

## Design of bulk and interface structures of fuel cell materials

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### Abstract

Fuel cells have been developed as a clean and efficient power source for generating electricity from a hydrogen and oxygen. Especially, the development of ‘intermediate temperature (i.e. 300 - 500°C)’ operation of fuel cells has attracted increasing attentions from the perspective of its residential scale application. Also, the challenges associated with CO poisoning to platinum (Pt) electrode (or H<sub>2</sub>S poisoning to Ni electrode) and development of non-Pt electrodes would be met by a design of bulk and interfaces structures of fuel cell materials. In our fuel cell project, we try to design the nano-hetero micro-domain structure in solid electrolyte and the nano-hetero interface between solid electrolyte and electrode. In addition, a challenge for design of high quality electrodes has been started in there. To characterize the bulk and interface structures of our fuel cell materials, we used HR-TEM, EELS, SR-XPS, and so on. Also we started the simulation of defect structure of our fuel cell materials. In the present work, some interesting micro-structural features in the bulk and interface were already observed. Those micro-structural features are subtle. However, we believe that such key micro-structural features have to be controlled at atomic scale by means of careful microanalysis, simulation and improvement of fabrication process. That combination of ultimate analysis, simulation and processing route design will provide us the great opportunity for the design of breakthrough fuel cell materials. We will introduce some of results in the seminar.

# The Practical Use of Energy Networks to Introduce Large Capacity of Renewable Energy

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## **Abstract**

My research interests include ideal energy systems being in harmony with the environment. The current research is focused on cogeneration and energy networks by using fuel cells and hydrogen energy. I have resulted that decentralization of power production could be useful for energy savings at the end-user's level, mainly household appliances and lighting systems. Applications will be extended to DC electric distribution and pure hydrogen fuel supply for connecting with photovoltaics, wind turbines, and biomass outputs in the near future. I will talk about the related research themes and their progress.