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## Preparation and study of ultrafine flake-aluminum with high reactivity

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### Abstract

To achieve aluminum particles with ultrafine granularity and high reactivity, the mechanical ball-milling method was adopted and three kinds of coatings, including stearic acid (SA), viton and dinitrotoluene (DNT), were added. The effects of milling time and different coatings on granularity and reactivity of ultrafine aluminum particles were studied. The structures of prepared ultrafine aluminum were characterized by scanning electron microscopy, X-ray particle diffraction and the thermal properties were analyzed by TG/DSC. Besides, the reactivity of prepared ultrafine aluminum particles was comprehensively analyzed and judged according to several thermodynamic parameters, the maximal oxidation rate, the oxidation degree of aluminum and the enthalpy change. The results revealed that aluminum particles prepared by the mechanical ball milling method were all flake-like and the particle sizes were below 5  $\mu\text{m}$  with nanometer-scale thickness. And the crystal form of aluminum was found to be unchanged. Besides, the ultrafine flake aluminum coated with stearic acid after milling for 5h showed the highest reactivity with 56.1% of oxidation degree before 660  $^{\circ}\text{C}$ , 0.945  $\text{mg}/^{\circ}\text{C}$  of maximal oxidation rate and 20491 J/g of enthalpy change.

Key word: aluminum; flake; surface coating; reactivity; thermal property

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