

9aC-1

September 9th (Tue.), <10:00-12:00>
Room 2

Active Fluid Control by Multi-electrode Microplasma Actuator

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Abstract:

In this study, multi-electrode microplasma actuator for active fluid control was investigated. Our microplasma electrode could generate plasma by relatively low voltage less than 1.5 kV due to the μm discharge gap. Such low voltage is easily controlled by semiconductor switches and small step-up transformer. This contributes miniaturize the system on parallel operation the electrodes system. Therefore, more active flow control could be carried out compared as traditionally plasma actuator. Air flow induced by the atmospheric microplasma was measured by the Particle Image Velocimetry (PIV). Incense smoke sub-micron diameter was used for tracer particles and Nd YVO₄ 532 nm laser was utilized to visualize the tracer particles. By applying sinusoidal voltage 1.3 kV, 15 kHz, to the multi-electrode microplasma electrodes, air flow velocity of 0.1~0.6 m/s was obtained and its direction (left, right, up, down) was controlled without changing the electrode geometry.

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Room 2

Selective Production of Radicals Using Vacuum Ultraviolet Light

Yusuke Tokumitsu

The University of Tokyo

Abstract:

According to the recent studies of plasma medicine, it is expected that radicals have the therapeutic and sterilization effects. But the reaction mechanism of the plasma is so complicated that it is difficult to clarify which radicals are really effective. Therefore, we developed a new device which uses a vacuum ultraviolet light to selectively produce radicals, and measured the densities of ozone and OH produced by the device and compared with simulation results. It was revealed that the device can produce sufficient quantity of radicals.

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September 9th (Tue.), <10:00-12:00>
Room 2

Effect of gas flow rate on treatment of mouse melanoma cells using a nanosecond streamer discharge

Taketoshi AKIYAMA

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Abstract:

Recently it is expected that atmospheric pressure plasma is useful to induce apoptosis, and plasma is used for cancer treatment. We treated mouse melanoma cells (B16F10) using a nanosecond streamer discharge, and examine the effect of gas flow rate on the cell survival rate. The effect of water vapor evaporated from the culture medium that produce radicals such as OH and H₂O₂ is discussed.

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Room 2

Effect of humidification for the sterilization of Staphylococcus aureus on the electrode surface by corona discharge.

○Takahiro Miura, Akinori Zukeran, Jun Sawai

Kanagawa Institute of Technology

Abstract:

In this paper, it is investigated to sterilize staphylococcus aureus on an electrode in an electrostatic precipitator (ESP) under high relative humidity condition. The ESP consisted of a precharger and a collecting unit. The bacterium was put on the grounded plate electrode surface of the precharger and the collecting unit, whereby that was sterilized by corona discharge. The relative humidity was controlled using pure water or tap water. As a result, Staphylococcus aureus was sterilized at relative humidity greater than 75%. However, the bacterium on the upstream side of the electrode in the precharger was not sterilized. The effect of humidification by pure water was almost same as that by tap water.

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biofilm sterilization by mist air discharge

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Abstract:

Biofilm that is any group of microorganisms sticks to the wall and floor of food factory, pharmaceutical factory and causes environmental degradation. Hydrogen peroxide solution, ozone water and advanced oxidation process (AOP) were tested to examine their availability for killing the biofilms of *Pseudomonas aeruginosa*. AOP showed higher bactericidal activity than other methods. Though the hydrogen peroxide can be generated with a dielectric barrier discharge in mist air, the concentration was found to be too low to remove the biofilm.

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Room 2

Inactivation of Airborne Microorganism by Corona Discharge Plasma

Takanori TANINO, Ataru MIYAZAKI, Takuya FURUHASHI* and [○]Takayuki OHSHIMA

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Abstract:

Inactivation of airborne microorganism by corona discharge was investigated using *Staphylococcus epidermidis* as the model airborne microorganism. Significant decrease of airborne *S. epidermidis* number compared to that of natural attenuation without corona discharge plasma was detected. The living cell number of *S. epidermidis* trapped on grand electrode plate was almost tithe of decreased airborne *S. epidermidis*, and this successfully demonstrated inactivation of airborne microorganism by corona discharge plasma. Several applied voltage waveforms, DC positive, DC negative, DC superimposed pulse and rectangular wave, were used to generate corona discharge plasma. In all applied voltage waveforms, airborne *S. epidermidis* was inactivated. But the inactivation was depended on consumed energy and there was no difference between applied voltage waveforms. Damages to microorganisms' cell-surface and genomic DNA by the exposure of corona discharge were also investigated. Damage to cell-surface was investigated using fluorescently labeled yeast. Decrease of fluorescence localized yeast cell-surface that suggests damage to cell-surface was observed. Damage to genomic DNA was investigated by polymerase chain reaction using *S. epidermidis* genomic DNA as the template. The resulted weak band strength of PCR products using corona discharge plasma exposed *S. epidermidis* suggested damage of genomic DNA by corona discharge.

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Electrification of Slide Glass and fixing of fluorescent beads on it by AC Corona Discharge

○Tomoko NAKAJIMA*, Jumpei HIGASHIO**, Hachiro YASUDA*, Hirofumi KURITA*, Kazunori TAKASHIMA* and Akira MIZUNO*

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Abstract:

With a view to fixing and handling of DNA and viruses for fluorescent microscopic observation, electrification of microscopic slide glass by AC corona was studied. In result, negative surface potential appeared on slide glass by AC corona exposure. The surface potential inversely related distance between electrode and slide glass; though it appeared at the relatively long distance without apparent AC corona, and nearly disappeared at distance shorter than most suitable one. Negatively charged fluorescent beads showed coagulation on the bottom side of AC corona treated slide glass which has positive electric potential.