

Abstract Submitted
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A nonlinear feedback model for granular and surface charging¹

TROY SHINBROT, LEO KOZACHKOV, THEO SIU, Rutgers University — Independent laboratories have experimentally demonstrated that identical materials brought into symmetric contact generate contact charges. Even the most basic features of this odd behavior remain to be explained. In this talk, we provide a simple, Ising-like, model that appears to account for many of the observed phenomena. We calculate the electric field acting on surface molecules in a lattice, and we show that if the molecules are polarizable, then infinitesimal random polarizations typically build exponentially rapidly in time. These polarizations self-assemble to produce surface patterns that come in two types, and we find that one of these types accounts for strong localized charging, while the other produces a weaker persistent surface charge pattern. We summarize predictions for both ideal surfaces and for defects in granular beds.

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Troy Shinbrot
Rutgers University

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