

Abstract Submitted  
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**Structure-**

**Properties Relationship in Segmented Polyurethane/Silica Nanoparticle Composites** MATTHEW HOOD, Drexel University, JAMES SANDS, JOHN LA SCALA, FREDERICK BEYER, Army Research Laboratory, CHRISTOPHER LI, Drexel University — Segmented polyurethanes (SPUs) phase separate into hard and soft domains due to differences in segment composition, resulting in extraordinary mechanical properties. We have synthesized a set of SPU/nanoparticle composites possessing 25, 35 or 45wt.% hard segment content and loaded with less than 5wt.% silica nanoparticles (SiNPs). SiNPs were added either during SPU synthesis or blended after. Drastic effects on morphology and mechanical properties were observed. Blended composites, due to their destabilizing of the hard domain, showed decreased mechanical robustness. When particles are added, at very low SiNP concentrations, during SPU synthesis the SiNPs are covalently attached to the SPU matrix and hard domains are intact which enhanced elongation to break and tensile strength considerably. With increasing SiNP concentration this effect was reversed and hard domain crystallization was hindered. Thermal, mechanical and diffraction experiments were used to correlate the relationship between interfacial chemistry of the SiNP and SPU matrix and the mechanical properties of the composites.

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