

## Experiment SC951

### *Structures in solutions of di-chain surfactants. Comparison of DDAB with Analogues*

**Beamline** ID02a

8 shifts, 19 July 2002 to 22 July 2002

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#### **1. Aims, Background, Measurements**

The proposed experiment was aimed at studies of the di-chain surfactants that are analogous to DDAB (didodecyl dimethyl ammonium bromide). Unusual behaviour had been observed in studies of surface structure. The aim was to extend previous published work [1, 2, 3] to the low concentration region where interesting structures are observed in the surface experiments.

We studied samples of symmetric surfactants for  $x=y=10,11,12,13,14$  as well as a range of the asymmetric surfactants. As an initial series, we complemented the data for symmetric materials with the following compounds:

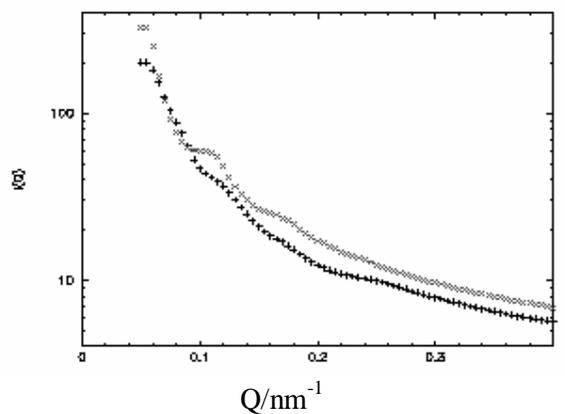
<u>x</u>	<u>y</u>
10	12
10	14
10	16

Measurements were made over a range of temperatures from 25 to 65 C and at concentrations between 0.1 and 1 % w/w. Data was collected at two sample detector distances (1 m and 10 m) to cover a wide range of momentum transfer. All data was collected in a single flow-through capillary. Background measurements were made for the same capillary. This was necessary as at the lowest concentrations, signal was small and very careful subtraction of the background from the capillary and solvent was required.

#### **2. Results**

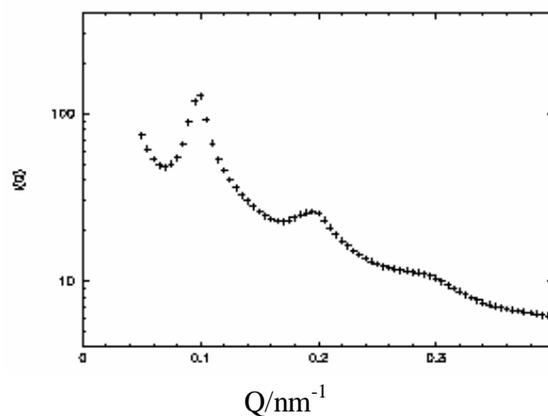
Data for most of these systems showed a lamellar phase at concentrations of 0.5 or 1.0% w/w. The spacings compare well with those seen at surfaces and may alter the previous suggestion that vesicles form. The effect of added salt and other additives (e.g. glycerol) is interesting. A comparison of a sample with and without 1% glycerol is shown in Figure 1. In contrast to these samples, the lamellar phase for asymmetric surfactants is often more evident. Figure 2 shows an example for the C10C16 surfactant at the same temperature.

Figure 1. Effect of glycerol on the lamellar phase at 45 C for  $C_{13}C_{13}Me_2N^+Br^-$



$C_{13}C_{13} Br$  1% w/w + pure water, X with 1% glycerol

Figure 2. Lamellar phase at 45 C for  $C_{10}C_{16}Me_2N^+Br^-$



Some other surprising features in the results included orientation of some of the samples due to the flow. We propose to make more measurements to clarify this behaviour.

#### References:

1. H. Kunieda and K. Shinoda *J. Phys. Chem.* **82**, 1710 (1978).
2. M. Dubois and Th. Zemb, *Langmuir* **7**, 1352 (1991).
3. S. Haas, H. Hoffmann, C. Thinig and E. Hoinkis *Colloid Polym. Sci.* **277**, 856-867 (1999).