WS 2026/2027

Title:

Probing Conformational Transitions in Polymer Brushes by the Fluorescence Red-Edge Effect

Abstract:

The rapid development of stimuli-responsive (or smart) materials led to the recent emergence of polymer brush-coated surfaces in a variety of fields, ranging from tunable lubrication through intelligent membranes with on-demand filtration ability to sophisticated sensing and biomimetic systems. In the presence of specific stimuli, polymer chains change conformation (stretched to collapsed). The applicable stimuli may include pH, temperature, electric or magnetic signal, solvent composition, which allows for a really interesting sensing method for probing these stimuli. If, we can rapidly identify the conformational transitions in real time. A new way forward to probing this, is to sense changes in localised viscosity as brushes undergo collapse transitions. The so-called “Red-Edge” effect, is when a fluorophore is excited on the red-edge of its excitation spectrum, the output fluorescence is an inherent indicator of viscosity. To explore new avenues in determining viscosity in nanoscopic polymer brush coatings, we offer you an internship position aimed at systematically measuring the fluorescence of responsive polymer brushes under different solvency conditions, via the Red-Edge effect. During your internship, your task will be the preparation of various solvent-responsive polymer brush layers with integrated fluorescent moieties, and the subsequent characterisation of their fluorescence as a function of polymer brush conformation.

Skills that you should already have:

- Good understanding over the basics of organic and polymer chemistry
- Good understanding over the fundamentals of interfacial phenomena
- Good understanding over spectrometry and fluorescence phenomena
- Analytical mindset and affinity to detailed experimental planning

Skills that you will acquire during the internship:

- Experience in synthetic modification of polymers
- Experience in polymer brush preparation (spin-coating)
- Hands-on experience in fluorescence spectroscopy