

Measurements of the effect of strain on contact electrification

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Abstract— It is well known that the greater the amount of force that is applied between two objects the greater the amount of triboelectric charging that will be observed. There are many possibilities for this effect, including a greater amount of surface area contact or a change in the charging due to the change in strain. Sow, Lacks and Sankaran¹ have shown indications that strain applied to a latex membrane effects the triboelectric charging with steel, polyurethane, and nylon. However, their experiments did not control the force between the surfaces or the applied direction of the strain, and these experiments were done in air where ions can land onto the surface. In our experiment we demonstrate the impact of strain and contact pressure between various polymer films and contact balls inside vacuum, which was used to reduce the impact of free ions neutralizing the polymer and to reduce the effect of discharge of the polymer to other components. We applied a strain on the polymer in a single direction. The contact area of the ball and membrane was measured as a function of displacement and a force gauge is attached to the contact ball so that the pressure of the contact was controllable and could be measured. The total charge was measured using an electrometer and normalized to the contact area. We measured tribocharging as a function of strain and average contact pressure between the ball and the membrane.

REFERENCES

- [1] M. Sow, D. J. Lacks and R. M. Sankaran, “Effects of material strain on triboelectric charging: Influence of material properties”, J. Electrostatics 71, 396-399, 2013