



Original Research Article

Effect of support nature on performance and kinetics of nickel nanoparticles in toluene hydrogenation

Nastaran Parsafard^{1*}, Mohammad Hasan Peyrovi^{2*} and Zahra Mohammadian²

¹Kosar University of Bojnord, Department of Applied Chemistry, North Khorasan, 9415615458, Iran

²Faculty of Chemistry and Petroleum Sciences, Department of Petroleum Chemistry and Catalysis,
University of Shahid Beheshti, Tehran, 1983963113, Iran

*Corresponding authors Fax number: Tel.: +98 (58) 32427408

*E-mail: n-parsafard@kub.ac.ir (N. Parsafard) and m-peyrovi@sbu.ac.ir (M. H. Peyrovi)

ABSTRACT

The kinetics of toluene hydrogenation over Ni-supported catalysts with various supports was investigated under the wide range of conditions as 130 to 210 °C reaction temperature, 2.6×10^{-5} to 5.9×10^{-5} atm partial pressure of hydrogen and 1.4×10^{-9} to 3.7×10^{-8} atm partial pressure of toluene. For more study, two kinetics models were also selected and studied to describe the kinetics of this process. The modelling study indicates that the competitive adsorption mechanism provides a good fit towards the experimental data and allows to determine the kinetics parameters. According to these studies, Ni/HZSM-5(40 wt. %)-HMS catalyst has better performance than other prepared catalysts for the toluene hydrogenation process.

Keywords: Toluene; Mechanism; Zeolite; Modelling; Hydrogenation.