

Influence Mechanism of Solution Parameters on the Micro-morphology Structure of Nano-Aluminum/F2604 Composite Particles

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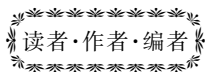
Abstract: To reveal the coating mechanism of fluorine rubber(F2604) on nano-aluminum powder(n-Al), by using electrostatic spray technology, the composite particles with different content of F2604 were prepared in different solvents (ethyl acetate and acetone). The morphology of the composite particles was characterized by scanning electron microscope (SEM). The influence of solution parameters on the micro-morphology of nano-Al/F2604 composite particles was studied by means of experiment and molecular dynamics simulation. Results show that acetone as a solvent can make the composite particles more uniform and regular in morphology. When the content of fluorine rubber is less than 13%, the particle diameter increases with increasing the proportion of fluorine rubber. When the content of fluorine rubber continues to increase, the particle size distribution of composite particles becomes uneven. The shape is irregular and obvious spinning phenomenon is appeared. The diffusion coefficient of fluorine rubber in the solvent is one of the important factors affecting the molecular chain morphology when coating nano-aluminum powder using fluorine rubber, thus the principle of “large diffusion coefficient of fluorine rubber” should be followed when selecting solvents. The unit binding energy between fluorine rubber and nano-aluminum powder is mainly composed of electrostatic interaction energy (75%–93%) and van der Waals interaction energy(6%–22%). The effect of fluorine rubber content on the micro-morphology of composite particles is affected by intermolecular electrostatic interaction.

Key words: fluorine rubber(F2604); solution parameters; micro-morphology; diffusion coefficient; electrostatic interaction; nano-aluminum powder

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