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Understanding and Controlling Scrolled Polymer Single Crystal Habits in Isotactic Polybutene-1 HAO-JAN SUN, University of Akron, BERNARD LOTZ, Institut Charles Sadron, France, STEPHEN CHENG, University of Akron — The origin of non-planar polymer crystal habit, lamellar twisting and scrolling, still remains unclear. In this study, isotactic polybutene-1 (iPBu-1) was chosen as a model compound to investigate the precise relationship between the building molecules and the scrolled morphology. The scrolled micro-tubular iPBu-1 Form III single crystals have been successfully produced through dilute solution crystallization. TEM observation confirmed the edges are the (110) growth faces and that the scroll axis is along (320) plane. Polyethylene decoration experiments showed the lozenge shape crystal has four sectors with fold direction in each sector along the (110) growth surface. TEM and AFM studies also showed that the micro-tube size can be controlled by lamellar thickness which is dependent on crystallization temperature. Based upon these observations, a mechanism for lamellar scrolling is proposed where the asymmetric chain folds on opposite fold surfaces could be introduced by the isochiral 4_1 helical packing scheme in the unit cell. These asymmetric chain folds along the growth direction can generate unbalanced surface stresses to make the lamellar scrolling.

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