

TiO₂-Ni inverse Catalyst for CRM Reactions with High Resistance to Coke Formation

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TiO₂-Ni inverse catalysts were prepared using atomic layer deposition (ALD) process and catalytic CO₂ reforming of methane (CRM) reaction over catalysts (either bare Ni or TiO₂ coated-Ni particles) were performed using a continuous flow reactor at 800°C. TiO₂-Ni inverse catalyst showed higher catalytic reactivity at initial stage of CRM reactions at 800°C comparing to bare Ni catalysts. Moreover, catalytic activity of TiO₂/Ni catalyst was kept high during 13 hrs of the CRM reactions at 800°C, whereas deactivation of bare Ni surface was started within 1hr under same conditions. The results of surface analysis using SEM, XPS, and Raman showed that deposition of graphitic carbon was effectively suppressed in a presence of TiO₂ nanoparticles on Ni surface, thereby improving catalytic reactivity and stability of TiO₂/Ni catalytic systems. We suggest that utilizing decoration effect of metal catalyst with oxide nanoparticles is of great potential to develop metal-based catalysts with high stability and reactivity.

Keywords: CRM, Inverse catalyst, TiO₂, Ni