

Spectra Galore

Spectroscopy in Inorganic Chemistry. Vol. 1. Edited by John R. Ferraro and C. N. R. Rao. Pp. xiii + 410. (Academic: New York and London, October 1970.) \$19.50; £9.10.

THE two volume treatise of which this volume is the first part is more specialized than its title suggests. It describes recent advances in inorganic spectroscopy but omits well known aspects of spectroscopy such as electronic or vibrational spectroscopy and their applications to coordination chemistry as well as lengthy discussions of instruments and methods. The articles are intended not as complete compilations but as reports of the present position and of future potentialities.

There has not been much time for some of the new results to be digested, and many of the chapters are oriented towards methods and methodology (even when these can be found elsewhere) rather than towards the interpretation of spectra in terms of structure and bonding. Many chapters are anecdotal rather than correlative, some are too elementary. Thus section D of the chapter on high-resolution NMR begins: "The electronic environment in molecules does one more subtle thing. It couples magnetic nuclei present in the same molecule. Such a coupling is experimentally observed as a splitting of NMR lines." (Surprise, surprise.) This chapter describes some useful inorganic studies, but fails to mention superconducting magnets, liquid crystals and Fourier transforms.

Some of the chapters are competently written, a few well written. The foreign language literature, however, and its English translations, is often poorly served. The first article refers to one German and to two (translated) Japanese papers in 65 references. The review of Mössbauer spectroscopy, which is a German invention, refers to two German papers (by Mössbauer), two Japanese and one (translated) Russian paper among 90 references. Editors (on both sides of language barriers) should encourage their authors in scientific internationalism, for this lack of effort, which is not necessarily chauvinism, is only too common. In a volume costing £9 (£1 per article of about 45 pp.) we expect coverage of the less accessible, and no less relevant, parts of the chosen fields.

There are other examples of parochialism. Thus the description of the early work in matrix isolation spectroscopy refers to Pimentel but not to Norman and Porter, Rice or Lewis and Lipkin¹.

While counting references, we could congratulate the authors of the chapter on soft X-ray spectroscopy on their activity in this field, for 23.5% of their references are to their own work. They tell us that their examples were chosen to show "typical results", but the references, if not the text, should aim at a reasonable

coverage and should mention other useful accounts that are available². Their suggestion (p. 210) that the future significance of this method lies in the interpretation of spectra rather than in the determination of concentration is misleading; they themselves report (p. 242) that the analysis of rocks by X-ray emission spectroscopy was shown (1965) to be better than with wet chemical techniques.

As the book goes on, the proof reading flags, and a strange chemistry, of nitrogen, cyanides and ferrocyanides, develops. We need these reviews; but the high cost of distribution justifies a plea for a high standard of preparation.

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¹ Norman, I., and Porter, G., *Nature*, **174**, 508 (1954); Rice, F. O., and Freamo, M., *J. Amer. Chem. Soc.*, **73**, 5529 (1951); **75**, 548 (1953); Lewis, G. N., and Lipkin, D., *J. Amer. Chem. Soc.*, **64**, 2801 (1942).

² *Practical X-ray Spectrometry* by R. Jenkins and J. L. De Vries, Macmillan, London; Springer, New York (1971); and "X-ray Fluorescence Spectrography" by K. Norrish and B. Chappell, in *Physical Methods in Determinative Mineralogy*, Academic Press, London (1967).

Hot Polymers

Thermal Stability of Polymers. Vol. 1. By Robert T. Conley. (Monographs in Macromolecular Chemistry.) Pp. x + 644. (Marcel Dekker: New York, October 1970.) \$44.50.

THE wide uses to which polymeric materials, especially those of synthetic origin, are now applied make it imperative that information on properties and performance should be as complete as possible. Plastics, rubbers and fibres are often subjected to environmental conditions which may have a profound effect on their chemical, physical and mechanical properties. Behaviour at elevated temperatures is an important factor when selecting suitable materials, and this book provides a welcome collective survey on thermal and thermal/oxidative degradation. Edited by Professor Conley of Wright State University, Dayton, Ohio, it has fourteen chapters, by experts in US academic, industrial and research organizations and one contributor from the UK (Dr Wright of the Royal Aircraft Establishment, Farnborough).

In two initial chapters, Professor Conley discusses the general concepts of polymer properties, degradation processes, molecular structure, and stability criteria, drawing attention to structures which contribute to thermal resistance. Chapters by R. H. Boyd and A. V. Tobolsky and co-authors then review the more theoretical aspects of thermal depolymerization, scission processes and polymer oxidation, providing a background essential for appreciation of later chapters where

important classes of polymers are considered. These deal with polyolefines (R. H. Hansen), rubbers (E. M. Bevilacqua) and fluorocarbon polymers (W. W. Wright). Professor Conley and co-authors provide chapters on vinyl and acrylic polymers; on polyamide, polyimide and related condensates, polyesters and polyethers; on thermosetting polymers (phenolic, nitrogen, furan and epoxy resins); and on cellulosic products. The remaining chapters are by G. P. Shulman who deals with heterocyclic polymers and to some extent covers the same field as Conley's chapter ten, and by J. Economy and J. H. Mason on the behaviour of some inorganic polymers.

Each chapter is accompanied by lists of references to the more important papers (usually up to 1967), so giving an extensive but sometimes non-critical review since the treatment varies with the individual contributors. While the editor has endeavoured to bring the contributions together in a uniform manner, some repetition or overlap is evident (particularly in the tenth and thirteenth chapters). To some extent this may be an advantage in that the chapters become self-contained. There are places where the reader will see omissions or be critical of the authors' interpretation of published information, evident in discussions on acrylic, vinyl and olefine polymers. Another feature is the apparent insufficient attention given to technological implications, particularly on the use of stabilizers, antioxidants and modified process conditions, all of major importance in polymer-using industries. Again, one notes that while there is much on the degradation of polyacrylonitrile, the bearing of this on carbon fibre formation is not stressed; nor are polyurethanes dealt with.

Author and subject indexes are provided, although the latter could have been more comprehensive, and I noticed some typographical errors throughout the text.

The book presents a useful addition to the literature and those who are concerned with the behaviour of polymers in conditions where thermal and oxidative influences are encountered will find it to be of particular value. Unfortunately, the high price may well limit its general availability and it is likely to be consulted in libraries rather than purchased for personal use. I look forward to the second volume, now in preparation, and although the possible content has not been indicated it is hoped that this will be complementary to the first volume and perhaps be concerned with other polymer types and with thermal degradation as it affects processing and properties rather than chemical structure.

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