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Dynamic Polymer Brush using Amphiphilic Block Copolymers

HIDEAKI YOKOYAMA, HIROKAZU TANOUE, MANABU INUTSUKA, KOHZO ITO, The University of Tokyo, 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 prevention of protein adsorption and anti-fouling activity. 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 hydrophobic polymer matrix by the segregation of amphiphilic diblock copolymers blended in the matrix. In this system, while the hydrophilic block with high surface energy avoids air surface it segregate to cover the interface between hydrophobic PDMS and water. The structures of formed brush layers at D₂O/polymer interfaces were observed by neutron reflectometry (NR). The brush density was calculated to be even comparable the density of typical polymer brushes fabricated by the grafting-from method. We further studied the kinetics of dynamic polymer brush formation using Quartz Crystal Microbalance (QCM) and time-resolved NR. We will discuss the detail of the brush forming mechanism in the presentation.

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