

Triboelectric charging of identical materials by asymmetric rubbing

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Abstract— The charging that occurs when materials of identical chemical composition are contacted or rubbed (i.e. triboelectric charging) remains poorly understood since there is no apparent driving force in terms of difference in material properties. Following ideas of Lowell and Truscott [1], recent modeling [2] and experimental efforts [3] have suggested that in the case of triboelectric charging of insulators, electrons may exist in trapped electronic states and transfer from one material to another during contact. To study these effects, we have recently set-up experiments that asymmetrically contact two materials by rotating one cylindrical rod against a stationary one. This geometry allows the charge transfer to be precisely controlled such that the surface area available for contact is much larger in the case of one (the rotating rod) than the other (stationary rod). In addition, the charge on the rotating rod is spatially characterized by a combination of our electrical measurement and data acquisition system. In this talk, we will show that charging occurs between dissimilar materials (i.e. Teflon-Nylon) as predicted by the triboelectric series. In the case of identical materials (i.e. Teflon-Teflon), charging also occurs, but the nature of charge transfer is more complicated. Results for various material combinations and experiments in air and vacuum will be discussed in detail.

REFERENCES

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