

Book Reviews

Handbook of HeI Photoelectron Spectra of Fundamental Organic Molecules—Ionization Energies, Ab Initio Assignments, and Valence Electronic Structure for 200 Molecules. By K. Kimura, S. Katsumata, Y. Achiba, T. Yamazaki, and S. Iwata. Japan Scientific Societies Press, Tokyo, and Halsted Press, New York. 1981. VIII + 268 pp. \$39.95.

Photoelectron spectroscopy, invented 20 years ago, has been developed into one of the most powerful methods for real-time gas analysis in flow-systems (cf. the review in *Angew. Chem., Int. Ed. Engl.* 1981, 20, 427). Based on characteristic ionization patterns as molecular fingerprints, it allows one to determine low-temperature decomposition channels, to detect short-lived intermediates, and above all, to optimize (heterogeneously catalyzed) gas-phase reactions. Therefore, the excellent handbook on photoelectron spectra of over 200 basic and mostly organic chemicals—saturated and unsaturated, open-chain, and cyclic systems partly with substituents, such as halogen, OR, SR, NR₂ or functional groups such as COX, CN, NO₂, etc.—recorded under comparable conditions is a most valuable source of information for all industrial and academic researchers interested in an easy optimization of gas-phase reactions. In addition, all spectra have been assigned via Koopmans' correlation with ab initio calculations (431 and 631 basis sets, partly including different levels of configuration interaction): the accompanying tables and diagrams enlarge the usefulness of the collection to include spectroscopists, theoreticians, and all those who are involved in teaching the use of orbitals to describe certain facets of chemical bonding.

The book is superbly organized. It contains the necessary short introduction on the principle of measurement, instrumentation, and details of the calculations. The fair selection of spectra has been arranged from the chemist's point of view, i.e., compound type and functional groups. They are clearly indexed by name as well as by Chemical Abstracts sum formula. There are 231 literature quotations given for the spectra and 135 for calculations, respectively (some updating in the next edition would be appreciated). An extensive list of printing errors is attached.

Altogether this is a well conceived, perfectly arranged and most useful book, which will be of great help to further stimulate the use of photoelectron molecular fingerprints for real-time gas analysis in flow-systems.

Hans Bock, *University of Frankfurt*

The Chemical Physics of Solid Surfaces and Heterogeneous Catalysis. Volume 1. Clean Solid Surfaces. By J. M. Blakely, M. Eisenberg, D. P. Woodruff, J. E. Inglesfield, and B. W. Holland. Edited by D. A. King and D. P. Woodruff. Elsevier Scientific Publishing Co., New York and Amsterdam. 1981. 372 pp. \$112.25.

Studies of detailed two-dimensional reaction pathways on well-defined surfaces have opened a novel and presently world-wide actively pursued area of research in heterogeneous catalysis. This progress is largely based on the enormous achievements of surface physics within the last decade and especially the variety of sophisticated measurement techniques developed to characterize individual surfaces of single crystals and to study the adsorption and the chemisorption phenomena on these surfaces.

This book on "Clean Solid Surfaces" is the first volume out of a series of four (announced for 1982: Vol. 2 on "Adsorption at Solid Surfaces", Vol. 3 on "Chemisorption Systems", and Vol. 4 on "Fundamental Studies of Heterogeneous Catalysts"). Despite its outrageous price, which largely will prevent personal acquisition, it has to be recommended due to its well-written, richly illustrated presentation of the subject in terms of the individual phenomena and based on altogether 822 literature quotations, many of which are not easily accessible for the chemist.

The first chapter, on Morphology and Composition of Crystal Surfaces by J. M. Blakely and M. Eisenberg (Cornell University), starts with the notation for surface planes, introduces scattering principles as well as other surface measurement techniques, discusses the information obtainable, deals extensively with surface thermodynamics, and also includes the topic of surface morphology transitions.

The review on Surface Periodicity, Crystallography and Structure, written by editor, D. P. Woodruff (University of Warwick, G.B.), further

elaborates on both theory and results of electron diffraction techniques, such as LEED and RHEED (low energy and reflection high energy electron diffraction). Thermal effects are discussed and a survey of surface structures is supplied.

The topic Electrons on Surfaces, by J. E. Inglesfield (Science Research Council, Daresbury Laboratory, Warrington, G.B.) and B. W. Holland (University of Warwick, G.B.), accounts for half of the book (180 pages) and covers electronic structure and bonding at solid surfaces. Starting with wave functions of Hartree-Fock as well as Green type and surface potentials, correlation with experiment, e.g., work functions or photoemission data, are presented. Surface states and their density are elaborated upon and exemplified in the discussion of individual transition metal and semiconductor surfaces. Many-body effects presented include plasmons and exchange correlation energy.

Emphasizing the topical subjects covered and their relevance to many rapidly developing research areas, this first volume of "The Chemical Physics of Solid Surfaces and Heterogeneous Catalysis" should be of interest not only to the specialist working in the respective field, but also to a broader audience.

Hans Bock, *University of Frankfurt*

Organic Synthesis: Today and Tomorrow. Edited by Barry M. Trost and C. Richard Hutchinson (University of Wisconsin). Pergamon Press, New York. 1981. x + 354 pp. \$90.00.

"Organic Synthesis: Today and Tomorrow" details the many excellent lectures given at the 3rd IUPAC Symposium on Organic Synthesis held in June of 1980 at Madison, Wisconsin. The main focus of the symposium was on modern synthetic chemistry as divided into three areas: synthetic methods, the development of chemistry for the construction of molecular subassemblies, and finally the application of the first two in the total synthesis of organic molecules. The following listing of titles gives a flavor for the diversity and richness of the chemistry presented at the symposium: New and Selective Reactions and Reagents; Application of Some Polymer Supported Reagents to Organic Synthesis; Molecular Engineering: The Design and Synthesis of Catalysts for the Rapid 4-Electron Reduction of Molecular Oxygen to Water; Synthetic Applications of the Chemistry of Dicarboxyl Cyclopentadienyliron Complexes; Zirconium Reagents in Organic Synthesis; Arene-Metal Complexes in Organic Chemistry; Transition Metal Mediated Carbon-Carbon Bond Formations: A General, Partially Chemo-, Regio-, and Stereospecific Synthesis of Annelated Cyclohexadienes from Acyclic Starting Materials; Some Uses of Silicon Compounds in Organic Synthesis; New Strategic Methods for Synthesis; The Rich Chemistry of Vinyl Organoboranes; Synthesis of Polyether Antibiotics. Adjacent and Remote Asymmetric Induction via Cyclic Hydroboration; New Methods for Formation of Carbon-Carbon Bonds; New Reagents based on Heteroatom-Facilitated Lithiations; Synthesis and Reactions of Novel 3-Oxo-1,2-diazetidinium Ylides; Synthetic Studies Towards Calcimycin; Macrolide Synthesis: 6-Desoxyerythronolide B via Aldol Condensations; The Total Synthesis of Quadrone; Biomimetic Prenylation Reactions; Aspects of Carbocyclic Ring Formation and Modification; A Total Synthesis of Racemic Eriolanin; TXA₂ Structure. The Synthesis of Alternatives; New Methodologies Related to Prostaglandin Synthesis; Synthetic Studies in the Alkaloid Field; Chirally Selective Synthesis of Natural Products. The 10-Hydroxy Analogs of Dihydroquinine; An Approach to the Synthesis of Higher-Carbon Sugars; Carbohydrate Derivatives in the Asymmetric Synthesis of Natural Products; A Practicable Synthesis of Thienamycin; Approaches to the Synthesis of Topologically Spherical Molecules. Recent Advances in the Chemistry of Dodecahedrane.

The book's main assets are that it collects a great deal of excellent chemistry in a single volume and that much of the chemistry is described in more detail than it would be through normal publications. The book's main drawback is its hefty \$90 price tag.

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