Supporting Information

Enantioselective Construction of Six- and Seven-Membered Triorgano-Substituted Silicon-Stereogenic Heterocycles

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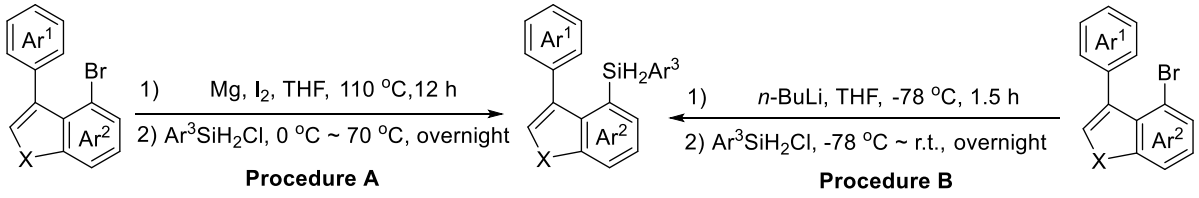
I. General Information

Regular reactions were carried out under argon atmosphere with magnetic stirring. Catalysis reactions were performed in colorless 5 mL microwave reaction tube under an inert atmosphere of argon. Anhydrous solvents were obtained from Inert Pure Solv solvent purification system or purchased from Energy Chemical. TLC were performed on silica gel Huanghai HSGF254 plates and visualization of the developed chromatogram was performed by fluorescence quenching (λ_{max} = 254 nm). Column chromatography was performed using GENERAL-REAGENT silica gel (200-300 mesh). Unless otherwise noted, all reagents were obtained from commercial suppliers (Bide Pharmatech, Aladdin, Energy Chemical, Adamas, and TCI) and used without further purification.

NMR spectra were obtained on Bruker DPX 400 (400 MHz) or Bruker DPX 600 (600 MHz) instruments. The ^{1}H NMR (400 or 600 MHz) chemical shifts were measured relative to $CDCl_3$ as the internal reference ($CDCl_3$: δ 7.26 ppm). The ^{13}C NMR (100 or 150 MHz) chemical shifts were given using $CDCl_3$ as the internal standard ($CDCl_3$: δ 77.0 ppm). High resolution mass spectra (HRMS) were obtained with an Agilent Technologies 6230 TOF LC/MS or Waters Premier GC-TOF MS by electrospray ionization (ESI) or electron impact ionization (EI). X-Ray single-crystal diffraction data were collected on Bruker D8 VENTURE. Absorption spectra were measured with a UV-Vis spectrophotometer (Shimadzu, UV3600). Emission spectra were measured with a Shimadzu RF-6000 spectrometer. Circular polarized luminescence (CPL) spectra were measured on a JASCO CPL-300 spectrometer. Circular dichroism (CD) spectra were measured on an APPLIED PHOTOPHYSICS Chirascan CD Spectrometer. Chiral HPLC chromatograms were obtained from an Agilent 1260 system. Optical rotation was measured on Rudolph Automatic Polarmeter at concentrations of 0.1 g/100 mL in $CHCl_3$.

II. Preparation of Dihydrosilane Substrates

1. Indole Dihydrosilane Substrates[1,2,3]



X = NR, O, S

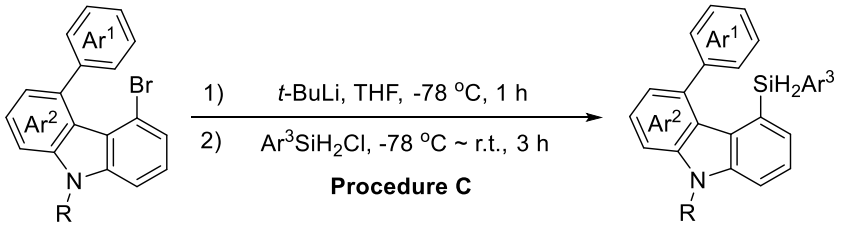
X = NR

Procedure A: Under argon atmosphere, a 50 mL Schlenk tube was charged with brominated heterocycle[4,5,6] (1 equiv), Mg powder (5 equiv), I_2 (2 granules), and THF (0.5 M). The tube was then sealed and the mixture was stirred at 110 °C for 12 h. The Grignard reagent was used for next step without further purification.

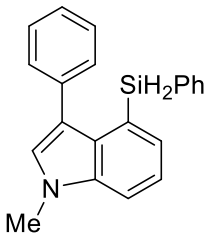
Under argon atmosphere, Ar^3SiH_2Cl (1.5 eq) was added to a well stirred solution of Grignard reagent slowly at 0 °C. Then the reaction mixture was stirred at 70 °C overnight. After cooling the solution to room temperature, saturated NH_4Cl was added. The mixture was extracted with EtOAc and the combined organic layer was dried over anhydrous Na_2SO_4, filtered, concentrated under reduced pressure and purified by silica gel flash column chromatography to provide the desired compound.

Procedure B: Under argon atmosphere, a 50 mL Schlenk tube was charged with brominated heterocycle[4] (1 equiv) and THF (0.5 M). The mixture was cooled down to -78 °C and *n*-BuLi (1.1 equiv) was added slowly. After 1.5 h, Ar^3SiH_2Cl (1.5 equiv) was added dropwise. Then the reaction mixture was allowed to warm to room temperature and stirred overnight. After cooling the solution to room temperature, saturated NH_4Cl was added. The mixture was extracted with EtOAc and the combined organic layer was dried over anhydrous Na_2SO_4, filtered, concentrated under reduced pressure and purified by silica gel flash column chromatography to provide the desired compound.

2. Carbazole Dihydrosilane Substrates[1,7]

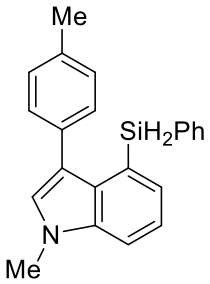


Procedure C: Under argon atmosphere, a 50 mL Schlenk tube was charged with brominated heterocycle[8] (1 equiv) and THF (0.1 M). The mixture was cooled down to -78 °C and *t*-BuLi (2.2 equiv) was added slowly. After 1 h, Ar^3SiH_2Cl (1.5 equiv) was added dropwise. Then the reaction mixture was allowed to warm to room temperature and stirred for additional 3 h. Then, saturated NH_4Cl was added. The mixture was extracted with EtOAc and the combined organic layer was dried over anhydrous Na_2SO_4, filtered, concentrated under reduced pressure and purified by silica gel flash column chromatography to provide the desired compound.



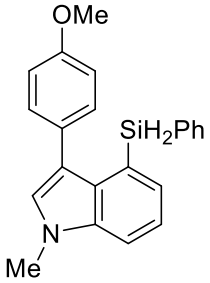
1-Methyl-3-phenyl-4-(phenylsilyl)-1*H*-indole (1a)

The reaction was performed at 3 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate = 40/1, v/v) afforded the product **1a** as a white solid (526 mg, 56% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.47 (dd, J = 8.2, 0.9 Hz, 1H), 7.36 (dd, J = 6.9, 1.0 Hz, 1H), 7.32 – 7.25 (m, 6H), 7.25 – 7.18 (m, 5H), 7.04 (s, 1H), 4.64 (s, 2H), 3.84 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 136.0, 135.8, 135.5, 132.7, 131.7, 131.0, 131.0, 129.1, 128.1, 127. 8, 127. 6, 126.7, 123.0, 121.2, 119.4, 111.7, 32.8 ppm. HRMS (ESI): calcd for $C_{21}H_{20}NSi$ $[M+H]^+$ 314.1360, found 314.1357.



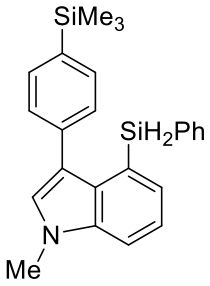
1-Methyl-4-(phenylsilyl)-3-(*p*-tolyl)-1*H*-indole (1b)

The reaction was performed at 3.7 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate = 40/1, v/v) afforded the product **1b** as a white solid (556 mg, 46% yield).^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.45 (d, J = 8.0 Hz, 1H), 7.34 (d, J = 6.9 Hz, 1H), 7.31 – 7.17 (m, 6H), 7.15 (d, J = 7.9 Hz, 2H), 7.04 (d, J = 7.8 Hz, 2H), 7.01 (s, 1H), 4.65 (s, 2H), 3.82 (s, 3H), 2.38 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 136.4, 135.8, 135.5, 132.9, 132. 8, 131.8, 130.9, 130.8, 129.1, 128.5, 128.1, 127.5, 123.0, 121.1, 119.3, 111.6, 32.7, 21.2 ppm. HRMS (ESI): calcd for $C_{22}H_{22}NSi$ $[M+H]^+$ 328.1516, found 328.1513.



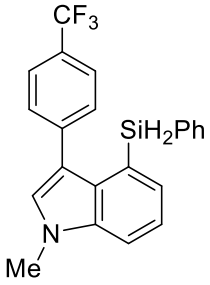
3-(4-Methoxyphenyl)-1-methyl-4-(phenylsilyl)-1*H*-indole (1c)

The reaction was performed at 3.6 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate = 80/1, v/v) afforded the product **1c** as a white solid (501 mg, 40% yield).^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.46 (d, J = 8.2 Hz, 1H), 7.39 – 7.32 (m, 1H), 7.32 – 7.25 (m, 3H), 7.25 – 7.18 (m, 3H), 7.15 (dd, J = 8.5, 2.0 Hz, 2H), 7.00 (s, 1H), 6.77 (dd, J = 8.5, 1.9 Hz, 2H), 4.64 (d, J = 2.6 Hz, 2H), 3.88 – 3.80 (m, 6H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 158.8, 135.7, 135.4, 132.8, 132.1, 132.0, 130.8, 129.1, 128.1, 128.1 127.5, 122.9, 121.1, 118.9, 113.2, 111.6, 55.3, 32.7 ppm. HRMS (ESI): calcd for $C_{22}H_{22}NOSi$ $[M+H]^+$ 344.1465, found 344.1462.



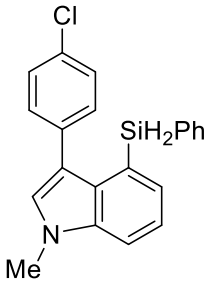
1-Methyl-4-(phenylsilyl)-3-(4-(trimethylsilyl)phenyl)-1*H*-indole (1d)

The reaction was performed at 1.7 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate = 40/1, v/v) afforded the product **1d** as a pale yellow oil (332 mg, 50% yield).^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.47 (d, J = 8.2 Hz, 1H), 7.41 (dd, J = 6.9, 0.9 Hz, 1H), 7.36 (d, J = 7.9 Hz, 2H), 7.30 – 7.25 (m, 2H), 7.21 (d, J = 7.9 Hz, 2H), 7.19 – 7.11 (m, 4H), 7.02 (s, 1H), 4.68 (s, 2H), 3.83 (s, 3H), 0.31 (s, 9H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 138.2, 136.3, 135.9, 135.3, 132.8, 132.8, 131.6, 131.2, 130.2, 129.0, 128.1, 127.5, 123.0, 121.2, 119.5, 111.7, 32.8, -1.0 ppm. HRMS (ESI): calcd for $C_{24}H_{28}NSi_2$ $[M+H]^+$ 386.1755, found 386.1749.



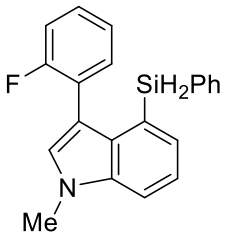
1-Methyl-4-(phenylsilyl)-3-(4-(trifluoromethyl)phenyl)-1*H*-indole (1e)

The reaction was performed at 1.5 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **1e** as a white solid (184 mg, 32% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.50 (dd, J = 8.3, 0.9 Hz, 1H), 7.47 (dd, J = 7.0, 1.0 Hz, 1H), 7.41 (d, J = 8.0 Hz, 2H), 7.34 – 7.24 (m, 4H), 7.15 (t, J = 7.6 Hz, 2H), 7.09 (dd, J = 8.0, 1.4 Hz, 2H), 7.03 (s, 1H), 4.71 (s, 2H), 3.85 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 139.9, 136.0, 135.1, 132.1, 131.7, 131.2, 130.8, 129.2, 128.6 (q, $J_{C\text{-}F}$ = 32.1 Hz), 128.4, 127.6, 124.6 (q, $J_{C\text{-}F}$ = 3.7 Hz), 124.5 (q, $J_{C\text{-}F}$ = 270.2 Hz), 122.7, 121.6, 118.1, 112.0, 32.9 ppm. ^{19}F NMR (565 MHz, $CDCl_3$): δ = -62.32 ppm. HRMS (ESI): calcd for $C_{22}H_{19}F_3NSi$ $[M+H]^+$ 382.1233, found 382.1229.



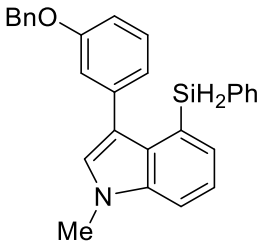
3-(4-Chlorophenyl)-1-methyl-4-(phenylsilyl)-1*H*-indole (1f)

The reaction was performed at 1.4 mmol scale according to procedure B. Purification via silica gel column chromatography (petroleum ether) afforded the product **1f** as a white solid (208 mg, 43% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.47 (dd, J = 8.2, 0.9 Hz, 1H), 7.41 (dd, J = 7.0, 1.0 Hz, 1H), 7.31 – 7.25 (m, 2H), 7.23 – 7.17 (m, 4H), 7.16 – 7.09 (m, 4H), 7.00 (s, 1H), 4.69 (s, 2H), 3.83 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 135.9, 135.3, 134.4, 132.7, 132.3, 132.1, 131.5, 131.3, 129.2, 128.2, 127.8, 127.6, 122.8, 121.4, 118.1, 111.8, 32.8 ppm. HRMS (ESI): calcd for $C_{21}H_{19}ClNSi$ $[M+H]^+$ 348.0970, found 348.0967.



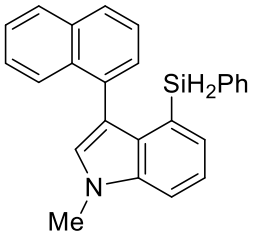
3-(2-Fluorophenyl)-1-methyl-4-(phenylsilyl)-1*H*-indole (1g)

The reaction was performed at 3.3 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =100/1, v/v) afforded the product **1g** as a pale yellow oil (624 mg, 57% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.47 (d, J = 8.2 Hz, 1H), 7.36 (d, J = 6.9 Hz, 1H), 7.30 – 7.22 (m, 3H), 7.22 – 7.16 (m, 5H), 7.07 (s, 1H), 7.02 – 6.93 (m, 2H), 4.65 (s, 2H), 3.83 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 161.2 (d, J_{C-F} = 243.5 Hz), 135.9, 135.4, 133.9 (d, J_{C-F} = 2.4 Hz), 132.3, 132.0, 130.9, 129.1, 128.9, 128.9, 127.5, 123.6 (d, J_{C-F} = 16.5 Hz), 123.3 (d, J_{C-F} = 3.5 Hz), 122.9, 121.3, 115.2 (d, J_{C-F} = 22.4 Hz), 111.8, 111.4, 32.9 ppm. ^{19}F NMR (565 MHz, $CDCl_3$): δ = -113.21 ppm. HRMS (ESI): calcd for $C_{21}H_{19}FNSi$ $[M+H]^+$ 332.1265, found 332.1262.



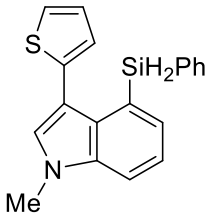
3-(3-(Benzyloxy)phenyl)-1-methyl-4-(phenylsilyl)-1*H*-indole (1h)

The reaction was performed at 2.0 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =40/1, v/v) afforded the product **1h** as a white solid (433 mg, 52% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.47 (d, J = 8.2 Hz, 1H), 7.44 – 7.34 (m, 5H), 7.34 – 7.24 (m, 4H), 7.24 – 7.13 (m, 4H), 7.03 (s, 1H), 6.90 (t, J = 9.5 Hz, 2H), 6.85 (s, 1H), 4.88 (s, 2H), 4.69 (d, J = 1.6 Hz, 2H), 3.83 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 158.3, 137.4, 137.2, 135.8, 135.4, 132.7, 131.6, 131.1, 129.0, 128.8, 128.5, 128.1, 127.8, 127.6, 127.5, 123.9, 122.9, 121.3, 119.3, 116.7, 113.9, 111.7, 69.6, 32.8 ppm. HRMS (ESI): calcd for $C_{28}H_{26}NOSi$ $[M+H]^+$ 420.1778, found 420.1772.



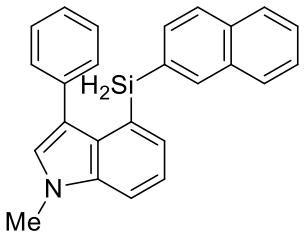
1-Methyl-3-(naphthalen-1-yl)-4-(phenylsilyl)-1*H*-indole (1i)

The reaction was performed at 3.3 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **1h** as a white solid (740 mg, 62% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.84 – 7.77 (m, 2H), 7.61 (d, J = 8.5 Hz, 1H), 7.47 (dd, J = 8.1, 1.1 Hz, 1H), 7.39 – 7.34 (m, 1H), 7.33 – 7.23 (m, 4H), 7.22 – 7.17 (m, 1H), 7.15 – 7.09 (m, 1H), 7.05 (s, 1H), 7.05 – 6.97 (m, 4H), 4.22 – 4.09 (m, 2H), 3.80 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 135.8, 135.1, 134.5, 133.4, 133.4, 133.0, 132.4, 130.6, 129.7, 129.1, 128.8, 127.8, 127.6, 127.3, 126.9, 125.6, 125.5, 125.1, 123.4, 121.3, 116.1, 111.6, 32.8 ppm. HRMS (ESI): calcd for $C_{25}H_{22}NSi$ $[M+H]^+$ 364.1516, found 364.1513.



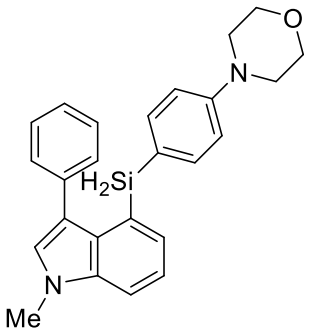
1-Methyl-4-(phenylsilyl)-3-(thiophen-2-yl)-1*H*-indole (1j)

The reaction was performed at 2.0 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **1j** as a brown oil (224 mg, 35% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.46 (d, J = 8.2 Hz, 1H), 7.35 – 7.31 (m, 4H), 7.28 – 7.25 (m, 4H), 7.15 (s, 1H), 7.00 – 6.98 (m, 1H), 6.86 (d, J = 2.7 Hz, 1H), 4.65 (s, 2H), 3.83 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 136.3, 135.7, 135.5, 132.8, 132.6, 131.1, 129.7, 129.1, 129.1, 127.6, 126.9, 125.6, 123.2, 121.5, 111.7, 110.3, 32.9 ppm. HRMS (ESI): calcd for $C_{19}H_{18}NSSi$ $[M+H]^+$ 320.0924, found 320.0921.



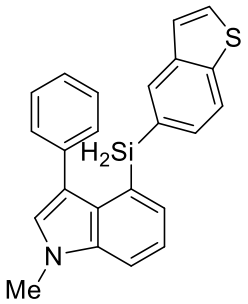
1-Methyl-4-(naphthalen-2-ylsilyl)-3-phenyl-1*H*-indole (1k)

The reaction was performed at 2.5 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =40/1, v/v) afforded the product **1k** as a colorless oil (618 mg, 68% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.75 (d, J = 7.7 Hz, 1H), 7.72 (s, 1H), 7.69 (d, J = 7.7 Hz, 1H), 7.66 (d, J = 8.0 Hz, 1H), 7.47 – 7.40 (m, 4H), 7.30 – 7.24 (m, 5H), 7.20 – 7.17 (m, 2H), 7.01 (s, 1H), 4.78 (s, 2H), 3.80 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 136.5, 136.0, 135.9, 133.7, 132.8, 131.7, 131.3, 131.1, 131.0, 130.3, 128.2, 128.1, 127.8, 127.6, 126.8, 126.7, 126.3, 125.7, 122.9, 121.2, 119.4, 111.7, 32.8 ppm. HRMS (ESI): calcd for $C_{25}H_{22}NSi$ $[M+H]^+$ 364.1516, found 364.1510.



4-(4-((1-Methyl-3-phenyl-1*H*-indol-4-yl)silyl)phenyl)morpholine (1l)

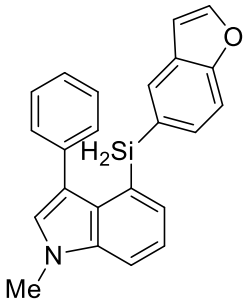
The reaction was performed at 1.0 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =20/1, v/v) afforded the product **1l** as a white solid (251 mg, 63% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.43 (d, J = 8.1 Hz, 1H), 7.33 – 7.23 (m, 7H), 7.18 (d, J = 8.5 Hz, 2H), 7.03 (s, 1H), 6.77 (d, J = 8.5 Hz, 2H), 4.59 (s, 2H), 3.84 – 3.82 (m, 4H), 3.81 (s, 3H), 3.15 – 3.13 (m, 4H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 151.8, 136.7, 136.2, 135.8, 131.6, 131.0, 130.7, 128.1, 127.8, 126.7, 123.8, 121.9, 121.2, 119.5, 114.7, 111.4, 66.8, 48.7, 32.7 ppm. HRMS (ESI): calcd for $C_{25}H_{27}N_2OSi$ $[M+H]^+$ 399.1887, found 399.1884.



4-(Benzo[*b*]thiophen-5-ylsilyl)-1-methyl-3-phenyl-1*H*-indole (1m)

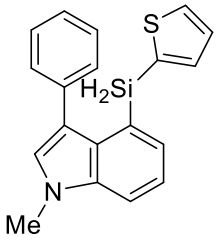
The reaction was performed at 2.5 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **1m** as an orange solid (240 mg, 26% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.53 (d, J = 2.1 Hz, 1H), 7.44 (t, J = 4.0 Hz, 2H), 7.38 (d, J = 6.7 Hz, 1H), 7.34 (d, J = 8.2 Hz, 1H), 7.27 – 7.23 (m, 4H), 7.21 – 7.18 (m, 2H), 7.14 (d, J = 8.2 Hz, 1H), 6.99 (s, 1H), 6.62 (d, J = 1.5 Hz, 1H), 4.74 (s, 2H), 3.78 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 155.8, 144.6, 136.0, 135.9, 131.6, 131.2, 131.0, 128.9, 128.2, 127.7, 127.1, 126.7, 126.0, 123.5, 121.2, 119.4, 111.7, 110.8, 106.3,

32.7 ppm. HRMS (ESI): calcd for $C_{23}H_{20}NSSi$ $[M+H]^+$ 370.1080, found 370.1077.



4-(Benzofuran-5-ylsilyl)-1-methyl-3-phenyl-1*H*-indole (1n)

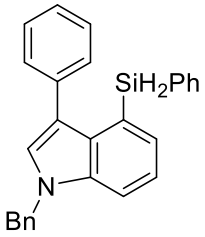
The reaction was performed at 2.5 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **1n** as an orange solid (274 mg, 31% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.56 (d, J = 2.1 Hz, 1H), 7.47 (d, J = 8.2 Hz, 1H), 7.45 (s, 1H), 7.38 (d, J = 6.9 Hz, 1H), 7.35 (d, J = 8.2 Hz, 1H), 7.29 – 7.23 (m, 4H), 7.21 – 7.19 (m, 2H), 7.14 (d, J = 8.2 Hz, 1H), 7.02 (s, 1H), 6.65 (d, J = 2.0 Hz, 1H), 4.73 (s, 2H), 3.83 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 155.8, 144.6, 136.1, 135.9, 131.6, 131.2, 131.0, 131.0, 129.0, 128.2, 127.7, 127.1, 126.7, 126.1, 123.5, 121.2, 119.4, 111.7, 110.8, 106.4, 32.8 ppm. HRMS (ESI): calcd for $C_{23}H_{20}NOSi$ $[M+H]^+$ 354.1309, found 354.1304.



4-(Benzofuran-5-ylsilyl)-1-methyl-3-phenyl-1*H*-indole (1o)

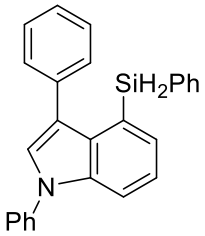
The reaction was performed at 2.5 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **1o** as a pale yellow solid (176 mg, 22% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.57 (d, J = 4.5 Hz, 1H), 7.47 (d, J = 8.2 Hz, 1H), 7.37 – 7.31 (m, 6H), 7.26 (d, J = 7.4 Hz, 1H), 7.10 – 7.08 (m, 2H), 7.06 (s, 1H), 4.72 (s, 2H), 3.84 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 137.5, 136.1, 135.8, 131.9, 131.6, 130.9, 130.5, 128.2, 128.1, 127.9, 126.9, 122.6, 121.3, 119.3, 111.8,

32.8 ppm. HRMS (ESI): calcd for $C_{19}H_{18}NSSi$ $[M+H]^+$ 320.0924, found 320.0921.



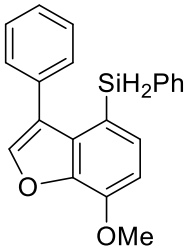
1-Benzyl-3-phenyl-4-(phenylsilyl)-1*H*-indole (1p)

The reaction was performed at 2.6 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether) afforded the product **1p** as a white solid (428 mg, 42% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.43 (dd, J = 8.3, 0.9 Hz, 1H), 7.36 – 7.14 (m, 17H), 7.11 (s, 1H), 5.35 (s, 2H), 4.64 (s, 2H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 137.1, 136.0, 135.5, 135.5, 132.7, 132.0, 131.2, 131.0, 129.1, 128.8, 127.8, 127.7, 127.6, 127.5, 127.0, 126.8, 123.2, 121.4, 120.0, 112.1, 50.1 ppm. HRMS (ESI): calcd for $C_{27}H_{24}NSi$ $[M+H]^+$ 390.1673, found 390.1668.



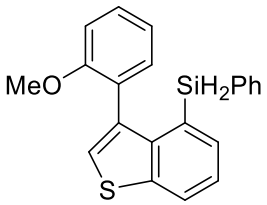
1,3-Diphenyl-4-(phenylsilyl)-1*H*-indole (1q)

The reaction was performed at 1.3 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether) afforded the product **1q** as a white solid (243 mg, 50% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.69 (d, J = 8.3 Hz, 1H), 7.57 – 7.48 (m, 4H), 7.43 – 7.20 (m, 14H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 139.4, 135.5, 135.5, 135.2, 132.6, 132.6, 131.9, 131.0, 129.7, 129.2, 127.9, 127.6, 127.2, 127.1, 126.8, 124.7, 123.4, 122.0, 121.6, 112.9 ppm. HRMS (ESI): calcd for $C_{26}H_{22}NSi$ $[M+H]^+$ 376.1516, found 376.1515.



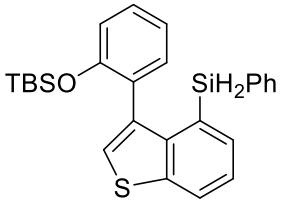
(7-Methoxy-3-phenylbenzofuran-4-yl)(phenyl)silane (1r)

The reaction was performed at 1.0 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **1r** as a white solid (220 mg, 67% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.59 (s, 1H), 7.40 (d, *J* = 7.9 Hz, 1H), 7.37 – 7.16 (m, 10H), 6.85 (d, *J* = 7.9 Hz, 1H), 4.59 (s, 2H), 4.05 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 147.5, 144.2, 142.6, 135.3, 134.9, 134.1, 132.2, 131.8, 130.5, 129.3, 128.1, 127.9, 127.7, 124.8, 115.1, 106.2, 56.0 ppm. HRMS (ESI): calcd for $C_{21}H_{19}O_2Si$ $[M+H]^+$ 331.1149, found 331.1146.



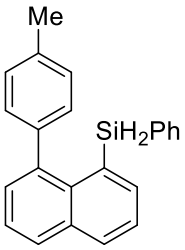
(3-(2-Methoxyphenyl)benzo[*b*]thiophen-4-yl)(phenyl)silane (1s)

The reaction was performed at 3.1 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **1s** as a colorless viscous oil (717 mg, 67% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.99 (dd, *J* = 8.1, 1.1 Hz, 1H), 7.50 (dd, *J* = 7.0, 1.1 Hz, 1H), 7.41 – 7.27 (m, 4H), 7.26 – 7.22 (m, 4H), 7.10 (dd, *J* = 7.4, 1.8 Hz, 1H), 6.85 (td, *J* = 7.4, 1.0 Hz, 1H), 6.79 (d, *J* = 8.3 Hz, 1H), 4.39 – 4.31 (m, 2H), 3.48 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 158.3, 143.4, 140.3, 136.5, 135.7, 135.5, 133.0, 132.5, 129.8, 129.2, 127.6, 126.8, 125.6, 125.5, 125.1, 123.2, 120.0, 110.5, 54.9 ppm. HRMS (ESI): calcd for $C_{21}H_{19}OSSi$ $[M+H]^+$ 347.0920, found 347.0918.



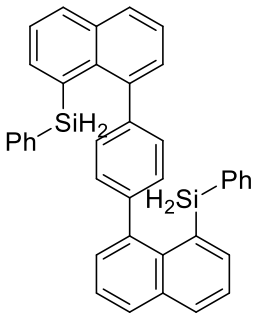
***tert*-Butyldimethyl(2-(4-(phenylsilyl)benzo[*b*]thiophen-3-yl)phenoxy)silane (1t)**

The reaction was performed at 1.6 mmol scale according to procedure A. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **1t** as a colorless oil (350 mg, 45% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.95 (dd, J = 8.1, 1.1 Hz, 1H), 7.44 (dd, J = 7.1, 1.1 Hz, 1H), 7.35 – 7.22 (m, 8H), 7.12 – 7.07 (m, 1H), 6.87 – 6.80 (m, 2H), 4.54 – 4.30 (m, 2H), 0.50 (s, 9H), 0.04 (s, 3H), -0.10 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 154.8, 143.5, 140.1, 137.2, 135.6, 135.3, 132.9, 132.7, 129.5, 129.3, 128.7, 127.7, 127.2, 125.4, 124.8, 123.1, 120.8, 119.1, 25.0, 17. 6, -4.2, -4.8 ppm. HRMS (ESI): calcd for $C_{26}H_{31}OSSi_2$ $[M+H]^+$ 447.1629, found 447.1627.



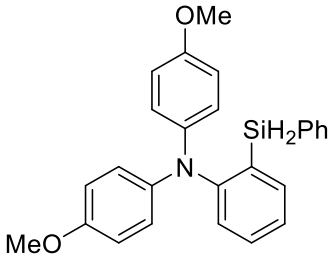
Phenyl(8-(*p*-tolyl)naphthalen-1-yl)silane (1u)

The reaction was performed at 3.4 mmol scale according to literature[1,2,9]. Purification via silica gel column chromatography (petroleum ether) afforded the product **1u** as a white solid (648 mg, 64% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.96 (d, J = 8.1 Hz, 1H), 7.87 (dd, J = 8.1, 1.1 Hz, 1H), 7.72 (dd, J = 6.8, 1.2 Hz, 1H), 7.49 (t, J = 7.8 Hz, 1H), 7.41 (t, J = 7.8 Hz, 1H), 7.36 (dd, J = 7.0, 1.3 Hz, 1H), 7.33 – 7.29 (m, 1H), 7.26 – 7.19 (m, 4H), 7.14 (d, J = 7.9 Hz, 2H), 7.09 (d, J = 7.7 Hz, 2H), 4.16 (s, 2H), 2.41 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 142.0, 139.8, 139.5, 137.6, 136.6, 135.3, 134.7, 134.5, 131.3, 131.2, 129.9, 129.4, 129.1, 129.1, 128.7, 127.6, 124.9, 124.7, 21.3 ppm.



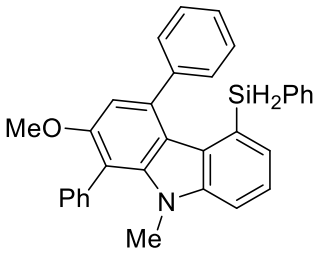
1,4-Bis(8-(phenylsilyl)naphthalen-1-yl)benzene (1v)

The reaction was performed at 1.0 mmol scale according to literature[1,2,9]. Purification via silica gel column chromatography (petroleum ether) afforded the product **1v** as a white solid (266 mg, 49% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.04 (d, J = 8.0 Hz, 2H), 7.97 (d, J = 7.9 Hz, 2H), 7.82 (d, J = 6.5 Hz, 2H), 7.62 (t, J = 7.5 Hz, 2H), 7.54 (d, J = 6.8 Hz, 2H), 7.49 (t, J = 7.4 Hz, 2H), 7.33 – 7.27 (m, 10H), 7.20 (s, 4H), 4.34 (s, 4H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 142.2, 141.8, 140.0, 136.4, 135.2, 134.5, 131.5, 131.2, 129.8, 129.8, 129.2, 129.0, 127.7, 125.0, 124.8 ppm.



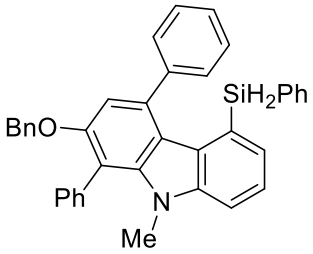
***N*,*N*-Bis(4-methoxyphenyl)-2-(phenylsilyl)aniline (1w)**

The reaction was performed at 5.5 mmol scale according to literature[1,2,10]. Purification via silica gel column chromatography (petroleum ether) afforded the product **1w** as a pale yellow solid (766 mg, 34% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.40 (dd, J = 7.3, 1.2 Hz, 1H), 7.34 (d, J = 6.6 Hz, 2H), 7.26 – 7.18 (m, 2H), 7.15 (t, J = 7.1 Hz, 2H), 6.98 (t, J = 7.3 Hz, 1H), 6.92 (d, J = 8.0 Hz, 1H), 6.67 (d, J = 9.0 Hz, 4H), 6.58 (d, J = 9.0 Hz, 4H), 4.39 (s, 2H), 3.60 (s, 6H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 154.7, 154.4, 142.4, 138.7, 135.6, 132.0, 131.7, 130.9, 129.4, 127.8, 127.7, 124.2, 124.2, 114.2, 55.3 ppm. HRMS (ESI): calcd for $C_{26}H_{26}NO_2Si$ $[M+H]^+$ 412.1727, found 412.1719.



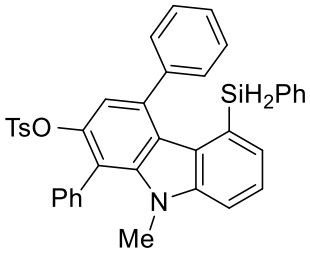
2-Methoxy-9-methyl-1,4-diphenyl-5-(phenylsilyl)-9*H*-carbazole (3a)

The reaction was performed at 3.0 mmol scale according to procedure C. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **3a** as a white solid (985 mg, 70% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.64 – 7.58 (m, 2H), 7.51 – 7.46 (m, 4H), 7.45 – 7.40 (m, 3H), 7.40 – 7.34 (m, 1H), 7.32 – 7.18 (m, 7H), 7.05 (dd, *J* = 6.9, 1.0 Hz, 1H), 6.76 (s, 1H), 3.97 (s, 2H), 3.81 (s, 3H), 3.22 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 155.7, 143.0, 142.3, 141.5, 137.8, 135.9, 135.7, 134.8, 131.6, 130.1, 129.9, 129.4, 129.0, 127.9, 127.7, 127.6, 127.3, 125.0, 123.8, 116.7, 112.2, 110.0, 107.5, 56.6, 32.6 ppm. HRMS (ESI): calcd for $C_{32}H_{28}NOSi$ $[M+H]^+$ 470.1935, found 470.1922.



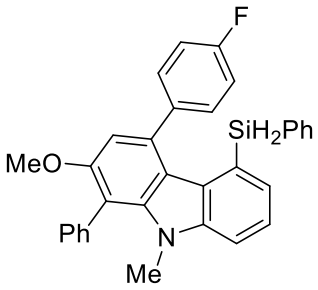
2-(Benzyloxy)-9-methyl-1,4-diphenyl-5-(phenylsilyl)-9*H*-carbazole (3b)

The reaction was performed at 1.0 mmol scale according to procedure C. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **3b** as a white solid (283 mg, 52% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.58 (d, *J* = 7.3 Hz, 2H), 7.51 (d, *J* = 6.9 Hz, 2H), 7.48 (t, *J* = 7.4 Hz, 2H), 7.45 – 7.40 (m, 3H), 7.36 (t, *J* = 7.3 Hz, 1H), 7.32 – 7.24 (m, 6H), 7.23 – 7.19 (m, 4H), 7.12 (d, *J* = 7.1 Hz, 2H), 7.07 (d, *J* = 7.0 Hz, 1H), 6.83 (s, 1H), 5.08 (s, 2H), 3.97 (s, 2H), 3.27 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 154.7, 142.9, 142.3, 141.4, 137.8, 137.5, 135.9, 135.7, 134.8, 131.6, 130.1, 130.0, 129.4, 129.0, 128.2, 127.9, 127.7, 127.60, 127.4, 127.3, 126.7, 125.1, 123.9, 117.1, 113.4, 110.0, 109.7, 71.3, 32.6 ppm. HRMS (ESI): calcd for $C_{38}H_{32}NOSi$ $[M+H]^+$ 546.2248, found 546.2249.



9-Methyl-1,4-diphenyl-5-(phenylsilyl)-9*H*-carbazol-2-yl 4-methylbenzenesulfonate (3c)

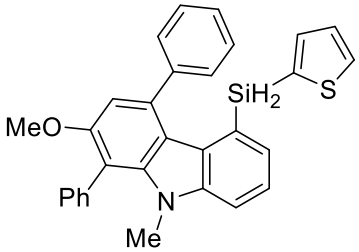
The reaction was performed at 1.0 mmol scale according to procedure C. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =40/1, v/v) afforded the product **3c** as a white solid (340 mg, 56% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.50 (d, J = 7.8 Hz, 2H), 7.42 – 7.34 (m, 8H), 7.34 – 7.26 (m, 5H), 7.24 – 7.20 (m, 4H), 7.17 – 7.12 (m, 3H), 7.01 (d, J = 2.1 Hz, 1H), 3.96 (d, J = 1.9 Hz, 2H), 3.21 (s, 3H), 2.41 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 145.0, 144.7, 142.5, 141.7, 140.4, 137.7, 135.7, 134.4, 133.8, 133.2, 131.5, 130.6, 130.0, 129.5, 129.4, 129.1, 128.3, 127.9, 127.8, 127.7, 127.6, 126.8, 126.4, 125.0, 121.0, 117.6, 116.6, 110.5, 32.6, 21.6 ppm. HRMS (ESI): calcd for $C_{38}H_{32}NO_3SSi$ $[M+H]^+$ 610.1867, found 610.1865.



4-(4-Fluorophenyl)-2-methoxy-9-methyl-1-phenyl-5-(phenylsilyl)-9*H*-carbazole (3d)

The reaction was performed at 1.2 mmol scale according to procedure C. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **3d** as a white solid (380 mg, 65% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.58 – 7.52 (m, 2H), 7.51 – 7.45 (m, 4H), 7.45 – 7.41 (m, 1H), 7.33 – 7.21 (m, 7H), 7.15 – 7.05 (m, 3H), 6.69 (s, 1H), 4.03 (s, 2H), 3.81 (s, 3H), 3.21 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 162.7 (d, $J_{C\text{-}F}$ = 245.4 Hz), 155.6, 142.3, 141.5, 139.0 (d, $J_{C\text{-}F}$ = 2.7 Hz), 136.6, 135.8, 135.7, 134.3, 131.7 (d, $J_{C\text{-}F}$ = 7.8 Hz), 131.5, 130.1, 129.1, 128.0, 127.7, 127.6, 127.4, 124.6, 124.0, 116.7, 116.3

(d, $J_{C\text{-}F}$ = 21.5 Hz), 112.4, 110.1, 107.5, 56.6, 32.5 ppm. ^{19}F NMR (565 MHz, $CDCl_3$): δ = -114.88 ppm. HRMS (ESI): calcd for $C_{32}H_{27}FNOSi$ $[M+H]^+$ 488.1840, found 488.1839.



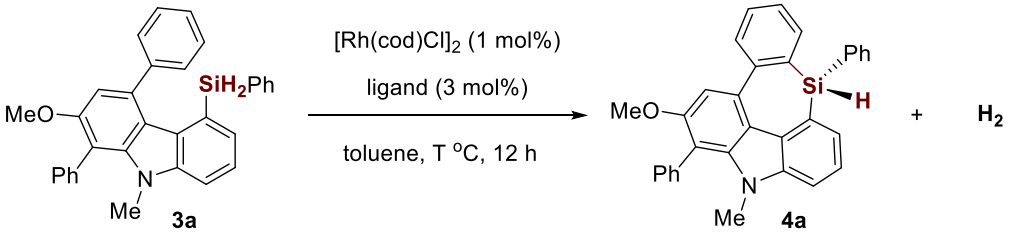
2-Methoxy-9-methyl-1,4-diphenyl-5-(thiophen-2-ylsilyl)-9*H*-carbazole (3e)

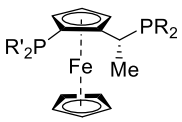
The reaction was performed at 1.0 mmol scale according to procedure C. Purification via silica gel column chromatography (petroleum ether/ethyl acetate =80/1, v/v) afforded the product **3e** as a white solid (190 mg, 40% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.64 (d, J = 7.4 Hz, 2H), 7.54 (d, J = 4.5 Hz, 1H), 7.50 – 7.42 (m, 7H), 7.40 (t, J = 7.4 Hz, 1H), 7.31 (d, J = 8.0 Hz, 1H), 7.27 (t, J = 7.5 Hz, 1H), 7.14 (d, J = 6.9 Hz, 1H), 7.11 (d, J = 2.9 Hz, 1H), 7.08 (t, J = 3.9 Hz, 1H), 6.77 (s, 1H), 4.07 (s, 2H), 3.82 (s, 3H), 3.21 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 155.7, 142.8, 142.2, 141.5, 137.7, 137.4, 135.9, 133.0, 131.9, 131.6, 130.1, 129.5, 129.5, 128.0, 128.0, 127.8, 127.4, 127.3, 124.6, 123.9, 116.6, 112.3, 110.2, 107.5, 56.6, 32.6 ppm. HRMS (ESI): calcd for $C_{30}H_{26}NOSSi$ $[M+H]^+$ 476.1499, found 476.1501.

III. Optimization for 7-Membered Si-Stereogenic Heterocycles

A 5 mL microwave tube was charged with dihydrosilanes **3a** (0.1 mmol, 46.9 mg, 1.0 equiv), $[Rh(cod)Cl]_2$ (0.5 mg, 1 mol%), ligand (3 mol%), and toluene (1 mL) in glovebox. The tube was capped, then removed from the glovebox and stirred at indicated temperature for 12 h. After the system was cooled to room temperature, the reaction mixture was concentrated *in vacuo*, the crude residue was dissolved in 1 mL of deuterated chloroform for ^{1}H NMR analysis. The yields were determined by crude ^{1}H NMR analysis using dibromomethane as an internal standard. The *ee* value of desired compound **4a** was determined by HPLC analysis on a chiral stationary phase. The result of optimization of reaction conditions was listed in **Table S1**.

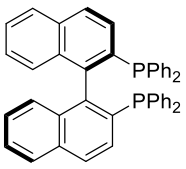
Table S1. Optimization of Reaction Conditions[a]



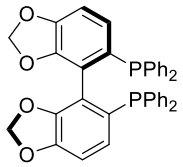


Josiphos-type

L1, R = *t*Bu, R' = Ph
L2, R = *t*Bu, R' = Cy
L3, R = Ph, R' = *t*Bu
L4, R = Cy, R' = Ph
L5, R = Cy, R' = Cy



L6, (*R*)-BINAP



L7

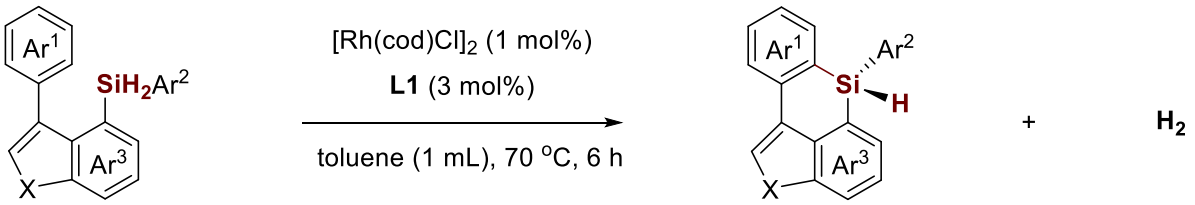
Entry	Ligand	T (°C)	Yield (%)[b]	*ee* (%)[d]
1	L1	70	50	69
2	L1	100	72	76
3	L1	120	70	72
4	L2	100	35	42
5	**L3**	**100**	**83 (78[c])**	**90**
6	L4	100	76	10
7	L5	100	67	3

8	L6	100	16	36
9	L7	100	25	29

[a]Reaction conditions: **3a** (46.9 mg, 0.1 mmol), $[Rh(cod)Cl]_2$ (0.5 mg, 1 mol%) and chiral ligand (3 mol%) in anhydrous toluene (1.0 mL) at indicated temperature for 12 h. [b]NMR yield. [c]Isolated yield. [d]*ee* value was based on chiral HPLC analysis: AD-3 column, wavelength = 250 nm, eluents: hexane/isopropanol = 95/5, flow rate = 1.0 mL/min, temperature = 28 °C.

IV. Enantioselective Construction of Si-Stereogenic Heterocycles

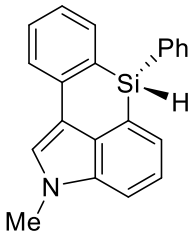
1. Scope of Six-Membered Silicon-Stereogenic Heterocycles



1 **2**

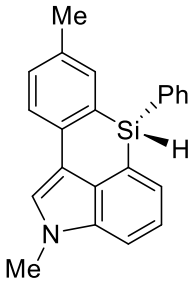
X = NR, O, S

A 5 mL microwave tube was charged with **1** (0.1 mmol, 1 equiv), $[Rh(cod)Cl]_2$ (0.5 mg, 1 mol%), **L1** (1.6 mg, 3 mol%), and toluene (1 mL) in glovebox. The tube was sealed, then removed from the glovebox, and the mixture was stirred at 70 °C for 6 h. After the completion of the reaction, the solvent was evaporated under reduced pressure and the residue was purified by flash column chromatography on silica gel to give the product.



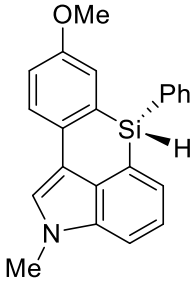
(*S*)-2-Methyl-6-phenyl-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2a)

The product **2a** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 80/1, v/v) as a white solid (25.9 mg, 83% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.77 (d, J = 7.9 Hz, 1H), 7.64 – 7.59 (m, 3H), 7.58 (s, 1H), 7.45 (d, J = 6.8 Hz, 1H), 7.41 – 7.35 (m, 3H), 7.34 – 7.30 (m, 3H), 7.13 (t, J = 7.3 Hz, 1H), 5.71 (s, 1H), 3.84 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 139.5, 136.6, 135.7, 135.5, 135.4, 131.8, 129.9, 129.6, 128.0, 127.0, 126.7, 125.5, 124.7, 122.7, 122.5, 122.4, 115.7, 110.7, 33.0 ppm. HRMS (ESI): calcd for $C_{21}H_{18}Si$ $[M+H]^+$ 312.1203, found 312.1201. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 11.7 min, t_r (minor) = 15.5 min, 96% *ee*. $[\alpha]_D^{28.3}$ = +132 (c = 0.1, $CHCl_3$).



(*S*)-2,8-Dimethyl-6-phenyl-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2b)

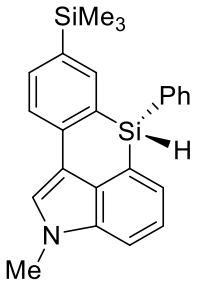
The product **2b** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 80/1, v/v) as a white solid (25.4 mg, 78% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.68 (d, *J* = 8.0 Hz, 1H), 7.65 – 7.59 (m, 2H), 7.53 (s, 1H), 7.45 – 7.40 (m, 2H), 7.39 – 7.28 (m, 5H), 7.20 (dd, *J* = 8.1, 1.6 Hz, 1H), 5.69 (s, 1H), 3.83 (s, 3H), 2.30 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 136.9, 136.8, 135.9, 135.5, 134.0, 131.8, 130.9, 129.6, 128.0, 126.9, 126.6, 125.0, 122.6, 122.5, 115.7, 110.6, 33.0, 21.1 ppm. HRMS (ESI): calcd for $C_{22}H_{20}NSi$ $[M+H]^+$ 326.1360, found 326.1361. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 8.2 min, t_r (minor) = 8.9 min, 96% *ee*. $[\alpha]_D^{29.7}$ = +69 (c = 0.1, $CHCl_3$).



(*S*)-8-Methoxy-2-methyl-6-phenyl-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2c)

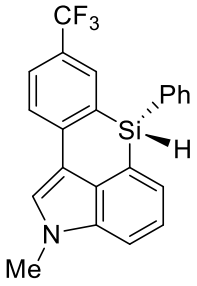
The product **2c** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 80/1, v/v) as a white solid (26.0 mg, 76% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.71 (d, *J* = 8.7 Hz, 1H), 7.62 (dd, *J* = 7.7, 1.6 Hz, 2H), 7.46 (s, 1H), 7.43 (d, *J* = 6.7 Hz, 1H), 7.39 – 7.28 (m, 5H), 7.13 (d, *J* = 2.8 Hz, 1H), 6.96 (dd, *J* = 8.7, 2.8 Hz, 1H), 5.70 (s, 1H), 3.81 (s, 3H), 3.78 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 156.6, 135.6, 135.4, 135.4, 132.5, 131.6, 129.6, 128.4, 128.0, 126.5, 124.5, 123.9, 122.6, 122.1, 120.5, 116.5, 115.5, 110.6, 55.3, 32.9 ppm. HRMS (ESI): calcd for $C_{22}H_{20}NOSi$ $[M+H]^+$ 342.1309, found 342.1305. HPLC

(Chiralpak AD-3) *i*-PrOH/hexane = 1/99, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 30.7 min, t_r (minor) = 48.3 min, 96% *ee*. $[\alpha]_D^{28.8}$ = +47 (c = 0.1, $CHCl_3$).



(*S*)-2-Methyl-6-phenyl-8-(trimethylsilyl)-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2d)

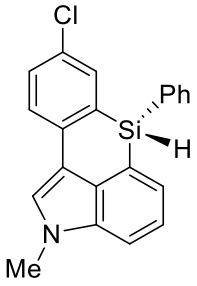
The product **2d** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 40/1, v/v) as a colorless oil (27.2 mg, 71% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.79 (s, 1H), 7.73 (d, *J* = 7.8 Hz, 1H), 7.62 (dd, *J* = 7.6, 1.8 Hz, 2H), 7.57 (s, 1H), 7.54 (dd, *J* = 7.8, 1.3 Hz, 1H), 7.46 (d, *J* = 6.2 Hz, 1H), 7.38 – 7.29 (m, 5H), 5.73 (s, 1H), 3.81 (s, 3H), 0.24 (s, 9H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 141.8, 140.0, 135.9, 135.8, 135.5, 135.3, 134.9, 131.9, 129.5, 127.9, 126.7, 126.0, 125.7, 122.7, 122.6, 121.7, 115.7, 110.6, 33.0, -1.1 ppm. HRMS (ESI): calcd for $C_{24}H_{26}NSi_2$ $[M+H]^+$ 384.1598, found 384.1595. HPLC (Chiralpak AD-3) *i*-PrOH/hexane = 1/99, 1.0 mL/min, T = 28 °C, λ = 280 nm, t_r (major) = 7.8 min, t_r (minor) = 9.1 min, 97% *ee*. $[\alpha]_D^{29.6}$ = +23 (c = 0.1, $CHCl_3$).



(*S*)-2-Methyl-6-phenyl-8-(trifluoromethyl)-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2e)

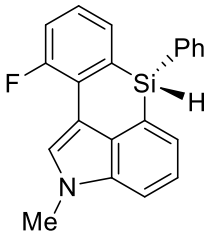
The product **2e** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 10/1, v/v) as a white solid (26.5 mg, 70% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.82 (s, 1H), 7.79 (d, *J* = 8.3 Hz, 1H), 7.63 – 7.54 (m, 4H), 7.47 (d, *J* = 6.7 Hz, 1H), 7.42 – 7.31 (m, 5H), 5.74 (s, 1H), 3.83 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 142.9, 135.6, 135.4,

134.8, 133.2 (q, J_{C-F} = 3.9 Hz), 131.7, 130.0, 128.2, 127.7, 127.3, 126.7, 126.6 (q, J_{C-F} = 3.8 Hz), 126.2 (q, J_{C-F} = 32.1 Hz), 124.5 (q, J_{C-F} = 269.9 Hz), 123.1, 122.4, 121.7, 114.7, 111.0, 33.2 ppm. ^{19}F NMR (565 MHz, $CDCl_3$): δ = -62.20 ppm. HRMS (ESI): calcd for $C_{22}H_{17}F_3NSi$ $[M+H]^+$ 380.1077, found 380.1082. HPLC (Chiralpak AD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 7.3 min, t_r (minor) = 8.6 min, 92% *ee*. $[\alpha]_D^{29.7}$ = +196 (c = 0.1, $CHCl_3$).



(*S*)-8-Chloro-2-methyl-6-phenyl-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2f)

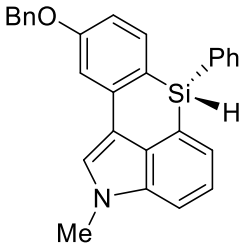
L5 (1.8 mg, 3 mol%) was used as ligand, the product **2f** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 40/1, v/v) as a white solid (25.4 mg, 74% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.57 (d, *J* = 8.5 Hz, 1H), 7.51 (d, *J* = 7.9 Hz, 2H), 7.45 (d, *J* = 2.1 Hz, 1H), 7.42 (s, 1H), 7.36 (d, *J* = 6.8 Hz, 1H), 7.32 – 7.28 (m, 2H), 7.28 – 7.20 (m, 4H), 5.61 (s, 1H), 3.72 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 137.8, 135.8, 135.5, 135.4, 135.0, 131.6, 130.2, 130.0, 129.9, 129.4, 128.1, 126.9, 125.7, 123.9, 122.9, 121.6, 114.8, 110.9, 33.0 ppm. HRMS (ESI): calcd for $C_{21}H_{17}ClNSi$ $[M+H]^+$ 346.0813, found 346.0819. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 9.0 min, t_r (minor) = 9.5 min, 92% *ee*. $[\alpha]_D^{29.7}$ = +77 (c = 0.1, $CHCl_3$).



(*R*)-10-Fluoro-2-methyl-6-phenyl-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2g)

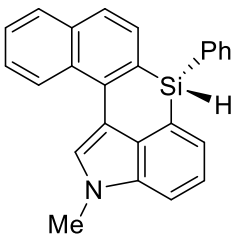
The product **2g** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 40/1, v/v) as a white solid (26.2 mg, 80% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ =

7.84 (d, J = 3.4 Hz, 1H), 7.62 – 7.57 (m, 2H), 7.48 – 7.30 (m, 7H), 7.18 – 7.06 (m, 2H), 5.73 (s, 1H), 3.86 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 159.6 (d, $J_{C\text{-}F}$ = 248.9 Hz), 135.4, 134.7, 132.2 (d, $J_{C\text{-}F}$ = 3.3 Hz), 132.0, 130.6, 130.4, 130.2 (d, $J_{C\text{-}F}$ = 2.0 Hz), 129.8, 128.0, 127.4 (d, $J_{C\text{-}F}$ = 11.2 Hz), 126.9, 125.2 (d, $J_{C\text{-}F}$ = 7.8 Hz), 122.7, 121.7, 116.9 (d, $J_{C\text{-}F}$ = 22.3 Hz), 110.8, 110.1, 33.0 ppm. ^{19}F NMR (565 MHz, $CDCl_3$): δ = -111.36 ppm. HRMS (ESI): calcd for $C_{21}H_{17}FNSi$ $[M+H]^+$ 330.1109, found 330.1106. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 220 nm, t_r (major) = 5.5 min, t_r (minor) = 6.4 min, 92% *ee*. $[\alpha]_D^{29.5}$ = +152 (c = 0.1, $CHCl_3$).



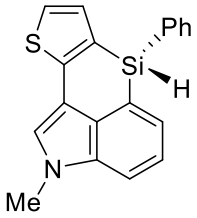
(*S*)-9-(Benzyloxy)-2-methyl-6-phenyl-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2h)

The product **2h** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 40/1, v/v) as a white solid (34.2 mg, 82% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.61 (dd, J = 7.7, 1.6 Hz, 2H), 7.52 (t, J = 4.1 Hz, 2H), 7.45 (t, J = 7.5 Hz, 3H), 7.42 – 7.28 (m, 9H), 6.80 (dd, J = 8.2, 2.4 Hz, 1H), 5.68 (s, 1H), 5.12 (s, 2H), 3.82 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 160.4, 141.2, 138.0, 137.0, 136.1, 135.5, 135.4, 131.9, 129.5, 128.6, 128.0, 127.9, 127.6, 126.8, 125.6, 122.7, 118.7, 115.6, 111.7, 110.6, 108.9, 69.8, 33.0 ppm. HRMS (ESI): calcd for $C_{28}H_{24}NOSi$ $[M+H]^+$ 418.1622, found 418.1615. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 15/85, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (minor) = 21.0 min, t_r (major) = 26.8 min, 97% *ee*. $[\alpha]_D^{29.3}$ = +98 (c = 0.1, $CHCl_3$).



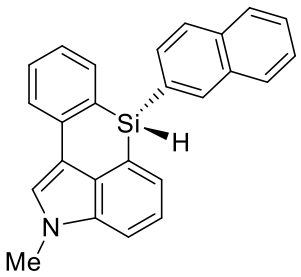
(*S*)-2-Methyl-6-phenyl-2,6-dihydronaphtho[1',2':5,6]silino[4,3,2-*cd*]indole (2i)

The product **2i** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 40/1, v/v) as a pale yellow solid (10.9 mg, 30% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.77 (d, J = 8.6 Hz, 1H), 8.06 (s, 1H), 7.84 (d, J = 7.9 Hz, 1H), 7.69 – 7.55 (m, 5H), 7.52 (t, J = 7.1 Hz, 2H), 7.43 (d, J = 7.5 Hz, 1H), 7.40 – 7.28 (m, 4H), 5.82 (s, 1H), 3.91 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 138.1, 136.0, 135.5, 135.4, 134.8, 133.1, 132.1, 130.4, 130.3, 129.7, 129.0, 128.0, 126.9, 126.0, 126.0, 125.9, 124.4, 123.0, 122.7, 114.8, 110.6, 33.1 ppm. HRMS (ESI): calcd for $C_{25}H_{20}NSi$ $[M+H]^+$ 362.1360, found 362.1355. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 ºC, λ = 250 nm, t_r (major) = 12.1 min, t_r (minor) = 21.7 min, 87% *ee*. $[\alpha]_D^{29.4}$ = +120 (c = 0.1, $CHCl_3$).



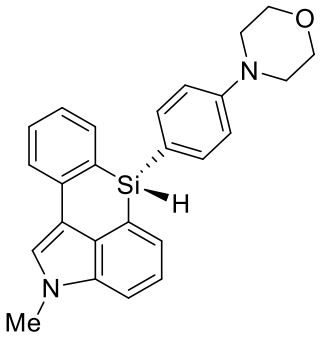
(*R*)-2-Methyl-6-phenyl-2,6-dihydrothieno[2',3':5,6]silino[4,3,2-*cd*]indole (2j)

The product **2j** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 80/1, v/v) as a dark green solid (29.0 mg, 91% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.61 – 7.59 (m, 2H), 7.49 – 7.48 (m, 1H), 7.36 – 7.30 (m, 6H), 7.16 (d, J = 4.9 Hz, 1H), 7.14 (d, J = 5.0 Hz, 1H), 5.77 (s, 1H), 3.74 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 145.5, 135.5, 135.2, 135.1, 132.2, 131.3, 129.6, 128.0, 127.5, 125.7, 124.9, 123.1, 122.2, 121.1, 112.0, 110.7, 32.8 ppm. HRMS (ESI): calcd for $C_{19}H_{16}NSSi$ $[M+H]^+$ 318.0767, found 318.0763. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 ºC, λ = 250 nm, t_r (major) = 11.7 min, t_r (minor) = 12.5 min, 91% *ee*. $[\alpha]_D^{25.0}$ = +242 (c = 0.1, $CHCl_3$).



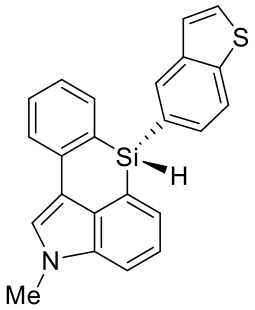
(*S*)-2-Methyl-6-(naphthalen-2-yl)-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2k)

The product **2k** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 40/1, v/v) as a white solid (27.1 mg, 75% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.18 (s, 1H), 7.82 – 7.73 (m, 4H), 7.62 (d, J = 7.6 Hz, 2H), 7.57 (s, 1H), 7.49 – 7.41 (m, 3H), 7.41 – 7.34 (m, 2H), 7.31 (t, J = 6.9 Hz, 1H), 7.11 (t, J = 7.0 Hz, 1H), 5.84 (s, 1H), 3.82 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 139.6, 136.7, 136.6, 135.5, 134.0, 133.2, 133.0, 131.8, 131.2, 130.0, 128.2, 127.7, 127.3, 127.0, 126.8, 126.6, 125.9, 125.6, 124.7, 122.7, 122.5, 122.4, 115.7, 110.7, 33.0 ppm. HRMS (ESI): calcd for $C_{25}H_{20}NSi$ $[M+H]^+$ 362.1360, found 362.1355. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 254 nm, t_r (major) = 13.5 min, t_r (minor) = 21.6 min, 96% *ee*. $[\alpha]_D^{25.0}$ = +133 (c = 0.1, $CHCl_3$).



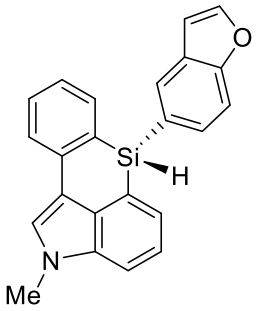
(*S*)-4-(4-(2-Methyl-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indol-6-yl)phenyl)morpholine (2l)

The product **2l** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 40/1, v/v) as a white solid (30.9 mg, 78% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.76 (d, J = 7.9 Hz, 1H), 7.59 (d, J = 7.2 Hz, 1H), 7.57 (s, 1H), 7.52 (d, J = 8.5 Hz, 2H), 7.43 (d, J = 6.8 Hz, 1H), 7.36 (t, J = 7.6 Hz, 2H), 7.32 – 7.30 (m, 1H), 7.12 (t, J = 7.3 Hz, 1H), 6.87 (d, J = 8.4 Hz, 2H), 5.67 (s, 1H), 3.84 (s, 3H), 3.83 – 3.81 (m, 4H), 3.17 – 3.15 (m, 4H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 139.5, 136.7, 136.6, 135.5, 131.8, 129.7, 127.7, 126.7, 125.4, 124.6, 123.1, 122.7, 122.4, 115.8, 114.8, 110.5, 66.8, 48.5, 33.0 ppm. HRMS (ESI): calcd for $C_{25}H_{25}N_2OSi$ $[M+H]^+$ 397.1731, found 397.1727. HPLC (Chiralpak AD-3) *i*-PrOH/hexane = 50/50, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 8.7 min, t_r (minor) = 51.5 min, 93% *ee*. $[\alpha]_D^{25.0}$ = +77 (c = 0.1, $CHCl_3$).



(*S*)-6-(Benzo[*b*]thiophen-5-yl)-2-methyl-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2m)

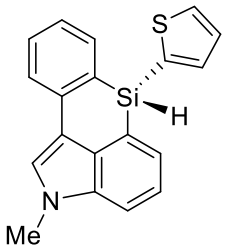
The product **2m** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 80/1, v/v) as a pale yellow solid (8.8 mg, 24% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.87 (s, 1H), 7.78 (d, J = 7.9 Hz, 1H), 7.62 – 7.59 (m, 2H), 7.58 (d, J = 2.1 Hz, 1H), 7.55 (d, J = 8.2 Hz, 1H), 7.48 (d, J = 8.2 Hz, 1H), 7.44 (d, J = 6.8 Hz, 1H), 7.40 – 7.37 (m, 2H), 7.33 – 7.31 (m, 1H), 7.12 (t, J = 7.2 Hz, 1H), 6.70 (d, J = 1.6 Hz, 1H), 5.79 (s, 1H), 3.86 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 156.1, 144.8, 139.5, 136.7, 135.5, 131.8, 131.2, 129.9, 129.4, 129.0, 127.5, 126.8, 125.5, 124.7, 122.9, 122.7, 122.5, 115.7, 111.3, 110.6, 106.5, 33.0 ppm. HRMS (ESI): calcd for $C_{23}H_{18}NSSi$ $[M+H]^+$ 368.0924, found 368.0922. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 254 nm, t_r (major) = 14.9 min, t_r (minor) = 22.2 min, 90% *ee*. $[\alpha]_D^{25.0}$ = +176 (c = 0.1, $CHCl_3$).



(*S*)-6-(Benzofuran-5-yl)-2-methyl-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2n)

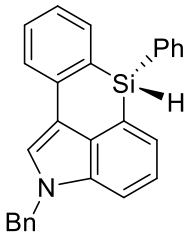
The product **2n** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 80/1, v/v) as a pale yellow solid (17.6 mg, 50% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.09 (s, 1H), 7.85 (d, J = 8.0 Hz, 1H), 7.78 (d, J = 7.9 Hz, 1H), 7.62 – 7.60 (m, 2H), 7.55 (d, J = 8.0 Hz, 1H), 7.45 (d, J = 6.8 Hz, 1H), 7.40 – 7.37 (m, 3H), 7.33 – 7.31 (m, 1H), 7.28 (d, J = 5.4 Hz, 1H), 7.12 (t, J = 7.3 Hz, 1H), 5.81 (s, 1H), 3.86 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 141.3, 139.5, 139.4, 136.7, 135.5, 131.8, 131.3, 131.0, 130.5, 130.0, 127.2, 126.8,

126.1, 125.6, 124.7, 123.9, 122.7, 122.6, 122.5, 122.2, 115.7, 110.7, 33.0 ppm. HRMS (ESI): calcd for $C_{23}H_{18}NOSi$ $[M+H]^+$ 352.1152, found 352.1150. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 254 nm, t_r (major) = 14.6 min, t_r (minor) = 23.4 min, 94% *ee*. $[\alpha]_D^{25.0}$ = +81 (c = 0.1, $CHCl_3$).



(*S*)-2-Methyl-6-(thiophen-2-yl)-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2o)

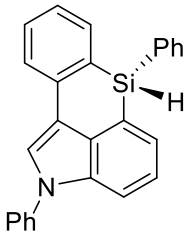
The product **2o** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 80/1, v/v) as a white solid (19.7 mg, 62% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.76 (d, J = 7.9 Hz, 1H), 7.69 (d, J = 7.3 Hz, 1H), 7.65 (d, J = 4.6 Hz, 1H), 7.58 (s, 1H), 7.52 (d, J = 6.8 Hz, 1H), 7.40 (t, J = 8.0 Hz, 3H), 7.36 – 7.34 (m, 1H), 7.19 – 7.18 (m, 1H), 7.16 (d, J = 7.3 Hz, 1H), 5.85 (s, 1H), 3.85 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 139.4, 137.1, 136.6, 135.5, 134.3, 132.3, 131.7, 130.1, 128.4, 126.8, 126.5, 125.7, 124.8, 122.7, 122.5, 121.8, 115.5, 110.9, 33.0 ppm. HRMS (ESI): calcd for $C_{19}H_{16}NSSi$ $[M+H]^+$ 318.0767, found 318.0765. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 254 nm, t_r (major) = 13.1 min, t_r (minor) = 17.3 min, 90% *ee*. $[\alpha]_D^{25.0}$ = +156 (c = 0.1, $CHCl_3$).



(*S*)-2-Benzyl-6-phenyl-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2p)

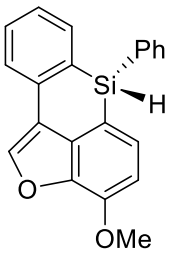
The product **2p** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 80/1, v/v) as a white solid (28.5 mg, 74% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.75 (d, J = 7.9 Hz, 1H), 7.67 – 7.58 (m, 4H), 7.45 (d, J = 6.7 Hz, 1H), 7.40 – 7.23 (m, 9H), 7.20 – 7.11 (m, 3H), 5.72 (s, 1H), 5.34 (s, 2H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 139.4,

137.1, 136.6, 135.6, 135.5, 135.2, 132.0, 129.9, 129.6, 128.9, 128.0, 127.8, 127.1, 127.0, 126.9, 124.8, 122.9, 122.6, 122.6, 116.3, 111.1, 50.3 ppm. HRMS (ESI): calcd for $C_{27}H_{22}NSi$ $[M+H]^+$ 388.1516, found 388.1513. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 16.7 min, t_r (minor) = 27.5 min, 91% *ee*. $[\alpha]_D^{29.3}$ = +72 (c = 0.1, $CHCl_3$).



(*S*)-2,6-Diphenyl-2,6-dihydrobenzo[5,6]silino[4,3,2-*cd*]indole (2q)

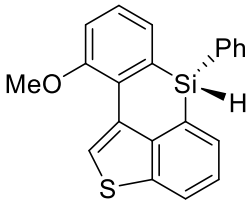
The product **2q** was purified via silica gel column chromatography (petroleum ether) as a white solid (26.8 mg, 72% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.88 (s, 1H), 7.86 (d, *J* = 7.9 Hz, 1H), 7.69 – 7.60 (m, 4H), 7.59 – 7.49 (m, 5H), 7.44 – 7.29 (m, 6H), 7.18 (td, *J* = 7.4, 1.0 Hz, 1H), 5.74 (s, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 139.5, 139.0, 136.6, 135.5, 134.7, 132.6, 130.0, 129.7, 129.7, 128.0, 127.8, 127.4, 126.7, 125.2, 124.4, 124.1, 123.5, 122.9, 122.9, 117.8, 112.0 ppm. HRMS (ESI): calcd for $C_{26}H_{20}NSi$ $[M+H]^+$ 374.1360, found 374.1356. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 6.7 min, t_r (minor) = 7.3 min, 95% *ee*. $[\alpha]_D^{29.6}$ = +90 (c = 0.1, $CHCl_3$).



(*S*)-3-Methoxy-6-phenyl-6*H*-benzo[5,6]silino[4,3,2-*cd*]benzofuran (2r)

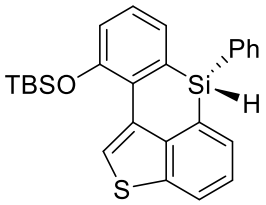
The product **2r** was purified via silica gel column chromatography (petroleum ether/ethyl acetate = 80/1, v/v) as a white solid (19.8 mg, 60% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.16 (s, 1H), 7.83 (d, *J* = 7.9 Hz, 1H), 7.66 (d, *J* = 7.1 Hz, 1H), 7.59 (dd, *J* = 7.8, 1.5 Hz, 2H), 7.50 (d, *J* = 7.8 Hz, 1H), 7.44 (td, *J* = 7.8, 1.3 Hz, 1H), 7.41 – 7.31 (m, 3H), 7.27 (dd, *J* = 7.4,

0.9 Hz, 1H). 6.95 (d, *J* = 7.8 Hz, 1H), 5.65 (s, 1H), 4.06 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 146.7, 142.9, 141.0, 136.7, 136.1, 135.4, 135.1, 133.9, 131.2, 130.0, 129.9, 129.4, 128.1, 126.8, 124.3, 121.4, 114.2, 108.6, 56.2 ppm. HRMS (ESI): calcd for $C_{21}H_{17}O_2Si$ $[M+H]^+$ 329.0992, found 329.0989. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 1/99, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (minor) = 11.5 min, t_r (major) = 13.5 min, 95% *ee*. $[\alpha]_D^{29.6}$ = +112 (c = 0.1, $CHCl_3$).



(*S*)-10-Methoxy-6-phenyl-6*H*-2-thia-6-silaaceanthrylene (2s)

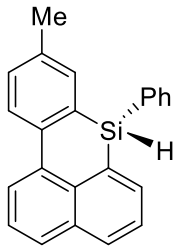
$[Rh(cod)Cl]_2$ (2.0 mg, 4 mol%), **L1** (4.5 mg, 8 mol%) was used, the product **2s** was purified via silica gel column chromatography (petroleum ether) as a colorless oil (18.3 mg, 53% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.99 (s, 1H), 7.98 (dd, *J* = 8.0, 0.7 Hz, 1H), 7.66 (dd, *J* = 6.9, 0.5 Hz, 1H), 7.61 – 7.56 (m, 2H), 7.41 – 7.26 (m, 6H), 7.12 (dd, *J* = 7.1, 2.4 Hz, 1H), 5.67 (s, 1H), 4.04 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 157.6, 143.3, 138.0, 135.5, 135.2, 131.4, 131.1, 130.3, 129.9, 129.3, 128.6, 128.4, 128.1, 127.2, 125.8, 124.6, 123.9, 113.4, 55.4 ppm. HRMS (ESI): calcd for $C_{21}H_{17}OSSi$ $[M+H]^+$ 345.0764, found 345.0762. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 1/99, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (minor) = 6.8 min, t_r (major) = 7.7 min, 94% *ee*. $[\alpha]_D^{29.5}$ = +87 (c = 0.1, $CHCl_3$).



(*S*)-10-((*tert*-Butyldimethylsilyl)oxy)-6-phenyl-6*H*-2-thia-6-silaaceanthrylene (2t)

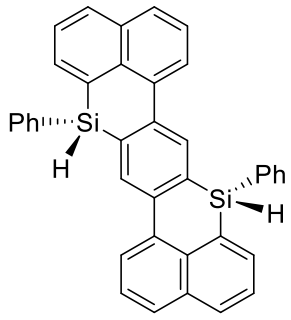
The product **2t** was purified via silica gel column chromatography (petroleum ether) as a colorless oil (26.9 mg, 61% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.93 (s, 1H), 7.98 (d, *J* = 8.0 Hz, 1H), 7.66 (d, *J* = 6.9 Hz, 1H), 7.58 (dd, *J* = 7.8, 1.4 Hz, 2H), 7.42 – 7.31 (m, 4H), 7.28 (d, *J* = 7.1 Hz, 1H), 7.15 (t, *J* = 7.6 Hz, 1H), 7.05 (dd, *J* = 8.0, 1.1 Hz, 1H), 5.66 (s, 1H), 1.05

(s, 9H), 0.35 (s, 6H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 153.8, 143.2, 138.0, 135.5, 135.2, 131.4, 131.4, 130.4, 130.2, 129.9, 129.4, 128.7, 128.1, 126.8, 125.9, 124.5, 123.9, 122.3, 26.2, 18.8, -3.4, -3.4 ppm. HRMS (ESI): calcd for $C_{26}H_{31}OSSi_2$ $[M+H]^+$ 445.1472, found 445.1469. HPLC (Chiralpak IB) *i*-PrOH/hexane = 0/100, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (minor) = 8.6 min, t_r (major) = 15.1 min, 95% *ee*. $[\alpha]_D^{29.4}$ = +96 (c = 0.1, $CHCl_3$).



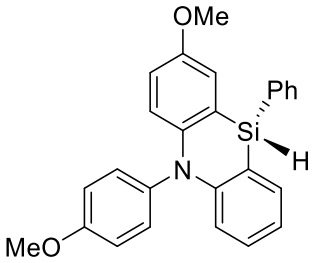
(*S*)-9-Methyl-7-phenyl-7*H*-benzo[*e*]naphtho[1,8-*bc*]siline (2u)

The reaction was performed with $[Rh(cod)Cl]_2$ (1.0 mg, 2 mol%), **L1** (2.2 mg, 4 mol%), and toluene (1 mL) at 60 °C for 8 h. The product **2u** was purified via silica gel column chromatography (petroleum ether) as a colorless oil (24.6 mg, 76% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.32 (d, *J* = 7.6 Hz, 1H), 8.11 (d, *J* = 8.4 Hz, 1H), 7.94 (d, *J* = 8.1 Hz, 1H), 7.83 (t, J = 7.4 Hz, 2H), 7.63 – 7.54 (m, 3H), 7.52 – 7.44 (m, 2H), 7.42 – 7.31 (m, 4H), 5.59 (s, 1H), 2.35 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 140.7, 136.5, 136.4, 135.7, 135.6, 135.0, 134.4, 134.3, 134.0, 131.7, 131.3, 129.9, 129.5, 129.0, 128.1, 127.6, 126.4, 125.9, 125.0, 124.7, 20.9 ppm. HRMS (ESI): calcd for $C_{23}H_{19}Si$ $[M+H]^+$ 323.1251, found 323.1249. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 1/99, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (minor) = 5.6 min, t_r (major) = 8.0 min, 97% *ee*. $[\alpha]_D^{29.6}$ = +30 (c = 0.1, $CHCl_3$).



The reaction was performed with **1v** (27.1 mg, 0.05 mmol), $[Rh(cod)Cl]_2$ (0.5 mg, 2 mol%), **L1** (1.6 mg, 6 mol%), and toluene (1 mL) at 70 °C for 12 h. The product **2v** was purified via silica

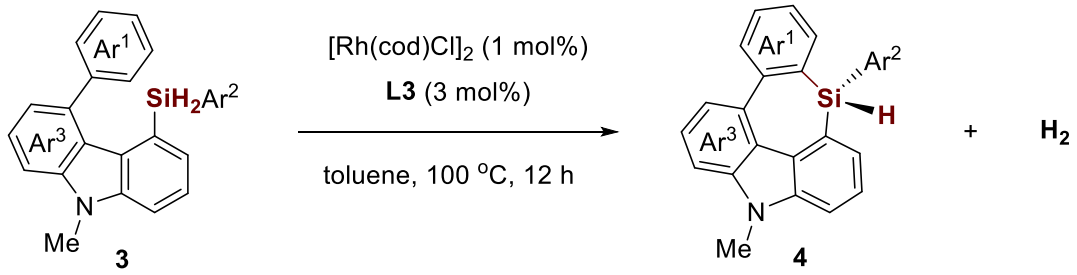
gel column chromatography (petroleum ether) as a pale yellow solid (11.2 mg, 42% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.46 (s, 2H), 8.30 (d, J = 7.4 Hz, 2H), 7.96 (d, J = 8.1 Hz, 2H), 7.86 (d, J = 8.1 Hz, 4H), 7.67 (d, J = 7.1 Hz, 4H), 7.57 (t, J = 7.7 Hz, 2H), 7.52 (t, J = 7.2 Hz, 2H), 7.43 – 7.41 (m, 2H), 7.38 (t, J = 7.2 Hz, 4H), 5.71 (s, 2H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 141.4, 135.9, 135.7, 134.5, 134.0, 133.9, 133.7, 131.6, 131.4, 130.1, 130.0, 128.2, 127.3, 126.0, 125.4, 125.2 ppm. HRMS (EI): calcd for $C_{38}H_{26}Si_2$ $[M]^+$ 538.1573, found 538.1574. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 1/99, 1.0 mL/min, T = 28 ^{o}C, λ = 250 nm, t_r (major) = 7.5 min, t_r (minor) = 8.2 min, 99% *ee*. $[\alpha]_D^{25.0}$ = -172 (c = 0.1, $CHCl_3$).



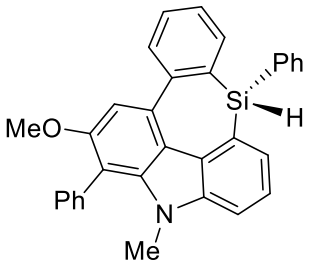
(*R*)-2-Methoxy-5-(4-methoxyphenyl)-10-phenyl-5,10-dihydrodibenzo[*b*,*e*][1,4]azasiline (2w)

L7 (1.8 mg, 3 mol%) was used as ligand, the product **2w** was purified via silica gel column chromatography (petroleum ether) as a white solid (18.3 mg, 45% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.67 (d, J = 6.5 Hz, 2H), 7.49 (d, J = 7.2 Hz, 1H), 7.44 – 7.37 (m, 3H), 7.21 (d, J = 8.7 Hz, 2H), 7.11 – 7.17 (m, 3H), 7.00 (d, J = 3.0 Hz, 1H), 6.86 (t, J = 7.1 Hz, 1H), 6.76 (dd, J = 9.3, 3.0 Hz, 1H), 6.41 (t, J = 6.6 Hz, 2H), 5.69 (s, 1H), 3.92 (s, 3H), 3.71 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 159.0, 152.7, 150.2, 144.6, 136.3, 136.1, 135.6, 135.4, 132.2, 130.5, 129.9, 128.1, 119.2, 118.9, 118.8, 117.6, 116.9, 116.1, 114.3, 112.1, 55.6, 55.5 ppm. HRMS (ESI): calcd for $C_{26}H_{24}NO_2Si$ $[M+H]^+$ 410.1571, found 410.1566. HPLC (Chiralpak OD-H) *i*-PrOH/hexane = 0.5/99.5, 1.0 mL/min, T = 28 ^{o}C, λ = 250 nm, t_r (major) = 15.9 min, t_r (minor) = 21.9 min, 58% *ee*. $[\alpha]_D^{29.9}$ = -23 (c = 0.1, $CHCl_3$).

2. Scope of Seven-Membered Silicon-Stereogenic Heterocycles

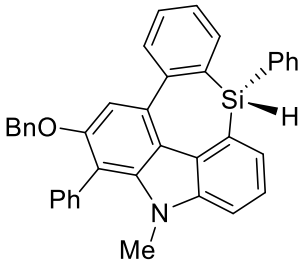


A 5 mL microwave tube was charged with **3** (0.1 mmol, 1 equiv), $[Rh(cod)Cl]_2$ (0.5 mg, 1 mol%), **L3** (1.6 mg, 3 mol%), and toluene (1 mL) in glovebox. The tube was sealed, then removed from the glovebox, and the mixture was stirred at 100 °C for 12 h. After the completion of the reaction, the solvent was evaporated under reduced pressure and the residue was purified by flash column chromatography on silica gel to give the product.



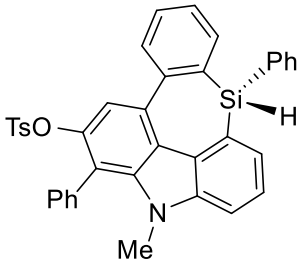
(*S*)-11-Methoxy-1-methyl-5,12-diphenyl-1,5-dihydrobenzo[6,7]silepino[2,3,4,5-*def*]carbazole (4a)

The product **4a** was purified via silica gel column chromatography ((petroleum ether/ethyl acetate = 80/1, v/v) as a white solid (36.3 mg, 78% yield). ^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.89 (dd, J = 7.3, 1.4 Hz, 1H), 7.80 (d, J = 8.0 Hz, 1H), 7.55 (td, J = 7.7, 1.6 Hz, 1H), 7.51 – 7.39 (m, 10H), 7.34 (s, 1H), 7.32 – 7.27 (m, 2H), 7.25 – 7.22 (m, 2H), 5.62 (s, 1H), 3.90 (s, 3H), 3.19 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): δ = 155.7, 145.8, 141.3, 141.0, 137.4, 136.8, 135.7, 135.3, 133.6, 133.2, 132.5, 131.5, 131.4, 130.2, 129.6, 127.9, 127.9, 127.4, 127.2, 127.1, 125.3, 125.1, 116.9, 113.4, 109.4, 106.4, 56.7, 32.6 ppm. HRMS (ESI): calcd for $C_{32}H_{26}NOSi$ $[M+H]^+$ 468.1778, found 468.1767. HPLC (Chiralpak AD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 7.3 min, t_r (minor) = 9.2 min, 90% *ee*. $[\alpha]_D^{29.6}$ = +71 (c = 0.1, $CHCl_3$).



(*S*)-11-(Benzyloxy)-1-methyl-5,12-diphenyl-1,5-dihydrobenzo[6,7]silepino[2,3,4,5-*def*]carbazole (4b)

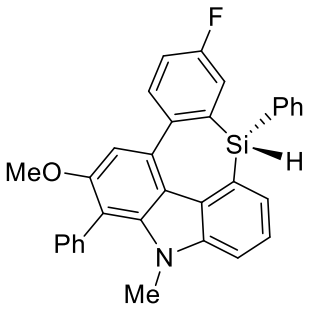
The product **4b** was purified via silica gel column chromatography ((petroleum ether/ethyl acetate = 80/1, v/v) as a white solid (29.6 mg, 55% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.88 (d, *J* = 7.1 Hz, 1H), 7.58 (d, *J* = 7.9 Hz, 1H), 7.53 (d, *J* = 7.4 Hz, 1H), 7.51 – 7.43 (m, 7H), 7.43 – 7.38 (m, 3H), 7.37 (s, 1H), 7.32 – 7.24 (m, 5H), 7.23 – 7.17 (m, 4H), 5.62 (s, 1H), 5.21 – 5.12 (m, 2H), 3.23 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 154.6, 145.7, 141.3, 140.8, 137.6, 137.4, 136.7, 135.7, 135.3, 133.6, 133.2, 132.5, 131.6, 131.5, 130.2, 129.6, 128.3, 127.9, 127.8, 127.5, 127.4, 127.3, 127.0, 126.9, 125.3, 125.1, 117.2, 114.6, 109.4, 109.1, 71.5, 32.6 ppm. HRMS (ESI): calcd for $C_{38}H_{30}NOSi$ $[M+H]^+$ 544.2091, found 544.2088. HPLC (Chiralpak AD-3) *i*-PrOH/hexane = 2/98, 0.5 mL/min, T = 28 ^{o}C, λ = 250 nm, t_r (major) = 14.0 min, t_r (minor) = 20.3 min, 85% *ee*. $[\alpha]_D^{29.8}$ = +27 (c = 0.1, $CHCl_3$).



(*S*)-1-Methyl-5,12-diphenyl-1,5-dihydrobenzo[6,7]silepino[2,3,4,5-*def*]carbazol-11-yl 4-methylbenzenesulfonate (4c)

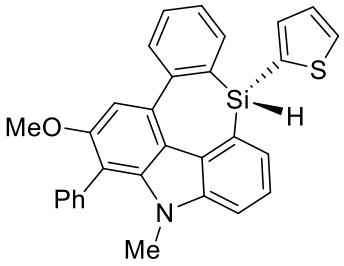
The product **4c** was purified via silica gel column chromatography ((petroleum ether/ethyl acetate = 40/1, v/v) as a white solid (41.2 mg, 68% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.90 (d, *J* = 7.2 Hz, 1H), 7.80 (s, 1H), 7.74 (d, *J* = 8.0 Hz, 1H), 7.59 – 7.51 (m, 3H), 7.45 (t, *J* = 7.3 Hz, 1H), 7.40 (d, *J* = 7.6 Hz, 2H), 7.38 – 7.33 (m, 3H), 7.32 – 7.26 (m, 5H), 7.25 – 7.21 (m, 2H), 7.06 (d, *J* = 8.1 Hz, 2H), 7.03 (d, *J* = 7.6 Hz, 1H), 5.65 (s, 1H), 3.16 (s, 3H), 2.37 (s,

3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 145.3, 144.7, 144.6, 141.6, 140.0, 137.6, 136.8, 135.2, 133.4, 133.3, 133.1, 132.9, 132.9, 131.5, 131.3, 130.5, 129.7, 129.5, 128.9, 128.2, 127.9, 127.8, 127.7, 127.7, 127.4, 127.0, 126.4, 125.7, 120.9, 118.0, 115.5, 109.9, 32.7, 21.6 ppm. HRMS (ESI): calcd for $C_{38}H_{30}NO_3SSi$ $[M+H]^+$ 608.1710, found 608.1702. HPLC (Chiralpak AD-H) *i*-PrOH/hexane = 10/90, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 9.7 min, t_r (minor) = 14.4 min, 90% *ee*. $[\alpha]_D^{29.7}$ = +78 (c = 0.1, $CHCl_3$).



(*S*)-7-Fluoro-11-methoxy-1-methyl-5,12-diphenyl-1,5-dihydrobenzo[6,7]silepino[2,3,4,5-*def*]carbazole (4d)

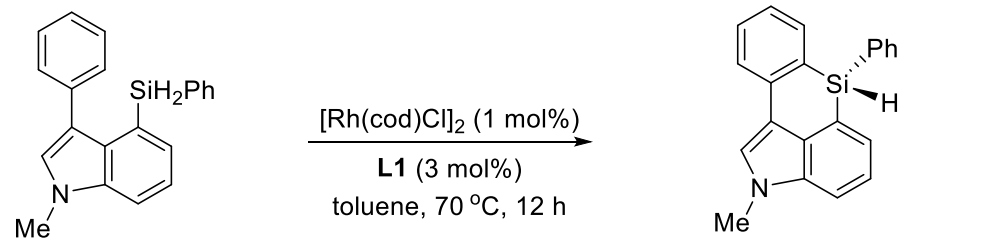
The product **4d** was purified via silica gel column chromatography ((petroleum ether/ethyl acetate = 80/1, v/v) as a white solid (38.6 mg, 80% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.79 – 7.75 (m, 1H), 7.55 (dd, *J* = 8.4, 2.7 Hz, 1H), 7.50 – 7.41 (m, 9H), 7.35 – 7.31 (m, 2H), 7.29 – 7.20 (m, 4H), 5.57 (s, 1H), 3.90 (s, 3H), 3.20 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 162.0 (d, $J_{C\text{-}F}$ = 249.5 Hz), 155.7, 141.9 (d, $J_{C\text{-}F}$ = 3.2 Hz), 141.3, 141.0, 136.4, 135.9 (d, $J_{C\text{-}F}$ = 4.1 Hz), 135.6, 135.3, 134.6 (d, $J_{C\text{-}F}$ = 6.9 Hz), 132.7, 131.4 (d, $J_{C\text{-}F}$ = 10.4 Hz), 129.9, 128.1, 127.9 (d, $J_{C\text{-}F}$ = 1.7 Hz), 127.8, 127.4, 126.3, 125.4, 125.2, 122.6 (d, $J_{C\text{-}F}$ = 19.1 Hz), 117.0 (d, $J_{C\text{-}F}$ = 20.7 Hz), 116.7, 113.4, 109.6, 106.4, 56.7, 32.6 ppm. ^{19}F NMR (565 MHz, $CDCl_3$): δ = -116.27 ppm. HRMS (ESI): calcd for $C_{32}H_{25}FNOSi$ $[M+H]^+$ 486.1684, found 486.1679. HPLC (Chiralpak AD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 6.2 min, t_r (minor) = 8.8 min, 91% *ee*. $[\alpha]_D^{29.8}$ = +69 (c = 0.1, $CHCl_3$).



(*S*)-11-Methoxy-1-methyl-12-phenyl-5-(thiophen-2-yl)-1,5-dihydrobenzo[6,7]silepino[2,3,4,5-*def*]carbazole (4e)

The product **4e** was purified via silica gel column chromatography ((petroleum ether/ethyl acetate = 80/1, v/v) as a white solid (18.7 mg, 40% yield). ^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.92 (d, *J* = 7.3 Hz, 1H), 7.80 (d, *J* = 8.0 Hz, 1H), 7.57 (d, *J* = 7.6 Hz, 1H), 7.55 (d, *J* = 4.8 Hz, 1H), 7.53 – 7.42 (m, 8H), 7.36 (s, 1H), 7.33 (d, *J* = 7.8 Hz, 1H), 7.20 (d, *J* = 3.2 Hz, 1H), 7.08 (t, *J* = 3.9 Hz, 1H), 5.75 (s, 1H), 3.92 (s, 3H), 3.21 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$): δ = 155.8, 145.6, 141.3, 141.0, 137.4, 137.1, 136.3, 135.6, 133.1, 132.5, 132.3, 131.9, 131.5, 131.5, 130.4, 128.3, 127.9, 127.4, 127.1, 127.0, 125.4, 124.8, 116.8, 113.4, 109.6, 106.4, 56.7, 32.6 ppm. HRMS (ESI): calcd for $C_{30}H_{24}NOSSi$ $[M+H]^+$ 474.1342, found 474.1339. HPLC (Chiralpak AD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 7.7 min, t_r (minor) = 10.2 min, 86% *ee*. $[\alpha]_D^{29.7}$ = +59 (c = 0.1, $CHCl_3$).

V. Gram-Scale Reaction



1a, 5 mmol, 1.57 g

2a, 1.32 g, 85% yield, 98% *ee*

A 250 mL Schlenk tube was charged with **1a** (1.57 g, 5 mmol), $[Rh(cod)Cl]_2$ (24.7 mg, 1 mol%), **L1** (83.5 mg, 3 mol%), and toluene (50 mL) in glovebox. The tube was sealed, then removed from the glovebox, and the mixture was stirred at 70 °C for 12 h. After the completion of the reaction, the solvent was evaporated under reduced pressure and the residue was purified by flash column chromatography on silica gel (petroleum ether/ethyl acetate = 80/1, v/v) afforded the product **2a** as a white solid (1.32 g, 85% yield). HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 220 nm, t_r (major) = 11.6 min, t_r (minor) = 16.4 min, 98% *ee*. $[\alpha]_D^{25.0}$ = +188 (c = 0.1, $CHCl_3$).

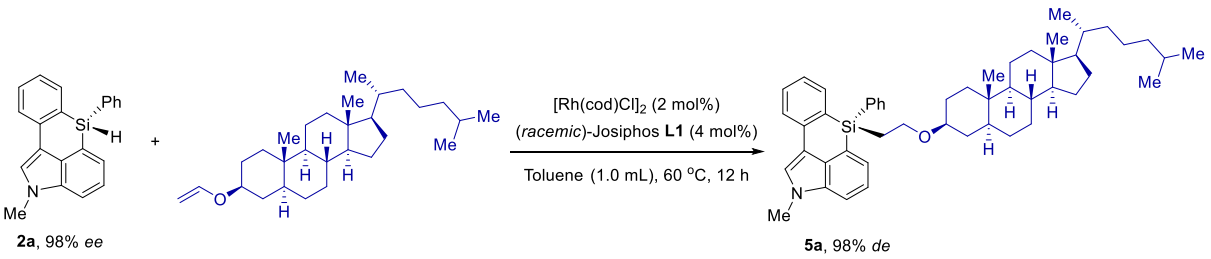
VI. Photophysical Data of Selected Si-Stereogenic Heterocycles

Table S2. Absorption Maxima, Emission Maxima, and Stokes Shifts of Si-Stereogenic Heterocycles

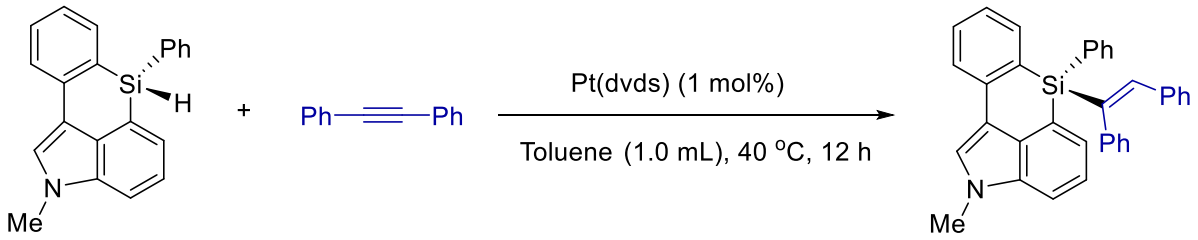
Compound	λ_{abs} (nm)[a]	λ_{em} (nm)[b]	Stokes Shift (cm^{-1})
2i	367	417	3268
2u	333, 348	378	3575
2v	365, 382	396, 416	2140
4b	339	409	5049
4c	376	400	1596
4d	339	405	4807

[a]Absorption maximum in $CHCl_3$ at 10^{-5} mol/L. [b]Emission maximum in $CHCl_3$ at 10^{-5} mol/L.

VII. Derivatization of Si-Stereogenic Heterocycles

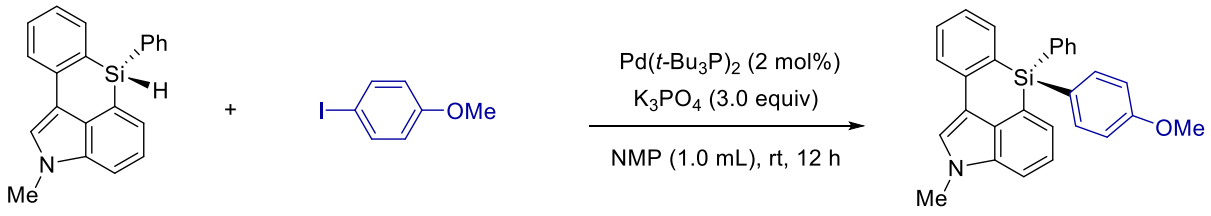


To a 5 mL tube containing **2a** (0.1 mmol, 31.1 mg, 1.0 equiv), vinyl ether (0.2 mmol, 82.9 mg, 2.0 equiv), $[Rh(cod)Cl]_2$ (1.0 mg, 2 mol%) and (*racemic*)-Josiphos **L1** (2.2 mg, 4 mol%) was added toluene (1.0 mL) under argon atmosphere (in glovebox). Then the tube was sealed with a screw cap and taken out of the glovebox. The reaction mixture stirred at 60 °C for 12 h. After the completion of the reaction, the mixture was filtered through a plug of celite with CH_2Cl_2. The filtrate was concentrated under reduced pressure, and the residue was purified by flash chromatography on silica gel to give **5a** as a white solid (56.1 mg, 77% yield). ^{1}H NMR (600 MHz, $CDCl_3$) δ = 7.75 (d, J = 7.8 Hz, 1H), 7.63 (d, J = 7.2 Hz, 1H), 7.58 – 7.52 (m, 3H), 7.45 (d, J = 6.6 Hz, 1H), 7.38 – 7.22 (m, 6H), 7.13 (t, J = 7.8 Hz, 1H), 3.82 (s, 3H), 3.54 – 3.45 (m, 2H), 3.03 – 2.95 (m, 1H), 1.92 (d, J = 12.6 Hz, 1H), 1.84 – 1.73 (m, 3H), 1.64 – 1.55 (m, 2H), 1.54 – 1.47 (m, 2H), 1.44 – 1.17 (m, 11H), 1.16 – 0.90 (m, 12H), 0.90 – 0.82 (m, 10H), 0.70 (s, 3H), 0.61 (s, 3H), 0.55 – 0.46 (m, 1H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$) δ = 139.4, 137.1, 135.6, 135.3, 134.8, 131.7, 129.5, 129.3, 129.1, 127.8, 126.0, 125.2, 124.7, 124.4, 122.6, 122.3, 115.7, 110.3, 77.9, 64.2, 56.5, 56.3, 54.4, 44.8, 42.6, 40.0, 39.5, 36.9, 36.2, 35.8, 35.7, 35.4, 34.6, 33.0, 32.1, 28.8, 28.2, 28.2, 28.0, 24.2, 23.8, 22.80, 22.5, 21.2, 18.6, 17.3, 12.2, 12.0. ppm. HRMS (ESI): calcd for $C_{50}H_{68}NOSi$ $[M+H]^+$ 726.5065, found 726.5083. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 15/85, 1.0 mL/min, T = 28 °C, λ = 230 nm, t_r (minor) = 11.0 min, t_r (major) = 40.4 min, 98% *de*. $[\alpha]_D^{29.7}$ = +17 (c = 0.1, $CHCl_3$).



2a, 98% *ee* **5b**, 98% *ee*

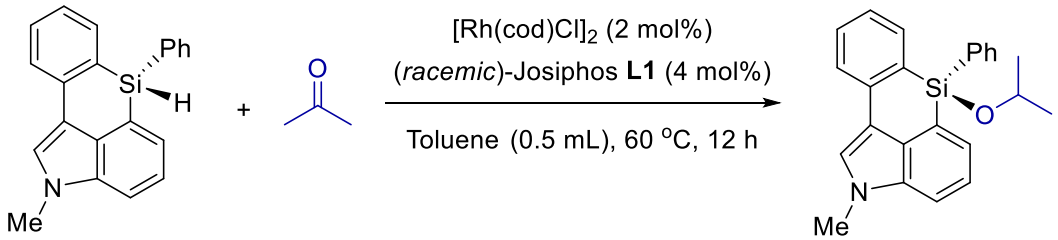
To a 5 mL tube containing **2a** (0.1 mmol, 31.1 mg, 1.0 equiv), 1,2-diphenylacetylene (0.2 mmol, 35.6 mg, 2.0 equiv), and Pt(dvds) (10 µL, 0.1 M in xylene) was added toluene (1.0 mL) under argon atmosphere (in glovebox). Then the tube was sealed with a screw cap and taken out of the glovebox. The reaction mixture stirred at 40 °C for 12 h. After the completion of the reaction, the mixture was filtered through a plug of celite with CH_2Cl_2. The filtrate was concentrated under reduced pressure, and the residue was purified by flash chromatography on silica gel to give **5b** as a white solid (34.0 mg, 70% yield).[11] ^{1}H NMR (600 MHz, $CDCl_3$) δ = 7.74 (d, J = 7.9 Hz, 1H), 7.71 (dd, J = 7.4, 1.8 Hz, 2H), 7.61 (d, J = 6.8 Hz, 1H), 7.50 (s, 1H), 7.39 – 7.37 (m, 1H), 7.35 – 7.33 (m, 2H), 7.32 – 7.28 (m, 4H), 7.11 – 7.03 (m, 8H), 6.90 (dd, J = 7.4, 2.0 Hz, 2H), 6.87 (dd, J = 7.5, 1.8 Hz, 2H), 3.77 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$) δ = 143.0, 141.9, 141.6, 139.7, 137.2, 136.8, 135.8, 135.7, 135.4, 131.6, 129.7, 129.6, 129.2, 128.5, 128.2, 127.9, 127.8, 127.8, 127.2, 126.9, 125.7, 125.3, 124.2, 123.7, 122.5, 122.4, 115.6, 110.3, 32.9 ppm. HRMS (ESI): calcd for $C_{35}H_{28}NSi$ $[M+H]^+$ 490.1986, found 490.1981. HPLC (Chiralpak AD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 7.4 min, t_r (minor) = 17.0 min, 98% *ee*. $[\alpha]_D^{25.0}$ = -35 (c = 0.1, $CHCl_3$).



2a, 98% *ee* **5c**, 98% *ee*

To a 5 mL tube containing **2a** (0.1 mmol, 31.1 mg, 1.0 equiv), 1-iodo-4-methoxybenzene (0.2 mmol, 46.8 mg, 2.0 equiv), Pd(*t*-$Bu_3P)_2$ (1.0 mg, 2 mol%) and K_3PO_4 (0.3 mmol, 63.7 mg, 3.0 equiv) was added 1-Methyl-2-pyrrolidinone (NMP, 1.0 mL) under argon atmosphere (in glovebox). Then the tube was sealed with a screw cap and taken out of the glovebox. The

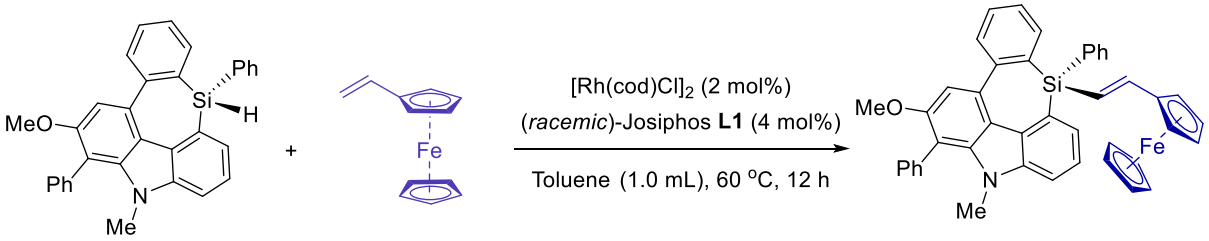
reaction mixture stirred at room temperature for 12 h. The mixture was quenched with H_2O and extracted with ethyl acetate. The organic layer was washed with brine, dried over Na_2SO_4 and concentrated under reduced pressure. The residue was purified by flash chromatography on silica gel to give **5c** as a white solid (30.1 mg, 72% yield). ^{1}H NMR (600 MHz, $CDCl_3$) δ = 7.79 (d, J = 7.9 Hz, 1H), 7.68 (d, J = 7.4 Hz, 1H), 7.61 (d, J = 7.7 Hz, 2H), 7.57 (s, 1H), 7.54 (d, J = 7.8 Hz, 2H), 7.51 (d, J = 6.6 Hz, 1H), 7.40 – 7.26 (m, 6H), 7.14 (t, J = 7.3 Hz, 1H), 6.86 (d, J = 7.8 Hz, 2H), 3.82 (s, 3H), 3.76 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$) δ = 160.7, 139.6, 137.4, 136.5, 136.5, 135.8, 135.4, 131.7, 129.6, 129.2, 127.8, 126.9, 126.4, 125.4, 124.8, 124.6, 122.7, 122.4, 115.7, 113.6, 110.4, 55.0, 33.0 ppm. HRMS (ESI): calcd for $C_{28}H_{24}NOSi$ $[M+H]^+$ 418.1622, found 418.1617. HPLC (Chiralpak OD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 210 nm, t_r (minor) = 16.4 min, t_r (major) = 21.3 min, 98% *ee*. $[\alpha]_D^{29.6}$ = -18 (c = 0.1, $CHCl_3$).



2a, 98% *ee* **5d**, 98% *ee*

To a 5 mL tube containing **2a** (0.05 mmol, 15.6 mg, 1.0 equiv), acetone (0.1 mmol, 82.9 mg, 2.0 equiv), $[Rh(cod)Cl]_2$ (0.5 mg, 2 mol%) and (*racemic*)-Josiphos **L1** (1.1 mg, 4 mol%) was added toluene (0.5 mL) under argon atmosphere (in glovebox). Then the tube was sealed with a screw cap and taken out of the glovebox. The reaction mixture stirred at 60 °C for 12 h. After the completion of the reaction, the mixture was filtered through a plug of celite with CH_2Cl_2. The filtrate was concentrated under reduced pressure, and the residue was purified by flash chromatography on silica gel to give **5d** as a white solid (11.0 mg, 60% yield). ^{1}H NMR (600 MHz, $CDCl_3$) δ = 7.79 (d, J = 7.9 Hz, 1H), 7.74 (d, J = 7.4 Hz, 1H), 7.66 – 7.64 (m, 2H), 7.61 (s, 1H), 7.56 (d, J = 6.8 Hz, 1H), 7.43 (d, J = 8.0 Hz, 1H), 7.41 – 7.39 (m, 1H), 7.36 (d, J = 7.0 Hz, 1H), 7.34 – 7.29 (m, 3H), 7.16 (t, J = 7.3 Hz, 1H), 3.99 (dt, J = 12.1, 6.0 Hz, 1H), 3.86 (s, 3H), 1.06 (d, J = 1.7 Hz, 3H), 1.05 (d, J = 1.7 Hz, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$) δ =

140.1, 136.6, 135.8, 135.5, 134.9, 132.1, 130.0, 129.9, 129.5, 127.6, 126.3, 125.7, 125.0, 124.5, 122.5, 122.2, 115.1, 110.9, 65.9, 33.0, 25.5, 25.4 ppm. HRMS (ESI): calcd for $C_{24}H_{24}NOSi$ $[M+H]^+$ 370.1622, found 370.1616. HPLC (Chiralpak AD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (major) = 4.9 min, t_r (minor) = 15.8 min, 98% *ee*. $[\alpha]_D^{25.0}$ = +88 (c = 0.1, $CHCl_3$).



4a, 90% *ee* **6a**, 90% *ee*

To a 5 mL tube containing **4a** (0.05 mmol, 23.4 mg, 1.0 equiv), vinyl ferrocene (0.1 mmol, 22.7 mg, 2.0 equiv), $[Rh(cod)Cl]_2$ (0.5 mg, 2 mol%) and (*racemic*)-Josiphos **L1** (1.1 mg, 4 mol%) was added toluene (1.0 mL) under argon atmosphere (in glovebox). Then the tube was sealed with a screw cap and taken out of the glovebox. The reaction mixture stirred at 60 °C for 12 h. After the completion of the reaction, the mixture was filtered through a plug of celite with CH_2Cl_2. The filtrate was concentrated under reduced pressure, and the residue was purified by flash chromatography on silica gel to give **6a** as an orange solid (16.8 mg, 50% yield). ^{1}H NMR (600 MHz, $CDCl_3$) δ = 7.83 (d, J = 8.0 Hz, 1H), 7.70 (dd, J = 7.4, 1.2 Hz, 1H), 7.64 (d, J = 6.7 Hz, 2H), 7.56 (td, J = 7.8, 1.2 Hz, 1H), 7.49 – 7.42 (m, 4H), 7.41 – 7.35 (m, 7H), 7.35 – 7.31 (m, 2H), 6.46 (d, J = 18.8 Hz, 1H), 6.21 (d, J = 18.8 Hz, 1H), 4.30 (s, 1H), 4.26 (s, 1H), 4.17 (d, J = 1.2 Hz, 2H), 3.89 (s, 3H), 3.80 (s, 5H), 3.20 (s, 3H) ppm. ^{13}C NMR (150 MHz, $CDCl_3$) δ = 155.7, 148.2, 146.4, 141.4, 140.8, 138.0, 136.7, 136.4, 135.8, 134.8, 134.0, 132.7, 131.5, 131.5, 129.9, 129.5, 129.4, 128.3, 127.8, 127.8, 127.8, 127.3, 126.8, 125.5, 124.9, 118.7, 117.2, 113.3, 109.1, 106.5, 83.7, 69.3, 69.2, 69.1, 67.3, 67.0, 56.8, 32.6 ppm. HRMS (ESI): calcd for $C_{44}H_{35}FeNOSi$ $[M]^+$ 677.1837, found 677.1821. HPLC (Chiralpak AD-3) *i*-PrOH/hexane = 5/95, 1.0 mL/min, T = 28 °C, λ = 250 nm, t_r (minor) = 4.7 min, t_r (major) = 6.6 min, 90% *ee*. $[\alpha]_D^{29.7}$ = +114 (c = 0.1, $CHCl_3$).

VIII. Single Crystal X-Ray Diffraction

Single crystal suitable for X-ray diffraction of compound **2j** was obtained from a solution of the compound **2j** (91% *ee*) in dichloromethane layered with hexane. The X-ray crystal structure is deposited in the Cambridge Crystallographic Data Centre under reference number CCDC 2031952. Diffraction Data were collected on a BrukerD8 venture employing Mo-Kα radiation (λ = 0.71073 Å). The crystal structure was shown in **Figure S1**. The detailed information was listed in the **Tables S3**.

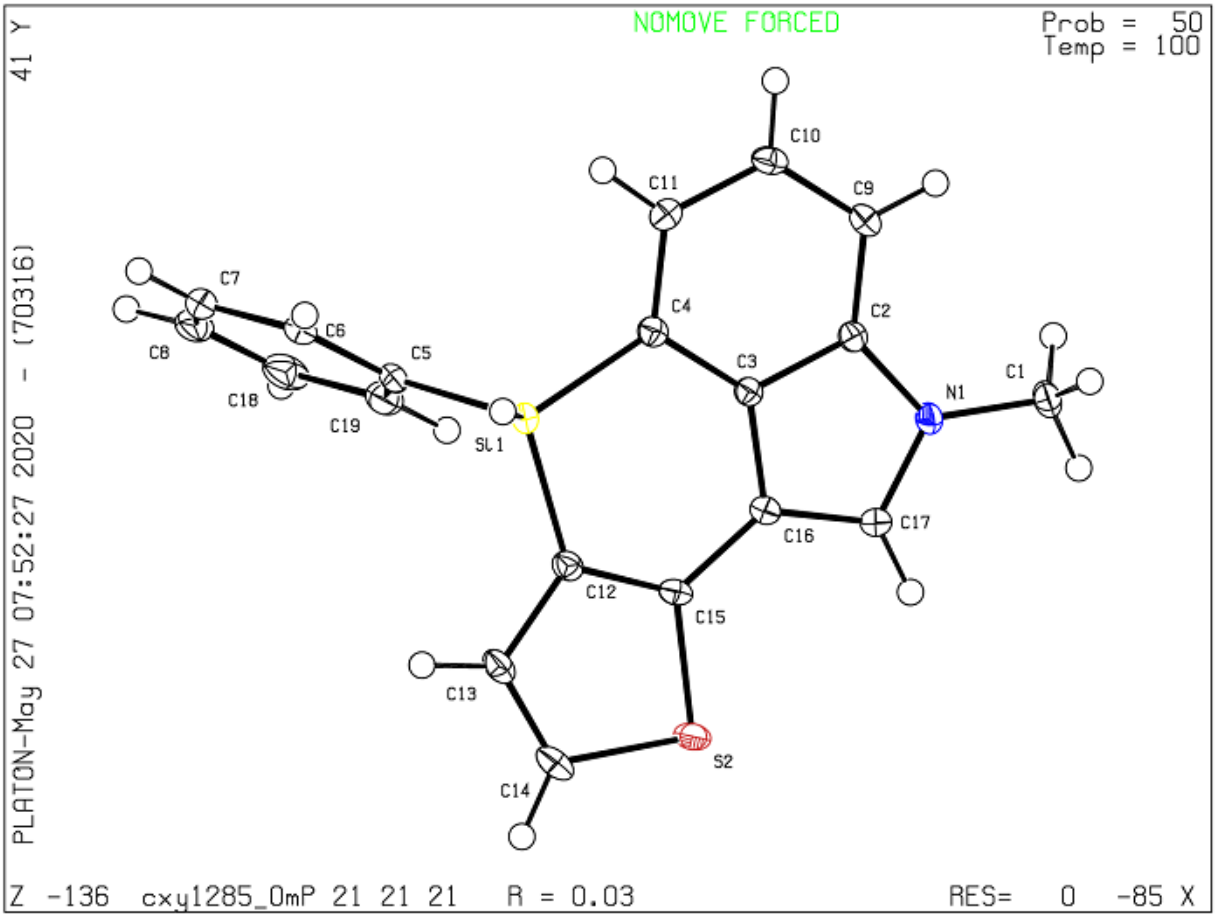


Figure S1. Crystal structure of **2j** (CCDC 2031952).

Table S3. Crystallographic Data and Structure Refinement for compound **2j**.

Compound	**2j**
CCDC deposition No.	2031952
Empirical formula	$C_{19}H_{15}NSSi$
Formula weight	317.47
Temperature	100 K
Crystal system, space group	orthorhombic, $P2_12_12_1$
Unit cell dimensions	*a* = 7.3548(3) Å alpha = 90° *b* = 8.2124(3) Å beta = 90° *c* = 26.1737(9) Å gamma = 90°
Volume	1580.91(10) $Å^3$
Z, Calculated density	4, 1.334 g/cm^3
Absorption coefficient	0.276 mm^{-1}
F(000)	664.0
Crystal size	0.35 × 0.31 × 0.23 mm^3
Radiation	MoKα (λ = 0.71073)
2Θ range for data collection	5.198 to 61.068°
Index ranges	$-7 \le h \le 10$, $-11 \le k \le 10$, $-37 \le l \le 31$
Reflections collected	16195
Independent reflections	4773 [R_{int} = 0.0374, R_{sigma} = 0.0403]
Data / restaints / parameters	4773/0/201
Goodness-of-fit on F^2	1.043
Final R indices [I>=2sigma(I)]	R_1 = 0.0345, wR_2 = 0.0748
R indices (all data)	R_1 = 0.0412, wR_2 = 0.0776
Largest diff. peak/hole	0.34 /-0.17 e $Å^{-3}$
Flack parameter	-0.02(3)

Single crystal suitable for X-ray diffraction of compound **6a** was obtained from a solution of the compound **6a** (90% *ee*) in dichloromethane layered with methyl alcohol. The X-ray crystal structure is deposited in the Cambridge Crystallographic Data Centre under reference number CCDC 2031700. Diffraction Data were collected on a BrukerD8 venture employing Cu-Kα radiation (λ = 1.54178 Å). The crystal structure was shown in **Figure S2**. The detailed information was listed in the **Tables S4**.

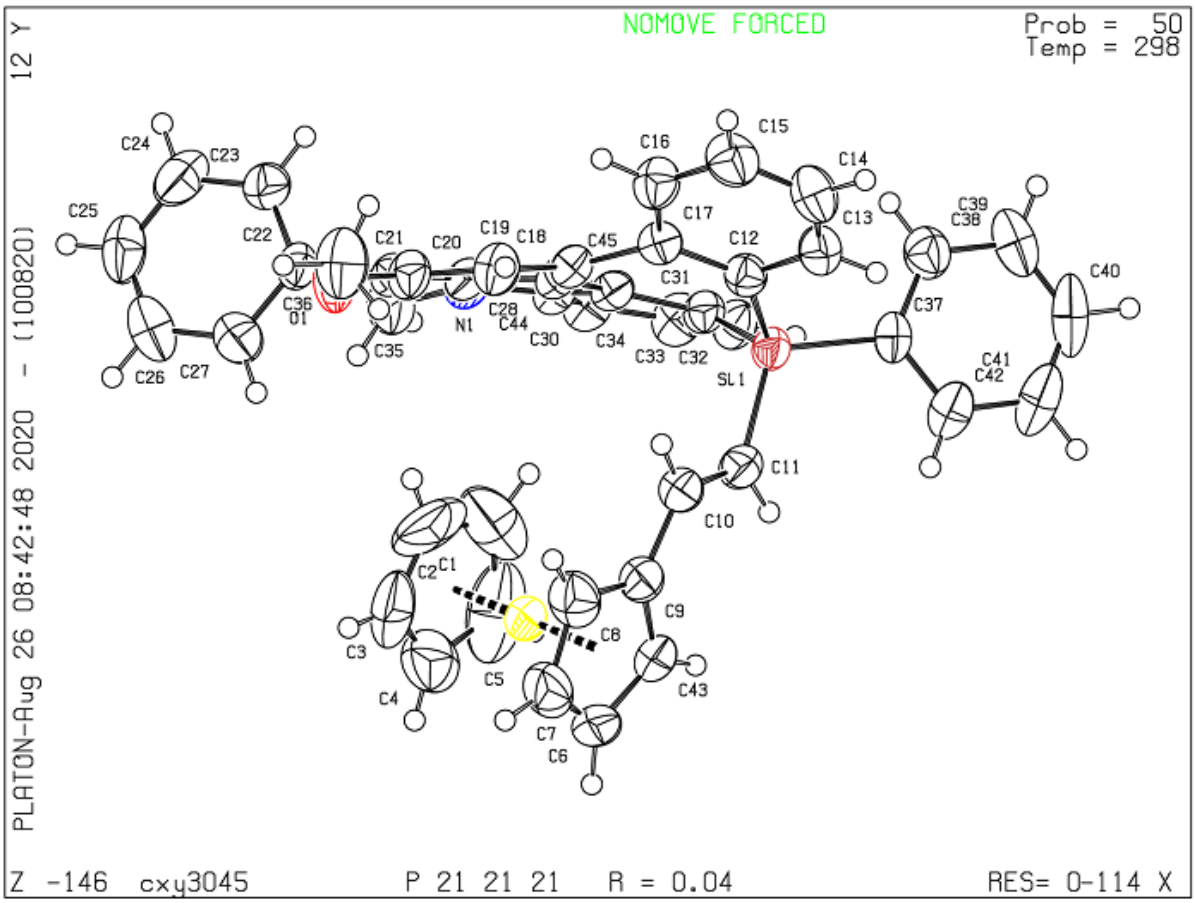


Figure S2. Crystal structure of **6a** (CCDC 2031700).

Table S4. Crystallographic Data and Structure Refinement for compound **6a**.

Compound	**6a**
CCDC deposition No.	2031700
Empirical formula	$C_{44}H_{35}FeNOSi$
Formula weight	677.67
Temperature	298 K
Crystal system, space group	orthorhombic, $P2_12_12_1$
Unit cell dimensions	*a* = 10.5746(7) Å alpha = 90° *b* = 15.7664(9) Å beta = 90° *c* = 20.3486(12) Å gamma = 90°
Volume	3392.60(4) $Å^3$
Z, Calculated density	4, 1.327 g/cm^3
Absorption coefficient	4.177 mm^{-1}
F(000)	1416.0
Crystal size	0.35 × 0.32 × 0.31 mm^3
Radiation	CuKα (λ = 1.54178)
2Θ range for data collection	7.092 to 136.874°
Index ranges	$-12 \le h \le 12$, $-18 \le k \le 18$, $-24 \le l \le 22$
Reflections collected	34876
Independent reflections	6213 [R_{int} = 0.0858, R_{sigma} = 0.0573]
Data / restaints / parameters	6213/0/436
Goodness-of-fit on F^2	0.979
Final R indices [I>=2sigma(I)]	R_1 = 0.0373, wR_2 = 0.0891
R indices (all data)	R_1 = 0.0430, wR_2 = 0.0914
Largest diff. peak/hole	0.28 /-0.28 e $Å^{-3}$
Flack parameter	-0.034(5)

IX. References

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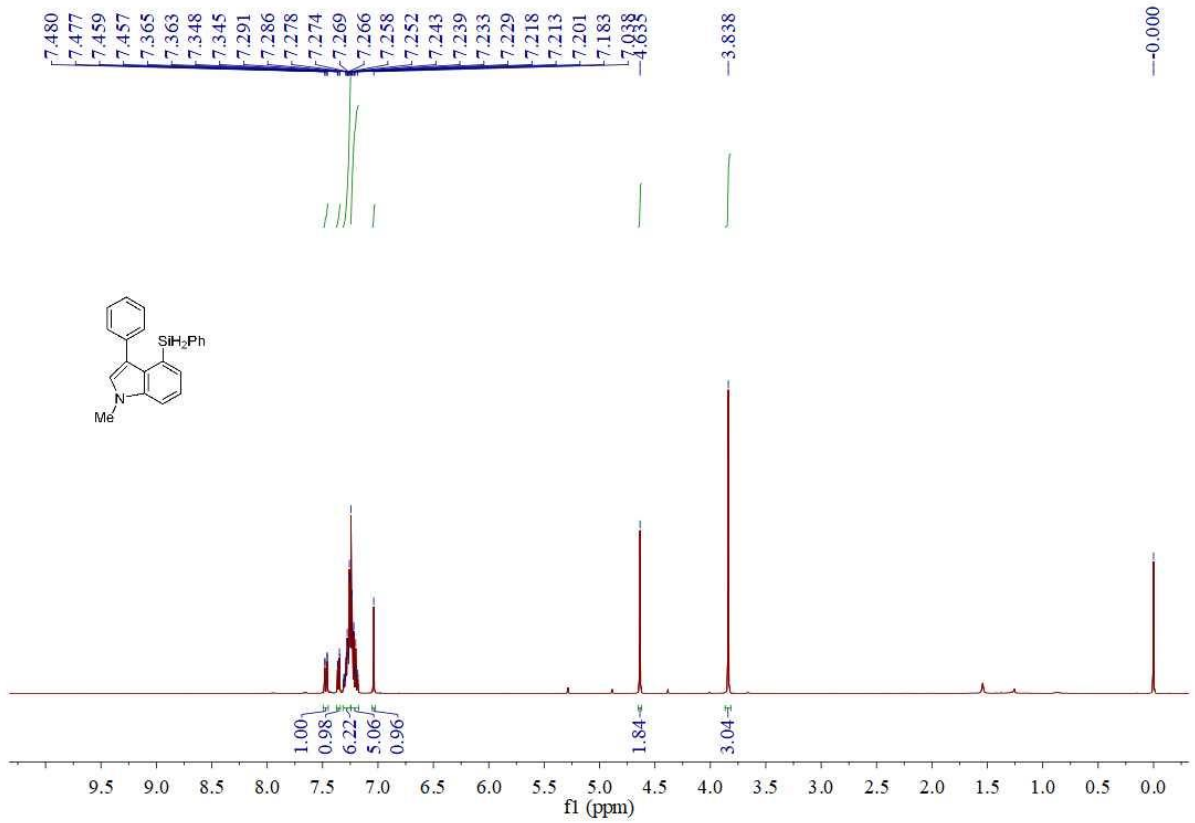
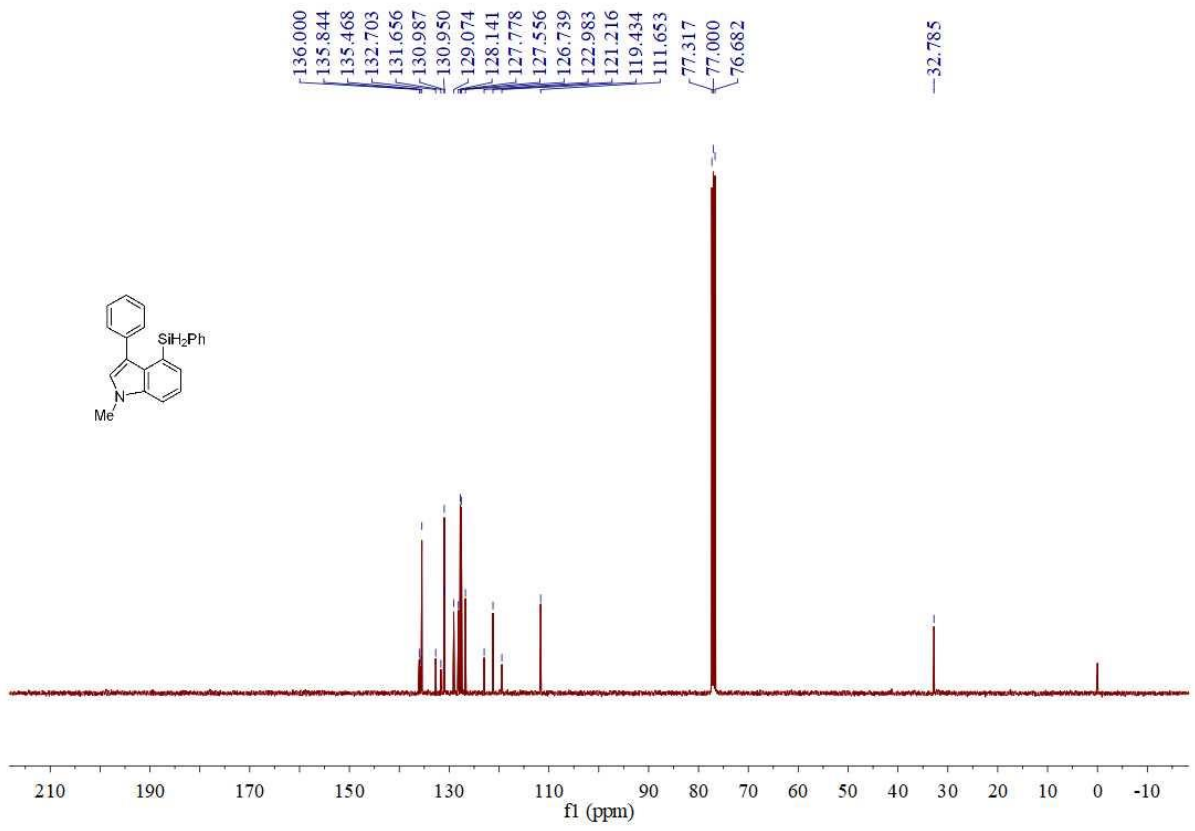
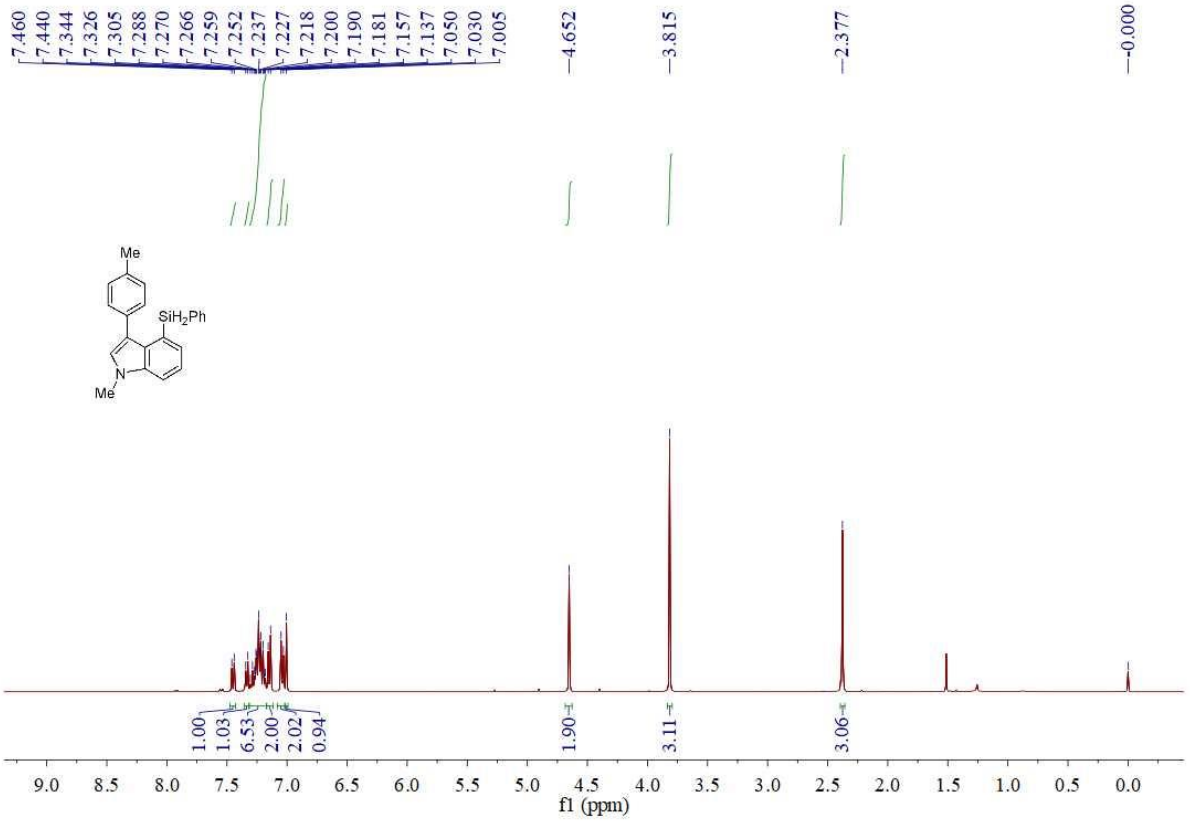
X. NMR Spectra



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Me
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6.53
2.00
2.02
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3.11
3.06
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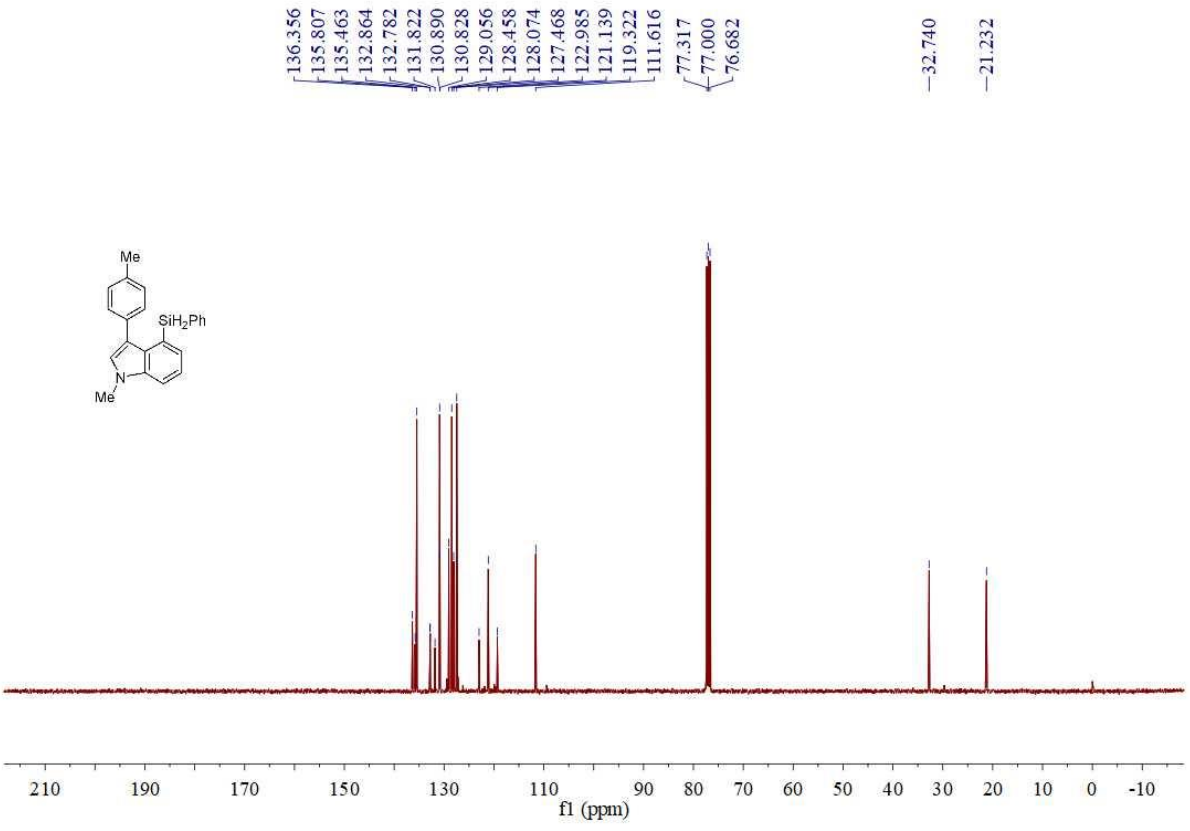
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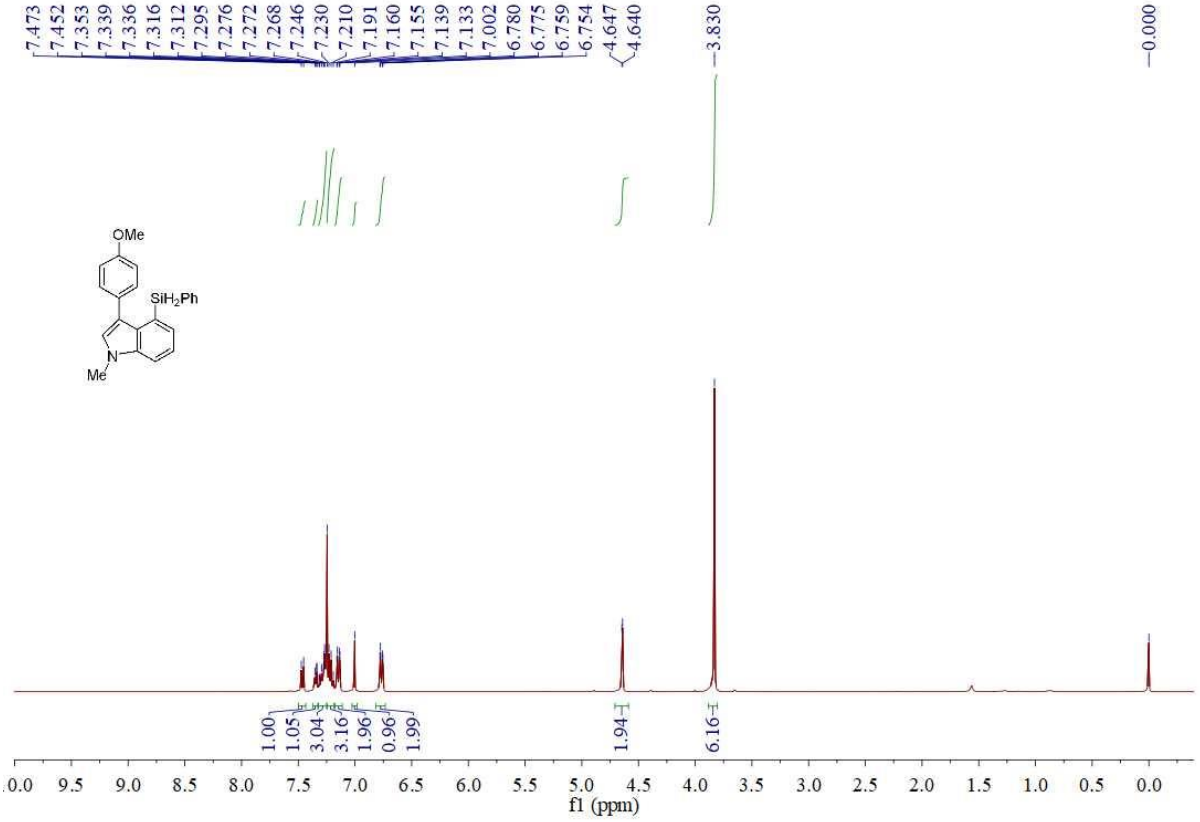
f1 (ppm)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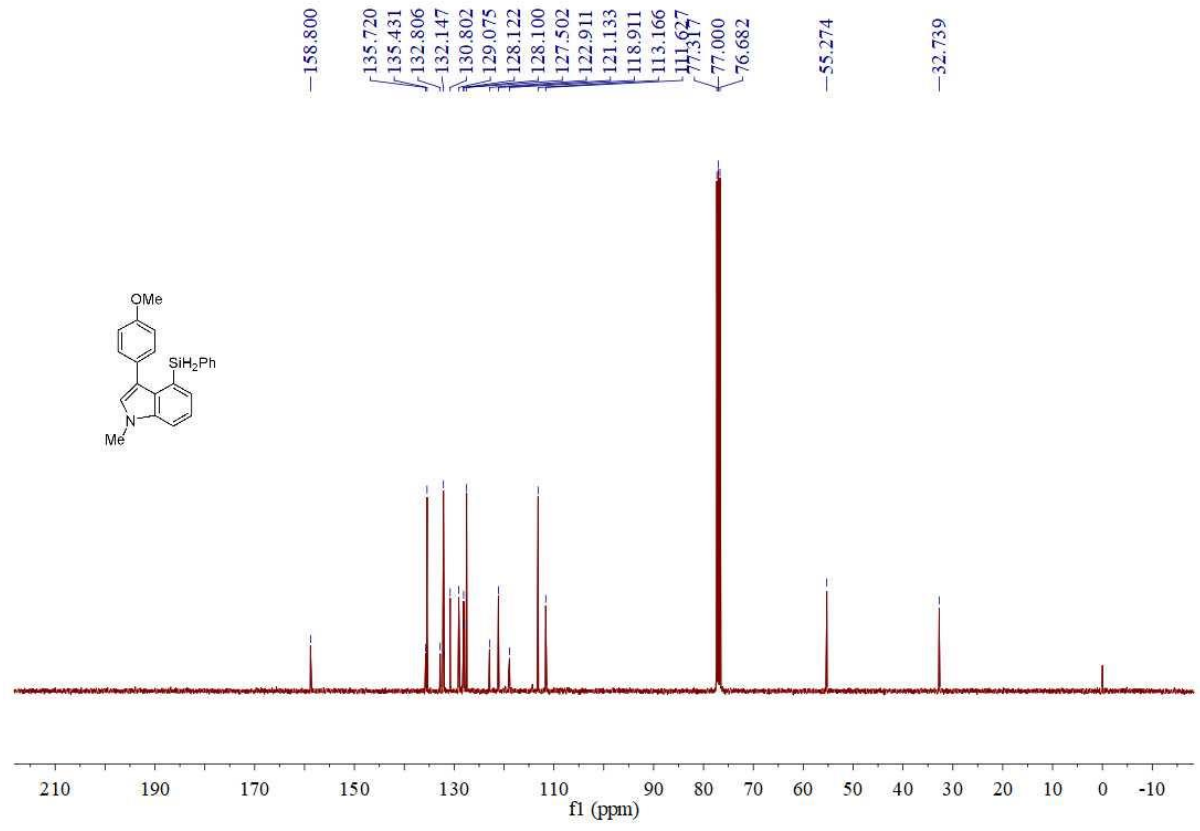
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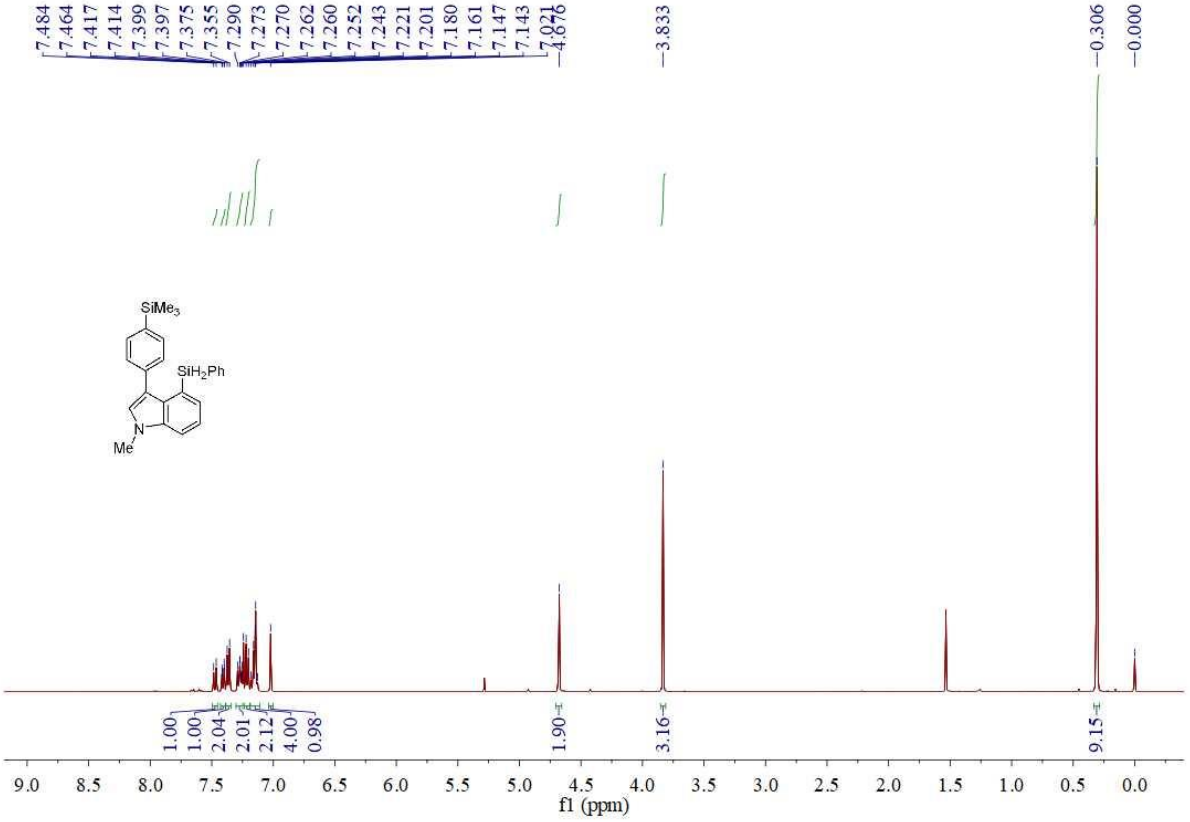
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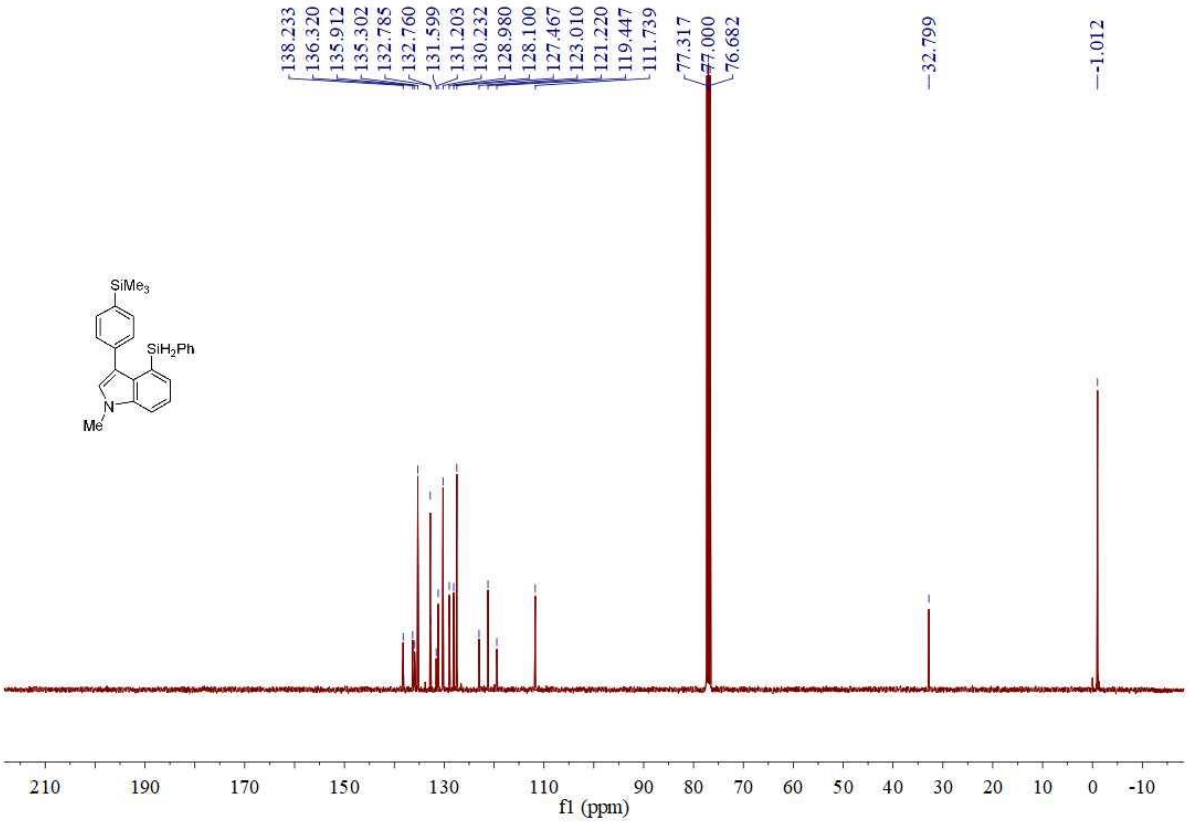
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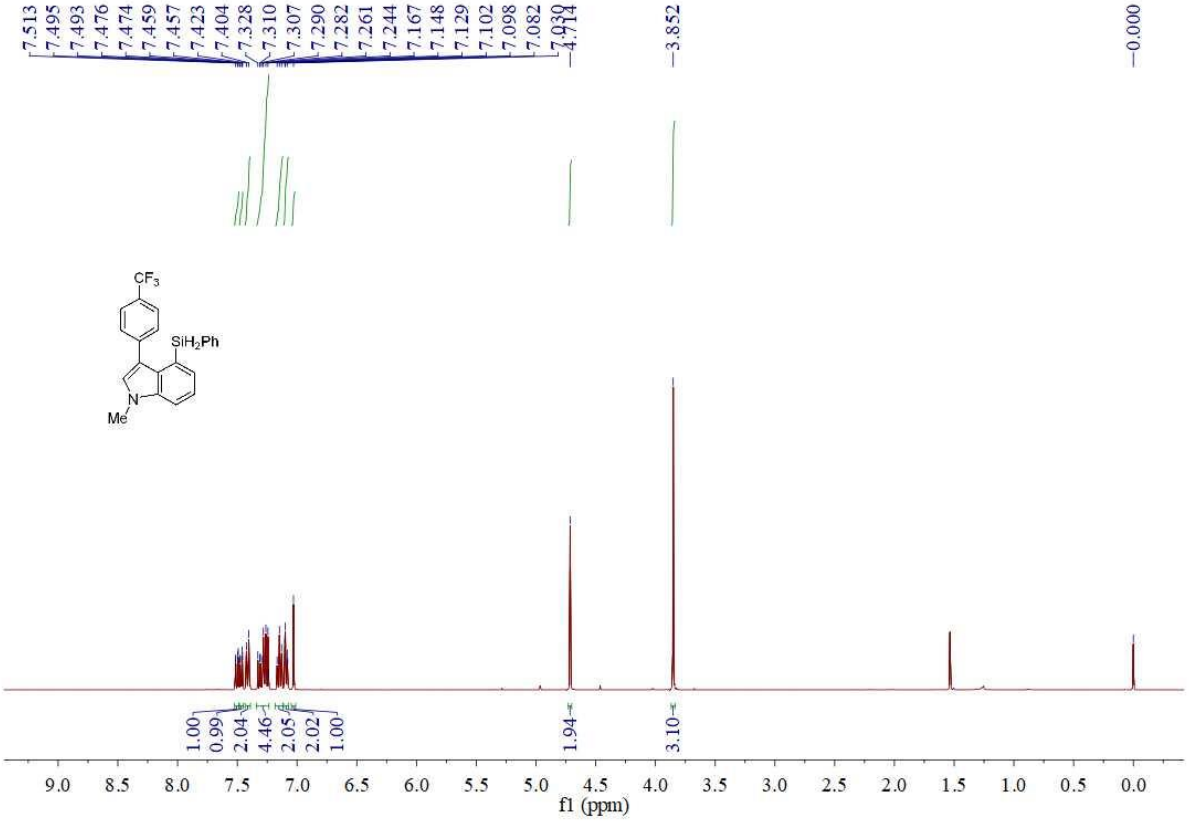
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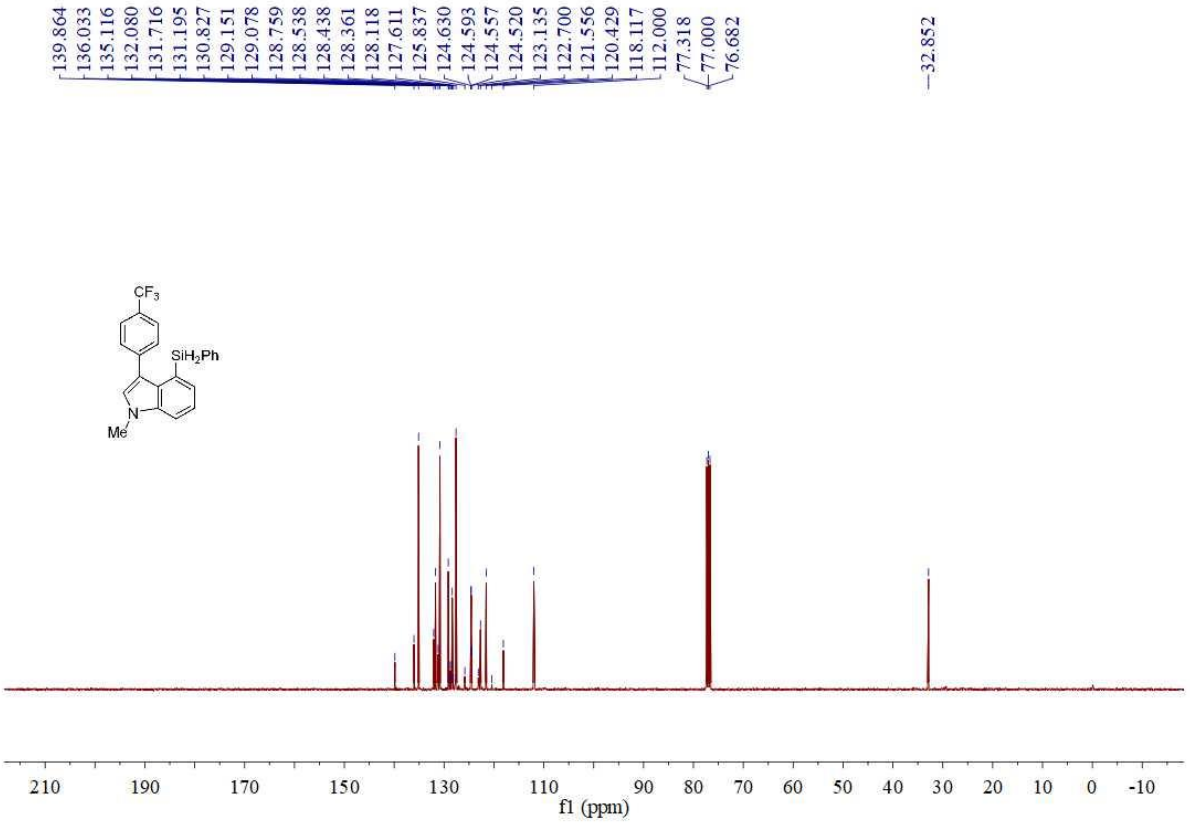
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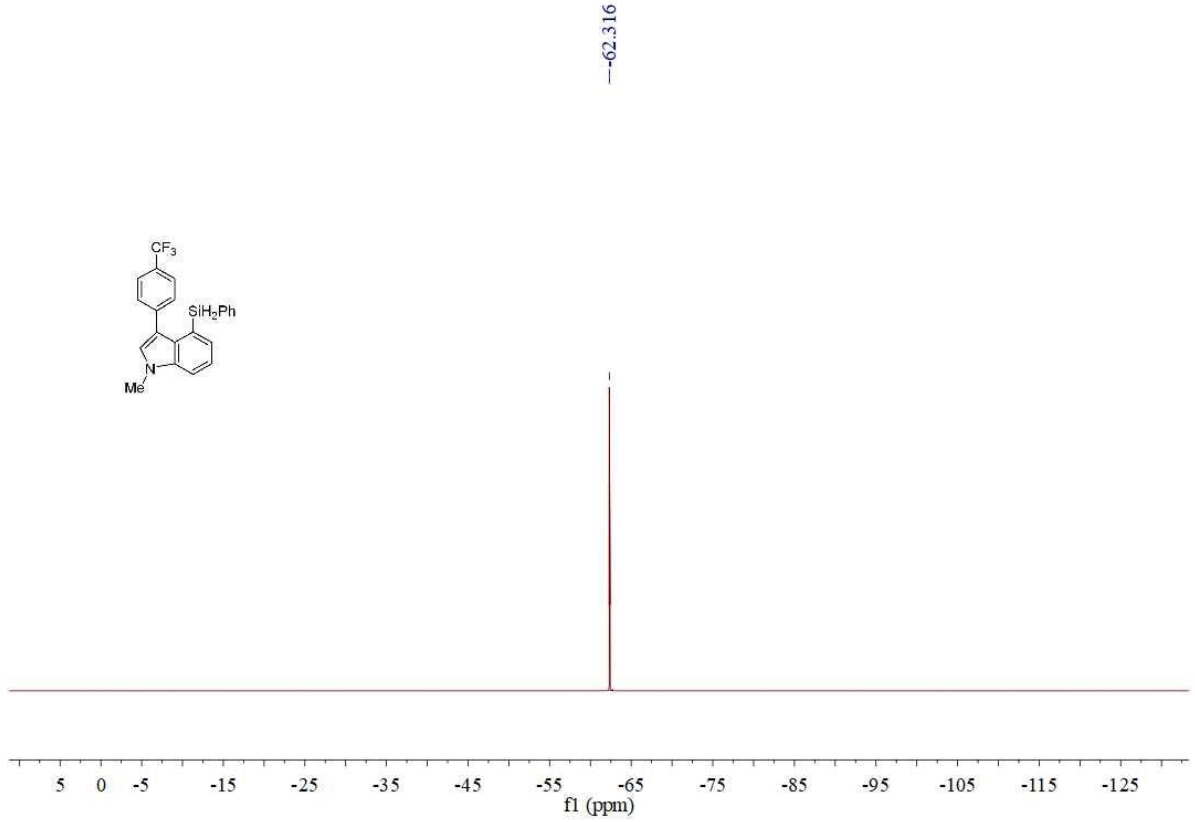
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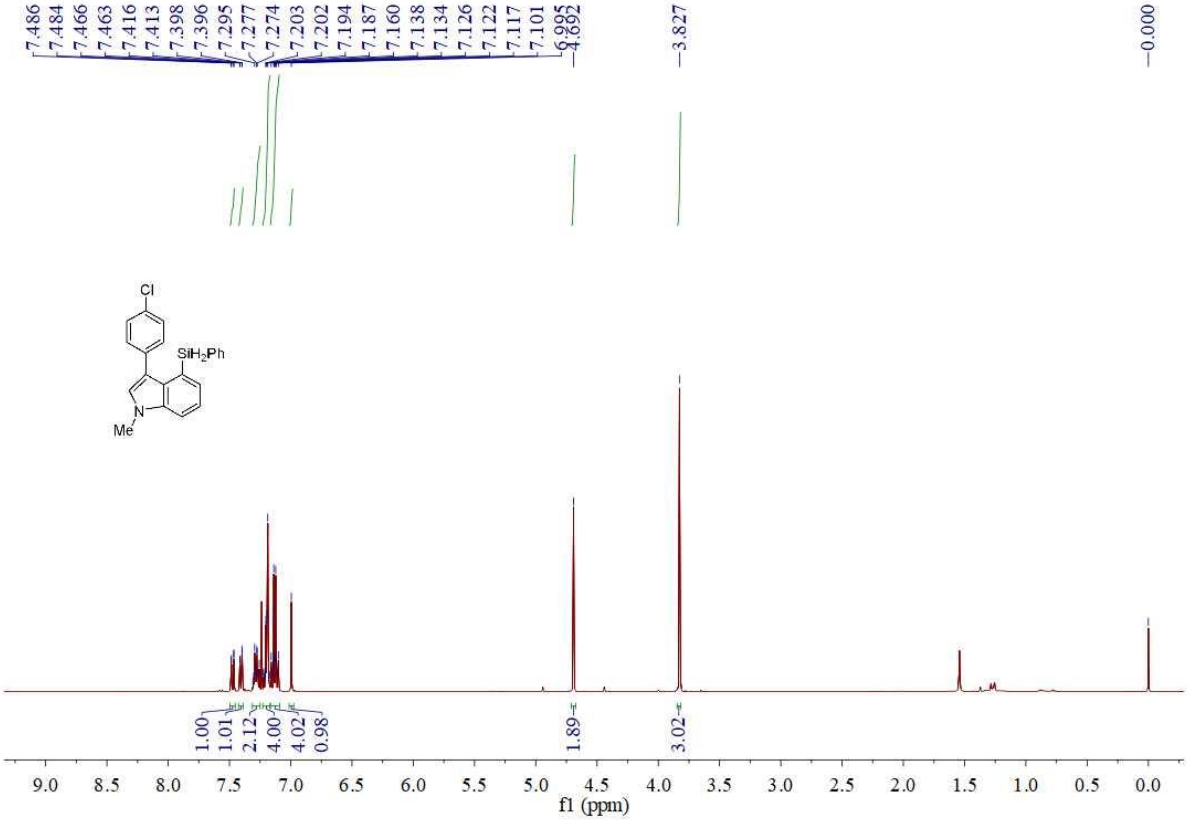
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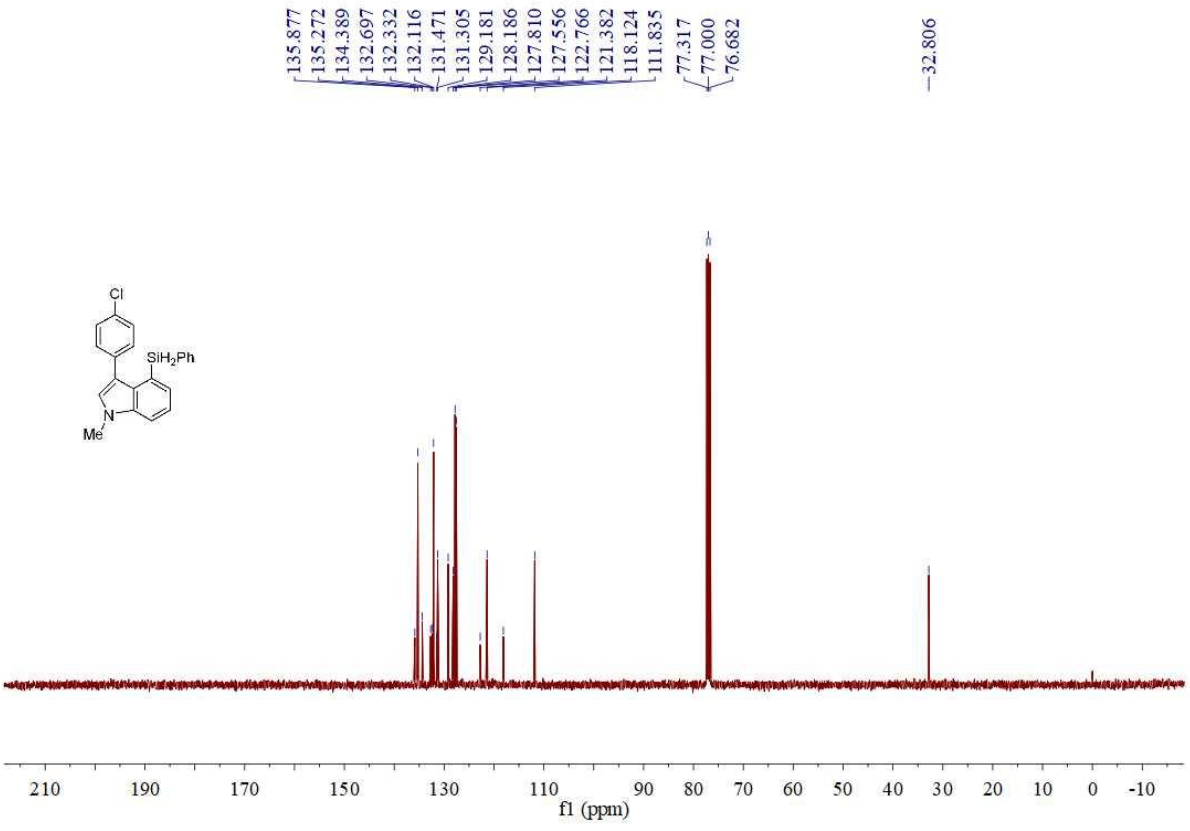
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Cl
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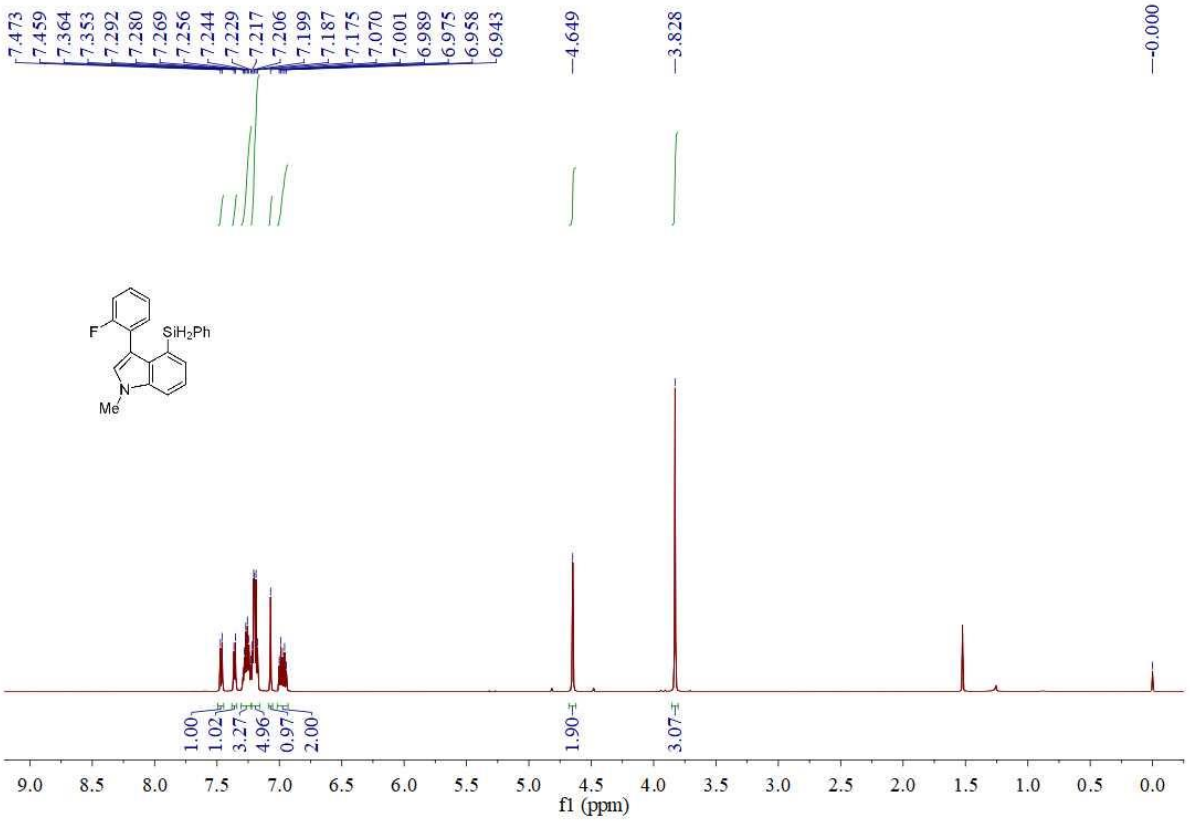
N
Me
f1 (ppm)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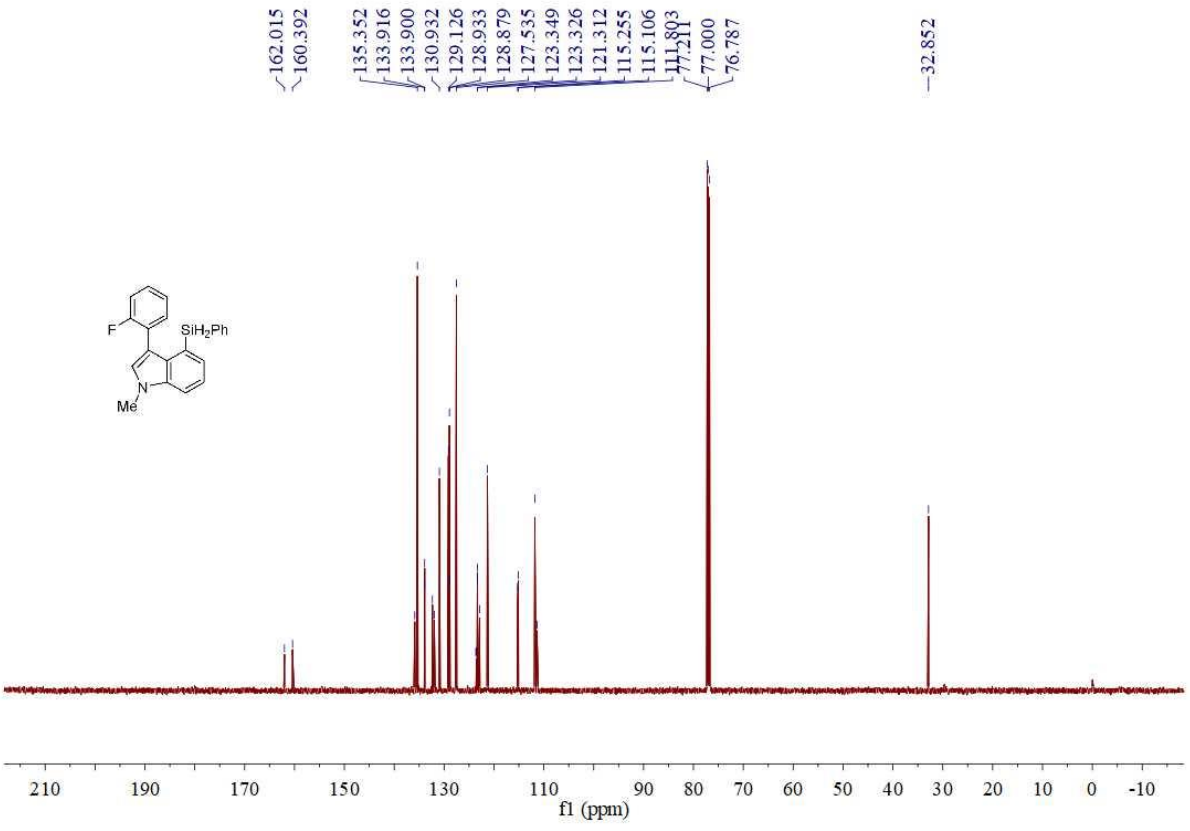
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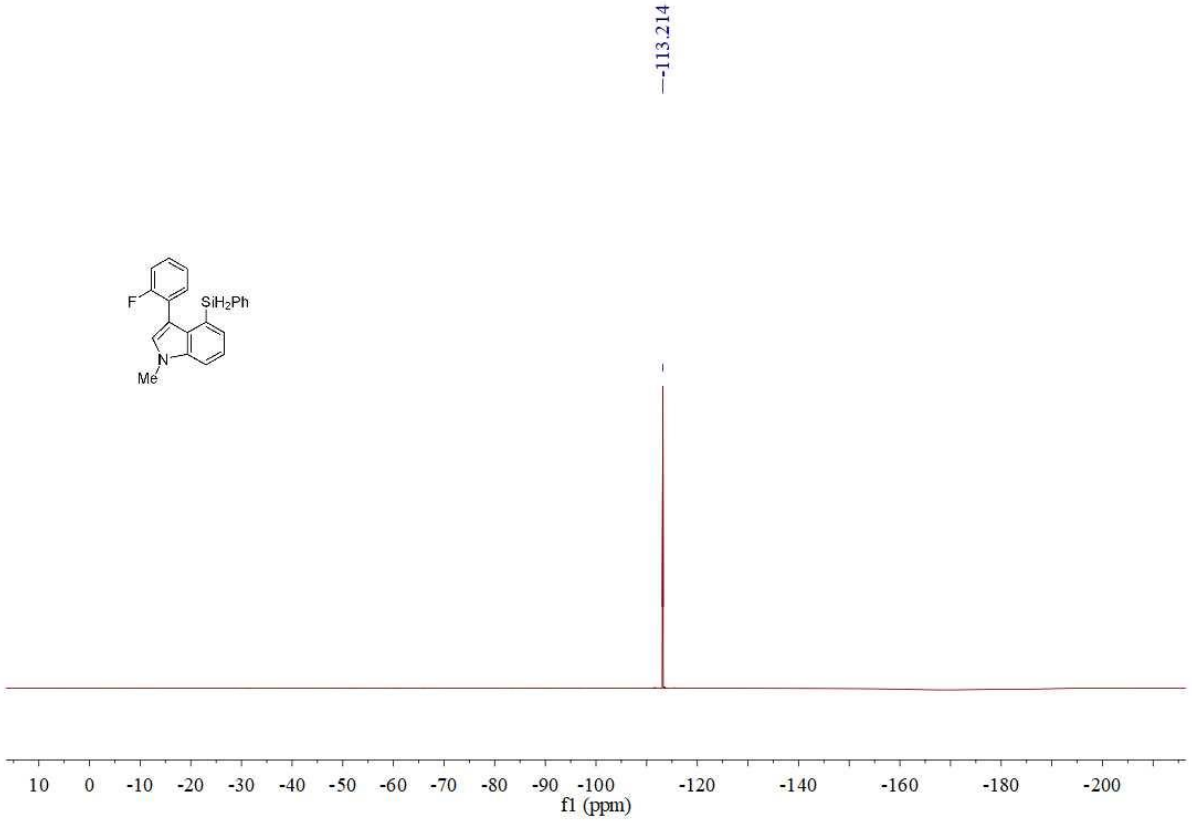
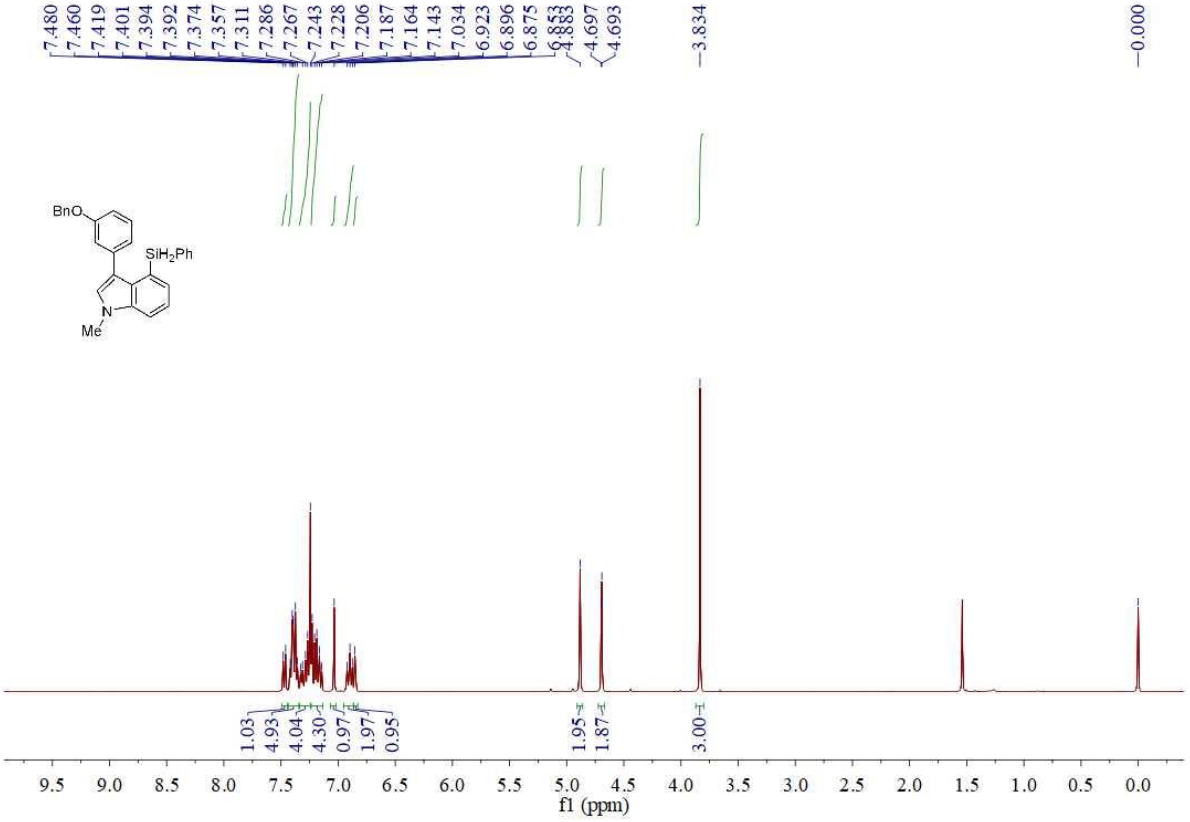
135.352
133.916
133.900
130.932
129.126
128.933
128.879
127.535
123.349
123.326
121.312
115.255
115.106
111.803
77.211
77.000
76.787
32.852
F
SiH2Ph
N
Me
f1 (ppm)


-113.214
F
SiH2Ph
N
Me
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-120
-140
-160
-180
-200
f1 (ppm)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7.401
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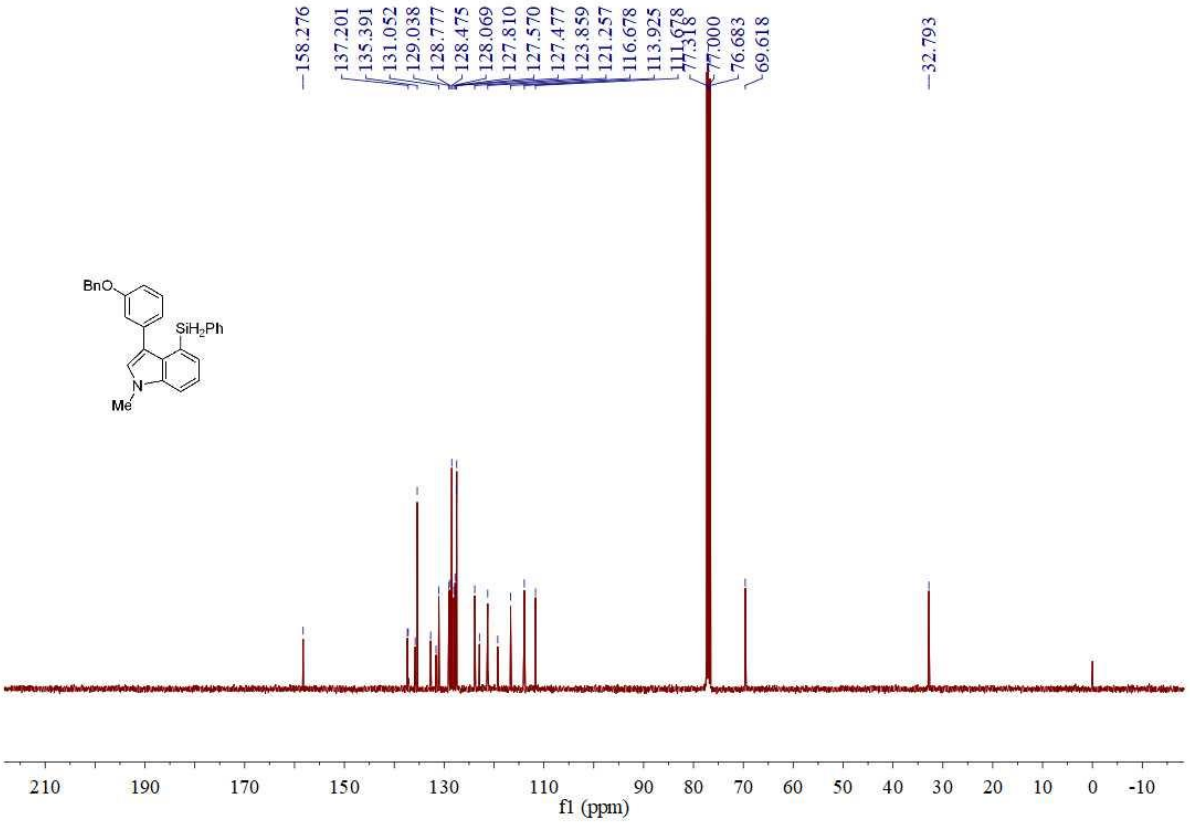
7.392
7.374
7.357
7.311
7.286
7.267
7.243
7.228
7.206
7.187
7.164
7.143
7.034
6.923
6.896
6.875
6.853
6.833
4.697
4.693
3.834
0.000
BnO
SiH2Ph
N
Me
1.03
4.93
4.04
4.30
0.97
1.97
0.95
1.95
1.87
3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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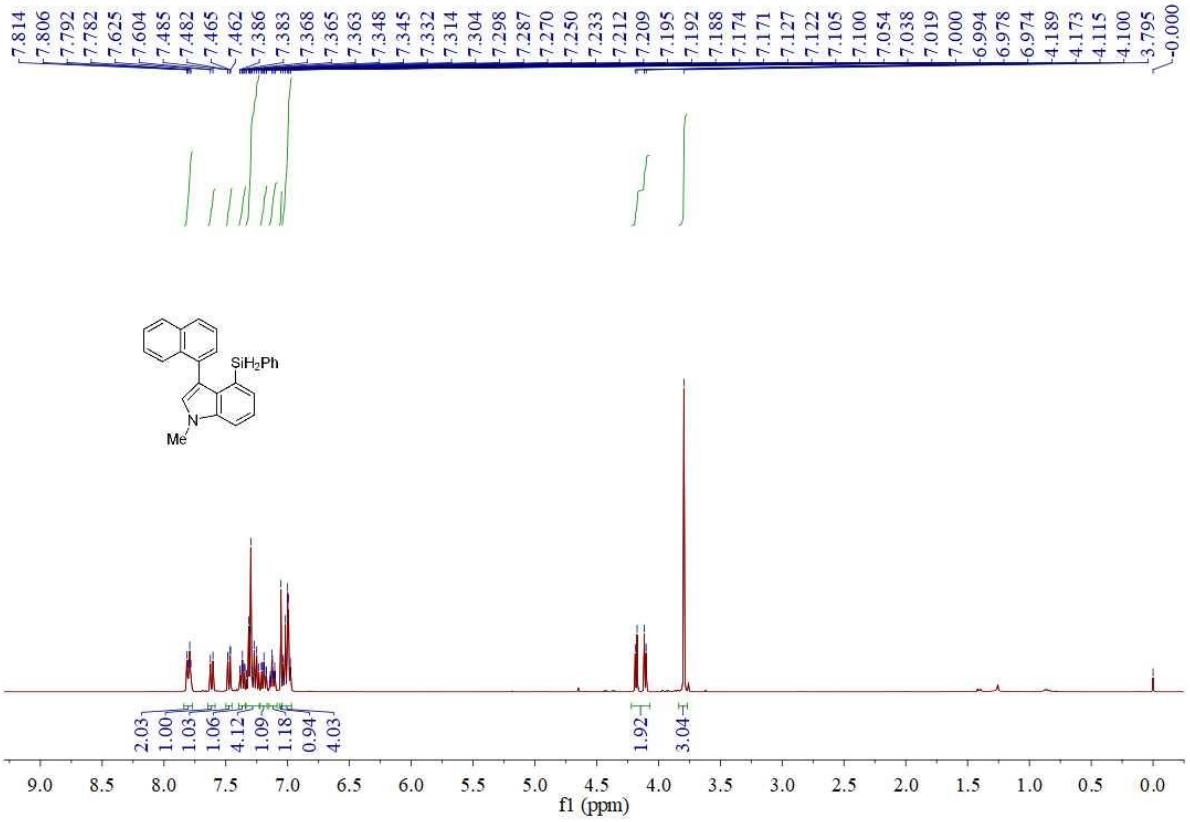
128.777
128.475
128.069
127.810
127.570
127.477
123.859
121.257
116.678
113.925
111.678
77.318
77.000
76.683
69.618
32.793
BnO
SiH2Ph
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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7.782
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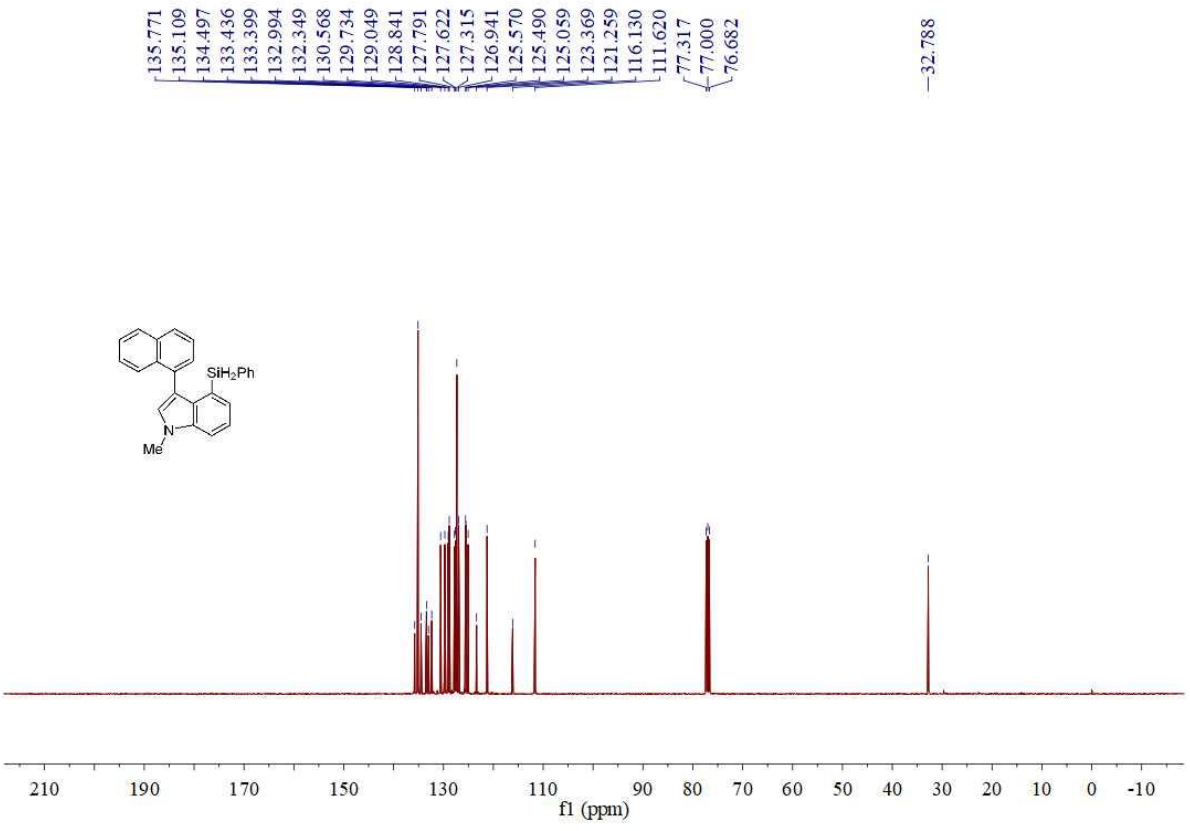
7.604
7.485
7.482
7.465
7.462
7.386
7.383
7.368
7.365
7.363
7.348
7.345
7.332
7.314
7.304
7.298
7.287
7.270
7.250
7.233
7.212
7.209
7.195
7.192
7.188
7.174
7.171
7.127
7.122
7.105
7.100
7.054
7.038
7.019
7.000
6.994
6.978
6.974
4.189
4.173
4.115
4.100
3.795
-0.000
SiH2Ph
N
Me
2.03
1.00
1.03
1.06
4.12
1.09
1.18
0.94
4.03
1.92
3.04
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
f1 (ppm)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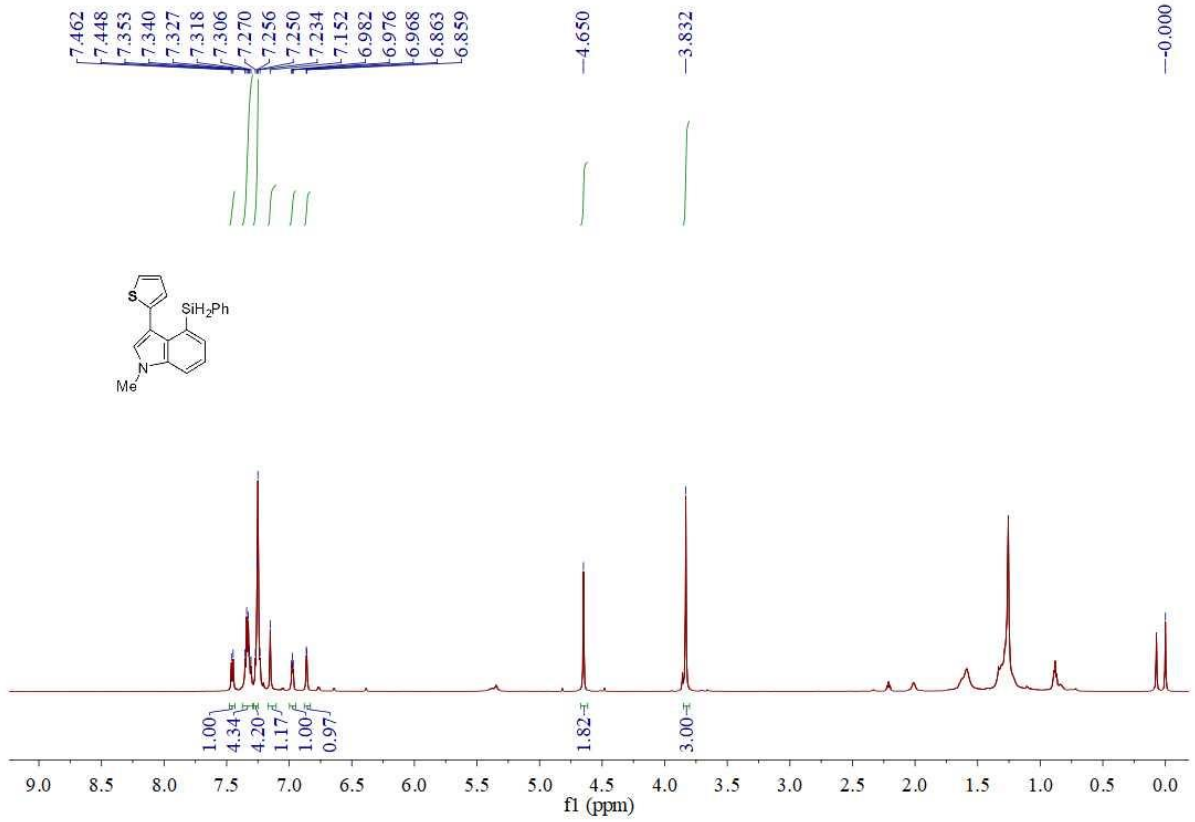
135.109
134.497
133.436
133.399
132.994
132.349
130.568
129.734
129.049
128.841
127.791
127.622
127.315
126.941
125.570
125.490
125.059
123.369
121.259
116.130
111.620
77.317
77.000
76.682
32.788
SiH2Ph
N
Me
210
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)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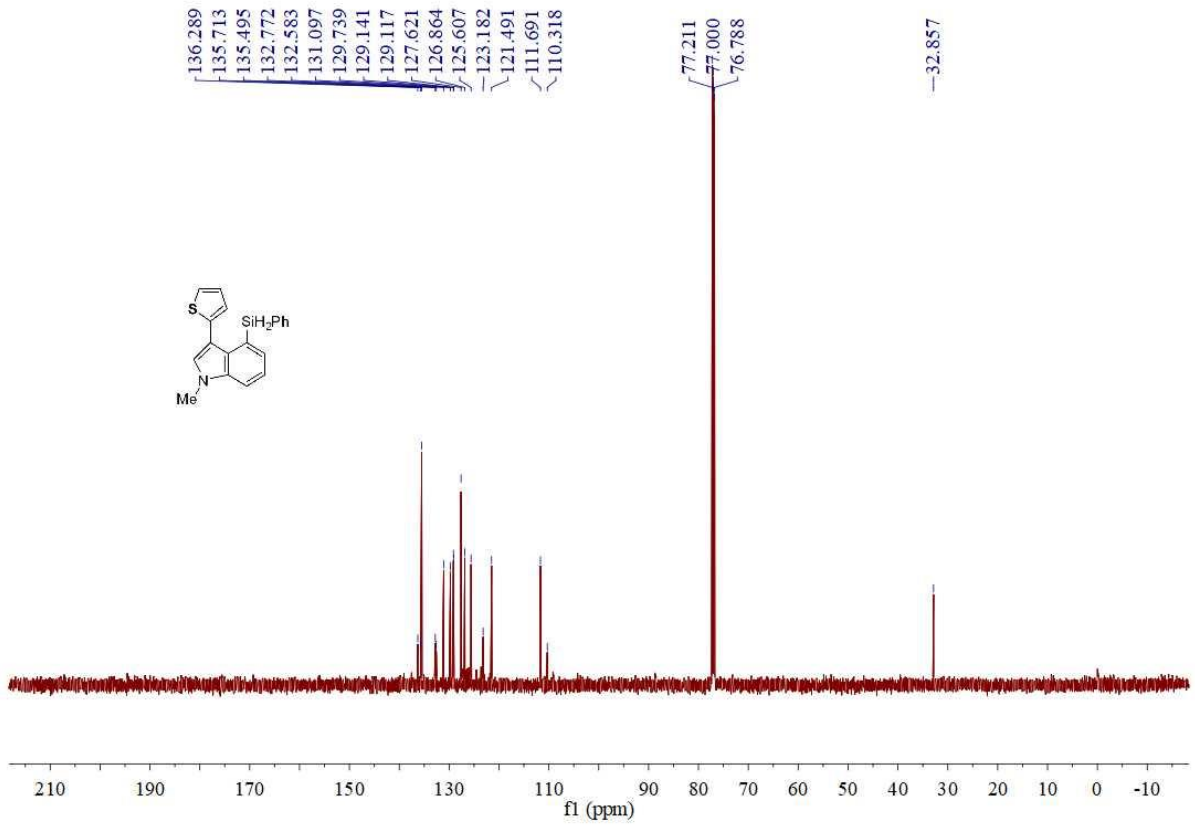
7.448
7.353
7.340
7.327
7.318
7.306
7.270
7.256
7.250
7.234
7.152
6.982
6.976
6.968
6.863
6.859
4.650
3.832
0.000
SiH2Ph
Me
1.00
4.34
4.20
1.17
1.00
0.97
1.82
3.00
f1 (ppm)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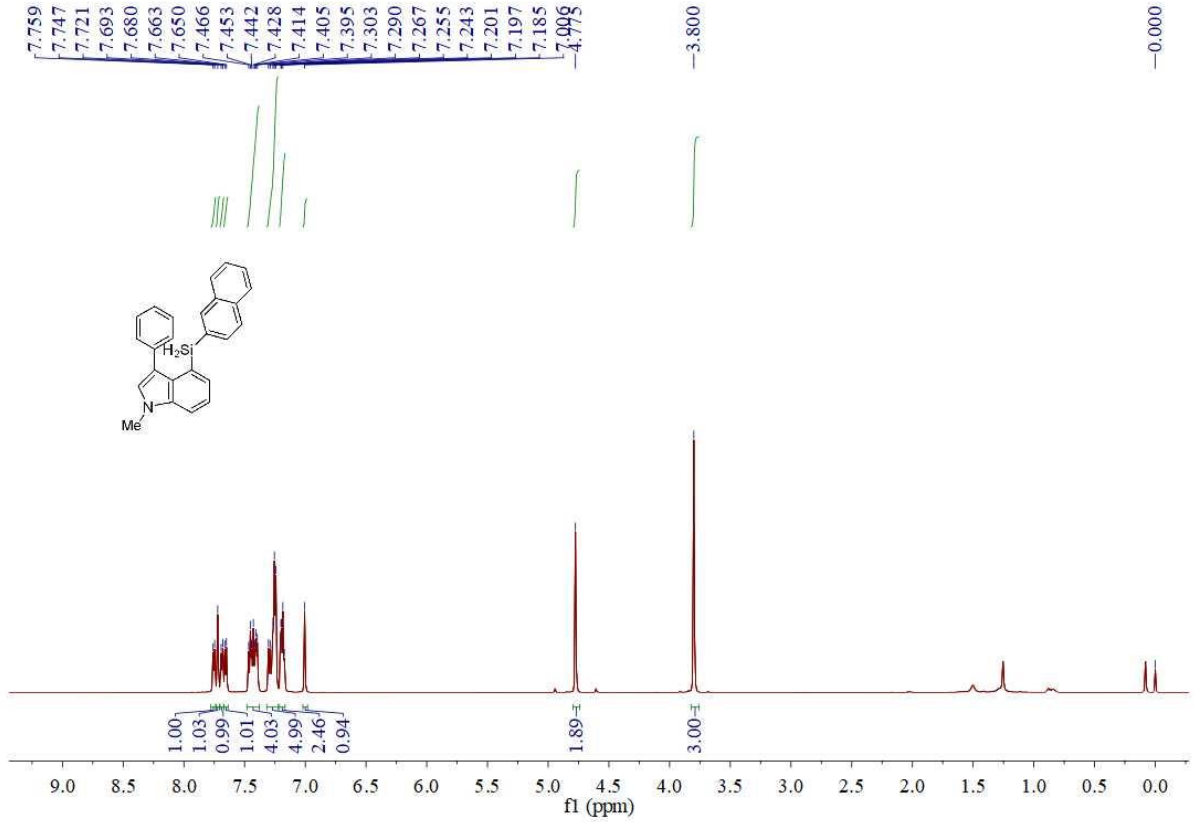
135.713
135.495
132.772
132.583
131.097
129.739
129.141
129.117
127.621
126.864
125.607
123.182
121.491
111.691
110.318
77.211
77.000
76.788
32.857
SiH2Ph
Me
f1 (ppm)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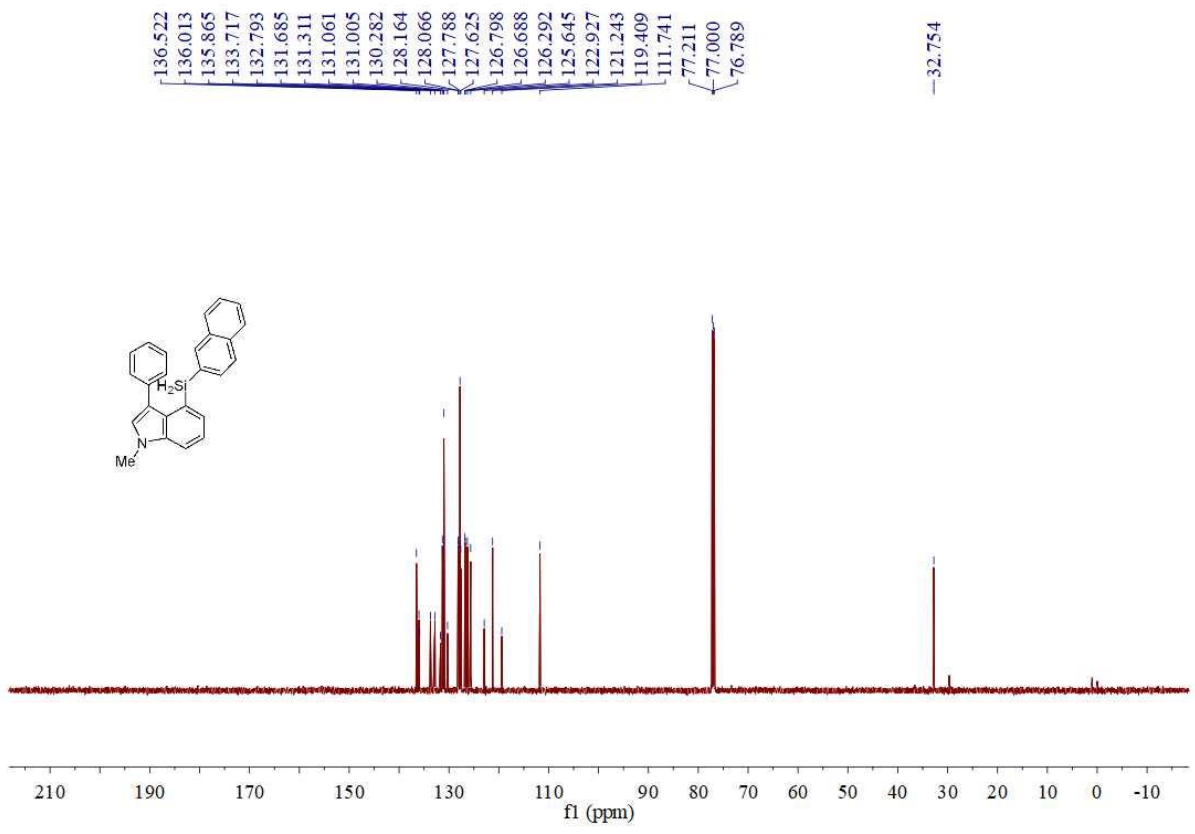
7.747
7.721
7.693
7.680
7.663
7.650
7.466
7.453
7.442
7.428
7.414
7.405
7.395
7.303
7.290
7.267
7.255
7.243
7.201
7.197
7.185
7.006
4.775
3.800
0.000
H2Si
N
Me
1.00
1.03
0.99
1.01
4.03
4.99
2.46
0.94
1.89
3.00
f1 (ppm)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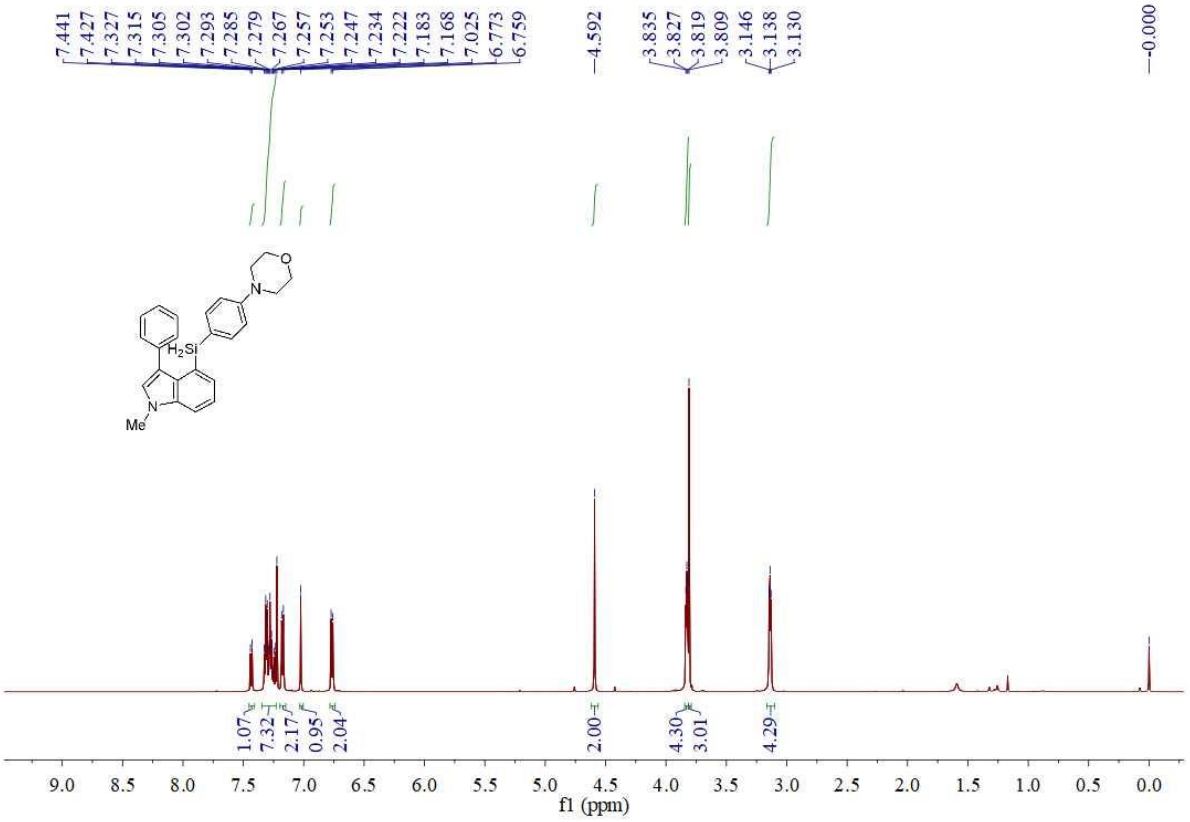
136.013
135.865
133.717
132.793
131.685
131.311
131.061
131.005
130.282
128.164
128.066
127.788
127.625
126.798
126.688
126.292
125.645
122.927
121.243
119.409
111.741
77.211
77.000
76.789
32.754
H2Si
N
Me
f1 (ppm)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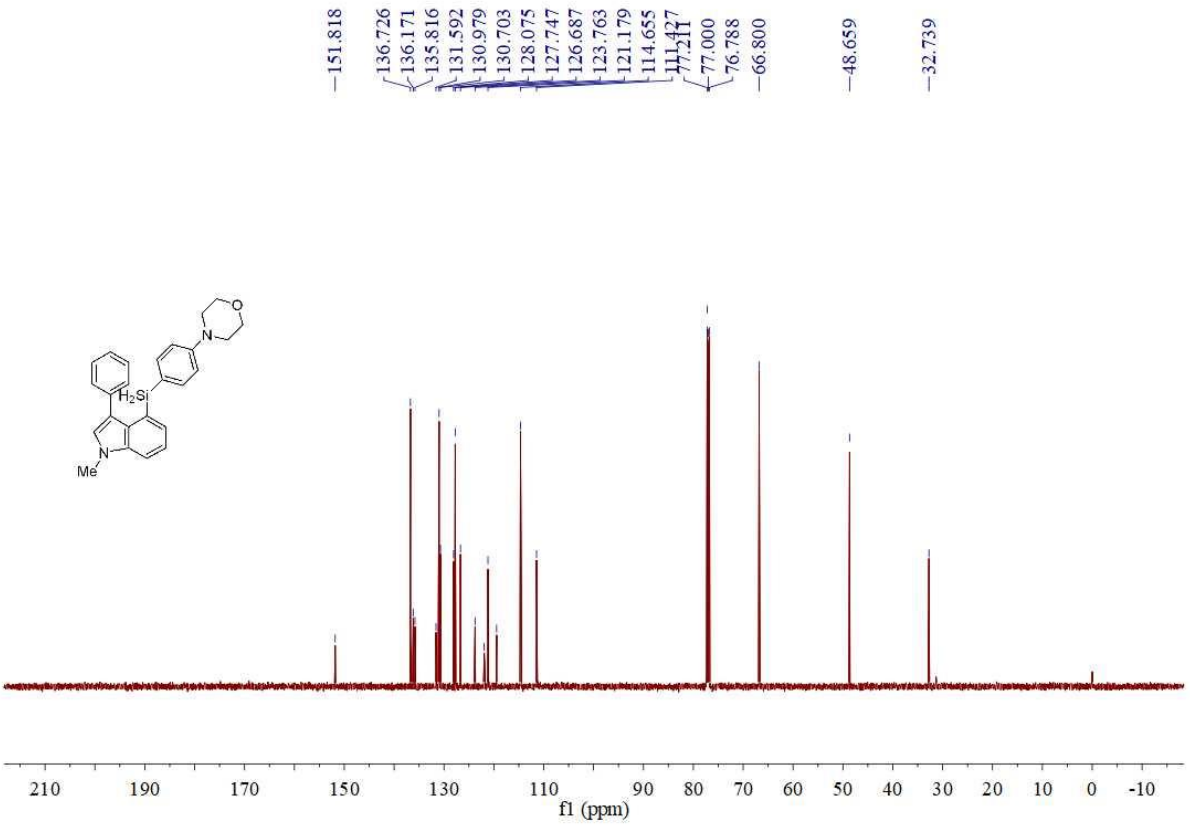
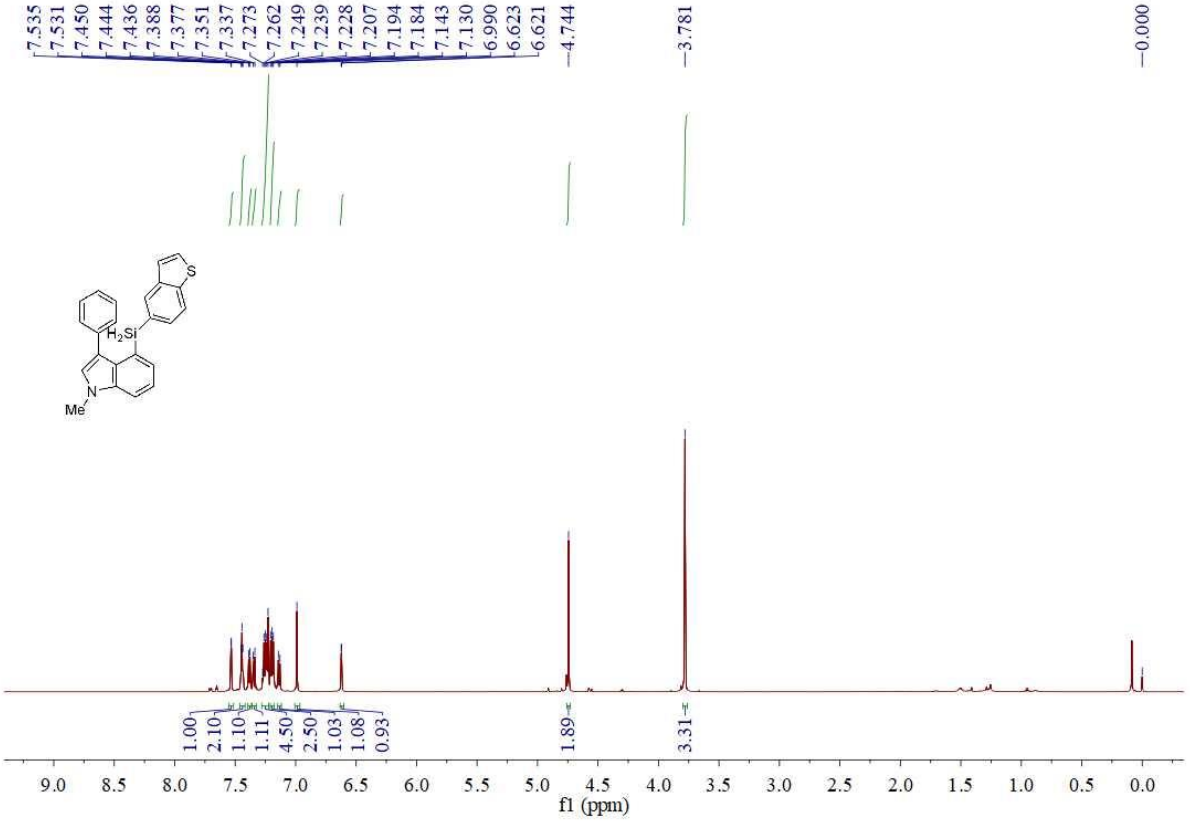
7.427
7.327
7.315
7.305
7.302
7.293
7.285
7.279
7.267
7.257
7.253
7.247
7.234
7.222
7.183
7.168
7.025
6.773
6.759
4.592
3.835
3.827
3.819
3.809
3.146
3.138
3.130
0.000
1.07
7.32
2.17
0.95
2.04
2.00
4.30
3.01
4.29
f1 (ppm)


151.818
136.726
136.171
135.816
131.592
130.979
130.703
128.075
127.747
126.687
123.763
121.179
114.655
111.427
77.211
77.000
76.788
66.800
48.659
32.739
f1 (ppm)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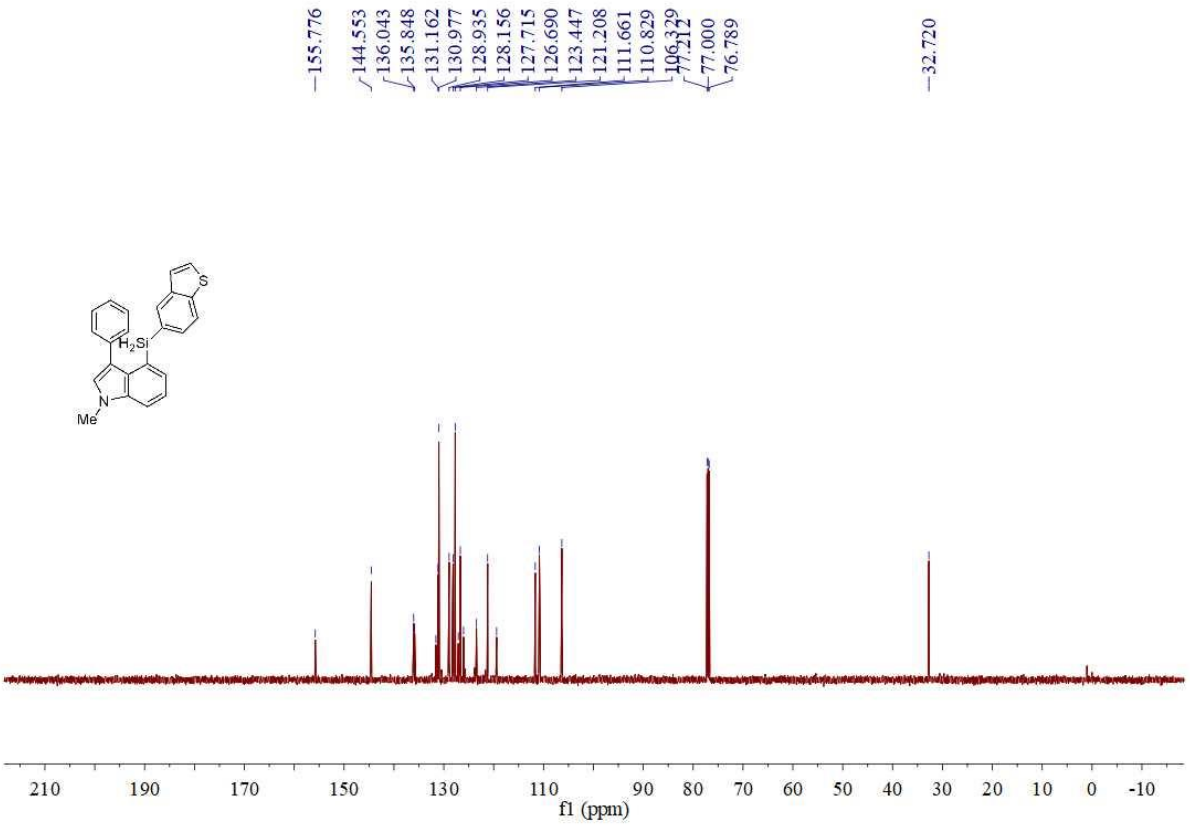
7.531
7.450
7.444
7.436
7.388
7.377
7.351
7.337
7.273
7.262
7.249
7.239
7.228
7.207
7.194
7.184
7.143
7.130
6.990
6.623
6.621
4.744
3.781
0.000
1.00
2.10
1.10
1.11
4.50
2.50
1.03
1.08
0.93
1.89
3.31
f1 (ppm)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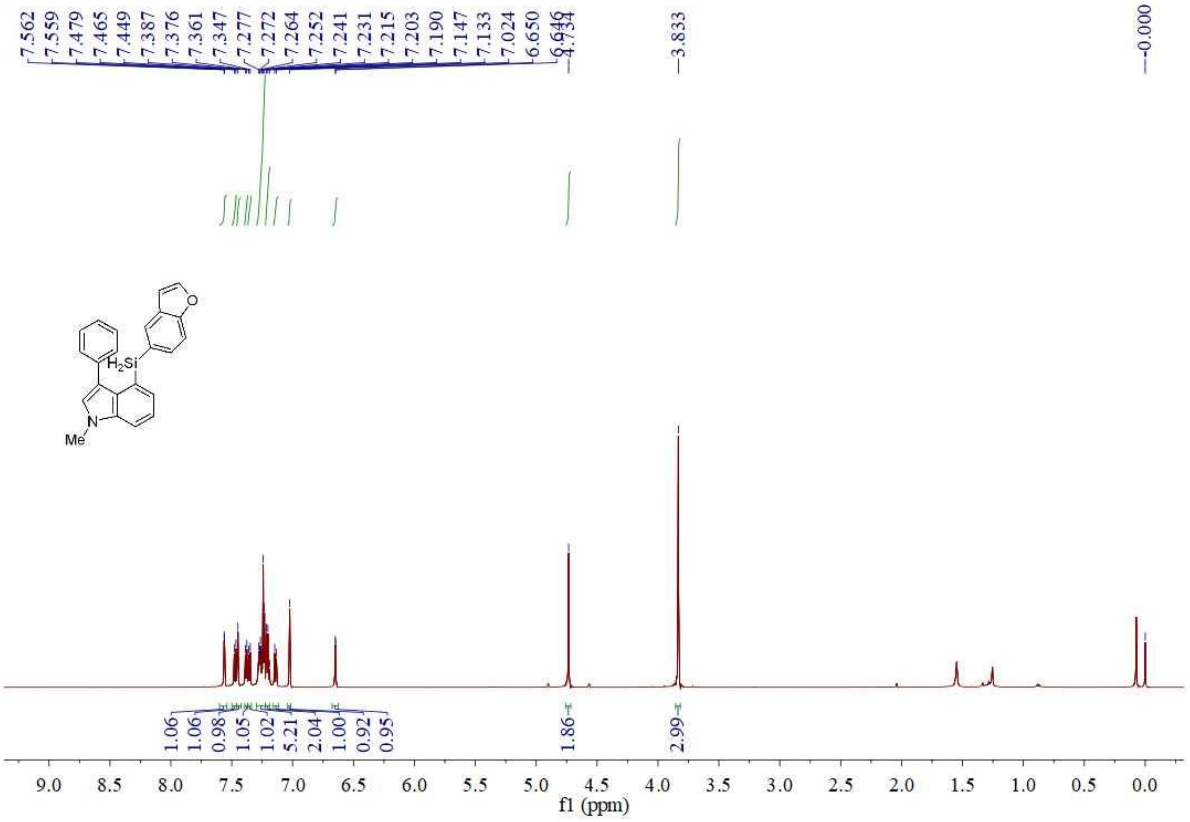
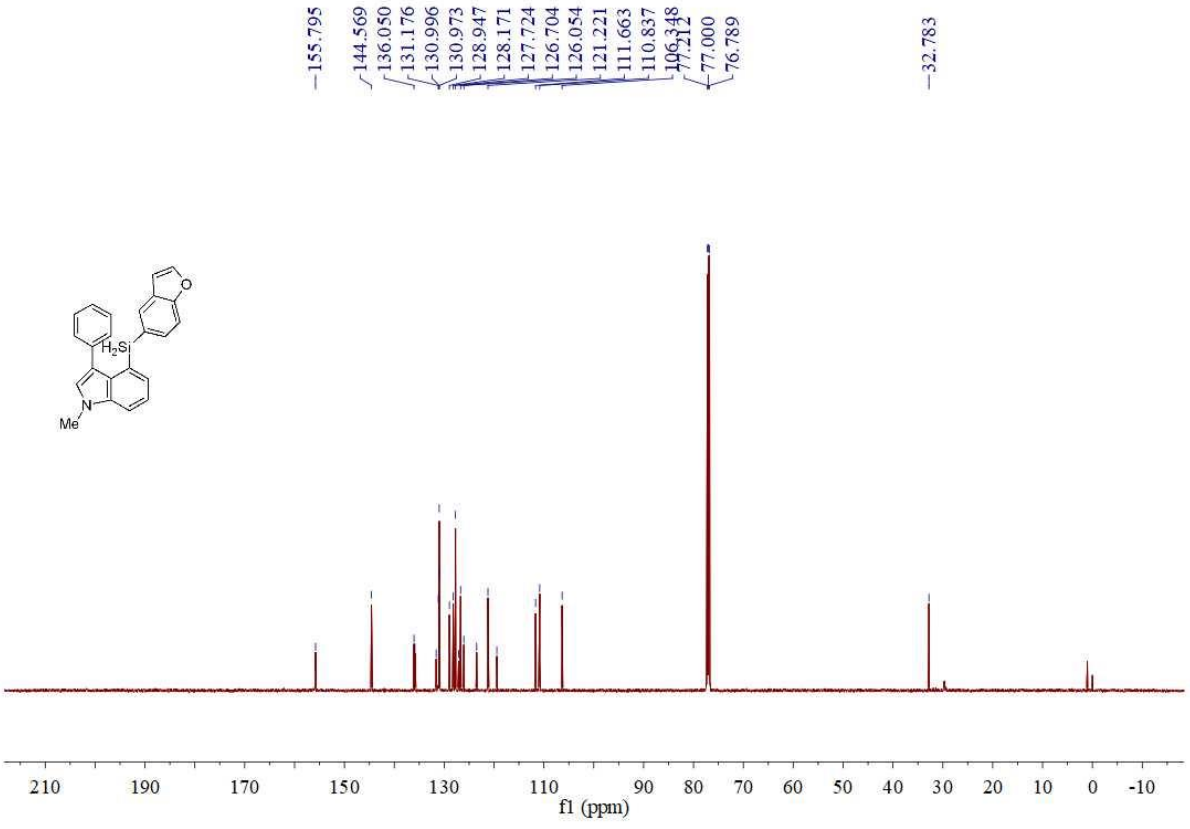
144.553
136.043
135.848
131.162
130.977
128.935
128.156
127.715
126.690
123.447
121.208
111.661
110.829
77.212
77.000
76.789
32.720
f1 (ppm)


7.562
7.559
7.479
7.465
7.449
7.387
7.376
7.361
7.347
7.277
7.272
7.264
7.252
7.241
7.231
7.215
7.203
7.190
7.147
7.133
7.024
6.650
6.646
4.734
3.833
0.000
H2Si
N
Me
O
1.06
1.06
0.98
1.05
1.02
5.21
2.04
1.00
0.92
0.95
1.86
2.99
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
f1 (ppm)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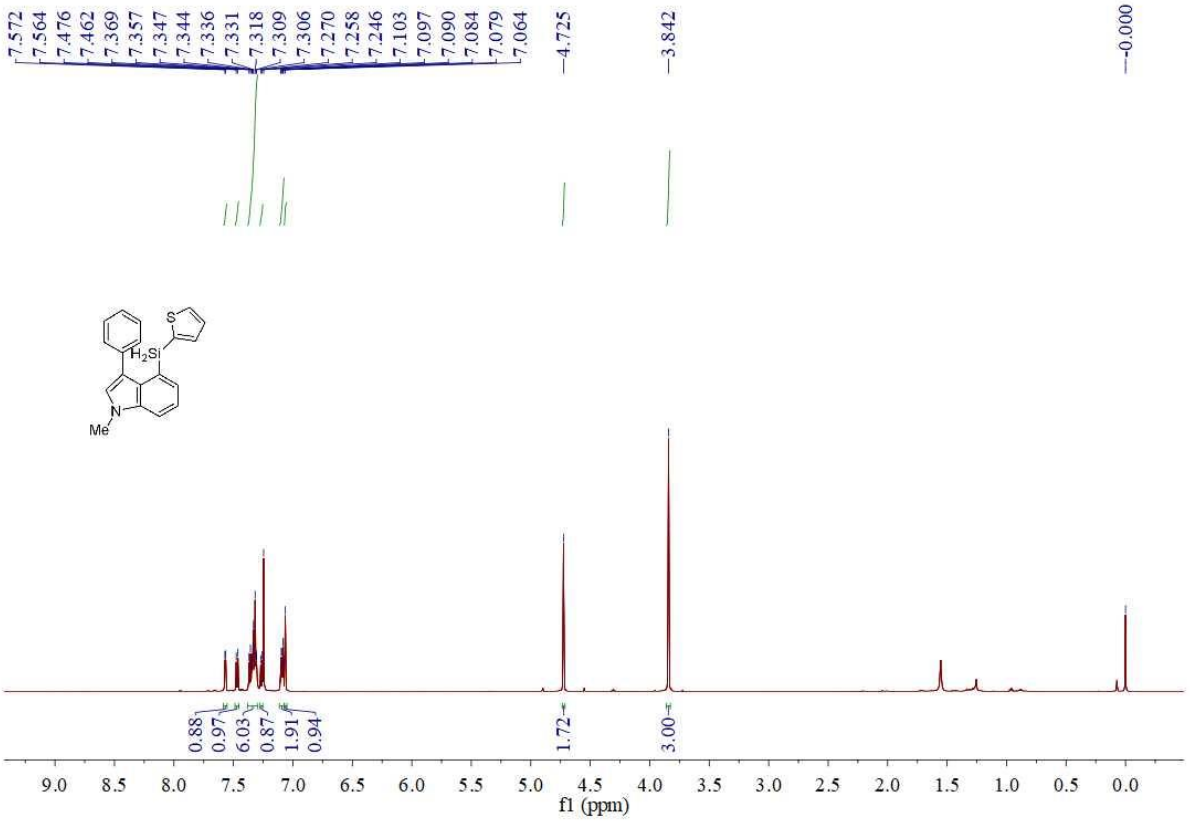
131.176
130.996
130.973
128.947
128.171
127.724
126.704
126.054
121.221
111.663
110.837
106.348
77.212
77.000
76.789
32.783
H2Si
N
Me
O
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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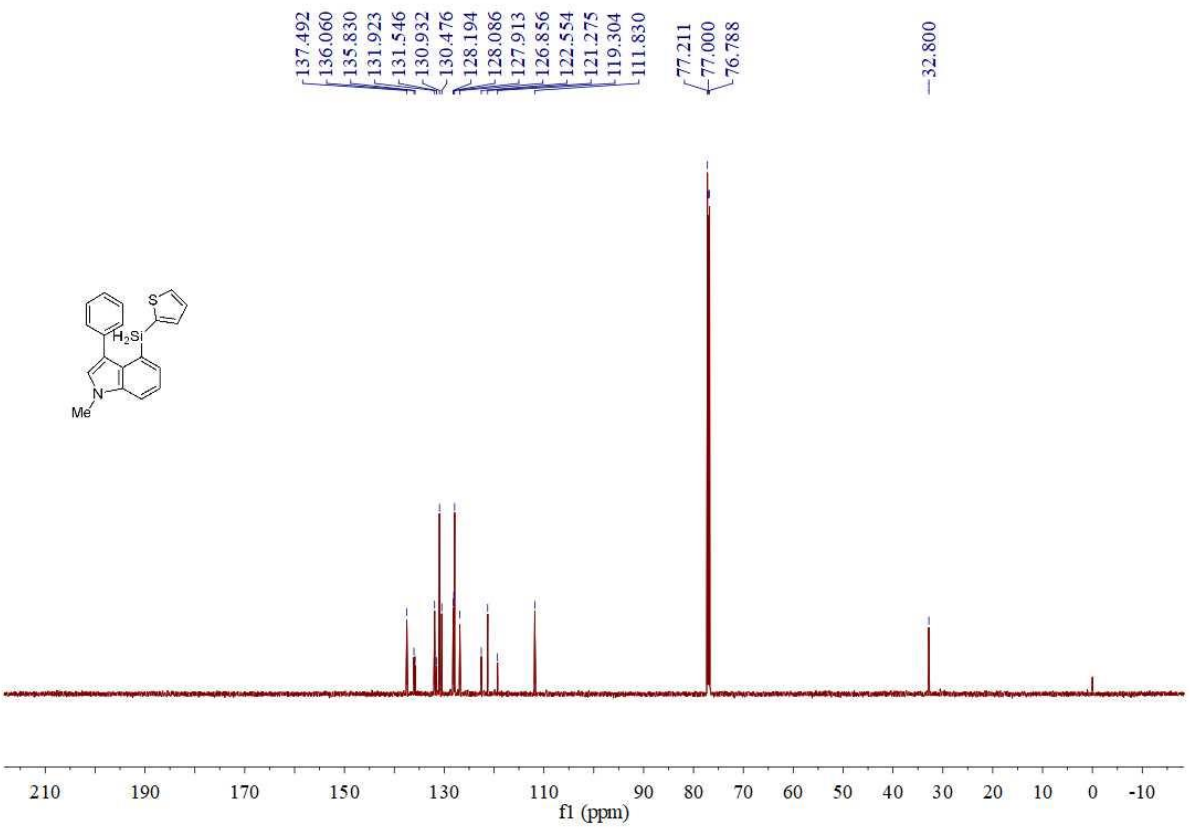
7.369
7.357
7.347
7.344
7.336
7.331
7.318
7.309
7.306
7.270
7.258
7.246
7.103
7.097
7.090
7.084
7.079
7.064
4.725
3.842
0.000
S
H2Si
N
Me
0.88
0.97
6.03
0.87
1.91
0.94
1.72
3.00
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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136.060
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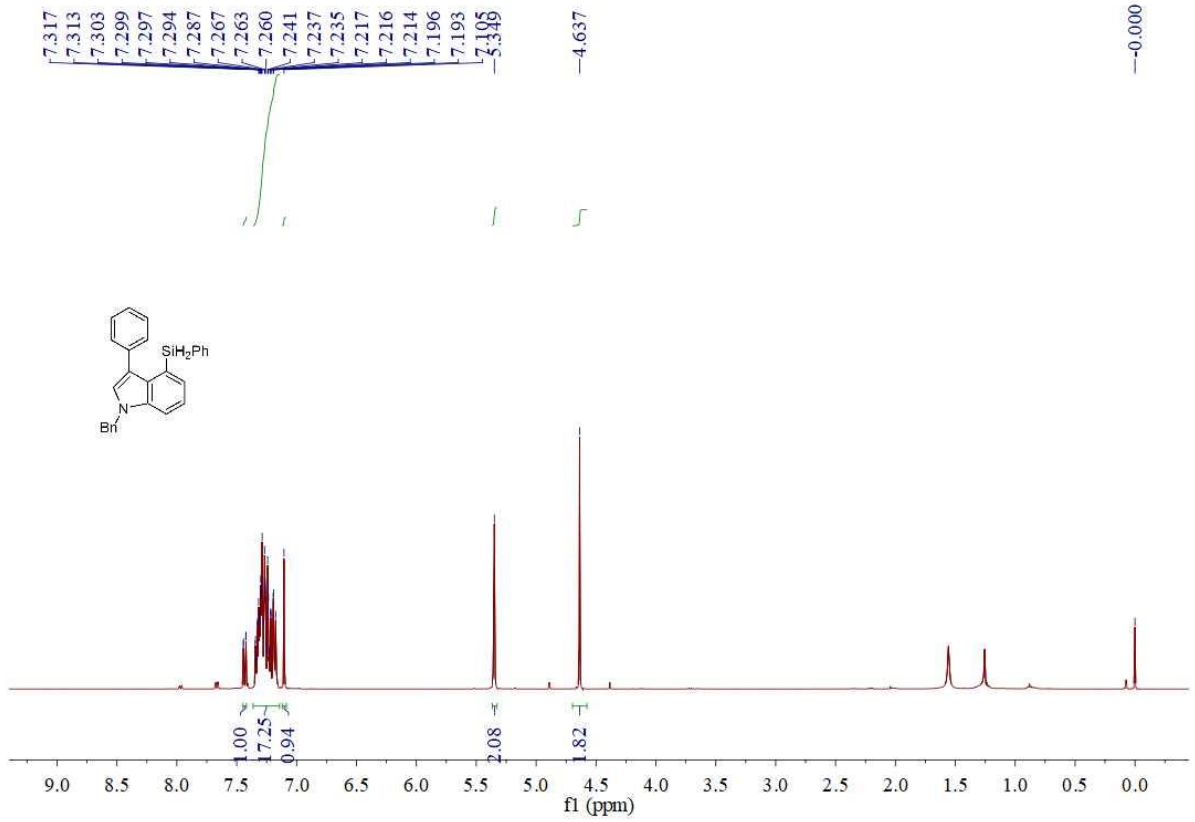
131.923
131.546
130.932
130.476
128.194
128.086
127.913
126.856
122.554
121.275
119.304
111.830
77.211
77.000
76.788
32.800
S
H2Si
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


7.317
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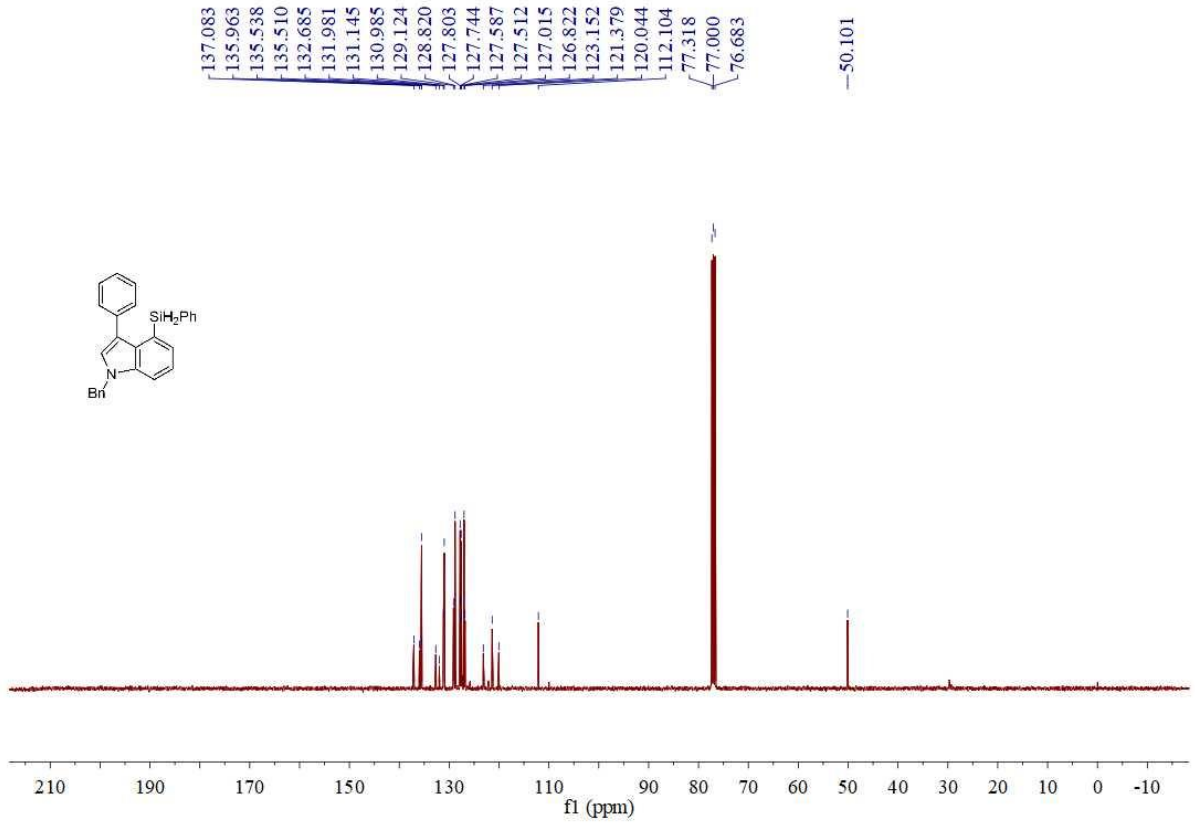
7.303
7.299
7.297
7.294
7.287
7.267
7.263
7.260
7.241
7.237
7.235
7.217
7.216
7.214
7.196
7.193
5.349
4.637
0.000
SiH2Ph
N
Bn
1.00
17.25
0.94
2.08
1.82
f1 (ppm)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130.985
129.124
128.820
127.803
127.744
127.587
127.512
127.015
126.822
123.152
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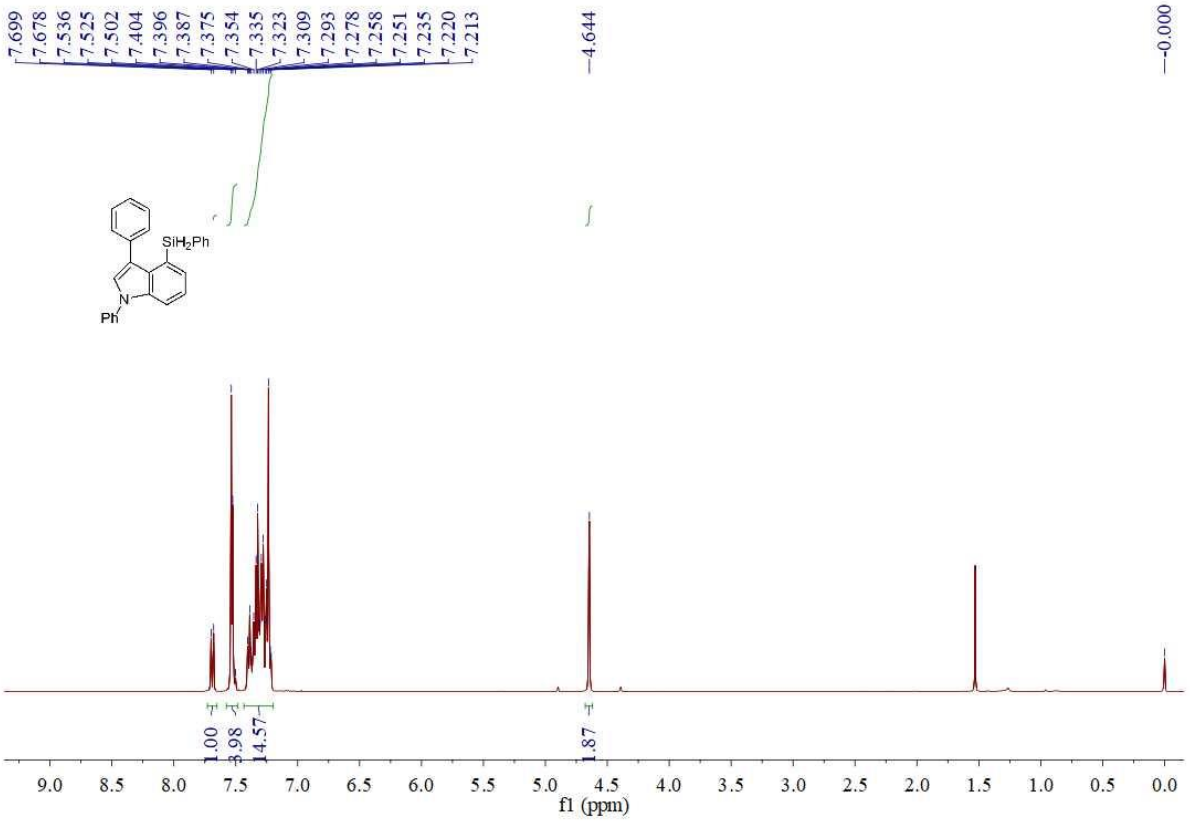
120.044
112.104
77.318
77.000
76.683
50.101
SiH2Ph
N
Bn
f1 (ppm)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7.335
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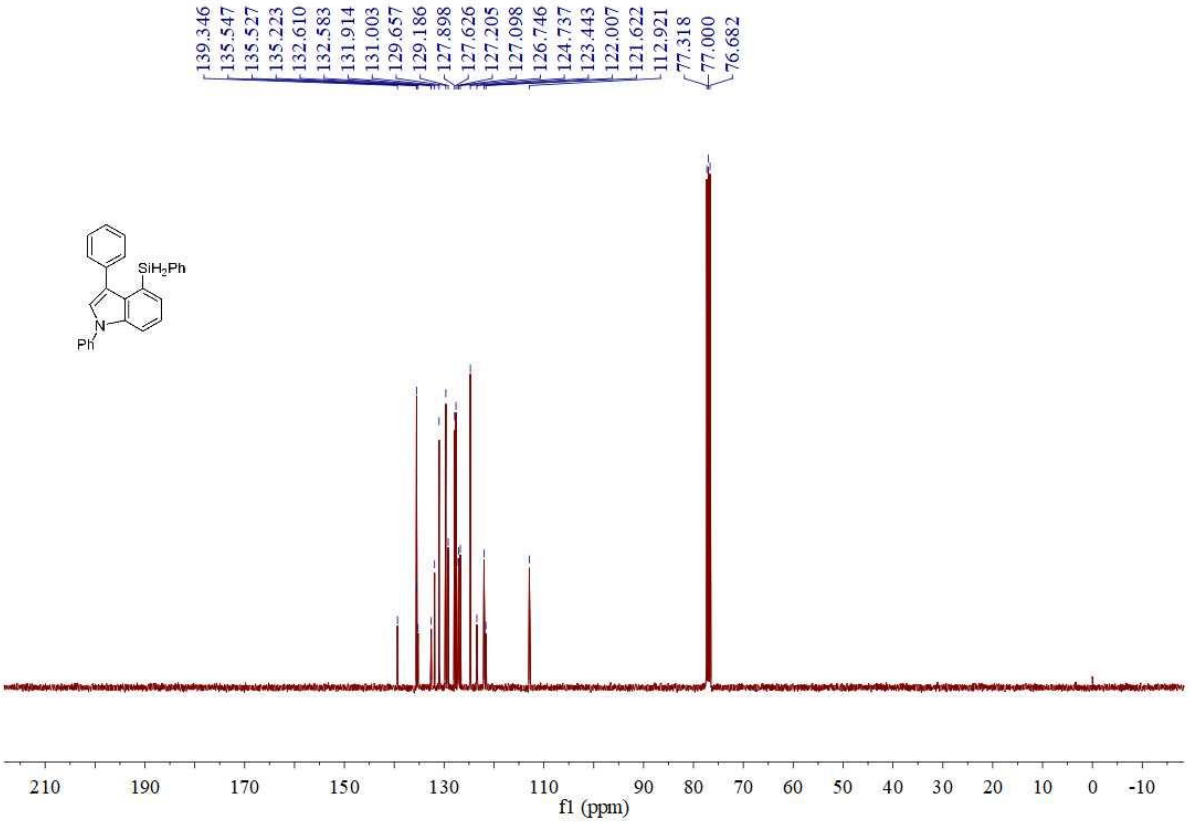
7.309
7.293
7.278
7.258
7.251
7.235
7.220
7.213
4.644
0.000
SiH2Ph
N
Ph
1.00
3.98
14.57
1.87
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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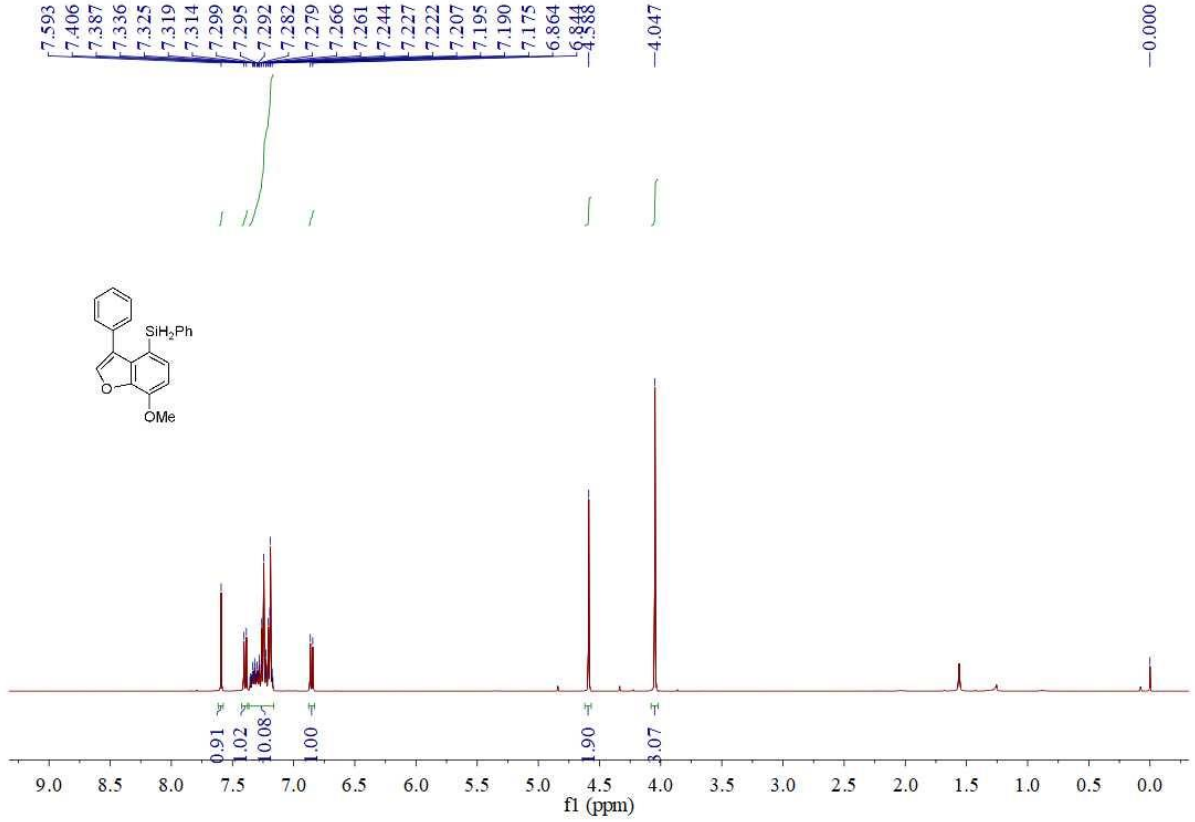
132.583
131.914
131.003
129.657
129.186
127.898
127.626
127.205
127.098
126.746
124.737
123.443
122.007
121.622
112.921
77.318
77.000
76.682
SiH2Ph
N
Ph
210
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)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7.319
7.314
7.299
7.295
7.292
7.282
7.279
7.266
7.261
7.244
7.227
7.222
7.207
7.195
7.190
7.175
6.864
4.588
4.047
0.000
SiH2Ph
OMe
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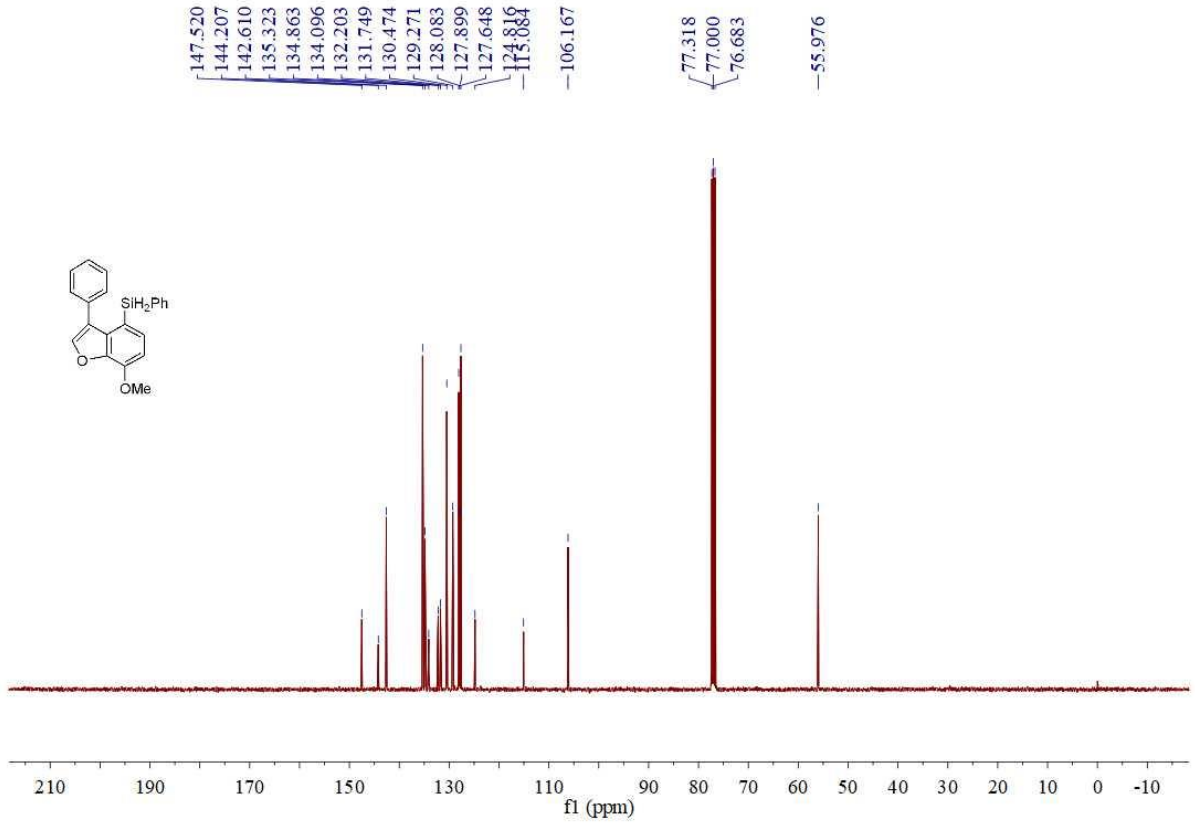
1.02
10.08
1.00
1.90
3.07
f1 (ppm)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134.096
132.203
131.749
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128.083
127.899
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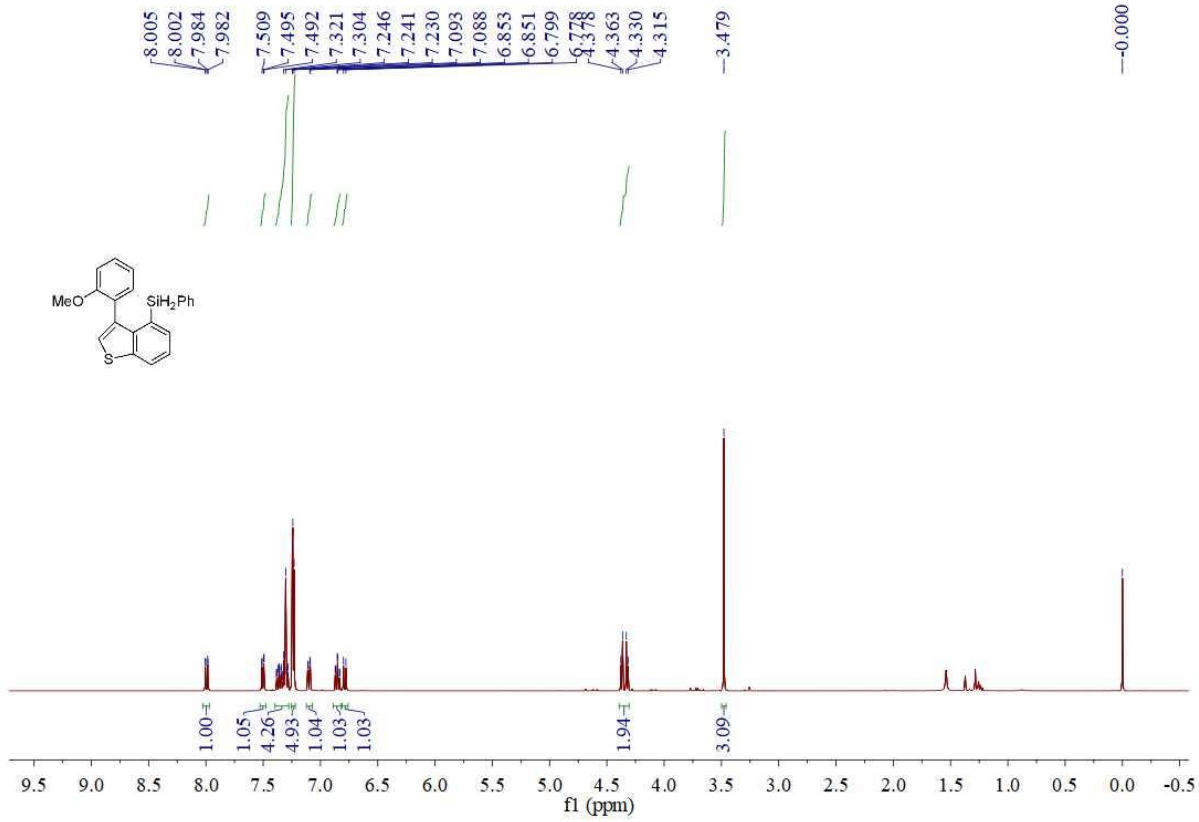
124.816
115.084
106.167
77.318
77.000
76.683
55.976
SiH2Ph
OMe
f1 (ppm)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7.495
7.492
7.321
7.304
7.246
7.241
7.230
7.093
7.088
6.853
6.851
6.799
4.363
4.330
4.315
3.479
0.000
MeO
SiH2Ph
S
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1.05
4.26
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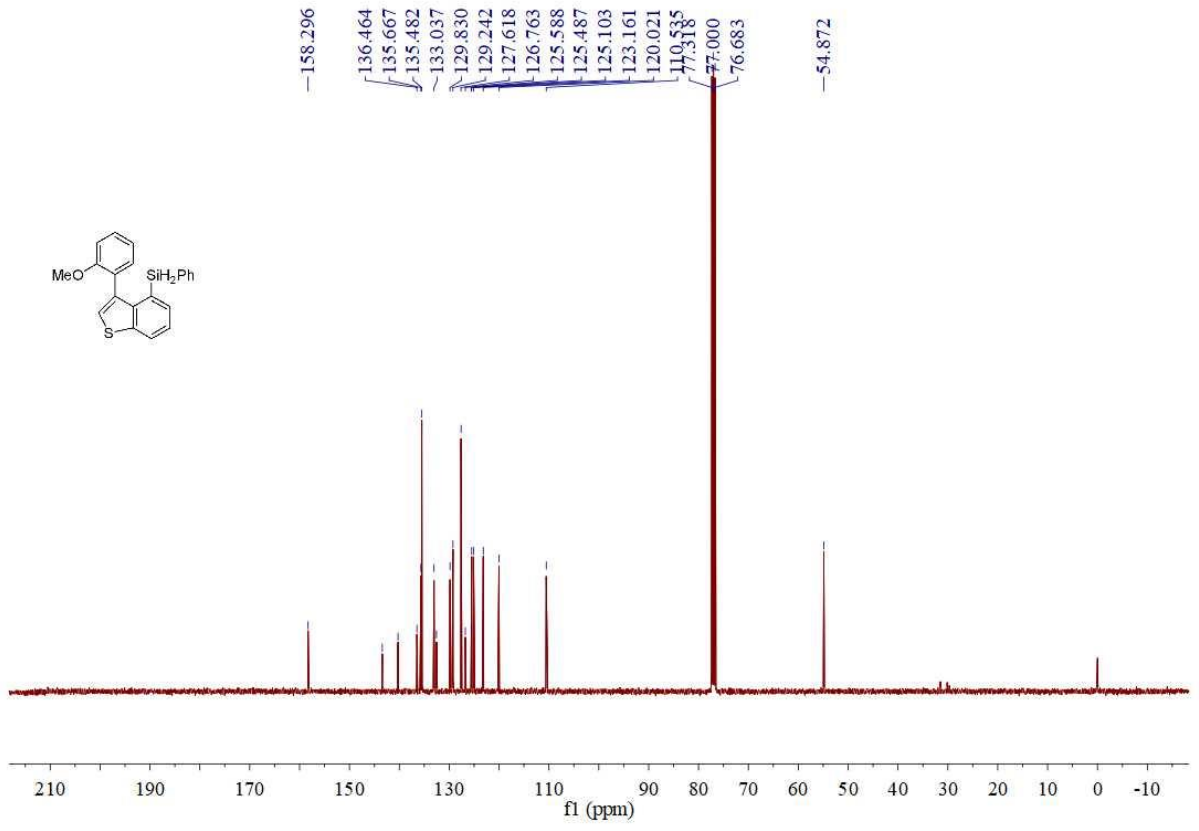
1.04
1.03
1.03
1.94
3.09
f1 (ppm)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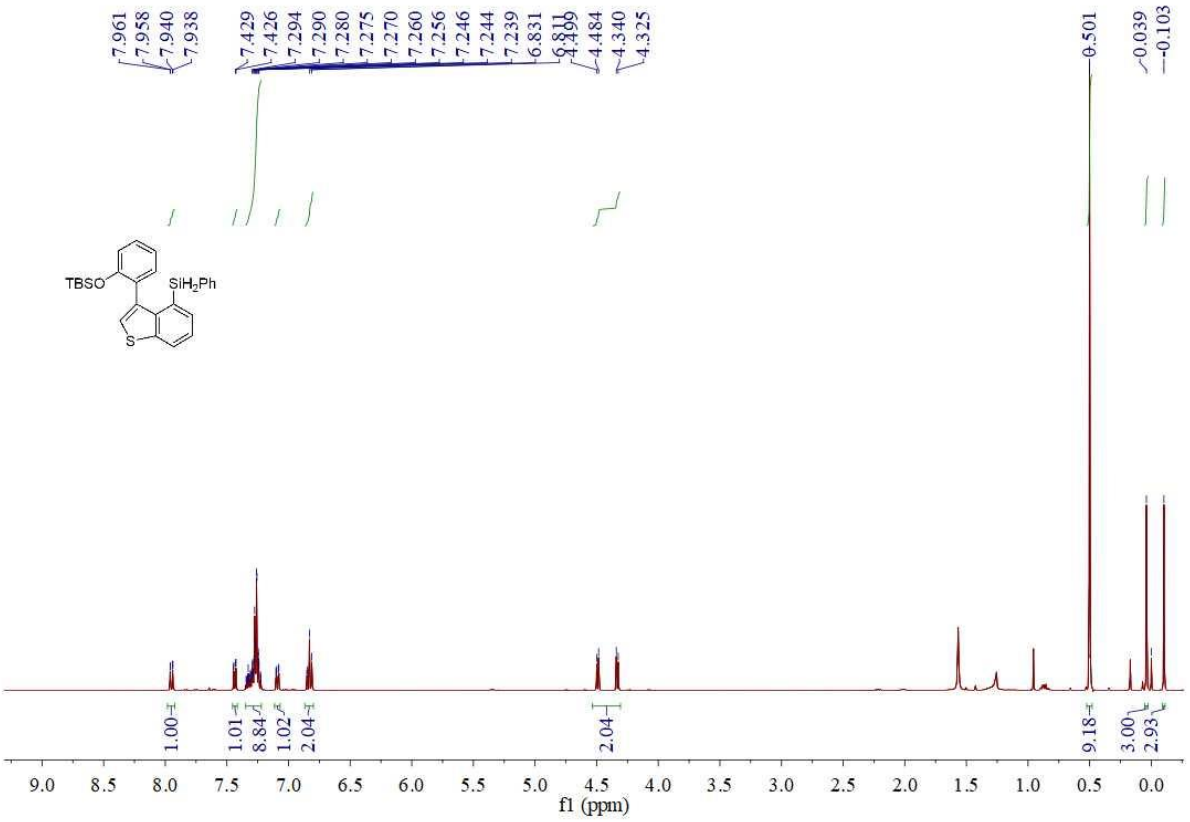
135.667
135.482
133.037
129.830
129.242
127.618
126.763
125.588
125.487
125.103
123.161
120.021
110.535
77.318
77.000
76.683
54.872
MeO
SiH2Ph
S
f1 (ppm)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7.294
7.290
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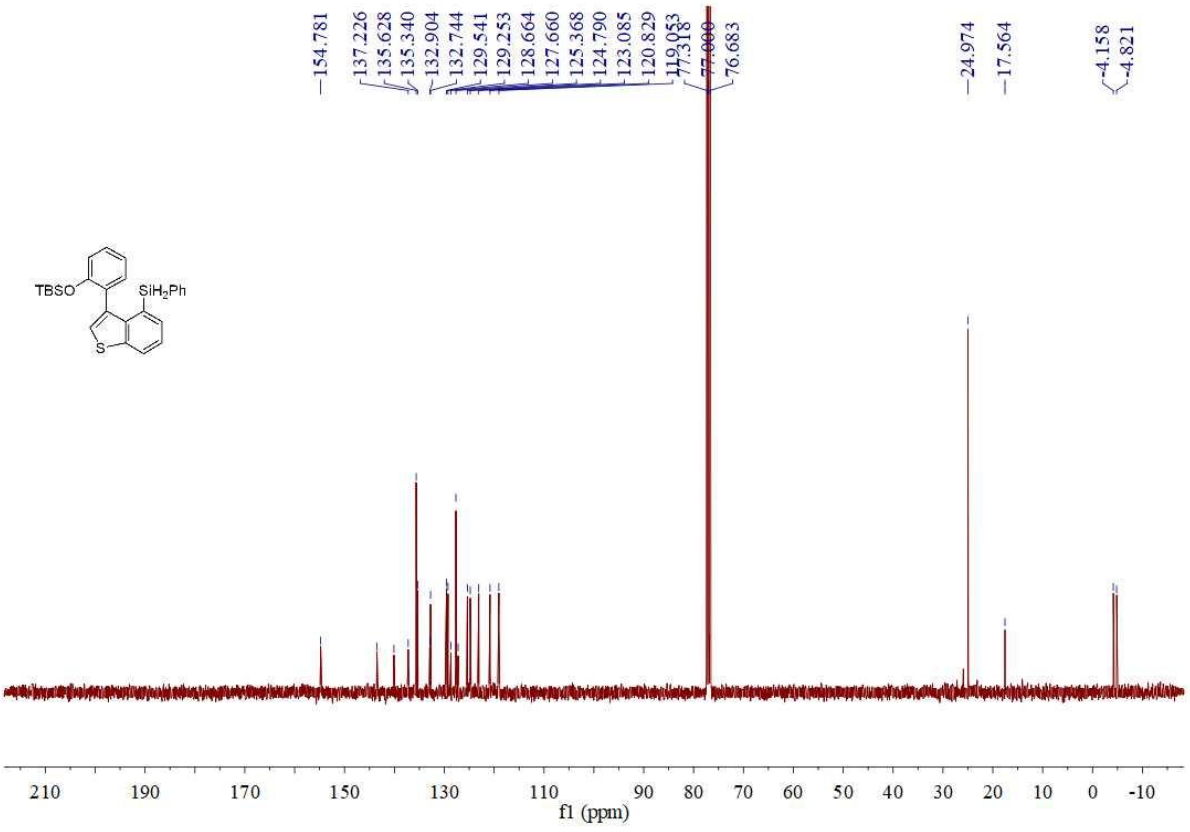
7.270
7.260
7.256
7.246
7.244
7.239
6.831
6.811
4.499
4.484
4.340
4.325
0.501
0.039
-0.103
TBSO
SiH2Ph
S
1.00
1.01
8.84
1.02
2.04
2.04
9.18
3.00
2.93
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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124.790
123.085
120.829
119.053
77.318
77.000
76.683
24.974
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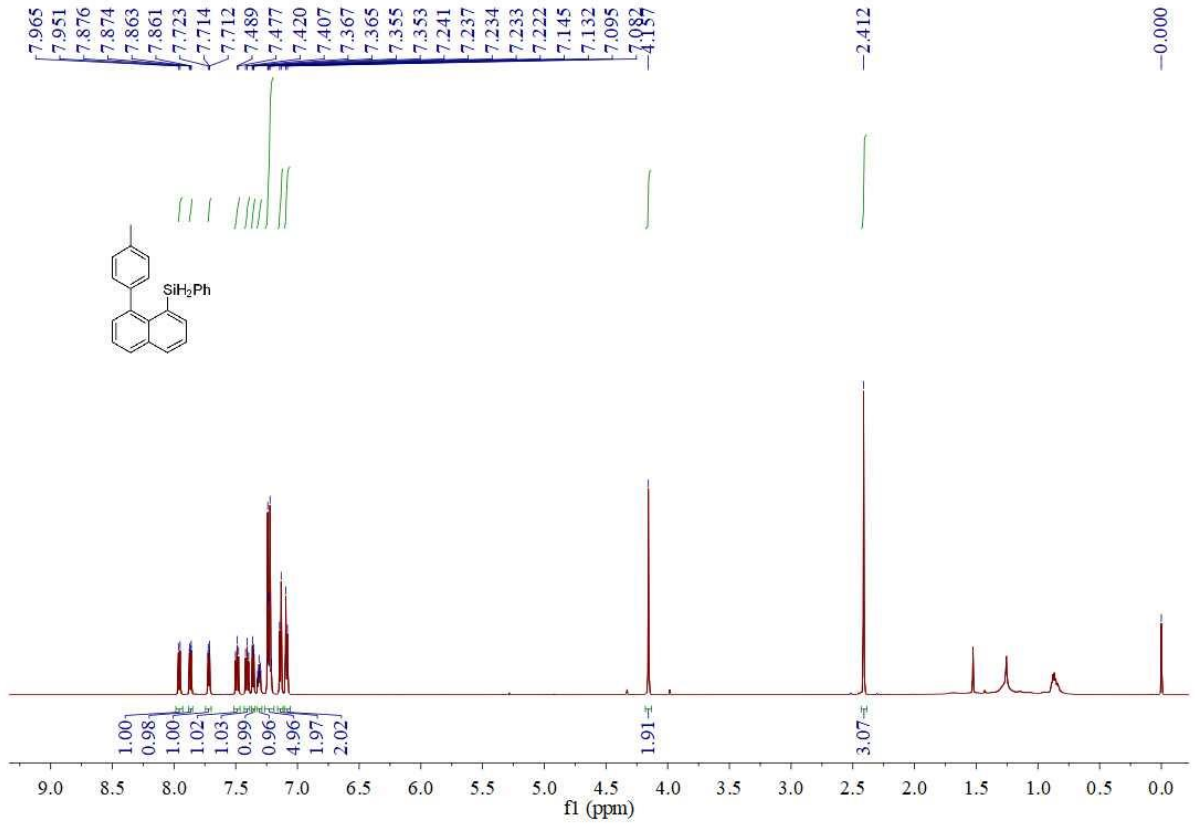
-4.821
TBSO
SiH2Ph
S
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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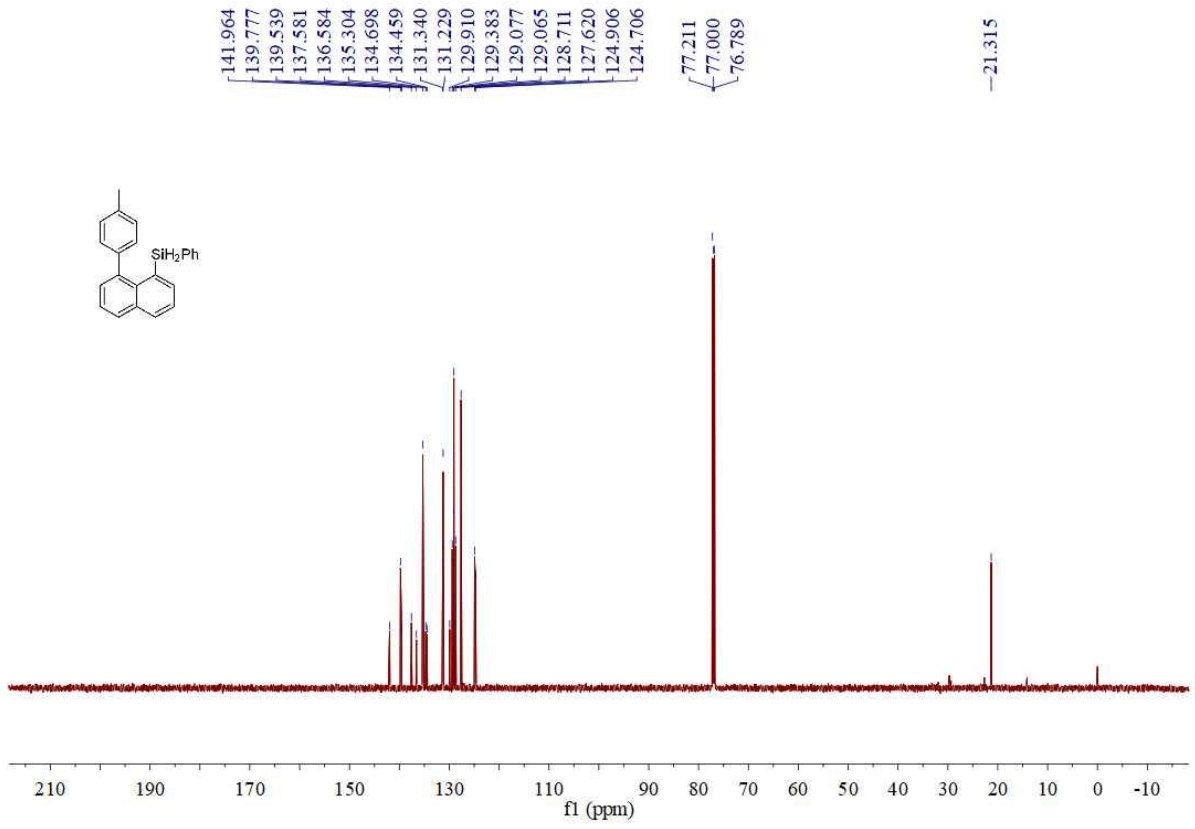
7.477
7.420
7.407
7.367
7.365
7.355
7.353
7.241
7.237
7.234
7.233
7.222
7.145
7.132
7.095
7.082
4.197
2.412
0.000
SiH2Ph
1.00
0.98
1.00
1.02
1.03
0.99
0.96
4.96
1.97
2.02
1.91
3.07
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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139.539
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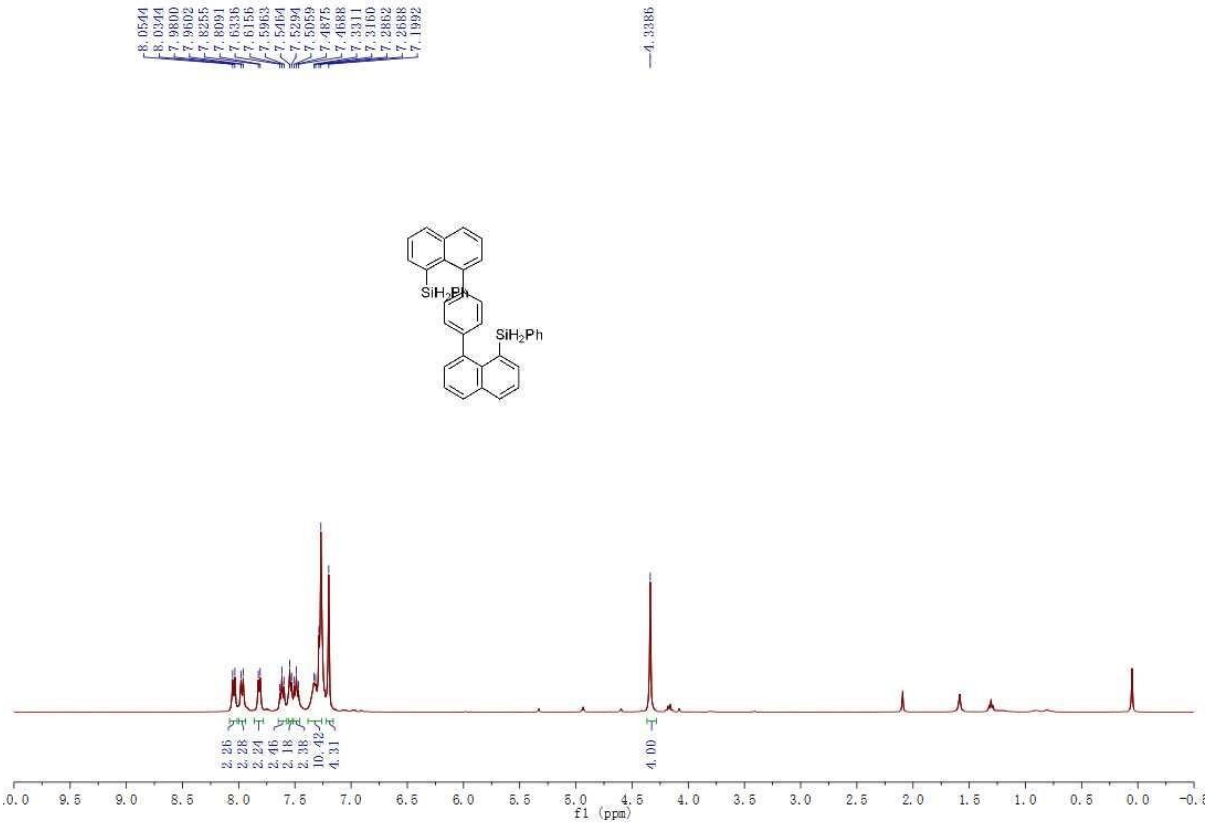
129.383
129.077
129.065
128.711
127.620
124.906
124.706
77.211
77.000
76.789
21.315
SiH2Ph
210
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)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7.8255
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7.6156
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7.5059
7.4875
7.4688
7.3311
7.3160
7.2862
7.2688
7.1992
4.3386
SiH2Ph
SiH2Ph
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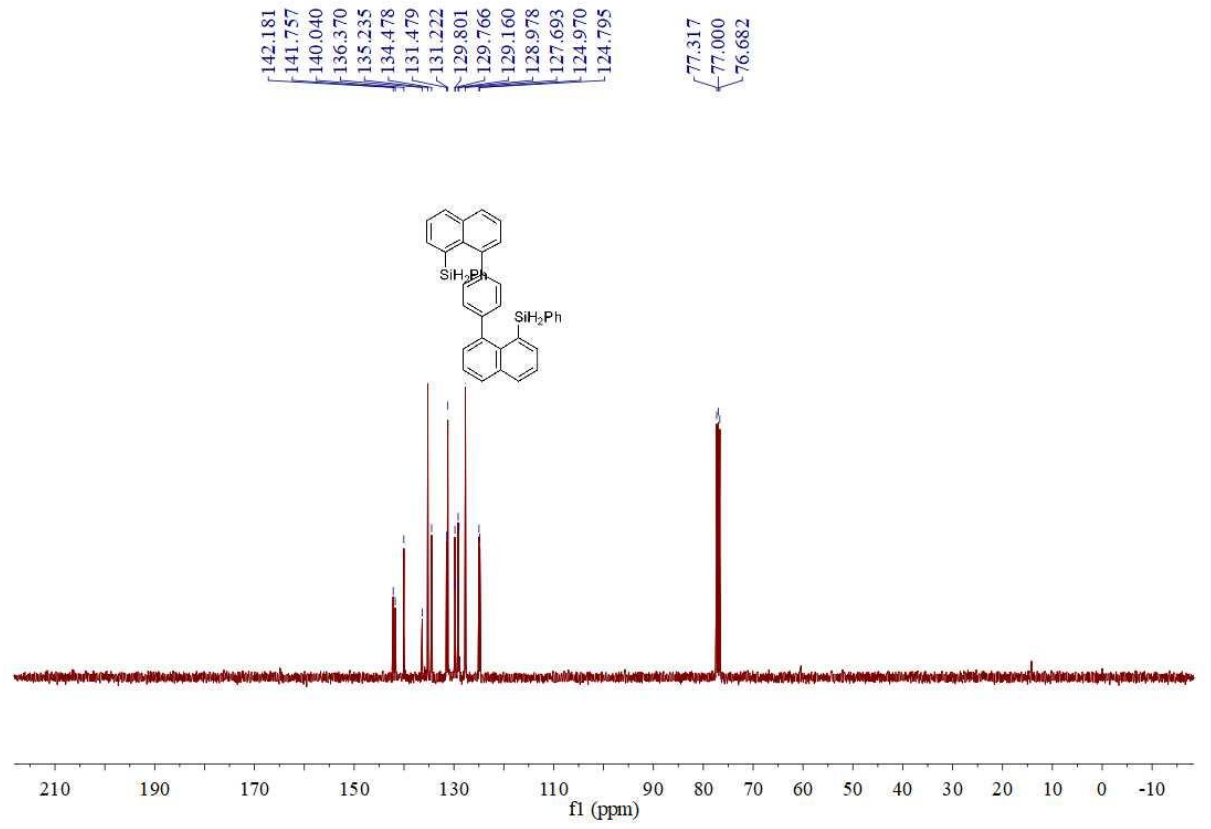
2.28
2.24
2.46
2.18
2.38
10.42
4.31
4.00
f1 (ppm)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141.757
140.040
136.370
135.235
134.478
131.479
131.222
129.801
129.766
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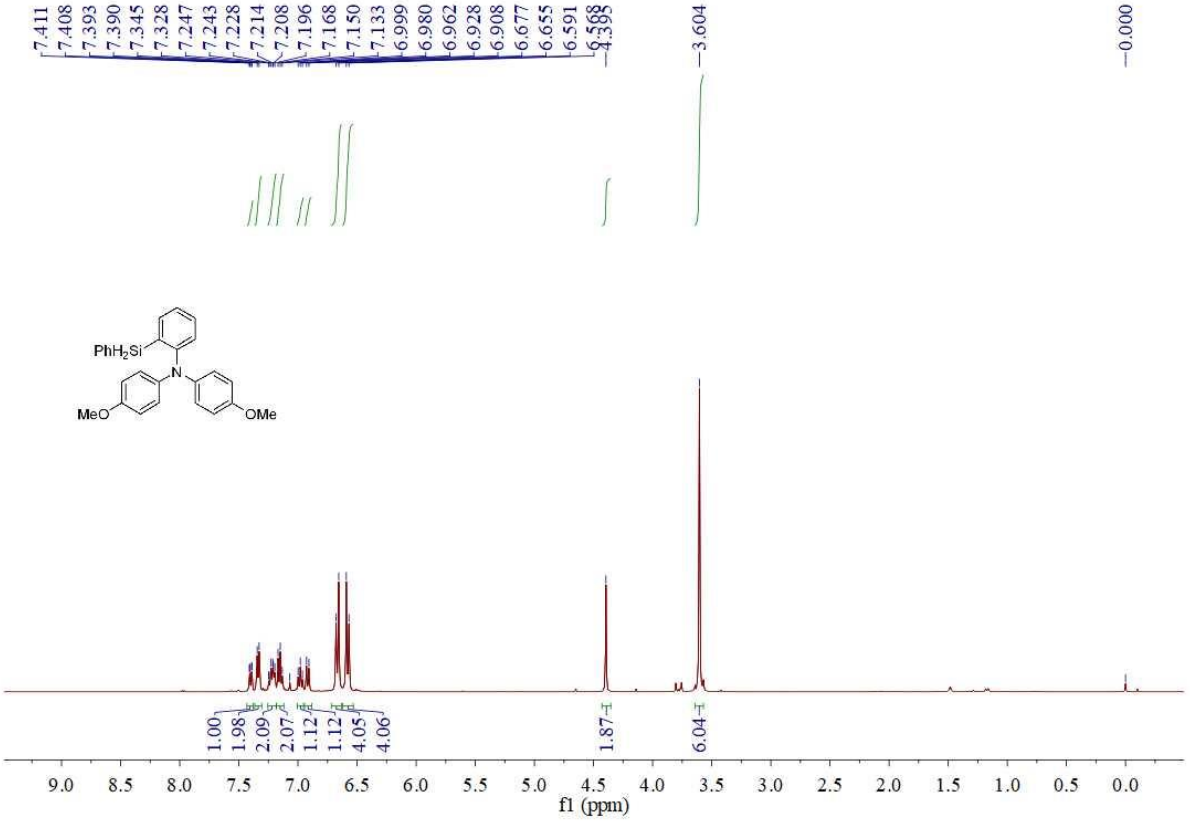
128.978
127.693
124.970
124.795
77.317
77.000
76.682
SiH2Ph
SiH2Ph
f1 (ppm)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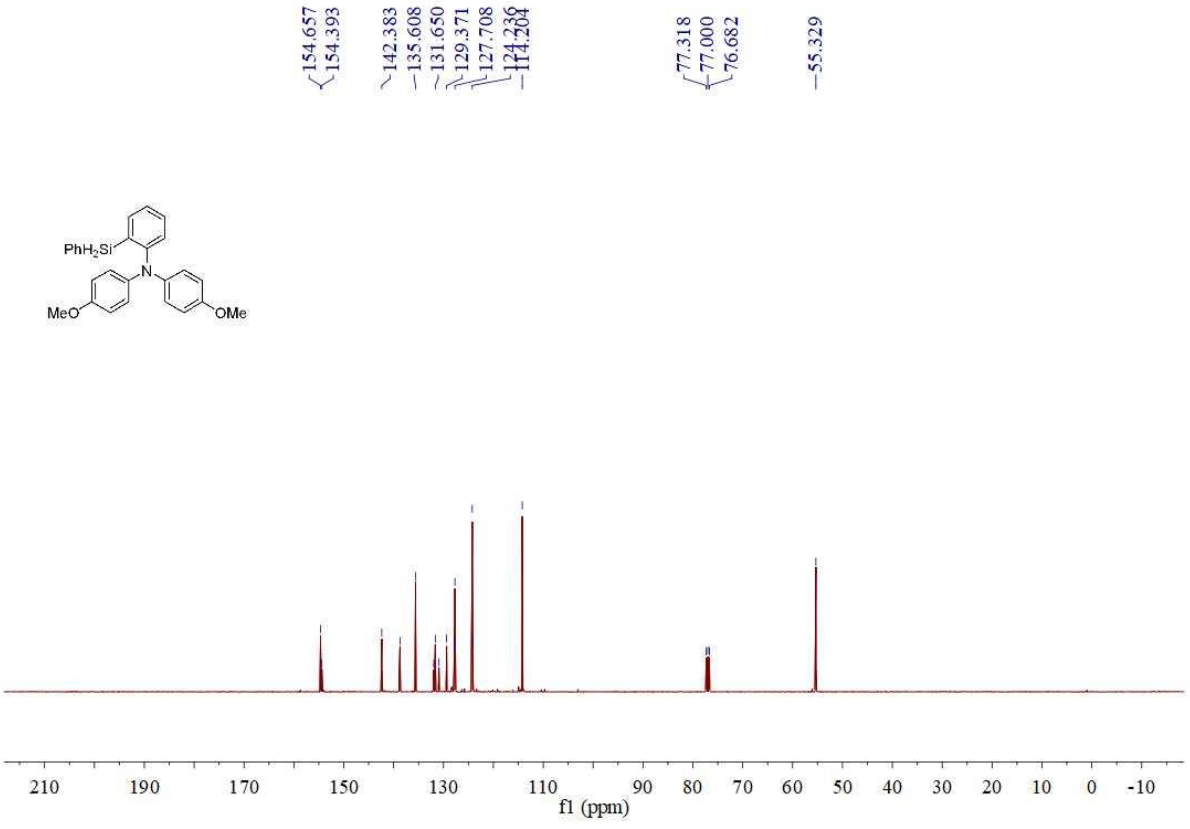
7.408
7.393
7.390
7.345
7.328
7.247
7.243
7.228
7.214
7.208
7.196
7.168
7.150
7.133
6.999
6.980
6.962
6.928
6.908
6.677
6.655
6.591
6.568
4.395
3.604
0.000
PhH2Si
N
MeO
OMe
1.00
1.98
2.09
2.07
1.12
1.12
4.05
4.06
1.87
6.04
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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142.383
135.608
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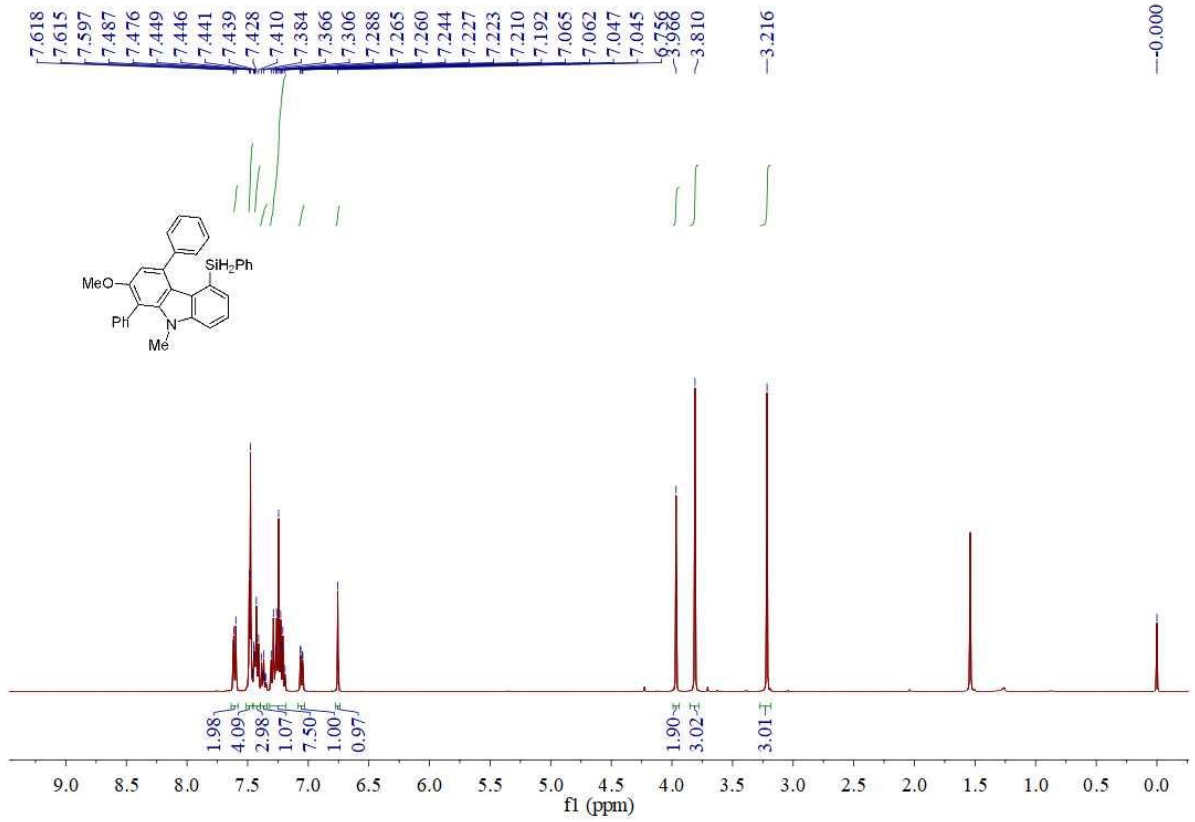
129.371
127.708
124.236
114.204
77.318
77.000
76.682
55.329
PhH2Si
N
MeO
OMe
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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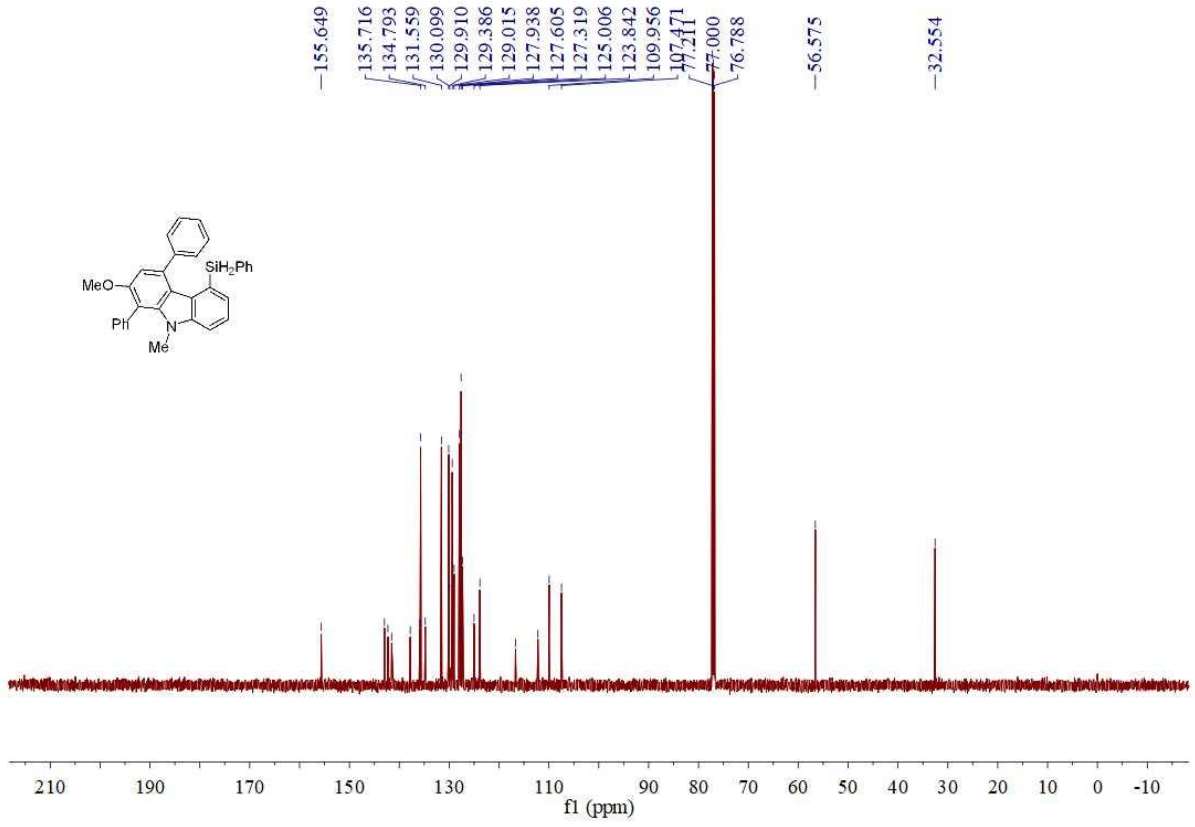
7.597
7.487
7.476
7.449
7.446
7.441
7.439
7.428
7.410
7.384
7.366
7.306
7.288
7.265
7.260
7.244
7.227
7.223
7.210
7.192
7.065
7.062
7.047
7.045
6.756
3.968
3.810
3.216
0.000
MeO
SiH2Ph
Ph
N
Me
1.98
4.09
2.98
1.07
7.50
1.00
0.97
1.90
3.02
3.01
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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135.716
134.793
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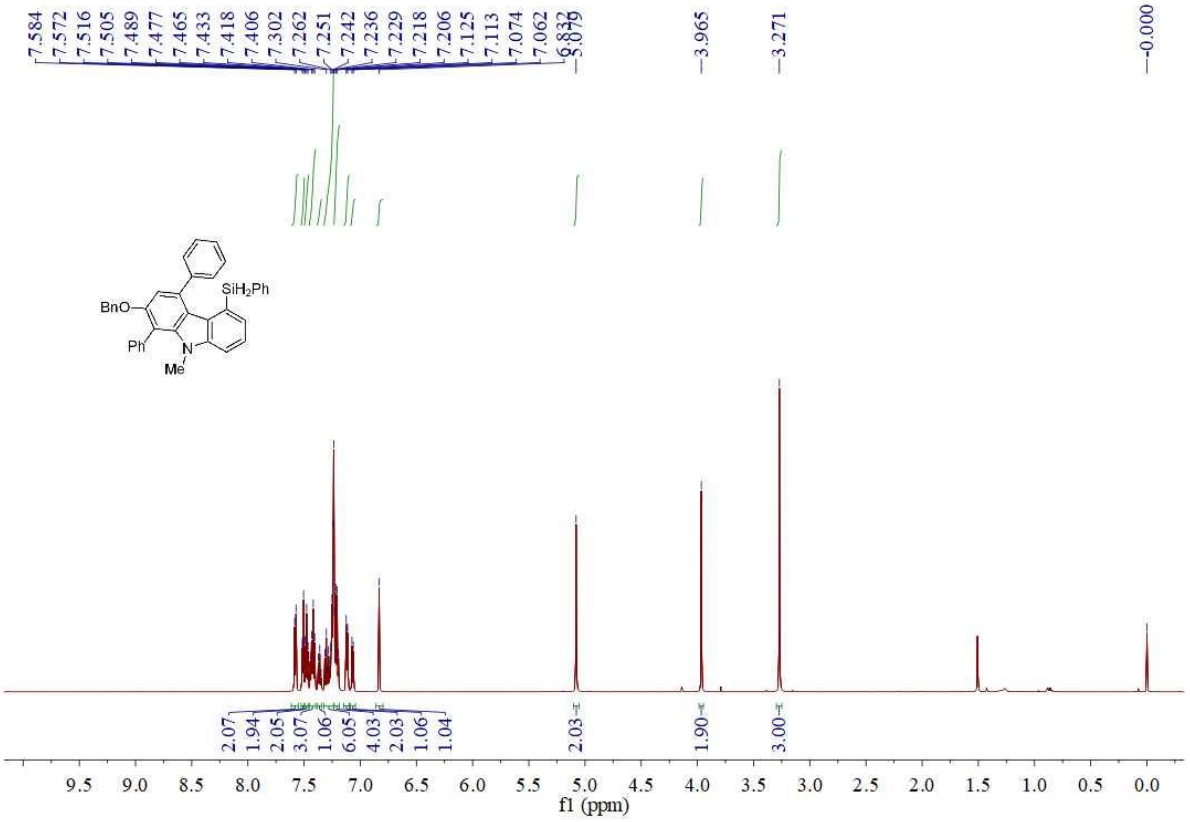
129.015
127.938
127.605
127.319
125.006
123.842
109.956
107.471
77.211
77.000
76.788
56.575
32.554
MeO
SiH2Ph
Ph
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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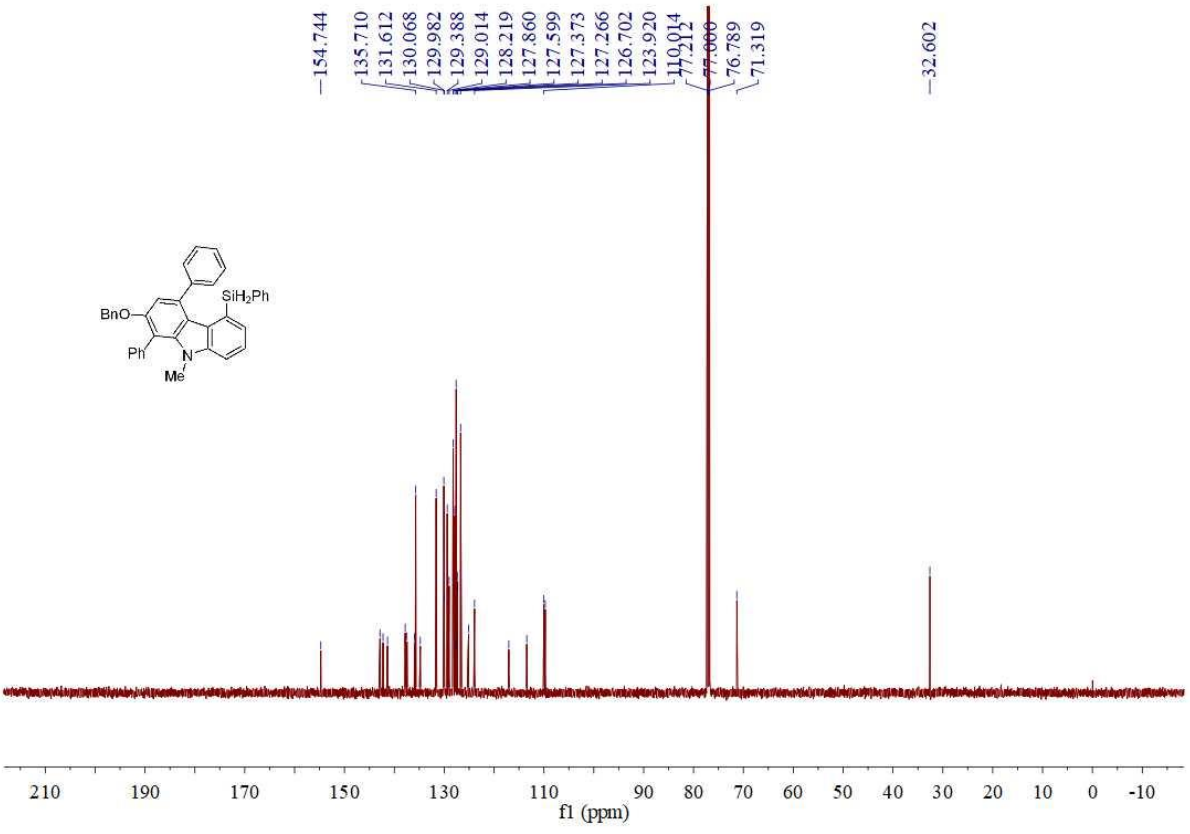
7.516
7.505
7.489
7.477
7.465
7.433
7.418
7.406
7.302
7.262
7.251
7.242
7.236
7.229
7.218
7.206
7.125
7.113
7.074
7.062
6.832
5.079
3.965
3.271
0.000
BnO
Ph
N
Me
SiH2Ph
2.07
1.94
2.05
3.07
1.06
6.05
4.03
2.03
1.06
1.04
2.03
1.90
3.00
f1 (ppm)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128.219
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127.373
127.266
126.702
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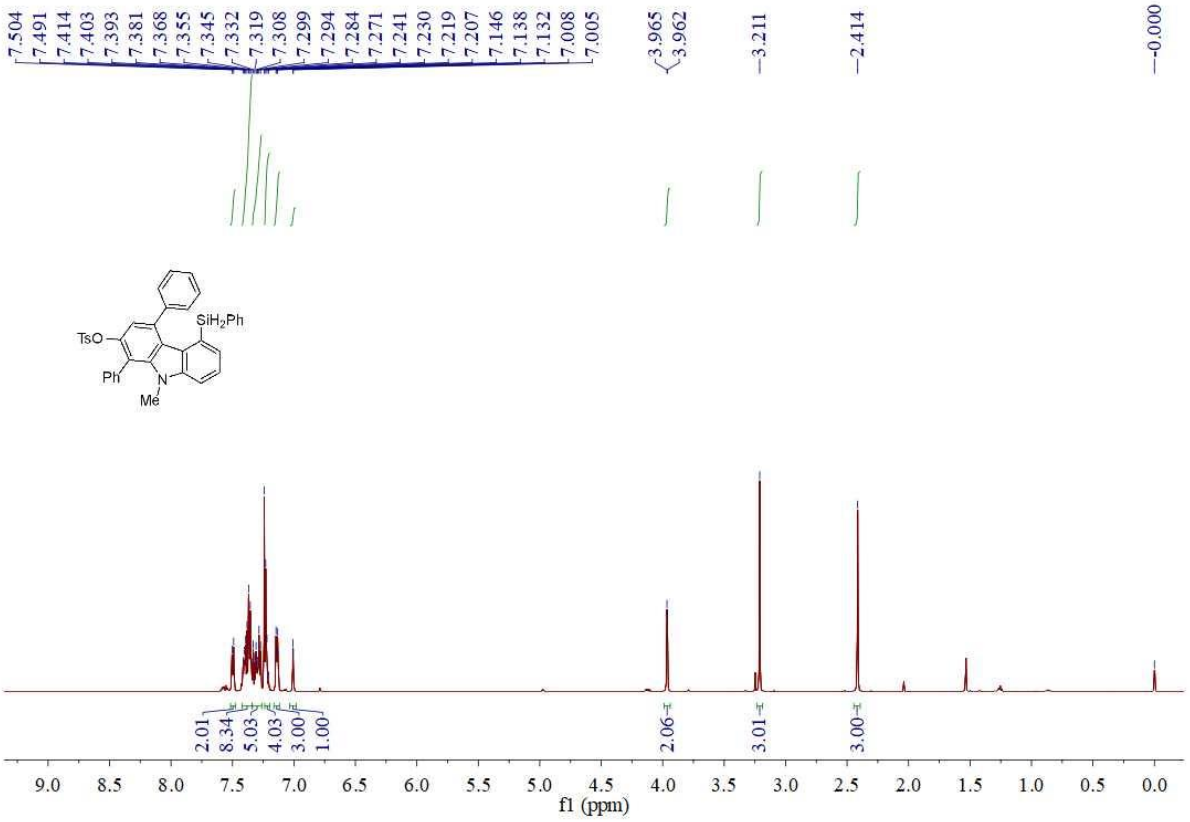
77.000
76.789
71.319
32.602
BnO
Ph
N
Me
SiH2Ph
f1 (ppm)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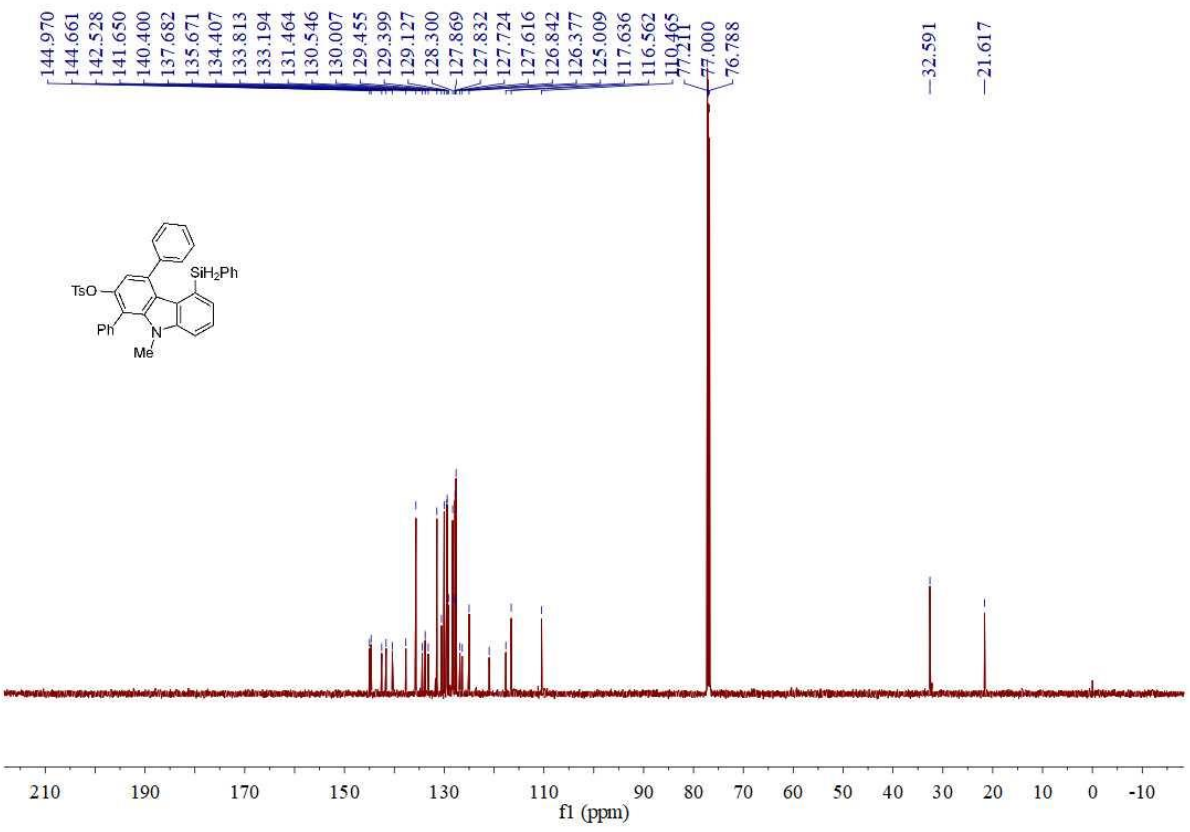
7.393
7.381
7.368
7.355
7.345
7.332
7.319
7.308
7.299
7.294
7.284
7.271
7.241
7.230
7.219
7.207
7.146
7.138
7.132
7.008
7.005
3.965
3.962
3.211
2.414
0.000
TsO
SiH2Ph
Ph
N
Me
2.01
8.34
5.03
4.03
3.00
1.00
2.06
3.01
3.00
f1 (ppm)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135.671
134.407
133.813
133.194
131.464
130.546
130.007
129.455
129.399
129.127
128.300
127.869
127.832
127.724
127.616
126.842
126.377
125.009
117.636
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77.000
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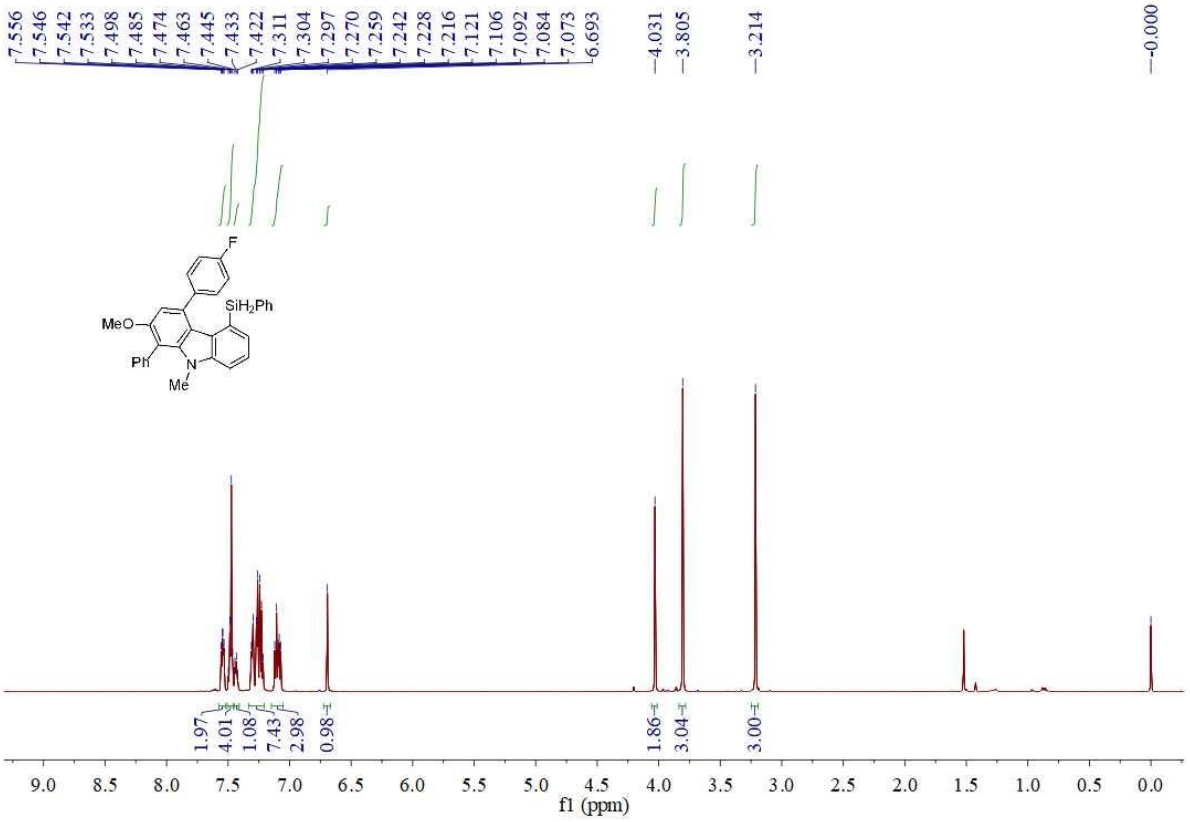
32.591
21.617
TsO
SiH2Ph
Ph
N
Me
f1 (ppm)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7.463
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7.433
7.422
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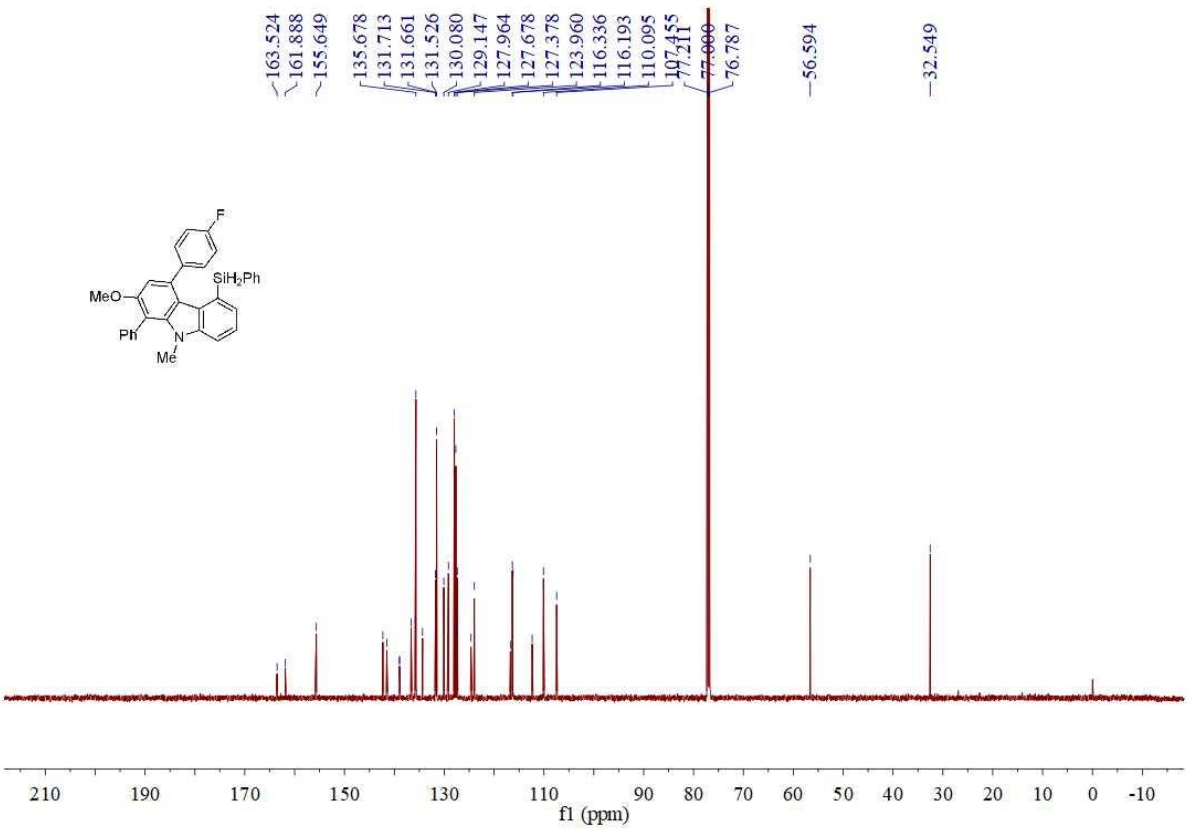
7.304
7.297
7.270
7.259
7.242
7.228
7.216
7.121
7.106
7.092
7.084
7.073
6.693
4.031
3.805
3.214
0.000
F
SiH2Ph
MeO
Ph
N
Me
1.97
4.01
1.08
7.43
2.98
0.98
1.86
3.04
3.00
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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130.080
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127.678
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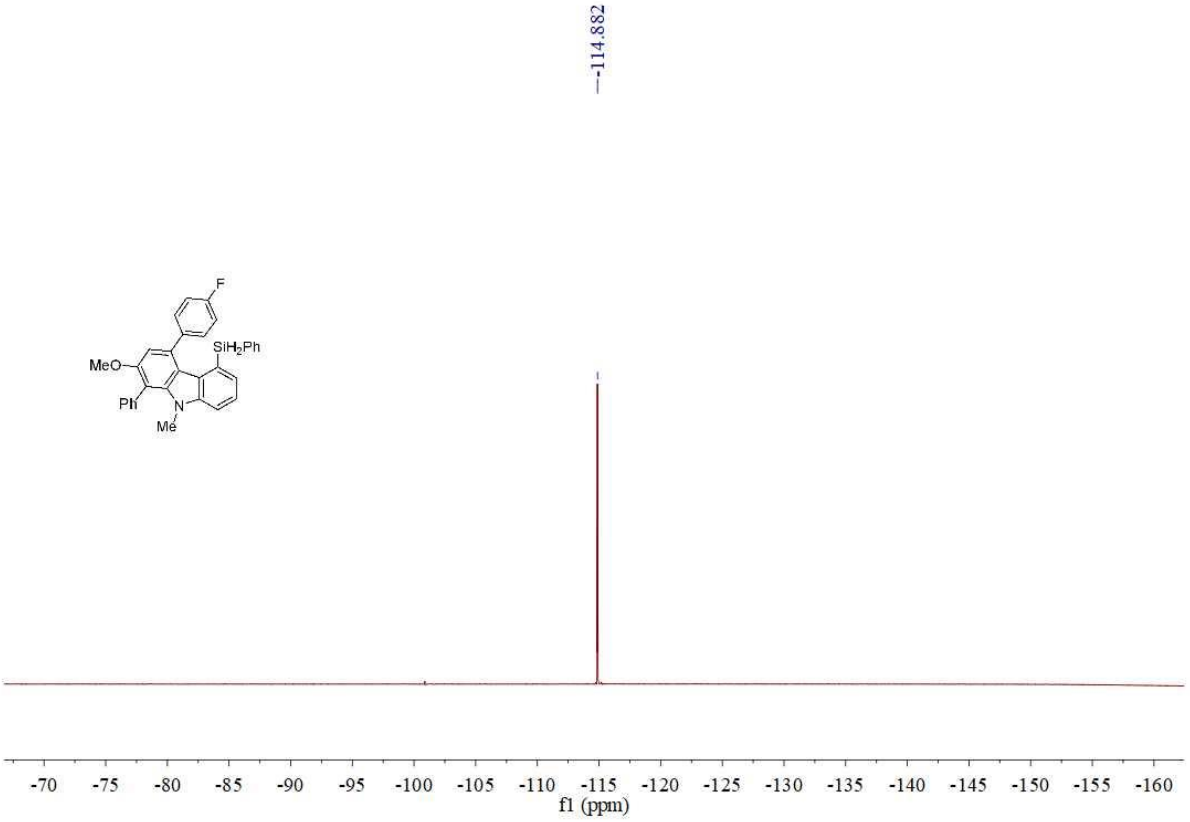
116.336
116.193
110.095
107.455
77.211
77.000
76.787
56.594
32.549
F
SiH2Ph
MeO
Ph
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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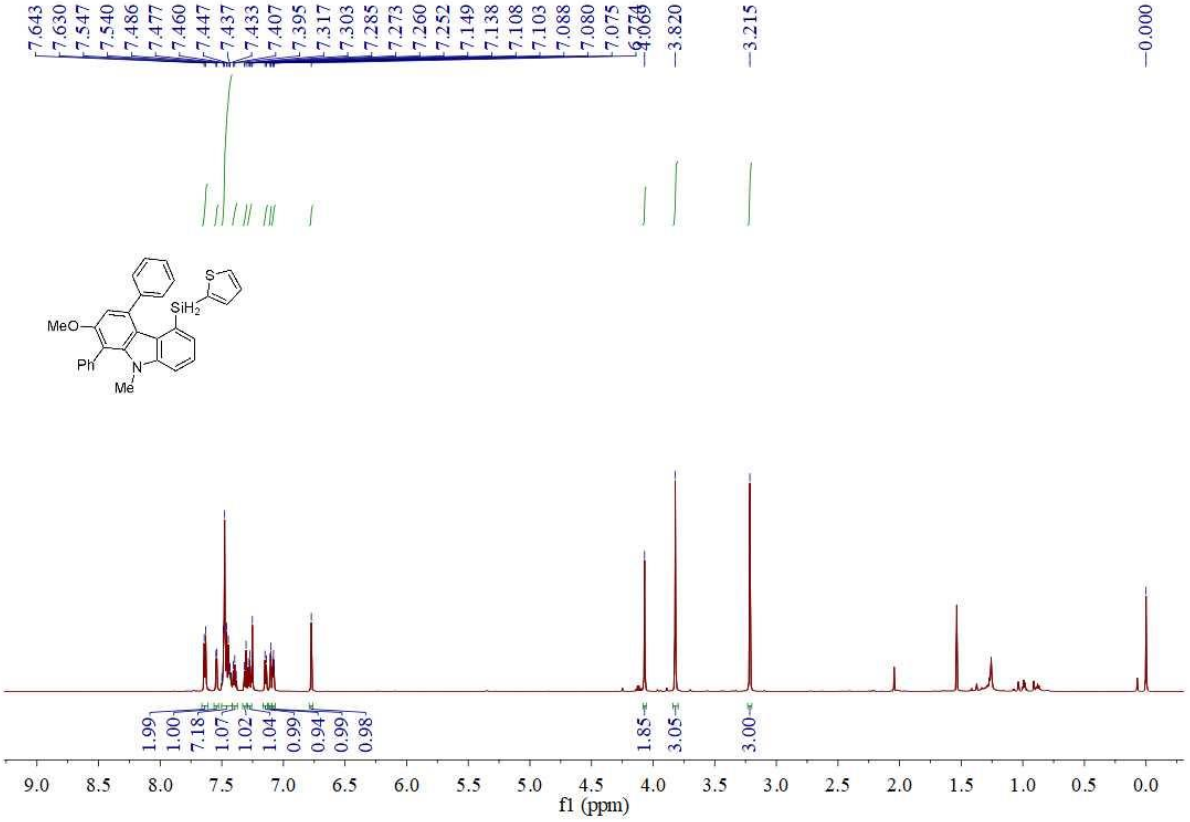
Ph
N
Me
-70 -75 -80 -85 -90 -95 -100 -105 -110 -115 -120 -125 -130 -135 -140 -145 -150 -155 -160
f1 (ppm)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7.317
7.303
7.285
7.273
7.260
7.252
7.149
7.138
7.108
7.103
7.088
7.080
7.075
6.774
4.069
3.820
3.215
0.000
MeO
Ph
N
Me
SiH2
S
1.99
1.00
7.18
1.07
1.02
1.04
0.99
0.94
0.99
0.98
1.85
3.05
3.00
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
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3.5
3.0
2.5
2.0
1.5
1.0
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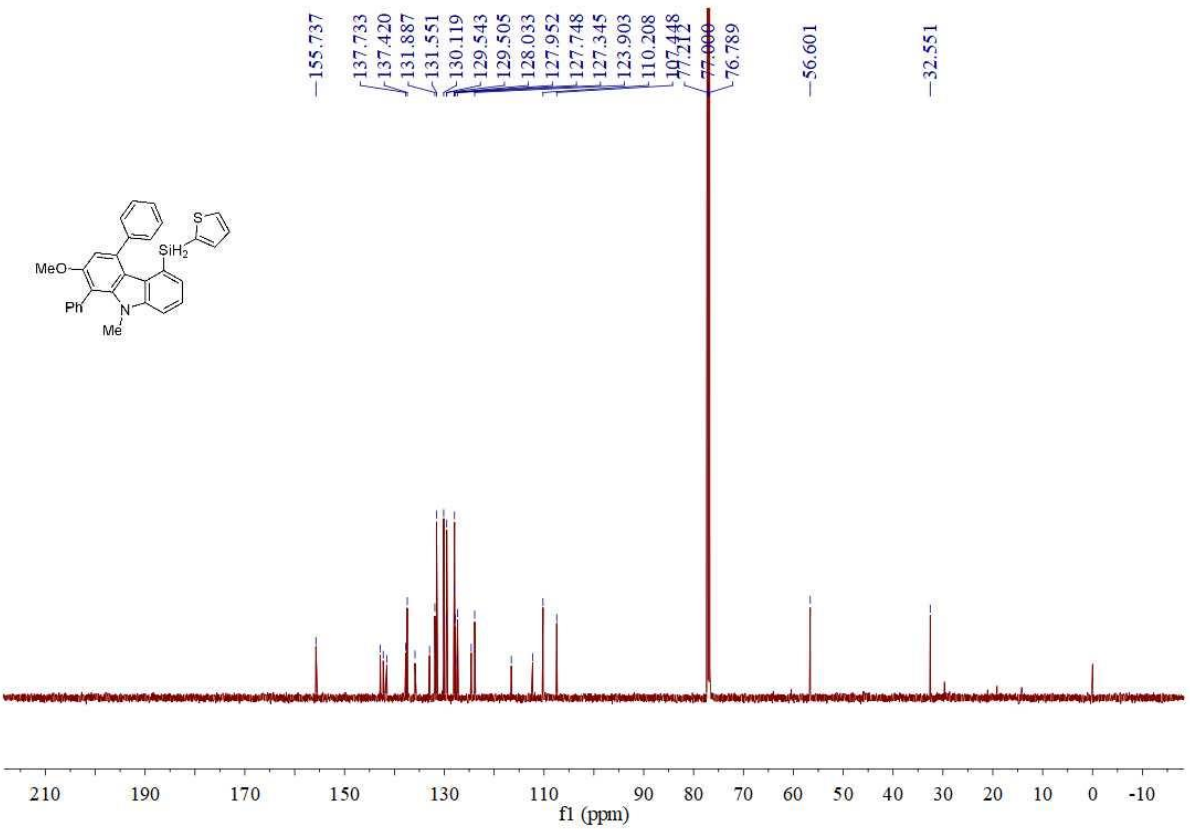
0.0
f1 (ppm)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129.505
128.033
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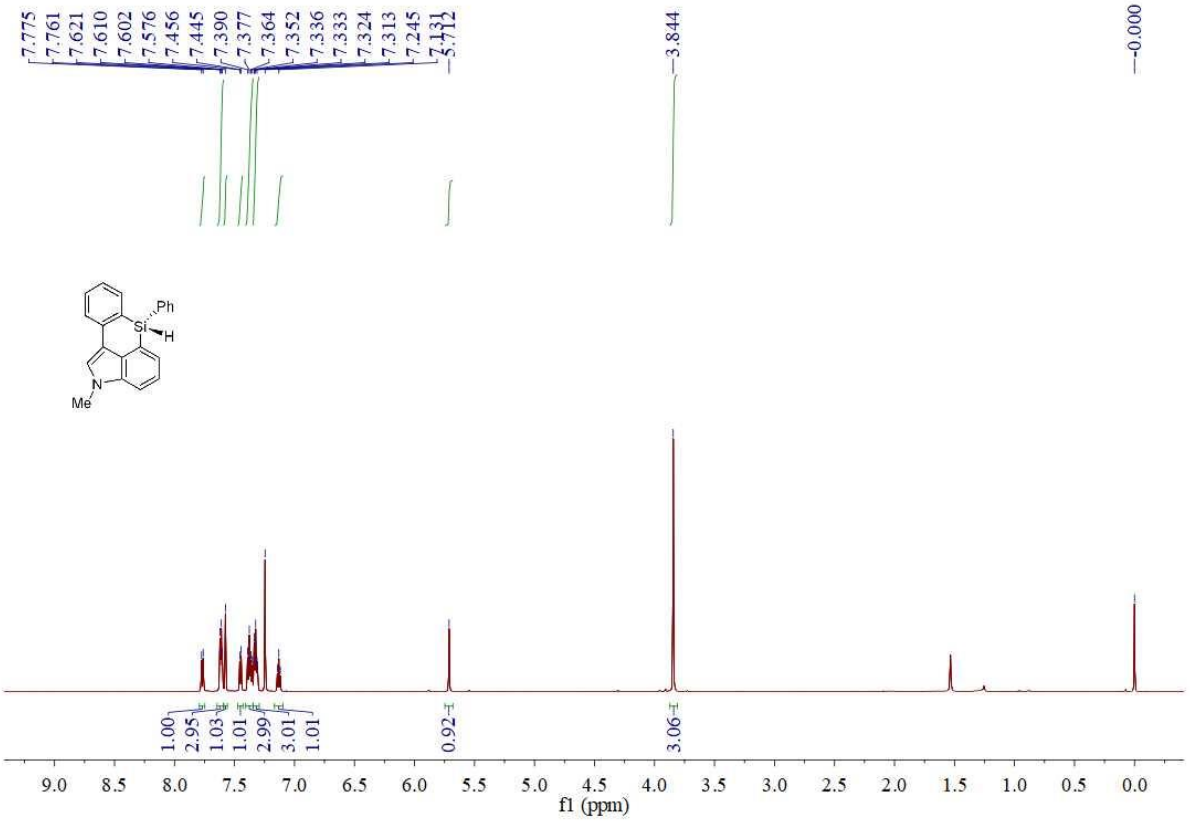
127.748
127.345
123.903
110.208
107.448
77.212
77.000
76.789
56.601
32.551
MeO
Ph
N
Me
SiH2
S
210
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)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7.336
7.333
7.324
7.313
7.245
7.131
5.712
3.844
0.000
Ph
Si
H
N
Me
1.00
2.95
1.03
1.01
2.99
3.01
1.01
0.92
3.06
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
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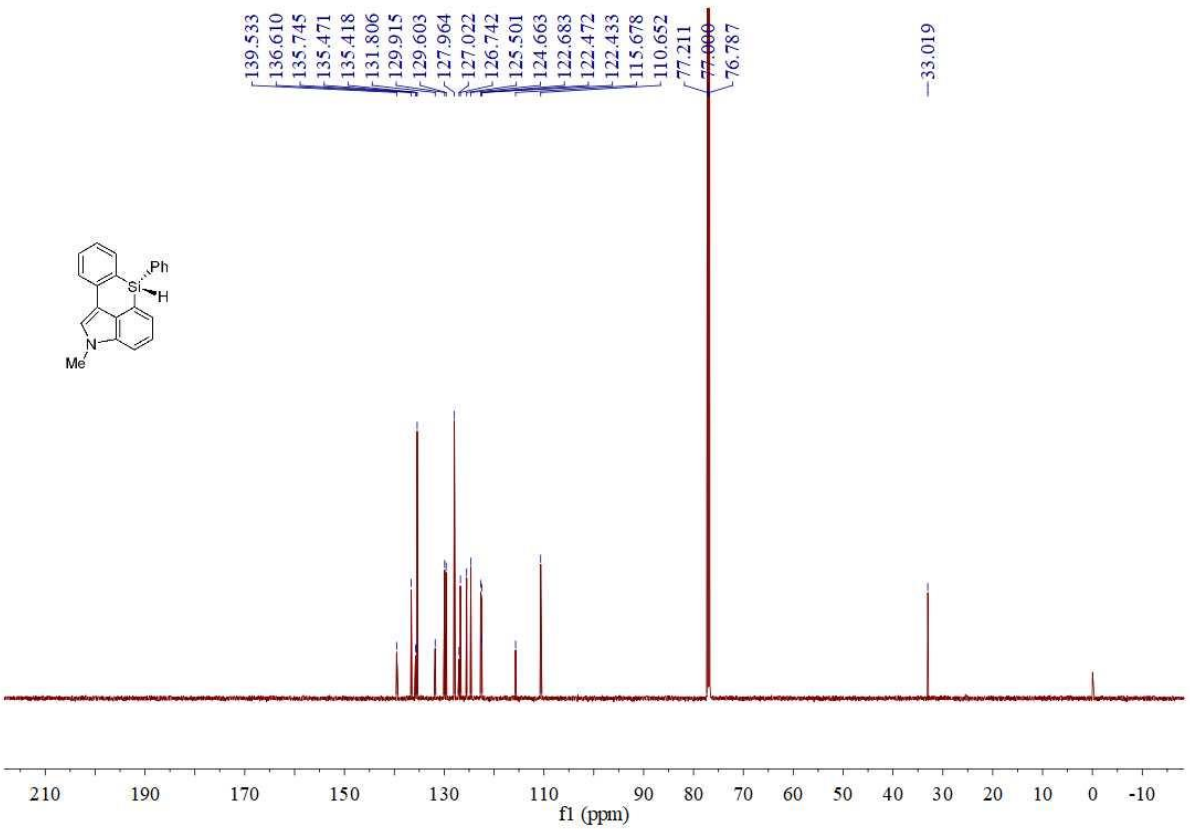
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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135.471
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127.022
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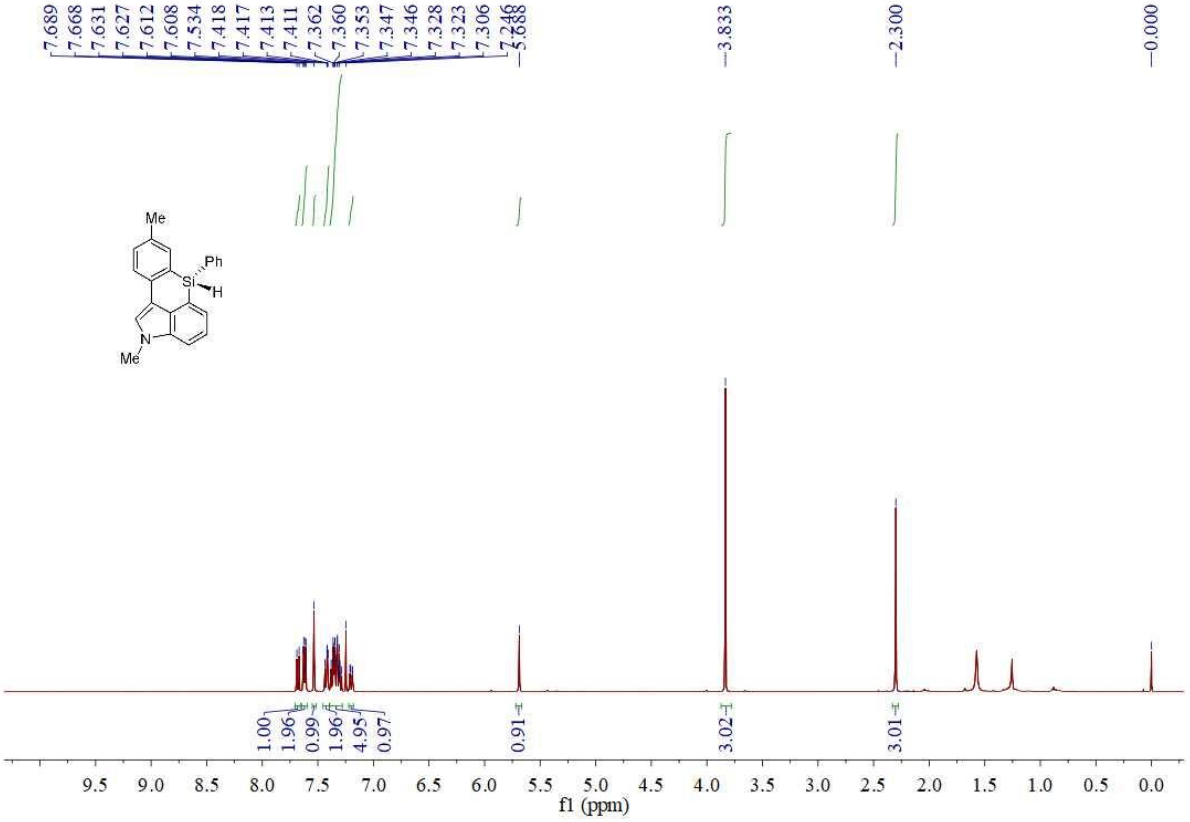
125.501
124.663
122.683
122.472
122.433
115.678
110.652
77.211
77.000
76.787
33.019
Ph
Si
H
N
Me
210
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)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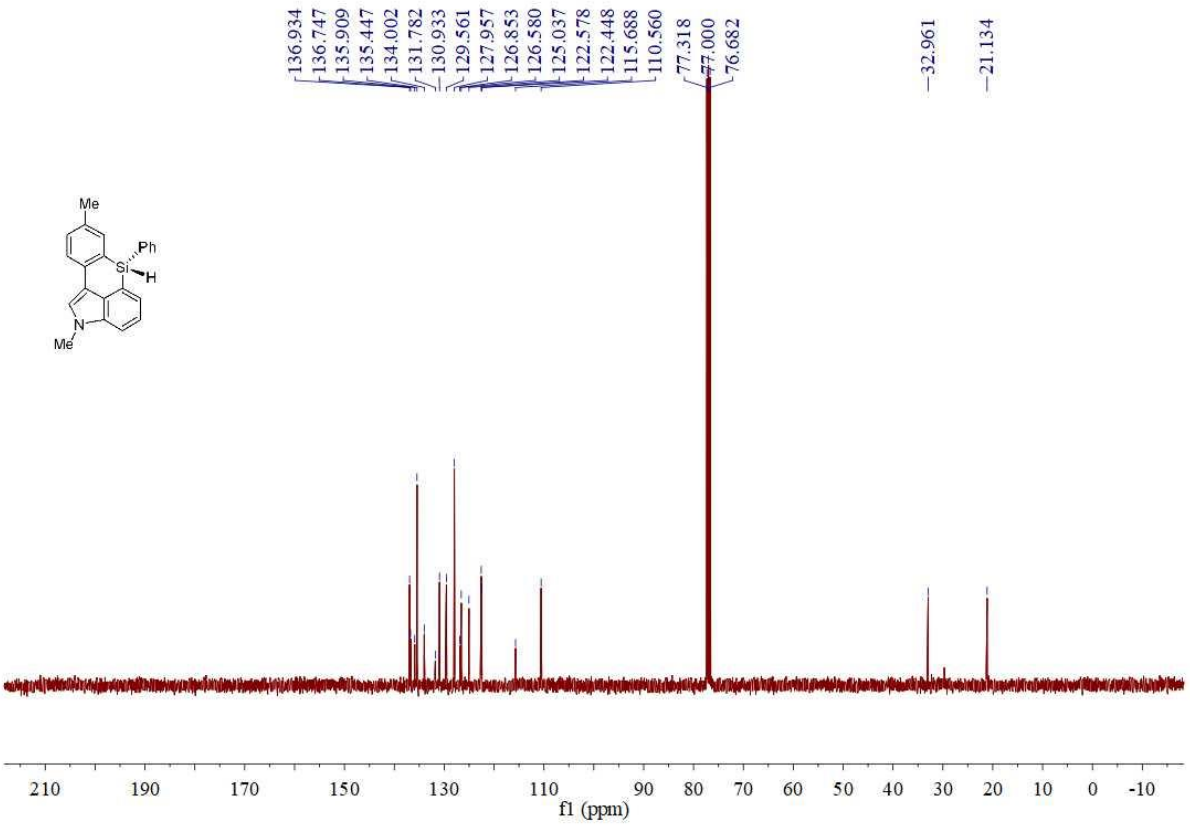
7.353
7.347
7.346
7.328
7.323
7.306
7.246
5.688
3.833
2.300
0.000
Me
Ph
Si
H
N
Me
1.00
1.96
0.99
1.96
4.95
0.97
0.91
3.02
3.01
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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135.447
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130.933
129.561
127.957
126.853
126.580
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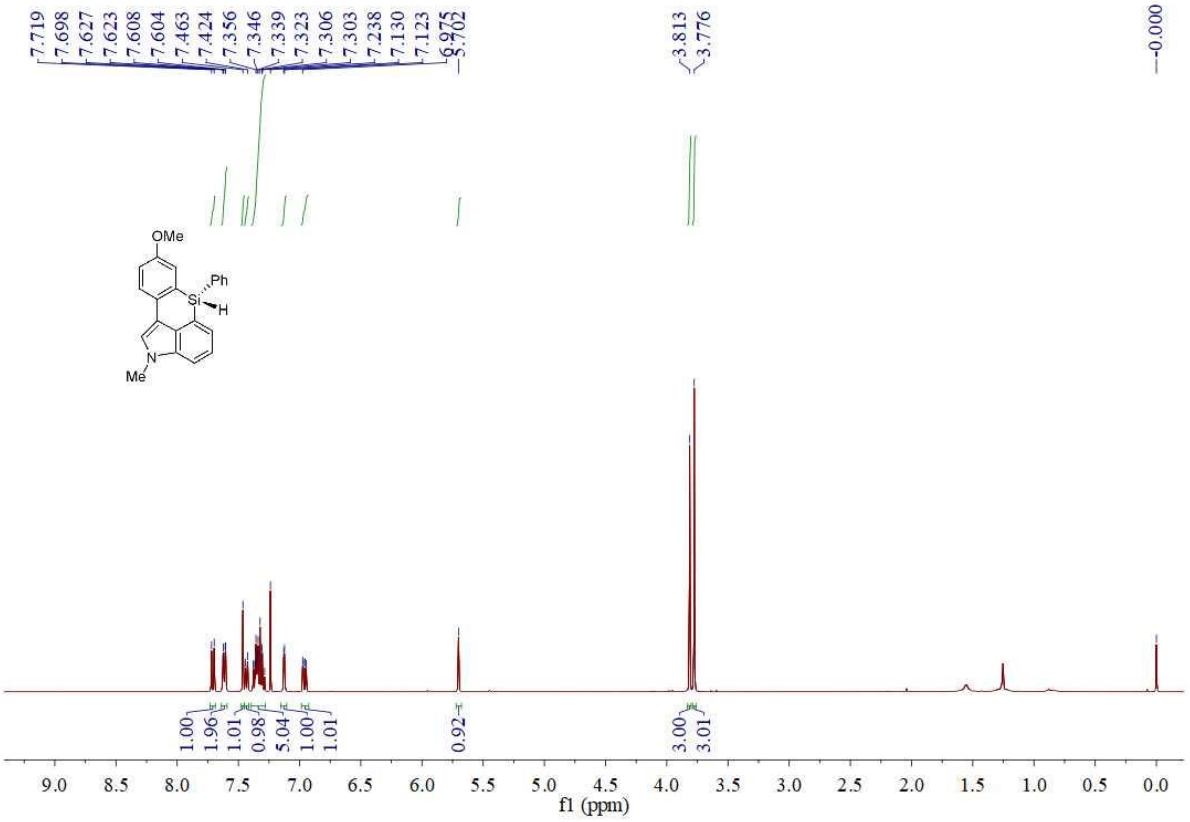
122.578
122.448
115.688
110.560
77.318
77.000
76.682
32.961
21.134
Me
Ph
Si
H
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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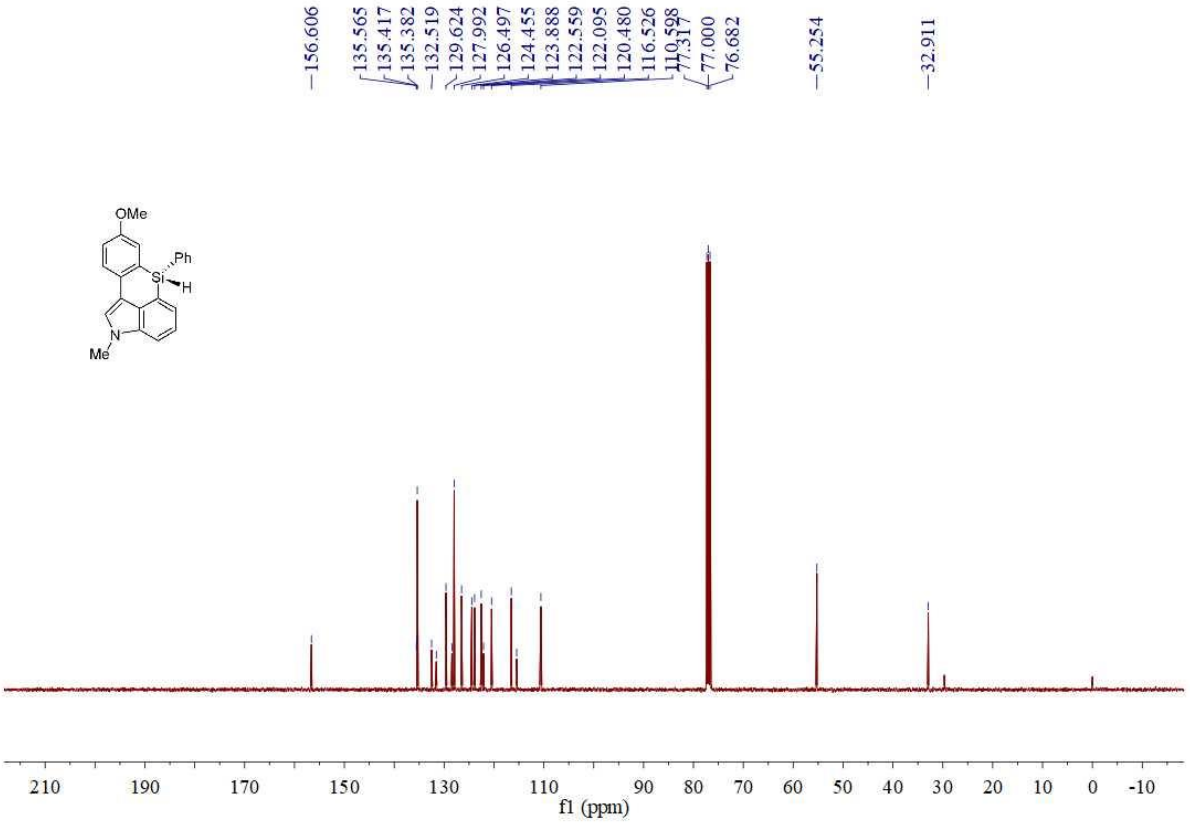
7.323
7.306
7.303
7.238
7.130
7.123
6.975
5.702
3.813
3.776
0.000
OMe
Ph
Si
H
N
Me
1.00
1.96
1.01
0.98
5.04
1.00
1.01
0.92
3.00
3.01
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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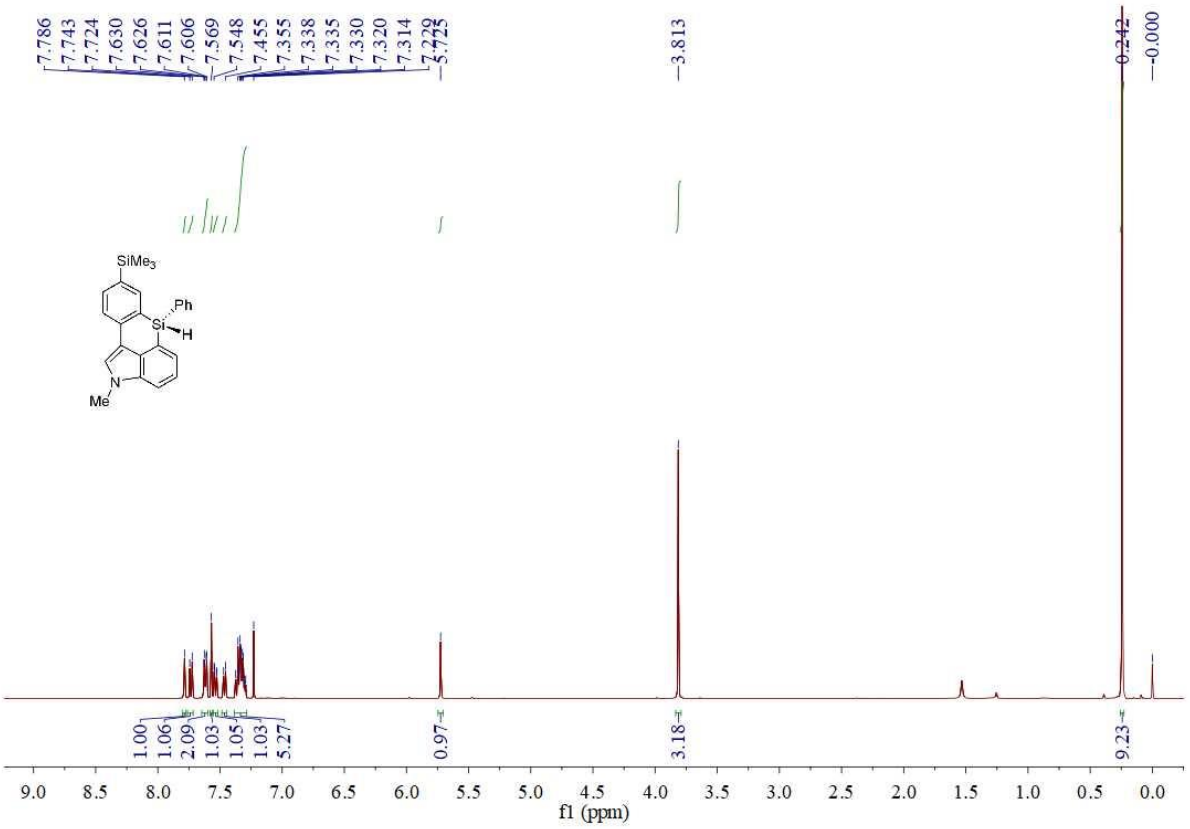
135.565
135.417
135.382
132.519
129.624
127.992
126.497
124.455
123.888
122.559
122.095
120.480
116.526
110.598
77.317
77.000
76.682
55.254
32.911
OMe
Ph
Si
H
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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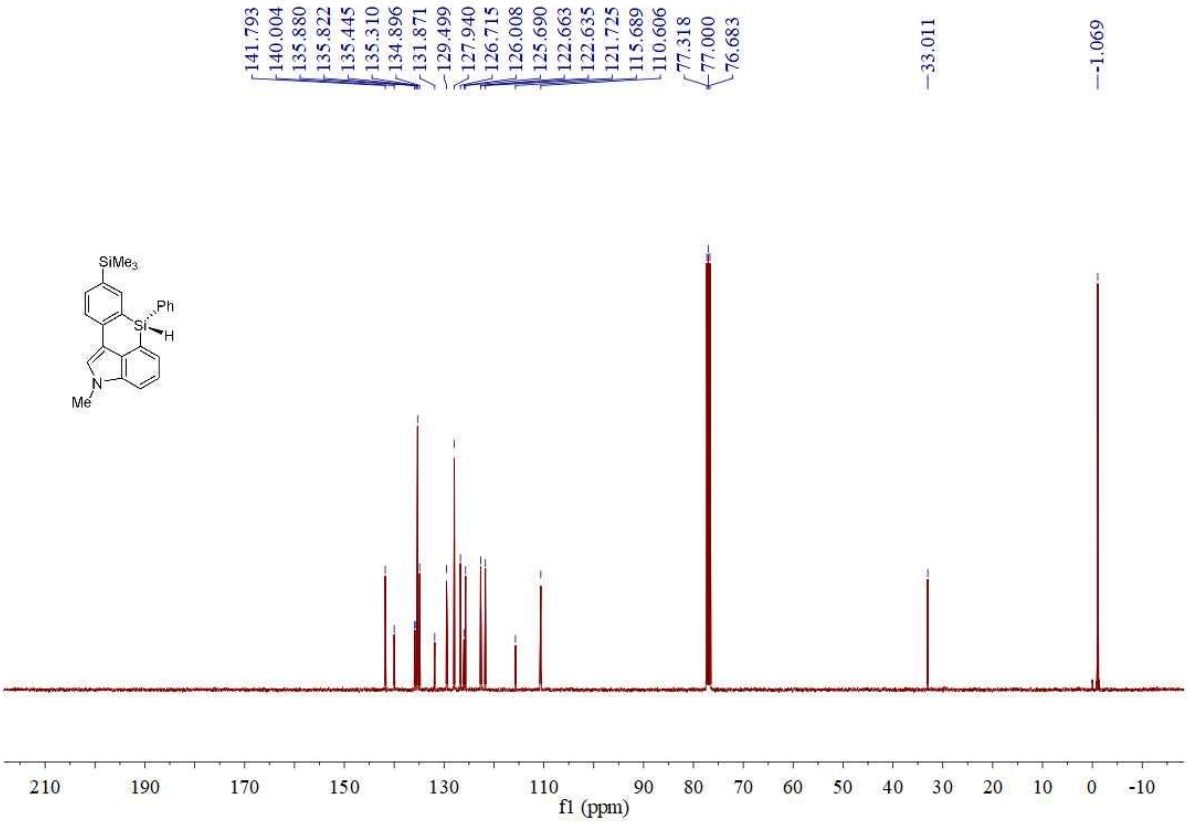
7.626
7.611
7.606
7.569
7.548
7.455
7.355
7.338
7.335
7.330
7.320
7.314
7.229
5.725
3.813
0.242
0.000
SiMe3
Ph
Si
H
N
Me
1.00
1.06
2.09
1.03
1.05
1.03
5.27
0.97
3.18
9.23
f1 (ppm)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131.871
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126.715
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125.690
122.663
122.635
121.725
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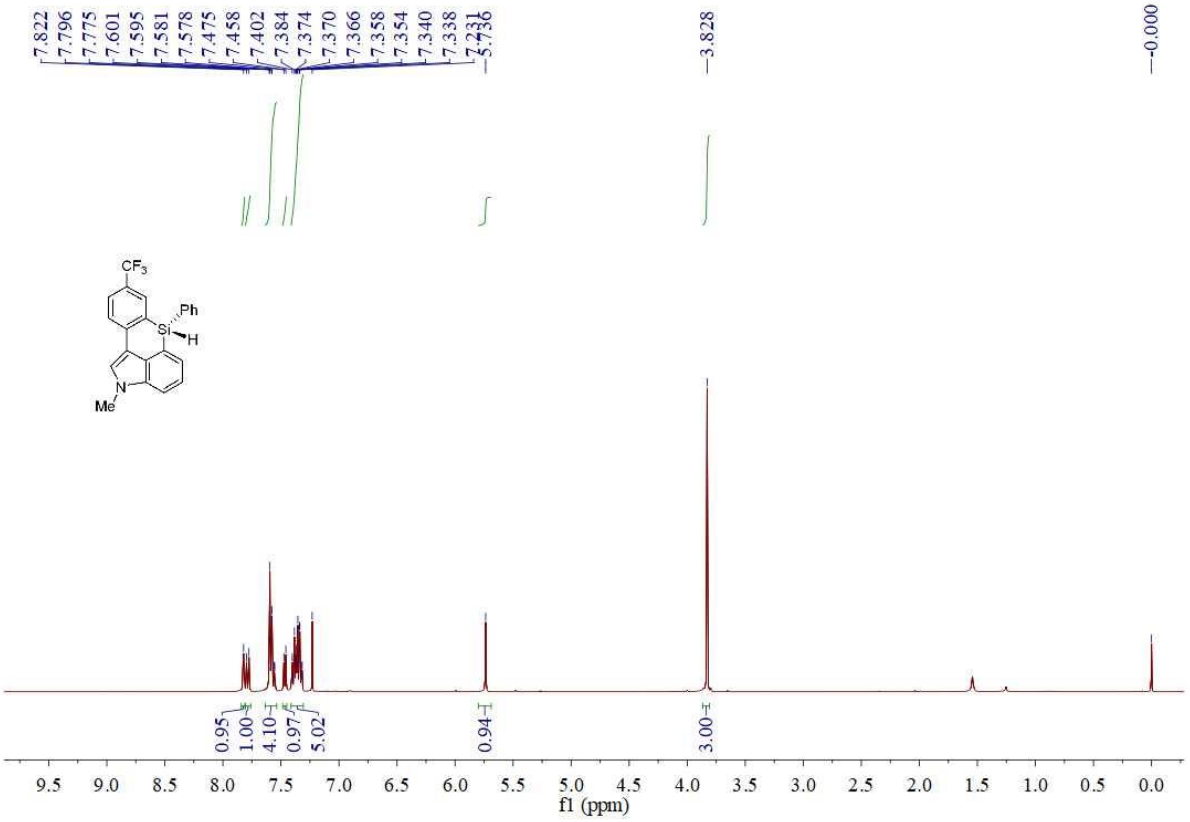
77.000
76.683
33.011
1.069
SiMe3
Ph
Si
H
N
Me
f1 (ppm)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7.475
7.458
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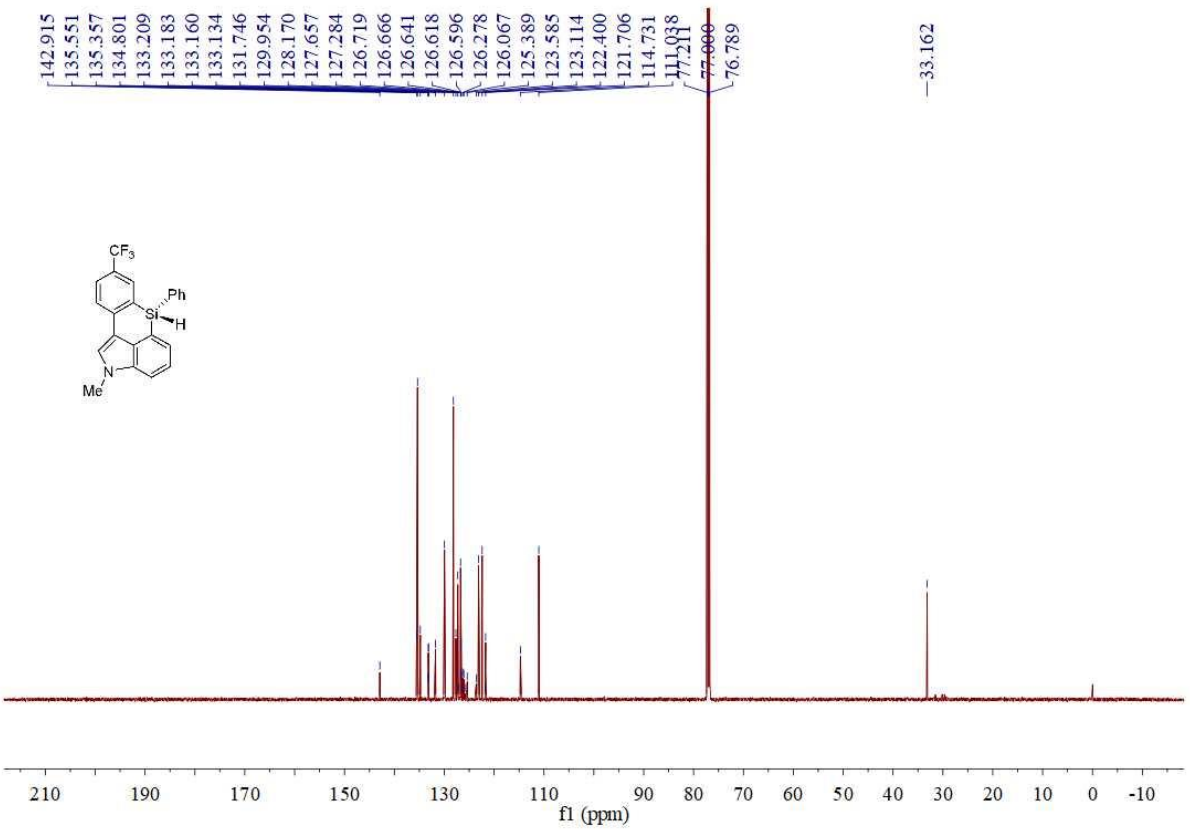
7.374
7.370
7.366
7.358
7.354
7.340
7.338
7.231
5.736
3.828
0.000
CF3
Ph
Si
H
N
Me
0.95
1.00
4.10
0.97
5.02
0.94
3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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127.284
126.719
126.666
126.641
126.618
126.596
126.278
126.067
125.389
123.585
123.114
122.400
121.706
114.731
111.038
77.211
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CF3
Ph
Si
H
N
Me
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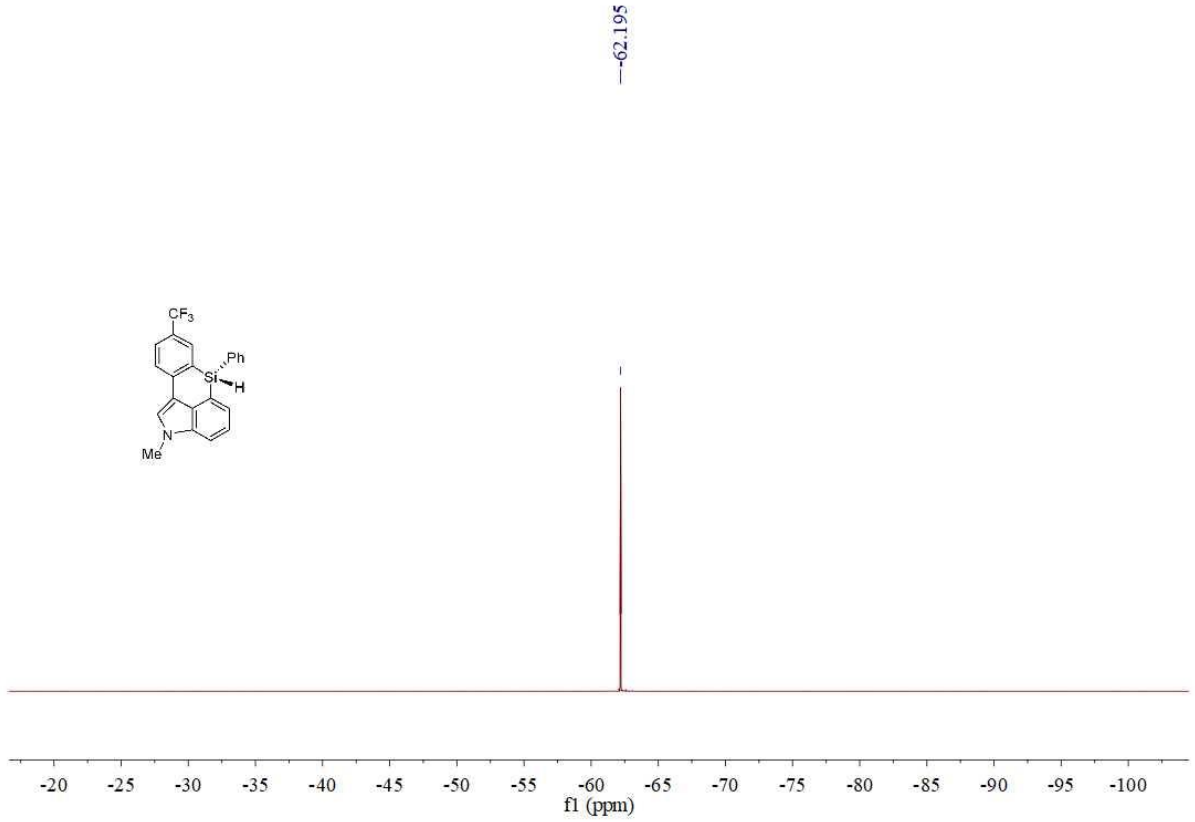
f1 (ppm)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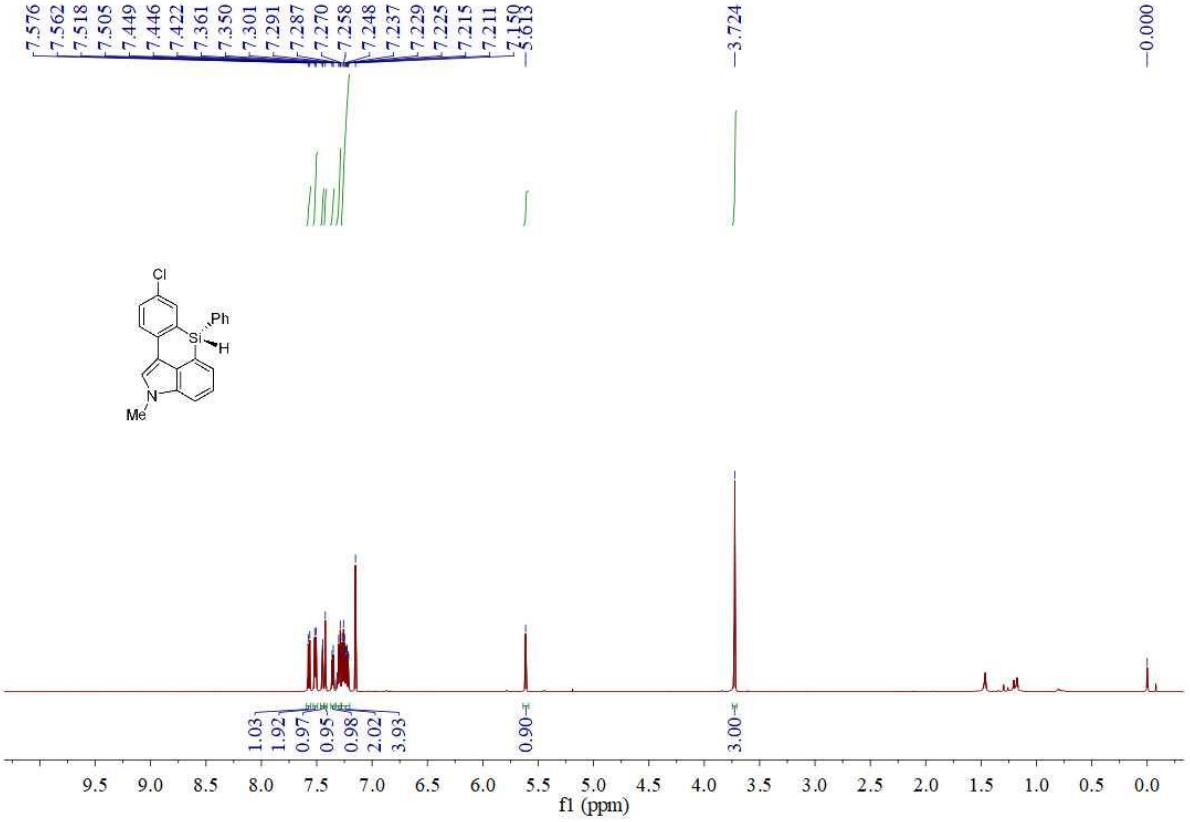
-80
-85
-90
-95
-100
f1 (ppm)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7.446
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7.361
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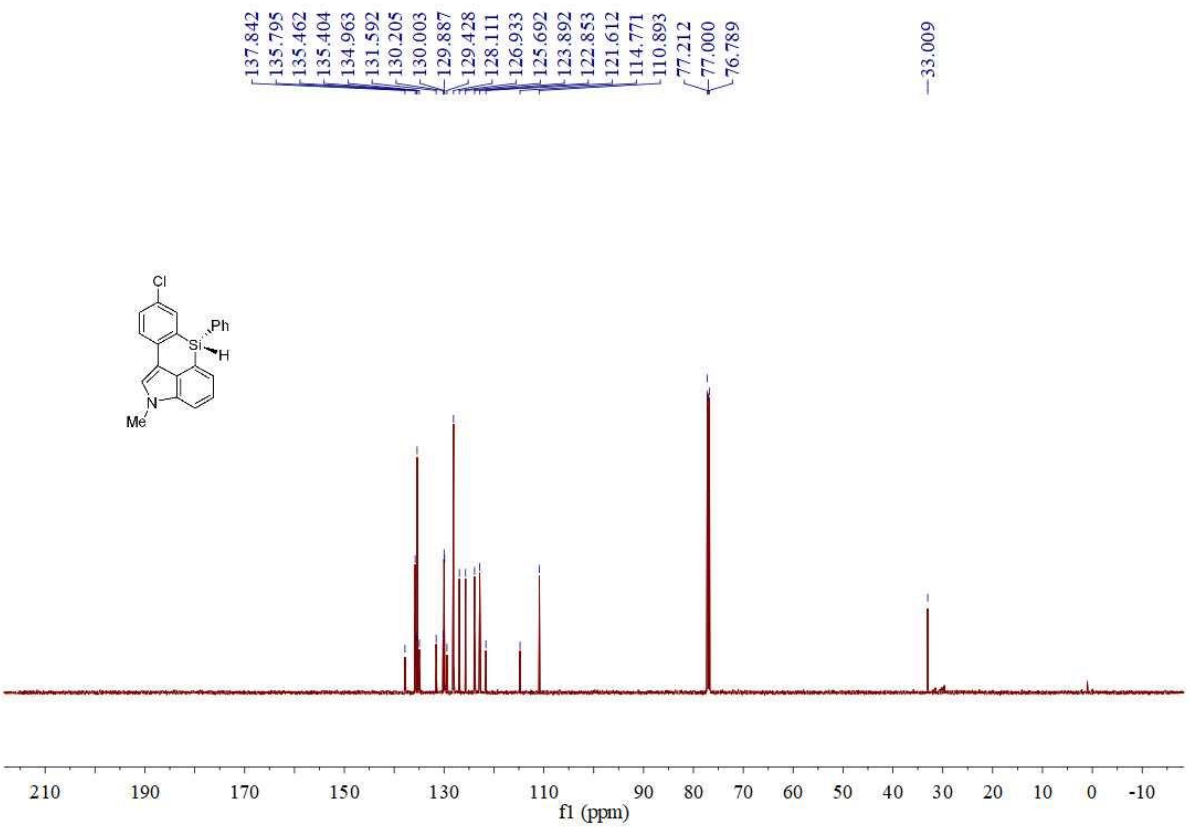
7.301
7.291
7.287
7.270
7.258
7.248
7.237
7.229
7.225
7.215
7.211
7.150
5.613
3.724
0.000
Cl
Ph
Si
H
N
Me
1.03
1.92
0.97
0.95
0.98
2.02
3.93
0.90
3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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135.462
135.404
134.963
131.592
130.205
130.003
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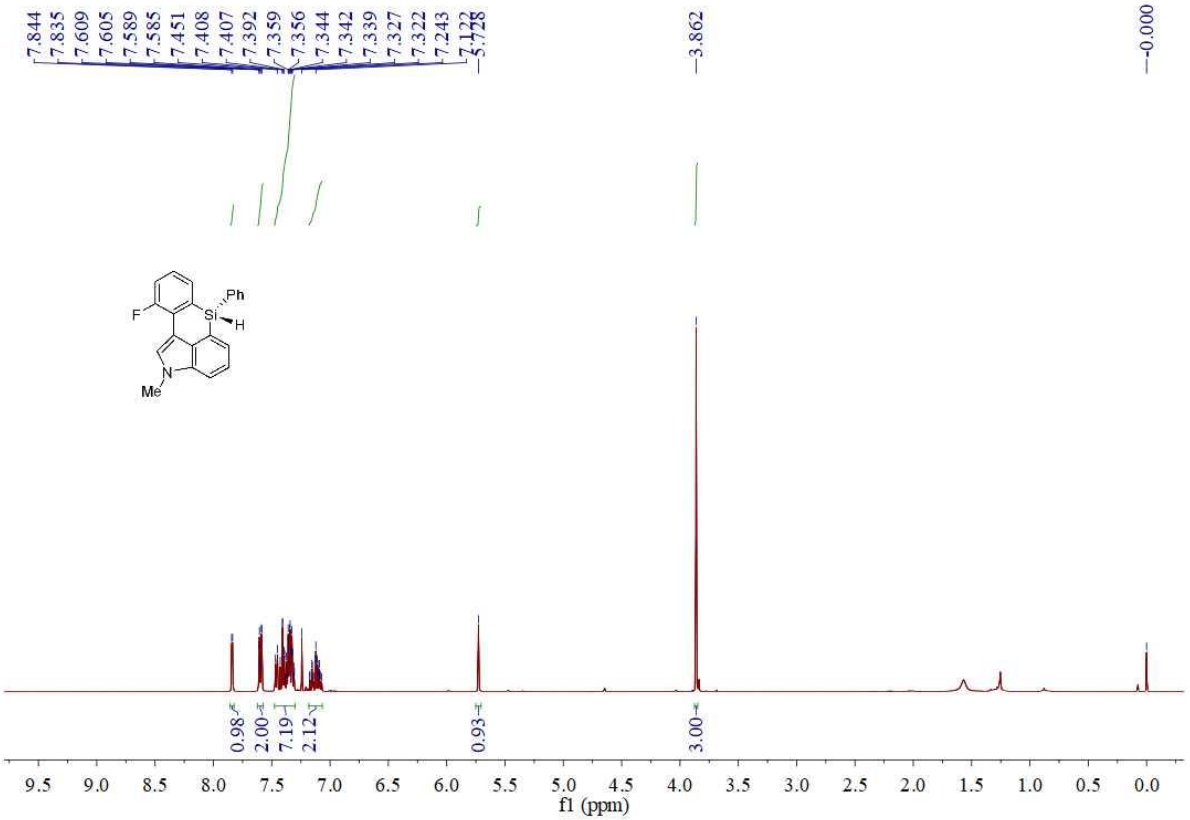
129.428
128.111
126.933
125.692
123.892
122.853
121.612
114.771
110.893
77.212
77.000
76.789
33.009
Cl
Ph
Si
H
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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7.609
7.605
7.589
7.585
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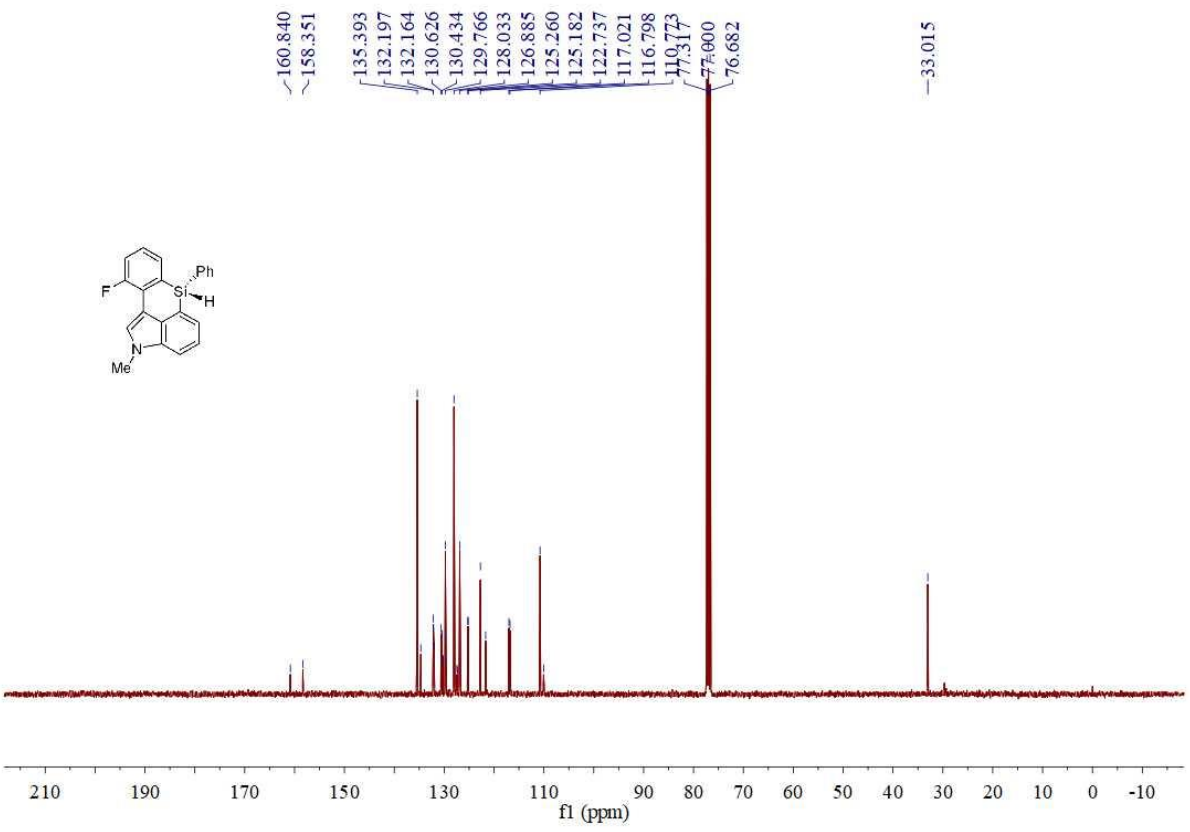
7.408
7.407
7.392
7.359
7.356
7.344
7.342
7.339
7.327
7.322
7.243
7.122
5.328
3.862
0.000
F
Si
Ph
H
N
Me
0.98
2.00
7.19
2.12
0.93
3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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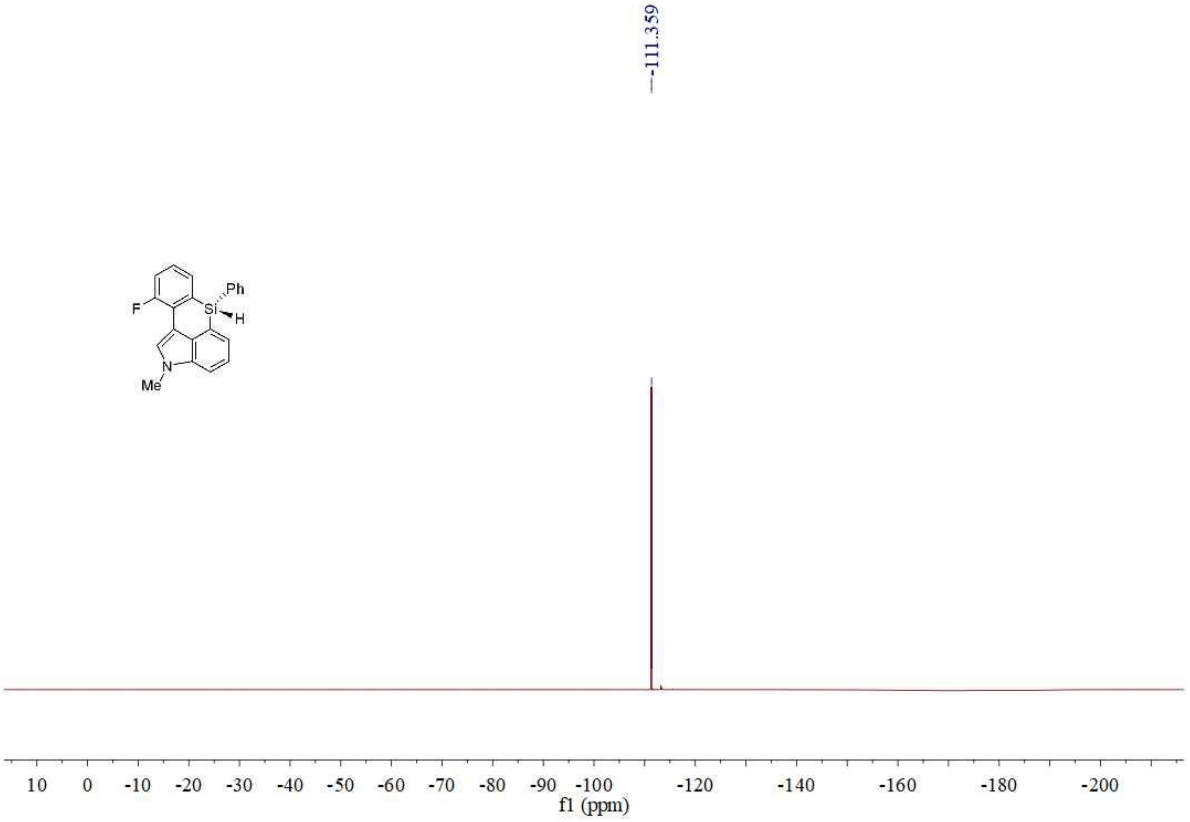
135.393
132.197
132.164
130.626
130.434
129.766
128.033
126.885
125.260
125.182
122.737
117.021
116.798
110.773
77.317
77.000
76.682
33.015
F
Si
Ph
H
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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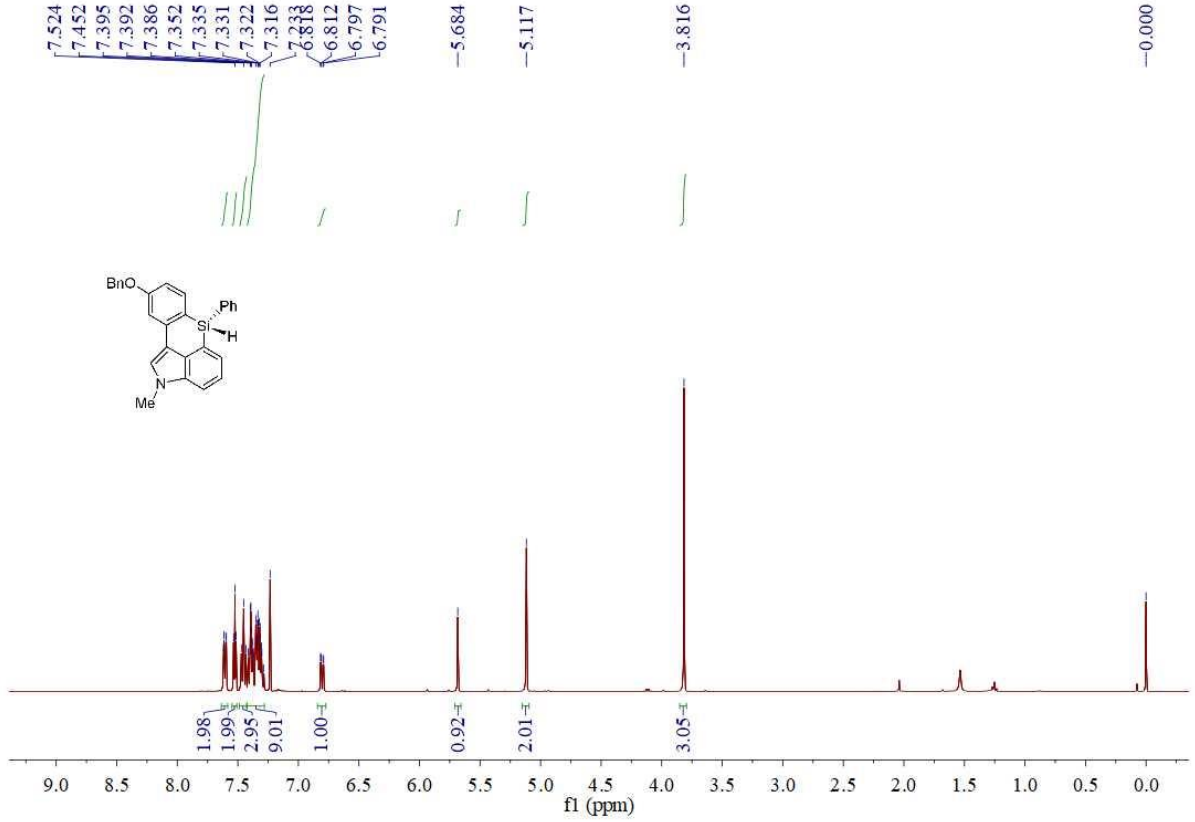
F
Si
Ph
H
N
Me
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-120
-140
-160
-180
-200
f1 (ppm)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7.392
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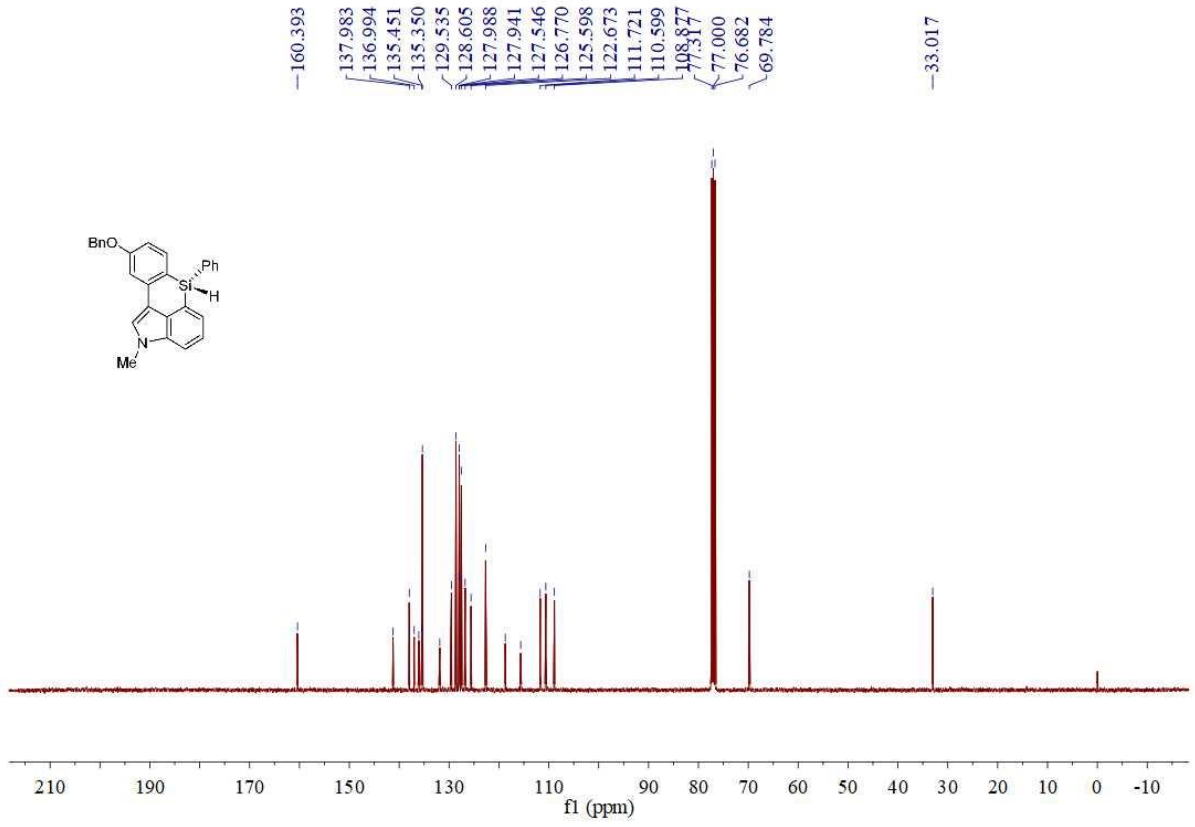
7.352
7.335
7.331
7.322
7.316
7.233
6.818
6.812
6.797
6.791
5.684
5.117
3.816
0.000
BnO
Ph
Si
H
N
Me
1.98
1.99
2.95
9.01
1.00
0.92
2.01
3.05
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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127.988
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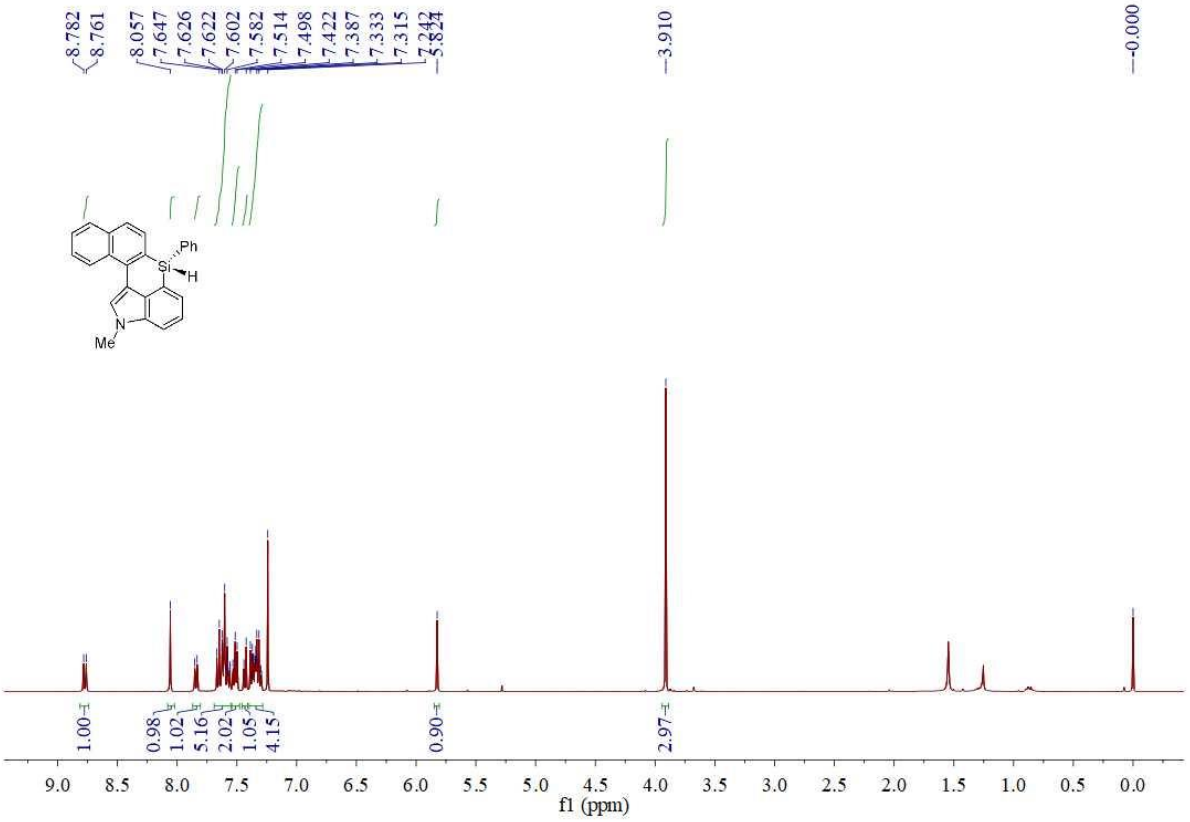
122.673
111.721
110.599
108.877
77.317
77.000
76.682
69.784
33.017
BnO
Ph
Si
H
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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8.057
7.647
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7.602
7.582
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7.498
7.422
7.387
7.333
7.315
7.242
5.824
3.910
0.000
Ph
Si
H
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Me
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0.98
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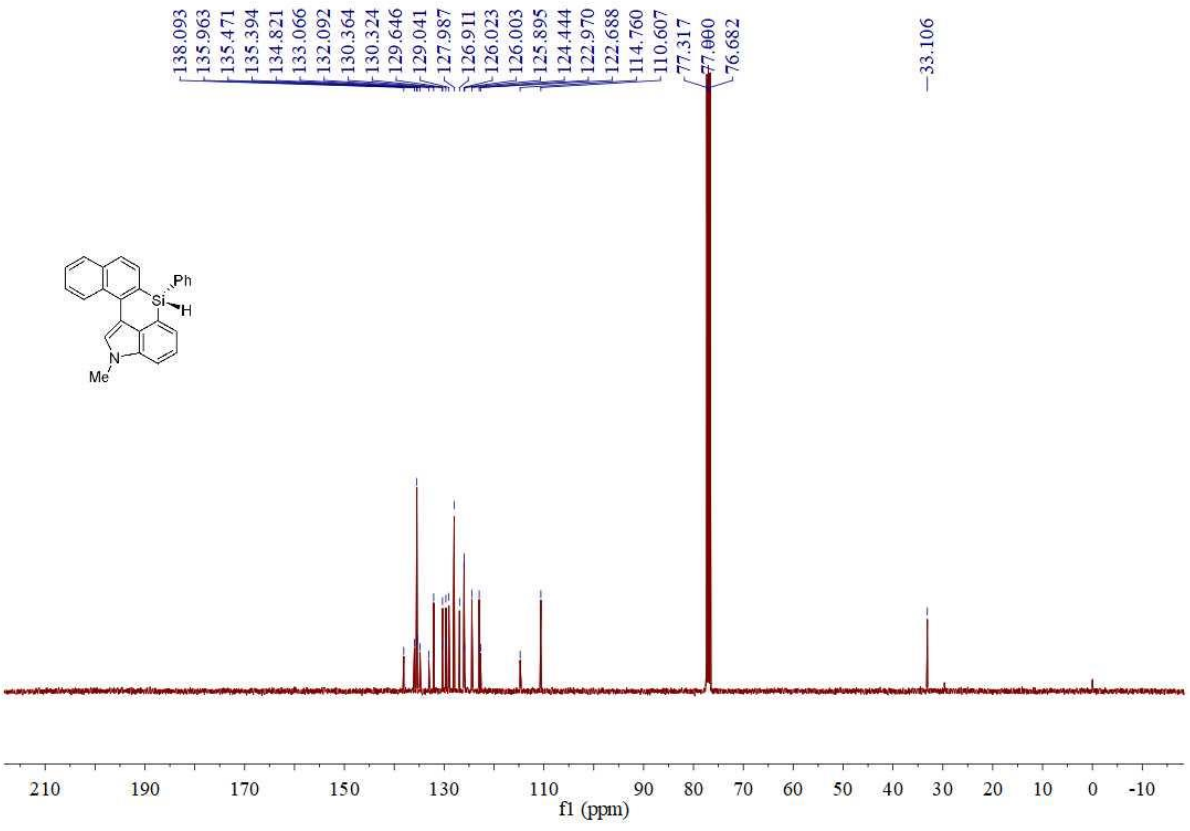
5.16
2.02
1.05
4.15
0.90
2.97
f1 (ppm)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135.471
135.394
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133.066
132.092
130.364
130.324
129.646
129.041
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126.911
126.023
126.003
125.895
124.444
122.970
122.688
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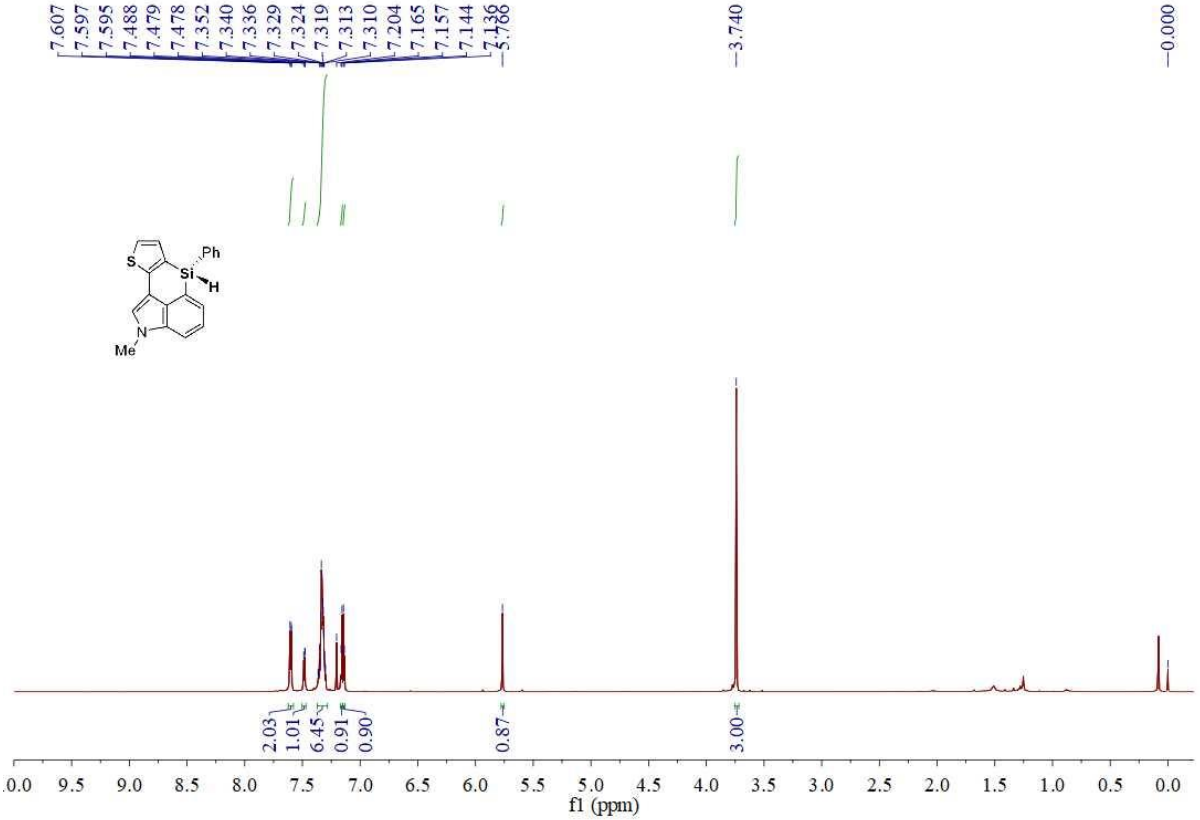
110.607
77.317
77.000
76.682
33.106
Ph
Si
H
N
Me
f1 (ppm)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7.595
7.488
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7.478
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7.340
7.336
7.329
7.324
7.319
7.313
7.310
7.204
7.165
7.157
7.144
7.136
5.766
3.740
0.000
Ph
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H
S
N
Me
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1.01
6.45
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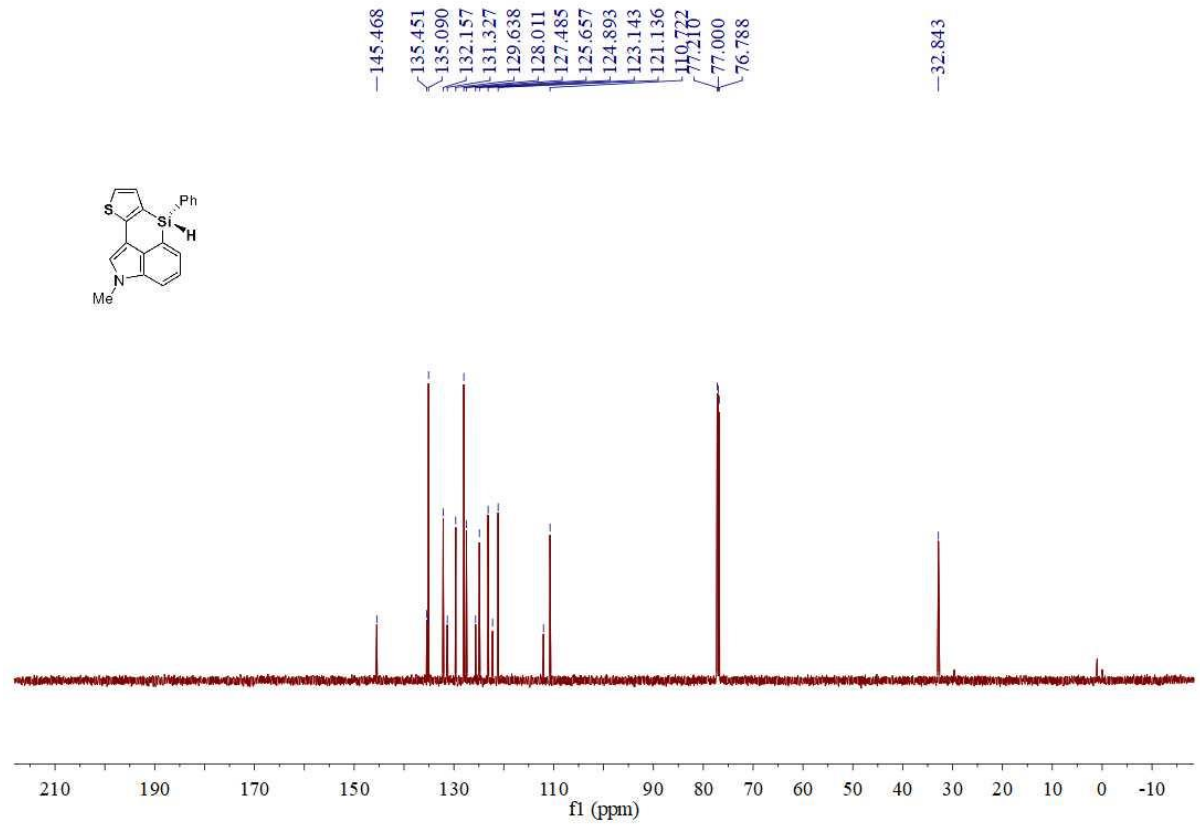
0.90
0.87
3.00
f1 (ppm)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124.893
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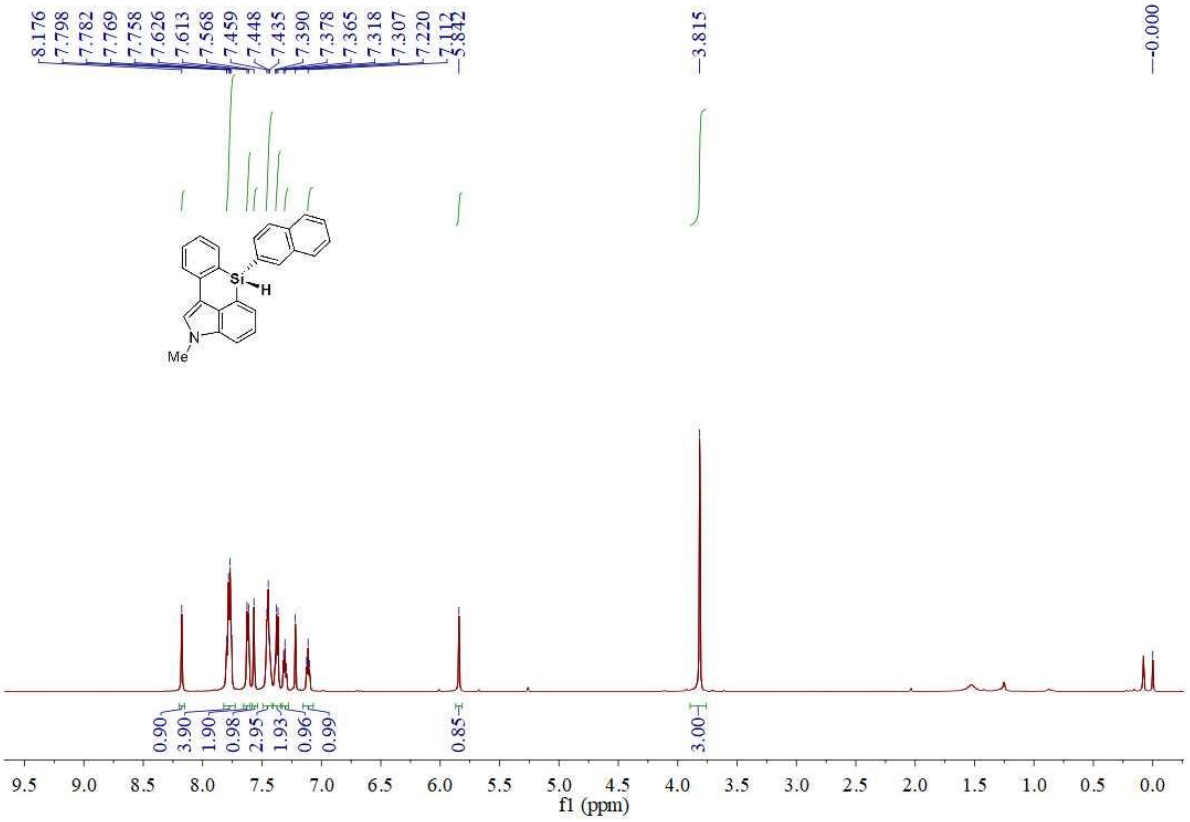
Ph
Si
H
S
N
Me
f1 (ppm)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7.378
7.365
7.318
7.307
7.220
7.112
5.842
3.815
0.000
Si
H
N
Me
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1.90
0.98
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0.99
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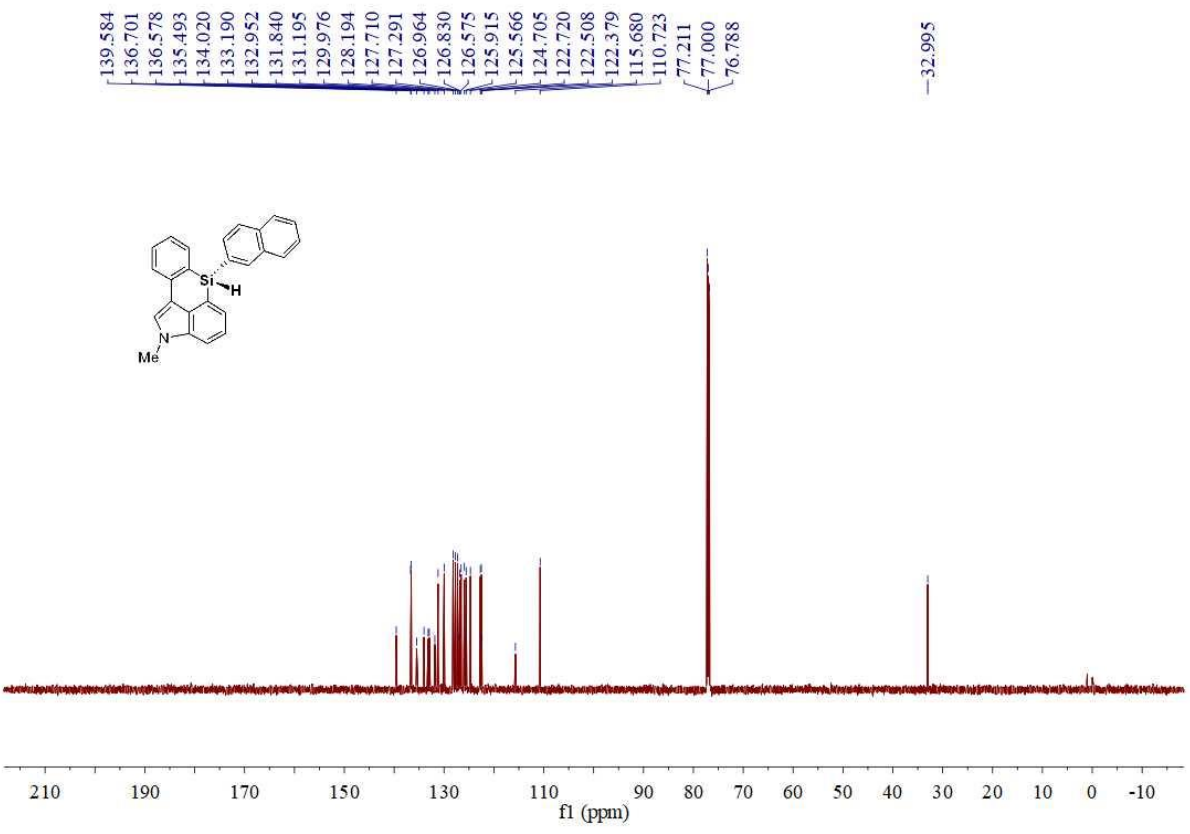
3.00
f1 (ppm)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131.840
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127.710
127.291
126.964
126.830
126.575
125.915
125.566
124.705
122.720
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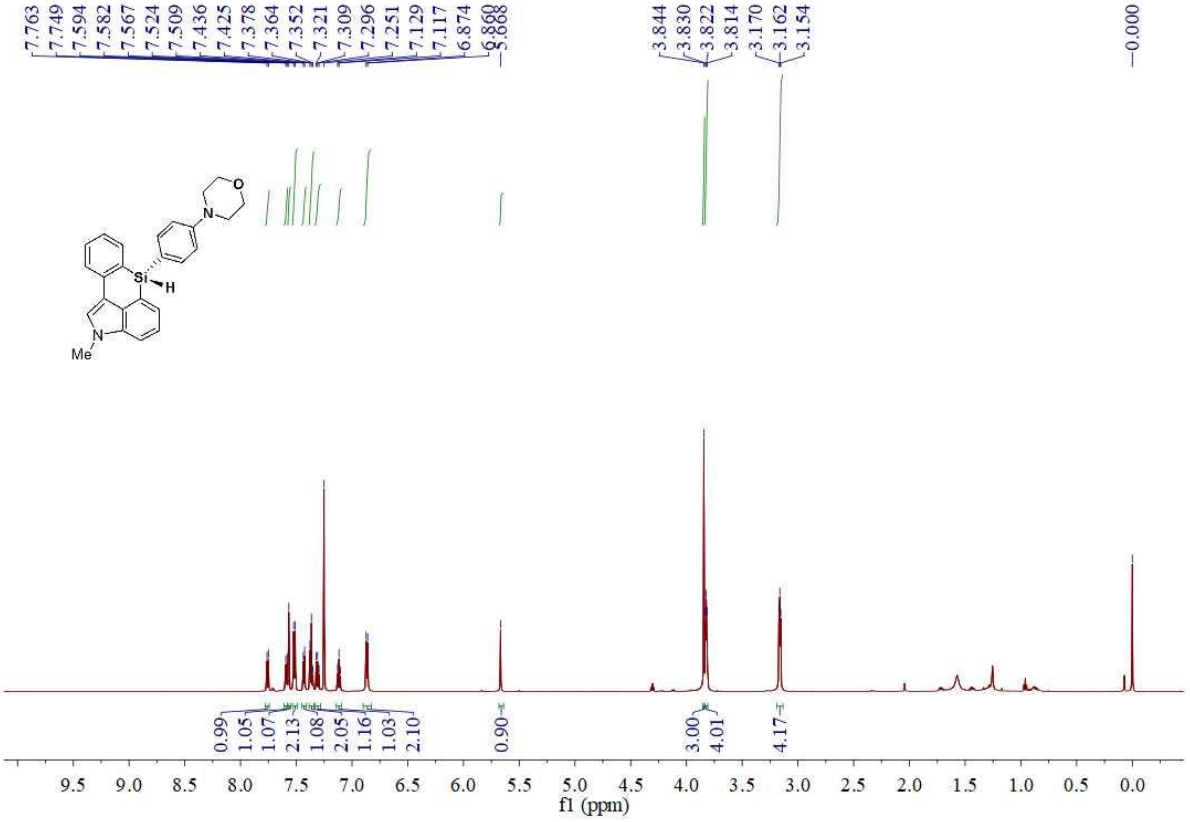
77.000
76.788
32.995
Si
H
N
Me
f1 (ppm)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7.436
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7.378
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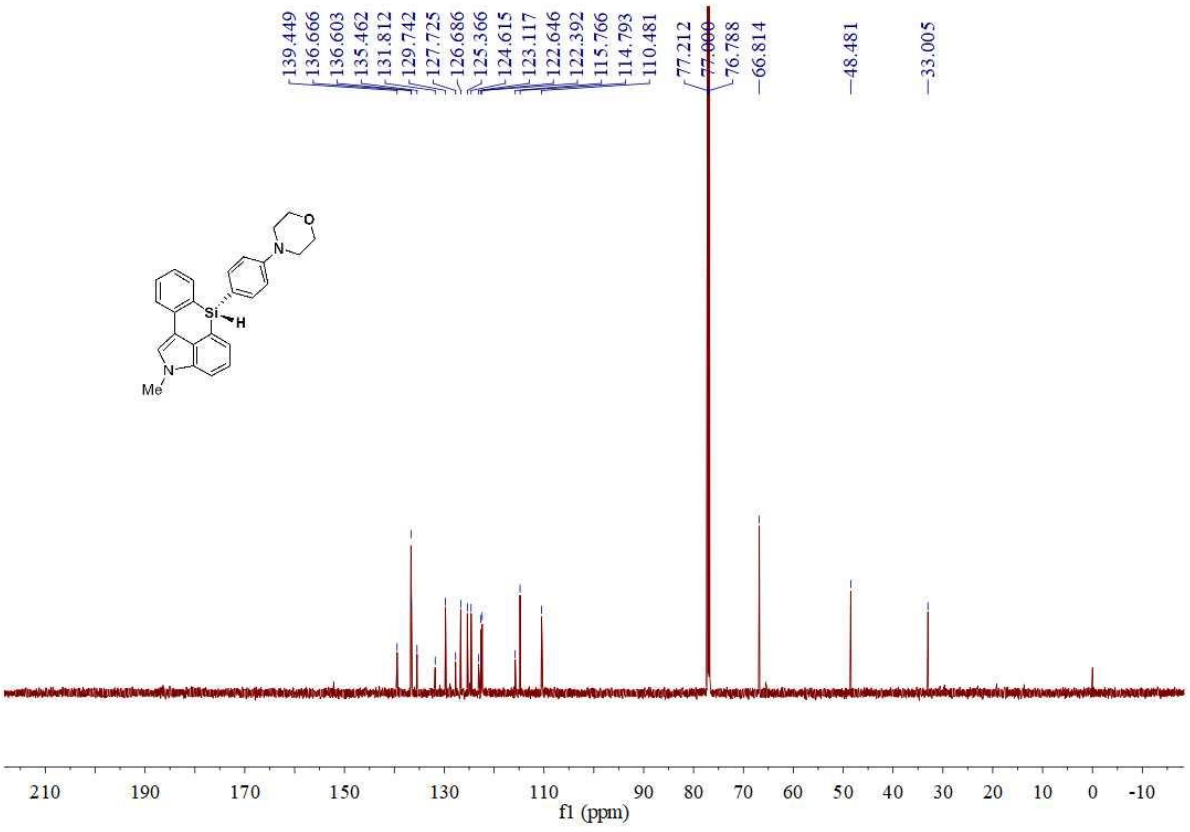
7.321
7.309
7.296
7.251
7.129
7.117
6.874
6.868
3.844
3.830
3.822
3.814
3.170
3.162
3.154
0.000
Si
H
N
Me
O
N
0.99
1.05
1.07
2.13
1.08
2.05
1.16
1.03
2.10
0.90
3.00
4.01
4.17
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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136.603
135.462
131.812
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126.686
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123.117
122.646
122.392
115.766
114.793
110.481
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77.000
76.788
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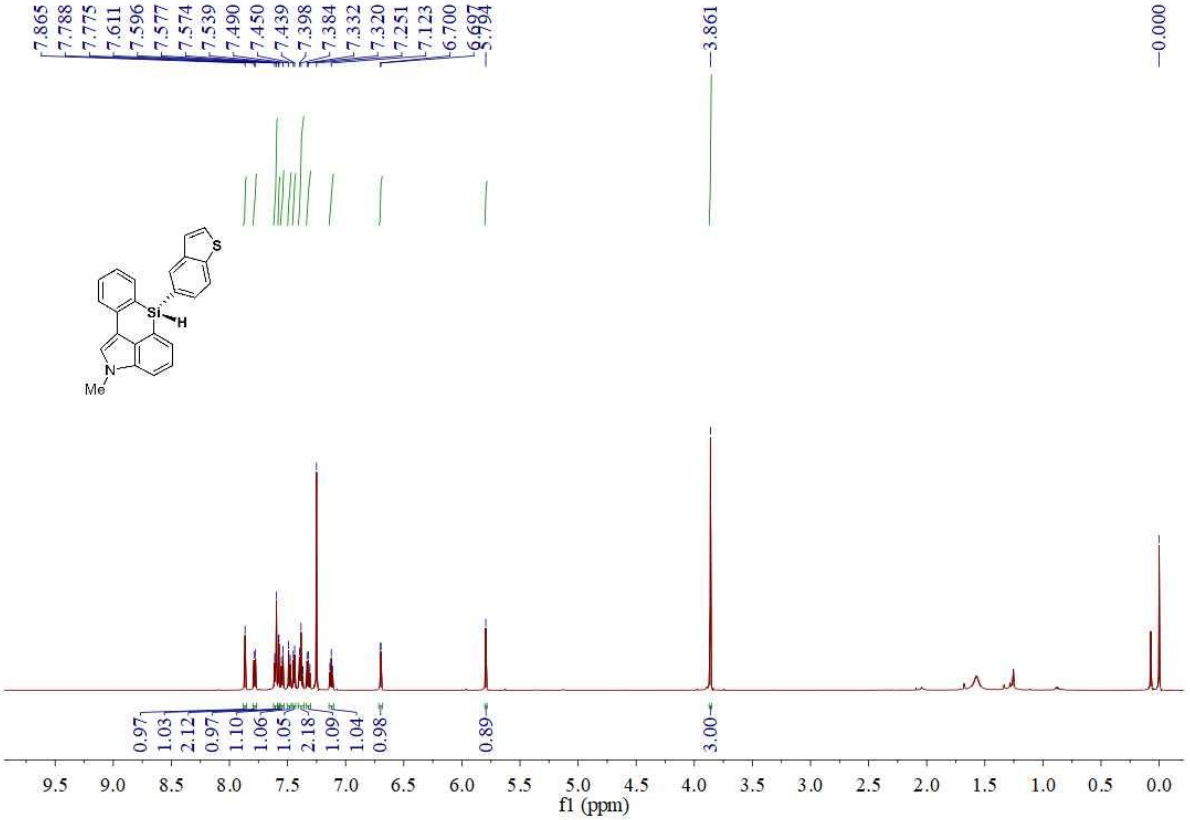
Si
H
N
Me
O
N
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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7.384
7.332
7.320
7.251
7.123
6.700
6.687
5.794
3.861
0.000
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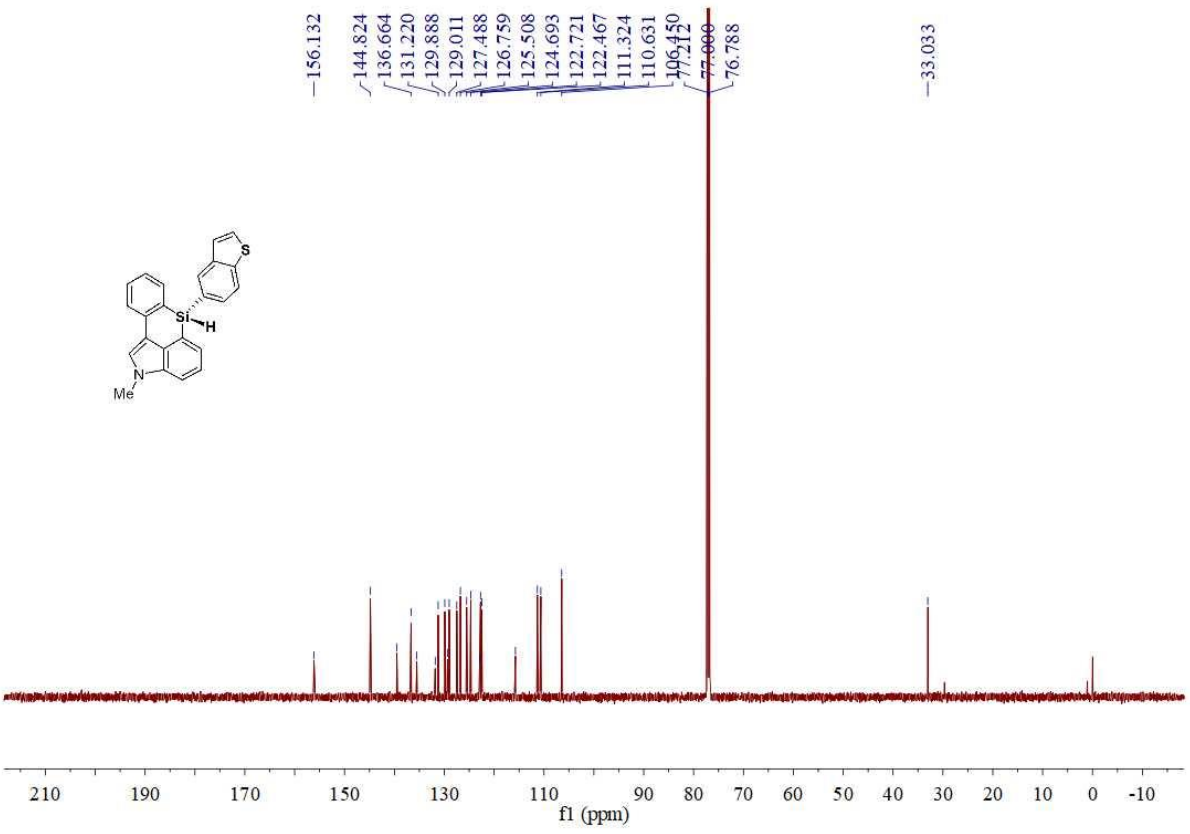
H
N
Me
S
0.97
1.03
2.12
0.97
1.10
1.06
1.05
2.18
1.09
1.04
0.98
0.89
3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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124.693
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122.467
111.324
110.631
106.450
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77.000
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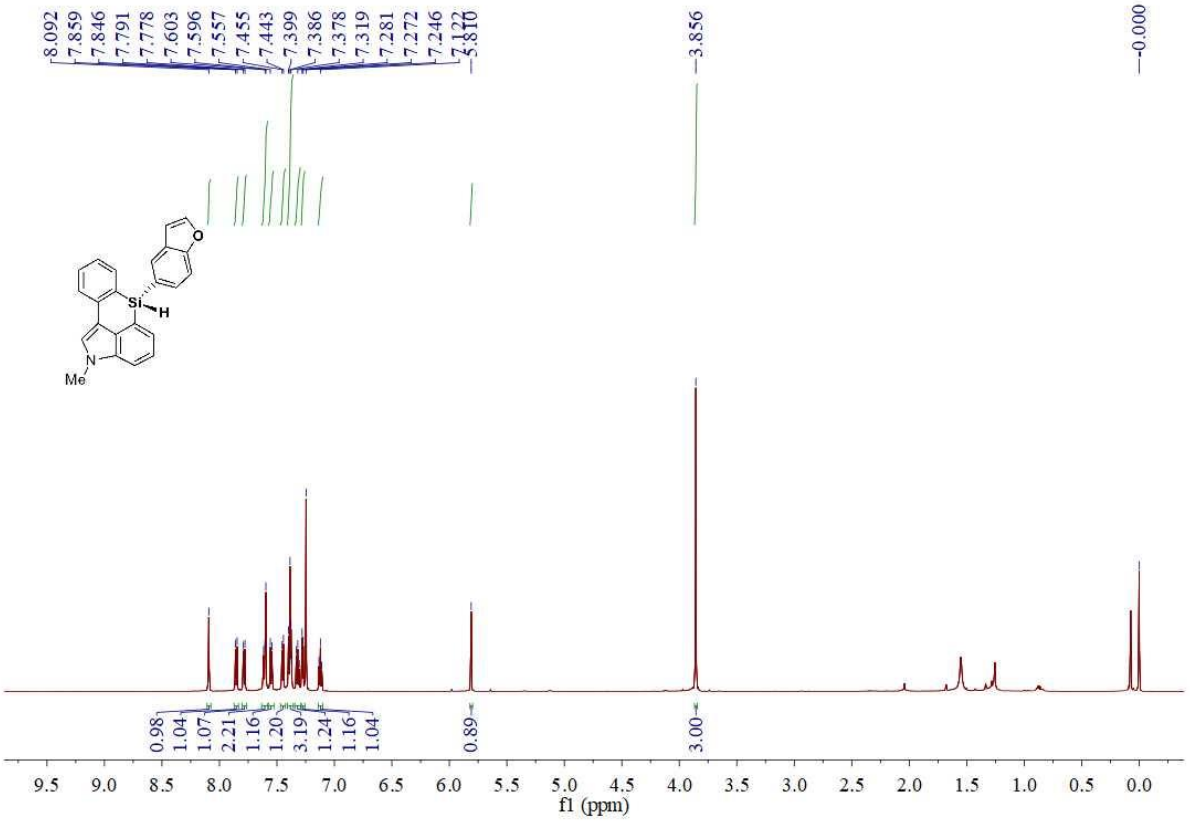
33.033
Si
H
N
Me
S
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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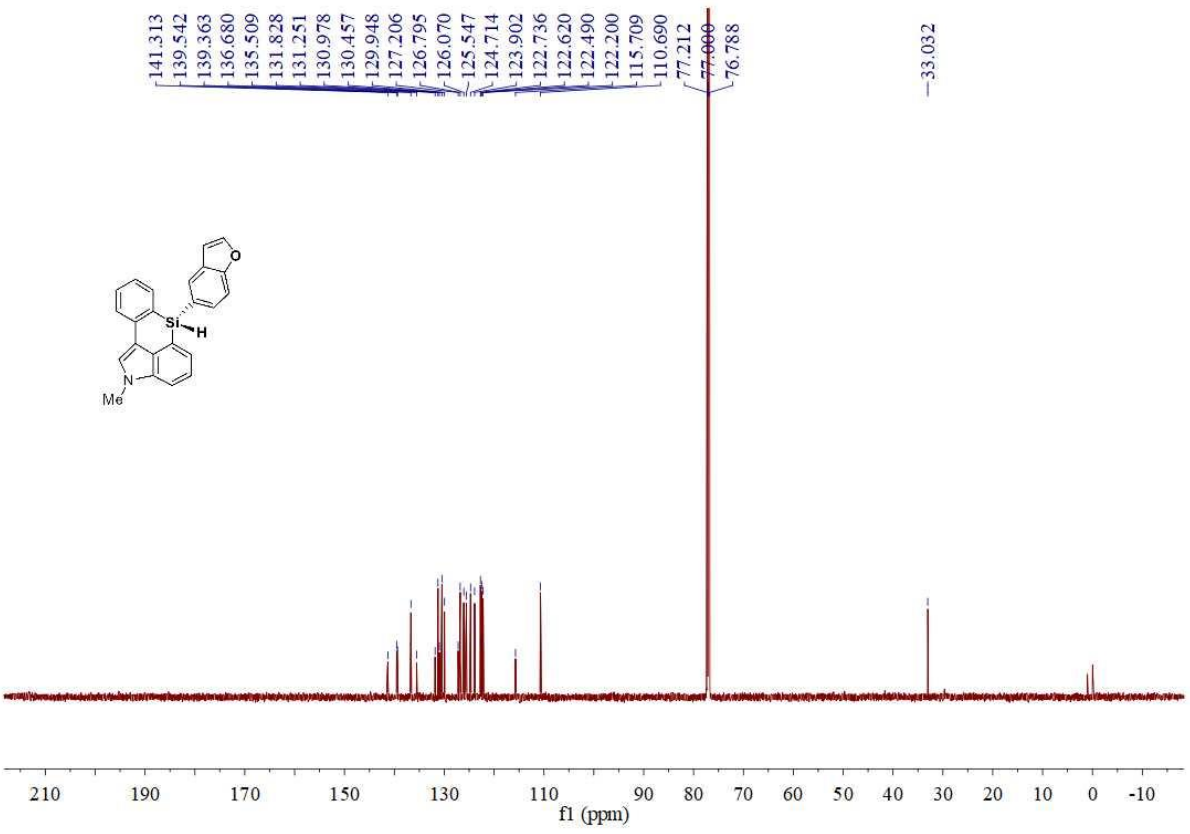
7.378
7.319
7.281
7.272
7.246
7.122
5.810
3.856
0.000
Si
H
O
N
Me
0.98
1.04
1.07
2.21
1.16
1.20
3.19
1.24
1.16
1.04
0.89
3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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126.070
125.547
124.714
123.902
122.736
122.620
122.490
122.200
115.709
110.690
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33.032
Si
H
O
N
Me
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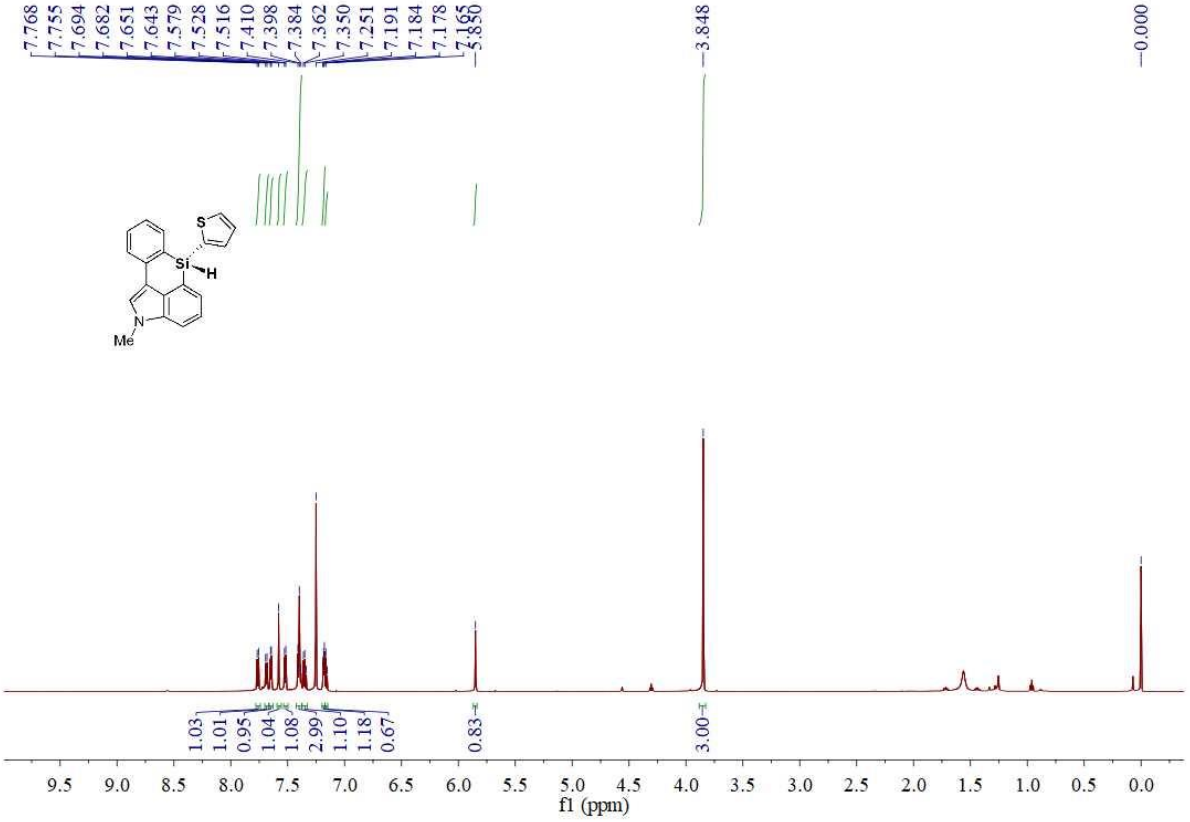
f1 (ppm)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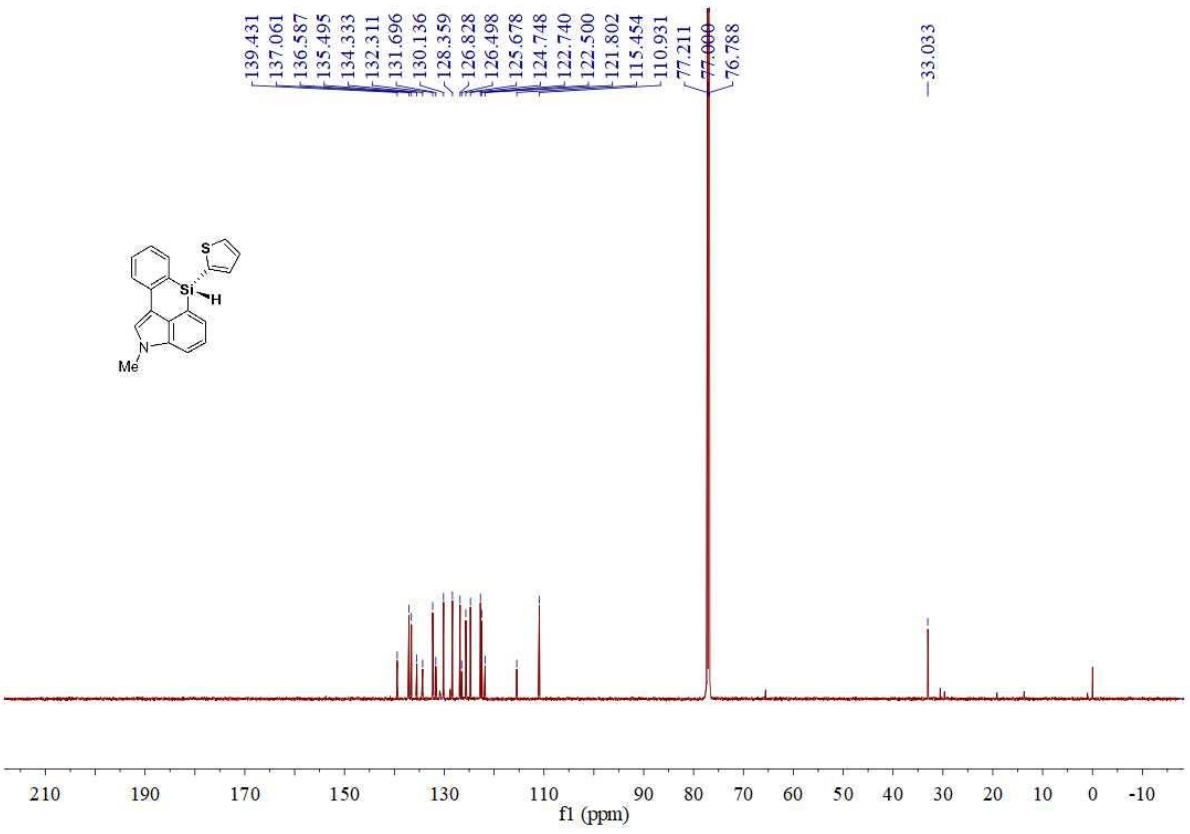
7.362
7.350
7.251
7.191
7.184
7.178
7.165
5.850
3.848
0.000
S
Si
H
N
Me
1.03
1.01
0.95
1.04
1.08
2.99
1.10
1.18
0.67
0.83
3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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122.740
122.500
121.802
115.454
110.931
77.211
77.000
76.788
33.033
S
Si
H
N
Me
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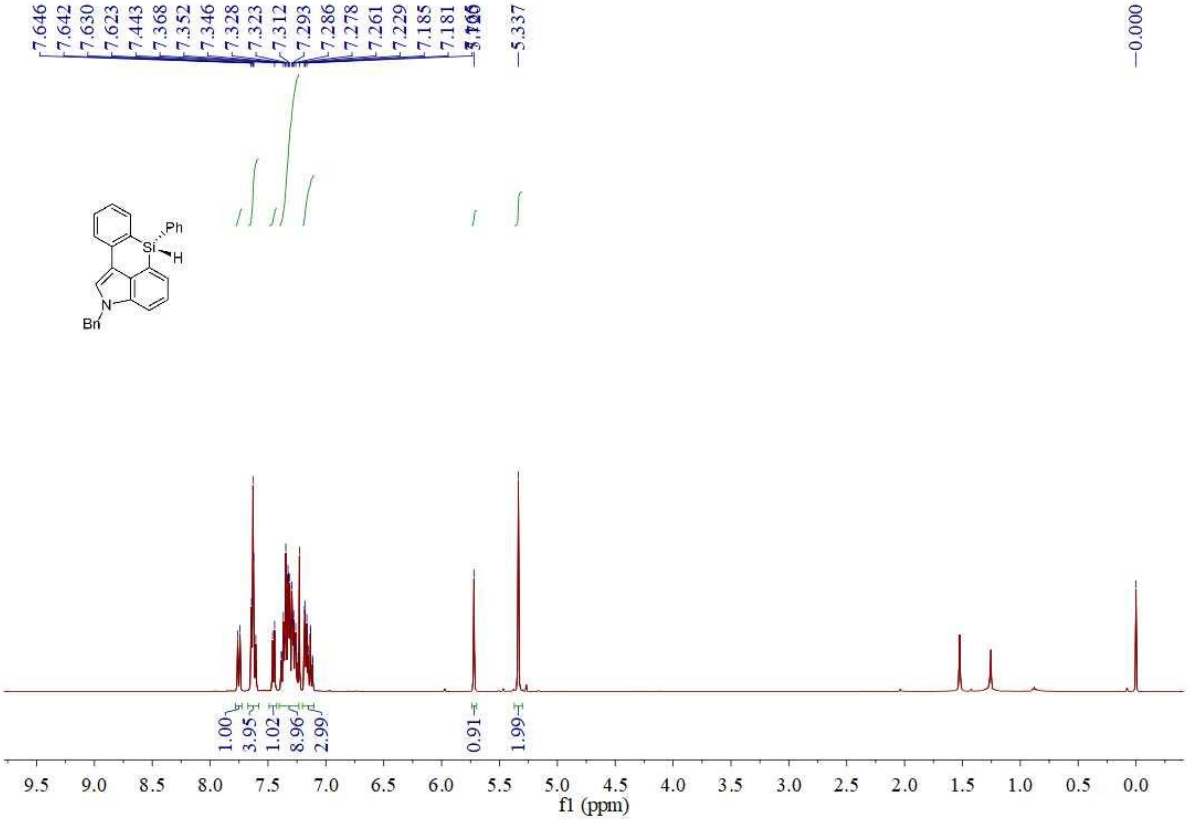
f1 (ppm)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7.642
7.630
7.623
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7.368
7.352
7.346
7.328
7.323
7.312
7.293
7.286
7.278
7.261
7.229
7.185
7.181
5.337
0.000
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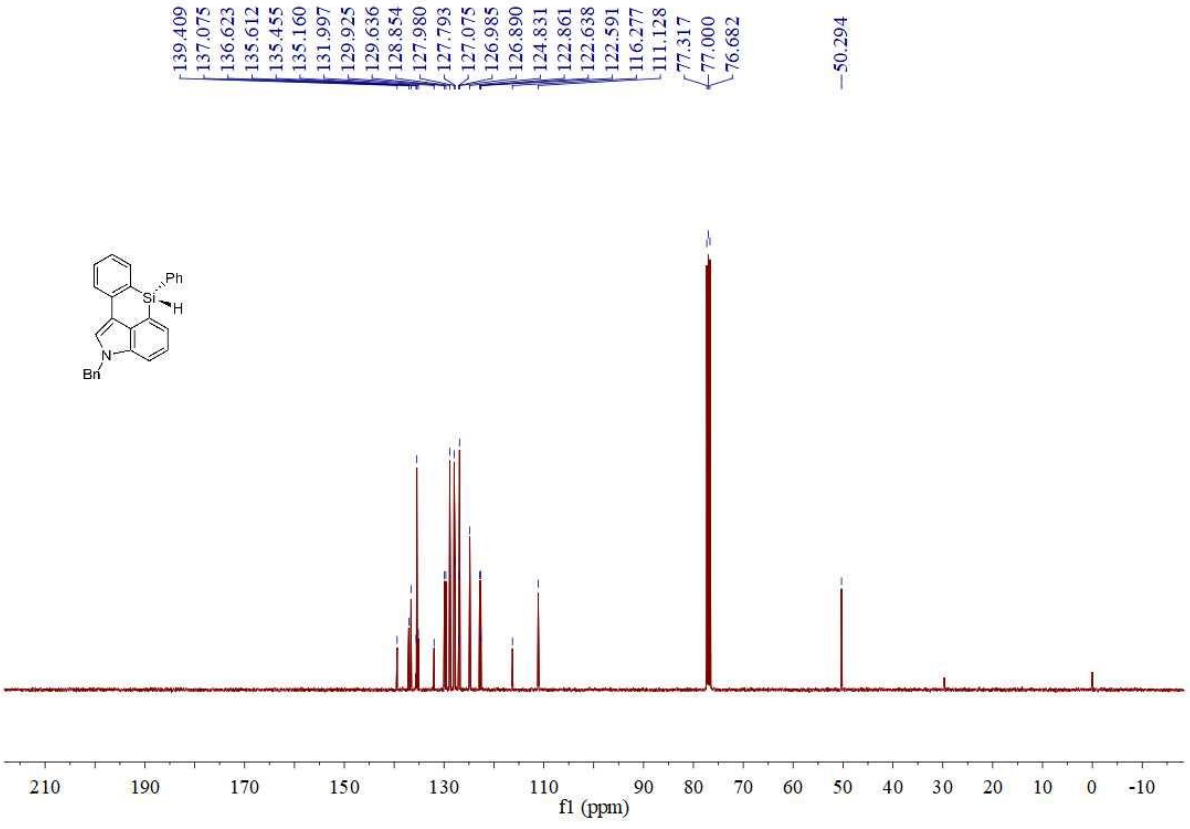
Si
H
N
Bn
1.00
3.95
1.02
8.96
2.99
0.91
1.99
f1 (ppm)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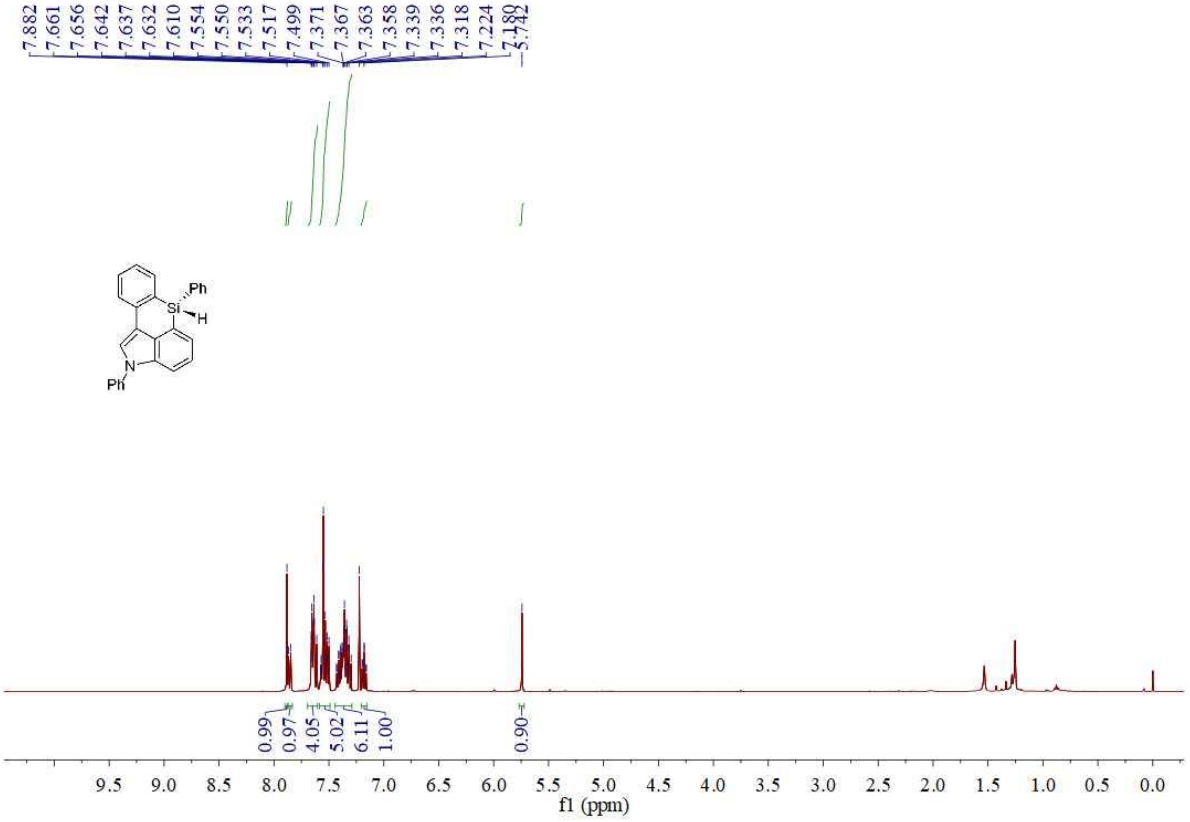
136.623
135.612
135.455
135.160
131.997
129.925
129.636
128.854
127.980
127.793
127.075
126.985
126.890
124.831
122.861
122.638
122.591
116.277
111.128
77.317
77.000
76.682
50.294
Ph
Si
H
N
Bn
f1 (ppm)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7.656
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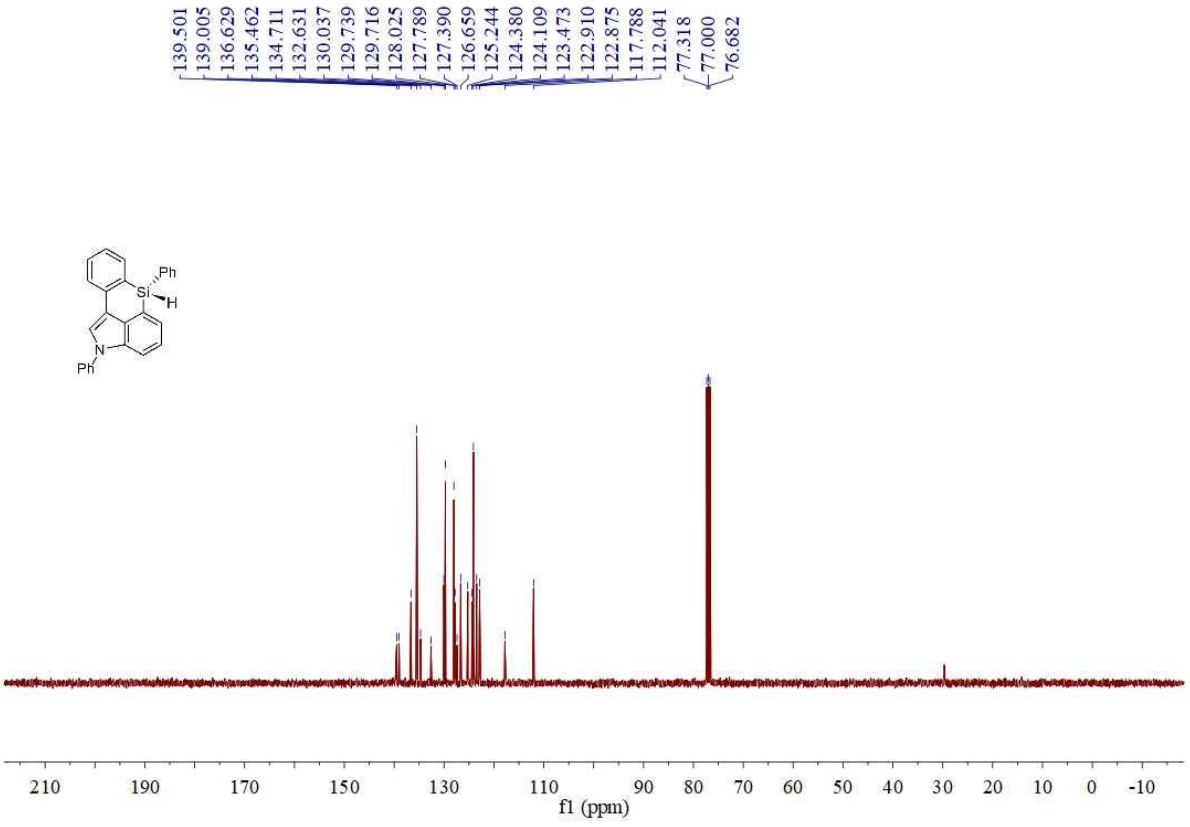
7.632
7.610
7.554
7.550
7.533
7.517
7.499
7.371
7.367
7.363
7.358
7.339
7.336
7.318
7.224
7.180
5.742
Ph
Si
H
N
Ph
0.99
0.97
4.05
5.02
6.11
1.00
0.90
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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139.005
136.629
135.462
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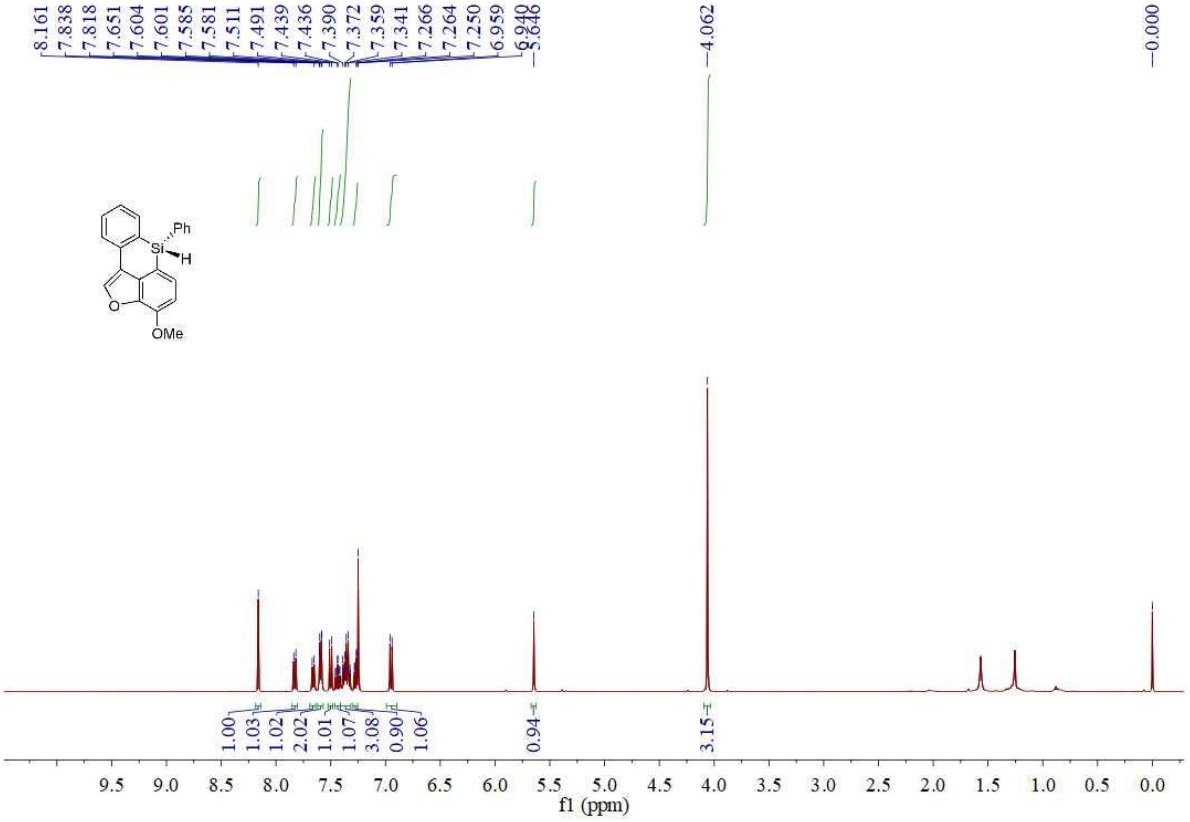
132.631
130.037
129.739
129.716
128.025
127.789
127.390
126.659
125.244
124.380
124.109
123.473
122.910
122.875
117.788
112.041
77.318
77.000
76.682
Ph
Si
H
N
Ph
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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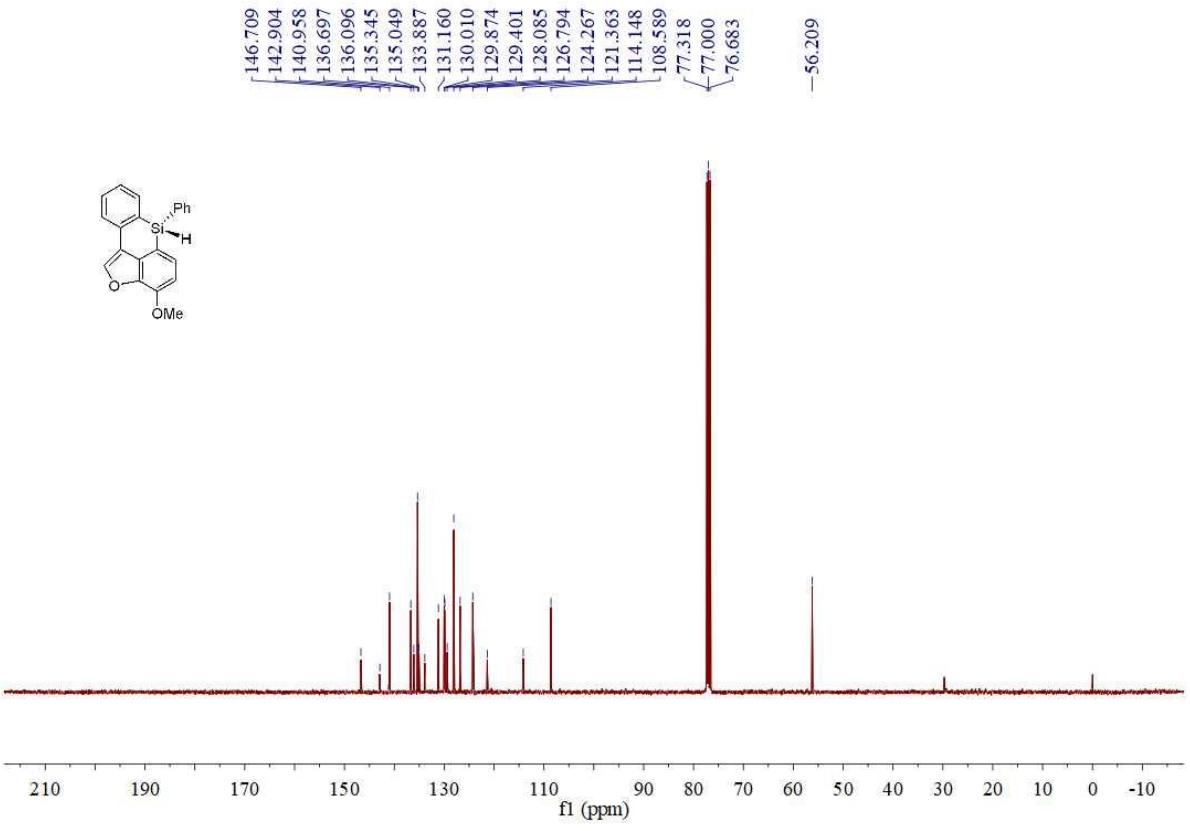
7.838
7.818
7.651
7.604
7.601
7.585
7.581
7.511
7.491
7.439
7.436
7.390
7.372
7.359
7.341
7.266
7.264
7.250
6.959
6.940
5.646
4.062
0.000
Ph
Si
H
O
OMe
1.00
1.03
1.02
2.02
1.01
1.07
3.08
0.90
1.06
0.94
3.15
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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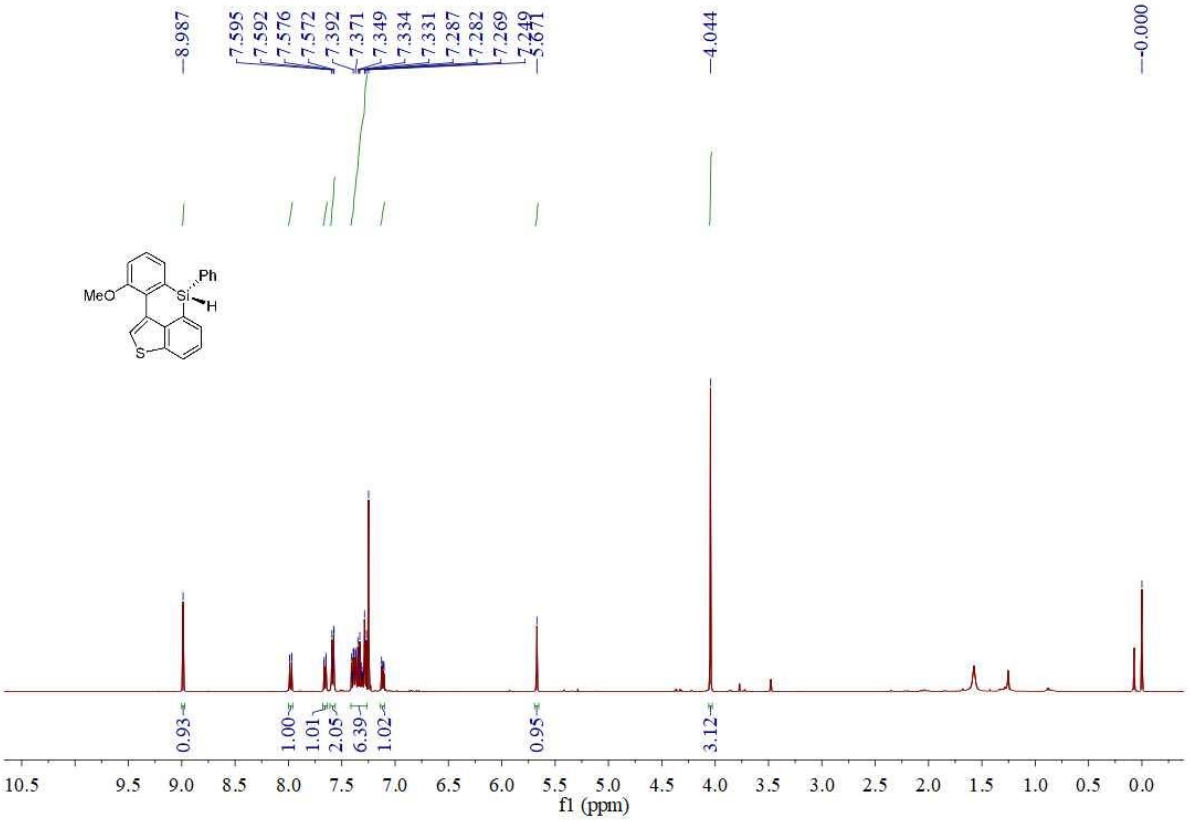
142.904
140.958
136.697
136.096
135.345
135.049
133.887
131.160
130.010
129.874
129.401
128.085
126.794
124.267
121.363
114.148
108.589
77.318
77.000
76.683
56.209
Ph
Si
H
O
OMe
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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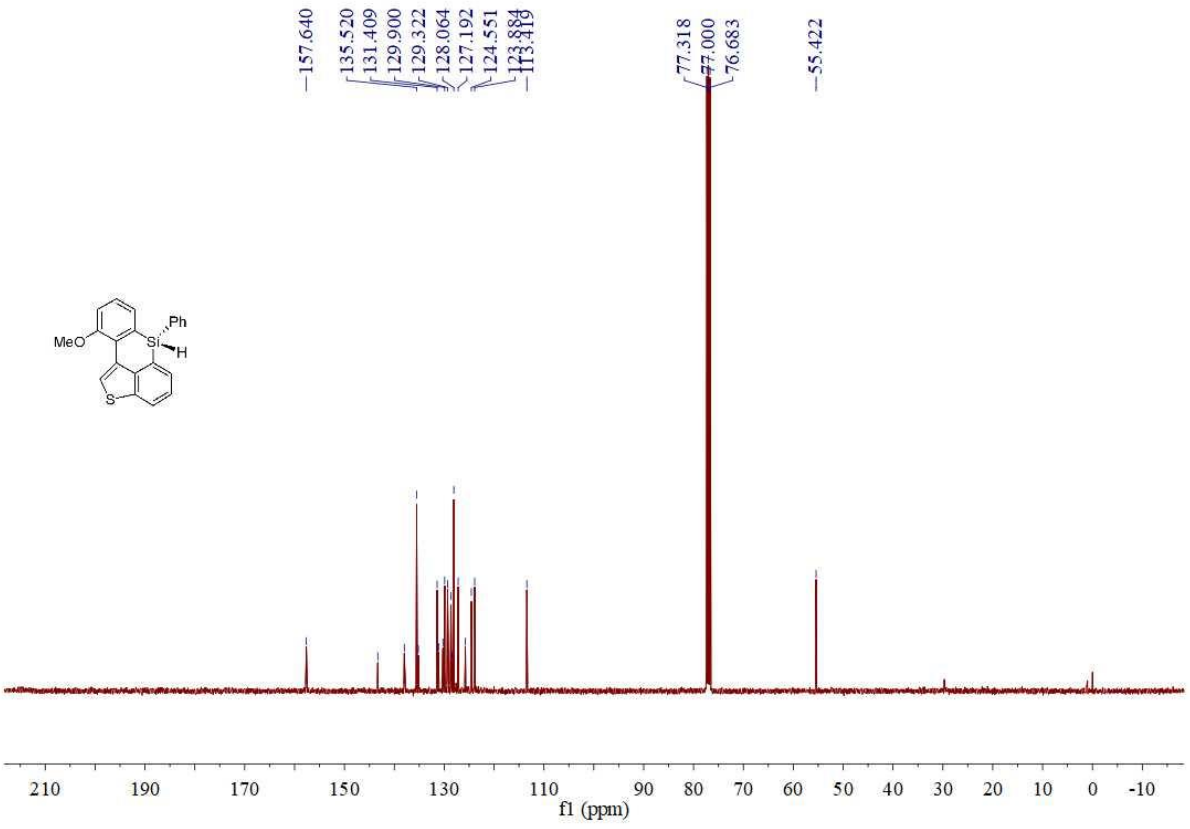
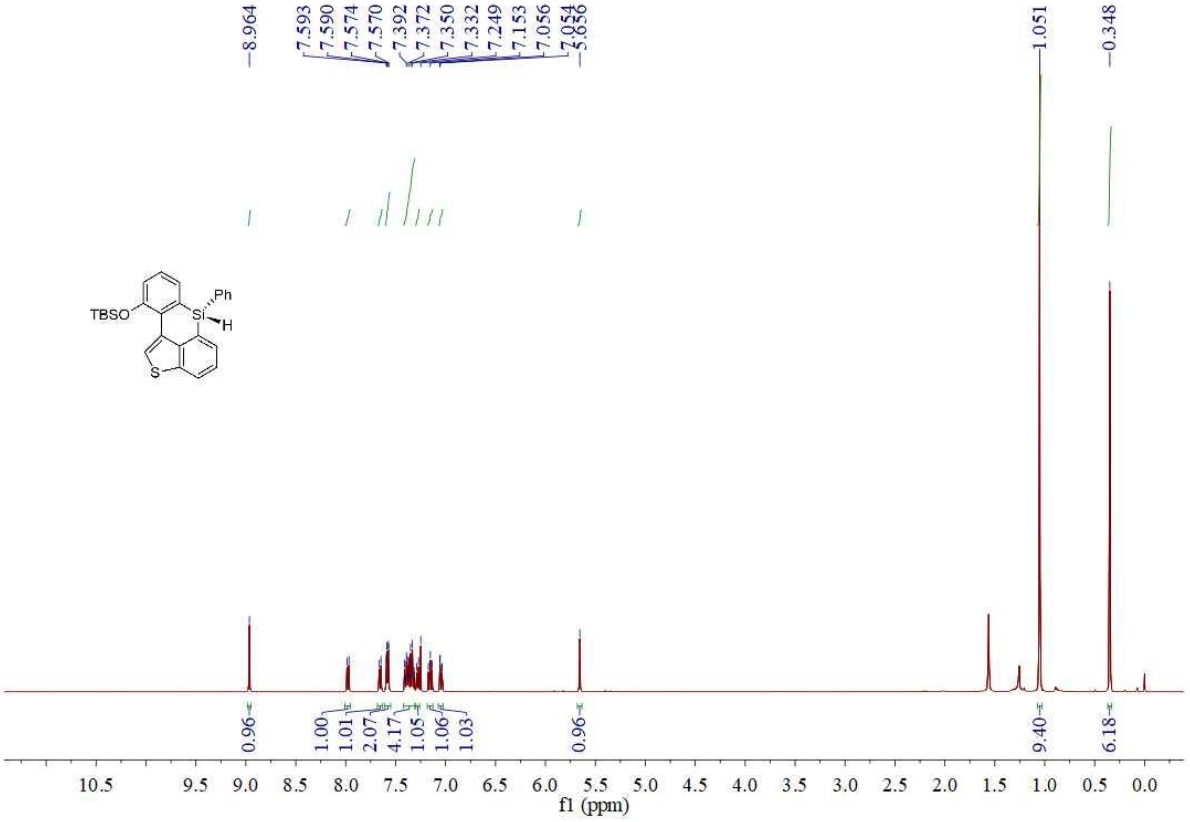
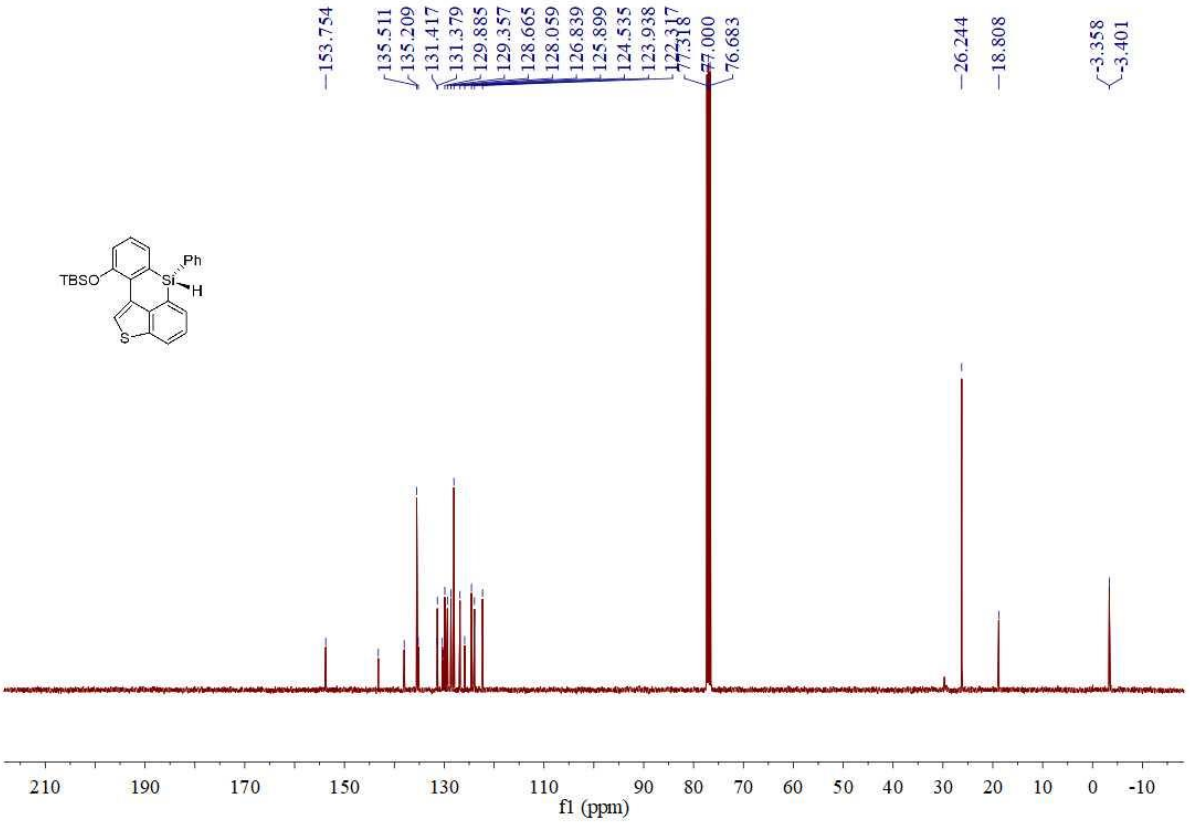
7.595
7.592
7.576
7.572
7.392
7.371
7.349
7.334
7.331
7.287
7.282
7.269
7.249
5.671
4.044
0.000
MeO
Ph
Si
H
S
0.93
1.00
1.01
2.05
6.39
1.02
0.95
3.12
f1 (ppm)


157.640
135.520
131.409
129.900
129.322
128.064
127.192
124.551
123.884
113.419
77.318
77.000
76.683
55.422
MeO
Ph
Si
H
S
f1 (ppm)


8.964
7.593
7.590
7.574
7.570
7.392
7.372
7.350
7.332
7.249
7.153
7.056
7.054
5.856
1.051
0.348
TBSO
Si
Ph
H
S
0.96
1.00
1.01
2.07
4.17
1.05
1.06
1.03
0.96
9.40
6.18
f1 (ppm)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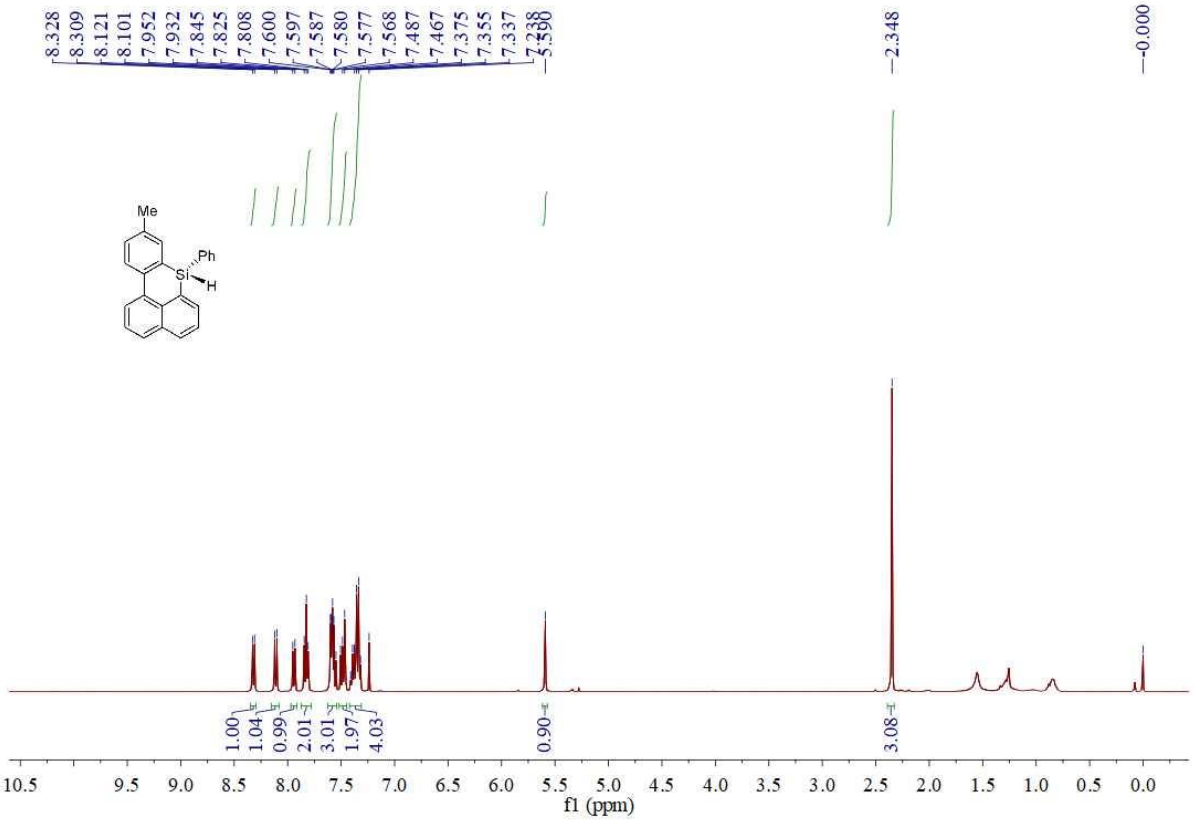
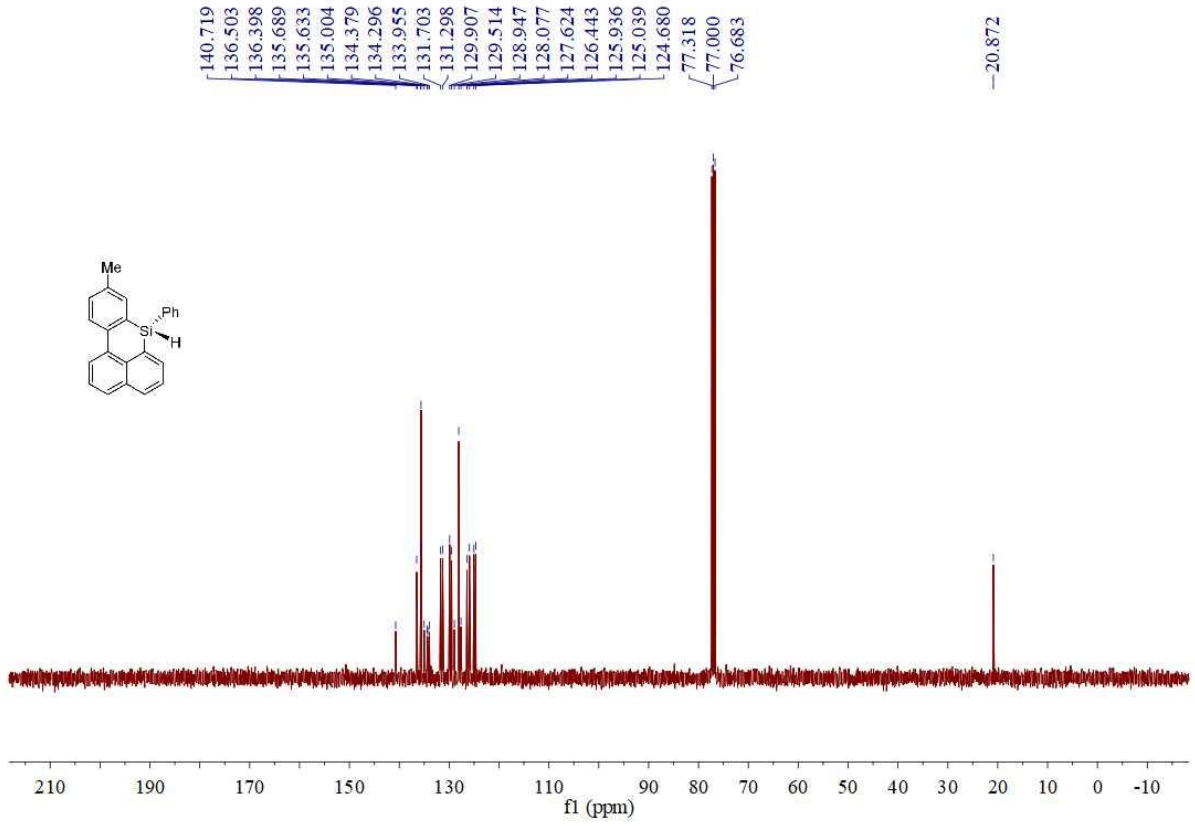
135.511
135.209
131.417
131.379
129.885
129.357
128.665
128.059
126.839
125.899
124.535
123.938
77.000
76.683
26.244
18.808
-3.358
-3.401
TBSO
Si
Ph
H
S
f1 (ppm)


8.328
8.309
8.121
8.101
7.952
7.932
7.845
7.825
7.808
7.600
7.597
7.587
7.580
7.577
7.568
7.487
7.467
7.375
7.355
7.337
7.238
5.530
2.348
0.000
Me
Ph
Si
H
1.00
1.04
0.99
2.01
3.01
1.97
4.03
0.90
3.08
10.5
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
f1 (ppm)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136.398
135.689
135.633
135.004
134.379
134.296
133.955
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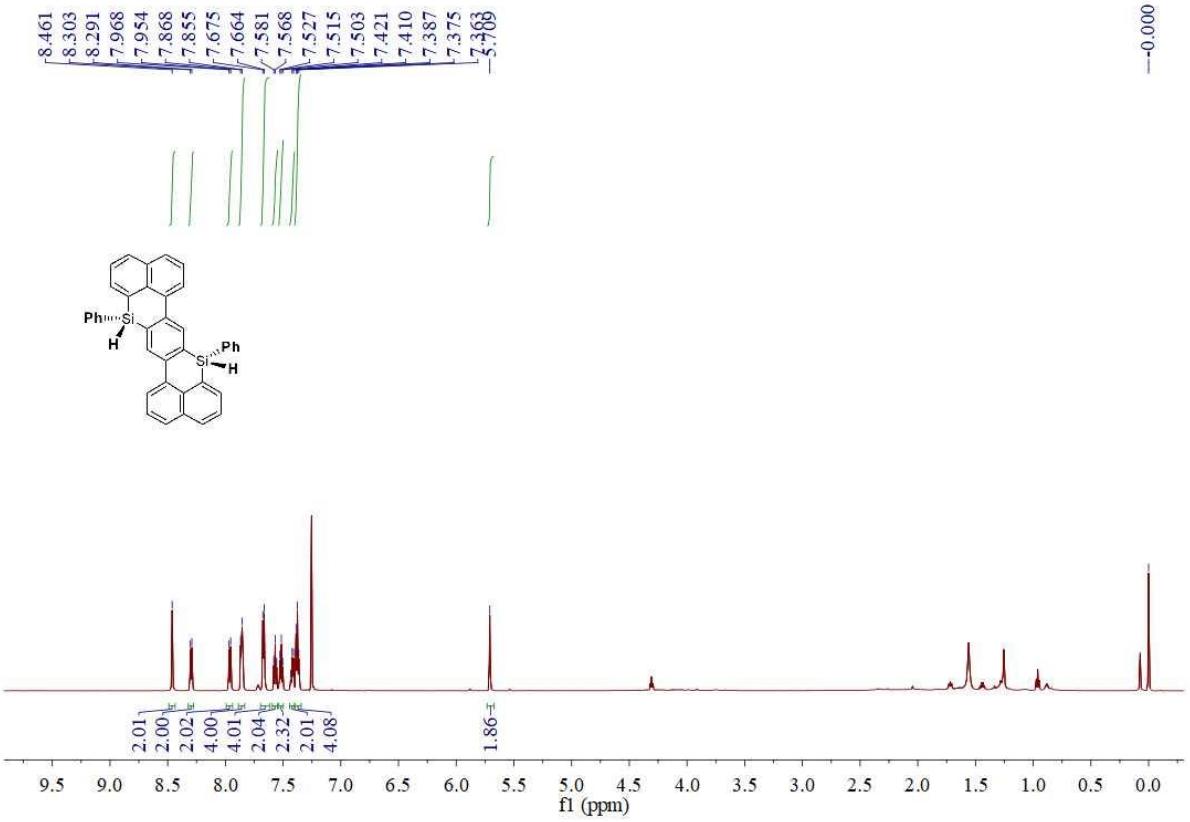
129.907
129.514
128.947
128.077
127.624
126.443
125.936
125.039
124.680
77.318
77.000
76.683
20.872
Me
Ph
Si
H
210
190
170
150
130
110
90
80
70
60
50
40
30
20
10
0
-10
f1 (ppm)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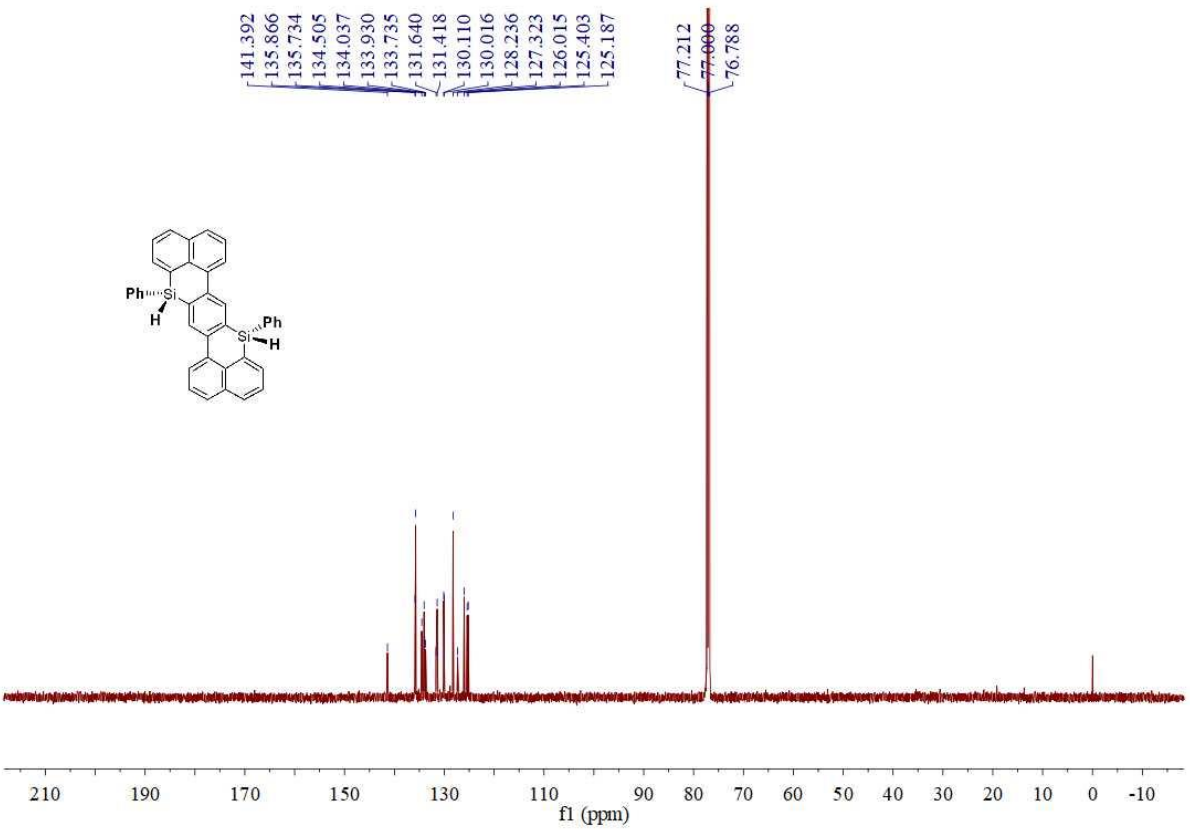
8.303
8.291
7.968
7.954
7.868
7.855
7.675
7.664
7.581
7.568
7.527
7.515
7.503
7.421
7.410
7.387
7.375
5.709
0.000
Ph
Si
H
Ph
Si
H
2.01
2.00
2.02
4.00
4.01
2.04
2.32
2.01
4.08
1.86
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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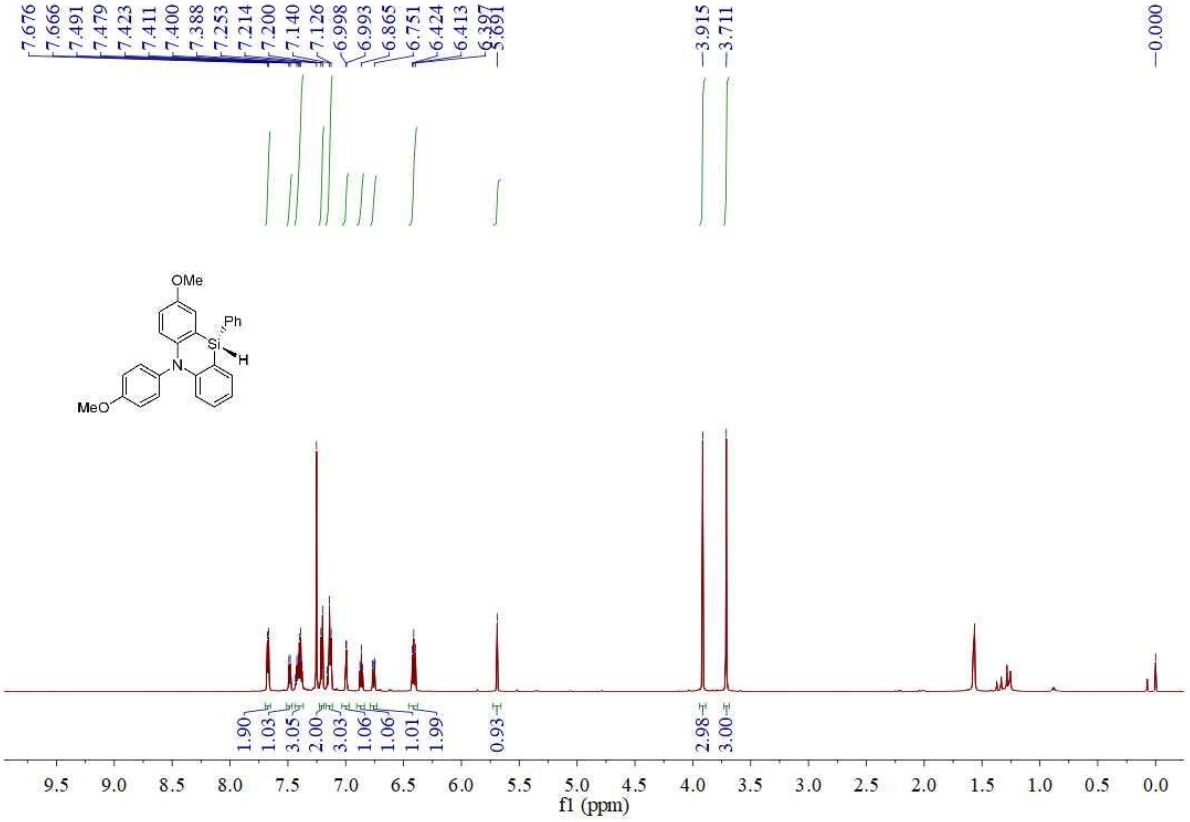
135.734
134.505
134.037
133.930
133.735
131.640
131.418
130.110
130.016
128.236
127.323
126.015
125.403
125.187
77.212
77.000
76.788
Ph
Si
H
Ph
Si
H
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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7.479
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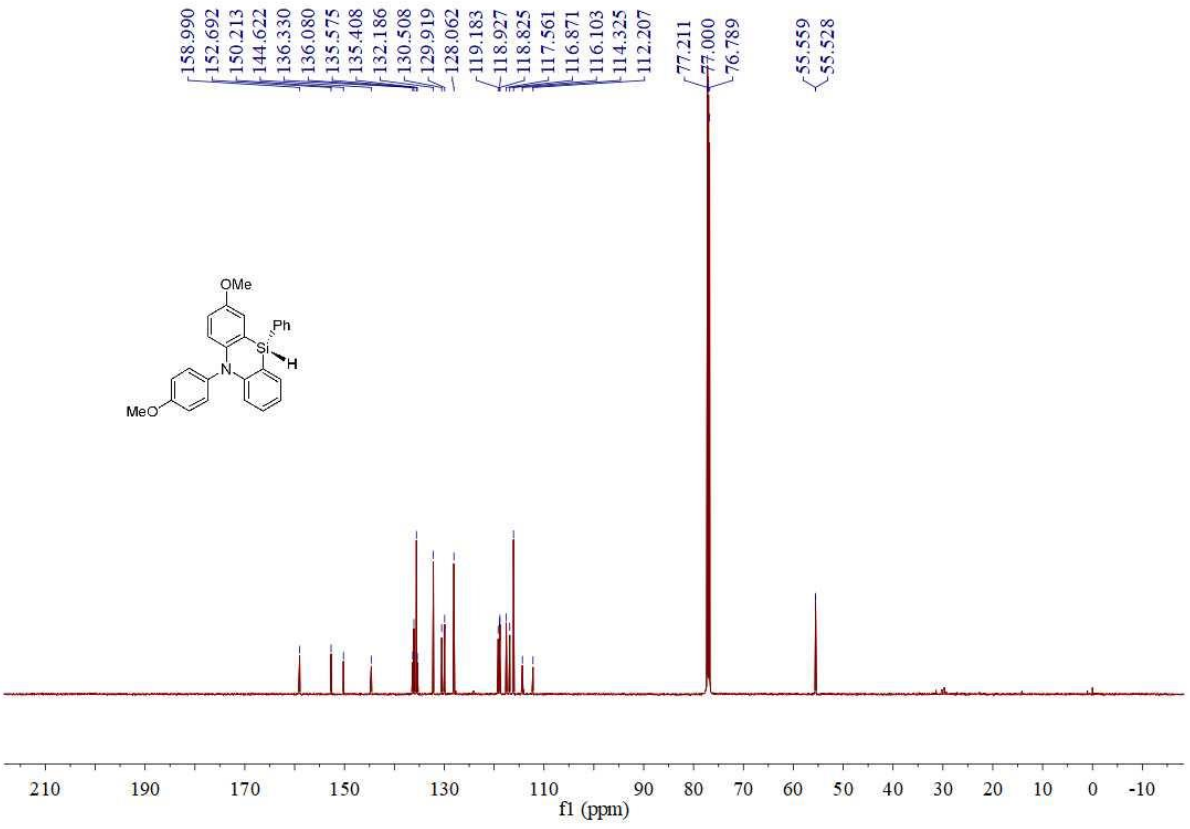
7.411
7.400
7.388
7.253
7.214
7.200
7.140
7.126
6.998
6.993
6.865
6.751
6.424
6.413
6.397
5.891
3.915
3.711
0.000
OMe
Ph
Si
H
N
MeO
1.90
1.03
3.05
2.00
3.03
1.06
1.06
1.01
1.99
0.93
2.98
3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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135.575
135.408
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129.919
128.062
119.183
118.927
118.825
117.561
116.871
116.103
114.325
112.207
77.211
77.000
76.789
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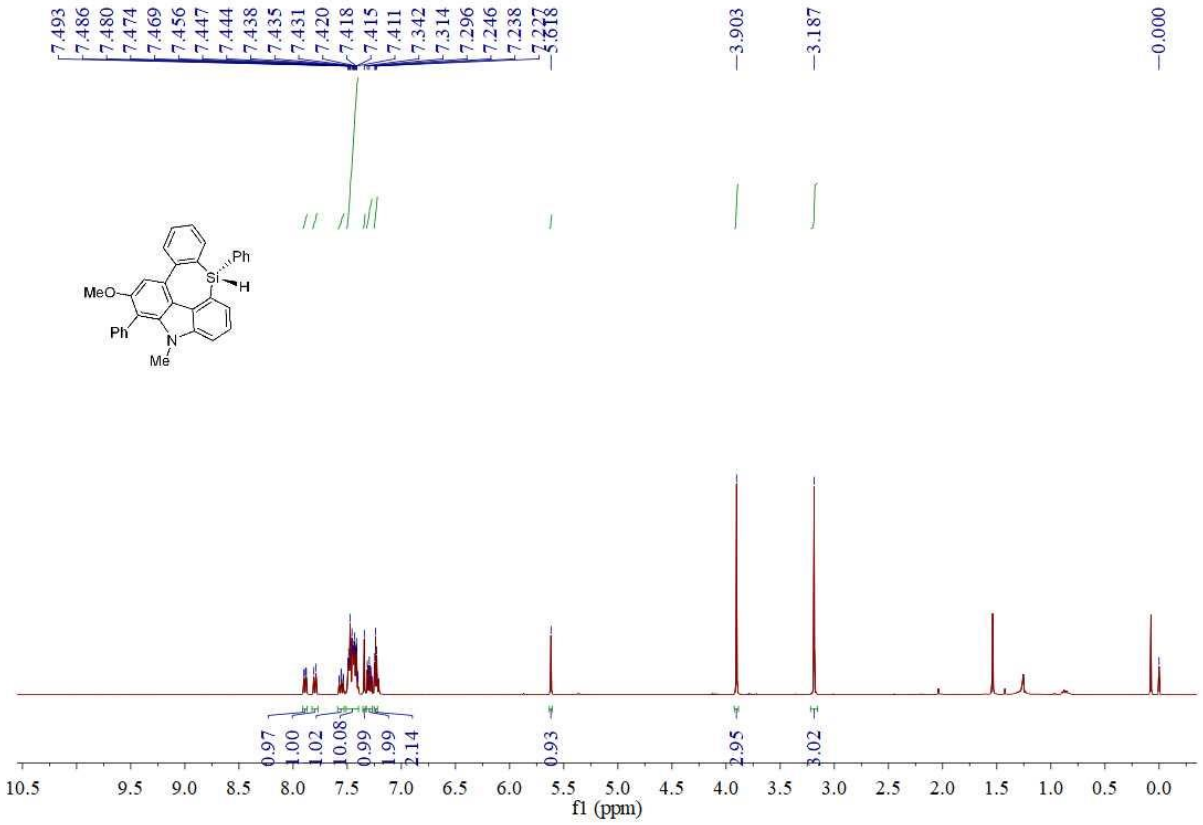
55.528
OMe
Ph
Si
H
N
MeO
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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7.444
7.438
7.435
7.431
7.420
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7.415
7.411
7.342
7.314
7.296
7.246
7.238
7.227
5.618
3.903
3.187
0.000
Ph
Si
H
MeO
Ph
N
Me
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1.02
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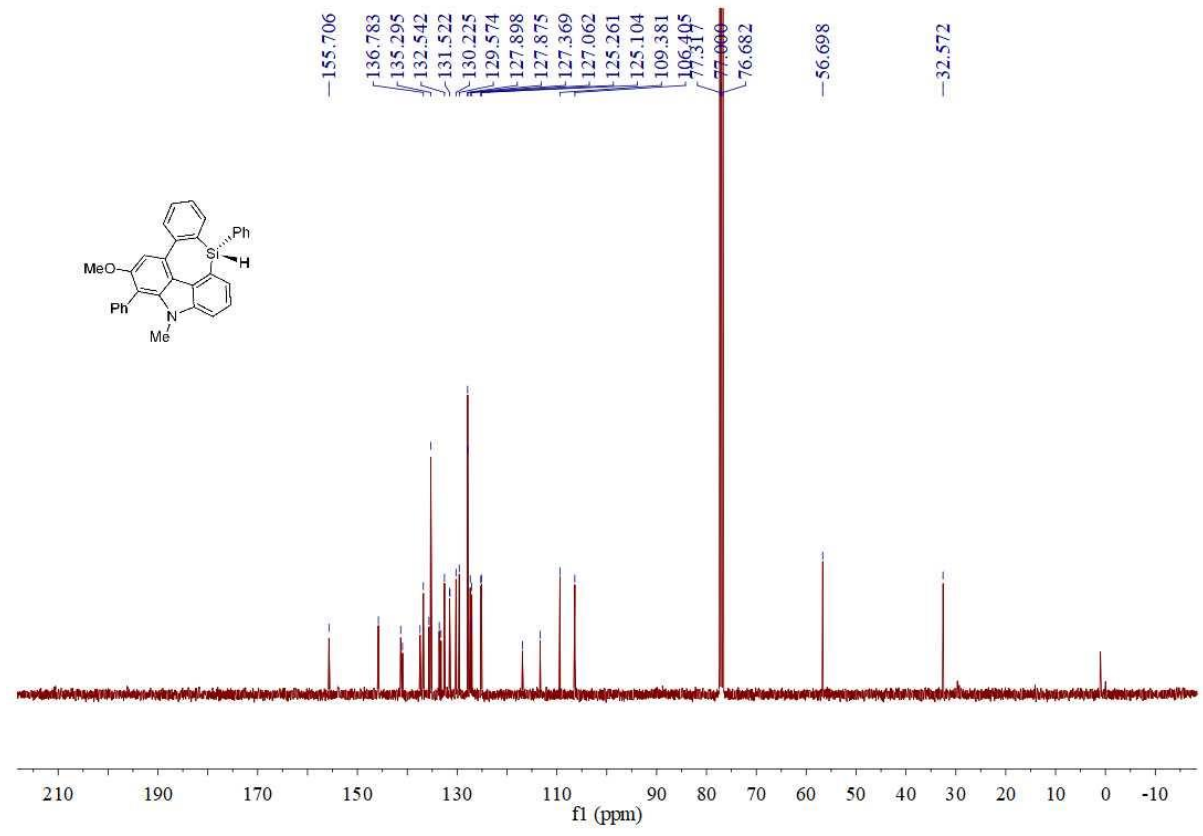
2.14
0.93
2.95
3.02
f1 (ppm)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135.295
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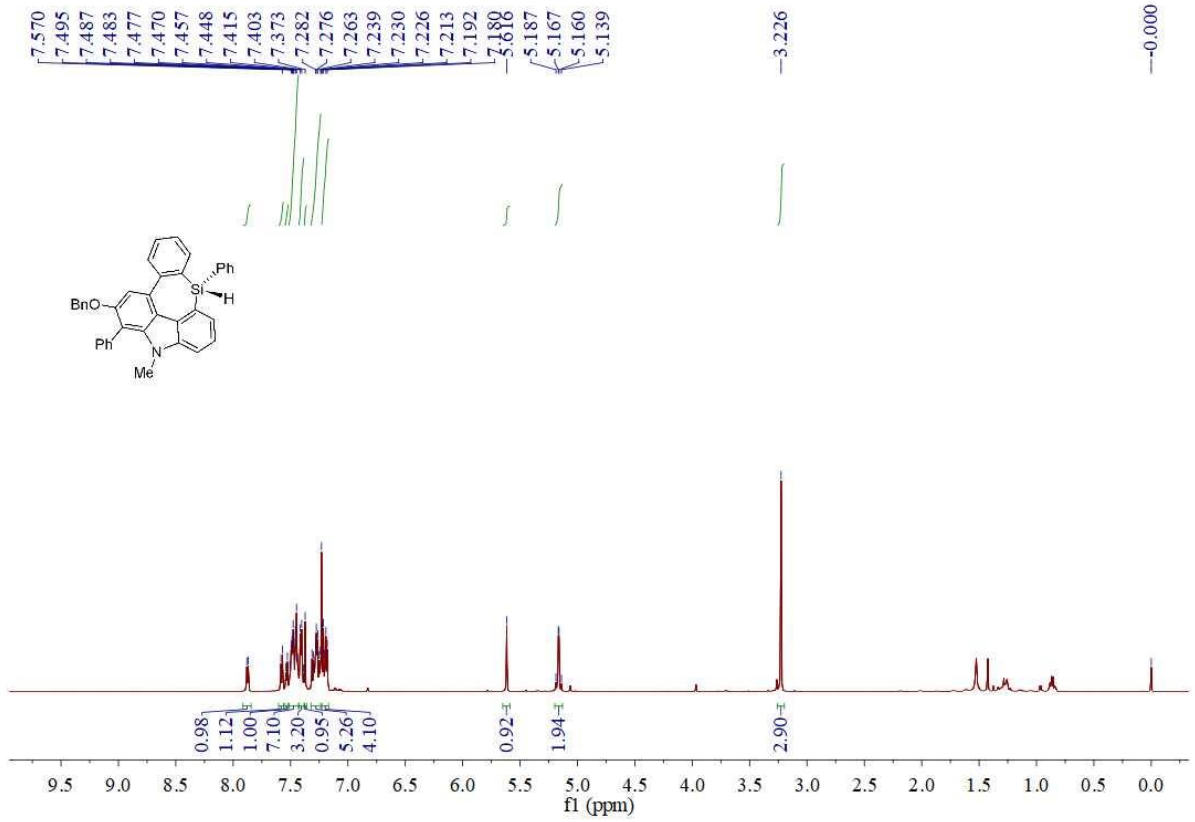
131.522
130.225
129.574
127.898
127.875
127.369
127.062
125.261
125.104
109.381
106.405
77.317
77.000
76.682
56.698
32.572
Ph
Si
H
MeO
Ph
N
Me
f1 (ppm)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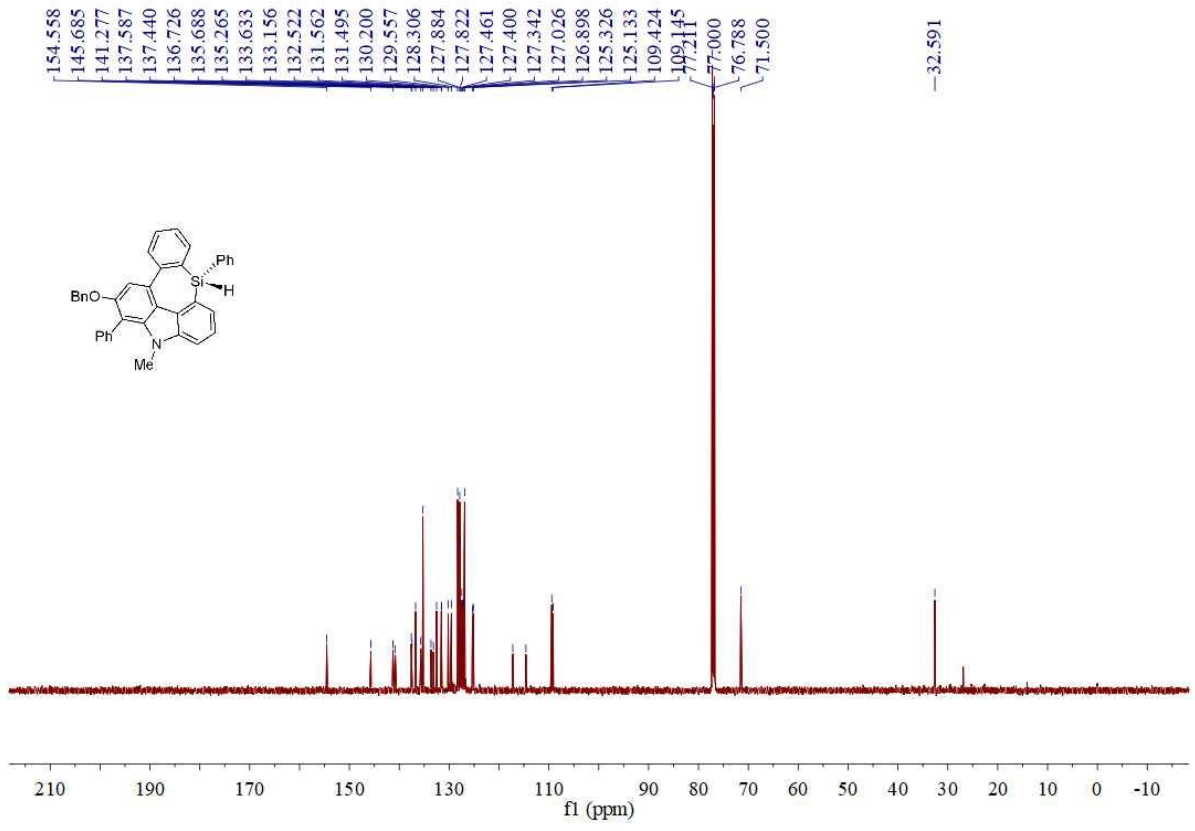
7.448
7.415
7.403
7.373
7.282
7.276
7.263
7.239
7.230
7.226
7.213
7.192
7.180
5.618
5.187
5.167
5.160
5.139
3.226
0.000
Ph
Si
H
BnO
Ph
N
Me
0.98
1.12
1.00
7.10
3.20
0.95
5.26
4.10
0.92
1.94
2.90
f1 (ppm)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137.440
136.726
135.688
135.265
133.633
133.156
132.522
131.562
131.495
130.200
129.557
128.306
127.884
127.822
127.461
127.400
127.342
127.026
126.898
125.326
125.133
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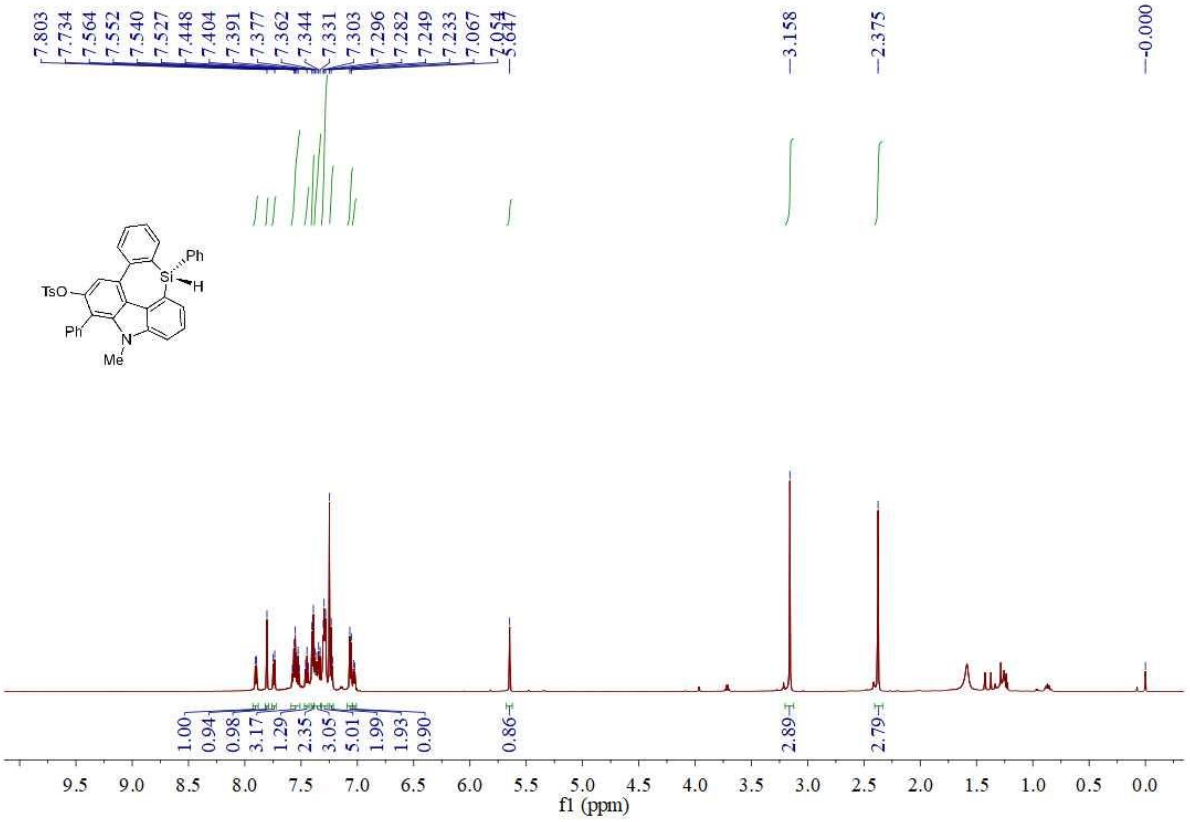
Ph
Si
H
BnO
Ph
N
Me
f1 (ppm)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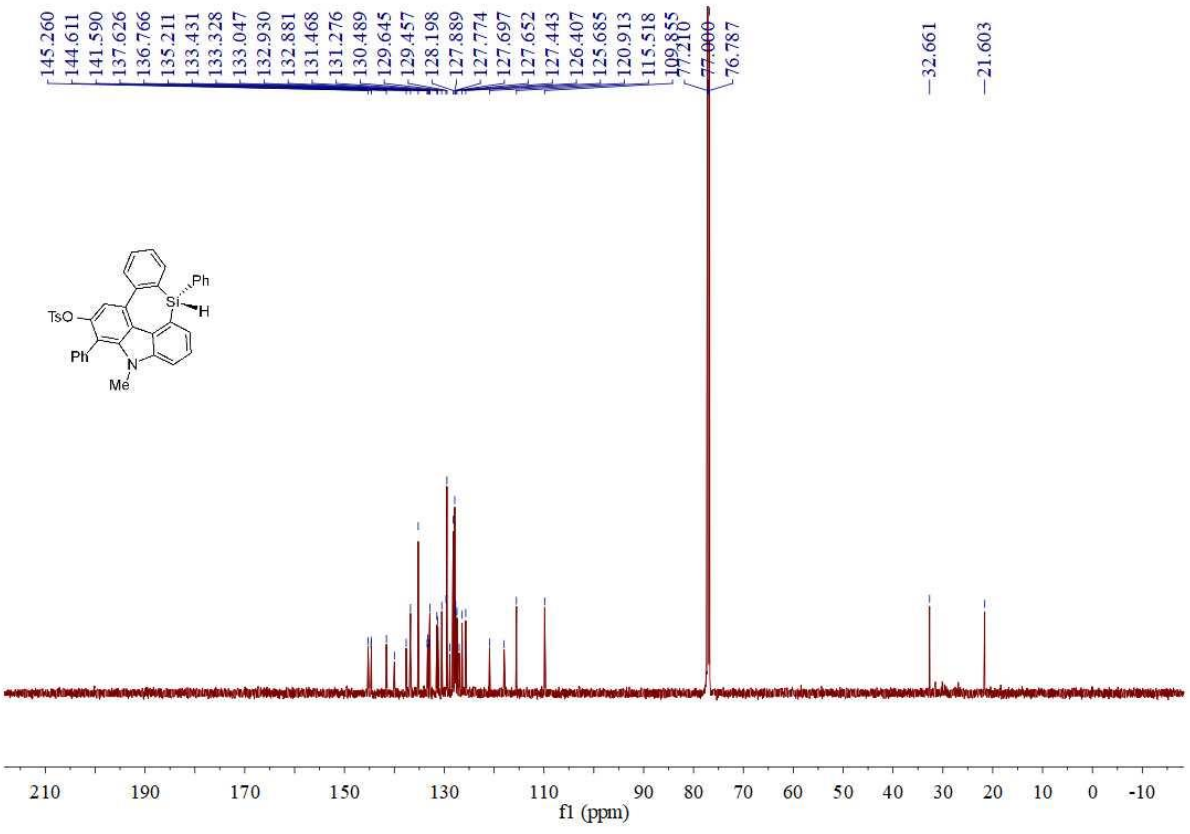
7.527
7.448
7.404
7.391
7.377
7.362
7.344
7.331
7.303
7.296
7.282
7.249
7.233
7.067
7.054
5.047
3.158
2.375
0.000
Ph
Si
H
TsO
Ph
N
Me
1.00
0.94
0.98
3.17
1.29
2.35
3.05
5.01
1.99
1.93
0.90
0.86
2.89
2.79
f1 (ppm)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135.211
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133.328
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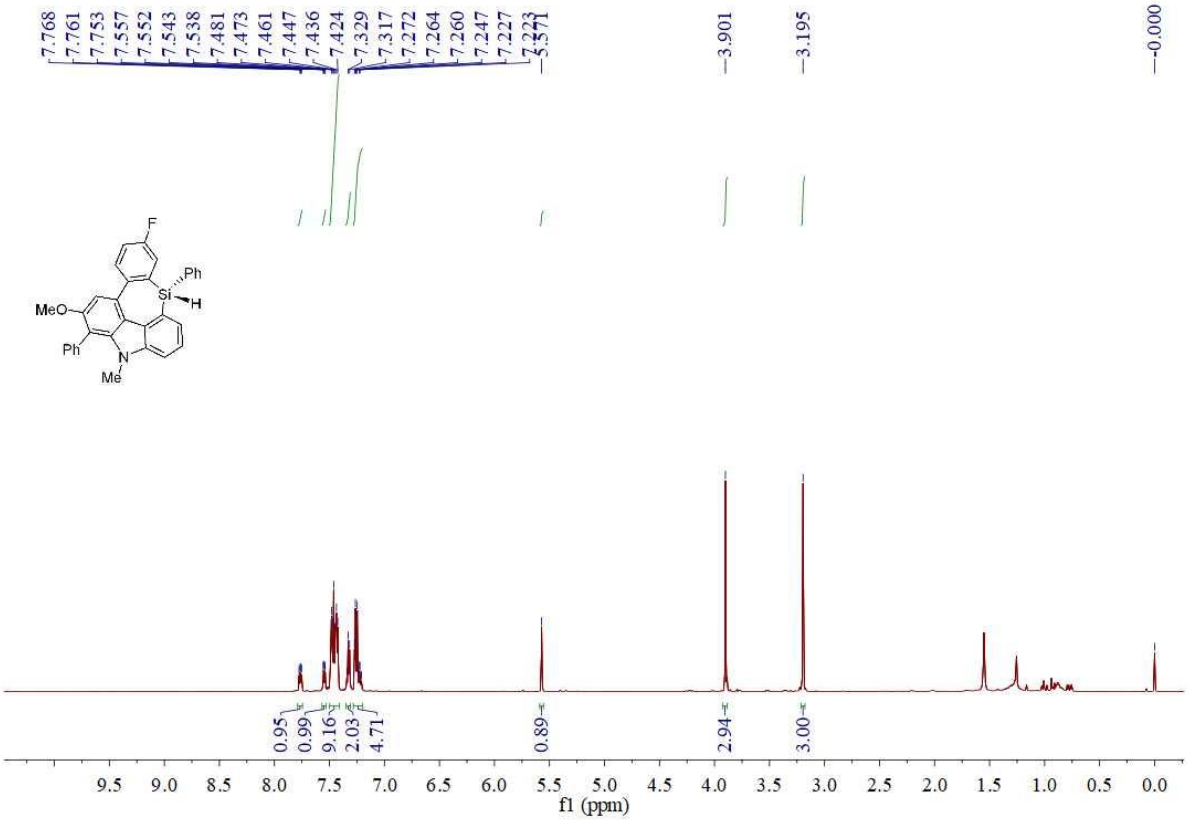
132.881
131.468
131.276
130.489
129.645
129.457
128.198
127.889
127.774
127.697
127.652
127.443
126.407
125.685
120.913
115.518
109.855
77.210
77.000
76.787
32.661
21.603
Ph
Si
H
TsO
Ph
N
Me
f1 (ppm)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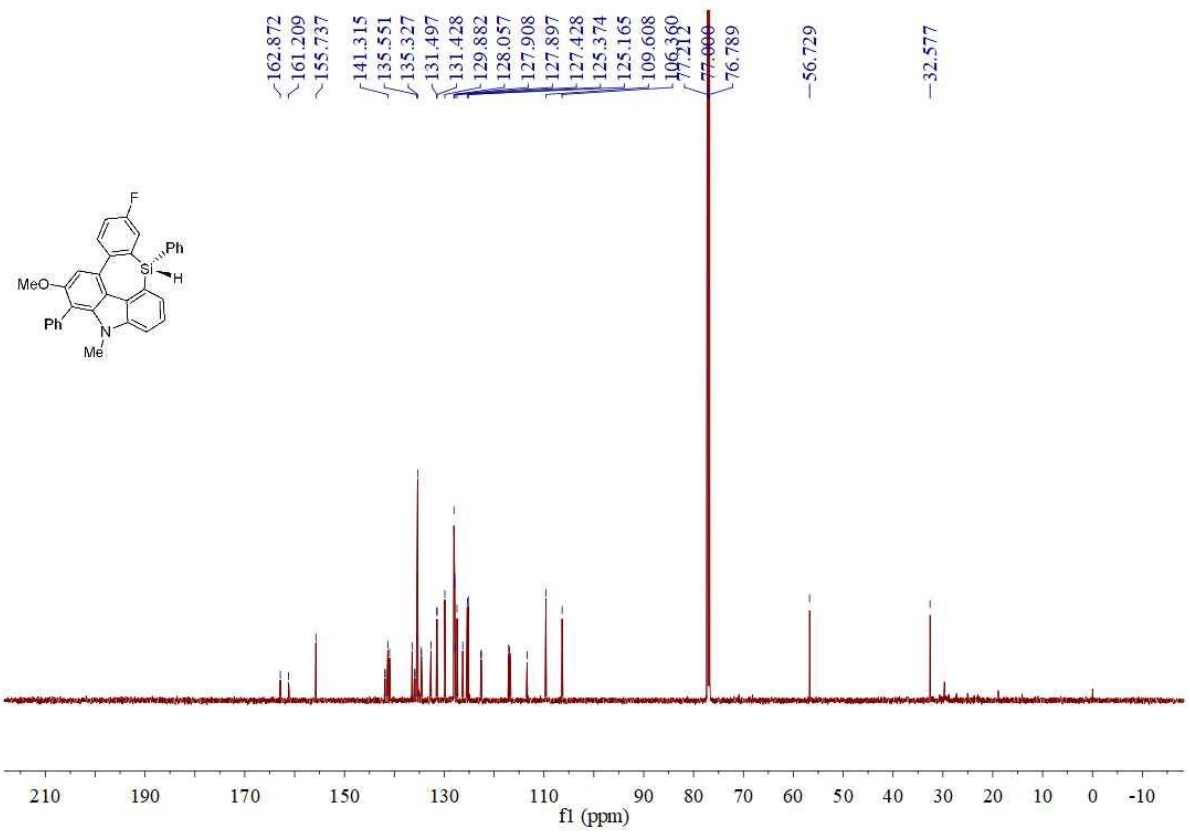
7.447
7.436
7.424
7.329
7.317
7.272
7.264
7.260
7.247
7.227
7.223
3.901
3.195
0.000
F
Ph
Si
H
MeO
Ph
N
Me
0.95
0.99
9.16
2.03
4.71
0.89
2.94
3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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135.327
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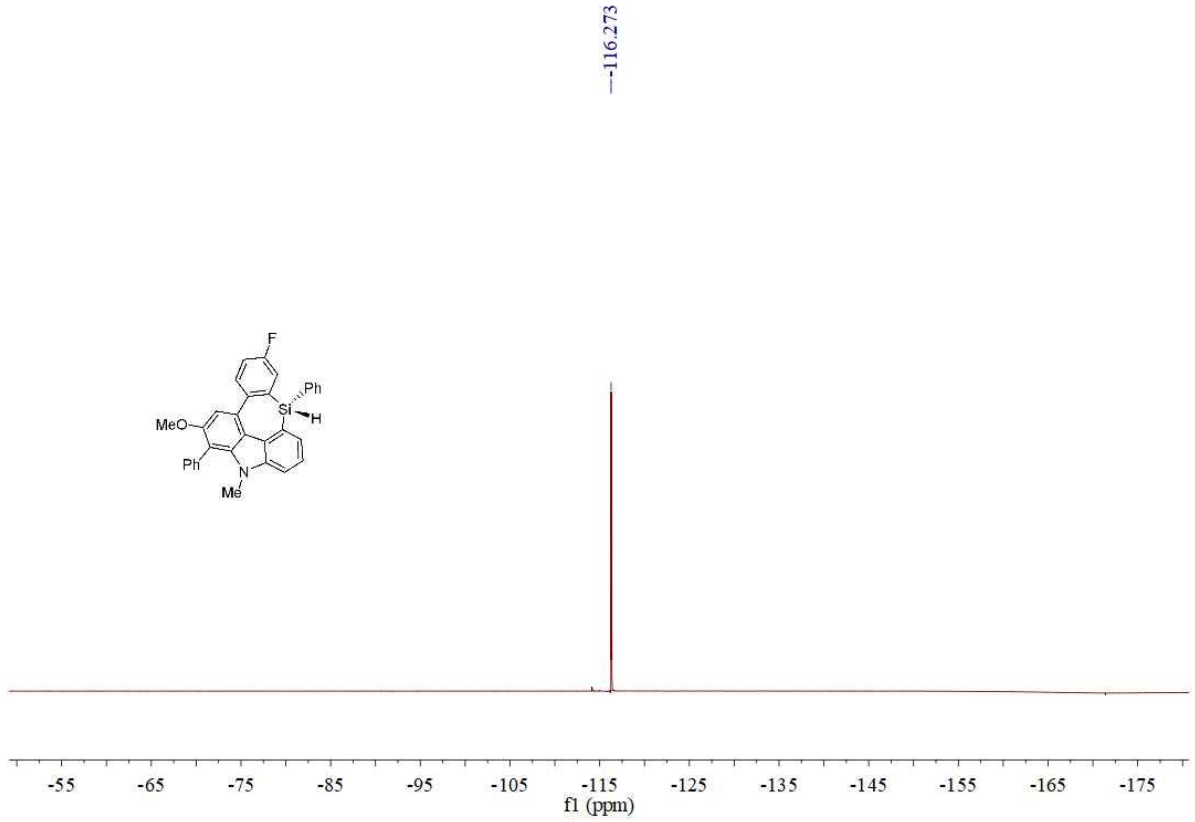
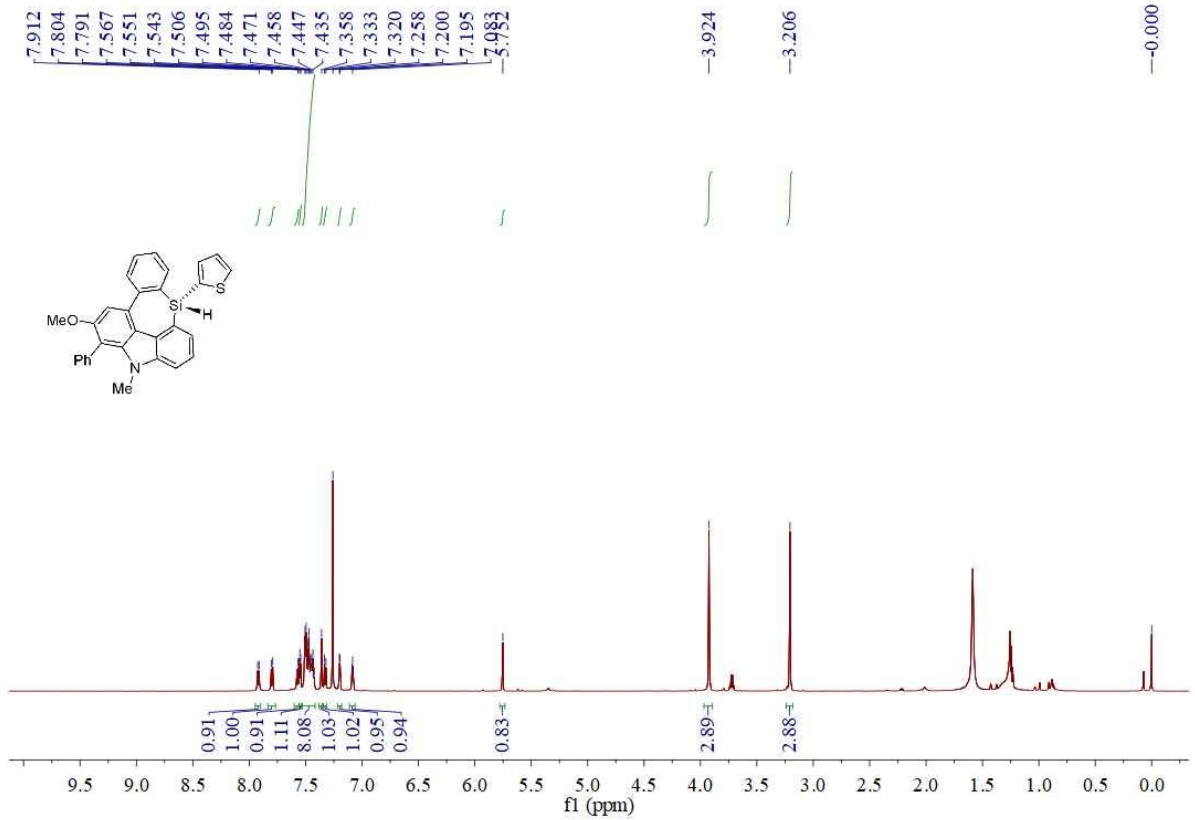
128.057
127.908
127.897
127.428
125.374
125.165
109.608
106.360
77.212
77.000
76.789
56.729
32.577
F
Ph
Si
H
MeO
Ph
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


-116.273
F
Ph
Si
H
MeO
Ph
N
Me
-55
-65
-75
-85
-95
-105
-115
-125
-135
-145
-155
-165
-175
f1 (ppm)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7.543
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7.358
7.333
7.320
7.258
7.200
7.195
3.924
3.206
0.000
MeO
Ph
N
Me
Si
H
S
0.91
1.00
0.91
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1.03
1.02
0.95
0.94
0.83
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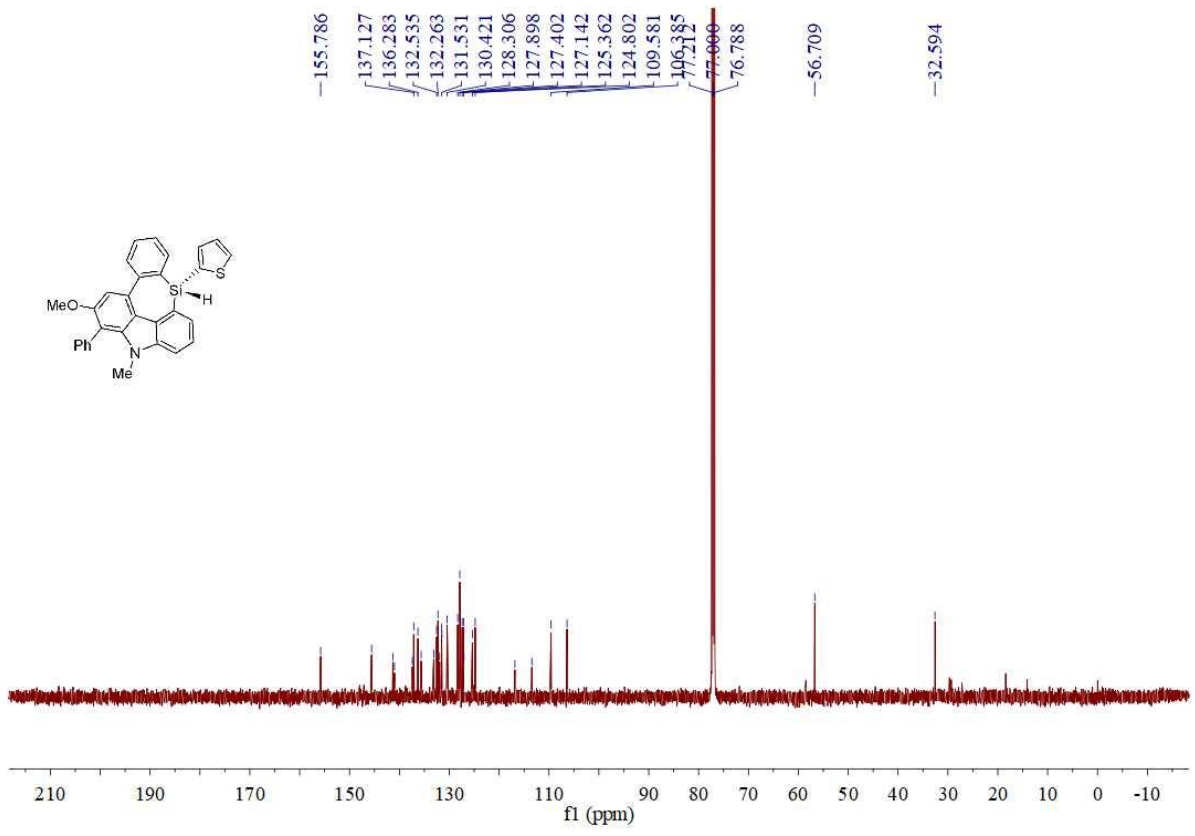
2.88
f1 (ppm)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124.802
109.581
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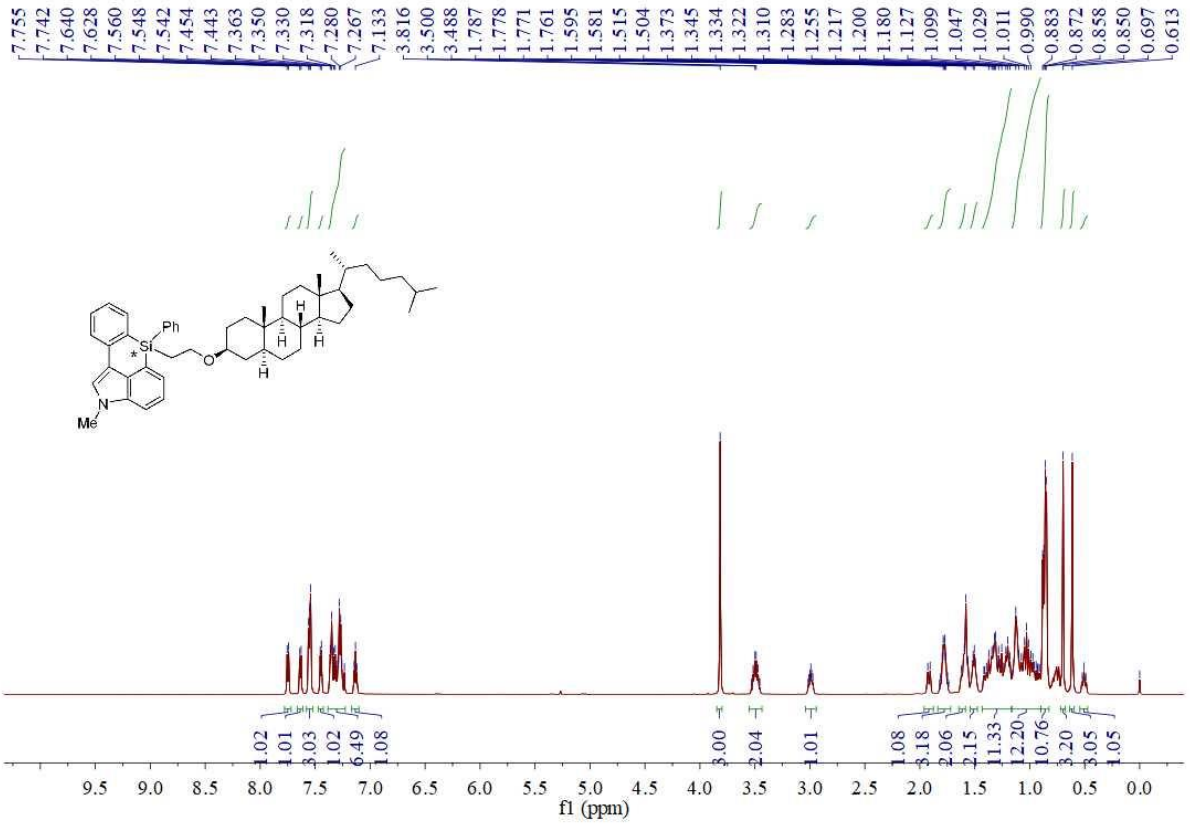
77.000
76.788
56.709
32.594
MeO
Ph
N
Me
Si
H
S
f1 (ppm)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7.330
7.318
7.280
7.267
7.133
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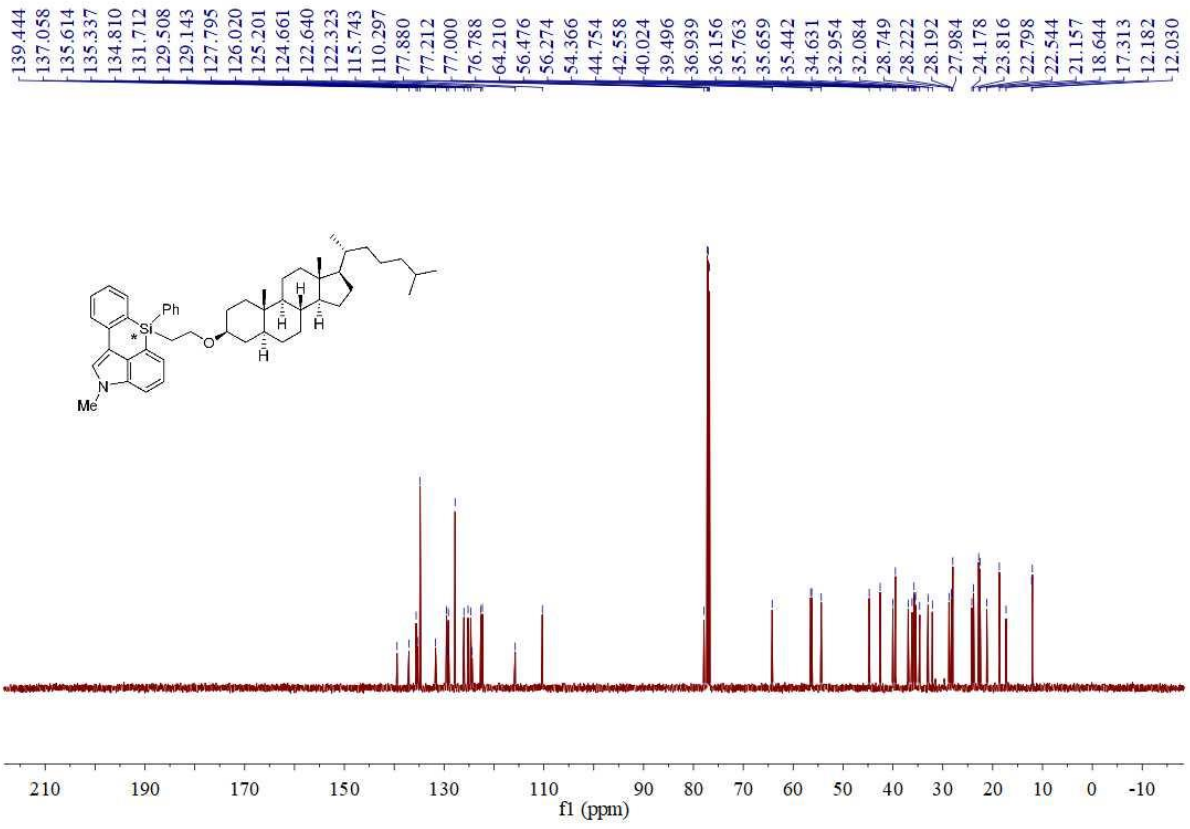
3.500
3.488
1.787
1.778
1.771
1.761
1.595
1.581
1.515
1.504
1.373
1.345
1.334
1.322
1.310
1.283
1.255
1.217
1.200
1.180
1.127
1.099
1.047
1.029
1.011
0.990
0.883
0.872
0.858
0.850
0.697
0.613
Ph
Si
O
H
H
H
N
Me
1.02
1.01
3.03
1.02
6.49
1.08
3.00
2.04
1.01
1.08
3.18
2.06
2.15
11.33
12.20
10.76
3.20
3.05
1.05
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
f1 (ppm)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110.297
77.880
77.212
77.000
76.788
64.210
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56.274
54.366
44.754
42.558
40.024
39.496
36.939
36.156
35.763
35.659
35.442
34.631
32.954
32.084
28.749
28.222
28.192
27.984
24.178
23.816
22.798
22.544
21.157
18.644
17.313
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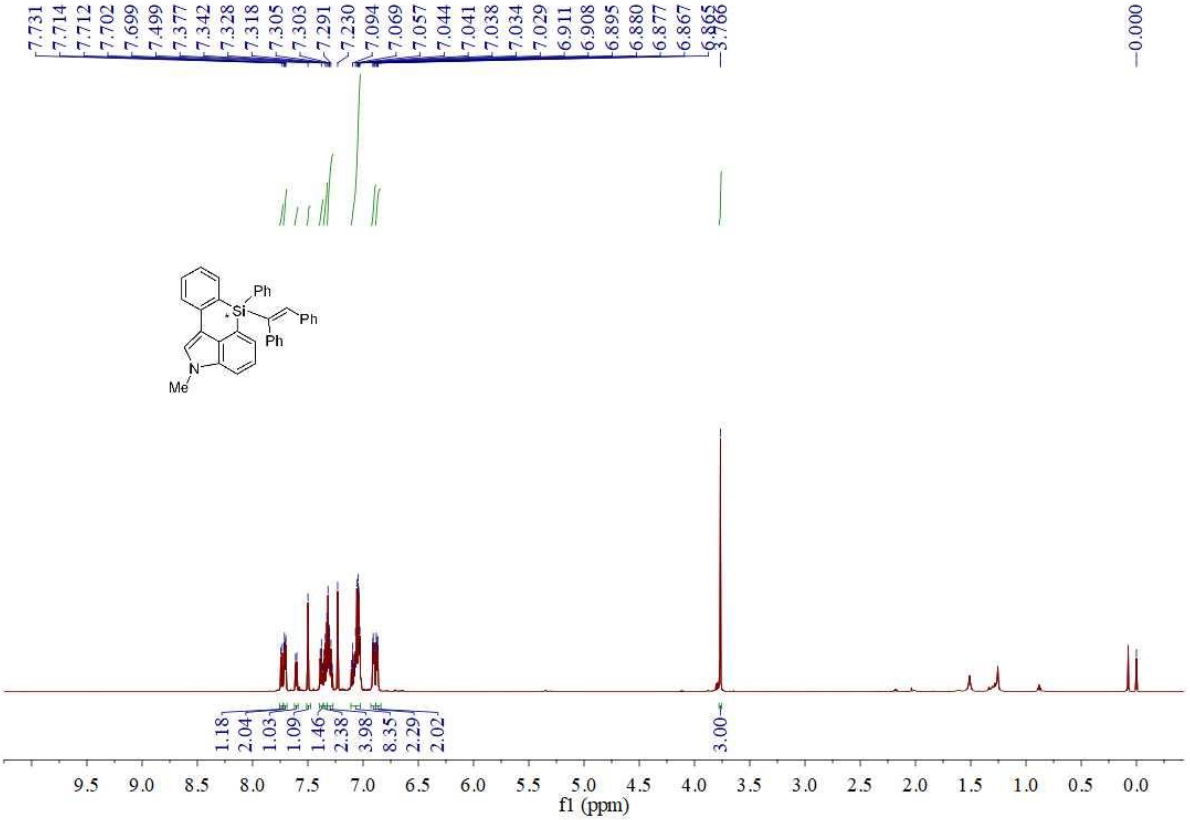
12.030
Ph
Si
O
H
H
H
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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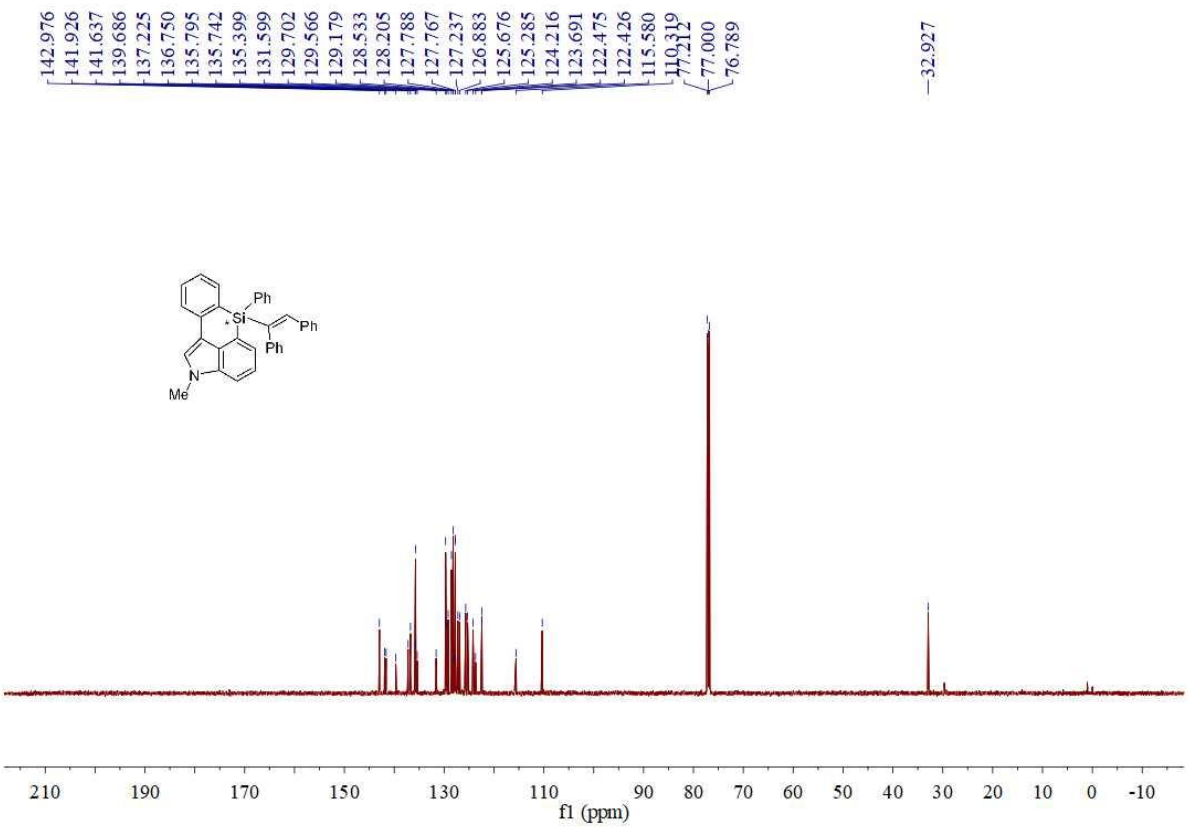
7.303
7.291
7.230
7.094
7.069
7.057
7.044
7.041
7.038
7.034
7.029
6.911
6.908
6.895
6.880
6.877
6.867
6.865
3.988
0.000
Ph
Si
Ph
Ph
N
Me
1.18
2.04
1.03
1.09
1.46
2.38
3.98
8.35
2.29
2.02
3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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131.599
129.702
129.566
129.179
128.533
128.205
127.788
127.767
127.237
126.883
125.676
125.285
124.216
123.691
122.475
122.426
115.580
110.319
77.212
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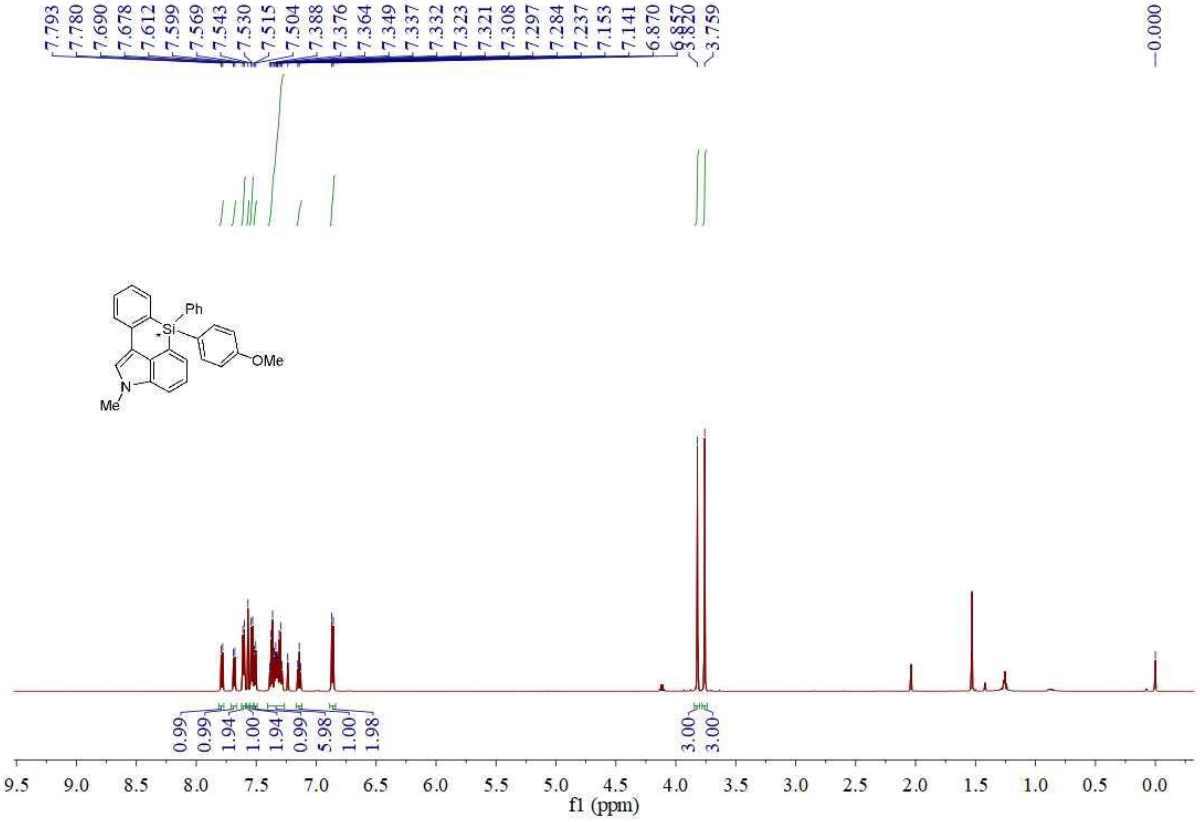
Ph
Si
Ph
Ph
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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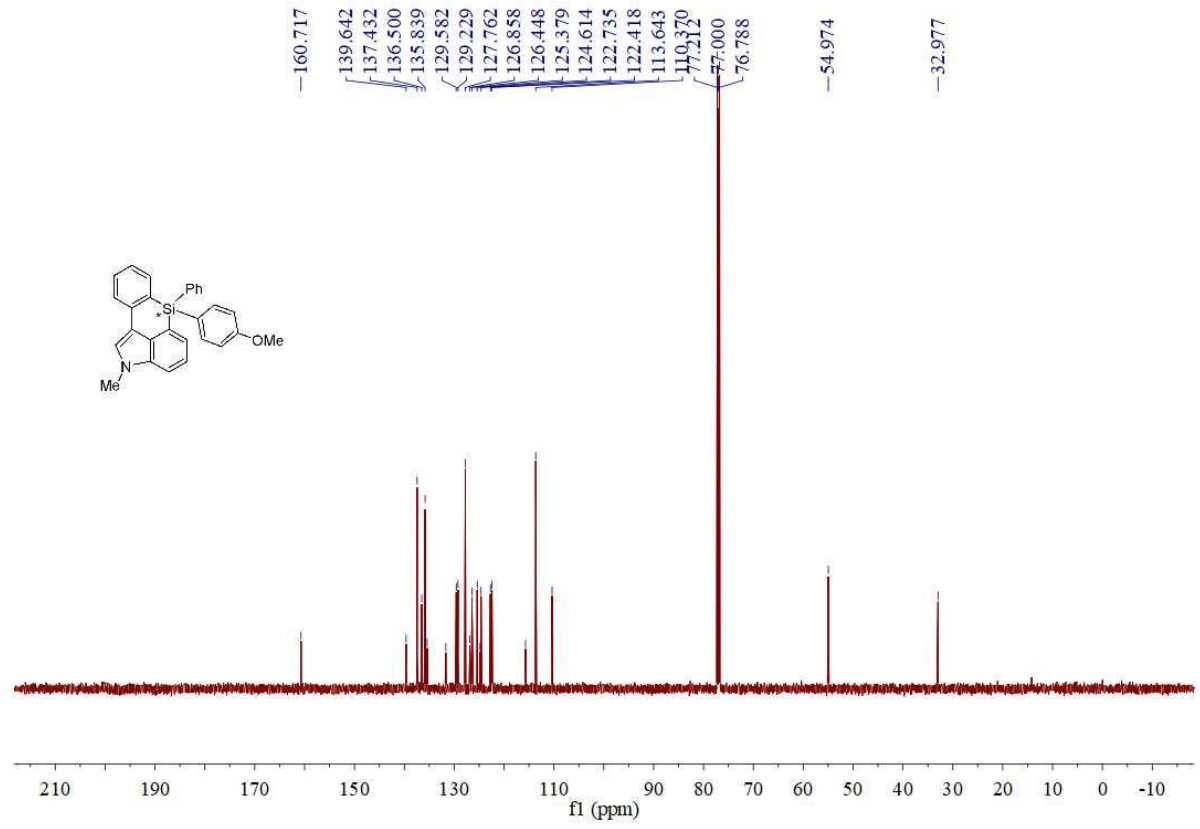
7.543
7.530
7.515
7.504
7.388
7.376
7.364
7.349
7.337
7.332
7.323
7.321
7.308
7.297
7.284
7.237
7.153
7.141
6.870
3.820
3.759
0.000
Ph
Si
OMe
N
Me
0.99
0.99
1.94
1.00
1.94
0.99
5.98
1.00
1.98
3.00
3.00
f1 (ppm)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125.379
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122.735
122.418
113.643
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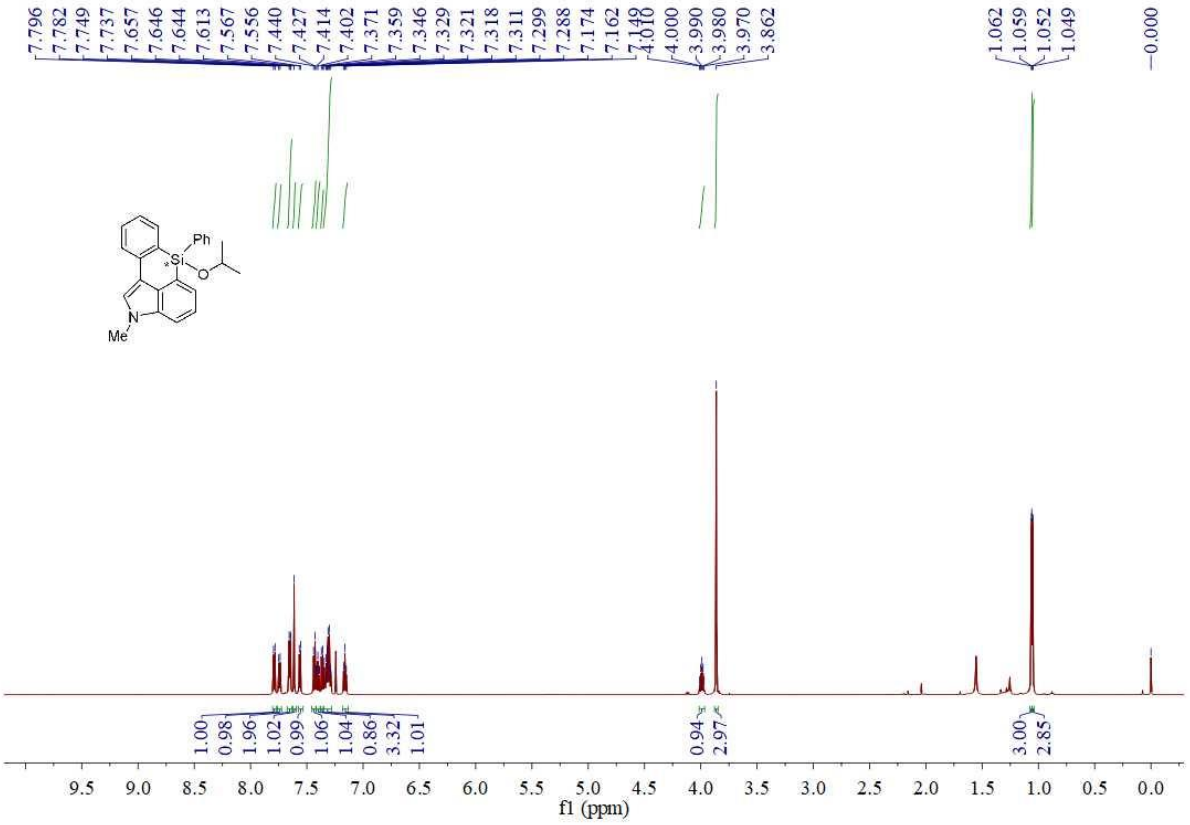
77.212
77.000
76.788
54.974
32.977
Ph
Si
OMe
N
Me
f1 (ppm)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7.613
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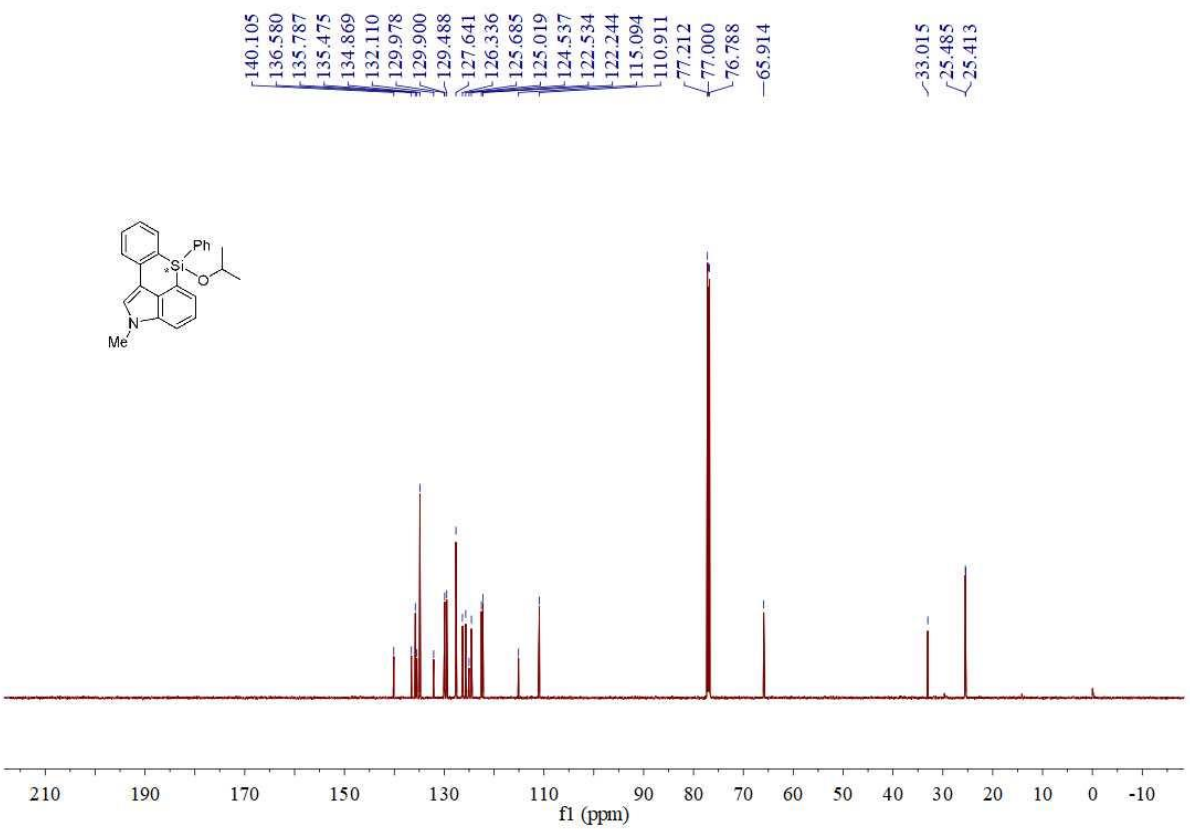
7.556
7.440
7.427
7.414
7.402
7.371
7.359
7.346
7.329
7.321
7.318
7.311
7.299
7.288
7.174
7.162
7.149
4.010
4.000
3.990
3.980
3.970
3.862
1.062
1.059
1.052
1.049
0.000
Ph
Si
O
N
Me
1.00
0.98
1.96
1.02
0.99
1.06
1.04
0.86
3.32
1.01
0.94
2.97
3.00
2.85
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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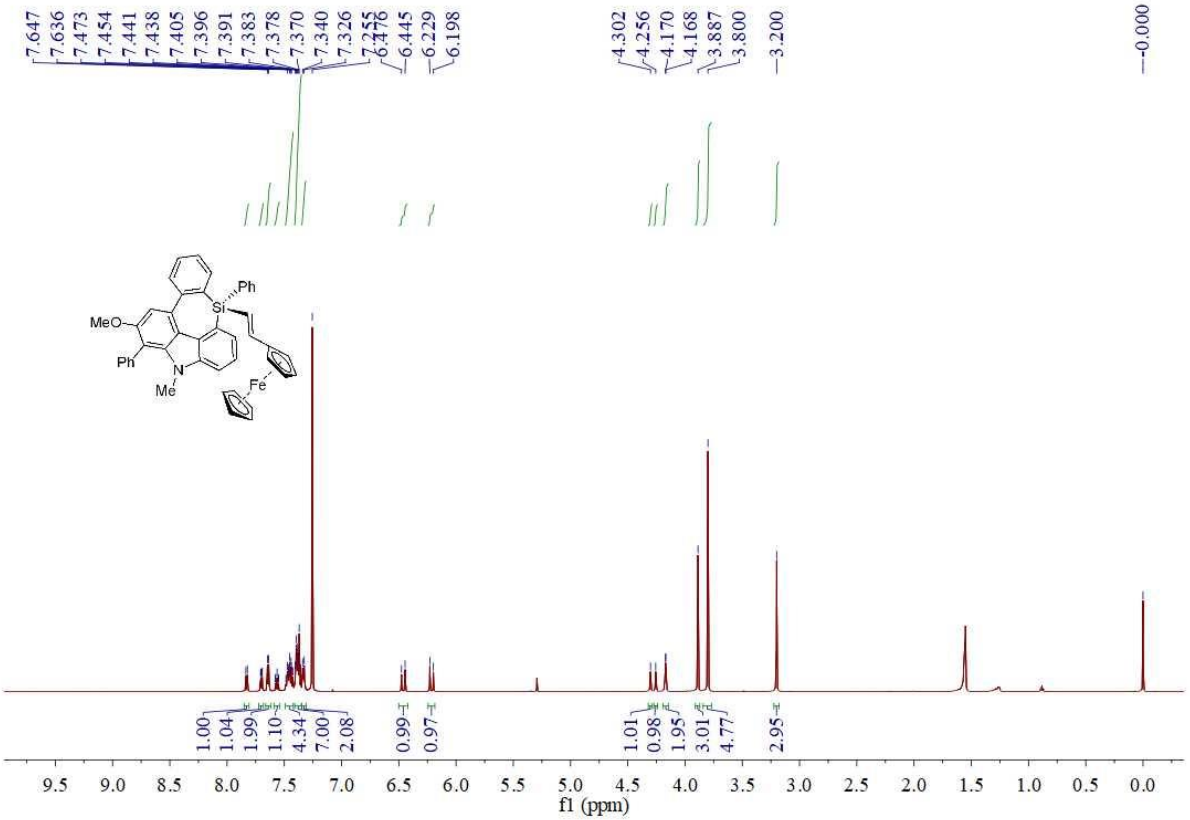
77.212
77.000
76.788
65.914
33.015
25.485
25.413
Ph
Si
O
N
Me
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)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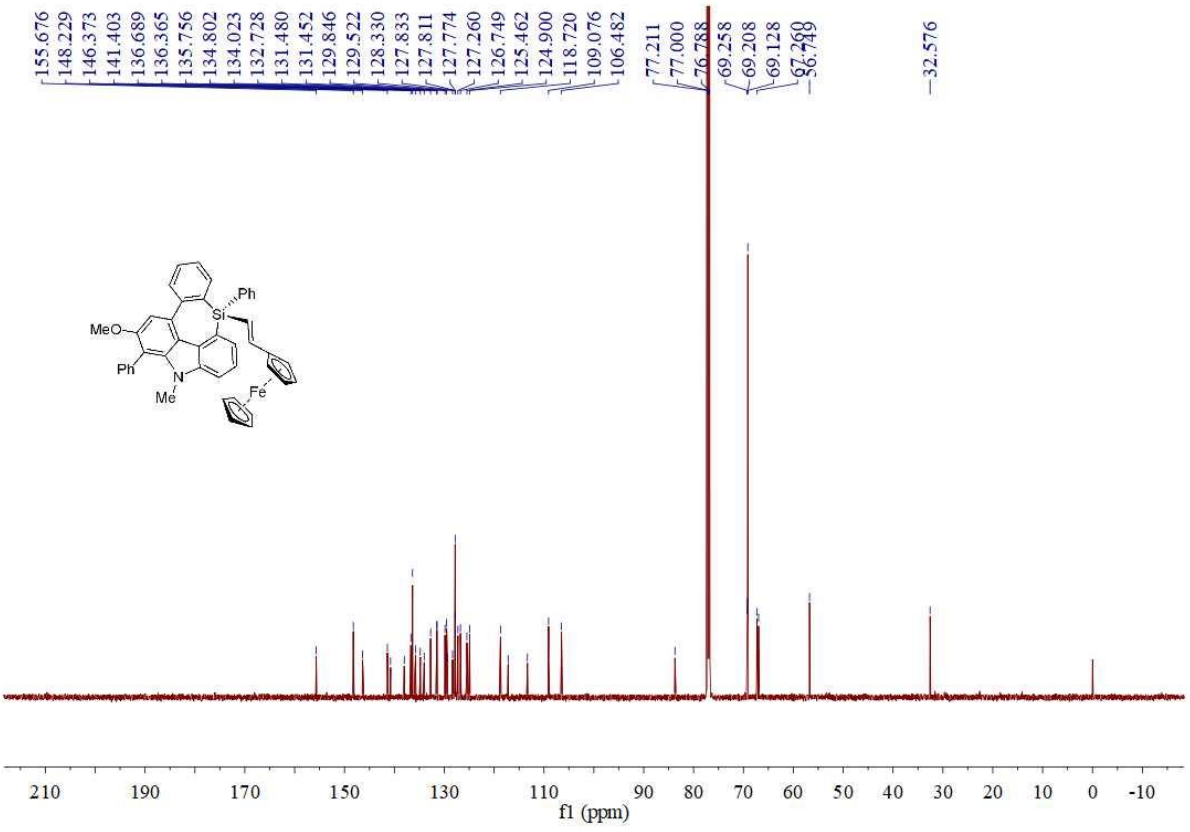
7.383
7.378
7.370
7.340
7.326
6.445
6.229
6.198
4.302
4.256
4.170
4.168
3.887
3.800
3.200
0.000
MeO
Ph
Si
Ph
N
Me
Fe
1.00
1.04
1.99
1.10
4.34
7.00
2.08
0.99
0.97
1.01
0.98
1.95
3.01
4.77
2.95
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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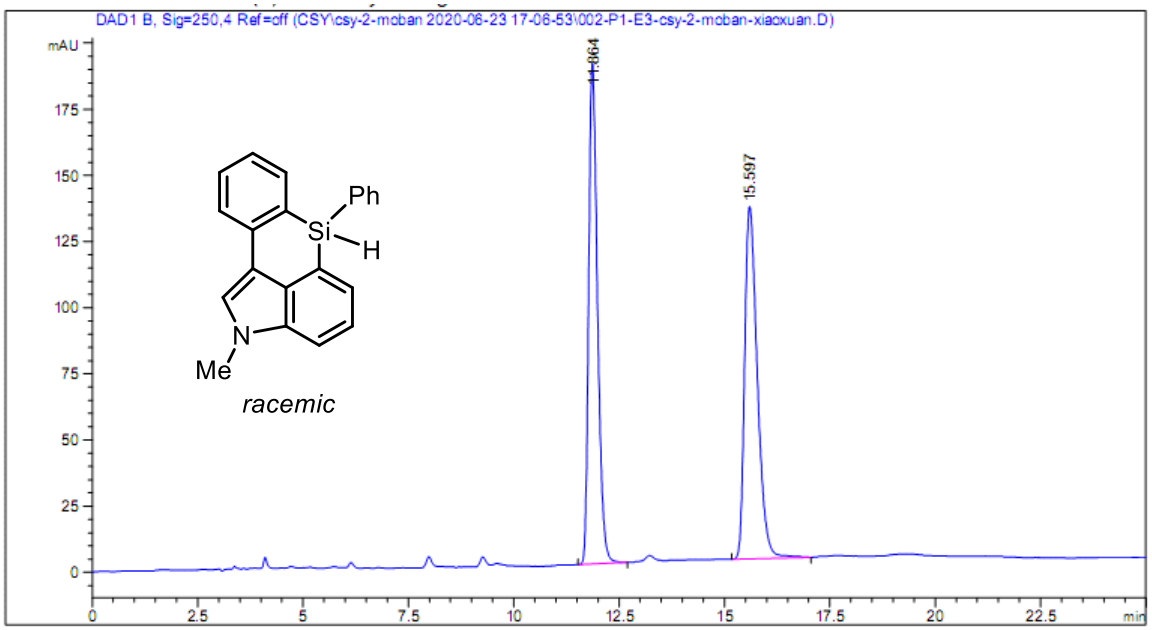
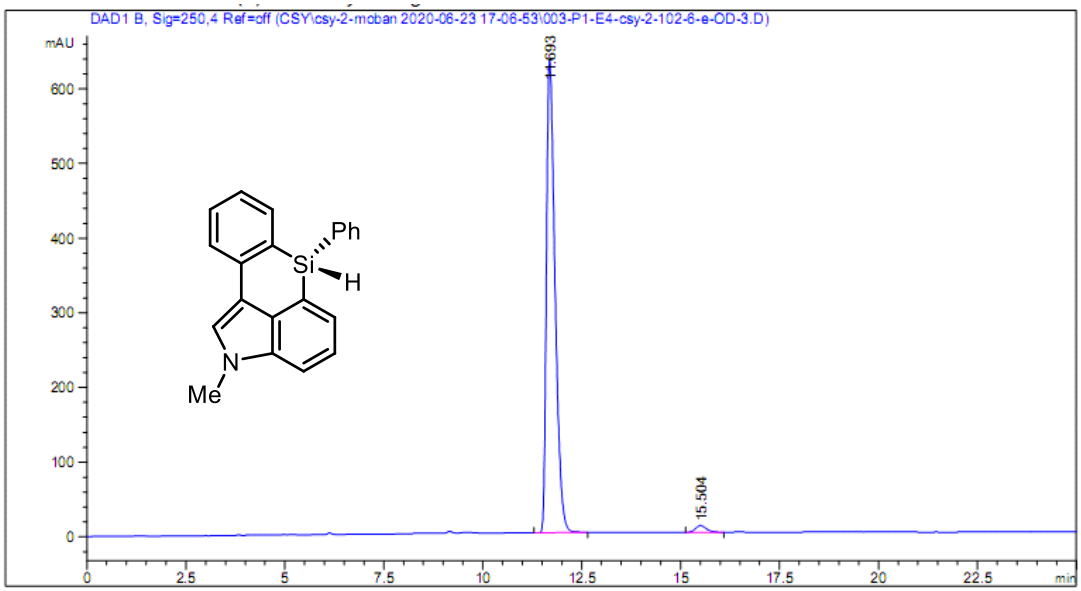
132.728
131.480
131.452
129.846
129.522
128.330
127.833
127.811
127.774
127.260
126.749
125.462
124.900
118.720
109.076
106.482
77.211
77.000
76.788
69.258
69.208
69.128
67.260
56.749
32.576
MeO
Ph
Si
Ph
N
Me
Fe
210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

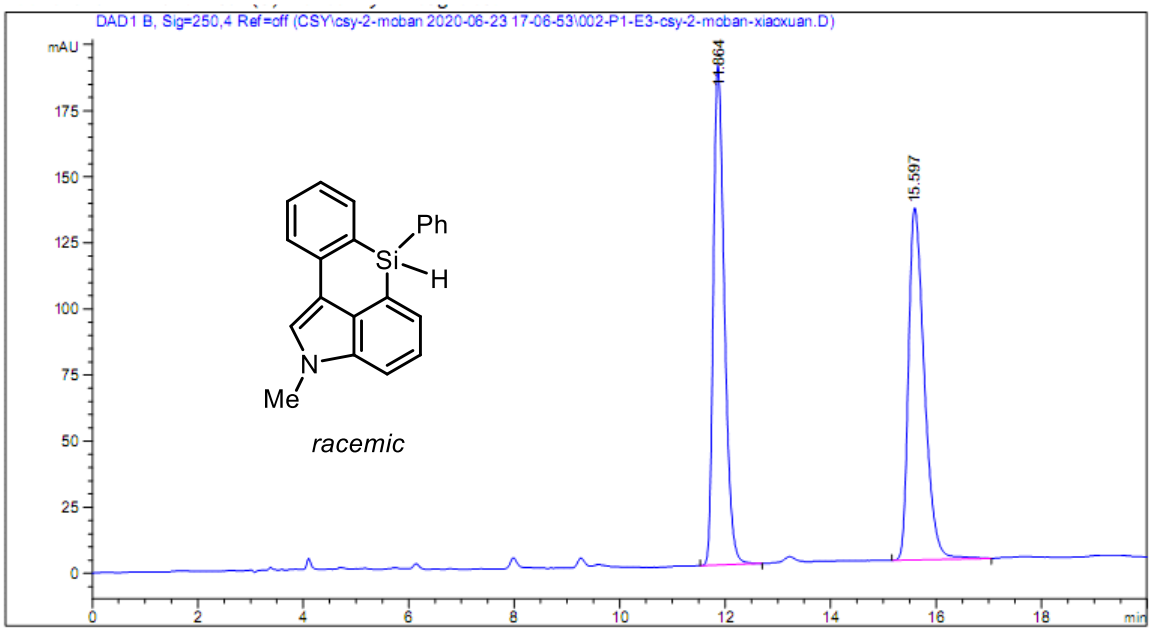
XI. Chiral HPLC Spectra



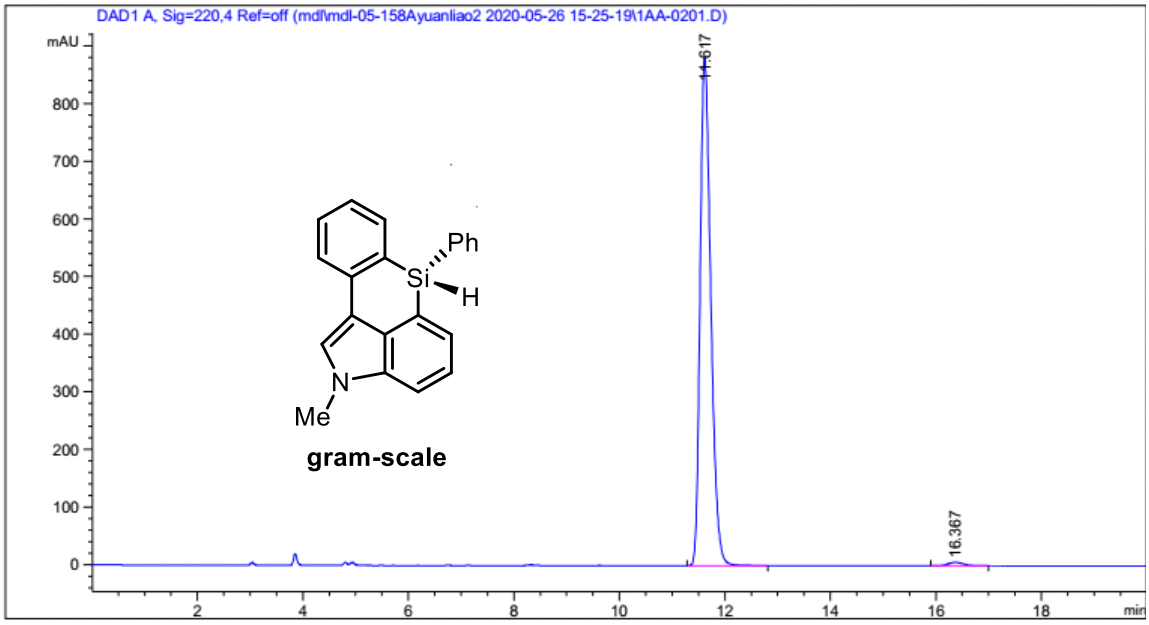
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.864	BB	0.2234	2748.67114	189.30153	49.7685
2	15.597	BB	0.3211	2774.23901	133.14737	50.2315



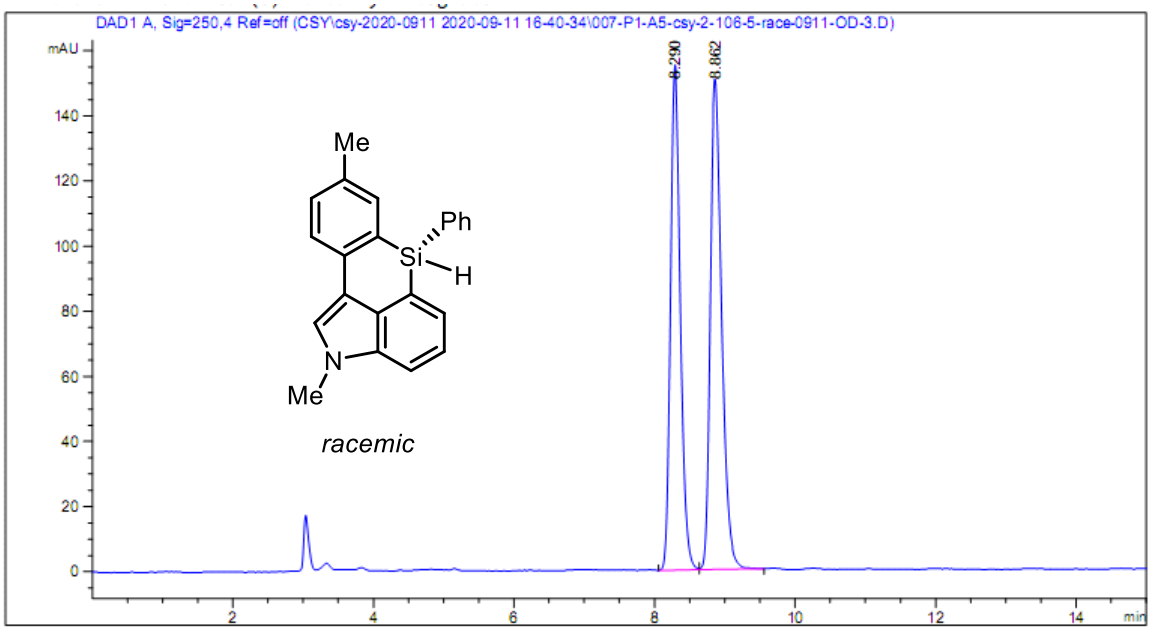
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.693	BB	0.2319	9557.10449	633.71014	98.2252
2	15.504	BB	0.2876	172.68571	8.92954	1.7748



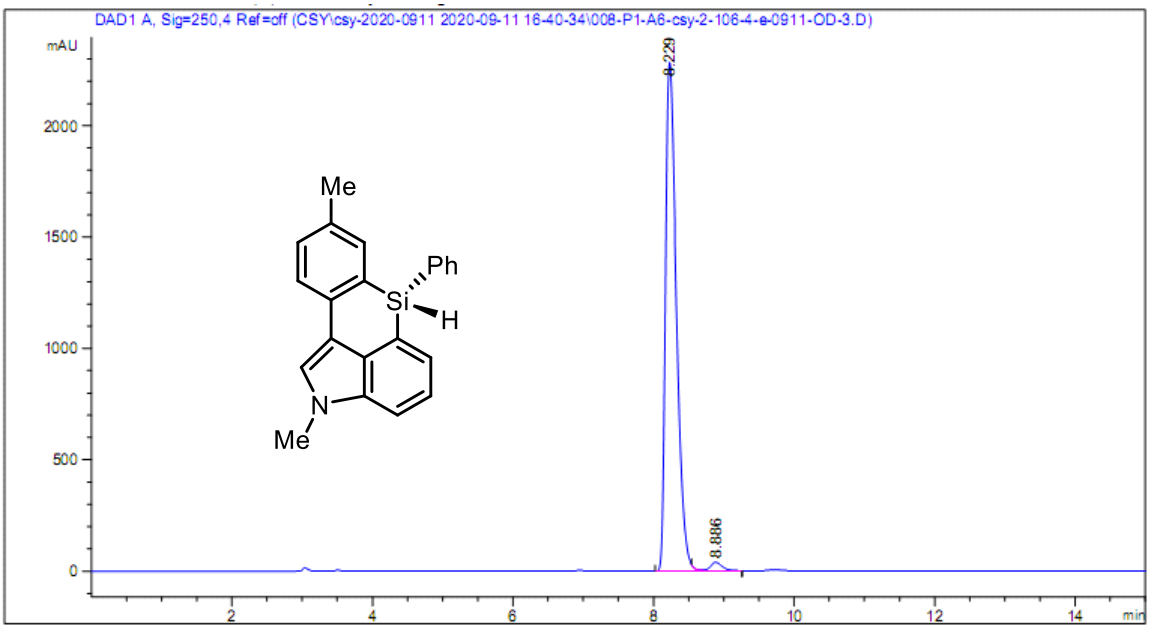
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.864	BB	0.2234	2748.67114	189.30153	49.7685
2	15.597	BB	0.3211	2774.23901	133.14737	50.2315



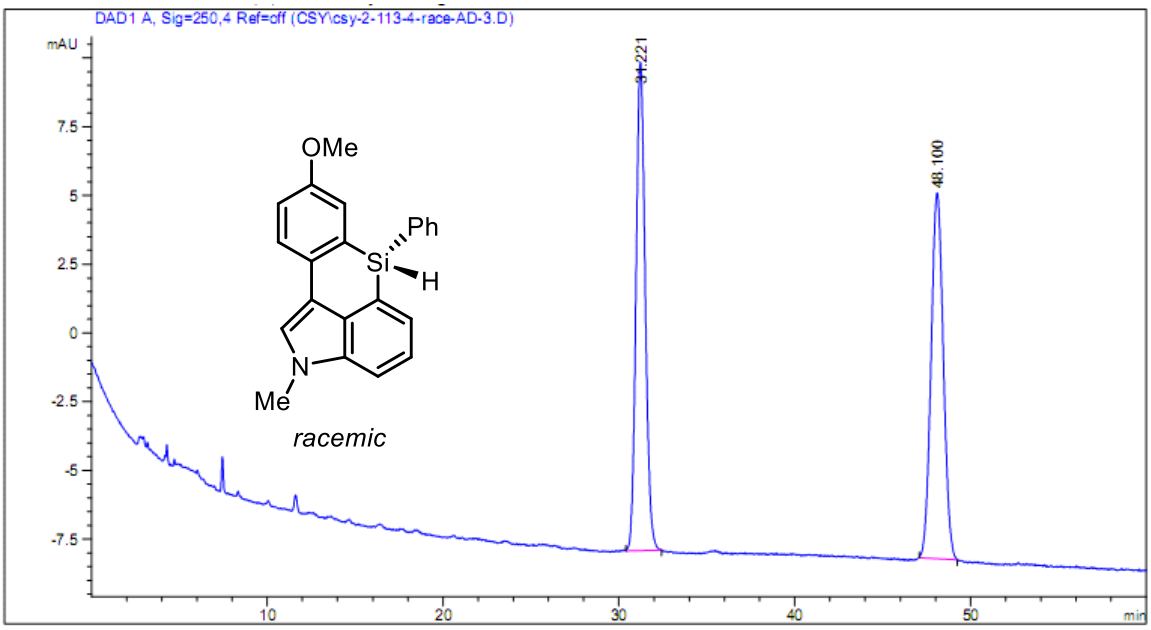
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.617	BB	0.2185	1.24229e4	881.03131	98.9602
2	16.367	BB	0.3095	130.52673	6.35764	1.0398



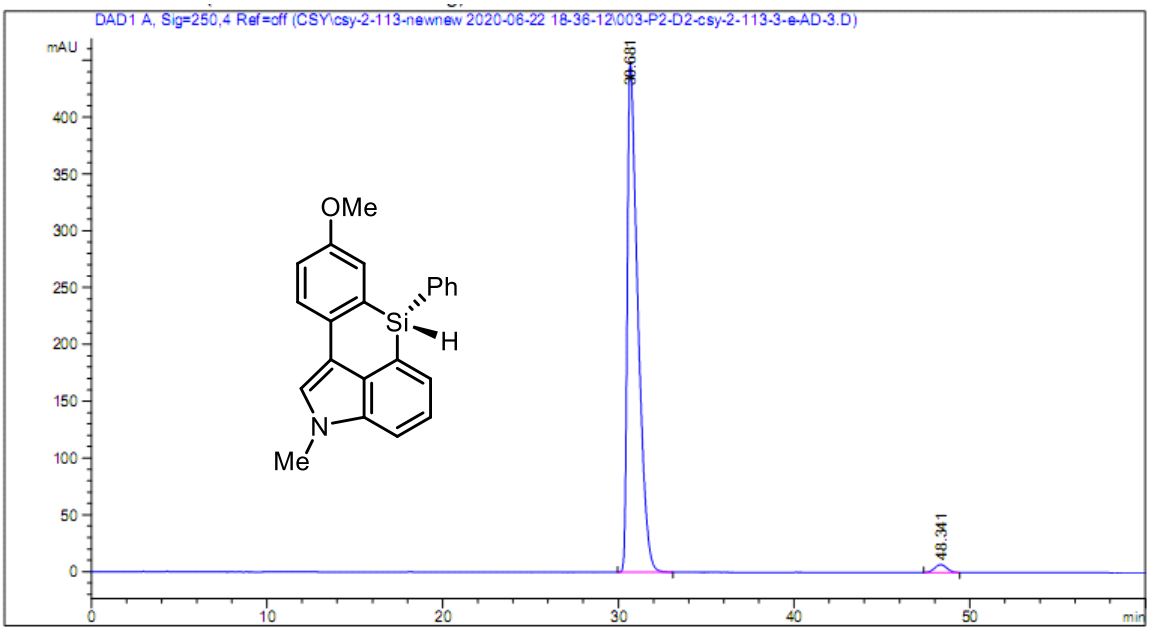
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.290	BV	0.1501	1518.10779	155.29291	47.2492
2	8.862	VB	0.1711	1694.87073	150.88129	52.7508



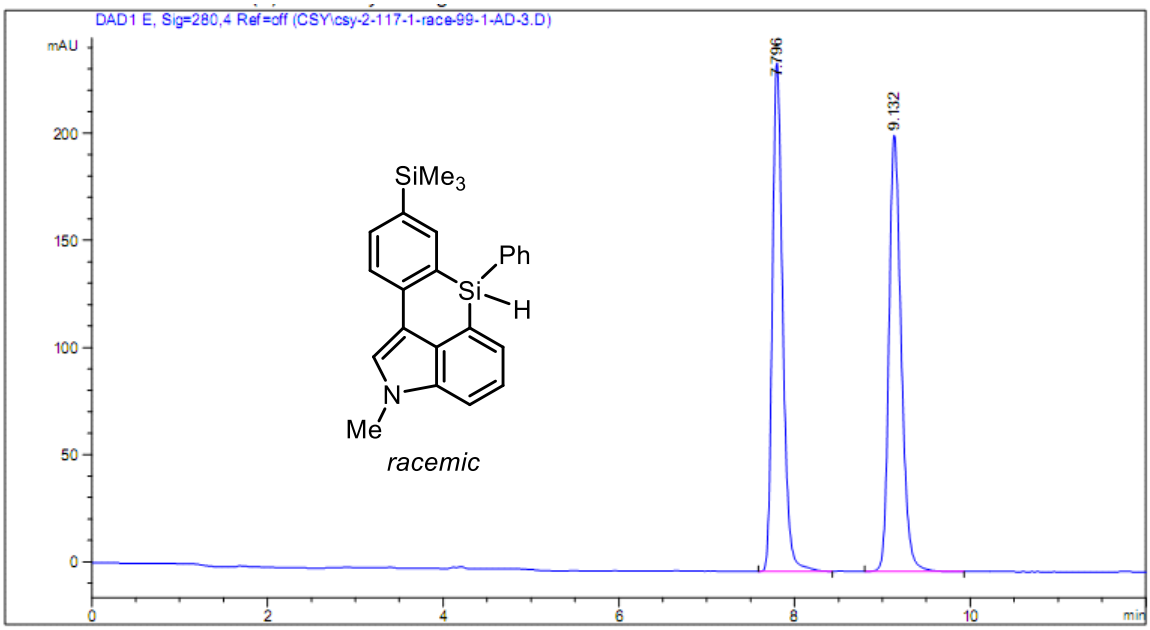
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.229	BV R	0.1652	2.45170e4	2284.09351	98.1966
2	8.886	VB E	0.1795	450.25708	38.20245	1.8034



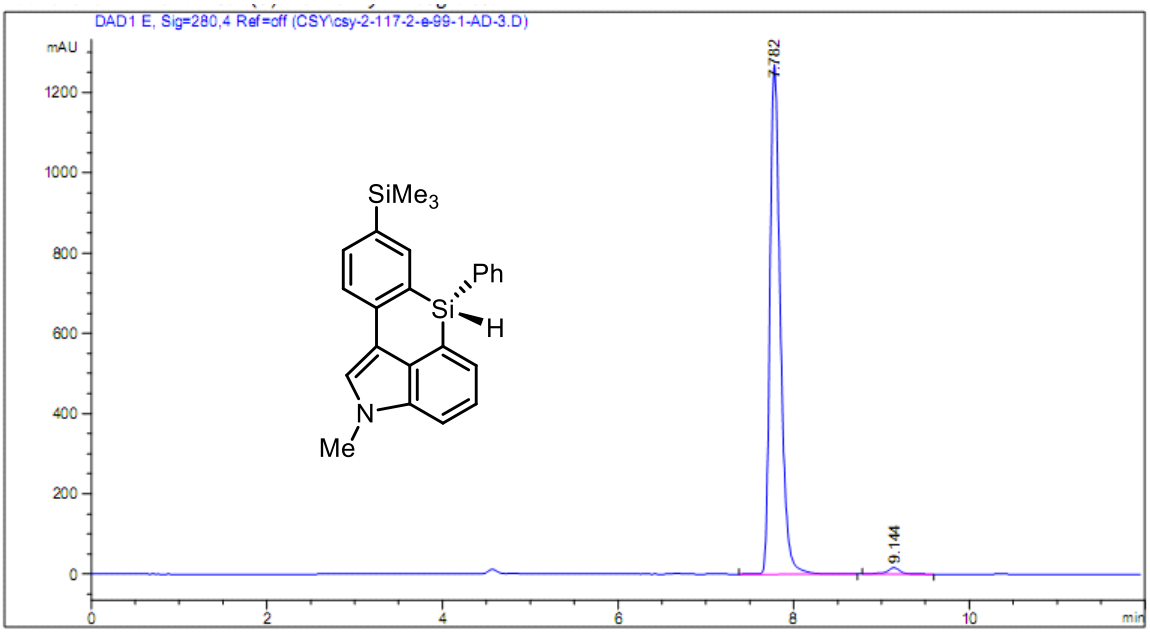
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	31.221	BB	0.5425	643.61505	17.77425	50.0317
2	48.100	BB	0.6218	642.79919	13.30128	49.9683



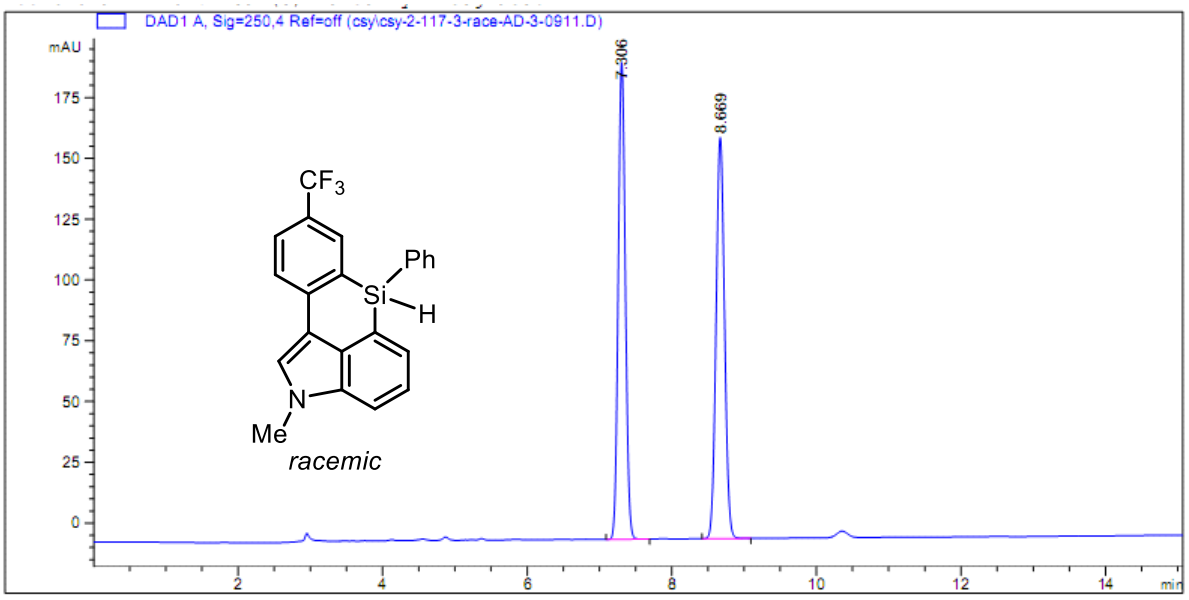
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	30.681	BB	0.6181	1.87256e4	447.62598	98.1724
2	48.341	BB	0.5916	348.59680	7.21593	1.8276



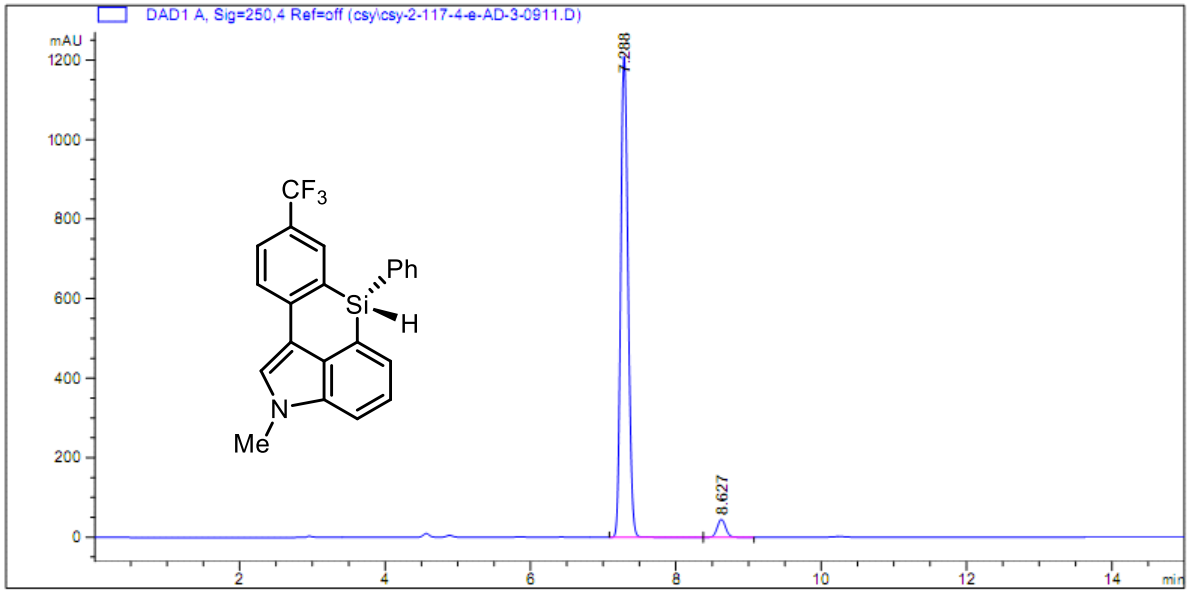
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.796	BB	0.1259	1949.95007	237.12775	49.7586
2	9.132	BB	0.1489	1968.86926	203.52560	50.2414



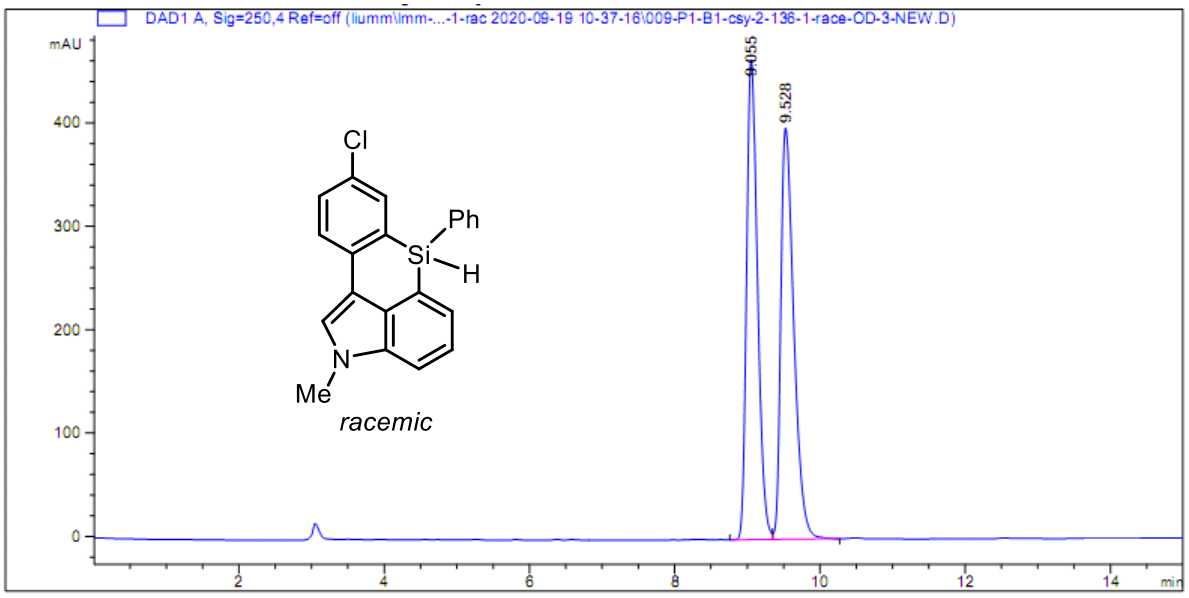
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.782	BB	0.1264	1.04826e4	1269.19507	98.3719
2	9.144	BB	0.1565	173.48804	16.25193	1.6281



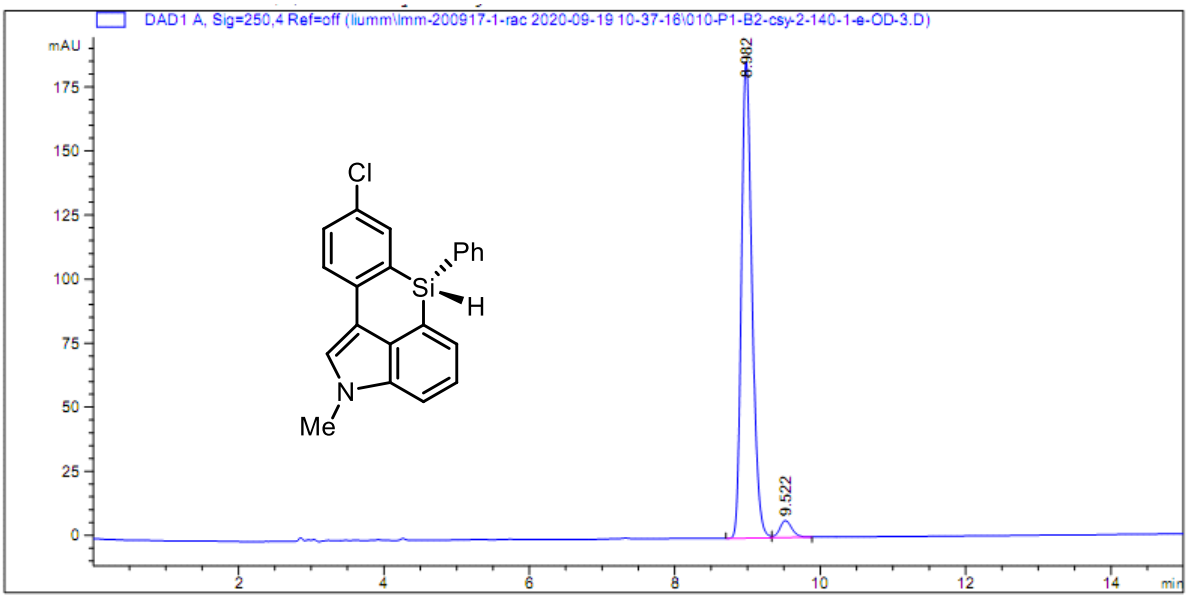
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.306	BB	0.1078	1342.07300	196.32816	49.9803
2	8.669	BB	0.1270	1343.13293	165.02065	50.0197



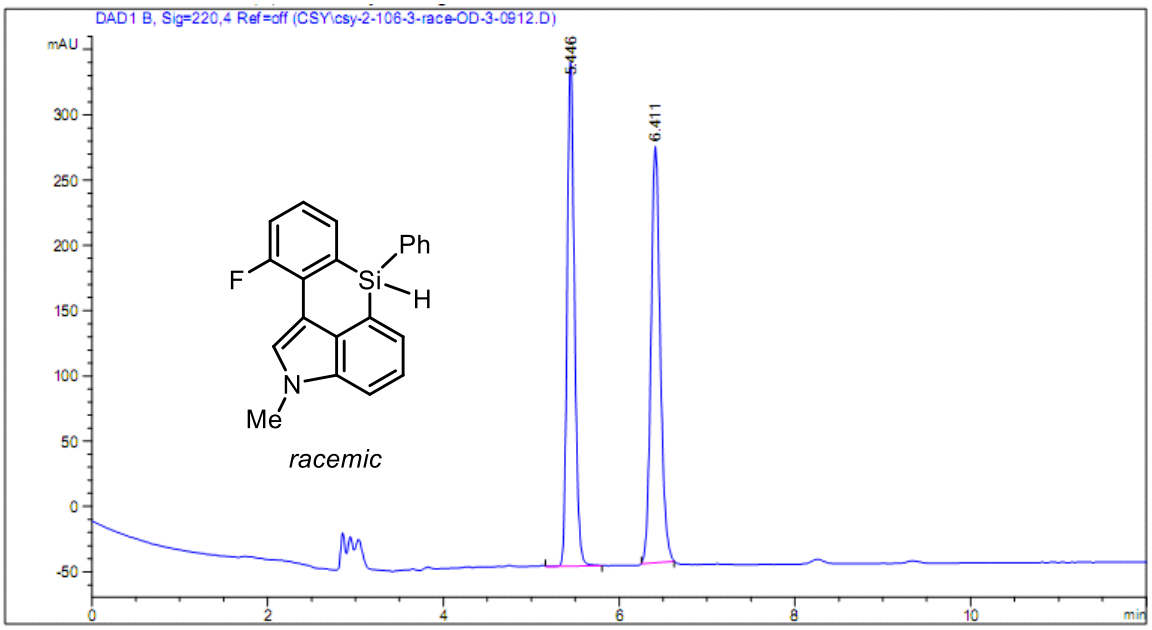
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.288	BB	0.1079	8300.38086	1212.13757	95.9021
2	8.627	BB	0.1227	354.67490	44.62615	4.0979



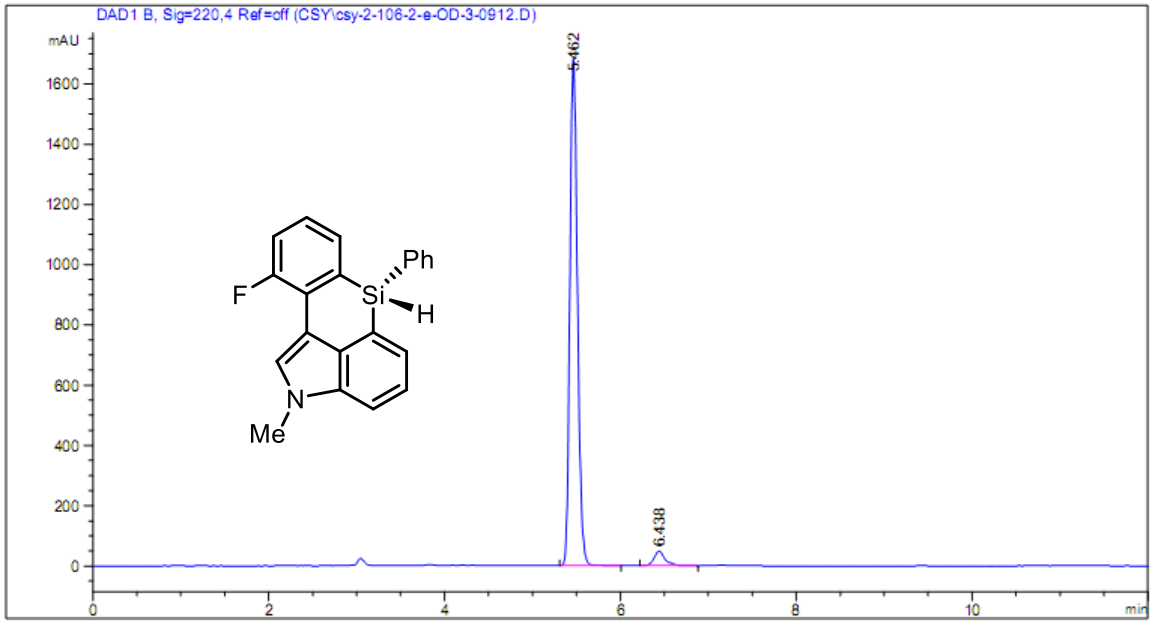
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.055	BV	0.1606	4800.50928	464.44989	49.5055
2	9.528	VB	0.1895	4896.41309	398.07642	50.4945



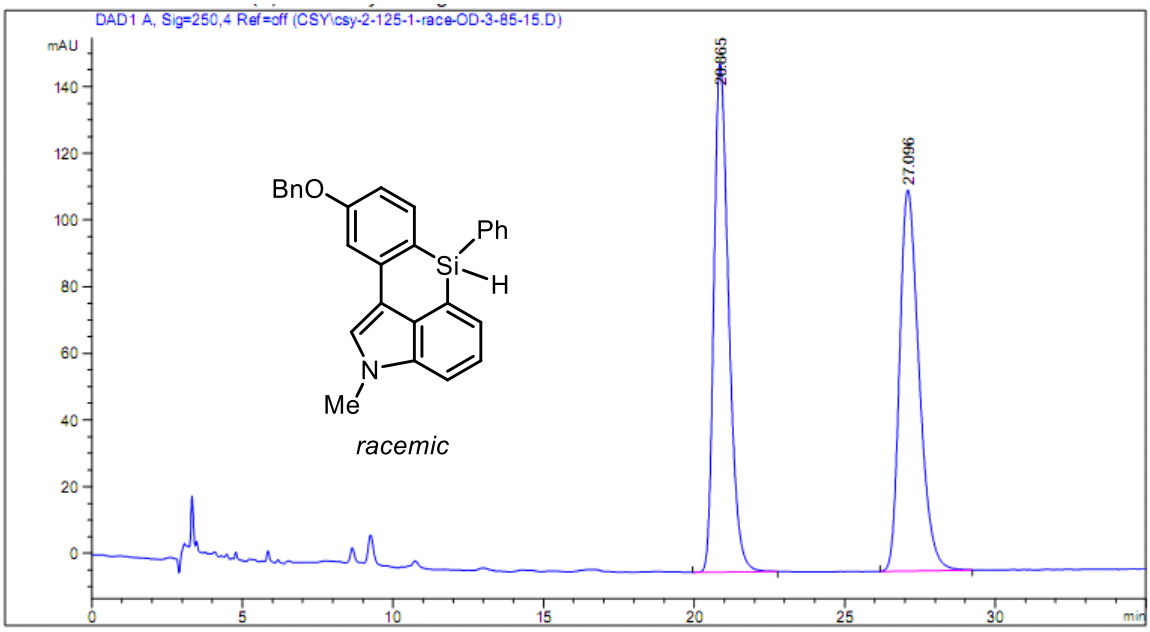
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.982	MF R	0.1691	1889.36548	186.19286	96.1528
2	9.522	FM R	0.1913	75.59692	6.58509	3.8472



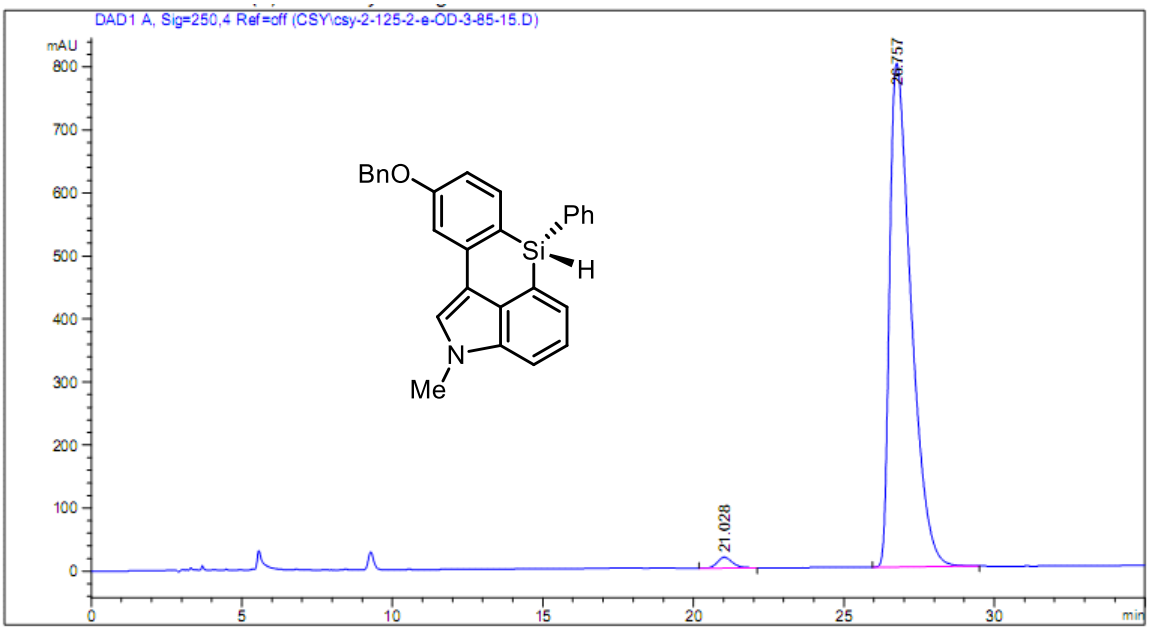
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.446	MM R	0.0968	2248.72388	387.00912	49.0353
2	6.411	MM R	0.1220	2337.20654	319.32523	50.9647



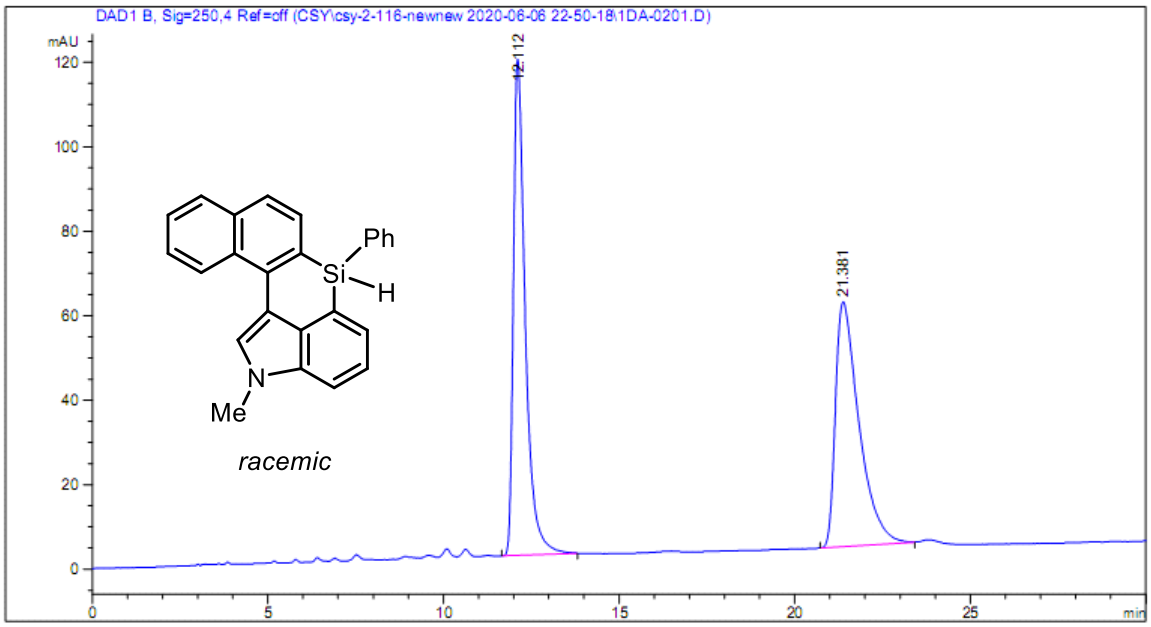
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.462	BB	0.0937	1.00798e4	1687.49207	95.8970
2	6.438	BB	0.1289	431.26443	48.88698	4.1030



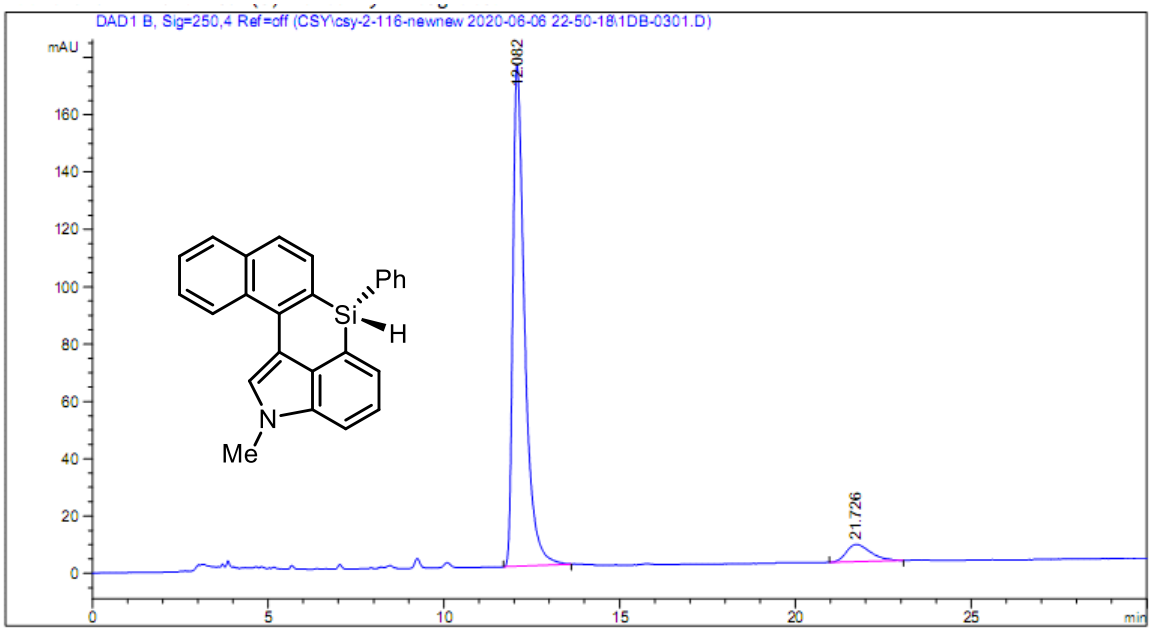
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	20.865	BB	0.5245	5215.26465	152.68034	50.3957
2	27.096	BB	0.6881	5133.36865	114.27600	49.6043



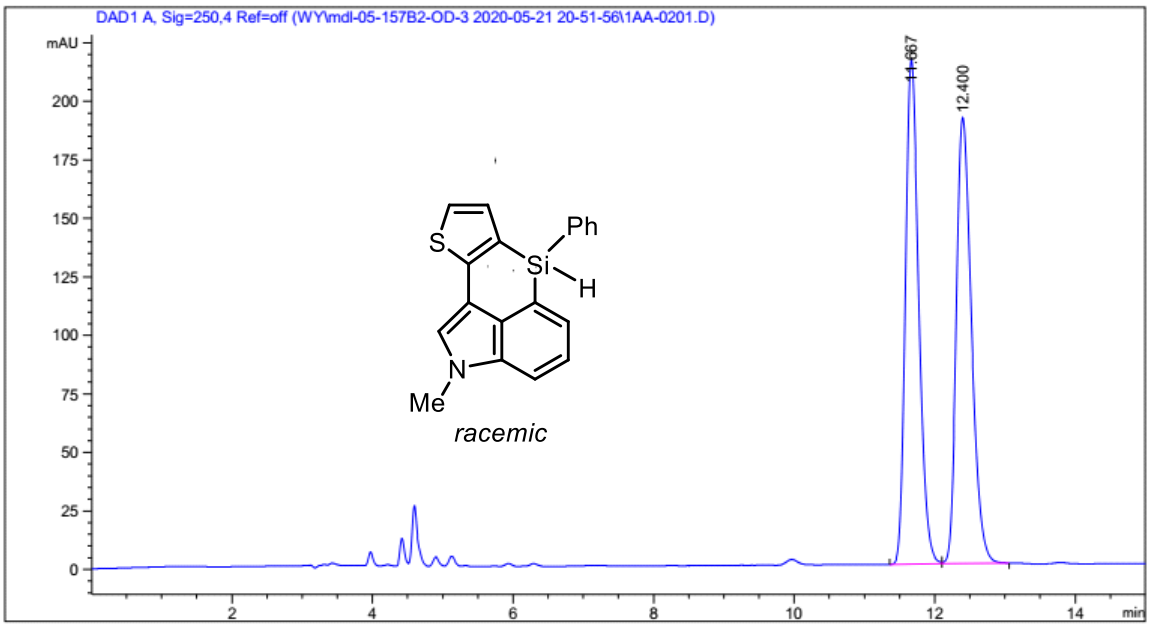
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	21.028	BB	0.5269	581.99030	16.93843	1.4547
2	26.757	BB	0.7475	3.94256e4	799.29529	98.5453



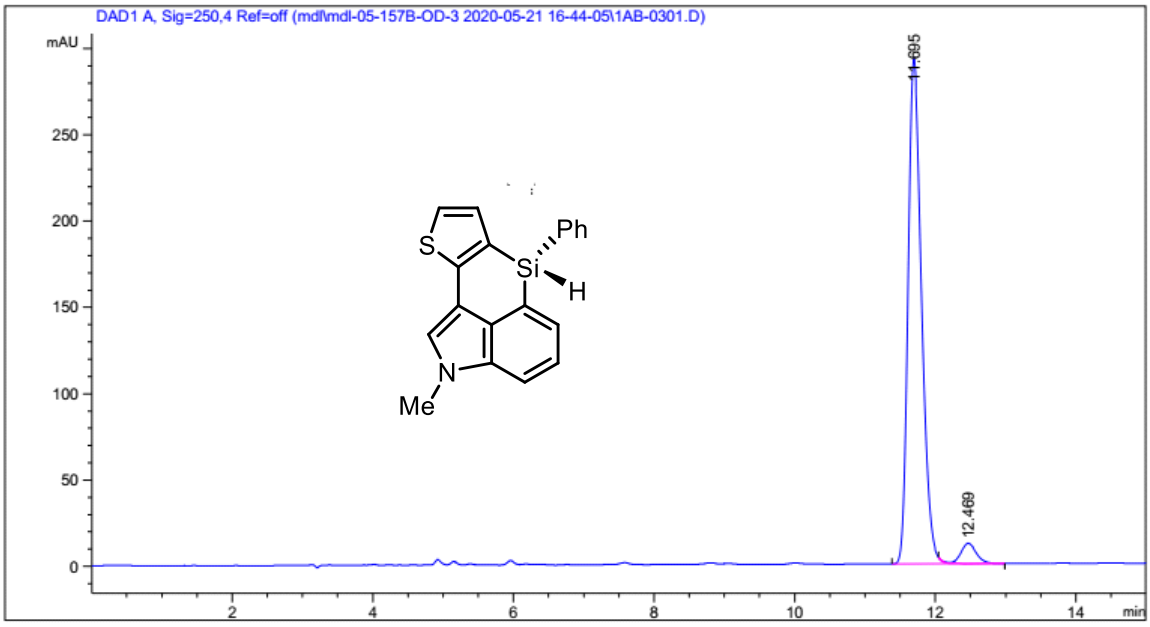
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.112	BB	0.3502	2759.41650	117.42313	50.5986
2	21.381	BB	0.6864	2694.12598	57.94521	49.4014



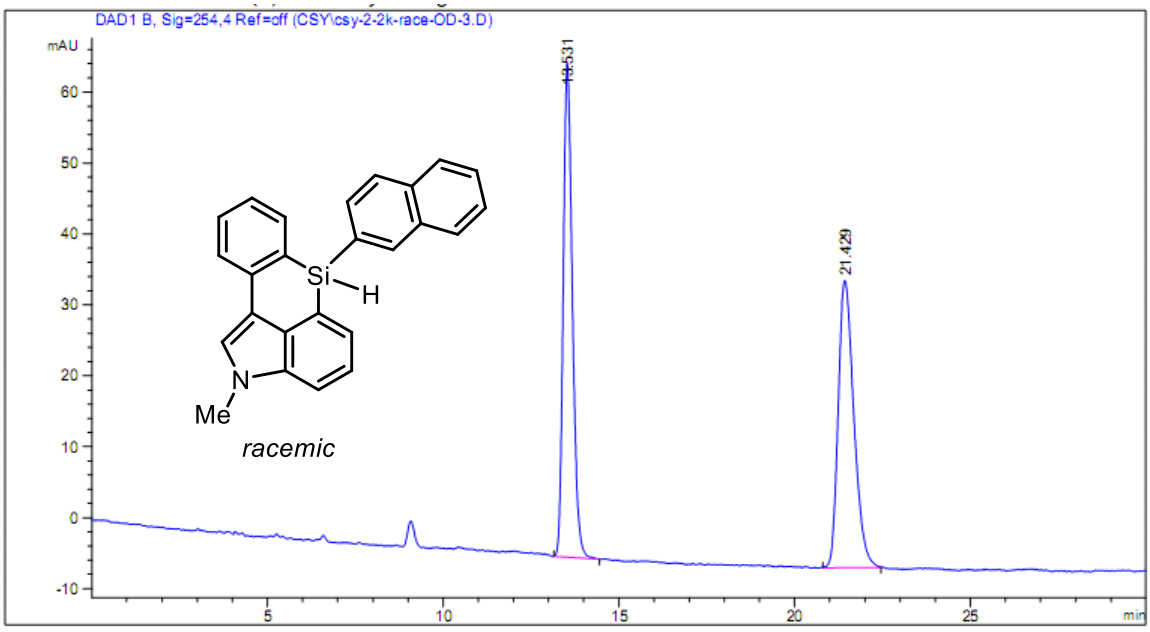
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.082	BB	0.3490	4066.16748	175.01926	93.3426
2	21.726	BB	0.5650	290.00824	6.05278	6.6574



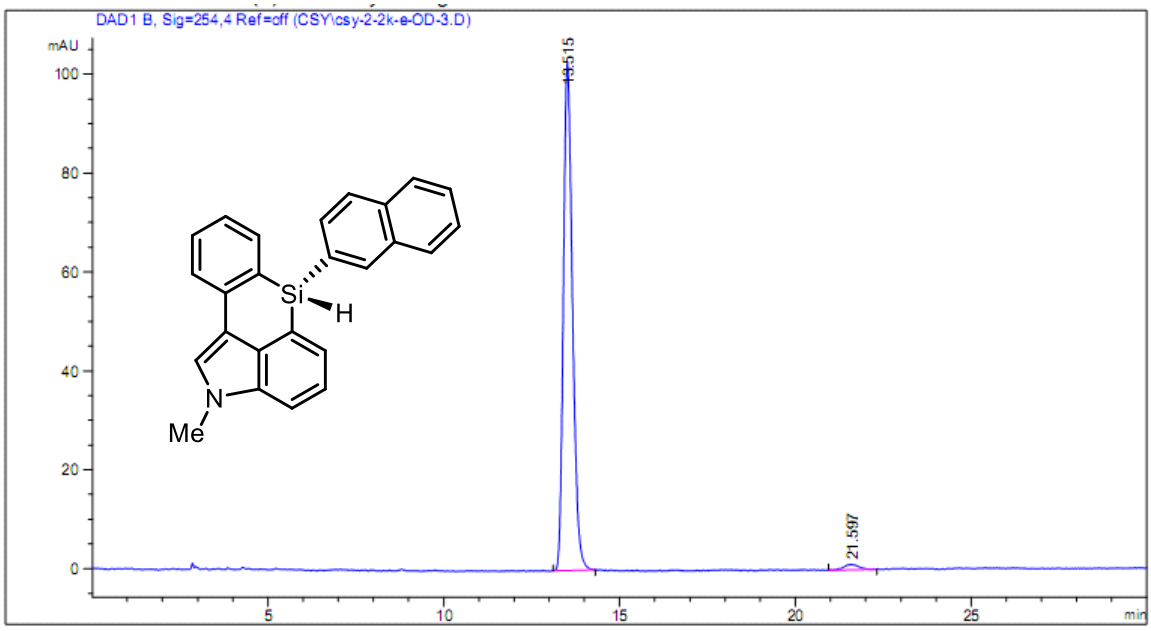
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.667	BV	0.2031	2829.31519	215.60249	49.8782
2	12.400	VB	0.2301	2843.13696	190.57463	50.1218



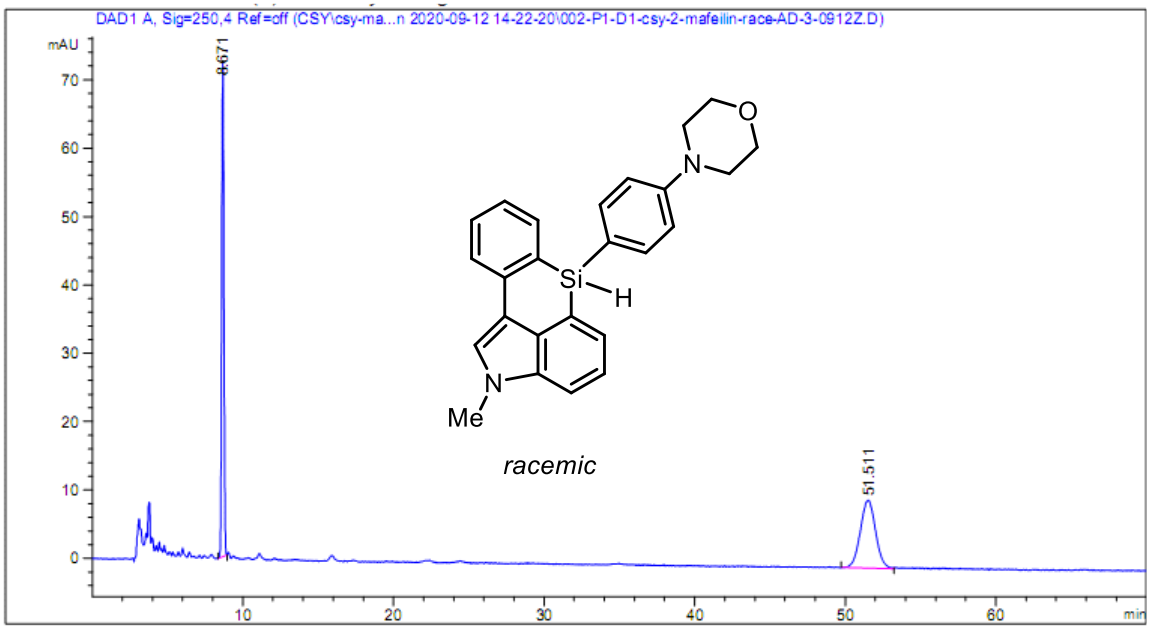
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.695	BV R	0.2074	3896.50171	292.56125	95.5281
2	12.469	VB E	0.2378	182.40567	11.83558	4.4719



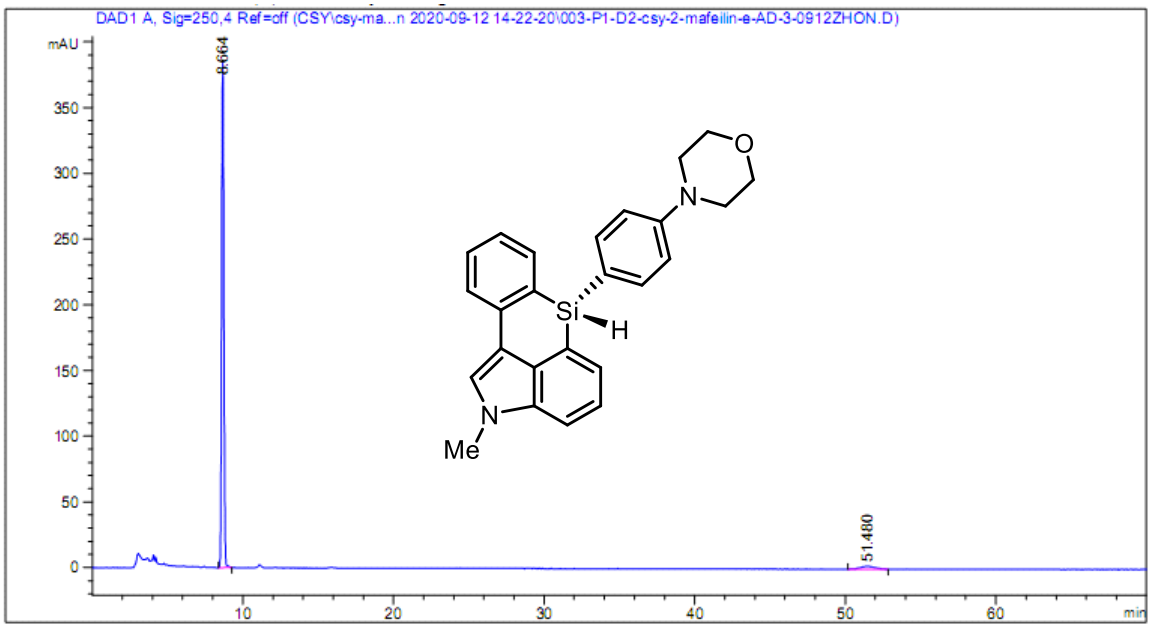
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.531	BB	0.2790	1260.36267	69.68239	50.2162
2	21.429	BB	0.4580	1249.51074	40.49051	49.7838



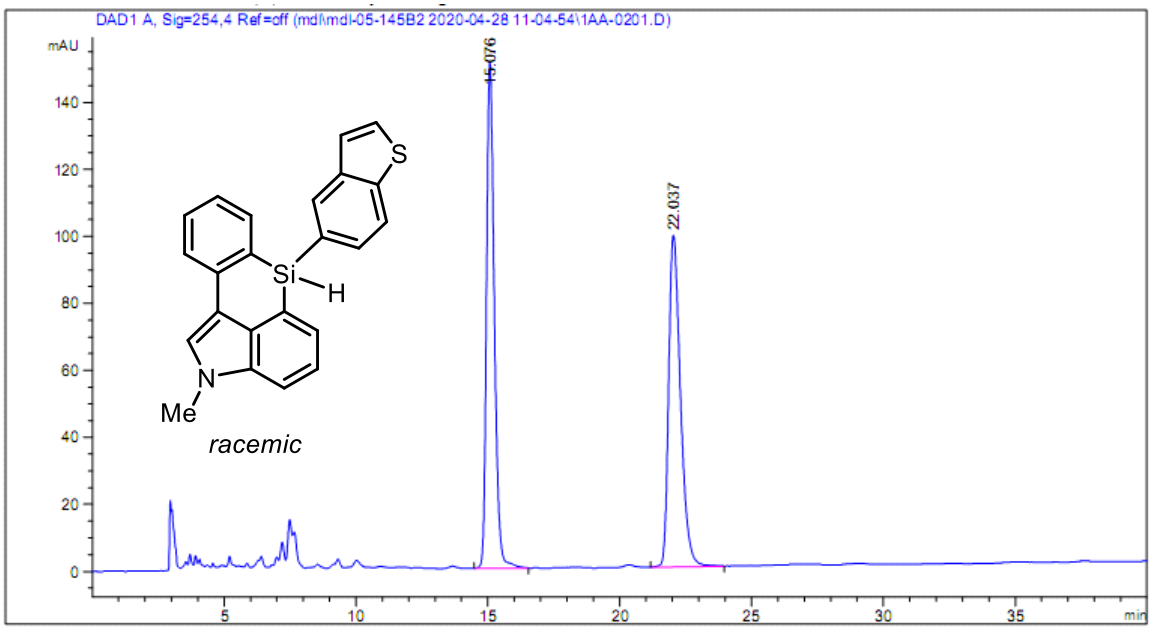
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.515	BB	0.2776	1843.20288	102.61981	98.2482
2	21.597	MM R	0.4971	32.86547	1.10195	1.7518



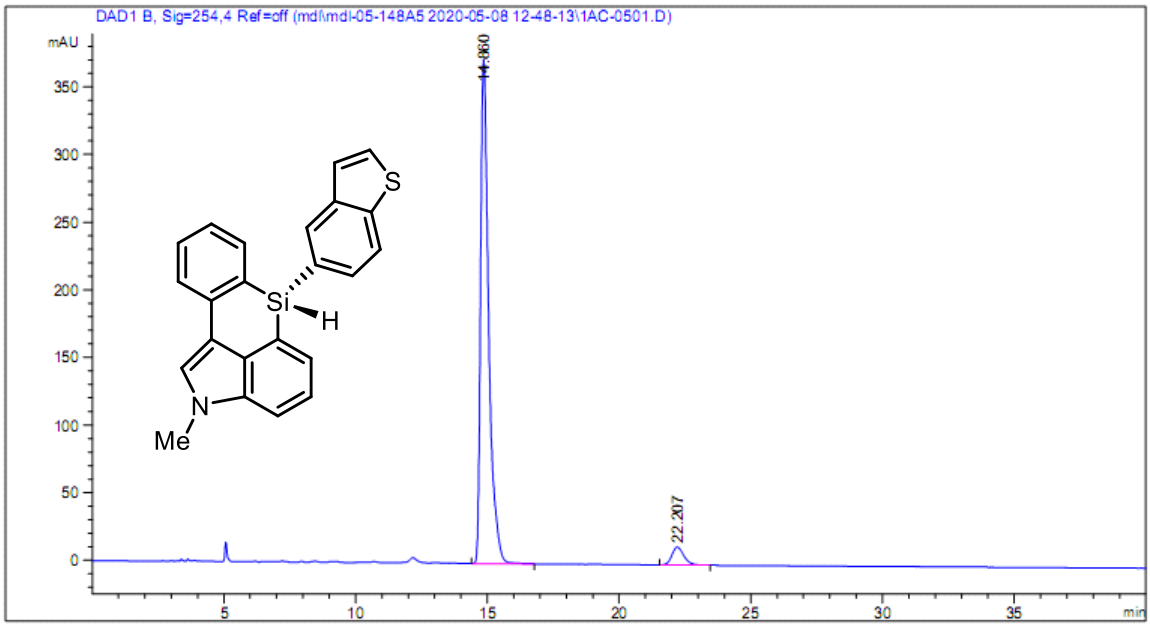
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.671	MM R	0.1631	708.26599	72.36091	50.4486
2	51.511	MM R	1.1708	695.66937	9.90293	49.5514



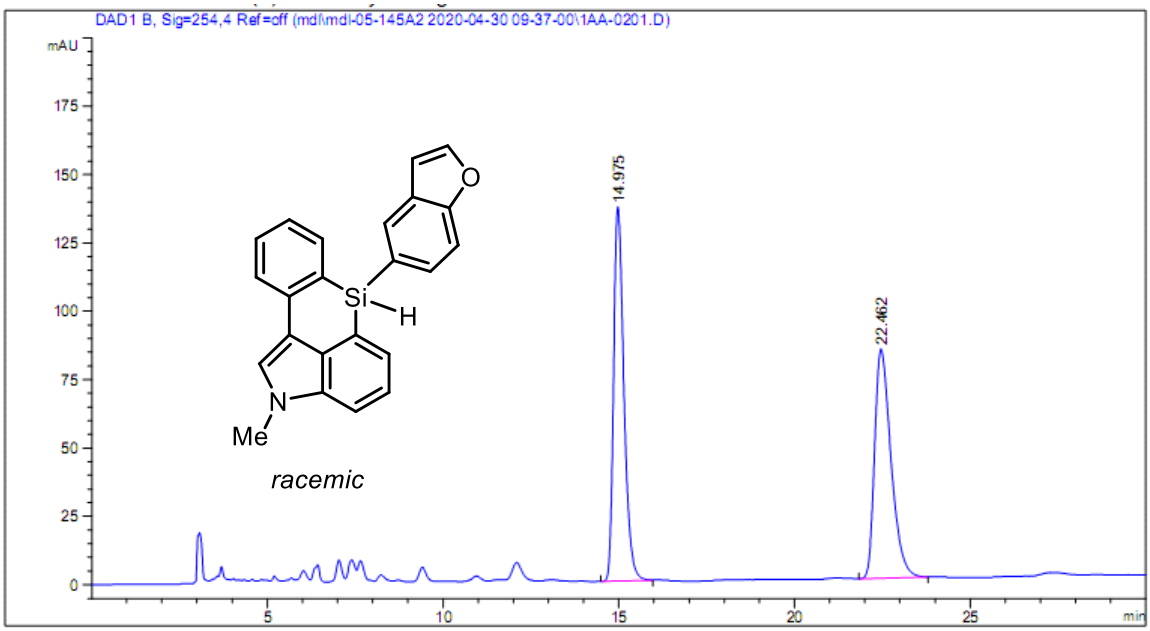
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.664	BB	0.1537	3819.60596	385.18637	96.2729
2	51.480	MM R	1.1735	147.87158	2.10011	3.7271



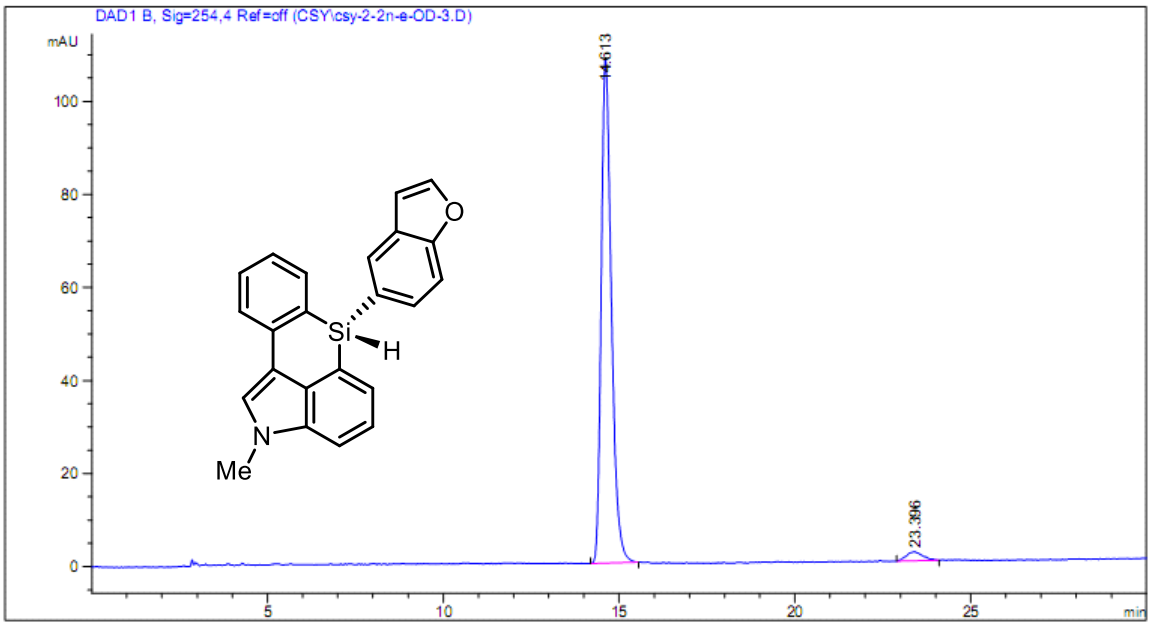
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.076	BB	0.3155	3098.71362	150.94339	50.1961
2	22.037	BB	0.4763	3074.50757	98.99536	49.8039



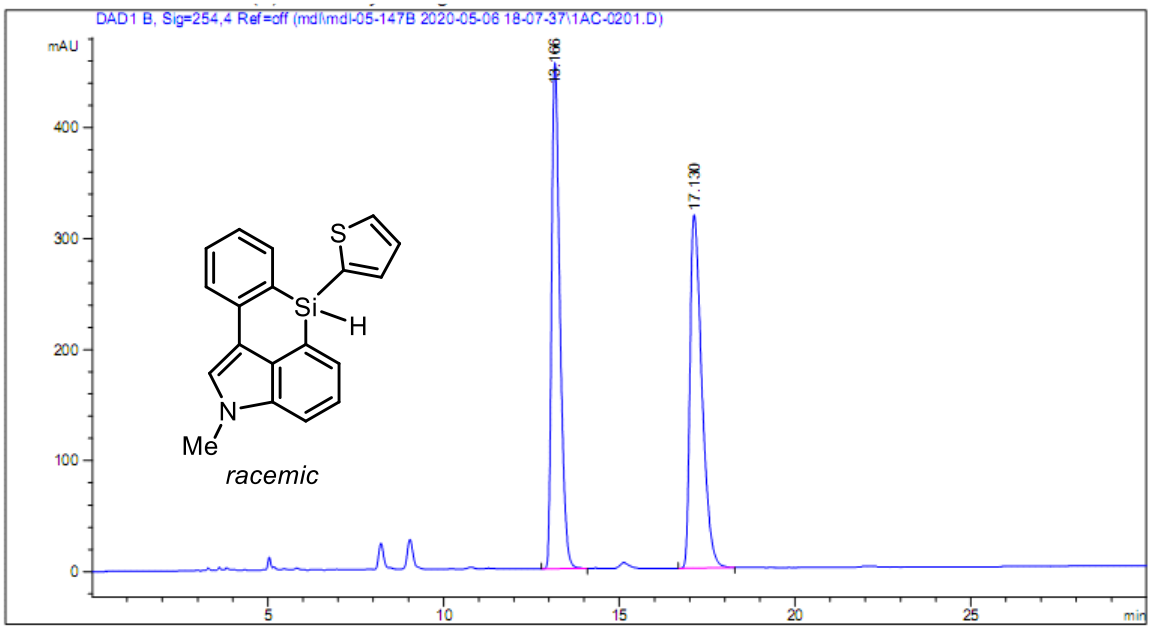
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.860	BB	0.3220	7994.50732	373.00394	95.0263
2	22.207	BB	0.4742	418.43558	13.25923	4.9737



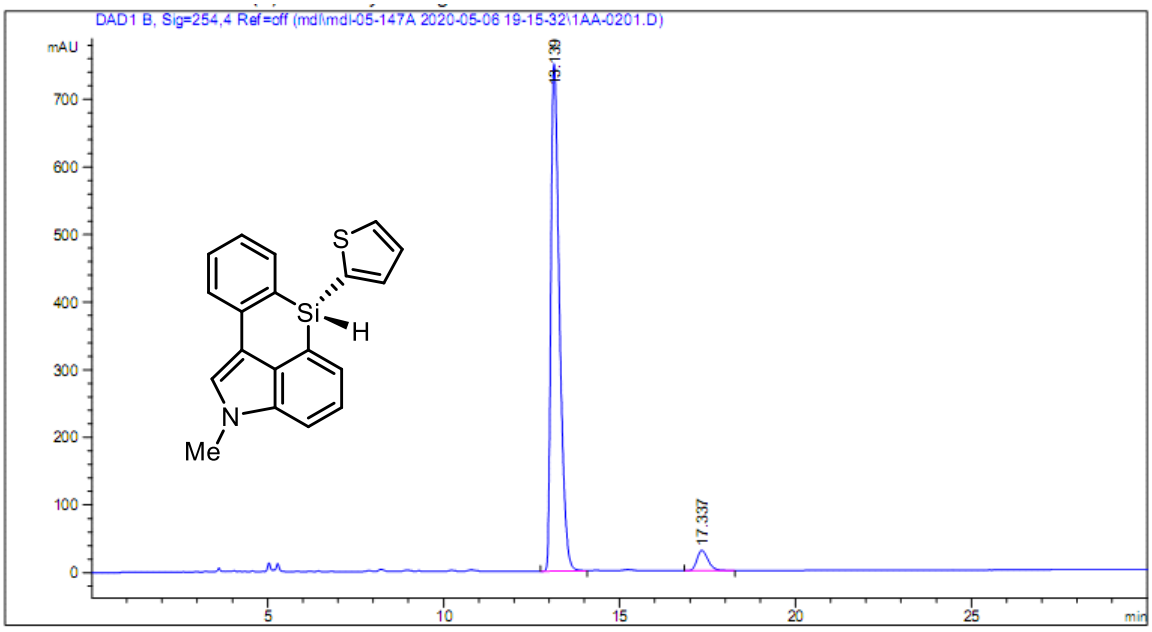
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.975	BB	0.3114	2784.14429	136.82396	50.6694
2	22.462	BB	0.4975	2710.58203	83.77981	49.3306



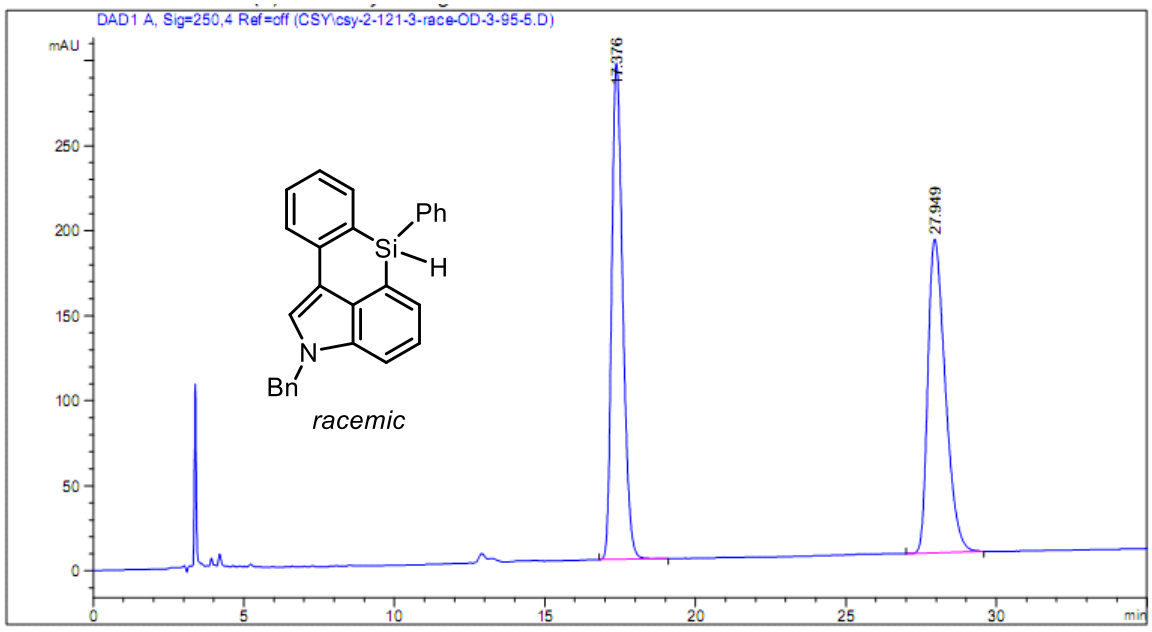
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.613	BB	0.3126	2177.18628	108.29329	97.2273
2	23.396	BB	0.3937	62.08735	1.89794	2.7727



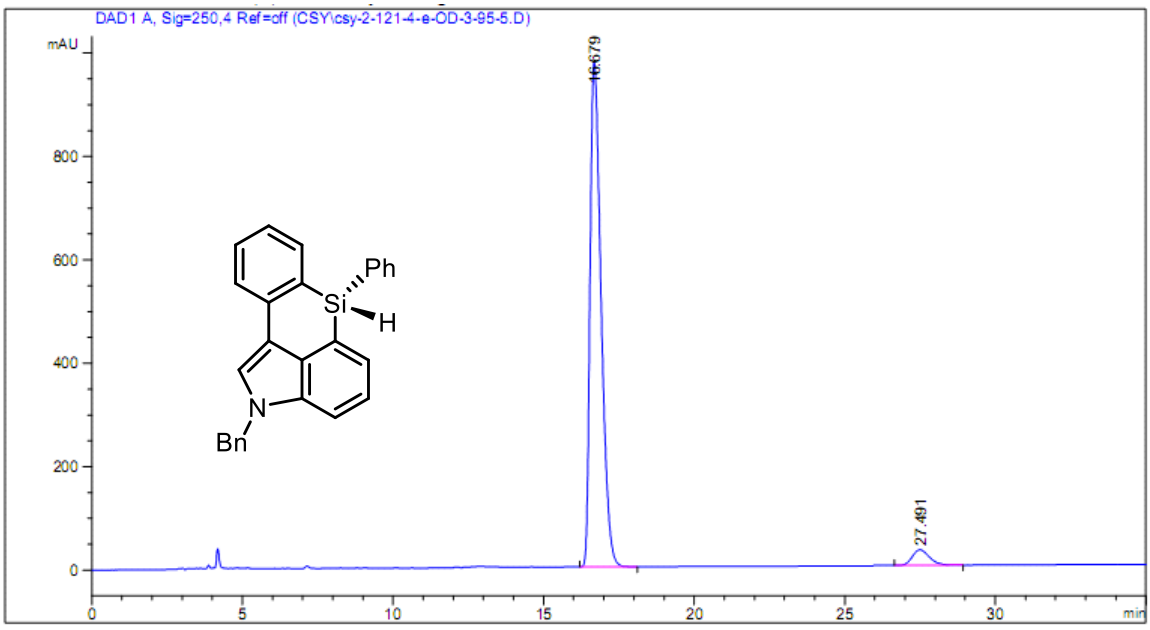
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.166	BB	0.2526	7448.05713	456.00995	49.9635
2	17.130	BB	0.3595	7458.94141	318.21225	50.0365



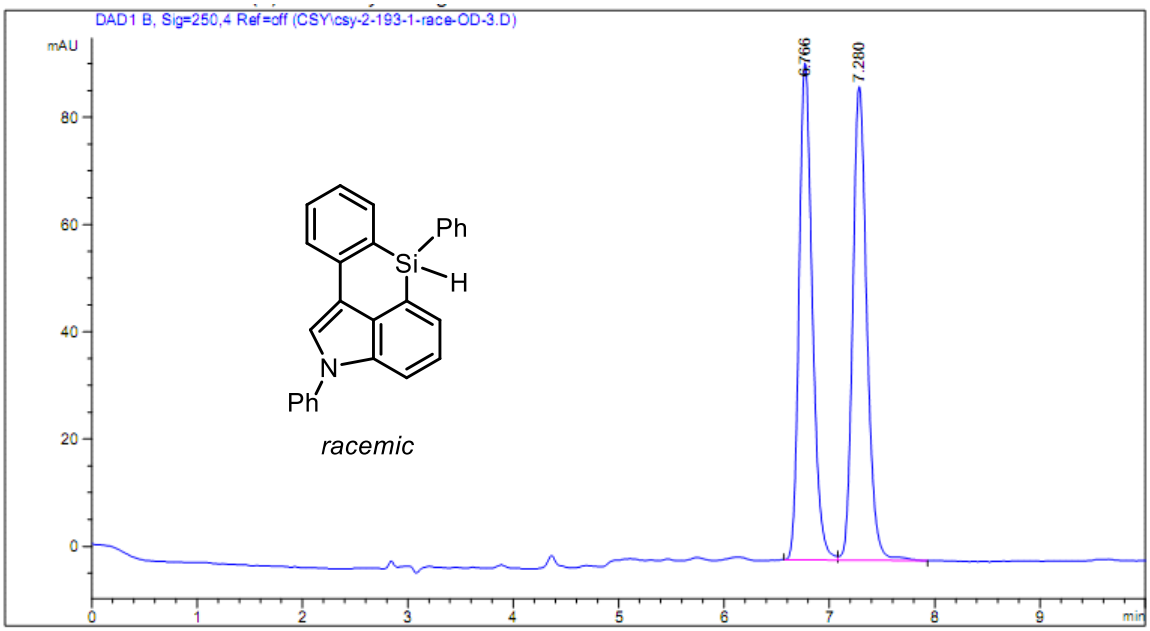
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.139	BB	0.2587	1.26506e4	750.36188	94.9847
2	17.337	BB	0.3408	667.96411	30.35104	5.0153



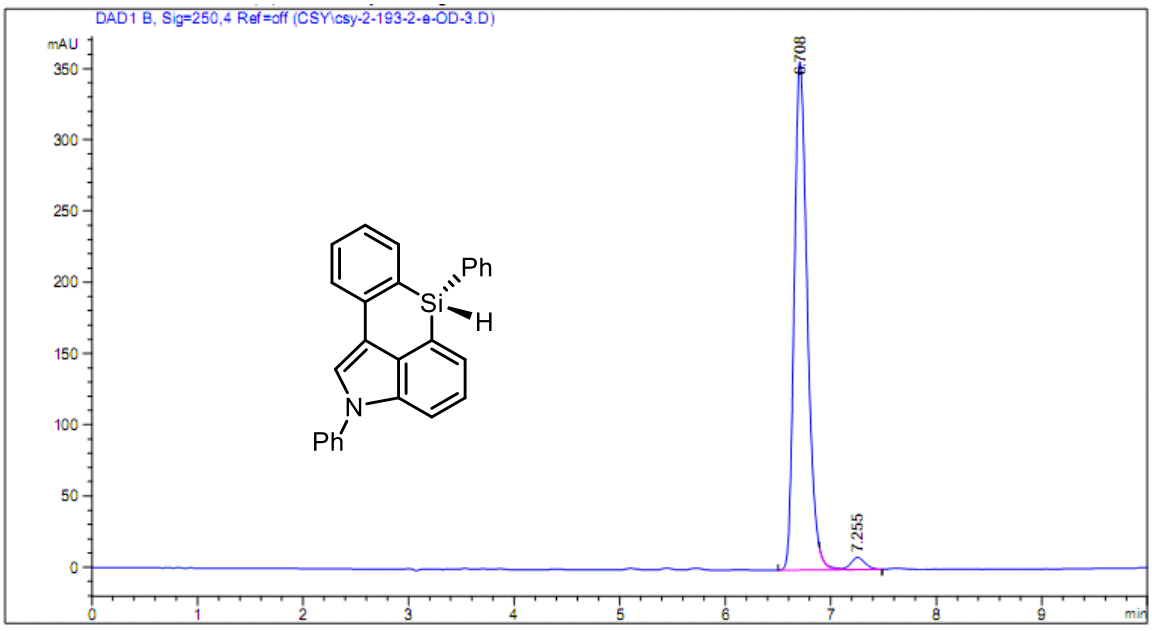
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.376	BB	0.3927	7420.21436	291.79440	50.0383
2	27.949	BB	0.6170	7408.84229	184.30550	49.9617



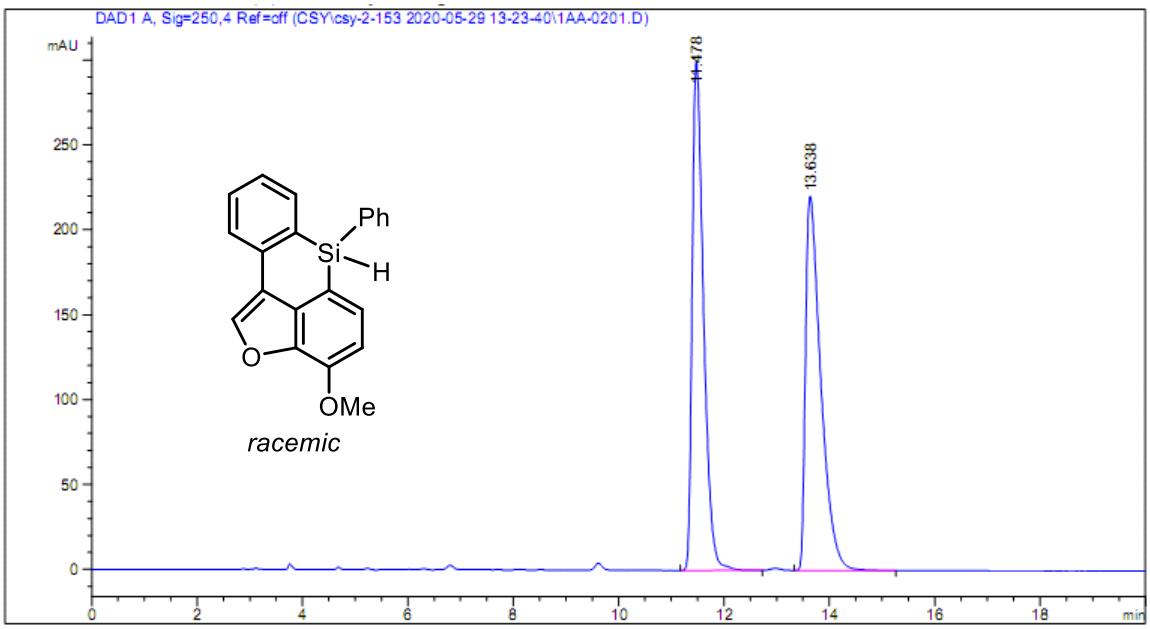
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.679	BB	0.3919	2.47828e4	977.09082	95.3658
2	27.491	BB	0.6022	1204.30151	30.26572	4.6342



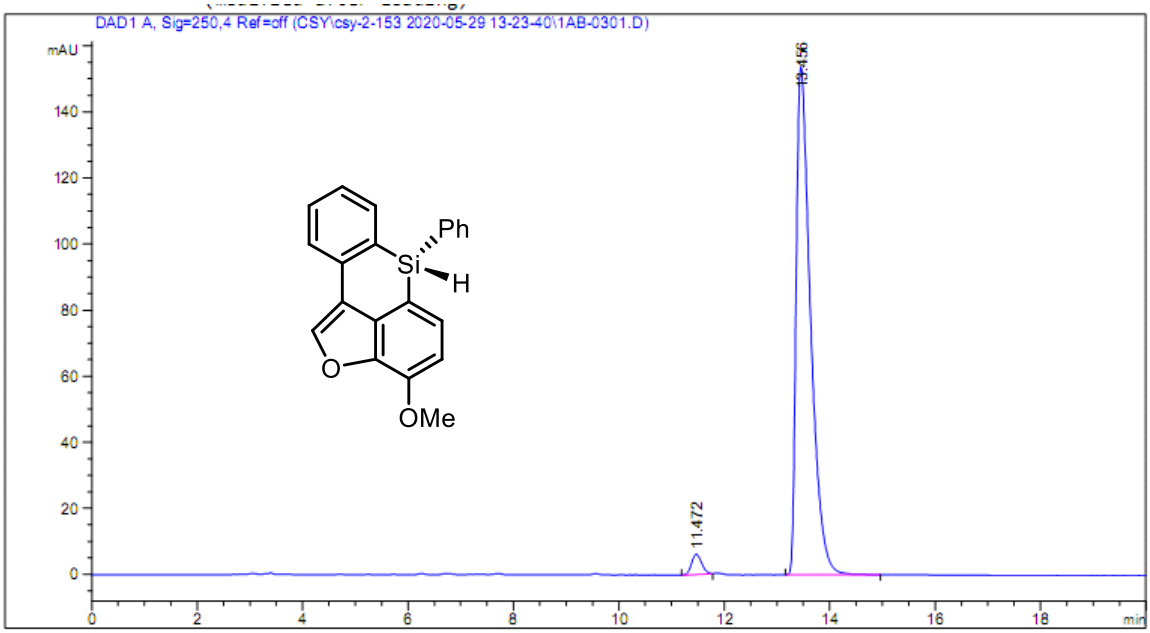
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.766	BV	0.1338	808.83246	92.67847	49.6423
2	7.280	VB	0.1423	820.48962	88.41254	50.3577



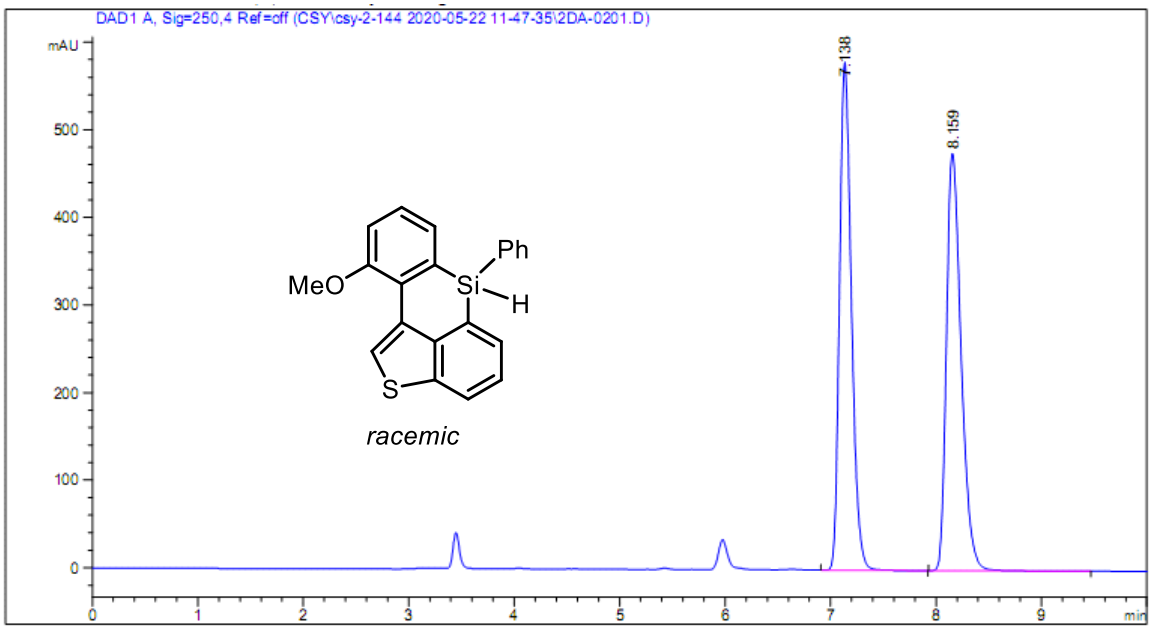
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.708	BV R	0.1326	3074.99512	356.76843	97.3233
2	7.255	VB E	0.1483	84.57084	8.48608	2.6767



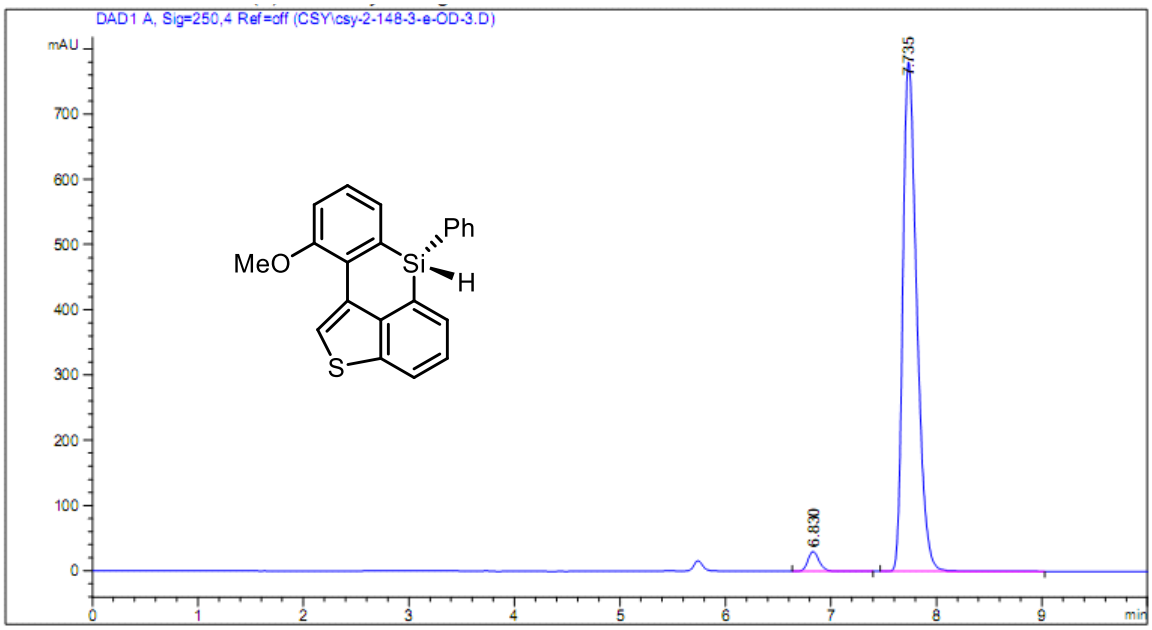
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.478	BB	0.2282	4472.62305	299.61514	50.1170
2	13.638	BB	0.3015	4451.73389	220.51158	49.8830



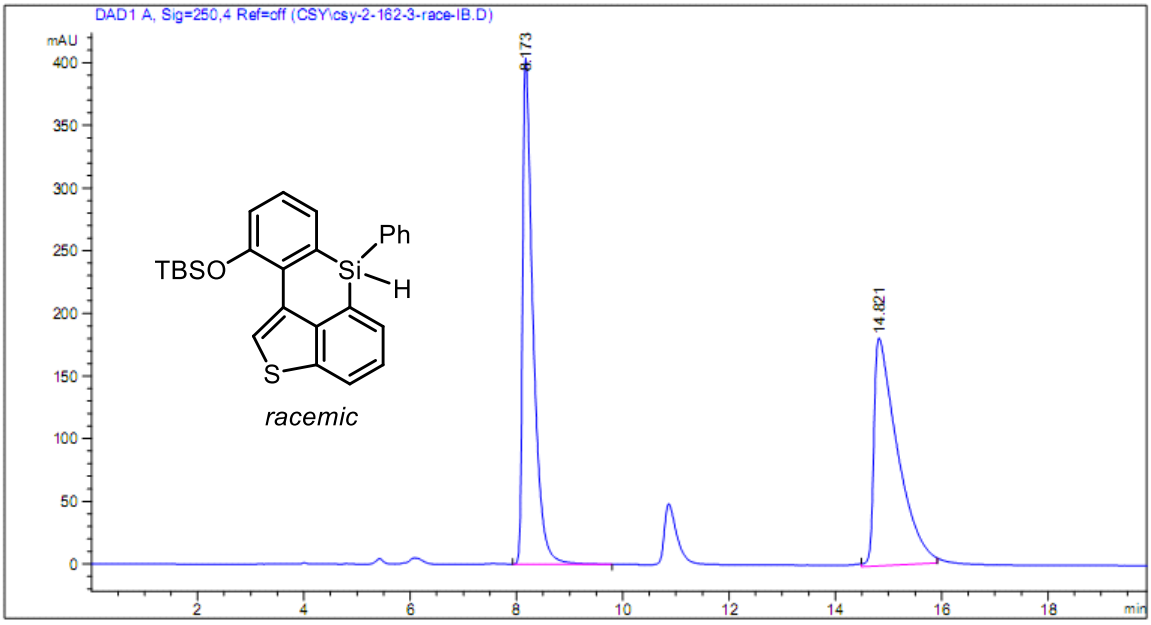
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.472	BB	0.2029	80.39582	6.13331	2.7024
2	13.456	BB	0.2836	2894.57349	153.77072	97.2976



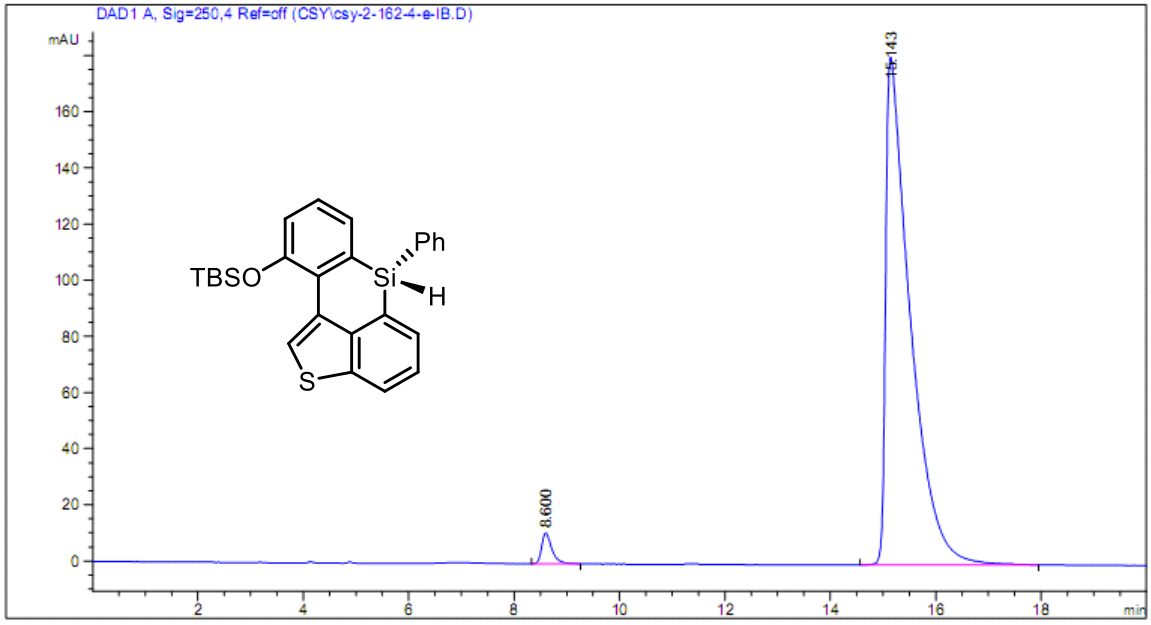
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.138	BB	0.1213	4541.96387	580.32104	49.7173
2	8.159	BB	0.1485	4593.61914	476.51880	50.2827



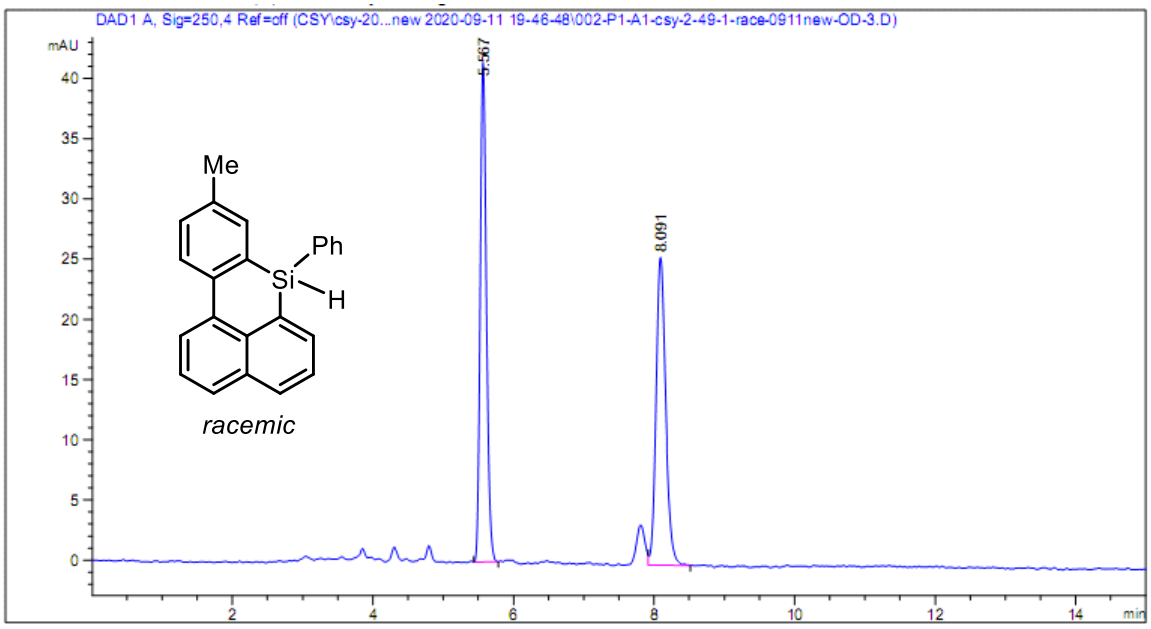
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.830	BB	0.1154	226.53676	30.23831	3.0672
2	7.735	BB	0.1409	7159.13916	781.38623	96.9328



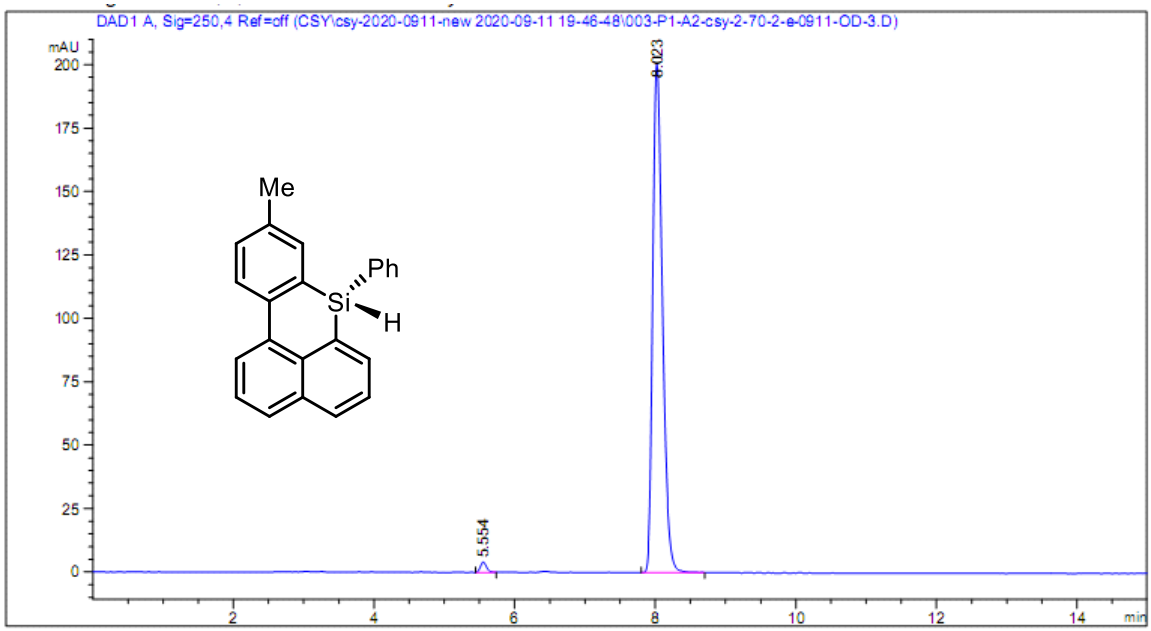
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.173	BB	0.1990	5510.95605	404.31238	49.6637
2	14.821	MM R	0.5120	5585.59717	181.81107	50.3363



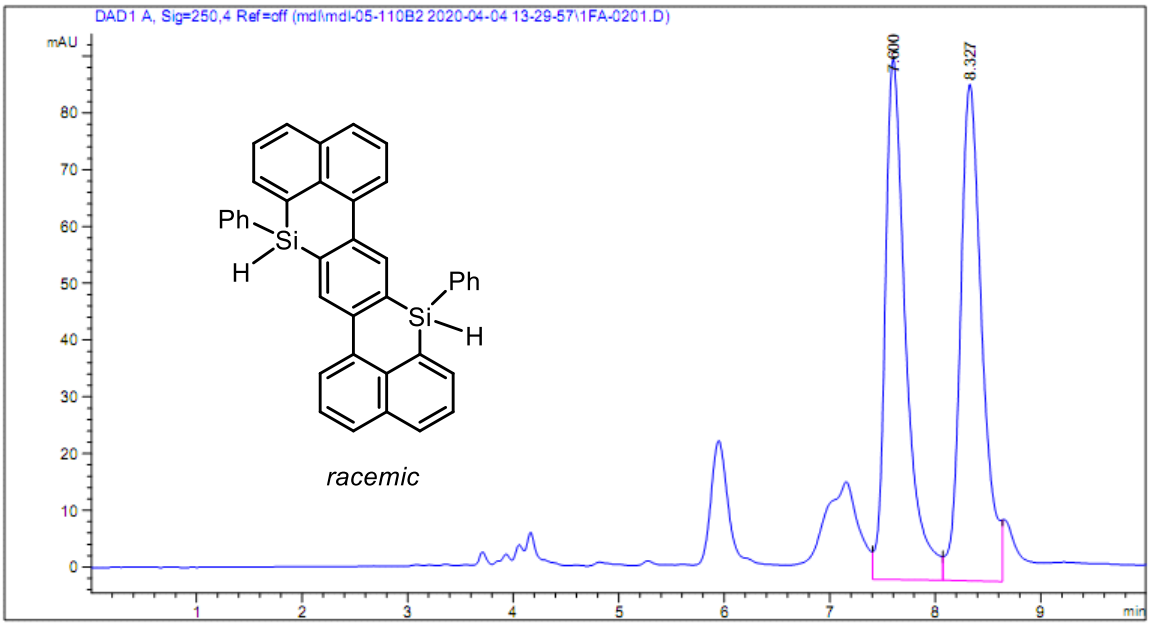
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.600	BB	0.2040	149.46031	11.03790	2.4953
2	15.143	BB	0.4549	5840.26318	180.78598	97.5047



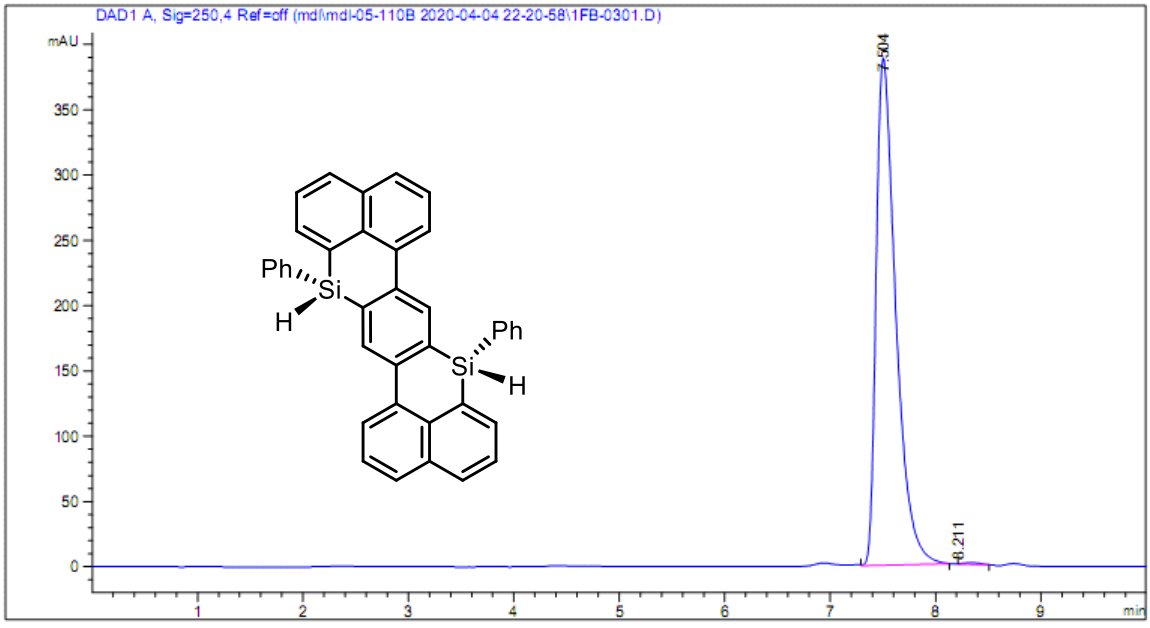
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.567	BB	0.0919	248.60840	41.50169	50.7409
2	8.091	FM R	0.1571	241.34807	25.60515	49.2591



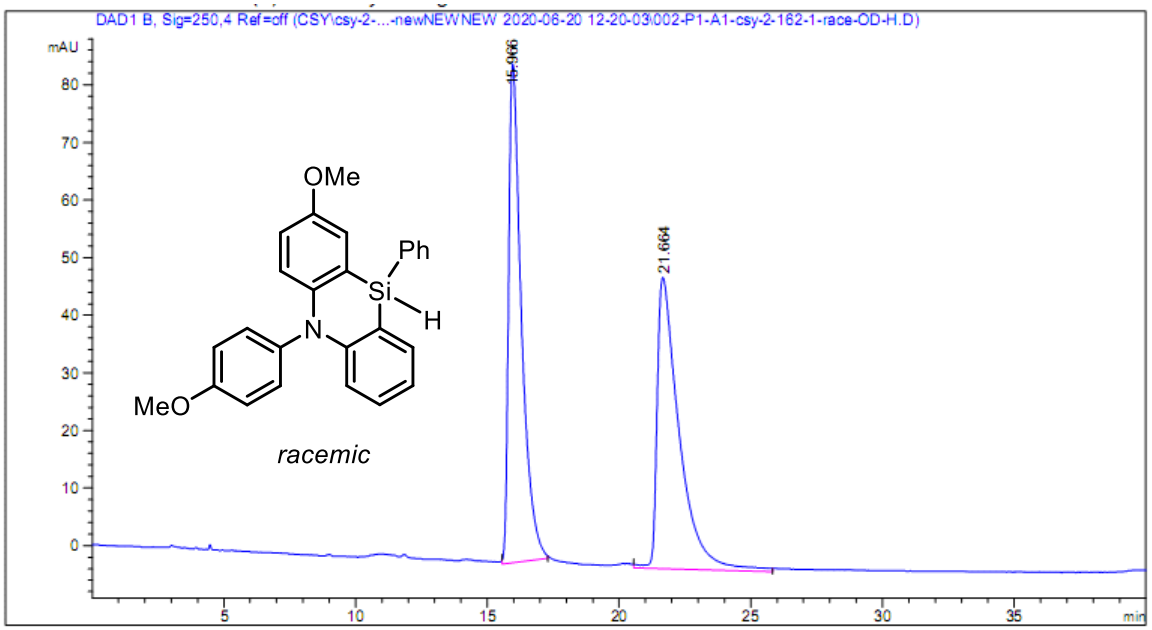
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.554	BB	0.0931	24.95003	4.09229	1.2962
2	8.023	BB	0.1464	1899.90369	200.72807	98.7038



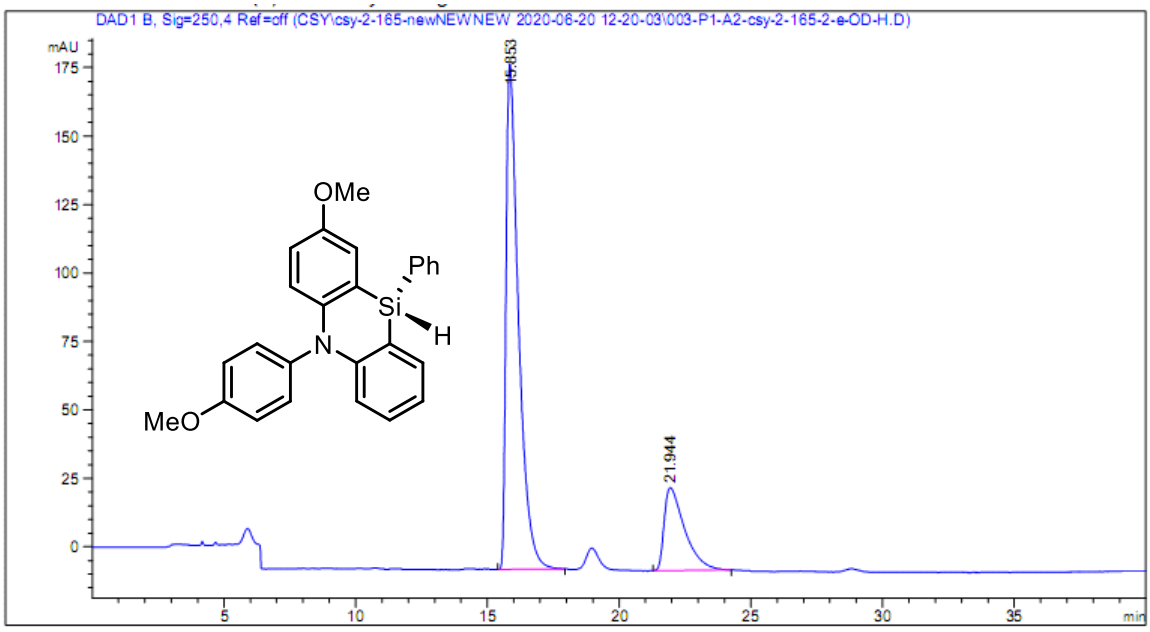
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.600	MF R	0.2258	1243.04468	91.74100	49.8210
2	8.327	FM R	0.2385	1251.97571	87.49155	50.1790



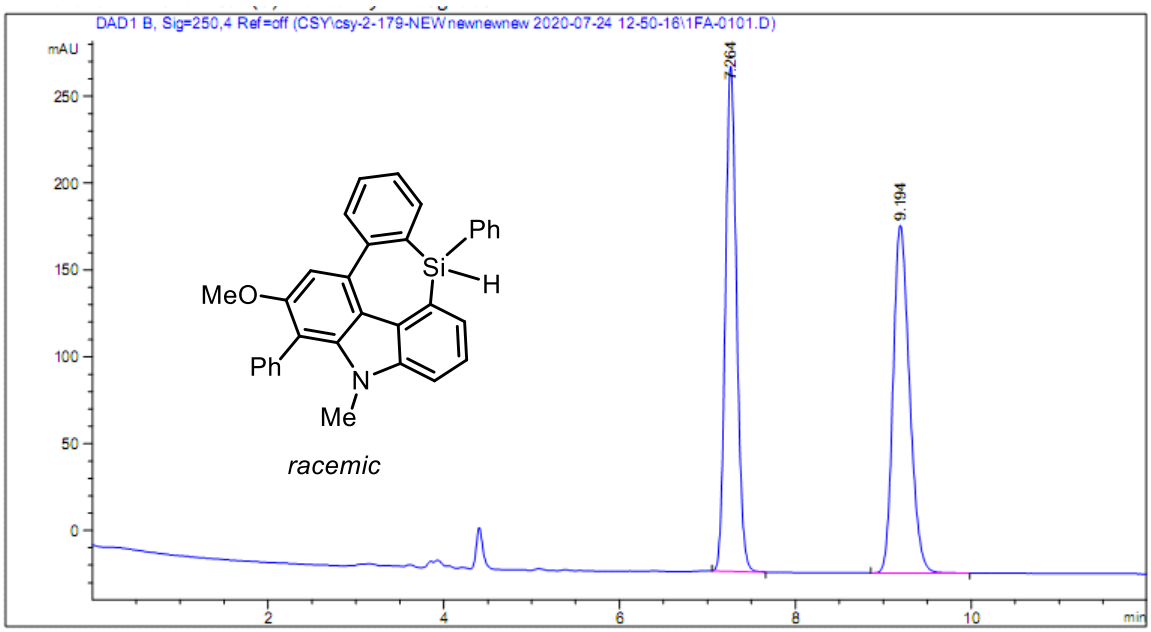
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.504	MM R	0.2155	5024.80908	388.55637	99.6710
2	8.211	MM R	0.1878	16.58517	3.91149e-1	0.3290



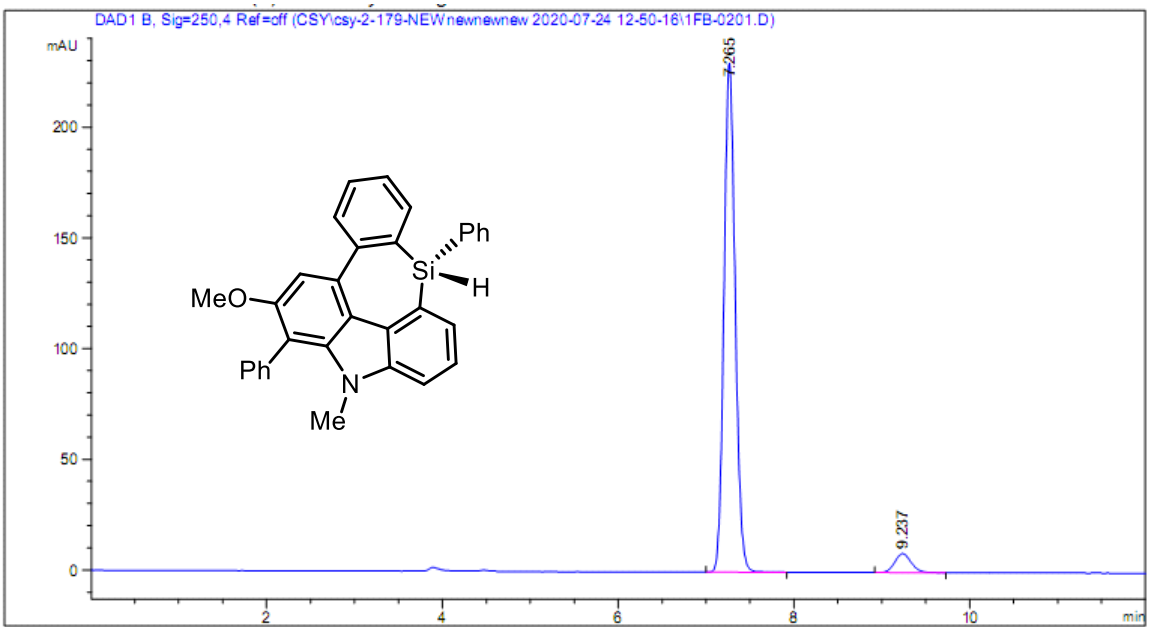
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.966	MM R	0.5644	2934.51294	86.65720	49.9035
2	21.664	MM R	0.9705	2945.85693	50.59251	50.0965



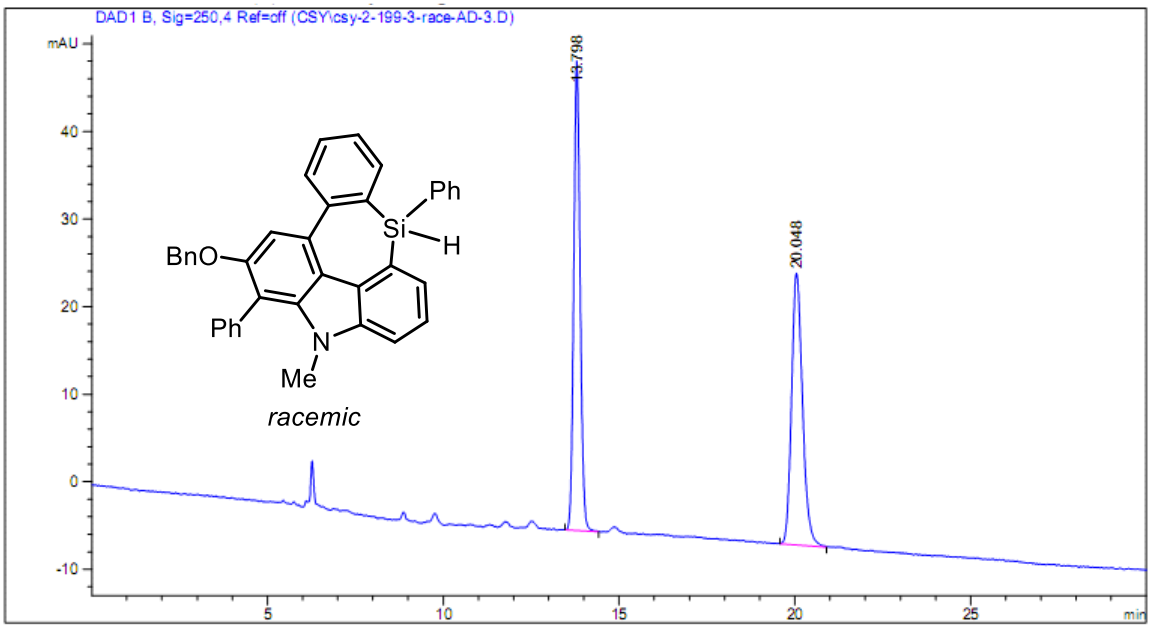
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.853	BB	0.4901	6080.81055	184.71217	78.7271
2	21.944	BB	0.7533	1643.10413	30.36423	21.2729



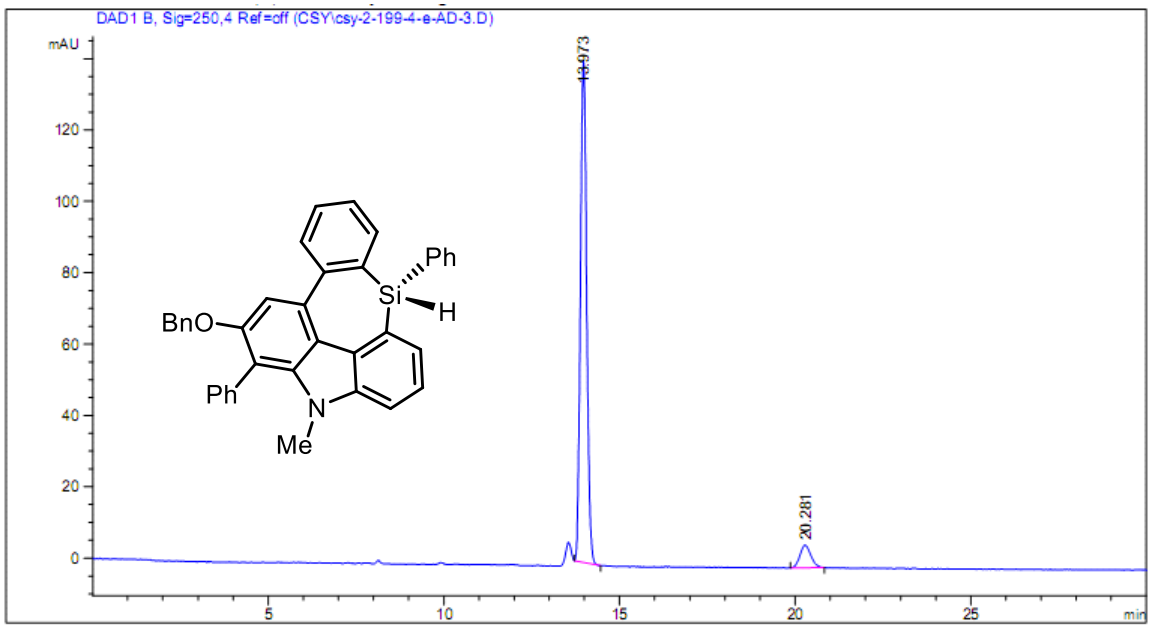
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.264	BB	0.1373	2576.33716	291.03967	49.7903
2	9.194	BB	0.1994	2598.04272	200.14909	50.2097



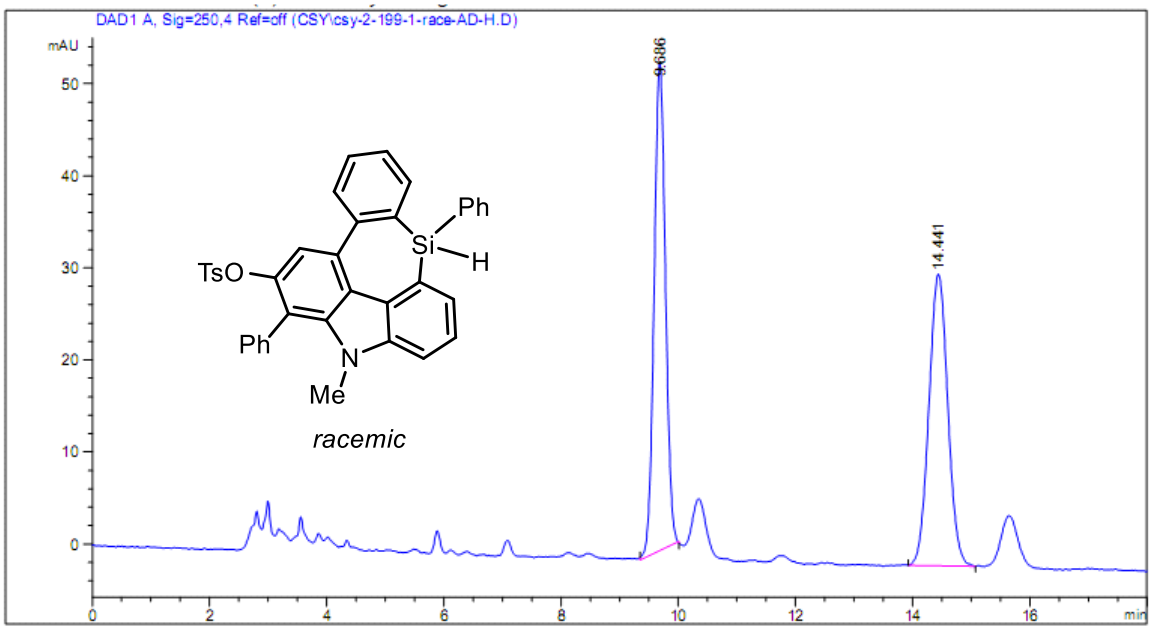
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.265	BB	0.1375	2039.20862	229.82327	94.7597
2	9.237	BB	0.2032	112.77008	8.58966	5.2403



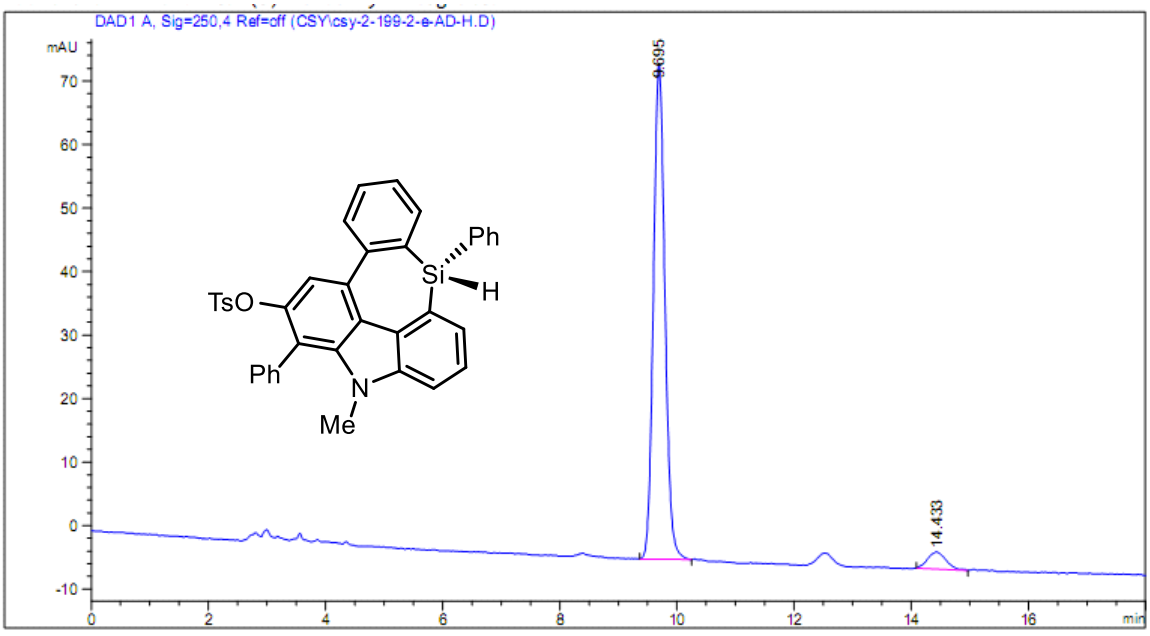
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.798	BB	0.1960	679.92151	53.59085	50.3228
2	20.048	BB	0.3304	671.19983	31.02085	49.6772



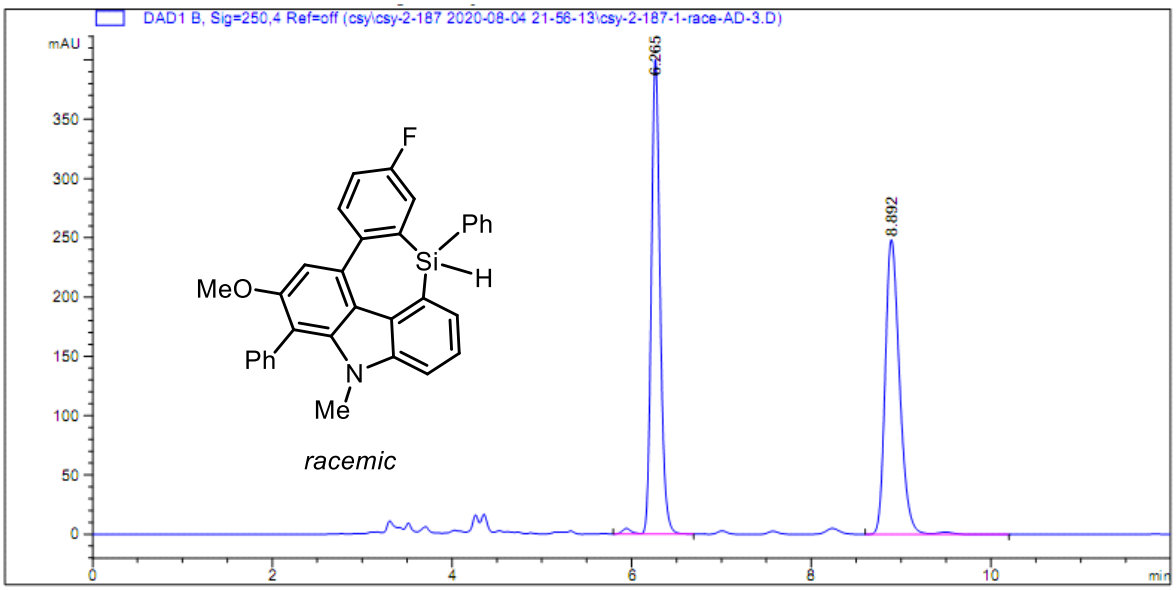
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.973	MM R	0.2059	1733.51147	140.33629	92.6183
2	20.281	BB	0.3001	138.16063	6.39350	7.3817



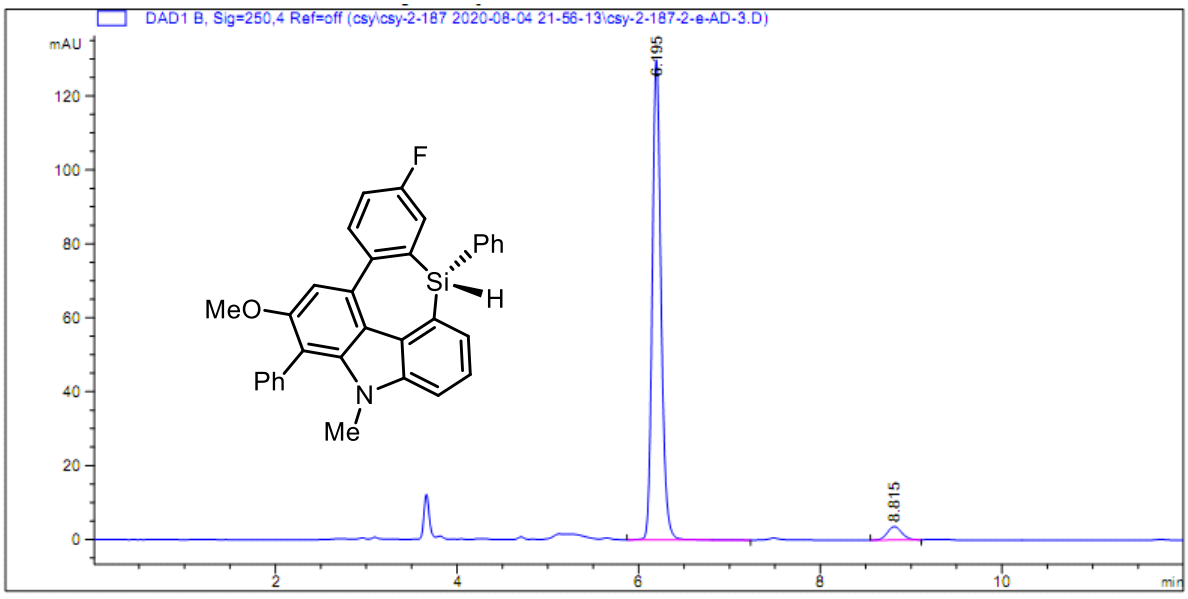
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.686	MM R	0.2233	710.06366	52.99446	50.0290
2	14.441	BB	0.3452	709.23907	31.68392	49.9710



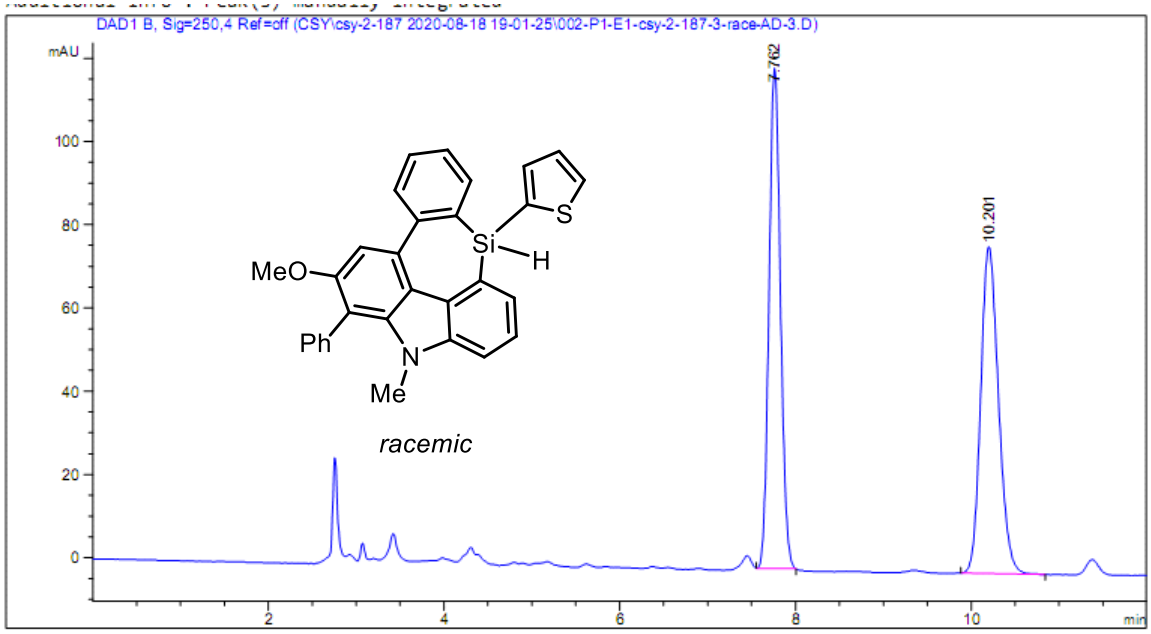
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.695	BB	0.2108	1059.71570	77.84142	94.8723
2	14.433	BB	0.2703	57.27629	2.66976	5.1277



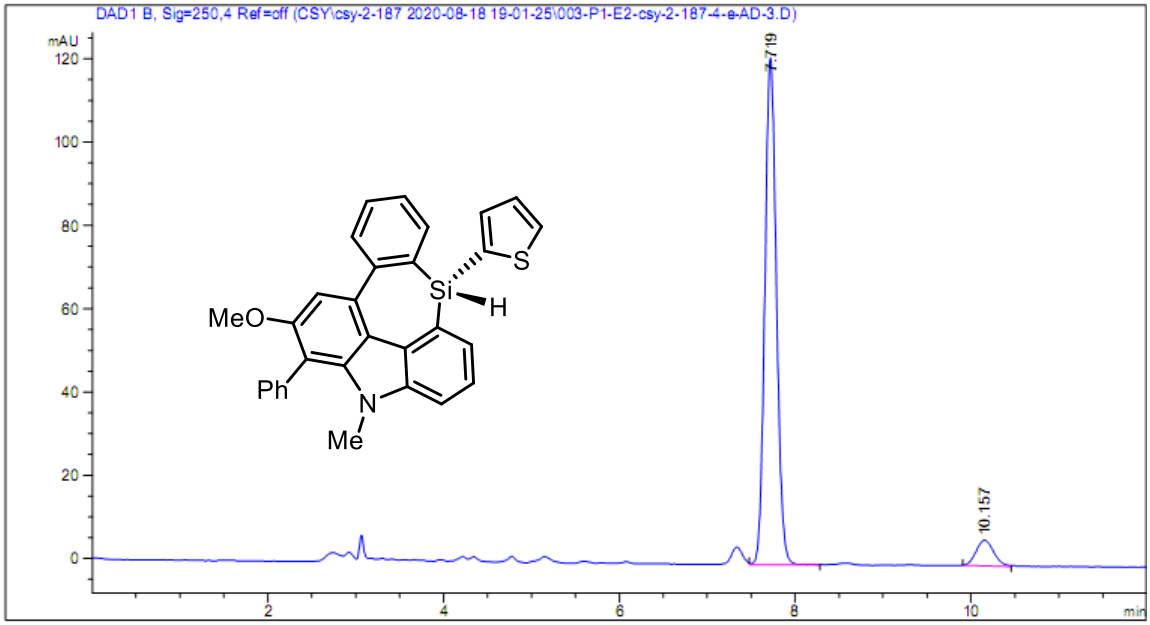
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.265	VB R	0.1031	2755.05566	400.98779	49.9272
2	8.892	BV R	0.1705	2763.09033	248.61623	50.0728



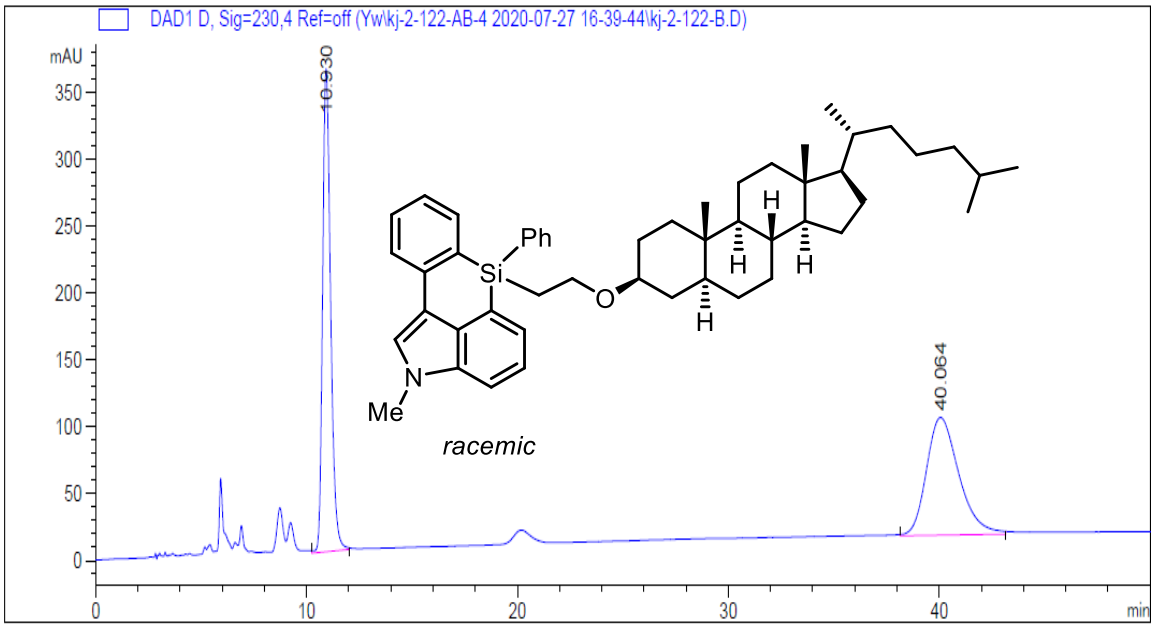
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.195	BB	0.1024	875.33569	130.20793	95.6773
2	8.815	BB	0.1695	39.54797	3.61764	4.3227



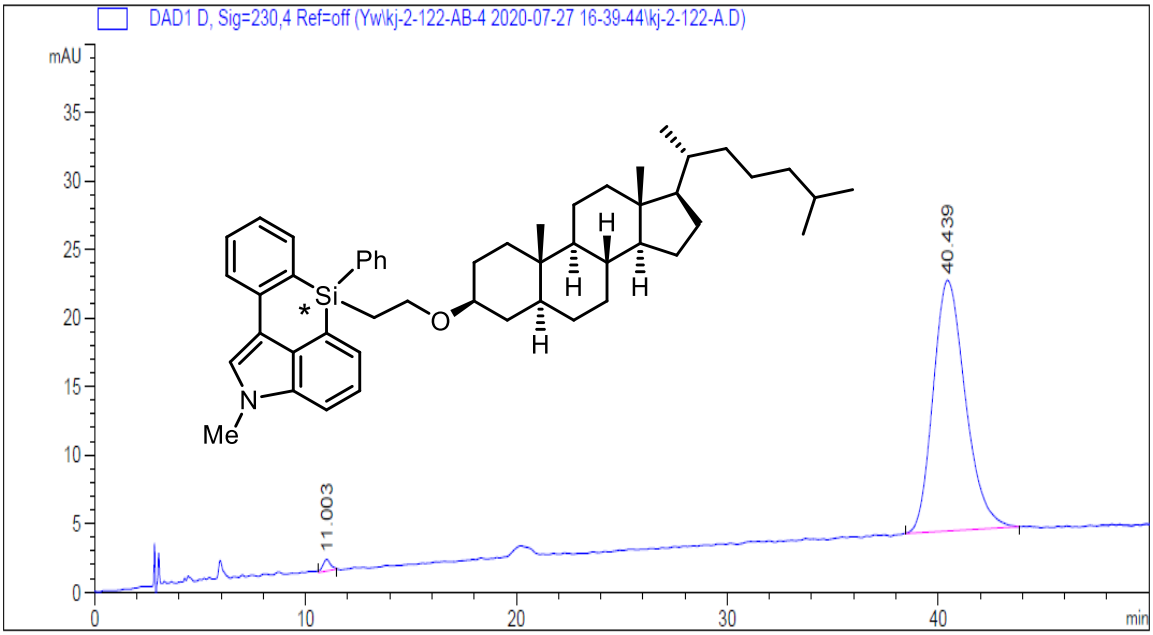
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.762	MM R	0.1503	1084.68604	120.26268	49.6360
2	10.201	BB	0.2175	1100.59607	78.53077	50.3640



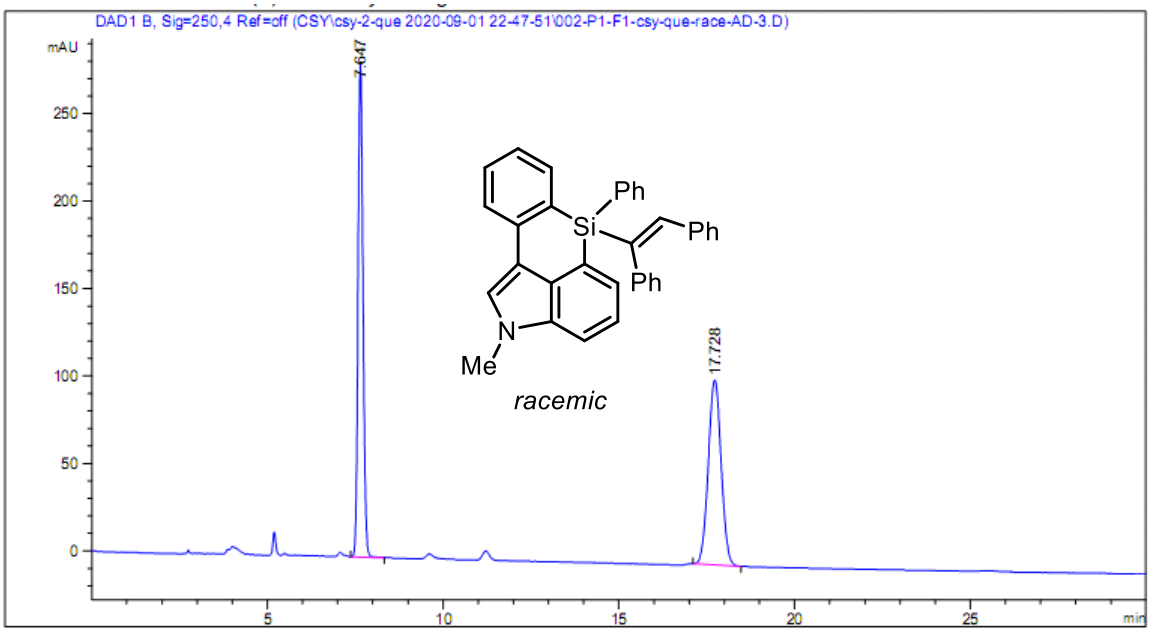
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.719	MM R	0.1518	1110.15161	121.87543	92.7628
2	10.157	MM R	0.2343	86.61270	6.16140	7.2372



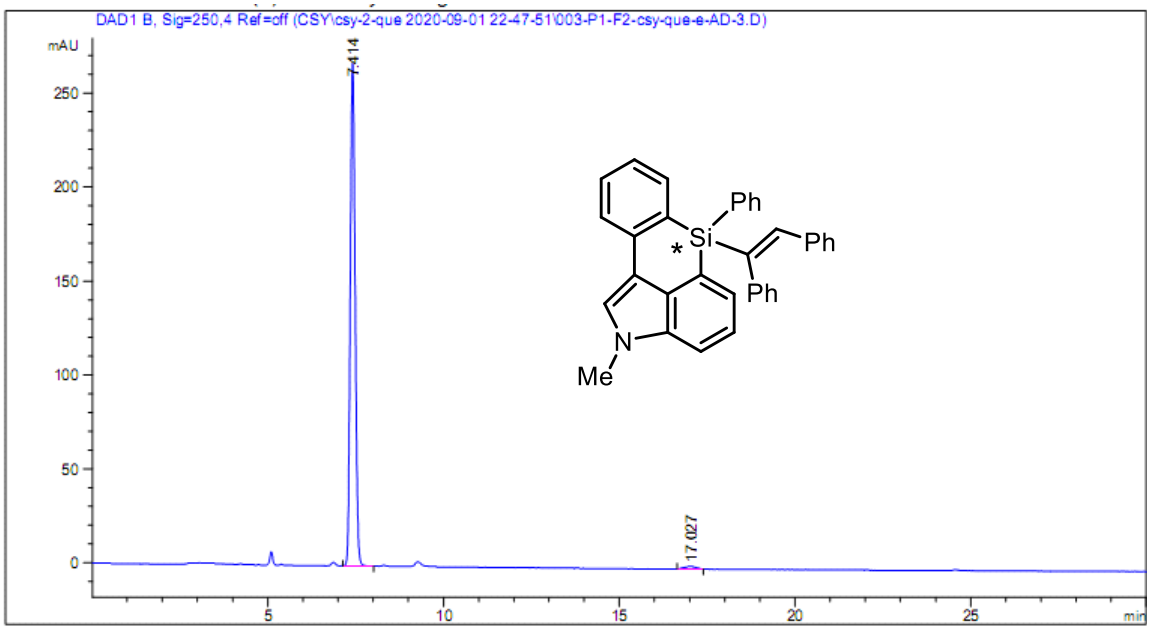
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.930	MM R	0.4386	9499.81543	361.00558	50.1861
2	40.064	MM R	1.7867	9429.35449	87.95641	49.8139



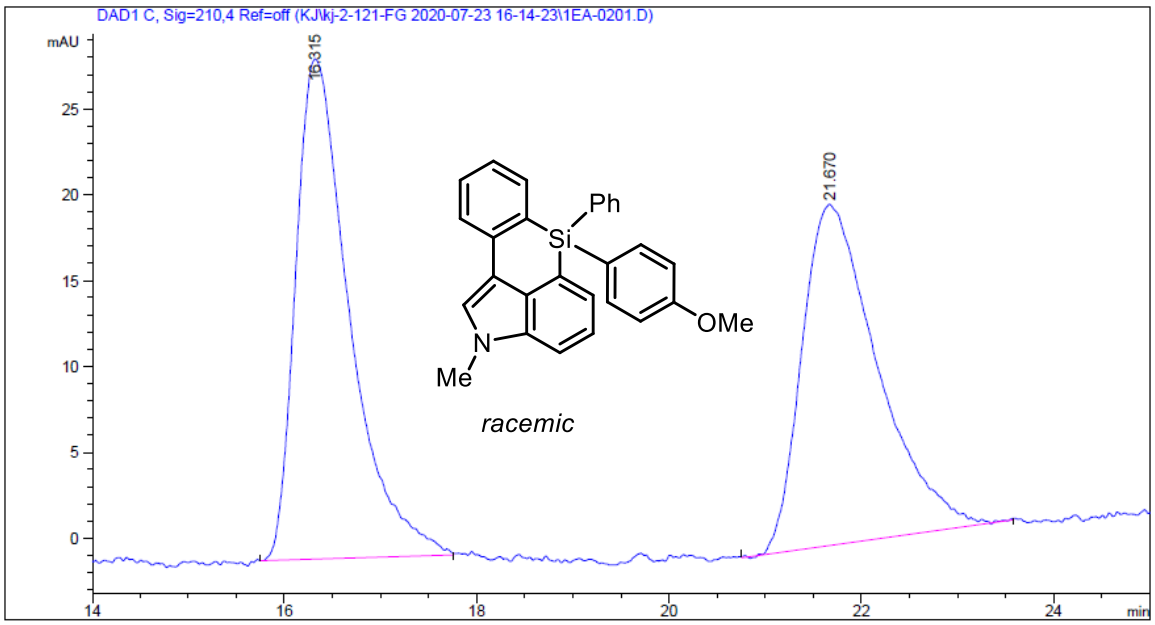
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.003	MM R	0.4205	21.30786	8.44549e-1	1.0829
2	40.439	BB	1.4579	1946.41211	18.28441	98.9171



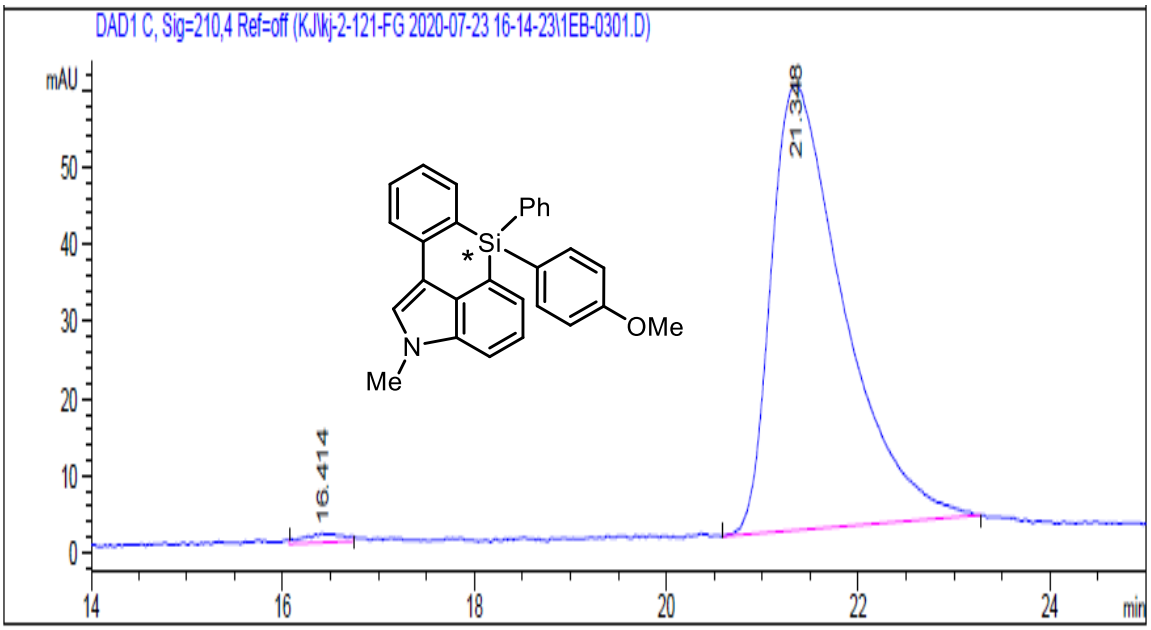
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.647	BB	0.1497	2750.28198	282.18976	50.5670
2	17.728	BB	0.3964	2688.60645	105.81007	49.4330



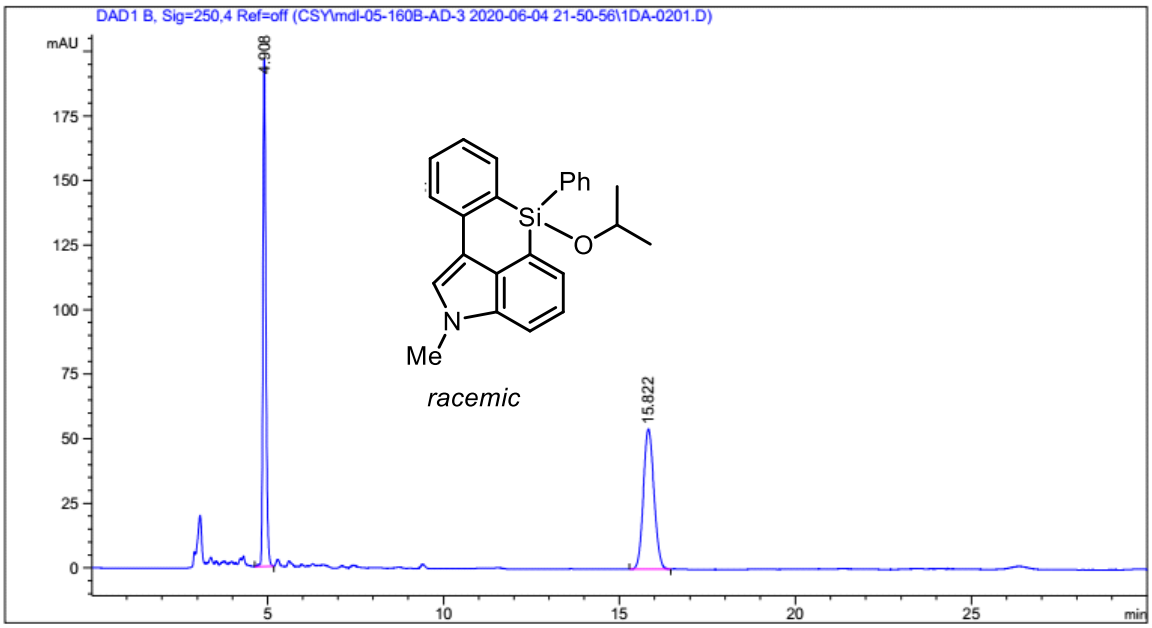
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.414	BB	0.1487	2537.22363	267.49890	98.8358
2	17.027	MM R	0.3863	29.88544	1.28938	1.1642



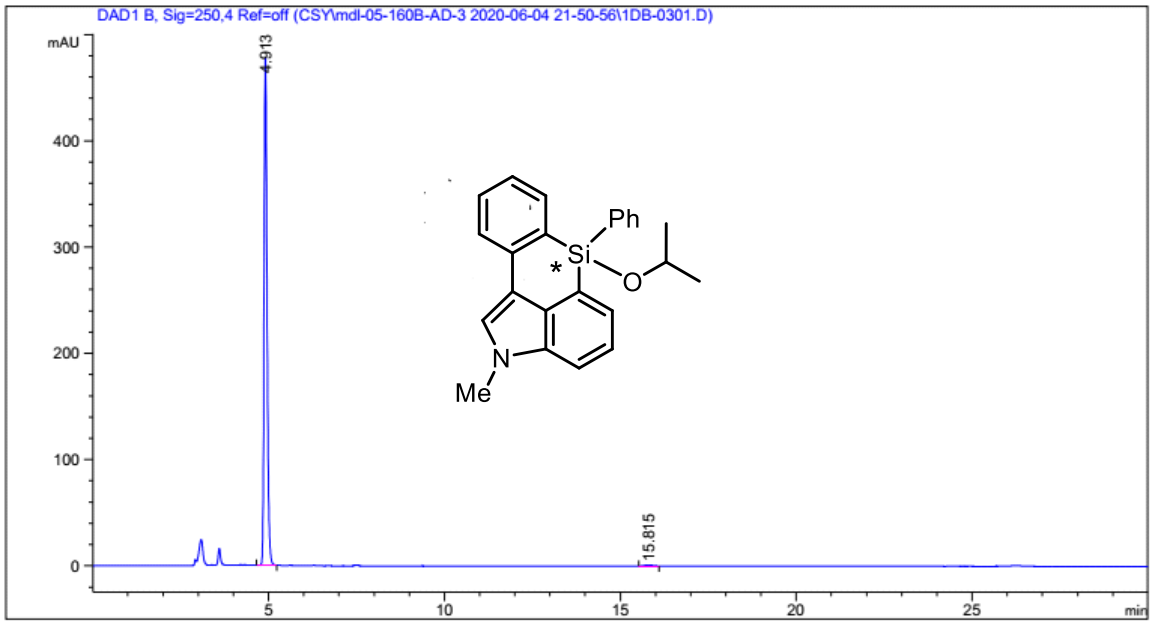
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.315	MM R	0.6477	1132.22729	29.13316	51.0594
2	21.670	MM R	0.9092	1085.24304	19.89431	48.9406



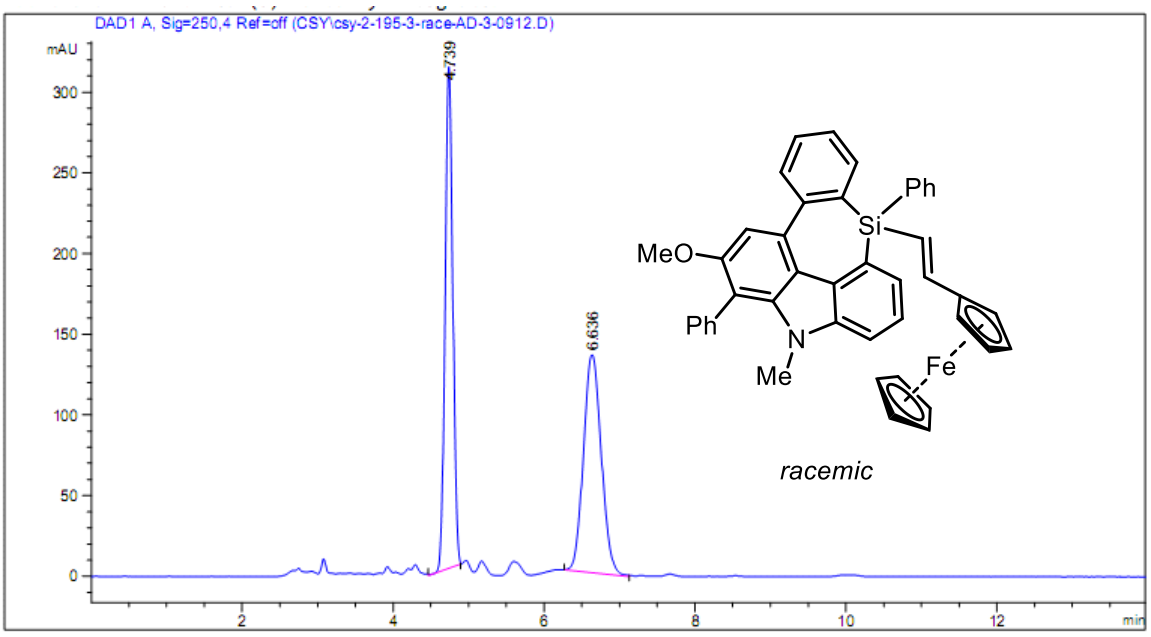
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.414	MM R	0.4816	33.65550	1.16463	1.0953
2	21.348	BB	0.7124	3039.07104	57.70648	98.9047



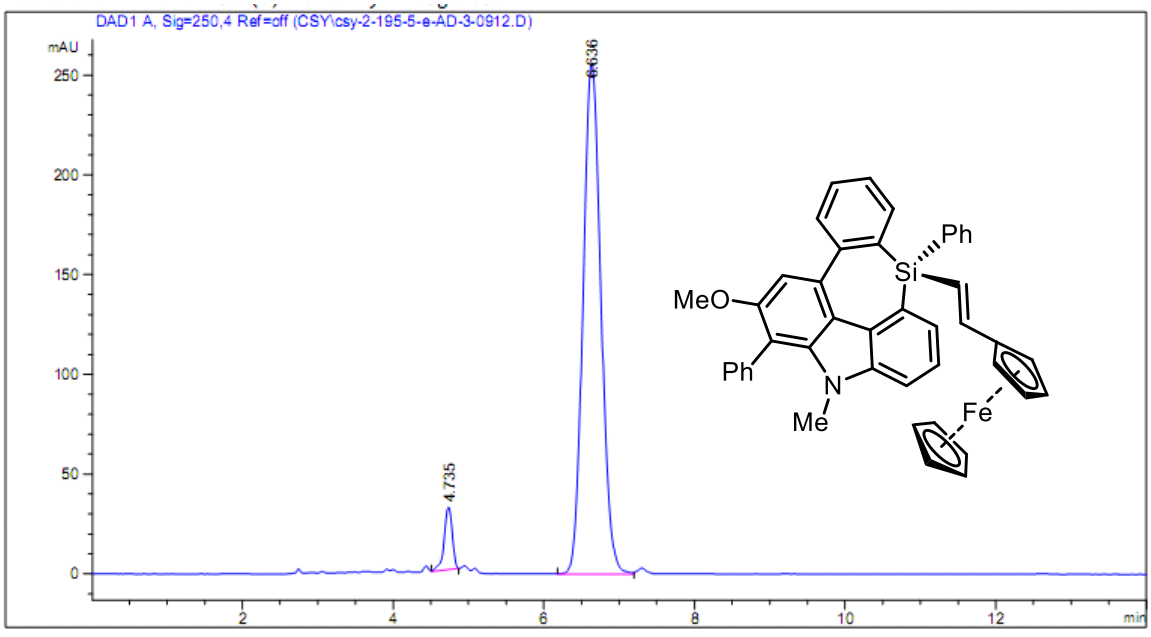
Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	4.908	VB R	0.0898	1143.61926	196.71693	50.1565
2	15.822	BB	0.3283	1136.48157	54.27884	49.8435



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	4.913	BB	0.0890	2830.44531	478.24933	99.0423
2	15.815	MM R	0.3889	27.36983	1.17311	0.9577



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	4.739	MM R	0.1182	2208.51758	311.33322	49.9800
2	6.636	MM R	0.2730	2210.28101	134.95793	50.0200



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	4.735	MM R	0.1234	233.05380	31.46772	5.2382
2	6.636	MM R	0.2751	4216.07861	255.40259	94.7618