Supporting Information

Next generation amino acid technology for CO_2 capture

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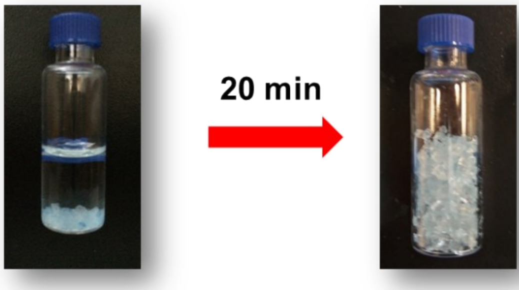

Fig. S1. Illustration of formation of PSA-LAHPs (0.2g hydrogel in 1.0 g potassium sarcosinate solution with a mass concentration of 30.0 wt.%)

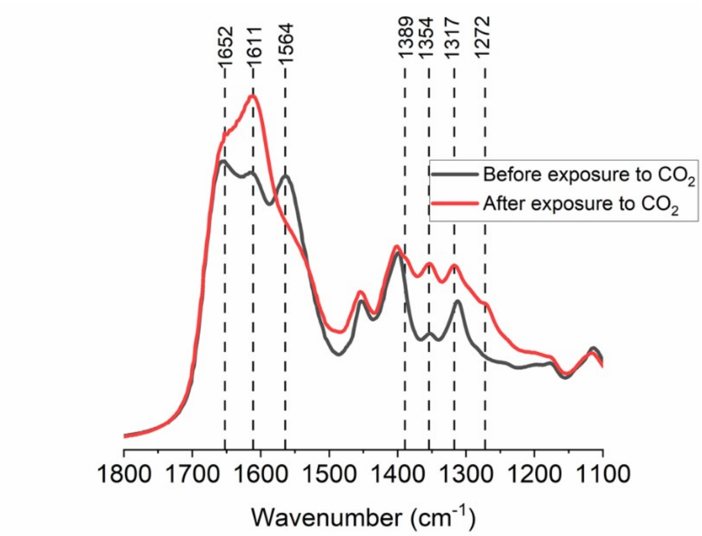

Fig. S2. FTIR spectrum of PSA-LAHPs before and after exposure to CO_2 (30.0 wt.% potassium sarcosinate)

The FTIR spectra in Fig. S2 shows clear differences before and after CO_2 exposure that provide evidence for the formation of carbamate species with a minor amount of hydrolysis leading to carbonate species upon sorption. The increase in the symmetric carbonyl bands at 1272 and 1317 cm^{-1} is indicative of a carbonate species. The peaks at 1652 cm^{-1} increasing and at 1564 cm^{-1} diminishing is consistent with the formation of a carbamate species while the increase in intensity at 1636 cm^{-1} is consistent with formation of a bicarbonate species (which could result from hydrolysis of the carbamate species with water present in the hydrogel).

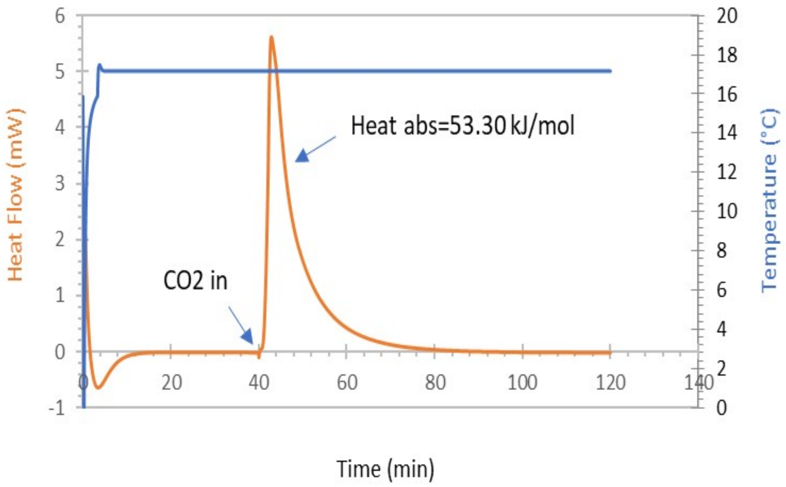

Fig. S3. DSC of PSA-LAHPs upon CO_2 absorption (potassium sarcosinate 30.0 wt.%)

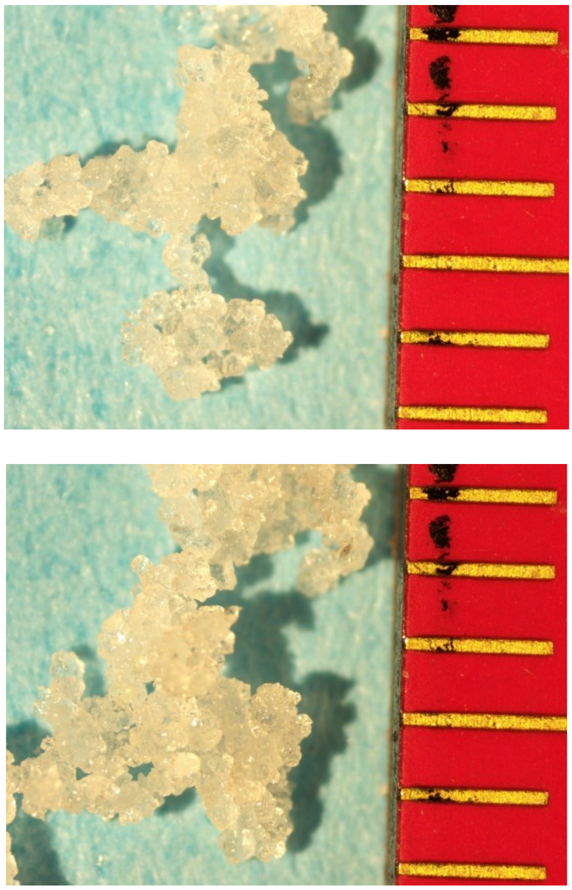

Fig. S4. Microscope images (top: before exposure to CO_2, bottom: after exposure to CO_2) of 30 wt.% potassium sarcosinate in ethylene glycol swelled in cross-linked PHEAA (2:1 liquid:solid ratio). Spacing between lines on ruler is 1 mm.

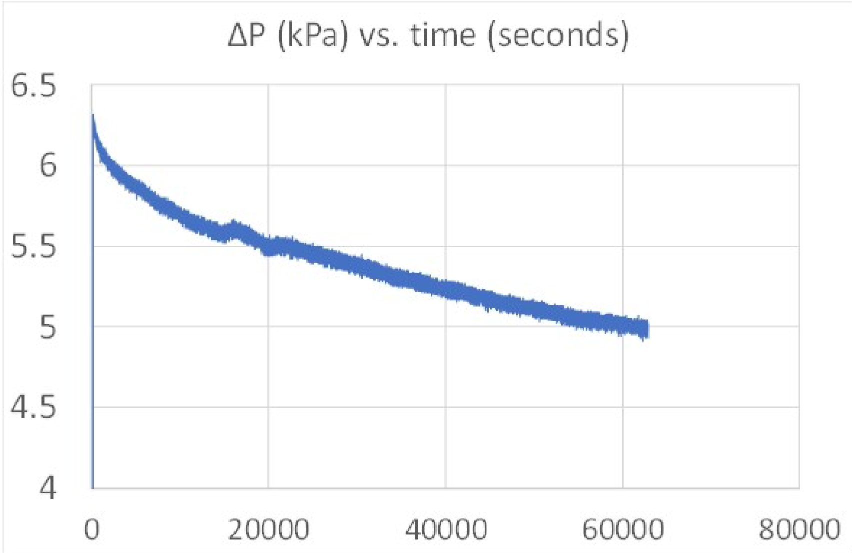

Fig. S5. Pressure differential data (as determined by Licor Li-840a analyzers) for 30 wt.% potassium sarcosinate in ethylene glycol swelled in cross-linked PHEAA (2:1 liquid:solid ratio). The column is 10 cm in length and has an ID of 10.22 mm (resulting in a cross-sectional area of 0.82 cm^2). The air flow rate is 500 std. cm^3/min and the viscosity of air is approximately 0.018 cP under these conditions.

Table S1. IR peak assignments of CO_2 absorption by PSA-LAHPs (potassium sarcosinate 30.0 wt.%)

1652	Asymmetric carbonyl bands of $-OCO_2^-$ [1]
1611	-NH bending vibration [2]
1564	-NH stretching [3, 4]
1389	Symmetric carbonyl bands of $-OCO_2^-$ [4]
1354	C-O stretch (from carbonate/bicarbonate)[5]
1317	NH_3^+ deformation, symmetric carbonyl bands of $-OCO_2^-$ [1, 6, 7]
1272	Symmetric carbonyl bands of $-OCO_2^-$ [1]

Table S2. Variation in uptake with 30 wt.% potassium sarcosinate swelled in cross-linked PHEAA hydrogel

Trial #	Pure CO_2 uptake (wt. %)
1	4.29
2	3.52
3	3.92
4	3.59
5	3.58
6	3.55
7	3.53
8	3.57
9	3.54
10	3.53
11	3.55

Table S3. CO_2 uptakes of LAHPs and some of the existing absorbents/adsorbents

No.	Material	Method	CO2 uptake (mg/g)			Reference
			Pure CO2	15.0 vol.% CO2	Air	
1	**LAHPs**	**Chemical absorption**	**72.9**	**62.8**	**42.4**	**This work**
2	K_2CO_3 solution (30.0 wt. %)	Chemical absorption	**39.6**			8
3	MEA solution (30.0 wt. %)	Chemical absorption	**103.1**			9
4	TEA solution (30.0 wt. %)	Chemical absorption	**54.7**			9
5	ppg[Tf2N] (ionic liquid)	Physical absorption	**96.3**			10
6	Jeffamine /nano-silica	Chemical adsorption	**78.3**			11
7	TEPA /meso-silica	Chemical adsorption	**154.1**			12
8	[Mg_2(dobdc)] (MOFs)	Chemical adsorption	**236.5**			13
9	β-Zeolite	Physical adsorption	**53.2**			14
10	TEA solution	Chemical		**50.8**		15

	(30.0 wt. %)	absorption				
11	PEI /MCM-41	Chemical absorption		**89.1**		16
12	2N-APS /SBA-15	Chemical absorption		**60.4**		17
13	mmen-CuBTTr (MOFs)	Chemical adsorption		**105.6**		18
14	$[NH_2emim][BF_4]$ (Ionic liquid)	Physical absorption		**61.3**		19
15	PEI /fumed silica	Chemical absorption			**73.0**	20
16	HAS polymer brush	Chemical adsorption			**74.8**	21
17	PET /dolomite	Chemical absorption			**22.3**	22
18	Al-PEI 35	Chemical absorption			**45.3**	23
19	Mg2(dobpdc) (MOFs)	Chemical adsorption			**93.5**	24
20	PAA /MCF	Chemical adsorption			**37.8**	25

Notes and references

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