[*C6.* J. Jestin] **Dispersions of polymer grafted nanoparticles in a same polymer matrix : the effect of deformation**
Recently nanoparticles with grafted chains were synthesized owing to grafting from controlled radicalar polymerization in polar organic solvent. After purification, we obtain a stable sol, with silica cores of the same size as in the original sol, and characterize the polymer layer around the silica core using contrast matching [1]. We then disperse these particles in a polymer matrix of the same polymer as the grafted one. We observe that they **re-aggregate**, in different ways depending on the synthesis. Observation under deformation permits to refine the differences between two cases: left, coexistence of large deformable compact aggregates (responsible for a elongated scattering pattern) with small aggregates responsible for a correlation peak in I(q) along the parallel (//) direction; middle: large deformable fractal-like aggregates (elongated scattering pattern, I(q) curves shifted along q).We can also observe the polymer corona among matrix chains of different labelling. We conclude from the patterns anisotropy (silica core, right above, corona, below) that the corona is interpenetrated with the matrix chains, and deformed with a similar ratio.
*[Collaboration : A. El Harrak, S. Lorrain, G. Carrot, J. Oberdisse, J. Jestin, F. Boué, LLB]*
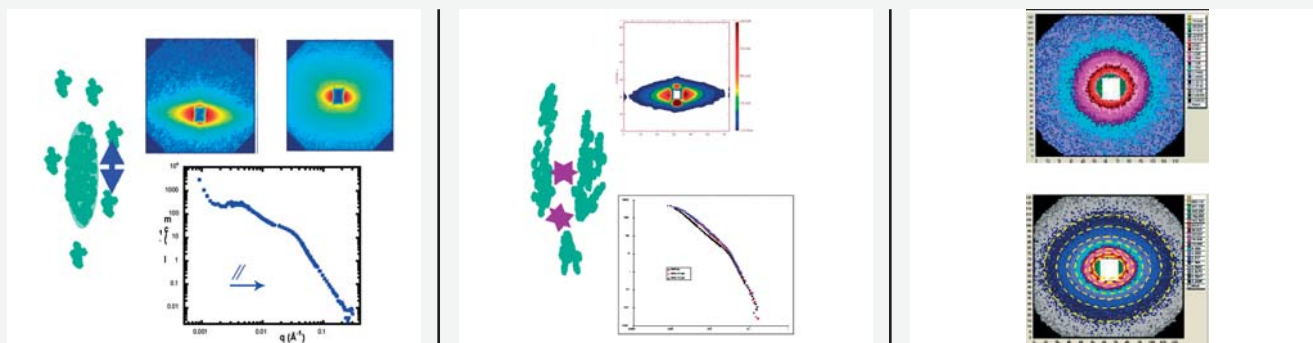
[1] G. Carrot. A. El Harrak, J. Oberdisse, J. Jestin, F. Boué, Soft Matter, in press

[*C7 & C8* L.T. Lee] **Interfacial and thin-film properties of complex systems**
This project aims to correlate interfacial structures of complex systems (polymer-surfactant-nanoparticle) with their thin film properties that are of relevance in potential applications. Neutron reflectivity used in conjunction with isotopic substitution provides a unique route to obtain structural and compositional information of surface layers in multicomponent systems. Here, we show two examples where structural and compositional information of adsorbed mixed layers are correlated with: (i) soap film stability and gas permeability, and (ii) thin-film dewetting as liquid template for nanoparticle organization on solid substrates.

(i) Gas permeability (ii) Controlled nanoparticle organization by liquid template
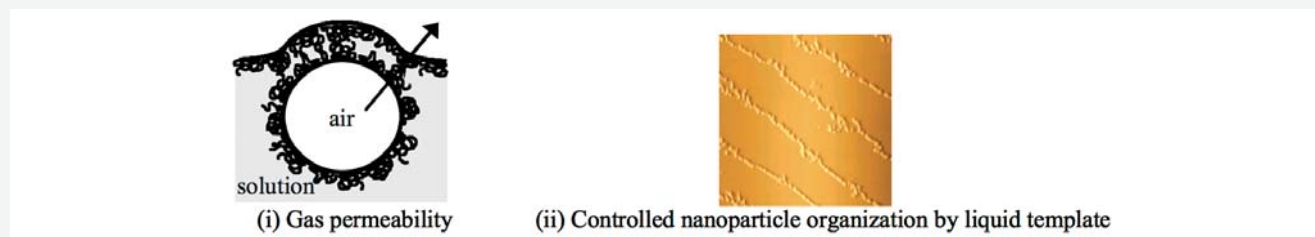
(i) <u>Gas permeability of polymer-surfactant layers</u> The structural properties of adsorbed poly(N-isopropylacrylamide) (PNIPAM) and mixed PNIPAM-SDS layers are correlated to gas permeation behavior of thin foam films. The gas permeability coefficient (K) of the liquid film is evaluated from the rate of diminishing size of microbubbles (d ~ 250 mm) formed on the surface of the solution. Irrespective of film thickness and physical appearance, the gas permeability of a film stabilized by PNIPAM alone is low (K $\approx$ 0.045 cm/s) compared to that stabilized by SDS alone (K $\approx$ 0.10 cm/s). This is explained by the characteristic concentration profile of the adsorbed polymer layer: a monomer-rich proximal zone (ϕ_s ~ 1) and a solvent-rich central zone. The closed-packed structure of monomers in the proximal zone thus acts as an efficient barrier to gas permeation - an explanation supported by the non-dependence of the proximal zone and of K on polymer chain length. For polymer-surfactant mixtures, K increases with surfactant/polymer ratio in the adsorbed layer up to K $\approx$ 0.14 cm/s. Mixed layers therefore show reduced efficiency as gas barrier, a result attributed to mutual decrease in the structural order of the adsorbed species.
[Collaboration: L.T. Lee, LLB; G. Andreatta, J.-J. Benattar, SPEC-CEA, Saclay]