

Table of Contents

List of contributors	IX
Introduction (Achille Cappiello)	XI
1 Basic aspects of electrospray ionization (Laura Molin and Pietro Traldi)	1
1.1 The Taylor cone	2
1.2 Fate of sprayed droplets	4
1.3 Ions formation from charged droplets	7
1.4 Some further considerations	7
References	8
2 Atmospheric pressure chemical ionization (APCI): new avenues for an old friend (Andrea Raffaelli)	11
2.1 Introduction	11
2.2 Principles and apparatus	14
2.3 Applications	20
References	24
3 Electron ionization in LC-MS: a technical overview of the Direct EI interface (Achille Cappiello and Pierangela Palma)	27
3.1 Introduction	27
3.2 The interface	29
3.3 Interface performance	31
3.4 Applications	38
3.5 Conclusion	42
References	43

4	Electron ionization LC–MS with supersonic molecular beams (Ori Granot and Aviv Amirav)	45
4.1	Introduction	45
4.2	Experimental – liquid sampling EI–MS with SMB	46
4.3	Results – cold EI mass spectra	51
4.4	Results – selected applications	56
4.5	Discussion and potential advantages	60
	Acknowledgements	61
	References	61
5	A case for congruent multiple ionization modes in atmospheric pressure ionization mass spectrometry (Michael P. Balogh)	65
5.1	Introduction	65
5.2	Atmospheric pressure ionization: electrospray	66
5.3	Atmospheric pressure ionization: chemical ionization	67
5.4	Atmospheric pressure ionization: photoionization	68
5.5	Combining ionization mechanisms	69
5.6	Developing reproducible mechanism boundaries	70
5.7	True combined mechanism designs	73
5.8	Development of ESCi [®] multimode ionization	73
5.9	Applications of multimode ionization	77
5.10	Developments in progress	82
	Acknowledgments	85
	References	85
6	Atmospheric pressure laser ionization (APLI) (Oliver J. Schmitz and Thorsten Benter)	89
6.1	Motivation	89
6.2	Principles of laser ionization	92
6.3	Spectroscopic considerations	94
6.4	From jet-REMPI to APLI	97
6.5	Coupling stages for APLI MS and experimental results	103
6.6	Conclusions and outlook	110
	References	111
7	LC–ICP–MS – a primary tool for elemental speciation studies? (Katarzyna Wrobel, Kazimierz Wrobel and Joseph A. Caruso)	115
7.1	Introduction: target elements and samples in speciation analysis	115
7.2	Inductively coupled plasma mass spectrometry (ICP–MS) as element-specific detector	119

7.3	Liquid chromatographic techniques for species separation	127
7.4	Coupling ICP-MS to liquid chromatography	132
7.5	Element speciation by LC-ICP-MS in the real-world samples	134
7.6	Approaching a higher reliability of speciation results	148
7.7	Conclusions	153
	References	153
8	HPCL-chip/MS: a new approach to nano-LC/MS (Tom A. van de Goor)	165
8.1	Introduction	165
8.2	Micro fabrication of HPLC-chip devices	168
8.3	Analytical performance of HPLC-chip/MS versus nano-LC/MS [10]	172
8.4	Applications of HPLC-chip/MS	178
8.5	Future directions	188
8.6	Conclusion	191
	References	192
9	Matrix effect, signal suppression and enhancement in LC-ESI-MS (Loris Tonidandel and Roberta Seraglia)	193
	References	210
10	Differential mobility spectrometry (FAIMS): a powerful tool for rapid gas phase ion separation and detection (Raanan A. Miller, Erkinjon G. Nazarov and Daren Levin)	211
10.1	Introduction and history	211
10.2	Principle of operation overview	212
10.3	How it works: fundamentals of the ion separation method	214
10.4	Physical implementation: planar versus cylindrical ion filter geometries	228
10.5	The importance of ionization: fundamentals of atmospheric pressure ion formation and ion chemistry	232
10.6	Applications of DMS	237
10.7	Conclusion	255
	Acknowledgments	255
	References	255
	Index	259