Preparation of hierarchically ordered macro-mesoporous xK/Ni-Al_2O_3 catalysts for steam reforming of 1-methyl naphthalene

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Hierarchically ordered macro-mesoporous xK/Ni-Al_2O_3 catalysts are prepared in this study. The surface area and pore size distribution of catalysts are obtained from nitrogen adsorption-desorption method (BET). The macro-mesopore structure and Ni active sites dispersion are found through SEM and TEM images. The reduction ability of catalysts also is investigated by hydrogen temperature-programmed reduction (H_2-TPR). These catalysts are expected to be catalyst for 1-methyl steam reforming since the ordered macro-mesopores in Al_2O_3 support played an important role in enhancing the big reactant diffusion to the active sites, increasing the reaction rate. In addition, using macroporous alumina also decreases polymerates condensed on surface of catalysts, slowing down the catalytic deactivation. Moreover, the interaction between Ni and alumina in presence of potassium is observed from X-ray diffraction (XRD) and X-ray photoelectron spectroscopy (XPS) patterns. The introduction of potassium onto Ni-Al_2O_3 support creates more nickel active sites for steam reforming.