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The interaction of metal nanopowders with components of the blend compositions

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Abstract

The introduction nanopowders of metals in the mixed compositions increases the rate of energy release and reduction in performance and mass loss. The negative side of the use of metal nanopowders in the energy formulations of mixed compositions is their low chemical compatibility with the components of the compositions and low temperature resistance of mixtures containing nanopowders of metals. It is necessary to evaluate the interaction of the components with the most promising nanometals for the development of compositions containing nanometals. The aim of this work is research of chemical compatibility and thermal stability of mixtures containing nanometals with the subsequent clustering of substances based on their functions and functional groups to select chemically compatible with nanometals components of composite energetic compositions. The results show a definite influence of the type of functional groups of compounds of different classes on the parameters of chemical stability of the compounds and the catalytic efficiency of the number nanometals and their oxides. The catalytic activity of the aluminum nanopowder is determined, apparently, the catalytic activity γ-Al_2O_3. The selected classes of substances in the case of the oxidizers, polymers, plasticizers, combustible-binder the energy supplements are acceptable compatible with nanopowders of metals. The majority of nanometals actively interact in mixtures with some basic components during long-term storage in normal conditions, unlike with micropowders of some metals, that practically is not monitored according to test results of the initial mixtures. The chemical compounds that contain primarily nitroamine, nitrile and some other active group is not advisable to use at developing formulations of mixed energy compositions with nanometals and their oxides. The most stable compounds in mixtures with nanoaluminum, are compounds of nitric and perchloric acids, substances, including the active fragments such as C-NO_2, N-NO_2, hydrocarbons.

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