

Séminaire - Fabrice Cousin

Jeudi 14 mars 2019, 14h15 - S001

Le 13 mars 2019



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Titre: "Neutron scattering and contrast variation: a unique tool for probing the conformation of polymeric systems in bulk and at interfaces"

Neutron scattering is a unique tool to determine the structure of polymeric systems in the 1–100 nm range, which are the relevant scales to probe their conformation and gyration radius, whether polymers are in melt, in thin films or in solutions. This comes from the fact that a deuterated polymer has a different scattering length density, which characterizes the probability of a given species to scatter neutrons, compared to its hydrogenated counterpart. This enables to label some chains within a sample in order to perform so-called "contrast variation experiments" to either create some contrast in an homogenous system, eg to probe the conformation of a single chain in a polymer melt, or to mask the contribution of one specie in a ternary system, eg in solutions of core-shell objects or in mixtures of different species. These strategies of contrast variation can be performed in in Small Angle Neutron Scattering experiments (SANS), when ones want to probe the structure of a sample in bulk, or in Neutron Reflectivity (NR), when one probes the structure of thin films.

In this lecture, I will show with several examples of how of contrast variation can be used in SANS or in NR to address the following questions: What is the inner structure of polyelectrolyte multilayers? What is the kinetics of inter-diffusion between a polymer brush and a melt of the same polymer? What is the conformation of a polymeric chain in the polymeric melt doped with inorganic nanoparticles? What is the structure of complexes of polyelectrolyte and proteins of opposite charges in aqueous solution?