Electrostatic phenomena (Item No.: P1432600)

Curricular Relevance

Area of Expertise: Physics
Education Level: Age 14-16
Topic: Electricity
Subtopic: Electric charge, electrostatics
Experiment: Electrostatic phenomena

Difficulty	Preparation Time	Execution Time	Recommended Group Size
Intermediate	10 Minutes	20 Minutes	2 Students

Additional Requirements:

Experiment Variations:

Keywords:

Task and equipment

Introduction

In this experiment the students will be introduced to the term “charge” and the electroscope.

Task

Equipment

Position No.	Material	Order No.	Quantity
1	Electroscope, Kolbe type, Electrometer	07120-00	1
2	Faraday pail	06231-00	1
3	Film, transparent, DIN A4, 100 sheets	08186-10	1
4	Support rod with hole, stainless steel, 10 cm	02036-01	1
5	Neon tube	06656-00	1
6	Connecting cord, 32 A, 1000 mm, green-yellow	07363-15	1
7	Connecting cord, 32 A, 500 mm, green-yellow	07361-15	1
8	Paper clippings, e.g. from a hole puncher		

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Set-up and procedure

Set-up and procedure

Experiment 1

- Place the Faraday pail on the electroscope (Fig. 1).
- Connect the 100-mm rod as a grounding rod to discharge the pail with the casing of the electroscope (this could also be possibly connected with the ground, e.g. with the grounding connection of a power supply).
- Scatter several paper clippings over the table.
- Rub the transparency on your clothes (e.g. cotton works best) or place on the table and rub with paper and hold it over the clippings.

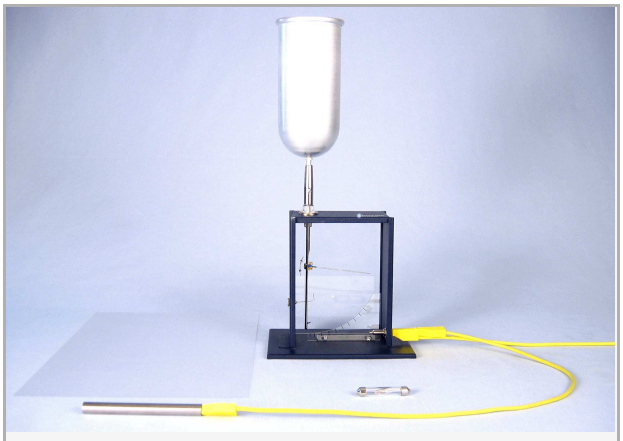

Fig.1

Experiment 2

- Rub the transparency again.
- Hold one end of the neon tube in one hand and stroke with the other end over the surface of the transparency (if possible make the room as dark as you can).
- Rub the transparency and stroke it along the Faraday pail, observe the direction of the pointer on the electroscope.
- Take one end of the neon tube and the grounding rod in one hand and touch the pail on the outer side with the other end of the neon tube, observe the neon tube and the pointer on the electroscope.

Results and evaluation

Results

Experiment 1

After you have rubbed the transparency, the paper clippings jump towards the transparency or move if the transparency is moved over them.

Experiment 2

A crackling sound is created and the neon tube illuminates, if it is held in one hand and moved over the surface of the transparency, which had been rubbed before.
If the transparency is stroked over the Faraday pail, the pointer moves. If the neon tube comes in contact with the pail (with connection to the electroscope housing), this lights up and the pointer moves back.

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Evaluation

That what exerts force on the paper clippings, what makes the air crackle and the neon tube light up is called “electric charge”. The transparency becomes electrically charged if it is rubbed. Electrical charges are now on its surface. These charges exert force on the paper clippings so that they move. This force is called electrostatic force.
If the charges are directed through a neon tube, then this lights up for a short period of time. If the charges have to travel through air along their path, the air crackles as a result.
The charges can also travel from the transparency to the pail of the electroscope. The pail is connected electrically with the pointer of the electroscope, however, it is electrically insulated against the housing. The charges can travel to the pointer, but not to the housing. The pointer of the electroscope moves, since the electric charges exert a force on it similar to the situation with the paper clippings. The charges on the pail and pointer can travel over the neon tube to the housing of the electroscope, whereby the pointer moves back. There is no longer a difference in charge between the pail and the housing.
The electroscope can be used as a measuring instrument for electrical charges.

Remarks:

1. Undesired movements of the electroscope pointer can be avoided by grounding the experimenting person and the electroscope housing.
2. The Faraday pail should not be touched accidentally with the hand, as this would falsify the results.
3. If electrostatic experiments are unsuccessful, then cleaning with methylated spirit may help to obtain the desired results. The insulation of the electroscope or the transparency may be contaminated.

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