

Effect of solid acids in the conversion of glycerol over ru/bentonite catalyst in glycerol hydrogenolysis reaction

Abstract

Glycerol known as by-product of transesterification of vegetables oil become an important materials after some chemical modification. In this study, hydrogenolysis reaction of glycerol to 1,2-propanediol was conducted using various supported ruthenium based catalyst. The support materials used in this study are bentonite, TiO₂, Al₂O₃ and SiO₂. All experiments were carried out at reaction condition of 150°C, hydrogen pressure 20-30 bar for 7 hours and the 20%(wt) glycerol content in distilled water. The result shows that activity of the catalyts increased following this order: Ru/SiO₂ < Ru/TiO₂ ~ Ru/Al₂O₃ < Ru/bentonite. High selectivity to 1,2-propanediol was obtained in hydrogenolysis glycerol over Ru/TiO₂ (83.7%) and Ru/bentonite (80.1%) catalysts. Since Ru/bentonite catalyst performed better than other tested catalyst, we choose this catalyst system to investigate the effect of various solid acids (zeolite, ZrO₂, Nb₂O₅ and amberlyst) on conversion of glycerol in hydrogenolysis reaction. Addition of solid acid in hydrogenolysis glycerol had promote the activity of Ru/bentonite catalyst drastically. The result shows that the presence of zeolite make the conversion of glycerol increased to maximum from 62.8% to 81.6% compared the other solid acids. Interestingly, selectivity to 1,2-propanediol still was achieved over 80.0%. These catalysts system were characterized by XRD, XPS, BET, and TEM for obtaining some physicochemical properties of the catalysts.