Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Controlling Phase Separation of Interpenetrating Polymer Networks by Addition of Block Copolymers BRIAN ROHDE, RAMANAN KRISHNAMOORTI, MEGAN ROBERTSON, University of Houston, Department of Chemical and Biomolecular Engineering — Interpenetrating polymer networks (IPNs) offer a unique way to produce mechanically superior thermoset blends relative to the neat components. In this study, IPNs were prepared consisting of polydicyclopentadiene (polyDCPD), contributing high fracture toughness, and an epoxy resin (the diglycidyl ether of bisphenol A cured with nadic methyl anhydride), contributing high tensile strength and modulus. In the absence of compatibilization, the simultaneous curing of the networks leads to a macroscopically phase separated blend that exhibits poor mechanical behavior. To control phase separation and drive the system towards more mechanically robust nanostructured IPNs, block copolymers were designed to compatibilize this system, where one block possesses affinity to polyDCPD (polynorbornene in this study) and the other block possesses affinity to DGEBA (poly(ϵ-caprolactone) in this study). The influence of the block copolymer composition on the degree of phase separation and interfacial adhesion in the IPN was studied using a combination of small-angle scattering and imaging techniques. The resultant mechanical properties were explored and structure-property relationships were developed in this blend system.

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Date submitted: 14 Nov 2014 Electronic form version 1.4