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Book Reviews

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Book Reviews

Liquid Crystallinity in Polymers: Principles and Fundamental Properties, Alberto Ciferri, Editor, 438 pp., VCH Publishers, Inc., 1991; ISBN: 0-89573-771-X

The commercial introduction in recent years of high performance polymers based on liquid crystalline concepts has stimulated the curiosity of researchers to gain fundamental and comprehensive understanding of this relatively unexplored state of matter. Initially, there were ultra-high strength fibers spun from main chain liquid crystalline, lyotropic, polymer solutions and later high temperature, high strength thermotropic molding resins. Now, there is the promise of side chain liquid crystalline polymers having unusual functional properties, e.g. optical, stress-optical, electro-optical, conductive, photo-conductive, non-linear optical, etc.

The book in question is an admirable effort to take inventory of our current knowledge in the area of polymer physics of liquid crystalline polymers, LCPs. Topics covered are: the conformation and persistence length of mesogenic chains; theories of Onsager, Flory and others attempting to predict the formation of the mesophase in terms of fundamental measurable quantities; liquid crystalline polymer thermodynamics, structure property relationships (segmented chain and side chain LCP's); elastic and viscous properties; defects and rheology.

Professor Ciferri is a well known figure and expert in the field of liquid crystalline polymers, having been active in the area since its infancy both in Genova and North Carolina. He has used this experience to good advantage in collecting a renowned team of authors who have contributed a collection of well written, authoritative chapters on the respective topics. With its copious references, the book represents a good starting point for pursuing in depth the topics mentioned above.

The book, while having a well defined theme in trying to explore the interplay between macromolecularity and liquid crystallinity and to identify correlations has not been homogenized into textbook format, however. Each chapter has its own entry barrier in terms of pre-requisites and notation. The set of entry barriers will vary from reader to reader. There is no attempt to define a lowest common denominator of terminology and concepts fundamental to both polymer and liquid crystal physics. In fact, notation varies from chapter to chapter as evidenced by the lexicon at the end of the book.

In practical terms the book has a pleasing style, is type set with legible figures and footnotes, is handsomely packaged and has a high quality binding.

L. Lawrence Chapoy
Ausimont
Bollate, Italy

High-Technology Applications of Organic Colorants, Peter Gregory, Plenum Press, New York, London, 1991; ISBN 0-306-43637-X; xv + 293 pages; $ 59.50

This interesting book deals primarily with the use of organic molecular materials in electronic and reprographic technologies. It is aimed primarily at chemists, rather than physicists or device engineers. The technologies discussed include those already in the commercial marketplace as well as others which have not yet achieved commercial success. The book will be found useful by students of chemistry and other disciplines seeking an introduction to applications of organic colorants and also by beginning researchers in the fields covered.

The book is divided into four parts and a subject index. References to original literature and patents are given at the end of each chapter. The four parts are titled "Historical Perspectives", "Colorants for Electronics", "Colorants for Reprographics", and "Future Perspective", and each part includes several chapters. The chapters dealing with specific technologies are well illustrated with the general principles relevant to each. Many of the topics covered have also appeared in recent monographs or conference proceedings volumes, although several of the technologies covered are known only to specialists.

Liquid crystals, laser dyes, and nonlinear optical colorants are among the topics included in "Colorants for Electronics". The chapter on nonlinear optics deals almost exclusively with second order processes. A discussion of third order processes in conjugated polymers and molecular compounds would have been a valuable addition.

"Colorants for Reprographics" is the largest part of the book, 153 pages. It includes chapters on electrophotography, thermography, ink-jet printing, and a brief treatment of electrography, ionography, and magnetography. Valuable additions to the chapter on electrophotography would have been a discussion of the relative merits of single component polymers (e.g., poly-*N*-vinylcarbazole) versus molecularly doped polymers as charge transport layers and the use of soluble dyes as charge generators.

The final part "Future Perspectives" consists of chapters on infrared absorbers, toxicology, and future trends. The chapter on infrared absorbers is a very good summary of this topic. Many readers will find the author's assessment of the "paperless office" to be on-target. The author is to be commended for the emphasis given to toxicology and materials recycling.

Modern Nonlinear Optics, Part I, M. Evans and S. Kielich, (eds.), **Advances in Chemical Physics**, Vol. LXXXV, Series Editors I. Prigogine and S. A. Rice, Interscience, John Wiley & Sons, Inc., New York, 1993; ISBN 0-471-57548-8; 472 pages; $150.00.

Modern Nonlinear Optics (Part 1) is a collection of review articles on a very diverse range of topics. The unifying theme of course, is that they are in some way related to nonlinear optical phenomena. Most of the contributors to the volume are from the

*Unsigned book reviews are by the Book Review Editor.

Poznan School (Nonlinear Optics Division, Institute of Physics, Adam Mickiewicz University, Poznan, Poland) which happens to be the affiliation of one of the editors. This volume is not meant to serve as a text for graduate students or for someone hoping to get an overview of the field but more for the specialist. Unfortunately, the topics covered are so diverse that even a specialist may find only a few topics of interest in the entire book. However, the book does have certain merits. The volume exposes researchers in other parts of the world to the work carried out by the Poznan school. The diverse range of topics covered in the book is not usually treated in most textbooks or monographs in nonlinear optics. The book can serve as a reference source and make a valuable addition to most technical libraries.

A brief overview of the topics covered in the book is presented here. The first chapter in the book is a review of the theory of relaxation of nonlinear electro-optical effects in molecular liquids and dilute solution of macromolecules. The second chapter deals with the theory of light scattering in a solution of monodisperse macromolecules which fulfill the conditions o f Rayleig–Rayleigh–Debye–Gans approximation. There are two reviews on the theory of hyper-Rayleigh and hyper-Raman scattering. Hyper-Rayleigh scattering experiments have been recently utilized to measure the first and second hyperpolarizability of organic molecules. The chapter dealing with fast molecular reorientation in liquid crystals is well written and should find wider appeal as it deals with both experimental and theoretical aspects of the phenomena. There is an interesting review second harmonic generation in glass fibers due to self-organized nonlinear optical phenomena. Various models attempting an explanation of the experimental observations have been analyzed. Another review describes nonlinear magneto-optic effects in magnetically ordered crystals. In particular, it addresses the issue of self-induced changes in the polarization state of a light beam propagating along the Z-axis of a ferromagnetically or antiferromagnetically ordered crystal under the influence of a magnetic field. The rest of the review articles are related to quantum optical phenomena in nonlinear optics. They include topics such as photon statistics in nonlinear optical processes (such as three and four wave mixing), quantum resonance fluorescence from correlated atoms and generation of squeezed states in second and third harmonics and nonlinear Kerr-like medium.

In summary, the book, Modern Nonlinear Optics Part 1 (ed. Evans and Kielich), may serve as valuable reference book for specialists in the area of nonlinear optics. It is not meant to be used as a graduate text or for researchers attempting to get acquainted with the field. The strength of the book is that some of the topics reviewed are not covered in the most books on nonlinear optics and quite coherently presented.

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