

Numerical simulation of vortex structures in the spraying of electrically charged gas suspension on a plate

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Abstract

© 2018 Institute of Physics Publishing. All rights reserved. Based on the numerical solution of polydisperse gas suspension dynamics system of equations, the process of powder spraying on a plane surface in an electric field is described. The model includes motion equations of the carrier medium and disperse phase fractions under aerodynamic friction and Coulomb forces action taking into account interfacial exchange of pulse and energy. The system solves by an explicit predictor-corrector method with splitting on the spatial directions and the non-linear correction scheme. The numerical model is applied to gas suspension speed and density fields receiving in interelectrode space and on target electrode surface. The system of equations was written in the generalized curvilinear coordinates: the physical region of a current in variables (x, y) was written in a canonical computational region in variables (ξ, η) and was solved by an explicit second-order Mac-Cormack method. The Poisson equation for the electric field potential was written in the generalized coordinates and was solved by finite difference method with the use of the iterative Seidel scheme on a gas-dynamic computational mesh.

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