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خلاصه مقاله:

The hydrodynamic behaviour of air-glass beads bubbling fluidized bed reactor containing spherical glass beads is numerically studied, using OpenFoam v۷ CFD software. Both Gidaspow and Syamlal-O'Brien drag models are used to calculate momentum exchange coefficients. Simulation predictions of pressure loss, bed expansion rate, and air volume fraction parameters were compared and validated using data, existing in the literature obtained experimentally and performed by other numerical softwares. Pressure loss and rate of bed expansion were calculated with relative root mean square error (RMSE) equal to ۰.۶۵ and ۰.۰۹۵ respectively; Syamlal-O'Brien model is considered more accurate than Gidaspow model. Hence, numerical model reliability developed on OpenFoam was also proved. The hydrodynamic aspect study of the fluidized bed reactor was then performed, to analyse the impact of inlet air velocity (U) on particles motion. It was revealed that with U increment, air and glass beads axial velocities increase in the reactor centre and decrease in the sidewalls. Thus, a greater particle bed expansion is induced and the solid particles accumulated highly on the reactor sidewalls. In general, with the increase of U, the solid volume fraction decreases from ۰.۶۳ to ۰.۵۸ observed at ۰.۰۶۵ m/s and ۰.۵۱ m/s, respectively.

کلمات کلیدی:

CFD modelling, Eulerian-Eulerian approach, Fluidized bed reactor, Hydrodynamic, Multiphase flow, OpenFOAM

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