

Martian Regolith Simulant Particle Charging

Airborne dust lifted into the Martian atmosphere by frequent dust devils can be transported by strong surface winds of daily occurrence during the Martian summer in the southern hemisphere. Dust and sand particles lifted into the wind stream can be carried for a distance, falling back to the surface where they can possibly kick up more particles, in a process known as saltation. The saltation action can create highly charged particles leading to adhesion and discharge. Since wind gusts in the Martian atmosphere could reach velocities of up to 100 m/s, saltation and impact charging can be a significant issue in electrostatics on Mars.

To measure the amount of electrostatic charge generated on Martian regolith simulant particles, an apparatus was built that measured the degree of charging of the JSC Mars-1 Martian Regolith simulant particles as they came into contact with different materials. The particles were dropped down a deflection board under a 5 mbar atmosphere to simulate the average pressure on the surface of Mars. The surfaces of the board were covered with copper, acetate, or glass sheets. We speculated that the rolling, sliding and bouncing of the particles would result in a net charge transfer, which could be measured with a Faraday cup and electrometer. Our results were consistent with the triboelectric series and showed that the glass yielded a net positive charge to the simulant. The copper and acetate materials yielded a net negative charge to the simulant. A schematic representation of the experiment is shown in figure 1. Figure 2 shows the entire system in the vacuum chamber.

Key Accomplishments:

- ?? Design and construction of saltation simulator for low pressure testing
- ?? Acquisition of data for electrification of Martian simulant dust particles in contact with three different materials

Key Milestones

- ?? Improve the design of the system
- ?? Implement a mechanism to discharge the particles before they come into contact with the materials
- ?? Implement a corona charging mechanism
- ?? Introduce a UV

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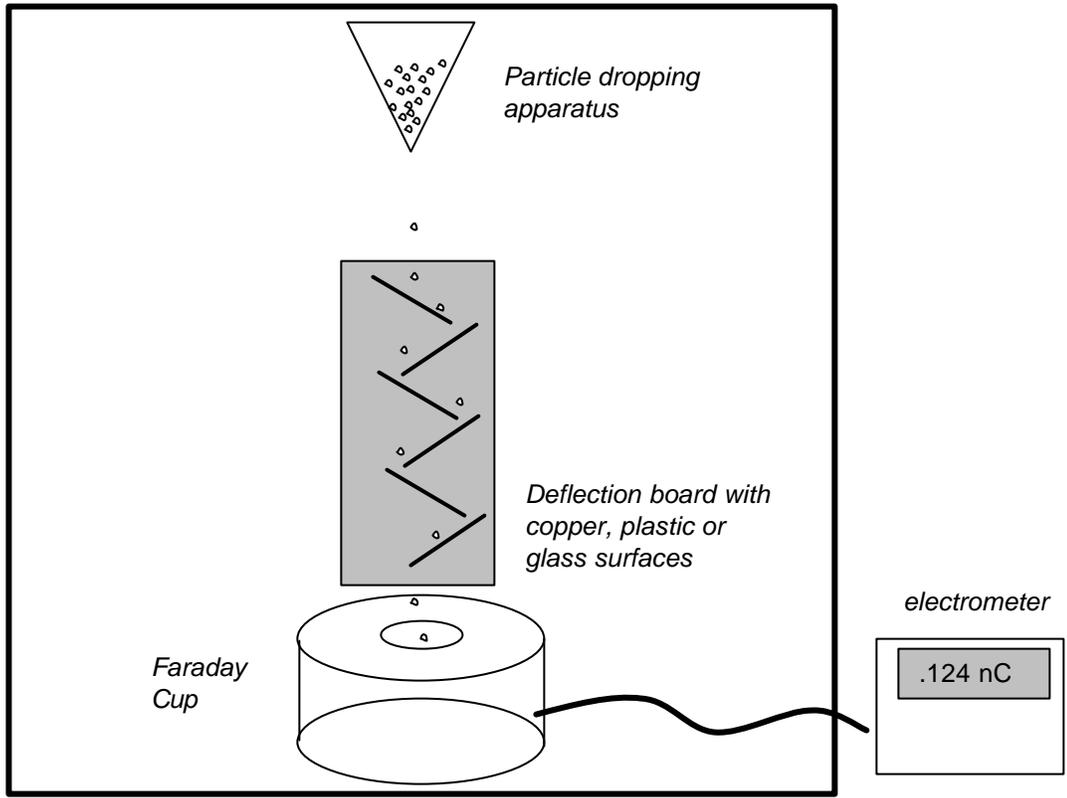


Figure 1

"Figure 2-Martian Regolith Simulant Particle Charging

Figure 2