

Supporting Information

A steerable internal structure carbon sphere synthesized driven by water-solubility and its application in gas separation

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Supplementary Figures

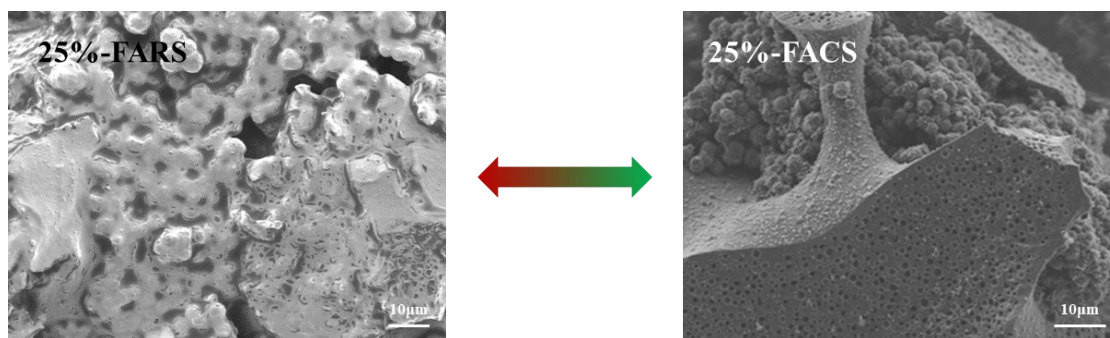


Fig. S1. SEM images of 25%-FARS without calcination and 25%-FACS sample

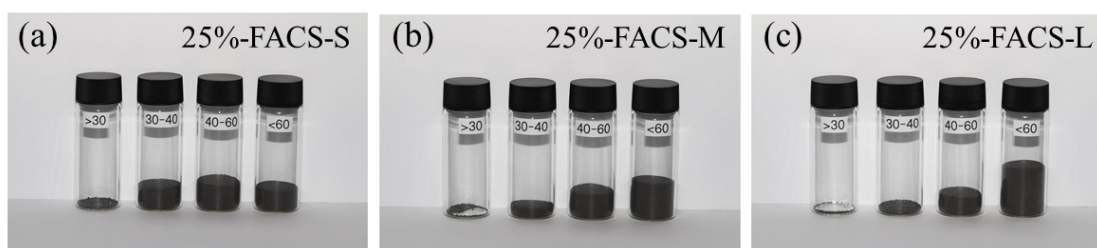


Fig. S2. Particle size distribution of (a) 25%-FACS-S, (b) 25%-FACS-M, (c) 25%-FACS-L.

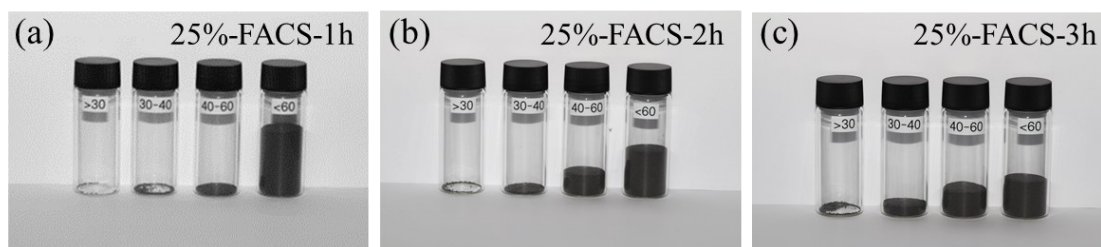


Fig. S3. Particle size distribution of (a) 25%-FACS-1h, (b) 25%-FACS-2h, (c) 25%-FACS-3h.

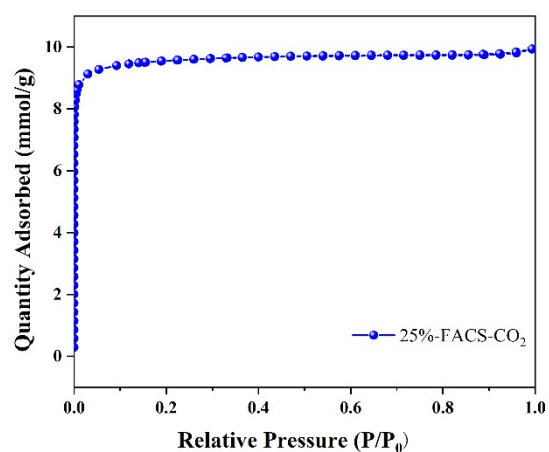


Fig. S4. N₂ adsorption-desorption isotherms of 25%-FACS-CO₂ activated by CO₂ under 800 °C.

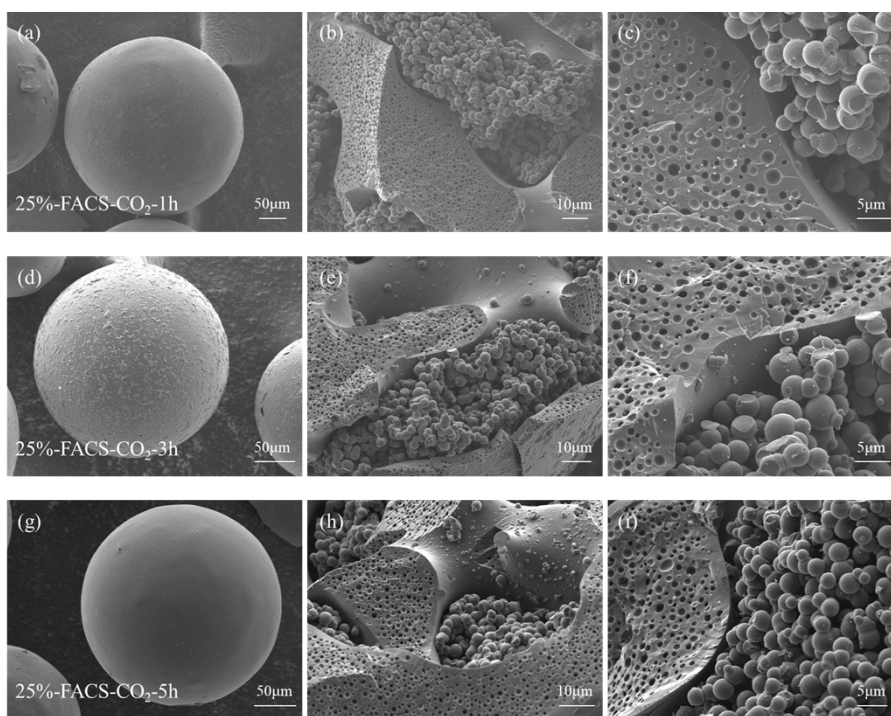


Fig. S5. SEM images of the outside and inside structure of (a, b, c) 25%-FACS-CO₂-1h, (d, e, f) 25%-FACS-CO₂-3h and (g, h, i) 25%-FACS-CO₂-5h.

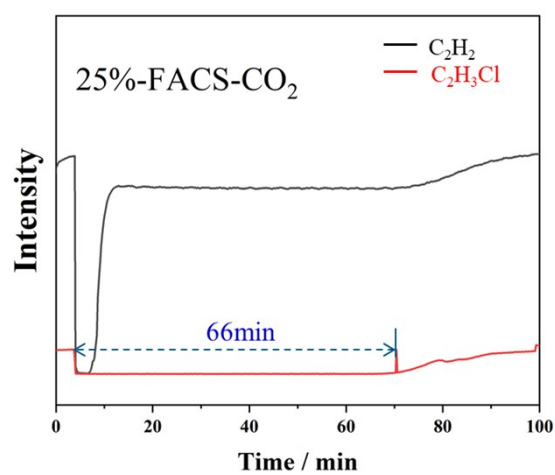


Fig. S6. Breakthrough curves of C_2H_3Cl and C_2H_2 on 25%-FACS- CO_2

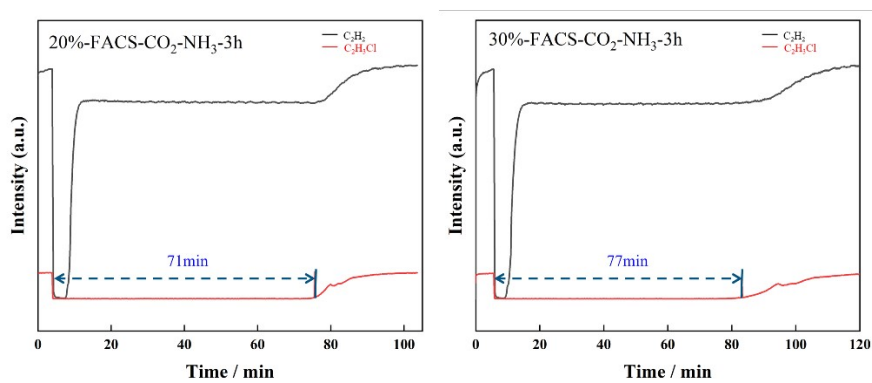


Fig. S7. Breakthrough curves of C_2H_3Cl and C_2H_2 on 20%-FACS- CO_2-NH_3-3h and 30%-FACS- CO_2-NH_3-3h

Supplementary Tables

Table S1 BET of x%-FACS with different contents/molecular weight of PPG 2000 and 25%-FACS with different dosage of PVA

Sample	BET (m ² /g)	Micropore area (m ² /g)
FACS	126	123
20%-FACS	188	186
25%-FACS	232	223
30%-FACS	381	321
50%-FACS	446	412
25%-FACS-1500	179	174
25%-FACS-4000	379	347
25%-FACS-S	243	213
25%-FACS-L	251	219

Table S2. Mechanical strength of x%-FACS sample

Sample	Crushing strength (N)
FACS	67.0
20%-FACS	30.8
25%-FACS	4.25
30%-FACS	1.17
50%-FACS	0.52

Table S3. C₂H₂ adsorption performance of FACS samples

Sample	Breakthrough capacity (mmol/g)
25%-FACS-CO ₂ -1h	0.035
25%-FACS-CO ₂ -3h	0.037
25%-FACS-CO ₂ -5h	0.031
25%-FACS-CO ₂ -NH ₃ -1h	0.031
25%-FACS-CO ₂ -NH ₃ -2h	0.028
25%-FACS-CO ₂ -NH ₃ -3h	0.025
20%-FACS-CO ₂ -NH ₃ -3h	0.035
30%-FACS-CO ₂ -NH ₃ -3h	0.038

Table S4. Physical properties of C₂H₃Cl and C₂H₂.

Adsorbate	Polarizability	Dipole moment
C ₂ H ₃ Cl	6.29	1.5D
C ₂ H ₂	3.55	0