

Probing the internal structure of magnetic nanocomposites – thermo-sensitive gels and lamellar films – respectively by small angle neutron scattering and neutron reflectivity

Siham Douadi¹, Delphine El kharrat¹, Olivier Sandre¹, Maud Save², Bernadette Charleux² and Valérie Cabuil¹

¹LI₂C UMR7612, ²LCP UMR76120, Centre National de la Recherche Scientifique / Université Pierre et Marie Curie - 4 place Jussieu case 51 75252 Paris Cedex 5 France

In this poster we show two types of nanocomposite materials consisting of nanoparticles embedded in polymer matrices. On the one hand, a matrix with a high degree of organization is investigated for visible light optics and hyper-frequencies applications (reflectors, guides, antennae). On the other hand, a gel matrix with an isotropic loading of nanoparticles can exhibit a swelling transition triggered by an external field (electric or magnetic) or by temperature. The first system combines the self-assembly of a symmetrical diblock copolymer matrix poly(n-butylmethacrylate)-*b*-poly(styrene) (PBMA-*b*-PS) and the orientation properties under magnetic field of γ -Fe₂O₃ nanoparticles. To confine the nanoparticles within the layers of PBMA-*b*-PS (Fig.1a), those were coated by a polymeric shell grown by surface initiation polymerization of PS ("grafting from"). Thin films obtained by spin-coating and annealing above the glass temperature T_g were doped with nanoparticles. The lamellar order was investigated by neutron reflectivity experiments (Fig.1b) which enable to fit the density profile of the films and to localize precisely the nanoparticles within the first PS blocs. The second system consists of the same iron oxide nanoparticles, which are confined this time within spherical clusters of PTEA-PAM (Fig.2a., cf. Pr. Perzynski), dispersed into a thermosensitive hydrogel of poly(N-isopropylacrylamide) PNIPAM. The deswelling of the matrix above the transition temperature causes the decrease of the average distance between those clusters, as shown by small angle neutron scattering experiment (Fig.2b).

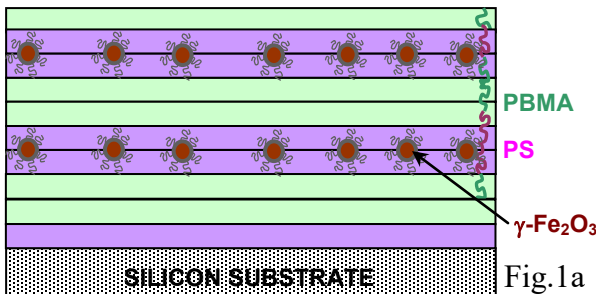


Fig.1a

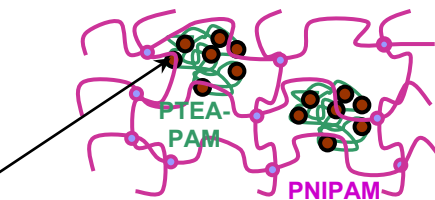


Fig.2a

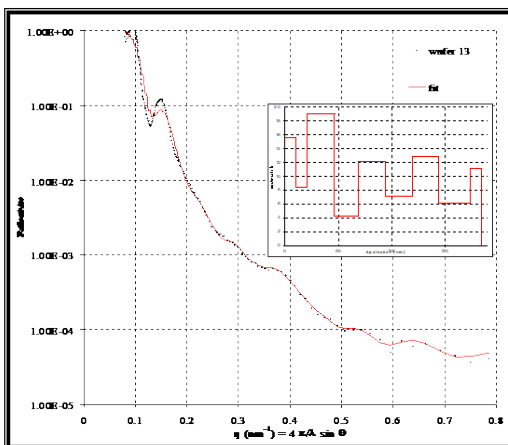


Fig.1b

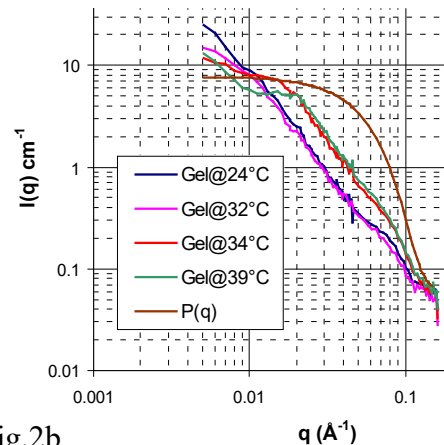


Fig.2b