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Formation and Collapse of Single-Monomer-Thick Monolayers of Poly(n-Butyl Acrylate) at the Air-Water Interface YOU-YEON WON, KEVIN WITTE, WEI SUN, Purdue University, SUMIT KEWALRAMANI, MASAFUMI FUKUTO, Brookhaven National Laboratory, IVAN KUZMENKO, Argonne National Laboratory — The behavior of poly(n-butyl acrylate) (PnBA) spread at the air-water interface has been studied for a full range of surface coverages. Beginning in the concentrated regime, and through the full coverage regime, x-ray reflectivity measurements show the formation of a continuous water-free one-monomer-thick film of the polymer. At surface concentrations above the transition point to the full coverage regime, Brewster angle microscopy shows that the excess polymer material does not distribute uniformly in the polymer film layer but instead leads to formation of micrometer-scale isolated globular domains. Further, the number of such domains increases as the surface polymer concentration is increased, whereas the size of the domains is unaffected by the concentration variation. X-ray grazing incidence diffraction indicates that these domains are regions of bulk-like polymer. We speculate that the globular domains are formed as a result of the interplay between the entropic tendency of the excess PnBA chains to create as many small domains as possible and the energetic penalty associated with the creation of additional polymer-water interfaces. A simple theoretical model based on this picture will be presented and used as a basis for discussion of the experimental observations.

You-Yeon Won
Purdue University

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