THE EFFECT OF TEMPERATURE DIFFERENCE PRETREATMENT OF NITRAMINE-CLASS HE ON PLASTIC EXPLOSIVE COMPOSITION DETONABILITY

A. Yu. Tarasov, E. B. Smirnov, A. V. Sarafannikov, A. I. Akhmetzyanov, I. A. Makarchev, K. A. Gaisina, R. N. Valiev, A. V. Molteninov

FSUE «RFNC – VNIITF named after Academ. E. I. Zababakhin», Snezhinsk, Russia

The paper is a continuation of a series of studies on the effect of particle size distribution and structural defects of high explosives (hereinafter HEs) on detonability of explosive compositions (hereinafter ECs). Earlier, using the examples of the bimodal fraction distribution of nitramine-class HE [1] and screen-sizing of a nitramine-class HE batch [2], the effect of HE particle size distribution on the EC detonability was shown. Besides, as exemplified by the ultrasonic pretreatment of nitramine-class HE crystals [3–4], the effect of HE structural defects on detonability of a plastic EC was also demonstrated.

In our study, we used the temperature difference treatment described in [5] to introduce different defects into nitramine-class HE crystals with a number of treatments: 1, 3, 5, and 10. The temperature difference was approximately 300°C. Figure 1 shows the electron micrographs of RDX crystals after the temperature difference treatment.

The observed changes in the appearance of HE crystals suggest that the temperature difference treatment contributes to the formation of cracks with the subsequent fracture of crystals, as clearly shown in Figure 1. The increase of the number of temperature difference treatments in the studied samples results in the increase of the number of crystals with characteristic surface spalls and the number of crystals with multiple cracks, as well as the decrease in the number of crystal clusters and fine fractions. These observations prove that the

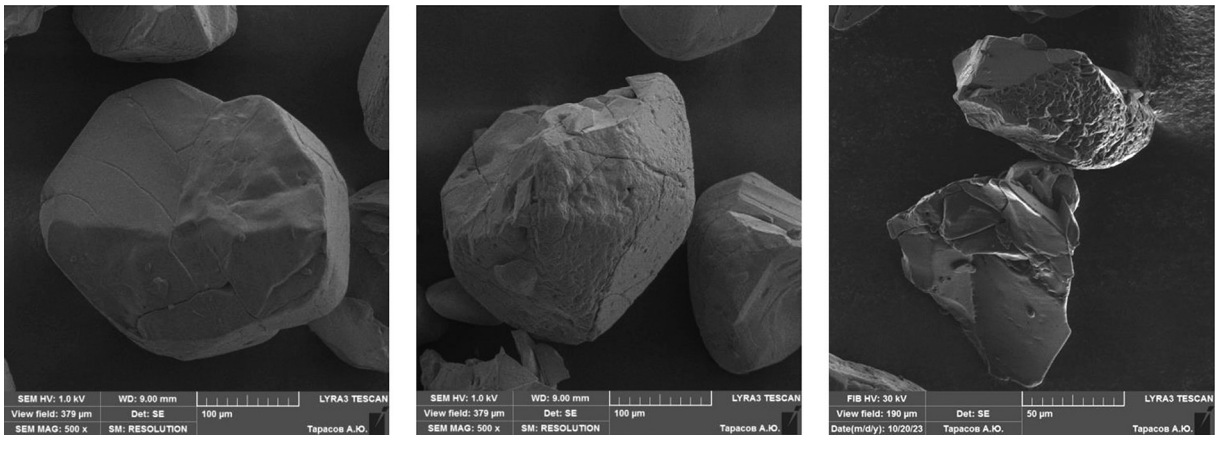

Fig. 1. Appearance of nitramine-class HE crystals

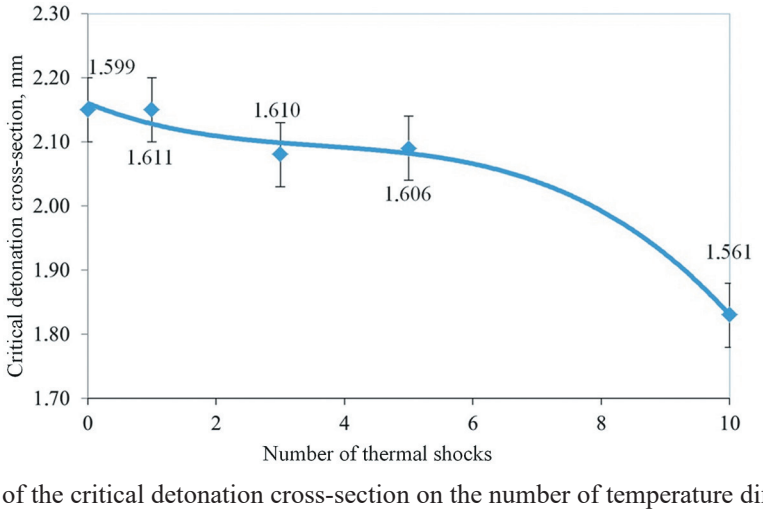

Fig. 2. Dependence of the critical detonation cross-section on the number of temperature difference treatments

number and magnitude of structural defects decrease after the treatment. Most likely, after thermal shocks, the structure of RDX crystals contains too few defects due to the relaxation of internal stresses for cracking.

The obtained HE samples were mixed with polyisobutylene to improve reprocessing performance.

The EC detonability was determined using the wedge method. Breakup of the detonation process was registered on the witness plate. The obtained results are shown in Figure 2.

As seen from Figure 2, the EC detonability is influenced by the temperature difference treatment. The increase in the number of temperature difference treatments results in the increase of the EC detonability.

References

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