**Name** | Shuichiro Hirai  
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**Affiliation** | Tokyo Institute of Technology

## Invited Keynote Lecture

**Presentation Title**  
Measurement and Analysis of Ink Dispersion and Structure of PEFC Catalyst

**Abstract (150 words)**  
To achieve high power density operation of polymer electrolyte fuel cells (PEFCs), it is required to realize high-performance catalyst layer with low oxygen transport resistance, high proton and electron conductivities and high electrochemical surface area (ECSA). Because dispersion of catalyst ink strongly affects porous structure of the catalyst layer, it is crucial for realization of high-performance catalyst layer to understand the dispersion mechanism of the catalyst ink which is not easy to measure due to its non-transparent liquid with mixture of polymer and solid carbon. Measurements were investigated by several new techniques, laser scattering particle size distribution analyzer, scanning electron assisted- dielectric microscopy (SE- ADM) and attenuated total reflection infrared (ATR-IR) spectroscopic methods. Effect of solvent composition of catalyst ink was investigated varying water/ethanol ratios. Large water content induces well dispersion. Ionomer/carbon ratio was varied to show proper range in needed for dispersion. Effect of drying speed was also studied.

**Biographical Sketch (150 words)**  
Since 1993, he has been with Tokyo Tech, where he has been engaged in the development of CO2 ocean and underground sequestration and fuel cell. From 1993 to present, his research centered on measurements on fundamental data of CO2 ocean sequestration, which has been referred to ocean sequestration activities including national project of Japan. His interest extended to CO2 underground sequestration since 1997. From 2002, his research field further extended to fuel cell technology. The key-point of this area is to control and measure water concentration inside polymer electrolyte membrane by MRI on power-generation mode. It is now extended to measure water profile using soft X-ray technology that could measure not only on membrane but also diffusion layer, MPL. Although his knowledge is base on thermo-fluid engineering in mechanical engineering area, it is widely used to energy and environmental issues. He is now investigating catalysis layer formation of fuel cell.