

25pB-1

September 25th (Fri.), <14:00-15:00>
Room 2

Study of Plasma-assisted Combustion for Low Emission

○Tomohiko IKEDA*

Study of Plasma-assisted Combustion for Low Emission

Abstract:

This paper proposes using a dielectric barrier discharge (DBD) instead of catalyst of catalytic combustion. The catalytic combustion is used for a stable combustion of a lean mixture, but it has some disadvantages. The DBD is expected to reduce the disadvantages of the catalyst. A lean premixed methane-air mixture flows in a DBD, then the emission gas is measured. It is shown that the DBD can cause combustion below the lean flammable limit. When the discharge energy increases, the combustion rate of methane increases, while NO_x emission increases. It means that radicals in plasma promote chemical reaction different from the usual combustion reaction.

25pB-2

September 25th (Fri.), <14:00-15:00>
Room 2

Production of Au Nanoparticle Films Using Electron-Beam Induced Non-Thermal Plasma on the Surface of Aqueous Solutions

○Teruyuki HAKODA*, Ayaka TAKAHASHI**, Akihiko SHIMADA*, Shunya YAMAMOTO*, Hirofumi ARITANI**, and Tetsuya YAMAKI*

*Japan Atomic Energy Agency, ** Saitama Institute of Technology

Abstract:

Aqueous solutions containing 1 mmol/L AuCl₄⁻ ions and 0.5-20v% alcohol (2-propanol or ethanol) were irradiated with a few tens keV electron beams (EBs). Gold (Au) films were produced on the surface of the irradiated solution. The

production rate of the Au films was high at concentrations of 0.5-1v% for 2-propanol and became lower at higher concentrations. At an alcohol concentration of 0.5v%, the Au particles of the films were 5-20 nm and

5-100 nm in diameter for 2-propanol and ethanol, respectively. The XPS analysis demonstrated that the films consisted of about 85wt% of metal Au(0), 10wt% of Au(I), and a few w% of Au(III) for 2-propanol. A Fourier transform infrared diffusion reflectance (FTIR-DR) measurement showed that CO was oxidized into CO₂ over the Au films loaded to TiO₂ substrates at a temperature of 200°C, enabling us to confirm a catalytic activity.

25pB-3

September 25th (Fri.), <14:00-15:00>
Room 2

Generation of ZnO particle using pulse arc discharge plasma

Kunisuke Fujii

Kumamoto University

Abstract:

ZnO particle has a high UV shielding property and transparency. So ZnO particle is widely applicable, for example cosmetics, medicines and plastics. But, usual creating method is difficult control and complicated equipment. In this study, ZnO particle was created using pulse arc discharge plasma. This method is easier control and complicated than usual. And, we investigated influences of component of the product, diameter of the product and shape of the product by charging energy and gas pressure.

25pB-4

September 25th (Fri.), <14:00-15:00>
Room 2

Atmospheric Plasma Hybrid Surface Treatment for Fluoropolymer Plastics (Toward Applications for Medical Devices, Biocompatible Materials, and Electronic Devices)

Masaaki Okubo, Tomoyuki Kuroki

Osaka Prefecture University

Abstract:

A surface modification technique that improves the adhesion of fluorocarbon polymer films such as polytetrafluoroethylene (PTFE) is developed using argon at atmospheric pressure and acrylic acid vapor nonthermal plasma. From results of peeling tests, XPS analyses, and SEM photograph, it is confirmed that chemical bonds with F atoms decrease greatly on the surface and that a hydrophilic layer is formed due to the process. Using the present surface treatment apparatus, it is possible to bond A4-sized sheets of PTFE and metals or rubbers without losing the excellent physical properties of PTFE.