

The interfacial properties of polystyrene thin films as revealed by neutron reflectivity

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We have studied the glass transition temperature (T_g) and molecular mobility of polystyrene (PS) thin films near the interface between polymer and the substrate with bi-layer thin films consisting of surface hydrogenated PS (h-PS) and bottom deuterated PS (d-PS) using neutron reflectivity measurements by SOFIA in J-PARC/MLF. With decreasing the thickness of the bottom d-PS layer, the evaluated interfacial T_g increased compared to bulk T_g and the drastic increase of T_g was observed for the bottom d-PS layer below 155Å thick. The polymer chain mobility decreased with decreasing the layer thickness even for the bottom d-PS layer with no discernable change of T_g . The in-plane orientation of polymer chains at the interface between PS and the substrate might induce the chain pinning or strong binding to the substrate, resulting the decrease of mobility and the increase of T_g near the interface between PS and the substrate.