Transesterification of glycerol with dimethyl carbonate using CaO : Homogeneous vs heterogeneous

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Glycerol carbonate was synthesized by transesterification of glycerol with dimethyl carbonate (DMC) under various reaction conditions using CaO, which already known as a heterogeneous catalyst in the transesterificatioin. On the contrary, in this study, we found CaO that calcined at 900°C was completely dissolved in the specific reaction mixture of glycerol and DMC in 5 min at 75°C, which indicate the CaO is act as homogeneous catalyst. The dissolved Ca species was recovered and characterized using TOF-SIMS, elemental analysis, and FT-IR. The results indicated that an active species, $Ca(C_3H_7O_3)(OCO_2CH_3)$ was generated from the interaction of CaO with glycerol and DMC and its formation in the reaction mixture was affected by the amount of DMC used. A plausible reaction mechanism to the formation of $Ca(C_3H_7O_3)(OCO_2CH_3)$ and glycerol carbonate were proposed on the basis of experimental and spectroscopic results.