

BOOK REVIEWS

Kwantyikulowa Teoria Wiazania Chemicznego. By Prof. Dr. KAZIMIERZ FAJANS. Walter J. Johnson, Inc., 111 Fifth Avenue, New York 3, N. Y., 1961. 145 pp. 17.5 × 24.5 cm. Price, \$1.50.

The title of the book can be translated into English as "Quanticule Theory of Chemical Bonding." It is actually a monograph devoted to the chemical bonding theory developed by Professor Fajans during his long scientific and teaching career in Europe and the United States.

The quanticule is defined by Fajans as a group of electrons quantized in a definite manner with respect to certain nuclei or atomic cores. The quanticule demonstrates its specific behavior in intramolecular processes and reactions with other molecules. The quanticule theory emphasizes the significance of the electrostatic forces of attraction and repulsion within the quantized groups of electrons and between the quantized electrons and respective nuclei.

This theory combined with the phenomenon of deformation of electron boundary surfaces in ions and molecules allows Fajans to derive stereochemical properties of the molecule and crystalline lattice. Consequently, Fajans is able to present the structure of any molecule by a single formula. In this respect, the quanticule theory contradicts the theory of mesomerism or resonance which, for any molecule, assumes the existence of a number of molecular structures (resonance hybrids) as a result of electron exchange among various atoms.

The book is divided into four parts.

In Part A the basic theories of molecular and crystalline structures are compared. A number of molecular structures are represented in terms of the theory of valences, of electron pairs and octets, of electron pairs and atomic cores, and of quanticules. The principles of the quanticule theory and its application to a variety of chemical compounds are also explained.

Part B is devoted to mutual polarization (deformation) of ions in molecules and crystals, resulting from the action of electrostatic forces between the ions. This is a decisive phenomenon in the application of the theory of quanticules.

The general principles of formulation of the quanticular structure of matter are given in Part C. In this part numerous examples of quanticular formulas of inorganic and organic compounds are shown and many chemical reactions are presented in terms of the quanticule theory.

Part D summarizes publications relating to the theory of chemical bonding written by Fajans and his co-workers during the period 1919-1960.

The quanticule theory developed by Fajans should be of great interest to students of chemical bonding, and translation of the book into English might well be an important contribution to this field of science.

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Cosmic Rays. By A. W. WOLFENDALE, B. Sc., Ph.D., F. Inst. P., Senior Lecturer in Physics, Durham College in the University of Durham, with Foreword by Professor G. D. Rochester, F. R. S. Philosophical Library, Inc., 15 East Fortieth Street, New York 16, N. Y. 1963. 14.5 × 22.5 cm. 222 pp. Price, \$10.00.

The author states in the preface that "the purpose of this book is to give an introduction to the subject of Cosmic Rays suitable for students at undergraduate level and scientists working in other fields." The level of the book and the tone in which it is written are certainly in keeping with his aim and generally speaking the book accomplishes its stated purpose. It would certainly be easy to find "carping" fault with the contents with respect to subject matter omitted; Prof. Wolfendale is clearly aware of the dangers of writing a book in a field which is in a state of constant flux due to the advent of satellites as platforms for cosmic ray experiments and rather than attempt a partial portrayal of data, much of which is as yet undigested, he has wisely restricted himself to rather well defined and fairly well understood areas. Essentially he is portraying the state of affairs prior to the advent of the large scale scientific programs utilizing satellites and has one very brief chapter on the radiation belts which is completely qualitative. In a certain sense (which is somewhat unfortunate) the book is "classical" in its approach to the subject in that a significant part of its contents are devoted to the secondary aspects of cosmic rays, that is their behavior in the atmosphere, rather than focusing on the primary properties. In this vein the balloon observations on solar X-rays and the correlation of

various geophysical phenomena with cosmic ray phenomena are either not mentioned or only alluded to in passing reference.

The mathematical level of the book is quite elementary and the author endeavors to make it as self-contained as possible, including chapters on basic ideas of nuclear physics, electromagnetic interactions, nuclear interactions, and cosmic ray detectors. The nonphysicists or the undergraduate with a good physics course in his background will be able to obtain a good introductory knowledge of the field *ca.* 1958 from this book, and to this audience the book is recommended.

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MORTON F. KAPLON

Advances in Heterocyclic Chemistry. Volume 1. Edited by A. R. KATRITZKY, University Chemical Laboratory, Cambridge, England. Academic Press, Inc., 111 Fifth Avenue, New York 3, N. Y. 1963. xi + 467 pp. 16 × 24 cm. Price, \$15.00.

First-rate editing is clearly reflected in this outstanding and modestly priced collection of up-to-date reviews, in which almost all the writing is good and much is conspicuously original. Reader interest and preference naturally vary, so this reviewer will avoid invidious comparisons as well as the temptation of citing the rare misprint. The slim subject index proves serviceable, although more numerous and detailed entries would be a great convenience.

The contents of this volume are: S. Gronowitz: Recent Advances in the Chemistry of Thiophenes. R. M. Acheson: Reactions of Acetylenecarboxylic Acids and Their Esters with Nitrogen-Containing Heterocyclic Compounds. D. Beke: Heterocyclic Pseudo Bases. J. Gut: Aza Analogs of Pyrimidine and Purine Bases of Nucleic Acids. W. L. F. Armarego: Quinazolines. A. R. Katritzky and J. M. Lagowski: Prototropic Tautomerism of Heteraromatic Compounds: I. General Discussion and Methods of Study. II. Six-Membered Rings.

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ERWIN KLINGSBERG

Leybold Vakuum-Taschenbuch. Herausgegeben von K. DIELS und R. JÄCKEL, Zweite neubearbeitete und erweiterte Auflage. Springer-Verlag, Abteilung VI, 1 Berlin-Wilmersdorf, Heidelberg Platz 3, West Berlin. 1962. xii + 366 pp. 16.5 × 23.5 cm. Price, DM 56.

This enlarged and revised second edition of the Leybold vacuum handbook is a welcome addition to the rapidly expanding literature on vacuum technology. Fortunately, the uniqueness of the first edition is preserved in the second; that is, the presentation is *concise and clear*. There is a prodigious amount of data displayed in a well organized and readily understandable manner. The book abounds with equations, tables, graphs, nomographs, and references.

The first section of this handbook is devoted to vacuum physics. It includes terse but generally accurate definitions of terms encountered in vacuum technology. Important formulas from the kinetic theory of gases are listed. Tables and graphs display, as a function of temperature, the average velocity, mean free path, collision frequency, etc., for H₂, N₂, O₂, air, He, Ne, Ar, Kr, Xe, Hg, H₂O, CO, CO₂, HCl, SO₂, Cl₂, C₂H₅OH, and NH₃. Viscosities, thermal conductivities, and ionization potentials are listed for these gases.

Viscous and molecular flow in tubes are summarized with the usual approximate formulas. Graphs and nomographs make it possible to estimate rapidly conductances of long and short pipes and apertures. The thermodynamics of supersonic flow through nozzles is treated with special emphasis on the design of mercury and oil diffusion pumps.

Vacuum pumps, baffles, gages, and partial pressure measuring devices are considered briefly; however, magnetic deflection mass spectrometers are neglected.

Ultrahigh vacuum technology, unfortunately, is given only a very limited (four pages) and sometimes misleading coverage. There is no mention, for example, of motion seals.

The second section, vacuum engineering, begins with 36 pages of detailed drawings and lists of specification of Leybold components. Much of this information can be put to good use in designing equipment. It is unfortunate that the authors felt it necessary to waste space by repeating five previous figures on flange design in this section.