SUPPORTING INFORMATION

Propylene oxide as dehydrating agent: Potassium carbonate-catalyzed carboxylative cyclization of propylene glycol with CO_2 in polyethylene glycol/CO_2 biphasic system

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General Information.

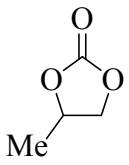
Alcohols, epoxides and PEGs used in experiments were purchased from Aladdin. PG was dried with Na_2SO_4, then decanted and distilled it under reduced pressure. Additionally, PEGs were dried in vacuum oven at 80 ^oC for two days and all the catalysts were dried in vacuum conditions at 150 ^oC for 4 h. CO_2 was commercially available with a purity of 99.99%. Other reagents including diethyl ether, ethyl acetate, petroleum ether, were purchased from Tianjin Guangfu Fine Chemical Research Institute without further purification. GC analyses were performed on Shimadzu GC-2014 equipped with a capillary column (RTX-17 30 m × 0.25 μm) and a flame ionization detector. GC-MS analyses were performed on Shimadzu 2014-QP2010 SE.

NMR spectra were recorded on Bruker 400 in $CDCl_3$. ^1H and ^{13}C NMR chemical shifts (δ) were given in ppm relative to $CDCl_3$ (7.26 ppm and 77.0 ppm).

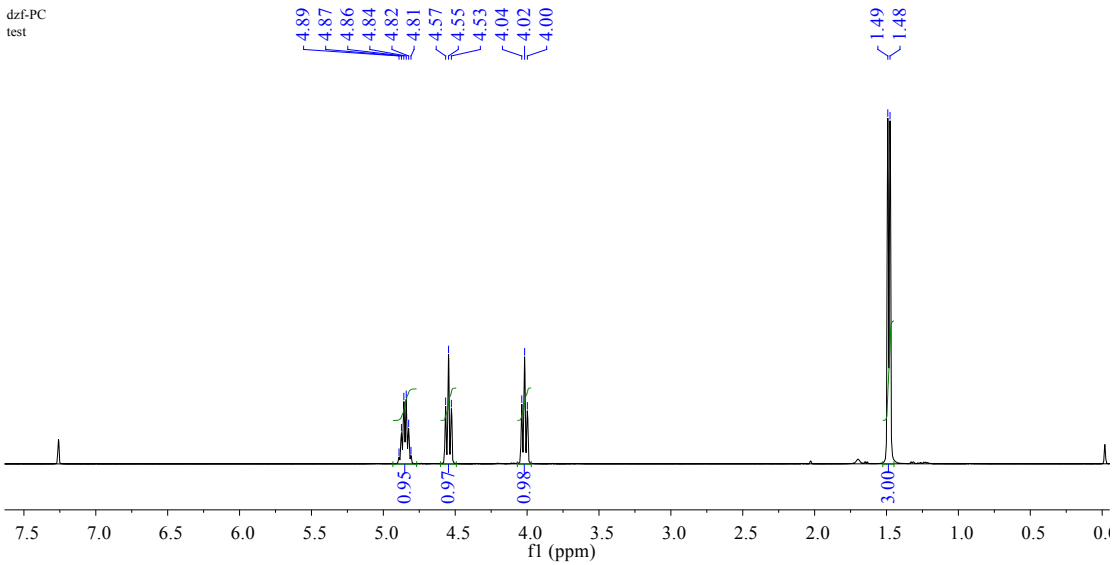
General Procedure for K_2CO_3-Promoted PC Synthesis from PG and CO_2.

A mixture of PG (2.5 mmol), catalyst (5 mol%), epoxide (5 mmol) and PEG_{800} (0.5 mmol, 0.4 g) were placed in a 25 mL autoclave, equipped with an inner glass tube. 2 MPa of CO_2 was sequentially introduced into the autoclave and heated to the designed reaction temperature. The final pressure at the reaction temperature was regulated by introducing necessary amount of CO_2 and the mixture was stirred continuously for the designed reaction time. Then the reactor was cooled in ice water after the reaction and the CO_2 was released slowly. After depressurization, the products were extracted with diethyl ether, and analyzed by gas chromatograph using biphenyl as internal standard. The products were further identified using GC-MS by comparing retention times and fragmentation patterns with authentic samples and were also isolated by column chromatography on silica gel (200-300 mesh, ethyl acetate and petroleum ether as eluent, V/V = 1/3) and identified by NMR and MS.

4-methyl-1,3-dioxolan-2-one



Colorless oil; ^1H NMR (400 MHz, $CDCl_3$): δ = 4.93 – 4.77 (m, 1H, CH), 4.55 (t, J = 8.0 Hz, 1H, CH_2), 4.02 (t, J = 7.8 Hz, 1H, CH_2), 1.48 (d, J = 6.2 Hz, 3H, CH_3); ^{13}C NMR (101 MHz, $CDCl_3$): δ = 155.0 (C), 73.5 (CH), 70.7 (CH_2), 19.5 (CH_3). EI-MS, m/z (relative int.): 103.14 (26), $[M]^+$, 57.03 (100).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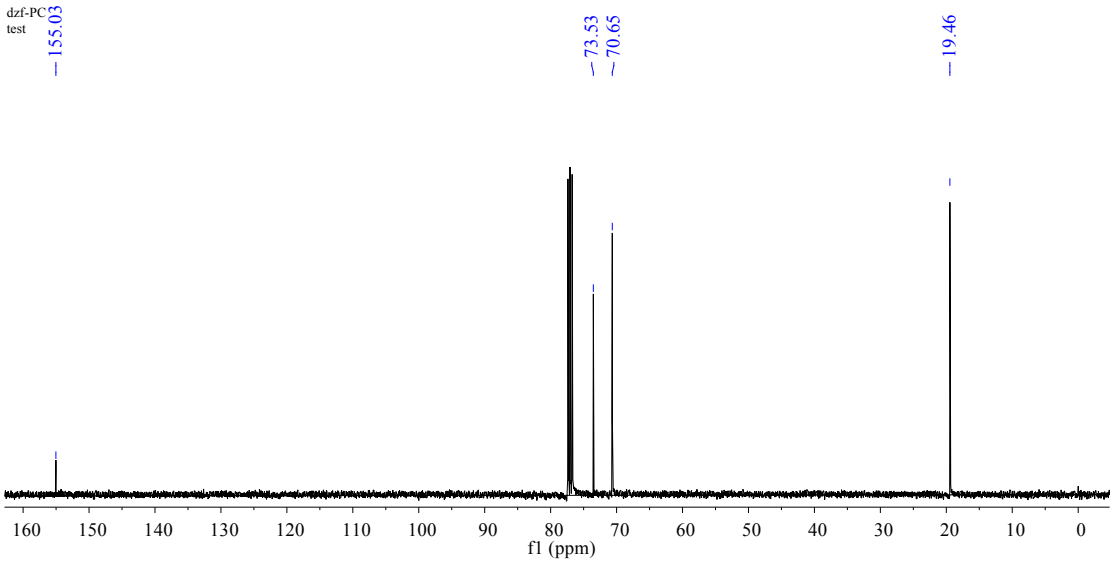
4.84
4.82
4.81
4.57
4.55
4.53
4.04
4.02
4.00
1.49
1.48
0.95
0.97
0.98
3.00
f1 (ppm)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test
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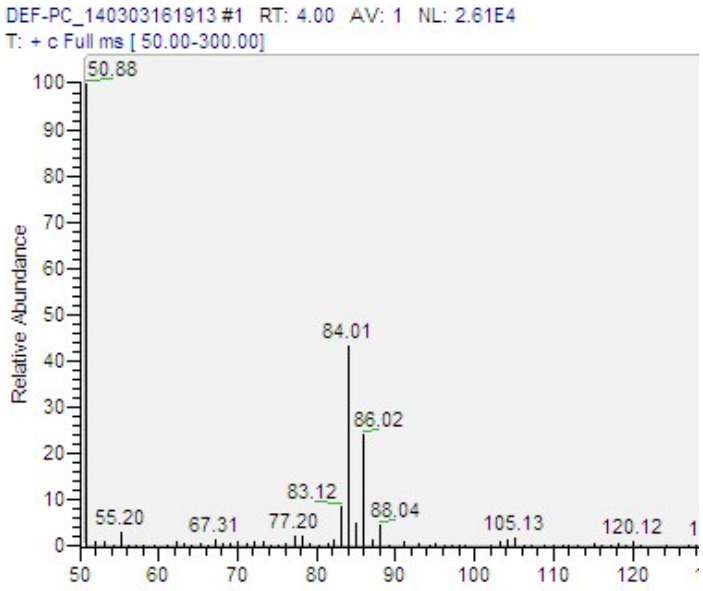
73.53
70.65
19.46
f1 (ppm)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T: + c Full ms [50.00-300.00]
Relative Abundance
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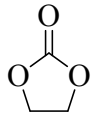
83.12
88.04
55.20
67.31
77.20
105.13
120.12

1,3-dioxolan-2-one (EC):



Colorless crystal; ^{1}H NMR (400 MHz, $CDCl_3$): δ = 4.50(s, 4H, CH2); ^{13}C NMR (101 MHz, $CDCl_3$): δ = 155.5 (C), 64.6 (CH_2).