

Modeling of Polyethylene Particle Size Distribution in Fluidized Bed Reactors

Authors : R. Marandi, H. Shahrir, T. Nejad Ghaffar Borhani, M. Kamaruddin

Abstract : In the present study, a steady state population balance model was developed to predict the polymer particle size distribution (PSD) in ethylene gas phase fluidized bed olefin polymerization reactors. The multilayer polymeric flow model (MPFM) was used to calculate the growth rate of a single polymer particle under intra-heat and mass transfer resistance. The industrial plant data were used to calculate the growth rate of polymer particle and the polymer PSD. Numerical simulations carried out to describe the influence of effective monomer diffusion coefficient, polymerization rate and initial catalyst size on the catalyst particle growth and final polymer PSD. The results present that the intra-heat and mass limitation is important for the ethylene polymerization, the growth rate of particle and the polymer PSD in the fluidized bed reactor. The effect of the agglomeration on the PSD is also considered. The result presents that the polymer particle size distribution becomes broader as the agglomeration exits.

Keywords : population balance, olefin polymerization, fluidized bed reactor, particle size distribution, agglomeration

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