Abstract Submitted
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Effect of gas flow on granular convection in a vertically vibrated bed[1] FUWENG ZHANG, LI WANG, CHUANPING LIU, ZHAOWU CHI, School of Mechanical Engineering, University of Science and Technology Beijing, ENERGY SAVING AND ENVIRONMENTAL PROTECTION TEAM — To probe the effect of gas flow on convection in a vibrated granular bed, a gas flow is introduced into the granular bed from its perforated bottom. The convection strength does not follow a monotonic relationship with the velocity of gas flow v. When v is small, convection of grains is formed with a heap, in which the convective flow is upward in the center and downward near the sidewalls, known as the upward mode convection. The convection disappears gradually with increasing v. There is a critical value of velocity v_c, at which no appreciable convection motion is observed and the granular surface becomes flat. When the velocity slightly exceeds v_c, the convection reappears with reversed direction. The grains drop in the center and rise along the sidewalls, resulting in the downward mode convection. The bed becomes completely fluidized and the convective motion is disappeared completely by further increasing velocity of gas flow. v_c is dependent on vibration amplitude and wall roughness, while almost independent on the vibration frequency. Due to the wall effect and decrease of effective gravity, the gas flow may reduce the strength and even reverse the direction of convection.

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