

## Book review

### Colour Chemistry, R.M. Christie

Despite the current availability of a number of excellent introductory and intermediate level texts related to the chemistry of coloured compounds, the author has provided us with an excellent monologue of contemporary colour chemistry that fills a void in the open literature. No other book is available that provides a broad overview of key colour chemistry topics at a relatively low cost. While a cursory review of the contents page suggests a very broad overview of key topics within the field of colour chemistry, only critical aspects of each topic are presented. The lucid, no-frills style employed ensures that the relatively inexperienced colour chemist will be able to comprehend easily the subject matter and ideally will be motivated to search for more in-depth information about one or more topics covered in each chapter.

The text is essentially structured into three main parts: introduction and key principles of colour formation, colorant synthesis and molecular structural characteristics, and colorant application and environmental chemistry. Comprehensive and consistent cross-referencing throughout enhances the utility of the text as a general introductory reference book.

Chapter 1 neatly establishes the general scope of the book with a brief historical perspective of the emergence of synthetic dye chemistry and highlights the impact that this field has had—and continues to have—on industrial organic chemistry. After presenting the essential requirements for visible light to be perceived as colour by the human eye in chapter two, the author describes the key physical and chemical basis for colour in molecules, and

provides a particularly effective overview of colour and constitution in organic molecules in terms of valence bond theory and molecular orbital approaches. However, many readers will no doubt require additional background information to develop a full appreciation of the methodologies used in the latter.

Chapters 3–6 describe the fundamental principles behind the synthesis of all the major chemical classes of colorants. Christie approximately weights the level of detail to the industrial significance of each chemical class, and consequently first discusses azo dyes and pigments (Chapter 3), and then carbonyl based dyes and pigments (Chapter 4). In Chapter 3, key principles involving the isomerism in azo dyes are discussed and a detailed summary of diazotisation and coupling reactions is presented, including the associated reaction mechanisms. Chapter 4 focuses mainly on anthraquinone and indigoid chemistry, and includes the chemistry of dyes and pigments within these families. Also included in this section are the benzodifuranone, diketopyrrolopyrrole, quinacridone, and perylene colorants. The commercial significance of phthalocyanine colorants is highlighted, by dedicating a separate chapter to this chemical class (Chapter 5). In Chapter 6, the chemistry of a number of miscellaneous chemical classes, including polyenes, polymethines, arylcarbonium ions, dioxazines, sulfur and nitro dyes, is presented. In addition, strategies for preparing complex polyazo compounds and metal complexation are provided.

In the later chapters of this book, the chemistry and technology associated with the application of various colorants is covered. No doubt due to the historical and current importance of dyes for

textile applications, chapters seven and eight are dedicated to this end use, with Chapter 8 focusing solely on the important field of fibre-reactive dyes. Although the chemistry of pigments is covered in some detail in earlier chapters, the author dedicates Chapter 9 to these insoluble colorants and uses the chapter to introduce inorganic pigments. Some key structural features of the most commercially important organic pigments are presented, including the so-called high performance pigments and pigments that produce special effects such as pearlescence and fluorescence.

An interesting growth area in colorant chemistry in recent years involves colorants that are utilized for 'high-tech applications', such as dyes and pigments for liquid crystal displays, lasers, solar energy converters, infra-red absorption, and photo-dynamic therapy. Dyes for these application areas are discussed briefly in chapter ten, as well as dyes for electrophotographic applications and ink-jet printing.

*Colour Chemistry* is concluded with a short chapter on the environmental and occupational impact of colored compounds. The author weaves some of the chemistry discussed in earlier chapters into this now critical aspect of all fields of colour technology. By leaving the chemist with this topic, the author encourages the reader to think of environmental responsibility when considering the design, synthesis and application of colorants in future research and study.

For a text to be used effectively as a resource a comprehensive index and bibliography is critical, even for a relatively short volume. Thoughtful

consideration to the index was clearly given, with most technical phrases and terms being cross-referenced comprehensively (although a few words such as crystallochromy, page 82, and diazoacetoacetanilide, page 162 were not indexed). However, in a world of comprehensive Internet searching tools, it is probably unnecessary to have an exhaustive referencing system for a general book.

The level and scope of this book is aimed at either the university student (advanced undergraduate or early post-graduate), or the scientist who requires an overview of the chemical principles of dyes and pigments. The book would probably be less useful to readers who do not fall into either of these categories. University and college libraries should certainly have the book in their inventory. In addition to having important content, its reasonable price means that this book could serve as a text for university courses in colorant chemistry at either the advanced undergraduate or Master of Science level, with the prerequisite of a sufficient level of understanding of organic chemistry. Indeed, this reviewer would encourage its use in colour chemistry related courses taught in his department.

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