Supplementary Information

CO_2 fixation at atmospheric pressure: porous $ZnSnO_3$ nanocrystals as highly efficient catalyst for synthesis of cyclic carbonates

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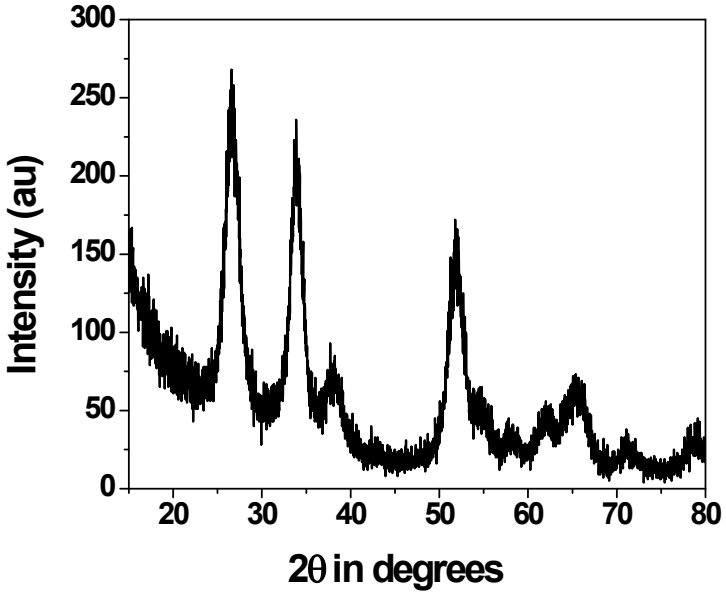


Figure S1. Wide angle powder XRD pattern of meso-SnO_2

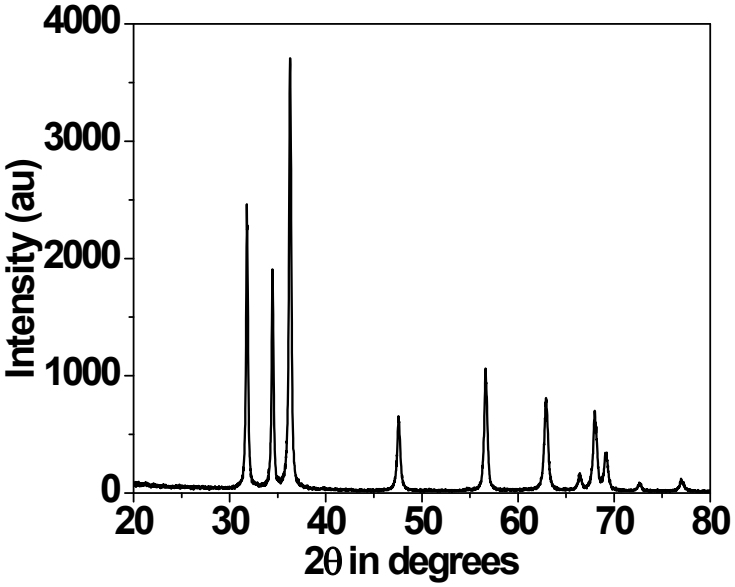


Figure S2. Wide angle powder XRD pattern of meso-ZnO

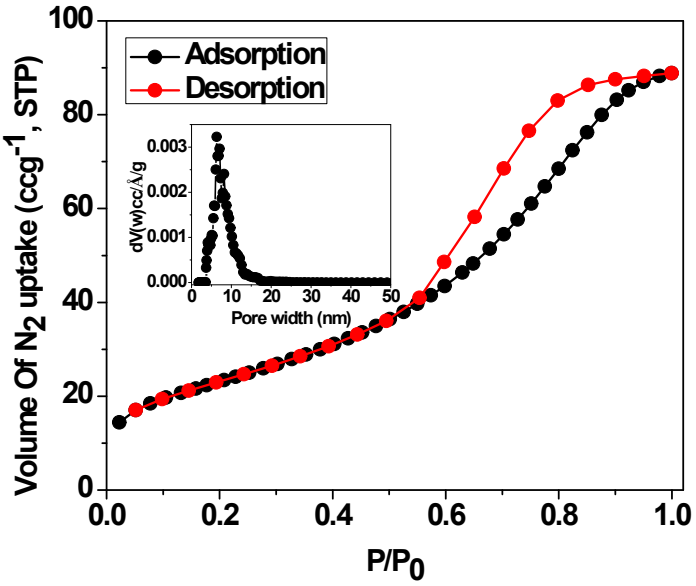


Figure S3. N_2 adsorption-desorption isotherm of the meso SnO_2. Pore size distribution (PSD) is shown in the inset of the figure employing NLDFT model.

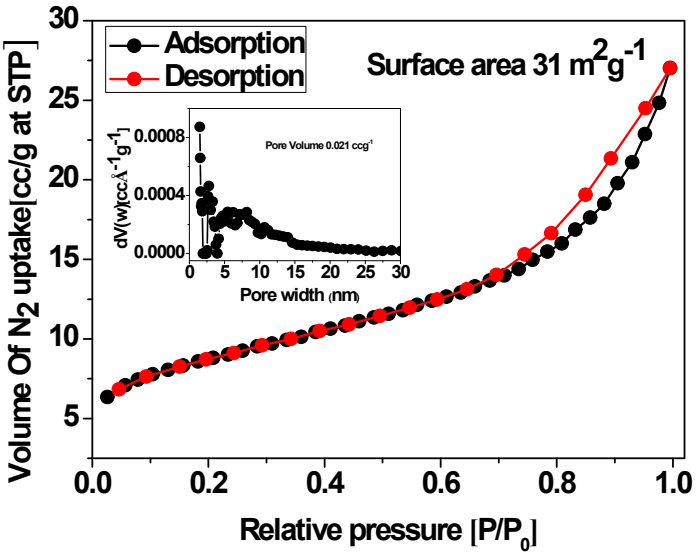


Figure S4. N_2 adsorption-desorption isotherm of the meso ZnO. Pore size distribution (PSD) is shown in the inset of the figure employing NLDFT model.

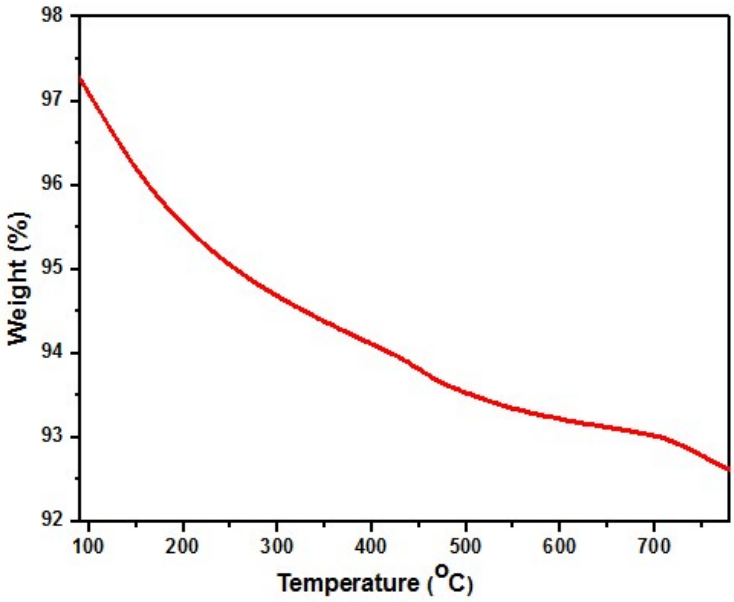


Figure S5. TGA profile of MZS-1 catalyst.

Analytical Data of Synthesized Cyclic carbonates

4-phenyl-1,3-dioxolan-2-one (Table 2, entry 1)

White solid, ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.28 (t, *J* = 8.4 Hz, 1H), 4.73 (t, *J* = 8.4 Hz, 1H), 5.61 (t, *J* = 8.0 Hz, 1H), 7.28-7.30 (m, 2H), 7.33-7.41 (m, 3H) ppm.; ^{13}C NMR (100.0 MHz, $CDCl_3$) δ 71.2, 77.8, 125.8, 129.1, 129.7, 135.8, 154.9 ppm

4-(phenoxymethyl)-1,3-dioxolan-2-one (Table 2, entry 2)

White solid. ^{1}H NMR (400 MHz, $CDCl_3$): δ 4.18 (dd, *J* = 11.2, 4.8 Hz, 1H), 4.26 (dd, *J*= 11.4, 2.8 Hz, 1H), 4.36-4.39 (m, 1H), 4.62 (t, *J* = 8.1 Hz, 1H), 5.12-5.16 (m, 1H), 6.93-6.98 (m, 3H), 7.28-7.32 (m, 2H) ppm; ^{13}C NMR (100.0 MHz, $CDCl_3$) δ 66.0, 67.3, 74.8, 114.6, 121.2, 129.5, 154.8, 157.9 ppm.

4-(isopropoxymethyl)-1,3-dioxolan-2-one (Table 2, entry 3)

Yellow liquid; ^{1}H NMR (400 MHz, $CDCl_3$) δ1.57 (d, *J* = 5.6 Hz, 6 H), 3.59-3.68 (m, 3 H), 4.36-4.41 (m, 1H), 4.47 (t, *J* = 8.5 Hz, 1 **H),** 4.76-4.80 (m, 1 H); ^{13}C NMR (100.6 MHz, CDCl3) δ 21.5, 21.6, 66.2, 66.9, 72.7, 75.1, 155.0.

4-methyl-1,3-dioxolan-2-one (Table 2, entry 4)

Yellowish oil, ^{1}H NMR (400 MHz, $CDCl_3$) δ 1.50 (d, *J* = 6.4 Hz, 1 H), 4.02-4.06 (m, 1 H), 4.57 (t, *J* = 8.4 Hz, 1 H), 4.83-4.91 (m, 1 H) ppm.; ^{13}C NMR (100 MHz, CDCl3) δ 19.4, 70.6, 73.5, 155.0 ppm.

2-(allyloxymethyl)oxirane (Table 2, entry 5)

Colourless liquid; ^{1}H NMR (500 MHz, $CDCl_3$) δ 3.58-3.70 (m, 2 H), 4.03-4.05 (m, 2 H), 4.36-4.40 (m, 1H), 4.49 (t, *J* = 8 Hz, 1 H), 4.78-4.84 (m, 2H), 5.80-5.89 (m, 2H) ppm.; ^{13}C NMR (125 MHz, CDCl3) δ 66.4, 68.9, 72.7, 75.1, 118.0, 133.7, 155.0 ppm.

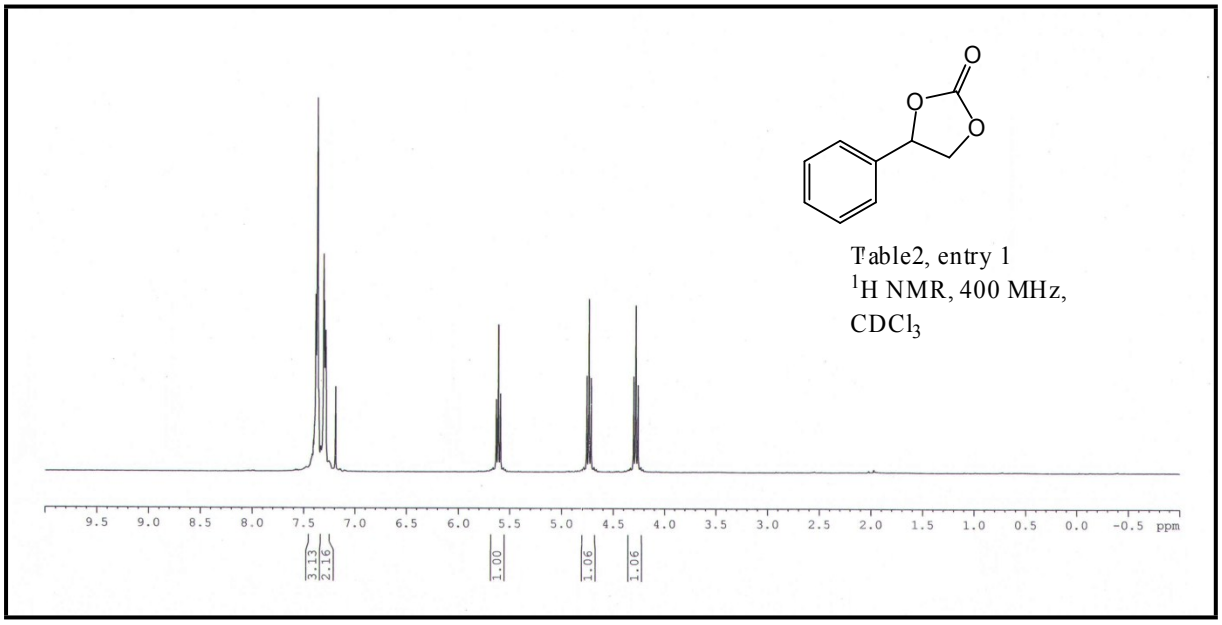
4-(Hydroxymethyl)-1,3-dioxolan-2-one (Table 2, entry 6)

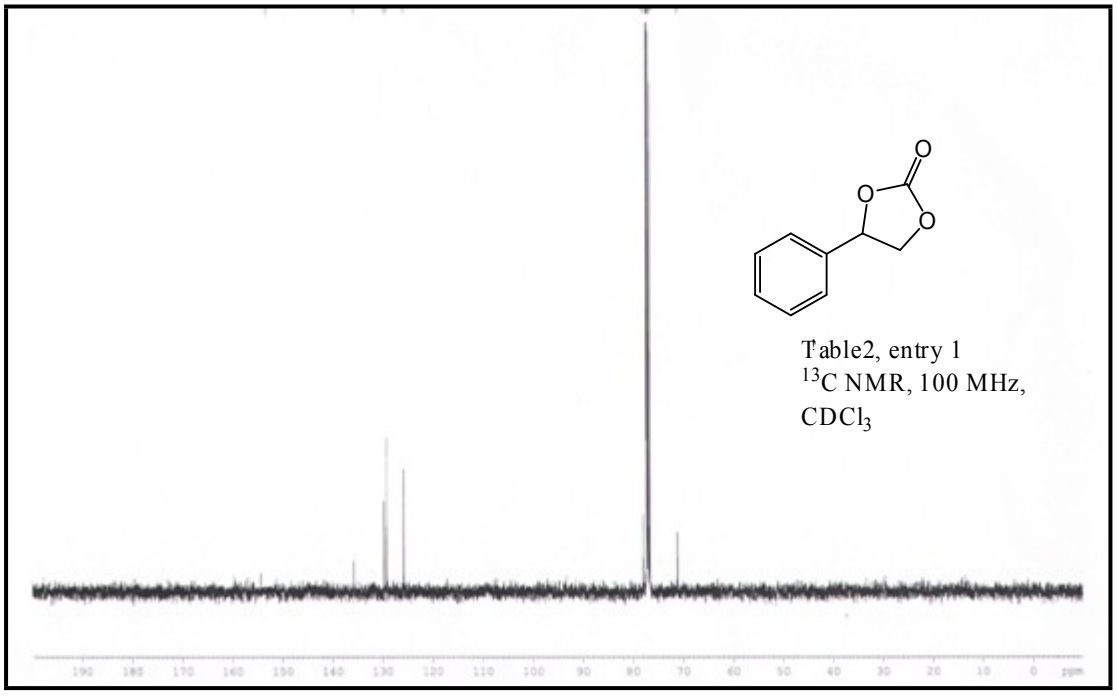
^{1}H NMR (400 MHz, CDCl3) δ 4.81 (m, 1 H), 4.59 – 4.43 (m, 2 H), 4.00 (ddd, *J* = 12.8, 5.0, 2.9 Hz, 1 H), 3.72 (ddd, *J* = 12.8, 6.6, 3.4 Hz, 1 H), 2.80 (br s, 1 H) ppm. **^{13}C NMR** (75 MHz, CDCl3) δ 156.0, 76.7, 65.8, 61.0 ppm.

4-(chloromethyl)-1,3-dioxolan-2-one (Table 2, entry 7)

Yellowish oil, ^{1}H NMR (400 MHz, $CDCl_3$) δ 3.70 (dd, *J* = 12.2, 3.6 Hz, 1H), 3.79 (dd, *J* = 12.2, 4.8 Hz, 1H), 4.36-4.40 (m, 1 H), 4.57 (t, *J* = 8.4 Hz, 1 H), 4.95-5.0 (m, 1H) ppm.; ^{13C} NMR (100 MHz, CDCl3) δ 43.9, 67.0, 74.4, 154.8 ppm.

Scan copies of ^{1}H and ^{13}C NMR Spectra





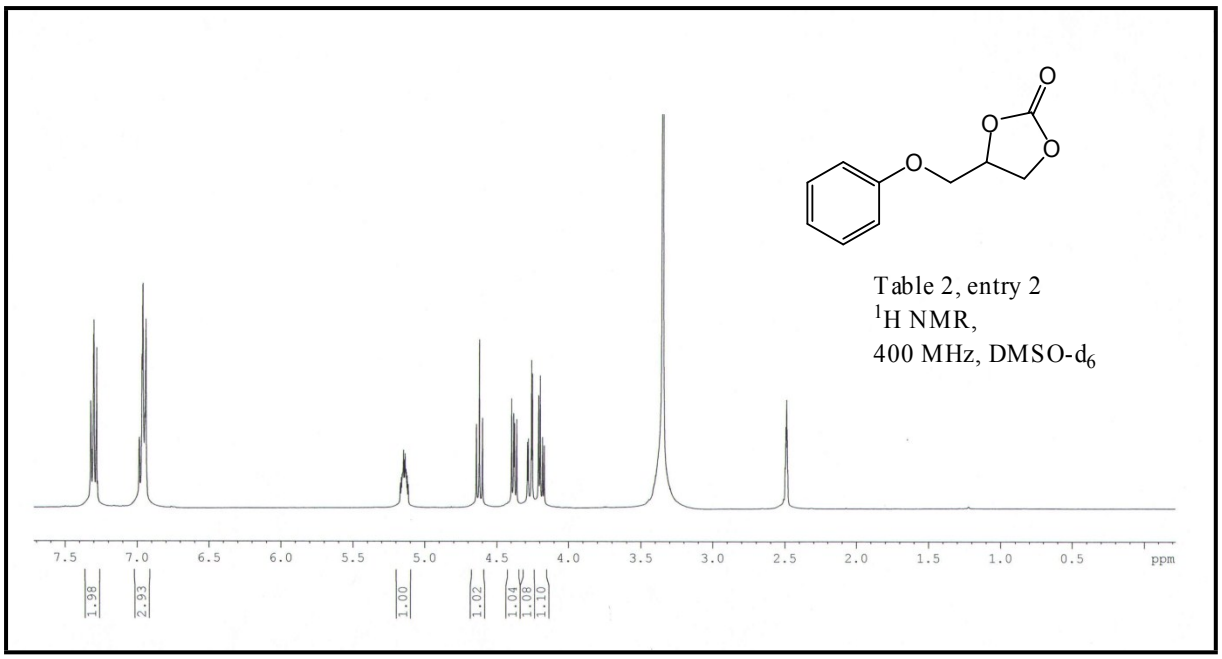


Table 2, entry 2
^{1}H NMR,
400 MHz, DMSO-d_6

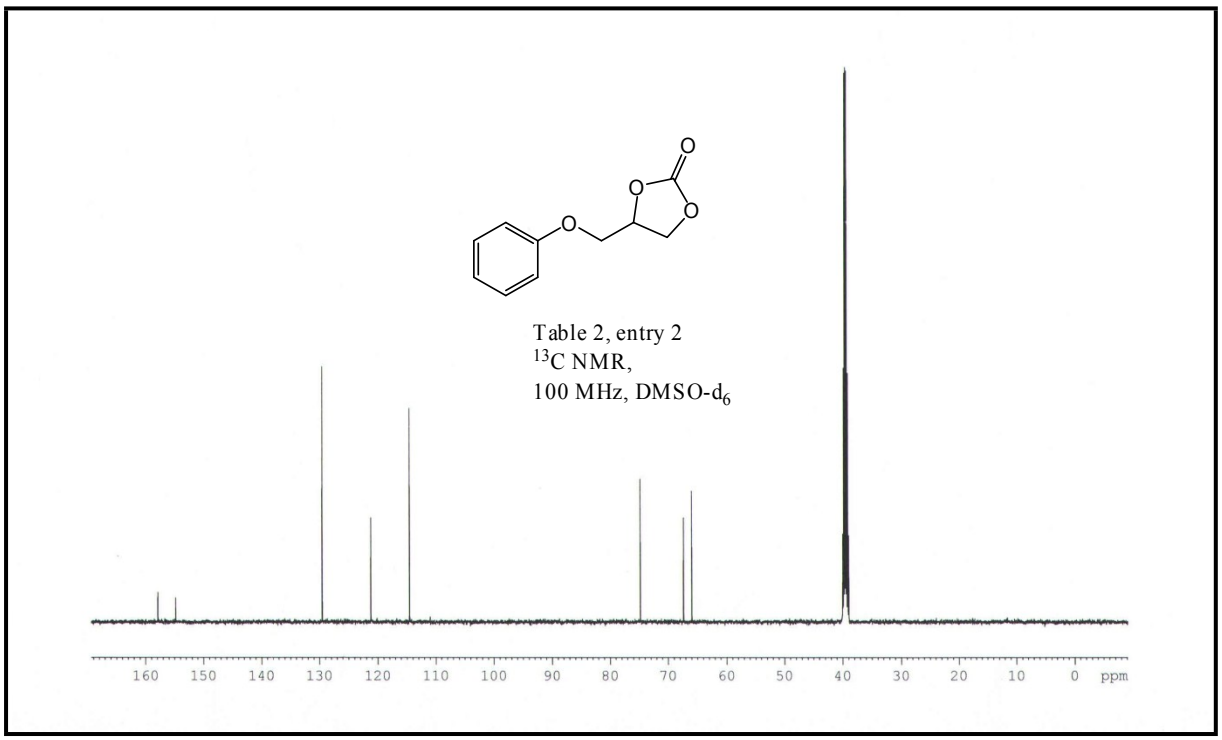


Table 2, entry 2
^{13}C NMR,
100 MHz, DMSO-d_6

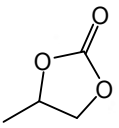


Table 2, entry 4
^{1}H NMR,
400 MHz, $CDCl_3$

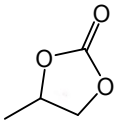
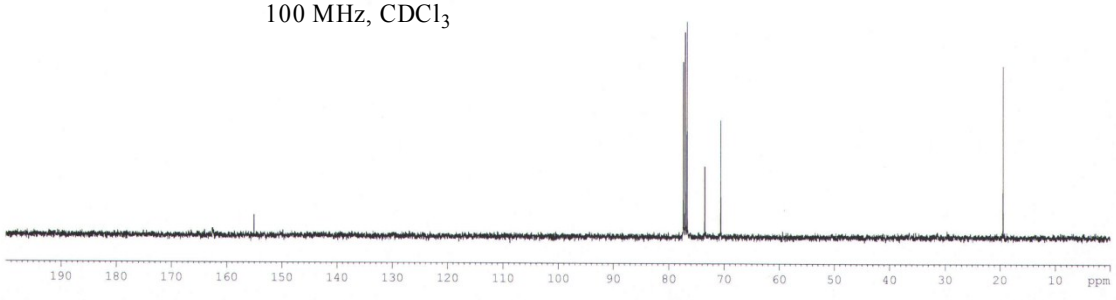


Table 2, entry 4
^{13}C NMR,
100 MHz, $CDCl_3$



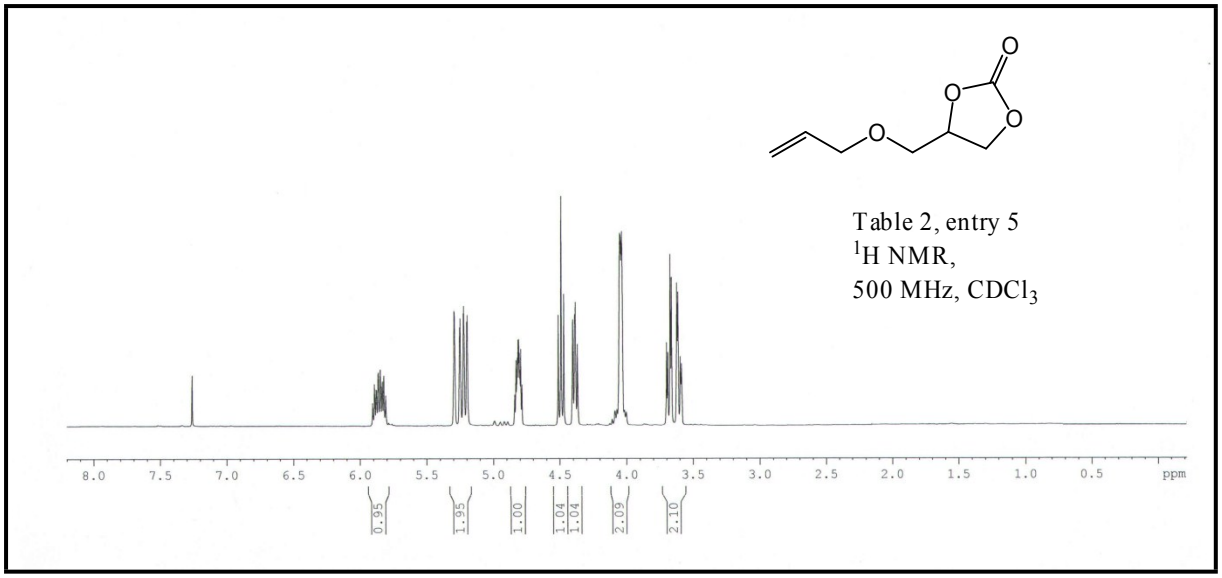


Table 2, entry 5
^{1}H NMR,
500 MHz, $CDCl_3$
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
0.95 1.95 1.00 1.04 1.04 2.09 2.10

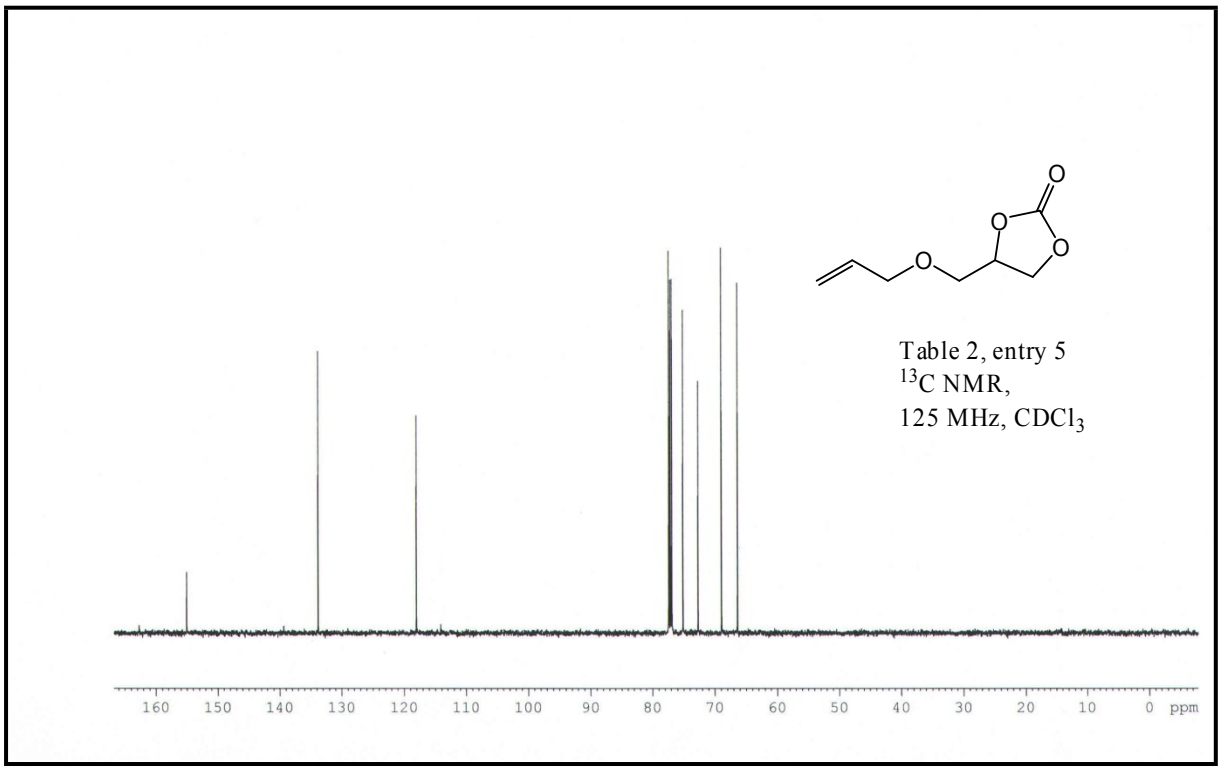


Table 2, entry 5
^{13}C NMR,
125 MHz, $CDCl_3$
160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

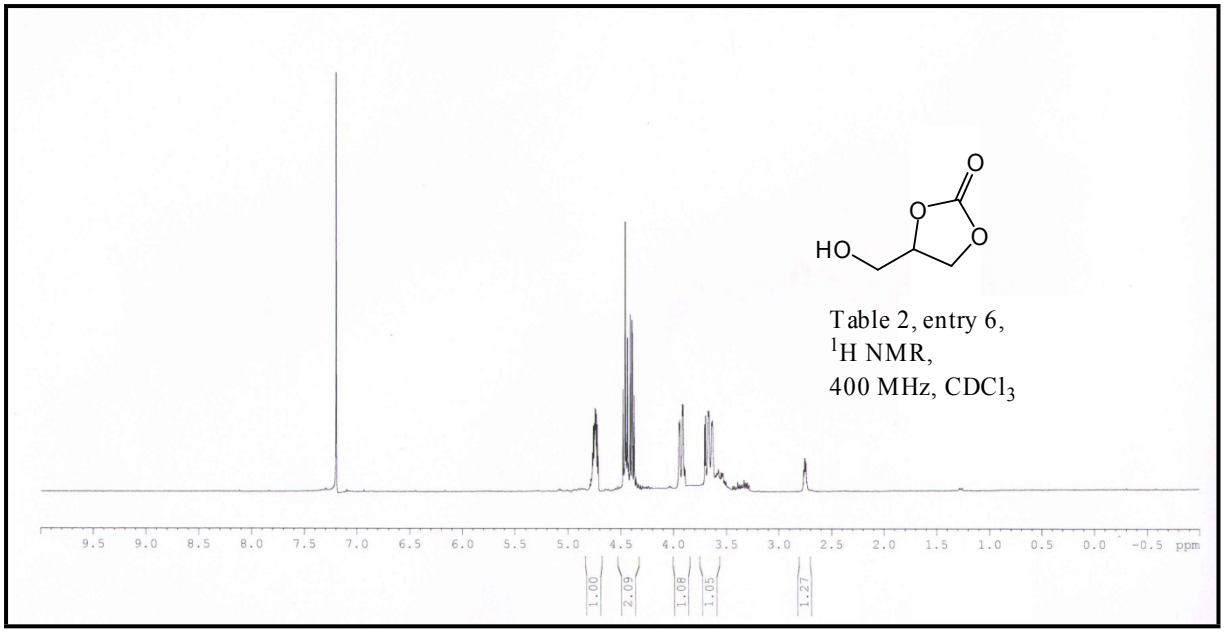


Table 2, entry 6,
^{1}H NMR,
400 MHz, $CDCl_3$

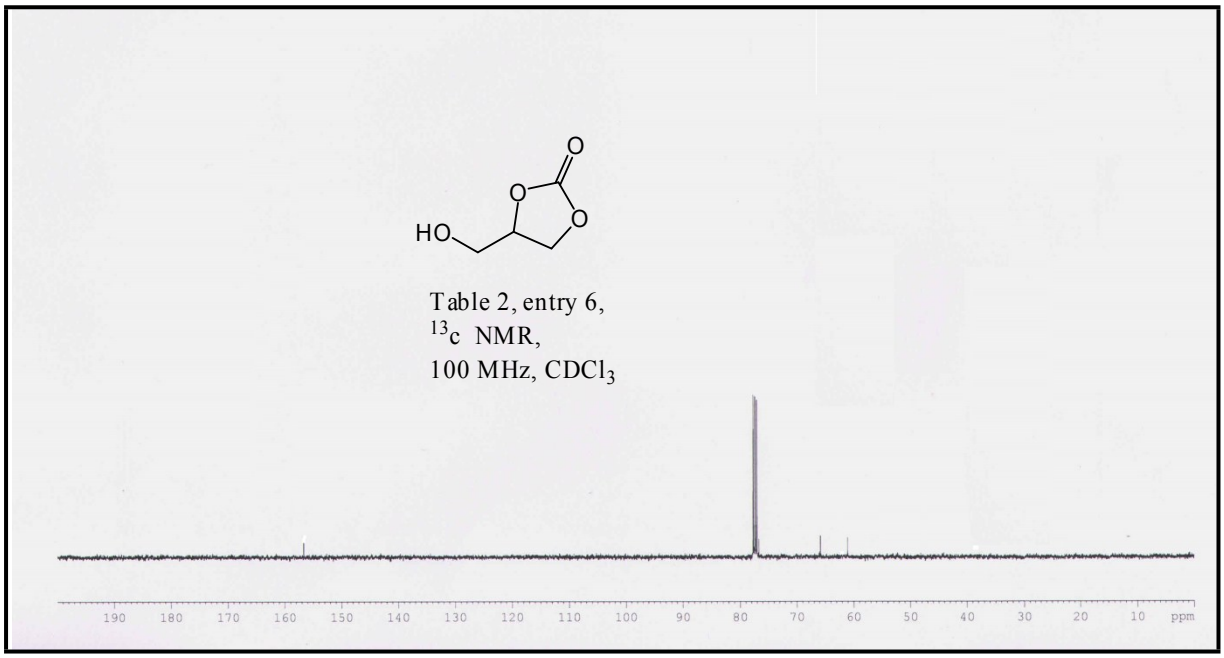


Table 2, entry 6,
^{13}c NMR,
100 MHz, $CDCl_3$

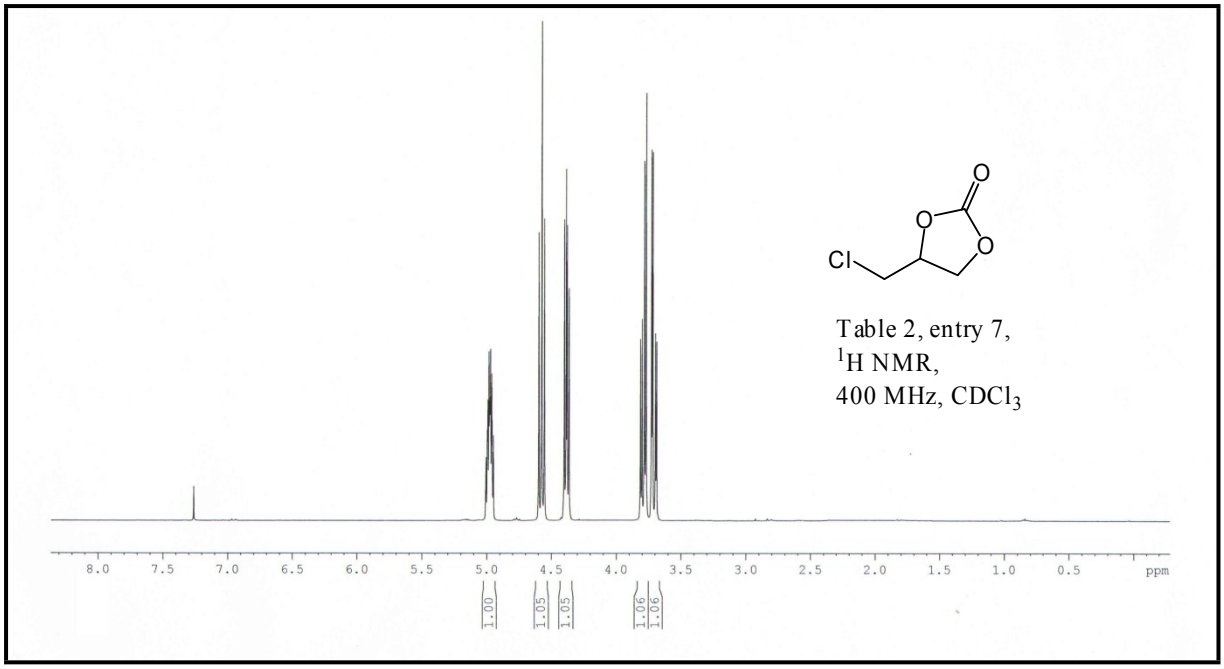


Table 2, entry 7,
^{1}H NMR,
400 MHz, $CDCl_3$

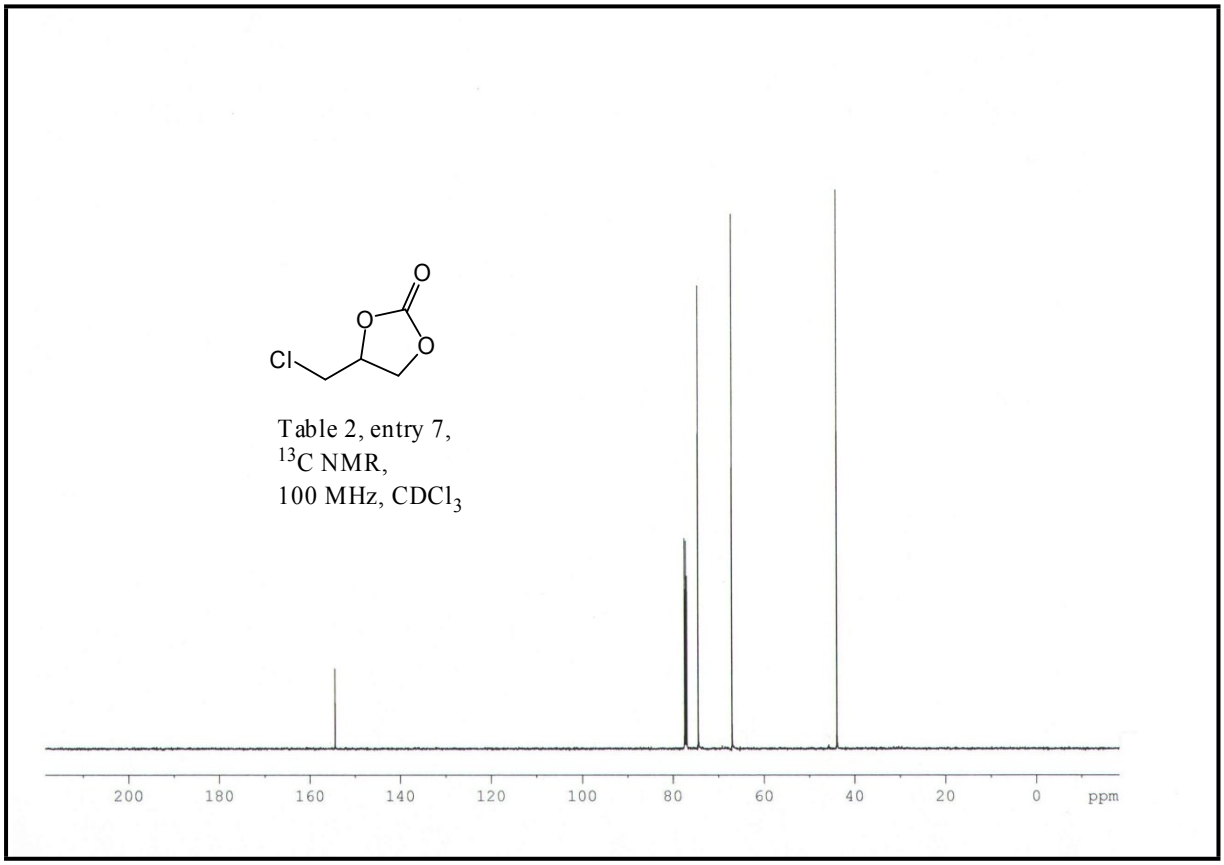


Table 2, entry 7,
^{13}C NMR,
100 MHz, $CDCl_3$