The effect of Calcination atmosphere over Ni-based Mesoporous alumina catalysts for Dry Reforming of Methane

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In recent decades, the demand for alternative energy resources has steadily increased. The methane dry reforming has drawn huge attention on converting greenhouse gases (namely CH_4 & CO_2) into highly useful synthesis gases with a H_2/CO ratio of 1. Ordered mesoporous alumina is known to have large specific surface area, big pore volume, uniform pore size and excellent thermal stability. The obtained materials were used as a support for Ni based catalysts for dry reforming of methane. Reactivity of Ni based mesoporous alumina catalysts are attributed to high dispersion of the Ni within the framework, which are more accessible to reactants. In this work, Ni@mesoporous alumina catalysts were prepared by calcination under different gaseous atmosphere (N_2, air) and they were applied in dry reforming. Catalytic activities were studied in a fixed-bed reaction system with 1 bar, 700 °C and 3000 GHSV. It was found that NiO and $NiAl_2O_4$ phase were observed for air calcined catalyst, however N_2 calcined catalysts only showed $NiAl_2O_4$ phase. N_2 calcined catalyst had stronger interaction between metal and support, and showed smaller crystalline size and higher catalytic stability.