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BALLISTIC LIMIT EQUATION FOR ALUMINUM HONEYCOMB SANDWICH PANELS

Abstract

The ballistic limit equation of aluminum honeycomb sandwich panel is the key foundation to assess the debris/meteoroid impact risks for spacecraft. Hypervelocity impact tests and numerical simulation for aluminum honeycomb sandwich panel are carried on in this paper. HVI tests are carried out on the two-stage light-gas gun with the impact velocity of 3km/s-7km/s and impact angles of 0, 45and 60. With the failure criterion of perforation diameter greater than 1mm on the back panel, the ballistic limit of projectile against aluminum honeycomb sandwich panels are obtained via the HVI test results. A SPH-FE coupled method is adopted to simulate the process of hypervelocity impact on honeycomb sandwich panels. The block effect of the honeycomb core for secondary fragments produced by projectile's impact on the front panel is studied and the influence of the impact angle for the limit projectile diameters is analyzed. It is found that quadratic curve is a good description for the relationship of limit projectile diameter and the cosine of impact angle and the quantitative relationship is obtained via data fitting. By synthesizing the test results and numerical simulation results, the analytical expression of ballistic limit equation for aluminum honeycomb sandwich panels is obtained at last.