

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Ultrafiltration of Polymeric Micelles through Nanopores

LIANGZHI HONG, CHI WU, Department of Chemistry, The Chinese University of Hong Kong — The micellization of block copolymers in a selective solvent has been extensively studied, a wide range of methods have been used to study the formation kinetics and mechanism of block copolymer micelles. Some questions are still remained to be answered, such as the equilibrium between micelles and individual copolymer chains (unimers) and the strength of interaction between the insoluble blocks in the micelle core. It is rather difficult, if not impossible, to separate micelles from unimers and analyze them separately even by size exclusion chromatography. Recently, using a special double-layer membrane with nanopores, we have, for the first time, observed the predicted discontinuous first-order transition in ultrafiltration of flexible linear polymer chains. Namely, the chain could pass through a pore much smaller than its unperturbed radius only when the flow rate is higher than a critical value. Using a similar device, we can separate unimers from micelles by using a specific membrane with a pore size smaller than radii of micelles and unimers and a proper flow rate because micelles can be treated as "star" polymers. In this way, we can determine the amounts of unimers in the solution. Furthermore, by increasing the flow rate, we can estimate the interaction strength from the critical flow rate at which micelles are broken into unimers to pass through the nanopores.

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Date submitted: 20 Nov 2006

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