

Supporting information

Efficient non-aqueous solvent formed by 2-piperidineethanol and ethylene glycol for CO₂ absorption

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Experimental section

Materials

Ethylene glycol (99.5%) and 2-piperidineethanol (98%) were supplied by J&K Scientific Ltd. CO₂ ($\geq 99.99\%$) and N₂ ($\geq 99.99\%$) were provided by Beijing ZG Special Gases Sci. and Tech. Co. Ltd. Molecular sieves (4Å), used to dry ethylene glycol, were purchased from Alfa Aesar.

Characterizations

A PerkinElmer Frontier spectrometer was used to record the FTIR spectrum of the absorbents before and after CO₂ absorption. A Bruker spectrometer was applied to record the ¹H NMR (600 MHz) and ¹³C NMR(151 MHz) data using DMSO-d₆ as the external reference.

Preparation of the absorbents

2-PE and EG were added into a glass vial (20 ml) at required molar ratio. Then, the vial was heated at 50 °C and the mixture in the vial was stirred until a homogenous solution was formed. Finally, the liquid absorbent can be obtained after the solution was cooled down to room temperature.

Uptake and release of CO₂

Glass tubes with an inner diameter of 10 mm were dried in an oven and then cooled down to room temperature before CO₂ uptake experiment. The liquid absorbent (~2.0 g) was loaded into the glass tube which was equipped with a rubber lid and two needles. One needle was long for CO₂ inlet and the other was short for CO₂ outlet. After that, the tube was partially immersed in a water bath of 25°C and CO₂ was bubbled into the solution (50 mL/min) through the long needle. The weight change of the tube after CO₂ uptake was determined by a digital balance.

After the uptake was finished, the tube was placed into a water bath of 50°C and N₂ was introduced the tube (60 mL/min) using the long needle. The weight decrease of the tube during desorption process was also determined by the balance.

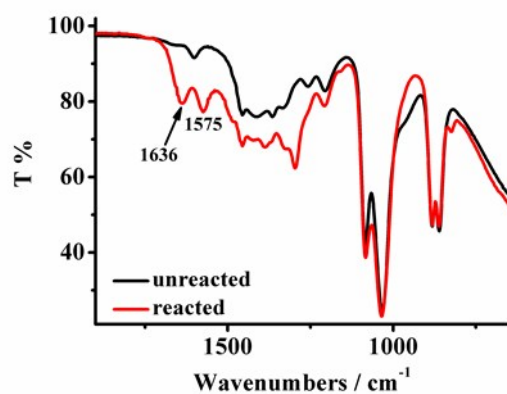


Fig. S1 The FTIR spectrum of MEA:EG(1:6) before and after reaction with CO₂.

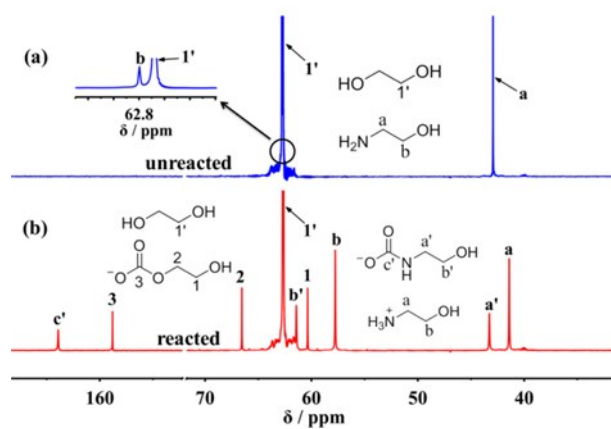


Fig. S2 The NMR spectrum of MEA:EG(1:6) before and after reaction with CO₂.

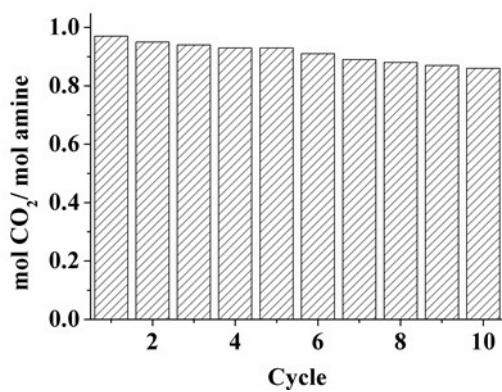


Fig. S3 Ten absorption-desorption cycles by 2-PE:EG (1:6). Absorption: ◆, 25°C; Desorption: ◇, 50°C.