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Two Different Types of Single Crystal Morphologies of the γ -Phase and Their Conversion in Isotactic Polypropylene YAN CAO, RYAN VAN HORN, CHI-CHUN TSAI, MATTHEW GRAHAM, KWUANG-UN JEONG, CLAUDIO DE ROSA, BERNARD LOTZ, STEPHEN Z.D. CHENG — In the past, the crystallographic relationship between the γ -phase and the α -phase in isotactic polypropylene was extensively studied via oligomers of iPP. We attempt to investigate how the crystal morphological changes take place in the γ -phase using high molecular weight iPP-co-polyethylene samples. Due to the specific epitaxial growth of the γ -phase on the elongated α -phase single crystals, two different morphologies were identified via transmission electron and atomic force microscopies. The first γ -phase crystal morphology is needle-like. Selective area electron diffraction results showed that their $[\bar{1}10]$ or $[110]$ zone axis was parallel to the thin film normal. The growth of this type of epitaxial γ -phase crystal was due to the stem direction in the initial α -phase single crystal being parallel to the thin film normal. The second γ -phase crystal morphology was flat lamellae. This requires that the initial α -phase single crystal had to have a stem orientation tilted away from the thin film normal. Therefore, the sufficient and necessary condition for the γ -phase morphological conversion from the needle-like crystal to the flat crystal is the change of the stem orientation direction of the initial α -phase single crystals.

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