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Dynamical simulations of rheology and phase behavior of ternary polymer blend systems. BHARADWAJ NARAYANAN, VENKAT GANESAN, VICTOR PRYAMITSYN, Department of Chemical Engineering, The University of Texas at Austin — We present the results of a multiscale simulation approach which combines Brownian dynamics simulations with polymer self-consistent field theory to study flow induced phase transitions in microemulsion phases of ternary polymer blends with homopolymers A and B with added copolymer AB. The results match qualitatively with the experimental observations and suggest flow transition of microemulsion phases into a three-phase coexistence followed by macrophase separation at stronger shears. We explore the effect of viscoelastic asymmetry (by varying polymer mobilities) and the copolymer (AB) to homopolymer length ratio (α) on flow induced phase transitions. Though the series of phase transitions remain unchanged, quantitative differences arise as a function of viscoelastic asymmetry and α. These transitions are also accompanied by a strong shear-thinning behavior in the rheological response. The results suggest significant differences between ternary polymeric systems and oil-water-surfactant systems. We rationalize the above results from a molecular viewpoint.

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