

Abstract Submitted
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Life-time of the bound layer in nanocomposites DAN ZHAO, JACQUES JESTIN, SANAT K. KUMAR, Columbia University — It is now well accepted that an effectively irreversibly adsorbed monolayer of polymer forms when a polymer melt is intimately mixed with nanoparticles, in the limit where their enthalpic interactions are favorable. This bound layer has been postulated as being a central player in many of the highly favorable properties that result from polymer based nanocomposite materials. We investigated well-defined nanocomposites formed with different combinations of deuterated and hydrogenated polymers (P2VP and PMMA) and silica nanoparticles. SANS, in conjunction with contrast variation, then provides a direct means of probing the structure of the bound layer as a core-shell and its exchange kinetics with bulk (unbound) chains with annealing time and temperature. SAXS directly provides information on the particle-particle partial structure factor and particle dispersion. Thermodynamic equilibrium of the bound layer is reached around one day at 150 °C while its exchange life time is \sim one hour at 180 °C.

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