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HIGHLY TRANSPARENT POLYPROPYLENE SHEET CONTROLLED BY POLYMER DESIGN AND BLENDING LINEAR LOW DENSITY POLYETHYLENE

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In order to obtain highly transparent isotactic polypropylene (PP) sheet by an industrial process, the influence of the isotacticity, molecular weight distribution and metallocene-catalyzed linear low density polyethylene (L-LDPE) as crystallization control material contributing to transparency were analyzed. The sheet samples were extruded by using a direct single belt process as the quick quenching system. The higher order structure of each sample sheet was investigated by phase-contrast microscopy, polarizing microscopy, light scattering, wide-angle X-ray diffraction (WAXD), small angle X-ray scattering (SAXS) and transmission electron microscope (TEM).

Even if the sheeting was carried out under the same conditions, the lower tacticity PP generated the less and the smaller size of spherulites, and the better transparent sheet was acquired. In the case of low tacticity PP, the improvement behavior on transparency by heat treatment showed the same tendency as the high tacticity PP.

Concerning with the influence of molecular weight distribution on transparency, PP with narrow molecular weight distribution, which has shorter relaxation time, showed better external haze and as a result better transparence.

Moreover, the behavior of transparency was investigated by 10 wt% addition of various metallocene L-LDPE with wide range density. Thanks to the fine distribution particles of L-LDPE in PP matrix, the number of generated spherulites and the growth rate of them were restrained. In the case of addition of L-LDPE with the specific density to PP, the transparency was markedly improved by the heat treatment of quick quenching sheets. According to the density of added L-LDPE, the suitable heat treatment temperature condition which showed the best transparency was changed. This phenomenon could be explained by the refractive index difference of PP matrix and the fine distribution particles of L-LDPE.