

Direct measurement of size dependent charging in chemically identical grains

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Abstract— Tribocharging is the transfer of electrical charge between surfaces in contact. Granular interactions are governed by contacts, and as a result tribocharging can have important effects on bulk granular behavior. What is surprising is that this occurs even in grains of the same material. Past work has shown that this same chemistry tribocharging (SCT) correlates with the particle size distribution: larger particles generally charge positively and smaller particles negatively. Despite this observation, a satisfactory mechanism for SCT remains elusive, partly because of a lack of quantitative SCT data to compare with theoretical models. We have developed an experimental technique to make *in situ* measurements of the particle size and charge on small ($\sim 100\text{-}500\ \mu\text{m}$) grains. With high speed videography of freely-falling grains we resolve individual grain charges as small as ten thousand electrons. Our results confirm the charge segregation observed in previous SCT experiments and are a first step toward a quantitative understanding of same chemistry tribocharging in granular systems.