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Wetting of Heterogeneous Surfaces by Polymer Nanodroplets[1]
DAVID R. HEINE, GARY S. GREST, EDMUND B. WEBB III, Sandia National Laboratories — The development of microfluidics, micro-contact printing, and other micron scale processes has led to renewed interest in surface wetting at sub-micron length scales. Molecular dynamics simulation is used to study the dynamics of polymer nanodroplets wetting heterogeneous surfaces, specifically cylindrical polymer droplets on surfaces composed of strips oriented perpendicular to the droplets that have either strong or weak interactions with the polymers. Each polymer droplet contains ∼200,000 to 350,000 monomers described using the bead-spring model with either 10 or 100 monomers per chain. The droplets are initially placed in contact with a patterned surface at a contact angle near 90°. As the droplets wet the surface, the spreading dynamics over different regions of the surface is monitored through measurement of the contact angle, contact radius, and velocity profiles. The spreading dynamics are strongly dependent on the wavelength of the strips relative to the polymer chain length.

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