

# Electronics

## Static Electricity and Static Sensitive Devices

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# Triboelectric series

- 1 Materials charge when rubbing against each other according to how much affinity each one has for electrons.

# Triboelectric series

- 1 Materials charge when rubbing against each other according to how much affinity each one has for electrons.
- 2 Which item becomes “positive” and which becomes “negative” will depend on where it is in the series. The farther apart items are, the more charge will transfer.

- **positive**

- **positive**
- skin

- **positive**
- skin
- leather

- **positive**
- skin
- leather
- rabbit fur

- **positive**
- skin
- leather
- rabbit fur
- glass



- **positive**
- skin
- leather
- rabbit fur
- glass
- hair

- **positive**
- skin
- leather
- rabbit fur
- glass
- hair
- nylon

- **positive**
- skin
- leather
- rabbit fur
- glass
- hair
- nylon
- wool

- **positive**
- skin
- leather
- rabbit fur
- glass
- hair
- nylon
- wool
- cat fur

- **positive**
- skin
- leather
- rabbit fur
- glass
- hair
- nylon
- wool
- cat fur
- silk

- **positive**
- skin
- leather
- rabbit fur
- glass
- hair
- nylon
- wool
- cat fur
- silk
- aluminum

- **positive**
- skin
- leather
- rabbit fur
- glass
- hair
- nylon
- wool
- cat fur
- silk
- aluminum
- paper

- **positive**
- skin
- leather
- rabbit fur
- glass
- hair
- nylon
- wool
- cat fur
- silk
- aluminum
- paper
- cotton **about neutral**



- cotton **about neutral**

- cotton **about neutral**
- steel

- cotton **about neutral**
- steel
- hard rubber

- cotton **about neutral**
- steel
- hard rubber
- copper

- cotton **about neutral**
- steel
- hard rubber
- copper
- polyester

- cotton **about neutral**
- steel
- hard rubber
- copper
- polyester
- styrene (eg. styrofoam)

- cotton **about neutral**
- steel
- hard rubber
- copper
- polyester
- styrene (eg. styrofoam)
- Saran wrap

- cotton **about neutral**
- steel
- hard rubber
- copper
- polyester
- styrene (eg. styrofoam)
- Saran wrap
- polyethylene (eg. Scotch tape)



- cotton **about neutral**
- steel
- hard rubber
- copper
- polyester
- styrene (eg. styrofoam)
- Saran wrap
- polyethylene (eg. Scotch tape)
- polypropylene

- cotton **about neutral**
- steel
- hard rubber
- copper
- polyester
- styrene (eg. styrofoam)
- Saran wrap
- polyethylene (eg. Scotch tape)
- polypropylene
- vinyl

- cotton **about neutral**
- steel
- hard rubber
- copper
- polyester
- styrene (eg. styrofoam)
- Saran wrap
- polyethylene (eg. Scotch tape)
- polypropylene
- vinyl
- Teflon

- cotton **about neutral**
- steel
- hard rubber
- copper
- polyester
- styrene (eg. styrofoam)
- Saran wrap
- polyethylene (eg. Scotch tape)
- polypropylene
- vinyl
- Teflon
- **negative**

# Sparks in air

- 1 Dry air (as in winter) allows bigger charges to build up.

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- 2 Sparks in the air require about 3000 V/mm of dry air.

# Static Sensitive Devices

- 1 Logic gates operate on a few volts.

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# Static Sensitive Devices

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- ② Logic gates operate on small currents; mA to  $\mu\text{A}$ .
- ③ Static charges can destroy certain kinds of chips.
- ④ **More expensive chips tend to be more static sensitive.**

# Transportation of static sensitive devices

- 1 Use static bags and/or foam.

# Transportation of static sensitive devices

- 1 Use static bags and/or foam.
- 2 Place in breadboard instead of leaving on bench.

# Use of static sensitive devices

- 1 Use static mat on bench.

# Use of static sensitive devices

- 1 Use static mat on bench.
- 2 Attach ground lead from mat to earth ground.

# Use of static sensitive devices

- 1 Use static mat on bench.
- 2 Attach ground lead from mat to earth ground.
- 3 Attach wrist straps.