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Precisely Branched Polyethylene: Effect of Alkyl Branch Size on Nanoscale Morphology INGO LIEBERWIRTH, Max Planck Institute for Polymer Research, KENNETH WAGENER, BORA INCI, Department of Chemistry, University of Florida, HAIXIN ZHOU, Beijing University of Science and Technology — Morphological characterization is reported for a series of precisely branched polyethylene structures, the branch being placed on every 20^{st} or 38^{th} carbon and varying in size from methyl to pentadecyl group and additionally with the introduction of phosphate and phosphonate groups. The morphology and physical properties of the crytallized polymer were investigated using DSC, x-ray scattering and TEM. Precise branching significantly reduces the melting point and lamellaer thickness. On the other hand, all further branches from ethyl to pentadecyl produce polymers that have similar melting points. A polyethylene with short branches at precisely every 38th unit will incorporate these defects into the crystal. Structural analysis reveals, that the packing perpendicular to the main chain axis is of orthorhombic PE type with an increase of lattice parameters. The appearance of the (00l) spots, on the other hand, gives rise to assume a much higher disorder of crystal structure in direction of the molecular backbone.

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