Book Reviews

Magnetism. Volumes 1 and 2. By S. V. VONSOVSKII (Translated from the Russian (Magnetizm, 1971) by RON HARDIN). Wiley/Halsted, New York, N.Y. 1974. xxviii + 1256 pp. $99.50.

These books are the magnum opus of S. V. Vonsovskii, after more than 40 years in the field, and are intended to cover the physical aspects of all the important topics associated with magnetism.

The time required to write and publish so long a work in Russian, then to translate and republish it in English, has dated its literature survey slightly—none of the over 7000 references is later than 1970, and the majority are from several years earlier. Such disadvantages are outweighed by the sound theoretical development and background given for each topic, and the uniformity only possible with a single author for the entire work.

The books are divided into Parts I–III (the Russian edition is a large single volume). Part I begins with a historical sketch and lays the groundwork for the remainder of the books with electrodynamics, thermodynamics, statistical mechanics, and a general classification of magnetic substances. Part II deals with weakly magnetic substances without magnetic ordering, and Part III (Volume 2 in the English edition) with ordered substances (ferro-, ferri- and antiferromagnets). A few sample topics indicate the diversity of subject matter brought together: magnetic and cyclotron resonance, susceptibility, magnetic neutron diffraction, superconductivity, metals, semiconductors; the Mössbauer, Faraday and Cotton–Mouton effects; metal halides, oxides, and ferrites.

"Magnetism" is written from a physicist's viewpoint but is legible to chemists; familiarity with matrix and group theory notation is assumed. The depth of coverage varies with the topic, but an adequate theoretical background is provided in each case. Given the breadth of coverage, it cannot be deep enough to satisfy specialists in any given topic, but the books constitute a valuable reference work, well worth translating into English, and could form the basis of advanced course work. There is also a useful compilation of Russian literature references, which would otherwise tend to be overlooked, yet these are balanced with extensive reference to the non-Russian literature.

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Magnetism. Volume 5. Edited by GEORGE T. RADO and HARRY SUHL. Academic Press, New York, N.Y. 1973. xvi + 400 pp. $34.00.

This book deals with the magnetic properties of metallic alloys and continues in the tradition of the excellent earlier volumes, each specializing in a narrow branch of magnetism.

According to subject matter, the book is divided into Parts I–III and 12 chapters (by various well-known authors) each self-contained, carefully written, and provided with a separate reference list in addition to adequate subject and author indexes. Chapter 1 (Formation of Local Magnetic Moments by D. K. Wohlleben and B. R. Coles) is a delight to read. Part III, on superconductors (Chapters 10–12, M. B. Maple; Ø. Fischer and M. Peter; E. Müller-Hartmann), should interest a number of chemists, given the interest Little's theory has generated in this subject. Although there is more detail here and in the rest of the book than the average reader of the *Journal of the American Chemical Society* would need, the fundamental principles and experiments should interest solid-state chemists, and Volume 5 is a valuable addition to the series. It gives a good idea of the current state of the art and of how much remains unknown on magnetic interactions in metals.

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Chemical Bonding in Solids. Structure and Bonding. Volume 19. Edited by J. D. DUNITZ et al. Springer Verlag, New York-Heidelberg-Berlin. 1974. 165 pp. $26.30.

The first article (43 pp), by R. D. Shannon and H. Vincent, is on the "Relationship between Covalency, Interatomic Distances, and Magnetic Properties in Halides and Chalcogenides". The authors define a "covalency contraction" parameter as the ratio of the cell volume of a transition metal M_mX_n compound to the cell volume of the corresponding Mg_mX_n compound. The parameter is proportional to the electronegativity of X and therefore inversely proportional to the covalence of the bond M–X. This brings some order into the volume and radii relationships of transition metal compounds. The contraction parameter is also shown to be linearly related to spin-transfer coefficients as determined by magnetic resonance and to Mössbauer isomer shifts for the case of Fe^{2+}. Two articles by A. Kjekshus and T. Rakke deal with "Considerations on the Valence Concept" (38 pp) and with "Geometrical Considerations on the Marcasite Type Structure" (20 pp). In the first of these articles, the (8-N) rule is examined in abstract fashion in terms of the valence bond and the molecular orbital method. In the other paper, the marcasite, pyrite, and related structure types are investigated geometrically in regard to the packing of the X_2 groups. The final article, by G. E. Allen and K. D. Warren, on "The Electronic Spectra of the Hexafluoro Complexes of the Second and Third Transition Series" (60 pp) reviews work done so far and treats nephelauxetic effects and optical electronegativities. These are valuable contributions which should be useful for solid-state chemists.

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Polymer Molecular Weights. Part I (Techniques and Methods of Polymer Evaluation Series. Volume 4). Edited by PHILIP E. SLADE, JR. (Monsanto Textiles Co.). Marcel Dekker, Inc., New York, N.Y. 1975. ix + 286 pp. $24.50.

This book is a collection of five contributed chapters describing the major techniques for polymer molecular weight determination. The authors of each chapter have had considerable first-hand experience in this field and attempt to pass on to the reader intimate experimental and theoretical refinements.

The first chapter by the editor is only eight pages in length and provides a brief but necessary discussion of the different terminology used in describing molecular weights. The second chapter deals with the Membrane Osmometry technique and provides a short description of the theory, experimental, and data analysis procedures. Particularly useful is the inclusion of a critical evaluation of commercially available instrumentation—their capabilities and limitations. Chapter 3 describes the technique known as End Group Analysis for measuring number average molecular weights. Critical review of all methods applied to end group analysis of condensation and vinyl polymers is presented. The author includes a discussion of technical procedures and useful modifications. Absolute Colligative Property Methods is the topic of Chapter 4. Very extensive in scope, this chapter describes the use of ebulliometry, cryoscopy, and the differential vapor pressure methods for molecular weight determination. A general understanding of these methods is provided by a good discussion of the underlying principles. An excellent discussion of the theoretical aspect, equipment, operating procedures, data treatment, error analysis, advantages, and limitations of each method is provided.

The last chapter surveys the aspects of Light Scattering from Solutions of Macromolecules. In addition to its use in molecular weight determinations, the properties of this technique provide useful information concerning the thermodynamic and conformational properties of macromolecules in solution. Sufficient theory is included to permit data handling with experimental procedures and the reduction of data; even the basic design of light-scattering apparatus is well covered. The effects and interpretation of intramolecular and intermolecular interference are discussed in considerable detail. Also covered are experimental problems and general criteria which enter into the evaluation of commercially available instrumentation with a brief discussion of different manufactures of light-scattering instruments.

Part II of this volume (with three additional chapters) remains to come and marks the end of this series which is certain to be of great practical value and a useful reference source for polymer chemists.

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