

SPACE DEBRIS SYMPOSIUM (A6)
Hypervelocity Impacts and Protection (3)

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CHARACTERISTICS OF ACOUSTICS EMISSION SIGNALS PRODUCED BY HYPERVELOCITY
IMPACT

Abstract

The risk of collision of man-made orbital debris in near Earth orbits continues to increase. Damage from these un-tracked debris impacts is a serious hazard to spacecraft. Acoustic Emission detecting technique has been recognized as an important technology for damage detecting due to the AE signals offering a potentially useful additional means of non-invasively gathering concerning the state of damaged spacecraft when impacted by hypervelocity space debris and micrometeoroids. This information can help operators and designers at the ground station take effective measures to maintain the function of spacecrafts. A two-stage light gun is used to fire different diameter spherical aluminum ball at various impact velocities to aluminum panels, which more closely simulates damages caused by hypervelocity impacts of micrometeoroids and space debris on spacecraft. The AE impact signals are recorded by an oscillograph with AE sensors. In order to separate the characteristics of different wave modes, the AE signals are divided into low frequency and high frequency parts by wavelet time-frequency transform and reconstruction. The results show that the damage condition of the spacecraft can be represented by the peak values of the impact signals. The empirical equations between the impact depth, the diameter of the impact crater and the peak value ration are given.