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Deactivation of nickel-based anode in solid oxide fuel cells operated on carbon-containing fuels

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Abstract

Deactivation of Ni-YSZ (yttrium stabilized zirconia) anode of SOFCs operated on CH_4 and CO, respectively, is investigated systematically. Experiments show that the rate of carbon deposition on Ni-YSZ substrate from CH_4 increases with temperature in the whole testing temperature range (550-800°C), while the rate from CO increases with temperature at lower temperatures but decreases at higher temperatures. Larger amount of carbon deposit results in more significant substrate deformation and destruction, which can be explained by the mechanism of carbon fiber growth on Ni exposed to carbon-containing gases. Carbon deposition can be avoided by oxygen ion flux through the electrolyte of SOFCs operated on either CH_4 or CO.

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