2014 Annual Meeting of The Institute of Electrostatics Japan
Hiroshima International University
September 7-8, 2014

9pC-1

September 9th (Tue.), <14:00-15:00>
Room 1

2-D Concentration Distribution of ROS Supplied on Liquid Target by Non-thermal Plasma Jet

○Masaki HAMADA, Yasutaka WAKABAYASI, Wataru ETO, Yasuhumi ABE, Keisuke KIHARA, Miho SAKAI, and Toshiyuki KAWASAKI

Faculty of Engineering, Nippon Bunri University

Abstract:

The distribution of reactive oxygen species (ROS) generated by a plasma jet has been investigated using the chemical reagent prepared in our laboratory. This chemical reagent provides the important and special information which can't be obtained by other methods. In this paper, the influence of the irradiation distance, supplied gas and water on the 2-D ROS distribution was studied using the chemical reagent. Helium (He) gas with or without oxygen (O2) were supplied into the generator. The irradiation distance was changed from 5 mm to 50 mm. The experiment with the water layer on the reagent was also conducted in order to study the production and transport of ROS through water. The relative concentration distribution was also obtained by an absorbance measurement. The ROS distribution significantly depended on the irradiation distance in He plasma jet. The high efficiency and local supply of ROS to the target can be controlled by the irradiation distance. In the case of O2 (0.5%)/He mixture gas supply, it is considered that the ROS distribution significantly influenced by the synergistic effect of long-lived species generated in the plasma phase. The interesting 2-D distribution patterns were visually obtained in the water using the reagent underwater.

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Room 1

Influence on Plants by Irradiation of Atmospheric-pressure LF Plasma Jet

○Kei ETO, Daichi OTORI, Shuichi AKAMINE, Ryuta ICHIKI, Seiji KANAZAWA

Department of Electrical and Electronic Engineering, Oita University

Abstract:

In this study, Arabidopsis thaliana was irradiated by atmospheric-pressure low frequency (LF) plasma jet. Here, helium gas was used as an operating gas. We evaluated the influence of the atmospheric-pressure plasma jet on growth of the plants by measuring the leaf area of Arabidopsis thaliana and comparing with a control group. We also measured chlorophyll fluorescence of leaves. As a result, the effect of atmospheric-pressure plasma jet was different with state and form of plants. The growth stimulation was observed for the seeds irradiated by atmospheric pressure-plasma jet after vernalization. After germination the apoptosis occurred for the leaves irradiated by the plasma jet. This inactivation was related to the intensity decrease of chlorophyll fluorescence from the leaves.

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9pC-3

September 9th (Tue.), <14:00-15:00>
Room 1

Analysis of Biomolecular Damage and Cellular Responses Induced by Atmospheric Pressure Plasma Exposure

○Hirofumi KURITA*, Kaori SANO*, Mika SHIMIZU*, Tomoko NAKAJIMA*, Kazue MIZUNO**, Ryo ONO**, Hachiro YASUDA*, Kazunori TAKASHIMA*, and Akira MIZUNO*

*Toyohashi University of Technology, **The University of Tokyo

Abstract:

Recently, non-thermal atmospheric pressure plasma has been studied in biological and medical applications. Among them, reactive oxygen and nitrogen species (RONS) in aqueous solution injected by the plasma exposure play an important role. Therefore, we have been trying to use large DNA molecules as a biomarker to estimate intensity of RONS in the aqueous media. Here, we report the measurement of OH radical by electron spin resonance (ESR) spectroscopy with spin trapping technique. The correlation between the signal intensity of OH radical measured by ESR and the number of strand breaks obtained by single-molecule DNA observation was examined. Furthermore, cellular responses after plasma exposure in human cell lines were also studied.

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September 9th (Tue.), <14:00-15:00>
Room 1

DNA Detection using Dynamic Change of Microbeads Dielectrophoresis with DNA Labeling

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

Kyushu University

Abstract:

In this paper, a new DNA detection method using dielectrophoresis of dielectric microbeads is described. This method can detect DNA amplified by polymerase chain reaction (PCR) rapidly and easily. PCR is used to diagnose bacterial/viral infection as the one of the most sensitive and specific methods. PCR amplifies DNA for the target pathogens. After PCR, the amplified DNA should be determined by a method such as an agarose gel electrophoresis. This takes a few hours and requires complicated processes. It was found that dielectrophoresis of the microbeads was dramatically altered by DNA immobilization on them. The DNA-labeled microbeads were trapped on a microelectrode by positive dielectrophoresis, whereas the pristine ones were repelled from the microelectrode. The trapped microbeads were measured by electrically. This method is faster than a standard DNA detection.