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Book review

Mass Spectrometry, Principles and Applications, by E. de Hoffmann, J. Charette and V. Stroobant; John Wiley and Sons and Masson, 1996, xii + 340 pp., price £24.95, ISBN 0-471-96697-5.

The book *Mass Spectrometry, Principles and Application* is the English translation of the book *Spéctrométrie de masse* which appeared from Masson in 1994. The text is updated at a few places upon translation, because 1995 references are present in the text. The book clearly presents all the important MS techniques developed until today and, as such, is a valuable contribution to the general and tutorial literature on current MS. Given the incredible speed of developments in MS technologies and applications, there is a clear need of up-to-date texts like this one. The book can certainly be recommended for teaching purposes or as a reference text, elucidating most recent developments in the field. In reviewing this book, my starting point was my own teaching experience in MS and the difficulties I experienced in selecting appropriate textbooks for my students, without the need to provide numerous additional papers required for a 'complete' view. Most of my 'critical' remarks should be considered from this perspective.

After a short general and historical introduction, the techniques and applications of MS are discussed in seven chapters. All chapters contain numerous references for further, more detailed study.

In Chapter 1, the various ionisation methods are discussed, ranging from electron ionisation, chemical ionisation, various desorption methods, to atmospheric ionisation techniques like electrospray, atmospheric-pressure chemical ionisation and inductively coupled plasma.

Chapter 2 is devoted to the five types of mass

analyzers, i.e., quadrupoles, ion-traps, time-of-flight, magnetic sector, and Fourier-transform ion-cyclotron resonance instruments. Some attention is also paid to detectors and computers. The text reaches a significant level of detail, e.g., in discussing equations of ion motions in the quadrupole field, in illustrating the principles of reflectrons and post-source decay experiments in time-of-flight, as well as in explaining various scan types in electromagnetic analyzers. Given the detailed level of the discussions, it is strange that no attention is paid to the important practical aspects of instrument tuning and calibration, nor to the importance of the ion entrance and exit slits with respect to setting the resolution in sector instruments.

The next two chapters are used to discuss hyphenated techniques, i.e., GC-MS and LC-MS in Chapter 3, and MS-MS in Chapter 4. The sections on data acquisition and treatment in Chapter 3 are considered extremely useful, because these are often forgotten in texts like this. The chapter on MS-MS is rather short. Obviously, important aspects related to scan modes in sector instruments are discussed in Chapter 2, but a clear explanation of the analytical usefulness of the various scan modes in a triple-quadrupole instrument, illustrated with a clearcut example, is lacking.

The next three chapters are devoted to aspects related to the analytical application of MS.

Chapter 5 pays attention to the information that can be retrieved from the mass spectra and the chromatogram in qualitative and quantitative analysis. Important topics as resolution, isotopic abundances, types of ions and fragments, as well as a detailed discussion of quantitative analysis, including isotope dilution, are presented.

Chapter 6 pays attention to various fragmentation

reactions as an introduction to the interpretation of mass spectra. As to be expected, not only fragmentation of odd-electron ions generated by electron ionisation, but also the fragmentation of even-electron ions generated by soft ionisation methods are covered in depth.

Chapter 7 is devoted to the analysis of biomolecules (peptides and proteins, oligonucleotides, oligosaccharides and lipids) and contains, for instance, a detailed discussion on peptide sequencing, both in terms of practical applications and in terms of underlying mechanisms, e.g., with respect to charge delocalization and charge-remote fragmentation.

Finally, Chapter 8 contains a number of exercises with their answers. A series of appendices and an index completes the book, including a glossary of terms, a list of abbreviations and tables of isotopes.

Given the exercises in Chapter 8, the book is primarily written for use in university courses on mass spectrometry. As such, it is extremely useful, because it is clearly written, mostly easy to read, and very well illustrated with many creative, well-drawn and self-explaining figures. The fact that the book not only clearly explains the state-of-the-art in MS of ten years ago, but also pays excellent and elaborate attention to the current research topics in analytical MS results in a good preparation of students to the current daily practice in MS. And given the current explosive sales of mass spectrometers, there is a clear need for well-trained chemists with experience and understanding of MS and its current developments. Perhaps a minor disadvantage of the text for teaching purposes is the fact that the nomenclature not always follows the latest conventions, e.g., electron impact instead of electron ionisation, and

the dimensions used not always follow SI units. While, to my pleasure, pressures are given in Pascal (a conversion table for pressure units is included in the text!), gas-phase acidities and basicities are given in kcal/mol instead of kJ/mol.

Obviously, the book can be used as a reference text as well, just to quickly find out some details on specific topics related to one's own work. I used the book in this way for a couple of months, consulting this text first rather than the ones I commonly use. As such, I very much appreciate the book due to the clear way the topics are discussed. The level of detail is sufficient for most of the questions I needed a reference book for. I most certainly consult this book for reference quite often in the future. Again, a critical remark should be made. In quite many cases, the reader is referred for a more detailed discussion on a subject to another place in the book, which in principle is nice. However, quite often the reference to the other page was not very accurate and, more importantly, it referred to a section further on in the book. While in using the book as a reference, this is not too much of a problem, but in using it for teaching this may be a serious drawback.

In conclusion, I very much appreciate this book, and despite the critical remarks made, I can highly recommend the book for both teaching purposes and for reference, because it clearly covers the principles of the current MS technologies and the research topics mass spectrometrists are working on at present. It is clearly written and very nicely illustrated.

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