Oxidative Coupling of Methane over Transition Metal -doped TiO_2 Nanowire Catalysts

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With the vast availability of natural gas and shale gas, the use of methane through direct conversion has been developed. The catalytic oxidative coupling of methane (OCM) is an ideal method to produce C2 hydrocarbons, including ethane and ethylene. The OCM process on transition metal -doped TiO2 nanowire catalysts was performed and the effects of metal dopants were studied. The selection nanowire as the OCM catalysts was because of high preparation temperature that can secure the stability of the nanowire catalysts during the OCM reaction (700 -850 oC) and because the transition metal doping to TiO2 nanowire may adjust the catalytic activity of TiO2. A Mn -doped TiO2 nanowire catalyst exhibited the highest C2 yield with the highest (ethylene)/(ethane) ratio because of its moderate oxidation activity, while a highly active Rh -doped TiO2 nanowire catalyst converted methane into fully oxidized CO and CO2. The semiconductivity assessed by UV -vis absorption represented the oxidation activity of the nanowire catalysts.