METHOD TO INVESTIGATE THE CHARGING CHARACTERISTICS OF LUNAR DUST PARTICLES.

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Introduction: Previously, Buhler, et al. had previously had devised a test method for *in situ* measurement of electrostatic properties of lunar dust [1]. We have designed a laboratory experiment to investigate the induction charging and charge decay characteristics of lunar dust particles. The induction and charge decay characteristics of granular materials depend on the surface resistivity of the material. Since the surface resistivity properties of hydrophilic materials can be easily controlled with humidity, we have conducted initial experiments with borosilicate glass beads in a 10-20 kV constant electric field at various humidities in a controlled environmental chamber. We report on the results of these initial experiments.

Experimental Setup: The trials are conducted in an environmental chamber at 23 C and at a particular humidity. The apparatus producing the electric field consists of two parallel brass electrodes, 25 cm in diameter, with a separation of 1.0 cm, mounted in an adjustable dielectric frame (Figure 1). The top electrode is connected to a DC high voltage power source, and the bottom electrode is connected to earth ground. Borosilicate glass beads of diameter 1 mm are cleaned with 91% IPA solution and dried through baking. The beads are placed in the chamber for 24 hours to allow for adequate adsorption of humidity [2]. Six beads are placed on the bottom electrode and spaced approximately uniformly. It was important that the specimens not contact each other as this will affect charge acquisition and decay time [3]. The chamber is then flooded with positive and negative ions to remove any residual electrostatic charge on the beads and electrodes. After disconnecting the ion source, the trial is recorded by camera as we initiate the high voltage. A trial duration lasts three hours and provides us with many samples for analysis.

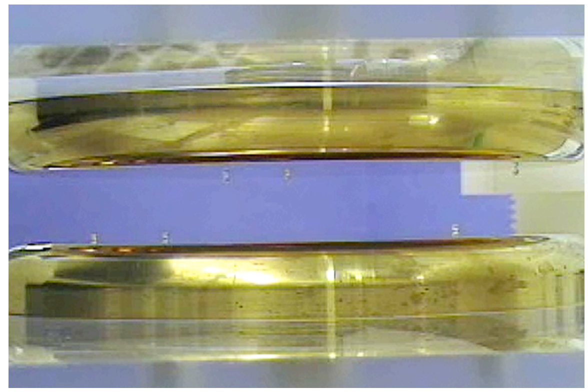

Figure 1. A configuration of glass beads between brass electrodes at 18 kV, 60% RH and 23 C. Three beads are in resident phases on the top plate, and three are in resident phases on the bottom.

Preliminary Results: Thus far, we have identified very interesting behaviors at 60% relative humidity and 18 kV. Most notably, after beads come in contact with either electrode, they tend to remain for a particular amount of time before acquiring or losing enough charge and departing from it. Early results suggest that resident times measured on the bottom plate are generally greater than those on the top plate. More trials are forthcoming.

References:

[1] Buhler C. R., et al. (2007) *IEEE Aerospace Conference*. [2] Awakuni Y., et al. (1972) *J. Phys. D: Appl. Phys.*, 5, 1038-1045. [3] Howell D. S. et al. (2001) *Phys. Rev. E*, 63, 050301(R).