

Methanol synthesis from CO₂/H₂ using Pd/silica; Pd₂Ga/silica; PdZn/silica catalysts

Regular student: Raydel Manrique Suarez (rmanrique@udec.cl).

Program: PhD in Engineering Sciences, Mention Chemical Engineering.

Tutors: Dr. Alejandro Iván karelovic Burotto

Dr. Romel Mario Jiménez Concepción

Abstract

The promotion of Ga and Zn on SiO₂ supported Pd in the hydrogenation of CO₂ to methanol at 800 kPa and 220-280 °C was investigated. Pd/SiO₂, PdZn/SiO₂ and Pd₂Ga/SiO₂ catalysts were prepared by the formation of organic complexes from the impregnation wetting incipient technique resulting in Pd clusters of 9-11 nm. It was found that Ga and Zn addition increased methanol formation rate by an order of magnitude without significantly changing that for the reverse water gas shift (RWGS). A kinetic and in situ DRIFTS analysis reveals presence of formate on the surface, formates can be the formation route to methanol. In addition, studies of CO adsorption and XRD analysis show the presence of bimetallic phases on the surface. The results suggest that Ga and Zn promotes Pd increasing methanol activity, probably creating new more active sites for the formation of methanol from a new bimetallic phase.