

# THE INFLUENCE OF CATALYSTS ON THE BURNING RATE OF AN ACTIVE BINDER PROPELLANT WITH AMMONIUM NITRATE

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**Abstract:** The effect of combustion catalysts in combination with carbon nanotubes on the burning rate of fuel, in which low-calorie double-base propellant (30%) is used as an active binder and ammonium nitrate (70%) as an oxidizer, has been studied. It is shown that a triple catalyst in combination with carbon nanotubes has a significant effect on the burning rate, for example, at a pressure of 2 MPa, it increases the combustion rate by a factor of 9 and reduces the  $\nu$  value from 0.92 to 0.45. The effect of catalysts decreases sharply when HMX and a metal fuel are added to this propellant, which is probably due to the difficulties in the formation of a carbon frame on the combustion surface caused by increase in temperature in this zone and the presence of a large amount of metal particles that impede the access of reacting molecules to the catalyst.

**Keywords:** double-base propellant on the ammonium nitrate basis; combustion catalysis; carbon nanotubes

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## Figure Captions

**Figure 1** Dependence of the combined catalyst efficiency on the ratio of components (Nickel salicylate:MWCNT) (a) and (Potassium Bichromate):MWCNT (b): 1 — 2 MPa; and 2 — 10 MPa

**Figure 2** Influence of the triple catalyst on the burning rate of the base propellant with AN: 1 — 3% NS + 1.5% PBC + 1.5% MWCNT; 2 — 3% NS + 1.5% PBC + 1.5% carbon black [8]; and 3 — without catalyst

## Table Captions

**Table 1** Catalyst effect (NS:MWCNT) on the ballistic characteristics of the propellant with AN

**Table 2** Catalyst effect (PBC:MWCNT) on the ballistic characteristics of the propellant with AN

**Table 3** Triple catalyst influence on the ballistic characteristics of the propellant with AN

**Table 4** Catalysts influence on the burning rate of high-energy propellant No. 3

**Table 5** Triple catalyst influence on the burning rate of propellant No. 3

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