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Designing Balanced Surfactants for Organizing Immiscible Polymers MEGAN RUEGG, BENEDICT REYNOLDS, NITASH BALSARA, University of California, Berkeley, MIN LIN, DAVID LOHSE, ExxonMobil Research and Engineering — The phase behavior of A/B/A-C polymer blends with attractive and repulsive interactions was analyzed with scattering experiments and mean field theories. Transitions between lamellar phases, microemulsions, homogeneous phases and macrophase separated states are easily accessed in A/B/A-C blends simply by adjusting the temperature. The domain spacing was predicted utilizing the Random Phase Approximation (RPA) and Self-Consistent Field Theory (SCFT) in the homogeneous and organized states, respectively, with no adjustable parameters. The only inputs into the calculations were the binary Flory-Huggins interaction parameters (chi) and statistical segment lengths. The domain spacing determined from theory was often within 5 percent of the experimental values. Furthermore, in this particular A/B/A-C system, in which the chi parameter between the immiscble A and B homopolymers is 2.0-2.6 in our accessible temperature range, a blend was found to form an organized phase with only 3 percent of the diblock copolymer in the blend. This is the lowest amount of polymeric surfactant to form an organized phase to our knowledge. The transition temperature from single-phase systems to a macrophase separated state determined from theory was in good agreement with experimental values.

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