INFLUENCE OF MECHANICAL ACTIVATION ON IGNITION OF ARESTED REACTIVE MILLING Al/MoO_3 COMPOSITES

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Abstract: The factors affecting the ability of Arested Reactive Milling (ARM) nanocomposites Al/MoO_3 to be ignited by the hot substrate were analyzed. For this purpose, the composites using Al with different particle sizes (micro or nano) and morphology (spherical or laminar) were prepared. Also, the concentration of defects in MoO_3 [N] and the value of contact surface S_c between ingredients were controlled. There are two critical parameters: T_0 — the temperature of the substrate, at which the ignition delay time (τ) < 1 s; and T_∞ — the temperature of the substrate, below which no ignition occurs. It was found that between T_∞ and T_0, the ignition delay time (τ) depends linearly on substrate temperature. It is shown that T_∞ and T_0 decrease with the contact surface area and correlate with the concentration of paramagnetic centers in MoO_3. The minimum values of $T_0 = 355$ °C and $T_\infty = 265$ °C were found for ARM composites, prepared from lamellar aluminum particles. In this case, low ignition temperatures can be attained due to the rapid spread of sites of reaction initiation because of the high thermal conductivity of the aluminum flakes.

Keywords: nanothermites; MICs; ball milling; mechanochemistry

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