

Copper-dolomite as effective catalyst for glycerol hydrogenolysis to 1,2-propanediol

ABSTRACT

A series of Cu/dolomite catalysts were synthesized using the impregnation technique, characterized using NH₃-TPD, FTIR-Pyridine, XRD, H₂-TPR, BET, BJH, FESEM-EDX, and XPS techniques and evaluated in glycerol hydrogenolysis into 1,2-propanediol (1,2-PDO). Remarkably, dolomite support exhibited high acidity, which is, to our knowledge the first acid characteristic revealed among the reported literatures. By doping copper on dolomite support, the acid amount and strength of the catalyst increased. N₂O chemisorption analysis suggests that the metallic copper species were well dispersed on dolomite support while the copper surface area increased with copper loading. The formation of metallic copper on dolomite support agreed well with findings derived from XRD and XPS analysis. According to the results of XPS and H₂-TPR, metallic copper species were enriched on the grain surfaces of dolomite and not in the bulk. The addition of copper to dolomite ameliorates the redox properties of the catalysts, owing to the reduction at a lower temperature than that of pure CuO and dolomite support. From the catalytic results, 20 wt% Cu/dolomite was the most active catalyst by giving 100% glycerol conversion and 92% selectivity toward 1,2-PDO at 180 °C, 2 MPa H₂ in 6 h reaction time.

Keyword: Glycerol hydrogenolysis; Copper; Dolomite; Acidity 1-2-propanediol