

Polymer brushes at biointerface

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This work addresses the problem of the interaction of stimuli-responsive polymer brushes with functional particles and cells originated from biological systems or artificially introduced into biological systems. Polymer brush–particle interactions are analyzed and experimentally studied for label-free sorting and isolation of nano- or colloidal particles, large protein complexes, and cells. We demonstrate that polymer brush architecture could become an efficient tool for sorting colloids and cells in highly asymmetric mixtures using affinity-based principles. The application of chromatography principles – affinity-based separation on adsorbents is based on a dynamic equilibrium between adsorbed and bulk molecules fueled by thermal fluctuation. This dynamic equilibrium is not feasible for particles and cells because of very high adsorption hysteresis - the energy barrier to detach particles from the interface can be as high as a million kT . In our work, we employ stimuli-responsive brushes for the solution of the problem.

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