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Ultra-low interfacial tensions of a polymer/polymer interface with diblock copolymer surfactant KWANHO CHANG, DAVID MORSE, CHRISTOPHER MACOSKO, University of Minnesota — The equilibrium interfacial tension between immiscible homopolymers A and B mixed with an AB copolymer reaches a minimum value γ_{sat} beyond a critical concentration of copolymer at which the copolymer begins to self-assemble into micelles or a bicontinuous microemulsion. This saturation value has been measured with a spinning drop tensiometer for systems of poly(isoprene) (PI), poly(dimethyl siloxane) (PDMS), and PI-b-PDMS copolymers, for a sequence of 11 copolymers with PDMS volume fractions $f = 0.5 - 0.73$. Ultra-low tensions of $\gamma_{sat} \simeq 10^{-3}$ mN/m have been measured for copolymers with $f = 0.5$. Self-consistent field theory predictions of the tension between a PI phase and a PDMS phase containing swollen micelles agree very well with measured values for copolymers with $f \geq 0.61$. For $f = 0.5 - 0.6$, however, measured values of $\gamma_{sat}(f)$ are much lower than predicted by this theory, and exhibit a discontinuous dependence on f at $f \simeq 0.6$. We suggest that the behavior observed for nearly balanced copolymers could be due to formation a middle-phase bicontinuous microemulsion phase that wets the macroscopic PI-PDMS interface.

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