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USE OF AMORPHOUS ALLOY COATING ON ANGULAR SURFACES TO PREVENT LUNAR DUST ACCUMULATION

Abstract

Past lunar missions have shown that metallic surfaces easily attract lunar dust accumulation due to the charged nature of lunar regolith particles due to extensive triboelectric exposure experienced by the lunar surface. Such accumulation poses a significant threat to the equipment's performance and longevity as agglutinate, composing 60-70

Amorphous alloy coating is determined as one solution to protect equipment surfaces due to its high wear resistance and high elastic modulus. The high density of atoms beyond that of a lattice structure also gives it a low friction property as defects of grain boundaries and dislocations are not present. While the first property of hardness will protect the underlying structure from any accumulated dust, the high micro-level surface uniformity and low coefficient of friction indicates that the coating can prevent the accumulation of dust altogether by having the particles slide down on angular surfaces.

This study compares the coefficient of friction of amorphous alloy coating on various angular environments with different dust materials. The reduced gravity of the lunar surface may have some influence on the frictional properties of lunar dust, but the "lighter" weight of the dust particles will likely be matched with the reduced gravity available to pull the particle down the surface.

The study concludes that using amorphous alloy coating on lunar structures purposefully designed at slanted angles will allow for a reduced accumulation of harmful lunar dust particles. As the alloy cannot be applied over too wide an area, it is recommended that such structures be used above and around key sensor ports and mobility components. Lastly, the study identifies that testing using charged particles will increase the fidelity of such tests, and denotes the current limitations in experimental sciences to create a high quantity of asymmetrically charged particles that will not discharge in mixing or dispersion of said particles.