# THE INFLUENCE OF PARTICLE SURFACE FRICTION ON THE BEHAVIOR OF GAS-FLUIDIZED BEDS: DEVELOPMENT OF A TWO FLUID MODEL

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The influence of physically realistic collisional properties on the hydrodynamics in a bubbling dense gas-solid fluidized bed is investigated using both a Discrete Particle Model (DPM) and a Two Fluid Model (TFM) incorporating a kinetic theory of granular flow (KTGF) for rough spheres by Lei et al. (1). The validated KTGF accounts for particle rotation and particle surface friction expilicitly. Comparisons between the two models are carried out to investigate the influence of particle friction on axial particle velocity, solids circulation pattern, and bubble behavior. The simulated results from both models reveal that the friction coefficient plays an important role in the formation of heterogeneous structures in a bubbling bed. When the friction coefficient is increased, larger bubbles appear and the fluidization in the bed is more vigorous. In addition, the time-averaged gas-solid flow field and time-averaged solids volume fraction vary significantly with different friction coefficient. Less dense zones are found in the bed for larger values of the friction coefficient.

SAMPLE RESUTLS

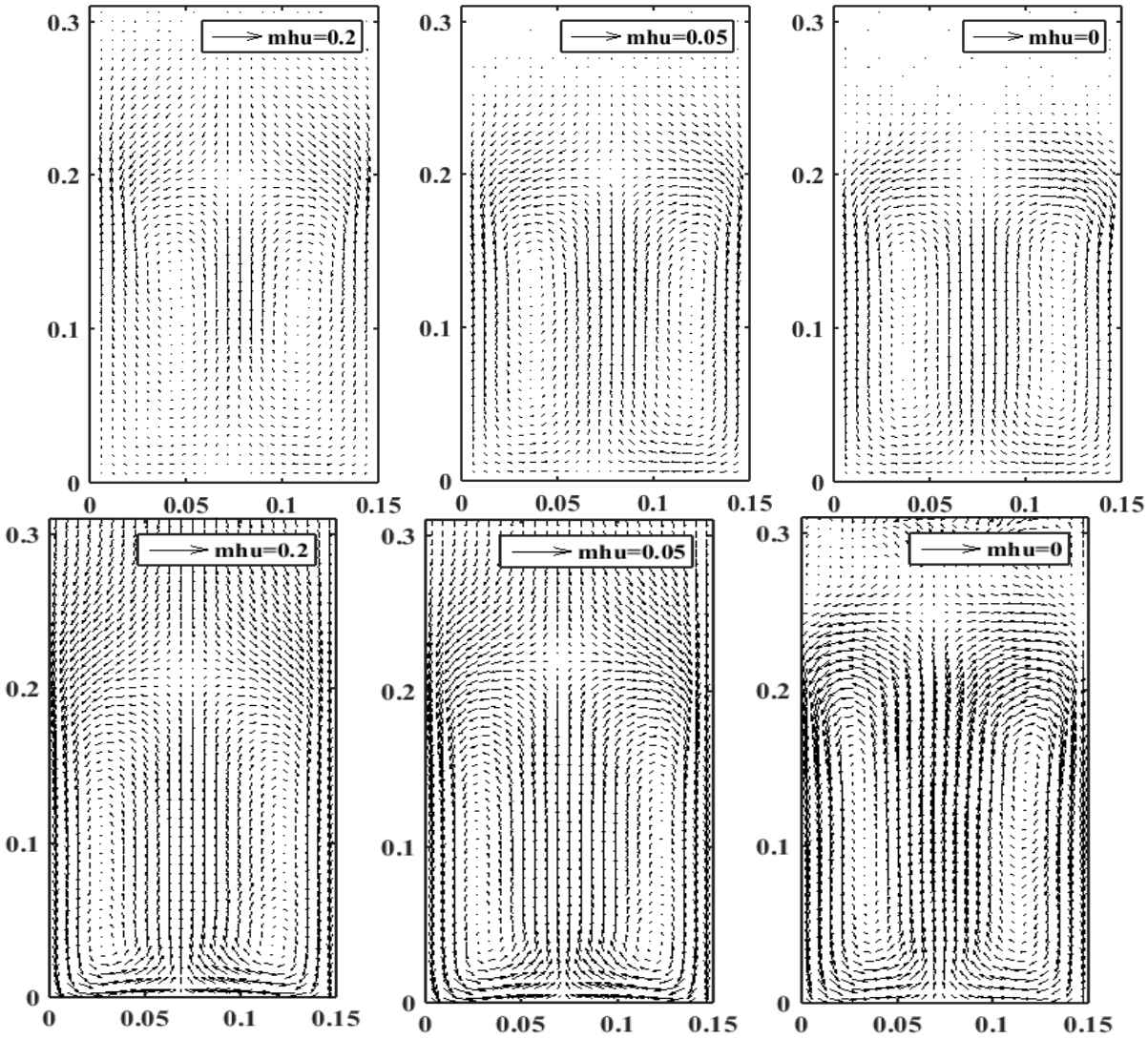


*Fig.1 Time-averaged solids circulation pattern with different particle-particle friction coefficients in pseudo 2D system, above-DPM simulations, below-TFM simulations. Superficial gas velocity: 2 $U_{mf}$, packed bed aspect ratio of 1, $d_p$ = 2mm, normal restitution coefficient 0.97, tangential restitution coefficient 0.33, free slip boundary condition for particle-wall.*

REFERENCES

L. Yang, J.T. Padding, J.A.M. Kuipers. Modification of Kinetic Theory Granular Flow for Frictional Spheres, Part I: Two-fluid model derivation and numerical implementation (in preparation).