

Methane combustion over mesoporous cobalt oxide catalysts: The effect of acid treatment

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Natural gas is popular energy source globally, especially for transportation. However, emission of unburnt methane is observed from the natural gas vehicles and regulation of methane emission is necessary for the environmental protection. Catalytic combustion of methane is an effective method for reducing methane emission and Pd catalyst is known as the best catalyst for the methane combustion reaction. However, it is limited in commercial usage because of high price and rarity. Among non-noble metal oxide catalysts, cobalt oxide is an active catalyst for the methane oxidation reaction. However, poor structural and textural properties limit its application for the methane combustion reaction. In this work, mesoporous cobalt oxide was synthesized by nano-replication method to improve mass transfer efficiency. Also, mesoporous cobalt oxide catalyst was treated by nitric acid to modify surface chemistry. Significant enhancement of methane oxidation activity was observed for the acid treated catalyst and the effect of acid treatment was investigated by various characterization techniques.