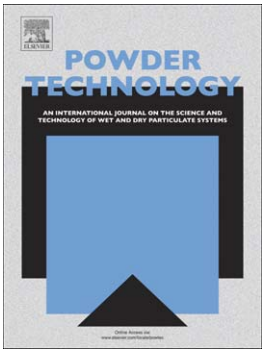

Flow pattern transition characteristics in vibrated gas-solid fluidized bed of Geldart B magnetite powder using pressure drop signals analysis

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Abstract: The vibrated gas-solid fluidized bed with the – 0.3 + 0.074 mm magnetite powder was utilized to study the flow pattern of bed and the effects of bubble motion on the fluidization characteristics. The results demonstrated that the standard deviation of the bed pressure fluctuation changed, as the gas velocity increased forming an inverted "U" shape plot. When the bed was in the bubbling fluidization mode, the bubbles were produced with a main frequency of 7.5 Hz and the pressure drop signal energy was high. When the bed was in a quasi-turbulent state, the bed mainly produced relatively smaller bubbles between 7.5-20 Hz in frequency and the pressure drop signal energy was low. As the vibration frequency increased, both the bed initiation bubbling velocity u_1 and the onset velocity of turbulent fluidization u_2, decreased. The values of $\Delta u = u_2 - u_1$, firstly increased and then gradually decreased with the increase of vibration frequency. Under the condiation of vibration frequency f=25 Hz and three different vibration amplitudes A (ie, 1, 2 and 3 mm), the maximum values of Δu are 8.9 cm/s, 7.67 cm/s and 7.28 cm/s, respectively.

Keywords: Vibrated gas-solid bed; Pressure drop signals; Standard deviation; Flow pattern