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Controlling PS-b-PEO Morphologies by Solution Conditions

PRACHUR BHARGAVA, XIAOLIANG ZHENG, YINGFENG TU, STEPHEN Z.D. CHENG, MAURICE MORTON INSTITUTE OF POLYMER SCIENCE, THE UNIVERSITY OF AKRON TEAM — We have investigated the self-assembly behavior of amphiphilic diblock copolymer polystyrene-b-poly(ethylene oxide) (PS-b-PEO) in DMF/water and DMF/acetonitrile mixtures. The morphology of the block copolymer can be controlled in both these systems by varying copolymer concentration and solvent composition. The morphologies were visualized directly by transmission electron microscopy. Increasing the water content in the DMF/water mixture or acetonitrile in the DMF/acetonitrile mixture changes the morphology from spheres to worm-like/rods and then to vesicles. Increasing the copolymer concentration shows a similar effect on the morphology. The block copolymer exhibits distinct phases of both exclusive and mixed morphologies. The morphological transitions were also captured by static light scattering and turbidity measurements. Although the trend in morphological changes is similar, there are remarkable differences in the morphological phase behavior of PS-b-PEO in the two solvent systems and thus the role of the ‘selective solvent’ in such systems is also evidenced.

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