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

24aC-1

September 24th (Thu.), <10:00-12:00>
Room 3

Analysis of bacterium isolated from used soluble cutting oil and it's tolerance toward pulsed-discharge plasma treatment

Makoto HIROSAWA, Takanori TANINO, Kouhei MAKITA, Takayuki OHSHIMA

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Abstract:

In this study, we focused on a bacterium that was isolated from used soluble cutting oil after pulsed-discharge plasma treatment. A bacteria identification analysis based on the 16s rRNA coding sequence region concluded that the bacterium is Bacillus barbaricus with 98.30% homology. Isolated B. barbaricus was cultivated both in liquid medium for 4, 22 h and on agar plate for 1 week. The former condition could allow B. barbaricus to be vegetative cell form and the later condition could allow it to form spore. All cells showed tolerance toward puled-discharge plasma inactivation treatment in distilled water. We also investigated tolerances of B. barbaricus toward heat and ozone inactivation treatments. Contrary to our expectations, it didn't show significant tolerances toward heat and ozone. From these results, B. barbaricus possesses only significant tolerance toward pulsed-discharge plasma inactivation treatment.

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24aC-2

September 24th (Thu.), <10:00-12:00>
Room 3

The effect of gas flow rate and composition in nanosecond pulsed plasma irradiation on mouse melanoma cell

○Yuki Shirakawa*, Kazue Mizuno** and Ryo Ono*

*Department of Advanced Energy, The University of Tokyo, ** Department of Materials Engineering, The University of Tokyo

Abstract:

The relation between survival rate of mouse melanoma cell treated with nanosecond pulsed streamer discharge and gas flow rate and composition are investigated. Using N2, low gas flow rate induces more cell death. Using N2/O2 mixed gas, O2 concentration has little effect on cell survival rate. The results imply that in our experiment condition some reactive species derived from water vapor such as OH are more effective for mouse melanoma cell death than reactive species derived from O2 such as O and NO.

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24aC-3

September 24th (Thu.), <10:00-12:00>
Room 3

Fundamental study of a novel gene transfection of mammalian cells by water-in-oil droplet manipulation in an electric field

Yasuhiro TAKAO

Department of Environmental and Life Sciences, Toyohashi University of Technology

Abstract:

We developed a novel gene transfection method, water-in-oil (W/O) droplet electroporation, using dielectric oil and a liquid droplet containing living cells and transgene DNA. This method is based on water-in-oil droplet manipulation by using electrostatic force. When a water droplet is placed between a pair of electrodes, a reciprocal motion is made by applying a DC electric field. This droplet motion is brought about as follows. First, a droplet is carried to one electrode by Coulomb force, possibly due to electrostatic induction. When the droplet makes contact with the electrode, droplet is charged with the same polarity as the electrode. The droplet then moves to the other electrode and the same process occurs repeatedly. Furthermore, more intense electric field can induce droplet deformation and it leads instantaneous short circuit via the droplet. Small holes could be made in the cell membrane during the short circuit, and genes could be introduced into the cells. We have investigated a gene transfection using the droplet containing mammalian culture cells (HEK293 cell) and foreign plasmid DNA. Viability and transfection level measured 24 hours after the voltage application under various applied condition were investigated.

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September 24th (Thu.), <10:00-12:00>
Room 3

Plasma Irradiation to Subcutaneous Cancer Tumor on Mice and Verification of Immune System

○Kenta YONETAMARI*, Yuki SHIRAKAWA*, Kazue MIZUNO** and Ryo ONO*

*Department of Advanced Energy, The University of Tokyo,**Department of Bioengineering, The University of Tokyo

Abstract:

Cancer treatment using plasma has intensively studied these days. In this study, mouse melanoma cells were injected subcutan eously on mice and treated using nanosecond pulsed streamer discharge. Two types of mice were used, CD2F1 and Balb/c nu/nu.

The former has immunity and the latter lacks immunity. It was shown that the treatment of CD2F1 is effective, while that of Balb/c nu/nu is not effective. It suggests that the plasma treatment might stimulate the immune system in mice that is effec tive for cancer treatment.

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September 24th (Thu.), <10:00-12:00>
Room 3

Verification of Sterilization Effect by OH radicals Using Vacuum Ultraviolet Light Method

○Kenta YONETAMARI and Ryo ONO

The University of Tokyo

Abstract:

Recently, plasma medicine is one of the most attracting fields because radicals in plasma have the therapeutic and sterilization effects. However, the mechanism is not revealed so plasma medicine is not yet to use. In this study, sterilization experiment of bacillus atrophaeus (ATCC9372) was performed using VUV method which is developed in our previous work. As a result, sterilization effect was observed when wet He and He/O2 was used as the working gas. This result indicates that OH radical kills bacteria.

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24aC-6

September 24th (Thu.), <10:00-12:00>
Room 3

Examination of Cell Separation Condition Using the Inclined Comb-shaped Dielectrophoretic Electrodes

○Masayo TAKANO, Takayuki ITOI, Takaharu ENJOJI and Yoshikazu WAKIZAKA

AFI Corporation

Abstract:

The importance of cell separation techniques are increasing with development of biopharmaceutical and regenerative medicine. Dielectrophoresis (DEP) is a noninvasive method for cell separation without labeling the cells. We had developed the DEP devices with the inclined comb-shaped electrodes for cell separation, and examined the effect of micro-gap size between electrodes, flow rate and AC voltage on cell separation efficiency. Furthermore, the viable and the non-viable cells were separated, and also one cell line was separated from mixture of two cell lines by the DEP device.

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Study of dielectrophoretic property of DNA-labeled dielectric microbeads for DNA detection

Michihiko Nakano, Hiromichi Kasahara, Zhenhao Ding, ○Junya Suehiro

Department of Electrical Engineering, Kyushu University

Abstract:

New DNA detection method using dielectrophoresis (DEP) of dielectric microbeads was proposed. The method is based on dynamic change of microbeads DEP by attaching DNA. Dielectric microbeads having natively negative DEP property become behaving positive DEP when they are labeled with DNA. The DNA-labeled microbeads can be collected on a microelectrode by positive DEP. DEP collection of the DNA-labeled microbeads causes the impedance change of the microelectrode. By measuring the impedance change, DNA-labeled microbeads are detected. The aim of this study is to investigate influence of DNA on the dielectrophoretic property of the dielectric microbeads. The crossover frequency of DEP and zeta potential of the microbeads were investigated. Three kinds of DNA and two kinds of microbeads were used. From the results, it was suggested that not only the conductance of DNA but also permittivity of DNA could affect DEP of the microbeads. Moreover, it is demonstrated that quantitative detection of DNA.