Answer on Question #69825, Physics / Electromagnetism

Question. How is static electricity used to control air pollution?

How does a Xerox machine work?

What is the benefit of using static electricity to paint cars?

Answer: **How is static electricity used to control air pollution?**

Factories use static electricity to reduce pollution coming from their smokestacks. They give the smoke an electric charge. When it passes by electrodes of the opposite charge, most of the smoke particles cling to the electrodes. This keeps the pollution from going out into the atmosphere (see fig. 1).

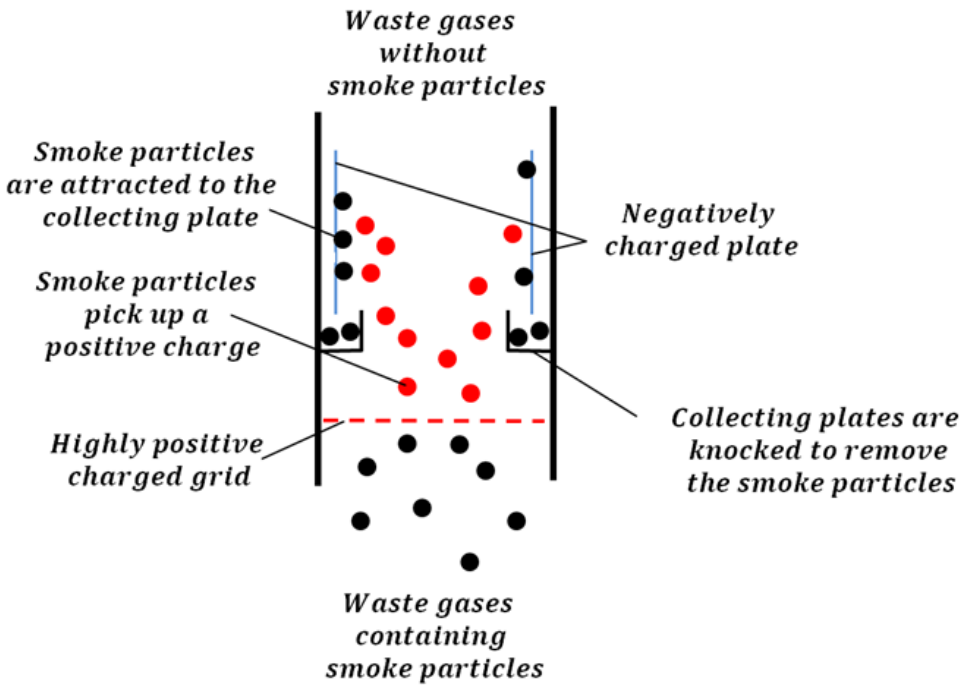

Figure 1.

How does a Xerox machine work?

The heart of the process is shown in simplified form in fig.2.

A selenium-coated aluminum drum is sprayed with positive charge from joints on a device called a corotron. Selenium is a substance with an interesting property – it is a photoconductor. That is, selenium is an insulator when in the dark and a conductor when exposed to light.

In the first stage (fig. 2a) of the xerography process, the conducting aluminum drum is grounded so that a negative charge is induced under the thin layer of uniformly positively charged selenium. In the second stage (fig. 2b), the surface of the drum is exposed to the image of whatever is to be copied. Where the image is light, the selenium becomes conducting, and the positive charge is neutralized. In dark areas, the positive charge remains, and so the image has been transferred to the drum.

The third stage (fig. 2c) takes a dry black powder, called toner, and sprays it with a negative charge so that it will be attracted to the positive regions of the drum. Next (fig. 2d), a blank piece of paper is given a greater positive charge than on the drum so that it will pull the toner from the drum. Finally (fig. 2e), the paper and electrostatically held toner are passed through heated pressure rollers, which melt and permanently adhere the toner within the fibers of the paper.

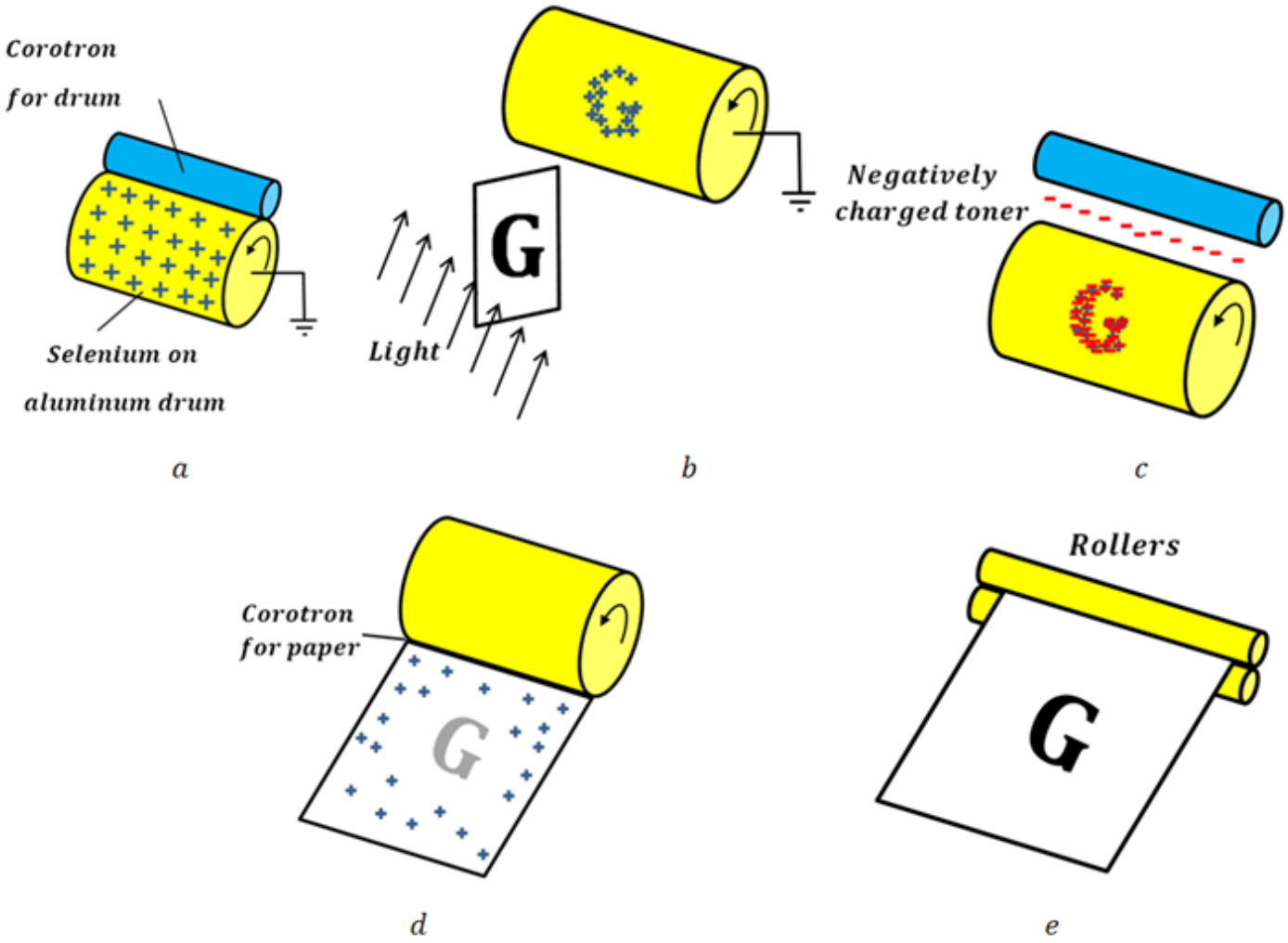

Figure 2.

What is the benefit of using static electricity to paint cars?

Some automobile manufacturers use static electricity to help them paint the cars they make. The way this works is that they first prepare the car's surface and then put it in a paint booth. Next, they give the paint an electrical charge and then spray a fine mist of paint into the booth. The charged paint particles are attracted to the car and stick to the body, just like a charged balloon sticks to a wall. Once the paint dries, it sticks much better to the car and is smoother because it is evenly distributed.