Computational Investigation of Energy Characteristics of Propellant Containing Hydroxylammonium 2-Dinitromethyl-5-nitrotetrazolate

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Abstract: Under the standard condition (ratio of chamber pressure to exit pressure ($p_c : p_e$) is 70/1), the energy parameters of HTPB and CMDB propellants containing hydroxylammonium 2-dinitromethyl-5-nitrotetrazole (HADNMNT) were calculated by minimum free energy method. The density impulse of the HADNMNT monopropellant is 4936.4 N·s·cm^{-3}, which is higher to that of the RDX and lower to HMX and CL-20. Replacing AP with HADNMNT in HTPB propellant can increase specific impulse by 428.7 N·s·kg^{-1}. The iso-impulse trigonal figure of the HTPB propellant is drawn out, and the relationship between specific impulse and ingredients was discovered. The impulse of HTPB propellant is up to 2778.9 N·s·kg^{-1}, when the mass fractions of HTPB, HADNMNT, RDX and Al powder are 10%, 60%–62%, 14%–16% and 14%–15%, respectively. Replacing RDX with HADNMNT in smokeless CMDB propellant, the specific impulse increases to 2522.9 N·s·kg^{-1}. Moreover, the specific impulse of CMDB propellant can be remarkably improved through adjusting the mass fractions of HADNMNT and Al powder. The impulse of CMDB propellant reaches 2598.5 N·s·kg^{-1}, when the mass fractions of NC, NG, HADNMNT, Al, DINA and Al powder are 25%, 33%, 11%, 20%, 3.5% and 7.5%, respectively.

Key words: hydroxylammonium 2-dinitromethyl-5-nitrotetrazolate (HADNMNT); oxidizer; high energy propellant; energy characteristics

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《含能材料》高效毁伤弹药专栏征稿

高效毁伤弹药以“利用最小化成本获得最大化效果”为目标，对含能材料的性能和能量提出了更高的要求。为进一步促进高效毁伤弹药及其技术的研究，本刊将于2015年增设高效毁伤弹药专栏，内容涉及(1)传统含能材料的优化和改进以及先进含能材料的开发和应用，包括：传统含能材料合成、制造、处理和应用的新方法与新技术，新的CHON含能材料的开发和应用，金属化炸药，非传统概念炸药(如燃料空气炸药、温压炸药)，高能量密度材料；(2)含能材料能量的控制输出研究，包括：能量输出增强(如组合装药)，能量输出聚焦/定向，能量输出模式可控(如多模装药)，能量输出范围可控(如低附带毁伤炸药)。欢迎广大学者投稿，来稿时请选择对应的专栏。

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