

Lab 1 – Triboelectricity

Purpose

This activity is intended to convey familiarity with the triboelectric effect.

Theory

Triboelectricity (“TRY-boe”) comes from the Greek *tribos*, meaning *to rub*. Electric charge Q is a component of all neutral matter. Friction or adhesive contact between dissimilar materials can render one positive and the other negative until random impacts of air molecules disperse the charges. If one material is above the other on the ***Triboelectric Series***, it will always end up the positive material of the pair.

Triboelectric Series of Materials:
dry air (very positive)
leather
glass/mica
hair/wool/fur
silk
paper/cotton/wood
amber/resins
rubber
plastics
silicone
ebonite (very negative)

Figure 1: A simplified Triboelectric Series[†]

Before performing this experiment, note that moisture, skin oil, and dust and dirt all have severely disruptive effects on electrostatic experiments.

Procedure

1. Find a plastic tube: a soda straw or pen or mechanical pencil, paper towel or toilet paper, a glass jar, salt and pepper, and Scotch or packing tape.
2. Sprinkle a thin, mixed layer of salt and pepper on a sheet of paper.
3. Rub the tube aggressively with the tissue so triboelectric charging occurs.

4. Immediately pass the tube over the seasonings, low and flat. Observe.
5. Replenish the salt and pepper pile.
6. Stick a wide strip of tape, or several strips overlapping to have more width, to the side of the jar. Fold over one end of the strip(s) so that removal can be done with one rapid tug.
7. Gently pat the tape with a lightly dampened towel or tissue to remove any incidental charge, then wait for the tape to dry. Do not blow on it: Wait!
8. Rapidly and aggressively remove the strip of tape without touching the part of the glass where it was stuck.
9. Immediately bring the glass surface on which the tape was stuck near the seasonings, touching if necessary.
10. Now hold the non-sticky side of the tape within a millimeter of the glass with the seasonings on it. Observe.

Analysis

Submit answers via Canvas to the following questions, using complete, grammatically correct sentences:

1. Which seasoning (if either) was the predominate one attracted in step 4 above, and why?
2. What remarkable activity may have been seen happening between the tape and glass for at least a few particles in step 10. (Try it again if necessary.)

A bad grade will be given to vague, empty answers indicative of not having bothered to perform the activities with necessary care or patient observation.

[†]A more complete list can be seen at soft-matter.seas.harvard.edu/index.php/Triboelectric_series