



ESRF

Experiment title:

Study of the role of the defect in lamellar-nematic transition in phospholipidic-detergent-water system; SAXS experiments

Experiment number:

SC-404

Beamline:

ID2

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Shifts:

9

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Report:

We have used ID2 to investigate the phase transition between a lamellar phase and a nematic phase in a ternary lyotropic liquid crystal : DMPC (the lipid) C12E5 (non-ionic surfactant) and WATER the solvent. Previous experiments using small angle neutron and X-ray (SC339) scattering suggested that the transition is induced by defects which are at the origin of the lost of the long range order in the lamellar phase.

The aim of this experiment was :

- 1st to study the Bragg peak profile when we are close to the transition in order to characterise the ETA parameter which is related to the product of elastic constants B and K of the lamellar phase.
- 2nd to study the scattering at smaller angles which characterise the form factor of these defects.

To summarise the experimental results, strong pretransitional effects have been observed in the vicinity of the lamellar-to-cholesteric phase transition of the mixed DMPC-C₁₂E₅ system. Their signature in scattering experiments is i) a noticeable temperature effect on

the Bragg peak position q_0 , ii) a significant variation of the lamellar Bragg peaks profiles, both effects being associated to iii) the presence of a diffuse signal—with characteristic anisotropic features—described as originating from Burgers vector 2 screw dislocations.

We believe that the decrease of η as temperature is decreased is more probably related to the same phenomenon that gives rise to the anisotropic diffuse scattering and is presumably the signature on the elastic properties of the appearance of defects in the lamellar phase.

The proliferation of screw dislocations may appear as a plausible mechanism for driving this transition.

O DHEZ, S. KÖNIG, D. ROUX, F. NALLET, O. DIAT, submitted to *Eur. Phys. J. B.*