

PREPOLYMERIZED ZIEGLER-NATTA CATALYST FOR GAS PHASE PRODUCTION OF LLDPE

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ABSTRACT

In the late sixties, magnesium chloride was discovered to be the ideal support for the fixation of titanium tetrachloride and its derivatives to yield high activity catalysts for olefin polymerization. This led to an unprecedented growth in the polyolefin market and was accompanied by a great deal of publications, particularly in the patent literature.

A series of superactive Ziegler-Natta catalysts were prepared in our laboratories according to the following steps [1]:

- i) Complexing an ether with a partially anhydridized magnesium chloride.
- ii) Mixing an alkyl aluminium with the partially activated support (i).
- iii) Adding an alcohol to form an activated magnesium chloride / alcohol complex.
- iv) Reacting titanium tetrachloride with the activated complex (iii).

Reaction of the alkyl aluminium with the residual water and the complexed ether is deemed responsible for the formation of structural faults and the introduction of defects in the crystal structure of MgCl₂. Apart from also contributing to the structural breakdown of the MgCl₂ crystal, the amount of alcohol introduced is responsible for the amount of alkyl available for reducing a proportion of the TiCl₄ added [2]. The inactive reaction products are removed by thorough washing of the final catalyst with an inert hydrocarbon.

The activity of supported Ziegler-Natta catalysts of more than 100 000 g/g catalyst which were prepared in our laboratories according to the method described below is too high for utilization in gas phase homo- and copolymerization because the rate at which the reaction heat can be removed is limited.

In order to decrease the activity, ethylene and the monomer(s) to be used for the co- or terpolymerization were first polymerized in slurry phase to obtain a prepolymerized catalyst containing between 5 and 20 wt% of the catalyst in an ethylene copolymer matrix. This prepolymerized catalyst was filtered and subsequently used for the gas phase co- or terpolymerization of ethylene with the same comonomer(s) and ratios as those used in the prepolymerization step. These prepolymerized catalysts have been used successfully in homo- co- and terpolymerization of ethylene with higher α -olefins [3].

References:

1. Tincul I., Joubert D.J., Potgieter I.H., *WO 974560/97*, (1997).
2. Joubert D.J., Tincul I., Moss J.R., *Inorganic '99 Conf. Proceedings*, p 49, (1999).
3. Tincul I., Joubert D.J., Potgieter I.H., *WO 9745454/97*, (1997).