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Optimization of optical properties of polypropylene by studying the impact of catalyst activity on polymerization process

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Polypropylene is inherently a semicrystalline non-transparent opaque polymer, and can be a suitable substitute for many transparent polymers provided its transparency is improved. The use of transparent PP in packaging, bottle manufacturing, and pharmaceutical industries is of paramount importance considering its transparency, chemical resistance, gas impermeability, and low cost, and it is manufactured by thermoforming, injection molding, and blow molding (extrusion blow molding, injection blow molding, and injection stretch blow molding). Earlier studies discussed recognition of factors influencing turbidity (opaqueness) of polymer films for packaging applications. This research studied transparency of samples of homopolymer grades (HP502R-HP510L) produced by three types of catalysts with different activities. Haze Meter, Cast Film, FTIR, Gloss Meter, and MFR machines were used and numerous tests including HAZE, MFR, Yellow Index, and Gloss were performed on sample films produced to improve this property through presenting the impact of catalyst activity on the optical properties of polypropylene. Results of tests indicate there is a direct relationship between efficiency of the catalyst utilized in the polymerization process and polypropylene transparency so that it is possible to improve polymer transparency and reduce its opacity by using a highly efficient catalyst. The increase in catalyst activity also improves polymer glossiness. In addition, the yellowness index of a polymer, which is an indicator of residual catalyst, was improved by increasing catalyst activity.

Biography

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