principle, MO and VB descriptions of H_2, and theory of chromophores.

These six chapters provide a coherent and useful introduction to qualitative aspects of molecular spectroscopy and should make the subject intelligible to the neophyte. The main criticism is that on the whole the development could be more physically based. For example, the important example of splitting of states in benzene is attributed in a mysterious way (to the beginner) to symmetry instead of placing the blame squarely where it belongs—on electron repulsion interactions. Similarly, the treatment of intensities is too involved in MO computation of dipole transition moments instead of bringing out more forcefully the basic local selection rules at the atomic level, and how these tie in with the total symmetry properties. The discussion of chromophores and substitution effects are good and will go a long way to make wave length shifts between related compounds understandable to the beginner.

The next eight chapters (312 pages) deal with the spectra of complex organic molecules. A wealth of carefully selected illustrative spectra, tables of absorption wavelengths, and intensities are given, well tied in with the text. The conjugated diene, polyene, and polycyclic hydrocarbon chapters are particularly well written, containing summaries of many empirical regularities supported by tables and graphs. Theory and empirical regularity are nicely and lucidly tied together. The chapters on α, β unsaturated carbonyl compounds and heterocyclics are also well developed from the standpoint of empirical regularities of the spectra and accounting of $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ promotions. There are, in addition, detailed chapters on substituted hydrocarbon spectra, steric effects, organic ion and radical spectra, organic sulfur, phosphorus and halogen spectra, and a less detailed one on inorganic complexes. These provide a comprehensive and systematic discussion of electronic spectra of key classes of organic compounds (charge transfer spectra, both intermolecular and intramolecular, and alkyl halide spectra have been slighted, however). Because of the wealth of illustrative spectra and careful treatment of empirical regularities, these chapters will be useful to molecular spectroscopists as well as to chemists in general. The reviewer's principal criticism stems from the omissions (or lack of emphasis) in the nine introductory chapters. Since the authors have not emphasized local selection rules, they cannot give an adequate discussion of intensities in carbonyl or heterocyclic spectra. The important (to the chemist) spectroscopic moments are not discussed in sufficient detail to be useful to predict or discuss intensity effects on substitution, and thus spectroscopic evidence for expansion of valence shells in organometallic and halogen compounds is unmentioned. The lack of attention given to distinguishing zeroth and higher order configurational interaction in the early chapters leaves the energy level patterns of polycyclic hydrocarbons and sterically hindered molecules somewhat unclear. The 66 pages on steric effects fail to provide a basis for distinguishing between the spectra of *o,o'*-substituted dimethylanilines and *o,o'*-substituted anisoles, for example.

Two chapters (54 pages) on emission spectra (containing several errors) and on spectroscopic determination of equilibrium constants conclude the book. There is a good glossary and a set of character tables (not needed) in an appendix. The references are fairly extensive, but in some cases the reference where points were first covered is omitted.

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Inorganic Adduct Molecules of Oxo-Compounds. By INGVAR LINDQVIST, Uppsala, Sweden. Academic Press, Inc., 111 Fifth Avenue, New York 3, N. Y. 1963. 128 pp. 16 × 24 cm. Price, $6.50.

There have been instances where the publication of a critical summary or review of work in a field of investigation has led to a greatly increased rate of development of that field. This catalytic effect has resulted because the author collected relevant material from diverse sources, organized it, pointed out the places where data were sparse or missing, and suggested a tentative theory or theories which subsequent investigation would confirm or modify. It is very likely that Dr. Lindqvist has written in the present brief monograph such a review of molecular compounds formed by oxo-compounds acting as donors.

The book is concerned with molecular compounds (adducts) formed by the reaction of a donor molecule having an unshared pair of electrons with an acceptor molecule lacking a pair of electrons necessary to complete a stable octet or other stable grouping of electrons. However, the treatment is restricted to those molecular compounds where the donor molecule has an oxygen atom bound solely to a single atom of another element. The information, often arising only incidentally to other types of investigations, has been gathered from such diverse fields as studies in nonaqueous solvents, metal separations ($POCl_3$ addition products of $ZrCl_4$ and $HfCl_4$), and catalysis of organic reactions. After considering the conditions for adduct formation and the characteristic coordination numbers of various elements, the author presents tables of and brief comments about adducts with donor molecules containing the groups: $>C=O$, $RC(=O)$, $>NO$, $-NO_2$, $-N=O$, $>P=O$, $>As=O$, $>Sb=O$, $>S=O$, $>S(=O)_2$, and $>Se=O$ as well as adducts with SO_2 and SO_3. Then the author summarizes the results of studies of adduct molecules in the liquid state and in solution, affinity studies, structural data, charge distribution, decomposition, and catalytic activity. He concludes by rationalizing the experimental facts within a number of general aspects and by pointing out where additional data must be obtained to permit a truly theoretical treatment of the subject. The significance of this book is that it will make the task of future investigators easier by their having available a summary of the literature and a clear statement of the places where additional study will very likely yield results of real significance.

The book has some faults. While it has a table of contents, it has no subject index. The references are listed by year but not alphabetized within each year. Thus one may have some difficulty locating a subject after an initial reading. Although the author states why certain adducts were omitted, this reviewer feels that other references (like those to the work of A. F. O. Germann) were omitted which should have been included. The quality of workmanship of the publishers is excellent.

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Compound Semiconductors. Volume 1. Preparation of III–V Compounds. Edited by ROBERT K. WILLARDSON, Bell and Howell Research Center, Pasadena, California, and HARVEY L. GOERING, Battelle Memorial Institute, Columbus, Ohio. Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1963. xxii + 553 pp. 18 × 26 cm. Price, $25.00.

The American and English chemical literature contain very few comprehensive surveys dealing with the preparation of inorganic compounds. If one needs the information, there is always "Gmelin." The time when compounds were synthesized as an end in itself has long passed. This is even more true for the III–V compounds which are playing such a central role in semiconductor technology and solid state physics. Physicists and chemists who intend to study the electronic transport properties or the dislocation patterns in one of these binaries will usually obtain their crystals from commercial sources.

The present volume should rather be looked upon as a magnificent description of the state of the art (as of 1962) in that area often described as "crystal growth" (and its ramifications). This area is truly "interdisciplinary"; a host of chemical, metallurgical, crystallographic, and physical techniques has been brought to bear on the problem of manufacturing the most perfect single crystals. A large number of those techniques were learned during the "germanium-and-silicon" years (forties and early fifties). However, many of these methods have reached their present level of sophistication only through their application to the III–V compounds. Although the members of this family are quite a bit more complicated in their chemical and physical behavior than the group IV elements, our knowledge of their properties has attained an unusually high level in only 10 years. Hence the choice of the III–V binaries as an illustration of the different aspects of crystal growth is a happy one.

The editors of this book have decided to include the following subjects: chemical synthesis of the compounds, single crystal growth and zone melting, purification of the constituents, detection of impurities (by spectrochemical means, mass spectrometry, colorimetry, activation analysis, and electrical resistivity), thin films, surfaces, diffusion, segregation, crystal structure, and chemical bond, as well as thermodynamical properties (phase diagrams, heats of formation, etc.). Besides the compounds of Al, Ga, and In with P, As, and Sb, some attention is given to BP, AlN, and GaN. More than 60 authors from both sides of the Atlantic Ocean have contributed to this book.

This reviewer was particularly impressed by the cleavage studies of G. A. Wolf, the spark source mass spectrometer (R. Brown, R. D. Craig, and J. D. Waldron of A.E.I., Ltd., Eng.), the anisotropic segregation of impurities in InSb (Mullin), and the clean surfaces investigations of Larrabee and of Haneman. That the contributions are of course rather uneven in quantity and quality has become a cliche remark.

It is regrettable that this book contains no information concerning the preparation of p–n junctions and tunneling barriers. Al-