Name: Melissa Chang | Group Members: Melissa Chang

AP PHYSICS II

Lab 4: Triboelectric Effect

Purpose

The purpose of this lab is to use the Faraday's properties of electrostatic induction

Background

Faraday claims that the net charge of the exterior of an enclosed space is equal to the charge of the object inside of the container (as seen in **Figure 1** to the right). Knowing this, we can quantitatively measure the charge of objects which are placed inside the container. We simply need to supply a "neutral reference" referred to as "ground" which, in this experiment, is attached to Earth Ground. You will be using a modified ice pail for this as seen in **Figure 2**.

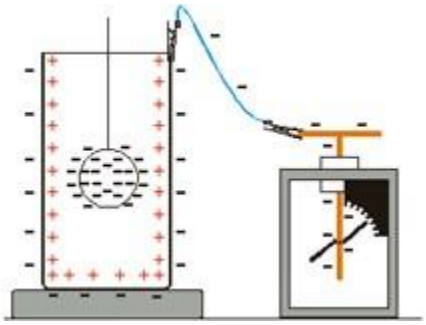

Figure 1

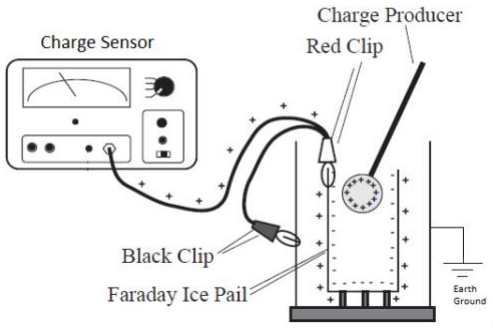

Figure 2

To record the charge on a wand, simply place is inside the ice pail but do not allow it to touch. Periodically, it will be necessary to ground (neutralize) the charge of the 2 wans as well as the inner ice pale. To do so, simply touch whatever you would like to ground to the outside mesh, which is attached to Earth Ground. To neutralize the inner ice pail, make a direct connection between ground and the pail with your as seen in **Figure 3**, HOWEVER, use an alligator wire rather than your finger to do this. This will assure the pail is grounded. You also have to periodically "zero" the charge sensor.

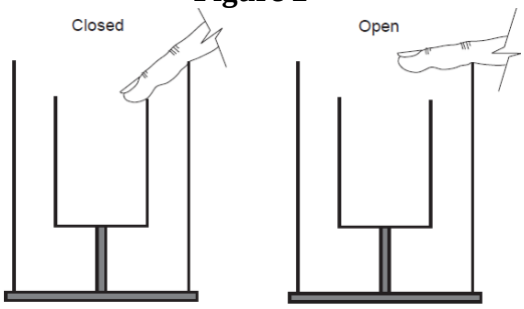

Figure 3

Procedure

1. Take the two wands and *gently* rub them together.
2. Electrons are exchanged through this rubbing. What is the process of electron exchange called?

   Electron Transfer

3. Place either of the two wands in the pail but do not let it touch the mesh.
4. Note the reading on the charge sensor. What has happened to the reading? How does this happen even when the charged object does not physically touch the mesh?

   The charge became positive or negative, depending on which wand you put in. The wand attracts the opposite charge to the center while repelling the same charges to the outside of the mesh.

5. Make sure everything is properly grounded, including the two wands before moving onto the next step.

Please ask the teacher to check your progress before moving on.

6. Perform the experiment again. This time, we will ***quickly*** measure the charge of each wand. Rub the 2 wands together, then dip one into the pail (without touching the pail), quickly remove, and then dip the other (without touching the pail) and quickly remove. Record the charges for each.

$Q_{blue\ wand}$ =_____-0.1_____, $Q_{white\ wand}$ =_____0.1_____

What do you notice about the charges of the two wands?

They are equal, but have opposite charges

7. What do you think the charge would read if you dipped both wands into the mesh (without touching the pail) at the same time? Try it to see if your prediction was correct.

We think that the charge sensor will read 0, and it was correct

8. Next, place a charged wand inside the pail (without touching the pail) and ***tap*** the pail with the grounding wire attached to the shield. Remove the wand and note the charge indicated by the charge sensor. Why do you think this happens?

When we put the blue wand in, there was a negative charge. Once it was grounded, the electrons moved to the ground, leaving more protons than electrons in the inner pail and giving it a positive charge when the wand was removed.

9. Lastly, ground everything and rub the wands together to build a charge once more. Dip one wand into the pail and allow it to touch the mesh this time. Remove the wand and note the reading of the charge sensor. Why do you are seeing this?

When we put the blue wand in and touched the inner pail, the electrons transferred from the wand to the pail, so the pail has more electrons and is negatively charged.

10. Draw diagrams which would indicate the location of charges for the following situations. Look at Figure 2 for an example.
    a. A Positively charged object inside (but not touching) the ice pail.
    b. A Negatively charged object inside (but not touching) the ice pail.
    c. A Positively charged object inside (and touching) the ice pail.
    d. A Negatively charged object inside (and touching) the ice pail.