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Crystalline - Crystalline Diblock Copolymers of Linear Polyethylene - Hydrogenated Polynorbornene RICHARD REGISTER, SASHA MYERS, SHENG LI, Princeton University — The melt and solid-state morphologies of linear polyethylene (LPE) - hydrogenated polybnorbornene (hPN) diblock copolymers, and their crystallization behavior, were explored over a range of block ratios and diblock molecular weights. LPE and hPN are both highly-crystalline polymers, with similar melting points, so the final structure can potentially be dictated by the melt structure, or by crystallization of either block. For diblocks with molecular weights of 50 kg/mol, symmetric copolymers exhibited lamellar microphase-separated melts, while diblocks with 20 or 80% LPE were homogeneous, indicating a modest LPE-hPN interaction energy density of approximately 1 J/cc. For the relatively slow crystallizations which can be conducted isothermally, hPN appears to always crystallize first; the two crystallization processes can be resolved by time-resolved DSC and x-ray diffraction at small undercoolings. However, the LPE block has a stronger temperature dependence of its crystallization rate, implying that LPE would crystallize first at deep undercoolings. Up to the highest diblock molecular weights explored (100 kg/mol), crystallization "breaks out" from the melt mesophase to form spherulites defined by the hPN block; subsequent crystallization of the LPE within these spherulites is apparent from a change in optical texture.

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