2015 Annual Meeting of The Institute of Electrostatics Japan
Tokyo Metropolitan University
September 24-25, 2015

24aA-1

September 24th (Thu.), <10:00-12:00>
Room 1

Surface charging when the water droplet dropped with a charge (Second report)

○Yusuke FUTAMI and Hirofumi SHIMOKAWA

Kanagawa Institute of Technology

Abstract:

This report examined charging characteristics of the surface in dropping water droplet which was charged on super-water-repellent agent (HIREC1100). In the previous report, it was shown the surface was charged negatively, when +200pC water droplet was dropped in the water-repellent surface. Is this report, the similar experiment was carried out in water droplet which electric charge which in bigger then +200pC. The surface was charged positively in case of the +300pC water droplet. And, the surface was charged negatively in case of +220pC. Surface density of charge in which the surface in not charge see to be 24~30μC / m2.

2015 Annual Meeting of The Institute of Electrostatics Japan
Tokyo Metropolitan University
September 24-25, 2015

24aA-2

September 24th (Thu.), <10:00-12:00>
Room 1

Current waveform and electric charge in electrostatic spraying(second report)

Kazumasa CHIKU, Hirofumi SHIMOKAWA

Kanagawa Institute of Technology

Abstract:

In this study, current waveform detected in the electrostatic atomization by the nozzle was made to synchronize with the image of high-speed camera. The change of the process according to the resistivity and the nozzle gauge of the electrostatic atomization phenomenon is observed from the synchronization, and the electrification process is revealed. The electric charge was calculated from pulse current form in dependent on the value of applied voltage and the nozzle gauge. The electric charge when the nozzle 23G has changed irregularly. After the droplets from the liquid thread breakup, the electric charge is increased by the liquid surface or thread vibrates greatly.

2015 Annual Meeting of The Institute of Electrostatics Japan
Tokyo Metropolitan University
September 24-25, 2015

24aA-3

September 24th (Thu.), <10:00-12:00>
Room 1

Flow Electrification between Pure Water and PFA with Intermittent Flow

○Daichi Obata, Hiroshi Tasaka, Sunao Katsuki, Hidenori Akiyama

Graduate School of Science and Technology, Kumamoto University

Abstract:

Flow electrification phenomenon between pure water and PFA (PerFluoroAlkoxyethylene) tube was described in this paper. Essentially, pure water flowing in a PFA tube is positively electrified, but negative charges on the head of the intermittent flow are observed in high Reynolds number conditions. The amount of the negative charges depends on flow velocity, tube length, and initial residual charges on the PFA tube. These results indicate that initial residual charges on the PFA tube are collected by the head of water flow. In spite of the relatively high conductivity of pure water, the collected negative charges are not diffused because the two-phase flow condition is mixed and atomized, which means insulated condition.

2015 Annual Meeting of The Institute of Electrostatics Japan
Tokyo Metropolitan University
September 24-25, 2015

24aA-4

September 24th (Thu.), <10:00-12:00>
Room 1

Thermal Endurance of Multi-doped Nanocomposite Polymeric Insulating Material Using Azo-benzoic Compound

Yoshiaki YAMANO

faculty of Education, Chiba University

Abstract:

Thermal endurance evaluation according to IEC 60216 series was carried out on the multi-doped nano-composite polymeric insulating material which we newly designed for high resistance to the electrical tree degradation. The base material was LDPE, which was added with nano-particle of Al2O3 and azobenzoic compound. The size of the particle is about 50 nm in average. The aging test was carried out using 3 chambers controlled at 85 ºC, 90 ºC and 95 ºC, individually. The results indicated that RTE of the test sample was almost 40 % higher than that of LDPE, which indicates very high performance against the thermal degradation.

2015 Annual Meeting of The Institute of Electrostatics Japan
Tokyo Metropolitan University
September 24-25, 2015

24aA-5

September 24th (Thu.), <10:00-12:00>
Room 1

Observation of Ultra-short Pulsed Discharge in Supercritical Carbon Dioxide

○Miyuki OTA*, Tomohiro FURUSATO**, Takahiro IMAMICHI*, Takashi SAKUGAWA*, Sunano KATSUKI*, and Hidenori AKIYAMA*

*Graduate School of science and technology, Kumamoto University, **Graduate School of Engineering, Nagasaki University

Abstract:

This paper deals with pre-breakdown phenomena in supercritical carbon dioxide (SC-CO2) with ultra-short positive pulsed voltages. Previously, we studied a cylindrical shock wave propagated from a filament-like positive streamer channel with a rise time of 90 ns, peak voltage of 60 kV and half-width of 170 ns. For this study, we developed an ultra-short nanosecond pulse generator with a rise time of 6.6 ns, peak voltage of 9 kV and half-width of 15 ns. The voltage was applied to a needle-to-plane electrode in SC-CO2. The gap length was set at approximately 320 μm. A filament-like streamer was observed using the shadowgraph method as with our previous study.

Furthermore, unique images of shock waves were observed in which the shock wave appeared to propagate from the vicinity of the needle tip. In addition, a relatively weak shock waves along the streamer channel were also observed. This data allowed us to infer that heating of the streamer vicinity of the needle tip was enhanced compared with the streamer tip.

2015 Annual Meeting of The Institute of Electrostatics Japan
Tokyo Metropolitan University
September 24-25, 2015

24aA-6

September 24th (Thu.), <10:00-12:00>
Room 1

Measurement of infrared emission spectrometry of O2(a1Δg) in atmospheric-pressure helium plasma jet

○Yuki Inoue, Ryo Ono

Graduate School of Frontier Sciences, The University of Tokyo

Abstract:

The atmospheric-pressure helium plasma jet is an important device for plasma biomedical applications. We measured the density of singlet delta oxygen O2(α1Δg) in the plasma jet. O2(α1Δg) is effective in the treatment of blood sterilization and cancer. The measurement result shows the O2(α1Δg) density under the high voltage electrode is approximately 2-8 ppm. The O2(α1Δg) density become maximum when the oxygen concentration is 0.2% and the peak-to-peak voltage is 11kV.

2015 Annual Meeting of The Institute of Electrostatics Japan
Tokyo Metropolitan University
September 24-25, 2015

24aA-7

September 24th (Thu.), <10:00-12:00>
Room 1

DEVELOPMENT OF LOW IMPEDANCE HIGH VOLTAGE NANOSECOND PULSED POWER GENERATOR

○Satoru MATSUMOTO*, Shintaro KODAMA*, Douyan WANG**, Takao NAMIHIRA** and Hidenori AKIYAMA **

* Graduate School of Science and Technology, Kumamoto University , **Institute of Pulsed Power Science

Abstract:

This study focuses on improving our nanosecond pulse generator by changing insulation and dielectric medium and improving the configuration of the spark gap switch (SGS). The insulation and dielectric medium were changed from silicone oil to ethylene glycol, with εr referring to the dielectric constant. The dielectric constant of silicone oil and ethylene glycol are 2.7 and 44. Therefore, characteristic impedance of silicone oil and ethylene glycol become about 50 Ω and 12.5 Ω. The pulse width of silicone oil was extended from 5.0 ns to 20 ns in ethylene glycol. Therefore, pulse width can be varied by changing the length of the triaxial Blumlein line, with the length of the line 500 mm under the previous configuration but 125 mm using the reconfigured generator. The previous SGS path was longer than the one we have currently. Therefore, due to inductance inside the switch, we developed a low inductance new SGS. It is developed five generators by combining the three previous factors. The output current of Generator 5 is about 2.6 times that of Generator 1. Generator 5 has the highest power, making it the best generator.