ESRF	**Experiment title:** A SAXS Study of the Self-Assembly of Amyloid Peptide Amphiphiles and Their Response to Enzymes	**Experiment number**: SC-3468
Beamline:	**Date of experiment**: from: 5/12/12 to: 7/12/12	**Date of report**: 30/1/13
Shifts:	**Local contact(s)**: Dr T. Narayanan	*Received at ESRF:*

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Report:

The peptide amphiphile C_{16}-KKFFVLK was found to self-assemble into nanotubes and helical ribbons in aqueous solution at room temperature. A remarkable unwinding transition, leading to twisted tapes, was eludicated by SAXS on heating. Nanotubes and ribbons re-form on cooling. Highly aligned SAXS patterns indicating nematic ordering of the nanotubes/ribbons were obtained.

Experiments (including kinetics measurements) on a 1 wt% sample were performed using with a FReLoN Kodak CCD for SAXS with a 1.2 m sample-detector distance and WAXS data were measured simultaneously with an Aviex CCD. The x-ray wavelength was 0.995 Å. The solution was injected using a syringe into ENKI KI-beam thin (0.05 mm) wall 1.85 mm diameter polycarbonate capillaries which optimise background subtraction. Measurements were performed at 25 ^{o}C. Measurements on samples at 25 ^{o}C and 55 ^{o}C were performed with the sample mounted in a quartz capillary instead of the ENKI polycarbonate capillary. All data were reduced to one-dimensional intensity profiles by radial integration.

The nanotubes exhibit spontaneous flow-induced alignment, as revealed by SAXS (Fig.1). This suggests nematic orientational ordering. This was confirmed by polarized optical microscopy (which showed thermo-reversibility of birefringence when the sample was heated to 55 ^{o}C and then cooled back to 22 ^{o}C). By SAXS, alignment was observed on flowing the sample through the capillary holder, and the extent of orientation could be increased by manually shearing by driving a delivery syringe back and forth. SAXS shows that orientation of the sample is retained on heating to 55 ^{o}C (Fig.1), although alignment with respect to the flow direction is lost in the absence of shear forces. The form factor oscillations disappear. The extent of orientation as gauged by the anisotropy of the SAXS pattern appears greater at 55 ^{o}C (compare Fig.1b and Fig.1a or Fig.1d). On cooling to 20 ^{o}C, the form factor oscillations reappear within 30 minutes, although they continue to develop for up to 9 hr (Fig.1).

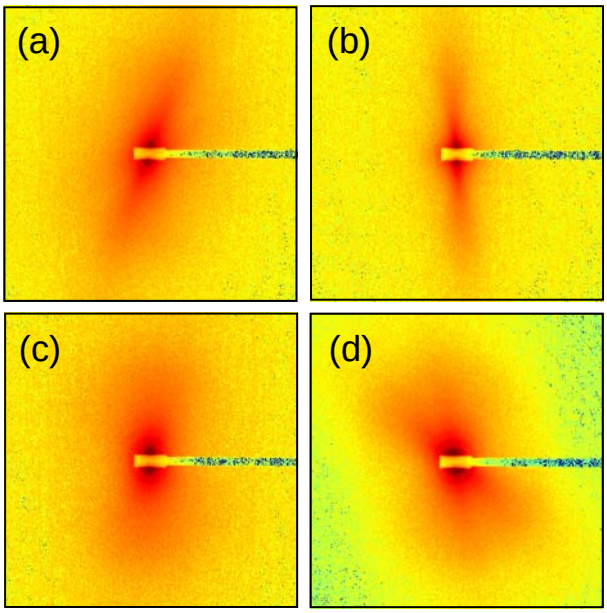

Fig.1. SAXS patterns (q range: -0.03 to 0.03 nm^{-1}) of C_{16}-KKFFVLK flow-aligned in a capillary. (a) At 55 ^{o}C, (b) Immediately after cooling to 20 ^{o}C, (c) After 30 min at 20 ^{o}C, (d) After 9 hr at 20 ^{o}C. All images have a logarithmic intensity scale.

This work has been submitted for publication.[1] Further publications concerning the self-assembly of this peptide, and related ones,[2] are submitted or in preparation.

References

1 I. W. Hamley, A. Dehsorkhi, V. Castelletto, S. Furzeland, D. Atkins, J. Seitsonen and J. Ruokolainen. *submitted*, 2013.

2 I. W. Hamley, A. Dehsorkhi, V. Castelletto, J. Seitsonen, J. Ruokolainen and H. Iatrou. *submitted*, 2013.