

CHAIN MOBILITY OF POLYMERS AT VARIOUS INTERFACES

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The segmental mobility of amorphous polymers at the interfaces with solid substrates was noninvasively examined by fluorescence lifetime measurements using evanescent wave excitation [1] in conjunction with coarse-grained molecular dynamics simulation [2]. The glass transition temperature (T_g) was higher at the interface than in the internal region. Measurements at different incident angles of excitation pulses revealed that T_g became higher closer to the interface. The gradient became more marked with an increasing difference in the free energy at the interface between the polymer and solid substrate. The T_g value at the interface decreased with decreasing molecular weight. However, the decrement for the interfacial T_g was not as much as that for the bulk T_g , due to the restriction of chain end portions by the substrate. Effects of chain stiffness and film thickness on the T_g elevation at the interfaces were also discussed.

[1] (a) Tanaka et al., Appl. Phys. Lett. 89(6), 061919-1-2, 2006, (b) Tanaka et al., J. Phys. Chem. B. 113(14), 4571-4577, 2009

[2] Morita et al., Macromolecules 39(18), 6233-6237, 2006