

# New Observations on the Bipolar Nature of Charge Segregation in Triboelectrically Charged Granular Materials.

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*Abstract*— The bipolar nature of insulating particles in nature has been examined throughout the literature and is classified by smaller particles carrying a net negative charge while the larger particles carry a net positive charge. New research has uncovered a unique asymmetry that exists when tribocharging macroscopic particle systems. We have discovered that the sign of the charge carriers is dependent on the dynamics of the system when all other symmetries are present. Here we show for the first time that the energetic particles choose one charging sign over the particles that remain stationary or less energetic during triboelectrification. Once the sign is determined for a particular granular material, this methodology can be used to estimate the sign of similar materials for a given dynamical system.