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DEVELOPMENT OF AN ELECTROSTATIC DUST REPEALING DEVICE FOR LUNAR MISSIONS

Abstract

Unlike Earth, moon does not have a magnetic field to protect it from high energy particles emitting from the Sun. Once they reach the surface of the moon, they penetrate into the dust particles and remove their electrons leaving them positively charge on the day side. On the dark side electron plasma makes the surface negatively charged in the order of thousands of volts. Since the materials composing regolith have low conductivity and there is no atmosphere on the moon, the dust particles tend to keep their electrical charge. The charge particles repeal themselves and hover above the surface. From Apollo documents all the lunar surface activities inversely affected by highly abrasive and electrically charged dust particles which cover everything they come into contact with. In this study, the possibility of using electrostatic and dielectriphoretic forces in dust removal from rover equipment is addressed. Electrodes placed parallel to one another shaping planar, cylindrical, and spherical configurations connected to a voltage source generating a traveling electric field which applies force to the charged particles and move them along or against the field. Applied frequency, voltage amplitude and shape, inclination angle, and particles shapes are the parameters their influence were examined on cleaning efficiency of the device. The results show this technique can remove 75 to 95 percent of the accumulated dust on surfaces. Furthermore, applications of traveling electric field in transporting dust particles between two points, e.g. moon surface to an on-board lab, and separating and sorting particles based on their electrical charge s and mass for geotechnical sampling and examinations were investigated.