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Poly(ethylene oxide) Chains Are Not "Hydrophilic" When They Exist As Polymer Brush Chains HOYOUNG LEE, DAE HWAN KIM, KEVIN N. WITTE, KIMBERLY OHN, JE CHOI, School of Chemical Engineering, Purdue University, KYUNGIL KIM, MATI MERON, BINHUA LIN, CARS, The University of Chicago, BULENT AKGUN, SUSHIL SATIJA, NIST Center for Neutron Research, NIST, YOU-YEON WON, School of Chemical Engineering, Purdue University — By using a combined experimental and theoretical approach, a model poly(ethylene oxide) (PEO) brush system, prepared by spreading a poly(ethylene oxide)-poly(*n*-butyl acrylate) (PEO-PnBA) amphiphilic diblock copolymer onto an air-water interface, was investigated. The polymer segment density profiles of the PEO brush in the direction normal to the air-water interface under various grafting density conditions were determined from combined X-ray and neutron reflectivity data. In order to achieve a theoretically sound analysis of the reflectivity data, we developed a new data analysis method that uses the self-consistent field theoretical modeling as a tool for predicting expected reflectivity results for comparison with the experimental data. Using this new data analysis method, we discovered that the effective Flory-Huggins interaction parameter of the PEO brush chains is significantly greater than that corresponding to the theta condition, suggesting that contrary to what is more commonly observed for PEO in normal situations, the PEO chains are actually not "hydrophilic" when they exist as polymer brush chains, because of the many body interactions forced to be effective in the brush situation.

Hoyoung Lee
School of Chemical Engineering, Purdue University

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