RESEARCH AND SIMULATION OF FAST, STRONG EXOTHERMIC REACTION IN GAS-SOLID FLUIDIZED BED ABOUT TEMPERATURE DISTRIBUTION AND HOT SPOT PROBLEM

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Gas-solid fluidized bed is widely used in petro-chemical and coal-chemical industry and other fields because of its superior heat transfer and mass transfer performances. In consideration of these performances, it is generally believed that there is a uniform temperature distribution and no hot spot in gas-solid fluidized bed compared with fixed bed. But in real industrial processes of fast, strong exothermic reactions, there are great axial and radial temperature differences and even hot spots in gas-solid fluidized bed.

In this study, two-dimensional diffusion model based upon the momentum and energy conservation equations was successfully used to compute the temperature distribution of aniline reaction in fluidized bed. The result is in good agreement with real industrial measurement. In addition, this study discussed the influence of velocity and fluidized bed diameter on the temperature distribution. The result showed that in contrast to the fixed bed, increasing gas velocity during turbulent region in fluidized bed would help eliminate hot spot and reduce temperature difference. Finally, based on the comprehensive consideration of velocity and diameter, this study showed a stability region for scaling up of gas-solid fluidized bed with fast, strong exothermic reactions which helps to guide the practical operation.

FIGURES OF THE ABSTRACT

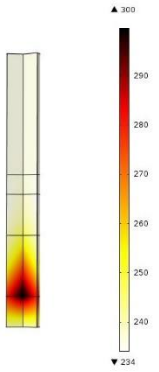

Fig. 1. Temperature distribution

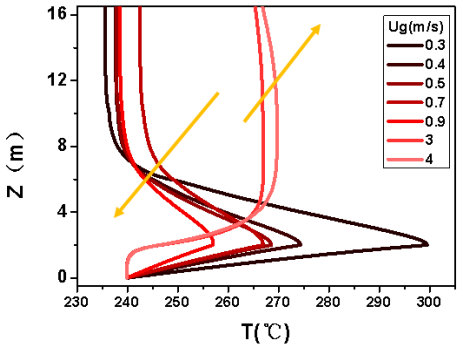

Fig.1. Axial temperature distribution versus height with different gas velocity

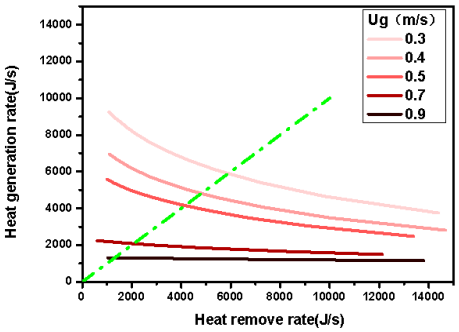

Fig.2. Heat generation rate versu remove rea with different gas velocity

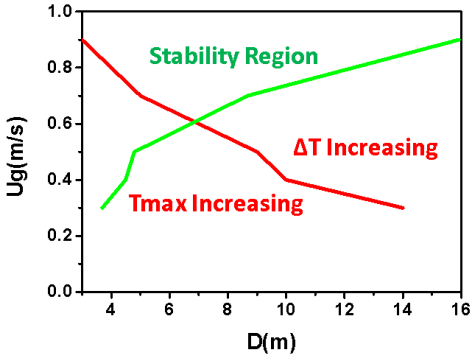

Fig.4. Stability region for scaling up

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