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

9aB-1

September 9th (Tue.), <10:00-10:45>
Room1

Development of Low-Temperature Sintering Technique for Plastic Dye-Sensitized Solar Cells

Shungo Zen

The University of Tokyo Department of Advanced Energy

Abstract:

Dye-sensitized solar cell (DSSC) requires sintering of TiO2 photoelectrode at 450~550 C to be manufactured.

However, the high-temperature sintering is disadvantageous because it limits the use of materials that cannot withstand high temperatures.

In our previous work, we proposed plasma and low-pressure mercury (Hg) lamp ultraviolet (UV) treatments of the TiO2 electrode to reduce the sintering temperature by half. It was concluded that the effect of the surface treatment is due to reactive oxygen species (O3, O, OH) produced by the plasma and UV light.In this paper, we propose two techniques for TiO2 photoelectrode, there can reduce the sintering temperature from 450 C to 150 C. We were succeded in manufacturing plastic DSSC at 150-C sintered by using new techniques.

The conversion efficiency of plastic DSSC was 3.1 %.

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9aB-2

September 9th (Tue.), <10:00-10:45>
Room 1

Production of Platinum Particles on the Surface of Porous Substrates Using A Few Tens keV Electron Beam Induced Reduction Method

○Teruyuki HAKODA*, Shunya YAMAMOTO*, Hirofumi ARITANI**, and Masahito YOSHIKAWA*

* Japan Atomic Energy Agency ** Saitama Institute of Technology

Abstract:

The production of noble metal catalyst particles on the surface of catalyst substrates were studied using low energy electron beams (EBs) as a radiation-induced reduction method. Porous alumina substrates were impregnated in a solution containing PtCl42- ions and ethanol. The surface of the substrates was irradiated with EBs. As a result, platinum particles were produced on the surface of the substrates. The platinum particles had catalytic activity. The obtained results suggest that low energy EBs can be applied to the production of noble metal catalysts as new application of a radiation-induced reduction method.

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9aB-3

September 9th (Tue.), <10:00-10:45>
Room 1

Stabilization method of gold nano-particle on porous materials using an electrospray microreactor in liquid

Yoshiyuki TERAMOTO

AIST

Abstract:

Gold nano-particls were stabilized on porous materials using a novel method. First, colloidal gold solution was prepared using an electrospray microreactor in liquid. Its particle size was around 3 nm regardless of atomizing time of electrospray. And then, carriers were immersed in the prepared colloidal gold solution. The forms of supported gold nanoparticles were identified as hemispheres ca.3-5 nm in diameter. Their sizes increased with increasing the colloid concentration (= atomizing time of electrospray). On the other hand, its size was hardly affected by the carrier material.

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9aA-1

September 9th (Tue.), <11:00-12:00>
Room 1

Emission Spectroscopic Measurements of Atmospheric-pressure Non-thermal Plasma Jets Generated Using Glass- and Alumina- Tubes

○Norimitsu Takamura*, Douyan Wang**, Takao Namihira***, Hidenori Akiyama***

Graduate School of Science and Technology, Kumamoto University, Japan*Priority Organization for Innovation and Excellence, Kumamoto University, Japan**Institute of Pulsed Power Science, Kumamoto University, Japan***

Abstract:

Atmospheric-pressure non-thermal plasma jets (APPJs) have been widely studied for the processing of a variety of materials and biomedical applications. In the past, a number of papers related to the APPJs' emission spectra have been already reported. However, the emission spectra of the APPJs generated using different dielectric tubes have not been adequately investigated and reported yet. In this study, therefore, the emission spectra of the APPJs generated using glass- and alumina- tubes were measured to compare how the amount and types of active species changes. In this experiment, an observation system using an ICCD camera coupled to a spectrograph was used to measure the emission spectra. The experimental results show えｄ the amount of active species such as OH＊ (309 nm), N2＊ (C3Πu

- B3Πg, 337.1 nm), and N2+＊ (B2Σu+ - X2Σg+, 395.1 nm) were increased by using alumina tube compared to glass tube. In addition, the experimental results suggest that there are some different production mechanisms of active species between using glass- and alumina- tubes.

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9aA-2

September 9th (Tue.), <11:00-12:00>
Room 1

Effect of interval time between pulses on streamer discharge

○Yuta Ishibashi**,Yoshiyuki Teramoto*, Ryo Ono**

School of Engineering, The University of Tokyo National Institute of Advanced Industrial Science and Technology (AIST)* Graduate School of Frontier Sciences, The University of Tokyo**

Abstract:

Effect of interval time between pulses on discharge was investigated using a double-pulse corona discharge in N2. N2(C) production and discharge energy of 2nd pulse discharge decreased with decreasing interval time (Δt), regardless of same applied voltage. Additionally, breakdown voltage of 2nd pulse significantly decreased with decreasing Δt. When Δt was 20 □s, breakdown voltage of 2nd pulse came down from 6.3 kV to 2.6 kV.

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September 9th (Tue.), <11:00-12:00>
Room 1

Measurement of negative streamer propagation

Hanakawa Wataru

The university of Tokyo

Abstract:

A negative pulsed corona discharge streamer is observed in a point-to-plane gap using a short-gated intensified CCD camera and a streak-like photograph. When the applied voltage is low, the streamer propagates as far as the middle of the gap. It is different characteristics from the positive streamer. The shape of the streamer head is rounded and thicker than that of the positive streamer. The streak-like photograph shows that the negative streamer propagates in three stages: (i) primary streamer, (ii) strong return stroke from the positive plane to the negative point electrode, and (iii) secondary streamer.

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September 9th (Tue.), <11:00-12:00>
Room 1

Numerical analysis of negative and positive streamer corona discharge propagations

Daiki Saito

Department of Advanced Energy, The University of Tokyo

Abstract:

We numerically calculate the two-dimensional point-to-plane negative and positive streamers in a dry-air environment. The calculation has been performed in the case of a point to plane corona discharge filled with dry air (80% N2, 20% O2) at atmospheric-pressure ambient temperature. The calculation shows difference between negative and positive streamer propagations.