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

25aA-1

September 25th (Fri.), <10:00-10:45>
Room 1

Minimally-Invasive Electrically-induced Bubble Injector for Patterning to Variety of Biological Materials

Kazuki Takahashi,Yoko Yamanishi

Shibaura Institute of Technology, JST PRESTO

Abstract:

We have successfully developed minimally-invasive bubble injector which is applicable for variety of biological materials with various hardness. The novelty is that the minimally-invasiveness of injection whose resolution is in the range of 10 - 200 μm, and hence cellular-scale injection and two-dimensional patterning injection can be fulfilled. The novelty of the present techniques are (1) unique perforation techniques by means of cavitation phenomena using high-speed bubbles cavitation, (2) powerful but minimally invasive precise perforation to wide range of biological materials, (3) high versatility that bubble-injector can be used under water and in the air. The developed injector can be used for wide range of biomedical study, especially in gene engineering. This technique has advantages over the conventional electroporation or ultrasound operation in terms of localization of injection and ability of transportation of material.

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25aA-2

September 25th (Fri.), <10:00-10:45>
Room 1

A Study of Mechanism of High Piezoelectric Performance Poly (lactic acid) Film Manufactured by Solid-State Extrusion

○Mitsunobu Yoshida*,**, Yoshiro Tajitsu**

○*Mitsui Chemicals Inc., **Graduate School of Engineering, Kansai University

Abstract:

A piezoelectric film of poly (L-lactic acid) (PLLA) has no pyroelectricity and has a high voltage output coefficient g; thus, recently, it has become a key material for realizing pressure sensors with high sensitivity.

For realizing small sensors with high sensitivity, the piezoelectric performance of PLLA films should be improved. Previously, we investigated solid-state extrusion (SSE) to improve the piezoelectric performance of poly (D-lactic acid) (PDLA), which showed that piezoelectric constant d14 reached 18.9 pCN-1. In this paper, we conducted quantitative crystal structural analysis by X-ray diffraction (XRD) and geometric structural analysis of a helical chiral polymer to investigate the mechanism of the high piezoelectric performance of SSE films.

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25aA-3

September 25th (Fri.), <10:00-10:45>
Room 1

Fundamental characteristics of discharge in the short gap length using the Cockcroft-Walton circuit

Yuma SANO

Department of Mechanical and Electrical Engineering, Nippon Bunri University

Abstract:

We were using a battery to power in this study. We have to control the voltage by the switch. And the positive DC voltage is applied to the needle electrodes in the Cockcroft-Walton circuit through the DC-AC inverter. The experiment of the basic properties of corona discharge in the closed-type needle-to-plane electrode system reactor we went.

Atmospheric pressure non-thermal equilibrium plasma is utilized in the removal of air pollutants. The Cockcroft-Walton circuit is used in the accelerator. It was applied to the needle electrode by raising the voltage at the Cockcroft-Walton circuit. It was discharged in a dark room. Bluish white light was generated at the tip of the needle electrode If you confirm with the naked eye. DC discharge current pulsations appear to be affected by the DC-AC inverter. It is measured by the oscilloscope.

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25aB-1

September 25th (Fri.), <11:00-12:00>
Room 1

Low ozone emission characteristics of a carbon brush ionizer

Hak-Joon Kim, Bangwoo Han, Chang-Gyu Woo, Yong-Jin Kim

Korea Institute of Machinery and Materials (KIMM)

Abstract:

The concentration of ozone produced as a by-product of ESP usage was measured by changing the voltage to an ionizer with thin carbon fiber brushes, and it was compared to those from general ionizers which were made of different materials for high voltage electrode or were made of carbon electrodes with different diameters and numbers. This was done in order to understand the reason why carbon brush ionizer emits low ozone, which has not been researched until now. The experimental results showed that the low ozone emission from a carbon brush ionizer was possible not by material but by sharpness of the high voltage electrode and by multi electrode effect.

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25aB-2

September 25th (Fri.), <11:00-12:00>
Room 1

Hak-Joon Kim, Bangwoo Han, Chang-Gyu Woo, Yong-Jin Kim

Korea Institute of Machinery and Materials (KIMM)

Abstract:

A novel two-stage ESP for IT manufacturing industries was developed that uses indirect type carbon brush charger which is located outside of a main gas flow duct to achieve perfect separation from contact of polluted gases, and imposes additional electric field between upper and bottom plates of the charging stage to enhance collisions between ions and particles thus increase particle charges. The performance of the ESP was evaluated experimentally for ultrafine particles with a mean diameter of 100 nm based on number by varying the voltages for chargers and for additional electric field imposing, and number of the chargers. The total air flow rate for the test were approximate 110 L/min with 10 : 1 ratio of main and mixing flows in the ESP, and applied voltages for chargers and additional electric field were from -10 to -22 kV, and from -5 to -10 kV, respectively. Collection efficiencies in the ESP were linearly proportional to increase in number of chargers and applied voltage to chargers, while those were inversely proportional to increase in applied voltage for additional electric field. The collection efficiency of the ESP was reached to over 90% based on total particle number at the applied voltage to triple chargers of -15 kV and additional electric field between upper and bottom plates in charging stage of -6 kV/ 100 mm

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25aB-3

September 25th (Fri.), <11:00-12:00>
Room 1

Study on influence of exhaust gas temperature in the electrostatic precipitator

○Mitsuhiro Takasaki, Hirofumi Kurita, Kazunori Takashima and Akira Mizuno

Dept. of Environmental and Life Sciences, Toyohashi University of Technology

Abstract:

A diesel engine is one of the most fuel efficient engines and expected to save energy even it is necessary to remove particulate matter (PM) contained in the exhaust gas. Diesel particulate filter (DPF) has been established as a key technology in reducing diesel PM, however, technological improvements to pressure drop is still required.

Therefore, we focused on an electrostatic precipitation by taking advantage of its small pressure drop and efficient collection of nano-sized particles. However, one of the problems with an electrostatic precipitator (ESP) is abnormal dust re-entrainment. To cope with this problem, we studied the effect of gas temperature and surface roughness of collecting electrode on electrostatic precipitation of diesel PM. As a result, lower gas temperature showed stable collection and high collection efficiency of particles. In addition, varying the surface roughness of collecting electrode was effective for improving the collection efficiency by installing a mesh on it.

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25aB-4

September 25th (Fri.), <11:00-12:00>
Room 1

Water purification using a packed bed reactor with pulsed electric field

○Yudai TAKEDA, Yuki TAINO, Hirofumi KURITA, Hachiro YASUDA, Kazunori TAKASHIMA and Akira MIZUNO

Dept. of Environmental and Life Sciences, Toyohashi University of Technology

Abstract:

In previous study, we have developed a novel water treatment technique to remove and inactivate bacteria such as Escherichia coli (E. coli) utilizing dielectrophoresis (DEP) induced by pulsed high voltage application. The result showed that E. coli was successfully trapped by DEP force and at the same time, inactivated by pulsed electric field (PEF). However, the effect of electrical properties of sample water on the collection and sterilization characteristics was not studied. In this study, influence of the conductivity of the samples on the collection and sterilization of E. coli was investigated. The conductivity of the samples was adjusted by NaCl and mannitol addition as well as bacteria concentration. As a result, removal and inactivation rate of E. coli decreased with conductivity of the sample. But around 50% inactivation rate was observed even for highly conductive sample.

Comparison between E. coli and PS beads having nearly the same size showed that E. coli was collected much more effectively than PS beads probably because of its agglomerative nature. High inactivation efficiency by PEF can be resulted from the agglomeration on the pellet surface, through which it is more likely for the cell membrane to be broken when the pulsed electrostatic field is induced.