

LI Hong-xia, QIANG Hong-fu, WU Wen-ming. Molecular simulation on plasticizer migration in the bond system of HTPB propellant

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Migration Kinetics of Ingredient in GAP Propellant and Its Bonding System

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Abstract: The migrating components in the interface of the bonded samples of glycidyl azide polymer (GAP) based propellant/Hydroxyl-Terminated Polybutadiene (HTPB) based liner/Ethylene-Propylene-Diene Mischpolymere (EPDM) based insulation were determined by high performance liquid chromatography (HPLC) after aged at 50, 60 °C and 70 °C. The apparent migration activation energy (E_a) and the average diffusion coefficients (D) of the migrating components were determined. The results show that during aging nitrate ester plasticizers of nitroglycerine (NG) and 1,2,4-Butanetriol Trinitrate (BTTN) migrated from propellant to liner and insulation. The E_a values of NG and BTTN were among 43-121 kJ · mol⁻¹ and their average diffusion coefficients were in the range of 10⁻¹⁹-10⁻¹⁶ m² · s⁻¹. The amine stabilizers of AD1 and AD2 were found to migrate during curing of the samples, while during storage, consumption of them was the main phenomenon. It could also be concluded that the content of AD1 had correlation with the mechanic property of the bonding system. When content of AD1 was less than 40%, the tensile strength of the samples decreased sharply.

Key words: glycidyl azide polymer (GAP); migration; activation energy; diffusion coefficients

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