World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:9, No:09, 2015

2D CFD-PBM Coupled Model of Particle Growth in an Industrial Gas Phase Fluidized Bed Polymerization Reactor

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Abstract : In an industrial fluidized bed polymerization reactor, particle size distribution (PSD) plays a significant role in the reactor efficiency evaluation. The computational fluid dynamic (CFD) models coupled with population balance equation (CFD-PBM) have been extensively employed to investigate the flow behavior in the poly-disperse multiphase fluidized bed reactors (FBRs) utilizing ANSYS Fluent code. In this study, an existing CFD-PBM/ DQMOM coupled modeling framework has been used to highlight its potential to analyze the industrial-scale gas phase polymerization reactor. The predicted results reveal an acceptable agreement with the observed industrial data in terms of pressure drop and bed height. The simulated results also indicate that the higher particle growth rate can be achieved for bigger particles. Hence, the 2D CFD-PBM/DQMOM coupled model can be used as a reliable tool for analyzing and improving the design and operation of the gas phase polymerization FBRs.

Keywords : computational fluid dynamics, population balance equation, fluidized bed polymerization reactor, direct quadrature method of moments
Conference Title : ICCEAC 2015 : International Conference on Chemical Engineering and Applied Chemistry
Conference Location : Rome, Italy
Conference Dates : September 17-18, 2015