

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Thermodynamic and Kinetic Control of Charged Triblock Copolymer Assembly into Complex Nanostructures HONGGANG CUI, DARRIN POCHAN, Dept. of Materials Sci. and Eng., University of Delaware, ZHIYUN CHEN, KAREN WOOLEY, Dept. of Chemistry, Washington University in Saint Louis — Self-assembly of poly (acrylic acid)-block-poly (methyl acrylate)-block-polystyrene triblock copolymers produces various ordered nano-domains in THF/water solution through the interaction with organic counterions. These assembled structures include classic micelles (spheres, cylinders and vesicles), and non-classic micelles (disks, toroids, branched micelles and segmented micelles). Each micelle structure is stable and reproducible at different assembly conditions depending on not only solution components (thermodynamics) but also mixing procedure and consequent self-assembly pathway (kinetics). The key factors that determine the thermodynamic interactions that help define the assembled structures and the kinetic assembly process include THF/water ratio, PS block length, the type and amount of organic counterions, and the mixing pathway. The complex phase behavior and controlled morphology production have been studied via in-situ cryogenic transmission electron microscopy in combination with scattering techniques (small angle neutron scattering and light scattering). Delicate control of the interplay of thermodynamics with slow chain kinetics of block copolymers in solution offers a new strategy to create unique, functional nanostructures.

Honggang Cui
University of Delaware

Date submitted: 30 Nov 2006

Electronic form version 1.4