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Modifying Surface Fluctuations of Polymer Melt Films with Substrate Modification YANG ZHOU, QIMING HE, FAN ZHANG, FEIPENG YANG, Department of Polymer Science, The University of Akron, Akron, Ohio 44325, United States, SURESH NARAYANAN, X-ray Science Division, Argonne National Laboratory, Argonne, Illinois 60439, United States, GUANGCUI YUAN, Center for Neutron Research, National Institute of Standards and Technology, Gaithersburg, Maryland 20899, United States, ALI DHINOJWALA, MARK FOSTER, Department of Polymer Science, The University of Akron, Akron, Ohio 44325, United States — Deposition of a plasma polymerized film on a silicon substrate changes surface fluctuations of a sufficiently thin, glass-forming film on the substrate. X-ray photon correlation spectroscopy measurements show that the surface fluctuations on a 43 nm thick melt film of 131 k linear polystyrene (PS) on a silicon wafer can be described using a hydrodynamic continuum theory (HCT) that assumes the film is characterized by the bulk viscosity. When a plasma polymerized layer is placed on the silicon wafer, the same is seen for a 43 nm film. However, when film thickness is reduced to 32 nm, the fluctuations are slower than predicted by the HCT. The confinement effect for PS on silicon is larger than that for PS on the plasma polymerized film. We attribute this to the variation in the thickness of a bound layer at the substrate with the surface chemistry of the substrate. Use of the Advanced Photon Source at Argonne National Laboratory was supported by the DOE's Office of Science under Contract DE-AC02-06-CH11357. DoD funding provided through the TCC (#FA7000-14-2-20016).

Yang Zhou
The University of Akron, Akron

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