Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Photocontrol over the Disorder-to-Order Transition (DOT) in Thin Film of Polystyrene-*block*-Poly(methyl methacrylate) Block Copolymers Containing Photodimerizable anthracene functionality

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— Reversible photocontrol over the disorder-to-order transition (DOT) of block copolymers can be used to fabricate defect-free, long-range ordered nanomaterials over macroscopic distances by "photo-combing" the microdomains. Here, we randomly copolymerized anthracene functionalities in a "dilute" way with 2-hydroxyethyl methacrylate as the middle block, forming deuterated polystyrene-*block*-poly(2-(methacryloyloxy)ethyl anthracene-9-carboxylate-*random*-2-hydroxyethyl methacrylate)-*block*-poly(methyl methacrylate) (d_8-PS-*b*-P(9AnEMA-*r*-HEMA)-*b*-PMMA) triblock copolymers. Upon UV irradiation of a thin film of the phase-mixed triblock copolymer, photodimerization of anthracene links the junction of d_8-PS and PMMA blocks and produces an artificial interface to force a phase-separation, i.e. a UV-induced DOT, as evidenced by small angle neutron scattering (SANS). Reversible photocontrol over the DOT can be achieved by taking advantage of photodimerization and photodissociation of anthracene.

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Date submitted: 10 Nov 2009

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