Dehua He et al., J Pet Environ Biotechnol 2014, 5:4
http://dx.doi.org/10.4172/2157-7463.S1.008

OMICS Group Conferences
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2nd World Congress on
Petrochemistry and Chemical Engineering
October 27-29, 2014 Embassy Suites Las Vegas, USA

Conversion of methane into Syngas over Ni-based catalysts prepared with a novel method

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Conversion of methane (natural gas) to syngas and finally high value-added products is an attractive route for the effective utilization of natural gas. Catalytic conversion of methane with CO_2 (CRM) is environmental friendly and has attracted more and more attentions of scientists. Ni-based catalysts were mostly broadly employed due to their low costs and high initial catalytic activities in CRM. However, Ni-based catalysts were suffered deactivation during the reaction due to Ni metal sintering and carbon deposition. It has been reported that smaller sizes of Ni particles possessed stronger ability to resist carbon deposition. Novel methods for preparing highly dispersed and stable Ni catalysts are desired. In this paper, a novel preparation method of supported Ni catalysts for the CO_2 reforming of methane is reported and the characterization of physicochemical properties of these catalysts is also revealed. Supported Ni catalysts were prepared by a modified impregnation method with cyclodextrins (αCD, βCD or γCD) as the modification reagent, SBA-15 (a ordered mesoporous silica) as the support, and $Ni(NO_3)_2$ as the precursor of Ni component. Results showed that, compared with Ni/SBA-15 prepared by the conventional impregnation method, these cyclodextrins modified catalysts possessed smaller sizes of NiO particles and exhibited higher catalytic activities in CRM. Characterization results revealed that some kinds of complexes could be formed between $Ni(NO_3)_2$ and cyclodextrins, which were favorable for taking Ni^{2+} into the channels of SBA-15 and benefitted to the mutual isolation of Ni species, and finally resulted in better dispersion of Ni species.

Biography

Dehua HE has completed his PhD at the age of 35 years from Tokyo Institute of Technology and postdoctoral study from Sagami Chemical Research Center, Japan. He has published more than 80 papers in peer-reviewed journals and served as a scientific committee member of the Coordination Catalysis of Chemical Society of China (2003 - present).

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