

## Supplement

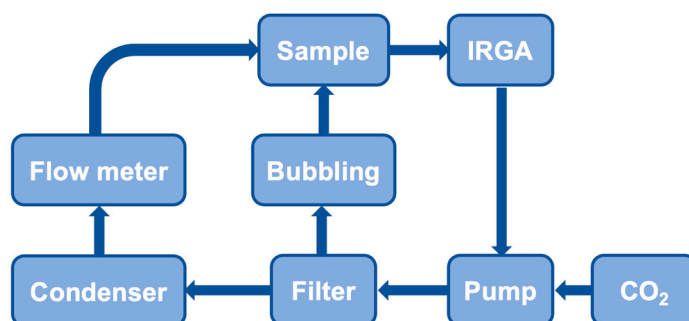


Figure S1. A simple schematic diagram of the experimental gas path.

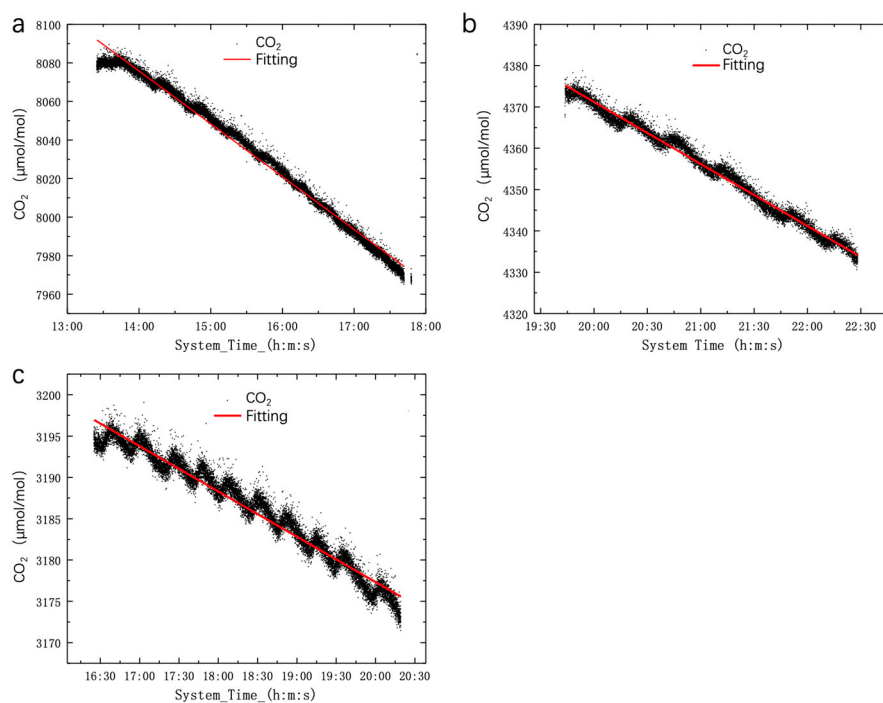


Figure S2. The device leakage rates are 8000ppm, 4500ppm, and 3000ppm respectively. The leakage rate at 3000ppm is 5ppm/h.

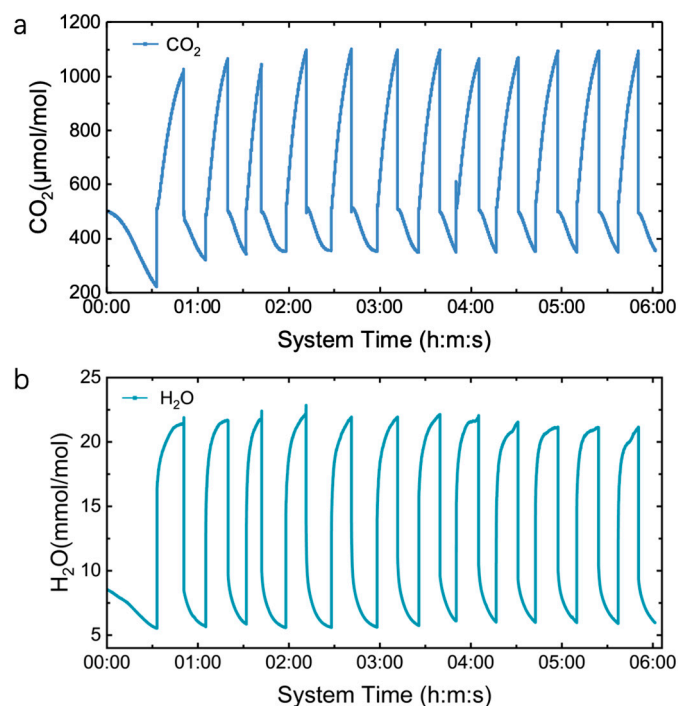


Figure S3. After the humidifier circuit is replaced with tap water, perform approximately ten cycles.

Table S1. The amine-based anion exchange resins, preparation method, particle size and CO<sub>2</sub> adsorption.<sup>1</sup>

anion exchange resins	amine group	particle size (mm)	operating temp (°C)	Capacity (mmol/g)
IRA-900 (0.074- 0.160mm)	quaternary amine	0.65–0.82	60	3.7
D201	quaternary amine	0.315–1.25	75	3.7
717	quaternary amine	0.3–1.2	60	3.6
D301-R	tertiary amine	0.315–1.25	100	4.8
D301-G	tertiary amine	0.6–1.6	100	4.2
IRA67RF	tertiary amine	0.5–0.75	50	5.0

## Reference:

1. Wang, X. *et al.* CO<sub>2</sub> absorption over ion exchange resins: the effect of amine functional groups and microporous structures. *Industrial & engineering chemistry research* **59**, 16507–16515 (2020).