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Dynamic Polymer Brush at Polymer/Water Interface HIDEAKI YOKOYAMA, KAZUMA INOUE, KOHZO ITO, MANABU INUTSUKA, The University of Tokyo, KEIJI TANAKA, Kyushu University, NORIFUMI YAMADA, J-PARC — A layer of polymer chains tethered by one end to a surface is called polymer brush and known to show various unique properties such as anti-fouling. The surface segregation phenomena of copolymers with surface-active blocks should be useful for preparing such a brush layer in spontaneous process. We report hydrophilic polymer brushes formed at the interface between water and polymer by the segregation of amphiphilic diblock copolymers blended in a crosslinked rubbery matrix and call it "dynamic polymer brush." In this system, the hydrophilic block with high surface energy avoids air surface, but segregates to cover the interface between hydrophobic elastomer and water. The structures of the brush layers at D_2O/polymer interfaces were measured by neutron reflectivity. The dynamic polymer brush layer surprisingly reached 75% of the contour length of the chain and 2.7 chains/nm^2. The brush density was surprisingly comparable to the polymer brush fabricated by the "grafting-from" method. We will discuss the dependence of the brush structure on molecular weight and block fraction of amphiphilic block copolymers. Such a surprisingly thick and dense polymer brush were induced by the large enthalpy gain of hydration of hydrophilic block.

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