



## Study of Various of Phenomena in Thermal Fluids with Charge Transfer and Chemical Reaction

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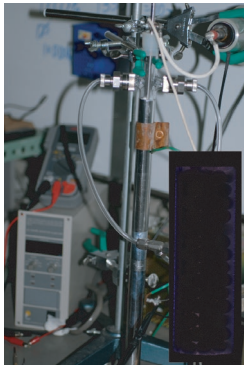
**Research Fields** Efficient Energy Utilization, Material Synthesis Process

**Keywords** Electrochemistry, Plasma, CVD, Fuel Cell

### ● Research Outline

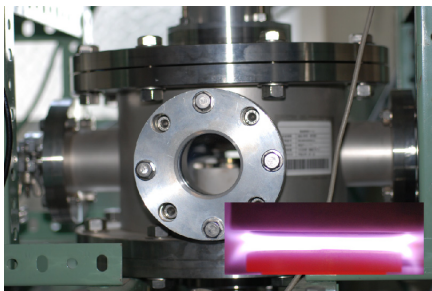
#### 1. Efficient Generation of Ozone by Dielectric Barrier Discharge Using Packed Bed of TiO<sub>2</sub> Photocatalytic Particles

Ozone is almost generated by a DBD (dielectric barrier discharge) from air. In this study, the reaction field from air to ozone is formed by using DBD and packed particle bed of TiO<sub>2</sub>. TiO<sub>2</sub> can generate active oxygen species for ozone generation by photocatalytic reactions.



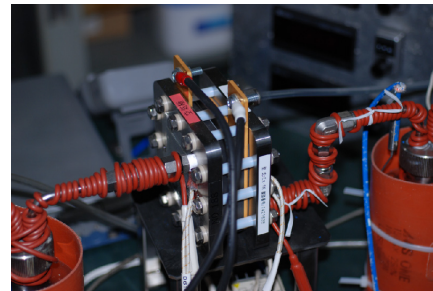
#### 2. Development of RF Discharge Plasma for CVD of Functional Carbon Materials

In order to apply nonequilibrium plasma chemical reactions to CVD (Chemical Vapor Deposition) of functional carbon materials (carbon micro fibers etc.), the RF discharge plasma which combined the effect of pulse modulation with the effect of helium mixing is realized in the raw gas using methane and hydrogen.



#### 3. Utilization Method of Low Hydrogen Concentration Fuel for PEFC

Hydrogen fuel including impurities (CO<sub>2</sub>, N<sub>2</sub>) is used as a fuel gas of PEFC (Polymer Electrolyte Fuel Cell). In this case, characteristics of PEFC are evaluated, and the utilization method of this fuel gas for PEFC is investigated.



#### 4. Fundamental Characteristics of Atmospheric Pressure Micro Plasma Jets

Plasma jets have been generated in a discharge system consisting of a dielectric/metal tube (through which He gas flows at the atmospheric pressure) and a single electrode attached to the tube, to which low-frequency, high-voltage pulses (~10kV, ~10kHz) are applied. The plasma jets are energetic enough to generate highly reactive charge-neutral radicals but their gas temperatures remain low. Therefore the plasma jets are ideal for processing at low temperatures.

