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Cluster Formation During Aging of Colloid-Polymer Dispersions

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Abstract:

We report the dynamics of aqueous dispersions of the disk-shaped colloidal clay laponite® with poly(ethylene oxide) (PEO) chains of moderate molecular weight, explored via angle-dependent dynamic light scattering (DLS) and rheology. The PEO chains adsorb onto the laponite® surfaces, causing interesting dynamic behavior, including transitions from arrested states to liquid states as the concentration and molecular weight of PEO is increased. This re-entrant behavior has been attributed to formation of particle clusters induced free PEO chains. Our DLS results are consistent with a slow diffusive dynamic process, suggesting the formation of large particle clusters, in samples at aging times < 75 days. By contrast to behavior observed in laponite® dispersions with a non-adsorbing polymer, poly(acrylic acid) (PAA), diffusion coefficients of these clusters in the laponite®-PEO systems continue to decrease with aging time until samples reach an arrested state.

Keywords: colloidal glass, colloidal gel, aging, polymer-clay

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