

Study of deactivation mechanism over SiO₂ supported Ni catalysts for direct internal reforming
in molten carbonate fuel cell

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A direct internal reforming (DIR) reaction for a molten carbonate fuel cell (MCFC) was carried out using SiO₂ supported catalysts, which are known to be a highly stable. The SiO₂ supported Ni catalysts rapidly deactivated in DIR-MCFC. To elucidate the mechanism of the catalyst deactivation, various characteristic analyses (BET, H₂-chemisorption, FT-IR, and SEM) of fresh and used catalysts were employed. It was found that the SiO₂ species changed to Si(OH)₄ in the presence of both H₂O and K. This transformation caused a significant decrease in Ni dispersion and BET surface area resulting in the deactivation of the catalyst.