Supplementary Information (SI) for Green Chemistry.
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Direct Synthesis of Cyclic Carbonates from Olefins and CO_2 via Ionic Liquid Catalysis with Mutual Promoting Bifunctional Groups

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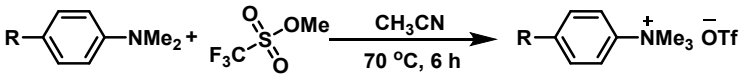
1. General information

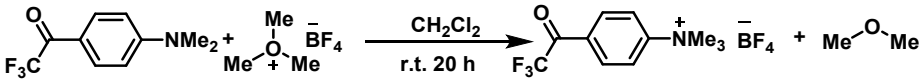
All ^{1}H NMR, $^{13}C\{^{1}H\}$ NMR and $^{19}F\{^{1}H\}$ NMR spectra were recorded in $CDCl_3$ or D_2O at room temperature on Bruker spectrometers (400 MHz). Chemical shifts were reported in parts per million (ppm), and the residual solvent peak was used as an internal reference: proton ($CDCl_3$: δ 7.26, D_2O: δ 4.79), carbon ($CDCl_3$: δ 77.10) or tetramethylsilane (TMS: δ 0.00) was used as a reference. Multiplicity was indicated as follows: s (singlet), d (doublet), t (triplet), q(quartet), m (multiplet), dd (doublet of doublet). Coupling constants were reported in Hertz (Hz). High-resolution mass spectra (HRMS) analyses were recorded by ESI-HRMS on a Q-TOF (time-of-flight) mass spectrometer. Unless otherwise noted, all GC analyses were carried out on a Shimadzu GC-2014C gas chromatograph using a KB-5 column (30 m × 0.53 mm × 1 μm) with FID detector.

All the substrates and solvents for the synthesis of compounds were purchased from commercial sources (Aladdin, Bidepharm, Macklin) and used as received without any further purification.

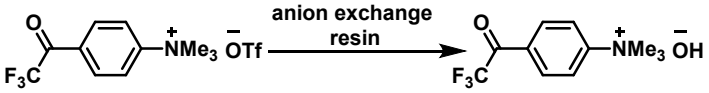
2. Synthesis of ionic liquids

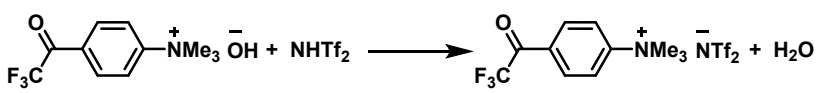


[TMTFABA]OTf and [PTMA]OTf were synthesized according to the literature procedure.[1] To a stirred solution of dimethylaniline (1 mmol, 1 eq.) in CH_3CN (1 mL) was added dropwise methyl trifluoro methane sulfonate (136 μL, 1.2 mmol, 1.2 eq.) at room temperature. The reaction mixture was then heated to 70 °C and stirred for 6 hours. All operations were performed in an argon atmosphere. Solvent was then removed in vacuum and the residue was washed with Et_2O. After dried under vacuum, the product was obtained as brown viscous liquid of [TMTFABA]OTf (849.3 mg, 88%) and white solid of [PTMA]OTf (523.7 mg, 92%).



[TMTFABA]BF_4 was synthesized according to the literature procedure[2]. In an argon-protected 50 mL two-neck flask, 1-[4-(dimethylamino) phenyl]-2,2,2-trifluoroethanone (217.2 mg, 1 mmol, 1 eq), and $(CH_3)_3O^+BF_4^-$ (147.9 mg, 1 mmol, 1 eq.) were added, followed by 5 mL of anhydrous dichloroethane. The mixture was stirred at room temperature for 20 hours. After the reaction, the mixture was evaporated to dryness under reduced pressure and washed with Et_2O to afford a light yellow solid (239.3 mg, 75%).

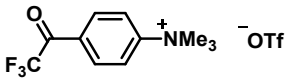




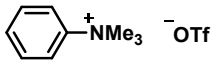
[TMTFABA]NTf_2 was synthesized via an ion exchange method. [TMTFABA]OTf (381.2 mg, 1 mmol, 1 eq) was passed through an anion exchange resin to yield an aqueous solution of

[TMTFABA]OH, which was then mixed with an aqueous solution of bis(trifluoromethane-sulfonyl) imide (309.3 mg, 1.1 mmol, 1.1 eq.). The water was removed by rotary evaporation, and the resulting solid was washed with 50 mL of Et_2O to obtain a yellow solid (425.1 mg, 83%).

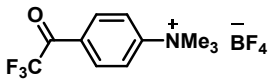
3. Structure characterization data of ionic liquids



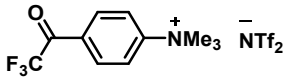
[TMTFABA]OTf: Brown viscous liquid; ^{1}H NMR (400 MHz, D_2O) δ 7.92 (s, 4H), 3.66 (s, 9H). ^{13}C{^{1}H} NMR (101 MHz, D_2O) δ 147.7, 138.9, 129.4, 122.7 (q, $^1J_{C\text{-}F}$=286.0 Hz), 119.9, 119.7(q, $^1J_{C\text{-}F}$=316.0 Hz), 92.7(q, $^2J_{C\text{-}F}$=32.6 Hz), 57.0. ^{19}F{^{1}H} NMR (376 MHz, D_2O) δ -78.93, -84.31. HRMS (ESI-MS) *m/z* calcd for $[C_{11}H_{13}F_3NO]^+$ M^+: 232.0944, found: 232.0948; *m/z* calcd for $[C_{11}H_{15}F_3NO_2]^+$ M^+: 250.1049, found: 250.1083; *m/z* calcd for $[CF_3O_3S]^-$ M^-: 148.9526, found: 148.9540.



[PTMA]OTf: White solid; m.p. 82-83 °C; ^{1}H NMR (400 MHz, D_2O) δ 7.81 (d, *J* = 8.1 Hz, 2H), 7.72-7.51 (m, 3H), 3.63 (s, 9H). ^{13}C {^{1}H} NMR (101 MHz, D_2O) δ 146.5, 130.5, 130.4, 119.7 (q, *J* = 317.4 Hz), 119.5, 56.9. ^{19}F{^{1}H} NMR (376 MHz, D_2O) δ -78.93. HRMS (ESI-MS) *m/z* calcd for $[C_9H_{14}N]^+$ M^+: 136.1121, found: 136.1119; *m/z* calcd for $[CF_3O_3S]^-$ M^-: 148.9526, found: 148.9528.

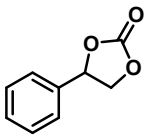


[TMTFABA]BF_4: Light yellow solid; m.p. 109-111 °C; ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.91 (m, 4H), 3.62 (s, 9H). ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 147.7, 140.5, 129.0, 123.3(q, *J*=289.9 Hz), 120.1, 92.2 (q, *J* = 31.1 Hz), 56.4. ^{19}F{^{1}H} NMR (376 MHz, DMSO-d_6) δ -82.78, -148.16. HRMS (ESI-MS) *m/z* calcd for $[C_{11}H_{13}F_3NO]^+$ M^+: 232.0944, found: 232.0940; *m/z* calcd for $[C_{11}H_{15}F_3NO_2]^+$ M^+: 250.1049, found: 250.1058; *m/z* calcd for $[BF_4]^-$ M^-: 87.0035, found: 87.0033.

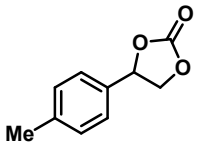


[TMTFABA]NTf_2: Yellow solid; m.p. 145-146 °C ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.12 (d, J = 9.0 Hz, 2H), 8.06 (d, J = 9.1 Hz, 2H), 3.63 (s, 9H). ^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) δ 166.2, 149.7, 130.7, 128.9, 120.8,120.0, 119.5(q, *J*=320.0 Hz) , 56.4. ^{19}F{^{1}H} NMR (376 MHz, DMSO-d_6) δ -78.72, -82.78. HRMS (ESI-MS) *m/z* calcd for $[C_{11}H_{13}F_3NO]^+$ M^+: 232.0944, found: 232.1026; *m/z* calcd for $[C_{11}H_{15}F_3NO_2]^+$ M^+: 250.1049, found: 250.1069; *m/z* calcd for $[C_2F_6NO_4S_2]^-$ M^-: 279.9178, found: 279.9179.

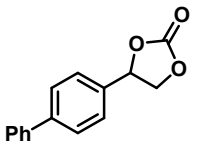
4. Structure characterization data of cyclic carbonates



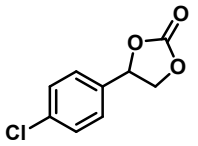
4-phenyl-1,3-dioxolan-2-one (4a): Light yellow solid; m.p. 51-53 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.51-7.30 (m, 5H), 5.68 (t, *J* = 8.0 Hz, 1H), 4.80 (t, *J* = 8.4 Hz, 1H), 4.34 (t, *J* = 8.2 Hz, 1H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 154.9, 135.9, 129.8, 129.3, 125.9, 78.1, 71.2. HRMS (ESI) *m/z* calcd for $C_9H_8O_3$ [M+H]$^+$: 156.0546, found: 156.0539.



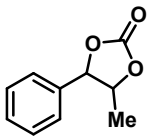
4-(4-methylphenyl)-1,3-dioxolan-2-one (4b): White solid; m.p. 40-41 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.25 (m, 4H), 5.64 (t, *J* = 8.0 Hz, 1H), 4.77 (t, *J* = 8.4 Hz, 1H), 4.33 (t, *J* = 8.3 Hz, 1H), 2.38 (s, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 155.0, 140.0, 132.8, 129.9, 126.1, 78.2, 71.2, 21.3. HRMS (ESI) *m/z* calcd for $C_{10}H_{10}O_3$ [M+Na]$^+$: 201.0522, found: 201.0517.



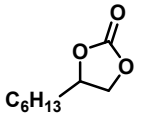
4-[1,1'-biphenyl]-4-yl-1,3-dioxolan-2-one (4c): White solid; m.p. 175-176 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 (d, *J* = 8.1 Hz, 2H), 7.59 (d, *J* = 7.4 Hz, 2H), 7.51-7.35 (m, 5H), 5.72 (t, *J* = 8.0 Hz, 1H), 4.83 (t, *J* = 8.4 Hz, 1H), 4.39 (t, *J* = 8.2 Hz, 1H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 154.9, 142.9, 140.1, 134.7, 129.0, 128.0, 128.0, 127.2, 126.5, 78.0, 71.2. HRMS (ESI) *m/z* calcd for $C_{15}H_{12}O_3$ [M+H]$^+$: 241.0859, found: 241.0862.



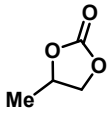
4-(4-chlorophenyl)-1,3-dioxolan-2-one (4d): White solid; m.p. 68-69 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.45 – 7.37 (m, 2H), 7.30 (d, *J* = 8.5 Hz, 2H), 5.66 (t, *J* = 8.0 Hz, 1H), 4.80 (t, *J* = 8.4 Hz, 1H), 4.34 – 4.25 (m, 1H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 154.6, 135.8, 134.3, 129.5, 127.3, 77.4, 71.0. HRMS (ESI) *m/z* calcd for $C_9H_7O_3Cl$ [M+H]$^+$:199.0157, found: 199.0146.



4-methyl-5-phenyl-1,3-dioxolan-2-one (4e): White solid; m.p. 112-113 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48-7.39 (m, 3H), 7.39-7.32 (m, 2H), 5.13 (d, *J* = 8.0 Hz, 1H), 4.60 (dq, *J* = 7.8, 6.2 Hz, 1H), 1.55 (d, *J* = 6.2 Hz, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 154.3, 135.1, 129.8, 129.2, 126.0, 84.9, 80.8, 18.4. HRMS (ESI) *m/z* calcd for $C_{10}H_{10}O_3$ $[M+H]^+$: 201.0522, found: 201.0522.



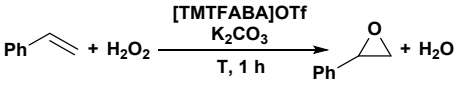
4-hexyl-1,3-dioxolan-2-one (4f): White solid; m.p. 68-69 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 4.75-4.63 (m, 1H), 4.51 (t, *J* = 8.1 Hz, 1H), 4.05 (t, *J* = 7.8 Hz, 1H), 1.86-1.74 (m, 1H), 1.66 (ddd, *J* = 14.3, 10.4, 5.1 Hz, 1H), 1.52-1.26 (m, 8H), 0.88 (t, *J* = 6.5 Hz, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 155.2, 77.1, 69.5, 33.9, 31.6, 28.8, 24.4, 22.5, 14.0. HRMS (ESI) *m/z* calcd for $C_9H_{16}O_3$ $[M+H]^+$:173.1172, found:173.1173.



1,3-dioxolan-2-one (4g): Colorless liquid; ^{1}H NMR (400 MHz, $CDCl_3$) δ 4.82 (q, *J* = 6.7 Hz, 1H), 4.52 (t, *J* = 8.0 Hz, 1H), 3.99 (t, *J* = 7.8 Hz, 1H), 1.44 (d, *J* = 5.7 Hz, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 155.0, 73.6, 70.6, 19.1. HRMS (ESI) *m/z* calcd for $C_4H_6O_3$ $[M+H]^+$:103.0390, found: 103.0389.

5. Optimization of reaction parameters

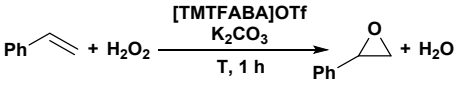
Table S1 The epoxidation reaction with different solvents[a]



Entry	Solvent	Conv.%	Yield%
1	CH_3CN	98	95
2	MeOH	trace	trace
3	EA	trace	trace
4	DMF	trace	trace
5	t-BuOH	trace	trace
6	THF	NR	NR

[a]Reaction conditions: styrene (114 μL, 1 mmol), [TMTFABA]OTf (19.1 mg, 0.05 mmol), K_2CO_3 (13.8 mg, 0.1 mmol), 30% H_2O_2 (612 μL, 6 mmol), 80 °C, 1 h, 1 mL solvent. Quantitative analysis was conducted by gas chromatography using biphenyl as an internal standard. NR = No Reaction.

Table S2 Epoxidation reaction under different reaction parameters[a]



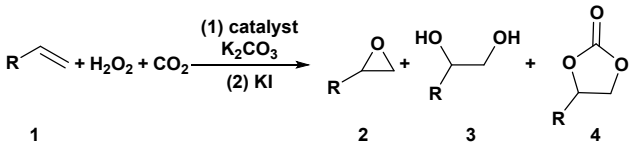
Entry	T/ °C	Conv.%	Yield%
1	80	98	95
2	r.t.	31	30
3	40	62	60
4	60	86	85
5	100	99	57
6[b]	80	72	71
7[c]	80	99	77
8[d]	80	65	63
9[e]	80	85	83
10[f]	80	35	34
11[g]	80	83	81
12[h]	80	99	86
13[i]	80	99	79

[a] Reaction conditions: [TMTFABA]OTf (19.1 mg, 0.05 mmol), K_2CO_3 (13.8 mg, 0.1 mmol), 30% H_2O_2 (612 μL, 6 mmol). Quantitative analysis was conducted by gas chromatography using biphenyl as an internal standard. [b] [TMTFABA]OTf (9.6 mg, 0.025 mmol). [c] [TMTFABA]OTf (38.1 mg, 0.1

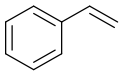
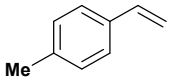
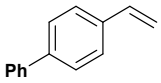
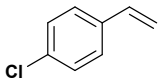
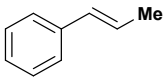
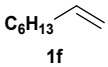
mmol). [d] K_2CO_3 (6.9 mg, 0.05 mmol). [e] K_2CO_3 (27.6 mg, 0.2 mmol). [f] 30% H_2O_2 (204 μL, 2 mmol). [g] 30% H_2O_2 (408 μL, 4 mmol). [h] 30% H_2O_2 (816 μL, 8 mmol). r.t. = room temperature. [i] Use TFAP instead of [TMTFABA]OTf.

6. Synthesis of cyclic carbonate from different olefins and CO_2

Table S3 Product selectivity of different olefins[a]



1 2 3 4

Entry	Olefins	Product selectivity %				
		1	2	3	4[c]	others[b]
1	 1a	1	2	6	86	1
2	 1b	5	2	20	60	2
3	 1c	22	4	5	62	n.d.
4[d]	 1d	52	1	8	32	3
5	 1e	1	50	1	40	1
6[d]	 1f	42	1	5	43	2
7[e]	 1g	-	n.d.	n.d.	9	n.d.

[a] Reaction conditions: Epoxidation: styrene (114 μL, 1 mmol), 30% H_2O_2 (612 μL, 0.6 mmol), [TMTFABA]OTf (19.1 mg, 0.05 mmol), K_2CO_3 (13.8 mg, 0.1 mmol), KI (16.6 mg, 0.1 mmol), CH_3CN (1 mL), 80 °C, 1 h. Cycloaddition: [TMTFABA]OTf (19.1 mg, 0.05 mmol), K_2CO_3(13.8 mg, 0.1 mmol), KI (16.6 mg, 0.1 mmol), CH_3CN (4 mL), 80 °C, 30 h, P (CO_2) =2 MPa. Quantitative analysis was conducted by gas chromatography using biphenyl as an internal standard. n.d.=not detected [b] Other byproducts contain aldehydes, ketones. [c] Isolated yield [d] [TMTFABA]OTf (38.2 mg, 0.1 mmol), K_2CO_3 (27.6 mg, 0.2 mmol). [e] The pressure of propylene was 0.5 MPa.

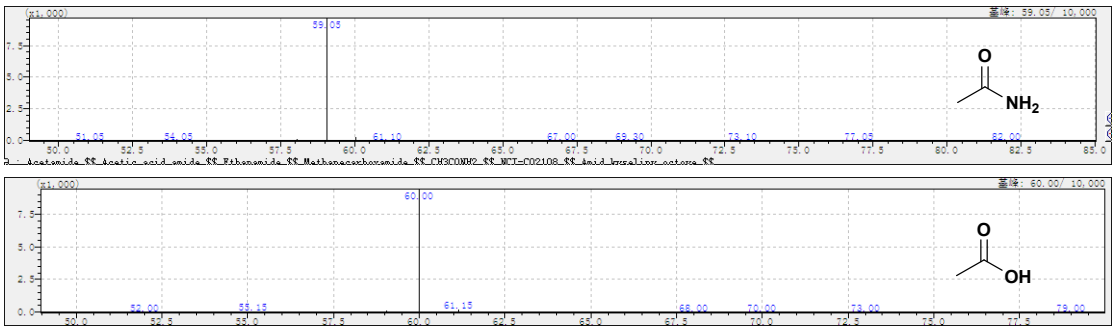


Figure S1 Mass spectra of acetamide and acetic acid from GC-MS.

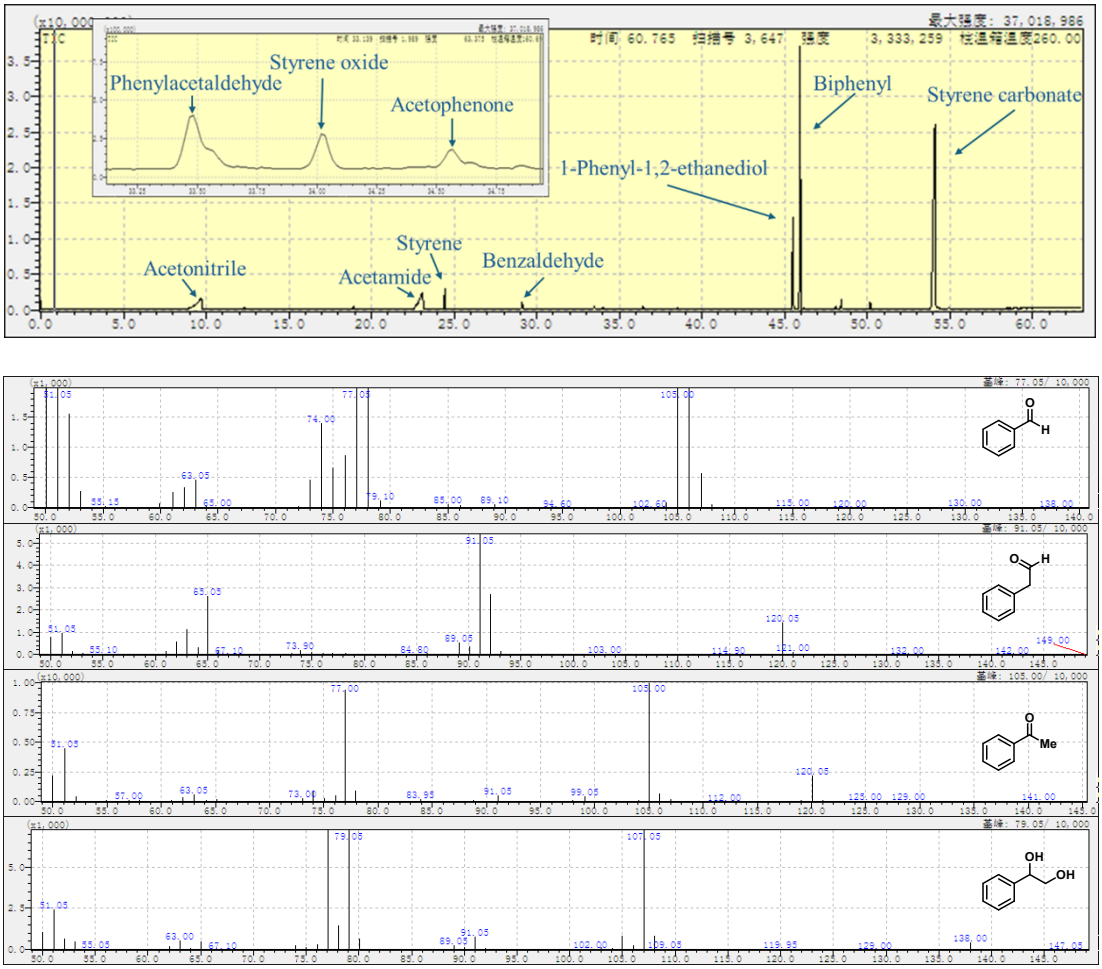
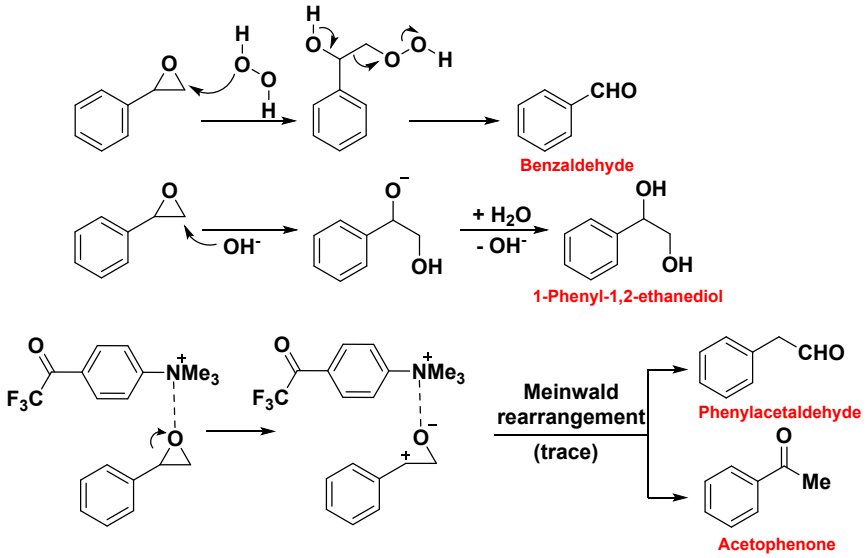
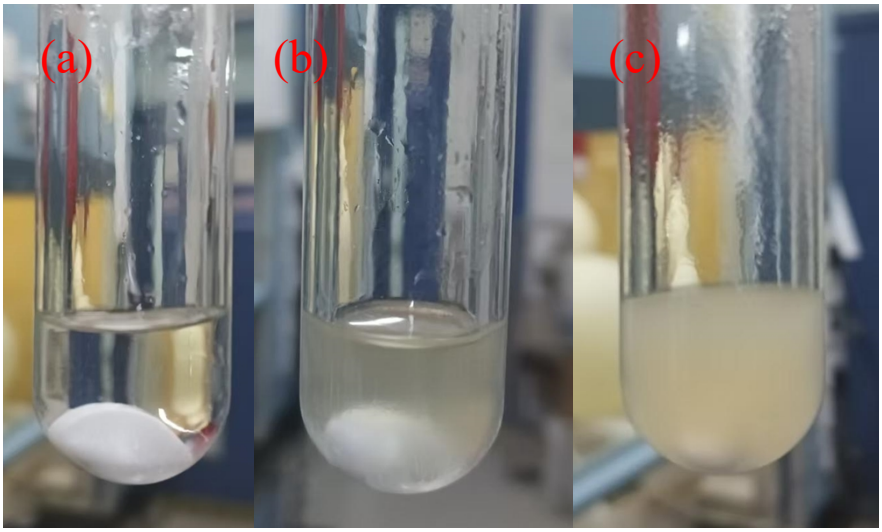


Figure S2 Characterization of by-products via GC-MS



Scheme S1 Formation mechanism of by-products

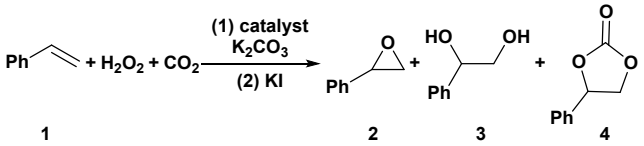


(a) [TMTFABA]OTf as the catalyst in epoxidation reaction. (b) [TMTFABA]BF_4 as the catalyst in epoxidation reaction. (c) [TMTFABA]NTf_2 as the catalyst in epoxidation reaction.

Figure S3 Epoxidation reaction with different catalysts

7. Mechanistic investigations

Table S4 Control experiments[a]



1 2 3 4

Entry	Variation from standard conditions	Product selectivity %				
		1	2	3	4	others[b]
1	none	1	2	6	90	1
2	without K_2CO_3	96	0	0	0	4
3	without KI	1	84	13	0	2
4	without H_2O_2	>99	0	0	0	0
5	without catalyst	31	5	2	43	19

[a] Reaction conditions: Epoxidation: styrene (114 μL, 1 mmol), 30% H_2O_2 (612 μL, 0.6 mmol), [TMTFABA]OTf (19.1 mg, 0.05 mmol), K_2CO_3 (13.8 mg, 0.1 mmol), KI (16.6 mg, 0.1 mmol), CH_3CN (1 mL), 80 °C, 1 h. Cycloaddition: [TMTFABA]OTf (19.1 mg, 0.05 mmol), K_2CO_3(13.8 mg, 0.1 mmol), KI (16.6 mg, 0.1 mmol), CH_3CN (4 mL), 80 °C, 30 h, P (CO_2) =2 MPa. Quantitative analysis was conducted by gas chromatography using biphenyl as an internal standard. [b] Other byproducts contain benzaldehyde, phenylacetaldehyde, acetophenone.

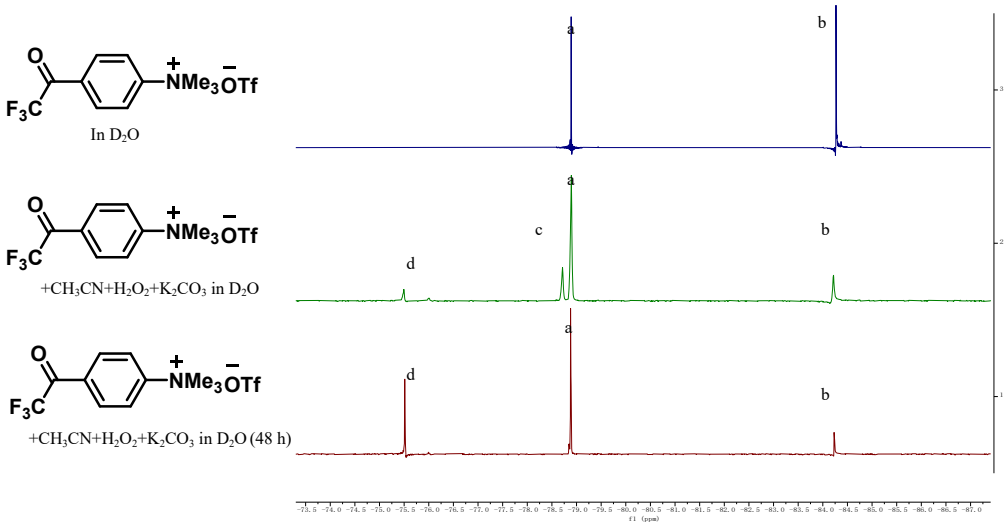


Figure S4 $^{19}F\{^1H\}$ NMR experiments for epoxidation mechanism

Subsequently, we investigated the reaction mechanism, beginning with the epoxidation mechanism. Based on $^{19}F\{^1H\}$ NMR analysis, it was determined that upon the addition of CH_3CN, H_2O_2, and K_2CO_3, the trifluoro-methane sulfonate anion remained unchanged (signal a). Most of the cation was converted to intermediate (signal c). After standing at room temperature for 48 h, the intermediate disappeared, and most of the cation was transformed into the active species D (signal d).

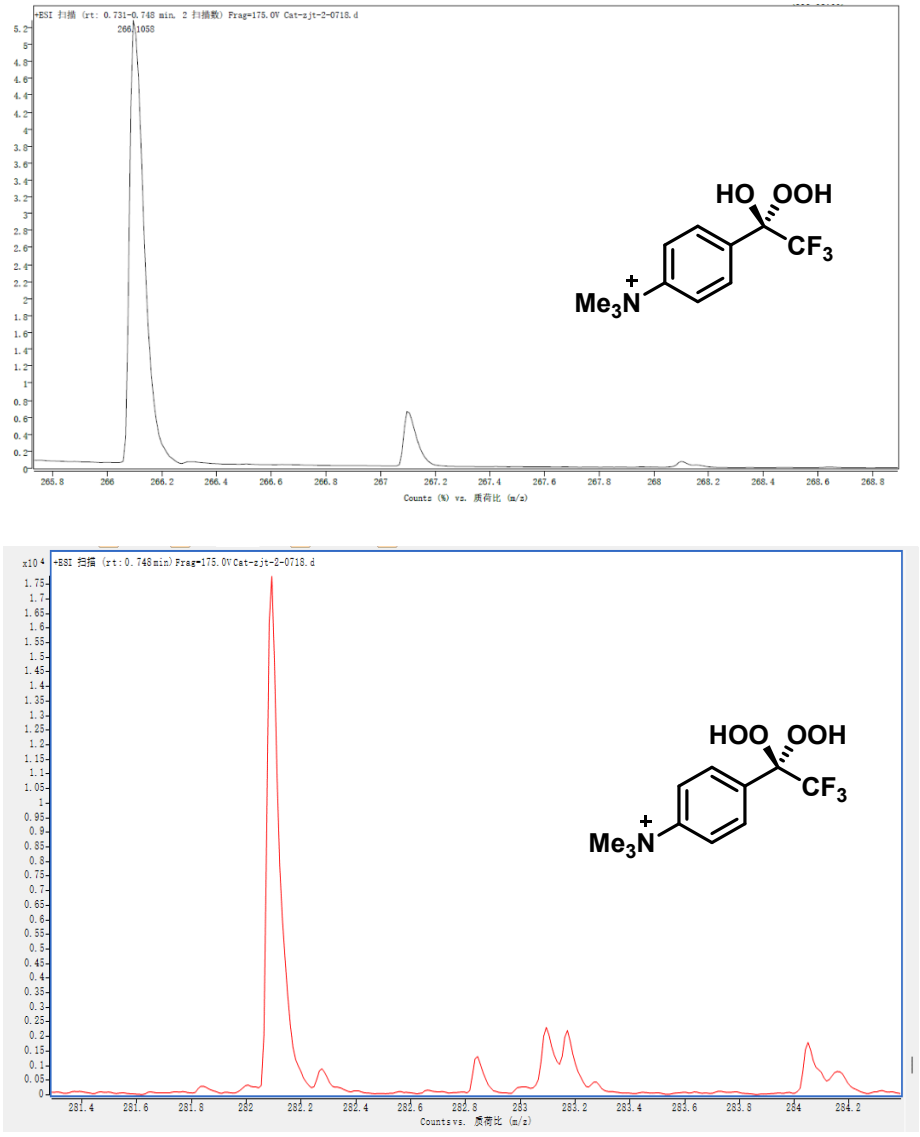
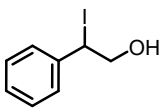


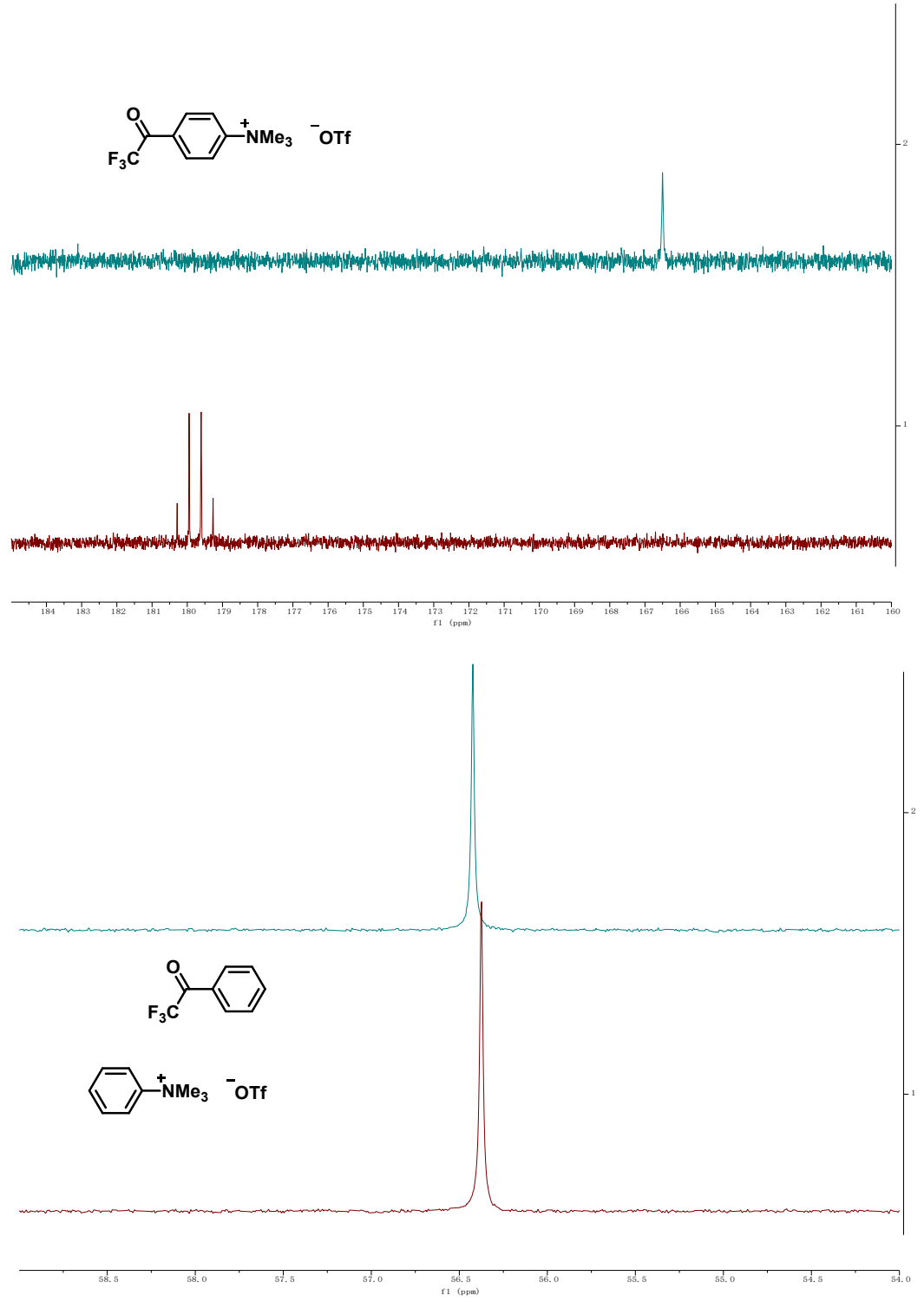
Figure S5 HRMS spectrum of the epoxidation reaction intermediate

HRMS (ESI) *m/z* calcd for $[C_{11}H_{15}F_3NO_3]^+$:266.0999, found: 266.1068
HRMS (ESI) *m/z* calcd for $[C_{11}H_{15}F_3NO_4]^+$: 282.0948, found: 282.0933

Characterization data of β-iodobenzeneethanol intermediate

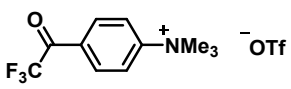


β-iodobenzeneethanol: White solid; m.p. 78-79 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80 – 6.94 (m, 5H), 5.20 (t, J = 7.2 Hz, 1H), 4.09 (dd, J = 12.1, 7.3 Hz, 1H), 3.89 (dd, J = 12.1, 7.1 Hz, 1H), 2.05 (s, 1H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 140.11, 129.14, 128.75, 128.06, 68.76, 35.89. HRMS (ESI) *m/z* calcd for C_8H_9OI [M+Na]$^+$: 270.9590, found: 270.9593.



[a] $^{13}C\{^{1}H\}$ NMR (101 MHz, DMSO-d_6)

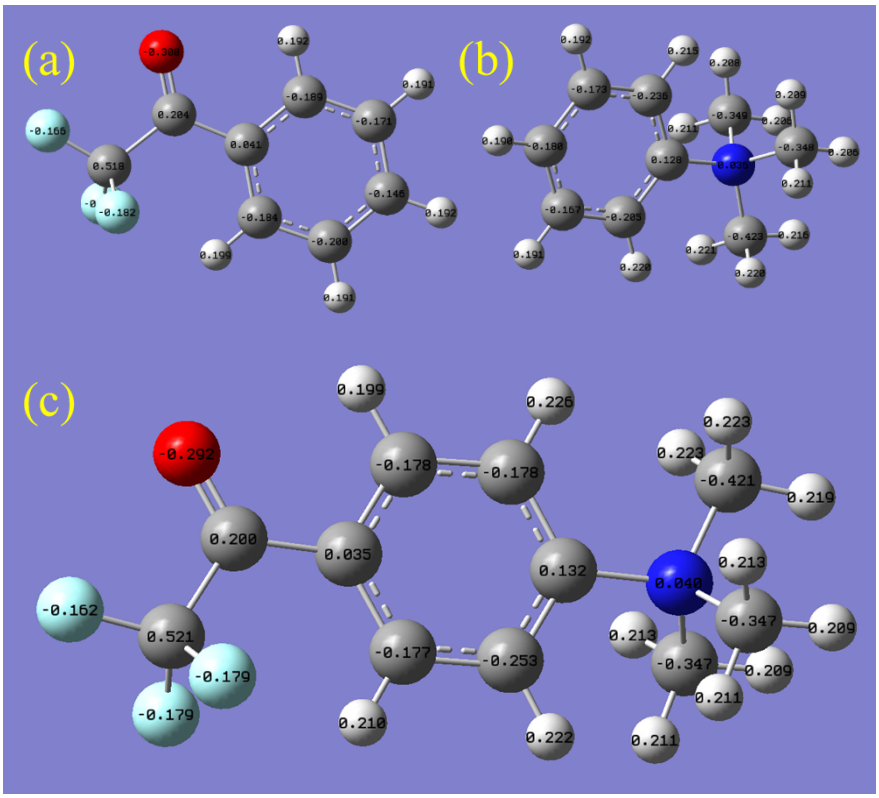
Figure S6 $^{13}C\{^{1}H\}$ NMR spectra for TFAP, [PTMA]OTf, [TMTFABA]OTf. [a]



8. DFT-calculated Mulliken charges for [TMTFABA]OTf, [PTMA]OTf, TFAP

DFT Calculation method

The computational works were carried out by using the Gaussian 16 (Revision A.03)[3]. Geometry optimizations and vibration frequency analysis calculations used DFT method B3LYP-D3BJ[4] with 6-31G** basis[5] for all atoms and the polarized continuum model using the integral equation formalism variant (IEFPCM)[6] to model solvent effects (Acetonitrile). The single point energy and Mulliken charge calculations for the optimized structures used DFT method M062X-D3[7] with def2-TZVP basis[8] for all atoms and the polarized continuum model using the integral equation formalism variant (SMD)[9] to model solvent effects (Acetonitrile).



(a) TFAP (b) [PTMA]OTf (C) [TMTFABA]OTf

9. References

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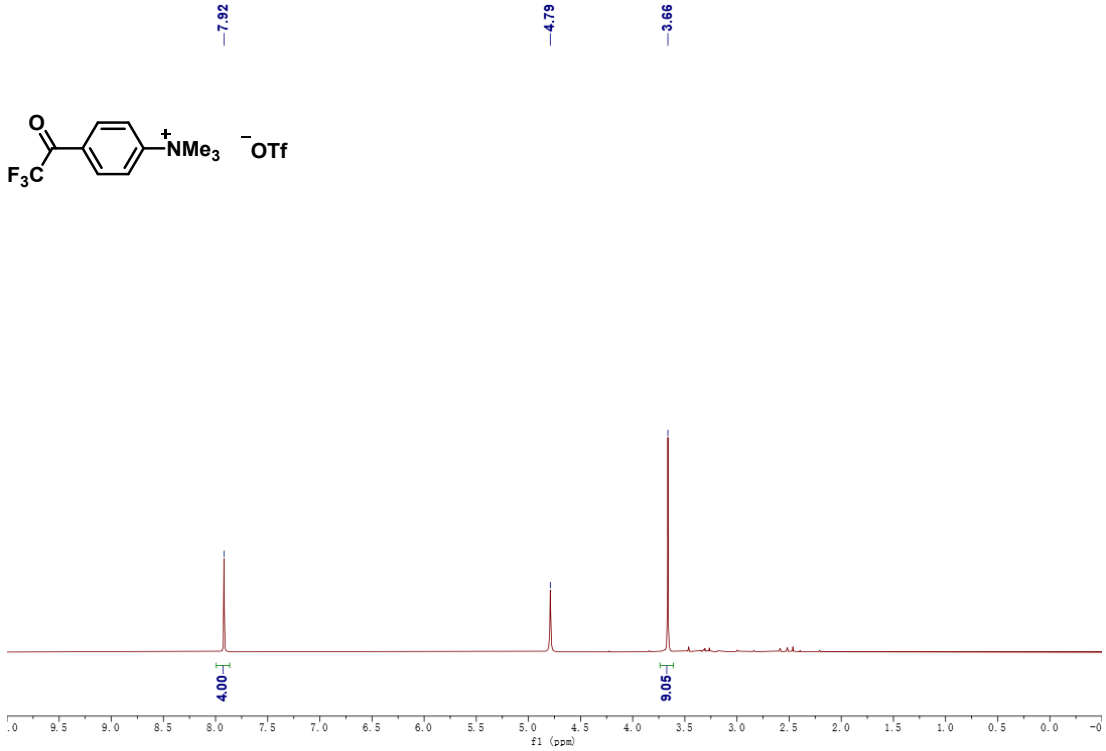
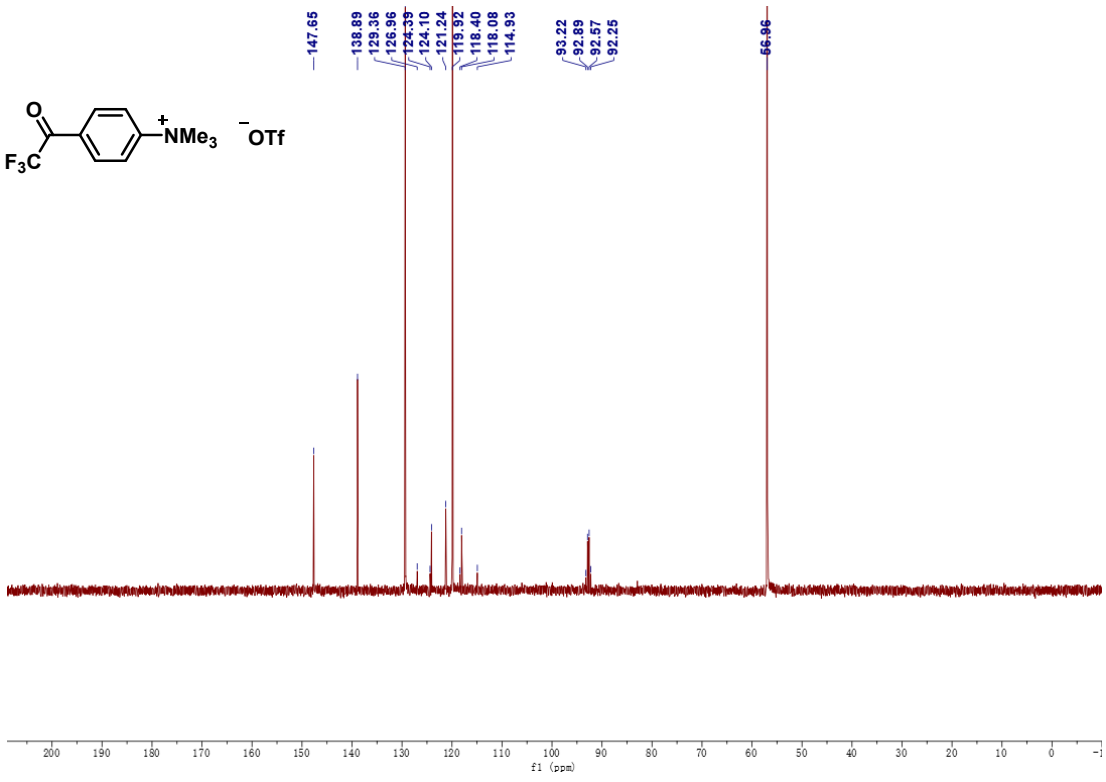
10. NMR and HRMS charts

[TMTFABA]OTf

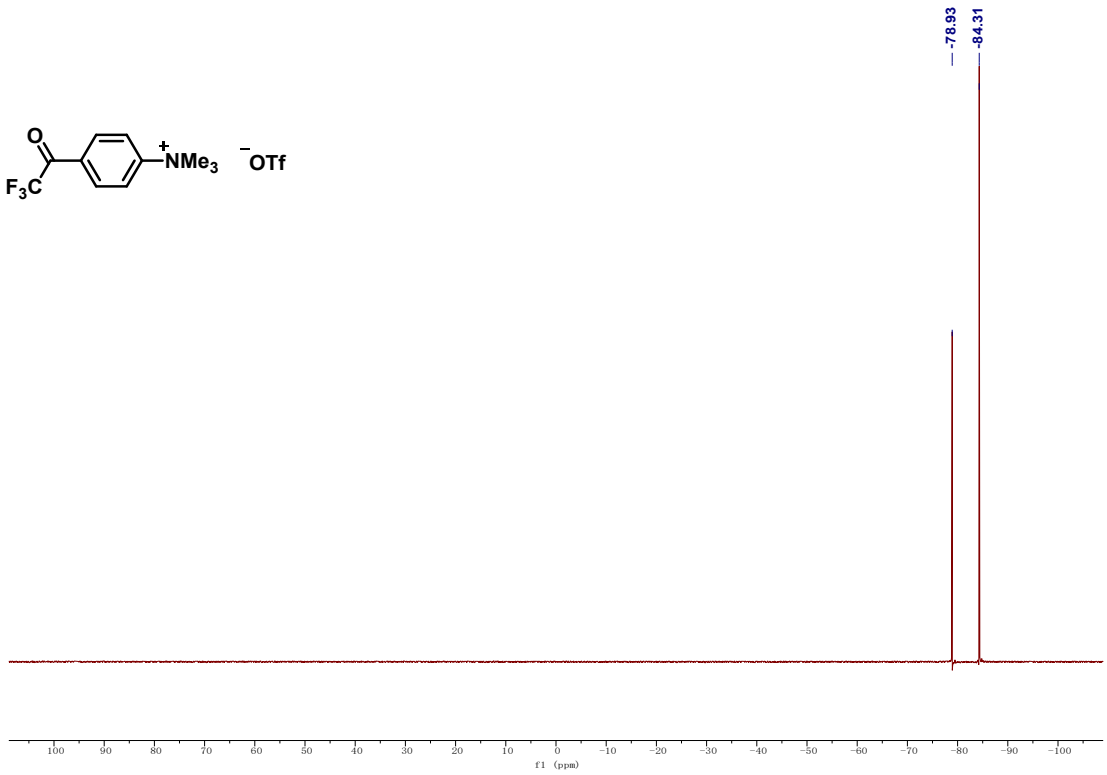
^{1}H NMR (400 MHz, D_2O) spectrum of [TMTFABA]OTf



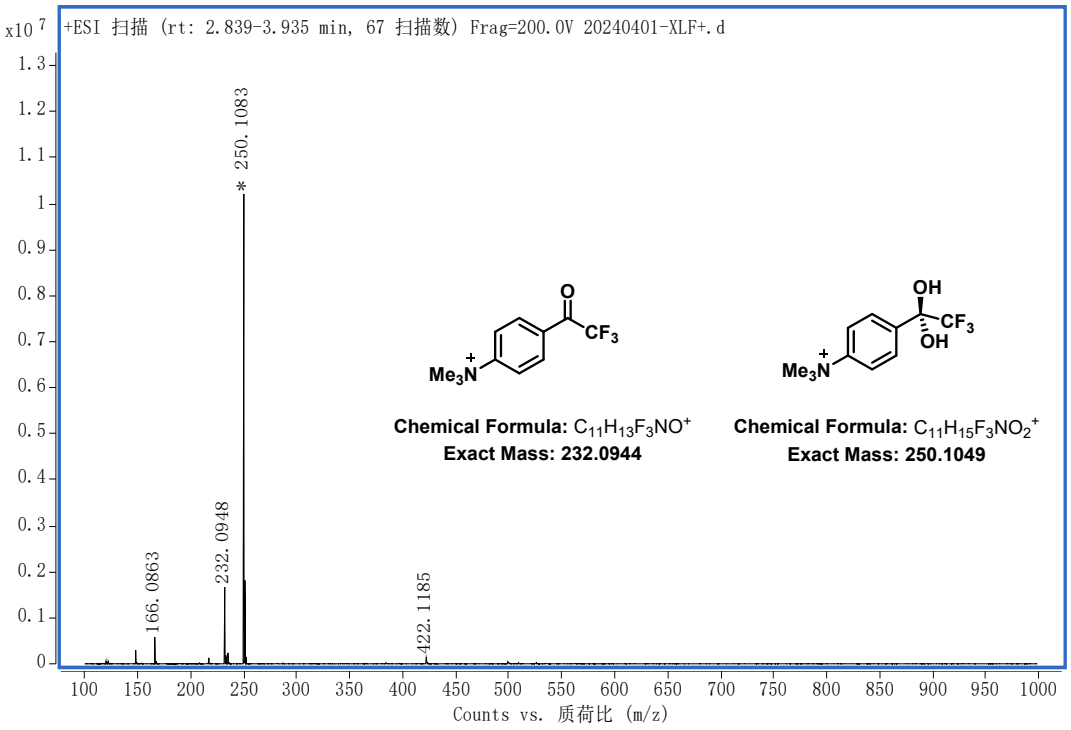
^{13}C{^{1}H} NMR (101 MHz, D_2O) spectrum of [TMTFABA]OTf

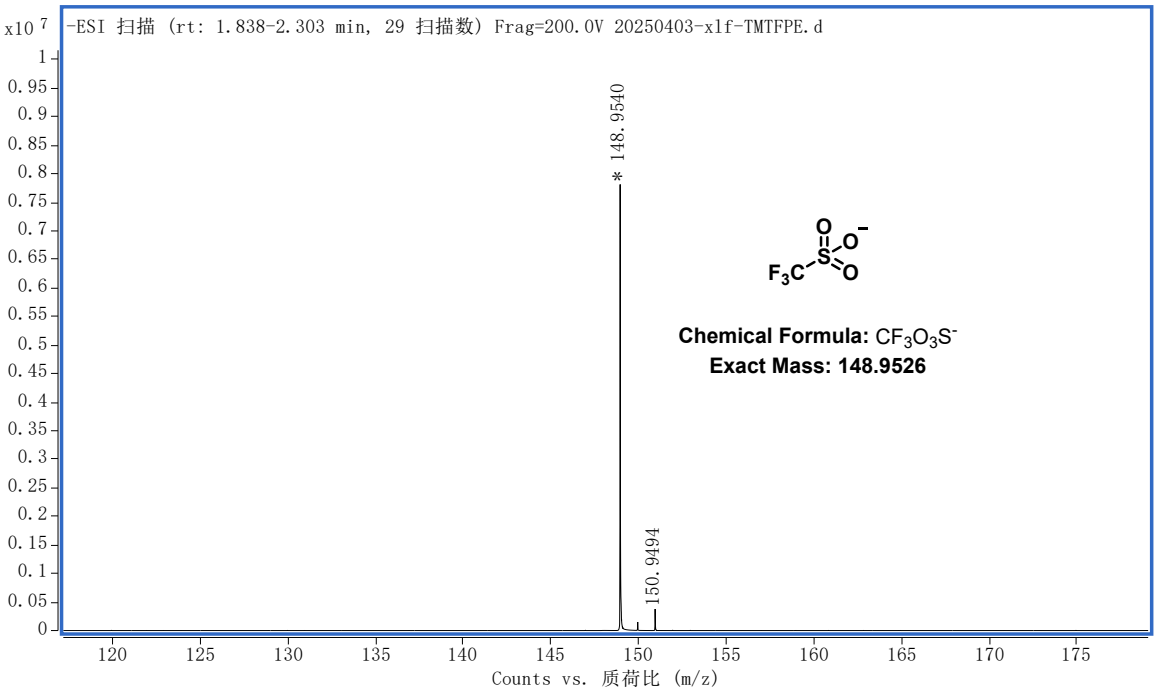


$^{19}F\{^{1}H\}$ NMR (376 MHz, D_2O) spectrum of [TMTFABA]OTf



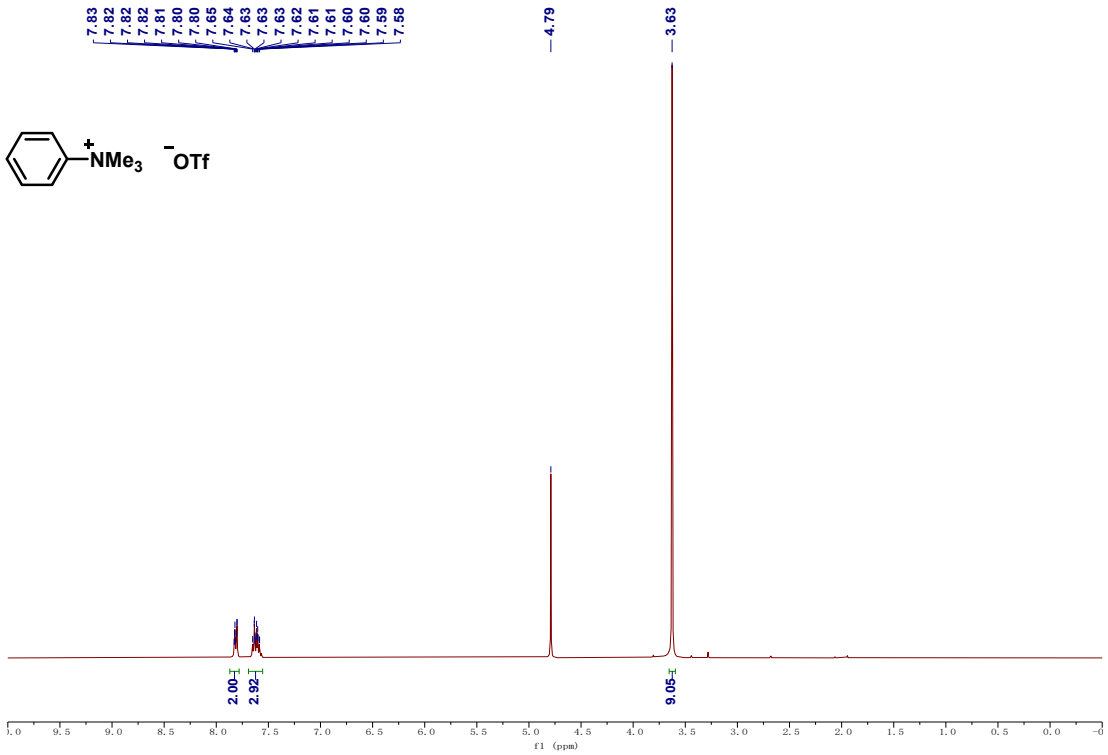
HRMS (ESI) spectrum of [TMTFABA]OTf



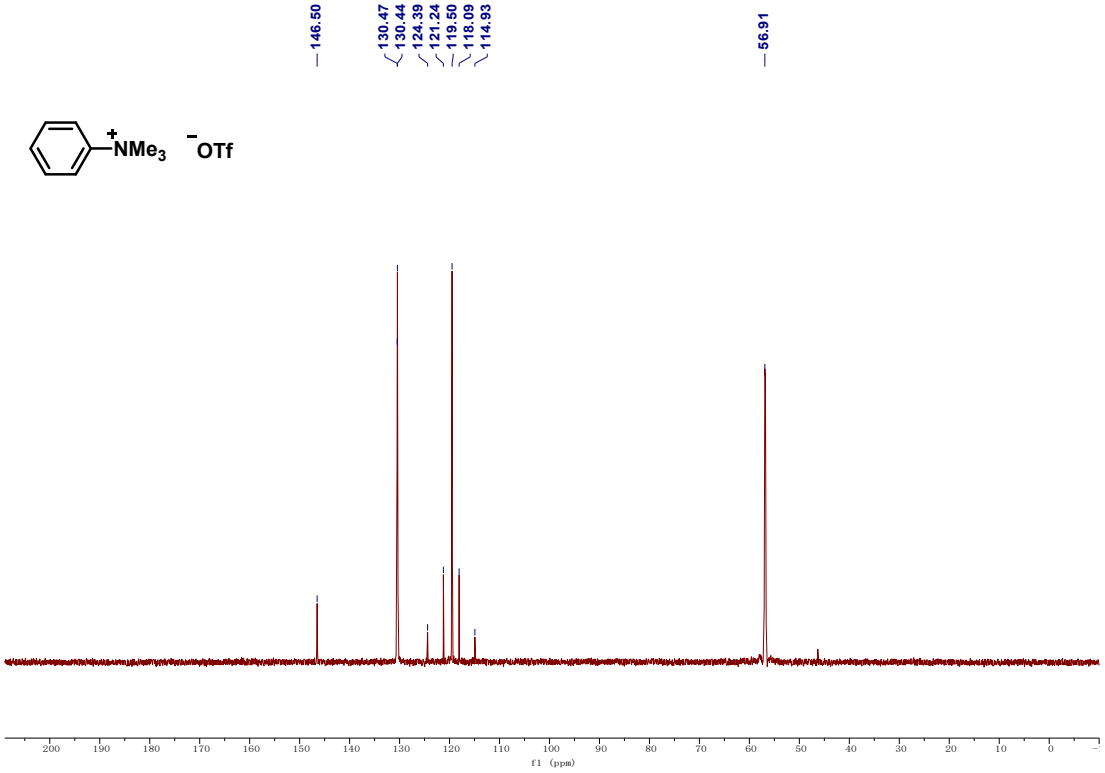


[PTMA]OTf

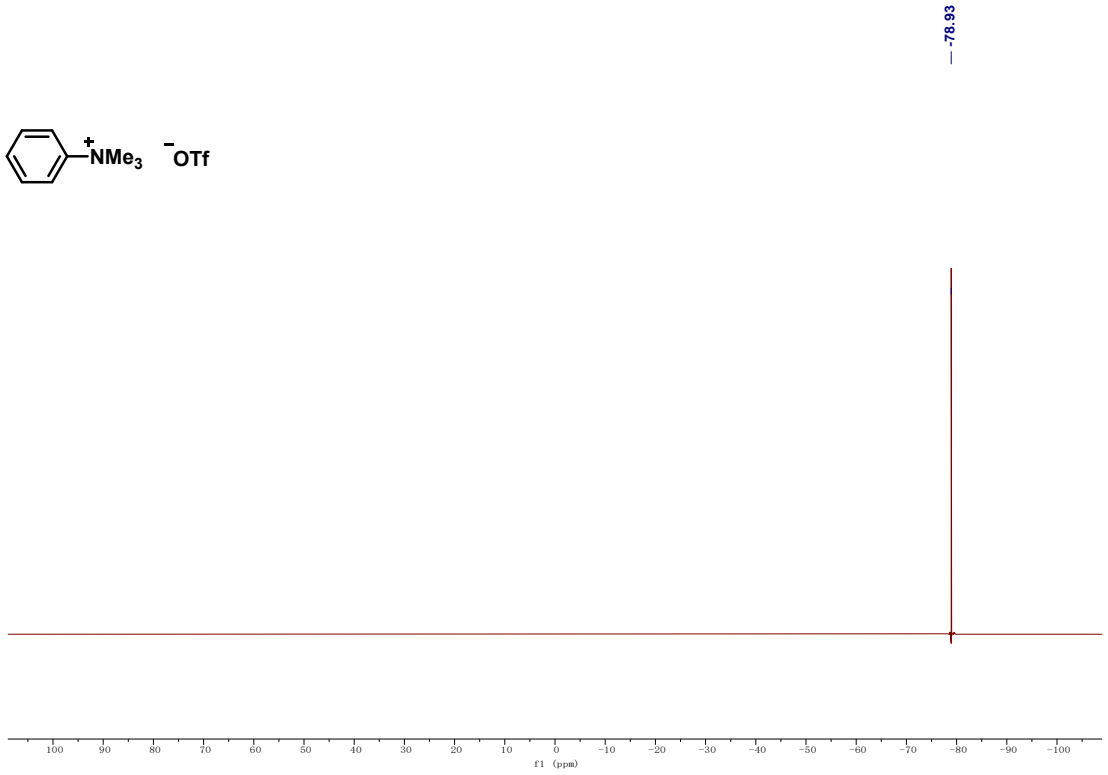
^{1}H NMR (400 MHz, D_2O) spectrum of [PTMA]OTf



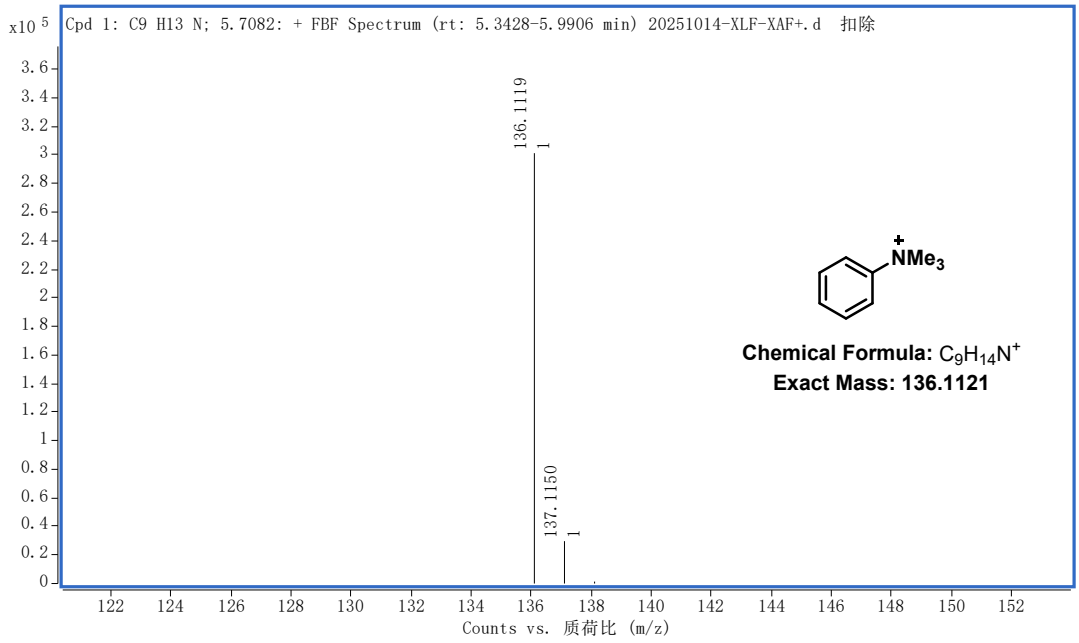
$^{13}C\{^{1}H\}$ NMR (101 MHz, D_2O) spectrum of [PTMA]OTf

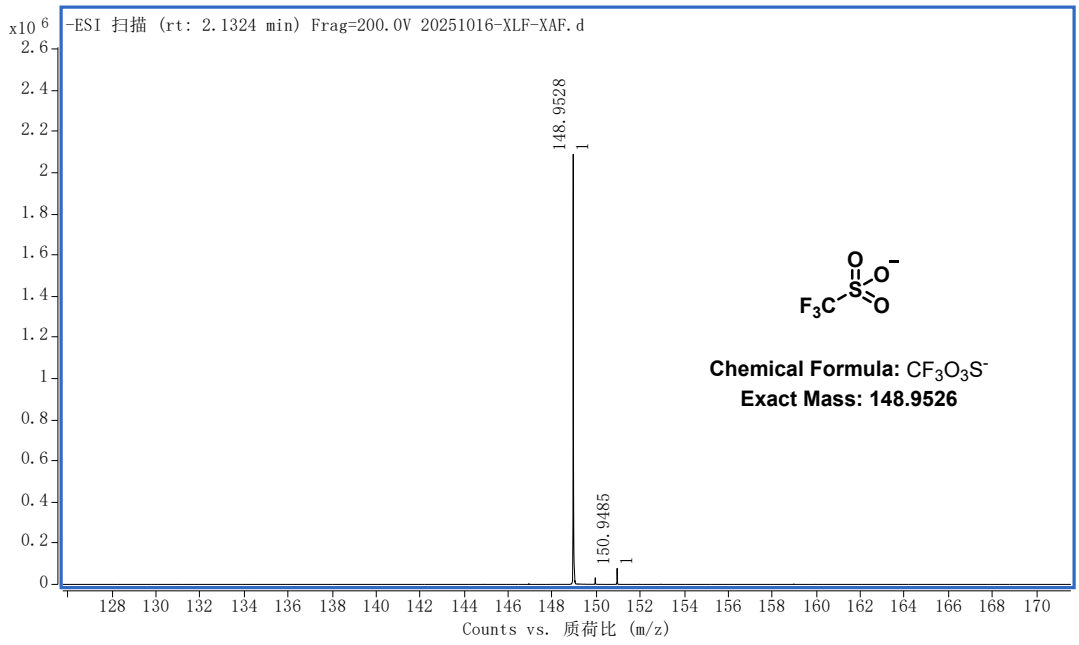


$^{19}F\{^{1}H\}$ NMR (376 MHz, D_2O) spectrum of [PTMA]OTf



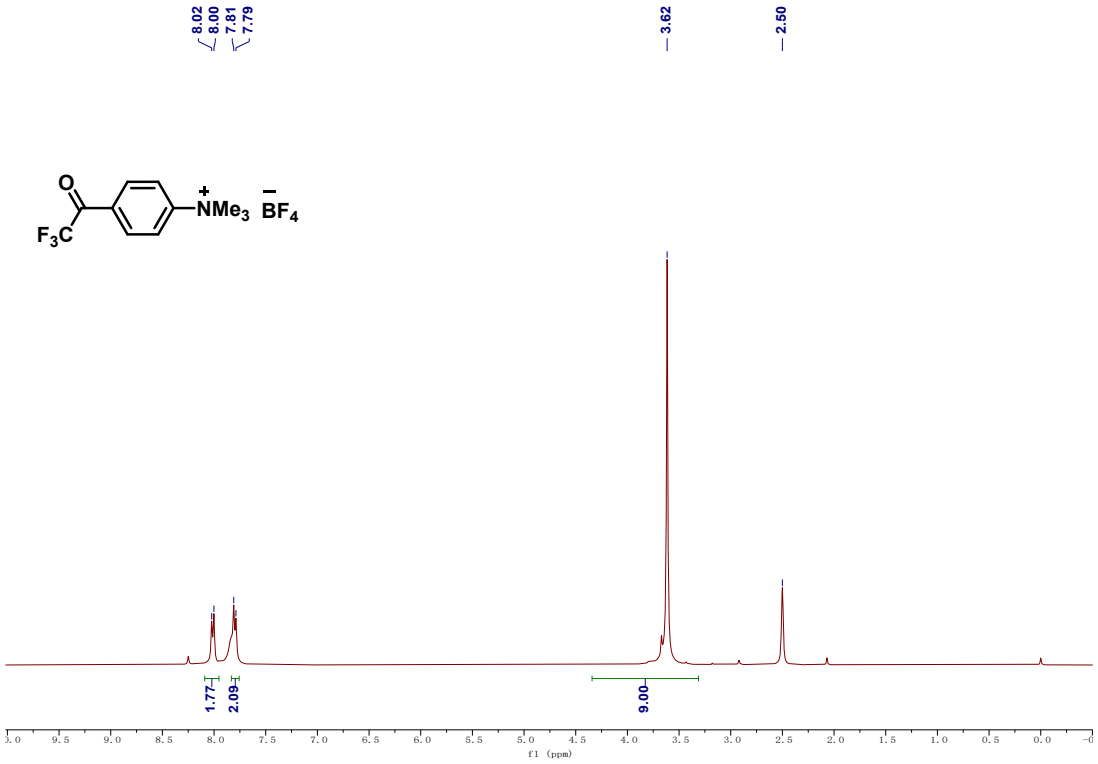
HRMS (ESI) spectrum of [PTMA]OTf



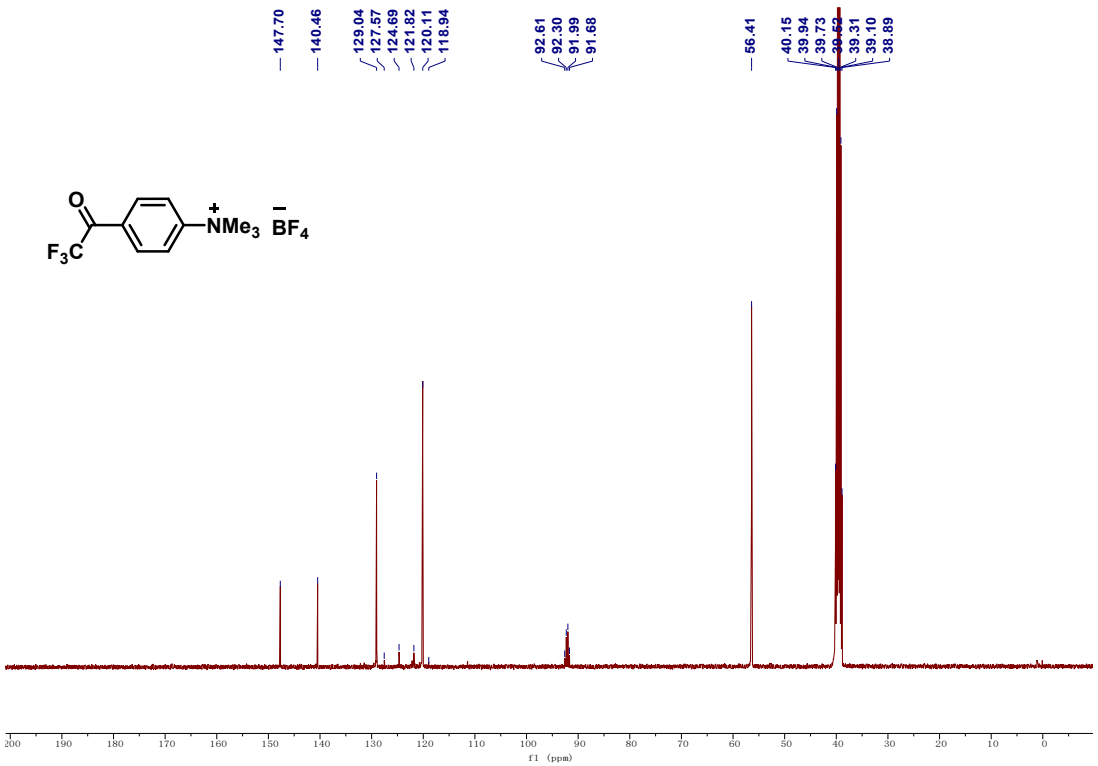


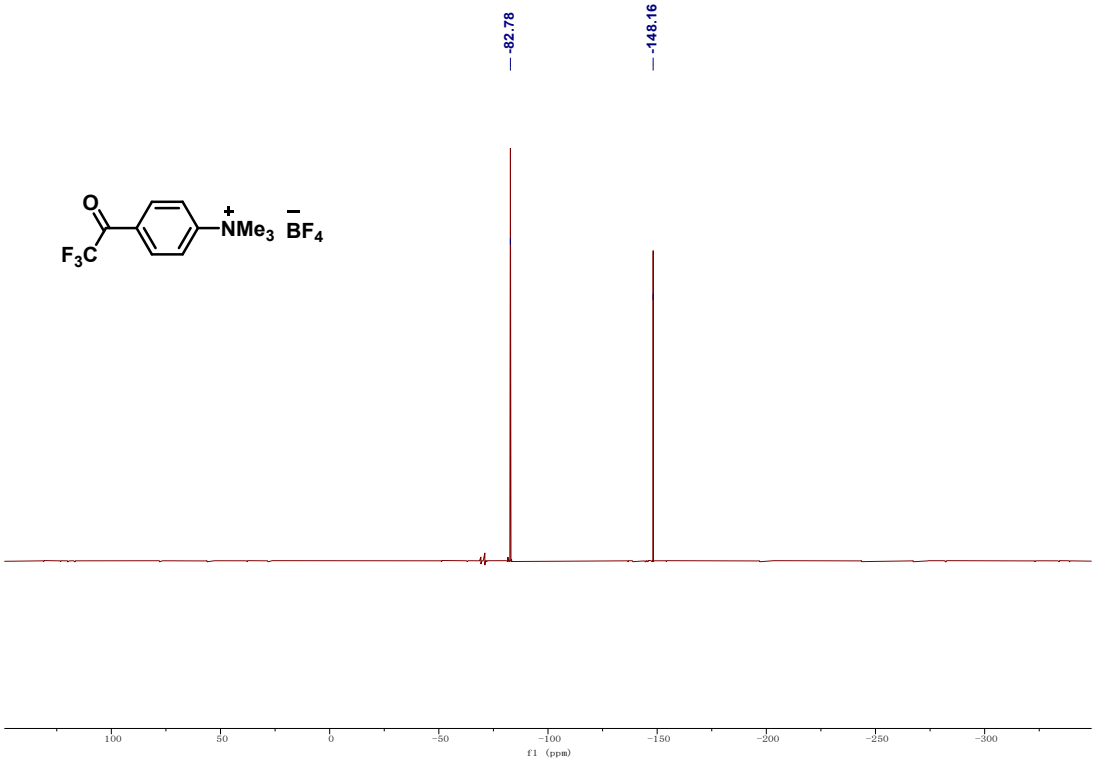
[TMTFABA]BF_4

^{1}H NMR (400 MHz, DMSO-d_6) spectrum of [TMTFABA]BF_4



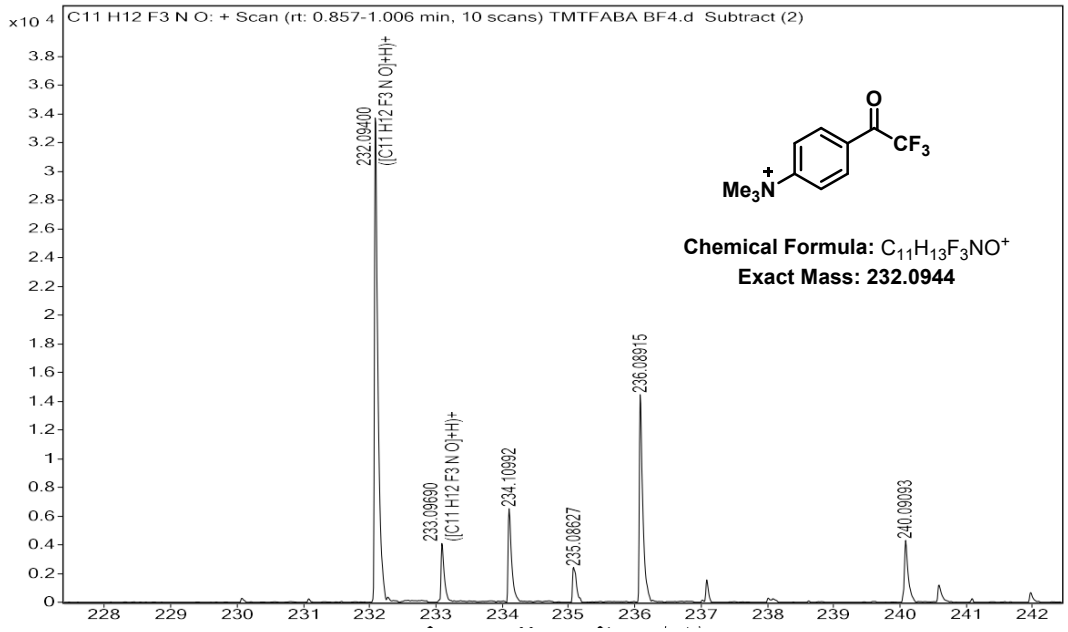
^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) spectrum of [TMTFABA]BF_4

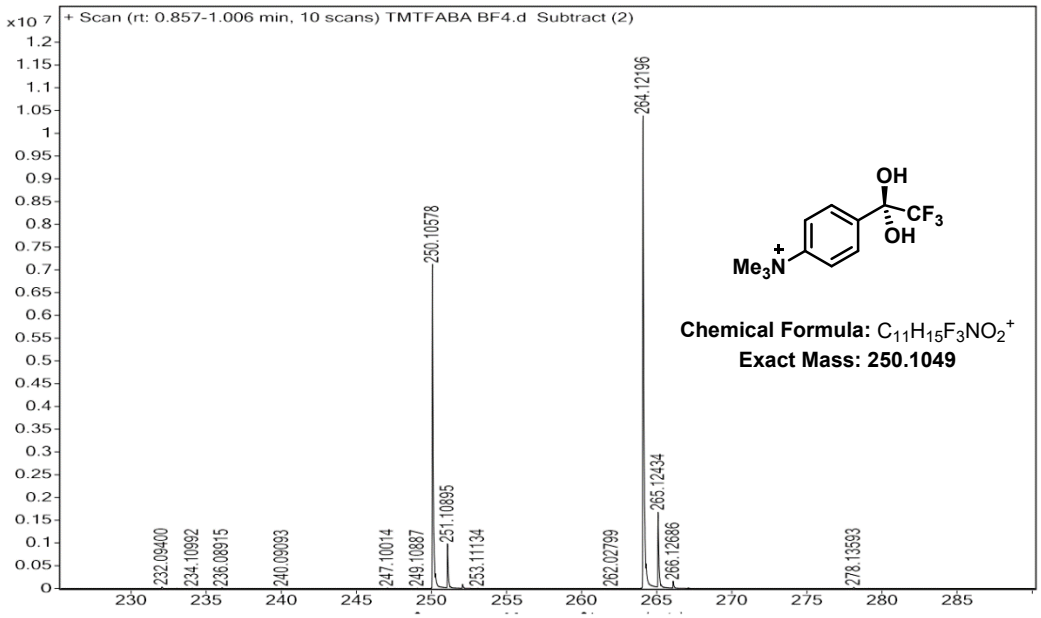




$^{19}F\{^{1}H\}$ NMR (376 MHz, DMSO-d_6) spectrum of [TMTFABA]BF_4

HRMS (ESI) spectrum of [TMTFABA]BF_4

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x10 7
264.12196
250.10578
265.12434
251.10895
232.09400
234.10992
236.08915
240.09093
247.10014
249.10887
253.11134
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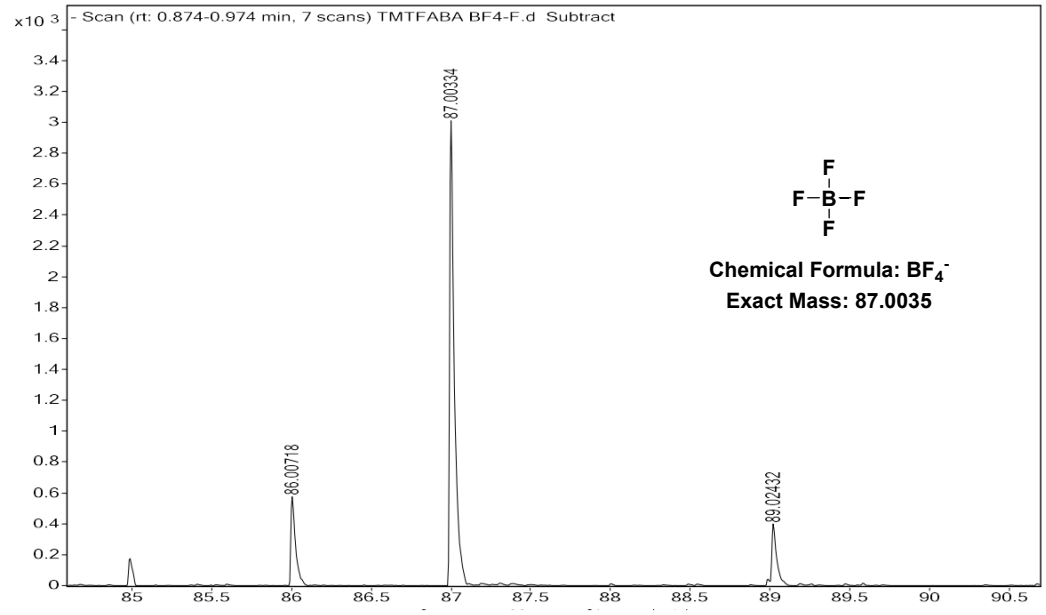
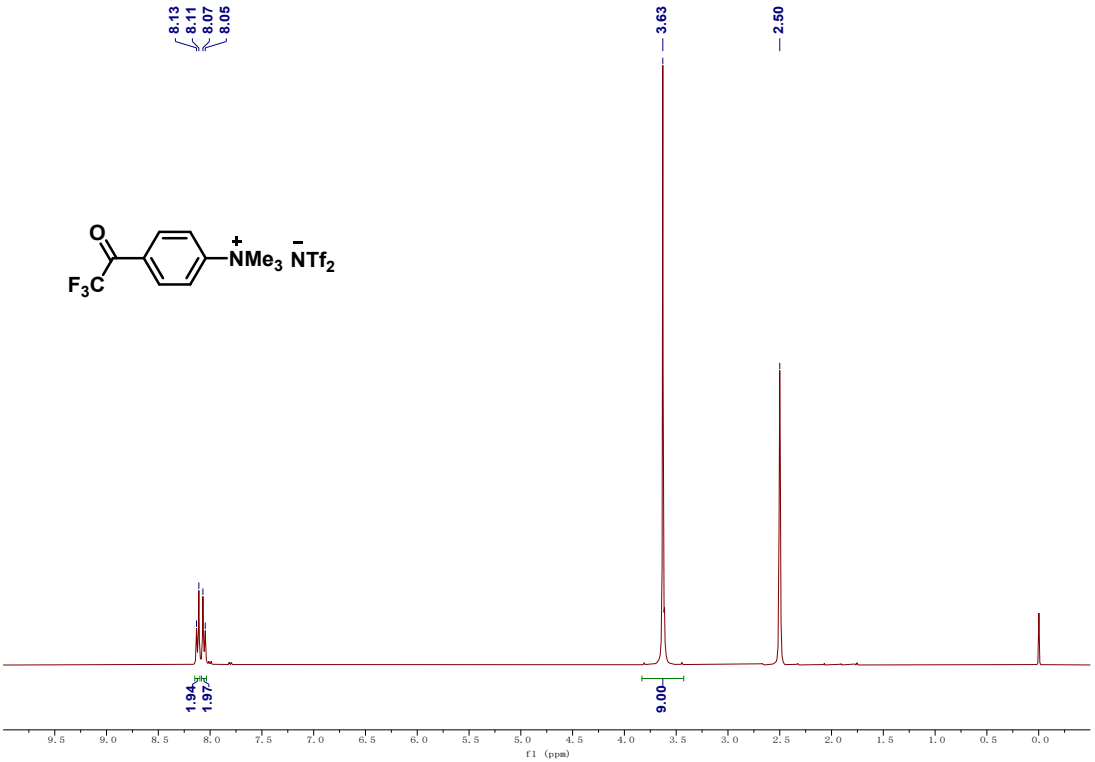
OH
CF3
OH
Me3N
Chemical Formula: C11H15F3NO2+
Exact Mass: 250.1049

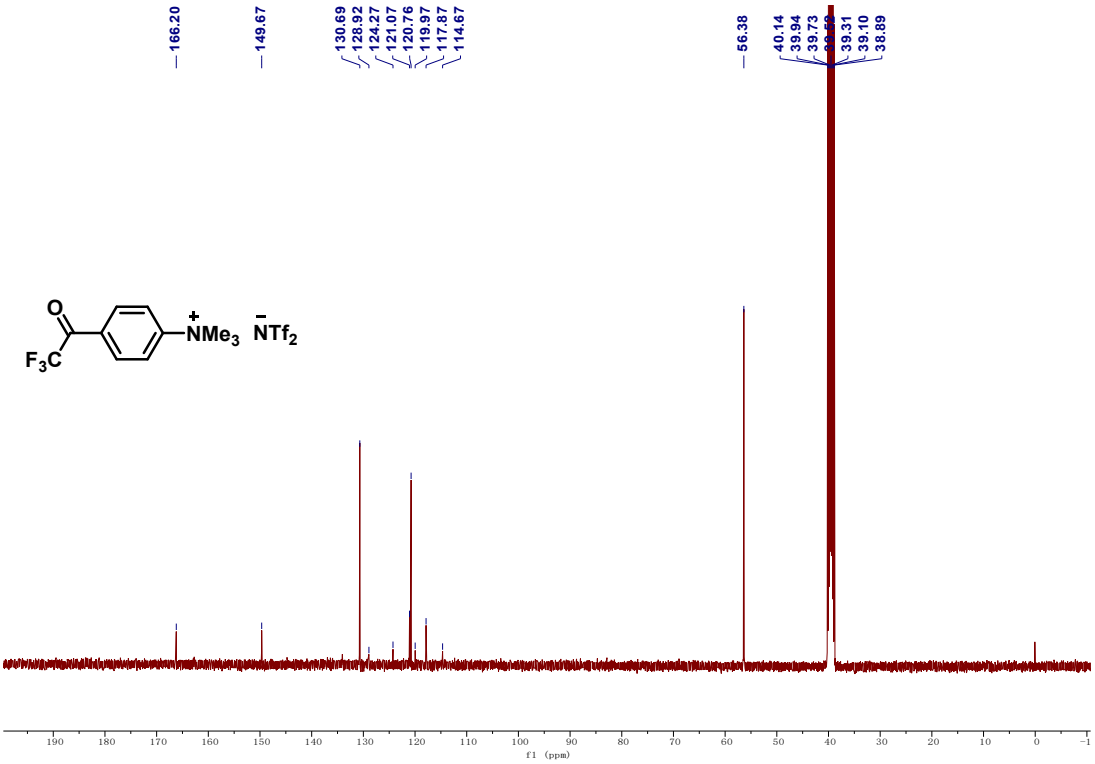

- Scan (rt: 0.874-0.974 min, 7 scans) TMTFABA BF4-F.d Subtract
x10 3
87.00334
86.00718
89.02432
F
F
B
F
F
Chemical Formula: BF4-
Exact Mass: 87.0035

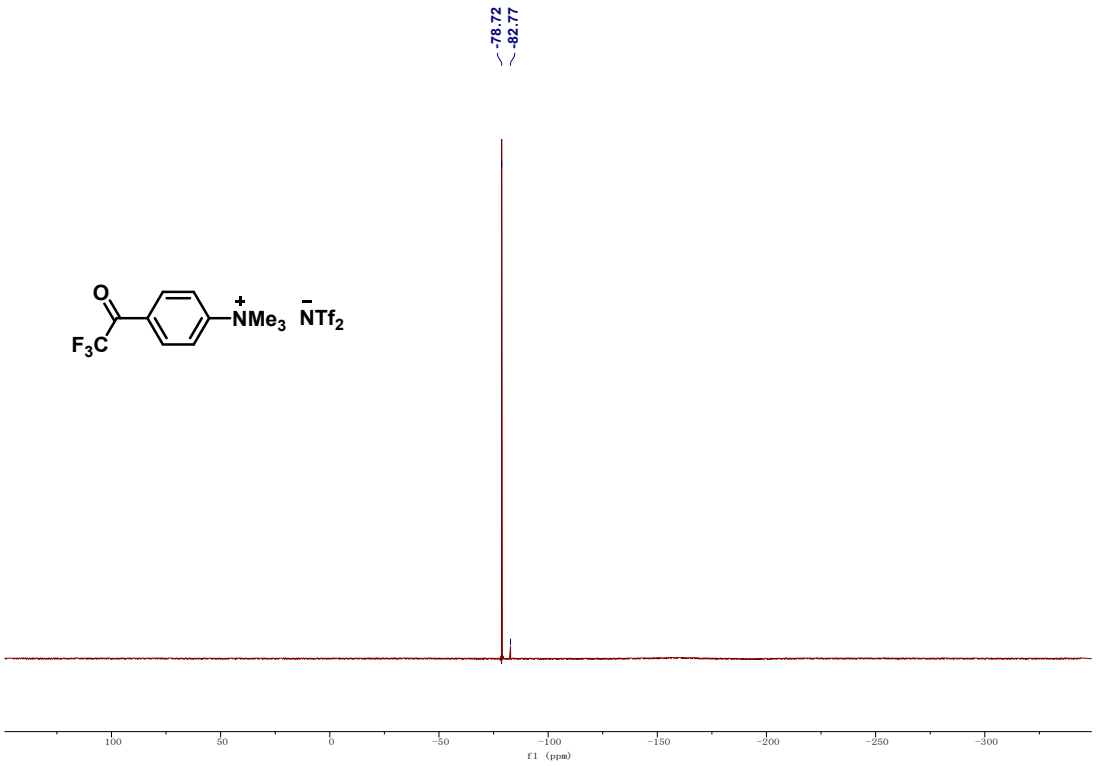
[TMTFABA]NTf_2

^{1}H NMR (400 MHz, DMSO-d_6) spectrum of [TMTFABA] NTf_2



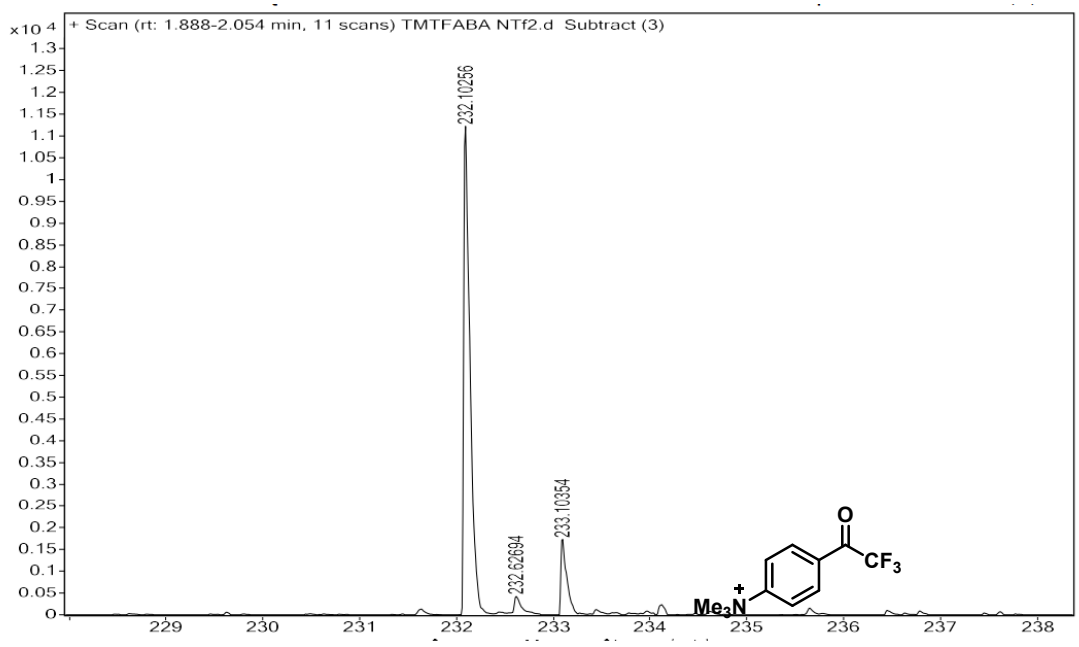
^{13}C{^{1}H} NMR (101 MHz, DMSO-d_6) spectrum of [TMTFABA]NTf_2

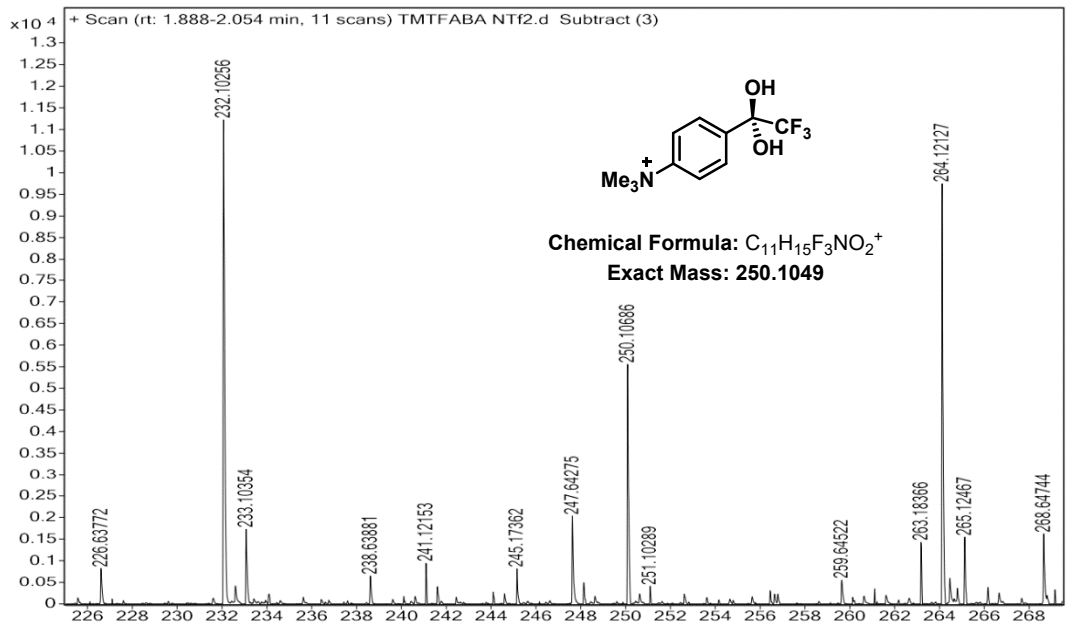




$^{19}F\{^{1}H\}$ NMR (376 MHz, DMSO-d_6) spectrum of [TMTFABA]NTf_2

HRMS (ESI) spectrum of [TMTFABA]NTf_2




+ Scan (rt: 1.888-2.054 min, 11 scans) TMTFABA NTf2.d Subtract (3)
x10 4
OH
CF3
OH
Me3N
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Exact Mass: 250.1049
226.63772
232.10256
233.10354
238.63881
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251.10289
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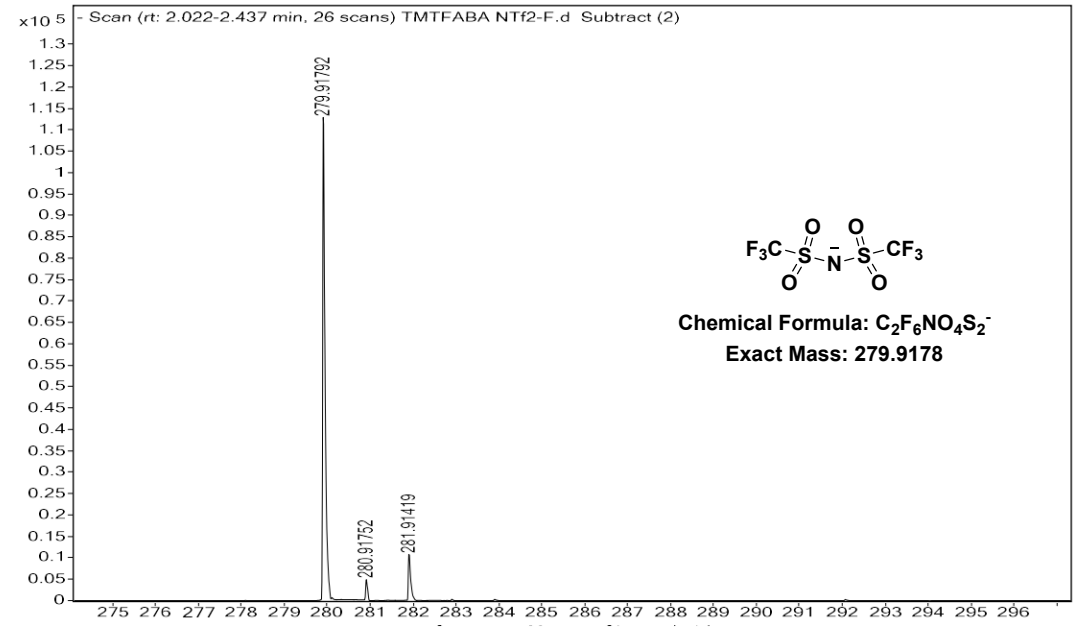
263.18366
264.12127
265.12467
268.64744


- Scan (rt: 2.022-2.437 min, 26 scans) TMTFABA NTf2-F.d Subtract (2)
x10 5
F3C
CF3
Chemical Formula: C2F6NO4S2-
Exact Mass: 279.9178
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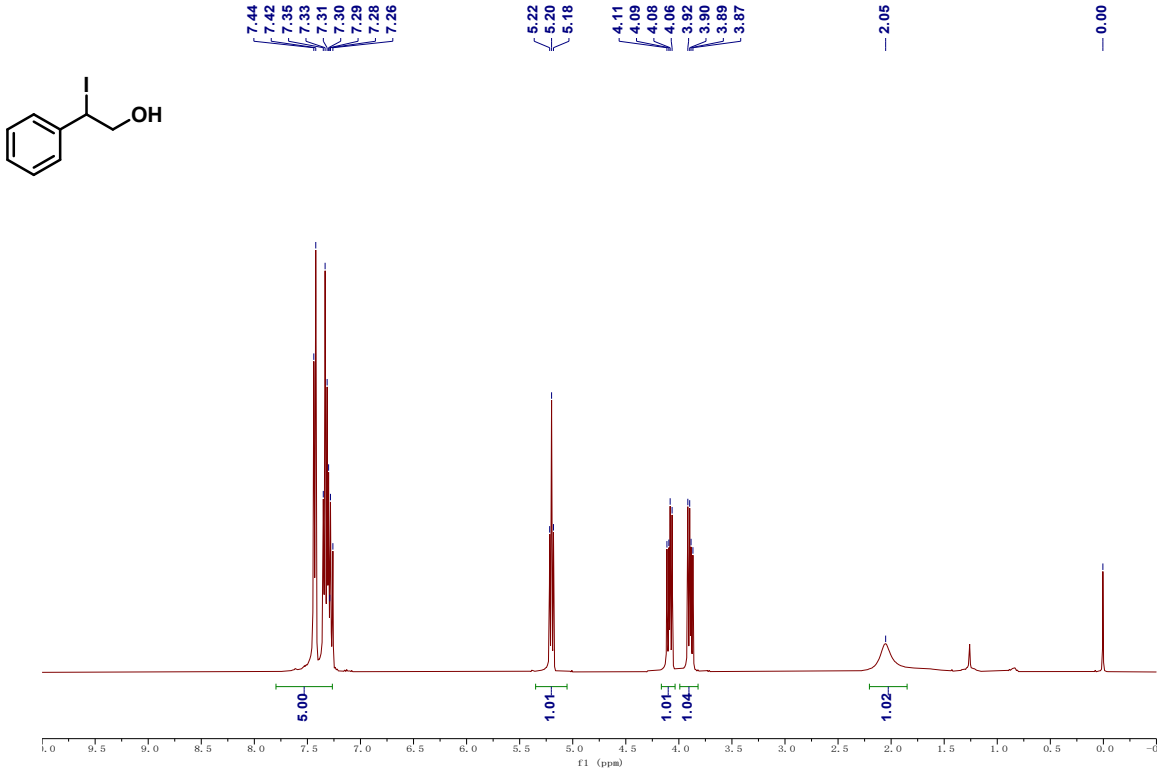
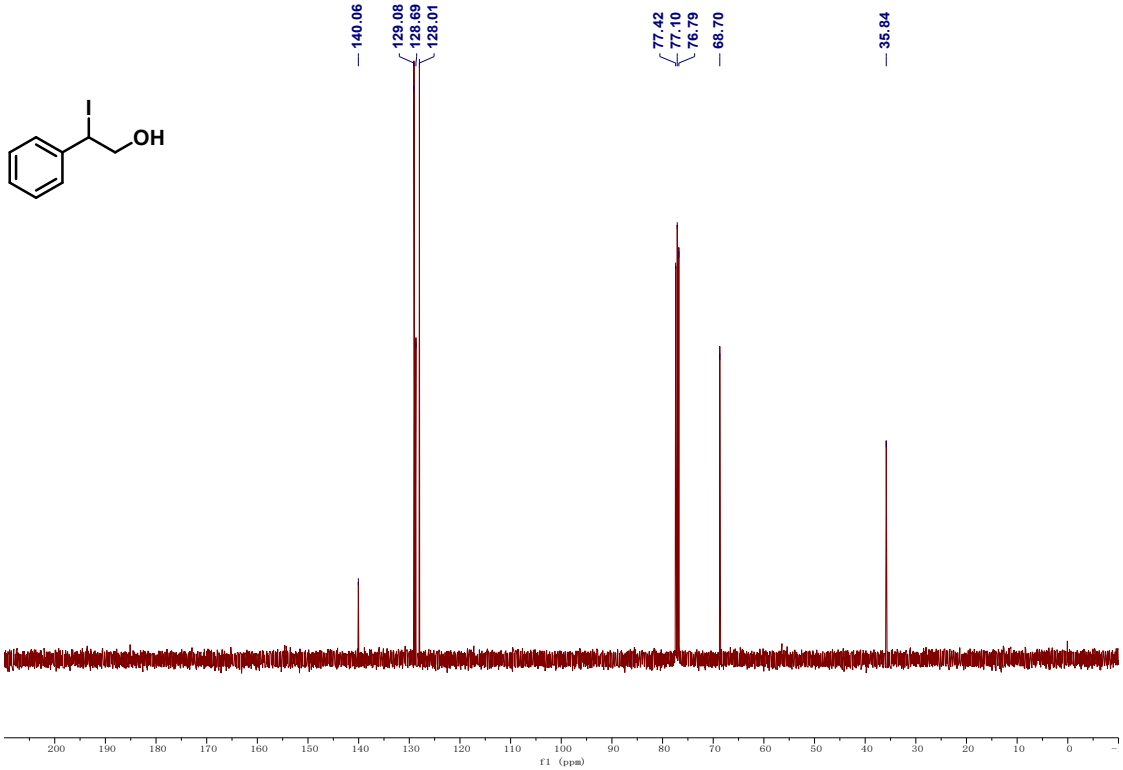
280.91752
281.91419

β-iodobenzeneethanol

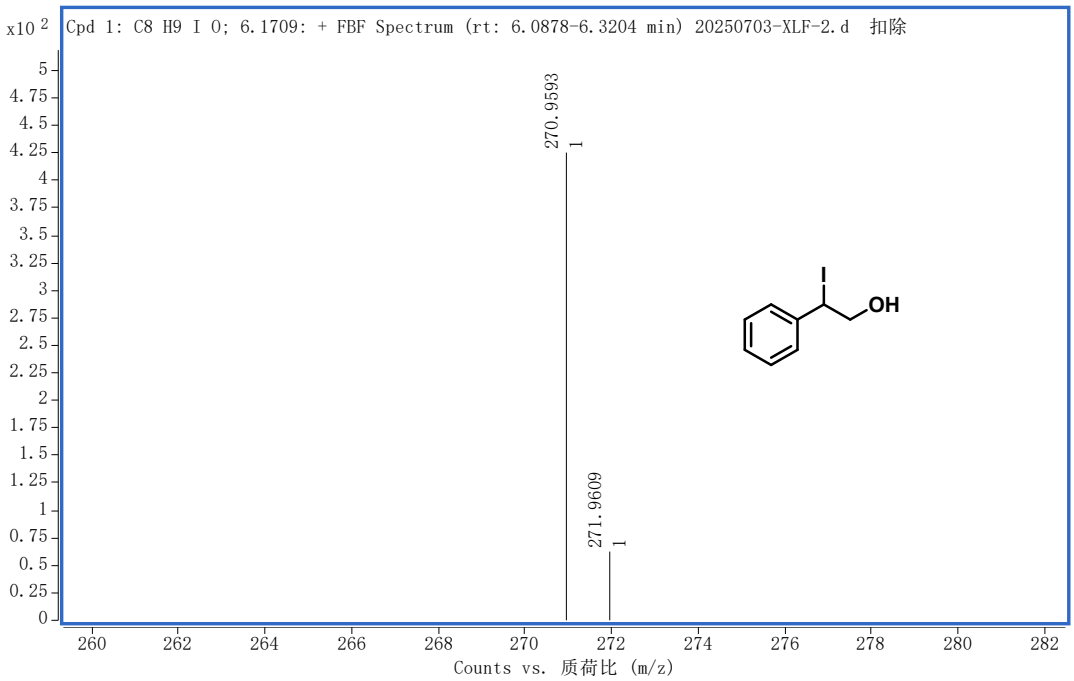
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of β-iodobenzeneethanol



^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) spectrum of β-iodobenzeneethanol

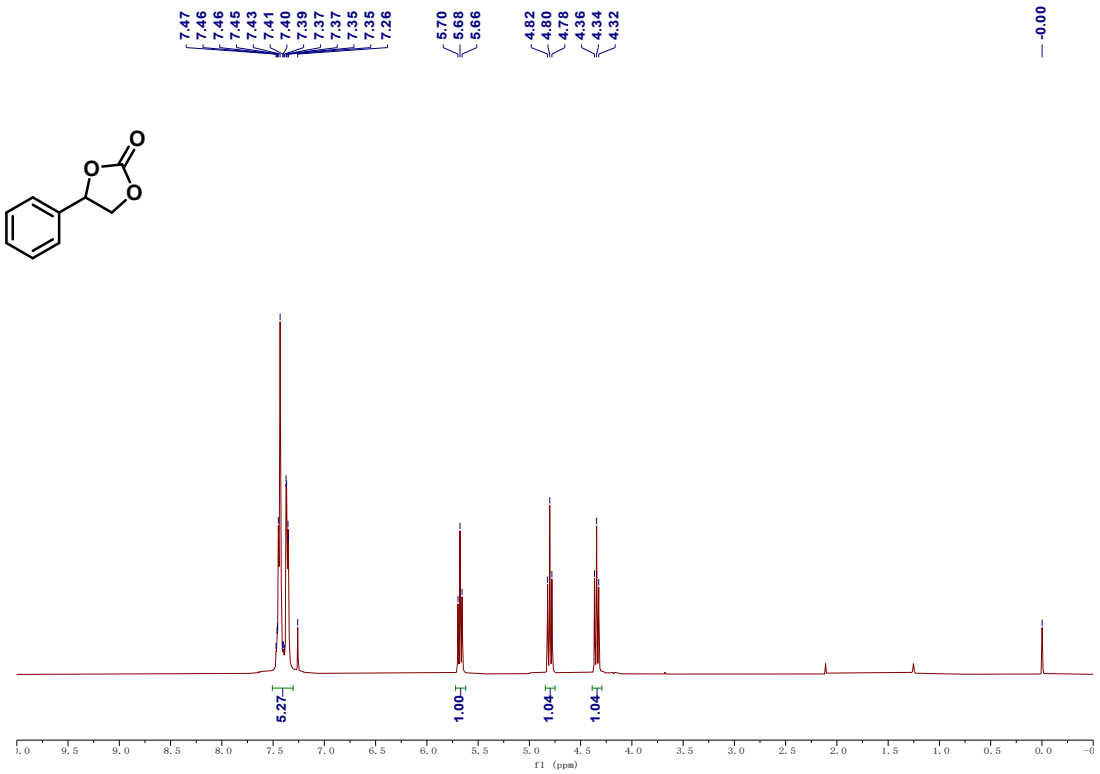


HRMS (ESI) spectrum of β-iodobenzeneethanol

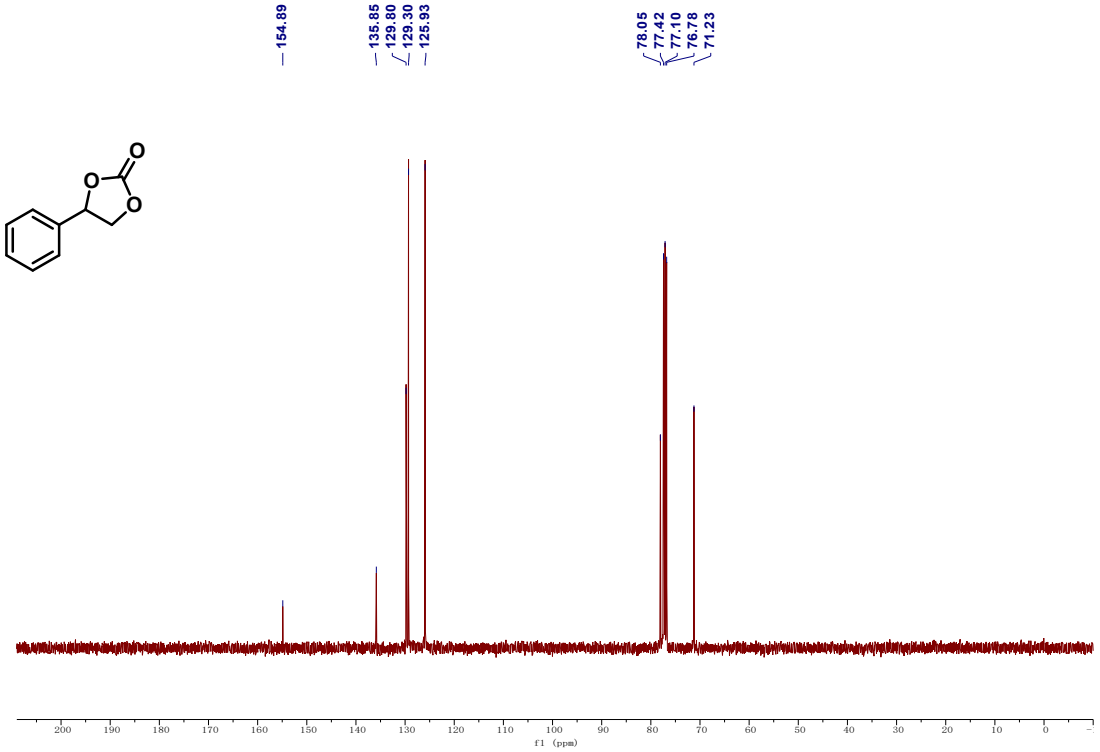


4-Phenyl-1,3-dioxolan-2-one (**4a**)

^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4a**

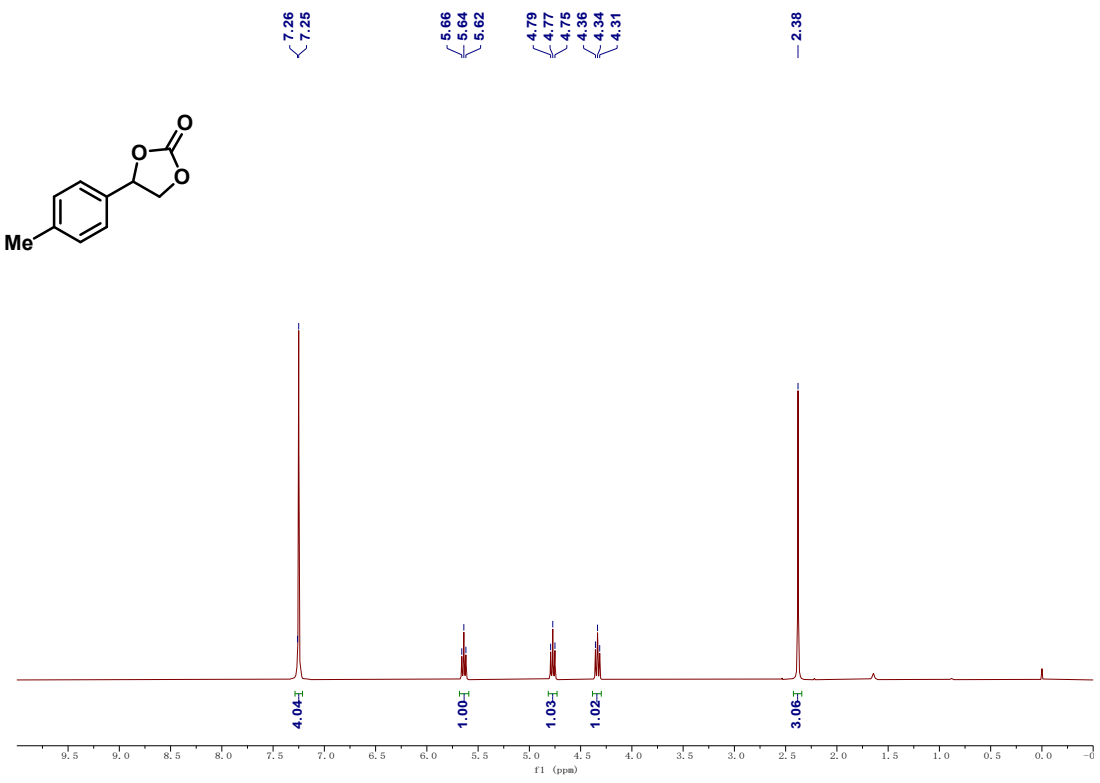


^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) spectrum of **4a**

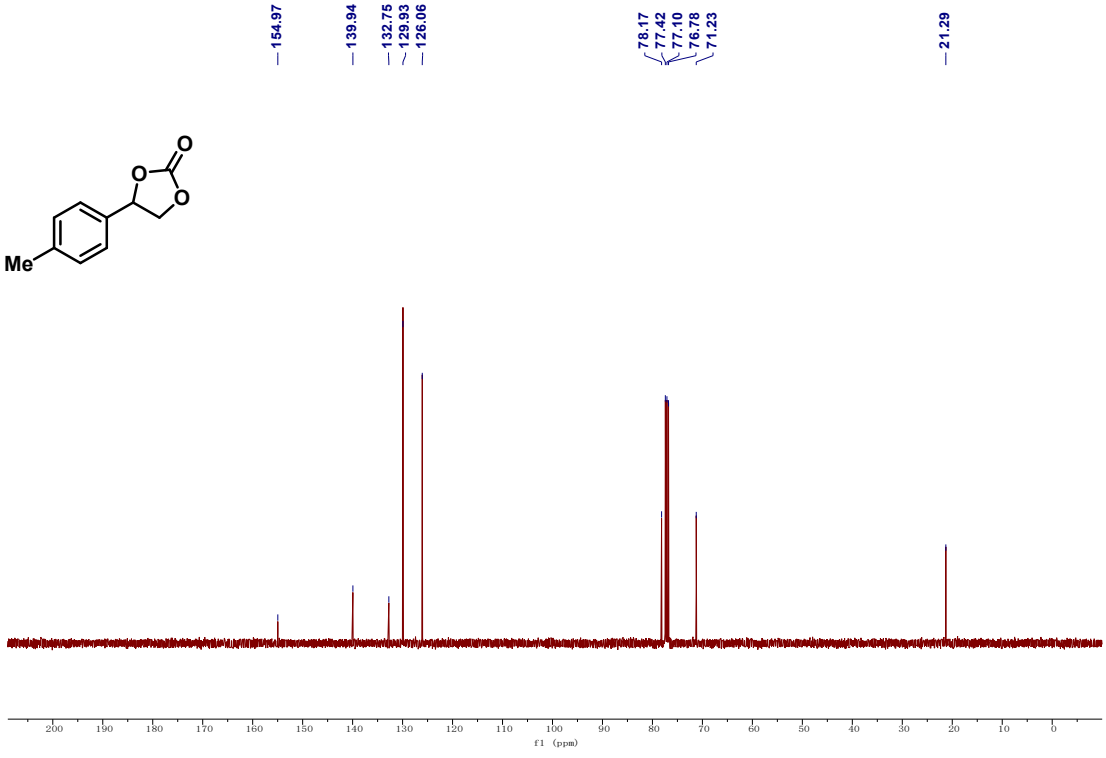


4-(4-Methylphenyl)-1,3-dioxolan-2-one (**4b**)

^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4b**

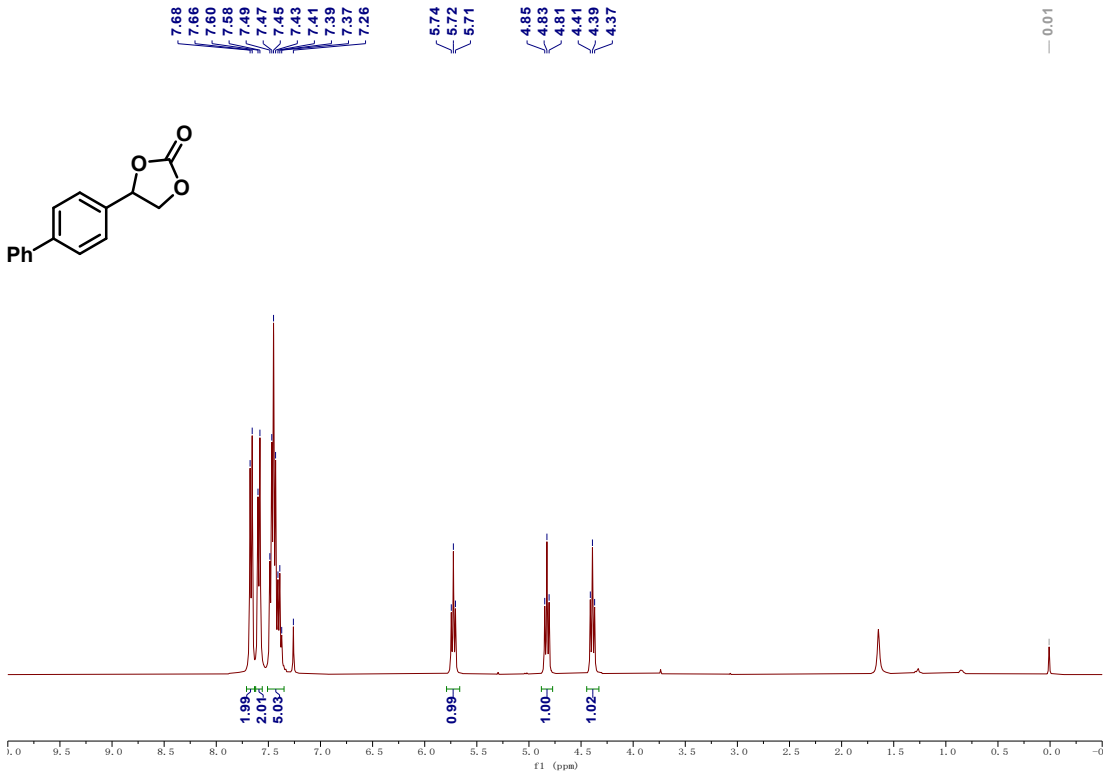


^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) spectrum of **4b**

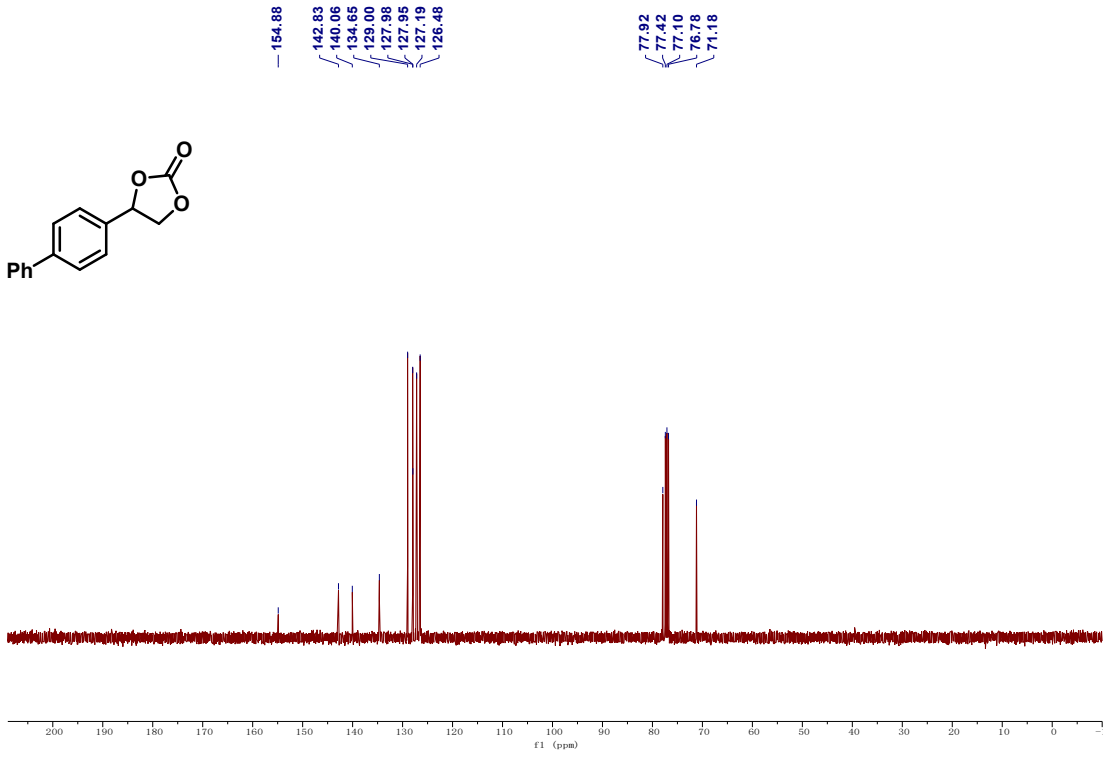


4-[1,1′-Biphenyl]-4-yl-1,3-dioxolan-2-one (**4c**)

^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4c**

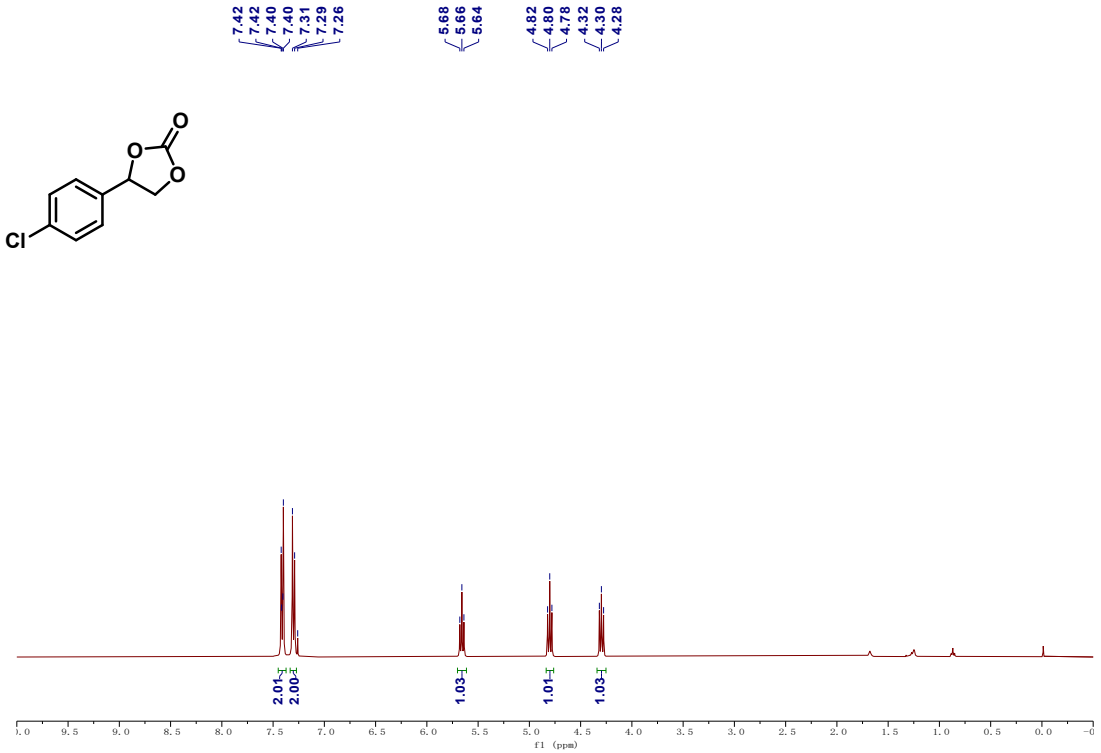


^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) spectrum of **4c**

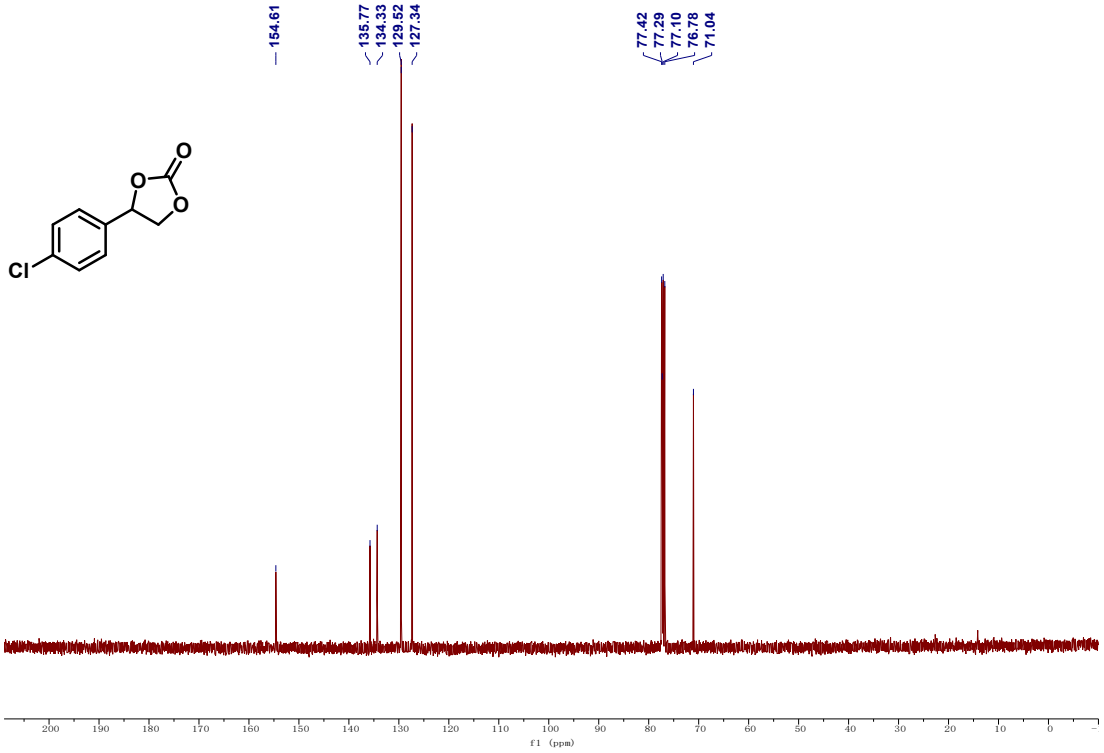


4-(4-Chlorophenyl)-1,3-dioxolan-2-one (**4d**)

^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4d**

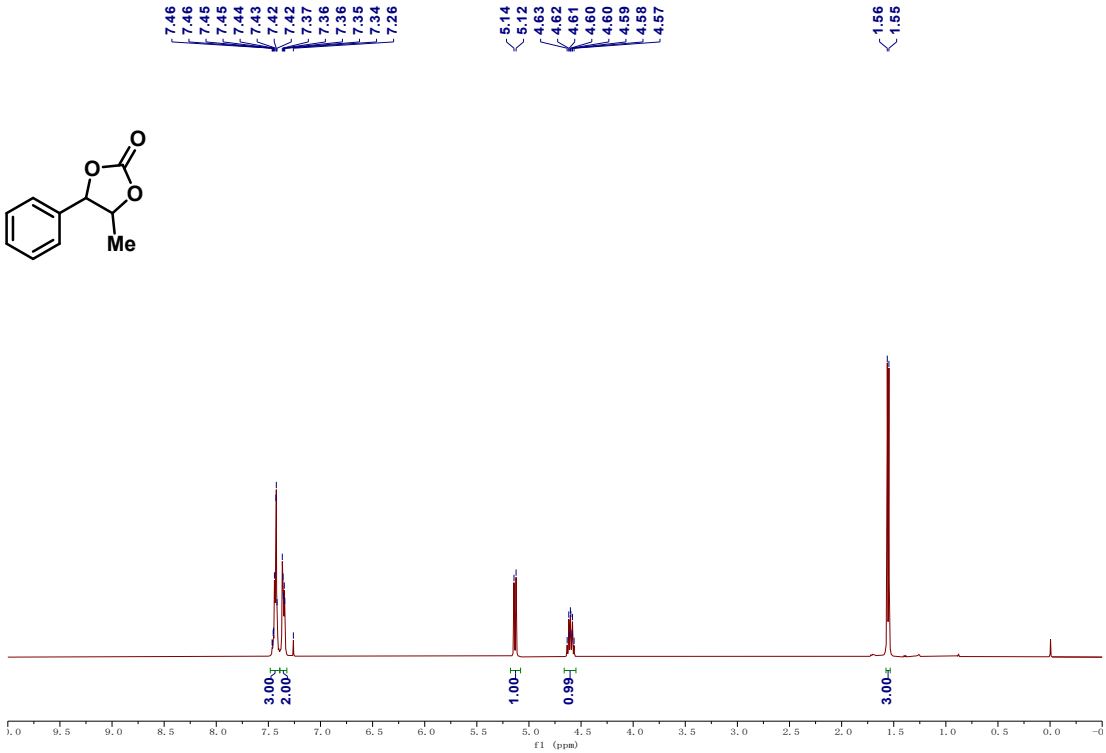


^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) spectrum of **4d**

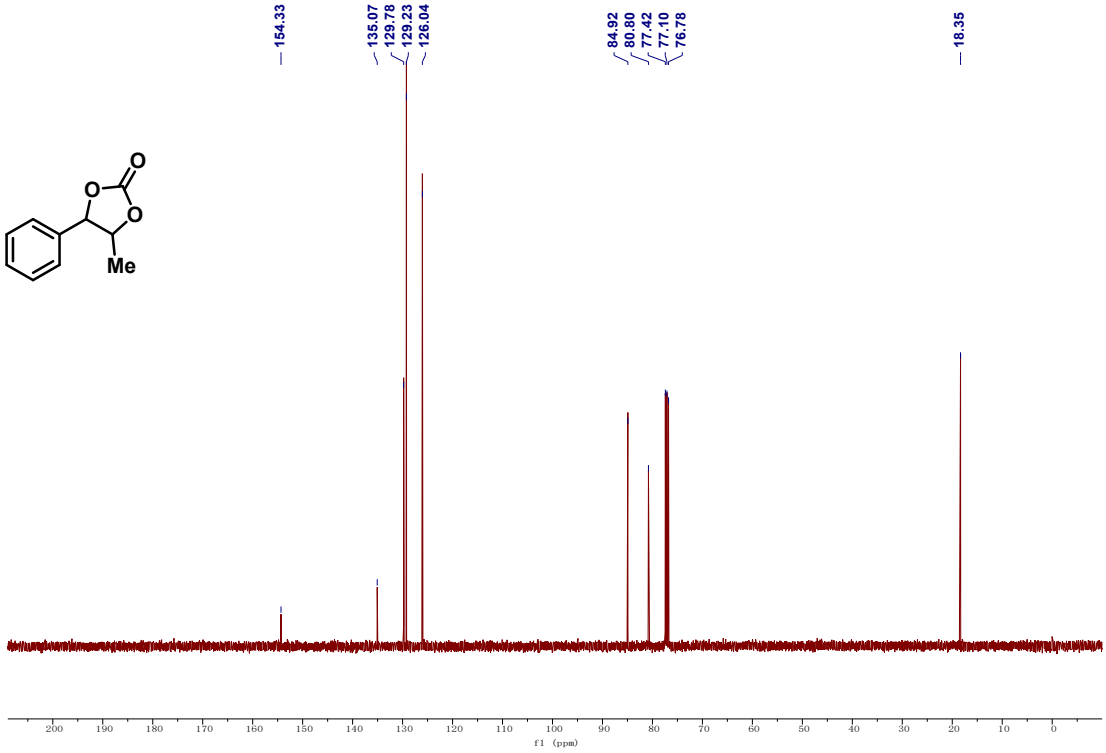


4-methyl-5-phenyl-1,3-Dioxolan-2-one (**4e**)

^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4e**

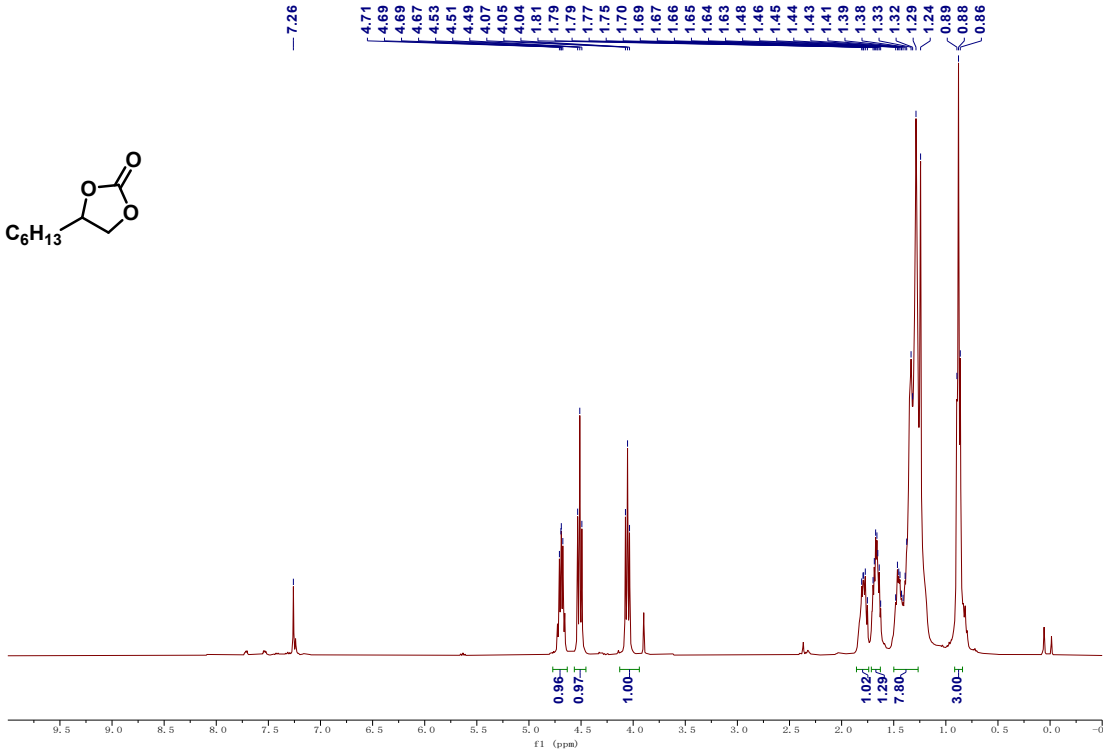


^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) spectrum of **4e**

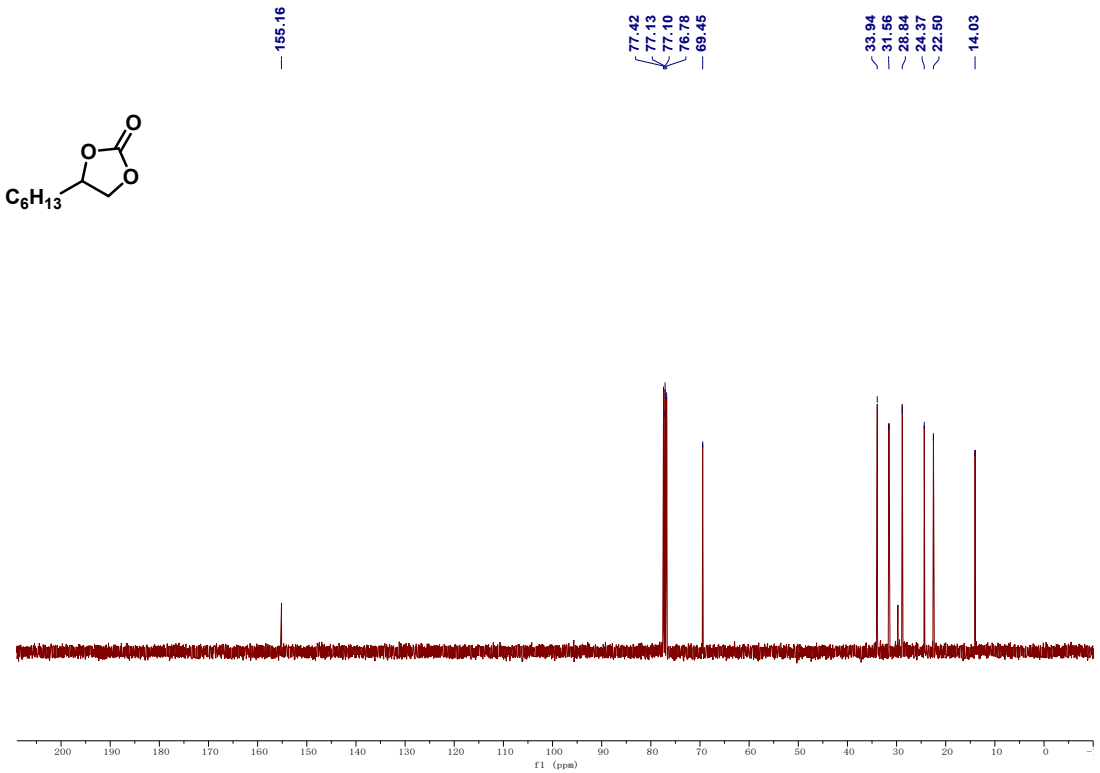


4-hexyl-1,3-dioxolan-2-one (**4f**)

^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4f**

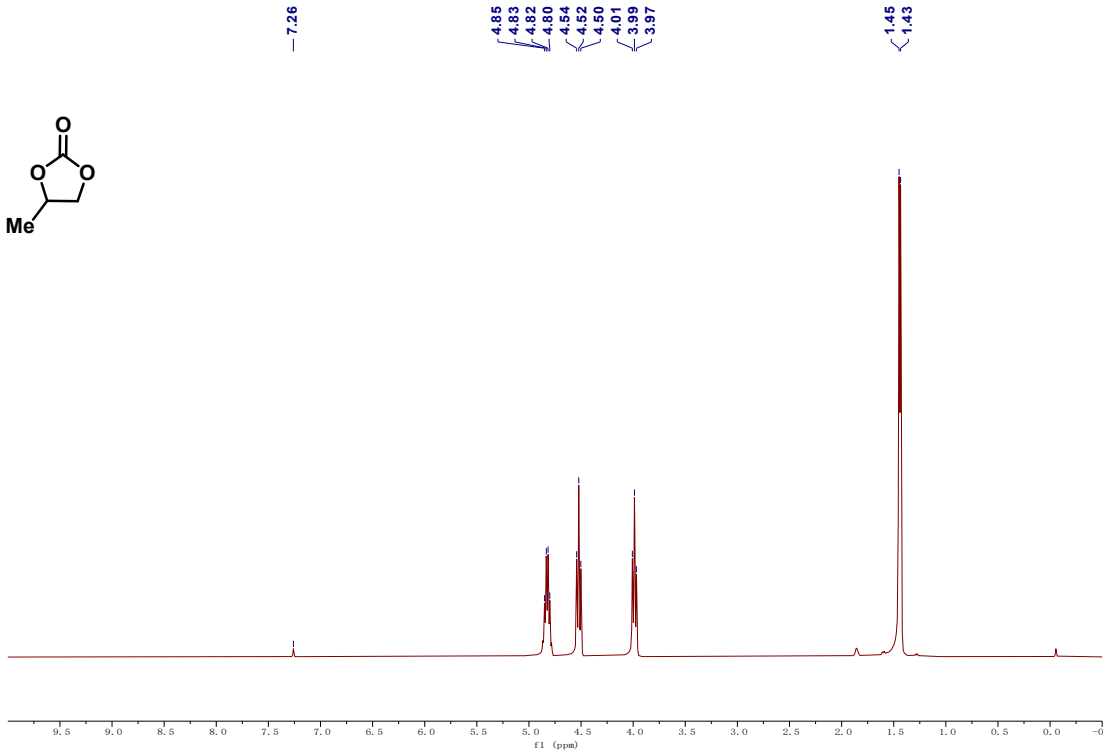


^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) spectrum of **4f**



1,3-Dioxolan-2-one (**4g**)

^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **4g**



^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) spectrum of **4g**