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# A review of: "Handbook of Liquid Crystal Research," Editors in Chief: P.J. Collings and J. S. Patel; Oxford University Press, New York, Oxford, 1997; ISBN 0-19-508442-X; xv + 600 pp.; $195.00.

Edward T. Samulski [a]

[a] Bald Head Island, North Carolina Department of Chemistry, University of North Caroline, Chapel Hill, Chapel Hill, North Carolina, 27599-3290

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# Book Review

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"Handbook of Liquid Crystal Research," Editors in Chief: P.J. Collings and J. S. Patel; Oxford University Press, New York, Oxford, 1997; ISBN 0–19–508442-X; xv + 600 pp.; $195.00.

In contrast with extant handbooks on liquid crystals that deal primarily with the underlying physics and chemistry of mesomorphism, this work focuses on the interface between the basic science of liquid crystals (LCs) and their unique suitability for display technologies (LCDs). One third of the fifteen chapters deal overtly with details of materials and methodologies underlying contemporary LCDs: Chiral and Achiral Calamitic LCs for Display Applications (Hall, Hollingshurst and Goodby), Active Matrix LCDs (Kobayashi, Hori and Tanaka), Addressing Passive Matrix, RMS Responding LCDs (Scheffer), LCs for Optical Communication Devices (Patel), and Applications of LCs in Image and Signal Processing (Owechko). Therein a summary of state-of-the-art technology is presented by researchers intimately associated with the LCD research that has advanced this field in the last two decades. The rest of the handbook is devoted to reviews of the underlying scientific principles.

Some very succinct chapters are ideal for gauging the status of our understanding of particular topics in liquid crystalline materials. Pelcovits summarizes advances in Theory and Computation by delineating solved problems and highlighting recent computer simulations. He concludes by speculating on how theory and computation will impact specific problems such as LC defects, coarsening dynamics, and confined systems. Electric Field Effects are integral to LCD applications and Blinov places newer effects such as field-induced biaxiality and distortions of cubic and ferroelectric LCs, periodic structures, and flexoelectricity, into perspective with a systematic review of the classical field effects (phase transition shifts, Kerr effect, Frederiks transition, etc.). His review also considers discotics, amphiphiles, and polymeric LCs. The chapter on Interfaces and Thin Films by Yokohama could be used as a self-contained course on this

complex topic as he systematically considers in turn the relevant thermodynamics and statistical mechanics underlying the physics (and chemistry) of surface anchoring. Kuzma and Saupe introduce the reader to lyotropic phases as a special class of the more general topic of complex fluids in Structure and Phase Transitions of Amphiphilic LCs. And Barberi and Durand focus on a potential viable LCD phenomenon: switchable bistable states in Controlled Textural Bistability in Nematic LCs. In both of these chapters the variety of phenomena and the background surrounding each is presented in an extremely accessible manner as only masterful practitioners can.

There is a self-contained chapter on Polymer Dispersed LCs: Nematic Droplets and Related Systems by Crawford, Doane, and Zumer. These authors cover the materials (types of polymer dispersions), phenomenology of confined LCs, the techniques for characterizing PDLCs (including texture simulations, light scattering, and microscopic measurements of anchoring via NMR), the thermodynamic ramifications of surface-induced ordering, and display applications. From Molecular to Macromolecular LCs is an idiosyncratic compilation of molecular and supramolecular structural motifs explored by the author. Fortunately Percec has worked on a variety of aspects of polymer LCs and this breadth makes his review more generally useful. Santamato and Shen briefly summarize a unique and specialized area of LCs in Liquid Crystals for Nonlinear Optical Studies.

The editors Patel and Collings preface the Handbook with intoductory material and skillfully manage with figures to give a degree of continuity to the text as a whole. In the chapter Phase Structures and Transitions in Thermotropic LCs, Collings augments the usual introductory mesophase structural taxonomy with a concise review of phase transitions. Generally, the inclusion of the introductory material in the Handbook makes it a comprehensive text with potential utility in a graduate course on liquid crystals. It is designed to enable both novice and experienced liquid crystallographers to explore many aspects of liquid crystal display chemistry and physics in a thorough historical context. If I had to spend time on an island removed from libraries and the web and wanted access to a survey of this fascinating field of ordered fluids, I would take the Handbook of Liquid Crystal Research with me.

Edward T. Samulski
(Bald Head Island, North Carolina)
Department of Chemistry,
University of North Caroline, Chapel Hill,
Chapel Hill, North Carolina 27599–3290