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Effect of supercritical carbon dioxide on the thermodynamics of miscible polymer blends NICHOLAS YOUNG, University of California, Berkeley, SEBNEM INCEOGLU, Lawrence Livermore National Laboratory, ANDREW JACKSON, European Spallation Source, STÉPHANE COSTEUX, Dow Chemical Company, NITASH BALSARA, University of California, Berkeley and Lawrence Berkeley National Laboratory — The design of environmentally-benign polymer processing techniques is an area of growing interest, motivated by the desire to reduce the emission of volatile organic compounds. Recently, supercritical carbon dioxide ($scCO_2$) has gained traction as a viable candidate for various processes as either a polymer solvent or diluent. To elucidate the impact of $scCO_2$ on polymer miscibility, the phase behavior and thermodynamic interactions of multicomponent mixtures comprising $scCO_2$, styrene-acrylonitrile copolymer (SAN), and poly(methyl methacrylate) (PMMA) were studied by small angle neutron scattering. Application of the Random Phase Approximation and Flory-Huggins Theory allowed quantitative analysis of scattering profiles to obtain the dependence of pairwise interaction parameters on $scCO_2$ activity. The location of the spinodal boundary was found to have a non-trivial dependence on $scCO_2$ processing conditions which can be interpreted in the context of balancing interaction strengths. The presence of $scCO_2$ was shown to disrupt the miscibility of SAN-PMMA induced by intramolecular repulsion, and decrease the accessible demixing temperature by over 130 °C.

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