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Supplementary Materials for

Electrochemical oxidation-induced etherification via C(sp^3)─H/O─H cross-coupling

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General information

All reactions were run under a dry nitrogen atmosphere on a Schlenk tube. All glassware was oven dried at 110 ^{o}C for hours and cooled down under vacuum. All the solvents were purified according to the solvent handbook. The instrument for electrolysis is dual display potentiostat (DJS-292B) (made in China). The anode electrode is carbon rod electrodes (Φ 6mm) and the cathode electrode is platinum plate electrodes (15 mm×15 mm×0.3 mm) or nickel plate electrodes (15 mm×15 mm×1 mm). Unless otherwise noted, reagents were obtained from commercial suppliers and used without further purification. Thin layer chromatography (TLC) employed glass 0.25 mm silica gel plates. Flash chromatography columns were packed with 200-300 mesh silica gel in petroleum (bp. 60-90 ^{o}C). GC-MS spectra were recorded on a Varian GC-MS 3900-2100T. All compounds were characterized by ^{1}H NMR, ^{13}C NMR. ^{1}H and ^{13}C NMR data were recorded with ADVANCE III 400 MHz with tetramethylsilane as an internal standard. High resolution mass spectra (HRMS) were measured with a Waters Micromass GCT instrument. All chemical shifts (δ) were reported in ppm and coupling constants (*J*) in Hz. All chemical shifts were reported relative to tetramethylsilane (0 ppm for ^{1}H), $CDCl_3$ (77.16 ppm for ^{13}C) and DMSO (2.50 ppm for ^{1}H, 39.52 ppm for ^{13}C), respectively.

Graphical guide for the set-up

As experimental set-up, a carbon rod electrode (Φ 6mm), nickel plate electrode (15 mm x 15 mm x 1 mm) a platinum plate electrode (15 mm×15 mm×0.3 mm), rubber plugs, an undivided three-necked bottle and a dual display potentiostat (DJS-292B) (made in China) were used.

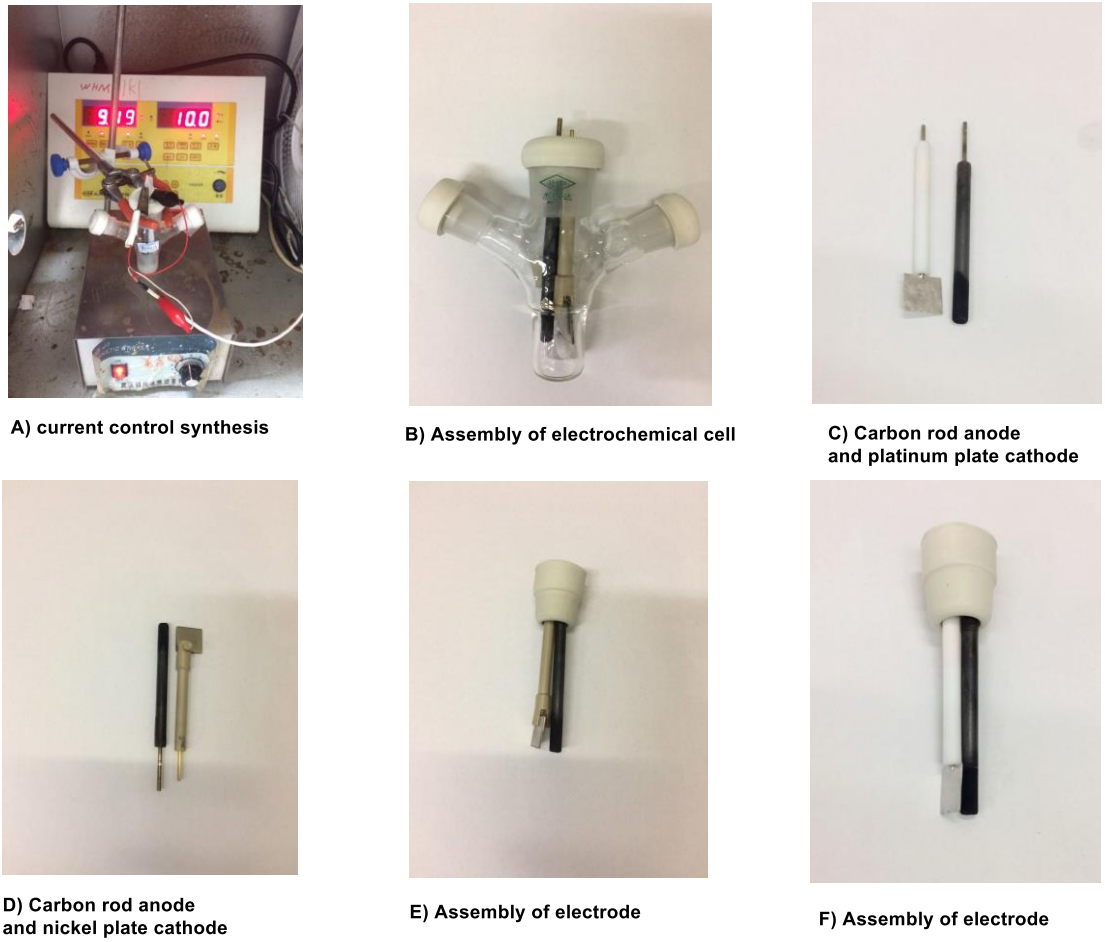
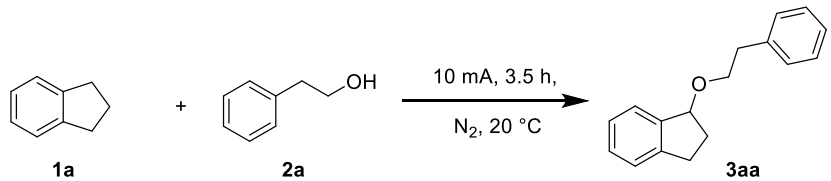


Figure S1. Graphical guide for the set-up (Photo Credit: Huamin Wang, Wuhan University)

Experimental section

1) Impact of reaction parameters

Table S1. Impact of reaction parameters [a]

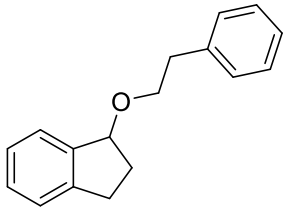


1a + **2a** → **3aa**

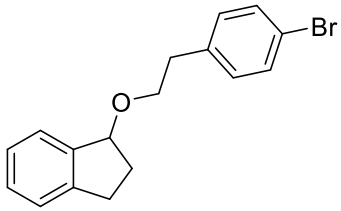
Entry	Ratio of **1a:2a**	Solvents	Bases	Electrolyte	Electrodes	Isolated yield(%) **3aa**
1	1:3	DCE	—	Bu_4NClO_4	C(+) | Pt(-)	27
2	1:3	DCE	Cs_2CO_3	Bu_4NClO_4	C(+) | Pt(-)	50
3	1:3	DCE	Cs_2CO_3	Bu_4NClO_4	C(+) | C(-)	32
4	1:3	DCE	Cs_2CO_3	Bu_4NClO_4	C(+) | Ni(-)	56
5[b]	1:3	CH_3CN	Cs_2CO_3	Bu_4NClO_4	C(+) | Ni(-)	31
6[c]	1:3	DCE/THF	Cs_2CO_3	Bu_4NClO_4	C(+) | Ni(-)	50
7	1:3	DCE/Et_2O	Cs_2CO_3	Bu_4NClO_4	C(+) | Ni(-)	60
8[d]	1:3	DCE/Et_2O	Cs_2CO_3	Bu_4NClO_4	C(+) | Ni(-)	60
9[e]	1:3	DCE/Et_2O	Cs_2CO_3	Bu_4NClO_4	C(+) | Ni(-)	49
10	1:3	DCE/Et_2O	Na_2CO_3	Bu_4NClO_4	C(+) | Ni(-)	24
11	1:3	DCE/Et_2O	NaOAc	Bu_4NClO_4	C(+) | Ni(-)	25
12	1:3	DCE/Et_2O	Cs_2CO_3	Bu_4NBF_4	C(+) | Ni(-)	40
13	1:2	DCE/Et_2O	Cs_2CO_3	Bu_4NClO_4	C(+) | Ni(-)	24
14	1:3	DCE/Et_2O	Cs_2CO_3	Bu_4NClO_4	—	n.d.[f]
15[g]	1:3	DCE/Et_2O	Cs_2CO_3	Bu_4NClO_4	C(+) | Ni(-)	50

[a] Standard conditions: Carbon rod anode, nickel plate (15 mm x 15 mm x 1 mm) cathode, constant current = 10 mA, **1a** (0.5 mmol), **2a** (3 equiv.), $^nBu_4NClO_4$ (0.5 equiv), Cs_2CO_3 (2 equiv.), 20°C, in DCE/Et_2O (6 mL/0.5 mL) under N_2 atmosphere for 3.5 h, and an undivided cell, isolated yields. [b]CH_3CN (6 mL). [c]DCE/THF (6 mL/0.5 mL). [d] DCE/Et_2O (6 mL/2 mL). [e] Cs_2CO_3 (1.5 equiv.). [f] "n.d." means "not detected".

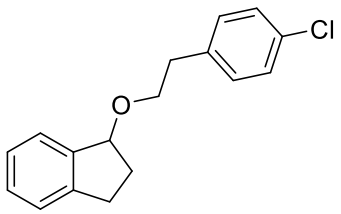
2) Procedure and analytical data of compounds.



1-Phenethoxy-2,3-dihydro-1H-indene (3aa): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.36 – 7.15 (m, 9H), 4.91 (dd, *J* = 6.7, 4.2 Hz, 1H), 3.73 (qd, *J* = 9.2, 8.3, 5.3 Hz, 2H), 3.10 – 3.00 (m, 1H), 2.91 (td, *J* = 7.4, 2.8 Hz, 2H), 2.78 (ddd, *J* = 16.0, 8.4, 5.6 Hz, 1H), 2.32 (ddt, *J* = 12.5, 8.7, 6.1 Hz, 1H), 2.05 (ddt, *J* = 13.1, 8.6, 5.1 Hz, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.97, 142.92, 139.18, 129.10, 128.42, 128.38, 126.40, 126.27, 125.14, 124.97, 83.47, 69.77, 36.80, 32.48, 30.28. HRMS (ESI+) calculated for $C_{17}H_{18}NaO^{+}$ $(M+Na)^{+}$: 261.1250; found: 261.1253.

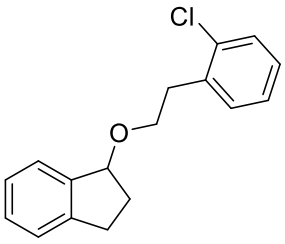


1-(4-Bromophenethoxy)-2,3-dihydro-1H-indene (3ab): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.42 – 7.36 (m, 2H), 7.31 (d, *J* = 7.2 Hz, 1H), 7.24 (d, *J* = 3.6 Hz, 2H), 7.22 – 7.16 (m, 1H), 7.09 (d, *J* = 8.3 Hz, 2H), 4.89 (dd, *J* = 6.6, 4.3 Hz, 1H), 3.76 – 3.64 (m, 2H), 3.09 – 2.99 (m, 1H), 2.84 (t, *J* = 7.1 Hz, 2H), 2.81 – 2.73 (m, 1H), 2.35 – 2.25 (m, 1H), 2.07 – 1.97 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.94, 142.75, 138.32, 131.39, 130.85, 128.42, 126.39, 125.06, 124.99, 120.04, 83.48, 69.21, 36.12, 32.42, 30.26. HRMS (ESI+) calculated for $C_{17}H_{17}BrNaO^{+}$ $(M+Na)^{+}$: 339.0355; found: 339.0355.

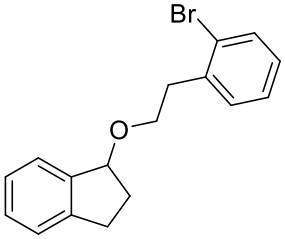


1-(4-Chlorophenethoxy)-2,3-dihydro-1H-indene (3ac): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.31 (d, *J* = 7.2 Hz, 1H), 7.27 – 7.17 (m, 5H), 7.15 (d, *J* = 8.3 Hz, 2H), 4.89 (dd, *J* = 6.6, 4.4 Hz, 1H), 3.80 – 3.64 (m, 2H), 3.04 (ddd, *J* = 16.0, 8.4, 5.8 Hz,

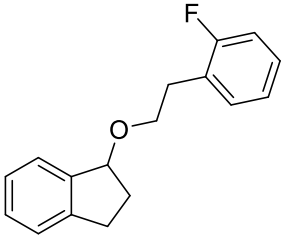
1H), 2.86 (t, *J* = 7.0 Hz, 2H), 2.78 (ddd, *J* = 16.0, 8.5, 5.6 Hz, 1H), 2.30 (ddt, *J* = 12.8, 8.4, 6.2 Hz, 1H), 2.07 – 1.97 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.94, 142.77, 137.80, 131.96, 130.43, 128.44, 128.42, 126.39, 125.06, 124.98, 83.48, 69.30, 36.06, 32.42, 30.26. HRMS (ESI+) calculated for $C_{17}H_{17}ClNaO^+$ $(M+Na)^+$: 295.0860; found: 295.0863.



1-(2-Chlorophenethoxy)-2,3-dihydro-1H-indene (3ad): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.36 – 7.29 (m, 2H), 7.29 – 7.08 (m, 6H), 4.91 (dd, *J* = 6.7, 4.5 Hz, 1H), 3.81 – 3.69 (m, 2H), 3.10 – 2.98 (m, 3H), 2.82 – 2.71 (m, 1H), 2.36 – 2.26 (m, 1H), 2.08 – 1.98 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.88, 142.87, 136.67, 134.21, 131.32, 129.45, 128.34, 127.77, 126.74, 126.38, 125.05, 124.92, 83.40, 67.62, 34.43, 32.46, 30.22. HRMS (EI+) calculated for $C_{17}H_{17}ClO$ (M+): 272.0968; found: 272.0973.

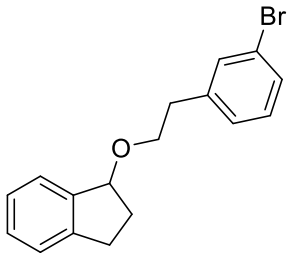


1-(2-Bromophenethoxy)-2,3-dihydro-1H-indene (3ae): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.57 – 7.48 (m, 1H), 7.34 (d, *J* = 7.1 Hz, 1H), 7.29 – 7.16 (m, 5H), 7.05 (td, *J* = 7.7, 1.8 Hz, 1H), 4.93 (dd, *J* = 6.7, 4.5 Hz, 1H), 3.82 – 3.70 (m, 2H), 3.11 – 2.99 (m, 3H), 2.82 – 2.73 (m, 1H), 2.37 – 2.26 (m, 1H), 2.10 – 1.98 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.90, 142.88, 138.39, 132.80, 131.33, 128.37, 128.05, 127.41, 126.40, 125.08, 124.94, 124.75, 83.43, 67.71, 36.95, 32.48, 30.25. HRMS (ESI+) calculated for $C_{17}H_{17}BrNaO^+$ $(M+Na)^+$: 339.0355; found: 339.0354.

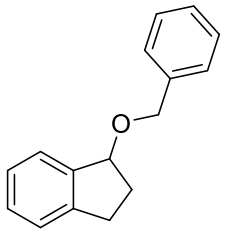


1-(2-Fluorophenethoxy)-2,3-dihydro-1H-indene (3af): The synthesis procedure is the same as for

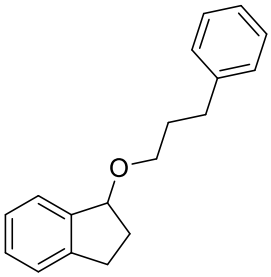
3a. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.32 (d, *J* = 6.4 Hz, 1H), 7.28 – 7.11 (m, 5H), 7.02 (dt, *J* = 18.0, 8.3 Hz, 2H), 4.91 (s, 1H), 3.75 (qd, *J* = 6.8, 2.5 Hz, 2H), 3.04 (dt, *J* = 14.0, 6.0 Hz, 1H), 2.95 (t, *J* = 6.1 Hz, 2H), 2.77 (dt, *J* = 14.4, 6.4 Hz, 1H), 2.31 (dq, *J* = 12.8, 6.2 Hz, 1H), 2.09 – 1.98 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 161.36 (d, J_{CF} = 245.8 Hz), 143.91, 142.88, 131.48 (d, J_{CF} = 4.8 Hz), 128.35, 128.01 (d, J_{CF} = 8.1 Hz), 126.39, 125.97 (d, J_{CF} = 15.9 Hz), 125.00 (d, J_{CF} = 13.6 Hz), 123.97 (d, J_{CF} = 3.6 Hz), 115.23 (d, J_{CF} = 22.3 Hz), 83.41, 68.13, 32.46, 30.23, 29.99, 29.97. ^{19}F NMR (377 MHz, Chloroform-*d*) δ -118.46. HRMS (ESI+) calculated for $C_{17}H_{17}FNaO^{+}$ $(M+Na)^{+}$: 279.1156; found: 279.1155.



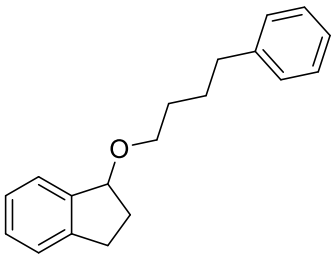
1-(3-Bromophenethoxy)-2,3-dihydro-1H-indene (3ag): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.39 (s, 1H), 7.33 (dd, *J* = 7.4, 3.3 Hz, 2H), 7.25 – 7.11 (m, 5H), 4.89 (dd, *J* = 6.6, 4.4 Hz, 1H), 3.78 – 3.64 (m, 2H), 3.05 (ddd, *J* = 14.5, 8.2, 5.9 Hz, 1H), 2.85 (t, *J* = 7.0 Hz, 2H), 2.82 – 2.74 (m, 1H), 2.37 – 2.25 (m, 1H), 2.08 – 1.98 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.93, 142.73, 141.69, 132.10, 129.90, 129.33, 128.43, 127.77, 126.42, 125.09, 124.98, 122.39, 83.52, 69.12, 36.33, 32.39, 30.26. HRMS (ESI+) calculated for $C_{17}H_{17}BrNaO^{+}$ $(M+Na)^{+}$: 339.0355; found: 339.0352.



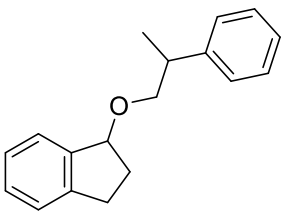
1-(Benzyloxy)-2,3-dihydro-1H-indene (3ah): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.44 – 7.36 (m, 3H), 7.33 (t, *J* = 7.6 Hz, 2H), 7.30 – 7.16 (m, 4H), 5.01 (dd, *J* = 6.6, 4.4 Hz, 1H), 4.67 – 4.57 (m, 2H), 3.09 (ddd, *J* = 14.9, 8.1, 6.0 Hz, 1H), 2.86 – 2.74 (m, 1H), 2.34 (ddt, *J* = 12.6, 8.4, 6.2 Hz, 1H), 2.19 – 2.09 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 144.09, 142.91, 138.86, 128.46, 128.43, 127.81, 127.58, 126.39, 125.18, 124.98, 82.67, 70.56, 32.54, 30.31. HRMS (ESI+) calculated for $C_{16}H_{16}NaO^{+}$ $(M+Na)^{+}$: 247.1093; found: 247.1095.



1-(3-Phenylpropoxy)-2,3-dihydro-1H-indene (3ai): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.38 (d, *J* = 6.7 Hz, 1H), 7.29 – 7.13 (m, 8H), 4.88 (dd, *J* = 6.7, 4.5 Hz, 1H), 3.62 – 3.46 (m, 2H), 3.14 – 3.00 (m, 1H), 2.84 – 2.74 (m, 1H), 2.71 (t, *J* = 7.6 Hz, 2H), 2.32 (dddd, *J* = 12.4, 8.4, 6.7, 5.7 Hz, 1H), 2.05 (dddd, *J* = 13.1, 8.4, 5.7, 4.4 Hz, 1H), 1.96 – 1.87 (m, 2H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.91, 143.14, 142.14, 128.61, 128.39, 128.32, 126.38, 125.81, 125.11, 124.95, 83.31, 67.79, 32.58, 32.49, 31.71, 30.29. HRMS (ESI+) calculated for $C_{18}H_{20}NaO^{+}$ $(M+Na)^{+}$: 275.1406; found: 275.1404.

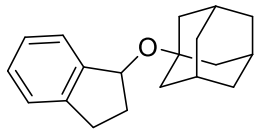


1-(4-Phenylbutoxy)-2,3-dihydro-1H-indene (3aj): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.37 (d, *J* = 7.0 Hz, 1H), 7.34 – 7.08 (m, 8H), 4.89 (dd, *J* = 6.7, 4.4 Hz, 1H), 3.55 (td, *J* = 6.2, 2.9 Hz, 2H), 3.12 – 3.00 (m, 1H), 2.79 (ddd, *J* = 15.6, 8.3, 5.8 Hz, 1H), 2.62 (t, *J* = 7.3 Hz, 2H), 2.38 – 2.28 (m, 1H), 2.04 (ddt, *J* = 10.0, 8.5, 5.5 Hz, 1H), 1.76 – 1.60 (m, 4H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.95, 143.13, 142.66, 128.56, 128.38, 128.33, 126.39, 125.78, 125.13, 124.97, 83.29, 68.64, 35.89, 32.53, 30.30, 29.84, 28.33. HRMS (ESI+) calculated for $C_{19}H_{22}NaO^{+}$ $(M+Na)^{+}$: 289.1563; found: 289.1562.

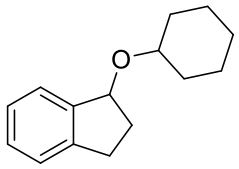


1-(2-Phenylpropoxy)-2,3-dihydro-1H-indene (3ak): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.35 – 7.14 (m, 9H), 4.89 (ddd, *J* = 11.1, 6.7, 4.8 Hz, 1H), 3.67

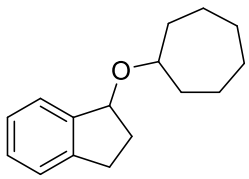
(ddd, *J* = 14.9, 9.1, 5.9 Hz, 1H), 3.54 (dt, *J* = 14.2, 8.5 Hz, 1H), 3.09 – 2.96 (m, 2H), 2.82 – 2.70 (m, 1H), 2.36 – 2.24 (m, 1H), 2.01 (dddd, *J* = 19.1, 17.4, 8.6, 5.4 Hz, 1H), 1.31 (dd, *J* = 7.0, 2.7 Hz, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 144.68, 144.65, 143.82, 143.08, 143.05, 128.41, 128.40, 128.28, 127.53, 127.51, 126.39, 126.37, 125.09, 125.07, 124.90, 124.88, 83.54, 83.52, 74.65, 40.43, 40.29, 32.39, 32.36, 30.23, 18.57, 18.55. HRMS (ESI+) calculated for $C_{18}H_{20}NaO^+$ $(M+Na)^+$: 275.1406; found: 275.1411.



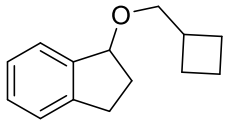
(3s,5s,7s)-1-((2,3-Dihydro-1H-inden-1-yl)oxy)adamantane (3al): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.34 – 7.29 (m, 1H), 7.24 – 7.13 (m, 3H), 5.23 (t, *J* = 7.1 Hz, 1H), 2.99 (ddd, *J* = 15.8, 9.1, 2.7 Hz, 1H), 2.82 – 2.71 (m, 1H), 2.40 (dtd, *J* = 12.9, 8.0, 3.0 Hz, 1H), 2.20 (s, 3H), 1.98 – 1.81 (m, 7H), 1.67 (s, 6H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 145.02, 142.77, 127.65, 126.57, 124.79, 124.59, 74.00, 72.88, 43.06, 36.60, 36.44, 30.78, 30.12. HRMS (ESI+) calculated for $C_{19}H_{24}NaO^+$ $(M+Na)^+$: 291.1719; found: 291.1721.



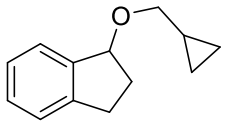
1-(Cyclohexyloxy)-2,3-dihydro-1H-indene (3am): The synthesis procedure is the same as for **3a**.^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.41 – 7.33 (m, 1H), 7.26 – 7.16 (m, 3H), 5.03 (t, *J* = 6.1 Hz, 1H), 3.49 (tt, *J* = 9.4, 3.8 Hz, 1H), 3.03 (ddd, *J* = 15.8, 8.6, 4.6 Hz, 1H), 2.77 (dt, *J* = 15.6, 7.6 Hz, 1H), 2.38 (dddd, *J* = 12.9, 8.3, 6.8, 4.6 Hz, 1H), 1.98 (dddd, *J* = 12.5, 8.7, 6.9, 5.4 Hz, 3H), 1.77 (q, *J* = 4.0, 3.3 Hz, 2H), 1.60 – 1.51 (m, 1H), 1.43 – 1.18 (m, 5H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 144.03, 143.41, 128.00, 126.45, 124.81, 124.78, 80.67, 76.60, 33.87, 33.62, 32.77, 30.10, 25.94, 24.50, 24.46. HRMS (ESI+) calculated for $C_{15}H_{20}NaO^+$ $(M+Na)^+$: 239.1406; found: 239.1414.



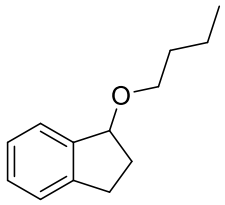
1-(Cycloheptyloxy)-2,3-dihydro-1H-indene (3an): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.39 – 7.32 (m, 1H), 7.24 – 7.13 (m, 3H), 4.97 (t, *J* = 6.1 Hz, 1H), 3.69 (tt, *J* = 8.2, 4.3 Hz, 1H), 3.03 (ddd, *J* = 15.8, 8.6, 4.6 Hz, 1H), 2.77 (dt, *J* = 15.6, 7.6 Hz, 1H), 2.38 (dddd, *J* = 12.8, 8.2, 6.7, 4.5 Hz, 1H), 2.03 – 1.90 (m, 3H), 1.76 – 1.62 (m, 4H), 1.61 – 1.51 (m, 4H), 1.41 (ddqd, *J* = 11.8, 5.9, 4.3, 2.0 Hz, 2H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 144.12, 143.43, 128.01, 126.47, 124.82, 124.78, 81.00, 79.10, 35.33, 34.34, 33.75, 30.10, 28.56, 28.44, 23.19, 23.04. HRMS (ESI+) calculated for $C_{16}H_{22}NaO^{+}$ $(M+Na)^{+}$: 253.1563; found: 253.1565.



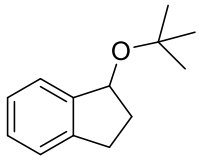
1-(4-Phenylbutoxy)-2,3-dihydro-1H-indene (3ao): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.39 (d, *J* = 6.7 Hz, 1H), 7.29 – 7.16 (m, 3H), 4.91 (dd, *J* = 6.8, 4.6 Hz, 1H), 3.52 (d, *J* = 6.9 Hz, 2H), 3.05 (ddd, *J* = 16.0, 8.5, 5.4 Hz, 1H), 2.79 (ddd, *J* = 15.6, 8.4, 6.0 Hz, 1H), 2.59 (dq, *J* = 14.8, 7.4 Hz, 1H), 2.35 (dddd, *J* = 13.7, 8.4, 6.7, 5.5 Hz, 1H), 2.05 (dddd, *J* = 17.8, 8.7, 6.4, 3.9 Hz, 3H), 1.95 – 1.82 (m, 2H), 1.79 – 1.69 (m, 2H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.88, 143.21, 128.25, 126.37, 125.12, 124.90, 83.31, 73.44, 35.43, 32.46, 30.26, 25.32, 25.22, 18.75. HRMS (ESI+) calculated for $C_{14}H_{18}NaO^{+}$ $(M+Na)^{+}$: 225.1250; found: 225.1247.



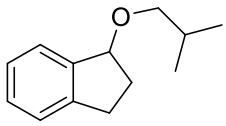
1-(Cyclopropylmethoxy)-2,3-dihydro-1H-indene (3ap): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.39 (d, *J* = 7.0 Hz, 1H), 7.32 – 7.11 (m, 3H), 4.94 (dd, *J* = 6.7, 4.5 Hz, 1H), 3.38 (qd, *J* = 10.0, 6.9 Hz, 2H), 3.07 (ddd, *J* = 14.8, 8.4, 5.7 Hz, 1H), 2.79 (ddd, *J* = 15.4, 8.3, 5.8 Hz, 1H), 2.33 (dq, *J* = 13.4, 6.2 Hz, 1H), 2.13 – 2.02 (m, 1H), 1.09 (tdt, *J* = 6.8, 5.2, 3.4 Hz, 1H), 0.65 – 0.43 (m, 2H), 0.22 (q, *J* = 4.9, 4.4 Hz, 2H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.93, 143.03, 128.26, 126.32, 125.13, 124.88, 82.98, 73.46, 32.49, 30.26, 11.09, 3.32, 3.19. HRMS (ESI+) calculated for $C_{13}H_{16}NaO^{+}$ $(M+Na)^{+}$: 211.1093; found: 211.1092.



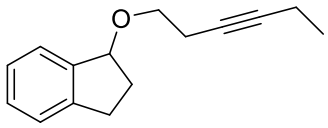
1-Butoxy-2,3-dihydro-1H-indene (3aq): ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.39 (d, *J* = 6.6 Hz, 1H), 7.26 – 7.17 (m, 3H), 4.90 (dd, *J* = 6.7, 4.5 Hz, 1H), 3.59 – 3.49 (m, 2H), 3.06 (ddd, *J* = 15.9, 8.5, 5.6 Hz, 1H), 2.79 (ddd, *J* = 15.8, 8.4, 5.8 Hz, 1H), 2.34 (dddd, *J* = 13.2, 8.5, 6.7, 5.6 Hz, 1H), 2.05 (dddd, *J* = 13.1, 8.5, 5.8, 4.5 Hz, 1H), 1.65 – 1.55 (m, 2H), 1.45 – 1.35 (m, 2H), 0.92 (t, *J* = 7.4 Hz, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.89, 143.21, 128.26, 126.36, 125.10, 124.92, 83.23, 68.62, 32.53, 32.26, 30.27, 19.56, 14.08. HRMS (EI+) calculated for $C_{13}H_{18}O$ (M+): 190.1358; found: 190.1364.



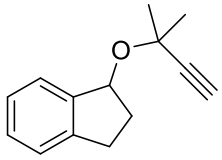
1-(Tert-butoxy)-2,3-dihydro-1H-indene (3ar): ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.33 – 7.27 (m, 1H), 7.23 – 7.16 (m, 3H), 5.07 (t, *J* = 7.0 Hz, 1H), 2.98 (ddd, *J* = 15.8, 9.1, 2.9 Hz, 1H), 2.76 (dt, *J* = 16.1, 8.4 Hz, 1H), 2.49 – 2.37 (m, 1H), 1.92 (dtd, *J* = 12.9, 8.9, 6.9 Hz, 1H), 1.32 (s, 9H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 144.95, 142.61, 127.67, 126.57, 124.65, 124.61, 75.98, 73.67, 36.28, 30.06, 28.93. HRMS (ESI+) calculated for $C_{13}H_{18}NaO^{+}$ $(M+Na)^{+}$: 213.1250; found: 213.1249.



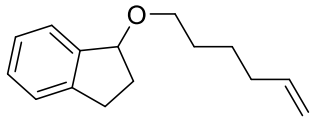
1-Isobutoxy-2,3-dihydro-1H-indene (3as): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.39 (d, *J* = 6.6 Hz, 1H), 7.28 – 7.16 (m, 3H), 4.89 (dd, *J* = 6.7, 4.8 Hz, 1H), 3.37 – 3.23 (m, 2H), 3.05 (ddd, *J* = 15.6, 8.5, 5.4 Hz, 1H), 2.79 (ddd, *J* = 15.5, 8.3, 6.1 Hz, 1H), 2.40 – 2.28 (m, 1H), 2.10 – 1.99 (m, 1H), 1.88 (dp, *J* = 13.4, 6.7 Hz, 1H), 0.93 (d, *J* = 6.7 Hz, 6H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.81, 143.32, 128.22, 126.36, 125.08, 124.90, 83.37, 75.83, 32.49, 30.24, 28.85, 19.67, 19.65. HRMS (EI+) calculated for $C_{13}H_{18}O$ (M+): 190.1358; found: 190.1362.



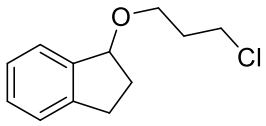
1-(Hex-3-yn-1-yloxy)-2,3-dihydro-1H-indene (3at): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.40 (d, *J* = 7.1 Hz, 1H), 7.28 – 7.17 (m, 3H), 4.96 (dd, *J* = 6.5, 4.5 Hz, 1H), 3.62 (t, *J* = 7.3 Hz, 2H), 3.06 (ddd, *J* = 14.6, 8.3, 5.8 Hz, 1H), 2.81 (dd, *J* = 8.5, 5.8 Hz, 1H), 2.45 (tt, *J* = 7.3, 2.3 Hz, 2H), 2.39 – 2.28 (m, 1H), 2.16 (qq, *J* = 7.7, 2.6 Hz, 2H), 2.11 – 2.02 (m, 1H), 1.11 (t, *J* = 7.5 Hz, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.94, 142.72, 128.40, 126.40, 125.12, 124.93, 83.40, 82.85, 76.15, 67.40, 32.37, 30.23, 20.54, 14.30, 12.52. HRMS (ESI+) calculated for $C_{15}H_{18}NaO^{+}$ $(M+Na)^{+}$: 237.1250; found: 237.1249.



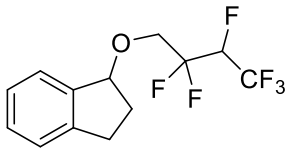
1-((2-Methylbut-3-yn-2-yl)oxy)-2,3-dihydro-1H-indene (3au): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.41 (td, *J* = 4.4, 2.1 Hz, 1H), 7.29 – 7.18 (m, 3H), 5.37 (t, *J* = 6.8 Hz, 1H), 3.01 (ddd, *J* = 15.8, 9.1, 3.4 Hz, 1H), 2.80 (dt, *J* = 16.0, 8.1 Hz, 1H), 2.61 – 2.38 (m, 2H), 2.07 – 1.95 (m, 1H), 1.60 (s, 3H), 1.55 (s, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 144.27, 142.85, 127.98, 126.62, 125.06, 124.66, 87.55, 78.91, 71.95, 70.80, 35.26, 30.17, 30.14, 29.88. HRMS (EI+) calculated for $C_{14}H_{16}O$ (M+): 200.1201; found: 200.1202.



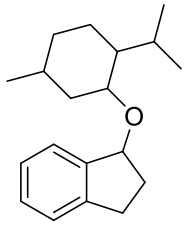
1-(Hex-5-en-1-yloxy)-2,3-dihydro-1H-indene (3av): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.39 (d, *J* = 6.8 Hz, 1H), 7.29 – 7.16 (m, 3H), 5.81 (ddt, *J* = 16.9, 10.2, 6.7 Hz, 1H), 5.08 – 4.83 (m, 3H), 3.54 (tt, *J* = 5.9, 3.0 Hz, 2H), 3.05 (dd, *J* = 8.5, 5.9 Hz, 1H), 2.80 (ddd, *J* = 15.5, 8.2, 5.9 Hz, 1H), 2.40 – 2.29 (m, 1H), 2.07 (q, *J* = 7.3 Hz, 3H), 1.62 (dt, *J* = 14.7, 6.5 Hz, 2H), 1.53 – 1.43 (m, 2H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.94, 143.18, 138.97, 128.32, 126.39, 125.12, 124.96, 114.60, 83.27, 68.67, 33.73, 32.54, 30.29, 29.66, 25.71. HRMS (ESI+) calculated for $C_{15}H_{20}NaO^{+}$ $(M+Na)^{+}$: 239.1406; found: 239.1406.



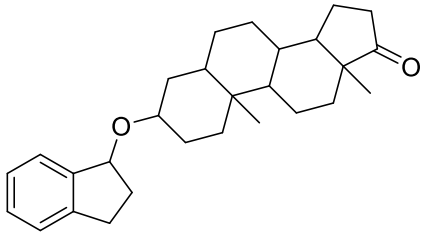
1-(3-Chloropropoxy)-2,3-dihydro-1H-indene (3aw): ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.38 (d, *J* = 7.0 Hz, 1H), 7.30 – 7.15 (m, 3H), 4.91 (dd, *J* = 6.7, 4.3 Hz, 1H), 3.67 (dt, *J* = 12.6, 6.1 Hz, 4H), 3.12 – 2.99 (m, 1H), 2.86 – 2.74 (m, 1H), 2.34 (ddd, *J* = 20.9, 8.5, 6.3 Hz, 1H), 2.10 – 1.97 (m, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.89, 142.82, 128.43, 126.42, 125.04, 124.97, 83.50, 64.95, 42.21, 33.04, 32.36, 30.24. HRMS (ESI+) calculated for $C_{12}H_{15}ClNaO^{+}$ $(M+Na)^{+}$: 233.0704; found: 233.0703.



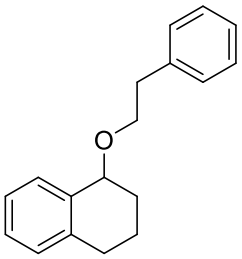
1-(2,2,3,4,4,4-Hexafluorobutoxy)-2,3-dihydro-1H-indene (3ax): HRMS (EI+) calculated for $C_{13}H_{12}F_6O$ (M+): 298.0792; found: 298.0789. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.37 (d, *J* = 7.3 Hz, 1H), 7.33 – 7.19 (m, 3H), 5.34 – 4.81 (m, 2H), 4.03 – 3.72 (m, 2H), 3.01-3.16 (m, 1H), 2.91-2.77 (m, 1H), 2.30-2.43 (m, 1H), 2.05-2.17 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 144.31, 144.27, 141.18, 141.17, 129.17, 126.72, 126.70, 125.26, 125.22, 125.19, 122.55, 122.29, 119.92, 119.89, 119.74, 119.69, 119.64(2), 119.63(5), 119.49, 117.44, 117.39, 117.19, 117.16, 116.94, 116.68, 114.95, 114.91, 114.71, 114.66, 85.21, 85.07, 85.06, 84.89, 84.82, 84.61, 84.52, 84.27, 84.17, 83.92, 83.82, 83.57, 83.28, 83.03, 82.93, 82.68, 82.59, 82.34, 82.24, 81.99, 81.89, 81.65, 66.56, 66.45, 66.30, 66.21, 66.11, 65.96, 65.86, 31.98, 31.87, 30.23, 30.22. ^{19}F NMR (377 MHz, Chloroform-*d*) δ -73.95, -73.97, -73.98, -73.99, -74.00, -74.01, -74.02, -74.03, -74.05, -116.70, -116.72, -116.73, -116.75, -116.76, -116.77, -116.79, -116.80, -116.99, -117.00, -117.01, -117.03, -117.04, -117.06, -117.07, -117.09, -120.65, -120.67, -120.68, -120.70, -120.71, -120.72, -120.73, -120.75, -120.76, -120.78, -121.38, -121.40, -121.41, -121.43, -121.44, -121.45, -121.46, -121.47, -121.49, -121.51, -214.41, -214.43, -214.44, -214.45, -214.46, -214.47, -214.48, -214.49, -214.51, -214.52, -214.54, -214.55, -214.56, -214.57, -214.59.



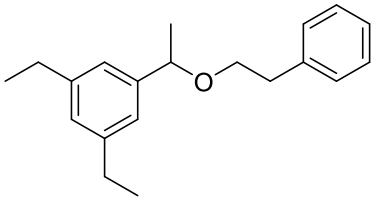
1-((2-Isopropyl-5-methylcyclohexyl)oxy)-2,3-dihydro-1H-indene (3ay): ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.35 (q, *J* = 4.3, 3.4 Hz, 1H), 7.20 (d, *J* = 1.5 Hz, 3H), 4.97 (dt, *J* = 24.6, 6.0 Hz, 1H), 3.28 (dtd, *J* = 18.9, 10.5, 4.2 Hz, 1H), 3.08 – 2.97 (m, 1H), 2.76 (dtd, *J* = 15.5, 7.7, 3.6 Hz, 1H), 2.44 – 2.17 (m, 3H), 2.09 – 1.93 (m, 1H), 1.64 (dddq, *J* = 15.6, 9.2, 6.1, 2.9 Hz, 2H), 1.40 (dtp, *J* = 15.3, 9.5, 3.2 Hz, 1H), 1.25 (dddt, *J* = 12.7, 10.0, 6.3, 3.1 Hz, 1H), 1.05 – 0.84 (m, 9H), 0.75 (dd, *J* = 38.8, 7.0 Hz, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 144.21, 143.93, 143.46, 143.41, 128.07, 127.99, 126.57, 126.29, 124.95, 124.89, 124.85, 124.76, 82.53, 80.97, 79.20, 78.11, 48.76, 48.24, 42.48, 41.61, 35.45, 34.65, 34.59, 33.39, 31.78, 30.31, 30.00, 25.33, 25.03, 23.13, 23.10, 22.60, 22.58, 21.33, 21.24, 15.94, 15.90. HRMS (ESI+) calculated for $C_{19}H_{28}NaO^{+}$ $(M+Na)^{+}$: 295.2032; found: 295.2030.



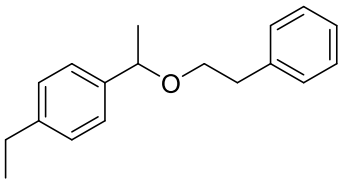
3-((2,3-dihydro-1H-inden-1-yl)oxy)-10,13-dimethylhexadecahydro-17H-cyclopenta[a]phenanthren-17-one (3az): ^{1}H NMR (400 MHz, Chloroform-*d*) δ ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.38 – 7.33 (m, 1H), 7.25 – 7.13 (m, 3H), 5.04 (ddd, *J* = 7.5, 5.4, 2.9 Hz, 1H), 3.49 (tdd, *J* = 11.2, 5.6, 2.3 Hz, 1H), 3.04 (ddd, *J* = 15.8, 8.6, 4.8 Hz, 1H), 2.77 (dt, *J* = 15.5, 7.4 Hz, 1H), 2.50 – 2.32 (m, 2H), 2.12 – 1.88 (m, 4H), 1.83 – 1.63 (m, 5H), 1.61 – 1.42 (m, 3H), 1.40 – 1.23 (m, 7H), 1.06 – 0.93 (m, 2H), 0.85 (d, *J* = 6.1 Hz, 6H), 0.70 (td, *J* = 11.6, 3.8 Hz, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 221.49, 143.86, 143.83, 143.48, 143.44, 128.06, 126.44, 124.80, 80.96, 80.84, 77.57, 77.45, 54.59, 51.51, 47.89, 45.14, 45.08, 37.20, 37.15, 36.11, 36.02, 36.01, 35.93, 35.36, 35.12, 33.97, 33.86, 31.64, 31.03, 30.10, 29.79, 29.40, 28.77, 28.64, 28.61, 21.86, 20.57, 13.90, 12.39. HRMS (ESI+) calculated for $C_{28}H_{38}NaO_{2}^{+}$ $(M+Na)^{+}$: 429.2764; found: 429.2771.



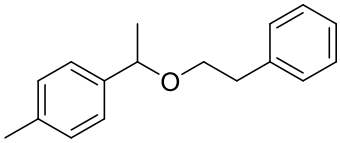
1-Phenethoxy-1,2,3,4-tetrahydronaphthalene (3ba): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.36 – 7.02 (m, 9H), 4.37 (t, *J* = 4.2 Hz, 1H), 3.79 (dt, *J* = 9.3, 7.0 Hz, 1H), 3.66 (dt, *J* = 9.3, 6.9 Hz, 1H), 2.83 (t, *J* = 6.9 Hz, 2H), 2.76 – 2.58 (m, 2H), 1.81 (dd, *J* = 9.3, 2.9 Hz, 3H), 1.62 (ddt, *J* = 11.7, 9.5, 6.4 Hz, 1H). ^{13}C NMR (400 MHz, DMSO-d_6) δ 139.23, 136.97, 136.87, 129.12, 128.88, 128.60, 128.17, 127.21, 126.00, 125.36, 74.63, 68.82, 36.08, 28.49, 27.66, 18.45. HRMS (ESI+) calculated for $C_{18}H_{20}NaO^+$ $(M+Na)^+$: 275.1406; found: 275.1402.



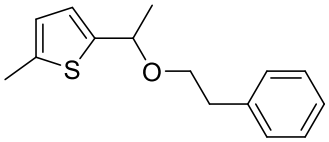
1,3-Diethyl-5-(1-phenethoxyethyl)benzene (3ca): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.26 – 7.20 (m, 2H), 7.17 (d, *J* = 7.2 Hz, 3H), 6.90 (d, *J* = 7.0 Hz, 3H), 4.35 (q, *J* = 6.4 Hz, 1H), 3.58 – 3.44 (m, 2H), 2.87 (td, *J* = 7.3, 6.8, 2.9 Hz, 2H), 2.59 (q, *J* = 7.6 Hz, 4H), 1.42 (d, *J* = 6.5 Hz, 3H), 1.21 (t, *J* = 7.6 Hz, 6H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 144.32, 144.04, 139.24, 129.04, 128.28, 126.58, 126.14, 123.01, 78.31, 69.62, 36.70, 28.92, 24.34, 15.71. HRMS (ESI+) calculated for $C_{20}H_{26}NaO^+$ $(M+Na)^+$: 305.1876; found: 305.1875.



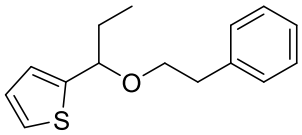
1-Ethyl-4-(1-phenethoxyethyl)benzene (3da): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.29 – 7.07 (m, 9H), 4.36 (q, *J* = 6.5 Hz, 1H), 3.60 – 3.39 (m, 2H), 2.98 – 2.75 (m, *J* = 7.0 Hz, 2H), 2.61 (q, *J* = 7.6 Hz, 2H), 1.41 (d, *J* = 6.5 Hz, 3H), 1.21 (t, *J* = 7.6 Hz, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 143.33, 141.17, 139.11, 129.01, 128.30, 127.92, 126.20, 126.15, 78.01, 69.60, 36.67, 28.62, 24.24, 15.65. HRMS (ESI+) calculated for $C_{18}H_{22}NaO^+$ $(M+Na)^+$: 277.1563; found: 277.1564.



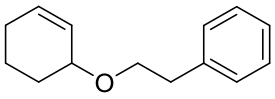
1-Methyl-4-(1-phenethoxyethyl)benzene (3ea): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.28 – 7.10 (m, 9H), 4.37 (q, *J* = 6.5 Hz, 1H), 3.57 – 3.42 (m, 2H), 2.95 – 2.79 (m, *J* = 7.1 Hz, 2H), 2.33 (s, 3H), 1.41 (d, *J* = 6.5 Hz, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 140.97, 139.15, 137.08, 129.18, 129.06, 128.35, 126.21, 126.20, 78.03, 69.62, 36.68, 24.29, 21.25. HRMS (ESI+) calculated for $C_{17}H_{20}NaO^{+}$ $(M+Na)^{+}$: 263.1406; found: 263.1399.



2-methyl-5-(1-phenethoxyethyl)thiophene (3fa): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.29 – 7.24 (m, 2H), 7.19 (dt, *J* = 5.9, 1.5 Hz, 3H), 6.68 (d, *J* = 3.4 Hz, 1H), 6.56 (dq, *J* = 3.5, 1.2 Hz, 1H), 4.58 (q, *J* = 6.4 Hz, 1H), 3.61 (ddd, *J* = 9.4, 8.4, 6.4 Hz, 1H), 3.52 (ddd, *J* = 9.3, 8.4, 6.4 Hz, 1H), 2.94 – 2.80 (m, 2H), 2.45 (s, 3H), 1.51 (d, *J* = 6.4 Hz, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 145.36, 139.34, 139.09, 129.09, 128.40, 126.25, 124.46, 124.39, 73.79, 69.43, 36.58, 24.11, 15.59. HRMS (ESI+) calculated for $C_{15}H_{18}NaOS^{+}$ $(M+Na)^{+}$: 269.0971; found: 269.0974.

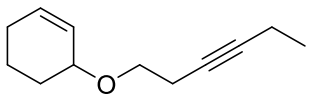


2-(1-Phenethoxypropyl)thiophene (3ga): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, DMSO-d_6) δ 7.46 (dd, *J* = 4.9, 1.4 Hz, 1H), 7.28 – 7.22 (m, 2H), 7.22 – 7.12 (m, 3H), 7.05 – 6.92 (m, 2H), 4.47 (t, *J* = 6.7 Hz, 1H), 3.55 – 3.42 (m, 2H), 2.78 (hept, *J* = 6.9 Hz, 2H), 1.78 (dq, *J* = 14.4, 7.2 Hz, 1H), 1.69 – 1.57 (m, 1H), 0.79 (t, *J* = 7.4 Hz, 3H). ^{13}C NMR (101 MHz, DMSO-d_6) δ 146.22, 138.96, 128.80, 128.16, 126.47, 126.02, 125.45, 125.24, 78.12, 68.88, 35.63, 30.86, 10.06. HRMS (ESI+) calculated for $C_{15}H_{18}NaOS^{+}$ $(M+Na)^{+}$: 269.0971; found: 269.0974.

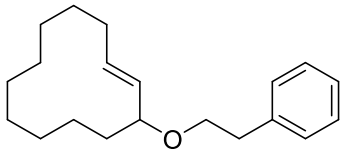


(2-(Cyclohex-2-en-1-yloxy)ethyl)benzene (3ha): The synthesis procedure is the same as for **3a**. ^{1}H

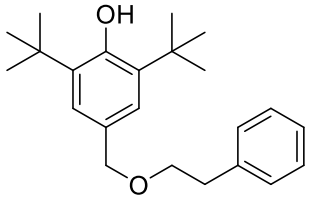
NMR (400 MHz, Chloroform-*d*) δ 7.31 – 7.16 (m, 5H), 5.94 – 5.69 (m, 2H), 3.84 (dq, *J* = 4.7, 1.6 Hz, 1H), 3.75 – 3.61 (m, 2H), 2.89 (t, *J* = 7.5 Hz, 2H), 2.08 – 1.88 (m, 2H), 1.84 – 1.61 (m, 3H), 1.56 – 1.47 (m, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 139.13, 130.89, 129.00, 128.35, 127.87, 126.18, 73.04, 69.40, 36.94, 28.37, 25.30, 19.30. HRMS (ESI+) calculated for $C_{14}H_{18}NaO^+$ $(M+Na)^+$: 225.1250; found: 225.1251.



3-(Hex-3-yn-1-yloxy)cyclohex-1-ene (3ia): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 5.90 – 5.61 (m, 2H), 3.89 (dp, *J* = 6.2, 2.4, 1.9 Hz, 1H), 3.64 – 3.51 (m, 2H), 2.42 (tt, *J* = 7.4, 2.4 Hz, 2H), 2.15 (qt, *J* = 7.5, 2.4 Hz, 2H), 2.09 – 1.89 (m, 2H), 1.84 – 1.66 (m, 3H), 1.55 (dddd, *J* = 11.4, 4.6, 3.8, 2.0 Hz, 1H), 1.11 (t, *J* = 7.5 Hz, 3H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 131.06, 127.81, 82.81, 76.17, 73.06, 67.08, 28.34, 25.30, 20.71, 19.29, 14.32, 12.53. HRMS (ESI+) calculated for $C_{12}H_{18}NaO^+$ $(M+Na)^+$: 201.1250; found: 201.1246.

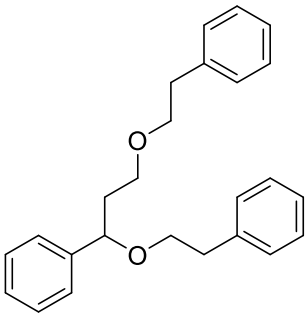


(E)-3-Phenethoxycyclododec-1-ene (3ja): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.51 – 7.02 (m, 5H), 5.55 (ddd, *J* = 15.0, 10.1, 4.6 Hz, 1H), 5.26 (dd, *J* = 15.4, 8.6 Hz, 1H), 3.78 – 3.53 (m, 2H), 3.45 (td, *J* = 8.9, 6.7 Hz, 1H), 2.98 – 2.69 (m, 2H), 2.29 – 2.13 (m, 1H), 2.00 (dtd, *J* = 13.7, 10.2, 3.4 Hz, 1H), 1.79 (tt, *J* = 9.4, 4.2 Hz, 1H), 1.57 – 1.09 (m, 15H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 139.30, 134.65, 131.98, 129.08, 128.38, 126.19, 81.97, 69.14, 36.69, 33.10, 31.82, 26.10, 25.68, 25.14, 25.11, 24.55, 22.63. HRMS (ESI+) calculated for $C_{20}H_{30}NaO^+$ $(M+Na)^+$: 309.2189; found: 309.2191.



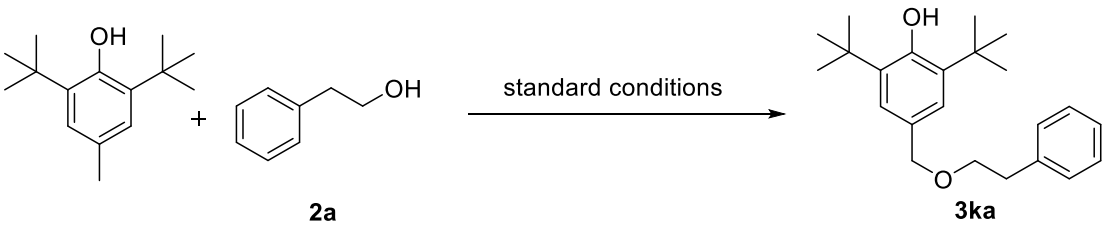
2,6-Di-tert-butyl-4-(phenethoxymethyl)phenol (3ka): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.32 – 7.19 (m, 5H), 7.12 (s, 2H), 5.18 (s, 1H), 4.42 (s, 2H), 3.71 (t, *J* = 7.2 Hz, 2H), 2.94 (t, *J* = 7.2 Hz, 2H), 1.43 (s, 18H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 153.52, 139.22, 135.83, 129.07, 128.91, 128.43, 126.25, 125.10, 73.77, 71.32, 36.49, 34.39,

30.37. HRMS (ESI+) calculated for $C_{23}H_{32}NaO_2^+$ $(M+Na)^+$: 363.2295; found: 363.2287.



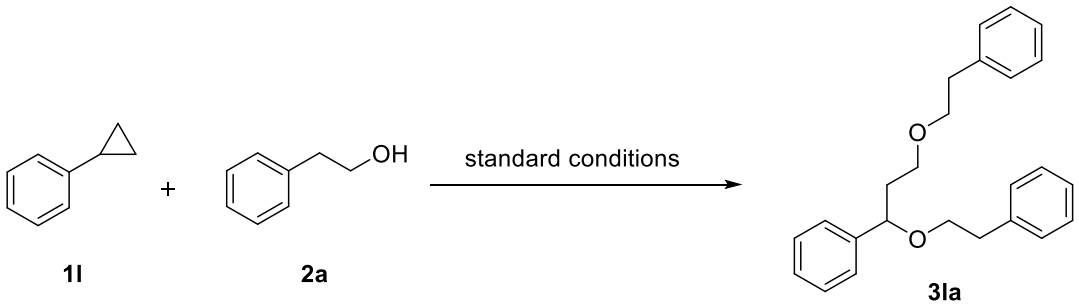
(((1-Phenylpropane-1,3-diyl)bis(oxy))bis(ethane-2,1-diyl))dibenzene (3la): The synthesis procedure is the same as for **3a**. ^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.23 (dddd, *J* = 23.4, 21.1, 10.3, 4.7 Hz, 15H), 4.34 (dd, *J* = 8.3, 5.4 Hz, 1H), 3.62 – 3.45 (m, 4H), 3.42 – 3.28 (m, 2H), 2.84 (dt, *J* = 16.7, 7.0 Hz, 4H), 2.03 (ddt, *J* = 11.6, 8.7, 5.7 Hz, 1H), 1.82 (ddd, *J* = 13.6, 7.6, 5.5 Hz, 1H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 142.58, 139.34, 139.24, 129.09, 129.05, 128.42, 128.40, 128.30, 127.48, 126.67, 126.26, 126.16, 79.00, 71.86, 69.73, 67.23, 38.49, 36.51, 36.48. HRMS (ESI+) calculated for $C_{25}H_{28}NaO_2^+$ $(M+Na)^+$: 383.1982; found: 383.1981.

3) Control experiments



2a **3ka**

Typical procedure for radical trapping experiments: A mixture of phenethyl alcohol (**2a**, 3 equiv.), BHT (0.5 mmol), Cs_2CO_3 (2 equiv.), $^nBu_4NClO_4$ (0.5 equiv.), DCE/Et_2O (6 mL/ 0.5 mL), in an undivided cell with carbon rode electrode anode, nickel cathode, constant current = 10 mA, r.t., 3.5 h. Then, the system was concentrated under reduced pressure. The resulting crude product was separated on a silica gel column with hexane and ethyl acetate as eluent to afford the desired product**.**



1l 2a 3la

Typical procedure for radical trapping experiments: A mixture of phenethyl alcohol (**2a**, 3 equiv.), cyclopropylbenzene (0.5 mmol), Cs_2CO_3 (2 equiv.), $^nBu_4NClO_4$ (0.5 equiv.), DCE/Et_2O (6 mL/ 0.5 mL), in an undivided cell with carbon electrode anode, nickel cathode, constant current = 10 mA, r.t., 3.5 h. Then, the system was concentrated under reduced pressure. The resulting crude product was separated on a silica gel column with hexane and ethyl acetate as eluent to afford the desired product**.**

3) EPR experiments

EPR spectra was recorded at 298 K on EPR spectrometer operated at 9.4158 GHz. Typical spectrometer parameters are shown as follows, scan range: 100 G; center field set: 3359.8 G; time constant: 163.84 ms; scan time: 30.72 s; modulation amplitude: 1.0 G; modulation frequency: 100 kHz; receiver gain: 1.00×105; microwave power: 19.05 mW.

3.1 1a under the standard conditions: A mixture of indan (**1a**, 0.5 mmol), Cs_2CO_3 (2 equiv.), $^nBu_4NClO_4$ (0.5 equiv.) in degased dry CH_3CN (6 mL) was in an undivided cell with carbon electrode anode, nickel cathode, constant current = 10 mA, r.t., stirred under an argon atmosphere for 30 min. Afterwards, DMPO (40 uL) was added to the system to stir under electrolysis for 1 min. Finally, 20 uL of the mixture was quickly taken out into a small tube and analyzed by EPR.

3.2 2a under the standard conditions: A mixture of phenethyl alcohol (**1a**, 0.5 mmol), Cs_2CO_3 (2 equiv.), $^nBu_4NClO_4$ (0.5 equiv.) in degased dry CH_3CN (6 mL) was in an undivided cell with carbon rode electrode anode, nickel cathode, constant current = 10 mA, r.t., stirred under an argon atmosphere for 30 min. Afterwards, DMPO (40 uL) was added to the system to stir under electrolysis for 1 min. Finally, 20 uL of the mixture was quickly taken out into a small tube and

analyzed by EPR.

4) Cyclic voltammograms

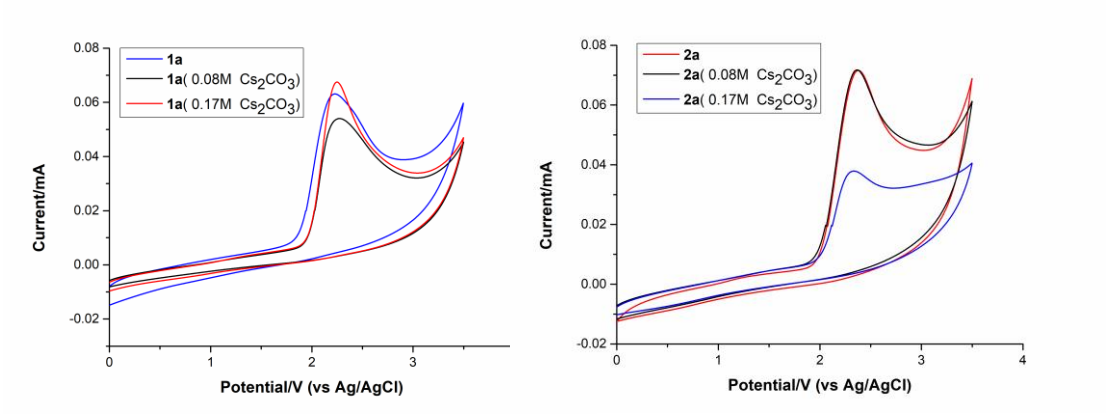
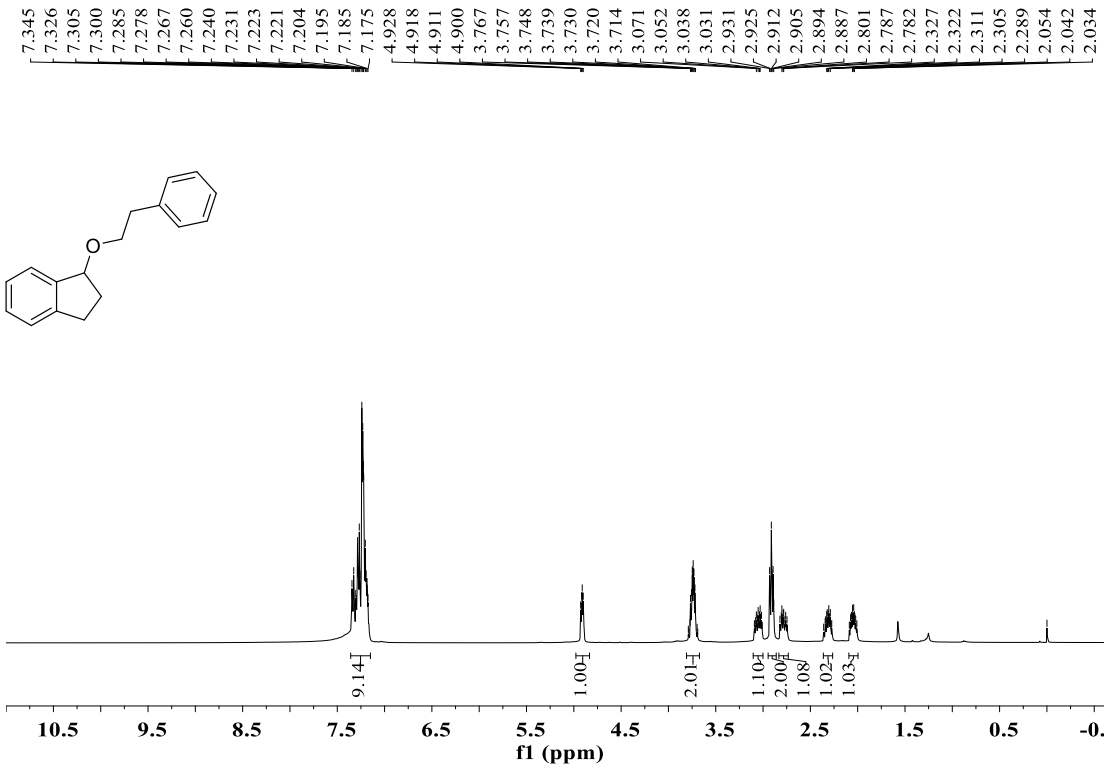
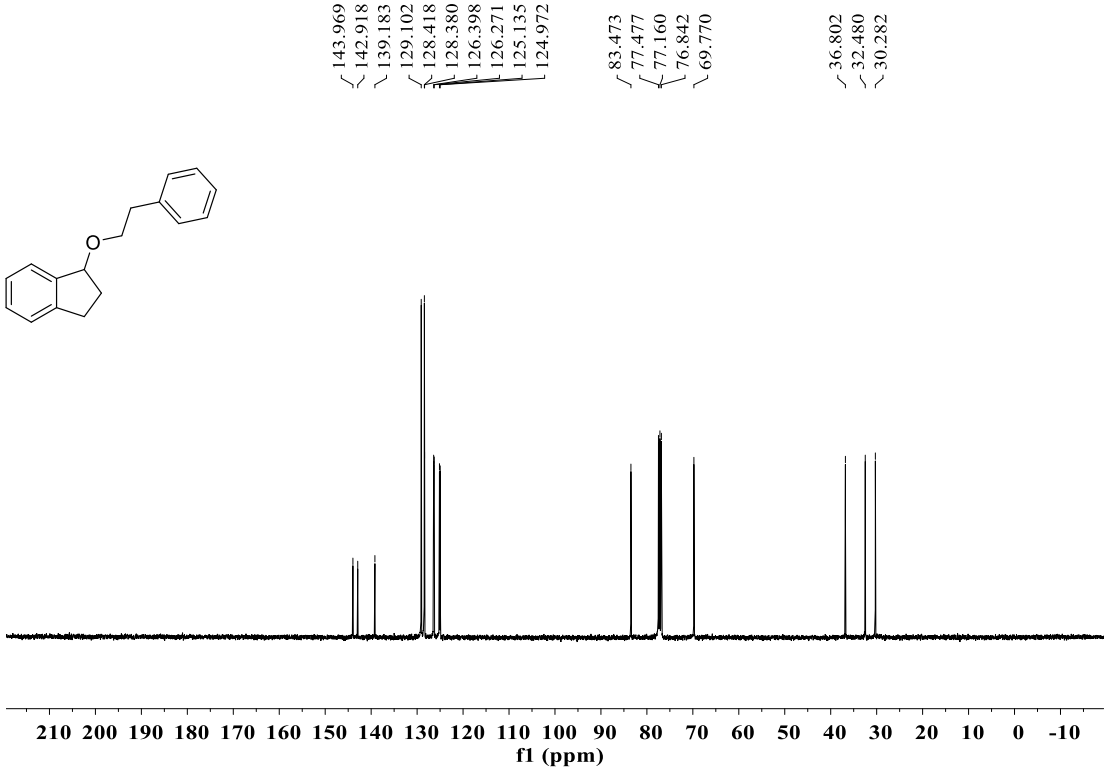
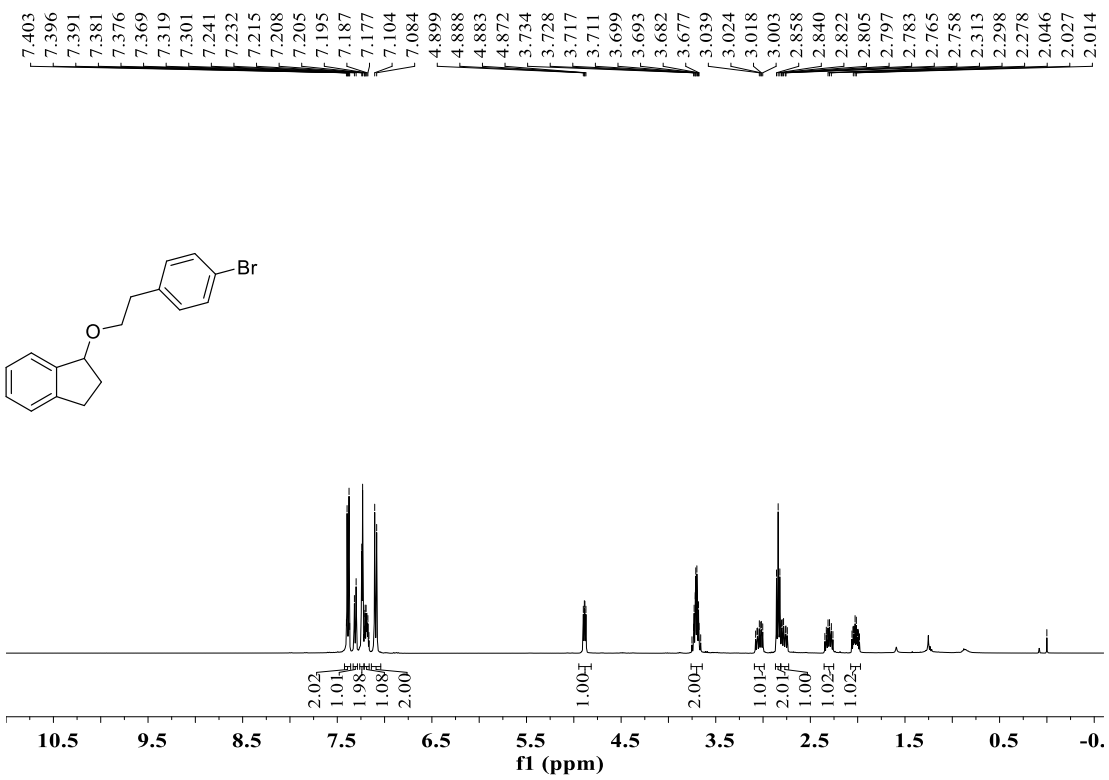


Figure S2. Cyclic voltammograms. Cyclic voltammetry of either 0.01 M **1a** or 0.01 M **2a** in 0.24 M $^{n}Bu_4NClO_4$ in DCE (1,2-dichloroethane), with or without Cs_2CO_3 (0.08 M and 0.17 M, respectively), using glass carbon working electrode, Pt wire as counter electrode and Ag/AgCl as reference electrode at 50 mV/s scan rate. An oxidation peak of **1a** in DCE was observed at 2.22 V (vs Ag|AgCl). An oxidation peak of **2a** in DCE was observed at 2.38 V (vs Ag|AgCl).

NMR Spectra of Products



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1.08
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1.02
10.5
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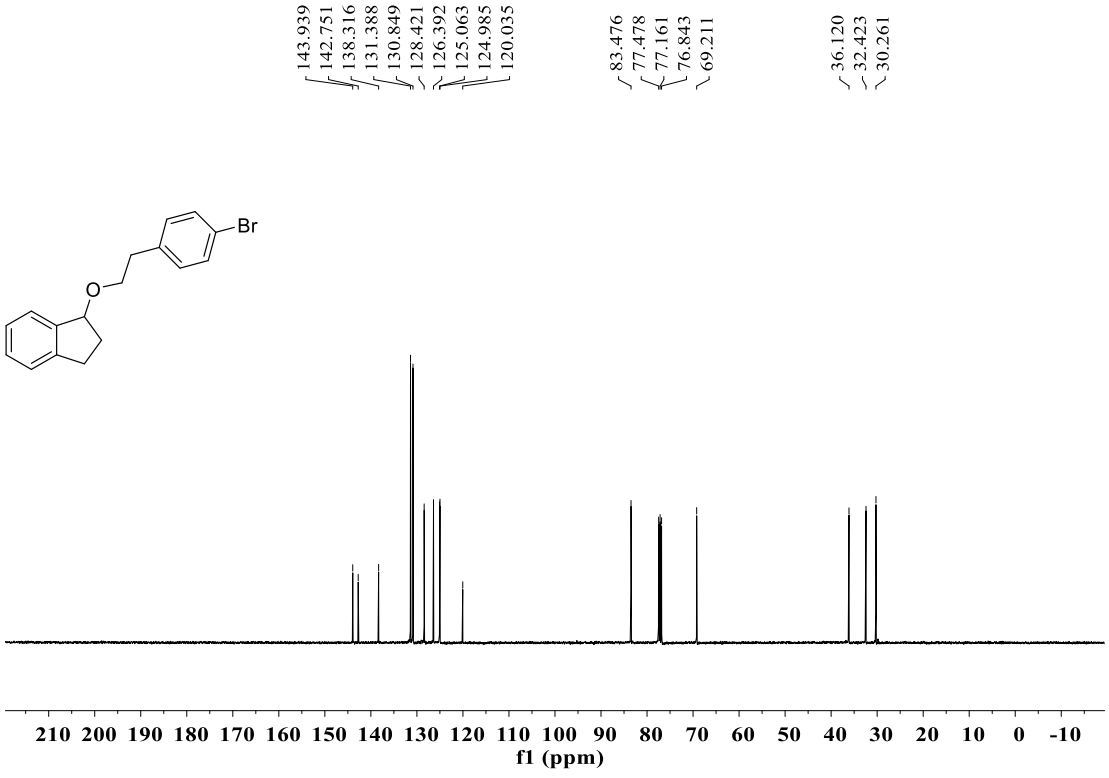
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.
f1 (ppm)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76.843
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Br
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


7.321
7.303
7.247
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7.232
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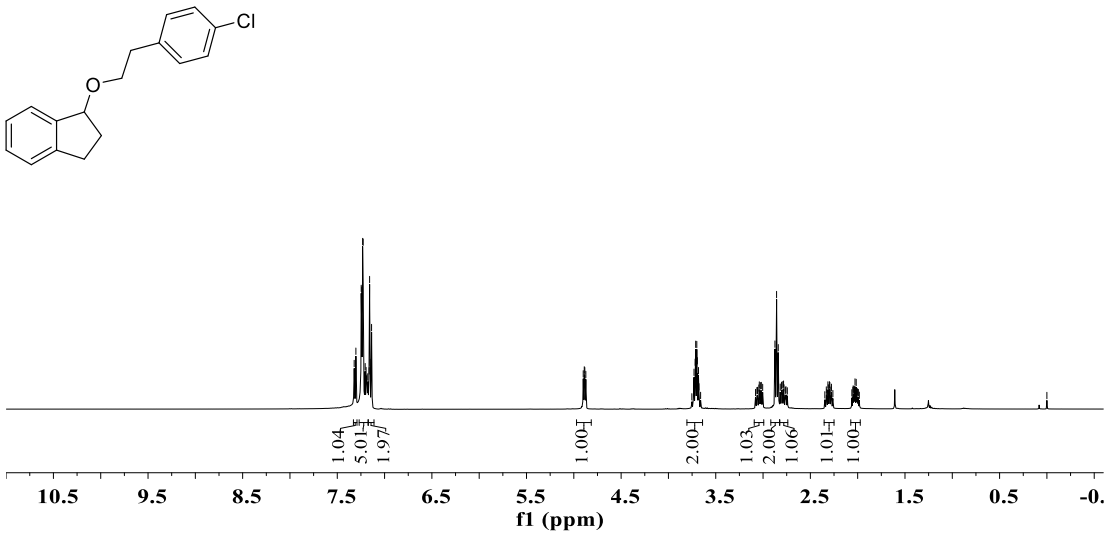
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1.97
1.00
2.00
1.03
2.00
1.06
1.01
1.00
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4.5
3.5
2.5
1.5
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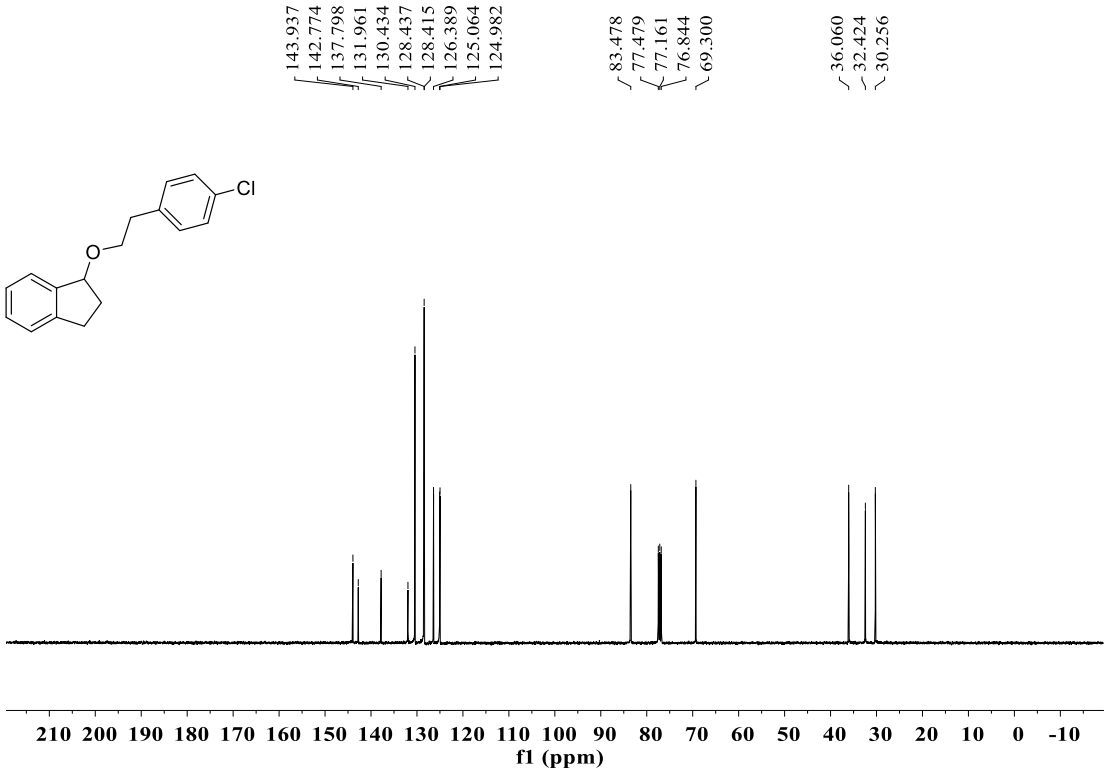
f1 (ppm)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O
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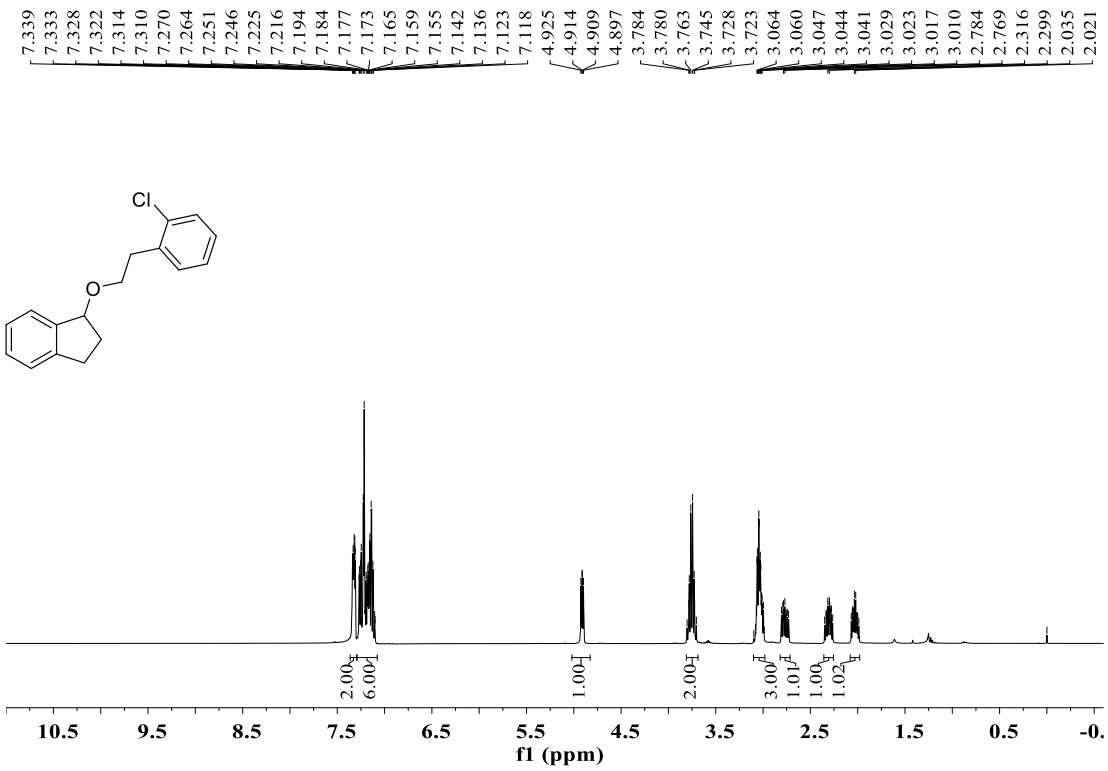
f1 (ppm)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7.136
7.123
7.118
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4.914
4.909
4.897
3.784
3.780
3.763
3.745
3.728
3.723
3.064
3.060
3.047
3.044
3.041
3.029
3.023
3.017
3.010
2.784
2.769
2.316
2.299
2.035
2.021
Cl
O
2.00
6.00
1.00
2.00
3.00
1.01
1.00
1.02
10.5
9.5
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6.5
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4.5
3.5
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1.5
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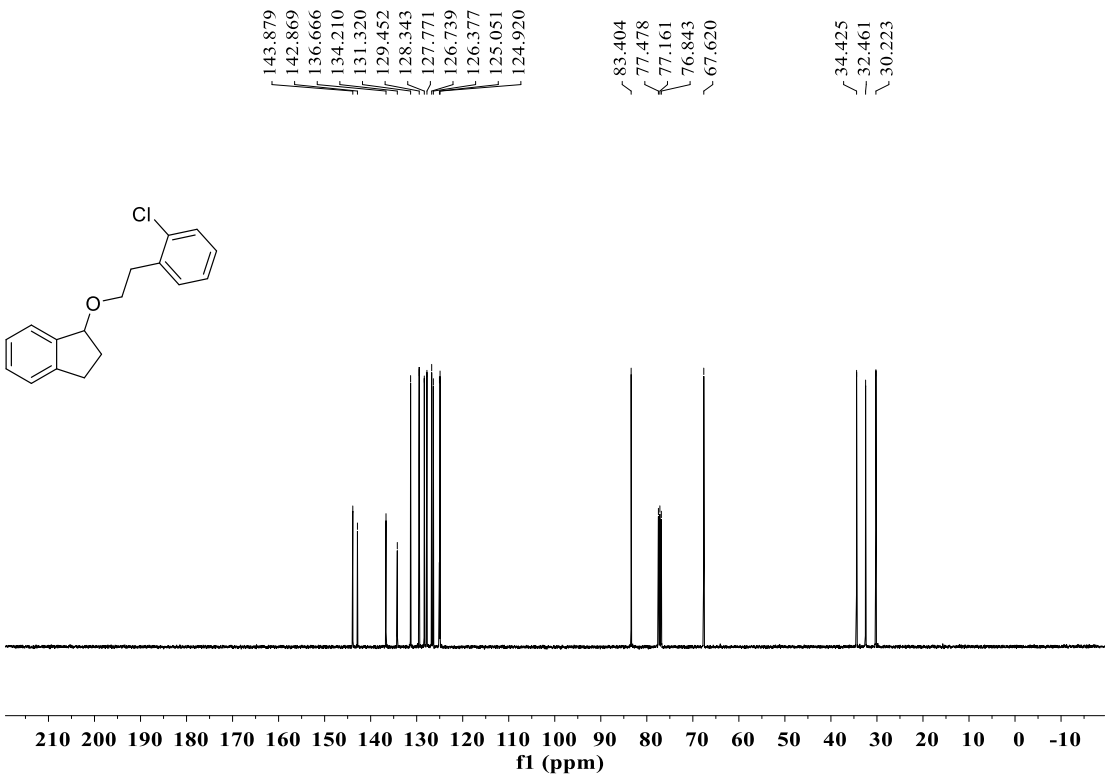
f1 (ppm)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77.478
77.161
76.843
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32.461
30.223
Cl
O
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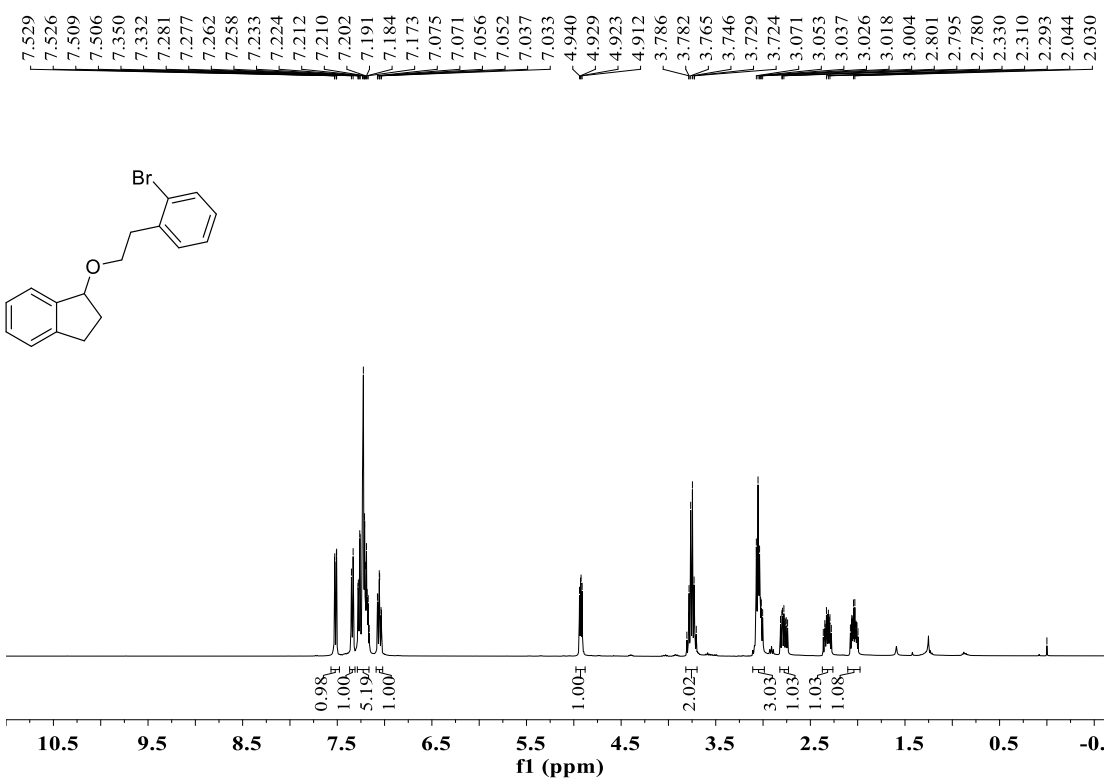
f1 (ppm)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7.210
7.202
7.191
7.184
7.173
7.075
7.071
7.056
7.052
7.037
7.033
4.940
4.929
4.923
4.912
3.786
3.782
3.765
3.746
3.729
3.724
3.071
3.053
3.037
3.026
3.018
3.004
2.801
2.795
2.780
2.330
2.310
2.293
2.044
2.030
Br
O
0.98
1.00
5.19
1.00
1.00
2.02
3.03
1.03
1.03
1.08
10.5
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4.5
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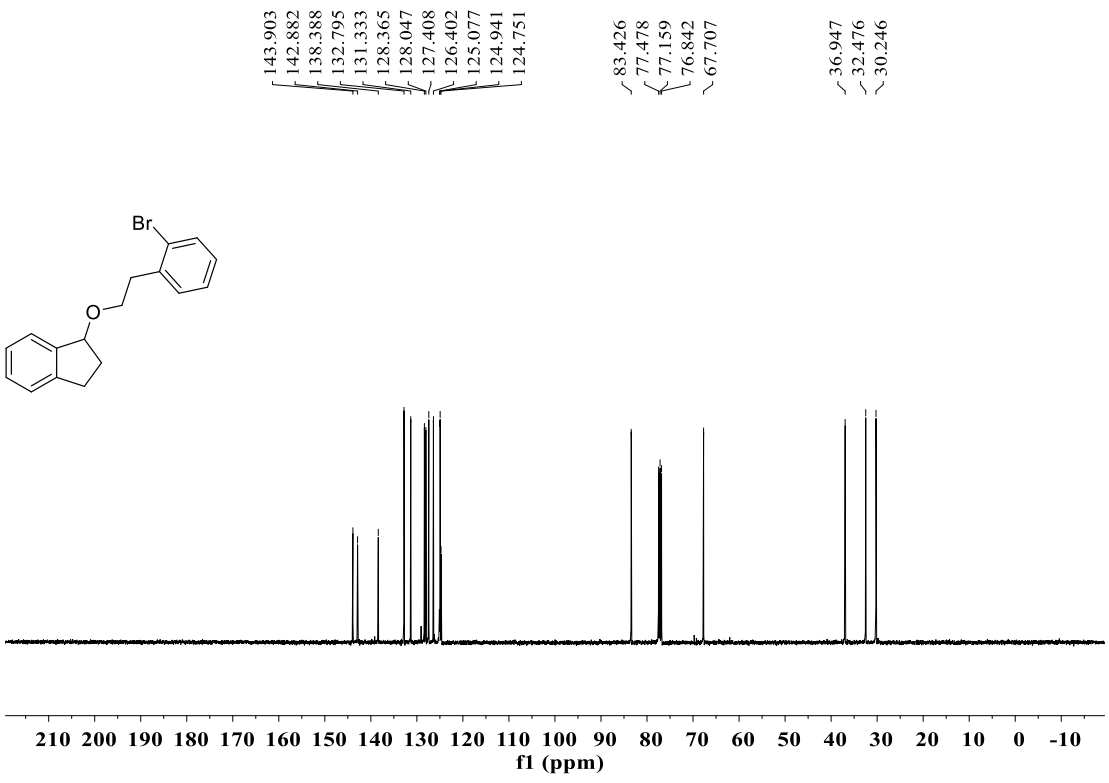
f1 (ppm)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77.478
77.159
76.842
67.707
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30.246
Br
O
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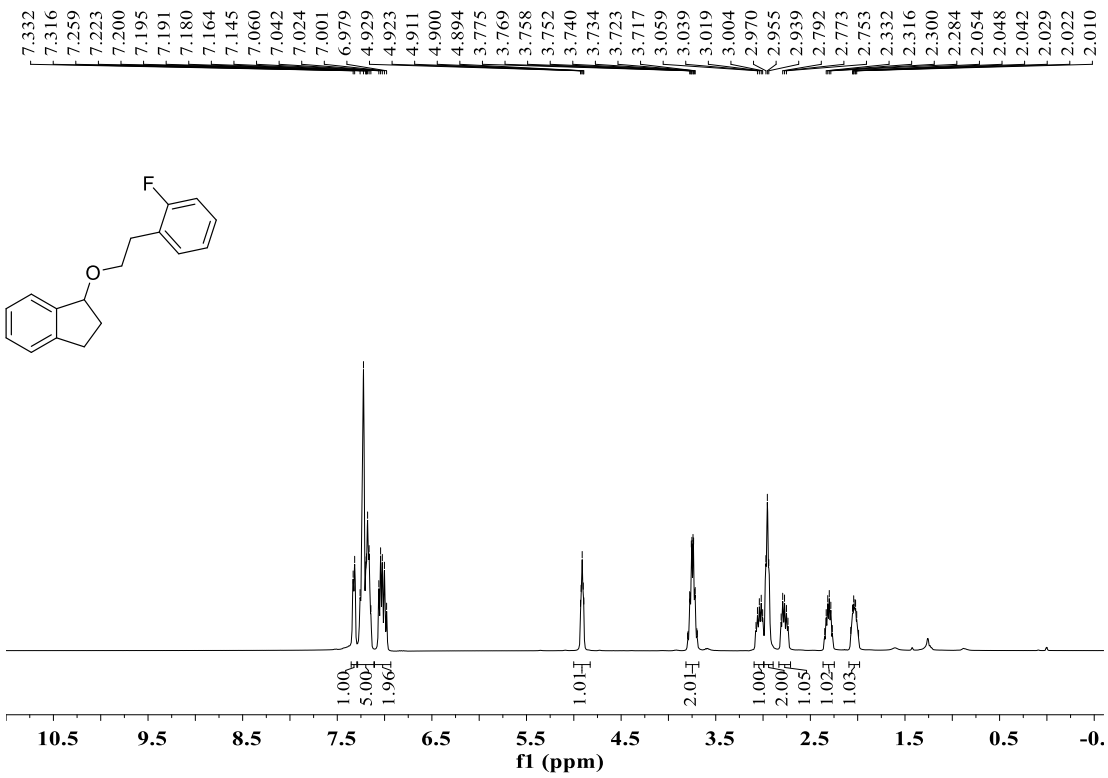
f1 (ppm)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7.180
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7.042
7.024
7.001
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4.929
4.923
4.911
4.900
4.894
3.775
3.769
3.758
3.752
3.740
3.734
3.723
3.717
3.059
3.039
3.019
3.004
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2.955
2.939
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2.773
2.753
2.332
2.316
2.300
2.284
2.054
2.048
2.042
2.029
2.022
2.010
F
O
1.00
5.00
1.96
1.01
2.01
1.00
2.00
1.05
1.02
1.03
10.5
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8.5
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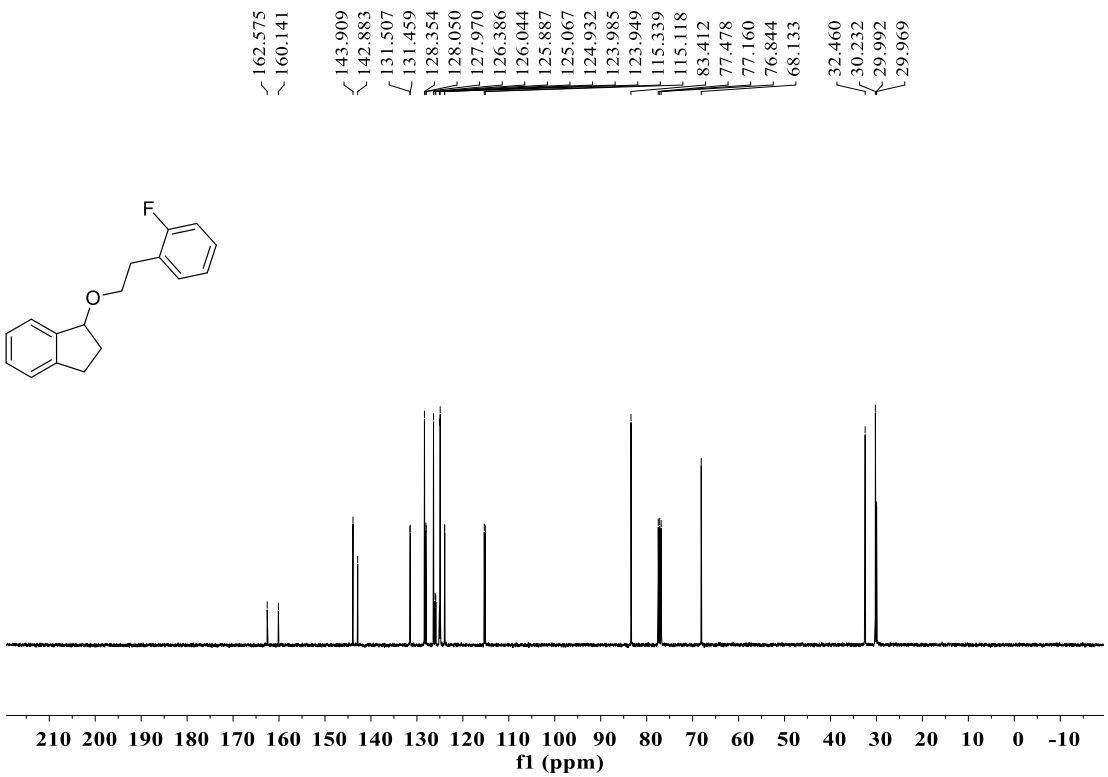
4.5
3.5
2.5
1.5
0.5
-0.
f1 (ppm)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123.985
123.949
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115.118
83.412
77.478
77.160
76.844
68.133
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29.992
29.969
F
O
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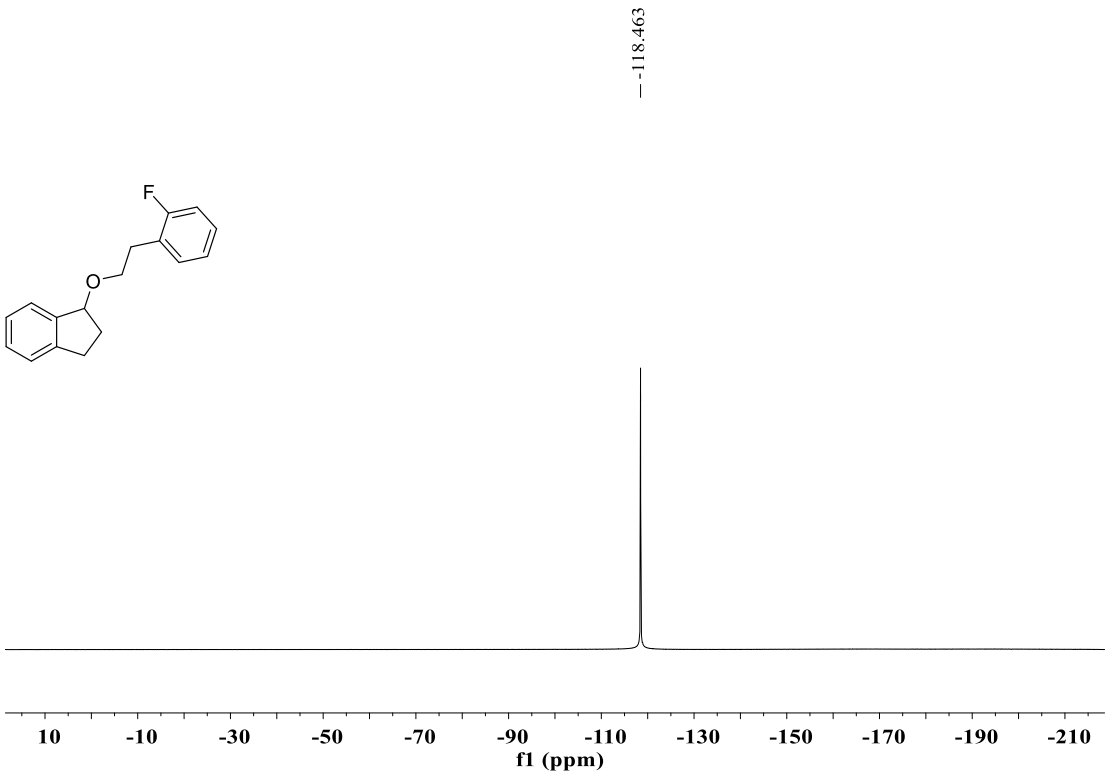
f1 (ppm)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F
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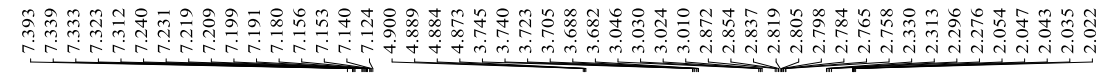
10
-10
-30
-50
-70
-90
-110
-130
-150
-170
-190
-210
f1 (ppm)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7.231
7.219
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7.191
7.180
7.156
7.153
7.140
7.124
4.900
4.889
4.884
4.873
3.745
3.740
3.723
3.705
3.688
3.682
3.046
3.030
3.024
3.010
2.872
2.854
2.837
2.819
2.805
2.798
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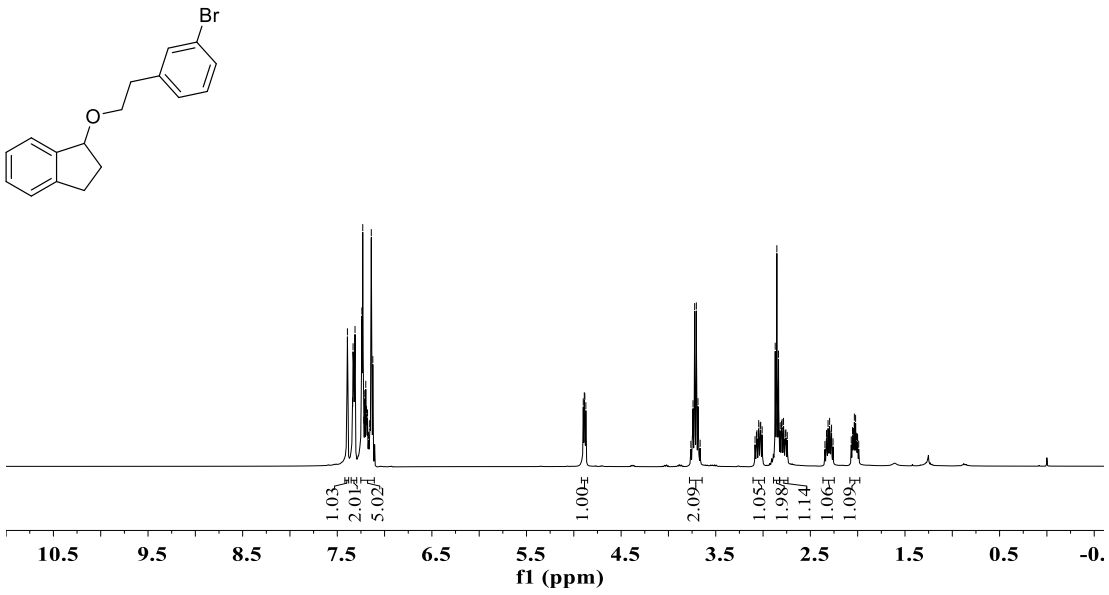
2.054
2.047
2.043
2.035
2.022


Br
O
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5.02
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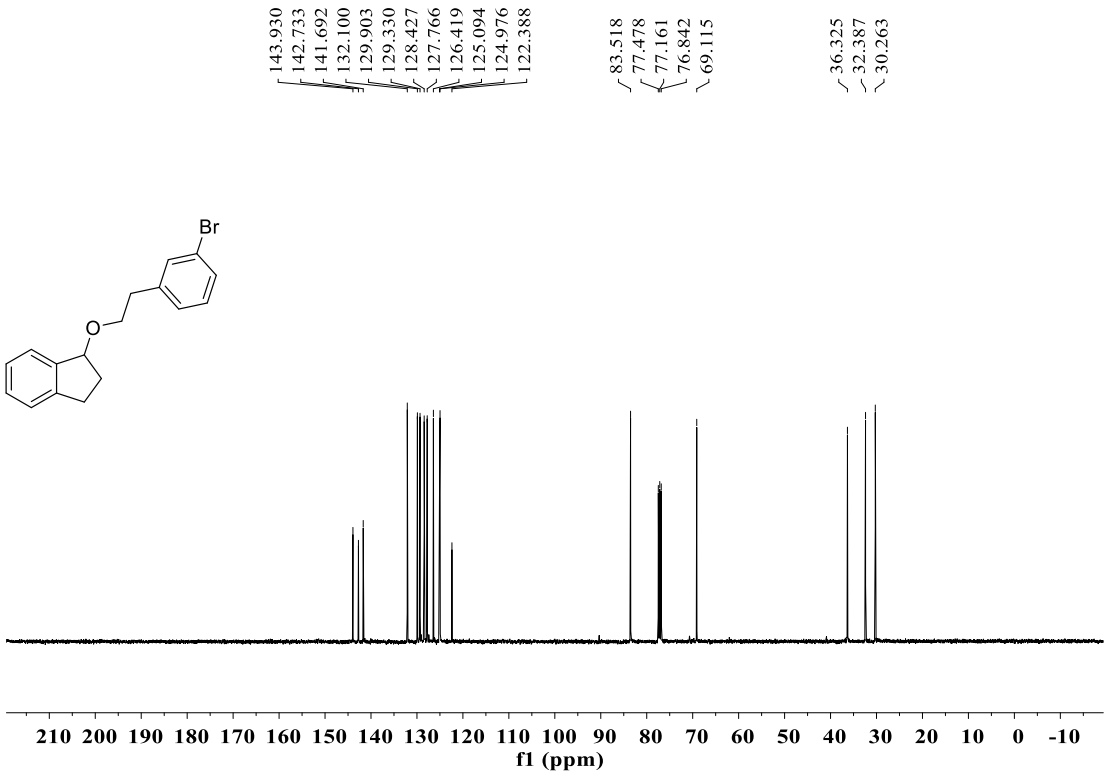
2.09
1.05
1.98
1.14
1.06
1.09
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.
f1 (ppm)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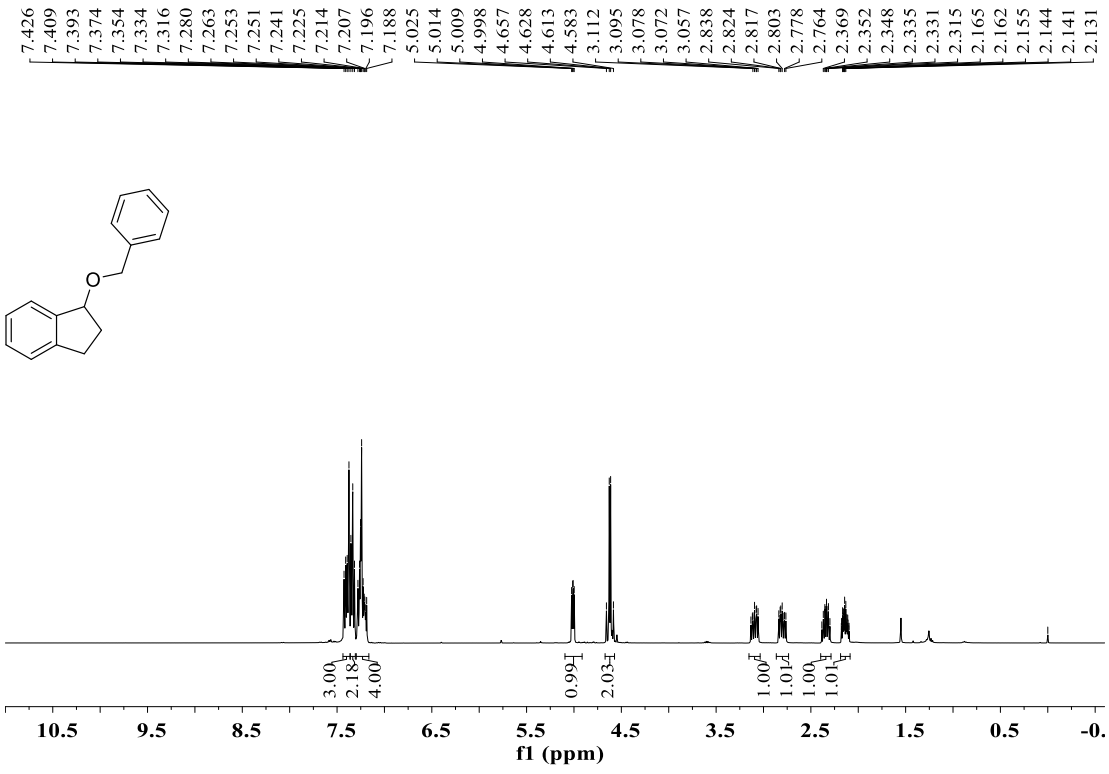
124.976
122.388
83.518
77.478
77.161
76.842
69.115
36.325
32.387
30.263
Br
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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7.334
7.316
7.280
7.263
7.253
7.251
7.241
7.225
7.214
7.207
7.196
7.188
5.025
5.014
5.009
4.998
4.657
4.628
4.613
4.583
3.112
3.095
3.078
3.072
3.057
2.838
2.824
2.817
2.803
2.778
2.764
2.369
2.352
2.348
2.335
2.331
2.315
2.165
2.162
2.155
2.144
2.141
2.131
O
3.00
2.18
4.00
0.99
2.03
1.00
1.01
1.00
1.01
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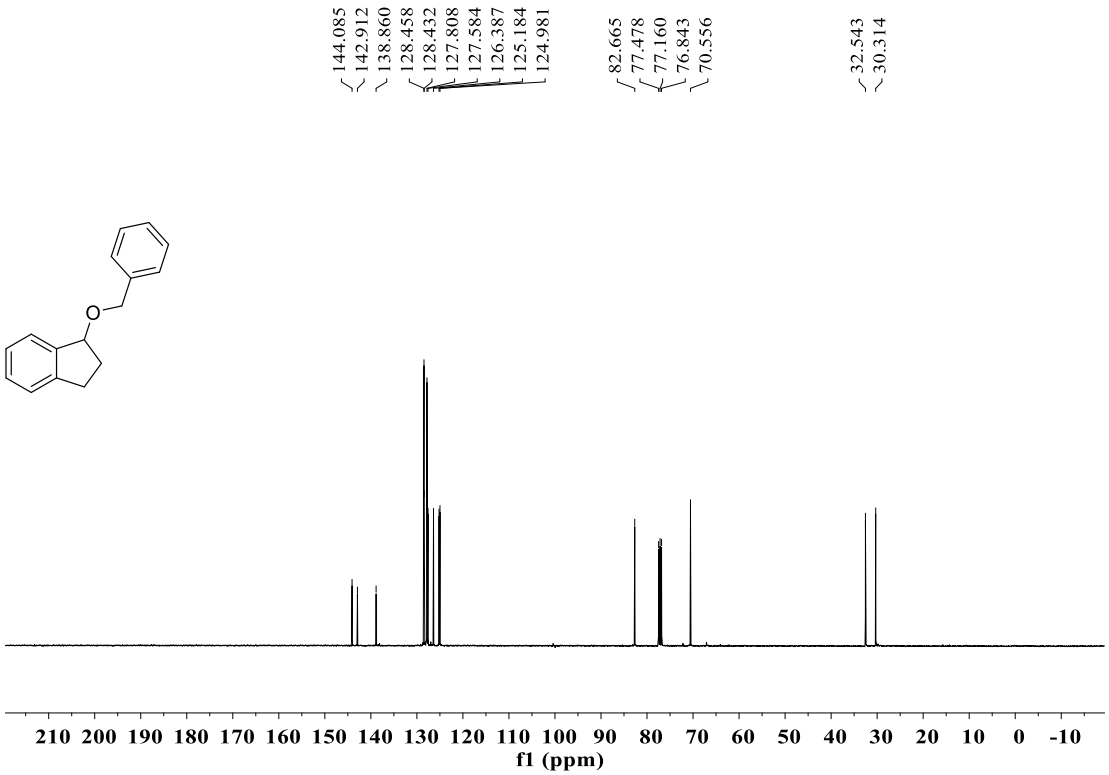
f1 (ppm)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126.387
125.184
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77.478
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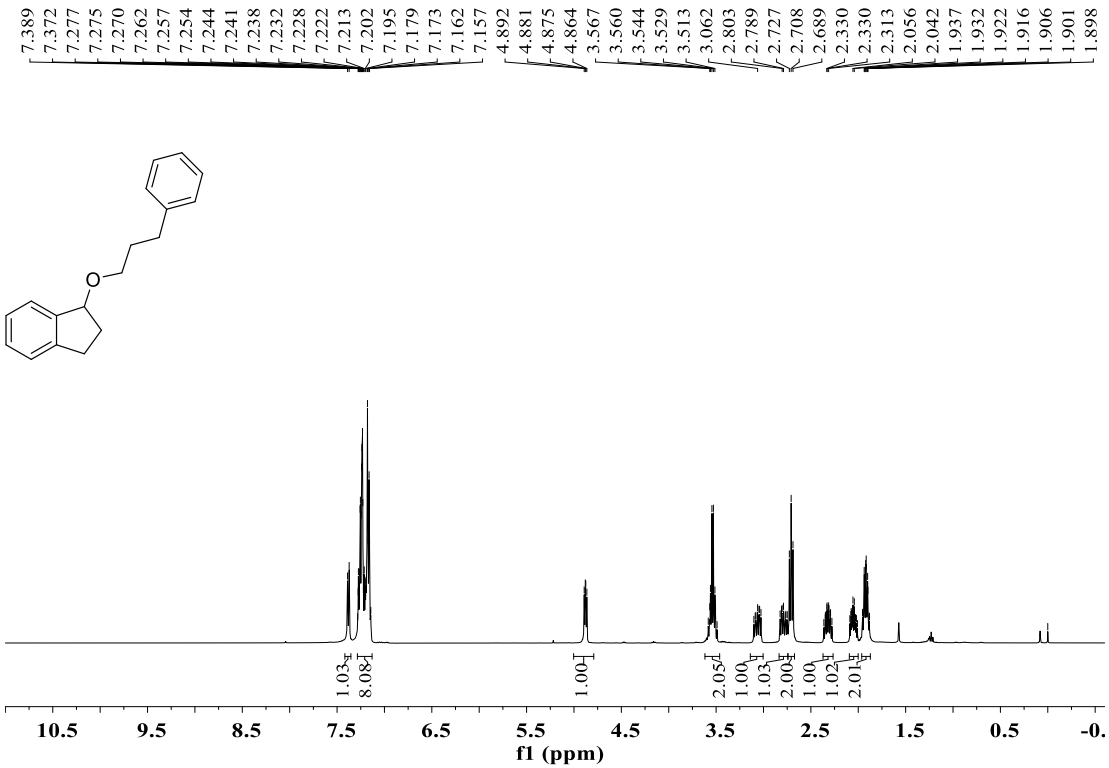
76.843
70.556
32.543
30.314
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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7.238
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7.228
7.222
7.213
7.202
7.195
7.179
7.173
7.162
7.157
4.892
4.881
4.875
4.864
3.567
3.560
3.544
3.529
3.513
3.062
2.803
2.789
2.727
2.708
2.689
2.330
2.330
2.313
2.056
2.042
1.937
1.932
1.922
1.916
1.906
1.901
1.898
O
1.03
8.08
1.00
2.05
1.00
1.03
2.00
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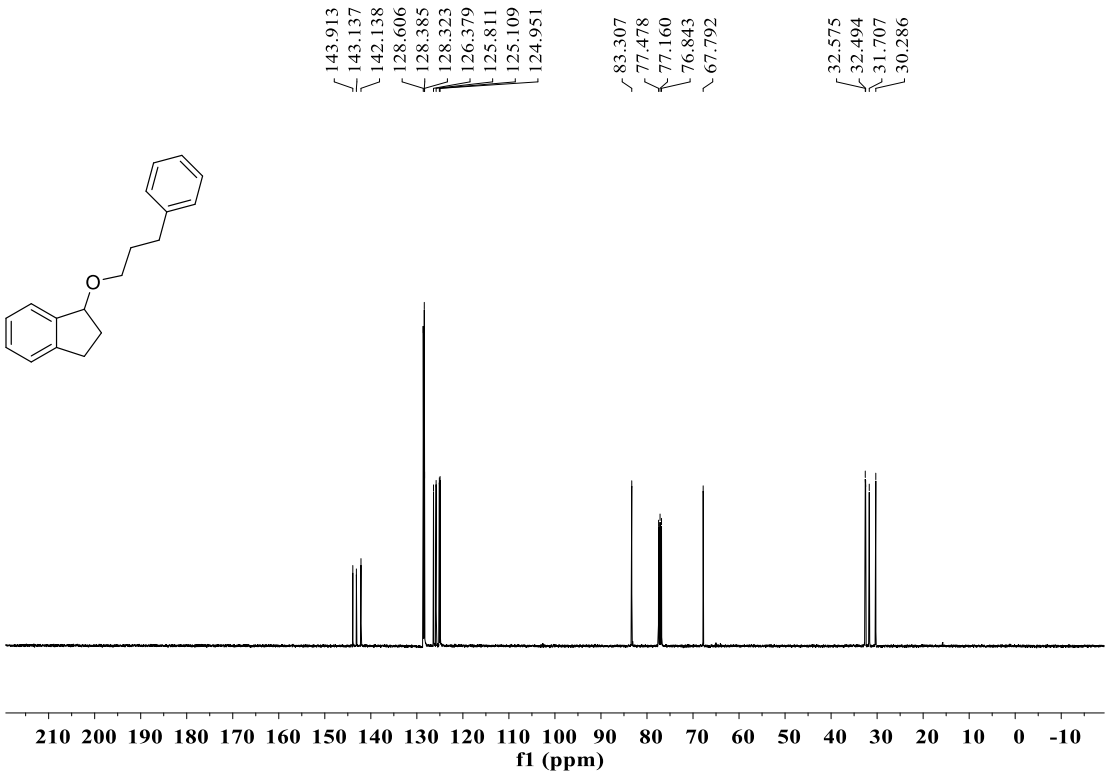
1.02
2.01
10.5 9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.
f1 (ppm)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77.160
76.843
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31.707
30.286
O
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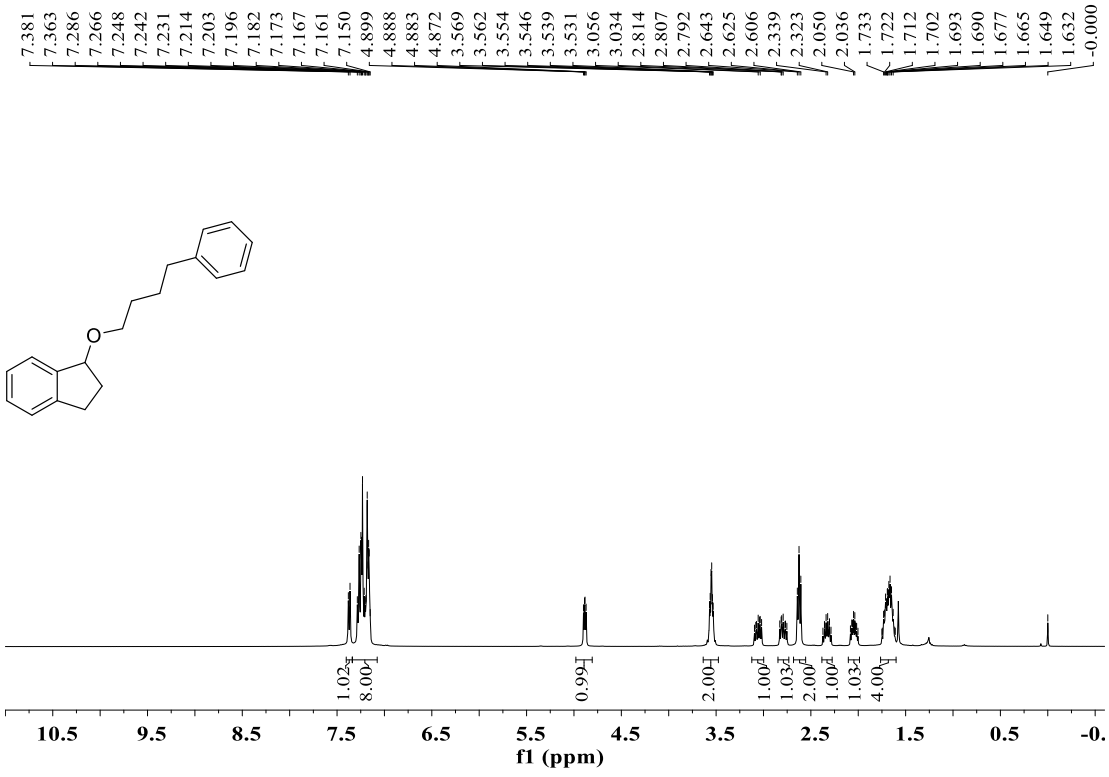
f1 (ppm)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7.167
7.161
7.150
4.899
4.888
4.883
4.872
3.569
3.562
3.554
3.546
3.539
3.531
3.056
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2.792
2.643
2.625
2.606
2.339
2.323
2.050
2.036
1.733
1.722
1.712
1.702
1.693
1.690
1.677
1.665
1.649
1.632
-0.000
O
1.02
8.00
0.99
2.00
1.00
1.03
2.00
1.00
1.03
4.00
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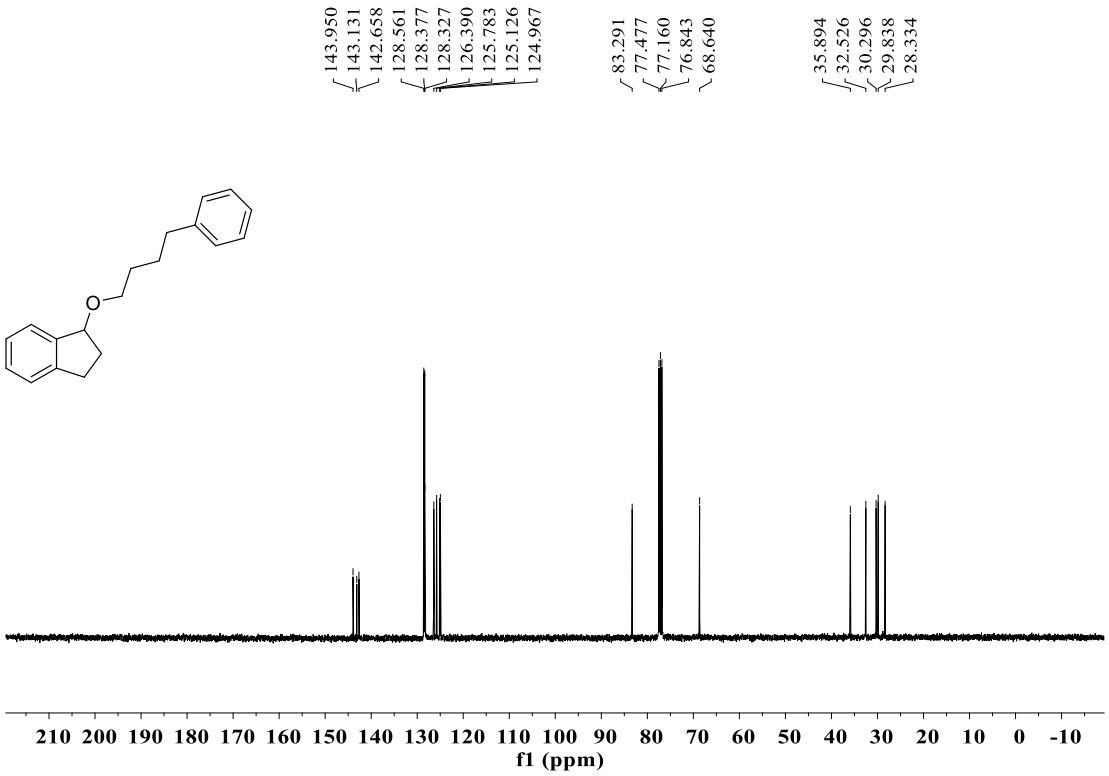
f1 (ppm)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77.160
76.843
68.640
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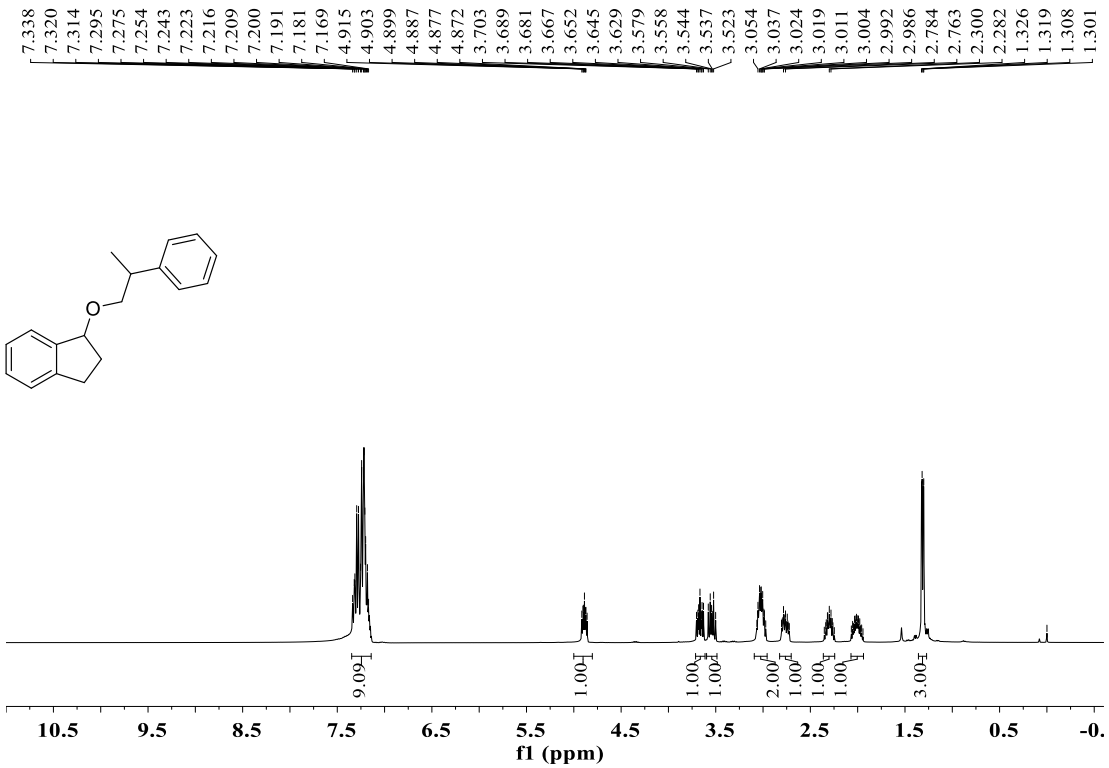
f1 (ppm)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7.181
7.169
4.915
4.903
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4.887
4.877
4.872
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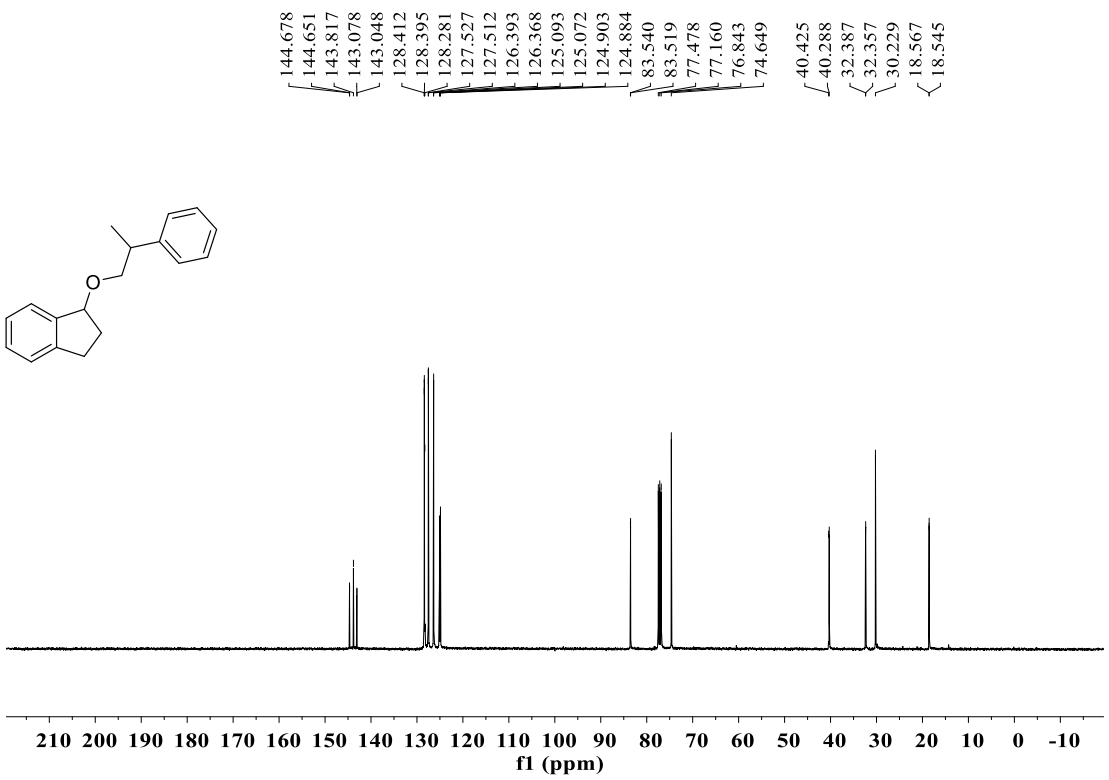
3.689
3.681
3.667
3.652
3.645
3.629
3.579
3.558
3.544
3.537
3.523
3.054
3.037
3.024
3.019
3.011
3.004
2.992
2.986
2.784
2.763
2.300
2.282
1.326
1.319
1.308
1.301
O
9.09
1.00
1.00
1.00
2.00
1.00
1.00
1.00
3.00
10.5 9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.
f1 (ppm)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127.512
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125.093
125.072
124.903
124.884
83.540
83.519
77.478
77.160
76.843
74.649
40.425
40.288
32.387
32.357
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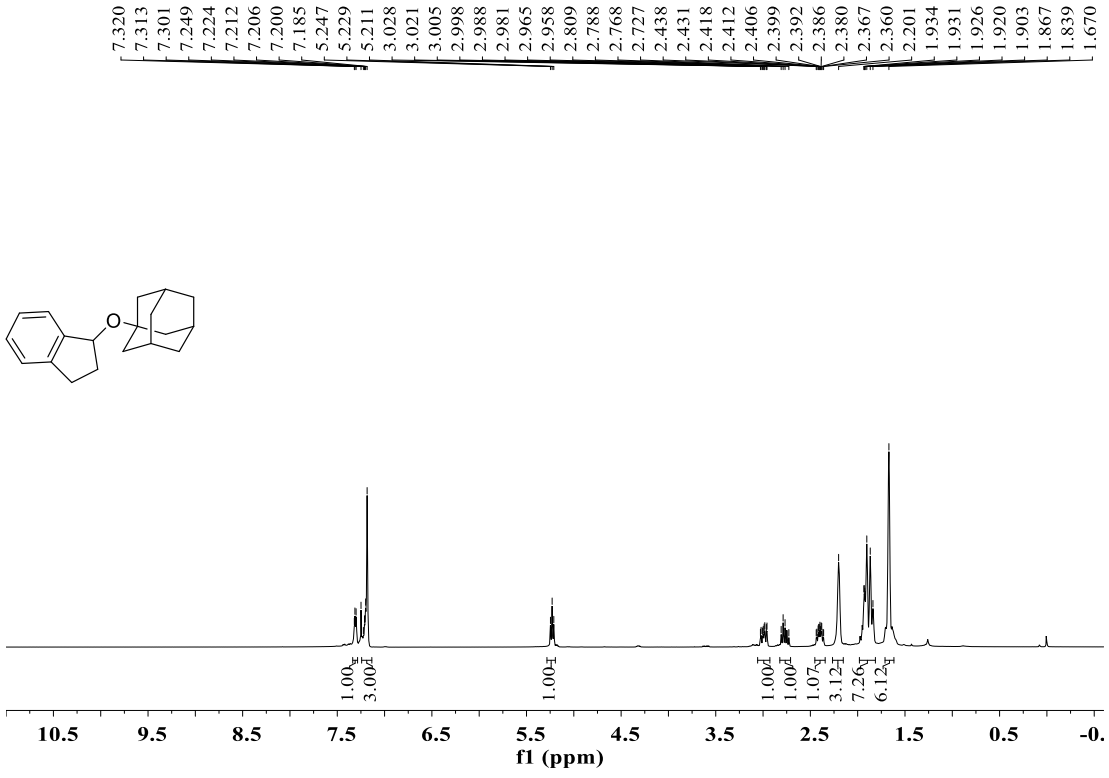
18.567
18.545
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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5.229
5.211
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3.021
3.005
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2.981
2.965
2.958
2.809
2.788
2.768
2.727
2.438
2.431
2.418
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2.392
2.386
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2.367
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1.931
1.926
1.920
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O
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1.00
1.00
1.00
1.07
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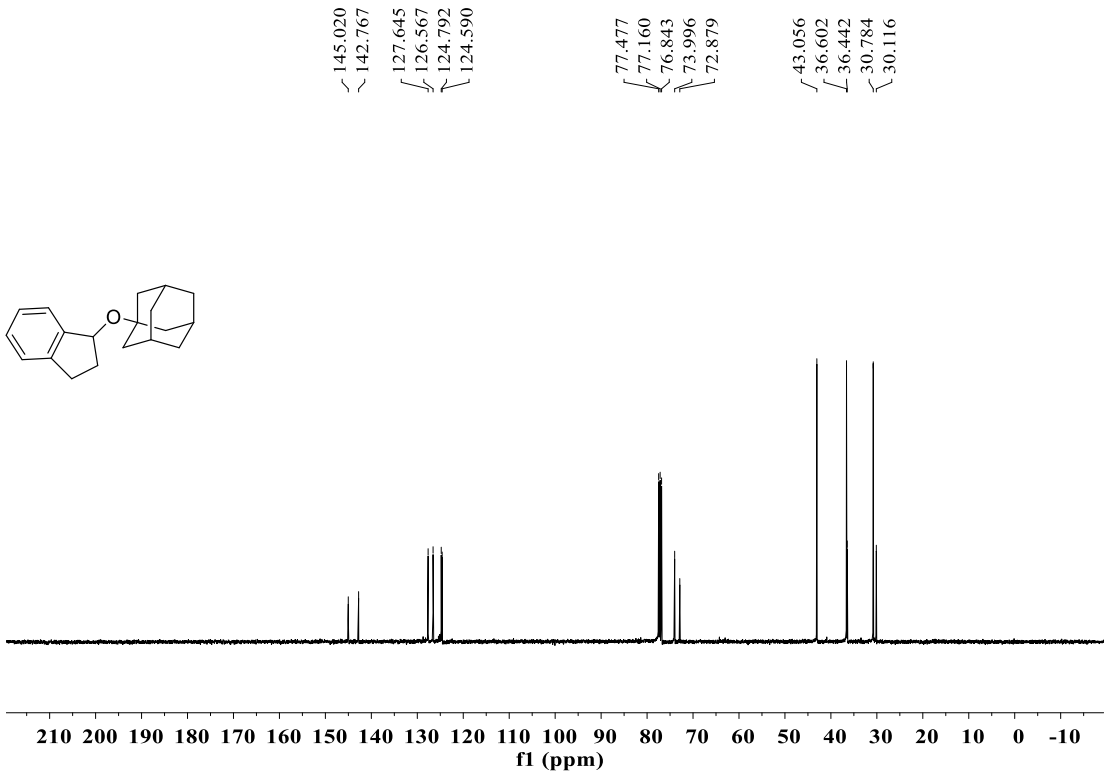
f1 (ppm)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30.784
30.116
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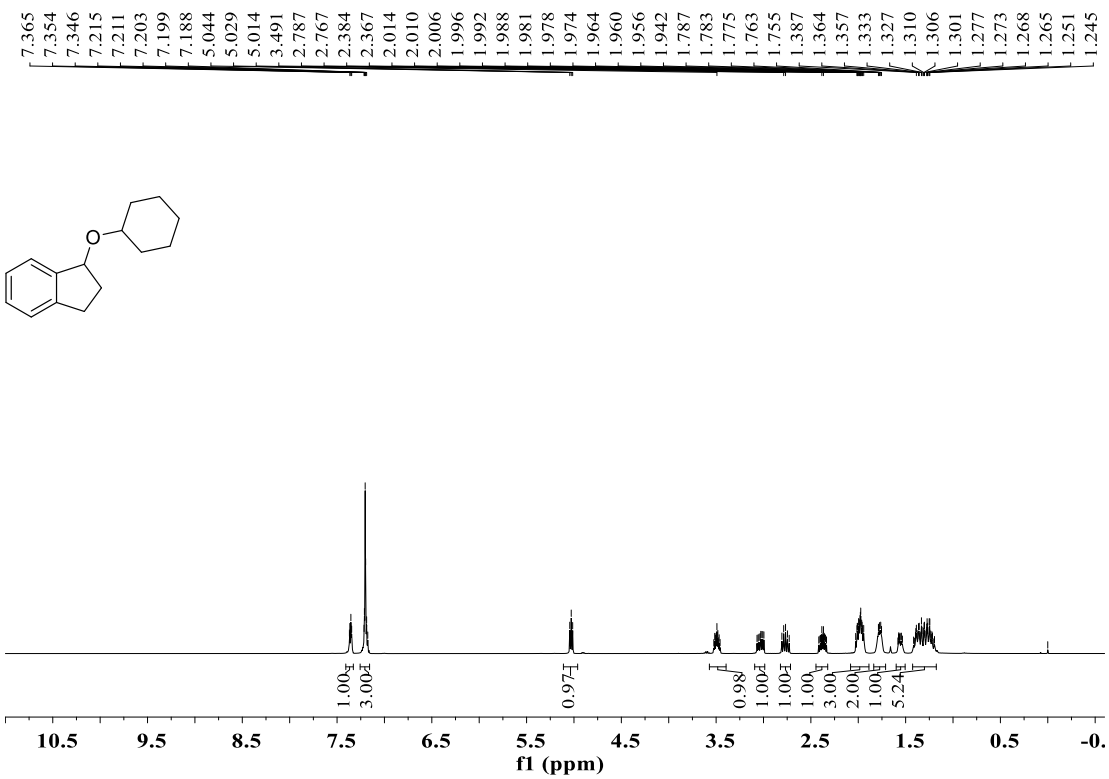
f1 (ppm)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2.010
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1.988
1.981
1.978
1.974
1.964
1.960
1.956
1.942
1.787
1.783
1.775
1.763
1.755
1.387
1.364
1.357
1.333
1.327
1.310
1.306
1.301
1.277
1.273
1.268
1.265
1.251
1.245
O
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3.00
0.97
0.98
1.00
1.00
3.00
2.00
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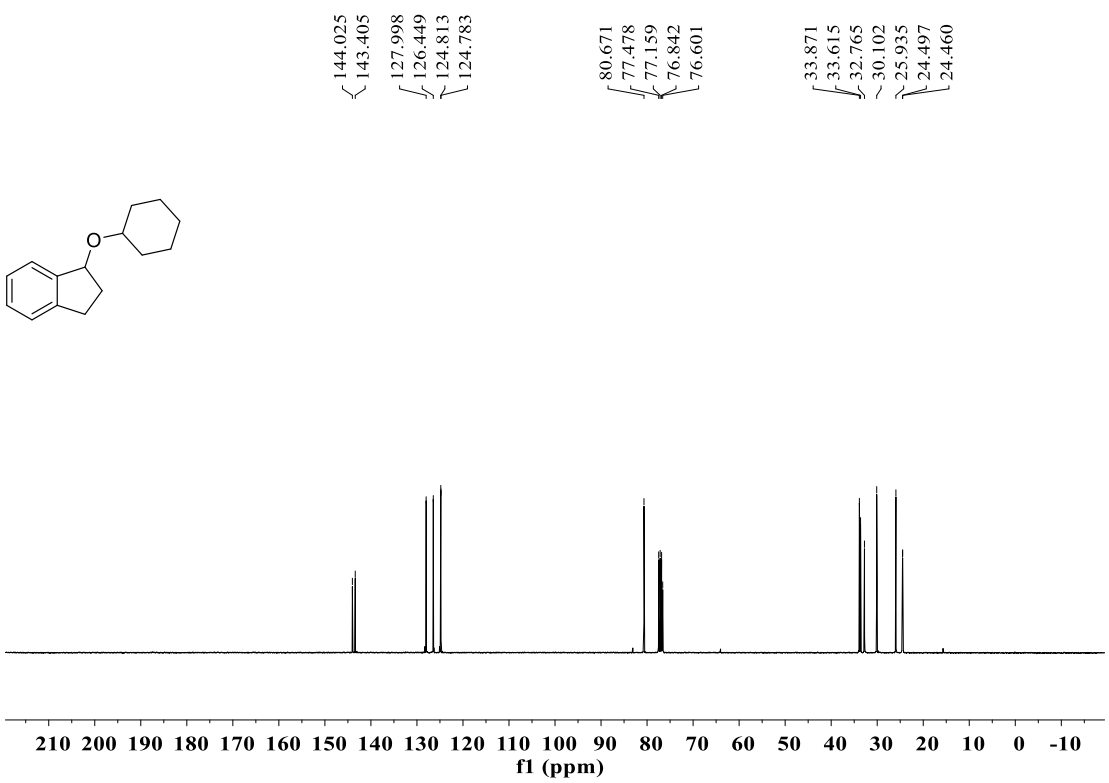
f1 (ppm)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76.842
76.601
33.871
33.615
32.765
30.102
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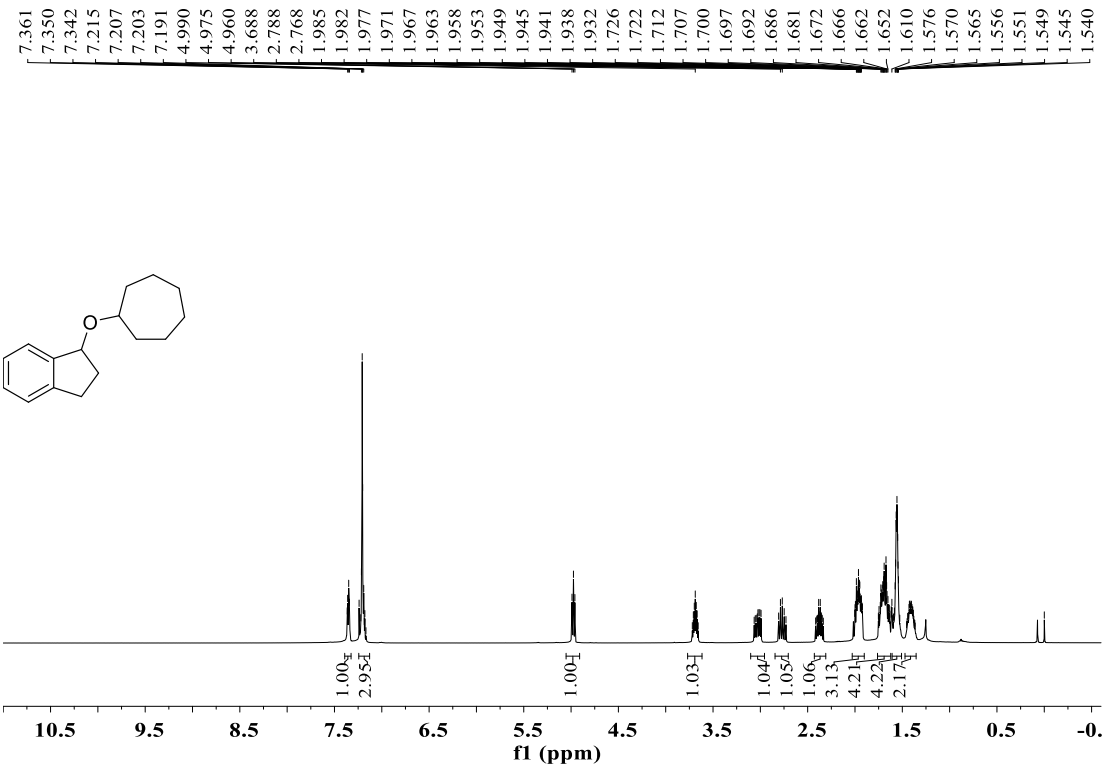
24.497
24.460
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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1.953
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1.941
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O
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1.04
1.05
1.06
3.13
4.21
4.22
2.17
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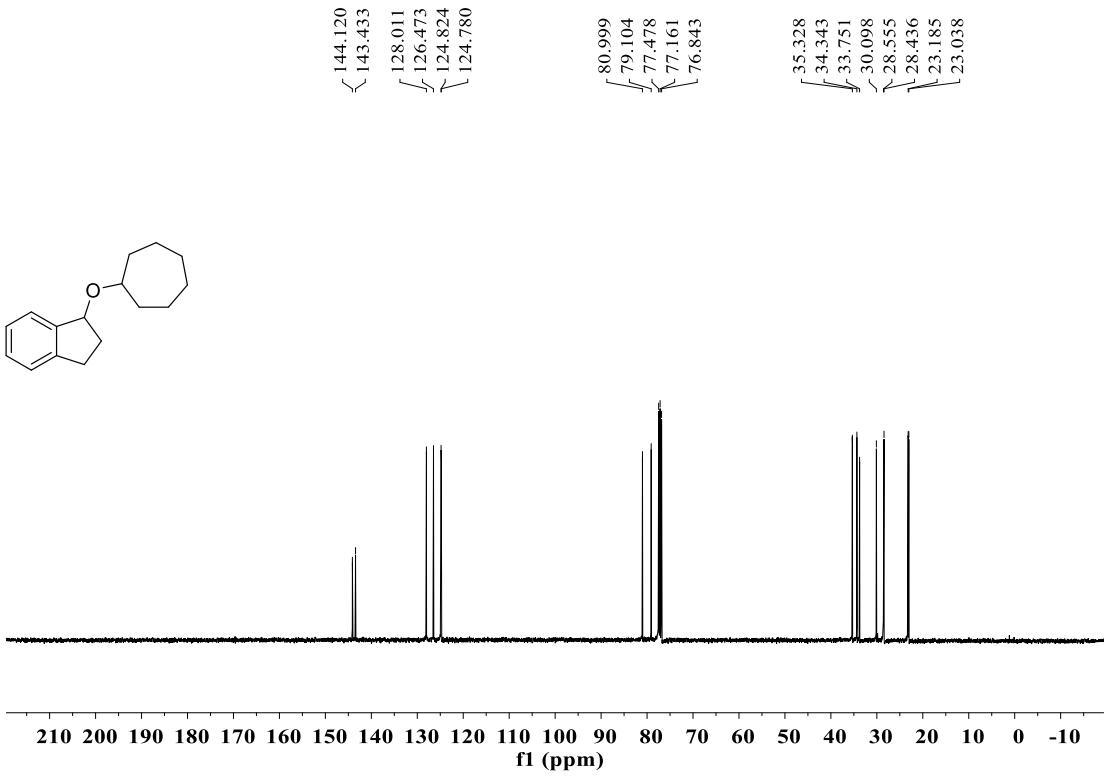
f1 (ppm)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34.343
33.751
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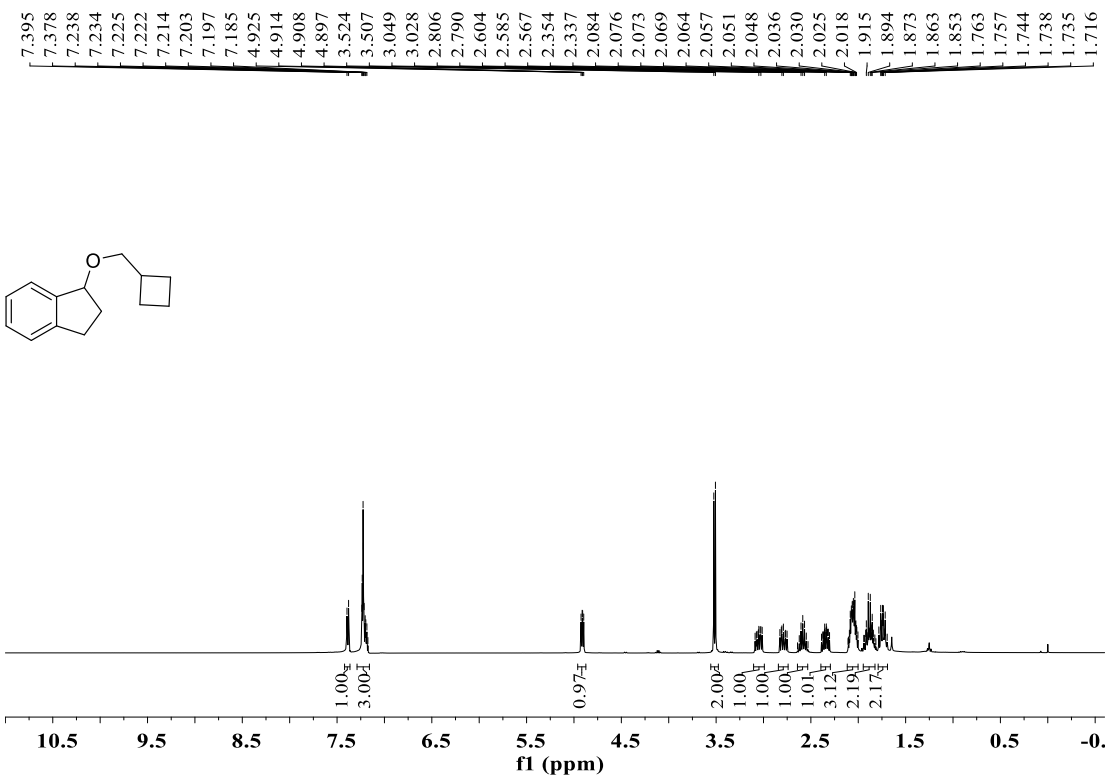
28.436
23.185
23.038
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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7.203
7.197
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4.908
4.897
3.524
3.507
3.049
3.028
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2.567
2.354
2.337
2.084
2.076
2.073
2.069
2.064
2.057
2.051
2.048
2.036
2.030
2.025
2.018
1.915
1.894
1.873
1.863
1.853
1.763
1.757
1.744
1.738
1.735
1.716
O
1.00
3.00
0.97
2.00
1.00
1.00
1.00
1.01
3.12
2.19
2.17
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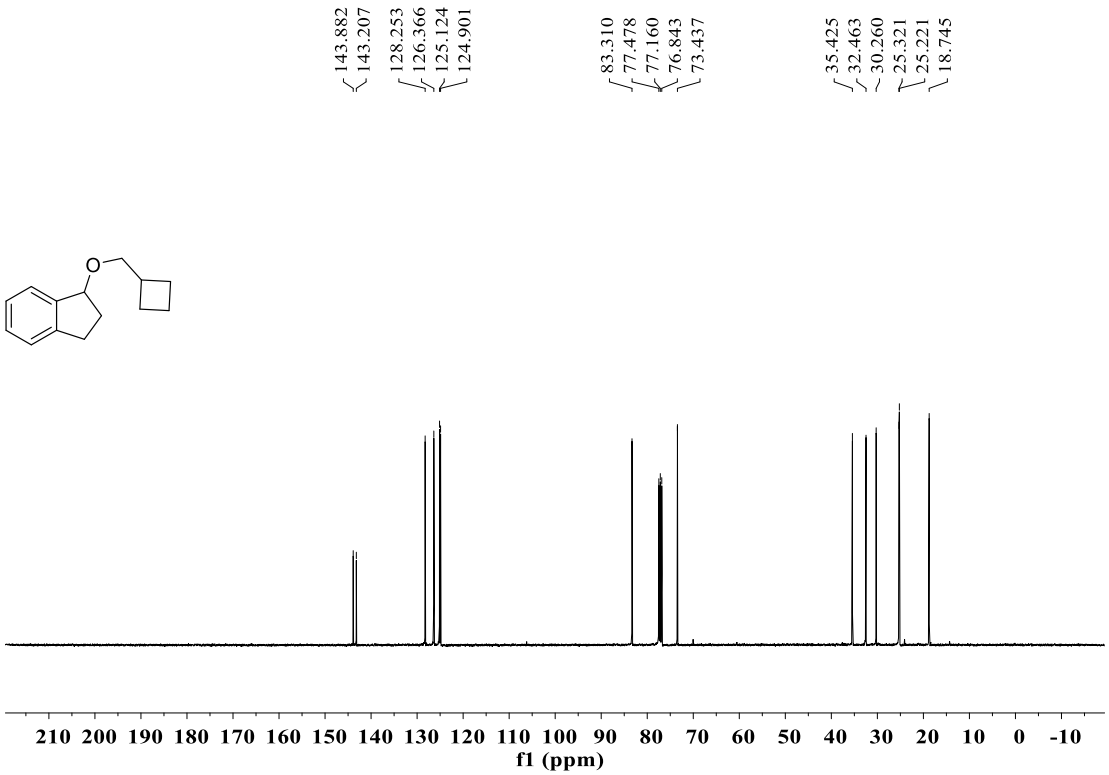
f1 (ppm)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25.321
25.221
18.745
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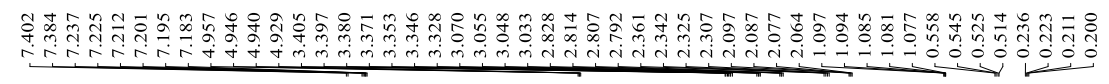
f1 (ppm)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7.183
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3.405
3.397
3.380
3.371
3.353
3.346
3.328
3.070
3.055
3.048
3.033
2.828
2.814
2.807
2.792
2.361
2.342
2.325
2.307
2.097
2.087
2.077
2.064
1.097
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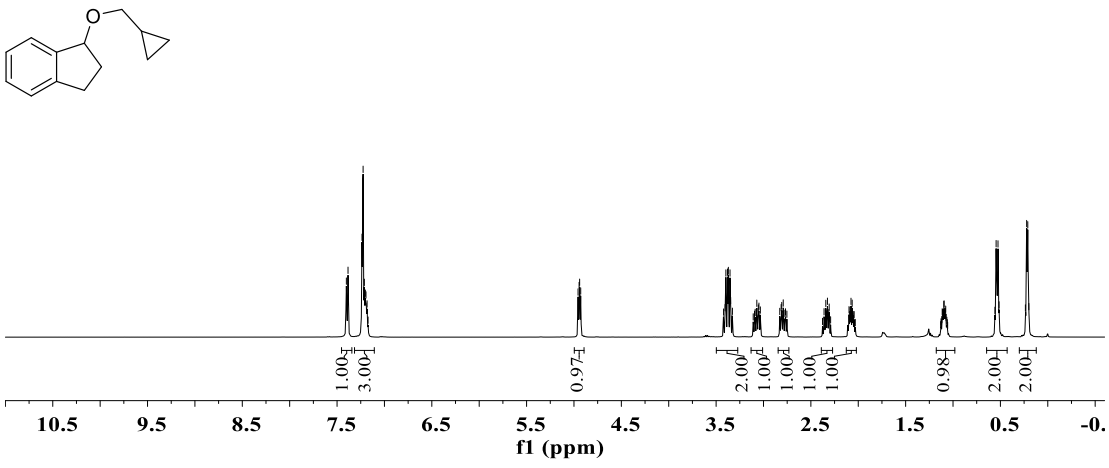
0.200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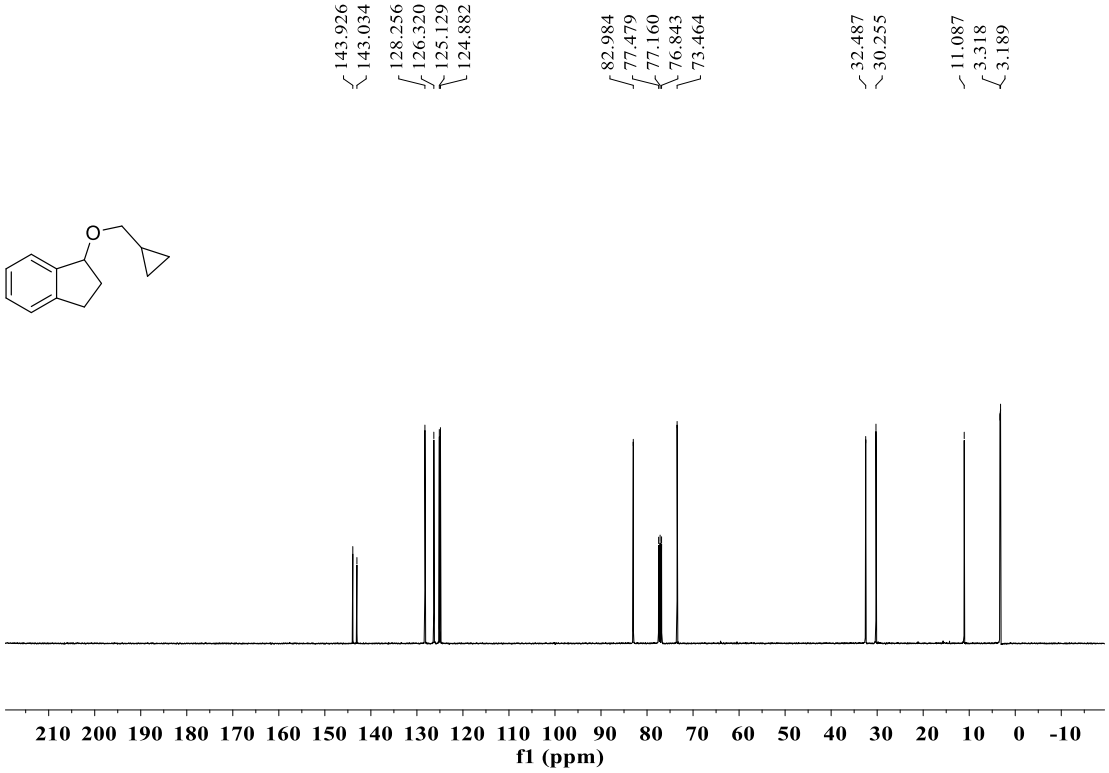
1.00
1.00
1.00
0.98
2.00
2.00
10.5 9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.
f1 (ppm)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3.189
O
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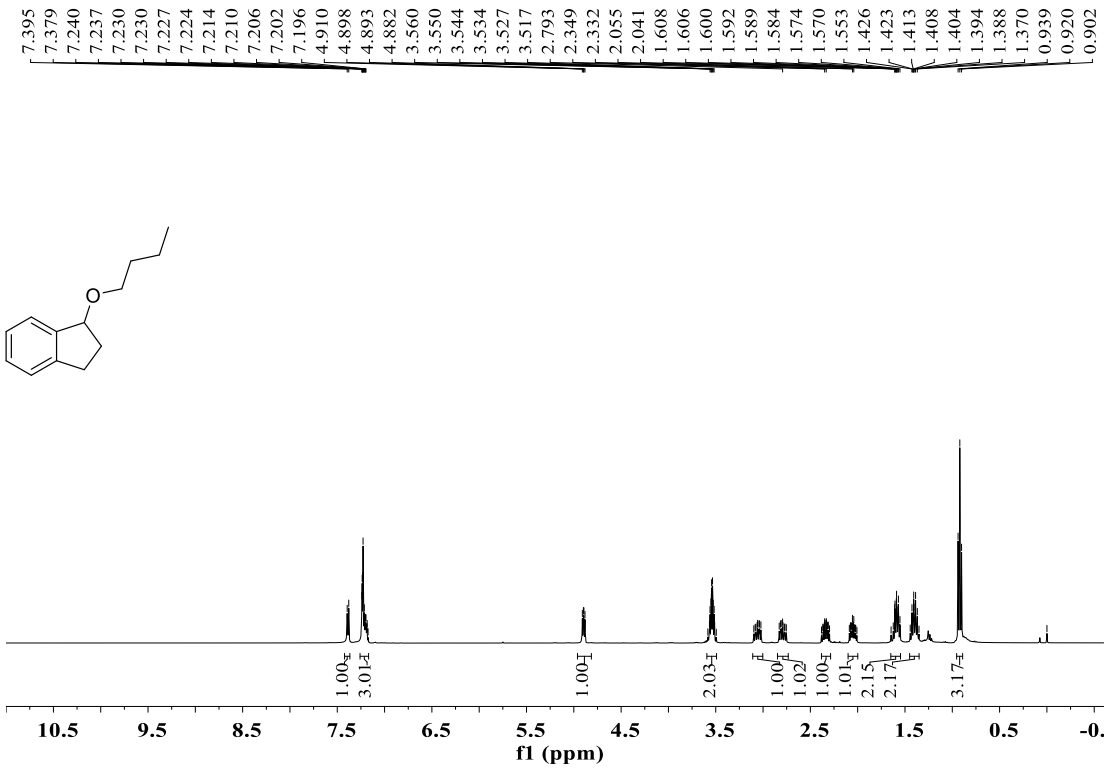
f1 (ppm)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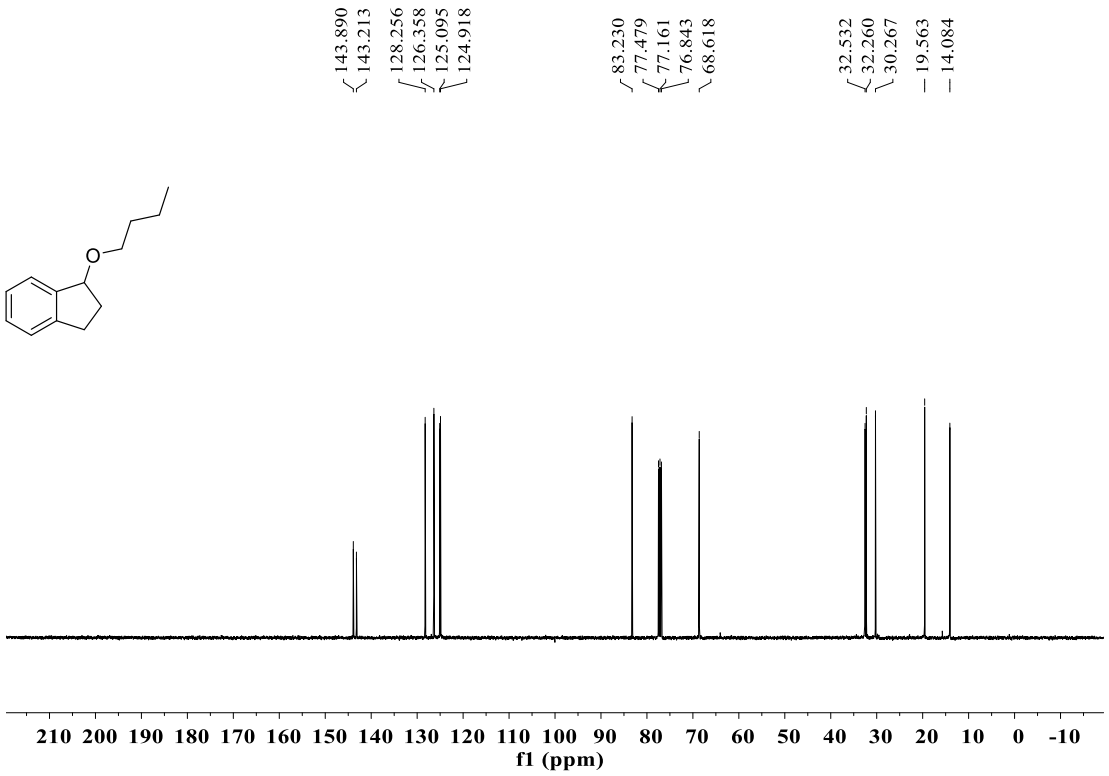
7.202
7.196
4.910
4.898
4.893
4.882
3.560
3.550
3.544
3.534
3.527
3.517
2.793
2.349
2.332
2.055
2.041
1.608
1.606
1.600
1.592
1.589
1.584
1.574
1.570
1.553
1.426
1.423
1.413
1.408
1.404
1.394
1.388
1.370
0.939
0.920
0.902
O
1.00
3.01
1.00
2.03
1.00
1.02
1.00
1.01
2.15
2.17
3.17
10.5 9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.
f1 (ppm)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19.563
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O
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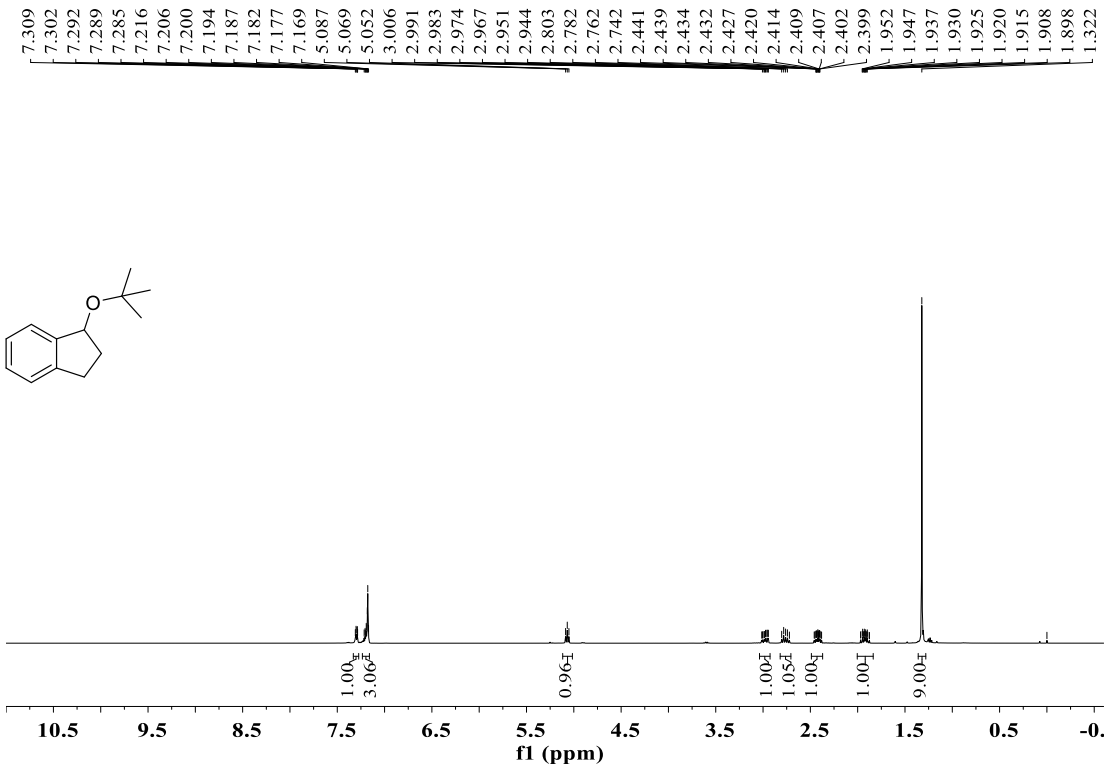
f1 (ppm)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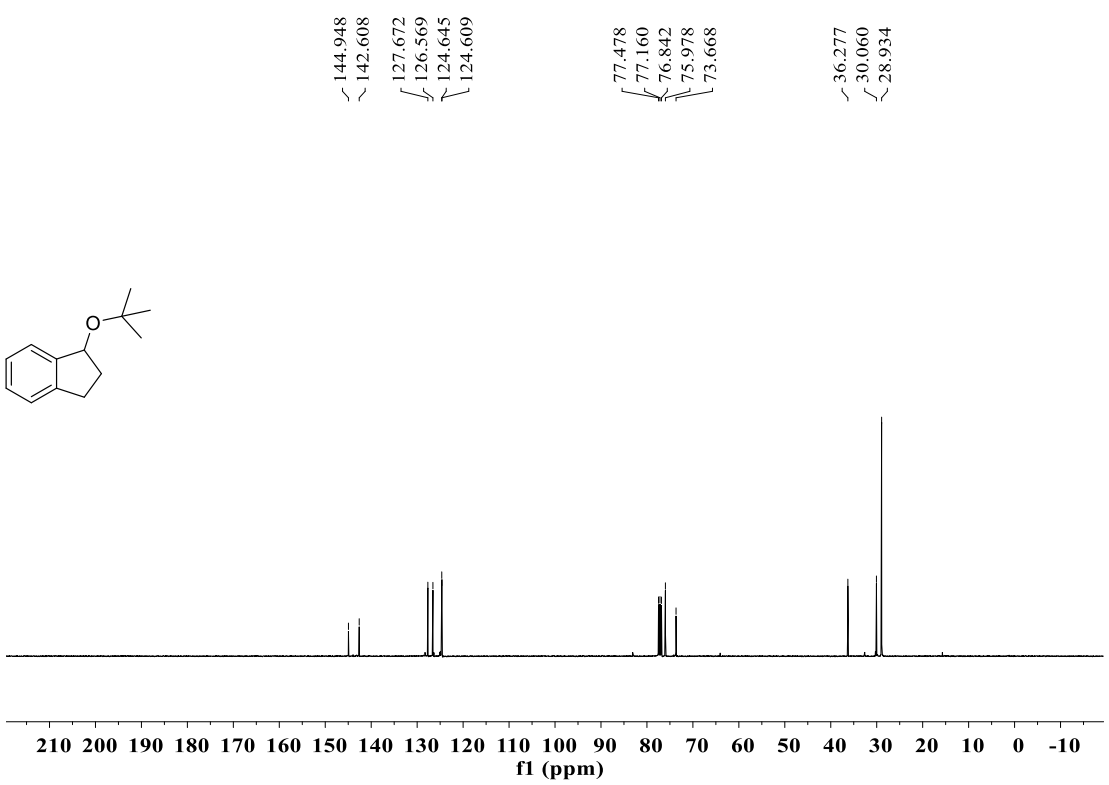
7.169
5.087
5.069
5.052
3.006
2.991
2.983
2.974
2.967
2.951
2.944
2.803
2.782
2.762
2.742
2.441
2.439
2.434
2.432
2.427
2.420
2.414
2.409
2.407
2.402
2.399
1.952
1.947
1.937
1.930
1.925
1.920
1.915
1.908
1.898
1.322
O
1.00
3.06
0.96
1.00
1.05
1.00
1.00
9.00
10.5 9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.
f1 (ppm)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124.645
124.609
77.478
77.160
76.842
75.978
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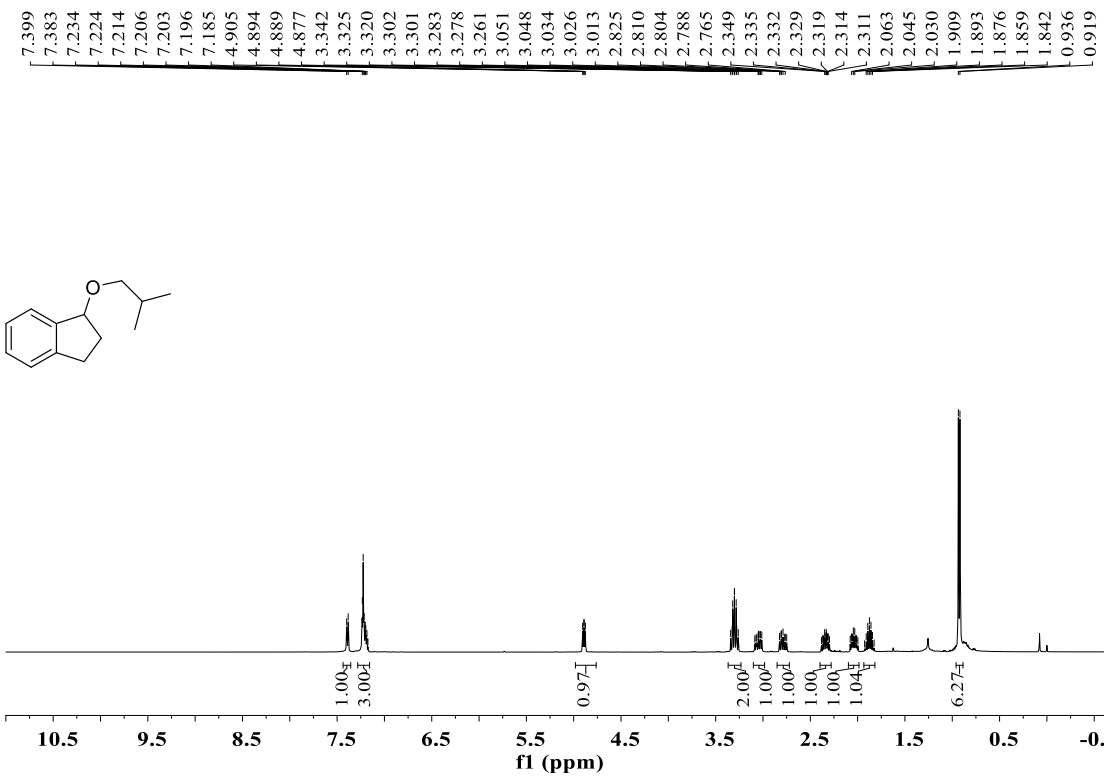
30.060
28.934
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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7.196
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4.889
4.877
3.342
3.325
3.320
3.302
3.301
3.283
3.278
3.261
3.051
3.048
3.034
3.026
3.013
2.825
2.810
2.804
2.788
2.765
2.349
2.335
2.332
2.329
2.319
2.314
2.311
2.063
2.045
2.030
1.909
1.893
1.876
1.859
1.842
0.936
0.919
O
1.00
3.00
0.97
2.00
1.00
1.00
1.00
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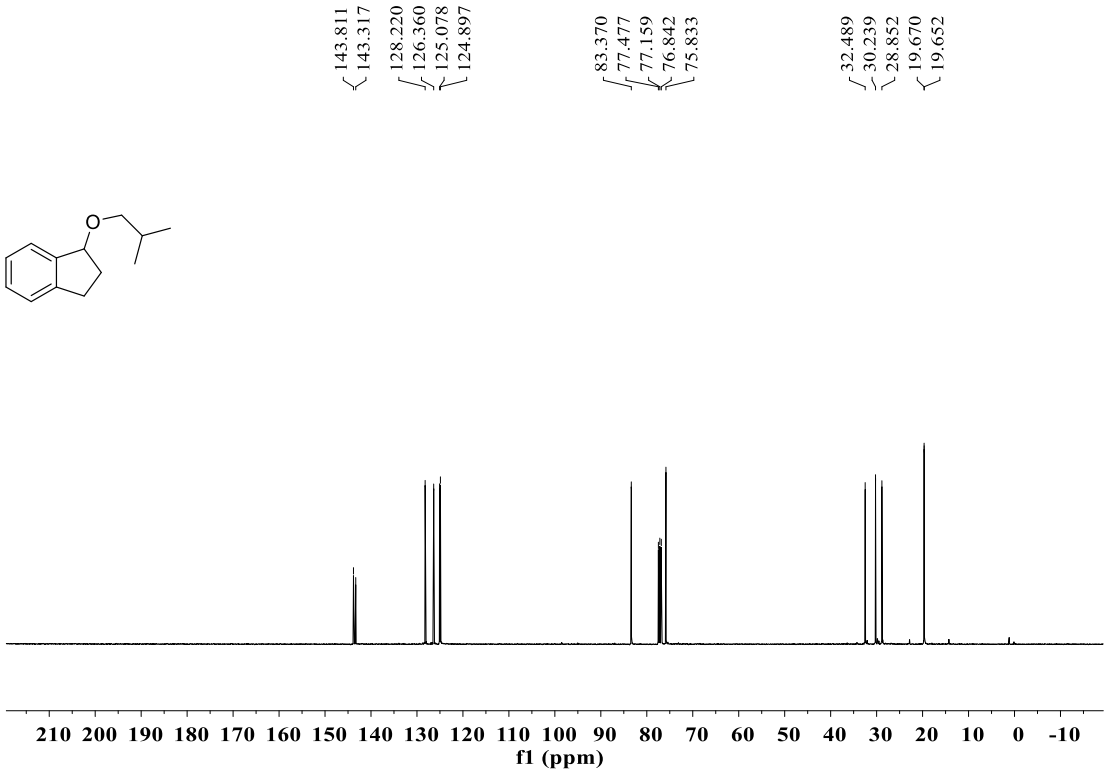
1.04
6.27
10.5 9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.
f1 (ppm)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83.370
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75.833
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19.670
19.652
O
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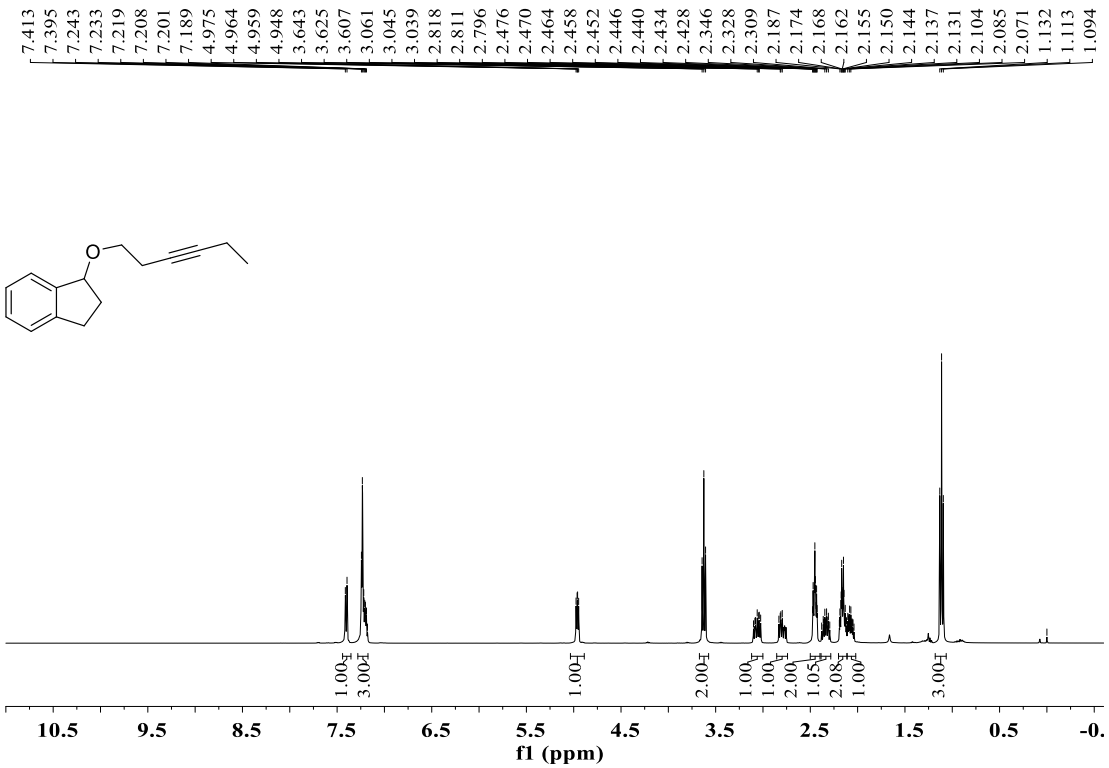
f1 (ppm)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4.948
3.643
3.625
3.607
3.061
3.045
3.039
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2.811
2.796
2.476
2.470
2.464
2.458
2.452
2.446
2.440
2.434
2.428
2.346
2.328
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2.174
2.168
2.162
2.155
2.150
2.144
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2.131
2.104
2.085
2.071
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1.113
1.094
O
1.00
3.00
1.00
2.00
1.00
1.00
2.00
1.05
2.08
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3.00
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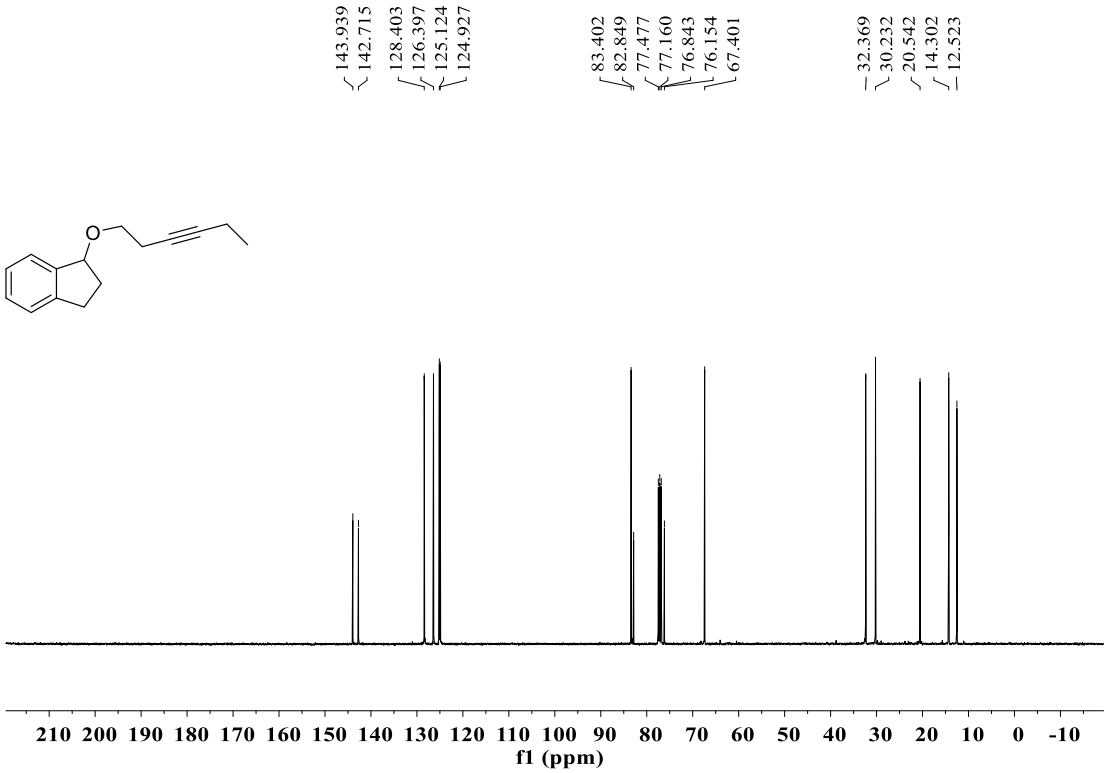
f1 (ppm)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77.477
77.160
76.843
76.154
67.401
32.369
30.232
20.542
14.302
12.523
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


5.392
5.375
5.358
3.047
3.039
3.024
3.016
3.008
2.999
2.985
2.976
2.836
2.816
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2.776
2.756
2.554
2.546
2.536
2.534
2.527
2.526
2.522
2.515
2.513
2.507
2.503
2.502
2.495
2.493
2.480
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2.028
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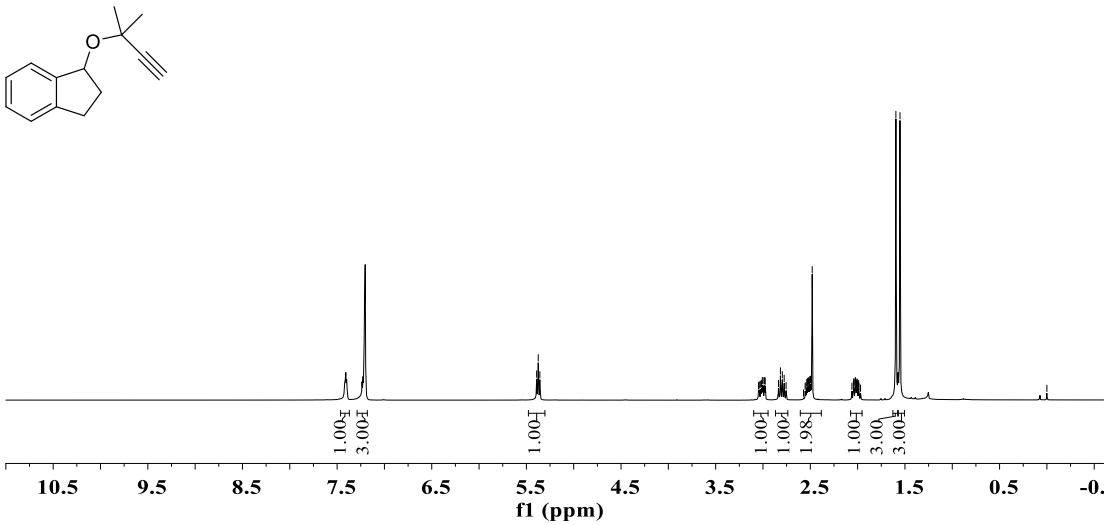
1.596
1.552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1.00
1.00
1.98
1.00
3.00
3.00
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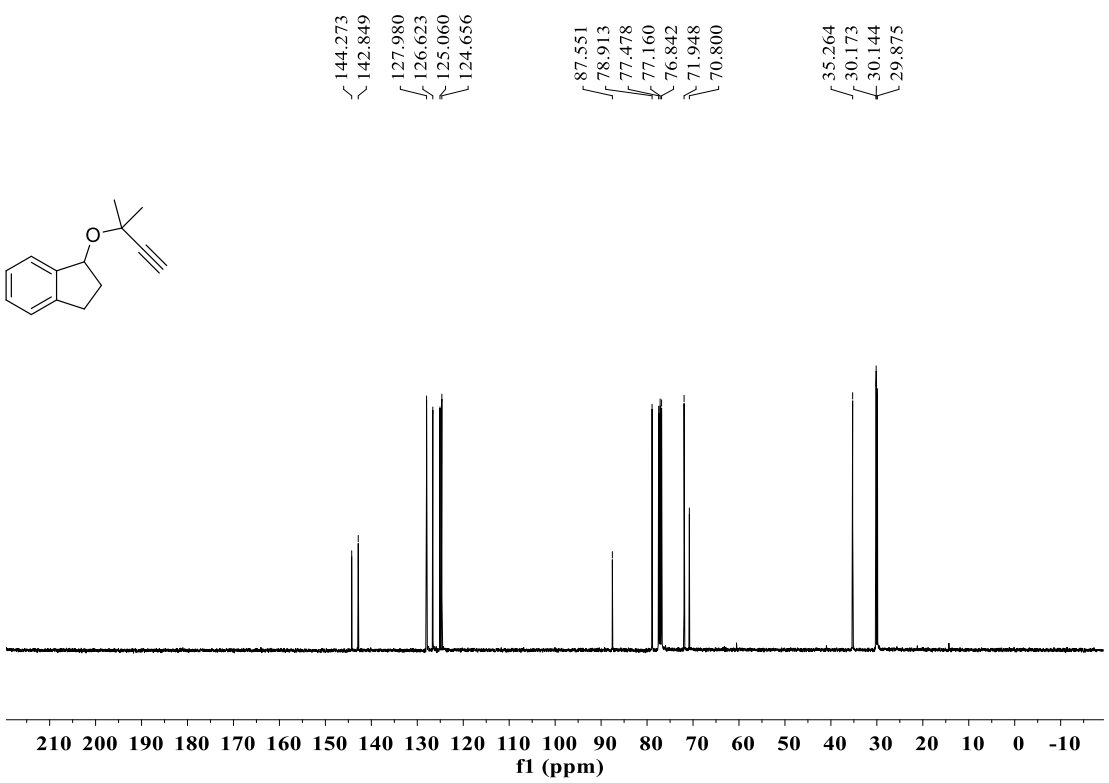
f1 (ppm)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77.160
76.842
71.948
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35.264
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30.144
29.875
O
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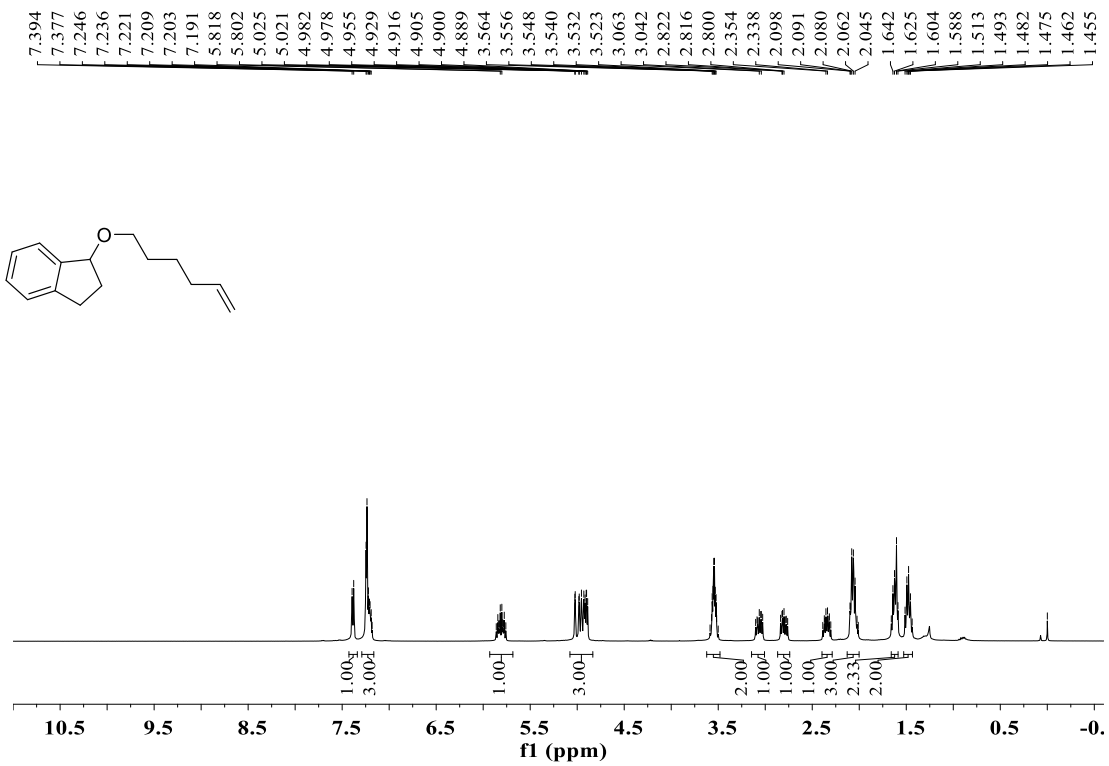
f1 (ppm)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7.191
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5.802
5.025
5.021
4.982
4.978
4.955
4.929
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4.905
4.900
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3.556
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3.532
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2.080
2.062
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1.625
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1.455
O
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3.00
1.00
3.00
2.00
1.00
1.00
1.00
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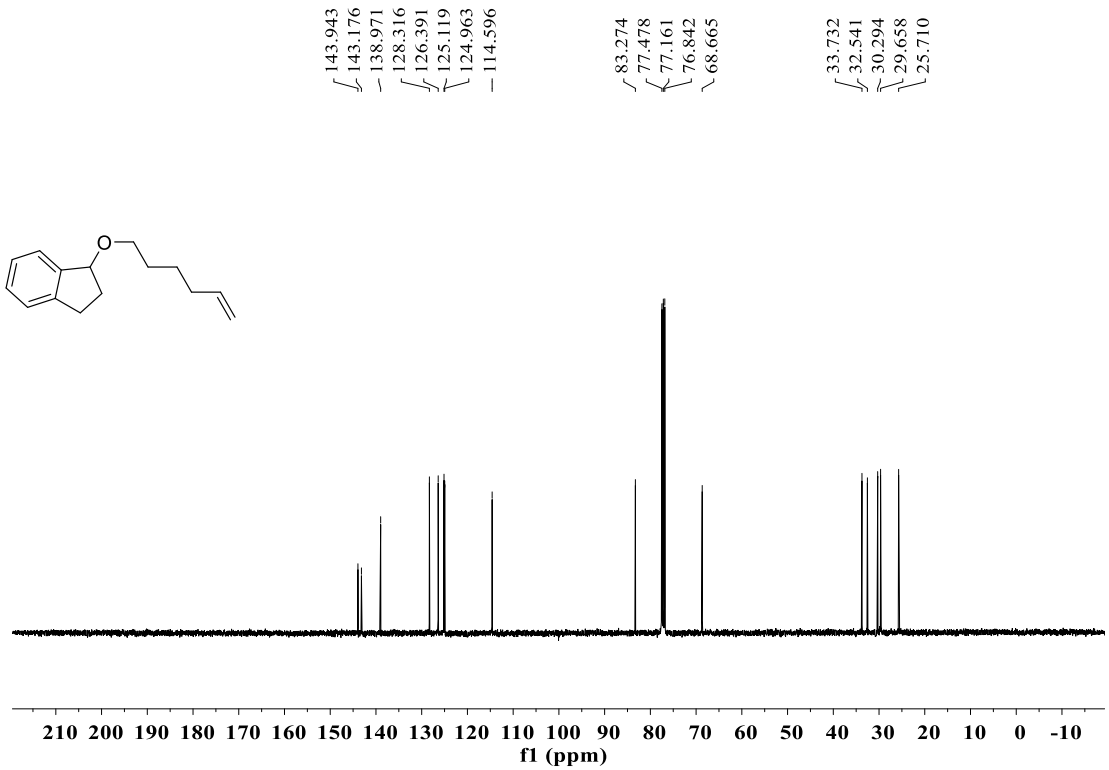
f1 (ppm)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77.161
76.842
68.665
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29.658
25.710
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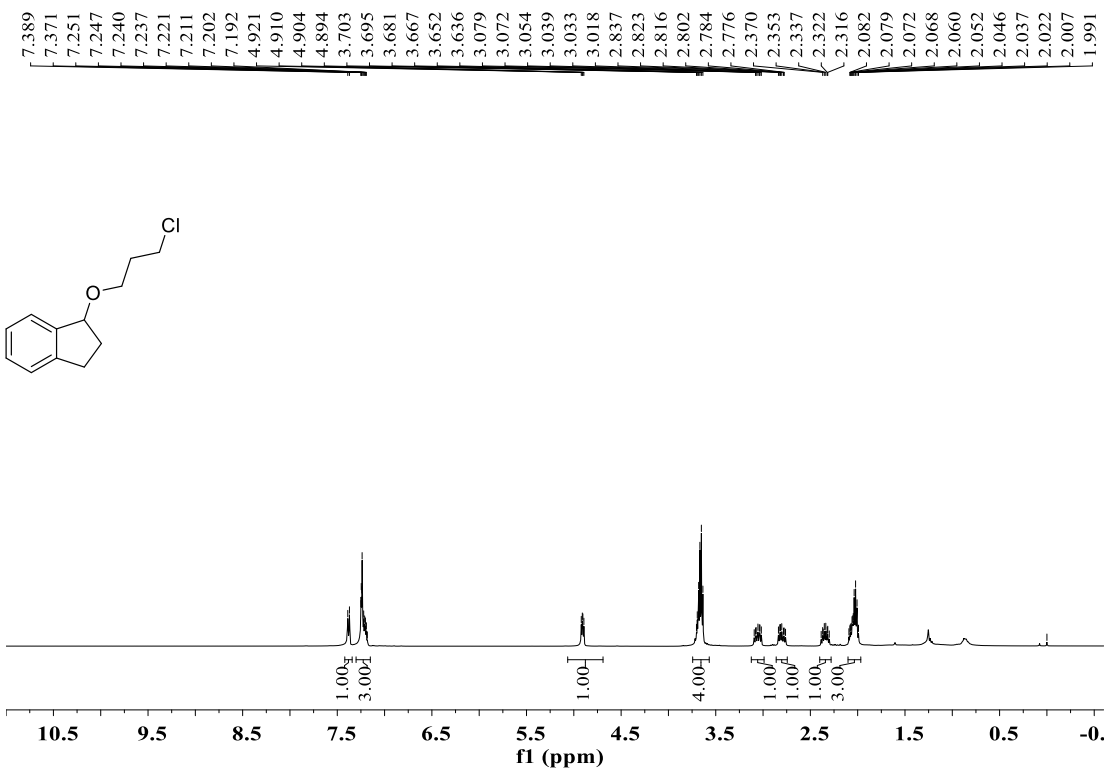
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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2.082
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2.052
2.046
2.037
2.022
2.007
1.991
Cl
O
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3.00
1.00
4.00
1.00
1.00
1.00
3.00
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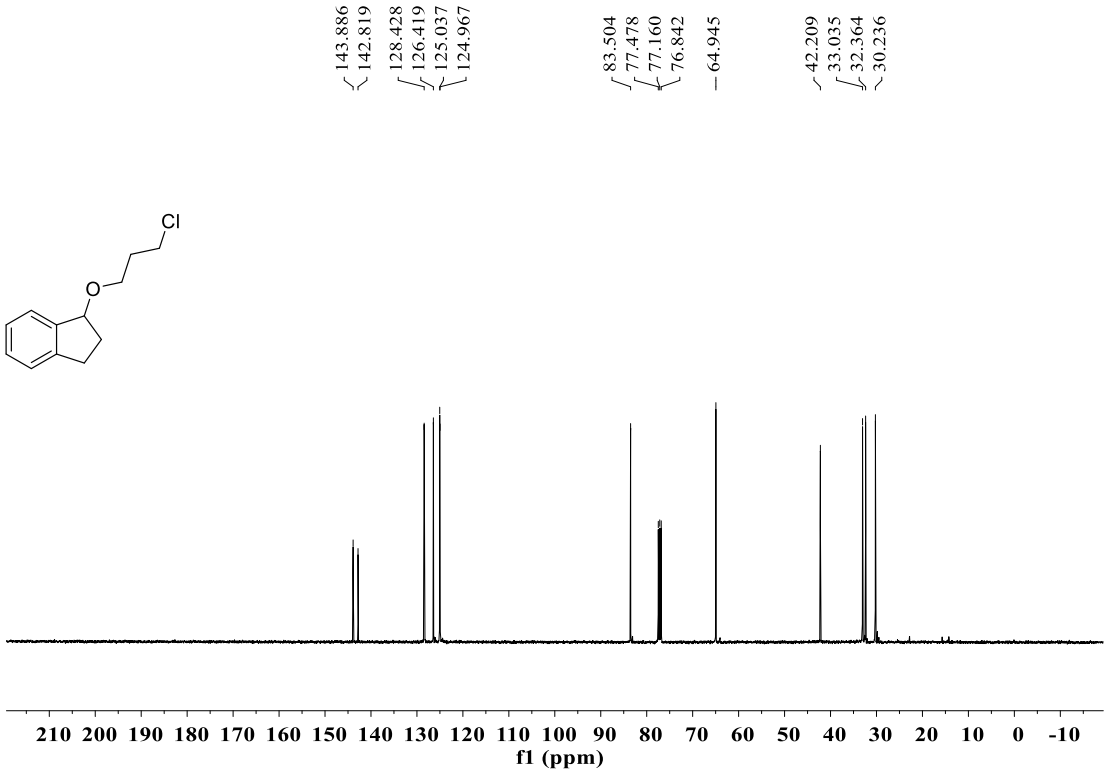
f1 (ppm)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32.364
30.236
Cl
O
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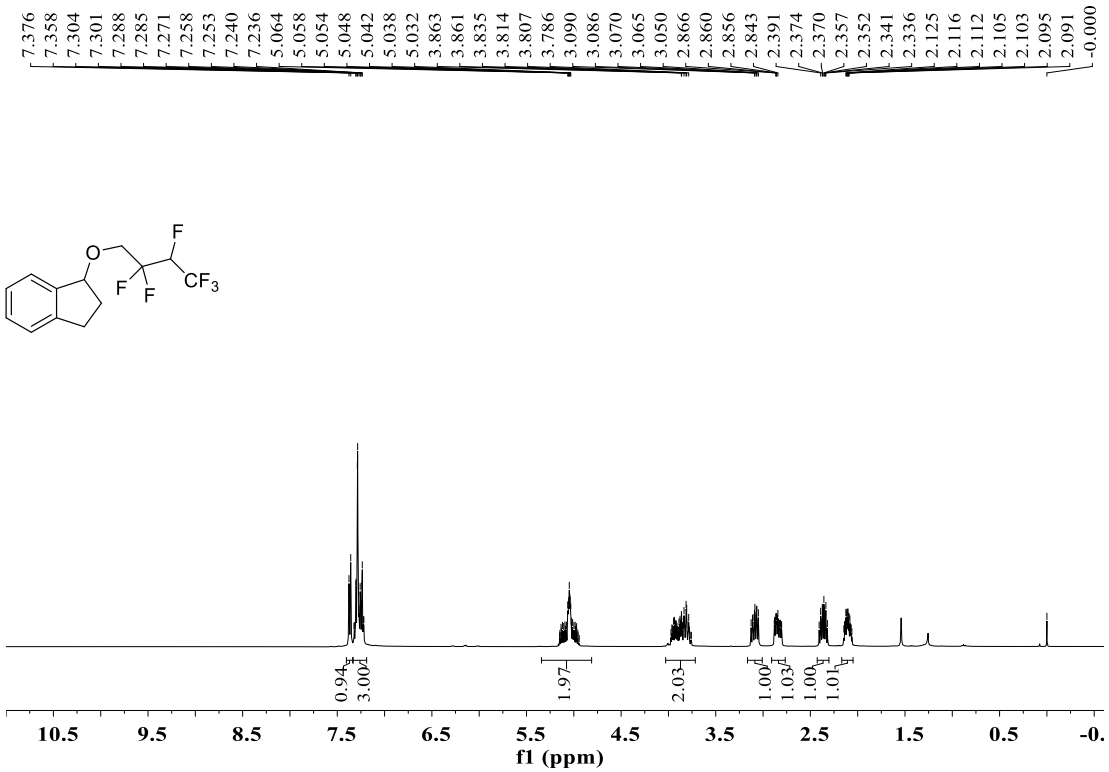
f1 (ppm)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5.054
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3.807
3.786
3.090
3.086
3.070
3.065
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2.860
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-0.000
O
F
F
F
CF3
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2.03
1.00
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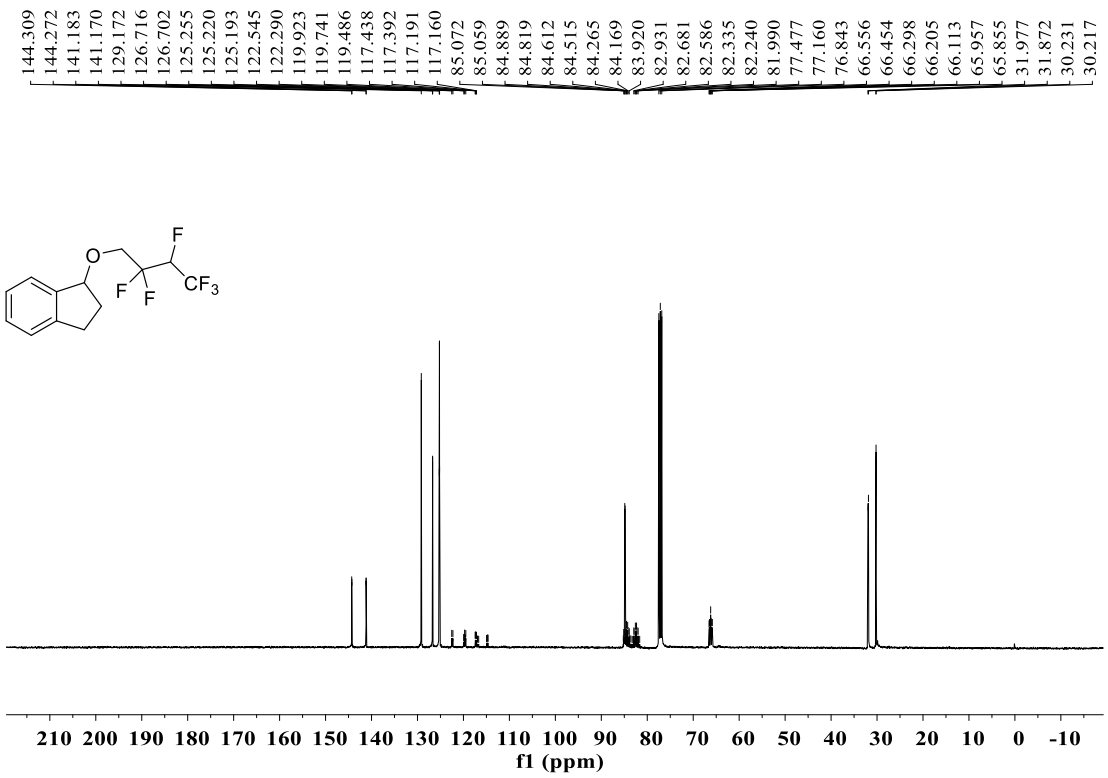
f1 (ppm)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85.059
84.889
84.819
84.612
84.515
84.265
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82.681
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82.240
81.990
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77.160
76.843
66.556
66.454
66.298
66.205
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65.957
65.855
31.977
31.872
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O
F
F
F
CF3
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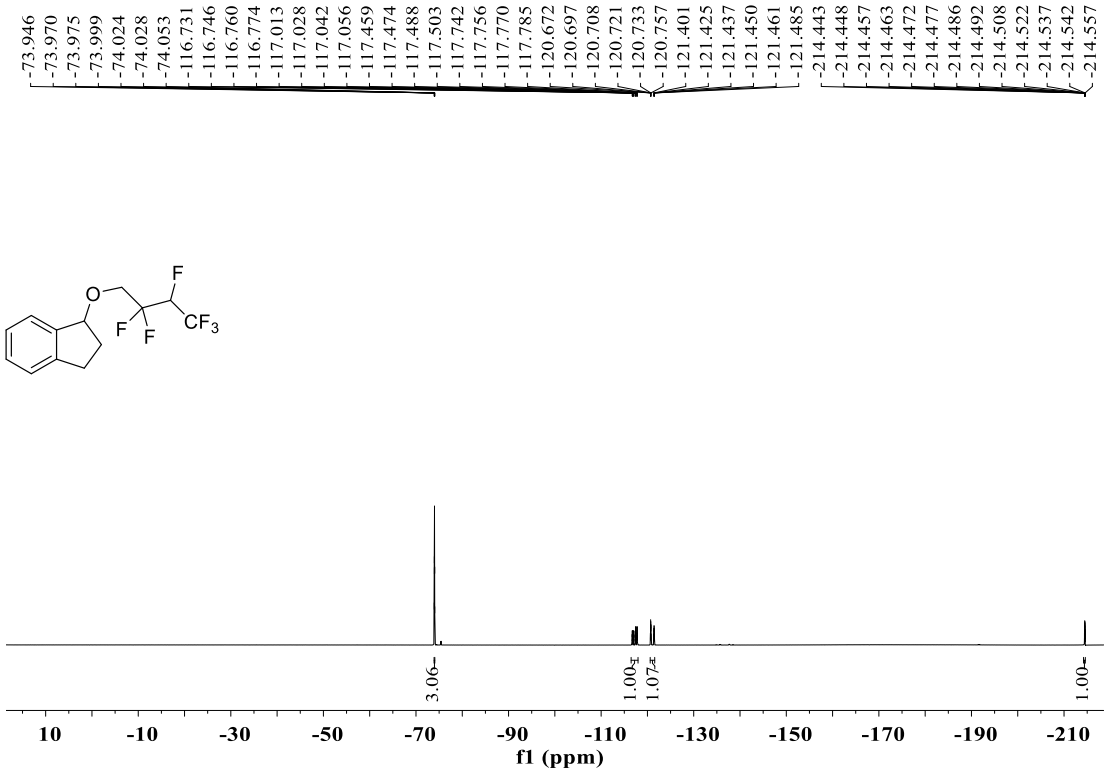
f1 (ppm)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-121.425
-121.437
-121.450
-121.461
-121.485
-214.443
-214.448
-214.457
-214.463
-214.472
-214.477
-214.486
-214.492
-214.508
-214.522
-214.537
-214.542
-214.557
O
F
F
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1.07
1.00
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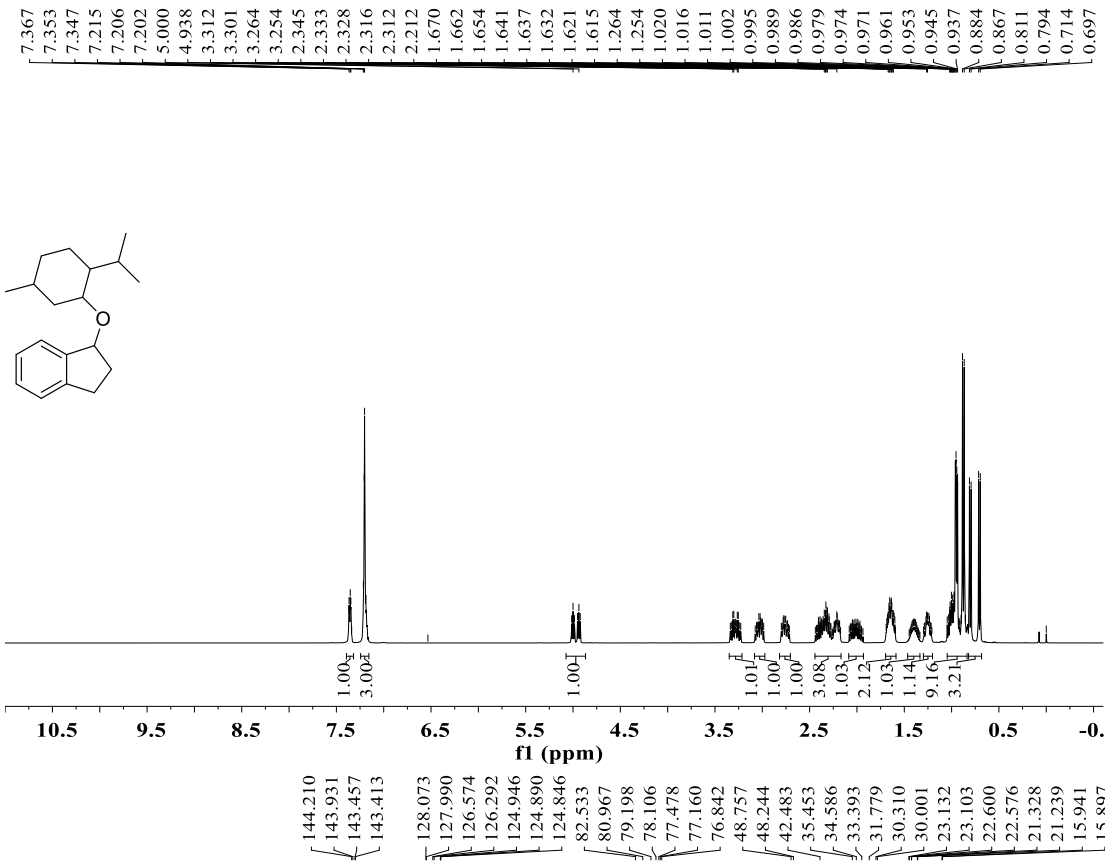
f1 (ppm)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1.637
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1.011
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0.974
0.971
0.961
0.953
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0.937
0.884
0.867
0.811
0.794
0.714
0.697
O
1.00
3.00
1.00
1.01
1.00
1.00
3.08
1.03
2.12
1.03
1.14
9.16
3.21
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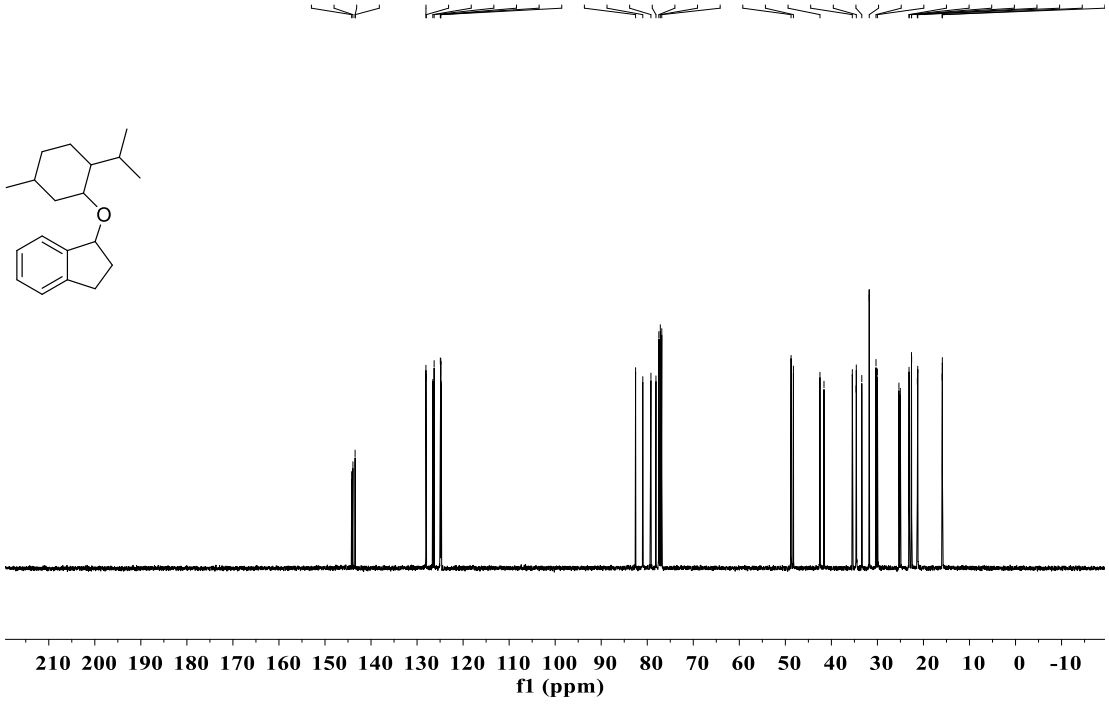
f1 (ppm)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77.160
76.842
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48.244
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33.393
31.779
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30.001
23.132
23.103
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21.239
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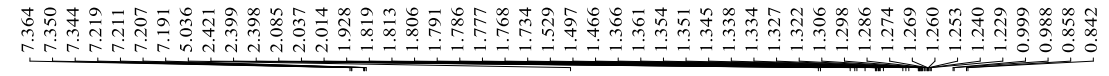
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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1.777
1.768
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1.529
1.497
1.466
1.366
1.361
1.354
1.351
1.345
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1.334
1.327
1.322
1.306
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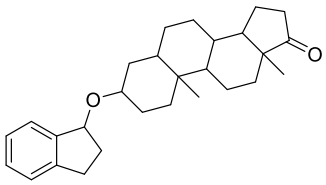
0.842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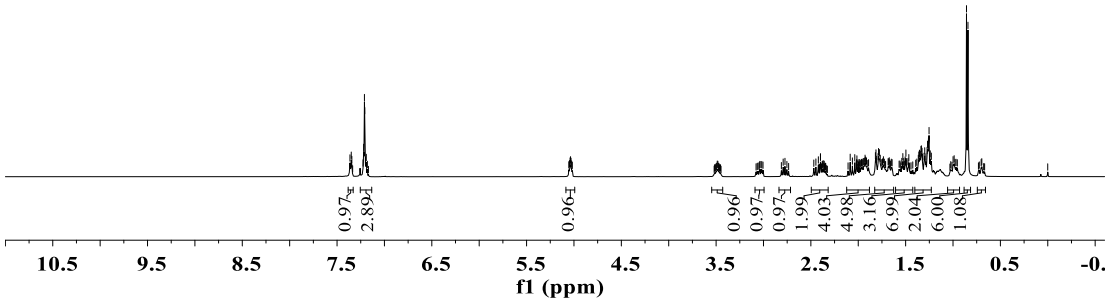
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1.08
10.5
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6.5
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4.5
3.5
2.5
1.5
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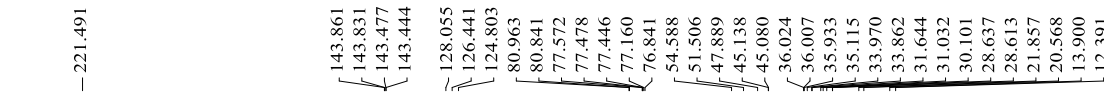
f1 (ppm)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47.889
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45.080
36.024
36.007
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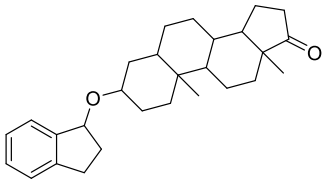
13.900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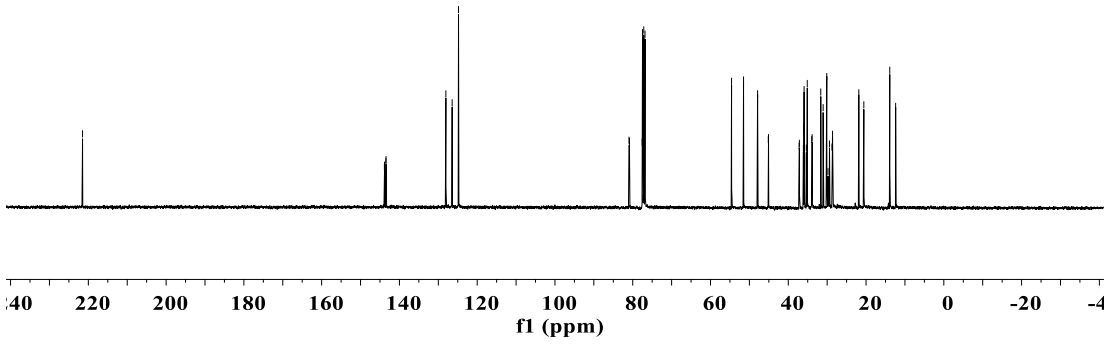
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180
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140
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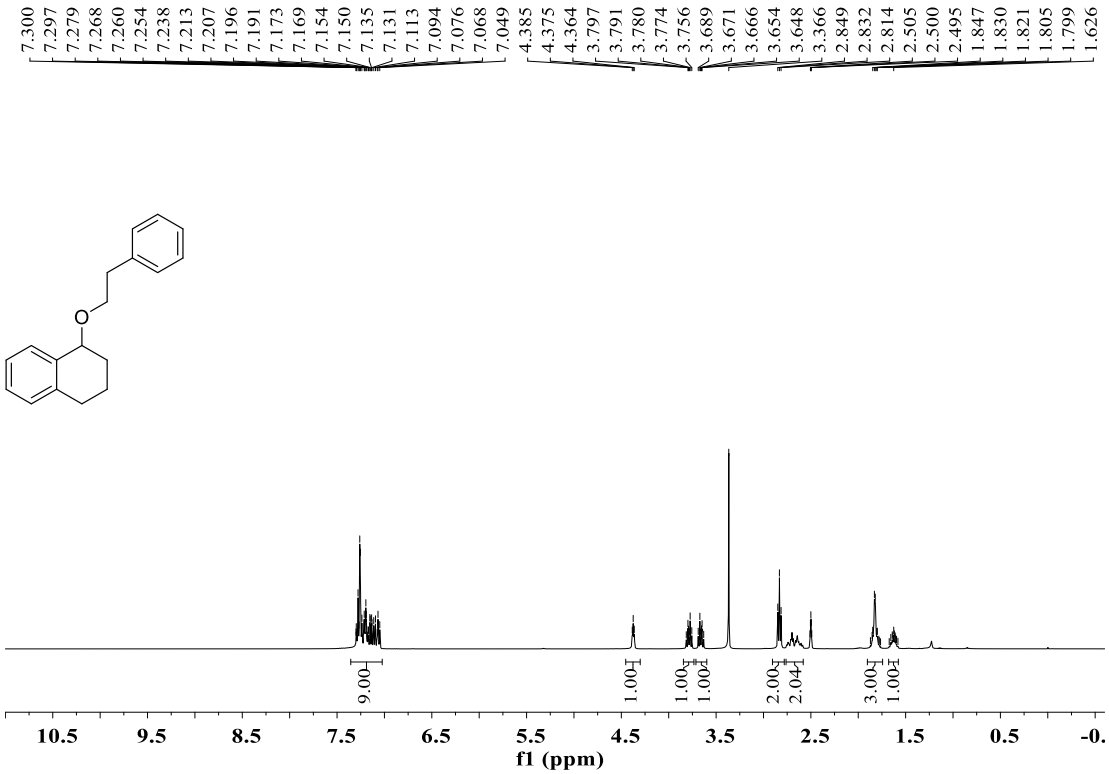
100
80
60
40
20
0
-20
f1 (ppm)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7.254
7.238
7.213
7.207
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7.191
7.173
7.169
7.154
7.150
7.135
7.131
7.113
7.094
7.076
7.068
7.049
4.385
4.375
4.364
3.797
3.791
3.780
3.774
3.756
3.689
3.671
3.666
3.654
3.648
3.366
2.849
2.832
2.814
2.505
2.500
2.495
1.847
1.830
1.821
1.805
1.799
1.626
O
9.00
1.00
1.00
1.00
2.00
2.04
3.00
1.00
10.5
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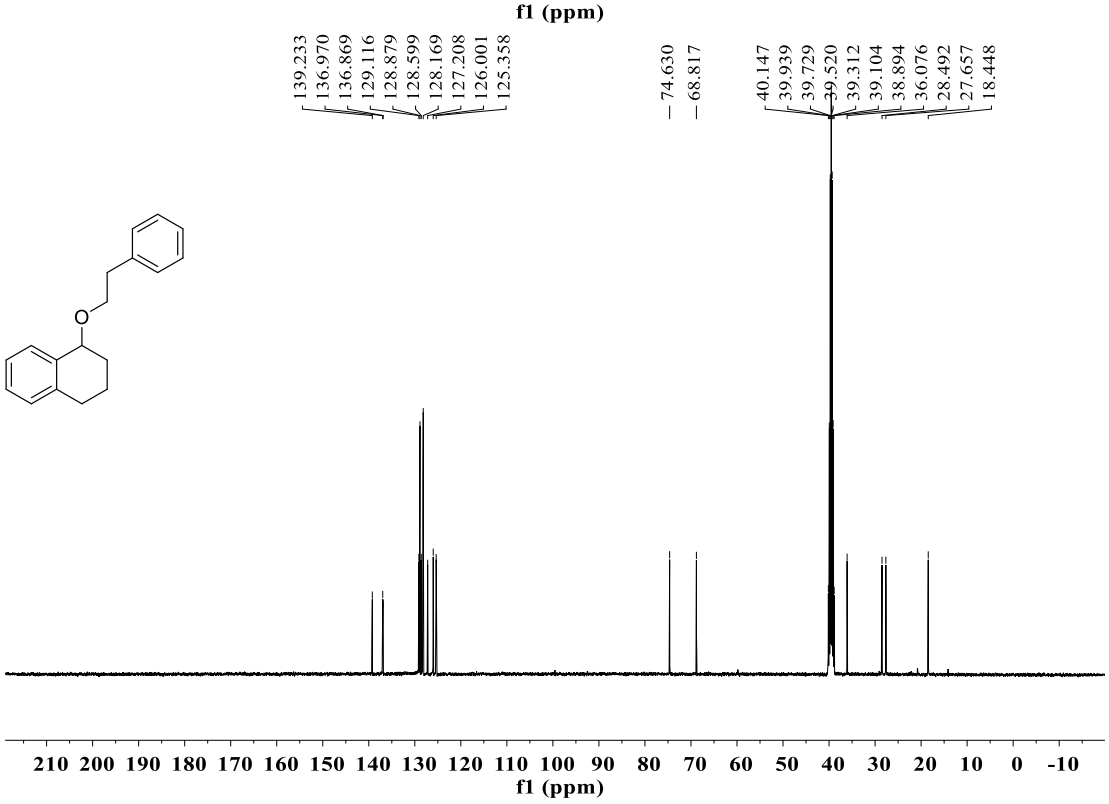
4.5
3.5
2.5
1.5
0.5
-0.
f1 (ppm)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40.147
39.939
39.729
39.520
39.312
39.104
38.894
36.076
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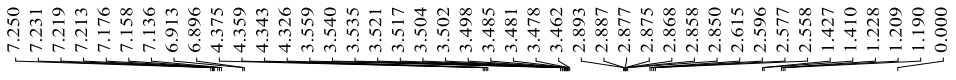
27.657
18.448
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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6.896
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4.343
4.326
3.559
3.540
3.535
3.521
3.517
3.504
3.502
3.498
3.485
3.481
3.478
3.462
2.893
2.887
2.877
2.875
2.868
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2.596
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2.558
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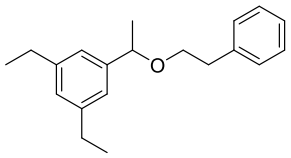
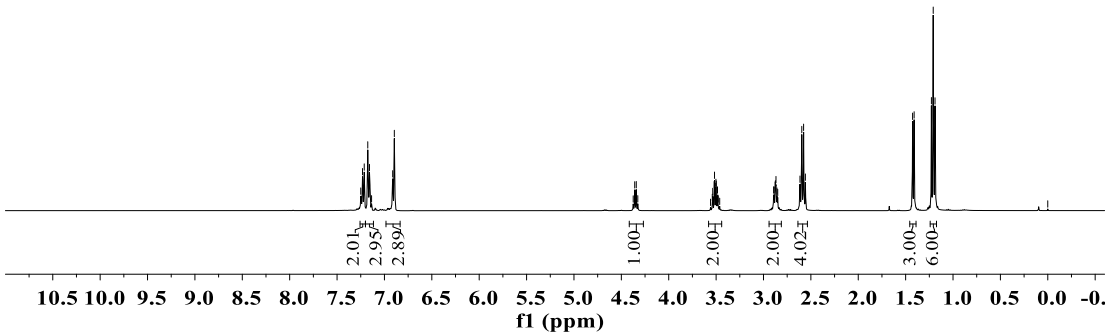
1.190
0.000

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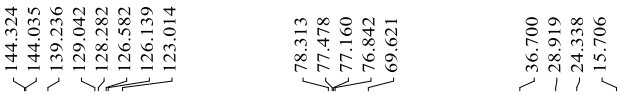
2.00
2.00
4.02
3.00
6.00
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.
f1 (ppm)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123.014
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77.160
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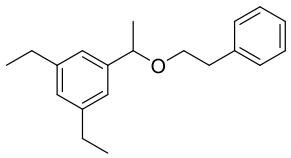

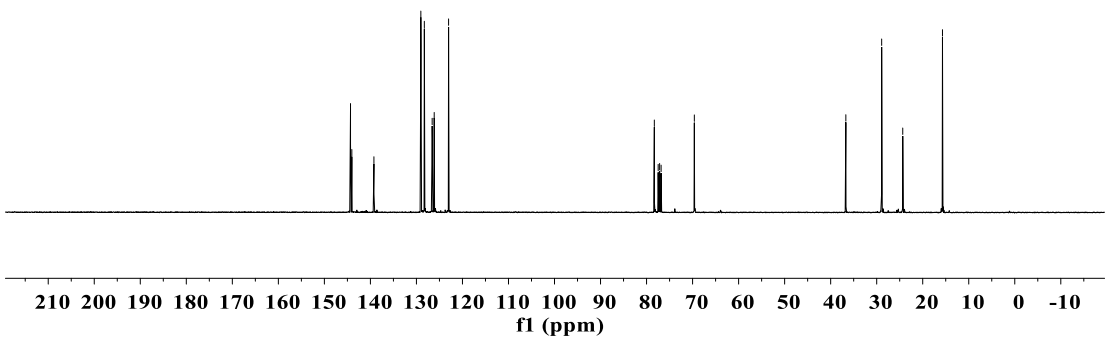
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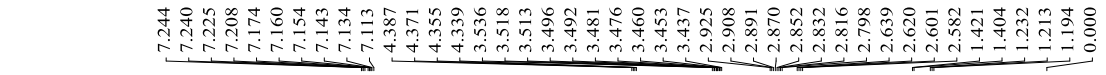
f1 (ppm)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7.134
7.113
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4.355
4.339
3.536
3.518
3.513
3.496
3.492
3.481
3.476
3.460
3.453
3.437
2.925
2.908
2.891
2.870
2.852
2.832
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2.620
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2.582
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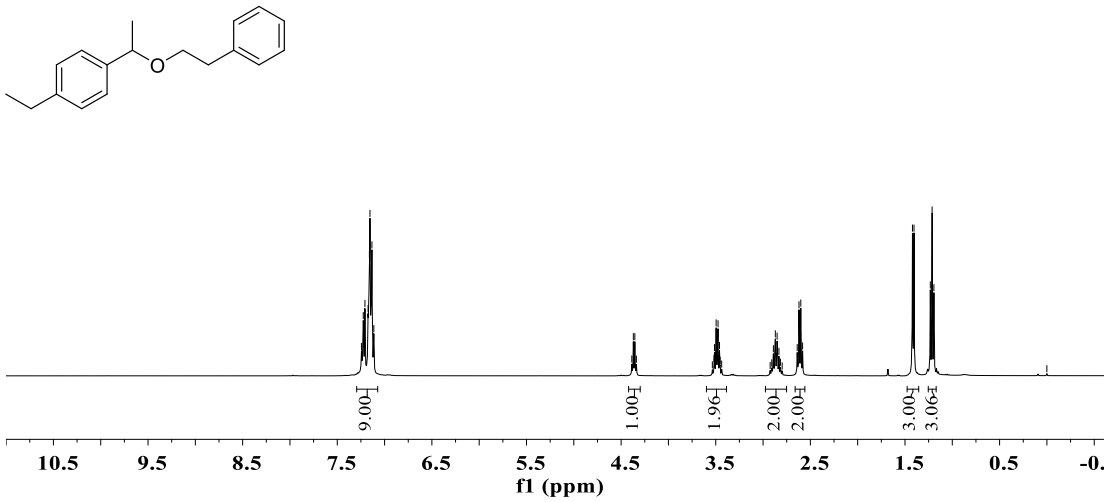
1.404
1.232
1.213
1.194
0.000


O
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1.00
1.96
2.00
2.00
3.00
3.06
10.5
9.5
8.5
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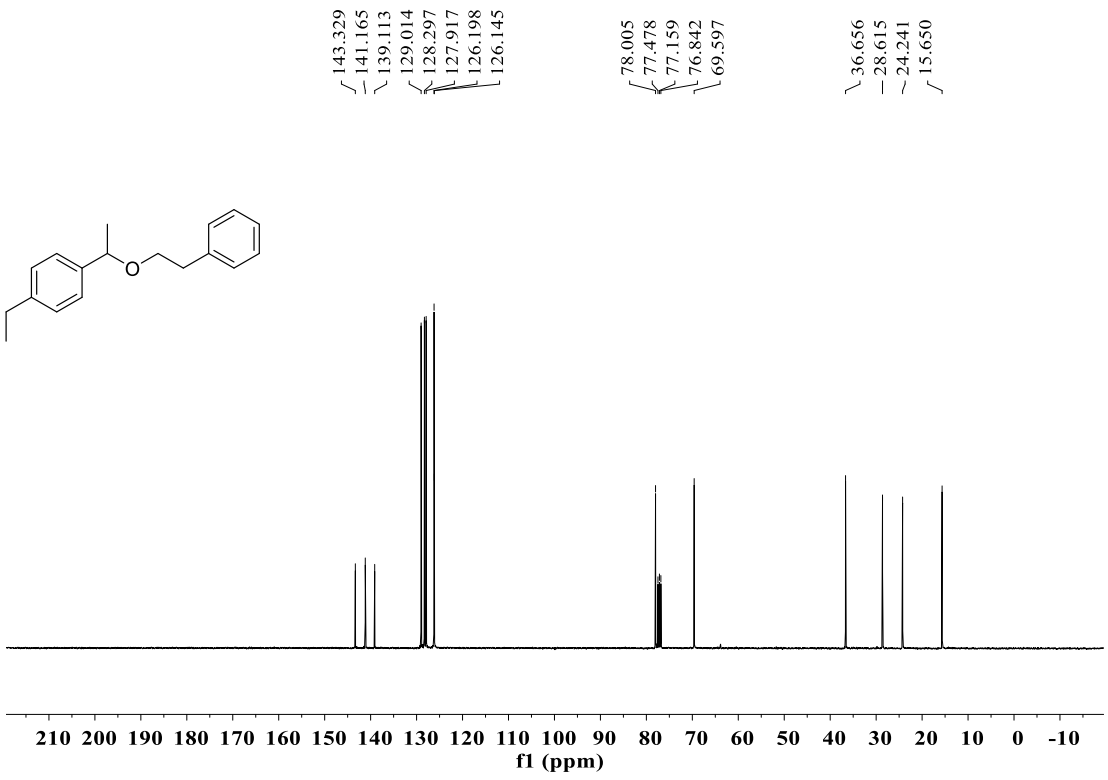
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.
f1 (ppm)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126.145
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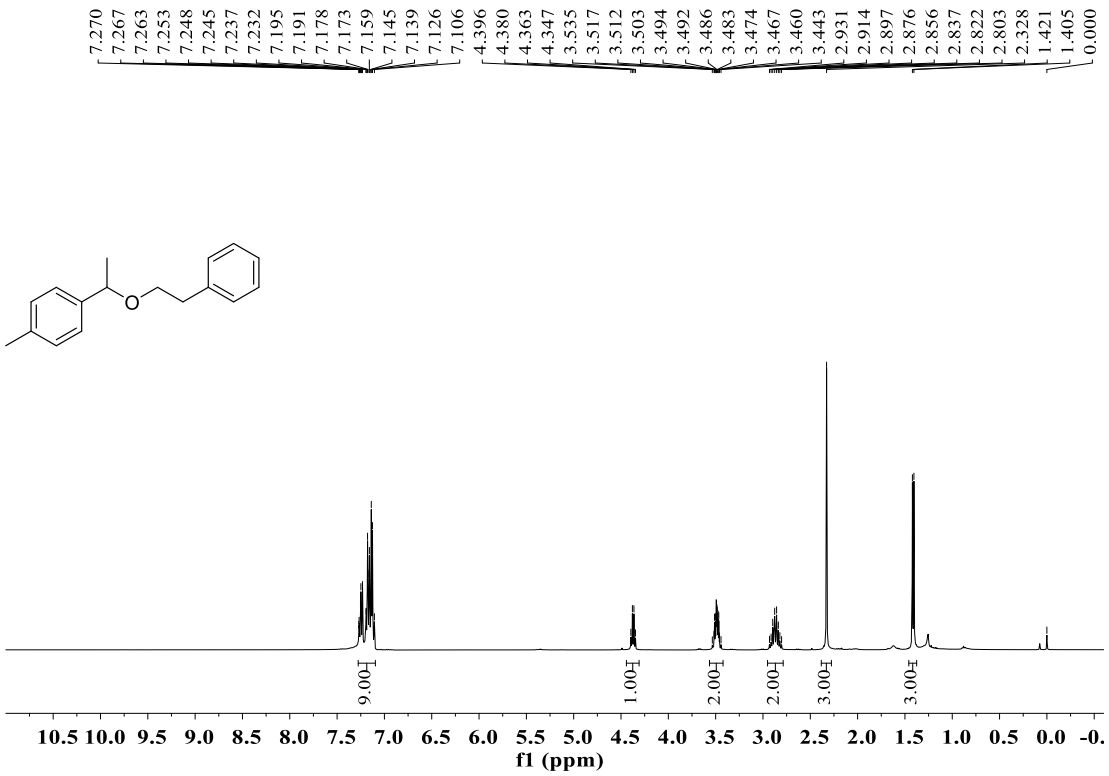
77.478
77.159
76.842
69.597
36.656
28.615
24.241
15.650
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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7.159
7.145
7.139
7.126
7.106
4.396
4.380
4.363
4.347
3.535
3.517
3.512
3.503
3.494
3.492
3.486
3.483
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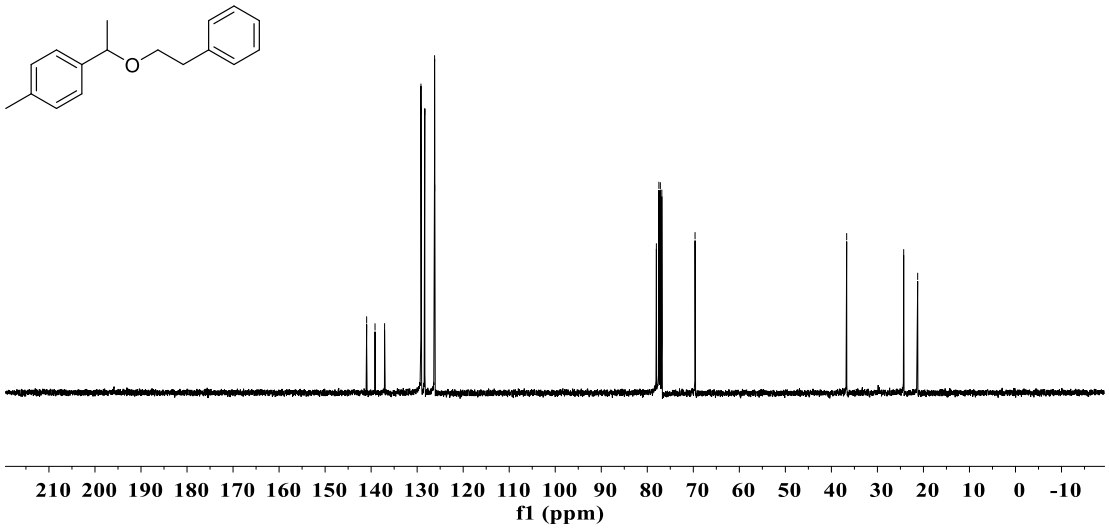
2.837
2.822
2.803
2.328
1.421
1.405
0.000
O
9.00
1.00
2.00
2.00
3.00
3.00
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.
f1 (ppm)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O
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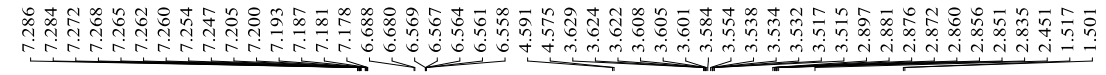
f1 (ppm)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7.181
7.178
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6.564
6.561
6.558
4.591
4.575
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3.622
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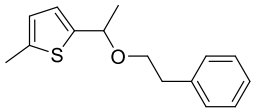
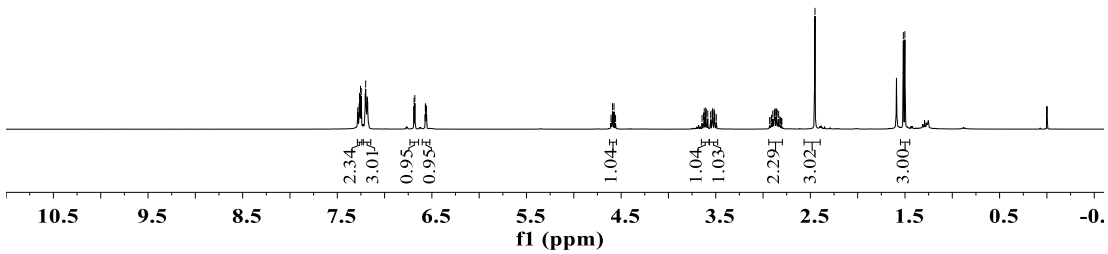
1.501


S
O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1.04
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4.5
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1.5
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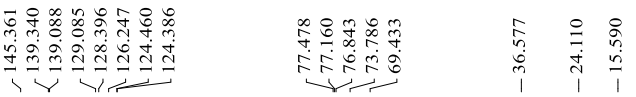
f1 (ppm)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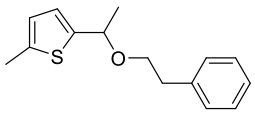
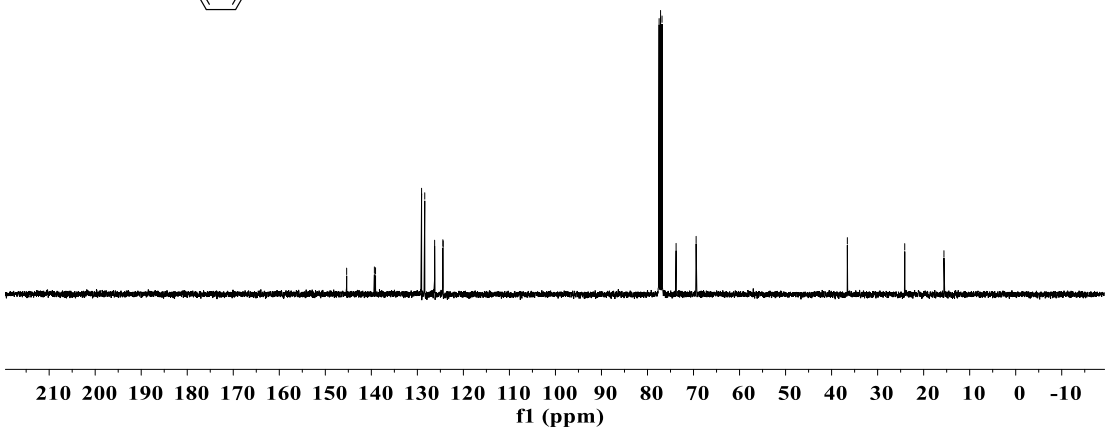
15.590


S
O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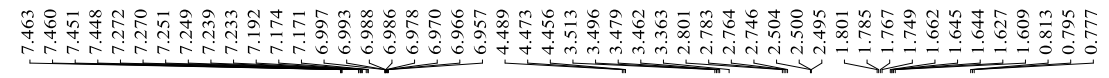
f1 (ppm)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6.988
6.986
6.978
6.970
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3.479
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1.627
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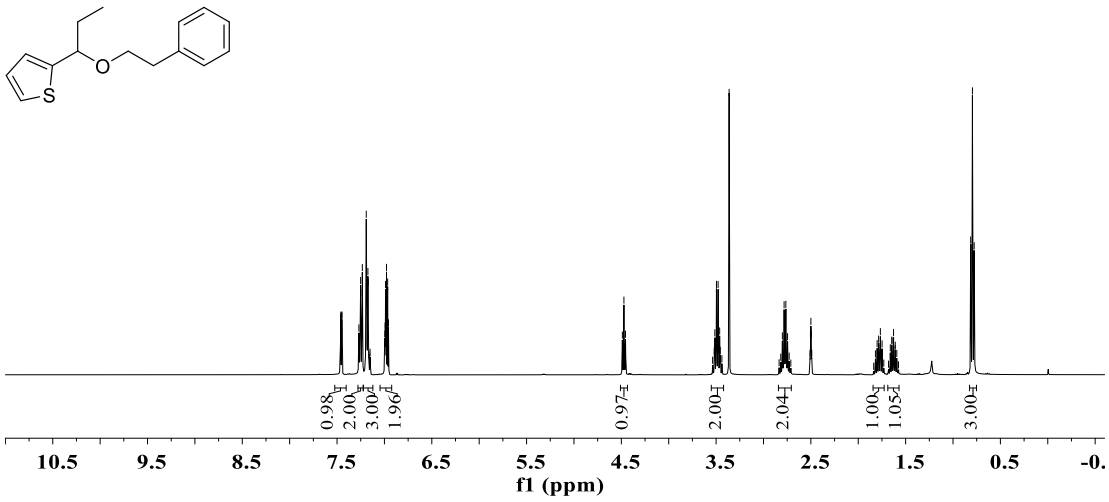
O
S
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1.05
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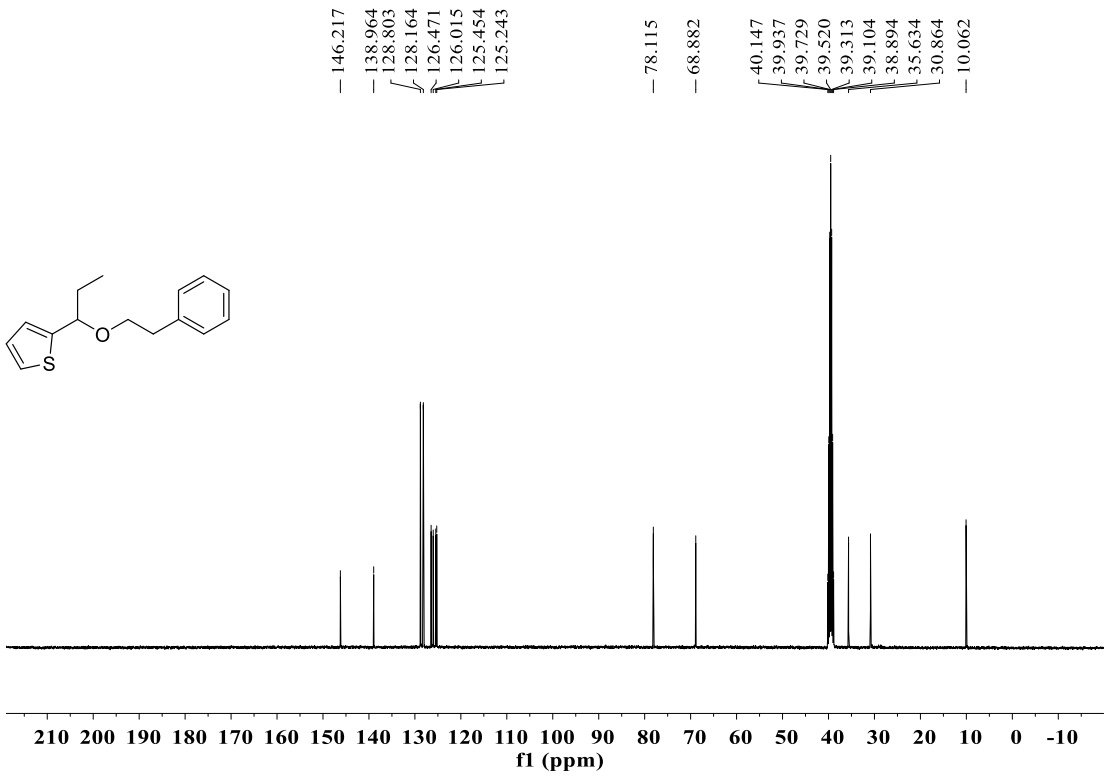
f1 (ppm)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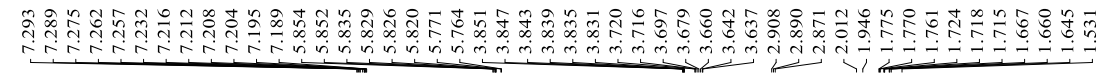
39.520
39.313
39.104
38.894
35.634
30.864
10.062
O
S
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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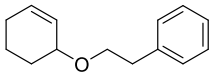
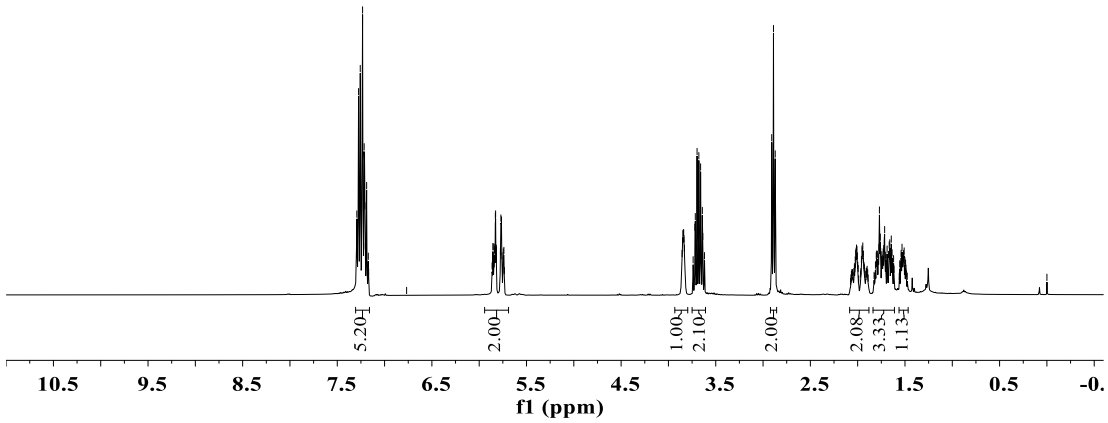
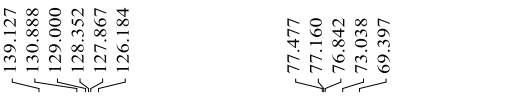
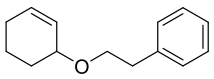
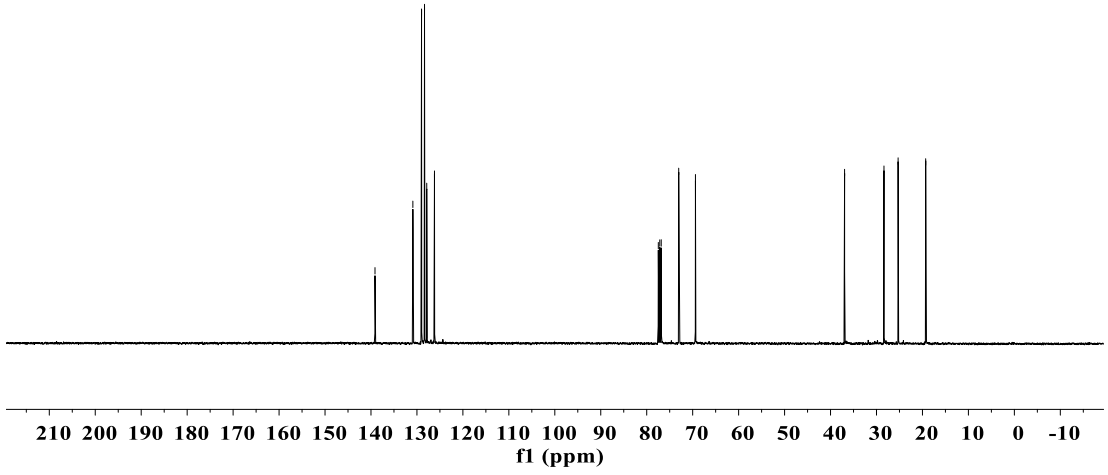
7.289
7.275
7.262
7.257
7.232
7.216
7.212
7.208
7.204
7.195
7.189
5.854
5.852
5.835
5.829
5.826
5.820
5.771
5.764
3.851
3.847
3.843
3.839
3.835
3.831
3.720
3.716
3.697
3.679
3.660
3.642
3.637
2.908
2.890
2.871
2.012
1.946
1.775
1.770
1.761
1.724
1.718
1.715
1.667
1.660
1.645
1.531

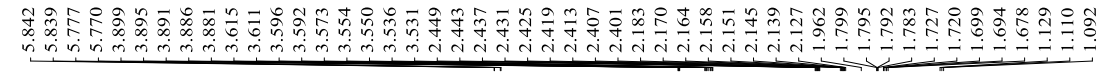


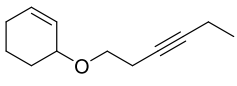

5.20
2.00
1.00
2.10
2.00
2.08
3.33
1.13
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.
f1 (ppm)

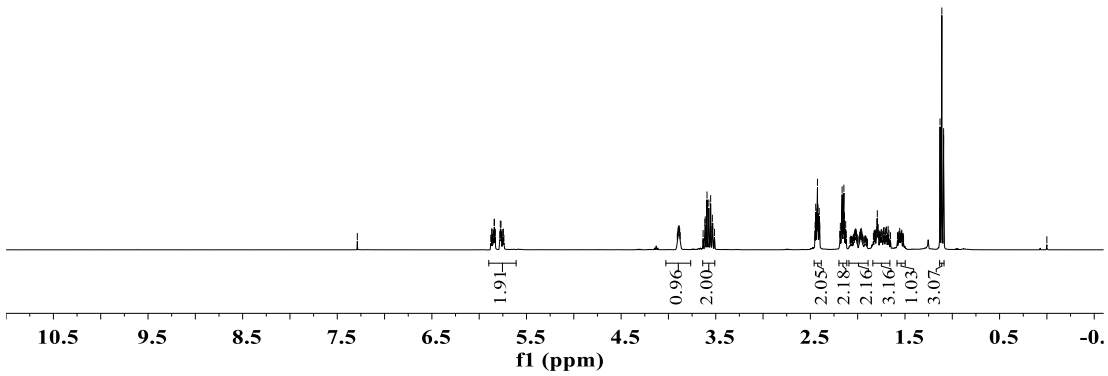

139.127
130.888
129.000
128.352
127.867
126.184
77.477
77.160
76.842
73.038
69.397
36.944
28.372
25.295
19.296

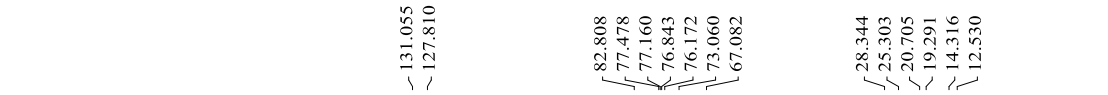


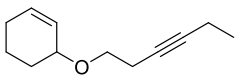

210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

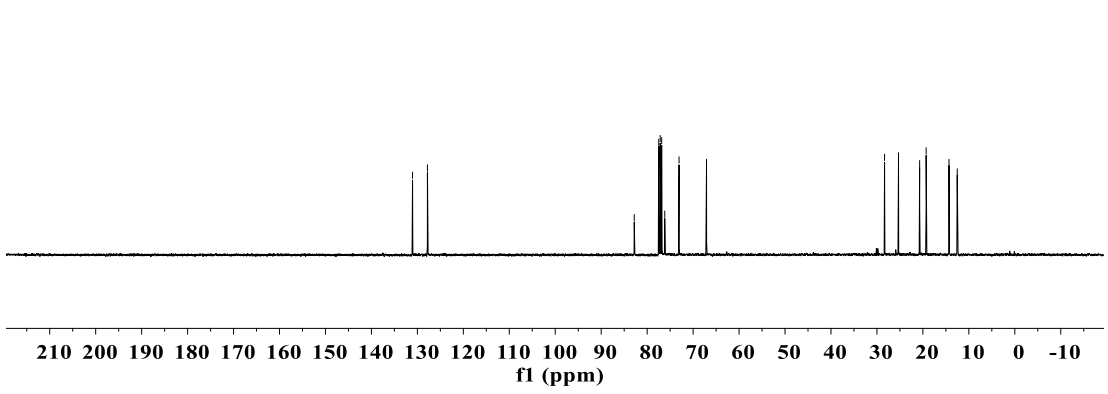

5.842
5.839
5.777
5.770
3.899
3.895
3.891
3.886
3.881
3.615
3.611
3.596
3.592
3.573
3.554
3.550
3.536
3.531
2.449
2.443
2.437
2.431
2.425
2.419
2.413
2.407
2.401
2.183
2.170
2.164
2.158
2.151
2.145
2.139
2.127
1.962
1.799
1.795
1.792
1.783
1.727
1.720
1.699
1.694
1.678
1.129
1.110
1.092

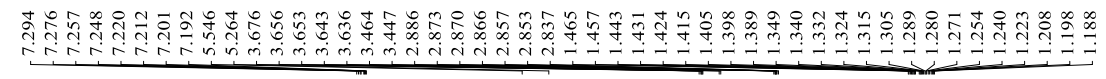


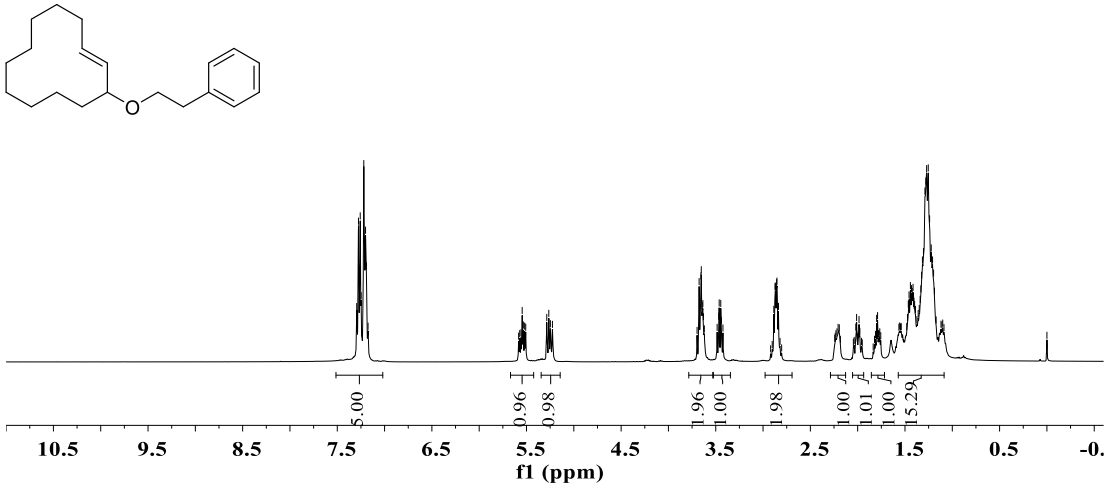

1.91
0.96
2.00
2.05
2.18
2.16
3.16
1.03
3.07
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.
f1 (ppm)

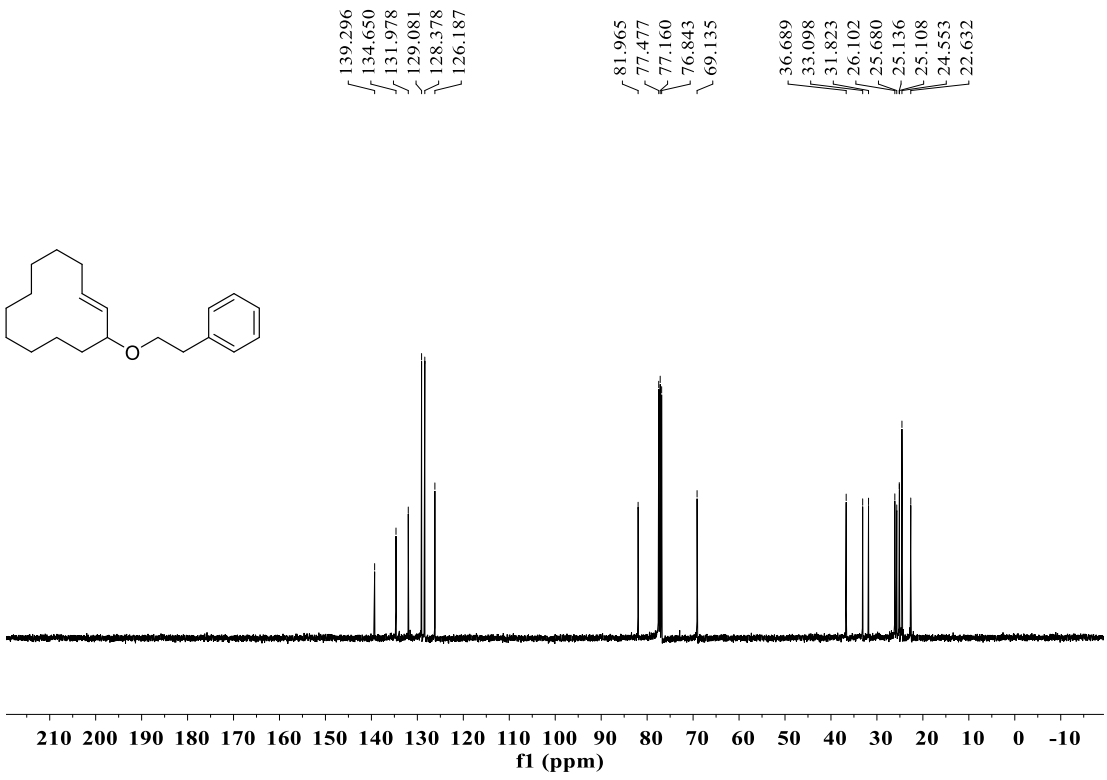

131.055
127.810
82.808
77.478
77.160
76.843
76.172
73.060
67.082
28.344
25.303
20.705
19.291
14.316
12.530

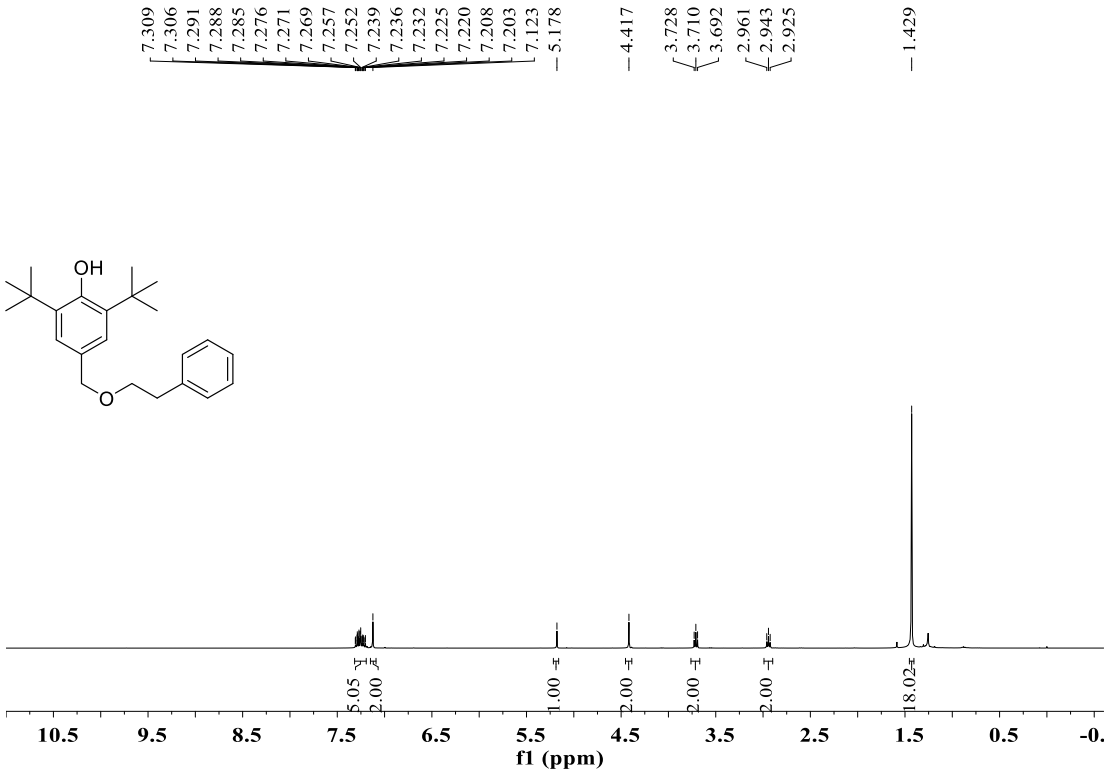


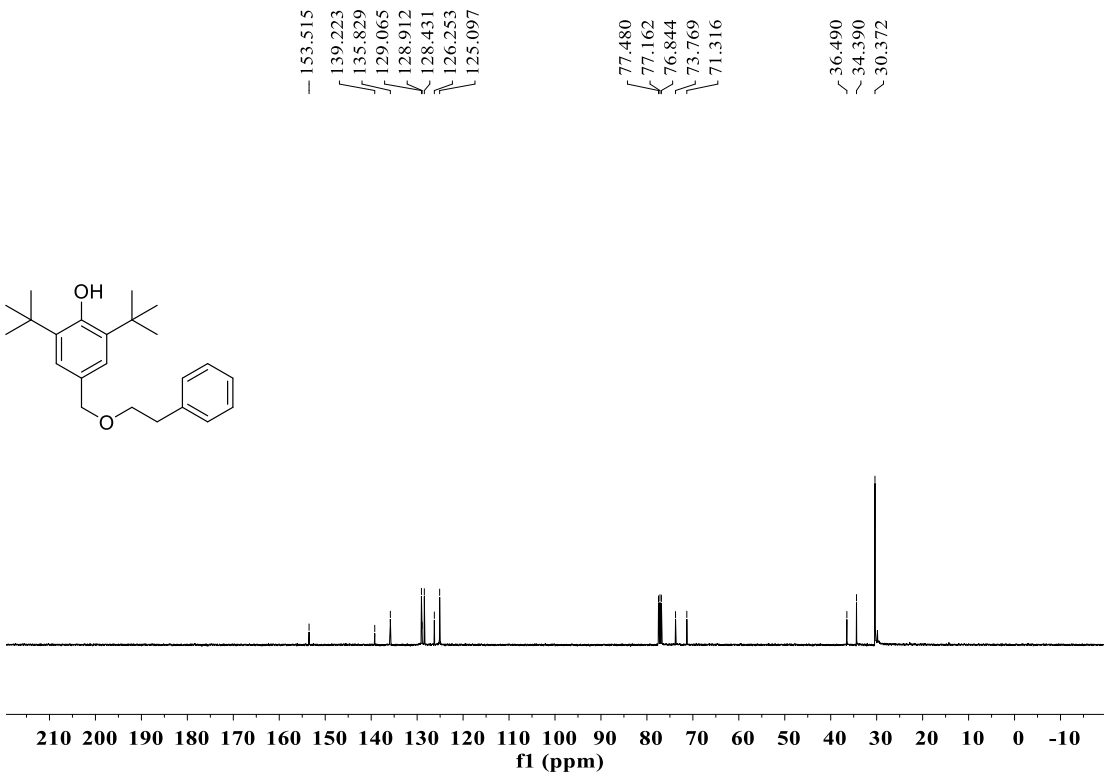

210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

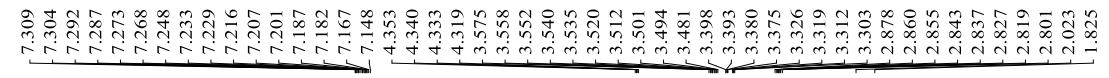

7.294
7.276
7.257
7.248
7.220
7.212
7.201
7.192
5.546
5.264
3.676
3.656
3.653
3.643
3.636
3.464
3.447
2.886
2.873
2.870
2.866
2.857
2.853
2.837
1.465
1.457
1.443
1.431
1.424
1.415
1.405
1.398
1.389
1.349
1.340
1.332
1.324
1.315
1.305
1.289
1.280
1.271
1.254
1.240
1.223
1.208
1.198
1.188

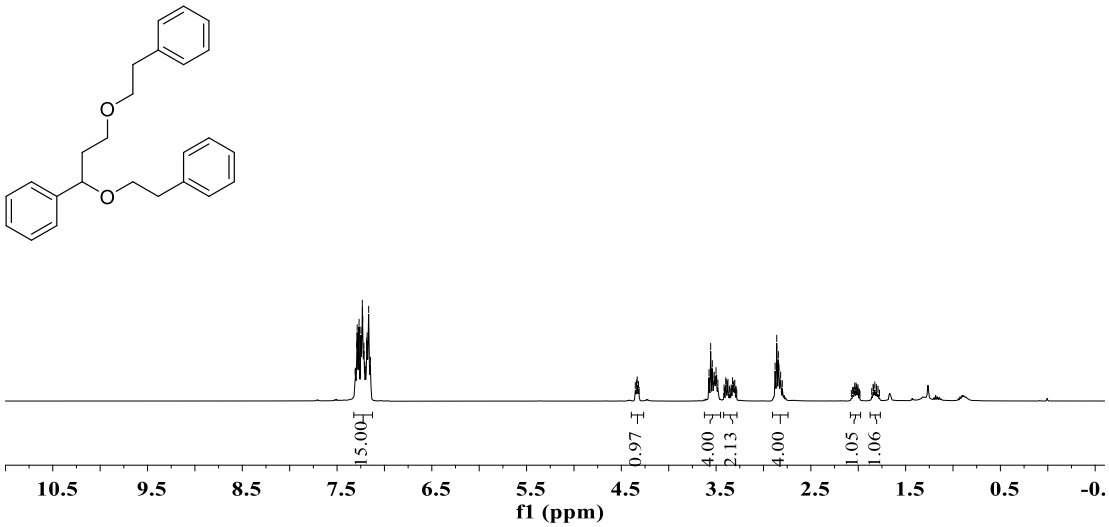

O
5.00
0.96
0.98
1.96
1.00
1.98
1.00
1.01
1.00
15.29
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.
f1 (ppm)


139.296
134.650
131.978
129.081
128.378
126.187
81.965
77.477
77.160
76.843
69.135
36.689
33.098
31.823
26.102
25.680
25.136
25.108
24.553
22.632
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

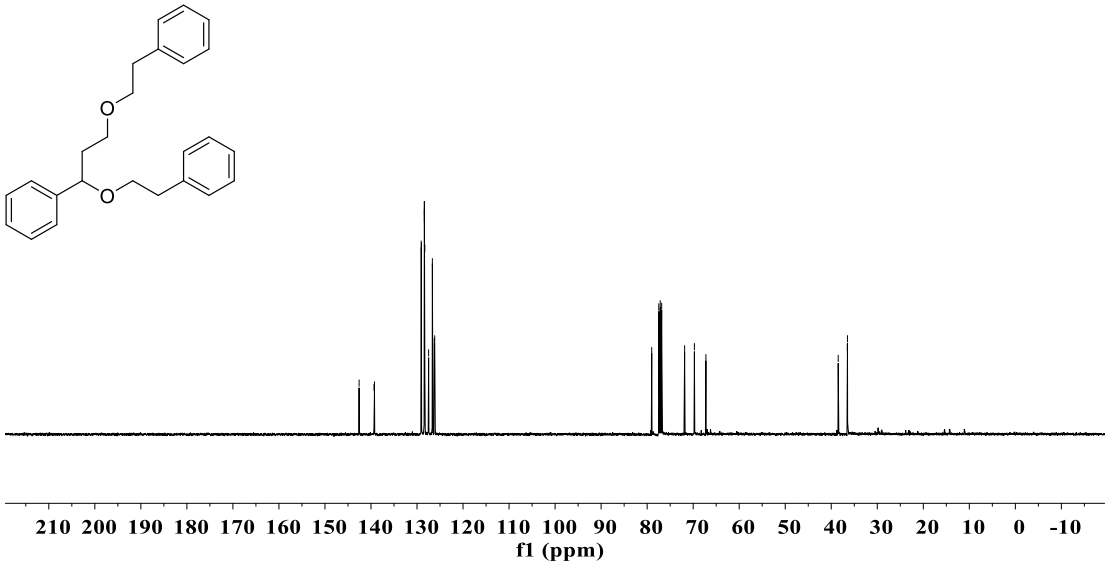

7.309
7.306
7.291
7.288
7.285
7.276
7.271
7.269
7.257
7.252
7.239
7.236
7.232
7.225
7.220
7.208
7.203
7.123
5.178
4.417
3.728
3.710
3.692
2.961
2.943
2.925
1.429
OH
O
5.05
2.00
1.00
2.00
2.00
2.00
18.02
10.5 9.5 8.5 7.5 6.5 5.5 4.5 3.5 2.5 1.5 0.5 -0.
f1 (ppm)


153.515
139.223
135.829
129.065
128.912
128.431
126.253
125.097
77.480
77.162
76.844
73.769
71.316
36.490
34.390
30.372
OH
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


7.309
7.304
7.292
7.287
7.273
7.268
7.248
7.233
7.229
7.216
7.207
7.201
7.187
7.182
7.167
7.148
4.353
4.340
4.333
4.319
3.575
3.558
3.552
3.540
3.535
3.520
3.512
3.501
3.494
3.481
3.398
3.393
3.380
3.375
3.326
3.319
3.312
3.303
2.878
2.860
2.855
2.843
2.837
2.827
2.819
2.801
2.023
1.825


O
O
15.00
0.97
4.00
2.13
4.00
1.05
1.06
10.5
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.
f1 (ppm)


142.583
139.340
139.243
129.085
129.052
128.415
128.401
128.301
127.480
126.666
126.260
126.155
79.004
77.477
77.160
76.842
71.860
69.733
67.232
38.486
36.509
36.476


O
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)