

Abstract Submitted
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Numerical Simulations of Fragmentation Onset Velocity of Projectile Impact on Thin Bumper WEI ZHANG, Harbin Institute of Technology, CAIXIA JIANG, WENLAI MA, BAOJUN PANG, HYPERVELOCITY IMPACT RESEARCH CENTER TEAM — The conventional spacecraft meteoroids and orbital debris shielding system is the Whipple shield. In general there is a threshold velocity that is just sufficient to shatter the projectile for each system consisting of a projectile and bumper. This velocity is known as the fragmentation onset velocity. To determine the fragmentation onset velocity experimentally, a number of experiments have been conducted with different projectile/bumper configuration. The numerical simulation of fragmentation onset velocity of different material projectile hypervelocity impacts on bumpers with different combination of impact velocities and bumper-thicker-to-projectile-diameter ratios (t/D) has been performed using the SPH technique of AUTODYN. The spherical projectile materials are aluminum, steel and copper. All bumper materials are aluminum alloy 6061-T6. The simulation velocities were in the range of 1km/s-7km/s. The ratios of t/D were varied from 0.01 to 0.80. The material models were consisted of Mie-Gruneisen (shock) equation of state, Steinberg-Guinan strength model and Grady fragmentation failure model. The simulation results are given and compared with the experimental results. The simulation results are consistent very well with the experimental results.

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