

Morphology and reactivity of aluminum nanoflakes

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Aluminum powders are used as a component in propellant formulations, explosives and pyrotechnics. Recently, we showed that shape and nanostructuration of the grains influence the reactivity of aluminum nanopowders. The powders are obtained by high energy ball milling. The influence of the milling parameters and additives on the morphology, structure and reactivity of the powder was investigated. The aluminum powders, obtained by high energy ball milling, show a flake like morphology. Depending on the milling conditions, the nanoflakes are highly dispersed in lateral size and thickness; the biggest ones have micronic lateral sizes (1-4 μm) and thickness less than 200 nm, and the smallest ones 100 nm lateral size and 30 nm in thickness. The nanoflakes contain several crystallites with an orientation relationship; a [110] texture was observed. They are surrounded by an amorphous layer of aluminum oxide, whose thickness seems to depend on the milling conditions. The amorphous layer thickness depends also on the size of the crystallite and on the underlying crystallographic planes.