

ELECTRICITY IN MATERIALS

Static Electricity

Rubbing certain materials together can make both materials become charged up, one becoming positive and the other becoming negative. Interestingly, while we know which materials tend to become positive and which materials tend to become negative, why exactly certain materials go one way or the other is still a mystery.

Sometimes this manifests as static cling. If you are doing laundry, and all your socks are made of the same material, then there will not be much cling since two items comprised of the same material will not exchange charges. However, if you have some socks made of cotton and others made of acrylic, the two different materials can rub together in the dryer and become oppositely charged, clinging together.

This phenomenon can also create a slight electric shock. When you walk through your home on a dry day, your socks rubbing against the rug can make you build up excess electric charge. This charge needs somewhere to go, as all those excess charges are repelling each other and want to move away from each other. If you put your hand near a metal doorknob, then the charges will see a viable path to get away and will move from your hand, through the air and into the metal, creating a short-lived electric circuit and giving you a slight shock. (We will explore what is happening in such situations in greater detail in an upcoming section.)

A Van de Graaff generator uses static electricity to create interesting effects. A Van de Graaff generator has a vertical conveyor belt that continually rubs two materials together at the bottom of a tower, bringing stray electrons to the top, where they gather on the surface of a metal sphere. If you touch the metal sphere, the electrons travel into you, making you negatively charged. This can result in the strands of your hair, which are now all negatively charged, repelling each other, making your hair stand up on end (Figure 18). Note that the amount of charge that you are building up is a tiny fraction of a coulomb. And yet even that tiny amount of charge is enough to overcome the gravity of the entire Earth pulling your hair down. This provides a clear example of how much stronger the electric force is compared to the gravitational force.

FIGURE 18



Touching the charged metal surface causes the charge to flow into the person, with each strand of charged hair repelling the other.