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The Structure Evolution in Thin Films of a Nearly Symmetric Polystyrene-block-Poly(methyl methacrylate) on a Layer of homopolystyrene chains

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The distributions of dPS in PLs // can be probed by grazing-incidence small-angle neutron scattering (GISANS) and time-of-flight neutron reflectivity (ToF-NR). In this work, by adjusting the composition (ϕPS+dPS = 63.8 vol%) of the total PS/dPS component and annealing temperature (230 and 270 ℃), P(S-b-MMA)/dPS blend films mainly form perforated layers with parallel orientation (hereafter PLs //). Where basically follow up our previous studied segmental distributions of polymer chains in blend films of a weakly-segregated polystyrene-block-poly(methyl methacrylate) [P(S-b-MMA)] and deuterated polystyrene (dPS). The GISANS and ToF-NR results offer evidence that dPS chains are preferentially located at the free surface and within the PS layers for blend films that were annealed at 230 ℃. Upon annealing at 270 ℃, dPS chains distribute within PS layers and perforated PMMA layers. Nevertheless, dPS chains still retain a surface preference for thin films. In contrast, such surface segregation of dPS chains is prohibited for thick films when annealed at 270 ℃.

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