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13th INTERNATIONAL LIQUID CRYSTAL CONFERENCE VANCOUVER, 22 – 27 July 1990

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MEETING REPORTS

13th INTERNATIONAL LIQUID CRYSTAL CONFERENCE VANCOUVER, 22 — 27 July 1990

This 13th Conference was held at the University of British Columbia in Vancouver, Canada. The liquid crystal community from 36 countries was represented by 575 delegates. This Conference marked the 25th Anniversary of the first Conference in this series, which was held in Kent, Ohio, USA in 1965 where 42 scientific papers were presented. At the 13th ILCC, 23 invited talks were given, 140 contributed papers were presented in three parallel oral sessions, and 564 contributions were given as posters.

The scientific programme was divided into fourteen topics ranging from "Applications and Devices" to "Pattern Formation and Instabilities", with particularly large numbers of contributions under "Ferroelectric Liquid Crystals" and "Phases and Phase Transitions". Liquid crystals thus continue to present challenging and broad areas for scientific research.

One example of this is the liquid crystal analogue of the superconductor Abrikosov flux lattice, discussed by Ronald Pindak from AT&T Bell Laboratories. At the nematic to smectic A phase transition, rod-shaped molecules which were orientationally ordered in the fluid nematic phase, develop a one-dimension positional ordering in the direction parallel to their long molecular axes. De Gennes¹ recognised that, neglecting layer fluctuations, the Landau free energy which described this phase was formally identical to the Landau free energy used to describe the normal to superconductor transition, with twist or bend distortion of the layered structure playing the role of a magnetic field applied to the superconductor. In a liquid crystal a twist distortion can be readily realised on the microscopic level by including an optically active chiral group in the molecular structure. Under such an applied twist field, De Gennes further postulated that, by analogy with superconductors, type II behaviour could be exhibited; that is, above a critical twist, the twist distortion would not be expelled by the layered phase, but rather, the twist strain would be localised in an ordered array (Abrikosov flux lattice). A model for

this ordered array of screw dislocations was recently proposed by Renn and Lubensky², which they refer to as the 'twist grain boundary' phase.

Experimental evidence for the existence of a helical smectic A phase has been found by Goodby et al^{3,4}. At this Conference, Pindak reported detailed X-ray and optical measurements on aligned samples which test the applicability of the TGB model. Aspects of the model were shown to be consistent with the experimental data. First, the phase was shown selectively to reflect right-circularly-polarised light. Second, the helical axis was shown to be parallel to the smectic layers. Third, the predicted radial delta-function X-ray structure factor was confirmed. Finally, the experimentalists showed that the helical phase which they studied meets stability criteria for type II behaviour. In summary, the existence of a helically ordered smectic A phase has been confirmed, and the TGB model has been shown to provide a good description of the mechanism underlying the helical rotation.

An interesting feature of the Conference was an exhibition of liquid crystal paintings by David Makow of Creative Explorations, Ottawa. These were painted using cholesteric liquid crystals, and showed colours which cannot be realised with conventional pigments.

The 14th Liquid Crystal Conference will be held at Pisa, Italy in 1992 — for details see page 8.

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OPTICS OF LIQUID CRYSTALS

Cetraro, Italy, 1 — 5 October 1990

Held in South Italy, the conference was small, perhaps reflecting the seemingly narrow subject area, but drew delegates from many different countries. The work presented was wide-ranging and there was plenty of discussion.

Much of the work was on the non-linear optical properties of liquid crystals. New techniques were described, such as the Z-scan technique from CREOL, Florida, used to measure the real and imaginary parts of n_2 , (the non-linear refractive index), as well as new effects, such as ultrasound generation in nematic and isotropic phases, obtained by probing the liquid crystal with 80ps laser pulses; work which was carried out at Berlin University. Y R Shen presented some careful studies of the surface alignment of nematic and smectic liquid crystals using second harmonic generation (SHG) and sum frequency generation. Only the surface is probed by this method so it is possible to study the effect of the bulk on alignment, as well as different alignment surfactants. The two techniques are complementary since one, (SHG), probes the core of the molecule and the other probes the alkyl chain.

A few papers were presented on the applications of liquid crystals. A Schmid from Rochester University, USA, talked about their use in high power laser systems, including the need for large fast non-linear optical effects, which may be possible using liquid crystals. G Durand from Paris presented a new bi-stable switching effect using nematic liquid crystals and a special SiO alignment. Other papers were on a variety of subjects, Raman scattering from side chain polymers, cross-correlation spectra as a means to measure threshold voltages and a method of measuring, relatively rapidly, the dispersion of the refractive indices of liquid crystals as a function of temperature.

The conference finished on a slightly unusual note, with all 60 delegates helping the hotel owner to rotate the "gazebo" by 180°, with many comments made as to its chirality!

OLC will next be held in Orlando, Florida in October 1991, details on page 8.

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