

Supporting Information

Enhanced selective CO₂ adsorption on polyamine/MIL-101(Cr) composites

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and Liang Chen*^[a]

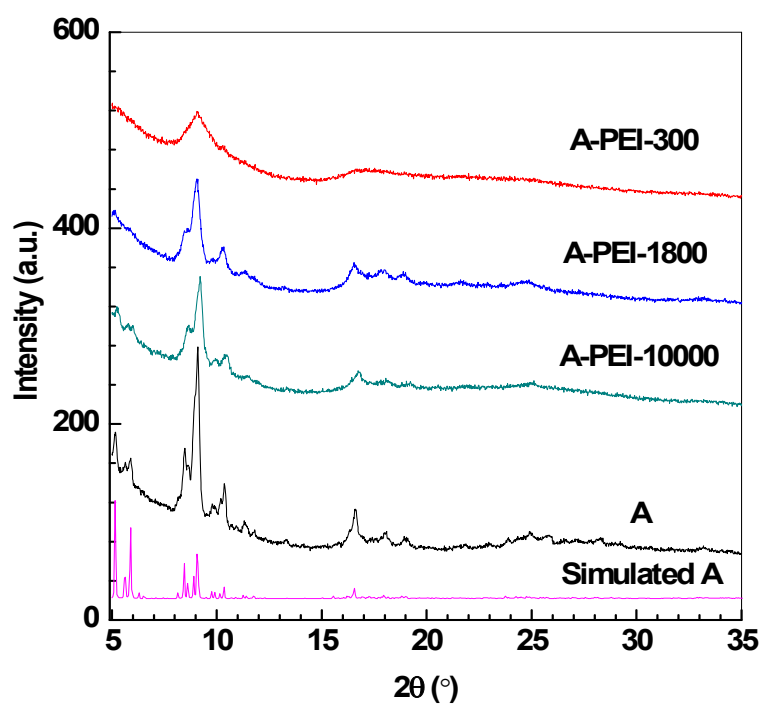


Figure S1. Powder XRD patterns of A before and after loading PEI, and simulated XRD patterns of A.

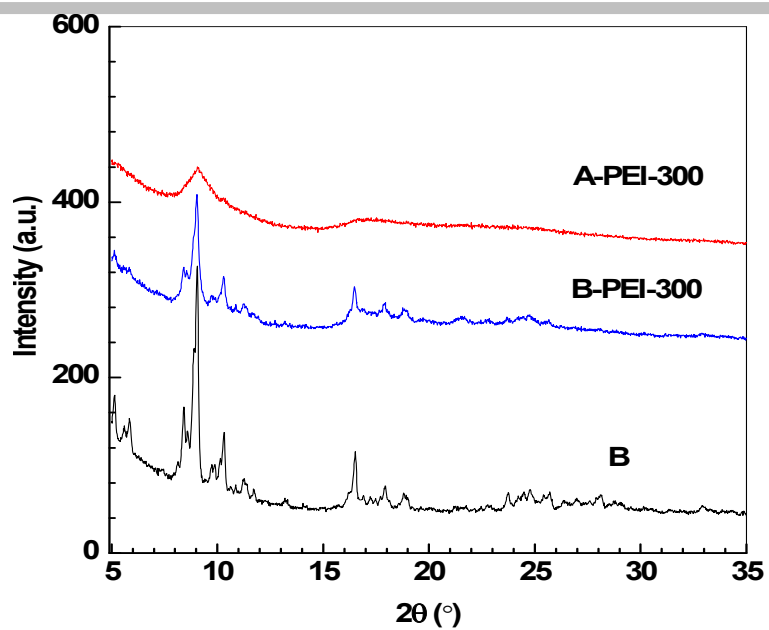


Figure S2. Powder XRD patterns of sample B before and after loading PEI, and XRD patterns of A-PEI-300.

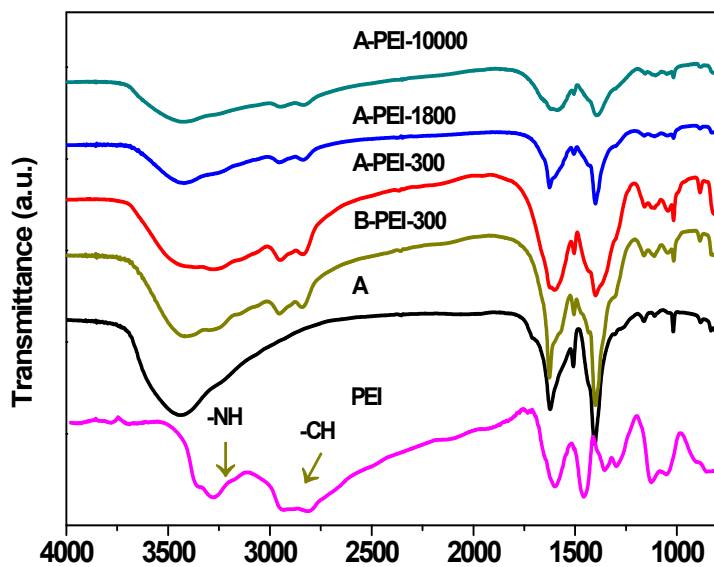


Figure S3. IR spectra of PEI, A, A-PEI-300, A-PEI-1800, B-PEI-10000 and B-PEI-300.

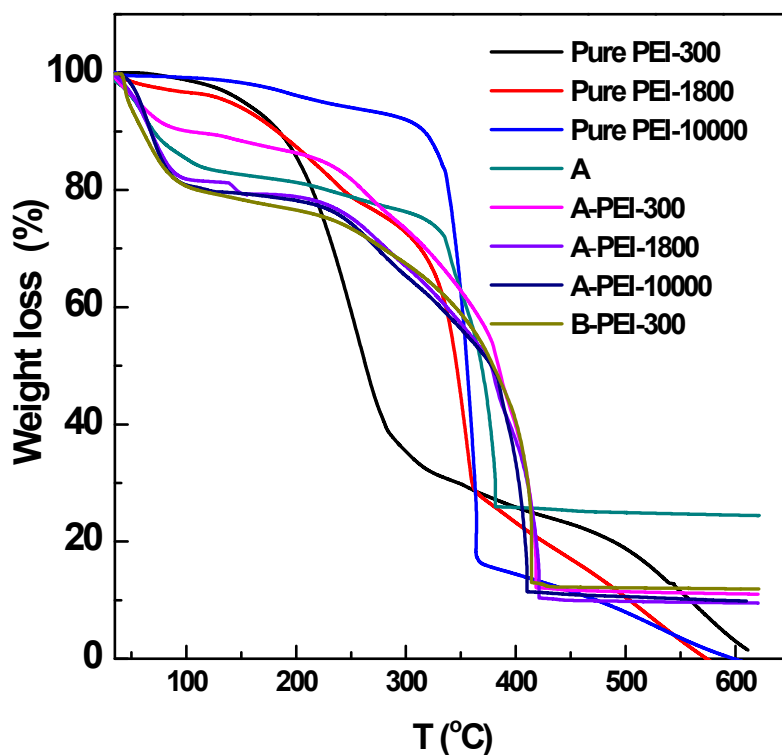


Figure S4. Weight loss curves of the pure PEI and MIL-101(Cr) before and after loading PEI.

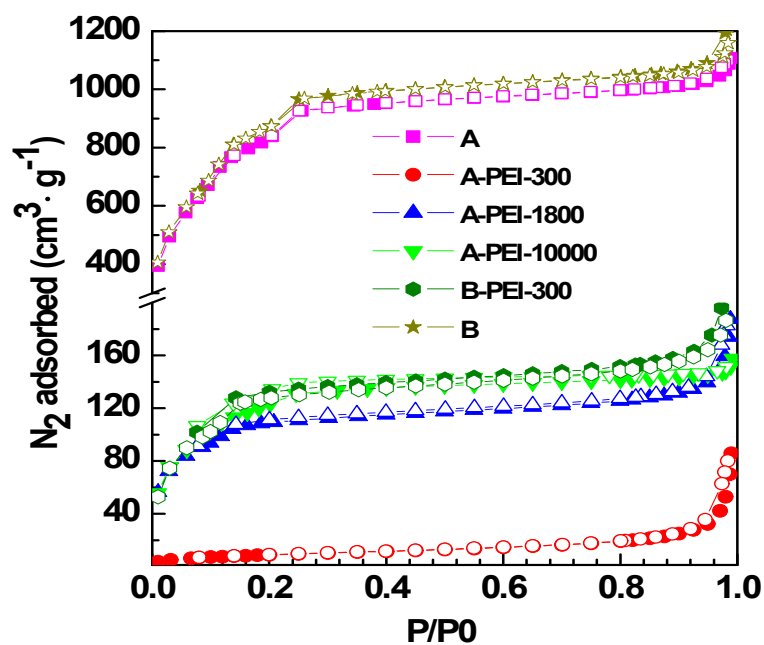


Figure S5. N₂ adsorption/desorption isotherms at 77 K. The symbols: Filled, adsorption; Blank, desorption.

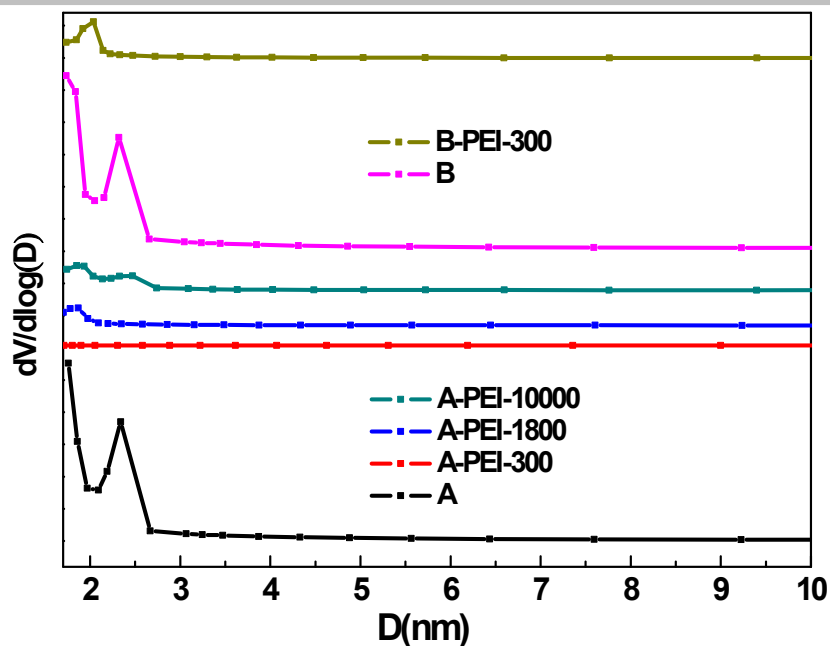


Figure S6. Pore size distribution of the samples A and B before and after loading PEI.

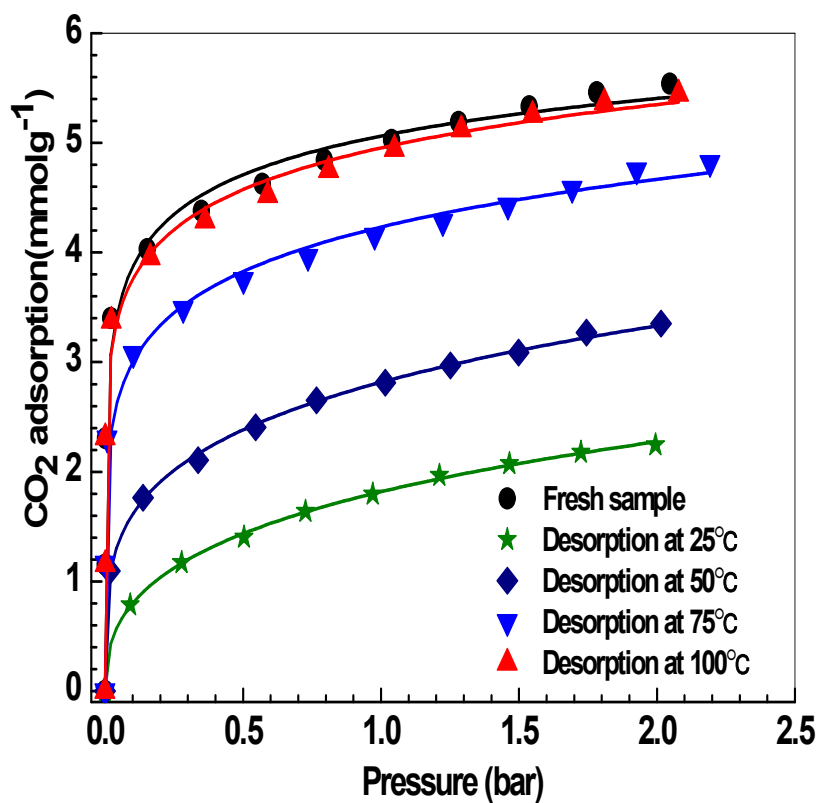


Figure S7. CO_2 adsorption isotherms for B-PEI-300 after CO_2 desorbed at different temperature under vacuum for 1 hour.

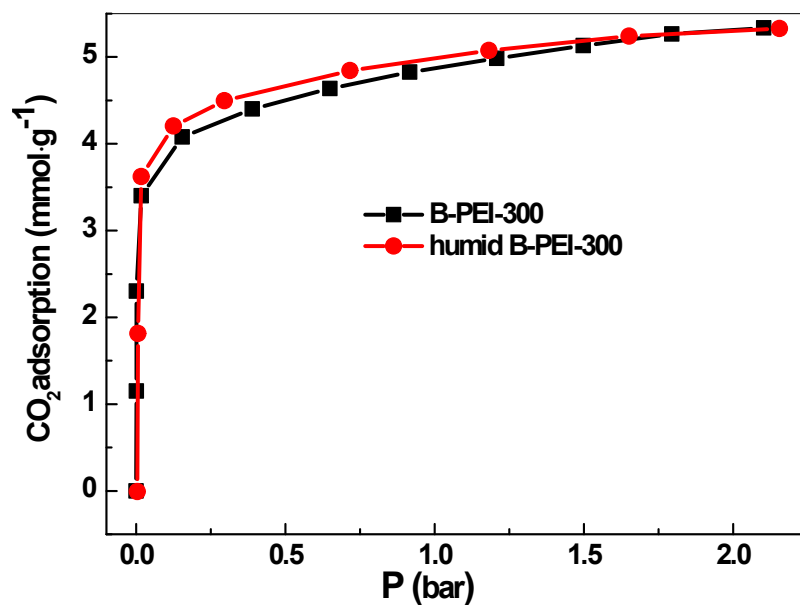


Figure S8. CO₂ adsorption properties of B-PEI-300 and B-PEI-300 exposed in the moisture for 2 hours, respectively.

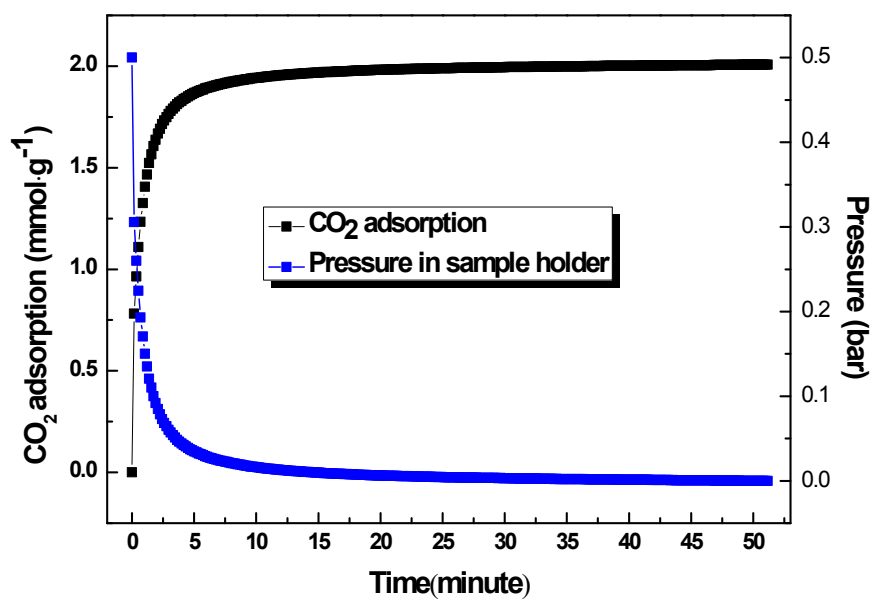


Figure S9. CO₂ adsorption kinetics of A-PEI-300 at 25 °C.

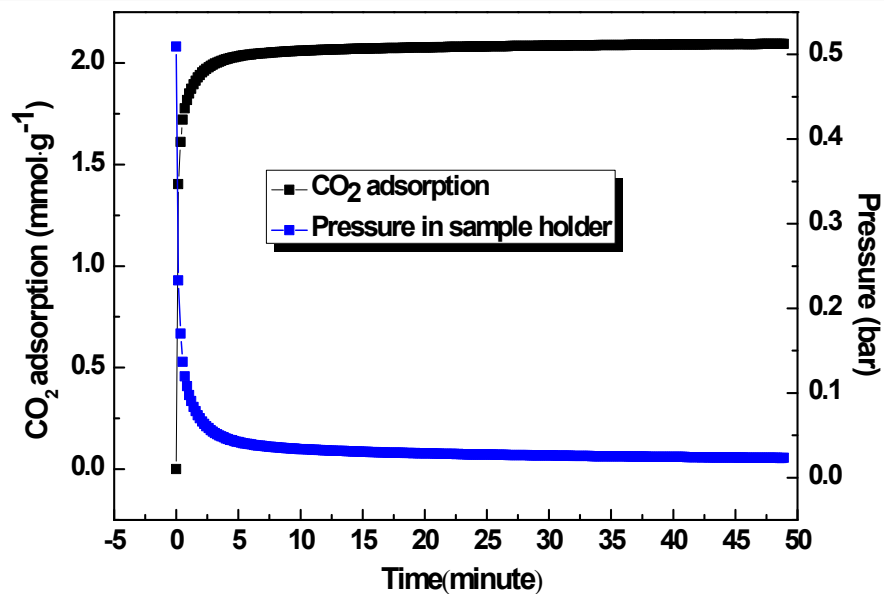


Figure S10. CO₂ adsorption kinetics of A-PEI-300 at 50 °C.

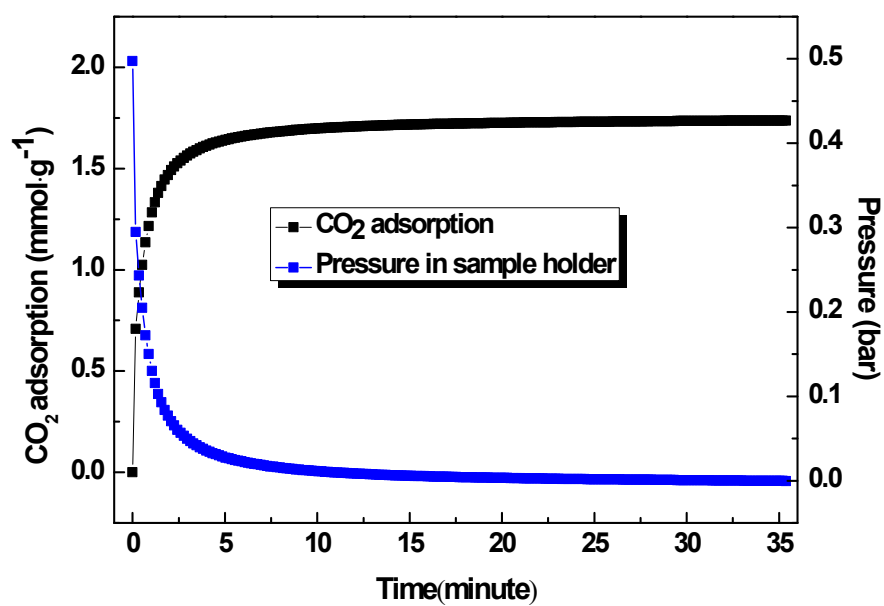


Figure S11. CO₂ adsorption kinetics of A-PEI-1800 at 25 °C.

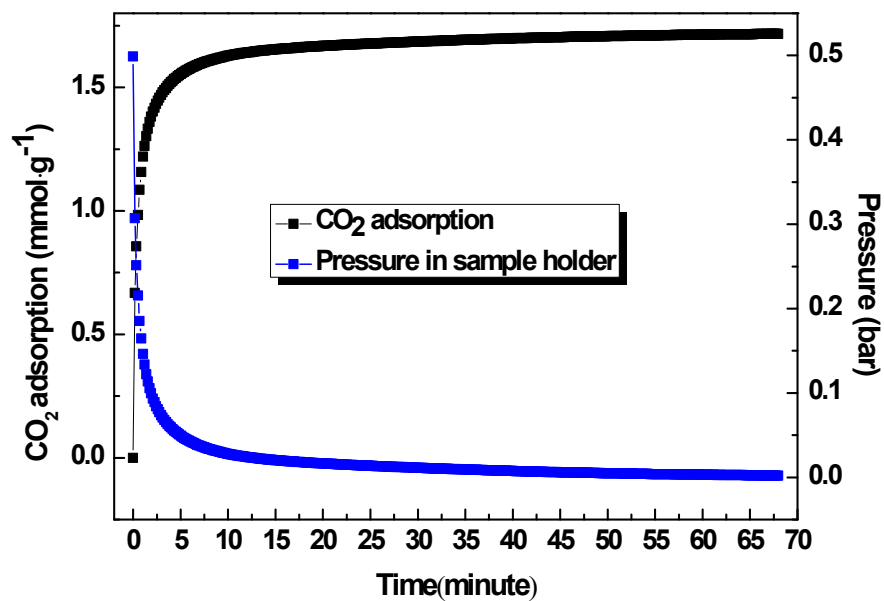


Figure S12. CO₂ adsorption kinetics of A-PEI-1800 at 50 °C.

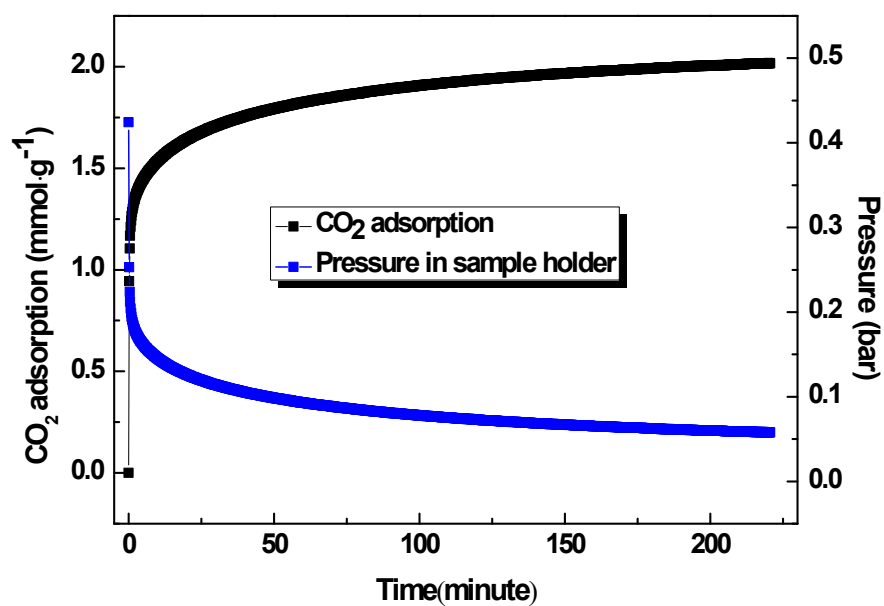


Figure S13. CO₂ adsorption kinetics of A-PEI-10000 at 25 °C.

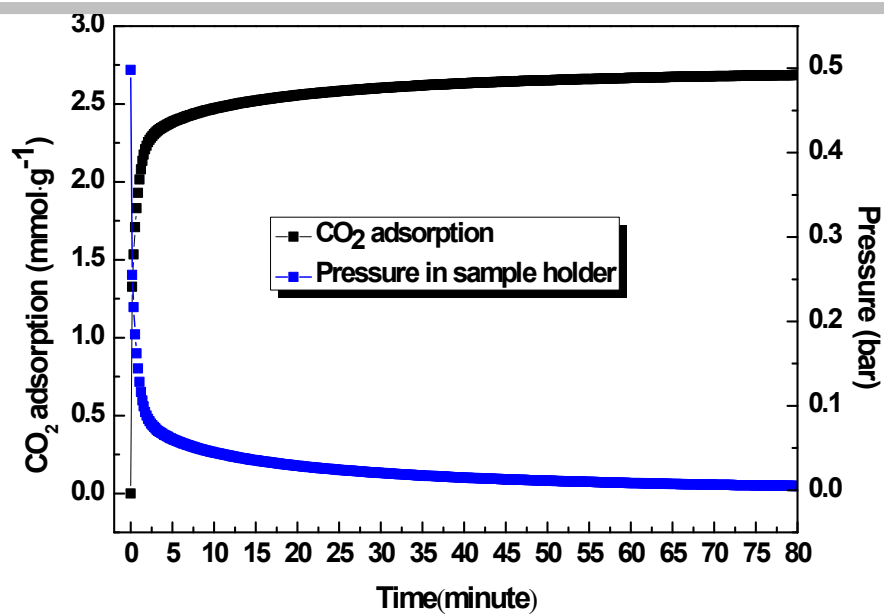


Figure S14. CO₂ adsorption kinetics of A-PEI-10000 at 50 °C.

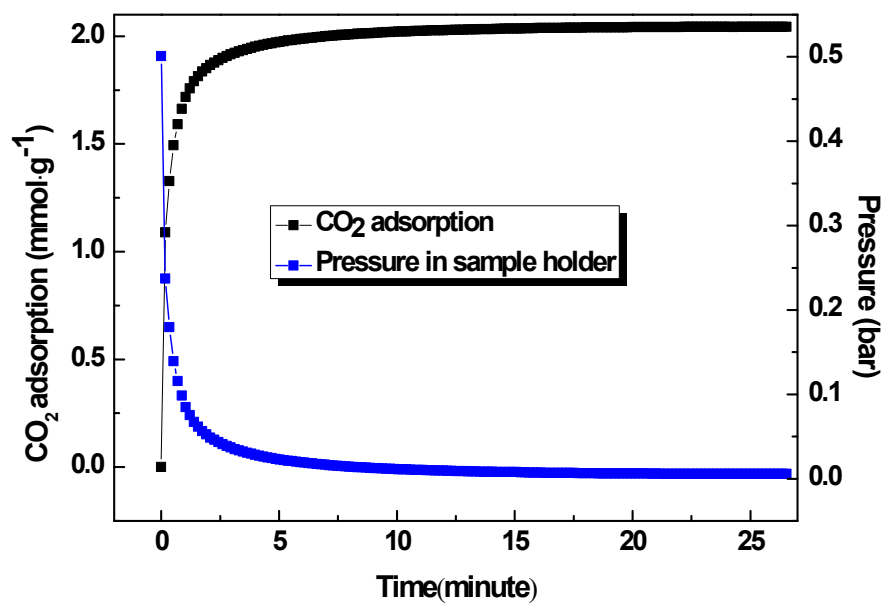


Figure S15. CO₂ adsorption kinetics of B-PEI-300 at 25 °C.

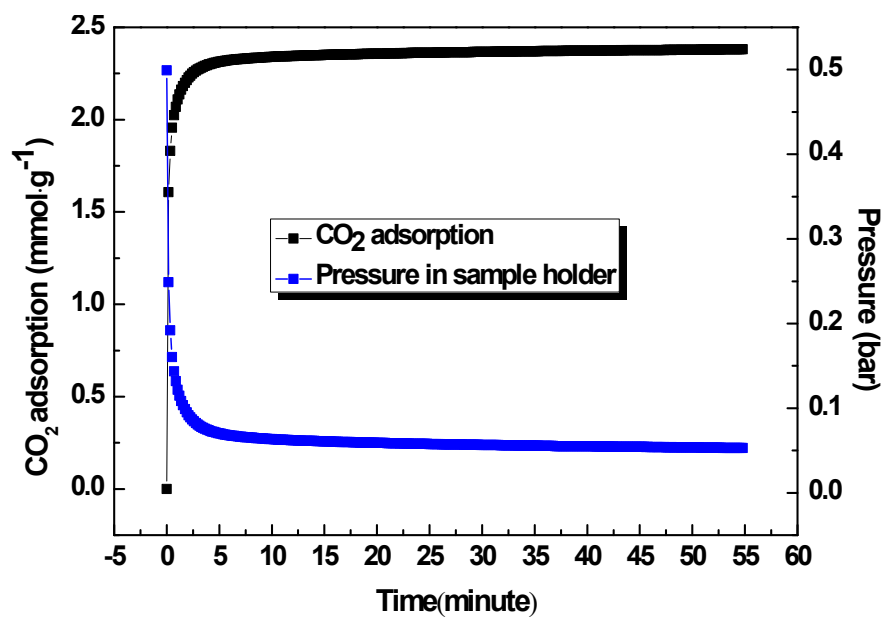


Figure S16. CO₂ adsorption kinetics of B-PEI-300 at 50 °C.

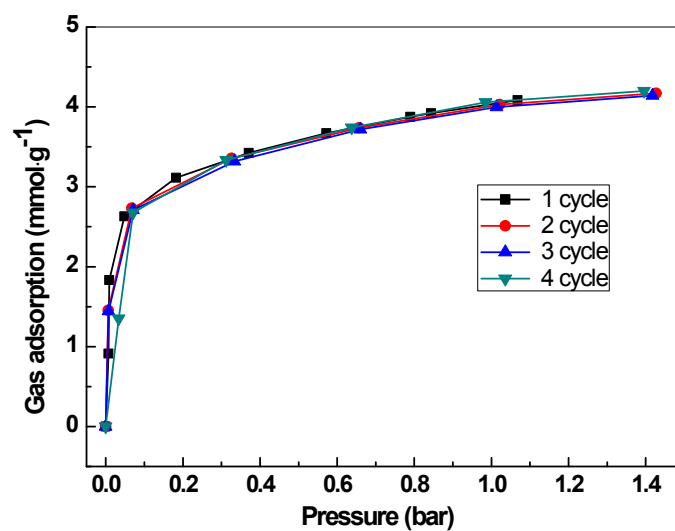


Figure S17. Cyclic measurements for A-PEI-300 at 25 °C. Between each measurement, the sample was evacuated for 2 hours at 110 °C.

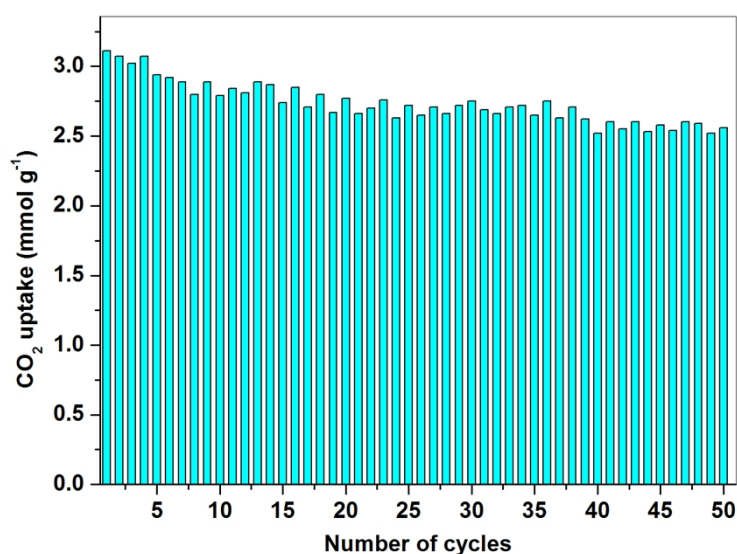


Figure S18. The cyclic CO₂ uptake of PEI-MIL-101-300 at 25 °C and 0.15 bar.

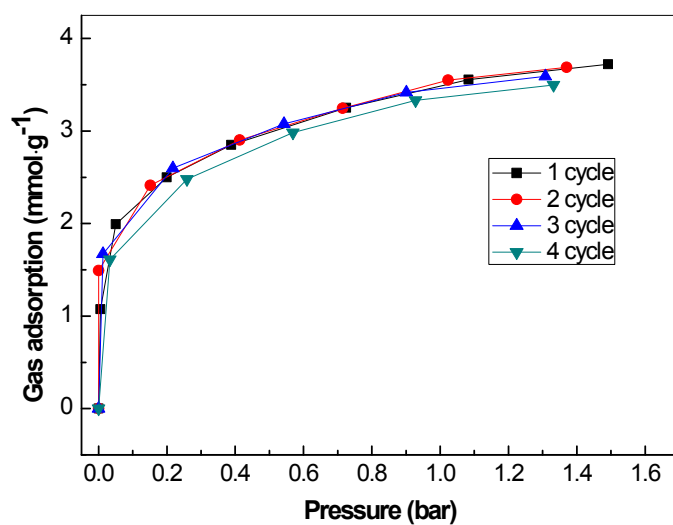


Figure S19. Cyclic measurements for A-PEI-1800 at 25 °C. Between each measurement, the sample was evacuated for 2 hours at 110 °C.

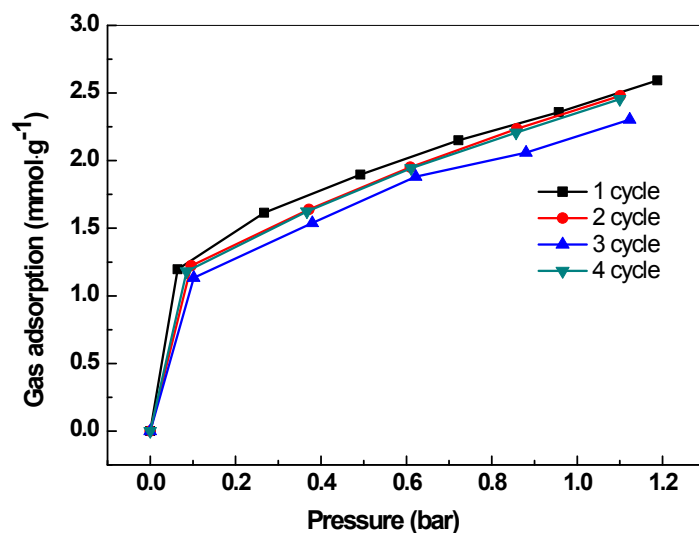


Figure S20. Cyclic measurements for A-PEI-10000 at 25 °C. Between each measurement, the sample was evacuated for 2 hours at 110 °C.

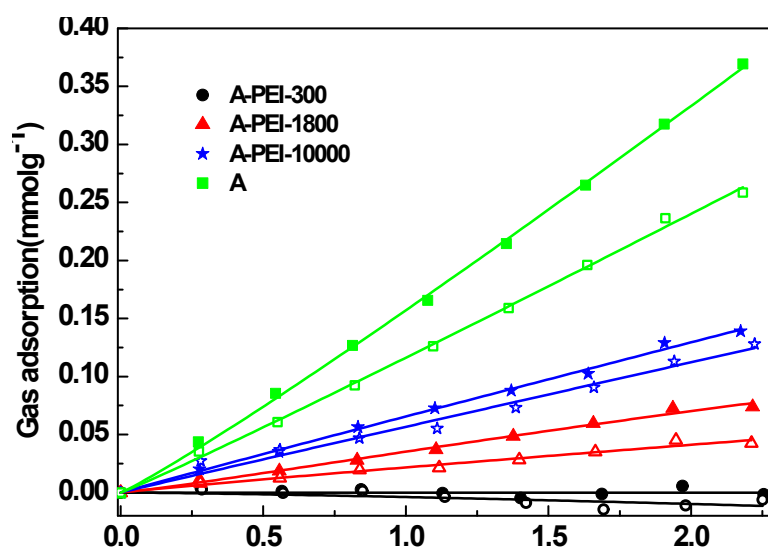


Figure S21. N₂ adsorption isotherms of the sample A before and after loading PEI. Symbols: Filled, 25 °C; Hollow, 50 °C.

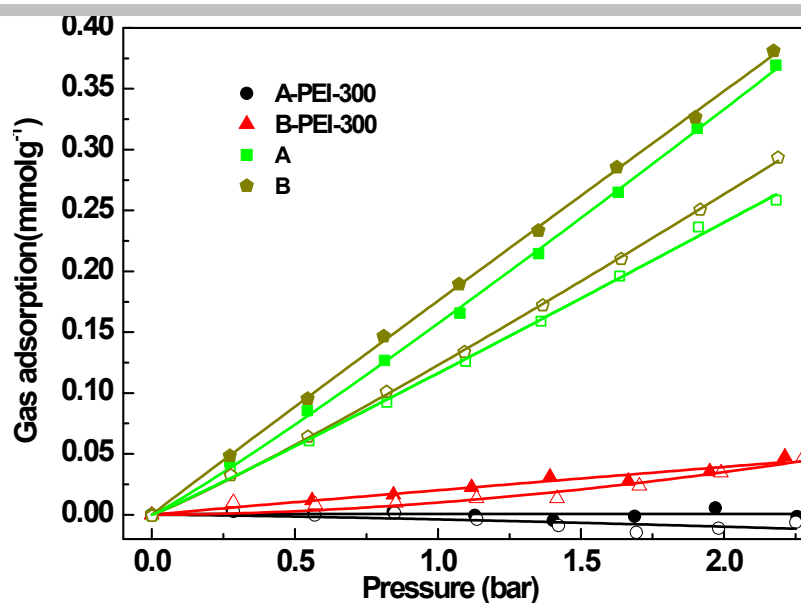


Figure S22. N₂ adsorption isotherms of the samples A and B before and after loading PEI. Symbols: Filled, 25°C; Hollow, 50°C.

Table S1 amine efficiency of PEI loaded samples

| | mmol CO ₂ / mmol N at 0.15 bar | |
|-------------|--|-------|
| | 25 °C | 50 °C |
| | A-PEI-300 | 0.77 |
| A-PEI-1800 | 0.58 | 0.51 |
| A-PEI-10000 | 0.30 | 0.48 |
| B-PEI-300 | 0.88 | 0.65 |

Isosteric heat calculation

The isosteric heat of CO₂ adsorption values were calculated using the Clausius-Clapeyron equation:

$$\frac{d \ln P}{d(1/T)} = -\frac{Q_{st}}{R}, \quad \ln P = -\frac{Q_{st}}{R} \frac{1}{T} + \text{const}$$

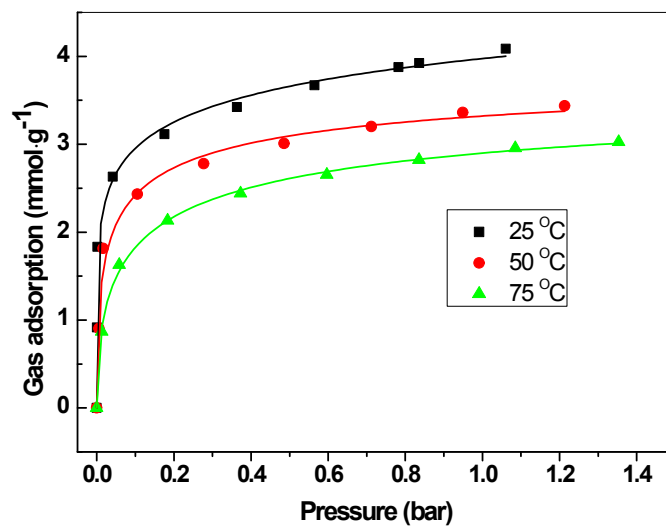


Figure S23. The CO₂ adsorption isotherms of A-PEI-300 at 25-75 °C

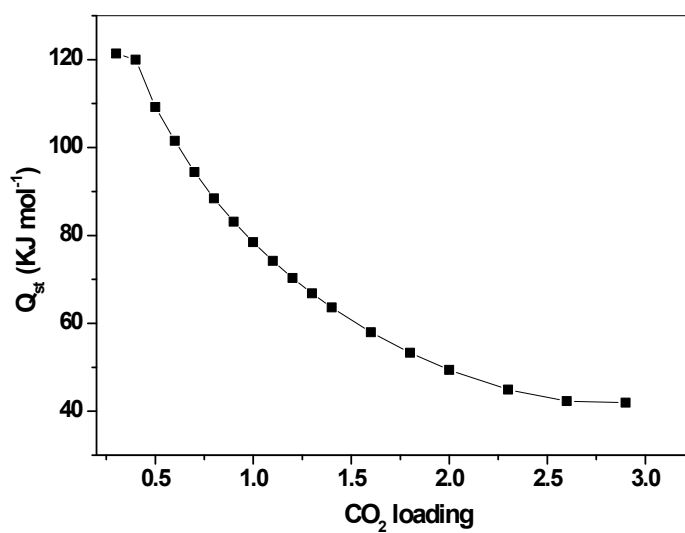


Figure S24 The isosteric heat of the CO₂ adsorption calculated from the adsorption isotherms measured from 25 °C to 75 °C using Clausius-Clapeyron equation.