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PRELIMINARY STUDY OF ARAMID FIBER CLOTH REMOVING THE SPACE DEBRIS

Abstract

As the increasing space debris threatens the safety of on-orbit spacecraft, it is the current topic to remove the space debris. The aramid fiber cloth has good performance of intercepting the debris cloud, which has been used as the stuffed structure of space shield configuration. The study of aramid fiber cloth removing the space debris cloud was carried out in the paper, and three fiber cloth intercepting structures were designed to intercept 5mm-diameter aluminum projectile with the velocities of about 4.0 km/s. The first structure was the single layer of aramid fiber cloth. The second structure was several layers of aramid fiber cloth with some distance, and there was no stuffing between them. The third structure was also several layers of aramid fiber cloth, and there was Al honeycomb between them. There was Al plate placed after the fiber cloth structure, which was used to validate the cracking and decelerating of the projectile. The impact process was recorded by the hypervelocity sequencing laser shadowgraph instrument, which was used to analyze the cracking of projectile. The hypervelocity impact test results show that the aramid fiber cloth has the effect of intercepting and decelerating the projectile, which validates preliminary the feasibility of aramid fiber cloth being used to remove the space debris. In order to eliminate the effect of aramid fiber cloth cracking the projectile, there is need to optimize the thickness and distance of the cloth.