

Project: Making Electro-static Generator

You have seen lightning in the night sky, or may have experienced an electro-static shock in the dry season, especially in winter, when you take off your sweaters or touch the door-knob. Unlike mechanics, however, electromagnetism is not directly experienced in our daily life. It was not until Maxwell formulated equations that electricity and magnetism had been fully understood; they were not even considered to be related each other until Faraday showed their relationship experimentally. Although EM phenomena are summarized in Maxwell's equations, they cannot be handled until vector calculus is sufficiently mastered. You probably use electro-chemical batteries and AC power every day, but don't routinely deal with electro-static phenomena. Therefore, students sometimes find it difficult to explain all EM phenomena, stemmed from the behavior of electrons (quantized electric charge), with clear understandings.

The following idea constitutes one of the policies of A.Semi: we can understand completely only when we actually work out the problems ourselves — they may be those problems in mathematics, experiments in sciences you might encounter.

In this project, a simple electro-static generator is constructed by use of inexpensive materials available today. We freely provide tools but you need to collect materials, such as brass rods, aluminum sheet, kitchen aluminum foil, acrylic plates, and the motor, battery, etc.

Here is the complete list of materials you need. We list the shop names, too, in a separate file, but if you find the lower priced items at the internet shop, or your favorite stores, you can order from them. In Tokyo, everything is obtained at Tokyu Hands, or in Electric District of Akihabara.

1. Dielectric Materials: acrylic plates

- ❑ 12" × 12" 1/8" thick plate...clear (or any transparent/translucent color) ...1 ~\$13
- ❑ Purchase the cheaper 6" × 12" 1/8" thick plate; any color ...4 \$3 × 4
- ❑ liquid cement for acrylic material ...1 ~\$3 ?

2. Metal: Al sheet 12" × 12"

- ❑ small screws and nuts, ❑ Super Glue such as Crazy Glue ...1 ?

3. Metal: brass rods 3~5mm (~5/32) diameter

- ❑ brass rods → need to be cut to make at least 8, 12 ~16 rods; refer to the drawings for the length (~13cm) ... ?

4. Electrical:

the DC motor 3V 

D cell battery × 2

battery holder for 2 × D cell 

slide switch × 1 

wires, small screws and nuts → refer to the drawings

~\$3

~\$

~\$2

~\$2?

- 5. pulley large × 1, small × 1 
- thin rubber band for the belt

- 6. lids of the frozen juice  ← collect them; 6 needed; 5~7cm diameter;

It's coated so that it is suitable for preventing corona discharge.

- 7. Tools: acryl cutter, file or rasp, sand paper #1200~#1500~#2000, drills; acrylic cement, super-glue or hot bond.

Procedure in Outline:

I. Electro-static Generator

1. Cut brass rods; file and make the end round with the sand paper.
The rounded smooth surface prevents corona discharge from the tip.
2. Make the circular disk from the acrylic plate. Some shops sell such circular disks in a variety of sizes.
3. Use Super glue adhesives to attach the rods in the radial direction.
4. Attach lids for the attractors as well as the collectors.
5. Support the disk and attach the pulley.

II. Plate Capacitor

6. Cut Al sheet to fit the acrylic plate.
7. Al foil may be used on the back side of the acryl plate.
8. Construct a divider at the center with acryl strip.
9. Make the discharge bars.
10. Connect wires with the generator and attach the brass tip.

III. Clapper, Electro-static motor, etc.

11. Make the swinging Al plate in the middle between the two plates.

