

Mixture of Polymers and Coating Fullerene Soft Nanoparticles

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Abstract : We study the stability and structural properties of mixtures of model nanoparticles and non-adsorbing polymers in the 'protein limit', where the size of polymers exceeds the particle size substantially. We have synthesized in institute (Charles Sadron Strasbourg) model nanoparticles by coating fullerene C60 molecules with low molecular weight polystyrene (PS) chains (6 PS chains with a degree of polymerization close to 25 and 50 are grafted on each fullerene C60 molecule. We will present a Small Angle Neutron scattering (SANS) study of Tetrahydrofuran (THF) solutions involving long polystyrene (PS) chains and fullerene (C60) nanoparticles. Long PS chains and C60 nanoparticles with different arm lengths were synthesized either hydrogenated or deuteriated. They were characterized through Size Exclusion Chromatography (SEC) and Quasielastic Light Scattering (QLS). In this way, the solubility of the C60 nanoparticles in the usual good solvents of PS was controlled. SANS experiments were performed by use of the contrast variation method in order to measure the partial scattering functions related to both components. They allow us to obtain information about the dispersion state of the C60 nanoparticles as well as the average conformation of the long PS chains. Specifically, they show that the addition of long polymer chains leads to the existence of an additional attractive interaction in between soft nanoparticles.

Keywords : fulleren nanoparticles, polymer, small angle neutron scattering, solubility

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