ESRF	**Experiment title:** Novel photonic and phononic materials with complex bicontinuous morphologies	**Experiment number**: SC-5162
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Report:

Synthesis, Molecular Characterization, and Phase Behavior of Miktoarm Star Copolymers of the ABn and AnB (n = 2 or 3) Sequences, Where A Is Polystyrene and B Is Poly(dimethylsiloxane)

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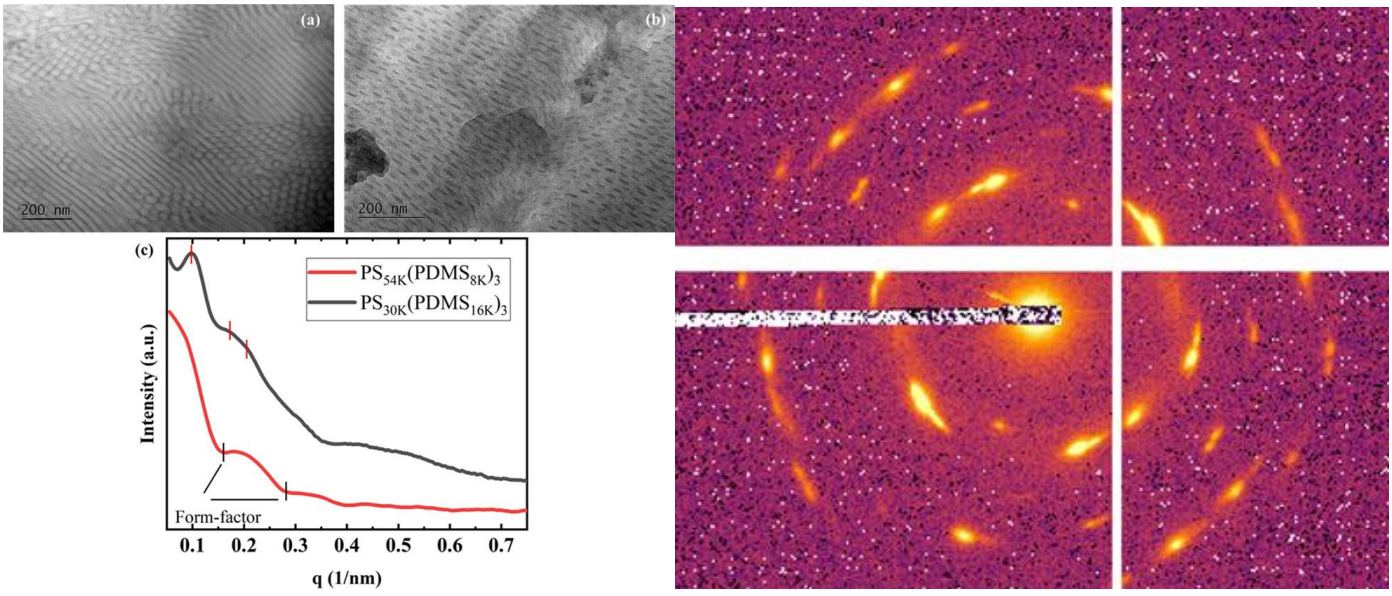

Figure 1. Left: Bright-field TEM images corresponding to miktoarm star copolymers of $PS(PDMS)_3$ type: (a) HCP morphology for the $PS_{30k}(PDMS_{16k})_3$ sample; (b) BCC spheres for the $PS_{54k}(PDMS_{8k})_3$ sample; and (c) SAXS profiles of the $PS_{30k}(PDMS_{16k})_3$ and $PS_{54k}(PDMS_{8k})_3$ samples indicated in black and red colors, respectively. **Right:** 2D-diffraction pattern of triblock copolymer PS (polystyrene)-PDMS (polydimethylsiloxane)-PB-1,4(polybutadiene-1,4) triblock copolymer forming gyroid phase investigated at ID02 beamline during the experimental session.

SAXS experiments helped to understand the structural behavior of the miktoarm star copolymers and to conclude on how a change in the design of the final materials architecture [PS(PDMS)$_{2 \text{ or } 3}$ vs PDMS(PS)$_{2 \text{ or } 3}$] can have a great impact on the structure/property relationship. Each segment's intrinsic properties such as the high flexibility of PDMS components attributed to the increased bond angle in the inorganic backbone chain or rigidity of the amorphous PS segments play a significant role in the final adopted morphology. This is especially the case when the complexity (number of arms) of the system increases and different topological constraints are imposed. Additionaly, a series of triblock copolymers were investigated in order to obtain correlation between the molecular weigth of the blocks and self-assembled structure in broad range of distances. Additionally, some triblocks copolymers with crystallisible blocks, such as PCL (poly-e-caprolactone) were investigated in order to expolore the effect of spatial confinement.