Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Flattening process of polymer chains irreversibly adsorbed on a solid[1] MANI SEN, NAISHENG JIANG, JUSTIN CHEUNG, MAYA ENDOH, TADANORI KOGA, Stony Brook University, DAISUKE KAWAGUCHI, KEIJI TANAKA, Kyushu University — We report the structural relaxation process of irreversibly adsorbed polymer chains that lie flat on a solid ("flattened chains (FC)") via thermal annealing. Amorphous polystyrene (PS) on quartz, which together constitute a weakly attractive system, was used as a model system and the local chain conformations of the FC were investigated by sum frequency generation spectroscopy (SFG). Two different film preparation processes (i.e., spin coating and dip coating) were used to create different initial chain conformations. PS films were annealed at $T>>T_g$ to reach the "quasiequilibrium" state and subsequently rinsed with chloroform, a good solvent to uncover the buried FC. SFG results revealed that the backbone chains (constituted of CH and CH_2 groups) of the FC preferentially orient to the weakly interactive substrate surface via thermal annealing regardless of the initial chain conformations, while the orientation of the phenyl rings becomes randomized. We postulate that increasing the number of surface-segmental contacts (i.e., enthalpic gain) is the driving force to overcome the conformational entropy loss in the total free energy.

[1] Acknowledgement of financial support from NSF Grant (CMMI -1332499).

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Date submitted: 10 Nov 2016

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