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Crystallization Control of Hard and Soft Segments of Polyurethanes via Controlled Placement of Surface Functionalized Nanoparticles MATTHEW A. HOOD, JAMES M. SANDS, JOHN J. LA SCALA, FREDERICK BEYER, CHRISTOPHER Y. LI — Segmented polyurethanes (SPUs) phase separate into hard and soft domains, due to differences in segment composition, resulting in extraordinary properties. We synthesized a SPU composed of PTMO-HDI-BDO and demonstrated that addition of 12nm silica nanoparticles (SiNPs) will have drastic effects on mechanical and morphological properties. Moreover, SiNPs with specific surface chemical groups (i.e. hydroxyl, amine, etc.) have been synthesized in order to tailor the interaction between NPs and soft/hard domains of SPU. Thermal, mechanical and diffraction experiments along with electron microscopy have been used to characterize these systems and compare them to neat SPU and as-received SiNP/SPU composites. By controlling the particle placement within the SPU a systematic structure-processing-properties relationship can be inferred for use in the design of more complex NP/SPU composites.

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