Supplementary Information

Building Metal-functionalized Porous Carbons from Microporous Organic Polymers for CO_2 Capture and Conversion under Ambient Conditions

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1. Character

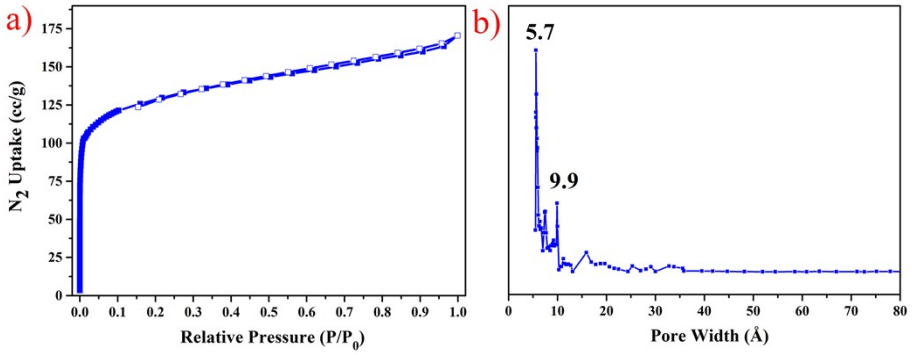


Figure S1. (a) N_2 adsorption (solid symbols)/desorption (open symbols) isotherms at 77K and (b) NLDFT pore size distribution of the precursor.

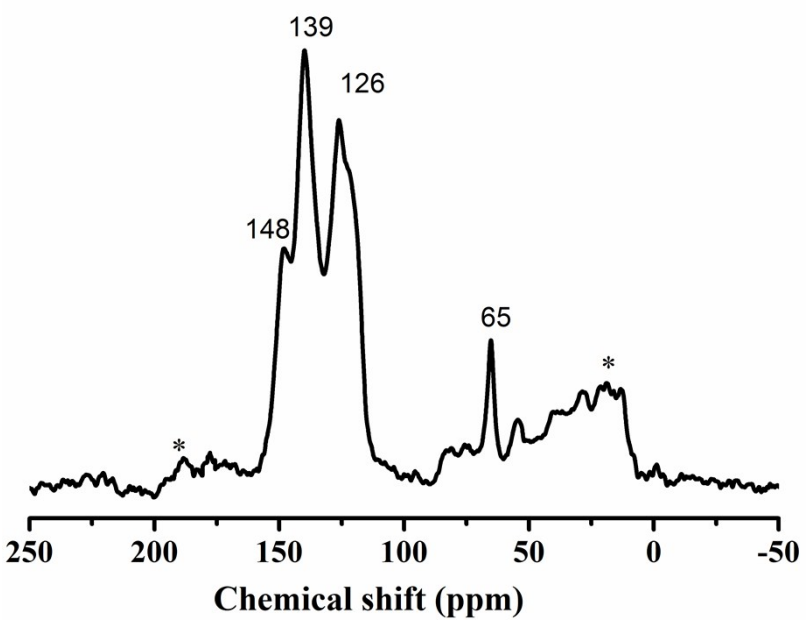


Figure S2. ^{13}C CP-MAS NMR spectrum of the precursor.

2. Powder X-Ray Diffraction

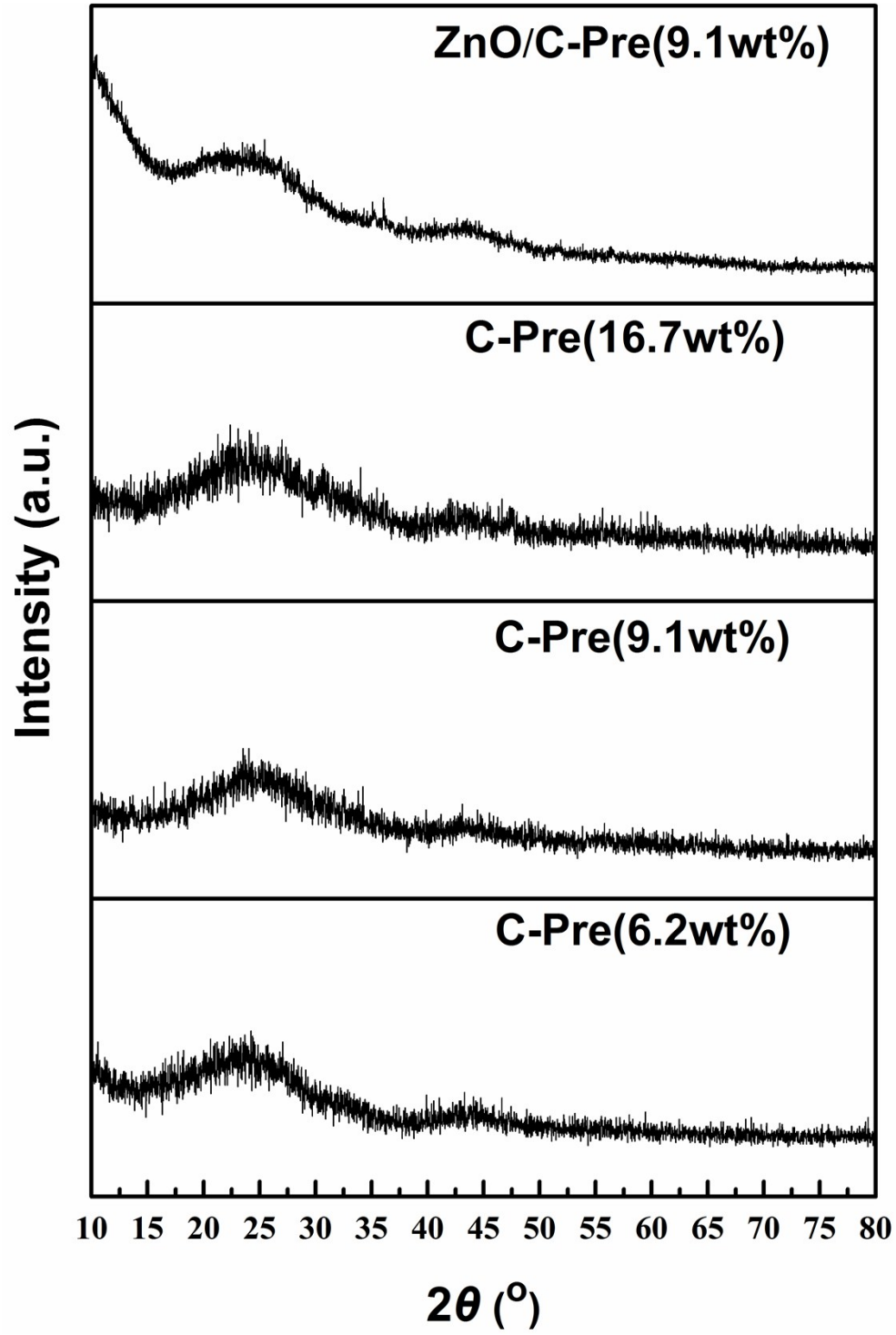


Figure S3. Powder X-Ray Diffraction of porous carbons.

3. Morphology analysis by SEM

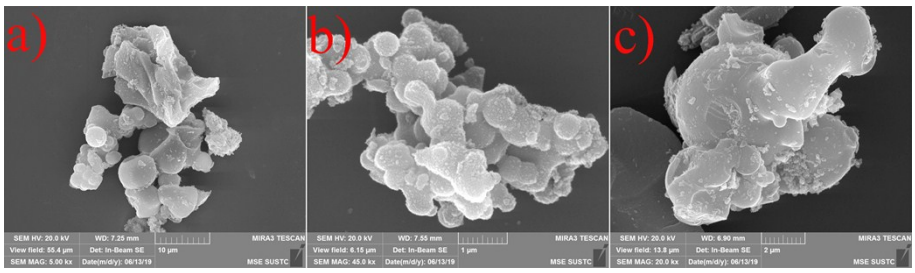


Figure S4. SEM images of (a) ZnO/C-Pre(9.1wt%), (b) C-Pre(9.1wt%) and (c) ZnO/C-Pre(9.1wt%)/PBM.

4. Morphology analysis by TEM

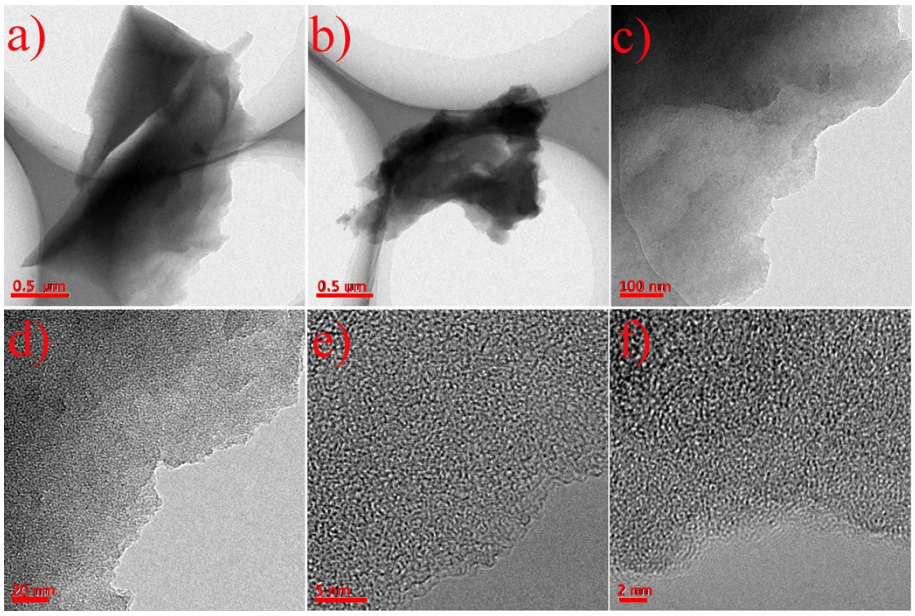


Figure S5. TEM images of precursor.

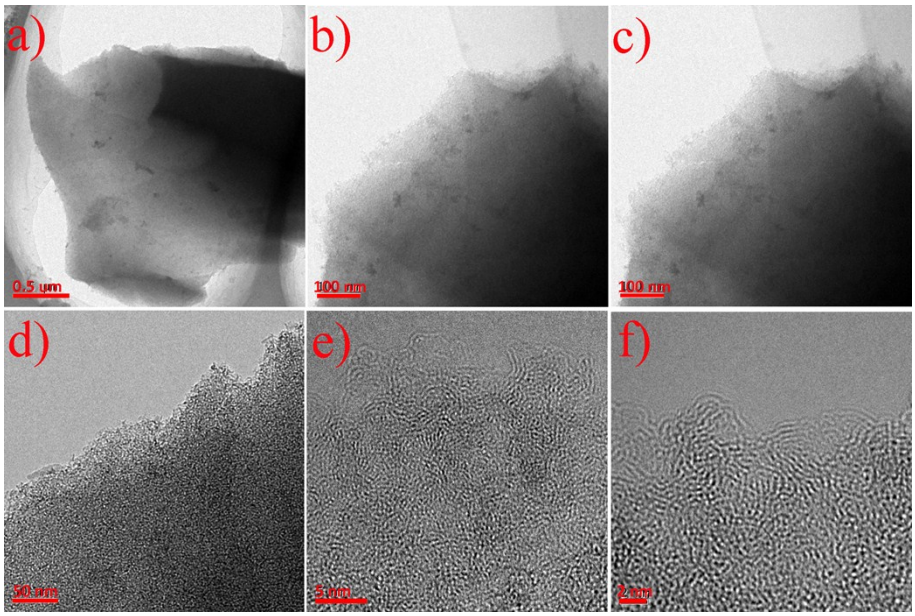


Figure S6. TEM images of C-Pre(9.1wt%).

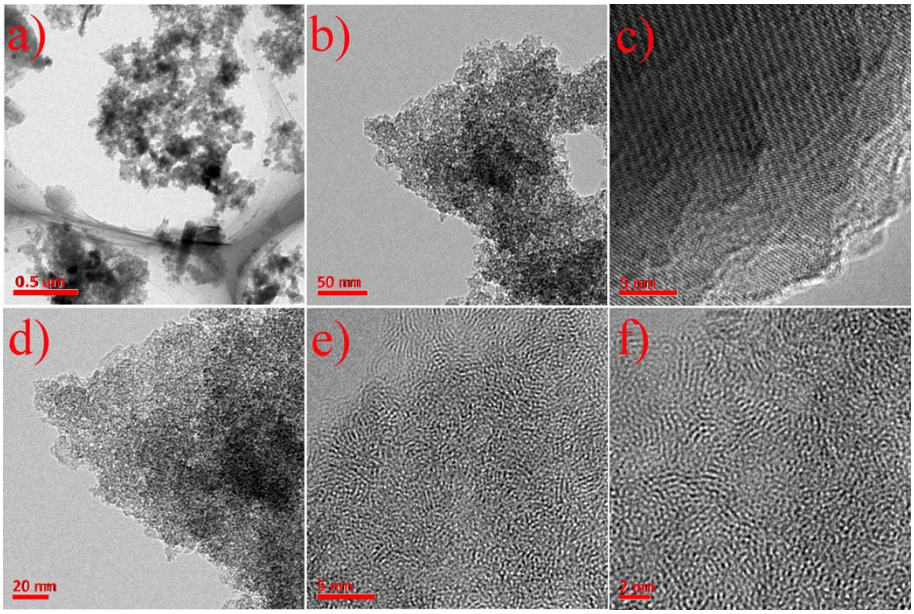


Figure S7. TEM images of ZnO/C-Pre(9.1wt%).

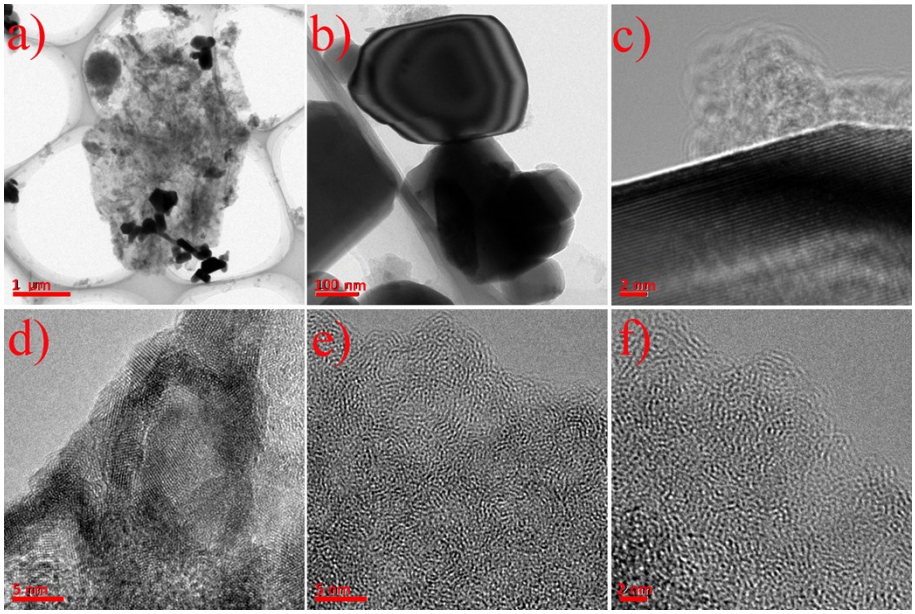


Figure S8. TEM images of ZnO/C-Pre(9.1wt%)/PBM.

5. Elemental analysis

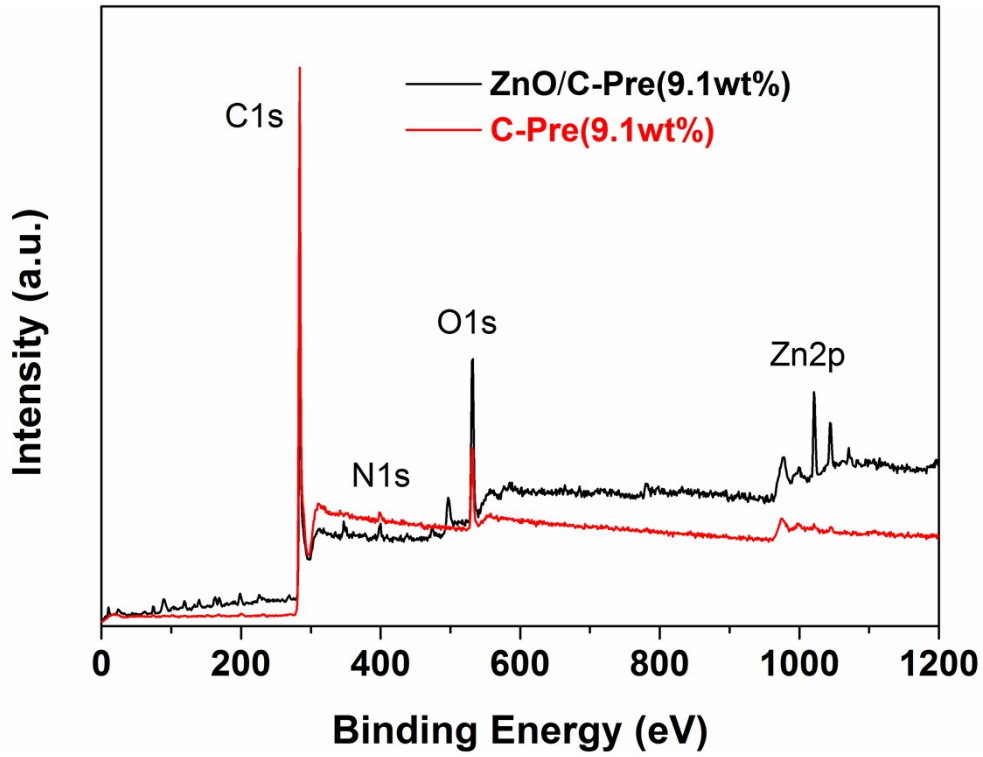


Figure S9. Wide XPS survey spectra of carbons.

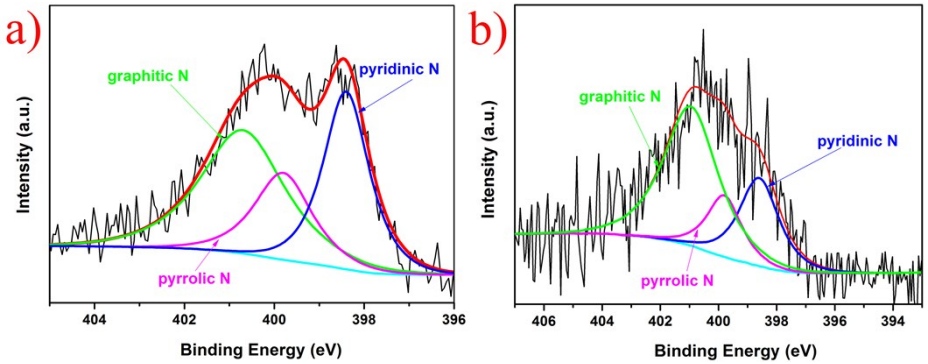


Figure S10. High-resolution N 1s XPS spectra of (a) ZnO/C-Pre(9.1wt%) and (b) C-Pre(9.1wt%).

6. Infrared spectroscopy

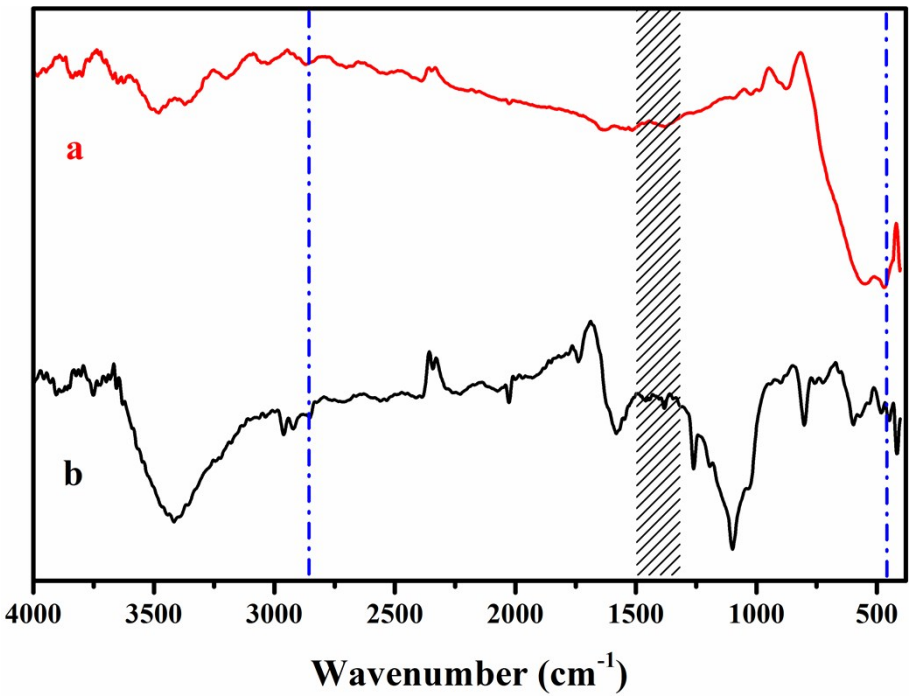


Figure S11 FTIR spectra of (a) ZnO and (b) ZnO/C-Pre(9.1wt%).

Table S1. XPS elemental data (at%) of carbon materials.

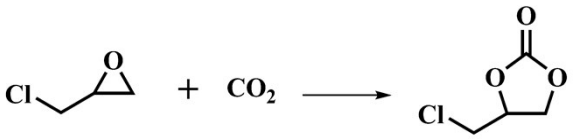
Sample	C	O	N	Zn	Cl
ZnO/C-Pre(9.1wt%)	78.87	11.51	6.86	2.36	-
C-Pre(9.1wt%)	97.22	ND	2.14	0.35	0.29

Table S2. ICP-AES data (wt%) of carbon materials.

Sample	Zn
ZnO/C-Pre(9.1wt%)	2.42
C-Pre(16.7wt%)	0.05
C-Pre(9.1wt%)	0.12
C-Pre(6.2wt%)	0.14

7. CO_2 cycloaddition reaction

Table S3. Catalytic cycloaddition of CO_2 with epichlorohydrin to form cyclic carbonates[a].



Entry	Catalyst	Time (h)	Yield[b] (%)
1	ZnO/C-Pre(9.1wt%)	12	57
2	ZnO/C-Pre(9.1wt%)	24	75
3	ZnO/C-Pre(9.1wt%)	36	87
4	ZnO/C-Pre(9.1wt%)	48	91
5	ZnO/C-Pre(9.1wt%)	60	92
6	C-Pre(16.7wt%)	48	61
7	C-Pre(9.1wt%)	48	45
8	C-Pre(6.2wt%)	48	60
9	MOP-8C	48	69
10	ZnO/C-Pre(9.1wt%)/PBM	48	54

[a] Reaction conditions: 10 mmol epoxide, 10 mg catalyst, 1 mmol TBAB, CO_2 (0.1 MPa), 25 °C. [b] Products were characterized by ^1H NMR and the yields refer to isolated products.

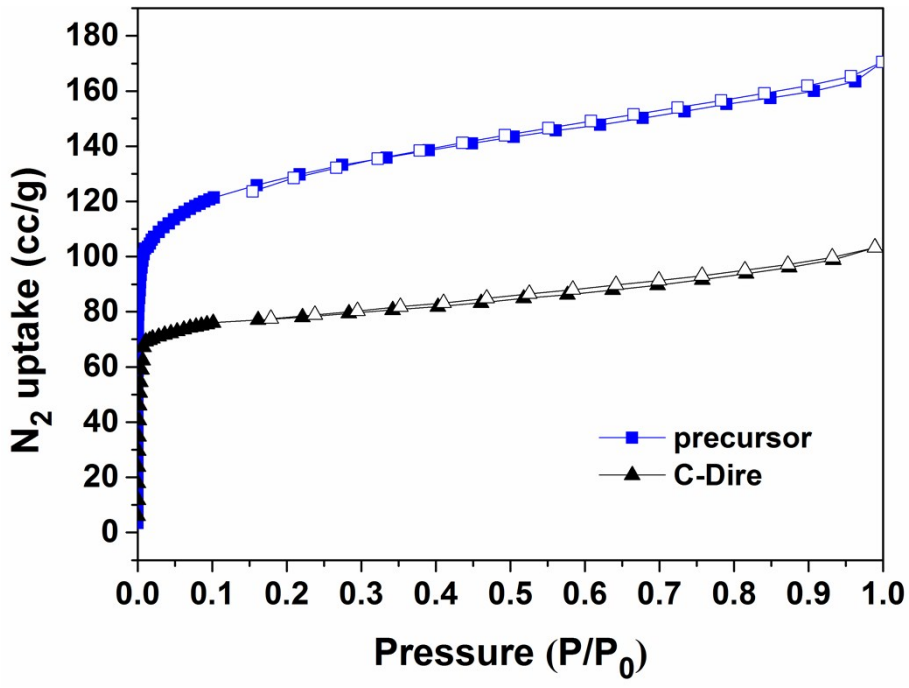


Figure S12. N_2 adsorption (solid symbols)/desorption (open symbols) isotherms of the precursor and the C-Dire (the carbon material pyrolysed without $ZnCl_2$ molten salt) at 77K.

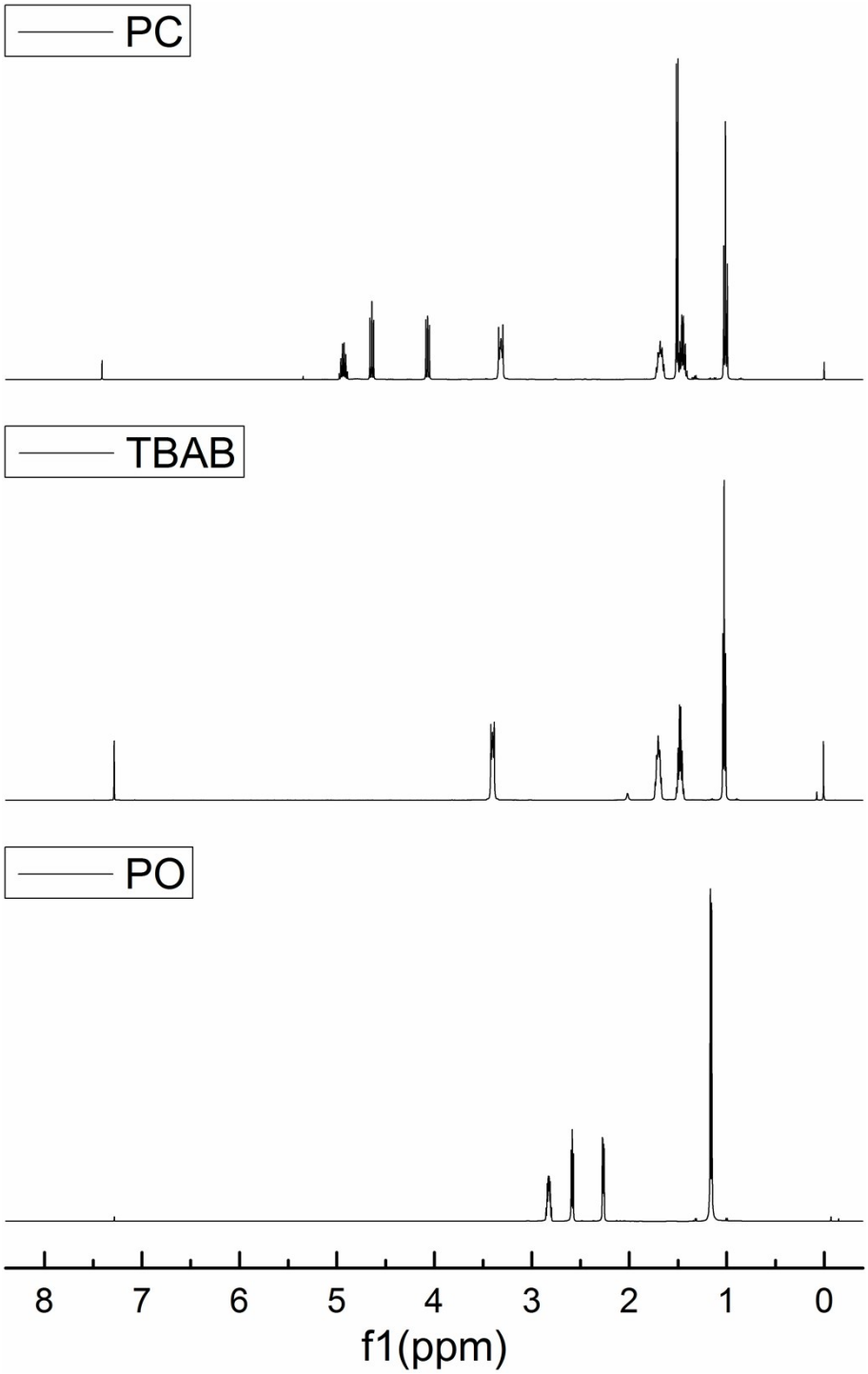


Figure S13. ^{1}H NMR (400 MHz, $CDCl_3$, 298 K) spectra of (±)-propylene oxide and its corresponding cyclic carbonate (^{1}H NMR spectrum was obtained from the crude sample).

Possible catalytic pathway

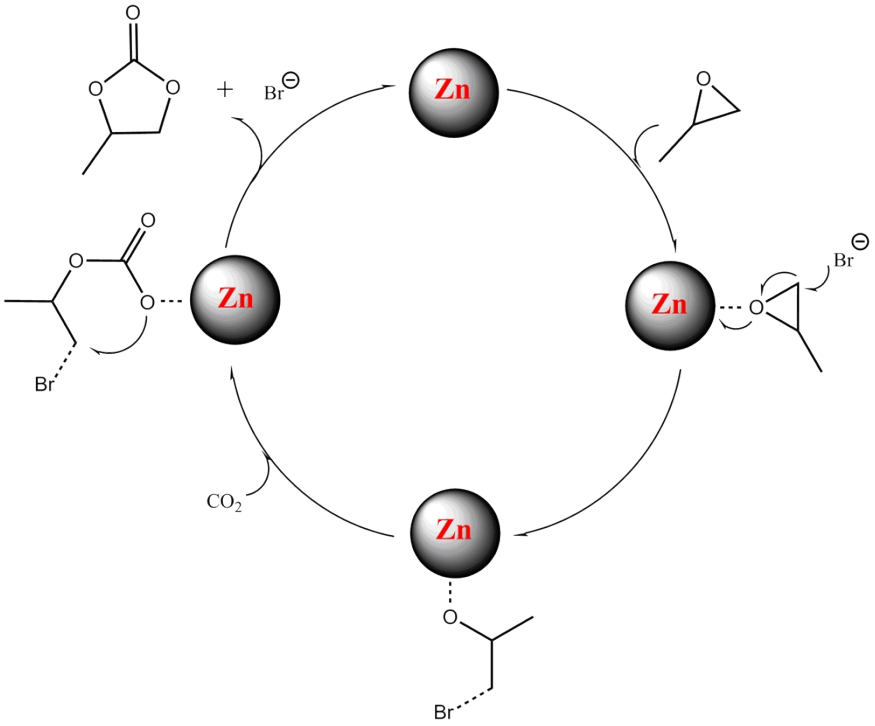


Figure S14. Scheme of possible catalytic mechanism for the reaction of epoxide and CO_2 into cyclic carbonate catalyzed by ZnO/C-Pre(9.1wt%).

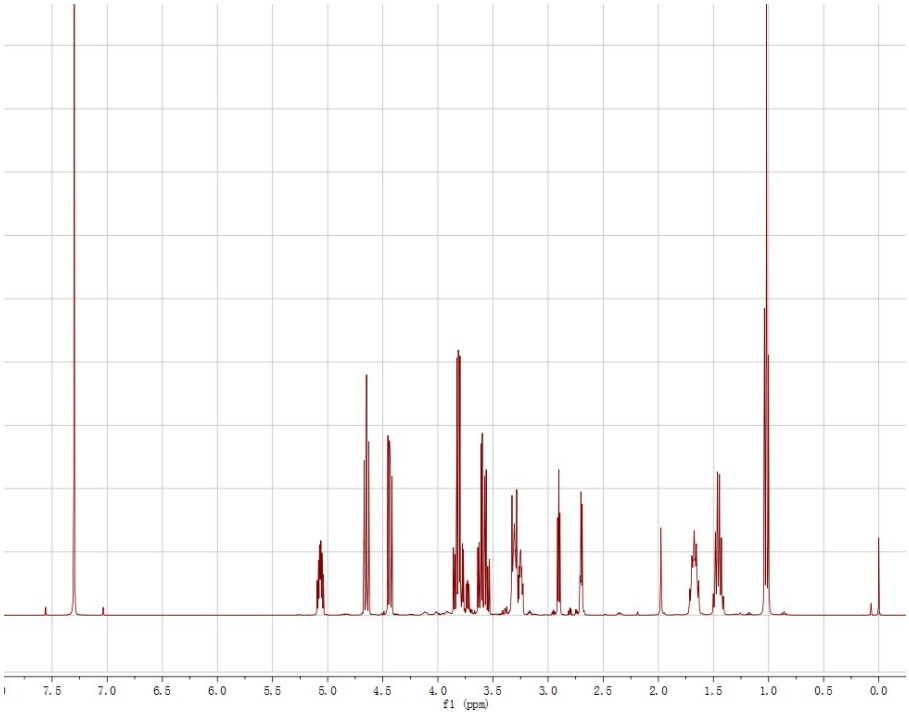


Figure S15. ^{1}H NMR (400 MHz, $CDCl_3$, 298 K) spectra of epichlorohydrin and its corresponding cyclic carbonate at 12 h (^{1}H NMR spectrum was obtained from the crude sample).

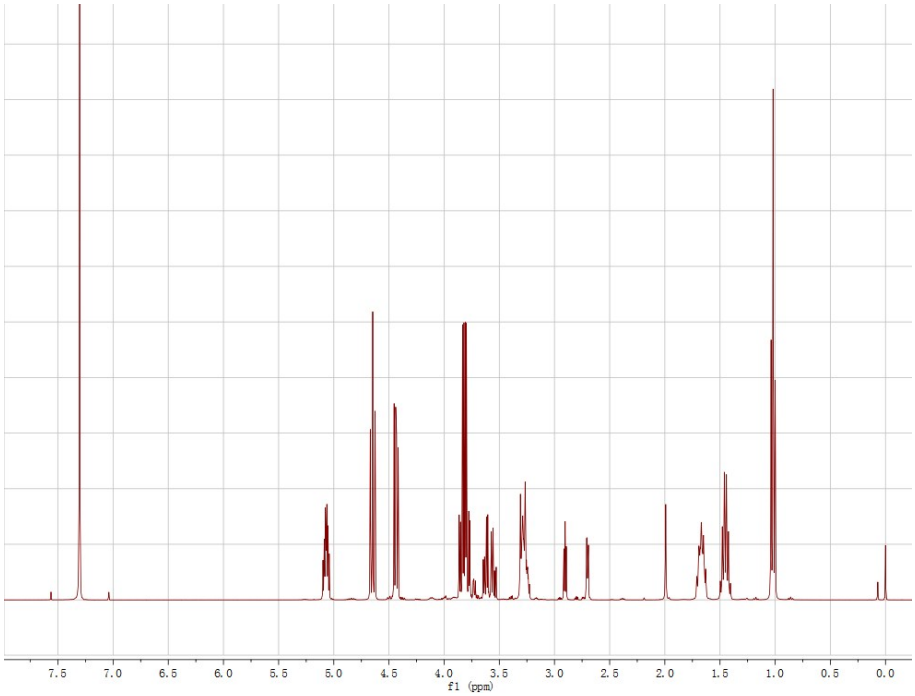


Figure S16. ^{1}H NMR (400 MHz, $CDCl_3$, 298 K) spectra of epichlorohydrin and its corresponding cyclic carbonate at 24 h (^{1}H NMR spectrum was obtained from the crude sample).

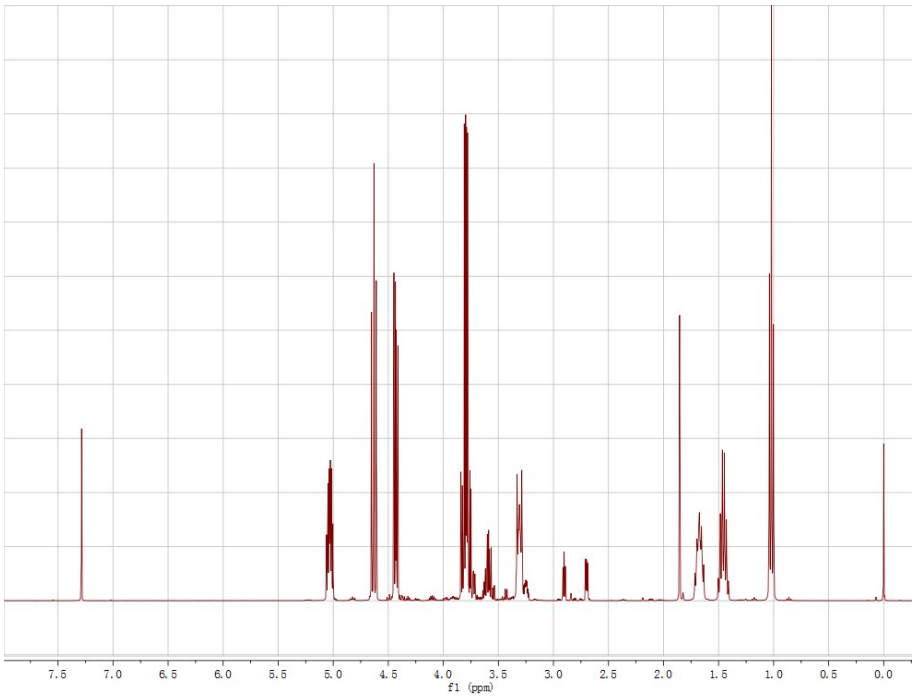


Figure S17. ^{1}H NMR (400 MHz, $CDCl_3$, 298 K) spectra of epichlorohydrin and its corresponding cyclic carbonate at 36 h (^{1}H NMR spectrum was obtained from the crude sample).

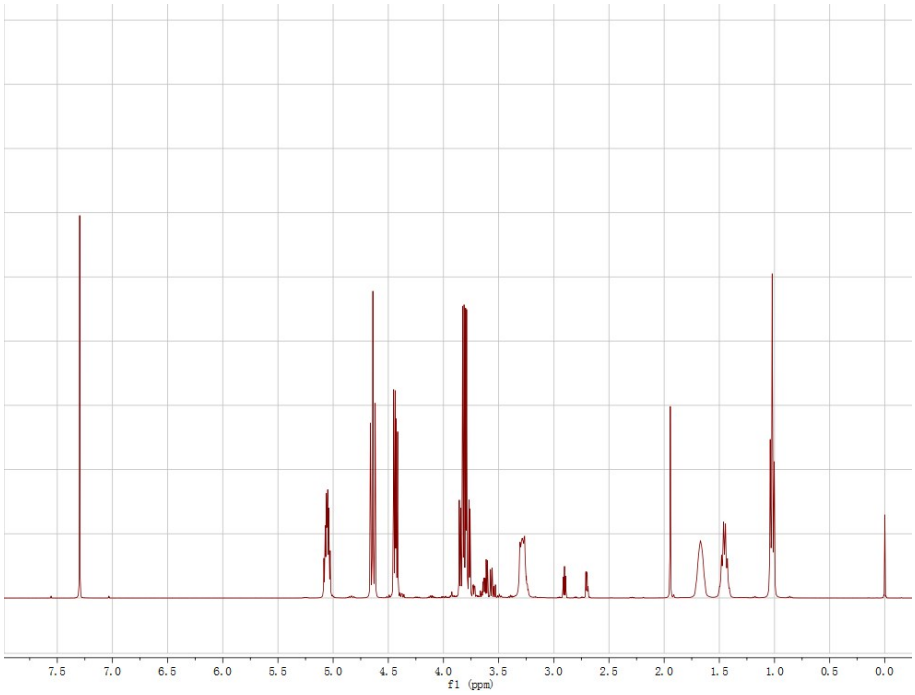


Figure S18. ^{1}H NMR (400 MHz, $CDCl_3$, 298 K) spectra of epichlorohydrin and its corresponding cyclic carbonate at 48 h (^{1}H NMR spectrum was obtained from the crude sample).

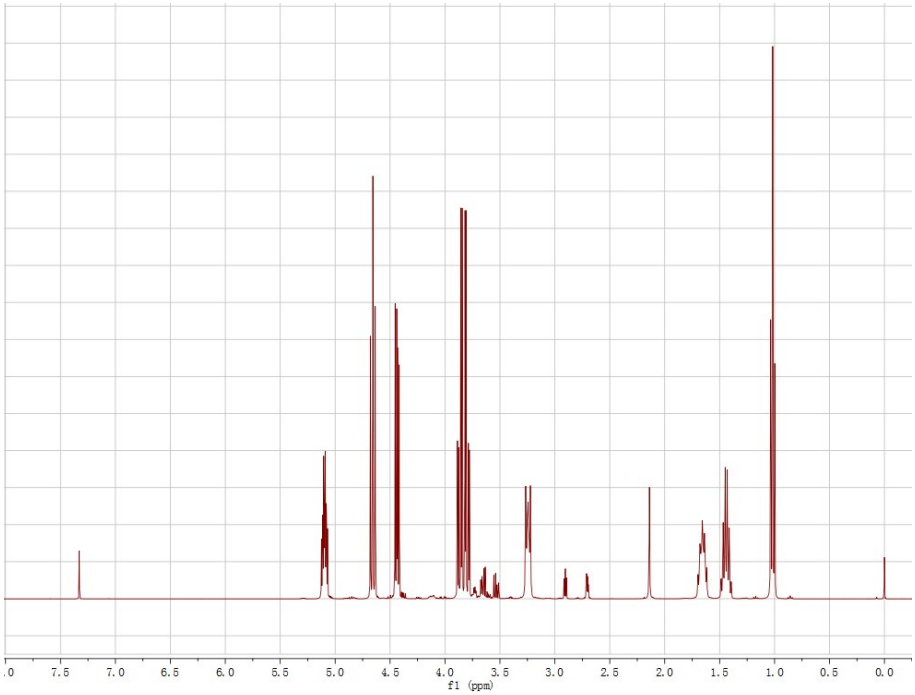


Figure S19. ^{1}H NMR (400 MHz, $CDCl_3$, 298 K) spectra of epichlorohydrin and its corresponding cyclic carbonate at 60 h (^{1}H NMR spectrum was obtained from the crude sample).

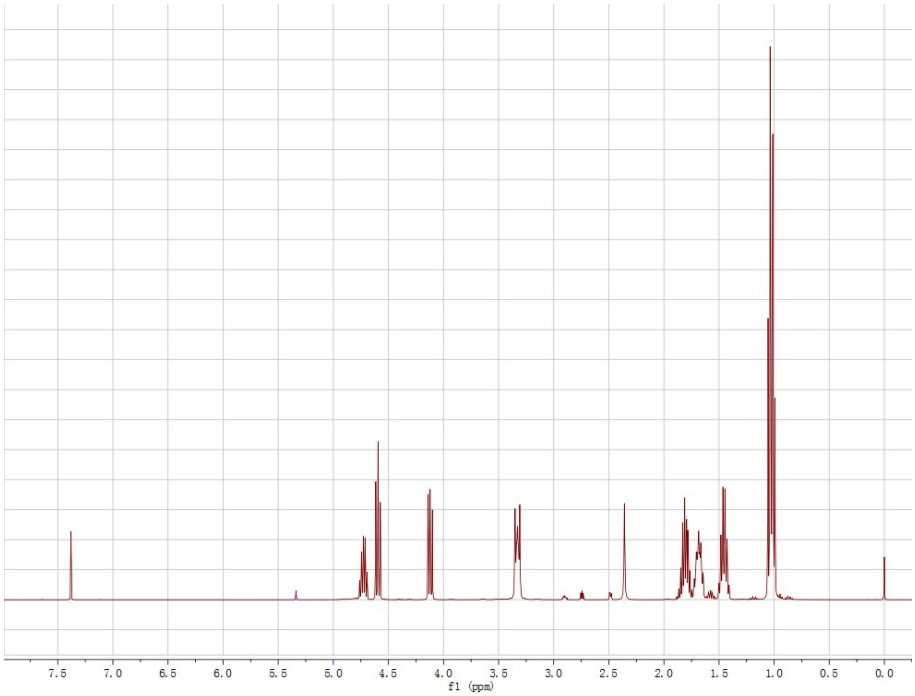


Figure S20. ^{1}H NMR (400 MHz, $CDCl_3$, 298 K) spectra of 1,2-epoxybutane and its corresponding cyclic carbonate (^{1}H NMR spectrum was obtained from the crude sample).

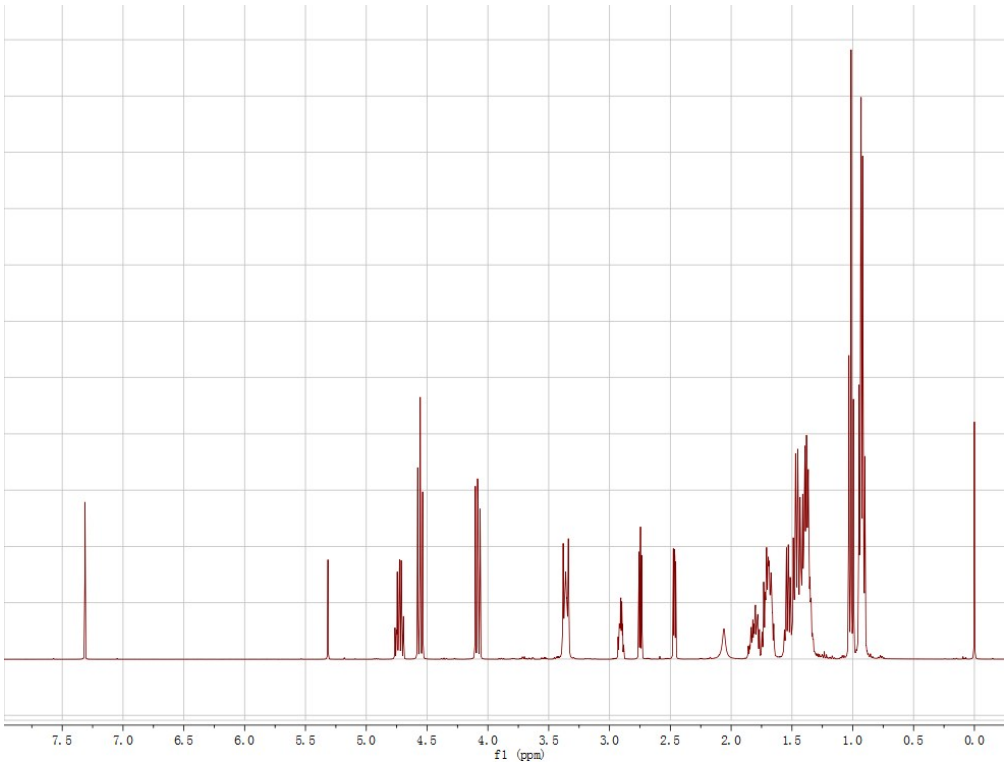


Figure S21. ^{1}H NMR (400 MHz, $CDCl_3$, 298 K) spectra of cyclohexane oxide and its corresponding cyclic carbonate (^{1}H NMR spectrum was obtained from the crude sample).

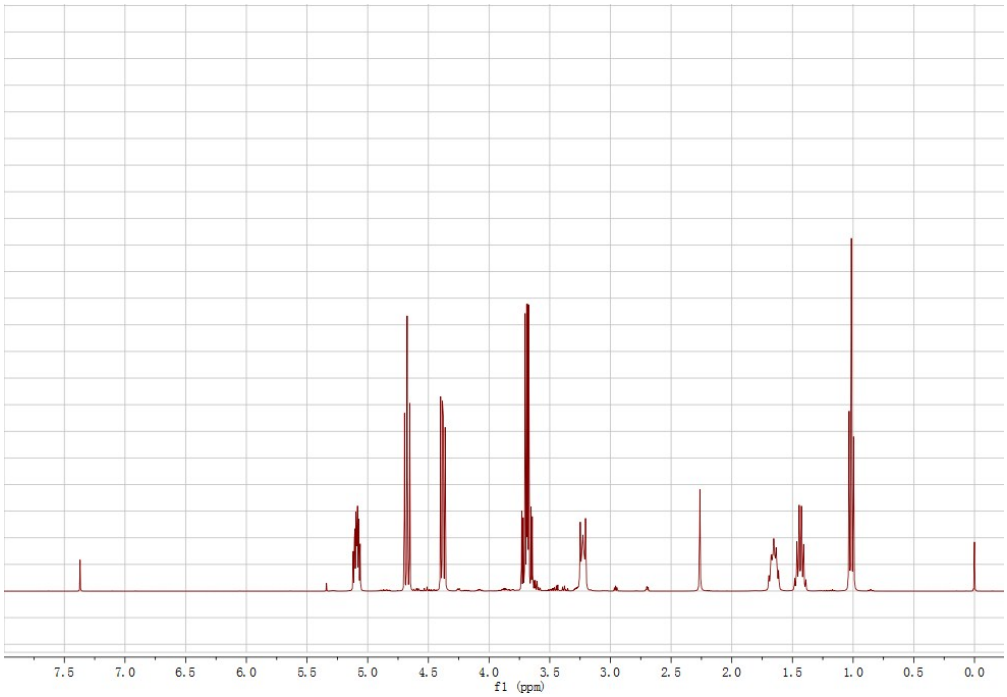


Figure S22. ^{1}H NMR (400 MHz, $CDCl_3$, 298 K) spectra of epibromohydrin and its corresponding cyclic carbonate (^{1}H NMR spectrum was obtained from the crude sample).

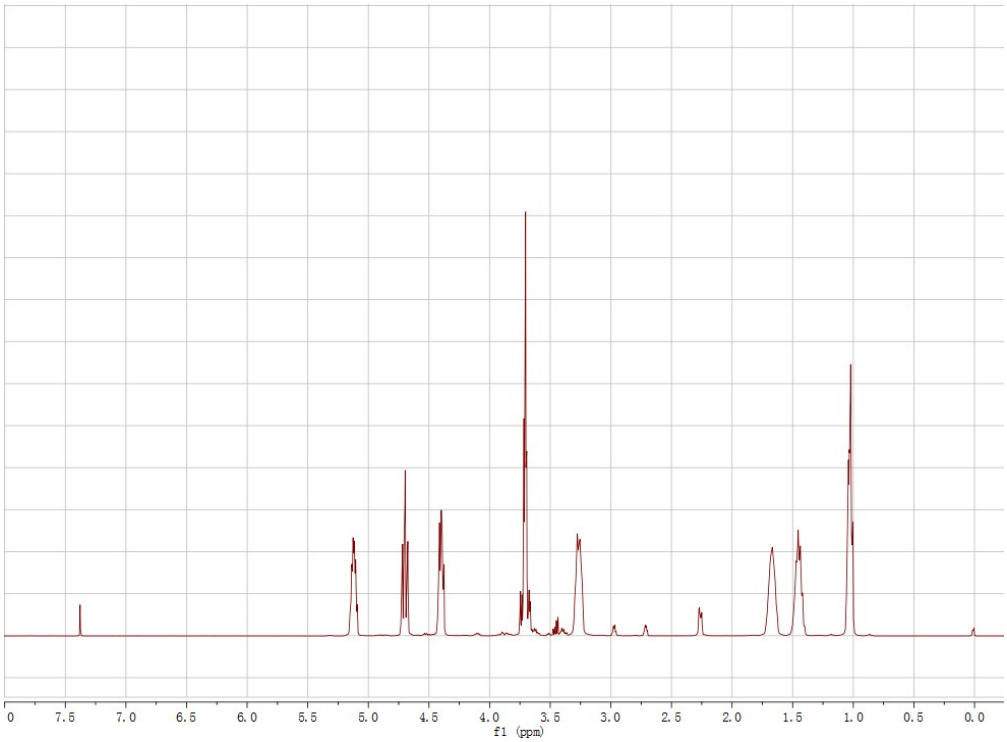


Figure S23. ^{1}H NMR spectra (in $CDCl_3$) of the reaction mixture (epibromohydrin) using ZnO/C-Pre(9.1wt%) as a catalyst in the 2nd cycle of recyclability test.

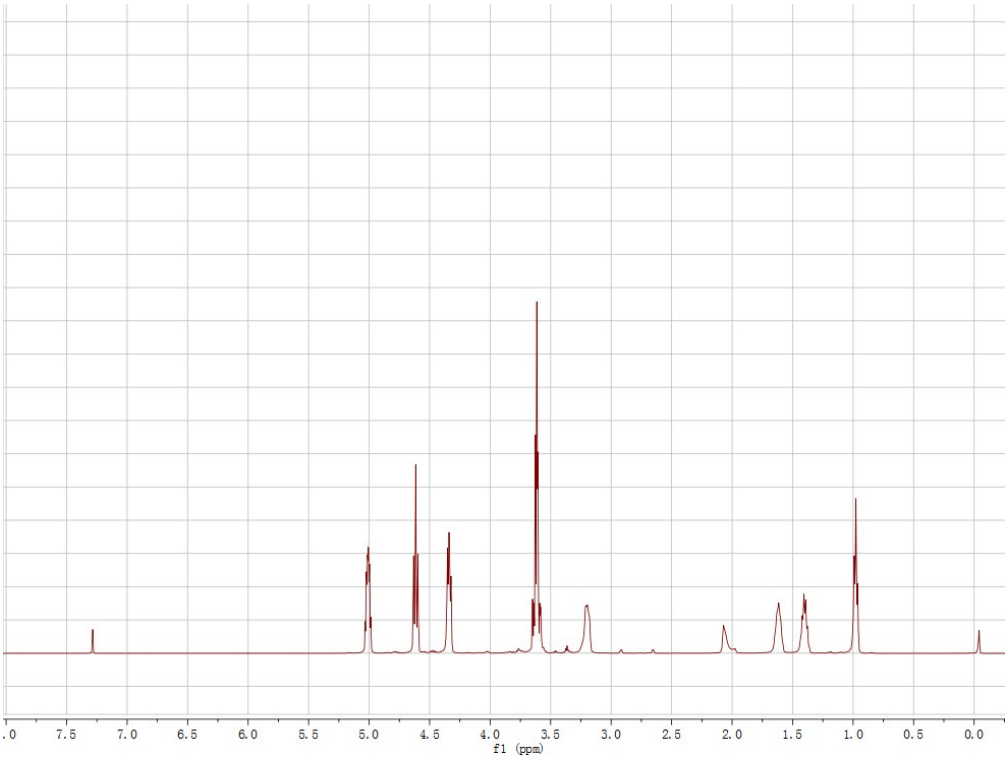


Figure S24. ^{1}H NMR spectra (in $CDCl_3$) of the reaction mixture (epibromohydrin) using ZnO/C-Pre(9.1wt%) as a catalyst in the 3^{rh} cycle of recyclability test.

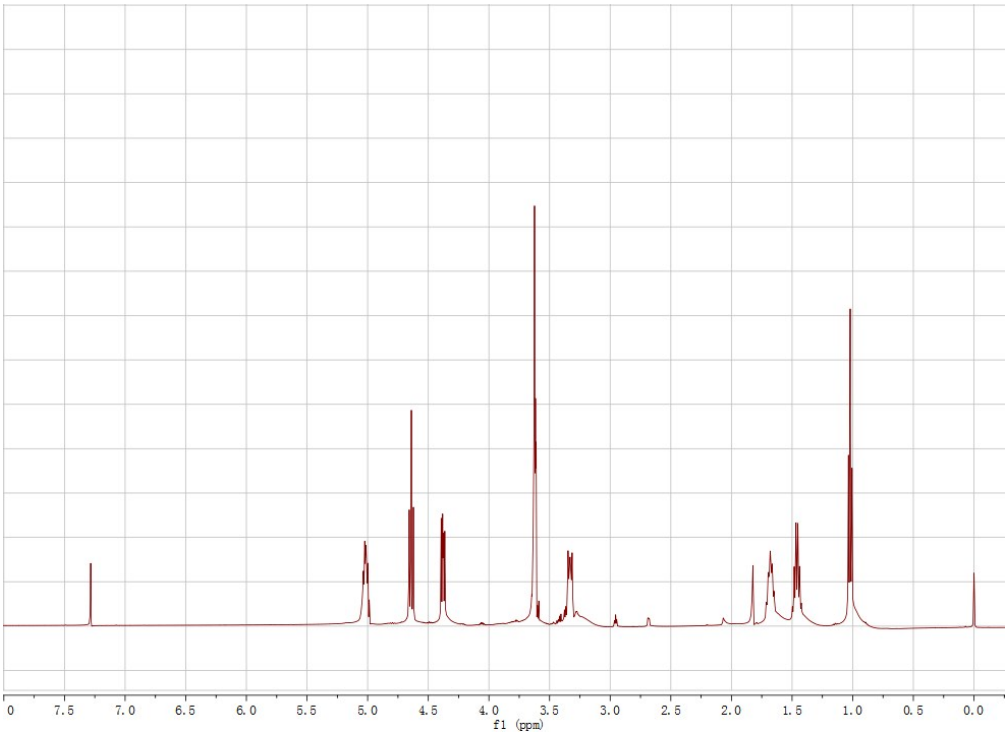


Figure S25. ^{1}H NMR spectra (in $CDCl_3$) of the reaction mixture (epibromohydrin) using ZnO/C-Pre(9.1wt%) as a catalyst in the 4th cycle of recyclability test.

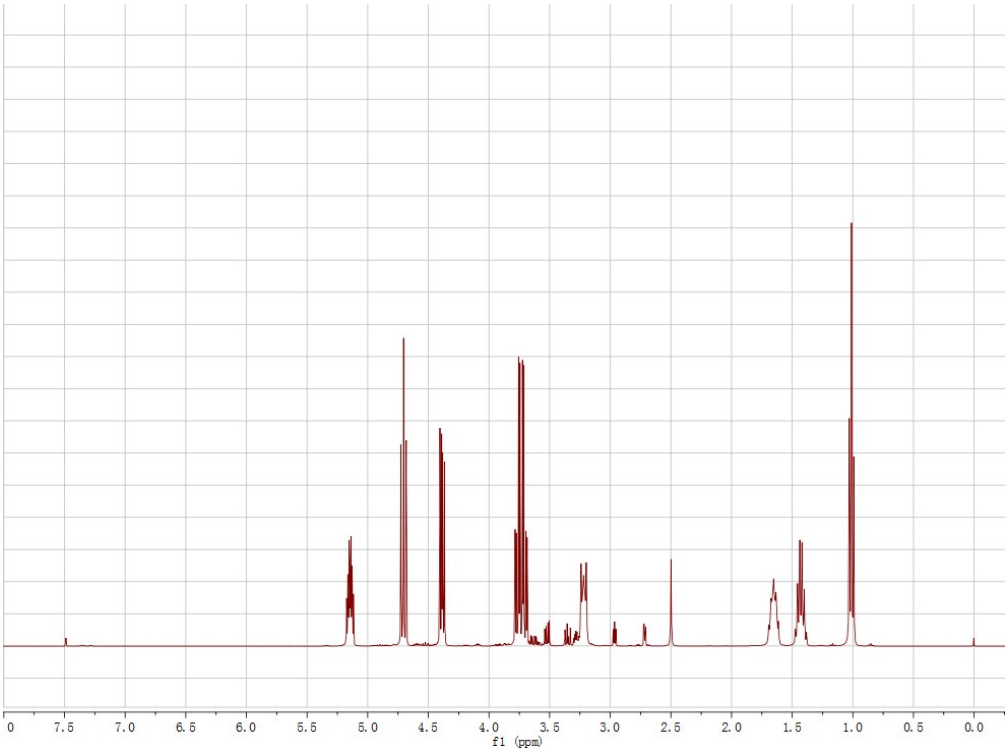


Figure S26. ^{1}H NMR spectra (in $CDCl_3$) of the reaction mixture (epibromohydrin) using ZnO/C-Pre(9.1wt%) as a catalyst in the 5th cycle of recyclability test.