

Reaction Mechanism of Forming Pore in HTPB/ADN Propellants

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Abstract: In order to reveal the reasons of forming pore in hydroxyl terminated polybutadiene/ammonium dinitramide/ammonium perchlorate/aluminium (HTPB/ADN/AP/Al) composite propellants, a series of propellant samples containing ADN and triethanolamine (TEA), triethanolamine trifluoroboron complex (T-313), tris (2-methylaziridiny) phosphine oxide (MAPO), isophthaloyl-bis-(2-methylaziridine) (HX-752) were prepared, and the components of reacting with ADN and forming pore were confirmed, and the reaction mechanism was analyzed by DSC/TG-IR/MS. Results show that there are no pores in the propellant samples containing curing agents such as toluene diisocyanate (TDI), isophrone diisocyanate (IPDI) and ethanolamine bonding agents such as TEA, T-313 respectively, but the pores are formed in the samples containing aziridine bonding agents MAPO and HX-752. It is proved by DSC that there is a strong interaction between ADN and MAPO, which decreases the temperature of the main decomposition peak of ADN by about 99.7 °C. When the mixture of ADN and MAPO (mass ratio 1 : 1) was heated continuously at 50 °C for 2 h, the gaseous products N₂O and NO₂ are formed and detected by mass spectrum. It is considered that the aziridine bonding agents can accelerate the decomposition of ADN, which form pores in the propellants.

Key words: analytical chemistry; bonding agent of aziridine; HTPB/ADN propellant; reaction pore; interaction; reaction mechanism



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