# Chracteristics of $Sr_{0.92}Y_{0.08}Ti_{1-y}Ni_yO_{3-\delta}$ anode and Ni-infiltrated $Sr_{0.92}Y_{0.08}TiO_{3-\delta}$ anode using $CH_4$ fuel in Solid Oxide Fuel Cells

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Strontium titanium oxide co-doped with yttrium and nickel ($Sr_xY_{1-x}Ti_yNi_{1-y}O_{3-\delta}$, SYTN) was investigated as an alternative anode material for solid oxide fuel cells. To improve the ionic conductivity of the $Sr_{0.92}Y_{0.08}TiO_{3-\delta}$(SYT) anode, $Ni^{2+}$ was substituted into the B-site (initially occupied by $Ti^{4+}$), thereby forming oxygen vacancies. To analyze the effects of Ni-doping in the SYT anode, the electrochemical properties of the SYTN anode were compared with those of the Ni-infiltrated SYT(Ni@SYT) using $H_2$ and $CH_4$ as fuels. The electrochemical reactions at the SYTN anode in the presence of both $H_2$ and $CH_4$ were limited by relatively slow reactions, such as non-charged processes including oxygen surface exchange and solid surface diffusion. The high electrical conductivity and excellent catalytic activity of the Ni nanoparticles in the Ni@SYT anode led to improved cell performance. $CH_4$ decomposition at the Ni@SYT anode occurred via thermal pyrolysis of $CH_4$ raher than by steam methane reforming, resulting in carbon deposition.

Keyword : Solid oxide fuel cell, infiltration method, SYTN, carbon deposition, alternative anode