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Coatings with Thermally Switchable Surface Energy Produced From Block Copolymer Films RALEIGH DAVIS, RICHARD REGISTER, Princeton University — Polymer-based coatings are employed across a wide array of sectors. One application of such coatings is to impart a prescribed surface energy, *i.e.* hydrophilic or hydrophobic character. The present work explores an approach to create surfaces with thermally switchable wetting behavior by employing coatings based on block copolymers which possess both hydrophilic and hydrophobic segments. The amphiphilic block copolymers were synthesized by coupling allyl-ended poly(ethylene oxide) (PEO) and hydride-ended poly(dimethylsiloxane) (PDMS) oligomers via a Pt catalyst. One PEO-PDMS diblock possessed an order-disorder-transition-temperature (T_{ODT}) of 64°C as characterized by small angle x-ray scattering. Above the T_{ODT} the polymer is a disordered melt, but below this temperature it self-assembles into alternating lamellae with a repeat spacing of 7.7 nm. When cooled through the T_{ODT} in vacuum or dry air, the PDMS-enriched domains wet the film's surface, producing a hydrophobic surface with a contact angle (CA) $\approx 90°$ as measured from CA goniometry. However, when cooled under water or in humid air, a PEO-rich hydrophilic surface is produced, yielding CAs ranging from 20-40°. The coatings can then be reversibly switched between the two states by reheating above the T_{ODT}, exposing to the appropriate environment, and re-cooling, ideally "locking in" the structure until the next processing cycle. The T_{ODT}, and thus the switching temperature, can be continuously tuned by blending with PEO-PDMS diblocks of different molecular weights.

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