a flavour of the way things are developing and the reasons why the particular materials systems are important. In this, all are highly successful, although here I must inject a caveat that there appears to have been a long lead-time in producing this book. It appeared in 1998 but although there is a gratifyingly large number of references none is later than 1995 and rather few are past 1990. In some cases this may not materially affect the work, but in rapidly developing fields such as nanoparticles and lithium batteries many new advances have been made that make the book seem a little bit outdated (already!).

Some chapters cover particular materials types, whilst others deal with particular properties or synthetic techniques. This has the potential for overlap between the chapters, but careful editing has removed this pitfall. The one thing that does appear to have suffered is the index, which has some notable omissions—for example, I was unable to find high T_c superconductors' under High T_c, Oxide or Superconductor, although they are covered in the chapter on Layered Transition Metal Oxides and Chalcogenides.

Overall, the coverage is patchy, a major omission being that of liquid crystals, which are hardly mentioned at all. In the chapter on CVD, there is no mention of GaAs, which is now a major player in the solar-cell area, and precious little of III/V materials in general, which have major applications in light-emitting (diode and laser) devices. These semiconductors are probably the largest CVD-produced materials after SnO_2 for glass coatings. Organic/inorganic microporous solids such as MeAlPOs (aluminium methylphosphonates) are missing and there is mention of neither porous silicon nor nano-engineering.

As an overview of the state-of-the-art in advanced materials, this book is a very useful guide and there are one or two stunning points: for example, the graph on p. 58 which shows the uncharacterized $V(TCNE)_x$ to have a magnetic critical temperature some 320 °C above that of any other molecular material and well above room temperature. The list on p. 503 of biomaterials that have recently become unavailable for medical device manufacture as a result of worries about possible law suits, and the costs implied, is as striking as it is depressing since a major crisis in the availability of implants of various kinds will soon be upon us.

Overall, the book is well produced and presented, given its black and white, non-photographic format, but there are some notable proof-reading flaws; for example, in Fig. 8.12 on p. 357, double bonds and five-coordination C atoms are thrown about with gay abandon, and some figures (such as that on p. 58) have poor labelling.

An obvious text for comparison is *Inorganic Materials*, edited by D. W. Bruce and D. O'Hare (Wiley, Chichester, 1992), which, however, concentrates on inorganic functional materials and has a quite different scope. *Chemistry of Advanced Materials* is much broader in scope and the only real overlap is in the biomaterials area (although the new book is much more applications-orientated) and in the chapter on charge-transfer salts. For the chapter on charge-transfer salts, one of the authors is the same in both books, but again the scope of the current text is much broader, perhaps indicating the advances that have been made in the intervening few years.

Overall the book is a good read and well worth having in the library.

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Transition Metal Sulphides: Chemistry and Catalysis

T. Weber, R. Prins and R. A. van Santen (eds)
Kluwer Academic Publishers, Dordrecht, 1998
364 pages. £99
ISBN 0-7923-5255-6.

The chapters in this book represent contributions based on lectures presented at the NATO Advanced Research Workshop on Challenges for Sulphides in Materials Sciences and Catalysis' held in Bulgaria towards the end of 1997 (even though the book in its best typographical error suggests that the subject is Maternal' Science!). The subject of the workshop was predicated on the rle of transition metal sulphides in the hydrotreatment of crude oil, where molybdenum sulphides combined with either cobalt or nickel supported on γ-alumina form the basis for industrial catalysts.

The 12 chapters cover a large breadth in transition-metal sulphide chemistry and are contributed by internationally respected authors. The general appearance of the book is fine, although poor original artwork from some authors does detract and occasionally borders on the unreadable. The chapters largely break down into three groups covering structure and characterization of solid-state materials, reactivity of soluble metal sulphide systems and catalytic aspects of supported metal sulphides.

Genin and Ibers give a very nice overview of a wide range of solid metal sulphides which sets the scene rather well, and which is complemented by a chapter by Byskov *et al.* on Density Functional Theory (DFT) calculations on sulphur bonding which also argues that the rle of the promoter normally cobalt or nickel in the case of commercial hydrodesulphurization (HDS) catalysts is to create site vacancies. Knowledge of sulphur bonding is of great importance, as related by Hensen, de Beer and van Santen in their chapter on how reactivity depends on the nature of sulphur bonding. Further chapters by Knzinger and by de Jong *et al.* look at the structural characterization of supported and unsupported metal sulphides, while Kogan reports mechanistic studies of C–S bond cleavage reactions and Zdrazil discusses the

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. US195
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 spectrometery 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 $M^{+\cdot}$, 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