

Radiation-chemical modification of energy-intensive compounds of polyvinyltetrazole and cyclic nitramines HNIW and HMX

Kalmykov P I^{1,®}, Mikhaylenko M A², Artemova Ye V^{1,2}, Sidorov K A^{1,2} and Chernousov Y D³

¹ Joint Stock Company “Federal Research and Production Center “Altai”, Sotsialisticheskaya 1, Biysk, Altaiskiy Kray 659322, Russia

² Institute of Solid State Chemistry and Mechanochemistry of the Siberian Branch of the Russian Academy of Sciences, Kutateladze 18, Novosibirsk 630128, Russia

³ Institute of Chemical Kinetics and Combustion of the Siberian Branch of the Russian Academy of Sciences, Institutskaya 3, Novosibirsk 630090, Russia

® alpineclub@mail.ru

The study of the effect of electron-beam treatment of poly-N-methyl-5-vinyltetrazole and cyclic nitramines HNIW (hexanitrohexaazaisowurtzitane) and HMX (octogen) on the processes of further spatial crosslinking of the polymer and thermochemical transformations of energy-intensive compounds on accelerators U-12 (Boreskov Institute of Catalysis SB RAS) and ILU-6 (Budker Institute of Nuclear Physics SB RAS). The treatment of the compounds was carried out in the mode of moving the samples under the outlet window of the accelerators with minimal heating of the substance. The energy of an electron is 2.4–2.9 MeV. Radiation doses 20–100 kGy. It has been shown that electron beam treatment of poly-N-methyl-5-vinyltetrazole reduces the vulcanization time of this polymer by 30% compared to compositions obtained using the untreated polymer. A linear dependence of the rate constant of the structuring process of nitroethertetrazole compositions on the irradiation dose of the polymer was found. The effect of various doses of intense ionizing radiation (20–100 kGy) on surface morphology, thermal stability, and polymorphic composition of cyclic nitramines ϵ -HNIW and β -HMX has been studied.