ESRF	**Experiment title:** Structure of Novel Templates for Colloidal Self-Assembly	**Experiment number**: 26-02 659
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Report:

The primary objective of the proposed experiment was to study the microstructures of the different liquid crystalline (LC) phases of sodium dodecyl sulphate (SDS)-β-Cyclodextrin (CD) complex in aqueous solution at different stoichiometric ratios both as a function of concentration and temperature.

Although the placement of all the required equipment for our experiments was relatively fast, the build-up of the SAXS set up took much longer than what is usually expected. The main reason being the alignment of the set up which was far from ideal. One of the aligning mirrors had malfunctioned which resulted in a beam that was poor both in terms of the quality as well as intensity. Further the beam intensity which was moderately good after the refilling decayed quite fast; as a result we could do only a part of the planned measurement.

Samples at three different molar ratios (A) of CD to SDS at different water content and at different temperatures were measured. Fig. 1 shows the typical 2-D patterns at different molar ratios of CD to SDS while the temperature and the water content were kept fixed. All of them show lamellar phases. As one can see from the Fig.1, for all the samples where A=1, the lamellar phase was polycrystalline in nature while for higher molar ratios the bilayers are partially aligned. Interestingly, the lamellar phase for A=1 shows much more long ranged order while for A=2 and A=3 the ordering is comparatively short ranged as one can see from the peak width [fig.2] as well as from the number of peaks visible in fig.1.

Typical results for the temperature dependence are shown in Fig.3A. The highlight of the present study is that the inter-bilayer spacing (d-spacing) decreases with increase in the temperature [fig.3B]. This result is a bit counterintuitive as one expects with increase in temperature the bilayers to be more floppy which will result in enhanced thermal fluctuation leading to a higher inter bilayer spacing. It is plausible that with increase in temperature some CD might escape from the bilayers to change the local stoichiometric ratio which gives rise to this anomalous behaviour.

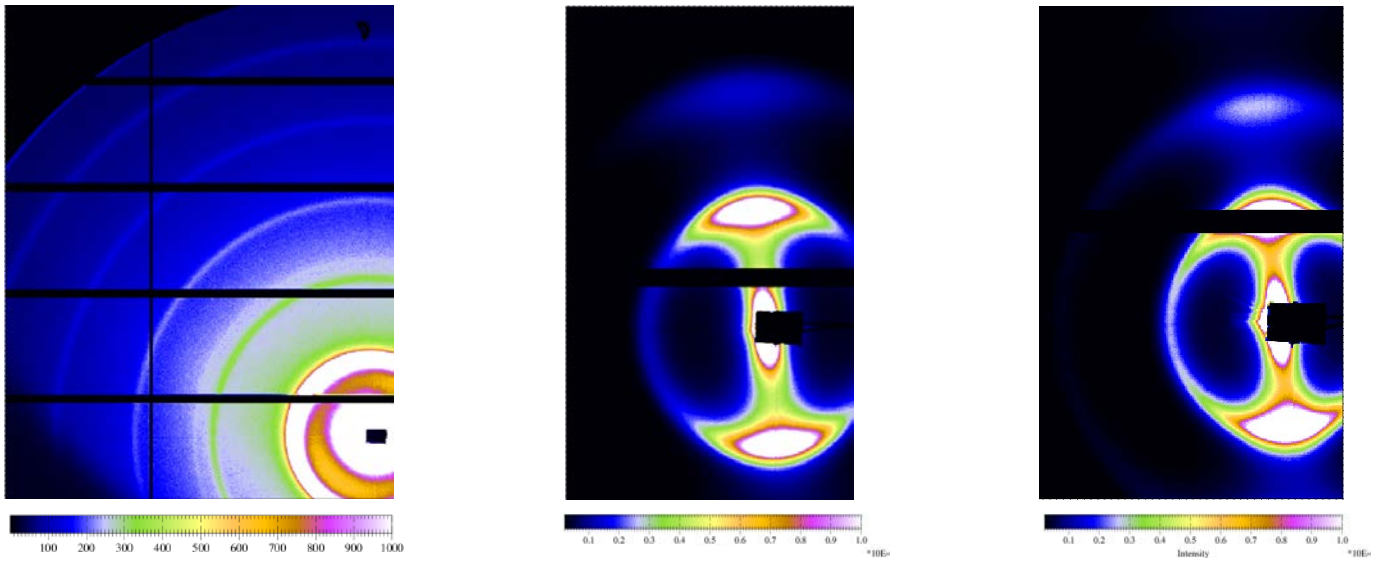

Fig.1. Typical 2-D patterns at different molar ratios of CD to SDS while the temperature [25^{0}C] and the water content [80%] were kept fixed.

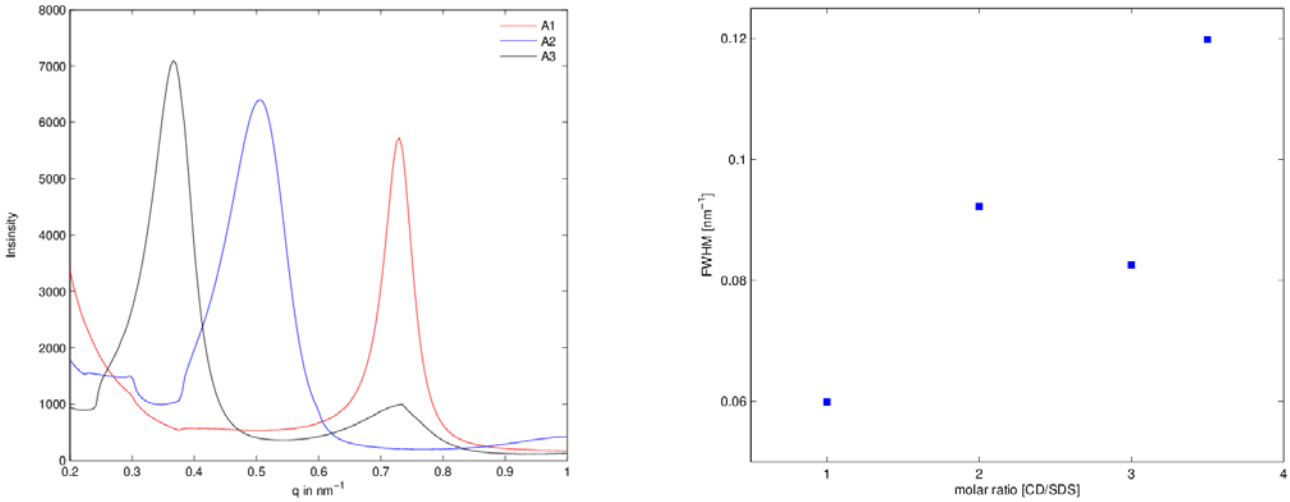

Fig.2. Peak width at different molar ratios while the temperature [25^{0}C] and the water content [80%] were kept fixed.

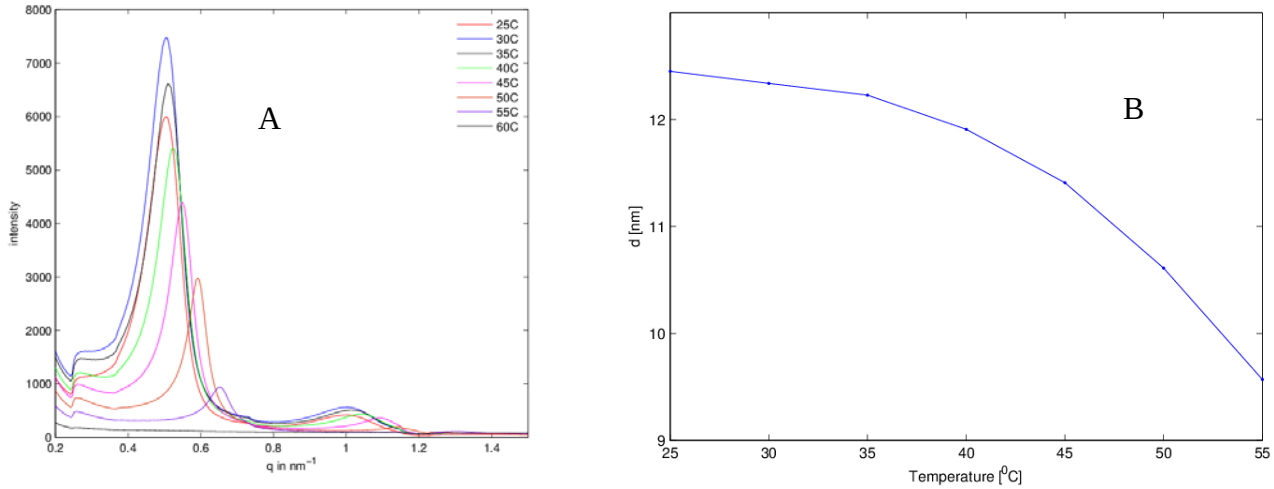

Fig.3.A) Typical intensity profile at different temperatures. B) Variation of d-spacing as a function of temperature