

Effect of a Co-Catalyst Modifier in the Synthesis of Ultra-High Molecular Weight Polyethylene Having a Reduced Number of Entanglements.

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In the vast panorama of catalyst structures that have been developed in the past 30 years, the bis-(phenoxy-imine) based complexes of group IV metals reported by Fujita in the late 1990s¹ have attracted a considerable amount of attention. For some bis-(phenoxy-imine) based catalysts it is possible to synthesize Ultra High Molecular Weight Polyethylene (UHMWPE) with a reduced number of entanglements² highly desirable to an easier and economically more favourable solid state processing³.

The use of a hindered phenol to trap free trimethylaluminum (TMA) in methylaluminoxane (MAO) solutions has been reported to improve the performance of single-site, homogeneous catalysts for olefin polymerisation. In the present study, with the help of rheological analyses we have investigated and compared the molecular weight, molecular weight distribution and entanglement density of UHMWPE synthesised with a single-site catalyst activated by MAO and phenol-modified MAO. While the number average molecular weight (M_n) of the obtained polymers remains the same for both activations, a higher yield and a higher entanglement density are found in the initial stages of polymerisation on using phenol-modified MAO as the cocatalyst. These results suggest that on using the phenol-modified MAO as activator, a higher number of active sites are obtained. Surprisingly in the presence of untreated MAO, a tail in the higher molecular mass region is produced⁴.

References:

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