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BOOK REVIEW

LIQUID CRYSTALS — Second Edition

by S CHANDRASEKHAR, Cambridge University Press
(1992), ISBN 0-521-41747-3 (HB), ISBN 0-521-42741-X (PB).

Reviewed by Peter Raynes, Sharp Laboratories of Oxford Ltd

One of the first problems facing a new recruit or research student moving into a new field, and hence those who advise them, is the choice of textbook to read to become familiar with the field. Perhaps surprisingly for such a vibrant and expanding field as liquid crystals, there are few comprehensive physics books that can be recommended without hesitation. One of the few is Chandrasekhar's book, "Liquid Crystals". In the sixteen years since this was first published in 1977, the rapid advances in the field were beginning to show the book's age. It is therefore a pleasure to discover that there is now a second edition, in which the chapters on the nematic, cholesteric and smectic phases have been revised and extended, and a new chapter added on discotic phases.

The book is divided into six chapters. The first, and rather short chapter, introduces the principal features of the thermotropic, lyotropic and polymeric liquid crystal phases found in materials composed of rod-like and disc-like molecules. After this the book concentrates on thermotropic liquid crystals, and it should be made clear that this is not a book intended for those looking for great depth in lyotropic or polymeric liquid crystals — such readers must look elsewhere. The book then goes on to survey the various statistical theories of

the nematic phase, and this leads into the chapter called "Continuum theory of the nematic state". This chapter is broader than the title suggests, and it may have been more in keeping with both the content and later chapters to have simply labelled it "Nematic liquid crystals". The chapter is an excellent survey of the physics of the nematic phase that includes the static and dynamic continuum theories (including a useful introduction to the techniques widely used for modelling nematic display devices), disclinations, light scattering, electrohydrodynamics and hydrodynamics.

Chapter four deals with the cholesteric phase, concentrating on the optical properties. Although comprehensive, the chapter does not make enough contact with the optics of the widely used twisted nematic and supertwist display devices. For example, one might have reasonably hoped for at least a mention of the Gooch/Tarry curve so fundamental to the operation of the present generation of twisted nematic devices. The chapter on smectic liquid crystals is the most revised chapter in the second edition. A useful classification of the wide range of smectic phases now identified has been added together with sections on re-entrant, twist grain boundary, C and C* smectic phases. The final chapter is totally new and covers the



relatively new area of disc-like, or discotic liquid crystals. This chapter is a valuable addition to the book and covers many aspects of these new materials from the molecular structures through to the discotic and biaxial nematic phases.

The book does have some limitations. The scope is limited, but the author is quite frank about this. It does not cover lyotropic or polymeric liquid crystals or non-linear optical properties, nor does it cover material structures of rod-like liquid crystals in any significant depth. The layout of the contents pages is not helpful. Everything from the chapter headings to the individual section headings is in an identical font, making the contents pages difficult to use.

These limitations are few and in reality the book is an excellent summary of the physics of thermotropic liquid crystal phases with references which are thorough and up-to-date. I can recommend the second edition of Chandrasekhar's "Liquid Crystals" as an excellent addition to any liquid crystaller's bookshelf, and should be required reading for those new to the field. □



NEW BOOKS

Liquid Crystals—Applications and Uses

Edited B BAHADUR, World Scientific Publishing Co Ltd, Singapore/New Jersey/London/HongKong 3 Vols. Vols 1 and 2 already published.

Vol 1 (1990) — ISBN 981-02-0110-9

Vol 2: (1991) — ISBN 981-02-0111-7

Vol 3: ISBN 981-02-0403-5 (424 pp)

Contents: Surface Alignment of Liquid Crystals; Dichroic Liquid Crystal Displays; Applications of Liquid Crystals in Optical Computing; Other Types of LCDs; Thermochromic Liquid Crystals in Devices; Liquid Crystal Polymers.

The Physics of Liquid Crystals — SECOND EDITION

P G de GENNES and J PROST

International Series of Monographs on Physics No 83., Clarendon Press, Oxford UK, (1993).

ISBN 0-19-852084-7, 624 pp

The original edition was immediately recognised as a classic of condensed matter physics. Topics covered by this new edition include smectics and columnar phases and the properties of nematics.

Optics & Nonlinear Optics of Liquid Crystals

I-C KHOO and S T WU

World Scientific Publishing Co Ltd., Singapore (1993), 425 pp.

ISBN 981-02-0934-7 (Hdbk)

ISBN 981-02-0935-5 (Pbk)

Brief Contents: Optical Properties of Liquid Crystals; Electrooptical Properties of Liquid Crystals; Non-linear Optical Properties of Liquid Crystals; Non-linear Optics.