

Experimental Investigation and Modelling of Z-N catalyst pre-contacting in Industrial Ethylene Polymerization

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Polyolefines make up one third of the plastics production. Heterogeneous Ziegler-Natta (Z-N) catalysts dominate the polyolefin production and extensive research is done to increase their polymer powder output as well as material properties.

The pre-treatment of the catalyst bears several possibilities to influence the activity of the catalyst system and particle morphology [1]. Especially catalyst/cocatalyst pre-contacting before the polymerization process has a large effect on polymerization.

The subject of pre-contacting has been studied experimentally and also by modelling the diffusion process taking place at the particle. Figure 1 shows the polymerization in dependency on pre-contacting.

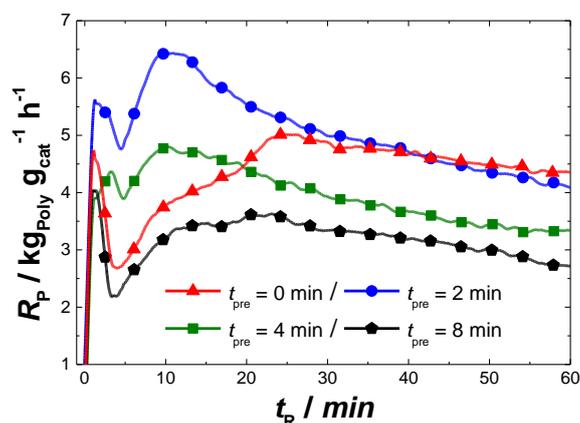


Figure 1: Illustration of pre-contacting effect on activity profile with various pre-contacting times (t_{pre}).

Ideal pre-contacting has increased the activity of the catalyst up to 30 %, but pre-contacting beyond the optimum leads to a profound loss in polymerization activity. For the effect of pre-contacting two main influence factors are accountable, namely the titanium oxidation state evolution and cocatalyst diffusion [2,3]. To define the effect of diffusion a dynamic mass transfer model has been applied, which considers internal and external mass transfer limitation in dependency on mixing conditions. The data retrieved with the model is in full alignments with the results obtained by the experimental study.

References

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