Electronic Supplementary Material (ESI) for Catalysis Science & Technology

Synthesis and high-throughput testing of multilayered supported ionic liquid catalysts for the conversion of CO_2 and epoxides into cyclic carbonates

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Supporting Information

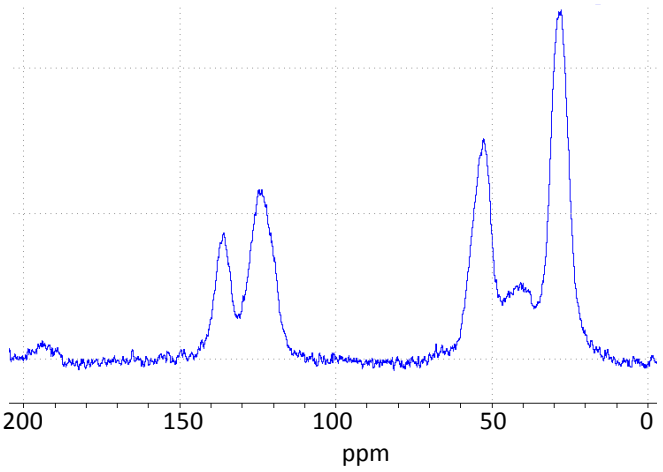


Figure S1. Solid state MAS ^{13}C NMR spectrum of Octane-I.

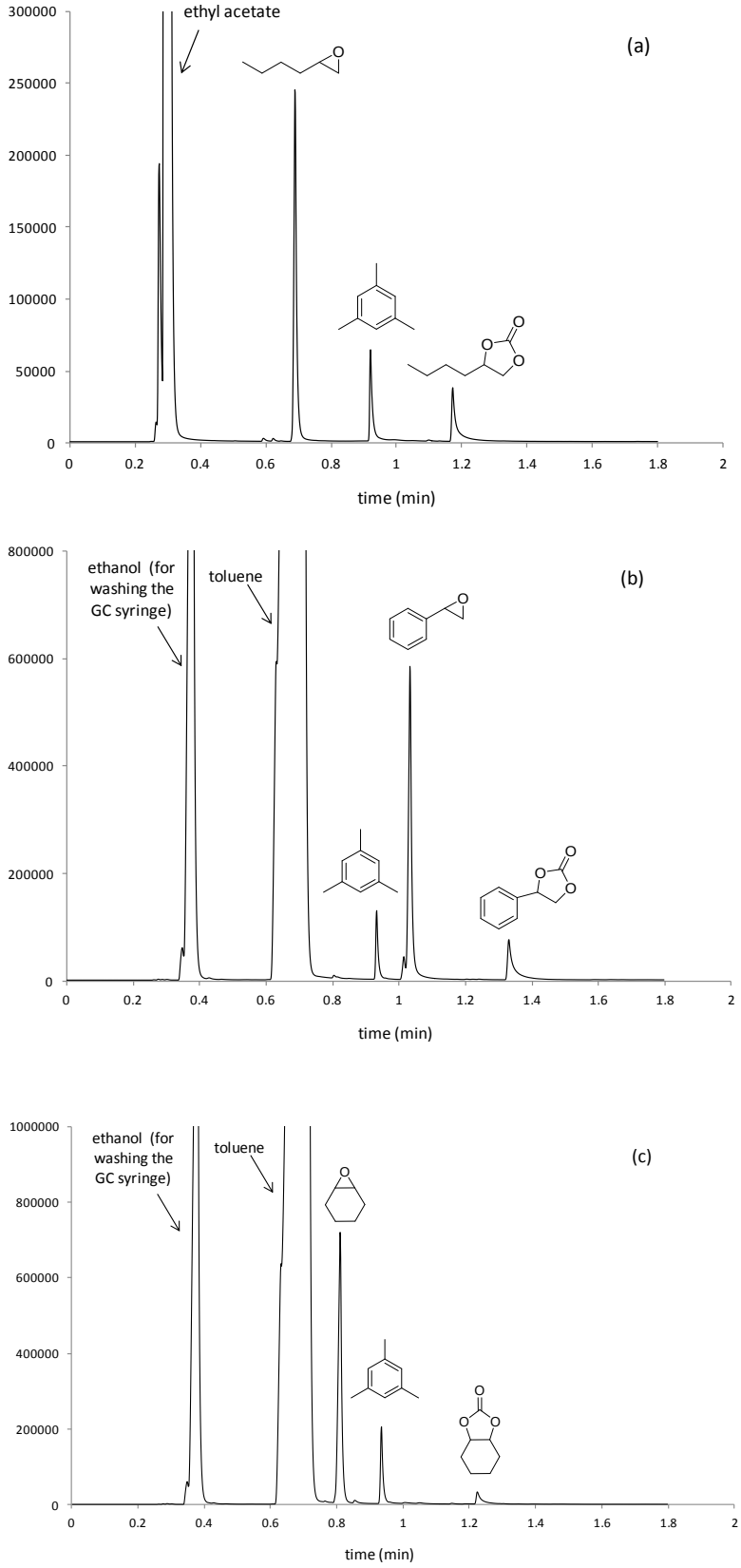
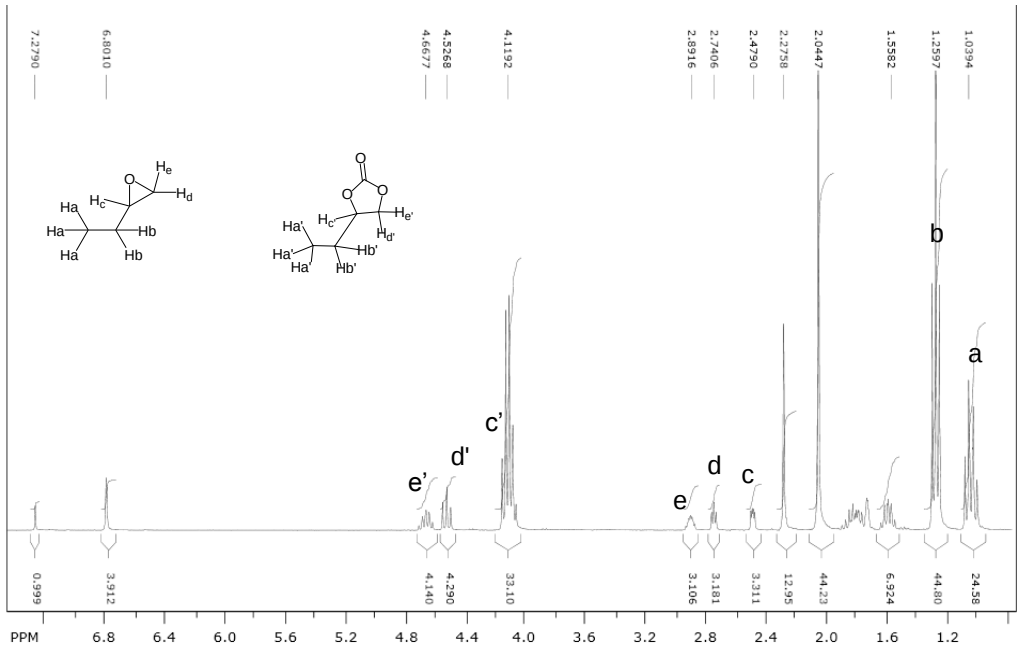
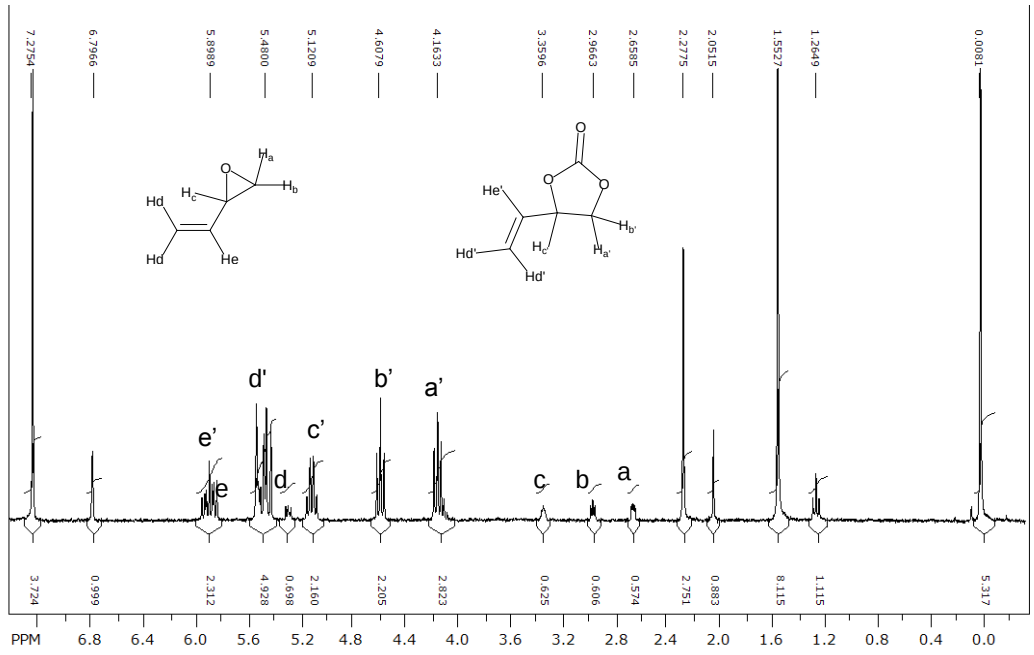


Figure S2. Representative chromatograms of the reaction solutions at the end of the catalytic tests. In all cases, mesitylene was employed as internal standard. A solvent (toluene or ethyl acetate) was added to dilute the samples. From top to bottom: (a) reaction of CO_2 with 1,2-epoxyhexane (entry 8 in Table 2); (b) reaction of CO_2 with styrene oxide (entry 6 in Table 3); (c) reaction of CO_2 with cyclohexene oxide (entry 4 in Table 4).

(a)



(b)



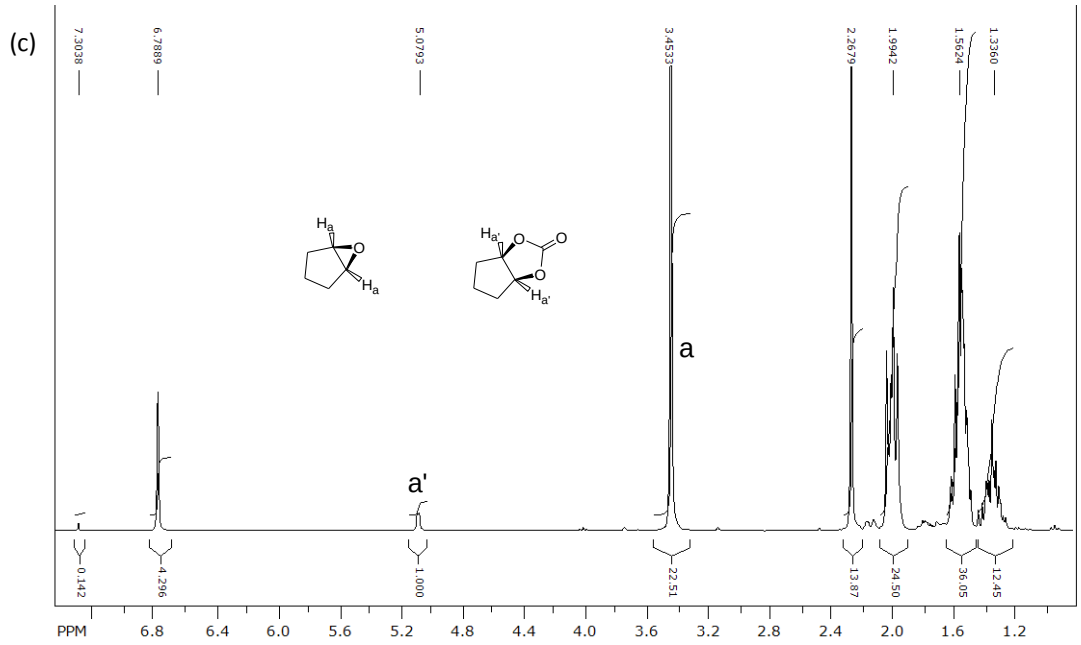
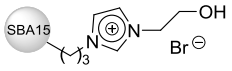
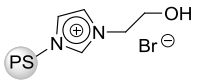
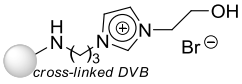
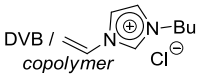
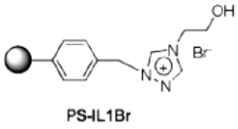
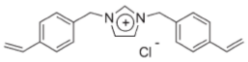
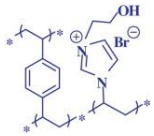


Figure S3. Representative ^{1}H NMR spectra of the reaction solutions at the end of the catalytic tests. In all cases, mesitylene was employed as internal standard. $CDCl_3$ was added to dilute the samples. From top to bottom: reaction of CO_2 with 1,2-epoxybutane (entry 1 in Table 4); (b) reaction of CO_2 with 1,2-epoxy-3-butene (entry 2 in Table 4); (c) reaction of CO_2 with cyclopentene oxide (entry 3 in Table 4).

Table S1. Comparison between supported ionic-liquid catalysts for the cycloaddition of CO_2 to styrene oxide.

Entry	Catalyst	Catalyst amount as $mol_{IL}/mol_{epoxide}$ (%)	Pressure (MPa)	Temp. (°C)	Time (h)	Yield (%)	TOF (h^{-1})	Productivity ($g_{carbonate}/g_{catalyst}$)	Ref.
1		1.24	2	120	2	99.6	40	23	[19b]
2		1.6	2.5	120	6	93	10	31	[19d]
3		0.44	2	140	4	99.5	56	47	[16b]
4		0.68	6	110	7	79	17	19	[16a]
5		1	2	110	3	80	27	13	[6d]
6	$[C_4\text{-mim}]^+[BF_4]^-/SiO_2$	1.8	8	160	4	92	51	-	[16c]
7	poly[bvbim]Cl 	1	5	140	3	25	25	12	[19a]
8	P-DVB-HEImBr 	0.65	2	140	5	98.9	30	-	[19c]
9	SBA-15-*p*-Xylene-Br-B (mlc-SILP)	1	8	150	3	90	30	45	[9]
10	SiO_2-*p*-Xylene-I (mlc-SILP)	0.42	8	150	3	99	79	76	this work
11	SiO_2-*p*-Xylene-I (mlc-SILP)	0.42	8	125	3	37	29	28	this work
12	SiO_2-Octane-I (mlc-SILP)	0.12	8	150	3	45	127	138	this work

TOF: turnover frequency, defined as ($mol_{epoxide\ converted}$ /mol_{halide})/h.