The kinetic effect of H 2 O pressure on CO hydrogenation over different Rh cluster sizes

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 The effect of H 2 O pressure (P H2O) on CH 4 formation turnover rate (TOF CH4) was evaluated as a function of Rh cluster size. In-situ DRIFTS and kinetic measurements were used to study the CO hydrogenation at methanation conditions on two Rh/Al 2 O 3 catalysts with different cluster sizes (Rh-1nm and Rh-3nm). It was observed a significant effect of P H2O on TOF CH4 over Rh-1nm catalysts, while the rate on Rh-3nm resulted insensible to the H 2 O pressure. The mean Rh cluster sizes were estimated by H 2 chemisorption, TEM and XPS analyses. It is confirmed the structural sensitivity of the CO methanation reaction on supported Rh catalysts as the TOF CH4 resulted significantly higher in the larger clusters. Nonetheless, lower apparent activation energy was measured in smaller Rh clusters, which is successfully explained by the energies involved into the parameter of the proposed L-H kinetic model. CO adsorption isotherms were obtained from in-situ