PULSED MODE OF COMBUSTION OF SUBSURFACE LAYER IN HOMOGENEOUS ENERGETIC MATERIALS

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Abstract: Conditions in the subsurface layer in combustion of homogeneous energetic materials, such as double-base propellants and explosives are studied. For propellant N, the ratio of the two characteristic times is estimated: the time of adiabatic thermal explosion of the reactive layer and the residence time in the zone of reaction. This ratio is shown to depend on the surface temperature. Therefore, a critical temperature exists such as for the temperatures higher than critical, the subsurface layer can burn steadily with constant combustion speed, while for lower temperatures, the combustion might occur in unsteady pulsed mode. Due to the instability of one-dimensional (1D) pulsed mode, the transition to non-1D hotspot-pulsed mode of combustion might occur. This mode is related with the effect of dispersion, and the ratio of dispersion increases with the decrease of temperature.

Keywords: combustion of propellants; homogeneous energetic materials; hotspot pulsed mode; combustion instability; dispersion; thermal explosion

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