

of authors totals 36. Considering this, the uniformity of quality and method of presentation has remained remarkably uniform and good.

Each article surveys for its particular specialty the experimental work which has been done and indicates its importance in the total understanding of solid state physics. The text is fast moving and the information density is very high as the necessary ideas and experimental methods of each subject are presented in order in clear language, with a minimum demand upon the readers' mathematical skills. References to the current literature are generously provided and could form the basis for additional reading.

The book could be used profitably by students of solid state physics quite early in their graduate training. Mature scientists with specialties in the other physical sciences or other branches of physics who wish to review the modern developments in this area should find this volume easy and profitable reading.

General experimental methods are covered. The details of experimental technique (which often make the difference between success and failure in an experiment) are not included. Readers seeking this information should look elsewhere.

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The Proton in Chemistry. The George Fisher Baker Non-Resident Lectureship in Chemistry at Cornell University. By R. P. BELL, Fellow of Balliol College and University Reader in Physical Chemistry, Oxford University. Cornell University Press, 124 Roberts Place, Ithaca, N. Y. 1959. vii + 223 pp. 16 × 24 cm. Price, 4.75.

This book is based on the lectures given by the author at Cornell University as George Fisher Baker Non-Resident Lecturer during 1958. The material covered complements that in "Acid-Base Catalysis" (Oxford, 1941). The author states that "Many of the theses which were argued in some detail in the earlier book now have become generally accepted, and the kinetic evidence obtained from catalyzed reactions has been supplemented by direct studies of acid-base reactions using a variety of modern techniques." An idea of the scope of the book may be obtained from the topics discussed: 1. Qualitative Nature of Acids and Bases, 2. Definition and Measurement of Acid-Base Strengths in Aqueous Solution, 3. Effect of the Solvent on Acid-Base Equilibria, 4. Thermodynamic Functions Relating to Acid-Base Equilibria, 5. Concentrated Solutions of Acids and Bases, 6. Acid-Base Strength and Molecular Structure, 7. Rates of Acid-Base Reactions, 8. Acid Base Catalysis, 9. Rates, Equilibria, and Structures in Acid-Base Reactions, 10. Isotope Effects in Acid-Base Reactions. The writing is lucid, concise, and well documented. The author has wisely omitted the terms "acid" and "base" from the title of this book because these terms are often used in a wider sense without reference to the proton.

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Advances in Chemical Physics. Volume II. Edited by I. PRIGOGINE, University of Brussels, Brussels, Belgium. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1959. ix + 412 pp. 16 × 23.5 cm. Price, \$11.50.

This is the second volume of a series whose expressed aim is to present personalized reviews of various topics, allowing the authors full scope to express their own views on the subjects discussed. It is natural that various writers will use this freedom in different ways; some will address themselves primarily to specialists in their own subjects, others will try to give more or less self-contained accounts which can serve as introductions to workers whose own interests are in other more or less closely related fields. Some of these essays can, indeed, serve the latter purpose, whereas others, either through predisposition on the part of the author or, perhaps, through a feeling of compulsion

toward brevity (even though the introduction states that there was no limitation of space), would seem to be of greater service to the specialist than to the general reader. All of the topics are of timely interest, and they are extremely varied as to content and method.

The volume begins with an article on "Clathrate Solutions," by J. H. Van der Waals and J. C. Platteeuw. This is a particularly interesting class of solutions of gases in crystals for which the usual methods and approximations of statistical mechanics work unusually well. A discussion is given of the theory and the article concludes with a detailed account of numerous experimental data. There follows an account of "Inter- and Intramolecular Forces and Molecular Polarizability," by Kenneth S. Pitzer. This is quite compressed, and the equations are not explained in sufficient detail for the article to serve as an introduction to the subject. It may, however, bring one already acquainted with the field up-to-date, and there are some useful tables. The next paper, by J. S. Rowlinson and M. J. Richardson, is on "The Solubility of Solids in Compressed Gases." It contains a readable introduction to the subject, and a collection of data on a considerable number of systems. (A reference to the point K was omitted in Fig. 1, and the text refers to the curve FO in Fig. 8, as EO, which could cause some momentary confusion.) The fourth article, "Thermodynamics of Metallic Solutions," by R. A. Oriani, brings out some of the difficulties of this theory, and shows that some of the assumptions of the order-disorder theory are invalid. It points to the desirability of further research in this subject. An article, "Recent Advances in Polymer Chemistry," by M. Szwarc, the most "chemical" paper in the collection, gives an account of various aspects of initiation, propagation and termination of polymerization reactions. "Nuclear Quadrupole Resonance in Irradiated Crystals," by Jules Duchesne, describes one of the newer methods of obtaining information on crystal imperfections. By far the most ambitious article in the collection is entitled, "Correlation Problem in Many-Electron Quantum Mechanics," by Per-Olov Löwdin. This deals with the interaction between electrons in atoms and molecules—the many-body problem, with special reference to chemical binding. In spite of the fact that this is the longest article in the volume, it appears to be compressed. Too many of the equations are merely quoted, and too much is taken for granted about the notation for it to be very readable for anyone not already more or less acquainted with the subject. Together with the following article by Hiroyuki Yoshizumi, which is a bibliography of the subject, it serves as a guide to the literature, so that the less experienced reader may find out what he has to learn and where he can find it; for the more experienced reader it will serve as an outline of the present state of the subject. The final article is by E. Bright Wilson, Jr., "The Problem of Barriers to Internal Rotation in Molecules." It discusses both the experimental methods for determining barrier heights, and the various theories concerning them.

Altogether the book offers a useful collection of review articles, which can instruct in many cases, and in any event can offer a guide to the field covered. This series of volumes should be in every chemical library, and in many cases will be valuable in personal libraries. Compared to the "Annual Reviews of Physical Chemistry," we may say that the volumes under review offer, in general, more coherent accounts of more specialized topics. It is probably to be expected that, over the years, "Annual Reviews" will give a more complete coverage of the literature.

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Struktur und Eigenschaften der Materie in Einzeldarstellungen. Band XXII. Elektron- und Ionenprozesse in Ionenkristallen mit Berücksichtigung Photochemischer Prozesse. By Professor DR. OSTAP STASIW, Institut für Kristallphysik Berlin-Adlershof. Springer-Verlag, Heidelberg Platz 3, Berlin-Wilmersdorf, Germany. 1959. viii + 307 pp. 16 × 23.5 cm. Price, DM. 66.—

Although it has a somewhat more comprehensive title, this book covers a less extended field than the now classic work of Mott and Gurney, "Electronic Processes in Ionic

Crystals" (1940). The book of Stasiw is not a complete survey of the subjects denoted by its title, but a more specialized account of photochemical processes in alkali and silver halides, to which some background information from related fields has been added. It is therefore not a suitable introductory treatment for the student of the physical chemistry of solids, but may be of use to workers in the special fields mentioned. Even here, however, the treatment ignores much modern work of importance, and concentrates on studies by relatively few German and Russian investigators.

Some specific criticisms may illustrate these points. (1) In the discussion of the energies of formation of defects, progress after about 1954 is neglected, including the recent calculations of Fumi and his co-workers. Similarly the discussion of the thermodynamics of defects makes no mention of the work of Kroger, and remains at a rather schematic and elementary level. (2) The section on diffusion processes omits any discussion of correlation factors and isotope effects, two of the most promising fields of current work leading to elucidation of mechanisms. (3) The electronic properties of oxide semiconductors are discussed without reference to Hall effect or thermoelectric data. (4) There is a ten page discussion of the theory of n.m.r. and e.p.r. as applied to defects, but virtually nothing on the important applications of these methods in elucidating the structures of specific defects and color centers in the alkali halides. These examples may indicate that the book is already somewhat out of date and cannot be regarded as a reliable guide to the fundamentals of its stated subject matter.

The book concludes with a long chapter of about sixty pages on the applications of quantum mechanics to the absorption spectra of defects in ionic crystals, following the work of Spicar and Davydov. This section is entirely theoretical, but the theory developed is not applied in any systematic way in the discussion of the experimental work given earlier in the book, nor does it lead to any comparisons with experiment in this chapter.

Another topic given unusually detailed treatment (40 pages) is the effect of various impurities on photochemical processes in silver halides. About forty-five pages are devoted to a similar discussion of the alkali halides. These sections contain much detailed information not collected elsewhere.

The volume is produced in the simple elegance that is typical of the Springer-Verlag, printing, illustrations and indexing being of customary perfection.

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The Chemistry of Plant Gums and Mucilages and Some Related Polysaccharides. ACS Monograph No. 141. By F. SMITH, Professor, Institute of Agriculture, University of Minnesota, St. Paul, Minn., and R. MONTGOMERY, Associate Professor, Department of Biochemistry, State University of Iowa, Iowa City, Iowa. Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1959. x + 627 pp. 16 × 23.5 cm. Price \$18.00.

Written by two eminent teachers and research workers, this monograph reflects the disciplines and critiques of the British Universities that fostered such men as Purdie, Haworth, Hirst and many other great chemists exploring

the structure of the carbohydrates. The present authors were nurtured in this same tradition. They have collaborated before, and their present volume is a highly successful one, clearly and interestingly written.

How does a mucilage differ from a gum? Apparently there is no clear line of demarcation, and no chemical basis exists for such a differentiation. Hence the reviewer will use the terms interchangeably. Certain resinous products (like "gum rosin," derived from the pines) find no place in the present volume, and this is as it should be. The true gums (or inucilages) are polysaccharides.

The monograph deals mostly with natural products obtained from many exudates, from seeds, roots, leaves, and from lichens, but it also includes a chapter on synthetic gums and gum derivatives. There is a very extensive chapter as well on the structures of polysaccharides derived from seaweeds.

An interesting map shows the origins of the more important gums, and a comprehensive review is given of their occurrence, isolation, detection, identification and physical properties. Separations of mixtures of polysaccharides are described, as well as their analysis and the methods used in determining their molecular weights. Chapters dealing with these areas are unusually well documented; for example, the one on analytical procedures includes 545 references. The chapter describing mixtures of polysaccharides gives discussions on fractional precipitations with various complexing agents, and on separations by means of chromatographic procedures, by enzymes that destroy undesirable components, by electrophoresis and ionophoresis, and by means of ultrafiltration. In this section more than 170 references are given.

Throughout, emphasis is placed on structural studies. An entire chapter is devoted to periodate oxidations; another deals with the separation and identification of cleavage products obtained from methylated gums. An interesting section describes the use of specific immunological reactions in determining the structures of certain mucilages. The book includes useful tables, some of which show what sugar units are present in purified gums, and, whenever possible, quantitative data are given. The methods used in making studies on the structure of the polysaccharides are described in detail, and nearly 400 structural formulas are included in the text.

Two appendices are of interest. One outlines the uses of various gums; the other gives the physical constants of methylated sugars and derivatives that have been isolated or formed in making structural studies of the gums, in the form of an extensive and very useful table. Specific references are given at the end of each chapter (or appendix); some of these are as late as 1959, but the older literature is also very well covered. Altogether there are over 2900 citations.

A very minor criticism involves the use of a separate "Formula Index," giving the formula number (as it occurs on a specific page in the text) and the name of the corresponding substance. The names could have been included equally well in the subject index itself.

This is probably the first comprehensive monograph on the subject of gums and mucilages, and it should remain the standard reference work for many years to come. It is an excellent book, which should be indispensable to those interested in basic studies on gums used in papermaking, adhesives, food products, pharmaceuticals, textiles, soil conditioners, and various emulsions.

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