Experimental Report template

Proposal title: SAXS/WAXS study of the pH-dependent mechanism of formation of twisted ribbons using bioderived sophorolipid bolaform		**Proposal number:** SC-4419
Beamline: BM26B	**Date(s) of experiment:** from: 30/01/2017 to: 02/02/2017	**Date of report:** 23/02/2017
Shifts: 9	**Local contact(s):** Daniel Hermida-Merino	*Date of submission: 23/01/2017*

Objective & expected results:

Sophorolipids are one of the most interesting classes of biosurfactants because of their large scale production by microbial synthesis, biodegradability and low toxicity. Typical applications are antimicrobial, dermatological, immunoregulatory, spermicidal, antiviral as well as additives in cleaning and cosmetic products. However, there is no knowledge on their phase behaviour. IN addition, sophorolipids, as microbial biosurfactants, can be produced in limited amount by microbial fermentation. For this reason, classical approaches employing large amounts of matter for a phase diagramme study should be avoided. We then want to apply the use of microfluidic devices to the study of phase behaviour of sophorolipids and establish the methodology to do so at the beamline BM26B.

Results and conclusion

We studied two sophorolipid samples of similar composition at a 100% concentration in a serpentine microevaporator device. For sample named SL-N3, we have studied 3 different external humidity conditions, RH= 30%, 60% and 90%, while for sample named SL_T59C, we have studied RH= 30%, 40%, 60%, 80%, 90%.

Preliminary analysis of the data show that all samples have a diffraction peak at q= 2.2 nm^{-1} indicative of the mesophase preliminary observed using cross-polarizers with an optical microscope. The diffraction pattern does not change neither with the employed humidity nor with the type of sample.

As for the background, we have sampled the PDMS of different microevaporators at different locations. Two type of PDMS backgrounds were noted.

Data treatment

The experiments have been done at 12.0 KeV and AuBenh was used to calibrate the low q-range while alpha-alumina was used to calibrate the high-q range. Data are not scaled in absolute intensity due to the microfluidic geometry which does not allow a proper background. The limited amount of microevaporators did not allow us to collect the signal of water. We have used a double-shuttered (vertically and horizontally) sample holder to hold the microfluidic device. By mean of an optical microscope, one microfluidic channel was aligned with the opening and then set in front of the beam. This task, once optimized, was reproducible in terms of beam alignement with the capillary. The beam size was ellipsoidal 50x300 μm, which fitted perfectly in the microchannel (50x1000 μm). We did not observe edge scattering at low-q under conditions of perfect alignement between the beam and the channel, although this could happen for small alignement imperfections. To avoid that, one should introduce an extra motor which tilts the sample holder in the plane normal to the beam and which was not available at the moment of the experiment.

All 2D data were integrated and masked at the beamline but not corrected by the transmission.

We did not observe beam damage on none of the samples.

Justification and comments about the use of beam time:

The use of the beamline was well-adapted to the case study, as the beam size was compatible with the microevaporator channel size and type of experiments. This methodology can easily be appled to similar studies on derivatives of sophorolipids. However, the study of pH-changes or analysis of different points in the microchannel requires a beam having a circular section with a diameter smaller than 50 μm.
The local stuff was also very helpful and crucial to make the experiment succesful.

Problems during beamtime:

After finding the good sample holder, we did not experience any trouble during the beamtime