

Effect of Temperature on Fatigue Properties of HTPB Propellant

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Abstract: To study the fatigue properties of hydroxyl terminated polybutadiene (HTPB) propellant at different temperatures, the constant stress control fatigue cyclic loading tests at different temperatures were carried out. Taking peak strain as damage factor, based on damage mechanics and viscoelastic theory, a three-stage model of fatigue damage with temperature effect of HTPB propellant was established. The results show that with increasing temperature, the fatigue life of materials decreases, the fracture strain increases. The peak strain in the process of fatigue obviously has three stages of evolution: initial deformation stage, stable development stage and acceleration stage, which is the macro-behavior of material damage. The three-stage model established overcomes the shortcomings of two-phase model that can't consider macroscopic crack propagation. By fitting the model parameters, the theoretical results of 213 K and 333 K are predicted by linear regression method, which are in good agreement with the experimental results, therefore it can be used to characterize the damage evolution law of materials very well.

Key words: hydroxyl terminated poly-butadiene (HTPB) propellant; stress control; fatigue life; damage factor; damage model

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第二届弹药安全技术研讨会

暨第六届固体推进剂安全技术研讨会征文通知(第一轮)

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