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Thermally Switchable Aggregation of Gold Nanoparticles in Polymer Nanocomposites KYUYOUNG HEO, CAROLINE MIESCH, TODD EMRICK, RYAN HAYWARD, Department of Polymer Science & Engineering, University of Massachusetts Amherst — The level of dispersion or aggregation of nanoparticles is a key factor in determining the performance of polymer-based nanocomposites for a wide range of applications. However, controlling this dispersion can often be challenging due to the interplay between chemical and physical interactions between the nanoparticles and polymer matrix. In this study, we characterize a simple and effective means of controlling the aggregation state of nanoparticles based on hydrogen bonding between the nanoparticle ligands and the matrix. Strong hydrogen bonding interactions provides almost uniform dispersion of poly(styrene-*r*-2-vinylpyridine) functionalized gold nanoparticles for annealing temperatures well above the glass transition temperature of the poly(styrene-*r*-4-hydroxystyrene) matrix. However, annealing at higher temperatures diminishes the strength of hydrogen bonds, leading to the formation of aggregates. This aggregation was found to be largely reversible, with nanoparticles dispersing once again by annealing the nanocomposites at reduced temperature. We track the thermal switching behavior during a series of heating/cooling cycles through changes in optical properties and by transmission electron microscopy.

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