Kinetic and in situ FTIR study of CO methanation on a Rh/Al<inf>2</inf>O<inf>3</inf> catalyst

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Carbon monoxide hydrogenation was studied over a ?-alumina-supported 1 wt% Rh catalyst by means of kinetic and in situ infrared measurements. The study was carried out at 200-300 °C, 0-22.5 kPa H<inf>2</inf> and 1-7.5 kPa CO. The in situ FTIR scrutiny of the catalyst surface shows that adsorbed CO? species and vacancies dominate the Rh surface, while no effect of H<inf>2</inf> and H<inf>2</inf>O pressures on surface coverage was observed under the conditions studied. The kinetic data are consistent with the mechanism in which the C-O bond dissociation is assisted by a double H-addition while H<inf>2</inf> dissociative adsorption, CO molecular adsorption and the HCO? formation are quasi-equilibrated steps. A two-parameter Langmuir-Hinshelwood rate expression is deduced for CH<inf>4</inf> formation, in agreement with the proposed sequence of elementary steps and kinetic data. The effect of temperature on parameters ? and K<inf>CO</inf> leads to an ap