

## SEARCH FOR EFFECTIVE METALLIC FUELS AND METHODS OF THEIR ACTIVATION\*

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**Abstract:** A literature review on methods of activation of combustion of metallic fuels (MF) — Al and B — and their compounds in the composite propellant combustion is presented. The main ways and techniques aimed at increasing the completeness of MF combustion and the realization of its calorific value are considered, namely: the use of combined fuels, alloys, and mechanical activation; applying functional coatings to the surface of MF particles; making the composite conglomerates (granules); increasing the dispersion of MF; and the use of unconventional oxidizers and optimal binders. Some methods and ideas have been tested experimentally using a laboratory approach designed to compare a variety of MF. As a result, it seems promising to use mechanically activated aluminum diboride and activating additives in the propellant formulations and to increase the boron mass fraction in propellant over 40% provided that particles are protected from interaction with other propellant ingredients and the agglomeration is minimized.

**Keywords:** boron; aluminum; magnesium; aluminum borides; boron carbide; particles; composites; mechanical activation; coatings; combustion; condensed combustion products; combustion completeness; heat release efficiency

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### Figure Caption

Comparison of solid rocket motor and solid fuel ramjet (SFRJ). Due to the presence of an air intake and the use of atmospheric air as an oxidizer, as well as a propellant with a fuel excess, the missile with SFRJ has a higher specific impulse  $I_{sp}$  and longer flight range

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