Abstract Submitted for the MAR08 Meeting of The American Physical Society

Scaling of the ODT of Block Copolymers in Compressed CO₂ CURRAN CHANDLER, TIMOTHY FRANCIS¹, JAMES WATKINS, University of Massachusetts, Amherst; Department of Polymer Science & Engineering — It is well-known that diblock copolymers with sufficient χN form periodic microphaseseparated domains upon cooling through an order-disorder transition (ODT). We have investigated the scaling behavior of the ODT as a function of polymer volume fraction, ϕ , of several nearly symmetric poly(styrene-b-2-vinylpyridine) and poly(styrene-b-isoprene) diblock copolymer/diluent systems in relation to the wellknown dilution approximation. Using compressed CO_2 in the place of conventional liquid diluents allowed the determination of the scaling parameter, α , for highly concentrated systems where ϕ ranges from 0.85 to 1.0 at high temperatures. The scaling was determined by combining optical birefringence measurements of the ODT (χ_{ODT}) with the ellipsometric swelling measurements (ϕ) of the constituent homopolymers at increasing CO_2 pressures. We show that sorption of small volume fractions of CO_2 results in significant reductions in the observed ODTs. Yet, α was clearly shown not to be universal even for a specific diblock copolymer. For styrene-b-isoprene copolymers, it appears that α is an increasing function of copolymer molecular weight. In contrast, the styrene-b-2-vinylpyridine copolymers studied show no obvious correlation with molecular weight, with α taking on both positive and negative values.

¹Currently at BASF

Curran Chandler University of Massachusetts, Amherst; Department of Polymer Science & Engineering

Date submitted: 05 Dec 2007

Electronic form version 1.4