

## Catalytic CO methanation over Mesoporous ZSM5 with different metal promoters

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### ABSTRACT

The carbon monoxide methanation has possessed huge potential as an effective method to produce synthetic natural gas (SNG). The basic requirements such as high catalytic activity at low temperatures (<500 °C) and high stability throughout all temperatures is needed for an ideal methanation catalysts. The ultimate goal of the study is to examine the influential of different metal promoters towards catalytic properties and catalytic CO methanation performance. A series of metal promoters (Rh, Co, Pd and Zn) mesoporous ZSM5 were synthesized using an incipient-wetness impregnation method and evaluated for catalytic CO methanation. XRD analysis showed that only metal oxides and no metallic phase of Rh, Co, Pd, and Zn were observed. The nitrogen physisorption analysis showed that mZSM5 possessed high surface area and micro-mesoporosity with intra- and interparticle pores. FESEM analysis illustrated that mZSM5 had typical coffin-type morphology and Rh metal dispersed on the surface of the support was confirmed by EDX analysis. Moreover, Rh (CO conversion = 95%, CH<sub>4</sub> yield = 82%) and Co (CO conversion = 91%, CH<sub>4</sub> yield = 71%) promoters showed significant improvement in CO methanation. On the other hand, Pd (CO conversion = 18%, CH<sub>4</sub> yield = 12%) and Zn (CO conversion = 10%, CH<sub>4</sub> yield = 9%) promoters had only low benefit to the CO methanation. This study affirmed that the catalytic activity of CO methanation was influenced by the variation in the type of metal loading due to different nature of metallic phases and their synergistic interaction with the supporting material.

### KEYWORDS:

Synthetic Natural Gas; CO Methanation; Mesoporous ZSM5; Metal Promoters; Rh