The 257th MANA Special Seminar

Photo-triggered assemblies of amphi philic copolymers with and with no surfactants: experimental studies and model predicting the response to light

Chair: Prof. Françoise Winnik(MANA Satellite PI)

Dr. Christophe Tribet

(Department of Chemistry,
The École normale supérieure (ENS), France)

Amphiphilic copolymers form in aqueous solutions co-assemblies, for instance with micelles of surfactants, lipids. They also form self-assemblies upon transferring a fraction of their hydrophobic groups from water into apolar clusters. The energy balance between attractive hydrophobic binding and intra/inter chain repulsions controls these assemblies, that are used since decades to tailor properties of complex fluids, for instance emulsions, physical gels, dispersion of cargoe-particles for drug delivery, etc… In practice, the hydrophobic drive toward (self-)assembly can be modulated at the microscopic level upon variation of control parameters (pH, temperature, or exposure to stimuli: e.g. light), which in turn provide remote control of macroscopic properties.

We tailor azobenzene-modified copolymers to achieve marked photo-switch in such assemblies. Experimental illustrations include mixed micellization with surfactants, and photo-triggered permeabilization of lipid and plasma membrane of mammal cells. To analyze experimental data on the degree of hydrophobic binding of polymer chains, we propose a model based solely on one parameter: a critical hydrophobicity of a (bound) polymer segment. This model is shown to reproduce the measured fractions of micelle-bound hydrophobes (here azobenzene) as a function of density of hydrophobic groups per chain. Non-monotonic variation of LCST are also predicted and experimentally evidenced. The model enables us to discuss a bottom up approach to the design of systems having optimal responses to light.

Venue: **Seminar Room #431, 4F, MANA Bldg.,**

Date: **May 7th, Monday** ***Time:*** **15:00-15:45**

Namiki site

Contact: International Center for Materials Nanoarchitectonics (MANA), Nakata (ex. 8806)