Electronic Supplementary Material (ESI) for ChemComm.

Supporting information

Efficient CO_2 absorption by azolide-based deep eutectic solvents

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Experimental section

Materials and characterizations: Tetraethylammonium hydroxide (35% w/w) water solution and the exchange resin (OH^- type) were purchased form Alfa Aesar. Imiazole (99%) and Ethylene glycol (99.5%, Super dry) were obtained from J&K scientific. Ethylene glycol was dried by 4Å molecular sieve prior to use. 1,2,4-Triazole was provide by Beijing Ouhe Technology Co., LTD. Tetraethylphosphonium bromide ($[P_{2222}]Br$) was purchased form TCI. The infrared spectra were recorded on a PerkinElmer Frontier FTIR spectrometer on a KBr disk. The ^1H NMR spectra were taken on a Bruker spectrometer (400 MHz) and the ^{13}C NMR spectra were recorded at 100.6 MHz, using the d_6-DMSO as the internal reference.

Synthesis of azolide ILs. All the azolide ILs were prepared based on the reported procedure.[1] Typically, for the synthesis of $[P_{2222}][Triz]$, a solution of $[P_{2222}][OH]$ in water was prepared from $[P_{2222}][Br]$ using the anion-exchange resin method. The concentration of $[P_{2222}][OH]$ in water solution was titrated with potassium hydrogen phthalate. Equimolar 1,2,4-triazole was added to the water solution of $[P_{2222}][OH]$. After the mixture was stirred for 2 hours at room temperature, the water in the solution was removed by using rotary evaporation at 70 ^oC. The obtained product was dried under vacuum at 80 ^oC.

Synthesis of DESs: The azolide IL and ethylene glycol were simply mixed at the molar ratio of 1:2. Then, the mixture was stirred at 80 ^oC until a liquid was formed, which was cooled down to room temperature prior to use.

Absorption and Desorption of CO_2: A DESs (~2g) was added into a glass tube with an inner diameter of 10 mm. The glass tube was partially immersed into the water bath at 25℃. Carbon dioxide was bubbled through the needle into the DESs at a flow rate of 50 ml / min. The weight of the absorbent was weighed at regular intervals using an electronic analytical balance with an accuracy of ±0.1 mg.

In the desorption of CO_2, N_2 of atmospheric pressure (50 mL /min) was bubbled through the solutions at required temperature. The weight of the solution was

determined at regular intervals during the desorption process by the electronic balance.

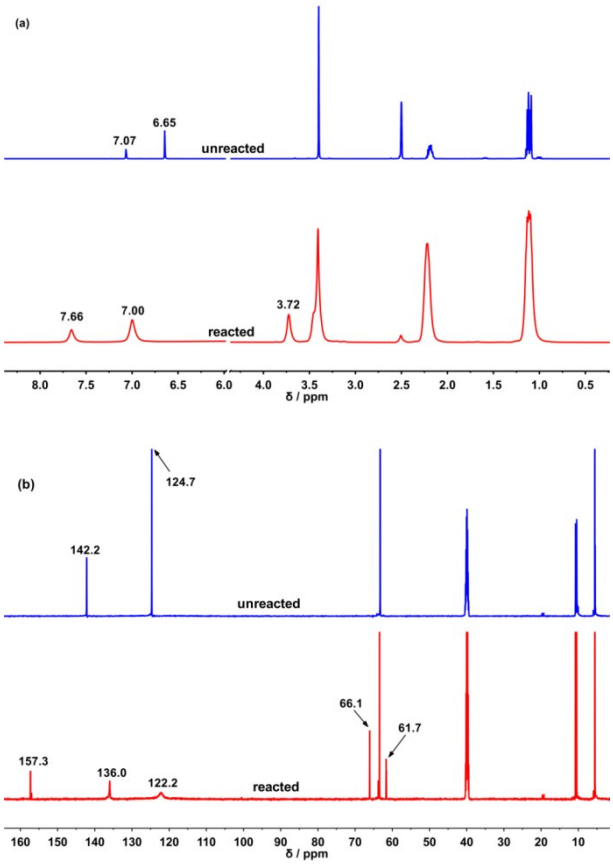
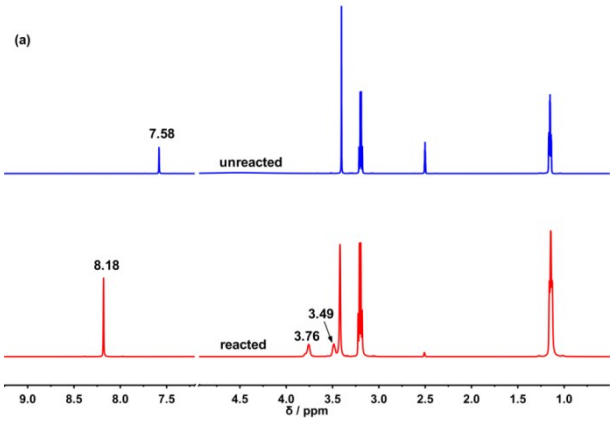


Fig. S1. The ^{1}H (a) and ^{13}C NMR (b) spectra of $[P_{2222}][Im]$-EG (1:2) before and after CO_2 uptake.



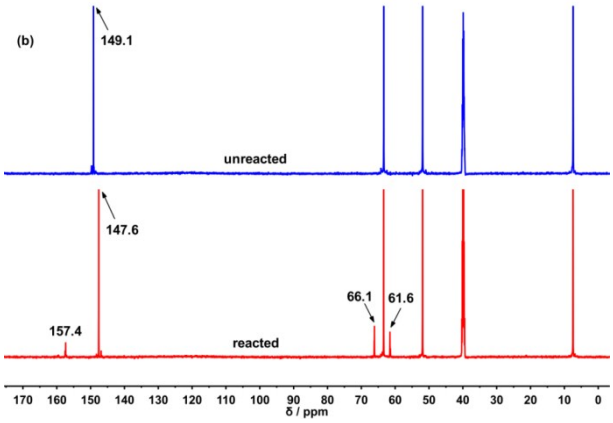
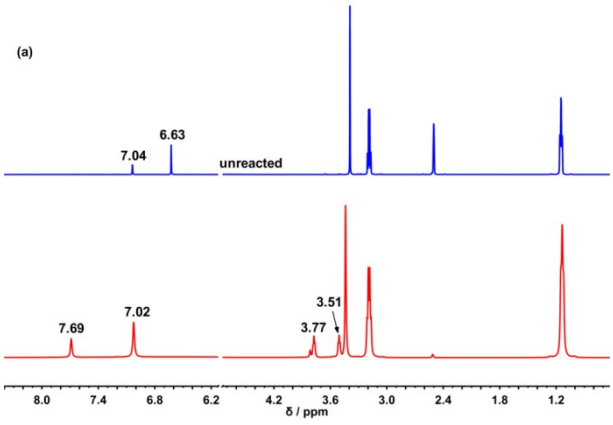


Fig. S2. The ^{1}H (a) and ^{13}C NMR (b) spectra of $[N_{2222}][Triz]$-EG (1:2) before and after CO_2 uptake.



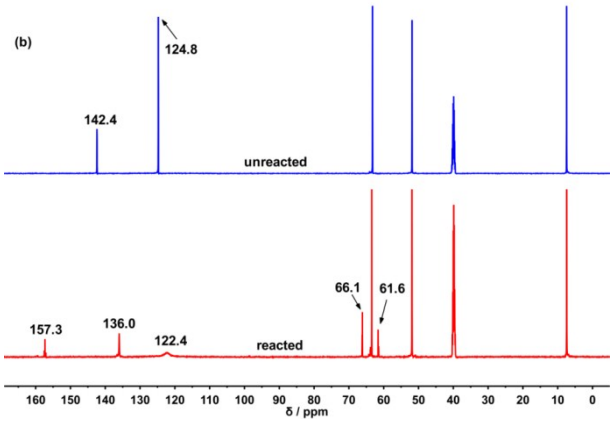


Fig. S3. The ^{1}H (a) and ^{13}C NMR (b) spectra of $[N_{2222}][Im]$-EG (1:2) before and after CO_2 uptake.

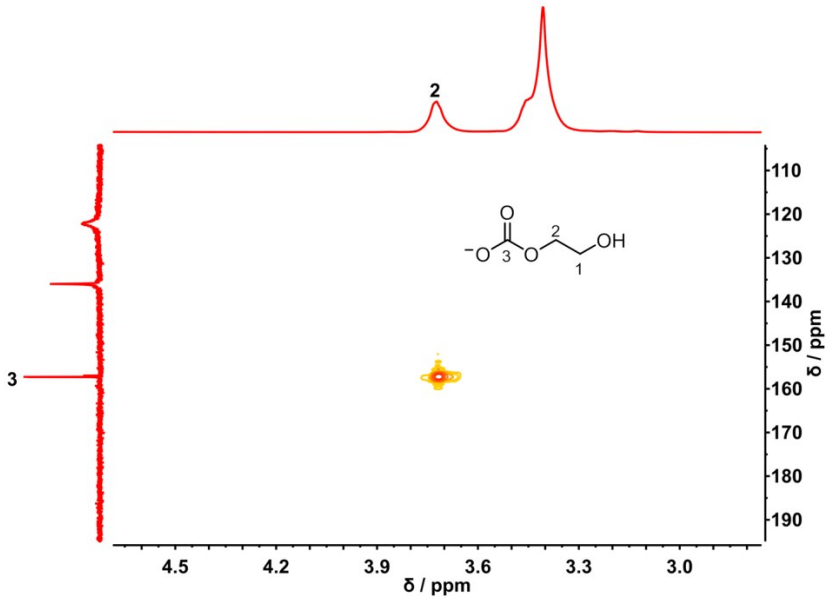


Fig. S4. The ^{1}H - ^{13}C HMBC spectra of $[P_{2222}][Im]$-EG (1:2) after CO_2 uptake.

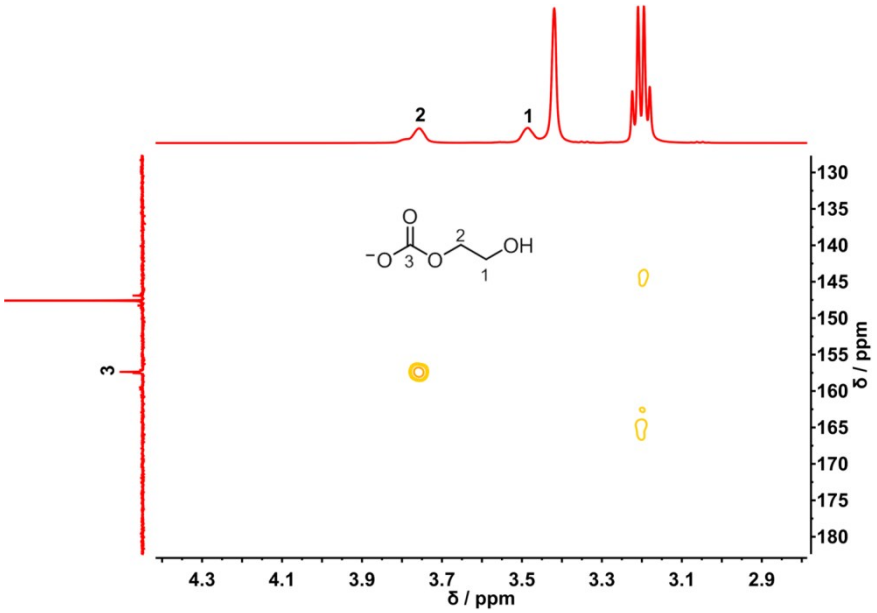


Fig. S5. The ^{1}H - ^{13}C HMBC spectra of $[N_{2222}][Triz]$-EG (1:2) after CO_2 uptake.

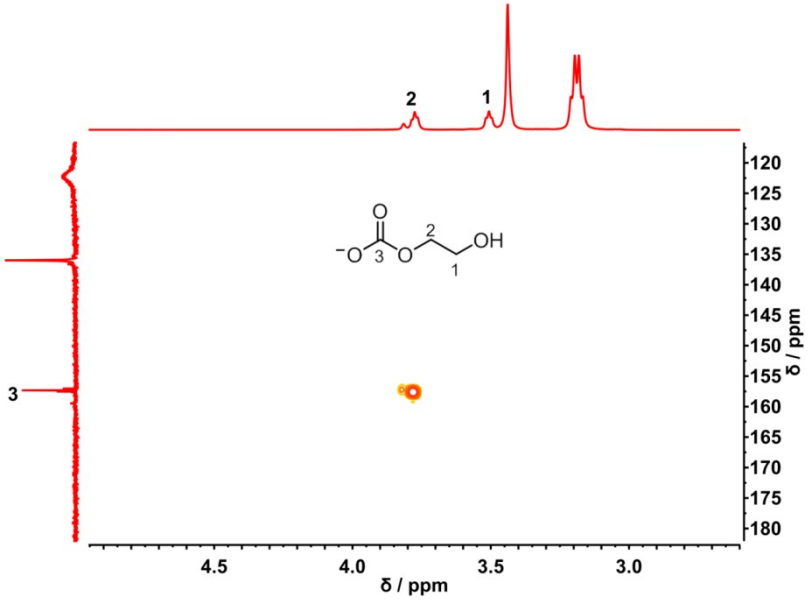


Fig. S6. The ^{1}H - ^{13}C HMBC spectra of $[N_{2222}][Im]$-EG (1:2) after CO_2 uptake.

References:

[1] C. Wang, X. Luo, H. Luo, D.-e. Jiang, H. Li, S. Dai, *Angew. Chem. Int. Ed.*, **2011**, *50*, 4918-4922.