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Network Structures in ABC Block Copolymers THOMAS EPPS, MICHAEL FASOLKA, NIST, Polymers Division, FRANK BATES, University of Minnesota — At mesoscopic length scales interfacial curvature and packing geometry often reflect the self-assembly of molecules with prescribed architectures and directed interactions. It is well known that block copolymers microphase separate into periodic structures controlled by interaction parameters, volume fractions, and degree of polymerization. Some of the most promising morphologies in block copolymers are the periodic network phases, which generally have superior mechanical properties when compared to their one- and two-dimensional counterparts. We investigated the phase behavior of linear poly(isoprene-*b*-styrene-*b*-ethylene oxide) (ISO) triblock melts and discovered three triply-periodic networks. Two cubic network phases were found, along with an orthorhombic network in our bulk studies. It is also important to expand knowledge of free and substrate surface energy effects on triblock films, as the greater surface to volume ratio, relative to bulk materials, increases the influence of these parameters on thin film morphologies. To this end, we studied the effects of surface energy on the structure of the same ISO triblocks mentioned above. These films were examined on gradient substrates using AFM and XPS. Surface energy and PI content were found to influence the polymer nanostructures. The results we obtained demonstrate the importance of exploring both the thin film and bulk behavior of polymeric materials.

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