

Supporting Information

Highly Efficient Carbon Dioxide Capture with a Porous Organic Polymer Impregnated with Polyethylenimine

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Experimental Section

General Methods. All chemicals and solvents used in the syntheses were of reagents grade and used without further purification. Branched polyethylenimine (PEI, Mw, ~800) was purchased from Sigma Aldrich. 1,3,5-tris(4-bromophenyl)benzene and PAF-5 were prepared by the methods previously reported.^{S1,S2} Infrared spectra were recorded with a Perkin-Elmer Spectrum One FT-IR spectrophotometer. Thermogravimetric analyses (TGA) were carried out under a N₂ stream at a scan rate of 5 °C/min, using TGA Q50 of TA instruments. Elemental analyses were performed with a Perkin-Elmer 2400 Series II CHN analyzer.

Preparation of PAF-5 Impregnated with Polyethylenimine, PEI(x wt%)⊂PAF-5 (X= 10~40 wt%). PAF-5 was impregnated with a branched polyethylenimine (PEI, Mw, ~800, water content ≤ 2%) by a previously reported wet impregnation method.^{S3} Before PEI impregnation, as-synthesized PAF-5 was activated under reduced pressure at 373 K for 24 h. Various amount of PEI was dissolved in anhydrous methanol (25 mL) by stirring for 10 min, and activated PAF-5 (*ca.* 0.2 g) was added to the solution. The PAF-5 slurry in the PEI/methanol solution was stirred and sonicated under each condition shown in Table S1. Finally, the resulting slurry was filtered, washed with anhydrous methanol (10 mL x 3), and activated at 373 K under reduced pressure for 24 h. The amount of PEI impregnated in PAF-5 was determined by TGA data as well as elemental analysis data (Table S2) after activating the as-synthesized PEI(x wt%)⊂PAF-5.

Water Stability Test. The activated PEI(40 wt%)⊂PAF-5 (*ca.* 0.2 g) was exposed to water vapor in a closed glass bottle for 7 days at 313 K and then activated under reduced pressure at 373 K for 48 h.

Gas Cycling Experiment. Prior to gas cycling experiment, the sample was activated at 373 K under reduced pressure for 24 h. The activated sample was introduced to a thermogravimetric apparatus under N₂, and then the CO₂ gas cycling experiments were performed at 313 K on a TGA Q50 by using a stream of 15% (v/v) CO₂ in N₂ and a stream of 15% (v/v) CO₂ in He, followed by a stream of pure N₂. A flow rate of the gas was 60 mL/min.

Low Pressure Gas Sorption Measurements. The gas adsorption-desorption experiments were performed by using an automated micropore gas analyzer Autosorb-3B (Quantachrome Instruments). All gases used were of 99.9999% purity. Gas sorption isotherms for N₂ were monitored at 77, 298, 313, and 323 K, and CO₂ gas sorption isotherms

were conducted at 298, 313, and 323 K at each equilibrium pressure by the static volumetric method. An exactly measured amount of the solid, which was activated at 373 K under reduced pressure, was introduced into the gas-sorption apparatus and the sample was reactivated at 373 K under high vacuum (10^{-4} atm) for 1 h. After each gas sorption measurement, the sample was precisely weighed again. From the N_2 gas isotherms at 77 K, surface area, pore size distribution, and pore volume were calculated. Multipoint BET surface area was estimated by using the data recorded at $P/P_0 = 0.005 - 0.1$ atm. The pore size distribution and pore volume were calculated from non-local density functional theory (NLDFT) applying the model of carbon as an adsorbent and slit pore.

Calculation of Isothermic Heat of CO₂ Adsorption. Pressure as a function of the amount of adsorbed CO₂ was determined by fitting the adsorption isotherms measured at 298, 313, and 323 K to the dual-site Langmuir equation (eq 1). In eq 1, P is pressure (atm), N is the amount adsorbed gas (mmol g⁻¹), N_m is the amount of adsorbed gas at saturation, and b is a constant. The isosteric heat (Q_{st}) of the CO₂ adsorption was calculated by applying these fits to the Clausius-Clapeyron equation (eq 2).^{S4}

$$N = \frac{N_{m,A} b_A P}{1 + b_A P} + \frac{N_{m,B} b_B P}{1 + b_B P} \quad (1)$$

$$\frac{\partial(\ln P)}{\partial(1/T)} = -\frac{Q_{st}}{R} \quad (2)$$

References

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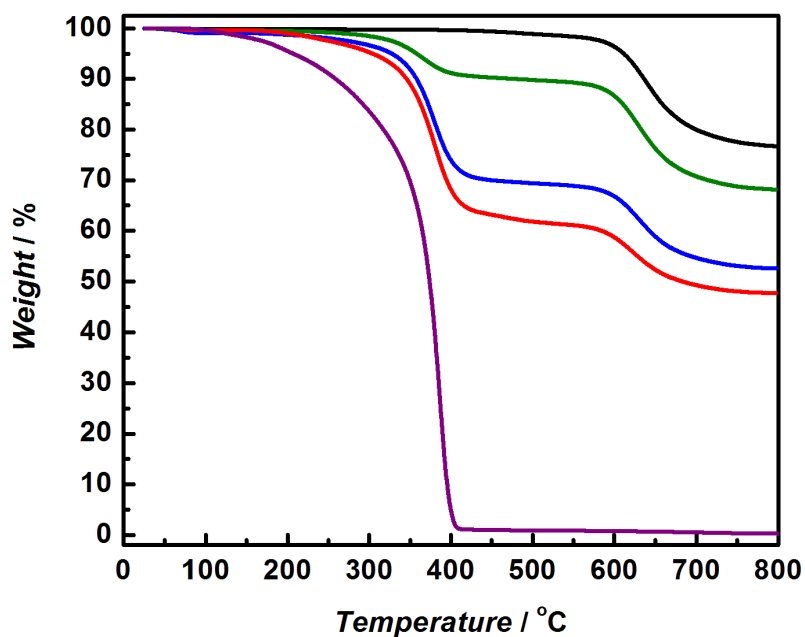


Figure S1. TGA traces for **PAF-5** (black), **PEI(10 wt%)@PAF-5** (green), **PEI(30 wt%)@PAF-5** (blue), **PEI(40 wt%)@PAF-5** (red), and pure **PEI** (purple) .

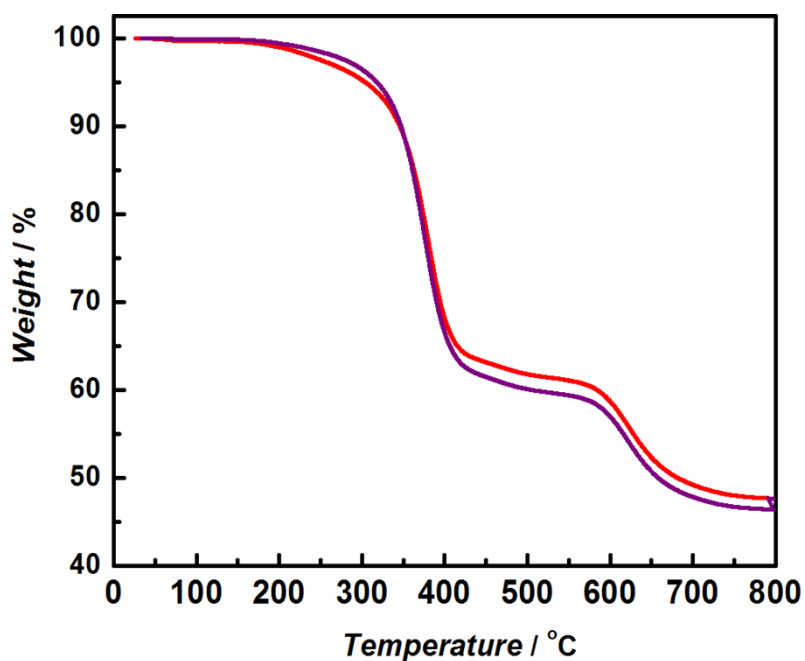


Figure S2. TGA traces for **PEI(40 wt%)@PAF-5** a) before (red) and b) after (purple) exposure to water vapor at 313 K for 7 days followed by activation at 373 K under vacuum for 48 hours.

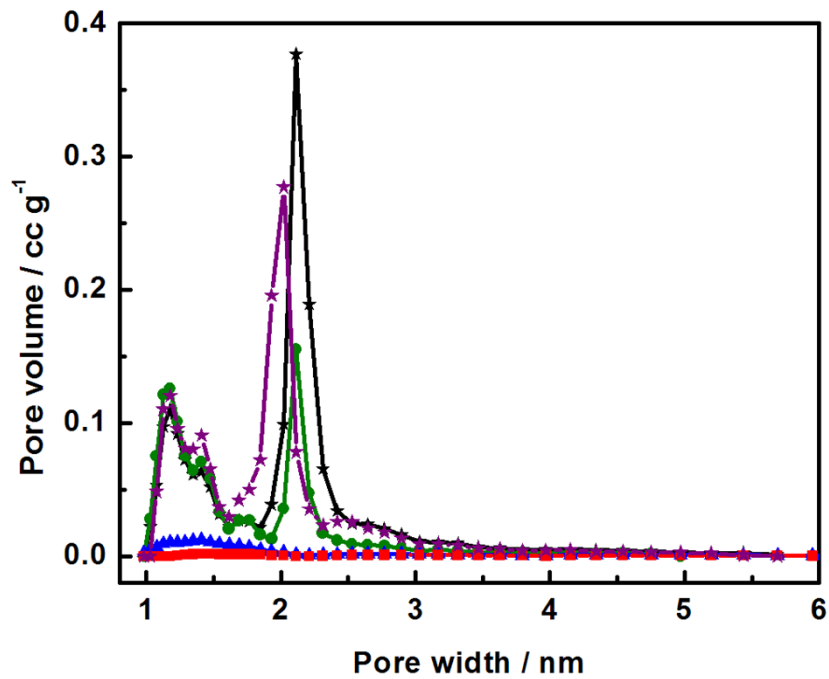


Figure S3. Pore width distributions of PAF-5 (heat-vacuum activation) (★), PAF-5 (supercritical CO₂ drying activation) (★), PEI(10 wt%)@PAF-5 (●), PEI(30 wt%)@PAF-5 (▲), and PEI(40 wt%)@PAF-5 (■), calculated from non-local density functional theory (NLDFT) applying the model of carbon as an adsorbent and slit pore.

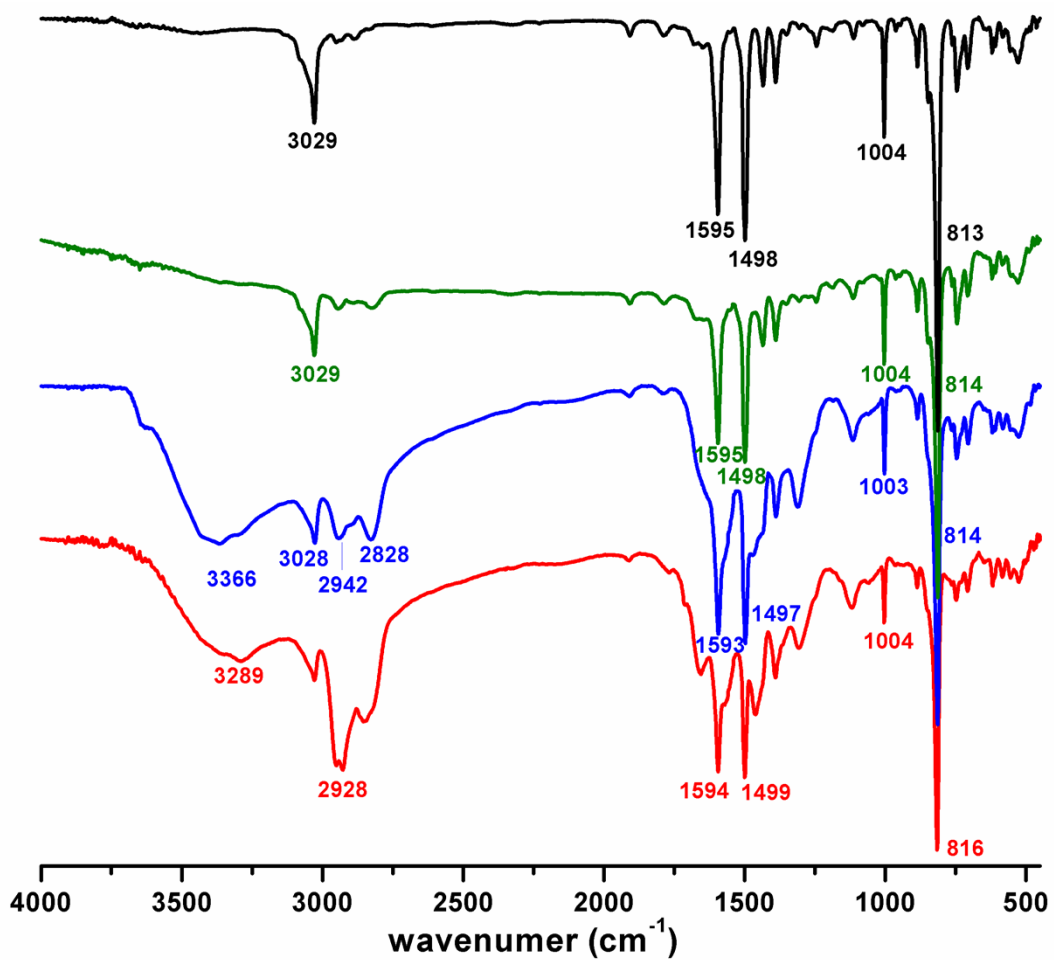


Figure S4. IR spectra of PAF-5 (black), PEI(10 wt%) \subset PAF-5 (green), PEI(30 wt%) \subset PAF-5 (blue), and PEI(40 wt%) \subset PAF-5 (red).

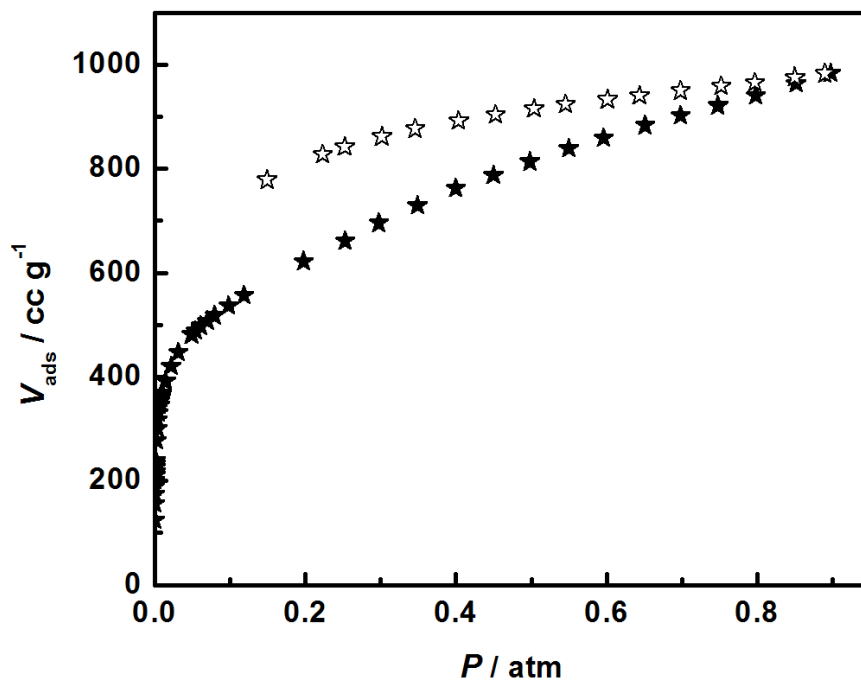


Figure S5. N_2 gas adsorption and desorption isotherms measured at 77 K: **PAF-5** (★) activated by CO_2 supercritical drying method.

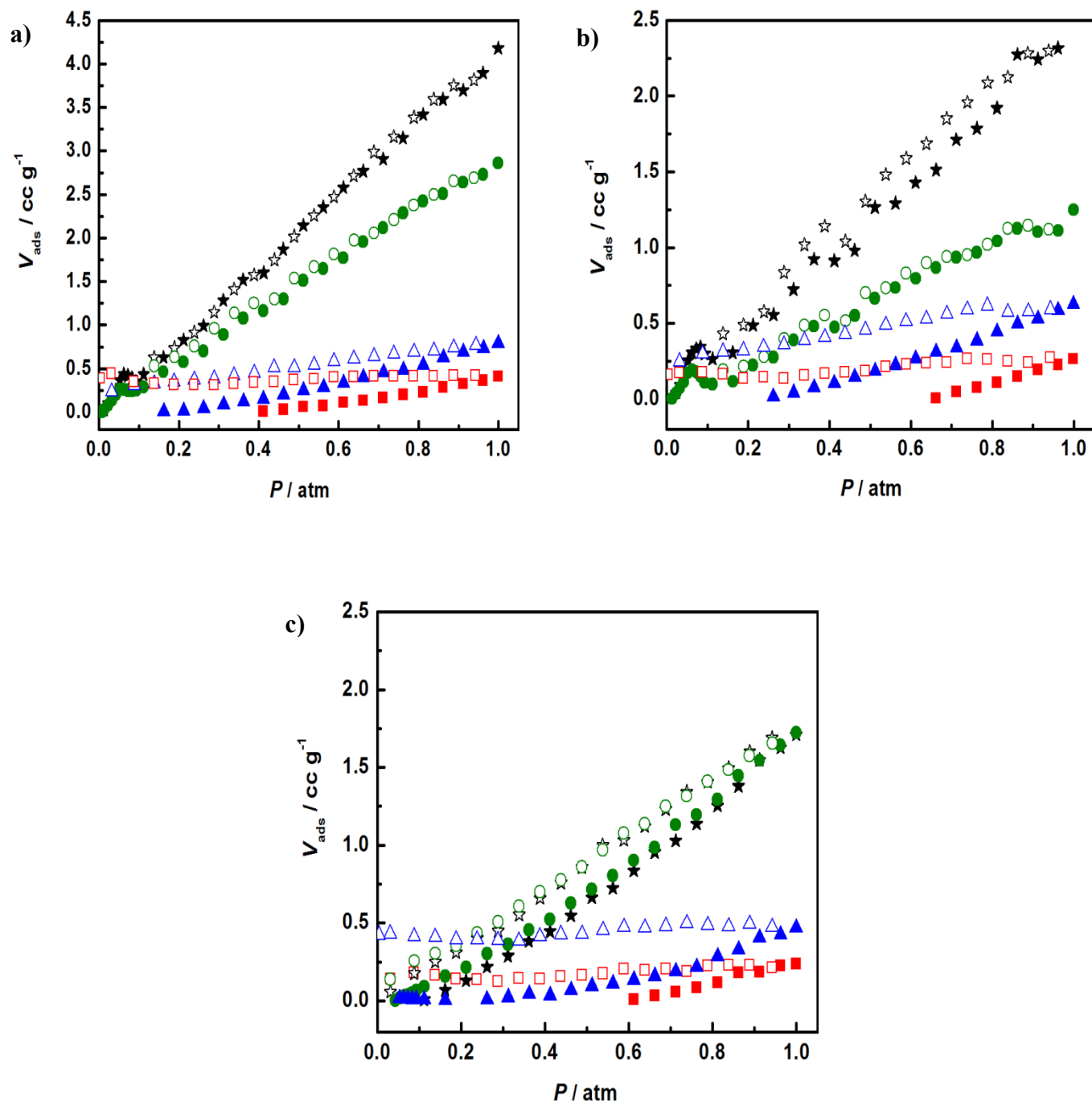


Figure S6. N₂ gas adsorption and desorption isotherms measured at a) 298 K, b) 313 K, and c) 323 K for PAF-5 (★), PEI(10 wt%)@PAF-5 (●), PEI(30 wt%)@PAF-5 (▲), and PEI(40 wt%)@PAF-5 (■).

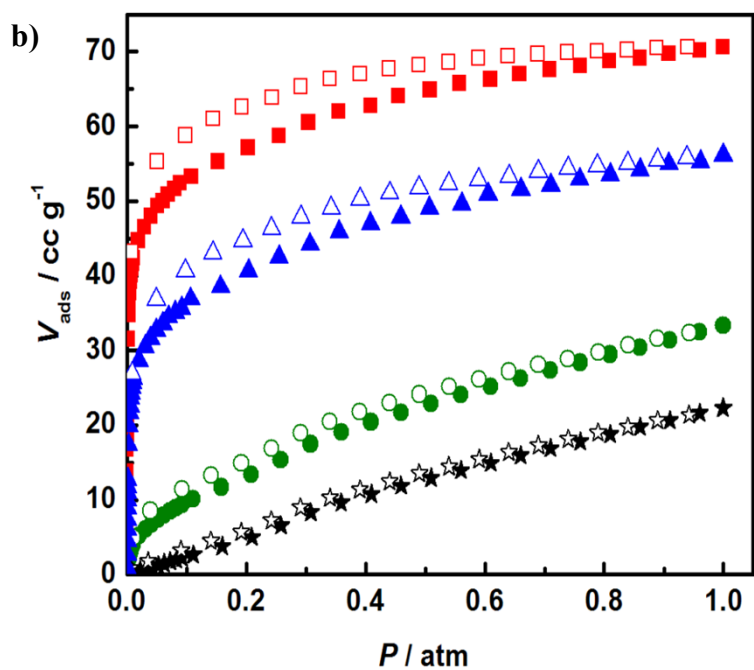
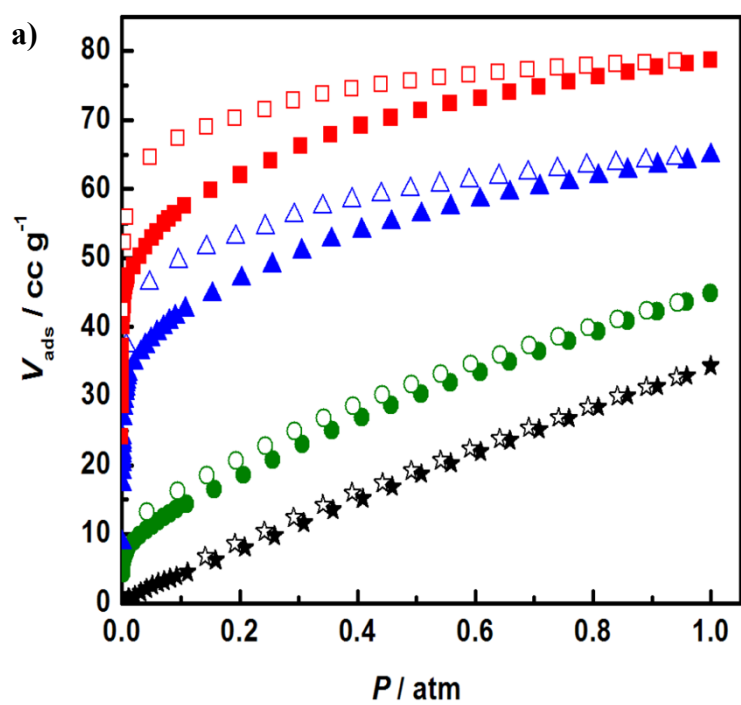


Figure S7. CO₂ gas adsorption and desorption isotherms measured at a) 298 K and b) 323 K for PAF-5 (★), PEI(10 wt%)@PAF-5 (●), PEI(30 wt%)@PAF-5 (▲), and PEI(40 wt%)@PAF-5 (■).

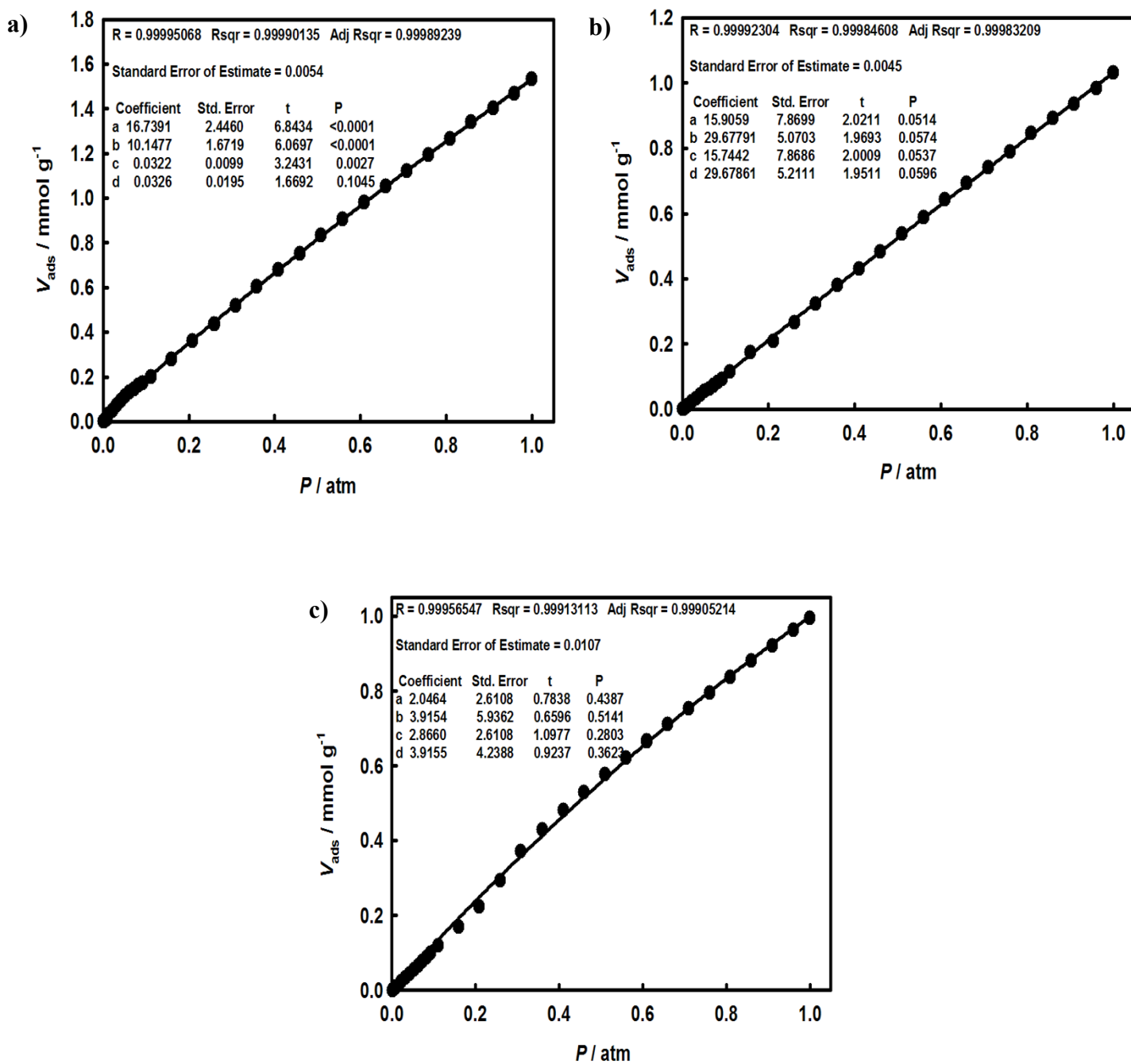


Figure S8. CO₂ gas adsorption isotherms of PAF-5 measured at a) 298 K, b) 313 K, and c) 323 K. The solid line corresponds to dual-site Langmuir equation fit. Coefficients a, b, c, and d inside of the figures correspond to the values of $N_{m,A}b_A$, b_A , $N_{m,B}b_B$, and b_B , respectively, obtained for the dual-site Langmuir equation (eq. 1), which is described in the experimental section.

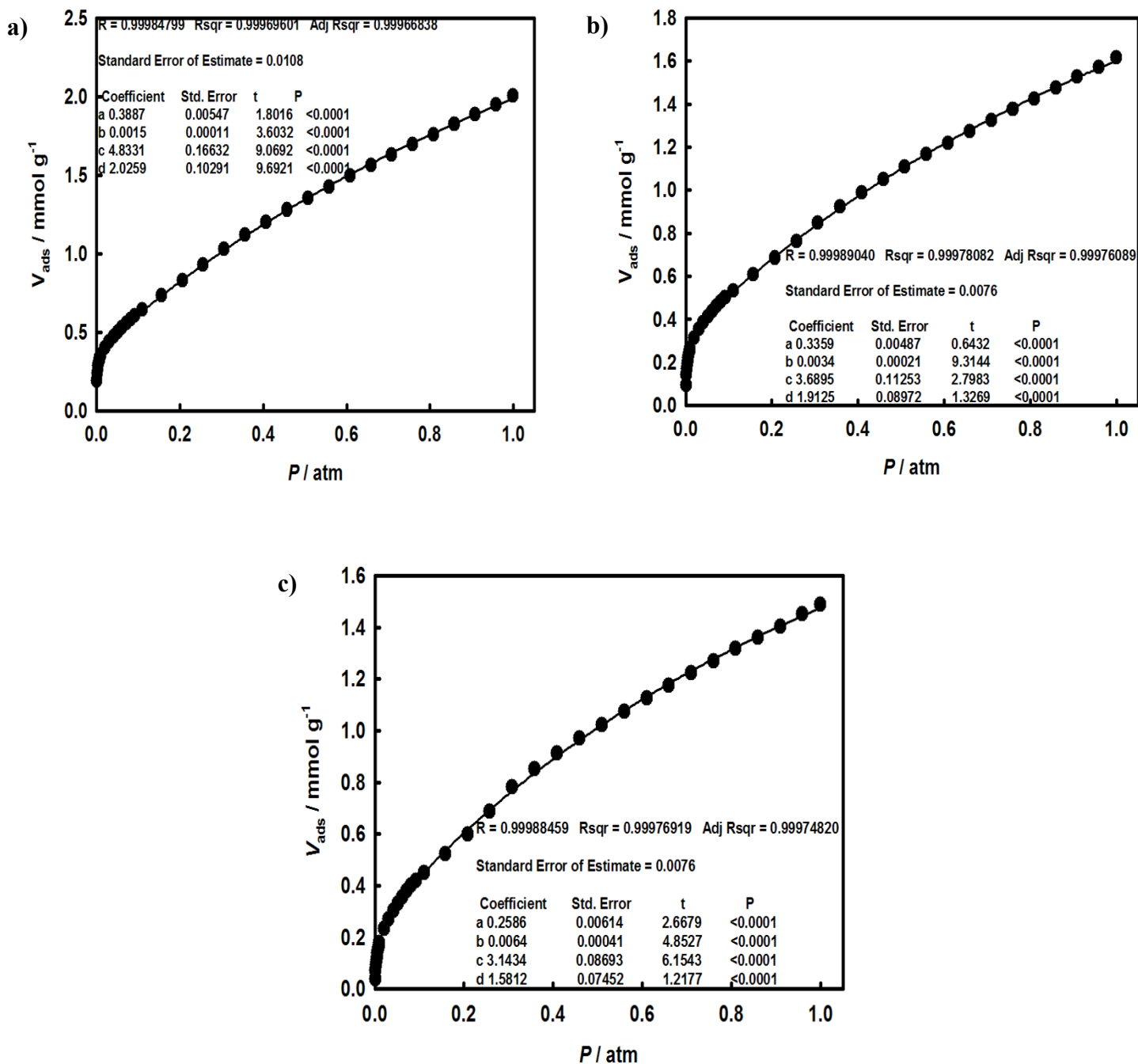


Figure S9. CO₂ gas adsorption isotherms of PEI(10 wt%)@PAF-5 measured at a) 298 K, b) 313 K, and c) 323 K. The solid line corresponds to dual-site Langmuir equation fit. Coefficients a, b, c, and d inside of the figures correspond to the values of $N_{m,A}b_A$, b_A , $N_{m,B}b_B$, and b_B , respectively, obtained for the dual-site Langmuir equation (eq. 1), which is described in the experimental section.

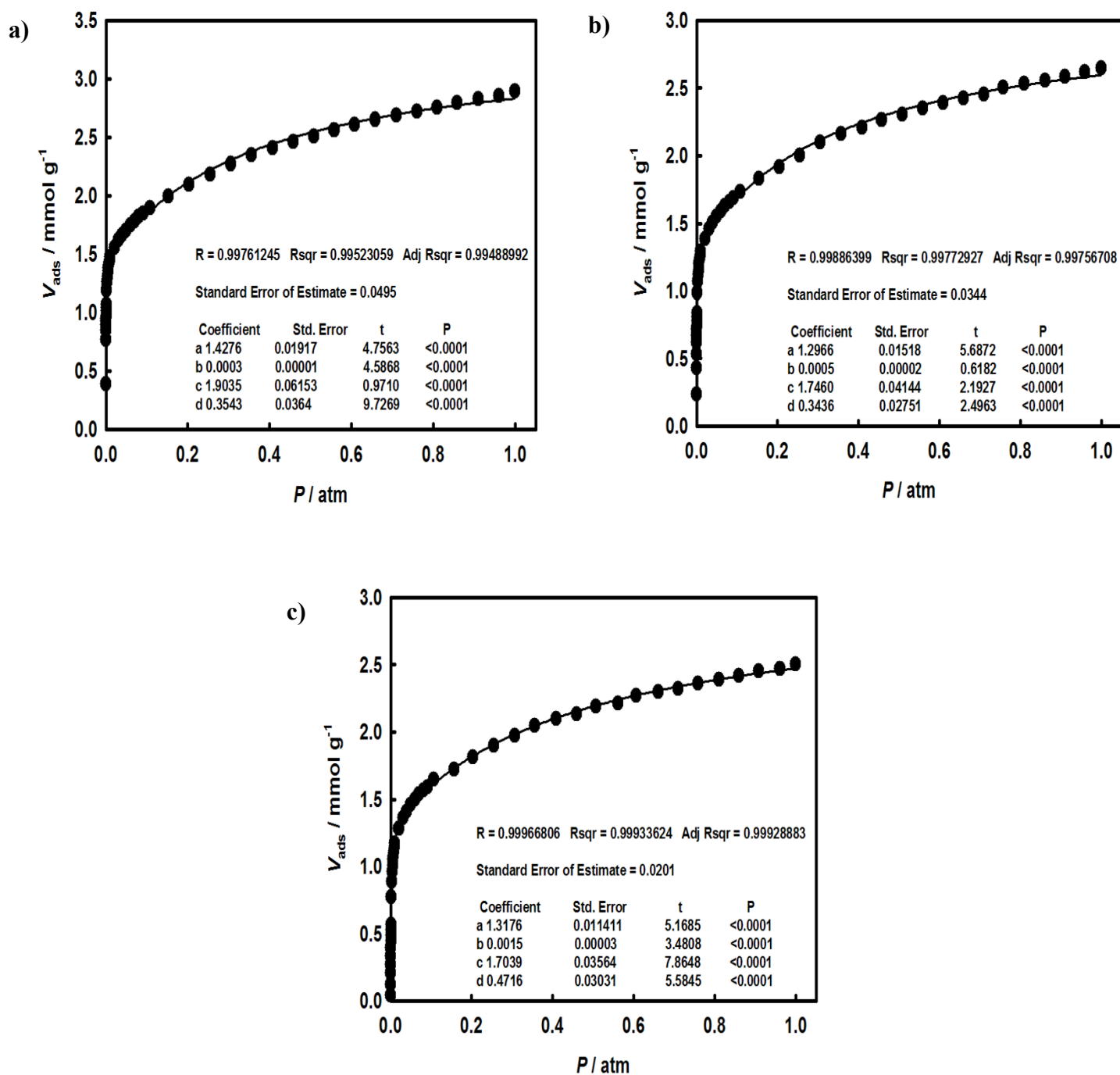


Figure S10. CO₂ gas adsorption isotherms of PEI(30 wt%)@PAF-5 measured at a) 298 K, b) 313 K, and c) 323 K. The solid line corresponds to dual-site Langmuir equation fit. Coefficients a, b, c, and d inside of the figures correspond to the values of $N_{m,A}b_A$, b_A , $N_{m,B}b_B$, and b_B , respectively, obtained for the dual-site Langmuir equation (eq. 1), which is described in the experimental section.

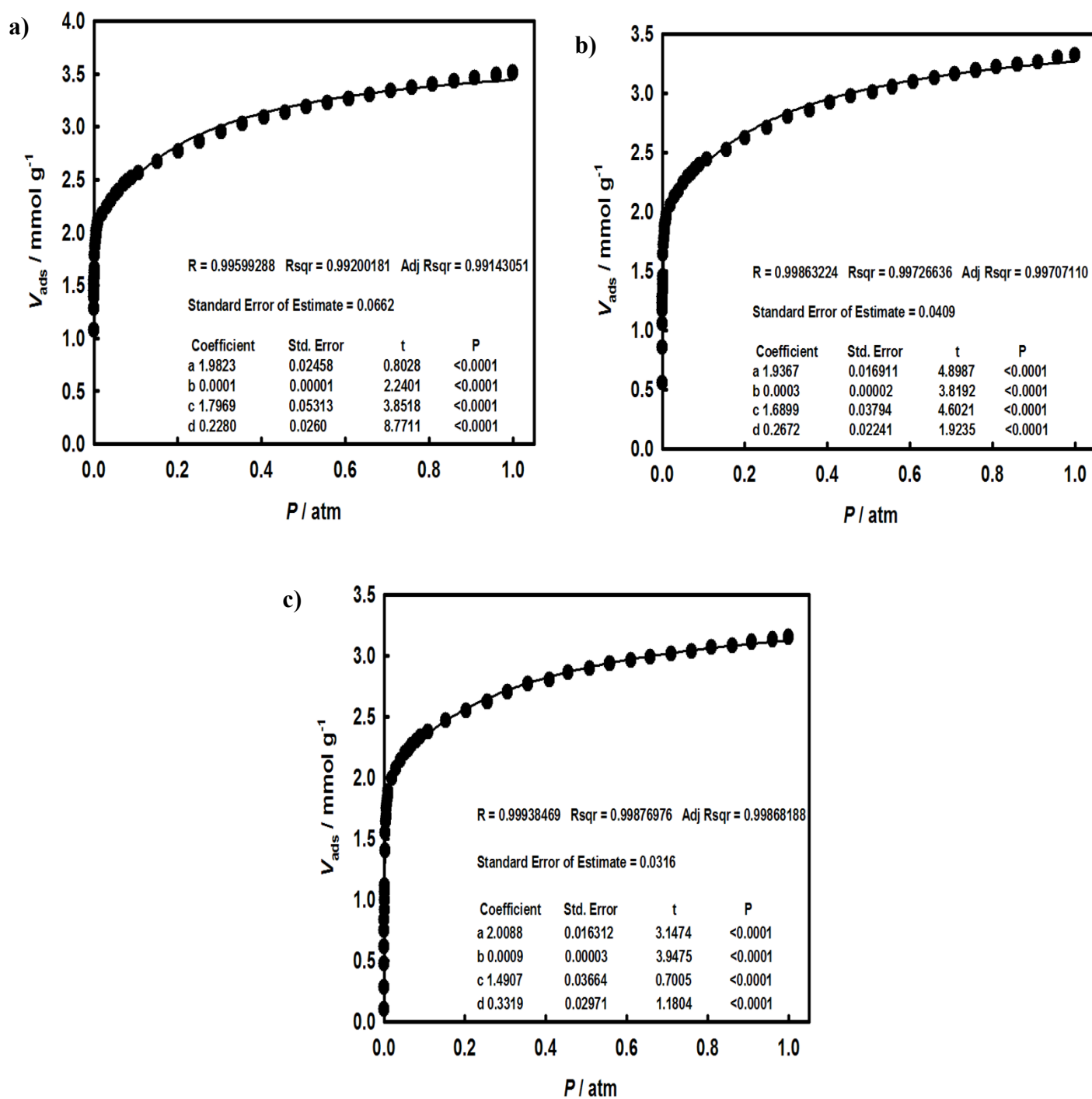


Figure S11. CO₂ gas adsorption isotherms of PEI(40 wt%)@PAF-5 measured at a) 298 K, b) 313 K, and c) 323 K. The solid line corresponds to dual-site Langmuir equation fit. Coefficients a, b, c, and d inside of the figures correspond to the values of $N_{m,A}b_A$, b_A , $N_{m,B}b_B$, and b_B , respectively, obtained for the dual-site Langmuir equation (eq. 1), which is described in the experimental section.

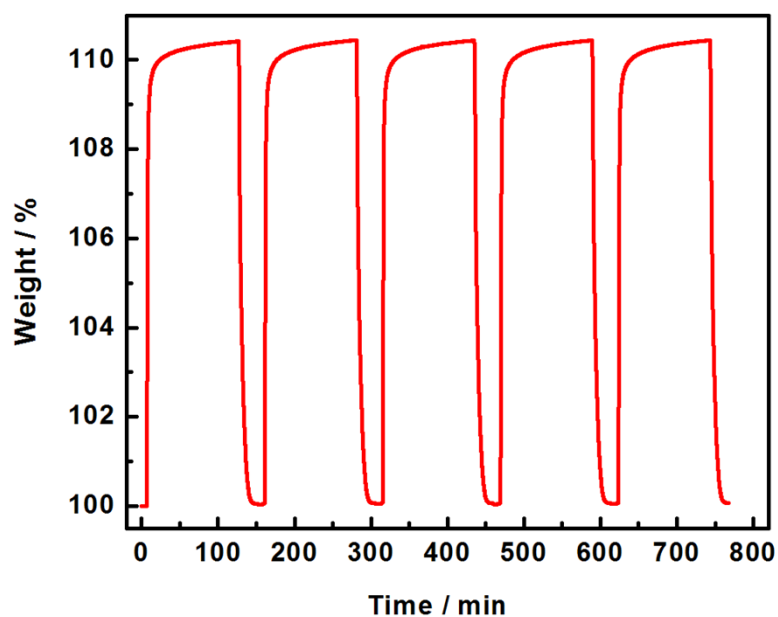


Figure S12. Gas cycling data of PEI(40 wt%)@PAF-5 under a flow of 15% CO₂ (v/v) in N₂ at 313 K. 120 minutes and 20 minutes of adsorption and desorption time were given respectively. For desorption process, temperature was elevated to 343 K under a N₂ flow.

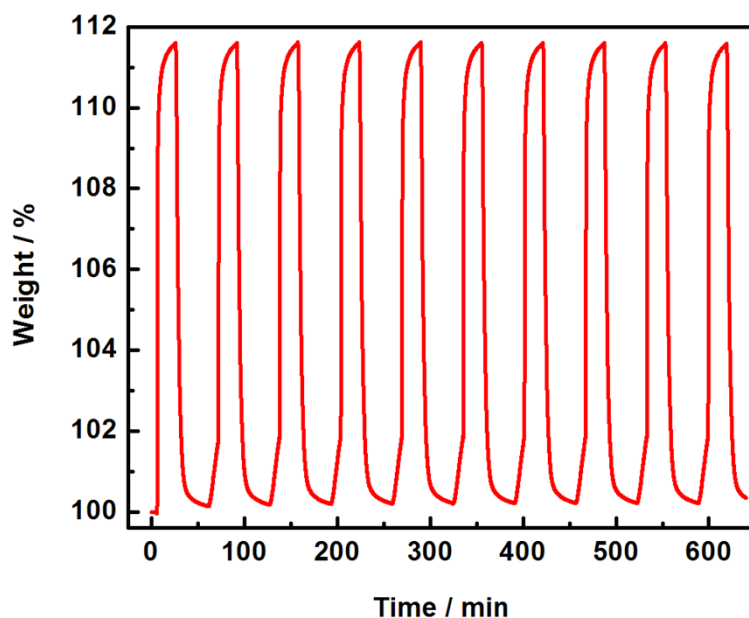


Figure S13. Gas cycling data of PEI(40 wt%)@PAF-5 under a flow of 15% CO₂ (v/v) in He at 313 K. 20 minutes and 30 minutes of adsorption and desorption time were given respectively. For desorption process, temperature was elevated to 353 K under a N₂ flow.

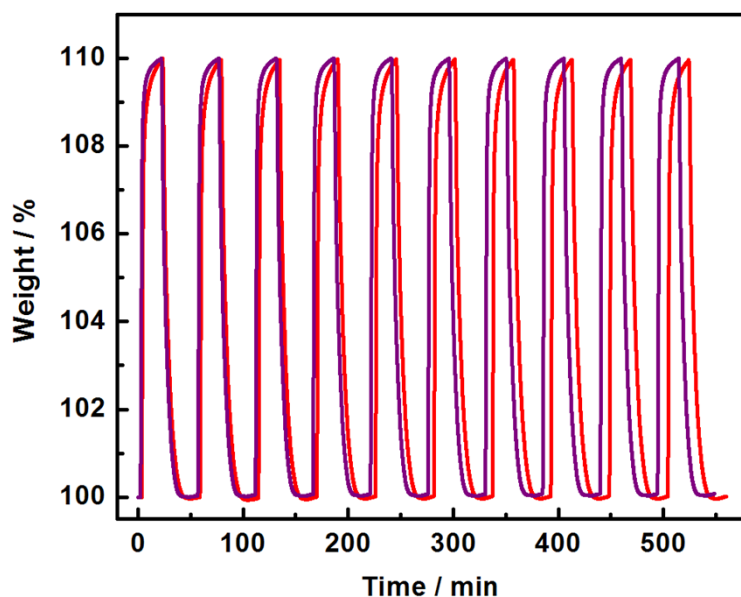


Figure S14. Gas cycling data of PEI(40 wt%)@PAF-5 before (red) and after (purple) water vapor-exposure for 7 days at 313 K followed by activation at 373 K under vacuum for 48 h. The experiments were performed under a flow of 15% CO₂ (v/v) in N₂ at 313 K, followed by a N₂ stream at 343 K. 20 minutes of adsorption and desorption time were given.

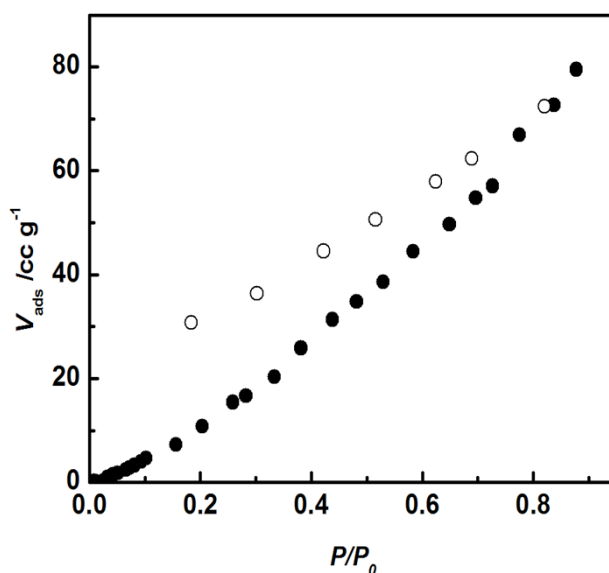


Figure S15. Water vapor adsorption and desorption isotherms of PEI(40 wt%)@PAF-5 measured at 313 K. The sample adsorbed 5.0 wt% of water vapor at $P/P_0 = 0.68$, which corresponds to 0.05 atm of water vapor pressure in the post-combustion flue gas.

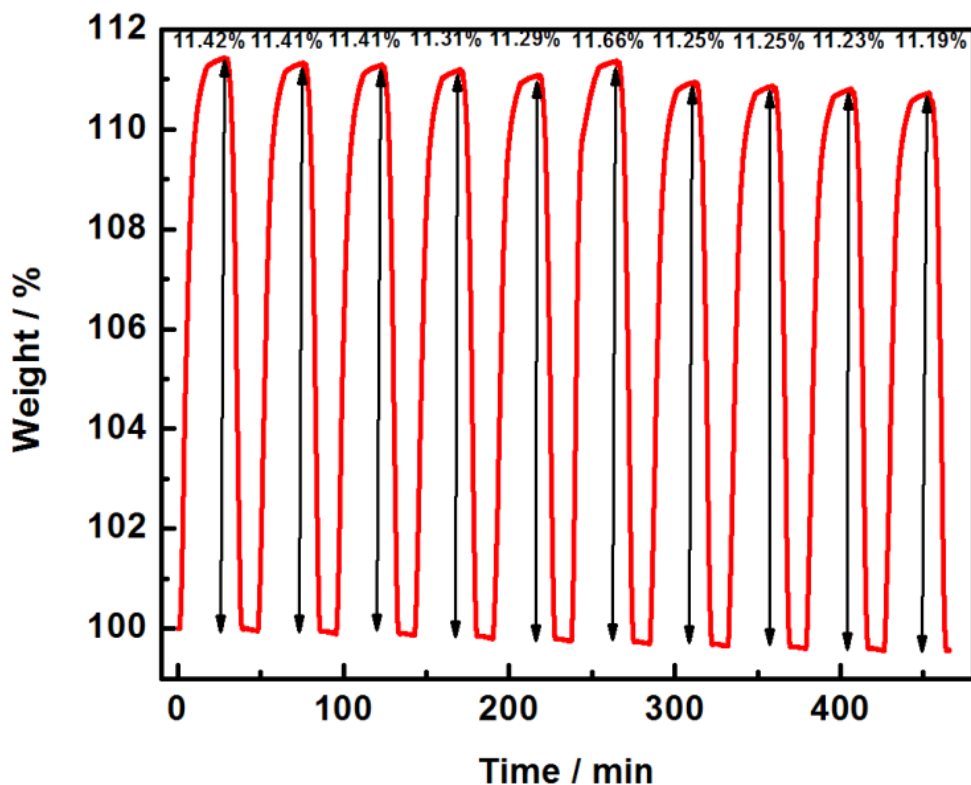


Figure S16. Weight change in each cycle of temperature swing adsorption (TSA) processes for PEI(40 wt%)@PAF-5. A stream of 15% CO₂ (v/v) in N₂ was applied at 313 K for 10 minutes and then the temperature was increased to 413 K at a rate of 10 K/min under a stream of 1 atm CO₂. For the complete regeneration of the sample, the temperature of 413 K was maintained for another 10 minutes. As seen in the figure, the material hardly loses its CO₂ adsorption capacity: during the 10 cycles of TSA, the CO₂ uptake capacities slightly fluctuated, showing the highest amount of CO₂ (11.7 wt%) adsorption in the 6th cycle. However, the difference of the CO₂ uptake capacities between the first and 10th cycle is only 0.23 wt%.

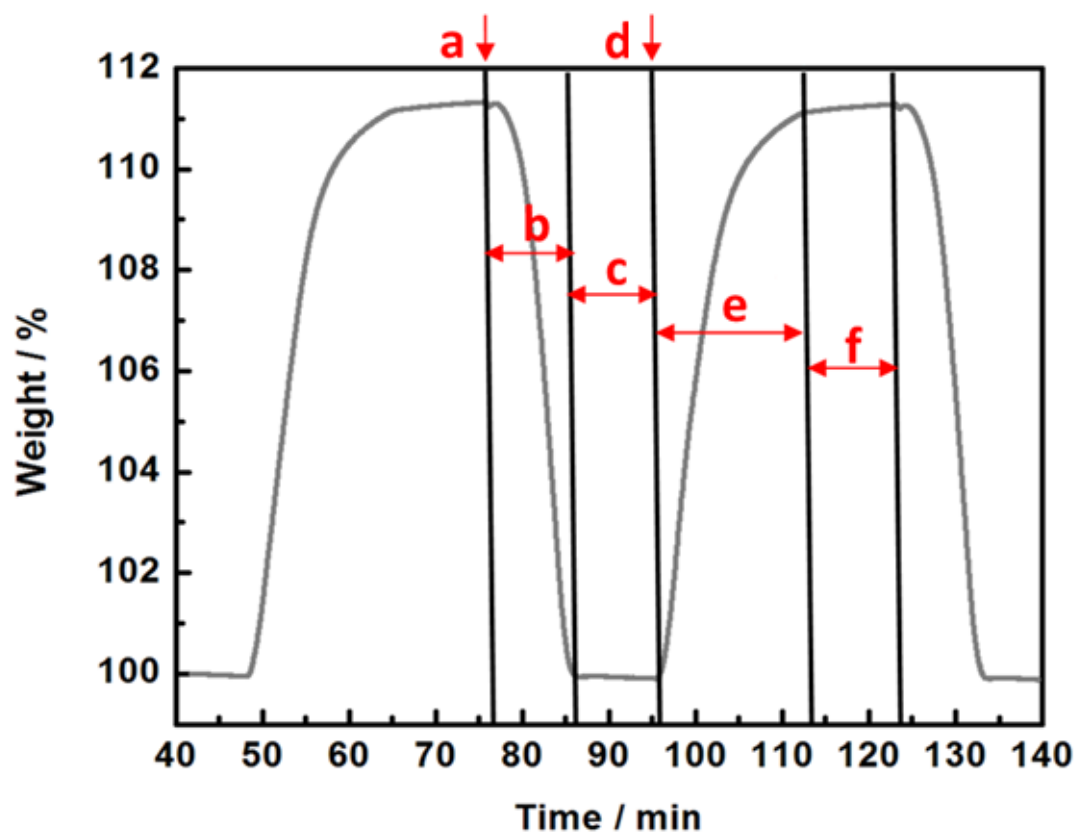


Figure S17. Detailed procedures (second and third cycles) in temperature swing adsorption (TSA) of PEI(40 wt%)@PAF-5.

- a. Gas stream was switched from a stream of 15% CO₂ (v/v) in N₂ to a pure CO₂ stream.
- b. Temperature was raised from 313 K to 413 K at a rate of 10 K/min under a pure CO₂ stream.
- c. Temperature was maintained at 413 K for another 10 minutes under a pure CO₂ stream.
- d. Gas stream was switched from a pure CO₂ stream to a stream of 15% CO₂ (v/v) in N₂
- e. Temperature was lowered from 413 K to 313 K under a stream of 15% CO₂ (v/v) in N₂.
- f. Temperature was maintained at 313 K for another 10 minutes under a stream of 15% CO₂ (v/v) in N₂.

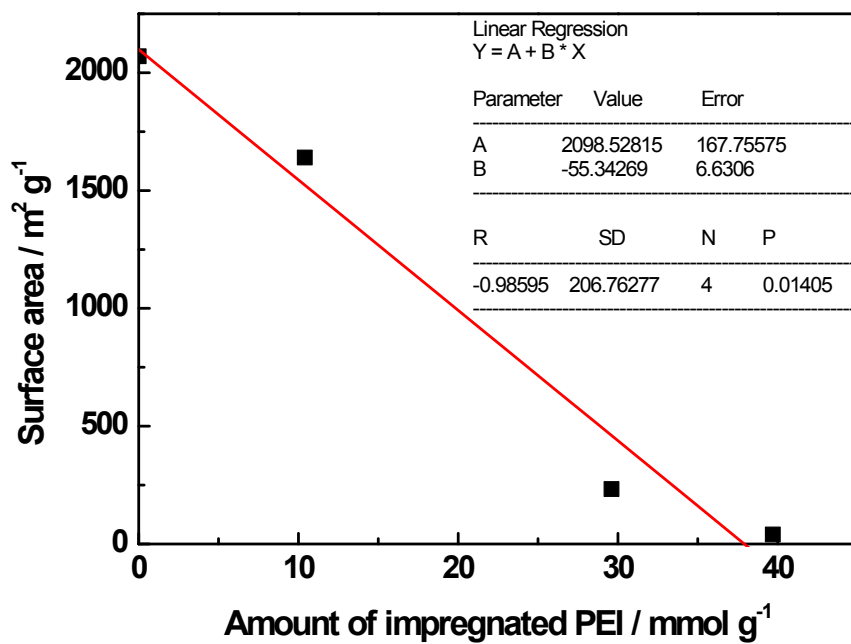
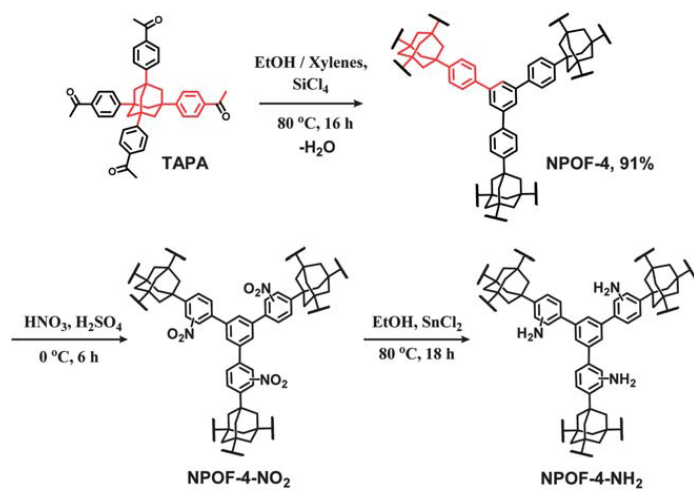
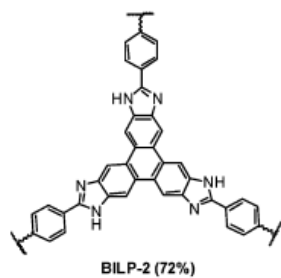


Figure S18. Correlation of the amount of impregnated PEI and the surface areas of PEI(40 wt%)@PAF-5. Maximum amount of impregnated PEI can be obtained from the x-intercept (38 wt%).

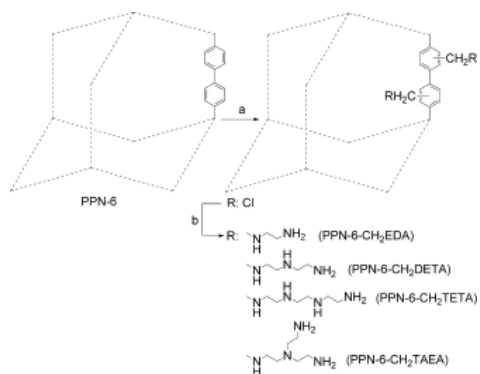
(a)



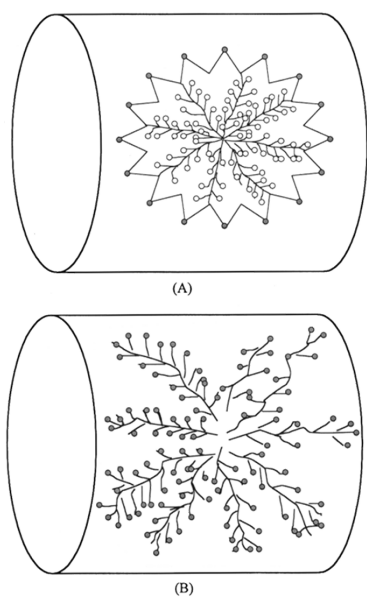
(b)



(c)



(d)



(f)

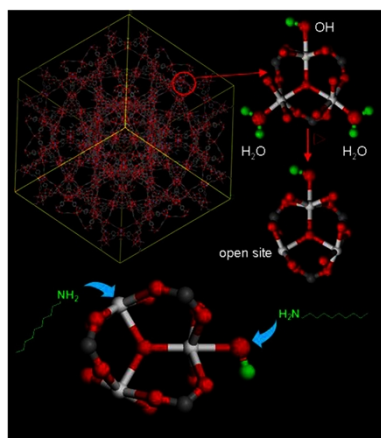


Figure S19. Schematic representation of (a) NPOF-4^{S5}, (b) BILP-2^{S6}, (c) PPN-6-CH₂DETA^{S7}, (d) MCM-41^{S8}, (e) PEI/Zr11-SBA-15^{S9}, and (f) PEI-MIL-101-125^{S10}.

References

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- S9. Y. Kuwahara, D.-Y. Kang, J. R. Copeland, N. A. Brunelli, S. A. Didas, P. Bollini, C. Sievers, T. Kamegawa, H. Yamashita and C. W. Jones, *J. Am. Chem. Soc.*, 2012, **134**, 10757-10760.
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Table S1. Conditions for impregnating various amounts of PEI in *ca.* 0.2 g of PAF-5.

Compound	PEI (g) ^[a]	stirring time (h) /temp (K)	sonication time (h) /temp (K)	amount of impregnated PEI (wt%) ^[b]
PEI(10 wt%)\subsetPAF-5	1.0	-	1/298	10.4
PEI(30 wt%)\subsetPAF-5	2.0	3/298	3/323	29.6
PEI(40 wt%)\subsetPAF-5	3.0	6/298	6/323	39.7

[a] Commercially available PEI (PEI, Mw, ~800, water content \leq 2%) is dissolved in 25 ml of absolute methanol.

[b] Determined by thermogravimetric analysis data.

Table S2. Elemental Analysis Data of **PAF-5**, **PEI(10 wt%) \subset PAF-5**, **PEI(30 wt%) \subset PAF-5**, and **PEI(40 wt%) \subset PAF-5**.^[a]

Compound	C (%)	N (%)	H (%)	N/C (%)
PAF-5 (C₆₀H₃₆)	93.3 (95.3)	0.24 (0.00)	5.02 (4.76)	-
PEI(10 wt%)\subsetPAF-5	89.4 (91.1)	2.76 (3.38)	5.58 (5.51)	0.0309
PEI(30 wt%)\subsetPAF-5	77.2 (83.5)	9.73 (9.62)	7.08 (6.84)	0.126
PEI(40 wt%)\subsetPAF-5	72.9 (79.6)	11.7 (12.9)	8.68 (7.54)	0.160

^[a]Calculated values are in the parentheses.

Table S3. Amount of adsorbed CO₂ by chemi- and physisorption in Figure 1.

Compound	Chemisorbed CO ₂ (mmol g ⁻¹)	Physisorbed CO ₂ (mmol g ⁻¹)	Chemisorbed CO ₂ / physisorbed CO ₂
PAF-5 (C₆₀H₃₆)	-	1.00	-
PEI(10 wt%)\subsetPAF-5	0.45	1.04	0.43
PEI(30 wt%)\subsetPAF-5	1.50	1.01	1.49
PEI(40 wt%)\subsetPAF-5	1.99	1.16	1.72

Table S4. N₂ adsorption and desorption data at 77 K.

PAF-5		PEI (10 wt%) \subset PAF-5		PEI (30 wt%) \subset PAF-5		PEI (40 wt%) \subset PAF-5	
<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)
1.07E-04	1.49E+02	9.57E-05	8.66E+01	9.22E-05	1.10E+01	1.07E-03	2.70E+00
2.07E-04	1.77E+02	1.95E-04	1.09E+02	1.89E-04	1.41E+01	2.06E-03	3.38E+00
2.95E-04	1.93E+02	3.02E-04	1.25E+02	2.90E-04	1.60E+01	3.00E-03	3.76E+00
4.07E-04	2.08E+02	3.99E-04	1.35E+02	3.93E-04	1.75E+01	4.01E-03	4.09E+00
5.01E-04	2.17E+02	5.10E-04	1.45E+02	4.91E-04	1.87E+01	5.03E-03	4.49E+00
6.11E-04	2.27E+02	5.99E-04	1.52E+02	5.91E-04	1.97E+01	6.05E-03	4.71E+00
7.20E-04	2.35E+02	7.06E-04	1.59E+02	7.01E-04	2.07E+01	7.13E-03	4.91E+00
7.98E-04	2.40E+02	8.16E-04	1.65E+02	8.03E-04	2.14E+01	8.02E-03	5.06E+00
9.36E-04	2.48E+02	9.25E-04	1.70E+02	8.99E-04	2.21E+01	9.01E-03	5.22E+00
1.02E-03	2.52E+02	1.00E-03	1.74E+02	9.97E-04	2.28E+01	1.01E-02	5.38E+00
2.01E-03	2.85E+02	2.02E-03	2.05E+02	2.01E-03	2.73E+01	2.05E-02	6.40E+00
3.00E-03	3.06E+02	3.06E-03	2.25E+02	3.03E-03	3.01E+01	3.12E-02	7.11E+00
4.05E-03	3.21E+02	4.00E-03	2.37E+02	4.04E-03	3.22E+01	4.16E-02	7.64E+00
5.05E-03	3.32E+02	5.06E-03	2.49E+02	5.04E-03	3.38E+01	5.18E-02	8.09E+00
6.85E-03	3.48E+02	6.95E-03	2.65E+02	6.06E-03	3.52E+01	6.20E-02	8.47E+00
7.81E-03	3.56E+02	7.68E-03	2.70E+02	7.08E-03	3.63E+01	7.21E-02	8.80E+00
8.34E-03	3.59E+02	8.37E-03	2.74E+02	8.04E-03	3.73E+01	8.22E-02	9.11E+00
9.22E-03	3.65E+02	9.21E-03	2.79E+02	9.13E-03	3.83E+01	9.23E-02	9.39E+00
9.70E-03	3.66E+02	9.91E-03	2.84E+02	1.01E-02	3.91E+01	1.11E-01	9.84E+00
1.54E-02	3.90E+02	1.52E-02	3.06E+02	2.22E-02	4.55E+01	1.60E-01	1.08E+01
2.66E-02	4.23E+02	2.97E-02	3.43E+02	2.97E-02	4.81E+01	2.10E-01	1.17E+01
3.29E-02	4.36E+02	3.94E-02	3.59E+02	3.95E-02	5.09E+01	2.60E-01	1.26E+01
4.30E-02	4.53E+02	4.65E-02	3.68E+02	5.02E-02	5.33E+01	3.08E-01	1.38E+01
5.46E-02	4.69E+02	5.42E-02	3.77E+02	6.08E-02	5.52E+01	3.60E-01	1.48E+01
6.21E-02	4.77E+02	6.57E-02	3.87E+02	7.13E-02	5.68E+01	4.09E-01	1.58E+01
7.43E-02	4.89E+02	7.56E-02	3.94E+02	7.95E-02	5.79E+01	4.59E-01	1.68E+01
8.24E-02	4.96E+02	8.37E-02	3.99E+02	9.16E-02	5.93E+01	5.09E-01	1.79E+01
1.00E-01	5.12E+02	9.82E-02	4.06E+02	1.07E-01	6.09E+01	5.59E-01	1.90E+01
1.19E-01	5.28E+02	1.22E-01	4.17E+02	1.51E-01	6.42E+01	6.09E-01	2.02E+01
1.47E-01	5.50E+02	1.96E-01	4.42E+02	2.03E-01	6.71E+01	6.59E-01	2.15E+01
2.51E-01	6.29E+02	2.53E-01	4.56E+02	2.55E-01	6.95E+01	7.08E-01	2.30E+01
3.02E-01	6.69E+02	2.98E-01	4.67E+02	3.05E-01	7.16E+01	7.58E-01	2.46E+01
3.50E-01	7.14E+02	3.46E-01	4.77E+02	3.54E-01	7.40E+01	8.06E-01	2.65E+01
4.01E-01	7.53E+02	4.03E-01	4.90E+02	4.06E-01	7.60E+01	8.55E-01	2.89E+01
4.48E-01	7.95E+02	4.53E-01	4.99E+02	4.56E-01	7.81E+01	9.01E-01	3.22E+01
4.99E-01	8.30E+02	5.04E-01	5.12E+02	5.06E-01	8.02E+01	8.41E-01	2.86E+01
5.49E-01	8.65E+02	5.48E-01	5.22E+02	5.55E-01	8.23E+01	7.93E-01	2.70E+01
6.00E-01	8.96E+02	6.02E-01	5.35E+02	6.05E-01	8.46E+01	7.43E-01	2.52E+01
6.49E-01	9.23E+02	6.51E-01	5.49E+02	6.54E-01	8.70E+01	6.92E-01	2.36E+01
7.00E-01	9.50E+02	7.05E-01	5.61E+02	7.04E-01	8.95E+01	6.42E-01	2.22E+01
7.50E-01	9.75E+02	7.53E-01	5.78E+02	7.52E-01	9.24E+01	5.91E-01	2.09E+01

8.03E-01	1.00E+03	8.01E-01	5.91E+02	8.00E-01	9.57E+01	5.41E-01	1.97E+01
8.49E-01	1.02E+03	8.53E-01	6.11E+02	8.57E-01	1.01E+02	4.90E-01	1.86E+01
9.00E-01	1.05E+03	8.97E-01	6.26E+02	9.04E-01	1.08E+02	4.40E-01	1.75E+01
8.92E-01	1.05E+03	8.90E-01	6.25E+02	8.50E-01	1.01E+02	3.90E-01	1.65E+01
8.48E-01	1.04E+03	8.49E-01	6.19E+02	7.94E-01	9.69E+01	3.40E-01	1.55E+01
7.99E-01	1.03E+03	7.99E-01	6.12E+02	7.48E-01	9.40E+01	2.90E-01	1.46E+01
7.49E-01	1.02E+03	7.48E-01	6.06E+02	6.99E-01	9.14E+01	2.40E-01	1.37E+01
6.98E-01	1.01E+03	7.03E-01	6.02E+02	6.49E-01	8.91E+01	1.90E-01	1.27E+01
6.49E-01	1.00E+03	6.47E-01	5.96E+02	5.98E-01	8.68E+01	1.40E-01	1.17E+01
5.99E-01	9.91E+02	5.92E-01	5.90E+02	5.45E-01	8.50E+01	9.06E-02	1.05E+01
5.51E-01	9.82E+02	5.53E-01	5.86E+02	4.94E-01	8.30E+01	4.26E-02	8.65E+00
5.02E-01	9.71E+02	4.98E-01	5.80E+02	4.44E-01	8.10E+01	6.51E-03	5.47E+00
4.46E-01	9.56E+02	4.49E-01	5.74E+02	3.94E-01	7.91E+01	4.05E-03	4.89E+00
4.04E-01	9.45E+02	3.96E-01	5.67E+02	3.44E-01	7.71E+01		
3.51E-01	9.28E+02	3.50E-01	5.61E+02	2.94E-01	7.52E+01		
3.02E-01	9.11E+02	3.03E-01	5.53E+02	2.44E-01	7.31E+01		
2.51E-01	8.86E+02	2.47E-01	5.42E+02	1.95E-01	7.08E+01		
1.99E-01	8.56E+02	1.99E-01	5.30E+02	1.47E-01	6.80E+01		
1.78E-01	8.41E+02	1.72E-01	5.21E+02	1.00E-01	6.44E+01		

Table S5. N₂ adsorption and desorption data at 298 K.

PAF-5		PEI (10 wt%) \subset PAF-5		PEI (30 wt%) \subset PAF-5		PEI (40 wt%) \subset PAF-5	
<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)
1.26E-02	2.21E-02	4.32E-03	6.00E-04	1.62E-01	6.80E-03	4.12E-01	6.00E-03
2.26E-02	9.92E-02	5.02E-03	9.00E-04	2.12E-01	1.59E-02	4.62E-01	2.68E-02
3.24E-02	1.72E-01	6.04E-03	2.10E-03	2.62E-01	4.54E-02	5.12E-01	6.07E-02
4.22E-02	2.53E-01	7.01E-03	2.90E-03	3.12E-01	8.20E-02	5.62E-01	7.38E-02
5.20E-02	3.62E-01	9.24E-03	8.40E-03	3.62E-01	1.23E-01	6.12E-01	1.11E-01
6.21E-02	4.33E-01	9.85E-03	8.20E-03	4.12E-01	1.50E-01	6.62E-01	1.32E-01
7.23E-02	4.18E-01	1.27E-02	2.57E-02	4.62E-01	2.02E-01	7.12E-01	1.66E-01
8.26E-02	3.91E-01	2.25E-02	7.77E-02	5.12E-01	2.50E-01	7.62E-01	2.02E-01
9.30E-02	3.49E-01	3.23E-02	1.34E-01	5.62E-01	2.82E-01	8.12E-01	2.28E-01
1.12E-01	4.32E-01	4.23E-02	2.02E-01	6.12E-01	3.32E-01	8.62E-01	2.83E-01
1.62E-01	6.31E-01	5.20E-02	2.64E-01	6.62E-01	3.99E-01	9.12E-01	3.24E-01
2.12E-01	8.28E-01	6.24E-02	2.59E-01	7.12E-01	4.53E-01	9.62E-01	3.64E-01
2.62E-01	9.91E-01	7.26E-02	2.45E-01	7.62E-01	4.88E-01	9.99E-01	4.09E-01
3.11E-01	1.28E+00	8.28E-02	2.44E-01	8.12E-01	5.40E-01	9.42E-01	4.18E-01
3.61E-01	1.52E+00	9.30E-02	2.48E-01	8.62E-01	6.29E-01	8.88E-01	4.19E-01
4.12E-01	1.60E+00	1.12E-01	2.87E-01	9.12E-01	6.92E-01	8.38E-01	4.12E-01
4.62E-01	1.87E+00	1.61E-01	4.65E-01	9.62E-01	7.31E-01	7.88E-01	4.11E-01
5.11E-01	2.14E+00	2.12E-01	5.75E-01	9.99E-01	7.88E-01	7.38E-01	4.14E-01
5.61E-01	2.35E+00	2.62E-01	7.00E-01	9.43E-01	7.66E-01	6.88E-01	4.12E-01
6.12E-01	2.58E+00	3.12E-01	8.92E-01	8.88E-01	7.42E-01	6.38E-01	4.07E-01
6.61E-01	2.77E+00	3.61E-01	1.08E+00	8.38E-01	7.02E-01	5.88E-01	4.03E-01
7.11E-01	2.91E+00	4.12E-01	1.16E+00	7.88E-01	6.88E-01	5.38E-01	3.81E-01
7.61E-01	3.15E+00	4.62E-01	1.30E+00	7.38E-01	6.69E-01	4.88E-01	3.68E-01
8.11E-01	3.42E+00	5.11E-01	1.51E+00	6.88E-01	6.38E-01	4.38E-01	3.50E-01
8.61E-01	3.59E+00	5.61E-01	1.65E+00	6.38E-01	6.13E-01	3.88E-01	3.42E-01
9.12E-01	3.70E+00	6.12E-01	1.77E+00	5.88E-01	5.88E-01	3.38E-01	3.29E-01
9.61E-01	3.90E+00	6.61E-01	1.96E+00	5.38E-01	5.40E-01	2.88E-01	3.10E-01
9.99E-01	4.18E+00	7.11E-01	2.12E+00	4.88E-01	5.13E-01	2.38E-01	3.14E-01
9.39E-01	3.81E+00	7.62E-01	2.29E+00	4.38E-01	5.16E-01	1.88E-01	3.14E-01
8.88E-01	3.75E+00	8.11E-01	2.42E+00	3.88E-01	4.48E-01	1.38E-01	3.30E-01
8.38E-01	3.59E+00	8.61E-01	2.51E+00	3.38E-01	4.18E-01	8.80E-02	3.46E-01
7.88E-01	3.38E+00	9.12E-01	2.64E+00	2.88E-01	3.84E-01	3.11E-02	4.42E-01
7.38E-01	3.16E+00	9.62E-01	2.73E+00	2.38E-01	3.72E-01	3.97E-03	3.87E-01
6.88E-01	2.99E+00	9.99E-01	2.86E+00	1.88E-01	3.48E-01		
6.38E-01	2.71E+00	9.39E-01	2.69E+00	1.38E-01	3.29E-01		
5.88E-01	2.47E+00	8.88E-01	2.65E+00	8.81E-02	3.06E-01		
5.38E-01	2.26E+00	8.38E-01	2.50E+00	3.15E-02	2.33E-01		
4.88E-01	2.02E+00	7.88E-01	2.37E+00				
4.39E-01	1.75E+00	7.39E-01	2.21E+00				
3.88E-01	1.57E+00	6.88E-01	2.06E+00				
3.38E-01	1.41E+00	6.39E-01	1.98E+00				

2.89E-01	1.15E+00	5.88E-01	1.81E+00
2.39E-01	9.15E-01	5.38E-01	1.67E+00
1.89E-01	7.37E-01	4.89E-01	1.54E+00
1.38E-01	6.29E-01	4.40E-01	1.30E+00
		3.88E-01	1.26E+00
		3.39E-01	1.14E+00
		2.89E-01	9.61E-01
		2.39E-01	7.57E-01
		1.89E-01	6.33E-01
		1.38E-01	5.29E-01

Table S6. N₂ adsorption and desorption data at 313 K.

PAF-5		PEI (10 wt%) \subset PAF-5		PEI (30 wt%) \subset PAF-5		PEI (40 wt%) \subset PAF-5	
<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)
1.27E-02	1.14E-02	1.31E-02	2.30E-03	2.62E-01	1.31E-02	6.62E-01	4.00E-03
2.28E-02	4.04E-02	2.26E-02	3.58E-02	3.12E-01	4.07E-02	7.12E-01	4.53E-02
3.26E-02	9.02E-02	3.22E-02	7.34E-02	3.62E-01	7.47E-02	7.62E-01	7.34E-02
4.24E-02	1.74E-01	4.21E-02	1.11E-01	4.12E-01	1.02E-01	8.12E-01	1.07E-01
5.22E-02	2.53E-01	5.18E-02	1.72E-01	4.62E-01	1.44E-01	8.62E-01	1.48E-01
6.22E-02	3.05E-01	6.21E-02	1.92E-01	5.12E-01	1.83E-01	9.12E-01	1.90E-01
7.22E-02	3.30E-01	7.23E-02	1.78E-01	5.62E-01	2.23E-01	9.62E-01	2.26E-01
8.24E-02	3.44E-01	8.26E-02	1.51E-01	6.12E-01	2.65E-01	9.99E-01	2.63E-01
9.29E-02	2.97E-01	9.29E-02	1.07E-01	6.62E-01	3.10E-01	9.42E-01	2.75E-01
1.12E-01	2.63E-01	1.12E-01	9.59E-02	7.12E-01	3.36E-01	8.88E-01	2.42E-01
1.62E-01	3.05E-01	1.62E-01	1.15E-01	7.62E-01	3.84E-01	8.38E-01	2.48E-01
2.12E-01	4.86E-01	2.12E-01	2.22E-01	8.12E-01	4.43E-01	7.88E-01	2.62E-01
2.62E-01	5.55E-01	2.62E-01	2.76E-01	8.62E-01	4.95E-01	7.38E-01	2.64E-01
3.11E-01	7.23E-01	3.12E-01	3.87E-01	9.12E-01	5.28E-01	6.88E-01	2.42E-01
3.61E-01	9.21E-01	3.62E-01	4.81E-01	9.62E-01	5.85E-01	6.38E-01	2.38E-01
4.12E-01	9.12E-01	4.12E-01	4.74E-01	9.99E-01	6.24E-01	5.88E-01	2.29E-01
4.62E-01	9.80E-01	4.62E-01	5.51E-01	9.43E-01	5.91E-01	5.38E-01	2.14E-01
5.12E-01	1.26E+00	5.11E-01	6.65E-01	8.88E-01	5.77E-01	4.88E-01	1.84E-01
5.62E-01	1.29E+00	5.62E-01	7.34E-01	8.38E-01	5.73E-01	4.38E-01	1.78E-01
6.11E-01	1.43E+00	6.12E-01	7.96E-01	7.88E-01	6.16E-01	3.88E-01	1.68E-01
6.62E-01	1.51E+00	6.62E-01	8.67E-01	7.38E-01	5.87E-01	3.38E-01	1.57E-01
7.11E-01	1.71E+00	7.12E-01	9.34E-01	6.88E-01	5.59E-01	2.88E-01	1.37E-01
7.62E-01	1.79E+00	7.62E-01	9.67E-01	6.38E-01	5.29E-01	2.38E-01	1.45E-01
8.11E-01	1.92E+00	8.12E-01	1.04E+00	5.88E-01	5.14E-01	1.88E-01	1.35E-01
8.61E-01	2.27E+00	8.61E-01	1.12E+00	5.38E-01	4.88E-01	1.38E-01	1.64E-01
9.12E-01	2.24E+00	9.12E-01	1.10E+00	4.88E-01	4.54E-01	8.80E-02	1.78E-01
9.62E-01	2.31E+00	9.62E-01	1.11E+00	4.38E-01	4.29E-01	3.12E-02	1.70E-01
9.99E-01	2.56E+00	9.99E-01	1.25E+00	3.88E-01	4.06E-01	3.94E-03	1.62E-01
9.38E-01	2.30E+00	9.39E-01	1.12E+00	3.38E-01	3.86E-01		
8.87E-01	2.28E+00	8.88E-01	1.15E+00	2.88E-01	3.56E-01		
8.38E-01	2.12E+00	8.38E-01	1.13E+00	2.38E-01	3.42E-01		
7.88E-01	2.09E+00	7.88E-01	1.02E+00	1.88E-01	3.20E-01		
7.38E-01	1.96E+00	7.39E-01	9.52E-01	1.38E-01	3.12E-01		
6.88E-01	1.85E+00	6.88E-01	9.38E-01	8.80E-02	2.97E-01		
6.38E-01	1.69E+00	6.38E-01	8.98E-01	3.13E-02	2.47E-01		
5.88E-01	1.59E+00	5.88E-01	8.29E-01				
5.38E-01	1.48E+00	5.38E-01	7.34E-01				
4.88E-01	1.30E+00	4.88E-01	7.01E-01				
4.39E-01	1.04E+00	4.39E-01	5.16E-01				
3.88E-01	1.14E+00	3.88E-01	5.52E-01				
3.38E-01	1.02E+00	3.38E-01	4.86E-01				
2.88E-01	8.35E-01	2.89E-01	3.98E-01				

2.39E-01	5.76E-01	2.39E-01	2.77E-01
1.89E-01	4.88E-01	1.88E-01	2.14E-01
1.38E-01	4.30E-01	1.38E-01	1.91E-01

Table S7. N₂ adsorption and desorption data at 323 K.

PAF-5		PEI (10 wt%) \subset PAF-5		PEI (30 wt%) \subset PAF-5		PEI (40 wt%) \subset PAF-5	
<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)
1.12E-01	7.50E-03	4.29E-02	2.40E-03	5.29E-02	1.40E-02	6.12E-01	6.20E-03
1.62E-01	6.78E-02	5.30E-02	1.80E-02	6.29E-02	1.60E-02	6.62E-01	3.11E-02
2.12E-01	1.29E-01	6.30E-02	2.81E-02	7.29E-02	1.08E-02	7.12E-01	5.61E-02
2.62E-01	2.18E-01	7.30E-02	3.83E-02	8.30E-02	8.70E-03	7.62E-01	8.28E-02
3.12E-01	2.88E-01	8.30E-02	4.80E-02	9.30E-02	1.04E-02	8.12E-01	1.15E-01
3.62E-01	3.83E-01	9.29E-02	6.62E-02	1.12E-01	7.60E-03	8.62E-01	1.79E-01
4.12E-01	4.45E-01	1.12E-01	9.16E-02	1.62E-01	3.40E-03	9.12E-01	1.86E-01
4.62E-01	5.47E-01	1.62E-01	1.58E-01	2.62E-01	7.20E-03	9.62E-01	2.26E-01
5.12E-01	6.63E-01	2.12E-01	2.13E-01	3.12E-01	2.21E-02	9.99E-01	2.38E-01
5.62E-01	7.24E-01	2.62E-01	3.04E-01	3.62E-01	4.26E-02	9.42E-01	2.12E-01
6.12E-01	8.35E-01	3.12E-01	3.61E-01	4.12E-01	3.28E-02	8.88E-01	2.28E-01
6.62E-01	9.54E-01	3.62E-01	4.57E-01	4.62E-01	6.72E-02	8.38E-01	2.30E-01
7.12E-01	1.03E+00	4.12E-01	5.22E-01	5.12E-01	9.27E-02	7.88E-01	2.26E-01
7.62E-01	1.14E+00	4.62E-01	6.26E-01	5.62E-01	1.09E-01	7.38E-01	1.87E-01
8.12E-01	1.25E+00	5.12E-01	7.17E-01	6.12E-01	1.34E-01	6.88E-01	2.04E-01
8.62E-01	1.38E+00	5.62E-01	8.04E-01	6.62E-01	1.58E-01	6.38E-01	1.96E-01
9.11E-01	1.55E+00	6.12E-01	9.03E-01	7.12E-01	1.87E-01	5.88E-01	2.03E-01
9.62E-01	1.63E+00	6.62E-01	9.86E-01	7.62E-01	2.16E-01	5.38E-01	1.74E-01
9.99E-01	1.71E+00	7.12E-01	1.13E+00	8.12E-01	2.84E-01	4.88E-01	1.64E-01
9.42E-01	1.69E+00	7.62E-01	1.20E+00	8.62E-01	3.27E-01	4.38E-01	1.56E-01
8.88E-01	1.60E+00	8.12E-01	1.29E+00	9.12E-01	4.04E-01	3.88E-01	1.39E-01
8.38E-01	1.50E+00	8.62E-01	1.45E+00	9.62E-01	4.24E-01	3.38E-01	1.43E-01
7.88E-01	1.41E+00	9.12E-01	1.54E+00	9.99E-01	4.68E-01	2.88E-01	1.24E-01
7.38E-01	1.34E+00	9.62E-01	1.64E+00	9.42E-01	4.72E-01	2.38E-01	1.36E-01
6.88E-01	1.23E+00	9.99E-01	1.72E+00	8.88E-01	4.94E-01	1.88E-01	1.39E-01
6.38E-01	1.12E+00	9.42E-01	1.66E+00	8.38E-01	4.77E-01	1.38E-01	1.65E-01
5.88E-01	1.03E+00	8.88E-01	1.58E+00	7.88E-01	4.84E-01	8.80E-02	1.79E-01
5.38E-01	9.98E-01	8.38E-01	1.48E+00	7.38E-01	4.96E-01	3.12E-02	1.41E-01
4.88E-01	8.59E-01	7.88E-01	1.41E+00	6.88E-01	4.79E-01		
4.38E-01	7.57E-01	7.38E-01	1.32E+00	6.38E-01	4.69E-01		
3.88E-01	6.61E-01	6.88E-01	1.25E+00	5.88E-01	4.74E-01		
3.38E-01	5.52E-01	6.38E-01	1.14E+00	5.38E-01	4.53E-01		
2.88E-01	4.48E-01	5.88E-01	1.08E+00	4.88E-01	4.29E-01		
2.38E-01	4.02E-01	5.38E-01	9.69E-01	4.38E-01	4.26E-01		
1.88E-01	3.10E-01	4.88E-01	8.62E-01	3.88E-01	4.12E-01		
1.38E-01	2.50E-01	4.38E-01	7.75E-01	3.38E-01	3.85E-01		
8.82E-02	1.75E-01	3.88E-01	7.00E-01	2.88E-01	3.88E-01		
3.14E-02	5.79E-02	3.38E-01	6.07E-01	2.38E-01	3.92E-01		
		2.88E-01	5.07E-01	1.88E-01	3.93E-01		
		2.38E-01	4.37E-01	1.38E-01	4.07E-01		
		1.88E-01	3.54E-01	8.80E-02	4.12E-01		
		1.38E-01	3.05E-01	3.09E-02	4.31E-01		

8.81E-02	2.56E-01	3.78E-03	4.22E-01
3.14E-02	1.39E-01		

Table S8. CO₂ adsorption and desorption data at 298 K.

PAF-5		PEI (10 wt%) \subset PAF-5		PEI (30 wt%) \subset PAF-5		PEI (40 wt%) \subset PAF-5	
<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)
1.00E-03	1.63E-02	1.00E-03	4.25E+00	1.00E-04	8.74E+00	9.98E-05	2.41E+01
2.01E-03	4.70E-02	2.00E-03	5.31E+00	1.99E-04	1.72E+01	1.99E-04	2.87E+01
3.00E-03	7.84E-02	3.05E-03	5.93E+00	2.99E-04	1.90E+01	2.99E-04	3.11E+01
4.02E-03	1.13E-01	4.08E-03	6.40E+00	4.01E-04	2.01E+01	3.99E-04	3.26E+01
5.00E-03	1.42E-01	5.11E-03	6.76E+00	5.08E-04	2.08E+01	4.99E-04	3.39E+01
6.35E-03	1.89E-01	6.05E-03	7.03E+00	6.01E-04	2.13E+01	5.99E-04	3.47E+01
7.03E-03	2.08E-01	7.13E-03	7.30E+00	7.00E-04	2.19E+01	7.01E-04	3.55E+01
9.12E-03	2.86E-01	8.25E-03	7.56E+00	8.06E-04	2.28E+01	8.00E-04	3.62E+01
1.04E-02	6.26E-01	9.09E-03	7.73E+00	9.02E-04	2.33E+01	9.00E-04	3.68E+01
1.25E-02	6.77E-01	1.01E-02	7.91E+00	1.01E-03	2.39E+01	1.00E-03	3.72E+01
2.19E-02	1.07E+00	2.01E-02	8.95E+00	2.01E-03	2.67E+01	2.02E-03	4.00E+01
3.15E-02	1.60E+00	3.06E-02	9.82E+00	3.00E-03	2.82E+01	3.01E-03	4.19E+01
4.15E-02	2.07E+00	4.09E-02	1.06E+01	4.04E-03	2.93E+01	4.03E-03	4.31E+01
5.12E-02	2.54E+00	5.11E-02	1.12E+01	5.12E-03	3.04E+01	5.02E-03	4.42E+01
6.13E-02	2.91E+00	6.13E-02	1.18E+01	6.01E-03	3.10E+01	6.05E-03	4.51E+01
7.17E-02	3.21E+00	7.14E-02	1.25E+01	7.06E-03	3.16E+01	7.08E-03	4.58E+01
8.19E-02	3.61E+00	8.15E-02	1.30E+01	8.06E-03	3.21E+01	8.13E-03	4.64E+01
9.25E-02	3.89E+00	9.16E-02	1.36E+01	9.12E-03	3.26E+01	9.10E-03	4.69E+01
1.11E-01	4.48E+00	1.10E-01	1.44E+01	1.02E-02	3.31E+01	1.02E-02	4.74E+01
1.59E-01	6.25E+00	1.57E-01	1.65E+01	2.07E-02	3.48E+01	2.01E-02	4.88E+01
2.08E-01	8.07E+00	2.06E-01	1.86E+01	3.15E-02	3.63E+01	3.05E-02	5.03E+01
2.59E-01	9.78E+00	2.56E-01	2.08E+01	3.96E-02	3.72E+01	4.08E-02	5.16E+01
3.09E-01	1.16E+01	3.06E-01	2.30E+01	4.93E-02	3.82E+01	5.11E-02	5.29E+01
3.58E-01	1.35E+01	3.57E-01	2.51E+01	5.95E-02	3.91E+01	5.92E-02	5.37E+01
4.09E-01	1.52E+01	4.07E-01	2.69E+01	6.99E-02	3.99E+01	7.14E-02	5.49E+01
4.59E-01	1.69E+01	4.57E-01	2.86E+01	7.98E-02	4.07E+01	7.97E-02	5.56E+01
5.08E-01	1.87E+01	5.08E-01	3.03E+01	9.05E-02	4.14E+01	8.95E-02	5.64E+01
5.58E-01	2.03E+01	5.58E-01	3.19E+01	1.08E-01	4.25E+01	1.07E-01	5.75E+01
6.09E-01	2.20E+01	6.08E-01	3.35E+01	1.53E-01	4.47E+01	1.51E-01	5.98E+01
6.59E-01	2.36E+01	6.58E-01	3.50E+01	2.03E-01	4.70E+01	2.01E-01	6.20E+01
7.08E-01	2.52E+01	7.08E-01	3.65E+01	2.55E-01	4.89E+01	2.52E-01	6.41E+01
7.59E-01	2.68E+01	7.58E-01	3.80E+01	3.05E-01	5.09E+01	3.03E-01	6.62E+01
8.09E-01	2.84E+01	8.08E-01	3.94E+01	3.56E-01	5.26E+01	3.55E-01	6.78E+01
8.58E-01	3.00E+01	8.58E-01	4.08E+01	4.07E-01	5.39E+01	4.06E-01	6.92E+01
9.09E-01	3.14E+01	9.08E-01	4.23E+01	4.57E-01	5.52E+01	4.57E-01	7.03E+01
9.59E-01	3.29E+01	9.58E-01	4.36E+01	5.08E-01	5.62E+01	5.07E-01	7.13E+01
9.99E-01	3.44E+01	9.99E-01	4.49E+01	5.58E-01	5.73E+01	5.57E-01	7.23E+01
9.42E-01	3.27E+01	9.43E-01	4.35E+01	6.08E-01	5.84E+01	6.08E-01	7.32E+01
8.90E-01	3.13E+01	8.91E-01	4.24E+01	6.58E-01	5.94E+01	6.59E-01	7.40E+01
8.41E-01	3.00E+01	8.41E-01	4.12E+01	7.09E-01	6.02E+01	7.08E-01	7.48E+01
7.91E-01	2.85E+01	7.91E-01	3.99E+01	7.60E-01	6.09E+01	7.59E-01	7.55E+01
7.41E-01	2.69E+01	7.41E-01	3.87E+01	8.09E-01	6.18E+01	8.08E-01	7.63E+01

6.91E-01	2.54E+01	6.92E-01	3.74E+01	8.59E-01	6.26E+01	8.60E-01	7.68E+01
6.41E-01	2.38E+01	6.41E-01	3.60E+01	9.09E-01	6.34E+01	9.08E-01	7.76E+01
5.91E-01	2.24E+01	5.92E-01	3.46E+01	9.60E-01	6.40E+01	9.60E-01	7.82E+01
5.41E-01	2.07E+01	5.42E-01	3.32E+01	9.99E-01	6.48E+01	9.99E-01	7.87E+01
4.91E-01	1.92E+01	4.92E-01	3.17E+01	9.40E-01	6.44E+01	9.41E-01	7.85E+01
4.42E-01	1.74E+01	4.42E-01	3.02E+01	8.89E-01	6.41E+01	8.88E-01	7.83E+01
3.91E-01	1.60E+01	3.92E-01	2.85E+01	8.39E-01	6.37E+01	8.39E-01	7.81E+01
3.41E-01	1.42E+01	3.42E-01	2.68E+01	7.89E-01	6.33E+01	7.89E-01	7.79E+01
2.92E-01	1.24E+01	2.93E-01	2.49E+01	7.39E-01	6.28E+01	7.39E-01	7.76E+01
2.42E-01	1.04E+01	2.43E-01	2.28E+01	6.89E-01	6.23E+01	6.89E-01	7.73E+01
1.91E-01	8.60E+00	1.94E-01	2.07E+01	6.40E-01	6.18E+01	6.39E-01	7.69E+01
1.41E-01	6.76E+00	1.44E-01	1.85E+01	5.90E-01	6.12E+01	5.89E-01	7.65E+01
		9.41E-02	1.62E+01	5.40E-01	6.06E+01	5.39E-01	7.61E+01
		4.24E-02	1.32E+01	4.90E-01	5.99E+01	4.89E-01	7.56E+01
				4.40E-01	5.92E+01	4.40E-01	7.51E+01
				3.90E-01	5.83E+01	3.90E-01	7.45E+01
				3.41E-01	5.74E+01	3.40E-01	7.38E+01
				2.92E-01	5.61E+01	2.91E-01	7.28E+01
				2.43E-01	5.45E+01	2.42E-01	7.15E+01
				1.93E-01	5.30E+01	1.93E-01	7.03E+01
				1.43E-01	5.15E+01	1.43E-01	6.90E+01
				9.54E-02	4.95E+01	9.52E-02	6.74E+01
				4.64E-02	4.63E+01	4.75E-02	6.46E+01
				7.51E-03	3.73E+01	8.38E-03	5.59E+01
						4.53E-03	5.23E+01
						9.87E-04	4.25E+01

Table S9. CO₂ adsorption and desorption data at 313 K.

PAF-5		PEI (10 wt%) \subset PAF-5		PEI (30 wt%) \subset PAF-5		PEI (40 wt%) \subset PAF-5	
<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)
1.03E-03	7.00E-04	1.02E-03	2.14E+00	1.03E-04	5.28E+00	1.02E-04	1.25E+01
2.02E-03	1.80E-02	2.04E-03	3.19E+00	2.02E-04	9.61E+00	2.02E-04	1.91E+01
3.05E-03	3.67E-02	3.01E-03	3.78E+00	3.03E-04	1.20E+01	3.02E-04	2.37E+01
4.01E-03	5.52E-02	4.10E-03	4.31E+00	4.06E-04	1.39E+01	4.01E-04	2.62E+01
5.03E-03	7.53E-02	5.18E-03	4.69E+00	5.04E-04	1.50E+01	5.12E-04	2.75E+01
6.03E-03	9.41E-02	6.08E-03	4.97E+00	6.09E-04	1.60E+01	6.08E-04	2.87E+01
7.27E-03	1.19E-01	7.23E-03	5.26E+00	7.12E-04	1.66E+01	7.13E-04	2.98E+01
9.30E-03	1.65E-01	8.30E-03	5.53E+00	8.05E-04	1.75E+01	8.05E-04	3.11E+01
9.84E-03	1.74E-01	9.12E-03	5.71E+00	9.03E-04	1.81E+01	9.06E-04	3.20E+01
1.25E-02	2.63E-01	1.01E-02	5.90E+00	1.01E-03	1.87E+01	1.01E-03	3.26E+01
2.24E-02	5.10E-01	1.99E-02	7.02E+00	2.01E-03	2.21E+01	2.04E-03	3.67E+01
3.25E-02	7.54E-01	3.06E-02	7.91E+00	3.03E-03	2.39E+01	3.04E-03	3.87E+01
4.20E-02	1.01E+00	4.11E-02	8.62E+00	4.06E-03	2.51E+01	4.08E-03	3.98E+01
5.21E-02	1.24E+00	5.13E-02	9.24E+00	5.07E-03	2.60E+01	5.00E-03	4.11E+01
6.24E-02	1.40E+00	6.15E-02	9.81E+00	6.19E-03	2.69E+01	6.07E-03	4.20E+01
7.22E-02	1.63E+00	7.16E-02	1.03E+01	7.24E-03	2.75E+01	7.12E-03	4.27E+01
8.21E-02	1.85E+00	8.17E-02	1.08E+01	8.08E-03	2.80E+01	8.01E-03	4.31E+01
9.26E-02	2.09E+00	9.18E-02	1.12E+01	9.03E-03	2.85E+01	9.13E-03	4.38E+01
1.11E-01	2.59E+00	1.10E-01	1.20E+01	1.01E-02	2.90E+01	1.03E-02	4.43E+01
1.59E-01	3.91E+00	1.57E-01	1.37E+01	2.06E-02	3.10E+01	1.98E-02	4.61E+01
2.11E-01	4.70E+00	2.07E-01	1.54E+01	3.12E-02	3.27E+01	2.95E-02	4.77E+01
2.60E-01	5.98E+00	2.57E-01	1.71E+01	3.95E-02	3.37E+01	3.91E-02	4.87E+01
3.10E-01	7.26E+00	3.07E-01	1.90E+01	4.94E-02	3.47E+01	5.01E-02	5.03E+01
3.60E-01	8.50E+00	3.58E-01	2.07E+01	5.95E-02	3.57E+01	6.15E-02	5.15E+01
4.10E-01	9.66E+00	4.08E-01	2.21E+01	6.99E-02	3.65E+01	7.05E-02	5.21E+01
4.60E-01	1.08E+01	4.59E-01	2.35E+01	8.10E-02	3.71E+01	7.93E-02	5.29E+01
5.10E-01	1.20E+01	5.09E-01	2.48E+01	9.07E-02	3.78E+01	8.95E-02	5.37E+01
5.59E-01	1.32E+01	5.59E-01	2.61E+01	1.08E-01	3.89E+01	1.07E-01	5.47E+01
6.09E-01	1.44E+01	6.09E-01	2.73E+01	1.54E-01	4.10E+01	1.55E-01	5.64E+01
6.60E-01	1.56E+01	6.59E-01	2.85E+01	2.05E-01	4.29E+01	2.01E-01	5.87E+01
7.09E-01	1.66E+01	7.09E-01	2.97E+01	2.55E-01	4.48E+01	2.53E-01	6.07E+01
7.60E-01	1.77E+01	7.59E-01	3.08E+01	3.05E-01	4.70E+01	3.04E-01	6.27E+01
8.09E-01	1.89E+01	8.09E-01	3.19E+01	3.57E-01	4.84E+01	3.57E-01	6.40E+01
8.59E-01	2.00E+01	8.60E-01	3.30E+01	4.08E-01	4.95E+01	4.06E-01	6.54E+01
9.09E-01	2.10E+01	9.09E-01	3.42E+01	4.57E-01	5.07E+01	4.56E-01	6.66E+01
9.60E-01	2.20E+01	9.60E-01	3.52E+01	5.09E-01	5.17E+01	5.09E-01	6.74E+01
9.99E-01	2.31E+01	9.99E-01	3.62E+01	5.58E-01	5.27E+01	5.57E-01	6.84E+01
9.40E-01	2.18E+01	9.43E-01	3.52E+01	6.09E-01	5.36E+01	6.08E-01	6.93E+01
8.89E-01	2.09E+01	8.91E-01	3.42E+01	6.60E-01	5.43E+01	6.59E-01	7.00E+01
8.40E-01	2.02E+01	8.41E-01	3.33E+01	7.09E-01	5.50E+01	7.08E-01	7.09E+01
7.90E-01	1.90E+01	7.91E-01	3.24E+01	7.58E-01	5.61E+01	7.59E-01	7.15E+01

7.40E-01	1.79E+01	7.41E-01	3.15E+01	8.10E-01	5.68E+01	8.09E-01	7.22E+01
6.90E-01	1.68E+01	6.91E-01	3.05E+01	8.61E-01	5.72E+01	8.60E-01	7.27E+01
6.39E-01	1.58E+01	6.41E-01	2.94E+01	9.10E-01	5.79E+01	9.10E-01	7.31E+01
5.90E-01	1.47E+01	5.91E-01	2.83E+01	9.59E-01	5.87E+01	9.58E-01	7.39E+01
5.40E-01	1.37E+01	5.41E-01	2.72E+01	9.99E-01	5.93E+01	9.99E-01	7.44E+01
4.90E-01	1.26E+01	4.91E-01	2.61E+01	9.40E-01	5.90E+01	9.41E-01	7.42E+01
4.41E-01	1.14E+01	4.41E-01	2.49E+01	8.89E-01	5.86E+01	8.88E-01	7.41E+01
3.90E-01	1.05E+01	3.91E-01	2.36E+01	8.39E-01	5.83E+01	8.39E-01	7.39E+01
3.40E-01	9.30E+00	3.42E-01	2.22E+01	7.89E-01	5.80E+01	7.89E-01	7.36E+01
2.90E-01	8.06E+00	2.92E-01	2.06E+01	7.40E-01	5.75E+01	7.39E-01	7.34E+01
2.41E-01	6.76E+00	2.43E-01	1.88E+01	6.89E-01	5.70E+01	6.89E-01	7.30E+01
1.89E-01	5.92E+00	1.93E-01	1.71E+01	6.39E-01	5.65E+01	6.39E-01	7.27E+01
1.39E-01	4.65E+00	1.43E-01	1.53E+01	5.89E-01	5.60E+01	5.89E-01	7.23E+01
		9.35E-02	1.34E+01	5.40E-01	5.55E+01	5.39E-01	7.19E+01
		4.18E-02	1.06E+01	4.90E-01	5.49E+01	4.91E-01	7.12E+01
				4.40E-01	5.42E+01	4.40E-01	7.07E+01
				3.90E-01	5.34E+01	3.90E-01	7.01E+01
				3.42E-01	5.23E+01	3.41E-01	6.94E+01
				2.91E-01	5.12E+01	2.92E-01	6.84E+01
				2.42E-01	4.97E+01	2.44E-01	6.69E+01
				1.93E-01	4.81E+01	1.94E-01	6.55E+01
				1.44E-01	4.64E+01	1.44E-01	6.42E+01
				9.70E-02	4.41E+01	9.81E-02	6.21E+01
				4.86E-02	4.05E+01	5.10E-02	5.87E+01
				8.03E-03	3.09E+01	7.88E-03	4.79E+01
						4.46E-03	4.42E+01
						9.77E-04	3.40E+01

Table S10. CO₂ adsorption and desorption data at 323 K.

PAF-5		PEI (10 wt%) \subset PAF-5		PEI (30 wt%) \subset PAF-5		PEI (40 wt%) \subset PAF-5	
<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)	<i>P</i> (atm)	<i>V</i> (cc/g)
1.10E-03	5.90E-03	1.03E-03	8.61E-01	1.04E-04	9.48E-01	1.04E-04	2.31E+00
2.11E-03	3.00E-02	2.08E-03	1.59E+00	2.07E-04	2.67E+00	2.02E-04	6.32E+00
3.19E-03	5.33E-02	3.04E-03	2.06E+00	3.04E-04	4.60E+00	3.02E-04	1.07E+01
4.26E-03	7.64E-02	4.19E-03	2.49E+00	4.08E-04	6.07E+00	4.07E-04	1.38E+01
5.33E-03	1.01E-01	5.15E-03	2.80E+00	5.02E-04	7.43E+00	5.13E-04	1.67E+01
6.41E-03	1.23E-01	6.25E-03	3.10E+00	6.05E-04	8.87E+00	6.10E-04	1.87E+01
7.49E-03	1.47E-01	7.25E-03	3.40E+00	7.03E-04	9.99E+00	7.05E-04	2.06E+01
8.55E-03	1.70E-01	8.12E-03	3.59E+00	8.07E-04	1.10E+01	8.08E-04	2.23E+01
9.62E-03	1.95E-01	9.17E-03	3.80E+00	9.08E-04	1.18E+01	9.08E-04	2.38E+01
1.07E-02	2.19E-01	1.02E-02	4.01E+00	1.05E-03	1.27E+01	1.00E-03	2.50E+01
2.26E-02	5.07E-01	2.06E-02	5.19E+00	2.06E-03	1.74E+01	2.10E-03	3.15E+01
3.24E-02	7.34E-01	3.11E-02	6.05E+00	3.01E-03	1.99E+01	3.06E-03	3.48E+01
4.26E-02	9.81E-01	4.14E-02	6.78E+00	4.14E-03	2.16E+01	4.06E-03	3.69E+01
5.25E-02	1.23E+00	5.16E-02	7.42E+00	5.06E-03	2.26E+01	5.03E-03	3.76E+01
6.26E-02	1.48E+00	6.18E-02	7.97E+00	6.06E-03	2.36E+01	6.22E-03	3.92E+01
7.26E-02	1.72E+00	7.20E-02	8.46E+00	7.16E-03	2.43E+01	7.11E-03	4.01E+01
8.26E-02	1.98E+00	8.19E-02	8.96E+00	8.04E-03	2.51E+01	8.06E-03	4.10E+01
9.26E-02	2.22E+00	9.21E-02	9.40E+00	9.28E-03	2.57E+01	9.29E-03	4.16E+01
1.11E-01	2.66E+00	1.11E-01	1.01E+01	1.02E-02	2.62E+01	1.03E-02	4.23E+01
1.60E-01	3.79E+00	1.59E-01	1.17E+01	2.02E-02	2.87E+01	1.91E-02	4.47E+01
2.09E-01	5.00E+00	2.08E-01	1.34E+01	3.06E-02	3.05E+01	2.99E-02	4.65E+01
2.58E-01	6.58E+00	2.58E-01	1.54E+01	3.94E-02	3.16E+01	4.03E-02	4.80E+01
3.08E-01	8.32E+00	3.08E-01	1.75E+01	4.91E-02	3.27E+01	5.14E-02	4.93E+01
3.59E-01	9.62E+00	3.59E-01	1.91E+01	6.02E-02	3.35E+01	6.05E-02	5.00E+01
4.10E-01	1.08E+01	4.09E-01	2.04E+01	6.94E-02	3.45E+01	6.91E-02	5.09E+01
4.60E-01	1.19E+01	4.59E-01	2.17E+01	8.11E-02	3.51E+01	7.99E-02	5.16E+01
5.10E-01	1.29E+01	5.10E-01	2.29E+01	9.12E-02	3.56E+01	8.95E-02	5.24E+01
5.60E-01	1.39E+01	5.60E-01	2.40E+01	1.07E-01	3.69E+01	1.08E-01	5.33E+01
6.10E-01	1.49E+01	6.10E-01	2.52E+01	1.57E-01	3.85E+01	1.53E-01	5.52E+01
6.60E-01	1.59E+01	6.60E-01	2.63E+01	2.04E-01	4.06E+01	2.03E-01	5.71E+01
7.10E-01	1.69E+01	7.10E-01	2.74E+01	2.55E-01	4.25E+01	2.55E-01	5.87E+01
7.60E-01	1.78E+01	7.60E-01	2.84E+01	3.07E-01	4.42E+01	3.05E-01	6.05E+01
8.10E-01	1.88E+01	8.09E-01	2.95E+01	3.56E-01	4.59E+01	3.56E-01	6.20E+01
8.60E-01	1.98E+01	8.60E-01	3.04E+01	4.08E-01	4.70E+01	4.09E-01	6.28E+01
9.10E-01	2.06E+01	9.10E-01	3.14E+01	4.59E-01	4.78E+01	4.55E-01	6.41E+01
9.60E-01	2.16E+01	9.59E-01	3.25E+01	5.07E-01	4.90E+01	5.09E-01	6.49E+01
9.99E-01	2.23E+01	9.99E-01	3.33E+01	5.61E-01	4.96E+01	5.58E-01	6.57E+01
9.43E-01	2.14E+01	9.42E-01	3.24E+01	6.06E-01	5.09E+01	6.10E-01	6.63E+01
8.90E-01	2.06E+01	8.89E-01	3.16E+01	6.60E-01	5.15E+01	6.58E-01	6.70E+01
8.40E-01	1.98E+01	8.40E-01	3.08E+01	7.10E-01	5.21E+01	7.09E-01	6.76E+01
7.90E-01	1.90E+01	7.90E-01	2.97E+01	7.59E-01	5.29E+01	7.60E-01	6.81E+01

7.40E-01	1.81E+01	7.39E-01	2.89E+01	8.10E-01	5.35E+01	8.09E-01	6.87E+01
6.90E-01	1.73E+01	6.89E-01	2.81E+01	8.60E-01	5.41E+01	8.61E-01	6.91E+01
6.40E-01	1.64E+01	6.40E-01	2.72E+01	9.09E-01	5.50E+01	9.09E-01	6.97E+01
5.90E-01	1.54E+01	5.90E-01	2.62E+01	9.61E-01	5.53E+01	9.60E-01	7.02E+01
5.40E-01	1.45E+01	5.40E-01	2.52E+01	9.99E-01	5.61E+01	9.99E-01	7.06E+01
4.90E-01	1.35E+01	4.90E-01	2.41E+01	9.39E-01	5.58E+01	9.40E-01	7.06E+01
4.40E-01	1.25E+01	4.40E-01	2.30E+01	8.89E-01	5.55E+01	8.88E-01	7.05E+01
3.90E-01	1.14E+01	3.90E-01	2.18E+01	8.39E-01	5.50E+01	8.39E-01	7.02E+01
3.40E-01	1.03E+01	3.40E-01	2.05E+01	7.89E-01	5.47E+01	7.89E-01	7.00E+01
2.91E-01	8.98E+00	2.91E-01	1.90E+01	7.39E-01	5.44E+01	7.38E-01	6.99E+01
2.42E-01	7.24E+00	2.42E-01	1.69E+01	6.89E-01	5.40E+01	6.89E-01	6.97E+01
1.91E-01	5.70E+00	1.92E-01	1.50E+01	6.40E-01	5.33E+01	6.39E-01	6.94E+01
1.41E-01	4.47E+00	1.41E-01	1.33E+01	5.89E-01	5.28E+01	5.89E-01	6.91E+01
9.07E-02	3.26E+00	9.21E-02	1.14E+01	5.39E-01	5.23E+01	5.40E-01	6.86E+01
3.52E-02	1.79E+00	3.93E-02	8.54E+00	4.90E-01	5.18E+01	4.90E-01	6.82E+01
5.72E-03	8.41E-01	9.74E-03	4.96E+00	4.40E-01	5.11E+01	4.40E-01	6.77E+01
				3.91E-01	5.02E+01	3.91E-01	6.70E+01
				3.42E-01	4.91E+01	3.40E-01	6.63E+01
				2.92E-01	4.79E+01	2.92E-01	6.53E+01
				2.43E-01	4.64E+01	2.44E-01	6.38E+01
				1.94E-01	4.47E+01	1.93E-01	6.26E+01
				1.44E-01	4.31E+01	1.45E-01	6.10E+01
				9.80E-02	4.06E+01	9.87E-02	5.88E+01
				4.93E-02	3.68E+01	5.12E-02	5.53E+01
				8.42E-03	2.69E+01	7.93E-03	4.32E+01
