

Study on Constitutive Model of Particle Filling Material Considering Volume Expansion

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Abstract : The NEPE (nitrate ester plasticized polyether) propellant is a kind of particle filling material with relatively high filling fraction. The experimental results show that the microcracks, microvoids and dewetting can cause the stress softening of the material. In this paper, a series of mechanical testing in inclusion with CCD technique were conducted to analyze the evolution of internal defects of propellant. The volume expansion function of the particle filling material was established by measuring of longitudinal and transverse strain with optical deformation measurement system. By analyzing the defects and internal damages of the material, a visco-hyperelastic constitutive model based on free energy theory was proposed incorporating damage function. The proposed constitutive model could accurately predict the mechanical properties of uniaxial tensile tests and tensile-relaxation tests.

Keywords : dewetting, constitutive model, uniaxial tensile tests, visco-hyperelastic, nonlinear

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