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Phase Transitions of Polystyrene-b-Polydimethylsiloxane in Solvents of Varying Selectivity TING-YA LO, CHIA-CHENG CHAO, RONG-MING HO, Nationsal Tsing Hua University, PROKOPIOS GEORGOPANOS, APOSTOLOS AVGEROPOULOS, University of Ioannina, EDWIN L. THOMAS, Rice University — A simple method to create a variety of nanostructures via the self-assembly of a single composition silicon-containing block copolymer (BCP) is developed. By using selective solvents for the self-assembly of polystyrene-block-polydimethylsiloxane (PS-PDMS), the phase behavior of intrinsic BCP can be enriched due to the strong segregation of the PS-PDMS enabling the clear-cut phase transitions during solvent evaporation. The solution-state phase behaviors of the strong segregation BCP system are systematically studied using temperature-resolved SAXS. Meanwhile, owing to the high etching contrast of the silicon-containing block versus the PS block, various nanostructured SiOC can be fabricated by using one-step oxidation. Furthermore, the recovery of the intrinsic lamellar phase can be achieved by thermal annealing the metastable cylinder and gyroid phases through order−order transition (OOT). Time-resolved SAXS and electron tomography are carried out to reveal the variation of the structural evolution in reciprocal space and real space, respectively. This result offers new insights into the phase behaviors of the OOT of BCPs.

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