

Abstract Submitted
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The Development of Structure in Nanoscale Colloidal Silica – Polymer Nanocomposites JEFF METH, J. DAVID LONDONO, CHANGZAI CHI, BARBARA WOOD, PATRICIA COTTS, Nanocomposite Technologies, Central R&D, DuPont Co., SANGAH GAM, KAREN WINEY, RUSSELL COMPOSTO, Dept. of Materials Science & Engineering, Univ. of Pennsylvania — Controlling the state of dispersion or agglomeration in polymeric nanocomposites has a profound impact on their properties. Many nanocomposites are manufactured by a solution process. In such processes, colloidal silica dispersed in a formulation possesses a certain interparticle structure, and this structure changes as the coating formulation dries. In this work, we have measured the structure of colloidal silica – PMMA formulations as a function of solvent content using small angle X-ray scattering (SAXS). We found that the formulations dried in two stages: concentration and neutralization. In the concentrating stage, the charged colloid structure prevails, and the formulation simply concentrated down. In the neutralization stage, the colloid gradually lost its charge. Controlling the matrix viscosity enables one to control the final state of dispersion. These findings explain how and why it is possible to create good nanodispersions in some material systems. These general findings are applicable to a wide range of material systems.

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