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

*24aB-1*

September 24th (Thu.), <10:00-12:00>
Room 2

# Study on the discharge electrode of an electrostatic precipitator

○Yoshiyuki KISANUKI*, Yuji MAKISHIMA*, Shinjirou KATSUSHIMA*,Kazunori TAKASHIMA** and Akira MIZUNO**

AMANO Co., Ltd*, Toyohashi University of Technology**

Abstract:

By adopting ISO14000 series etc., improvement of the working environment in the factory has become an important issue. The authors have verified the effectiveness of the discharge electrode against sedimentation of the oil mist at its tip. The electrodes used in the experiment are; A) needle?plate, B) needle-circular hole, C) protruding needle-circular hole.

In order to confirm the influence of the sediment attached on the needle tip, we performed simplified measurement of ionic wind, verification of the charging efficiency and the field experiment. From the results of ionic wind measurement and the field experiment, it was found to be effective to direct the needle tips in the same direction as the main gas flow. From the verification of the charging efficiency and the field experiment, the shape C) , newly invented by us, of the protruding needle-circular hole was the most effective as a discharge electrode for an electrostatic precipitator to collect fine suspended particles.

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# Electrostatic Precipitator using the weak Corona Discharge generated by Carbon Fiber Flocking Electrodes

Atsushi KATATANI*, ○Hiroshi HOSONO**, Hikaru MURATA**, Hiroshi YAHATA** and Akira MIZUNO***

Panasonic Environmental Systems & Engineering Co., Ltd*, ○Panasonic Ecology Systems Co., Ltd**, Toyohashi University of Technology***

Abstract:

The authors have been studying the electrostatic precipitator (ESP) which can charge particles without using corona discharge to collect particles with Coulomb's force in strong electric field. In this method, we have tried to use "induction charging". DC high-voltage lower than corona-start-voltage is applied to electrostatic-flocked electrodes with carbon fibers. Particles are attracted to the fibers due to gradient force. Then, particles are induction-charged just as particles that have attached to the fibers are re-entrained. Because of the strengthened electric field by converged electric-force-lines, the particles should acquire larger induction charge compared to the case of plate electrodes without flocked fibers. After these particles detach from the fibers, they are collected by the following parallel plate electrode assembly. Even without corona discharge, the experimental results in the last study showed that a certain value of particle collection efficiency was observed. The observed collection efficiency was stable for smaller particles (from 0.3 to 1.0 μm), however, was unstable for larger particles (from 1.0 to 5.0 μm). In this study, when a weak corona discharge was generated in the flocked electrodes with carbon fibers, the collection efficiency of 80% or higher, equivalent to conventional ESPs, was obtained in all the diameter range using only 10% of the electric power consumption compared with conventional ESPs.

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Room 2

# Basic Characteristics of Ionic Wind Devices Prepared by a 3D Printer

○Wataru IMAGAWA*, Masataka KAI*, Shouhei MATSUNARI*, Shuichi AKAMINE*,
Ryuta ICHIKI*, Seiji KANAZAWA*, Koji KANAZAWA**

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Abstract:

The corona discharges are widely used in many industrial applications such as gas cleaning, particle precipitation, and gas flow control. Essentially, the corona discharge apparatus consists of the metallic electrodes and those supporting insulators. The insulating parts are usually made of plastic, ceramics or glass. Therefore there is a limit for the design and fabrication of the apparatus. We have introduced 3D printing technology into the development of non-thermal plasma reactors. In this study, ionic wind devices based on the dc corona discharge is studied. Except for the electrodes, the ionic wind devices were prepared by using a 3D printer. The electrode of corona discharge is a needle-to-mesh configuration. The performance of the ionic wind devices was evaluated with respect to the gas flow velocity and its spatial distribution. Moreover, we examined the effect of the array by the multi-devices. As the advantage of the array, it is possible to increase the ionic win!

d velocity and to control the air flow distribution widely.

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Room 2

# Development of an ion wind use humidification system

○Takahiro SAKAI*,Yasutaka INANAGA*,Akira MORIKAWA*,Keita SAKAI*,Tasuku IZUTANI*

*Mitsubishi Electric Co. Advanced Technology R&D Center

Abstract:

We examined vaporization-type humidification performance control characteristics, and we paid our attention about the humidification method that used an ion style together with a filter. As a result, the wind velocity to water absorptive porous metal increased by injection electric discharge electricity and understood that the humidification performance improved. In this way understood that control of the quantity of humidification was possible.

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# Decomposition of the Water Insoluble Odor Using Corona Discharge

○Chisaki MATSUMOTO, Nozomi HARASAWA, Josuke HONMA, Sayaka MITSUI, Azuchi HARANO

Graduate School of Science and Technology, Gunma University

Abstract:

This presentation describes the bench scale experiments of decomposition of the water insoluble odor (the flow rate of odor gas about 1 m3/min) using corona discharge. The odor concentration was adjusted by the bubbling of ethyl mercaptan solution diluted the excess ethanol into cooling container. The concentration of ethyl mercaptan was successfully controlled by the flow rate of bubbling gas (N2) and it enabled a stable experiment for a long period of time. The decomposition of ethyl mercaptan was accomplished by the corona discharge reactor consisted of four stainless wires and achieved the 50% conversion at an initial concentration of 79ppb and electric power of 15W. Furthermore, the experimental results suggested that the most of ethyl mercaptan directly was due to decomposition into corona plasma not oxidation of the ozone produced by corona discharge.

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# Removal of High Concentration N2O Anesthetic Gas Using Nonthermal Plasma and Adsorbent

○Tomoyuki KUROKI*, Toshiaki YAMAMOTO*, Shunsuke NISHII*, Masayuki AKITA**, and Masaaki OKUBO*

* Department of Mechanical Engineering, Osaka Prefecture University, ** Enomoto BeA Co., Ltd.

Abstract:

The high concentration of N2O removal system was investigated using nonthermal plasma combined with adsorbent. N2O gas that simulates the waste gas from anesthetic equipment used for operation rooms was decomposed using the surface discharge plasma reactor. When N2O was decomposed, NOx was generated. The generated NOx was adsorbed by NOx adsorbent. As a result, 66% of N2O decomposition efficiency was achieved with 12.8% of N2O, the flow rate of 1.1 L/min, and the input power to the plasma reactor of 375 W. Furthermore, 0.4% of NO and 1.0% of NO2 were generated upon N2O decomposition; both of them were removed using adsorbent. The adsorbed NOx was able to be decomposed with nitrogen plasma. It was demonstrated that high concentration of N2O removal system can be accomplished using nonthermal plasma combined with adsorbent process.

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# Study of hexadecane removal using atmospheric microplasma electrode

kazuo Shimizu

Organization for innovation and Social Collaboration, Shizuoka University

Abstract:

In recent years, the deterioration of IAQ (Indoor Air Quality) became a big concern. Because indoors is the place where we spend most of our life, IAQ is an important factor to be considered for a comfortable and healthy living. In this study, we evaluated by-product and deodorization process of hexadecane in small and large capacity box by using microplasma electrode. Both small and large capacity deodorization process could reduce hexadecane each of 90 % and 70 %, while CO and N2O were generated as byproduct.