

The Influence of Nucleating Agents and Process Parameters on Phase Structure of Isotactic Polypropylene and its Copolymer with 3% Ethylene

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The homopolymer of the isotactic polypropylene (iPP) and the random copolymer of the isotactic polypropylene and 3% ethylene (iPPE) were used in this study. Isotactic polypropylene can be prepared in α , β and γ morphological phases depending on its crystallization conditions. The phase β content has a strong influence on mechanical, optical and thermal properties. The samples with nucleating agents (NA) α and β were used. Various process parameters were used to prepare melted samples: two thicknesses and three different cooling regimes. Wide-angle X-ray scattering (WAXD) and scanning electron microscopy (SEM) were used to investigate the phase structure. The results show that iPP without nucleation agents (4mm, $<1^\circ\text{C}/\text{min}$) has the highest crystallinity (83.7%). The sample of iPP with β -NA (4mm, $<1^\circ\text{C}/\text{min}$) has the highest phase β (61.3%); the slower cooling regime and the higher thickness increased the crystallinity (73.3%). iPPE with β -NA (0.4mm, $15^\circ\text{C}/\text{min}$) has the lower amount of the phase β (33.8%); the higher thickness and slower cooling regime decreased the amount of the phase β (7.1%) however the crystalline content of iPPE (63.7%) is increased.

Keywords: nucleation, isotactic polypropylene, crystallization

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