

## The Triboelectric series

When two different materials are brought into contact and rubbed together, often a transfer of electrons between them will cause one material to become positive and the other negative. The basic reason for this is little understood and the results are not always reproducible. Below are two nearly the same listings obtained from different URLs on the web.

<p>Air (*?)          Human Hands    Most Positive          Asbestos          Rabbit Fur          Glass          Mica          Human Hair          Nylon          Wool          Fur          Lead          Silk          Aluminum          Paper          Cotton            ZERO          Steel          Wood          Amber          Sealing Wax          Hard Rubber          Nickel, Copper          Brass, Silver          Gold, Platinum          Sulfur          Acetate, Rayon          Polyester          Styrene (Styrofoam)          Orlon          Saran          Polyurethane          Polyethylene          Polypropylene          Vinyl (PVC)          Silicon          Teflon            Most Negative</p>	<p>Air            Most Positive          Human Hands          Asbestos          Rabbit's Fur          Glass          Human Hair          Mica          Nylon          Wool          Lead          Cat's Fur          Silk          Aluminum          Paper          Cotton          Steel          Wood          Lucite          Sealing wax          Amber          Polystyrene          Polyethylene          Rubber balloon          Sulphur (? see 5 below)          Hard rubber          Nickel, Copper          Brass, Silver          Gold, Platinum          Sulfur          Acetate, Rayon          Polyester          Celluloid          Polyurethane          Polyethylene          Polypropylene          Vinyl          Silicon          Teflon          Saran Wrap    Most Neg.</p>	<p>It must be understood that any <u>conductor</u> on the list such as lead must be held with an insulator or the charges will immediately drain off.</p> <p>The following warning was found on the web:          “Caveat: contact electrification is not well understood. Friction DOES play a part. For example, the ordering of the triboelectric series is different when surfaces are rubbed together rather than simply touched. The order of the series also changes when surfaces of differing roughness are rubbed together. Even IDENTICAL substances can generate a charge-imbalance if one surface is rough and the other one smooth.”</p> <p>On the backside of this page is a suggested experiment that a student could do that might revise the two listings given on the left. The experiment requires a simple torsion cradle apparatus and many different examples of materials in solid form and in cloth like form.</p> <p>Rubbing different materials together is probably best effected if one is cloth like and the other is solid. However, solid-to-solid might be attempted as well as other possibilities. The reported results suggest that simple contact and rubbing may give different result. (See above.)</p>
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