

PECULIARITIES OF THE PROCESS OF IGNITION OF CONDENSED ENERGY MATERIAL AT THERMAL INITIATION

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Abstract: The ignition conditions in the layer of a semi-infinite sample of a homogeneous energetic material heated by an external heat source are calculated in a one-dimensional formulation. Various methods for creating a heated fuel layer are considered. At the first stage of the process under consideration, the subsurface zone is heated due to an external heat flux. After that, because of the exothermic reaction in the heated layer, the heat flux from the reaction zone exceeds the external flux and the sign of the heat flux at the boundary changes. Since then, the process is considered in the absence of heat loss through the sample surface. It is found that under certain conditions, the maximum temperature and the reaction rate are observed at a certain distance from the surface and this leads to the possibility of certain layer separating from the main mass along which the combustion front starts to propagate. The burning rate of the remained part undergoes irregular changes and appears to be initially increased due to the influence of the elevated temperature of the heated layer.

Keywords: combustion; nitroglycerin powder (double-base propellants); unsteady front; combustion stability; hot spot; transverse wave; local combustion rate

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