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Physical and Morphological Characterization of Templated Thermosets THERESA J. HERMEL-DAVIDOCK, H. SEAN TANG, STEVE F. HAHN, DAN J. MURRAY, NIKHIL E. VERGHESE, The Dow Chemical Company, Plastics R&D Materials Research — It has been found that by the addition of low concentrations of an amphiphilic block copolymer to an epoxy resin, novel disordered morphologies can be formed and preserved through cure. It has also been found that the addition of small amounts of block copolymer can improve the fracture resistance significantly without sacrificing the high modulus and glass transition temperature of these thermoset materials. This report will focus on characterizing the influence of the block copolymer and casting solvent on the morphology achieved in the thermoset sample and the resulting physical properties. Templated thermoset samples exhibiting two different diblock copolymer morphologies, worm-like micelles and spherical micelles were investigated. The micro-deformation mechanisms of these templated thermosets were studied via an in-situ tensile deformation technique performed in a transmission electron microscope (TEM). The micro-deformation behaviors of these samples were found to correlate well with the macroscopic mechanical properties. The toughening effect obtained in the epoxy resin was attributed to the well-dispersed worm-like morphology and the weak interfacial adhesion between the micelles and the matrix.

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