Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting information

Self-supported branched Poly(ethyleneimine) Materials for CO_2 Adsorption from Simulated Flue Gas

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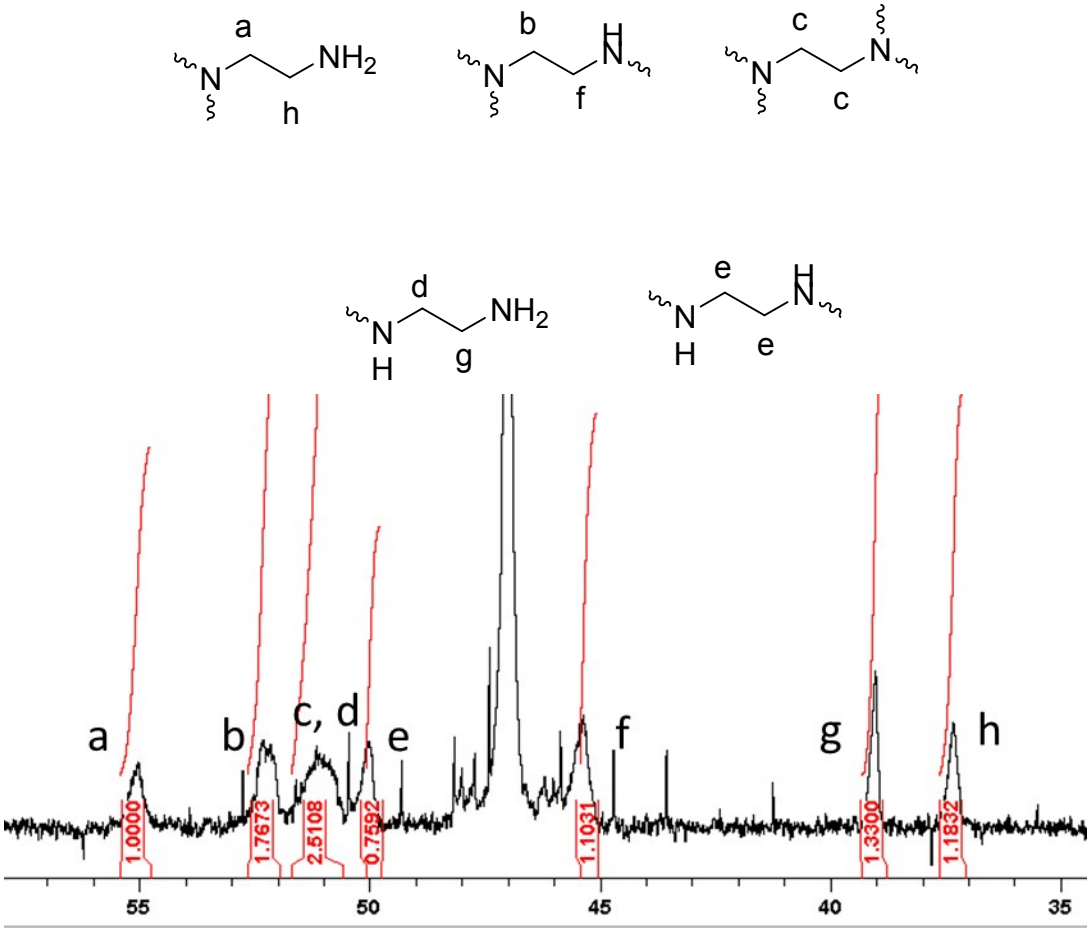

Figure S1. Liquid state ^{13}C NMR of the b-PEI (60 kda)

Primary : g+h = 1.33+1.18 = 2.51

Secondary: (d+e+f)/2 = (1.33+1.52+2.21= 5.06)/2 = 2.53

Tertiary: (a+b+c)/3 = (1+1.77+1.18= 3.95)/3 = 1.316

Primary/ Secondary/Tertiary = 40/40/20

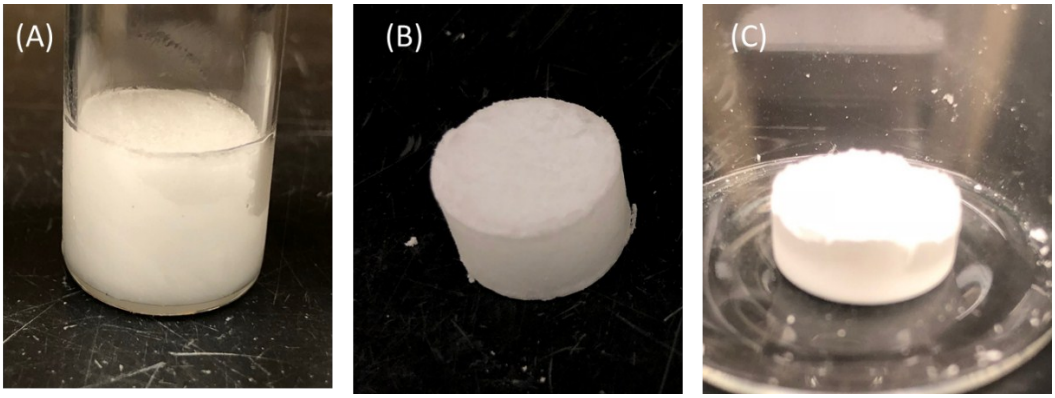

Figure S2. The images of crosslinked PEI adsorbents (A) after 2 days storage in the freezer (B) after collecting from the vial (C) after drying under vacuum at 60 °C

IMG_1574.MOV

Video S1.

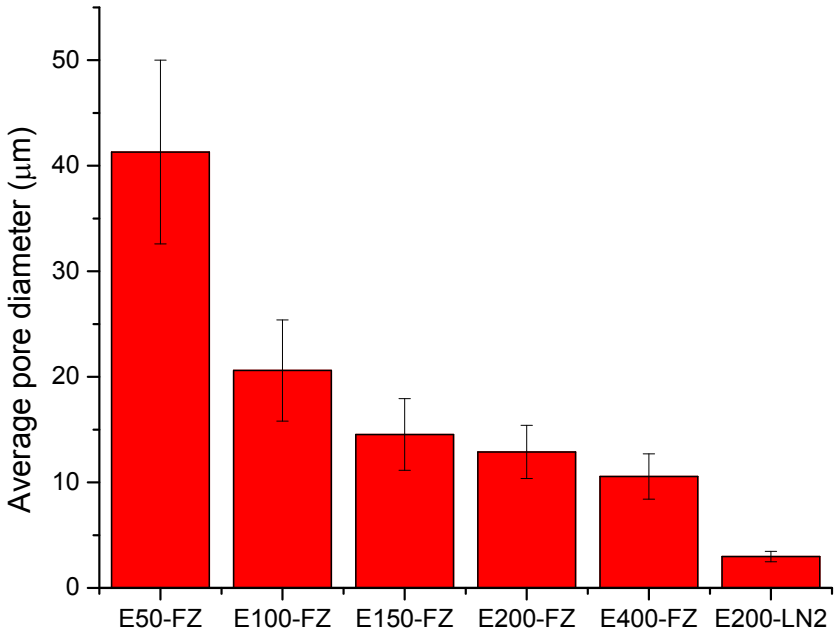

Figure S3. The average pore diameter of the self-supported PEI adsorbents. The average pore size of the material was estimated by using imaging program (Digimizer). (Error bars from the standard deviation of more than 30 pores imaged via microscopy)

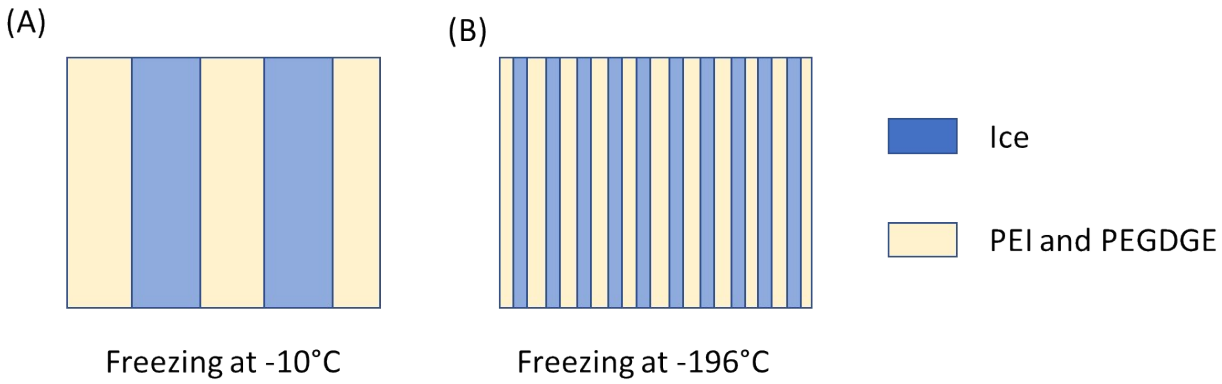

Figure S4. The schematic configuration of the ice and the suspension (mixture of PEI and PEGDGE) depending on the freezing temperature (A) -10 ˚C (B) -196 ˚C

Table S1. Summary of PEI based adsorbents and their CO_2 capacity at given conditions

Amine	Support	Amine Loading (wt.%)	CO_2 conc (%)	Adsorption temp (°C)	Amine efficiency	CO_2 capacity (mmol CO_2/g)	ref
PEI	MCM-41	50	100	75	0.27	2.54	[1]
		50	100	50	0.11	1	
		75	100	75	0.21	3.02	
PEI	SBA-15	50	100	25	0.09	0.83	[2]
		50	100	45	0.18	1.7	
		50	100	75	0.21	2.04	
		70	100	45	0.17	2	
PEI	SBA-15	50	15	75	0.27	3.18	[3]
PEI	SBA-15	50	12	75	0.14	1.358	[4]
		50	12	55	0.14	1.295	
PEI	KIT-6	50	100	75	0.27	3.06	[5]
PEI	KIT6	50	100	25	0.16	1.79	
PEI	monolith	65	5	75	0.32	3.75	[6]
PEI	PMMA	40	10	45	0.32	2.4(3.53)	[7]
PEI	SIO_2 (cariACT)	40	10	45	0.34	2.55(3.65)	
PEI	SiO_2 capsule	83	10	75	0.3	4.45 (5.58)	[8]
PEI	PE-MCM-41	55	100	25	0.17	1.8	[9]
		55	100	50	0.22	2.27	
		55	100	75	0.43	4.5	
		55	10	25	0.13	1.36	
		55	10	50	0.22	2.27	
		55	10	75	0.33	3.41	
PEI	Silica monolith	60	100	75	0.21	2.4	[10]
		60	20	75	0.04	0.5	
		60	100	25	0.09	1	
PEI	Silica monolith	50	100	80	0.39	3.78	[11]
PEI	Spherical silica foams	60	100	75	0.33	4.27	[12]
PEI	MCF	50	100	75	0.36	4.11	[13]
PEI	MCF	50	15	75	0.3	3.45	[14]
PEI	HMS	45	100	75	0.26	2.7	[15]
PEI	SBA-15PLT	55	10	25	0.2	2.56	[16]
			10	50	0.3	3.775	
			10	75	0.31	3.92	
PEI	SBA-15	48	15	75	0.21	2.38	[17]

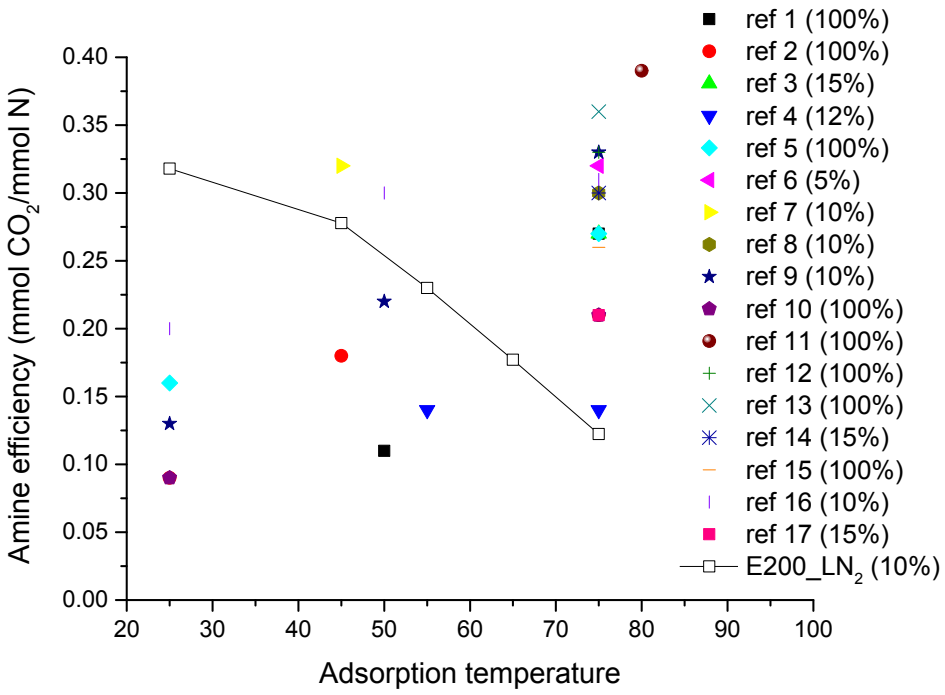

Figure S5. Amine efficiency of supported PEI adsorbent under various CO_2 concentrations (5-100%)

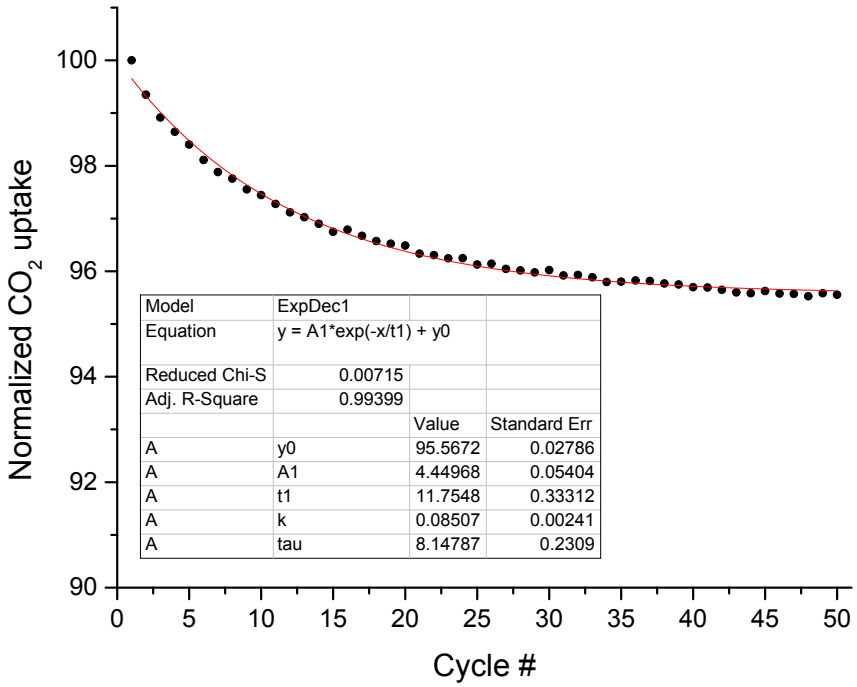

Figure S6. Normalized CO_2 uptakes along with the increasing number of cycle and fitted exponential decay equation.

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