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Development of technology for improving the durability of the hydrogen electrode in Solid Oxide Electrolyzer Cells (SOECs)

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A Solid Oxide Electrolyzer Cells (SOECs) is an electrochemical device for producing hydrogen by electrolysis water vapor at a high temperature. SOEC is that they can operate reversibly as solid oxide fuel cells, producing electricity with high efficiency by consuming stored hydrogen. It can also be used in next-generation power generation and storage systems that produce hydrogen using surplus power. SOEC have disadvantage to provide high temperature/high-pressure water vapor to the hydrogen electrode and since oxygen is released very quickly at the air electrode, deterioration of cells and stacks is larger than SOFC and it is a stumbling block to commercialization. In this study, the effect of operating conditions on hydrogen electrode performance and deterioration of SOEC was investigated. To improve the durability of the hydrogen electrode the material technology for inhibiting oxidation of Ni/YSZ was studied. The polarization resistance and J-V characteristics are evaluated in both SOFC/SOEC. The partial pressure of water vapor is changed to 10, 30 and 50%. The change of voltage is observed under the condition of applying current density of 0.1 mA/cm2 to the cell. And the durability of the cell is evaluated by measuring the voltage change according to the SOFC-SOEC switching operation. In addition, to suppress the oxidation of the hydrogen electrode (Ni/YSZ) in a steam atmosphere, a composite hydrogen electrode was fabricated by applying anti-corrosion technology and the possibility of oxidation suppression is examined.

Biography

Min Jin Lee is currently pursuing Doctorate degree in department of materials science and engineering, Inha University, Republic of Korea. His main research focuses on solid oxide fuel cell/solid oxide electrolyzer cell performance evaluation and fabrication of electrode materials.

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