ESRF	**Experiment title:** Chiral nematic liquid crystals of cellulose in confinement	**Experiment number**: 26-02 756
Beamline: BM-26B	**Date of experiment**: from: 11/09/2015 to: 14/09/2015	**Date of report**: 06/11/2015
Shifts: 9	**Local contact(s)**: Dr. Daniel Hermida	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Jasper Landman*, Pepijn Moerman*, Kari-Anne van der Zon*, Anne Weijkamp*, Samia Ouhajji, A. V. Petukhov, W.K. Kegel

Van 't Hoff Laboratory for Physical and Colloid Chemistry, Utrecht University, Padualaan 8, 3584 CH, Utrecht, NL

Report:

The objective of the proposed experiment was to investigate the local structures of chiral cellulose nanowhiskers, formed in confinement provided by the sample geometry. These nanowhiskers are known to form chiral nematic or cholesteric liquid crystalline phases in bulk. The proposal was initially placed on the reserve list, but we were given the opportunity to perform the experiment after all when a time slot opened up in the schedule.

From preliminary experiments at ID-11 earlier this year, it was found that the cellulose nanowhiskers show only very minor scattering contrast in comparison to colloidal particles, which were also present in the samples used in that experiment. The focus of this experiment was shifted to study the structures formed by cellulose nanowhiskers. We therefore needed to find the proper conditions under which scattering of cellulose nanowhiskers could be observed. A follow up experiment at ID-13 microfocus beamline is proposed to use the information obtained in this experiment to gain more local information.

Samples were measured in glass capillaries of different concentrations of cellulose nanowhiskers obtained by hydrolysis of a cellulose source (filtration paper, i.e. cotton). Added to these suspensions were different concentrations of dextran polymer, acting as a deplentant. These samples were known to form tactoids of chiral nematic phase in an isotropic continuous phase. We measured SAXS and WAXS patterns simultaneously. Typical WAXS and SAXS patterns can be seen in Figs. 1 and 2 respectively.

Figure 3 shows a comparison of integrated SAXS and WAXS patterns for cellulose nanowhisker suspensions in the absence and presence of 2.0 wt% and 2.5 wt% dextran respectively.

Fig. 1) Typical WAXS pattern of a suspension of cellulose nanowhiskers.

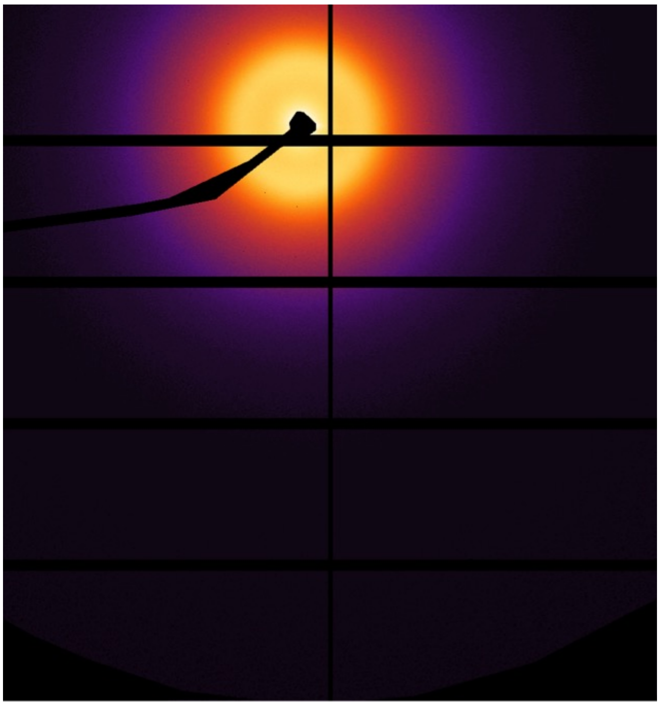

Fig. 2) Typical SAXS pattern of a suspension of cellulose nanowhiskers

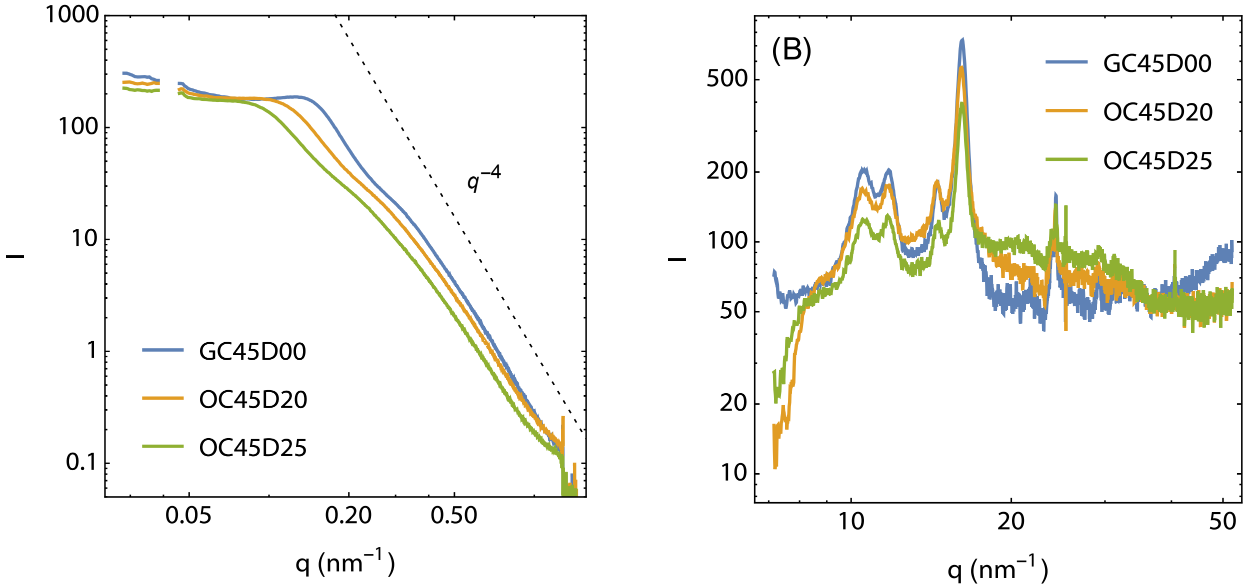

Fig. 3A) Comparison of radially integrated SAXS patterns and B) WAXS patterns, of suspensions of 4.5 wt% cellulose nanowhiskers in the absence (blue curves) and presence of increasing amounts (2.0 wt%, 2.5 wt%, yellow and green curves respectively) of dextran.

We would like to thank Daniel Hermida for his support during this experiment.