

## Development of 1kW class SOFC stack and residential cogeneration system at KEPRI

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One kW-class SOFC stacks using metallic interconnects such as ferritic stainless steel and anode-supported single cells of  $10 \times 10 \text{ cm}^2$  with thin electrolyte layer ( $< 25 \text{ mm}$ ) of YSZ was fabricated for application of Residential Power Generation(RPG). Mixtures of NiO and 8YSZ were used as anode substrates and a Cathode of  $(\text{La}_{0.6}\text{Sr}_{0.4})(\text{Co}_{1-x}\text{Fe}_x)\text{O}_3$  ( $x=0.8$ ) and  $\text{Ce}_{0.8}\text{Sm}_{0.2}\text{O}_2$  mixtures was fabricated on electrolytes after screen printing and heat-treatment. I-V and AC impedance characteristics of single cells were evaluated at intermediate temperature ( $650 \sim 800^\circ\text{C}$ ) by using hydrogen gas as a fuel. Maximum power density of  $10 \times 10 \text{ cm}^2$  anode-supported cells was about  $0.32 \text{ W/cm}^2$  at  $750^\circ\text{C}$  and  $0.2 \text{ W/cm}^2$  at  $650^\circ\text{C}$ . A 1kW-class SOFC stack composed of 48 cells ( $10 \times 10 \text{ cm}^2$ ) was successfully manufactured and a SOFC system with BOP (reformer, heat exchanger, catalytic burner etc.) for combined heat and power was integrated to operate and evaluate for long-term. The system designed for residential power generation by using natural gas (or LPG) as fuel can concurrently produce electricity at a SOFC stack and hot water from recuperating heat. The system showed maximum DC output of  $1.6 \text{ kW}_e$  at  $720^\circ\text{C}$ . Detailed status and experimental results of the 1kW SOFC system will be discussed in this paper.