Bed-to-wall heat transfer characteristics in a dual circulating fluidized bed reactor

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The effects of gas velocity to the riser (3.5 – 4.25 m/s), to the bubbling fluidized bed (0 – 0.3 m/s), and solid circulation rate (20 – 100 kg/m^{2}s) on the bed-to-wall heat transfer coefficient have been determined in a dual circulating fluidized bed reactor. The convective heat transfer coefficient and particle suspension density increase with solid circulation rate and decrease with gas velocity at the lower solid circulation rates. At higher solid circulation rates, relatively constant convective heat transfer coefficient and suspension density were obtained. The bed-to-wall heat transfer coefficient increases with increasing the cross-sectional area averaged particle suspension density. However, the convective heat transfer dependence on particle suspension density varies with the riser height with the dense and dilute phases. The heat transfer coefficient decreases with increasing solid circulation rate in the bubbling fluidized bed. The slip velocity between gas and solid phases with solid circulation in the bubbling fluidized bed is lower than that of without solid circulation. The bed-to-wall heat transfer coefficient in the riser of the dual circulating fluidized bed system has been correlated with the pertinent dimensionless groups.