KINETICS OF PE CRYSTALLIZATION

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A key issue in the understanding of the nascent polymerisation of ethylene, and on the development of the morphology of polyethylene (PE) particles is the competition between polymer growth and crystallization. In particular, in the case of production of PE in condensed mode cooling, the nascent polymer can be formed in conditions of extreme plastification – in other words, polymer can be formed under conditions where the nascent polymer is in a negligible concentration with respect to the alkanes present in the gas phase of the reactor. We have performed a series of thermal analyses to look at the rates of crystallization under isothermal conditions, and it has been observed that the time scale for the formation of crystals can actually be very long with respect to the times scale for the production of the individual polymer chains.

This in turn can have a significant impact on mass transfer rates during the initial stages of polymerisation, as well as on the morphology of the particles as they are formed.