Electronic Supporting Information

Renewable N-doped microporous carbons from walnut shell for CO_2 capture and conversion

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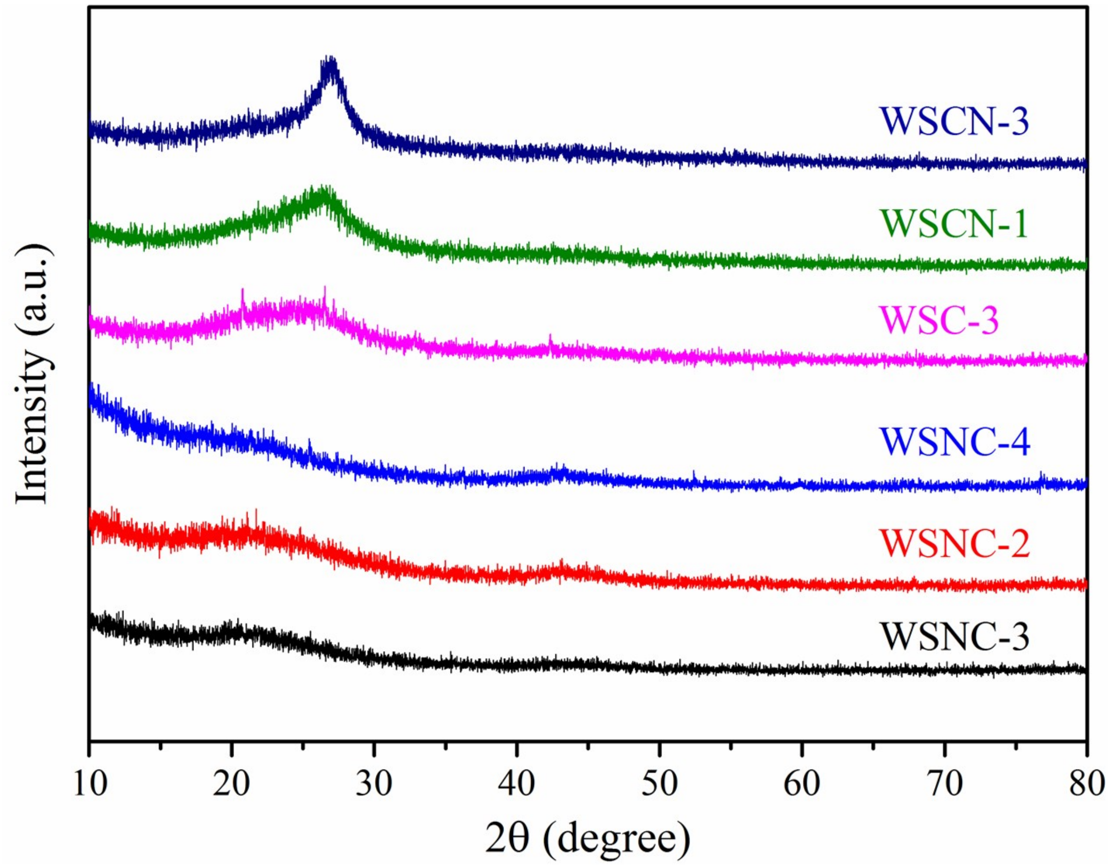


Figure S1. XRD patterns of different carbon materials.

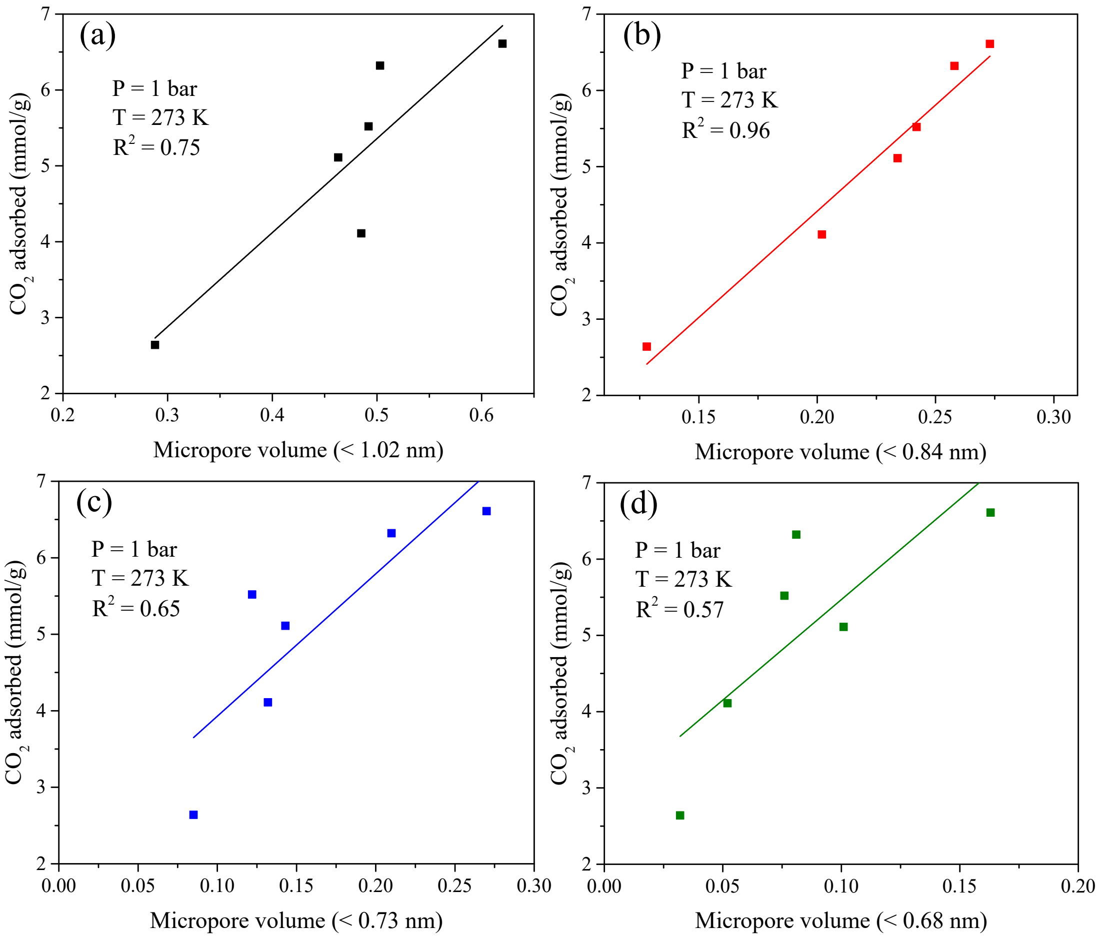


Figure S2. Linear fitting of the experimental data presenting a plot of CO_2 adsorption capacity vs. the micropore volume of pore size (a) < 0.68 nm, (b) <0.73 nm, (c) <0.84 nm, and (d) < 1.02 nm.

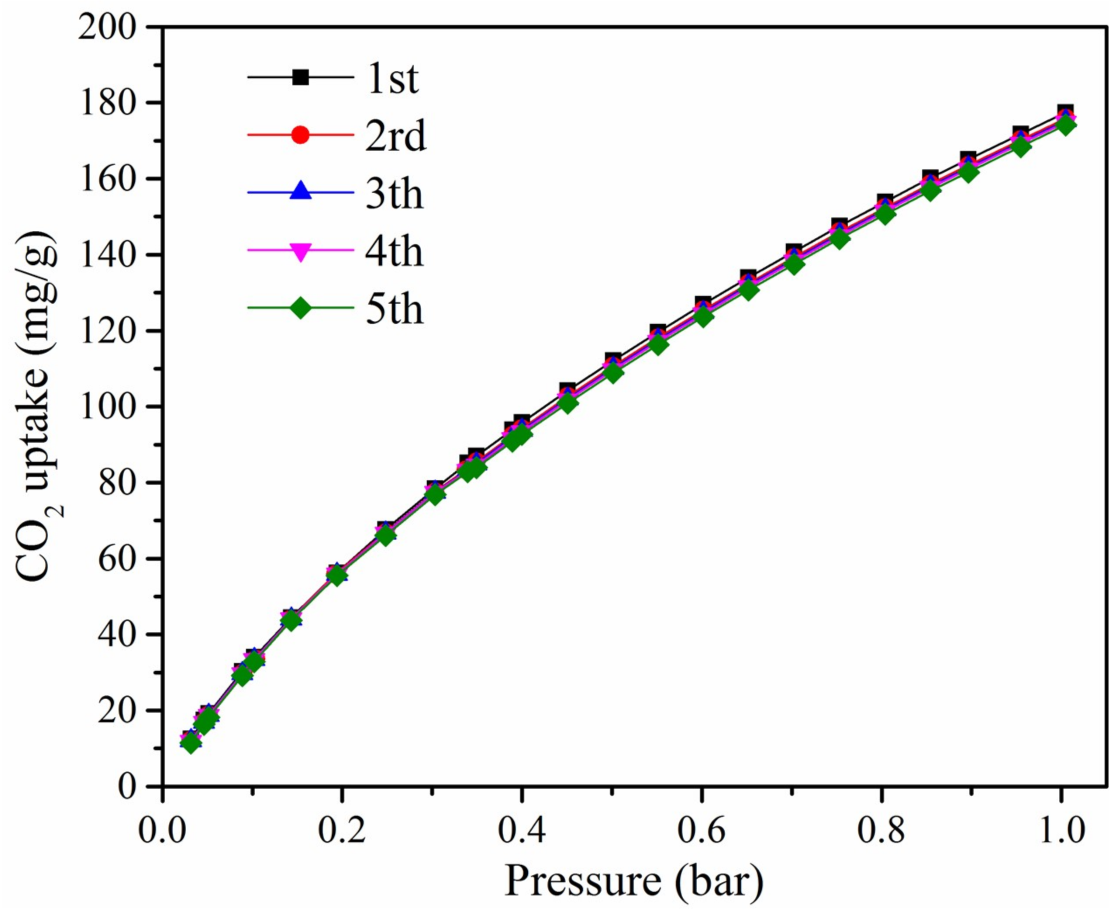


Figure S3. Cyclic study of CO_2 adsorption for WSNC-3 at 298K.

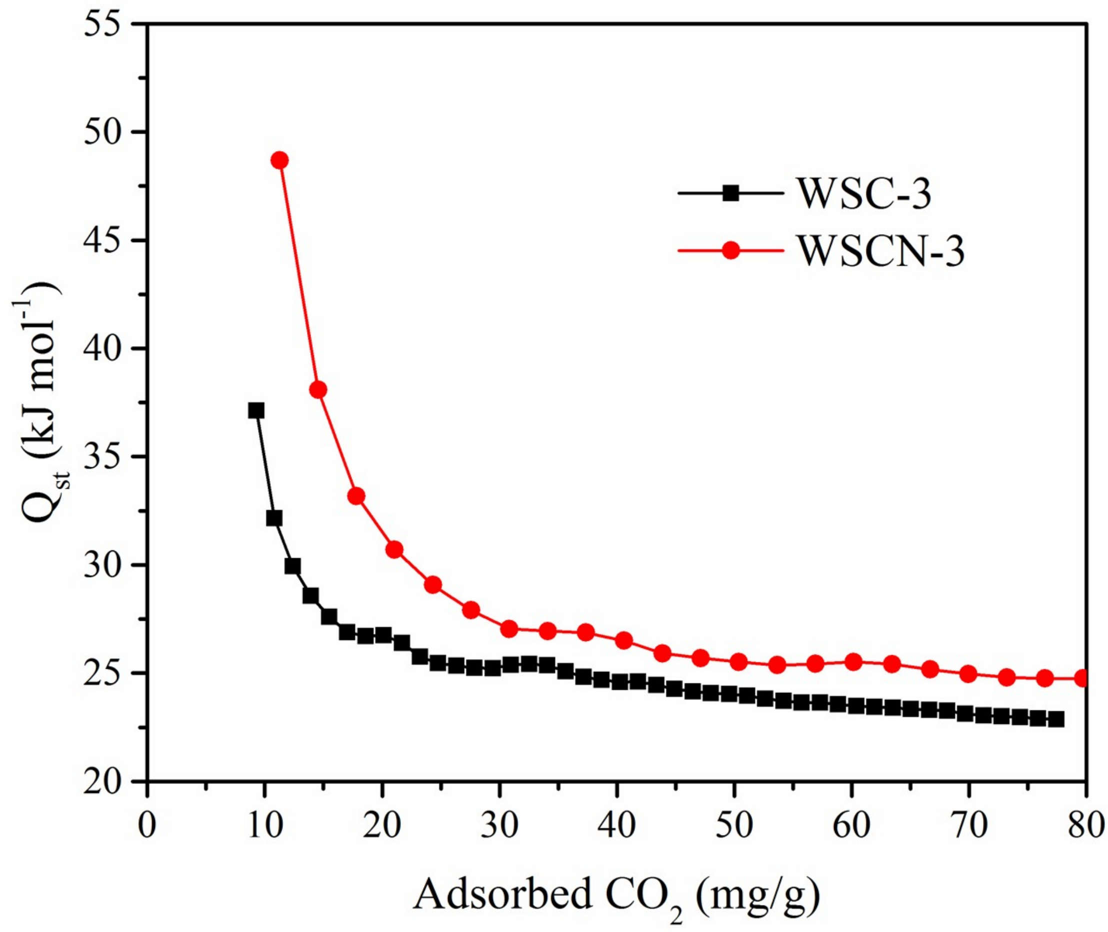


Figure S4. Isosteric heat of CO_2 adsorption on WSCN-3 and WSC-3.

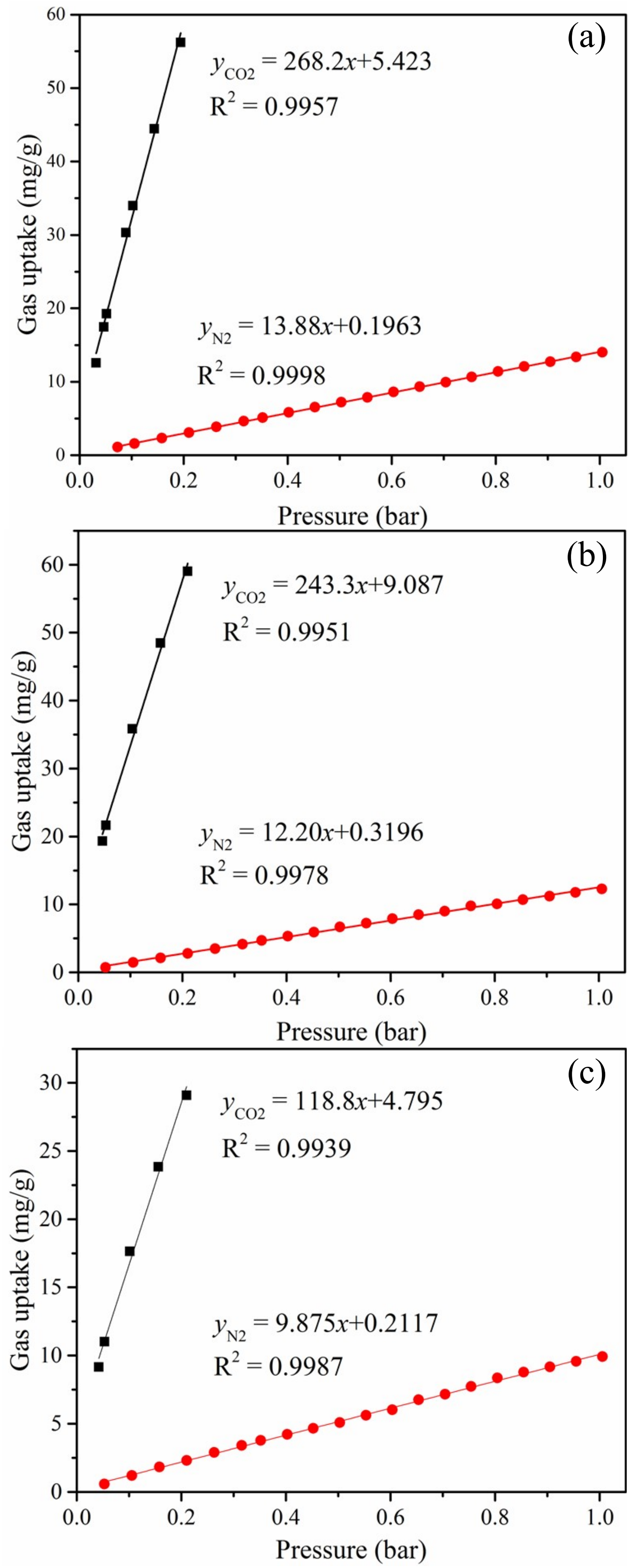


Figure S5. Initial slope calculation for CO_2 and N_2 isotherms collected at 298K. (a) WSNC-3, (b) WSCN-3, (c) WSC-3.

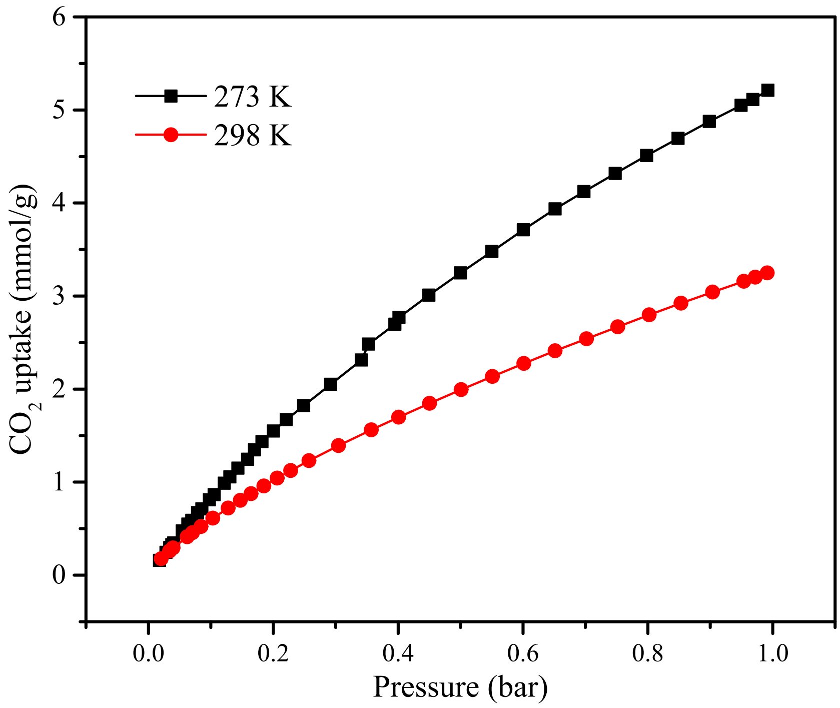


Figure S6. CO_2 adsorption isotherms obtained at 273 K and 298 K of Ag/WSNC-3

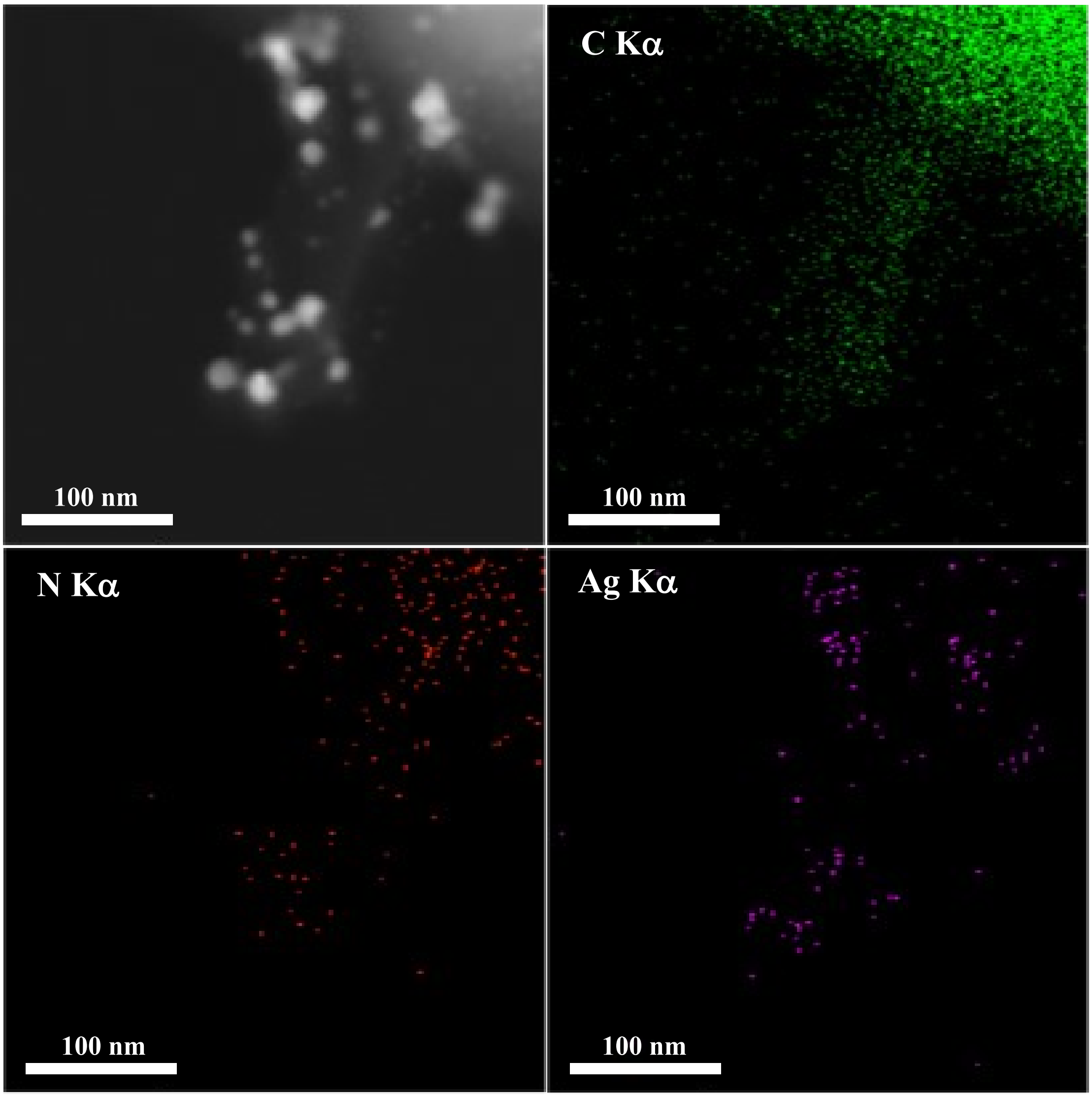


Figure S7. EDS mapping of Ag/WSNC-3

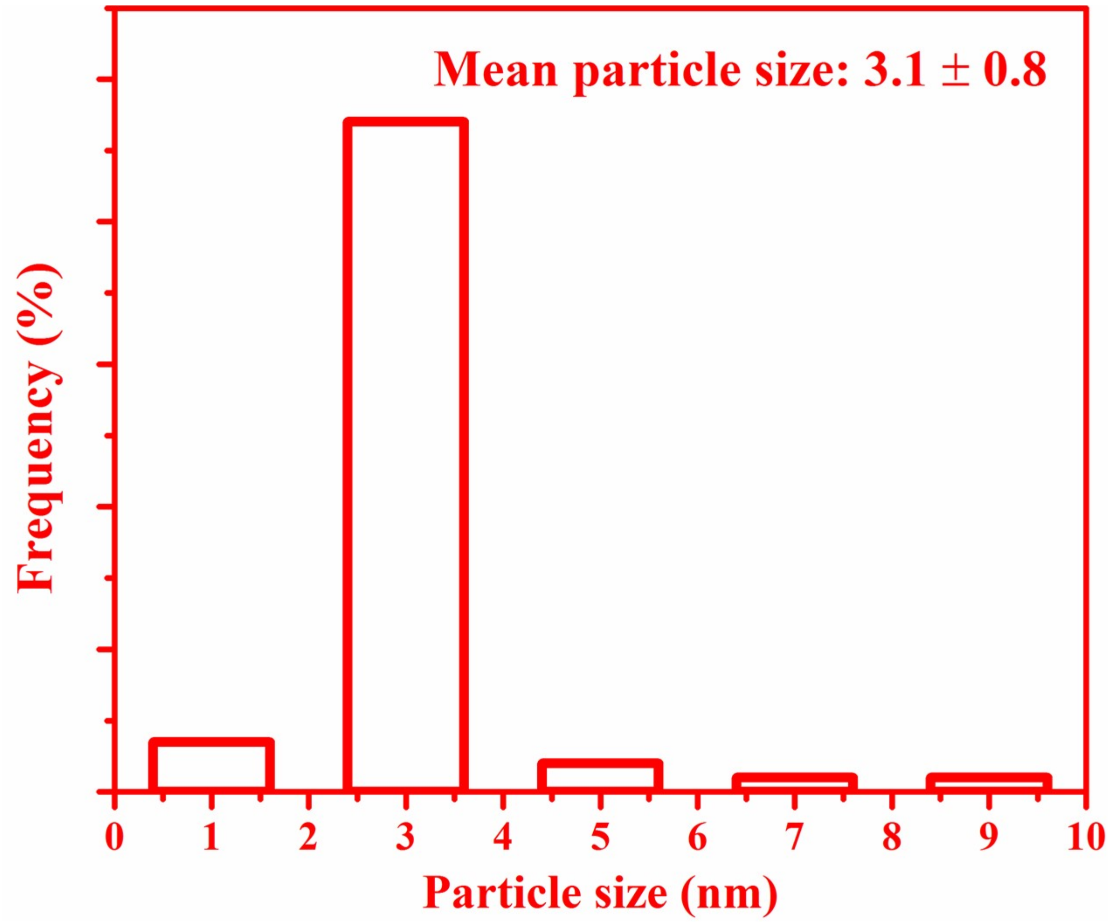


Figure S8. Histogram of Ag particle size distribution.

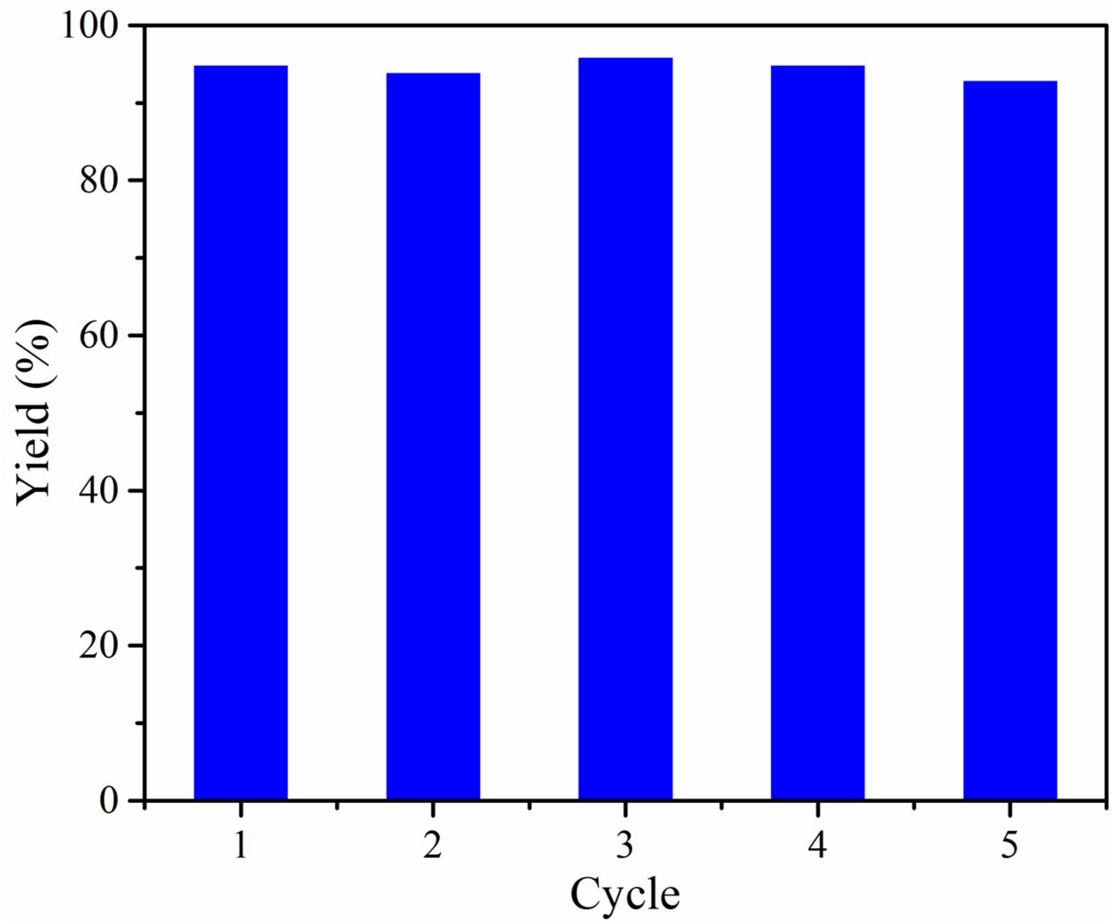
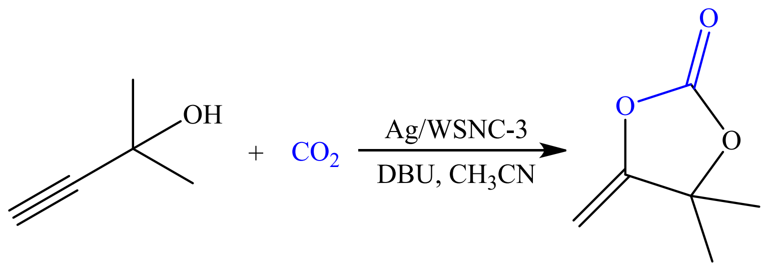


Figure S9. Recyclability test of Ag/WSNC-3. Reaction conditions: 1.0 mmol substrate; Ag was 0.1 mol% based on substrate; DBU, 1.0 mmol; CO_2 1 MPa; CH_3CN, 3 mL; 30 ^{o}C, 12 h. Yields were determined by ^{1}H NMR.

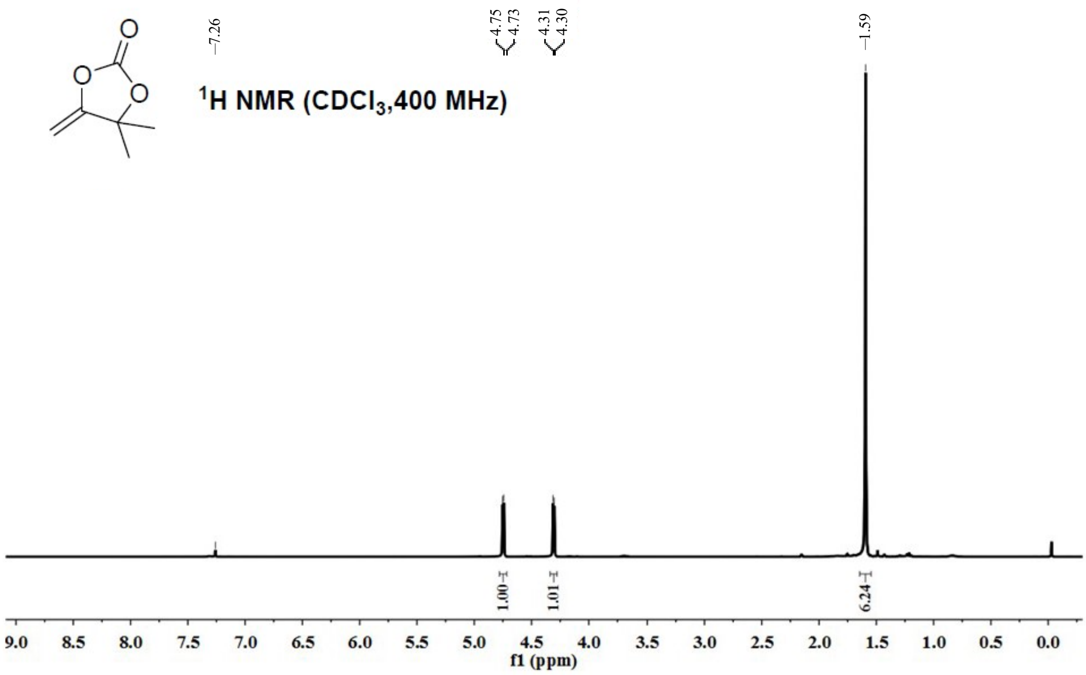
Table S1. Carboxylative Cyclization of 2-methyl-3-butyn-2-ol with CO_2 over Ag/WSNC-3[a]



Entry	Catalyst	Times/h	Yield/%[b]	TOF/h^{-1} [c]
1	No Ag/WSNC-3 and DBU	12	<1	-
2	No Ag/WSNC-3	12	24	-
3	WSNC-3 instead of Ag/WSNC-3	12	25	-
4	Ag/WSNC-3	12	95	79
5	Ag/AC	12	62	52
6	Ag/WSC-3	12	67	56
7	Ag/WSNC-3	1	41	410
8	Ag/WSNC-3	6	74	123
9 [d]	Ag/WSNC-3	12	43	36
10	Ag/WSNC-3	0.5	21	420
11	Ag/WSNC-3	16	99	62
12 [e]	Ag/WSNC-3	1	48	480
13 [f]	Ag/WSNC-3	1	59	590
14 [g]	Ag/WSNC-3	1	67	670
15 [f]	Ag/WSNC-3	12	76	63

[a] Reaction condition: 1.0 mmol substrate (2-methyl-3-butyn-2-ol); Ag/WSNC-3, Ag was 0.1 mol% based on substrate; DBU, 1.0 mmol; CO_2 1 MPa; CH_3CN, 3 mL; 30 °C, 12 h. [b] Determined by ^{1}H NMR. [c] TOF = [mol product obtained]/[(total mol metal) × (reaction time)]. [d] CO_2 1 atm. [e] 40 °C. [f] 50 °C. [g] 60 °C. [f] Flue gas (10% CO_2, 90% N_2) instead of pure CO_2.

Figure S10 to S15: ^1H and ^{13}C NMR spectra of the products of carboxylative cyclization of propargyl alcohols with CO_2.



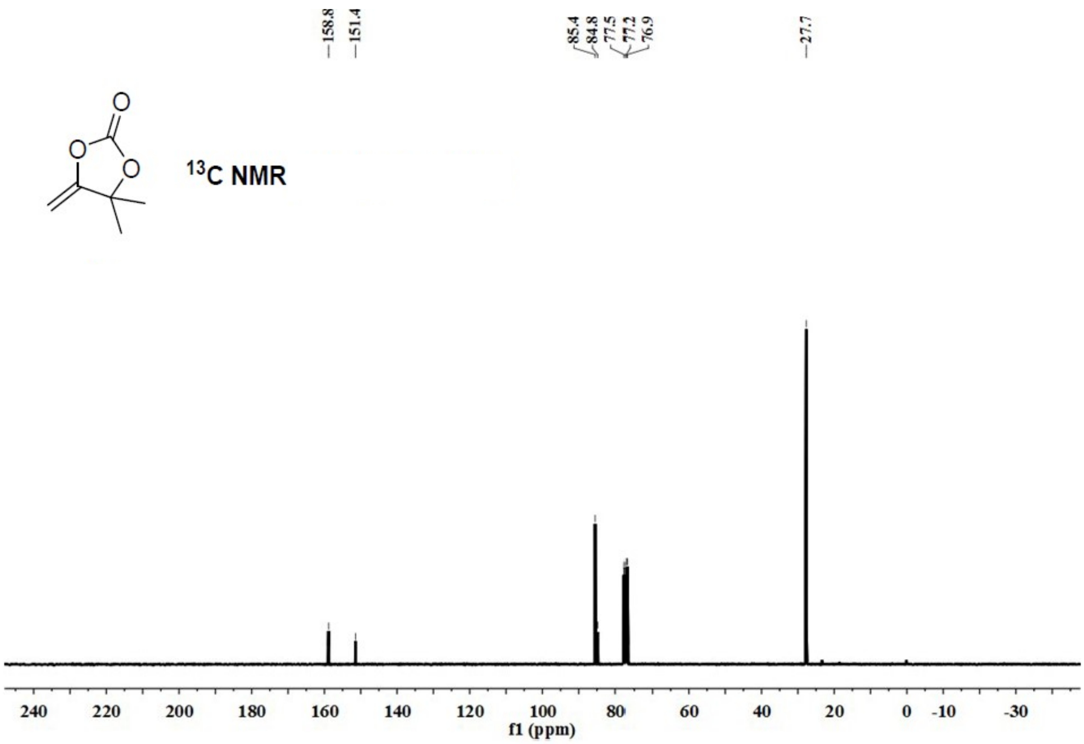
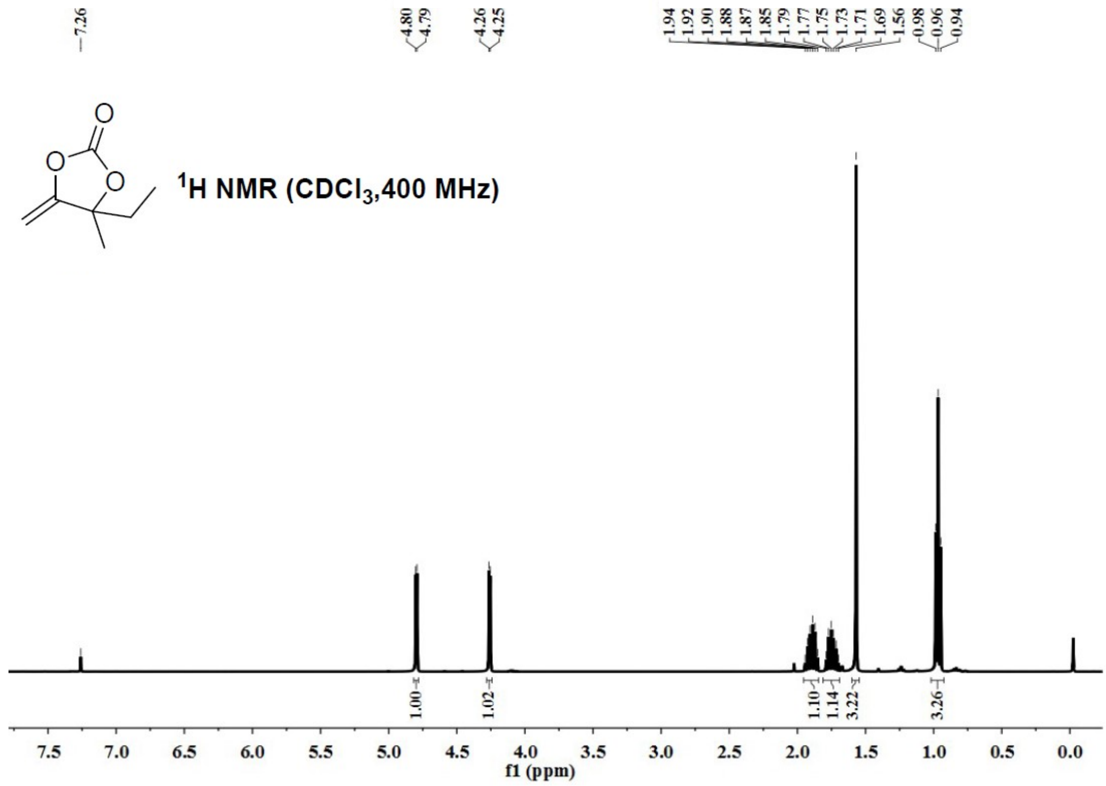


Figure S10. ^1H and ^{13}C NMR spectra of the 4,4-dimethyl-5-methylene-1,3-dioxolan-2-one



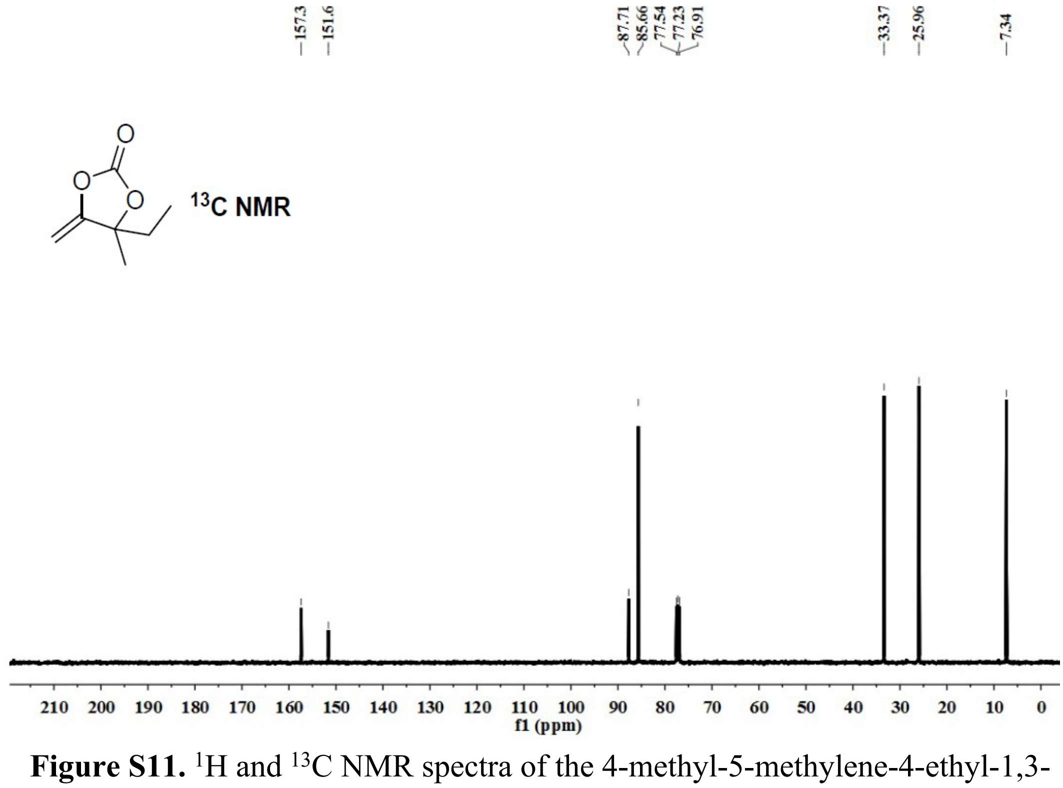
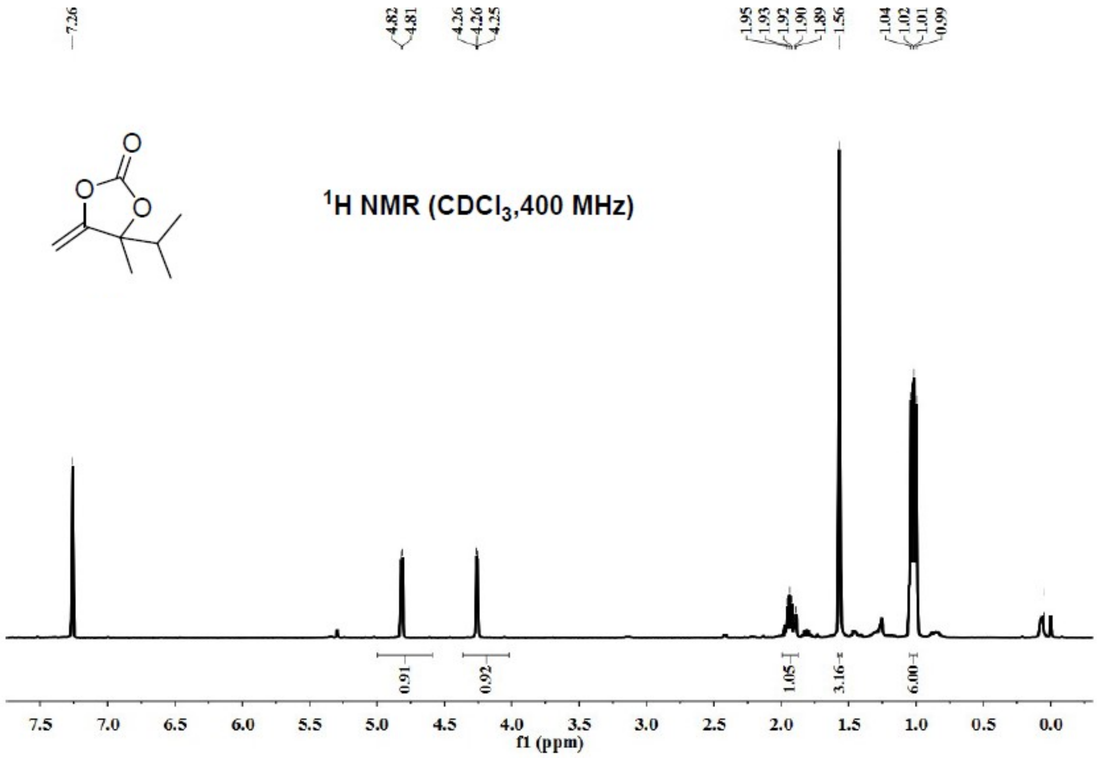


Figure S11. ^{1}H and ^{13}C NMR spectra of the 4-methyl-5-methylene-4-ethyl-1,3-dioxolan-2-one



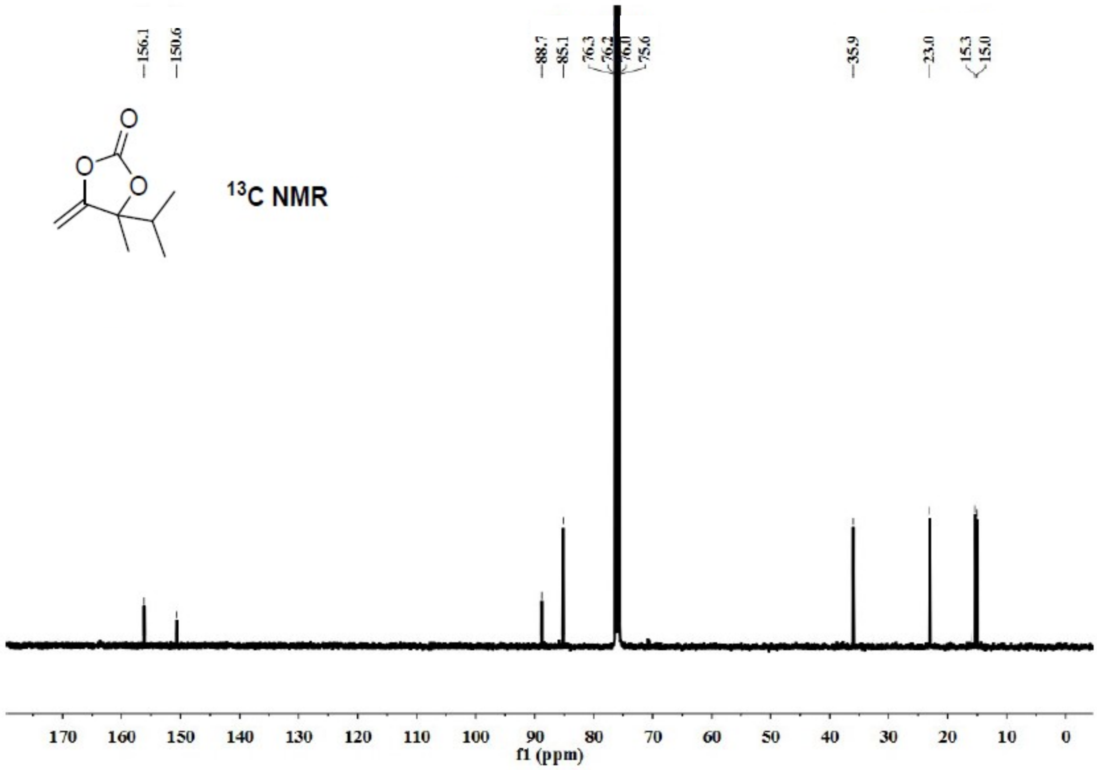
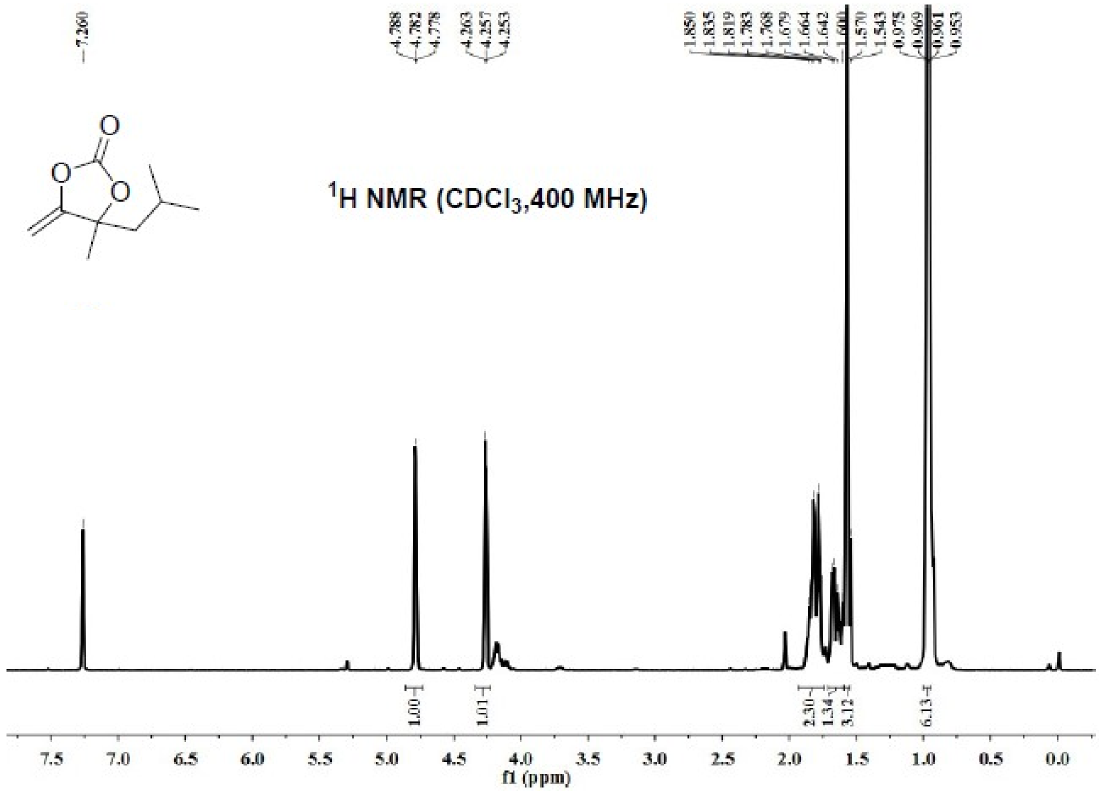


Figure S12. ^{1}H and ^{13}C NMR spectra of the 4-methyl-5-methylene-4- isopropyl-1,3-dioxolan-2-one



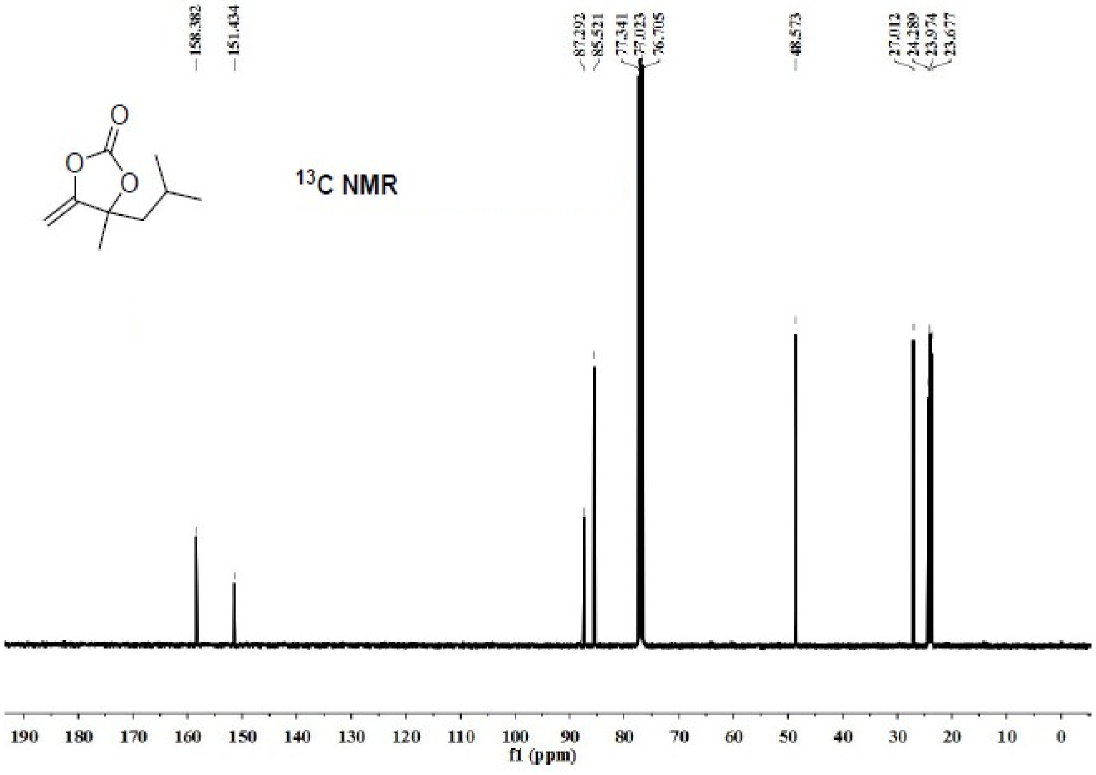


Figure S13. ^{1}H and ^{13}C NMR spectra of the 4-methyl-5-methylene-4- isobutyl-1,3-dioxolan-2-one

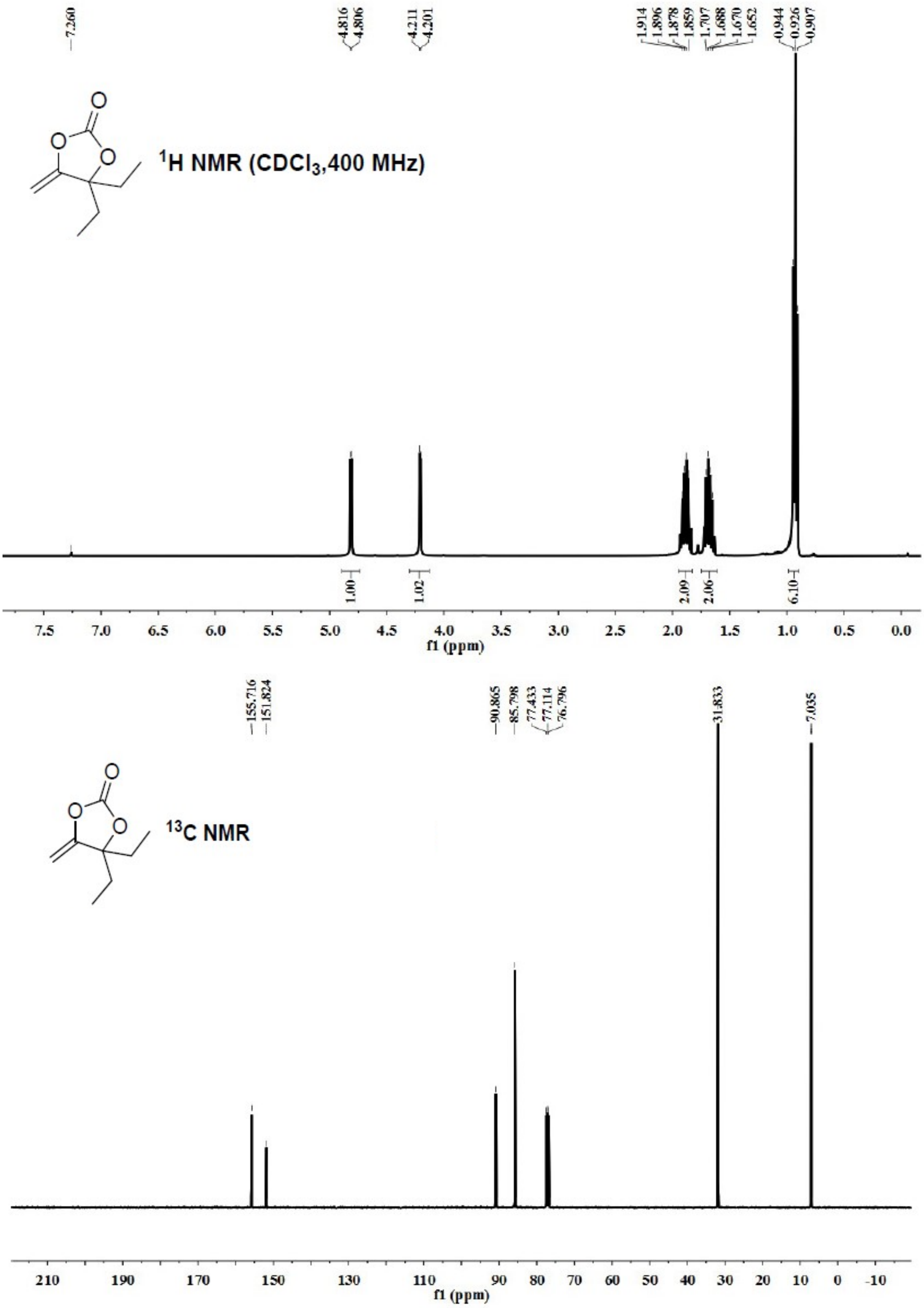
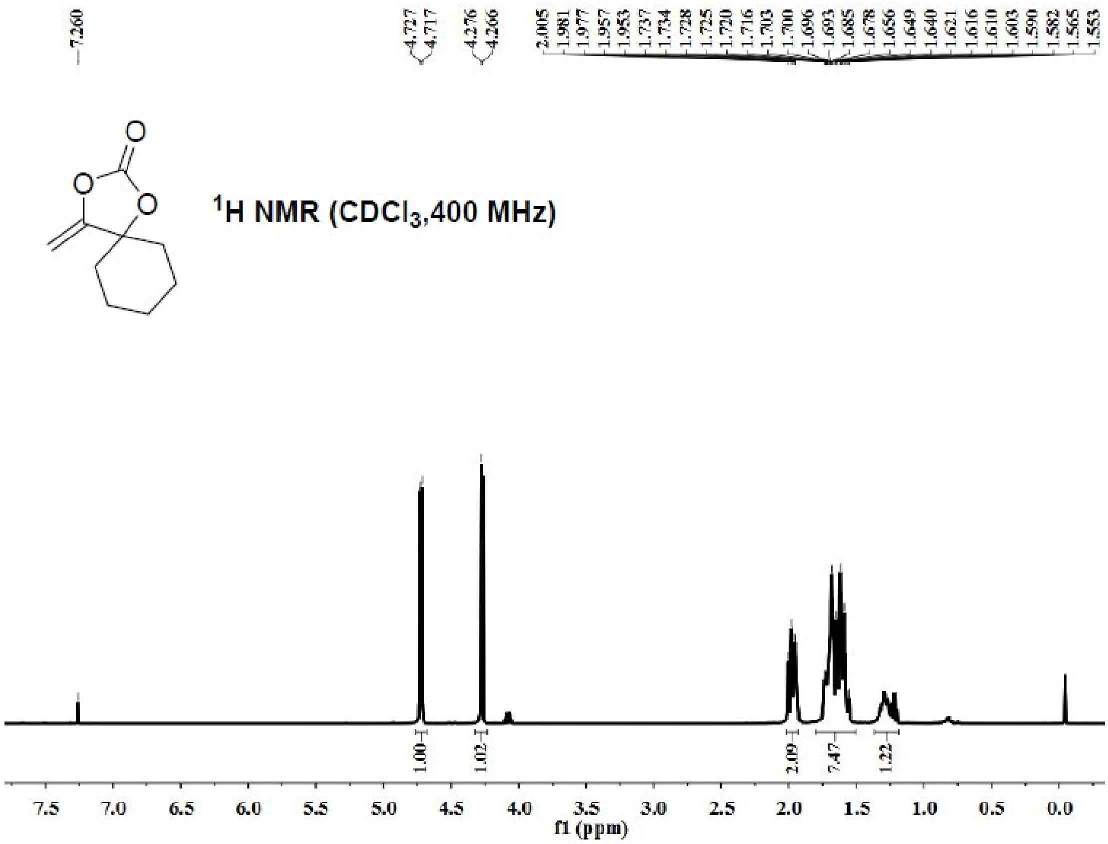


Figure S14. ^{1}H and ^{13}C NMR spectra of the 4-diethyl-5-methylene-1,3-dioxolan-2-one



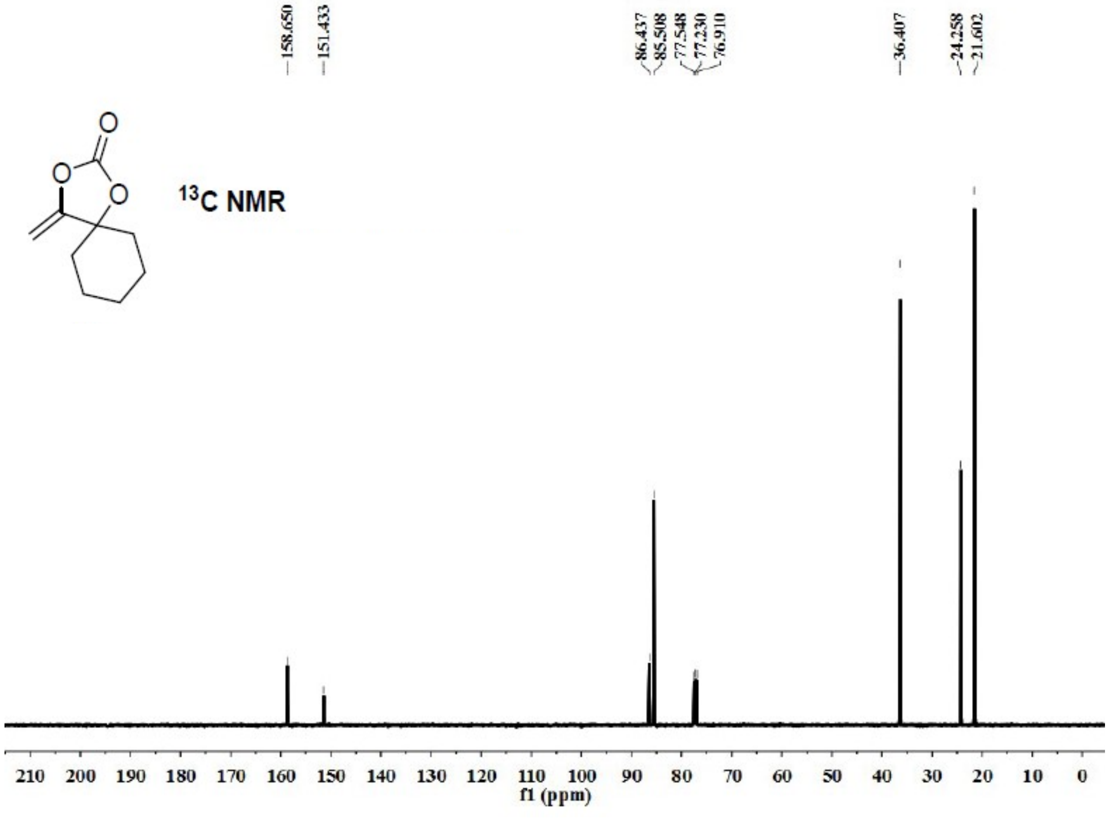


Figure S15. ^{1}H and ^{13}C NMR spectra of the 4-cyclohexyl-5-methylene-1,3-dioxolan-2-one