[*C11.* **B. Jean**] **Cellulose whiskers-based multilayers**

Layer-by-layer assembly is used here to prepare multilayer films composed of colloidal cellulose whiskers (negatively charged rod-like nanocrystals with cross dimensions between 2 and 25 nm, depending on the biological origin, and lengths between 0,3 and several mm) and a polycation, Poly-allylamine hydrochloride (PAH). They provide tools for understanding biopolymers interactions in primary cell walls and designing biocompatible materials.

Neutron Reflectivity experiments and AFM imaging allowed us to characterize the multilayers and results show that cellulose layers with a high packing density and low roughness can be obtained. A linear growth of the film with the number of layers was observed and oriented layers were prepared using ordered cellulose nanocrystals suspensions. Moreover, the possible replacement of PAH interlayers by positively charged nanoparticles such as chitin nanocrystals (rods) or mineral platelets (discs) was also evidenced.

[Collaboration :. B. Jean CERMAV-Grenoble and F. Cousin LLB]

Figure 1. Neutron reflectivity curves of a polyelectrolyte (blue in the drawing below) -cellulose whiskers (red) multi-layer *before* (black squares) and *after* (red circles) adsorption. Continuous lines are fits to a multilayer model.
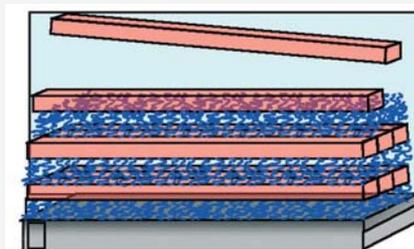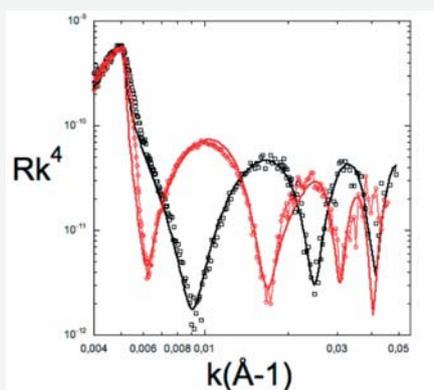
[*C12.* **J. Daillant**] **Effect of solvent-polymer interaction in swelling dynamics of ultra-thin polyacrylamide films : A neutron and x-ray reflectivity study**

The swelling dynamics of the ultra-thin polyacrylamide (PAM) spin-coated films in saturated vapour of D_2O and H_2O were studied using neutron and x-ray reflectivity. A uniform scattering length density (SLD) profile represents the dry PAM films, whereas the SLD profiles corresponding to the swelled films were characterized with a decreasing solvent concentration along the film thickness from top surface to the film/substrate interface. The profile of D_2O fraction in the film (725 Å) at different exposure times is shown in the figure below. The diffusion mechanism of D_2O into the films was found to be a non - Fickian process, as the D_2O diffusion coefficient was observed to be decreasing as a function of film thickness. The thickness dependent structural changes in the dry polymer films were suggested from the increased density of thinner films. The diffusion coefficient of polymer chains in the solvent on the contrary was independent of film thickness. A different nature of D_2O-PAM interaction (stronger) as compared to H_2O-PAM interaction was found to play a crucial role on the diffusion of polymer, where the diffusion coefficient of the chains was an order of magnitude higher in D_2O as compared to that in the H_2O. A lower value of the excluded-volume parameter in case of D_2O also indicates stronger monomer-solvent interaction [1].
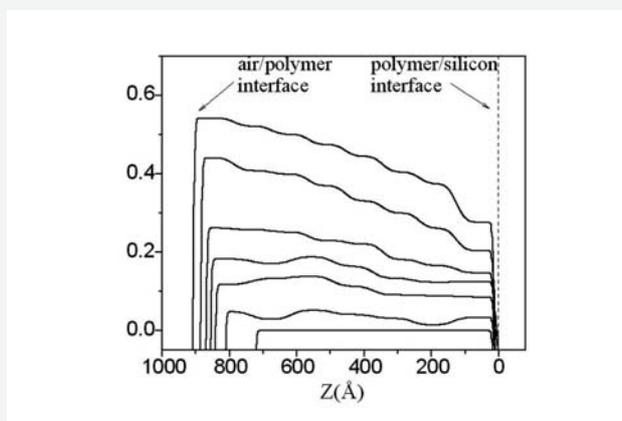
[1] submitted to Macromolecules (2006)

[Collaboration : M. Mukherjee, A. Singh, Saha Institute of Nuclear Physics, India, J. Daillant, LIONS, CEA-Saclay, A. Menelle, F. Cousin; LLB]