

effects of catalyst composition and pretreatment on the product distribution in HDS, hydrodenitrogenation and hydrodeoxygenation reactions.

HDS can also be carried out with soluble metal complexes, this being explored in some of the early chapters. Angelici discusses the coordination chemistry of thiophenes and its relevance to the HDS reaction while Bianchini and Meli first look at hydrogenation and hydrogenolysis of unsaturated organosulphurs before considering desulphurization reactions. Hydrogen is a key component of HDS processes and molecular hydrogen complexes have been postulated to be important intermediates in HDS by soluble complexes, an area nicely described in a chapter by Morris. Finally in this section, Kaim *et al.* look at the phenomenon of charge transfer in a number of heterobi- and tri-metallic complexes which are held together by bridging sulphide ligands.

The last chapter, by Gosselink from Shell, takes a very industrially oriented look at metal sulphides in the context of refinery processes and is extremely useful in providing an industrial perspective in which to frame the work discussed in the earlier chapters.

For those in the area of metal sulphide chemistry or for those wanting an entry point to this field, the book has much to commend it, although at £99 for 364 pages it cannot be described as good value.

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Liquid Chromatography–Mass Spectrometry

W. M. A. Niessen

2nd edn, Marcel Dekker, New York, 1999

viii + 634 pages. US\$195

ISBN 0-8247-1936-0

This second edition (634 pages, 18 chapters) represents Volume 79 of a vast series of monographs devoted to the many aspects of chromatography. The combination of liquid chromatography with one or another type of mass spectrometer as the detector/analyser system has undergone dramatic changes in the past 10 years and commercial instruments are now largely computer-controlled. The LC–MS combination undoubtedly represents the most versatile, sensitive and reliable technique for identifying low-volatility components of complex mixtures; electrospray and atmospheric-pressure chemical ionization are now the major interfaces.

After three introductory chapters, a further eight are devoted to the technology involved in combining liquid chromatography with mass spectrometry as the detector system. This is followed by five chapters on environmental, biochemical, pharmaceutical and other areas of interest. The final two chapters are concerned with

related techniques. The extensive lists of references included for each chapter will be invaluable to any specialist in the field; most references are post-1983, and there is a short but useful section on library searching.

There are, however, many criticisms of the way material is presented and there are many errors. It would have been helpful to a non-specialist reader if the many abbreviations (such as APCI, TIC, CAMM) had been listed and defined in a glossary. It would also have been helpful if the book had included a summary of the commercial instrument manufacturers and the current costs.

Some of the descriptive parts are oddly worded: for example, fragmentation of M^+ , formed by electron impact, is described as obscuring the molecular ion (p. 34), and the need to vaporize a molecule for electron impact study is referred to as a disadvantage rather than a limitation of the method (p. 33). It would have been better if structural formulae had been numbered (X, XI etc.) and referred to as such in the text. Sections of the text would have been more readable and understandable if structural formulae had been included for specific compounds that are named and discussed, e.g. the alkaloid ajmalicine, on p. 467. A number of the structural formulae that are included have grotesque errors, often with two- or three-coordinate C and two-coordinate N (e.g. pp. 375, 425, 431, 432, 484). Grammatical errors and the erroneous use of words abound and it is also unfortunate that spelling errors in the text have been incorporated in the index. On p. 42, Eqn 2.15 does not include a term for the velocity of the ion, and on p. 539 we are told that fullerenes such as C_{60} are not detected by proton NMR!

Even with the criticisms mentioned above, this volume undoubtedly updates information in an important technological area and will therefore be of considerable use to the many specialists.

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Catalysis by Di- and Polynuclear Metal Cluster Complexes

R. D. Adams and F. A. Cotton (eds)

Wiley-VCH, New York, 1998

x + 555 pages. £100.

ISBN 0-471-23930-5

This is a good, very much needed book which discusses an area very much at the forefront of modern inorganic chemistry. The authors are experts in the area and their expertise shows. This is a well considered text and embraces most of the current work and views on catalysis by di- and poly-nuclear metal cluster complexes. Themes range from concepts and models for characterizing homogeneous reactions catalysed by transition-metal