Computational fluid dynamics simulation of industrial fluidized bed reactors for propylene polymerization

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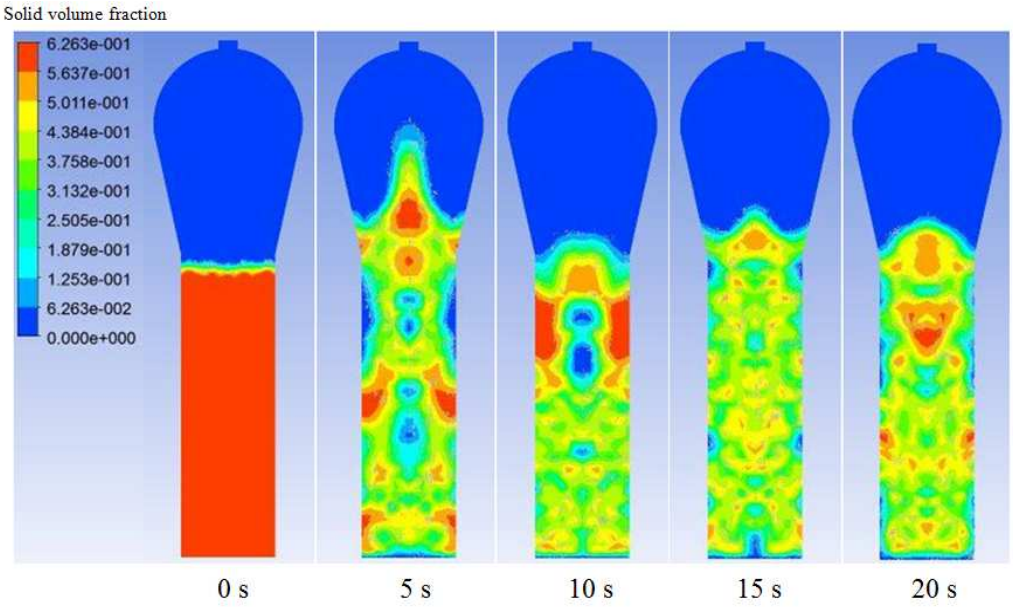
Fluidized bed reactors have found wide range of applications in olefin polymerization. A better understanding of the hydrodynamic behavior is crucial to maximize its productivity. This research presents a computational fluid dynamics (CFD) simulation of industrial fluidized bed reactors for propylene polymerization. The catalyst particles with the diameter ranging between 20 and 80 µm are fed to the reactor and react with the monomer fed from the bottom of the reactor. The particle growth rates are included in a two-dimensional CFD simulation to find the particle size distribution within the reactor. The particle growth rates directly depend on the polymerization rates varying with the monomer concentration and the concentration of catalyst active site. As the polymer particles grow, large particles tend to accumulate at the bottom of the bed while small particles tend to appear at the upper part of the bed. At a normal operating condition, the temperature of polymer particles is uniform at the lower part of the bed and slightly decreases with the bed height. The polymerization rates of small catalyst particles are higher than those of large catalyst particles due to a higher rate of mass transfer.



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