

3rd International Symposium on the Manipulation of Smart Advanced Materials

- Recent Developments in Spectroscopic Studies of Oriented Phases -

31st August – 3rd September 2010; I & I Land

Round Table Discussion at I & I Hall

15:30-17:00 on 1st of September

Mario Cifelli

Is it so obvious that the anticlinic arrangement should strongly hinder out of plane translational diffusion the synclinc-anticlinic transition? This would imply maybe also polar order in the smectic planes? That is, for example, that all the helices in a plane are in phase in terms of the azimuthal angle?

Another point is a possible "magneto-clinic" effect that we have noticed in the SmA phase of a chiral de Vries smectogen. Basically we noticed a quite evident increase of the ²H quadrupolar splitting as the magnetic field is increased in a smectic A phase of a de Vries type smectogen (*CHEMPHYSICHEM*, **11**, 1641 (2010)). Even it is related to a single deuteriated phenyl moiety we think that it is quite peculiar.

Rauzah Hashim

Problems which I am currently preoccupied are associated with the purity of branched chain glycosides, the material we have prepared and their thermotropic phases.

It is obvious now that alpha- and beta- anomers behave differently as far as their liquid crystal phase transitions are concerned. For example, comparing a 90% beta dominant compound to that of 98% beta-dominant will show a transition temperature difference as high as 40-50°C, while some others show a completely different phase behaviour. Due to an increase in curvature strength, the chain branching promotes curved phases (instead of just a bilayer) and clearly adds more phase mesomorphism diversity. I believe there are many other phases formed, yet to be identified. So far we have only assumed smectic A, columnar phases and cubic bicontinuous phases. I guess there are, for example, different types of columnar structures, not just hexagonal but possibly also a rectangular arrangement.

It is just amazing how a little change of chemical structure can result in a vast difference in self-assembly behaviour which in turn can be reflected in biological phenomena.

Something which has bothered me lately and I hesitate to say it, since it is a scientific taboo. My student claims that even when the purity remains the same, say at 98% beta dominant (by chemical analysis), the phase transition temperatures of these materials can be different, since different people or different preparation (pathway) are involved. According to her there are reports

of other lipid systems which give different phase transition temperatures, she did not give me the report, instead quoted this one Kinetic asymmetry in the gel–liquid crystalline state transitions of DDAB vesicles studied by DSC, Journal of Colloid and Interface Science 344 (2010) 70–74 which is a mixture. But according to her, it is widely known that transition temperature of liquid crystal material is dependent on the **history of its preparation**.

When dealing with cubic bicontinuous phases, we know that its occurrence is governed by kinetic rather than thermodynamics. What does this means?

Geoffrey Luckhurst

How may orientational order parameters other than those of second rank be determined? For example, those dependent on the on the off-diagonal elements of the supermatrix equivalent of the Saupe ordering matrix which is used to characterise the order of biaxial liquid crystal phases.

The definition of the directors for liquid crystals with high point group symmetry is straightforward. Thus for uniaxial nematics ($ND_{\infty h}$) and biaxial nematics (ND_{2h}) the directors can be identified with the rotational symmetry axes. For biaxial nematics having lower symmetry such as NC_{2h} only one director can be so defined. The question now is whether there is a unique definition for the other directors and the implications of this in, for example, continuum theory both static and dynamic.

Lou Madsen

I would be interested in thoughts on anisotropic transport, and orientation on different length scales in a single material. We are considering these issues in our laboratory in the areas of nanophase-separated polymeric phases. These include block copolymer LC phases with domain structure (locally ordered but macroscopically disordered), and lamellar or cylindrical micellar phases.

I am sure we will discuss N_B phase dynamics, symmetries, and latest measurements as well.

Assis Martins

How to obtain simple and meaningful singlet orientational director distribution functions for the simulation of the observed NMR spectra?

The meaning of the semi-empirical forms so far proposed.

The influence of the operating, boundary and initial conditions on the NMR spectra obtained

Hiroyoshi Naito

Free-slip boundary condition for fluid flow in vertically aligned liquid crystal cells.

The free-slip boundary condition means that nematogenic molecules move freely on the electrodes. We believe that this condition is essential to explain fast director response in vertically aligned liquid crystal cells, and is contrary to the conventional no-slip boundary condition that mesogenic molecules, adjacent to the alignment layer surface, are stationary relative to the solid surface.

We have tried to measure directly the flow velocity by adding small but optically observable particles into liquid crystals, but we did not find results

consistent with our theoretical prediction. See *Jpn. J. Appl. Phys.* **43** L1588-L1591 (2004).

Simultaneous measurements of anchoring energy and elastic constants. To the best of my knowledge, elastic constant measurements assume infinite anchoring energy, and anchoring energy measurements, such as the strong electric field method proposed by H. Yokoyama, require the values of elastic constants measured under the strong anchoring condition. For this reason, simultaneous measurements of anchoring energy and elastic constants are essential.

We have developed an experimental setup and computer program for the simultaneous measurements based on the theory given in *Phys. Rev. E* **52**, 681-689 (1995).

Hideo Takezoe

Biaxial nematics: Why do many scientists apparently mistake uniaxial nematics as biaxial nematics. Does any biaxial nematic phase exist or not in thermotropic LCs.

LC displays: Is the next display going to be an LCD? What is required and how is it possible?

Spontaneous symmetry breaking (chirality and polarity): spontaneous deracemisation and spontaneous polar order

Bakir Timimi

Consistency in the identification and characterisation of the biaxial nematic phase.

Carlo Alberto Veracini

As far as the dynamics, for instance, (but this is also true with NMR results in general) I often ask myself what is really safe and how we could improve our understanding of Liquid Crystal phases.

Certainly we could introduce in Dynamical studies, in analogy to what is made for averaged spectral quantities, the ^{13}C relaxation, (in conjunction with that for ^2H). This could perhaps bring new aspects, to be contrasted with available results.

In the field of Chiral Phases I am at the moment interested in magnetic field effects. A wealth of information could be obtained in LC phases in general by the contemporaneous use of an electric field. They are already suggested in the literature that, in this way, we could induce phase biaxiality in suitable cases.

At the phase transitions molecular conformational changes can appear: could we follow in detail these changes with NMR?

Jagdish Vij

One of the issues currently in my mind has been a comparison of techniques for the determination of the biaxial order parameters for example NMR and IR spectroscopy as well other techniques. I can introduce their determination using the IR technique.