

The mosaic of surface charge in contact electrification

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Abstract— When dielectric materials are brought into contact and then separated, they develop static electricity. For centuries, it has been assumed that such contact charging derives from the spatially homogeneous material properties (along the material’s surface), and that within a given pair of materials, one charges uniformly positively and the other, negatively. We demonstrate that this picture of contact charging is incorrect. While each contact-electrified piece develops a net charge of either positive or negative polarity, each surface supports a random “mosaic” of oppositely charged regions of nanoscopic dimensions. These mosaics of surface charge have the same topological characteristics for different types of electrified dielectrics, accommodate significantly more charge per unit area than previously thought.