

## Mass Spectrometry Handbook

It is indeed true, as observed by Richard A. Yost in the foreword to this book, that “mass spectrometry, although barely a hundred years old, has become the dominant force in modern analytical chemistry.” I would add to this observation that, due to the enormous boost to mass spectrometry through the invention of the “soft” ESI (electrospray ionization) and MALDI (matrix-assisted laser desorption/ionization) techniques (for which John B. Fenn and Koichi Tanaka were awarded a shared Nobel Prize in Chemistry in 2002), combined with the new mass analysis and computer technologies, this “science” seems to have no visible horizon in terms of its capabilities for molecular investigation: sensitivity, selectivity, resolving power, and high mass limits. Contributions presented at the recent International Mass Spectrometry Conference (Kyoto, September 2012) showed a resolving power well above 10 million and masses of millions of Da for intact viral capsids! As a consequence, in our present post-genome era the applications of mass spectrometry, especially in the biological field, and even in medicine and surgery, are continuing to grow. It is in this impressive, rapidly progressing, context that the *Mass Spectrometry Handbook*, edited by Mike S. Lee, is presented as a welcome guide to the field.

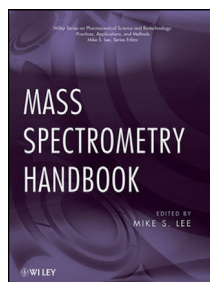
It is absolutely impossible to cover all the areas of the discipline. Accordingly, as is clearly declared in the first sentence of the preface, the book deals with a large number (not all) of current applications of mass spectrometry (MS). More than 50 review papers are distributed within 13 sections, which range from pharmaceutical and clinical analysis to food analysis and homeland security, from forensic investigation to environmental, from space exploration and geology to archaeology, surface analysis, and polymers. The section on “analytical techniques” includes only a few applications such as TLC coupled with MS, analysis of metals, alloys, and inorganic ions, and some specialized fields such as: 1) isotopic transient kinetic analysis (for chemical processes on the surface and in the lattice of solids) and 2) proton transfer reaction MS in life sciences. Indeed, it is in the large area of the life sciences, where mass spectrometry nowadays plays a pivotal role, that the book appears to be somewhat deficient. Only the first section, with four chapters, deals with biotechnology and proteins. Apart from proteomics, all the other “omics” sciences, such as metabolomics and metabonomics, glycomics, and lipidomics, for which MS is essential, are not

treated at all as such, but just indicated, *inter alia*, in a few chapters centered on different specialized applications. Also bottom-up and top-down proteomics, the two complementary approaches to protein identification and characterization in the cell, are not given dedicated chapters dealing with these important fields but only mentioned as particular applications (e.g., in food analysis). It is, in fact, the area of structural biology that is almost completely absent from the book. Also there is no section on the straightforward application of GC-MS to the characterization of secondary metabolites.

Many chapters of the book are organized in the form of tutorials. This, in my opinion, is especially useful to readers who want to enter that particular field actively for the first time. While some chapters appear rather poor, most of them enter deeply into the topic, and are also particularly rich in bibliography, which makes them even more useful.

Rather than bother the reader of this review with a full list of the topics covered, here I single out those topics that I find particularly rich and well presented. The chapter on molecular imaging introduces this new field in detail, and shows very well what mass spectrometry can offer in diagnosis and clinical medicine in the future. The same applies to the application of LC-MS in drug metabolism, providing a good description for the reader who wants to know where to begin. Many useful data are reported in the review on steroid analysis. On isotope ratio MS, which again is a huge area, there is a good description of its application in forensic science. Homeland security, as mentioned above, is treated usefully and comprehensively in a dedicated section of the book. Proton transfer reaction MS, which could be regarded as the old topic of chemical ionization under a new name, actually is a more sophisticated technique, which allows trace detection of volatile organic compounds; a chapter of the book gives a wealth of information on this. The whole section on archaeology is substantially rich and informative. As to the two sections on material sciences, the three reviews on MS in semiconductor research, film analysis, and synthetic polymers treat the fields very thoroughly. The chapter on physical-chemical properties of metals and alloys (Knudsen effusion mass spectrometry) is also worth mentioning for its extensive treatment of the topic.

The reader, whether a researcher, graduate student, or industrial chemist, should also be aware that, despite the title of the book, which leads one to expect a comprehensive treatment, not all the more well-established consolidated techniques nor the more modern ones are described in dedicated reviews. There are no chapters explaining the principles and fundamentals of mass spectrometry and the instrumental characteristics of EI-MS (is it



### Mass Spectrometry Handbook

Wiley Series on Pharmaceutical Science and Biotechnology—Practices, Applications, and Methods. Edited by Mike S. Lee. John Wiley & Sons, Hoboken, 2012. 1368 pp., hardcover, € 159.60.—ISBN 978-0470536735

still important?), ESI-MS, or MALDI-time-of-flight MS, nor of the new ionization methods (ambient ionization), of the tandem, hybrid, or FT-ICR, of portable instrumentation, of ion mobility, or IR spectroscopy of gaseous ions, or of ion surface collisions and soft landing.

That leaves the question: who might be interested in this book? My overall impression is that the book should serve well as a quick reference source or starting-point for researchers who already have a good knowledge and practical experience of mass spectrometry but have to deal with a topic that is outside her/his own primary area of interest. Many applications (again, not all) are gathered here in one volume, thus avoiding the need for a web search of the bibliography and

published reviews to enter a particular field. Finally, unfortunately, many world-renowned experts in mass spectrometry do not appear among the authors of the reviews in the book. However, those who have contributed, most of whom are absolutely top level scientists, have made a huge effort to present a very useful, but sometimes tough, discipline in a clear and easily understandable way. The editor, also, has done an excellent job of keeping all these things together in an organized handbook.

*Francesco De Angelis*  
University of L'Aquila (Italy)

**DOI: 10.1002/anie.201208029**