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Real time SANS studies on the transformation between the hexagonal cylinder phase and the bi-continuous gyroid structure: transient structures[1] KELL MORTENSEN, Univ of Copenhagen, MARTIN VIGILD, Technical University of Denmark, RUYA ESKIMERGEN, Leo Pharma, Denmark
— Combined application of SANS and oscillatory shear is effective tools for studying structure and real-time dynamics of soft matter materials. Large-amplitude oscillatory shear can be used to effectively control the texture of soft materials in the ordered states. We will show experimental data proving that the 10-spot pattern often characterizing the gyroid phase of block copolymer melts as well as surfactant systems is a 2D powder-pattern, originating from the dominating structure of the cylinder axis when grown from single-domain hexagonal structures. We show that the gyroid state is unstable when exposed to large amplitude / large frequency shear, transforming into the a hexagonal cylinder phase.[2] The transformation is completely reversibly. With the slow kinetics, it is possibly in detail to follow the complex materials transformation from one-dimensional cylinders to the complex three-dimensional gyroid phase of block copolymers. The transformation kinetics is different within the various crystallographic directions, and shows the transformation through a transient structure rather similar to that found in SCFT-studies.[3,4].

[1]Supported by the Danish Research Council, Natural Sciences.
[2]Eskimergen et al., **Macromol** 38, 1286 (2005)
[3]Mortensen et al, unpubl.
[4]Ly et al. **Macromol** 40, 2928 (2007)

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