

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 These examples may indicate that the book is already somewhat out of date and cannot be regarded as a reliable guide to the fundamentals of its stated subject matter.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 mucilages) 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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