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Author: Mr. Xuezhong Wen

China Aerodynamics Research and Development Center(CARDC), China

Ms. Jie Huang

China Aerodynamics Research and Development Center(CARDC), China

Mr. Fa-wei Ke

China Aerodynamics Research and Development Center(CARDC), China

Dr. Sen Liu

China Aerodynamics Research and Development Center(CARDC), China

SHIELDING PERFORMANCE OF POLYURETHANE FOAM STUFFED IN SHIELD

Abstract

Polyurethane foam was a low-density material with excellent thermal insulation property, which was used widely in spacecraft to insulate heating. To study the feasibility and shielding performance of a shield stuffed with polyurethane foam to shield the debris impacting, hypervelocity impact tests were carried out at hypervelocity impact range A of CARDC. The projectiles are aluminum spheres with 4.0mm to 6.0mm diameter, while the impact velocity ranges from 4.0km/s to 6.0km/s. The targets were polyurethane foam plate stuffed shields, Whipple shield and aluminum triple-wall shield with same areal density. Polyurethane foam plates were stuffed in two different positions of the shield: the first position was the center of between the bumper and rear wall, the second position was close to the face place of rear wall. The shielding performance of between polyurethane foam plate stuffed shield and aluminum -wall shield were compared. The difference of shielding performances of those shields was investigated, and the effect on shielding performance of shields which polyurethane foam plates were stuffed in different position was analyzed. Results showed that polyurethane foam plate stuffed in shield can improve the capability to absorb impact energy of debris cloud, and reduce the damage of the rear wall. The shielding performance of the polyurethane foam plate stuffed shield was better than that of aluminum-wall shield with same areal density obviously.