easy introduction to its subject matter, though readers already familiar with the relevant symbols and equations should have little difficulty following the arguments or finding the material they seek, and teachers will find the book a real boon.

The first few introductory chapters helpfully set the scene, outlining the quantitative basis of crystal fields, and explaining the angular overlap model (AOM), the molecular orbital approach whereby an examination of ligand and metal orbital interactions allows one to appreciate how the ligand coordination sphere influences the valence shell energy levels. There follow chapters explaining the origin and calculation of ligand field splitting energies Δ, the energy levels of transition-metal ions, and the effects of ligand fields thereon. Later, substantial chapters discuss the influence of the *d* electronic configuration on the geometry and stability of complexes, the electronic spectra of complexes, and the magnetic properties of complex ions. The final two chapters discuss the EPR (electron paramagnetic resonance) spectra of complexes, and the extent to which ligand field effects are of concern in the chemistry of the lanthanide and actinide elements. Series of appendices give useful mathematical relationships, very helpfully list the many symbols used, and provide relevant fundamental constants.

As an interested outsider to the field, I appreciated greatly the short sections scattered throughout the book that put things in perspective, telling the reader what is important and what is not. Examples include the relative importance of ligand field and other effects for different metal types (p. 5), the summary of the key features of AOM on pp. 56 and 57, comparisons with crystal-field (simple electrostatic) arguments on pp. 78–80, the discussion of the distinction between electronic configurations and term states on pp. 93–94, the orbital correlation and Tanabe–Sugano diagrams on pp. 126–141, and the discussion of superexchange pathways starting on p. 273. I could cite many more such sections that concisely convey much information and insight.

Concentrating understandably on systems in which metal ions with incompletely filled *d* shells are surrounded by arrays of ligand atoms acting mainly as σ-donors, possibly also as π-donors or -acceptors, this book may prove of limited interest to organometallic chemist readers of this journal whose main concern is with closed-shell (18-electron) systems containing polyhapto unsaturated organic ligands. Such readers will find little if any reference here to metal-cyclopentadienyls or related systems. Nevertheless, this is an excellent book that deals clearly and rigorously with its chosen subject. It looks destined to be resorted to by those interested in the structures, stabilities and magnetic, electronic and spectroscopic properties of a wide variety of transition-metal complexes. The authors are to be congratulated on packing so much useful information into this one source.

K. WADE
University of Durham, UK

Method performance studies for speciation analysis

P. Quevauviller
Royal Society of Chemistry, Cambridge, 1998
xxii + 272 pages. £59.50
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This book follows from the very rapid growth in our ability to detect and measure not only the total element concentration in a matrix (water, soil, biota etc.) but also the different forms in which the element is present (speciation). Speciation drastically affects the toxicity of elements, e.g. arsenic trioxide is very toxic (and the inspiration of innumerable detective stories), whereas arsenobetaine [$(CH_3)_3As^+CH_2COO^-$] has little or no toxicity. Allied with this comes the knowledge that there are at least 10 forms of organotin present in the natural environment (deriving from tributyltin, for example) — most with different toxicities There are also about 20 naturally occurring methylarsenic species in the marine environment (including a series of dimethylarsenic ribosides) which have a whole range of toxicities and other properties.

Hence there is a need to measure each of the species present and not simply the total element concentration. In addition to this need, researchers have acquired a wide variety of analytical methods to separate and detect the range of species occurring together of a single element (e.g. mercury(II) and methylmercury). How can we be assured that all of these methods, applied to a single sample containing several chemical species, will give (a) the same answer, and (b) the correct answer? Even defining the latter is no simple matter.

In order to encourage confidence and reliability in this area of work, numerous networks and trialling systems have been established in recent years, and those organized by the Standards, Measurement and Testing Programme of the European Union (EU) stand out. Numerous collaborative interlaboratory analytical trials have been held where the methodology is usually to analyse for unknown (to the analysts) concentrations of known species in a sample distributed to each laboratory. The key feature is then a follow-up meeting where results and information are openly exchanged (the results, of course, may have been obtained by different methods).

Out of this may result the availability of a material whose chemical composition, at least as far as a given element and its compounds are concerned, is known. When sufficient confidence exists it may then be defined as a Certified Reference Material (CRM). The usefulness of such CRMs to working scientists in the analytical, regulatory or environmental fields hardly needs to be stated. A number of organometallic compounds have been assessed in this context. The present work summarizes interlaboratory and CRM work for a number of elements of environmental relevance. Four chapters cover the general aims, principles and methodologies of

work in this area. Other chapters then cover speciation work for individual elements (and their environmental organometallic compounds where relevant), namely mercury, lead, tin, arsenic, selenium, chromium and aluminium. A final chapter describes the important networking aspects of this work.

The book is written from a European perspective, where the situation of numerous national efforts easily allows separate work to be done, followed up by discussion as a whole. The book is edited by Dr Philippe Quevauviller of the Standards, Measurements and Testing Bureau of DCXII of the EU, the inspirator and coordinator of much work in this area. No more knowledgeable, enthusiastic and able editor for a work of this nature could possibly be selected. The present reviewer writes as one who has engaged in the process and can vouch for the value of a summative work such as this. It will be on all our bookshelves!

P. J. CRAIG
De Montfort University, Leicester, UK

Organosilicon chemistry IV—From molecules to materials

N. Auner and J. Weis (eds)
Wiley–VCH, Weinheim, 2000
xviii + 834 pages. £95
ISBN 3-527-29854-1

This volume is the fourth in the series covering the lectures and posters presented at the now well-established Münchner Silicontage meetings, this latest one held in April 1998. The book follows a similar format to its predecessors with most contributions being about four to seven pages long. There are 124 contributions as well as an Introduction, and an Author and a Subject Index.

The book opens with an Introduction by the editors that covers some of the differences between carbon and silicon chemistry together with a brief description of a selection of the newer trends in organosilicon chemistry. There is no obvious division of the many contributions by either the original type of conference presentation or subject area, but the indexes compensate for this so that it is not a problem. The contributions are, however, grouped roughly according to subject. The opening few papers (*ca* 32 pages) are devoted to the increasingly important area of silicon biotechnology, including biomineralization of silica and Si- and Ge-containing amino acids. This is followed by about 15 papers (*ca* 120 pages) on the still-popular area of small reactive molecule silicon compounds containing double bonds or divalent silicon centres. There are then about 26 contributions concerning new synthetic methods and structures of stable monomeric silicon compounds that could be used as synthons in a wide range of further chemistry. This section will be of interest to many chemists, as silicon is now used so widely in general synthesis of organometallic compounds. There are then shorter sections dealing with silicon compounds containing metals, five- and six-coordination at silicon, and the increasingly important silsesquioxanes. These are followed by more than 200 pages devoted to many aspects of polymers containing silicon (polysiloxanes, polysilanes, polycarbosilanes etc.), and this area then makes a natural progression into the field of ceramics containing silicon and other 'materials' such as silica and elemental silicon. The format thus follows the subtitle for the book, *From Molecules to Materials*, very well and demonstrates the extraordinary range of compounds and applications in which silicon is to be found in modern chemistry. The wide range of topics covered illustrates the strength of German chemistry in this field, since almost all of the contributions are, as in former volumes, from either German or Austrian groups. This is a treasure trove for organosilicon chemists, all of whom will find many articles of interest. The only disappointment may be for those who use organosilicon chemistry purely for organic synthesis. The focus here is very much on chemistry at the silicon atom and rather less on how it might be of advantage for the organic chemist.

As in previous volumes, the layout of the book is clear, the figures are well reproduced and the overall impression is excellent. Unfortunately the sheer size of the book is starting to make its price go beyond reach for personal purchase. This is a pity, as one of the strengths of the book is its coverage; many other books of conference proceedings provide only a relatively small range of long chapters derived from plenary or invited lectures. Here we get an excellent feel for what is going on across the whole range of organosilicon chemistry. The book can be recommended to any library where organometallic chemistry is covered and also to individuals with a serious interest in organosilicon chemistry.

PAUL D. LICKISS
Imperial College London, UK