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Impact-Induced Mission Effects and Risk Assessments (3)

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STUDY OF THE TEMPERATURE EFFECTS ON THE SHIELDING PERFORMANCE OF A
WHIPPLE SHIELD ENHANCED BY TI-AL-MG IMPEDANCE-GRADED MATERIALS

Abstract

With better shielding performance than aluminum Whipple shields, Ti-Al-Mg impedance-graded shields has a good prospect of engineering application. For the complicated Space environment, the performance of shields such as aluminum Whipple shields and multi-shock shields will suffer different degree of affects. Impedance-graded materials are relatively complex affected by temperature due to their own material properties. The critical projectile diameter at positive and negative 100 centigrade are investigated experimentally, using a two-stage light gas gun and temperature controlling device. The mechanism of impact is analyzed from penetration holes in the bumper, characteristic of debris clouds, and damage patterns on the rear wall, and the temperature effect factors are obtained. The results show that the temperature effect of impedance-graded materials cannot be neglected.