



Molecular Crystals and Liquid Crystals Science and Technology. Section A. Molecular Crystals and Liquid Crystals

Publication details, including instructions for authors and
subscription information:

<http://www.tandfonline.com/loi/gmcl19>

Book reviews

Bart Kahr^a, Andreas Skiebe^b & Andreas Hirsch^b

^a University of Tübingen Institute of Organic Chemistry II,
Tübingen, Germany

^b Department of Chemistry, Purdue University, West Lafayette,
Indiana, 47907-1393

Version of record first published: 23 Sep 2006.

To cite this article: Bart Kahr, Andreas Skiebe & Andreas Hirsch (1994): Book reviews, Molecular Crystals and Liquid Crystals Science and Technology. Section A. Molecular Crystals and Liquid Crystals, 257:1, 295-299

To link to this article: <http://dx.doi.org/10.1080/10587259408033787>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.tandfonline.com/page/terms-and-conditions>

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae, and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand, or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

Phthalocyanines: Properties and Applications, Volume 2, edited by C. C. Leznoff and A. B. P. Lever, VCH Publishers, New York, Weinheim, 1993; ISBN 1-56081-544-2; 305 pages; 268 DM.

Volume 2 of this continuing series consists of 6 chapters dealing with various aspects (single-atom bridged dimers; Mössbauer spectroscopy; synthesis of analogs; thin films; catalytic functions; liquid crystals) of these useful materials. Readers will find that the overall quality and utility of this volume compares well with the first volume of this series. (Review: H. Schultz, *Mol. Cryst. Liq. Cryst. (Letters Sect.)*, 7, 171(1990).)

The first chapter (C. Ercolani and B. Floris) reviews synthesis, mechanism of formation, and structural and spectral properties of single-atom bridged dimer systems and relates their properties to known porphyrin systems. Its sections of Mössbauer spectroscopy have some overlap with the second chapter by M. Hanack and coworkers. That chapter discusses Mössbauer studies of iron, tin, cobalt and iodine containing phthalocyanine materials. In Chapter 3, N. Kobayashi reviews synthesis and spectra of phthalocyanine analogues. This topic is taken to include materials in which the benzenoid ring of phthalocyanines is replaced by another moiety, cyclo-oligomers with other than 4 repeat units, and related porphyrin materials. This chapter is a useful summary in spite of significant overlap with Chapter 1 of Vol. 1. The chapter on thin films (T. Saji) is largely a discussion of electrochemical formation of large area films by the micelle disruption method. The chapter on catalytic functions (K. Hanabusa and H. Shirai) has a heavy emphasis on enzyme mimetic reactions. Structure and symmetry is a recurring theme of the chapter on liquid crystals (J. Simon and P. Bassoul). This volume has a subject index, and references are given at the end of each chapter.

Reflections on Symmetry in Chemistry.... and Elsewhere, Edgar Heilbronner and Jack D. Dunitz, VCH, Weinheim, New York, 1993. ISBN (VCH, Weinheim, 3-527-28488-5); VCH (New York) 1-56081-254-0, 168 pages; \$ 32.00; 58.00 DM.

“What, another book on symmetry! Are there not enough already? Yes but.....” starts the back jacket of *Reflections on Symmetry*. A book this beautiful hardly needs an apologia. A plain wrapper would have been better dress for it would force the reader to to crack open the cover. Inside she would find a “poem” about symmetry by Edgar Heilbronner, translated/transformed by Jack Dunitz, and decorated with the crisp graphics of Ruth Pfalzberger.

† Unsigned book reviews by the Book Review Editor.

Many other books about symmetry are listed as recommended reading. One way to introduce *Reflections* would be to compare it with some of these books that solid state scientists might already be familiar with. In its decidedly chemical focus *Reflections* resembles *Symmetry Through the Eyes of a Chemist* by Hargittai and Hargittai. The latter book succeeds in its abundance of examples. *Reflections* is sparse. Its style is closer to Weyl's *Symmetry*; "A classic essay" clearly much admired by Heilbronner and Dunitz. *Reflections*, however, is unique in its emphasis on the historical development of structural chemistry.

Chapter six is the best one. In less than 30 pages it sails through the history of molecular structure. They begin with Dalton's radicals and proceed through Berzelius, Couper, Kekule, and the representation of organic molecules, especially benzene. The stereochemical consequences of substitution reactions link Van't Hoff and Korner in the discussion. There is nevertheless time enough for a brief aside—symmetry sometimes can be too compelling as evidenced by Gaudin's hexagonal structure of steric acid. Willstätter, von Baeyer, Hückel, Sachse and Mohr make much more sense out of rings. Complexity builds a buckyball. The chapter ends with a diagram of the Coulomb explosion of H_3^+ .

On page 79, there is a mistake in the representative of the *meso* forms of trihydroxyglutartic acid; structures 31 and 32 are identical. It is strange that the authors choose to include this example in their development of the history of stereochemistry. The trihydroxyglutaric acids can be confusing particularly in the context of symmetry. Chemists have gone to great length to uncouple the stereochemical and geometric information in compounds with so-called pseudoasymmetric carbon atoms. It is at this midway point that the authors have left *Nature* for a jaunt with convention.

If you should find yourself in a bar in Switzerland, don't get suckered into any games. *Reflections* is sprinkled with cigar and domino tricks that are intended to highlight the power of symmetry arguments. These games serve the same function as Körner's proof of the constitution of disubstituted benzenes. The authors show that science sometimes has a lot to do with common sense.

Reflections succeeds in part by its presentation. It would not be pejorative to describe it as a "coffee table" book for crystallographers. Along with the games, cartoons illustrate symmetry principles; there is no need for jargon. Historical documents are interwoven with the illustrations.

The composition of the essay, as well as the overall design, is brilliant. Themes recur frequently and the latter part of the book is always conscious of the beginning. An electron density map of phthalocyanine introduces crystal structure analysis. The structure, say the authors, can be drawn on the map with a "little imagination". When next we meet contour maps it is in the context of the structurally related corrin nucleus of vitamin B_{12} . Here, the bonds are drawn in. The book closes with a discussion of the conservation of orbital symmetry and the following statement, "It was ... in the early states of the synthesis of vitamin B_{12} that the effect of orbital symmetry rules was first discerned, and it was in the successful culmination....that the full power of these rules was made evident". It might seem like an abrupt ending for such a general story were it not for the fact that the reference to B_{12} carries the whole book with it.

Reflections would be appreciated by a thoughtful friend or relative, ignorant of chemistry, but with a keen desire to know what a crystallographer does. At the same

time sophisticated scientists cannot be bored by the grand scope and presentation. This thoughtful, pretty work is highly recommended.

Bart Kahr
Department of Chemistry
Purdue University
West Lafayette, Indiana 47907-1393

The Fullerenes: New Horizons for the Chemistry, Physics and Astrophysics of Carbon. H. W. Kroto, D. R. M. Walton, (Eds.) Cambridge University Press, Cambridge UK 1993, 154 pages; ISBN 0-521-45917-6.

This book contains the proceedings of a Royal Society Discussion Meeting, held in October 1992. It was entitled "A Post-Buckminsterfullerene View of the Chemistry, Physics and Astrophysics of Carbon". The title implies that several researchers from different areas of interest, presented their papers dealing with, or related to the field of this new molecular allotropic form of carbon. At the end of each contribution, a detailed list of references is generally given, followed by a short abstract of the ensuing discussion. The topic of the first paper, presented in this highly interesting compilation, constitutes the link between two-dimensional Hückel π -systems and C_{60} . In 1970, its author Osawa postulated C_{60} as a soccer-like structure with inherent "superaromaticity". D. Jones, who has published under the pseudonym Daedalus some scientific proposals since the 1960s, presents the second paper. In 1966, in one of his publications he suggested a hollow shell graphite molecule. His current contribution gives a short overview about his predictions concerning the properties of giant nanotubes and giant fullerenes, which were in the meantime found by Ijima and others. According to Jones, giant fullerenes should have supercritical fluid properties at ambient temperature. The formation mechanism of fullerenes in the chaos of condensing carbon vapour is a real challenge. Two of the most prominent ways to explain it are the "pentagon road", where open sheets of carbon grow and the "fullerene road", where "smaller fullerenes grow in small steps in a process which finds C_{60} as local deep minimum and to a lesser extent the C_{70} minimum". R. F. Curl reports in his paper the results of his mass spectroscopic experiments regarding this subject. W. Krätschmer and D. Huffman are the authors of the next article, obviously entitled "Production and Discovery of Fullerites". As they initially discovered how to make fullerenes, their statements do not need further comment. "Systematics of Fullerenes and related Clusters" was introduced by P. Fowler, who gives a short overview about theoretical concepts for the description of the fullerene family, including doped fullerenes and metallocarbohedrenes. One of the most dominating properties of buckminsterfullerene is its high electron acceptor strength, and R. C. Haddon briefly describes in his paper the electronic properties of fullerenes and their reduction products. Among those are superconducting alkali metal doped phases of C_{60} which are particularly fascinating forms. The topic of the subsequent two papers—the interstellar existence of elemental carbon and its compounds, for example as acetylene together with hydrogen or as

cyanopolyynes—is introduced by M. Jura and C. T. Pillinger. The simulation of interstellar conditions in the laboratory, allowing one “to gain insight into the way in which those chain molecules and possible carbon clusters in general might form” was one motivation of research for H. W. Kroto, and D. R. M. Walton. Their contribution summarizes their classic work on polyynes and fullerenes. Theoretical experiments about fullerenes with negative curvature were presented by Mackay and Terrones. The last contribution eventually emphasizes the analogy between geodesic domes and fullerenes (T. Tarnai). Particularly impressive are the high quality contributions conveying a general idea about the current state of research. This book may be recommended for beginners as well as for experts in the area of fullerenes. The book does not limit itself to the given information, but invites the reader to investigate further by means of a variety of references in which details are discussed more specifically.

Andreas Skiebe
Andreas Hirsch
University of Tübingen
Institute of Organic Chemistry II
Tübingen Germany

“Applied Radiation Chemistry: Radiation Processing” by R. J. Woods and A. K. Pikaev, Wiley-Interscience, John Wiley & Sons, New York, Chichester, 1994; ISBN 0-471-54452-3; x + 535 pages;

R. J. Woods is the coauthor, with J. W. T. Spinks, of “Introduction to Radiation Chemistry”, the well known treatise whose third edition was published by Wiley in 1990. Readers familiar with the earlier books will find a similar style and many figures from the earlier work reprinted in this new book. In the preface, the authors note that, dating from the 1950s, it was expected that nuclear sciences such as radiation chemistry would be sources of new and exotic materials and products. In this book, they seek to reassess the early aspirations and identify the areas where significant progress has been made. Radiation-induced cross-linking of polymers and radiation sterilization of medical products have become substantial industries. The introduction of radiation-processed food appears imminent in the U.S.

The book consists of the following 13 chapters: Introduction; Radiation: Sources and Characteristics; Interaction of Radiation with Matter; Radiation Dosimetry; Radiolysis Intermediates; Selected Topics in Radiation Chemistry; Radiation Synthesis; Polymerization; Polymer Modification; Radiation Sterilization of Medical Products; Radiation treatment of Food; Waste Management; Other Applications. An appendix and a subject index are also included. References and bibliography are given at the end of each chapter. Readers familiar with Spinks and Wood's books will find the first six chapters generally familiar territory. The remainder of the book is generally new material with numerous references from 1990 and later. Readers, especially those interested in applications, will find these chapters valuable sources of much information, and it is this section of the book which makes it recommendable. Several chapters have useful historical summaries of their topic.

In the preface, the authors give the impression that radiation-initiated chemical synthesis has not lived up to its early expectations. While this is generally true, several generally recent examples not discussed by the authors give hope that radiation-initiated synthesis may yet find a niche. The section in Chapter 8, Polymerization, on solid state polymerization lacks a discussion of the diacetylene polymerization. Over the last fifteen years, radiation-induced polymerization of diacetylenes has produced examples of macroscopic polymer single crystals which, to date, have not been obtained by other methods. Recent radiation-induced stereospecific trimerizations and other reactions of unsaturated metal carboxylates discovered by B. M. Foxman and coworkers (Brandeis University) may be the beginning of a whole new variety of synthetically useful reactions.

On the whole, the authors are successful in their attempt to assess the accomplishments of radiation chemistry.

Nanostructures Based on Molecular Materials", edited by W. Göpel and Ch. Ziegler, VCH Publishers, Weinheim, New York, 1992; ISBN 3-527-28416-8 (Weinheim); 1-56081-210-9 (New York); x + 377 pages; DM 168.00; £ 63.00.

This book was developed from the workshop with the same title sponsored by the Commission of the European Community for a small group of invited experts and held in Monrepos Castle, Ludwigsburg, FRG in October 1991. With the exception of two contributions from Japan and one each from U.S.A. and the People's Republic of China, all of the authors are European. The book thus provides a useful summary of current European work in the area of nanostructures. The editors seek to emphasize current activities in nanotechnologies based on molecular structures, a synonym for "molecular electronics" where one deals with devices of molecular dimension. The editors contrast nanolithographic patterning ("top-down approach") and molecular engineering ("bottom-up approach"), and both approaches are presented in different chapters in the book.

The book consists of an Introductory Chapter by the editors and 21 chapters divided into four parts: Design of Molecular Functional Units; Design and Synthesis of Specific Molecules; Assembly of Molecules; Characterization of Molecular Structures. While the theme of the book is nanostructures, each of the four parts has chapters that deal either with macroscopic experimental systems or with experimental techniques and theory that are applicable to either nanostructures or more macroscopic systems. Each chapter is individually referenced. There are no indices.

The introductory chapter presents a useful roadmap to the remainder of the book. It describes ten aspects central to the theme of the book: property, theory, order, bonding type, molecular unit, preparation, structurization, technology, devices, characterization. The importance of Langmuir-Blodgett films in current research on molecular nanostructures is revealed in seven chapters in Part I and III on this subject. Scanning probe microscopies are clearly important characterization techniques for further development of the subject of molecular nanostructures, and two chapters deal with this topic.