



Contribution ID: 14

Type: **Talk**

Distortion of amphiphile lamellar phases induced by surface roughness

Tuesday 8 December 2020 13:40 (25 minutes)

The structure of concentrated solutions of tetraethyleneglycol dodecyl ether has been compared against a smooth surface and one with a roughness of the order of the lamellar spacing. This has been done in order to investigate the role perturbations have on the overall lamellar order, when these have length scales of the order of the interactions between neighboring lamellae. The results showed that the surfactant forms a well-ordered and aligned structure at a smooth surface, extending to a depth of several micrometers from the interface. Increasing the temperature of the sample and subsequent cooling promotes alignment and increases the number of oriented layers at the surface. The same sample forms a significantly less aligned structure, against a rough surface that does not align to the same extent, even after heating. The perturbation of the structure caused by thermal fluctuations was found to be much less than that imposed by a small surface roughness.

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Session Classification: MLZ Users 2020 - Soft Matter

Track Classification: UM: Soft Matter