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CHARACTERISTICS OF MICROWAVE EMISSIONS FROM HYPERVELOCITY IMPACTS ON PURE ALUMINUM AND VARIOUS ALUMINUM ALLOY PLATES

Abstract

Space debris are traveling at the velocity of 7-8 km/s in low Earth orbit and the collision between spacecraft can affect a significant damage. Hypervelocity impact generates not only mechanical phenomena such as crater and secondary debris but also electrical ones such as radio frequency (RF) emission, plasma generation, flash, and variation in electrical potential of the impacted target. However, the mechanism of the RF emission has not been verified. There is a possibility that factors of the mechanism are considered as the combinations of a projectile and a target, and the impact velocity. In the target, there are a lot of parameters such as material, composition, size, and thickness. So far, it was difficult to discuss the relationship between the parameters and the phenomenon of RF emission. We conducted the hypervelocity impacts using a two-stage light gas gun and measured the electrical phenomena at the same time. To minimize the parameters, we used 7mm-diameter nylon sphere with the impact velocity of approximately 7 km/s for projectiles and a pure aluminum and various aluminum alloy plates for targets. In this paper, the characteristics of microwave emissions from hypervelocity impacts on various aluminum plates will be described.