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

Supporting information

Novel Metalporphyrin-based Microporous Organic Polymer with High CO_2 Uptake and Efficient Chemical Conversion of CO_2 under Ambient Conditions

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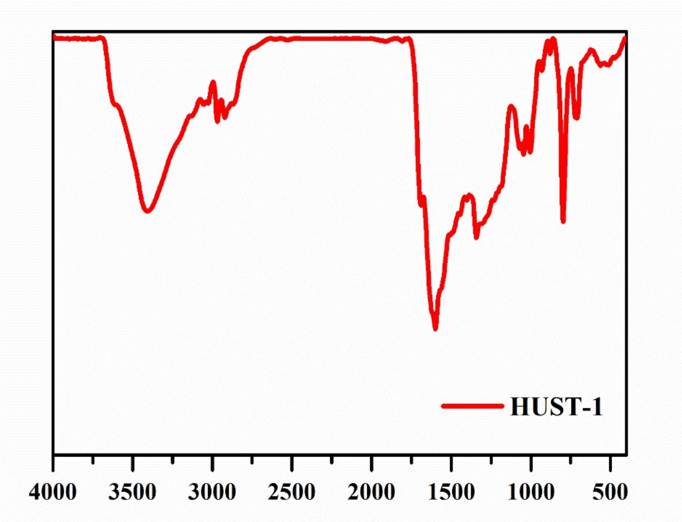


Figure S1. Fourier transform infrared (FT-IR) spectrum of HUST-1.

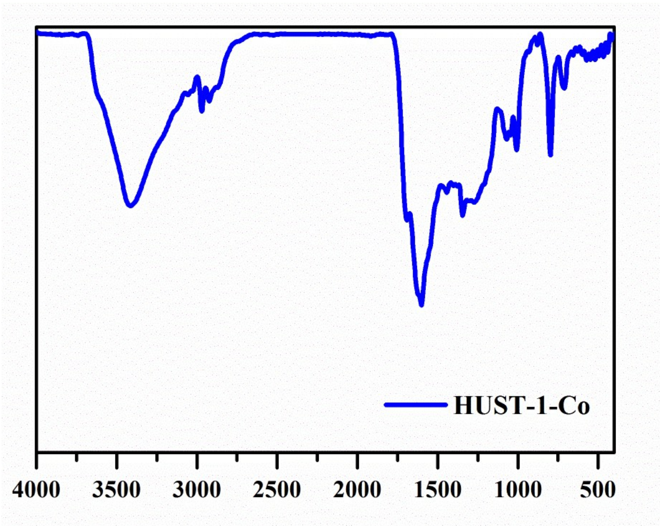
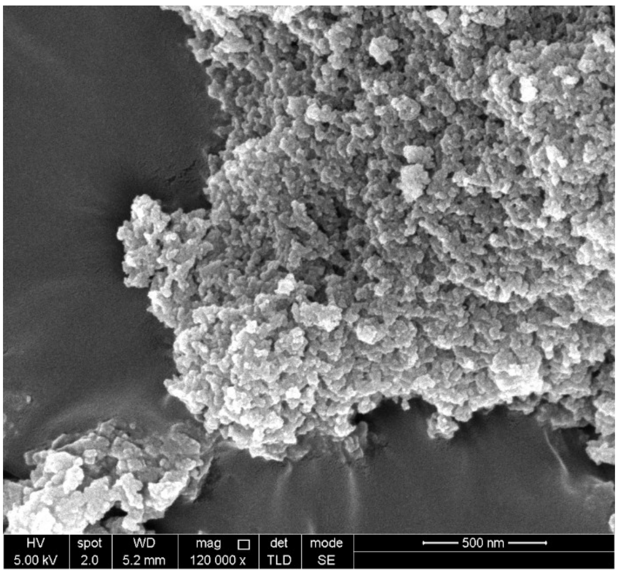
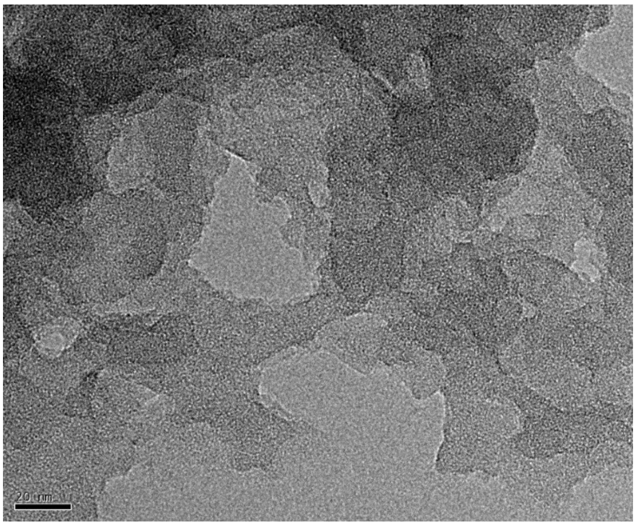


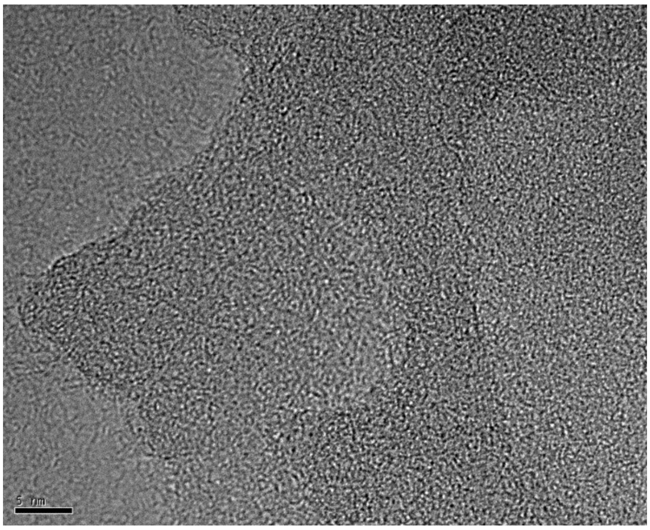
Figure S2. Fourier transform infrared (FT-IR) spectrum of HUST-1-Co.



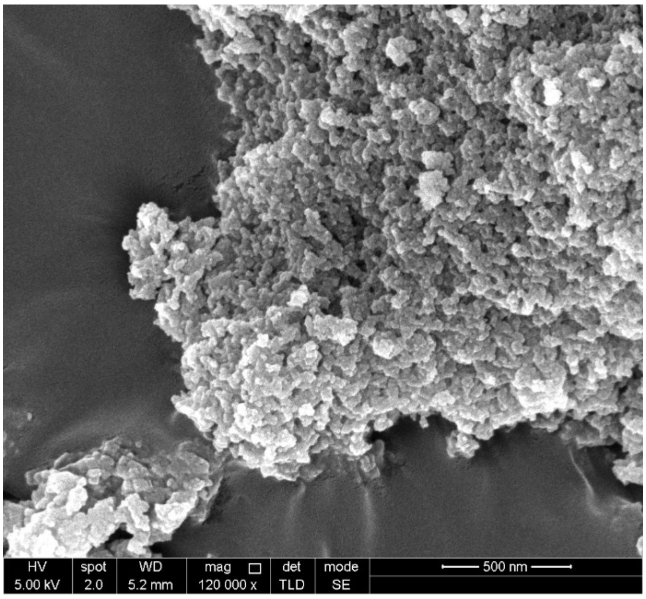
(a)


20 nm

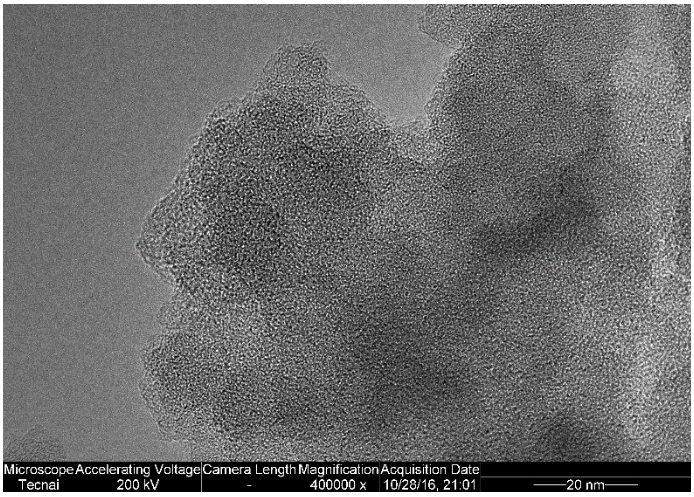
(b)


5 nm

(c)


HV
spot
WD
mag
det
mode
500 nm
5.00 kV
2.0
5.2 mm
120 000 x
TLD
SE

(d)



(e)

Figure S3. FE-SEM image (a), HR-TEM images (b) and (c) of HUST-1; FE-SEM image (d) and HR-TEM image (e) of HUST-1-Co.

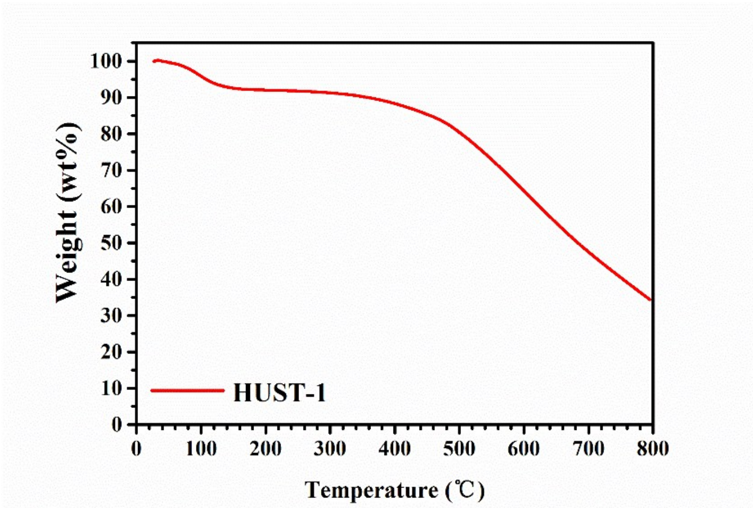


Figure S4. TGA of HUST-1 with a heating rate of 10 °C min^{-1}.

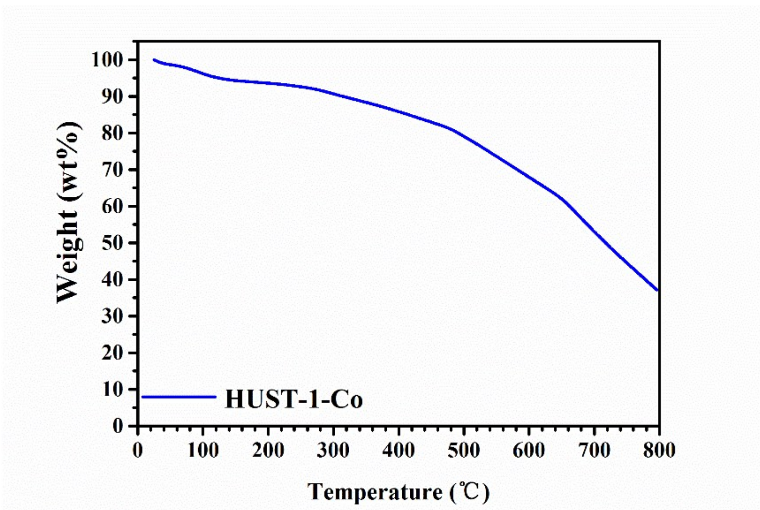


Figure S5. TGA of HUST-1-Co with a heating rate of 10 °C min^{-1}.

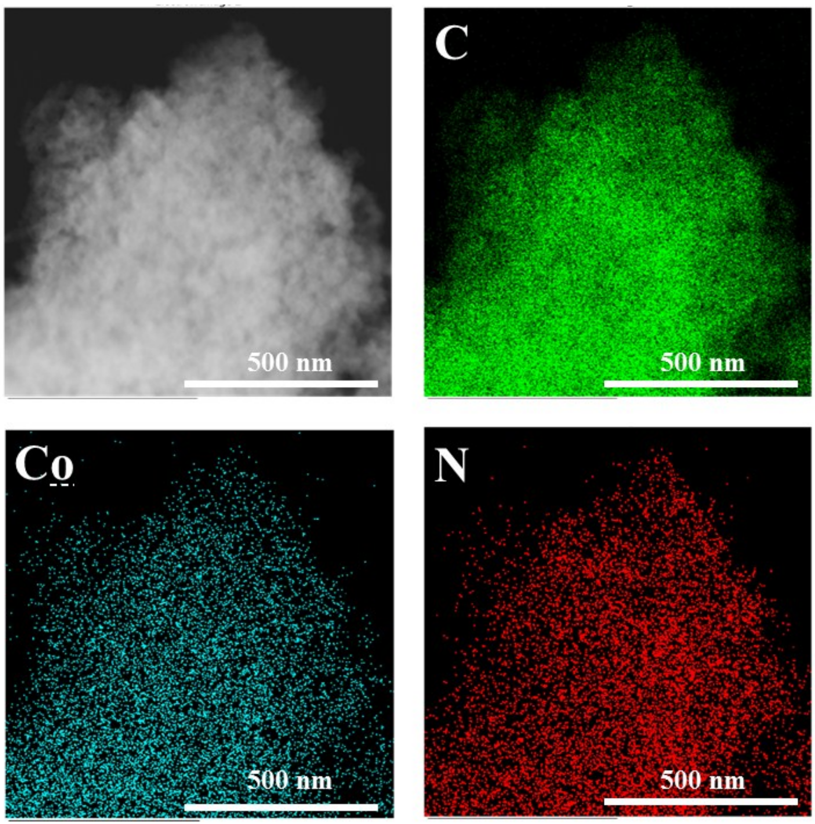


Figure S6. Electron image and element mapping (C, Co, and N) spectra for HUST-1-Co.

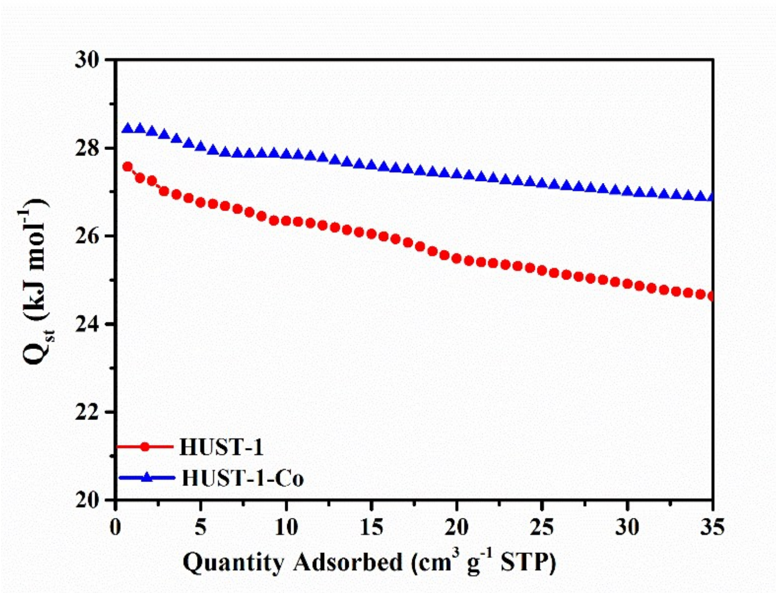
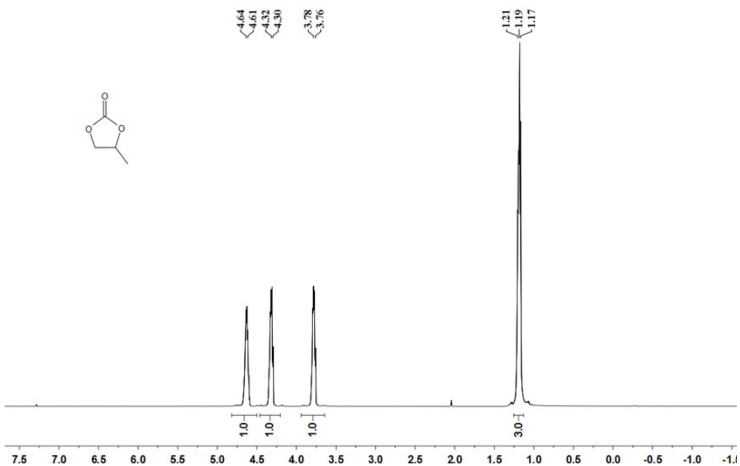
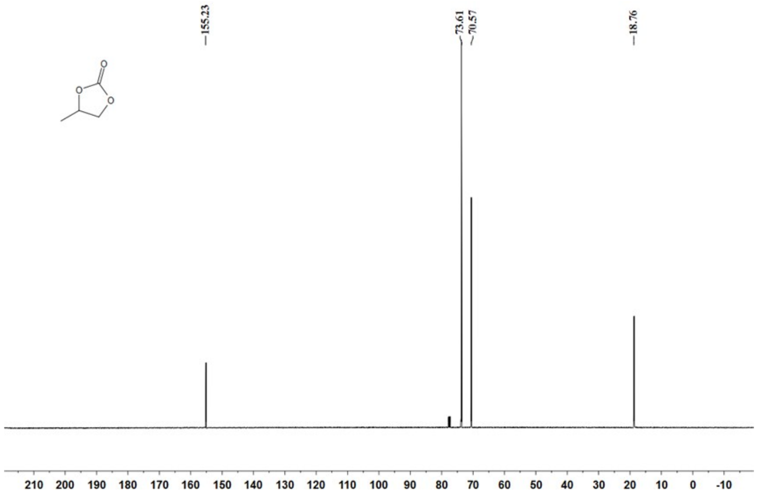


Figure S7. Isosteric heat of adsorption for CO_2 at different CO_2 loadings.

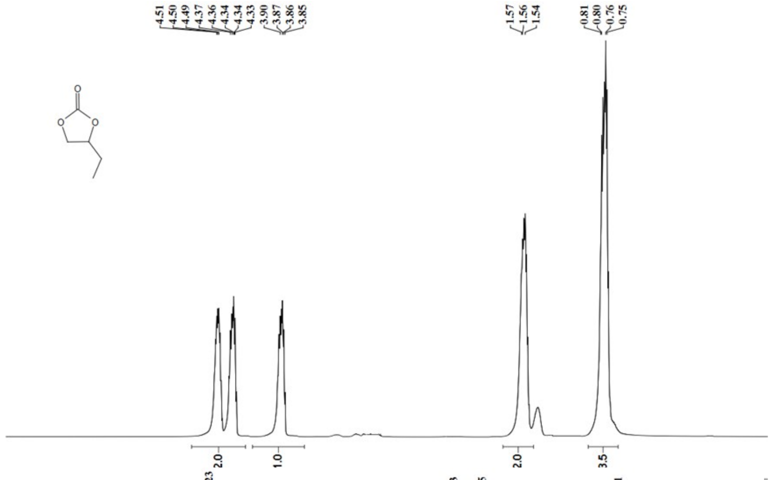


(a)

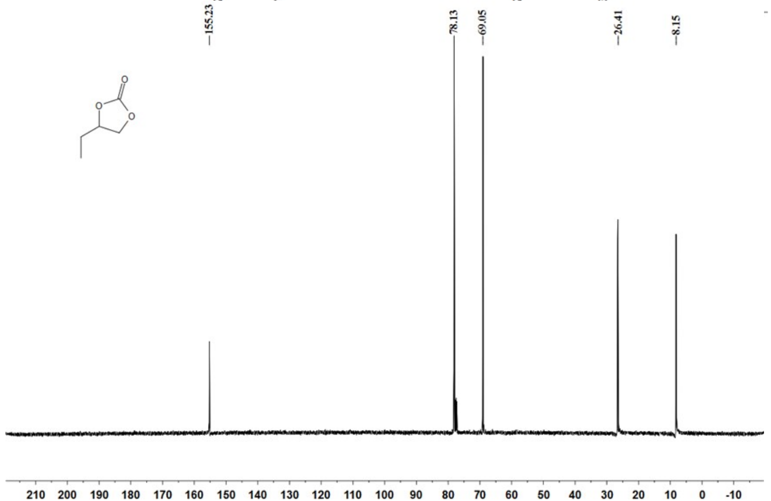


(b)

Figure S8. ^{1}H (a) and ^{13}C (b) NMR images of 4-methyl-1,3-dioxolan-2-one.

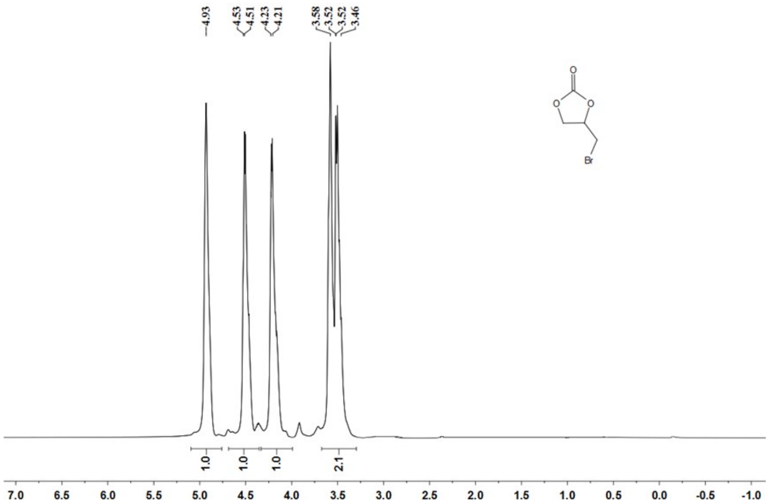


(a)

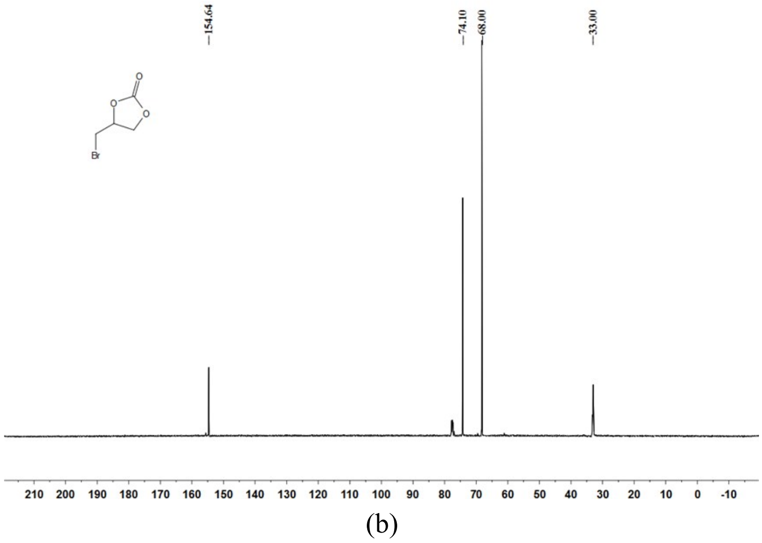


(b)

Figure S9. ^{1}H (a) and ^{13}C (b) NMR images of 4-ethyl-1,3-dioxolan-2-one.

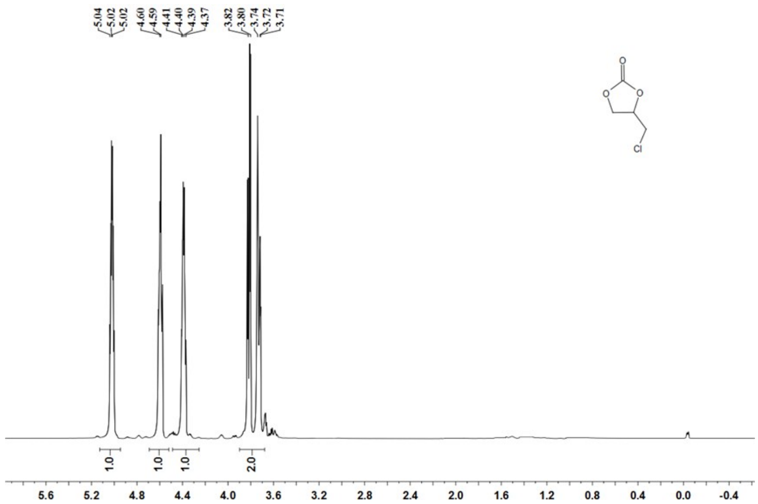


(a)

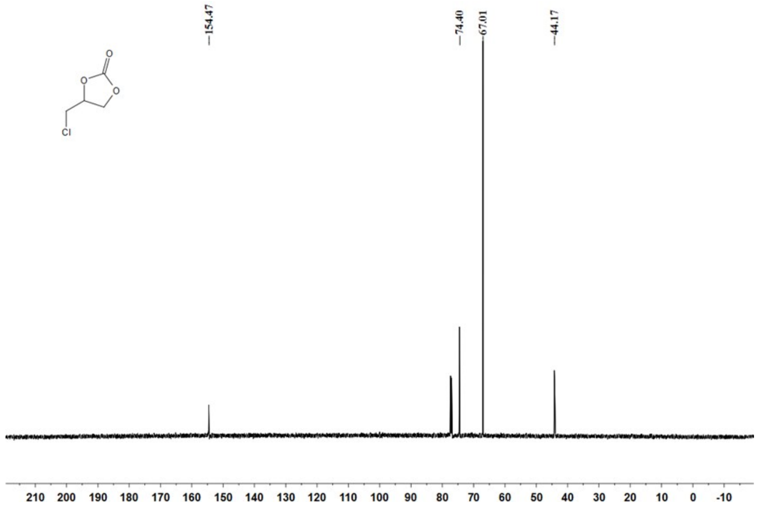


(b)

Figure S10. ^{1}H (a) and ^{13}C (b) NMR images of 4-(bromomethyl)-1,3-dioxolan-2-one.

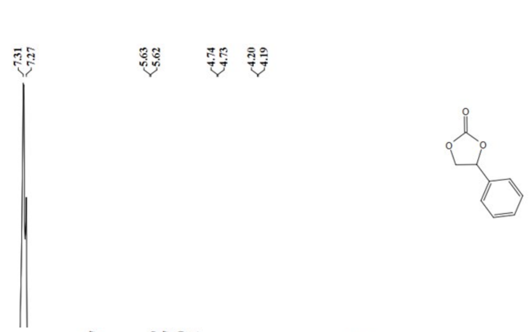


(a)

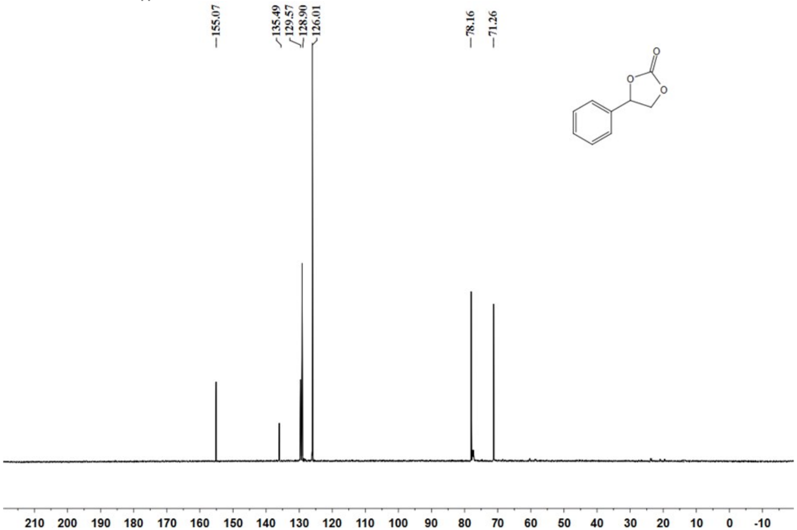


(b)

Figure S11. ^{1}H (a) and ^{13}C (b) NMR images of 4-(chloromethyl)-1,3-dioxolan-2-one.



(a)



(b)

Figure S12. ^{1}H (a) and ^{13}C (b) NMR images of 4-phenyl-1,3-dioxolan-2-one.

Table S1 The catalytic performance for chemical conversion of CO_2 into cyclic carbonates catalyzed by different metals (Co^{2+}, Zn^{2+} and Al^{3+}) catalytic system[a].

Entry	TBAB (mmol)	Catalyst (mg)	P (MPa)	Time (h)	Yield (%)
HUST-1-Co	1.8	10	0.1	24	54.3
HUST-1-Zn	1.8	10	0.1	24	16.7
HUST-1-Al	1.8	10	0.1	24	10.2

[a] Typical reaction conditions of exploration stage: 25 mmol PO with 10 mg catalysts, theory of metal content is 1.0 wt%, room temperature, 1 atm CO_2 pressure and reaction time is 24 h.

Table S2 The catalytic performance for chemical conversion of CO_2 into cyclic carbonates catalyzed by various catalytic systems.

Catalyst	T (°C)	P (MPa)	Time (h)	Yield (%)	TON (TOF)	Ref.
HUST-1-Co[a]	25	0.1	48	94.6	3101 (64)	This work
MMCF-2[a]	25	0.1	48	95.4	763 (16)	S1
MOF 1[a]	25	0.1	48	96	383 (8)	S2
Co-CMP[a]	25	0.1	48	81.5	167 (3)	S3
Cr-CMP[a]	25	0.1	48	67.7	150 (3)	S4
Co/CMP-TPP[a]	29	0.1	24	95.8	441 (18)	S5
Co-MON[a]	60	1	12	94	1860 (155)	S6
Salen-Co[a]	25	0.1	48	75.8	155 (3)	S7
PCN-224(Co)[a]	100	2	4	42	461 (115)	S8

[a] propylene oxide as epoxide substrates.

The yeild of polymers calculations.

$$w = \frac{(m_{polymers})}{(m_{monomers})} * 100\%$$

where $m_{polymers}$ is the weight of the dry polymers obtained by solvent knitting hyper-crosslinked microporous polymers method, $m_{monomers}$ is the weight of the corresponding monomers of polymers.

References

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