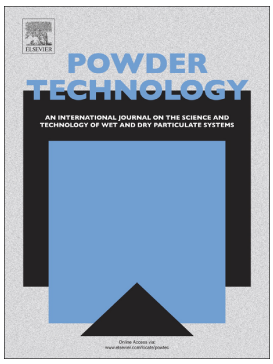

Numerical study on fine-particle charging and transport behaviour in electrostatic precipitators

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Numerical study on fine-particle charging and transport behaviour in electrostatic precipitators

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Abstract

In this work, a numerical study on the charging and transport of fine particles has been carried out based on wire-plate electrostatic precipitators (ESPs) with multiple wire electrodes. The effect of the applied wire voltage, inlet height, and wire spacing on particle charging and transport, and the influence of the precipitator structure on particle trapping are analysed in detail. Results indicate that a voltage increase in the high voltage range improves the particle-trapping efficiency. However, the Brownian diffusion causes the particle fluctuation, but it doesn't change the direction of main movement. Particles injected into the precipitator at the channel centre are influenced most intensively, whereas particles injected at approximately 5 mm from the centre of the precipitator exhibit the poorest particle-trapping ability. An increased wire spacing enhances particle trapping, within a certain range, and a larger particle size causes an even more obvious enhancement. Furthermore, changing the discharge-electrode arrangement shows a much greater effect on the charging and transport behaviour of particles in the model of M3, which has the highest trapping efficiency.

Keywords：Electrostatic precipitators (ESPs); Electrostatic precipitators structure; Particle trapping; Wire spacing.