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Rheology and flow-induced structure in a polystyrene-polyisoprene biocontinuous microemulsion KRISTIN BRINKER, WESLEY BURGHARDT, Northwestern University — Polymer bicontinuous microemulsions are blends of immiscible polymers compatibilized with diblock copolymer in such a way as to produce an equilibrium interconnected morphology. Previous experiments on a microemulsion of poly(ethyl ethylene) (PEE) and poly(dimethyl siloxane) (PDMS) have revealed a fascinating array of rheological and flow-induced structural phenomena. We have prepared a new microemulsion sample from low molecular weight polystyrene (PS) and polyisoprene (PI) and their corresponding block copolymer. Despite the fact that the constituent homopolymers are strictly Newtonian, the microemulsion exhibits substantial viscoelasticity associated with flow-induced deformation of the supramolecular organization. The linear viscoelastic properties of the PS-PI microemulsion closely resemble those previously found in the PEE- PDMS system. Under even fairly weakly nonlinear flow conditions, the PS-PI microemulsion exhibits a flow-induced phase transition. In situ small-angle x-ray scattering is used to probe both the flow-induced deformation of the equilibrium microemulsion structure as well as the onset and development of a flow-induced bulk phase separation. The higher suscepibility of the PS-PI system to phase separation may be related to a higher viscosity contrast between its constituents and those in the previously studied PEE-PDMS system.

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