

INFLUENCE OF PARAMETER VARIATIONS ON ZIEGLER-NATTA CATALYZED ETHYLENE POLYMERIZATIONS

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Introduction

Since the 1953 discovery of a new catalyst system by Karl Ziegler, which is now commonly referred to as Ziegler-Natta catalyst (ZN), the importance of this system for the production of polyolefins, and specifically polyethylene (PE) has continually increased.¹ One very reactive version of this system is comprised of TiCl_4 fixed onto a MgCl_2 substrate with triethylaluminium (TEA) as a co-catalyst.² In this study we compare three experimental ZN of the mentioned kind, differing in their substrate size, regarding their polymerizing properties and produced PE with changing polymerization parameters.

Experimental

To achieve comparable polymerization conditions, a 0,5 l isoperibolic semi-batch reactor system was used and the reactions were carried out for 60 minutes as slurries with 160 ml – 170 ml liquid propane as the reaction medium. Homo- and co-polymerizations were performed with an initial medium temperature of 85 °C and 1-Buten as co-monomer. Initial hydrogen partial pressure was 0,4 bar, and ethylene feeding pressure during polymerizations was 3,0 bars. Approximately 5 mg catalyst (cat.) and 120 mg TEA were used in each experiment. Consumption of ethylene and the evolution of reaction heat served as polymerization indicators. The obtained polymer was analysed by size exclusion chromatography (SEC) and differential scanning calorimetry (DSC).

Results and Discussion

The results show indeed an influence of the catalyst morphology on reaction parameters as can be seen in Figure 1, which depicts the catalyst activity versus the used co-monomer amount. The DSC and SEC results substantiate the difference in the catalyst systems since the polymers differ in molecular weight distribution, bulk density and incorporated co-monomer content.

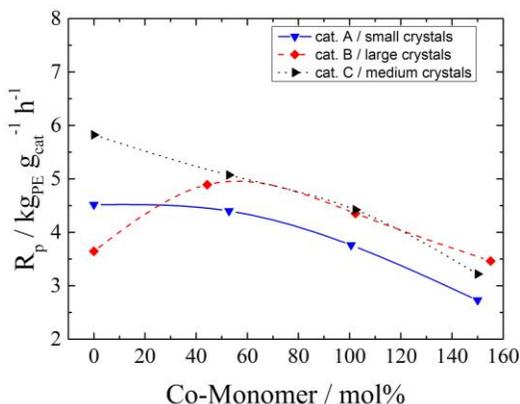


Figure 1: Catalyst activity versus Co-monomer amount.

REFERENCES

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