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Book review

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Book review

Freely Suspended Liquid Crystalline Films
By ANDREI A. SONIN

John Wiley and Sons, Chichester (1998), pp. ix and 165. ISBN 0 471 97155 3. Reviewed by George Gray, Southampton Liquid Crystal Institute.

Free standing films of thermotropic liquid crystals were studied by Friedel in the 1920s, and of course soap films and bubbles were known and investigated by Hooke and by Newton in the 18th century. However, as pointed out by Noel Clark in his foreword to the book, the real impetus for the current high level of research in freely suspended liquid crystalline (FSLC) films came in the 1970s when FSLC films consisting of not only a simple integral number of smectic layers, but also of just a single smectic layer were produced. Studies of such extremely thin films have contributed critically to condensed matter physics and to present day understanding of liquid crystalline behaviour—for example by providing true hexatic systems giving phase transitions in two dimensions.

Whilst the average liquid crystal researcher knows something of FSLC films and their importance from publications and reviews, the value of this slim, nicely produced volume by Professor Sonin of the Institute of Crystallography, the Russian Academy of Sciences, is that for the first time it gathers together the present day state of knowledge in the field between two covers. It therefore meets a perceived need for anyone wishing ready access to the current state of the art in the subject.

The 23 page introduction (Chapter 1) puts the subject into historical perspective and summarises those aspects of the factual and theoretical background of liquid crystals necessary for the reader to understand the following more specialised chapters. This introduction could perhaps have been longer and taken at a gentler, more careful pace; as it is, it gives the impression that the author could not wait to get onto the real material concerning these fascinating FSLC films.

The seven chapters which follow cover films derived from both single component thermotropic materials and multicomponent lyotropic systems. Basic physical properties (surface tension, viscoelasticity and pressure) and concepts of organisation are the subject matter of Chapter 2, and the critically important techniques for the production of FSLC films are described and illustrated in Chapter 3. Chapter 4 then deals with details of the physics of thinning, stratification and rupture of FSLC films, and Chapter 5 with experimental and theoretical aspects of orientational phase transitions in nematic and smectic C films.

Of particular relevance to the dominant applications of bulk liquid crystals in electro-optic displays is Chapter 6 which covers field-induced effects—Fréedericksz, electrohydrodynamic, flexoelectric and linear electro-optical—in FSLC films.

The structures in stable thin films, including thermotropic smectic films, black soap films and biomembranes are discussed in Chapter 7, together with two dimensional defects and defects in phase transitions. The final chapter is about different applications of FSLC films, concentrating on foams and soap films and on lyotropic films used in biology and medicine.

The book is well referenced, carries a very adequate index, and is pleasing to handle, browse through and read. A nice feature is that the figure legends are printed in a quite bold and easy to read type face.

The book will of course be of main interest to FSLC specialists and to those contemplating work in the field. In the latter context, the book's readability and accumulation of information will be valuable in helping to attract new researchers to this hitherto rather specialised area of liquid crystals. It will also be an important addition to libraries seeking to cover recent developments in liquid crystals and the physics of soft condensed matter.

G. W. GRAY
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