



Abstract

Bivalent metal complexes of meso-tetraphenyl porphyrin were used in the solventless cycloaddition reaction of cyclohexene oxide with CO₂ in the compressed medium. In order to improve the catalytic activity, a nucleophilic co-catalyst say tetrabutyl ammonium bromide (TBAB) was required and the best yields of cyclic carbonates were obtained at 110°C, and 1 bar pressure of CO₂ purged for 4 hours. In this screening, metal complexes of meso-tetraphenyl porphyrin comprising bivalent metal atoms (M = Zn, Ni, and Co) were designated as catalytic agents. These metal complexes of meso-tetraphenyl porphyrin (Zn-TPP, Ni-TPP and Co-TPP) were prepared by using metal salts in DMSO by sonication, reflux, and hydrothermal techniques under controlled parameters. The UV-Visible spectroscopic results showed that Q-bands of catalysts were more intense, and intensity of "Soret" band decreased as metal ion was inserted in the core of porphyrin ligand. Moreover, the characteristic signal of N-H was disappeared in the FTIR spectra of catalysts. I have revealed my efficacious results in solvent-free one-pot construction of cyclic carbonates by reacting CO₂ and epoxides by using symmetrical metal-porphyrin catalysts at ambient conditions with and without the use of co-catalyst named as TBAB. The HPLC method was used to investigate the amount of products formed during the catalytic reactions. The catalysts were very active and showed high catalytic activity (turnover number (TON) = 3187 and turnover frequency (TOF) = 796 h⁻¹ at 110°C).