BOOKS

Pigment Handbook, Temple C. Patton (ed.), Interscience, New York, London, Sidney, Toronto (1973). Three-vol. set—$150.00.

Vol. 1 Properties and Economics, 985 pages.
Vol. 2 Applications and Markets, 455 pages.
Vol. 3 Characterization and Physical Relationships, 538 pages.

Volume 1 gives an exhaustive review of the economics, historical background, major reasons for use, and manufacturing methods for various classes of pigments including the following: white primary, extenders, inorganic and organic colored, black, metallic, anticorrosive, pearlescent, luminescent, antifouling, mold control, molecular sieve, food and cosmetic pigments.

The nearest similar coverage of pigments of which this reviewer is aware is Volume II of *Protective and Decorative Coolings,* J. J. Mattiello, Editor, Wiley, 1942. Patton's *Handbook* gives a more complete coverage than Mattiello's and includes many new and unusual classes. Particularly noteworthy are the discussion of aluminum and copper flake pigments, natural and synthetic pearl essence, luminescent and fluorescent pigments, Day-Glo colors, thermographic and the infra-red quenching pigments used during World War II in Snooper Scopes and at present for aerial photography and product identification. Particularly useful are extensive bibliographies after each chapter in all three volumes and identification of the current manufacturers of each of the pigments.

Electron photomicrographs, scanning electron photomicrographs, and regular photomicrographs of many of the pigments are given. These would be more useful to a technologist interested in product identification if they could be grouped together in some way and were all taken under the same conditions. There are no color plates in any of the volumes showing the mass tone color of the various colored pigments or their tint color when let down with titanium dioxide. I assume that color plates were omitted because of their cost, but they would be useful in pigment selection. Another useful addition would be a table comparing various properties of the different pigments such as permanence to light, bleeding, resistance to heat, alkali resistance, hiding power, density, and approximate price. This information is available in the handbook but only in the individual chapters by various authors in the section of the chapters listing typical properties. The editor has been successful in maintaining a uniform format for the various chapters in spite of the diverse authorship.

Volume 2, *Application and Markets,* has chapters on masonry coatings, automotive paints, coil coatings, marine paints, structural steel coatings, paints for nonferrous metals and Trade Sales Paints for wood substrates as well as many unusual specialties. Particularly noteworthy and unusual are chapters on electrocoating pigmentation of markers such as crayons and pencils, pigmentation of magnetic tapes, textile printing, and pigmentation of ceramics and glass.

Salient chapters in Volume 3 are an extensive discussion by H. S. Ritter of the surface properties of titanium dioxide, including a clear explanation of zeta potential, its significance in dispersions, and how it can be modified. Another excellent chapter is the one by Ruth M. Johnston on color theory including a good discussion of the Munsell system, tristimulus matching, metamerism, and Kubelka-Munk theory. The bibliography for this chapter has 119 references. The chapter by Parker B. Milton on opacity hiding power and tinting strength is also a very thorough and exhaustive treatise with 91 references in the bibliography and discussion of Kubelka-Munk theory relative to opacity. Other good chapters in Volume 3 are those on the nature measurement and characterization of pigment particles and pigment dispersions, pigment surface characteristics, and pigment dispersion and rheology.

The *Pigment Handbook* is a significant contribution to the literature on pigments and their uses in coatings, rubber, plastics, textiles, and ceramics. A copy should be available in the library of anyone concerned with the formulation of products containing pigments. It will be useful to the technician interested in pigment selection as well as to the chemical engineer interested in color theory, hiding power, and dispersion forces.

JOHN B. GREGORY
CHEM. ENG. DEPARTMENT
DYNATECH R/D COMPANY
CAMBRIDGE, MASSACHUSETTS 02139

Process Optimization, With Applications in Metallurgy and Chemical Engineering, W. H. Ray and J. Szekely, Wiley, New York (1973). 371 pages. $19.95.

This book provides a good broad-stroked introduction to process optimization. The authors set out to write a book to introduce the applied aspects of process optimization to chemical and metallurgical engineers and, at the same time, to provide a ready interface with process modeling which they rightly recognize as being vitally important in practical applications. In order to encompass the broad range of topics in a relatively compact volume, the material is presented as a tool box of computing techniques with a brief sketch of theory followed by one or more illustrative examples. By and large, this approach has succeeded very well, although inevitably the coverage is rather thin at places. For instance, an average reader would probably not gain much insight from the brief discussion of duality in Chapter 2. As a senior or graduate level textbook, instructors may find it necessary to supplement the text with selected reading assignments drawn from the references at the end of each chapter. But the readers will share the intimacy and excitement of the many examples taken directly from the authors' own investigations.

After an excellent introduction of the morphology of the subject, the necessary conditions for optima are developed in Chapter 2. The conditions are used in many worked examples throughout the subsequent chapters. Unconstrained and constrained optimization are treated in Chapters 3 and 4. The material covered in these two chapters is now classic, but brief discussions with references at the end of appropriate sections help to bring to the readers the more recent developments. Chapter 5 discusses techniques for exploiting problem structure in optimization. Both serially structured systems and multilevel optimization are covered in this chapter. A surprising omission is the reference to graph theory-based decomposition techniques, particularly since the very example used in Section 5.6 has in fact been analyzed from that viewpoint in chemical engineering literature.

Chapters 6 and 7 cover trajectory optimization of lumped and distributed parameter systems. This material treated is often omitted in senior un-