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## Liquid Crystals Today

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## High Contrast Liquid Crystal Shutter

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acrylates and polyacrylates) and Guillon (ferroelectric properties of chiral sulphinate compounds).

Although polymer liquid crystals did not have a separate session, a number of interesting developments were reported including exciting work on liquid crystalline epoxy resins (Carfagna), and the production of optical quality mono-domain liquid crystal polymer films (Toyooka). The optical and electrooptical properties of polymer-dispersed liquid crystals were reviewed in a plenary lecture by Kitzerow, while the theory and experimental observations on polymerisation-induced phase separation in PDLCs were covered by Palfy Muhoray. Results of the electrooptical responses of main chain polymers were presented by Galli. New electrooptic phenomena based on a flexoelectric response in chiral nematics exhibiting a finger print texture with a shear-aligned axis were described by Komitov.

Possibilities for using the techniques of AFM and STM in liquid crystal studies were elegantly presented in a plenary lecture by Frommer (see this issue of *Liquid Crystals Today*). Applications of AFM to the measurement of surface interactions were given in a poster by Uchida, and use of the technique in studies of wetting of liquid crystals on Ag/glass and SiO<sub>2</sub>/glass surfaces was described in a talk by Barberi. Results of other methods to study surface organisation were presented by Henn (X-ray reflectivity from aligned polymer smectic films at a glass surface) and Kosenkov (orientational ordering of liquid crystalline linearly photopolymerised films). A talk by Osipov outlined the use of density functional theory to study the director orientation at nematic/isotropic and nematic/substrate interfaces. Experimental studies of the development of focal conics at the isotropic/smectic A transition in droplets anchored at a surface were presented by Fournier, while Buka gave results on the dendritic growth of a smectic B phase from nematic phases aligned in both planar and homeotropic configurations.

The plenary lecture by Leibler on mesophase behaviour in block co-polymers provided a link between many of the topics discussed at the conference. Segregation in diblock co-polymers is a clear manifestation of molecular organisation, and the description of polymer phase transitions has relevance to PDLCs. Furthermore the observed phase behaviour and phase struc-

tures in block co-polymers resemble lyotropic liquid crystals. Especially the binary co-polymer/homopolymer system which develops a bicontinuous phase. Self-organisation in lyotropic/biological systems were discussed in a plenary lecture by Gruler on self-organised molecular machines. Results of electron microscopic examination of organised DNA presented by Le Forestier have shown the development of double twist structures similar to chiral nematic blue phases, and Krueke indicated that blue phases can be induced in discotic liquid crystals, using chiral dopants of strong twisting power. Dopant induced columnar phases formed from a discotic nematic liquid crystals and a strongly dipolar species were described by Luckhurst, who gave results of nmr studies of the order of the dipolar dopant, while Andreozzi indicated the use of infra-red dichroism and esr probes to study the dynamics of molecular organisation in acrylate side chain liquid crystal polymers.

The session on self organising systems ended the conference, and the final paper of that session given by Latterman was concerned with hydrogen-bonded diols which organised to give smectic A and columnar phases. In addition to the oral communications, the poster sessions contained many high quality presentations — device research and development were not much represented at the conference, but the creativity of liquid crystal scientists continues to produce new possibilities for devices of the future. □

*D A Dunmur, Vice-Chairman ECLC 93*

## Scientific Notes

### High Contrast Liquid Crystal Shutter

A new black and white liquid crystal light shutter has been developed by Charles Rosenblatt, Rolfe Petschek, Michael Fisch, and Karl Crandall of Case Western Reserve University. Exhibiting a dark "off" state and a transmitting "on" state, the device is based upon a negative dielectric anisotropy, weakly cholesteric liquid crystalline material situated between crossed polarisers. Surface stabilised alignment of the liquid crystal is homeotropic and, in consequence, no rubbing of the substrate is necessary. Owing to the perfect homeotropic alignment in the voltage "off" state, superb extinction is obtained. In the voltage "on" state the molecules tilt with respect to the cell normal. By arranging the cholesteric pitch, cell thickness, and material birefringence, spatially uniform transmission with virtually no colour dispersion can be obtained. To date transmission efficiencies have exceeded 90%. Contrast ratios for normally incident collimated light approach 5000:1, and for obliquely incident light both transmission efficiencies and contrast ratios are again quite good. Switching times are comparable to twisted nematic cells. Further information from Dr Rosenblatt, University Technology Inc, CWRU, Tel: 216-368-5514. □

## NEW BOOKS

### "Diffraction Optics of Complex-Structured Periodic Media"

V A BELYAKOV, 352pp, 86 illus., Springer-Verlag (1992). Hardcover \$98.00, ISBN 0-387-97654-X

Probing matter with beams of photons, neutrons and electrons provides much information about both the microscopic and macroscopic structure of materials, particularly those with periodic structure such as crystals and liquid crystals. This book discusses the interaction of X-rays, gamma-rays, electrons and neutrons with various kinds of ordered media.

*Contents:* Waves in media with one-dimensional periodicity; Approx description of the interaction radiation with regular media; Diffraction of Mössbauer radiation in magnetically ordered crystals; Optics of Chiral LCs; Radiation of fast charged particles in regular media; Non-linear optics of periodic media; Dynamic scattering of thermal neutrons in magnetically ordered crystals; Polarisation phenomena in X-ray optics; Magnetic X-ray scattering; Mössbauer filtration of synchrotron radiation.

### NEW LC SERIES

World Scientific Publishing Co. has launched a book series in Liquid Crystals to promote fundamental and applied research on liquid crystals.

Editors are: Dr H L Ong, IBM, T J Watson Research Center (Editor-in-Chief and Regional Editor for USA); Prof S Kobayashi (Regional Editor, Asia); and Prof J Prost (Regional Editor, Europe). The series welcomes any book proposal on LCs and related areas, including chemistry, physics and applications.

Further details from Dr H L Ong at Thomas J Watson Research Center, Eastview 71-C10, P O Box 218, Yorktown Heights, New York 10598. e.mail: HLONG@WATSON.IBM.COM □