Supporting Information for

Silver(I)-Promoted Insertion into X-H (X = Si, Sn, and Ge) Bonds with *N*-Nosylhydrazones

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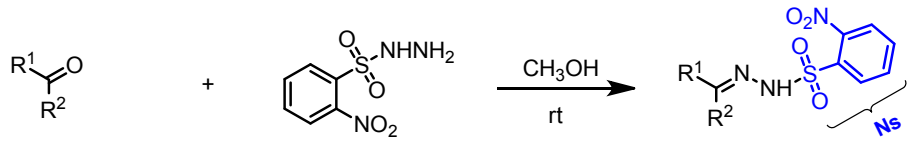
1. General Information

All reagents were purchased from commercial sources and used without purification unless otherwise mentioned. The products were purified by column chromatography over silica gel (200-400 size). ^{1}H and ^{13}C Nuclear Magnetic Resonance (NMR) spectra were recorded at 25 ^{o}C on a Varian 500 MHz and 125 MHz or on a Bruker 400 MHz and 100 MHz, and TMS was used as internal standard. Mass spectra were recorded on BRUKER AutoflexIII Smartbeam MS-spectrometer. High resolution mass spectra (HRMS) were recorded on Bruck microTof by using ESI method.

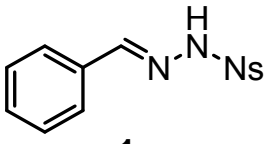
2. Synthesis and Analytical Data of *N*-Nosylhydrazones



NBSH **1a-1s**

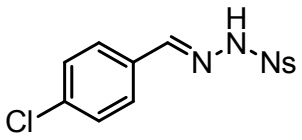
N-nitrobenzenesulfonylhydrazide (NBSH) was prepared according to literature procedure.[1]

General procedure for converting carbonyl compounds to *N*-nosylhydrazones: To a stirred solution of NBSH (2.0 mmol, 1 equiv) in methanol (2 mL) were added carbonyl compounds (2.2 mmol, 1.1 equiv) and the mixture was stirred for 1-2 h at room temperature. The mixture was filtered and the resulting solid was washed with ice cold diethyl ether and dried under reduced pressure to give pure *N*-nosylhydrazones. The yields were around 80% in general.



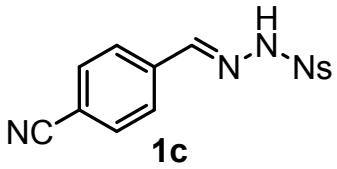
1a

(1a) White solid, m.p. 149-150 ^{o}C; **^{1}H-NMR** (500 MHz, DMSO-d_6) δ 12.17 (s, 1H), 8.09-8.06 (m, 2H), 8.02-8.00 (m, 1H), 7.89-7.87 (m, 2H), 7.58-7.57 (m, 2H), 7.39-7.38 (m, 3H); **^{13}C-NMR** (125 MHz, DMSO-d_6) δ 148.4, 148.3, 135.3, 133.9, 133.1, 131.4, 131.0, 130.9, 129.3, 127.5, 125.1; **HRMS** (ESI) m/z calcd. for $C_{13}H_{11}N_3O_4SNa$ $[M+Na]^+$ 328.0362, found 328.0368.



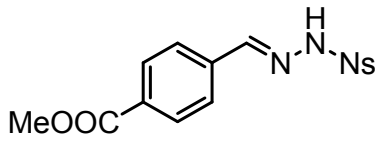
1b

(1b) White solid, m.p. 152-153 °C; **^{1}H-NMR** (400 MHz, DMSO-d_6) δ 12.28 (s, 1H), 8.08-8.02 (m, 3H), 7.92-7.90 (m, 2H), 7.61 (d, *J* = 8.4 Hz, 2H), 7.47 (d, *J* = 8.4 Hz, 2H); **^{13}C-NMR** (125 MHz, DMSO-d_6) δ 148.4, 144.4, 143.0, 131.4, 129.2, 128.8, 127.4, 127.0, 125.5, 125.1, 121.1; **HRMS** (ESI) m/z calcd. for $C_{13}H_{10}ClN_3O_4SNa$ $[M+Na]^+$ 361.9973, found 361.9968.



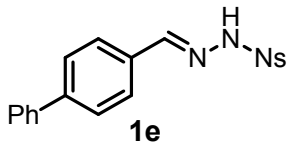
1c

(1c) White solid, m.p. 178-179 °C; **^{1}H-NMR** (500 MHz, DMSO-d_6) δ 12.54 (s, 1H), 8.12 (s, 1H), 8.09-8.08 (m, 1H), 8.02-8.01 (m, 1H), 7.90-7.89 (m, 2H), 7.85 (d, *J* = 7.5 Hz, 2H), 7.76 (d, *J* = 7.5 Hz, 2H); **^{13}C-NMR** (125 MHz, DMSO-d_6) δ 148.3, 146.1, 138.3, 135.5, 133.2, 131.2, 131.1, 130.4, 128.0, 125.1, 119.0, 112.7; **HRMS** (ESI) m/z calcd. for $C_{14}H_{10}N_4O_4SNa$ $[M+Na]^+$ 353.0314, found 353.0321.



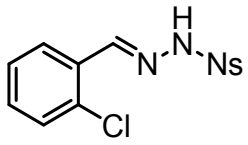
1d

(1d) White solid, m.p. 107-108 °C; **^{1}H-NMR** (600 MHz, DMSO-d_6) δ 12.39 (s, 1H), 8.14 (s, 1H), 8.10-8.07 (m, 1H), 8.03-8.00 (m, 1H), 7.96 (d, *J* = 8.4 Hz, 2H), 7.91-7.88 (m, 2H), 7.72 (d, *J* = 8.4 Hz, 2H), 3.84 (s, 3H); **^{13}C-NMR** (151 MHz, DMSO-d_6) δ 166.2, 148.3, 146.8, 138.2, 135.3, 133.1, 131.4, 131.2, 130.9, 130.0, 127.5, 125.1, 52.7; **HRMS** (ESI) m/z calcd. for $C_{15}H_{13}N_3O_6SNa$ $[M+Na]^+$ 386.0419, found 386.0438.



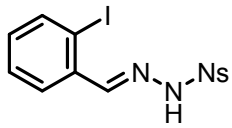
1e

(1e) Yellow solid, m.p. 154-155 °C; **^{1}H-NMR** (600 MHz, DMSO-d_6) δ 12.15 (s, 1H), 8.12 (s, 1H), 8.10-8.18 (m, 1H), 8.02-8.00 (m, 1H), 7.90-7.88 (m, 2H), 7.7-7.66 (m, 6H), 7.47 (t, *J* = 7.8 Hz, 2H), 7.38 (t, *J* = 7.8 Hz, 1H); **^{13}C-NMR** (151 MHz, DMSO-d_6) δ 148.3, 147.8, 142.3, 139.7, 135.2, 133.0, 132.9, 131.4, 131.0, 129.4, 128.4, 128.0, 127.5, 127.1, 125.0; **HRMS** (ESI) m/z calcd. for $C_{19}H_{15}N_3O_4SNa$ $[M+Na]^+$ 404.0677, found 404.0657.



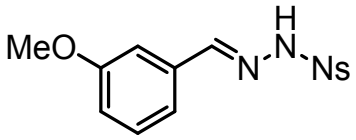
1f

(1f) White solid, m.p. 166-167 °C; **^{1}H-NMR** (500 MHz, DMSO-d_6) δ 12.41 (s, 1H), 8.44 (s, 1H), 8.10-8.08 (m, 1H), 8.03-8.01 (m, 1H), 7.91-7.89 (m, 2H), 7.74 (d, *J* = 7.2 Hz, 1H), 7.47 (d, *J* = 7.2 Hz, 1H), 7.41 (t, *J* = 7.2 Hz, 1H), 7.35 (t, *J* = 7.2 Hz, 1H); **^{13}C-NMR** (125 MHz, DMSO-d_6) δ 148.3, 144.1, 135.5, 133.6, 133.3, 132.4, 131.3, 131.2, 131.1, 130.5, 128.2, 127.1, 125.2; **HRMS** (ESI) m/z calcd. for $C_{13}H_{10}ClN_3O_4SNa$ $[M+Na]^+$ 361.9972, found 361.9976.



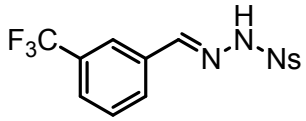
1g

(1g) White solid, m.p. 172-173 °C; **^{1}H-NMR** (600 MHz, DMSO-d_6) δ 12.39 (s, 1H), 8.31 (s, 1H), 8.10-8.18 (m, 1H), 8.06-7.99 (m, 1H), 7.94-7.85 (m, 3H), 7.65 (dd, *J* = 7.9, 1.4 Hz, 1H), 7.39 (t, *J* = 7.5 Hz, 1H), 7.14 (td, *J* = 7.7, 1.5 Hz, 1H); **^{13}C-NMR** (151 MHz, DMSO-d_6) δ 150.9, 148.2, 140.1, 135.4, 135.3, 133.1, 132.4, 131.3, 131.1, 129.0, 127.2, 125.1, 100.2; **HRMS** (ESI) m/z calcd. for $C_{13}H_{10}IN_3O_4SNa$ $[M+Na]^+$ 453.9330, found 453.9360.



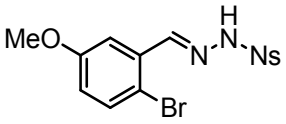
1h

(1h) White solid, m.p. 152-153 °C; **^{1}H-NMR** (400 MHz, DMSO-d_6) δ 12.15 (s, 1H), 8.08-8.00 (m, 3H), 7.90-7.88 (m, 2H), 7.30 (t, *J* = 8.0 Hz, 1H), 7.15-7.13 (m, 2H), 6.97 (d, *J* = 8.0 Hz, 1H), 3.75 (s, 3H; **^{13}C-NMR** (125 MHz, DMSO-d_6) δ 160.0, 148.4, 148.1, 135.4, 135.3, 133.1, 131.3, 131.1, 130.5, 125.0, 120.1, 116.8, 112.0, 55.7; **HRMS** (ESI) m/z calcd. for $C_{14}H_{13}N_3O_5SNa$ $[M+Na]^+$ 358.0468, found 358.0476.



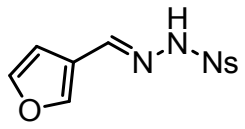
1i

(1i) White solid, m.p. 147-148 °C; **^{1}H-NMR** (600 MHz, DMSO-d_6) δ 12.39 (s, 1H), 8.17 (s, 1H), 8.10-8.08 (m, 1H), 8.02-7.99 (m, 1H), 7.92 (s, 1H), 7.91-7.86 (m, 3H), 7.73 (d, *J* = 7.8 Hz, 1H), 7.62 (t, *J* = 7.8 Hz, 1H); **^{13}C-NMR** (151 MHz, DMSO-d_6) δ 148.4, 146.5, 135.3, 135.0, 133.0, 131.3, 131.0 ,130.9, 130.4, 130.1 (q, *J* = 32.0 Hz), 127.0 (q, *J* = 3.0 Hz), 125.0, 124.3 (q, *J* = 272.0 Hz), 123.7 (q, *J* = 3.6 Hz).



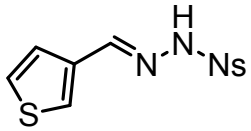
1j

(1j) White solid, m.p. 163-164 °C; **^{1}H-NMR** (400 MHz, DMSO-d_6) δ 12.39 (s, 1H), 8.32 (s, 1H), 8.11-8.09 (m, 1H), 8.02-8.00 (m, 1H), 7.91-7.89 (m, 2H), 7.52 (d, *J* = 8.8 Hz, 1H), 7.22 (d, *J* = 2.8 Hz, 1H), 6.96-6.93 (m, 1H), 3.74 (s, 3H); **^{13}C-NMR** (125 MHz, DMSO-d_6) δ 159.1, 148.4, 146.2, 135.6, 134.5, 133.3, 133.2, 131.3, 131.0, 125.0, 119.1, 114.5, 111.6, 56.0; **HRMS** (ESI) m/z calcd. for $C_{14}H_{12}BrN_3O_5SNa$ $[M+Na]^+$ 435.9573, found 435.9560.



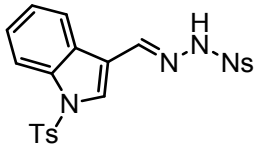
1k

(1k) Brown solid, m.p. 148-149 °C; **^{1}H-NMR** (500 MHz, DMSO-d_6) δ 11.96 (s, 1H), 8.08 (s, 1H), 8.05-8.02 (m, 2H), 8.01-7.99 (m, 1H), 7.89-7.87 (m, 2H), 7.68 (s, 1H), 6.62 (s, 1H); **^{13}C-NMR** (125 MHz, DMSO-d_6) δ 148.4, 146.2, 145.4, 141.4, 135.2, 133.1, 131.4, 131.0, 125.0, 122.3, 107.4; **HRMS** (ESI) m/z calcd. for $C_{11}H_9N_3O_5SNa$ $[M+Na]^+$ 318.0155, found 318.0150.



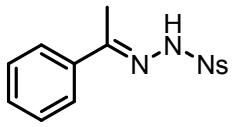
1l

(1l) Brown solid, m.p. 152-153 °C; **^{1}H-NMR** (400 MHz, DMSO-d_6) δ 11.99 (s, 1H), 8.10 (s, 1H), 8.07-8.04 (m, 1H), 8.01-7.99 (m, 1H), 7.89-7.87 (m, 3H), 7.56-7.55 (m, 1H), 7.29 (d, *J* = 4.8 Hz, 1H); **^{13}C-NMR** (125 MHz, DMSO-d_6) δ 148.4, 144.0, 137.0, 135.2, 133.1, 131.4, 131.1, 129.3, 128.3, 125.0, 124.8; **HRMS** (ESI) m/z calcd. for $C_{11}H_9N_3O_4S_2Na$ $[M+Na]^+$ 333.9926, found 333.9935.



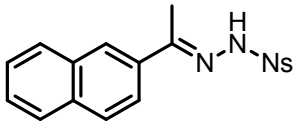
1m

(1m) Yellow solid, m.p. 184-185 °C; **^{1}H-NMR** (500 MHz, DMSO-d_6) δ 12.15 (s, 1H), 8.32 (s, 1H), 8.24 (s, 1H), 8.13-8.11 (m, 1H), 8.00-7.98 (m, 1H), 7.94 (d, *J* = 8.0 Hz, 1H), 7.90 (d, *J* = 8.0 Hz, 1H), 7.88-7.85 (m, 4H), 7.39-7.37 (m, 3H), 7.30 (t, *J* = 7.5 Hz, 1H), 2.29 (s, 3H); **^{13}C-NMR** (125 MHz, DMSO-d_6) δ 148.4, 146.5, 143.0, 135.4, 135.1, 134.1, 133.0, 131.3, 131.2, 131.1, 130.9, 127.4, 126.9, 126.3, 125.0, 124.8, 123.2, 117.6, 113.6, 21.6; **HRMS** (ESI) m/z calcd. for $C_{22}H_{18}N_4O_6S_2Na$ $[M+Na]^+$ 521.0559, found 521.0567.



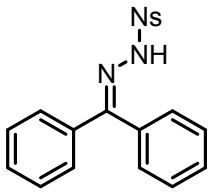
1n

(1n) White solid, m.p. 150-151 °C; **^{1}H-NMR** (600 MHz, DMSO-d_6) δ 11.20 (s, 1H), 8.07-8.05 (m, 1H), 8.00-7.98 (m, 1H), 7.89-7.86 (m, 2H), 7.63-7.61 (m, 2H), 7.37-7.34 (m, 3H), 2.28 (s, 3H); **^{13}C-NMR** (151 MHz, DMSO-d_6) δ 154.8, 148.7, 137.6, 135.0, 132.8, 131.6, 130.7, 130.1, 128.8, 126.6, 124.8, 15.1; **HRMS** (ESI) m/z calcd. for $C_{14}H_{13}N_3O_4SNa$ $[M+Na]^+$ 342.0520, found 342.0521.



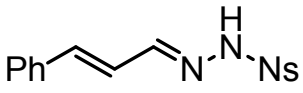
1p

(1p) Yellow solid, m.p. 128-129 °C; **^{1}H-NMR** (600 MHz, DMSO-d_6) δ 11.29 (s, 1H), 8.18 (s, 1H), 8.13-8.10 (m, 1H), 8.02-7.99 (m, 1H), 7.95 (dd, *J* = 6.1, 3.4 Hz, 1H), 7.90-7.87 (m, 3H), 7.85-7.85 (m, 2H), 7.55-7.52 (m, 2H), 2.40 (s, 3H); **^{13}C-NMR** (151 MHz, DMSO-d_6) δ 154.5, 148.7, 135.1, 134.9, 133.8, 133.0, 132.8, 131.5, 130.8, 129.0, 128.2, 127.9, 127.5, 127.0, 126.9, 124.8, 123.6, 14.8; **HRMS** (ESI) m/z calcd. for $C_{18}H_{15}N_3O4_SNa$ $[M+Na]^+$ 392.0681, found 392.0676.



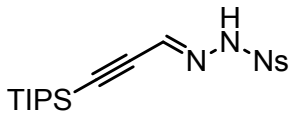
1q

(1q) White solid, m.p. 158-159 °C; **^{1}H-NMR** (600 MHz, DMSO-d_6) 10.70 (s, 1H), 8.13-8.08 (m, 1H), 8.03 (dt, *J* = 7.5, 3.7 Hz, 1H), 7.94-7.89 (m, 2H), 7.60-7.55 (m, 3H), 7.39 (t, *J* = 7.2 Hz, 1H), 7.33 (t, *J* = 7.6 Hz, 2H), 7.29 (dd, *J* = 6.1, 3.1 Hz, 4H); **^{13}C-NMR** (151 MHz, DMSO-d_6) δ 156.3, 148.8, 137.1, 135.2, 133.0, 132.6, 131.4, 130.8, 130.5, 130.2, 129.5, 129.1, 128.8, 127.8, 124.9; **HRMS** (ESI) m/z calcd. for $C_{19}H_{15}N_3O_4SNa$ $[M+Na]^+$404.41.0685, found 404.0671.



1r

(1r) Yellow solid, m.p. 148-149 °C; **^{1}H-NMR** (400 MHz, DMSO-d_6) δ 12.10 (s, 1H), 8.03-7.98 (m, 2H), 7.90-7.88 (m, 3H), 7.56 (d, *J* = 7.2 Hz, 2H), 7.37-7.28 (m, 3H), 7.02 (d, *J* = 16.0 Hz, 1H), 6.89-6.83 (m, 1H); **^{13}C-NMR** (125 MHz, DMSO-d_6) δ 150.6, 148.4, 140.5, 136.1, 135.2, 133.2, 131.8, 130.8, 129.5, 129.3, 127.7, 125.2, 125.0; **HRMS** (ESI) m/z calcd. for $C_{15}H_{13}N_3O_4SNa$ $[M+Na]^+$ 354.0519, found 354.0525.



1s

(1s) Yellow solid, m.p. 104-105 °C; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 9.29 (s, 1H), 8.24-8.22 (m, 1H), 7.85-7.83 (m, 1H), 7.77-7.73 (m, 2H), 6.70 (s, 1H), 1.09-1.08 (m, 18H), 1.02-1.01 (m, 3H),; **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 148.1, 134.5, 132.8, 132.6, 131.6, 127.6, 125.3, 110.2, 93.5, 18.4, 10.9; **HRMS** (ESI) m/z calcd. for $C_{18}H_{27}N_3O_4SSiNa$ $[M+Na]^+$ 432.1384, found 432.1387.

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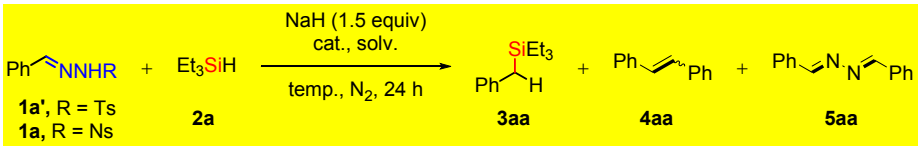
3. Optimization of the Reaction Conditions

STable 1 Optimization of the Reaction Conditions[a]



Entry	R	Cat. (30 mol %)	Solvent	Temp. (°C)	Yield (%)[b] 3aa	1a/1a'	4aa	5aa
1	Ts	AgOTf	CH_2Cl_2	40	15	68	6	4
2	Ns	AgOTf	CH_2Cl_2	40	57	22	10	2
3	Ns	AgOTf	CH_2Cl_2	80	84 (81)[d]	0	8	2

4	Ns	AgOAc	CH_2Cl_2	80	55	0	22	14
5	Ns	AgOTAF	CH_2Cl_2	80	60	0	16	4
6	Ns	AgF	CH_2Cl_2	80	28	0	60	2
7	Ns	Ag_2CO_3	CH_2Cl_2	80	34	0	48	6
8	Ns	AgOTf	1,4-dioxane	80	20	0	26	18
9	Ns	AgOTf	PhCl	80	6	32	10	16
10	Ns	AgOTf	MeCN	80	<5	20	6	40
11	Ns	AgOTf	$ClCH_2CH_2Cl$	80	32	0	42	18
12	Ns	$Cu(OTf)_2$	CH_2Cl_2	80	7	0	26	44
13	Ns	$Cu(MeCN)_4PF_6$	CH_2Cl_2	80	10	0	26	20
14[c]	Ns	$Rh_2(OAc)_4$	CH_2Cl_2	80	25	0	60	2

[a] Reaction conditions: **1a** (0.3 mmol), **2a** (1.5 mmol), NaH (0.45 mmol), and the catalyst (30 mol %) in solvent (6.0 mL) for 24 h under N_2-atmosphere. [b] Yield calculated from ^{1}H-NMR spectroscopy with CH_2Br_2 as the internal standard. [c] $Rh_2(OAc)_4$ (5 mol %) was used. [d] Isolated yield.

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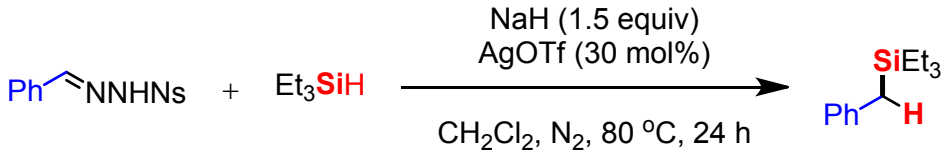
4. Synthesis and Analytical Data of compounds 3aa to 3sa, and 3bb-3bs

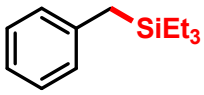
The synthesis of compounds **3aa-3sa** and **3bb-3bs** is performed according to the below given procedure for the synthesis of compound **3aa**.



1a **2a** **3aa**

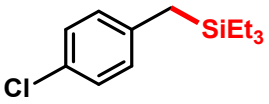
General procedure (with **3aa** as an example): To a flame-dried sealed tube were added *N*-nosylhydrazone **1a** (91.5 mg, 0.3 mmol, 1.0 equiv), NaH (18 mg, 60 wt%, 0.45 mmol, 1.5 equiv) and dry CH_2Cl_2 (6.0 mL, 0.05 M) inside a glove box. The resulting mixture was stirred at room temperature for 1 h. Then, triethylsilane **2a** (240 µl, 1.5 mmol, 5.0 equiv) and AgOTf (23.1 mg, 0.09 mmol, 30 mol %) were added and the tube was sealed and heated at 80 °C for additional 24

h.The reaction was monitored by TLC. When the reaction was completed, the crude reaction mixture was allowed to reach room temperature, and filtered through a short pad of silica gel with EtOAc as an eluent. The filtrate was evaporated under reduced pressure to leave a crude mixture, which was purified by column chromatography on silica gel (eluting with petroleum ether) to afford **3aa** as a colorless oil (50.1 mg, 81% yield).



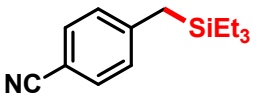
3aa

(3aa) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.19 (t, *J* = 7.5 Hz, 2H), 7.05 (t, *J* = 7.5 Hz, 1H), 7.01 (d, *J* = 7.5 Hz, 2H), 2.09 (s, 2H), 0.91 (t, *J* = 8.0 Hz, 9H), 0.51 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** ($CDCl_3$, 125 MHz) δ 140.6, 128.11, 128.07, 123.7, 21.6, 7.3, 3.0; **HRMS** (ESI) m/z calcd. for $C_{26}H_{45}Si_2$ $[2M+H]^+$: 413.3058, found: 413.3054.



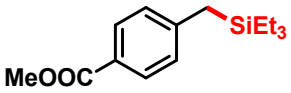
3ba

(3ba) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.18 (d, *J* = 8.5 Hz, 2H), 6.95 (d, *J* = 8.5 Hz, 2H), 2.08 (s, 2H), 0.93 (t, *J* = 8.0 Hz, 9H), 0.52 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 139.2, 129.4, 129.3, 128.2, 21.1, 7.3, 2.9.



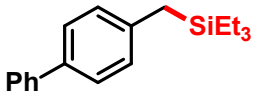
3ca

(3ca) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.48 (d, *J* = 8.0 Hz, 2H), 7.09 (d, *J* = 8.0 Hz, 2H), 2.19 (s, 2H), 0.91 (t, *J* = 8.0 Hz, 9H), 0.51 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 147.4, 132.0, 128.6, 119.4, 107.4, 23.1, 7.2, 2.9; **HRMS** (ESI) m/z calcd. for $C_{14}H_{21}NNaSi$ $[M+Na]^+$: 254.1335, found: 254.1337.



3da

(3da) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.88 (d, *J* = 8.0 Hz, 2H), 7.07 (d, *J* = 8.0 Hz, 2H), 3.88 (s, 3H), 2.18 (s, 2H), 0.91 (t, *J* = 8.0 Hz, 9H), 0.51 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 167.3, 147.1, 129.6, 127.9, 125.8, 51.8, 22.6, 7.2, 2.9; **HRMS** (ESI) m/z calculated for $C_{15}H_{24}NaO_2Si$ $[M+Na]^+$: 287.1438, found: 287.1424.

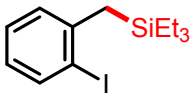


3ea

(3ea) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.58 (d, *J* = 8.5 Hz, 2H), 7.44 (d, *J* = 8.5 Hz, 2H), 7.41 (t, *J* = 8.0 Hz, 2H), 7.29 (t, *J* = 8.0 Hz, 1H), 7.08 (d, *J* = 8.0 Hz, 2H), 2.14 (s, 2H), 0.94 (t, *J* = 8.0 Hz, 9H), 0.54 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 141.2, 139.9, 136.6, 128.6, 128.5, 126.8, 126.74, 126.70, 21.3, 7.3, 3.0; **HRMS** (ESI) m/z calculated for $C_{19}H_{26}NaSi$ [M+Na]+: 282.1877, found: 282.1884.

3fa

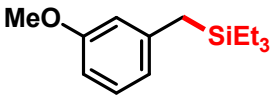
(3fa) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.28 (d, *J* = 8.0 Hz, 1H), 7.15-7.03 (m, 2H), 6.98-7.00 (m, 1H), 2.28 (s, 2H), 0.91 (t, *J* = 8.0 Hz, 9H), 0.56 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 139.1, 132.7, 129.9, 129.3, 126.4, 125.2, 19.4, 7.2, 3.4.



3ga

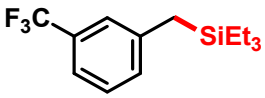
(3ga) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.76 (dd, *J* = 8.0 Hz, *J* = 1.0 Hz, 1H), 7.18 (td, *J* = 7.5, 1.0 Hz, 1H), 7.08-7.06 (m, 1H), 6.75-6.72 (m, 1H), 2.37 (s, 2H), 0.91 (t, *J* = 8.0 Hz, 9H), 0.59 (q,

J = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 144.6, 139.4, 128.4, 127.9, 125.6, 100.4, 27.1, 7.3, 3.6.



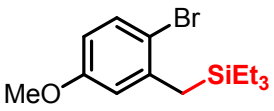
3ha

(3ha) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.11 (t, *J* = 7.5 Hz, 1H), 6.61 (d, *J* = 7.5 Hz, 2H), 6.57 (s, 1H), 3.77 (s, 3H), 2.08 (s, 2H), 0.92 (t, *J* = 8.0 Hz, 9H), 0.51 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 159.5, 142.3, 129.0, 120.8, 113.9, 109.0, 55.0, 21.8, 7.3, 3.0.



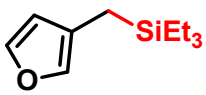
3ia

(3ia) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.32-7.28 (m, 2H), 7.26-7.24 (m, 1H), 7.19-7.17 (m, 1H), 2.16 (s, 2H), 0.91 (t, *J* = 8.0 Hz, 9H), 0.51 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 141.8, 131.3 (d, *J* = 1 Hz), 130.4 (d, *J* = 31.6 Hz), 128.5, 124.5 (q, *J* = 3.8 Hz), 124.0 (q, *J* = 270.0 Hz), 120.6 (q, *J* = 3.8 Hz), 21.9, 7.2, 2.9.



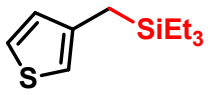
3ja

(3ja) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.28 (d, *J* = 8.5 Hz, 1H), 6.55 (d, *J* = 3.0 Hz, 1H), 6.43 (dd, *J* = 9.0, 3.0 Hz, 1H), 3.68 (s, 3H), 2.21 (s, 2H), 0.84 (t, *J* = 8.0 Hz, 9H), 0.51 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 158.6, 142.0, 133.1, 115.0, 114.4, 111.3, 55.3, 22.4, 7.3, 3.5.



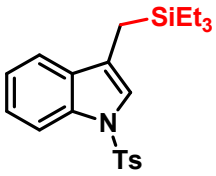
3ka

(3n) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.30-7.29 (m, 1H), 7.09 (s, 1H), 6.15-6.14 (m, 1H), 1.79 (s, 2H), 0.93 (t, *J* = 8.0 Hz, 9H), 0.52 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 142.3, 137.8, 121.6, 112.2, 8.5, 7.3, 3.1.



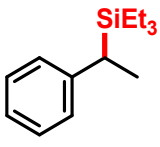
3la

(3o) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.19-7.17 (m, 1H), 6.79-6.78 (m, 1H), 6.69-6.68 (m, 1H), 2.11 (s, 2H), 0.92 (t, *J* = 8.0 Hz, 9H), 0.52 (q, *J* = 7.5 Hz, 6H); **^{13}CNMR** (125 MHz, $CDCl_3$) δ 139.6, 129.0, 124.7, 117.6, 15.5, 7.3, 3.1.



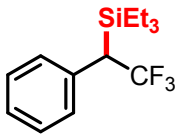
3ma

(3ma) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 8.00 (d, *J* = 8.0 Hz, 1H), 7.68 (d, *J* = 8.0 Hz, 2H), 7.39 (d, *J* = 7.5 Hz, 1H), 7.28 (t, *J* = 7.5 Hz, 1H), 7.21 (t, *J* = 7.5 Hz, 1H), 7.15-7.13 (m, 3H), 2.28 (s, 3H), 2.02 (s, 2H), 0.85 (t, *J* = 8.0 Hz, 9H), 0.45 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 144.4, 135.3, 135.1, 132.0, 129.5, 126.6, 124.4, 122.9, 121.4, 121.2, 119.5, 113.9, 21.4, 8.6, 7.2, 3.2; **HRMS** (ESI) m/z calculated for $C_{22}H_{29}NNaO_2SSi$ $[M+Na]^+$: 422.1578, found: 422.1582.



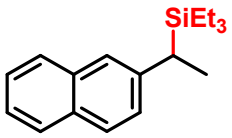
3na

(3na) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.24-7.21 (m, 2H), 7.08-7.06 (m, 3H), 2.30 (q, *J* = 7.5 Hz, 1H), 1.37 (d, *J* = 7.5 Hz, 3H), 0.89 (t, *J* = 8.0 Hz, 9H), 0.51 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** ($CDCl_3$, 125 MHz) δ 146.3, 128.0, 127.1, 124.2, 26.8, 15.4, 7.5, 2.0.



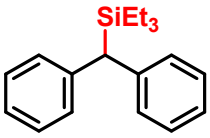
4oa

(3oa) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.32 (t, *J* = 7.5 Hz, 2H), 7.25 (t, *J* = 7.5 Hz, 1H), 7.21 (d, *J* = 7.5 Hz, 2H), 3.07-3.00 (m, 1H), 0.93 (t, *J* = 8.0 Hz, 9H), 0.69-0.60 (m, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 134.3 (q, *J* = 3.4 Hz), 129.0, 128.5, 128.4 (q, *J* = 276.0 Hz), 126.6, 40.9 (q, *J* = 11 Hz), 7.0, 2.9.



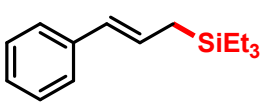
3pa

(3pa) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.80-7.66 (m, 3H), 7.48 (s, 1H), 7.41 (t, *J* = 7.5 Hz, 1H), 7.35 (t, *J* = 7.5 Hz, 1H), 7.24 (dd, *J* = 8.0, 1.0 Hz, 1H), 2.47 (q, *J* = 7.5 Hz, 1H), 1.47 (d, *J* = 7.5 Hz, 3H), 0.90 (t, *J* = 8.0 Hz, 9H), 0.54 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 144.1, 133.7, 131.2, 127.5, 127.23, 127.17, 127.0, 125.7, 124.4, 124.3, 27.1, 15.5, 7.5, 2.1; **HRMS** (ESI) m/z calculated for $C_{18}H_{26}NaSi$ $[M+Na]^+$: 293.1797, found: 293.1784.



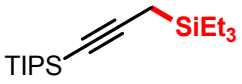
3qa

(3qa) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.27-7.21 (m, 8H), 7.14-7.09 (m, 2H), 3.65 (s, 1H), 0.84 (t, *J* = 8.0 Hz, 9H), 0.60 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 142.9, 128.8, 128.2, 125.0, 43.0, 7.5, 3.4; **HRMS** (ESI) m/z calculated for $C_{19}H_{26}NaSi$ $[M+Na]^+$: 305.1697, found: 305.1684.



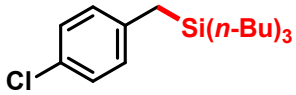
3ra

(3ra) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.31-7.23 (m, 4H), 7.18-7.10 (m, 1H), 6.28-6.20 (m, 2H), 1.70 (dd, *J* = 5.0, *J* = 2.0 Hz, 2H), 0.96 (t, *J* = 8.0 Hz, 9H), 0.57 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 138.5, 128.4, 128.1, 128.0, 126.1, 125.4, 18.8, 7.4, 3.3.



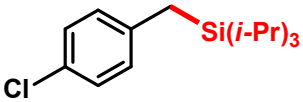
3sa

(3sa) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 1.59 (s, 2H), 1.05-1.03 (m, 18H), 1.02-1.00 (m, 3H), 0.96 (t, *J* = 8.0 Hz, 9H), 0.63 (q, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 106.6, 78.4, 18.6, 11.5, 7.3, 3.4, 3.1, 1.0.



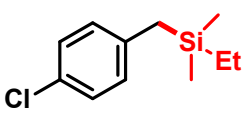
3bb

(3bb) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.15 (d, *J* = 8.5 Hz, 2H), 6.91 (d, *J* = 8.5 Hz, 2H), 2.05 (s, 2H), 1.32-1.20 (m, 12H), 0.87 (t, *J* = 7.5 Hz, 9H), 0.50-0.44 (m, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 139.3, 129.4, 129.3, 128.1, 26.7, 25.9, 22.2, 13.7, 11.6;



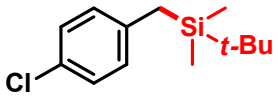
3bc

(3bc) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.15 (d, *J* = 8.5 Hz, 2H), 7.01 (d, *J* = 8.5 Hz, 2H), 2.15 (s, 2H), 1.08-1.03 (m, 3H), 1.01-1.00 (m, 18H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 139.6, 129.8, 129.4, 128.1, 18.6, 18.5, 10.9; **HRMS** (ESI) m/z calculated for $C_{16}H_{27}ClNaSi$ $[M+Na]^+$:305.1464, found: 305.1456.



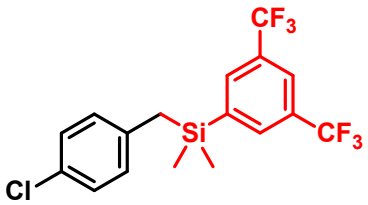
3bd

(3bd) Colourless oil; **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.16 (d, *J* = 8.5 Hz, 2H), 6.91 (d, *J* = 8.5 Hz, 2H), 2.05 (s, 2H), 0.92 (t, *J* = 8.0 Hz, 3H), 049 (q, *J* = 8.0 Hz, 2H), 0.05 (s, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 139.1, 129.5, 129.3, 128.2, 24.7, 7.2, 6.4, -4.2.



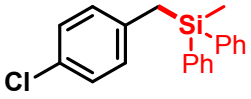
3be

(3be) Colourless oil; **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.17 (d, *J* = 8.0 Hz, 2H), 6.90 (d, *J* = 8.5 Hz, 2H), 2.07 (s, 2H), 0.92 (s, 9H), 0.10 (s, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 139.2, 129.5, 128.2, 26.5, 22.1, 16.7, -6.6.



3bf

(3bf) Colourless oil; **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.87 (s, 1H), 7.77 (s, 2H), 7.16 (d, *J* = 8.0 Hz, 2H), 6.81 (d, *J* = 8.0 Hz, 2H), 2.31 (s, 2H), 0.35 (s, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 141.5, 136.8, 133.4, 130.7 (q, *J* = 33.4 Hz), 130.4, 129.4, 128.5, 123.9 (q, *J* = 272.0 Hz), 123.0 (q, *J* = 3.6 Hz), 25.2, -3.8.



3bg

(3bg) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.45-7.43 (m, 4H), 7.40-7.36 (m, 2H), 7.35-7.31 (m, 4H), 7.07 (d, *J* = 8.5 Hz, 2H), 6.77 (d, *J* = 8.5 Hz, 2H), 2.58 (s, 2H), 0.46 (s, 3H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 137.4, 135.9, 134.6, 129.9, 129.8, 129.4, 128.1, 127.8, 24.0, -4.9; **HRMS** (ESI) m/z calculated for $C_{20}H_{19}ClNaSi$ [M+Na]+: 345.0838, found: 345.0867. ----------

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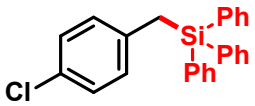
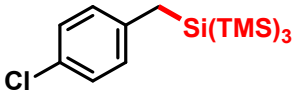


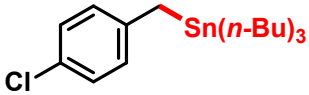
3bh

(3bh) White solid, m.p. 166-167 °C; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.41-7.38 (m, 9H), 7.33-7.31 (m, 6H), 7.01 (d, *J* = 8.5 Hz, 2H), 6.74 (d, *J* = 8.5 Hz, 2H), 2.87 (s, 2H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 136.8, 135.9, 133.8, 130.4, 130.1, 129.7, 128.0, 127.8, 23.0; **HRMS** (ESI) m/z calculated for $C_{25}H_{21}ClNaSi$ [M+Na]+: 407.0995, found: 407.0972.



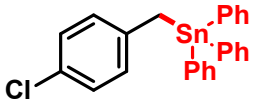
3bi

(3bi) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.16 (d, *J* = 8.0 Hz, 2H), 6.99 (d, *J* = 8.0 Hz, 2H), 2.30 (s, 2H), 0.12 (s, 27H); **^{13}C-NMR** (125 MHz, $CDCl_3$,) δ 141.8, 129.6, 129.4, 128.3, 16.1, 1.1; **HRMS** (ESI) m/z calculated for $C_{16}H_{33}ClNa\ Si_4$ [M+Na]+: 395.1246, found: 395.1254.



3bj

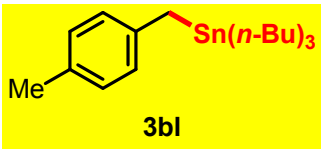
(3bj) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.11 (d, *J* = 8.5 Hz, 2H), 6.89 (d, *J* = 8.5 Hz, 2H), 2.26 (t, J_{Sn-H} = 56 Hz, 2H), 1.47-1.35 (m, 6H), 1.29-1.22 (m, 6H), 0.87 (t, *J* = 8.0 Hz, 9H), 0.80 (t, *J* = 8.0 Hz, 6H); **^{13}C-NMR** (125 MHz, CDCl3) δ 142.4, 128.22 (128.27, 128.18), 128.13, 128.05, 29.00 (29.08, 29.02), 27.30 (27.52, 27.09), 17.7, 13.7, 9.3 (10.60, 10.54, 8.11, 8.06); (The spliting peaks generated from J-coupling of ^{115}Sn/^{119}Sn with ^{13}C).



3bk

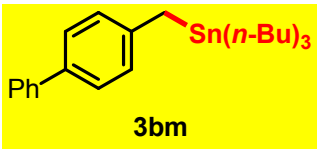
(3bk) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.41-7.33 (m, 15H), 7.06 (d, J = 8.5 Hz, 2H), 6.93 (d, J = 8.5 Hz, 2H), 2.91 (t, J_{Sn-H} = 66 Hz, 2H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 139.5, 139.3, 137.0 (137.1, 136.9), 129.11 (129.15, 129.06), 129.0, 128.7, 128.6, 128.37 (128.42, 128.31),

19.5(20.78,20.72, 18.25, 18.19). (The spliting peaks generated from J-coupling of $^{115}Sn/^{119}Sn$ with ^{13}C).



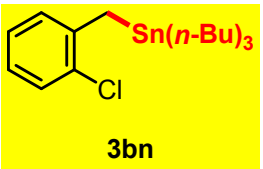
3bl

(3bl) Colourless oil; **^{1}H-NMR** (600 MHz, $CDCl_3$) δ 6.96 (d, *J* = 7.8 Hz, 2H), 6.89 (d, *J* = 7.8 Hz, 2H), 2.26 (s, 3H), 2.25 (t, J_{Sn-H} = 28 Hz, 2H), 1.44-1.39 (m, 6H), 1.29-1.23 (m, 6H), 0.86 (t, *J* = 7.8 Hz, 9H), 0.79 (t, *J* = 7.8 Hz, 6H); **^{13}C-NMR** (150 MHz, CDCl3) δ 140.3, 132.0, 128.90 (128.93, 128.86), 126.87 (126.94, 126.80), 29.03 (29.10, 28.97), 27.33 (27.50, 27.15), 20.8, 17.5, 13.7, 9.23 (10.28, 10.23, 8.23, 8.18); (The spliting peaks generated from J-coupling of $^{115}Sn/^{119}Sn$ with ^{13}C).



3bm

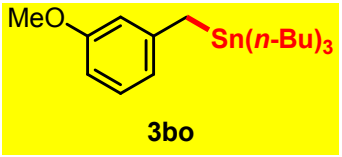
(3bm) Colourless oil; **^{1}H-NMR** (600 MHz, $CDCl_3$) δ 7.56 (d, *J* = 7.8 Hz, 2H), 7.42-7.39 (m, 4H), 7.28 (d, *J* = 7.2 Hz, 1H), 7.05 (d, *J* = 7.8 Hz, 2H), 2.34 (t, J_{Sn-H} = 28 Hz, 2H), 1.46-1.40 (m, 6H), 1.29-1.24 (m, 6H), 0.88-0.81 (m, 15H); **^{13}C-NMR** (150 MHz, CDCl3) δ 143.1, 141.3, 135.7, 128.6, 127.33 (127.40, 127.26), 126.92 (126.96, 126.88), 126.7, 126.5, 29.03 (29.10, 28.96), 27.32 (27.50, 27.14), 17.9, 13.7, 9.38 (10.43, 10.39, 9.38, 8.38, 8.33); (The spliting peaks generated from J-coupling of $^{115}Sn/^{119}Sn$ with ^{13}C).



3bn

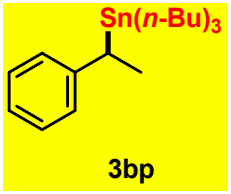
(3bn) Colourless oil; **^{1}H-NMR** (600 MHz, $CDCl_3$) δ 7.26-7.24 (m, 1H), 7.07-7.04 (m, 2H), 6.92-6.90 (m, 1H), 2.40 (t, J_{Sn-H} = 28 Hz, 2H), 1.45-1.39 (m, 6H), 1.27-1.22 (m, 6H), 0.87-0.81 (m, 15H); **^{13}C-NMR** (150 MHz, CDCl3) δ 142.2, 131.6, 129.06 (129.10, 129.02), 128.57 (128.63, 128.50), 126.56 (126.60, 126.52), 124.21 (124, 124.17), 28.94 (29.01, 28.87), 27.30 (27.48, 27.12), 17.2, 13.7,

10.04 (11.09, 11.05, 9.02, 8.98); (The spliting peaks generated from J-coupling of $^{115}Sn/^{119}Sn$ with ^{13}C).



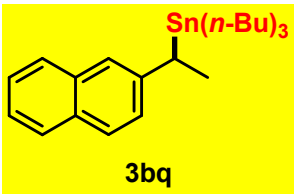
3bo

(3bo) Colourless oil; **^{1}H-NMR** (600 MHz, $CDCl_3$) δ 7.07 (t, *J* = 7.8 Hz, 1H), 6.57 (d, *J* = 7.8 Hz, 1H), 6.54-6.51 (m, 2H), 3.76 (s, 3H), 2.28 (t, J_{Sn-H} = 28 Hz, 2H), 1.45-1.40 (m, 6H), 1.29-1.23 (m, 6H), 0.86 (t, *J* = 7.8 Hz, 9H), 0.81 (t, *J* = 7.8 Hz, 6H); **^{13}C-NMR** (150 MHz, CDCl3) δ 159.6, 145.4, 129.1, 119.6, 112.4, 108.4, 55.0, 29.02 (29.09, 28.95), 27.31 (27.49, 27.13), 18.36 (19.14, 19.11, 17.61, 17.58), 13.7, 9.35 (10.41, 10.36, 8.35, 8.30); (The spliting peaks generated from J-coupling of $^{115}Sn/^{119}Sn$ with ^{13}C).



3bp

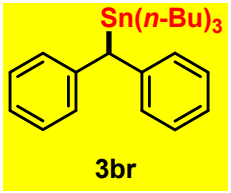
(3bp) Colourless oil; **^{1}H-NMR** (600 MHz, $CDCl_3$) δ 7.20 (t, *J* = 7.2 Hz, 2H), 7.02 (d, *J* = 7.2 Hz, 2H), 6.98 (t, *J* = 7.2 Hz, 1H), 2.70 (q, *J* = 7.8 Hz, 1H), 1.57 (d, *J* = 7.8 Hz, 3H), 1.40-1.35 (m, 6H), 1.27-1.22 (m, 6H), 0.85 (t, *J* = 7.8 Hz, 9H), 0.79-0.76 (m, 6H); **^{13}C-NMR** (150 MHz, CDCl3) δ 149.0, 128.16 (128.20, 128.12), 125.51 (125.58, 125.44), 123.2, 29.05 (29.11, 28.98), 27.45 (27.62, 27.27), 26.8, 17.4, 13.7, 8.72 (9.73, 9.68, 7.76, 7.71); (The spliting peaks generated from J-coupling of $^{115}Sn/^{119}Sn$ with ^{13}C).



3bq

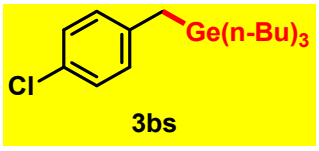
(3bq) Colourless oil; **^{1}H-NMR** (600 MHz, $CDCl_3$) δ 7.74-7.66 (m, 3H), 7.41-7.39 (m, 2H), 7.33-7.30 (m, 1H), 7.19-7.18 (m, 1H), 2.86 (q, *J* = 7.8 Hz, 1H), 1.67 (d, *J* = 7.8 Hz, 3H), 1.41-1.35 (m, 6H), 1.26-1.20 (m, 6H), 0.83-0.78 (m, 15H); **^{13}C-NMR** (150 MHz, CDCl3) δ 146.7, 134.1, 130.8, 127.5,

127.4, 127.0, 126.31 (126.36, 126.26), 125.7, 124.0, 121.71 (121.79, 121.62), 29.08 (29.04, 29.01), 27.44 (27.62, 27.28), 27.3, 17.31, 13.6, 8.88 (9.88, 9.84, 7.91, 7.87); (The spliting peaks generated from J-coupling of $^{115}Sn/^{119}Sn$ with ^{13}C).



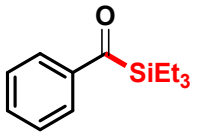
3br

(3br) Colourless oil; **^{1}H-NMR** (600 MHz, $CDCl_3$) δ 7.23 (t, *J* = 7.2 Hz, 4H), 7.17 (d, *J* = 7.2 Hz, 4H), 7.06 (t, *J* = 7.2 Hz, 2H), 4.04 (s, 1H), 1.35-1.30 (m, 6H), 1.23-1.17 (m, 6H), 0.82-0.79 (m, 15H); **^{13}C-NMR** (150 MHz, CDCl3) δ 144.5, 128.3, 127.83 (127.91, 127.75), 124.3, 42.4, 28.86 (28.92, 28.79), 27.30 (27.49, 27.12), 13.6, 10.49 (11.52, 11.47, 9.51, 9.47); (The spliting peaks generated from J-coupling of $^{115}Sn/^{119}Sn$ with ^{13}C).



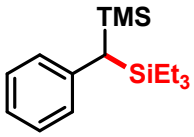
3bs

(3bs) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.15 (d, *J* = 8.5 Hz, 2H), 6.91 (d, *J* = 8.5 Hz, 2H), 2.17 (s, 2H), 1.33-1.25 (m, 12H), 0.87 (t, *J* = 7.0 Hz, 9H), 0.70-0.66 (m, 6H); **^{13}C-NMR** (125 MHz, CDCl3) δ 140.4, 129.1, 128.9, 128.1, 27.2, 26.5, 21.6, 13.7, 12.2.



4

(4) Colourless oil; **^{1}H-NMR** (500 MHz, $CDCl_3$) δ 7.81 (d, *J* = 7.5 Hz, 2H), 7.53 (t, *J* = 7.5 Hz, 1H), 7.47 (t, *J* = 7.5 Hz, 2H), 0.99 (t, *J* = 7.5 Hz, 9H), 0.93-0.89 (m, 6H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 236.1, 142.4, 132.6, 128.6, 127.1, 7.4, 3.7; **HRMS** (ESI) m/z calculated for $C_{13}H_{21}OSi$ $[2M+H]^+$: 221.1358, found: 221.1354.



5

(5) Colourless oil; **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.18 (t, *J* = 7.5 Hz, 2H), 7.04 (t, *J* = 7.5 Hz, 1H), 6.97 (d, *J* = 7.5 Hz, 2H), 1.65 (s, 1H), 0.92 (t, *J* = 8.0 Hz, 9H), 0.61 (q, *J* = 8.0 Hz, 6H), 0.04 (s, 9H); **^{13}C-NMR** (125 MHz, $CDCl_3$) δ 142.8, 129.0, 127.9, 123.2, 25.8, 7.8, 4.8, 0.2; **HRMS** (ESI) m/z calculated for $C_{16}H_{31}Si_2$ $[M+H]^+$: 279.1964, found: 279.1954.

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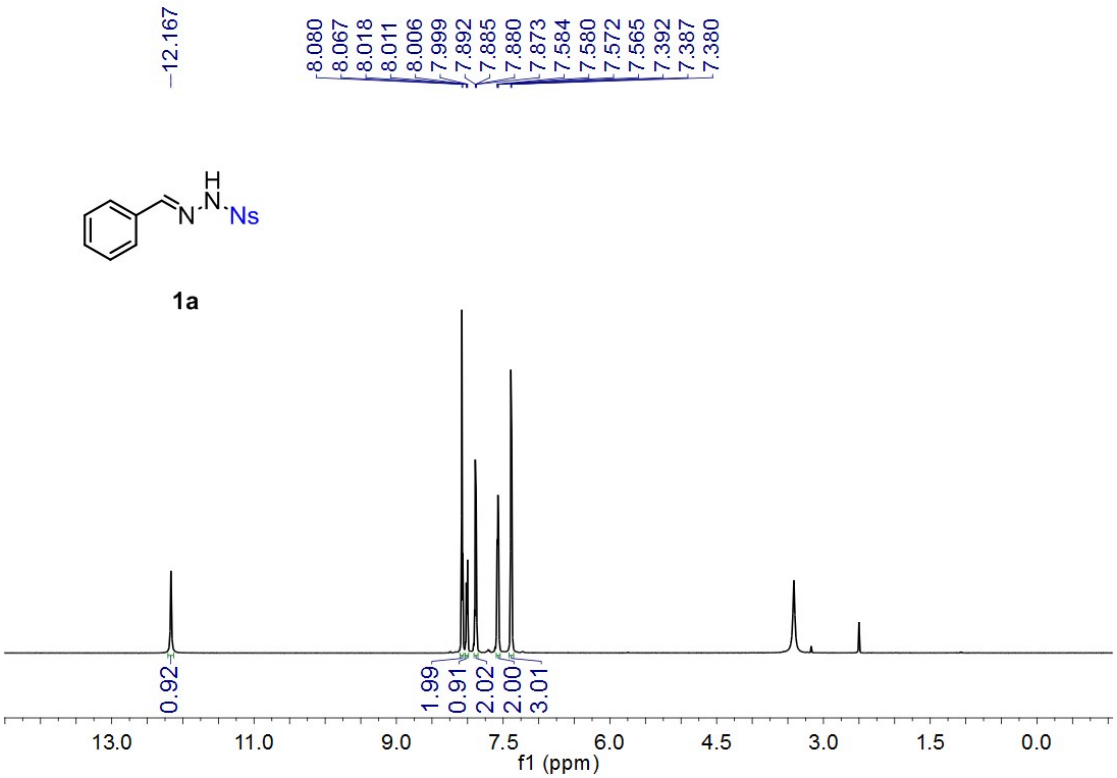
5. ^{1}H and ^{13}C NMR Spectral Copies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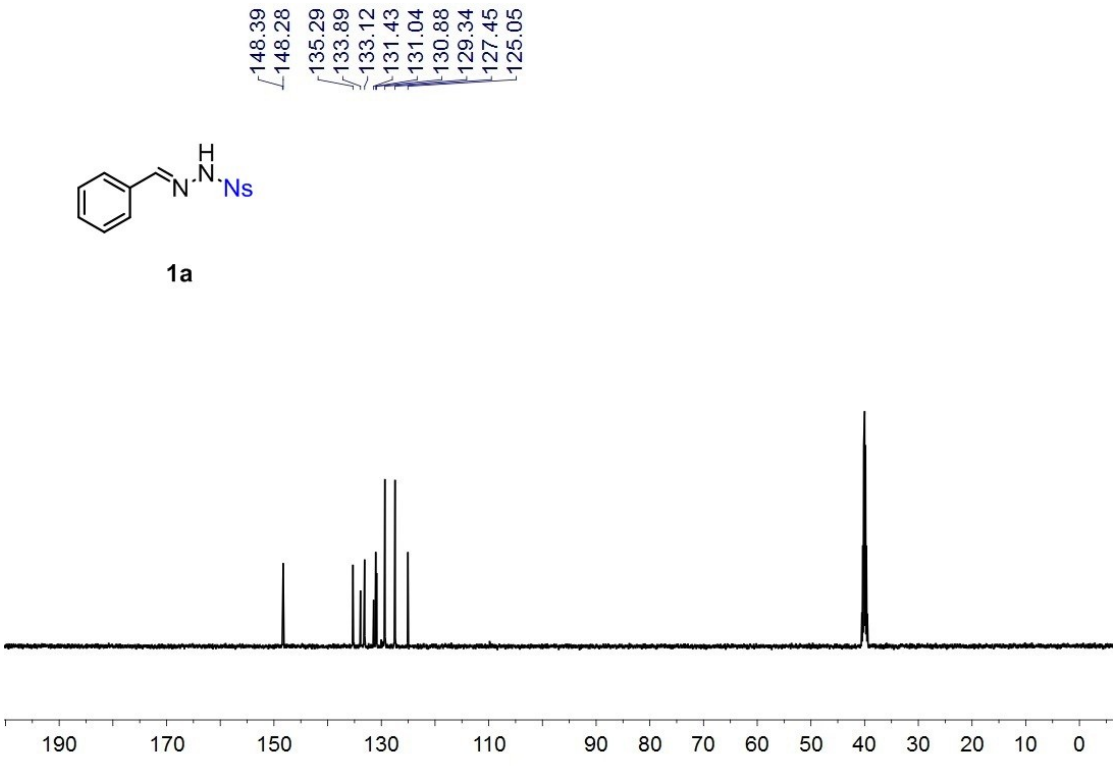
8.067
8.018
8.011
8.006
7.999
7.892
7.885
7.880
7.873
7.584
7.580
7.572
7.565
7.392
7.387
7.380
Ns
0.92
1.99
0.91
2.02
2.00
3.01
13.0
11.0
9.0
7.5
6.0
4.5
3.0
1.5
0.0
f1 (ppm)

1a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148.28
135.29
133.89
133.12
131.43
131.04
130.88
129.34
127.45
125.05
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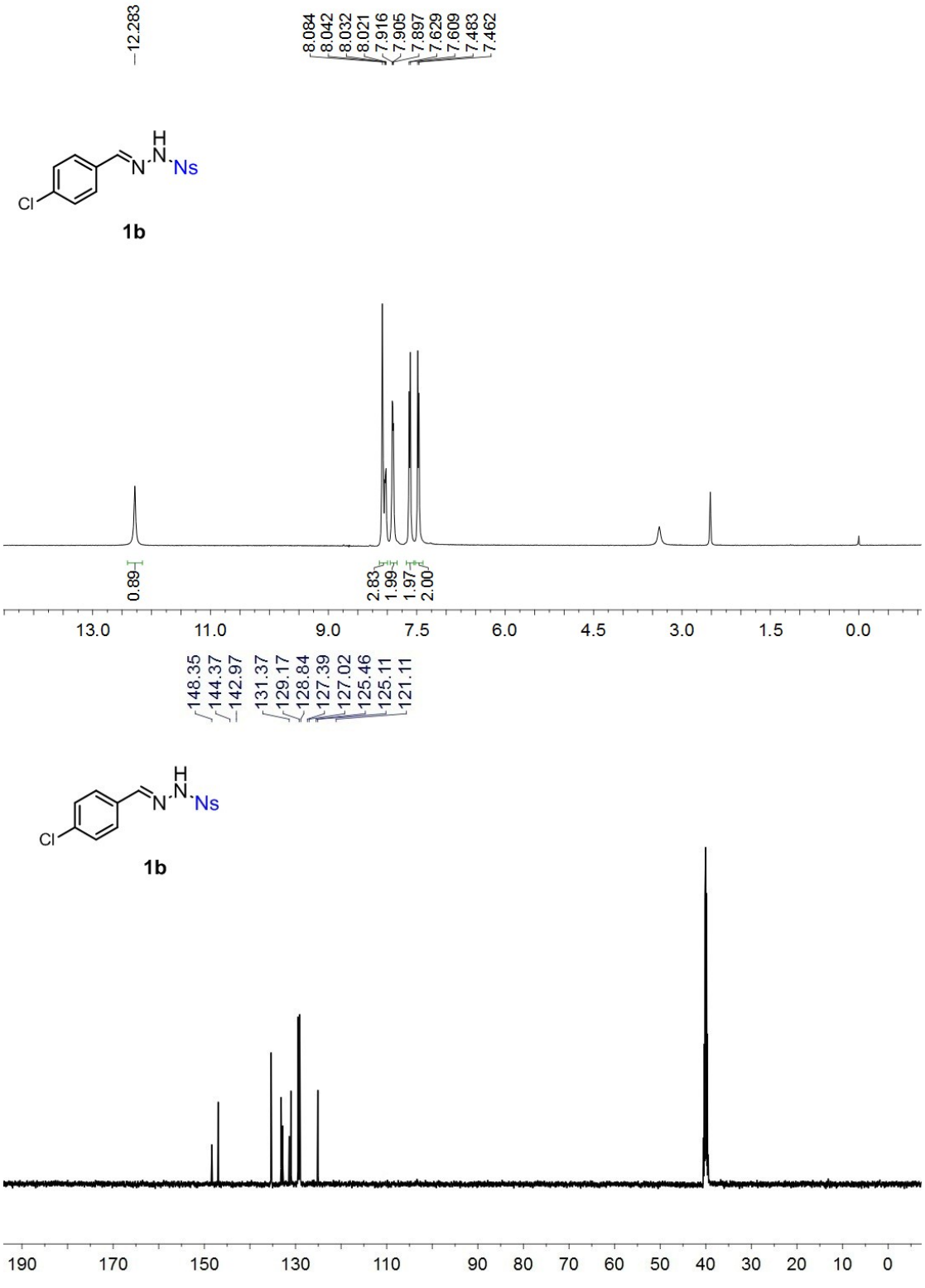
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0

1a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8.042
8.032
8.021
7.916
7.905
7.897
7.629
7.609
7.483
7.462
Cl
N
H
N
Ns
1b
0.89
2.83
1.99
1.97
2.00
13.0
11.0
9.0
7.5
6.0
4.5
3.0
1.5
0.0
148.35
144.37
142.97
131.37
129.17
128.84
127.39
127.02
125.46
125.11
121.11
Cl
N
H
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70
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50
40
30
20
10
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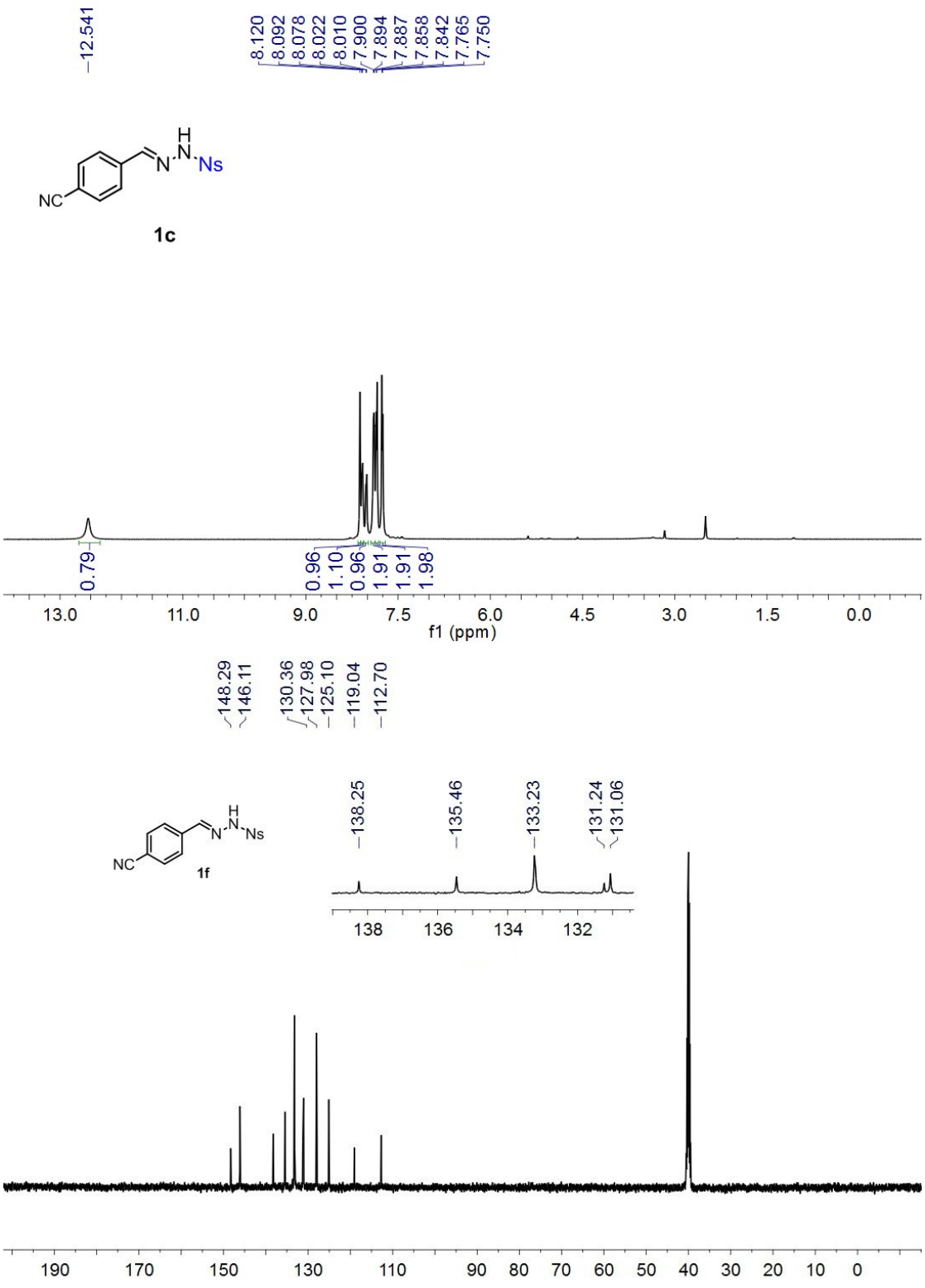
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7.765
7.750
NC
Ns
1c
0.79
0.96
1.10
0.96
1.91
1.91
1.98
13.0
11.0
9.0
7.5
6.0
4.5
3.0
1.5
0.0
f1 (ppm)
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146.11
130.36
127.98
125.10
119.04
112.70
138.25
135.46
133.23
131.24
131.06
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90
80
70
60
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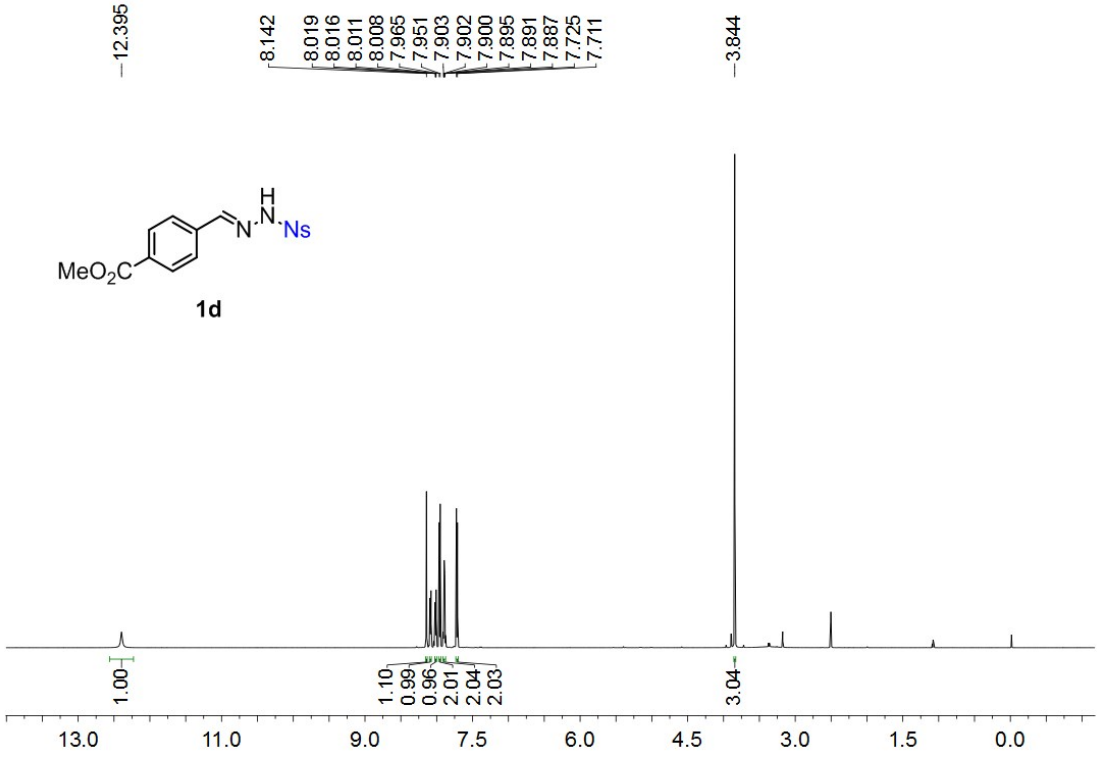
40
30
20
10
0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7.951
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7.902
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7.891
7.887
7.725
7.711
3.844
MeO2C
N
H
N
Ns
1d
1.00
1.10
0.99
0.96
2.01
2.04
2.03
3.04
13.0
11.0
9.0
7.5
6.0
4.5
3.0
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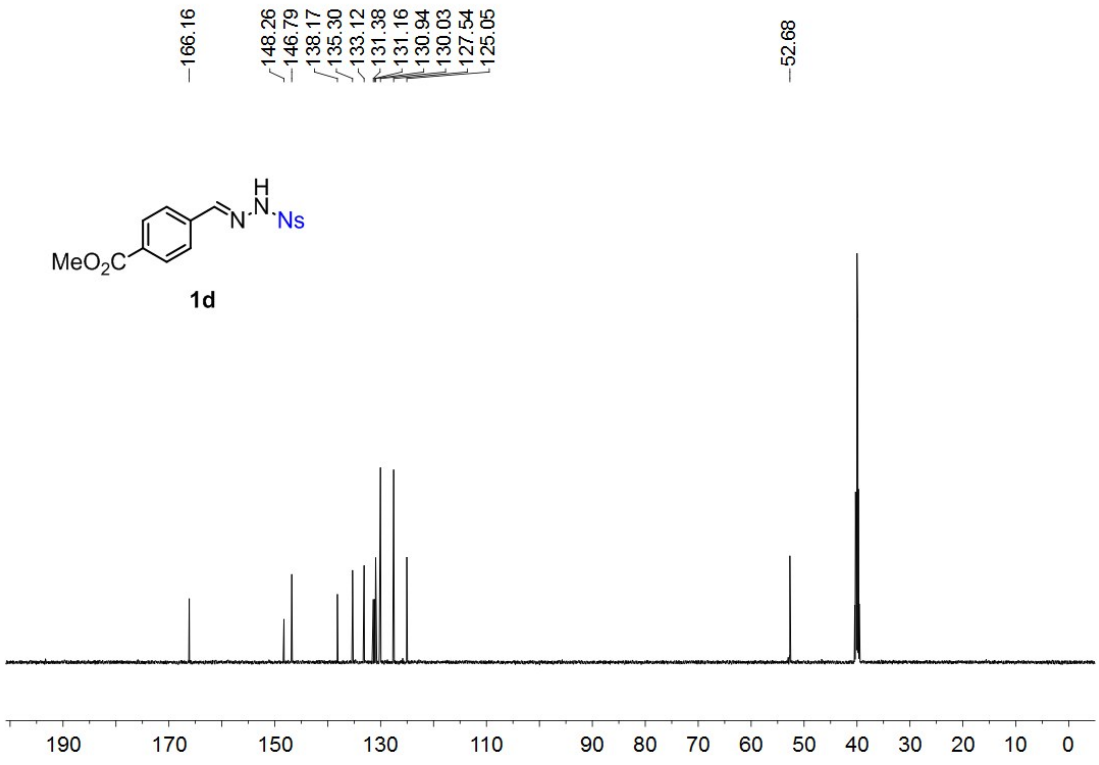
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130.03
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125.05
52.68
MeO2C
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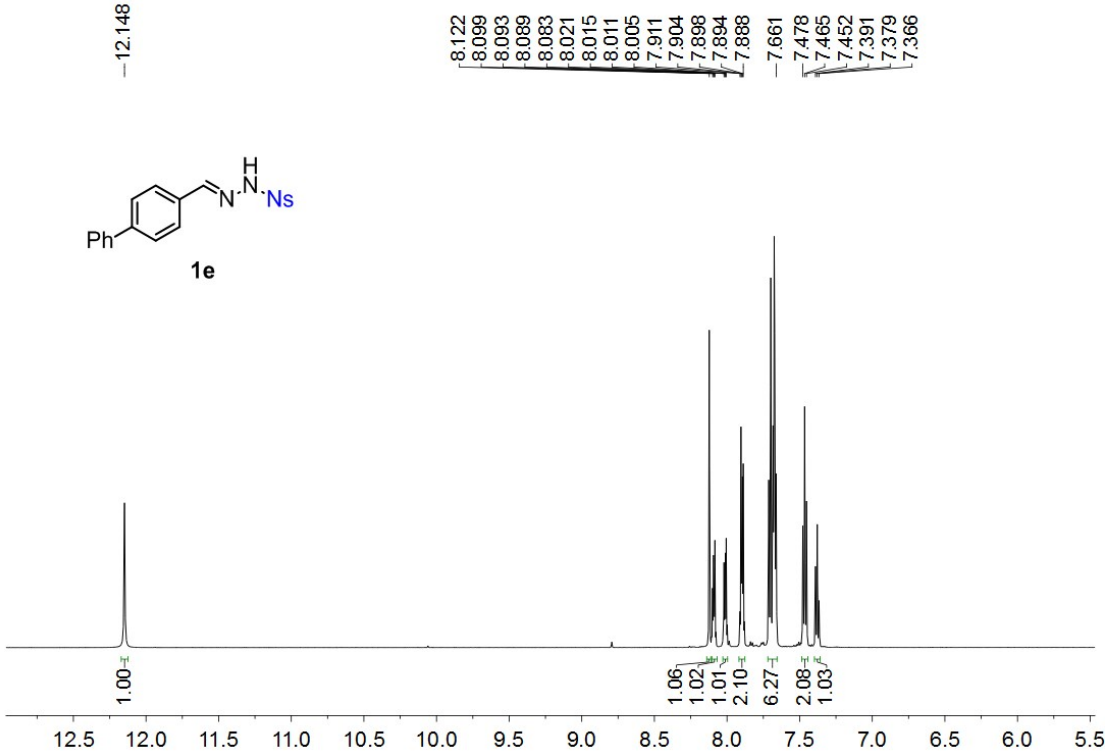
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7.898
7.894
7.888
7.661
7.478
7.465
7.452
7.391
7.379
7.366
Ph
N
H
N
Ns
1e
1.00
1.06
1.02
1.01
2.10
6.27
2.08
1.03
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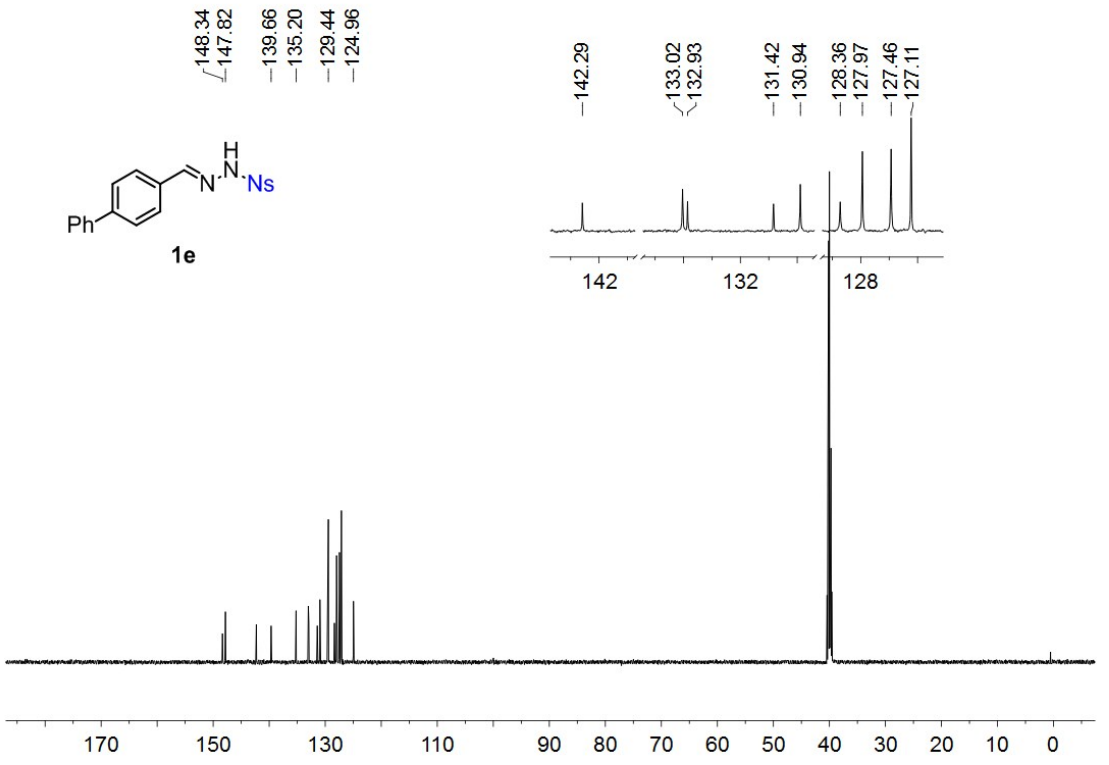
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133.02
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130.94
128.36
127.97
127.46
127.11
Ph
N
H
N
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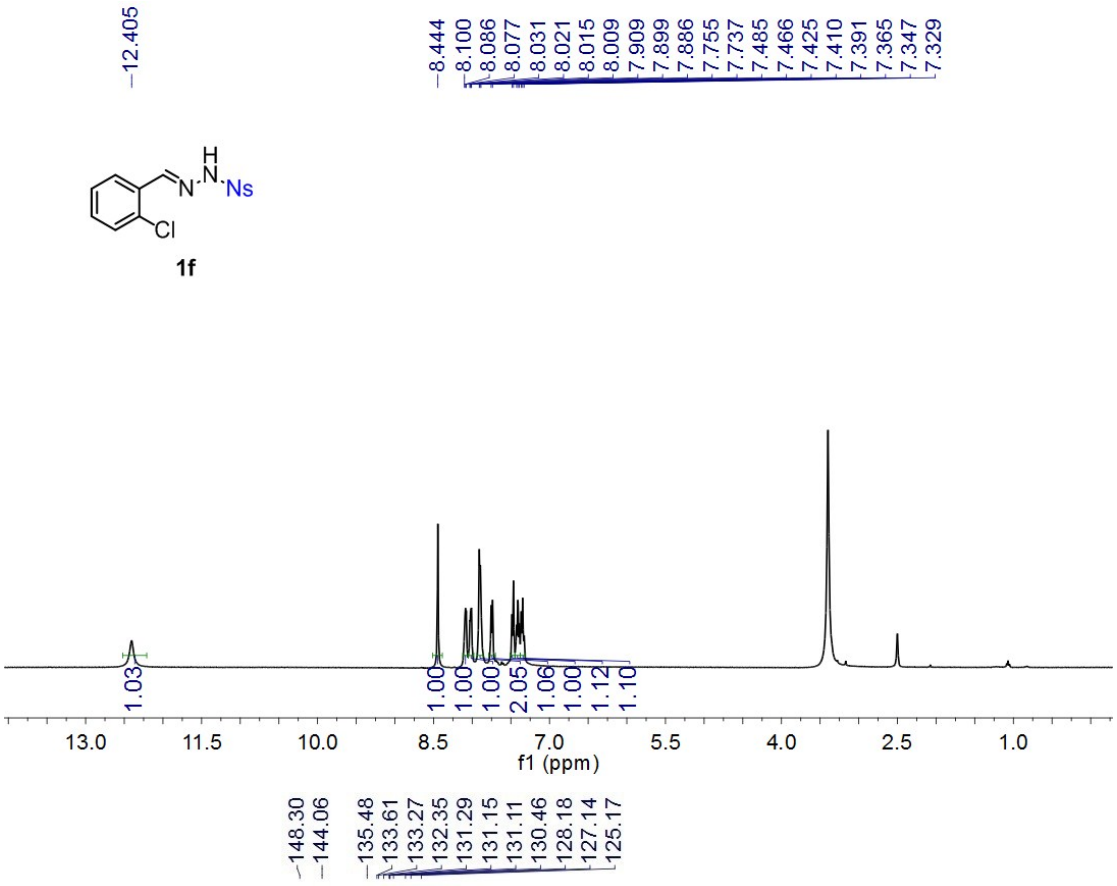
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8.015
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7.899
7.886
7.755
7.737
7.485
7.466
7.425
7.410
7.391
7.365
7.347
7.329
H
N
N
Ns
Cl
1f
1.03
1.00
1.00
1.00
2.05
1.06
1.00
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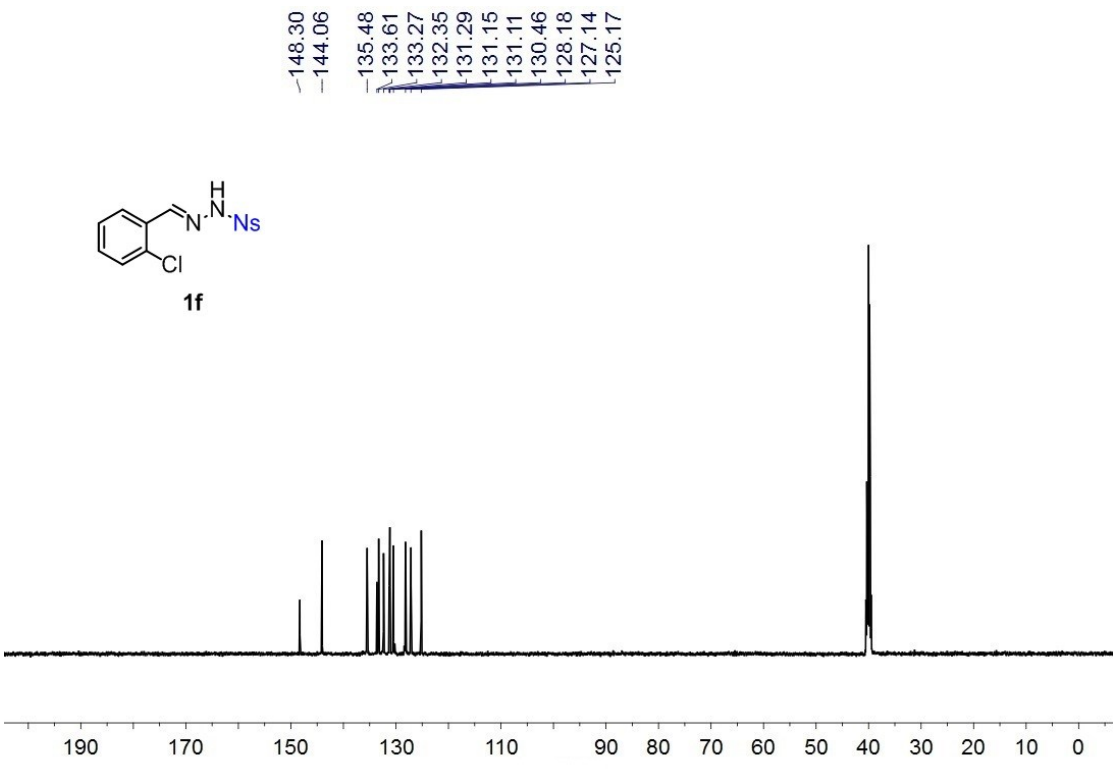
f1 (ppm)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144.06
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131.15
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130.46
128.18
127.14
125.17
H
N
N
Ns
Cl
1f
190
170
150
130
110
90
80
70
60
50
40
30
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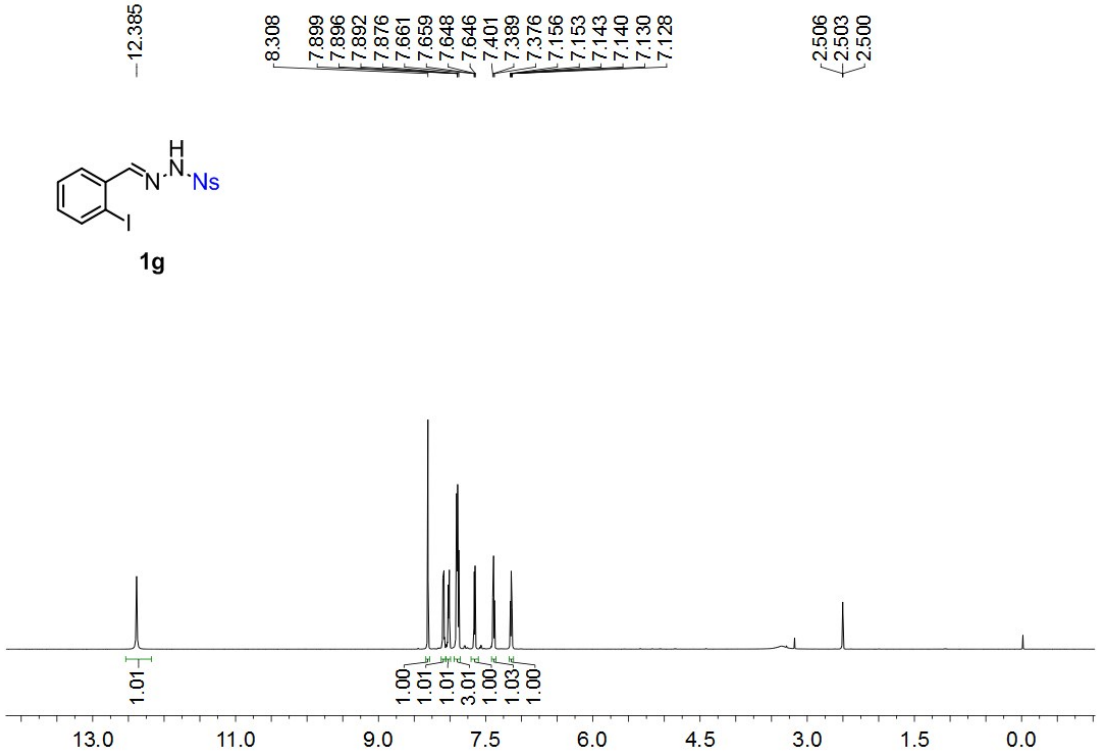
10
0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7.659
7.648
7.646
7.401
7.389
7.376
7.156
7.153
7.143
7.140
7.130
7.128
2.506
2.503
2.500
Ns
1g
1.01
1.00
1.01
1.01
3.01
1.00
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6.0
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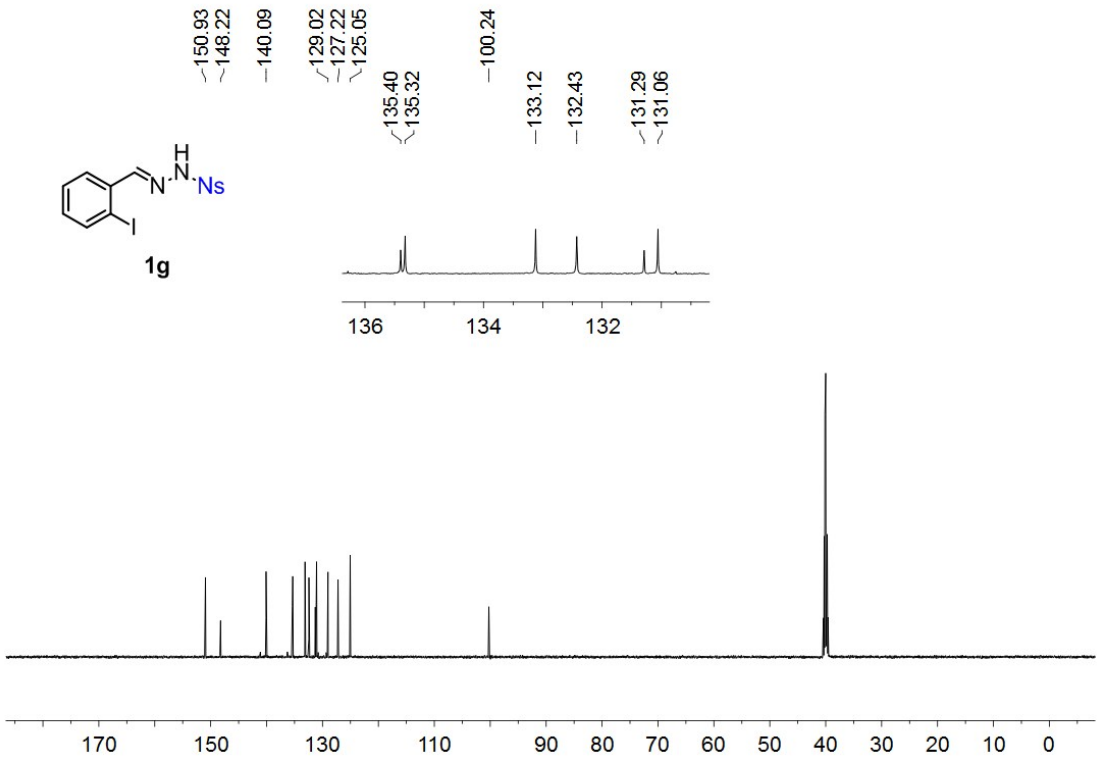
0.0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140.09
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127.22
125.05
100.24
135.40
135.32
133.12
132.43
131.29
131.06
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1g
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134
132
170
150
130
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90
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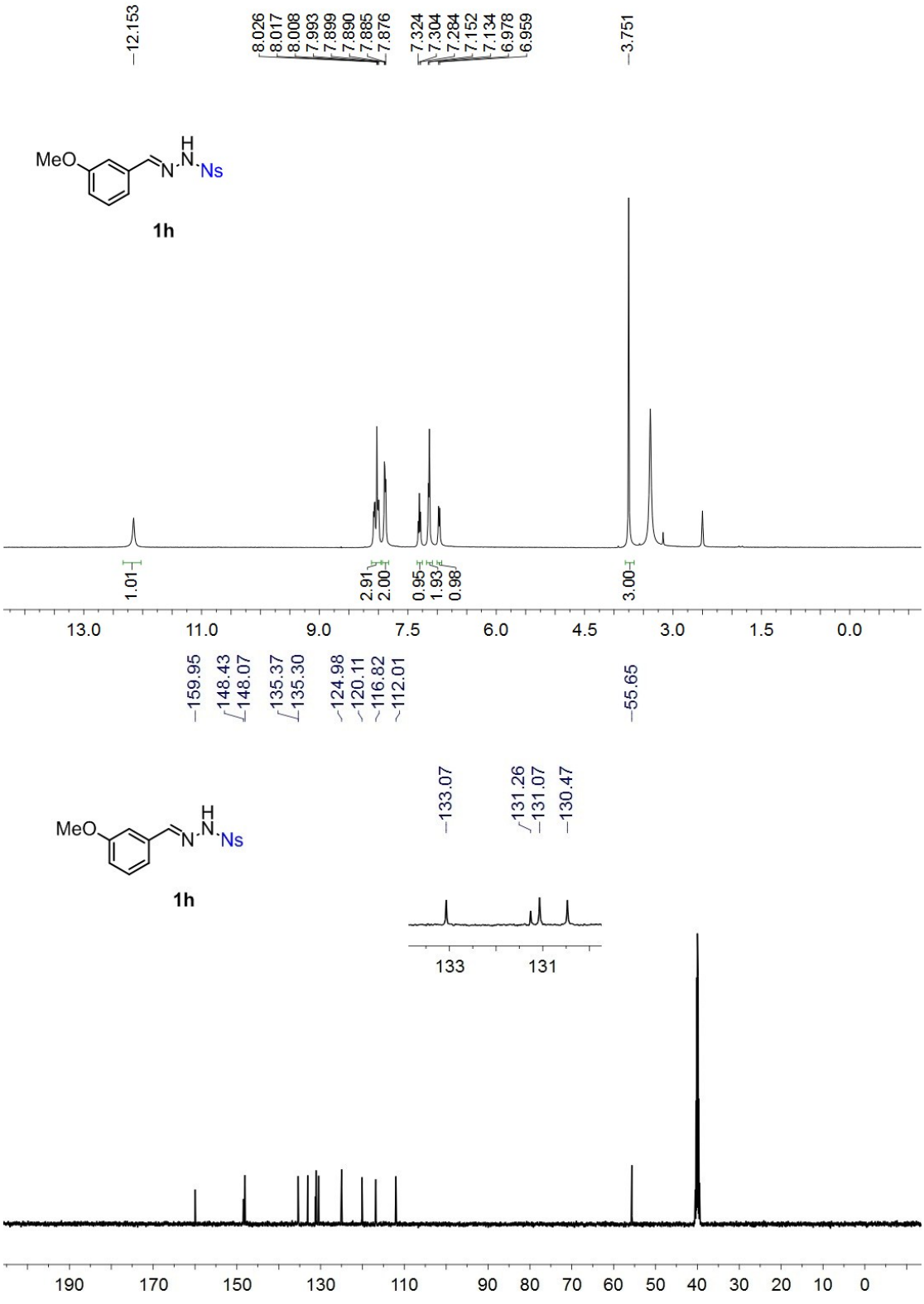
10
0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7.899
7.890
7.885
7.876
7.324
7.304
7.284
7.152
7.134
6.978
6.959
3.751
MeO
N
H
N
Ns
1h
1.01
2.91
2.00
0.95
1.93
0.98
3.00
13.0
11.0
9.0
7.5
6.0
4.5
3.0
1.5
0.0
159.95
148.43
148.07
135.37
135.30
124.98
120.11
116.82
112.01
55.65
133.07
131.26
131.07
130.47
MeO
N
H
N
Ns
1h
133
131
190
170
150
130
110
90
80
70
60
50
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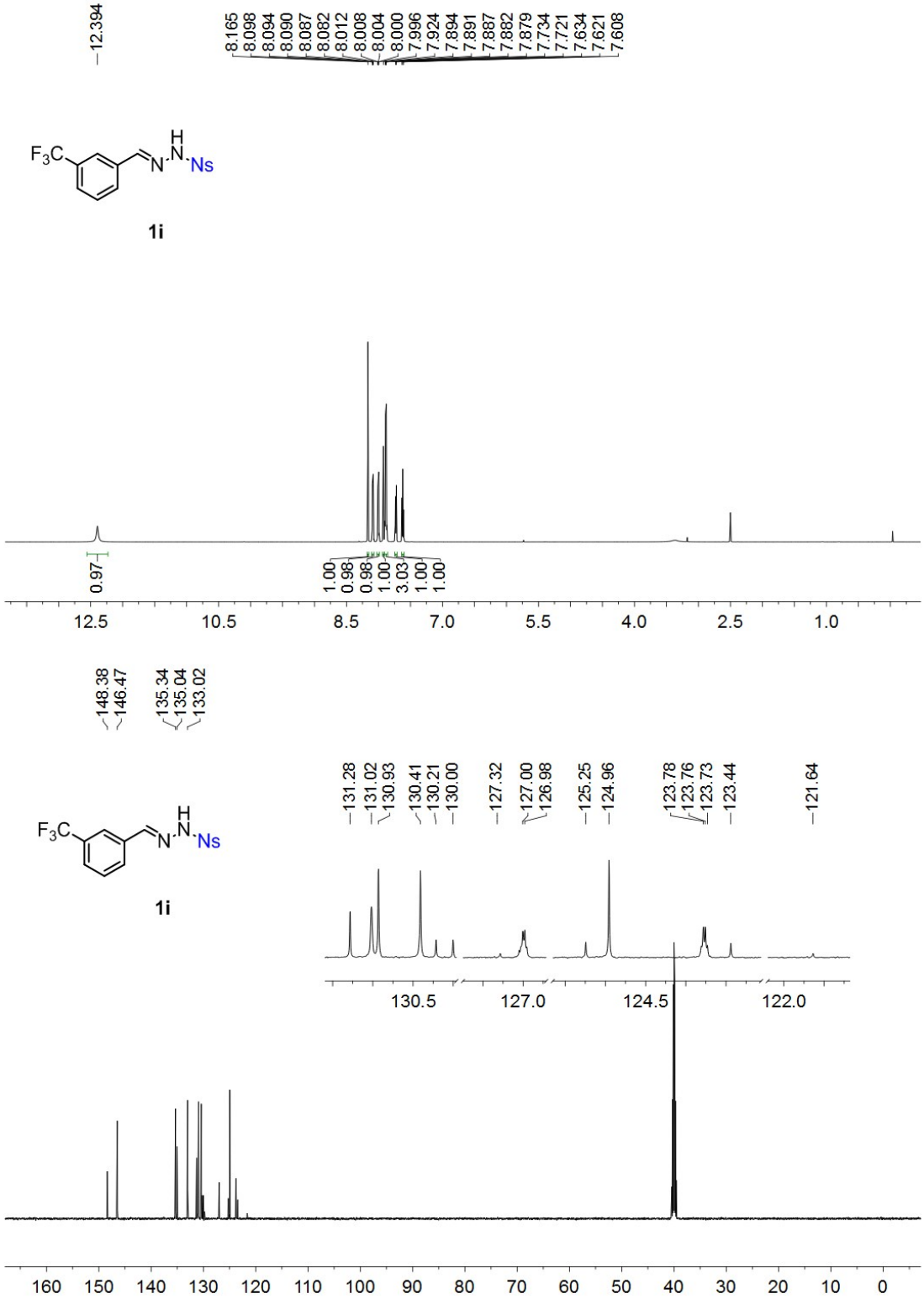
30
20
10
0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8.090
8.087
8.082
8.012
8.008
8.004
8.000
7.996
7.924
7.894
7.891
7.887
7.882
7.879
7.734
7.721
7.634
7.621
7.608
F3C
H
N
N
Ns
1i
0.97
1.00
0.98
0.98
1.00
3.03
1.00
1.00
12.5
10.5
8.5
7.0
5.5
4.0
2.5
1.0
148.38
146.47
135.34
135.04
133.02
131.28
131.02
130.93
130.41
130.21
130.00
127.32
127.00
126.98
125.25
124.96
123.78
123.76
123.73
123.44
121.64
130.5
127.0
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140
130
120
110
100
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70
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30
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10
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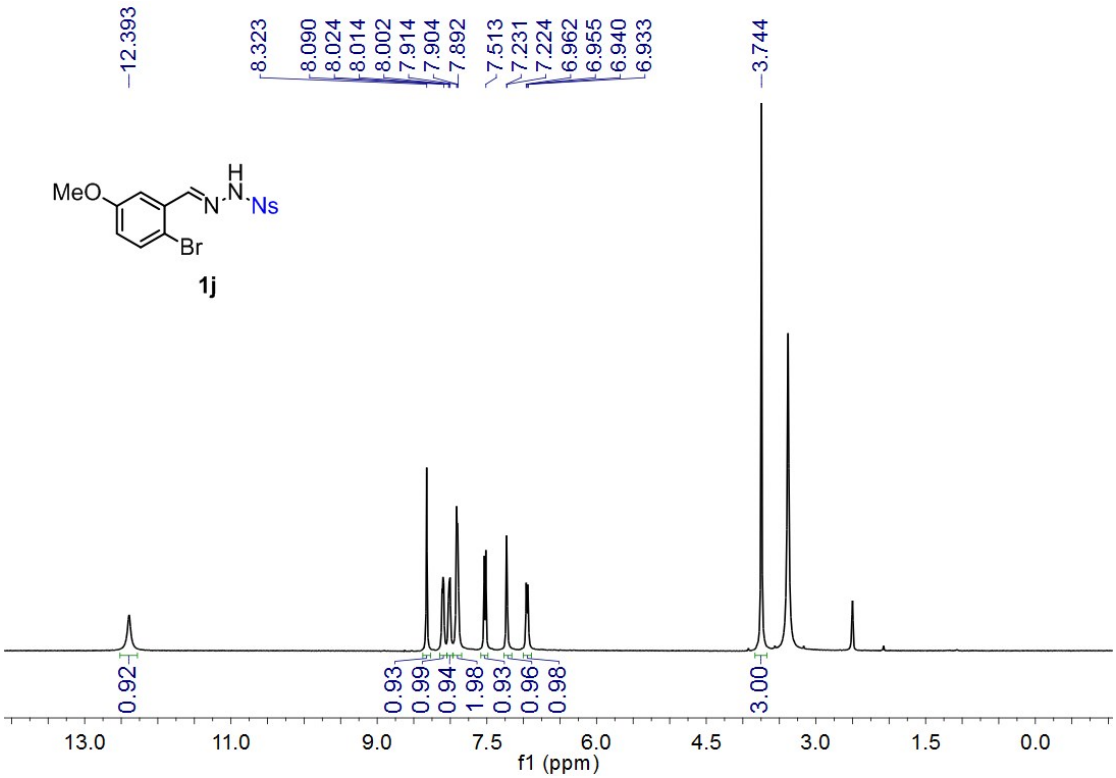
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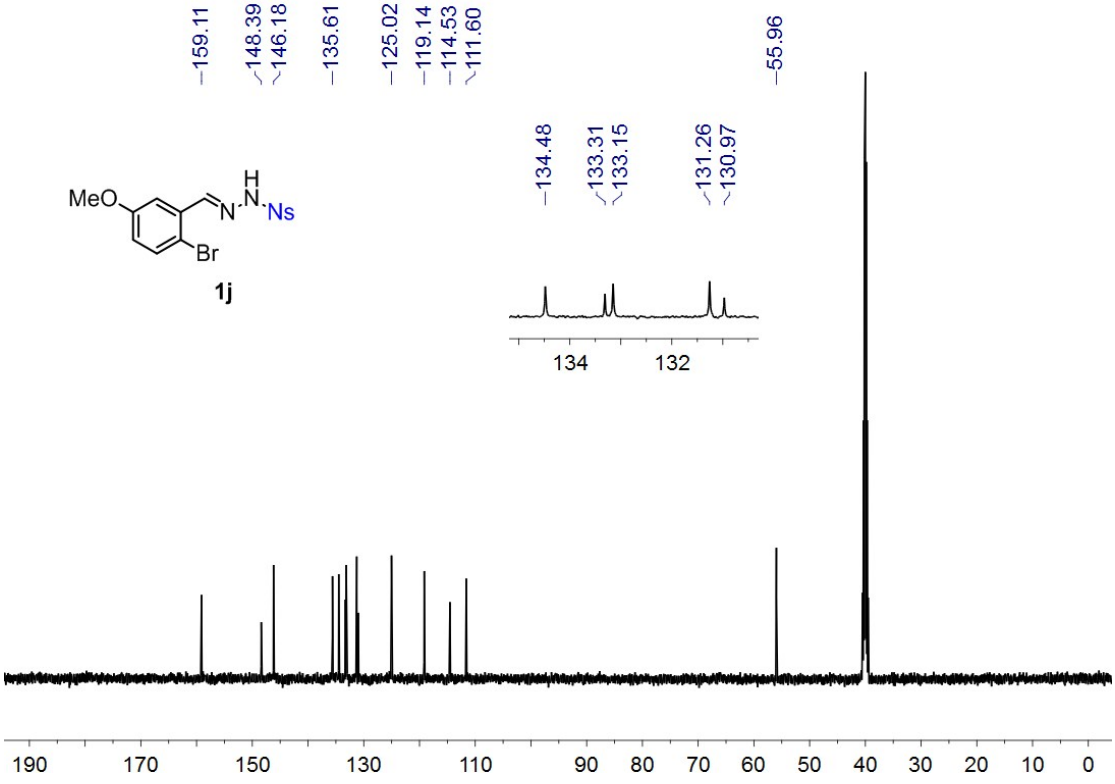
8.090
8.024
8.014
8.002
7.914
7.904
7.892
7.513
7.231
7.224
6.962
6.955
6.940
6.933
3.744
MeO
N
H
N
Ns
Br
1j
0.92
0.93
0.99
0.94
1.98
0.93
0.96
0.98
3.00
13.0
11.0
9.0
7.5
6.0
4.5
3.0
1.5
0.0
f1 (ppm)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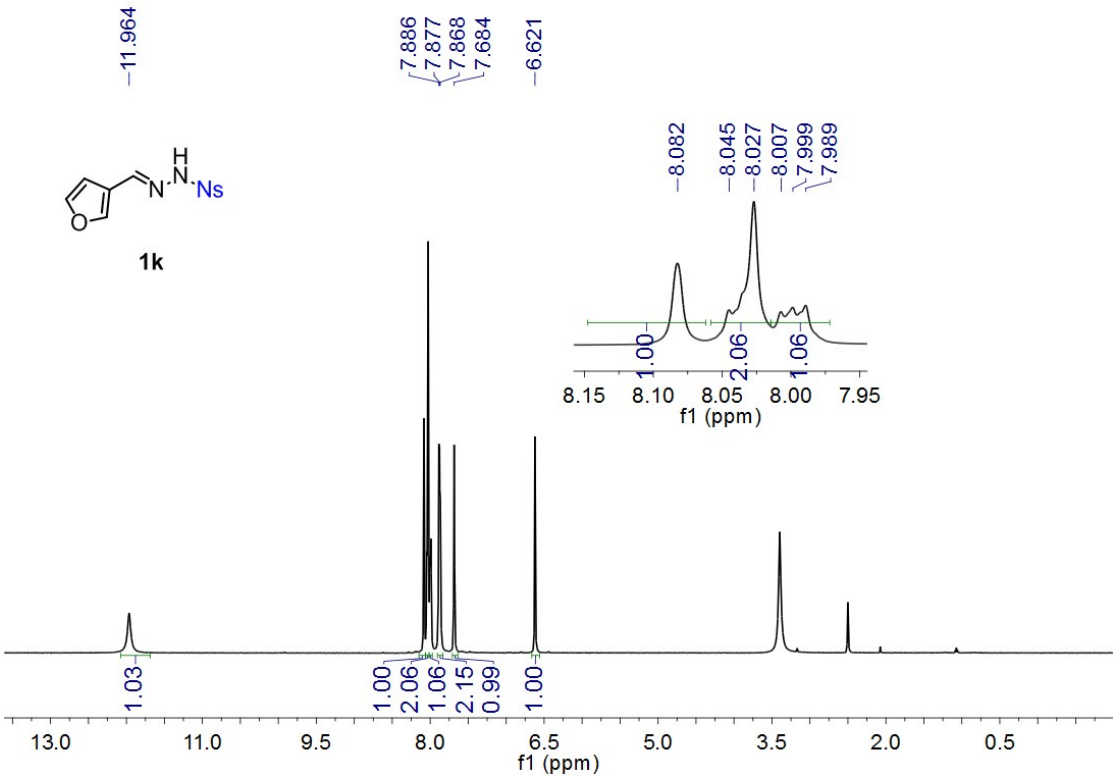
146.18
135.61
125.02
119.14
114.53
111.60
55.96
134.48
133.31
133.15
131.26
130.97
MeO
N
H
N
Ns
Br
1j
134
132
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0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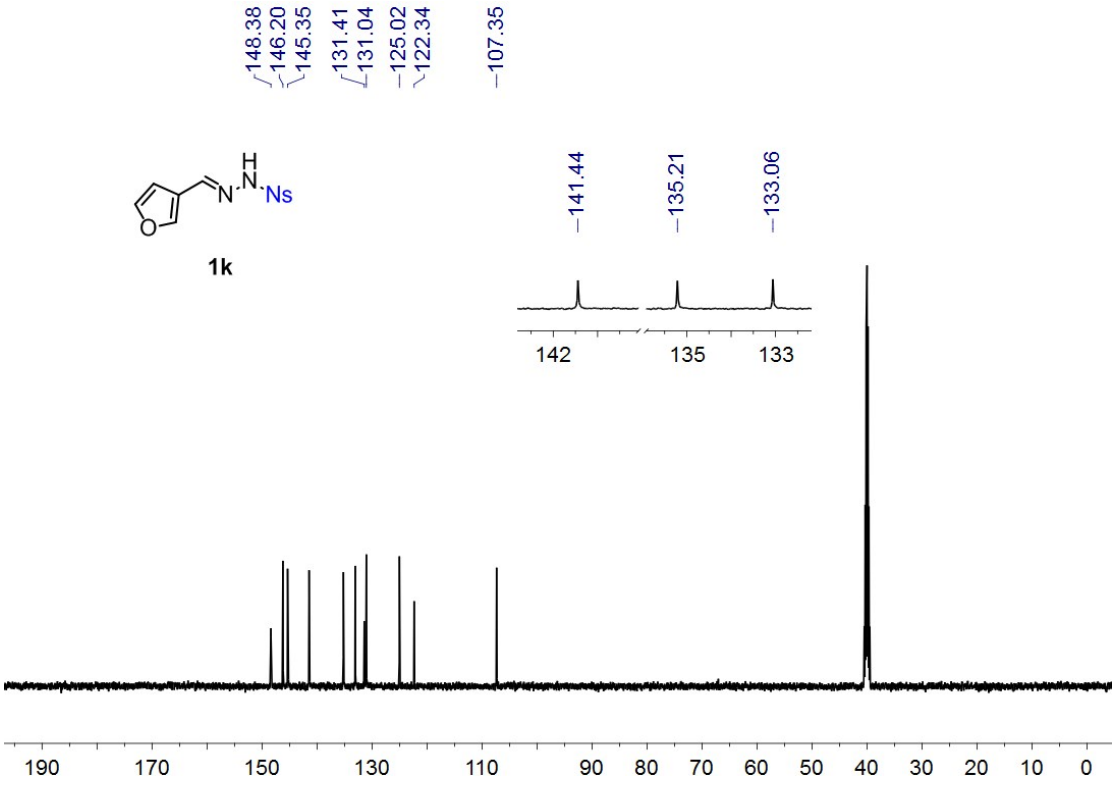
7.877
7.868
7.684
6.621
8.082
8.045
8.027
8.007
7.999
7.989
1k
1.00
2.06
1.06
8.15
8.10
8.05
8.00
7.95
f1 (ppm)
1.03
1.00
2.06
1.06
2.15
0.99
1.00
13.0
11.0
9.5
8.0
6.5
5.0
3.5
2.0
0.5
f1 (ppm)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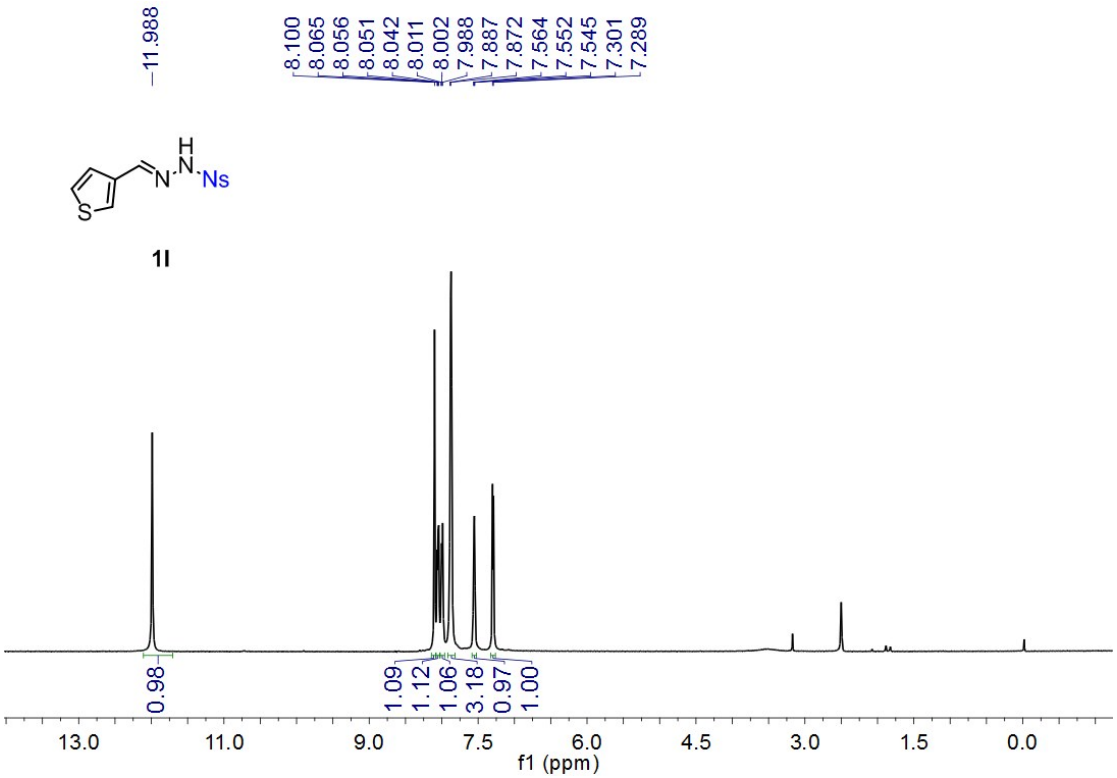
146.20
145.35
131.41
131.04
125.02
122.34
107.35
141.44
135.21
133.06
1k
142
135
133
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0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8.042
8.011
8.002
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7.887
7.872
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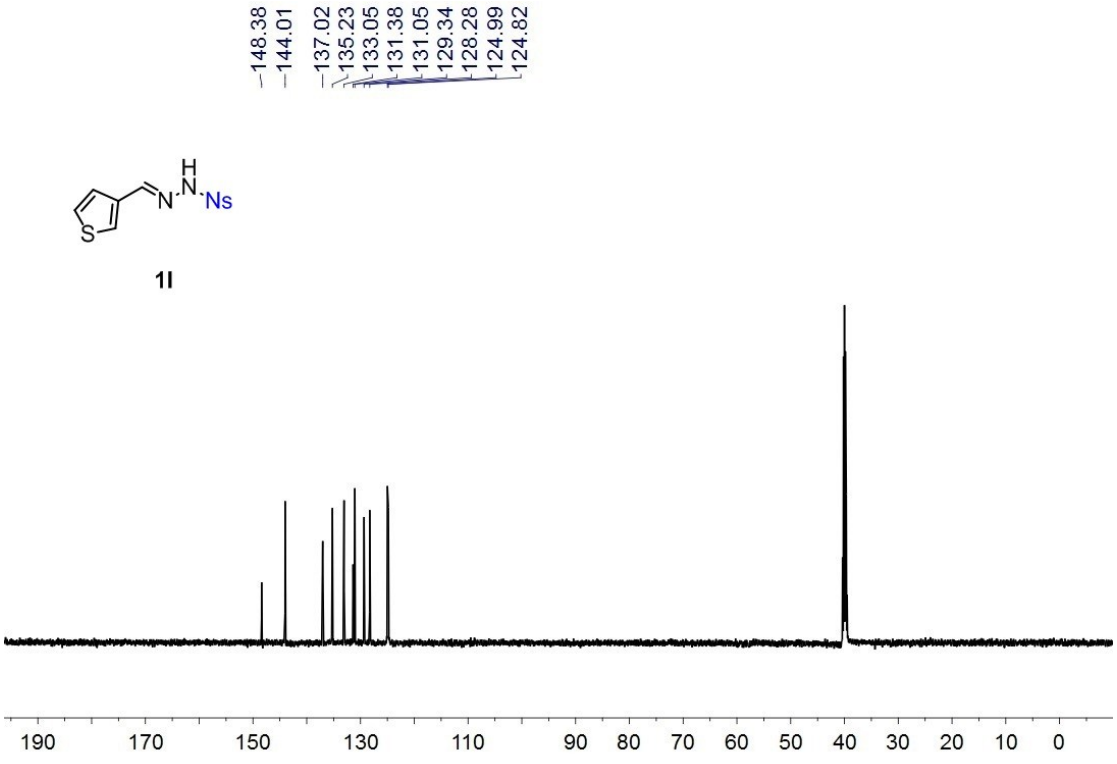
7.552
7.545
7.301
7.289
Ns
1l
0.98
1.09
1.12
1.06
3.18
0.97
1.00
13.0
11.0
9.0
7.5
6.0
4.5
3.0
1.5
0.0
f1 (ppm)


148.38
144.01
137.02
135.23
133.05
131.38
131.05
129.34
128.28
124.99
124.82
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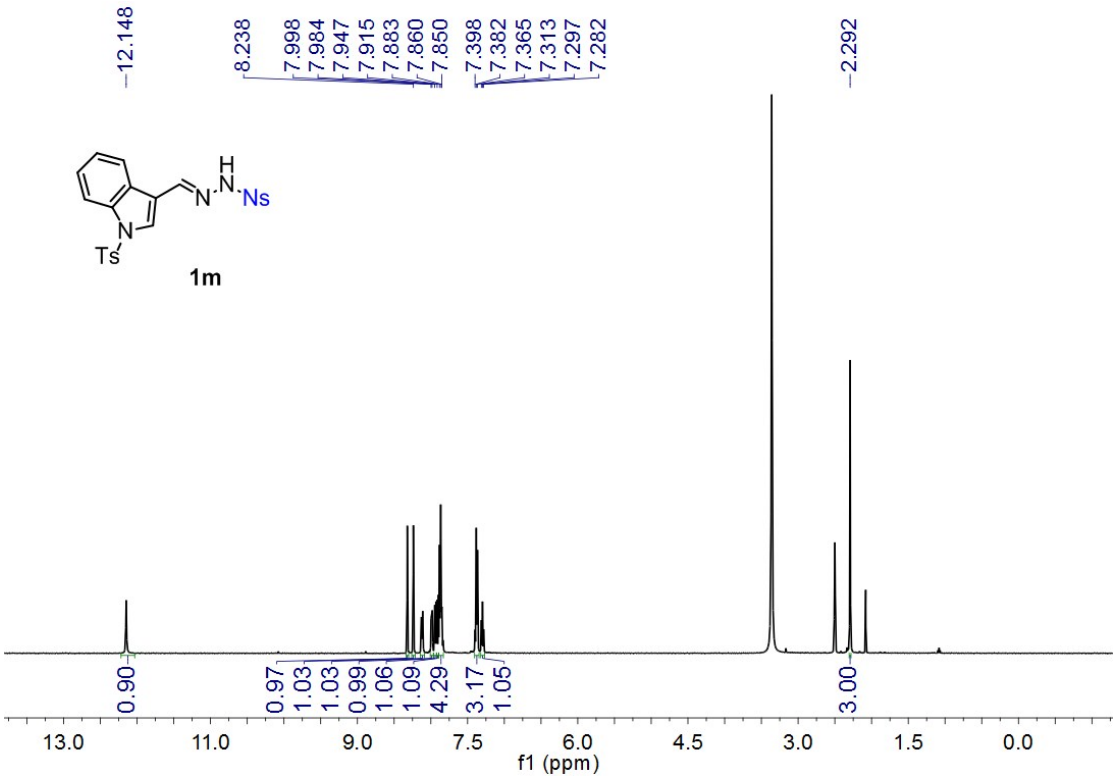
1l
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0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7.947
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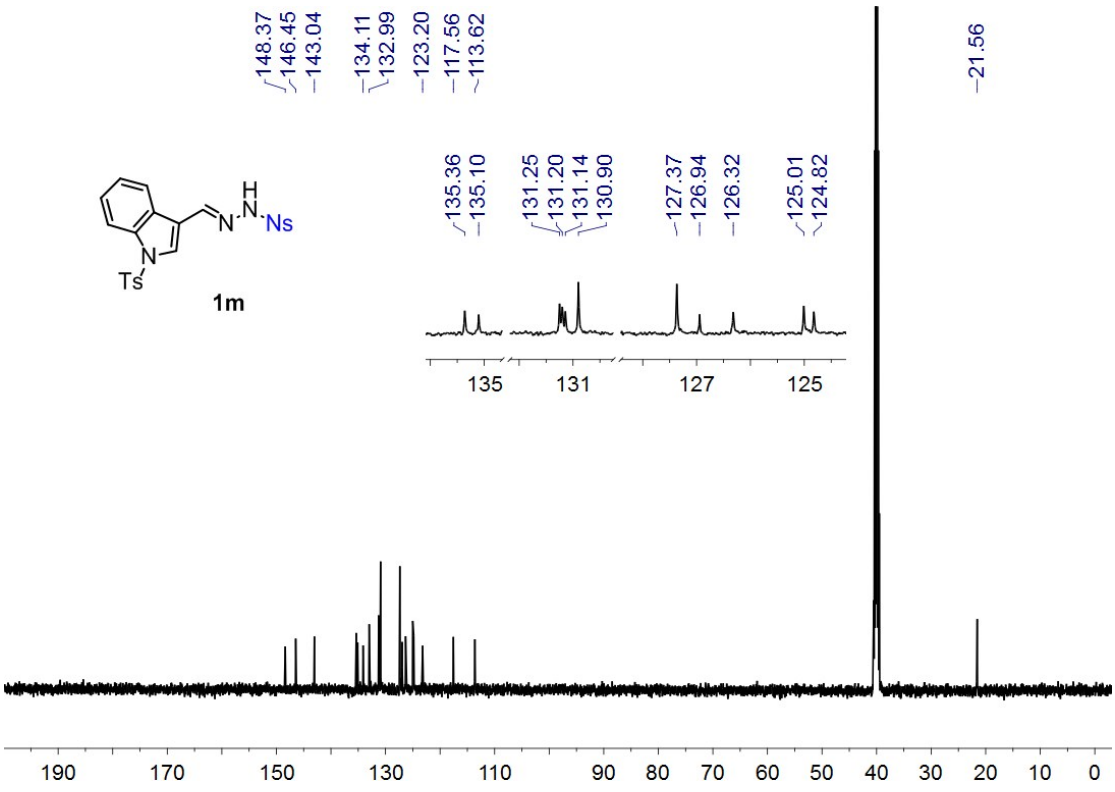
7.883
7.860
7.850
7.398
7.382
7.365
7.313
7.297
7.282
2.292
Ns
Ts
1m
0.90
0.97
1.03
1.03
0.99
1.06
1.09
4.29
3.17
1.05
3.00
13.0
11.0
9.0
7.5
6.0
4.5
3.0
1.5
0.0
f1 (ppm)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123.20
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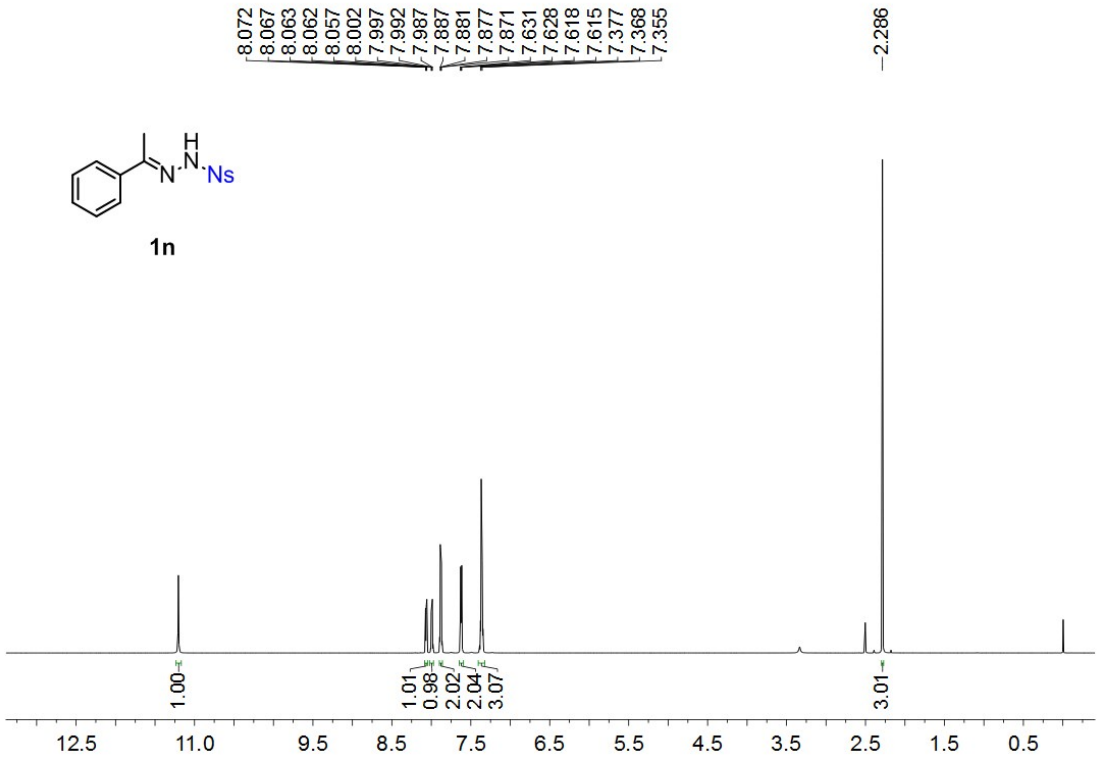
113.62
135.36
135.10
131.25
131.20
131.14
130.90
127.37
126.94
126.32
125.01
124.82
21.56
Ns
Ts
1m
135
131
127
125
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0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7.992
7.987
7.887
7.881
7.877
7.871
7.631
7.628
7.618
7.615
7.377
7.368
7.355
2.286
Ns
1n
1.00
1.01
0.98
2.02
2.04
3.07
3.01
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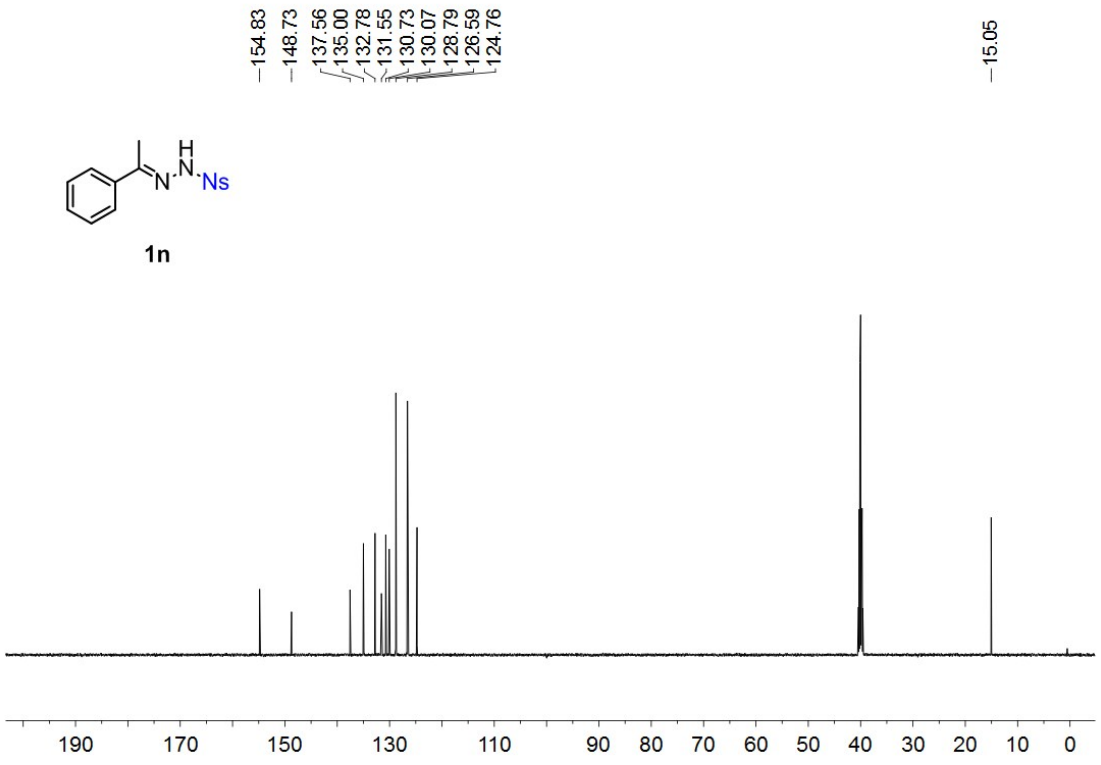
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5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131.55
130.73
130.07
128.79
126.59
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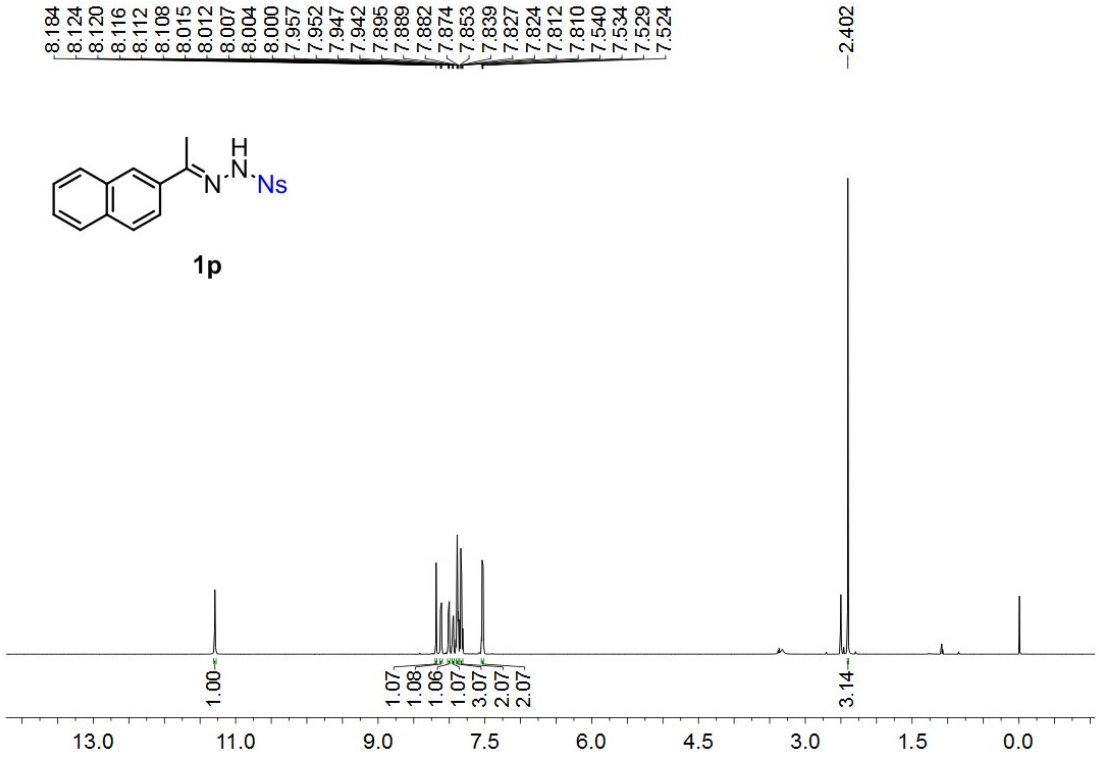
15.05
Ns
1n
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0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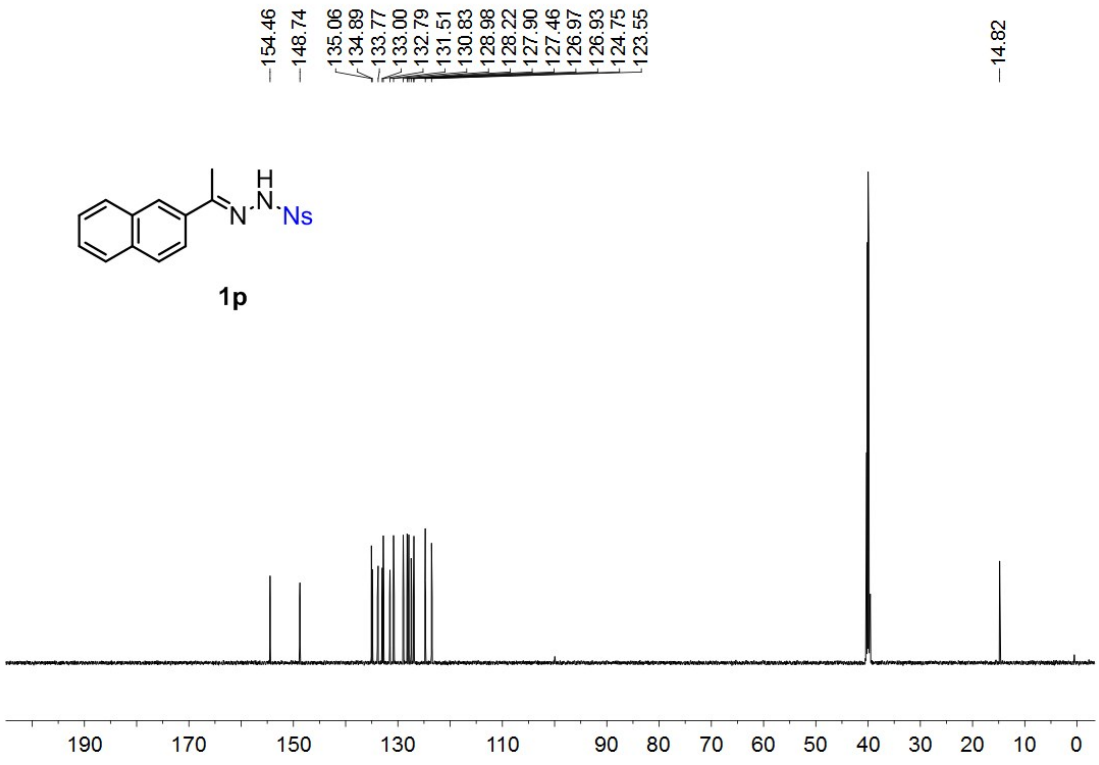
8.112
8.108
8.015
8.012
8.007
8.004
8.000
7.957
7.952
7.947
7.942
7.895
7.889
7.882
7.874
7.853
7.839
7.827
7.824
7.812
7.810
7.540
7.534
7.529
7.524
2.402
Ns
1p
1.00
1.07
1.08
1.06
1.07
3.07
2.07
2.07
3.14
13.0
11.0
9.0
7.5
6.0
4.5
3.0
1.5
0.0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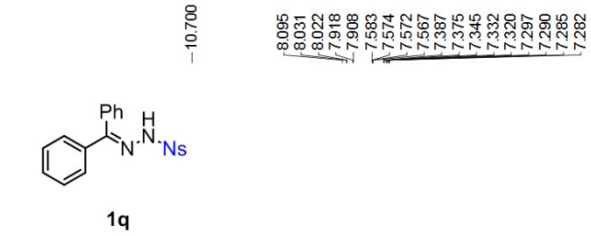
134.89
133.77
133.00
132.79
131.51
130.83
128.98
128.22
127.90
127.46
126.97
126.93
124.75
123.55
14.82
Ns
1p
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0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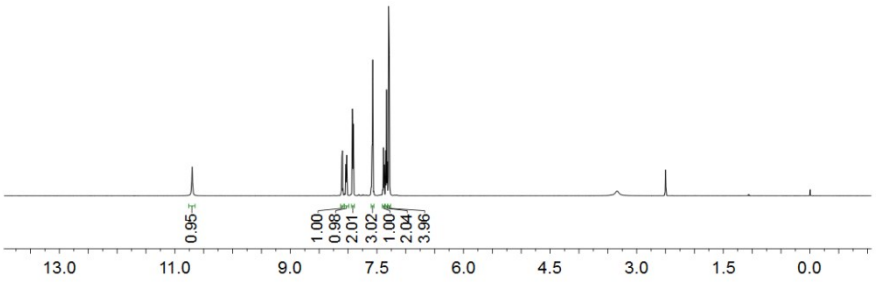
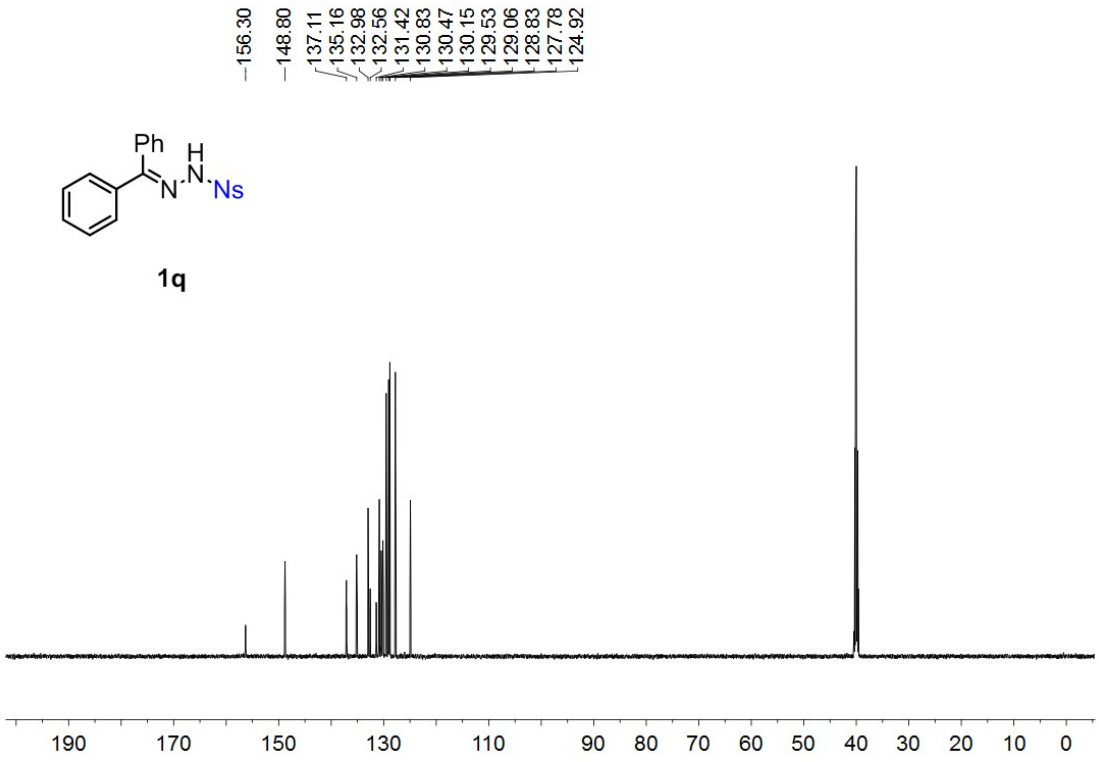
8.031
8.022
7.918
7.908
7.583
7.574
7.572
7.567
7.387
7.375
7.345
7.332
7.320
7.297
7.290
7.285
7.282
Ph
H
N
N
Ns

1q


0.95
1.00
0.98
2.01
3.02
1.00
2.04
3.96
13.0
11.0
9.0
7.5
6.0
4.5
3.0
1.5
0.0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148.80
137.11
135.16
132.98
132.56
131.42
130.83
130.47
130.15
129.53
129.06
128.83
127.78
124.92
Ph
H
N
N
Ns
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0

1q


12.099
8.033
8.024
8.017
8.009
7.998
7.992
7.983
7.902
7.894
7.888
7.879
7.569
7.551
7.365
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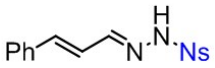
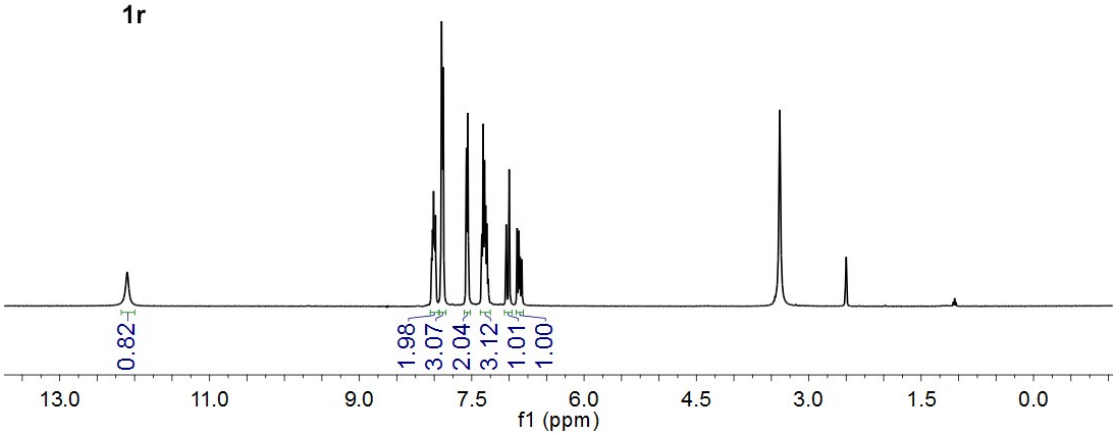
7.329
7.314
7.297
7.279
7.039
6.999
6.893
6.870
6.853
6.830


Ph
N
H
N
Ns

1r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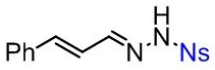
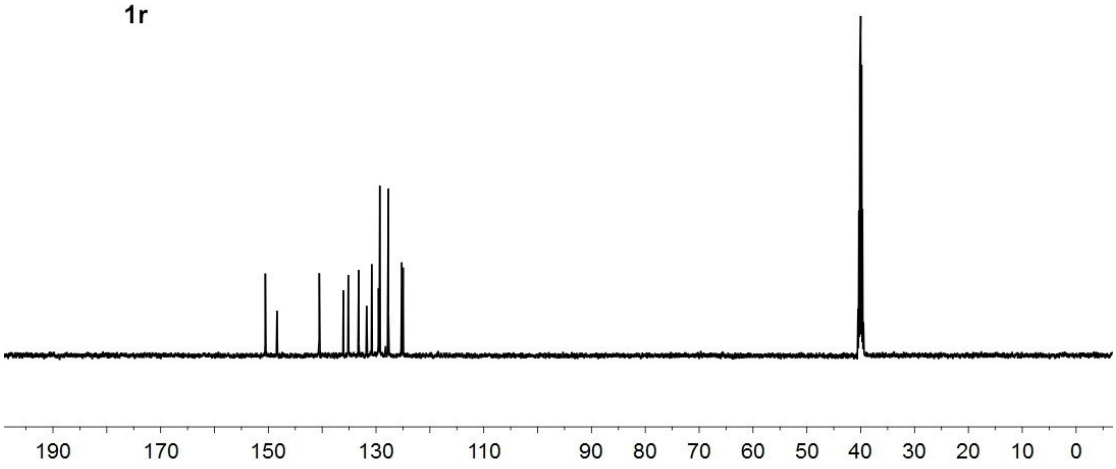
1.98
3.07
2.04
3.12
1.01
1.00
13.0
11.0
9.0
7.5
6.0
4.5
3.0
1.5
0.0
f1 (ppm)


150.56
148.39
140.54
136.07
135.15
133.22
131.75
130.80
129.54
129.30
127.71
125.23
124.98


Ph
N
H
N
Ns

1r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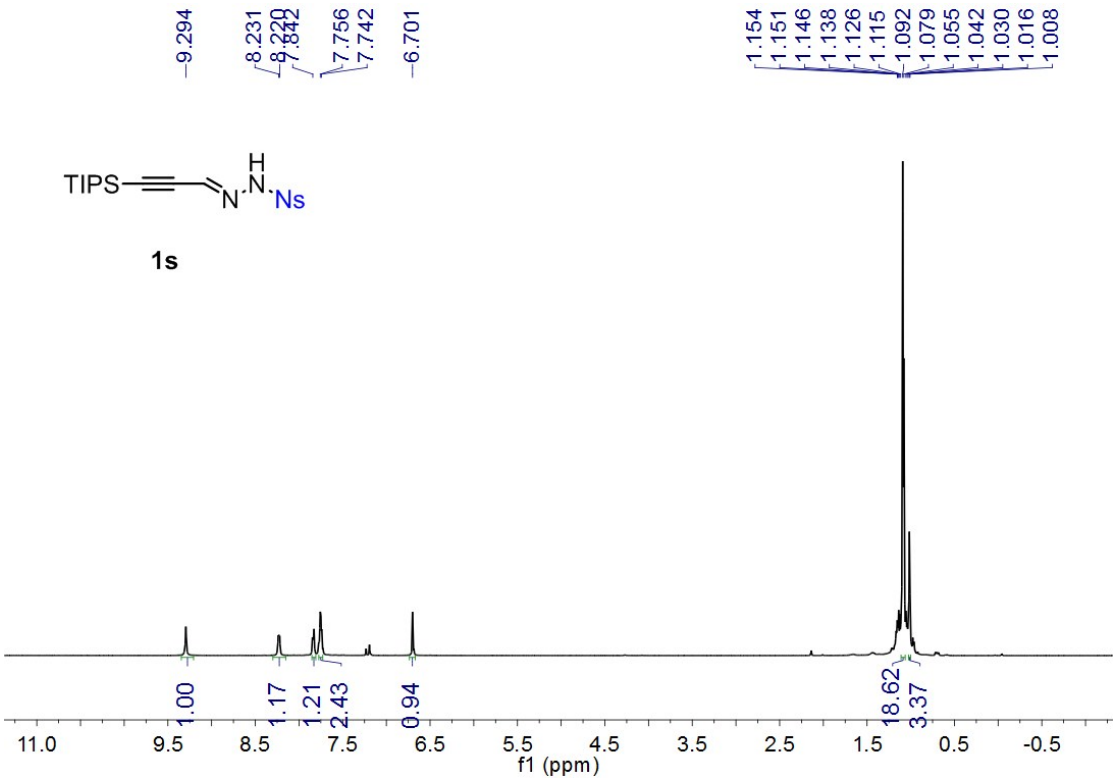
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1.154
1.151
1.146
1.138
1.126
1.115
1.092
1.079
1.055
1.042
1.030
1.016
1.008
TIPS
N
H
N
Ns
1s
1.00
1.17
1.21
2.43
0.94
18.62
3.37
11.0
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6.5
5.5
4.5
3.5
2.5
1.5
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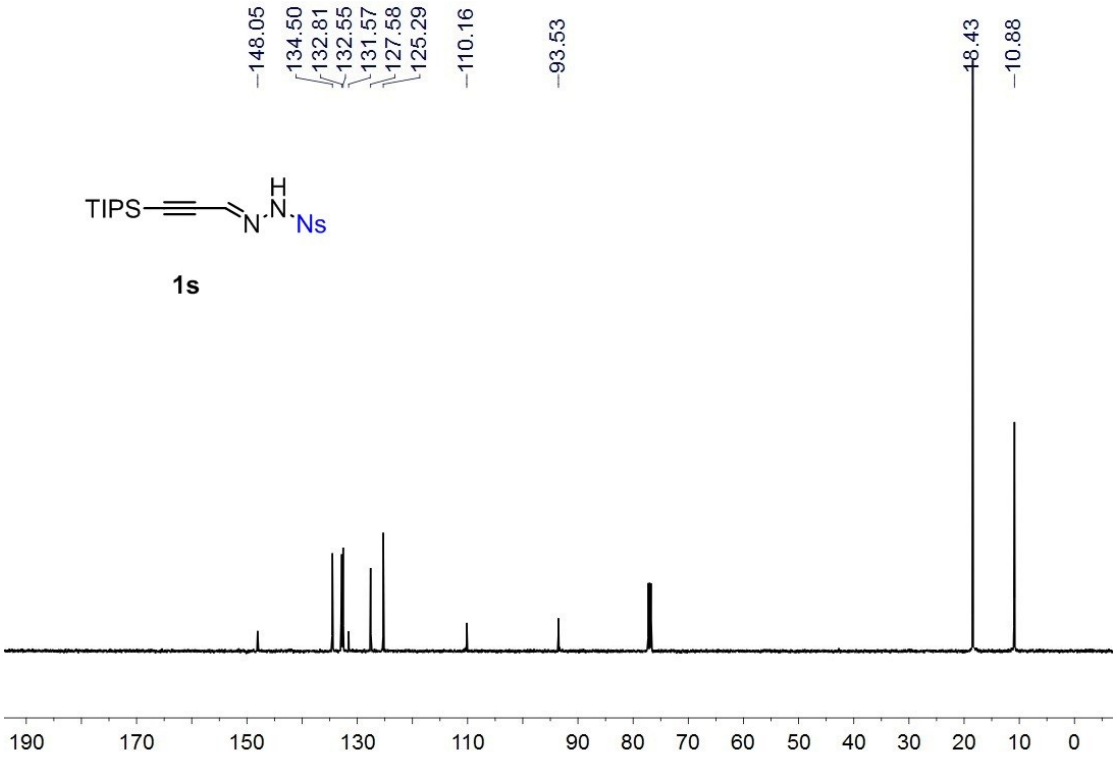
f1 (ppm)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10.88
TIPS
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N
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1s
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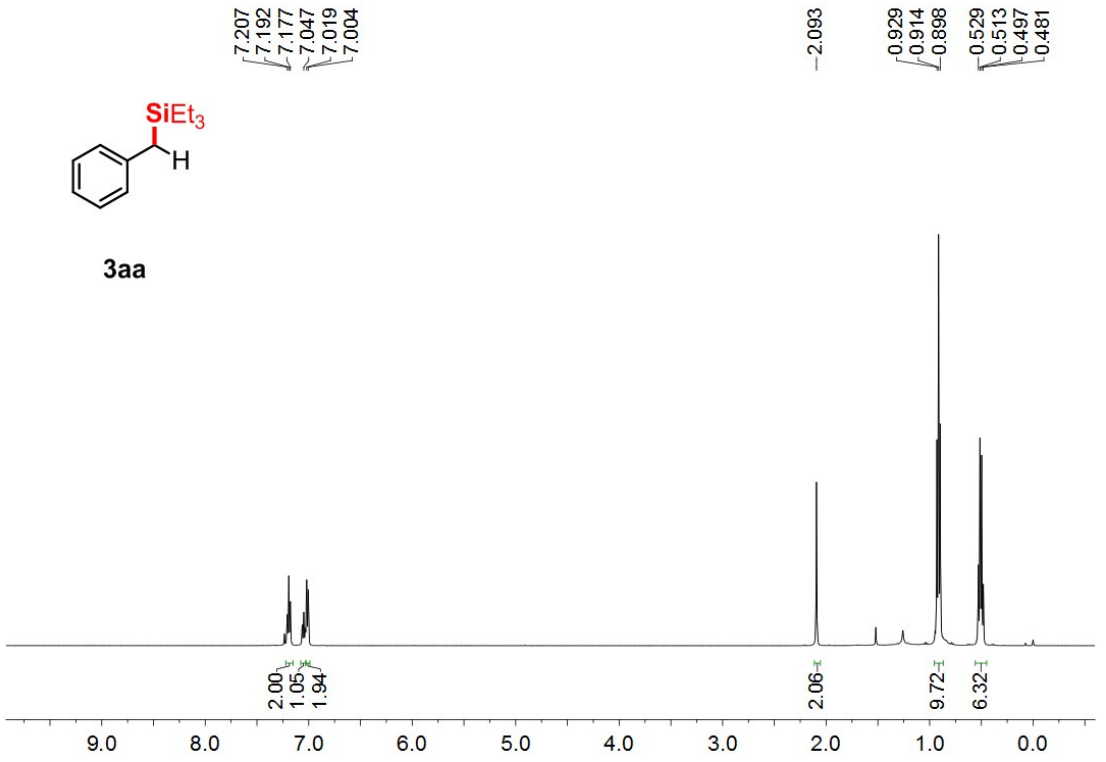
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0.898
0.529
0.513
0.497
0.481
SiEt3
H
3aa
2.00
1.05
1.94
2.06
9.72
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8.0
7.0
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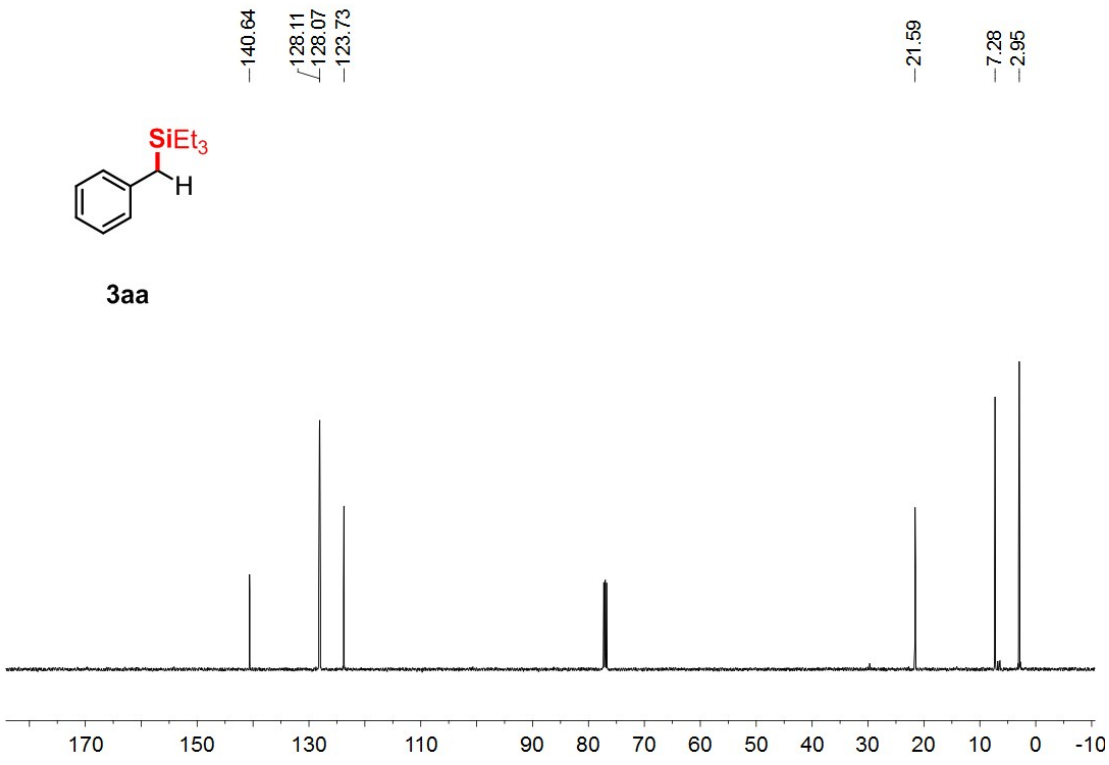
0.0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128.07
123.73
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7.28
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3aa
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50
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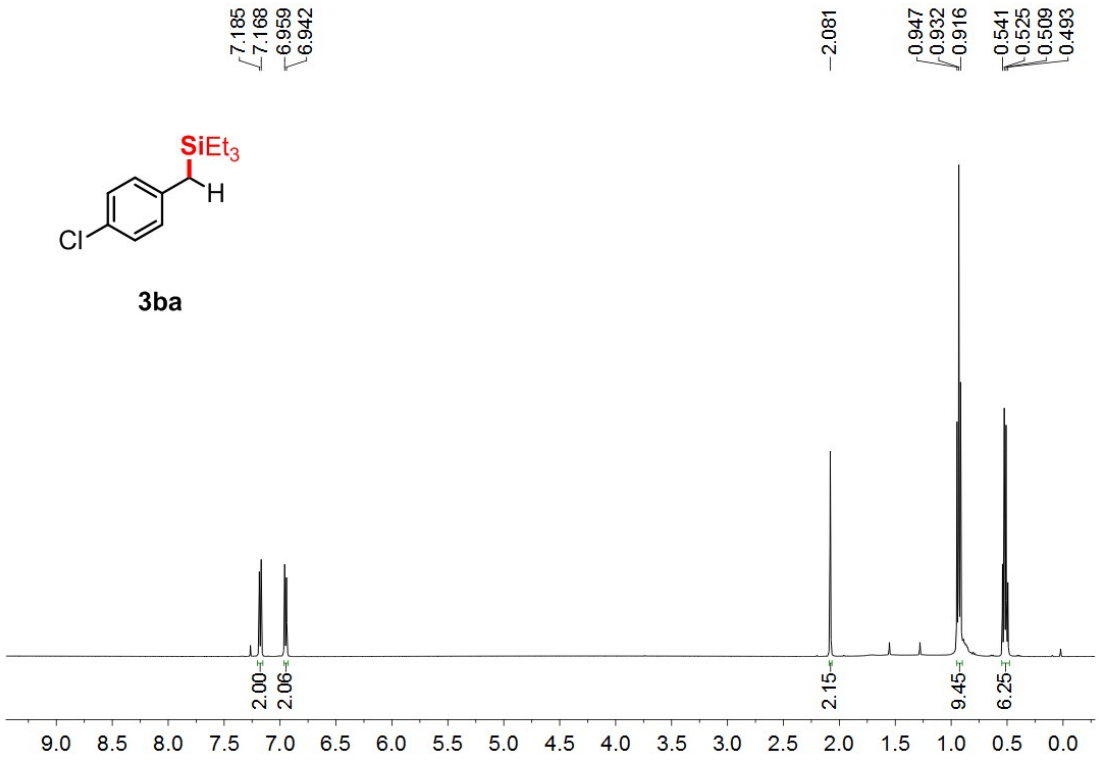
10
0
-10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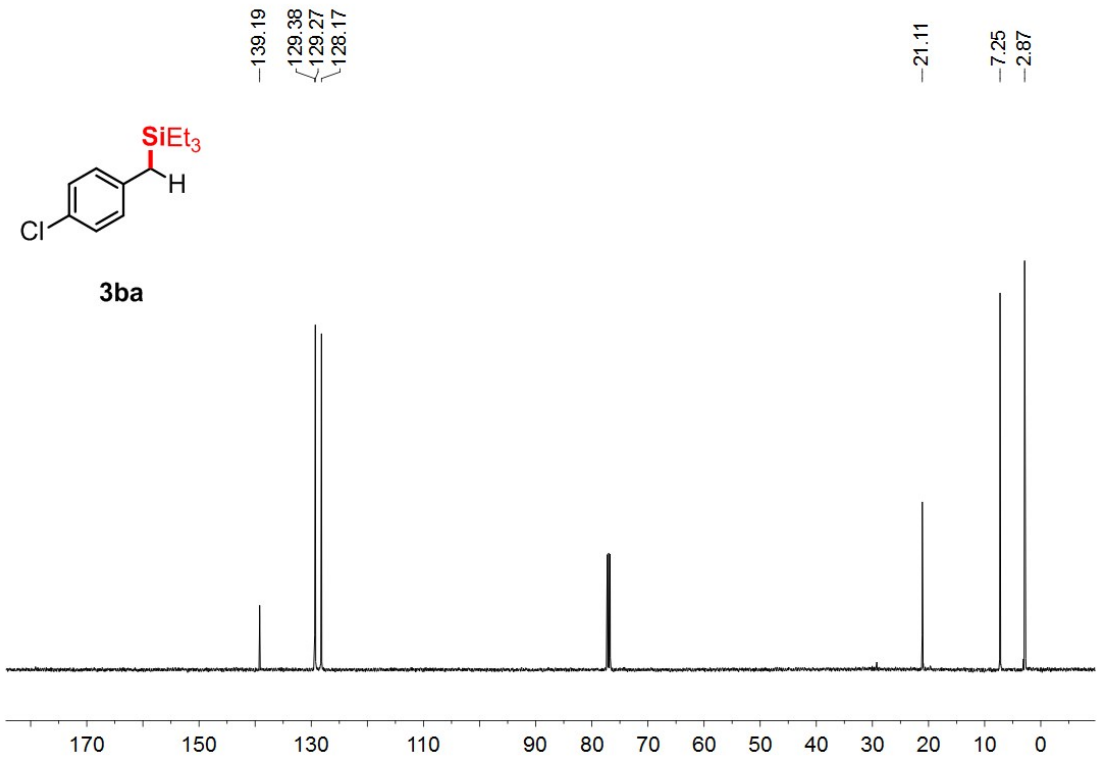
0.916
0.541
0.525
0.509
0.493
SiEt3
H
Cl
3ba
2.00
2.06
2.15
9.45
6.25
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0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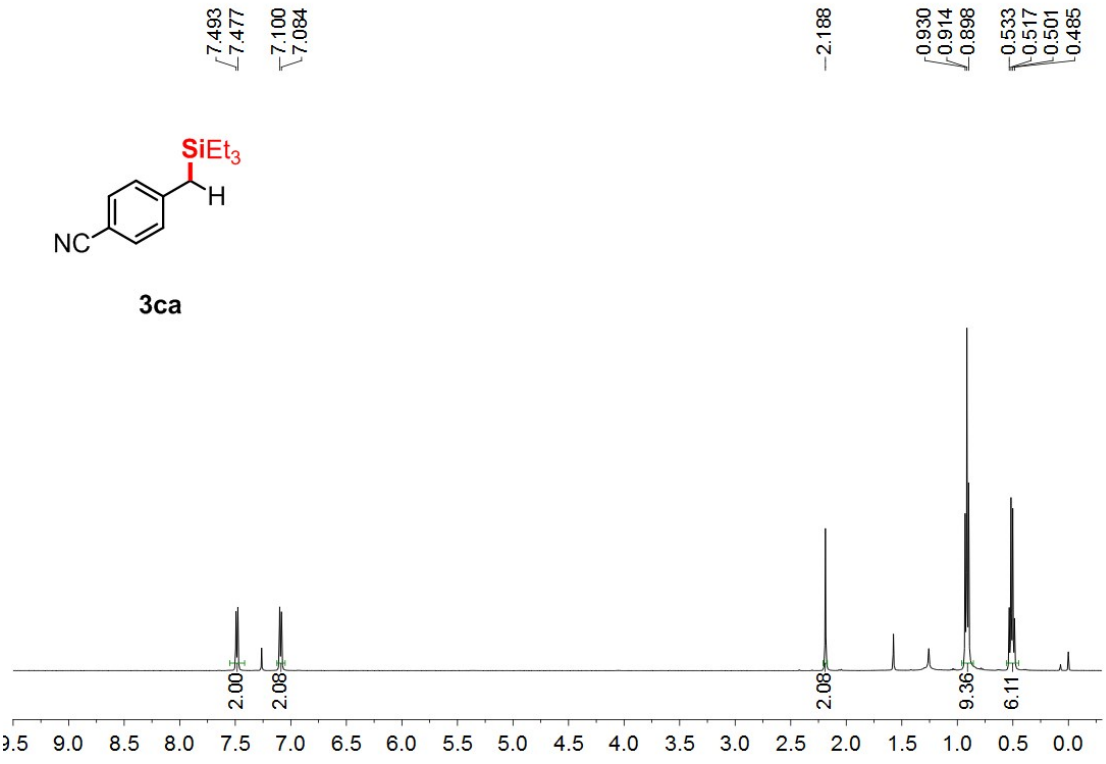
Cl
3ba
170 150 130 110 90 80 70 60 50 40 30 20 10 0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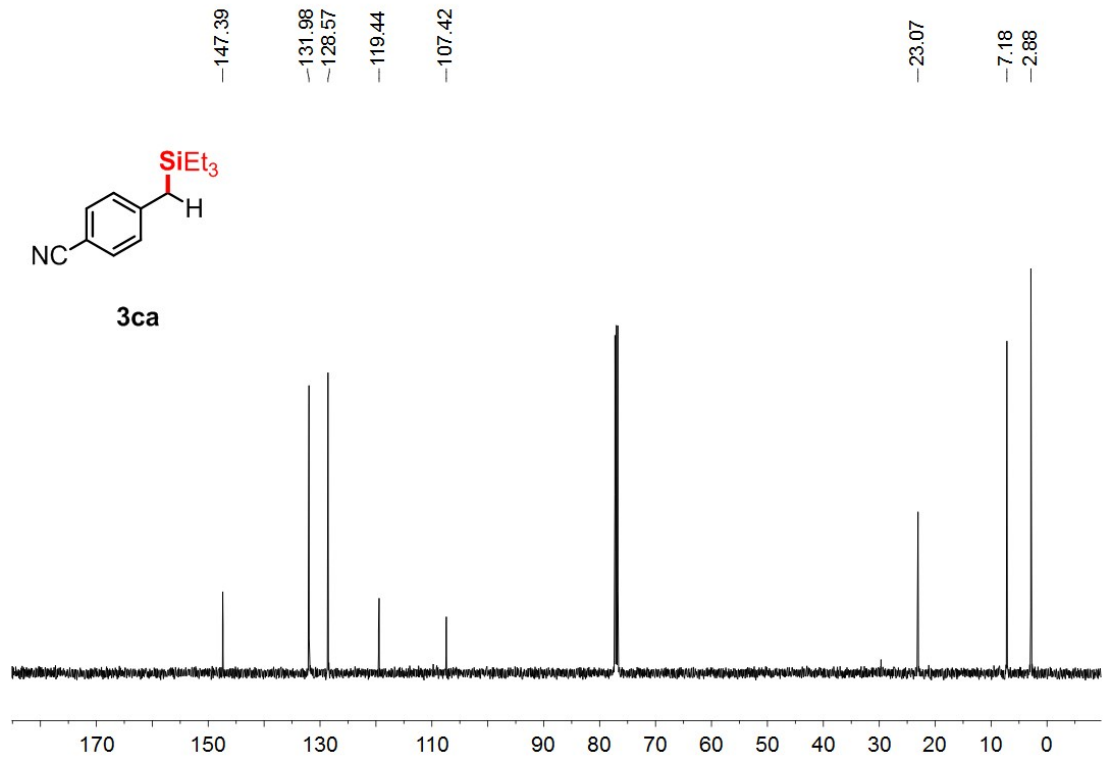
0.898
0.533
0.517
0.501
0.485
SiEt3
H
NC
3ca
2.00
2.08
2.08
9.36
6.11
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0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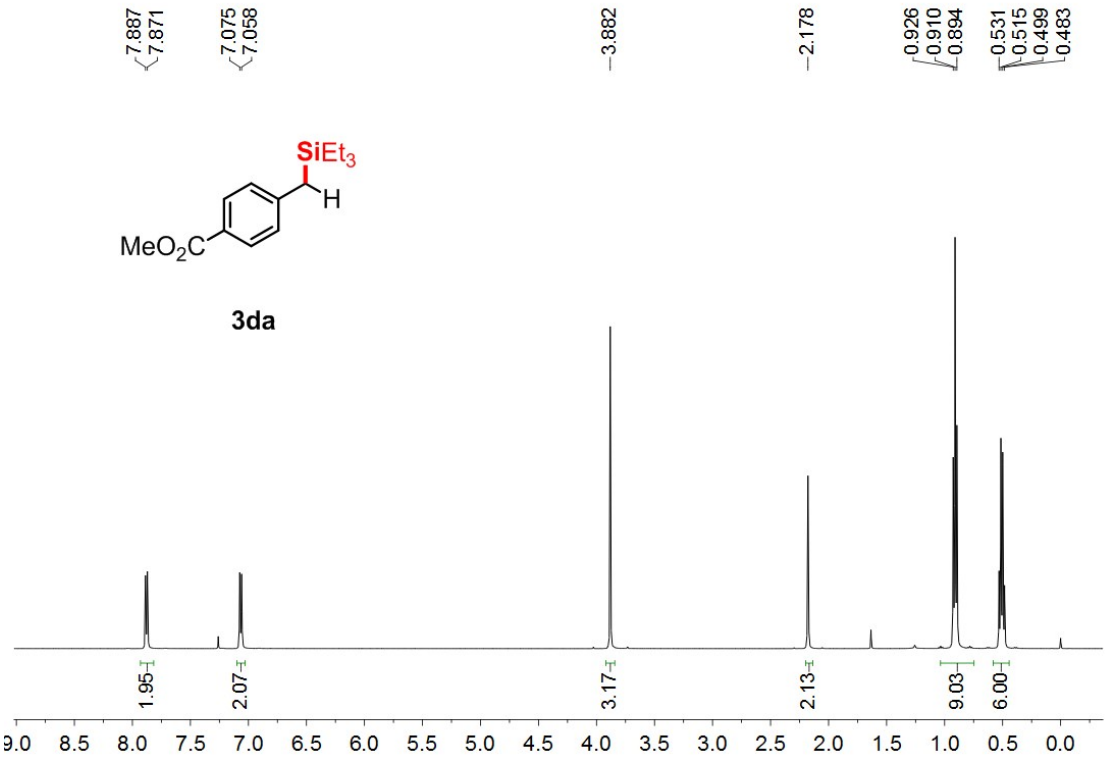
7.18
2.88
SiEt3
H
NC
3ca
170 150 130 110 90 80 70 60 50 40 30 20 10 0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7.871
7.075
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2.178
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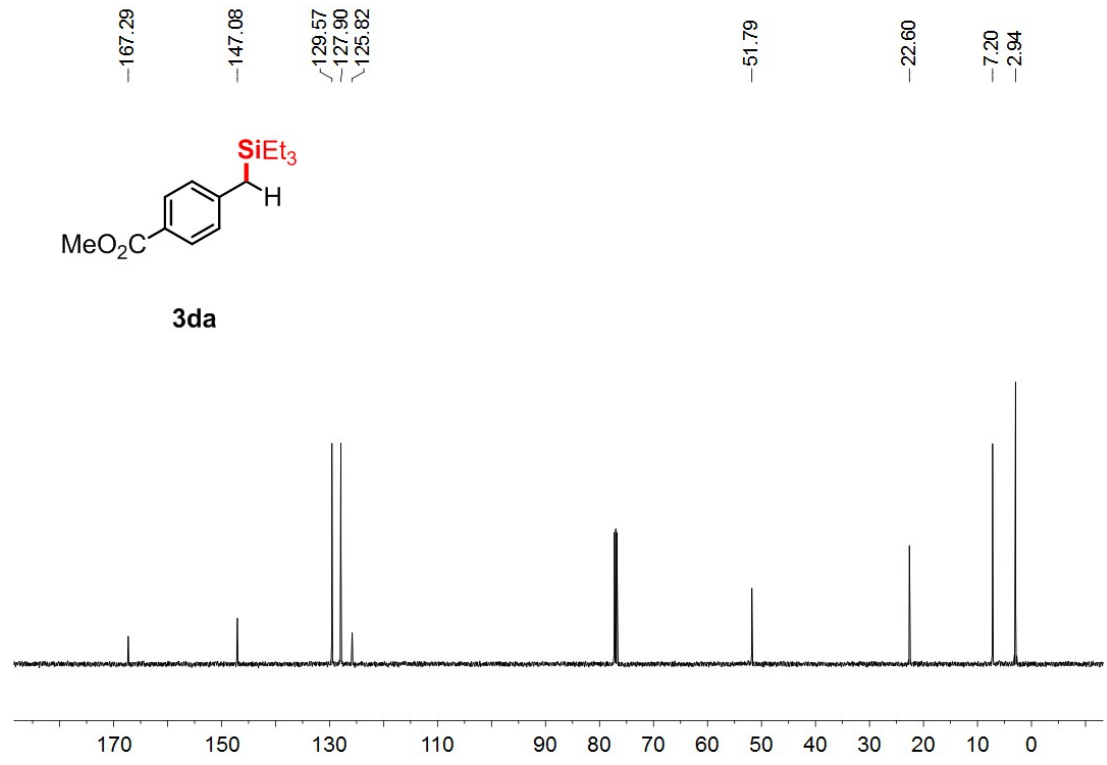
0.910
0.894
0.531
0.515
0.499
0.483
SiEt3
H
MeO2C
3da
1.95
2.07
3.17
2.13
9.03
6.00
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0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22.60
7.20
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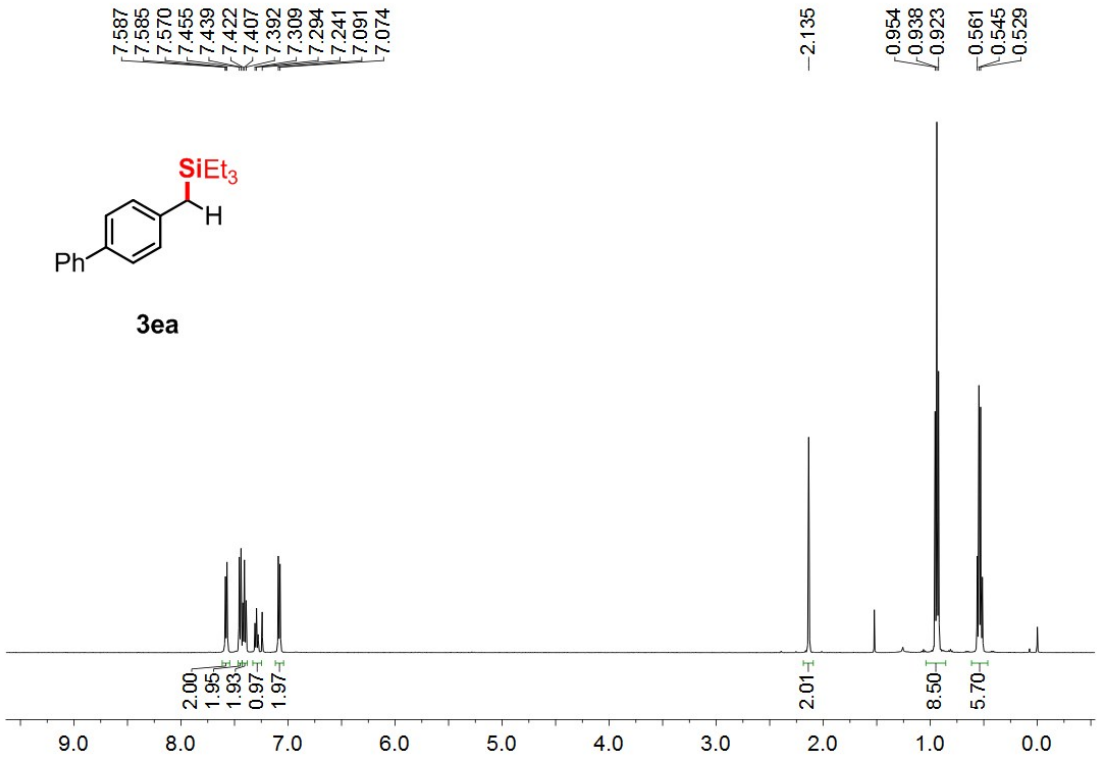
H
MeO2C
3da
170 150 130 110 90 80 70 60 50 40 30 20 10 0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7.392
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7.294
7.241
7.091
7.074
2.135
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0.938
0.923
0.561
0.545
0.529
SiEt3
H
Ph
2.00
1.95
1.93
0.97
1.97
2.01
8.50
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7.0
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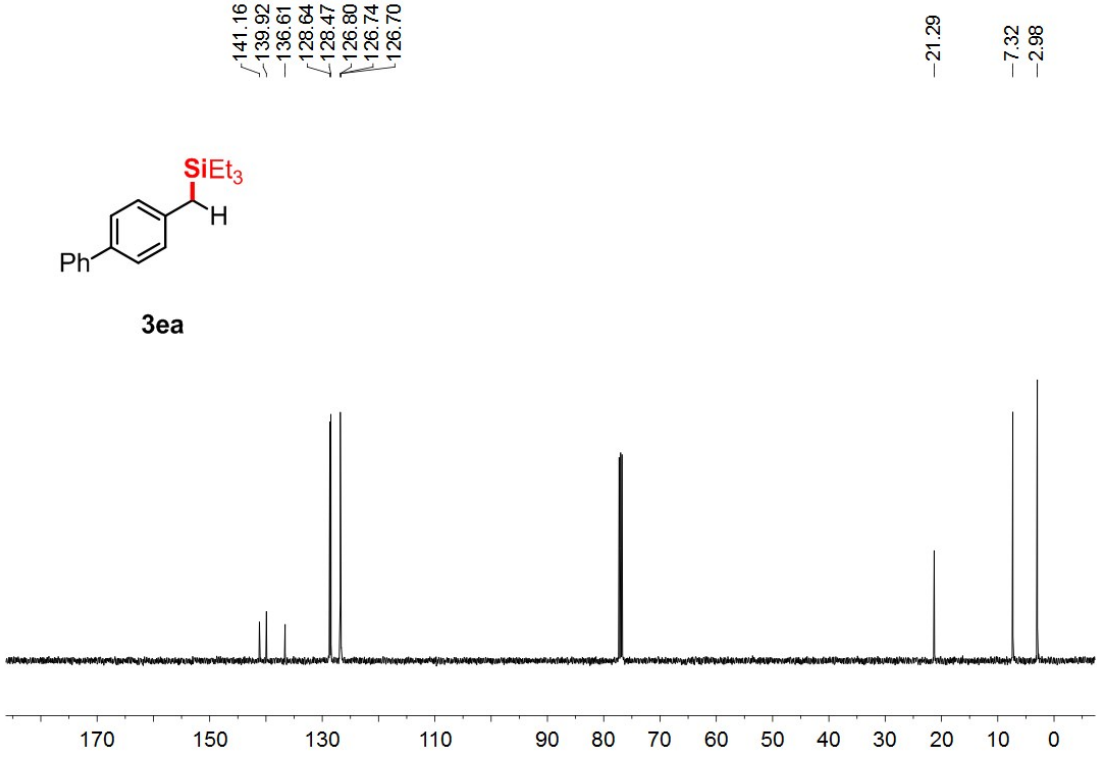
3.0
2.0
1.0
0.0

3ea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7.32
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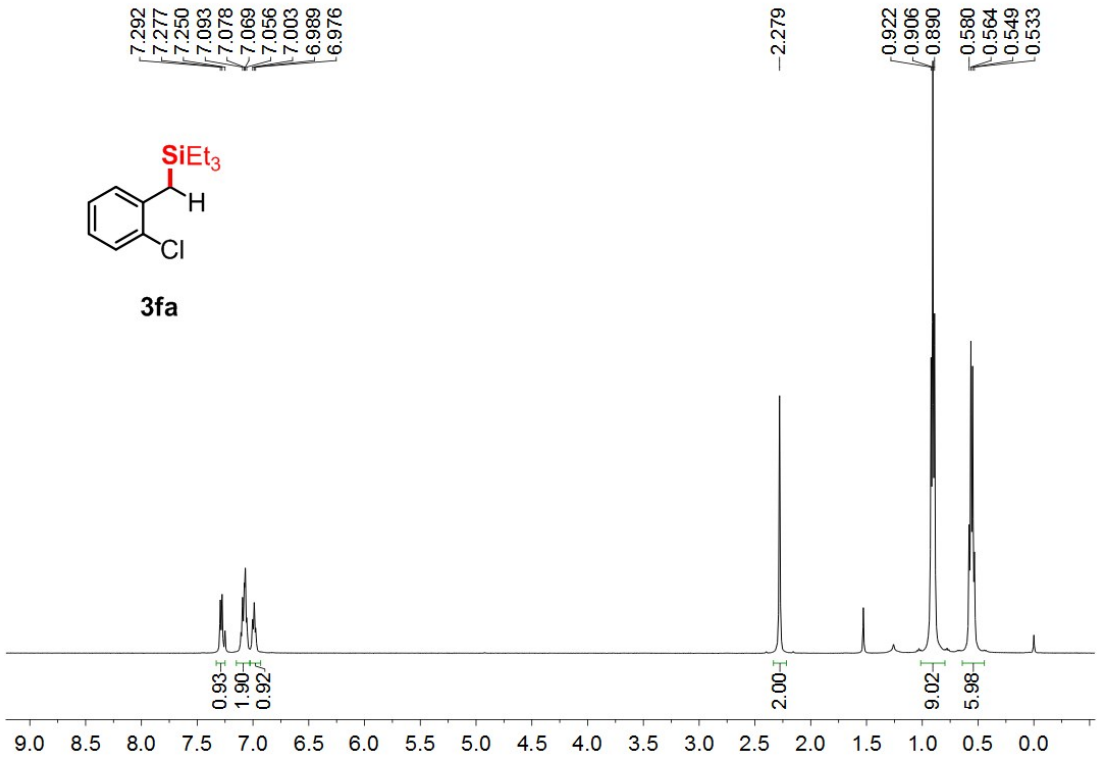
Ph
170
150
130
110
90
80
70
60
50
40
30
20
10
0

3ea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7.003
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0.906
0.890
0.580
0.564
0.549
0.533
SiEt3
H
Cl
3fa
0.93
1.90
0.92
2.00
9.02
5.98
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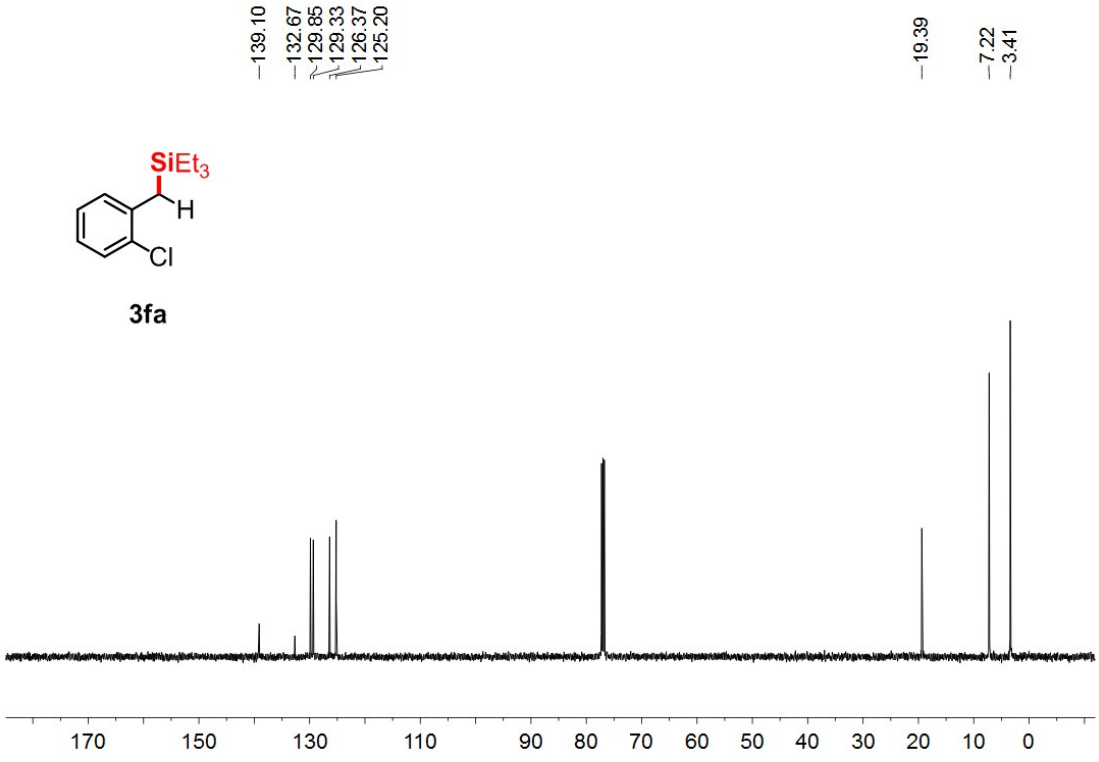
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3.41
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H
Cl
3fa
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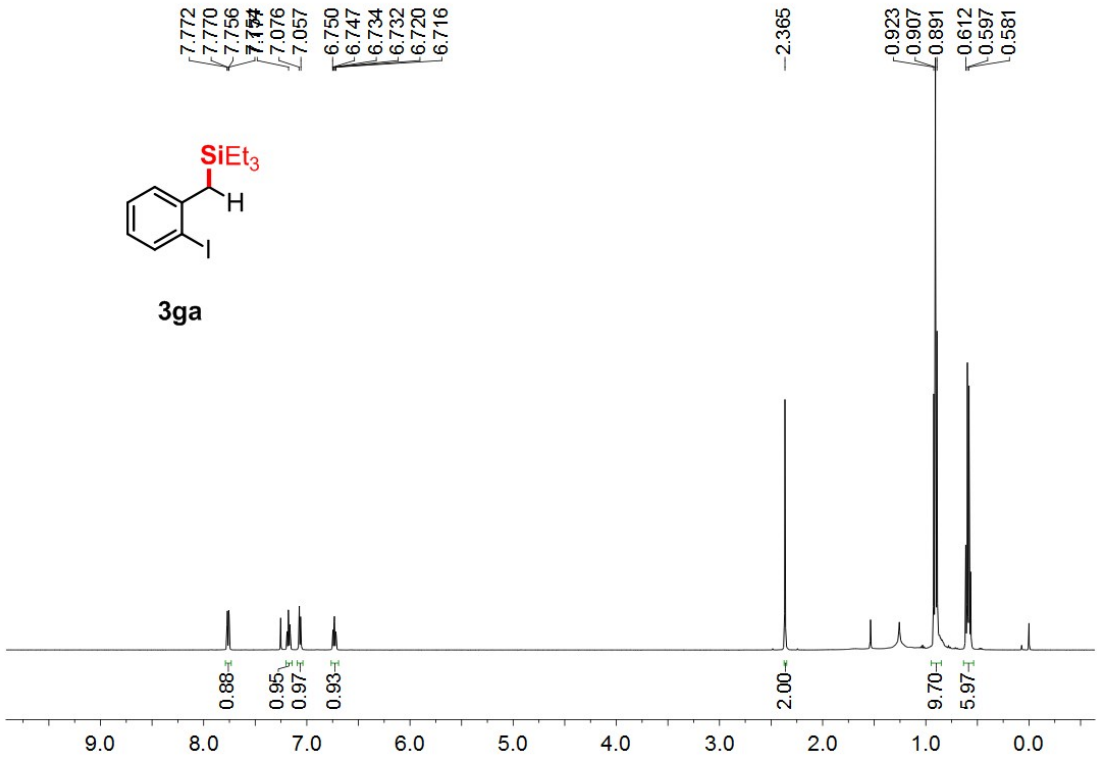
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6.734
6.732
6.720
6.716
2.365
0.923
0.907
0.891
0.612
0.597
0.581
SiEt3
H
I
3ga
0.88
0.95
0.97
0.93
2.00
9.70
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9.0
8.0
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6.0
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4.0
3.0
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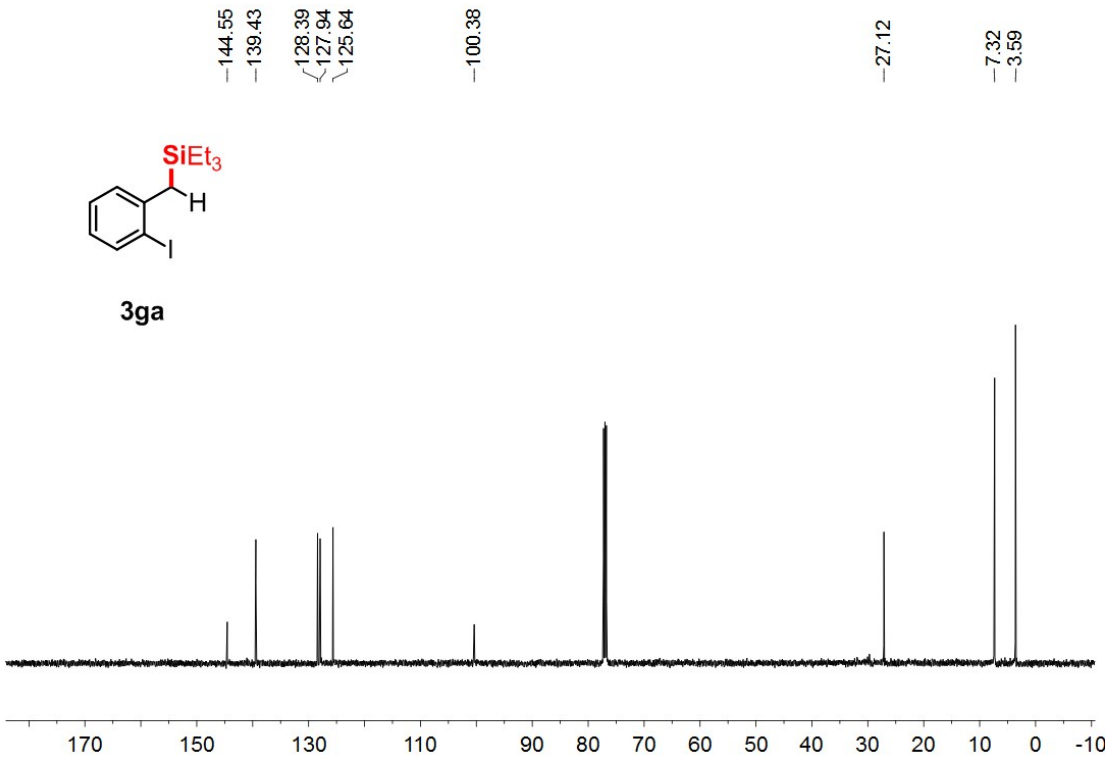
1.0
0.0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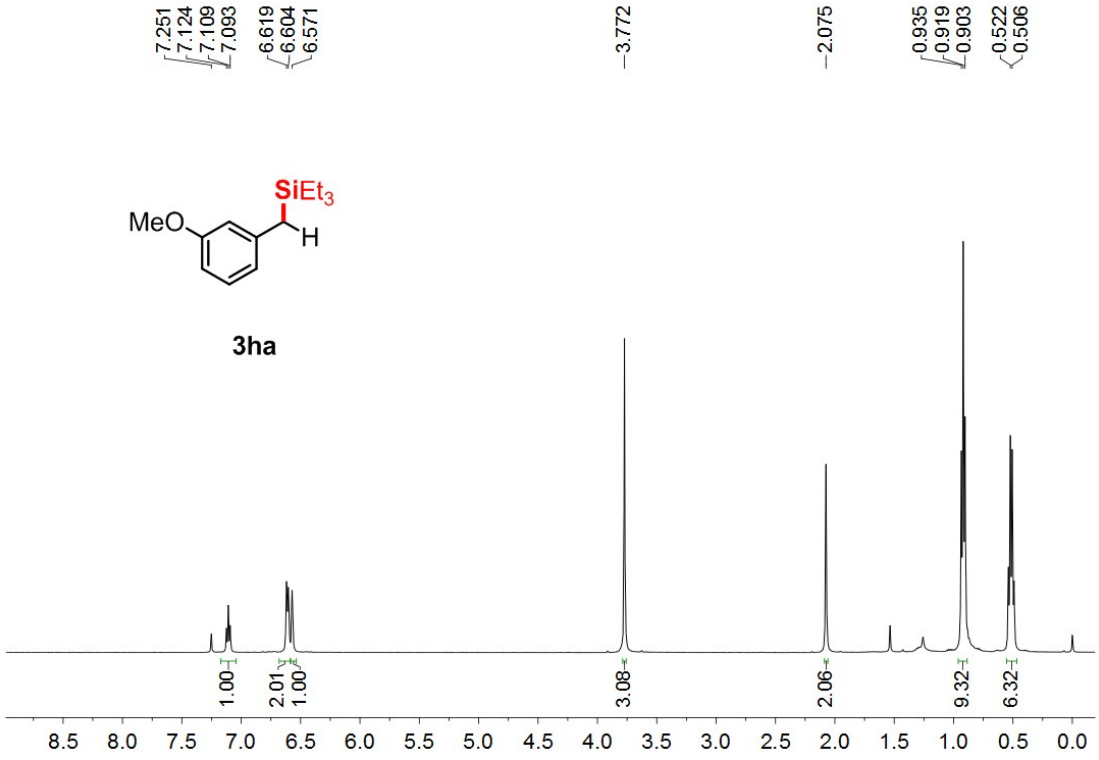
127.94
125.64
100.38
27.12
7.32
3.59
SiEt3
H
I
3ga
170
150
130
110
90
80
70
60
50
40
30
20
10
0
-10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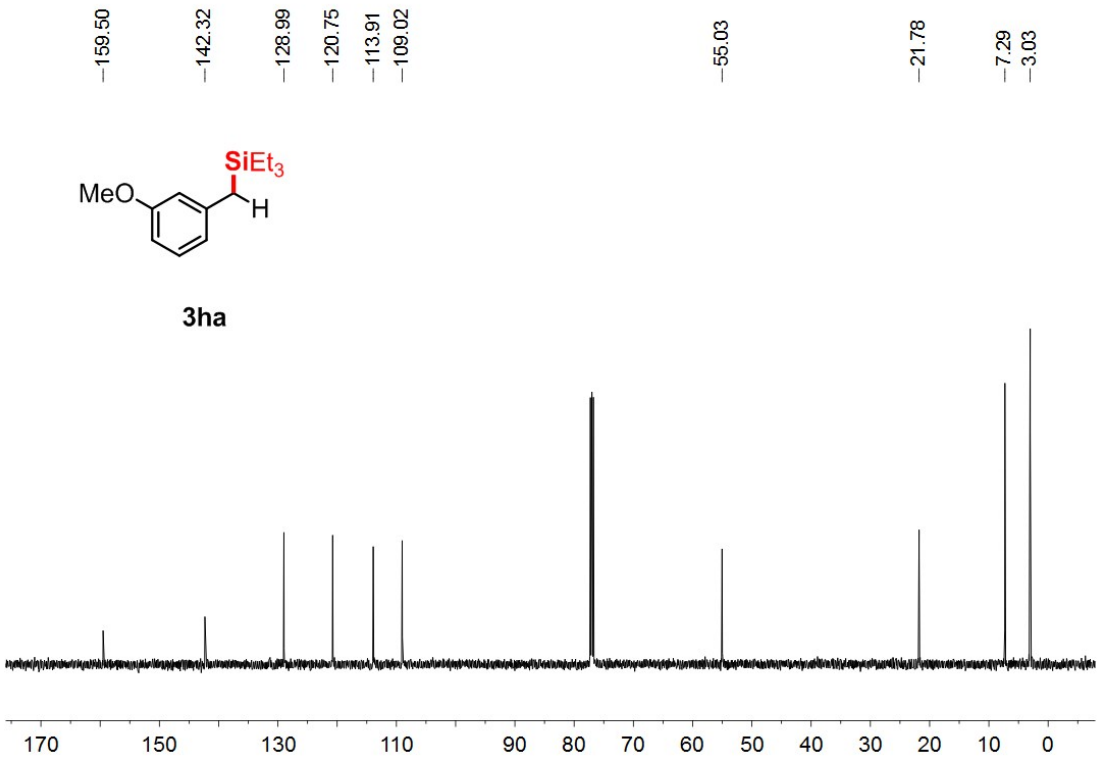
3.772
2.075
0.935
0.919
0.903
0.522
0.506
SiEt3
MeO
H
1.00
2.01
1.00
3.08
2.06
9.32
6.32
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0

3ha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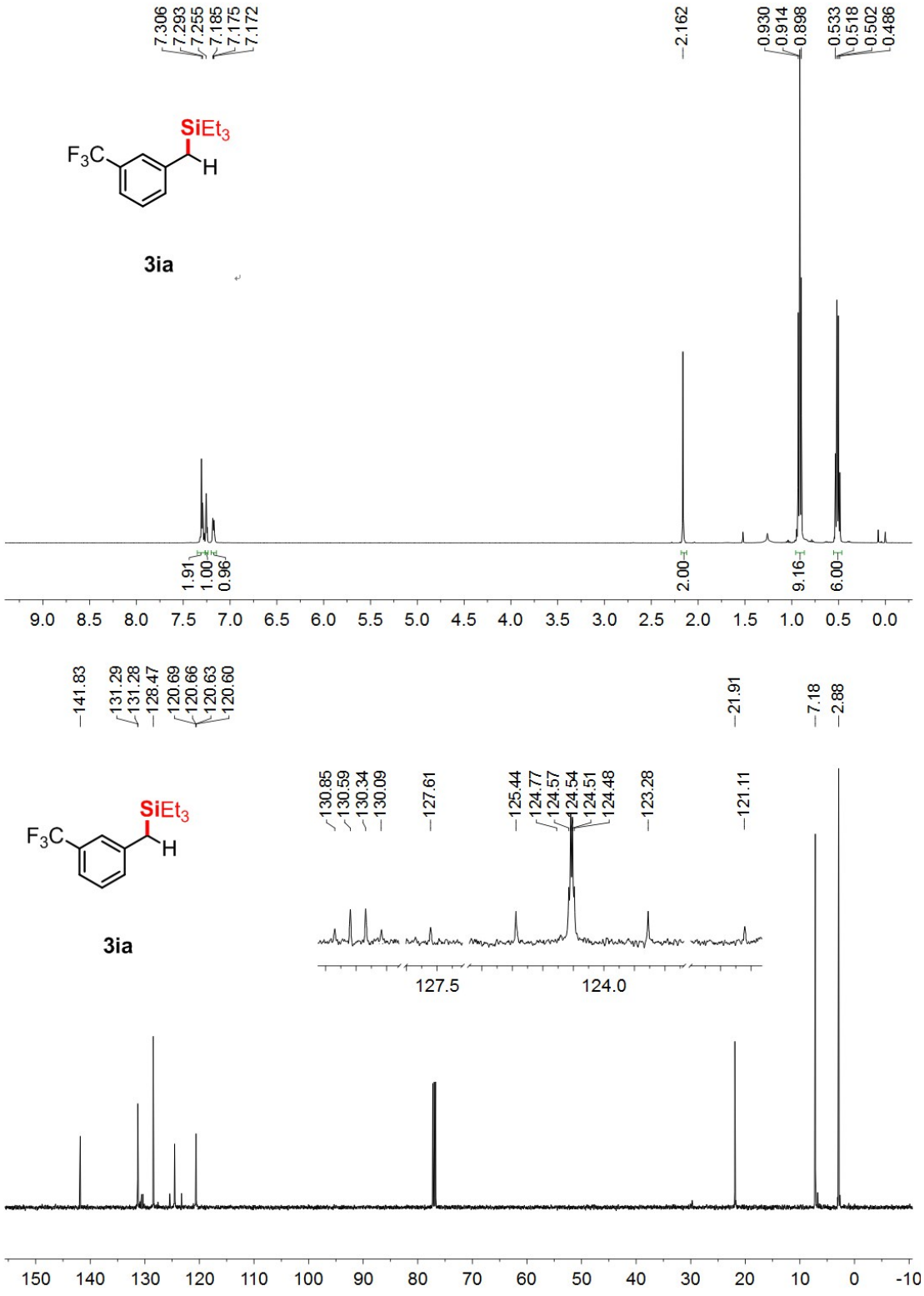
3.03
SiEt3
MeO
H
170 150 130 110 90 80 70 60 50 40 30 20 10 0

3ha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0.898
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0.518
0.502
0.486
SiEt3
F3C
H
3ia
1.91
1.00
0.96
2.00
9.16
6.00
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
141.83
131.29
131.28
128.47
120.69
120.66
120.63
120.60
21.91
7.18
2.88
130.85
130.59
130.34
130.09
127.61
125.44
124.77
124.57
124.54
124.51
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H
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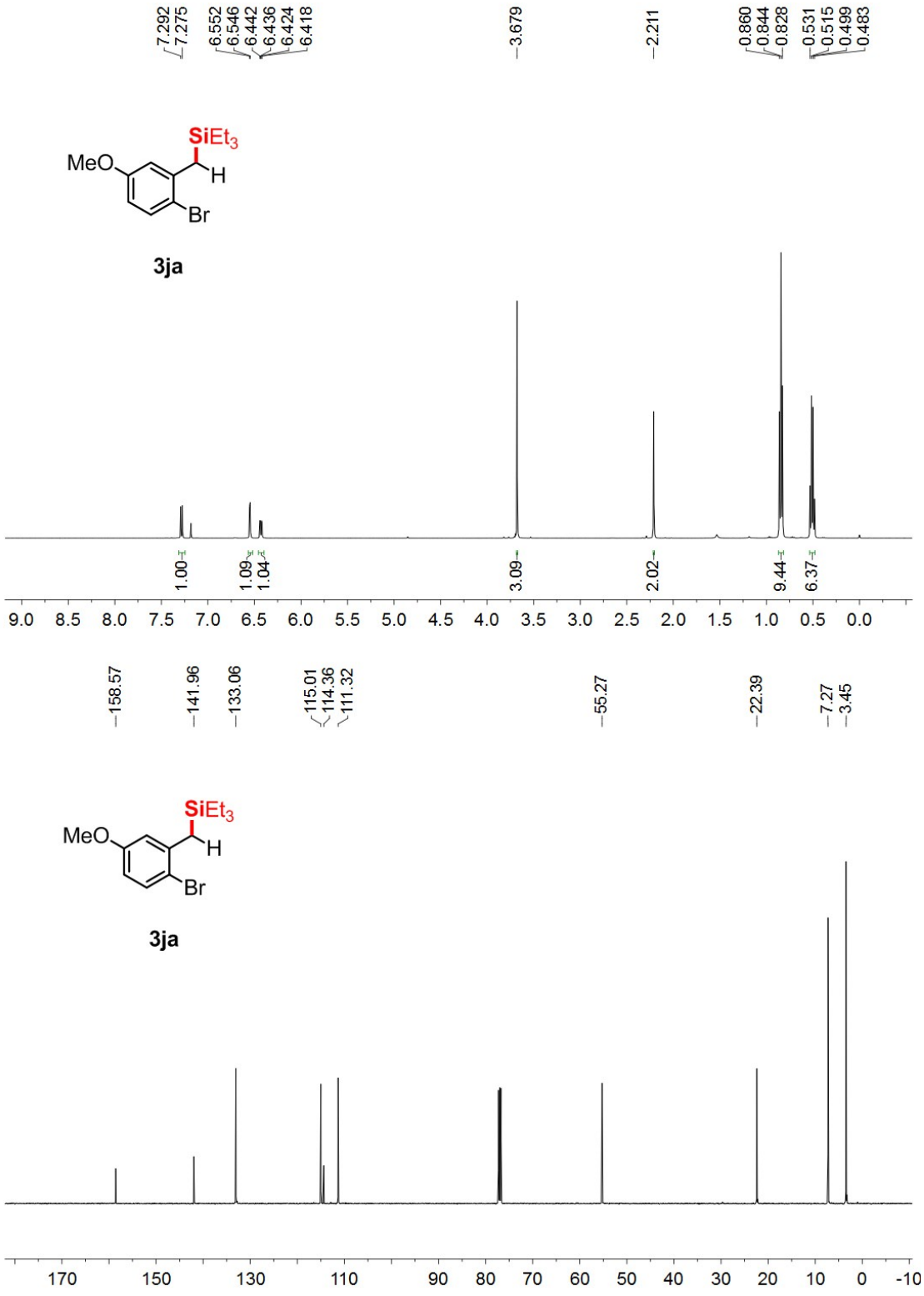
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0.828
0.531
0.515
0.499
0.483
SiEt3
MeO
H
Br
3ja
1.00
1.09
1.04
3.09
2.02
9.44
6.37
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
158.57
141.96
133.06
115.01
114.36
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7.27
3.45
SiEt3
MeO
H
Br
3ja
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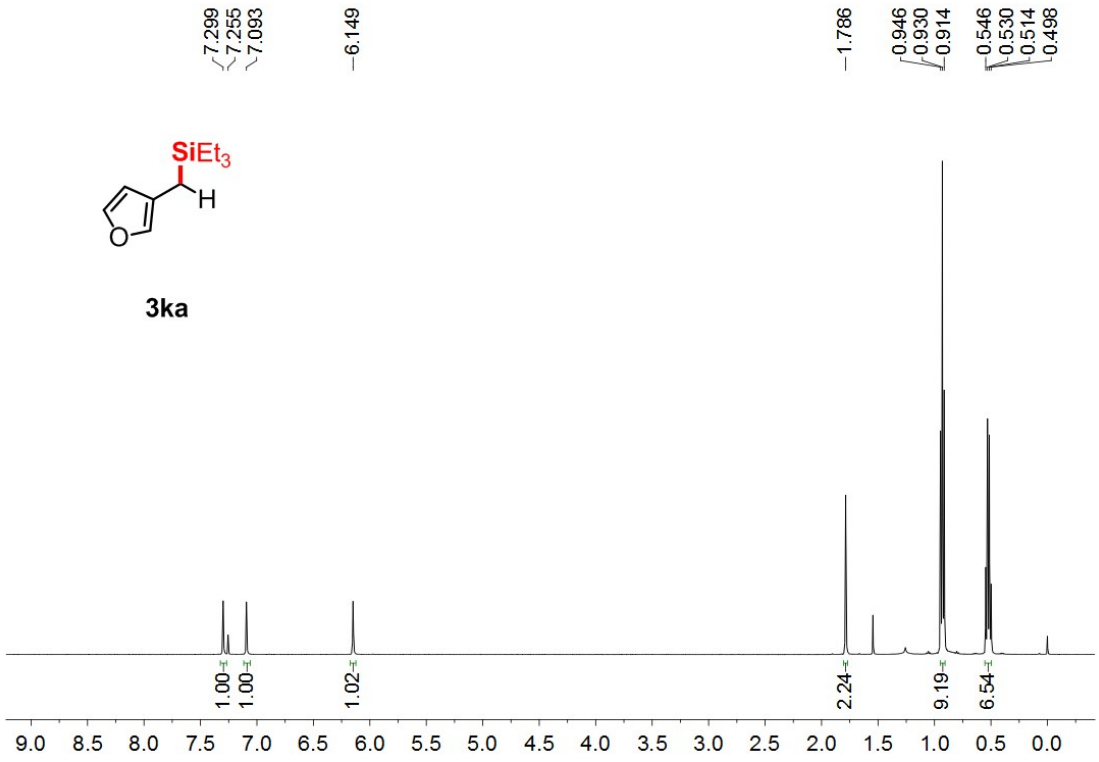
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0.930
0.914
0.546
0.530
0.514
0.498
SiEt3
H
O
3ka
1.00
1.00
1.02
2.24
9.19
6.54
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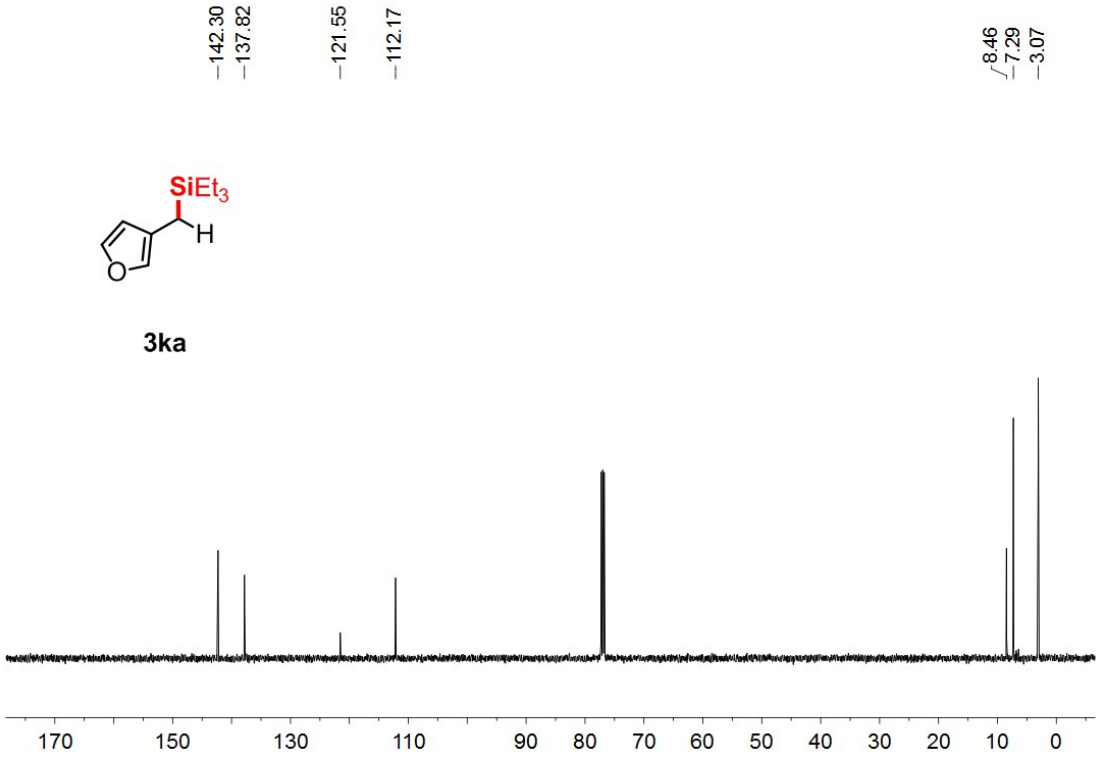
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7.29
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O
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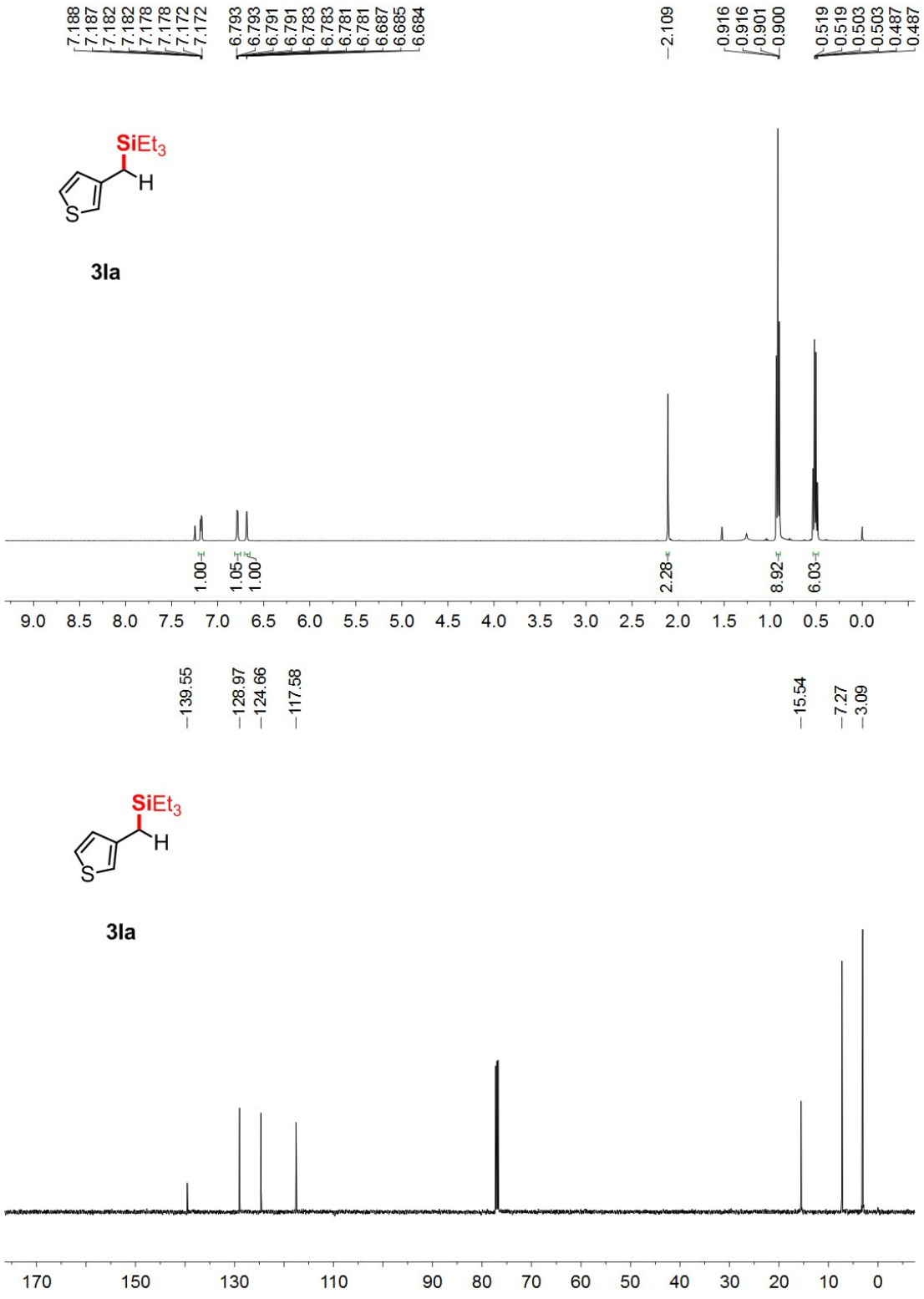
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6.783
6.781
6.781
6.687
6.685
6.684
2.109
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0.916
0.901
0.900
0.519
0.519
0.503
0.503
0.487
0.487
SiEt3
H
S
3la
1.00
1.05
1.00
2.28
8.92
6.03
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
139.55
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15.54
7.27
3.09
SiEt3
H
S
3la
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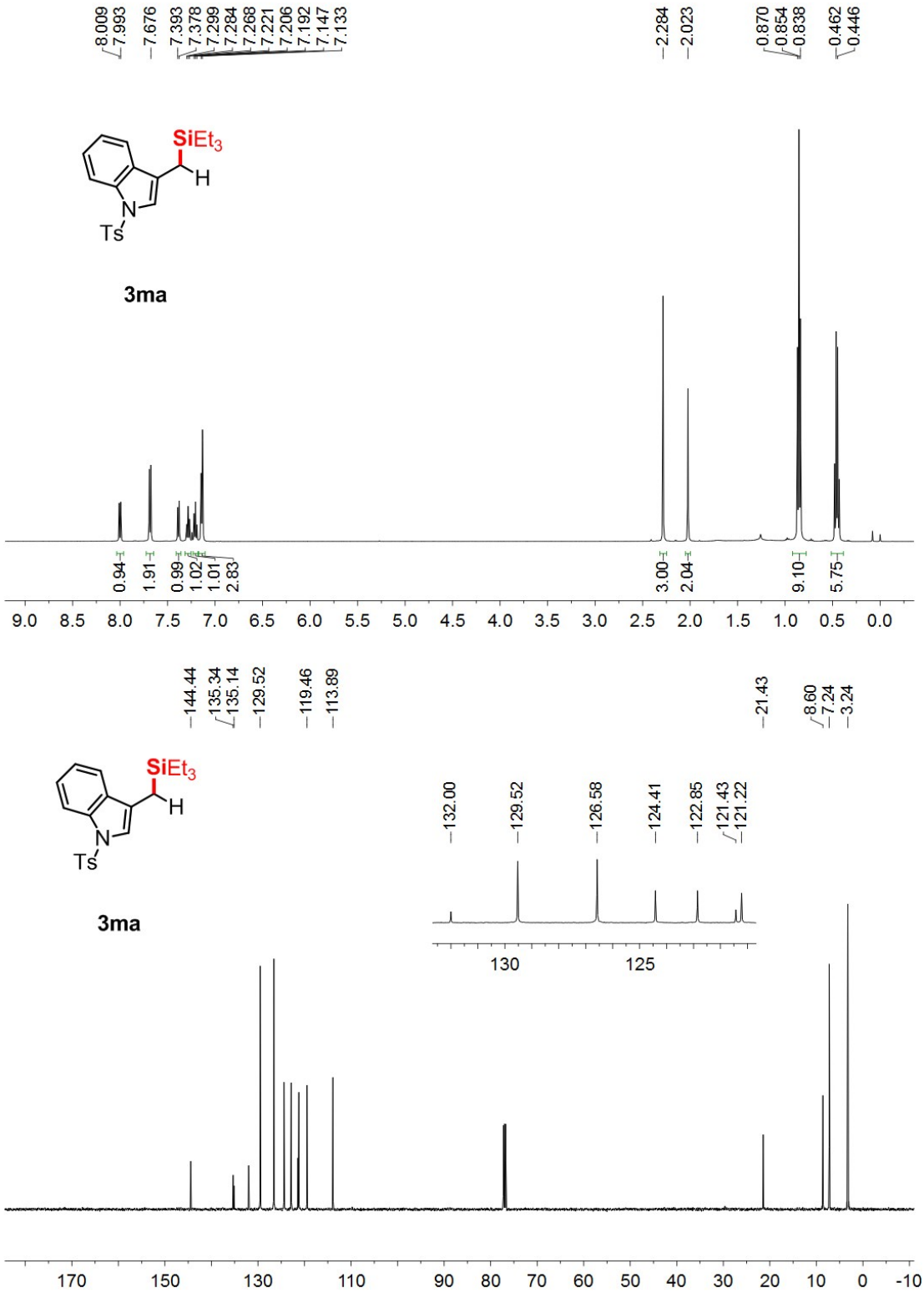
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7.268
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7.147
7.133
2.284
2.023
0.870
0.854
0.838
0.462
0.446
SiEt3
H
N
Ts
3ma
0.94
1.91
0.99
1.02
1.01
2.83
3.00
2.04
9.10
5.75
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
144.44
135.34
135.14
129.52
119.46
113.89
21.43
8.60
7.24
3.24
SiEt3
H
N
Ts
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130
125
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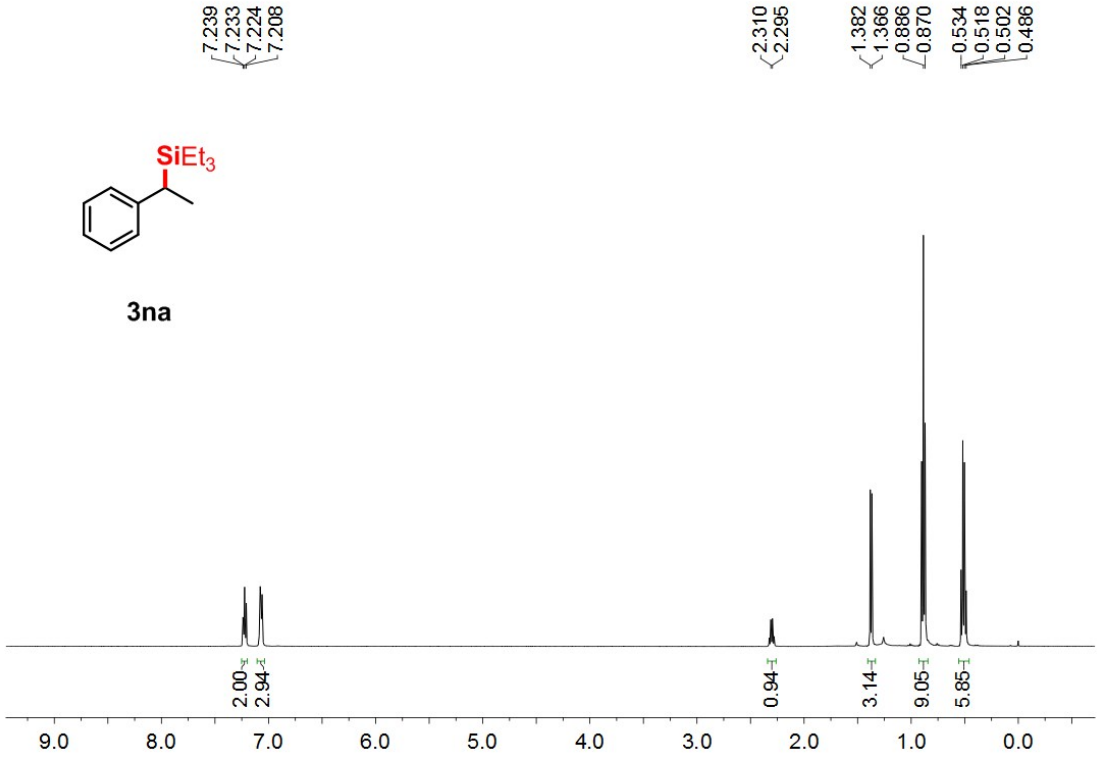
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1.366
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0.518
0.502
0.486
SiEt3
3na
2.00
2.94
0.94
3.14
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8.0
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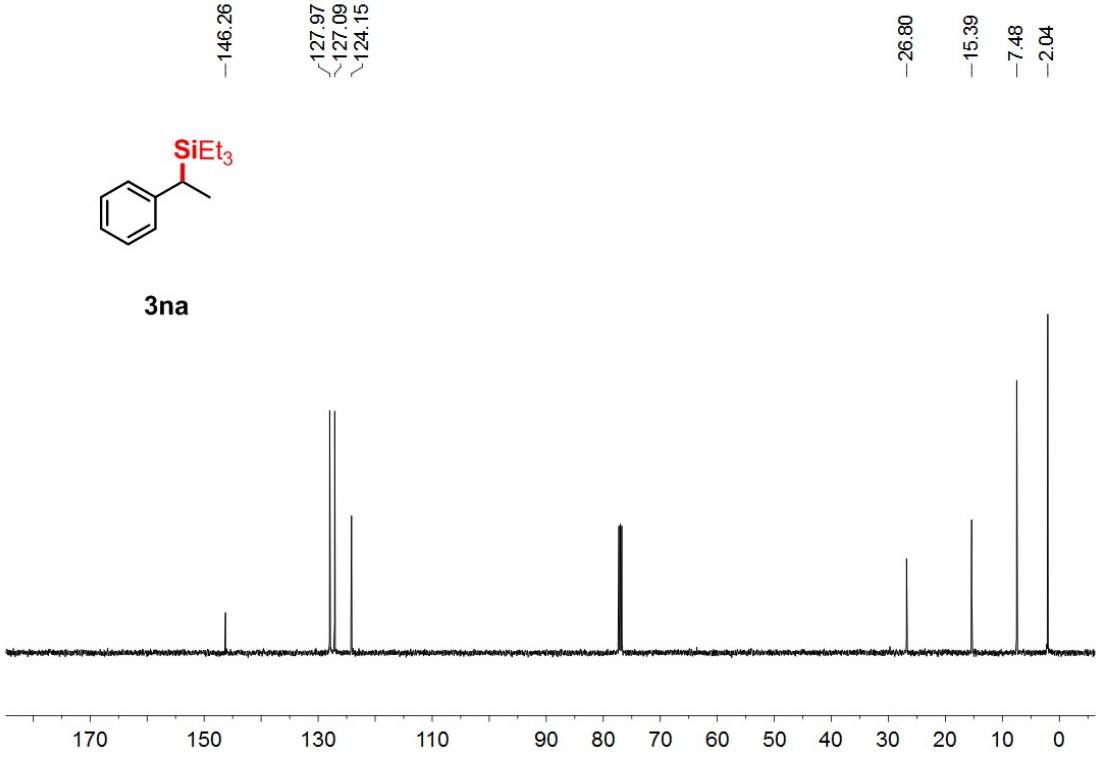
1.0
0.0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70
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30
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10
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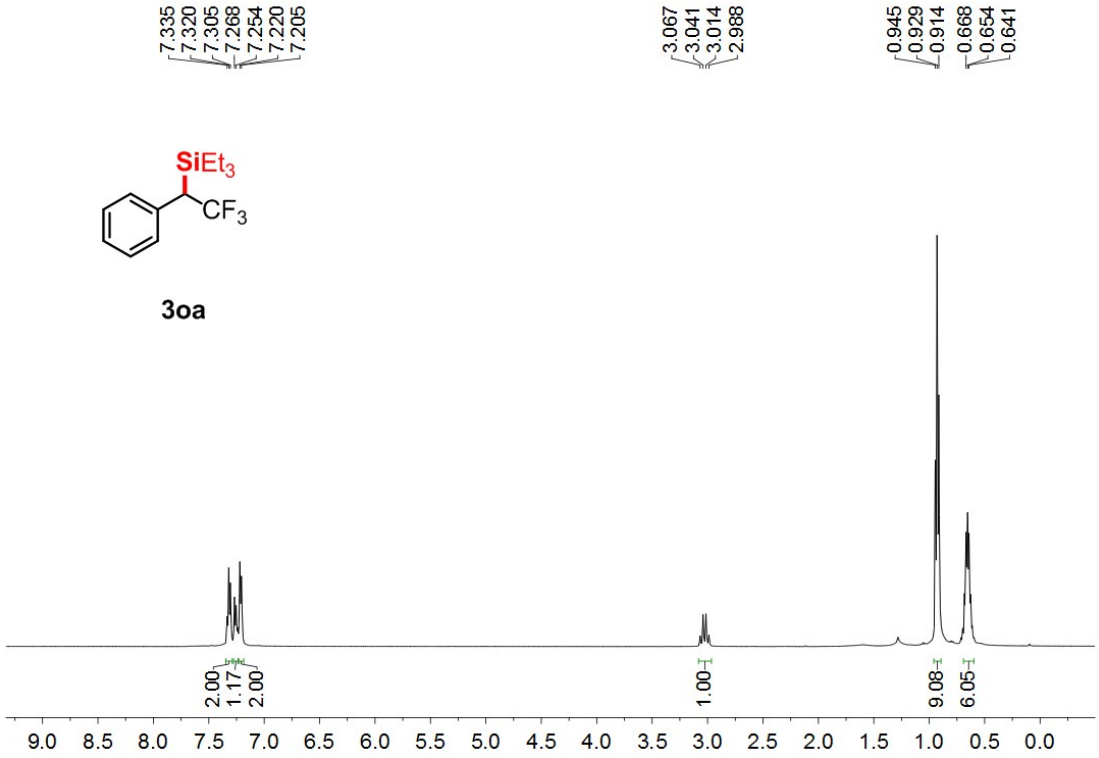
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2.988
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0.914
0.668
0.654
0.641
SiEt3
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3oa
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1.17
2.00
1.00
9.08
6.05
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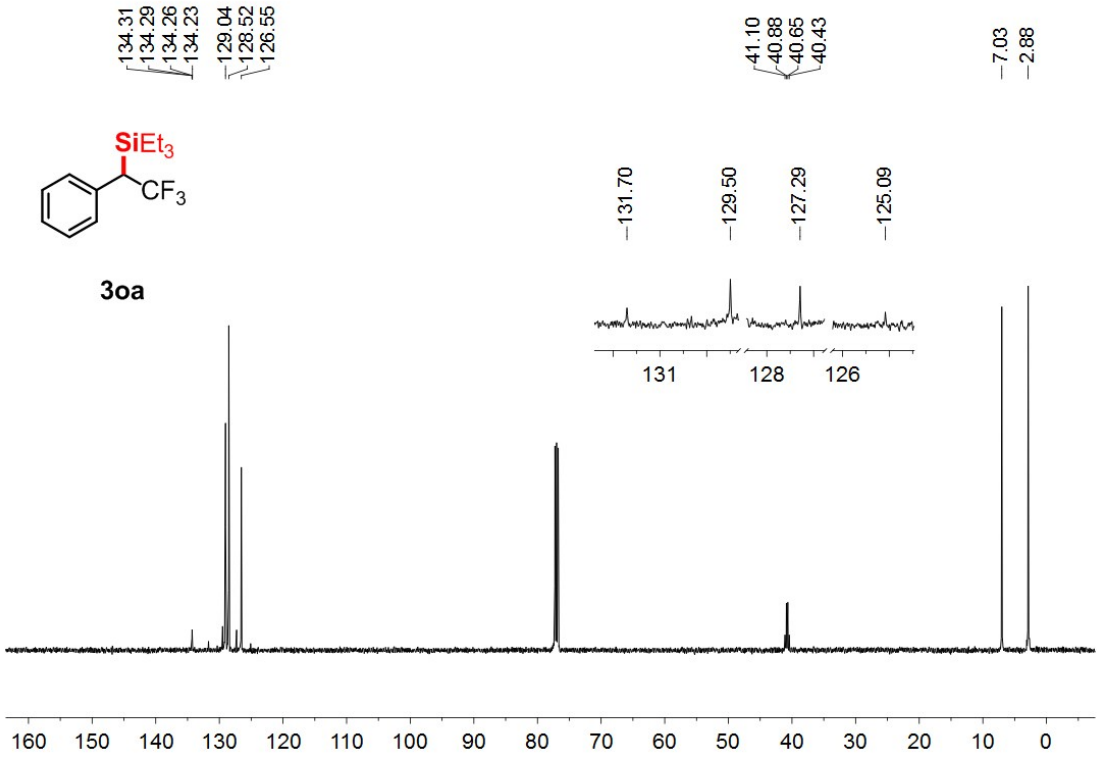
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7.03
2.88
SiEt3
CF3
3oa
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127.29
125.09
131
128
126
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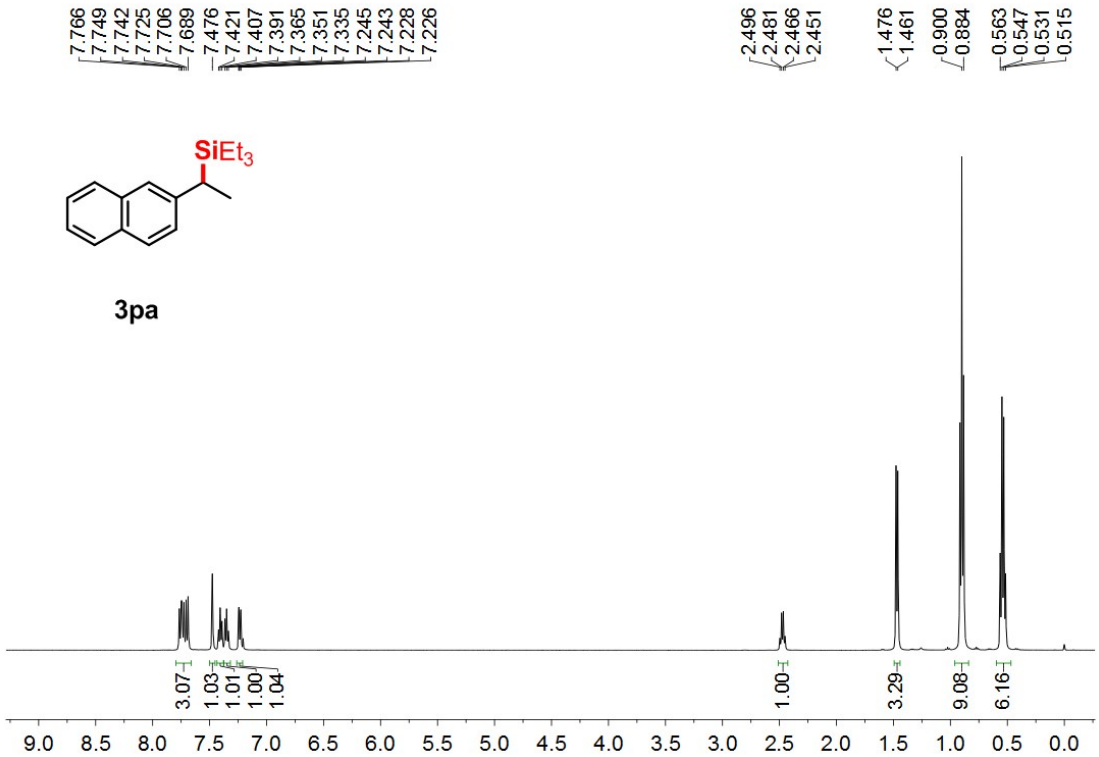
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7.243
7.228
7.226
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2.466
2.451
1.476
1.461
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0.884
0.563
0.547
0.531
0.515
SiEt3
3pa
3.07
1.03
1.01
1.00
1.04
1.00
3.29
9.08
6.16
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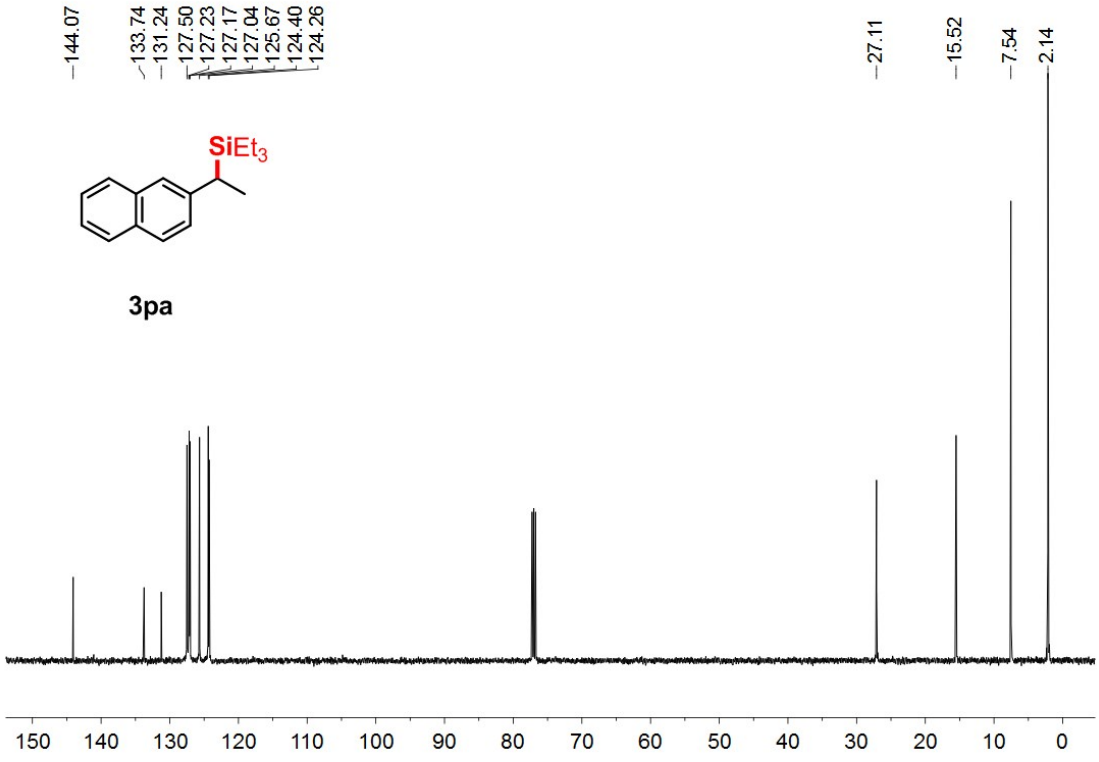
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7.54
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3pa
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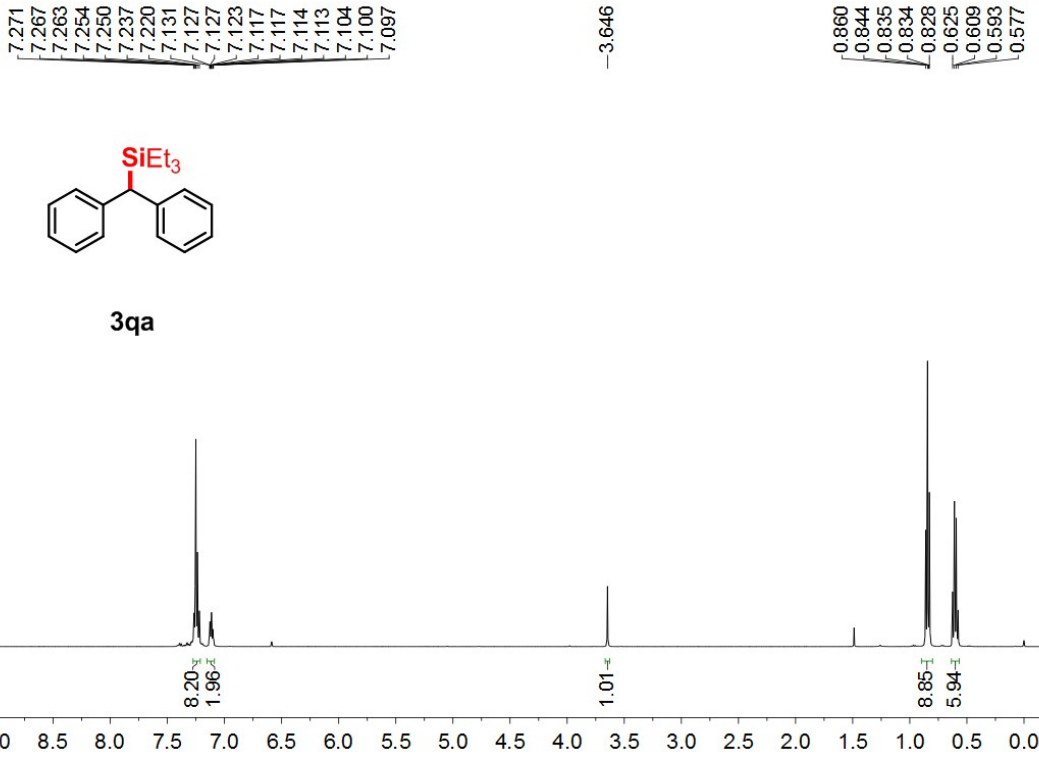
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7.117
7.114
7.113
7.104
7.100
7.097
3.646
0.860
0.844
0.835
0.834
0.828
0.625
0.609
0.593
0.577
SiEt3
3qa
8.20
1.96
1.01
8.85
5.94
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
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SiEt3
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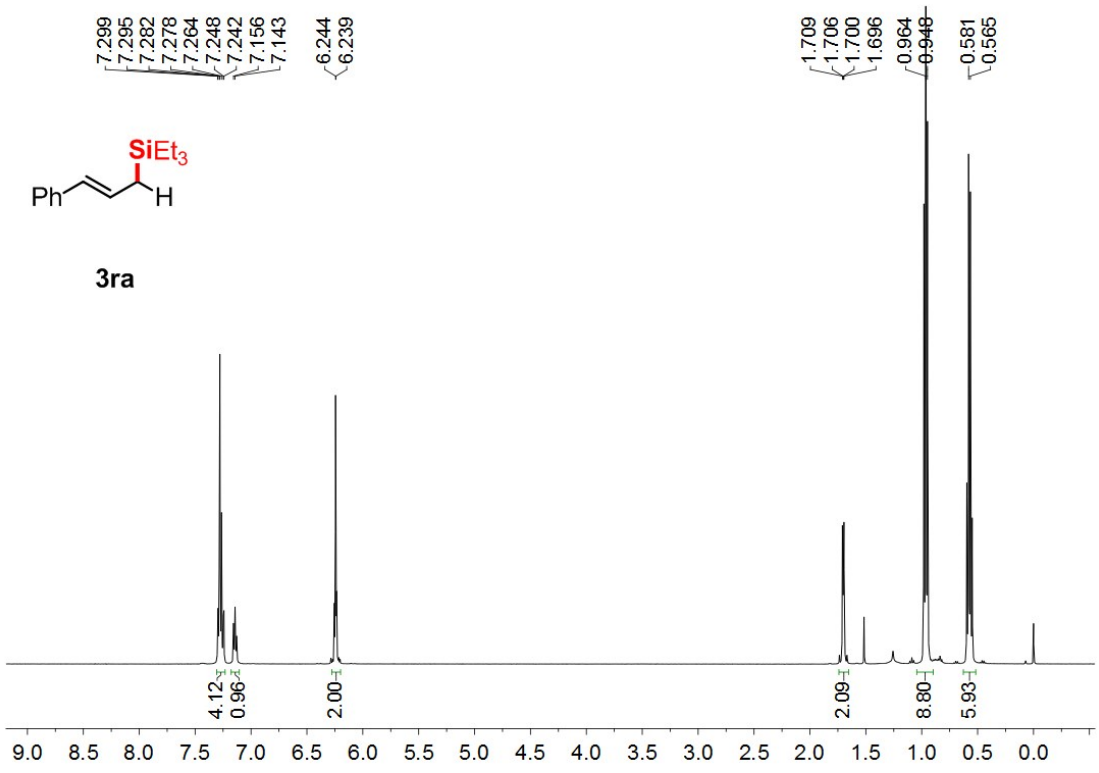
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7.156
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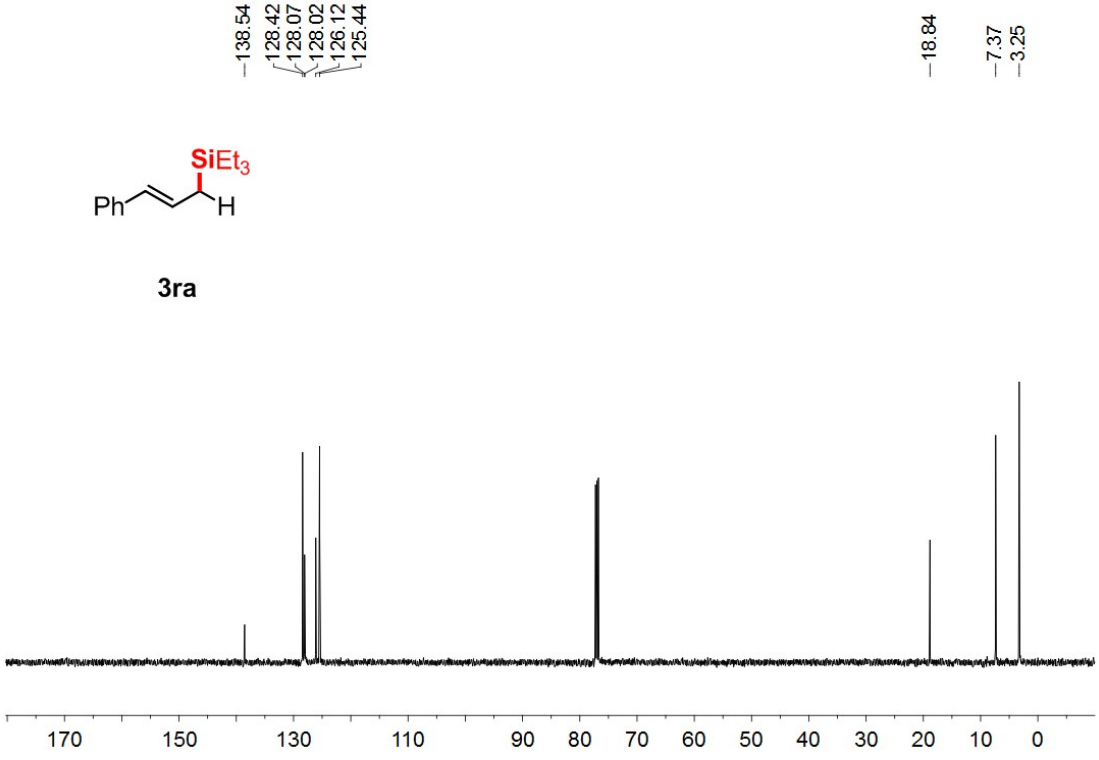
6.244
6.239
1.709
1.706
1.700
1.696
0.964
0.948
0.581
0.565
SiEt3
Ph
H
4.12
0.96
2.00
2.09
8.80
5.93
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0

3ra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Ph
H
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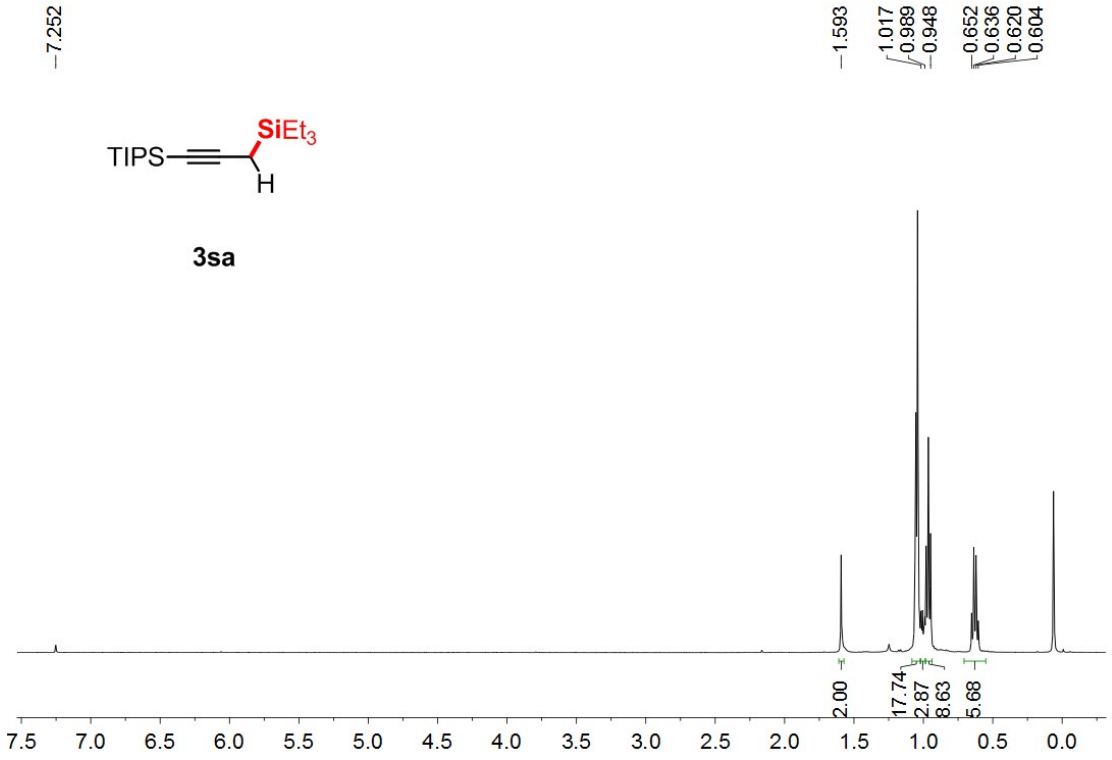
3ra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1.593
1.017
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0.636
0.620
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TIPS
SiEt3
H
3sa
2.00
17.74
2.87
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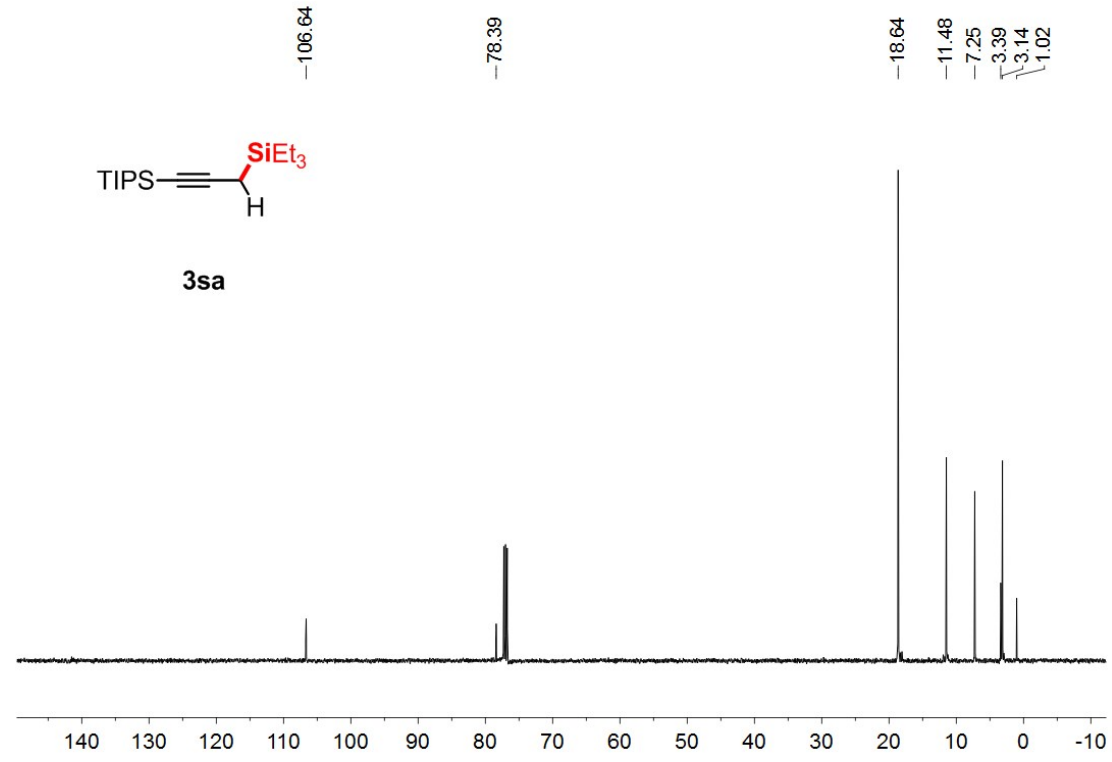
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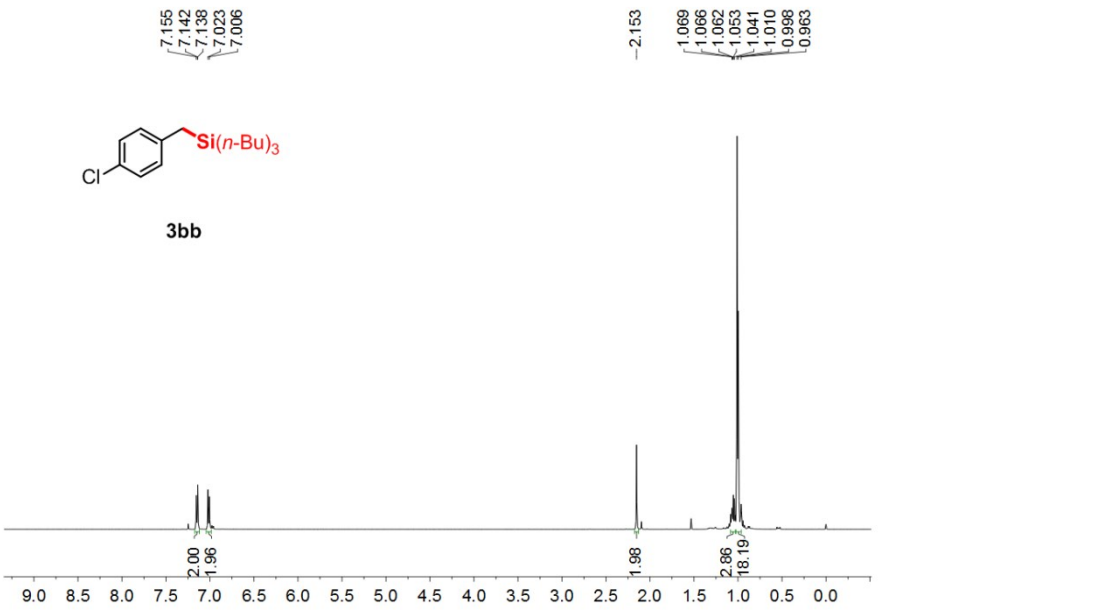
3.14
1.02
TIPS
SiEt3
H
3sa
140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10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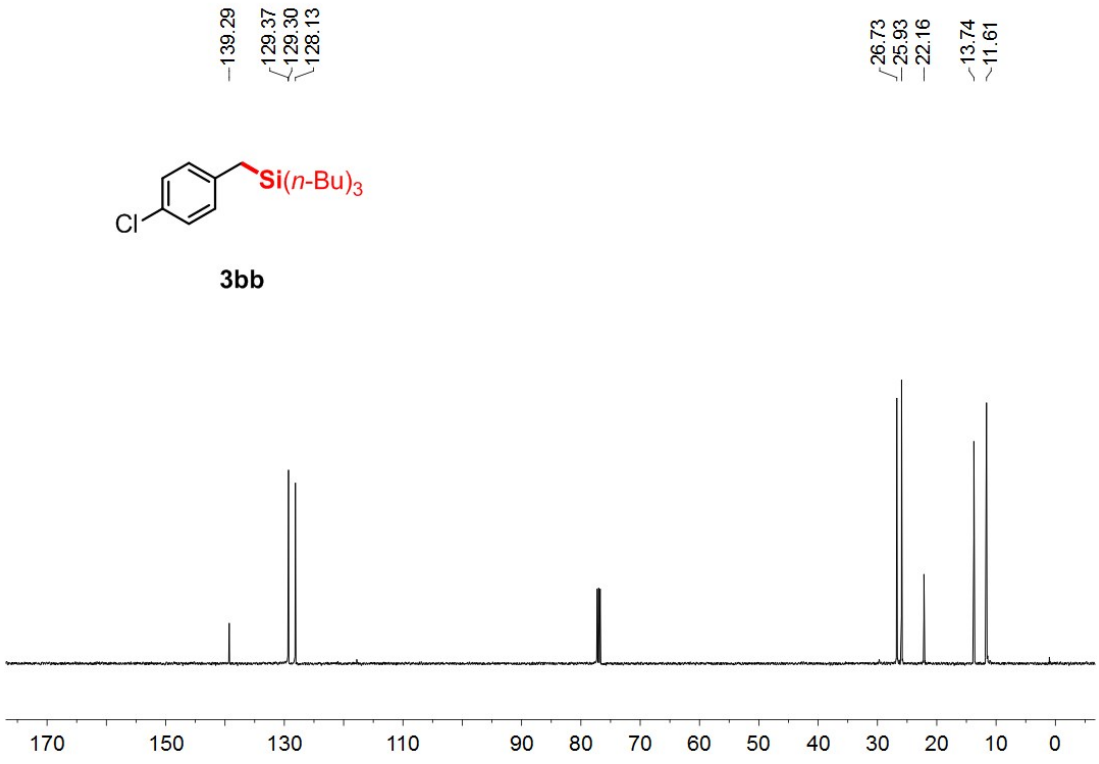
7.142
7.138
7.023
7.006
2.153
1.069
1.066
1.062
1.053
1.041
1.010
0.998
0.963
Si(n-Bu)3
Cl
2.00
1.96
1.98
2.86
18.19
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0

3bb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129.30
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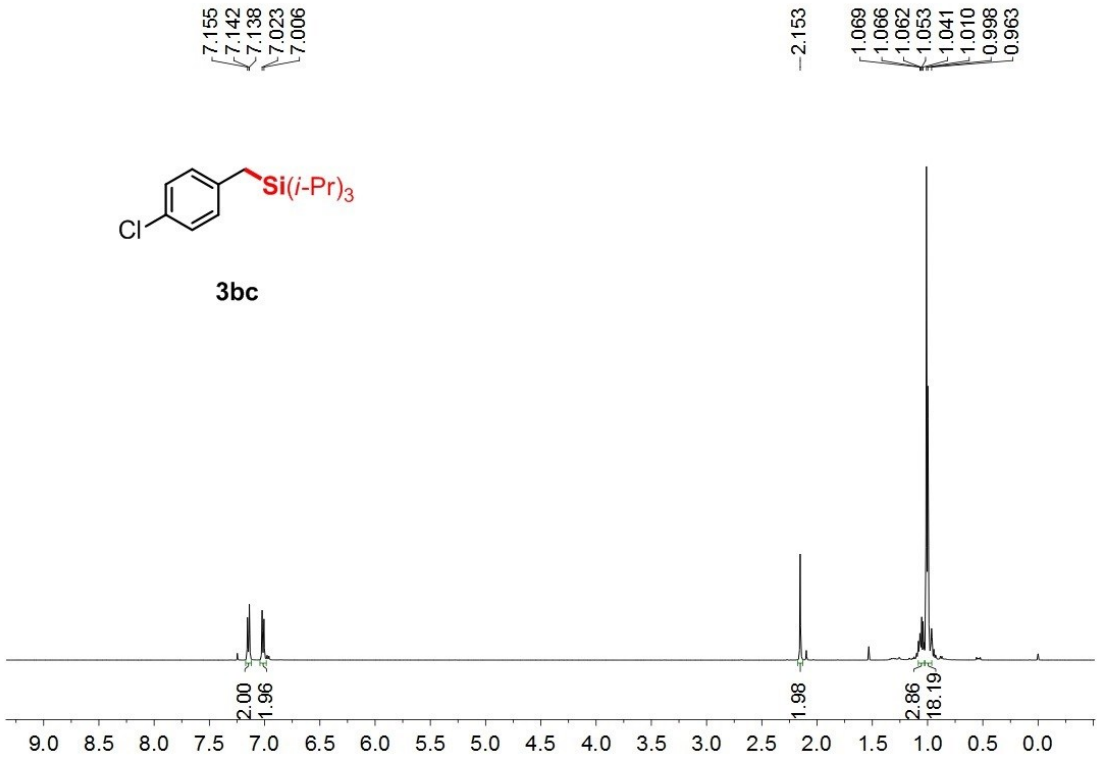
22.16
13.74
11.61
Si(n-Bu)3
Cl
170 150 130 110 90 80 70 60 50 40 30 20 10 0

3bb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7.142
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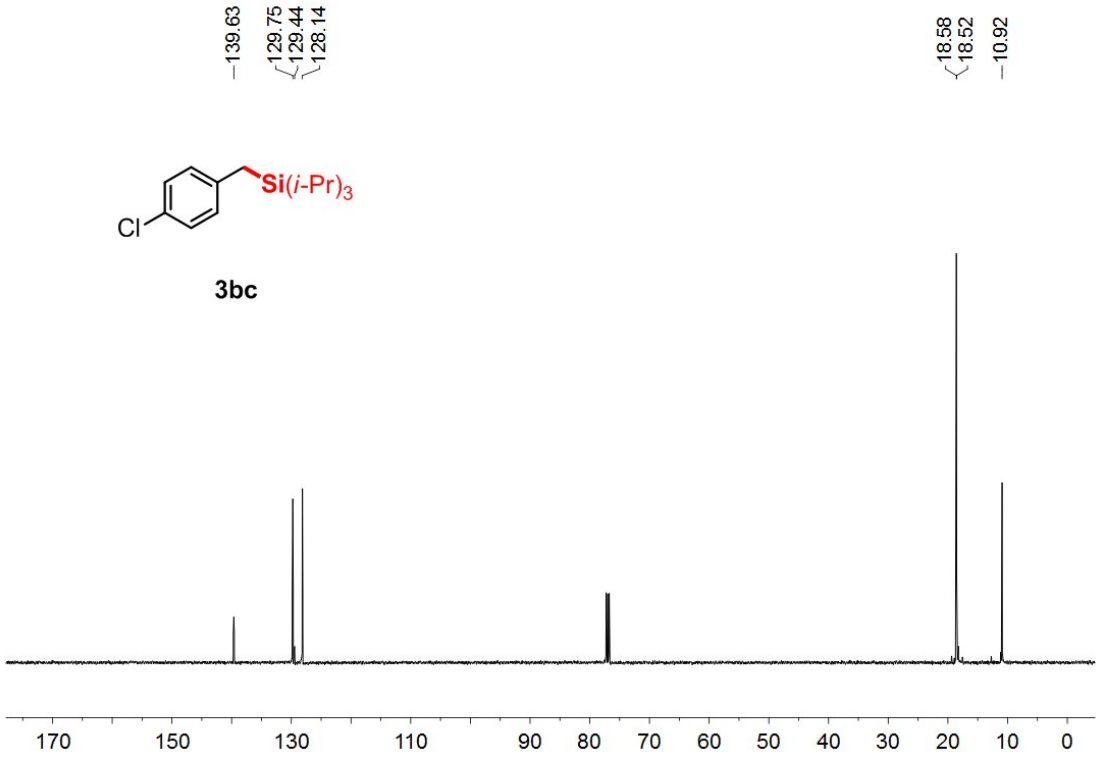
7.006
2.153
1.069
1.066
1.062
1.053
1.041
1.010
0.998
0.963
Si(i-Pr)3
Cl
3bc
2.00
1.96
1.98
2.86
18.19
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0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18.58
18.52
10.92
Si(i-Pr)3
Cl
3bc
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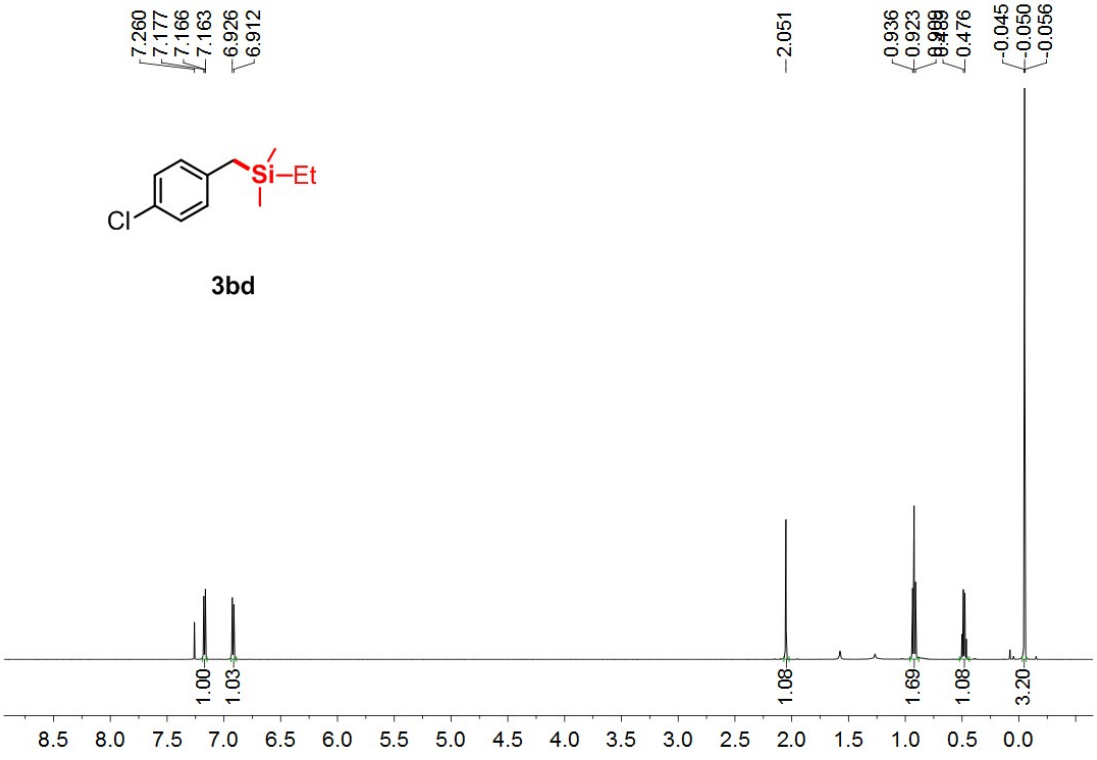
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7.166
7.163
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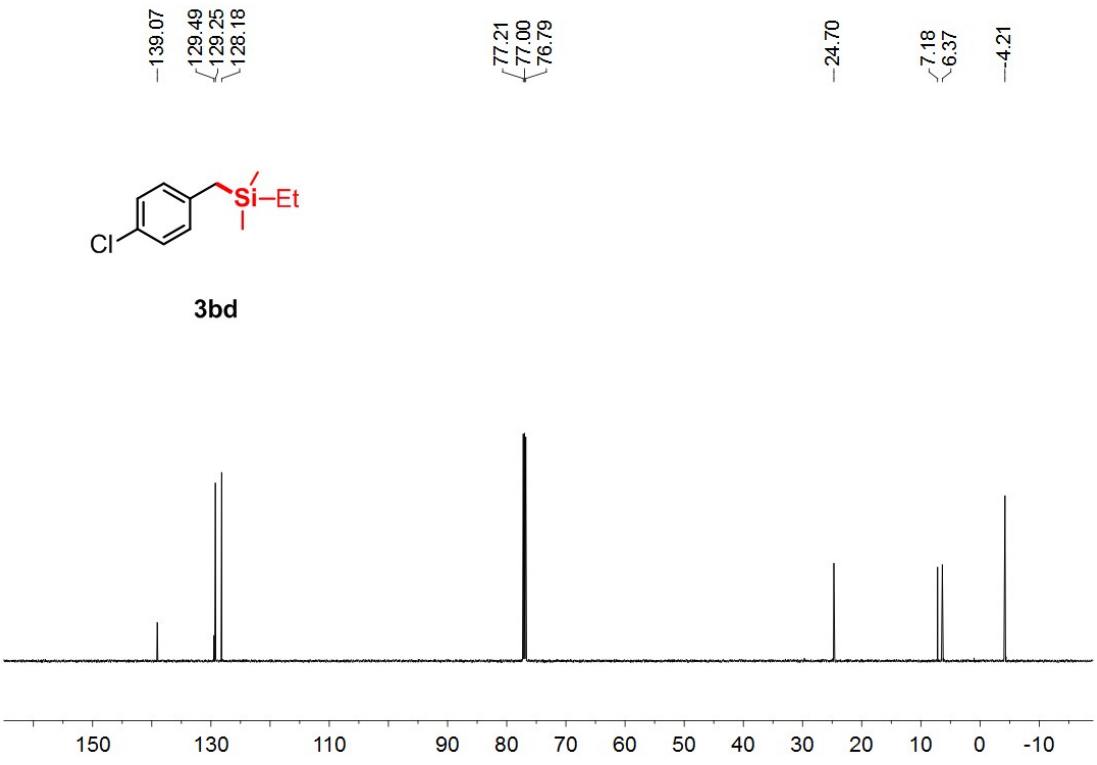
6.912
2.051
0.936
0.923
0.476
-0.045
-0.050
-0.056
Si—Et
Cl
1.00
1.03
1.08
1.69
1.08
3.20
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0

3bd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129.25
128.18
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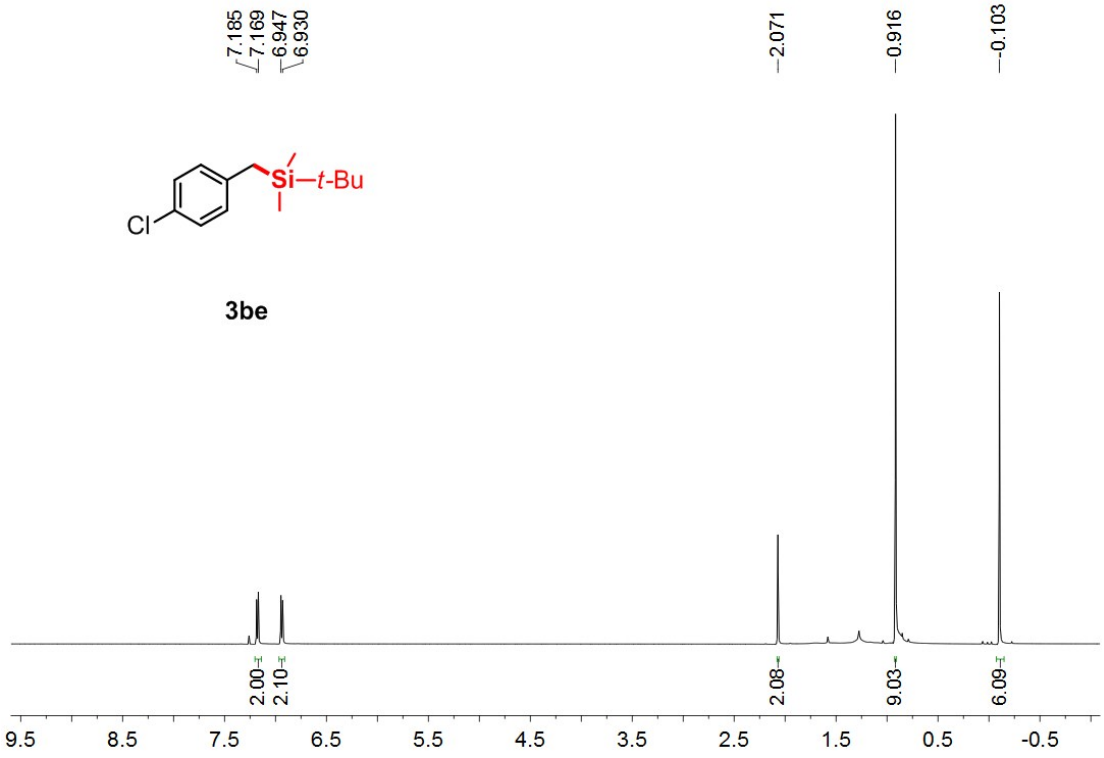
76.79
24.70
7.18
6.37
-4.21
Si—Et
Cl
150 130 110 90 80 70 60 50 40 30 20 10 0 -10

3bd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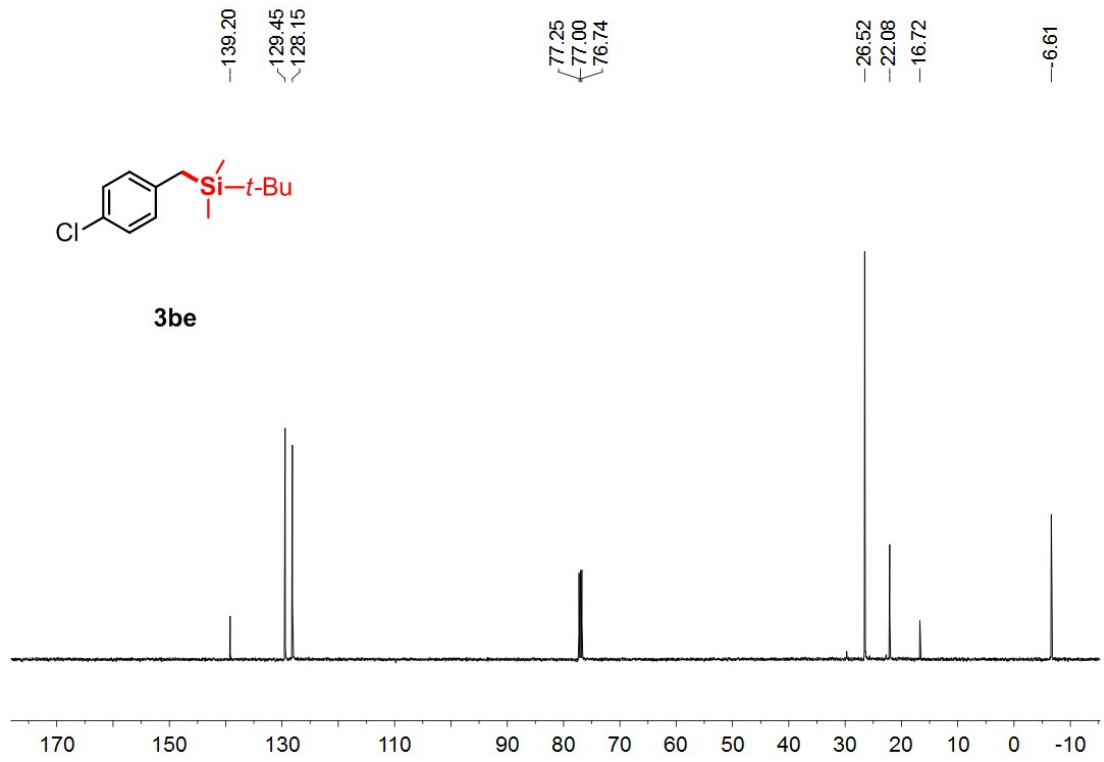
0.916
0.103
Si—t-Bu
Cl
3be
2.00
2.10
2.08
9.03
6.09
9.5
8.5
7.5
6.5
5.5
4.5
3.5
2.5
1.5
0.5
-0.5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77.00
76.74
26.52
22.08
16.72
6.61
Si—t-Bu
Cl
3be
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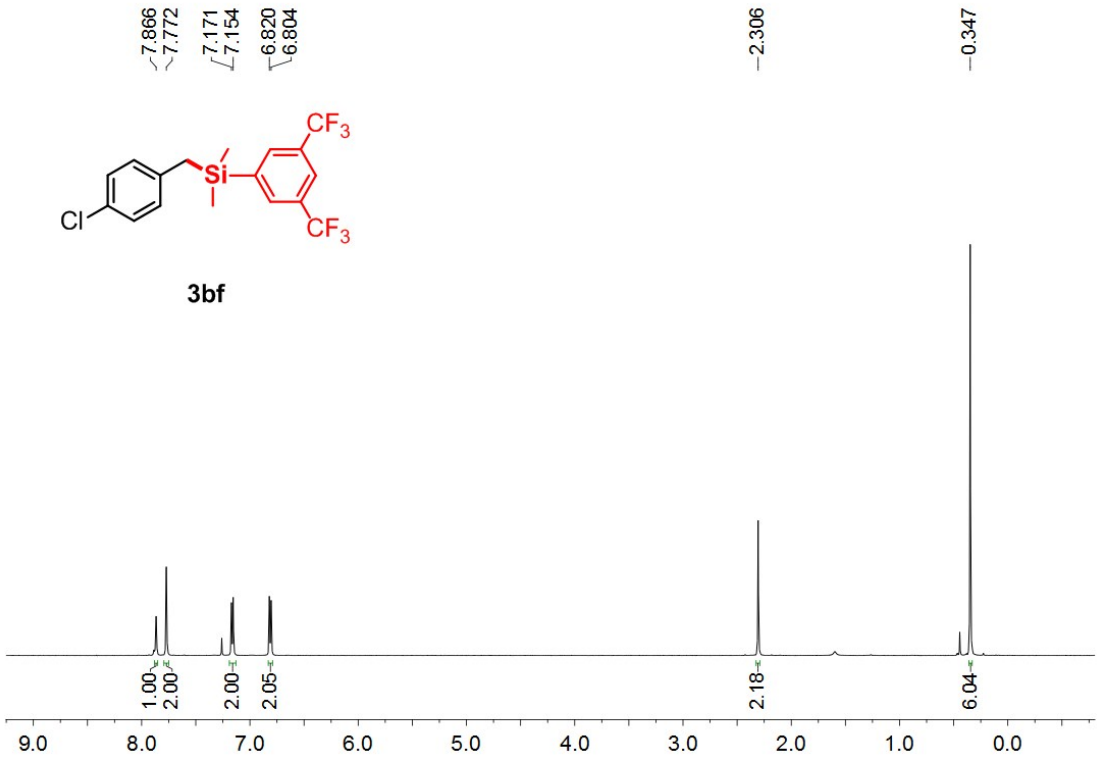
150
130
110
90
80
70
60
50
40
30
20
10
0
-10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6.804
2.306
0.347
CF3
Si
Cl
CF3
3bf
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2.00
2.00
2.05
2.18
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8.0
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6.0
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4.0
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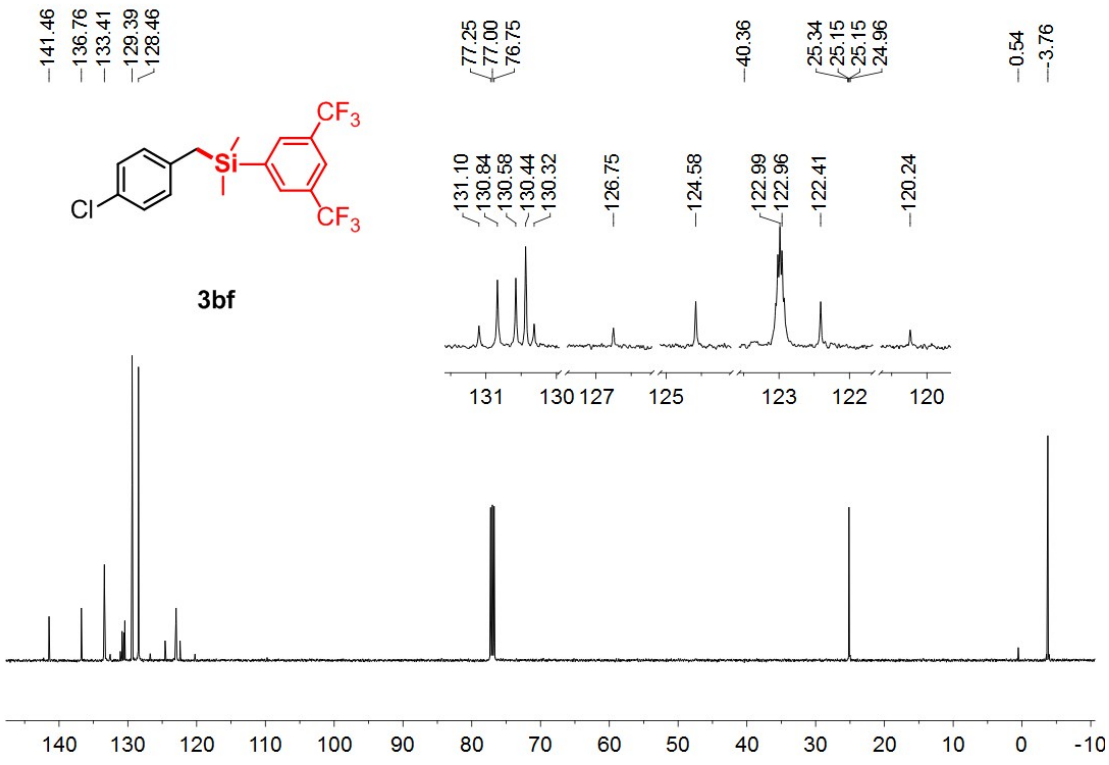
2.0
1.0
0.0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77.00
76.75
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25.34
25.15
25.15
24.96
0.54
-3.76
CF3
Si
Cl
CF3
3bf
131.10
130.84
130.58
130.44
130.32
126.75
124.58
122.99
122.96
122.41
120.24
131
130
127
125
123
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140
130
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100
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80
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50
40
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20
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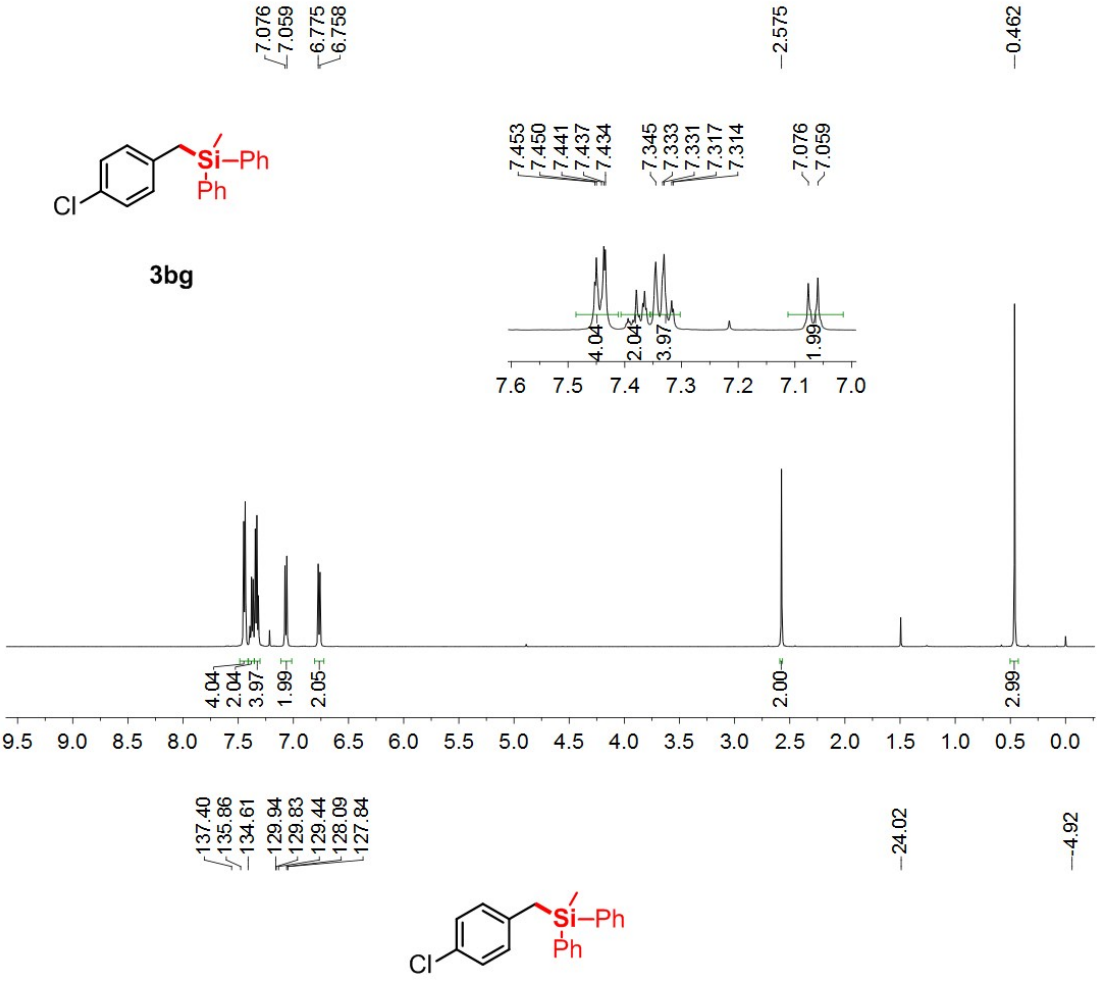
0
-10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Si–Ph
Ph
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7.345
7.333
7.331
7.317
7.314
7.076
7.059
4.04
2.04
3.97
1.99
7.6 7.5 7.4 7.3 7.2 7.1 7.0
4.04
2.04
3.97
1.99
2.05
2.00
2.99
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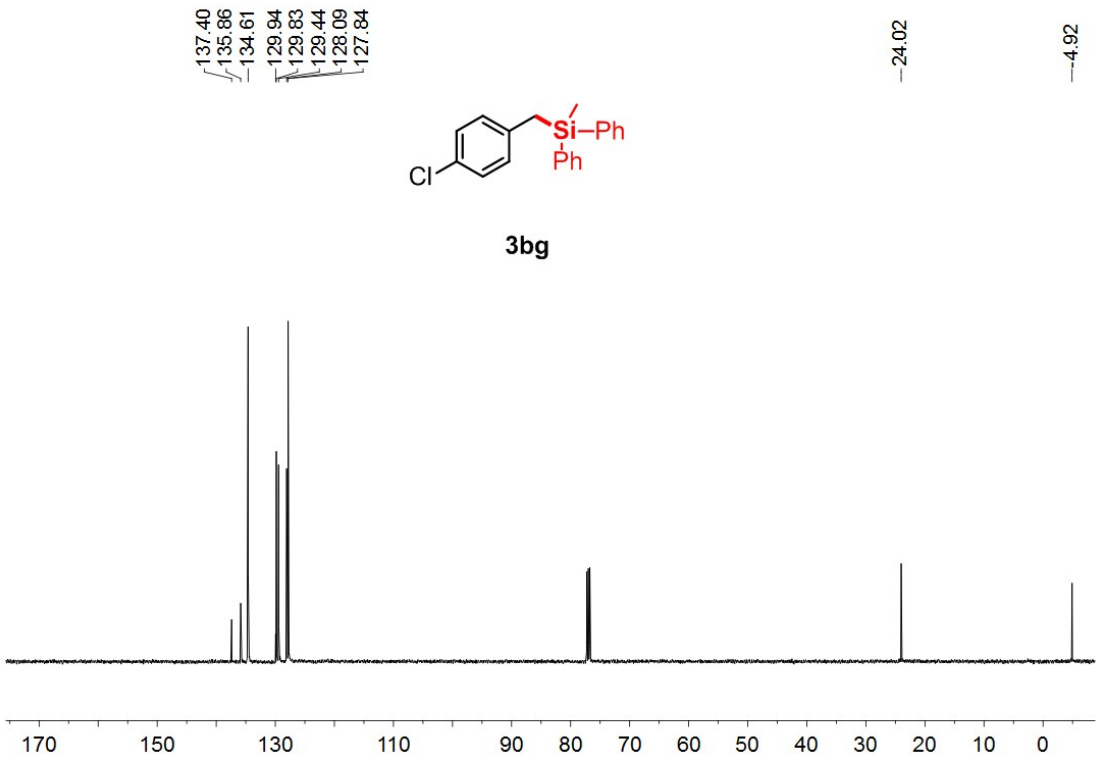
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127.84
24.02
4.92
Cl
Si–Ph
Ph
3bg
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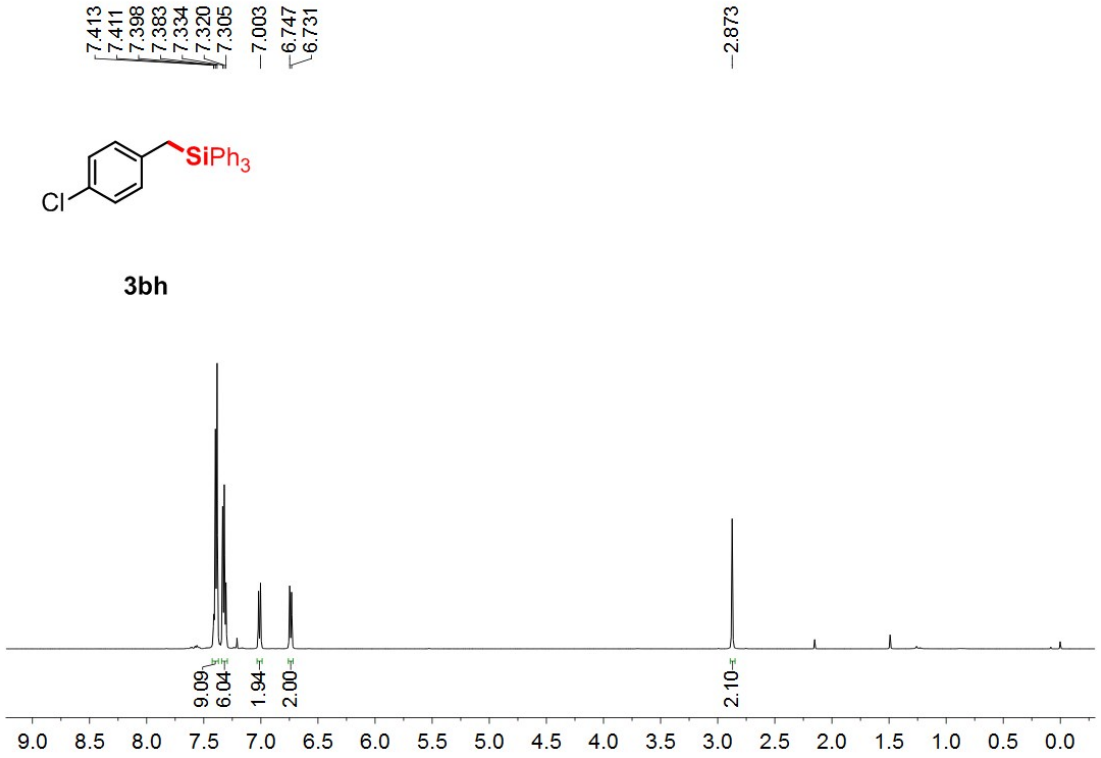
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7.003
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6.731
2.873
SiPh3
Cl
9.09
6.04
1.94
2.00
2.10
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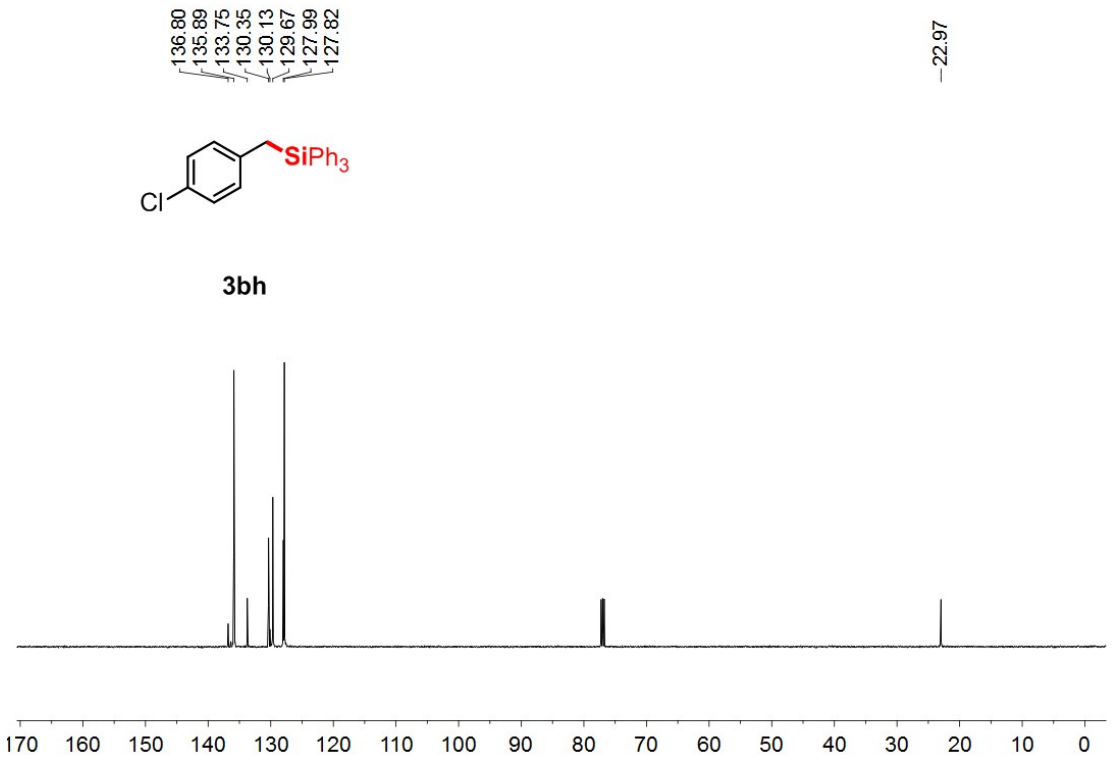
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Cl
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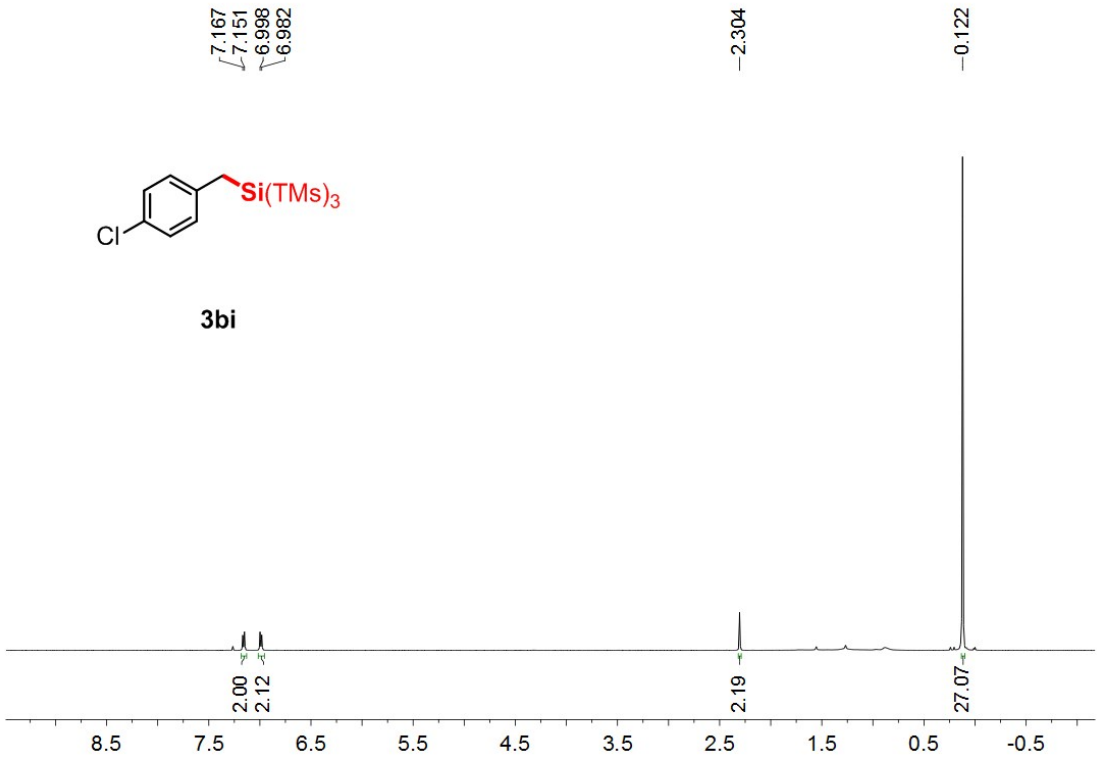
3bh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Cl
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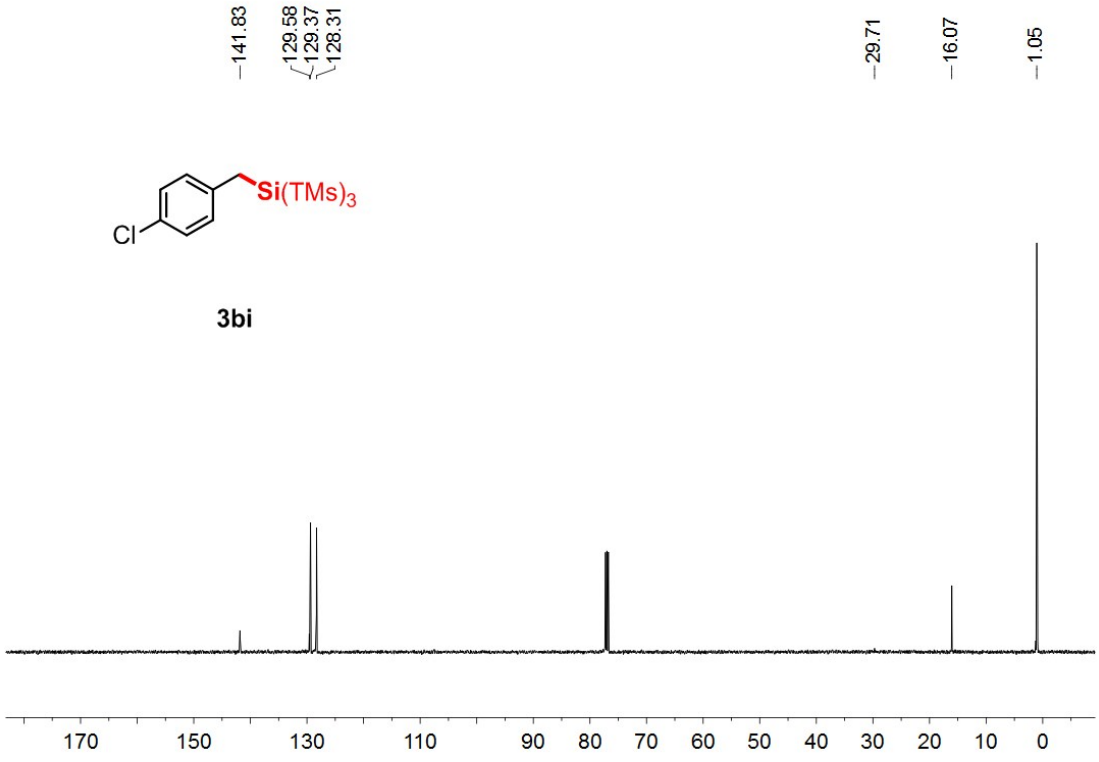
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Cl
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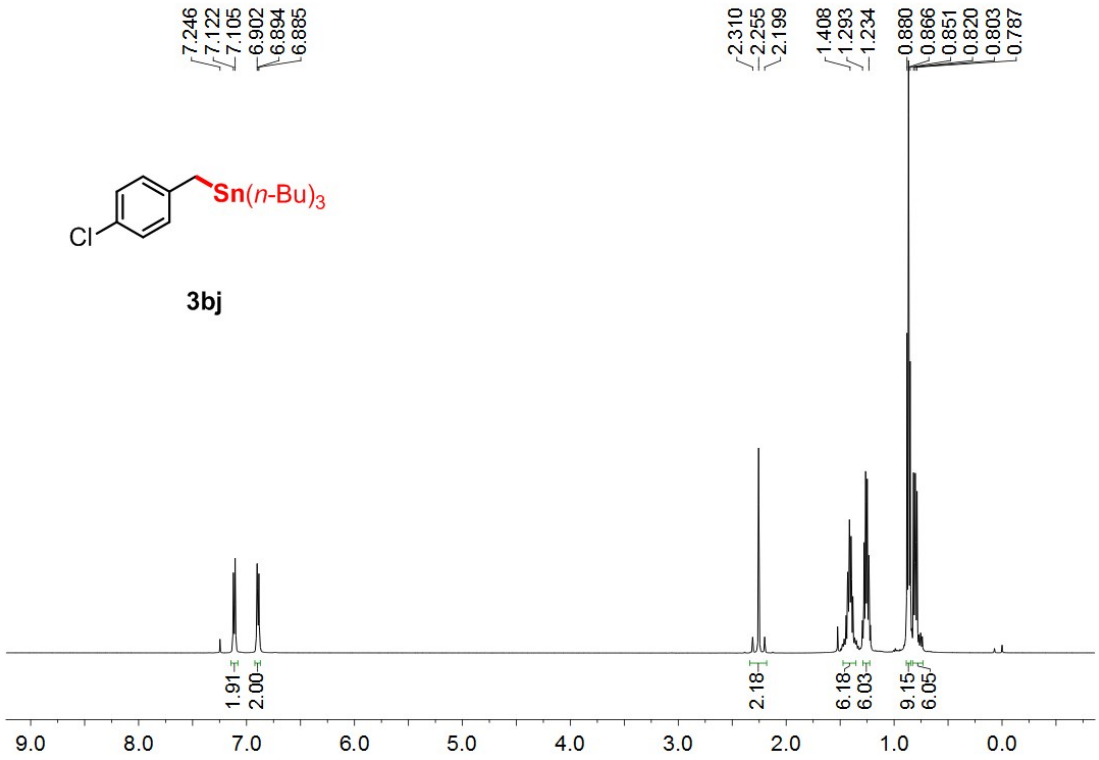
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0.851
0.820
0.803
0.787
Sn(n-Bu)3
Cl
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6.18
6.03
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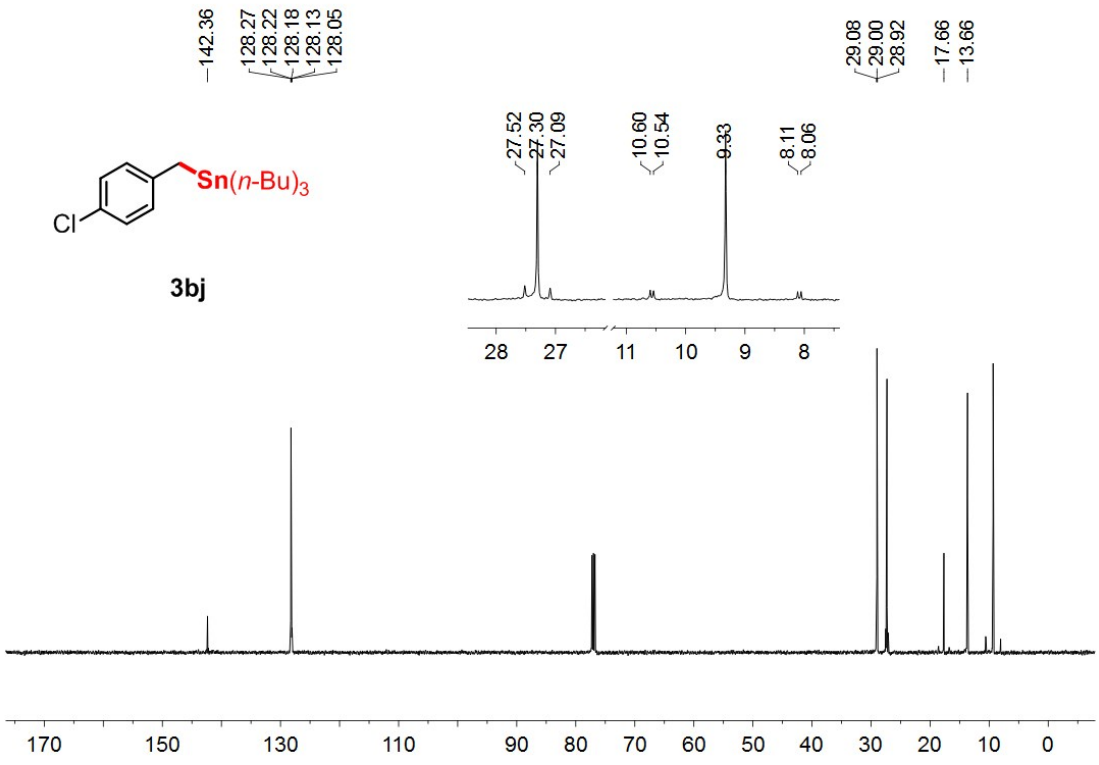
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13.66
27.52
27.30
27.09
10.60
10.54
9.33
8.11
8.06
Sn(n-Bu)3
Cl
3bj
28
27
11
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9
8
170
150
130
110
90
80
70
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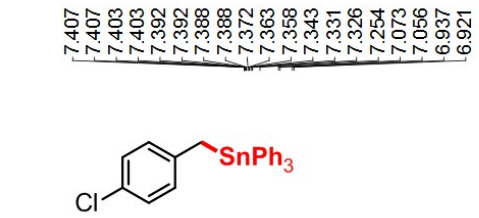
0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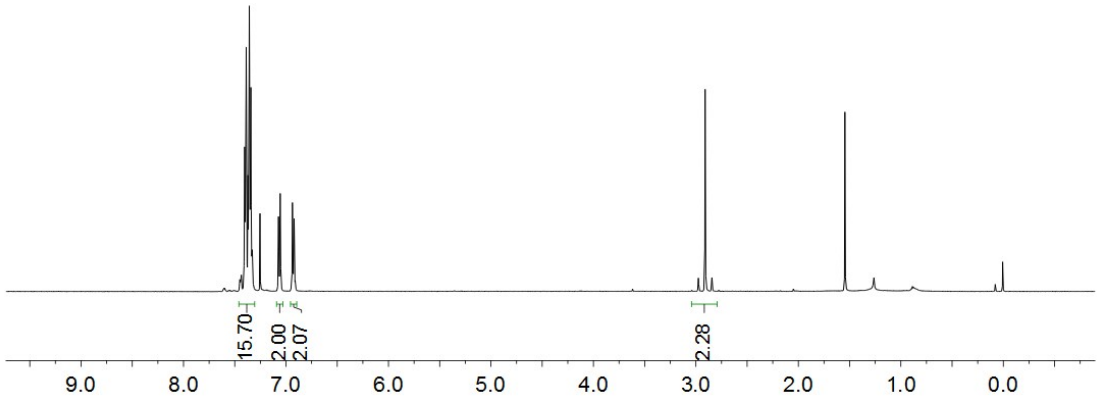
SnPh3
Cl

3bk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3.0
2.0
1.0
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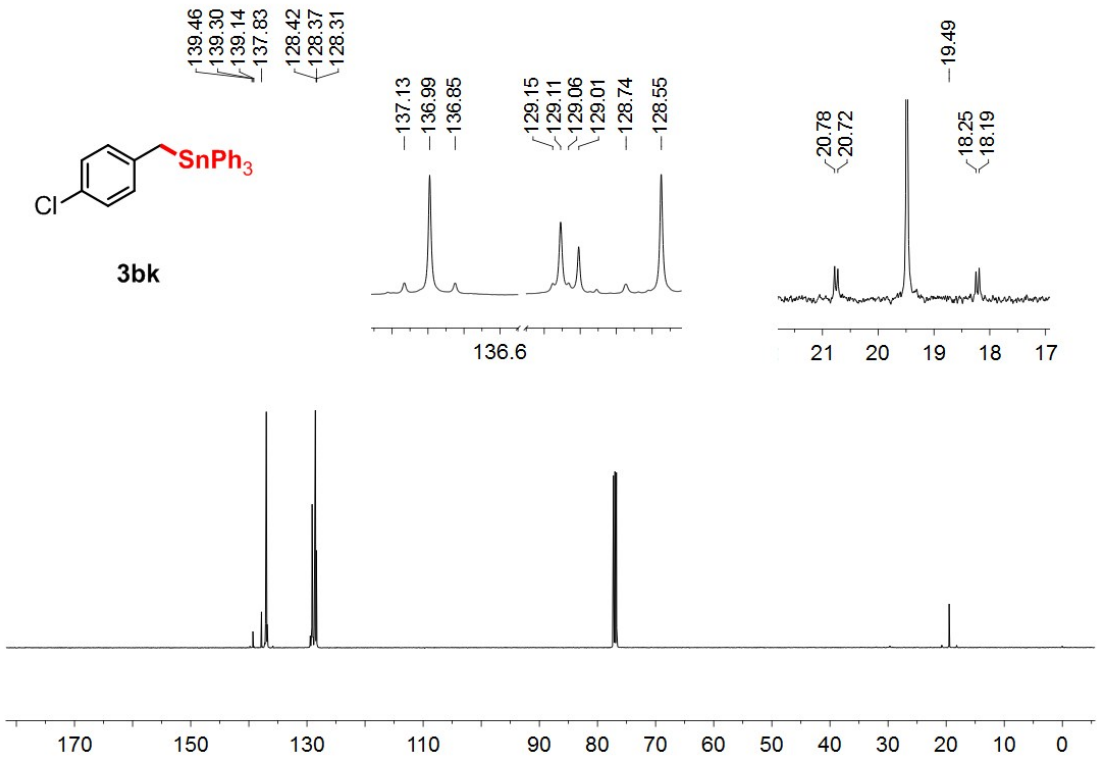
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SnPh3
Cl
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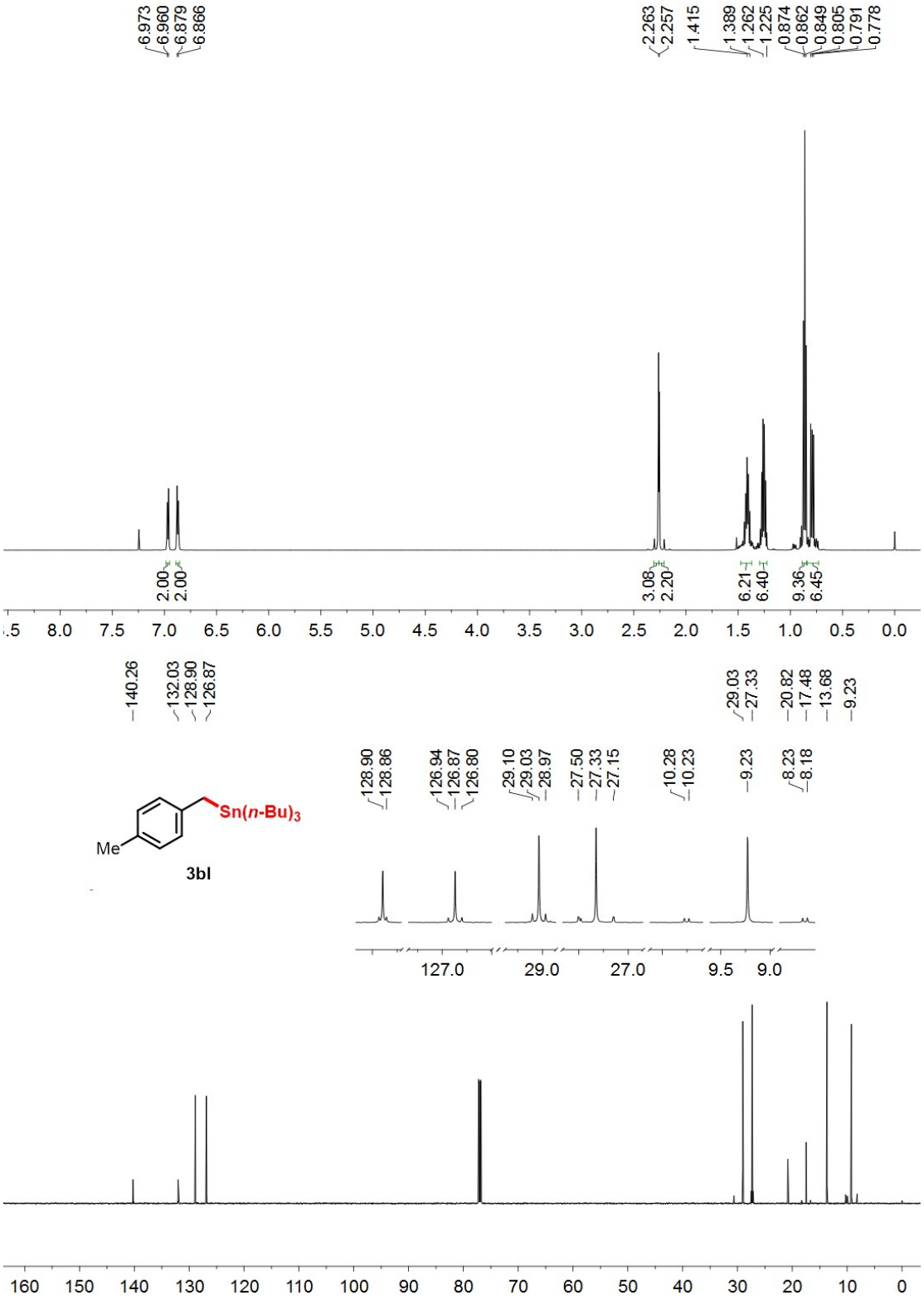
0

3bk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0.805
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2.00
2.00
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2.20
6.21
6.40
9.36
6.45
140.26
132.03
128.90
126.87
29.03
27.33
20.82
17.48
13.68
9.23
128.90
128.86
126.94
126.87
126.80
29.10
29.03
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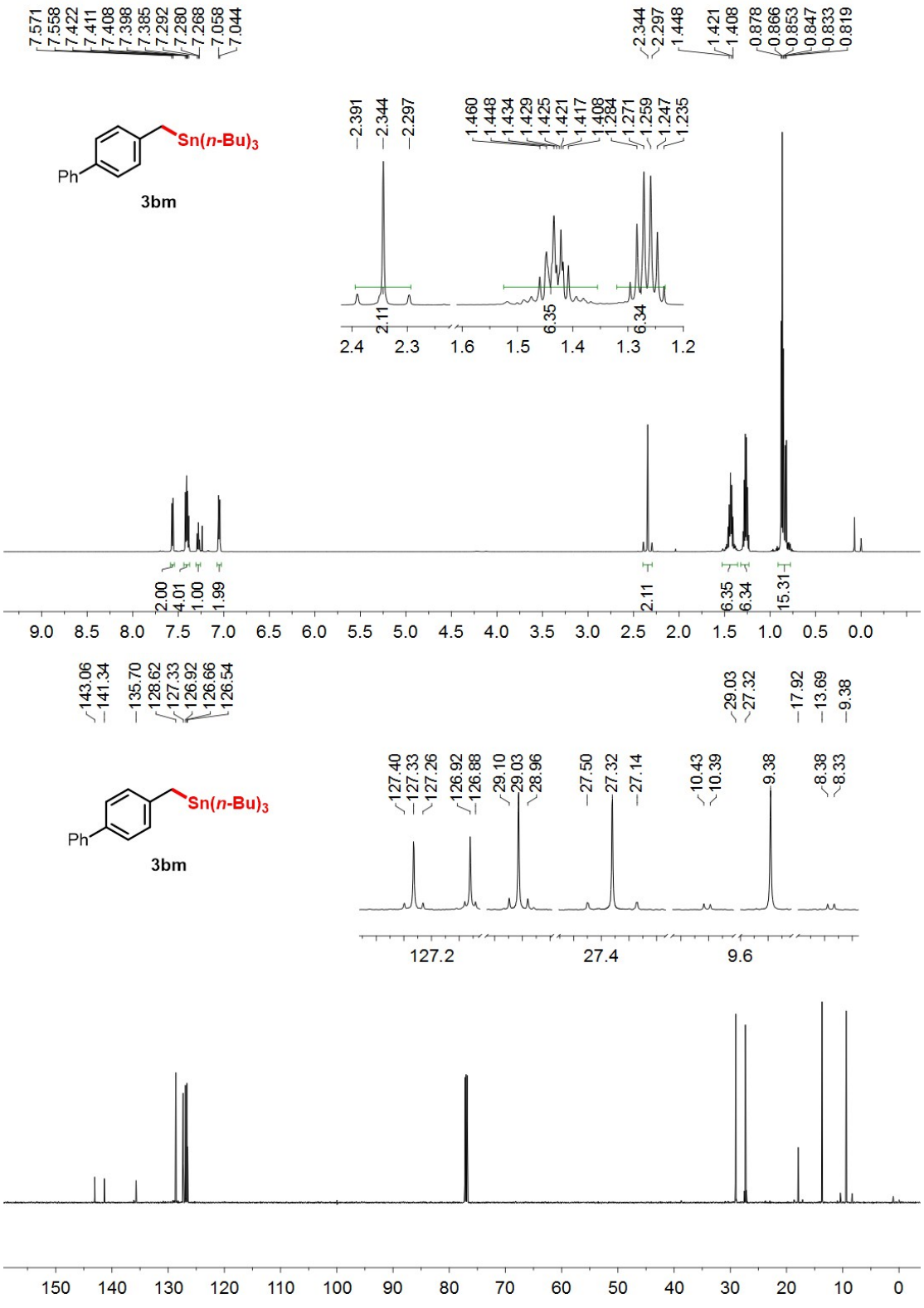
Me
3bl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Ph
3bm
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1.421
1.417
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1.6
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4.5
4.0
3.5
3.0
2.5
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1.0
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141.34
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126.92
126.66
126.54
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Ph
3bm
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127.33
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29.03
28.96
27.50
27.32
27.14
10.43
10.39
9.38
8.38
8.33
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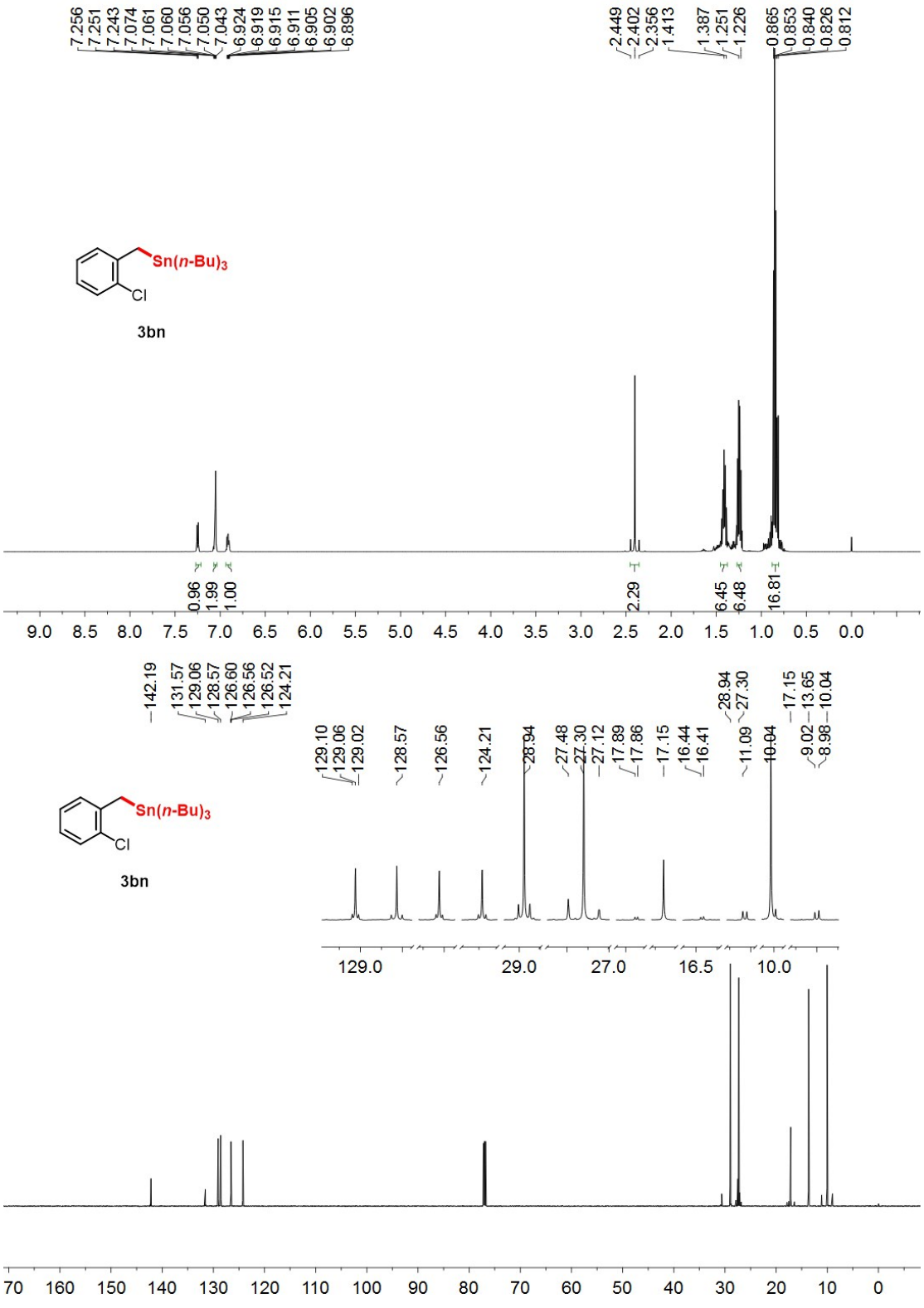
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6.902
6.896
2.449
2.402
2.356
1.413
1.387
1.251
1.226
0.865
0.853
0.840
0.826
0.812
Sn(n-Bu)3
Cl
3bn
0.96
1.99
1.00
2.29
6.45
6.48
16.81
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
142.19
131.57
129.06
128.57
126.60
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126.52
124.21
129.10
129.06
129.02
128.57
126.56
124.21
28.94
27.48
27.30
27.12
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17.86
17.15
16.44
16.41
28.94
27.30
11.09
10.04
17.15
13.65
9.02
8.98
10.04
Sn(n-Bu)3
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3bn
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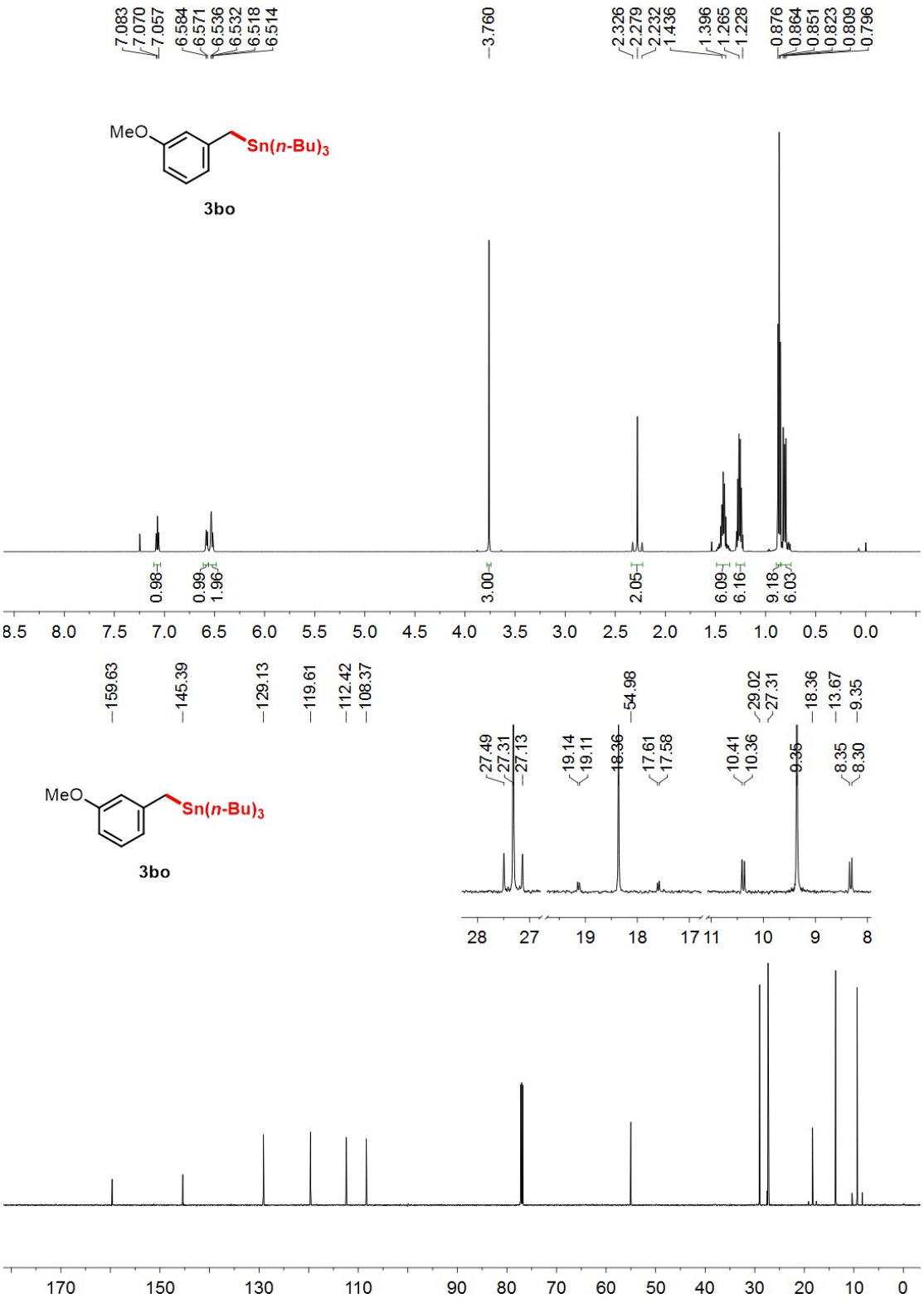
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2.232
1.436
1.396
1.265
1.228
0.876
0.864
0.851
0.823
0.809
0.796
MeO
Sn(n-Bu)3
3bo
0.98
0.99
1.96
3.00
2.05
6.09
6.16
9.18
6.03
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
159.63
145.39
129.13
119.61
112.42
108.37
54.98
29.02
27.31
18.36
13.67
9.35
27.49
27.31
27.13
19.14
19.11
18.36
17.61
17.58
10.41
10.36
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8.30
MeO
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3bo
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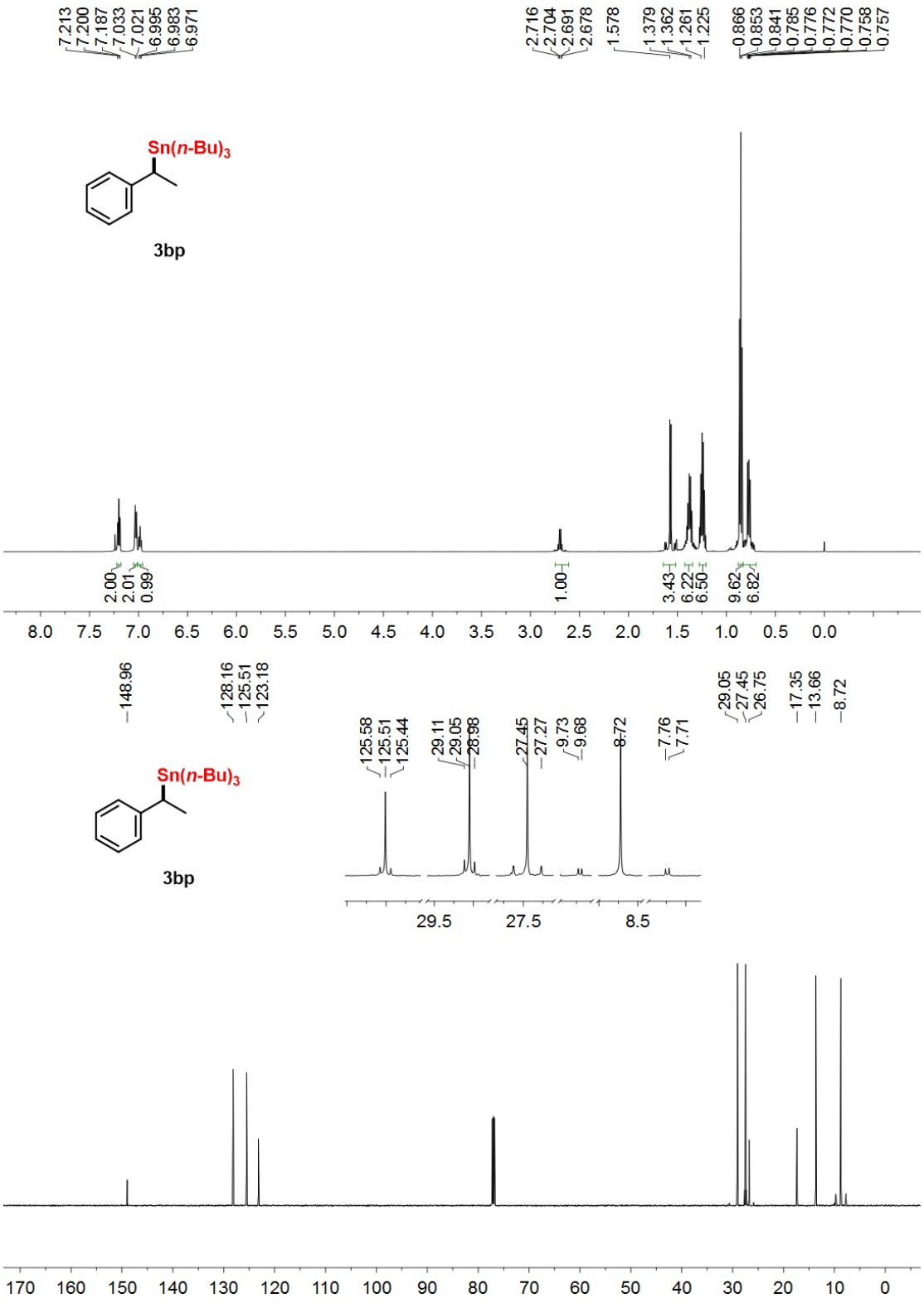
170 150 130 110 90 80 70 60 50 40 30 20 10 0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1.379
1.362
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1.225
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0.853
0.841
0.785
0.776
0.772
0.770
0.758
0.757
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2.01
0.99
1.00
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6.50
9.62
6.82
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
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128.16
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123.18
125.58
125.51
125.44
29.11
29.05
28.98
27.45
27.27
9.73
9.68
8.72
7.76
7.71
29.05
27.45
26.75
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13.66
8.72
Sn(n-Bu)3
3bp
29.5
27.5
8.5
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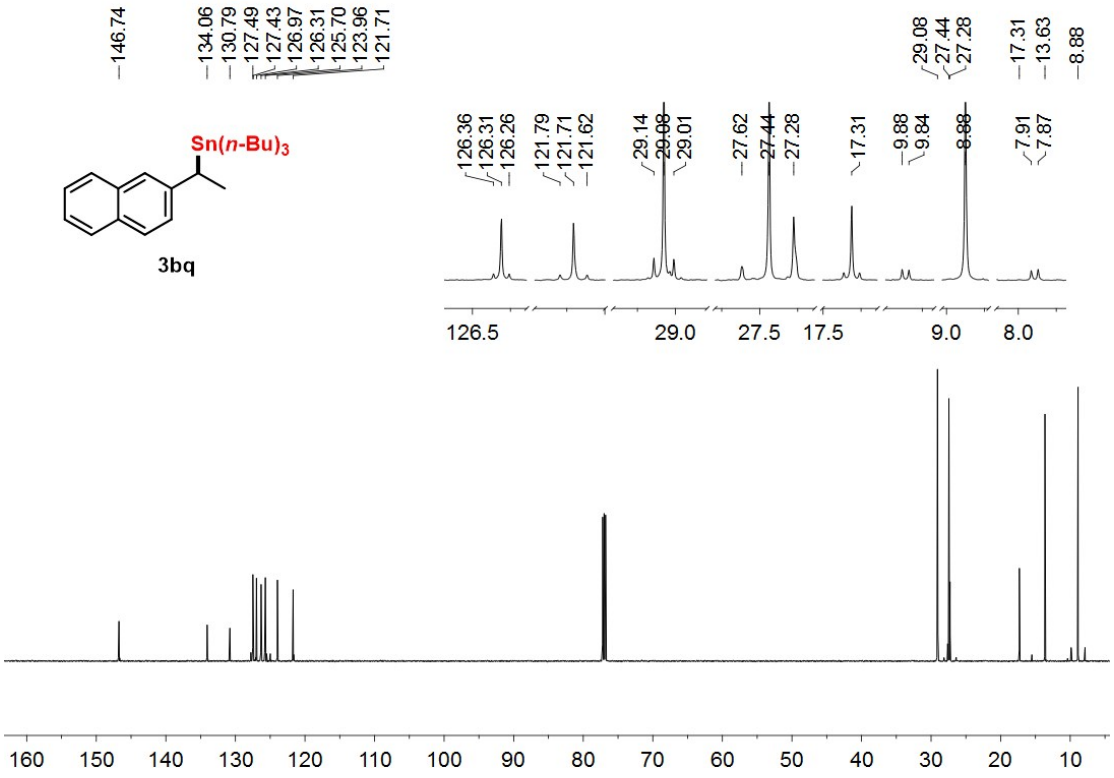
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27.28
17.31
13.63
8.88
Sn(n-Bu)3
3bq
126.36
126.31
126.26
121.79
121.71
121.62
29.14
29.08
29.01
27.62
27.44
27.28
17.31
9.88
9.84
8.88
7.91
7.87
126.5
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27.5
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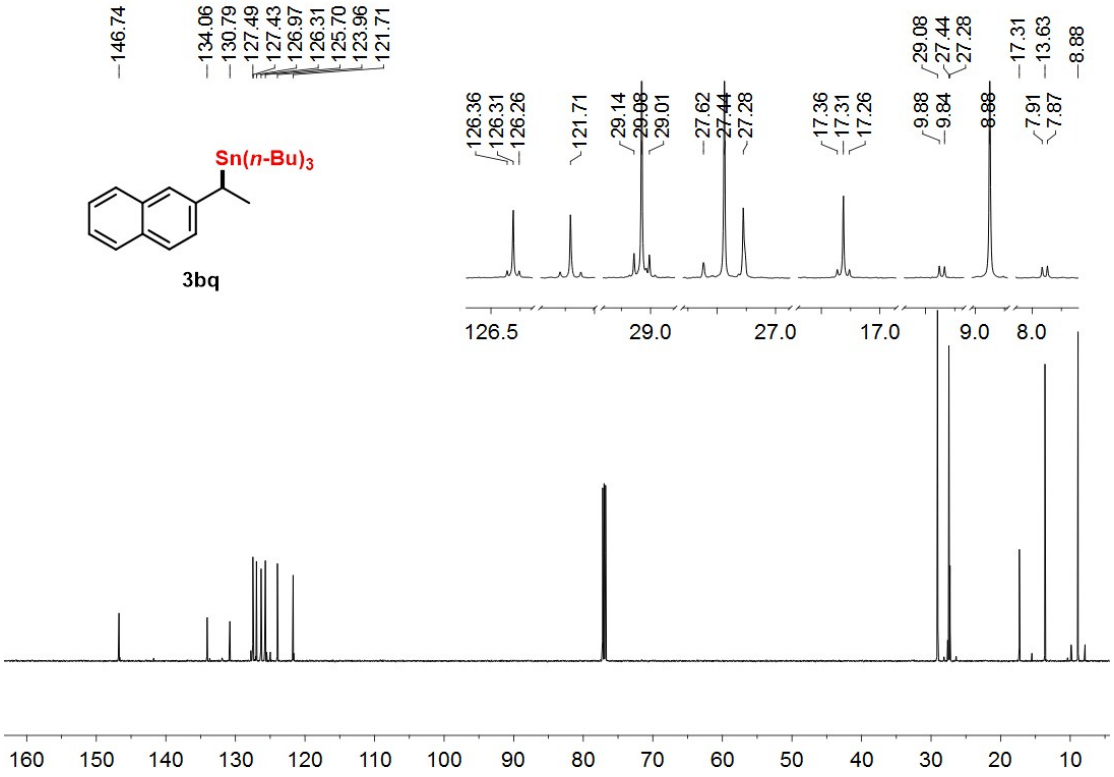
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121.71
29.08
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27.28
17.31
13.63
8.88
Sn(n-Bu)3
3bq
126.36
126.31
126.26
121.71
29.14
29.08
29.01
27.62
27.44
27.28
17.36
17.31
17.26
9.88
9.84
8.88
7.91
7.87
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27.0
17.0
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150
140
130
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100
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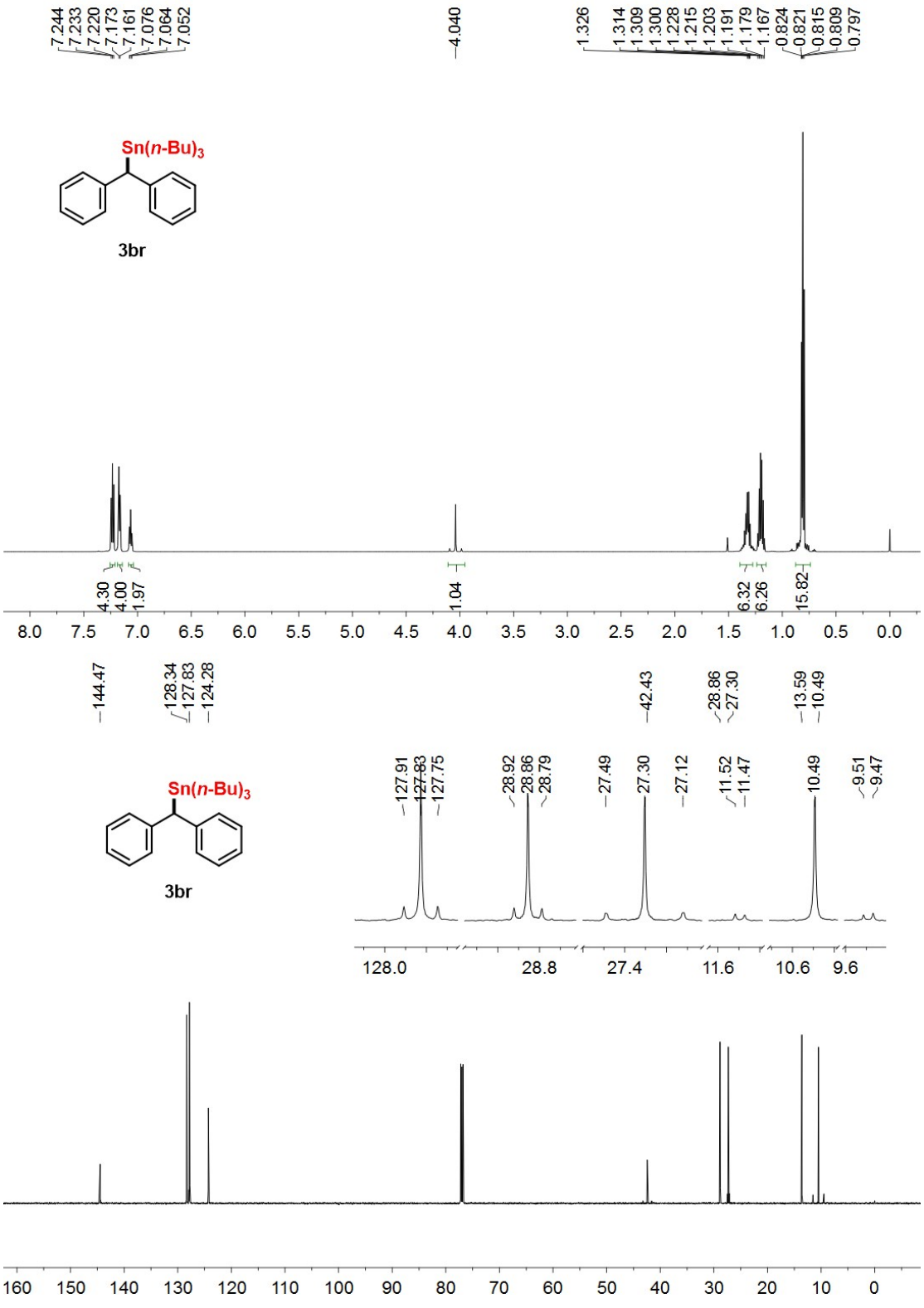
10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7.052
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1.228
1.215
1.203
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1.179
1.167
0.824
0.821
0.815
0.809
0.797
Sn(n-Bu)3
3br
4.30
4.00
1.97
1.04
6.32
6.26
15.82
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42.43
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127.91
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9.51
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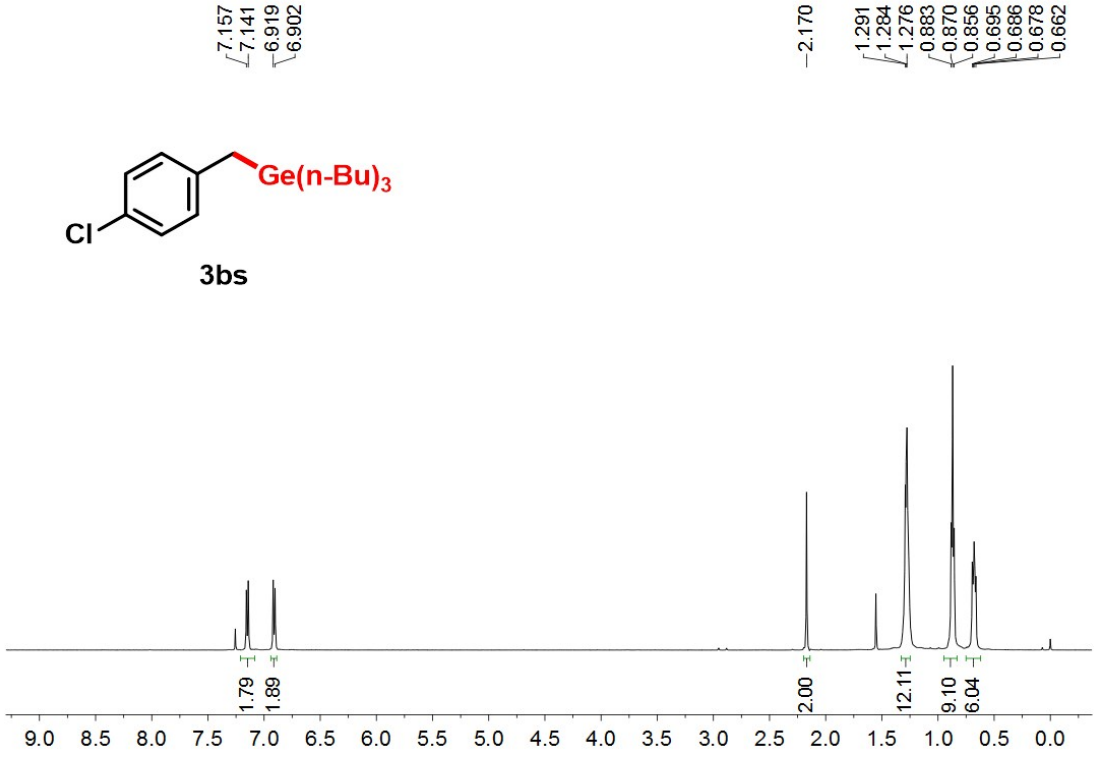
Sn(n-Bu)3
3br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1.276
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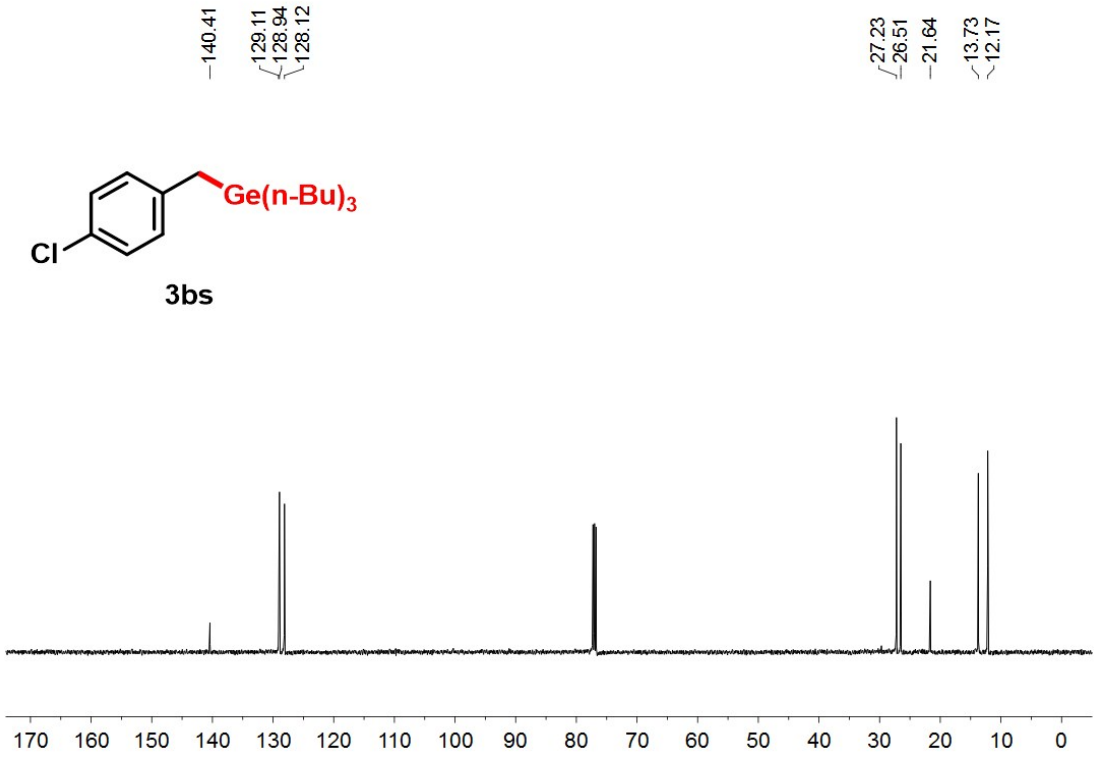
0.870
0.856
0.695
0.686
0.678
0.662
Ge(n-Bu)3
Cl
3bs
1.79
1.89
2.00
12.11
9.10
6.04
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0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128.12
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26.51
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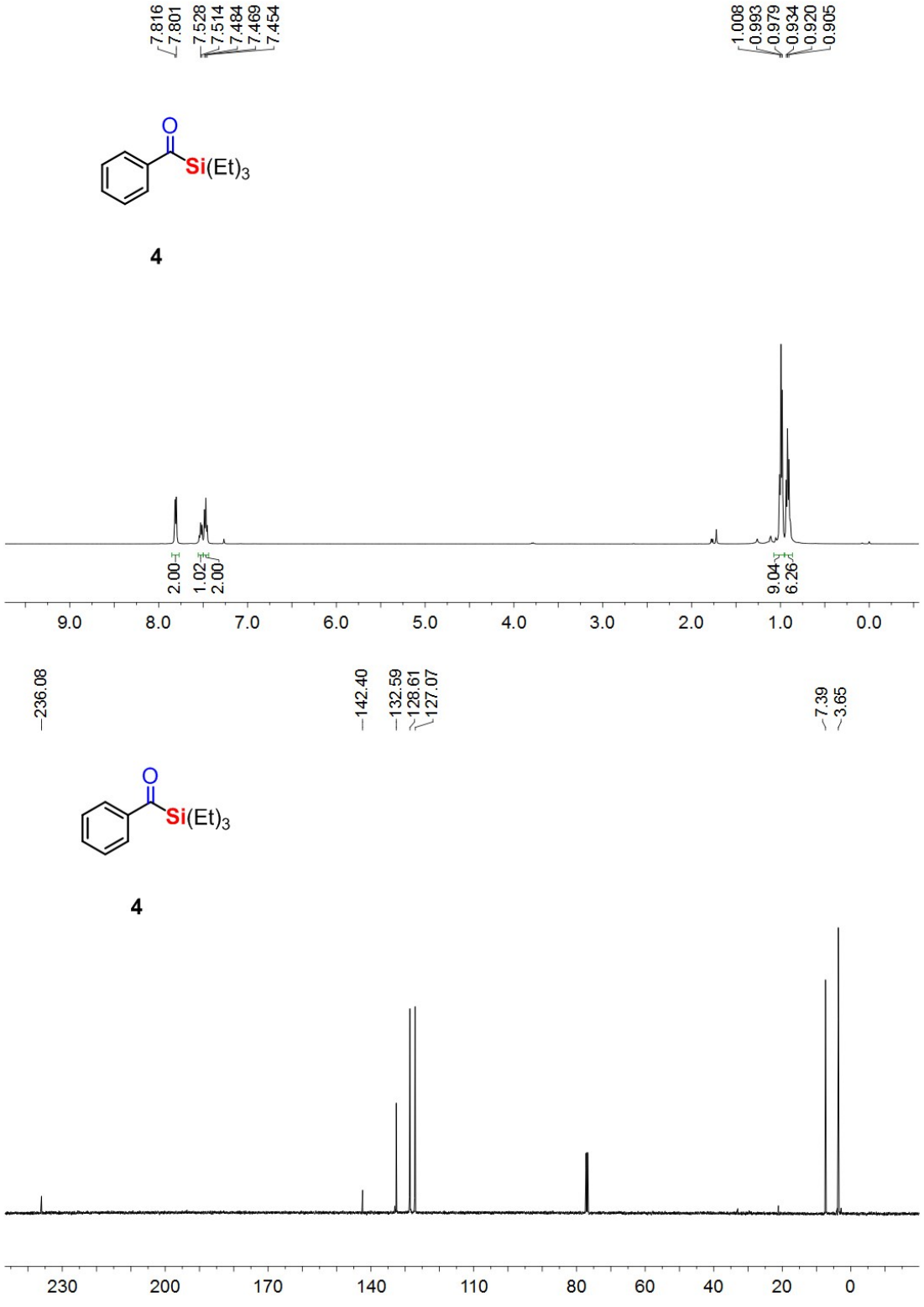
13.73
12.17
Ge(n-Bu)3
Cl
3bs
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0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7.514
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7.469
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0.979
0.934
0.920
0.905
O
Si(Et)3
4
2.00
1.02
2.00
9.04
6.26
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
236.08
142.40
132.59
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3.65
O
Si(Et)3
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170
140
110
80
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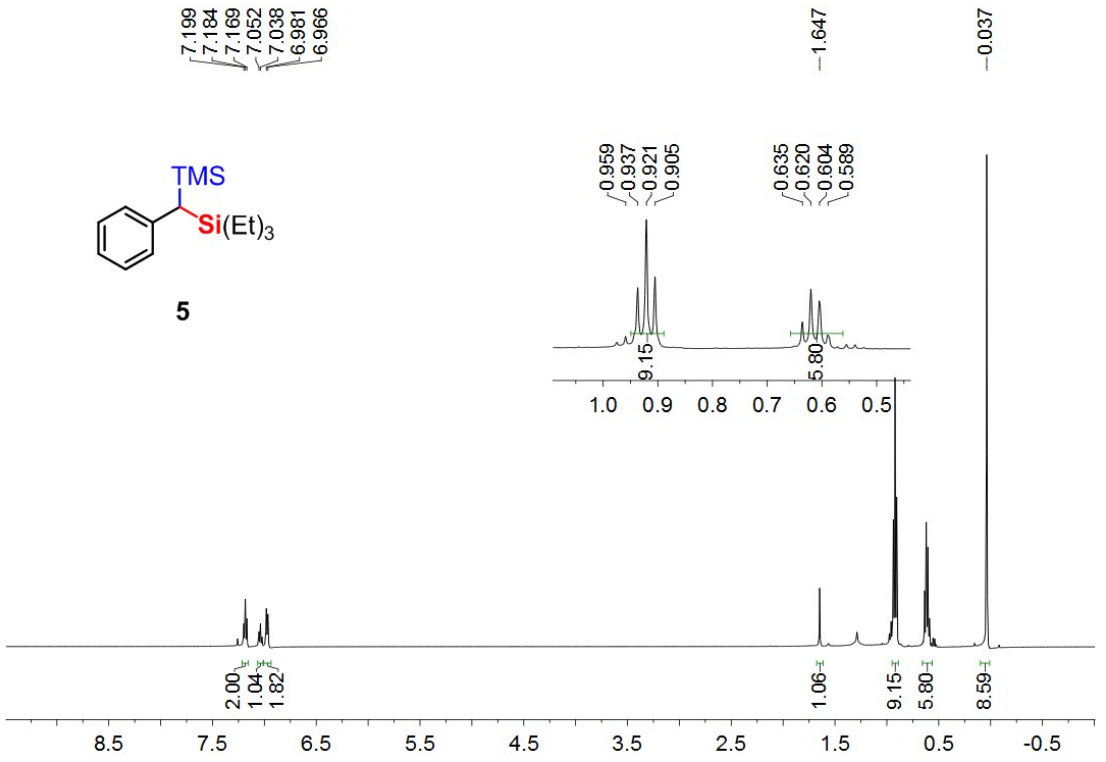
40
20
0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7.169
7.052
7.038
6.981
6.966
1.647
0.037
TMS
Si(Et)3
5
0.959
0.937
0.921
0.905
0.635
0.620
0.604
0.589
9.15
5.80
1.0 0.9 0.8 0.7 0.6 0.5
2.00
1.04
1.82
1.06
9.15
5.80
8.59
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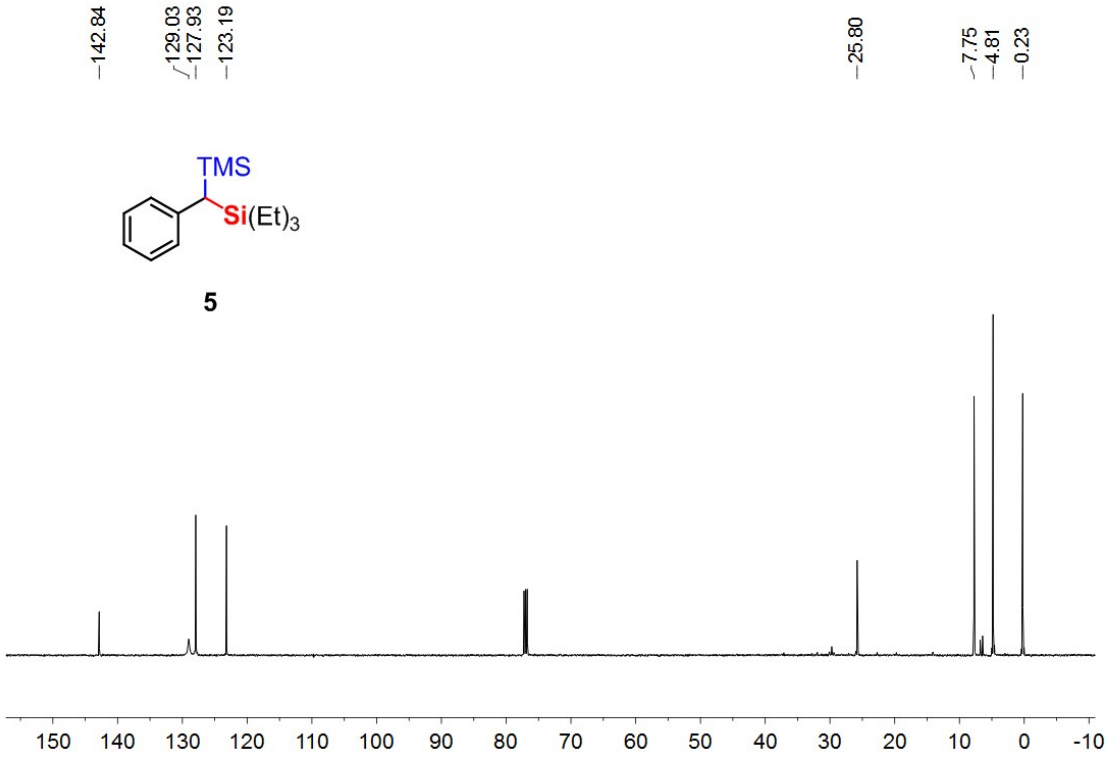
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Si(Et)3
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