Fast and efficient CO_2 absorption in non-aqueous tertiary amines promoted by ethylene glycol

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Abstract

With the catalytic induction of EG, anhydrous DMEA shows CO_2 absorption performance via chemical binding and physical storage under normal pressure. Among the absorbents, pure DMEA can hardly absorb CO_2 directly but when the zwitterionic alkylcarbonates are formed between CO_2 and DMEA-EG which can be characterized by ^{13}C NMR and FTIR, the absorption rate of CO_2 will be improved at this time. An increasing the CO_2 loading as the mass fraction of EG in DMEA-EG, 90wt.% EG captures up to 0.72 mol/mol. The amount of chemically bound and physically stored is directly dependent on temperature, within the range of 293 to 323K, an absorption-regeneration cycle can be formed in a closed vessel because of the zwitterion DMEA-EG-CO_2 is unstable at the higher temperature. In other words, DMEA-EG-CO_2 can be easily regenerated upon appropriate depressurization or heating, corresponding thermodynamic calculations prove that the regenerative energy of DMEA-EG-CO_2 is 25.49kJ/mol.

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