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Selection of components and recipe optimization of igniting composition for launcher of liquid rocket engines

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Abstract

The article shows the main advantages of using pyrotechnic igniters in comparison with other ignition sources. The research considers the ignition and combustion processes of liquid hydrocarbon fuels. Hydrocarbon fuel oxidation process is presented and complex of basic requirements for igniting composition is formulated. The prospects for the creation of fundamentally new and high efficiency igniting compositions that have catalytic effect on the processes of physico-chemical conversion and decomposition of liquid rocket fuel are designated. Researchers selected main components of pyrotechnic composition and presented the optimization parameters. A thermodynamic calculation of compositions was carried out in the «TERMO» software and comparative analysis of condensate combustion products was performed. The effects of fuel and oxidizing component contents on the burning velocity and flame size of pressed samples is determined. Approximate functional connections «burning velocity – content of component» was constructed. This equates to use the method of recipe control in development of perspective compositions. The effect of mixing technology of components on the composition burning velocity was investigated. The ignitability of compositions from the action of source with small heat impulse was carried out based on the results of optical sensitivity tests. The high efficiency of application of the proposed compositions in the launchers of liquid rocket engines was confirmed.

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