

Highly durable nickel-silica catalyst for dry reforming of methane

민혜현, 강성봉[†]
광주과학기술원
(sbkang@gist.ac.kr[†])

The catalyst research on the dry reforming of methane (DRM) producing syngas (H_2 and CO) are worldwide undergoing projects to prepare upcoming greenhouse and hydrogen economic issues. However, the major hurdle in the DRM is to overcome the catalyst deactivation caused by sintering and carbon deposition during a course of catalytic operations, requiring highly active and stable catalysts. This study report uniformly dispersed nickel-silica catalyst (D-(Ni-SiO₂)) synthesized with a precise promoter-free formulation in a one-pot batch. Comparing typical formulation of Ni-based catalysts (impregnation and sol-gel synthesized), the D-(Ni-SiO₂) outperformed the catalytic activity at both fresh and long-term operating conditions. The superior performance of the D-(Ni-SiO₂) catalyst is mainly due to the improved CO₂ conversion, which is achieved by the enhanced CO₂ dissociation adsorption. The promoter-free catalyst is considered high oxygen mobility and thus facilitates the removal of the deposited carbon species, which is consistent as characterized by surface techniques such as H₂-TPR, NH₃-TPD, BET and TEM-EDX.