

## Correlation of thermal explosion characteristics and thermal decomposition of components and compositions of mixed energy materials

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### Abstract

Thermal explosion is of considerable interest as a target (regular) mode of explosive transformation of energy materials (EM) in some applied areas, as well as a factor of danger in various technological processes and operations. In the production and use of EM, accompanied by an increase in the temperature of the entire volume of material or its local areas. The use of exact or approximate solutions of thermal conductivity equations with localized or distributed heat sources with different boundary conditions in the problems of thermal explosion of EM is faced with the uncertainty of a number of kinetic parameters of their thermal decomposition. Values of kinetic parameters of models, obtained in other conditions or processes, give incorrect results of estimation of characteristics of thermal explosion that determines necessity of multipoint calibration of models.

The thermal mechanism of initiation of EM is the determining, at some known exceptions, at external influences of different physical nature. Therefore, it looks expedient for generalization, processing of experimental data on thermal decomposition, thermal explosion, ignition, for estimation of these processes for new components and mixed compositions to use empirical dependences between the parameters of thermal explosion and, for example, the characteristics of thermal decomposition of EM. The kinetic parameters of the EM decomposition are not used explicitly. In relation to the mixed energy materials for prediction of their thermal explosion perspective the definition of interrelations of this process with characteristics of thermal explosion and thermal decomposition of dominating components looks promising. Presence of such stable (invariant) dependences and interrelations allows to detect and new processes (formation of molecular complexes, co-crystallizes, etc.) in mixed compositions, leading to formation of new dominating components and deviation of the results of their tests from invariant dependencies.

To date, a reproducible experimental material has been accumulated on the characteristics of thermal explosion and thermal decomposition in various conditions of a number of individual energy compounds and compositions based on them. It allows to carry out statistical analysis of experimental data with the purpose of determination of stable (invariant) dependences between characteristics of thermal explosion, thermal decomposition of power components and compositions. The proposed article presents some of the results of this analysis, showing the prospect of such an approach.

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