高分子学会九州支部外国人講演会

Sminars on Soft Matter Materials using Small-Angle Neutron Scattering (SANS)

Structural studies of aqueous solutions of PEO - PPO - PEO triblock copolymers, their micellar aggregates and mesophases; a small-angle neutron scattering study

講　師　：Kell Mortensen 教授

(Research Professor, RISØ National Institute, Denmark)

場 所 ：九州大学 理学部 化学第3講義室（理学部2号棟2階2275室）

日 時 ： 1 月24 日(水) 13:00-14:30

ABSTRACT

The structural characteristics of aqueous solutions of the Pluronic triblock copolymers of poly(ethylene oxide) - poly(propylene oxide) - poly(ethylene oxide), PEO - PPO - PEO, and their self-associated assemblies are reviewed. It is shown by small-angle neutron scattering that at low temperatures and/or concentration the individual copolymers exist in solution as individual unimers. Thermodynamically stable micelles are formed with increasing copolymer concentration and/or temperature. The unimer-to-micelle transition is not sharp, however. Micelles of well defined spherical shape and size coexist with unimers over a relatively wide temperature/concentration range. The micellar volume fraction increases accordingly with increasing temperature, increasing copolymer concentration and decreasing hydrostatic pressure. The copolymer suspension undergoes as a result a transition from a Newtonian liquid to a soft solid material when the micellar volume fraction crosses the critical value for hard-sphere crystallization. Crystallographic investigations on shear-aligned monodomain samples prove that the micelles in the solid phase are organized on a body-centred cubic lattice. As a result of an increasing micellar size upon increasing the temperature, the micelles themselves undergo a sphere-to-rod transition at elevated temperatures. In a shear field these rod-like micelles form a macroscopic nematic phase for low copolymer concentration, and a hexagonal solid phase for higher concentrations. For even higher concentrations, lamellar phases are observed: one lamellar type which is still governed by the hydrophobic interactions, and one type which appears as a result of crystallization of the PEO blocks.

For further information, please contact M. Annaka (092-642-2594)