Effect of Different Rover Wheel Materials on Triboelectric Charge of Lunar Simulant Dust Particles

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On the moon, rovers and humans disturb the surrounding lunar dust by moving, creating plumes of dust. When two objects collide, they may become tribocharged and carry a level of voltage due to a transfer of electrons and thus a buildup of static electricity. This means that interacting with the dust on the moon gives the individual particles their own charges, and in large quantities a layer of dust that falls on equipment could be enough to cause damage. In the past, there have been known issues with lunar dust adhering to surfaces and causing difficulty to astronauts. Due to the new Artemis missions to be launched in the next few decades, it is crucial to use rover materials that minimize the effects of tribocharged lunar dust particles. As of today, rovers are made primarily from aluminum, which is a conductive metal. This experiment explores the level of charge induced by four different materials on an engineered wheel design: aluminum, brass, nylon, and spacesuit fabric. JSC-1 Lunar Simulant was used to determine what causes the lowest level of tribocharging through use of a Faraday Cup. The results indicate that aluminum may not be the best material for the construction of future rovers in order to minimize potential damage to lunar equipment and decrease risk to the safety of astronauts. Further research through additional trials in a vacuum are required to support the findings in an environment as similar to the moon as possible.

Awards Won:

Central Intelligence Agency: Second Award: $300