Thermally stable Ni-Ce@SiO_2 core-shell structures with a superior activity for dry reforming of methane

권재현, 배종욱†
성균관대학교
(finejw@skku.edu†)

For the direct utilization of greenhouse gases of methane and carbon dioxide, a dry reforming of methane (DRM) has advantages for producing syngas, which is used as a building block for production of valuable chemicals. Ni-based catalysts are known to be appropriate due to their low cost and high activity. However, significant coke deposition and sintering of Ni particles to form less active agglomerates lead to the deactivation. To overcome these problems, cerium was used as a promoter. Cerium is widely used to promote DRM activity with its oxygen vacancy. Single Ni-Ce nanoparticle was encapsulated with SiO_2 shell, which suppressed coke formations and aggregations of Ni-Ce nanoparticles by the spatial confinement effects. In this study, prepared Ni-Ce@SiO_2 showed a stable catalytic activity as well as sustained the structure under a high temperature DRM reaction.

Keywords: Dry reforming of methane (DRM); Ni nanoparticles; Ce promoter; Silica shell; Core-shell structure; Confinement effect; Coke deposition.