Characterization of Novel Semicrystalline Ethylene-α-Olefin Block Copolymers

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Poster (2:20 PM)

In semicrystalline block copolymers, formation of solid-state morphology can be driven either by block incompatibility or by crystallization of one or more of the blocks. Depending on the block interaction strength, a wide array of solid-state morphologies may be observed, ranging from spherulitic to confined crystallization within preexisting microphase-separated domains. [1,2]

The Dow Chemical Company recently developed a novel chain shuttling polymerization process to economically produce olefin block copolymers with alternating amorphous and semicrystalline chain segments [3]. In particular, a class of polydisperse and high-octene polyolefins was found to exhibit solid-state morphological characteristics that are consistent with confined or templated crystallization from a microphase-separated melt.

We examined the melt and solid-state morphologies of these novel olefin block copolymers using 2D small-angle and wide-angle x-ray scattering. The multiblock and diblock copolymers with near symmetric compositions showed well-ordered lamellar structure with long period on the order of 100nm. The presence of these large-period microstructures explains the blue tint exhibited by these olefin block copolymers, a feature extremely uncommon in other conventional near-monodisperse block copolymers of comparable molecular weight.

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[2] Y. L. Loo, and R. A. Register, *Development in Block Copolymer Science and Technology*, Chichester, John Wiley & Sons, LTD, 2004.
[3] D. J. Arriola, E. M. Carnahan, P. D. Hustad, R. L. Kuhlman, and T. T. Wenzel, *Science*, 312, 714 (2006).