Supporting Information for:

Aminated poly(vinyl chloride) solid sorbents with hydrophobic function for post-combustion CO_2 capture.

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Table S1. CO_2 adsorption characteristic of the current state-of-the-art materials

Absorbent type	P_{CO2} [bar]	Temperature [°C]	CO_2 adsorption capacity [$cm^3\ g^{-1}$]	Reference
Zeolites	1.0	25 – 30	34 – 134	[1]
MOFs	0.15	25 – 40	22 – 134	[2]
NH_2-grafted mesoporous silica	0.1 – 0.15	25 – 60	11 – 45	[1]
PEI-impregnated mesoporous silica	0.15	75	31 – 67	[1]
PEI-impregnated mesoporous silica (humid condition)	0.15	75 - 115	0.26 - 2.2	[3]
Nanoporous carbon materials	1.0	25	34 – 67	[1]

[1] A. Samanta, A. Zhao, G. K. H. Shimizu, P. Sarkar and R. Gupta, Ind. Eng. Chem. Res. 2012, 51, 1438.
[2] Q. Wang, J. F. Bai, Z. Y. Lu, Y. Pan and X. Z. You, Chem. Commun., 2016, 52, 443.
[3] D. J. N. Subagyono, M. Marshall, G. P. Knowles, A. L. Chaffee, Microporous Mesoporous Mater., 2014, 186, 84.

Figure S1

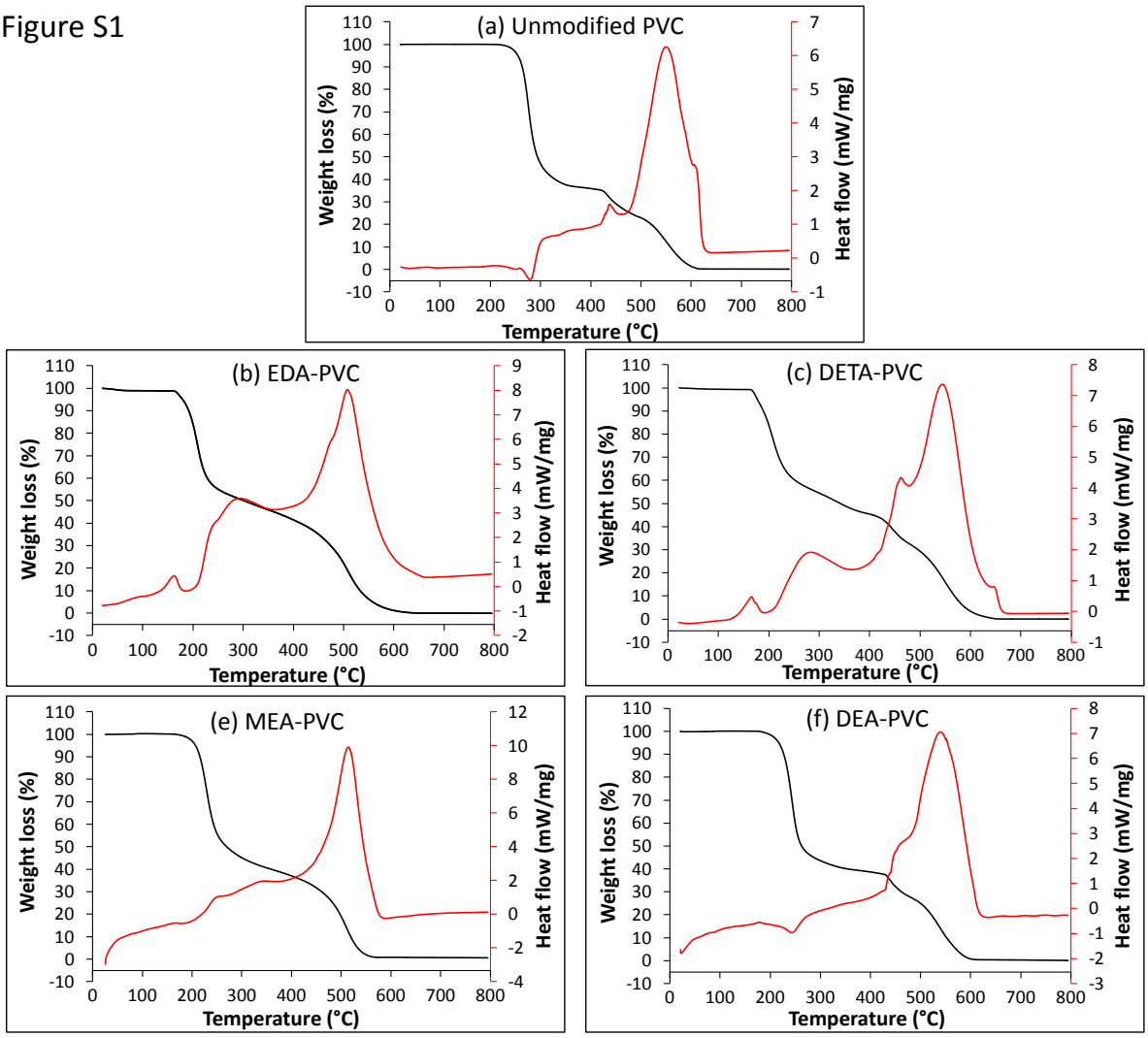

Figure S1. TGA (black, left scale) and DSC (red, right scale) for aminated PVC composites and untreated PVC prepared in this work showing high stability up to 140 °C.

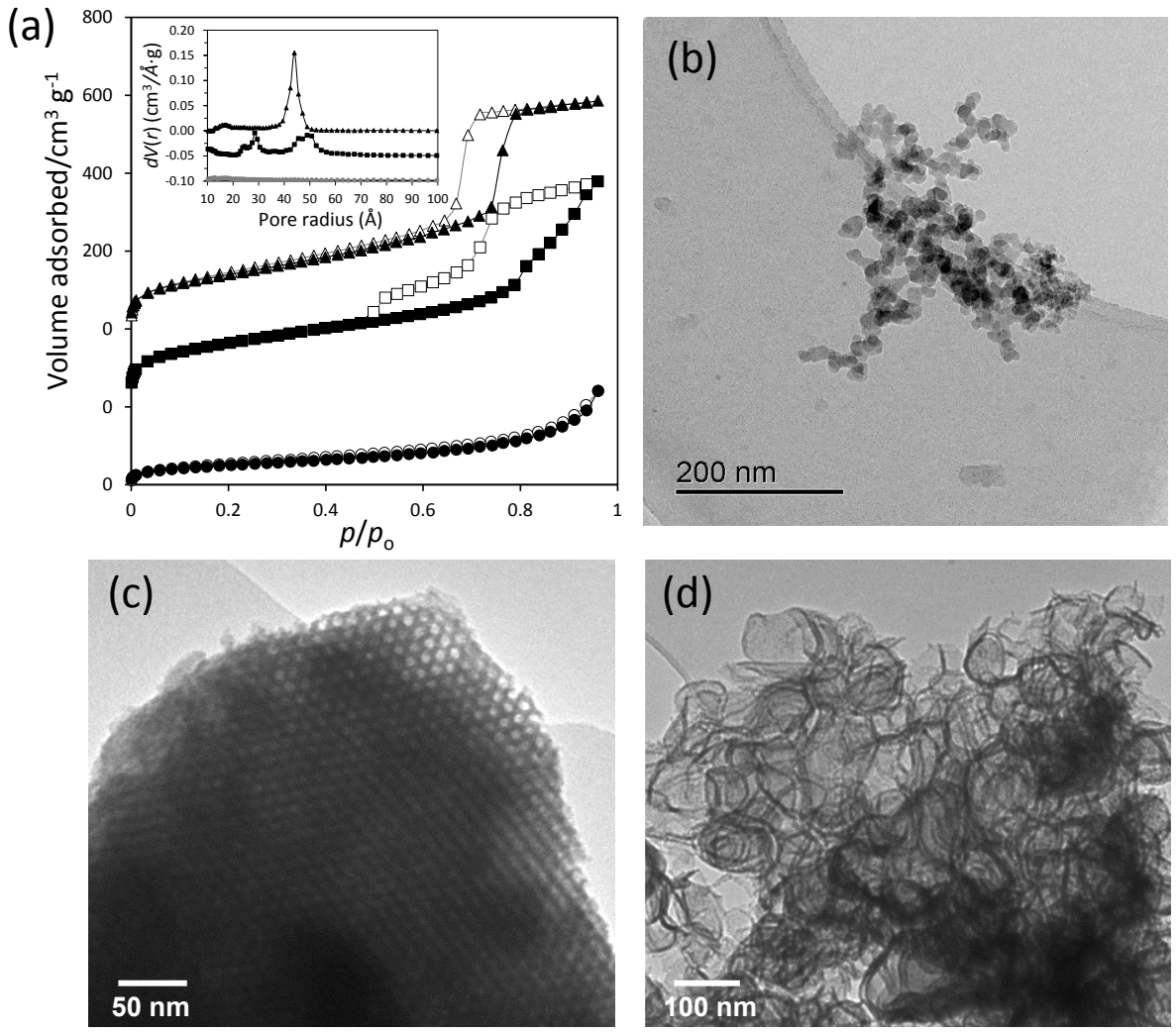

Figure S2. Surface characterisation of supports used in this work. (a) N_2 adsorption and desorption isotherms for fumed silica (circles, ●/○), SBA-15 (triangles, ◘/❒) and MCF (squares, ■/□). Filled markers indicate the adsorption points while open markers are for desorption. Pore size distribution of all three samples is shown in inset. SBA-15 and MCF show distinct hysteresis loops that are consistent with results in the literature. (P. I. Ravikovitch and A. V. Neimark, *J. Phys. Chem. B*, 2001, **105**, 6817). TEM images for fumed silica (b), SBA-15 (c) and MCF (d). Fumed silica has a random structure of microsized particles while SBA-15 has a highly ordered 2D hexagonal array of pores of around 4 – 5 nm in diameter. MCF silica support has a "foam-like" structure.

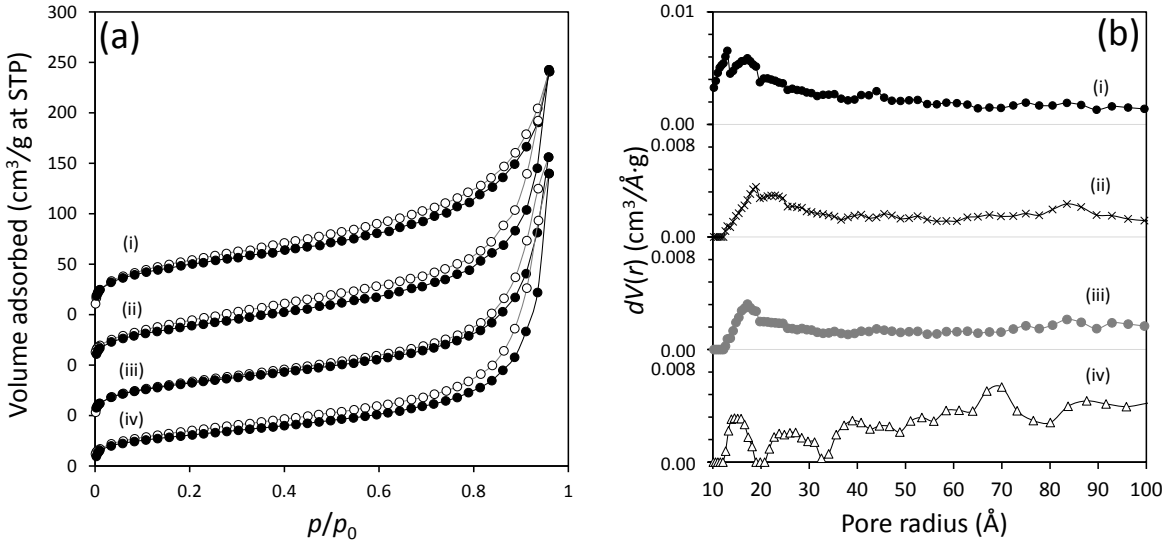

Figure S3. Control experiments for N_2 adsorption and desorption isotherms and PSD for EDA-PVC/ fumed silica composites. (i) for 0%, pure fumed silica, (ii) for 4%, (iii) 7% and (iv) for 19%. Both the isotherms and PSD graphs were off-set along the y-axis for clarity.

Table S2. Correlation berween BET surface area, pore volume and mean pore size and CO_2 adsorption capacity for APVC-mesoporous silica composites.

Adsorbent	BET surface area (m^2g^{-1})	Pore Volume (cm^3g^{-1})	Pore radius (nm)	CO_2 adsorption capacity (cm^3g^{-1})
Unsupported EDA-PVC	0	0	0	0.7
EDA-PVC/SBA-15(4%)	314	0.66	3.0	11.7
DETA-PVC/SBA-15(4%)	441	0.88	4.4	6.6
MEA-PVC/SBA-15(4%)	404	0.81	4.4	5.6
DEA-PVC/SBA-15(4%)	463	0.79	3.8	5.1

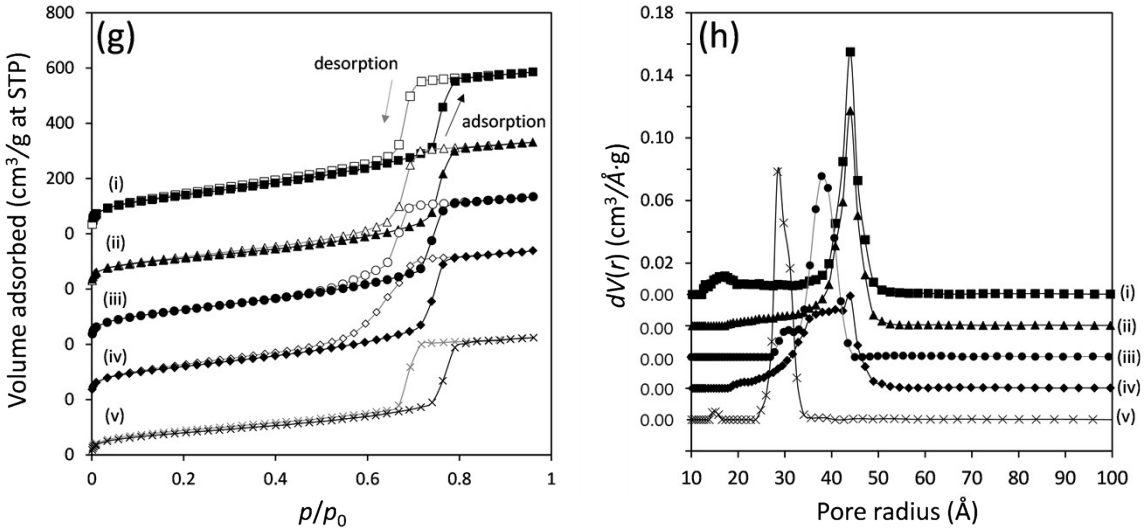

Figure S4. N_2 adsorption and desorption isotherms and PSD for EDA-PVC/ fumed silica composites. (i) for pure SBA-15 support, (ii) for 4% EDA-PVC, (iii) 4% MEA-PVC, (iv) for 4% DEA-PVC and (v) for 4% DETA-PVC. Both the isotherms and PSD curves were off-set along the y-axis for clarity.

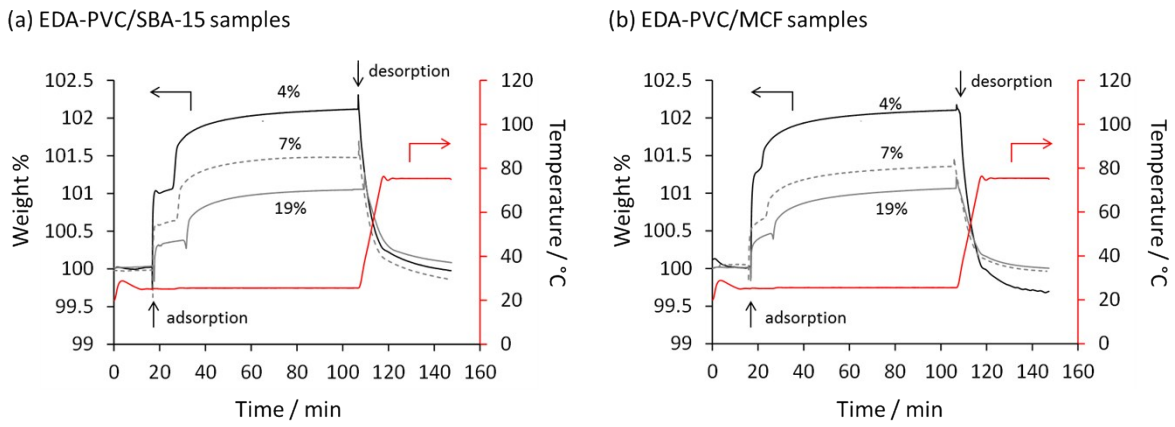

Figure S5. Kinetic profiles of CO_2 adsorption by (a) EDA-PVC/SBA-15 and (b) EDA-PVC/MCF samples. The red curves refer to the temperature profile (right scale).

Table S3. Assessment of mechanical properties by gas sortion experiment for EDA-PVC/SBA-15(4%) composites subject to grinding with pestle and mortar for 5 minutes, pelletized to a 5 mm pellet under 1 ton and boiled for 1 hour in water. The slight difference from the pristine material characteristics quoted for analogue in the Table S2 is due to the fact that the experiments were carried out on different batches.

Adsorbent	BET surface area (m^2g^{-1})	Pore Volume (cm^3g^{-1})	Pore radius (nm)
Pristine	333	0.71	3.0
Pestle / Mortar	335	0.72	3.0
Pellet	295	0.63	3.0
Hydrothermal	319	0.71	3.0

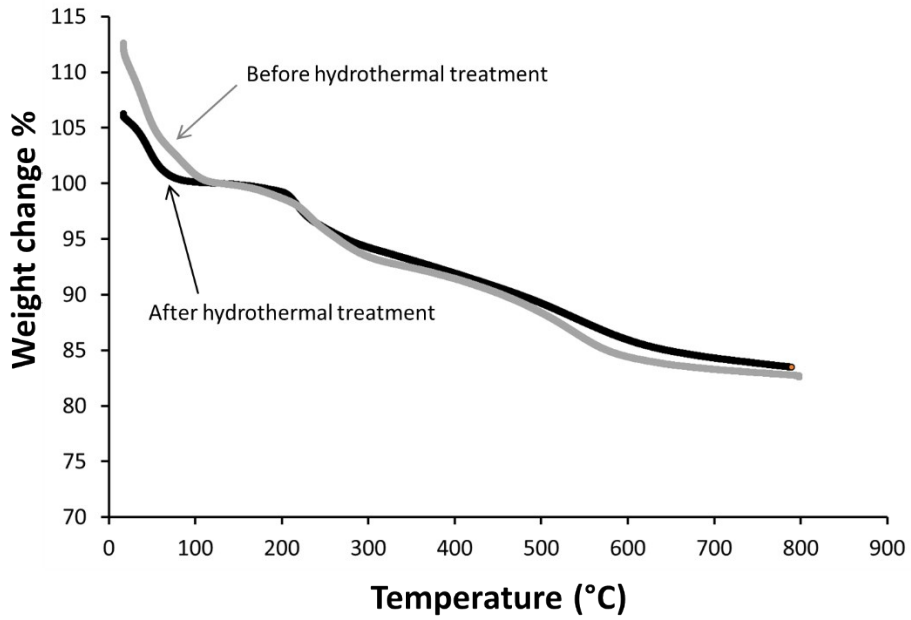

Figure S6. TGA curves for EDA-PVC/SBA-15 before and after hydrothermal treatment at 100^{o}C.