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FRAGMENTATION AND EJECTION FOR AL-SPHERE HYPERVELOCITY IMPACTING ON
METAL MESH BUMPER**Abstract**

Metal mesh bumper is a breakthrough to traditional principle of making effective space debris bumper constructed from contiguous metal sheet material. In this paper, the hypervelocity impact characteristics of 5052 aluminum mesh and 304 stainless steel mesh bumper were studied by a series of hypervelocity impact tests being practiced. The hypervelocity impact tests were performed with a gas driver two-stage light gas gun at Harbin Institute of Technology, which is capable of accelerating projectiles up to 0.7g at a maximum velocity of 7km/s. For this study, 2017-T4 aluminum alloy spheres were launched, with the protection of sabots, at velocities between 2km/s and 5km/s. The diameter of projectiles ranged from 3.2mm to 6.4mm. The impact angle was 0 for all the tests. The projectile velocities were measured by magnetic induction. The uncertainty in these measurements is approximately 2%. The pressure of nitrogen gas in the first stage reservoir ranged from 5MPa to 12MPa. The pressure of hydrogen gas in pump tube ranged from 0.1MPa to 0.12MPa. The pressure in test chamber was approximately 200Pa. The fragmentation and ejection characteristic of hypervelocity projectile against mesh bumper were analyzed. The effect on fragmentation of projectile from different impact position on mesh bumper was studied. The debris clouds ejection shapes of projectile from different impact velocity and mesh size bumper were obtained. The results indicated that the debris clouds configuration from aluminum sphere projectile impacting mesh bumper was different with the different impact position on mesh bumper. The debris clouds as palpus was found in the front of projectile debris clouds. Some local kinetic energy concentrated appeared in the debris clouds. When a wire across point position was impacted, projectile debris clouds expand to form film configuration, and debris clouds distribution was more uniform, it was good for comminuting projectile and weakening the kinetic energy of projectile.