MODIFICATIONS OF ZIEGLER-NATTA CATALYSTS FOR IMPROVED COMONOMER INCORPORATION

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Since the beginning of industrial polyethylene production, it has become increasingly important. In terms of volume, polyethylene is dominating plastic market today, with linear low-density polyethylene (LLDPE) as one of its major types. It is produced by copolymerization of ethylene with α-olefins, e.g. 1-butene or 1-hexene. Using Ziegler-Natta (ZN) catalysts for polymerization usually leads to a random incorporation of the comonomers in the growing polymer chain. Therefore, the comonomer content is higher in the low-molecular weight fractions, leading to a faster degradation. These problems can be avoided using metallocene catalysts, with the disadvantage of their difficult handling and higher price. Synthesizing a ZN catalyst showing the behavior of metallocenes would be favorable [1].

In the presented work, various $MgCl_2$-based ZN catalysts were prepared varying several synthesis conditions. The aim was to influence the comonomer incorporation as shown in Figure 1, improving the material properties of the polymer.

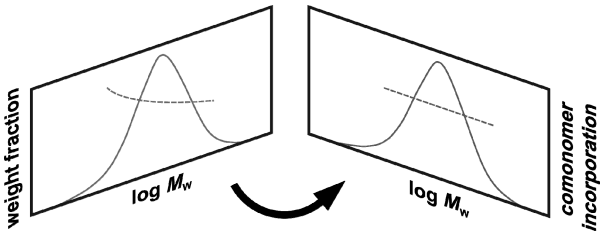

Figure 1: Molecular weight distribution and comonomer incorporation.

The synthesized catalysts were used in slurry-phase copolymerizations to study their behavior. All catalysts, as well as the polymer powders were investigated by means of various analysis methods such as X-ray diffraction (XRD), inductively coupled plasma mass spectrometry (ICP-MS), gel permeation chromatography (GPC) and dynamic scanning calorimetry (DSC). The results indicate that the heat treatment during the addition of $TiCl_4$ has a particularly strong influence on the comonomer incorporation.

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[1] Aigner P., Averina E., Garoff T., Paulik C.: Macromolecular Reaction Engineering, *11*, (2017), in press.