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"Smart" Surfaces of Polymer Brushes QIANG WANG, DONG MENG, Department of Chemical and Biological Engineering, Colorado State University — "Smart" surfaces, also known as stimuli-responsive surfaces, can change their properties (e.g., wettability, adhesion, friction, elasticity, and biocompatibility) in response to external stimuli (e.g., temperature, pressure, light, solvent selectivity, ionic strength, type of salt, pH, applied electric field, etc.). In this work, we use numerical self-consistent field calculations to study in detail the structure and stimuli- responses of various polymer brushes, including (1) the thermo- response of PNIPAM brushes in water, (2) solvent-response of uncharged diblock copolymer brushes, and (3) the stimuli- response of charged two-component polymer brushes (including both the binary A/B brushes and diblock copolymer A-B brushes) to ionic strength, pH, and applied electric field. Among the many design parameters (e.g., chain lengths, grafting densities, A-B incompatibility, degree of ionization of charged polymers, etc.) we identify those that strongly affect the surface switchability. Such knowledge is useful to the experimental design of these smart polymer brushes for their applications.

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