

Isothermal decomposition kinetics of two single base gunpowders used in 7.62×39mm and 9×18mm calibers

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Abstract Isothermal and non-isothermal decomposition kinetics are mainly used to study the thermal stability of energetic materials. In this work, thermal properties and kinetic study of the decomposition process of two single base propellants used in some local calibers manufacturing (7.62 × 39 mm and 9×18 mm) were investigated using vacuum stability test (VST). The 7.62 × 39 mm propellant have a cylindrical geometry with a single perforation while the other type of propellant used in 9×18 mm ammunition is multi perforated grain. The mechanism reaction model and Arrhenius parameters of the thermal decomposition process of the investigated powders were obtained using model fitting and model free (isoconversional) methods. According to VST results, it is found the two propellants samples are relatively stable and safe during the usage and storage, and the mechanism of thermal decomposition of the powders is controlled by the second order reaction model.

Keywords: gunpowders, vacuum stability, kinetics