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Temperature-Dependent Conformational Changes of PNIPAM Grafted Chains in Water: Effects of Molecular Weight and Grafting Density MICHAEL KENT, HYUN YIM, Sandia National Laboratories, SERGIO MENDEZ, S.S. BALAMURUGAN, S. BALAMURUGAN, GABRIEL LOPEZ, University of New Mexico, SUSHIL SATIJA, YOUNG-SOO SEO, National Institutes of Standards and Technology — Poly(N-isopropyl acrylamide) (PNIPAM) is perhaps the most well known member of the class of responsive polymers. Free PNIPAM chains have a lower critical solution temperature (LCST) in water at about 31° C. This very sharp transition (about 5° C) is attributed to alterations in the hydrogen bonding interactions of the amide groups. Grafted chains of PNIPAM have shown promise for creating responsive surfaces. Conformational changes of the polymer are likely to play a role in some of these applications, in addition to changes in local interactions. In this work we investigated the temperature-dependent conformational changes of grafted PNIPAM chains in D2O over a range of surface density and molecular weight using neutron reflection and AFM. The molecular weight and surface density of the PNIPAM brushes were controlled using atom transfer radical polymerization (ATRP). We discovered a strong effect of surface density and molecular weight. Large conformational changes were observed for intermediate grafting densities and high molecular weights.

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