# 第3回　ERATOソフト界面セミナー

## Multicompartment/Multicomponent Micelles with Block Copolymer Blending through Kinetic Control of Solution Assembly


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Prof. Darrin J. Pochan is a professor of Materials Science and Engineering, University of Delaware. He serves as an associate editor for North America, Soft Matter, since 2005. He received PhD from University of Massachusetts, Amherst. He worked as a Post-doc Research Associate at Polymers Division, National Institute of Standards and Technology (NIST) before moving to the University of Delaware. He received several awards for his outstanding works, one of which is “John H. Dillon medal, Division of Polymer Physics, American Physical Society (APS). He is a member of APS, MRS, Royal Society of Chemistry, and others. Prof. Pochan has over 90 publications including Science, Nature and Nature Materials. He is known as a specialist in cryo transmission electron microscopy (Cryo TEM).

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**Abstract**: The combination of charged block copolymer architecture with the kinetic control of solvent processing offers great flexibility for the creation of new assembled morphologies in solution and outstanding ability to control and manipulate those morphologies. When charged, acidic blocks are present, assembled structures are tunable in a well-defined way via co-assembly of organic bases with adjustable chain structure and control of the solution assembly pathway. A rich variety of polymeric nanostructures have been made such as toroids, disks, and helical cylinders from poly(acrylicacid)-containing diblock and triblock copolymers in THF/water mixtures with multiamines to complex with the Poly(acrylic amide) (PAA). Both the type and amount of multiamine were found to be critical for formation of specific micelles.

Kinetic pathways and temporal stabilities of different micelles and nanoscale aggregates have also been studied. Due to low chain exchange dynamics between block copolymeric micelles in solution, global thermodynamic equilibrium is extremely difficult, if not impossible, to achieve. However, by taking advantage of slow kinetics behavior of polymeric micelles in solution, one can purposely produce multicompartment micelles and mulitgeometry micelles by now mixing different PAA-containing block copolymers together but forcing them to ultimately reside in the same nanoscale structure through kinetic processing.  While kinetically trapped in common nanostructures, local phase separation can occur producing compartments.  This compartmentalization can be used within common micelle geometries to make complex spheres and cylinders or can be used to make new nanostructures such as multigeometry aggregates (e.g. hybrid cylinder-sphere aggregates).



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