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Self-assembly of Nanoparticles at Polymer Surfaces Induced by Supercritical Carbon Dioxide[1] MITSUNORI ASADA, Kuraray Co., Ltd., PETER GIN, MAYA K. ENDOH, Dept. of Mat. Sci. & Eng., Stony Brook University, SUSHIL K. SATIJA, Center for Neutron Research, NIST, TADANORI KOGA, Dept. of Mat. Sci. & Eng., Stony Brook University — The surface segregation (i.e., preferential segregation of one component to the surface in multicomponent systems) is common to all material classes and is typically driven by a reduction in surface energy which more than compensates for the entropy loss and/or energy gain associated with the demixing of the components. However, the conventional surface segregation requires high temperatures, typically close to 200°C, and long annealing time, in order to ensure enough polymer mobility. Here we show a low-temperature and environmentally green method to preferentially migrate inorganic nanoparticles to the polymer surface regions using supercritical carbon dioxide near the critical point. In addition, the $scCO_2$-based surface segregation may be a general phenomenon regardless of a choice of nanoparticles and polymers. In this talk, we will discuss the mechanism and detailed characterization of the surface structures using scanning probe microscope, neutron/X-ray reflectivity, and X-ray photoelectron spectroscopy.

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