Ni/SBA-15 catalysts for methane dry reforming

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Ten catalyst samples, with increasing nickel loadings of 4 to 29 wt. %, were prepared by impregnation of different nickel precursors (acetate, nitrate, and citrate) in different concentrations on SBA-15 mesoporous silica support. A modified sol-gel method was used to prepare the support, which proved to have a high BET surface area of 834 m_2/g, a very well-ordered mesoporous structure and narrow pore size distribution around 7.8 nm. An exhaustive physical, chemical and dynamic characterisation of the prepared samples was performed and an optimised catalyst with optimum activity was proposed. XRD, SEM/EDS, XPS, TEM, and N_2 adsorption isotherm were used to assess the bulk and surface structure, morphology and texture of the prepared samples. Good dispersion and reasonably high loadings were obtained from less concentrated solutions of nickel acetate precursors, while the highest loading is obtained using nickel nitrate as precursor. The dry reforming of methane (DRM) reaction, using a model biogas, CH_4/CO_2 ratio of 1.5:1, was operated isothermally at 550, 600, 650 and 700°C, respectively. The carbon deposition on the catalyst surface was surveyed by XRD, SEM, and TGA/DSC and TPO measurements. There was no carbon formed over the ex- NI acetate samples while for the ones obtained from Ni-nitrate, the amount of carbon increased with the Ni loading. decomposition and Boudouard reaction. Therefore, many research studies were focused on the preparation of supported catalysts with improved activity and stability, by using different preparation methods and different supports. This work deals with the preparation of newly-developed nickel catalysts supported on mesoporous SBA-15 silica. A modified sol-gel method was chosen for the support preparation and impregnation method was used to incorporate the active phase, namely nickel, onto the support. The prepared Ni/SBA-15 catalysts with different Ni loading and different Ni precursor were tested in DRM reaction.

Biography: Dr. Rawaz Ahmed: She worked at Teesside University, with valuable experience in heterogeneous catalysis and sustainable technology having won the top poster prize in catalysis by Royal Chemical Society at Johnson Matthey Conference, Biillingham in March, 2011, and the optimized preparation method and results obtained over the catalyst with optimal formulation are the subject of a patent application (P136962GB; New UK Patent Application; Supported Metal Catalyst; Teesside University). She worked as Research Associate: biomass carbonization at Teesside University after her PhD study. The major subject is focus on the biomass hydrothermal carbonization. Dr. Ahmed's is currently working on a number of research projects on heterogeneous catalysis and refinery processing at KISSR.

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