

Contact Charging between Surfaces of Quartz (0001) and Sapphire (0001) – An Experimental Investigation

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Abstract— A conclusive principle mechanism of contact charging between insulators remains unknown because of experimental variability. This present study aimed to determine the effect of material transfer on triboelectric charging of insulators through experimentation. We used well-characterized surfaces of aluminum oxide (sapphire) and silicon oxide (quartz) to develop a basis methodology of charging. We then built an automated and controlled system environment to address variability issues. The system controlled humidity, gas composition, and different modes of contact. Charge transfer was measured in situ with surface charge maps and composition recorded by Kelvin force microscopy and x-ray photoelectron spectroscopy. The experimental results were compared with a related theoretical study. Furthermore, this charging methodology can be utilized to study contact charging of more complicated insulators.