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Chain conformation near the buried interface in nanoparticle stabilized polymer thin films[1] JUSTIN CHEUNG, DEBORAH BARKLEY, NAISHENG JIANG, MANI SEN, MAYA ENDOH, JONATHAN RUDICK, TADANORI KOGA, Stony Brook University, YUGANG ZHANG, NSLS II, OLEG GANG, Columbia University, GUANGCUI YUAN, SUSHIL SATIJA, NIST, DAISUKE KAWAGUCHI, KEIJI TANAKA, Kyushu University, ALAMGIR KARIM, University of Akron — It is known that when nanoparticles are added to polymer thin films, they often migrate to the film-substrate interface and form an "immobile interfacial layer", which has been believed as the origin of suppression of dewetting. We here report an alternative mechanism of dewetting suppression from the structural aspect of a polymer. Dodecane thiol-functionalized gold (Au) nanoparticles embedded in PS thin films prepared on Si substrates were used as a model. It was found that thermal annealing promotes irreversible polymer adsorption onto the substrate surface along with the surface migration of the nanoparticles. We also revealed that the surface migration causes additional nanoconfined space for the adsorbed polymer chains. As a result, the self-organization process of the strongly adsorbed polymer chains on the solid surface was so hindered that the chain conformations were randomized and expanded in the film normal direction. The resultant chain conformation allows the interpenetration between free chains and the adsorbed chains, promoting adhesion and hence stabilizing the thin film.

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