292a Numerical Simulation on the Effects of the Design Feature of a Cyclone and the Inlet Flow Velocity on the Separation of Co_2 Particles from a Co_2-Cof_2 Mixture

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In synthesizing COF_2 from CO, a considerable amount of CO_2 is produced. A method of solidifying CO_2 at low temperature and separating CO_2 particles from the COF_2 gas using a cyclone was designed and the separation efficiency according to the cyclone feature was studied. Optimal sizing and operation conditions of the cyclone were investigated by reviewing the flow velocity profile and the particle trajectory using a numerical analysis with computational fluid dynamics (CFD). The effects of the inlet flow velocity and the ratio of the cyclone diameter to the cone length (D/L) on the recovery efficiency were estimated. Results revealed that the separation efficiency increases with the increase in the ratio of D/L and the decrease in the cyclone size. The recovery efficiency of CO_2 increases with the increase in the inlet flow velocity while that of high-purity COF_2 increases with the decrease in the inlet flow velocity. Based on these results, we could propose the concept and methodology to design the optimal feature and sizing of a cyclone suitable for separating solid CO_2 from gaseous COF_2 at low temperature.