**Greener synthesis of styrene carbonate from CO2 using heterogeneous catalyst**

Victor Onyenkeadi and Basu Saha

*Centre for Green Process Engineering, School of Engineering, London South Bank University, 103 Borough Road, London SE1 0AA, UK.*

Carbon dioxide (CO2) is the most important anthropogenic greenhouse gas and therefore it is considered as the main contributor to global warming. However, CO2 is recognised as an abundant, cheap, recyclable and non-toxic carbon source and thus its utilisation for the production of value-added chemicals is extremely beneficial for the chemical industry. Styrene carbonate is a non-toxic, biodegradable and a valuable chemical of great commercial interest. Styrene carbonate is an excellent precursor material for the production of polycarbonates. Styrene carbonate can be used as a solvent for lithium battery because of its high polarity property. Several reaction routes have been attempted for styrene carbonate production, which was phosgene, oxidative carboxylation, direct synthesis using homogeneous catalyst and direct synthesis using a heterogeneous catalyst. The latter being the most attractive route due to the inexpensive raw material, ease of catalyst recovery and the avoidance of corrosive reagents, such as phosgene and dimethyl formamide.

The research study is aimed at catalytic conversion of carbon dioxide (CO2) to value added chemicals as to reduce the emission of greenhouse gases in order to prevent global warming. The utilisation of carbon dioxide will not only offer one of the means to prevent global warming but also offer a mean of value-added chemicals such as fuel additives, substitute for various chemical reagents, organic solvent and green reagents.

The synthesis of organic carbonate through cycloaddition of carbon dioxide to epoxide in the present of the heterogeneous catalyst using high-pressure reactor is known to be a ‘Green Processes’.

Heterogeneous catalyst of metal oxides such as magnesium oxide, cerium oxide, zirconium oxide, lanthanum oxide, lanthana doped zirconia, magnesium oxide and cerium doped zirconium oxide ceria lanthana doped zirconia was used to synthesised styrene carbonate through cycloaddition of carbon dioxide to styrene oxide in a batch high-pressure reactor under different reaction conditions.

 Among other catalysts ceria lanthana doped zirconia catalyst showed good activity and selectivity for styrene carbonate without additional organic solvents. The optimum reaction conditions for the synthesis of styrene carbonate in the presence of ceria lanthana doped zirconia catalyst system was at 408 K, 75 bar, 20 h and 300 rpm with the corresponding yield of 52% and conversion of 84%.