

第 72 回化学コロキウムのお知らせ

日時: 平成 17 年 12 月 2 日(金) 午後 2:30 ~ 4:30

場所: 国際交流会館中会議室

演者: Heinz Hoffmann 教授 (University of Bayreuth, Germany)

演題: Block Copolymers with a Hydrophobic and a Polyelectrolyte
Block: Their Micellar Structures and Macroscopic Properties

Abstract: Block copolymers with a hydrophobic block and a polyelectrolyte block of about the same length form micelles but are not surface active. In order to control the charge density on the poly-electrolyte chain the block copolymer P-nBuA-b-PAA with a hydrophobic block and a polyacrylic acid chain has been studied as a function of the neutralisation degree α . The viscosities increase with α and pass over a maximum at $\alpha = 0.5$. Solutions with a concentration of $C_p \geq 1\%$ and at $\alpha = 0.5$ are highly viscoelastic and have a yield stress value. Cryo-TEM micrographs show that globular micelles are present in the viscoelastic solutions. The radii of the hydrophobic core of the largest micelles are as large as the length of the fully stretched hydrophobic block. The rheological properties of the solutions are explained on the basis of the globular core-shell micelles where the polyelectrolyte chains form a corona around the hydrophobic block. Most of the counter-ions are in the condensed and free state inside the corona. Some of the counter-ions are outside of the corona and form an electrical double layer whose thickness depends on α . The viscoelastic properties of the solutions are thus given by the dense packing of the charged globular micelles. The decrease of the viscosity for $\alpha > 0.5$ comes about by the shrinkage of the thickness of the electrical double layer. With increase of excess salt the double layer and the corona also shrink and the viscoelastic properties break down. With adsorption of zwitterionic surfactants the viscoelastic properties also disappear. Cryo-TEM micrographs of the block copolymers at $\alpha = 0.5$ with adsorbed zwitterionic surfactants show that the polyelectrolyte chains of the block copolymers are wrapped around small globular micelles of the zwitterionic surfactants. The supra-molecular structures look like raspberry-like micelles.

Hoffmann 教授は、界面活性剤や両親媒性高分子が作る集合体の構造やダイナミクスについて、各種緩和法・中性子小角散乱・Cryo-TEM 等種々の手法を駆使して多くの重要な業績を挙げてこられた方で、特に粘弾性に関する先駆的な研究は広く知られています。今回、名古屋大学で開かれる Asian Conference on Recent Trends in Colloid and Surface Science の Plenary Lecturer として来日されるのを機に、本学にお招きいたしました。

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