

BOOK REVIEWS

Inorganic Chemistry Concepts, Vol. 3, Mössbauer Spectroscopy and Transition Metal Chemistry, by P. GÜTLICH, R. LINK and A. TRAUTWEIN. Published by *Springer-Verlag, Berlin-Heidelberg-New York*, 1978; clothbound, x + 280 pp. Price DM 76 (US\$ 38). ISBN 3-540-08671-4.

In the last few years some books dealing with Mössbauer spectroscopy have been published (Gonser, 1975; Cohen, 1976; Gibb, 1976). The availability of these excellent texts and of less recent others (Greenwood and Gibb, 1971; May, 1971; Janot, 1972; Bancroft, 1973) has been a response to the development of this subject. Nevertheless, it has become evident that many Mössbauer problems bridge the disciplines of solid state physics and chemistry and can benefit from a common theoretical point of view. The authors have endeavoured to reach this aim by giving a particular emphasis to the theoretical methods for the description of the electronic and magnetic structure by quantum mechanical theory. Mathematical derivations are in general kept at a minimum while sound physical interpretation is emphasized. If compared with other books on Mössbauer spectroscopy, this volume might appear less broad in coverage but more advanced in theoretical topics.

The subject matter is organized in three major parts:

- the basic physical concepts, the hyperfine interactions, the experimental methodology and the mathematical evaluation of the spectra are introduced in the first five chapters (about 20% of the book);
- the interpretation of the parameters of iron and of the remaining Mössbauer active transition metals is discussed in chapters 6 and 7 respectively (ca. 60%);
- a selection of some applications, principally in metallurgy and biochemistry (solid state reactions, frozen solution measurements, surface studies and after effects of nuclear transformations), is introduced in the final chapter.

The material in each section is presented in a logical connection and examples are selected with care to illustrate the various points. This can also be said for the data presented in the tables and figures.

The 7th chapter is wholly devoted to the 'exotic' *d*-block Mössbauer nuclei (^{61}Ni , ^{67}Zn , ^{99}Tc , $^{99-101}\text{Ru}$, ^{107}Ag , $^{176-177-178-180}\text{Hf}$, ^{181}Ta , $^{180-182-183-184-186}\text{W}$, ^{187}Re , $^{186-188-189-190}\text{Os}$, $^{191-193}\text{Ir}$, ^{195}Pt , ^{197}Au and

$^{199-201}\text{Hg}$) for which little is known and often dispersed among unknown papers and internal reports. This long chapter (112 pages!) is probably the most complete review one can find on this subject. Another enjoyable part of the book is the one concerning the 'fluctuations and transitions' in iron systems.

The book maintains the high standard set in the previous two volumes of the 'Inorganic Chemistry Concepts' series for its readability, convenience of book format, functionality of printing and drawing. The text is lucidly and concisely written and the amount of illustrative materials (19 tables and 160 figures) improves its clarity. The up-to-date nuclear data are also collected in a separate folding plate. The literature selection (up to 1976 with about 950 references) is very accurate. Only the iron chapter seems a little inadequate even considering the authors' foreword.

The book may be extremely useful for chemists and physicists as a source of possible new ideas and for researchers in related fields who need Mössbauer spectroscopy to solve their problems. Some chapters may perhaps also answer advanced educational purposes.

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Synthesis and Properties of Low-dimensional Materials, Edited by J. S. MILLER and A. J. EPSTEIN, *Annals of the New York Academy of Sciences, Vol. 313*, published by *The New York Academy of Sciences, New York*, 1978; x + 828 pp. Price US\$ 80.00. ISBN 0-89072-069-X.

This volume collects the papers presented at a Conference held by the New York Academy of Sciences in June 1977 and devoted to an area of fast expanding interdisciplinary research in which physical inorganic and organic chemists, physicists, material scientists and electrical engineers are involved. Inorganic, organic and polymeric materials exhibiting a high degree of structural anisotropy (linear chains, 1-D or layers, 2-D structures) and in which cooperative electronic interactions take place display unusual optical, magnetic and electrical properties. The papers reported in the volume cover many aspects of the research activity on these systems.

The first part deals with fundamental concepts of the physics and chemistry mostly of 1-D systems. The authors succeed in achieving the goal put forward by the conference organizers, particularly in making accessible ideas and results from solid state physics to a large audience of chemists. Short reviews illustrate effectively the current research trends and give a glimpse into the direction of future developments. The section ends with an interesting review on technological applications of organic conductors based on TCNQ which will certainly contribute to stimulate new research efforts in this field.

More specialized papers on specific systems are collected in the subsequent parts of the volume. The part on organic materials is mainly devoted to the synthesis and crystal chemistry of 1-D compounds based on TTF, TCNQ and new molecules derived from their chemical modification, in an attempt to clarify the relationships between solid state physical properties and molecular structures.

In addition to analogous attempts carried out by modifying the classical compounds of the Krogmann salt type, the inorganic section presents completely newly synthesized systems like partially oxidized metal bis(dioximates), phthalocyanine materials and transition metal tricalcogenides.

The last section on the so called 'covalent materials' is opened by a review article on the solid-state synthesis and electronic properties of large-dimension crystals of organic polymers belonging to the family of the polydiacetylenes. This is followed by many papers on halogen doping as an effective way of improving the electrical properties of the well known polymeric conductor $(SN)_x$ and polyacetylene, $(CH)_x$, on which renewed interest is constantly growing. Also reported are some papers on the chemical characterization, crystal growing and the use of $(SN)_x$ as an electrode material. The section is closed by two reports on new, quite unusual 1-D materials: the linear chain mercury compounds $Hg_{3-5}AsF_6$.

The efforts of the conference organizers and of the editors have produced a high caliber and largely comprehensive volume which succeeds in giving something between conference proceedings and a reference book reminiscent to some extent of the very famous *Discussions of the Faraday Society*. The book, mostly chemically oriented, is a timely complement to the available monographs devoted to 1-D systems. The reader finds a list of the latter in the very useful general bibliography given in the introductory remarks by the editor, J. S. Miller.

Careful and up-to-date lists of references at the end of each paper are precious guides to the literature whose scattering is typical of an interdisciplinary subject. In conclusion, the book can be strongly recommended to all researchers active in the field and is an invaluable tool for introducing newcomers into this research area which is continuously growing and rich in exciting perspectives.

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Inorganic Molecular Dissymmetry, by Y. SAITO. *Volume 4 of the series 'Inorganic Chemistry Concepts'*, published by Springer-Verlag, Berlin-Heidelberg-New York, 1979; clothbound, 167 pp. Price DM 78.

For a century, chemists have been fascinated by the geometrical properties of molecules and polyatomic ions lacking a centre of inversion. The first case of two enantiomers identified by anomalous X-ray scattering was a tartrate (in 1951) and this book gives an extensive survey of assignment of absolute configurations, with emphasis on cobalt(III) complexes of a large number of multidentate ligands. The theoretical models of conformational analysis involving the energy as a function of $(3N - 6)$ spatial variables (when the species contains N nuclei) and of circular dichroism are discussed at length. Another subtle effect derived from X-ray scattering is the evaluation of electronic density distributions, and it is argued that Co(III) contains 26.3 electrons in the cation and 26.8 in the anion of the salt $[Co(NH_3)_6][Co(CN)_6]$. There is a minor discrepancy between these values and the 'ligand field' interpretation of the visible spectra suggesting between $(Z - 1)$ and $(Z - 2)$ electrons in most d -group compounds, but there are many conceptual and experimental difficulties in such an evaluation.

The book is the fourth in a series '*Inorganic Chemistry Concepts*' treating modern physical and quantum-mechanical techniques applied to interesting problems of inorganic chemistry, and it should be of wide interest to a great majority of the readers of *Inorganica Chimica Acta*.

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