Abstract Submitted
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Novel adhesion properties of irreversibly adsorbed polymer chains[1] ZHIZHAO CHEN, MANI SEN, JUSTIN CHEUNG, DEBORAH BARKLEY, NAISHENG JIANG, WENDUO ZENG, MAYA K. ENDOH, TADANORI KOGA, Stony Brook University — The stability of thin polymer films on solids is of vital interest in traditional technologies and in new emerging nanotechnologies. We recently found that nanoscale structures of polymer chains adsorbed onto a silicon (Si) substrate ("adsorbed nanolayers") play a crucial role in the thermal stability of the film. To understand the adhesion mechanism at the adsorbed polymer-free polymer interface, we mimicked the interface by preparing bilayers where a 200 nm-thick polymer film and an adsorbed nanolayer, both prepared on Si, were pressed together at high temperature. The bilayers were then subjected to an adhesion test by measuring the critical normal force required to separate the two films. Polystyrene was used as a model. The results are intriguing as they show an absence of adhesion between the "flattened" adsorbed chains, which lie flat on the solid, and the chemically identical free chains. On the other hand, the "loosely adsorbed" polymer chains, which are formed as a result of limited adsorption space on the solid surface, do display a degree of adhesion with the bulk polymer. We postulate that the loosely adsorbed chains act as "connectors" which promote adhesion effectively across the solid-polymer interface.

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