BOOK REVIEWS

Physical Inorganic Chemistry. Edited by ROBERT A. PLANE and MICHELL J. SIENKO. W. A. Benjamin, Inc., 2465 Broadway, New York 25, N. Y. 1963. ix + 166 pp. 16 × 23.5 cm. Price, $3.95 paper, $7.00 cloth.

Professors Sienko and Plane have chosen to consider "five areas basic to inorganic chemistry" in their introductory volume to a new Benjamin series, "The Physical Inorganic Chemistry Series." Each of these areas, namely atomic structure, molecules, solid state, liquids and solutions, and chemical reactions, is "outlined in a separate chapter of this book." The authors suggest that succeeding monographs will expand these areas.

This book, which is intended by the authors to bridge inorganic chemistry and the disciplines of the calculus, elementary physics, and introductory physical chemistry, begins with an introductory four pages labeled "Concepts From Thermodynamics." This section (in which the Free Energy Function is not mentioned) acts as an outline review of the thermodynamic principles desirable to a study of inorganic chemistry. The book proceeds to discuss (superficially) the topics mentioned above in the order listed.

Chapter 1 begins with the one electron Schrödinger equation which is reproduced assuming the de Broglie condition and the general mathematical form of wave motion. (No attempt is made to justify the quantized solutions even though generalized associated Laguerre and Legendre polynomials are presented. The concept of normalization is only briefly mentioned while the term orthogonality is not used anywhere in describing the solutions.) The names Hartree-Fock and Slater are introduced as being associated with approximate methods for many electron atoms. Spectroscopic state formalism is presented. Magnetic properties of atoms are discussed. Electronic spectra, selection rules, band width, etc., are mentioned, and finally the chapter ends with discussions of ionization potential and electron affinity. (All this is in an 18-page package.) The remaining four chapters follow similarly, each introducing the reader to the topics considered of importance (by the authors) to the inorganic chemist.

This book, which appears to be relatively free from misprints (this reviewer notes no "dashed lines" on p. 11 and the replacement of B by b on p. 81; the numerical equation on p. 81 also is incorrect; states a, b, e, and t on p. 54 should be A, B, E, and T) is written in the same readable style common to another popular general work by the authors. It does not contain footnotes but does suggest, at the end of each chapter, some books which "should prove helpful" as supplementary reading.

The brevity with which topics are treated in this book, intended to be used along with several other monographs in the series as a text for an advanced inorganic chemistry course, is best displayed by a few examples. Chapter 2, "Molecules," has a section labeled Valence Bond in which the ionic form or description is not mentioned. (Ionic forms are briefly introduced in a section called Resonance.) Also in Chapter 2, symmetry LCAO molecular orbitals for an octahedral complex are presented without adequate description of their construction. In Chapter 3, "Solid State," fluorescence and phosphorescence are discussed in a less than 300-word treatment of luminescence. In Chapter 4 the Born and Sackur–Tetrode equations are presented without even qualitative justification of their validity. A result of such abbreviated descriptions is a book reading much like an encyclopedia with an arbitrary listing of physical quantities.

By implication, the authors of this text (and authors of several other recent inorganic texts) have condemned the teaching of physical chemistry in many of our colleges and universities. The traditional course which excludes (or only briefly discusses) such topics as atomic and molecular structure, chemical bonding, and molecular spectroscopy, does not become a suitable prerequisite for topics such as transition metal chemistry (which uses ligand field theory), boron hydride chemistry, mechanisms of chemical reactions, and discussions of the hydrogen bond. In an attempt to give the inorganic student a satisfactory background for these topics, glossed-over, semirigorous, and unfortunately rather uncritical treatments of theoretical chemistry are presented under the guise of physical (or theoretical) inorganic chemistry. Such treatments certainly are not desirable and (in the opinion of this reviewer) should be avoided if possible.

The authors of this book have not avoided the pitfalls that are likely to result when topics are introduced briefly, superficially, and uncritically. The following statements are some examples found particularly distressing to this reviewer:

"For the majority of compounds where d electrons are important . . . the atom with d electrons is located in a field of cubic symmetry," p. 12.

"In ligand field theory, orbitals of a central atom orient themselves spatially so as to give the most favorable interaction energy between the central atom and surrounding ligands," p. 34.

"This theorem (Jahn–Teller) states that if an electronic state is degenerate in a given symmetry then distortion will occur so as to remove degeneracy," p. 61.

"The dielectric constant is defined as the ratio of the effective field to the imposed field, or $1 + 4\pi(P/E)$," p. 69.

"An n-fold axis is a symmetry operation. . .," p. 76.

The cost of this book (paperback) will enable many chemists to purchase it. Hopefully these chemists will have built their own "bridge" between inorganic chemistry and the disciplines of the calculus, physics, and physical chemistry. Hence they will not have to depend on this "monograph" (a misnomer) to build the bridge as the footings used are rather poorly constructed.

Because of the rather interesting simile used (and its implications), it seems suitable that this review be concluded with a philosophical quotation from the introductory paragraph to the chapter on Chemical Reactions. ". . . . dynamic considerations (in inorganic chemistry) too often have been made subsidiary to structural studies. . . . It is hoped that further systematization of inorganic thermodynamic and kinetic information will lead to unifying concepts which will stimulate the field to the same extent that the tetrahedral carbon atom did to organic chemistry."

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Nouveau Traité de Chimie Minérale. Tome XX. Alliages Métalliques (Suite). Edited by PAUL PASCAL. Masson et Cie, Éditeurs, 120 Boulevard Saint-Germain, Paris (6e). 1963. pp. 773–1926. 17.5 × 26 cm. Price, broche 200 F, cartonne toile 212 F.

This is Part Two of Volume XX, on metallic alloys, of the Pascal treatise. Part One dealt with alloys of light metals (groups IA, IIA, magnesium, and aluminum) and with alloys of transition metals with metalloids. This second part contains three sections: alloys of copper and silver (370 pp.), alloys of refractory transition metals (580 pp.), and alloys of low melting heavy metals (200 pp.). Most of the book, about 650 pages, is written by M. Oswald, about 250 pages are by M. R. Collongues, and about 200 are by P. Pascal; a small section, on coins, is by P. Fauconnier and R. Lapassade.

The scheme is essentially that of the classical compilation on binary alloys by M. Hansen (1936). Although the general impression is that it is not as meticulously complete and exact as the well-known older Hansen, still the field has been brought up to date, serving a valuable purpose. The phase diagrams look more like schematic diagrams than like plots of actual experimental data, which we have in the Hansen book. They are for this reason, however, very clear and effective. Some of the data are presented in clear tabular form. Every section, moreover, as also almost every system of importance, is presented with some brief critical discussion or summary.

The bibliography, subdivided into a great number of sections, seems to be exhaustive, and is stated to have been taken through December, 1961, with a few sections closed as of January or June of 1961. At the same time most sections of the bibliography include references to 1962 papers. The bibliography is effectively presented, and every page of the book states where to find the pertinent references. The total number of references is immense, but many of them are repeated in various sections.