPLC. *Methods Enzymol.*, 161 (Biomass, Pt. B) (1988) 453-457; *C.A.*, 111 (1989) 36030j.
- 5166 Stefanelli, C., Niola, I. and Vallettrisco, M.: (Possibilities of differentiating between nectar and honeydew honeys by HPLC). *Ind. Aliment.*, 28 (1989) 138-140; *C.A.*, 111 (1989) 6013p.
- 5167 Sugahara, K., Okumura, Y. and Yamashina, I.: The Englebreth-Holm-Swarm mouse tumor produces undersulfated heparan sulfate and oversulfated galactosaminoglycans. *Biochem. Biophys. Res. Commun.*, 162 (1989) 189-197.
- 5168 Takamoto, M., Endo, T., Isemura, M., Kochibe, N. and Kobata, A.: Structures of asparagine-linked oligosaccharides of human placental fibronectin. *J. Biochem. (Tokyo)*, 105 (1989) 742-750.
- 5169 Yano, Y., Tanaka, K. and Someya, Y.: (The hydrophobic chromatography of sugars). *Shokunotsu Gakkaishi*, 43 (1988) 1-7; *C.A.*, 111 (1989) 58163g - a review with 15 refs.

See also 5187, 5188, 5191, 5315, 5854, 5861, 5872.

### 10b. Polysaccharides, mucopolysaccharides, lipopolysaccharides

- 5170 Baeyens, W.R.G., Ling, B.L., de Moerloose, P., del Castillo, B. and de Jonge, C.: Cyclodextrins: spectroscopic, pharmaceutical and chromatographic applications. *An. R. Acad. Farm.*, 54 (1988) 698-714; *C.A.*, 110 (1989) 23720iu - a review with 139 refs.

- 5171 Fosang, A.J. and Hardingham, T.E.: Isolation of the N-terminal globular protein domains from cartilage proteoglycans. Identification of G2 domain and its lack of interaction with hyaluronate and link protein. *Biochem. J.*, 261 (1989) 801-809.
- 5172 Gaal, J.C., McIntosh, L.C. and Forrester, J.V.: Retina contains endogenous heparinase activity. *Biochem. Biophys. Res. Commun.*, 161 (1989) 604-614.
- 5173 Hamano, T., Mitsuhashi, Y., Acki, N., Yamamoto, S., Tsuji, S., Ito, Y. and Oji, Y.: High performance liquid chromatographic assay of chondroitin sulphate in food products. *Analyst (London)*, 114 (1989) 891-893.
- 5174 Lidholt, K., Kjellén, L. and Lindahl, U.: Biosynthesis of heparin. Relationship between the polymerization and sulphation processes. *Biochem. J.*, 261 (1989) 999-1007.
- 5175 Lindblom, A., Carlstedt, I. and Fransson, L.-A.: Identification of the core proteins in proteoglycans synthesized by vascular endothelial cells. *Biochem. J.*, 261 (1989) 145-153.
- 5176 Makela, M., Mattsson, P. and Korpela, T.: Specific adsorbents in isolation and purification of cyclodextrins. *Biotechnol. Appl. Biochem.*, 11 (1989) 193-200; *C.A.*, 111 (1989) 53519t.
- 5177 Marini, D.: (Liquid chromatography (HPLC) of glucomannan). *Fitoterapia*, 59 (1988) 407-413; *C.A.*, 111 (1989) 20280e.
- 5178 Melching, L.I. and Roughley, P.J.: The synthesis of dermatan sulphate proteoglycans by fetal and adult human articular cartilage. *Biochem. J.*, 261 (1989) 501-508.
- 5179 Ohmori, T., Tamura, K., Ohgane, N., Nakamura, T., Kawanishi, G., Yamada, H. and Nomoto, K.: The correlation between molecular weight and antitumor activity of galactosaminoglycan (CO-N) from *Cordyceps ophioglossoides*. *Chem. Pharm. Bull.*, 37 (1989) 1337-1340.
- 5180 Rasilo, M.-L. and Yamagata, T.: Characterization of a glucose polymer from PC12 cells and neuronal cells of rat embryo. *J. Biochem. (Tokyo)*, 104 (1988) 742-754.
- 5181 Reitsma, J.C.E. and Pilnik, W.: Analysis of mixtures of pectins and amidated pectins. *Carbohydr. Polym.*, 10 (1989) 315-319; *C.A.*, 1<sup>1</sup> (1989) 38091d.
- 5182 Rochas, C. and Lahaye, M.: Average molecular weight and molecular weight distribution of agarose and agarose-type polysaccharides. *Carbohydr. Polym.*, 10 (1989) 289-298; *C.A.*, 111 (1989) 53532s.
- 5183 Shimizu, N., Tomoda, M., Gonda, R., Kanari, M., Takanashi, N. and Takahashi, N.: The major pectic arabinogalactan having activity on the reticuloendothelial system from the roots and rhizomes of *Saposhnikovia divaricata*. *Chem. Pharm. Bull.*, 37 (1989) 1329-1332.
- 5184 Yamamoto, S., Hase, S., Yamauchi, H., Tanimoto, T. and Ikenaka, T.: Studies on the sugar chains of interferon- $\gamma$  from human peripheral-blood lymphocytes. *J. Biochem. (Tokyo)*, 105 (1989) 1034-1039.

For additional information see:

*C.A.*, 111 (1989) 37881z, 55933x.

See also 5046, 5081.

#### 10c. Glycoproteins and their components

- 5185 Akoum, A., Vijayalakshmi, M.A. and Sigot, M.: Scale-up of "myxalin" purification by a pseudoaffinity method using a radial flow column. *Chromatographia*, 28 (1989) 157-160.
- 5186 Bergold, A.F. and Carr, P.W.: Improved resolution of glycoproteins by chromatography with concavalin A immobilized on microparticulate silica via temperature-programmed elution. *Anal. Chem.*, 61 (1989) 1117-1128.
- 5187 Calvete, J.J., Henschen, A. and Gonzales-Rodriguez, J.: Complete localization of the intrachain disulphide bonds and the N-glycosylation points in the  $\alpha$ -subunit of human platelet glycoprotein IIb. *Biochem. J.*, 261 (1989) 561-568.
- 5188 Hardy, M.R.: Liquid chromatographic analysis of the carbohydrates of glycoproteins. *LC-GC*, 7 (1989) 242-246; *C.A.*, 111 (1989) 36029x.
- 5189 Houdret, N., Ramphal, R., Scharfman, A., Perini, J.-M., Filliat, M., Lamblin, G. and Roussel, P.: Evidence for the *in vivo* degradation of human respiratory mucins during *Pseudomonas aeruginosa* infection. *Biochim. Biophys. Acta*, 992 (1989) 96-105.

- 5190 Neame, P.J., Choi, H.U. and Rosenberg, L.C.: The primary structure of the core protein of the small, leucine-rich proteoglycan (PG I)' from bovine articular cartilage. *J. Biol. Chem.*, 264 (1989) 8653-8661.
- 5191 Piller, V., Piller, F., Klier, F.G. and Fukuda, M.: O-Glycosylation of leukosialin in K562 cells. Evidence for initiation and elongation in early Golgi compartments. *Eur. J. Biochem.*, 183 (1989) 123-135.
- 5192 Yamamoto, S., Hase, S., Fukuda, S., Sano, O. and Ikenaka, T.: Structures of the sugar chains of interferon- $\gamma$  produced by human myelomonocyte cell line HBL-38. *J. Biochem. (Tokyo)*, 105 (1989) 547-555.

For additional information see:  
*C.A.*, 111 (1989) 3649g.

## 11. ORGANIC ACIDS AND LIPIDS

### 11a. Organic acids and simple esters

- 5193 Albarran, G. and Collins, C.H.: Separations using ion-moderated partition chromatography. Comparisons of efficiency and resolution with several different columns. *J. High Resolut. Chromatogr.*, 12 (1989) 486-488.
- 5194 Ansari, K.A. and Shoeman, D.W.: Measurement of hydroperoxydocosahexaenoic acid in rat brain homogenates by reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 475 (1989) 457-460.
- 5195 Bidló-Iglóy, M.: Reversed-phase thin-layer and high-performance liquid chromatography of aromatic alkoxy and hydroxy acids. *J. Chromatogr.*, 475 (1989) 321-329.
- 5196 Cheynier, V., Basire, N. and Rigaud, J.: Mechanism of *trans*-caffeoyltartaric acid and catechin oxidation in model solutions containing grape polyphenoloxidase. *J. Agric. Food Chem.*, 37 (1989) 1069-1071.
- 5197 Cilliers, J.J.L. and Singleton, V.L.: Nonenzymic autoxidative phenolic browning reactions in a caffeic acid model system. *J. Agric. Food Chem.*, 37 (1989) 890-896.
- 5198 Daulatabad, C.D., Ankalagi, R.F. and Desai, V.A.: Cyclopropenoid and fatty acid composition of *Kydia calycina* seed oil. *Fat Sci. Technol.*, 91 (1989) 237-238.
- 5199 Goncalves, D.: (Dimers of fatty acid esters. Characterization by gel permeation chromatography). *Arq. Biol. Tecnol.*, 31 (1988) 469-474; *C.A.*, 111 (1989) 6012n.
- 5200 Gordon, J.A., Figard, P.H. and Spector, A.A.: Identification of the major metabolite of 12-HETE produced by renal tubular epithelial cells. *J. Lipid Res.*, 30 (1989) 731-738.
- 5201 Hayakawa, M., Ogawa, T., Sugiyama, S. and Ozawa, T.: Hydroxyl radical and leukotoxin biosynthesis in neutrophil plasma membrane. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1077-1085.
- 5202 Husain, S., Pratap, G. and Rao, R.N.: High-performance liquid chromatography of long chain 7-oxo alcohols, acids and their esters. *J. Chromatogr.*, 475 (1989) 426-431.
- 5203 Johnson, C.B.: An improved method for the analysis of ruminant fats. *J. Am. Oil Chem. Soc.*, 66 (1989) 935-937.
- 5204 Kaduce, T.L., Figard, P.H., Leifur, R. and Spector, A.A.: Formation of 9-hydroxyoctadecadienoic acid from linoleic acid in endothelial cells. *J. Biol. Chem.*, 264 (1989) 6823-6830.
- 5205 Kohda, H., Takeda, O., Tanaka, S., Yamasaki, K., Yamashita, A., Kurokawa, T. and Ishibashi, S.: Isolation of inhibitors of adenylate cyclase from dan-shen, the root of *Salvia miltiorrhiza*. *Chem. Pharm. Bull.*, 37 (1989) 1287-1290.
- 5206 Mallikaarjun, S., Wood, J.H. and Karnes, H.T.: High-performance liquid chromatographic method for the determination of salicylic acid and its metabolites in urine by direct injection. *J. Chromatogr.*, 493 (1989) 93-104.
- 5207 Reinaud, O., Delaforge, M., Boucher, J.L., Rocchiccioli, F. and Mansuy, D.: Oxidative metabolism of linoleic acid by human leukocytes. *Biochem. Biophys. Res. Commun.*, 161 (1989) 883-891.
- 5208 Schadewaldt, P., Hummel, W., Trautvetter, U. and Wendel, U.: A convenient enzymatic method for the determination of 4-methyl-2-oxopentanoate in plasma: comparison with high-performance liquid chromatographic analysis. *Clin. Chim. Acta*, 183 (1989) 171-182.

- 5209 Tulyathan, V., Boulton, R.B. and Singleton, V.L.: Oxygen uptake by gallic acid as a model for similar reactions in wines. *J. Agric. Food Chem.*, 37 (1989) 844-849.
- 5210 Van der Horst, F.A.L.: Micellar catalysis for the derivatization of carboxylic acids in physiological matrices. *TrAC*, 8 (1989) 268-273.
- 5211 Van der Stegen, G.H.D. and van Duijn, J.: Analysis of normal organic acids in coffee. *Colloq. Sci. Int. Cafe (C.R.)*, 12 (1988, Pub. 1987) 238-246; *C.A.*, 111 (1989) 22261y.
- 5212 Walker, T.A., Ho, T.V. and Akbari, N.: Indirect UV detection of organic analyte anions using a low-capacity anion exchange column. *J. Liq. Chromatogr.*, 12 (1989) 1213-1230.
- 5213 Walter, J.H., Thompson, G.N., Leonard, J.V., Heatherington, C.S. and Bartlett, K.: Measurement of propionate turnover *in vivo* using sodium [<sup>2</sup>H<sub>5</sub>]propionate and sodium [<sup>13</sup>C]propionate. *Clin. Chim. Acta*, 182 (1989) 141-150.

For additional information see:

- C.A.*, 110 (1989) 241888r, 241893p;  
111 (1989) 20289q, 22287m, 36037s, 36253j.

See also 5044, 5141, 5142, 5154, 5155, 5246, 5663, 5854, 5861.

#### 11b. Prostaglandins

- 5214 Beck, G.M., Roston, D.A. and Jaselskis, B.: Derivatization procedures for detection of prostaglandins in biological matrices by liquid chromatography/electrochemistry. *Talanta*, 36 (1989) 373-377; *C.A.*, 111 (1989) 858w.
- 5215 Doehl, J. and Grebrokk, T.: Identification of reaction products from the pyridinium dichromate derivatization of prostaglandins by high-performance liquid chromatography and direct chemical ionization mass spectrometry. *J. Chromatogr.*, 477 (1989) 345-357.
- 5216 Fauler, J., Sielhorst, G. and Fröhlich, J.C.: Platelet-activating factor induces the production of leukotrienes by human monocytes. *Biochim. Biophys. Acta*, 1013 (1989) 80-85.
- 5217 Herrmann, T., Steinhilber, D., Morof, O. and Roth, H.J.: Determination of HETES by HPLC and electrochemical detection. *Adv. Prostaglandin, Thromboxane, Leukotriene Res.*, 19 (Tapei Conf. Prostaglandin, Leukotriene Res., 1988) (1989) 696-699; *C.A.*, 111 (1989) 50489x.
- 5218 Ng, C.F., Lam, B.K., Pritchard, K.A., Jr., Sterman, M.B., Hejny, P. and Wong, P.Y.-K.: Agonist-dependent generation of lipoxins from rat basophilic leukemia cell (RBL-1). *Biochim. Biophys. Acta*, 1004 (1989) 332-336.
- 5219 Patrignani, P., Morton, H., Cirino, M., Lord, A., Charette, L., Gillard, J., Rokach, J. and Patrono, C.: Fractional conversion of thromboxane A<sub>2</sub> and B<sub>2</sub> to urinary 2,3-dinor-thromboxane B<sub>2</sub> and 11-dehydrothromboxane B<sub>2</sub> in the cynomolgus monkey. *Biochim. Biophys. Acta*, 992 (1989) 71-77.
- 5220 Schafer, W., Strandberg, C., Gaillard, T. and Zahradnik, H.P.: On-line sample clean-up and HPLC analysis of prostaglandins in urine, amniotic fluid and plasma using a column-switching technique. *Eicosanoids*, 1 (1988) 101-106; *C.A.*, 111 (1989) 17831e.
- 5221 Serhan, C.N.: On the relationship between leukotriene and lipoxin production by human neutrophils: evidence for differential metabolism of 15-HETE and 5-HETE. *Biochim. Biophys. Acta*, 1004 (1989) 158-168.

#### 11c. Lipids and their constituents

- 5222 Balla, T., Hunyady, L., Baukal, A.J. and Catt, K.J.: Structures and metabolism of inositol tetrakisphosphates and inositol pentakisphosphate in bovine adrenal glomerulosa cells. *J. Biol. Chem.*, 264 (1989) 9386-9390.
- 5223 Barron, L.J.R. and Santa-Maria, G.: HPLC analysis of complex mixtures of triglycerides using gradient elutions and an ultraviolet detector. *Chromatographia*, 28 (1989) 183-188.
- 5224 Bocckino, S.B., Wilson, P. and Exton, J.H.: An enzymatic assay for picomole levels of phosphatidate. *Anal. Biochem.*, 180 (1989) 24-27.
- 5225 Crick, D.C. and Rip, J.W.: Age-associated changes in dolichol and dolichyl phosphate metabolism in the kidneys and liver of mice. *Biochim. Biophys. Acta*, 1004 (1989) 180-186.

- 5226 Eick, S., Brummel, M. and Spener, F.: Analyse und *in vitro* Nachbau der Triglyceride des sibirischen Marmeltieröls aus *Marmota bobac*. *Fat Sci. Technol.*, 91 (1989) 231-233.
- 5227 Grosberger, T. and Rothschild, E.: Determination of the triglyceride composition of vegetable oils by HPLC. *LC-GC*, 7 (1989) 439-441; *C.A.*, 111 (1989) 38063w.
- 5228 Honda, Y., Kataoka, K., Hayashi, H., Takahashi, H., Suzuki, A. and Akino, T.: Alterations of acidic phospholipids in bronchoalveolar lavage fluids of patients with pulmonary alveolar proteinosis. *Clin. Chim. Acta*, 181 (1989) 11-18.
- 5229 Hughes, A.R. and Putney, J.W., Jr.: Source of <sup>3</sup>H-labeled inositol bis- and monophosphates in agonist-activated rat parotid acinar cells. *J. Biol. Chem.*, 264 (1989) 9400-94007.
- 5230 Husain, S., Sastry, G.S.R. and Raju, N.P.: Detection of foreign oil adulteration in coconut oil by size exclusion chromatography. *J. Oil Technol. Assoc. India*, 20 (1988) 17-21; *C.A.*, 111 (1989) 22264b.
- 5231 Mita, H., Yasueda, H., Hayakawa, T. and Shida, T.: Quantitation of platelet-activating factor by high-performance liquid chromatography with fluorescent detection. *Anal. Biochem.*, 180 (1989) 131-135.
- 5232 Nakayama, R. and Saito, K.: Presence of 1-O-alk-1'-enyl-2-O-acetyl glycerophosphocholine (vinyl form of PAF) in perfused rat and guinea pig hearts. *J. Biochem. (Tokyo)*, 105 (1989) 494-496.
- 5233 Ranny, M. and Pokorny, J.: Comparison of TLC-FID and HPLC for the determination of oxidized products in ethyl linoleate. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 255-257; *C.A.*, 110 (1989) 241868j.
- 5234 Ratnayake, W.M.N., Matthews, D.G. and Ackman, R.G.: Triacylglycerols of evening primrose (*Oenothera biennis*) seed oil. *J. Am. Oil Chem. Soc.*, 66 (1989) 966-969.
- 5235 Suzuki, M., Yamakawa, T. and Suzuki, A.: (Analysis of neutral glycosphingolipids by HPLC/MS). *Iyo Masu Kenkyukai Koenshu*, 13 (1988) 61-64; *C.A.*, 111 (1989) 20451m.
- 5236 Talmadge, K.W. and Siebert, C.J.: Efficient endotoxin removal with a new sanitizable affinity column: Affi-Prep Polymyxin. *J. Chromatogr.*, 476 (1989) 175-185.
- 5237 Turner, M.R. and Lumb, R.H.: Synthesis of platelet activating factor by tissues from the rainbow trout, *Salmo gairdneri*. *Biochim. Biophys. Acta*, 1004 (1989) 49-52.
- 5238 Vercellone, A. and Puzo, G.: New-found phenolic glycolipids in *Mycobacterium bovis* BCG. Presence of a diglycosylated glycolipid. *J. Biol. Chem.*, 264 (1989) 7447-7454.
- 5239 Yano, I., Natsuhara, Y., Ikawa, H., Han, Y., Oka, S., Numashiri, Y. and Kato, Y.: (LC/MS analysis of glycolipids containing mycolic acids in acid-fast bacteria). *Iyo Masu Kenkyukai Koenshu*, 13 (1988) 207-211; *C.A.*, 111 (1989) 36202s.
- For additional information see:  
*C.A.*, 111 (1989) 36036r, 36041p.

See also 5092, 5854, 5855, 5872.

#### 11d. Lipoproteins and their constituents

- 5240 Desai, K., Bruckdorfer, K.R., Hutton, R.A. and Owen, J.S.: Binding of apoE rich high density lipoprotein particles by saturable sites on human blood platelets inhibits agonist - induced platelet aggregation. *J. Lipid Res.*, 30 (1989) 831-840.
- 5241 Dory, L.: Synthesis and secretion of apoE in thioglycolate - elicited mouse peritoneal macrophages: effect of cholesterol efflux. *J. Lipid Res.*, 30 (1989) 809-816.
- 5242 Fless, G.M., Snyder, M.L. and Scanu, A.M.: Enzyme-linked immunoassay for Lp[a]. *J. Lipid Res.*, 30 (1989) 651-662.
- 5243 Fong, B.S. and Angel, A.: Transfer of free and esterified cholesterol from low-density lipoproteins and high-density lipoproteins to human adipocytes. *Biochim. Biophys. Acta*, 1004 (1989) 53-60.
- 5244 Kondo, K., Allan, C. and Fidge, N.: Quantitation of apolipoprotein A-IV in human plasma using a competitive enzyme-linked immunosorbent assay. *J. Lipid Res.*, 30 (1989) 939-944.

- 5245 Lagrost, L., Gambert, P., Meunier, S., Morgado, P., Desgres, J., d'Athis, P. and Lallemand, C.: Correlation between apolipoprotein A-IV and triglyceride concentrations in human sera. *J. Lipid Res.*, 30 (1989) 701-710.
- 5246 Matsushima, T., Cryer, D.R., Winkler, K.E., Marsh, J.B. and Cortner, J.A.: Measurement of apolipoprotein B synthesis in perfused rat liver using stable isotopes: [<sup>15</sup>N]hippurate as a measure of the intracellular [<sup>15</sup>N]glycine precursor enrichment. *J. Lipid Res.*, 30 (1989) 841-846.
- 5247 Meyer, B.J., Ha, Y.C. and Barter, P.J.: Effects of experimental hypothyroidism on the distribution of lipids and lipoproteins in the plasma of rats. *Biochim. Biophys. Acta*, 1004 (1989) 73-79.
- 5248 Rimoldi, O.J., Soulages, J.L., Gonzales, S.M., Peluffo, R.O. and Brenner, R.R.: Purification and properties of the very high density lipoprotein from the hemolymph of adult *Triatoma infestans*. *J. Lipid Res.*, 30 (1989) 857-864.

For additional information see:

*C.A.*, 111 (1989) 20307u.

## 12. ORGANIC PEROXIDES

See 5854.

## 13. STEROIDS

### 13a. Pregnane and androstane derivatives

- 5249 Bonsall, R.W., Rees, H.D. and Michael, R.P.: Identification of radioactivity in cell nuclei from brain, pituitary gland and genital tract of male rhesus monkeys after the administration of [<sup>3</sup>H]testosterone. *J. Steroid Biochem.*, 32 (1989) 599-608.
- 5250 Clemons, K.V., Stover, E.P., Schär, G., Stathis, P.A., Chan, K., Tökès, L., Stevens, D.A. and Feldman, D.: Steroid metabolism as a mechanism of escape from progesterone-mediated growth inhibition in *Trichophyton mentagrophytes*. *J. Biol. Chem.*, 264 (1989) 11186-11192.
- 5251 Dintinger, T., Gaillard, J.-L., Zwain, I., Bouhamidi, R. and Silberzahn, P.: Synthesis and aromatization of 19-norandrogens in the stallion testis. *J. Steroid Biochem.*, 32 (1989) 537-544.
- 5252 Edgar, J.A., Weiss, M. and Than, K.A.: Identification of 5 $\beta$ -pregnane and 5 $\beta$ -androstane derivatives in adrenal venous and peripheral blood plasma of the female possum (*Trichosurus vulpecula*). *J. Steroid Biochem.*, 32 (1989) 565-572.
- 5253 Imaoka, S., Terano, Y. and Funae, Y.: Expression of four phenobarbital-inducible cytochrome P-450s in liver, kidney, and lung of rats. *J. Biochem. (Tokyo)*, 105 (1989) 939-945.
- 5254 Iwata, J. and Suga, T.: Determination of 17-oxosteroid sulphates in serum by ion-pair extraction, prelabelling with dansylhydrazine and high-performance liquid chromatography with fluorescence detection. *J. Chromatogr.*, 474 (1989) 363-371.
- 5255 Monder, C., Marandici, A., Iohan, F., Lakshmi, V. and Rosen, J.E.: Synthesis of tritium labeled corticoids. *J. Steroid Biochem.*, 32 (1989) 845-849.
- 5256 Raeside, J.I., Renaud, R.L. and Friendship, R.M.: Aromatization of 19-nor-androgens by porcine Leydig cells. *J. Steroid Biochem.*, 32 (1989) 729-735.
- 5257 Spicer, L.J., Kiser, T.E., Leung, K. and Convey, E.M.: High performance liquid chromatography of steroids in bovine adrenal glands: changes during the postpartum interval. *J. Steroid Biochem.*, 32 (1989) 669-674.
- 5258 Weiss, M., Adgar, J.A., Than, K.A. and Young, I.R.: Identification of 5 $\alpha$ -androstane-3 $\alpha$ ,17 $\alpha$ -diol in adrenal venous plasma of female possum (*Trichosurus vulpecula*). *J. Steroid Biochem.*, 32 (1989) 591-597.

For additional information see:

*C.A.*, 111 (1989) 834k, 5352s, 50498z.

See also 5031, 5264, 5845, 5854.

## 13b. Estrogens

- 5259 Numazawa, M. and Satoh, S.: 2-Bromo- and 16-bromo-estrogens and related compounds: potential inhibitors for both estradiol 2- and 16-hydroxylases in rat liver microsomes. *J. Steroid Biochem.*, 33 (1989) 111-117.
- 5260 Van Aswegen, C.H., Purdy, R.H. and Wittliff, J.L.: Binding of 2-hydroxyestradiol and 4-hydroxyestradiol to estrogen receptors from human breast cancer. *J. Steroid Biochem.*, 32 (1989) 485-492.

See also 5256, 5845.

## 13c. Sterols

- 5261 Beyer, R.S. and Jensen, L.S.: Overestimation of the cholesterol content of eggs. *J. Agric. Food Chem.*, 37 (1989) 917-920.
- 5262 Iwata, T., Hanazono, H., Yamaguchi, M., Nakamura, M. and Ohkura, Y.: Ultramicro determination of 7-dehydrocholesterol in rat skin by high-performance liquid chromatography with fluorescence detection. *J. Chromatogr.*, 491 (1989) 404-409.
- 5263 Saucier, S.E., Kandutsch, A.A., Gayen, A.K., Swahn, D.K. and Spencer, T.A.: Oxysterol regulators of 3-hydroxy-3-methylglutaryl-CoA reductase in liver. Effect of dietary cholesterol. *J. Biol. Chem.*, 264 (1989) 6863-6869.
- 5264 Taylor, F.R. and Kandutsch, A.A.: Metabolism of 25-hydroxycholesterol in mammalian cell cultures. Side-chain scission to pregnenolone in mouse L929 fibroblasts. *J. Lipid Res.*, 30 (1989) 899-905.
- 5265 Wilson, W.K., Pinkerton, F.D., Kirkpatrick, N.D. and Schroepfer, G.J., Jr.: Inhibitors of sterol synthesis. Chemical synthesis of 5 $\beta$ -cholest-8-ene-3 $\beta$ ,15 $\alpha$ -diol and its effects on 3-hydroxy-3-methyl-glutaryl coenzyme A reductase activity in CHO-K 1 cells. *J. Lipid Res.*, 30 (1989) 919-928.

See also 5108, 5854.

## 13d. Bile acids and alcohols

- 5266 Batta, A.K., Salen, G. and Shefer, S.: Characterization of sarcosylsarcosodeoxycholic acid formed during the synthesis of sarcosodeoxycholic acid. *J. Lipid Res.*, 30 (1989) 771-774.
- 5267 Dumaswala, R., Setchell, K.D.R., Zimmer-Nechemias, L., Iida, T., Goto, J. and Nambara, T.: Identification of 3 $\alpha$ ,4 $\beta$ ,7 $\alpha$ -trihydroxy-5 $\beta$ -cholanoic acid in human bile: reflection of a new pathway in bile acid metabolism in humans. *J. Lipid Res.*, 30 (1989) 847-856.
- 5268 Goto, J., Gang, S., Miura, H., Manbara, T., Tazawa, Y. and Tada, K.: Studies on steroids CCXXXIV. Separation and characterization of C-25 epimers of unconjugated and conjugated trihydroxycholestanoic acids in urine from a patient with Zellweger syndrome by high-performance liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 1075-1084.
- 5269 Heuman, D.M.: Quantitative estimation of hydrophilic-hydrophobic balance of mixed bile salt solutions. *J. Lipid Res.*, 30 (1989) 719-730.
- 5270 Scalia, S., Pazzi, P. and Guarneri, M.: Determination of bile acids in pharmaceutical dosage forms by HPLC. *Anal. Lett.*, 22 (1989) 915-927.
- 5271 Zimniak, P., Holsztynska, E.J., Lester, R., Waxman, D.J. and Radomska, A.: Detoxification of lithocholic acid. Elucidation of the pathways of oxidative metabolism in rat liver microsomes. *J. Lipid Res.*, 30 (1989) 907-918.

For additional information see:

C.A., 111 (1989) 3424n.

## 13e. Ecdysones and other insect steroid hormones

- 5272 Ohnishi, E., Hiramoto, M., Fujimoto, Y., Kakinuma, K. and Ikekawa, N.: Isolation and identification of major ecdysteroid conjugates from the ovaries of *Bombyx mori*. *Insect Biochem.*, 19 (1989) 95-101; C.A., 111 (1989) 20437m.

## 13f. Other steroids

- 5273 Verbiscar, A.J., Banigan, T.F., Marsh, R.E. and Tunberg, A.D.: Red squill modified by *Lactobacillus acidophilus* for rodenticide use. *J. Agric. Food Chem.*, 37 (1989) 1005-1009.

## 14. STEROID GLYCOSIDES AND SAPONINS

- 5274 Kazarinov, N.: (Determination of cardiac glycosides in 0.05% injection solutions of strophanthin K by HPLC). *Pharm. Zh. (Kiev)*, (1989) 67-68; *C.A.*, 110 (1989) 219190k.

## 15. TERPENES AND OTHER VOLATILE AROMATIC COMPOUNDS

## 15a. Terpenes

- 5275 Herman, Z., Hasegawa, S., Fong, C.H. and Ou, P.: Limonoids in *Citrus ichangensis*. *J. Agric. Food Chem.*, 37 (1989) 850-851.
- 5276 Van Beek, T.A., Kleis, R., Lelyveld, G.P. and de Groot, A.: Preparative isolation of (+)-beta-eudesmol from *Amyris balsamifera*. *Chromatographia*, 28 (1989) 126-128.

See also 5738.

## 16. NITRO AND NITROSO COMPOUNDS

- 5277 Ni, F., Thomas, L. and Cotton, T.M.: Surface-enhanced resonance Raman spectroscopy as an ancillary high-performance liquid chromatography detector for nitrophenol compounds. *Anal. Chem.*, 61 (1989) 888-894.

For additional information see:  
*C.A.*, 111 (1989) 9786d, 38944j.

See also 5037.

## 17. AMINES, AMIDES AND RELATED NITROGEN COMPOUNDS

## 17a. Amines and polyamines

- 5278 Friedman, S.M. and Oshima, T.: Polyamines of sulfur-dependent archaeobacteria and their role in protein synthesis. *J. Biochem. (Tokyo)*, 105 (1989) 1030-1033.
- 5279 Hull, C.J., Guthrie, J.L., McKinney, R.W., Taylor, D.C., Mabud, M.A. and Prescott, S.R.: Determination of toluenediamines in polyurethane foams by high-performance liquid chromatography with electrochemical detection. *J. Chromatogr.*, 477 (1989) 387-395.
- 5280 Ishida, J., Yamaguchi, M., Iwata, T. and Nakamura, M.: 3,4-Dihydro-6,7-dimethoxy-4-methyl-3-oxoquinoline-2-carbonyl chloride as a sensitive fluorescence derivatization reagent for amines in liquid chromatography. *Anal. Chim. Acta*, 223 (1989) 319-326.
- 5281 Kanda, S., Takahashi, M. and Nagase, S.: Fluorometric assay for polyamines in urine and tissues using electrophoresis on Titan III cellulose acetate. *Anal. Biochem.*, 180 (1989) 307-310.
- 5282 Maruta, K., Teradaira, R., Watanabe, N., Nagatsu, T., Asano, M., Yamamoto, K., Matsumoto, T., Shionoya, Y. and Fujita, K.: Simple, sensitive assay of polyamines by high-performance liquid chromatography with electrochemical detection after post-column reaction with immobilized polyamine oxidase. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1694-1696.



- 5283 Pegg, A.E., Wechter, R., Pakala, R. and Bergeron, R.J.: Effect of N<sup>1</sup>,N<sup>12</sup>-bis(ethyl)spermine and related compounds on growth and polyamine acetylation, content, and excretion in human colon tumor cells. *J. Biol. Chem.*, 264 (1989) 11744-11749.
- 5284 Taga, C., Tsuji, M. and Nakajima, T.: Rapid and sensitive determination of  $\beta$ -phenylethylamine in animal brains by high performance liquid chromatography with fluorometric detection. *Biomed. Chromatogr.*, 3 (1989) 118-120.
- 5285 Tod, M., Prevot, M., Poulou, M., Farinotti, R., Chalom, J. and Mahuzier, G.: Chromatographic and luminescence properties of a 7-aminocoumarin derivative with peroxyoxalate chemiexcitation. *Anal. Chim. Acta*, 223 (1989) 309-317.
- 5286 Van Liedekerke, B.M., Nelis, H.J., Lambert, W.E. and de Leenheer, A.P.: High-performance liquid chromatography of quaternary ammonium compounds on a polystyrene-divinylbenzene column. *Anal. Chem.*, 61 (1989) 728-732.

For additional information see:

C.A., 111 (1989) 36031k, 36056x, 38096j, 53530q.

See also 5037, 5050, 5622, 5854.

#### 17b. Catecholamines and their metabolites

- 5287 Bartlett, W.A.: Effects of mobile phase composition on the chromatographic and electrochemical behaviour of catecholamines and selected metabolites. Reversed-phase ion-paired high-performance liquid chromatography using multiple-electrode detection. *J. Chromatogr.*, 493 (1989) 1-14.
- 5288 Bauch, H.-J. and Hauss, W.H.: The significance of plasma catecholamine levels in the pathogenesis of arteriosclerosis. *Chromatographia*, 28 (1989) 69-77.
- 5289 Bauch, H.-J., Strüwer, E. and Kelsch, U.: A general method for the quantitative determination of catecholamines in body fluids using off-line sample pretreatment and HPLC-ED analysis. *Chromatographia*, 28 (1989) 78-84.
- 5290 Church, W.H. and Justice, J.B., Jr.: On-line small-bore chromatography for neurochemical analysis in the brain. *Adv. Chromatogr.*, 28 (1989) 165-194; C.A., 111 (1989) 3499r.
- 5291 Davidson, D.F.: Simultaneous assay for urinary 4-hydroxy-3-methoxy-mandelic acid, 5-hydroxyindoleacetic acid and homovanillic acid by isocratic HPLC with electrochemical detection. *Ann. Clin. Biochem.*, 26 (1989) 137-143; C.A., 111 (1989) 20284j.
- 5292 Dhalla, K.S., Ganguly, P.K., Rupp, H., Beamish, R.E. and Dhalla, N.S.: Measurement of adrenolutin as an oxidation product of catecholamines in plasma. *Mol. Cell Biochem.*, 87 (1989) 85-92; C.A., 111 (1989) 33741f.
- 5293 Gerhardt, G.A., Drebing, C.J., Stephen, C. and Freedam, R.: Direct determination of unconjugated HVA in human plasma filtrates by HPLC coupled with dual-electrode coulometric electrochemical detection. *Biomed. Chromatogr.*, 3 (1989) 105-109.
- 5294 Kawasaki, T., Higuchi, T., Imai, K. and Wong, O.S.: Determination of dopamine, norepinephrine, and related trace amines by prechromatographic derivatization with naphthalene-2,3-dicarboxaldehyde. *Anal. Biochem.*, 180 (1989) 279-285.
- 5295 Kojima, K., Parvez, H., Parvez, S. and Nagatsu, T.: Microbore HPLC for biological samples: catecholamines, peptides and proteins. *Prog. HPLC*, 4 (Supercrit. Fluid Chromatogr. Micro-HPLC) (1989) 211-227; C.A., 111 (1989) 17754g.
- 5296 Munoz, N.M., Tutins, C. and Leff, A.R.: Highly sensitive determination of catecholamine and serotonin concentrations in plasma by liquid chromatography-electrochemistry. *J. Chromatogr.*, 493 (1989) 157-163.
- 5297 Nohta, H., Yamaguchi, E., Ohkura, Y. and Watanabe, H.: Measurement of catecholamines, their precursor and metabolites in human urine and plasma by solid-phase extraction followed by high-performance liquid chromatography with fluorescence derivatization. *J. Chromatogr.*, 493 (1989) 15-26.
- 5298 Papadoyannis, I., Arzoglou, P., Asverta, S., Grammatopoulos, D. and Lazaridis, A.: Rapid simultaneous determination for catecholamines by reversed-phase high-performance liquid chromatography. *Anal. Lett.*, 22 (1989) 545-554.
- 5299 Peterson, S.L.: Separation of catecholamines and indoleamines. *Chromatogram*, 10 (1989) 10; C.A., 111 (1989) 3526x.

- 5300 Yoshida, A., Yoshioka, M. and Parvez, H.: HPLC of metabolites of catecholamines and serotonin in urine, plasma, cerebrospinal fluid and brain tissue. I. Analytical methodology. *Prog. HPLC*, 4 (Supercrit. Fluid Chromatogr. Micro-HPLC) (1989) 229-271; *C.A.*, 111 (1989) 808e.

For additional information see:  
*C.A.*, 111 (1989) 853r, 17810x.

See also 5104, 5152, 5854.

*17c. Urea and guanidine derivatives*

- 5301 Almy, J. and Ough, C.S.: Urea analysis for wines. *J. Agric. Food Chem.*, 37 (1989) 968-970.
- 5302 Polhuijs, M., Kuipers, F., Vonk, R.J. and Mulder, G.J.: Stereoselectivity of glutathione conjugation: blood elimination of alpha-bromoisovalerylurea enantiomers and biliary excretion of the conjugates in unanesthetized normal or congenitally jaundiced rats. *J. Pharmacol. Exp. Ther.*, 249 (1989) 874-878.

See also 5044, 5872.

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

- 5303 Cress, A.P., Fraker, P.J. and Bieber, L.L.: Carnitine and acylcarnitine levels of human peripheral blood lymphocytes and mononuclear phagocytes. *Biochim. Biophys. Acta*, 992 (1989) 135-139.
- 5304 Pomfret, E.A., da Costa, K.-A., Schurman, L.L. and Zeisel, S.H.: Measurement of choline and choline metabolite concentrations using high-pressure liquid chromatography and gas chromatography-mass spectrometry. *Anal. Biochem.*, 180 (1989) 85-90.
- 5305 Rashed, M.S. and Nelson, S.D.: Use of thermospray liquid chromatography-mass spectrometry for characterization of reactive metabolites of 3'-hydroxy-acetanilide, a non-hepatotoxic regioisomer of acetaminophen. *J. Chromatogr.*, 474 (1989) 209-222.
- 5306 Rastogi, S.C.: Analysis of diisocyanate monomers in chemical products containing polyurethanes by high pressure liquid chromatography. *Chromatographia*, 28 (1989) 15-18.
- 5307 Schmidt-Sommerfeld, E., Penn, D., Kerner, J. and Bieber, L.L.: Analysis of acylcarnitines in normal human urine with the radioisotopic exchange-high performance liquid chromatography (HPLC) method. *Clin. Chim. Acta*, 181 (1989) 231-238.

See also 5664, 5894.

18. AMINO ACIDS AND PEPTIDES; CHEMICAL STRUCTURE OF PROTEINS

*18a. Amino acids and their derivatives*

- 5308 Akanya, J.N. and Taylor, D.R.: Chiral bonded packings for liquid chromatography: preparation and evaluation of N-acylated amino acid packings based on amino-propylated silica gel. *Chromatographia*, 28 (1989) 212-216.
- 5309 Atamna, I.Z., Muschik, G.M. and Issaq, H.J.: A direct injection procedure for the determination of proline in unextracted urine with micellar hydro-organic mobile phases containing copper ions. *J. Liq. Chromatogr.*, 12 (1989) 1085-1094.
- 5310 Atherton, N.D.: HPLC measurement of phenylalanine by direct injection of plasma onto an internal-surface reversed-phase silica support. *Clin. Chem. (Winston-Salem)*, 35 (1989) 975-978.
- 5311 Bronzert, T.J.: Phenylthiohydantoin amino acid analysis by HPLC. *Chromatogram*, 7 (1986) 7-9; *C.A.*, 110 (1989) 241847b.
- 5312 Brückner, H., Wittner, R. and Godel, H.: Automated enantioseparation of amino acids by derivatization with o-phthaldialdehyde and N-acylated cysteines. *J. Chromatogr.*, 476 (1989) 73-82.

- 5313 Fiorino, A., Frigo, G. and Cucchetti, E.: Liquid chromatographic analysis of amino and imino acids in protein hydrolysates by post-column derivatization with *o*-phthalaldehyde and 3-mercaptopropionic acid. *J. Chromatogr.*, 476 (1989) 83-92.
- 5314 Fournier, B., Gineyts, E. and Delmas, P.D.: Evidence that free gamma carboxy-glutamic acid circulates in serum. *Clin. Chim. Acta*, 182 (1989) 173-182.
- 5315 Gupta, R. and Jentoft, N.: Analysis of natural and modified amino acids and hexosamines by reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 474 (1989) 411-417.
- 5316 Kalbé, J., Höcker, H. and Berndt, H.: Design of enzyme reactors as chromatographic columns for racemic resolution of amino acid esters. *Chromatographia*, 28 (1989) 193-196.
- 5317 Kubacki, S.J., Havery, D.C. and Fazio, T.: HPLC analysis of N-nitrosamino acids and N-nitrosodipeptides N-terminal in proline. *Z. Gesamte Hyg. Ihre Grenageb.*, 35 (1989) 98-100; *C.A.*, 111 (1989) 3507s.
- 5318 Lecavalier, L., Horber, F.F. and Haymond, M.W.: Determination of plasma concentrations and <sup>3</sup>H-specific activity of phenylalanine in plasma using high-performance liquid chromatography. *J. Chromatogr.*, 491 (1989) 410-417.
- 5319 Malin, E.L., Greenberg, R., Piotrowski, E.G., Foglia, T.A. and Maerker, G.: Deamination of lysine as a marker for nitrite-protein reactions. *J. Agric. Food Chem.*, 37 (1989) 1071-1076.
- 5320 Marshall, H.F., Jr., Shaffer, G.P. and Conkerton, E.J.: Free amino acid determination in whole peanut seeds. *Anal. Biochem.*, 180 (1989) 264-268.
- 5321 May, M.E. and Brown, L.L.: Instability of orthophthalaldehyde reagent for amino acid analysis. *Anal. Biochem.*, 181 (1989) 135-139.
- 5322 Micallef, B.J., Shelp, B.J. and Ball, R.O.: Quantification of <sup>14</sup>C-labeled amino acids by reverse-phase high performance liquid chromatography. *J. Liq. Chromatogr.*, 12 (1989) 1281-1300.
- 5323 Miyashita, M. and Yamashita, S.: Studies on iodinated compounds. VI. Separation characteristics of iodohistidines on reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 475 (1989) 135-144.
- 5324 Neidle, A., Banay-Schwartz, M., Sacks, S. and Dunlop, D.S.: Amino acid analysis using 1-naphthylisocyanate as a precolumn high performance liquid chromatography derivatization reagent. *Anal. Biochem.*, 180 (1989) 291-297.
- 5325 Okamoto, Y., Kaida, Y., Aburatani, R. and Hatada, K.: Optical resolution of amino acid derivatives by high-performance liquid chromatography on tris(phenyl-carbamate)s of cellulose and amylose. *J. Chromatogr.*, 477 (1989) 367-376.
- 5326 Palla, G., Marchelli, R., Dossena, A. and Casnati, G.: Occurrence of D-amino acids in food. Detection by capillary gas chromatography and by reversed-phase high-performance liquid chromatography with L-phenylalaninamides as chiral selectors. *J. Chromatogr.*, 475 (1989) 45-53.
- 5327 Pastoris, A., Scaffi, A. and Faniuolo, L.: OPA-amino acid analysis in complex biological fluids by HPLC: separation of some interfering substances. *Chromatogram*, 9 (1988) 3-5; *C.A.*, 110 (1989) 150699p.
- 5328 Pecci, L., Costa, M., Pinnen, F., Antonucci, A. and Cavallini, D.: Properties of the phenylthiohydantoin derivatives of some sulfur-containing cyclic amino acids. *Physiol. Chem. Phys. Med. NMR*, 20 (1988) 199-203; *C.A.*, 111 (1989) 36191n.
- 5329 Qureshi, G.A. and Qureshi, A.R.: Determination of free amino acids in biological samples: problems of quantitation. *J. Chromatogr.*, 491 (1989) 281-289.
- 5330 Rabenstein, D.L. and Yamashita, G.T.: Determination of homocysteine, penicillamine, and their symmetrical and mixed disulfides by liquid chromatography with electrochemical detection. *Anal. Biochem.*, 180 (1989) 259-263.
- 5331 Retho, C. and Diep, L.: Low-level determination of ethylenediaminetetraacetic acid in complex matrixes. *Z. Lebensm.-Unters. Forsch.*, 188 (1989) 223-226; *C.A.*, 111 (1989) 38071x.
- 5332 Schneider, H.-J.: Amino acid analysis using DABS-Cl. *Chromatographia*, 28 (1989) 45-48.
- 5333 Shea, P. and Jacobs, W.: Determination of PTH-amino acids using the BAS 200A. *Curr. Sep.*, 9 (1989) 34; *C.A.*, 111 (1989) 36190m.
- 5334 Teerlink, T. and de Boer, E.: Determination of 3-methylhistidine in urine by high-performance liquid chromatography using pre-column derivatization with 9-fluorenylmethyl chloroformate. *J. Chromatogr.*, 491 (1989) 418-423.

- 5335 Thio, A.P. and Tompkins, D.H.: Regulatory approach to determination of lysine in feedstuffs by liquid chromatography with fluorescence detection *via* precolumn dansylation. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 609-613.
- 5336 Treston, A.M., Vicchio, D., Mulshine, J.L. and Yergey, A.L.: High-performance liquid chromatography with thermospray mass spectrometric detection of  $\alpha$ -carboxy-amido amino acids. *J. Chromatogr.*, 474 (1989) 187-195.
- 5337 Tsuchiya, H. and Hayashi, T.: Determination of L-3,4-dihydroxyphenylalanine in blood by high-performance liquid chromatography after solvent extraction. *J. Chromatogr.*, 491 (1989) 291-298.
- 5338 Van der Boon, J., van den Thillart, G.E.E.J.M. and Addink, A.D.F.: Reversed-phase liquid chromatographic analysis of *o*-phthalaldehyde-derivatized free aminoacids in two types of goldfish muscles. *J. Pharm. Biomed. Anal.*, 7 (1989) 471-481.
- 5339 Van Kleef, M.A.G., Jongejan, J.A. and Duine, J.A.: Factors relevant in the reaction of pyrroloquinoline quinone with amino acids. Analytical and mechanistic implications. *Eur. J. Biochem.*, 183 (1989) 41-47.
- 5340 Yao, T., Sato, M. and Wasa, T.: Optically specific detection of L- and D-amino acids by a high-performance liquid chromatographic system with immobilized amino acid oxidase reactor. *Chem. Express*, 3 (1988) 559-562; *C.A.*, 110 (1989) 241864e.

For additional information see:

*C.A.*, 111 (1989) 20291j, 22087w, 36042q, 38068b, 53529w, 53741j, 53742x.

See also 5053, 5091, 5187, 5246, 5295, 5372, 5420, 5622, 5854.

18b. *Peptides and peptidic and proteinous hormones*

- 5341 Alouf, J.E., Dufourcq, J., Siffert, O., Thiaudiere, E. and Geoffroy, C.: Interaction of staphylococcal  $\delta$ -toxin and synthetic analogues with erythrocytes and phospholipid vesicles. Biological and physical properties of the amphipathic peptides. *Eur. J. Biochem.*, 183 (1989) 381-390.
- 5342 Balasubramaniam, A., Renugopalakrishnan, V., Rigel, D.F., Nussbaum, M.S., Rapaka, R.S., Dobbs, J.C., Carreira, L.A. and Fischer, J.E.: Synthesis and biological properties of 4-norleucine-neuropeptide Y; secondary structure of neuropeptide Y. *Biochim. Biophys. Acta*, 997 (1989) 176-181.
- 5343 Bennett, G.W., Johnson, J.V. and Marsden, C.A.: Separation and determination of neuropeptides using HPLC with electrochemical detection. *IBRO Handb. Ser.*, 11 (Neuropeptides) (1989) 125-145; *C.A.*, 111 (1989) 786w - a review with 22 refs.
- 5344 Bousquet, E., Santagati, N.A. and Lancetta, T.: Determination of glutathione in biological tissues by high-performance liquid chromatography with electrochemical detection. *J. Pharm. Biomed. Anal.*, 7 (1989) 643-647.
- 5345 Burke, T.W.L., Mant, C.T., Black, J.A. and Hodges, R.S.: Strong cation-exchange high-performance liquid chromatography of peptides. Effect of non-specific hydrophobic interactions and linearization of peptide retention behaviour. *J. Chromatogr.*, 476 (1989) 377-389.
- 5346 Carriere, P.D. and Bennett, H.P.J.: Reversed-phase liquid chromatography of radiolabeled peptides using a C18 guard-PAK precolumn system. *Peptides*, 10 (1989) 485-487; *C.A.*, 111 (1989) 50495w.
- 5347 Chowdjury, S.K. and Chait, B.T.: A mass spectrometric technique for detecting and identifying by-products in the synthesis of peptides. *Anal. Biochem.*, 180 (1989) 387-395.
- 5348 Eckerskorn, C. and Lottspeich, F.: Internal amino acid sequence analysis of proteins separated by gel electrophoresis after tryptic digestion in polyacrylamide matrix. *Chromatographia*, 28 (1989) 92-94.
- 5349 Emori, T., Hirata, Y., Ohta, K., Shichiri, M., Shimokado, K. and Marumo, F.: Concomitant secretion of big endothelin and its C-terminal fragment from human and bovine endothelial cells. *Biochem. Biophys. Res. Commun.*, 162 (1989) 217-223.
- 5350 Flynn, T.G., Brar, A., Tremblay, L., Sarda, I., Lyons, C. and Jennings, D.B.: Isolation and characterization of iso-rANP, a new natriuretic peptide from rat atria. *Biochem. Biophys. Res. Commun.*, 161 (1989) 830-837.
- 5351 Harvey, P.R.C., Ilson, R.G. and Strasberg, S.M.: The simultaneous determination of oxidized and reduced glutathiones in liver tissue by ion pairing reverse phase high performance liquid chromatography with a coulometric electrochemical detector. *Clin. Chim. Acta*, 180 (1989) 203-212.

- 5352 Itoh, H., Nakao, K., Kambayashi, Y., Hosoda, K., Saito, Y., Yamada, T., Mukoyama, M., Arai, H., Shirakami, G., Suga, S.-i., Yoshida, I., Inouye, K. and Imura, H.: Occurrence of a novel cardiac natriuretic peptide in rats. *Biochem. Biophys. Res. Commun.*, 161 (1989) 732-739.
- 5353 Jadaud, P. and Wainer, I.W.: Stereochemical recognition of enantiomeric and diastereomeric dipeptides by high-performance liquid chromatography on a chiral stationary phase based upon immobilized  $\alpha$ -chymotrypsin. *J. Chromatogr.*, 476 (1989) 165-174.
- 5354 Kalonia, D.S., Musunuri, S. and Tanglertpaibul, J.: Simultaneous analysis of different species involved in hexaglycine hydrolysis. *J. Chromatogr.*, 475 (1989) 416-420.
- 5355 Krieter, P.A., Olins, G.M., Verrett, S.P. and Durley, R.C.: *In vivo* metabolism of atrial natriuretic peptide: identification of plasma metabolites and enzymes responsible for their generation. *J. Pharmacol. Exp. Ther.*, 249 (1989) 411-417.
- 5356 Lork, K.D., Unger, K.K., Brückner, H. and Hearn, M.T.W.: Retention behaviour of paracelsin peptides on reversed-phase silicas with varying *n*-alkyl chain length and ligand density. *J. Chromatogr.*, 476 (1989) 135-145.
- 5357 Madej, A., Hallin, P., Magorzata, M., Seguin, B. and Edqvist, L.E.: Influence of bovine LH tracer quality on levels of LH in GnRH-treated cows. *J. Immunoassay*, 10 (1989) 277-300; *C.A.*, 111 (1989) 33729h.
- 5358 Maraganore, J.M., Chao, B., Joseph, M.L., Jablonski, J. and Ramachandran, K.L.: Anticoagulant activity of synthetic hirudin peptides. *J. Biol. Chem.*, 264 (1989) 8692-8698.
- 5359 Pernow, J., Hensen, A. and Lundberg, J.M.: Tissue specific distribution, clearance and vascular effects of endothelin in the pig. *Biochem. Biophys. Res. Commun.*, 161 (1989) 647-653.
- 5360 Purcell, A.W., Aguilar, M.I. and Hearn, M.T.W.: High-performance liquid chromatography of amino acids, peptides and proteins. XC. Investigations into the relationship between structure and reversed-phase high-performance liquid chromatography retention behaviour of peptides related to human growth hormone. *J. Chromatogr.*, 476 (1989) 113-123.
- 5361 Purcell, A.W., Aguilar, M.I. and Hearn, M.T.W.: High-performance liquid chromatography of amino acids, peptides and proteins. XCI. The influence of temperature on the chromatographic behaviour of peptides related to human growth hormone. *J. Chromatogr.*, 476 (1989) 125-133.
- 5362 Reams, G.P., Souther, M., Parisi, M., van Stone, J.C. and Bauer, J.H.: Arterial-venous determination of the "immunoreactive" angiotensin peptides in human subjects. *J. Lab. Clin. Med.*, 113 (1989) 749-752; *C.A.*, 111 (1989) 34197v.
- 5363 Reeve, J.R., Jr. and Walsh, J.H.: Characterizing molecular heterogeneity of gastrin-releasing peptide and related peptides. *Methods Enzymol.*, 168 (Horm. Action, Pt. K) (1989) 660-677; *C.A.*, 111 (1989) 17813a.
- 5364 Schmidt, T., Stumm-Zollinger, E., Chen, P., Böhlen, P. and Stone, S.R.: A male accessory gland peptide with protease inhibitory activity in *Drosophila funebris*. *J. Biol. Chem.*, 264 (1989) 9745-9749.
- 5365 Shinmi, O., Kimura, S., Yoshizawa, T., Sawamura, T., Uchiyama, Y., Sugita, Y., Kanazawa, I., Yanagisawa, M., Goto, K. and Masaki, T.: Presence of endothelin-1 in porcine spinal cord: isolation and sequence determination. *Biochem. Biophys. Res. Commun.*, 162 (1989) 340-346.
- 5366 Smith, M.C., Cook, J.A., Furman, T.C. and Occolowitz, J.L.: Structure and activity dependence of recombinant human insulin-like growth factor II on disulfide bond pairing. *J. Biol. Chem.*, 264 (1989) 9314-9321.
- 5367 Uchida, K. and Kawakishi, S.: Ascorbate-mediated specific modification of histidine-containing peptides. *J. Agric. Food Chem.*, 37 (1989) 897-901.
- 5368 Vadász, Z., Seprödi, J., Erchegyi, J., Teplán, I. and Schöen, I.: High-performance liquid chromatographic monitoring of transpeptidation reactions in analogues of gonadotropin releasing hormone containing aspartic acid derivatives in position six. *J. Chromatogr.*, 477 (1989) 377-385.
- 5369 Wetsel, W. and Negro-Vilar, A.: Combined antibody-HPLC approach to assess prohormone processing. *Methods Enzymol.*, 168 (Horm. Action, Pt. K) (1989) 517-545; *C.A.*, 111 (1989) 873x.

- 5370 Wodecki, Z.J., Slebioda, M. and Kolodziejczyk, A.M.: High-performance liquid chromatographic improvement of the Young racemization test. *J. Chromatogr.*, 477 (1989) 454-457.

For additional information see:

*C.A.*, 111 (1989) 5467c, 50505z, 51243z.

See also 5091, 5317, 5413, 5452, 5463, 5479, 5604.

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

- 5371 Chartier, F., Laine, B., Belaiche, D., Touzel, J.-P. and Sautière, P.: Primary structure of the chromosomal protein MC1 from the archaeobacterium *Methanosarcina* sp. CHTI 55. *Biochim. Biophys. Acta*, 1008 (1989) 309-314.
- 5372 Chiou, S.-H. and Wang, K.-T.: Peptide and protein hydrolysis by microwave irradiation. *J. Chromatogr.*, 491 (1989) 424-431.
- 5373 Dong, M.W., Vandemark, F.L. and Gant, J.R.: A liquid chromatographic system for high-sensitivity peptide mapping. *Am. Biotechnol. Lab.*, 7 (1989) 10-16; *C.A.*, 111 (1989) 36064y.
- 5374 Funabashi, H., Kawaguchi, A., Tomoda, H., Omura, S., Okuda, S. and Iwasaki, S.: Binding site of cerulenin in fatty acid synthetase. *J. Biochem. (Tokyo)*, 105 (1989) 751-755.
- 5375 Hayakawa, M., Kudo, I., Tomita, M., Nojima, S. and Inoue, K.: The primary structure of rat platelet phospholipase A<sub>2</sub>. *J. Biochem. (Tokyo)*, 104 (1988) 767-772.
- 5376 Hoff, E.R.: A biotechnology approach to assessing HPLC gradient performance. *LC-GC*, 7 (1989) 320-326; *C.A.*, 111 (1989) 36034p.
- 5377 Ibrahim, J. and Harding, J.J.: Pinpointing the sites of hydroxylysine glycosides in peptide  $\alpha$ 1-CB7 of bovine corneal collagen, and their possible role in determining fibril diameter and thus transparency. *Biochim. Biophys. Acta*, 992 (1989) 9-22.
- 5378 Imamura, Y. and Kawakita, M.: Purification of limited tryptic fragments of Ca<sup>2+</sup>, Mg<sup>2+</sup>-adenosine triphosphatase of the sarcoplasmic reticulum and identification of conformation-sensitive cleavage sites. *J. Biochem. (Tokyo)*, 105 (1989) 775-781.
- 5379 Kamei, K., Hara, S., Ikenaka, T. and Murao, S.: Amino acid sequence of a lysozyme (B-enzyme) from *Bacillus subtilis* YT-25. *J. Biochem. (Tokyo)*, 104 (1988) 832-836.
- 5380 Kamei, K., Yamamura, Y., Hara, S. and Ikenaka, T.: Amino acid sequence of chitinase from *Streptomyces erythraeus*. *J. Biochem. (Tokyo)*, 105 (1989) 979-985.
- 5381 Kellaris, K.V.: Identification of a disulfide between cysteine 214 and cysteine 277 in the  $\beta$  subunit of native (Na<sup>+</sup>+K<sup>+</sup>)ATPase. *Biochem. Biophys. Res. Commun.*, 162 (1989) 64-70.
- 5382 Kobayashi, T., Kagami, O., Takagi, T. and Konishi, K.: Amino acid sequence of horseshoe crab, *Tachypleus tridentatus*, striated muscle troponin C. *J. Biochem. (Tokyo)*, 105 (1989) 823-828.
- 5383 Kobayashi, T., Takagi, T., Konishi, K., Morimoto, S. and Ohtsuki, I.: Amino acid sequence of porcine cardiac muscle troponin C. *J. Biochem. (Tokyo)*, 106 (1989) 55-59.
- 5384 Miyata, T., Takeya, H., Ozeki, Y., Arakawa, M., Tokunaga, F., Iwanaga, S. and Omori-Satoh, T.: Primary structure of hemorrhagic protein, HR2a, isolated from the venom of *Trimeresurus flavoviridis*. *J. Biochem. (Tokyo)*, 105 (1989) 847-853.
- 5385 Nitta, Y., Isoda, Y., Toda, H. and Sakiyama, F.: Identification of glutamic acid 186 affinity-labeled by 2,3-epoxypropyl  $\alpha$ -D-glucopyranoside in soybean  $\beta$ -amylase. *J. Biochem. (Tokyo)*, 105 (1989) 573-576.
- 5386 Omichi, K. and Ikenaka, T.: Inspection of human salivary  $\alpha$ -amylase action by its transglycosylation action. *J. Biochem. (Tokyo)*, 104 (1988) 881-883.
- 5387 Ozols, J.: Structure of cytochrome b<sub>5</sub> and its topology in the microsomal membrane. *Biochim. Biophys. Acta*, 997 (1989) 121-130.
- 5388 Padron, G., Besada, V., Agraz, A., Quinones, Y., Herrera, L., Shimonishi, Y. and Takao, T.: Mass spectrometric analysis of recombinant human  $\alpha$ -2 interferon. *Anal. Chim. Acta*, 223 (1989) 361-369.
- 5389 Parvez, H., Reich, A.R., Lucas-Reich, S. and Parvez, S. (Editors): *Progress in HPLC. Flow through Radioactivity Detection in HPLC*. Vol. 3, VSP, Utrecht, 1988, 214 p.; *C.A.*, 111 (1989) 20468x.

- 5390 Raggi, A., Grand, R.J.A., Moir, A.J.G. and Perry, S.V.: Structure-function relationships in cardiac troponin T. *Biochim. Biophys. Acta*, 997 (1989) 135-143.
- 5391 Sakai, T., Yoshioka, A., Yamamoto, K., Niinomi, K., Fujimura, Y., Fukui, H., Miyata, T. and Iwanaga, S.: Blood clotting factor IX Kashihara: amino acid substitution of valine-182 by phenylalanine. *J. Biochem. (Tokyo)*, 105 (1989) 756-759.
- 5392 Salva, M. and Aviles, F.X.: Improvements in the application of the 4,4-N,N-dimethylaminoazobenzene-4'-isothiocyanate micromethod to the sequence analysis of proteins. *Anal. Biochem.*, 180 (1989) 374-379.
- 5393 Simpson, R.J., Ward, L.D., Reid, G.E., Batterham, M.P. and Moritz, R.L.: Peptide mapping and internal sequencing of proteins electroblotted from two-dimensional gels onto polyvinylidene difluoride membranes. A chromatographic procedure for separating proteins from detergents. *J. Chromatogr.*, 476 (1989) 345-361.
- 5394 Stolowitz, M.L., Paape, B.A. and Dixit, V.M.: Thioacetylation method of protein sequencing: derivatization of 2-methyl-5(4H)-thiazolones for high-performance liquid chromatographic detection. *Anal. Biochem.*, 181 (1989) 113-119.
- 5395 Sugimoto, M., Miyata, T., Kawabata, S.-i., Yoshioka, A., Fukui, H., Takahashi, H. and Iwanaga, S.: Blood clotting factor IX Niigata: substitution of alanine-390 by valine in the catalytic domain. *J. Biochem. (Tokyo)*, 104 (1988) 878-880.
- 5396 Takahashi, S., Irie, A. and Miyake, Y.: Primary structure of human urinary prokallikrein. *J. Biochem. (Tokyo)*, 104 (1988) 222-229.
- 5397 Takasuga, A., Adachi, H., Ishino, F., Matsuhashi, M., Ohta, T. and Matsuzawa, H.: Identification of the penicillin-binding active site of penicillin-binding protein 2 of *Escherichia coli*. *J. Biochem. (Tokyo)*, 104 (1988) 822-826.
- 5398 Takeya, H., Arakawa, M., Miyata, T., Iwanaga, S. and Omori-Sato, T.: Primary structure of H<sub>2</sub>-proteinase, a non-hemorrhagic metalloproteinase, isolated from the venom of the habu snake, *Trimeresurus flavoviridis*. *J. Biochem. (Tokyo)*, 106 (1989) 151-157.
- 5399 Tsugita, A., Kamo, M., Jone, C.S. and Shikama, N.: Sensitization of Edman amino acid derivatives using the fluorescent reagent, 4-aminofluorescein. *J. Biochem. (Tokyo)*, 106 (1989) 60-65.
- 5400 Uchida, A., Ebata, S., Wada, K., Matsubara, H. and Ishida, Y.: Complete amino acid sequence of ferredoxin from *Peridinium bipes* (Dinophyceae). *J. Biochem. (Tokyo)*, 104 (1988) 700-705.
- 5401 Vogt-Schaden, M., Gagelmann, M., Hock, D., Herbst, F. and Forssmann, W.G.: Degradation of porcine brain natriuretic peptide (pBNP-26) by endoprotease-24.11 from kidney cortical membranes. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1177-1183.
- 5402 Wada, K., Onda, M. and Matsubara, H.: Amino acid sequences of ferredoxin isoproteins from radish roots. *J. Biochem. (Tokyo)*, 105 (1989) 619-625.
- 5403 Watanabe, H., Katoh, H., Ishii, M., Komoda, Y., Sanda, A., Takizawa, Y., Ohgi, K. and Irie, M.: Primary structure of a ribonuclease from bovine brain. *J. Biochem. (Tokyo)*, 104 (1988) 939-945.

For additional information see:  
*C.A.*, 111 (1989) 20496e, 53743m.

See also 5348, 5464.

## 19. PROTEINS

### 19a. General techniques

- 5404 Anspach, F.B., Johnston, A., Wirth, H.-J., Unger, K.K. and Hearn, M.T.W.: High-performance liquid chromatography of amino acids, peptides and proteins. XCII. Thermodynamic and kinetic investigations on rigid and soft affinity gels with varying particle and pore sizes. *J. Chromatogr.*, 476 (1989) 205-225.
- 5405 Choli, T., Kapp, U. and Wittmann-Liebold, B.: Blotting of proteins onto Immobilon membranes. *In situ* characterization and comparison with high-performance liquid chromatography. *J. Chromatogr.*, 476 (1989) 59-72.

- 5406 Chuan, H., Lin, J. and Wang, J.H.: 8-Azido-2'-O-dansyl-ATP. A fluorescent photoaffinity reagent for ATP-binding proteins and its application to adenylate kinase. *J. Biol. Chem.*, 264 (1989) 7981-7988.
- 5407 Drake, A.F., Fung, M.A. and Simpson, C.F.: Protein conformation changes as the result of binding to reversed-phase chromatography column materials. *J. Chromatogr.*, 476 (1989) 159-163.
- 5408 Hagel, L., Lunström, H., Andersson, T. and Lindblom, H.: Properties, in theory and practice, of novel gel filtration media for standard liquid chromatography. *J. Chromatogr.*, 476 (1989) 329-344.
- 5409 Hagen, W.R.: Direct electron transfer of redox proteins at the bare glassy carbon electrode. *Eur. J. Biochem.*, 182 (1989) 523-530.
- 5410 Hjerten, S. and Li, J.-P.: High-performance chromatofocusing of proteins on agarose columns. I. Macroporous 15-20  $\mu\text{m}$  beads. *J. Chromatogr.*, 475 (1989) 167-175.
- 5411 Hjerten, S., Li, J.-P. and Liao, J.-L.: High-performance chromatofocusing of proteins on agarose columns. II. Deformed non-porous 12-15  $\mu\text{m}$  beads. *J. Chromatogr.*, 475 (1989) 177-185.
- 5412 Hodder, A.N., Aguilar, M.I. and Hearn, M.T.W.: High-performance liquid chromatography of amino acids, peptides and proteins. LXXXIX. The influence of different displacer salts on the retention properties of proteins separated by gradient anion-exchange chromatography. *J. Chromatogr.*, 476 (1989) 391-411.
- 5413 Huang, J.-X. and Guiochon, G.: Applications of preparative high-performance liquid chromatography to the separation and purification of peptides and proteins. *J. Chromatogr.*, 492 (1989) 431-469 - a review with 180 refs.
- 5414 Jilge, G., Unger, K.K., Esser, U., Schäfer, H.-J., Rathgeber, G. and Müller, W.: Evaluation of advanced silica packings for the separation of biopolymers by high-performance liquid chromatography. VI. Design, chromatographic performance and application of non-porous silica-based anion exchangers. *J. Chromatogr.*, 476 (1989) 37-48.
- 5415 Josic, D., Reutter, W. and Reusch, J.: Crown ethers as ligands for high-performance liquid chromatography of proteins and nucleic acids. *J. Chromatogr.*, 476 (1989) 309-318.
- 5416 Litzen, A. and Wahlund, K.-G.: Improved separation speed and efficiency for proteins, nucleic acids and viruses in asymmetrical flow field flow fractionation. *J. Chromatogr.*, 476 (1989) 413-421.
- 5417 Mant, C.T., Zhou, N.E. and Hodges, R.S.: Correlation of protein retention times in reversed-phase chromatography with polypeptide chain length and hydrophobicity. *J. Chromatogr.*, 476 (1989) 363-375.
- 5418 Mascher, E. and Lundahl, P.: Sodium dodecyl sulphate-protein complexes. Changes in size of shape below the critical micelle concentration, as monitored by high-performance agarose gel chromatography. *J. Chromatogr.*, 476 (1989) 147-158.
- 5419 Nopper, B., Kohen, F. and Wilchek, M.: A thiophilic adsorbent for the one-step high-performance liquid chromatography purification of monoclonal antibodies. *Anal. Biochem.*, 180 (1989) 66-71.
- 5420 Rozing, G.P. and Goetz, H.: Fast separation of biological macromolecules on non-porous, microparticulate columns. *J. Chromatogr.*, 476 (1989) 3-19.
- 5421 Simpson, R.J. and Moritz, R.L.: Chromatographic fractionation of proteins at high organic solvent modifier concentrations. *J. Chromatogr.*, 474 (1989) 418-423.
- 5422 Stout, R.W., Leibu, H.J., Rousak, A.T. and Wright, R.C.: New porous organic microspheres for high-performance liquid chromatography. *J. Chromatogr.*, 476 (1989) 21-35.
- 5423 Thevenon, G. and Regnier, F.E.: Reversed-phase liquid chromatography of proteins with strong acids. *J. Chromatogr.*, 476 (1989) 499-511.
- 5424 Warren, W., Peterson, A., Wheat, T., Strickler, M.P., Stone, M.J., Dwyer, M. and Pfeifer, R.: A new strategy for rapid optimization of protein separations. *Am. Biotechnol. Lab.*, 7 (1989) 34-40; *C.A.*, 111 (1989) 53545y.
- 5425 Yagi, S., Izawa, K., Nakagawa, T., Tanaka, H., Yoshitake, A. and Mohri, Z.-I.: Efficient high-performance liquid chromatographic system for protein purification. *J. Chromatogr.*, 493 (1989) 27-33.



- 5426 Zhou, F.L., Muller, D., Santarelli, X. and Jozefovicz, J.: Coated silica supports for high-performance affinity chromatography of proteins. *J. Chromatogr.*, 476 (1989) 195-203.

For additional information see:  
*C.A.*, 111 (1989) 37811b.

See also 5013, 5071, 5081, 5091, 5292, 5372.

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

- 5427 Adams, M.L., Ostapiuk, I. and Grasso, J.A.: The effects of inhibition of heme synthesis on the intracellular localization of iron in rat reticulocytes. *Biochim. Biophys. Acta*, 1012 (1989) 243-253.
- 5428 Avvakumov, G.V., Krupenko, S.A. and Strel'chyonok, O.A.: Study of the transcortin binding to human endometrium plasma membrane. *Biochim. Biophys. Acta*, 984 (1989) 143-150.
- 5429 Babashak, J.V. and Phillips, T.M.: Isolation of a specific membrane protein by immunoaffinity chromatography with biotinylated antibodies immobilized on avidin-coated glass beads. *J. Chromatogr.*, 476 (1989) 187-194.
- 5430 De Pinto, V., Benz, R. and Palmieri, F.: Interaction of non-classical detergents with the mitochondrial porin. A new purification procedure and characterization of the pore-forming unit. *Eur. J. Biochem.*, 183 (1989) 179-187.
- 5431 Kamogashira, T., Sakaguchi, M., Ohmoto, Y., Mizuno, K., Shimizu, R., Nagamura, K., Nakai, S., Masui, Y. and Hirai, Y.: Site-specific mutagenesis of the human interleukin-1 $\beta$  gene: the role of arginine residue at the N-terminal region. *J. Biochem. (Tokyo)*, 104 (1988) 837-840.
- 5432 Kimura, I., Gotoh, Y. and Ozawa, E.: Further purification of a fibroblast growth factor-like factor from chick embryo extract by heparin-affinity chromatography. *In Vitro Cell. Dev. Biol.*, 25 (1989) 236-242; *C.A.*, 111 (1989) 36033n.
- 5433 O'Connor, D.T., Randian, M.R., Carlton, E., Cervenka, J.H. and Hsiao, R.J.: Rapid radioimmunoassay of circulating chromogranin A: *in vitro* stability, exploration of the neuroendocrine character of neoplasia, and assessment of the effects of organ failure. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1631-1637.
- 5434 Richardson, P.J. and Luzio, J.P.: Immunoaffinity purification of membrane fractions from mammalian cells. *Subcell. Biochem.*, 12 (1988) 221-241; *C.A.*, 111 (1989) 20222n - a review with 24 refs.
- 5435 Van Ede, J., Nijmeijer, J.R.J., Welling-Wester, S., Orvell, C. and Welling, G.W.: Comparison of non-ionic detergents for extraction and ion-exchange high-performance liquid chromatography of Sendai virus integral membrane proteins. *J. Chromatogr.*, 476 (1989) 319-327.
- 5436 Welling-Wester, S., Haring, R.M., Laurens, H., Orvell, C. and Welling, G.W.: Comparison of ion-exchange high-performance liquid chromatography columns for purification of Sendai virus integral membrane proteins. *J. Chromatogr.*, 476 (1989) 477-485.

For additional information see:  
*C.A.*, 111 (1989) 5576n.

19c. *Proteins synthesized by genetic manipulation*

- 5437 Bischoff, R., Clesse, D., Whitechurch, O., Lepage, P. and Roitsch, C.: Isolation of recombinant hirudin by preparative high-performance liquid chromatography. *J. Chromatogr.*, 476 (1989) 245-255.
- 5438 Kimura, S., Utsumi, J., Yamazaki, S. and Shimizu, H.: Disulfide bond interchange in *Escherichia coli*-derived recombinant human interferon- $\beta$ 1 under denaturing conditions. *J. Biochem. (Tokyo)*, 104 (1988) 44-47.
- 5439 Kolbe, H.V.J., Jaeger, F., Lepage, P., Roitsch, C., Lacaud, G., Kieny, M.-P., Sabatie, J., Brown, S.W. and Lecocq, J.-P. and Girard, M.: Isolation of recombinant partial gag gene product p18 (HIV-1Bru) from *Escherichia coli*. *J. Chromatogr.*, 476 (1989) 99-112.
- 5440 Minami, Y., Emori, Y., Imajoh-Ohmi, S., Kawasaki, H. and Suzuki, K.: Carboxyl-terminal truncation and site-directed mutagenesis of the EF hand structure-domain of the small subunit of rabbit calcium-dependent protease. *J. Biochem. (Tokyo)*, 104 (1988) 927-933.

- 5441 Mortensen, S.B., Thim, L., Christensen, T., Woeldike, H., Boel, E., Hjortshoej, K. and Hansen, M.T.: Affinity chromatography of recombinant *Rhizomucor miehei* aspartic proteinase on Si-300 bacitracin. *J. Chromatogr.*, 476 (1989) 227-233.
- 5442 Tonouchi, N., Oouchi, N., Kashima, N., Kawai, M., Nagase, K., Okano, A., Matsui, H., Yamada, K., Hirano, T. and Kishimoto, T.: High-level expression of human BSF-2/IL-6 cDNA in *Escherichia coli* using a new type of expression-preparation system. *J. Biochem. (Tokyo)*, 104 (1988) 30-34.

For additional information see:

*C.A.*, 111 (1989) 53740h.

19d. *Microbial and plant proteins*

- 5443 Ansari, A.A., Shenbagamurthi, P. and Marsh, D.G.: Complete amino acid sequence of a *Lolium perenne* (perennial rye grass) pollen allergen, Lol pII. *J. Biol. Chem.*, 264 (1989) 11182-11185.
- 5444 Durante, M., Bernardi, R., Lupi, M.C. and Sabelli, P.: Characterization of *Helianthus annuus* L. Storage proteins. *J. Agric. Food Chem.*, 37 (1989) 852-855.
- 5445 Habuka, N., Murakami, Y., Noma, M., Kudo, T. and Horikoshi, K.: Amino acid sequence of *Mirabilis* antiviral protein, total synthesis of its gene and expression in *Escherichia coli*. *J. Biol. Chem.*, 264 (1989) 6629-6637.
- 5446 Molnar, I., Boysen, R.I. and Erdmann, V.A.: High-performance liquid chromatography of *Thermus aquaticus* 50S and 30S ribosomal proteins. *Chromatographia*, 28 (1989) 39-44.
- 5447 Morishita, R., Asano, T., Kato, K., Itoh, H. and Kaziro, Y.: Purification and identification of two pertussis-toxin-sensitive GTP-binding proteins of bovine spleen. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1280-1285.
- 5448 Snow, S.D. and Brooks, J.R.: Fractionation of rice glutelin polypeptides using gel filtration chromatography. *J. Food Sci.*, 54 (1989) 730-733; *C.A.*, 111 (1989) 56128a.
- 5449 Theerasilp, S., Hitotsuya, H., Nakajo, S., Nakaya, K., Nakamura, Y. and Kurihara, Y.: Complete amino acid sequence and structure characterization of the taste-modifying protein, miraculin. *J. Biol. Chem.*, 264 (1989) 6655-6659.
- 5450 Vensel, W.H., Lafiandra, D. and Kasarda, D.D.: The effect of an organic eluent modifier and pH on the separation of wheat-storage proteins: application to the purification of  $\gamma$ -gliadins of *Triticum monococcum* L. *Chromatographia*, 28 (1989) 133-138.
- 5451 Xue, C.-B., Caldwell, G.A., Becker, J.M. and Naider, F.: Total synthesis of the lipopeptide a-mating factor of *Saccharomyces cerevisiae*. *Biochem. Biophys. Res. Commun.*, 162 (1989) 253-257.

For additional information see:

*C.A.*, 111 (1989) 3677x, 35577f.

See also 5479, 5848.

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

- 5452 Cheng, C.-H.C. and DeVries, A.L.: Structures of antifreeze peptides from the antarctic eel pout, *Austrolyciathys brachycephalus*. *Biochim. Biophys. Acta*, 997 (1989) 55-64.
- 5453 Coppola, G., Underwood, J., Cartwright, G. and Hearn, M.T.W.: High-performance liquid chromatography of amino acids, peptides and proteins. XCIII. Comparison of methods for the purification of mouse monoclonal immunoglobulin M autoantibodies. *J. Chromatogr.*, 476 (1989) 269-290.
- 5454 Di Martino, A., Cella, G., Callegaro, L. and Prosdociimi, M.: Improved method for purification of human platelet factor 4 by affinity and ion-exchange chromatography. *Thromb. Res.*, 54 (1989) 277-287; *C.A.*, 111 (1989) 53540t.
- 5455 Hey, A.W., Browne, C.A., Simpson, R.J. and Thorburn, G.D.: Simultaneous isolation of insulin-like growth factors I and II from adult sheep serum. *Biochim. Biophys. Acta*, 997 (1989) 27-35.
- 5456 Jungbauer, A., Tauer, C., Reiter, M., Purtscher, M., Wenisch, E., Steindl, F., Buchacher, A. and Katinger, H.: Comparison of protein A, protein G and copolymerized hydroxyapatite for the purification of human monoclonal antibodies. *J. Chromatogr.*, 476 (1989) 257-268.

- 5457 Pilatte, Y., Hammer, C.H., Frank, M.M. and Fries, L.F.: A new simplified procedure for C1 inhibitor purification. A novel use for jacalin-agarose. *J. Immunol. Methods*, 120 (1989) 37-43; *C.A.*, 111 (1989) 55319b.
- 5458 Rutty, Y., Brandin, M.P. and Vijayalakshmi, M.A.: Chromatography of human plasma on aminohexyl Sepharose: separation of factor VIII/vWF and behaviour of factors II, VII, IX and X and antithrombin III. *J. Chromatogr.*, 491 (1989) 299-308.
- 5459 Vidal, P., Deckert, T., Hansen, B. and Welinder, B.S.: High-performance liquid chromatofocusing and column affinity chromatography of *in vitro* <sup>14</sup>C-glycated human serum albumin. Demonstration of a glycation-induced anionic heterogeneity. *J. Chromatogr.*, 476 (1989) 467-475.
- 5460 Yamamoto, H., Terabayashi, M., Egawa, T., Hayashi, E., Nakamura, H. and Kishimoto, S.: Affinity separation of human plasma gelsolin on Affi-Gel Blue. *J. Biochem. (Tokyo)*, 105 (1989) 799-802.

For additional information see:

*C.A.*, 111 (1989) 2310k, 3646m, 5466b, 3527y, 20407b, 55692t.

See also 5473

19f. *Structural and muscle proteins*

- 5461 Kuwayama, H., Suzuki, M., Koga, R. and Ebashi, S.: Preparation of protein components exhibiting myosin light chain kinase activities from bovine aorta: discrepancies between its enzyme activity and actomyosin activating effect. *J. Biochem. (Tokyo)*, 104 (1988) 862-866.
- 5462 Ojima, T. and Nishita, K.: Separation of Akazara scallop and rabbit troponin components by a single-step chromatography on CM-Toyopearl. *J. Biochem. (Tokyo)*, 104 (1988) 9-11.
- 5463 Sparrow, L.G., Robinson, C.P., McMahon, D.T.W. and Rubira, M.R.: The amino acid sequence of component 7c, a type II intermediate-filament protein from wool. *Biochem. J.*, 261 (1989) 1015-1022.

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

- 5464 Hayashi, T., Hayashi, H. and Iwai, K.: *Tetrahymena* HMG nonhistone chromosomal protein. Isolation and amino acid sequence lacking the N- and C-terminal domains of vertebrate HMG 1. *J. Biochem. (Tokyo)*, 105 (1989) 577-581.

19h. *Chromoproteins and metalloproteins*

- 5465 Ambler, R.P. and Tobar, J.: Two distinct azurins function in the electron-transport chain of the obligate methylotroph *Methylomonas* J. *Biochem. J.*, 261 (1989) 495-499.
- 5466 Kavanaugh, M.P., Perutz, M.F., Fermi, G., Shih, D.T. and Jones, R.T.: Structure and function of human hemoglobin covalently labeled with periodate-oxidized adenosine triphosphate. *J. Biol. Chem.*, 264 (1989) 11009-11013.
- 5467 Kim, I.C.: Quantitation of testicular and somatic cytochromes c in testis and somatic tissues from developing rats. *Anal. Biochem.*, 181 (1989) 140-144.
- 5468 Komori, M., Hashizume, T., Ohi, H., Miura, T., Kitada, M., Nagashima, K. and Kamataki, T.: Cytochrome P-450 in human liver microsomes: high-performance liquid chromatographic isolation of three forms and their characterization. *J. Biochem. (Tokyo)*, 104 (1988) 912-916.
- 5469 Le Maréchal, P., Decottignies, P., Jacquot, J.-P. and Miginiac-Maslow, M.: Separation by high-performance liquid chromatography of the ferredoxin-thioredoxin system proteins. *J. Chromatogr.*, 477 (1989) 305-314.
- 5470 Ogishima, T., Mitani, F. and Ishimura, Y.: Isolation of two distinct cytochromes P-450<sub>11β</sub> with aldosterone synthase activity from bovine adrenocortical mitochondria. *J. Biochem. (Tokyo)*, 105 (1989) 497-499.
- 5471 Park, R.Y. and McDonald, M.J.: Kinetics of heme binding to semi-alpha-hemoglobin. *Biochem. Biophys. Res. Commun.*, 162 (1989) 522-527.
- 5472 Shapira, E., Miller, V.L., Miller, J.B. and Qu, Y.: Sick cell screening using a rapid automated HPLC system. *Clin. Chim. Acta*, 182 (1989) 301-308.
- 5473 Weaver, J. and Pollack, S.: Low-M<sub>r</sub> iron isolated from guinea pig reticulocytes as AMP-Fe and ATP-Fe complexes. *Biochem. J.*, 261 (1989) 787-792.

- 5474 Ye, J., Baldwin, R.P. and Schlager, J.W.: LCEC determination of the copper protein ceruloplasmin in human serum at a polyaniline chemically modified electrode. *Electroanalysis*, 1 (1989) 133-140; *C.A.*, 111 (1989) 52858r.

For additional information see:  
*C.A.*, 111 (1989) 6225j, 53679v.

See also 5409, 5613.

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

- 5475 Abrahamsson, P.-A., Andersson, C., Björk, T., Fernlund, P., Lilja, H., Murne, A. and Weiber, H.: Radioimmunoassay of  $\beta$ -microseminoprotein, a prostatic-secreted protein present in sera of both men and women. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1497-1503.
- 5476 Aird, S.D., Middaugh, C.R. and Kaiser, I.I.: Spectroscopic characterization of textilotoxin, a presynaptic neurotoxin from the venom of the Australian eastern brown snake (*Pseudonaja t. testilis*). *Biochim. Biophys. Acta*, 997 (1989) 219-223.
- 5477 Aten, R.F. and Behrman, H.R.: A gonadotropin-releasing hormone-binding inhibitor from bovine ovaries. Purification and identification as histone H2A. *J. Biol. Chem.*, 264 (1989) 11065-11071.
- 5478 Bezwoda, W.R. and Mansoor, N.: Lactoferrin from human breast milk and from neutrophil granulocytes. Comparative studies of isolation, quantitation, characterization and iron binding properties. *Biomed. Chromatogr.*, 3 (1989) 121-126.
- 5479 Edmonds, C., Griffin, G.E. and Johnstone, A.P.: Demonstration and partial characterization of ADP-ribosylation in *Pseudomonas maltophilia*. *Biochem. J.*, 261 (1989) 113-118.
- 5480 Hidalgo, F.J. and Kinsella, J.E.: Changes induced in  $\beta$ -lactoglobulin B following interactions with linoleic acid 13-hydroperoxide. *J. Agric. Food Chem.*, 37 (1989) 860-866.
- 5481 Moriyama, T., Yamadera, K., Takebe, T., Makino, I., Kato, H., Nobuoka, M. and Makino, M.: Purification of the pancreatic stone protein by high-performance liquid chromatography. *J. Chromatogr.*, 493 (1989) 164-169.
- 5482 Raffioni, S., Luporini, P. and Bradshaw, R.A.: Purification, characterization, and amino acid sequence of the mating pheromone Er-10 of the *Euplotes raikovi*. *Biochemistry*, 28 (1989) 5250-5256.
- 5483 Tseng, A., Berry, S.L., Cotton, B., Exner, T., Sheumack, D.D. and Howden, M.E.H.: Isolation and purification of a fibrinogenolysin from the venom of the saw-scaled viper (*Echis carinatus*) by high-performance liquid chromatography. *J. Chromatogr.*, 474 (1989) 424-429.

See also 5437.

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

- 5484 Bai, R., Lin, C.M., Nguyen, N.Y., Liu, T. and Hamel, E.: Identification of the cysteine residue of the  $\beta$ -tubulin alkylated by the antimitotic agent 2,4-dichlorobenzyl thiocyanate, facilitated by separation of the protein subunits of tubulin by hydrophobic column chromatography. *Biochemistry*, 28 (1989) 5606-5612.

See also 5552.

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

- 5485 Okimura, Y., Kitajima, N., Uchiyama, T., Yagi, H., Abe, H., Shakutsui, S. and Chihara, K.: Insulin-like growth factor I (IGF-I) production and the presence of IGF-I receptors in rat medullary thyroid carcinoma cell line 6-23(clone 6). *Biochem. Biophys. Res. Commun.*, 161 (1989) 589-595.
- 5486 Tominaga, S.-i. and Tominaga, K.: Interferon alters the pattern of secreted proteins from Ehrlich ascites-tumour cells. *Biochem. J.*, 261 (1989) 57-61.

- 5487 Wun, T., Palmier, M.O., Siegel, N.R. and Smith, C.E.: Affinity purification of active plasminogen activator inhibitor-1 (PAI-1) using immobilized anhydrourokinase. Demonstration of the binding, stabilization, and activation of PAI-1 by vitronectin. *J. Biol. Chem.*, 264 (1989) 7862-7868.

191. *Specific binding and receptor proteins*

- 5488 Aiyar, N., Bennett, C.F., Nambi, P., Valinski, W., Angioli, M., Minnich, M. and Crooke, S.T.: Solubilization of rat liver vasopressin receptors as a complex with a guanine-nucleotide-binding protein and phosphoinositide-specific phospholipase C. *Biochem. J.*, 261 (1989) 63-70.
- 5489 Ando, Y., Imamura, S., Hong, Y., Owada, M.K., Kakunaga, T. and Kannagi, R.: Enhancement of calcium sensitivity of lipocortin I in phospholipid binding induced by limited proteolysis and phosphorylation at the amino terminus as analyzed by phospholipid affinity column chromatography. *J. Biol. Chem.*, 264 (1989) 6948-6955.
- 5490 Bosker, F.J., van Bussel, F.J., Thielen, A.P.G.M., Soei, Y.L., Sieswerda, G.T., Dijk, J., Tepper, P.G., Horn, A.S. and Moller, W.: Affinity chromatography with the immobilized agonist N-0434 yields an active and highly purified preparation of the dopamine D-2 receptor from bovine striatum. *Eur. J. Pharmacol.*, 163 (1989) 319-326; *C.A.*, 111 (1989) 33737j.
- 5491 Dufrene, L., Pageaux, J.F., Fanidi, A., Renoir, J.M., Laugier, C. and Baulieu, E.E.: Biochemical characterization and subunit structure of quail oviduct progesterone receptor. *J. Steroid Biochem.*, 32 (1989) 703-713.
- 5492 Fauque, J., Scali, J., Cavailles, V. and Borgna, J.L.: Mapping of the calf estrogen receptor of the binding domain for an antibody interfering with receptor activation. *J. Steroid Biochem.*, 32 (1989) 769-780.
- 5493 Ferrera, N. and Henzel, W.J.: Pituitary follicular cells secrete a novel heparin-binding growth factor specific for vascular endothelial cells. *Biochem. Biophys. Res. Commun.*, 161 (1989) 851-858.
- 5494 Fujioka, T., Inoue, F. and Kuriyama, M.: Affinity resins for the purification of opioid-binding materials. *Chem. Pharm. Bull.*, 37 (1989) 1100-1102.
- 5495 Fukai, F., Yatomi, S., Morita, T., Nishizawa, S., Nagai, T. and Katayama, T.: Protection of glutathione S-transferase from bilirubin inhibition. *J. Biochem. (Tokyo)*, 105 (1989) 968-973.
- 5496 Guéant, J.L., Hambaba, L., Vidailhet, M., Schaefer, C., Wahlstedt, V. and Nicolas, J.P.: Concentration and physicochemical characterisation of unsaturated cobalamin binding proteins in amniotic fluids. *Clin. Chim. Acta*, 181 (1989) 151-162.
- 5497 Head, J.F.: Amino acid sequence of a low molecular weight, high affinity calcium-binding protein from the optic lobe of the squid *Loligo pealei*. *J. Biol. Chem.*, 264 (1989) 7202-7209.
- 5498 Hodgetts, J. and Morgan, B.P.: Purification of S protein (vitronectin) by a one-step immunoaffinity chromatography procedure. *Biochem. Soc. Trans.*, 17 (1989) 726-727; *C.A.*, 111 (1989) 36173h.
- 5499 Hutchens, T.W., Hawkins, E.F. and Markland, F.S., Jr.: Glucocorticoid acceptor from lactating goat mammary tissue comparison of native and activated forms in a cell free system. *J. Steroid Biochem.*, 32 (1989) 651-668.
- 5500 Hyder, S.M. and Wittliff, J.L.: Separation of two molecular forms of human estrogen receptor by hydrophobic interaction chromatography. Gradient optimization and tissue comparison. *J. Chromatogr.*, 476 (1989) 455-466.
- 5501 Jentsch, T.J., Garcia, A.M. and Lodish, H.F.: Primary structure of a novel 4-acetamido-4'-isothiocyanostilbene-2,2'-disulphonic acid (SITS)-binding membrane protein highly expressed in *Torpedo californica* electroplax. *Biochem. J.*, 261 (1989) 155-166.
- 5502 Lopez-Corcuera, B., Kanner, B.I. and Aragon, C.: Reconstitution and partial purification of the sodium and chloride-coupled glycine transporter from rat spinal cord. *Biochim. Biophys. Acta*, 983 (1989) 247-252.
- 5503 Margolis, B.L., Lax, I., Kris, R., Dombalagian, M., Honegger, A.M., Howk, R., Givol, D., Ullrich, A. and Schlessinger, J.: All autophosphorylation sites of epidermal growth factor (EGF) receptor and HER2/neu are located in their carboxyl-terminal tails. Identification of a novel site in EGF receptor. *J. Biol. Chem.*, 264 (1989) 10667-10671.

- 5504 McEwan, I.J., Rowney, D.A. and Hodgins, M.B.: Partial purification and characterisation of the human skin fibroblast androgen receptor: detection of abnormal receptor complexes in cells from patients with androgen-insensitivity syndromes. *J. Steroid Biochem.*, 32 (1989) 789-795.
- 5505 Moser, E.H. and Daxenbichler, G.: Purification and characterization of a heat- and acid-stable progesterin binding protein of rat lung. *J. Steroid Biochem.*, 32 (1989) 759-767.
- 5506 Nakata, H.: 5'-N-Ethylcarboxamido[<sup>3</sup>H]adenosine binding sites of mouse P815 mastocytoma cell membranes: solubilization and partial purification by affinity chromatography. *J. Biochem. (Tokyo)*, 105 (1989) 700-704.
- 5507 Namkung, P.C., Stanczyk, F.Z., Cook, M.J., Novy, M.J. and Petra, P.H.: Half-life of plasma sex steroid-binding protein (SBP) in the primate. *J. Steroid Biochem.*, 32 (1989) 675-680.
- 5508 Philip, A. and Murphy, B.E.P.: Low polarity ligands of sex hormone-binding globulin in pregnancy. Part I - characterization. *J. Steroid Biochem.*, 32 (1989) 865-872.

For additional information see:  
*C.A.*, 111 (1989) 3520r, 35327z.

See also 5171.

#### 19m. Urinary proteins

- 5509 Gilmore, W.S. and McGuckin, C.P.: HPLC of human urinary colony-stimulating factors. *Biochem. Soc. Trans.*, 17 (1989) 602-603; *C.A.*, 111 (1989) 17835j.

For additional information see:  
*C.A.*, 111 (1989) 53526t.

#### 19n. Other proteins

- 5510 Kato, Y., Matsuda, T., Kato, N. and Nakamura, R.: Maillard reaction of disaccharides with protein: suppressive effect of nonreducing end pyranoside groups on browning and protein polymerization. *J. Agric. Food Chem.*, 37 (1989) 1077-1081.
- 5511 Levison, P.R., Toome, D.W., Badger, S.E., Brook, B.N. and Carcary, D.: Influence of mobile phase composition on the adsorption of hen-egg-white proteins to anion-exchange cellulose. *Chromatographia*, 28 (1989) 170-178.
- 5512 Odani, S., Koide, T., Ono, T., Takahashi, Y. and Suzuki, J.-i.: Covalent structure of a low-molecular-mass protein, meleagrins, present in a turkey (*Meleagris gallopavo*) ovomucoid preparation. *J. Biochem. (Tokyo)*, 105 (1989) 660-663.
- 5513 Power, M.J., Gosling, J.P. and Fottrell, P.F.: Radioimmunoassay of osteocalcin with polyclonal and monoclonal antibodies. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1408-1415.
- 5514 Sanchez-Monge, R., Gomez, L., Garcia-Olmedo, F. and Salcedo, G.: New dimeric inhibitor of heterologous  $\alpha$ -amylases encoded by a duplicated gene in the short arm of chromosome 3B of wheat (*Triticum aestivum* L.). *Eur. J. Biochem.*, 183 (1989) 37-40.
- 5515 Takeda, A., Kaji, H., Nakaya, K., Nakamura, Y. and Samejima, T.: Comparative studies on the primary structure of human cystatin As from epidermis, liver, spleen, and leukocytes. *J. Biochem. (Tokyo)*, 105 (1989) 986-991.
- 5516 Vysotsky, E.S., Bondar, V.S. and Letunov, V.N.: (Extraction and purification of obelin, a Ca-activated photoprotein from the hydroid polyps *Obelia longissima*). *Biokhimiya (Moscow)*, 54 (1989) 965-973.

For additional information see:  
*C.A.*, 111 (1989) 53546z.

See also 5560.

## 20. ENZYMES AND ENZYME ACTIVITY ESTIMATION

- 5517 Leaver, J. and Foster, G.: The enantioselectivity of enzymes monitored using a chiral detector. *Biotechnol. Tech.*, 3 (1989) 179-184; *C.A.*, 111 (1989) 53687w.
- 5518 Rossomando, E.F.: Application of high-performance liquid chromatography to enzyme activity determination. *J. Chromatogr.*, 492 (1989) 361-375 - a review with 22 refs.

See also 5113.

## 20a. Oxidoreductases

- 5519 Carrea, G., Longhi, R., Mazzola, G., Pasta, P. and Vecchio, G.: Denaturation by urea and renaturation of 20 $\beta$ -hydroxysteroid dehydrogenase studied by high-performance size exclusion chromatography. *Anal. Biochem.*, 180 (1989) 181-185.
- 5520 Hara, A., Mouri, K., Nakagawa, M., Nakamura, M., Nakayama, T., Matsuura, K. and Sawada, H.: Monkey liver indanol dehydrogenase. Purification, properties, and kinetic mechanism. *J. Biochem. (Tokyo)*, 106 (1989) 126-132.
- 5521 Iwata, N., Inazu, N. and Satoh, T.: The purification and properties of NADPH-dependent carbonyl reductases from rat ovary. *J. Biochem. (Tokyo)*, 105 (1989) 556-564.
- 5522 Milstien, S. and Kaufman, S.: The biosynthesis of tetrahydrobiopterin in rat brain. Purification and characterization of 6-pyruvoyl tetrahydropterin (2'-oxo)reductase. *J. Biol. Chem.*, 264 (1989) 8066-8073.
- 5523 Priestley, N.D. and Robinson, J.A.: Purification and catalytic properties of L-valine dehydrogenase from *Streptomyces cinnamonensis*. *Biochem. J.*, 261 (1989) 853-861.
- 5524 Rogalski, J., Dawidowicz, A., Kapusta, K., Miedziak, I. and Leonowicz, A.: The application of new aminoorganic silanes for affinity chromatography of plant peroxidases on vanillin-liganded controlled porosity glass columns. *Acta Biotechnol.*, 9 (1989) 79-87; *C.A.*, 111 (1989) 35468w.
- 5525 Sharkis, D.H. and Swenson, R.P.: Purification by Cibacron Blue F3GA dye affinity chromatography and comparison of NAD(P)H:quinone reductase (E.C. 1.6.99.2) from rat liver cytosol and microsomes. *Biochem. Biophys. Res. Commun.*, 161 (1989) 434-441.
- 5526 Smith, L.D., Budgen, N., Bungard, S.J., Danson, M.J. and Hough, D.W.: Purification and characterization of glucose dehydrogenase from the thermoacidophilic archaeobacterium *Thermoplasma acidophilum*. *Biochem. J.*, 261 (1989) 973-977.
- 5527 Stell, J.G.P., Warne, A.J. and Lee-Wooley, C.: Purification of rabbit liver aldehyde oxidase by affinity chromatography on benzamidine Sepharose 6B. *J. Chromatogr.*, 475 (1989) 363-372.
- 5528 Taniguchi, H. and Pyerin, W.: Separation and purification of component proteins of the cytochrome P-450-dependent microsomal monooxygenase system by high-performance liquid chromatography. *J. Chromatogr.*, 476 (1989) 299-308.
- 5529 Watanabe, K., Aihara, H., Nakagawa, Y., Nakamura, R. and Sasaki, T.: Properties of the purified extracellular cholesterol oxidase from *Rhodococcus equi* No. 23. *J. Agric. Food Chem.*, 37 (1989) 1178-1182.
- 5530 Xu, X., Kanaya, S., Koyama, N., Sekiguchi, T., Nosoh, Y., Ohashi, S. and Tsuda, K.: Tryptic digestion of NADH dehydrogenase from alkalophilic *Bacillus*. *J. Biochem. (Tokyo)*, 105 (1989) 626-632.
- 5531 Yamaguchi, M. and Hatefi, Y.: Mitochondrial nicotinamide nucleotide transhydrogenase: HADPH binding increases and NADP binding decreases the acidity and susceptibility to modification of cysteine-893. *Biochemistry*, 28 (1989) 6050-6056.

See also 5623, 5625.

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

- 5532 Alin, P., Jansson, H., Cederlund, E., Jörnvall, H. and Mannervik, B.: Cytosolic glutathione transferases from rat liver. Primary structure of class alpha glutathione transferase 8-8 and characterization of low-abundance class Mu glutathione transferases. *Biochem. J.*, 261 (1989) 531-539.

- 5533 Beckett, G.J., Hussey, A.J., Laing, I., Howie, A.F., Hayes, J.D., Strange, R.C., Faulder, C.G. and Hume, R.: Measurements of glutathione S-transferase B<sub>1</sub> in plasma after birth asphyxia: an early indication of hepatocellular damage. *Clin. Chem. (Winston-Salem)*, 35 (1989) 995-999.
- 5534 Benson, A.M., Hunkeler, M.J. and York, J.L.: Mouse hepatic glutathione transferase isoenzymes and their differential induction by anticarcinogens. Specificities of butylated hydroxyanisole and bisethylxanthogen as inducers of glutathione transferases in male and female CD-1 mice. *Biochem. J.*, 261 (1989) 1023-1029.
- 5535 Bogaards, J.J.P., van Ommen, B. and van Bladeren, P.J.: An improved method for the separation and quantification of glutathione S-transferase subunits in rat tissue using high-performance liquid chromatography. *J. Chromatogr.*, 474 (1989) 435-440.
- 5536 Feild, M.J., Nguyen, D.C. and Armstrong, F.B.: Amino acid sequence of *Salmonella typhimurium* branched-chain amino acid aminotransferase. *Biochemistry*, 28 (1989) 5306-5310.
- 5537 Furukawa, Y., Urano, T., Itoh, H., Takahashi, C. and Kimura, S.: Isolation and properties of rat plasma lecithin-cholesterol acyltransferase. *J. Biochem. (Tokyo)*, 105 (1989) 962-967.
- 5538 Harada, H., Ueno, Y., Kamei, M., Ohura, R., Tanabe, N., Uchida, Y., Koyama, F. and Yamaguchi, T.: Rapid assay of  $\beta$ -galactosidase and sialyltransferase by lectin affinity high performance liquid chromatography with fluorescence detection. *Biomed. Chromatogr.*, 3 (1989) 110-113.
- 5539 Korkkolainen, T. and Nissinen, E.: Purification of rat liver soluble catechol-O-methyltransferase by high performance liquid chromatography. *Biomed. Chromatogr.*, 3 (1989) 127-130.
- 5540 Lobet, Y., Lhoest, J. and Colson, C.: Partial purification and characterization of the specific protein-lysine N-methyltransferase of YL32, a yeast ribosomal protein. *Biochim. Biophys. Acta*, 997 (1989) 224-231.
- 5541 Masuyoshi, S., Okubo, T., Inoue, M. and Mitsuhashi, S.: Purification and some properties of a chloramphenicol acetyltransferase mediated by plasmids from *Vibrio anguillarum*. *J. Biochem. (Tokyo)*, 104 (1988) 131-135.
- 5542 Sato, T., Omichi, K. and Ikenaka, T.: Simple assay for sialyltransferase activity with a new fluorogenic substrate. *J. Biochem. (Tokyo)*, 104 (1988) 18-21.
- 5543 Shinki, T. and Suda, T.: Purification and characterization of spermidine N<sup>1</sup>-acetyltransferase from chick duodenum. *Eur. J. Biochem.*, 183 (1989) 285-290.
- 5544 Vandercammen, A., Francois, J. and Hers, H.-G.: Characterization of trehalose-6-phosphate synthase and trehalose-6-phosphate phosphatase of *Saccharomyces cerevisiae*. *Eur. J. Biochem.*, 182 (1989) 613-620.
- 5545 Yee, W.C., Eglisaer, S.J. and Richards, W.R.: Confirmation of a ping-pong mechanism for S-adenosyl-L-methionine:magnesium protoporphyrin methyltransferase of etiolated wheat by an exchange reaction. *Biochem. Biophys. Res. Commun.*, 162 (1989) 483-490.

See also 5623.

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

- 5546 Berkow, R.L., Dodson, R.W. and Kraft, A.S.: Human neutrophils contain distinct cytosolic and particulate tyrosine kinase activities: possible role in neutrophil activation. *Biochim. Biophys. Acta*, 997 (1989) 292-301.
- 5547 Burger, M., Lawen, A. and Martini, O.H.W.: Insulin-induced S6 kinase activation in HeLa cells and its reversal by hyperthermic stress. *Eur. J. Biochem.*, 183 (1989) 255-262.
- 5548 Chuang, L.F., Zhao, F.-K. and Chuang, R.Y.: Isolation and purification of protein kinase C from human leukemia ML-1 cells: phosphorylation of human leukemia RNA polymerase II *in vitro*. *Biochim. Biophys. Acta*, 992 (1989) 87-95.
- 5549 Elizarov, S.M.: Application of fast protein liquid chromatography for the isolation of vertebrate casein kinase-1. *J. Chromatogr.*, 477 (1989) 448-453.
- 5550 Kikuchi, Y., Ando, Y., Ichimura, N. and Noda, A.: Exoribonuclease activity of purified reverse transcriptase preparations from retroviruses. *J. Biochem. (Tokyo)*, 105 (1989) 974-978.



- 5551 Kitamura, K., Uyeda, K., Kangawa, K. and Matsuo, H.: Purification and characterization of rat skeletal muscle fructose-6-phosphate, 2-kinase:fructose-2,6-bisphosphatase. *J. Biol. Chem.*, 264 (1989) 9799-9806.
- 5552 Kuwayama, H. and Ebashi, S.: Isolation from bovine brain of 155 kDa component exhibiting myosin light chain kinase activity. *J. Biochem. (Tokyo)*, 104 (1988) 858-861.
- 5553 Landt, Y., Vaidya, H.C., Porter, S.E., Dietzler, D.N. and Ladenson, J.H.: Immunoaffinity purification of creatine kinase-MB from human, dog, and rabbit heart with use of a monoclonal antibody specific for CK-MB. *Clin. Chem. (Winston-Salem)*, 35 (1989) 985-989.
- 5554 Lawen, A., Burger, M. and Martini, O.H.W.: Mitogen-responsive S6 kinase. *Eur. J. Biochem.*, 183 (1989) 245-253.
- 5555 Lopatin, S.A., Varlamov, V.P. and Rogozhin, S.V.: Chromatographic study of the sites of microbial ribonuclease which bind chelated metal ions. *Biotekhnologiya*, 5 (1989) 183-188; *C.A.*, 111 (1989) 52907E.
- 5556 Pace, M., Mauri, P.L., Gardana, C. and Pietta, P.G.: High-performance liquid chromatographic assay for nicotinamide-adenine dinucleotide kinase. *J. Chromatogr.*, 476 (1989) 487-490.
- 5557 Popanda, O. and Thielmann, H.W.: DNA polymerase  $\alpha$  from normal rat liver is different than DNA polymerases  $\alpha$  from Morris hepatoma strains. *Eur. J. Biochem.*, 183 (1989) 5-13.
- 5558 Roberti, R., Vecchini, A., Freysz, L., Masoom, M. and Binaglia, L.: An improved procedure for the purification of ethanolaminephosphotransferase. Reconstitution of the purified enzyme with lipids. *Biochim. Biophys. Acta*, 1004 (1989) 80-88.
- 5559 Sakac, D. and Lingwood, C.A.: Modulation of testicular galactolipid sulphotransferase activity by phosphorylation. Stimulation of enzyme activity *in vitro* by an endogenous kinase. *Biochem. J.*, 261 (1989) 423-429.
- 5560 Sarre, T.F., Hermann, M. and Bader, M.: Differential effect of hemin-controlled eIF-2 $\alpha$  kinases from mouse erythro leukemia cells on protein synthesis. *Eur. J. Biochem.*, 183 (1989) 137-143.
- 5561 Takazawa, K., Passareiro, H., Dumont, J.E. and Erneux, C.: Purification of bovine brain inositol 1,4,5-triphosphate 3-kinase. Identification of the enzyme by sodium dodecyl sulphate/polyacrylamide-gel electrophoresis. *Biochem. J.*, 261 (1989) 483-488.
- 5562 Tsukamoto, H., Azuma, K., Miyauchi, T., Usui, H. and Takeda, M.: Tyrosine protein kinases in membrane fractions from rat cerebral cortex. *J. Biochem. (Tokyo)*, 104 (1988) 807-816.
- 5563 Woodgett, J.R.: Use of peptide substrates for affinity purification of protein-serine kinases. *Anal. Biochem.*, 180 (1989) 237-241.

For additional information see:  
*C.A.*, 111 (1989) 55847x.

See also 5406, 5544.

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

- 5564 Aarsman, A.J., de Jong, J.G.N., Arnoldussen, E., Neys, F.W., van Wassenaar, P.D. and van den Bosch, H.: Immunoaffinity purification, partial sequence, and subcellular localization of rat liver phospholipase A<sub>2</sub>. *J. Biol. Chem.*, 264 (1989) 10008-10014.
- 5565 Baldassare, J.J., Henderson, P.A. and Fisher, G.J.: Isolation and characterization of one soluble and two membrane-associated forms of phosphoinositide-specific phospholipase C from human platelets. *Biochemistry*, 28 (1989) 6010-6016.
- 5566 Chwetzoff, S., Tsunasawa, S., Sakiyama, F. and Ménez, A.: Nigexine, a phospholipase A<sub>2</sub> from cobra venom with cytotoxic properties not related to esterase activity. Purification, amino acid sequence, and biological properties. *J. Biol. Chem.*, 264 (1989) 13289-13297.
- 5567 Gassama-Diagne, A., Fauvel, J. and Chap, H.: Purification of a new, calcium-independent, high molecular weight phospholipase A<sub>2</sub>/lysophospholipase (phospholipase B) from guinea pig intestinal brush-border membrane. *J. Biol. Chem.*, 264 (1989) 9470-9475.
- 5568 Hayman, A.R., Warburton, M.J., Pringle, J.A.S., Coles, B. and Chambers, T.J.: Purification and characterization of a tartrate-resistant acid phosphatase from human osteoclastomas. *Biochem. J.*, 261 (1989) 601-609.

- 5569 Hibino, Y., Yamamura, T. and Sugano, N.: Purification and properties of an endonuclease endogenous to rat-liver nuclei. *Biochim. Biophys. Acta*, 1008 (1989) 287-292.
- 5570 Himeno, M., Koutoku, H., Tsuji, H. and Kato, K.: Purification and characterization of acid phosphatase in rat liver lysosomal contents. *J. Biochem. (Tokyo)*, 104 (1988) 773-776.
- 5571 Lin, Y. and Carman, G.M.: Purification and characterization of phosphatidate phosphatase from *Saccharomyces cerevisiae*. *J. Biol. Chem.*, 264 (1989) 8641-8645.
- 5572 Meldrum, E., Katan, M. and Parker, P.: A novel inositol-phospholipid-specific phospholipase C. Rapid purification and characterization. *Eur. J. Biochem.*, 182 (1989) 673-677.
- 5573 Miyake, T., Inoue, S., Ikeda, K., Teshima, K., Samejima, Y. and Omori-Sato, T.: pH Dependence of the reaction rate of His 48 with *p*-bromophenacyl bromide and of the binding constant to Ca<sup>2+</sup> of the monomeric forms of intact and  $\alpha$ -NH<sub>2</sub> modified phospholipases A<sub>2</sub> from *Trimeresurus flavoviridis*. *J. Biochem. (Tokyo)*, 105 (1989) 565-572.
- 5574 Schauer, R., Reuter, G., Stoll, S. and Shukla, A.K.: Partial purification and characterization of sialate O-acetyltransferase from bovine brain. *J. Biochem. (Tokyo)*, 106 (1989) 143-150.
- 5575 Seilhamer, J.J., Plant, S., Pruzanski, W., Schilling, J., Stefanski, E., Vadas, P. and Johnson, L.K.: Multiple forms of phospholipase A<sub>2</sub> in arthritic synovial fluid. *J. Biochem. (Tokyo)*, 106 (1989) 38-42.
- 5576 Shalongo, W., Jagannadham, M.V., Flynn, C. and Stellwagen, E.: Refolding of denatured ribonuclease observed by size exclusion chromatography. *Biochemistry*, 28 (1989) 4820-4825.
- 5577 Sobek, H. and Görisch, H.: Further kinetic and molecular characterization of an extremely heat-stable carboxylesterase from the thermoacidophilic archaeobacterium *Sulfolobus acidocaldarius*. *Biochem. J.*, 261 (1989) 993-998.
- 5578 Valcour, A.A., Bowers, G.N., Jr. and McComb, R.B.: Evaluation of a kinetic method for prostatic acid phosphatase with use of self-indicating substrate, 2,6-dichloro-4-nitrophenyl phosphate. *Clin. Chem. (Winston-Salem)*, 35 (1989) 939-945.
- 5579 Yoshida, H., Oikawa, S., Ikeda, M. and Reese, E.T.: A novel acid phosphatase excreted by *Penicillium funiculosum* that hydrolyzes both phosphodiester and phosphomonoesters with aryl leaving groups. *J. Biochem. (Tokyo)*, 105 (1989) 794-798.

For additional information see:

*C.A.*, 111 (1989) 3059x, 52923h, 52924j.

See also 5544, 5551.

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

- 5580 DeGasperis, R., Li, Y. and Li, S.: Presence of two endo- $\beta$ -N-acetylglucosaminidases in human kidney. *J. Biol. Chem.*, 264 (1989) 9329-9334.
- 5581 Greber, U.F., Kozulic, B. and Mosbach, K.: Purification of endo-N-acetyl- $\beta$ -D-glucosaminidase H by substrate-affinity chromatography. *Carbohydr. Res.*, 189 (1989) 289-299; *C.A.*, 111 (1989) 19862q.
- 5582 Halliwell, G. and Halliwell, N.: Cellulolytic enzyme components of the cellulase complex of *Clostridium thermocellum*. *Biochim. Biophys. Acta*, 992 (1989) 223-229.
- 5583 Janis, L.J., Grott, A., Regnier, F.E. and Smith-Gill, S.J.: Immunological-chromatographic analysis of lysozyme variants. *J. Chromatogr.*, 476 (1989) 235-244.
- 5584 Keskar, S.S., Srinivasan, M.C. and Deshpande, V.V.: Chemical modification of a xylanase from a thermotolerant *Streptomyces*. Evidence for essential tryptophan and cysteine residues at the active site. *Biochem. J.*, 261 (1989) 49-55.
- 5585 Kinoshita, K., Taniguchi, N., Makita, A., Narita, M. and Oikawa, K.: Purification and characterization of  $\beta$ -N-acetylhexosaminidase I from human placenta. *J. Biochem. (Tokyo)*, 104 (1988) 827-831.
- 5586 Koenig, D. and Day, D.: The purification and characterization of a dextranase from *Lipomyces starkeyi*. *Eur. J. Biochem.*, 183 (1989) 161-167.

- 5587 Matsushashi, S., Yokohiki, K. and Hatanaka, C.: HPLC measurement of the degradation limits of pectate by exopectinases. *Agric. Biol. Chem.*, 53 (1989) 1417-1418; *C.A.*, 111 (1989) 36100g.
- 5588 Moneghini, M., Maurich, V., Sciortino, T., Solinas, D., Franchi, G. and Lencioni, E.: A high-performance liquid chromatographic method for the determination of amylase (*p*-nitrophenyl- $\alpha$ -maltosidase) activity. *J. Pharm. Biomed. Anal.*, 7 (1989) 513-517.
- 5589 Onodera, S., Matsui, H. and Chiba, S.: Single active site mechanism of rabbit liver acid  $\alpha$ -glucosidase. *J. Biochem. (Tokyo)*, 105 (1989) 611-618.
- 5590 Pereira, B. and Sivakami, S.: Neutral maltase/glucoamylase from rabbit renal cortex. *Biochem. J.*, 261 (1989) 43-47.
- 5591 Roger, L., Bernard, M.-A., Percheron, F. and Foglietti, M.-J.: Alpha-L-fucosidase activity in normal human lymphocytes. *Clin. Chim. Acta*, 180 (1989) 303-310.

For additional information see:  
*C.A.*, 111 (1989) 20118h.

See also 5538, 5544.

20f. Other hydrolases

- 5592 Al, B.J.M., Tiffany, C.W., Gomes de Mesquita, D.S., Moser, H.W., Tager, J.M. and Schram, A.W.: Properties of acid ceramidase from human spleen. *Biochim. Biophys. Acta*, 1004 (1989) 245-251.
- 5593 Barthomeuf, C., Pourrat, H. and Pourrat, A.: Properties of a new alkaline proteinase from *Aspergillus niger*. *Chem. Pharm. Bull.*, 37 (1989) 1333-1336.
- 5594 Bullough, D.A., Ceccarelli, E.A., Verburg, J.G. and Allison, W.S.: Localization of sites modified during inactivation of the bovine heart mitochondrial  $F_1$ -ATPase by quinacrine mustard using [ $^3$ H]aniline as a probe. *J. Biol. Chem.*, 264 (1989) 9155-9163.
- 5595 Buttle, D.J., Kembhavi, A.A., Sharp, S.L., Shute, R.E., Rich, D.H. and Barrett, A.J.: Affinity purification of the novel cysteine proteinase, papaya proteinase IV, and papain from papaya latex. *Biochem. J.*, 261 (1989) 469-476.
- 5596 Chiou, T.-K., Matsui, T. and Konosu, S.: Purification and properties of an aminopeptidase from Alaska pollack, *Theragra chalcogramma*, Roe. *J. Biochem. (Tokyo)*, 105 (1989) 505-509.
- 5597 Endo, S., Yokosawa, H. and Ishii, S.-i.: Purification and characterization of a substance P-degrading endopeptidase from rat brain. *J. Biochem. (Tokyo)*, 104 (1988) 999-1006.
- 5598 Grant, A.J., Russell, P.J. and Raghavan, D.: Elastase activities of human bladder cancer cell lines derived from high grade invasive tumours. *Biochem. Biophys. Res. Commun.*, 162 (1989) 308-315.
- 5599 Harada, M., Mogi, M., Fukasawa, K. and Fukasawa, K.M.: High-performance liquid chromatographic determination of aminopeptidase P activity in Fischer F344 rat serum and kidney. *J. Chromatogr.*, 493 (1989) 176-181.
- 5600 Harrison, R., Teahan, J. and Stein, R.: A semicontinuous, high-performance liquid chromatography-based assay for stromelysin. *Anal. Biochem.*, 180 (1989) 110-113.
- 5601 Hayashi, Y., Mimura, K., Matsui, H. and Takagi, T.: Minimum enzyme unit for  $Na^+/K^+$ -ATPase is the  $\alpha\beta$ -protomer. Determination by low-angle laser light scattering photometry coupled with high-performance gel chromatography for substantially simultaneous measurement of ATPase activity and molecular weight. *Biochim. Biophys. Acta*, 983 (1989) 217-229.
- 5602 Jacobs, G.R., Pike, R.N. and Dennison, C.: Isolation of cathepsin D using three-phase partitioning in *t*-butanol/water/ammonium sulfate. *Anal. Biochem.*, 180 (1989) 169-171.
- 5603 Kirley, T.L.: Determination of three disulfide bonds and one free sulfhydryl in the  $\beta$  subunit of (Na,K)-ATPase. *J. Biol. Chem.*, 264 (1989) 7185-7192.
- 5604 Knott, J.A., Orr, D.C., Montgomery, D.S., Sullivan, C.A. and Weston, A.: The expression and purification of human rhinovirus protease 3C. *Eur. J. Biochem.*, 182 (1989) 547-555.
- 5605 Kumita, K.-i., Murazumi, N., Araki, Y. and Ito, E.: Solubilization and properties of UDP-D-glucose:N-acetylglucosaminyl pyrophosphorylundecaprenol glucosyltransferase from *Bacillus coagulans* AHU 1366 membranes. *J. Biochem. (Tokyo)*, 104 (1988) 985-988.

- 5606 Mahn, M.M. and Husic, H.D.: A laboratory experiment to demonstrate the principles of bio-ligand affinity chromatography: the purification of chicken muscle AMP aminohydrolase by phosphocellulose chromatography. *Biochem. Educ.*, 17 (1989) 94-96; *C.A.*, 111 (1989) 38535b.
- 5607 Myara, I., Moatti, N. and Lemonnier, A.: Separation of two erythrocyte prolidase isoforms by fast protein liquid chromatography; application to prolidase deficiency. *J. Chromatogr.*, 493 (1989) 170-175.
- 5608 Oshima, G.: Time-dependent conformational change of thrombin molecules induced by sulfated polysaccharides. *Chem. Pharm. Bull.*, 37 (1989) 1324-1328.
- 5609 Peek, K., Roberts, N.B. and Taylor, W.H.: Improved separation of human pepsins from gastric juice by high-performance ion-exchange chromatography. *J. Chromatogr.*, 476 (1989) 291-297.
- 5610 Peek, K., Roberts, N.B. and Taylor, W.H.: Heterogeneity of human pepsin 1, as shown by high-performance ion-exchange chromatography. *J. Chromatogr.*, 476 (1989) 491-498.
- 5611 Shannon, J.D., Baramova, E.N., Bjarnason, J.B. and Fox, J.W.: Amino acid sequence of a *Crotalus atrox* venom metalloproteinase which cleaves type IV collagen and gelatin. *J. Biol. Chem.*, 264 (1989) 11575-11583.
- 5612 Silberring, J. and Nyberg, F.: A novel bovine spinal cord endoprotease with high specificity for dynorphin B. *J. Biol. Chem.*, 264 (1989) 11082-11086.
- 5613 Spungin, A. and Blumberg, S.: *Streptomyces griseus* aminopeptidase is a calcium-activated zinc metalloprotein. *Eur. J. Biochem.*, 183 (1989) 471-477.
- 5614 Takahashi, T., Ikai, A. and Takahashi, K.: Purification and characterization of proline- $\beta$ -naphthylamidase, a novel enzyme from pig intestinal mucosa. *J. Biol. Chem.*, 264 (1989) 11565-11571.
- 5615 Xu, K.: Any of several lysines can react with 5'-isothiocyanatofluorescein to inactivate sodium and potassium ion activated adenosinetriphosphatase. *Biochemistry*, 28 (1989) 5764-5772.
- 5616 Yoshikawa, S., Tashiro, T. and Takahashi, K.: Specificity of action on neuropeptides of an endopeptidase from the synaptosomal membranes of guinea pig brain. *J. Biochem. (Tokyo)*, 104 (1988) 1007-1010.

For additional information see:  
*C.A.*, 111 (1989) 35437k, 55731e.

See also 5441.

#### 20g. Lyases

- 5617 Balasundaram, D. and Tyagi, A.K.: Modulation of arginine decarboxylase activity from *Mycobacterium smegmatis*. Evidence for pyridoxal 5'-phosphate-mediated conformational changes in the enzyme. *Eur. J. Biochem.*, 183 (1989) 339-345.
- 5618 McNaughton, G.A.L., Fewson, C.A., Wilkins, M.B. and Nimmo, H.G.: Purification, oligomerization state and malate sensitivity of maize leaf phosphoenolpyruvate carboxylase. *Biochem. J.*, 261 (1989) 349-355.
- 5619 Van der Straeten, D., van Wiemeersch, L., Goodman, H.M. and van Montagu, M.: Purification and partial characterization of 1-aminocyclopropane-1-carboxylate synthase from tomato pericarp. *Eur. J. Biochem.*, 182 (1989) 639-647.

See also 5626.

#### 20h. Isomerases

- 5620 Rosa, R., Blouquit, Y., Calvin, M.-C., Prome, D., Prome, J.-C. and Rosa, J.: Isolation, characterization, and structure of a mutant 89 Arg<sup>+</sup>Cys bisphosphoglycerate mutase. Implication of the active site in the mutation. *J. Biol. Chem.*, 264 (1989) 7837-7843.
- 5621 Sullivan, D.M., Latham, M.D., Rowe, T.C. and Ross, W.E.: Purification and characterization of an altered topoisomerase II from a drug-resistant chinese hamster ovary cell line. *Biochemistry*, 28 (1989) 5680-5687.

See also 5625, 5626.

## 20i. Ligases

- 5622 Marqués, S., Florencio, F.J. and Candau, P.: Ammonia assimilating enzymes from cyanobacteria: *in situ* and *in vitro* assay using high-performance liquid chromatography. *Anal. Biochem.*, 180 (1989) 152-157.

## 20j. Complex mixtures and incompletely identified enzymes

- 5623 Ahmad, I. and Hellebust, J.A.: A spectrophotometric procedure for measuring oxoglutarate and determining aminotransferase activities using nicotinamide adenine dinucleotide phosphate-linked glutamate dehydrogenase from algae. *Anal. Biochem.*, 180 (1989) 99-104.
- 5624 Basu, A., Tirumalai, R.S. and Modak, M.J.: Substrate binding in human immunodeficiency virus reverse transcriptase. An analysis of pyridoxal 5'-phosphate sensitivity and identification of lysine 263 in the substrate-binding domain. *J. Biol. Chem.*, 264 (1989) 8746-8752.
- 5625 Mathis, R., Hubert, P. and Dellacherie, E.: Polyoxyalkyleneglycols immobilized on Sepharose 6B for the sequential extraction of three enzymes from a crude extract of *Pseudomonas testosteroni*. *J. Chromatogr.*, 474 (1989) 396-399.
- 5626 Weir, A.N.C., Bucke, C., Holt, G., Lilly, M.D. and Bull, A.T.: A high-performance liquid chromatography method for the simultaneous assay of diaminopimelate epimerase and decarboxylase. *Anal. Biochem.*, 180 (1989) 298-302.

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

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

- 5627 Banks, J.F., Jr. and Novotny, M.V.: Microcolumn liquid chromatography of small nucleic acid constituents. *J. Chromatogr.*, 475 (1989) 13-21.
- 5628 Guthridge, M., Bertolini, J. and Hearn, M.T.W.: High-performance liquid chromatography of amino acids, peptides, proteins and polynucleotides. XCIV. Solid-phase hybridization of complementary oligonucleotides. *J. Chromatogr.*, 476 (1989) 445-453.
- 5629 Hummel, M., Herbst, H. and Stein, H.: Reversed-phase high-performance liquid chromatography of very long oligodeoxyribonucleotides. *J. Chromatogr.*, 477 (1989) 420-426.
- 5630 Kojima, T., Nishina, T., Kitamura, M., Kamatani, N. and Nishioka, K.: Reversed-phase high-performance liquid chromatography of 2,8-dihydroxyadenine in serum and urine with electrochemical detection. *Clin. Chim. Acta*, 181 (1989) 109-114.
- 5631 Kremmer, T., Paulik, E., Boldizsar, M. and Holenyi, I.: Application of the fast protein liquid chromatographic system and MonoQ HR 5/5 anion exchanger to the separation of nucleotides. *J. Chromatogr.*, 493 (1989) 45-52.
- 5632 Kresbach, G.M., Itani, M., Saha, M., Rogers, E.J., Vouros, P. and Giese, R.W.: Ester and related derivatives of ring N-pentafluorobenzylated 5-hydroxymethyluracil. Hydrolytic stability, mass spectral properties, and trace detection by gas chromatography-electron-capture detection, gas chromatography-electron-capture negative ion mass spectrometry, moving-belt liquid chromatography-electron-capture negative ion mass spectrometry. *J. Chromatogr.*, 476 (1989) 423-438.
- 5633 Li, B.F.L. and Swann, P.F.: Synthesis and characterization of oligodeoxynucleotides containing O<sup>6</sup>-methyl-, O<sup>6</sup>-ethyl-, and O<sup>6</sup>-isopropylguanine. *Biochemistry*, 28 (1989) 5779-5786.
- 5634 Liautard, J., Ferraz, C., Sri Widada, J., Capony, J.P. and Liautard, J.P.: Purification of synthetic oligonucleotides on a weak ion-exchange column. *J. Chromatogr.*, 476 (1989) 439-443.
- 5635 Nakahara, T., Shiraishi, A., Hirano, M., Matsumoto, T., Kuroki, T., Tatebayashi, Y., Tsutsumi, T., Nishiyama, K., Ooboshi, H., Nakamura, K., Yao, H., Waki, M. and Uchimura, H.: Determination of guanine by high-performance liquid chromatography with electrochemical detection: application to DNA and RNA assays. *Anal. Biochem.*, 180 (1989) 38-42.
- 5636 Palmisano, F., Rotunno, T., Guerrieri, A. and Zambonin, P.G.: Simultaneous determination of pseudouridine and creatinine in untreated urine by ion-pair liquid chromatography with diode-array ultraviolet detection. *J. Chromatogr.*, 493 (1989) 35-43.

- 5637 Pulaski, S.P. and Hatzenbuehler, N.T.: Investigation of columns and conditions for the large scale HPLC purification of oligodeoxyribonucleotides. *BioChromatography*, 4 (1989) 41-45; *C.A.*, 111 (1989) 20279m.
- 5638 Sant, M.E., Lyons, S.D., Kemp, A.J., McClure, L.K., Szabados, E. and Christopherson, R.I.: Dual effects of pyrazofurin and 3-deazauridine upon pyrimidine and purine biosynthesis in mouse L1210 leukemia. *Cancer Res.*, 49 (1989) 2645-2650.
- 5639 Seliger, H., Kotschi, U., Scharpf, C., Martin, R., Eisenbeiss, F., Kinkel, J.N. and Unger, K.K.: Polymer support synthesis. XV. Behaviour of non-porous surface-coated silica gel microbeads in oligonucleotide synthesis. *J. Chromatogr.*, 476 (1989) 49-57.
- 5640 Smolenski, R.T., Skladanowski, A.C., Perko, M. and Zydowo, M.M.: Adenylate degradation products released from the human myocardium during open heart surgery. *Clin. Chim. Acta*, 182 (1989) 63-74.
- 5641 Sonoki, S., Tanaka, Y., Hisamatsu, S. and Kobayashi, T.: High-performance liquid chromatographic analysis of fluorescent derivatives of adenine and adenosine and its nucleotides. Optimization of derivatization with chloroacetaldehyde and chromatographic procedures. *J. Chromatogr.*, 475 (1989) 311-319.
- 5642 Wermeling, J.R., Pruemer, J.M., Hassan, F.M., Warner, A. and Pesce, A.J.: Liquid-chromatographic monitoring of cytosine arabinoside and its metabolite, uracil arabinoside, in serum. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1011-1015.

For additional information see:

*C.A.*, 111 (1989) 3529a, 3530u, 53076w, 53538y.

See also 5081, 5473, 5812, 5832, 5855.

*21b. Nucleic acids, RNA*

- 5643 Urata, H. and Akagi, M.: Mechanism of the reversal reaction of platinated DNA with thiourea studied by platinated 5'-GMP. *Biochem. Biophys. Res. Commun.*, 161 (1989) 819-824.

See also 5414-5416, 5420.

*21c. Nucleic acids, DNA*

- 5644 Barat-Gueride, M., Dufresne, C. and Rickwood, D.: Effect of DNA conformation on the transcription of mitochondrial DNA. *Eur. J. Biochem.*, 183 (1989) 297-302.
- 5645 Weingart, S., Sommer, U., Gerhold, H. and Seifart, K.H.: Transcription of the  $\alpha^A$ -globin gene of the duck. Development of a homologous *in vitro* system and identification of *trans*-acting factors. *Eur. J. Biochem.*, 183 (1989) 145-153.

For additional information see:

*C.A.*, 111 (1989) 20463s.

See also 5414-5416, 5420.

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

- 5646 Kawakami, M., Takemura, S., Kondo, T., Fukami, T. and Goto, T.: Chemical structure of a new modified nucleoside located in the anticodon of *Bombyx mori* glycine tRNA. *J. Biochem. (Tokyo)*, 104 (1988) 108-111.

*21f. Complex mixtures of nucleic acids and their fragments*

- 5647 Park, J.W., Cundy, K.C. and Ames, B.N.: Detection of DNA adducts by HPLC with electrochemical detection. *Carcinogenesis*, 10 (1989) 827-832; *C.A.*, 111 (1989) 51785c.

See also 5705.

## 22. ALKALOIDS

- 5648 Anonymous: Changes in official methods of analysis. Morphine sulfate in bulk drug injections. Liquid chromatographic method. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 192-193.
- 5649 Auriola, S., Ranta, V.-P., Naaranlahti, T. and Lapinjoki, S.P.: Thermospray liquid chromatographic-mass spectrometric analysis of *Catharanthus* alkaloids. *J. Chromatogr.*, 474 (1989) 181-185.
- 5650 Chung, H.L. and Blume, D.E.: Identification of nicotine biosynthetic intermediates in tobacco roots by liquid chromatography-mass spectrometry. *J. Chromatogr.*, 474 (1989) 329-333.
- 5651 El-Sayed, Y.M. and Islam, S.I.: Comparison of fluorescence polarization immunoassay and HPLC for the determination of theophylline in serum. *J. Clin. Pharm. Ther.*, 14 (1989) 127-134; *C.A.*, 111 (1989) 49793k.
- 5652 Friedman, M. and Levin, C.E.: Composition of jimson weed (*Datura stramonium*) seeds. *J. Agric. Food Chem.*, 37 (1989) 998-1005.
- 5653 Huang, J.L. and McLeish, M.J.: High-performance liquid chromatographic determination of the alkaloids in betel nut. *J. Chromatogr.*, 475 (1989) 447-450.
- 5654 Kaper, L.: ISO (International Standards Organization) - activities on the determination of caffeine in coffee products. *Colloq. Sci. Int. Cafe (C.R.)*, 12 (1987, Publ. 1988) 169-178; *C.A.*, 111 (1989) 22259d.

See also 5845, 5847, 5854, 5856.

## 23. OTHER SUBSTANCES CONTAINING HETEROCYCLIC NITROGEN

## 23a. Porphyrins and other pyrroles

- 5655 Gunter, E.W., Turner, W.E. and Huff, D.L.: Investigation of protoporphyrin IX standard materials used in acid-extraction methods, and a proposed correction for the millimolar absorptivity of protoporphyrin IX. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1601-1608.
- 5656 Haeberlein, H. and Doss, M.O.: (Urinary and fecal porphyrins in hepatic porphyrias determined by HPLC). *Aerztl. Lab.*, 35 (1989) 60-65; *C.A.*, 111 (1989) 3506r.
- 5657 Kennedy, S.W. and Maslen, A.L.: Separation of porphyrin isomers by high-performance liquid chromatography. *J. Chromatogr.*, 493 (1989) 53-62.
- 5658 Perkins, S.L. and Johnson, P.M.: Loss of porphyrins from solution during analysis: effect of sample pH and matrix on porphyrin quantification in urine by "high-performance" liquid chromatography. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1508-1512.
- 5659 Rimington, C., Ronnestad, A., Kongshaug, M. and Moan, J.: Convenient preparation of hematoporphyrin esters from higher alcohols; dihexyl, dioctyl, diamyl, dibutyl and dipropyl ester. *Biochim. Biophys. Acta*, 992 (1989) 241-242.

See also 5854.

## 23c. Indole derivatives

- 5660 Koel, M. and Nebinger, P.: Determination of urinary 5-hydroxy-3-indoleacetic acid by an automated HPLC method. *Biomed. Chromatogr.*, 3 (1989) 114-117.

For additional information see:  
*C.A.*, 111 (1989) 5372t.

See also 5296, 5300.

## 23d. Pyridine derivatives

- 5661 Shibata, K.: HPLC measurement of nicotinamide N-oxide in urine after extracting with chloroform. *Agric. Biol. Chem.*, 53 (1989) 1329-1331; *C.A.*, 111 (1989) 36058z.

- 5662 Youngster, S.K., Sonsalla, P.K., Sieber, B.-A. and Heikkila, R.E.: Structure-activity study of the mechanism of 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP)-induced neurotoxicity. I. Evaluation of the biological activity of MPTP analogs. *J. Pharmacol. Exp. Ther.*, 249 (1989) 820-828.

For additional information see:  
*C.A.*, 111 (1989) 6027w.

See also 5784, 5819.

### 23e. Other N-heterocyclic compounds

- 5663 Bui, L.V.: Determination of orotic acid by liquid chromatography as a criterion for calculating nonfat milk solids in milk bread. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 627-631.
- 5664 Kikugawa, K., Kato, T. and Takahashi, S.: Possible presence of 2-amino-3,4-dimethylimidazo[4,5-f]quinoline and other heterocyclic amino-like mutagens in roasted coffee beans. *J. Agric. Food Chem.*, 37 (1989) 881-886.
- 5665 Naoi, M., Matsuura, S., Takahashi, T. and Nagatsu, T.: A N-methyltransferase in human brain catalyses N-methylation of 1,2,3,4-tetrahydroisoquinoline into N-methyl-1,2,3,4-tetrahydroisoquinoline, a precursor of a dopaminergic neurotoxin, N-methylisoquinolinium ion. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1213-1219.

See also 5339, 5854, 5872.

### 24. ORGANIC SULPHUR COMPOUNDS

- 5666 Sinkkonen, S.: Liquid chromatographic determination of planar aromatic sulphur compounds in crude oil. *J. Chromatogr.*, 475 (1989) 421-425.
- 5667 Taylor, B.F., Hood, T.A. and Pope, L.A.: Assay of sulfur as triphenylphosphine sulfide by HPLC: application to studies of sulfur bioproduction and sulfur in marine sediments. *J. Microbiol. Methods*, 9 (1989) 221-231; *C.A.*, 111 (1989) 20283h.
- 5668 Toyo'oka, T., Suzuki, T., Saito, Y. and Takahashi, A.: Electrochemical detection of mercapturic acid derivatives after separation by high-performance liquid chromatography. *J. Chromatogr.*, 475 (1989) 391-399.
- 5669 Zhou, C., Bahr, A. and Schwedt, G.: Studies on the HPLC determination of xanthates via copper(I)xanthates and dixanthogens. *Fresenius' Z. Anal. Chem.*, 334 (1989) 527-533.

See also 5330, 5351, 5836.

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

- 5670 Ankrah, P., Loerch, S.C. and Dehority, B.A.: Occurrence of 2-aminoethylphosphonic acid in feeds, ruminal bacteria and duodenal digesta from defaunated sheep. *J. Anim. Sci.*, 67 (1989) 1061-1069; *C.A.*, 111 (1989) 20293m.
- 5671 Chowdhury, B.K., Nandy, A., Saha, C., Podder, G., Sarkar, S., Saha, D., Chakraborty, S., Chatterjee, H.P. and Roy, P.G.: Determination of tricresyl phosphate in edible oil by HPLC method. *J. Inst. Chem.*, 60 (1988) 197-198; *C.A.*, 111 (1989) 22272c.

See also 5159, 5726.



## 26. ORGANOMETALLIC AND RELATED COMPOUNDS

## 26a. Organometallic compounds

- 5672 Ishizaka, T., Suzuki, T. and Saito, Y.: Metabolism of dibutyltin dichloride in male rats. *J. Agric. Food Chem.*, 37 (1989) 1096-1101.

For additional information see:

- C.A., 110 (1989) 241855c;  
111 (1989) 16820p.

## 26c. Coordination compounds

- 5673 Connor, M., O'Shea, T. and Smyth, M.R.: Reversed-phase liquid chromatographic separation of Fe(II) and Fe(III) as their respective 1,10-phenanthroline and 5-sulphosalicylate complexes. *Anal. Chim. Acta*, 224 (1989) 65-71.
- 5674 Gower, J.D., Healing, G. and Green, C.J.: Determination of desferrioxamine-available iron in biological tissues by high-pressure liquid chromatography. *Anal. Biochem.*, 180 (1989) 126-130.
- 5675 Main, M.V. and Fritz, J.S.: Chromatographic determination of metal ions after complexation with bis(quaternary ammonium hydrazones) of 2,6-diacetylpyridine. *Anal. Chem.*, 61 (1989) 1272-1275.
- 5676 Ohtsuka, C., Wada, H., Ishizuki, T. and Nakagawa, G.: Reversed-phase ion-pair partition liquid chromatography of chelates with 2-(3,5-dibromo-2-pyridylazo)-5-[-ethyl-N-(3-sulphopropyl)amino]phenol and analogues. *Anal. Chim. Acta*, 223 (1989) 339-347.

See also 5831.

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

- 5677 Arai, T., Matsuda, H. and Oizumi, H.: Determination of optical purity by high-performance liquid chromatography on chiral stationary phases: pantothenic acid and related compounds. *J. Chromatogr.*, 474 (1989) 405-410.
- 5678 Czinkotai, B., Daood, H. and Biacs, P.A.: Analysis of carotenoids from paprika by HPLC. *Chromatogram*, 10 (1989) 4-5; *C.A.*, 111 (1989) 55924v.
- 5679 Gehas, J. and Wetlaufer, D.B.: Hydrophobic interaction chromatography of small molecules: characterization of the retention of acyl coenzyme A homologues. *J. Chromatogr.*, 477 (1989) 249-258.
- 5680 Huang, Y. and Kissinger, P.T.: Simultaneous LC determination of ascorbic acid and dehydroascorbic acid in foods and biological fluids. *Curr. Sep.*, 9 (1989) 19-23; *C.A.*, 111 (1989) 3494k.
- 5681 Kim, H.-J.: Determination of total vitamin C by ion exclusion chromatography with electrochemical detection. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 681-686.
- 5682 Kirk, E.M. and Fell, A.F.: Analysis of supplemented vitamin K<sub>1</sub>(20) in serum microsomes by solid-phase extraction and narrow-bore HPLC with multichannel ultraviolet detection. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1288-1292.
- 5683 Mannino, S. and Pagliarini, E.: A rapid HPLC method for the determination of vitamin C in milk. *Lebensm.-Wiss. Technol.*, 21 (1988) 313-314; *C.A.*, 111 (1989) 38057x.
- 5684 May, H.E. and Koo, S.I.: The reversed-phase HPLC behavior of retinyl esters. *J. Liq. Chromatogr.*, 12 (1989) 1261-1280.
- 5685 Okano, T., Tsugawa, N. and Kobayashi, T.: Identification and determination of 1 $\alpha$ ,25-dihydroxyvitamin D<sub>3</sub> in rat skin by high-performance liquid chromatography and radioreceptor assay. *J. Chromatogr.*, 493 (1989) 63-70.
- 5686 Runge, G. and Steinhart, H.: Zur Tocochromanol - und Fettsäureanalytik im Fisch. *Fat Sci. Technol.*, 91 (1989) 281-287.
- 5687 Sampson, D.A. and O'Connor, D.K.: Analysis of B<sub>6</sub> vitamers and pyridoxic acid in plasma, tissues and urine using HPLC. *Nutr. Res.*, 9 (1989) 259-272; *C.A.*, 111 (1989) 3525w.

- 5688 Stary, E., Cruz, A.M.C., Donomai, C.A., Monfardini, J.L. and Vargas, J.T.F.: Determination of vitamins A-palmitate, A-acetate, E-acetate, D<sub>3</sub> and K<sub>1</sub> in vitamin mix by isocratic reverse phase HPLC. *J. High Resolut. Chromatogr.*, 12 (1989) 421-423.
- 5689 Tan, B. and Andersson, A.: Analytical and preparative chromatography of tomato paste carotenoids (Erratum to document cited in CA 109(7):53493p). *J. Food Sci.*, 54 (1989) 496; *C.A.*, 111 (1989) 22386t.
- 5690 Tan, B. and Brzuskiwicz, L.: Separation of tocopherol and tocotrienol isomers using normal- and reverse-phase liquid chromatography. *Anal. Biochem.*, 180 (1989) 368-373.
- 5691 Yamada, S., Yamamoto, K., Ino, E., Sakaida, K., Takayama, H., Shinki, T., Suda, T., Iitaka, Y. and Itai, A.: Synthesis and determination of the stereochemistry of 23,25-dihydroxy-24-oxovitamin D<sub>3</sub>, a major metabolite of 24(R),25-dihydroxy-vitamin D<sub>3</sub>. *Biochemistry*, 28 (1989) 4551-4556.
- 5692 Zhang, S., Zhuang, X., Zhou, D. and Liu, S.: (Separation and determination of  $\alpha$ -tocopherol in vegetable oils). *Fenxi Shiyanshi*, 7 (1988) 24-26; *C.A.*, 111 (1989) 22267e.

For additional information see:  
*C.A.*, 111 (1989) 6215f, 22284h.

See also 5059, 5854.

## 28. ANTIBIOTICS

- 5693 Aerts, R.M.L., Keukens, H.J. and Werdmuller, G.A.: Liquid chromatographic determination of chloramphenicol residues in meat: interlaboratory study. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 570-576.
- 5694 Champney, W.S.: Reductive methods for isotopic labeling of antibiotics. *Anal. Biochem.*, 181 (1989) 90-95.
- 5695 Dalga, R.J. and Lambert, W.J.: Development of a polymer-based reversed-phase high-performance liquid chromatographic stability indicating assay for U-78 608, an iron complexing monocarbam antibiotic. *J. Chromatogr.*, 477 (1989) 427-433.
- 5696 De Graaf, S.S.N., Riley-Stewart, C.A. and Evans, W.E.: Improved high-performance liquid chromatographic method using loop-column extraction for analysis of idarubicin and idarubicinol in plasma. *J. Chromatogr.*, 491 (1989) 501-506.
- 5697 Frank, L.R. and Barnes, C.J.: Liquid chromatographic determination of lasalocid sodium in chicken skin: interlaboratory study. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 584-586.
- 5698 Giesbrecht, E.E., Soldin, S.J. and Wong, P.Y.: A rapid, reliable HPLC micromethod for the measurement of cyclosporine in whole blood. *Ther. Drug Monit.*, 11 (1989) 332-336; *C.A.*, 111 (1989) 88v.
- 5699 Hoogmartens, J., Khan, N.H., Vanderhaeghe, H., van der Leeden, A.L., Oosterbaan, M., Veld-Tulp, G.L., Plugge, W., van der Vlies, C., Mialanne, D., Melamed, R. and Miller, J.H.McB.: A collaborative study of the analysis of doxycycline hyclate by high-performance liquid chromatography on polystyrene-divinylbenzene packing materials. *J. Pharm. Biomed. Anal.*, 7 (1989) 601-610.
- 5700 Hou, W. and Wang, E.: Liquid chromatographic determination of tetracycline antibiotics an electrochemically pre-treated glassy carbon electrode. *Analyst (London)*, 114 (1989) 699-702.
- 5701 Ikai, Y., Oka, H., Kawamura, N., Yamada, M., Harada, K.-I., Suzuki, M. and Nakazawa, H.: Improvement of chemical analysis of antibiotics. XVI. Simple and rapid determination of residual pyridonecarboxylic acid antibacterials in fish using a prepacked amino cartridge. *J. Chromatogr.*, 477 (1989) 397-406.
- 5702 Iversen, B., Aanesrud, A., Kolstad, A.K. and Rasmussen, K.E.: Determination of oxytetracycline in plasma from rainbow trout using high-performance liquid chromatography with ultraviolet detection. *J. Chromatogr.*, 493 (1989) 217-221.
- 5703 Jaglan, P.S., Kubicek, M.F., Arnold, T.S., Cox, B.L., Robins, R.H., Johnson, D.B. and Gilbertson, T.J.: Metabolism of ceftiofur. Nature of urinary and plasma metabolites in rats and cattle. *J. Agric. Food Chem.*, 37 (1989) 1112-1118.

- 5704 McBride, J.H., Rodgerson, D.O., Park, S.S. and Reyes, A.F.: Measurement of cyclosporine in plasma from patients with various transplants: HPLC and radioimmunoassay with a specific monoclonal antibody compared. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1726-1730.
- 5705 Musser, S.M., Pan, S.-S. and Callery, P.S.: Liquid chromatography-thermospray mass spectrometry of DNA adducts formed with mitomycin C, porfiromycin and thiotepa. *J. Chromatogr.*, 474 (1989) 197-207.
- 5706 Neuzil, J., Novotna, J., Vancurova, I., Behal, V. and Hostalek, Z.: A direct-injection reversed-phase liquid chromatographic micromethod for studying the kinetics of terminal reactions of tetracycline biosynthesis. *Anal. Biochem.*, 181 (1989) 125-129.
- 5707 Newkirk, D.R. and Barnes, C.J.: Liquid chromatographic determination and gas chromatographic-mass spectrometric confirmation of lasalocid sodium in bovine liver. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 581-584.
- 5708 Nishi, H., Tsumagari, N., Kakimoto, T. and Terabe, S.: Separation of  $\beta$ -lactam antibiotics by micellar electrokinetic chromatography. *J. Chromatogr.*, 477 (1989) 259-270.
- 5709 Plebani, M., Masiero, M., Paleari, C.D., Sciacovelli, L., Faggian, D. and Burlina, A.: High-performance liquid chromatography for cyclosporine measurement: comparison with radioimmunoassay. *J. Chromatogr.*, 476 (1989) 93-98.
- 5710 Shaw, L.M.: Advances in cyclosporine pharmacology, measurement, and therapeutic monitoring. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1299-1308.
- 5711 Takeshima, H., Inokoshi, J., Takada, Y., Tanaka, H. and Omura, S.: A deacylation enzyme for aculeacin A, a neutral lipopeptide antibiotic, from *Actinoplanes utahensis*: purification and characterization. *J. Biochem. (Tokyo)*, 105 (1989) 606-610.
- 5712 Thomas, M.H.: Simultaneous determination of oxytetracycline, tetracycline, and chlortetracycline in milk by liquid chromatography. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 564-567.
- 5713 Uchida, K., Yamada, N., Orihara, A., Tominaga, Y., Tanaka, Y., Hayashi, S., Kondo, T., Nishikawa, Y., Morozumi, K. et al.: Fully automated HPLC determination using pretreatment polymer column and column-switching for fast, daily, routine bedside monitoring of cyclosporine in whole blood. *Transplant. Proc.*, 21 (1989) 901-903; *C.A.*, 111 (1989) 33006v.
- 5714 Van Duijn, J.W., Barends, D.M., Groot, D.W. and de Neeling, A.J.: High pressure liquid chromatographic determination with ultraviolet detection of gentamicin and correlation with the microbiological potency. *Pharm. Weekbl., Sci. Ed.*, 10 (1988) 267-271; *C.A.*, 110 (1989) 237206z.
- 5715 Vekey, K., Edwards, D.M.F. and Zerilli, L.F.: Liquid chromatographic-mass spectrometric studies on rifamycin antibiotics. *J. Chromatogr.*, 474 (1989) 317-327.
- 5716 Williams, W.H., Ash, G.D. and Heady, M.A.: High performance liquid chromatographic technique for the determination of polyether antibiotic lysocellin sodium. *Analyst (London)*, 114 (1989) 887-889.
- 5717 Yamashita, G.T. and Rabenstein, D.L.: Determination of penicillamine, penicillamine disulfide and penicillamine-glutathione mixed disulfide by high-performance liquid chromatography with electrochemical detection. *J. Chromatogr.*, 491 (1989) 341-354.

For additional information see:

*C.A.*, 111 (1989) 12372w, 12373x, 17055e, 33014w.

See also 5330, 5760, 5854.

## 29. INSECTICIDES, PESTICIDES AND OTHER AGROCHEMICALS

- 5718 Mostert, I.A. and Ramsteiner, K.A.: Coupled high-performance liquid chromatography-gas chromatography for the determination of pesticide residues in biological matrices. *J. Chromatogr.*, 477 (1989) 359-365.
- 5719 Voyksner, R.D. and Cairns, T.: Application of liquid chromatography-mass spectrometry to the determination of pesticides. *Anal. Methods Pestic. Plant Growth Regul.*, 17 (Adv. Anal. Tech.) (1989) 119-166; *C.A.*, 111 (1989) 19346z - a review with many refs.

## 29a. Chlorinated insecticides

- 5720 Cheng, T., Bodden, R.M., Puhl, R.J. and Bauriedel, W.R.: Absorption, distribution, and metabolism of [<sup>14</sup>C]chlorpyrifos applied dermally to goats. *J. Agric. Food Chem.*, 37 (1989) 1108-1111.
- 5721 Langen, H., Epprecht, T., Linden, M., Hehlgers, T., Gutte, B. and Buser, H.-R.: Rapid partial degradation of DDT by a cytochrome P-450 model system. *Eur. J. Biochem.*, 182 (1989) 727-735.

## 29b. Phosphorus insecticides

- 5722 Anonymous: Changes in official methods of analysis. Azinphos-methyl in pesticide formulations. Liquid chromatographic method. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 181.
- 5723 Lee, P.W., Stearns, S.M., Hernandez, H., Powell, W.R. and Naidu, M.V.: Fate of dicrotophos in the soil environment. *J. Agric. Food Chem.*, 37 (1989) 1169-1174.

## 29c. Carbamates

- 5724 Ali, M.S.: Determination of N-methylcarbamate pesticides in liver by liquid chromatography. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 586-592.
- 5725 Hammond, I., Moore, K., James, H. and Watts, C.: Thermospray liquid chromatography-mass spectrometry of pesticides in river water using reversed-phase chromatography. *J. Chromatogr.*, 474 (1989) 175-180.

## 29d. Herbicides

- 5726 Barcelo, D. and Albaiges, J.: Characterization of organophosphorus compounds and phenylurea herbicides by positive and negative ion thermospray liquid chromatography-mass spectrometry. *J. Chromatogr.*, 474 (1989) 163-173.
- 5727 Berger, B. and Heitefuss, R.: Bestimmung des Herbicids Isoproturon und seiner möglichen Abbauprodukte im Boden durch Hochdruckflüssigkeits-Chromatographie. *Fresenius' Z. Anal. Chem.*, 334 (1989) 360-362.
- 5728 Escoffier, B.H., Parker, C.E., Mester, T.C., Dewit, J.S.M., Corbin, F.T., Jorgensen, J.W. and Tomer, K.B.: Comparison of open-tubular liquid chromatography-mass spectrometry and direct liquid introduction liquid chromatography-mass spectrometry for the analysis of metribuzin and its metabolites in plant tissue and water samples. *J. Chromatogr.*, 474 (1989) 301-316.
- 5729 Feng, P.C.C. and Wratten, S.J.: *In vitro* transformation of chloroacetanilide herbicides by rat liver enzymes: a comparative study of metolachlor and alachlor. *J. Agric. Food Chem.*, 37 (1989) 1088-1093.
- 5730 Flanagan, R.J. and Ruprah, M.: HPLC measurement of chlorophenoxy herbicides, bromoxynil, and ioxynil, in biological specimens to aid diagnosis of acute poisoning. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1342-1347.
- 5731 Günther, W.J. and Kettrup, A.: High-performance-liquid chromatographic separation of 1,3,5-triazine herbicides. *Chromatographia*, 28 (1989) 209-211.
- 5732 Hogendoorn, E.A. and Goewie, C.E.: Residue analysis of the herbicides cyanazine and bentazone in sugar maize and surface water using high-performance liquid chromatography and an on-line clean-up column-switching procedure. *J. Chromatogr.*, 475 (1989) 432-441.
- 5733 Meier, M., Hamann, R. and Kettrup, A.: Determination of phenoxy acid herbicides by high-performance liquid chromatography and on-line enrichment. I. Possibilities of chromatographic separation by means of high-performance liquid chromatography considering especially on-line enrichment of the herbicide compounds. *Fresenius' Z. Anal. Chem.*, 334 (1989) 231-234.
- 5734 Meier, M., Hamann, R. and Kettrup, A.: Determination of phenoxyacid herbicides by high-performance liquid chromatography and on-line enrichment. II. Determination of phenoxy acid herbicides in soil samples. *Fresenius' Z. Anal. Chem.*, 334 (1989) 235-237.

See also 5093, 5108.

## 29e. Fungicides

- 5735 Rolle, S.D. and de Cormis, L.: High-performance liquid chromatography for the determination of penicuron residues in several vegetables. *J. Agric. Food Chem.*, 37 (1989) 975-978.
- 5736 Szeto, S.Y., Burlinson, N.E., Rettig, S.J. and Trotter, J.: Identification of hydrolysis products of the fungicide vinclozolin by spectroscopic and X-ray crystallographic methods. *J. Agric. Food Chem.*, 37 (1989) 1103-1108.

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

- 5737 Pang, G. and Wang, B.: (HPLC determination of residues of carbaryl and carbofuran in maize). *Sepu*, 7 (1989) 110-112; *C.A.*, 111 (1989) 38069c.
- 5738 Yamasaki, R.B. and Klocke, J.A.: Structure-bioactivity relationships of salannin as an antifeedant against the Colorado potato beetle (*Leptinotarsa decemlineata*). *J. Agric. Food Chem.*, 37 (1989) 1118-1124.

For additional information see:  
*C.A.*, 111 (1989) 19364d.

See also 5725.

## 30. SYNTHETIC AND NATURAL DYES

## 30a. Synthetic dyes

- 5739 Mason, R.W. and Edwards, I.R.: High-performance liquid chromatographic determination of rhodamine B in rabbit and human plasma. *J. Chromatogr.*, 491 (1989) 468-472.
- 5740 White, P.C. and Harbin, A.-M.: High performance liquid chromatography of acidic dyes on a dynamically modified polystyrene-divinylbenzene packing material with multi-wavelength detection and absorbance ratio characterisation. *Analyst (London)*, 114 (1989) 877-882.

See also 5286.

## 30b. Chloroplast and other natural pigments

- 5741 Engelhard, M., Pevec, B. and Hess, B.: Modification of two peptides of bacteriorhodopsin with a pentaamminecobalt(III) complex. *Biochemistry*, 28 (1989) 5432-5438.
- 5742 Kawai, S., Nagano, H. and Maji, T.: Improved method for the separation of methylolmelamines by high-performance liquid chromatography. *J. Chromatogr.*, 477 (1989) 467-470.
- 5743 Lesellier, E., Marty, C., Berset, C. and Tchaplal, A.: Optimization of the isocratic non-aqueous reverse phase (NARP) HPLC separation of *trans/cis*- $\alpha$ - and  $\beta$ -carotenes. *J. High Resolut. Chromatogr.*, 12 (1989) 447-454.
- 5744 Ohga, K., Aritomi, Y. and Ohtsu, H.: Chromatography with pH-gradient elution of dissolved humic substances in river water. *Anal. Sci.*, 5 (1989) 215-216; *C.A.*, 111 (1989) 12250e.
- 5745 Peschek, G.A., Hinterstoisser, B., Pineau, B. and Missbichler, A.: Light-independent NADPH-protochlorophyllide oxidoreductase activity in purified plasma membrane from the cyanobacterium *Anacystis nidulans*. *Biochem. Biophys. Res. Commun.*, 162 (1989) 71-78.
- 5746 Peschek, G.A., Hinterstoisser, B., Wastyn, M., Kuntner, O., Pineau, B., Missbichler, A. and Lang, J.: Chlorophyll precursors in the plasma membrane of a cyanobacterium, *Anacystis nidulans*. Characterization of protochlorophyllide and chlorophyllide by spectrophotometry, spectrofluorimetry, solvent partition, and high performance liquid chromatography. *J. Biol. Chem.*, 264 (1989) 11827-11832.
- 5747 Saito, K. and Fukushima, A.: An improved method for large-scale isolation of a water-soluble safflor pigment from dyer's saffron flowers. *Food Chem.*, 32 (1989) 297-306; *C.A.*, 111 (1989) 38158f.

- 5748 Scalia, S. and Francis, G.W.: Preparative scale reversed-phase HPLC method for simultaneous separation of carotenoids and carotenoid esters. *Chromatographia*, 28 (1989) 129-132.
- 5749 Shimasaki, H., Hirai, N. and Ueta, N.: Comparison of fluorescence characteristics of products of peroxidation of membrane phospholipids with those of products derived from reaction of malonaldehyde with glycine as a model of lipofuscin fluorescent substances. *J. Biochem. (Tokyo)*, 104 (1988) 761-766.
- 5750 Tan, B.: Palm carotenoids, tocopherols and tocotrienols. *J. Am. Oil Chem. Soc.*, 66 (1989) 770-776.
- 5751 Yamada, S., Noda, N., Mikami, E., Hayakawa, J. and Yamada, M.: Analysis of natural coloring matters in food. III. Application of methylation with diazomethane for the detection of lac color. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 48-51.

See also 5678, 5684.

### 31. PLASTICS AND THEIR INTERMEDIATES

- 5752 Berlinova, I., Vladimirov, N. and Panaiotov, I.: Gel-permeation chromatography. Study of aqueous-methanolic solutions of diblock and branched copolymers based on polystyrene and poly(ethylene oxide). *Macromol. Chem. Rapid Commun.*, 10 (1989) 163-166; *C.A.*, 110 (1989) 232395a.
- 5753 Cortes, H.J., Jewett, 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.

For additional information see:  
*C.A.*, 111 (1989) 8122x.

See also 5047, 5049, 5279, 5833.

### 32. DRUG ANALYSIS

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

- 5754 Arzamastsev, A.P., Nikulichev, D.B., Popov, D.M. and Sokolov, A.V.: (Use of high performance liquid chromatography in the analysis of medicinal preparations. (A review). *Khim.-Farm. Zh.*, 23 (1989) 486-491; *C.A.*, 110 (1989) 237202 - a review with 27 refs.
- 5755 Barker, S.A., Long, A.R. and Short, C.R.: Isolation of drug residues from tissues by solid phase dispersion. *J. Chromatogr.*, 475 (1989) 353-361.
- 5756 Bowers, L.D.: High-performance liquid chromatography/mass spectrometry: state of the art for the drug analysis laboratory. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1282-1287.
- 5757 Maldener, G.: Requirements and tests for HPLC apparatus and methods in pharmaceutical quality control. *Chromatographia*, 28 (1989) 85-88.
- 5758 Nunn, A.D.: HPLC as the archetypical animal. *Nucl. Med. Biol.*, 16 (1989) 187-190; *C.A.*, 111 (1989) 17002k - a review with 17 refs.
- 5759 Richardson, V.J. and Ford, C.H.J.: Stability of antibody-drug conjugates using wide-pore, reversed-phase HPLC. *Chromatogram*, 10 (1989) 2-3; *C.A.*, 111 (1989) 12574p.
- 5760 Svinarov, D.A. and Dotchev, D.C.: Simultaneous liquid-chromatographic determination of some bronchodilators, anticonvulsants, chloramphenicol, and hypnotic agents, with Chromosorb P columns used for sample preparation. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1615-1618.
- 5761 Wong, S.H.Y.: Supercritical fluid chromatography and microbore liquid chromatography for drug analysis. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1293-1298.

See also 5015, 5019, 5117.

## 32b. Antirheumatics and antiinflammatory drugs

- 5762 Achtert, G., Borchers, F., Jacquot, C. and Christen, M.O.: Metabolism of isobutylnaphthyl acetic acid in rats: determination of the chemical structures of metabolites. *Eur. J. Drug Metab.*, 14 (1989) 29-34.
- 5763 Beaulieu, N., Lefrancois, J., Ong, H. and Lovering, E.G.: Liquid chromatographic determination of ketoprofen and its related compounds in raw materials, capsules, and entering coated tablets. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 559-561.
- 5764 Crevoisier, C., Heizmann, P., Forgo, I. and Dubach, U.C.: Plasma tenoxicam after single and multiple oral doses. *Eur. J. Drug Metab.*, 14 (1989) 23-27.
- 5765 Knadler, M.P., Brater, D.C. and Hall, S.D.: Plasma protein binding of flurbiprofen: enantioselectivity and influence of pathophysiological status. *J. Pharmacol. Exp. Ther.*, 249 (1989) 378-385.
- 5766 Mawatari, K.-I., Iinuma, F. and Watanabe, M.: Fluorimetric determination of indomethacin in human serum by high-performance liquid chromatography coupled with post-column photochemical reaction with hydrogen peroxide. *J. Chromatogr.*, 491 (1989) 389-396.
- 5767 Nonzioli, A., Luque, G. and Fernandez, C.: High performance liquid chromatographic method for the determination of nimesulide and its impurities. *J. High Resolut. Chromatogr.*, 12 (1989) 413-416.
- 5768 Okumura, M., Sugibayashi, K., Ogawa, K. and Morimoto, Y.: Skin permeability of water-soluble drugs. *Chem. Pharm. Bull.*, 37 (1989) 1404-1406.
- 5769 Tomankova, H. and Sabartova, J.: Determination of potential degradation products of piroxicam by HPTLC densitometry and HPLC. *Chromatographia*, 28 (1989) 197-202.

See also 5845.

## 32c. Autonomic and cardiovascular drugs

- 5770 Bagwell, E.E., Webb, J.G., Walle, T. and Gaffney, T.E.: Stereoselective uptake of atenolol into storage granules isolated from PC12 cells. *J. Pharmacol. Exp. Ther.*, 249 (1989) 476-481.
- 5771 Belolipetskaja, V.G., Piotrovskii, V.K., Metelitsa, V.I. and Pavlinov, S.A.: Ion-exchange high-performance liquid chromatography in drug assay in biological fluids. V. Propranolol and metabolites. *J. Chromatogr.*, 491 (1989) 507-512.
- 5772 Boje, K.M. and Fung, H.-L.: Characterization of the pharmacokinetic interaction between nifedipine and ethanol in the rat. *J. Pharmacol. Exp. Ther.*, 249 (1989) 567-571.
- 5773 Boswell, G.W., Munoz, A.C., Aaron, D.T., Chin, C.L. and Quinn, K.P.: High-performance liquid chromatographic assay for RA 642, a compound with cardiovascular effect, in human and rabbit serum. *J. Chromatogr.*, 491 (1989) 513-518.
- 5774 Eisenberg, E.J., Patterson, W.R. and Kahn, G.C.: High-performance liquid chromatographic method for the simultaneous determination of the enantiomers of carvedilol and its O-desmethyl metabolite in human plasma after chiral derivatization. *J. Chromatogr.*, 493 (1989) 105-115.
- 5775 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.
- 5776 McDowall, R.D., Pearce, J.C., Murkitt, G.S., Jelly, J.A., Leavens, W.J., Fernandes, K.A. and Lee, R.M.: Approaches to the analysis of two cardiovascular drugs in plasma. *Methodol. Surv. Biochem. Anal.*, 18 (Bioanal. Drugs Metab.) (1988) 201-206; *C.A.*, 111 (1989) 66m.
- 5777 Musch, G., Buelens, Y. and Massart, D.L.: A strategy for the determination of beta blockers in plasma using solid-phase extraction in combination with high-performance liquid chromatography. *J. Pharm. Biomed. Anal.*, 7 (1989) 483-497.
- 5778 Pieniaszek, H.J., Jr., Shen, H.-S.L., Garner, D.M., Page, G.O., Shalaby, L.M., Isensee, R.K. and Whitney, C.C., Jr.: Determination of unlabeled and <sup>13</sup>C-labeled moricizine in human plasma using thermospray liquid chromatography-mass spectrometry. *J. Chromatogr.*, 493 (1989) 79-92.

- 5779 Plessas, C.T., Souras, S., Karayannacos, P.E., Plessas, S.T., Dontas, I., Kotsarelis, D., Asimakopoulos, G. and Gogas, J.: Pharmacokinetic interaction in beagle dogs of antiplatelet drugs: acetylsalicylic acid, dipyridamole and calcium dobesilate. *Eur. J. Drug Metab.*, 14 (1989) 79-83.
- 5780 Rona, K. and Gachalyi, B.: Determination of debrisoquine and its 4-hydroxy metabolites in human urine by HPLC. *Chromatogram*, 10 (1989) 3; *C.A.*, 111 (1989) 94u.
- 5781 Selinger, K., Hill, H.M., Matheou, D. and Dehelean, L.: Determination of free and total metaproterenol in human plasma by high-performance liquid chromatography with fluorimetric detection. *J. Chromatogr.*, 493 (1989) 230-238.
- 5782 Sheridan, M.E., Clarke, G.S. and Robinson, M.L.: Analysis of nifedipine in serum using solid-phase extraction and liquid chromatography. *J. Pharm. Biomed. Anal.*, 7 (1989) 519-522.
- 5783 Shibukawa, A., Nakagawa, T., Miyake, M., Nishimura, N. and Tanaka, H.: Effect of protein binding on high performance liquid chromatography analysis of drugs with an internal-surface reversed-phase silica column. *Chem. Pharm. Bull.*, 37 (1989) 1311-1315.
- 5784 Terada, T., Ishibashi, K., Tschuchiya, T. and Noguchi, M.: Simultaneous high-performance liquid chromatography assay of two metabolites of 6-chloro-2-pyridylmethyl nitrate, a new antianginal drug, and its application to a pharmacokinetic study in rats. *J. Pharm. Sci.*, 78 (1989) 515-518.
- 5785 Walhagen, A., Edholm, K.-E., Heeremans, C.E.M., van der Hoeven, R.A.M., Niessen, W.M.A., Tjaden, U.R. and van der Greef, J.: Coupled column chromatography-mass spectrometry. Thermospray liquid chromatographic-mass spectrometric and liquid chromatographic-tandem mass spectrometric analysis of metoprolol enantiomers in plasma using phase-system switching. *J. Chromatogr.*, 474 (1989) 257-263.
- 5786 Zhao, H. and Chow, Mosos, S.S.: Analysis of diltiazem and desacetyldiltiazem in plasma using modified HPLC: improved sensitivity and reproducibility. *Pharm. Res.*, 6 (1989) 428-430; *C.A.*, 111 (1989) 33028d.

For additional information see:

*C.A.*, 111 (1989) 12584s, 49791h.

See also 5185, 5768, 5854.

### 32d. Central nervous system drugs

- 5787 Abuirjeie, M.A. and Abdel-Hamid, M.E.: Simultaneous high-performance liquid chromatographic and first-derivative spectrophotometric determination of amitriptyline hydrochloride and chlordiazepoxide in capsules. *Anal. Lett.*, 22 (1989) 951-962.
- 5788 Bhagat, H.R., Bhargava, H.N. and Williams, D.A.: High-performance liquid chromatographic determination of dyclonine hydrochloride in the presence of its degradation products. *J. Pharm. Biomed. Anal.*, 7 (1989) 441-446.
- 5789 Bianchi, G.: High-performance liquid chromatographic assay of k-opioid selective benzeneacetamide derivatives (U50488, U69593 and PD117302) in rat plasma and brain. *J. Chromatogr.*, 491 (1989) 481-487.
- 5790 Chen, Z.R., Bochner, F. and Somogyi, A.: Simultaneous determination of codeine, norcodeine and morphine in biological fluids by high-performance liquid chromatography with fluorescence detection. *J. Chromatogr.*, 491 (1989) 367-378.
- 5791 Cooper, J.K., Hawes, E.M., Hubbard, J.W., McKay, G. and Midha, K.K.: An ultrasensitive method for the measurement of fluphenazine in plasma by HPLC with coulometric detection. *Ther. Drug Monit.*, 11 (1989) 354-360; *C.A.*, 111 (1989) 92s.
- 5792 Dagna, S., Aubert, C. and Cano, J.P.: Direct liquid inlet liquid chromatographic/mass spectrometric identification and HPLC analysis of a benzodiazepine glucuronide. *Biomed. Environ. Mass Spectrom.*, 18 (1989) 359-362; *C.A.*, 111 (1989) 49794m.
- 5793 Getek, T.A., Korfmacher, W.A., McRae, T.A. and Hinson, J.A.: Utility of solution electrochemistry mass spectrometry for investigating the formation and detection of biologically important conjugates of acetaminophen. *J. Chromatogr.*, 474 (1989) 245-256.



- 5794 Gibson, K.M. and Nyhan, W.L.: Metabolism of [ $^{14}\text{C}$ ]-4-hydroxybutyric acid to intermediates of the tricarboxylic acid cycle in extracts of rat liver and kidney mitochondria. *Eur. J. Drug Metab.*, 14 (1989) 61-70.
- 5795 Hansen, E.B., Jr., Getek, T.A. and Korfmacher, W.A.: Application of HPLC-thermospray ionization mass spectrometry for the analysis of triprolidine and its metabolite hydroxymethyltriproloidine in biological samples. *J. Anal. Toxicol.*, 13 (1989) 185-187; *C.A.*, 111 (1989) 32996f.
- 5796 Köppel, C., Tenczer, J. and Wagemann, A.: Mass spectral characterization of urinary pipamperone metabolites and high-performance liquid chromatography assay for pipamperone plasma levels. *J. Chromatogr.*, 491 (1989) 432-438.
- 5797 Kurono, Y., Jinno, Y., Kuwayama, T., Sato, N., Yashiro, T. and Ikeda, K.: *cis/trans* Isomerization rate of oxazolam in organic solvents measured by high-performance liquid chromatography. *Chem. Pharm. Bull.*, 37 (1989) 1044-1046.
- 5798 Lloyd, J.B.F. and Parry, D.A.: Forensic applications of the determination of benzodiazepines in blood samples by microcolumn cleanup and HPLC with reductive mode electrochemical detection. *J. Anal. Toxicol.*, 13 (1989) 163-168; *C.A.*, 111 (1989) 18924z.
- 5799 Moor, M.J., Rashed, M.S., Kalthorn, T.F., Levy, R.H. and Howald, W.N.: Application of thermospray liquid chromatography-mass spectrometry to the simultaneous quantification of tracer concentrations of isotopically labelled carbamazepine epoxide and steady-state levels of carbamazepine and carbamazepine epoxide. *J. Chromatogr.*, 474 (1989) 223-230.
- 5800 Moore, C.M. and Oliver, J.S.: Rapid extraction and determination of xylazine in greyhound urine using high-performance liquid chromatography. *J. Chromatogr.*, 491 (1989) 519-524.
- 5801 Orsulak, P.J., Haven, M.C., Burton, M.E. and Akers, L.C.: Issues in methodology and applications for therapeutic monitoring of antidepressant drugs. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1318-1325.
- 5802 Persson, K., Lindström, B., Spalding, D., Wahlström, A. and Rane, A.: Determination of codeine and its metabolites in human blood plasma and in microsomal incubates by high-performance liquid chromatography with ultraviolet detection. *J. Chromatogr.*, 491 (1989) 473-480.
- 5803 Ruud-Christensen, M., Aasen, A.J., Rasmussen, K.E. and Salvesen, B.: High-performance liquid chromatographic determination of (R)- and (S)-propranolol in human plasma. *J. Chromatogr.*, 491 (1989) 355-366.
- 5804 Schmitt, P., Batt, A.M., Decouvelaere, B., Gaillot, J. and Siest, G.: Preparative high-performance liquid chromatographic method for the 2-hydroxy metabolite of caripramine, excreted by isolated perfused liver. *J. Chromatogr.*, 491 (1989) 495-500.
- 5805 Van Ginkel, L.A., Schwillens, P.L.W.J. and Olling, M.: Liquid chromatographic method with on-line UV spectrum identification and off-line thin-layer chromatographic confirmation for the detection of tranquillizers and carazolol in pig kidneys. *Anal. Chim. Acta*, 225 (1989) 137-146.
- 5806 Wilson, T.D., Trompeter, W.F. and Gartelman, H.F.: Analysis of barbiturate mixtures using HPLC with diode array detection. *J. Liq. Chromatogr.*, 12 (1989) 1231-1251.

For additional information see:

*C.A.*, 111 (1989) 17038b.

See also 5020, 5094, 5760, 5763, 5764, 5783, 5845, 5854.

32e. Chemotherapeutics (except cytostatics and antibiotics)

- 5807 Baker, J.K., Yarber, R.H., Hufford, C.D., Lee, I.S., ElSohly, H.N. and McChesney, J.D.: Thermospray mass spectroscopy/HPLC identification of the metabolites formed from arteether using a rat liver microsome preparation. *Biomed. Environ. Mass Spectrom.*, 18 (1989) 337-351; *C.A.*, 111 (1989) 49819y.
- 5808 Camilleri, P., Dyke, C. and Hossner, F.: Chiral separation of the optical isomers of the antimalarial drug halofantrine. *J. Chromatogr.*, 477 (1989) 471-473.
- 5809 Chan, C.Y., Lam, A.W. and French, G.L.: Rapid HPLC assay of fluoroquinolones in clinical specimens. *J. Antimicrob. Chemother.*, 23 (1989) 597-604; *C.A.*, 111 (1989) 85s.

- 5810 Essien, E.E., Ette, E.I., Thomas, W.O.A. and Brown-Awala, E.A.: Chloroquine disposition in hypersensitive and non-hypersensitive subjects and its significance in chloroquine-induced pruritus. *Eur. J. Drug Metab.*, 14 (1989) 71-77.
- 5811 Idowu, O.R., Edwards, G., Ward, S.A., Orme, M.L.E. and Breckenridge, A.M.: Determination of arteether in blood plasma by high-performance liquid chromatography with ultraviolet detection after hydrolysis with acid. *J. Chromatogr.*, 493 (1989) 125-136.
- 5812 Irth, H., Tocklu, R., Welten, K., de Jong, G.J., Brinkman, U.A.T. and Frei, R.W.: Trace-level determination of 3-azido-3'-deoxythymidine in human plasma by preconcentration on a silver(I)-thiol stationary phase with on-line reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 491 (1989) 321-330.
- 5813 Juma, F.D. and Ogeto, J.O.: Mefloquine disposition in normals and in patients with severe *Plasmodium falciparum* malaria. *Eur. J. Drug Metab.*, 14 (1989) 15-17.
- 5814 Kinabo, L.D.B., McKellar, Q.A. and Murray, M.: Determination of halofuginone in bovine plasma by competing-ion high performance liquid chromatography after solid phase extraction. *Biomed. Chromatogr.*, 3 (1989) 136-138.
- 5815 Koechlin, C., Jehl, F., Linger, L. and Monteil, H.: High-performance liquid chromatography for the determination of three new fluoroquinolones, fleroxacin, temafloxacin and A-64730, in biological fluids. *J. Chromatogr.*, 491 (1989) 379-387.
- 5816 Lewis, J.L., Macy, T.D. and Garteiz, D.A.: Determination of nicarbazin in chicken tissues by liquid chromatography and confirmation of identity by thermospray liquid chromatography/mass spectrometry. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 577-581.
- 5817 Long, A.R., Hsieh, L.C., Short, C.R. and Barker, S.A.: Isocratic separation of seven benzimidazole anthelmintics by high-performance liquid chromatography with photodiode array characterization. *J. Chromatogr.*, 475 (1989) 404-411.
- 5818 Oehler, D.D. and Miller, J.A.: Liquid chromatographic determination of ivermectin in bovine serum. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 59.
- 5819 Okezaki, E., Terasaki, T., Nakamura, M., Nakata, O., Kato, M. and Tsuji, A.: Serum protein binding of lomefloxacin, a new antimicrobial agent, and its related quinolones. *J. Pharm. Sci.*, 78 (1989) 504-507.
- 5820 Parks, O.W.: Liquid chromatographic-electrochemical detection screening procedure for six nitro-containing drugs in chicken tissues at low ppb level. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 567-569.
- 5821 Rao, G.R., Murty S.S.N., Raju, I.R.K. and Srivastava, C.M.R.: High performance liquid chromatographic determination of sulfalene with pyrimethamine or trimethoprim. *Indian Drugs*, 26 (1989) 176-180; *C.A.*, 111 (1989) 12597y.
- 5822 Shimooka, K., Ito, M., Matsumoto, K., Niimi, H., Matsunaga, T. and Kawasaki, K.: (Sensitive HPLC-amperometric and microbiological assays for determining sulbactam in serum. *Chemotherapy (Suppl. 8)*, 36 (1988) 81-89; *C.A.*, 111 (1989) 17039c.
- 5823 Vohra, R.M. and Dube, S.: Identification and quantitation of rifamycins by reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 477 (1989) 463-466.
- 5824 Wojtowicz, E.J.: Reverse-phase liquid chromatographic determination of clioquinol in cream and ointment preparations: collaborative study. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 562-563.

For additional information see:  
*C.A.*, 111 (1989) 106z.

See also 5697, 5707, 5829, 5854.

### 32f. Cytostatics

- 5825 Ames, M.M. and Mathiesen, D.A.: High-performance liquid chromatographic assay and preclinical pharmacologic studies with the experimental antitumor agent batracyclin. *J. Chromatogr.*, 491 (1989) 488-497.
- 5826 Bierman, J.A.C., Lingeman, H., Reeuwijk, H.J.E.M., de Bruijn, E.A., Tjaden, U.R. and van der Greef, J.: Reversed-phase ion-pair analysis of 5-fluorouracil in pig bile, liver homogenate, plasma and urine after administration by isolated liver perfusion. *J. Pharm. Biomed. Anal.*, 7 (1989) 611-617.

- 5827 Cummings, J., Double, J.A., Bibby, M.C., Farmer, P., Evans, S., Kerr, D.J., Kaye, S.B. and Smyth, J.F.: Characterization of the major metabolites of flavone acetic acid and comparison of their disposition in humans and mice. *Cancer Res.*, 49 (1989) 3587-3593.
- 5828 Kindberg, C.G., Slavik, M., Riley, C.M. and Stobaugh, J.F.: High-performance liquid chromatography of 5-fluorouracil after derivatization with 4-bromomethyl-7-methoxycoumarin. Characterization of the derivative and the use of column switching for the improvement of resolution and the enhancement of sensitivity. *J. Pharm. Biomed. Anal.*, 7 (1989) 459-469.
- 5829 Kupferschmidt, R. and Schmid, R.W.: Specific routine determination of 3'-azido-3'-deoxythymidine (AZT) in plasma by partly automated liquid chromatography. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1313-1317.
- 5830 Palmisano, F., Guerrieri, A., Zambonin, P.G. and Cataldi, T.R.I.: Determination of methotrexate in untreated body fluids by micellar liquid chromatography. *Anal. Chem.*, 61 (1989) 946-950.
- 5831 Urasa, I.T., Lewis, V.D., DeZwaan, J. and Northcott, S.E.: Characterization and purity determination of trans( $\pm$ )1,2-diaminocyclohexane platinum(IV) tetrachloride using liquid chromatography with a platinum selective detector. *Anal. Lett.*, 22 (1989) 597-619.
- 5832 Wang, L.-M., Woodward, C.N., White, J.C. and Capizzi, R.L.: Determination of  $^3\text{H}$ -labelled cytosine arabinoside and eight metabolites in cell extracts by high-performance liquid chromatography and scintillation spectrometry. *J. Chromatogr.*, 491 (1989) 331-340.

See also 5179, 5642, 5696, 5705.

### 32g. Other drug categories

- 5833 Andersson, S., Hedsten, U. and Jacobsson, S.: Quantitation of polydimethylsiloxane in pharmaceutical formulations by gel permeation chromatography. *J. Chromatogr.*, 477 (1989) 474-476.
- 5834 Brownam, G.P., Arnold, A., Booker, L., Johnstone, B., Skingley, P. and Levine, M.N.: Etrretinate blood levels in monitoring of compliance and contamination in a chemoprevention trial. *J. Natl. Cancer Inst.*, 81 (1989) 795-798; *C.A.*, 111 (1989) 33029e.
- 5835 De Vries, J. and Völker, U.: Separation of the enantiomers of phenprocoumon and warfarin by high-performance liquid chromatography using a chiral stationary phase. Determination of the enantiomeric ratio of phenprocoumon in human plasma and urine. *J. Chromatogr.*, 493 (1989) 149-156.
- 5836 Igaki, A., Kobayashi, K., Kimura, M., Sakoguchi, T. and Matsuoka, A.: Determination of serum sulphonylureas by high-performance liquid chromatography with fluorimetric detection. *J. Chromatogr.*, 493 (1989) 222-229.
- 5837 Kitada, Y., Sasaki, M., Yamazoe, Y. and Nakazawa, H.: Simultaneous determination of stevioside, rebaudioside A and C and dulcoside A in foods by high-performance liquid chromatography. *J. Chromatogr.*, 474 (1989) 447-451.
- 5838 Matlin, S.A. and Wu, Z.Y.: Anti-hormonal agents. V. HPLC of anordrin. *J. Liq. Chromatogr.*, 12 (1989) 1095-1100.
- 5839 Sadana, G.S. and Gaonkar, M.V.: Quantitative high performance liquid chromatographic determination of chlorpropamide in pharmaceutical dosage forms. *Indian Drugs*, 26 (1989) 180-184; *C.A.*, 111 (1989) 12598z.
- 5840 Smith, V.J., Green, R.A. and Hopkins, T.R.: Determination of aspartame in beverages using an alcohol oxidase enzyme electrode. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 30-33.
- 5841 Tu, Y.H., Allen, L.V., Jr. and Wang, D.P.: Stability of loperamide hydrochloride in aqueous solutions as determined by high-performance liquid chromatography. *Int. J. Pharm.*, 51 (1989) 157-160; *C.A.*, 110 (1989) 237023n.

See also 5270, 5697, 5698, 5704, 5707, 5709, 5710, 5713, 5739, 5817, 5854, 5866.

### 32h. Toxicological and forensic applications

- 5842 Bakale, G.: Carcinogen/mutagen detector for HPLC. *Report 1987*, Order No. PB89-130751, 12 pp.; *C.A.*, 111 (1989) 51803g.
- 5843 Benedek, C. and Rivier, L.: Evidence for the presence of tetrodotoxin in a powder used in Haiti for zombification. *Toxicol.*, 27 (1989) 473-480; *C.A.*, 111 (1989) 34743v.

- 5844 Hayashida, M., Nihiro, M., Watanabe, T., Suzuki, S. and Yamamoto, Y.: (Simultaneous HPLC analysis of toxicologically important drugs by means of a multiwavelength UV detector). *Jpn. J. Toxicol.*, 2 (1989) 49-60; *C.A.*, 111 (1989) 34737w.
- 5845 Liu, H.-F., Leroy, P., Nicolas, A., Magdalou, J. and Siest, G.: Evaluation of a versatile reversed-phase high-performance liquid chromatographic system using cethexonium bromide as ion-pairing reagent for the analysis of glucuronic acid conjugates. *J. Chromatogr.*, 493 (1989) 137-147.
- 5846 Rona, K. and Gachalyi, B.: Drug oxidator phenotyping by liquid chromatography: a review. *J. Liq. Chromatogr.*, 12 (1989) 1111-1130.
- 5847 Sood, S.P., Green, V.I. and Nieva, L.L.: Routine methods in toxicology and therapeutic drug monitoring by HPLC. VI: A rapid microscale method for determination of caffeine in plasma and saliva. *Ther. Drug Monit.*, 11 (1989) 361-364; *C.A.*, 111 (1989) 93t.
- 5848 Vovk, V.A. and Uchakina, N.A.: (Isolation of *Pseudomonas aeruginosa* exotoxin A by the method of affinity chromatography with the use of specific antibodies). *Zh. Mikrobiol., Epidemiol. Immunobiol.*, (1989) 64-68; *C.A.*, 111 (1989) 34753y.

See also 5798, 5880.

### 32i. Plant extracts

- 5849 Hashimoto, Y.: New microchemistry of plant components - histochemistry and enflourage chromatography. *J. Nat. Prod.*, 52 (1989) 441-462; *C.A.*, 111 (1989) 53473y - a review with 23 refs.
- 5850 Henry, M., Pauthe-Dayde, D. and Rochd, M.: Extraction and high-performance liquid chromatographic determination of gypsogenin 2,0-glucuronide. *J. Chromatogr.*, 477 (1989) 413-419.
- 5851 Iyer, K., Bhanu, M.N., Sujatha, S. and Vasudevan, T.N.: Rapid chromatographic technique for the preparative separation of natural products. *Indian Drugs*, 26 (1989) 153-154; *C.A.*, 111 (1989) 12388f.
- 5852 Kashiwada, Y., Nonaka, G.-i. and Nishioka, I.: Studies on rhubarb (*Rhei rhizoma*). XV. Simultaneous determination of phenolic constituents by high-performance liquid chromatography. *Chem. Pharm. Bull.*, 37 (1989) 999-1004.
- 5853 Tun, L., Wenzao, L. and Guoshi, T.: Separation and determination of 8 $\beta$ -hydroxy-asterolid and perlolyrine in *Codonopsis pilosula* by reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 477 (1989) 458-462.

For additional information see:  
*C.A.*, 111 (1989) 6019v.

See also 5122, 5205, 5837.

## 33. CLINICO-CHEMICAL APPLICATIONS

### 33a. General papers and reviews

- 5854 Nissen, H.-P. and Kreysel, H.W.: HPLC-methods in the clinical-chemical laboratory of the department of dermatology of the university of Bonn. *Chromatographia*, 28 (1989) 49-58 - a review with 206 refs.

See also 5879.

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

- 5855 Werner, A., Grune, T., Siems, W., Schneider, W., Shimasaki, H., Esterbauer, H. and Gerger, G.: Nucleotide and aldehyde analysis by HPLC for determination of radical induced damage. *Chromatographia*, 28 (1989) 65-68.

For additional information see:  
*C.A.*, 111 (1989) 20292k.

See also 5159, 5228, 5244, 5245, 5282, 5288, 5289, 5291, 5293, 5307, 5310, 5314, 5327, 5433, 5472, 5475, 5504, 5533, 5568, 5578, 5630, 5655, 5656, 5658, 5660, 5704.

## 34. FOOD ANALYSIS

34a. *General papers and reviews*

- 5856 Hagenauer-Hener, U., Hener, U., Dettmar, F. and Mosandl, A.: LiChrospher® 60 RP-select B in der HPLC-Analytik von Lebensmitteln. *Kontakte (Darmstadt)*, No. 1 (1989) 24-29.
- 5857 Simonella, A., Filipponi, C., Torretti, L. and D'Aurizio, V.: (HPLC procedures in feed analysis). *Lab. 2000*, 2 (1988) 26-28; *C.A.*, 111 (1989) 6009s.

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

- 5858 Adensam, L., Lebedova, H., Pavlosek, J. and Turek, B.: (Determination of patulin in apple-based baby foods using HPLC). *Prum. Potravin*, 40 (1989) 127-128; *C.A.*, 111 (1989) 55952c.
- 5859 De Pooter, H.L. and Schamp, N.M.: The study of aroma formation and ripening of apples Golden Delicious by headspace analysis. *J. Essent. Oil Res.*, 1 (1989) 47-56; *C.A.*, 111 (1989) 38191m.
- 5860 Hollman, P.C.H., de Jong, W.J.H.J., Venema, D.P., van Oostrom, S. and Herstel, H.: Detection of water-binding additives in canned mushrooms. *Z. Lebensm.-Unters. Forsch.*, 188 (1989) 337-342; *C.A.*, 111 (1989) 38208x.
- 5861 Lazaro, M.J., Carbonell, E., Aristoy, M.C., safon, J. and Rodrigo, M.: Liquid chromatographic determination of acids and sugars in homolactic cucumber fermentations. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 52-55.

For additional information see:

*C.A.*, 111 (1989) 6000g.

See also 5092, 5138, 5146, 5147, 5149, 5211, 5227, 5230, 5326, 5331, 5335, 5654, 5671, 5678, 5680, 5683, 5689, 5692, 5701, 5751, 5837, 5840, 5889.

## 35. ENVIRONMENTAL ANALYSIS

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

- 5862 Zhou, S., Ren, G. and Yu, S.: Separation and determination of organics in air particulate matters using a new technique, low-volume liquid chromatography. *Atmos. Environ.* 1988, 23 (1989) 863-867; *C.A.*, 111 (1989) 11823g.

See also 5135, 5894.

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

- 5863 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.

See also 5065, 5128, 5876.

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

See 5128.

## 36. SOME TECHNICAL PRODUCTS AND COMPLEX MIXTURES

36a. *Surfactants*

- 5864 Dowle, J.C., Campbell, W.C. and Cooksey, B.G.: Separation of cationic surfactant homologues by high performance liquid chromatography. *Analyst (London)*, 114 (1989) 883-885.
- 5865 Tsubone, K., Uchida, N., Niwase, H. and Honda, K.: Syntheses of sodium 2-(N-alkyl-N-methylamino)ethanephosphates and their physicochemical properties. *J. Am. Oil Chem. Soc.*, 66 (1989) 829-833.

36b. *Antioxidants and preservatives*

- 5866 Analysis of preservatives in cosmetics - methyl-isothiazolones. *Chromatographia*, 28 (1989) 34-38.

For additional information see:  
*C.A.*, 111 (1989) 6007q.

See also 5856.

36c. *Various technical products*

- 5867 Sliwka, E. and Surygala, J.: (Use of liquid chromatography for studying chemical structure of low-temperature coal tars). *Chem. Anal. (Warsaw)*, 33 (1988) 343-351; *C.A.*, 110 (1989) 234427m.

For additional information see:  
*C.A.*, 110 (1989) 234294r, 236304t.

36d. *Complex mixtures and unidentified compounds*

- 5868 Azuma, J. and Tetsuo, K.: Lignin-carbohydrate complexes from various sources. *Methods Enzymol.*, 161 (Biomass, Pt. B) (1988) 12-18; *C.A.*, 111 (1989) 3674u.
- 5869 Goto, A., Yamada, K., Ishii, M., Yoshioka, M., Ishiguro, T., Eguchi, C. and Sugimoto, T.: Existence of a polar digitalis-like factor in mammalian hypothalamus. *Biochem. Biophys. Res. Commun.*, 161 (1989) 953-958.
- 5870 Hessefort, N., Hedstrom, M. and Greive, W.: Characterization of phenolic-modified oils using size-exclusion chromatography and a diode-array detector. *LC-GC*, 7 (1989) 130-136; *C.A.*, 110 (1989) 232388a.
- 5871 Sugiura, M., Inagami, T. and Kon, V.: Endotoxin stimulates endothelin-release *in vivo* and *in vitro* as determined by radioimmunoassay. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1220-1227.
- 5872 Wolff, S.D., Yancey, P.H., Stanton, T.S. and Balaban, R.S.: A simple HPLC method for quantitating major organic solutes of renal medulla. *Am. J. Physiol.*, 256 (1989) F954-F956; *C.A.*, 111 (1989) 36046u.

See also 5859.

## 37. CELLS, CELLULAR PARTICLES AND SUPRAMOLECULAR STRUCTURES

- 5873 Panoff, J.M. and Joset, F.: Selection by anion-exchange chromatography of exopolysaccharide mutants of the cyanobacterium *Synechocystis* strain PCC 6803. *Appl. Environ. Microbiol.*, 55 (1989) 1452-1456; *C.A.*, 111 (1989) 53539z.
- 5874 Salter, J.E., Timperi, R.J., Hennigan, L.J., Sefton, L. and Reece, H.: Comparison evaluation of liquid chromatographic and bioassay methods of analysis for determination of paralytic shellfish poisons in shellfish tissues. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 670-673.

## 38. INORGANIC COMPOUNDS

## 38a. Cations

- 5875 Aelvoet, C. and Hanocq, M.: (A new HPLC determination of selenium traces in biological media with amperometric detection). *Analisis*, 17 (1989) 131-135; *C.A.*, 111 (1989) 3516u.
- 5876 Catoggio, J.A. and Porta, A.A.: Concentration of differently charged heavy metals species from natural waters. *J. High Resolut. Chromatogr.*, 12 (1989) 495-497.
- 5877 Cews, M.H., Dean, J.R., Ebdon, L. and Massey, R.C.: Application of high performance liquid chromatography-inductively coupled plasma mass spectrometry to the investigation of cadmium speciation in pig kidney following cooking and *in vitro* gastro-intestinal digestion. *Analyst (London)*, 114 (1989) 895-899.
- 5878 Fernandez, F., Marina, M.L. and Ridriguez, A.R.: Separation of metal ions by reversed-phase high performance liquid chromatography using *in situ* complexation. Application to determination of Fe(III) and Fe(II) as *o*-phenanthroline complexes. *J. Liq. Chromatogr.*, 12 (1989) 1253-1260.
- 5879 Hayashi, K. and Umemoto, M.: Analysis of negative ions in blood by ion chromatography. *Kensa To Gijutsu*, 17 (1989) 135-140; *C.A.*, 111 (1989) 53457w - a review with 10 refs.
- 5880 Heitkemper, D., Creed, J., Caruso, J. and Fricke, F.L.: Speciation of arsenic in urine HPLC with inductively coupled plasma mass spectrometric detection. *J. Anal. At. Spectrom.*, 4 (1989) 279-284; *C.A.*, 111 (1989) 2223j.
- 5881 Khalifa, S.M., El-Alfy, M.S. and Zakareia, N.: Separation and determination of zirconium and hafnium in uranium matrix. *Radioanal. Nucl. Chem.*, 125 (1988) 11-17; *C.A.*, 111 (1989) 16808r.
- 5882 Okada, T., Miyakoshi, M. and Inoue, M.: Adsorbability to and desorbability from Sephadex G-15 of sodium and phosphate ions. *J. Chromatogr.*, 475 (1989) 412-415.
- 5883 Tackett, J.E.: Characterization of chromium(III) acetate in aqueous solution. *Appl. Spectrosc.*, 43 (1989) 490-499; *C.A.*, 110 (1989) 239381b.
- 5884 Yan, D., Zhang, J. and Schwedt, G.: Ion-chromatographic trace analysis of mercury, cadmium and zinc by post-column derivatisation with a water-soluble porphyrin. *Fresenius' Z. Anal. Chem.*, 334 (1989) 507-510.

For additional information see:

*C.A.*, 110 (1989) 241728p, 241814p.

See also 5076, 5427, 5673, 5674, 5676.

## 38b. Anions

- 5885 Bruins, J. and Maurer, W.: Zur direkten Bestimmung von Jodidspuren mittels Ionen-chromatographie in Wässern mit hohem Salzgehalt. *Fresenius' Z. Anal. Chem.*, 334 (1989) 122-125.
- 5886 Cruz, L.A. and Jenke, D.R.: Evaluation of assay specificity in non-suppressed ion chromatography. *J. Chromatogr.*, 477 (1989) 271-276.
- 5887 Daignault, L.G., Rillema, D., Shaver, R., Jackman, D. and Burke, J.W.: Retention behavior of nitrate ion on high performance ion chromatography columns. *J. High Resolut. Chromatogr.*, 12 (1989) 476-478.
- 5888 Dudley, L.M.: Determination of borate in extracts of gypsiferous soils by single-column ion chromatography. *Commun. Soil Sci. Plant Anal.*, 20 (1989) 483-499; *C.A.*, 111 (1989) 22583e.
- 5889 Grunau, J.A. and Swiader, J.M.: Ion chromatography in nutrient depletion studies: measurement of very low nitrate concentrations. *Commun. Soil Sci. Plant Anal.*, 20 (1989) 721; *C.A.*, 111 (1989) 56346v.
- 5890 Maiti, B., Walvekar, A.P. and Krishnamoorthy, T.S.: Separation and determination of inorganic anions by high-performance liquid chromatography using micellar mobile phase. *Analyst (London)*, 114 (1989) 731-733.
- 5891 Mehra, H.C. and Frankenberger, W.T., Jr.: Determination of trace of molybdate in soil by ion chromatography. *Analyst (London)*, 114 (1989) 707-710.
- 5892 Pastore, P., Lavagnini, I., Boaretto, A. and Magno, F.: Ion chromatographic determination of nitrite in the presence of a large amount of chloride. *J. Chromatogr.*, 475 (1989) 331-341.

5893 Steudel, R., Holdt, G. and Göbel, T.: Ion-pair chromatographic separation of inorganic sulphur anions including polysulphide. *J. Chromatogr.*, 475 (1989) 442-446.

For additional information see:  
*C.A.*, 111 (1989) 16789k, 22655e.

See also 5065, 5076, 5882.

*38c. Permanent and rare gases*

For additional information see:  
*C.A.*, 111 (1989) 9721d.

*38d. Volatile inorganic compounds*

5894 Possanzini, M. and Di Palo, V.: Determination of atmospheric ammonia as *m*-toluamide by denuder sampling and HPLC-UV detection. *Chromatographia*, 28 (1989) 27-30.

#### 39. RADIOACTIVE AND OTHER ISOTOPE COMPOUNDS

See 5126, 5318, 5427, 5799, 5832, 5881.



## Gas Chromatography

### 1. REVIEWS AND BOOKS

- 2518 Kaljurand, M. and Kullik, E.: *Computerized Multiple Input Chromatography*. E. Horwood, Chichester, 1989, 226 p.
- 2519 Ravindranath, B.: *Principles and Practice of Chromatography*. E. Horwood, Chichester, 1989, 502 p.
- See also 2525, 2551, 2572, 2583, 2584, 2585, 2591, 2612, 2616, 2622, 2632, 2634, 2645, 2713, 2727, 2729, 2788, 2863, 2864.

### 2. FUNDAMENTALS, THEORY AND GENERAL

#### 2a. General

- 2520 Petrishchev, S.D. and Sakodynskii, K.I.: Mathematical modelling of peak shapes taking into account mass-exchange kinetics in the case of linear gas-liquid chromatography. *Zh. Fiz. Khim.*, 62 (1988) 2147-2151.
- 2521 Sobolev, D.M., Sharikov, Yu.V. and Selekova, G.B.: (Application of regression models for calculation of chromatograms with overlapping peaks). *Zh. Anal. Khim.*, 44 (1989) 1266-1273.

#### 2b. Thermodynamics and theoretical relationships

- 2522 Grigor'eva, D.N., Golovnya, R.V. and Vasil'ev, A.V.: (Unusual variations of free sorption energy of methylene unit in homologous substances). *Zh. Anal. Khim.*, 44 (1989) 1274-1280.
- 2523 Hsiu Su Lan, Kawaki, H., Yokoyama, K., Takai, H. and Sasaki, Y.: Availability of substituent entropy constants  $\sigma_{20}$  and descriptor  $\mu^2/\alpha$  as predictors of relative retention values in gas-liquid chromatography of substituted propane and butane derivatives. *Chem. Pharm. Bull.*, 36 (1988) 4474-4477; *C.A.*, 111 (1989) 16931a.

#### 2c. Relationship between structure and chromatographic behaviour

- 2524 Belyaev, N.F., Vigderbauz, M.S. and Dmitrieva, G.V.: (Alternation of chromatographic properties of liquid crystal azoxy esters). *Izv. Akad. Nauk SSSR, Ser. Khim.*, (1989) 1402-1404.
- 2525 Khorasheh, F., Gray, M.R. and Selucky, M.L.: Methods for prediction of Kovats retention indices of hydrocarbons. *J. Microcolumn Sep.*, 1 (1989) 174-181 - a review with 49 refs.
- 2526 Lirvinenko, G.S., Isakova, L.A. and Rubanyuk, N.N.: (Quantitative correlation between the structure of stereoisomeric saturated cyclic compounds and gas chromatographic retention indexes. I. Methyl derivatives). *Izv. Akad. Nauk Kaz. SSR, Ser. Khim.*, No. 5 (1988) 54-66; *C.A.*, 111 (1989) 6610f.
- 2527 Szymanowski, J., Kusz, P. and Szewczyk, H.: Increments of the arithmetic retention index for polyoxyethylene glycol monoalkyl ethers and their degradation products. *J. Chromatogr.*, 477 (1989) 407-412.
- 2528 Zhang Shuzhong, Zhao Guoliang and Wang Guoyong: (Correlation of structure parameters and retention behavior in gas chromatography). *Dalian Gongxueyuan Xuebao*, 27 (1988) 133-136; *C.A.*, 111 (1989) 32900v.

See also 2522, 2572, 2639, 2640, 2647, 2670, 2708.

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

- 2529 Agathonos, P. and Karaiskakis, G.: Measurement of activity coefficients, mass-transfer coefficients and diffusion coefficients in multicomponent liquid mixtures by reversed-flow gas chromatography. *J. Chem. Soc., Faraday Trans. 1*, 85 (1989) 1357-1363; *C.A.*, 111 (1989) 13223k.
- 2530 Anthony, L.J. and Holland, R.A.: New method for surface characterization by gas chromatography. *J. Chromatogr.*, 477 (1989) 291-304.
- 2531 Azandegbe, E.C.: Determination des enthalpies de vaporisation ou de sublimation de substances organiques par la technique combinee de calorimetrie et de chromatographie gaz-liquide. *Analisis*, 17 (1989) 285-289.
- 2532 Coca, J., Rodriguez, J.L., Medina, I. and Langer, S.H.: Thermodynamic properties of some organic compounds with tetrachloroterephthaloyl oligomers by gas chromatography. *J. Chem. Eng. Data*, 34 (1989) 280-284; *C.A.*, 111 (1989) 29145x.
- 2533 Dvorak, B., Hudec, A. and Pasek, J.: Measurement of specific copper surface area by a pulse chromatographic techniques. *Coll. Czech. Chem. Commun.*, 54 (1989) 1514-1529.
- 2534 Guitart, R., Puigdemont, A. and Arboix, M.: Rapid headspace gas chromatographic method for the determination of liquid/gas partition coefficients. *J. Chromatogr.*, 491 (1989) 271-280.
- 2535 Jönsson, J.A., Lövkuist, P.: Calculation of adsorption isotherms from chromatographic peak shapes. *Chemometrics Intel. Lab. Systems*, 5 (1989) 303-310.
- 2536 Revel'skii, I.A., Sokolov, S.V., Yashin, Yu.S., Volodin, V.N., Kurochkin, V.K. and Kostyanovskii, R.G.: (Determination of molecular formula of microcomponents of mixtures by combination of chromatography, mass spectrometry and plasma spectroscopy). *Izv. Akad. Nauk SSSR, Ser. Khim.*, (1989) 1449.
- 2537 Treiner, C., Khodja, A.A., Fromon, M. and Chevalet, J.: Effect of sodium salicylate and other electrolytes on the partition of 1-pentanol between sodium dodecylsulfate micelles and water: a gas-chromatographic study. *J. Solution Chem.*, 18 (1989) 217-228; *C.A.*, 111 (1989) 12845c.
- 2538 Yamanishi, T. and Kudo, H.: Adsorption equilibrium of hydrogen isotopes on alumina adsorbents for gas-solid chromatography. *J. Chromatogr.*, 475 (1989) 125-134.

See also 2549, 2566, 2738, 2739, 2748, 2874.

## 3. GENERAL TECHNIQUES

## 3a. Apparatus and accessories

- 2539 Grob, K., Jr. and Li Zhangwan: Introduction of water and water-containing solvent mixtures in capillary gas chromatography. I. Failure to produce water-wettable precolumns (retention gaps). *J. Chromatogr.*, 473 (1989) 381-390.
- 2540 Grob, K., Jr. and Li Zhangwan: Introduction of water and water-containing solvent mixtures in capillary gas chromatography. II. Wettability of precolumns by mixtures of organic solvents and water; retention gap techniques. *J. Chromatogr.*, 473 (1989) 391-400.
- 2541 Grob, K., Jr. and Müller, E.: Introduction of water and containing solvent mixtures in capillary gas chromatography. IV. Principles of concurrent solvent evaporation with cosolvent trapping. *J. Chromatogr.*, 473 (1989) 411-422.
- 2542 Grob, K., Jr., Neukom, H. and Li Zhangwan: Introduction of water and water-containing solvent mixtures in capillary gas chromatography. III. Water-resistant deactivation of uncoated precolumns? *J. Chromatogr.*, 473 (1989) 401-409.
- 2543 Herraiz, M., Reglero, G. and Herraiz, T.: Evaluation of a PTV injector for quantitative analysis of volatile compounds at low concentrations. *J. High Resolut. Chromatogr.*, 12 (1989) 442-446.
- 2544 Kocian, V. and Vojtek, J.: (Device for determination of trace amounts of hydrocarbon in gas mixture by means of thermal conductivity and flame ionization detectors). *Czech. Pat.* CS 251,007 (Cl. G01N30/68), 11 Sep. 1988, Appl. 84/2,728, 10 Apr. 1984; 8 pp.; *C.A.*, 111 (1989) 9373s.

- 2545 Mitra, S.: Development of techniques using thermal desorption modulators for gas chromatography and their applications in hydrodesulfurization studies. Avail. *Diss. Abstr. Int. B*, 49 (1989) 4274; *Univ. Microfilms*, Order No. DA8817241 (1987), 158 pp.; *C.A.*, 111 (1989) 42575g.
- 2546 Müller, F., Müller, H. and Straub, H.: Dossier- und Trennsäulenschaltssysteme für die hochauflösende Gasanalytik. *J. Chromatogr.*, 477 (1989) 25-38.
- 2547 Orlick, H. and Kuschel, D.: (Solid-state welding of assemblies for gas chromatographs). *ZIS Mitt.*, 31 (1989) 39-45; *C.A.*, 111 (1989) 49633h.
- 2548 Pinchugov, V.N., Buchneva, N.N. and Khachatryan, S.G.: (Automatic industrial chromatograph for determination of the loss of BTX hydrocarbons). *Koks Khim.*, No. 4 (1989) 43-46; *C.A.*, 111 (1989) 26062g.
- 2549 Remelli, M., Blo, G., Dondi, F., Vidal-Madjar, M.C. and Guiochon, G.: Fluidic and syringe injection study by peak shape analysis. *Anal. Chem.*, 61 (1989) 1489-1493.
- 2550 Roberts, D. and Bertsch, W.: Practical aspects of recycle gas chromatography with capillary columns. *J. Chromatogr.*, 477 (1989) 59-62.
- 2551 Yashin, Ya.I.: (Chromatographic equipments from NPO Khimavtomatika). *Zav. Lab.*, No. 6 (1989) 14-17.

See also 2530, 2587, 2589, 2593, 2595, 2597, 2602, 2627, 2631, 2854.

### 3b. Detectors and detection reagents

- 2552 Bradter, M., Buscher, W., Faust, M., Winter, F. and Cammann, K.: (The plasma emission detector (PED) as an element-selective detector for high-resolution capillary gas chromatography). *GIT Fachz. Lab.*, 33, No. 3 (1989) 166-169; *C.A.*, 111 (1989) 16912v.
- 2553 Butakov, A.A.: Cause and mechanism of the formation of anomalous thermal-conductivity detector signals during chromatographic determination of hydrogen using helium as the carrier gas. *Zh. Fiz. Khim.*, 62 (1988) 1069-1071.
- 2554 Goode, S.R. and Kimbrough, L.K.: The influence of the optical viewing axis on the performance of the microwave-induced plasma GC (gas chromatography) detector. *Appl. Spectrosc.*, 42 (1988) 1011-1015.
- 2555 Guibault, L.F., Hohmann, R. and Wehry, E.L.: Gas chromatographic detection by electron impact-induced fluorescence spectrometry of molecular fragments. *J. Chromatogr.*, 475 (1989) 237-245.
- 2556 Popp, P., Beutel, C., Oppermann, G., Baer, H., Ortlieb, H.J. and Keibelmann, L.: (Electron-capture detector for gas chromatographs). *Ger. (East) Pat.* DD 263,356 (Cl. G01N30/70), 28 Dec. 1988, Appl. 306,066, 17 Aug. 1987; 4 pp.; *C.A.*, 111 (1989) 49687d.
- 2557 Rasulev, U.K., Nazarov, E.G., Sidel'nikov, V.O., Evtukhov, R.N., Alimkhodzhaev, S.S., Tashpulatov, B.M. and Khudaeva, G.B.: (Method and apparatus for analysis of organic compounds by means of chromatography with surface ionization detector). *Ger. Pat. Offen.* DE 3,835,081 (Cl. G01N30/62), 27 Apr. 1989, SU Appl. 4,313,898, 16 Oct. 1987; 12 pp.; *C.A.*, 111 (1989) 32944n.
- 2558 Wu Een Teng and Ou Wei Hsiung: Adaptive PID control with an adjustable identification interval. *Chem. Eng. Commun.*, 77 (1989) 183-194; *C.A.*, 110 (1989) 156990y.

See also 2544, 2588, 2590, 2598, 2600, 2622, 2632, 2712, 2721, 2722, 2752, 2769, 2904.

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

- 2559 Alioshev, V.R., Berezkin, V.G., Itsikson, L.B. and Shukurova, K.N.: (Possible increasing of maximal working temperature of inland polysiloxane stationary liquid phases). *Zav. Lab.*, No. 7 (1989) 21-23.
- 2560 Basso, M.A., dos Santos, M.J.T.F., Collins, K.E. and Collins, C.H.:  $\gamma$ -Immobilized SE 30 on Chromosorb supports for use in packed-column gas chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 500-502.
- 2561 Bystricky, L.: (Method for preparation for a silicone-type immobilized stationary phase modified with nitrogen bases for gas chromatographs). *Czech. Pat.* CS 257,478 (Cl. G01N30/04), 15 Feb. 1989, Appl. 86/4,313, 11 Jun. 1986; 3 pp.; *C.A.*, 111 (1989) 49688e.

- 2562 Cartoni, G.P., Goretti, G., Neri, B. and Russo, M.V.: Evaluation of small diameter capillary columns for gas chromatography. *J. Chromatogr.*, 475 (1989) 145-151.
- 2563 Dai Renci, Li Shengqiang, Hu Jiazeng, Hu Lizhi, Tang Yingyu and Lin Bingzhen: (Preparation of gas chromatographic stationary phase coated with alumina thin layer using r.f. sputtering). *Ranliao Huaxue Xuebao*, 16 (1988) 333-336; *C.A.*, 111 (1989) 9393y.
- 2564 Dement'eva, N.N.: (Effect of the nature of a stationary liquid phase on gas-chromatographic analysis of some alkaloids, barbiturates, and anesthetics). *Nauch. Tr. VNII Farmats.*, No. 26 (1988) 67-76; *C.A.*, 111 (1989) 45425u.
- 2565 Fuggerth, E.: Zone gas chromatography. *Anal. Chem.*, 61 (1989) 1478-1485.
- 2566 Golovnya, R.V. and Polanuer, B.M.: Thermodynamic evaluation of the intermolecular interactions of potassium fluoride crystal dihydrate in gas chromatography. *Chromatographia*, 28 (1989) 179-182.
- 2567 Gumerov, M.F., Rodinkov, O.V., Moskvin, L.N. and Gorshkov, A.I.: Effect of stationary gas-phase supports on liquid-gas partition chromatography. *Zh. Fiz. Khim.*, 62 (1988) 2249-2251.
- 2568 Hetem, M., Rutten, G., Vermeer, B., Rijks, J., van de Ven, L., de Haan, J. and Cramers, C.: Deactivation with polymerhyldrogsiloxane. A comparative study with capillary gas chromatography and solid-state <sup>29</sup>Si nuclear magnetic resonance spectroscopy. *J. Chromatogr.*, 477 (1989) 3-24.
- 2569 Langhorst, M.L.: Multicapillary gas chromatography column. *U.S. Pat. US 4,818,264* (Cl.65-4.3; C03B23/20), 4 Apr. 1989, Appl. 44,396, 30 Apr. 1987; 4 pp.; *C.A.*, 111 (1989) 16967s.
- 2570 Liu Howei, Zhang Aiqing, Jin Yonghao and Fu Ruonong: A new method for *in situ* crosslinking of stationary phases on fused silica capillary columns. *J. High Resolut. Chromatogr.*, 12 (1989) 537-539.
- 2571 Nawrocki, J. and Aue, W.A.: Synthesis of bonded layers from cyclic organo-silicones in the gas phase. *J. Chromatogr.*, 456 (1988) 337-345.
- 2572 Price, G.J.: The use and properties of mixed stationary phases in gas chromatography. *Adv. Chromatogr. (N.Y.)*, 28 (1989) 113-163; *C.A.*, 111 (1989) 12808t.
- 2573 Sandra, P., David, F., Turner, K.A., McNair, H.M. and Brownstein, A.D.: Observations with high-molecular-weight polyethylene glycol stationary phases in capillary gas chromatography. I. Adsorption *versus* partitioning chromatography. *J. Chromatogr.*, 477 (1989) 63-71.
- 2574 Sidisky, L.M., Nolan, L., Stormer, P.L., Shirey, R.E. and Bartram, R.J.: A bonded acidic capillary column for analyses for volatile free fatty acids. *Am. Lab. (Fairfield)*, 20 (1988) 100-105.
- 2575 Van Es, A., Rijks, J. and Cramers, C.: Turbulent flow in capillary gas chromatography. *J. Chromatogr.*, 477 (1989) 39-47.
- 2576 Viktorova, E.N., Berezkin, V.G., Garrichev, V.S., Slivinskii, E.V. and Vytnova, L.A.: (Selective chromatographic separation of organic compounds in water vapour on inorganic salt sorbents). *Zav. Lab.*, No. 5 (1989) 17-21.
- 2577 Yin, H.F., Huang, A.J. and Sun, Y.L.: Practical aspects of the temperature dependence of the activity of uncoated and coated fused-silica column in gas chromatography. *Chromatographia*, 25 (1988) 899-902.
- See also 2524, 2539, 2540, 2541, 2542, 2549, 2550, 2595, 2602, 2616, 2617, 2619, 2620, 2624, 2625, 2626, 2628, 2630, 2633, 2636, 2641, 2670.

### 3d. Quantitative analysis

- 2578 Vigdergauz, A.S. and Krauze, I.M.: (Quantitative interpretation of chromatograms using the product of peak height and retention time). *Zh. Anal. Khim.*, 44 (1989) 1080-1084.

See also 2543, 2614, 2786.

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

See 2526.

## 3g. High performance procedures

See 2546.

## 4. SPECIAL TECHNIQUES

## 4a. Automation and computerization

- 2579 Borisenkov, V.I. and Il'in, V.M.: Architecture of an automated system for measurement and processing of chromatographic signals: digital filtering and restoration of data. *Vysokochist. Veshchestva*, No. 5 (1988) 167-171; *C.A.*, 111 (1989) 49626h.
- 2580 Hayashi, Y., Yoshioka, S. and Takeda, Y.: Shannon information retrieved from overlapped chromatographic peaks with Kalman filter. *Anal. Sci.*, 5 (1989) 329-334.
- 2581 Henrion, R., Henrion, G., Michael, G. and Petereit, D.: (Multidimensional analysis of variance, discriminant analysis and classification methods for data evaluation in gas chromatography). *Z. Chem.*, 28 (1988) 315-324; *C.A.*, 111 (1989) 16907x.
- 2582 Mowery, R.A., Jr.: Gas chromatography simulation. *U.S. Pat.* US 4,824,446 (Cl. 55-67; B01D15/08), 25 Apr. 1989, Appl. 196,720, 23 May 1988, 17 pp; *C.A.*, 111 (1989) 49690z.
- 2583 Papas, A.N.: Chromatographic data systems: A critical review. *CRC Crit. Rev. Anal. Chem.*, 20 (1989) 359-404 - a review with 166 refs.
- 2584 Stan, H.J.: Application of computers for the evaluation of gas chromatographic data. *Anal. Methods Pestic. Plant Growth Regul.*, 17 (1989) 167-115; *C.A.*, 111 (1989) 19347a - a review with 23 refs.

See also 2518, 2708.

## 4b. Combination of various chromatographic techniques

- 2585 Blomberg, L.: Comparison of gas, supercritical fluid and liquid as mobile phase for chromatography. *Chim. Oggi*, No. 1/2 (1988) 17-21; *C.A.*, 111 (1989) 49610y - a review with 22 refs.
- 2586 Fujimoto, C., Watanabe, T. and Jinno, K.: Size exclusion chromatography of polystyrenes with supercritical dichloromethane. *J. Chromatogr. Sci.*, 27 (1989) 325-328.
- 2587 Grob, K.: Concurrent eluent evaporation with co-solvent trapping for on-line reversed-phase liquid chromatography-gas chromatography. Optimization of conditions. *J. Chromatogr.*, 477 (1989) 73-86.
- 2588 Malisch, R.: (Diode array detector in HPLC (simultaneous various wavelength detection, UV spectra); ECD and NFID in GC (specificity, derivatization)). *Lebensmittelchem., Lebensmittelqual.*, 13 (1988) 123-158; *C.A.*, 111 (1989) 6005n.
- 2589 Riekkola, M.-L.: Application of on-line coupled liquid chromatography-gas chromatography. *J. Chromatogr.*, 473 (1989) 315-323.

See also 2519, 2535, 2603, 2606, 2612, 2645, 2652, 2659, 2702, 2711, 2733, 2737, 2751, 2763, 2785, 2786, 2794, 2824, 2857, 2885, 2892.

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

- 2590 Bartle, K.D., Raynor, M.W., Clifford, A.A., Davies, I.L., Kithinji, J.P., Shilstone, G.F., Chalmers, J.M. and Cook, B.W.: Capillary supercritical fluid chromatography with Fourier transform infrared detection. *J. Chromatogr. Sci.*, 27 (1989) 283-292.
- 2591 Chen Zuoru, Wang Junde and Lue Yunhua: (Gas chromatography-Fourier transform infrared spectroscopy and its application). *Fenxi Huaxue*, 16 (1988) 84-89; *C.A.*, 111 (1989) 49611z.

- 2592 Cooper, J.R. and Wilkins, C.L.: Utilization of spectrometric information in linked gas chromatography-Fourier transform infrared spectroscopy-mass spectrometry. *Anal. Chem.*, 61 (1989) 1571-1577.
- 2593 Edlund, P.O. and Henion, J.D.: Packed column supercritical fluid chromatography/mass spectrometry via a two-stage momentum separator. *J. Chromatogr. Sci.*, 27 (1989) 274-282.
- 2594 Fehl, A.J. and Marcott, C.: Capillary gas chromatography/Fourier transform infrared spectroscopy using an injector/trap and liquid/liquid extraction. *Anal. Chem.*, 61 (1989) 1596-1598.
- 2595 Goates, S.R., Sin Chung Hang, Simmons, J.K., Markides, K.E., Lee, M.L.: Supercritical fluid chromatography-supersonic jet spectroscopy: II. Capillary column SFC with a sheath-flow nozzle. *J. Microcolumn Sep.*, 1 (1989) 207-211.
- 2596 Gurka, D.F., Franham, I., Potter, B.B., Pyle, S., Titus, R. and Duncan, W.: Quantitation capability of a directly linked gas chromatography/Fourier transform infrared/mass spectrometry system. *Anal. Chem.*, 61 (1989) 1584-1589.
- 2597 Kalinoski, H.T. and Hargiss, L.O.: Design and industrial applications of a removable probe interface for direct capillary supercritical - fluid chromatography-mass spectrometry. *J. Chromatogr.*, 474 (1989) 69-82.
- 2598 Niessen, W.M.A., van der Hoeven, R.A.M., De Kraa, M.A.G., Heeremans, C.E.M., Tjaden, U.R. and van der Greef, J.: Repeller effects in discharge ionization in combined liquid or supercritical-fluid chromatography-mass spectrometry using a thermospray interface. I. Changes in the reagent gas spectrum. *J. Chromatogr.*, 474 (1989) 113-122.
- 2599 Passas, R.P.B. and Stevenson, D.: Comparison of an enzyme method with a capillary GC method for a red blood cell sorbitol assay. *Methodol. Surv. Biochem. Anal.*, 18 (1989) 279-281; *C.A.*, 111 (1989) 3680t.
- 2600 Sabot, J.F., Ribon, B., Kouadio-Kouakou, L.P., Pinatel, H. and Mallein, R.: Comparison of two calculation procedures for gas chromatography-mass spectrometry associated with stable isotope dilution. *Analyst (London)*, 113 (1988) 1843-1847.
- 2601 Sheeley, D.M. and Reinhold, V.N.: Supercritical-fluid chromatography - mass spectrometry of high-molecular-weight biopolymers. Instrumental considerations and recent progress. *J. Chromatogr.*, 474 (1989) 83-96.
- 2602 Simons, J.K., Sin Chung Hang, Zabriskie, N.A., Lee, M.L., Goates, S.R. and Fields, S.M.: Supercritical fluid chromatography-supersonic jet spectroscopy: I. Microcolumns and direct expansions. *J. Microcolumn Sep.*, 1 (1989) 200-206.
- 2603 Verheij, E.R., la Vos, G.F., Niessen, W.M.A., Tjaden, U.R. and van der Greef, J.: Belt-speed programming, a new technique for peak compression in liquid chromatography-mass spectrometry and supercritical-fluid chromatography-mass spectrometry with moving-belt interfaces. *J. Chromatogr.*, 474 (1989) 275-283.
- 2604 Zaikin, V.G., Ivanov, A.V., Kliger, G.A. and Mikaya, A.I.: (Reaction gas chromatography/mass spectrometry. 16. Mass-spectra of chemical ionization of some N-trifluoro-acetylaminines). *Izv. Akad. Nauk SSSR, Ser. Khim.*, (1989) 1526-1530.

See also 2531, 2536, 2555; 2623, 2648, 2650, 2657, 2658, 2666, 2676, 2702, 2727, 2741, 2747, 2784, 2848, 2895, 2907.

#### 4e. Functional analysis

- 2605 Vath, J.E., Zollinger, M. and Biemann, K.: Method for the derivatization of organic compounds at the sub-nanomole level with reagent vapor. *Fresenius' Z. Anal. Chem.*, 331 (1988) 248-252.

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

- 2606 Andersen, M.R., Swanson, J.T., Porter, N.L. and Richter, B.E.: Supercritical fluid extraction as a sample introduction method for chromatography. *J. Chromatogr. Sci.*, 27 (1989) 371-377.
- 2607 Bicchi, C., D'Amato, A., David, F. and Sandra, P.: Direct capture of volatiles emitted by living plants. Part II. *Flavour Fragrance J.*, 3 (1988) 143-153; *C.A.*, 111 (1989) 36038t.

- 2608 Dommroese, A.M. and Figge, K.: (Determination of trace organic substances in gaseous, solid, and liquid samples). *Gewaesserschutz, Wasser, Abwasser*, 105 (1988) 90-108; *C.A.*, 111 (1989) 16948m.
- 2609 Hawthorne, S.B., Miller, D.J. and Krieger, M.S.: Coupled SFE-GC: A rapid and simple technique for extracting, identifying, and quantitating organic analytes from solids and sorbent resins. *J. Chromatogr. Sci.*, 27 (1989) 347-354.
- 2610 Juettner, F.: Quantitative trace analysis of volatile organic compounds. *Methods Enzymol.*, 167 (1988) 609-616; *C.A.*, 111 (1989) 3489n.
- 2611 Kayashima, M. and Aoki, K.: (Evaluation of a cooled solid sorbent technique as a method for sampling and analysis of volatile hydrocarbons). *Tokyo-to Kankyo Kagaku Kenkyusho Nempo*, (1988) 42-49; *C.A.*, 111 (1989) 11804b.
- 2612 King, J.W.: Fundamentals and applications of supercritical fluid extraction in chromatographic science. *J. Chromatogr. Sci.*, 27 (1989) 355-364 - a review with 59 refs.
- 2613 Nielsen, M.W.F., Sanderson, J.T., Frei, R.W. and Brinkman, U.A.T.: On-line system for supercritical fluid extraction and capillary gas chromatography with electron-capture detection. *J. Chromatogr.*, 474 (1989) 388-395.
- 2614 Roerden, O., Reisinger, K., Leymann, W. and Frischkorn, C.B.S.: A simple clean-up procedure for the quantitative determination of PCBs in complex materials. *Fresenius' Z. Anal. Chem.*, 334 (1989) 413-417.
- 2615 Thiebaut, D., Chervet, J.-P., Vannoort, R.W., de Jong, G.J., Brinkman, U.A.T. and Frei, R.W.: Supercritical-fluid extraction of aqueous samples and on-line coupling to supercritical-fluid chromatography. *J. Chromatogr.*, 477 (1989) 151-159.
- See also 2539, 2540, 2541, 2542, 2544, 2594, 2629, 2635, 2692, 2726, 2785, 2806, 2835, 2841, 2845, 2847, 2849, 2850, 2853, 2854, 2859, 2860, 2901.

#### 4g. Separation of enantiomers

- 2616 Koenig, W.A.: (A new generation of chiral phases for gas chromatography (GC)). *Nachr. Chem. Tech. Lab.*, 37 (1989) 471-476; *C.A.*, 111 (1989) 49616e - a review with 31 refs.
- 2617 Macaudiere, P., Caude, M., Rosset, R. and Tambute, A.: CO<sub>2</sub> supercritical fluid chromatography with chiral stationary phases: A promising coupling for the resolution of various racemates. *J. Chromatogr. Sci.*, 27 (1989) 383-394.
- 2618 Mosandl, A., Palm, U., Guenther, C. and Kustermann, A.: Stereoisomeric flavor compounds. Part 25. Stereodifferentiation of enantiomeric  $\gamma$ -lactones by HRGC on chiral stationary phases. *Z. Lebensm.-Unters. Forsch.*, 188 (1989) 148-150; *C.A.*, 111 (1989) 5999c.
- 2619 Schurig, V., Bürkle, W., Hintzer, K. and Weber, R.: Evaluation of nickel(II) bis[ $\alpha$ -(heptafluorobutanyl)terpeneketonates] as chiral stationary phases for the enantiomer separation of alkyl-substituted cyclic ethers by complexation gas chromatography. *J. Chromatogr.*, 475 (1989) 23-44.
- 2620 Schurig, V., Nowotny, H.-P., Schleimer, M. and Schmaltzing, D.: Gas chromatographic enantiomer separation on per-*n*-pentylated amylose. *J. High Resolut. Chromatogr.*, 12 (1989) 549-551.
- 2621 Srinivas, N.R., Cooper, J.K., Hubbard, J.W. and Midha, K.K.: Isothermal capillary gas chromatography with electron-capture detection of heptafluorobutyl-L-prolyl derivatives of chiral amphetamines. *J. Chromatogr.*, 491 (1989) 262-264.

See also 2699, 2817.

#### 4h. Other special techniques

See 2533, 2609, 2612, 2661, 2678.

#### 4i. Supercritical fluid chromatography

- 2622 Bornhop, D.J. and Wangsgaard, J.G.: Optical detection methods in supercritical fluid chromatography. *J. Chromatogr. Sci.*, 27 (1989) 293-302 - a review with 81 refs.

- 2623 Chester, T.L., Pinkston, J.D., Innis, D.P. and Bowling, D.J.: Separation, detection, and identification of inositol triphosphate and phytic acid derivatives by supercritical fluid chromatography and SFC-mass spectrometry. *J. Microcolumn Sep.*, 1 (1989) 182-189.
- 2624 Crow, J.A. and Foley, J.P.: Optimization of separation using short capillary columns in supercritical fluid chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 467-470.
- 2525 Engelhardt, H., Gross, A., Mertens, R. and Petersen, M.: High-performance liquid chromatographic columns and stationary phases in supercritical-fluid chromatography. *J. Chromatogr.*, 477 (1989) 169-183.
- 2626 Giorgetti, A., Pericles, N., Widmer, H.M., Anton, K. and Dätwyler, P.: Mixed mobile phases and pressure programming in packed and capillary column supercritical fluid chromatography: A unified approach. *J. Chromatogr. Sci.*, 27 (1989) 318-324.
- 2627 Hirata, Y., Tanaka, M. and Inomata, K.: Purged splitless injection in micro-column supercritical fluid chromatography. *J. Chromatogr. Sci.*, 27 (1989) 395-398.
- 2628 Küpers, S., Lorenschat, B., Schmitz, F.P. and Klesper, E.: Programming of pressure and mobile phase composition at constant flow-rate using a self-adjusting valve in supercritical-fluid chromatography. *J. Chromatogr.*, 475 (1989) 85-94.
- 2629 Levy, J.M., Cavalier, R.A., Bosch, T.N., Rynaski, A.F. and Huhak, W.E.: Multidimensional supercritical fluid chromatography and supercritical fluid extraction. *J. Chromatogr. Sci.*, 27 (1989) 341-346.
- 2630 Nomura, A., Yamada, J., Tsunoda, K., Fukushima, K. and Nobuhara, K.: Silica-based inert packings for supercritical fluid chromatography. *Anal. Sci.*, 5 (1989) 335-338.
- 2631 Payne, K.M., Davies, I.L., Bartle, K.D., Markides, K.E. and Lee, M.L.: Multidimensional packed capillary column supercritical-fluid chromatography using a flow-switching interface. *J. Chromatogr.*, 477 (1989) 161-168.
- 2632 Richter, B.E., Bornhop, D.J., Swanson, J.T., Wangsgaard, J.G. and Andersen, M.R.: Gas chromatographic detectors in SFC. *J. Chromatogr. Sci.*, 27 (1989) 303-308 - a review with 43 refs.
- 2633 Smith, R.D., Fulton, J.L., Jones, H.K., Gale, R.W. and Wright, B.W.: The potential of reverse micelle mobile phases for supercritical fluid chromatography. *J. Chromatogr. Sci.*, 27 (1989) 309-317.
- 2634 Upmoor, D. and Brunner, G.: (Applications of supercritical fluid chromatography (SFC) for on-line analysis). *GIT Fachz. Lab.*, 33, No. 4 (1989) 311-317; *C.A.*, 111 (1989) 16906w - a review with 20 refs.
- 2635 Xie, Q.L., Markides, K.E. and Lee, M.L.: Supercritical fluid extraction-supercritical fluid chromatography with fraction collection for sensitive analytes. *J. Chromatogr. Sci.*, 27 (1989) 365-370.
- 2636 Yonker, C. and Smith, R.D.: Stationary phase solvation in capillary supercritical fluid chromatography. *Anal. Chem.*, 61 (1989) 1348-1353.
- See also 2586, 2590, 2593, 2595, 2597, 2598, 2601, 2602, 2603, 2606, 2617, 2693, 2705, 2736, 2747, 2785, 2787, 2788, 2862.

## 5. HYDROCARBONS AND HALOGEN DERIVATIVES

### 5a. Aliphatic hydrocarbons

- 2637 Stienlet, D., Vervloessem, A. and Ceulemans, J.: Radiolytic synthesis of high-molecular-weight alkanes for chromatographic characterization and identification purposes. *J. Chromatogr.*, 475 (1989) 247-260.

See also 2523, 2525, 2544, 2546, 2677, 2710, 2822, 2851, 2875.



*5b. Cyclic hydrocarbons*

- 2638 Guillen, M.D., Blanco, J., Bermejo, J. and Blanco, C.G.: Temperature programmed retention indices of some PAHs on capillary columns coated with OV-1701 and SE-54. *J. High Resolut. Chromatogr.*, 12 (1989) 552-554.
- 2639 Matisova, E., Kovacicova, E., Ha Pham Thi, Kolek, E. and Engewald, W.: Identification of alkylbenzenes up to C<sub>12</sub> by capillary gas chromatography and gas chromatography-mass spectrometry. II. Retention indices on OV-101 columns and retention-molecular structure correlations. *J. Chromatogr.*, 475 (1989) 113-123.

See also 2631, 2797, 2843, 2850, 2860, 2891, 2907.

*5c. Halogen derivatives*

- 2640 Pareas, D.M. and Vassilaros, D.L.: Comments on a paper describing elution order shifts of halogenated compounds. *J. Chromatogr.*, 474 (1989) 462.
- 2641 Zhukova, A.I., Kozlova, V.S., Bondarenko, S.V. and Tarasevich, Yu.I.: (Use of organomodified montmorillonite in gas chromatographic separation of chlorinated toluol). *Zh. Prikl. Khim.*, 62 (1989) 1311-1315.

See also 2614, 2723, 2724, 2726, 2728, 2835, 2840, 2841, 2842, 2845.

## 6. ALCOHOLS

- 2642 Lin Xiping, Zhao Ailing and Chen Xiuhua: (GC analysis of catalytic hydrogenation products of butynediol). *Zhongguo Yiyao Gongye Zazhi*, 20 (1989) 21-24; *C.A.*, 111 (1989) 45411m.

See also 2677, 2803, 2834, 2862, 2867, 2876.

## 7. PHENOLS

- 2643 Kerenman, Ya.I. and Fokin, V.N.: (Gas chromatographic determination of volatile phenols using an extraction system in aqueous salt solution-aqueous poly(ethylene-glycol) solution). *Zh. Anal. Khim.*, 44 (1989) 1281-1283.
- 2644 Naes, H.: Geosmin production. *Methods Enzymol.*, 167 (1988) 605-608; *C.A.*, 110 (1989) 227910k.

See also 2780, 2857, 2882, 2883.

## 8. SUBSTANCES CONTAINING HETEROCYCLIC OXYGEN

*8b. Aflatoxins and other mycotoxins*

- 2645 Betina, V.: Chromatographic methods as tools in the field of mycotoxins. *J. Chromatogr.*, 477 (1989) 187-233 - a review with 462 refs.
- 2646 Duncan, M.W., Kopin, I.J., Crowley, J.S., Jones, S.M. and Markey, S.P.: Quantification of the putative neurotoxin 2-amino-3-(methylamino)propanoic acid (BMAA) in cycadales: analysis of the seeds of some members of the family *Cycadaceae*. *J. Anal. Toxicol.*, 13 (1989) 169-175; *C.A.*, 111 (1989) 38075b.

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

- 2647 Korhonen, I.O.O. and Mäntykoski, K.M.: Gas-liquid chromatographic analyses. L. Retention, dispersion and selectivity indices of polychlorinated dibenzo-p-dioxins and dibenzofurans. *J. Chromatogr.*, 477 (1989) 327-336.

- 2648 Mossoba, M.M., Niemann, R.A. and Chen Jo-Yun T.: Picogram level quantitation of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in fish extracts by capillary gas chromatography/matrix isolation/Fourier transform infrared spectrometry. *Anal. Chem.*, 61 (1989) 1678-1685.

See also 2777, 2840.

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

- 2649 Harvey, S., Wiesler, D. and Novotny, M.: Formation of cyclic enol ethers from a labile biological precursor: an example of analytical artifacts. *J. Chromatogr.*, 491 (1989) 27-36.

See also 2618, 2619, 2809, 2817, 2827, 2834, 2846, 2884.

#### 10. CARBOHYDRATES

##### 10a. Mono and oligosaccharides. Structural studies

- 2650 Chaves des Neves, H.J. and Riscado, A.M.V.: Sequential determination of sugar units in reducing disaccharides by capillary gas chromatography/Fourier transform infrared spectroscopy. *J. High Resolut. Chromatogr.*, 12 (1989) 455-458.

See also 2599, 2605, 2623.

#### 11. ORGANIC ACIDS AND LIPIDS

##### 11a. Organic acids and lipids

- 2651 Aitzetmüller, K. and Ihrig, M.: Zur Fettsäurezusammensetzung von Mandelöl. *Fat Sci. Technol.*, 90 (1988) 464-470.
- 2652 Ansari, K.A. and Shoeman, D.W.: Measurement of hydroperoxydicosaenoic acid in rat brain homogenates by reversed-phase high-performance liquid chromatography. *J. Chromatogr.*, 475 (1989) 457-460.
- 2653 Carballeira, N.M. and Maldonado, M.E.: New phospholipid fatty acids from the Caribbean sponge *Ectyoplasia ferow*. *Lipids*, 24 (1989) 371-374.
- 2654 Carlier, J.-P. and Sellier, N.: Gas chromatographic-mass spectral studies after methylation of metabolites produced by some anaerobic bacteria in spent media. *J. Chromatogr.*, 493 (1989) 257-273.
- 2655 Cassidy, D.M., Pratt, D.A., Taylor, R., Alberti, K.G.M.M. and Laker, M.F.: Capillary column gas chromatography-mass spectrometry for the determination of the fatty acid composition of human adipose tissue. *J. Chromatogr.*, 491 (1989) 1-13.
- 2656 Das, A.K. and Hajra, A.K.: Quantification, characterization and fatty acid composition of lysophosphatidic acid in different rat tissues. *Lipids*, 24 (1989) 329-333.
- 2657 Dunlap, J.R. and Guinn, G.: A simple purification of indole-3-acetic acid and abscisic acid for GC-SIM-MS analysis by microfiltration of aqueous samples through nylon. *Plant Physiol.*, 90 (1989) 197-201; *C.A.*, 111 (1989) 20466v.
- 2658 Frahne, D. and Herrmann, D.: Determination of volatile fatty acids by gas chromatography-matrix isolated-Fourier transform IR spectroscopy. *Fat Sci. Technol.*, 91 (1989) 169-177.
- 2659 Hamberg, M.: Fatty acid hydroperoxide isomerase in *Saprolegnia parasitica*: Structural studies of epoxy alcohols formed from isomeric hydroperoxyocta-decadienoates. *Lipids*, 24 (1989) 249-255.
- 2660 Hannemann, K., Puchta, V., Simon, E., Ziegler, H. and Spittler, G.: The common occurrence of furan fatty acids in plants. *Lipids*, 24 (1989) 296-298.

- 2661 Le Quere, J.L., Semon, E., Lanher, B. and Sebedio, J.L.: On-line hydrogenation in GC-MS analysis of cyclic fatty acid monomers isolated from heated linseed oil. *Lipids*, 24 (1989) 347-350.
- 2662 Mallet, G., Dimitriades, C., Ucciani, E. and Morin, O.: Hydrogenation d'esters d'acides gras catalysee par du palladium sur charbon. Structure des isomeres formes. *Rev. Fr. Corps Gras*, 36 (1989) 21-25.
- 2663 McCalley, D.V.: Analysis of volatile fatty acids by capillary gas chromatography using on-column injection of aqueous solutions. *J. High Resolut. Chromatogr.*, 12 (1989) 465-467.
- 2664 Oboh, F.O.J. and Oderinde, R.: Composition of Cohune (*Attalea cohune*) kernel and kernel oil. *Riv. Ital. Sost. Grasse*, 65 (1988) 387-390.
- 2665 Retho, C. and Diep, L.: Low-level determination of ethylene diaminetetraacetic acid in complex matrixes. *Z. Lebensm.-Unters. Forsch.*, 188 (1989) 223-226; *C.A.*, 111 (1989) 38071x.
- 2666 Rojo, J.A. and Perkins, E.G.: Chemical synthesis and spectroscopic characteristics of C<sub>18</sub> 1,2-disubstituted cyclopentyl fatty acid methyl esters. *Lipids*, 24 (1989) 467-476.
- 2667 Romero, F., Doblado, J. and Cota, J.: (Characterization of bitter orange (*Citrus aurantium* L.) seed oil). *Grasas y Aceites*, 29 (1988) 353-358.
- 2668 Sonnet, P.E. and Baillargeon, M.W.: Synthesis and lipase catalyzed hydrolysis of thiol-esters of 2-, 3- and 4-methyl octanoic acids. *Lipids*, 24 (1989) 434-437.
- 2669 Sosulski, F.W. and Abdullahi, A.H.: Lipids in corn germ of Somali cultivars. *Riv. Ital. Sost. Grasse*, 65 (1988) 139-141.
- 2670 Wijesundera, R.C. and Ackman, R.G.: Evaluation of calculation of ECL values for *cis* and *trans* isomers of some diethylenic C<sub>20</sub> fatty acids: Mon- and diethylenic capillary GLC data for the liquid phases SP-2340, Supelcowax-10, and SPB-1. *J. Chromatogr. Sci.*, 27 (1989) 399-404.
- 2671 Wurth, C., Kumps, A. and Mardems, Y.: Urinary organic acids: retention indices on two capillary gas chromatography columns. *J. Chromatogr.*, 491 (1989) 186-192.
- 2672 Zeng Yongchang, Zhou Zaide and Hu Jiayuan: (Gas chromatographic analysis for C<sub>1</sub>-C<sub>8</sub> fatty acids and lactic acid in aqueous solution). *Sichuan Daxue Xuebao, Ziran Kexueban*, 25 (1988) 482-485; *C.A.*, 111 (1989) 32905a.
- See also 2526, 2574, 2623, 2674, 2676, 2677, 2696, 2701, 2717, 2783, 2790, 2791, 2798, 2800, 2804, 2805, 2808, 2810, 2811, 2814, 2821, 2823, 2825, 2826, 2828, 2829, 2837, 2838, 2865, 2894, 2908.

#### 11b. Prostaglandins

See 2792.

#### 11c. Lipids and their constituents

- 2673 Gilkison, I.S.: Quantitative capillary GC of triglycerides using a polarizable stationary phase. *J. High Resolut. Chromatogr.*, 12 (1989) 481-483.
- 2674 Malak, N.A., Brichon, G., Meister, R. and Zwingelstein, G.: Environmental temperature and metabolism of the molecular species of phosphatidylcholine in the tissue of the rainbow trout. *Lipids*, 24 (1989) 318-324.
- 2675 Muderhwa, J.M., Pina, M. and Graille, J.: Interesterification catalysee par les lipases regioselectives 1,3 en milieu fondu: applications a l'huile de palme et a sa fraction concrete. *Rev. Fr. Corps Gras*, 36 (1989) 11-19.
- 2676 Ohshima, T., Yoon, Hyung-Sik and Koizumi, C.: Application of selective ion monitoring to the analysis of molecular species of vegetable oil triacylglycerols separated by open-tubular column GLC on a methylphenylsilicone phase at high temperature. *Lipids*, 24 (1989) 535-544.
- 2677 Pakrashi, S.C., Dutta, P.K., Achari, B., Misra, S., Choudhury, A., Chattopadhyay, S. and Ghosh, A.: Lipids and fatty acids of the horseshoe crabs *Tachypleus gigas* and *Carcinoscorpius rotundicauda*. *Lipids*, 24 (1989) 443-447.
- 2678 Peter, S. and Ender, U.: Die Abtrennung von Ölsäuremonoglycerid aus einem Glyceridgemisch mit Hilfe eines überkritischen Extraktionsmittel. *Fat Sci. Technol.*, 91 (1989) 260-266.
- 2679 Phleger, C.F., Laub, R.J. and Benson, A.A.: Skeletal lipid depletion in spawning salmon. *Lipids*, 24 (1989) 286-289.

- 2680 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.

See also 2656, 2664, 2669, 2682, 2789, 2793, 2794, 2795, 2799, 2812, 2823.

11d. *Lipoproteins and their constituents*

- 2681 Ohshima, T., Wada, D. and Koizumi, C.: Application of selected-ion monitoring gas chromatography/mass spectrometry to the analysis of molecular species of 1,2-diacylglycerophospholipids of bonito white muscle. *Nippon Suisan Gakkaishi*, 55 (1989) 875-883; *C.A.*, 111 (1989) 22363g.

- 2682 Ohshima, T., Wada, S. and Koizumi, C.: 1-O-Alk-1'-enyl-2-acyl and 1-O-alkyl-2 acyl glycerophospholipids in white muscle of bonit *Euthynnus pelamis* (Linnaeus). *Lipids*, 24 (1989) 363-370.

See also 2653, 2674, 2680, 2697, 2791, 2794, 2795.

13. STEROIDS

13a. *Pregnane and androstane derivatives*

- 2683 Goto, J., Miura, H. and Nambara, T.: Studies on steroids. CCXXXV. Determination of 5 $\beta$ -cholestanic acids in human urine by gas chromatography-mass spectrometry with negative ion chemical ionization detection. *J. Chromatogr.*, 493 (1989) 245-255.

- 2684 Can Dam, G.H., Schoonen, W.G.E.J., Lambert, J.G.D. and Van Oordt, P.G.W.J.: Plasma profiles of fourteen ovarian steroids before, during and after ovulation in African catfish, *Clarias gariepinus*, determined by gas chromatography and mass spectrometry. *Fish Physiol. Biochem.*, 6 (1989) 79-89; *C.A.*, 111 (1989) 36895v.

13c. *Sterols*

- 2685 Fenner, G.P., Patterson, G.W. and Lusby, W.R.: Developmental regulation of sterol biosynthesis in *Cucurbita maxima* L. *Lipids*, 24 (1989) 271-277.

- 2686 Salt, T.A., Chitwood, D.J. and Lusby, W.R.: Sterol metabolism in the nematode *Panagrellus redivivus*. *Lipids*, 24 (1989) 325-328.

- 2687 Simal, J., Huidobra, J.F. and Muniategui, S.: (Study of sterol fraction of bee-collected pollen). *Grasas y Aceites*, 39 (1988) 327-333.

See also 2801, 2815, 2820, 2833.

13f. *Other steroids*

- 2688 Park Jongsei, Kwon Ohseung, Suh Jawon and Choo Hea Young, P.: Quantitation of oxandrolone (a synthetic anabolic steroid) in human urine by GC/MS. *Korean J. Toxicol.*, 4 (1988) 117-129; *C.A.*, 111 (1989) 17822c.

15. TERPENES AND OTHER VOLATILE AROMATIC COMPOUNDS

15a. *Terpenes*

- 2689 Leal, W.S., Kuwahara, Y., Suzuki, T. and Kurosa, K.:  $\beta$ -Acaridial, the sex pheromone of the acarid mite *Caloglyphus polyphyllae*. Pheromone study of acarid mites. XXI. *Naturwissenschaften*, 76 (1989) 332-333.

See also 2594, 2802.

15b. *Essential oils*

- 2690 Dubrova, M.A., Mindlin, L.O., Shchedrina, M.M. and Rudol'fi, T.A.: (Glass capillary chromatography columns for evaluation of essential oil quality). *Pishch. Prom-st. (Moscow)*, No. 4 (1989) 65-66; *C.A.*, 111 (1989) 12326j.
- 2691 Dugo, G. and Cotroneo, A.: Analytical methods for determining citrus oils. *Parfuem. Kosmet.*, 69 (1988) 544-563; *C.A.*, 110 (1989) 37853w.
- 2692 Werkhoff, P., Bretschneider, W., Herrmann, N.J. and Schreiber, K.: Fortschritte in der Aromastoff-Analytik (4). *LaborPraxis*, 13 (1989) 616-619.

## 16. NITRO AND NITROSO COMPOUNDS

- 2693 Johansen, H., Doehl, J. and Greibroock, T.: Light-induced decomposition of nitrobenzanthrenes of glass filters. *J. Chromatogr. Sci.*, 27 (1989) 378-382.
- 2694 Yoshida, T., Andoh, K., Tabuchi, T. and Sugimoto, K.: (Identification of urinary metabolites in rats treated with *p*-chloronitrobenzene by gas chromatography-mass spectrometry). *Osaka-furitsu Koshu Eisei Kenkyusho Kenkyu Hokoku, Rodo Eisei Hen*, 26 (1988) 41-48; *C.A.*, 111 (1989) 34738x.

See also 2754, 2843, 2857, 2873.

## 17. AMINES, AMIDES AND RELATED NITROGEN COMPOUNDS

17a. *Amines and polyamines*

- 2695 Lopez, A.F., Peralta de Ariza, M.T. and Orio, O.A.: Rapid method for quantitative determination of tetrabutylammonium bromide in aqueous solutions by gas chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 503-504.
- 2696 Murray, S., O'Malley, G., Taylor, I.K., Mallet, A.I. and Taylor, G.W.: Assay for N<sup>1</sup>-methylimidazoleacetic acid, a major metabolite of histamine in urine and plasma using capillary column gas chromatography-negative ion mass spectrometry. *J. Chromatogr.*, 491 (1989) 15-25.
- 2697 Can Dam, J.E.G., Maas, A.A.M., Kamerling, J.P. and Vliegenthart, J.F.G.: GLC-MS of N-(1-deoxyalditol-1-yl)octadecylamine derivatives in the analysis of methanolysates of neoglycolipids obtained by reductive amination. *Carbohydr. Res.*, 187 (1989) 25-34; *C.A.*, 111 (1989) 20786z.

See also 2621, 2709, 2880.

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

See 2604, 2831, 2855, 2886.

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

18a. *Amino acids and their derivatives*

- 2698 Brinck, C., Carlberg, M. and Elofsson, R.: Identification of L-3,4-dihydroxyphenylalanine in the brain of the crayfish *Pacifastacus lenisculus* (Dana) and in tentacles of the sea anemone *Metridium senile* (L.) by use of gas chromatography-mass spectrometry. *Comp. Biochem. Physiol., C: Comp. Pharmacol. Toxicol.*, 92C (1989) 201-203; *C.A.*, 111 (1989) 3694a.
- 2699 Koppenhoefer, B., Muschalek, V., Hummel, M. and Bayer, E.: Determination of the enhancement of the enantiomeric purity during recrystallization of amino acids. *J. Chromatogr.*, 477 (1989) 139-145.
- 2700 Moodie, I.M., Hough, B.J. and Labadarios, D.: Determination of amino acids in urine by gas chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 437-441.

- 2701 Nagao, A. and Kito, M.: Synthesis of O-acyl-L-homoserine by lipase. *J. Am. Oil Chem. Soc.*, 66 (1989) 710-713.

See also 2824.

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

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

- 2702 Kresbach, G.M., Itani, M., Saha, M., Rogers, E.J., Vouros, P. and Giese, R.W.: Ester and related derivatives of ring N-pentafluorobenzylated 5-hydroxymethyluracil. Hydrolytic stability, mass spectral properties, and trace detection by gas chromatography-electron-capture detection, gas chromatography-electron-capture negative ion mass spectrometry, and moving-belt liquid chromatography-electron-capture negative ion mass spectrometry. *J. Chromatogr.*, 476 (1989) 423-438.

See also 2760.

### 21c. Nucleic acids, DNA

## 22. ALKALOIDS

- 2703 Clezy, P.S., Duncan, M.W. and Smythe, G.A.: Preparation of a deuterated analog of tetrahydropapaveroline suitable for use as an internal standard for GC/MS analysis of this alkaloid: retro Pictt-Spengler condensation. *Aust. J. Chem.*, 41 (1988) 483-491; *C.A.*, 110 (1989) 173510j.
- 2704 Kompantseva, E.V., Botezat-Belyi, Y.K., Shardinov, V.N. and Berdnikova, A.V.: (Gas chromatographic determination of the quality of nanophyn). *Nauch. Tr. VNI Farmats.*, No. 26 (1988) 86-88; *C.A.*, 111 (1989) 45424t.

## 23. OTHER SUBSTANCES CONTAINING HETEROCYCLIC NITROGEN

### 23a. Porphyrins and other pyrroles

- 2705 Ashraf-Khorassani, M. and Taylor, L.T.: Application of sub- and supercritical fluid chromatography to vanadium and nickel porphyrins. *J. Chromatogr. Sci.*, 27 (1989) 329-333.

### 23c. Indole derivatives

- 2706 Bosin, T.R. and Faull, K.F.: Indole derivatization procedures for electron capture negative chemical ionization mass spectrometry: identification of 1-methyl-1,2,3,4-tetrahydro- $\beta$ -carboline in rat brain and lung. *Biomed. Environ. Mass Spectrom.*, 18 (1989) 247-252; *C.A.*, 111 (1989) 20434h.

### 23d. Pyridine derivatives

- 2707 Maslowska, J. and Bazylak, G.: Retention of some heterocyclic amines on mixed stationary phases containing nickel(II) Schiff base chelates. *Coll. Czech. Chem. Commun.*, 54 (1989) 1530-1537.

See also 2796, 2896.

## 23e. Other N-heterocyclic compounds

- 2708 Stanton, D.T. and Jurs, P.C.: Computer-assisted prediction of gas chromatographic retention indexes of pyrazines. *Anal. Chem.*, 61 (1989) 1328-1332.

See also 2526, 2819, 2868.

## 24. ORGANIC SULPHUR COMPOUNDS

- 2709 Akazaki, T., Kataoka, H., Fujimoto, A., Kono, K. and Kakita, M.: (Determination of taurine in biological sample by GC with flame photometric detection). *Bunseki Kagaku*, 38 (1989) 401-403.
- 2710 Carlson, D.A., Roan, C.S., Yost, R.A. and Hector, J.: Dimethyl disulfide derivatives of long chain alkenes, alkadienes, and alkatrienes for gas chromatography/mass spectrometry. *Anal. Chem.*, 61 (1989) 1564-1571.
- 2711 Fiebig, H.J., Sendfeld, A. and Aitzetmüller, K.: Vergleichende Untersuchungen zur Bestimmung des Gesamtglucosinolatgehaltes von Rapssamen. *Pat Sci. Technol.*, 90 (1988) 459-464.
- 2712 Hilscher, W., Goekcek, C., Schmicker, D., Riedel, E. and Kunik, P.: (Device and method for determination of the total sulfur content in samples by gas-chromatographic separation of sulfur and flame-photometric detection). *Ger. Offen. Pat. DE 3,735,599* (Cl. G01N31/00), 11 May 1989, Appl. 21 Oct. 1987; 7 pp.; *C.A.*, 111 (1989) 49686c.
- 2713 Khmel'nitskii, R.A. and Bondarenko, M.A.: (Instrumental methods for determination of lower mercaptans). *Zh. Anal. Khim.*, 44 (1989) 965-985 - a review with 139 refs.
- 2714 Kosareva, Z.P., Zelinskii, Y.G. and Koikov, L.N.: (Use of XE-60 for gas chromatography of a crude thiophene fraction). *Khim.-Farm. Zh.*, 22 (1988) 1406-1407; *C.A.*, 111 (1989) 45393g.
- 2715 Sugimoto, S., Kogawa, T. and Akieda, T.: (Analysis for sulfonic acid derivatives). *Kansei Chuo Bunsekishoho*, 28 (1988) 69-73; *C.A.*, 111 (1989) 32928k.

See also 2668, 2866.

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

- 2716 Ellington, J.J. and Trusty, C.D.: Quantitative analysis of alkyl phosphates using automated cool on-column aqueous injection. *J. High Resolut. Chromatogr.*, 12 (1989) 470-473.
- 2717 Purdon, J.G., Pagotto, J.G. and Miller, R.K.: Preparation stability and quantitative analysis by gas chromatography and gas chromatography-electron impact mass spectrometry of *tert.*-butyldimethylsilyl derivatives of some alkylphosphonic and alkyl methylphosphonic acids. *J. Chromatogr.*, 475 (1989) 261-272.
- 2718 Shcherbina, T.M., Kadyko, M.I., Komissarov, V.Yu., Butorina, L.S., Uryupin, A.B., Kaabak, L.V., Petrovskii, P.V., Matryukova, T.A. and Kabachnik, M.I.: (Gas-chromatographic determination of O,O-dimethyl-S-( $\alpha$ -carboxybenzyl)dithiophosphate). *Zh. Anal. Khim.*, 44 (1989) 1144-1146.

See also 2623.

## 26. ORGANOMETALLIC AND RELATED COMPOUNDS

## 26a. Organometallic compounds

- 2719 Ashby, J., Clark, S. and Craig, P.J.: Method for the production of volatile organometallic derivatives for application to the analysis of environmental samples. *J. Anal. At. Spectrom.*, 3 (1988) 735-736; *C.A.*, 111 (1989) 49661r.

- 2720 Aue, W.A., Flinn, B.J., Flinn, C.G., Paramasigamani, V. and Russell, K.A.: Transformation and transmission of organotin compounds inside a gas chromatograph. *Can. J. Chem.*, 67 (1989) 402-410.
- 2721 Costanzo, R.B. and Barry, E.F.: Gas chromatographic determination of organolead compounds with an alternating current plasma detector. *J. High Resolut. Chromatogr.*, 12 (1989) 522-526.
- 2722 Sun Xun Yun and Aue, W.A.: Detection at the picogram level of bis(cyclopentadienyl)ruthenium by gas chromatography-flame photometry. *Can. J. Chem.*, 67 (1989) 897-901.

See also 2816, 2839, 2853, 2859.

26c. Coordination compounds

See 2705.

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

See 2800, 2892.

29. INSECTICIDES, PESTICIDES AND OTHER AGROCHEMICALS

29c. Chlorinated insecticides

- 2723 Cavic, B. and Boncic-Caricic, G.: Separation and determination of polychlorinated biphenyls and DDE by oxidation using chromium trioxide. *J. Serb. Chem. Soc.*, 53 (1988) 485-490; *C.A.*, 111 (1989) 5998b.
- 2724 Driss, M.R., Sabbah, S. and Bouguerra, M.L.: Chromatographie haute resolution des PCB: I - Analyse de melanges techniques de phenochlor. *Analusis*, 17 (1989) 252-258.
- 2725 Guo Ying, Zhu Xueyu, Hao Ling, Li Honglin and Li Fenglan: (Determination of chloroorganic compounds with the SE-30 quartz capillary column). *Huanjing Wuxan Yu Fangzhi*, 10, No. 6 (1988) 37-39 and 17; *C.A.*, 111 (1989) 16959r.
- 2726 Heisch, H.-U. and Lafontaine, H.-J.: Quantitative Bestimmung von polychlorierten Biphenylen (PCB) neben polychlorierten Diphenylmethanen (PCDM) mittels Kapillar-Gas-Chromatographie. *Fresenius' Z. Anal. Chem.*, 334 (1989) 418-420.
- 2727 Kalasinsky, K.S.: Pesticide determination by GC/FT-IR. *Anal. Methods Pestic. Plant Growth Regul.*, 17 (1989) 101-117; *C.A.*, 111 (1989) 19345y - a review with 11 refs.
- 2728 Sabbah, S., Driss, M.R. and Bouguerra, M.L.: Chromatographie haute resolution des PCB: II - Analyse d'echantillons de lait maternel et d'oeufs de faucon. *Analusis*, 17 (1989) 259-263.
- 2729 Schaller, H.: (Instrumental aspects of pesticide analysis). *Gewässerschutz, Wasser, Abwasser*, 106 (1989) 40-61; *C.A.*, 111 (1989) 19351x - a review with 7 refs.
- 2730 Stankova, O., Cap, L. and Tran Thi Thu: (Gas chromatographic determination of chloroorganic pesticides). *Acta Univ. Palacki. Olomuc., Fac. Rerum Nat.*, 91 (1988) 191-202; *C.A.*, 111 (1989) 38061u.

See also 2584, 2841, 2842, 2849, 2888.

29b. Phosphorus insecticides

- 2731 Ameno, K., Fuke, C., Ameno, S., Kiriu, T. and Ijiri, I.: A rapid and sensitive quantitation of dipterex in serum by solid-phase extraction and chromatography with flame thermionic detection. *J. Anal. Toxicol.*, 13 (1989) 150-151; *C.A.*, 111 (1989) 18903s.

See also 2807, 2861.



29c. *Carbamates*

See 2852.

29d. *Herbicides*

- 2732 Buben, I., Karmazin, M. and Odchazel, J.: (Pesticide residues in the drug *Flos chamomillae*. I. Determination of Potabian residues by gas chromatography). *Cesk. Farm.*, 38 (1989) 60-63; *C.A.*, 111 (1989) 45413p.
- 2733 Häkkinen, V.M.A., Grob, K. and Bürki, C.: Analysis of dicamba in tobacco by on-line coupled liquid chromatography-gas chromatography. *J. Chromatogr.*, 473 (1989) 353-358.
- 2734 Holler, J.S., Fast, D.M., Hill, R.H., Jr., Cardinali, F.L., Todd, G.D., McCraw, J.M., Bailey, S.L. and Needham, L.L.: Quantification of selected herbicides and chlorinated phenols in urine by using gas chromatography/mass spectrometry/mass spectrometry. *J. Anal. Toxicol.*, 13 (1989) 152-157; *C.A.*, 111 (1989) 18904t.
- 2735 Scharfe, R.R. and McLenaghan, C.C.: Rapid gas chromatographic method using nitrogen-phosphorus detection for N-nitrosodimethylamine in 2,4-D and MCPA herbicide formulations. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 508-512.

See also 2847, 2856.

29e. *Fungicides*

- 2736 Kennedy, S. and Wall, R.J.: Electron-capture detection of agrochemicals by supercritical fluid chromatography. *LC-GC*, 6 (1988) 930-932.
- 2737 Mostert, I.A. and Ramsteiner, K.A.: Coupled high-performance liquid chromatography-gas chromatography for the determination of pesticide residues in biological matrices. *J. Chromatogr.*, 477 (1989) 359-365.

See also 2813, 2836.

## 31. PLASTICS AND THEIR INTERMEDIATES

- 2738 Agathonos, P. and Karaiskakis, G.: Thermodynamic study of polymer-solvent systems by reversed-flow gas chromatography. *J. Appl. Polym. Sci.*, 37 (1989) 2237-2250; *C.A.*, 111 (1989) 8206c.
- 2739 Chen Chein Tai and Al-Saigh, Z.V.: Characterization of semicrystalline polymers by inverse gas chromatography. 1. Poly(vinylidene fluoride). *Macromolecules*, 22 (1989) 2974-2981; *C.A.*, 111 (1989) 40270e.
- 2740 Chen Peng: Determination of residual monomer in polymer or polymer solution by sealed glass capillary sampling. *Chromatographia*, 28 (1989) 167-169.
- 2741 Duncan, W.P.: Use of GC-IR-MS and pyrolysis for polybutadiene characterization. *Am. Lab. (Fairfield)*, 20, No. 8 (1988) 40-46.
- 2742 Edelman, A. and Fradet, A.: Inverse gas chromatography study of some triacetin-polymer systems. *Polymer*, 30 (1989) 317-323; *C.A.*, 111 (1989) 24266c.
- 2743 Houlihan, F.M., Reichmanis, E., Tarascon, R.G., Taylor, G.N., Hellman, M.Y. and Thompson, L.F.: Gas chromatography/mass spectrometry study of the thermolysis and acidolysis of poly(4-(*tert*-butyloxycarbonyloxy)- $\alpha$ -methylstyrene), poly(4-(*tert*-butoxycarbonyloxy)styrene), and poly(4-(*tert*-butyloxycarbonyloxy)styrene sulfone). *Macromolecules*, 22 (1989) 2999-3004; *C.A.*, 111 (1989) 40024c.
- 2744 Mal'tseva, L.E., Popova, G.S., Makeeva, N.M. and Konpleva, M.M.: (Gas-chromatographic apparatus for studying the composition of volatile low-molecular weight components separated from polymers at elevated temperature). *Plast. Massy*, No. 3 (1989) 83-86; *C.A.*, 111 (1989) 24259c.
- 2745 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 (1988) 167-174; *C.A.*, 111 (1989) 40257f.

- 2746 Pacakova, V., Dieckmann, R., Leclercq, P.A. and Hoch, K.: A comparison of pyrolytical and oxidative degradation of poly(methylmethacrylate) and methyl methacrylate-styrene copolymer using the capillary GC and GC-MS methods. *Collect. Czech. Chem. Commun.*, 54 (1989) 934-939; *C.A.*, 111 (1989) 40061n.
- 2747 Pinkston, J.D., Bowling, D.J. and Delaney, T.E.: Industrial application of supercritical-fluid chromatography-mass spectrometry involving oligomeric materials of low volatility and thermally labile materials. *J. Chromatogr.*, 474 (1989) 97-111.
- 2748 Price, G.J., Siow, K.S. and Guillet, J.E.: Use of gas chromatography to determine the degree of crosslinking of a polymer network. *Macromolecules*, 22 (1989) 3116-3119; *C.A.*, 111 (1989) 41081f.
- 2749 Smith, C.G.: Library of pyrolysis-gas chromatography data for synthetic polymers. *J. Anal. Appl. Pyrolysis*, 15 (1988) 209-216; *C.A.*, 111 (1989) 40258g.

See also 2527, 2586, 2628, 2878, 2881.

## 32. DRUG ANALYSIS

### 32a. Drug analysis, general techniques

- 2750 Gavlick, W.K.: High resolution gas chromatographic methods for pharmaceutical analysis. Avail. *Diss. Abstr. Int. B*, 49 (1989) 3146; *Univ. Microfilms*, Order No. DA8822657 (1988), 543 pp.; *C.A.*, 111 (1989) 28623q.

See also 2564, 2588.

### 32c. Autonomic and cardiovascular drugs

- 2751 Giansello, V., Brenn, E., Figini, G. and Gazzaniga, A.: Determination by coupled high-performance liquid chromatography of the  $\beta$ -blocker levomoprolol in plasma following ophthalmic administration. *J. Chromatogr.*, 473 (1989) 343-352.
- 2752 Kawano, H., Inotsume, N., Arimoto, H., Fujii, T. and Nakano, M.: Rapid and sensitive determination of aprindine in serum by gas chromatography using a surface ionization detector. *J. Chromatogr.*, 493 (1989) 71-78.
- 2753 Macrae, P.V., Rance, D.J., Dankers, J. and Duchateau, G.S.M.J.E.: Analysis of a novel cardiac stimulant, UK-61 260, in human plasma by gas chromatography-mass spectrometry with selected-ion monitoring. *J. Chromatogr.*, 491 (1989) 439-447.
- 2754 Michel, G., Fay, L. and Prost, M.: Determination of isosorbide dinitrate and its metabolites in plasma by gas chromatography on a capillary column with electron-capture detection. *J. Chromatogr.*, 493 (1989) 188-195.
- 2755 Tan, H.S.I., Yan, Ya-Ping and Thio, A.P.: Stability-indicating capillary gas-liquid chromatographic assay of dicyclomine hydrochloride in some pharmaceutical formulations. *J. Chromatogr.*, 475 (1989) 381-389.

### 32d. Central nervous system drugs

- 2756 Culea, M., Palibroda, N., Moldovan, Z., Abraham, A.D. and Frangopol, P.T.: Gas chromatographic study of some local anesthetics. *Chromatographia*, 28 (1989) 24-30.
- 2757 De Kroon, I.F.I., Langendijk, P.N.J. and de Goede, P.N.F.C.: Simultaneous determination of midazolam and its three hydroxy metabolites in human plasma by electron-capture gas chromatography without derivatization. *J. Chromatogr.*, 491 (1989) 107-116.
- 2758 Fukuda, E.K., Choma, N. and Davis, P.P.: Quantitation of the benzodiazepine antagonist flumazenil in human plasma by gas chromatography-mass spectrometry. *J. Chromatogr.*, 491 (1989) 97-106.
- 2759 Godoy, C.G., Marcuse, E. and Rodriguez, A.: Simple alternative method for capillary gas chromatographic determination of lidocaine in plasma. *J. High Resolut. Chromatogr.*, 12 (1989) 491-493.

- 2760 Kapil, R.P. and Bruyere, H.J., Jr.: Applicability of capillary gas chromatography to study caffeine distribution in the developing chicken egg. *J. Chromatogr.*, 493 (1989) 182-187.
- 2761 Kawai, S., Nishioka, R., Nakahigashi, M., Kondo, K. and Takayama, Y.: Determination of 3-keto-valoproate in urine by metal capillary gas chromatography. *Anal. Sci.*, 5 (1989) 301-304.
- 2762 Kintz, P., Tracqui, A., Mangin, P., Luginier, A.A.J. and Chaumont, A.J.: A simple gas chromatographic identification and determination of 11 CNS stimulants in biological samples. Application on a fatality involving phendimetrazine. *Forensic Sci. Int.*, 40 (1989) 153-159; *C.A.*, 111 (1989) 2245t.
- 2763 Köppel, C., Tenczer, J. and Wagemann, A.: Mass spectral characterization of urinary pipamperone metabolites and high-performance liquid chromatography assay for pipamperone plasma levels. *J. Chromatogr.*, 491 (1989) 432-438.
- 2764 Marko, V.: Improved method for capillary gas-liquid chromatography/nitrogen-phosphorus detection determination of pentacaine in serum. *J. Pharm. Biomed. Anal.*, 7 (1989) 405-406; *C.A.*, 111 (1989) 33001q.
- 2765 Marliac, Y. and Barazi, S.: Dosage du nitrocepan dans le plasma par chromatographie en phase gazeuse. *J. Chromatogr.*, 491 (1989) 461-467.
- 2766 Mule, S.J. and Casella, G.A.: Quantitation and confirmation of the diazolo- and triazolobenzodiazepines in human urine by gas chromatography/mass spectrometry. *J. Anal. Toxicol.*, 13 (1989) 179-184; *C.A.*, 111 (1989) 18926b.
- 2767 Shin Hosang, Lho Dongseok and Park Jongsei: Simultaneous determination of propoxyphene and norpropoxyphene in biological samples by gas chromatography using an on-column injection technique with a fused-silica capillary column. *J. Chromatogr.*, 491 (1989) 448-454.
- 2768 Sunzel, M.: Determination of midazolam and the  $\alpha$ -hydroxy metabolite by gas chromatography in small plasma volumes. *J. Chromatogr.*, 491 (1989) 455-460.
- 2769 Suzuki, S.-I., Tsuchihashi, H. and Arimoto, H.: Studies on 1-(2-phenethyl)-4-(N-propionylanilino)piperidine (fentanyl) and related compounds. III. Effect of methyl group introduction into fentanyl on sensitivity enhancement in gas chromatography with surface ionization detection. *J. Chromatogr.*, 475 (1989) 400-403.

See also 2621, 2819.

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

- 2770 Feil, V.J., Paulson, G.D. and Lund, A.L.: Diazomethane derivatization of sulfamethazine: formation of isomeric products. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 515-516.
- 2771 Harris, S.C., Wallace, J.E., Foulds, G. and Rinaldi, M.G.: Assay of fluconazole by megabore capillary gas-liquid chromatography with nitrogen-selective detection. *Antimicrob. Agents Chemother.*, 33 (1989) 714-716; *C.A.*, 111 (1989) 84r.
- 2772 Schatz, F. and Haverl, H.: Analytical methods for the determination of terbinafine and its metabolites in human plasma, milk and urine. *Arzneim.-Forsch.*, 39 (1989) 527-532; *C.A.*, 110 (1989) 224887x.
- 2773 Tapanez, R.D., Ramos, F. and Perez Avila, J.: Contribution to the determination of chloroquine in biological fluids. *J. Chromatogr.*, 493 (1989) 196-201.

32f. *Cytostatics*

- 2774 Rotondo, S., Zucchetti, M., Sessa, C., D'Incalci, M., Benfenati, E. and Fanelli, R.: A gas chromatographic mass spectrometric assay for the determination of aphidicolin in plasma of cancer patients. *J. Pharm. Sci.*, 78 (1989) 399-401; *C.A.*, 111 (1989) 98y.

32g. *Other drug categories*

- 2775 Richards, R.P., Gordon, B.H., Ings, R.M.J., Campbell, D.B. and King, L.J.: The measurement of d-fenfluramine and its metabolite, d-norfenfluramine in plasma and urine with an application of the method to pharmacokinetic studies. *Xenobiotica*, 19 (1989) 547-553; *C.A.*, 111 (1989) 108b.

- 2776 Shin Hosang, Park Jongsei, Lho Dongseok and Kim Okman: Measurement of ziperol in rat plasma by gas chromatography with nitrogen-phosphorus detection. *J. Chromatogr.*, 493 (1989) 398-401.

32h. *Toxicological and forensic applications*

- 2777 Duffield, A.M., Jamieson, D.D., Lidgard, R.O., Duffield, P.H. and Bourne, D.J.: Identification of some human urinary metabolites of the intoxicating beverage kava. *J. Chromatogr.*, 475 (1989) 273-281.
- 2778 Johanson, G.: Analysis of ethylene glycol ether metabolites in urine by extractive alkylation and electron-capture gas chromatography. *Arch. Toxicol.*, 63 (1989) 107-111; *C.A.*, 111 (1989) 34758d.
- 2779 Manca, D., Ferron, L. and Weber, J.P.: A system for toxicological screening by capillary gas chromatography with use of a drug retention index based on nitrogen-containing references compounds. *Clin. Chem. (Winston-Salem)*, 35 (1989) 601-607.

See also 2688, 2762.

32i. *Plant extracts*

- 2780 Julkunen-Tiitto, R. and Tahvanainen, J.: The effect of the sample preparation method of extractable phenolics of *Salicaceae* species. *Planta Med.*, 55 (1989) 55-58; *C.A.*, 111 (1989) 3512q.
- 2781 Wu Qiao, Chen Yuing, Qiu Ningying and Huang Ronglin: (Analysis of Chinese herbal preparations by gas chromatography/Fourier transform infrared with the Nicolet 5sxc-FTIR spectrometer. I. Analysis of Hong Lingsan). *Fenxi Huaxue*, 17 (1989) 231-235; *C.A.*, 111 (1989) 12572m.

33. CLINICO-CHEMICAL APPLICATIONS

33a. *General papers and reviews*

- 2782 Baba, S.: Radio-gas chromatography. *J. Chromatogr.*, 492 (1989) 137-165 - a review with 43 refs.
- 2783 Kuksis, A. and Myher, J.J.: Gas chromatographic analysis of plasma lipids. *Adv. Chromatogr. (N.Y.)*, 28 (1989) 267-332; *C.A.*, 111 (1989) 20224q - a review with 142 refs.
- 2784 Lacroix, B., Huvenne, J.P. and Deveaus, M.: Gas chromatography with Fourier transform infrared spectrometry for biomedical applications. *J. Chromatogr.*, 492 (1989) 109-136 - a review with 92 refs.
- 2785 McDowall, R.D.: Sample preparation for biomedical analysis. *J. Chromatogr.*, 492 (1989) 3-58 - a review with 161 refs.
- 2786 Moodie, I.M., Shephard, G.S. and Labadarios, D.: A review of quantitative ion exchange, high performance liquid and gas chromatographic analysis of amino acids in physiological fluids. *J. High Resolut. Chromatogr.*, 12 (1989) 509-516 - a review with 159 refs.
- 2787 Niessen, W.M.A., Tjaden, U.R. and van der Greef, J.: Bioanalytical application of supercritical fluid chromatography. *J. Chromatogr.*, 492 (1989) 167-188 - a review with 93 refs.
- 2788 Novotny, M.V.: New developments in bioanalytical chromatography. *J. Pharm. Biomed. Anal.*, 7 (1988; Publ. 1989) 239-246; *C.A.*, 111 (1989) 3432p - a review with 51 refs.

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

- 2789 Bull, A.W., Bronstein, J.C. and Nigro, N.D.: The essential fatty acid requirement for azoxymethane-induced intestinal carcinogenesis in rats. *Lipids*, 24 (1989) 340-346.
- 2790 Burke, D.G., Lew, D.K.T. and Cominos, X.: Determination of fluoroacetate in biological matrices as the dodecyl ester. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 503-507.

- 2791 Croset, M., Black, J.M., Seanson, J.E. and Kinsella, J.E.: Effect of dietary n-3 polyunsaturated fatty acids on phospholipid composition and calcium transport in mouse cardiac sarcoplasmic reticulum. *Lipids*, 24 (1989) 278-285.
- 2792 Hughes, H., Mitchell, J.R. and Gaskel, S.J.: Quantitation of leukotriene B<sub>4</sub> in human serum by negative ion gas chromatography-mass spectrometry. *Anal. Biochem.*, 179 (1989) 304-308.
- 2793 Martinez, M.: Polyunsaturated fatty acid changes suggesting a new enzymatic defect in Zellweger Syndrome. *Lipids*, 24 (1989) 261-265.
- 2794 Myher, J.J., Kuksis, A. and Pind, S.: Molecular species of glycerophospholipids and sphingomyelins of human erythrocytes: Improved method of analysis. *Lipids*, 24 (1989) 396-407.
- 2795 Myher, J.J., Kuksis, A. and Pind, S.: Molecular species of glycerophospholipids and sphingomyelins of human plasma: Comparison to red blood cells. *Lipids*, 24 (1989) 408-418.
- 2796 Niwa, T., Takeda, N., Sasaoka, T., Kaneda, N., Hashizume, Y., Yoshizumi, H., Tatematsu, A. and Nagatsu, T.: Detection of tetrahydroisoquinoline in Parkinsonian brain as an endogenous amine by use of gas chromatography-mass spectrometry. *J. Chromatogr.*, 491 (1989) 397-403.
- 2797 Pekari, K., Riekkola, M.-L. and Aitio, A.: Simultaneous determination of benzene and toluene in the blood using head-space gas chromatography. *J. Chromatogr.*, 491 (1989) 309-320.
- 2798 Shi Jinpo, Shen Hong, Meng Qingrun, Li Shifu and Zhang Ziyang: (Testing of anaerobe of abdominal infection with gas chromatography). *Weishengwuxue Tongbao*, 15 (1988) 271-277; *C.A.*, 111 (1989) 36338r.

See also 2671.

#### 34. FOOD ANALYSIS

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

- 2799 Ackman, R.G.: Capillary GLC has finally 'arrived'. *J. Am. Oil Chem. Soc.*, 66 (1989) 293-301.
- 2800 Runge, G. and Steinhart, H.: Zur Tocochochromanol- und Fettsäureanalytik in Fisch. *Fat Sci. Technol.*, 91 (1989) 281-287.

See also 2865.

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

- 2801 Bergner-Lang, B. and Kaechele, M.: (Anabolics in veal. Detection, determination, and results. Part. 3. Statistical evaluation of the GC-MS method and results from inspections). *Dtsch. Lebensm.-Rundsch.*, 85 (1989) 78-79; *C.A.*, 111 (1989) 38131s.
- 2802 Bitteur, S., Gunata, Z., Brillouet, J.M., Bayonove, C. and Cordonnier, R.: GC and HPLC of grape monoterpene glycosides. *J. Sci. Food Agric.*, 47 (1989) 341-457; *C.A.*, 111 (1989) 22282E.
- 2803 Chen Zhihang, Murata Takeshi and Fang Rong: (Quantitative determination of diethylene glycol contents in wine by gas chromatography). *Shipin Yu Fajiao Gongye*, No. 1 (1989) 55-58; *C.A.*, 111 (1989) 5808q.
- 2804 Contarini, G., Toppino, P.M., Bocca, A. and Cozzoli, O.: (Gas chromatographic analysis of butter: results of a collaborative study). *Riv. Ital. Sost. Grasse*, 65 (1988) 369-375.
- 2805 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.
- 2806 De Pooter, H.L. and Schamp, N.M.: The study of aroma formation and ripening of apples cv Golden Delicious by head-space analysis. *J. Essent. Oil Res.*, 1 (1989) 47-56; *C.A.*, 111 (1989) 38191m.
- 2807 Di Muccio, A., Ausili, A., Camoni, I., Dommarco, R., Rizzica, M. and Vergori, F.: Single-step solid-matrix clean-up of vegetable extracts for organophosphorus pesticide residue determination. *J. Chromatogr.*, 456 (1988) 149-153.

- 2808 Grompone, M.A.: Chemical evaluation of Uruguayan *Cucurbitaceae* seeds as potential sources of vegetable oils. *Fat Sci. Technol.*, 90 (1988) 487-490.
- 2809 Guth, H. and Grosch, W.: 3-Methylnonane-2,4-dione - an intense odour compound formed during flavour reversion of soybean oil. *Fat Sci. Technol.*, 91 (1989) 225-230.
- 2810 Hernandez i Rabascall, N. and Boatella i Riera, J.: (Trans isomers content of fatty acids in margarines). *Grasas y Aceites*, 39 (1988) 348-352.
- 2811 Julin, L., Sarkki, J. and Manninen, A.: Analysis of erucic acid content of vegetable oils. *Riv. Ital. Sost. Grasse*, 65 (1988) 143-145.
- 2812 Kalo, P., Huotari, H. and Antila, M.: *Pseudomonas fluorescens* lipase-catalyzed interesterification of butterfat. *Fat Sci. Technol.*, 91 (1989) 276-281.
- 2813 Kobayashi, H., Matano, O. and Goto, S.: Determination of oxine-copper in orange by gas chromatography. *J. Chromatogr.*, 474 (1989) 381-387.
- 2814 Matsuo, T., Kanamori, H. and Sakamoto, I.: (Determination of benzoic and saccharin in foods by using trimethylsilyldiazomethane as methylation reagent). *Hiroshima-ken Eisei Kenkyusho Kenkyu Hokoku*, No. 35 (1988) 33-39; *C.A.*, 111 (1989) 6026v.
- 2815 Morgan, J.N. and Armstrong, D.J.: Wide-bore capillary gas chromatographic method for quantification of cholesterol oxidation products in egg yolk powder. *J. Food Sci.*, 54 (1989) 427-429; *C.A.*, 111 (1989) 38054u.
- 2816 Morisaki, S., Nagata, T., Ninomiya, T. and Nakama, S.: (Simple method for gas chromatographic determination of tributyltin compounds in fish and shellfish). *Shokuhin Eiseigaku Zasshi*, 30 (1989) 36-41; *C.A.*, 111 (1989) 22274e.
- 2817 Mosandi, A., Hener, U., Hagenauer-Hener, U. and Kustermann, A.: Direct enantiomer separation of chiral  $\gamma$ -lactones from food and beverages by multi-dimensional gas chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 532-536.
- 2818 Murakami, A. and Kobayashi, E.: (Examination of the measurement of anti-oxidant reagents (BHA, BHT) in dried small sardines). *Aomori-ken Eisei Kenkyushoho*, No. 25 (1988; Publ. 1989) 19-22; *C.A.*, 111 (1989) 5997a.
- 2819 Niwa, T., Yoshizumi, H., Tatamatsu, A., Matsuura, S. and Nagatsu, T.: Presence of tetrahydroisoquinoline, a parkinsonism-related compound, in foods. *J. Chromatogr.*, 493 (1989) 347-352.
- 2820 Nourooz, 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.
- 2821 Oboh, F.O.J. and Oderinde, R.: Development of Tucum pulp oil fractions for possible edible and industrial use. *Riv. Ital. Sost. Grasse*, 65 (1988) 209-211.
- 2822 Otero, J.A., Renedo, J. and Lena, G.: (Study of unsaponifiables of butterfat. Hydrocarbon fraction). *Grasas y Aceites*, 39 (1988) 359-362.
- 2823 Paganuzzi, V.: (Monoglycerides in vegetable oils. Note II. Highly unsaturated raw oils). *Riv. Ital. Sost. Grasse*, 65 (1988) 181-189.
- 2824 Palla, G., Marchelli, R., Dossena, A. and Casnati, G.: Occurrence of D-amino acids in food. Detection by capillary gas chromatography and by reversed-phase high-performance liquid chromatography with L-phenylalaninamides as chiral selectors. *J. Chromatogr.*, 475 (1989) 45-53.
- 2825 Prager, M.J.: Differential characteristics of fatty acids in cheese from milk of various animal species by capillary gas chromatography. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 418-421.
- 2826 Rao, K.S., Jones, G.P., Rivett, D.E. and Tucker, D.J.: Cyclopropene fatty acids of six seed oils from *Malvaceae*. *J. Am. Oil Chem. Soc.*, 66 (1989) 360-361.
- 2827 Sanders, T.H. and Greene, R.L.: The relationship of peanut maturity to 2-methylpropanal in headspace volatiles. *J. Am. Oil Chem. Soc.*, 66 (1989) 576-580.
- 2828 Sebedio, J.L., Le Quere, J.L., Morin, O., Vatele, J.M. and Grandgirard, A.: Heat treatment of vegetable oils. III. GC-MS characterization of cyclic fatty acid monomers in heated sunflower and linseed oils after total hydrogenation. *J. Am. Oil Chem. Soc.*, 66 (1989) 704-709.
- 2829 Shimizu, S., Kawashima, H., Akimoto, K., Shinmen, Y. and Yamada, H.: Microbial conversion of an oil containing  $\alpha$ -linolenic acid to an oil containing eicosa-pentaenoic acid. *J. Am. Oil Chem. Soc.*, 66 (1989) 342-347.
- 2830 Solinas, M., Angerosa, F. and Marsilio, V.: (Research of some flavor components of virgin olive oil in relation to olives variety). *Riv. Ital. Sost. Grasse*, 65 (1988) 361-368.

- 2831 Tekel, J., Farkas, P. and Kovac, M.: Determination of acrylamide in sugar by capillary GLC with alkali flame-ionization detection. *Food Addit. Contam.*, 6 (1989) 377-381; *C.A.*, 111 (1989) 22295n.
- 2832 Trost, V.W.: Characterization of corn oil, soybean oil and sunflowerseed oil nonpolar material. *J. Am. Oil Chem. Soc.*, 66 (1989) 325-333.
- 2833 Tsui, I.C.: Rapid determination of total cholesterol in homogenized milk. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 421-424.
- 2834 Van Ingen, R.H.M. and Nijssen, L.M.: Determination of diethylene glycol monoethyl ether in flavors by two-dimensional capillary gas chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 484-485.
- 2835 Van Rillaer, W. and Beernaert, H.: Determination of residual tetrachloroethylene in olive oil by headspace-gas chromatography. *Z. Lebensm.-Unters. Forsch.*, 188 (1989) 221-222; *C.A.*, 111 (1989) 38070w.
- 2836 Waliszewski, S.M. and Waliszewski, K.N.: GC determination of dichlofluanid (Euparen) residues and its metabolite dimethyphenylsulfamide (DMSA) in strawberries. *Fresenius' Z. Anal. Chem.*, 331 (1988) 528-529.
- 2837 Warner, K., Frankel, E.N. and Mounts, T.L.: Flavor and oxidative stability of soybean, sunflower and low erucic acid rapeseed oils. *J. Am. Oil Chem. Soc.*, 66 (1989) 558-564.
- 2838 Zullo, C., Caboni, M.F., Biagi, P.I., Bordoni, A., Turchetto, E. and Lercker, G.: (The composition of intramuscular lipids from meat and fish). *Riv. Ital. Sost. Grasse*, 65 (1988) 191-196.

See also 2588, 2648, 2676, 2711, 2728, 2777, 2870, 2887.

### 35. ENVIRONMENTAL ANALYSIS

#### 35a. General papers and reviews

- 2839 Matthias, C.L.: A gas chromatographic determination of tributyltin species in estuarine water and sediment using hydride derivatization and flame photometric detection. Avail. *Diss. Abstr. Int. B*, 49 (1989) 3150; *Univ. Microfilms*, Order No. DA8818178 (1988) 190 pp.; *C.A.*, 111 (1989) 44951a.
- 2840 Melnikov, N.N. and Belan, S.P.: (Polychlorodiphenyls, polychlorodibenzofurans and polychlorodibenzodioxins in environment). *Khim. Promyshl.*, (1989) 328-333 - a review with 101 refs.
- 2841 Onuska, F.I. and Terry, K.A.: Supercritical fluid extraction of PCBs in tandem with high resolution gas chromatography in environmental analysis. *J. High Resolut. Chromatogr.*, 12 (1989) 527-531.
- 2842 Roos, A.H., Kienhuis, P.G.M., Traag, W.A. and Tuinstra, L.G.M.T.: Problems encountered in the determination of 2,3,4-2',4',5'-hexachlorobiphenyl (CB 138) in environmental samples. *Int. J. Environ. Anal. Chem.*, 36 (1989) 155-161.

See also 2608, 2613, 2888.

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

- 2843 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.
- 2844 Wang Mingren and Zhang Yelan: (Sample enrichment in gas chromatography for determination of microamount of nitriles in air). *Fenxi Ceshi Tongbao*, 7, No. 6 (1988) 72-74; *C.A.*, 111 (1989) 11812c.
- 2845 Yokouchi, Y. and Ambe, Y.: Automated measurements of 1,1,1-trichloroethane, trichloroethylene, and tetrachloroethylene in the atmosphere by cryogenic preconcentration (capillary GC/flame ionization detection). *Bunseki Kagaku*, 38 (1989) 40-45.

See also 2881.

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

- 2846 Glaze, W.H., Koga, M. and Cancilla, D.: Ozonation byproducts. 2. Improvement of an aqueous-phase derivatization method for the detection of formaldehyde and other carbonyl compounds formed by the ozonation of drinking water. *Environ. Sci. Technol.*, 23 (1989) 838-847; *C.A.*, 111 (1989) 12232a.
- 2847 Grob, K., Jr. and Li Zhangwan: Coupled reversed-phase liquid chromatography-capillary gas chromatography for the determination of atrazine in water. *J. Chromatogr.*, 473 (1989) 423-430.
- 2848 Hale, J.R., Walla, M.D. and Bryson, T.A.: Determination of fenvalerate in seawater and sediment utilizing isotopic dilution and GC/MS. *J. Agric. Food Chem.*, 37 (1989) 70-74.
- 2849 Hinckley, D.A. and Bidleman, T.F.: Analysis of pesticides in seawater after enrichment onto C<sub>8</sub> bonded phase cartridges. *Environ. Sci. Technol.*, 23 (1989) 995-1000; *C.A.*, 111 (1989) 44940w.
- 2850 Kaiser, R.E. and Rieder, R.: High boiling organic traces in drinking water. Quantitative analysis by liquid-liquid enrichment within the analytical glass capillary. *J. Chromatogr.*, 477 (1989) 49-52.
- 2851 Kampbell, D.H., Wilson, J.T. and Vandegrift, S.A.: Dissolved oxygen and methane in water by a GC headspace equilibration technique. *Int. J. Environ. Anal. Chem.*, 36 (1989) 249-257.
- 2852 Karrenbrock, F., Oehmichen, U. and Maes, B.: (Determination of phenoxy-alkanecarboxylic acids by gas chromatography/secondary-ion mass spectrometry (GC/SIMS)). *Gewaesserschutz, Wasser, Abwasser*, 106 (1989) 282-296; *C.A.*, 111 (1989) 12264n.
- 2853 Lee, Y.H. and Mowrer, J.: Determination of methylmercury in natural waters at sub-nanograms per litre level by capillary gas chromatography after adsorbent preconcentration. *Anal. Chim. Acta*, 221 (1989) 259-268.
- 2854 McCabe, T., Hiller, J.F. and Morabito, P.L.: An automated large volume on-column injection technique for capillary gas chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 517-521.
- 2855 Scholz, B. and Palaschek, N.: The determination of substituted aromatic amines in water and sediment samples. *Fresenius' Z. Anal. Chem.*, 331 (1988) 282-289.
- 2856 Swineford, D.M. and Belisle, A.A.: Analysis of trifluralin, methyl parathion, methyl parathion, fenvalerate, and 2,4-D dimethylamine in pond water using solid-phase extraction. *Environ. Toxicol. Chem.*, 8 (1989) 465-468; *C.A.*, 111 (1989) 34759e.
- 2857 Winkeler, H.D. and Levsen, K.: Rapid and quantitative pentafluorobenzoylation of nitrophenols and other phenolic compounds in water for gas-chromatographic determination with electron capture detection. *Fresenius' Z. Anal. Chem.*, 334 (1989) 340-343.

See also 2534, 2539, 2540, 2541, 2542, 2729.

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

- 2858 Shcherbakov, A.P., Raikhinshtein, M.V. and Losev, E.E.: (Method of determining catalase activity of soil). *U.S.S.R. Pat.* SU 1,436,070 (Cl. G01N33/24), 7 Nov. 1988, Appl. 4,147,970, 18 Nov. 1986; *C.A.*, 111 (1989) 35776v.
- 2859 Siu, K.W.M., Maxwell, P.S. and Berman, S.S.: Extraction of butyltin species and their gas chromatographic determination as chlorides in a sediment certified reference material for trace metals, PACS-1. *J. Chromatogr.*, 475 (1989) 373-379.
- 2860 Wright, B.W., Wright, C.W. and Fruchter, J.S.: Supercritical fluid extraction of coal tar-contaminated soil samples. *Energy Fuels*, 3 (1989) 474-480; *C.A.*, 111 (1989) 49656t.
- 2861 Wu Leijun and Liu Aiguo: Determination of fensulfothion residues in soil. *Sepu*, 6 (1988) 247-249.

See also 2839, 2848, 2855.



## 36. SOME TECHNICAL PRODUCTS AND COMPLEX MIXTURES

## 36a. Surfactants

- 2862 Geissler, P.R.: Quantitative analysis of ethoxylated alcohols by supercritical fluid chromatography. *J. Am. Oil Chem. Soc.*, 66 (1989) 685-689.
- 2863 Szymanowski, J.: The polarity of nonionics. *Tenside Surf. Deterg.*, 26 (1989) 198-210 - a review with 102 refs.

## 36b. Antioxidants and preservatives

See 2818.

## 36c. Various technical products

- 2864 Alessi, P., Orlandini-Visalberghi, M. and Torriano, G.: New applications of gas chromatography in the field of paints and varnishes. *J. Oil Colour Chem. Assoc.*, 72 (1989) 15-19; *C.A.*, 111 (1989) 8896c - a review with 17 refs.
- 2865 Armanino, C., Learidi, R., Lanteri, S. and Modi, G.: Chemometric analysis of Tuscan olive oils. *Chemometrics Intel. Lab. Systems*, 5 (1989) 343-354.
- 2866 Benova, E., Louzecka, A. and Stefanova, J.: (Gas-chromatographic determination of the sulfur compound content in kraft pulping). *Pap. Celul.*, 44 (1989) 7-11; *C.A.*, 111 (1989) 41657y.
- 2867 Bernardini, M., Baroni, D., Fedeli, E., Zelinotti, T. and Migliorini, G.: (Universal calibration for alcohol determination in perfumes using N.I.R.A. technique). *Riv. Ital. Sost. Grasse*, 65 (1988) 133-137.
- 2868 Bhagat, S.D., Aswal, D.S. and Badoni, R.P.: Determination of N-methylpyrrolidone in lubricating oil samples by GC. *Fuel*, 68 (1989) 796-799; *C.A.*, 111 (1989) 42502f.
- 2869 Borowiec, R.: (Method for determining content of individual groups in gasoline fractions). *Pol. Pat.* PL 144,857 (Cl. G01N30/10), 30 Jul. 1988, Appl. 257,293, 31 Dec. 1985; 7 pp.; *C.A.*, 111 (1989) 26133f.
- 2870 Carelli, A. and Lozano, J.: Apple aroma from Argentina: Quality evaluation by capillary gas chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 488-490.
- 2871 Chiavari, G., Francioso, O., Galletti, G.C., Piccaglia, R. and Zadrazil, F.: Characterization by pyrolysis-gas chromatography of wheat straw fermented with white rot fungus *Stropharia rugosoannulata*. *J. Anal. Appl. Pyrolysis*, 15 (1988; Publ. 1989) 129-136; *C.A.*, 111 (1989) 6198c.
- 2872 Chirila, T.V., Constable, I.J., Russo, A.V. and Linton, R.G.: Ridley intra-ocular lens revisited: chemical analysis of residuals in the original lens material. *J. Cataract Refractive Surg.*, 15 (1989) 283-288; *C.A.*, 111 (1989) 12481f.
- 2873 Collier, S.W., Milstein, S.R., Orth, D.S. and Jayasimhulu, K.: Quantitative assay of volatile and non-volatile N-nitrosamines by gas chromatography with an electrolytic conductivity detector. I. Method development and assay of N-nitrosodiethanolamine (NDELA) in creams and lotions. *J. Soc. Cosmet. Chem.*, 39 (1988) 329-346; *C.A.*, 111 (1989) 28353b.
- 2874 Fleischmann, C. and Kummerer, W.: (Analytical methods in oil and gas production - simulated distillation of crude oil). *Erdoel, Erdgas, Kohle*, 105 (1989) 117-120; *C.A.*, 111 (1989) 25893s.
- 2875 Goncharova, V.F. and Kostyleva, V.V.: (Identification of light fractions at Orenburg). *Gazov. Prom-st.*, No. 3 (1989) 42; *C.A.*, 111 (1989) 9954g.
- 2876 Griot, M., Dettwiler, B., Heinle, E., Mayer, F. and Dunn, I.J.: Simple and rapid gas chromatographic determination of volatile metabolites in fermentation broths. *Anal. Chim. Acta*, 213 (1988) 11-22.
- 2877 Hackett, J.P. and Gibbon, G.A.: Capillary gas chromatographic characterization of Fischer-Tropsch liquefaction products: On-line analysis. *J. Chromatogr. Sci.*, 27 (1989) 405-412.
- 2878 Harahap, N., Burford, R.P. and Haken, J.K.: Gas chromatographic analysis of thermoplastic aromatic polyamides after alkali fusion. *J. Chromatogr.*, 477 (1989) 53-57.

- 2879 Heinzer, F., Maitre, H.P., Rigaux, M. and Wild, J.: Pattern recognition of tobacco headspace GC profiles. A potential new analytical tool for the classification of raw tobaccos. *Beitr. Tabakforsch. Int.*, 14 (1988) 93-103; *C.A.*, 111 (1989) 4500w.
- 2880 Jiao Kefang and Jiang Xiaochun: (Quantitative analysis of commercial *p*-phenetidine). *Huaxue Shijie*, 29 (1988) 458-459; *C.A.*, 111 (1989) 16949n.
- 2881 Krzymien, M.E.: GC-MS analysis of organic vapours emitted from polyurethane foam insulation. *Int. J. Environ. Anal. Chem.*, 36 (1989) 193-207.
- 2882 Niemela, K.: Gas-liquid chromatography-mass spectrometry studies on pine kraft black liquors. Part V. Identification of catechol compounds. *Holz-forschung*, 43 (1989) 99-110; *C.A.*, 111 (1989) 25157e.
- 2883 Paryzkova, J. and Kolb, I.: Method for parallel determination of phenol and byproducts in dian by capillary gas chromatography. *Czech. Pat.* CS 256,487 (Cl. G01N30/02) 1 May, 1989, Appl. 86/528, 24 Jan. 1986; 4 pp.; *C.A.*, 111 (1989) 16971p.
- 2884 Pham Huy Chuong, Lejay, J. and Hamon, M.: (Dynamic extraction and determination of residual ethylene oxide in oxygen generators and extracorporeal circuits). *Talanta*, 36 (1989) 495-499.
- 2885 Putun, E., Tolay, M. and Davies, I.L.: Application of on-line coupled micro-bore liquid chromatography/capillary gas chromatography to the analysis of liquefaction product of Turkish Goynuk lignite. *Chim. Acta Turc.*, 16 (1988) 193-208; *C.A.*, 111 (1989) 10039u.
- 2886 Rao, S.S., Vijayaraghavan, R., Suryanarayana, M.V.S. and Ramachandran, P.K.: Gas chromatographic identification of urinary metabolites of insect repellent *N,N*-diethylphenylacetamide on inhalation exposure in rats. *J. Chromatogr.*, 493 (1989) 210-216.
- 2887 Razzoni, A., Rochelli, V. and Ciarrucca, R.: (Capillary GC/FTIR of food packaging materials). *Lab. 2000*, 2, No. 11 (1988) 75-80; *C.A.*, 111 (1989) 6016s.
- 2888 Schulz, D.E., Petrick, G. and Duinker, J.C.: Complete characterization of polychlorinated biphenyl congeners in commercial Aroclor and Clophen mixtures by multidimensional gas chromatography-electron capture detection. *Environ. Sci. Technol.*, 23 (1989) 852-859; *C.A.*, 111 (1989) 16960j.
- 2889 Sokmen, T. and Oyman, U.: Examination of Thrace petroleum fraction with boiling points up to 150° by GLC method. *Chim. Acta Turc.*, 15 (1989) 351-366; *C.A.*, 111 (1989) 25985y.
- 2890 Su Keman, He Yihua, Wang Wei and Yu Qiding: (Analysis of tar from Lurgi pressurized coal gasification by GC and GC-MS). *Huadong Huadong Xueyuan Xuebao*, 14 (1988) 703-712; *C.A.*, 111 (1989) 206074n.
- 2891 Takatsu, M. and Yamamoto, T.: (Identification of soot produced from aromatic hydrocarbon by pyrolysis GC). *Bunseki Kagaku*, 38 (1989) 449-453.
- 2892 Yanotovskii, M.T.: (Unification of the analytical monitoring of technological mixtures of fine organic synthesis). *Zh. Anal. Khim.*, 43 (1988) 748-754.
- 2893 Zuber, K. and Bartl, P.: Quality control of aviation fuels. 1. Automatic simulated distillation and calculation of the vapor pressure of JP-4 aviation fuel (AVTAG) using capillary gas chromatography. *Fuel*, 68 (1989) 659-663; *C.A.*, 111 (1989) 9964k.

See also 2724.

36d. *Complex mixtures and unidentified compounds*

- 2894 Ayorinde, F.O., Powers, F.T., Streete, L.D., Shepard, R.L. and Tabi, D.N.: Synthesis of dodecanedioic acid from *Vermontia galamensis* oil. *J. Am. Oil Chem. Soc.*, 66 (1989) 690-692.
- 2895 Duncan, W.P.: Semiconductor solvent analysis by GC-IR-MS. *Spectroscopy (Eugene)*, 4 (1989) 42-45; *C.A.*, 111 (1989) 49622d.
- 2896 Kafka, Z. and Vodcak, L.: (Utilization of instrumental methods for determining products of hydrogenation of nitrogenous compounds on MoS<sub>2</sub> catalyst). *Ropa Uhlie*, 31 (1989) 402-408.
- 2897 Lanine, B.K., Ward, A.J.I. and Smith, R.-K.: Application of gas chromatography/pattern recognition techniques to the problem of identifying Africanized honey bees. *Microchem. J.*, 39 (1989) 308-316.
- 2898 Maniatis, K. and Buekens, A.: Fast pyrolysis of biomass. In: A.V. Bridgwater and J.L. Kuester (Editors), *Research of Thermochemical Biomass Conversion*, Elsevier, London, 1988, pp. 179-191.

- 2899 Serra Bonvehi, J.: (The study of the chemical composition of beeswax (*Apis mellifera* L.) from Spain). *Grasas y Aceites*, 39 (1988) 334-342.
- 2900 Valcarce, R. and Smith, G.G.: Chemical characterization of honey bees by Curie-point pyrolysis-gas chromatography-pattern recognition. *Chemometrics Intel. Lab. Systems*, 6 (1989) 157-166.
- 2901 Zeringue, H.J., Jr. and Mc Cormick, S.P.: Relationships between cotton leaf-derived volatiles and growth of *Aspergillus flavus*. *J. Am. Oil Chem. Soc.*, 66 (1989) 581-585.

See also 2877.

### 37. CELLS, CELLULAR PARTICLES AND SUPRAMOLECULAR STRUCTURES

- 2902 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 (1988; Publ. 1989) 137-158; *C.A.*, 111 (1989) 4274a.

See also 2599, 2607, 2610, 2644, 2654, 2798, 2901.

### 38. INORGANIC COMPOUNDS

#### 38b. Anions

See 2844.

#### 38c. Permanent and rare gases

- 2903 Baranov, S.B. and Rykov, V.I.: (Chromatographic analysis of gases in incandescent lamps). *Svetotekhnika*, No. 8 (1988) 24-26; *C.A.*, 111 (1989) 49493n.
- 2904 George, M.A., Hessler, J.P. and Carnahan, J.W.: Determination of impurities in argon by gas chromatography with a microwave-induced plasma detector. *J. Anal. At. Spectrom.*, 4 (1989) 51-54; *C.A.*, 111 (1989) 32818z.
- 2905 Matsui, M.: (Determination of hydrogen by thermal conductivity detection-GC using helium carrier gas). *Bunseki Kagaku*, 38 (1989) 395-398.
- 2906 Shutov, V.V., Kuz'min, L.V. and Stepanov, N.E.: (Automatic monitoring of decarbonation of a raw mix in a preheater). *Tsement*, No. 1 (1989) 22-23; *C.A.*, 111 (1989) 11688s.

See also 2538, 2546, 2553, 2851, 2858.

#### 38d. Volatile inorganic compounds

See 2866, 2906.

### 39. RADIOACTIVE AND OTHER ISOTOPE COMPOUNDS

- 2907 Hawthorne, S.B., Miller, D.J. and Aulich, T.R.: Preparation of deuterated aromatic hydrocarbons, heteroatom-containing aromatics, and polychlorinated biphenyls as internal standards for GC/MS analysis. *Fresenius' Z. Anal. Chem.*, 334 (1989) 421-426.
- 2908 Shibahara, A., Yamamoto, K., Takeoka, M., Kinoshita, A., Kajimoto, G., Nakayama, T. and Noda, M.: Application of a GC-MS method using deuterated fatty acids for tracing *cis*-vaccenic acid biosynthesis in kaki pulp. *Lipids*, 24 (1989) 488-493.

See also 2538, 2782.

## Planar Chromatography

### 1. REVIEWS AND BOOKS

- 1036 Dallas, F.A.A., Read, H., Ruane, R.J. and Wilson, I.D.: *Recent Advances in Thin-Layer Chromatography*, (Proc. Chromatogr. Soc. Int. Symp.), Plenum, New York, 1988, 247 p.; C.A., 111 (1989) 70083p.
- 1037 Do Quy Diem: (Thin-layer chromatography combined with densitometry and its application to drug analysis). *Tap Chi Duoc Hoc*, No. 6 (1988) 22-32; C.A., 110 (1989) 219153a - a review with 20 refs.
- 1038 Hamilton, R. and Hamilton, S.: *Thin Layer Chromatography (Analytical Chemistry by Open Learning)*, Wiley, Chichester, 1987, XIX + 129 p.
- 1039 Jaenchen, D.E. and Issaq, H.J.: Prospects and new developments in instrumental thin-layer chromatography. *Spectra 2000*, 136 (1989) 41-49; C.A., 111 (1989) 16904u - a review with 28 refs.
- 1040 Kaiser, R.E.: Scope and limitations of modern planar chromatography. Part 2: separation modes. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 265-268; C.A., 111 (1989) 49607c - a review.
- 1041 Sewell, P.A. and Clarke, B.: *Chromatographic Separations (Analytical Chemistry by Open Learning)*, Wiley, Chichester, 1987, XX + 335 p.
- 1042 Studer, A.: (Thin-layer chromatography (TLC)). *SLZ, Schweiz. Lab.-Z.*, 46, No.2 (1989) 52-54; C.A., 111 (1989) 16903t - a review with 20 refs.

See also 1048, 1068, 1181, 1186, 1208, 1209, 1243.

### 2. FUNDAMENTALS, THEORY AND GENERAL

#### 2b. Thermodynamics and theoretical relationships

- 1043 Kurenbin, O.I., Belen'kii, B.G., Litvinova, L.S. and Gankina, E.S.: (New approach to optimization in thin-layer chromatography). *Zh. Anal. Khim.*, 44 (1989) 493-502; C.A., 111 (1989) 12944j.
- 1044 Medic-Saric, M., Saric, S. and Maysinger, D.: Application of numerical taxonomy and information content to the selection of mobile phases in thin-layer chromatography. *Acta Pharm. Jugosl.*, 39, No. 1 (1989) 1-16; C.A., 111 (1989) 70066k.
- 1045 Oscik-Mendyk, B.: Analysis of chromatographic parameters in the systems with ternary mobile phases. II. Two polar solvents in mobile phase. *J. Liq. Chromatogr.*, 12 (1989) 891-906.

See also 1050.

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

- 1046 Kavetskii, V.N. and Bublik, L.I.: (Use of thin-layer chromatography for determination of organic compound dipole moments). *Zh. Fiz. Khim.*, 63 (1989) 1021-1024; C.A., 111 (1989) 32145c.

### 3. GENERAL TECHNIQUES

#### 3a. Apparatus and accessories

- 1047 Matysik, G. and Soczewinski, E.: A miniaturized device for the generation of eluent composition gradients for sandwich thin-layer chromatography. *Chem. Anal. (Warsaw)*, 33 (1988) 363-369; C.A., 110 (1989) 237204x.

## 3b. Detectors and detection reagents

- 1048 Baeyens, W.R.G., Nakashima, K., Imai, K., Ling, B.L. and Tsukamoto, Y.: Development of chemiluminescence reactions in biomedical analysis. *J. Pharm. Biomed. Anal.*, 7 (1989) 407-412 - a review with 66 refs.
- 1049 Belen'kii, B.G., Adamovich, T.B., Lobazov, A.F., Mostovnikov, V.A., Nechaev, S.V. and Solonenko, M.G.: High performance scanning laser fluorometric detector for HPTLC and electrophoresis. In: J. Pick and J. Vajda (Editors), *Proc. Int. Conf. Biochem. Sep., 2nd*, Hungarian Biochemical Society, Budapest, 1988, pp. 23-33; *C.A.*, 111 (1989) 49635k.

See also 1064, 1130, 1195, 1209.

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

- 1050 Bayne, C.K. and Ma, C.Y.: A comparison of overlapping resolution mapping with ideal separation to optimize the mobile phase composition for high performance thin-layer chromatography. *J. Liq. Chromatogr.*, 12 (1989) 235-246.
- 1051 Berezkin, V.G., Rummyantsev, V.Yu., Vorob'eva, S.V. and Dontsova, E.P.: (Method for separation by paper chromatography). *U.S.S.R. Pat.* SU 1,469,453 (Cl. G01N1=94), 30 Mar. 1989, Appl. 4,151,071, 25 Nov. 1986; *C.A.*, 111 (1989) 49600v.
- 1052 Bold, A., Popa, A., Vasile, A., Cruceanu, M., Popovici, E. and Alexandroaei, M.: Zeolite molecular sieves as stationary phase in thin-layer chromatography. V. On migration mechanism. *Rev. Roum. Chim.*, 34, No. 1 (1989) 59-63; *C.A.*, 111 (1989) 45808w.
- 1053 Gullner, G., Cserhati, T., Bordas, B. and Valko, K.: Multivariate methods to evaluate the role of mixed supports in reversed-phase thin-layer chromatography. *J. Liq. Chromatogr.*, 12 (1989) 957-978.
- 1054 Jost, W. and Hauck, H.E.: (High-performance thin-layer chromatographic material from silylated silica gel). *Faming Zhuanli Shenqing Gongkai Shuomingshu Pat.* CN 85,105,260 (Cl. B01J20/10), 07 Jan. 1987, Appl. 09 Jul. 1985; *C.A.*, 110 (1989) 241887q.
- 1055 Manvelyan, M.A., Sarkisyan, E.A., Martirosyan, R.S., Bagramyan, A.R., Amirkhanyan, S.A. and Abadzhev, F.G.: (Preparation of aluminium oxide for thin-layer chromatography). *U.S.S.R. Pat.* SU 1,463,719 (Cl. C01F7/02), 07 Mar. 1989, Appl. 4,286,935, 11 Jun. 1987; *C.A.*, 110 (1989) 234154v.
- 1056 Oveyan, T.V., Amirkhanyan, S.A., Abadzhev, F.G. and Sarkisyan, E.V.: (Method of preparing plates for thin-layer chromatography). *U.S.S.R. Pat.* SU 1,458,812 (Cl. G01N30/93), 15 Feb. 1989, Appl. 4,291,392, 28 Jul. 1987; *C.A.*, 110 (1989) 224767h.
- 1057 Rozylo, J.K., Chojnacka, G., Oscik-Mendyk, B. and Kolodziejczyk, H.: Some physico-chemical problems of prediction of the optimum separation in adsorption TLC with mixed mobile phase. *J. Liq. Chromatogr.*, 12 (1989) 247-269.
- 1058 Rozylo, J.K., Malinowska, I. and Kolodziejczyk, H.: Specific surface area of the adsorbent as the parameter of optimization in adsorption thin-layer chromatography. *Symp. Biol. Hung.*, 37 (Chromatography '87) (1988) 359-373; *C.A.*, 111 (1989) 49642k.
- 1059 Vamos, J., Brantner, A., Gracza, I., Lasztity, A. and Jozan, M.: (Ion-exchange interactions on silica gel layers. Part 3. Salts of organic bases with organic acids. Sodium salts of organic acids). *Acta Pharm. Hung.*, 59, No. 2 (1989) 69-86; *C.A.*, 111 (1989) 28420w.
- 1060 Vamos, J., Brantner, A., Jozan, M. and Gracza, I.: (Ion-exchange interactions on silica gel layers. Part 2. Halogen salts of compounds containing organic tertiary and quaternary nitrogen). *Acta Pharm. Hung.*, 59, No. 2 (1989) 59-68; *C.A.*, 111 (1989) 28419c.
- 1061 Wu, Y.: (A mixed layer made of microcrystalline cellulose and silica gel for thin-layer chromatography). *Sepu*, 7 (1989) 112-114; *C.A.*, 111 (1989) 3531v.
- 1062 Zhukov, A.V., Kusnetsova, E.I. and Vereshchagin, A.G.: Activation of thin adsorbent layers by an anhydrous organic solvent. *J. Chromatogr.*, 474 (1989) 400-404.

See also 1201, 1205, 1217.

*3d. Quantitative analysis*

- 1063 Haky, J.E., Sherwood, D.A. and Brennan, S.T.: Simplex optimization of densitometer parameters for maximum precision in quantitative thin-layer chromatography. *J. Liq. Chromatogr.*, 12 (1989) 907-917.
- 1064 Hüttenhain, S.H. and Balzer, W.: Quantitative evaluation of thin-layer chromatograms by means of the solvatochromic fluorescence of 8-(phenylamino)-1-naphthalenesulphonate. *Fresenius' Z. Anal. Chem.*, 334 (1989) 31-33.
- 1065 Uchiyama, K., Ohsawa, K., Yoshimura, Y., Arai, K. and Imaeda, K.: Preamplifier in photoacoustic densitometry by fast laser beam scanning. *Anal. Sci.*, 4 (1989) 421833u.

See also 1049, 1243.

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

See 1047.

## 4. SPECIAL TECHNIQUES

*4a. Automation and computerization*

See 1134, 1215.

*4b. Combination of various chromatographic techniques*

- 1066 Rozylo, J.K. and Janicka, M.: Some problems of using thin-layer chromatography as a pilot technique for liquid column chromatography in analysis for organic compounds. *Symp. Biol. Hung.*, 37 (Chromatography '87) (1988) 345-357; *C.A.*, 111 (1989) 16922y.

See also 1215.

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

- 1067 Iwaoka, T., Tsutsumi, S., Tada, K. and Suzuki, F.: FTIR spectrometry for TLC (thin-layer chromatography) adsorbate. Potassium bromide micropyramid technique. *Sankyo Kenkyusho Nenpo*, 40 (1988) 39-46; *C.A.*, 111 (1989) 36035q.
- 1068 Nakagawa, Y.: (Thin layer chromatography/mass spectrometry). *Gendai Kagaku Zokan*, 15 (Shitsuryo Bunsekiho no Shinkaiten) (1988) 81-90; *C.A.*, 111 (1989) 70044b - a review with 13 refs.

*4g. Separation of enantiomers*

See 1168, 1222.

*4h. Other special techniques*

See 1203.

## 5. HYDROCARBONS AND HALOGEN DERIVATIVES

*5b. Cyclic hydrocarbons*

See 1058, 1250.

## 6. ALCOHOLS

- 1069 Thakkar, R.A.: Detection of glycols in glycerol by thin-layer chromatography. *J. Oil Technol. Assoc. India (Bombay)*, 20, No. 3 (1988) 47-51; *C.A.*, 111 (1989) 64080u.

See also 1064, 1244.

## 7. PHENOLS

See 1053, 1058, 1089, 1221.

## 8. SUBSTANCES CONTAINING HETEROCYCLIC OXYGEN

*8a. Flavonoids*

- 1070 Ragot, J., Tubery, P., Carreras-Jansou, M., Lattes, A. and Symonds, P.: (Isolation of 5-primeverosyl genkwanin from *Daphne gnidium* roots). *Fitoterapia*, 59 (1988) 336-337; *C.A.*, 110 (1989) 237205y.
- 1071 Wang, Y. and Luo, W.: (Studies on quantitative determination of total flavonoids in Qingpi, Zhiqiao, and Zhishi by TLC-densitometric method). *Zhongguo Zhongyao Zazhi*, 14 (1989) 230-232; *C.A.*, 111 (1989) 45380a.

See also 1074.

*8b. Aflatoxins and other mycotoxins*

- 1072 Miguel, J.A. and de Andres, V.: (A rapid method for patulin and penicillic acid determination in grains by high-performance thin-layer chromatography). *Invest. Agrar.: Prod. Prot. Veg.*, 2 (1987) 225-235; *C.A.*, 111 (1989) 6010k.
- 1073 Valente-Soares, L.M. and Rodriguez-Amaya, D.B.: Survey of aflatoxins, ochratoxin A, zearalenone, and sterigmatocystin in some Brazilian foods by using multi-toxin thin-layer chromatographic method. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 22-26.

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

- 1074 Ben'kovich, E.I. and Butkov, V.V.: (Investigation of polyphenolic compounds by gel chromatography combined with thin-layer chromatography and spectrophotometry). *Probl. Anal. Khim.*, 8 (1988) 121-125; *C.A.*, 111 (1989) 22299s.
- 1075 Kaack, K.: Semiquantitative spectrophotometric determination of fruit juice adulteration by anthocyanin analysis. *Tidsskr. Planteavl.*, 92 (1988) 279-287; *C.A.*, 111 (1989) 22268f.
- 1076 Santoro, M.I.R.M., Hackmann, E.R.M. and Magalhaes, J.F.: (Detection of 5-hydroxymethylfurfural by thin-layer chromatography in pharmaceutical preparations containing glucose). *An. Farm. Quim., Supl.*, (1988) 58-64; *C.A.*, 110 (1989) 219225a.
- 1077 Wawrzynowicz, T., Waksmundzka-Hajnos, M. and Bieganowska, M.L.: Chromatographic investigations of furocoumarins from *Heracleum* genus fruits. *Chromatographia*, 28 (1989) 161-166.

See also 1241.

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

- 1078 Ahonkhai, S.: TLC analysis of the 2,4-dinitrophenylhydrazone derivatives of the carbonyl compounds of cooked, mature tubers of white yam (*Dioscorea rotundata* Poir). *Acta Aliment.*, 17 (1988) 283-289; *C.A.*, 111 (1989) 6150f.

- 1079 Saito, K., Nagao, T., Matoba, M., Koyama, K., Natori, S., Murakami, T. and Saiki, Y.: Chemical assay of ptaquiloside, the carcinogen of *Pteridium aquilinum*, and the distribution of related compounds in the Pteridaceae. *Phytochemistry*, 28 (1989) 1605-1611; *C.A.*, 111 (1989) 55965j.
- 1080 Werner, A., Grune, T., Siems, W., Schneider, W., Shimasaki, H., Esterbauer, H. and Gerber, G.: Nucleotide and aldehyde analysis by HPLC for determination of radical induced damage. *Chromatographia*, 28 (1989) 65-68.

See also 1241, 1244.

## 10. CARBOHYDRATES

### 10a. Mono and oligosaccharides. Structural studies

- 1081 Blanc, M.B., Davis, G.E., Parchet, J.-M. and Viani, R.: Chromatographic profile of carbohydrates in commercial soluble coffees. *J. Agric. Food Chem.*, 37 (1989) 926-930.
- 1082 Chopineau, J., Thomas, D. and Legoy, M.-D.: Dynamic interactions between enzyme activity and the microstructural environment. *Eur. J. Biochem.*, 183 (1989) 459-463.
- 1083 DeGasperi, R., Li, Y.T. and Li, S.-C.: Presence of two endo- $\beta$ -N-acetylglucosaminidases in human kidney. *J. Biol. Chem.*, 264 (1989) 9329-9334.
- 1084 Kamada, Y., Muramatsu, H., Kawata, M., Takamizawa, H. and Muramatsu, T.: Poly-N-acetyllactosamines synthesized by cultured Ehrlich carcinoma cells: application of endo- $\beta$ -galactosidase C for analysis of the terminal structure. *J. Biochem. (Tokyo)*, 104 (1988) 738-741.
- 1085 Patzsch, K., Netz, S. and Funk, W.: Quantitative HPTLC of sugars. Part 2. Determination in different matrixes. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 177-179; *C.A.*, 111 (1989) 32893v.

See also 1086.

### 10b. Polysaccharides, mucopolysaccharides, lipopolysaccharides

- 1086 Kimura, K., Kataoka, S., Nakamura, A., Takano, T., Kobayashi, S. and Yamane, K.: Functions of the COOH-terminal region of cyclodextrin glucanotransferase of alkalophilic *Bacillus* sp. 1011: relation to catalyzing activity and pH stability. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1273-1279.

## 11. ORGANIC ACIDS AND LIPIDS

### 11a. Organic acids and simple esters

- 1087 Baba, T., Kaneda, K., Kusunose, E., Kusunose, M. and Yano, I.: Thermally adaptive changes of mycolic acids in *Mycobacterium smegmatis*. *J. Biochem. (Tokyo)*, 106 (1989) 81-86.
- 1088 Gao, W. and Liu, Q.: (Quantitative determination of chlorogenic acid and isochlorogenic acid by TLC-densitometry). *Shenyang Yaoxueyuan Xuebao*, 6, No. 2 (1989) 99-103; *C.A.*, 111 (1989) 64045m.
- 1089 Hadziija, O., Tonkovic, M. and Iskrivic, S.: The behavior of some carboxy and hydroxy benzene derivatives on thin-layers of plain and Fe(III)-impregnated silica-gel. *J. Liq. Chromatogr.*, 12 (1989) 979-985.
- 1090 Husain, S.R., Ahmad, M.S., Jr., Ahmad, F., Ahmad, M. and Osman, S.M.: *Hibiscus mutabilis* seed oil - characterization of HBr-reactive acids. *Fat Sci. Technol.*, 91 (1989) 167-168.
- 1091 Ranny, M. and Pokorny, J.: Comparison of TLC-FID and HPLC for the determination of oxidized products in ethyl linoleate. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 255-257; *C.A.*, 110 (1989) 241868j.



- 1092 Tulyathan, V., Boulton, R.B. and Singleton, V.L.: Oxygen uptake by gallic acid as a model for similar reactions in wines. *J. Agric. Food Chem.*, 37 (1989) 844-849.

See also 1064.

11c. *Lipids and their constituents*

- 1093 Arthur, G.: Acylation of 2-acyl-glycerophosphocholine in guinea-pig heart microsomal fractions. *Biochem. J.*, 261 (1989) 575-580.
- 1094 Arthur, G.: Lysophospholipase A<sub>2</sub> activity in guinea-pig heart microsomal fractions displaying high activities with 2-acylglycerophosphocholines with linoleic and arachidonic acids. *Biochem. J.*, 261 (1989) 581-586.
- 1095 Chao, W., Siafaka-Kapadai, A., Hanahan, D.J. and Olson, M.S.: Metabolism of platelet-activating factor (PAF; 1-O-alkyl-2-acetyl-sn-glycero-3-phosphocholine) and lyso-PAF (1-O-alkyl-2-lyso-sn-glycero-3-phosphocholine) by cultured rat Kupffer cells. *Biochem. J.*, 261 (1989) 77-81.
- 1096 Childs, R.A., Drickamer, K., Kawasaki, T., Thiel, S., Mizuochi, T. and Feizi, T.: Neoglycolipids as probes of oligosaccharide recognition by recombinant and natural mannose-binding proteins of the rat and man. *Biochem. J.*, 262 (1989) 131-138.
- 1097 De Pinto, V., Benz, R. and Palmieri, F.: Interaction of non-classical detergents with the mitochondrial porin. A new purification procedure and characterization of the pore-forming unit. *Eur. J. Biochem.*, 183 (1989) 179-187.
- 1098 Fukaya, N., Ito, M., Iwata, H. and Yamagata, T.: Characterization of the glycosphingolipids of pig cortical bone and cartilage. *Biochim. Biophys. Acta*, 1004 (1989) 108-116.
- 1099 Garg, M.L., Wierzbicki, A.A., Thomson, A.B.R. and Clandinin, M.T.:  $\omega$ -3 Fatty acids increase the arachidonic acid content of liver cholesterol ester and plasma triacylglycerol fractions in the rat. *Biochem. J.*, 261 (1989) 11-15.
- 1100 Hamanaka, S., Asagami, C., Suzuki, M., Inagaki, F. and Suzuki, A.: Structure determination of glucosyl  $\beta$ 1-N-( $\omega$ -O-linoleoyl)-acylsphingosines of human epidermis. *J. Biochem. (Tokyo)*, 105 (1989) 684-690.
- 1101 Hikiji, T., Miura, K., Kiyono, K., Shibuya, I. and Ohta, A.: Disruption of the CHOL gene encoding phosphatidylserine synthase in *Saccharomyces cerevisiae*. *J. Biochem. (Tokyo)*, 104 (1988) 894-900.
- 1102 Hirabayashi, Y., Hirota, M., Matsumoto, M., Tanaka, H., Obata, K. and Ando, S.: Developmental changes of C-series polysialogangliosides in chick brains revealed by mouse monoclonal antibodies M6704 and M7103 with different epitope specificities. *J. Biochem. (Tokyo)*, 104 (1988) 973-979.
- 1103 Holmes, E.H.: Characterization and membrane organization of  $\beta$ 1 $\rightarrow$ 3- and  $\beta$ 1 $\rightarrow$ 4-galactosyltransferases from human colonic adenocarcinoma cell lines Colo 205 and SW403: basis for preferential synthesis of type 1 chain lacto-series carbohydrate structures. *Arch. Biochem. Biophys.*, 270 (1989) 630-646.
- 1104 Ikeda, I., Gu, X.-P., Miyamoto, I. and Okahara, M.: Preparation of 1,3-diacylglycerols and 1-alkyl-3-acylglycerols in the presence of quaternary ammonium salts. *J. Am. Oil Chem. Soc.*, 66 (1989) 822-824.
- 1105 Iwamori, M., Kawaguchi, T. and Nagai, Y.: Differential exposure of the major gangliosides in rabbit thymocytes to *Vibrio cholerae* neuraminidase. *J. Biochem. (Tokyo)*, 105 (1989) 723-727.
- 1106 Iwamori, M., Sakayori, M., Nozawa, S., Yamamoto, T., Yago, M., Noguchi, M. and Nagai, Y.: Monoclonal antibody-defined antigen of human uterine endometrial carcinomas is Le. *J. Biochem. (Tokyo)*, 105 (1989) 718-722.
- 1107 Karlsson, H., Karlsson, K.A., Olofsson, S.O., Pimlott, W. and Samuelsson, B.E.: Mass spectrometry of mixtures of glycosphingolipids after characterization with solid-phase binding assays for biologically active species. *Iyo Masu Kenkyukai Koenshu*, 13 (1988) 35-41; *C.A.*, 111 (1989) 20338e.
- 1108 Kasama, K., Blank, M.L. and Snyder, F.: Identification of 1-alkyl-2-acyl-3-(2',3'-diacylglycerol)glycerols, a new type of lipid class, in harderian gland tumors of mice. *J. Biol. Chem.*, 264 (1989) 9453-9461.
- 1109 Keough, K.M.W., Giffin, B. and Matthews, P.L.J.: Phosphatidylcholine-cholesterol interactions: bilayers of heteroacid lipids containing linoleate lose calorimetric transitions at low cholesterol concentration. *Biochim. Biophys. Acta*, 983 (1989) 51-55.

- 1110 Krishnamurthi, S., Wheeler-Jones, C.P.D. and Kakkar, V.V.: Effect of phorbol ester treatment on receptor-mediated versus G-protein-activator-mediated responses in platelets. Evidence for a two-site action of phorbol ester at the level of G-protein function. *Biochem. J.*, 262 (1989) 77-81.
- 1111 Krivan, H.C., Olson, L. D., Barile, M.F., Ginsburg, V. and Roberts, D.D.: Adhesion of *Mycoplasma pneumoniae* to sulfated glycolipids and inhibition by dextran sulfate. *J. Biol. Chem.*, 264 (1989) 9283-9288.
- 1112 Kubo, H., Irie, A., Inagaki, F. and Hoshi, M.: Melibiosylceramide as the sole ceramide dihexoside from the eggs of the sea urchin, *Anthodidaris crassispina*. *J. Biochem. (Tokyo)*, 104 (1988) 755-760.
- 1113 Langeland, N., Moore, L.J., Holmsen, H. and Haarr, L.: Herpes simplex virus-1-specific proteins are involved in alteration of polyphosphoinositide metabolism in baby-hamster kidney cells. *Biochem. J.*, 261 (1989) 683-686.
- 1114 Largis, E.E., Wang, C.H., DeVries, V.G. and Schaffer, S.A.: CL 277,082: A novel inhibitor of ACAT-catalyzed cholesterol esterification and cholesterol absorption. *J. Lipid Res.*, 30 (1989) 681-690.
- 1115 Lo, S.-L., Montague, C.E. and Chang, E.L.: Purification of glycerol dialkyl nonitol tetraether from *Sulfolobus acidocaldarius*. *J. Lipid Res.*, 30 (1989) 944-949.
- 1116 Medh, J.D. and Weigel, P.H.: Separation of phosphatidylinositols and other phospholipids by two-step one-dimensional thin-layer chromatography. *J. Lipid Res.*, 30 (1989) 761-764.
- 1117 Müller-Decker, K.: Interruption of TPA-induced signals by an antiviral and antitumoral xanthate compound: inhibition of a phospholipase C-type reaction. *Biochem. Biophys. Res. Commun.*, 162 (1989) 198-205.
- 1118 Newsholme, P. and Newsholme, E.A.: Rates of utilization of glucose, glutamine and oleate and formation of end-products by mouse peritoneal macrophages in culture. *Biochem. J.*, 261 (1989) 211-218.
- 1119 Nishio, T., Kamimura, M., Murata, M., Terao, Y. and Achiwa, K.: Production of optically active esters and alcohols from racemic alcohols by lipase-catalyzed stereoselective transesterification in non-aqueous reaction system. *J. Biochem. (Tokyo)*, 105 (1989) 510-512.
- 1120 Ontko, J.A. and Wang, C.-S.: Elevation of liver diacylglycerols and molecular species of diacylglycerols in rats fed a lipogenic diet. *J. Lipid Res.*, 30 (1989) 691-699.
- 1121 Pretorius, H.E. and du Plessis, L.M.: Determination of total grain surface waxes using the Iatroscan-Chromarod technique. *Fat Sci. Technol.*, 91 (1989) 200-203.
- 1122 Ratnayake, W.M.N., Matthews, D.G. and Ackman, R.G.: Triacylglycerols of evening primrose (*Oenothera biennis*) seed oil. *J. Am. Oil Chem. Soc.*, 66 (1989) 966-969.
- 1123 Rimoldi, O.J., Soulages, J.L., Gonzales, S.M., Peluffo, R.O. and Brenner, R.R.: Purification and properties of the very high density lipoprotein from the hemolymph of adult *Triatoma infestana*. *J. Lipid Res.*, 30 (1989) 857-864.
- 1124 Ritchie, A.S. and Jee, M.H.: A note on: triglyceride analysis using silver nitrate and 2-phase-2-dimensional thin-layer chromatography. In: F.A.A. Dallas (Editor), *Recent Adv. Thin-Layer Chromatogr.*, (Proc. Chromatogr. Soc. Int. Symp.), Plenum, New York, 1987 (Pub. 1988), pp. 201-205; C.A., 111 (1989) 55939d.
- 1125 Russell, Y., Evans, P. and Dodd, G.H.: Characterization of the total lipid and fatty acid composition of rat olfactory mucosa. *J. Lipid Res.*, 30 (1989) 877-884.
- 1126 Sakac, D. and Lingwood, C.A.: Modulation of testicular galactolipid sulphotransferase activity by phosphorylation. Stimulation of enzyme activity *in vitro* by an endogenous kinase. *Biochem. J.*, 261 (1989) 423-429.
- 1127 Sekine, M., Sakaizumi, M., Moriwaki, K., Yamakawa, T. and Suzuki, A.: Two genes controlling the expression of extended globoglycolipids in mouse kidney are closely linked to each other on chromosome 19. *J. Biochem. (Tokyo)*, 105 (1989) 680-683.
- 1128 Shi, S.P., Chang, C.C.Y., Gould, G.W. and Chang, T.Y.: Comparison of phosphatidylethanolamine and phosphatidylcholine vesicles produced by treating cholate-phospholipid micelles with cholestyramine. *Biochim. Biophys. Acta*, 982 (1989) 187-195.

- 1129 Suzuki, Y., Hidari, K., Matsumoto, M., Ikeda, M.-a. and Tsuchida, N.: Altered ganglioside expression in ras-oncogene-transformed cells. *J. Biochem. (Tokyo)*, 106 (1989) 34-37.
- 1130 Tamagno, B., Gatti, V. and Seta, F.: Improved staining method for thin-layer chromatograms of amniotic fluid phospholipids. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1539-1540.
- 1131 Wheeler, J.J. and Boss, W.F.: The presence of sn-1-palmitoyl lysophosphatidyl-inositol monophosphate correlates positively with the fusion-permissive state of the plasma membrane of fusogenic carrot cells grown in suspension culture. *Biochim. Biophys. Acta*, 984 (1989) 33-40.
- 1132 Wood, W.G., Cornwell, M. and Williamson, L.S.: High performance thin-layer chromatography and densitometry of synaptic plasma membrane lipids. *J. Lipid Res.*, 30 (1989) 775-779.
- 1133 Zaka, S., Asghar, B., Raie, M.Y., Khan, S.A. and Bhatti, M.K.: Lipid class and fatty acid composition of *Psoralea corylifolia* seed. *Fat Sci. Technol.*, 91 (1989) 205-207.

See also 1062.

### 13. STEROIDS

- 1134 Habibi-Goudarzi, S., Ruterbories, K.J., Steinbrunner, J.E. and Nurok, D.: A computer-aided survey of systems of separating steroids by two-dimensional thin-layer chromatography. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 161-167; *C.A.*, 110 (1989) 241846a.

#### 13a. Pregnane and androstane derivatives

- 1135 Ayub, M. and Levell, M.J.: Inhibition of human adrenal steroidogenic enzymes *in vitro* by imidazole drugs including ketoconazole. *J. Steroid Biochem.*, 32 (1989) 515-524.
- 1136 Babic-Gojmerac, T., Kniewald, Z. and Kniewald, J.: Testosterone metabolism in neuroendocrine organs in male rats under atrazine and deethylatrazine influence. *J. Steroid Biochem.*, 33 (1989) 141-146.
- 1137 Brind, J.L., Duo, S., Chervinsky, K. and Orentreich, N.: A new reversed-phase, paired-ion thin-layer chromatographic method for steroid sulfate separations. *Steroids*, 52 (1988) 561-570; *C.A.*, 111 (1989) 17828j.
- 1138 Dintinger, T., Gaillard, J.-L., Zwain, I., Bouhamidi, R. and Silverzahn, P.: Synthesis and aromatization of 19-norandrogens in the stallion testis. *J. Steroid Biochem.*, 32 (1989) 537-544.
- 1139 Edgar, J.A., Weiss, M. and Than, K.A.: Identification of 5 $\beta$ -pregnane and 5 $\beta$ -androstane derivatives in adrenal venous and peripheral blood plasma of the female possum (*Trichosurus vulpecula*). *J. Steroid Biochem.*, 32 (1989) 565-572.
- 1140 Ichihara, K. and Tanaka, C.: Progesterone metabolism in the gastric mucosa microsomes of guinea pig. *J. Steroid Biochem.*, 32 (1989) 835-840.
- 1141 Kühn-Velten, N., Meyer, I. and Staib, W.: Specificity of steroid binding to testicular microsomal cytochrome P-450. Relation of steroid structure to type-I spectral responses after correction for hydrophobic association with the membrane. *J. Steroid Biochem.*, 33 (1989) 33-39.
- 1142 Monder, C., Marandici, A., Iohan, F., Lakshmi, V. and Rosen, J.E.: Synthesis of tritium labeled corticoids. *J. Steroid Biochem.*, 32 (1989) 845-849.
- 1143 Salman, M., Stotter, P.L. and Chamness, G.C.: <sup>125</sup>I-Ligand for progesterone receptor 17 $\alpha$ -(6'-iodohex-1'-ynyl)-19-nortestosterone. *J. Steroid Biochem.*, 33 (1989) 25-31.
- 1144 Viger, A., Coustal, S., Perard, S., Piffeteau, A. and Marquet, A.: 18-Substituted progesterone derivatives as inhibitors of aldosterone biosynthesis. *J. Steroid Biochem.*, 33 (1989) 119-124.
- 1145 Weiss, M., Edgar, J.A., Than, K.A. and Young, I.R.: Identification of 5 $\alpha$ -androstane-3 $\alpha$ ,17 $\alpha$ -diol in adrenal venous plasma of female possum (*Trichosurus vulpecula*). *J. Steroid Biochem.*, 32 (1989) 591-597.

- 1146 Yang, S., Chang, G. and Yang, L.: (Determination of a steroid substrate and its product in *Beauveria bassiana* by thin-layer chromatography with densitometric scanning). *Sepu*, 7 (1989) 114-116; *C.A.*, 111 (1989) 3532w.

See also 1149, 1151, 1238.

### 13b. Estrogens

See 1137.

### 13c. Sterols

- 1147 Einarsson, K., Benthin, L., Ewerth, S., Hellers, G., Stahlberg, D. and Angelin, B.: Studies on acyl-coenzyme A: cholesterol acyltransferase activity in human liver microsomes. *J. Lipid Res.*, 30 (1989) 739-746.
- 1148 Eldredge, E.R., Jackson, B., Suckling, K.E. and Wolf, C.R.: Inhibition of cholesterol 7 $\alpha$ -hydroxylase by an antibody to a male-specific form of cytochrome P-450 from subfamily P450IIC. *Biochem. J.*, 262 (1989) 91-95.
- 1149 Hu, Z.Y., Jung-Testas, I., Robel, P. and Baulieu, E.-E.: Neurosteroids: steroidogenesis in primary cultures of rat glial cells after release of aminoglutethimide blockade. *Biochem. Biophys. Res. Commun.*, 161 (1989) 917-922.
- 1150 Smogols, V., Nozdrunova, N.A. and Filatova, E.N.: (New method for observing the cholesterol fraction on thin-layer silicagel plates). *Eksp. Med. (Riga)*, 23 (1987) 113-115; *C.A.*, 111 (1989) 36045t.
- 1151 Taylor, F.R. and Kandutsch, A.A.: Metabolism of 25-hydroxycholesterol in mammalian cell cultures. Side-chain scission to pregnenolone in mouse L929 fibroblasts. *J. Lipid Res.*, 30 (1989) 899-905.

See also 1097, 1099, 1109, 1114, 1239.

### 13d. Bile acids and alcohols

- 1152 Batta, A.K., Salen, G. and Shefer, S.: Characterization of sarcosylsarcosodeoxycholic acid formed during the synthesis of sarcosodeoxycholic acid. *J. Lipid Res.*, 30 (1989) 771-774.
- 1153 Princen, H.M.G., Meijer, P. and Hofstee, B.: Dexamethasone regulates bile acids synthesis in monolayer cultures of rat hepatocytes by induction of cholesterol 7 $\alpha$ -hydroxylase. *Biochem. J.*, 262 (1989) 341-348.
- 1154 Yamashita, H., Kuroki, S. and Nakayama, F.: Deoxycholate 7 $\alpha$ -hydroxylase in the hamster: substrate specificity and effect of phenobarbital. *J. Lipid Res.*, 30 (1989) 711-718.
- 1155 Zimniak, P., Holsztyńska, E.J., Lester, R., Waxman, D.J. and Radomska, A.: Detoxification of lithocholic acid. Elucidation of the pathways of oxidative metabolism in rat liver microsomes. *J. Lipid Res.*, 30 (1989) 907-918.

## 14. STEROID GLYCOSIDES AND SAPONINS

- 1156 Jia, Q., Qiu, D., Wang, B., Cheng, T. and Cai, M.: (Separation of  $\alpha, \beta$ -anomers of C-glycosides by medium-pressure liquid chromatography (MPLC)). *Sepu*, 6 (1988) 301-303; *C.A.*, 111 (1989) 32902x.
- 1157 Toh, C.A.: (Morphological and physicochemical studies of saponin drugs). *Nonchong-Han'guk Saenghwal Kwahak Yonguwon*, 42 (1988) 139-148; *C.A.*, 111 (1989) 63803v.
- 1158 Wang, S. and Chen, L.: (Determination of bufogenin and bufotoxins in preparations containing *Venenum bufonis*). *Yaowu Fenxi Zazhi*, 9, No. 2 (1989) 93-94; *C.A.*, 111 (1989) 45382c.

## 15. TERPENES AND OTHER VOLATILE AROMATIC COMPOUNDS

## 15a. Terpenes

- 1159 Doi, K., Horiguchi, Y. and Ito, K.: (Analysis of Hoelen by thin-layer chromatography and high-performance liquid chromatography). *Kanagawa-ken Eisei Kenkyusho Kenkyu Hokoku*, No. 18 (1988) 8-14; *C.A.*, 110 (1989) 219172f.
- 1160 Fischer, K.A. and Yanagimoto, K.C.: Transmembrane signaling: tumor promoter distribution. *Biochim. Biophys. Acta*, 982 (1989) 237-244.
- 1161 Jia, Y., Liu, X. and Lu, F.: (Determination of 1- $\alpha$ -terpineol in volatile oil from *Ephedra sinica* by TLC scanning method). *Yaowu Fenxi Zazhi*, 9, No. 2 (1989) 91-93; *C.A.*, 111 (1989) 45026g.

See also 1239.

## 15b. Essential oils

- 1162 Cabo Torres, J., Cabo Cires, M., Cruz Garcia, T. and Jimenez Martin, J.: (Thin-layer chromatographic studies on the essential oil of *Thymus longiflorus* Bross). *Arts Pharm.*, 29, No. 1 (1988) 77-84; *C.A.*, 110 (1989) 218773r.

See also 1240.

## 15c. Bitter substances

- 1163 Herman, Z., Hasegawa, S., Fong, C.H. and Ou, P.: Limonoids in *Citrus ichangensis*. *J. Agric. Food Chem.*, 37 (1989) 850-851.

## 17. AMINES, AMIDES AND RELATED NITROGEN COMPOUNDS

## 17a. Amines and polyamines

- 1164 Chen, T.H., Kuslikis, B.I. and Braselton, W.E., Jr.: Hydroxylation of 4,4'-methylenebis(2-chloroaniline) by canine, guinea pig, and rat liver microsomes. *Drug Metab. Disp.*, 17 (1989) 406-413.

See also 1053.

## 17c. Urea and guanidine derivatives

See 1233.

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

- 1165 Gondos, G., Szecsenyi, I. and Gera, L.: Separation of *cis* and *trans* isomers of cyclic compounds. Part I. Separation of *cis* and *trans* 2-amino-1-cyclohexanecarboxamide and their derivatives by thin-layer chromatography. *Symp. Biol. Hung.*, 37 (Chromatography '87) (1988) 219-224; *C.A.*, 111 (1989) 70058j.

See also 1250.

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

## 18a. Amino acids and their derivatives

- 1166 Dabral, S.K., Rawat, J.P. and Muktawat, K.P.S.: Ion-exchange chromatographic determination of amino acids on impregnated papers. *Anal. Lett.*, 22 (1989) 537-543.
- 1167 Eriksson, L., Jonsson, J., Sjoestroem, M. and Wold, S.: Multivariate parametrization of coded and non-coded amino acids by thin-layer chromatography. *Prog. Clin. Biol. Res.*, 291 (1989) 131-134; *C.A.*, 111 (1989) 3490f.

- 1168 Guenther, K.: Determination of TLC-separated amino acid enantiomers. *Analusis*, 16 (1988) 514-518; *C.A.*, 111 (1989) 70077q.
- 1169 Kiryukhina, N.N.: (Thin-layer chromatographic method for determination of the ethyl ester of N-benzoyl-N-3,4-dichlorophenylalanine). *U.S.S.R. Pat.* SU 1,173, 886 (Cl. GOIN30/90), 15 Jan. 1989, Appl. 3,598,180, 24 May 1983; *C.A.*, 110 (1989) 224782j.
- 1170 Konno, R., Nagata, Y., Niwa, A. and Yasumura, Y.: Spontaneous excretion of D-alanine in urine in mutant mice lacking D-amino-acid oxidase. *Biochem. J.*, 261 (1989) 285-287.
- 1171 Tang, Y., Wang, X. and Lu, Y.: (Determination of stachydrine in four Chinese traditional patent medicines). *Yaowu Fenxi Zazhi*, 9, No. 1 (1989) 22-24; *C.A.*, 110 (1989) 219184m.
- 1172 Thompson, J.: N<sup>5</sup>-(L-1-Carboxyethyl)-L-ornithine:NADP<sup>+</sup> oxidoreductase from *Streptococcus lactis*. Purification and partial characterization. *J. Biol. Chem.*, 264 (1989) 9592-9601.

See also 1061.

18b. *Peptides and peptidic and proteinous hormones*

- 1173 Babizhayev, M.A.: Antioxidant activity of L-carnosine, a natural histidine-containing dipeptide in crystalline lens. *Biochim. Biophys. Acta*, 1004 (1989) 363-371.
- 1174 Burger, M., Lawen, A. and Martini, O.H.W.: Insulin-induced S6 kinase activation in HeLa cells and its reversal by hyperthermic stress. *Eur. J. Biochem.*, 183 (1989) 255-262.
- 1175 Buttle, D.J., Kembhavi, A.A., Sharp, S.L., Shute, R.E., Rich, D.H. and Barrett, A.J.: Affinity purification of the novel cysteine proteinase papaya proteinase IV, and papain from papaya latex. *Biochem. J.*, 261 (1989) 469-476.
- 1176 Edmonds, C., Griffin, G.E. and Johnstone, A.P.: Demonstration and partial characterization of ADP-ribosylation in *Pseudomonas maltophilia*. *Biochem. J.*, 261 (1989) 113-118.
- 1177 El-Maliki, B., Blanchard, D., Dahr, W., Beyreuther, K. and Cartron, J.-P.: Structural homology between glycophorins C and D of human erythrocytes. *Eur. J. Biochem.*, 183 (1989) 639-643.
- 1178 Geisler, N., Hatzfeld, M. and Weber, K.: Phosphorylation *in vitro* of vimentin by protein kinases A and C is restricted to the head domain. Identification of the phosphoserine sites and their influence on filament formation. *Eur. J. Biochem.*, 183 (1989) 441-447.
- 1179 Mitchell, F.E., Marais, R.M. and Parker, P.J.: The phosphorylation of protein kinase C as a potential measure of activation. *Biochem. J.*, 261 (1989) 131-136.
- 1180 Sukhomlinov, B.F. and Vasilyeva, V.A.: (The primary structure of ondatra (*Ondatra zibethica*) myoglobin. Some peculiarities of functional morphology of myoglobins of semiaquatic animals). *Biokhimiya (Moscow)*, 54 (1989) 956-964.

See also 1181, 1222.

19. PROTEINS

19a. *General techniques*

- 1181 Bhushan, R., Mahesh, V.K. and Mallikharjun, P.V.: Thin-layer chromatography of peptides and proteins: a review. *Biomed. Chromatogr.*, 3 (1989) 95-104 - a review with 107 refs.

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

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

- 1182 Kikuchi, A., Sasaki, T., Araki, S., Hata, Y. and Takai, Y.: Purification and characterization from bovine brain cytosol of two GTPase-activating proteins specific for smg p21, a GTP-binding protein having the same effector domain as c-ras p21s. *J. Biol. Chem.*, 264 (1989) 9133-9136.
- 1183 Schurdak, M.E. and Randerath, K.: Effects of route of administration on tissue distribution of DNA adducts in mice: comparison of 7H-dibenzo[*c,g*]carbazole, benzo[*a*]pyrene, and 2-acetylaminofluorene. *Cancer Res.*, 49 (1989) 2633-2638.
- 1184 Szondy, Z. and Newsholme, E.A.: The rate of the AMP/adenosine substrate cycle in concanavalin-A-stimulated rat lymphocytes. *Biochem. J.*, 261 (1989) 739-742.
- 1185 Weaver, J. and Pollack, S.: Low- $M_r$  iron isolated from guinea pig reticulocytes as AMP-Fe and ATP-Fe complexes. *Biochem. J.*, 261 (1989) 787-792.
- 1186 Zagrebel'nyi, S.N., Pupkova, V.I. and Khripin, Yu.L.: (Methods of separation and quantitative determination of nucleotides, nucleosides, and bases). *Usp. Khim.*, 57 (1988) 1913-1932; *C.A.*, 111 (1989) 32868r - a review with 180 refs.

See also 1061.

## 22. ALKALOIDS

- 1187 Luo, S.R., Guo, R. and Yang, J.S.: (Determination of alkaloids in *Picrasma quassioides* (D. Don) Benn). *Yaowu Xuebao*, 23 (1988) 906-909; *C.A.*, 110 (1989) 219162c.
- 1188 Montagu, M., Petit-Paly, G., Levillain, P., Baumert, A., Gröger, D., Chenieux, J.C. and Rideau, M.: Synchronous fluorescence spectrometry and identification of dihydrofuro[2,3-*b*]quinazolinium alkaloids biosynthesized by *Ruta graveolens* cultures *in vitro*. *Pharmazie*, 44 (1989) 342-344.
- 1189 Zhang, Z. and Jiang, Yu.: (Dual-wavelength TLC determination of morphine in compound Platycodon tablets). *Zhongguo Yiyao Gongye Zazhi*, 20, No. 1 (1989) 28-30; *C.A.*, 111 (1989) 45386g.

See also 1222, 1238, 1248.

## 23. OTHER SUBSTANCES CONTAINING HETEROCYCLIC NITROGEN

## 23a. Porphyrins and other pyrroles

- 1190 Gunter, E.W., Turner, W.E. and Huff, D.L.: Investigation of protoporphyrin IX standard materials used in acid-extraction methods, and proposed correction for the millimolar absorptivity of protoporphyrin IX. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1601-1608.
- 1191 Henderson, M.J.: Thin-layer chromatography of free porphyrins for diagnosis of porphyria. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1043-1044.

## 23b. Bile pigments

- 1192 Brown, S.B., Holroyd, J.A., Vernon, D.I., Shim, Y.K. and Smith, K.M.: The biosynthesis of the chromophore of phycocyanin. Pathway of reduction of biliverdin to phycocyanobilin. *Biochem. J.*, 261 (1989) 259-263.

## 23c. Indole derivatives

See 1194.

## 23d. Pyridine derivatives

- 1193 Cee, A. and Horakova, B.: (Method for determination of citrazinic acid amide by thin-layer chromatography). *Czech. Pat.* CS 255,075 (Cl. G01N30/90), 15 Sep. 1988, Appl. 85/9,173, 12 Dec. 1985; *C.A.*, 110 (1989) 224801g.

## 23e. Other N-heterocyclic compounds

- 1194 Colthup, P.V.: A sensitive high performance thin-layer chromatography method for the determination of GR 38032F, a weakly fluorescent compound, in plasma. In: F.A.A. Dallas (Editor), *Recent Adv. Thin-Layer Chromatogr. (Proc. Chromatogr. Soc. Int. Symp.)*, Plenum, New York, 1987 (Pub. 1988) pp. 179-185; *C.A.*, 111 (1989) 33012u.
- 1195 Drabowicz, J., Kotynski, A., Kudzin, Z.H. and Skowronski, R.: Trifluoroacetic anhydride-sodium iodide as a reagent for the selective detection of nitrones and nitroxide radicals by thin-layer chromatography. *J. Chromatogr.*, 473 (1989) 287-292.
- 1196 Shimomura, O., Musicki, B. and Kishi, Y.: Semi-synthetic aequorins with improved sensitivity to  $Ca^{2+}$  ions. *Biochem. J.*, 261 (1989) 913-920.

See also 1044, 1058, 1233.

## 24. ORGANIC SULPHUR COMPOUNDS

- 1197 Bondareva, G.I. and Sukhoruchkin, A.G.: (Chromatographic monitoring of 2-aminoethanesulfonic acid purity). *Farmatsiya (Moscow)*, 38, No. 3 (1989) 66-67; *C.A.*, 111 (1989) 64090x.

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

See 1220

## 26. ORGANOMETALLIC AND RELATED COMPOUNDS

## 26a. Organometallic compounds

- 1198 Rumyantsev, V.Yu., Berezkin, V.G. and Kurkin, B.I.: Multistage two-dimensional TLC and its application to the investigation of catalysts for the hydroformylation of olefins. *Symp. Biol. Hung.*, 37 (Chromatography '87) (1988) 375-379; *C.A.*, 111 (1989) 16784e.

See also 1250.

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

- 1199 Han, Y. and Wang, D.: (Thin-layer chromatography - scanning densitometry for serum vitamin E). *Zhonghua Yixue Jiayuan Zazhi*, 12, No. 1 (1989) 9-11; *C.A.*, 111 (1989) 3502m.

See also 1114.



## 28. ANTIBIOTICS

- 1200 Busche, R., Tümmler, B., Cano-Gauci, D.F. and Riordan, J.R.: Equilibrium, kinetic and photoaffinity labeling studies of daunomycin binding to P-glycoprotein-containing membranes of multidrug-resistant Chinese hamster ovary cells. *Eur. J. Biochem.*, 183 (1989) 189-197.
- 1201 Cai, S., Wu, C. and Mao, Z.: (Studies on micellar solution as mobile phase in liquid chromatography. II. Thin-layer chromatographic analysis of the stability of penicillins). *Zhejiang Yike Daxue Xuebao*, 17 (1988) 118-120; *C.A.*, 111 (1989) 45377e.
- 1202 Datta, K., Roy, S.K. and Das, S.K.: A rapid and inexpensive thin layer chromatographic method for quantitative analysis of bleomycin complex. *J. Liq. Chromatogr.*, 12 (1989) 949-956.
- 1203 Kovacs-Hadady, K.: A note on: chromatographic study of several aminoglycoside type antibiotics by overpressure-layer chromatography. In: F.A.A. Dallas (Editor), *Recent Adv. Thin-Layer Chromatogr. (Proc. Chromatogr. Soc. Int. Symp.)*, Plenum, New York, 1987 (Pub. 1988) pp. 215-221; *C.A.*, 111 (1989) 64044k.
- 1204 Okayama, A., Aoki, Y., Umesako, S., Yamanaka, C., Yamamoto, Y., Ono, H. and Nishii, Y.: (Fundamental examination for the detection of aminoglycoside antibiotics by thin layer chromatography). *Nara-ken Eisei Kenkyusho Nenpo*, No. 22 (1987) 106-111; *C.A.*, 111 (1989) 12569r.
- 1205 Shrivastava, P.K. and Prakash, R.: Thin-layer chromatographic behavior and separation of some antibiotics on Scolecite as a new adsorbent. *Chim. Oggi*, 7, No. 1-2 (1989) 23-24; *C.A.*, 111 (1989) 28632s.
- 1206 Wang, B. and Lin, L.: (Fluoro-densitometric quantitative determination of gentamycin C components in fermentation broth). *Kangshengsu*, 14 (1989) 57-58; *C.A.*, 111 (1989) 55725f.
- 1207 Warlich, R. and Mutschler, E.: Thin-layer chromatographic separation and *in situ* fluorimetric determination of ofloxacin in plasma and pleural fluid. *J. Chromatogr.*, 490 (1989) 395-403.

## 29. INSECTICIDES, PESTICIDES AND OTHER AGROCHEMICALS

- 1208 Burger, K.: (Multimethods for ultratrace determinations: pesticides in groundwater and drinking water analyzed by thin-layer chromatography/automated multiple development (TLC/AMD)). *Gewaesserschutz, Wasser, Abwasser*, 106 (Instrum. Anal. Pestiz. Wasser Boden) (1989) 82-109; *C.A.*, 111 (1989) 44826p - a review.
- 1209 Karoly, G., Ferenczi, M. and Gyorfi, L.: (Application of enzyme inhibition thin layer chromatography in the residue analysis of cholinesterase-inhibition pesticides). *Novenyvedelem (Budapest)*, 25, No. 2 (1989) 49-53; *C.A.*, 111 (1989) 19355b - a review with 10 refs.

See also 1250.

## 29a. Chlorinated insecticides

- 1210 Singh, P.P. and Chawla, R.P.: A simple method for screening of soil samples for organochlorine insecticide residues by thin-layer chromatography. *Int. J. Environ. Anal. Chem.*, 36, No. 1 (1989) 17-25; *C.A.*, 111 (1989) 19361a.

See also 1213.

## 29b. Phosphorus insecticides

- 1211 Cheng, T., Bodden, R.M., Puhl, R.J. and Bauriedel, W.R.: Absorption, distribution, and metabolism of [<sup>14</sup>C]chlorpyrifos applied dermally to goats. *J. Agric. Food Chem.*, 37 (1989) 1108-1111.
- 1212 Lee, P.W., Stearns, S.M., Hernandez, H., Powell, W.R. and Naidu, M.V.: Fate of dicrotophos in the soil environment. *J. Agric. Food Chem.*, 37 (1989) 1169-1174.

- 1213 Os'kina, V.N.: (Scheme for the determination of pesticide mixtures of various chemical etiology under hothouse conditions). *Gig. Sanit.*, No. 2 (1989) 53-56; *C.A.*, 111 (1989) 27893r.

29c. *Carbamates*

See 1215.

29d. *Herbicides*

- 1214 Buben, I., Karmazin, M. and Odchazel, J.: (Pesticide residues in the drug *Flos chamomilae*. I. Determination of Potablan residues by gas chromatography). *Cesk. Farm.*, 38 (1989) 60-63; *C.A.*, 111 (1989) 45413p.
- 1215 Wang Guin-Sun, Gao Ru-Yu and Wang Heng-Yan: Computer-assisted transposition of conditions in high-performance thin-layer chromatography to high-performance liquid chromatography for the separation of pesticides. *Chromatographia*, 28 (1989) 285-288.

29e. *Fungicides*

- 1216 Perez, M., Barrios, C., Saelzer, R., Vega, M. and Villegas, R.: Determination of pentachlorophenol by high performance thin layer chromatography. *J. High Resolut. Chromatogr.*, 12 (1989) 419-421.

See also 1213.

30. SYNTHETIC AND NATURAL DYES

30a. *Synthetic dyes*

- 1217 Freeman, H.S., Hao, Z. and Hsu, W.-N.: The chromatographic behavior of some hydrophilic dyes and dye intermediates on thin layers of strong and weak ion exchangers. *J. Liq. Chromatogr.*, 12 (1989) 919-935.

30b. *Chloroplast and other natural pigments*

- 1218 Heimler, D., Michelozzi, M. and Boddi, V.: Quantitative TLC determination of chlorophylls in spruce needles under mild pollution conditions. *Chromatographia*, 28 (1989) 148-150.
- 1219 Yamada, S., Noda, N., Mikami, E., Hayakawa, J. and Yamada, M.: Analysis of natural coloring matters in food. III. Application of methylation with diazomethane for the detection of lac color. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 48-51.

31. PLASTICS AND THEIR INTERMEDIATES

- 1220 Podder, G., Saha, C., Nandy, A. and Chowdhury, B.K.: Detection of tricresyl phosphate in edible oil by TLC method. *J. Inst. Chem. (India)*, 60 (1988) 195-196; *C.A.*, 111 (1989) 22271b.
- 1221 Tikhonova, T.Z., Vakhtina, I.A., Kudim, T.V. and Medvedeva, T.A.: (Determination of residual diphenylolpropane in heat-resistant polymers by TLC). *Zh. Anal. Khim.*, 44 (1989) 572-574; *C.A.*, 110 (1989) 232393y.

See also 1250.

32. DRUG ANALYSIS

See 1037.

## 32a. Drug analysis, general techniques

- 1222 Bidlo-Igloi, M. and Szabo, S.: (Isomers of pharmaceutical interest). *Lab. 2000*, 2, No. 6 (1988) 48-51; *C.A.*, 111 (1989) 12588w.
- 1223 Daldrup, T. and Rickert, A.: Arzneimittel- und Drogenscreening aus Urin mittels DC unter besonderer Berücksichtigung von Reagentien mit geringer toxischer Belastung für Laborpersonal und Umwelt. *Fresenius' Z. Anal. Chem.*, 334 (1989) 349-353.
- 1224 Dallas, F.A.A., Halliday, T.J. and Saynor, D.A.: The accuracy and reproducibility of radio-thin layer chromatography measurements of drugs in biological fluids. In: F.A.A. Dallas (Editor), *Recent Adv. Thin-Layer Chromatogr. (Proc. Chromatogr. Soc. Int. Symp.)*, Plenum, New York, 1987 (Pub. 1988), pp. 87-99; *C.A.*, 111 (1989) 35826m.

See also 1238.

## 32b. Antirheumatics and antiinflammatory drugs

- 1225 Tomankova, H. and Sabartova, J.: Determination of potential degradation products of piroxicam by HPTLC densitometry and HPLC. *Chromatographia*, 28 (1989) 197-202.

See also 1232, 1238.

## 32c. Autonomic and cardiovascular drugs

- 1226 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.
- 1227 Lozenko, V.A. and Ikramov, L.T.: (Reaction for identification of oxylidine). *Farm. Zh. (Kiev)*, No. 2 (1989) 56-58; *C.A.*, 110 (1989) 219227c.
- 1228 Tucker, F.A.: Solid phase extraction of plasma for metabolite profiling by radio-thin-layer chromatography. In: F.A.A. Dallas (Editor), *Recent Adv. Thin-Layer Chromatogr. (Proc. Chromatogr. Soc. Int. Symp.)*, Plenum, New York, 1987 (Pub. 1988), pp. 101-105; *C.A.*, 111 (1989) 33010s.
- 1229 Yan, T., Wu, Y., Zhao, J., Nie, H., Yuan, F., Tang, H. and Jin, S.: (Preparation and structure of photochemical decomposition product of nisoldipine). *Yaowu Fenxi Zazhi*, 9, No. 1 (1989) 10-12; *C.A.*, 110 (1989) 237033r.

See also 1238.

## 32d. Central nervous system drugs

- 1230 Abdullaeva, M.U., Ikramov, L.T. and Islamov, T.Kh.: (Chromatographic methods for the detection of phencarol). *Farmatsiya (Moscow)*, 38, No. 1 (1989) 38-40; *C.A.*, 110 (1989) 160471x.
- 1231 Haagsma, N., Bathelt, E.R. and Engelsma, J.W.: A note on: a thin layer chromatographic screening method for the tranquilizers azaperone, propiopromazine, and carazolol in swine tissues. In: F.A.A. Dallas (Editor), *Recent Adv. Thin-Layer Chromatogr. (Proc. Chromatogr. Soc. Int. Symp.)*, Plenum, New York, 1987 (Pub. 1988), pp. 227-229; *C.A.*, 111 (1989) 55940x.
- 1232 Ichihara, S., Tomisawa, H., Fukazawa, H., Tateishi, M., Joly, R. and Heintz, R.: Oxidation of tenoxicam by leukocyte peroxidase and H<sub>2</sub>O<sub>2</sub> produces novel products. *Drug Metab. Disp.*, 17 (1989) 463-468.
- 1233 Pavlova, V.M., Berlyand, A.S., Zhidkova, A.M., Kutsyi, M.V. and Knizhnik, A.Z.: (Thin-layer chromatographic determination of the content of impurities in mebicar). *Vysokochist. Veshchestva*, (1989) 181-183; *C.A.*, 111 (1989) 64066u.
- 1234 Renger, B.: A note on: quantitative determination of amfetaminil by high-performance thin-layer chromatography. In: F.A.A. Dallas (Editor), *Recent Adv. Thin-Layer Chromatogr. (Proc. Chromatogr. Soc. Int. Symp.)*, Plenum, New York, 1987 (Pub. 1988), pp. 223-226; *C.A.*, 111 (1989) 28652y.
- 1235 Sheikh Salem, M.A., Alkaysi, H.N. and Gharaibeh, A.M.: Quantitation of orphenadrine citrate and acetaminophen in tablet formulation using thin layer chromatography densitometry. *Anal. Lett.*, 22 (1989) 585-596.

See also 1227, 1238.

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

- 1236 Chen, L. and Zeng, Y.: (Thin-layer chromatographic densitometric method for simultaneous determination of artemether or artesunate and their metabolite in rat plasma. *Zhongguo Yiyao Gongye Zazhi*, 20, No. 2 (1989) 75-78; *C.A.*, 111 (1989) 33025a.

See also 1044, 1215.

## 32f. Cytostatics

- 1237 Sun, X.: (Quantitative analysis of ftorafur and fluorouracil by TLC scanning method). *Shenyang Yaowuexueyuan Xuebao*, 6, No. 2 (1989) 123-125; *C.A.*, 111 (1989) 45406p.

## 32g. Other drug categories

See 1047.

## 32h. Toxicological and forensic applications

- 1238 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 1223.

## 32i. Plant extracts

- 1239 Doganca, S. and Laloglu, S.: (Phytochemical investigation of *Daphne oleoides* Schreb. subsp. *oleoides*). *Marmara Univ. Eczacilik Derg.*, 3, No. 1 (1987) 71-73; *C.A.*, 110 (1989) 218892d.
- 1240 Fan, S.T., Su, Z.W. and Li, C.G.: (Studies on the original plants of the traditional drug Haifenateng: comparative studies between *Piper hancei* Maxim. var. *hancei* Maxim. and *Piper hancei* Maxim. var. *squamiglandiferum* Fan). *Yaowu Xuebao*, 23 (1988) 944-952; *C.A.*, 110 (1989) 218881z.
- 1241 Ni, K., Zhang, G. and Lu, L.: (Determination of active components of *Salvia miltiorrhiza* and notoginseng in compound *Salvia miltiorrhiza* tablets by TLC-densitometry). *Yaowu Fenxi Zazhi*, 9, No. 2 (1989) 74-77; *C.A.*, 111 (1989) 45381b.
- 1242 Siddiqi, T.O., Ahmed, J., Javed, K. and Khen, M.S.Y.: Pharmacognostical studies of the bark of *Ficus infectoria* Roxb. *Indian Drugs*, 26 (1989) 205-210; *C.A.*, 110 (1989) 218883b.
- 1243 Vanhaelen, M. and Vanhaelen-Fastre, R.: Thin-layer chromatography-densitometry as a powerful method for the standardization of medicinal plant extracts. In: F.A.A. Dallas (Editor), *Recent Adv. Thin-Layer Chromatogr. (Proc. Chromatogr. Soc. Int. Symp.)*, Plenum, New York, 1987 (Pub. 1988) pp. 187-200; *C.A.*, 111 (1989) 64037k - a review with 15 refs.
- 1244 Wang, L.: (Quantitative determination of yuanhuatin in lilac daphne (*Daphne genkwa*) by TLC-densitometry). *Zhongcaoyao*, 20 (1989) 164-165; *C.A.*, 111 (1989) 12581p.
- 1245 Yang, X., Lin, S. and Ma, J.: (Probe into an extraction technology for ginseng preparations). *Zhongcaoyao*, 20 (1989) 209-210; *C.A.*, 111 (1989) 63808a.
- 1246 Yin, M. and Chen, Z.: (Large thin layer chromatography (LTLC) for separation of chemical constituents of medicinal plants). *Zhongcaoyao*, 20 (1989) 206-208; *C.A.*, 111 (1989) 63807z.
- 1247 Zhu, Y., Yan, K. and Tu, G.: (Chemical studies on the composition of Shengmai-San. III. Quantitative analysis of ginsenosides in Shengmai-San by TLC-densitometry). *Yaowu Fenxi Zazhi*, 9, No. 1 (1989) 5-9; *C.A.*, 110 (1989) 219183k.

## 33. CLINICO-CHEMICAL APPLICATIONS

33a. *General papers and reviews*

See 1048.

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

See 1080, 1130, 1190, 1191.

## 34. FOOD ANALYSIS

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

1248 Sil, S., Sengupta, P. and Gandhi, R.S.: Modified method for detection of Argemone oil by thin-layer chromatography. *J. Oil Technol. Assoc. India (Bombay)*, 20, No. 2 (1988) 33-34; *C.A.*, 111 (1989) 55935z.

1249 Sil, S., Sengupta, P., Mitra, M. and Gandhi, R.S.: Detection of palm oil in groundnut oil by thin-layer chromatography. *J. Oil Technol. Assoc. India (Bombay)*, 20, No. 2 (1988) 33; *C.A.*, 111 (1989) 55934y.

See also 1073, 1074, 1078, 1219, 1220, 1252.

## 35. ENVIRONMENTAL ANALYSIS

1250 Thompson, R.E., Tuschall, J.R. and Anderson, T.M.: (U.S. EPA reference standards and quality assurance materials for the analysis for environmental pollutants. *J. Res. Natl. Bur. Stand.*, 93 (1988) 237-238; *C.A.*, 111 (1989) 16913w.

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

See 1208, 1256.

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

See 1210.

## 36. SOME TECHNICAL PRODUCTS AND COMPLEX MIXTURES

36a. *Surfactants*

1251 Hellmann, H.: Adsorbentien als Ionenaustausch- und Trennmedien.  $Al_2O_3$  und  $SiO_2$  in der chromatographischen Tensidanalytik. *Fresenius' Z. Anal. Chem.*, 334 (1989) 126-132.

1252 Kato, H., Nagai, Y., Yamamoto, K. and Sakabe, Y.: Determination of polysorbates in foods by colorimetry with confirmation by infrared spectrophotometry, thin-layer chromatography, and gas chromatography. *J. Assoc. Off. Anal. Chem.*, 72 (1989) 27-29.

36c. *Various technical products*

See 1249.

36d. *Complex mixtures and unidentified compounds*

See 1079.

## 37. CELLS, CELLULAR PARTICLES AND SUPRAMOLECULAR STRUCTURES

- 1253 Alter, D.C., Ramanujam, P., Yamaguchi, J. and Subramanian, K.N.: Simple screening for the presence of antibiotic resistant CAT gene plasmids in bacteria. *BioTechniques*, 7 (1989) 247-248; *C.A.*, 111 (1989) 51661j.

## 38. INORGANIC COMPOUNDS

## 38a. Cations

- 1254 Ajmal, M., Mohammad, A., Fatima, N. and Ahmad, J.: Use of some aqueous salt solutions as an impregnant and eluent in thin-layer chromatography of metal ions: quantitative separation of nickel from iron, zinc, lead, cadmium and copper. *J. Planar Chromatogr.-Mod. TLC*, 1 (1988) 329-335; *C.A.*, 111 (1989) 32784k.
- 1255 Cheng, G., Hu, Z., Jia, X. and Zheng, J.: (Separation of fifteen rare earths with thin-layer chromatography by using P 204-P 507-TBP as eluent). *Fenxi Huaxue*, 16 (1988) 1098-1100; *C.A.*, 111 (1989) 69926j.
- 1256 Deshmukh, L. and Kharat, R.B.: Separation of metal ions in tube well water samples by thin layer partition chromatography. *Int. J. Environ. Anal. Chem.*, 36, No. 1 (1989) 1-6; *C.A.*, 111 (1989) 12259q.
- 1257 Deshmukh, I. and Kharat, R.B.: The effect of substituent groups on the migration of metal ions in thin layer chromatography. *J. Liq. Chromatogr.*, 12 (1989) 937-947.
- 1258 Kuroda, R., Ishimaru, S. and Oguma, K.: Reversed-phase thin-layer chromatography of rare earth elements on C<sub>18</sub> bonded silica. *Anal. Sci.*, 4 (1988) 667-669; *C.A.*, 110 (1989) 241671q.
- 1259 Luo, H. and Mo, J.: (Separation of rare earth elements by thin-layer chromatography). *Fenxi Huaxue*, 16 (1988) 821-823; *C.A.*, 110 (1989) 241676v.
- 1260 Ma, Y.F. and Yeung, E.S.: Detection of cations separated by thin-layer chromatography by fluorescence quenching of ethidium bromide. *Mikrochim. Acta*, 3 (1988) 327-332; *C.A.*, 111 (1989) 69921d.
- 1261 Thielemann, H. and Haase, H.H.: (Thin layer chromatographic separation and identification of inorganic metal ions on ready-made plates (cobalt, copper, nickel)). *Wiss. Z. Martin-Luther-Univ. Halle-Wittenberg, Math.-Naturwiss. Reihe*, 36, No. 6 (1987) 139; *C.A.*, 111 (1989) 16782c.
- 1262 Volynets, M.P.: (Thin-layer chromatography in analysis of inorganic substances). *Anal. Khimiya Redk. Elementov, M.*, (1988) 217-226; *C.A.*, 111 (1989) 69927k.
- 1263 Wang, Y. and Zhou, H.: (Synergistic effect and separation of rare earth elements in reversed-phase paper chromatography). *Xiangtan Daxue Ziran Kexue Xuebao*, 10, No. 4 (1988) 49-54; *C.A.*, 111 (1989) 16788j.

See also 1052, 1250.

## 38b. Anions

See 1262.

## 38c. Permanent and rare gases

See 1195.

## 39. RADIOACTIVE AND OTHER ISOTOPE COMPOUNDS

- 1264 Moss, S.R.: A note on: adverse electrostatic effects seen in radio-thin layer chromatography using a linear analyzer. In: F.A.A. Dallas (Editor), *Recent Adv. Thin-Layer Chromatogr. (Proc. Chromatogr. Soc. Int. Symp.)*, Plenum, New York, 1987 (Pub. 1988), pp. 131-135; *C.A.*, 111 (1989) 33011t.

See also 1224, 1228.

## Electrophoresis

### 1. REVIEWS AND BOOKS

- 2162 Shiba, K.: (Electrophoresis). *Bunseki*, (1989) 94-103; *C.A.*, 111 (1989) 3415k.  
2163 Suga, K.: (Electrophoresis). *Kagaku to Seibutsu*, 27 (1989) 264-269; *C.A.*, 111 (1989) 35965f.  
2164 Wagner, J. and Macek, K. (Editors): *Tenth International Symposium on Biomedical Applications of Chromatography and Electrophoresis. J. Chromatogr. Spec.*, Vol. 434 (2), Elsevier, Amsterdam, 1988, 151 pp.; *C.A.*, 110 (1989) 169798s.

See also 2179, 2237, 2528.

### 2. FUNDAMENTALS, THEORY AND GENERAL

#### 2a. General

- 2165 Hutchins, J.: A new western blotting variant. *BioTechniques*, 7 (1989) 248-251; *C.A.*, 111 (1989) 3611w.

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

- 2166 Richard, C., Han, K.-K., Yang, H.-L., Zhu, D.-X., Balduyck, M. and Mizon, J.: Evidence for the overestimation of molecular masses of proteins after chemical modification and chemical crosslinks on sodium dodecyl sulfate/polyacrylamide gel electrophoresis (SDS-PAGE). *Biomed. Chromatogr.*, 3 (1989) 131-135.

### 3. GENERAL TECHNIQUES

#### 3a. Apparatus and accessories

- 2167 Changeart, F.J., Marsal, O., Sanchez, V., Zago, F., Costet, R. and Amadiou, P.: SELECTE: Scientific instrument devoted to continuous flow electrophoretic separation on earth and in space. *Eur. Space Agency (Spec. Publ.) ESA SP*, 256 (Eur. Symp. Mater. Sci. Microgravity Cond., 6th 1986) (1987) 285-290; *C.A.*, 111 (1989) 20251w.  
2168 Godfrey, J.E.: Apparatus and methods for analyzing macro ions at electrophoretic steady state. *U.S. Pat.* US 4,801,366 (Cl. 204-180.1; G01N27/26), 31 Jan. 1989, Appl. 27,538, 18 Mar. 1987; 40 pp.; *C.A.*, 111 (1989) 8223f.  
2169 Inoue, S. and Ashihara, Y.: (Improvement of sample separation and collection by electrophoresis apparatus). *Jpn Kokai Tokkyo Koho Pat.* JP 63,215,961 (88,215,961) (Cl. G01N27/26), 08 Sep. 1988, Appl. 87/47,746, 04 Mar. 1987, 8 pp.; *C.A.*, 111 (1989) 20515k.  
2170 Love, J.D., Elliott, M.T., Morgan, P.L. and Woerner, L.G.: Apparatus for conducting horizontal gel electrophoresis for separation and subsequent vacuum-assisted transportation of molecules to a support membrane to facilitate detection. *Eur. Pat.* Appl. EP 300,924 (Cl. G01N27/26), 25 Jan. 1989, US Appl. 77,240, 24 Jul. 1987; 17 pp.; *C.A.*, 110 (1989) 241876k.  
2171 Nishizawa, H.: Electrophoretic apparatus for zone electrophoresis or for isoelectric focusing. *U.S. Pat.* US 4,814,057 (Cl. 204-299R; G01N27/26), 21 Mar. 1989, Appl. 143,546, 13 Jan. 1988; 8 pp.; *C.A.*, 110 (1989) 241882j.

- 2172 Okano, J. and Kitai, T.: (Surface treatment of buffer tank in electrophorins apparatus with fluororesins). *Jpn. Kokai Tokkyo Koho Pat.* JP 63,217,263 (88,217,263) (Cl. G01N27/26), 09 Sep. 1988, Appl. 87/50,924, 05 Mar. 1987, 3 pp.; *C.A.*, 111 (1989) 3755w.
- 2173 Tamotu, S., Kambara, H., Harada, Y., Watanabe, K. and Kenichi, T.J.: Apparatus for determining base sequence of nucleic acid using cylindrical electrophoresis gels and ring-shaped scintillation detector. *U.S. Pat.* US 4,830,830 (Cl. 422-71; G01N23/06), 16 May 1989, JP Appl. 85/34,360, 25 Feb. 1985, 7 pp.; *C.A.*, 111 (1989) 53731f.

3b. *Detection procedures and detectors*

- 2174 Markowski, S.: Silver staining of proteins on agarose gels modified by addition of anti-fogging agent (benzotriazole) into developer. *Immunol. Pol.*, 13 (1988) 123-129; *C.A.*, 111 (1989) 3610v.

See also 2196.

3c. *Electrophoresis in stabilized media*

- 2175 Kitani, T. and Ogawa, M.: (Electrophoresis stationary phase). *Jpn. Kokai Tokkyo Koho Pat.* JP 63,228,053 (88,228,053) (Cl. G01N27/26), 22 Sep. 1988, Appl. 86/298,527, 15 Dec. 1986, 13 pp.; *C.A.*, 111 (1989) 20518p.
- 2176 Kitani, T. and Ogawa, M.: (Polymers in adhesive layer in multilayered media for electrophoresis). *Jpn. Kokai Tokkyo Koho Pat.* JP 63,233,361 (88,233,361) (Cl. G01N27/26), 29 Sep. 1988, Appl. 86/298,529, 15 Dec. 1986, 14 pp.; *C.A.*, 111 (1989) 36271p.

See also 2565.

4. SPECIAL TECHNIQUES

4b. *Preparative and continuous procedures*

- 2177 Lottspeich, F.: HPLC and electrophoresis - competitors or partners. *Chromatographia*, 28 (1989) 89-91 - a review with 16 refs.

See also 2293,2460,2557.

4c. *Isoelectric focusing*

See 2235, 2243, 2308,2328, 2336, 2368, 2412,2435,2482.

4d. *Isotachopheresis*

See 2180.

4e. *Two dimensional electrophoresis*

See 2269, 2332 - 2334, 2341, 2345, 2389, 2430, 2551, 2573.

4g. *Other special techniques*

- 2178 Edmonds, C.G., Loo, J.A., Barinaga, C.J., Udseth, H.R. and Smith, R.D.: Capillary electrophoresis-electrospray ionization-mass spectrometry. *J. Chromatogr.*, 474 (1989) 21-37.
- 2179 Karger, B.L., Cohen, A.S. and Guttman, A.: High-performance capillary electrophoresis in the biological sciences. *J. Chromatogr.*, 492 (1989) 585-614 - a review with 23 refs.

See also 2196, 2214, 2237, 2328, 2585, 2591.



## 10. CARBOHYDRATES

## 10a. Mono and oligosaccharides. Structural studies

- 2180 Kvasnicka, F., Copikova, J. and Sterzikova, E.: (Use of capillary isotachopheresis in analysis at sugar mills). *LC, Listy Cukrov.,* 104 (1988) 255-258; *C.A.,* 110 (1989) 233509c.
- 2181 Yamashita, K., Totani, K., Iwaki, Y., Takamisawa, I., Tateishi, N., Higashi, T., Sakamoto, Y. and Kobata, A.: Comparative study of the sugar chains of  $\gamma$ -glutamyltranspeptidases purified from human hepatocellular carcinoma and from human liver. *J. Biochem. (Tokyo),* 105 (1989) 728-735.

## 10b. Polysaccharides, mucopolysaccharides, lipopolysaccharides

- 2182 Harab, R.C. and Mourao, P.A.S.: Increase of chondroitin 4-sulfate concentration in the endochondral ossification cartilage of normal dogs. *Biochim. Biophys. Acta,* 992 (1989) 237-240.
- 2183 Melching, L.I. and Roughley, P.J.: The synthesis of dermatan sulphate proteoglycans by fetal and adult human articular cartilage. *Biochem. J.,* 261 (1989) 501-508.
- 2184 Yamaguchi, M., Konoshita, S. and Suzuki, N.: Dermatan sulfate formation in gastrulae of the sea urchin *Clypeaster japonicus*. *J. Biochem. (Tokyo),* 106 (1989) 158-162.

See also 2596.

## 10c. Glycoproteins and their components

- 2185 Calvete, J.J., Alvarez, M.V., Rivas, G., Hew, C.-L., Henschen, A. and Gonzalez-Rodriguez, J.: Interchain and intrachain disulphide bonds in human platelet glycoprotein IIb. Localization of the epitopes for several monoclonal antibodies. *Biochem. J.,* 261 (1989) 551-560.
- 2186 Dekker, J., van Beurden-Lamers, W.M.O. and Strous, G.J.: Biosynthesis of gastric mucus glycoprotein of the rat. *J. Biol. Chem.,* 264 (1989) 10431-10437.
- 2187 Fraeyman, N.H., van de Velde, E.J., Belpaire, F.M. and Lameire, N.H.: Glycan microheterogeneity of  $\alpha_1$ -acid glycoprotein in sera and dialysates of patients on continuous ambulatory peritoneal dialysis. *Clin. Chim. Acta,* 181 (1989) 47-54.
- 2188 Gowda, D.C., Goossen, B., Margolis, R.K. and Margolis, R.U.: Chondroitin sulfate and heparan sulfate proteoglycans of PC12 pheochromocytoma cells. *J. Biol. Chem.,* 264 (1989) 11436-11443.
- 2189 Gu, J., Matsuda, T., Nakamura, R., Ishiguro, H., Ohkubo, I., Sasaki, M. and Takahashi, N.: Chemical deglycosylation of hen ovomucoid: protective effect of carbohydrate moiety of tryptic hydrolysis and heat denaturation. *J. Biochem. (Tokyo),* 106 (1989) 66-70.
- 2190 Heimer, R.: Proteoglycan profiles obtained by electrophoresis and triple immunoblotting. *Anal. Biochem.,* 180 (1989) 211-215.
- 2191 Heimgartner, U., Kozulic, B. and Mosbach, K.: Polycarylic polyhydrazides as reagents for detection of glycoproteins. *Anal. Biochem.,* 181 (1989) 182-189.
- 2192 Houdret, N., Ramphal, R., Scharfman, A., Perini, J.-M., Filliat, M., Lamblin, G. and Roussel, P.: Evidence for the *in vivo* degradation of human respiratory mucins during *Pseudomonas aeruginosa* infection. *Biochim. Biophys. Acta,* 992 (1989) 96-105.
- 2193 Kilpatrick, D.R., Srinivas, R.V. and Compans, R.W.: The spleen focus-forming virus envelope glycoprotein is defective in oligomerization. *J. Biol. Chem.,* 264 (1989) 10732-10737.
- 2194 Lieberman, D.M., Reithmeier, R.A.F., Ling, V., Charuk, J.H.M., Goldberg, H. and Skorecki, K.L.: Identification of P-glycoprotein in renal brush border membranes. *Biochem. Biophys. Res. Commun.,* 162 (1989) 244-252.
- 2195 Twining, S.S., Wilson, P.M. and Hatchell, D.L.: Characterization of corneal proteoglycans under vitamin A deficiency. *Biochim. Biophys. Acta,* 992 (1989) 181-190.

See also 2313, 2596.

## 11. ORGANIC ACIDS AND LIPIDS

## 11a. Organic acids and simple esters

- 2196 Huang, X., Luckey, J.A., Gordon, M.J. and Zare, R.N.: Quantitative analysis of low molecular weight carboxylic acids by capillary zone electrophoresis/conductivity detection. *Anal. Chem.*, 61 (1989) 766-770.

## 11d. Lipoproteins and their constituents

- 2197 Azhar, S. and Reaven, E.: Differences in uptake of high-density lipoproteins by rat adrenals using *in vivo* vs. *in situ* perfusion techniques. *Biochim. Biophys. Acta*, 1004 (1989) 61-66.
- 2198 Camato, R., Marcel, Y.L., Milne, R.W., Lussier-Cacan, S. and Weech, P.K.: Protein polymorphism of a human plasma apolipoprotein D antigenic epitope. *J. Lipid Res.*, 30 (1989) 865-875.
- 2199 Dory, L.: Synthesis and secretion of apoE in thioglycolate-elicited mouse peritoneal macrophages: effect of cholesterol efflux. *J. Lipid Res.*, 30 (1989) 809-816.
- 2200 Fless, G.M., Snyder, M.L. and Scanu, A.M.: Enzyme-linked immunoassay for Lp[ $\alpha$ ]. *J. Lipid Res.*, 30 (1989) 651-662.
- 2201 Forte, T.M., McCall, M.R., Knowles, B.B. and Shore, V.G.: Isolation and characterization of lipoproteins produced by human hepatoma - derived cell lines other than HepG2. *J. Lipid Res.*, 30 (1989) 817-829.
- 2202 Funahashi, T., Yokoyama, S. and Yamamoto, A.: Association of apolipoprotein E with the low density lipoprotein receptor: demonstration of its co-operativity on lipid microemulsion particles. *J. Biochem. (Tokyo)*, 105 (1989) 582-587.
- 2203 Kim, M.H., Nakayama, R., Manos, P., Tomlinson, J.E., Choi, E., Ng, J.D. and Holten, D.: Regulation of apolipoprotein E synthesis and mRNA by diet and hormones. *J. Lipid Res.*, 30 (1989) 663-671.
- 2204 Kondo, K., Allan, C. and Fidge, N.: Quantitation of apolipoprotein A-IV in human plasma using a competitive enzyme-linked immunosorbent assay. *J. Lipid Res.*, 30 (1989) 939-944.
- 2205 Lagrost, L., Gambert, P., Meunier, S., Morgado, P., Desgres, J., d'Athis, P. and Lallemand, C.: Correlation between apolipoprotein A-IV and triglyceride concentrations in human sera. *J. Lipid Res.*, 30 (1989) 701-710.
- 2206 Maguire, G.F., Lee, M. and Connelly, P.W.: Sodium dodecyl sulfate-glycerol polyacrylamide slab gel electrophoresis for the resolution of apolipoproteins. *J. Lipid Res.*, 30 (1989) 757-761.
- 2207 McNamara, J.R., Campos, H., Adolphson, J.L., Ordovas, J.M., Wilson, P.W.F., Albers, J.J., Usher, D.C. and Schaefer, E.J.: Screening for lipoprotein[ $\alpha$ ] elevations in plasma and assessment of size heterogeneity using gradient gel electrophoresis. *J. Lipid Res.*, 30 (1989) 747-755.
- 2208 Myrseth, L.-E., Hagve, T.A. and Prydz, H.: Separation and visualization of apolipoprotein B species by sodium dodecyl sulfate-agarose gel electrophoresis and immunoblotting. *Anal. Biochem.*, 181 (1989) 86-89.
- 2209 Podrez, E.A., Kosykh, V.A., Lankin, V.Z., Novikov, D.K., Volgushev, S.A., Viktorov, A.V. and Repin, V.S.: (Secretion of very low density lipoproteins by hepatocytes of rabbits receiving old commercial and purified cholesterol). *Biokhimiya (Moscow)*, 54 (1989) 999-1008.
- 2210 Puppione, D.L., Nicolosi, R.J., Kowala, M.C. and Schumaker, V.N.: Low density lipoprotein heterogeneity in the cebus monkey. *J. Lipid Res.*, 30 (1989) 641-650.
- 2211 Rimoldi, O.J., Soulages, J.L., Gonzales, S.M., Peluffo, R.O. and Brenner, R.R.: Purification and properties of the very high density lipoprotein from the hemolymph of adult *Triatoma infestans*. *J. Lipid Res.*, 30 (1989) 857-864.
- 2212 Wu, L.L., Warnick, G.R., Wu, J.T., Williams, R.R. and Lalouel, J.-M.: A rapid micro-scale procedure for determination of the total lipid profile. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1486-1491.
- 2213 Zawadzki, Z., Milne, R.W. and Marcel, Y.L.: An immunochemical marker of low density lipoprotein oxidation. *J. Lipid Res.*, 30 (1989) 885-891.

## 17. AMINES, AMIDES AND RELATED NITROGEN COMPOUNDS

## 17b. Catecholamines and their metabolites

- 2214 Fanali, S.: Separation of optical isomers by capillary zone electrophoresis based on host-guest complexation with cyclodextrins. *J. Chromatogr.*, 474 (1989) 441-446.
- 2215 Sanchez, C.P., Gonzalez, N.S. and Algranati, I.D.: Stable ornithine decarboxylase in promastigotes of *Leishmania mexicana mexicana*. *Biochem. Biophys. Res. Commun.*, 161 (1989) 754-761.

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

## 18a. Amino acids and their derivatives

See 2466.

## 18b. Peptides and peptidic and proteinous hormones

- 2216 Burger, M., Lawen, A. and Martini, O.H.W.: Insulin-induced S6 kinase activation in HeLa cells and its reversal by hyperthermic stress. *Eur. J. Biochem.*, 183 (1989) 255-262.
- 2217 Eckerskorn, C. and Lottspeich, F.: Internal amino acid sequence analysis of proteins separated by gel electrophoresis after tryptic digestion in polyacrylamide matrix. *Chromatographia*, 28 (1989) 92-94.
- 2218 Geisler, N., Hatzfeld, M. and Weber, K.: Phosphorylation *in vitro* of vimentin by protein kinases A and C is restricted to the head domain. Identification of the phosphoserine sites and their influence on filament formation. *Eur. J. Biochem.*, 183 (1989) 441-447.
- 2219 Ikeda, K., Weir, E.C., Sakaguchi, K., Burtis, W.J., Zimering, M., Mangin, M., Dreyer, B.E., Brandi, M.L., Aurbach, G.D. and Broadus, A.E.: Clonal rat parathyroid cell line expresses a parathyroid hormone-related peptide but not parathyroid hormone itself. *Biochem. Biophys. Res. Commun.*, 162 (1989) 108-115.
- 2220 Pahwa, G.S., Vollmer, G., Knuppen, R. and Emons, G.: Photoaffinity labelling of gonadotropin releasing hormone binding sites in human epithelial ovarian carcinomata. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1086-1092.
- 2221 Ploug, M., Jensen, A.L. and Barkholt, V.: Determination of amino acid compositions and NH<sub>2</sub>-terminal sequences of peptides electroblotted onto PVDF membranes from tricine-sodium dodecyl sulfate-polyacrylamide gel electrophoresis: application to peptide mapping of human complement component C3. *Anal. Biochem.*, 181 (1989) 33-39.
- 2222 Rybak, S.M., Auld, D.S., St. Clair, D.K., Yao, Q.-Z. and Fett, J.W.: C-Terminal angiogenin peptides inhibit the biological and enzymatic activities of angiogenin. *Biochem. Biophys. Res. Commun.*, 162 (1989) 535-543.
- 2223 Tominaga, N., Sakakibara, R., Yokoo, Y. and Ishiguro, M.: Existence of associated, non-associated, and oligomeric forms of human chorionic gonadotropin subunits in placental extracts. *J. Biochem. (Tokyo)*, 105 (1989) 992-997.

See also 2177, 2237.

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

- 2224 Hagiwara, M., Tokumitsu, H., Onoda, K., Tanaka, T., Ito, M., Kato, N. and Hidaka, H.: Monoclonal antibody assessment of tissue- and species-specific myosin light chain kinase isozymes. *J. Biochem. (Tokyo)*, 106 (1989) 71-75.
- 2225 Horie, N., Nalbantoglu, J., Kaneda, S., Ayasawa, D., Seno, T. and Takeishi, K.: Identification and characterization of an L1 family sequence with a very long open reading frame in the third intron of the human thymidylate synthase gene. *J. Biochem. (Tokyo)*, 106 (1989) 1-4.

- 2226 Ibrahim, J. and Harding, J.J.: Pinpointing the sites of hydroxylysine glycosides in peptide  $\alpha$ 1-CB7 of bovine corneal collagen, and their possible role in determining fibril diameter and thus transparency. *Biochim. Biophys. Acta*, 992 (1989) 9-22.
- 2227 Imamura, Y. and Kawakita, M.: Purification of limited tryptic fragments of  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ -adenosine triphosphatase of the sarcoplasmic reticulum and identification of conformation-sensitive cleavage sites. *J. Biochem. (Tokyo)*, 105 (1989) 775-781.
- 2228 Kriauciunas, A., Yu, L., Yu, C.-A., Wynn, R.M. and Knaff, D.B.: The *Rhodospirillum rubrum* cytochrome  $\text{bc}_1$  complex: peptide composition, prosthetic group content and quinone binding. *Biochim. Biophys. Acta*, 976 (1989) 70-76.
- 2229 Nefsky, B. and Bretscher, A.: Landmark mapping: a general method for localizing cysteine residues within a protein. *Proc. Natl. Acad. Sci. U.S.A.*, 86 (1989) 3549-3553; *C.A.*, 111 (1989) 36127w.
- 2230 Takagi, S., Kobayashi, M. and Matsuda, K.: Modification of essential carboxyl group in rabbit muscle phosphorylase by water-soluble carbodiimide. *J. Biochem. (Tokyo)*, 105 (1989) 933-938.
- 2231 Takasuga, A., Adachi, H., Ishino, F., Matsushashi, M., Ohta, T. and Matsuzawa, H.: Identification of the penicillin-binding active site of penicillin-binding protein 2 of *Escherichia coli*. *J. Biochem. (Tokyo)*, 104 (1988) 822-826.
- 2232 Tsukamoto, H., Azuma, K., Miyauchi, T., Usui, H. and Takeda, M.: Tyrosine protein kinases in membrane fractions from rat cerebral cortex. *J. Biochem. (Tokyo)*, 104 (1988) 807-816.
- 2233 Usanov, S.A., Chernogolov, A.A. and Chashchin, V.L.: (Immunochemical analysis of adrenocortical cytochrome P-450<sub>sc</sub>. Topology of the hemeprotein polypeptide chain in the phospholipid membrane). *Biokhimiya (Moscow)*, 54 (1989) 916-925.

See also 2217, 2221.

## 19. PROTEINS

### 19a. General techniques

- 2234 Choli, T., Kapp, U. and Wittmann-Liebold, B.: Blotting of proteins onto Immobilon membranes. *In situ* characterization and comparison with high-performance liquid chromatography. *J. Chromatogr.*, 476 (1989) 59-72.
- 2235 Cossu, G., Pirastri, M.G., Satta, M., Chiari, M., Chiesa, C. and Righetti, P.G.: Carrier ampholyte-mediated oxidation of proteins in isoelectric focusing. *J. Chromatogr.*, 475 (1989) 283-292.
- 2236 Grässel, S., Røling, A. and Hasilik, A.: Immunoprecipitation of labeled antigens with Eupergit C1Z. *Anal. Biochem.*, 180 (1989) 72-78.
- 2237 Grossman, P.D., Colburn, J.C., Lauer, H.H., Nielsen, R.G., Riggan, R.M., Sittampalam, G.S. and Rickard, E.C.: Application of free-solution capillary electrophoresis to the analytical scale separation of proteins and peptides. *Anal. Chem.*, 61 (1989) 1186-1194.
- 2238 Gumerlock, P.H., Meyers, F.J., Kokoris, S.P., Wong, G., McCormick, F.P. and deVere White, R.M.: RAS Enzyme-linked immunoblot assay discriminates p21 species: a technique to dissect gene family expression. *Anal. Biochem.*, 180 (1989) 158-168.
- 2239 Hagen, W.R.: Direct electron transfer of redox proteins at the bare glassy carbon electrode. *Eur. J. Biochem.*, 182 (1989) 523-530.
- 2240 Kirley, T.L.: Reduction and fluorescent labeling of cyst(e)ine-containing proteins for subsequent structural analyses. *Anal. Biochem.*, 180 (1989) 231-236.
- 2241 Nakagawa, S. and Fukuda, T.: Direct amino acid analysis of proteins electroblotted onto polyvinylidene difluoride membrane from sodium dodecyl sulfate-polyacrylamide gel. *Anal. Biochem.*, 181 (1989) 75-78.
- 2242 Park, K.B. and Labbe, R.G.: Artifacts following gold staining of Western-blotted membranes. *Anal. Biochem.*, 180 (1989) 55-58.
- 2243 Righetti, P.G., Wenisch, E. and Faupel, M.: Preparative protein purification in a multi-compartment electrolyser with immobiline membranes. *J. Chromatogr.*, 475 (1989) 293-309.

- 2244 Wang, D., Dzandu, J.K., Hussain, M. and Johnson, R.M.: Western blots from sodium dodecyl sulfate-polyacrylamide gels stained by metal salts. *Anal. Biochem.*, 180 (1989) 311-313.

See also 2166, 2177, 2596.

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

- 2245 Aiba, H., Nakasai, F., Mizushima, S. and Mizuno, T.: Phosphorylation of a bacterial activator protein, OmpR, by a protein kinase, EmvZ, results in stimulation of its DNA-binding activity. *J. Biochem. (Tokyo)*, 106 (1989) 5-7.
- 2246 Allee, G., Fagard, R., Danielian, S., Boulet, I., Soula, M. and Fischer, S.: Phosphorylation of p56<sup>lck</sup> by external ATP in intact cells. *Biochem. Biophys. Res. Commun.*, 162 (1989) 51-57.
- 2247 Baumann, H., Won, K. and Jahreis, G.P.: Human hepatocyte-stimulating factor-III and interleukin-6 are structurally and immunologically distinct but regulate the production of the same acute phase plasma proteins. *J. Biol. Chem.*, 264 (1989) 8046-8051.
- 2248 Birnboim, H.C., Matora, D. and Liteplo, R.G.: Indomethacin shifts the peak of c-fos, egr-1, and c-myc gene expression in confluent fibroblasts induced by phorbol myristate acetate. *Biochem. Biophys. Res. Commun.*, 161 (1989) 508-513.
- 2249 Boneh, A., Mandla, S. and Tenenhouse, H.S.: Phorbol myristate acetate activates protein kinase C, stimulates the phosphorylation of endogenous proteins and inhibits phosphate transport in mouse renal tubules. *Biochim. Biophys. Acta*, 1012 (1989) 308-316.
- 2250 Bresler, V.M., Valter, S.N., Jerebtsova, M.A., Isayev-Ivanov, V.V., Kazbekov, E.N., Kleiner, A.R., Orlov, Yu.N., Ostapenko, I.A., Suhodolova, A.T. and Fomichev, V.N.: The influence of the lipid bilayer phase state on the p-aminohippurate (PAH) transport and the activity of the alkaline phosphatase in brush-border membrane vesicles from normal and mutant rats. *Biochim. Biophys. Acta*, 982 (1989) 288-294.
- 2251 Chau, L.-Y., Tsai, Y.-M. and Cheng, J.-R.: Photoaffinity labeling of platelet activating factor binding sites in rabbit platelet membranes. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1070-1076.
- 2252 Chiang, C.S., Grove, T., Cooper, M., Cuan, J., Kowalski, A., Parcells, K., Tsunokawa, M., Rosenberg, M., Arcuri, E., Franklin, S., Smith, T. and Debouck, C.: Development of a confirmatory enzyme-linked immunosorbent assay for HIV-1 antibodies. *Clin. Chem. (Winston-Salem)*, 35 (1989) 946-952.
- 2253 Chiao, J.W., Abolhassani, M., Leung, K. and Heil, M.: Mechanism of regulating human leukemia cell growth and differentiation by a lymphokine. *Biochem. Biophys. Res. Commun.*, 161 (1989) 583-588.
- 2254 Conti, R., Ceccarini, C. and Tecce, M.F.: Thyroid hormone effect on  $\alpha$ -feto-protein and albumin coordinate expression by a human hepatoma cell line. *Biochim. Biophys. Acta*, 1008 (1989) 315-321.
- 2255 Cooper, M.S., Miller, J.P. and Fraser, S.E.: Electrophoresis of cytoplasmic molecules through gap junctions by externally applied electric fields. *Biol. Bull.*, 176 (1989) 150-156; *C.A.*, 111 (1989) 36126v.
- 2256 Fisher, K.A. and Yanagimoto, K.C.: Transmembrane signaling: tumor promoter distribution. *Biochim. Biophys. Acta*, 982 (1989) 237-244.
- 2257 Harel-Bellan, A., Korner, M., Brini, A.T., Ferris, D. and Farrar, W.L.: Activation of HIV-enhancer binding activity by mild detergents in human T cells. *Biochem. Biophys. Res. Commun.*, 162 (1989) 238-243.
- 2258 Ichida, S., Masada, A., Fujisue, T., Yoshioka, T. and Matsuda, N.: Photoaffinity labeling with dihydropyridine derivatives of crude membranes from rat skeletal, cardiac, ileal, and uterine muscles and whole brain. *J. Biochem. (Tokyo)*, 105 (1989) 767-774.
- 2259 Igbavboa, U., Zwizinski, C.W. and Pfeiffer, D.R.: Release of mitochondrial matrix proteins through a Ca<sup>2+</sup>-requiring, cyclosporin-sensitive pathway. *Biochem. Biophys. Res. Commun.*, 161 (1989) 619-625.
- 2260 Katz, A., Pick, U. and Avron, M.: Characterization and reconstitution of the Na<sup>+</sup>/H<sup>+</sup> antiporter from the plasma membrane of the halotolerant alga *Dunaliella*. *Biochim. Biophys. Acta*, 983 (1989) 9-14.
- 2261 Lazarowski, E.R., Lical, J.C. and Lapetina, E.G.: Agonist-induced phosphorylation of an immunologically ras-related protein in human erythroleukemia cells. *Biochem. Biophys. Res. Commun.*, 161 (1989) 972-978.

- 2262 Leslie, R.J. and Wilson, L.: Preparation and characterization of mitotic cytoskeletons from embryos of the sea urchin *Strongylocentrotus franciscanus*. *Anal. Biochem.*, 181 (1989) 51-58.
- 2263 Mitsui, K. and Tsurugi, K.: Identification of A1 protein as the fourth member of 13 kDa-type acidic ribosomal protein family in yeast *Saccharomyces cerevisiae*. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1001-1006.
- 2264 Mitsui, K., Nakagawa, T. and Tsurugi, K.: On the size and the role of a free cytosolic pool of acidic ribosomal proteins in yeast *Saccharomyces cerevisiae*. *J. Biochem. (Tokyo)*, 104 (1988) 908-911.
- 2265 Myers, L.M. and Kling, O.R.: Gonadotropin stimulated protein phosphorylation in porcine granulosa cells. *Biochem. Biophys. Res. Commun.*, 161 (1989) 442-447.
- 2266 Navas, P., Nowack, D.D. and Morre, D.J.: Isolation of purified plasma membranes from cultured cells and hepatomas by two-phase partition and preparative free-flow electrophoresis. *Cancer Res.*, 49 (1989) 2147-2156; *C.A.*, 111 (1989) 3686z.
- 2267 Raza, H., Pngubala, J.R. and Sorof, S.: Specific high affinity binding of lipoxigenase metabolites of arachidonic acid by liver fatty acid binding protein. *Biochem. Biophys. Res. Commun.*, 161 (1989) 448-455.
- 2268 Sanders, C.E., Melis, A. and Allen, J.F.: *In vivo* phosphorylation of proteins in the cyanobacterium *Synechococcus* 6301 after chromatic acclimation to Photosystem I or Photosystem II light. *Biochim. Biophys. Acta*, 976 (1989) 168-172.
- 2269 Singh, J.P., Bonin, P.D. and Adams, L.D.: Rapid modulation of a 64 k dalton fibroblast protein: a PDGF mediated early cellular event. *Biochem. Biophys. Res. Commun.*, 162 (1989) 394-401.
- 2270 Takagi, H., Morinaga, Y., Ikemura, H. and Inouye, M.: The role of Pro-239 in the catalysis and heat stability of subtilisin E. *J. Biochem. (Tokyo)*, 105 (1989) 953-956.
- 2271 Ullrich, S.J., Moore, S.K. and Appella, E.: Transcriptional and translational analysis of the murine 84- and 86-kDa heat shock proteins. *J. Biol. Chem.*, 264 (1989) 6810-6816.
- 2272 Valentine, M.A., Meier, K.E., Rossie, S. and Clark, E.A.: Phosphorylation of the CD20 phosphoprotein in resting B lymphocytes. Regulation by protein kinase C. *J. Biol. Chem.*, 264 (1989) 11282-11287.
- 2273 Van der Staay, G.W.M., Matthijs, H.C.P. and Mur, L.R.: Phosphorylation and dephosphorylation of membrane proteins from the prochlorophyte *Prochlorothrix hollandica* in fixed redox states. *Biochim. Biophys. Acta*, 975 (1989) 317-324.
- 2274 Vad Ede, J., Nijmeijer, J.R.J., Welling-Wester, S., Örvell, C. and Welling, G.W.: Comparison of non-ionic detergents for extraction and ion-exchange high-performance liquid chromatography of Sendai virus integral membrane proteins. *J. Chromatogr.*, 476 (1989) 319-327.
- 2275 Watanabe, K., Kinoshita, S. and Nakagawa, H.: Purification and characterization of cytokine-induced neutrophil chemoattractant produced by epithelioid cell line of normal rat kidney (NRK-52E cell). *Biochem. Biophys. Res. Commun.*, 161 (1989) 1093-1099.
- 2276 Woldegiorgis, G., Duff, T., Contreras, L., Shrago, E. and Ruoho, A.E.: Photo-affinity labeling of hamster brown adipose tissue mitochondria by an [<sup>125</sup>I] coenzyme A derivative: differential interaction with the uncoupling protein and ADP/ATP carrier. *Biochem. Biophys. Res. Commun.*, 161 (1989) 502-507.
- 2277 Xiang, R.H. and Lee, J.C.: Identification of neighboring protein pairs in the 60 S ribosomal subunits from *Saccharomyces cerevisiae* by chemical cross-linking. *J. Biol. Chem.*, 264 (1989) 10542-10546.
- 2278 Yamada, H., Stephens, R.W., Nakagawa, T. and McNicol, D.: Detection and partial characterization of a specific plasminogen activator inhibitor in human chondrocyte cultures. *J. Biochem. (Tokyo)*, 104 (1988) 960-967.
- 2279 Yamamoto, H., Terabayashi, M., Egawa, T., Hayashi, E., Nakamura, H. and Kishimoto, S.: Affinity separation of human plasma gelsolin of Affi-Gel Blue. *J. Biochem. (Tokyo)*, 105 (1989) 799-802.
- 2280 Yeo, K.-T., Yeo, T.-K. and Olden, K.: Bromoconduritol treatment delays intracellular transport of secretory glycoproteins in human hepatoma cell cultures. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1013-1019.

- 2281 Yoshimoto, A., Sakajo, S., Minagawa, N. and Komiyama, T.: Possible role of a 36 kDa protein induced by respiratory inhibitors in cyanide-resistant respiration in *Hansenula anomala*. *J. Biochem. (Tokyo)*, 105 (1989) 864-866.

See also 2299.

19c. *Proteins synthesized by genetic manipulation*

- 2282 Chen, L.R., Yuan, C.J., Somasekhar, G., Wejksnora, P., Peterson, J.E., Myers, A.M., Graves, L., Cohen, P.T.W., da Cruz e Silva, E.F. and Graves, D.J.: Expression and characterization of the  $\tau$  subunit of phosphorylase kinase. *Biochem. Biophys. Res. Commun.*, 161 (1989) 746-753.
- 2283 Ciccarelli, E., Massaer, M., Guillaume, J.-P., Herzog, A., Loriau, R., Carvador, A., Jacobs, P. and Bollen, A.: Porcine D-amino acid oxidase: production of the biologically active enzyme in *Escherichia coli*. *Biochem. Biophys. Res. Commun.*, 161 (1989) 865-872.
- 2284 Eggi, E.E., Gavriilyuk, I.P., Konarev, V.G., Bulargina, T.V. and Sveshnikov, P.G.: (Monoclonal antibodies to acid polypeptides of legumin). *Biokhimiya (Moscow)*, 54 (1989) (1015-1019).
- 2285 Hostomsky, Z., Appelt, K. and Ogden, R.C.: High-level expression of self-processed HIV-1 protease in *Escherichia coli* using a synthetic gene. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1056-1063.
- 2286 Iwasaki, A., Suda, M., Watanabe, M., Nakao, H., Hattori, Y., Nagoya, T., Saino, Y., Shidara, Y. and Maki, M.: Structure and expression of cDNA for calphobindin II, a human placental coagulation inhibitor. *J. Biochem. (Tokyo)*, 106 (1989) 43-49.
- 2287 Kajihara, J.-i., Enomoto, M., Nishijima, K., Yabuuchi, M. and Katoh, K.: Comparison of properties between human recombinant and placental copper-zinc SOD. *J. Biochem. (Tokyo)*, 104 (1988) 851-854.
- 2288 Leinbach, S.S. and Heath, L.S.: Characterization of the single-stranded DNA-binding domain of the herpes simplex virus protein ICP8. *Biochim. Biophys. Acta*, 1008 (1989) 281-286.
- 2289 Nakai, M., Harabayashi, M., Hase, T. and Matsubara, H.: Protein sorting between the outer and inner mitochondrial membranes: submitochondrial localization of cytochrome  $c_1$  whose presequence is replaced by the amino-terminal region of a 70 kDa outer membrane protein. *J. Biochem. (Tokyo)*, 106 (1989) 181-187.
- 2290 Sakai, Y., Tamao, Y., Shimamoto, T., Hama, H., Tsuda, M. and Tsuchiya, T.: Cloning and expression of the 5'-nucleotidase gene of *Vibrio parahaemolyticus* in *Escherichia coli* and overproduction of the enzyme. *J. Biochem. (Tokyo)*, 105 (1989) 841-846.
- 2291 Tsujimoto, M., Adachi, H., Kodama, S., Tsuruoka, N., Yamada, Y., Tanaka, S., Mita, S. and Takatsu, K.: Purification and characterization of recombinant human interleukin 5 expressed in Chinese hamster ovary cells. *J. Biochem. (Tokyo)*, 106 (1989) 23-28.
- 2292 Yoshimoto, T., Murayama, N., Honda, T., Tone, H. and Tsuru, D.: Cloning and expression of aminopeptidase P gene from *Escherichia coli* HB101 and characterization of expressed enzyme. *J. Biochem. (Tokyo)*, 104 (1988) 93-97.

19d. *Microbial and plant proteins*

- 2293 Curioni, A., Dal Belin Peruffo, A. and Pogna, N.E.: Electroendosmotic preparative electrophoresis as a one-step method for purification of high molecular weight subunits of wheat glutenin. *Cereal Chem.*, 66 (1989) 133-135; *C.A.*, 111 (1989) 38209y.
- 2294 Damerval, C. and de Vienne, D. (Editors): *Electrophoresis (Weinheim)*, Vol. 9 (11), VCH Verlagsgesellschaft, Weinheim, 1988, 115 pp.; *C.A.*, 110 (1989) 111296k.
- 2295 Durante, M., Bernardi, R., Lupi, M.C. and Sabelli, P.: Characterization of *Helianthus annuus* L. storage proteins. *J. Agric. Food Chem.*, 37 (1989) 852-855.

- 2296 Gavin, M.: (Determination of soft wheat in high and very-high temperature dried pasta). *Getreide, Mehl, Brot*, 43 (1989) 76-78; *C.A.*, 111 (1989) 55950a.
- 2297 Ohms, J.P.: (Variety identification at the Federal Office of Plant Varieties: protein separation by electrophoresis - an additional approach for characterizing plant varieties). *VDLUFA-Schriftenr.*, 28 (100 Jahre Agrarforsch. VA, Teil 2) (1989) 607-616; *C.A.*, 111 (1989) 3618d.
- 2298 Paredes-Lopez, O., Ordorica-Falomir, C. and Carabez-Trejo, A.: Production of safflower protein isolates: physicochemical characterization. *Lebensm.-Wiss. Technol.*, 21 (1988) 328-333; *C.A.*, 111 (1989) 38155c.
- 2299 Park, M.-H. and Chae, O.: Intracellular protein phosphorylation in oat (*Avena sativa* L.) protoplasts by phytochrome action. (1). Measurement of action spectra for the protein phosphorylation. *Biochem. Biophys. Res. Commun.*, 162 (1989) 9-14.
- 2300 Ross, L.F. and Bhatnagar, D.: Enzymatic phosphorylation of soybean proteins. *J. Agric. Food Chem.*, 37 (1989) 841-844.
- 2301 Taha, S.A. and Sagi, F.: Sodium dodecyl sulfate-polyacrylamide gel electrophoresis of seed proteins as a test for screening high cooking quality durum wheat strains. *Acta Aliment.*, 17 (1988) 291-297; *C.A.*, 111 (1989) 20361g.
- 2302 Thomas, R., de Man, J.M. and de Man, L.: Soymilk and tofu properties as influenced by soybean storage conditions. *J. Am. Oil Chem. Soc.*, 66 (1989) 777-782.
- 2303 Ventling, B.L. and Hurley, W.L.: Soy proteins in milk replacers identified by immunoblotting. *J. Food Sci.*, 54 (1989) 766-767; *C.A.*, 111 (1989) 55954e.
- 2304 Vuye, A., Baert, E., Kersten, K., Declerck, D., Vanhaecke, E. and Pijck, J.: Investigation of the ability of newer  $\beta$ -lactam antibiotics to select resistant mutants from *Serratia marcescens* after mutagenesis with nitrosoquanidin. *Arzneim.-Forsch.*, 39 (1989) 424-427.
- 2305 Wynn, R.M., Omaha, J. and Malkin, R.: Structural and functional properties of the cyanobacterial Photosystem I complex. *Biochemistry*, 28 (1989) 5554-5560.

See also 2263.

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

- 2306 Coppola, G., Underwood, J., Cartwright, G. and Hearn, M.T.W.: High-performance liquid chromatography of amino acids, peptides and proteins. XCIII. Comparison of methods for the purification of mouse monoclonal immunoglobulin M autoantibodies. *J. Chromatogr.*, 476 (1989) 269-290.
- 2307 Fay, W.P. and Owen, W.G.: Platelet plasminogen activator inhibitor: purification and characterization of interaction with plasminogen activators and activated protein C. *Biochemistry*, 28 (1989) 5773-5778.
- 2308 Frenz, G., Doxiadis, I., Voegeler, U. and Grosse-Wilde, H.: HLA class I biochemistry: definition and frequency determination of subtypes by one-dimensional isoelectric focusing and immunoblotting. *Vox Sang.*, 56 (1989) 190-195; *C.A.*, 111 (1989) 5473b.
- 2309 Juan-Pereira, L. and Fuentes-Arderiu, X.: Intra-individual variation of the electrophoretic serum. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1544.
- 2310 Jungbauer, A., Tauer, C., Reiter, M., Purtscher, M., Wenisch, E., Steindl, F., Buchacher, A. and Katinger, H.: Comparison of protein A, protein G and copolymerized hydroxyapatite for the purification of human monoclonal antibodies. *J. Chromatogr.*, 476 (1989) 257-268.
- 2311 Levinson, S.S. and Keren, D.F.: Immunoglobulins from the sera of immunologically activated persons with pairs of electrophoretic restricted bands show a greater tendency to aggregate than normal. *Clin. Chim. Acta*, 182 (1989) 21-30.
- 2312 Lindmark, B., Lilja, H., Alm, R. and Eriksson, S.: The microheterogeneity of desialylated  $\alpha_1$ -antichymotrypsin: the occurrence of two amino-terminal isoforms, one lacking a His-Pro dipeptide. *Biochim. Biophys. Acta*, 997 (1989) 90-95.
- 2313 Niewiarowski, S., Norton, K.J., Eckardt, A., Lukasiewicz, H., Holt, J.C. and Kornecki, E.: Structural and functional characterization of major platelet membrane components derived by limited proteolysis of glycoprotein IIIa. *Biochim. Biophys. Acta*, 983 (1989) 91-99.
- 2314 Nishi, S., Koyama, Y., Sakamoto, T., Soda, M. and Kairiyama, C.B.: Expression of rat  $\alpha$ -fetoprotein cDNA in *Escherichia coli* and in yeast. *J. Biochem. (Tokyo)*, 104 (1988) 968-972.



- 2315 Ohsawa, M. and Kimura, H.: Formation of vitamin D-binding protein-actin and binary and ternary plasma gelsolin-actin complexes in human serum. *Biochim. Biophys. Acta*, 992 (1989) 195-200.
- 2316 Roch, P., Canicatti, C. and Valembois, P.: Interactions between earthworm hemolysins and sheep red blood cell membranes. *Biochim. Biophys. Acta*, 983 (1989) 193-198.
- 2317 Ruttyn, Y., Brandin, M.P. and Vijayalakshmi, M.A.: Chromatography of human plasma on aminohexyl Sepharose: separation of factor VIII/vWf and behaviour of factors II, VII, IX and X and antithrombin III. *J. Chromatogr.*, 491 (1989) 299-308.
- 2318 Saraiva, M.J.M., Alves, I.L. and Costa, P.P.: Simplified method for screening populations at risk for transthyretin Met<sup>30</sup>-associated familial amyloidotic polyneuropathy. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1033-1035.
- 2319 Schubert, D., Cole, G., Saitoh, T. and Oltersdorf, T.: Amyloid beta protein precursor is a mitogen. *Biochem. Biophys. Res. Commun.*, 162 (1989) 83-88.
- 2320 Sinclair, D., Galloway, E., McKenzie, S., Follett, E.A.C. and Wallace, L.: Oligoclonal immunoglobulins in HIV infection. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1669-1671.
- 2321 Tamamizu, S., Miyake, Y., Ito, T. and Sinozara, H.: Changes in trypsin-binding properties and conformation of rabbit  $\alpha$ -2-macroglobulin on reaction with methylamine. *J. Biochem. (Tokyo)*, 105 (1989) 898-904.
- 2322 Ueno, E., Sakai, H., Kato, Y. and Yamamoto, K.: Activation mechanism of erythrocyte cathepsin E. Evidence for the occurrence of the membrane-associated active enzyme. *J. Biochem. (Tokyo)*, 105 (1989) 878-882.
- 2323 Vallette, G., Vranckx, R., Martin, M.-E., Benassayag, C. and Nunez, E.A.: Conformational changes in rodent and human  $\alpha$ -fetoprotein: influence of fatty acids. *Biochim. Biophys. Acta*, 997 (1989) 302-312.
- 2324 Werner, P.K., Lieberman, D.M. and Reithmeier, R.A.F.: Accessibility of the N-ethylmaleimide-unreactive sulfhydryl of human erythrocyte Band 3. *Biochim. Biophys. Acta*, 982 (1989) 309-315.
- 2325 Williams, E.B., Krishnaswamy, S. and Mann, K.G.: Zymogen/enzyme discrimination using peptide chloromethyl ketones. *J. Biol. Chem.*, 264 (1989) 7536-7545.

See also 2243, 2244.

#### 19f. Structural and muscle proteins

- 2326 Abe, H. and Ohinata, T.: An actin-depolymerizing protein in embryonic chicken skeletal muscle: purification and characterization. *J. Biochem. (Tokyo)*, 106 (1989) 172-180.
- 2327 Boissonneault, G., Gagnon, J., Ho-Kim, M.A., Rogers, P.A. and Tremblay, R.R.: Depressed translational activity in the androgen sensitive levator ani muscle of the rat. *J. Steroid Biochem.*, 32 (1989) 507-513.
- 2328 Chmelik, J., Deml, M. and Janca, J.: Separation of two components of horse myoglobin by isoelectric focussing field-flow fractionation. *Anal. Chem.*, 61 (1989) 912-914.
- 2329 Dublet, B., Oh, S., Sugrue, S.P., Gordon, M.K., Gerecke, D.R., Olsen, B.R. and van der Rest, M.: The structure of avian type XII collagen.  $\alpha$ 1(XII) chains contain 190-kDa non-triple helical amino-terminal domains and form homotrimeric molecules. *J. Biol. Chem.*, 264 (1989) 13150-13156.
- 2330 Fritz, J.D., Swartz, D.R. and Greaser, M.L.: Factors affecting polyacrylamide gel electrophoresis and electroblotting of high-molecular-weight myofibrillar proteins. *Anal. Biochem.*, 180 (1989) 205-210.
- 2331 Fujii, T., Ozawa, J., Ogoma, Y. and Kondo, Y.: Interaction between chicken gizzard cladesmon and tropomyosin. *J. Biochem. (Tokyo)*, 104 (1988) 734-737.
- 2332 Hirano-Ohnishi, J. and Watanabe, Y.: Ca<sup>2+</sup>/Calmodulin-dependent phosphorylation of ciliary  $\beta$ -tubulin in *Tetrahymena*. *J. Biochem. (Tokyo)*, 105 (1989) 858-860.
- 2333 Hori, S., Sugiura, H., Shimizu, T., Hirabayashi, T., Ohtani, S., Yoshida, M., Miyamoto, K. and Tanabe, H.: Detection of dystrophin on two-dimensional gel electrophoresis. *Biochem. Biophys. Res. Commun.*, 161 (1989) 726-731.
- 2334 Hosoya, M., Miyazaki, J.-I. and Hirabayashi, T.: Tropomyosin isoforms in developing chicken gizzard smooth muscle. *J. Biochem. (Tokyo)*, 105 (1989) 712-717.

- 2335 Hu, Di Hua, Kimura, S. and Maturiyama, K.: Myosin oligomers as the molecular mass standard in the estimation of molecular mass of nebulin ( $\approx$  800 kDa) by sodium dodecyl sulfate-polyacrylamide gel electrophoresis. *Biomed. Res.*, 10 (1989) 165-168; *C.A.*, 111 (1989) 20367p.
- 2336 Khristov, S.I.: (Use of isoelectric focusing method in hair protein investigation). *Suc.-Med. Ekspert.*, 32 (1989) 37-38; *C.A.*, 111 (1989) 51827t.
- 2337 Knudson, C.M. and Campbell, K.P.: Albumin is a major protein component of transverse tubule vesicles isolated from skeletal muscle. *J. Biol. Chem.*, 264 (1989) 10795-10798.
- 2338 Koffer, A. and Edgar, A.: Enhanced number of actin binding sites on plasma membranes of polyoma virus-transformed fibroblasts. *Biochim. Biophys. Acta*, 982 (1989) 295-299.
- 2339 Kuwayama, H., Suzuki, M., Koga, R. and Ebashi, S.: Preparation of protein components exhibiting myosin light chain kinase activities from bovine aorta: discrepancies between its enzyme activity and actomyosin activating effect. *J. Biochem. (Tokyo)*, 104 (1989) 862-866.
- 2340 Morimoto, S., Fujiwara, T. and Ohtsuki, I.: Restoration of  $Ca^{2+}$ -activated tension of CDFA-treated single skeletal muscle fibers by troponin C. *J. Biochem. (Tokyo)*, 104 (1988) 873-874.
- 2341 Morimoto, S. and Ohtsuki, I.: Effect of substitution of troponin C in cardiac myofibrils with skeletal troponin C or calmodulin on the  $Ca^{2+}$ - and  $Sr^{2+}$ -sensitive ATPase activity. *J. Biochem. (Tokyo)*, 104 (1988) 149-154.
- 2342 Nagai, R., Kuro-o, M., Babij, P. and Periasamy, M.: Identification of two types of smooth muscle myosin heavy chain isoforms by cDNA cloning and immunoblot analysis. *J. Biol. Chem.*, 264 (1989) 9734-9737.
- 2343 Ohashi, K. and Maruyama, K.: Refined purification and characterization of Z-protein. *J. Biochem. (Tokyo)*, 106 (1989) 110-114.
- 2344 Ohashi, K., Ishikawa, K. and Maruyama, K.: I-Protein forms cage-like aggregates of myosin *in vitro*. *J. Biochem. (Tokyo)*, 106 (1989) 104-109.
- 2345 Ohshima, S., Abe, H. and Obinata, T.: Isolation of profilin from embryonic chicken skeletal muscle and evaluation of its interaction with different actin isoforms. *J. Biochem. (Tokyo)*, 105 (1989) 855-857.
- 2346 O'Keefe, E.J., Erickson, H.P. and Bennett, V.: Desmoplakin I and desmoplakin II. Purification and characterization. *J. Biol. Chem.*, 264 (1989) 8310-8318.
- 2347 Priyatkin, T.N., Zaremskaya, O.R. and Goilo, T.A.: (Identification of myosin-like proteins within the composition of chromatin). *Biokhimiya (Moscow)*, 54 (1989) 933-939.
- 2348 Rajasekharan, K.N., Mayadevi, M. and Burke, M.: Studies of ligand-induced conformational perturbations in myosin subfragment 1. An examination of the environment about the SH2 and SH1 thiols using a photoprobe. *J. Biol. Chem.*, 264 (1989) 10810-10819.
- 2349 Sacks, D.B., Glenn, K.C. and McDonald, J.M.: The carboxyl terminal segment of the c-Ki-ras 2 gene product mediates insulin-stimulated phosphorylation of calmodulin and stimulates insulin-independent autophosphorylation of the insulin receptor. *Biochem. Biophys. Res. Commun.*, 161 (1989) 399-405.
- 2350 Simmerman, H.K.B., Lovelace, D.E. and Jones, L.R.: Secondary structure of detergent-solubilized phospholamban, a phosphorylatable, oligomeric protein of cardiac sarcoplasmic reticulum. *Biochim. Biophys. Acta*, 997 (1989) 322-329.
- 2351 Takahashi, K. and Kattori, A.:  $\alpha$ -Actinin is a component of the Z-filament, a structural backbone of skeletal muscle Z-disks. *J. Biochem. (Tokyo)*, 105 (1989) 529-536.
- 2352 Takashima, T., Matsumura, S., Kariya, T., Sunaga, T. and Kumon, A.: Studies on the physical states of human platelet myosin in crude extracts. *J. Biochem. (Tokyo)*, 104 (1988) 1027-1035.

See also 2386.

19g. Protamines, histones and other chromosomal proteins

- 2353 Baxter, G.D., Smith, P.J. and Lavin, M.F.: Molecular changes associated with induction of cell death in a human T-cell leukaemia line: putative nucleases identified as histones. *Biochem. Biophys. Res. Commun.*, 162 (1989) 30-37.
- 2354 Fujiwara, S., Inoko, Y. and Ueki, T.: Synchrotron X-ray scattering study of chromatin condensation induced by monovalent salt: analysis of the small-angle scattering data. *J. Biochem. (Tokyo)*, 106 (1989) 119-125.

- 2355 Hazama, M., Shimokawa, H., Shimamoto, N., Oguro, K., Mochizuki, N. and Utiyama, H.: Separation of total nuclear proteins by an improved two-dimensional polyacrylamide gel electrophoresis. The method and applications to the study of induced differentiation of HL-60 cells. *Bull. Inst. Chem. Res., Kyoto Univ.*, 66 (1988) 221-231; *C.A.*, 111 (1989) 36138a.
- 2356 Shanahan, M.M. and Kmiec, E.B.: Assembly of transcriptionally inactive chromatin *in vitro*. *J. Biochem. (Tokyo)*, 106 (1989) 29-33.
- 2357 Shawver, L.K., Behrens, C.B. and Deuel, T.F.: Characterization of pp64, a nuclear phosphoprotein induced by platelet-derived growth factor. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1118-1125.
- 2358 Srebrena, L., Iosifidu, M., Chimshirova, K. and Zlatanova, J.: Occurrence of histone H1<sup>0</sup>-related fraction in differentiated maize roots. *Biochim. Biophys. Acta*, 1008 (1989) 346-350.
- 2359 Suzuki, M.: Method of detecting cysteine-containing protein and its application to histone-like proteins. *Proc. Jpn. Acad., Ser. B*, 65 (1989) 45-48; *C.A.*, 111 (1989) 36123s.
- 2360 Vilardell, J., Dolorescoll, M., Querol, E. and Egozcue, J.: Histone electrophoretic pattern in the characterization of synaptonemal complexes. *Cell. Mol. Biol.*, 35 (1989) 207-217; *C.A.*, 111 (1989) 20369r.
- 2361 Williams, K.J., Landgraf, B.E., Whiting, N.L. and Zurlo, J.: Correlation between the induction of heat shock protein 70 and enhanced viral reactivation in mammalian cells treated with ultraviolet light and heat shock. *Cancer Res.*, 49 (1989) 2735-2742.

19h. *Chromoproteins and metalloproteins*

- 2362 Ambler, R.P. and Tobari, J.: Two distinct azurins function in the electron-transport chain of the obligate methylotroph *Methylomonas s.* *Biochem. J.*, 261 (1989) 495-499.
- 2363 Beaumont, C., Dugast, I., Renaudie, F., Souroujon, M. and Gradchamp, B.: Transcriptional regulation of ferritin H and L subunits in adult erythroid and liver cells from the mouse. Unambiguous identification of mouse ferritin subunits and *in vitro* formation of the ferritin shells. *J. Biol. Chem.*, 264 (1989) 7498-7504.
- 2364 Constantinidis, I., Kandler, R.L. and Satterlee, J.D.: Purity of *Glycera di-branchiata* monomer hemoglobin components III and IV determined by isoelectric focusing. *Comp. Biochem. Physiol., B: Compl. Biochem.*, 92B (1989) 619-622; *C.A.*, 111 (1989) 3615a.
- 2365 Kurokawa, T., Fukumori, Y. and Yamanaka, T.: *Nitrobacter* Winogradski cytochrome b-559: a nonhaem iron-containing cytochrome related to bacterioferritin. *Biochim. Biophys. Acta*, 976 (1989) 135-139.
- 2366 Sugimoto, M., Oikawa, T., Esaki, N., Tanaka, H. and Soda, K.: Chemical synthesis and expression of copper metallothionein gene of *Neurospora crassa*. *J. Biochem. (Tokyo)*, 104 (1988) 924-926.
- 2367 Yan, G., Zhu, D. and Yuan, T.: (Hb E and Hb A<sub>2</sub> determination by discontinuous polyacrylamide gel electrophoresis). *Shengwu Huaaxue Yu Shengwu Wuli Jinzhan*, 16 (1989) 64-66; *C.A.*, 111 (1989) 53626a.

See also 2239, 2389.

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

- 2368 Bezwoda, W.R. and Mansoor, N.: Lactoferrin from human breast milk and from neutrophil granulocytes. Comparative studies of isolation, quantitation, characterization and iron binding properties. *Biomed. Chromatogr.*, 3 (1989) 121-126.
- 2369 Chatterjee, T. and Majumder, G.C.: Identification of membrane antigens of goat epididymal spermatozoa. *Biochem. Biophys. Res. Commun.*, 162 (1989) 550-556.
- 2370 Gerdes, H.-H., Rosa, P., Phillips, E., Baeuerle, P.A., Frank, R., Argos, P. and Huttner, W.B.: The primary structure of human secretogranin II, a widespread tyrosine-sulfated secretory granule protein that exhibits low pH- and calcium-induced aggregation. *J. Biol. Chem.*, 264 (1989) 12009-12015.
- 2371 Grasser, K.D., Maier, U.-G. and Feix, G.: A nuclear casein type II kinase from maize endosperm phosphorylating HMG proteins. *Biochem. Biophys. Res. Commun.*, 162 (1989) 456-463.

- 2372 Hidalgo, F.J. and Kinsella, J.E.: Changes induced in  $\beta$ -lactoglobulin B following interactions with linoleic acid 13-hydroperoxide. *J. Agric. Food Chem.*, 37 (1989) 860-866.
- 2373 Khamidov, D.Kh., Yukelson, L.Ya., Salikhov, R.S. and Khafizova, M.G.: (Isolation and characterization of the nerve growth factor from the venom of the middle Asian snake *Echis multisquamatus*). *Biokhimiya (Moscow)*, 54 (1989) 987-991.
- 2374 Kim, I.C.: Isolation and identification of trophoblast lymphocyte cross-reactive (TLX) antigens from human lymphocytes. *J. Biol. Chem.*, 264 (1989) 9780-9784.
- 2375 Kim, J. and Kim, H.: Interaction of  $\alpha$ -lactalbumin with phospholipid vesicles as studied by photoactivated hydrophobic labeling. *Biochim. Biophys. Acta*, 983 (1989) 1-8.
- 2376 Maekawa, S., Toriyama, M., Hisanaga, S., Yonezawa, N., Endo, S., Hirokawa, N. and Sakai, H.: Purification and characterization of a  $\text{Ca}^{2+}$ -dependent actin filament severing protein from bovine adrenal medulla. *J. Biol. Chem.*, 264 (1989) 7458-7465.
- 2377 Morris, M.F., Waheed, A., Risley, J.M. and van Etten, R.L.: Carbohydrate removal fails to eliminate the heterogeneity of human prostatic acid phosphatase. *Clin. Chim. Acta*, 182 (1989) 9-20.
- 2378 Takeda, A., Kanoh, M., Shimazu, T. and Takeuchi, N.: Monoclonal antibodies recognizing different epitopes of the 27-kDa gap junction protein from rat liver. *J. Biochem. (Tokyo)*, 104 (1988) 901-907.
- 2379 Waite, J.H. and Rice-Ficht, A.C.: A histidine-rich protein from the vitellaria of the liver fluke *Fasciola hepatica*. *Biochemistry*, 28 (1989) 6104-6110.

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

- 2380 Beretta, L., Houdouin, F. and Sobel, A.: Identification of two distinct isoforms of stathmin and characterization of their respective phosphorylated forms. *J. Biol. Chem.*, 264 (1989) 9932-9938.
- 2381 Bizzozero, O.A., Odykirk, T.S., McGarry, J.F. and Lees, M.B.: Separation of the major proteins of central and peripheral nervous system myelin using reversed-phase high-performance liquid chromatography. *Anal. Biochem.*, 180 (1989) 59-65.
- 2382 Boulias, C. and Moscarello, M.A.: Guanine nucleotides stimulate hydrolysis of phosphatidyl inositol bis phosphate in human myelin membranes. *Biochem. Biophys. Res. Commun.*, 162 (1989) 282-287.
- 2383 Bozou, J.-C., de Nadai, F., Vincent, J.-P. and Kitabgi, P.: Neurotensin, bradykinin and somatostatin inhibit cAMP production in neuroblastoma N1E115 cells *via* both pertussis toxin sensitive and insensitive mechanisms. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1144-1150.
- 2384 DeWald, D.B. and Pearson, J.D.: Isolation and sequence analysis of proteins from mouse forebrain using two-dimensional gel electrophoresis coupled to high-pressure liquid extrusion. *Anal. Biochem.*, 180 (1989) 340-348.
- 2385 Dizhoor, A.M., Nekrasova, E.R. and Philippov, P.P.: The binding of G proteins to immobilized delipidated rhodopsin. *Biochem. Biophys. Res. Commun.*, 162 (1989) 544-549.
- 2386 Matsumura, S., Ohmori, K., Chiba, T. and Kumon, A.: Physical, enzymatic, and contractile properties of brain myosin with anti-brain myosin Fab- fragment bound on its tail. *J. Biochem. (Tokyo)*, 105 (1989) 803-812.
- 2387 Nakamura, A., Arai, T., Kondo, Y. and Fujii, T.: Inhibitory effects of poly(L-aspartic acid) on the assembly of brain microtubules and the interaction of microtubule-associated protein 2 with F-actin *in vitro*. *J. Biochem. (Tokyo)*, 106 (1989) 93-97.

See also 2593.

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

- 2388 Chan, P.K.: Cross-linkage of nucleophosmin in tumor cells by nitrogen mustard. *Cancer Res.*, 49 (1989) 3271-3275.
- 2389 Freedman, J.H. and Peisach, J.: Resistance of cultured hepatoma cells to copper toxicity. Purification and characterization of the hepatoma metallothionein. *Biochim. Biophys. Acta*, 992 (1989) 145-154.

- 2390 Sacchi, A., Falcioni, R., Piaggio, G., Gianfelice, M.A., Perrotti, N. and Kennel, S.J.: Ligand-induced phosphorylation of a murine tumor surface protein (TSP-180) associated with metastatic phenotype. *Cancer Res.*, 49 (1989) 2615-2620.

191. *Specific binding and receptor proteins*

- 2391 Alexandrides, T.K. and Smith, R.J.: A novel fetal insulin-like growth factor (IGF) I receptor. Mechanism for increased IGF I- and insulin-stimulated tyrosine kinase activity in fetal muscle. *J. Biol. Chem.*, 264 (1989) 12922-12930.
- 2392 Ando, Y., Imamura, S., Hong, Y., Owada, M.K., Kakunaga, T. and Kannagi, R.: Enhancement of calcium sensitivity of lipocortin I in phospholipid binding induced by limited proteolysis and phosphorylation at the amino terminus as analyzed by phospholipid affinity column chromatography. *J. Biol. Chem.*, 264 (1989) 6948-6955.
- 2393 Barrington, W.W., Jacobson, K.A. and Stiles, G.L.: Demonstration of distinct agonist and antagonist conformations of the A<sub>1</sub> adenosine receptor. *J. Biol. Chem.*, 264 (1989) 13157-13164.
- 2394 Bishayee, S., Majumdar, S., Khire, J. and Das, M.: Ligand-induced dimerization of the platelet-derived growth factor receptor. Monomer-dimer interconversion occurs independent of receptor phosphorylation. *J. Biol. Chem.*, 264 (1989) 11699-11705.
- 2395 Chatterjee, D., Lahiri, P., Chatterjee, A. and Chakraborty, M.: Bay K8644 like activity of an antibody against a 60 kDa tubular membrane protein. *Biochim. Biophys. Acta*, 984 (1989) 104-108.
- 2396 Ernst, J.D., Hoyer, E. and Blackwood, R.A.: Use of a novel strategy for the preparation and characterization of an antipeptide antibody capable of recognizing members of the annexin family. *Biochem. Biophys. Res. Commun.*, 161 (1989) 959-964.
- 2397 Foucher, J.-L. and Le Gac, F.: Evidence for an androgen binding protein in the testis of a teleost fish (*Salmo gairdneri* R.): a potential masker of Sertoli cell function. *J. Steroid Biochem.*, 32 (1989) 545-552.
- 2398 Gherzi, R., Sesti, G., Andraghetti, G., de Pirro, R., Lauro, R., Adezati, L. and Cordera, R.: An extracellular domain of the insulin receptor  $\beta$ -subunit with regulatory function on protein-tyrosine kinase. *J. Biol. Chem.*, 264 (1989) 8627-8635.
- 2399 Hampson, D.R., Wheaton, K.D., Dechesne, C.J. and Wenthold, R.J.: Identification and characterization of the ligand binding subunit of a kainic acid receptor using monoclonal antibodies and peptide mapping. *J. Biol. Chem.*, 264 (1989) 13329-13335.
- 2400 Heldin, C.-H., Ernlund, A., Rorsman, C. and Rönstrand, L.: Dimerization of B-type platelet-derived growth factor receptors occurs after ligand binding and is closely associated with receptor kinase activation. *J. Biol. Chem.*, 264 (1989) 8905-8912.
- 2401 Hinsch, K.-D., Tychowiecka, I., Gausepohl, H., Frank, R., Rosenthal, W. and Schultz, G.: Tissue distribution of  $\beta_1$  and  $\beta_2$ -subunits of regulatory guanine nucleotide-binding proteins. *Biochim. Biophys. Acta*, 1013 (1989) 60-67.
- 2402 Hurd, C., Nakao, M. and Moudgil, V.K.: Phosphorylation of calf uterine progesterone receptor by cAMP-dependent protein kinase. *Biochem. Biophys. Res. Commun.*, 162 (1989) 160-167.
- 2403 Jarvie, K.R. and Niznik, H.B.: Deglycosylation and proteolysis of photolabeled D<sub>2</sub> dopamine receptors of the porcine anterior pituitary. *J. Biochem. (Tokyo)*, 106 (1989) 17-22.
- 2404 Jarvie, K.R., Niznik, H.B., Bzowej, N.H. and Seeman, P.: Dopamine D<sub>2</sub> receptors retain agonist high-affinity form and guanine nucleotide sensitivity after removal of sialic acid. *J. Biochem. (Tokyo)*, 104 (1988) 791-794.
- 2405 Kitayama, S., Matsumura, O. and Masuda, S.: Isolation of a DNA-binding protein from *Deinococcus radiodurans* having an affinity for a Z-form polynucleotide. *J. Biochem. (Tokyo)*, 104 (1988) 127-130.
- 2406 Kluff, C., Jie, A.F.H., Los, P., de Wit, E. and Havekes, L.: Functional analogy between lipoprotein(a) and plasminogen in the binding to the kringle 4 binding protein, tetranectin. *Biochem. Biophys. Res. Commun.*, 161 (1989) 427-433.
- 2407 Lelong, J.-C., Prevost, G., Lee, K. and Crepin, M.: *In vitro* characterization of tissue-specific nuclear proteins preferentially bound to the mouse  $\beta$ -globin gene during MEL cell terminal differentiation. *Biochemistry*, 28 (1989) 4594-4600.

- 2408 Lipson, K.E., Kolhatkar, A.A. and Donner, D.B.: Insulin stimulates proteolysis of the  $\alpha$ -subunit, but not the  $\beta$ -subunit, of its receptor at the cell surface in rat liver. *Biochem. J.*, 261 (1989) 333-340.
- 2409 Liu, B., Meloche, S., McNicoll, N., Lord, C. and De Lean, A.: Topographical characterization of the domain structure of the bovine adrenal atrial natriuretic factor R<sub>1</sub> receptor. *Biochemistry*, 28 (1989) 5599-5605.
- 2410 Lu, Y. and Loiu, J.: (Methodological comments on the detection of membrane glycoporphins in human erythrocytes by immunoblotting techniques). *Shengwu Huaxue Yu Shengwu Wuli Jinzhan*, 16 (1989) 55-59; *C.A.*, 111 (1989) 53714c.
- 2411 Martin, E.R., Marsden, P.A., Brenner, B.M. and Ballermann, B.J.: Identification and characterization of endothelin binding sites in rat renal papillary and glomerular membranes. *Biochem. Biophys. Res. Commun.*, 162 (1989) 130-137.
- 2412 Masson, M., Fluharty, A.L. and Baumann, N.: Isoelectric focusing in immobilized pH gradients: a new approach for the study of the SAP-1 binding to lipids. *NATO ASI Ser., Ser. A*, 150 (Lipid Storage Disord.) (1988) 333-336; *C.A.*, 111 (1989) 53017c.
- 2413 McCaffery, P.J., Fraser, J.K., Lin, F. and Berridge, M.V.: Subunit structure of the erythropoietin receptor. *J. Biol. Chem.*, 264 (1989) 10507-10512.
- 2414 McCarthy, M.P. and Stroud, R.M.: Changes in conformation upon agonist binding, and nonequivalent labeling, of the membrane-spanning regions of the nicotinic acetylcholine receptor subunits. *J. Biol. Chem.*, 264 (1989) 10911-10916.
- 2415 Moxham, C.P., Duronio, V. and Jacobs, S.: Insulin-like growth factor I receptor  $\beta$ -subunit heterogeneity. Evidence for hybrid tetramers composed of insulin-like growth factor I and insulin receptor heterodimers. *J. Biol. Chem.*, 264 (1989) 13238-13244.
- 2416 Perlman, R., Bottaro, D.P., White, M.F. and Kahn, C.R.: Conformational changes in the  $\alpha$ - and  $\beta$ -subunits of the insulin receptor identified by anti-peptide antibodies. *J. Biol. Chem.*, 264 (1989) 8946-8950.
- 2417 Sawyer, S.T.: The two proteins of the erythropoietin receptor are structurally similar. *J. Biol. Chem.*, 264 (1989) 13343-13347.
- 2418 Silva, C.M. and Cidlowski, J.A.: Direct evidence for intra- and intermolecular disulfide bond formation in the human glucocorticoid receptor. Inhibition of DNA binding and identification of a new receptor-associated protein. *J. Biol. Chem.*, 264 (1989) 6638-6647.
- 2419 Smith, M.M., Merlie, J.P. and Lawrence, J.C., Jr.:  $\text{Ca}^{2+}$ -Dependent and cAMP-dependent control of nicotinic acetylcholine receptor phosphorylation in muscle cells. *J. Biol. Chem.*, 264 (1989) 12813-12819.
- 2420 Sutoh, K. and Yin, H.L.: End-label fingerprintings show that the N- and C-termini of actin are in the contact site with gelsolin. *Biochemistry*, 28 (1989) 5269-5275.
- 2421 Symington, B.E., Symington, F.W. and Rohrschneider, L.R.: Phorbol ester induces increased expression, altered glycosylation, and reduced adhesion of K562 erythroleukemia cell fibronectin receptor. *J. Biol. Chem.*, 264 (1989) 13258-13266.
- 2422 Watanabe, H., Miyazaki, H., Kondoh, M., Masuda, Y., Kimura, S., Yanagisawa, M., Masaki, T. and Murakami, K.: Two distinct types of endothelin receptors are present on chick cardiac membranes. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1252-1259.
- 2423 Zupan, A.A., Osborne, P.A., Smith, C.E., Siegel, N.R., Leimgruber, R.M. and Johnson, E.M., Jr.: Identification, purification, and characterization of truncated forms of the human nerve growth factor receptor. *J. Biol. Chem.*, 264 (1989) 11714-11720.

See also 2315.

#### 19m. Urinary proteins

- 2424 Filomena, C.A.: Oligoclonal banding detected by urinary protein electrophoresis and immunofixation in two patients with the acquired immuno deficiency syndrome and proteinuria. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1795-1798.
- 2425 Hamilton, R.W., Hopkins, M.B. and Shihabi, Z.K.: Myoglobinuria, hemoglobinuria, and acute renal failure. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1713-1720.
- 2426 Lonsdorfer, A., Comoe, L., Yap, A.E. and Lonsdorfer, J.: Proteinuria in sickle cell trait and disease: an electrophoretic analysis. *Clin. Chim. Acta*, 181 (1989) 239-248.

- 2427 Pascali, E. and Pezzoli, A.: Bence Jones proteins in the urine of patients with multiple sclerosis. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1550-1551.

19n. Other proteins

- 2428 Edelhaeuser, M. and Bergner, K.G.: (The proteins of honey. Part 9. Honey sucrase: isoelectric focusing and origin). *Z. Lebensm.-Unters. Forsch.*, 188 (1989) 237-242; *C.A.*, 111 (1989) 38219b.
- 2429 Ishidate, S. and Mabuchi, I.: A novel actin filament-capping protein from sea urchin eggs: a 20,000-molecular-weight protein-actin complex. *J. Biochem. (Tokyo)*, 104 (1988) 72-80.
- 2430 Iwasaki, M., Saito, H., Yamamoto, M., Korach, K.S., Hirogome, T. and Sugano, H.: Purification and heat shock protein 90 from calf uterus and rat liver and characterization of the highly hydrophobic region. *Biochim. Biophys. Acta*, 992 (1989) 1-8.
- 2431 Kobayashi, R. and Tashima, Y.: Identification and partial separation of three distinct 32-kDa calcium/phospholipid-regulated proteins from bovine spleen. *Biochem. Biophys. Res. Commun.*, 162 (1989) 15-23.
- 2432 Majumdar, A.P.N., Moshier, J.A., Arlow, F.L. and Luk, G.D.: Biochemical changes in the gastric mucosa after injury in young and aged rats. *Biochim. Biophys. Acta*, 992 (1989) 35-40.
- 2433 Pasqualini, J.R., Sterner, R., Mercat, P. and Allfrey, V.G.: Estradiol enhanced acetylation of nuclear high mobility group proteins of the uterus of newborn Guinea pigs. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1260-1266.

20. ENZYMES AND ENZYME ACTIVITY ESTIMATION

20a. Oxidoreductases

- 2434 Coremans, J.M.C.C., van der Zwaan, J.W. and Albracht, S.P.J.: Redox behaviour of nickel in hydrogenase from *Methanobacterium thermoautotrophicum* (strain Marburg). Correlation between the nickel valence state and enzyme activity. *Biochim. Biophys. Acta*, 997 (1989) 256-267.
- 2435 Dobransky, T., Sová, O. and Teleha, M.: Application of autofocusing in the isolation of peroxidase. *J. Chromatogr.*, 474 (1989) 430-434.
- 2436 Ewart, G.D. and Smith, G.D.: Immunochemical analysis of the soluble hydrogenase from the cyanobacterium *Anabaena cylindrica*. *Biochim. Biophys. Acta*, 997 (1989) 83-89.
- 2437 Hara, T. and Kimura, T.: Purification and catalytic properties of a cross-linked complex between adrenodoxin reductase and adrenodoxin. *J. Biochem. (Tokyo)*, 105 (1989) 594-600.
- 2438 Hara, T. and Kimura, T.: Active complex between adrenodoxin reductase and adrenodoxin in the cytochrome P-450<sub>SCC</sub> reduction reaction. *J. Biochem. (Tokyo)*, 105 (1989) 601-605.
- 2439 Hoglen, J. and Hollocher, T.C.: Purification and some characteristics of nitric oxide reductase-containing vesicles from *Paracoccus denitrificans*. *J. Biol. Chem.*, 264 (1989) 7556-7563.
- 2440 Huang, T., Trakshel, G.M. and Maines, M.D.: Detection of 10 variants of biliverdin reductase in rat liver by two-dimensional gel electrophoresis. *J. Biol. Chem.*, 264 (1989) 7844-7849.
- 2441 Hur, S., Toda, H. and Yamada, M.: Isolation and characterization of an unprocessed extracellular myeloperoxidase in HL-60 cell cultures. *J. Biol. Chem.*, 264 (1989) 8542-8548.
- 2442 Kvasnicka, F., Skriivan, P. and Janiczikova, T.: (Determination of lipoygenase activity by capillary isotachopheresis). *Sb. UVTIZ, Potravin. Vedy*, 7 (1989) 7-14; *C.A.*, 111 (1989) 35455q.
- 2443 Matsushita, K., Shinagawa, E., Adachi, O. and Ameyama, M.: Reactivity with ubiquinone of quinoprotein D-glucose dehydrogenase from *Glucanobacter suboxydans*. *J. Biochem. (Tokyo)*, 105 (1989) 633-637.
- 2444 Mizugaki, M., Nakazawa, M., Yamamoto, H. and Yamanaka, H.: Purification and characterization of N-ethylmaleimide reducing enzyme from *Candida lipolytica*. *J. Biochem. (Tokyo)*, 105 (1989) 782-784.

- 2445 Podlasek, S.J., Dufour, D.R. and McPherson, R.A.: Alterations in lactate dehydrogenase isoenzyme patterns after therapy with streptokinase or streptococcal infection. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1763-1766.
- 2446 Thompson, J.: N<sup>5</sup>-(L-1-Carboxyethyl)-1-ornithine:NADP<sup>+</sup> oxidoreductase from *Streptococcus lactis*. Purification and partial characterization. *J. Biol. Chem.*, 264 (1989) 9592-9601.
- 2447 Watanabe, K., Aihara, H., Nakagawa, Y., Nakamura, R. and Sasaki, T.: Properties of the purified extracellular cholesterol oxidase from *Rhodococcus equi* No. 23. *J. Agric. Food Chem.*, 37 (1989) 1178-1182.
- 2448 Xu, X., Kanayan, S., Koyama, N., Sekiguchi, T., Nosah, Y., Ohashi, S. and Tsuda, K.: Tryptic digestion of NADB dehydrogenase from alkalophilic *Bacillus*. *J. Biochem. (Tokyo)*, 105 (1989) 626-632.

See also 2501.

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

- 2449 Grahame, D.A.: Different isozymes of methylcobalamin:2-mercaptoethanesulfonate methyltransferase predominate in methanol - versus acetate-grown *Methanosarcina barkeri*. *J. Biol. Chem.*, 264 (1989) 12890-12894.
- 2450 Inoue, K., Kuramitsu, S., Aki, K., Watanabe, Y., Takagi, T., Nishigai, M., Ikai, A. and Kagamiyama, H.: Branched-chain amino acid aminotransferase of *Escherichia coli*: Overproduction and properties. *J. Biochem. (Tokyo)*, 104 (1988) 777-784.
- 2451 Lebenka, A.J. and Rackus, J.A.: (DNA methylase Sau 3A: isolation and properties). *Biokhimiya (Moscow)*, 54 (1989) 1009-1014.
- 2452 Lobet, Y., Lhoest, J. and Colson, C.: Partial purification and characterization of the specific protein-lysine N-methyltransferase of YL32, a yeast ribosomal protein. *Biochim. Biophys. Acta*, 997 (1989) 224-231.
- 2453 Ridgway, N.D. and Vance, D.E.: *In vitro* phosphorylation of phosphatidylethanolamine N-methyltransferase by cAMP-dependent protein kinase: lack of *in vivo* phosphorylation in response to N<sup>6</sup>-2'-O-dibutyryladenine 3',5'-cyclic monophosphate. *Biochim. Biophys. Acta*, 1004 (1989) 261-270.
- 2454 Sullivan, R., Ross, P. and Berube, B.: Immunodetectable galactosyltransferase is associated only with human spermatozoa of high buoyant density. *Biochem. Biophys. Res. Commun.*, 162 (1989) 184-188.

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

- 2455 Caputo, C.B., Sygowski, L.A., Brunner, W.F., Scott, C.W. and Salama, A.I.: Properties of several protein kinases that copurify with rat spinal cord neurofilaments. *Biochim. Biophys. Acta*, 1012 (1989) 299-307.
- 2456 Casagli, M.C., Borri, M.G., Bigio, M., Rossi, R., Nucci, D., Bossu, P., Boraschi, D. and Antoni, G.: Different conformation of purified human recombinant interleukin 1 $\beta$  from *Escherichia coli* and *Saccharomyces cerevisiae* is related to different level of biological activity. *Biochem. Biophys. Res. Commun.*, 162 (1989) 357-363.
- 2457 Chuang, L.F., Zhao, F.-K. and Chuang, R.Y.: Isolation and purification of protein kinase C from human leukemia ML-1 cells: phosphorylation of human leukemia RNA polymerase II *in vitro*. *Biochim. Biophys. Acta*, 992 (1989) 87-95.
- 2458 Fournier, A., Hardy, S.J., Clark, K.J. and Murray, A.W.: Phorbol ester induces differential membrane-association of protein kinase C subspecies in human platelets. *Biochem. Biophys. Res. Commun.*, 161 (1989) 556-561.
- 2459 Friedrich, T.D. and Ingram, V.M.: Identification of a novel casein kinase activity in HeLa cell nuclei. *Biochim. Biophys. Acta*, 992 (1989) 41-48.
- 2460 Geng, J.-G., Cheng, H.-Z., Yang, Y.-F., Quian, Z.-H. and Jiang, C.-Y.: Isolation of creatine kinase BB isoenzyme with high specific activity and adequate purity for radioimmunoassay from human placenta on preparative polyacrylamide gel electrophoresis. *Clin. Chim. Acta*, 181 (1989) 1-10.
- 2461 Hooper, W.C., Abraham, R.T., Ashendel, C.L. and Woloschak, G.E.: Differential responsiveness to phorbol esters correlates with differential expression of protein kinase C in KG-1 and KG-1a human myeloid leukemia cells. *Biochim. Biophys. Acta*, 1013 (1989) 47-54.



- 2462 Ikebe, M., Maruta, S. and Reardon, S.: Location of the inhibitory region of smooth muscle myosin light chain kinase. *J. Biol. Chem.*, 264 (1989) 6967-6971.
- 2463 Kariya, K.-i., Kawahara, Y., Fukuzaki, H., Hagiwara, M., Hidaka, H., Fukumoti, Y. and Takai, Y.: Two types of protein kinase C with different functions in cultured rabbit aortic smooth muscle cells. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1020-1027.
- 2464 Kitamura, K., Uyeda, K., Kangawa, K. and Matsuo, H.: Purification and characterization of rat skeletal muscle fructose-6-phosphate, 2-kinase: fructose-2,6-bisphosphatase. *J. Biol. Chem.*, 264 (1989) 9799-9806.
- 2465 Kwiatkowski, A.P. and King, M.M.: Autophosphorylation of the type II calmodulin-dependent protein kinase is essential for formation of a proteolytic fragment with catalytic activity. Implications for long-term synaptic potentiation. *Biochemistry*, 28 (1989) 5380-5385.
- 2466 Lawen, A., Burger, M. and Martini, O.H.W.: Mitogen-responsive S6 kinase. *Eur. J. Biochem.*, 183 (1989) 245-253.
- 2467 Rao, K.V.S. and Sehgal, V.N.: The use of isoelectric focusing in ultra-thin polyacrylamide gels for typing human red cell phosphoglucomutase. *Indian J. Forensic Sci.*, 3 (1989) 17-21; *C.A.*, 111 (1989) 21494q.
- 2468 Shur, S.A., Zemskova, M.A., Vulfson, P.L. and Skolyseva, L.K.: (The role of phosphorylase kinase subunits in the enzyme interaction with glycogen). *Biokhimiya (Moscow)*, 54 (1989) 1026-1033.
- 2469 Sonka, J., Kübler, D. and Kinzel, V.: Phosphorylation by cell surface protein kinase of bovine and human fibrinogen and fibrin. *Biochim. Biophys. Acta*, 997 (1989) 268-277.
- 2470 Takazawa, K., Passareiro, H., Dumont, J.E. and Erneux, C.: Purification of bovine brain inositol 1,4,5-triphosphate 3-kinase. Identification of the enzyme by sodium dodecyl sulphate/polyacrylamide-gel electrophoresis. *Biochem. J.*, 261 (1989) 483-488.
- 2471 Woodgett, J.R.: Use of peptide substrates for affinity purification of protein-serine kinases. *Anal. Biochem.*, 180 (1989) 237-241.

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

- 2472 Brookes, A.J. and Solomon, E.: Evaluation of the use of S1 nuclease to detect small length variations in genomic DNA. *Eur. J. Biochem.*, 183 (1989) 291-296.
- 2473 Bush, J.M. and Cardelli, J.A.: Processing, transport, and secretion of the lysosomal enzyme acid phosphatase in *Dictyostelium discoideum*. *J. Biol. Chem.*, 264 (1989) 7630-7636.
- 2474 Cohen, S.G., Salih, E., Solomon, M., Howard, S., Chishti, S.B. and Cohen, J.B.: Reactions of 1-bromo-2-[<sup>14</sup>C]pinacolone with acetylcholinesterase from *Torpedo nobiliana*. Effects of 5-trimethylammonio-2-pentanone and diisopropyl fluorophosphate. *Biochim. Biophys. Acta*, 997 (1989) 167-175.
- 2475 Goldfine, C., Knight, G.J., Haddow, J.E. and Palomaki, G.E.: Amniotic fluid acetylcholinesterase measurements: comparing immunochemical and polyacrylamide gel techniques. *Prenatal. Diagn.*, 9 (1989) 167-172; *C.A.*, 111 (1989) 3026j.
- 2476 Kawano, J.-i., Kotani, T., Ohtaki, S., Minamino, N., Matsuo, H., Oinuma, T. and Aikawa, E.: Characterization of rat and human steroid sulfatases. *Biochim. Biophys. Acta*, 997 (1989) 199-205.
- 2477 Murakami, M., Kobayashi, T., Umeda, M., Kudo, I. and Inoue, K.: Monoclonal antibodies against rat platelet phospholipase A<sub>2</sub>. *J. Biochem. (Tokyo)*, 104 (1988) 884-888.
- 2478 Zhao, Y., Zhou, Z. and Yang, G.: (The application of qualitative analysis of amniotic acetylcholinesterase in the diagnosis of open neural tube defects). *Shengshi Yu Biyun*, 8 (1988) 28-32; *C.A.*, 111 (1989) 55168b.

See also 2464.

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

- 2479 Kinoshita, K., Taniguchi, N., Makita, A., Narita, M. and Oikawa, K.: Purification and characterization of  $\beta$ -N-acetylhexosaminidase I from human placenta. *J. Biochem. (Tokyo)*, 104 (1988) 827-831.
- 2480 Kumagai, I. and Miura, K.-i.: Enhanced bacteriolytic activity of hen egg-white lysozyme due to conversion of Trp62 to other aromatic amino acid residues. *J. Biochem. (Tokyo)*, 105 (1989) 946-948.

- 2481 Mifflin, T.E., Forsman, R.W. and Bruns, D.E.: Interaction of immobilized anti-salivary amylase antibody with human macroamylases: implications for use in a pancreatic amylase assay to distinguish macroamylasemia from acute pancreatitis. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1651-1654.
- 2482 Rodriguez-Berrocal, F.J., Paez de la Cadena, M., Cabezas, J.A. and Perez-Gonzalez, N.: Purification and characterization of acid  $\beta$ -D-galactosidase from rabbit spleen. *J. Biochem. (Tokyo)*, 104 (1988) 66-71.

See also 2435.

20f. Other hydrolases

- 2483 Adachi, H., Kubota, I., Okamura, N., Iwata, H., Tsujimoto, M., Nakazato, H., Nishihara, T. and Noguchi, T.: Purification and characterization of human microsomal dipeptidase. *J. Biochem. (Tokyo)*, 105 (1989) 957-961.
- 2484 Bamezai, S., Tate, S. and Breslow, E.: Inhibition of ubiquitin-dependent proteolysis by des-Gly-Gly-ubiquitin: implications for the mechanism of poly-ubiquitin synthesis. *Biochem. Biophys. Res. Commun.*, 162 (1989) 89-94.
- 2485 Cong, J., Goll, D.E., Peterson, A.M. and Kapprell, H.-P.: The role of autolysis in activity of the  $\text{Ca}^{2+}$ -dependent proteinases ( $\mu$ -calpain and  $m$ -calpain). *J. Biol. Chem.*, 264 (1989) 10096-10103.
- 2486 Dumora, C., Lacoste, A.-M. and Cassaigne, A.: Phosphonoacetaldehyde hydrolase from *Pseudomonas aeruginosa*: purification properties and comparison with *Bacillus cereus* enzyme. *Biochim. Biophys. Acta*, 997 (1989) 193-198.
- 2487 Falkenburg, P.-E. and Kloetzel, P.-M.: Identification and characterization of three different subpopulations of the *Drosophila* multicatalytic proteinase (proteasome). *J. Biol. Chem.*, 264 (1989) 6660-6666.
- 2488 Hojima, Y., McKenzie, J., van der Rest, M. and Prockop, D.J.: Type I procollagen N-proteinase from chick embryo tendons. Purification of a new 500-kDa form of the enzyme and identification of the catalytically active polypeptides. *J. Biol. Chem.*, 264 (1989) 11336-11345.
- 2489 Jacobs, G.R., Pike, R.N. and Dennison, C.: Isolation of cathepsin D using three-phase partitioning in t-butanol/water/ammonium sulfate. *Anal. Biochem.*, 180 (1989) 169-171.
- 2490 Jonnalagadda, S., Butt, T.R., Monia, B.P., Mirabelli, C.K., Gotlib, L., Ecker, D.J. and Crooke, S.T.: Multiple ( $\alpha$ -NH-ubiquitin)protein endoproteases in cells. *J. Biol. Chem.*, 264 (1989) 10637-10642.
- 2491 Kondo, T., Miyamoto, K., Gasa, S., Taniguchi, N. and Kawakami, Y.: Purification and characterization of glutathione disulfide-stimulated  $\text{Mg}^{2+}$ -ATPase from human erythrocytes. *Biochem. Biophys. Res. Commun.*, 162 (1989) 1-8.
- 2492 Mazzarello, P., Poloni, M., Patrini, C., Bosone, D. and Rindi, G.: A lead conversion method for staining thiamine pyrophosphatase and other phosphatases in rat brain after thin layer polyacrylamide gel isoelectric focusing. *Basic Appl. Histochem.*, 32 (1988) 495-500; *C.A.*, 111 (1989) 19793t.
- 2493 Moriyama, A., Nakanishi, M. and Sasaki, M.: Porcine muscle prolyl endopeptidase and its endogenous substrates. *J. Biochem. (Tokyo)*, 104 (1988) 112-117.
- 2494 Pace-Asciak, C.R. and Lee, W.: Purification of hepoxilin epoxide hydrolase from rat liver. *J. Biol. Chem.*, 264 (1989) 9310-9313.
- 2495 Sakata, K., Maeda, T. and Nakagawa, H.: Activation by cathepsin G of latent gelatinase secreted from rat polymorphonuclear leukocytes. *Chem. Pharm. Bull.*, 37 (1989) 1321-1323.
- 2496 Schweikl, H., Keoin, U., Schindlbeck, M. and Wieszorek, H.: A vacuolar-type ATPase, partially purified from potassium transporting plasma membranes of tobacco hornworm midgut. *J. Biol. Chem.*, 264 (1989) 11136-11142.
- 2497 Sharma, M. and Singh, U.S.: Molecular and catalytic properties of angiotensin converting enzyme-I from bovine seminal plasma. *J. Biochem. (Tokyo)*, 104 (1988) 57-61.
- 2498 Sullivan, J. and Johnson, A.R.: Detection and analysis of neutral endopeptidase from tissues with substrate gel electrophoresis. *Biochem. Biophys. Res. Commun.*, 162 (1989) 300-307.
- 2499 Urayama, O., Shutt, H. and Sweadner, K.J.: Identification of three isozyme proteins of the catalytic subunit of the Na,K-ATPase in rat brain. *J. Biol. Chem.*, 264 (1989) 8271-8280.

- 2500 Welte, W., Leonhard, M., Diederichs, K., Weltzien, H.-U., Restall, C., Hall, C. and Chapman, D.: Stabilization of detergent-solubilized  $\text{Ca}^{2+}$ -ATPase by poly(ethylene glycol). *Biochim. Biophys. Acta*, 984 (1989) 193-199.

See also 2292.

20g. *Lyases*

- 2501 Beeckmans, S., van Driessche, E. and Kanarek, L.: The visualization by affinity electrophoresis of a specific association between the consecutive citric acid cycle enzymes fumarase and malate dehydrogenase. *Eur. J. Biochem.*, 183 (1989) 449-454.
- 2502 Miyamoto, K.-i., Oka, T., Fujii, T., Yamaji, M., Minami, H., Nakabou, Y. and Hagihira, H.: Purification and some properties of rat intestinal ornithine decarboxylase. *J. Biochem. (Tokyo)*, 106 (1989) 167-171.

20i. *Ligases*

- 2503 Kimura, K., Suzuki, H. and Nakano, Y.: Physical and chemical characterization of glutamine synthetase purified from *Mycobacterium phlei*. *J. Biochem. (Tokyo)*, 105 (1989) 648-652.

20j. *Complex mixtures and incompletely identified enzymes*

- 2504 Dixon, B.R. and Arai, H.P.: Differentiation of three species of *Hymenolepis (Cestodea)* using enzyme isoelectric focusing on thin-layer agarose gels. *Can. J. Zool.*, 67 (1989) 51-54; *C.A.*, 111 (1989) 21140w.
- 2505 Ogawa, T., Kimoto, M. and Sasaoka, K.: Purification and properties of a new enzyme,  $\text{N}^G, \text{N}^G$ -dimethylarginine dimethylaminohydrolase, from rat kidney. *J. Biol. Chem.*, 264 (1989) 10205-10209.
- 2506 Shirahata, A., Takeshima, T. and Samejima, K.: Monospecific antiserum to rat spermidine synthase and its application to rat tissues and several mammals. *J. Biochem. (Tokyo)*, 104 (1988) 717-721.

21. PURINES, PYRIMIDINES, NUCLEIC ACIDS AND THEIR CONSTITUENTS

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

See 2472.

21b. *Nucleic acids, RNA*

- 2507 Aburatani, H., Matsumoto, A., Ishikawa, T., Takaku, F. and Itakura, H.: Single base substitution between human intestinal and hepatic apolipoprotein B mRNA detected by ribonuclease cleavage analysis. *J. Biochem. (Tokyo)*, 105 (1989) 911-915.
- 2508 Costanzo, F., Bevilacqua, M.A., Giordano, M. and Cimino, F.: Expression of genes of ferritin subunits in human hepatoma cell lines. *Biochem. Biophys. Res. Commun.*, 161 (1989) 902-909.
- 2509 Coutlee, F., Bobo, L., Mayur, K., Yolken, R.H. and Viscidi, R.P.: Immunodetection of DNA with biotinylated RNA probes: a study of reactivity of a monoclonal antibody to DNA-RNA hybrids. *Anal. Biochem.*, 181 (1989) 96-105.
- 2510 Gomez-Marquez, J., Segade, F., Dosil, M., Pichel, J.G., Bustelo, X.R. and Freire, M.: The expression of prothymosin  $\alpha$  gene in T lymphocytes and leukemic lymphoid cells is tied to lymphocyte proliferation. *J. Biol. Chem.*, 264 (1989) 8451-8454.
- 2511 Hatada, E., Hasegawa, M., Mukaigawa, J., Shimizu, K. and Fukuda, R.: Control of influenza virus gene expression: quantitative analysis of each viral RNA species in infected cells. *J. Biochem. (Tokyo)*, 105 (1989) 537-546.
- 2512 Hirai, H., Lee, D.I., Natori, S. and Sekimizu, K.: Uridylation of U6 RNA in a nuclear extract of Ehrlich ascites tumor cells. *J. Biochem. (Tokyo)*, 104 (1988) 991-994.

- 2513 Horiuchi, K., Tajima, S., Menju, M. and Yamamoto, A.: Structure and expression of mouse apolipoprotein E gene. *J. Biochem. (Tokyo)*, 106 (1989) 98-103.
- 2514 Itoh, M., Shibata, Y. and Ohshima, Y.: Independent removal of two identical or different introns from mRNA precursors *in vitro*. *J. Biochem. (Tokyo)*, 105 (1989) 1014-1023.
- 2515 Katsurada, A., Iritani, N., Fukuda, H., Matsumura, Y., Noguchi, T. and Tanaka, T.: Effects of insulin and fructose on transcriptional and post-transcriptional regulation of malic enzyme synthesis in diabetic rat liver. *Biochim. Biophys. Acta*, 1004 (1989) 103-107.
- 2516 Lee, C.S.L., Koga, M. and Sutherland, R.L.: Modulation of estrogen receptor and epidermal growth factor receptor mRNAs by phorbol ester in MCF 7 breast cancer cells. *Biochem. Biophys. Res. Commun.*, 162 (1989) 415-421.
- 2517 Lopez-Casillas, F. and Kim, K.: Heterogeneity at the 5' end of rat acetylco-enzyme A carboxylase mRNA. Lipogenic conditions enhance synthesis of a unique mRNA in liver. *J. Biol. Chem.*, 264 (1989) 7176-7184.
- 2518 Miyajima, H., Oda, T. and Ichiyama, A.: Induction of mitochondrial serine:pyruvate aminotransferase of rat liver by glucagon and insulin through different mechanisms. *J. Biochem. (Tokyo)*, 105 (1989) 500-504.
- 2519 Novikova, N.A., Antsupova, A.S., Epifanova, N.V., Alrova, E.E. and Troitskaya, M.V.: (Electrophoretic analysis of human rotavirus genomic RNA). *Mol. Genet. Mikrobiol. Virusol.*, (1989) 45-49; *C.A.*, 111 (1989) 36368a.
- 2520 Resnekov, O., Kessler, M. and Aloni, Y.: RNA secondary structure is an integral part of the *in vitro* mechanism of attenuation in simian virus 40. *J. Biol. Chem.*, 264 (1989) 9953-9959.
- 2521 Tajima, S., Yamamura, T. and Yamamoto, A.: Analysis of apolipoprotein E5 gene from a patient with hyperlipoproteinemia. *J. Biochem. (Tokyo)*, 104 (1988) 48-52.
- 2522 Yoshikawa, K., Aizawa, T. and Nozawa, A.: Phorbol ester regulates the abundance of enkephalin precursor mRNA but not of amyloid  $\beta$ -protein precursor mRNA in rat testicular peritubular cells. *Biochem. Biophys. Res. Commun.*, 161 (1989) 568-575.
- 2523 Yoshizumi, M., Kurihara, H., Sugiyama, T., Takaku, F., Yanagisawa, M., Masaki, T. and Yazaki, Y.: Hemodynamic shear stress stimulates endothelin production by cultured endothelial cells. *Biochem. Biophys. Res. Commun.*, 161 (1989) 859-864.

See also 2199, 2203, 2222, 2254, 2538, 2545, 2549.

#### 21c. Nucleic acids, DNA

- 2524 Ahokas, H.: Transfection of fermenting barley seed electrophoretically with exogenous DNA. *Theor. Appl. Genet.*, 77 (1989) 469-472; *C.A.*, 111 (1989) 18793f.
- 2525 Apostolopoulos, J.J., la Scala, M.J., Shen, P. and Howlett, G.J.: The effect of triiodothyronine on the association of the rat apolipoprotein A-I, C-III and A-IV genes with the nuclear matrix. *Biochem. Biophys. Res. Commun.*, 161 (1989) 576-582.
- 2526 Barat-Gueride, M., Dufresne, C. and Rickwood, D.: Effect of DNA conformation on the transcription of mitochondrial DNA. *Eur. J. Biochem.*, 183 (1989) 297-302.
- 2527 Bickmore, W.A., Maule, J.C., van Heyningen, V. and Porteous, D.J.: Long-range structure of H-ras1-selected transgenomes. *Somatic Cell Mol. Genet.*, 15 (1989) 229-235; *C.A.*, 111 (1989) 34547j.
- 2528 Dawkins, H.J.S.: Large DNA separation using field alternation agar gel electrophoresis. *J. Chromatogr.*, 492 (1989) 615-639 - a review with 45 refs.
- 2529 Deutsch, J.M.: Explanation of anomalous mobility and birefringence measurements found in pulsed field electrophoresis. *J. Chem. Phys.*, 90 (1989) 7436-7441; *C.A.*, 111 (1989) 53623x.
- 2530 Devi, K.R.G., Chan, Y.-L. and Wool, I.G.: The primary structure of rat ribosomal protein L21. *Biochem. Biophys. Res. Commun.*, 162 (1989) 364-370.
- 2531 Ferris, S., Sparrow, L. and Stevens, A.: Megabase DNA electrophoresis - recent advances. *Aust. J. Biotechnol.*, 3 (1989) 33-35; *C.A.*, 111 (1989) 20225r.
- 2532 Ganai, M.W. and Tanksley, S.D.: Analysis of tomato DNA by pulsed field gel electrophoresis. *Plant Mol. Biol. Rep.*, 7 (1989) 17-28; *C.A.*, 111 (1989) 20360f.

- 2533 Hashimoto, T., Morohashi, K.-i. and Omura, T.: Cloning and characterization of bovine cytochrome P-450(11 $\beta$ ) genes. *J. Biochem. (Tokyo)*, 105 (1989) 676-679.
- 2534 Highsmith, W.E., Jr., Perry, T.R., Prior, T.W. and Silverman, L.M.: Use of the polymerase chain reaction for simultaneous analysis of two Pst I polymorphisms linked to cystic fibrosis. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1260-1261.
- 2535 Holzwarth, G., Platt, K.J., MaKee, C.B., Whitcomb, R.W. and Crater, G.D.: The acceleration of linear DNA during pulsed-field gel electrophoresis. *Biopolymers*, 28 (1989) 1043-1058; *C.A.*, 111 (1989) 53619a.
- 2536 Huang, L., Silberman, J., Rothschild, H. and Cohen, J.C.: Replication of baboon endogenous virus in human cells. Kinetics of DNA synthesis and integration. *J. Biol. Chem.*, 264 (1989) 8811-8814.
- 2537 Johns, M.B., Jr. and Paulus-Thomas, J.E.: Purification of human genomic DNA from whole blood using sodium perchlorate in place of phenol. *Anal. Biochem.*, 180 (1989) 276-278.
- 2538 Karlinsey, J., Stamatoyannopoulos, G. and Enver, T.: Simultaneous purification of DNA and RNA from small numbers of eukaryotic cells. *Anal. Biochem.*, 180 (1989) 303-306.
- 2539 Khan, W.N. and Hammarström, S.: Carcinoembryonic antigen gene family: molecular cloning of cDNA for a PS8G/FL-NCA glycoprotein with a novel domain arrangement. *Biochem. Biophys. Res. Commun.*, 161 (1989) 525-535.
- 2540 Lasker, B.A., Carle, G.F., Kobayashi, G.S. and Medoff, G.: Comparison of the separation of *Candida albicans* chromosome-sized DNA by pulsed-field gel electrophoresis techniques. *Nucleic Acids Res.*, 17 (1989) 3783-3793; *C.A.*, 111 (1989) 36137z.
- 2541 Lazo, P.A., DiPaolo, J.A. and Popescu, N.: Amplification of the integrated viral transforming genes of human papillomavirus 18 and its 5'-flanking cellular sequence located near the myc protooncogene in HeLa cells. *Cancer Res.*, 49 (1989) 4305-4310.
- 2542 Le Bourgeois, P., Mata, M. and Ritzenthaler, P.: Genome comparison of *Lactococcus* strains by pulsed-field gel electrophoresis. *FEMS Microbiol. Lett.*, 59 (1989) 65-69; *C.A.*, 111 (1989) 36481g.
- 2543 Liu, Y.-C. and Bambara, R.A.: Gene expression of PCNA/cyclin in adult tissues and the R3230AC mammary tumor of rat. *Biochem. Biophys. Res. Commun.*, 161 (1989) 873-882.
- 2544 McCormick, R.M.: A solid-phase extraction procedure for DNA purification. *Anal. Biochem.*, 181 (1989) 66-74.
- 2545 Mitsuru, S. and Masashi, O.: Means for electrophoresis, particularly of DNA and RNA. *Eur. Pat. Appl. EP 280,567 (Cl. G01N27/26)*, 31 Aug. 1988, JP Appl. 87/43,702, 26 Feb. 1987, 15 pp.; *C.A.*, 111 (1989) 36270n.
- 2546 Ngerpratsiritsiri, J., Chollet, R., Kobayashi, H., Sugiyama, T. and Akazawa, T.: DNA methylation and the differential expression of C<sub>4</sub> photosynthesis genes in mesophyll and bundle sheath cells of greening maize leaves. *J. Biol. Chem.*, 264 (1989) 8241-8248.
- 2547 Noolandi, J.: Suggestions for separation of chromosomal DNA by electrophoresis. *Makromol. Chem., Rapid Commun.*, 10 (1989) 207-210; *C.A.*, 111 (1989) 36136y.
- 2548 Ohki, M. and Smith, C.L.: Tracking bacterial DNA replication forks *in vivo* by pulsed field gel electrophoresis. *Nucleic Acids Res.*, 17 (1989) 3479-3490; *C.A.*, 111 (1989) 18791d.
- 2549 Oka, K., Yuan, J.G., Senda, M., Masibay, A.S., Oasba, P.K., Masuno, H., Scow, R.O., Paterniti, J.R., Jr. and Brown, W.V.: Expression of lipoprotein lipase gene in combined lipase deficiency. *Biochim. Biophys. Acta*, 1008 (1989) 351-354.
- 2550 Orita, M., Iwahana, H., Kanazawa, H., Hayashi, K. and Sekiya, T.: Detection of polymorphisms of human DNA by gel electrophoresis as single-strand conformation polymorphisms. *Proc. Natl. Acad. Sci. U.S.A.*, 86 (1989) 2766-2770; *C.A.*, 111 (1989) 20363j.
- 2551 Poddar, S.K. and Maniloff, J.: Determination of microbial genome sizes by two-dimensional denaturing gradient gel electrophoresis. *Nucleic Acids Res.*, 17 (1989) 2889-2895; *C.A.*, 111 (1989) 51665p.
- 2552 Pollman, M.J. and Zuccarelli, A.J.: Rapid isolation of high-molecular-weight DNA from agarose gels. *Anal. Biochem.*, 181 (1989) 12-17.
- 2553 Prior, T.W., Friedman, K.J. and Silverman, L.M.: Detection of Duchenne:Becker muscular dystrophy carriers by densitometric scanning. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1256-1257.

- 2554 Randall, T., Rao, T.R. and Reddy, C.A.: Use of a shuttle vector for the transformation of the white rot basidiomycete, *Phanerochaete chrysosporium*. *Biochem. Biophys. Res. Commun.*, 161 (1989) 720-725.
- 2555 Saluz, H. and Jost, J.P.: A simple high-resolution procedure to study DNA methylation and *in vivo* DNA-protein interactions on a single-copy gene level in higher eukaryotes. *Proc. Natl. Acad. Sci. U.S.A.*, 86 (1989) 2602-2606; *C.A.*, 111 (1989) 36122r.
- 2556 Schwartz, D.C. and Koval, M.: Conformational dynamics of individual DNA molecules during gel electrophoresis. *Nature*, 338 (1989) 520-522; *C.A.*, 111 (1989) 20362h.
- 2557 Serghini, M.A., Ritzenthaler, C. and Pinck, L.: A rapid and efficient "miniprep" for isolation of plasmid DNA. *Nucleic Acids Res.*, 17 (1989) 3604; *C.A.*, 111 (1989) 36210t.
- 2558 Silverman, A.L., Park, J.-G., Hamilton, S.R., Gazdar, A.F., Luk, G.D. and Baylin, S.B.: Abnormal methylation of the calcitonin gene in human colonic neoplasms. *Cancer Res.*, 49 (1989) 3468-3473.
- 2559 Smith, D.R., Fulton, T.R., Swain, P., Bowcock, A., Daneshvar, L., Traver, C., Gruenert, D.C., Davis, R., Cavalli-Sforza, L.L. and Donis-Keller, H.: Cystic fibrosis: diagnostic testing and the search for the gene. *Clin. Chem. (Winston-Salem)*, 35 (1989) B17-B20.
- 2560 Spector, S.A., Hsia, K., Denaro, F. and Spector, D.H.: Use of molecular probes to detect human cytomegalovirus and human immunodeficiency virus. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1581-1587.
- 2561 Stamato, T.D. and Denko, N.: Separation of large DNA molecules in alternating asymmetric electric fields. *U.S. Pat.* US 4,830,726 (Cl. 204-299R; G01N27/26), 16 May 1989, Appl. 151,651, 3 Feb. 1988, 9 pp.; *C.A.*, 111 (1989) 53769z.
- 2562 Steele, P.E., Carle, G.F., Kobayashi, G.S. and Medoff, G.: Electrophoretic analysis of *Histoplasma capsulatum* chromosomal DNA. *Moll. Cell Biol.*, 9 (1989) 983-987; *C.A.*, 110 (1989) 167275v.
- 2563 Strasberg, P.: Evaluation of the biotinylated (Blugene™) vs <sup>32</sup>p-labeled cDNA probes of β-glucocerebrosidase: relative sensitivities in genomic and other systems. *Clin. Chem. (Winston-Salem)*, 35 (1989) 1512-1516.
- 2564 Toyoda, H., Himeno, S.-i. and Imura, N.: The regulation of glutathione peroxidase gene expression relevant to species difference and the effects of dietary selenium manipulation. *Biochim. Biophys. Acta*, 1008 (1989) 301-308.
- 2565 Upcroft, J.A., Boreham, P.F.L. and Upcroft, P.: Different grades of agarose affect electrophoretic migration of large DNA molecules. *Nucleic Acids Res.*, 17 (1989) 3315; *C.A.*, 111 (1989) 3623b.
- 2566 Van Daelen, R.A.J., Jonkers, J.J. and Zabel, P.: Preparation of megabase-sized tomato DNA and separation of large restriction fragments by field inversion gel electrophoresis. *Plant Mol. Biol.*, 12 (1989) 341-352; *C.A.*, 111 (1989) 2146m.
- 2567 Weingart, S., Sommer, U., Gerhold, H. and Seifart, K.H.: Transcription of the α<sup>A</sup>-globin gene of the duck. Development of a homologous *in vitro* system and identification of *trans*-acting factors. *Eur. J. Biochem.*, 183 (1989) 145-153.

See also 2521.

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

- 2568 Baudin, F., Mougel, M., Romby, P., Eyermann, F., Ebel, J.-P., Ehresmann, B. and Ehresmann, Ch.: Probing the phosphates of the *Escherichia coli* ribosomal 16S RNA in its naked form, in the 30S subunit, and in the 70S ribosome. *Biochemistry*, 28 (1989) 5847-5855.
- 2569 Lee, D.I., Hirai, H., Natori, S. and Sekimizu, K.: Restricted degradation of U6 RNA in a nuclear extract of Ehrlich ascites tumor cells. *J. Biochem. (Tokyo)*, 105 (1989) 526-528.
- 2570 Masuta, C., Kuwata, S. and Takanami, Y.: Effects of extra 5' non-viral bases on the infectivity of transcripts from a cDNA clone of satellite RNA (Strain Y) of cucumber mosaic virus. *J. Biochem. (Tokyo)*, 104 (1988) 841-846.

See also 2173, 2576.

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

- 2571 Anand, R., Villasante, A. and Tyler-Smith, C.: Construction of yeast artificial chromosome libraries with large inserts using fractionation by pulsed-field gel electrophoresis. *Nucleic Acids Res.*, 17 (1989) 3425-3433; *C.A.*, 111 (1989) 18790c.
- 2572 Attree, O., Vidaud, D., Vidaud, M., Amselem, S., Lavergne, J.M. and Goossens, M.: Mutations in the catalytic domain of human coagulation factor IX/ rapid characterization by direct genomic sequencing of DNA fragments displaying an altered melting behavior. *Genomics*, 4 (1989) 266-272; *C.A.*, 111 (1989) 34649u.
- 2573 Chen, Y., Fu, J., Fan, Q. and Liu, B.: (A new two-dimensional analysis of DNA fragments: temperature gradient gel electrophoresis). *Ziran Zazhi*, 12 (1989) 155-157; *C.A.*, 111 (1989) 3622a.
- 2574 Corral, M., Baffet, G., Kitzis, A., Paris, B., Tichonicky, L., Kruh, J., Guguen-Guillouzo, C. and Defer, N.: DNA sequences homologous to mitochondrial genes in nuclei -rom normal rat tissues and from rat hepatoma cells. *Biochem. Biophys. Res. Commun.*, 162 (1989) 258-264.
- 2575 Halmekytö, M., Hirvonen, A., Wahlfors, J., Alhonen, L. and Jänne, J.: Methylation of human ornithine decarboxylase gene before transfection abolishes its transient expression in Chinese hamster ovary cells. *Biochem. Biophys. Res. Commun.*, 162 (1989) 528-534.
- 2576 Horii, A., Tomita, N., Yokouchi, H., Doi, S., Uda, K., Ogawa, M., Mori, T. and Matsubara, K.: On the cDNA's for two types of rat pancreatic secretory trypsin inhibitor. *Biochem. Biophys. Res. Commun.*, 162 (1989) 151-159.
- 2577 Inoue, H., Fukui, K. and Miyake, Y.: Identification and structure of the rat true tissue kallikrein gene expressed in the kidney. *J. Biochem. (Tokyo)*, 105 (1989) 834-840.
- 2578 Kioka, N., Tsubota, J., Kakehi, Y., Komano, T., Gottesman, M.M., Pastan, I. and Ueda, K.: P-Glycoprotein gene (MDR1) cDNA from human adrenal: normal P-glycoprotein carries Gly<sup>185</sup> with an altered pattern of multidrug resistance. *Biochem. Biophys. Res. Commun.*, 162 (1989) 224-231.
- 2579 Kitani, T. and Ogawa, M.: (Electrophoresis gel media for DNA base sequence determination). *Jpn Kokai Tokkyo Koho Pat.* JP 63,262,551 (88,262,551) (Cl. G01N27/26), 28 Oct. 1988, Appl. 87/96,807, 20 Apr. 1987, 13 pp.; *C.A.*, 111 (1989) 53766w.
- 2580 Kizaki, H., Shimada, H. and Ishimura, Y.: 12-O-Tetradecanoylphorbol 13-acetate induces DNA cleavage at linker regions in mouse thymocytes. *J. Biochem. (Tokyo)*, 105 (1989) 673-675.
- 2581 Lundwall, A.: Characterization of the gene for prostate-specific antigen, a human glandular kallikrein. *Biochem. Biophys. Res. Commun.*, 161 (1989) 1151-1159.
- 2582 Nelson, R.M. and Long, G.L.: A general method of site-specific mutagenesis using a modification of the *Thermus aquaticus* polymerase chain reaction. *Anal. Biochem.*, 180 (1989) 147-151.
- 2583 Richterich, P., Heller, C., Wurst, H. and Pohl, F.M.: DNA sequencing with direct blotting electrophoresis and colorimetric detection. *BioTechniques*, 7 (1989) 52-59; *C.A.*, 111 (1989) 18767a.
- 2584 Ross, R.S., Hoeg, J.M., Higuchi, K., Schumacher, U.K., Fojo, S., Gregg, R.E. and Brewer, H.B., Jr.: Homozygous hypobetalipoproteinemia: transcriptional regulation and 5'-flanking sequence analysis in an apolipoprotein B deficiency state. *Biochim. Biophys. Acta*, 1004 (1989) 29-35.
- 2585 Serwer, P. and Hayes, S.J.: Atypical sieving of open circular DNA during pulsed field agarose gel electrophoresis. *Biochemistry*, 28 (1989) 5827-5832.
- 2586 Villeponteau, B.: Characterization of a topoisomerase-like activity at specific hypersensitive sites in the *Drosophila* histone gene cluster. *Biochem. Biophys. Res. Commun.*, 162 (1989) 232-237.
- 2587 Watanabe, F., Fukui, K., Momoi, K. and Miyake, Y.: Site-specific mutagenesis of lysine-204, tyrosine-224, tyrosine-228, and histidine-307 of porcine kidney D-amino acid oxidase and the implications as to its catalytic function. *J. Biochem. (Tokyo)*, 105 (1989) 1024-1029.
- 2588 Wilson, N.M. and Omiecinski, C.J.: Xenobiotic microsomal epoxide hydrolase: 5' sequence of the human gene. *Biochim. Biophys. Acta*, 1008 (1989) 357-358.

See also 2173, 2507.

*21f. Complex mixtures of nucleic acids and their fragments*

- 2589 Matsumoto, K., Nagata, K., Hanaoka, F. and Ui, M.: Tissue-specific DNA binding of nuclear proteins that bind to the adenovirus inverted terminal repeat. *J. Biochem. (Tokyo)*, 105 (1989) 927-932.

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

- 2590 Hansen, M. and Nexø, E.: Isoelectric focusing of apo- and holo-transcobalamin present in human blood. Identification of a protein complexing with transcobalamin. *Biochim. Biophys. Acta*, 992 (1989) 209-214.

## 28. ANTIBIOTICS

- 2591 Hoyt, A.M., Jr. and Sepaniak, M.J.: Determination of benzylpenicillin in pharmaceutical formulations by capillary zone electrophoresis. *Anal. Lett.*, 22 (1989) 861-873.
- 2592 Nishi, H., Tsumagari, N., Kakimoto, T. and Terabe, S.: Separation of  $\beta$ -lactam antibiotics by micellar electrokinetic chromatography. *J. Chromatogr.*, 477 (1989) 259-270.

## 30. SYNTHETIC AND NATURAL DYES

*30b. Chloroplast and other natural pigments*

- 2593 Miercke, L.J.W., Ross, P.E., Stroud, R.M. and Dratz, E.A.: Purification of bacteriorhodopsin and characterization of mature and partially processed forms. *J. Biol. Chem.*, 264 (1989) 7531-7535.

## 32. DRUG ANALYSIS

*32d. Central nervous system drugs*

- 2594 Stransky, Z., Chmela, Z. and Safarik, L.: (Determination of trimecaine in biological materials by isotachopheresis). *Czech. Pat.* CS 249,371 (Cl. G01N27/26), 15 Jan. 1988, Appl. 85/223, 11 Jan. 1985, 2 pp.; *C.A.*, 111 (1989) 729e.

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## 33. CLINICO-CHEMICAL APPLICATIONS

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

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## 34. FOOD ANALYSIS

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2595 Li, A. and Zhang, Y.: (Application of isotachopheresis in food analysis). *Shipin Kexue*, 112 (1989) 1-4; *C.A.*, 111 (1989) 55941y.

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

2596 Kamenskaya, E.V. and Sulygova, Z.K.: (Differentiation and analysis of polysaccharides, proteins, and their complexes in fruit juices). *Probl. Anal. Khim.*, 8 (1988) 86-91; *C.A.*, 111 (1989) 55933x.

## 36. SOME TECHNICAL PRODUCTS AND COMPLEX MIXTURES

*36d. Complex mixtures and unidentified compounds*

2597 Harsh, J.B., Doner, H.E. and Fuerstenau, D.W.: Electrophoretic mobility of hydroxyaluminium and sodium hectorite in aqueous solutions. *Soil. Sci. Soc. Am. J.*, 52 (1988) 1589-1592; *C.A.*, 110 (1989) 237564q.

## 38. INORGANIC COMPOUNDS

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SUPPLEMENT TO THE  
JOURNAL OF CHROMATOGRAPHY

1989

INDEXES



## INTRODUCTION

As in previous years we present here the Subject Index and the Index of Types of Compounds Chromatographed. Because the methodological part differs substantially in individual techniques, we have retained the subdivision system, using the following abbreviations: C = Liquid column chromatography, E = Electrophoresis, G = Gas chromatography, P = Planar chromatography. In the Index of Types of Compounds Chromatographed all types of methods are indicated in the individual entries by appropriate abbreviations. Entries relevant to supercritical fluid chromatography are to be looked for in the section on Gas chromatography. In entries that are heavily populated by chromatographic papers we made a further subdivision into Techniques and Applications. In the Subject Index a selection was made in such entries and an appropriate note was attached. Reviews are clearly indicated. In the Subject Index materials and procedures in common use are not quoted as special entries.

*Prague (Czechoslovakia)*

*Brno (Czechoslovakia)*

Z. DEYL, V. SCHWARZ and K. MACEK

J. JANÁK



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## Index of Types of Compounds Chromatographed

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This Index follows generally identical rules as those published in previous years, i.e. references of general interest and techniques are within a given entry listed first, followed by applications and finally by papers limited to a certain area of applications only. This, however, is applicable only to highly populated entries, where subdivision appeared necessary. As in the past years (see J. Chromatogr. Vol. 460) the individual parts of the Bibliography section, i.e. Liquid column chromatography (C), Gas chromatography (G), Planar chromatography (P) and Electrophoresis (E) were numbered separately. Therefore the respective shortening should direct the reader to one of the techniques first before looking for a particular number identical numbers occur under different techniques). Please note that this Index refers to the entry numbers in the Bibliography section vol. 486.

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G: 1163, 2271, 2372, 2404  
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- , oxygen  
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G: 106, 1529, 2171, 2240, 2777  
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P: 547, 976  
*see also* Thiazoles and isothiazoles; Thiophenes
- Histamine and related substances  
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- G: 2373  
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*see also* Imidazoles
- Hormones peptidic and proteinous (including synthetic analogues)  
C: 2276, 3470, 3486, 4409, 4436, 4439, 4446, 5349, 5357, 5363, 5365  
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2095, 2102, 2104, 2105, 2111, 2126, 2129, 2131, 2151, 2159, 2187, 2188, 2191, 2197, 2313, 2411, 2414, 2422, 2432, 2438, 2456, 2459, 2469, 2472, 2526, 2562, 2570, 2576, 2586, 2590, 2595, 2602, 2609, 2638, 2639, 2714, 2738, 2740, 2797, 2843, 2850, 2860, 2887, 2891, 2902

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C: 166, 167, 172, 703, 986, 1088, 2136, 3219, 4158, 5042

G: 31, 48, 76, 100, 103, 129-131, 260-262, 289, 292, 309, 335, 357, 362, 376, 383, 393, 412, 413, 421, 423, 427, 428, 430, 431, 435, 437, 440, 442, 444, 445, 461, 464, 518, 530, 563, 575, 584, 585, 587, 590, 611-616, 727-729, 749, 755, 756, 827, 838, 848, 875, 883, 884, 888, 896, 920, 928, 959, 960, 970, 995, 997, 998, 1003, 1007, 1008, 1014, 1036, 1045, 1052, 1053, 1091, 1095, 1191, 1195, 1202, 1234, 1256, 1287, 1289, 1306, 1313, 1319, 1329, 1332, 1342, 1349, 1354, 1359, 1372, 1384, 1440, 1460, 1466, 1467, 1485, 1516, 1517, 1519, 1540, 1550, 1568, 1569, 1674, 1702-1704, 1714, 1834-1836, 1843, 1848, 1858, 1876, 1883, 1885, 1896-1898, 1904, 1905, 2009, 2026, 2028, 2035, 2042, 2048, 2077, 2087, 2093, 2097, 2099, 2105, 2106, 2113, 2133, 2198, 2523, 2596, 2612-2614, 2632, 2640, 2641, 2721, 2723-2726, 2728, 2730, 2835, 2840-2842, 2845, 2888, 2907

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Pesticides, chlorinated

## —, complex mixtures

C: 102, 169, 1090, 2160, 3257, 4159, 5132, 5133

G: 43, 51, 53, 54, 66, 92, 103, 133-135, 417, 585, 587, 601, 603, 617, 717, 778, 880, 912, 918, 1024, 1030, 1038, 1052, 1195, 1196, 1341, 1392, 1402, 1449, 1465, 1498, 1511, 1531, 1847, 1919, 1930, 1990, 2011, 2054, 2076, 2089, 2097, 2110, 2142, 2161, 2181, 2196, 2199, 2325, 2431, 2435, 2436, 2448, 2453, 2489, 2494, 2495, 2848, 2592, 2629, 2832, 2854, 2881, 2897, 2899, 2902

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G: 1899, 1963

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G: 30, 487, 910, 925, 932-936, 976, 1027, 1406, 1407, 1411, 1509, 1968, 1990, 1994, 2007, 2070, 2075, 2091, 2112, 2136, 2150, 2158, 2469, 2509, 2512, 2517, 2538, 2544, 2553, 2877, 2904-2906

- Hydrolases, acting on ester bonds (E.C. 3.1.-.-)
- C: 550 - 565, 1546 - 1562, 2675, 2689-2700, 2731, 3648, 3649, 3651 - 3656, 4615 - 4628, 4684, 5544, 5551, 5564-5579
- E: 328 - 335, 732 - 742, 1057, 1058, 1349, 1487 - 1499, 1982 - 1991, 2377, 2464, 2472 - 2478
- , structural studies
- C: 1388, 2509, 5375, 5566
- , acting on glycosyl compounds (E.C. 3.2.-.-)
- C: 563 - 567, 592, 1563 - 1574, 2701-2708, 3524, 3657 - 3661, 3662 (review), 3663, 4629 - 4634, 5538, 5544, 5580-5591
- E: 336 - 339, 743 - 747, 1059 - 1064, 1500, 1501, 1992 - 2001, 2479-2482
- , structural studies
- C: 1365, 3501, 5379, 5380, 5385, 5386
- , acting on ether bonds (E.C. 3.3.-.-)
- C: 581, 582, 4589
- E: 758, 2494
- , structural studies
- E: 2227
- , acting on peptide bonds (E.C. 3.4.-.-)
- C: 508, 569 - 571, 573 - 576, 578, 580, 583 - 585, 1575 - 1577, 1579 - 1586, 1588, 1590 - 1592, 2709, 2711 - 2713, 2715 - 2717, 2719 - 2722, 2729, 3664, 3665, 3667 - 3672, 3675, 3677 - 3684, 4438, 4635, 4636, 4638, 4639, 4642, 4644 - 4646, 4649, 4650, 5593, 5595-5598, 5600, 5602, 5604, 5605, 5608-5614, 5616
- E: 340 - 346, 348, 350, 352, 354, 355, 748, 749, 753 - 757, 759, 760, 767, 764, 765, 1064, 1066 - 1068, 1071 - 1073, 1076 - 1080, 1502, 1503, 1505-1513, 1515, 1516, 2003, 2005 - 2008, 2011, 2012, 2016, 2292, 2322, 2483-2485, 2487 - 2490, 2493, 2495, 2497, 2498
- , structural studies
- C: 387, 1364, 1372, 1377, 2503, 3500, 5398
- E: 1239, 1747
- , acting on C-N bonds other than peptide bonds (E.C. 3.5.-.-)
- C: 568, 572, 1578, 1589, 2710, 2718, 2728, 3674, 3676, 4640 - 4641, 4643, 4648, 5592, 5607
- E: 349, 751, 763, 1074, 1504, 2017, 2027
- , acting on acid anhydride bonds (E.C. 3.6.-.-)
- C: 577, 579, 1587, 2714, 2733, 3650, 3666, 3685, 4637, 4647, 5594, 5601, 5603, 5606, 5615
- E: 347, 353, 356, 750, 752, 762, 882, 1065, 1069, 1070, 1075, 1270, 1514, 2002, 2004, 2009, 2010, 2013 - 2015, 2491, 2492, 2496, 2499, 2500
- , structural studies
- C: 404, 5378, 5381
- , uncompletely identified
- E: 2486
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- G: 1150, 2154
- Hypnotics (barbiturates, sedatives)
- C: 792, 800, 1808, 1854, 1861, 2183, 2962, 5760
- G: 84, 295, 305, 337, 781, 1082, 1205, 1258, 1759, 1780, 1820, 2338, 2757, 2765, 2768
- P: 134, 150, 372, 375, 377 (review), 379, 533, 818, 824, 1227
- Hypolipidemic agents
- C: 760, 1938, 3936
- G: 772
- P: 365
- Hypotensives
- C: 757, 762, 769, 776 - 778, 1798, 1801, 1823, 1825, 1829, 1831, 1840, 1843, 2920, 2922, 2931, 2932, 2941, 2942, 3833, 3835, 3837, 3840, 3847, 3894, 4846, 4847 (review), 4850, 5773, 5774, 5776, 5780, 5782, 5854
- G: 301, 770, 1212, 1217, 1219
- P: 125, 129, 367, 369, 574 - 576, 1227-1229
- see also* Adrenergic and adrenergic blocking agents
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- Imidazoles and related compounds
- C: 633, 766, 1659, 1660, 3419, 3729, 5664, 5854
- G: 268, 322, 370, 376, 817, 1149, 1275, 1869, 1973, 2226, 2367
- P: 2 (review), 105, 106, 539, 630, 1194, 1233
- see also* Histamine and related substances
- Immunosuppressives
- C: 676, 677, 688, 700 - 702, 829, 830, 1726, 1240, 1934, 4781, 5698, 5704, 5709, 5710, 5713, 5854
- G: 2601
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- see also* Peptide and amino acid antibiotics
- Indole alkaloids
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- G: 1685, 2703
- P: 781, 791, 1187
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- C: 1652, 1653, 2783, 2785, 3723
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- C: 625, 627, 1654, 2470, 2784, 2786, 3419, 3720, 3724, 3725, 4704, 4705, 4706 (review), 5296, 5660
- G: 257, 852, 929, 1089, 1149, 1377, 1565, 1972, 2106, 2463, 2657, 2706

- P: 81, 105, 115, 537, 547, 755, 953,  
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E: 1612  
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teinous  
C: 474, 508, 509, 1418, 2635, 3545,  
3607, 3609, 4494, 4561, 5514, 5515,  
5560  
G: 1419  
P: 959  
E: 290, 701, 707, 986  
—, —, structure studies  
C: 400, 1389, 3502, 3504  
—, non-proteinous  
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G: 1228, 1261, 1419, 1767, 1768, 2246  
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G: 479 - 489, 930 - 940, 1404 - 1410,  
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E: 77, 84, 1192  
—, structural studies  
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C: 3033  
P: 598  
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Halides and other inorganic halogen  
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—, organic  
C: 1300, 1669, 4368, 5306  
G: 839, 975, 1080, 1335, 1887, 2182,  
2191, 2439  
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C: 587, 1515, 1598, 3688, 4655, 4656,  
5620, 5621, 5625, 5626  
E: 362, 363, 768 - 770, 1083, 1084,  
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- J**  
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C: 146, 4798 - 4800, 5738  
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G: 2593  
P: 146, 155, 386, 393  
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C: 3749  
G: 1692, 2442, 2719, 2721  
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C: 227, 230, 1062, 1139, 2313, 3327,  
4247  
G: 924  
E: 46, 48, 477, 486, 1199, 1200, 1206,  
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C: 1600, 2726, 2722, 4658  
E: 365  
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C: 588  
—, forming C-N bonds (E.C. 6.3.--)  
C: 5622  
E: 2026, 2027, 2503  
—, forming C-C bonds (E.C. 6.4.--)  
E: 364, 771, 2019  
—, —, structural studies  
C: 1387  
—, other (including E.C. 6.5.--)  
C: 4659  
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C: 1673, 3035, 3267, 3970, 5154  
G: 467, 475, 902, 1048, 1666, 1719,  
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- , group separation
  - C: 3367
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- , applications, non-biological
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  - G: 189, 190, 677, 1115, 2218
  - P: 41, 58, 59, 222, 224, 225, 232, 234, 255, 470, 472, 473, 483, 485, 690, 693, 697, 704, 714, 716, 935, 1101, 1115
- , —, plants
  - C: 1218, 2351, 3361, 3375, 3378, 4290, 4298, 5223, 5227, 5234
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  - P: 35, 65, 66, 243, 253, 261, 482, 493, 709, 912, 928, 1122, 1133
- , —, blood
  - C: 2362, 2363, 3363, 3369, 4289, 4301, 4303
  - G: 347, 805, 1125, 1583, 1587, 1596, 1620, 1811, 1822, 2371, 2783
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  - C: 2801, 4287
  - G: 1588, 1796
  - P: 36, 45, 47, 67, 246, 252, 466, 477, 487, 494, 495, 687, 713, 916-918, 920, 1102, 1111
- , —, milk and food products
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  - G: 170, 192, 194, 369, 374, 378, 381, 391, 403, 850, 853, 862-864, 1124, 1303, 1445, 1612, 1636, 1851, 1872, 2099, 2219, 2382, 2384, 2392, 2405, 2410, 2673, 2676, 2799, 2812, 2838
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- , —, other animal material
  - C: 261, 266, 273, 1194, 2355-2358, 2369, 2373, 2806, 3364, 3368, 3373, 3374, 4294, 5225, 5226, 5236
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- , —, oxidation products
  - C: 252, 260, 1217, 1218, 2364, 2380, 2650, 3282, 3346, 3353, 3354, 3372, 5233, 5854, 5855
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  - C: 216, 1145, 1201, 2304, 3309
  - E: 52
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  - E: 1210
- , techniques
  - C: 257, 1157, 3382, 3383, 3385
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- , applications
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  - E: 53, 56, 57, 59-66, 68-71, 490-508, 700, 889-907, 1210 (review), 1211-1213, 1215-1221, 1712-1728, 1856, 2197-2211, 2213
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  - G: 145, 452, 912, 1017, 1517, 2099, 2489, 2868
- Lupinine alkaloids
  - C: 2776



- Lyases, carbon-carbon (E.C. 4.1.-.-)  
 C: 586, 1593, 1596, 2723, 3686, 4651,  
 4652, 4654, 4722, 5617, 5618, 5626  
 E: 357-359, 1081, 1223, 1517, 1521,  
 1522, 2019-2021, 2502  
 —, —, structural studies  
 C: 1363  
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 —, carbon-oxygen (E.C. 4.2.-.-)  
 C: 587, 1594, 1597, 2724, 3687  
 E: 360, 361, 1520, 2501  
 —, —, structural studies  
 E: 1748  
 —, carbon-nitrogen (E.C. 4.3.-.-)  
 C: 2725  
 E: 767  
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 C: 1595, 2731, 5619  
 E: 766, 1082, 1518, 1519

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- Macrolides (including erythromycin)  
 C: 684, 1717, 1723, 1727, 1732, 1733,  
 1738, 1746, 1750, 2834, 2839, 2843,  
 2848, 3771, 3773, 4767  
 P: 337, 342, 343, 546, 548, 549, 552  
 E: 1135  
 Magnesium, *see* Alkaline earths  
 Manganese, *see* Cations, inorganic,  
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 Medicated feeds  
 C: 1904, 2826, 3417, 5697, 5707  
 G: 370, 788  
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 G: 257, 2481  
 Mercury, *see* Cations, inorganic,  
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 —, organo-compounds  
 G: 250, 1282, 1693, 2078, 2276, 2447,  
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 C: 2807, 4730 (review)  
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 G: 2722  
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 C: 106, 168, 1086, 1091, 1972, 2224,  
 2232, 3256, 4154, 4156, 5133  
 G: 38, 122, 132, 462, 463, 602, 604,  
 617, 886, 890, 893-895, 901, 906,  
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 1061, 1374-1376, 1378, 1380, 1398,  
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 Hydrocarbons, complex mixtures;  
 Crude oil and petroleum analysis

- Mitogens, mutagens and related compounds  
 (growth factors)  
 G: 416, 1803, 1806, 1808, 2372, 2441  
 P: 1079  
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 Molybdenum, *see* Cations, inorganic,  
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 Mycolic acids  
 G: 1595  
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 C: 183, 1100, 1103, 1104, 2245, 2248,  
 2249, 2251, 2253, 2255, 3271, 3272,  
 4171, 4174, 4175, 4178-4182, 5145,  
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 G: 259, 389, 579, 854, 1184, 1574,  
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 P: 2 (review), 17, 20, 153 (review), 170,  
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*see also* Aflatoxins  
 Myorelaxants  
 C: 18, 2958, 2966, 5800  
 G: 306, 1233  
 P: 370, 374, 584, 819, 1235

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- Narcotic analgesics and antagonists  
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 G: 84, 295, 313, 314, 337, 767, 780,  
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 1759, 1771, 2354, 2767, 2784  
 P: 533  
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 C: 1855, 1876, 1880, 2183, 2951, 5796,  
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 G: 295, 304, 1238, 1258, 2763  
 P: 131, 136, 825, 1002, 1003, 1006,  
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 Myorelaxants; Cholinergic and  
 cholinergic blocking substances  
 Nickel, *see* Cations, inorganic,  
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 Nicotinic acid and derivatives  
 C: 1693, 1729, 1802, 4755, 4759  
 G: 1887  
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- G: 11, 224, 303, 311, 416, 438, 501, 705, 766, 793, 875, 879, 900, 962, 1007, 1036, 1038, 1089, 1143, 1321, 1402, 1471, 1518, 1532, 1538, 1541, 1550, 1637, 1671, 1672-1674, 1730, 1745, 1858, 1884, 1909, 1924, 1967, 1974, 2020, 2021, 2035, 2047, 2089, 2116, 2154, 2163, 2185, 2188, 2304, 2360, 2433, 2445, 2458, 2523, 2555, 2570, 2596, 2693, 2694, 2754, 2856, 2857
- P: 176, 332, 420, 433  
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- G: 481, 2469  
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- Nitrogen oxides  
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- Nitrosamines  
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- G: 364, 387, 471, 472, 736, 847, 1004, 1144, 1337, 1362, 1367, 1368, 1449, 1892, 1936, 1966, 2258, 2497, 2735, 2855, 2873  
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 C: 1094, 2420, 4363, 4718  
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- Nootropics  
 C: 1859  
 P: 1008  
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- Nucleotides, *see* Purines, pyrimidines, nucleosides, nucleotides
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 G: 2180  
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- , applications non-biological  
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 C: 1970  
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- Oligonucleotides and polynucleotides  
 C: 596, 599, 1617, 1622(review), 1623, 1626, 1627, 2734, 2738, 2742, 3703, 4664, 4671, 5628, 5629, 5633, 5634, 5637, 5639  
 E: 368, 774, 1529-1531, 2036-2038
- Oligosaccharides  
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 G: 578, 626, 628, 2601, 2650, 2787  
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 E: 1687
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 C: 612-615, 796, 1637, 1642, 2768, 3232, 3713, 3718, 3719(review), 4689, 4696, 5648  
 G: 84, 235, 295, 331, 337, 339, 1074, 1209, 1231, 1235, 1251, 1253, 1255, 1258, 1446, 1759, 1771, 1772, 1778, 1785, 1820, 2006, 2269, 2350  
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1302, 1305, 1315, 1318, 1331, 1345,  
1349, 1359, 1389, 1393, 1400, 1502,  
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C: 644  
G: 485, 613, 915, 1694, 2043  
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G: 1170
- Oxazines  
C: 3160  
G: 2633  
P: 641
- Oxazoles and isoxazoles  
C: 5339  
G: 1520
- Oxazolines  
P: 177
- Oxidoreductases, acting on the C-OH  
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C: 513, 517, 521, 526, 1056, 1060,  
1500, 1511, 1515, 2639, 2649, 2652,  
2653, 2657, 2658, 2663, 2755, 3616,  
3625, 3628, 4571, 4686, 5519-5522,  
5526, 5529  
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1028, 1034-1036, 1039, 1458-1462,  
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C: 4575
- , acting on aldehyde or keto group of  
donors (E.C. 1.2.-.-)  
C: 1512, 1519, 2649, 3620, 3626, 4450,  
4570, 4573, 4576, 4583, 5527  
E: 720, 1399, 1961, 2443
- , —, structural studies  
C: 1374, 1516, 2642, 3614  
E: 88
- , acting on CH-CH group of donors  
(E.C. 1.3.-.-)  
C: 1513, 1514, 1517, 2644, 3618, 4566  
E: 2440
- , acting on the CH-NH<sub>2</sub> group of  
donors (E.C. 1.4.-.-)  
C: 1505, 1506, 1599, 2662, 4565, 4584,  
5523  
E: 716
- , —, structural studies  
C: 1363
- , acting on CH-NH group of donors  
(E.C. 1.5.-.-)  
C: 1502, 1510  
E: 2027, 2446
- , acting on reduced NAD or NADP as  
donors (E.C. 1.6.-.-)  
C: 525, 527, 1499, 1518, 2638, 2655,  
2657, 2659, 3615, 4577, 5525, 5530,  
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E: 312, 717, 1029, 1030, 1035, 1038,  
1954, 1963, 1964, 2437, 2438
- , —, structural studies  
C: 3627  
E: 1234
- , acting on other nitrogenous  
compounds as donor (E.C. 1.7.-.-)  
C: 2643, 3617  
E: 2439
- , acting on the sulphur group of  
donors (E.C. 1.8.-.-)  
C: 1501, 3621  
E: 1037
- , acting on a haem group of donors  
(E.C. 1.9.-.-)  
C: 510, 1503, 4567  
E: 309, 1464, 1962
- , —, structural studies  
C: 3509
- , acting on H<sub>2</sub>O<sub>2</sub> as acceptors  
(E.C. 1.11.-.-)  
C: 516, 530, 537, 2642, 2647, 2652,  
2731, 3612, 4574, 5524  
E: 304, 307, 308, 317, 711, 1031,  
1040, 1455, 1998, 2441
- , acting on single donors with incor-  
poration of oxygen (oxygenases)  
(E.C. 1.13.-.-)  
C: 511, 519, 528, 1504, 2650, 5528  
E: 302, 305, 1032, 1457, 1953, 2442
- , acting on paired donors with incor-  
poration of oxygen into one donor  
(hydroxylases) (E.C. 1.14.-.-)  
C: 512, 514, 524, 529, 1508, 1520,  
2645, 2646, 2654, 2660, 2661, 3613,  
3619, 3623, 3624, 4569, 4577, 4579,  
4581, 4582  
E: 312, 710, 1033
- , acting on superoxide radicals as  
acceptor (E.C. 1.15.-.-)  
C: 515, 518, 1507, 1509  
E: 310, 713, 1456, 1467, 2435
- , —, structural studies  
C: 1380
- , other and incompletely identified  
oxidoreductases (E.C. 1.99.-.-)  
C: 520, 522, 2640, 2648, 2651, 2652,  
2656, 3622, 3629, 4568, 4585  
E: 301, 303, 1958, 1959, 2434, 2436,  
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- , activity measurements  
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- , aliphatic aldehydes and ketones  
C: 190 - 193, 1107, 1110 - 1113, 2259, 3202, 3279, 3284, 4187, 4192, 4193, 5059, 5152, 5480, 5855  
G: 31, 36, 60, 104, 159, 191, 292, 338, 340, 343, 353, 356, 379, 394, 400-402, 426, 460, 461, 624, 638, 692, 749, 812, 819, 822, 823, 826, 830, 834, 846, 858, 871, 899, 907, 913, 929, 958, 959, 962, 964, 967, 1007, 1008, 1028, 1049, 1093, 1195, 1196, 1285, 1296, 1300, 1302, 1330, 1331, 1346, 1355, 1363, 1370, 1381, 1395, 1396, 1402, 1434, 1437, 1445, 1467, 1477, 1502, 1511, 1518, 1519, 1575-1577, 1784, 1847, 1882, 1901, 1906, 1910, 1912, 1919, 1981, 2011, 2025, 2035, 2040, 2082, 2102, 2108, 2115, 2208, 2209, 2285, 2365, 2377, 2383, 2386, 2403, 2407, 2409, 2431, 2466, 2472, 2523, 2528, 2530, 2555, 2610, 2649, 2806, 2809, 2827, 2830, 2846, 2870, 2879, 2881, 2887, 2901  
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- , —, animal material  
 C: 597, 598, 600, 1605, 1606, 1608, 1619, 1621, 2736, 2737, 2740, 2743, 2746, 2748, 2751, 3038, 3421, 4668-4670, 4674, 4679-4682, 5473, 5630, 5640, 5642, 5655  
 G: 234, 817, 1684, 2265  
 P: 95, 98, 99, 307, 574, 777, 778, 961, 978, 1182-1185  
 E: 2472
- , —, food products  
 C: 602  
 G: 818
- Pyrane derivatives  
 C: 2254  
 G: 1297, 1865, 2620
- Pyrazines  
 C: 3734  
 G: 715, 1049, 2422, 2707, 2708  
 P: 1196  
*see also* Diazines
- Pyrazoles  
 P: 319, 320, 975
- Pyrethrins (and other natural insecticides)  
 C: 2462  
 G: 739, 1193, 1713, 1715, 2297, 2408, 2849  
 P: 117, 352, 353, 561, 989 (review), 993, 994
- Pyridine and piperidine derivatives  
 C: 628, 629, 1656, 2203, 3726, 3727, 5661, 5662  
 G: 110, 238, 502, 585, 587, 715, 800-802, 812, 963, 964, 1048, 1051, 1162, 1194, 1377, 1465, 1471, 1474, 1488, 1547, 1887, 1972, 2020, 2035, 2166, 2325, 2526, 2566, 2633, 2704, 2707, 2896  
 P: 104, 166, 172, 180, 355, 375, 647  
 E: 840
- , carboxylic acids  
 C: 630, 631, 1655  
 G: 809, 1770, 1842, 2333, 2365  
 P: 1193  
*see also* Nicotinic acid and derivatives
- Pyridoxine, *see* Vitamins, B<sub>6</sub> group
- Pyrimidines, *see* Purines, pyrimidines, nucleosides, nucleotides
- γ-Pyrone derivatives, *see* Flavonoids and γ-pyrone derivatives
- Pyrroles, pyrrolidines and pyrrolidones  
 C: 787, 2799, 2781  
 G: 364, 714, 1149, 1164, 1286, 1892, 2868, 2896  
 P: 84, 370, 375, 840  
*see also* Bile pigments; Porphyrins and metalloporphyrins
- Pyrrolizidine alkaloids  
 G: 236, 326, 714, 1160, 1161, 2266-2268  
 P: 316

## Q

- Quinoline and isoquinoline alkaloids  
 C: 1643, 3717  
 G: 1239, 2487, 2703  
 P: 787, 788
- Quinolines and isoquinolines  
 C: 634, 1657, 1658, 2079, 5119, 5664, 5665  
 G: 316, 320, 358, 380, 809, 1012, 1089, 1377, 1516, 1538, 1565, 1915, 1972, 2106, 2463, 2796, 2819  
 P: 538, 647, 1044, 1058, 1207
- Quinolizidine alkaloids  
 P: 313, 317, 411, 780, 963, 970, 1188
- Quinones  
 C: 2260, 2803, 3283, 4188, 4190, 4276, 5196  
 G: 2300  
 P: 198, 323, 656

## R

- Radiopharmaceuticals  
 C: 3923, 3993, 3994  
 P: 620, 621, 854-856, 858
- Radioprotective agents  
 C: 3029, 4935
- Radiosensitisers  
 C: 1609

- Rare earths  
 C: 870, 1998, 2000, 2001, 3072-3074, 3077, 3082, 3086 (review), 3220, 4978, 5881  
 G: 252, 1176  
 P: 402, 609, 612, 613 (review), 617, 849, 1031, 1255, 1258, 1259, 1262, 1263
- Rauwolfia alkaloids  
 C: 620, 1638, 1645
- Repellents, *see* Larvicides, insecticides
- Resins, alkyd  
 G: 2472
- , phenolic  
 C: 2895  
 G: 1366, 2740  
 P: 1221
- , polyester  
 C: 1792  
 G: 274, 276, 278, 470, 580, 1195, 1201, 1721, 1731, 2302, 2305, 2478, 2742
- , polyethylene and polypropylene glycols  
 C: 2889, 2891, 2898, 3625, 3815  
 G: 1196, 2597
- , poly(vinyl acetate)  
 G: 1366, 1727, 1729, 2478, 2738
- , poly(vinyl alcohol)  
 C: 1790
- , poly(vinyl chloride)  
 C: 2890  
 G: 270, 281, 289, 291, 464, 754, 1199, 2318, 2468
- , poly(vinylidene fluoride)  
 G: 755, 1202, 1727, 1977, 2739
- , poly(vinylpyrrolidone)  
 G: 2738  
*see also* Acrylic resins; Epoxy resins; Polyolefins; Rubber (natural and synthetic); Styrene polymers
- Respiratory stimulants  
 C: 3008
- RNA, reviews  
 C: 1630, 4006
- , techniques  
 C: 606, 1628, 1629, 2758, 2759, 2761, 4683, 5415  
 E: 1111, 2035, 2050, 2545
- , applications, non-biological applications (in vitro processing)  
 C: 4687, 5643  
 E: 376, 377, 379, 387, 388, 390, 786, 1087, 1536, 1540, 1542, 1546, 2039, 2048, 2509-2512, 2514, 2517, 2518, 2523
- , —, microorganisms  
 E: 382, 383, 778, 784, 1102, 1284, 1538, 2042, 2046, 2051, 2519, 2520
- , —, animal material  
 C: 605, 2760, 3705  
 E: 370-375, 378, 380, 381, 384-386, 389, 391, 474, 775-777, 779-783, 785, 787-789, 1088-1101, 1532-1535, 1537, 1539, 1541, 1543-1545, 1547-1556, 1716, 2040, 2041, 2043-2045, 2047, 2049, 2199, 2203, 2507, 2508, 2513, 2515, 2516, 2521, 2522, 2538
- , structural studies  
 C: 5646  
 P: 775  
 E: 416, 417, 829-831, 1102, 1121-1124, 1593-1595, 2109, 2110, 2173, 2568-2570
- Rodenticides  
 C: 4802, 5273  
 G: 2342  
 P: 351
- Rubber natural and synthetic  
 C: 2892, 3812  
 G: 275, 284, 468, 750, 752, 759, 892, 1144, 1195, 1198, 1201, 1718, 1721, 1782, 2301, 2309, 2313, 2482, 2748  
 P: 567, 568
- Rubidium, *see* Alkali metals
- ## S
- Saponins and sapogenins  
 C: 1254, 1258, 1259, 2413, 3411, 3413, 4343, 4344, 5850  
 G: 204  
 P: 507, 510, 599, 745-747, 749, 948, 949, 1157
- Secretolytics  
 C: 3013, 3016, 3259
- Selenium compounds, inorganic, *see* Cations, inorganic, analytical group IIb
- , organic  
 C: 1679, 3748, 3751, 4732  
 G: 718, 1171, 1172, 2277
- Senecio alkaloids  
 G: 2266, 2267
- Sexual attractants, *see* Pheromones
- Sialic acids *see* Glycosaminoglycans
- Silicium compounds, inorganic  
 C: 4998  
 G: 480
- , organic  
 C: 3176, 4733  
 G: 251, 459, 469, 717, 1065, 1072, 1073, 1394, 1510, 1731, 2278, 2485, 2612
- Silver, *see* Cations, inorganic, analytical group I and IIa
- Snake venoms  
 C: 2587, 2590, 3574, 4534, 5476, 5483  
 E: 980, 1391  
*see also* respective enzymes
- , structural studies  
 C: 1375, 3506, 3507, 5384
- Sodium, *see* Alkali metals
- Soil pollution  
 C: 2254, 3071, 3076, 3260, 4794, 4986, 5128  
 G: 148, 243, 265, 446-448, 479, 731-734, 738, 877, 889, 890, 1185,

- 1294, 1361, 1362; 1531, 1563, 1695, 1702, 1709, 1711, 1836, 1871, 1914, 1923, 1939-1943, 2008, 2159, 2207, 2262, 2270, 2284, 2389, 2466, 2454, 2461-2463, 2592, 2719, 2737, 2839, 2848, 2855, 2858-2861
- P: 102, 345, 396 (review), 990, 1210  
*see also* individual polluting compounds
- Spasmolytics**  
 G: 303, 318, 1742, 1745, 2334, 2337, 2360  
 P: 126, 128, 821
- Specific binding proteins (receptors)**  
 C: 439, 447, 476, 489-502, 1411, 1452, 1464-1489, 2596-2631, 3576, 3584, 3587-3605, 4541-4544, 4546-4558, 4686, 5171, 5406, 5488-5508, 5513  
 E: 147, 249-252, 263-287, 289, 541, 545, 550, 563, 594, 609, 672-699, 891, 894, 898, 952, 997-1025, 1167, 1273, 1356, 1414, 1417-1440, 1847, 1916-1946, 2315, 2391-2423
- , structural studies  
 C: 393, 397, 402, 3503, 4545  
 E: 91, 522, 924, 1231, 2231, 2413
- Sphingolipids, (ceramides, cerebrosides, gangliosides, sulphatides)**  
 C: 2376, 2377, 3287, 3374, 3376, 3380, 4288, 4293, 4301, 4308, 5235  
 G: 1280, 1624, 1676, 2380, 2794, 2795  
 P: 9, 36, 45, 52, 54, 56, 63, 67, 246, 466, 467, 475, 476, 479, 489, 491, 494, 680, 688, 694, 696, 698, 702, 705, 711, 916, 917, 929, 932, 1098, 1100, 1102, 1103, 1105, 1111, 1112, 1129, 1132
- Stabilizers, *see* Plasticizers and stabilizers**
- Starch components**  
 C: 1140, 3307, 3310, 3315, 3316, 4219, 422, 4224, 4226, 4230  
 G: 2478  
 P: 459, 1086  
*see also* Polysaccharides
- Steroid alkaloids**  
 C: 2772  
 G: 204  
 P: 279
- Steroids**  
 C: 279-303, 1229-1253, 2389-2411, 3387-3410, 4316-4342, 5249-5273  
 G: 195-210, 681-689, 1127-1132, 1639-1653, 2241-2247, 2683-2688  
 P: 69-77, 263-284, 501-506, 722-744, 938-947, 1134-1155  
 E: 73, 74, 509
- , reviews and books  
 G: 2242, 2327  
 P: 2, 153
- , general techniques and theory  
 C: 2389, 2390, 2393, 4074, 4316, 4317, 5254  
 G: 84, 768, 1127, 1266, 1270, 2180, 2243, 2590, 2593, 2782, 2787, 2801  
 P: 69, 178, 405, 631, 947, 1134
- see also* Androstane derivatives;  
 Oestrogens; Pregnane derivatives;  
 Sterols
- Sterols, techniques**  
 C: 295, 1248, 2402, 2403, 2803, 4324, 4325  
 G: 204, 2181  
 P: 72, 75, 279, 423, 504, 1150
- , applications, non-biological  
 C: 1211, 1245, 1247, 2404, 2406, 2803, 3407, 3408, 4329-4331  
 G: 203, 373, 377, 671, 681, 688, 841, 850, 923, 1317, 1826, 1832, 1846, 1863, 1880, 1889, 2238, 2399, 2423, 2815, 2820, 2833, 2865  
 P: 35, 279, 502, 503, 505, 726, 736, 738, 739, 940, 944, 1097
- , biological  
 C: 291-294, 1246, 1248, 2405, 2407, 2408, 4326-4328, 4332, 5261-5265, 5854  
 G: 202, 205, 641, 817, 1110, 1129, 1182, 1551, 1607, 1617, 1628, 1636, 1646-1650, 1792, 1801, 1804, 1813, 1828, 1859, 2245-2247, 2250, 2685-2687  
 P: 57, 73, 74, 80, 138, 248, 276-278, 394, 482, 490, 679, 688, 691, 696, 700, 735, 737, 740, 926, 927, 943, 945, 1099, 1109, 1114, 1132, 1147-1149, 1151, 1239  
 E: 73
- Stimulants, *see* Psychostimulants**
- Strontium, *see* Alkaline earths**
- Strychnine group**  
 G: 295, 1205  
 P: 102
- Styrene polymers (inclusive pyrolysis products)**  
 C: 730, 735, 737, 1002, 1783, 1789, 2886, 3818, 4088, 4815, 4817, 5049, 5753  
 G: 110, 271, 283, 288, 458, 569, 744, 745, 758, 1194, 1197, 1199, 1542, 1716, 1718, 1722, 1730, 1845, 2303, 2316, 2322, 2586, 2628, 2738, 2740, 2742, 2743, 2746
- Subcellular particles**  
 C: 1980, 2219, 2877, 3971, 3973, 3976  
 G: 172, 202, 234, 1595, 2154  
 E: 855, 1276, 1627, 1628, 2154
- Sulphatides *see* Sphingolipids**
- Sulphides (thioethers) and polysulphides**  
 C: 635, 2790, 2795, 2799  
 G: 756, 1075, 1168, 1172, 1283, 1345, 1537, 1540, 1730, 1777, 2034, 2047, 2079, 2308, 2866  
 P: 322
- Sulphonamides**  
 C: 805, 818, 1883, 2986, 2987, 3902, 4836, 4900, 4908, 4917  
 G: 116, 1761, 2327, 2588, 2770  
 P: 139, 141, 369, 387, 590, 592-594, 828, 1010, 1011, 1014, 1018  
 E: 851

## Sulphonate esters

G: 451, 2274

## Sulphones

C: 3735

G: 245

## Sulphonylamines

G: 1242, 2709, 2836

## Sulphoxides

C: 2203, 3930

P: 321

## Sulphur compounds, inorganic

C: 898, 902, 1011, 2010, 2014, 2016, 2018, 2155, 3095, 3099-3101, 3105, 3106, 3988, 5000, 5002, 5003, 5065, 5891, 5893

G: 132, 481, 489, 936-938, 940, 1345, 1461, 1908, 1999, 2001, 2079, 2516, 2548, 2866

E: 1634, 2160

## —, organic, techniques

C: 144, 147, 637, 1661, 1664, 1665, 2793, 2797, 3176, 4719, 5666-5668

G: 716, 1689, 1690, 2088, 2432, 2531, 2712

P: 321

## —, —, acids and derivatives

C: 636, 639, 1094, 1663, 1671, 1673, 1674, 2794, 3173, 3736, 3738

G: 408, 599, 872, 917, 1089, 1165, 1166, 2272, 2406, 2709, 2715

P: 86, 105, 178, 322, 323, 547, 794, 1197

*see also* Heterocyclics, sulphur

## Sulphur elemental

G: 2364, 2499, 2513, 2516, 2712

## Sulphur oxides

C: 3070, 3107

G: 937, 1345, 2413, 2431, 2866

## Surfactants, emulsifiers and detergents

C: 855, 1967, 1968, 3051-3056, 3962-3966, 4968, 4969, 5864, 5865

G: 272, 449, 891, 892, 924, 1076, 1363-1365, 1677, 1732, 1733, 1938, 1917, 1944-1966, 2146, 2456, 2466, 2467, 2471, 2597, 2624, 2747, 2862, 2863

P: 2(review), 49, 159, 160, 172, 396(review), 397, 398, 570, 604, 640, 701, 704, 845, 883, 1017, 1251, 1252

E: 2149

## Suspensions, various

C: 160, 1975

E: 9, 10, 1619-1623, 2597

## Sweeteners, artificial

C: 3009, 3019, 3021, 3027, 3045, 5840

G: 2814

P: 599

E: 516

## Sweeteners of plant origin

P: 599

Sympathomimetics, *see* Adrenergic and adrenergic blocking substances

## T

## Tannins

C: 2256, 3265, 3278

P: 911, 1074

Tantalum, *see* Cations, inorganic, analytical group IIITechnetium, *see* Cations, inorganic, analytical group IIbTellurium, *see* Cations, inorganic, analytical group IIb

## Terpenes

C: 305, 306, 1261-1264, 2414-2417, 3415, 4345, 4346, 5275, 5276

G: 211-223, 690-703, 1133-1142, 1654-1670, 2248-2255, 2689-2692

P: 79, 80, 285, 286, 511-515, 751, 752, 950-952, 1159-1163

## —, general techniques

C: 295, 2414, 4317

G: 111, 211, 212, 218, 556, 1135, 1507, 2562, 2690

P: 2(review), 6, 279, 285, 599, 601, 880

## —, applications

C: 305, 306, 1261, 1262, 2415-2411, 3415, 4346, 5275, 5738

G: 213, 220-222, 588, 604, 690-692, 695, 696, 698, 699, 792, 1134, 1563, 1662, 1665, 1666, 1668, 1687, 1965, 2204, 2250, 2255, 2444, 2691, 2802, 2901

P: 80, 192, 285, 286, 394, 439, 511, 599, 601, 752, 950-952, 1024, 1160

## —, acids

G: 162, 1670

P: 511, 751, 840, 950, 1159

## —, alcohols

C: 5276

G: 222, 372, 395, 690, 1048, 1133, 1134, 1507, 1658, 1790, 1826, 2357, 2691, 2747, 2781, 2865

P: 79, 511, 951, 952, 1161, 1239

## —, resins

G: 222, 1657, 1670

## Tetracyclines

C: 1721, 1744, 1749, 1756, 1757, 2840(review), 2845, 3781, 3787, 3789, 4763, 4773-4775, 5699, 5700, 5702, 5706, 5711, 5712, 5854

G: 116, 726, 2787

P: 549, 550, 552, 1205

E: 845, 1135

## Textile dyes (including bleaching agents)

C: 857

## Textile materials

C: 857

G: 222, 1938, 2006, 2238, 2478, 2498, 2500

Thallium, *see* Cations, inorganic, analytical group I and IIa

- Thiamine, *see* Vitamins, B<sub>1</sub>
- Thiazoles and isothiazoles  
 C: 2796, 2798, 3068, 3734, 3739, 3741, 4187, 4717  
 G: 246, 585, 812, 929, 2440  
 P: 106, 180, 322, 325
- Thiazolones  
 C: 1667
- Thiocarbamates  
 C: 2292
- Thiocyanates and isothiocyanates  
 C: 2794, 3739  
 G: 244, 929, 1307  
 E: 75
- Thioglucosides  
 G: 244  
 P: 324
- Thiols  
 C: 638, 1662, 1666, 1672, 2792, 2797, 3737, 4065, 4715, 4720  
 G: 239, 241, 453, 476, 501, 1004, 1298, 1331, 1461, 1537, 2047, 2079, 2225, 2305, 2523, 2610, 2713, 2866  
 P: 178, 322, 872  
 E: 2136
- Thiophenes  
 C: 1661, 1668  
 G: 240, 243, 358, 873, 1045, 1075, 1167, 1516, 1959, 1987, 2040, 2273, 2440, 2609, 2714
- Thiophosphates  
 C: 4725  
 G: 376, 730, 831, 889, 911, 1187-1189, 1261, 1294, 1562, 1706-1709, 1884, 1922, 2284, 2718, 2807, 2861
- Thiourea  
 C: 1675  
 G: 246, 733, 2416
- Thorium, *see* Cations, inorganic, analytical group III
- Thyreostatics  
 C: 2444  
 G: 1766
- Thyreoglobulins and related compounds  
 C: 361
- Tin, inorganic, *see* Cations, inorganic, analytical group III
- , organic  
 C: 649, 988, 1050, 1680, 3749, 3750, 5672  
 G: 360, 382, 398, 399, 404, 485, 887, 1169, 1692, 1695, 1696, 1698, 1871, 1921, 1940, 2150, 2401, 2421, 2719, 2720, 2816, 2839, 2859  
 P: 327
- Titanium, *see* Cations, inorganic, analytical group III
- Toad venoms  
 P: 748
- Tobacco alkaloids  
 C: 835, 1069, 1636, 1641, 2773, 3712, 5650, 5854  
 G: 800, 1158, 1913, 2363  
 P: 178
- Tocopherols, *see* Vitamins, E
- Toxicological (and forensic) analysis, reviews and books  
 C: 3941, 4951, 5114  
 G: 329, 797, 1783, 2006, 2242  
 P: 153, 390  
 E: 854
- , general techniques  
 C: 833, 1052, 1948, 3229, 3939, 3940, 3942-3945, 3947-3949, 5846  
 G: 298, 337, 1254, 1775, 1786, 1787, 2556, 2779, 2784  
 P: 835
- , applications  
 C: 834-836, 1946, 3030, 3031, 3886, 3946, 4947, 4948, 4950, 5842-5845, 5847, 5848  
 G: 131, 138, 141, 146, 154, 183, 229, 230, 236, 241, 262, 305, 307, 312, 313, 316, 324, 328, 330, 331, 333, 615, 704, 714, 754, 767, 784, 793-796, 798-800, 1074, 1092, 1096, 1098, 1099, 1187, 1205, 1231, 1235, 1251-1253, 1255-1260, 1267, 1276, 1394, 1492, 1502, 1652, 1653, 1696, 1706, 1748, 1755, 1771-1774, 1776-1782, 1784, 1785, 1788, 1789, 1795, 1802, 1804, 1806, 1820, 1960, 2167, 2260, 2265, 2269, 2282, 2347-2354, 2363, 2377, 2432-2445, 2615, 2645, 2646, 2688, 2694, 2731, 2734, 2762, 2765, 2766, 2769, 2777, 2778, 2797  
 P: 151, 152, 154, 187, 351, 389, 415, 556, 586, 1022, 1032, 1223, 1238  
 E: 192, 293, 852, 853  
*see also* Proteins of blood, serum and blood cells
- Toxins (non-proteinous or unidentified)  
 C: 2744, 3068, 5874  
 G: 316, 2649, 2796, 2819  
 P: 389, 522  
*see also* Aflatoxins; Mycotoxins
- Toxins, proteinous  
 C: 355, 386, 1412, 1456, 1458, 2540, 2586, 3539, 3574, 3575, 3579, 4498, 4531, 4539, 4560  
 G: 2507  
 E: 1334, 1901, 1929  
*see also* Proteins of glands and gland products; Snake venoms; individual enzyme types
- , —, structural studies  
 C: 389, 3493  
 E: 521, 916
- Tranquilizers (anxiolytics)  
 C: 741, 786, 793, 1798, 1846, 1848, 1851, 2183, 2934, 2949, 2952, 2954, 2964, 2970, 3862, 3879, 3890, 4870, 4871, 4895, 5791, 5805  
 G: 84, 312, 315, 567, 1233, 1241, 1258, 1263, 1755, 1820, 2338-2340, 2617, 2758, 2766  
 P: 372, 376, 579, 815, 817, 819, 825, 968, 973, 1004, 1021, 1231, 1233, 1238

- Transferases, transferring one atom groups (methyl-, hydroxy-, formyl-, carbamoyl-, carbonyl-, amidine) and related transferases (E.C. 2.1.-.-)
- C: 533, 536, 1522, 1525, 1531, 2665, 2667, 2668, 2673, 3635, 4600, 5339, 5545
- E: 314, 1042, 1966, 2449, 2451 - 2453
- , structural studies
- C: 5540
- E: 316, 2225
- , transferring aldehyde or ketonic residues (E.C. 2.2.-.-)
- C: 3634
- E: 1970
- , transferring acyl- and aminoacyl-groups (E.C. 2.3.-.-)
- C: 531, 1533, 1534, 2664, 2669, 2670, 3632, 4356, 4556, 4599, 4602, 4603, 5537, 5541, 5543
- E: 315, 1348, 1473
- , transferring glycosyl residue (hexosyl and pentosyl transferases) (E.C. 2.4.-.-)
- C: 532, 534, 538, 1521, 1529, 1530, 1535, 1536, 2728, 3630, 3633, 3636, 3653, 4217, 4591, 4596, 4598, 5338, 5544
- E: 313, 723, 1045, 1968, 2454
- , structural studies
- C: 1366, 2507, 5542
- , transferring alkyl or aryl groups (E.C. 2.5.-.-)
- C: 519, 535, 537, 539, 1523, 1524, 1526, 1528, 1532, 2671, 2672, 2731, 4588, 4589, 4593, 4595, 4597, 5532-5535
- E: 317, 318, 721, 1470, 1471, 1971
- , transferring nitrogenous groups (E.C. 2.6.-.-)
- C: 1527, 2666, 4594, 5536
- E: 1041, 2450
- , transferring phosphorus containing groups (E.C. 2.7.-.-)
- C: 540 - 549, 592, 1061, 1537 - 1545, 2191, 2674 - 2688, 3638 - 3647, 4604 - 4614, 5544, 5546 - 5563
- E: 319 - 327, 724 - 731, 1046 - 1051, 1953 - 1056, 1474 - 1486, 1950, 1972 - 1981, 2455 - 2471
- , —, structural studies
- C: 399, 406, 1362, 1367, 1386, 2514, 3511, 5403
- E: 915, 2224, 2230, 2233
- , transferring sulphur containing groups (E.C. 2.8.-.-)
- C: 2731, 3631, 3637, 4587, 4590, 4592, 4601, 5495
- E: 722, 1043, 1044, 1967, 1969
- , —, structural studies
- C: 1361
- , activity measurements
- P: 435
- Triazines and triazanes
- C: 4788
- G: 1050, 2448, 2454
- Triazoles
- C: 3730, 3731, 4708
- G: 1051, 1358, 1544, 1871
- Tropine alkaloids
- C: 3714, 5652
- G: 295, 713, 798, 799, 1252, 1254, 1773, 1789, 2006
- P: 533, 783, 840, 966, 997
- Trypsin inhibitor (antitrypsin)
- C: 480, 503, 507, 3608, 4505
- E: 176
- Tryptophan metabolites
- C: 626
- G: 1149, 1797
- Tuberculostatics
- C: 1892, 2990, 5823, 5854
- G: 1762
- Tungsten, *see* Cations, inorganic, analytical group IIb

## U

- Ubiquinones (coenzyme Q)
- C: 1841, 3280
- Uranium, *see* Actinides and uranium
- Urethanes and polyurethanes (including pyrolysis products)
- G: 749, 1721, 2881
- Uricosuric drugs
- G: 2328
- Urea and urea derivatives
- C: 321, 1294, 1296, 3432, 3433, 5108, 5301, 5302
- G: 817, 975, 2229
- P: 1233
- see also* Thiourea
- Uric acids
- C: 1625, 4663
- G: 2328

## V

- Vanadium, *see* Cations, inorganic, analytical group IIb
- Vasoconstrictors
- C: 766
- G: 1250, 1820
- Vasodilantans (including coronar vasodilantans)
- C: 773, 1821, 1832, 1835, 2919, 2923, 2927, 2959, 2969, 3838, 3842, 3846, 3854, 4844, 4845, 4851, 4857, 4858, 5768, 5772, 5774, 5775, 5786
- G: 303, 311, 323, 1213, 1218, 1221, 1671, 1741, 1745, 1770, 2334, 2335, 2344, 2360, 2754
- P: 129, 368, 1226
- E: 849

- Venoms, proteinous, *see* Proteins, of glands and gland products; Toxins, proteinous; individual enzyme types
- Vinca alkaloids  
C: 611, 1646, 3721 (review)
- Vitamins (for vitamin protein complexes, *see* Specific binding proteins)  
C: 650-673, 1685-1714, 2810-2832, 3753-3766, 4735-4761, 5677-5692  
G: 254-258, 722-724, 1179-1183, 1699-1701, 2283, 2284  
P: 108-111, 333, 334, 543-545, 983-985, 1199  
E: 425, 842, 843, 1134, 1614, 2590
- , reviews and books  
C: 662  
G: 2327  
P: 2, 333
- , techniques for fat soluble vitamins  
C: 261, 658, 1686, 1709, 1712, 2813, 2822, 3766, 4735  
G: 2787  
P: 109
- , techniques for water soluble vitamins  
C: 1700, 2810, 2827, 3761, 4755  
G: 2787  
E: 842, 1614
- , A group (including synthetic retinoids)  
C: 650, 652, 656, 665, 671, 672, 1685, 1687, 1688, 1692, 1703, 1705, 1709, 1710, 1772, 1943, 2813, 2819-2821, 2823, 2825, 2831, 3753, 3739, 4736, 4739, 4744, 4761, 5678, 5680, 5684, 5688, 5689, 5743, 5748, 5750, 5854  
P: 1114  
*see also* Pigments, natural (and fluorescent substances)
- , B<sub>1</sub>  
C: 660, 1693, 1695, 1802, 3758, 4740, 4751, 4755, 5854  
E: 842, 2157
- , B<sub>2</sub> and other flavins  
C: 655, 1693, 1695, 1698, 1802, 4651, 4755  
G: 2633  
P: 983, 985  
E: 425, 842
- , B<sub>3</sub> group  
C: 1695, 5854  
E: 842
- , B<sub>6</sub> group  
C: 673, 1695, 1706, 1802, 2812, 2817, 3755, 4743, 4755, 4760, 5687, 5854  
G: 2633  
E: 425, 842
- , B<sub>12</sub> group  
C: 1695  
P: 10  
E: 842, 2590
- , C group  
C: 653, 666, 667, 1697, 1699, 1701, 1702, 1704, 2830, 3465, 3754, 3764, 4746, 5059, 5681, 5683, 5854  
G: 2892  
P: 544, 818  
E: 843, 1134

- , D group  
C: 657, 661, 663, 1689, 1709-1711, 2813, 2824, 2828, 3756, 3757, 3762, 4736, 4737, 4748, 4756, 5685, 5688, 5691, 5854  
G: 724, 1179, 1699  
P: 984
- , E  
C: 654, 659, 668, 1685, 1688, 1690, 1691, 1709, 1713, 2816, 2829, 2832, 3061, 4741, 4749, 5686, 5688, 5690, 5692, 5750, 5854  
G: 722, 815, 850, 1180, 1182, 1549, 1649, 1700, 1701, 1826, 1864, 2800  
P: 109, 111, 842, 1199
- , K group  
C: 664, 669, 670, 1708, 2815, 3765, 4738, 4747, 4752, 4757, 4758, 5682, 5688, 5854  
G: 78, 388, 2283  
P: 108, 334, 543
- Volatiles, flavours, odours, *see* Organoleptics

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- Water  
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G: 290, 482, 486, 489, 547, 832, 904, 925, 928, 939, 1008, 1018, 1024, 1369, 1391, 1409, 1725, 1736, 1912, 1980, 1999, 2109, 2301, 2310, 2514
- Water analysis and pollution  
C: 134, 852-854, 903, 988, 1661, 1984, 2235, 2867, 3049, 3050, 3081, 3103, 3106, 3260, 3446, 3741, 3961, 3985, 3991, 3995, 3996, 4164, 4275, 4788, 4966, 4967, 4969, 4997, 5003, 5065, 5128, 5725, 5728, 5863, 5876  
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P: 102, 289, 345, 350, 404, 558, 562, 616, 640, 652, 844, 1028, 1208, 1256  
E: 1144, 1618, 1710  
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- , review  
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P: 396
- Waxes  
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P: 149, 601, 688, 696, 1121



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**Z**

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Zirconium, *see* Cations, inorganic,  
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