

## Synthesis of Ce Impregnated on Functionalized Graphene Oxide Nanosheets for Transesterification of Propylene Carbonate and Ethanol to Produce Diethyl Carbonate

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**Abstract :** Organic carbonates have the potential to be used as fuels and because of this, their production through non-phosgene routes is a thrust area of research. Di-ethyl carbonate (DEC) synthesis from propylene carbonate (PC) in the presence of alcohol is a green route. In this study, the use of reduced graphene oxide (rGO) based metal oxide catalysts [rGO-MO, where M = Ce] with different amounts of graphene oxide (0.2%, 0.5%, 1%, and 2%) has been investigated for the synthesis of DEC by using PC and ethanol as reactants. The GO sheets were synthesized by an electrochemical process and the catalysts were synthesized using an in-situ method. A theoretical study of the thermodynamics of the reaction was done, which revealed that the reaction is mildly endothermic. The theoretical value of optimum temperature was found to be 420 K. The synthesized catalysts were characterized for their morphological, structural and textural properties using field emission scanning electron microscopy (FE-SEM), X-ray diffraction (XRD), N<sub>2</sub> adsorption/desorption, thermogravimetric analysis (TGA), and Raman spectroscopy. Optimization studies were carried out to study the effect of different reaction conditions like temperature (140 °C to 180 °C) and catalyst dosage (0.102 g to 0.255 g) on the yield of DEC. Amongst the various synthesized catalysts, 1% rGO-CeO<sub>2</sub> gave the maximum yield of DEC.

**Keywords :** GO, DEC, propylene carbonate, transesterification, thermodynamics

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