PREPOLYMERIZATION FOR THE GAS PHASE POLYMERIZATION OF PROPYLENE

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Since the development of Ziegler-Natta catalysts in the 1950s, continuous improvements were performed with regard to higher catalyst activity and higher stereo-selectivity. However, especially at the polymerization start, when the pure catalyst is injected under high rate conditions, the high activity of the catalyst may cause particle overheating and/or lead to an uncontrolled catalyst fragmentation resulting in lower catalyst activity and bad particle morphology. One possibility to solve the problem is to apply a prepolymerization step before the main polymerization. In the prepolymerization, the reaction starts at low rate conditions (mild reaction temperatures, low monomer concentration) in order to realize a controlled catalyst fragmentation and to improve heat removal conditions for the main polymerization by creating a higher heat transfer area. The current contribution deals with the prepolymerization of propylene in lab-scale under industrially relevant conditions. The main gas phase polymerization is conducted in a 5 l horizontal stirred tank reactor. Prepolymerization is performed in-situ, meaning in the same reactor by injecting the catalyst at a low initial temperature, or externally in a 250 ml calorimeter. The latter case offers the benefit of controlled prepolymerization conditions with access to prepolymerization kinetics and defined starting conditions for the main polymerization. Experiments were performed for varying reaction conditions. The two prepolymerization methods are compared and the effect of prepolymerization on the activity of the main polymerization is discussed.