

CONTENTS

Series Editor's Preface	xxi
Editor's Preface	xxiii
Chapter 1. Integration, a new paradigm in analytical chemistry	1
1.1 Integration in science and technology	1
1.2 Parts and components	7
1.3 Systems	10
1.4 Sensors	15
1.5 Array systems	19
1.6 Microsystems	22
1.7 Nanosystems	30
1.8 Conclusions and perspectives	32
Acknowledgements	33
References	33
SYSTEMS	
Chapter 2. Integrated separation systems	37
2.1 Introduction	37
2.2 General principles of bi-phase separation	38
2.3 Multiplication of single separation effect	48
2.4 Combined separation techniques	57
Acknowledgements	73
References	73
Chapter 3. Solid-phase spectrometric assays	81
3.1 Introduction	81
3.2 Integration of processes in solid-phase spectrometric assays	83
3.3 Types of solid-phase spectrometric assays	84
3.4 Features of solid-phase spectrometric assays	85
3.5 Particulated solid-phase spectrometric assays	86
3.6 Membrane solid-phase spectrometric assays	122
Acronyms	147
References	149

Chapter 4.	Continuous flow analytical systems	161
4.1	Introduction	161
4.2	Reverse flow injection	164
4.3	Integrating effect of conventional flow injection units	164
4.4	Derivatisation reactions in flow injection systems	174
4.5	External energy sources integrated with flow injection	176
4.6	In-line coupling of simple non-chromatographic continuous separation units and flow injection manifolds	182
4.7	On-line coupling of robotics and flow injection manifolds	214
4.8	Detection in flow injection	217
4.9	Integration and flow injection	226
	References	227
Chapter 5.	Distributed analytical instrumentation systems	245
5.1	The remote concept	245
5.2	The remote place	256
5.3	The link	269
5.4	The local place	276
5.5	Remote analytical instruments/systems : application examples	579
5.6	Conclusion	281
	References	283
Chapter 6.	Laboratory information management systems	287
6.1	The analytical laboratory	287
6.2	What is laboratory automation?	291
6.3	Laboratory Information Management Systems	298
6.4	LIMS and the system development life cycle	311
	References	325

SENSOR SYSTEMS

Chapter 7.	Chemically modified electrodes with integrated biomolecules and molecular wires	327
7.1	Introduction	327
7.2	Enzyme redox catalysis	329
7.3	Redox hydrogels	333
7.4	Self-assembled polyelectrolyte and protein films	339
7.5	Self-assembled enzyme films	340
7.6	Electrocatalysis	345
7.7	Structure of self-assembled enzyme films	357

7.8	Conclusions	367
	Acknowledgements	369
	References	369
Chapter 8.	Composite and biocomposite materials for electrochemical sensing	377
8.1	Introduction	377
8.2	Composite electrode materials	379
8.3	Composite- and biocomposite-based electrochemical sensors	394
8.4	Conclusions	406
	Acknowledgements	407
	References	407
Chapter 9.	Optical chemical sensors and biosensors	413
9.1	Introduction	413
9.2	Sensors structure	414
9.3	Modes of optical signal measurements	427
9.4	Conclusion	434
	References	435
ARRAY SYSTEMS		
Chapter 10.	Electronic tongues : new analytical perspective of chemical sensors	437
10.1	General approach to the application of sensor arrays	437
10.2	Electronic tongue systems	449
10.3	Selected applications of the electronic tongue	458
10.4	Problems and perspective	482
	References	483
Chapter 11.	A Taste sensors	487
11.1	Introduction	487
11.2	Structure of the taste sensor	488
11.3	Response characteristics	490
11.4	Amino acids	490
11.5	Quantification of the taste of foods	499
11.6	Interaction between taste qualities	502
11.7	Detection of wine flavor using taste sensor and electronic nose	507
11.8	Perspective	509
	References	511

Chapter 12. Application of electronic nose technology for monitoring water and wastewater	513
12.1 Introduction	513
12.2 Electronic nose technology	514
12.3 Electronic nose instrumentation	520
12.4 Application to water and wastewater monitoring	524
References	537

MICROSYSTEMS

Chapter 13. Integrated optical transducers for (bio) chemical sensing	541
13.1 Introduction	541
13.2 Basic concepts	542
13.3 Fundamentals of optical waveguides	545
13.4 Detection principles : Types of devices	549
13.5 Technologies for integrated optical transducer fabrication	553
13.6 Integrated optical sensors	574
13.7 Towards a total integrated systems	582
References	584
Chapter 14. ‘High order’ hybrid FET module for (bio) chemical and physical sensing	587
14.1 Introduction	587
14.2 Experimental	591
14.3 Multi-parameter detection of both (bio) chemical and physical quantities using the same transducer principle	594
14.4 Applications of the hybrid sensor module	615
14.5 Summary and conclusion	619
Acknowledgements	620
References	620
Chapter 15. Microdialysis based lab-on-a-chip, applying a generic MEMS technology	625
15.1 Introduction	625
15.2 The micromachined double lumen microdialysis probe connector	631
15.3 The passive and the active calibration system	639
15.4 The flow-through potentiometric and amperometric sensors array	646
15.5 The integrated microdialysis-based lab-on-a-chip	652
15.6 General conclusions	662
References	662

Chapter 16. Design methodology for a lab-on-a-chip for chemical analysis : the MAFIAS chip	665
16.1 Introduction	665
16.2 The design path	666
16.3 The design	667
16.4 Conclusions	682
References	683

NANOSYSTEMS

Chapter 17. Nanosensor and nanoprobe systems for in vivo bioanalysis	685
17.1 Introduction	685
17.2 Background on biosensors and bioreceptors	686
17.3 Fiberoptics nanosensor systems	689
17.4 Application in bioanalysis	695
17.5 Conclustion	698
Acknowledgements	699
References	699

Index	701
--------------	------------