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A New Electrostatic Generator that is Driven by Asymmetric Electrostatic Force

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Therefore, a friction charged Teflon sheet was used as a high voltage source in place of the high voltage power supply. As a result, it was confirmed by a simple experiment that the charge carrier transported +3.0nC charges from 0 volts to +160 volts.

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1. INTRODUCTION

“Electrostatic generator” has long history and it had been greatly studied in 17th and 18th century, after that it has been almost forgotten because electromagnetic generators become very popular. Today, safety pollution-free and low cost energy is strongly required. Therefore, electrostatic generator must be reconsidered.

The idea behind an electrostatic generator has been defined by lifting the charge to a high potential by mechanical force against the electric force that acts on this charge. It is impossible for the mechanical force to carry the charge directly. Therefore, the charge is packed into a suitable body. This body is called the charge carrier.

The most popular electrostatic generator is the Van de Graaff type electrostatic generator [1]. This was invented by Dr. Van de Graaff in 1931 in the USA. Today, it is used with a large voltage power supply. It can produce ten million volts. In this machine, an insulating belt is used as a charge carrier. Figure 1 shows an example of this generator.

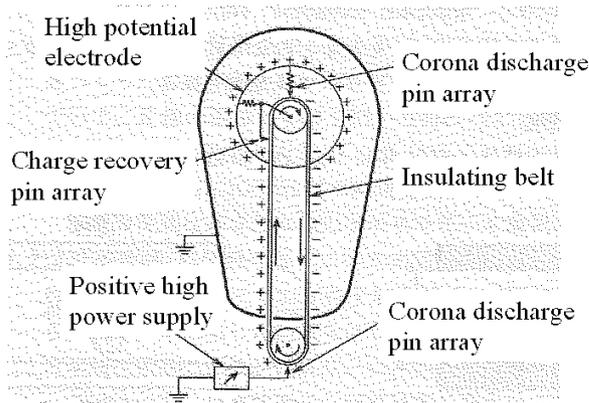


Figure 1 : Schematic layout of the Van de Graaff Electrostatic Generator

The insulating belt is moved in the direction of the arrow by a motor. The bottom corona discharge pin array places positive ions on the insulating belt. The positive ions on the insulating belt are carried to the high voltage electrode sphere by the mechanical force of a motor. Then, the positive charges are recovered to the high potential electrode.

In contrast, a new electrostatic generator was recently invented by this author [2]. Even if it is said as a new electrostatic generator, the basic principle of the generation is the same as the former electrostatic generator. Namely, the generator picks up charges into a charge carrier at a low electric potential place and transports the charge carrier to a high electric potential place.

For that purpose, an ordinary electrostatic generator has used a mechanical force. On the contrary, the new electrostatic generator uses an electrostatic force in place of a mechanical force.

Usually, the magnitude of the electrostatic force is the same when the direction of the electric field is reversed. However, this is true only for a point charge or a charged spherical shape conductor. On the contrary, the magnitude of the electrostatic force that acts on a charged asymmetric shape conductor is different when the direction of the electric field is reversed.

This very interesting new phenomenon was found by a simulation [3] and was recently confirmed by a experiment [4] This phenomenon was named Asymmetric electrostatic force. The new electrostatic generator is driven by Asymmetric electrostatic force in place of a mechanical force.

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A basic unit of the new electrostatic generator that is driven by Asymmetric electrostatic force is concretely shown in figure 2.

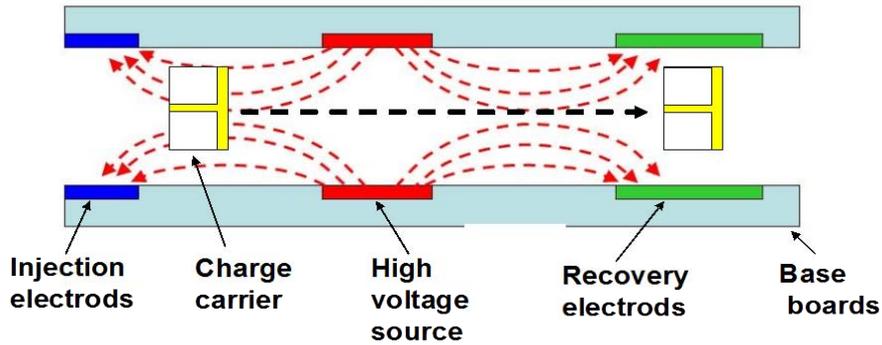


Figure 2 : Schematic Layout of A basic unit of the New Electrostatic Generator

This generator mainly consists of charge injection electrodes, high voltage sources, charge recovery electrodes and charge carrier. Those electrode and the high voltage source are disposed on insulating base board.

The high voltage source give a positive high voltage. The injection electrodes are grounded. The recovery electrodes are kept at a negative low voltage. As a result, the high voltage source and the injection electrodes produce a forward electric field for a negative charge between them. The high voltage source and the recovery electrodes produce a backward electric field for a negative charge between them. The line of electric force is depicted as red arrow dotted lines in figure 2.

A "T" character shape conductor is used as a charge carrier that carries negative charge (electron) from the injection electrodes to the recovery electrodes through the high voltage source.

Asymmetric electrostatic phenomenon produces a large electrostatic force in the forward field and it produces a weak electrostatic force in the backward field. Therefore, the charge carrier gains large kinetic energy in the forward field. Then, it loses some of its kinetic energy in the backward field. As a result, the charge carrier maintains extra kinetic energy, when it arrives between the recovery electrodes. The carried charge can be lifted to a higher potential by this extra energy.

This is the principle of the new electrostatic generator. This principle is a little different from that of the Van de Graaff electrostatic generator.

The principle of the both electrostatic generators is shown schematically in Fig. 3.

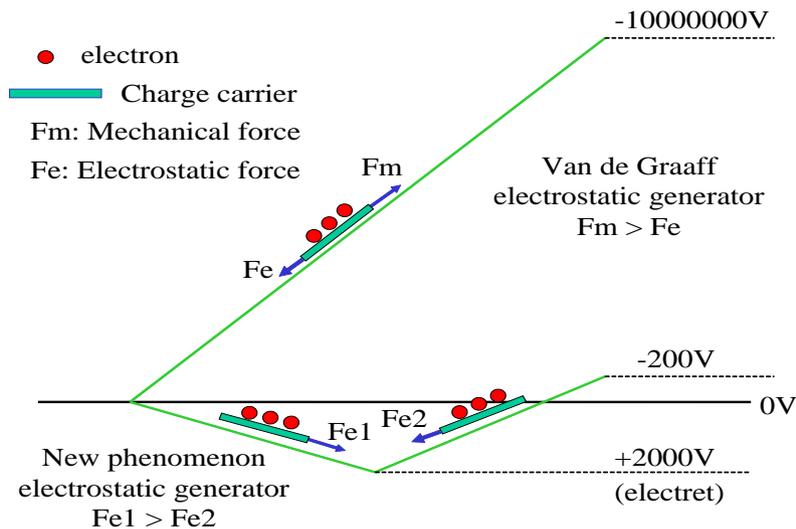


Figure 3 : Schematic Explanation of the Principles behind the Two Electrostatic Generators

In figure 3, the bold green line represents the potential, and the blue arrows represent the forces. The small red circles represent the electrons, and the sky blue plates represent the charge carriers. In the Van de Graaff electrostatic generator, the charge carrier is directly transported by a strong mechanical force, F_m , against the electrostatic force F_e .

In contrast, in the new electrostatic generator, the charge carrier is firstly moved in the forward electric field caused by electrets (the high voltage source) according to the electrostatic force F_{e1} . In this process, the charge carrier gains kinetic energy from the electric field. Then, the charge carrier is moved in the reverse electric field, expending the given energy against electrostatic force F_{e2} .

The shape of this charge carrier is asymmetric. Therefore, Asymmetric electrostatic force acts on this charge carrier. Thus, the absolute value of F_{e1} is larger than that of F_{e2} . As a result, the charge carrier can arrive at a potential that is larger (-200 V) than the initial potential (0 V).

The new electrostatic generator cannot produce ten million volts, but it does not require mechanical force. If the lifetime of the electret was infinite, the new electrostatic generator could generate electric energy forever without adding energy. As a result, this new electrostatic generator can solve the CO2 problem and the energy crisis at the same time.

At the first step of the development of the new electrostatic generator, a experiment instrument confirmed that Asymmetric electrostatic force can work as a driving force of the new electrostatic generator. Namely, the charge carrier could reach at the recovery electrode [5]. If Asymmetric electrostatic force did not

work, the charge carrier could not reach at the recovery electrode.

However, it is not yet confirmed that charges had been really carried from the injection electrode to the recovery electrode. If charges are recovered by the recovery electrode, its potential becomes higher. This is a very simple measurement, but it has not yet been performed.

In this step, a high voltage power supply was used as the high voltage source. However, there was a few leak current from the high voltage power supply to the recovery electrode. As a result, the recovered charges were cancelled by this leak current. This was because they had the other charge polarity and the quantity of them was almost the same.

Therefore, this measurement must be done with the other high voltage source that does not produce any leak current. This is the subject of this experiment.

II. EXPERIMENT INSTRUMENT

The high voltage source without leak current is of course the wellknown electret. Unfortunately, there was not the electret in this laboratory.

Therefore, a friction charged Teflon sheet was used in place of an electret. Both surfaces of a Teflon sheet were strongly rubbed by a nylon cloth one hundred times. As a result, both surfaces of the Teflon sheet was charged up minus high potential. .

This friction charged Teflon sheet was used as the high voltage source in the following experiment.

Figure 4 shows a photograph of the main part of the experiment equipment. Figure 5 shows the front view. And figure 6 shows a photograph of the capacitor and the surface potential meter.

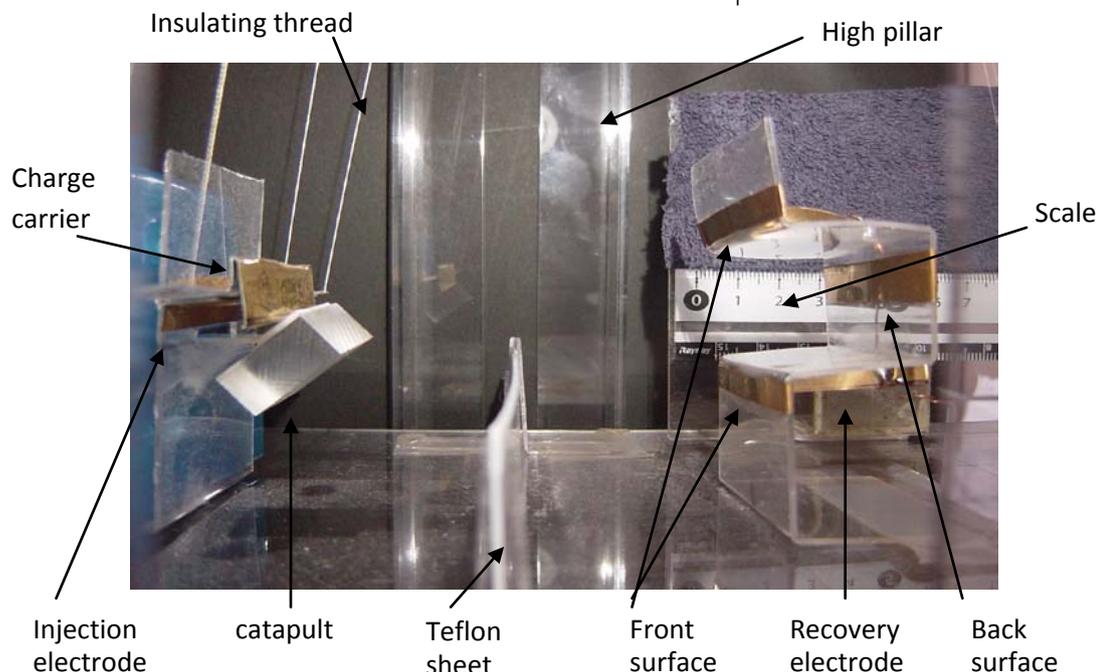


Figure 4 : A Photograph of the Main Part of the Experiment Equipment of the New Electrostatic Generator

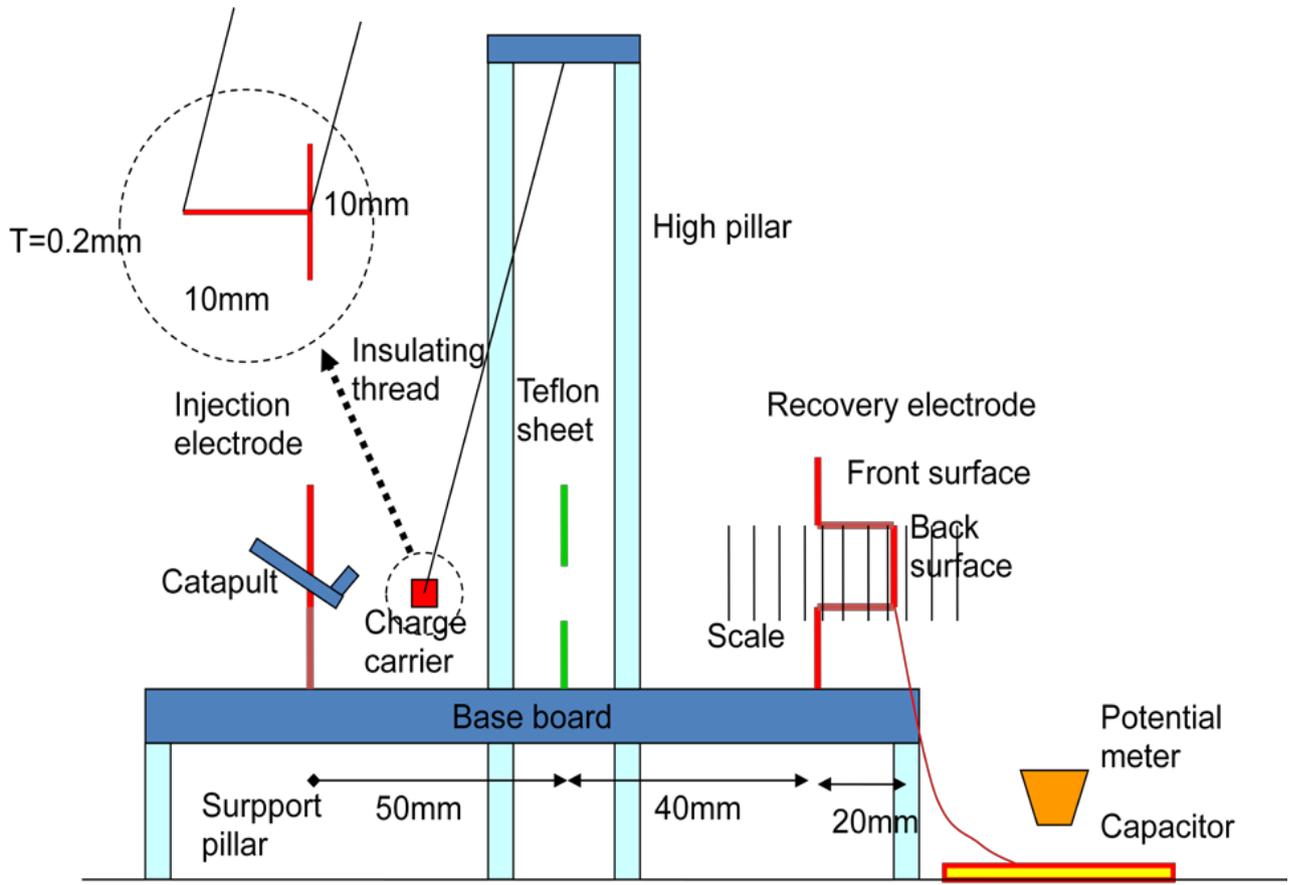


Figure 5 : Front View of the Experiment Instrument of the New Electrostatic Generator

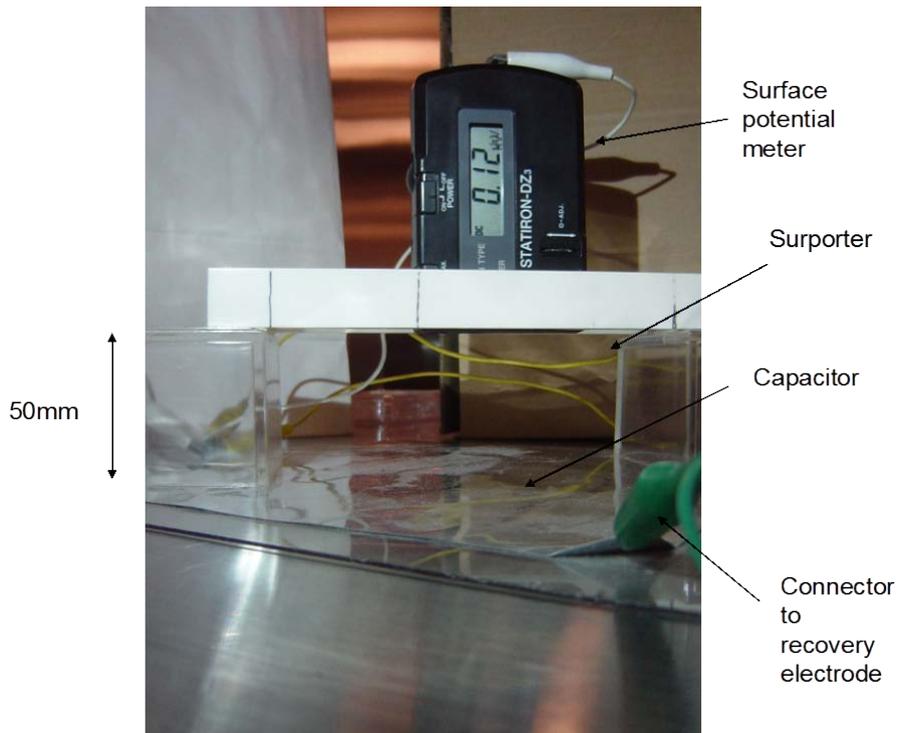


Figure 6 : A Photograph of the Capacitor that was Connected to the Recovery Electrode, and the Surface Potential Meter that is Displaying +0.12kv

This equipment mainly consists of a charge injection electrode, a friction charged Teflon sheet, a charge recovery electrode, and a charge carrier.

On the early stage of this experiment, upper and lower Teflon sheets was used as shown in figure 5. However, only lower Teflon sheet was used as shown in figure 4 on the following experiment. Because the potential of the Teflon sheet rapidly declined in a few minutes as shown in figure 7. Therefore, the potential of the lower Teflon sheet became useless before the upper Teflon sheet was prepared. Nevertheless, two electret sheets will be used on the future experiment. Because the potential of the electret does not decline for a long time.

The charge injection electrode has a catapult that releases the charge carrier from the charge injection electrode. The charge recovery electrode consists of a front surface electrode and a back surface electrode. And it was connected to the capacitor. The potential of it was measured by the surface potential meter.

In figure 5, the inside of big circle on the left is an enlarged picture of the charge carrier.

The injection and the recovery electrodes were made from aluminium plates with 0.2mm thickness and the charge carrier was made from one side gold gilding aluminium plates with 0.1mm thicknesses.

The injection electrode has a catapult at its center. The catapult holds the charge carrier temporary, and releases it automatically.

The charge recovery electrode had front surface electrodes and back surface electrode as shown in figure 5. As a result, the charge recovery electrode can perform semi-Faraday gauge. When the charge carrier touches the back surface of the charge recovery electrode, 90% charge on the charge carrier is transferred to the charge recovery electrode (simulation result).

The charge carrier was hung by the insulating thread at the center of this experiment instrument at first, then it was set on the catapult before an experiment start.

The insulating thread was made from raw silk that is used in Japanese kimono. A scale was placed on rear of the charge recovery electrode as shown in figure 5 for measuring the arriving position of the charge carrier.

The distance between the charge injection electrode and the center of this experiment instrument was 50mm. And the distance between the center of this experiment instrument and the front surface of the charge recovery electrode was 40mm.

The height of the friction charged Teflon sheet were 30mm. The heights of the lower part and the upper part of the front surface of the charge recovery electrode were 35mm and 20mm respectively. The width of the side part of the charge recovery electrode was 20mm.

And the height of the back part of the charge recovery electrode was 30mm.

The height and the width of the charge carrier were 10mm and 10mm respectively as shown in figure 5. The height of high pillars and the support pillars were 500mm and 150mm respectively. The length of the threads were 305mm.

The charge carrier consists of a T character shape conductor and a PET resin sheet. This sheet supported the conductor and it was hung by the insulating thread. As a result, this charge carrier was always maintained as electrically floating condition.

The surface potential meter (SHISHIDO ELECTROSTATIC: STATIRON-DZ 3, Japan) required a large measurement area, namely 20cm*20cm. Therefore, the capacitor was made with the same area by hand. It was made with a bottom aluminium sheet, a PET film and a top aluminium sheet. The thickness of the film was 1.0mm and the Relative permittivity is 3.2. As a result, the electric capacitance of this capacitor becomes 1100pF.

III. EXPERIMENT RESULTS

At the first experiment, the Teflon sheet without friction was placed at the center of this equipment. In this situation, there was no electric field because the Teflon sheet was not charged. Then, a weight of a catapult of the charge injection electrode was picked up.

As a result, the charge carrier was released from the catapult automatically. And it started to move to right direction by a tension of a thread against an air resistance. The charge carrier passed the no charged Teflon sheet. And it passed through the front surface of the charge recovery electrode. But, it never reached the back surface of the charge recovery electrode.

The distance between the center of this equipment and the charge injection electrode was 50mm and the distance between the center and the front surface of the charge recovery electrode was 40mm. Therefore, the charge carrier can pass through the front surface against an air resistance. The arriving position of the charge carrier was about 45mm from the center. This result means that, the lost distance by the air resistance was about 5mm.

However, the distance between the center and the back surface of the charge recovery electrode is 60mm. Accordingly, the remained distance to the back surface of the recovery electrode was 15mm. Therefore, Asymmetric electrostatic force must add an energy that can transport the charge carrier longer than 15mm.

At the next trial experiments, the Teflon sheet was charged by strong friction. And it was set up at the center of the experiment instrument as shown in figure 4.

In this forward electric field, induction charges are injected from the grounded charge injection electrode to the charge carrier. An strong electrostatic force acts on this charge. Then, the charge carrier was released from the catapult and It started to move to right direction by this strong electrostatic force and the tension of the thread, against the air resistance force.

This time, the charge carrier passed the friction charged Teflon sheet, and hit the back surface of the charge recovery electrode.

When the charge carrier hit the back surface of the charge recovery electrode, charges that was carried by this charge carrier was almost recovered to this charge recovery electrode automatically.

After that, the charge carrier returned to the charge injection electrode automatically. Because the distance between the center and the back surface was 60mm and the distance between the center and the charge injection electrode was 50mm.

Then, the returned charge carrier will get a next injection charge and hit the recovery electrode again. This hitting and return movement will be repeated until the voltage of the friction charged Teflon sheet becomes to the lower limit voltage.

A capacitor that has 1100pf was connected between the charge recovery electrode and the ground. Therefore the surface potential of the capacitor changes from 0 volts to about +3 volts, when a +3nC charge (Simulation result) is recovered from the charge carrier to the charge recovery electrode.

However, the minimum unit of this surface potential meter is 10 volts.

Therefore, the potential difference that is more than 10 volts is required to confirm the charge transfer from the grounded charge injection electrode to the charge recovery electrode.

Namely, the charge carrier must hit the back surface of the charge recovery electrode more than 4 times continuously.

Unfortunately, the best result of this trial ten experiments was only 2 times .

The main reason of less than 3 times was that the charge on the Teflon sheet leaks quickly. Figure 7 shows a change of the surface potential of the Teflon sheet after friction charging.

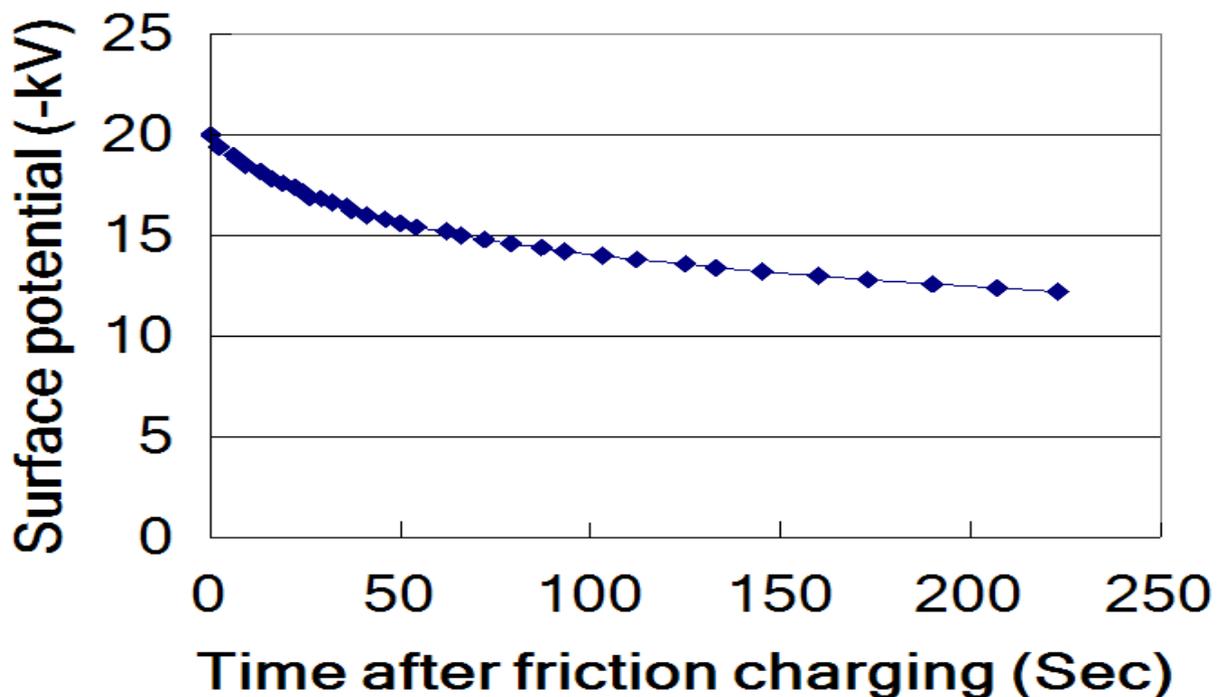


Figure 7 : A change of the surface potential of the Teflon sheet after friction charging

This was measured at 15°C,10%RH condition. Therefore, the rapid decline of the potential of the friction charged Teflon sheet can not be improved at any other conditions.

When a high voltage power supply was used as the high voltage source, the lower limit of the voltage for transporting the charge carrier to the back surface of the

recovery electrode was about 20kV. Therefore, when the friction charged Teflon sheet was used as the high voltage source, the charge carrier will hit the recovery electrode only one time. This was because the decrease of the surface potential of the charged Teflon sheet was very rapid as shown in figure 7.

However, if this experiment would be repeated many times, the potential of the recovery electrode must rise gradually in proportion to the number of hitting of the charge carrier. Therefore, the final experiments

confirming that charges were really transported from the injection electrode to the recovery electrode, were many times repeated with using the friction charged Teflon sheet.

Figure 8 shows the result of this many times repeated experiment.

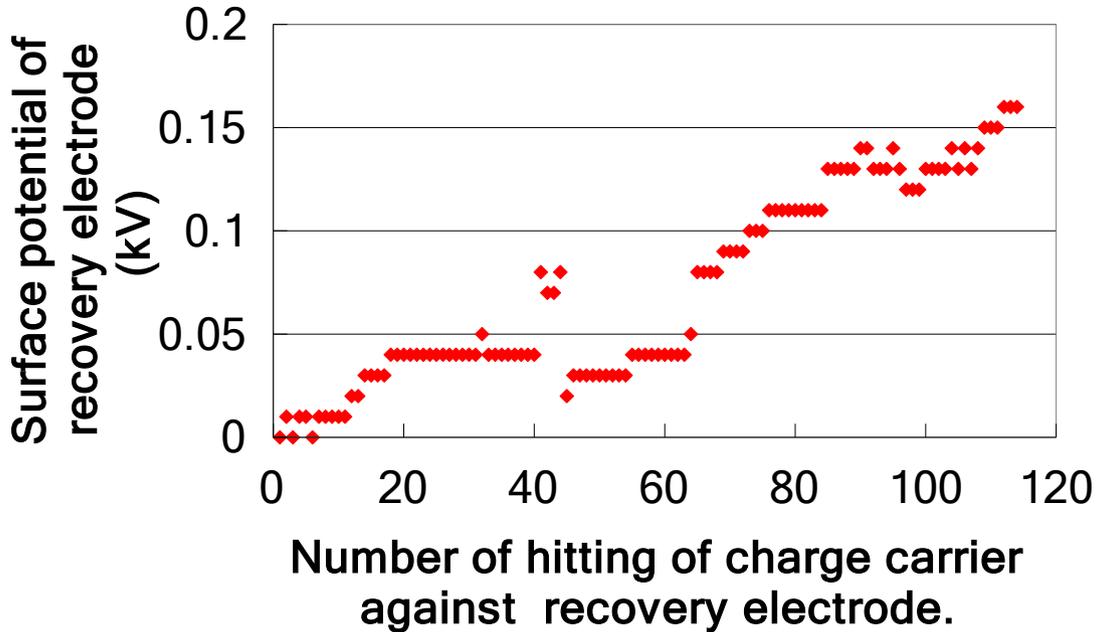


Figure 8 : The Surface potential of the recovery electrode as a function of the number of hitting of the charge carrier against the recovery electrode

It is apparent from this graph that the potential of the recovery electrode almost becomes higher in proportion to the number of hitting by the charge carrier. However, there are two times decline of the potential. The reason of this two declines is thought as a partial discharge by a mistake hand touch to the top aluminium sheet of the capacitor. The raise rate of the potential is about same after the two declines. It is about 2.7 volts per one hitting. Namely, the charge carrier transported about +3.0nC charges every time from the injection electrode to the recovery electrode. The potential of the recovery electrode of the last experiment was +160 Volts. Therefore, it was confirmed that charges were really transported from the low potential injection electrode to the high potential recovery electrode by the charge carrier.

IV. CONCLUSION

In the new electrostatic generator that is driven by Asymmetric electrostatic force, theoretically the charge carrier can transport a few charges from the low potential charge injection electrode to the high potential charge recovery electrode. This phenomenon has been confirmed by the simple experiment equipment that use the friction charged Teflon sheet as high voltage source.

However, this equipment needed every time friction charging of the Teflon sheet because its charge decrease was very rapid. Therefore, on the next research, the new equipment must use an electret as the high voltage source. The charges of the electret does not decrease for a long time. As a result, the new equipment will continue to generate electricity for a long time with only one electret.

REFERENCES RÉFÉRENCES REFERENCIAS

1. Handbook of electrostatics (Japan) (1998) p.962
2. K. Sakai, "Asymmetric Electrostatic Forces and a New Electrostatic Generator", first ed. Nova Science Publish, New York, 2010 p.41-p.54
3. K. Sakai, "Asymmetric Electrostatic Forces and a New Electrostatic Generator", first ed. Nova Science Publish, New York, 2010 p.25-p.39
4. K. Sakai, "Asymmetric electrostatic force", Journal of Electromagnetic Analysis and Applications 2014 on the Special Issue on Electromagnetic Field Theory, p.253-p.268
5. K. Sakai, "A first trial for the new electrostatic generator that will solve the CO₂ problem", *Proceedings of 2014 ESA annual Conference (2014)* B3.