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Liquid Crystals

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Book review

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Book review

The Optics of Thermotropic Liquid Crystals

Edited by STEVE ELSTON and ROY SAMBLES

Taylor and Francis Ltd, London (1998), pp. vi and 375.
ISBN 0-7484-0629-8 (cased).

As the multidisciplinary subject of liquid crystals evolves and matures, the need arises for texts focussed upon specific aspects of these self-organizing systems. As indicated by the present title, the area under consideration is the optics of thermotropic liquid crystals. Whilst this area is specific in the context of the overall phenomenological diversity of liquid crystals, it could not be more central in importance in the field, the optical characteristics of liquid crystals providing the basis for the highly developed technology of liquid crystal displays and for the classification and identification of the range of different liquid crystal phases using techniques such as polarizing optical microscopy and X-ray diffraction.

The book has been edited by Steve Elston and Roy Sambles, acknowledged experts in the optics of liquid crystals (LCs). Together they have written a short, but attractive introduction to the book, and individually they have contributed with co-authors to two of the additional 12 chapters. The editors have gathered together an international group of authorities to write the other ten chapters and have ensured thereby that all major aspects of the optics of LCs are covered.

Despite the multi-authorage, the text has a pleasing uniformity of style and is easy to read and browse, the publishers having done a fine job on the general layout and the presentation of figures, art work and equations.

Following the introduction, the reader is taken through Chapters 2 and 3 on the physical origins of the optical properties of LCs and the theory of the linear optics of LCs, respectively and thence on to the important subject

of their light scattering and its implications. These core chapters are essential for a proper understanding of the optics of LCs and provide the background for Chapter 5 by Sambles' group at Exeter on new optical techniques using guided modes to study the subject of LC alignment, so critical to display technology.

Chapter 6 on non-linear optical properties and Chapter 7 on light induced reorientation of LCs and dynamic gratings are followed by valuable chapters on the electroclinic effect and the optical properties of the important ferro- and antiferro-electric smectic LCs, the latter by Elston's group at Oxford. The optical uses of LC Polymers and the optical properties of Polymer Dispersed LCs constitute Chapters 10 and 11, and Chapter 12 describes the now classical role of the optics of LCs in today's omnipresent, commercial Twisted Nematic and Supertwisted Nematic LC Displays.

Finally, Chapter 13 is on defect textures of smectics, covering the uses of these in the classification and identification of LC phases using polarizing light microscopy. This chapter carries a full description of the diversity of thermotropic LC phases and their molecular organization.

If any criticism is to be levelled at the book, it is that this last chapter might have been better placed following the introduction, giving the reader an early understanding of the ordering in different mesophases before entering the complexities of their optical properties.

However, the book is an excellent addition to the growing number of texts on LCs and, although the index is but modest, it will be a valuable reading and reference source for all those engaged in physical research on LCs and development work on their potential for new applications.

G. W. GRAY
3 April 1998