METHOD TO INVESTIGATE THE CHARGING CHARACTERISTICS OF LUNAR DUST PARTICLES.
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Introduction: Previously, Buhler, et al. 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 an 18 kV constant electric field at various humidities in a controlled environmental chamber. We report on the results of these experiments.

Experimental Setup: The trials are conducted in an environmental chamber at 22 C and at 33, 40, 50, 60, and 75 percent relative humidities. 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 in an ultrasonic cleaner alternately with 99% IPA solution and distilled water, twice each [2]. They are then dried by baking in a vacuum oven. The beads are moved to the environmental chamber and allowed 24 hours for adequate adsorption of humidity [2]. Then one bead is placed in the center of the bottom electrode. The chamber is 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 for as long as the bead exhibits motion, usually ending when it travels off the testing apparatus. We measure the charging time as the total time the bead remains motionless on either electrode, between the cessation and onset of motion.

Results: The general trend in the results shows that at increased humidity, the charging time is small, and at lower humidities, it is much larger. For example, the greatest frequency of binned charging times at 33% RH was 1000 seconds, but only about 45 seconds at 75% RH. Histograms indicate the frequency of selected charging times, binned into regular intervals (Figures 2–3).

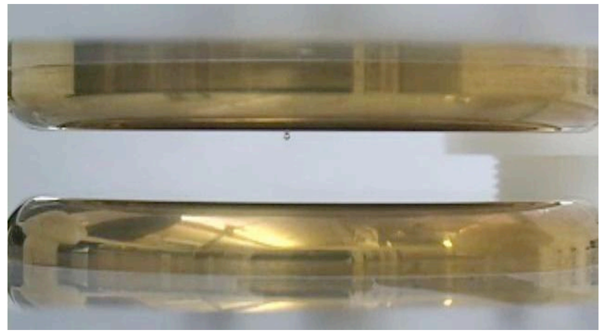

Figure 1. A glass bead has ascended to the top plate, which is charged to 18 kV.

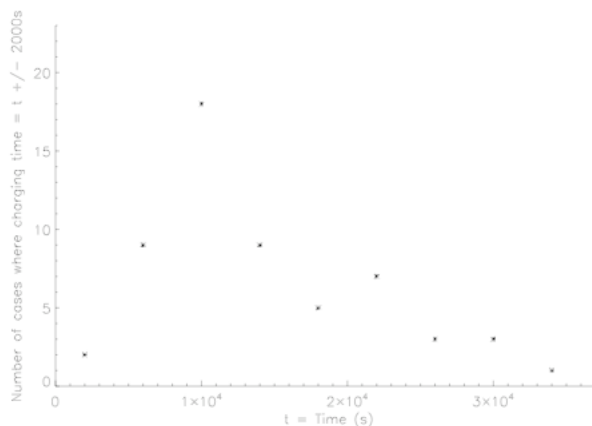

Figure 2. Histogram of charging times at 33% RH.

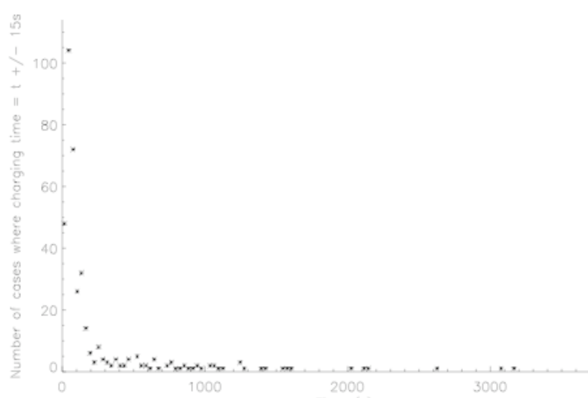

Figure 3. Histogram of charging times at 75% RH.

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.