

TABLE I

Values to be determined	Upper and lower limits, kcal./mole	Reactions by which upper and lower limits were obtained	Mean values, kcal./mole	Data obtained by the electron impact method
P_{H_2O}	171	$H_2O + C_2H_2^+ \not\rightarrow H_3O^+ + C_2H_2$	169 ¹	...
	167	$H_2O + H_2S^+ \rightarrow H_3O^+ + HS$		
$P_{CH_3OH^a}$	183	$CH_3OH + NH_3^+ \not\rightarrow CH_3OH_2^+ + NH_2$	180	...
	177	$CH_3OH^+ + H_2O \rightarrow CH_3OH_2^+ + OH$		
$P_{C_2H_5OH^a}$	202	$C_2H_5OH + C_6H_6^+ \not\rightarrow C_2H_5OH_2^+ + C_6H_5$	193	...
	185	$C_2H_5OH^+ + H_2O \rightarrow C_2H_6OH_2^+ + OH$		
$P_{H_2^a}$	79	$H_2 + C_2H_2 \not\rightarrow H_3^+ + C_2H$	70	...
	61	$H_2^+ + H_2 \rightarrow H_3^+ + H$		
$P_{CH_4^a}$	129	$CH_4^+ + H_2O \not\rightarrow CH_5^+ + OH$	122	...
	114	$CH_4^+ + CH_4 \rightarrow CH_5^+ + CH_3$		
$P_{C_2H_6^a}$	61	$C_2H_6 + H_2^+ \not\rightarrow C_2H_7^+ + H$	< 61	...
	...			
$P_{C_3H_8^a}$	61	$C_3H_8 + H_2^+ \not\rightarrow C_3H_9^+ + H$	< 61	...
	...			
$P_{C_2H_4^a}$	165	$C_2H_4^+ + C_3H_8 \not\rightarrow C_2H_5^+ + C_3H_7$	157	156.6 ⁴
	149	$C_2H_4 + C_3H_8^+ \rightarrow C_2H_5^+ + C_3H_7$		
$P_{C_3H_6^a}$	183	$C_3H_6 + NH_3^+ \not\rightarrow C_3H_7^+ + NH_2$	> 183	185 ¹
$D(C_2H-H)^a$	121	From spectroscopic data ³	> 116	...
	116	$H_2O + C_2H_2^+ \not\rightarrow H_3O^+ + C_2H$		
$D(C_2H_3-H)^a$...		> 97	> 96 ⁵
	97	$H_2O + C_2H_4^+ \not\rightarrow H_3O^+ + C_2H_3$		

^a Detailed results will be published in the near future.

affinity P or the dissociation energy D lies. If the bond dissociation energies and the ionization potentials are known, the proton affinity may be estimated; if the proton affinities are known, the dissociation energy D may be estimated. The values obtained by the authors are listed in Table I. Proton affinities for unsaturated compounds can also be measured by the electron impact method. The results of such measurements are quoted for comparison in Table I.

The determination of P_{CH_4} by this method as published in THIS JOURNAL² seems to be erroneous.

(2) F. W. Lampe and F. H. Field, THIS JOURNAL, **79**, 4244-4245 (1957).

(3) R. Cherton, *Bull. Soc. Sci. Liège*, **11**, 203 (1942).

(4) J. L. Franklin, *Trans. Faraday Soc.*, **48**, 443 (1952).

(5) T. Cottrell, "The Strengths of Chemical Bonds, London," 1954.

This is due to the fact that F. W. Lampe and F. H. Field failed to identify the CD_4H^+ in the ionized CD_4-H_2 mixture. On the other hand, our experiments have shown that CH_5^+ are formed in the ionization of CH_4-H_2 mixture. As can be seen from our data¹ Lampe and Field had not taken into account the fact that the cross sections for proton transfer may be as large as those for H transfer. Otherwise they would have seen their mistake, since if the reaction $CH_4 + H_2^+ \rightarrow CH_5^+ + H$ did not take place that would mean that $P_{CH_4} < 61$ kcal./mole and the method would not be self-consistent.

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BOOK REVIEWS

Progress in Semiconductors. Volume 1. ALAN F. GIBSON, B.Sc., Ph.D., General Editor, Prof. R. E. BURGESS, Vancouver, B.C., American Editor, and Prof. P. AIGRAIN, Paris, European Editor. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1956. vii + 220 pp. 15.5 × 23.5 cm. Price, \$8.00. **Volume 2.** vii + 280 pp. 16 × 24.5 cm. Price, \$10.50.

These are the first two of an annual series of volumes reviewing the general field of semiconductors. The editor points out in the preface to Volume 1 that about a thousand papers are published per year in this area, and has instigated this series as a means of helping semiconductor workers keep up-to-date. Each volume contains a number of review articles on some aspect of semiconductors (seven papers

in the first, eight in the second volume), by authorities from England, France, Canada, Switzerland and U.S.A. The subjects treated to date are: Recent Advances in Silicon, The Germanium Filament in Semiconductor Research, Theory of the Seebeck Effect in Semiconductors, The Electrical Properties of Phosphors, The Design of Transistors to Operate at High Frequencies, Photo-Magneto-Electric Effect in Semiconductors, Field Effect in Semiconductors (first volume) and Semiconductor Alloys, Properties of the III-V Compound Semiconductors, Radiation Effects in Semiconductors, Lifetimes of Free Electrons and Holes in Solids, The Production of High-Quality Germanium Single Crystals, Impurities in Germanium, High Electric Field Effects in Semiconductors, Theories of Electro-

luminescence (second volume). A total of 1005 references is given in the two volumes, each of which has a subject index containing about one hundred items.

The articles are not written for the casual reader, student or scientist working in another field. For example, the article on the design of high-frequency transistors does not explain how transistors work (although it presents a clear explanation of why they do *not* work at high frequencies). As is frequently the case in compilations of this sort, there is considerable variation in the level of difficulty, depth and mathematical detail. Some of the articles are probably comprehensible to all physicists, electrical engineers and chemists working in the field of semiconductors. Others, such as the excellent review of the theory of the Seebeck effect, probably would not be understood by one-tenth this number.

The articles seem to be carefully written and edited, and are as up-to-date as one could expect in a rapidly advancing field. There is no doubt that these volumes will improve the ability of most of us to keep abreast of developments in the whole area.

There is one criticism, however. For books which would make excellent bed-time reading, the type is extremely small (about 0.07 inch for a lower case letter) and the contrast is relatively poor. A lot more "brushing-up" in the evening would be done if the type were enlarged.

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Fortschritte der Physikalischen Chemie. Band 2. Edited by Prof. Dr. W. JOST, Göttingen. **Ausgewählte Moderne Trennverfahren zur Reinigung Organischer Stoffe.** By Dr. RER. NAT. H. RÖCK, Trostberg/Oberbayern. Verlag Dr. Dietrich Steinkopff, Holzhofallee 35, Darmstadt, Germany. 1957. vii + 169 pp. 15.5 × 23 cm. Price, DM 24, — —.

This little volume contains a concise description of the following methods for the separation of impurities from organic compounds: Zone-melting (Chpt. II), displacement and adsorption chromatography (liquids) (Chpt. III), gas-chromatography (Chpt. IV), and thermal diffusion in liquids (Chpt. V). The first chapter covers some general remarks concerning purification from the theoretical and practical point of view, such as the choice of method and the use of thermal analysis for the determination of purity. The fundamental physical and chemical principles are described briefly but clearly for each method by means of equations, tables and figures. The setup of the book is done in an expert and beautiful manner. Chemists interested in the purification of the materials they deal with will find this book a satisfactory starting point to the literature of the subject.

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Methoden zur Bestimmung pflanzlicher Wuchsstoffe. By HANS LINSENER, Dr. Phil., Privatdozent an der Technischen Hochschule und an der Hochschule für Bodenkultur, Wien; Leiter des Biologischen Laboratoriums der "Österreichische Stickstoffwerke Aktiengesellschaft, Linz, and OSWALD KIERMAYER, Dr. phil., Biologisches Laboratorium der Österreichische Stickstoffwerke Aktiengesellschaft, Linz. Springer-Verlag, Mölkerbastei 5, Wien 1, Austria. 1957. vii + 181 pp. 16 × 23.5 cm. Price, \$7.85.

Those who devote themselves to the study of naturally occurring hormonal substances are commonly beset with difficulties arising from the not inconsiderable tasks of isolation and determination of such potent chemical agents. Plant growth substances have been particularly difficult in this respect, and the student in this area must examine critically a vast and scattered international array of publications, if he is to be properly informed. In view of this situation, Drs. Linser and Kiermayer have done a genuine service to plant physiologists and biochemists in organizing this comprehensive work. In less than two hundred pages, all of the major methods both of chemical and biological

assay are presented in such concise, operational form that a novice to the study of auxins would experience no difficulty in learning what materials were needed and what procedures to follow. It does not follow, however, that this book is good for the raw beginner in biochemistry or experimental biology. It is, rather, a source-book for the advanced student or professional, whose general biological and chemical background is good. Part of the author's success in packing this small volume with a profusion of methods derives from a relative dearth of theoretical material; however, this book is far more than a bare compilation of recipes and procedures. To this reviewer, the inclusion of methods of historical interest is laudatory in that it contributes scope and perspective to an otherwise technical subject. Photographic reproductions, diagrams of apparatus, and graphical presentations are all excellently done and clearly described.

It should be pointed out that this book is uncritical in its presentation of a host of methods. For readers of adequate background, this does not constitute a serious limitation or objection. This book will be a valuable addition to the library of those who have an active interest in the physiology and biochemistry of plant growth.

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BOOKS RECEIVED

March 10, 1958–April 10, 1958

MILTON J. ALLEN. "Organic Electrode Processes." Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1958. 174 pp. \$6.50.

J. J. BIKERMAN. "Surface Chemistry. Theory and Applications." Second Edition, Revised and Enlarged. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1958. 501 pp. \$15.00.

DAVID F. BOLTZ, Editor. "Chemical Analysis." Volume VIII. "Colorimetric Determination of Nonmetals." Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1958. 372 pp. \$8.50.

JEROME FOX, Edited by. With the assistance of MARTHA CROWELL. "Proceedings of the Symposium on the Role of Solid State Phenomena in Electric Circuits. New York, N. Y. April 23, 24, 25, 1957." Volume VII. Sponsored by Polytechnic Institute of Brooklyn, Microwave Research Institute. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1957. 339 pp. \$5.00.

ROBERT KUNIN. "Ion Exchange Resins." Second Edition. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1958. 466 pp. \$11.00.

WILLIAM N. LACEY AND BRUCE H. SAGE. "Thermodynamics of One-Component Systems." Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1957. 376 pp. \$8.00.

GLYN ROBERTS, BEATRICE S. GALLAGHER AND R. NORMAN JONES. "Infrared Absorption Spectra of Steroids. An Atlas." Volume II. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1958. 478 pp. \$20.00.

KONRAD SAGEL. "Anleitungen für die Chemische Laboratoriumspraxis." Band VIII. "Tabellen zur Röntgenstrukturanalyse." Springer-Verlag, Reichpietscher 20, Berlin W 35, Germany. 1958. 204 pp. DM 28.—.

J. H. SCHULMAN, Edited by. "Surface Activity. Proceedings of the Second International Congress held in London, April, 1957." Volumes 1–4. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1958. Approx 1800 pp. \$50.00 per set. Non-subscription price: Vol. 1, \$15.00; Vol. 2, \$12.60; Vol. 3, \$16.80; Vol. 4, \$12.60.

IVOR SMITH, Edited by. "Chromatographic Techniques. Clinical and Biochemical Applications." Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1958. 309 pp. \$6.75.