

Synthesis of glycerol carbonate from glycerol and urea over Zn/Al mixed oxide catalysts prepared by different methods

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Glycerol carbonate (GC) can be synthesized under various catalysts by reaction routes homogeneous and heterogeneous. In this research, the Zn/Al mixed oxide (ZnAlO) catalysts (containing ZnO and ZnAl₂O₄ phases) were prepared by different methods: physical mixing of separated ZnO and ZnAl₂O₄ (p-ZnAlO), citric-template (ci-ZnAlO) and ZnO impregnated on ZnO and ZnAl₂O₄. These catalysts were experimented for the synthesis of glycerol carbonate from glycerol and urea at 140°C under vacuum condition (3kPa) to remove ammonia by-product in different reaction time. Reaction results are checked by GC-FID using internal standard method (tetraethylene glycol). XRD, XPS and FT-IR analysis of liquid products, fresh catalysts and spent catalysts are used to investigate the change of crystalline phase (ZnO, ZnAl₂O₄), the change of Zn's electronic state and the functional groups (NCO, glycerol carbonate). At the 1hr reaction time, the i-ZnAlO catalyst gave the lowest GC yield. However, at the 3hr reaction time, the p-ZnAlO showed the lowest GC yield and GC selectivity. In both of case, ci-ZnAlO had the best reaction result.