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An SCFT Study of Nanostructuring in Epoxy Thermosets[1] FOLUSHO OYEROKUN, GLENN FREDRICKSON, UCSB, LUDWIK LEIBLER, ESPCI — Increasing fracture resistance of epoxy thermosets via self assembly of block copolymers has generated significant interest in the past decade. Nanostructuring occurs because of the selectivity of the epoxy precursors to the different blocks of the block copolymer, i.e. one block is miscible (before curing), while the other block remains immiscible. The size and geometry of the nanostructures formed depends on the copolymer composition, solvent concentration and selectivity. Understanding the conditions at which nanostructuring occurs is important for rational design of high impact thermoset materials. A self-consistent field based study of blends of polystyrene-b-polybutadiene-b-polymethylmethacrylate (SBM) triblock and the reactive solvent DGEBA has been performed. At low copolymer concentration, the theory predicts micelles of PS and PB in the PMMA/DGEBA matrix. Increasing the copolymer concentration above a threshold value leads to formation of core-shell cylindrical or "sphere-on-sphere" morphologies, depending on the length of PB midblock. The theoretical predictions are in reasonable agreement with experiments.

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