Static Electricity in Materials

Become positive in charge

The following materials will tend to give up electrons when brought in contact with other materials. They are listed from those with the greatest tendency to give electrons to those that barely give up electrons.

|  |  |
| --- | --- |
| **Materials that gain a positive (+) electrical charge (or tend to give up electrons)** | |
| **Dry human skin** | Greatest tendency to giving up electrons and becoming highly positive (+) in charge |
| **Leather** |  |
| **Rabbit fur** | Fur is often used to create static electricity |
| **Glass** | The glass on your TV screen gets charged and collects dust |
| **Human hair** | "Flyaway hair" is a good example of having a moderate positive (+) charge |
| **Nylon** |  |
| **Wool** |  |
| **Lead** | A surprise that lead would collect as much static electricity as cat fur |
| **Cat fur** |  |
| **Rubber** |  |
| **Aluminum** | Gives up some electrons |
| **Paper** |  |

Neutral

There are very few materials that do not tend to readily attract or give up electrons when brought in contact or rubbed with other materials.

|  |  |
| --- | --- |
| **Materials that are relatively neutral** | |
| **Cotton** | Best for non-static clothes |
| **Steel** | Not useful for static electricity |

Become negative in charge

The following materials will tend to attract electrons when brought in contact with other materials. They are listed from those with the least tendency to attract electrons to those that readily attract electrons.

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| --- | --- |
| **Materials that gain a negative (−) electrical charge (Tend to attract electrons)** | |
| **Wood** | Attracts some electrons, but is almost neutral |
| **Amber** |  |
| **Hard rubber** | Some combs are made of hard rubber |
| **Nickel, Copper** | Copper brushes used in Wimshurst electrostatic generator |
| **Silk** |  |
| **Brass, Silver** |  |
| **Gold, Platinum** | It is surprising that these metals attract electrons almost as much as polyester |
| **Polyester** | Clothes have static cling |
| **Styrene (Styrofoam)** | Packing material seems to stick to everything |
| **Saran Wrap** | You can see how Saran Wrap will stick to things |
| **Polyurethane** |  |
| **Polyethylene (like Scotch Tape)** | Pull Scotch Tape off surface and it will become charged |
| **Polypropylene** |  |
| **Vinyl (PVC)** | Many electrons will collect on PVC surface |
| **Silicon** |  |
| **Teflon** | Greatest tendency of gathering electrons on its surface and becoming highly negative (−) in charge |

Best Combinations

The best combinations of materials to create static electricity would be one from the positive charge list and one from the negative charge list.

Skin and polyester clothes

A common complaint people have in the winter is that they shoot sparks when touching objects. This is typically caused because they have dry skin, which can become highly positive (+) in charge, especially when the clothes they wear are made of polyester material, which can become negative (−) in charge.

Combing your hair

Human hair becomes positive (+) in charge when combed. A hard rubber or plastic comb will collect negative (−) charges on its surface. Since similar charges repel, the hair strands will push away from each other, especially if the hair is very dry. This is called "flyaway" hair. Since the comb is negatively charged, it will attract object with a positive charge - like hair. It will also even attract material with no charge - like small pieces of paper.

Fur and Plexiglas rod

Rubbing a plexiglas rod with rabbit fur or wool will give the rod a negative charge. Although the rod can be used to pick up scraps of paper, the fur and wool quickly lose their charge.

Moderate combinations

When two materials that tend to give up electrons are rubbed together, the one with the greatest tendency will moderately become positive (+) in charge. Likewise, when two materials that tend to attract electrons are rubbed together, the one with the greatest tendency will moderately become negative (−) in charge.

Silk and glass

Rubbing a glass rod with a silk cloth will charge the glass with positive charges. The silk does not retain any charges for long.

Saran wrap

Unrolling a piece of Saran Wrap or similar plastic wrap creates negative charges on the sheet. It will tend to stick to neutral items.

Summary

Various materials have a tendency of either giving up electrons and becoming positive (+) in charge or attracting electrons and becoming negative (−) in charge. The list of materials shows the relative tendency to become charged. This list can be used to determine which combinations of materials create the most static electricity.

Electrostatic Series

*Electrons are transferred (not lost or gained)*

Materials tend to receive electrons and become NEGATIVELY charged

Materials tend to lose electrons and become POSITIVELY charged

Teflon

\*Saran wrap (polyethylene)

\*Hard rubber

Celluloid

Sulphur

Rubber balloon

Polyethylene (plastics)

Polystyrene

Amber

Sealing wax

Lucite

Wood

Cotton

Paper

Silk

Cat’s fur

\*Wool

Nylon

Mica

Glass

\*Rabbit’s fur