

# Catalytic hydrogenation of CO<sub>2</sub> on Ni catalysts

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The catalytic CO<sub>2</sub> hydrogenation is studied on Ni/SiO<sub>2</sub> catalysts in the effects of alkali promoter and particle size. A variety of kinetic measurements have been performed in this work. CO<sub>2</sub> and CH<sub>4</sub> are the major products during reaction. It is found that the reaction rate of CO<sub>2</sub> hydrogenation and selectivity of CH<sub>4</sub> may increase with Ni loading increasing. The selectivity of products is suggested to depend on the effect of particle size of Ni metal. On the other hand, small amount of Na additive can inhibit the formation of CH<sub>4</sub> and enhance the selectivity of CO. The apparent activation energies (E<sub>a</sub>) are obtained for all Ni/SiO<sub>2</sub> catalysts. It was found that the activation energies for CO<sub>2</sub> hydrogenation on Ni/SiO<sub>2</sub> catalysts without Na promoter are in the range of 54.4-61.9 kJ/mol, but however it can significantly reduce to 37.2 kJ/mol on the Ni-Na/SiO<sub>2</sub> catalyst. The E<sub>a</sub> values resulted from CO and CH<sub>4</sub> formation rate are further investigated, showing that the formation of CH<sub>4</sub> usually provides lower activation than CO formation. It is proposed that CO is likely not an intermediate in the path toward CH<sub>4</sub> formation.

Keywords: Ni/SiO<sub>2</sub>, CO<sub>2</sub>, catalytic hydrogenation

報告型式：☐口頭 ☒海報 ☐皆可

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