IMPROVED SOLID OXIDE FUEL-CELL PERFORMANCE WITH SPUTTERED PT CATALYST

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Losses in a solid oxide fuel cell (SOFC) arise not only from the resistance to O^{2-}-ion conduction across the electrolyte, but also from the rate of reactant dissociative chemisorption and migration across the electrode/electrolyte interfaces. According to previous studies in our group,both oxygen reduction on the surface and the oxide-ion conductivity in the bulk could be the rate determination steps of oxygen conduction in the mixed oxide-ion/electronic conductors (MIEC). Pt has been used widely as catalyst in the electrodes of the proton exchange membrane (PEM) fuel cell. Previous researchers have also used a Pt/oxide composite as a SOFC cathode material. Sputtering of the catalyst on the electrode surface reduces the Pt loading. We have investigated the enhancement by Ag and Pt catalysts for the dissociative chemisorption of O_2 at the surface of a MIEC cathode and of Pt for H_2 and CH_4 chemisorption on Cu and Ni anodes; a Cu anode is preferred over a Ni anode for hydrocarbon fuels. In this study, a power density of 1400 mW/cm^2 could be reached at 800°C with a 200 μm thick $La_{0.8}Sr_{0.2}Ga_{0.83}Mg_{0.17}O_{2.815}$ electrolyte.

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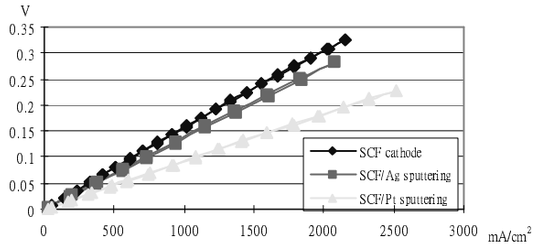

Figure 1. Comparison of overpotentials at 800°C of a SCF cathode without and with Ag and Pt catalyst sputtered onto the surface.

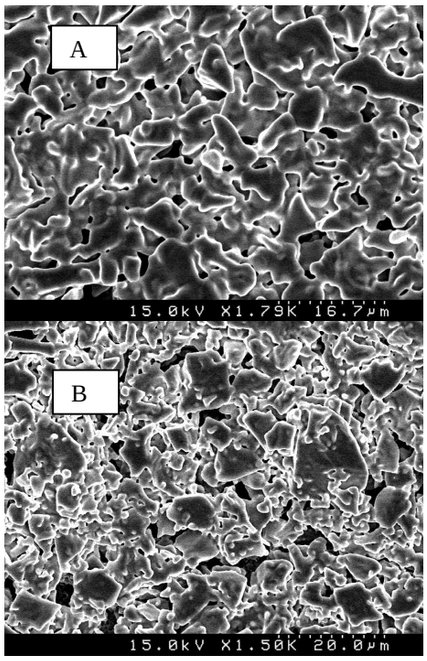

Figure 2. A. SEM image of the SCF surface. B. SEM image of the SCF with Pt sputtered for 5 min onto the surface.

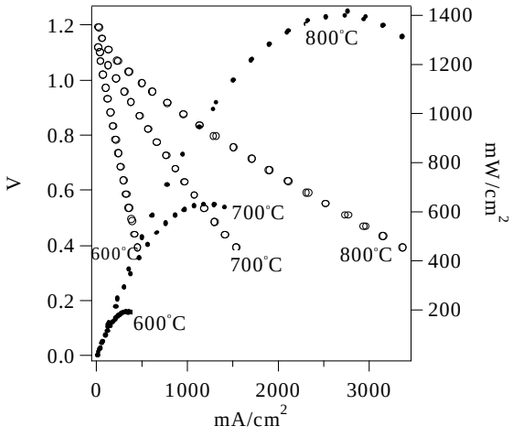

Figure 3. Cell voltage and power density as a function of current density at various temperatures. The cell consists of air, Pt+SCF /LSGM /LDC /LDC+Ni, dry H_2. The LSGM thickness is 200 μm.