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 ($\phi_{PS+dPS} = 63.8$ vol%) of the total PS/dPS component and annealing temperature (230 and 270 °C), 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 °C. Upon annealing at 270 °C, 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 °C.

Primary authors:  Dr NELSON, Andrew (ANSTO); Dr WU, Chun-Ming (NSRRC); Mr HONG, Jia-Wen (NCU); Dr HUANG, Tzu-Yen (NSRRC); Prof. SUN, Ya-Sen (NCKU)

Presenter:  Dr WU, Chun-Ming (NSRRC)

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