Interactions between Surface-Grown Polymer Brushes in Aqueous Media

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Abstract

If polymers are end anchored on the solid surface at a sufficiently high density, with their chains stretching into the surrounding medium, they form a brush-like structure. The understanding of such polymer brushes is important to colloidal stability and various biological processes. In the conventional "grafting to" strategy to form polymer brushes, end-functionalised polymers are adsorbed on the surface from a solution. However, this strategy has several limitations: the relatively weak anchorage (typically a few k_BT) thermodynamically limits the brush grafting density, and the brush formation may also be kinetically hindered.

A more recent alternative "grafting from" strategy is to grow polymer brushes directly from the solid surface. In this study, we have adapted this synthesis strategy to the mica surface, and report the growth of a water soluble brush on mica. This enables the direct measurement of surface forces and friction between the obtained brushes in aqueous media, using a surface force balance with mica as substrates. Our results reveal a deviation from the Alexander-de Gennes description of the brush interaction at high compressions.

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