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Plasma-catalytic dry reforming of propane over NiMoO₄ nanosheets and nanoflower catalyst supported on γ -Al₂O₃

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Uniform nanosheets and nanoflower NiMoO₄ structures have successfully been grown on γ -Al₂O₃ catalyst support using solvothermal method. The NiMoO₄ structure could be controlled by varying the catalyst preparation temperature and precursor concentration. The conversion of propane and carbon dioxide into synthesis gas (CO+H₂) was performed in an atmospheric-pressure plasma reactor packed with the NiMoO₄/ γ -Al₂O₃ catalysts at different temperature. The plasma substantially enhanced the propane and carbon dioxide conversion and increased the hydrogen yield. The nano-structured catalysts exhibited good catalytic activity and selectivity for the strongly endothermic dry reforming, and were chemically stable, resulting in enhanced resistance to coke formation and sintering. Notably, the catalytic activity of the NiMoO₄/ γ -Al₂O₃ led to stoichiometric reaction and negligible byproducts. The post-characterization of the used catalysts were characterized using scanning electron microscopy, temperature programmed oxidation, and Raman spectroscopy, which confirmed the less carbon formation and no structural deformation after the reforming reactions.

Biography

Young Sun Mok has received his BS degree in Chemical Engineering from Yonsei University, Seoul, Korea, in 1989, and the MS and PhD degrees in Chemical Engineering from the Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea, in 1991 and 1994, respectively. He has been with the Department of Chemical Engineering, Jeju National University, Korea, since 2000. He has studied applications of non-thermal plasma to pollution (air/water) control, energy production and material synthesis, and he is widening his plasma research horizon to meet various industrial needs, including plasma-mediated hydrophobic coating of powdery materials, sterilization of microorganisms, heterogeneous catalyst preparation, etc.

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