

Book review

Organic Coatings Science and Technology

2nd ed., Zeno W. Wicks, Jr., Frank N. Jones, S. Peter Pappas; Wiley-Interscience, New York, 630 pages hardback, ISBN 0-471-24507-0, £80.95

It is always delightful to come across books on surface coatings, simply because of their relative rarity. This particular book, as explained by the authors, was written primarily as a textbook for undergraduate courses in surface coatings science and technology.

This book is the second edition of the previous, two-volume edition of the same title. In comparison to the previous edition, it is clear that extensive updating and re-writing has been undertaken. Also, the second edition benefits from the inclusion of a greater number of references, making it useful even for the more experienced surface coatings scientist and technologist.

The book covers most areas of relevance to surface coatings science and technology, although the depth of coverage of any individual area is not especially great. However, the authors have included a large number of references for readers who wish to research specific aspects covered within the book; as such, the book is of high value as reference.

This edition comprises a total of 33 chapters, each of which deals with a distinct area of surface coatings science and technology. The book begins with a definition of coating which sets the scene for the discussion of organic coatings, which are more widely known as surface coatings in Europe. This is followed by six chapters that concern with various properties of surface coatings, namely *Film formation properties*, *Flow properties*, *Mechanical properties*, *Exterior durability*, *Adhesion properties* and *Anticorrosion properties*. In each of these chapters, the authors detail the contributions that

chemical and physico-chemical factors make to the above-mentioned surface coatings properties. Test methods for the evaluation of these coatings properties are also included in each relevant chapter. For the convenience of readers who are not familiar with polymer science, the authors have considerably provided a detailed introduction to polymers and polymerisation.

The authors then discuss the various resin precursors that are commonly used in surface coating systems, in nine chapters that are entitled *Latexes*, *Amino resins*, *Binders based on isocyanates*, *polyurethanes*, *Epoxy and phenolic resins*, *Acrylic resins*, *Polyester resins*, *Drying oils*, *Alkyd resins* and *Other resins and cross-linkers*, respectively. Once again, the authors present a comprehensive description of the fundamental chemistry relevant to the synthesis of each of these resin precursor systems. However, readers would need at least college-level organic chemistry in order to fully appreciate these chapters.

One chapter is then dedicated to solvents, in which the concepts of solubility parameter, rate of solvent evaporation and solvent viscosity effects, together with their significance in surface coatings formulation and applications, are discussed.

Before moving on to the topic of colorants and coloration (i.e. pigments and pigment dispersion) the authors introduce colour and appearance, in particular the creation of colour, the measurement of colour and gloss and the matching of colours. In a chapter entitled *Pigments*, the authors introduce pigments of five colour groups, namely white, yellow and orange, red, blue and black, together with metallic and interference pigments. Surface coatings students of non-colour chemistry background should find this chapter particularly helpful in the context of the selection of suitable pigments for coatings formulations.

The book also provides a brief introduction to the fundamental, physical chemical mechanisms of pigment dispersion and the principles of formulating millbase in one chapter. The authors also furnish brief descriptions of various types of dispersion machinery, including high-speed disk dispersers, ball mills, media mills, two- and three-roll mills and extruders. These descriptions also include commentary on the appropriate dispersion mechanisms and the application of each type of dispersion machinery; in the same chapter, methods to evaluate the degree of dispersion are also introduced.

Upon the completion of their discussions on pigment dispersion, it was logical for the authors to move on to discuss various methods of coatings application. Hence, factors influencing the choice of brush, pad, roller, spray, dip, flow or curtain coating methods are detailed. Discussions of the physico-chemical mechanisms of coating film defects, such as sagging, crawling, cratering, floating, flooding, wrinkling, blistering and popping then follow.

The authors have placed considerable emphasis on the principles of formulating several types of surface coatings system. In this context, a total of nine chapters are dedicated to *Solvent-borne and high solid coatings*, *Water-borne coatings*, *Electro-deposition coatings*, *Powder coating*, *Radiation cure coatings*, *Product coatings for metal substrates*, *Product coatings for non-metallic substrates*, *Architectural coatings* and *Special purpose coatings*. Surface coatings formulators should find these chapters particularly useful.

It is interesting to note that the authors include a chapter entitled *Perspectives on coating design*, clearly to emphasise both the importance and the challenging nature of formulating effective surface coatings. Beginners in surface coatings formulation will find the design strategies which are outlined in this particular chapter of value.

The appendix provides a list of useful books, journals and encyclopaedias that are relevant to

surface coatings; a listing of coatings conferences, conventions, symposia and electronic sources are also included.

There are several aspects of this book which could be improved. Firstly, it is a little disappointing to find that the authors did not discuss, in sufficient detail, the rheological aspects of surface coatings, which is of great importance to coatings application properties. Secondly, neither the inter-molecular/particulate nor the intra-molecular/particulate forces, as exemplified by the van der Waals forces and the liquid bridge force, which are so important for the understanding of pigment dispersion, were not dealt with in sufficient detail. Finally, throughout the book, the authors use the term 'resin' as a synonym of 'binder', clearly following industry tradition. The recent version of the *Oxford Dictionary* has expanded the definition of "resin" to cover "now usually, any of a large and varied class of synthetic organic polymers (solid or liquid)". In this context, perhaps the term 'resin precursor' would be more accurate, in most cases.

The more experienced surface coatings formulator may also find the book more desirable if it included detailed information on pigment concentrates and on universal pigment concentrates.

Nevertheless, the book will prove to be of outstanding value to the majority of those working in the area of surface coatings. Postgraduate students and advanced undergraduates of surface coatings science and technology will find the book a useful reference tool. I would also recommend the book to those seeking a working knowledge of surface coatings science and technology.

Long Lin

*Lecturer in Surface Coatings
Chemistry and Technology,*

*Department of Colour Chemistry, The University,
Leeds LS2 9JT, UK*

E-mail address: l.lin@leeds.ac.uk.