Catalytic Fixation of Carbon Dioxide with Epoxides Promoted by Hydrogen Bond-based Ionic Liquids

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Chemical fixation of CO_2 into cyclic carbonates has attracted extensive attention in both academia and industry. Its use on an industrial scale represents a much greener alternative to the use of phosgene. Various catalysts including ionic liquids (ILs) have been developed for the cycloaddition reaction. However, unsatisfactory activities, high cost, low water/thermal stabilities of catalysts as well as the requirement of organic solvent (DMF, toluene or CH_2Cl_2) and metal salts ($ZnCl_2$) as co-catalysts are still the disadvantages needed to be overcome. Current progress has found that hydrogen bond donors could activate the epoxides and enhance the reaction for conversion of CO_2 with epoxides, which observed positive influence in the presence of metal salts or quaternary onium salts. In this work, we designed and synthesized hydroxyl-functionalized ILs for cycloaddition of CO_2 and epoxides based on understanding of reaction mechanism, which exhibited high activity for this reaction without any solvent and co-catalyst.