

## New developments in liquid crystals and applications, edited by P.K. Choudhury

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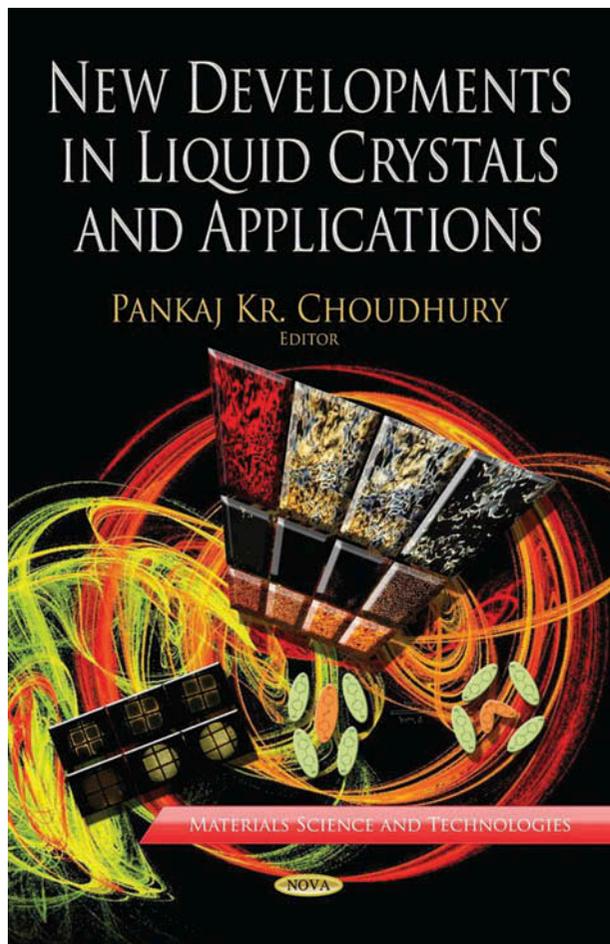
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## Book Reviews

**New developments in liquid crystals and applications**, edited by P.K. Choudhury, Hauppauge NY, Nova Science Publishers, 2013, 245 pp., £124 (hardcover), ISBN 1626186774



This book published by NOVA is a collection of contributions from researchers working in both fundamental and some application aspects of the subject. This book highlights some of the advances made in the area of liquid crystals (LC) research including the discovery of new materials and new effects. Well-understood phenomena are conceived for novel applications of LC and the developments in respect of some new devices, such as sensors, holographic and 3D devices. In particular, the chemistry of thermotropic LC is used in sensing applications. The use of LC in holographic technique is elaborated, and the

propagation of electromagnetic waves in LC-filled dielectric optical waveguides is discussed. Apart from these, visual features of advanced LC display panels for 3D vision are considered.

The book focuses on research advancements in several areas of LC chemistry, physics and technology reported by world-famous scientists from 10 different countries. The book has nine chapters, each describing special aspects of LC materials and realised applications. The topics covered in this book are liquid-crystalline-assisted nanoparticles synthesis, effects due to the nematic LC on the isomerisation of azoderivatives, intramolecular hydrogen bonding in LC, organosulphur compound sensing by LC chemically functionalised surfaces, application of LC in dynamic holographic modulators, electro-optic behaviour of LC due to carbon nanotubes, optical modes in chiral LC, propagation through LC in optical fibres and applications of the material in 3D electronic displays. The book will be useful for students, making research in related fields, expert researchers in universities and research experts in industries.

The first chapter highlights the importance of the nanoparticles (NPs)–LC interaction to develop new materials with a control LC organisation. This should help the challenging design of new LC mixtures with improved properties.

The second chapter considers the interaction of the LC and azo dye molecules for controlling the efficiency of the photo-induced host nematic order in azo dye–LC mixtures. The authors believe that supramolecular assembly through specific molecular interactions and the control of molecular shape are the keys for the effective structural control of materials. To build supramolecular mesophases, it is important to design molecules with appropriate chemical structures and to control the process of their self-organisation.

The third chapter describes some examples of recently developed hydrogen bonding in stabilised supramolecular mesophases. The general understanding of hydrogen bonding in stabilised supramolecular mesophases enables to design a sketch of mesogene to exhibit a desired structure with respect to the molecular shape and its main interaction. The particular, N–H...O=C hydrogen bonds are valuable building units because of their defined geometry and stability.

The detection of sulphur compounds on the surface is based on LC orientation transitions (from homeotropic

to planar) and can be used for surface sensing (Chapter 4). Following the exposure to ethyl sulphide and reverse, the optical appearance was found to be distinct and visible. In comparison to the existing agent detection techniques, such as colorimetric method, these LC-based sensors offer continuous monitoring and more rapid response. This kind of detection technique also requires no power and is less expensive than the spectroscopic and chromatographic techniques. Wider applications of this method to other potential chemical or biological warfare agents were envisaged.

Chapter 5 describes the dynamic holograms, recorded in thin-layer LC valves as the efficient tool for solutions in the tasks of adaptive optics and for various schemes of correction for optical distortions, in general. The authors provide schematics of holographic record in them as well as the basis for the implementation of such systems and their applications to various practical problems related to optical design.

The study of the behaviour of LC mixtures with carbon nanotubes related to the electro-optic and flexoelectric properties of these mixtures is reviewed in Chapter 6. The electro-optical behaviour revealed by either flexoelectric gradient domains, surface polarisation-induced domains or injection-induced electro-hydrodynamic domains have been investigated both theoretically and experimentally.

Chapter 7 describes optical modes in chiral LC, which provides a basic theoretical approach to the description of selective reflection in cholesteric liquid crystals (CLC). The basic approach proposed in the chapter can be also very useful in describing lasing effects in CLC.

Chapter 8 is an overview of LC optical fibres and their applications, in particular for sensing. Tapered LC-clad fibres were also considered and their merits were highlighted. The tapered geometry of guide greatly enhances the optical power in the clad section, which demonstrates the use of these fibres in sensing applications.

Chapter 9 highlights LCD shutter glass 3D display. A new type of full resolution time sequential 3D display with LED strobe backlight and optical shutter glasses was proposed. Testing results of the proposed dynamic backlight were presented and compared with results obtained by the traditional backlight type. With newer LED backlight technology, LCD TVs can be considerably improved. Multi-viewer contents full resolutions 3D vision shutter glasses display has been proposed and discussed.

The book can be recommended in particular to LC specialists, who would like to know the novel tendencies in LC development and applications.

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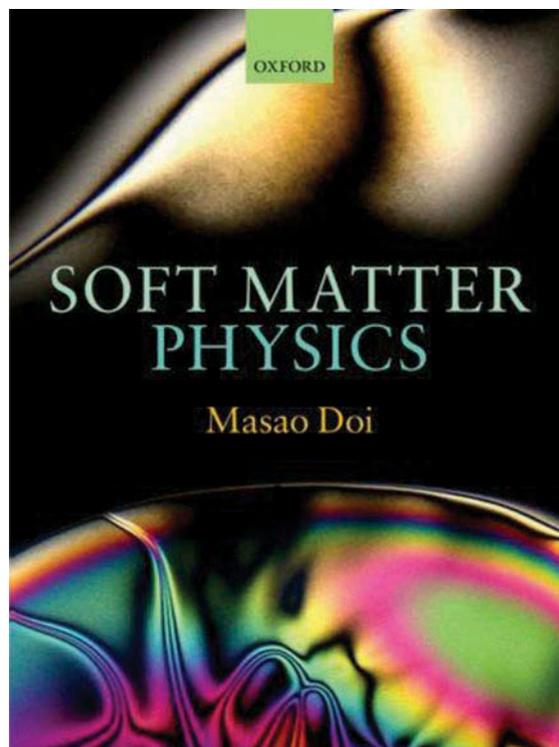
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**Soft matter physics**, by M. Doi, Oxford, OUP, 2013, 272 pp., £45 (hardcover), ISBN 0199652953



The general format of books on this topic is compressed into material classes *Polymers, Colloids, Surfactants, and Liquid Crystals*. In contrast to this general scheme, this book is not organised by covering materials' classes in individual chapters, but rather covers properties. Chapter 2 describes soft matter solutions, followed by elasticity and surfaces and surfactants. The liquid crystal aspects are covered in a single, consistent chapter (Chapter 5). It is followed by a description of fluctuations and Brownian motion (Chapter 6) and the use of the variational principle to discuss soft matter dynamics. In Chapter 8, the reader is introduced to further properties such as diffusion and permeation, followed by flow and deformation in Chapter 9. At last, ionic soft matter is discussed in Chapter 10. The monograph is rounded up by several appendices laying the mathematical foundations used before. And this is indeed necessary, as the text should not be seen as an