BOOK REVIEWS

Mössbauer Compendium

Mössbauer Spectroscopy. By N. N. Greenwood and T. C. Gibb. Pp. xii + 659. (Chapman and Hall: London, October 1971.) £12.

THE phenomenal growth of the use of nuclear gamma ray resonance spectroscopy—more commonly referred to as the Mössbauer effect—in the solution of chemical problems has been paralleled by an equally phenomenal rate at which this field is reviewed, surveyed, summarized and systematized. The reasons for this state of affairs are not difficult to deduce: the Mössbauer effect has been used to elucidate problems in chemical structure, chemical bonding, magnetism, hot atom effects, nuclear lifetimes, nuclear decay schemes, surface effects such as corrosion and catalysis, the study of alloys, biologically significant molecules, organometallic compounds, and a wide range of other problems. Consequently the structural chemist, the synthetic chemist, the nuclear physicist, the metallurgist, the biologist, and all the other practitioners of specialized subfields in the physical and biological sciences have felt a need to survey Mössbauer spectroscopy for their peers and colleagues, and have felt—rightly or wrongly—that the application of this spectroscopy to their area of science merited an individualistic treatment.

While one may question the validity of this approach in some fields, there can be little question of its appropriateness in the area of inorganic and metal-organic chemistry and related fields. The range of chemical problems which have been studied by Mössbauer effect spectroscopy is so wide that a book written by chemists, primarily for chemists, when well done, can only be considered a welcome addition to the scientist's bookshelf. This volume clearly falls into that category.

Greenwood and Gibb preface the main body of their work with three chapters which cover the fundamental physics of the Mössbauer effect, experimental techniques and hyperfine interactions. While the coverage of these topics is not (and was not intended to be) exhaustive, it is more than sufficient

to serve as a basis for a clear understanding of what is to follow. Any limitation in the range and depth of the material discussed in the individual chapters is adequately dealt with in the references to the scientific literature given in the extensive bibliography at the end of each chapter. After the interlude of a very brief (7-page) survey of applications of the Mössbauer effect to such areas as relativity and general physics, nuclear physics and solid state physics and chemistry, the reader comes to what is obviously the real love of the authors: nine chapters on Mössbauer effect spectroscopy in the field of iron chemistry, followed by chapters on tin, main group elements (including important and extensive discussion of antimony, iodine and xenon), transition metal elements, rare-earth elements and the actinides. It is, however, in the 284 pages devoted to Mössbauer effect studies using the 14.4 keV gamma transition in ^{57}Fe that the authors' extensive knowledge of the field and critical judgment of subject matter come through most strongly. The exposition here is not only lucid and well organized, but most clearly reflects the special expertise of the authors in terms of the (sometimes conflicting) interpretations of results which have been offered in the scientific literature. In writings which deal with quantitative experimental results collected from a wide range of sources, it is useful and convenient to summarize such data in tabular form for convenient access by the reader. In this regard, the present volume is particularly useful since there are extensive collections of tables of data which summarize in a convenient and economical way much of the information most useful to the reader. In this context it is appropriate to note that the authors have quoted isomer shifts not only with respect to a common reference point (for example, SnO_2 for ^{119}Sn spectroscopy, metallic iron for ^{57}Fe , etc.) often arrived at by recalculating the original data, but have also preserved for the critical reader the numerical data cited by the original authors. The only regrettable omission in some of these data tables (see, for example, Table 9.4 on iron cyclopentadiene compounds or

Table 14.5 on tin (IV) halide derivatives) is the temperature at which the measurements were made.

The overall format of this volume meets appropriate standards, although some of the figures are badly reproduced from the originals, making them less useful than they might be. The author and subject indices are comprehensive and add considerably to the overall usefulness of the book, as do the detailed references at the end of the individual chapters. (The inclusion at the bottom of each page of text of the page numbers of the references for the chapter in question is especially convenient and constitutes a welcome practice.) On the other hand, the quality of the bookmaking (in the nonspeculative sense) leaves much to be desired. In a volume selling for £12, the purchaser has a right to expect a sturdy binding, a spine which survives casual usage, and figure reproductions which are free from smudges and poor inking of the plates. In all of these aspects the efforts of Chapman and Hall fall short of the standards which one can reasonably expect at that price.

In summary, then, this book is a most useful and usable addition to the literature on Mössbauer effect spectroscopy, written by two authors who have not only themselves made significant contributions to this field, but who are also competent to exercise critical judgments in evaluations of the results which have been published. Any chemist who is seriously interested in using Mössbauer effect spectroscopy in his field will find this book a welcome addition to his library. Certainly no working science library should fail to include it in its holdings. It is possible that this will be the last book with broad coverage (in terms of chemistry) on Mössbauer effect spectroscopy, for the field has become so large and diversified that comprehensive reviews of the totality of the work which has been done become unmanageable. If this turns out to be the case, *Mössbauer Spectroscopy* by Greenwood and Gibb serves as a fitting summary, after one decade, of the application of this technique to the solution of a wide range of chemical problems.

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