

cyanines without the burdensome necessity of consulting original sources.

In a preface the author states that "emphasis has been laid on the preparative methods rather than on the theoretical aspects of the subject." The cyanine specialist will find this is indeed the case, for Dr. Hamer, a distinguished contributor to the subject over many years, has chosen to include all the considerable number of dye types in a manner reminiscent of Beilstein. The book is thus of great value as a reference source.

For a presentation of the "theoretical aspects" of the subject, the book cannot be recommended, however, as the author indicated, for although many separate themes are presented, little attempt has been made to combine them into a coherent whole.

A generous vote of thanks is owed to Dr. Hamer by the cyanine and heterocyclic fraternity for the accomplishment of a useful but formidable task undertaken at the close of a long and active career in the laboratory. The book will be of less interest to the general reader, however, for whom a lucid and concise account of these interesting dyes has still to appear.

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Identification of Materials via Physical Properties, Chemical Tests, and Microscopy. By A. A. BENEDETTI-PICHLER, Queens College of the University of the City of New York. Academic Press, Inc., 111 Fifth Ave., New York 3, N. Y. 1964. xi + 492 pp. 17 × 25 cm. Price, \$18.00.

The practice of modern chemistry frequently requires the identification of unknown materials ranging from sediment in pharmaceutical preparations to matter under the fingernails of a corpse. The book under discussion describes techniques, both macro and micro, for the systematic investigation of specimens and emphasizes the necessity for acute reasoning that continuously weighs all accumulating evidence. The content of the book is heavily weighted toward micro procedures—a well-justified arrangement.

Following a general introduction which outlines principles and limitations, there is a section on the use of the chemical microscope with its polarizing attachments (45 pp.). Then there is a detailed description of the techniques employable for handling samples on the gram, centigram, milligram, and microgram scales (160 pp.). At this point the author outlines various approaches which may be used in deriving maximum information with minimum destruction of material and the development of leads which will determine the further course of the investigation. Both organic and inorganic materials are treated (96 pp.).

The last major section of the book is devoted to descriptions of confirmatory tests for various elements and a systematic scheme for the detection of cations and anions (103 pp.). The Appendix contains useful tables of such things as melting points of inorganic materials in order of increasing temperatures; crystal systems of certain substances; compounds which sublime, explode with heat, ignite with heat, etc. An extensive bibliography is furnished at the end of the book.

This book is designed for self-instruction of readers and as possibly the basis for a laboratory course. It contains many illustrative experiments. The author's 40 years of experience are of great advantage in the accumulation of such great detail as is presented in this volume.

The most prominent deficiency of the book lies in the section on the use of the microscope. The discussion of the immersion method for determination of index of refraction of solids (pp. 39–41) makes no mention of the fact that most solids display more than one refractive index and that the method described would only apply to isotropic crystals. The section devoted to polarized light is so concentrated and heavily written as to be essentially useless to a beginner. The use of terms such as pleochroism, goniometer, slow component, α , β , γ (indices), Ramsden disk, etc., without any definitions, can only frustrate the reader. In the discussion on polarization colors, it would be helpful to include a statement to the effect that the end of each color order is located at the higher-order edge of the red band. To attempt to gather useful information from

the observation of interference figures without knowledge of orientation (p. 62) would be foolhardy. The important phenomenon of polymorphism is mentioned briefly on pages 64 and 271 but not called by name.

The other sections of the book cover their subjects quite well, and the techniques described should be extremely useful to the laboratory chemist even though he may not be working strictly on unknown materials.

There are a number of areas where the editor might well have produced a more tidy book. He should have corrected such oversights as "Fusions perform in crucibles of..." (p. 70), "vertical" instead of "perpendicular" (pp. 60 and 75), "...the latter is fused while observing through the microscope" (p. 205), "with the raser of a pencil" (p. 151), etc. Manuscript notations appear at the bottom of the first and second pages of each signature of the book.

There is certainly a wealth of useful information in the volume under discussion, and it is worthy of high recommendation if the uninitiated reader will refer to other sources for a more useful introduction to the polarizing microscope.

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Infrared Spectroscopy of High Polymers. By RUDOLF ZBINDEN, Pioneering Research Division, Textile Fibers Dept., E. I. du Pont de Nemours and Co., Inc., Wilmington, Del. Academic Press, Inc., 111 Fifth Ave., New York 3, N. Y. 1964. xii + 264 pp. 16 × 24 cm. Price, \$9.50.

This book is recommended to those who like to use infrared spectroscopy as one of their tools for polymer research. The material is also suited for discussion in an introductory course on molecular spectroscopy.

In Chapter II the group theory and its application to polymer spectra were discussed. The description is brief but it is enough to illustrate how the observed spectrum of a crystalline polymer can be analyzed. Two examples were given in this chapter. It is no doubt that polyethylene should be chosen as the first example. The second example, the spectrum of polyhydroxymethylene, is new and interesting. Since both of the polymers have a planar zig-zag backbone, it would be helpful if another example on the spectrum of helical polymer were given.

In Chapter V the important topic on the polarized spectra of oriented polymers was discussed. There are several review papers on this topic, but the present chapter gives the problem a much more detailed and systematic consideration. Some experimental problems and sources for errors in dichroic ratio measurements were discussed first, and then the expected dichroic ratios for various types of orientation were calculated. Examples on quantitative measurements were given. This chapter will be helpful to everyone interested in using polarized infrared radiation.

Other topics discussed in the book are as follows. In the discussions of crystallinity and analytical applications given in Chapter I, pertinent examples were given. Some figures in this part may be improved if the book is going to be printed again. The skeletal vibrations and the vibrational interaction in chain molecules, discussed, respectively, in Chapters III and IV, are of fundamental interest. Since the calculations were based on rather simplified models, the calculated frequencies may not be used for analytical purpose without caution. Those who are interested in normal coordinate analysis of high polymers may wish to see skeletal vibrations of helical polymers and somewhat detailed treatment on polyethylene to be included in the book.

In the appendix, the guide to the literature of individual polymers is listed. The list is quite complete and it is certainly a helpful collection. From the large number of references listed, it is indicated that there is room for additional chapters to the present book, or another volume to review and to make detailed discussions on the spectra of individual polymers or groups of polymers.

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