

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

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RESEARCH OF PERFORMANCE ABOUT CERAMIC COATING ON ALUMINUM BUMPER TO
RESIST HYPERVELOCITY IMPACT**Abstract**

Shield structure based on ceramic coating on aluminum bumper was designed, and a series of hypervelocity impact tests were practiced. Shield configuration in impact tests included Whipple shield and dual-wall bumper shield. At the same time, the ceramic coating is on one side and two sides of aluminum bumper respectively. Thickness of the single ceramic coating on the surface of aluminum bumper is 0.1mm. The thickness of aluminum alloy rear wall is 3mm. The overall space between bumper and rear wall is 100mm. For this study, 2017-T4 aluminum alloy sphere was launched, with the protection of sabots, at velocities between 1.5km/s and 5.0km/s. The diameters of projectile are 3.97mm and 6.35mm respectively. The uncertainty in these measurements is approximately 2%. The pressure of nitrogen gas in the first stage reservoir ranged from 3MPa to 15MPa. The pressure of hydrogen gas in pump tube ranged from 0.1MPa to 0.12MPa. The pressure in test chamber is approximately 180Pa. At the same time, using the method of numerical simulation, the damage of the ceramic coating on aluminum bumper Whipple shield under hypervelocity impact was studied. The effect on damage of the shield was analyzed by changing the thickness of the ceramic coating on aluminum bumper. This paper discussed the results obtained from impact tests and numerical simulations. It was found that the ceramic coating on aluminum bumper could help enhancing the protection performance of shield to resist hypervelocity impact. The results indicated when the ceramic coating is on the front side of aluminum bumper, it was good for comminuting projectile and weakening the kinetic energy of projectile. For a certain aluminum bumper, existing a critical thickness of ceramic coating in which capability of Whipple shield to resist hypervelocity impact is the best.