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Visualization research on electric agglomeration characteristics of fine particles

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Abstract

An experimental system composed of microscopic visualization and high-speed photography was developed to observe the relative motion and agglomeration characteristics between fine particles and a large glass particle directly. The large glass particle was fixed in the middle of a rectangular flow channel, fine particles were generated by burning sandalwoods in a buffer tank. The observations showed that fine particles flowed over the large glass particle when they were uncharged. When the large particle and fine particles carried charge of different polarities, an obvious attraction between them was observed. When the large particle and fine particles carried charge of the same polarity, the fine particles showed two kinds of motion characteristics, depending on the charge number they carried. When fine particles carried a small number of charge, they still attracted each other. In contrast, fine particles carrying a large number of charge led to repelling. The induced dipole force was taken into consideration to explain the observed phenomenon. A simulation of the movements of the fine particles considering the combined effects of the induced dipole force, the Coulomb force, the drag force and the electric field force was carried out. The simulation results matched the experimental results well.

Key words: fine particles; high-speed photography; electric agglomeration; simulation

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