
Preface

Mass spectrometry has progressed remarkably in the last half century. In the history of liquid chromatography mass spectrometry (LC-MS), for example, liquid flowing out from an LC column was vaporized and gaseous analytes were ionized by a dc corona discharge (APCI: [1]); the analytes in vaporized LC effluent were concentrated by a jet separator and ionized by electron ionization [2]; sample solutions were simply sprayed through the heated capillary into vacuum and analytes were ionized [3]; LC effluent was nebulized by helium gas into vacuum. The dried sample particulates accelerated by jet expansion collided with the heated wall leading to the collision-induced desorption of analytes that were ionized by electron ionization or chemical ionization (Particle beam: [4]). In 1979, [5] achieved a significant milestone in the history of mass spectrometry; they coupled a high electric field with liquid nebulization. This method can be regarded as an early-stage pneumatically assisted electrospray. Electrospray ionization [6] and matrix-assisted laser desorption ionization (MALDI) [7] triggered the explosive development of mass spectrometry.

Mass spectrometers of various kinds (e.g., quadrupole, time of flight, ion trap, Fourier-transform, and Orbitrap) have been the subject of marvelous improvements these days and this situation accentuates the importance of mass spectrometry as the indispensable analytical method in modern science and technology. Needless to say, mass spectrometry is an integrated science; it is based on physics, quantum mechanics, thermodynamics, physical chemistry, photochemistry, electromagnetism, instrumentation, and so on. Unfortunately, however, because mass spectrometry is nowadays widely applied in many fields as one of the most important analytical tools, there is less chance to learn about its fundamentals, and the aim of this book is to fill in this knowledge gap.

In this book, the fundamentals of mass spectrometry are explained in detail. We are confident that this book will be an excellent guide for students and researchers who are engaged in mass spectrometry and related fields because it provides answers to the question what is going on in the “black box” of highly sophisticated mass spectrometers. In addition, the fundamental knowledge is indispensable for creating new concepts for ionization

and instrumentation in order to be able to contribute to the next generation mass spectrometry. This book will be extremely useful for satisfying these future demands.

The editor (K.H.) would like to appreciate Dr. K. Howell of Springer USA for his patient encouragement in publishing this book.

Kofu, Japan

Kenzo Hiraoka

References

1. Carroll DI, Dzidic I, Stillwell RN, Haegele KD, Horning EC (1974) *Anal Chem* 47:2369
2. Takeuchi T, Hirata Y, Okumura Y (1978) *Anal Chem* 50:659
3. Blakley CR, Carmody JJ, Vestal ML (1980) *J Am Chem Soc* 102:5931
4. Willoughby RC, Browner RF (1984) *Anal Chem* 56:2625
5. Iribarne JV, Thomson BA (1976) *J Chem Phys* 64:2287
6. Yamashita M, Fenn JB (1984) *J Phys Chem* 88:4451, 4671
7. Tanaka K, Waki H, Ido Y, Akita S, Yoshida Y, Yoshida T (1988) *Rapid Commun Mass Spectrom* 2:151

Fundamentals of Mass Spectrometry

Hiraoka, K. (Ed.)

2013, VII, 239 p. 138 illus., 57 illus. in color., Hardcover

ISBN: 978-1-4614-7232-2