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Structure and Properties of PBO-PEO Diblock Copolymer Modified Epoxy JUNXIAN WU, YONATHAN THIO, FRANK S. BATES, Department of Chemical Engineering and Materials Science, University of Minnesota, Minneapolis, Minnesota 55455 — Amphiphilic diblock copolymers poly(n-butylene oxide)-b-poly(ethylene oxide) (PBO-PEO) of various compositions were synthesized and studied as modifiers for epoxy resins. In blends of PBO-PEO, epoxy resin, and curing agent, the copolymers formed well-defined microstructures that persisted upon curing of the epoxy. The resulting morphologies were vesicles, wormlike micelles, and spherical micelles (in order of increasing size of PEO block), as well as transitional morphologies. Addition of 5% by weight of these block copolymers improved the fracture toughness of the epoxy remarkably (by as much as nineteen times) with relatively small decrease in the elastic modulus. The highest level of toughness was measured in a system containing branched wormlike micelles. Close examination of the fracture surfaces of these composites suggests that while all the dispersed morphologies played a similar role to inclusions in particle-toughened thermosets, crack deflection toughening contributed to the significantly higher levels of toughness in the wormlike micelle systems.

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