TABLE I

INTERPLANAR d-SPACINGS (Å.) OF AN ERBIUM SESQUIOXIDE–BORON CARBIDE REACTION PRODUCT

d_{obsd}	ErB_{12} d_{calcd}	ErB_{12} (hkl)	ErB_4 d_{calcd}	ErB_4 (hkl)	d_{obsd}	ErB_{12} d_{calcd}	ErB_{12} (hkl)	ErB_4 d_{calcd}	ErB_4 (hkl)
5.019			5.000	110	1.670[a]	1.673	420	1.666	330
4.326	4.321	111			1.577			1.576	411
4.011			4.000	001	1.539			1.538	331
3.750	3.742	200			1.527	1.528	422		
3.538			3.536	200	1.490			1.490	312
3.161			3.162	210	1.440	1.440	333/511		
2.646	2.646	220	2.648	201	1.334			1.333	431
2.479			2.480	211				1.332	003
2.259	2.257	311			1.324	1.323	440		
2.236			2.236	310	1.312			1.313	520
2.161	2.160	222						1.310	511
2.121			2.120	221	1.302			1.301	412
2.000			1.999	002	1.280			1.280	332
1.952			1.951	311	1.265	1.265	531		
1.871	1.871	400			1.248	1.247	600	1.247	203
1.762			1.761	321	1.212			1.213	530
1.741			1.740	202	1.184	1.183	620		
1.714	1.716	331	1.715	410	1.161			1.160	531
1.689			1.689	212	1.142	1.141	533		

[a] Diffuse.

relationship between the stabilities of the hexaborides and the size of the metallic atom or ion might well exist.

Preliminary data seem to indicate that a correlation exists between the electronegativity of the lanthanon metals and the ease or difficulty encountered in the preparation of the corresponding hexaboride.

Acknowledgment.—The financial support of the U. S. Atomic Energy Commission is gratefully acknowledged.

DEPARTMENT OF CHEMISTRY
MICHIGAN STATE UNIVERSITY
EAST LANSING, MICHIGAN

GEORGE D. STURGEON
HARRY A. EICK

RECEIVED NOVEMBER 29, 1962

Book Reviews

Regular Solutions. By JOEL H. HILDEBRAND, University of California, Berkeley, California, and ROBERT L. SCOTT, University of California, Los Angeles, California. Prentice-Hall, Inc., Englewood Cliffs, N. J. (Prentice-Hall International Series in Chemistry), 1962. x + 180 pp. 15 × 23 cm. Price, $7.00.

Hildebrand published his first paper on solutions over four decades ago and since that time he and his collaborators have made outstanding contributions to our knowledge of solubility and of the properties of solutions. The results of the research from Hildebrand's laboratory have appeared in scientific journals and in three books, the most recent of which was entitled, "Solubility of Nonelectrolytes" (1950). The present monograph is a new book, quite different from the book written in 1950. The reader who compares the present volume with "Solubility of Nonelectrolytes" will find such topics as hydrogen bonding, high polymer solutions, and metallic solutions missing; the authors point out that the topics which are omitted are discussed adequately elsewhere.

The present volume, as the title states, is concerned only with regular solutions and is not concerned with the entire field of non-polar solutions. The authors define the term "regular solution" on p. 4 thus: "A regular solution is one involving no entropy change when a small amount of one of its components is transferred to it from an ideal solution of the same composition, the total volume remaining unchanged."

The monograph brings together under one cover the quantitative aspects of regular solutions. After a brief chapter explaining the regular solution concept, a short chapter on thermodynamic relations follows. The next eight chapters of the monograph deal with the topics of entropy of mixing, heat of mixing, volume changes on mixing, regular solutions of gases in liquids, regular solutions of solids, liquid–liquid mixtures, the liquid state, and intermolecular forces. The last chapter gives an appraisal of the present state of the regular solution theory; the chapter focuses attention on the conclusions which are based on substantial evidence and those problems still awaiting answers. Appendices contain tables of data and a supplement to the subject of solubility parameters.

The reader is struck with the wisdom of the senior author as he writes out of a background of a half-century of research and teaching; one is always aware of the care taken by the authors in testing a postulate or theory against the experimental evidence and that they are not led astray by the elegance of theory alone. It is a pleasure to read a book written by authors who have been major contributors to the subject about which they write and who have the gift of presenting their material clearly and concisely.

The monograph is well organized and the topics are developed in a logical sequence. The printing is of high quality and there are relatively few typographical errors or defective type. On p. 30, spacings in the words "hexadecane" and "degree" are imperfect; the abbreviation for *Comptes rendus* (*e.g.*, p. 12) is not in harmony with *Chemical Abstracts*; the abbreviation for *Chemical Reviews* is incorrect on p. 90. Figure 2.3 has no label on the ordinate. On p. 24, footnote number 13 is not referred to in the text. Hamann's name is misspelled in reference 15 on p. 74.

The authors have accomplished what they define as their goal. The one omission in literature coverage which would add to the value of the chapter on the liquid state concerns the experimental data available from X-ray studies of the liquid state. Some fine studies starting as early as 1938 and carrying through current literature would enhance, had they been cited and incorporated in the discussion, the consideration given to the liquid state.

The reader of the monograph is certainly to be rewarded; it is highly recommended to the novice as well as to those well versed in the field or related fields. One of the rewards in perusing the book will certainly be insight into new research ideas. The monograph can have many uses beyond those of scientists in their personal libraries. It could serve as a text for a seminar in the subject, or as supplementary reading in courses in physical chemistry, thermodynamics, and phase equilibrium.

DEPARTMENT OF CHEMISTRY
KENT STATE UNIVERSITY
KENT, OHIO
GLENN H. BROWN

Kinetics and Mechanism. Second Edition. By A. A. FROST and R. G. PEARSON. John Wiley and Sons, Inc., 440 Park Avenue South, New York, N. Y., 1961. 387 pp. 15.2 × 22.8 cm. Price, $11.00.

This book is a partial revision of the earlier edition (1953) with the same title. The main changes are additions of sections on polar reactions and pressure effects to the chapter on simple gas reactions (Chapter 6), and the inclusion of a new chapter (Chapter 11) on rapid reactions, to which has been transferred some of the material on flow reactions from the earlier book. The new chapter also includes a treatment of encounter-controlled reactions, and very brief descriptions of the techniques for studying very fast reactions. Otherwise the book remains essentially unaltered except for the use of a slightly more readable print.

In the opinion of this reviewer, this text continues to be the most satisfactory one on the market for use in a general introductory course in chemical kinetics. The emphasis is on mechanism determination, as the title implies, and this is the approach to kinetics which is unequivocally of value to all breeds of chemist. There are no errors of logic in the treatment, and only a few mechanical ones (such as the mistaken reference to eq. 46 on p. 47). One would hope that in the Third Edition, if such is contemplated, a more carefully thought out and systematically arranged treatment of reactions in solution (Chapter 7) could be developed. However, this is undoubtedly the least satisfactory aspect of modern reaction kinetics, and the textual inadequacy perhaps reflects only the experimental and theoretical shortcomings in this area. All in all, this is a good book, and can serve as a very suitable classroom text, if not as a comprehensive reference work.

DEPARTMENT OF CHEMISTRY
STATE UNIVERSITY OF NEW YORK
BUFFALO, NEW YORK
G. M. HARRIS

Hydrogen Compounds of the Group IV Elements. By F. G. A. STONE, Department of Chemistry, Harvard University, Cambridge, Massachusetts. Prentice-Hall, Inc., Englewood Cliffs, N. J., 1962. 112 pp. 16 × 24 cm. Price, Text Edition $3.95; Trade Edition $5.25.

In this monograph Dr. Stone has produced an interesting and easily read volume. This brief presentation of some recent research into the chemistry of the group IV hydrides should serve to stimulate interest and promote further work in this field. As an avowed critical survey of the field, however, it falls short of its mark. Mainly, it fails in this aim because it surveys the field in a rather cursory fashion and because there is a general lack of critical evaluation throughout.

As a result of these shortcomings the reader who intends to become well informed as to current research progress in this field could be misled. Thus, in the chapter entitled "General Considerations" a lengthy footnote is devoted to a description of the possible bonding in a compound reported by Fritz and Grobe as arising from the pyrolysis of tetramethylsilane and erroneously identified by these workers as 2,4,4-trimethyl-2,4-disila-2-pentene, which would possess a silicon–carbon double bond. A more complete and careful survey of the literature would have presented an earlier paper by Knoth and Lindsay describing the preparation of a compound with identical analysis and properties and properly identified as 1,1,3,3-tetramethyl-1,3-disilacyclobutane. Also exemplary of the casual nature of this survey is an instance where the characterization of potassium silyl is noted and reference made to recent work of Ring and Ritter, who isolated this most interesting compound. In this case there was failure to note the original preparation by Johnson and Isenberg, cited by Ring and Ritter in their paper. Similarly, in the discussion of methods of preparation of silanes, the reaction of silicon tetrachloride with lithium aluminum hydride to produce silane is noted and a statement made to the effect that the method can be extended to the preparation of Si_2H_6 and Si_3H_8 from Si_2Cl_6 and Si_3Cl_8, respectively. The preparation of Si_2H_6 by this reaction is described by Schlesinger and co-workers in one of the references cited by Dr. Stone, but this reviewer has been unable to find any reference in the literature to the preparation of Si_3H_8 by the reaction described. In fact, as far as we are able to determine, silane appears to be the sole volatile silicon hydride obtained when Si_3Cl_8 is treated with lithium aluminum hydride.

Where a satisfyingly complete survey is presented, such as the discussion of the various kinds of structural evidence for multiple bond character in silane derivatives, there is no evaluation of divergent points of view. While the reader is impressed with the author's neutrality some critical guidance would be appreciated and useful in a volume of this kind.

In summary, Dr. Stone, more reporter than critic, performs a useful function in gathering many references together in a highly readable form, while failing to produce a comprehensive or critical survey which would give confidence and guidance to a reader less well informed than Dr. Stone. The book is well worth the reading and the paucity of research effort, as indicated by the rapidly diminishing chapter size from "Germanes" to "Stannanes" to "Lead Hydrides," should act as a stimulant for the inorganic chemist desiring to do research in an uncluttered but highly interesting and significant field.

DEPARTMENT OF CHEMISTRY
PURDUE UNIVERSITY
LAFAYETTE, INDIANA
GRANT URRY

BOOKS RECEIVED

December 1, 1962–February 1, 1963

G. M. BARROW, "Introduction to Molecular Spectroscopy." McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York 36, N. Y. 1962. 313 pp. $11.75.

K. BIEMANN. "Mass Spectrometry." McGraw-Hill Series in Advanced Chemistry. McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York 36, N. Y. 1962. 360 pp. $13.75.

P. B. D. DE LA MARE AND W. KLYNE. "Progress in Stereochemistry." Volume 3. Butterworth Inc., 7235 Wisconsin Avenue, Washington 14, D. C. 1962. 376 pp. $13.50.

R. T. SANDERSON. "Teaching Chemistry with Models." D. Van Nostrand Co., Inc., 120 Alexander St., Princeton, N. J. 1962. 168 pp. $5.75.