tains a reference to eq. 5, which apparently pertains to the source of the figure, rather than the present book.

To sum up, the book is likely to be of importance only to chemists interested in the solid state or in magnetochemistry at a sophisticated level.

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Advances in Inorganic Chemistry and Radiochemistry. Volume 5. Edited by H. J. EMELÉUS and A. G. SHARPE. Academic Press Inc., New York, N. Y. 1963. ix + 429 pp. 16 × 23.5 cm. Price, $14.50.

Each of the preceding volumes of this series contains several chapters of considerable interest to me, and now I eagerly look forward to examining each new volume in much the same way that I look forward to reading each new issue of *Inorganic Chemistry*. I have not been disappointed by this volume.

R. S. Nyholm and M. L. Tobe have written a short chapter on "The Stabilization of Oxidation States of the Transition Metals" in which about one-third of the space is spent on rather elementary considerations of energetics. A chapter by M. Schmeisser and K. Brändle rather thoroughly covers the chemistry and properties of "Oxides and Oxyfluorides of the Halogens." N. N. Greenwood reviews "The Chemistry of Gallium," particularly emphasizing low oxidation states, semiconducting binary compounds, structures, and organo compounds. I. G. Campbell has written on "Chemical Effects of Nuclear Activation in Gases and Liquids"; both bond rupture and bond formation (resulting from nuclear transformations) are discussed. O. Glemser and H. G. Wendlandt discuss "Gaseous Hydroxides"; most of this chapter is devoted to high-temperature studies of metallic hydroxides. E. K. Mellon and J. J. Lagowski have comprehensively summarized the chemistry and physical properties of "The Borazines." M. F. Hawthorne discusses a rapidly moving field: the chemistry of "Decaborane-14 and its Derivatives." R. F. Hudson correlates "The Structure and Reactivity of Organophosphorus Compounds."

Many chemists will want this volume on their bookshelves; all chemistry libraries should subscribe to the series.

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Technique of Inorganic Chemistry. Edited by H. B. JONASSEN and A. WEISSBERGER. Volume 2. **Nuclear Chemistry.** By NOAH R. JOHNSON, EUGENE EICHLER, and G. DAVIS O'KELLEY. John Wiley and Sons, Inc., Interscience Division, 605 Third Ave., New York 16, N. Y. 1963. xiv + 202 pp. 16 × 23 cm. Price, $8.00.

"Nuclear Chemistry" was written by three knowledgeable Oak Ridge scientists "principally for the student and research worker with little or no previous radioisotope experience." It is nonetheless true that, as anticipated by the authors, much of the information is of interest and value to experienced nuclear chemists. In particular, this book is designed to acquaint persons interested in using isotopes with the methods of the nuclear chemist, whose concern is the properties of the nuclei themselves. Experimental procedure, and especially modern innovations, are emphasized and are accompanied by sufficient discussion of underlying principles, plus mention of associated topics of interest. The authors have succeeded well; by careful study of this book, an experienced scientist can indeed equip himself adequately to select suitable isotopes for use as tracers, etc., and choose methods for their production and detection.

The nature of radioactive decay is taken up first, with stress on lifetime consideration, decay modes, and decay schemes. This section is logically followed by a discussion of the interactions of radiations with matter. Attention is then given to methods of producing and separating isotopes. Finally, a major portion of the book is devoted to the critical topic of detection and measurement of radioactivity and the associated problems of source preparation. "Nuclear Chemistry" was not intended as a textbook so no problem sets are included.

A really outstanding feature of the book is its bibliography, a careful screening of the voluminous material on the subject, but comprehensive to the purpose at hand. The practical aspects of radiation detection are especially well presented. The section on isotope production provides a clear view of how to select a suitable reaction to produce the isotope of interest, and the descriptions of special techniques and abnormal behavior associated with the production and chemistry of carrier-free radioelements furnishes adequate warning of the experimental pitfalls to be expected.

Any criticisms are minor. The person for whom this book was designed would undoubtedly have benefited from a brief discussion of counting statistics and their limits on the accuracy of experimental results. He might also have profited from a few more two-sentence hints about potential applications of nuclear phenomena, as was done for the Mössbauer effect, since the necessary groundwork was laid. The section on positrons seems to imply that a nucleus must muster a minimum energy of twice the electron mass, in accordance with Dirac theory, for β^+ decay to be possible, whereas the factor of $2m_0c^2$ is a result of basing energy calculations on atomic rather than nuclear masses. And finally, it's tough to have to pay $8.00 for a 202-page book, albeit such a very good one.

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Compound Semiconductors. Volume I. Preparation of III–V Compounds. Edited by ROBERT K. WILLARDSON and HARVEY L. GOERING. Reinhold Publishing Corporation, 430 Park Ave., New York 22, N. Y. 1963. xxii + 553 pp. 17 × 25 cm. Price, $25.00.

A chemistry book that costs 5¢ per page, when the standard rate runs about 2 to 3¢, must really be saying something worthwhile. This is a slick job, a work of art, evoking the Italian connoisseur edition of "Tutankhamen." When confronted with it, the ordinary chemist, the one without a fur-lined pocketbook, is likely to feel a sense of indignation. What are these publishers up to? Do they think we are made of money? Why should I buy *that?*

Aye, there's the rub! Because we need it. There is nothing quite like it and, once you get past the whopping price tag, you find a gold mine of original material on the structure, preparation, and properties of the III–V materials. It's all there: the design for a liquid helium resistivity probe with 0.013-in. wall 0.25-in. stainless steel tubing with four wireleads wrapped with Teflon and tape; the beautiful half-tone cut showing claw growth from poor seeds of GaAs; the 1:3 H_2O_2:tartaric acid recipe for an etchant for InSb with rate 0.05; 1172 items of a III–V bibliography; etc. The only thing that's missing is the advertising, which even our beloved *Inorganic Chemistry* accepts as a way to cut costs.

Over 60 authors have contributed to this work, in many cases reviewing areas in which they themselves have made notable research contributions. These areas have been grouped in ten sections; crystal structure and bonding, purification of the elements, detection of impurities, preparation of compounds, single crystal growth, thin films, diffusion, segregation, surfaces, and thermodynamic properties. Each of these sections is in turn composed of several independent articles, wherein each author cov-

ers his specialty. For, example, in the crystal growth section, we find: "Model Studies of Crystal Growth Phenomena" by R. C. Sangster; "Czochralski Technique" by R. Gremmelmaier; "Floating Zone" by W. P. Allred; "Gradient Freeze" by S. E. Miller; "Horizontal Zone Melting" by J. L. Richards; "Vapor Phase Reactions" by G. R. Antell; and "Dendritic Growth" by O. Lindberg and J. W. Faust, Jr.

The writing in the whole volume is immensely practical and corresponds roughly to the comprehension level of a chemistry major in his senior year of college. Perhaps more worthwhile is the fact that many of the articles are illustrated with exceptionally clear line-drawings of equipment.

This volume could well be placed in all solid state libraries. Unfortunately, its high price will exclude it from most individual collections. It is too bad that some device cannot be found whereby industrial corporations and research institutes could help subsidize publications such as these—perhaps in exchange for a page or two of recruitment information. As it stands, this book will probably not be seen by those who could use it the most.

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Vapour Pressure of the Elements. By AN. N. NESMEYANOV. Translated and edited by J. I. Carasso. Academic Press Inc., 111 Fifth Ave., New York 3, N. Y. 1963. vi + 469 pp. 16 × 24 cm. Price, $14.50.

This book, originally published in Russian in 1961, presents a review of methods for measuring vapor pressures and a detailed discussion of available vapor pressure data for the chemical elements, except for hydrogen, nitrogen, oxygen, and the inert gases. The translation is well done and the quality of the paper and of the printing are excellent.

Tables of most of the original data are given along with a critical evaluation. All of the available data plus a "best" choice are plotted on a log P *vs.* $1/T$ graph and utilized for preparation of reference tables giving pressures at 50° temperature intervals and temperatures at which certain pressures are attained. The data have been fitted to the equation $\log P_{mm} = A - B/T + CT + D \log T$, and the coefficients are tabulated. Heats of sublimation at 0 and 298°K. are presented but no thermodynamic functions are tabulated.

Since a number of reviews of thermodynamic properties of the elements, including vapor pressures, have recently been published,[1-4] one must ask how this book is unique. Obviously, it is already 3 years out of date and most of the elements for which no data were available in 1960 (Rh, Pd, Os, Ir, or Hf, for example) have now been well studied. There have been several other recent reviews of vapor pressure methods but probably nowhere else, in English, is such a thorough description (26 pages) of the isotope exchange method developed by Nesmeyanov and his associates. Many of the important modern developments are treated very briefly; for example, high temperature mass spectrometry is covered in one page.

An interesting comparison of ΔH°_{298} for sublimation as chosen by Nesmeyanov, by Stull and Sinke,[1] and by Honig[2] is given in Table III in the Appendix. Certain outstanding discrepancies pinpoint areas where further research is badly needed. For example, discrepancies among the selected heats of sublimation are 17–22 kcal./mole for Nb, 19 kcal./mole for Co, 20 kcal./mole for Ni, and 14 kcal./mole for Si even though each of these elements has been extensively studied. Low evaporation and/or condensation coefficients account for the problems and new work (1961–1963) has resolved some of these. Their mere existence in 1960 emphasizes the possibility of other major changes in heats of sublimation as refined experiments reveal more about the kinetics of evaporation and condensation. Differences of 2–5 kcal./mole are common (B, Al, Au, Sc, Bi, Se, etc.). Agreement among the three authorities to ±1 kcal./mole was found for about 40 elements. Widely discrepant estimates for Ra, At, Tc, and Pa are listed.

In summary, the book is mainly useful as a reference to the literature before 1960 or for vapor pressures as f(T) based on this literature. Equivalent recent references, written originally in English, are available and usually include complete thermodynamic functions as well as vapor pressures.

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(1) D. R. Stull and G. S. Sinke, "Thermodynamic Properties of the Elements," Advances in Chemistry Series, No. 18, American Chemical Society, Washington, D. C., 1956.

(2) R. M. Honig, *RCA Rev.*, **23**, 567 (1962).

(3) R. Hultgren, R. L. Orr, P. D. Anderson, and K. K. Kelley, "Selected Values of Thermodynamic Properties of Metals and Alloys," John Wiley and Sons, New York, N. Y., 1963.

(4) For selected elements, the JANAF Thermochemical Tables, D. R. Stull, Ed., The Dow Chemical Company, Midland, Mich.

Friedel-Crafts and Related Reactions. Volume I. General Aspects. Edited by GEORGE OLAH. John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1964. xxxiv + 1031 pp. 14.5 × 22.7 cm. Price, $29.50.

This book, the first of four volumes dealing with the Friedel–Crafts reaction, contains much that could be of interest to an inorganic chemist. The entire set is intended to be a comprehensive treatise on one of the more important organic reactions. The first volume, which is subtitled "General Aspects," is more concerned with solvents, catalysts, and their interaction with organic substrates than with preparative organic chemistry. Most of the descriptive organic chemistry is found in the second chapter in which the scope of the Friedel–Crafts reaction is defined. The editor, George Olah, has been very prolific, having authored or coauthored five of the thirteen chapters in this volume. His contributions greatly add to the continuity of this volume and also cover some of his own work on stable carbonium ions.

Since a Friedel–Crafts reaction is defined as taking place under the catalytic effect of a Lewis acid type acidic halide or proton acid, a considerable portion of this volume is devoted to Brønsted and Lewis acids. The subject is ably introduced in Chapter III by R. J. Gillespie, who has written an excellent short review on these two concepts of acidity. A comparison of the Brønsted and Lewis definitions of acidity is emphasized and pertinent examples are included. The behavior of Lewis acid metal halides in nonaqueous donor solvents is the subject of Chapter V. The question of solvation and/or ionization is carefully described and a comparison of the halide ion donor and acceptor strength of various metal halides is also included. Adduct formation between the trihalides of boron, aluminum, and gallium and a wide variety of Lewis bases is rather completely documented in Chapters VI and VII. The chapter entitled "Intermediate Complexes" by Olah collects together information on a large number of metal halide–organic substrate systems in which complexation has been observed. Typical organic substrates are acyl halides, alkyl and aryl halides, aromatics, olefins, and ketones or aldehydes. Structural information is given when available. The next chapter, which is on spectroscopic methods, describes the use of infrared spectroscopy in studying the structure of some acyl halide–metal halide complexes. A discussion of the identification of the nitronium ion in various systems by spectral methods is also included.

In general the book is well written and reasonably free from errors. The sections briefly mentioned above should be of value to inorganic chemists, especially those interested in adduct formation. References to the original literature are numerous.