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Using β-NMR to Measure Surface Segregation of Short Chains in Binary Blends of Polystyrene IAIN MCKENZIE, TRIUMF, DAVID L. CORTIE, University of British Columbia, CHAD R. DALEY, PENDAR MAHMOUDI, NASSER M. ABUKHDEIR, MARK W. MATSEN, University of Waterloo, ROBERT F. KIEFL, University of British Columbia, C. D. PHILIP LEVY, TRIUMF, W. ANDREW MACFARLANE, RYAN M. L. MCFADDEN, University of British Columbia, GERALD D. MORRIS, MATTHEW R. PEARSON, TRIUMF, JAMES A. FORREST, University of Waterloo — A problem of significant interest in the studies of polymers at interfaces is the segregation of short chain polymers to the interface in a system with both long and short chains. It is difficult to study the segregation as methods used to introduce contrast between short and long chains often have an effect larger than that due simply to the different chain lengths. We have shown that β-detected nuclear spin relaxation of $^{8}Li^{+}$ can distinguish the two chains sizes without the need for any label. This, combined with the depth profiling ability of the technique, means we can determine the relative concentration of short and long chains in a blend without the need to introduce another perturbing factor. We have performed experiments on a 50/50 blend of 627 kg/mol and 0.980 kg/mol polystyrene-d8 and at depths ranging from 2.5 to 79 nm from the free surface. The results show definite surface segregation of short chains to the free surface. We theoretically examine the segregation of short chains to the surface of the binary blend using self-consistent field theory (SCFT). The model used in the calculation assumes an incompressible melt consisting of the freely-jointed polymer chains with either N_s or N_l monomers.

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