BOOK REVIEWS

Phenolic Resins. By A. A. K. WHITEHOUSE, E. G. K. PRITCHETT, and G. BARNETT. Published for The Plastics Institute by Iliffe Books Ltd., London, and by American Elsevier Publishing Co., New York, 1968.

This little monograph (143 pages) represents an updating of a treatise first published in 1947 and reprinted as a second, revised edition in 1955. It is available for the first time to other than members of the Institute. One of the original authors (A. A. K. Whitehouse) was unable to participate in the latest revision and his place has been taken by Mr. G. Barnett.

The book is eminently readable and technically well produced. In its original form it was apparently a lucid and rather complete coverage of a complex field of chemistry. Unfortunately, the revisions or updatings, particularly the current one, appear to have been somewhat superficial. The coverage of the older literature, particularly the British and German authors, is good but much of contemporary American publications appears to have escaped the authors completely.

There have been two excellent recent reference works on this subject. One by R. W. Martin published in 1956 in U.S.A. (J. Wiley & Sons, N.Y.) and the second by N. J. L. Megson in England in 1958 (Butterworths, London). The latter is listed in the bibliography, although not referred to in any particular sense, while the former is ignored.

The book consists of seven chapters. Chapter 1 provides a very brief history of the subject prior to 1935. Chapter 2, by far the most extensive, deals with the "Constitution and Theory of Formation" of phenolic resins. This discussion is good but omits mention of the work of a number of modern authors. For example, the sections dealing with synthesis and structure of intermediates take no account of the various papers of W. J. Burke and his collaborators in U.S.A., and, when referring to chromatographic separation of intermediates, there is no mention of papers by S. Seto in Japan or J. Reese in Germany. Three pages are devoted to discussion of the kinetics of the phenol-formaldehyde addition reaction and determination of the rate constants by various secondary methods Yet, there is no mention of the direct determination of the rates of formation of the several methylolphenols by Freeman and Lewis, published in *J. Am. Chem. Soc.* as long ago as 1954, and reviewed in detail in at least two reference texts since.

Chapter 3 dealing with "Properties," is quite superficial. It contains only six references and only one of these was published subsequent to 1950. Notable omissions include the work of Bender and others on the reactivity of *ortho*-linked structures, papers by G. R. Sprengling on the acidity of *ortho*-linked phenols and methylol substituted phenols and papers on the subject of self plasticized phenolic resins by W. Brookes and by Freeman and Traynor.

Chapter 4 on "Complex Resins" discussess resinous products other than simple phenol or cresol-formaldehyde products. The chapter as a whole provides a useful quick overview (no topic receives more than a couple of pages) of the varied subject of modified phenolics, including varnishes, rubber, tannins, oil modifications, and ion exchange resins. It contains a fairly good coverage of the reference material up to 1947, but with little evidence of any updating since that time. A notable omission in the discussion of phenol-formaldehyde-olefin copolymers is the work of Sprengling regarding chroman ring formation with oleic acid and *ortho*-methylolphenols. All of the references subsequent to 1955 relate to the subjects of polycarbonates and phenylene oxide polymers which are included

under the phenolic resin category because their precursor is a phenolic compound, even though the traditional reaction with formaldehyde is not involved.

Chapter 6 provides a useful and interesting summary of manufacturing procedures, raw materials and test methods, while Chapter 7 contains a description of the many end applications of this well diversified polymer family. These are particularly helpful to the novice becoming acquainted with the subject. Chapter 5, "Epoxide Resins," has been added by the authors as a quick rundown (9 pages) of this very broad subject because of its relation as a derivative of a phenolic substance. Only a cursory treatment of the subject is possible and only the bisphenol-A polymers receive more than passing mention.

In summary: this is a highly readable treatment of an historically complex subject. It will be useful as a starting point for the novice in the polymer laboratory or as an introductory text for a beginner survey course in college chemistry dealing with "plastics." It is definitely not intended for the serious student of the subject nor as an exhaustive up-to-date reference source.

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