	Experiment title: Beyond hard spheres: Self-organization of colloidal dumbbells	**Experiment number**: 26-02 660
Beamline:	**Date of experiment**: from: 21/02/2014 to: 24/02/2014	**Date of report**: 12/03/2014
Shifts: 9	**Local contact(s)**: Dr. Guiseppe Portale	*Received at ESRF:*

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Report:

The aim of this experiment was to study the self-organization of highly anisotropic dumbbell-like polystyrene colloids as a result of gravity-induced osmotic compression in aqueous suspensions.

Colloidal crystals of anisotropic dumbbells of different anisotropy were measured. Height scans of the sample sediments were performed (fig.1). At the top of the sediment the data showed only the form factor (not shown) followed by structure factor rings. As one goes down in the sediment, structures with long ranged order are visible. However, since most of the sediment is multi domain in nature, more analysis is needed to comment on the exact crystal symmetry.

Rotation scans (with a total range of 120 degrees) were performed at a particular height that showed hexagonal symmetry. In figure 2 we present the characteristic SAXS patterns for selected angles. With extensive and detailed analysis of the obtained structure we might be able to determine the exact ordering in the self-assembled phase.

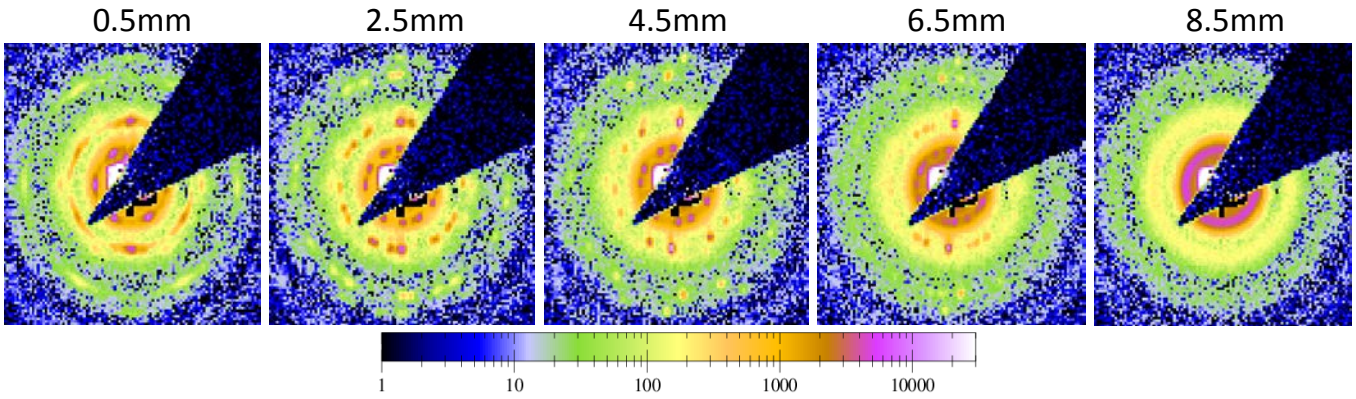

Figure 1. 2-D SAXS patterns of height scan through the sedimented sample of anisotropic colloidal dumbbells at different heights from the bottom of the sediment.

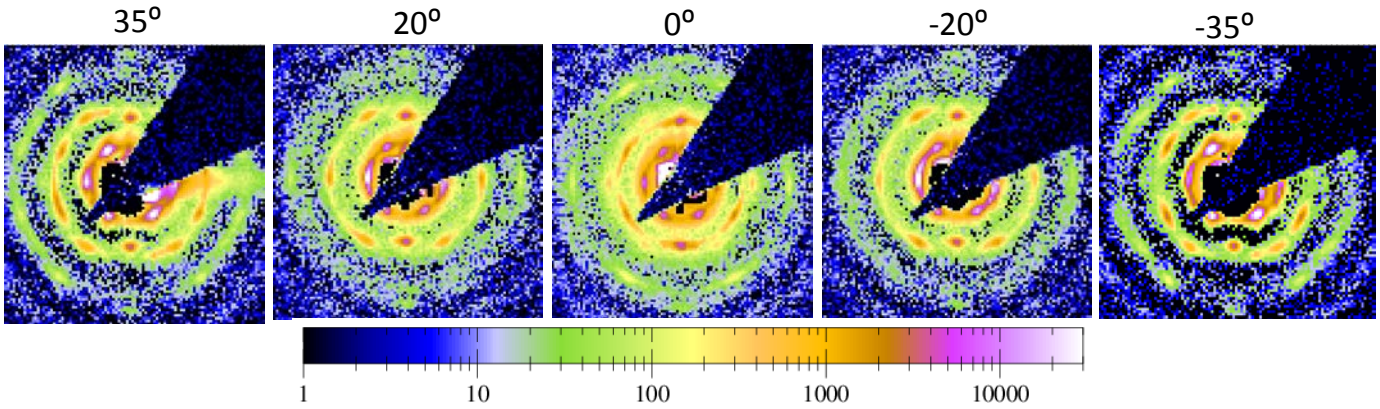

Figure 2. 2-D SAXS patterns of crystal of colloidal dumbbells at different rotation angles at a height 0.5mm from the bottom of the sediment. The dumbbells self-assembled into an ordered structure with hexagonal symmetry at zero degrees.

As it is clear from the diffraction data that the beam quality was poor. It was asymmetrical i.e. elongated bit more in the vertical direction, presumably due to the effect of vibrations leading to beam fluctuation on the detector. Further we found some oscillations in the direct beam position that affected our measurements. Last but not the least, the camera (Pilatus) which we have used to record the diffraction pattern is not the optimal one to suit the need of the present experiment. Unfortunately, since the 22µm Photonic science camera was not in working condition, we had no option other than to use Pilatus. In spite of all these difficulties we could perform most of our planned measurements. However, all the problems discussed above have severely affected the data quality and have led to poorly resolved data.

In addition we have also measured some crystals of anisotropic dumbbells in water-alcohol mixtures. Their SAXS patterns also showed strong Bragg spots revealing long ranged ordered structure are present in the sediments.