Modelling of heat exchange between drops in suspension polymerization of vinyl chloride

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Abstract

A population balance model is presented for suspension polymerization of vinyl chloride in a batch reactor to investigate the thermal properties of the system. Reactions are described using a simplified reaction model focusing on the heat generation of the highly exothermic polymerization reactions. The temperature of the continuous phase is assumed to be homogeneous over the reactor and the effects of some temperature rise of droplets due to the exothermic polymerization reactions and the possible heat exchange because of the coalescence/redispersion process are analysed. The population balance equation is solved applying a Monte Carlo method by coupling the deterministic polymerization reactions inside the droplets with the discrete event process induced by collisions of droplets.

The results obtained by simulation show that rise in the temperature of droplets over the mean temperature of continuous phase lead to acceleration of the process. The possible size distribution of droplets and no smooth distribution of the initiator in those decrease the process efficiency.

Keywords

Suspension polymerization, Vinyl chloride, Population balance model, Collisional heat exchange, Monte Carlo method

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