Entrainment rate of coarse particles at different temperatures in gas fluidized beds

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Particles with terminal velocities greater than the superficial gas velocity commonly appear among the particles captured by cyclones downstream of gas-fluidized-bed reactors. There is evidence that the entrainment of these coarse particles is caused by the fine particles. A comprehensive correlation to predict the entrainment rate of coarse particles at the exit of dense fluidized beds is developed based on extensive available experimental data. The correlation successfully includes the effects of gas velocity, temperature, particle density, particle size distribution, column diameter and height. The entrainment rate of coarse particles increases with increasing gas velocity and proportion of fine particles in the bed. The effect of the fine particles is expressed in terms of the upward momentum of fine particles per unit mass at a specified gas velocity. Fines play a lesser role on the entrainment of coarse particles as the gas velocity increases. The proposed correlation correctly predicts that the entrainment rate of coarse particles increases after initially decreasing with increasing temperature.