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The Order-Disorder Transition in Short Diblock Copolymers: Relaxation Calorimetry Experiments TIMOTHY GILLARD, DANIEL PHELAN, SANGWOO LEE, CHRIS LEIGHTON, FRANK BATES, Dept. of Chemical Engineering and Materials Science, University of Minnesota — Fluctuation-driven, weakly first-order phase transitions occur in a variety of physical systems, including the order-disorder transition (ODT) in block copolymers (BCPs), and certain phase transitions in liquid crystals, magnetic materials, and superconductors. BCPs provide an attractive model system for studying this fascinating class of transitions since BCPs exhibit universal phase behavior dependent on a small number of parameters that are easily tuned during synthesis. However, thermal measurements of the ODT in BCPs are rare since the magnitude of the latent enthalpy of the transition scales inversely with N, the degree of polymerization. Here we extend a thermal measurement technique common in the inorganic materials community, relaxation calorimety, to accurately measure the temperature dependence of the heat capacity near the ODT of poly(1,4-isoprene-*b*-DL-lactide) BCPs that form ordered structures at low N. The transition temperature (371 K), latent heat (0.3 J/g), and temperature hysteresis ($\sim$ 1 K) were found to agree with values obtained from differential scanning calorimetry, rheology, and scattering experiments, establishing relaxation calorimety as a valuable new tool for studying the ODT in BCPs.

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