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Synthesis, Chemical and Physical Characterization of TKX-50

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TKX-50 (bis(hydroxylammonium) 5,5'-bis(tetrazolate-1*N*-oxide)) is one of the most promising ionic salts as a possible replacement for RDX. The thermal behavior of TKX-50 (bis(hydroxylammonium) 5,5'-(tetrazolate-1*N*-oxide)) and the kinetics of its thermal decomposition were studied using differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA). The calculated results of the detonation parameters and equations of state for the detonation products (EOS DP) of explosive materials TKX-50 and MAD-X1 and several of their derivatives were obtained using the computer program EXPLO5 V.6.01. These values were also calculated for standard explosive materials which are commonly used such as TNT, PETN, RDX, HMX as well as for the more powerful explosive material CL-20 to allow comparisons to be made. The determination of the detonation parameters and EOS DP was conducted both for explosive materials having the maximum crystalline density and for porous right up to 50% in volume materials. The influence of the content of plastic binder polyisobutylene used (up to 20% in volume) on all of the investigated properties was also examined. Calculated results on shock wave loading of different inert barriers in a wide range of their dynamic properties under explosion on their surfaces of concrete size charges of different explosive materials in various initial states were obtained with the use of the one-dimensional computer hydrocode EP. Barriers due to materials such as polystyrene, textolite, magnesium, aluminum, zinc, copper, tantalum or tungsten were examined (Fig. 1). Initial values of pressure and other parameters of loading on the interface explosive-barrier were determined in the process of conducted calculations. Phenomena of propagation and attenuation of shock waves in barrier materials were considered too for all possible situations. From these calculations, an essentially complete overview of the explosion properties and characteristics of shock wave action onto barriers was obtained for several new and also for several standard explosive materials as a comparison.

[1]Work done in collaboration with Golubev/Fischer/Stierstorfer/Bohanek/Dobrilovic