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

24pC-1

September 24th (Thu.), <15:45-17:45>
Room 3

A study on Verification of Impurity Density Spatial Distribution in Silicon Wafer through Surface Potential Measurement with Electrostatic Force Microscope

Daichi Satou*, Haruyuki Miyano***, ○Hiroaki Takatsu*, Jumpei Higashio**, Toshio Uehara**, Yoshihiro Takahashi***, Yoshito Ashizawa***, Arata Tsukamoto***, Katsuji Nakagawa***

Nihon University* ***, Trek Japan Co.,Ltd**

Abstract:

Electrostatic force microscope (EFM) we developed can measure voltage on surface (VS) up to 1 kV in air with extremely high sensitivity (~20 mV) as well as high spatial resolution (~10 μm). We applied the EFM to measure impurity distribution. It is revealed that the measured VS showed opposite voltage polarity depending on n- or p-type dopant. The VS should correspond work function difference between sensor metal and Si substrate to keep flat-band condition of Si substrate. We observed density distribution of impurities with EFM by this method, and discussed the results.

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Study on N2 plasma processing to TiO 2 Photocatalyst

○Shota YAZAWA, Kiyozumi NIIZUMA, Yusuke KUDO

College of Industrial Technology, Nihon University

Abstract:

A photocatalyst is attracting widespread attention because it works semipermanently under light irradiation. A photocatalyst has useful characteristics such as an oxidative decomposition and a super-hydrophilicity. However, TiO2 photocatalysts which are often used can be activated only by ultraviolet rays. The ultraviolet rays for photoactivation of TiO2 are included nearly zero in indoor lights. If a photocatalyst can be activated with visible light as well as ultraviolet light, a photocatalyst can be used not only outdoors but also indoors. N-doped TiO2 is one of visible light responsible photocatalysts. We tried to produce N-doped TiO2 with N2-plasma processing. We have focused on the sample temperature under an N2-plasma processing. In this study, the N2 plasma processing time to TiO2 was changed.

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September 24th (Thu.), <15:45-17:45>
Room 3

Improvements of 150 .C annealing technique for dye-sensitized solar cells

Shungo Zen

The University of Tokyo Department of Advanced Energy

Abstract:

Dye-sensitized solar cells (DSSCs) require annealing of TiO2 photoelectrodes at 450C to 550C. However, high-temperature annealing is unfavorable because it limits the use of materials that cannot withstand high temperatures. In previous papers, we proposed a 150C annealing technique of TiO2 photoelectrodes to reduce the annealing temperature from 450C to 150C using a conventional TiO2 paste that contains organic binders. Using our technique, η of 4-μm-thick TiO2 film is achieved approximately 110% compared with that of 500C annealing and η of 11-μm-thick TiO2 film DSSCs is lower than that of500C annealed.

In this paper, we improve the 150C annealing technique by heating Dielectric Barrier Discharge (DBD) treatment device.

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Room 3

Synthesis and Shear Piezoelectricity of Optically Active Polysuccinimide.

○Kazuhiro TANIMOTO*,**, Shota SAIHARA*, Yu ADACHI*, Yuhei HARADA* and Yoshiro TAJITSU*

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Abstract:

Optically active crystalline polymers show shear piezoelectricity due to their asymmetric crystal structure. Polysuccinimide (PSI) is minimum structure of an optically active polyimide and we reported that optically active PSI shows shear piezoelectricity. In this study, we synthesized optically active polysuccinimides (PSI) and evaluated their shear piezoelectricity. As a result, the maximum value of shear piezoelectric d constant was 1.56 pC/N. This value is higher than many biopolymers and polypeptides.

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Room 3

Numerical Analysis on Body Force Characteristic of Dual-Grounded Tri-Electrode Plasma Actuator

○Asa Nakano, Hiroyuki Nishida, Masaki Tamura

Tokyo University of Agriculture and Technology

Abstract:

In this research, we focus on dielectric barrier discharge plasma actuator (DBDPA).

DBDPA is an active flow control device and when high frequency AC voltage is applied to it, it generates body force brings in inducted flow. However, this induced flow is too weak to install on aerodynamic bodies in a high-speed flow so we have suggested Dual-Grounded Tri-Electrode plasma actuator (DGTEPA) which makes stronger thrust with higher efficiency. In this study, we compare the body force of DBDPA and DGTEPA for different applied voltage by a plasma simulation. First it is confirmed that the simulation results are in qualitatively agreement with the experiments from the viewpoint of plasma distribution. Next we discuss the voltage characteristics of the body force and body force - power ratio. As a result of simulation, we found DGTEPA has smaller time averaged body force with worse efficiency than DBDPA. Although the quantitative discrepancy exists, it is expected that the simulation can reproduce the qualitative trends.

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Room 3

Production of a shock wave by a nanosecond-pulse discharge and the effects on the flow control

○Atsushi Komuro, Shuto Matsuyuki, Kaiki Konno, Kazunori Takahashi, Akira Ando

Tohoku University

Abstract:

Flow control technique driven by the nanoseconds-pulse discharge was investigated. As a fundamental experiment, we observed a shock wave generated by the nanoseconds-pulse discharge by the schlieren visualization. A complex pattern of quasi-planar and spherical compression waves was observed. From the schlieren imaging, shock wave intensity was evaluated with its contrast. The results showed that shock wave intensity increases as a pulse peak voltage increases and a rising time is lengthened.

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Experimental Estimation of Electrohydrodynamic Force onDBD Plasma Actuator and Its Validation

Hiroyuki Nishida

Tokyo University of Agriculture and Technology

Abstract:

To experimentally estimate the EHD force field generated by a DBD plasma actuator (DBDPA) using PIV measurement, some techniques have been proposed by several researchers. In those methods, the EHD force is estimated based on the Navier-Stokes equations under some assumptions.

Because of the assumptions, it is important to validate the result. In this study, the EHD force field is estimated by three different methods, and the comparison of these results is conducted. From the viewpoint of the time-averaged body force field, the result with the assumption of quasi-steady body force is different from other results with neglecting the pressure gradient or the vertical EHD force. From the view point of the time-varying body force, the results under the assumption of no-pressure gradient and no-vertical EHD force are similar. However both results have some estimation errors; a negative body force appears during no-discharge period.