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**Nanostructured polymer blends by addition of gradient copolymer during melt mixing: Effects of copolymer sequence distribution on morphology and crystallization behavior** ROBERT SANDOVAL, JUNGKI KIM, JOHN TORKELSON, Northwestern University — Nanostructured blends of polystyrene and poly(ethylene oxide) (PEO) are produced via the addition of styrene/methyl methacrylate (S/MMA) gradient copolymer during conventional melt mixing, introducing dipole-dipole interactions between PEO and MMA repeat units. Upon addition of S/MMA gradient copolymer, stable PEO domains with diameters of  $\sim 100$  nm are formed in optimized cases. This results in PEO domains homogeneously crystallizing at  $\sim -20$  C, well below the crystallization temperature of bulk PEO ( $\sim 50$  C). Additionally, nanostructured blends annealed at room temperature for 40 days resulted in no melting behavior upon heating, showing that the nanoconfined PEO domains remain in a rubbery state at room temperature, while bulk PEO typically remains in a crystalline state. This demonstrates that the blend properties can be easily tuned by adjusting the copolymer characteristics. This study is the first to lead to nanostructured polymer blends from non-reactive, simple melt mixing of two homopolymers and a compatibilizer.

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