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Self-assembly of Asymmetric Architectures: Study of the Phase Behavior of an ABAC Block Copolymer MICHAEL BLUEMLE, GUILLAUME FLEURY, TIMOTHY LODGE, FRANK BATES, University of Minnesota, Department of Chemical Engineering and Materials Science — We have investigated the bulk phase behavior of the asymmetric tetrablock poly(cyclohexylethylene-b-ethylene-b-cyclohexyethylene-b-dimethylsiloxane) (CECD) in order to elucidate the effects of asymmetry created by introducing a third chemically distinct block to the well-studied CEC triblock. These tetrablock polymers are especially attractive due to the potential of degrading the D block, leaving a mechanically robust polyolefin triblock nanoporous material. Starting with CEC triblocks that self-assemble into different morphologies (hexagonally packed cylinders and lamellae), varying amounts of D have been added, creating two series of polymers along distinct isopleths. A combination of small-angle x-ray scattering, transmission electron microscopy and dynamic mechanical spectroscopy have revealed the complex phase behavior of these asymmetric polymers. Addition of as little as nine percent D by volume drastically changes the tetrablock morphological behavior as compared to their precursor CEC triblocks. These promising results exhibit the influence of asymmetry on the self-assembly of complex architectures in block copolymers.

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