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Effect of the chain length and segment size of the free polymer on the interaction between two grafted monolayers in a good solvent WALTER CHAPMAN, SHEKHAR JAIN, Rice University, VALERIY GINZBURG, PRASANNA JOG, JEFFREY WEINHOLD, RAKESH SRIVASTAVA, Dow Chemical Company, ISAFT DFT COLLABORATION — The interaction between two polymer grafted surfaces is important in many applications, like nanocomposites, colloid- stabilization, and polymer alloys. In our previous work [Jain et. al., J. Chem. Phys. 128, 154910 (2008)], we showed that interfacial statistical associating fluid theory (iSAFT) density functional theory (DFT) successfully calculates the structure of the grafted polymer chains in the absence/presence of free polyatomic solvent. In the current work, we have applied iSAFT to calculate the force of interaction between two such grafted monolayers in implicit good solvent conditions. In particular, we have considered the case where the segment sizes of the free (σ_f) and grafted (σ_g) polymers are different. The interactions between the two monolayers in the absence of the free polymer is always repulsive. However, in the presence of free polymer, the force can be either purely repulsive or can have an attractive minimum depending upon the relative chain lengths of the free (N_f) and grafted polymers (N_g). The attractive minimum is observed only when the ratio, N_f/N_g, is greater than a critical value. We propose a scaling relation for this case, in agreement with self consistent field theory for ($\sigma_f = \sigma_g$).

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