Mixed Brush as a Smart Coating that Enhances the Polymer Adsorption.

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We theoretically study the reversible adsorption of polymers onto selective mixed brushes. Mixed brushes are recently developed self-adoptive materials that reversibly change their morphology in response to altering external stimuli (e.g. quality of the solvent). The above changes in the morphology result in the formation of different patterns on the outer surface of the brush. We prove that thus achieved patterning of the adsorbing surface of the mixed brush drastically affects the adsorption of polymers, as compared to the adsorption onto the homogeneous brush surface. For this purpose, we develop self-consistent field theory of the polymer adsorption onto selective mixed brushes. This theory shows that the interplay between the depletion effect caused by the loss of the polymer entropy in the interior of the brush and the attraction of the adsorbed polymers to the brush surface leads to a reach adsorption-desorption behavior. The obtained results are presented in the form of adsorption-desorption diagrams that are calculated for different values of the degree of polymerisation of polymer species, Flory-Huggins interaction parameters, and the grafting density of the brush. By comparing the adsorption-desorption diagrams calculated for different microphases of the binary brush and gradient brushes, we discuss the main enthalpic and entropic mechanizms responsible for enhancing/reducing the adsorption of the selected homo- and co- polymers onto the above brush morphologies. We also discuss how to enhance the adsorption ability of the binary brush with respect to polymers of certain properties (e.g. degree of polymerization, composition) by determining and switching to an appropriate brush morphology.