Explosive Properties of Cyclodextrin Nitrates

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Abstract: The explosive properties of cyclodextrin nitrates with different degrees of substitution of hydroxyl groups in cyclodextrins by nitrate groups have been estimated by calculation and experiment. It is shown that charges of β-cyclodextrin nitrate with 100% substitution at a density of 1.576 g/cm^3 detonate with a relative explosion impulse equal to 96.4% of its value for the 50/50 TNT/RDX composition with a density of 1.66 g/cm^3, whose impulse is taken as 100%. In this case, the detonation velocity is 7.15 km/s. It is concluded that the substance belongs to powerful blasting explosives. The sensitivity of cyclodextrin nitrates to mechanical stimuli was studied as a function of the degree of substitution. The obtained values of the explosive properties and sensitivity of cyclodextrin nitrates to impact and friction are compared with those of nitrocellulose.

Keywords: cyclodextrins, cyclodextrin nitrates, nitrocellulose, degree of substitution, sensitivity to mechanical stimuli (impact, friction), relative impulse, heat of explosion, detonation velocity.

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