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Externally Activated, Thermodynamically Governed Dispersion Behavior of Silica Nanoparticles in PMMA FREDERICK BEYER, PHILIP COSTANZO, Army Research Laboratory, MATERIALS DIVISION COLLABORATION — Dispersion of nanoparticles is a topic of significant interest to the industrial, government, and academic communities as a route for creating new materials that combine the properties of the matrix polymer with functional properties of the dispersed particulate phase. We have previously demonstrated that the inclusion of a Diels-Alder linkage in the ligands use to compatibilize nanoparticles allows external control over the miscibility of those particles in the polymer matrix. Above a known temperature range, the ligands separate at the Diels-Alder linkage site, changing the miscibility of the particle. Here we are investigating the dispersion of silica particles approximately 40 nm in diameter in a PMMA matrix, using SAXS, TEM, and optical microscopy to characterize the dispersion of the particles. Annealing the samples causes in a change in the morphology of the materials, with the formation of larger aggregates and depletion zones. The optical clarity of the PMMA is substantially degraded by this process.

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