

Development of SOFC anode catalysts with minimized coking

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Direct conversion of hydrocarbon fuels at the anodes in solid oxide fuel cells(SOFCs) has received a great attention for efficient conversion of chemical energy to electric power. One major problem of the method is significant carbon deposition on the anodes. The Ni-YSZ cermet anode, which is a composite of Ni metal and yttria-stabilized zirconia, is the most common in SOFCs with H₂ as a fuel. Large percentage of Ni helps the electrode to function as both an electric conductor and a catalyst for the oxidation of H₂. However, it is not suitable for direct utilization of dry hydrocarbon fuels because Ni catalyzes the decomposition of hydrocarbon and causes serious carbon deposition. The addition of small amounts of transition metals such as Sn, Pd, Ru to these anode is effective to decrease the carbon deposition rate of dry hydrocarbon. Here, we prepared Sn, Pd, Ru-doped Ni-YSZ and showed that the doping significantly reduce the coking. Additionally, effect of doping on various ion conductors such as samarium-doped ceria or gadolinium-doped ceria was examined.