

SESSION 2A. SPACEPORT MATERIALS

Results of a Wheel Electrometer for Measuring the Triboelectric Properties of Martian Regolith

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Abstract

The preliminary results of a prototype Wheel Electrometer System (WES) are presented that show that it is indeed possible to use the static electricity generated between polymers and soils after contact (triboelectricity) as a means of detecting property changes. Changes in the triboelectric signals offer information as to the mechanical properties of the soil such as grain size differences, texture, hardness and even moisture content. Initially, four polymers are chosen that span the triboelectric series such as Teflon, Lucite, Fiberglass and Lexan. It is shown that the average charge on Teflon is much higher when rolled over beach sand as compared to Martian simulant and limestone. Lucite was the most susceptible to particle size differences, while Lexan was able to detect underlying materials in the case of a soil lightly covered with a different soil type. All polymers responded differently when rolled over dry soil compared with moist soil. This information can be used as a type of “triboelectric spectroscopy” when a library of data is used to categorize the unique charging characteristics of individual polymers. This system is of great interest to planetary scientists and such measurements may be included in future Mars rover missions.