# γ-$C_3N_4$ and TBAB combined catalyzed efficient conversion of Epoxide to Cyclic Carbonate in ambient condition

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Research on carbon dioxide fixation has attracted great attention due to global warming and climate change. Fossil fuels are the major source of energy and which is indispensible for or day to day life. The majority of our required chemicals are produced from the petroleum and the renewable energy utilization technology is not developed enough to replace the fossil fuel based system. This accumulates a huge amount of carbon dioxide ($CO_2$) every day in the atmosphere. Consequently, CO2 utilization for the preparation of useful chemicals and fuel is necessary. Cyclic carbonates are well established as highly polar aprotic solvent, solvent for lithium ion battery, monomers of polycarbonates, etc.1 Previously very few works had been reported for fixation of $CO_2$ using graphite carbon nitride (γ-$C_3N_4$) or quaternary ammonium halides alone at relatively high $CO_2$ pressure.[2] Our objective is to develop methodologies for epoxide to cyclic carbonate formation at ambient CO2 pressure. We prepared γ- $C_3N_4$ from the thermal polycondensation of melamine.3 We have used catalysts mixture i.e. γ- $C_3N_4$ and tetrabutylammonium bromide (TBAB) which operates synergistically for the conversion of epoxide to cyclic carbonate in solvent free condition. We have taken epichlorohydrin as model substrate and the optimum condition is 105oC for 20 h under CO2 filled balloon condition. Our catalyst system is active for other substrates like styrene oxide, allyl glycidyl ether or phenyl glycidyl ether. The activity of our catalyst combination is remained almost same up to 7 cycles. The main scheme of the work is mentioned below (Scheme I). Key words: Global warming, CO2, γ- $C_3N_4$, TBAB, epoxide, cyclic carbonate, balloon, solvent free etc. Scheme I:

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