Immobilization and activation of single site chromium catalyst for ethylene polymerization using MgCl$_2$/AlR$_n$(OEt)$_{3-n}$

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Abstract:
The effective immobilization and activation of a single-site chromium catalyst for ethylene polymerization has been achieved using MgCl$_2$/AlR$_n$(OEt)$_{3-n}$ supports, without the use of methylaluminoxane (MAO) or a borate activator. High catalyst activity and spherical polyethylene particle morphology is obtained. Earlier accounts of this kind of supports with wide variety of Ti and Ni catalysts $^{[1,2]}$ proved the effective immobilization and activation of these catalysts. Furthermore, the single-site characteristics of the chromium catalyst are retained, the narrow molecular weight distribution of the polymers obtained being apparent from GPC. The homogeneous chromium catalysts are subject to the loss of activity but our studies showed gradual decay in the activity of supported catalysts being apparent from reactor cooling temperature.

Rheological measurements of PE were carried out to confirm the single site behavior of the catalyst. Change in the values of the storage modulus in the range of the shear frequency confirms the values of molecular weight distribution obtained from GPC.$^{[3]}$ It was investigated by Vega et al $^{[4]}$ that high molecular weight polyethylenes with narrow molecular weight distribution show plateau modules over a wide range of angular frequency. The value of plateau modulus depends on the molecular weight between entanglements.$^{[5]}$ The results presented in the poster illustrate the usefulness of melt Rheology in the characterization of the molecular weight distribution of high-molecular weight polyethylene, taking into account the difficulties inherent in GPC analysis of high molecular weight polymers.

References: