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Effect of the Cross-Sectional Geometry on Heat Transfer and Particle Motion of Circulating Fluidized Bed Riser for CO2 Capture

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Abstract : Effect of the cross-sectional geometry on heat transfer and particle motion of circulating fluidized bed riser for CO₂ capture was investigated. Numerical simulation using Eulerian-eulerian method with kinetic theory of granular flow was adopted to analyze gas-solid flow consisting in circulating fluidized bed riser. Circular, square, and rectangular cross-sectional geometry cases of the same area were carried out. Rectangular cross-sectional geometries were analyzed having aspect ratios of 1: 2, 1: 4, 1: 8, and 1:16. The cross-sectional geometry significantly influenced the particle motion and heat transfer. The downward flow pattern of solid particles near the wall was changed. The gas-solid mixing degree of the riser with the rectangular cross section of the high aspect ratio was the lowest. There were differences in bed-to-wall heat transfer coefficient according to rectangular geometry with different aspect ratios.

Keywords : bed geometry, computational fluid dynamics, circulating fluidized bed riser, heat transfer
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