

TRANSVERSE WAVES DURING DOUBLE-BASED PROPELLANT COMBUSTION

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Abstract: The mechanism for hotspot-pulsating combustion of double-base propellant is studied when the hotspots are formed by transverse waves. Video recording of NB propellant sample combustion in nitrogen at 1 atm is analyzed. The video recording allows monitoring the spread of the step-shaped transverse wave along the side of a sample and to determine the geometrical characteristics of the wave and its speed. It is shown that the speed of combustion along the profile varies and at the top of the sample may exceed the average normal burning velocity for the whole sample (U) by 2–3 times, while at the bottom, it may be almost 5 times lower. A model of the transverse wave with a rectangular profile and constant transverse and vertical burning speeds is proposed. The wave with the rectangular front is modeled in such a way that it is equivalent (by burnt mass) to the original wave (with the sloping front) and the value of these speeds can be derived using average normal burning velocity U .

Keywords: combustion; double-base propellant; multidimensional combustion front; hotspot; transverse wave; hotspot-pulsating mechanism of combustion

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