

Active species over ZnAl mixed oxide catalysts for carbonylation of glycerol with urea:
homogeneous and heterogeneous catalysis

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Glycerol carbonate is an emerging compound with various applications. Glycerol carbonate can be synthesized by a eco-friendly reaction route, carbonylation of glycerol with urea using Zn/Al mixed oxide catalyst. In this work, Zn/Al mixed oxide materials with different metal molar ratios were prepared by co-precipitation method using polystyrene template and experimented for the synthesis of glycerol carbonate from glycerol and urea at 140°C under vacuum condition (3kPa). Active species over Zn/Al mixed oxide catalysts and possible reaction routes for glycerol carbonylation to glycerol carbonate were investigated through XRD and FT-IR analysis of liquid products, fresh catalysts and spent catalysts. In the fresh Zn/Al mixed oxide catalysts, two crystalline phases (ZnO, ZnAl₂O₄) were observed. ZnO phase was dissolved into the reaction solution under the reaction condition to make Zn complexes with a functional group NCO and then, the complexes promoted the glycerol carbonylation via a homogeneous reaction route. On the contrary, ZnAl₂O₄ kept the solid phase, which involved in the glycerol carbonylation via a heterogeneous reaction route.