

Supporting Information

Preparation of Indolenines via Nucleophilic Aromatic Substitution

Florian Huber,[†] Joel Roesslein,[†] and Karl Gademann*

Department of Chemistry, University of Zurich Winterthurerstrasse 190, 8057 Zurich (Switzerland)

SUPPORTING INFORMATION

Table of Contents

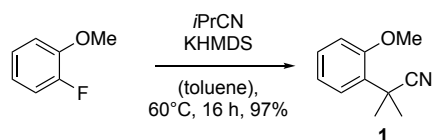
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|--|-----|
| 1. General Information, Materials and Equipment | 3 |
| 2. Experimental Procedures and Characterization of the Nitriles | 4 |
| 3. Experimental Procedures and Characterization of the Indolenines | 16 |
| 4. UV-Vis Spectra | 29 |
| 5. NMR Spectra | 30 |
| 6. References | 128 |

1. General Information, Materials and Equipment

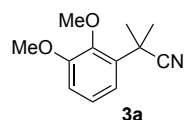
All chemicals were purchased from Sigma-Aldrich, Acros, Alfa Aesar or Fluka and were used without further purification. Solvents applied for chemical transformations were either puriss quality or HPLC grade solvents. For work-up and purification solvents were distilled from technical grade. All synthetic transformations have been monitored by either thin layer chromatography (TLC), ¹H-NMR spectroscopy or GC/EI-MS. TLC was performed on Merck silica gel 60 F₂₅₄ plates (0.25 mm thickness) precoated with a fluorescent indicator. The developed plates were examined under UV light and stained with ceric ammonium molybdate, potassium permanganate or ninhydrin followed by heating. GC/EI-MS measurements were performed on a Finnigan Trace GC ultra from Thermo Electron Corporation with EI (electron ionization), Zebron ZB-5MS (30 m) column and Finnigan Trace DSQ. Concentration under reduced pressure was performed by rotary evaporation at 40 °C. Flash chromatography was performed using silica gel 60 (230-400 mesh) from Sigma-Aldrich with a forced flow eluent at 0.3-0.5 bar pressure. All ¹H and ¹³C-NMR spectra were recorded using Bruker 300 MHz (¹H) or Bruker 400 MHz (¹H) & 101 MHz (¹³C) or Bruker 500 MHz (¹H) & 126 MHz (¹³C) spectrometers at rt. Chemical shifts (δ-values) are reported in ppm, spectra were calibrated related to solvents residual proton chemical shifts (CHCl₃, δ = 7.26; methanol-*d*₃, δ = 3.31; DMSO-*d*₅, δ = 2.50) and solvents residual carbon chemical shifts (CDCl₃, δ = 77.16; methanol-*d*₄, δ = 49.00; DMSO-*d*₆, δ = 39.52), multiplicity is reported as follows: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet or unresolved and coupling constant *J* in Hz. IR spectra were recorded on a Varian 800 FT-IR ATR spectrophotometer. The absorptions are reported in cm⁻¹. RP-HPLC was conducted with a *Prominence* modular HPLC instrument (*Shimadzu*) coupled to a *SPD-20A* UV/Vis detector (*Shimadzu*) using a reversed-phase column (*Gemini-NX* C18, 5 μm, 10 Å, 150 mm x 4.6 mm; *Phenomenex*) for analytical HPLC, and a reversed-phase column (*Gemini NX* C18, 5 μm, 110 Å, 250 mm x 21.2 mm;) for preparative HPLC. The LC was equipped with a *CBM-20A* system controller, a *LC-20AP* solvent delivery unit, a *DGU-20A* degassing unit and a *FRC-10A* fraction collector (all *Shimadzu*). The following solvents were used: H₂O + 0.1 % HCOOH (A), MeCN + 0.1 % HCOOH (B). All high-resolution mass spectra (HRMS-ESI) were recorded by the mass spectrometry service at the University of Zürich on a Finnigan MAT95 mass spectrometer or (for EI) on a *DFS* double-focusing (BE geometry) magnetic sector mass spectrometer (*ThermoFisher Scientific*, Bremen, Germany). Mass spectra were measured with electron ionization (EI) at 70 eV, solid probe inlet, a source temperature of 200 °C, an acceleration voltage of 5 kV, and a resolution of 10'000. The instrument was scanned between e.g. *m/z* 300 und 350 at scan rate of 100- 200 s / decade in the electric scan mode. Perfluorokerosene (PFK, Fluorochem, Derbyshire, UK) served for calibration. UV-Vis spectra were recorded on a Shimadzu UV-1800 spectrometer. Melting points (M.p.) were determined using a Büchi B-545 apparatus in open capillaries and are uncorrected. All nitriles were synthesized from commercially available starting materials. 2-(2,3-Dimethoxyphenyl)acetonitrile,^[1] 2-(2,4-dimethoxyphenyl)acetonitrile,^[2] 2-(2,5-dimethoxyphenyl)acetonitrile,^[3] 2-(2,6-dimethoxy-phenyl)acetonitrile,^[4] 1-bromo-2,3-dimethoxy-4-isopropylbenzene,^[5] sodium cyanoacetate,^[6] (4-isopropyl-2,3,5-trimethoxy-phenyl)methanol,^[7] (S)-2,2'-dimethoxy-1,1'-binaphthalene,^[8] *tert*-butyl(2-iodoethoxy)dimethylsilane,^[9] were prepared according to literature known procedures.

2. Experimental Procedures and Characterization for the Nitriles

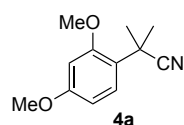
General procedure 1:



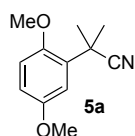
General procedure 1: 2-(2-methoxyphenyl)-2-methylpropanenitrile(1): 2-Fluoroanisole (1.1 mL 9.85 mmol, 1.0 eq.), *t*PrCN (3.5 mL, 39.4 mmol, 4 eq.) and KHMDS (2.95 g, 14.8 mmol, 1.5 eq.) were dissolved in dry toluene (11 mL) and stirred at 60 °C for 16 h. The reaction was quenched with sat. aq. NH₄Cl solution (30 mL) and extracted with EtOAc (3 x 30 mL), washed with brine, dried over Na₂SO₄, filtered and the solvent was removed under reduced pressure. The crude was purified with flash chromatography on silica (Et₂O/pentane 1:4) to give compound **1a** (1.68 g, 9.56 mmol, 97%) as a colorless liquid. *R_f* = 0.41 (Et₂O/pentane 1:4). ¹H-NMR (500 MHz, CDCl₃) δ = 7.35 – 7.30 (m, 2H), 6.98 – 6.95 (m, 2H), 3.93 (s, 3H), 1.77 (s, 6H). ¹³C-NMR (126 MHz, CDCl₃) δ = 157.5, 129.5, 128.8, 126.1, 124.9, 120.9, 112.1, 55.6, 34.6, 27.1. The analytical data are in agreement with the literature.^[10]



2-(2,3-dimethoxyphenyl)-2-methylpropanenitrile (3a): To a mixture of 579 mg (14.5 mmol, 2.6 eq.) sodium hydride in 16 mL THF were added 987 mg (5.57 mmol) 2-(2,3-dimethoxyphenyl)acetone nitrile in 1 mL THF at 0 °C. After stirring the mixture for 30 min, 0.81 mL (1.84 g, 12.8 mmol, 2.3 eq.) iodomethane were added dropwise and the reaction was stirred at rt for 16 h. 30 mL water were added to the reaction and the aq. phase was extracted with ethyl acetate (3 x 30 mL). The combined organic phases were washed with brine (30 mL) and dried over Na₂SO₄. The solvent was removed in vacuum. After flash chromatography on silica (pentane/Et₂O 9:1) compound **3a** (1.07 g, 5.23 mmol, 94%) was obtained as a colorless oil. *R_f* = 0.44 (pentane/Et₂O 8:2). IR (neat) ν = 2981, 2940, 2837, 2234, 1583, 1477, 1427, 1300, 1271, 1233, 1055, 1002, 789, 767, 744, 667 cm⁻¹. ¹H-NMR (400 MHz, CDCl₃) δ = 7.04 – 7.00 (m, 1H), 6.93 – 6.88 (m, 2H), 4.02 (s, 3H), 3.88 (s, 3H), 1.75 (s, 6H). ¹³C-NMR (101 MHz, CDCl₃) δ = 153.3, 147.5, 134.4, 125.6, 123.5, 117.3, 112.7, 60.5, 56.0, 34.1, 27.9. HRMS (ESI) m/z: calcd. for C₁₂H₁₅N₁O₂Na₁ [M+Na]⁺: 228.0995, found: 228.0992.



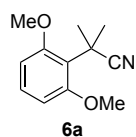
2-(2,4-dimethoxyphenyl)-2-methylpropanenitrile (4a): To a mixture of 596 mg (14.9 mmol, 2.2 eq.) sodium hydride in 20 mL THF were added 1.20 g (6.77 mmol) 2-(2,4-dimethoxyphenyl)acetone nitrile in 1 mL THF at 0 °C. After stirring the mixture for 30 min, 0.87 mL (1.99 g, 13.9 mmol, 2.1 eq.) iodomethane were added dropwise and the reaction was stirred at rt for 16 h. 30 mL water were added to the reaction and the aq. phase was extracted with ethyl acetate (3 x 30 mL). The combined organic phases were washed with brine (30 mL) and dried over Na₂SO₄. The solvent was removed in vacuum. After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **4a** (1.09 g, 5.31 mmol, 78%) was obtained as a white solid. *R_f* = 0.6 (pentane/ethyl acetate 8:2). IR (neat) ν = 2984, 2940, 2841, 2233, 1612, 1585, 1506, 1462, 1416, 1312, 1267, 1210, 1155, 1093, 1035, 939, 835, 488 cm⁻¹. mp: 52 - 53 °C. ¹H-NMR (400 MHz, CDCl₃) δ = 7.22 (d, *J* = 8.6 Hz, 1H), 6.51 (d, *J* = 2.4 Hz, 1H), 6.46 (dd, *J* = 8.6, 2.5 Hz, 1H), 3.89 (s, 3H), 3.81 (s, 3H), 1.73 (s, 6H). ¹³C-NMR (101 MHz, CDCl₃) δ = 160.8, 158.5, 126.7, 125.1, 121.4, 104.2, 99.9, 55.6, 55.5, 34.1, 27.3. HRMS (ESI) m/z: calcd. for C₁₂H₁₅N₁O₂Na₁ [M+Na]⁺: 228.0995, found: 228.0995.



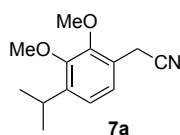
2-(2,5-dimethoxyphenyl)-2-methylpropanenitrile (5a): To a solution of 517 mg (2.92 mmol) 2-(2,5-dimethoxyphenyl)acetone nitrile in 29 mL THF were added 8.7 mL (8.76 mmol, 1 M in THF, 3.0 eq.) KHMDS at 0 °C. The reaction was stirred for 30 min and 0.40 mL (921 mg, 6.42 mmol, 2.2 eq.) iodomethane were added dropwise and the reaction was stirred at rt for 4 h. 30 mL of a sat. aq. NH₄Cl solution were added to the reaction and the aq. phase was extracted with Et₂O (3 x 30 mL). The combined organic phases were dried over Na₂SO₄. The solvent was removed in vacuum. After flash chromatography on silica (pentane/Et₂O 8:2) compound **5a** (549 mg, 2.68 mmol, 92%) was obtained as a colorless oil. *R_f* = 0.26 (pentane/Et₂O 8:2). IR (neat) ν = 2981, 2940, 2836, 2234, 1589, 1498,

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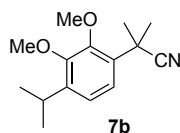
1463, 1422, 1284, 1233, 1181, 1082, 1050, 1025, 872, 809, 731 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 6.92 (d, J = 2.9 Hz, 1H), 6.88 (d, J = 8.9 Hz, 1H), 6.82 (dd, J = 8.9, 2.9 Hz, 1H), 3.88 (s, 3H), 3.78 (s, 3H), 1.75 (s, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 153.7, 151.6, 130.1, 124.8, 113.4, 113.2, 112.8, 56.2, 55.9, 34.6, 27.1. **HRMS** (ESI) m/z : calcd. for $\text{C}_{12}\text{H}_{15}\text{N}_1\text{O}_2\text{Na}_1$ $[\text{M}+\text{Na}]^+$: 228.0995, found: 228.0993.



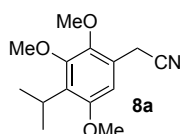
2-(2,6-dimethoxyphenyl)-2-methylpropanenitrile (6a): To a solution of 370 mg (2.09 mmol) 2-(2,6-dimethoxyphenyl)acetonitrile in 10 mL THF were added 1.25 g (6.27 mmol, 3.0 eq.) KHMDS at 0 °C. The reaction was stirred for 30 min and 0.30 mL (689 mg, 4.81 mmol, 2.3 eq.) iodomethane were added dropwise and the reaction was stirred at rt for 18 h. 30 mL of a sat. aq. NH_4Cl solution were added to the reaction and the aq. phase was extracted with Et_2O (3 x 30 mL). The combined organic phases were dried over Na_2SO_4 . The solvent was removed in vacuum. After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **6a** (226 mg, 1.10 mmol, 53%) was obtained as a colorless oil. R_f = 0.3 (pentane/ethyl acetate 9:1). **IR** (neat) ν = 2975, 2941, 2839, 2230, 1593, 1583, 1473, 1433, 1255, 1133, 1096, 784, 729, 589 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 7.21 (t, J = 8.3 Hz, 1H), 6.59 (d, J = 8.4 Hz, 2H), 3.84 (s, 6H), 1.86 (s, 6H). **$^{13}\text{C-NMR}$** (126 MHz, CDCl_3) δ = 158.4, 129.0, 126.6, 116.8, 105.8, 56.0, 34.2, 28.8. **HRMS** (ESI) m/z : calcd. for $\text{C}_{12}\text{H}_{15}\text{N}_1\text{O}_2\text{Na}_1$ $[\text{M}+\text{Na}]^+$: 228.0995, found: 228.0998.



2-(4-isopropyl-2,3-dimethoxyphenyl)acetonitrile (7a): A dry schlenk tube was equipped with 52.5 mg (144 μmol , 2 mol%) allylpalladium(II)chloride, 177 mg (431 μmol , 6 mol%) SPhos and 1.15 g (10.8 mmol, 1.5 eq.) sodium cyanoacetate. The tube was put under vacuum and flushed with argon (3 times). 1.86 g (7.18 mmol) 1-bromo-2,3-dimethoxy-4-isopropylbenzene in 14 mL mesitylene were added and the mixture was heated to 140 °C for 24 h. After cooling to rt the reaction was filtered over a short pad of celite®, washed with Et_2O and the solvent was removed in vacuum. After flash chromatography on silica (pentane/ Et_2O 9:1) compound **7a** (1.30 g, 5.92 μmol , 82%) was obtained as a colorless oil. R_f = 0.25 (pentane/ Et_2O 9:1). **IR** (neat) ν = 2963, 2937, 2871, 2832, 2251, 1459, 1414, 1335, 1275, 1048, 1017, 852, 815, 665 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 7.05 (d, J = 8.0 Hz, 1H), 6.97 (d, J = 8.1 Hz, 1H), 3.92 (s, 3H), 3.83 (s, 3H), 3.67 (s, 2H), 3.31 (hept, J = 7.0 Hz, 1H), 1.21 (d, J = 6.9 Hz, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 150.8, 150.6, 143.9, 124.2, 121.8, 121.7, 118.4, 60.7, 60.4, 26.9, 23.6, 18.6. **HRMS** (ESI) m/z : calcd. for $\text{C}_{13}\text{H}_{17}\text{N}_1\text{O}_2\text{Na}_1$ $[\text{M}+\text{Na}]^+$: 242.1151, found: 242.1151.



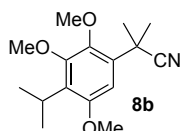
2-(4-isopropyl-2,3-dimethoxyphenyl)-2-methylpropanenitrile (7b): 423 mg of nitrile **7a** (283 μmol) were dissolved in 10 mL THF. To this solution were added 5.8 mL (5.79 mmol, 1 M in THF) KHMDS at 0 °C and the reaction was stirred for 30 min. Next 279 μL (5.79 mmol, 2.3 eq.) iodomethane were added and the reaction was stirred for 4 h. After completion of the reaction, the solution was treated with water (50 mL) and extracted with Et_2O (3 x 30 mL). The organic phases were washed with brine (30 mL), dried over Na_2SO_4 and the solvent was removed in vacuum. After flash chromatography on silica (pentane/ Et_2O 9:1) compound **7b** (453 mg, 1.83 mmol, 95%) was obtained as a colorless oil. R_f = 0.67 (pentane/ Et_2O 8:2). **IR** (neat) ν = 2963, 2871, 2234, 1456, 1407, 1332, 1273, 1227, 1064, 1033, 1015, 929, 853, 815, 676 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 6.99 (d, J = 8.3 Hz, 1H), 6.93 (d, J = 8.3 Hz, 1H), 4.02 (s, 3H), 3.82 (s, 3H), 3.31 (hept, J = 6.9 Hz, 1H), 1.74 (s, 6H), 1.22 (d, J = 6.9 Hz, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 151.4, 151.0, 143.5, 132.0, 125.6, 120.7, 120.4, 60.3, 60.0, 33.9, 28.0, 26.8, 23.6. **HRMS** (ESI) m/z : calcd. for $\text{C}_{15}\text{H}_{22}\text{N}_1\text{O}_2$ $[\text{M}+\text{H}]^+$: 248.1645, found: 248.1641.



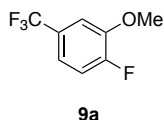
2-(4-isopropyl-2,3,5-trimethoxyphenyl)acetonitrile (8a): A solution of 944 mg (3.93 mmol) (4-isopropyl-2,3,5-trimethoxyphenyl)methanol in 4.0 mL dichloromethane was cool to 0 °C and subsequently treated with 0.38 mL (4.72 mmol, 1.2 eq.) pyridine and 0.43 mL (5.90 mmol, 1.5 eq.) thionyl chloride. The solution was stirred for 4 h at rt. Afterwards the reaction was treated with cold water (50 mL) and extracted with dichloromethane (3 x 30 mL). The combined organic phases were washed with aq. sat. NaHCO_3 ,

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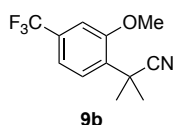
dried over Na₂SO₄ and the solvent was removed in vacuum. The crude benzyl chloride was dissolved in 8.0 mL DMSO, 358 mg (5.50 mmol, 1.4 eq.) potassium cyanide were added and the reaction was stirred at rt for 24 h. The mixture was diluted with cold water (100 mL) and extracted with ethyl acetate (3 x 30 mL). The organic phases were washed with brine, dried over Na₂SO₄ and the solvent was removed in vacuum. After flash chromatography on silica (pentane/Et₂O 8:2) compound **8a** (588 mg, 2.36 mmol, 60%) was obtained as a white solid. *R*_f = 0.31 (pentane/Et₂O 8:2). **IR** (neat) ν = 2958, 2877, 2836, 2249, 1601, 1483, 1453, 1411, 1341, 1237, 1192, 1131, 1065, 1024, 945, 835 cm⁻¹. **mp**: 51 - 52 °C. **¹H-NMR** (400 MHz, CDCl₃) δ = 6.59 (s, 1H), 3.84 (s, 3H), 3.81 (s, 3H), 3.79 (s, 3H), 3.69 (s, 2H), 3.49 (hept, *J* = 7.1 Hz, 1H), 1.29 (d, *J* = 7.1 Hz, 6H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 154.9, 152.0, 145.1, 131.2, 121.1, 118.4, 106.8, 60.8, 60.6, 56.0, 25.3, 21.2, 18.6. **HRMS** (ESI) *m/z*: calcd. for C₁₄H₂₀N₁O₃ [*M*+*H*]⁺: 250.1437, found: 250.1435.



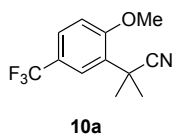
2-(4-isopropyl-2,3,5-trimethoxyphenyl)-2-methylpropanenitrile (8b): 399 mg (1.60 mmol) Nitrile **8a** were dissolved in 8.0 mL THF and cooled to 0 °C. 4.8 mL (4.80 mmol, 1 M in THF, 3.0 eq.) KHMDS were added and the solution was stirred for 30 min. Next 0.23 mL (3.68 mmol, 2.3 eq.) iodomethane were added and the reaction was stirred for 1 h. Water (30 mL) was added to the mixture and the aq. layer was extracted with Et₂O (3 x 30 mL). The organic phases were washed with brine (30 mL), dried over Na₂SO₄ and the solvent was removed in vacuum. After flash chromatography on silica (pentane/Et₂O 9:1) compound **8b** (401 mg, 1.45 mmol, 90%) was obtained as a white solid. *R*_f = 0.3 (pentane/Et₂O 9:1). **IR** (neat) ν = 2989, 2939, 2872, 2832, 2234, 1598, 1572, 1450, 1405, 1340, 1236, 1190, 1122, 1060, 1023, 970, 840 cm⁻¹. **mp**: 89 - 90 °C. **¹H-NMR** (400 MHz, CDCl₃) δ = 6.56 (s, 1H), 3.94 (s, 3H), 3.79 (s, 6H), 3.48 (hept, *J* = 7.1 Hz, 1H), 1.75 (s, 6H), 1.30 (d, *J* = 7.1 Hz, 6H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 154.1, 152.4, 145.7, 131.3, 131.0, 125.5, 104.1, 60.4, 60.1, 56.1, 34.7, 27.9, 25.3, 21.3. **HRMS** (ESI) *m/z*: calcd. for C₁₆H₂₄N₁O₃ [*M*+*H*]⁺: 278.1750, found: 278.1748.



1-fluoro-2-methoxy-4-(trifluoromethyl)benzene (9a): Commercially available 2-fluoro-5-(trifluoromethyl)phenol (6.00 g, 33.3 mmol) was dissolved in dry THF (150 mL) and NaH (1.46 g, 60% dispersion in mineral oil, 36.6 mmol, 1.1 eq.) was added at 0 °C. The reaction was warmed up to rt for 1 h and then was recooled to 0 °C. MeI (2.3 mL, 36.6 mmol, 1.1 eq.) were added dropwise at 0 °C and the reaction was warmed up to 60 °C for 1 h. After cooling to 0 °C the reaction was quenched with sat. aq. NH₄Cl solution. The aq. layer was extracted with Et₂O (3 x 50 mL), dried over Na₂SO₄, filtered and the solvent was removed under reduced pressure. The crude was purified by flash chromatography on silica (Et₂O/pentane 1:50 to 1:25) to give compound **9a** (3.12 g, 16.0 mmol, 48%) as a colorless liquid. *R*_f = 0.73 (Et₂O/pentane 1/25). **IR** (neat) ν = 2957, 2921, 1743, 1460, 1378, 1070 cm⁻¹. **¹H-NMR** (400 MHz, CDCl₃) δ = 7.23 - 7.11 (m, 3H), 3.94 (s, 3H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 158.0 - 151.4 (m), 148.2 (d, *J* = 11.2 Hz), 128.3 - 126.4 (m), 123.8 (d, *J* = 272.1 Hz), 118.5 - 118.3 (m), 116.5 (d, *J* = 19.6 Hz), 112.4 - 109.3 (m), 56.5. **¹⁹F-NMR** (376 MHz, CDCl₃) δ = -62.04 to -62.08 (m, 3F), -129.53 to -129.60 (m, 1F). **HRMS** (EI) *m/z*: calcd. for C₈H₆O₁F₄ [*M*]⁺: 194.0349, found: 194.0348.



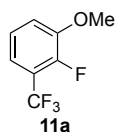
2-(2-methoxy-4-(trifluoromethyl)phenyl)-2-methylpropanenitrile (9b): Compound **9a** (980 mg, 5.05 mmol) was converted following general procedure 1 (75 °C, 16 h, 0.1 M). After flash chromatography on silica (Et₂O/pentane 1:10) compound **9b** (1.13 g, 4.64 mmol, 92%) was isolated as colorless solid. *R*_f = 0.33 (Et₂O/pentane 1:9). **IR** (neat) ν = 2957, 1463, 1415, 2333, 1247, 1173, 1126, 1101, 1027, 893, 827, 742 cm⁻¹. **mp**: 34 - 36 °C. **¹H-NMR** (400 MHz, CDCl₃) δ = 7.47 (dd, *J* = 8.1, 0.9 Hz, 1H), 7.24 (ddd, *J* = 8.1, 1.8, 0.8 Hz, 1H), 7.15 (d, *J* = 1.1 Hz, 1H), 3.98 (s, 3H), 1.78 (s, 6H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 157.6, 132.6 (q, *J* = 1.4 Hz), 131.8 (q, *J* = 32.8 Hz), 126.7, 124.1, 123.9 (q, *J* = 272.3 Hz), 117.7 (q, *J* = 4.0 Hz), 108.8 (q, *J* = 3.6 Hz), 56.0, 34.8, 26.9. **¹⁹F-NMR** (376 MHz, CDCl₃) δ = -62.8. **HRMS** (EI) *m/z*: calcd. for C₁₂H₁₂O₁N₁F₃ [*M*]⁺: 243.0865 found: 243.0867.



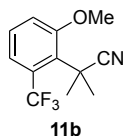
2-(2-methoxy-5-(trifluoromethyl)phenyl)-2-methylpropanenitrile (10a): 2-fluoro-4-trifluoromethylanisole (819 mg, 4.22 mmol) was converted following general procedure 1 (70 °C, 16 h, 0.1 M). After flash chromatography on silica (Et₂O/pentane 1:10) compound **10a** (564 mg, 2.32 mmol, 55%) was isolated as colorless solid. *R*_f = 0.16 (Et₂O/pentane 1:10). **IR** (neat) ν = 2984, 2238, 1619, 1508,

SUPPORTING INFORMATION

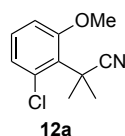
1464, 1424, 1366, 1333, 1286, 1267, 1226, 1172, 1147, 1119, 1087, 1025, 900, 880, 824, 691, 627, 616, 486 cm^{-1} . **mp**: 52 - 55 °C. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 7.62 – 7.58 (m, 1H), 7.55 (d, J = 2.2 Hz, 1H), 7.02 (d, J = 8.6 Hz, 1H), 3.99 (s, 3H), 1.79 (s, 6H). **$^{13}\text{C-NMR}$** (126 MHz, CDCl_3) δ = 159.8, 129.5, 127.0 (q, J = 3.9 Hz), 124.3 (d, J = 271.6 Hz), 124.0, 123.3 (q, J = 3.6 Hz), 123.1 (q, J = 33.1 Hz), 111.9, 56.0, 34.3, 26.9. **$^{19}\text{F-NMR}$** (376 MHz, CDCl_3) δ = -61.5. **HRMS** (ESI) m/z : calcd. for $\text{C}_{12}\text{H}_{12}\text{F}_2\text{N}_1\text{Na}_1\text{O}_1$ [$\text{M}+\text{Na}$] $^+$: 266.0763, found: 266.0759.



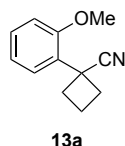
2-fluoro-1-methoxy-3-(trifluoromethyl)benzene (11a): To a solution of 2-Fluoro-3-(trifluoromethyl)phenol (1.22 g, 0.85 mL, 6.77 mmol) in dry DMF (35 mL), K_2CO_3 (1.87 g, 13.5 mmol, 2.0 eq.) and MeI (0.51 mL, 6.77 mmol, 1.2 eq.) were added. The reaction mixture was warmed up to 60 °C for 16 h and then recooled to rt. Sat. aq. NH_4Cl solution (50 mL) was added and the aq. layer was extracted with Et_2O , (3 x 50 mL). The combined organic layers were extensively washed with water (3 x 50 mL), brine (3 x 50 mL), dried over Na_2SO_4 , filtered and the solvent was carefully removed under reduced pressure. The crude was purified with flash chromatography on silica (Et_2O /pentane 1:50 to 1/20) to afford compound **11a** (980 mg, 5.05 mmol, 75%) as colorless oil. **R_f** = 0.62 (Et_2O /pentane 1:20). **IR** (neat) ν = 2953, 2855, 1625, 1593, 1496, 1465, 1445, 1328, 1309, 1279, 1234, 1207, 1172, 1124, 1080, 1037, 966, 871, 825, 786, 728, 632, 614, 526, 512 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 7.19 – 7.12 (m, 3H), 3.92 (s, 3H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 150.1 (dq, J = 256.7, 2.0 Hz), 148.6 (d, J = 9.6 Hz), 124.1 (d, J = 4.9 Hz), 122.7 (q, J = 272.4 Hz), 119.4 (qd, J = 32.6, 9.6 Hz), 117.9 (q, J = 4.7 Hz), 117.1 (d, J = 2.2 Hz), 56.7. **$^{19}\text{F-NMR}$** (376 MHz, CDCl_3) δ = -61.2 (d, J = 13.0 Hz, 3F), -136.9 to -136.8 (m, 1F). **HRMS** (EI) m/z : calcd. for $\text{C}_8\text{H}_6\text{O}_1\text{F}_4$ [M] $^+$: 194.0349, found: 194.0349.



2-(2-methoxy-6-(trifluoromethyl)phenyl)-2-methylpropanenitrile (11b): Fluoride **11a** (712 mg, 3.67 mmol) was converted following general procedure 1 (75 °C, 16 h, 0.1 M). After flash column chromatography on silica (Et_2O /pentane 1:9) nitrile **11b** (559 mg, 2.30 mmol, 63%) was isolated as a colorless oil. **R_f** = 0.19 (Et_2O /pentane 1:9). **IR** (neat) ν = 2995, 2949, 2850, 2237, 1468, 1449, 1434, 1307, 1272, 1186, 1164, 1124, 1100, 1068, 1032, 802, 754, 742, 692 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 7.46 – 7.32 (m, 2H), 7.23 – 7.18 (m, 1H), 4.00 (s, 3H), 1.91 – 1.90 (m, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 158.7, 128.9, 128.7 (m), 128.5 (q, J = 31.2 Hz), 126.1, 120.7 (q, J = 7.7 Hz), 124.2 (q, J = 273.8 Hz), 116.9, 56.5, 36.1, 28.0 (q, J = 4.1 Hz). **$^{19}\text{F-NMR}$** (376 MHz, CDCl_3) δ = -52.0. **HRMS** (ESI) m/z : calcd. for $\text{C}_{12}\text{H}_{12}\text{NF}_3\text{Na}_1\text{O}_1$ [$\text{M}+\text{Na}$] $^+$: 266.0761, found: 266.0759.

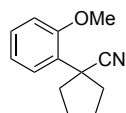


2-(2-chloro-6-methoxyphenyl)-2-methylpropanenitrile (12a): 3-Chloro-2-fluoroanisole (1.50 g, 9.34 mmol) was converted following general procedure 1 (75 °C, 16 h, 0.1 M). After flash chromatography on silica (Et_2O /pentane 1:10) compound **12a** (1.38 g, 6.58 mmol, 70%) was obtained as a slightly yellow liquid. **R_f** = 0.23 (Et_2O /pentane 1:9). **IR** (neat) ν = 2981, 2943, 2840, 2231, 2113, 1748, 1588, 1572, 1457, 1429, 1391, 1368, 1266, 1223, 1204, 1181, 1153, 1122, 1069, 1034, 925, 847, 780, 734, 716, 650, 636, 584, 527, 453 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 7.17 (dd, J = 8.2 Hz, 1H), 7.01 (dd, J = 8.1, 1.3 Hz, 1H), 6.87 (dd, J = 8.4, 1.3 Hz, 1H), 3.89 (s, 3H), 1.97 (s, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 158.9, 133.5, 129.2, 126.0, 125.6, 125.0, 111.6, 56.3, 36.3, 29.0. **HRMS** (ESI) m/z : calcd. for $\text{C}_{11}\text{H}_{12}\text{O}_1\text{N}_1\text{Cl}_1\text{Na}_1$ [$\text{M}+\text{Na}$] $^+$: 232.0500, found: 232.0499.



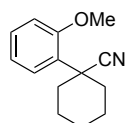
1-(2-methoxyphenyl)cyclobutane-1-carbonitrile (13a): 2-Fluoroanisole (1.00 g, 7.77 mmol) and cyclobutanecarbonitrile (2.9 mL, 31.1 mmol, 4.0 eq.) were converted following general procedure 1 (80 °C, 48 h). After flash chromatography on silica (Et_2O /pentane 1:10 to 2:8) nitrile **13a** (1.21 g, 6.46 mmol, 83%) was obtained as a colorless solid. **R_f** = 0.32 (Et_2O /pentane 1:9). **IR** (neat) ν = 2998, 2951, 2839, 2229, 1600, 1586, 1491, 1463, 1436, 1293, 1272, 1250, 1179, 1164, 1125, 1052, 1025, 935, 886, 858, 784, 754, 685, 655, 582, 569, 523, 502, 471 cm^{-1} . **mp**: 57 - 60 °C. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 7.32 – 7.28 (m, 1H), 7.16 (dd, J = 7.6, 1.7 Hz, 1H), 6.98 – 6.89 (m, 1H), 6.90 (dd, J = 8.2, 1.0 Hz, 1H), 3.88 (s, 3H), 2.86 – 2.77 (m, 2H), 2.64 – 2.53 (m, 2H), 2.52 – 2.37 (m, 1H), 2.02 – 1.89 (m, 1H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 157.5, 129.5, 127.9, 126.6, 124.6, 120.5, 111.3, 55.6, 38.1, 33.6, 17.9. **HRMS** (ESI) m/z : calcd. for $\text{C}_{12}\text{H}_{14}\text{O}_1\text{N}_1$ [$\text{M}+\text{H}$] $^+$: 188.1070, found: 188.1073.

SUPPORTING INFORMATION



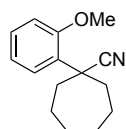
14a

1-(2-methoxyphenyl)cyclopentane-1-carbonitrile (14a): 2-Methoxyphenylacetonitrile (1.50 g, 10.2 mmol) was dissolved in dry THF (100 mL), cooled to 0 °C and KHMDS (6.10 g, 30.6 mmol, 3.0 eq.) was added. After 10 min 1-bromo-4-chlorobutane (1.3 mL, 11.2 mmol, 1.1 eq.) was added dropwise and the reaction mixture was stirred for 1 hour at 0 °C. The reaction was quenched with aq. HCl (1 M, 80 mL). The aq. layer was extracted with Et₂O (3 x 50 mL), washed with brine, dried over Na₂SO₄, filtered and the solvent was removed under reduced pressure. The crude was purified by flash chromatography on silica (Et₂O/pentane 1:10) to afford nitrile **14a** (1.88 g, 9.34 mmol, 92%) as a colorless solid. *R_f* = 0.39 (Et₂O/pentane 1:10). **IR** (neat) ν = 2957, 2876, 2838, 2232, 1599, 1585, 1491, 1462, 1437, 1317, 1293, 1248, 1181, 1166, 1293, 1114, 1055, 1025, 956, 901, 788, 754, 652, 580, 496 cm⁻¹. **mp**: 67 - 68 °C. **¹H-NMR** (400 MHz, CDCl₃) δ = 7.35 – 7.28 (m, 2H), 6.97 – 6.91 (m, 2H), 3.92 (s, 3H), 2.61 – 2.50 (m, 2H), 2.17 – 2.06 (m, 2H), 2.06 – 1.94 (m, 2H), 1.92 – 1.80 (m, 2H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 157.7, 129.4, 127.6, 126.6, 124.6, 120.6, 111.8, 55.6, 44.8, 37.9, 23.9. **HRMS** (ESI) *m/z*: calcd. for C₁₃H₁₆O₁N₁ [M+H]⁺: 202.1226, found: 202.1222.



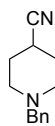
15a

1-(2-methoxyphenyl)cyclohexane-1-carbonitrile (15a): 2-Methoxyphenylacetonitrile (1.50 g, 10.2 mmol) was dissolved in dry THF (50 mL), cooled to 0 °C and NaH (60% dispersion in mineral oil, 6.10 g, 22.5 mmol, 2.2 eq.) was added. After 30 min 1,5-diiodopentane (1.7 mL, 11.2 mmol, 1.1 eq.) was added dropwise and the reaction was stirred for 16 h at rt. The reaction was quenched with aq. HCl (1 M, 100 mL). The aq. layer was extracted with Et₂O (3 x 50 mL), washed with brine, dried over Na₂SO₄, filtered and the solvent was removed under reduced pressure. The crude was purified by flash chromatography on silica (Et₂O/pentane 1:10) to afford nitrile **15a** (1.20 g, 5.62 mmol, 55%) as a colorless solid. *R_f* = 0.23 (Et₂O/pentane 1:9). **IR** (neat) ν = 2935, 1599, 1492, 1455, 1247, 1123, 1025, 753 cm⁻¹. **mp**: 102 - 103 °C. **¹H-NMR** (400 MHz, CDCl₃) δ = 7.34 – 7.28 (m, 2H), 6.99 – 6.94 (m, 2H), 3.92 (s, 3H), 2.43 – 2.31 (m, 2H), 1.97 – 1.71 (m, 7H), 1.33 – 1.18 (m, 1H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 157.7, 129.3, 129.2, 126.1, 122.7, 120.9, 112.3, 55.7, 40.9, 34.7, 25.5, 23.5. **HRMS** (ESI) *m/z*: calcd. for C₁₄H₁₈O₁N₁ [M+H]⁺: 216.1383, found: 216.1378. The analytical data are in agreement with the literature.^[11]



16a

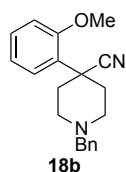
1-(2-methoxyphenyl)cycloheptane-1-carbonitrile (16a): 2-Fluoroanisole (499 mg, 3.88 mmol) and cycloheptanecarbonitrile (1.00 g, 7.76 mmol, 2.0 eq.) were converted following general procedure 1 (70 °C, 48 h, 0.25 M). After flash chromatography on silica (Et₂O/pentane 1:10) nitrile **16a** (585 mg, 2.56 mmol, 66%) was obtained as a colorless solid. *R_f* = 0.25 (Et₂O/pentane 1:10). **IR** (neat) ν = 2927, 2859, 1599, 1492, 1463, 1248, 1027, 754 cm⁻¹. **mp**: 78 - 79 °C. **¹H-NMR** (400 MHz, CDCl₃) δ = 7.41 (dd, *J* = 8.1, 1.7 Hz, 1H), 7.29 (ddd, *J* = 8.3, 7.4, 1.7 Hz, 1H), 6.98 – 6.93 (m, 2H), 3.91 (s, 3H), 2.33 – 2.26 (m, 2H), 2.22 – 2.15 (m, 2H), 1.96 – 1.72 (m, 6H), 1.68 – 1.56 (m, 2H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 157.1, 130.4, 129.1, 126.3, 124.0, 120.9, 112.4, 55.7, 44.6, 37.6, 28.1, 24.2. **HRMS** (ESI) *m/z*: calcd. for C₁₅H₂₀O₁N₁ [M+H]⁺: 230.1539, found: 230.1540.



18a

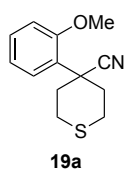
1-benzylpiperidine-4-carbonitrile (18a): Nitrile **18a** was synthesized following a literature known procedure.^[12] 4-Cyanopiperidine (6.3 mL, 55 mmol), NEt₃ (10 mL, 71.5 mmol, 1.3 eq.) and Bu₄NI (508 mg, 1.38 mmol, 2.5 mol%) were dissolved in dry MeCN (150 mL) and cooled to 0 °C. BnBr (7.2 mL, 60 mmol, 1.1 eq.) was added dropwise and the reaction mixture was warmed to rt and stirred for 16 h. Water (200 mL) was added and the resulting reaction mixture was extracted with EtOAc (3x 50 mL). The organic layer was then washed with aq. HCl (10%, 3x 80 mL) and the organic layer was discarded. The aq. layer was basified with NaOH (3 M) to a pH > 10, then the aq. layer was extracted with Et₂O (3x 50 mL), dried over Na₂SO₄, filtered and the solvent was removed under reduced pressure to afford nitrile **18a** 10.5 g (52.8 mmol, 96%) as a slightly yellow solid. **¹H-NMR** (400 MHz, CDCl₃) δ = 7.35 – 7.23 (m, 5H), 3.50 (d, *J* = 0.5 Hz, 2H), 2.77 – 2.56 (m, 3H), 2.31 (s, 2H), 2.01 – 1.81 (m, 4H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 138.1, 129.1, 128.4, 127.3, 122.0, 63.3, 51.5, 29.0, 26.3. The analytical data are in agreement with the literature.^[12]

SUPPORTING INFORMATION

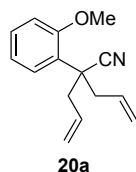


1-benzyl-4-(2-methoxyphenyl)piperidine-4-carbonitrile (18b):

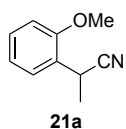
2-Fluoroanisole (1.00 g, 7.77 mmol) and nitrile **18a** (5.13 g, 25.6 mmol, 3.3 eq.) were converted following the general procedure 1. (80 °C, 48 h, 0.25 M, basic workup with sat. aq. NaHCO₃). After flash chromatography on silica (EtOAc/pentane 1:4 + 1% NEt₃) nitrile **18b** (1.82 g, 5.94 mmol, 76%) was obtained as a colorless solid. *R_f* = 0.28 (EtOAc/pentane 1:4 + 1% NEt₃). IR (neat) ν = 3028, 2935, 2811, 2769, 1599, 1585, 1492, 1455, 1437, 1397, 1368, 1346, 1291, 1248, 1179, 1160, 1129, 1104, 1074, 1056, 1026, 996, 945, 801, 788, 744, 699, 652, 610, 466 cm⁻¹. mp: 129 - 130 °C. ¹H-NMR (400 MHz, CDCl₃) δ = 7.40 – 7.25 (m, 7H), 6.99 (ddd, *J* = 6.8, 3.6, 2.4 Hz, 2H), 3.95 (s, 3H), 3.63 (s, 2H), 3.06 – 2.95 (m, 2H), 2.64 – 2.57 (m, 2H), 2.40 (dd, *J* = 13.4, 2.6 Hz, 2H), 2.17 – 2.02 (m, 2H). ¹³C-NMR (101 MHz, CDCl₃) δ = 157.8, 138.4, 129.5, 129.3, 128.4, 128.1, 127.3, 125.9, 122.1, 121.0, 112.3, 63.1, 55.7, 50.6, 39.0, 34.0. HRMS (ESI) *m/z*: calcd. for C₂₀H₂₃O₁N₂ [M+H]⁺: 307.1805, found: 307.1801.



4-(2-methoxyphenyl)tetrahydro-2H-thiopyran-4-carbonitrile (19a): 2-Fluoroanisole (798 mg, 6.20 mmol) and thiane-4-carbonitrile (789 mg, 6.20 mmol, 1.0 eq.) were converted following general procedure 1 (80 °C, 16 h, 0.1 M). After flash chromatography on silica (Et₂O/pentane 1:10) nitrile **19a** (790 mg, 3.39 mmol, 55%) was obtained as a colorless solid. *R_f* = 0.31 (Et₂O/pentane 1:9). IR (neat) ν = 2917, 2838, 2232, 1598, 1584, 1493, 1463, 1434, 1292, 1279, 1250, 1185, 1127, 1056, 1025, 968, 939, 882, 786, 755, 656, 573, 501 cm⁻¹. mp: 111 - 112 °C. ¹H-NMR (400 MHz, CDCl₃) δ = 7.37 – 7.30 (m, 2H), 7.03 – 6.95 (m, 2H), 3.92 (s, 3H), 3.28 (t, *J* = 13.2 Hz, 2H), 2.67 (d, *J* = 14.8 Hz, 2H), 2.56 (d, *J* = 13.6 Hz, 2H), 2.29 (td, *J* = 13.5, 3.2 Hz, 2H). ¹³C-NMR (126 MHz, CDCl₃) δ = 157.3, 129.7, 128.1, 126.3, 121.3, 121.2, 112.5, 55.7, 41.3, 35.3, 25.7. HRMS (ESI) *m/z*: calcd. for C₁₃H₁₅O₁N₁S₁Na₁ [M+Na]⁺: 256.0767, found: 256.0764.



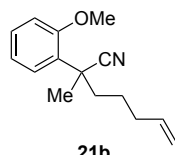
2-allyl-2-(2-methoxyphenyl)pent-4-enenitrile (20a): 2-Methoxyphenylacetone nitrile (530 mg, 3.60 mmol) was dissolved in dry THF (36 mL), cooled to 0 °C and solid KHMDS (958 mg, 7.92 mmol, 2.2 eq.) was added. The reaction mixture was stirred for 1 h at rt, then allyl bromide (0.69 mL, 7.92 mmol, 2.2 eq.) was added and the reaction was stirred at rt for 16 h. The reaction was quenched with sat. aq. NH₄Cl solution (100 mL), extracted with EtOAc (3 x 50 mL), washed with brine, dried over Na₂SO₄, filtered and the solvent was removed under reduced pressure. The crude was purified by flash chromatography on silica (Et₂O/pentane 1:20 to 1:10) to afford nitrile **20a** (466 mg, 2.05 mmol, 57%) as a colorless oil. *R_f* = 0.45 (Et₂O/pentane 1:10). IR (neat) ν = 3079, 3008, 2981, 2931, 2840, 2236, 1642, 1599, 1585, 1493, 1465, 1438, 1417, 1289, 1247, 1179, 1106, 1025, 993, 922, 850, 788, 754, 710, 633, 573, 489 cm⁻¹. ¹H-NMR (400 MHz, CDCl₃) δ = 7.43 (dd, *J* = 7.7, 1.6 Hz, 1H), 7.30 (ddd, *J* = 8.2, 7.4, 1.7 Hz, 1H), 6.99 – 6.90 (m, 2H), 5.65 (dddd, *J* = 17.1, 10.1, 7.6, 6.9 Hz, 2H), 5.16 – 5.05 (m, 4H), 3.88 (s, 3H), 3.05 – 3.00 (m, 2H), 2.75 (ddt, *J* = 13.9, 7.6, 1.1 Hz, 2H). ¹³C-NMR (101 MHz, CDCl₃) δ = 157.0, 132.8, 129.5, 129.5, 124.7, 122.4, 120.9, 119.4, 111.9, 55.4, 47.4, 41.1. HRMS (ESI) *m/z*: calcd. for C₁₅H₁₇N₁Na₁O₁ [M+Na]⁺: 250.1202, found: 250.1202.



2-(2-methoxyphenyl)propanenitrile (21a): Nitrile **21a** was synthesized following a literature known procedure.^[13a] 2-Methoxyphenylacetone nitrile (2.00 g, 13.6 mmol), K₂CO₃ (3.76 g, 27.2 mmol, 2.0 eq.) and dimethyl carbonate (20.8 mL, 245 mmol, 18 eq.) were placed in a stainless-steel autoclave. The autoclave was purged with N₂ and the closed system heated to 205 °C (outside temperature) for 48 h (inside pressure 30 bar). The reaction mixture was cooled to rt, a sat. aq. NH₄Cl solution (50 mL) and water (50 mL) were added and the reaction mixture was extracted with EtOAc (3 x 50 mL), dried over Na₂SO₄, filtered and the solvent was removed under reduced pressure. The crude was purified by flash chromatography on silica (Et₂O/pentane 1:10) to afford nitrile **21a** (1.98 g, 12.3 mmol, 90%) as a colorless liquid. *R_f* = 0.44 (Et₂O/pentane 1:10). ¹H-NMR (400 MHz, CDCl₃) δ = 7.44 (dd, *J* = 7.6, 1.7 Hz, 1H), 7.33 (ddd, *J* = 8.2, 7.5, 1.7 Hz, 1H), 7.04 – 6.99 (m, 1H), 6.92 (dd, *J* = 8.2, 1.1 Hz, 1H), 4.28 (q, *J* = 7.2 Hz,

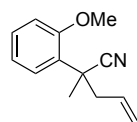
SUPPORTING INFORMATION

1H), 3.89 (s, 3H), 1.60 (d, $J = 7.2$ Hz, 3H). $^{13}\text{C-NMR}$ (101 MHz, CDCl_3) $\delta = 156.1, 129.4, 127.7, 125.5, 122.1, 121.1, 110.9, 55.6, 25.7, 19.6$. The analytical data are in agreement with the literature.^[13b]



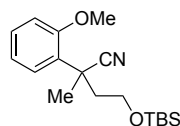
21b

2-(2-methoxyphenyl)-2-methylhept-6-enitrile (21b): Nitrile **21a** (540 mg, 3.35 mmol) was dissolved in dry THF (35 mL), cooled to 0 °C and solid KHMDS (802 mg, 4.02 mmol, 1.2 eq.) was added. Then a solution of 5-bromo-1-pentene (599 mg, 4.02 mmol, 1.2 eq.) in dry THF (5 mL) was added dropwise and the reaction mixture was stirred 16 h at rt. The reaction was quenched with sat. aq. NH_4Cl solution (80 mL), extracted with EtOAc (3 x 50 mL), washed with brine, dried over Na_2SO_4 , filtered and the solvent was removed under reduced pressure. The crude was purified by flash chromatography on silica (toluene/pentane 1:2 to 1:1 to 100% toluene) to afford nitrile **21b** (370 mg, 1.61 mmol, 48%) as a colorless oil. $R_f = 0.47$ (toluene). IR (neat) $\nu = 3076, 2934, 2840, 2234, 1641, 1600, 1584, 1494, 1462, 1437, 1291, 1251, 1181, 1027, 914, 788, 755, 490$ cm^{-1} . $^1\text{H-NMR}$ (400 MHz, CDCl_3) $\delta = 7.43$ (dd, $J = 7.7, 1.7$ Hz, 1H), 7.30 (ddd, $J = 8.2, 7.4, 1.7$ Hz, 1H), 6.99 – 6.91 (m, 2H), 5.74 (ddt, $J = 16.9, 10.2, 6.7$ Hz, 1H), 5.03 – 4.92 (m, 2H), 3.88 (s, 3H), 2.25 (ddd, $J = 13.5, 12.3, 4.6$ Hz, 1H), 2.11 – 2.01 (m, 2H), 1.91 (ddd, $J = 13.6, 12.3, 4.7$ Hz, 1H), 1.77 (s, 3H), 1.55 – 1.44 (m, 1H), 1.42 – 1.31 (m, 1H). $^{13}\text{C-NMR}$ (101 MHz, CDCl_3) $\delta = 157.2, 138.2, 129.3, 127.7, 127.5, 124.2, 120.9, 115.1, 112.1, 55.5, 41.1, 38.1, 33.6, 25.3, 24.9$. HRMS (ESI) m/z : calcd. for $\text{C}_{15}\text{H}_{19}\text{N}_1\text{Na}_1\text{O}_1$ [$\text{M}+\text{Na}$] $^+$: 252.1359, found: 252.1358.



22a

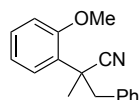
2-(2-methoxyphenyl)-2-methylpent-4-enitrile (22a): Freshly distilled diisopropylamine (0.33 mL, 2.34 mmol, 1.4 eq.) was dissolved in dry THF (16 mL) and cooled to -78 °C. $n\text{BuLi}$ (0.93 mL, 1.6 M in hexane, 2.34 mmol, 1.4 eq.) was added. The reaction was warmed to rt for 1 h and then was recooled to -78 °C. At -78 °C a solution of nitrile **21a** (269 mg, 1.67 mmol) in dry THF (2 mL) was added and the reaction was warmed up to rt for 1 h. The reaction was recooled to -78 °C and allyl bromide (0.22 mL, 2.51 mmol, 1.5 eq.) was added. The reaction was stirred for 2 h at rt and then the reaction mixture was quenched with sat. aq. NH_4Cl solution (20 mL), extracted with EtOAc (3 x 20 mL), washed with brine, dried over Na_2SO_4 , filtered and the solvent was removed under reduced pressure. The crude was purified by flash chromatography on silica (Et_2O /pentane 1:20 to 1:10) to afford nitrile **22a** (264 mg, 1.31 mmol, 78%) as a colorless liquid. $R_f = 0.5$ (Et_2O /pentane 1:9). IR (neat) $\nu = 2981, 2937, 2940, 1642, 1600, 1584, 1492, 1462, 1437, 1377, 1292, 1273, 1247, 1181, 1129, 1105, 1072, 1025, 995, 923, 786, 754, 715, 650, 488$ cm^{-1} . $^1\text{H-NMR}$ (400 MHz, CDCl_3) $\delta = 7.38$ (dd, $J = 7.7, 1.7$ Hz, 1H), 7.31 (ddd, $J = 8.1, 7.5, 1.7$ Hz, 1H), 6.99 – 6.93 (m, 2H), 5.70 (dddd, $J = 17.1, 10.2, 7.6, 6.9$ Hz, 1H), 5.18 – 5.08 (m, 2H), 3.91 (s, 3H), 3.01 – 2.92 (m, 1H), 2.75 – 2.65 (m, 1H), 1.76 (s, 3H). $^{13}\text{C-NMR}$ (101 MHz, CDCl_3) $\delta = 157.3, 132.9, 129.5, 127.5, 127.1, 123.7, 120.9, 119.5, 112.1, 55.6, 42.8, 40.2, 24.6$. HRMS (ESI) m/z : calcd. for $\text{C}_{13}\text{H}_{15}\text{O}_1\text{N}_1\text{Na}_1$ [$\text{M}+\text{Na}$] $^+$: 224.1046, found: 224.1046.



23a

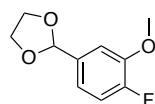
4-((tert-butyl)dimethylsilyloxy)-2-(2-methoxyphenyl)-2-methylbutanenitrile (23a): Nitrile **21a** (511 mg, 3.17 mmol) was dissolved in dry THF (30 mL), cooled to 0 °C and solid KHMDS (759 mg, 3.80 mmol, 1.2 eq.) was added and the reaction mixture was stirred for 1 h at rt. The reaction was cooled to -78 °C. Then a solution of *tert*-butyl(2-iodoethoxy)dimethylsilane (1.09 g, 3.80 mmol, 1.2 eq.) in dry THF (5 mL) was added dropwise and the reaction was stirred for 16 h at rt. The reaction was quenched with sat. aq. NH_4Cl solution (50 mL), extracted with EtOAc (3 x 50 mL), washed with brine, dried over Na_2SO_4 , filtered and the solvent was removed under reduced pressure. The crude was purified by flash chromatography on silica (Et_2O /pentane 1:10) to afford nitrile **23a** (645 mg, 2.02 mmol, 64%) as a colorless oil. $R_f = 0.3$ (Et_2O /pentane 1:10). IR (neat) $\nu = 2954, 2930, 2885, 2857, 2235, 1600, 1584, 1494, 1463, 1437, 1390, 1361, 1290, 1248, 1180, 1097, 1055, 1027, 1006, 938, 836, 812, 777, 753, 662, 585, 490$ cm^{-1} . $^1\text{H-NMR}$ (400 MHz, CDCl_3) $\delta = 7.45$ (dd, $J = 7.7, 1.7$ Hz, 1H), 7.30 (ddd, $J = 8.2, 7.4, 1.7$ Hz, 1H), 6.98 – 6.94 (m, 1H), 6.92 (dd, $J = 8.2, 1.2$ Hz, 1H), 3.88 (s, 3H), 3.70 (ddd, $J = 10.4, 7.9, 6.5$ Hz, 1H), 3.58 (ddd, $J = 10.5, 8.0, 5.6$ Hz, 1H), 2.48 (ddd, $J = 13.5, 7.8, 5.6$ Hz, 1H), 2.20 (ddd, $J = 13.6, 7.9, 6.5$ Hz, 1H), 1.82 (s, 3H), 0.85 (s, 9H), -0.02 (s, 3H), -0.01 (s, 3H). $^{13}\text{C-NMR}$ (101 MHz, CDCl_3) $\delta = 157.2, 129.4, 127.7, 127.1, 123.9, 120.9, 112.0, 60.4, 55.5, 40.8, 39.1, 26.0, 25.8, 18.4, -5.3$. HRMS (ESI) m/z : calcd. for $\text{C}_{18}\text{H}_{30}\text{O}_2\text{N}_1\text{Si}_1$ [$\text{M}+\text{H}$] $^+$: 320.2040, found: 320.2038.

SUPPORTING INFORMATION



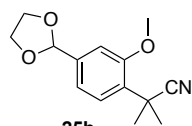
24a

2-(2-methoxyphenyl)-2-methyl-3-phenylpropanenitrile (24a): Nitrile **21a** (530 mg, 3.29 mmol) was dissolved in dry THF (30 mL), cooled to 0 °C and solid KHMDS (853 mg, 4.28 mmol, 1.3 eq.) was added and the reaction mixture was stirred for 1 h at rt. Benzyl bromide (0.51 mL, 4.28 mmol, 1.3 eq.) was added dropwise and the reaction mixture was stirred for 16 h at rt. The reaction was quenched with sat. aq. NH₄Cl solution (50 mL), extracted with EtOAc (3 x 50 mL), washed with brine, dried over Na₂SO₄, filtered and the solvent was removed under reduced pressure. The crude was purified by flash chromatography on silica (Et₂O/pentane 1:10) followed by Kugelrohr distillation (175 °C, 0.1 mbar) to afford nitrile **24a** (367 mg, 1.46 mmol, 44%) as a colorless oil. *R_f* = 0.22 (Et₂O/pentane 1:10). IR (neat) ν = 3063, 3030, 2980, 2938, 2839, 2235, 1600, 1583, 1493, 1455, 1437, 1377, 1292, 1248, 1182, 1125, 1082, 102, 934, 851, 756, 702, 682, 634, 587, 487 cm⁻¹. ¹H-NMR (400 MHz, CDCl₃) δ = 7.31 (ddd, *J* = 8.2, 7.4, 1.7 Hz, 1H), 7.23 – 7.17 (m, 4H), 7.07 – 7.02 (m, 2H), 6.99 (dd, *J* = 8.3, 1.1 Hz, 1H), 6.90 – 6.86 (m, 1H), 3.98 (s, 3H), 3.48 (d, *J* = 13.3 Hz, 1H), 3.21 (d, *J* = 13.3 Hz, 1H), 1.77 (s, 3H). ¹³C-NMR (101 MHz, CDCl₃) δ = 157.3, 136.1, 130.5, 129.6, 128.1, 127.9, 127.2, 127.0, 123.8, 120.9, 112.0, 55.6, 44.1, 41.7, 24.5. HRMS (ESI) *m/z*: calcd. for C₁₇H₁₇N₁Na₁O₁ [M+Na]⁺: 274.1202, found: 274.1198.



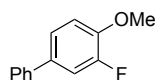
25a

2-(4-fluoro-3-methoxyphenyl)-1,3-dioxolane (25a): 4-Fluoro-3-methoxybenzaldehyde (1.65 g, 10.7 mmol), ethylene glycol (0.9 mL, 16 mmol, 1.5 eq.) and *p*-toluenesulfonic acid monohydrate (40.7 mg, 214 mmol, 2 mol%) were dissolved in dry toluene (80 mL) and refluxed for 16 h using a dean stark apparatus. An aq. sat. NaHCO₃ solution (50 mL) was added and the aq. layer was extracted with EtOAc (3 x 80 mL), washed with brine, dried over Na₂SO₄, filtered and the solvent was removed under reduced pressure. The crude was purified by flash chromatography on silica (Et₂O/pentane 1:4) to afford compound **25a** (1.83 g, 9.24 mmol, 86%) as a colorless oil. *R_f* = 0.28 (Et₂O/pentane 1:4). IR (neat) ν = 2887, 1613, 1518, 1466, 1395, 1280, 1215, 1164, 1117, 1082, 1030, 945, 860, 820, 774, 631, 458 cm⁻¹. ¹H-NMR (400 MHz, CD₂Cl₂) δ = 7.11 (dd, *J* = 8.3, 2.0 Hz, 1H), 7.06 (dd, *J* = 11.1, 8.3 Hz, 1H), 6.99 (ddd, *J* = 8.3, 4.5, 2.0 Hz, 1H), 5.72 (s, 1H), 4.15 – 4.06 (m, 2H), 4.05 – 3.96 (m, 2H), 3.89 (s, 3H). ¹³C-NMR (101 MHz, CD₂Cl₂) δ = 153.3 (d, *J* = 246.2 Hz), 148.2 (d, *J* = 11.1 Hz), 135.2 (d, *J* = 3.6 Hz), 119.6 (d, *J* = 7.2 Hz), 116.1 (d, *J* = 18.5 Hz), 112.0 (d, *J* = 2.4 Hz), 103.7, 65.9, 56.7. ¹⁹F-NMR (376 MHz, CDCl₃) δ = -135.4. HRMS (ESI) *m/z*: calcd. for C₁₀H₁₂O₃F₁ [M+H]⁺: 199.0765, found: 199.0766.



25b

2-(4-(1,3-dioxolan-2-yl)-2-methoxyphenyl)-2-methylpropanenitrile (25b): Compound **25a** (557 mg, 2.81 mmol) was converted following general procedure 1 (80 °C, 16 h, 0.1 M). After flash chromatography on silica (Et₂O/pentane 1:10) nitrile **25b** (384 mg, 1.55 mmol, 55%) was obtained as a yellow liquid. *R_f* = 0.16 (Et₂O/pentane 1:10). IR (neat) ν = 2980, 2942, 2887, 2235, 1615, 1583, 1503, 1462, 1421, 1386, 1297, 1263, 1232, 1201, 1174, 1153, 1097, 1034, 969, 947, 864, 823, 789, 721, 490 cm⁻¹. ¹H-NMR (400 MHz, CDCl₃) δ = 7.37 – 7.33 (m, 1H), 7.09 – 7.05 (m, 2H), 5.81 (s, 1H), 4.17 – 4.09 (m, 2H), 4.09 – 4.01 (m, 2H), 3.95 (s, 3H), 1.76 (s, 6H). ¹³C-NMR (101 MHz, CDCl₃) δ = 157.5, 139.5, 129.7, 126.2, 124.7, 118.9, 109.8, 103.3, 65.5, 55.7, 34.7, 27.1. HRMS (ESI) *m/z*: calcd. for C₁₄H₁₈O₃N [M+H]⁺: 248.1281, found: 248.1281.

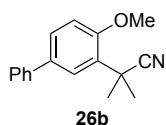


26a

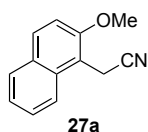
3-fluoro-4-methoxy-1,1'-biphenyl (26a): 795 mg (3.88 mmol) 4-Bromo-2-fluoroanisole and 585 mg (4.66 mmol, 1.2 eq.) phenylboronic acid were dissolved in a mixture of 22.8 mL 1,4-dioxane and 7.7 mL water. To this 3.22 g (23.3 mmol, 6.0 eq.) potassium carbonate and 76.2 mg (66.0 μ mol, 1.0 mol%) tetrakis(triphenylphosphine)palladium were added. The reaction mixture was heated to 90 °C for 16 h. After cooling to rt water (100 mL) was added and the aq. layer was extracted with dichloromethane (3 x 50 mL). The combined organic phases were dried over Na₂SO₄ and the solvent was removed in vacuum. After flash chromatography on silica (pentane/CH₂Cl₂ 9:1) compound **26a** (726 mg, 3.60 mmol, 93%) was obtained as a white solid. *R_f* = 0.31 (pentane/CH₂Cl₂ 9:1). ¹H-NMR (500 MHz, CDCl₃) δ = 7.54 – 7.53 (m, 2H), 7.43 (t, *J* = 7.7 Hz, 2H), 7.36 – 7.30 (m, 3H), 7.03 (t, *J* = 8.5 Hz, 1H), 3.94 (s, 3H). ¹³C-NMR (126 MHz, CDCl₃) δ = 152.7 (d, *J* = 245.4 Hz), 147.2 (d, *J* = 10.9 Hz), 139.9 (d, *J* = 1.8 Hz), 134.6 (d, *J* = 6.3 Hz),

SUPPORTING INFORMATION

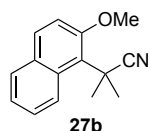
129.0, 127.3, 126.8, 122.8 (d, $J = 3.5$ Hz), 114.9 (d, $J = 18.7$ Hz), 113.8 (d, $J = 2.3$ Hz), 56.5. The analytical data are in agreement with the literature.^[14]



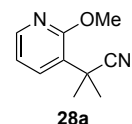
2-(4-methoxy-[1,1'-biphenyl]-3-yl)-2-methylpropanenitrile (26b): Fluoride **26a** (649 mg, 3.21 mmol) was converted following the general procedure 1 (60 °C, 18 h). After flash chromatography on silica (pentane/ethyl acetate 95:5) compound **26b** (751 mg, 2.99 mmol, 93%) was obtained as a white solid. $R_f = 0.19$ (pentane/ethyl acetate 95:5). **IR** (neat) $\nu = 3059, 3031, 2979, 2938, 2910, 2836, 2234, 1609, 1510, 1485, 1461, 1442, 1286, 1254, 1088, 1022, 821, 764, 699, 583, 504$ cm^{-1} . **mp**: 64 - 65 °C. **¹H-NMR** (400 MHz, CDCl_3) $\delta = 7.57 - 7.53$ (m, 4H), 7.46 - 7.42 (m, 2H), 7.36 - 7.31 (m, 1H), 7.03 (d, $J = 8.4$ Hz, 1H), 3.97 (s, 3H), 1.83 (s, 6H). **¹³C-NMR** (101 MHz, CDCl_3) $\delta = 156.9, 140.7, 134.1, 129.1, 128.9, 128.0, 127.1, 127.0, 125.1, 124.8, 112.5, 55.8, 34.8, 27.2$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{17}\text{H}_{17}\text{N}_1\text{O}_1\text{Na}_1$ $[\text{M}+\text{Na}]^+$: 274.1202, found: 274.1201.



2-(2-methoxynaphthalen-1-yl)acetonitrile (27a): A dry schlenk tube was charged with 34.0 mg (92.8 μmol , 2 mol%) allylpalladium(II)chloride, 114 mg (278 μmol , 6 mol%) SPhos and 745 mg (6.96 mmol, 1.5 eq.) sodium cyanoacetate. The tube was put under vacuum and flushed with argon (3 times). 1.10 g (4.64 mmol) 1-Bromo-2-methoxynaphthalene in 9.3 mL mesitylene were added and the mixture was heated to 140 °C for 24 h. After cooling to rt the reaction was filtered over a short pad of celite, washed with Et_2O and the solvent was removed in vacuum. After flash chromatography on silica (pentane/ Et_2O 9:1) compound **27a** (62.9 mg, 232 μmol , 86%) was obtained as a white solid. $R_f = 0.16$ (pentane/ Et_2O 9:1). **IR** (neat) $\nu = 2965, 2936, 2844, 2243, 1628, 1596, 1514, 1265, 801, 746, 507$ cm^{-1} . **mp**: 109 - 111 °C. **¹H-NMR** (300 MHz, CDCl_3) $\delta = 7.90 - 7.82$ (m, 3H), 7.62 - 7.57 (m, 1H), 7.44 - 7.39 (m, 1H), 7.28 (d, $J = 9.1$ Hz, 1H), 4.12 (s, 2H), 4.00 (s, 3H). **¹³C-NMR** (75 MHz, CDCl_3) $\delta = 154.7, 132.2, 130.5, 129.0, 128.9, 127.7, 123.9, 122.0, 118.4, 112.8, 110.8, 56.5, 13.4$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{13}\text{H}_{11}\text{N}_1\text{O}_1\text{Na}_1$ $[\text{M}+\text{Na}]^+$: 220.0733, found: 220.0736. The analytical data are in agreement with the literature.^[15]

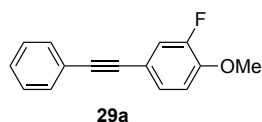


2-(2-methoxynaphthalen-1-yl)-2-methylpropanenitrile (27b): Nitrile **27a** (493 mg, 2.5 mmol) was dissolved in 25 mL THF and cooled to 0 °C. 7.5 mL (7.50 mmol, 1 M solution in THF, 3.0 eq.) KHMDS were added and the reaction was stirred for 30 min at 0 °C. 346 μL (5.50 mmol, 2.2 eq.) iodomethane were added, the reaction was brought to rt and stirred for 4h. Water (30 mL) was added to the mixture and the aq. layer was extracted with Et_2O (3 x 30 mL). The organic phases were washed with brine (30 mL), dried over Na_2SO_4 and the solvent was removed in vacuum. After flash chromatography on silica (pentane/ Et_2O 8:2) compound **27b** (500 mg, 2.22 mmol, 89%) was obtained as a yellow oil. $R_f = 0.28$ (pentane/ Et_2O 8:2). **IR** (neat) $\nu = 2980, 2940, 2844, 2230, 1621, 1600, 1513, 1462, 1325, 1273, 1249, 1151, 1068, 1034, 809, 749$ cm^{-1} . **¹H-NMR** (400 MHz, CDCl_3) $\delta = 8.49 - 8.47$ (m, 1H), 7.82 - 7.79 (m, 2H), 7.54 (ddd, $J = 8.9, 6.8, 1.5$ Hz, 1H), 7.38 (ddd, $J = 8.0, 6.8, 1.0$ Hz, 1H), 7.27 (d, $J = 9.0$ Hz, 1H), 3.96 (s, 3H), 2.11 (s, 6H). **¹³C-NMR** (126 MHz, CDCl_3) $\delta = 155.3, 131.8, 130.9, 130.3, 129.3, 126.9, 126.5, 124.4, 123.7, 120.3, 115.5, 56.9, 35.8, 30.0$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{15}\text{H}_{15}\text{N}_1\text{O}_1\text{Na}_1$ $[\text{M}+\text{Na}]^+$: 248.1045, found: 248.1042.

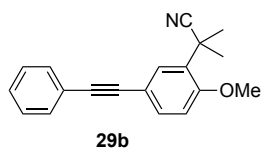


2-(2-methoxypyridin-3-yl)-2-methylpropanenitrile (28a): 3-Fluoro-2-methoxypyridine (1.00 g, 7.87 mmol) was converted following general procedure 1 (80 °C, 16 h, 0.2 M). After flash chromatography on silica (Et_2O /pentane 1:5) nitrile **28a** (1.01 g, 5.73 mmol, 73%) was obtained as a colorless liquid. $R_f = 0.42$ (Et_2O /pentane 1:5). **IR** (neat) $\nu = 2984, 2237, 1583, 1465, 1405, 1302, 1275, 1254, 1095, 1060, 1016, 802, 778$ cm^{-1} . **¹H-NMR** (400 MHz, CDCl_3) $\delta = 8.14$ (dd, $J = 5.0, 1.8$ Hz, 1H), 7.66 (dd, $J = 7.5, 1.8$ Hz, 1H), 6.91 (dd, $J = 7.5, 5.0$ Hz, 1H), 4.04 (s, 3H), 1.77 (s, 6H). **¹³C-NMR** (101 MHz, CDCl_3) $\delta = 161.0, 146.5, 135.0, 123.9, 123.2, 116.9, 53.6, 34.8, 26.4$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{10}\text{H}_{13}\text{O}_1\text{N}_2$ $[\text{M}+\text{H}]^+$: 177.1022, found: 177.1020.

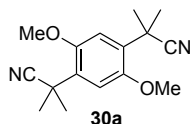
SUPPORTING INFORMATION



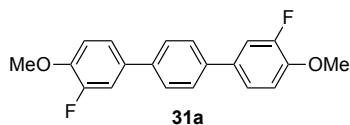
2-fluoro-1-methoxy-4-(phenylethynyl)benzene (29a): 29.6 mg (155 μ mol, 4 mol%) copper(I)-iodide and 109 mg (155 μ mol, 4 mol%) bis(triphenylphosphine)palladium dichloride were added to a flask with 12.9 mL triethylamine. The mixture was degassed with argon for 10 min. Afterwards 0.5 mL (795 mg, 3.88 mmol) 4-bromo-2-fluoroanisole and 512 μ L (476 mg, 4.66 mmol, 1.2 eq.) phenylacetylene were added and the mixture was heated to 60 °C for 18 h. After cooling to rt a sat. aq. NH_4Cl solution (50 mL) was added and the aq. phase was extracted with Et_2O (3 x 40 mL). The organic phases were dried over Na_2SO_4 and the solvent was removed in vacuum. After flash chromatography on silica (pentane/ CH_2Cl_2 9:1) compound **29a** (497 mg, 2.20 mmol, 57%) was obtained as a slightly red solid. R_f = 0.35 (pentane/ CH_2Cl_2 9:1). **IR** (neat) ν = 3006, 2967, 2936, 2909, 2841, 1596, 1513, 1299, 1268, 1107, 1025, 810, 756, 690, 540 cm^{-1} . **mp**: 71 - 73 °C. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 7.45 – 7.41 (m, 2H), 7.29 – 7.24 (m, 3H), 7.20 – 7.16 (m, 2H), 6.86 – 6.82 (m, 1H), 3.83 (s, 3H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 151.9 (d, J = 246.4 Hz), 148.2 (d, J = 10.7 Hz), 131.6, 128.5, 128.4, 128.3 (d, J = 3.4 Hz), 123.3, 119.3 (d, J = 19.6 Hz), 116.0 (d, J = 8.4 Hz), 113.3 (d, J = 2.4 Hz), 88.8, 88.3 (d, J = 2.7 Hz), 56.4. **$^{19}\text{F-NMR}$** (376 MHz, CDCl_3) δ = -135.0. **HRMS** (ESI) m/z : calcd. for $\text{C}_{15}\text{H}_{11}\text{F}_1\text{O}_1\text{Na}_1$ [$\text{M}+\text{Na}$] $^+$: 249.0686, found: 249.0685.



3,3-dimethyl-2-(naphthalen-1-yl)-3H-indole (29b): Fluoride **29a** (450 mg, 1.99 mmol) was converted following the general procedure 1 (60 °C, 12 h). After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **29b** (415 mg, 1.51 mmol, 76%) was obtained as a yellow oil. R_f = 0.25 (pentane/ethyl acetate 9:1). **IR** (neat) ν = 3055, 2980, 2839, 2235, 1595, 1499, 1288, 1253, 1150, 1086, 1024, 819, 756, 691, 504 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 7.54 – 7.49 (m, 4H), 7.35 – 7.33 (m, 3H), 6.94 – 6.92 (m, 1H), 3.96 (s, 3H), 1.78 (s, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 157.4, 133.0, 131.6, 129.6, 129.1, 128.5, 128.3, 124.5, 123.4, 115.8, 112.1, 89.0, 88.7, 55.8, 34.3, 27.1. **HRMS** (ESI) m/z : calcd. for $\text{C}_{19}\text{H}_{17}\text{N}_1\text{O}_1\text{Na}_1$ [$\text{M}+\text{Na}$] $^+$: 298.12023, found: 298.12019.

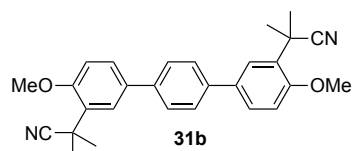


2,2'-(2,5-dimethoxy-1,4-phenylene)bis(2-methylpropanenitrile) (30a): 1,4-Difluoro-2,5-dimethoxybenzene (1.00 g, 5.74 mmol), $i\text{PrCN}$ (3.09 mL 34.4 mmol, 6.0 eq.) and KHMDs (2.86 g, 14.4 mmol, 2.5 eq.) were converted following general procedure 1 (and 75 °C, 16 h, 0.25 M). After flash chromatography on silica (CH_2Cl_2 /toluene 4:1 + 0.5% MeOH) nitrile **30a** (1.01 g, 5.73 mmol, 73%) was obtained as a colorless solid. R_f = 0.58 (CH_2Cl_2 /toluene 4:1 + 0.5% MeOH). **IR** (neat) ν = 3005, 2981, 2922, 2853, 2231, 1507, 1456, 1398, 1384, 1365, 1303, 1288, 1212, 1112, 1036, 948, 865, 853, 752, 707, 632, 512, 484, 471, 452 cm^{-1} . **mp**: 217 - 218 °C. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 6.99 (s, 2H), 3.90 (s, 6H), 1.77 (s, 12H). **$^{13}\text{C-NMR}$** (126 MHz, CDCl_3) δ = 151.2, 129.3, 124.6, 111.3, 56.3, 35.2, 26.9. **HRMS** (ESI) m/z : calcd. for $\text{C}_{16}\text{H}_{20}\text{O}_2\text{N}_2\text{Na}_1$ [$\text{M}+\text{Na}$] $^+$: 295.1417, found: 295.1414.

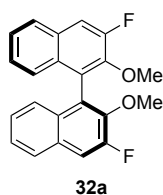


3,3''-difluoro-4,4''-dimethoxy-1,1':4',1''-terphenyl (31a): 1.20 g (7.06 mmol, 2.0 eq.) 3-Fluoro-4-methoxyphenylboronic acid, 833 mg (3.53 mmol, 1.0 eq.) 1,4-dibromobenzene and 81.6 mg (70.6 μ mol, 2 mol%) tetrakis(triphenylphosphine)palladium(0) were dissolved in a mixture of 28 mL toluene and 14.1 mL (14.1 mmol, 1M solution) of an aq. NaHCO_3 -solution. The mixture was degassed and heated to reflux for 18 h. After cooling to rt the reaction mixture was poured into a mixture of water (100 mL) and ethyl acetate (100 mL). The resulting white solid was collected by filtration, washed with water and ethyl acetate and dried in vacuum. Compound **31a** (833 mg, 2.55 mmol, 72%) was obtained as a white solid and used in the next steps without further purification. R_f = 0.3 (pentane/ethyl acetate 9:1). **IR** (neat) ν = 2974, 2916, 2844, 1580, 1540, 1507, 1304, 1249, 1173, 1139, 1043, 1018, 874, 835, 764, 804, 519 cm^{-1} . **mp**: 238–239 °C. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 7.59 (s, 4H), 7.39 – 7.34 (m, 4H), 7.07 – 7.02 (m, 2H), 3.94 (s, 6H). **$^{13}\text{C-NMR}$** (126 MHz, CDCl_3) δ = 152.8 (d, J = 245.8 Hz), 147.3 (d, J = 10.6 Hz), 138.7 (d, J = 1.9 Hz), 133.9 (d, J = 6.6 Hz), 127.2, 122.7 (d, J = 3.3 Hz), 114.8 (d, J = 19.0 Hz), 113.9 (d, J = 2.4 Hz), 56.5. **$^{19}\text{F-NMR}$** (376 MHz, CDCl_3) δ = -135.0. **HRMS** (EI) m/z : calcd. for $\text{C}_{20}\text{H}_{16}\text{F}_2\text{O}_2$ [M] $^+$: 326.1113, found: 326.1114.

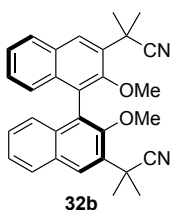
SUPPORTING INFORMATION



2,2'-(4,4''-dimethoxy-[1,1':4',1''-terphenyl]-3,3''-diyl)bis(2-methylpropanenitrile) (31b): Fluoride **31a** (702 mg, 2.15 mmol), *i*PrCN (1.54 mL, 1.19 g, 17.2 mmol, 8.0 eq.) and KHMDS (1.29 g, 6.45 mmol, 3.0 eq.) were converted following the general procedure 1 (70 °C, 18 h). After flash chromatography on silica (pentane/CH₂Cl₂ 75:25 + 5% ethyl acetate) nitrile **31b** (337 mg, 793 μmol, 37%) was obtained as a white solid. **R_f** = 0.21 (pentane/CH₂Cl₂ 75:25 + 5% ethyl acetate). **IR** (neat) ν = 2980, 2944, 2841, 2234, 1606, 1531, 1488, 1392, 1287, 1259, 1181, 1090, 1023, 812, 735, 650. **m.p.**: 204 - 206 °C. **¹H-NMR** (400 MHz, CDCl₃) δ = 7.61 – 7.56 (m, 8H), 7.05 (d, *J* = 8.4 Hz, 2H), 3.98 (s, 6H), 1.84 (s, 12H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 157.0, 139.4, 133.5, 129.2, 127.9, 127.4, 125.0, 112.6, 55.9, 34.9, 27.2. **HRMS** (ESI) *m/z*: calcd. for C₂₈H₂₉N₂O₂ [M+H]⁺: 425.2223, found: 425.2223.

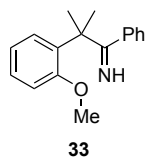


(S)-3,3'-difluoro-2,2'-dimethoxy-1,1'-binaphthalene (32a): 1.06 mL (813 mg, 7.00 mmol, 2.2 eq.) N,N,N',N''-tetramethylethylenediamine were dissolved in 31.8 mL Et₂O. To this solution 3.82 mL (9.54 mmol, 2.5 M in hexanes, 3.0 eq.) *n*-butyllithium were added at rt and the reaction was stirred for 15 min. Next 1.00 g (3.18 mmol, 1.0 eq.) (S)-2,2'-dimethoxy-1,1'-binaphthalene were added in one portion and the reaction was stirred for 3h at rt. Afterwards the reaction was brought to -78 °C and a solution of 2.41 g (7.63 mmol, 2.4 eq.) *N*-fluorobenzensulfonimide in 6.4 mL THF was added dropwise and the reaction was brought to rt over night. Water (100mL) was added to the mixture and the aq. layer was extracted with ethyl acetate (3 x 40 mL). The organic phases were washed with brine (50 mL), dried over Na₂SO₄ and the solvent was removed in vacuum. After flash chromatography on silica (pentane/CH₂Cl₂ 7:3) compound **32a** (508 mg, 1.45 mmol, 46%) was obtained as a white solid. **R_f** = 0.58 (pentane/CH₂Cl₂ 1:1). **IR** (neat) ν = 3063, 3003, 2945, 2832, 1603, 1504, 1471, 1445, 1424, 1255, 1106, 1005, 869, 748, 618, 532 cm⁻¹. **m.p.**: 81 - 82 °C. $[\alpha]_D^{24}$ = +3.27 (c 0.315, CHCl₃). **¹H-NMR** (500 MHz, CDCl₃) δ = 7.83 (d, *J* = 8.2 Hz, 2H), 7.67 (d, *J* = 12.0 Hz, 2H), 7.41 (t, *J* = 7.5 Hz, 2H), 7.23 (t, *J* = 7.6 Hz, 2H), 7.09 (d, *J* = 8.5 Hz, 2H), 3.71 (s, 6H). **¹³C-NMR** (126 MHz, CDCl₃) δ = 155.2 (d, *J* = 250.2 Hz), 145.7 (d, *J* = 14.1 Hz), 130.6, 130.5 (d, *J* = 9.1 Hz), 127.5 (d, *J* = 5.2 Hz), 126.0 (dd, *J* = 3.0 Hz), 125.9 (d, *J* = 2.6 Hz), 125.8, 125.7 (d, *J* = 2.0 Hz), 113.3 (d, *J* = 18.4 Hz), 61.5 (d, *J* = 5.3 Hz). **¹⁹F-NMR** (376 MHz, CDCl₃) δ = -129.2. **HRMS** (ESI) *m/z*: calcd. for C₂₂H₁₇F₂O₂ [M+H]⁺: 351.1191, found: 351.1187.



(S)-2,2'-(2,2'-dimethoxy-[1,1'-binaphthalene]-3,3'-diyl)bis(2-methylpropanenitrile) (32b): Fluoride **32a** (399 mg, 1.14 mmol), *i*PrCN (819 μL, 630 mg, 9.12 mmol, 8.0 eq.) and KHMDS (682 mg, 3.42 mmol, 3.0 eq.) were converted following the general procedure 1 (60 °C, 24 h). After flash chromatography on silica (pentane/ethyl acetate 85:15) compound **32b** (257 mg, 572 μmol, 50%) was obtained as a white solid. **R_f** = 0.48 (pentane/ethyl acetate 9:1). **IR** (neat) ν = 2981, 2943, 2233, 1622, 1593, 1559, 1459, 1403, 1359, 1403, 1240, 1205, 1066, 998, 909, 889, 750, 728, 615, 535, 501 cm⁻¹. **m.p.**: 175 - 176 °C. $[\alpha]_D^{25}$ = +184.2 (c 0.25, CHCl₃). **¹H-NMR** (400 MHz, CDCl₃) δ = 7.89 (d, *J* = 8.1 Hz, 4H), 7.45 – 7.41 (m, 2H), 7.33 – 7.29 (m, 2H), 7.23 (d, *J* = 8.4 Hz, 2H), 3.17 (s, 6H), 2.00 (s, 6H), 1.88 (s, 6H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 155.6, 134.4, 134.3, 129.7, 128.4, 127.4, 125.9, 125.6, 125.4, 125.3, 123.5, 60.4, 34.5, 28.5, 27.6. **HRMS** (ESI) *m/z*: calcd. for C₃₀H₂₉N₂O₂ [M+H]⁺: 449.2223, found: 449.2221.

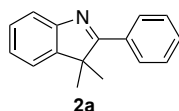
SUPPORTING INFORMATION



2-(2-methoxyphenyl)-2-methyl-1-phenylpropan-1-imine (33): Nitrile **1** (501 mg, 2.86 mmol) was dissolved in 14 mL toluene and the solution was brought to -78 °C. 4.29 mL (4.29 mmol, 1M solution in THF, 1.5 eq.) phenylmagnesium bromide were added and the reaction was stirred at rt over night. A sat. aq. NH₄Cl solution (100 mL) was added and the aq. phase was extracted with ethyl acetate (3 x 50 mL). The organic phases were washed with brine (50 mL), dried over Na₂SO₄ and the solvent was removed in vacuum. After flash chromatography on silica (pentane/ethyl acetate 1:1) compound **33** (148 mg, 586 μmol, 21%) was obtained as a colourless oil. **R_f** = 0.5 (pentane/ethyl acetate 1:1). **IR** (neat) ν = 3057, 2970, 2935, 2834, 1609, 1581, 1490, 1463, 1435, 1338, 1245, 1181, 1089, 1029, 957, 891, 753, 700, 584 cm⁻¹. **¹H-NMR** (500 MHz, CDCl₃) δ = 7.38 – 7.36 (m, 1H), 7.26 – 7.18 (m, 6H), 6.96 (t, *J* = 7.5 Hz, 1H), 6.77 (d, *J* = 8.1 Hz, 1H), 3.67 (s, 3H), 1.61 (s, 6H). **¹³C-NMR** (126 MHz, CDCl₃) δ = 187.6, 157.3, 141.0, 134.9, 128.5, 128.3, 127.7, 127.3, 126.7, 120.8, 111.4, 55.0, 46.7, 27.8. **HRMS** (ESI) *m/z*: calcd. for C₁₇H₂₀N₁O₁ [M+H]⁺: 254.1539, found: 254.1535.

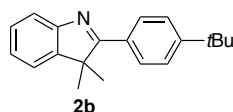
3. Experimental Procedures and Characterization of the Indolenines

3.1 Variation of the lithium reagent

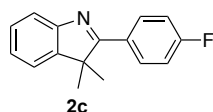


General procedure 2: 3,3-dimethyl-2-phenyl-3H-indole (2a): A solution of 51.5 mg 2-(2-methoxyphenyl)-2-methylpropanenitrile (**1**; 294 μmol , 1.0 eq.) in 2.9 mL toluene was cooled to $-78\text{ }^\circ\text{C}$. 162 μL phenyllithium (309 μmol , 1.0 eq., 1.9 M in dibutyl ether) were added dropwise and the reaction was stirred for 1 h at $-78\text{ }^\circ\text{C}$. Afterwards the reaction was warmed to rt and stirred for 1 h. Next the reaction was heated for 2 h at $100\text{ }^\circ\text{C}$. After cooling to rt the reaction was treated with sat. aq. NH_4Cl solution (40 mL) and extracted with Et_2O (3 x 25 mL). The combined organic phases were dried over Na_2SO_4 and the solvent was removed in vacuum. After flash chromatography on silica (pentane/ Et_2O 9:1) compound **2a** (60.9 mg, 275 μmol , 94%) was obtained as colorless oil. $R_f = 0.46$ (pentane/ Et_2O 9:1). $^1\text{H-NMR}$ (400 MHz, CDCl_3) $\delta = 8.16 - 8.14$ (m, 2H), 7.71 – 7.69 (m, 1H), 7.51 – 7.48 (m, 3H), 7.39 – 7.34 (m, 2H), 7.30 – 7.26 (m, 1H), 1.60 (m, 6H). $^{13}\text{C-NMR}$ (101 MHz, CDCl_3) $\delta = 183.4, 153.1, 147.7, 133.4, 130.7, 128.8, 128.5, 127.9, 126.0, 121.1, 121.0, 53.7, 24.9$. The analytical data are in agreement with the literature.^[14]

1 mmol scale synthesis of 3,3-dimethyl-2-phenyl-3H-indole (2a): Compound **1** (177mg, 1.01 mmol) was converted with 561 μL phenyllithium (1.01 mmol, 1.0 eq., 1.8 M in dibutyl ether) following the general procedure 2 ($100\text{ }^\circ\text{C}$, 2 h). After flash chromatography on silica (pentane/ Et_2O 9:1) compound **2a** (201 mg, 908 μmol , 90%) was obtained as a colorless oil.

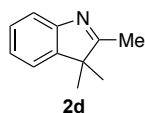


2-(4-(tert-butyl)phenyl)-3,3-dimethyl-3H-indole (2b): Compound **1** (49.6 mg, 283 μmol) was converted with the corresponding organolithium compound (0.25 M in THF) following the general procedure 2 ($100\text{ }^\circ\text{C}$, 2 h). After flash chromatography on silica (pentane/ Et_2O 9:1) compound **2b** (22.5 mg, 242 μmol , 86%) was obtained as a white solid. $R_f = 0.44$ (pentane/ Et_2O 9:1). IR (neat) $\nu = 3065, 2963, 2943, 2873, 1605, 1513, 1456, 1408, 1363, 1269, 1214, 1106, 992, 843, 772, 756, 556\text{ cm}^{-1}$. mp : $104 - 105\text{ }^\circ\text{C}$. $^1\text{H-NMR}$ (500 MHz, CDCl_3) $\delta = 8.13$ (d, $J = 8.5\text{ Hz}$, 2H), 7.70 (d, $J = 7.6\text{ Hz}$, 1H), 7.52 (d, $J = 8.6\text{ Hz}$, 2H), 7.38 – 7.33 (m, 2H), 7.27 – 7.25 (m, 1H), 1.61 (s, 6H), 1.37 (s, 9H). $^{13}\text{C-NMR}$ (126 MHz, CDCl_3) $\delta = 183.2, 154.3, 153.1, 147.7, 130.4, 128.4, 127.9, 125.8, 125.7, 121.0, 120.8, 53.6, 35.1, 31.3, 25.1$. HRMS (ESI) m/z : calcd. for $\text{C}_{20}\text{H}_{24}\text{N}$ [$\text{M}+\text{H}$] $^+$: 278.1895, found: 278.1899.

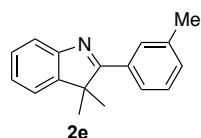


2-(4-fluorophenyl)-3,3-dimethyl-3H-indole (2c): Compound **1** (52.5 mg, 300 μmol) was converted with the corresponding organolithium compound (0.23 M in THF) following the general procedure 2 ($100\text{ }^\circ\text{C}$, 2 h). After flash chromatography on silica (pentane/ Et_2O 9:1) compound **2c** (56.1 mg, 234 μmol , 78%) was obtained as a yellow oil. $R_f = 0.31$ (pentane/ Et_2O 9:1). IR (neat) $\nu = 3079, 2967, 2929, 2864, 1601, 1506, 1470, 1456, 1407, 1386, 1365, 1337, 1311, 1295, 1268, 1232, 1156, 1108, 1013, 991, 936, 842, 819, 772, 753, 694, 555, 521\text{ cm}^{-1}$. $^1\text{H-NMR}$ (500 MHz, CDCl_3) $\delta = 8.13$ (dd, $J = 8.6, 5.6\text{ Hz}$, 2H), 7.65 (d, $J = 7.6\text{ Hz}$, 1H), 7.33 (dd, $J = 14.9, 7.4\text{ Hz}$, 2H), 7.24 (d, $J = 9.2\text{ Hz}$, 1H), 7.14 (t, $J = 8.7\text{ Hz}$, 2H), 1.55 (s, 6H). $^{13}\text{C-NMR}$ (126 MHz, CDCl_3) $\delta = 182.2, 164.3$ (d, $J = 252.0\text{ Hz}$), 152.9, 147.5, 130.6 (d, $J = 8.5\text{ Hz}$), 129.6 (d, $J = 3.0\text{ Hz}$), 127.9, 126.1, 121.0 (d, $J = 17.4\text{ Hz}$), 115.9, 115.8, 53.6, 24.9. $^{19}\text{F-NMR}$ (376 MHz, CDCl_3) $\delta = -109.3$. HRMS (ESI) m/z : calcd. for $\text{C}_{16}\text{H}_{15}\text{F}_1\text{N}_1$ [$\text{M}+\text{H}$] $^+$: 240.1183, found: 240.1179.

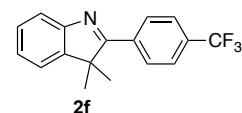
SUPPORTING INFORMATION



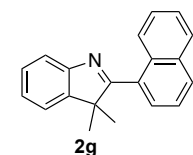
2,3,3-trimethyl-3H-indole (2d): Compound **1** (53.4 mg, 305 μmol) was converted with MeLi (1.5 eq., 2.2 M in Et₂O) following the general procedure 2 (100 °C, 2 h). After flash chromatography on silica (pentane/ethyl acetate 8:2) compound **2d** (37.3 mg, 234 μmol , 77%) was obtained as a yellow oil. R_f = 0.18 (pentane/ethyl acetate 8:2). $^1\text{H-NMR}$ (400 MHz, CDCl₃) δ = 7.54 (d, J = 7.6 Hz, 1H), 7.32 – 7.27 (m, 2H), 7.20 (td, J = 7.4, 1.1 Hz, 1H), 2.29 (s, 3H), 1.31 (s, 6H). $^{13}\text{C-NMR}$ (75 MHz, CDCl₃) δ = 188.1, 153.8, 145.7, 127.7, 125.2, 121.4, 120.0, 53.7, 23.2, 15.6. The analytical data are in agreement with the literature.^[16]



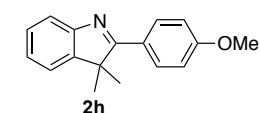
3,3-dimethyl-2-(*m*-tolyl)-3H-indole (2e): Compound **1** (51.3 mg, 293 μmol) was converted with the corresponding organolithium compound (0.25 M in THF) following the general procedure 2 (100 °C, 2 h). After flash chromatography on silica (pentane/Et₂O 9:1) compound **2e** (60.2 mg, 256 μmol , 87%) was obtained as a colorless oil. R_f = 0.29 (pentane/Et₂O 9:1). $^1\text{H-NMR}$ (400 MHz, CDCl₃) δ = 8.03 (s, 1H), 7.90 (d, J = 7.7 Hz, 1H), 7.71 (d, J = 7.6 Hz, 1H), 7.40 – 7.25 (m, 5H), 2.45 (s, 3H), 1.60 (s, 6H). $^{13}\text{C-NMR}$ (101 MHz, CDCl₃) δ = 183.7, 152.9, 147.7, 138.6, 133.2, 131.7, 129.2, 128.6, 127.9, 126.0, 125.5, 121.1, 120.9, 53.8, 25.0, 21.7. The analytical data are in agreement with the literature.^[16]



3,3-dimethyl-2-(4-(trifluoromethyl)phenyl)-3H-indole (2f): Compound **1** (47.5 mg, 271 μmol) was converted with the corresponding organolithium compound (0.28 M in THF) following the general procedure 2 (100 °C, 2 h). After flash chromatography on silica (pentane/Et₂O 9:1) compound **2f** (63.9 mg, 221 μmol , 74%) was obtained as a white solid. R_f = 0.50 (pentane/Et₂O 9:1). $^1\text{H-NMR}$ (500 MHz, CDCl₃) δ = 8.26 (d, J = 8.2 Hz, 2H), 7.74 (t, J = 7.9 Hz, 3H), 7.39 (ddd, J = 14.6, 7.3, 1.4 Hz, 2H), 7.35 – 7.29 (m, 1H), 1.60 (s, 6H). $^{13}\text{C-NMR}$ (126 MHz, CDCl₃) δ = 181.9, 152.7, 147.6, 136.6, 132.2 (q, J = 32.7 Hz), 128.7, 128.1, 127.3, 126.7, 125.7 (q, J = 3.7 Hz), 124.1 (q, J = 272.3 Hz), 121.4, 121.2, 53.8, 24.7. The analytical data are in agreement with the literature.^[16]

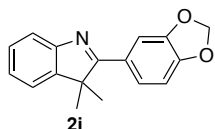


3,3-dimethyl-2-(naphthalen-1-yl)-3H-indole (2g): Compound **1** (49.6 mg, 283 μmol) was converted with the corresponding organolithium compound (0.25 M in THF) following the general procedure 2 (100 °C, 2 h). After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **2g** (62.9 mg, 232 μmol , 86%) was obtained as a white solid. R_f = 0.3 (pentane/ethyl acetate 9:1). IR (neat) ν = 3047, 2964, 2926, 2865, 1591, 1552, 1507, 1470, 1454, 1381, 1359, 1333, 1301, 1246, 1167, 1080, 1012, 955, 858, 801, 774, 754, 717, 656, 579, 500, 478 cm⁻¹. mp: 180 - 181 °C. $^1\text{H-NMR}$ (500 MHz, CDCl₃) δ = 7.96 – 7.94 (m, 2H), 7.90 (dd, J = 8.1, 1.4 Hz, 1H), 7.79 (d, J = 7.6 Hz, 1H), 7.57 – 7.40 (m, 6H), 7.35 (t, J = 7.3 Hz, 1H), 1.46 (s, 6H). $^{13}\text{C-NMR}$ (126 MHz, CDCl₃) δ = 186.3, 153.2, 145.6, 134.0, 132.3, 132.1, 129.7, 128.4, 128.0, 127.0, 126.4, 126.3, 125.9, 125.7, 124.7, 121.6, 121.3, 56.4, 23.5. HRMS (ESI) m/z : calcd. for C₂₀H₁₈N₁ [M+H]⁺: 272.1433, found: 272.1430.

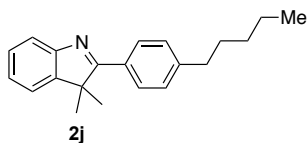


2-(4-methoxyphenyl)-3,3-dimethyl-3H-indole (2h): Compound **1** (51.1 mg, 292 μmol) was converted with the corresponding organolithium compound (0.22 M in THF) following the general procedure 2 (100 °C, 2 h). After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **2h** (65.0 mg, 259 μmol , 89%) was obtained as a white solid. R_f = 0.2 (pentane/ethyl acetate 9:1). $^1\text{H-NMR}$ (500 MHz, CDCl₃) δ = 8.17 – 8.15 (m, 2H), 7.67 (d, J = 7.6 Hz, 1H), 7.37 – 7.32 (m, 2H), 7.26 – 7.23 (m, 1H), 7.01 (d, J = 8.9 Hz, 2H), 3.88 (s, 3H), 1.59 (s, 6H). $^{13}\text{C-NMR}$ (126 MHz, CDCl₃) δ = 182.8, 161.7, 153.1, 147.5, 130.3, 127.8, 125.9, 125.5, 121.0, 120.5, 114.1, 55.5, 53.4, 25.2. The analytical data are in agreement with the literature.^[16]

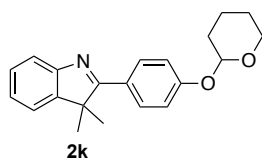
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2-(benzo[d][1,3]dioxol-5-yl)-3,3-dimethyl-3H-indole (2i): Compound **1** (50.1 mg, 286 μmol) was converted with the corresponding organolithium compound (0.23 M in THF) following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **2i** (52.3 mg, 197 μmol , 69%) was obtained as a yellow oil. $R_f = 0.33$ (pentane/ethyl acetate 9:1). **IR** (neat) $\nu = 2967, 2926, 2900, 2869, 1604, 1517, 1501, 1488, 1469, 1443, 1386, 1351, 1260, 1229, 1210, 1100, 1036, 1013, 934, 892, 812, 752, 557, 478 \text{ cm}^{-1}$. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) $\delta = 7.76$ (d, $J = 1.7 \text{ Hz}$, 1H), 7.67 (dd, $J = 8.2, 1.4 \text{ Hz}$, 2H), 7.37 – 7.31 (m, 2H), 7.25 (td, $J = 7.4, 1.1 \text{ Hz}$, 1H), 6.91 (dd, $J = 8.2, 0.4 \text{ Hz}$, 1H), 6.04 (s, 2H), 1.58 (s, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) $\delta = 182.5, 152.7, 150.0, 148.3, 147.5, 127.9, 127.4, 125.8, 123.6, 121.0, 120.6, 108.6, 108.3, 101.7, 53.4, 25.2$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{17}\text{H}_{16}\text{N}_1\text{O}_2$ $[\text{M}+\text{H}]^+$: 266.1175, found: 266.1169.



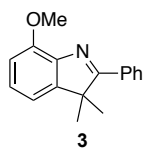
3,3-dimethyl-2-(4-pentylphenyl)-3H-indole (2j): Compound **1** (51.5 mg, 294 μmol) was converted with the corresponding organolithium compound (0.24 M in THF) following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (pentane/ Et_2O 9:1) compound **2j** (62.6 mg, 215 μmol , 73%) was obtained as a colorless oil. $R_f = 0.36$ (pentane/ Et_2O 9:1). **IR** (neat) $\nu = 3023, 2959, 2927, 2857, 1608, 1508, 1468, 1455, 1412, 1266, 1213, 1013, 991, 934, 848, 772, 751, 470, 521 \text{ cm}^{-1}$. **$^1\text{H-NMR}$** (500 MHz, CDCl_3) $\delta = 8.09$ (d, $J = 8.1 \text{ Hz}$, 2H), 7.69 (d, $J = 7.6 \text{ Hz}$, 1H), 7.37 – 7.25 (m, 5H), 2.69 – 2.66 (m, 2H), 1.70 – 1.64 (m, 2H), 1.60 (s, 6H), 1.37 – 1.34 (m, 4H), 0.91 (t, $J = 6.7 \text{ Hz}$, 3H). **$^{13}\text{C-NMR}$** (126 MHz, CDCl_3) $\delta = 183.3, 153.2, 147.7, 146.2, 130.7, 128.8, 128.5, 127.9, 125.8, 121.0, 120.8, 53.6, 36.0, 31.7, 31.0, 25.1, 22.7, 14.2$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{21}\text{H}_{26}\text{N}_1$ $[\text{M}+\text{H}]^+$: 292.2059, found: 292.2057.



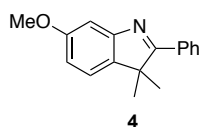
3,3-dimethyl-2-(4-((tetrahydro-2H-pyran-2-yl)oxy)phenyl)-3H-indole (2k): Compound **1** (52.0 mg, 297 μmol) was converted with the corresponding organolithium compound (0.24 M in THF) following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **2k** (71.6 mg, 223 μmol , 75%) was obtained as a yellow oil. $R_f = 0.33$ (pentane/ethyl acetate 9:1). **IR** (neat) $\nu = 2960, 2942, 2869, 1602, 1504, 1469, 1455, 1240, 1202, 1165, 1110, 1075, 1036, 956, 918, 872, 839, 771, 752, 737, 590, 525 \text{ cm}^{-1}$. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) $\delta = 8.15 - 8.11$ (m, 2H), 7.66 (d, $J = 7.6 \text{ Hz}$, 1H), 7.36 – 7.31 (m, 2H), 7.27 – 7.22 (m, 1H), 7.19 – 7.13 (m, 2H), 5.53 (t, $J = 3.2 \text{ Hz}$, 1H), 3.91 (ddd, $J = 11.3, 9.8, 3.1 \text{ Hz}$, 1H), 3.67 – 3.61 (m, 1H), 2.09 – 1.98 (m, 1H), 1.91 – 1.88 (m, 2H), 1.77 – 1.61 (m, 3H), 1.59 (s, 3H), 1.58 (s, 3H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) $\delta = 182.8, 159.2, 153.4, 147.7, 130.1, 127.8, 126.7, 125.5, 121.0, 120.6, 116.4, 96.2, 62.2, 53.4, 30.4, 25.3, 25.2, 25.1, 18.7$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{21}\text{H}_{24}\text{N}_1\text{O}_2$ $[\text{M}+\text{H}]^+$: 322.1801, found: 322.1799.

SUPPORTING INFORMATION

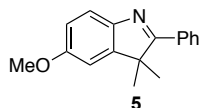
3.2 Substrate scope



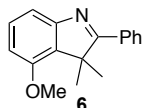
7-methoxy-3,3-dimethyl-2-phenyl-3H-indole (3): Compound **3a** (51.9 mg, 253 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **3** (59.5 mg, 237 μmol , 94%) was obtained as a yellow oil. R_f = 0.28 (pentane/ethyl acetate 9:1). **IR** (neat) ν = 2965, 2930, 2836, 1609, 1593, 1518, 1484, 1459, 1436, 1342, 1280, 1257, 1058, 1004, 991, 776, 750, 696, 482 cm^{-1} . **$^1\text{H-NMR}$** (500 MHz, CDCl_3) δ = δ 8.22 – 8.20 (m, 2H), 7.48 – 7.45 (m, 3H), 7.25 (dd, J = 8.2, 7.4 Hz, 1H), 6.96 (dd, J = 7.4, 0.9 Hz, 1H), 6.90 (dd, J = 8.2, 0.9 Hz, 1H), 4.04 (s, 3H), 1.59 (s, 6H). **$^{13}\text{C-NMR}$** (126 MHz, CDCl_3) δ = 181.9, 151.9, 149.9, 140.9, 133.1, 130.6, 128.6, 128.6, 127.5, 113.4, 110.5, 56.2, 54.0, 25.0. **HRMS** (ESI) m/z : calcd. for $\text{C}_{17}\text{H}_{18}\text{N}_1\text{O}_1$ $[\text{M}+\text{H}]^+$: 252.1382, found: 252.1380.



6-methoxy-3,3-dimethyl-2-phenyl-3H-indole (4): Compound **4a** (28.3 mg, 138 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **4** (30.5 mg, 121 μmol , 88%) was obtained as a colorless oil. R_f = 0.3 (pentane/ethyl acetate 9:1). **IR** (neat) ν = 2964, 2930, 2833, 1615, 1592, 1521, 1482, 1463, 39, 1275, 1148, 1030, 777, 697, 506 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 8.16 – 8.13 (m, 2H), 7.51 – 7.47 (m, 3H), 7.29 (d, J = 2.3 Hz, 1H), 7.22 (d, J = 8.2 Hz, 1H), 6.84 (dd, J = 8.2, 2.4 Hz, 1H), 3.87 (s, 3H), 1.58 (s, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 184.5, 160.0, 154.4, 139.9, 133.4, 130.7, 128.7, 128.4, 121.2, 112.3, 106.3, 55.7, 53.3, 25.1. **HRMS** (ESI) m/z : calcd. for $\text{C}_{17}\text{H}_{18}\text{N}_1\text{O}_1$ $[\text{M}+\text{H}]^+$: 252.1383, found: 252.1382.

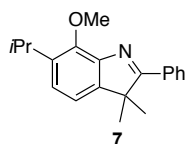


5-methoxy-3,3-dimethyl-2-phenyl-3H-indole (5): Compound **5a** (53.4 mg, 260 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **5** (46.8 mg, 186 μmol , 72%) was obtained as a yellow oil. R_f = 0.29 (pentane/ethyl acetate 9:1). **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 8.15 – 8.12 (m, 2H), 7.64 (d, J = 9.2 Hz, 1H), 7.48 – 7.47 (m, 3H), 6.90 – 6.88 (m, 2H), 3.86 (s, 3H), 1.59 (s, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 181.4, 158.8, 149.3, 146.3, 133.2, 130.5, 128.7, 128.2, 121.3, 112.7, 107.7, 55.8, 53.8, 25.1. The analytical data are in agreement with the literature.^[16]

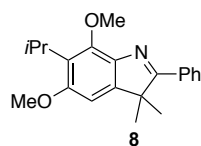


4-methoxy-3,3-dimethyl-2-phenyl-3H-indole (6): Compound **6a** (51.5 mg, 251 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (pentane/ Et_2O 9:1) compound **6** (56.9 mg, 226 μmol , 90%) was obtained as a colorless oil. R_f = 0.2 (pentane/ Et_2O 9:1). **IR** (neat) ν = 2973, 2934, 2836, 1631, 1598, 1524, 1485, 1456, 1267, 952, 793, 737, 698, 597, 527, 483 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 8.15 – 8.12 (m, 2H), 7.48 (dd, J = 6.5, 2.8 Hz, 3H), 7.35 – 7.30 (m, 2H), 6.81 – 6.77 (m, 1H), 3.91 (s, 3H), 1.69 (s, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 184.4, 155.3, 154.4, 133.4, 133.2, 130.5, 129.0, 128.6, 128.5, 114.0, 108.5, 55.5, 54.9, 21.9. **HRMS** (ESI) m/z : calcd. for $\text{C}_{17}\text{H}_{18}\text{N}_1\text{O}_1$ $[\text{M}+\text{H}]^+$: 252.1382, found: 252.1378.

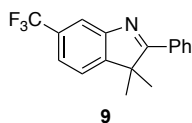
SUPPORTING INFORMATION



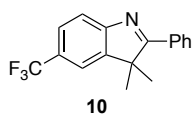
6-isopropyl-7-methoxy-3,3-dimethyl-2-phenyl-3H-indole (7): Compound **7b** (31.4 mg, 127 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (pentane/Et₂O 95:5) compound **7** (31.1 mg, 106 μmol , 84%) was obtained as a colorless oil. R_f = 0.62 (pentane/Et₂O 9:1). **IR** (neat) ν = 3057, 2962, 2929, 2868, 1587, 1523, 1478, 1459, 1418, 1316, 1304, 1252, 1135, 1043, 961, 815, 774, 695, 633, 483 cm^{-1} . **¹H-NMR** (400 MHz, CDCl₃) δ = 8.19 – 8.16 (m, 2H), 7.49 – 7.45 (m, 3H), 7.13 (d, J = 7.6 Hz, 1H), 6.97 (d, J = 7.6 Hz, 1H), 4.34 (s, 3H), 3.44 (hept, J = 7.0 Hz, 1H), 1.57 (s, 6H), 1.27 (d, J = 6.9 Hz, 6H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 180.7, 149.8, 147.9, 143.3, 139.5, 133.7, 130.3, 128.6, 128.4, 124.0, 114.8, 62.2, 53.0, 27.3, 25.2, 23.6. **HRMS** (ESI) m/z : calcd. for C₂₀H₂₄N₁O₁ [M+H]⁺: 294.1852, found: 294.1848.



6-isopropyl-5,7-dimethoxy-3,3-dimethyl-2-phenyl-3H-indole (8): Compound **8b** (55.2 mg, 199 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **8** (47.7 mg, 147 μmol , 74%) was obtained as a white solid. R_f = 0.3 (pentane/ethyl acetate 9:1). **IR** (neat) ν = 3058, 2958, 2930, 2869, 1586, 1521, 1451, 1418, 1316, 1131, 1114, 1086, 1058, 962, 842, 773, 694, 610, 497 cm^{-1} . **mp**: 128 - 129 $^{\circ}\text{C}$. **¹H-NMR** (300 MHz, CDCl₃) δ = 8.17 – 8.13 (m, 2H), 7.49 – 7.42 (m, 3H), 6.59 (s, 1H), 4.29 (s, 3H), 3.87 (s, 3H), 3.65 (hept, J = 7.1 Hz, 1H), 1.57 (s, 6H), 1.34 (d, J = 7.1 Hz, 6H). **¹³C-NMR** (126 MHz, CDCl₃) δ = 178.7, 157.7, 151.3, 147.8, 137.8, 133.7, 130.0, 128.6, 128.1, 127.2, 99.3, 62.2, 56.3, 53.5, 25.3, 25.0, 21.3. **HRMS** (ESI) m/z : calcd. for C₂₁H₂₆N₁O₂ [M+H]⁺: 324.1958, found: 324.1956.

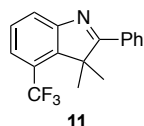


3,3-dimethyl-2-phenyl-6-(trifluoromethyl)-3H-indole (9): Nitrile **9b** (66.6 mg, 274 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (Et₂O/pentane 1:50 to 1:25) compound **9** (66.4 mg, 230 μmol , 84%) was obtained as a colorless liquid. R_f = 0.17 (Et₂O/pentane 1:50). **IR** (neat) ν = 2972, 1522, 1495, 1461, 1444, 1426, 1389, 1367, 1345, 1320, 1263, 1243, 1206, 1163, 1118, 1092, 1077, 1053, 1034, 1004, 988, 907, 891, 831, 777, 696, 666, 612, 602, 509 cm^{-1} . **¹H-NMR** (400 MHz, CDCl₃) δ = 8.20 – 8.14 (m, 2H), 7.97 – 7.94 (m, 1H), 7.55 (ddd, J = 7.8, 1.5, 0.7 Hz, 1H), 7.53 – 7.49 (m, 3H), 7.44 (d, J = 7.8 Hz, 1H), 1.62 (s, 6H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 185.0, 153.5, 151.3, 132.8, 131.2, 130.5 (q, J = 32.2 Hz), 128.9, 128.6, 124.4 (q, J = 272.0 Hz), 122.9 (q, J = 4.0 Hz), 121.4, 118.0 (q, J = 3.8 Hz), 54.0, 24.6. **¹⁹F-NMR** (282 MHz, CDCl₃) δ = -61.9. **HRMS** (ESI) m/z : calcd. for C₁₇H₁₅N₁F₃ [M+H]⁺: 290.1151, found: 290.1155.

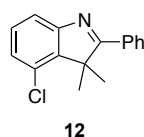


3,3-dimethyl-2-phenyl-5-(trifluoromethyl)-3H-indole (10): Nitrile **10a** (49.9 mg, 205 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (Et₂O/pentane 1:15 to 1:10) compound **10** (55.0 mg, 190 μmol , 93%) was obtained as a colorless solid. R_f = 0.35 (Et₂O/pentane 1:10). **IR** (neat) ν = 2986, 2934, 2874, 1517, 1432, 1327, 1256, 1244, 1224, 1160, 1148, 1116, 1106, 1095, 1076, 1052, 891, 831, 777, 749, 734, 700, 691, 680, 625, 506 cm^{-1} . **mp**: 148 - 149 $^{\circ}\text{C}$. **¹H-NMR** (500 MHz, CDCl₃) δ = 8.21 – 8.13 (m, 2H), 7.77 (d, J = 8.1 Hz, 1H), 7.65 (dd, J = 8.1, 1.7 Hz, 1H), 7.59 (d, J = 1.7 Hz, 1H), 7.52 (dd, J = 5.3, 2.1 Hz, 3H), 1.63 (s, 6H). **¹³C-NMR** (126 MHz, CDCl₃) δ = 186.0, 156.0, 148.2, 132.8, 131.3, 128.9, 128.7, 127.9 (q, J = 32.0 Hz), 125.6 (q, J = 3.9 Hz), 124.7 (q, J = 272.0 Hz), 121.0, 118.2 (q, J = 3.8 Hz), 54.1, 24.7. **¹⁹F-NMR** (376 MHz, CDCl₃) δ = -61.3. **HRMS** (ESI) m/z : calcd. for C₁₇H₁₅N₁F₃ [M+H]⁺: 290.1151, found: 290.1146.

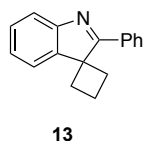
SUPPORTING INFORMATION



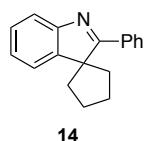
3,3-dimethyl-2-phenyl-4-(trifluoromethyl)-3H-indole (11): Nitrile **11b** (51.3 mg, 221 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:10) compound **11** (43.3 mg, 150 μmol , 71%) was obtained as a yellow solid. R_f = 0.32 (Et_2O /pentane 1:1). **IR** (neat) ν = 2986, 2939, 1534, 1427, 1318, 1308, 1295, 1241, 1171, 1119, 1097, 1056, 992, 813, 751, 745, 700 cm^{-1} . **mp**: 63 - 64 $^{\circ}\text{C}$. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 8.16 – 8.04 (m, 2H), 7.89 (dd, J = 7.4, 0.7 Hz, 1H), 7.60 – 7.43 (m, 5H), 1.70 (d, J = 0.8 Hz, 6H). **$^{13}\text{C-NMR}$** (126 MHz, CDCl_3) δ = 185.5, 155.1, 144.3 (m), 132.6, 130.9, 128.5, 128.8, 128.8, 125.5 (q, J = 32.7 Hz), 125.0, 124.6 (q, J = 273.0), 123.7 (q, J = 5.7 Hz), 55.9, 22.8 (q, J = 3.4 Hz). **$^{19}\text{F-NMR}$** (376 MHz, CDCl_3) δ = -56.36. **HRMS** (ESI) m/z : calcd. for $\text{C}_{17}\text{H}_{15}\text{N}_1\text{F}_3$ $[\text{M}+\text{H}]^+$: 290.1151, found: 290.1148.



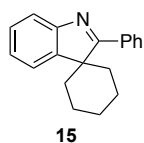
4-chloro-3,3-dimethyl-2-phenyl-3H-indole (12): Nitrile **12a** (54.1 mg, 258 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:10) compound **12** (47.6 mg, 186 μmol , 72%) was obtained as a colorless liquid. R_f = 0.31 (Et_2O /pentane 1:10). **IR** (neat) ν = 2979, 1575, 1525, 1494, 1466, 1451, 1423, 1386, 1365, 1336, 1314, 1291, 1231, 1193, 1185, 1160, 1134, 1048, 1004, 991, 919, 791, 776, 742, 717, 694, 601, 577, 550, 474 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 8.17 – 8.09 (m, 2H), 7.60 (dd, J = 7.6, 0.9 Hz, 1H), 7.53 – 7.46 (m, 3H), 7.30 (t, J = 7.8 Hz, 1H), 7.19 (dd, J = 8.1, 0.9 Hz, 1H), 1.76 (s, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 184.3, 155.0, 142.7, 132.8, 130.9, 129.2, 129.0, 128.7, 128.6, 126.9, 119.7, 55.9, 21.1. **HRMS** (ESI) m/z : calcd. for $\text{C}_{16}\text{H}_{15}\text{N}_1\text{Cl}_1$ $[\text{M}+\text{H}]^+$: 256.0887, found: 256.0886.



2'-phenylspiro[cyclobutane-1,3'-indole] (13): Nitrile **13a** (56.0 mg, 299 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:10) compound **13** (23.0 mg, 98.7 μmol , 33%) was obtained as a yellow solid. R_f = 0.26 (Et_2O /pentane 1:10). **IR** (neat) ν = 3378, 3054, 2953, 2870, 1607, 1485, 1466, 1445, 1391, 1320, 1269, 1055, 745, 700 cm^{-1} . **mp**: 72 - 74 $^{\circ}\text{C}$. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 8.31 – 8.25 (m, 2H), 7.76 – 7.72 (m, 1H), 7.68 – 7.63 (m, 1H), 7.58 – 7.49 (m, 3H), 7.40 – 7.30 (m, 2H), 3.10 – 2.96 (m, 2H), 2.71 – 2.38 (m, 4H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 180.2, 153.1, 147.2, 133.9, 130.6, 128.9, 128.1, 127.8, 126.2, 120.7, 120.5, 56.7, 30.5, 16.3. **HRMS** (ESI) m/z : calcd. for $\text{C}_{17}\text{H}_{16}\text{N}_1$ $[\text{M}+\text{H}]^+$: 234.1277, found: 234.1278.



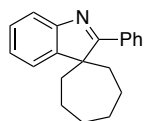
2'-phenylspiro[cyclopentane-1,3'-indole] (14): Nitrile **14a** (52.5 mg, 261 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:10) compound **14** (60.0 mg, 242 μmol , 93%) was obtained as colorless oil. R_f = 0.32 (Et_2O /pentane 1:10). **IR** (neat) ν = 2957, 2873, 1520, 1465, 1456, 1442, 1343, 1265, 1019, 770, 750, 695, 504 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 8.13 – 8.06 (m, 2H), 7.69 (dt, J = 7.7, 0.9 Hz, 1H), 7.52 – 7.46 (m, 3H), 7.40 (ddd, J = 7.4, 1.3, 0.7 Hz, 1H), 7.35 (td, J = 7.6, 1.3 Hz, 1H), 7.24 (td, J = 7.4, 1.1 Hz, 1H), 2.51 – 2.38 (m, 2H), 2.30 – 2.16 (m, 4H), 2.01 – 1.89 (m, 2H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 182.8, 153.1, 150.3, 133.0, 130.5, 128.7, 128.4, 127.5, 126.0, 121.0, 120.8, 63.4, 36.9, 27.7. **HRMS** (ESI) m/z : calcd. for $\text{C}_{18}\text{H}_{18}\text{N}_1$ $[\text{M}+\text{H}]^+$: 248.1434, found: 248.1431.



2'-phenylspiro[cyclohexane-1,3'-indole] (15): Nitrile **15a** (49.9 mg, 232 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:10) compound **15** (49.2 mg, 188 μmol , 81%) was obtained as colorless oil. R_f = 0.25 (Et_2O /pentane 1:10). **IR** (neat) ν = 3059, 2934, 2864, 1521, 1492, 1466, 1453, 1441, 1335, 1311, 1265, 1223, 1181, 1116, 1075, 1031, 988, 930, 852, 774, 751, 695, 635, 574, 514 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 8.09 – 8.02 (m, 2H), 7.83

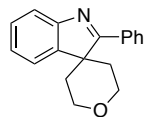
SUPPORTING INFORMATION

(d, $J = 7.5$ Hz, 1H), 7.74 (d, $J = 7.7$ Hz, 1H), 7.53 – 7.45 (m, 3H), 7.41 (td, $J = 7.6, 1.2$ Hz, 1H), 7.27 – 7.21 (m, 1H), 2.29 (td, $J = 13.4, 4.6$ Hz, 2H), 2.11 – 1.94 (m, 3H), 1.90 – 1.79 (m, 2H), 1.63 – 1.49 (m, 1H), 1.49 – 1.40 (m, 2H). $^{13}\text{C-NMR}$ (101 MHz, CDCl_3) $\delta = 184.1, 153.9, 146.2, 134.1, 130.1, 128.7, 128.5, 127.8, 125.0, 124.5, 121.4, 58.6, 31.3, 25.3, 21.8$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{19}\text{H}_{20}\text{N}_1$ $[\text{M}+\text{H}]^+$: 262.1590, found: 262.1585.



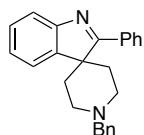
16

2'-phenylspiro[cycloheptane-1,3'-indole] (16): Nitrile **16a** (50.9 mg, 222 μmol) was converted following the general procedure 2 (100 $^\circ\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:10) compound **16** (51.8 mg, 188 μmol , 85%) was obtained as colorless oil. $R_f = 0.25$ (Et_2O /pentane 1:10). **IR** (neat) $\nu = 3669, 2922, 2857, 1523, 1492, 1457, 1442, 1394, 1338, 1317, 1263, 1223, 1180, 1075, 1066, 1056, 1027, 870, 769, 749, 695, 607, 505$ cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) $\delta = 7.95$ (dtd, $J = 5.4, 4.1, 2.6$ Hz, 2H), 7.73 – 7.69 (m, 1H), 7.60 (dt, $J = 7.4, 0.9$ Hz, 1H), 7.48 (tt, $J = 3.9, 2.6$ Hz, 3H), 7.38 (td, $J = 7.6, 1.2$ Hz, 1H), 7.27 (td, $J = 7.5, 1.2$ Hz, 1H), 2.30 (ddd, $J = 14.8, 10.0, 1.5$ Hz, 2H), 2.03 – 1.90 (m, 2H), 1.86 – 1.70 (m, 6H), 1.67 – 1.58 (m, 2H). $^{13}\text{C-NMR}$ (126 MHz, CDCl_3) $\delta = 186.2, 153.3, 147.5, 134.3, 130.2, 128.7, 128.5, 127.7, 125.5, 123.5, 121.1, 61.7, 35.1, 30.8, 25.7$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{20}\text{H}_{22}\text{N}_1$ $[\text{M}+\text{H}]^+$: 276.1747, found: 276.1744.



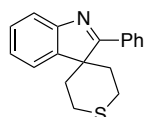
17

2-phenyl-2',3',5',6'-tetrahydrospiro[indole-3,4'-pyran] (17): 4-(2-Methoxyphenyl)tetrahydropyran-4-carbonitrile (56.5 mg, 260 μmol) was converted following the general procedure 2 (100 $^\circ\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:3) compound **17** (57.0 mg, 217 μmol , 83%) was obtained as colorless oil. $R_f = 0.32$ (Et_2O /pentane 1:3). **IR** (neat) $\nu = 2958, 2922, 2866, 1522, 1493, 1472, 1466, 1454, 1440, 1335, 1316, 1266, 1239, 1224, 1112, 1099, 1032, 1013, 945, 918, 841, 772, 750, 733, 696, 675, 648, 575, 540, 515$ cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) $\delta = 8.18$ (dd, $J = 6.8, 2.9$ Hz, 2H), 7.94 (d, $J = 7.3$ Hz, 1H), 7.76 (d, $J = 7.7$ Hz, 1H), 7.53 – 7.48 (m, 3H), 7.44 (td, $J = 7.6, 1.2$ Hz, 1H), 7.27 (dt, $J = 7.5, 1.2$ Hz, 1H), 4.19 (td, $J = 12.3, 2.5$ Hz, 2H), 4.15 – 4.08 (m, 2H), 2.75 (ddd, $J = 14.1, 12.4, 5.7$ Hz, 2H), 1.43 – 1.34 (m, 2H). $^{13}\text{C-NMR}$ (126 MHz, CDCl_3) $\delta = 181.6, 153.7, 145.9, 132.9, 130.6, 128.8, 128.7, 128.3, 125.4, 123.6, 121.8, 63.9, 55.2, 31.0$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{18}\text{H}_{18}\text{N}_1\text{O}_1$ $[\text{M}+\text{H}]^+$: 264.1383, found: 264.1379.



18

1'-benzyl-2-phenylspiro[indole-3,4'-piperidine] (18): Nitrile **18b** (52.7 mg, 172 μmol) was converted following the general procedure 2 (100 $^\circ\text{C}$, 2 h, workup with water and sat. aq. NaHCO_3 solution). After flash chromatography on silica (EtOAc /pentane 1:4 + 1% NEt_3) compound **18** (53.4 mg, 152 μmol , 88%) was obtained as colorless oil. $R_f = 0.37$ (EtOAc /pentane 1:4 + 1% NEt_3). **IR** (neat) $\nu = 3060, 2923, 2812, 2768, 1522, 1493, 1467, 1453, 1441, 1365, 1355, 1338, 1317, 1265, 1222, 1188, 1153, 1134, 1099, 1075, 1022, 1001, 986, 946, 773, 751, 739, 697, 652, 515$ cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) $\delta = 8.18$ (d, $J = 6.1$ Hz, 2H), 7.82 (d, $J = 6.8$ Hz, 1H), 7.75 (d, $J = 7.6$ Hz, 1H), 7.55 – 7.48 (m, 3H), 7.48 – 7.43 (m, 2H), 7.43 – 7.36 (m, 3H), 7.34 – 7.28 (m, 1H), 7.22 (td, $J = 7.5, 0.9$ Hz, 1H), 3.78 (s, 2H), 3.01 (d, $J = 9.9$ Hz, 2H), 2.90 – 2.63 (m, 4H), 1.46 (d, $J = 12.7$ Hz, 2H). $^{13}\text{C-NMR}$ (101 MHz, CDCl_3) $\delta = 182.9, 153.9, 145.8, 133.4, 130.3, 129.3, 128.8, 128.6, 128.5, 128.0, 127.4, 127.4, 124.9, 124.3, 121.6, 63.5, 56.2, 49.3, 31.3$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{25}\text{H}_{25}\text{N}_2$ $[\text{M}+\text{H}]^+$: 353.2012, found: 353.2009.

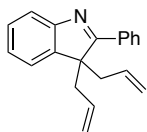


19

2-phenyl-2',3',5',6'-tetrahydrospiro[indole-3,4'-thiopyran] (19): Nitrile **19a** (52.7 mg, 226 μmol) was converted following the general procedure 2 (100 $^\circ\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:10) compound **19** (57.7 mg, 207 μmol , 91%) was obtained as yellow oil. $R_f = 0.22$ (Et_2O /pentane 1:10). **IR** (neat) $\nu = 3057, 2962, 2927, 2905, 1522, 1492, 1465, 1455, 1440, 1431, 1336, 1291, 1277, 1224, 1204, 1183, 1138, 1028, 1020, 954, 933, 896, 871, 769, 751, 732, 695, 671, 639, 512$ cm^{-1} . **$^1\text{H-NMR}$** (500 MHz, CDCl_3) $\delta = 8.20$ (dd, $J = 6.8, 3.0$ Hz, 2H), 7.81 (d, $J = 7.5$ Hz, 1H), 7.78 (d, $J = 7.8$ Hz, 1H), 7.51 (dd, $J = 5.1, 2.0$ Hz, 3H),

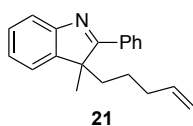
SUPPORTING INFORMATION

7.45 (t, $J = 7.6$ Hz, 1H), 7.28 (t, $J = 8.1$ Hz, 1H), 3.43 (td, $J = 13.5, 2.9$ Hz, 2H), 2.73 (td, $J = 13.3, 4.2$ Hz, 2H), 2.64 (d, $J = 14.3$ Hz, 2H), 1.66 (d, $J = 13.7$ Hz, 2H). $^{13}\text{C-NMR}$ (126 MHz, CDCl_3) $\delta = 182.2, 153.9, 144.5, 133.1, 130.5, 128.8, 128.7, 128.4, 125.1, 124.6, 121.9, 57.0, 31.5, 23.6$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{18}\text{H}_{18}\text{N}_1\text{S}_1$ $[\text{M}+\text{H}]^+$: 280.1154, found: 280.1152.



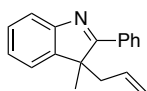
20

3,3-diallyl-2-phenyl-3H-indole (20): Nitrile **20a** (61.6 mg, 271 μmol) was converted following the general procedure 2 (100 $^\circ\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:10) compound **20** (66.2 mg, 242 μmol , 89%) was obtained as colorless oil. $R_f = 0.34$ (Et_2O /pentane 1:10). **IR** (neat) $\nu = 3076, 1641, 1522, 1493, 1466, 1457, 1443, 1219, 1018, 991, 919, 789, 770, 756, 692$ cm^{-1} . $^1\text{H-NMR}$ (400 MHz, CDCl_3) $\delta = 8.16 - 8.08$ (m, 2H), 7.67 (d, $J = 7.7$ Hz, 1H), 7.53 – 7.46 (m, 2H), 7.36 (ddd, $J = 17.2, 7.5, 1.4$ Hz, 2H), 7.30 – 7.25 (m, 1H), 5.11 (ddt, $J = 17.2, 10.1, 7.2$ Hz, 2H), 4.81 – 4.69 (m, 4H), 2.97 – 2.84 (m, 5H). $^{13}\text{C-NMR}$ (126 MHz, CDCl_3) $\delta = 180.4, 154.7, 143.1, 134.2, 131.9, 130.7, 128.7, 128.2, 128.1, 125.8, 121.9, 120.9, 118.3, 62.5, 41.9$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{20}\text{H}_{20}\text{N}_1$ $[\text{M}+\text{H}]^+$: 274.1590, found: 274.1590.



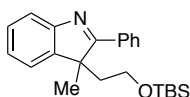
21

3-methyl-3-(pent-4-en-1-yl)-2-phenyl-3H-indole (21): Nitrile **21b** (62.1 mg, 271 μmol) was converted following the general procedure 2 (100 $^\circ\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:10) compound **21** (52.5 mg, 191 μmol , 70%) was obtained as colorless oil. $R_f = 0.26$ (Et_2O /pentane 1:10). **IR** (neat) $\nu = 3061, 2974, 2928, 2860, 1640, 1521, 1493, 1467, 1442, 1415, 1379, 1340, 1322, 1263, 1208, 1179, 1075, 1031, 1013, 1004, 988, 911, 865, 773, 752, 693, 674, 639, 579, 516$ cm^{-1} . $^1\text{H-NMR}$ (400 MHz, CDCl_3) $\delta = 8.07 - 8.02$ (m, 2H), 7.60 (dt, $J = 7.7, 0.9$ Hz, 1H), 7.42 – 7.37 (m, 3H), 7.27 (ddd, $J = 7.6, 6.8, 1.9$ Hz, 1H), 7.22 – 7.15 (m, 2H), 5.42 (ddt, $J = 18.3, 9.3, 6.7$ Hz, 1H), 4.81 – 4.69 (m, 2H), 2.16 (ddd, $J = 13.7, 12.2, 4.7$ Hz, 1H), 1.99 (ddd, $J = 13.7, 12.3, 4.4$ Hz, 1H), 1.79 – 1.68 (m, 2H), 1.48 (s, 3H), 0.93 – 0.74 (m, 1H), 0.65 – 0.50 (m, 1H). $^{13}\text{C-NMR}$ (101 MHz, CDCl_3) $\delta = 182.3, 154.0, 146.0, 138.1, 133.8, 130.7, 128.8, 128.1, 127.9, 125.9, 121.1, 120.9, 114.9, 58.2, 38.5, 33.7, 24.7, 23.3$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{20}\text{H}_{22}\text{N}_1$ $[\text{M}+\text{H}]^+$: 276.1747, found: 276.1751.



22

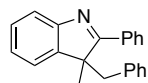
3-allyl-3-methyl-2-phenyl-3H-indole (22): Nitrile **22a** (51.5 mg, 256 μmol) was converted following the general procedure 2 (100 $^\circ\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:10) compound **22** (50.9 mg, 206 μmol , 80%) was obtained as colorless oil. $R_f = 0.23$ (Et_2O /pentane 1:10). **IR** (neat) $\nu = 2976, 2927, 1521, 1492, 1467, 1452, 1443, 1416, 1377, 1340, 1263, 1219, 1004, 991, 917, 772, 753, 726, 694, 675, 629, 574, 510$ cm^{-1} . $^1\text{H-NMR}$ (500 MHz, CDCl_3) $\delta = 8.17 - 8.10$ (m, 2H), 7.69 (d, $J = 7.6$ Hz, 1H), 7.52 – 7.46 (m, 3H), 7.41 – 7.31 (m, 2H), 7.30 – 7.25 (m, 1H), 5.13 (ddt, $J = 17.2, 10.1, 7.1$ Hz, 1H), 4.81 – 4.69 (m, 2H), 2.92 – 2.79 (m, 2H), 1.63 (s, 3H). $^{13}\text{C-NMR}$ (126 MHz, CDCl_3) $\delta = 182.0, 153.9, 145.3, 133.8, 132.3, 130.7, 128.7, 128.3, 128.0, 125.9, 121.5, 120.9, 118.2, 58.0, 42.9, 23.7$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{18}\text{H}_{18}\text{N}_1$ $[\text{M}+\text{H}]^+$: 248.1434, found: 248.1433.



23

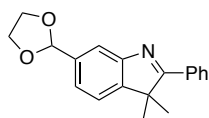
3-(2-((tert-butyl)dimethylsilyloxy)ethyl)-3-methyl-2-phenyl-3H-indole (23): Nitrile **23a** (52.1 mg, 163 μmol) was converted following the general procedure 2 (100 $^\circ\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:20) compound **23** (50.0 mg, 137 μmol , 84%) was obtained as colorless oil. $R_f = 0.13$ (Et_2O /pentane 1:20). **IR** (neat) $\nu = 2954, 2929, 2857, 1523, 1493, 1469, 1255, 1094, 836, 775, 752, 695, 516$ cm^{-1} . $^1\text{H-NMR}$ (400 MHz, CDCl_3) $\delta = 8.18 - 8.11$ (m, 2H), 7.68 (d, $J = 7.6$ Hz, 1H), 7.52 – 7.46 (m, 3H), 7.38 – 7.34 (m, 1H), 7.33 (ddd, $J = 7.4, 1.5, 0.7$ Hz, 1H), 7.29 – 7.25 (m, 1H), 3.09 (ddd, $J = 10.3, 9.0, 6.4$ Hz, 1H), 2.96 (ddd, $J = 10.3, 9.2, 4.9$ Hz, 1H), 2.58 (ddd, $J = 13.6, 9.3, 6.5$ Hz, 1H), 2.37 (ddd, $J = 13.8, 9.0, 4.9$ Hz, 1H), 1.58 (s, 3H), 0.68 (s, 9H), -0.26 (s, 3H), -0.25 (s, 3H). $^{13}\text{C-NMR}$ (126 MHz, CDCl_3) $\delta = 182.2, 153.8, 145.4, 133.7, 130.7, 128.7, 128.4, 128.0, 125.9, 121.2, 121.0, 59.4, 56.2, 41.7, 25.9, 25.3, 18.3, -5.5$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{23}\text{H}_{32}\text{N}_1\text{O}_1\text{Si}_1$ $[\text{M}+\text{H}]^+$: 366.2248, found: 366.2245.

SUPPORTING INFORMATION



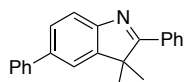
24

3-benzyl-3-methyl-2-phenyl-3H-indole (24): Nitrile **24a** (73.1 mg, 291 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:10) compound **24** (87.8 mg, 255 μmol , 88%) was obtained as colorless oil. R_f = 0.23 (Et_2O /pentane 1:10). **IR** (neat) ν = 3060, 3028, 2967, 2927, 1602, 1520, 1494, 1467, 1449, 1377, 1340, 1321, 1263, 1210, 1178, 1156, 1097, 1075, 1031, 1014, 1004, 989, 937, 908, 861, 756, 734, 693, 672, 647, 599, 577, 549, 508, 469 cm^{-1} . **$^1\text{H-NMR}$** (500 MHz, CDCl_3) δ = 8.25 – 8.18 (m, 2H), 7.58 – 7.48 (m, 4H), 7.31 (ddd, J = 7.7, 5.4, 3.3 Hz, 1H), 7.26 – 7.22 (m, 2H), 7.03 – 6.98 (m, 1H), 6.94 – 6.91 (m, 2H), 6.64 – 6.52 (m, 2H), 3.46 – 3.33 (m, 2H), 1.74 (s, 3H). **$^{13}\text{C-NMR}$** (126 MHz, CDCl_3) δ = 181.4, 153.9, 144.9, 136.0, 134.0, 130.7, 129.4, 128.8, 128.5, 128.0, 127.6, 126.6, 125.5, 122.1, 120.9, 58.9, 44.5, 24.1. **HRMS** (ESI) m/z : calcd. for $\text{C}_{22}\text{H}_{20}\text{N}_1$ $[\text{M}+\text{H}]^+$: 298.1590, found: 298.1591.



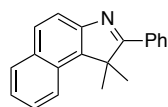
25

6-(1,3-dioxolan-2-yl)-3,3-dimethyl-2-phenyl-3H-indole (25): Nitrile **25b** (54.9 mg, 222 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (Et_2O /pentane 1:1) compound **25** (42.0 mg, 143 μmol , 65%) was obtained as colorless oil. R_f = 0.42 (Et_2O /pentane 1:1). **IR** (neat) ν = 2968, 2884, 1521, 1462, 1434, 1402, 1388, 1323, 1235, 1172, 1154, 1093, 1077, 1029, 1003, 988, 966, 944, 889, 832, 778, 698, 510 cm^{-1} . **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 8.19 – 8.12 (m, 2H), 7.86 – 7.79 (m, 1H), 7.53 – 7.46 (m, 3H), 7.41 (dd, J = 7.6, 1.5 Hz, 1H), 7.35 (d, J = 7.6 Hz, 1H), 5.92 (s, 1H), 4.22 – 4.12 (m, 2H), 4.11 – 4.02 (m, 2H), 1.59 (s, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 183.8, 153.4, 148.7, 138.2, 133.3, 130.7, 128.7, 128.4, 124.2, 120.9, 119.2, 103.9, 65.5, 53.6, 24.8. **HRMS** (ESI) m/z : calcd. for $\text{C}_{19}\text{H}_{20}\text{O}_2\text{N}_1$ $[\text{M}+\text{H}]^+$: 294.1489, found: 294.1482.



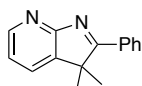
26

3,3-dimethyl-2,5-diphenyl-3H-indole (26): Compound **26b** (51.0 mg, 203 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (pentane/ethyl acetate 95:5) compound **26** (56.9 mg, 191 μmol , 94%) was obtained as a white solid. R_f = 0.42 (pentane/ethyl acetate 9:1). **IR** (neat) ν = 3058, 3029, 2968, 2927, 2870, 1600, 1518, 1491, 1460, 1442, 1217, 1074, 908, 832, 774, 755, 730, 693, 587, 505 cm^{-1} . **mp**: 116 - 117 $^{\circ}\text{C}$. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) δ = 8.20 – 8.17 (m, 2H), 7.77 (d, J = 8.0 Hz, 1H), 7.66 (dd, J = 8.3, 1.2 Hz, 2H), 7.61 (dd, J = 8.0, 1.8 Hz, 1H), 7.57 (d, J = 1.4 Hz, 1H), 7.53 – 7.45 (m, 5H), 7.39 – 7.34 (m, 1H), 1.66 (s, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) δ = 183.6, 152.6, 148.4, 141.5, 139.4, 133.4, 130.8, 128.9, 128.8, 128.5, 127.4, 127.3, 127.1, 121.1, 120.0, 53.8, 25.0. **HRMS** (ESI) m/z : calcd. for $\text{C}_{22}\text{H}_{20}\text{N}_1$ $[\text{M}+\text{H}]^+$: 298.1590, found: 298.1593.



27

1,1-dimethyl-2-phenyl-1H-benzo[e]indole (27): Compound **27b** (50.7 mg, 225 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (pentane/ Et_2O 9:1) compound **27** (45.0 mg, 166 μmol , 74%) was obtained as a yellow solid. R_f = 0.26 (pentane/ Et_2O 9:1). **$^1\text{H-NMR}$** (500 MHz, CDCl_3) δ = 8.24 – 8.22 (m, 2H), 8.13 (d, J = 8.4 Hz, 1H), 7.99 (d, J = 8.2 Hz, 1H), 7.95 – 7.90 (m, 2H), 7.61 – 7.58 (m, 1H), 7.55 – 7.47 (m, 4H), 1.85 (s, 6H). **$^{13}\text{C-NMR}$** (126 MHz, CDCl_3) δ = 185.4, 150.3, 140.7, 133.2, 132.9, 130.6, 130.0, 129.3, 128.8, 128.5, 128.2, 126.5, 124.8, 122.9, 120.7, 55.5, 24.3. The analytical data are in agreement with the literature.^[17]

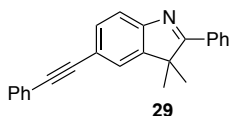


28

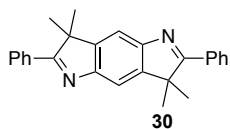
3,3-dimethyl-2-phenyl-3H-pyrrolo[2,3-b]pyridine (28): Nitrile **28a** (63.3 mg, 359 μmol) was converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (ethyl acetate/pentane 1:4 + 2.5% NEt_3) compound **28** (45.1 mg, 203

SUPPORTING INFORMATION

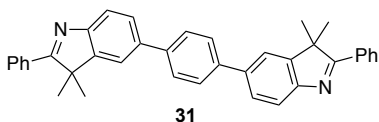
μmol , 57%) was obtained as colorless solid. $R_f = 0.2$ (ethyl acetate/pentane 1:4 + 2.5% NEt_3). **IR** (neat) $\nu = 3057, 2967, 2928, 2869, 1586, 1522, 1493, 1455, 1444, 1402, 1385, 1366, 1333, 1302, 1268, 1234, 1182, 1160, 1127, 1086, 1076, 1032, 1003, 988, 932, 877, 847, 795, 777, 697, 620, 610, 577, 555, 511 \text{ cm}^{-1}$. **mp**: 112 - 113 °C. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) $\delta = 8.49$ (dd, $J = 5.0, 1.7 \text{ Hz}$, 1H), 8.30 - 8.23 (m, 2H), 7.63 (dd, $J = 7.3, 1.7 \text{ Hz}$, 1H), 7.54 - 7.47 (m, 3H), 7.15 (dd, $J = 7.3, 5.1 \text{ Hz}$, 1H), 1.62 (s, 6H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) $\delta = 186.8, 166.8, 148.6, 140.3, 132.6, 131.5, 129.2, 128.8, 120.7, 52.7, 24.4$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{15}\text{H}_{15}\text{N}_2$ $[\text{M}+\text{H}]^+$: 223.1230, found: 223.1226.



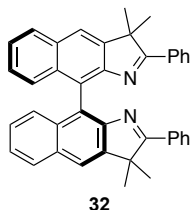
3,3-dimethyl-2-phenyl-5-(phenylethynyl)-3H-indole (29): Compound **29b** (50.7 mg, 184 μmol) was converted following the general procedure 2 (100 °C, 2 h). After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **29** (52.0 mg, 162 μmol , 88%) was obtained as a yellow solid. $R_f = 0.33$ (pentane/ethyl acetate 9:1). **IR** (neat) $\nu = 3033, 3057, 2970, 2928, 2873, 1596, 1517, 1491, 1460, 1442, 1386, 1218, 1070, 889, 832, 777, 755, 691, 587, 505 \text{ cm}^{-1}$. **mp**: 123 - 125 °C. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) $\delta = 8.17 - 8.14$ (m, 2H), 7.67 (d, $J = 8.0 \text{ Hz}$, 1H), 7.57 - 7.50 (m, 7H), 7.39 - 7.32 (m, 3H), 1.63 (s, 6H). **$^{13}\text{C-NMR}$** (126 MHz, CDCl_3) $\delta = 184.3, 153.3, 148.0, 133.2, 131.9, 131.7, 131.0, 128.8, 128.5, 128.5, 128.4, 124.5, 123.5, 121.0, 120.7, 90.1, 89.8, 53.8, 24.9$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{24}\text{H}_{20}\text{N}_1$ $[\text{M}+\text{H}]^+$: 322.1590, found: 322.1581.



3,3,7,7-tetramethyl-2,6-diphenyl-3,7-dihydropyrrolo[2,3-f]indole (30): Compound **30a** (53.9 mg, 198 μmol) was converted following the general procedure 2 (100 °C, 4 h, 2.0 eq. PhLi). After flash chromatography on silica (pentane/ethyl acetate 85:15) compound **30** (49.4 mg, 136 μmol , 69%) was obtained as an orange solid. $R_f = 0.32$ (pentane/ethyl acetate 85:15). **IR** (neat) $\nu = 3055, 3021, 2967, 2927, 2865, 1523, 1494, 1461, 1436, 1342, 1336, 1076, 984, 879, 775, 730, 694, 500 \text{ cm}^{-1}$. **mp**: 248 - 250 °C. **$^1\text{H-NMR}$** (500 MHz, CDCl_3) $\delta = 8.18 - 8.16$ (m, 4H), 7.66 (s, 2H), 7.53 - 7.47 (m, 6H), 1.66 (s, 12H). **$^{13}\text{C-NMR}$** (126 MHz, CDCl_3) $\delta = 183.4, 151.8, 148.2, 133.5, 130.6, 128.8, 128.4, 113.8, 53.6, 25.1$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{26}\text{H}_{25}\text{N}_2$ $[\text{M}+\text{H}]^+$: 365.2012, found: 365.2006.



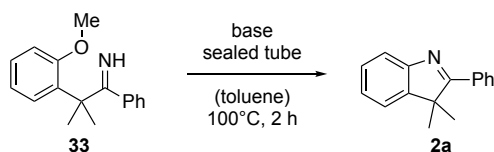
1,4-bis(3,3-dimethyl-2-phenyl-3H-indol-5-yl)benzene (31): Compound **31b** (50.5 mg, 119 μmol) was converted following the general procedure 2 (100 °C, 2 h, 2.0 eq. PhLi). After flash chromatography on silica (pentane/ CH_2Cl_2 1:1 + 5% ethyl acetate) compound **31** (48.1 mg, 93 μmol , 78%) was obtained as a white solid. $R_f = 0.2$ (pentane/ CH_2Cl_2 1:1 + 5% ethyl acetate). **IR** (neat) $\nu = 3057, 2966, 2926, 2859, 1519, 1459, 1442, 1258, 1169, 1122, 907, 820, 775, 730, 695, 588, 505 \text{ cm}^{-1}$. **mp**: 261 - 262 °C. **$^1\text{H-NMR}$** (400 MHz, CDCl_3) $\delta = 8.20 - 8.18$ (m, 4H), 7.78 (d, $J = 8.0 \text{ Hz}$, 2H), 7.75 (s, 4H), 7.67 (dd, $J = 8.0, 1.8 \text{ Hz}$, 2H), 7.62 (d, $J = 1.7 \text{ Hz}$, 2H), 7.53 - 7.49 (m, 6H), 1.68 (s, 12H). **$^{13}\text{C-NMR}$** (101 MHz, CDCl_3) $\delta = 183.6, 152.9, 148.5, 140.3, 138.8, 133.4, 130.8, 128.8, 128.5, 127.8, 127.0, 121.3, 119.8, 53.9, 25.1$. **HRMS** (ESI) m/z : calcd. for $\text{C}_{38}\text{H}_{33}\text{N}_2$ $[\text{M}+\text{H}]^+$: 517.2638, found: 517.2632.



(S)-3,3,3',3'-tetramethyl-2,2'-diphenyl-3H,3'H-9,9'-bibenzo[f]indole (32): Compound **32b** (41.7 mg, 93 μmol) was converted following the general procedure 2 (100 °C, 2 h, 2.0 eq. PhLi). After flash chromatography on silica (pentane/ethyl acetate 9:1) compound **32** (32.2 mg, 60 μmol , 64%) was obtained as a white solid. $R_f = 0.3$ (pentane/ethyl acetate 9:1). **IR** (neat) $\nu = 3058, 2965, 2926, 2863, 1521, 1492, 1443, 1383, 1364, 1288, 1263, 1166, 1149, 907, 884, 776, 751, 731, 695, 648, 587, 528 \text{ cm}^{-1}$. **mp**: 187 - 188 °C. $[\alpha]_D^{24} = +238.7$ (c 0.97, CHCl_3). **$^1\text{H-NMR}$** (500 MHz, CDCl_3) $\delta = 7.94$ (d, $J = 8.1 \text{ Hz}$, 2H), 7.88 (d, $J = 7.6 \text{ Hz}$, 4H), 7.86 (s, 2H), 7.47 (d, $J = 8.5 \text{ Hz}$, 2H), 7.42 - 7.39 (m, 2H), 7.32 - 7.20 (m, 8H), 1.76 (s, 6H), 1.75 (s, 6H). **$^{13}\text{C-NMR}$** (126 MHz, CDCl_3) $\delta =$

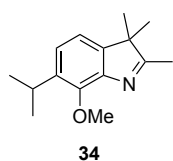
SUPPORTING INFORMATION

182.9, 151.7, 146.5, 133.9, 133.9, 132.7, 130.3, 128.7, 128.4, 128.1, 127.6, 125.9, 125.4, 125.2, 119.9, 53.1, 26.0, 25.8. **HRMS** (ESI) *m/z*: calcd. for C₄₀H₃₃N₂ [M+H]⁺: 541.2638, found: 541.2643.

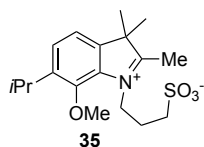


General procedure 3 for the conversion of imine **33** to indolenine **2a**:

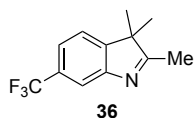
26.0 mg (103 μmol, 1.0 eq.) of imine **33** were dissolved in 1.0 mL toluene and cooled to -78 °C. 155 μL (155 μmol, 1M solution in THF, 1.5 eq.) of LHMDS were added dropwise and the reaction was stirred at -78 °C for 30 min. The solution was warmed to rt and stirred for 1h. Next the reaction was heated to 100 °C for 2h. A sat. aq. NH₄Cl-solution (30 mL) and 9.99 mg (58.8 μmol) 1,3,5-trimethoxybenzene as internal standard were added. The aq. layer was extracted with Et₂O (3 x 30 mL), the organic phases were dried over Na₂SO₄ and the solvent was removed in vacuum. The yield was determined by ¹H-NMR with internal standard (1,3,5-trimethoxybenzene).



6-isopropyl-7-methoxy-2,3,3-trimethyl-3H-indole (34): Compound **7b** (420 mg, 1.70 mmol) and MeLi (1.98 mL, 1.8 M in Et₂O, 3.57 mmol, 2.0 eq.) were converted following the general procedure 2 (100 °C, 2 h). After flash chromatography on silica (pentane/ethyl acetate 8:2) compound **34** (262 mg, 1.13 mmol, 67%) was obtained as a brown oil. *R_f* = 0.18 (pentane/ethyl acetate 8:2). **IR** (neat) ν = 2962, 296, 2863, 1583, 1461, 1416, 1290, 1251, 1122, 1037 cm⁻¹. **¹H-NMR** (400 MHz, CDCl₃) δ = 7.06 (d, *J* = 7.6 Hz, 1H), 6.93 (d, *J* = 7.6 Hz, 1H), 4.15 (s, 3H), 3.41 (hept, *J* = 6.8 Hz, 1H), 2.26 (s, 3H), 1.27 (s, 6H), 1.24 (d, *J* = 6.9 Hz, 6H). **¹³C-NMR** (101 MHz, CDCl₃) δ = 186.2, 149.1, 145.8, 144.7, 140.1, 123.1, 115.8, 62.2, 53.4, 23.7, 23.5, 15.6. **HRMS** (ESI) *m/z*: calcd. for C₁₅H₂₂N₁O₁ [M+H]⁺: 232.1696, found: 232.1694.

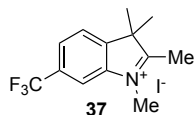


3-(6-isopropyl-7-methoxy-2,3,3-trimethyl-3H-indol-1-ium-1-yl)propane-1-sulfonate (35): 223 mg (964 μmol) of compound **34** and 428 μL (4.82 mmol, 5.0 eq.) 1,3-propanesultone were dissolved in 1.2 mL 1,2-dichlorobenzene and the solution was heated in the microwave to 150 °C for 1h. The solvent was removed in vacuum. After rp-hplc (gradient 10 –100% CH₃CN + 0.1% FA in 40 min) compound **35** (188 mg, 531 μmol, 55%) was obtained as a white solid. *R_f* = 0.12 (CH₂Cl₂/ethyl acetate/MeOH 3:1:1). **IR** (neat) ν = 3462, 2967, 2934, 2872, 1587, 1486, 1468, 1422, 1298, 1201, 1129, 1036, 730, 623, 523 cm⁻¹. **mp**: 155 – 156 °C. **¹H-NMR** (400 MHz, CDCl₃) δ = 7.44 (d, *J* = 7.9 Hz, 1H), 7.21 (d, *J* = 7.9 Hz, 1H), 5.06 – 5.02 (m, 2H), 4.01 (s, 3H), 3.40 (hept, *J* = 7.2 Hz, 1H), 3.08 (s, 3H), 3.00 – 2.97 (m, 2H), 2.38 (s, 2H), 1.57 (s, 6H), 1.28 (d, *J* = 6.9 Hz, 6H). **¹³C-NMR** (126 MHz, CDCl₃) δ = 196.7, 146.8, 144.9, 141.5, 132.9, 129.3, 118.8, 64.7, 54.1, 50.2, 47.7, 26.3, 25.6, 24.2, 23.5, 15.1. **HRMS** (ESI) *m/z*: calcd. for C₁₈H₂₇N₁O₄S₁Na₁ [M+Na]⁺: 376.1558, found: 376.1551.

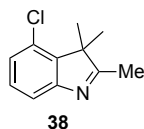


2,3,3-trimethyl-6-(trifluoromethyl)-3H-indole (36): Fluoride **9b** (880 mg, 3.62 mmol) and MeLi (4.00 mL, 1.8 M in Et₂O, 7.24 mmol, 2.0 eq.) were converted following the general procedure 2 (100 °C, 2 h). After flash chromatography on silica (EtOAc/pentane 1:4) compound **36** (552 mg, 2.30 mmol, 64%) was obtained as a colorless solid. *R_f* = 0.33 (EtOAc/pentane 1:4). **IR** (neat) ν = 2966, 1576, 1427, 1378, 1340, 1319, 1294, 1249, 1237, 1195, 1161, 1110, 1082, 1051, 922, 905, 839, 829, 695, 679 cm⁻¹. **mp**: 217 – 218 °C. **¹H-NMR** (400 MHz, CDCl₃) δ = 7.76 (s, 1H), 7.47 (d, *J* = 7.7 Hz, 1H), 7.36 (d, *J* = 7.7 Hz, 1H), 2.30 (s, 3H), 1.32 (s, 6H). **¹³C-NMR** (126 MHz, CDCl₃) δ = 190.0, 154.2, 149.5, 130.4 (q, *J* = 32.0 Hz), 124.4 (q, *J* = 272.3 Hz), 122.3 (q, *J* = 4.0 Hz), 121.7, 117.0 (q, *J* = 3.7 Hz), 54.1, 22.9, 15.6. **¹⁹F-NMR** (376 MHz, CDCl₃) δ = -91.9. **HRMS** (ESI) *m/z*: calcd. for C₁₂H₁₃N₁F₃ [M+H]⁺: 228.0995, found: 228.0992.

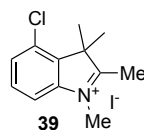
SUPPORTING INFORMATION



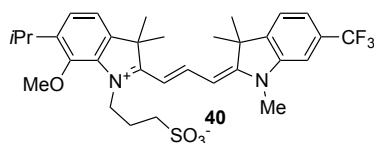
1,2,3,3-tetramethyl-6-(trifluoromethyl)-3H-indol-1-ium iodide (37): 359 mg (1.58 mmol) of compound **36** and 596 μL (9.48 mmol, 6.0 eq.) iodomethane were dissolved in 1.22 mL acetonitrile and the solution was heated in the microwave to 120 $^{\circ}\text{C}$ for 1 h. The product precipitated from the solution. The solid was removed by filtration and washed with Et₂O several times. Compound **37** (437 mg, 1.18 mmol, 75%) was obtained as a yellow solid and used without further purification. **IR** (neat) $\nu = 3470, 3008, 2871, 1620, 1437, 1323, 1261, 1170, 1129, 1078, 1055, 845, 733, 522 \text{ cm}^{-1}$. **mp:** 255 - 257 $^{\circ}\text{C}$. **¹H-NMR** (500 MHz, DMSO-*d*₆) $\delta = 8.41$ (s, 1H), 8.10 (d, *J* = 7.9 Hz, 1H), 8.04 (d, *J* = 7.8 Hz, 1H), 4.05 (s, 3H), 2.83 (s, 3H), 1.58 (s, 6H). **¹³C-NMR** (126 MHz, DMSO-*d*₆) $\delta = 198.2, 145.8, 142.8, 129.5$ (q, *J* = 32.7 Hz), 126.3 (m), 124.5, 123.7 (q, *J* = 272.7 Hz), 112.9 (m), 54.4, 35.1, 21.3, 14.5. **¹⁹F-NMR** (471 MHz, CDCl₃) $\delta = -60.3$. **HRMS** (ESI) *m/z*: calcd. for C₁₃H₁₅N₁F₃ [M]⁺: 242.1160, found: 242.1148.



4-chloro-2,3,3-trimethyl-3H-indole (38): Fluoride **12a** (49.9 mg, 238 μmol) and MeLi (264 μL , 1.8 M in Et₂O, 476 μmol , 2.0 eq.) were converted following the general procedure 2 (100 $^{\circ}\text{C}$, 2 h). After flash chromatography on silica (EtOAc/pentane 1:4) compound **38** (47.6 mg, 186 μmol , 72%) was obtained as a red liquid. **R_f** = 0.23 (Et₂O/pentane 1:4). **IR** (neat) $\nu = 2968, 2934, 2872, 1575, 1467, 1453, 1423, 1375, 1361, 1268, 1255, 1230, 1178, 1135, 1093, 1045, 923, 791, 743, 728, 573, 495 \text{ cm}^{-1}$. **¹H-NMR** (500 MHz, CDCl₃) $\delta = 7.42$ (d, *J* = 7.6 Hz, 1H), 7.25 – 7.22 (m, 1H), 7.11 (d, *J* = 7.8 Hz, 1H), 2.27 (s, 3H), 1.45 (s, 6H). **¹³C-NMR** (126 MHz, CDCl₃) $\delta = 189.1, 155.7, 141.3, 129.5, 129.1, 126.1, 118.7, 55.9, 20.0, 15.4$. **HRMS** (ESI) *m/z*: calcd. for C₁₁H₁₃N₁Cl₁ [M+H]⁺: 194.0731, found: 194.0732.

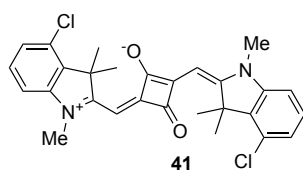


4-chloro-1,2,3,3-tetramethyl-3H-indol-1-ium iodide salt (39): Compound **38** (310 mg, 1.60 mmol) and MeI (600 μL , 1.37 g, 9.60 mmol, 6.0 eq.) in MeCN (1.0 mL) were heated in the microwave to 150 $^{\circ}\text{C}$ for 30 min. After cooling to rt the precipitate was filtered and washed with cold Et₂O. The resulting solid was dried under reduced pressure to give iodide salt **39** (464 mg, 1.38 mmol, 86%) as an other solid. **IR** (neat) $\nu = 3418, 3018, 2974, 2934, 2871, 1631, 1583, 1458, 1440, 1395, 1362, 1269, 1086, 1056, 988, 938, 859, 784, 738, 562 \text{ cm}^{-1}$. **mp:** 240 – 242 $^{\circ}\text{C}$. **¹H-NMR** (400 MHz, DMSO-*d*₆) $\delta = 7.95$ (d, *J* = 7.4 Hz, 1H), 7.76 – 7.60 (m, 2H), 3.98 (s, 3H), 2.82 (s, 3H), 1.65 (s, 6H). **¹³C-NMR** (101 MHz, DMSO-*d*₆) $\delta = 196.5, 144.0, 136.7, 130.7, 129.9, 129.2, 114.5, 55.1, 35.3, 18.6, 14.4$. **HRMS** (ESI) *m/z*: calcd. for C₁₂H₁₅N₁Cl₁ [M]⁺: 208.0887, found: 208.0886.



3-(6-isopropyl-7-methoxy-3,3-dimethyl-2-((E)-3-((E)-1,3,3-trimethyl-6-(trifluoromethyl)indolin-2-ylidene)prop-1-en-1-yl)-3H-indol-1-ium-1-yl)propane-1-sulfonate (40): Compound **35** (50.5 mg, 143 μmol) and *N,N'*-diphenylformamidinium (84.2 mg, 429 μmol , 3.0 eq.) were dissolved in Ac₂O (1 mL). The reaction mixture was heated in the microwave to 120 $^{\circ}\text{C}$ for 1 h. Next a solution of compound **37** (58.1 mg, 157 μmol , 1.1 eq.) in pyridine (1.0 mL) was added and the reaction mixture was heated in the microwave to 120 $^{\circ}\text{C}$ for 1 h. The mixture was cooled to rt and the solvent was removed in vacuum. After flash chromatography on silica (CH₂Cl₂/MeOH 95:5 to 9/1) compound **40** (51.5 mg, 85.0 μmol , 60%) was obtained as a purple solid. **IR** (neat) $\nu = 3454, 2969, 2929, 2866, 1561, 1470, 1431, 1321, 1218, 1121, 1060, 1038, 933, 862, 744 \text{ cm}^{-1}$. **mp:** 265 - 268 $^{\circ}\text{C}$. **¹H-NMR** (400 MHz, DMSO-*d*₆) $\delta = 8.35$ (t, *J* = 13.5 Hz, 1H), 7.82 (d, *J* = 9.9 Hz, 2H), 7.61 (d, *J* = 7.8 Hz, 1H), 7.40 (d, *J* = 7.9 Hz, 1H), 7.30 (d, *J* = 7.9 Hz, 1H), 6.76 (d, *J* = 13.6 Hz, 1H), 6.43 (d, *J* = 13.3 Hz, 1H), 4.44 – 4.40 (m, 2H), 3.86 (s, 3H), 3.66 (s, 3H), 3.37 – 3.30 (m, 1H), 2.60 – 2.56 (m, 2H), 2.12 – 2.03 (m, 2H), 1.71 (s, 6H), 1.68 (s, 6H), 1.23 (d, *J* = 6.8 Hz, 6H). **¹³C-NMR** (126 MHz, DMSO-*d*₆) $\delta = 175.7, 173.7, 150.1, 144.5, 143.8, 143.7, 143.1, 140.9, 132.8, 129.4$ (q, *J* = 31.9 Hz), 124.5, 124.1 (q, *J* = 272.5 Hz), 123.2, 121.4 (m), 118.5, 108.1 (m), 104.4, 102.8, 63.7, 54.9, 48.8, 48.6, 48.2, 45.3, 27.7, 27.1, 25.5, 24.7, 24.0. **¹⁹F-NMR** (471 MHz, DMSO-*d*₆) $\delta = -60.4$. **HRMS** (ESI) *m/z*: calcd. for C₃₂H₄₀N₂F₃O₄S₁ [M+H]⁺: 605.2655, found: 605.2649.

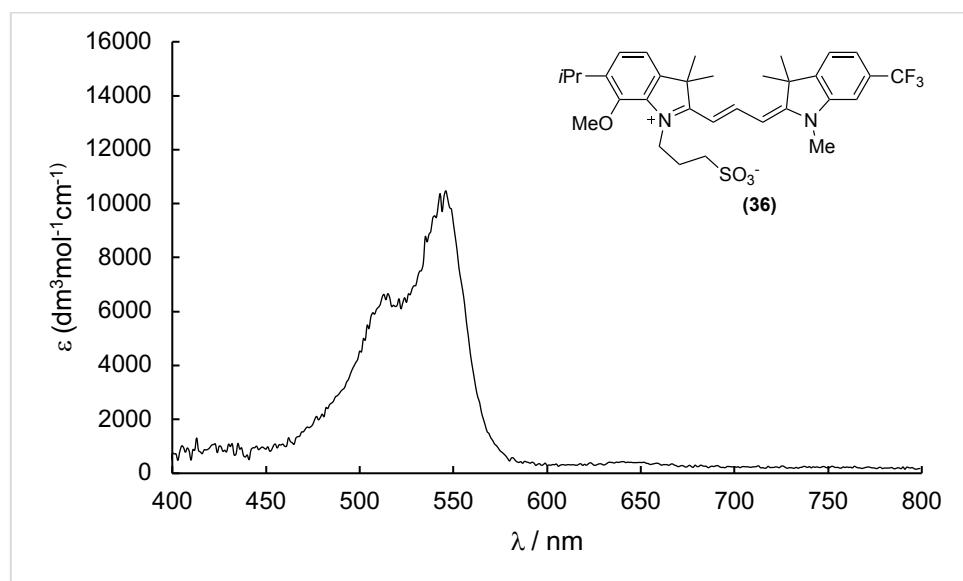
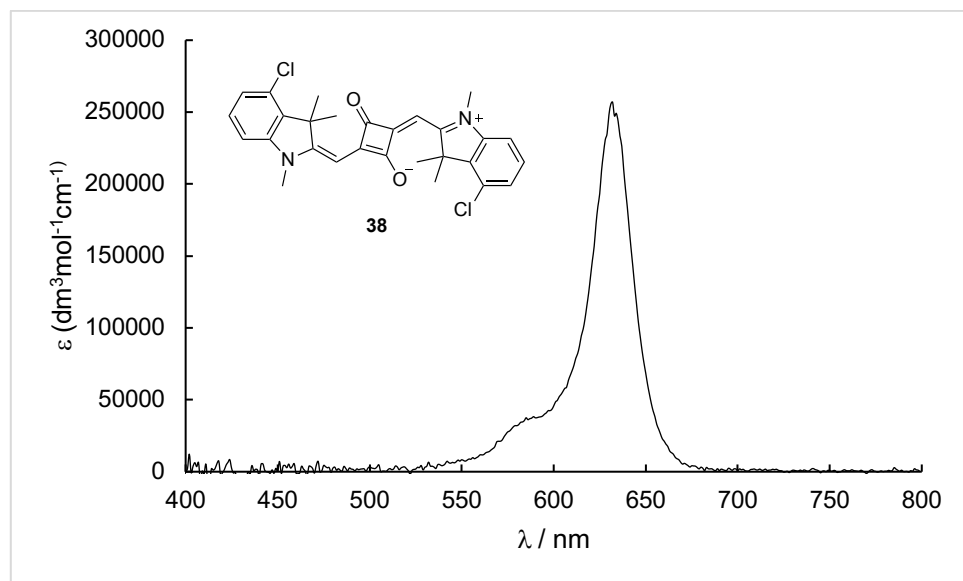
SUPPORTING INFORMATION



(E)-4-((4-chloro-1,3,3-trimethyl-3H-indol-1-ium-2-yl)methylene)-2-(((E)-4-chloro-1,3,3-trimethylindolin-2-ylidene)methyl)-3-oxocyclobut-1-en-1-olate (41): A mixture of iodide salt **39** (200 mg, 596 μmol , 2.0 eq.) and squaric acid (35.0 mg, 298 μmol , 1.0 eq.) in butanol (0.8 mL) and PhMe (0.8 mL) was heated in the microwave to 160 °C for 30 min. The crude was dried under reduced pressure and purified by flash chromatography on silica (CH_2Cl_2 + 0% – 10% MeOH) to afford compound **41** (114 mg, 231 μmol , 78%) as blue-green solid. For analytical purpose a small sample was purified over a SPE column (DSC-18). R_f = 0.67 CH_2Cl_2 +10% MeOH). **IR** (neat) ν = 2933, 1596, 1487, 1467, 1445, 1395, 1362, 1350, 1259, 1222, 1172, 1148, 1105, 1070, 1038, 961, 917, 850, 787, 775, 734, 676, 655, 579, 559, 532 cm^{-1} . **mp**: 329 – 330 °C. **$^1\text{H-NMR}$** (500 MHz, $\text{CD}_2\text{Cl}_2/\text{CD}_3\text{OD}$ 3/1, referenced on CD_3OD) δ = 7.33 – 7.30 (m, 2H), 7.11 (d, J = 8.0 Hz, 2H), 7.07 (d, J = 7.9 Hz, 2H), 5.89 (s, 2H), 3.59 (s, 6H), 1.88 (s, 12H). **$^{13}\text{C-NMR}$** (126 MHz, $\text{CD}_2\text{Cl}_2/\text{CD}_3\text{OD}$ 3/1, referenced on CD_3OD) δ = 183.7, 178.1, 172.2, 145.5, 137.2, 130.6, 130.0, 125.9, 109.2, 86.9, 51.5, 31.6, 23.7. **HRMS** (ESI) m/z : calcd. for $\text{C}_{28}\text{H}_{27}\text{O}_2\text{N}_2\text{Cl}_2$ $[\text{M}+\text{H}]^+$: 493.1444, found: 493.1435.

SUPPORTING INFORMATION

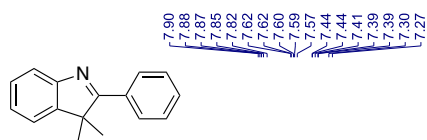
4. UV-Vis Spectra



5. NMR Spectra

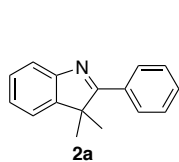
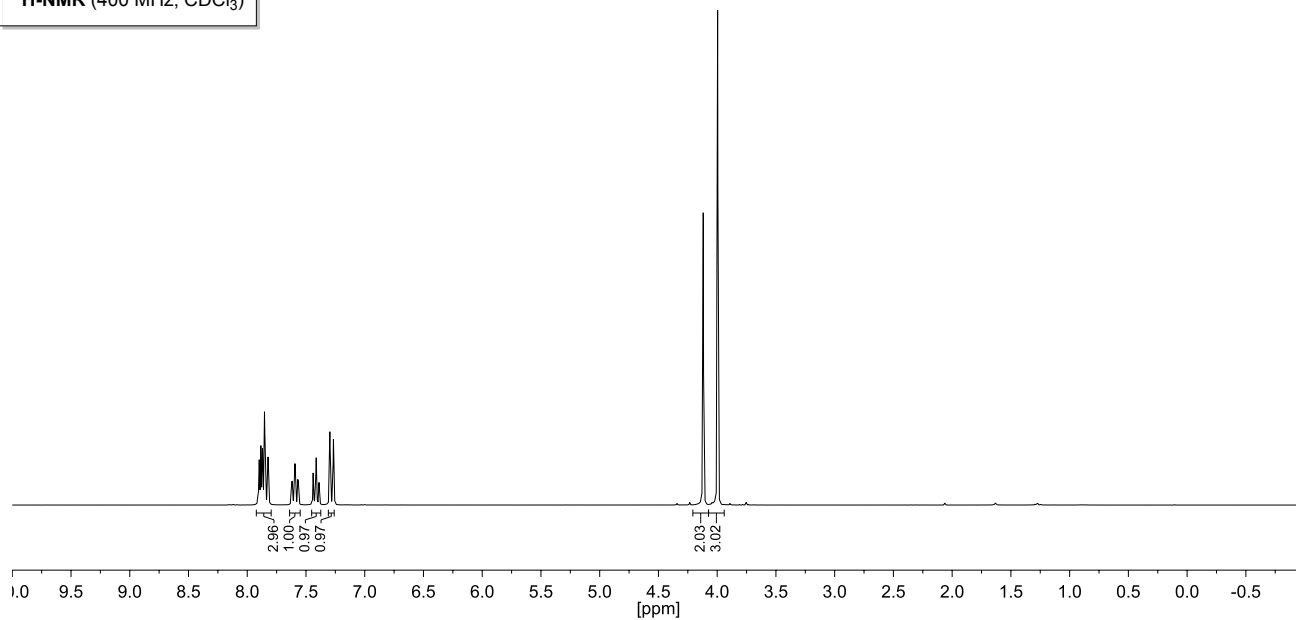
5.1 NMR spectra of the indolenines

SUPPORTING INFORMATION



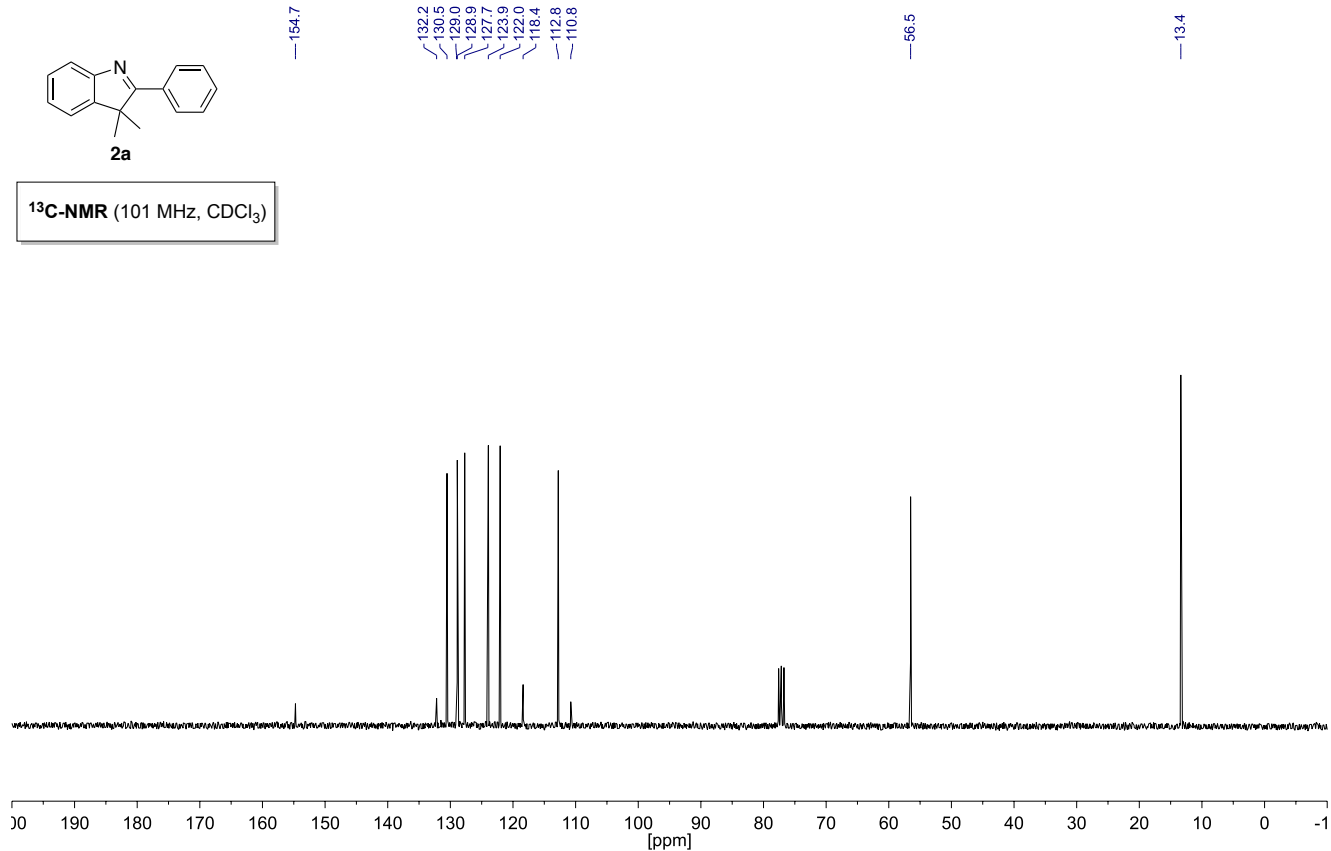
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¹H-NMR (400 MHz, CDCl₃)

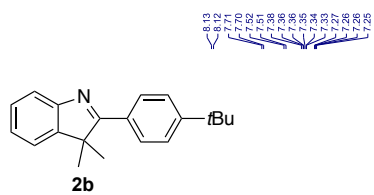


2a

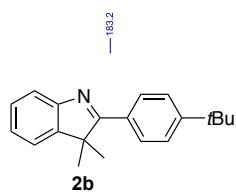
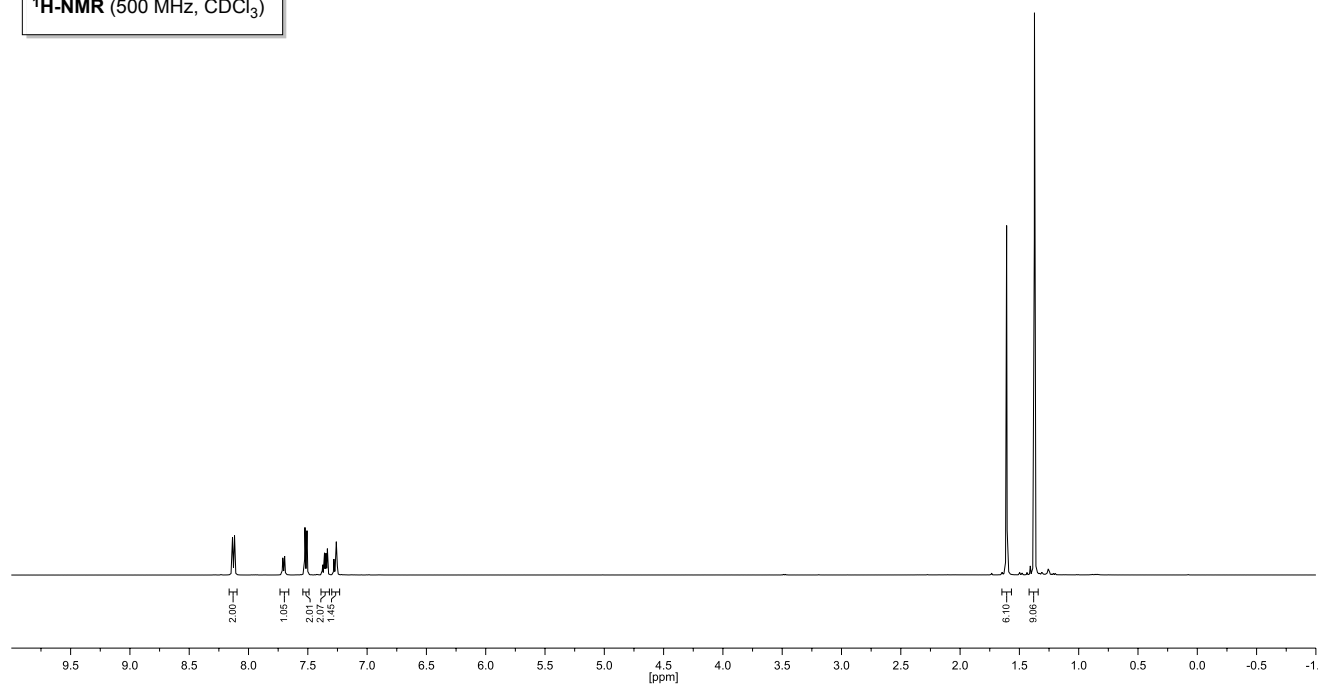
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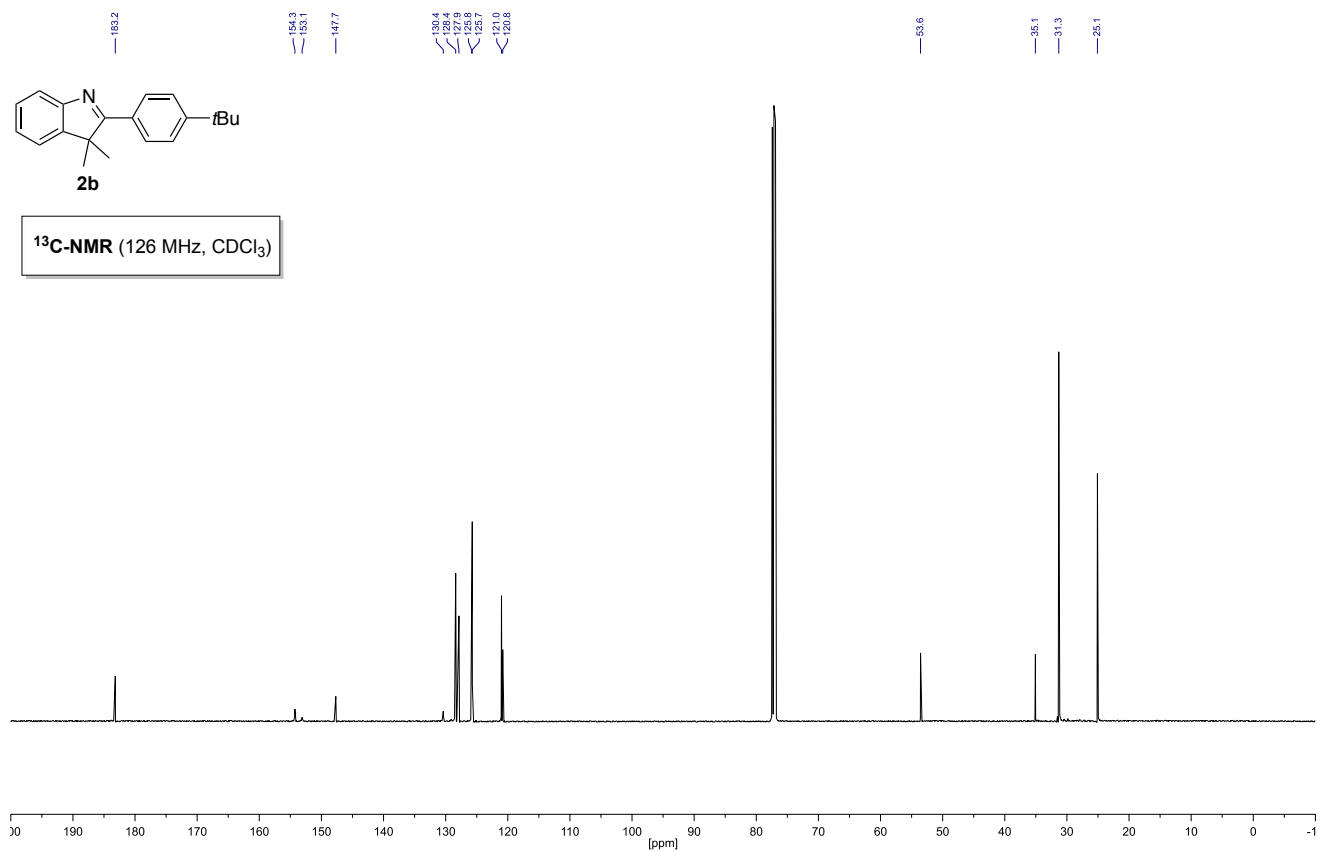
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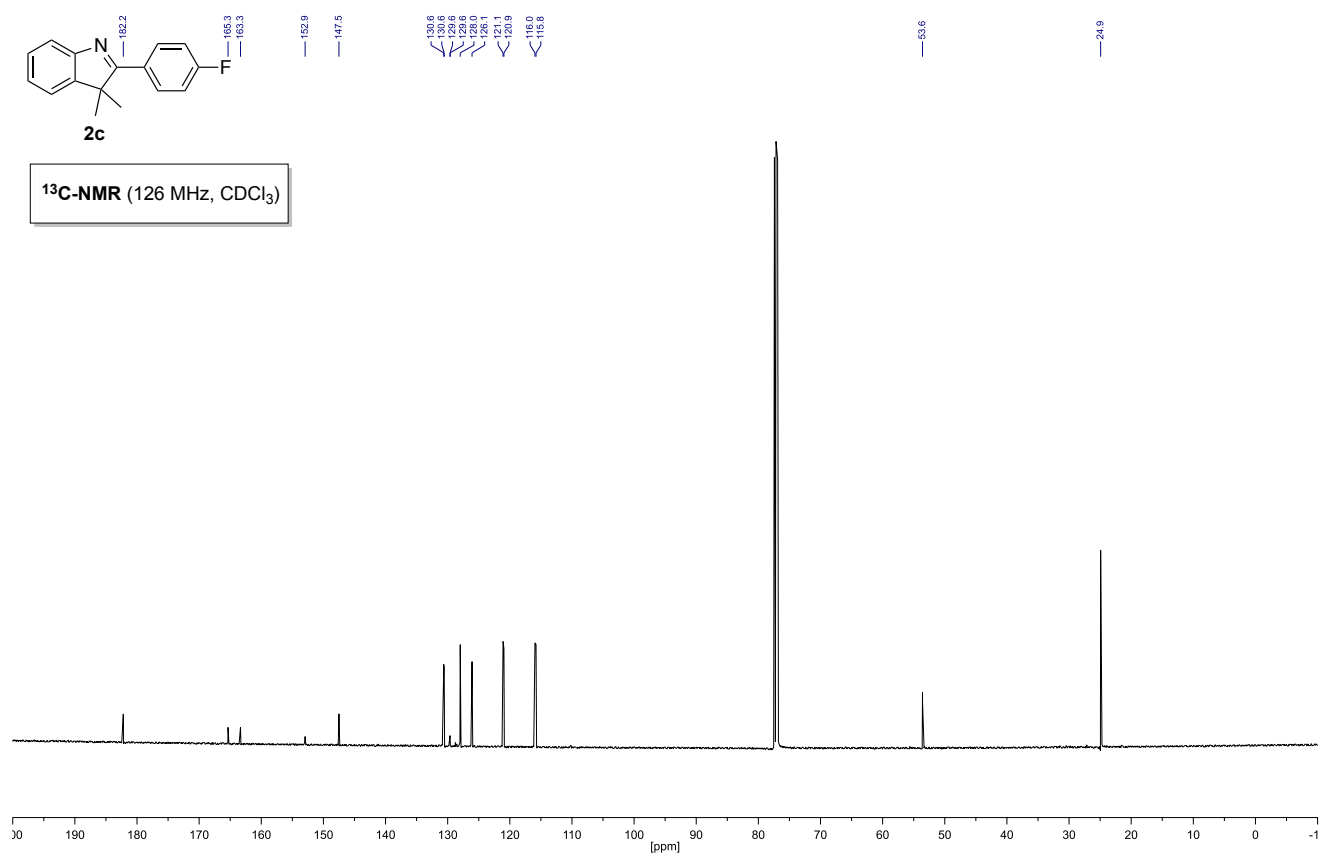
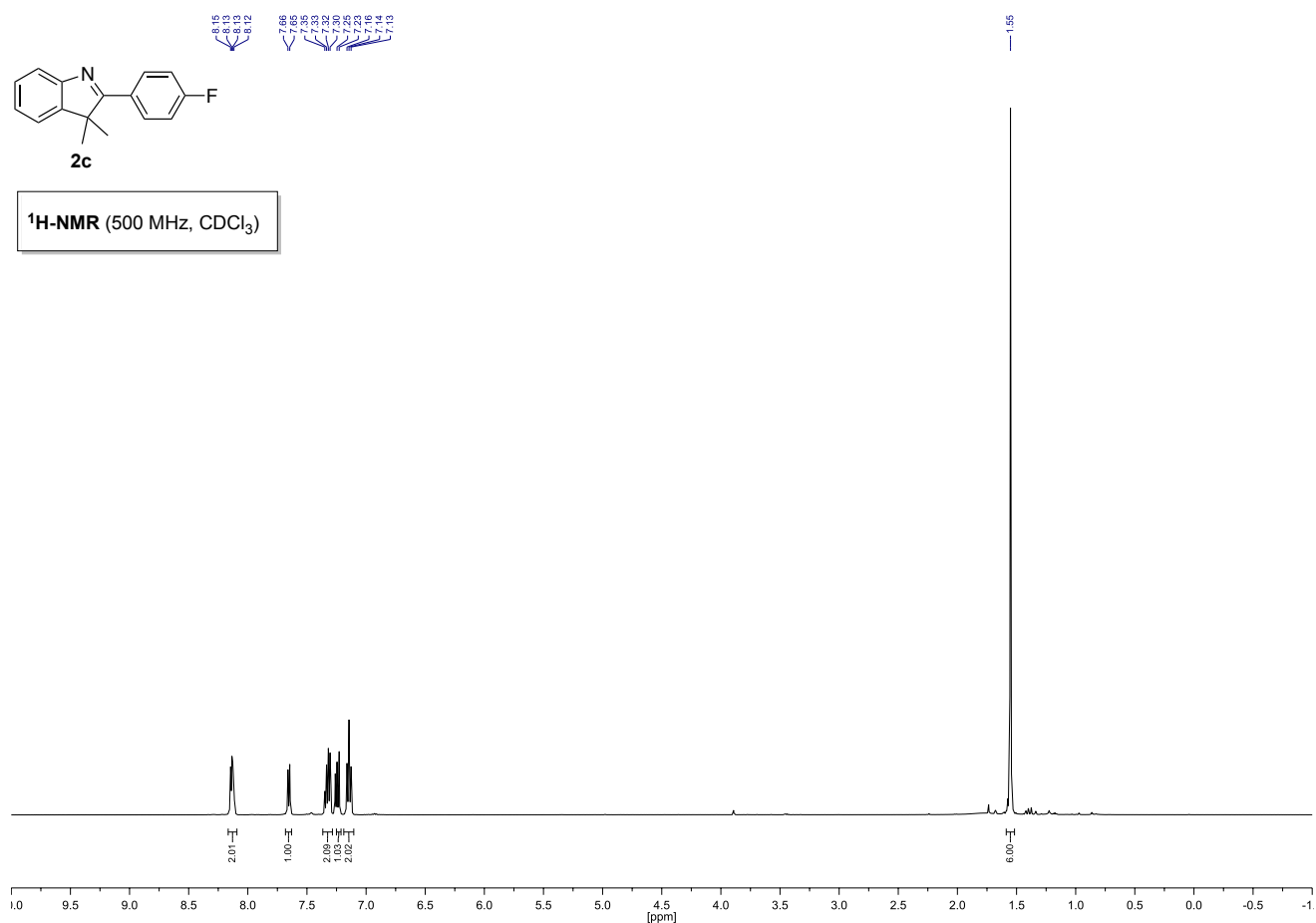
¹H-NMR (500 MHz, CDCl₃)



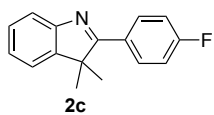
¹³C-NMR (126 MHz, CDCl₃)



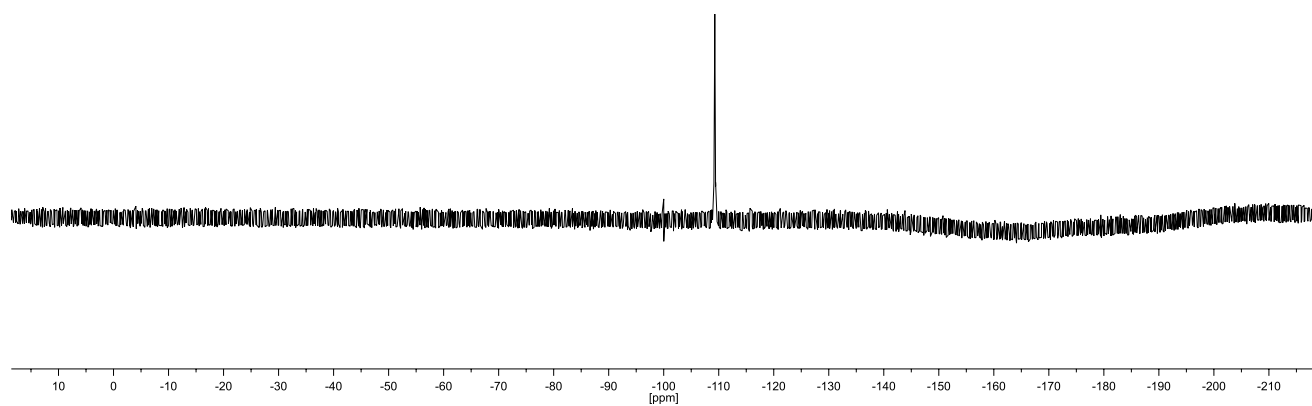
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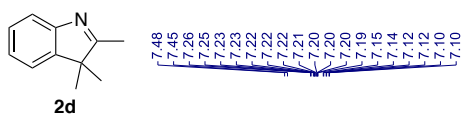
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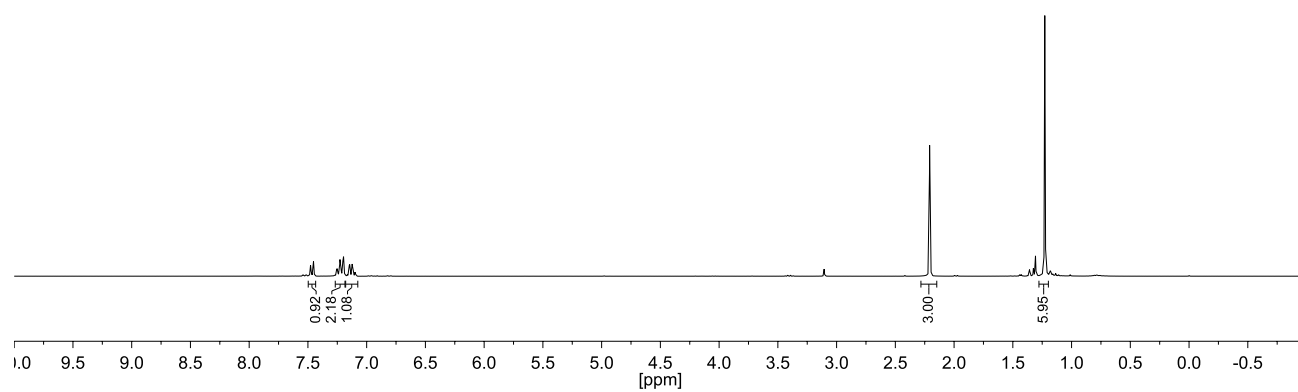
¹⁹F-NMR (376 MHz, CDCl₃)



SUPPORTING INFORMATION



¹H-NMR (400 MHz, CDCl₃)



—188.1

—153.8

—145.7

—127.7

—125.2

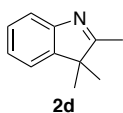
—121.4

—120.0

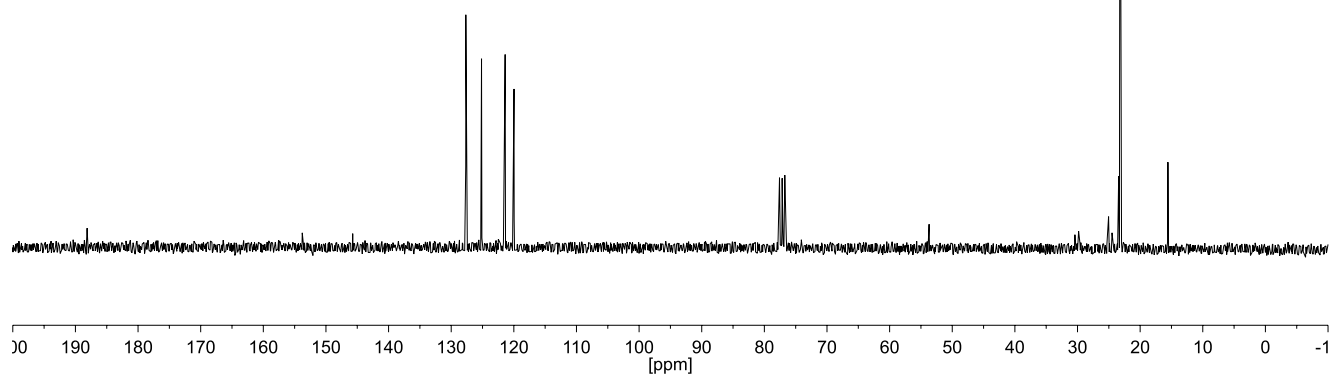
—63.7

—23.2

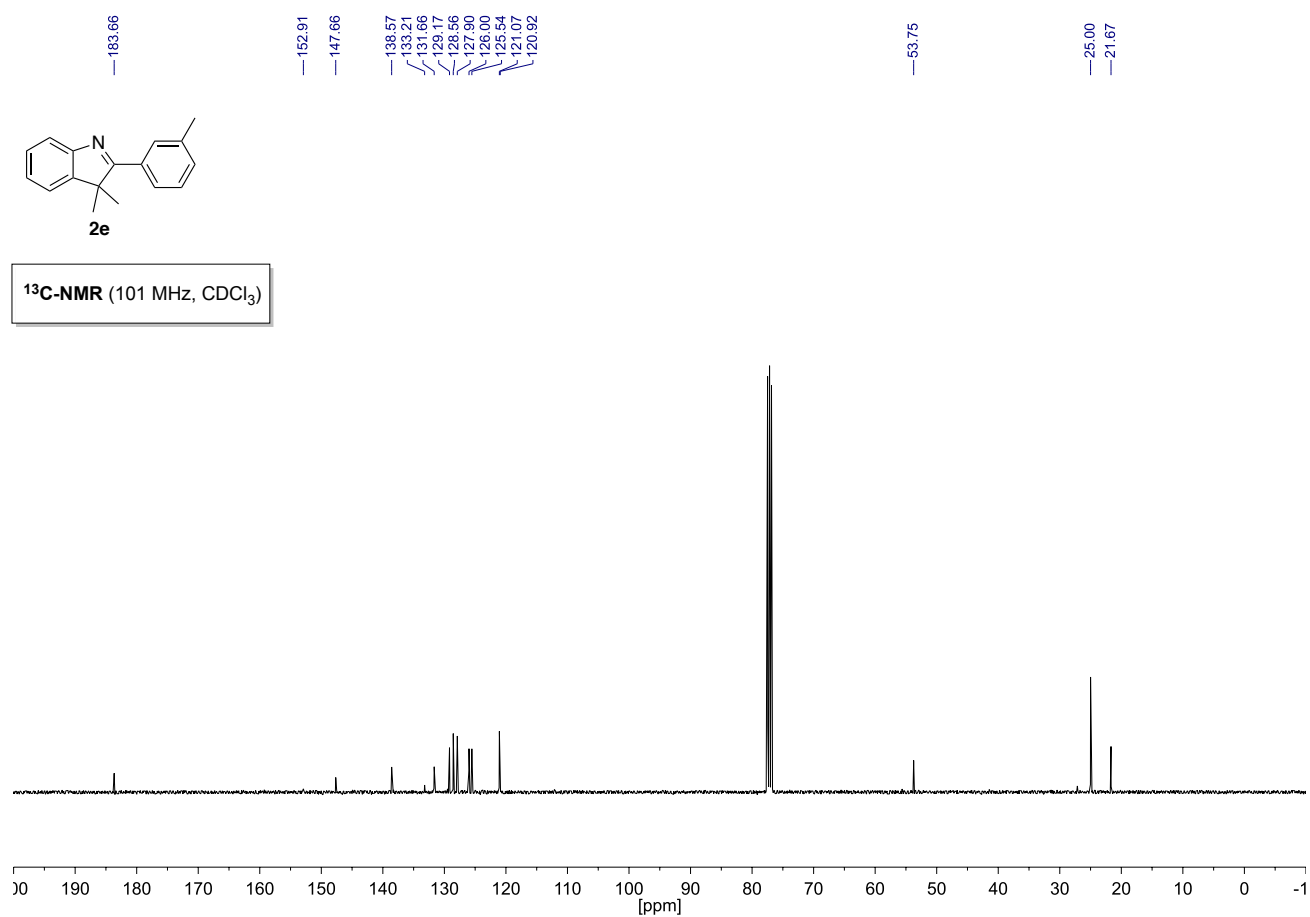
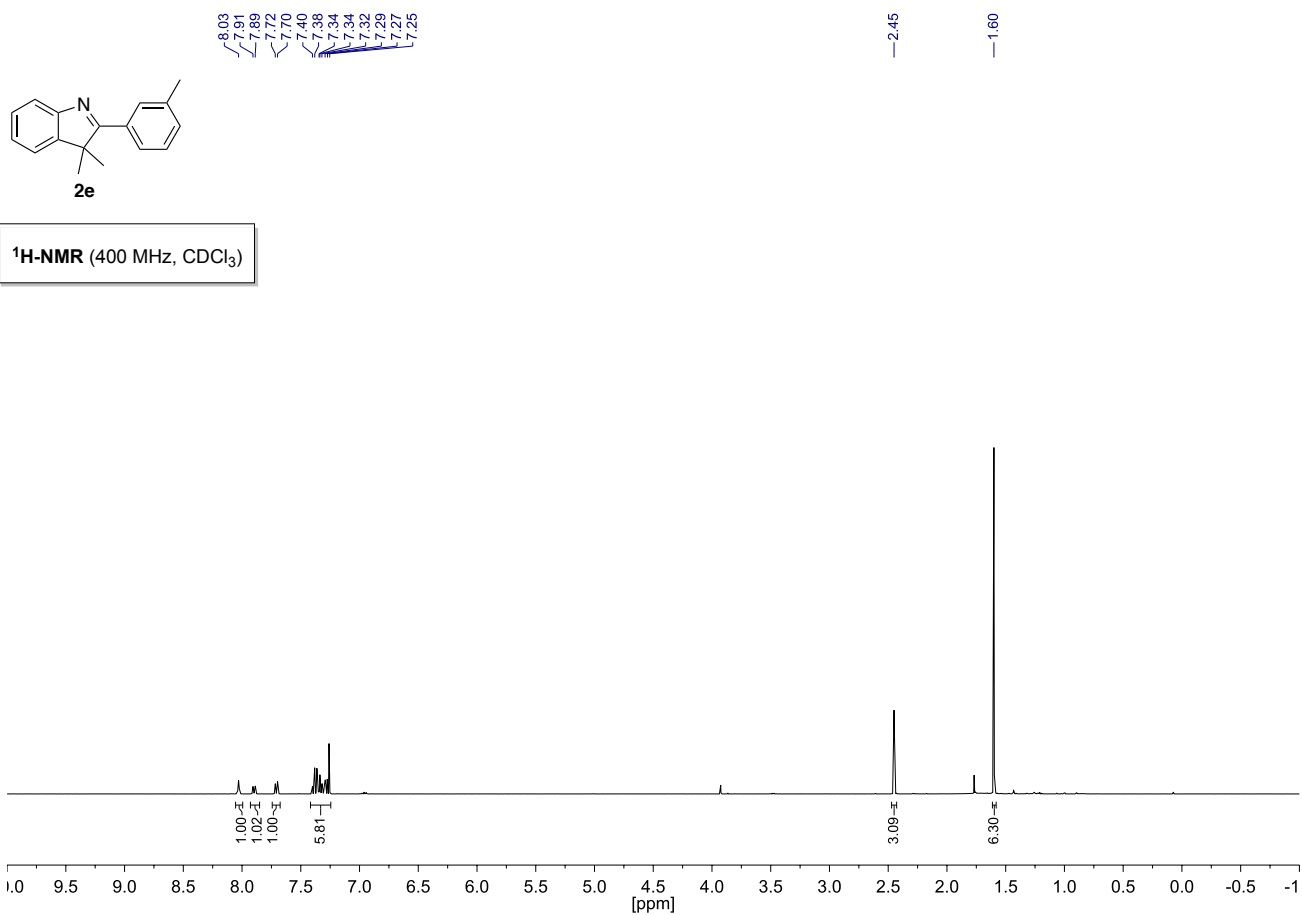
—15.6



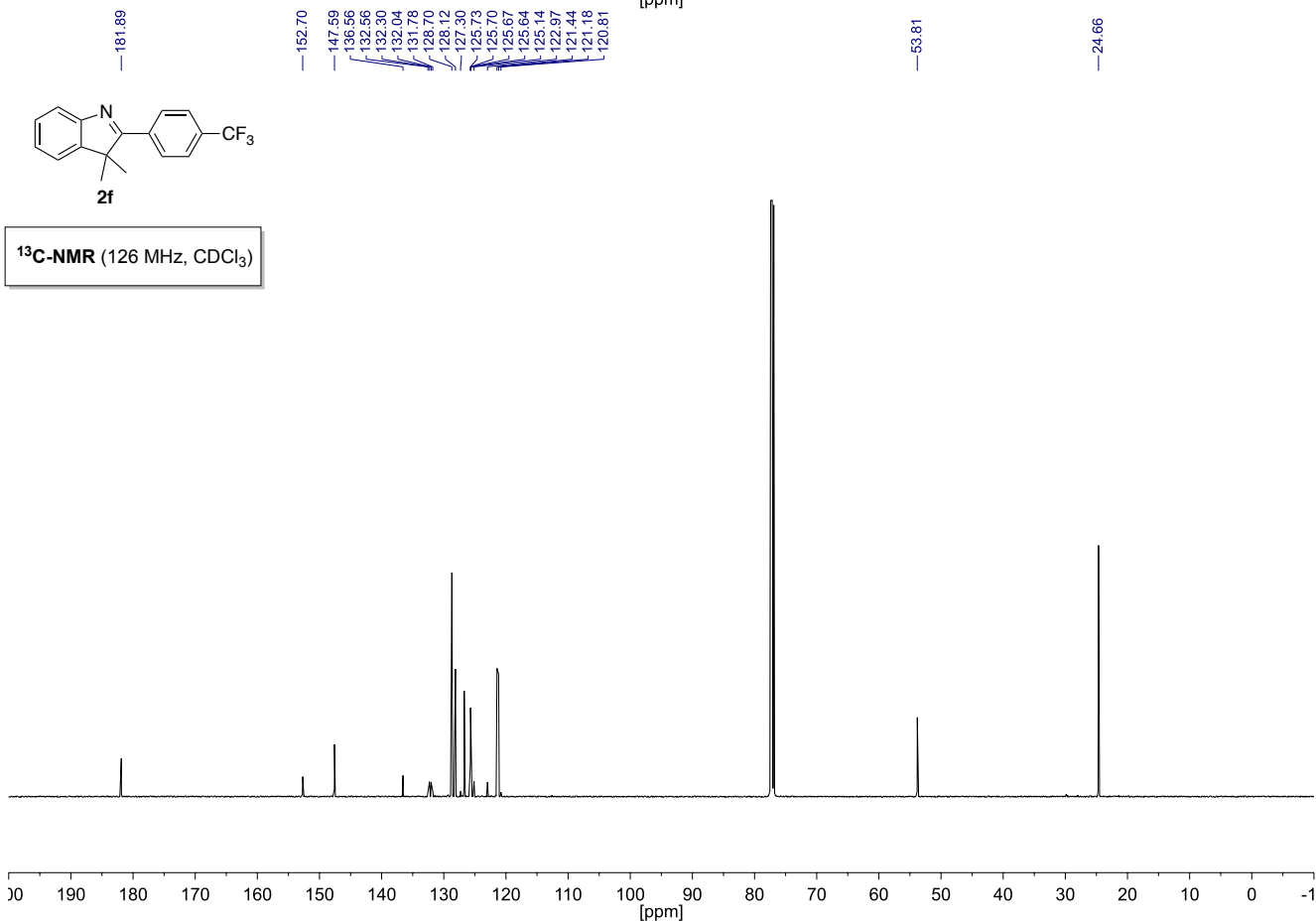
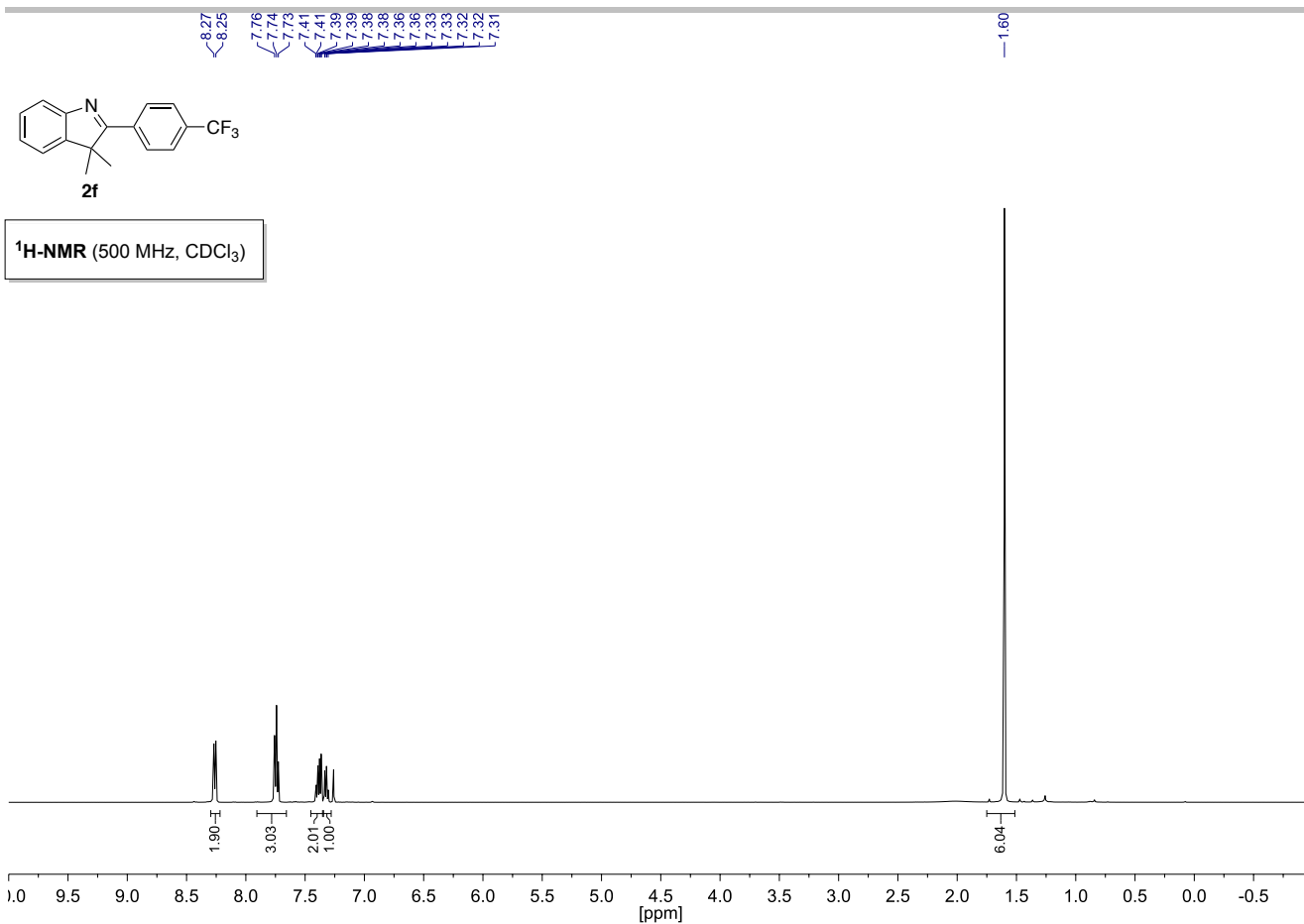
¹³C-NMR (75 MHz, CDCl₃)



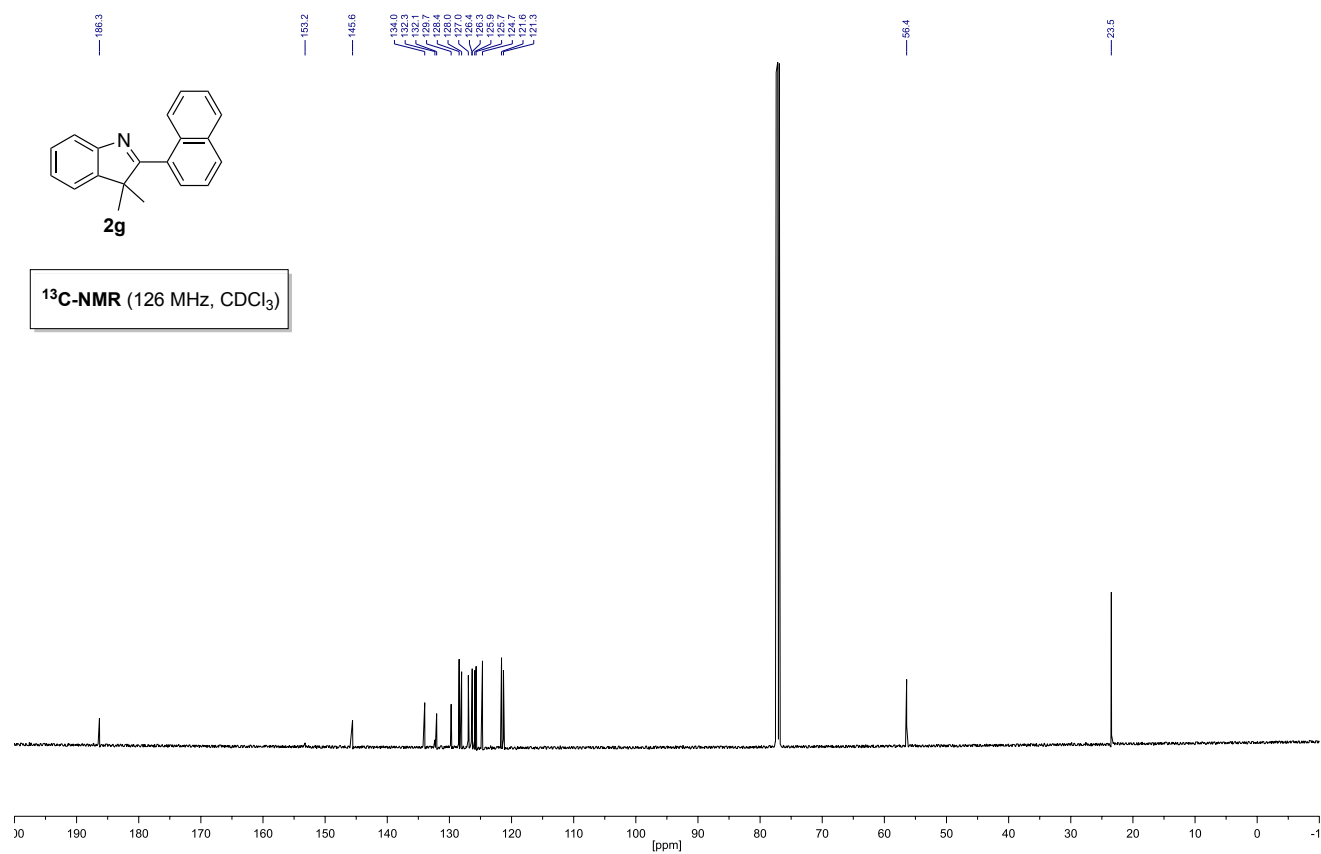
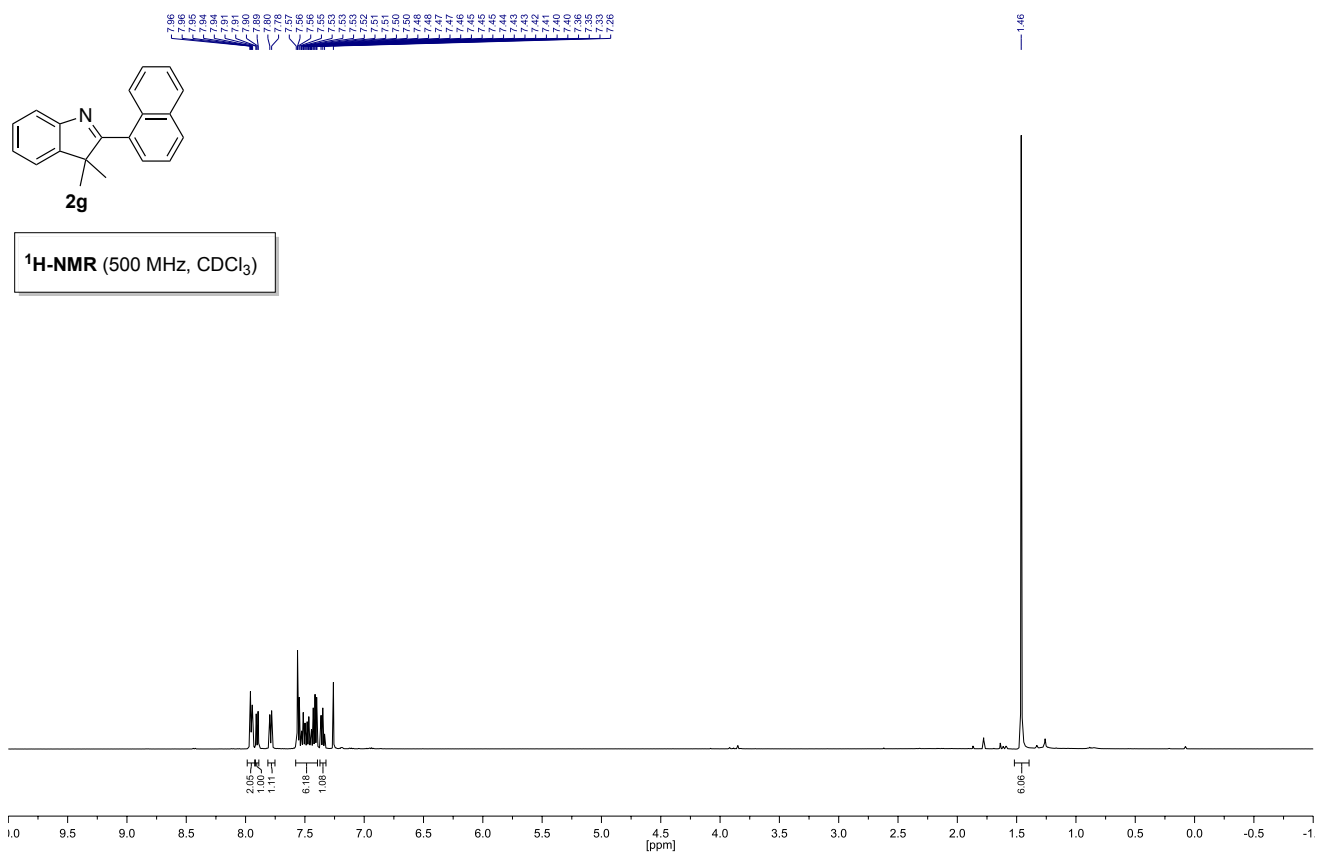
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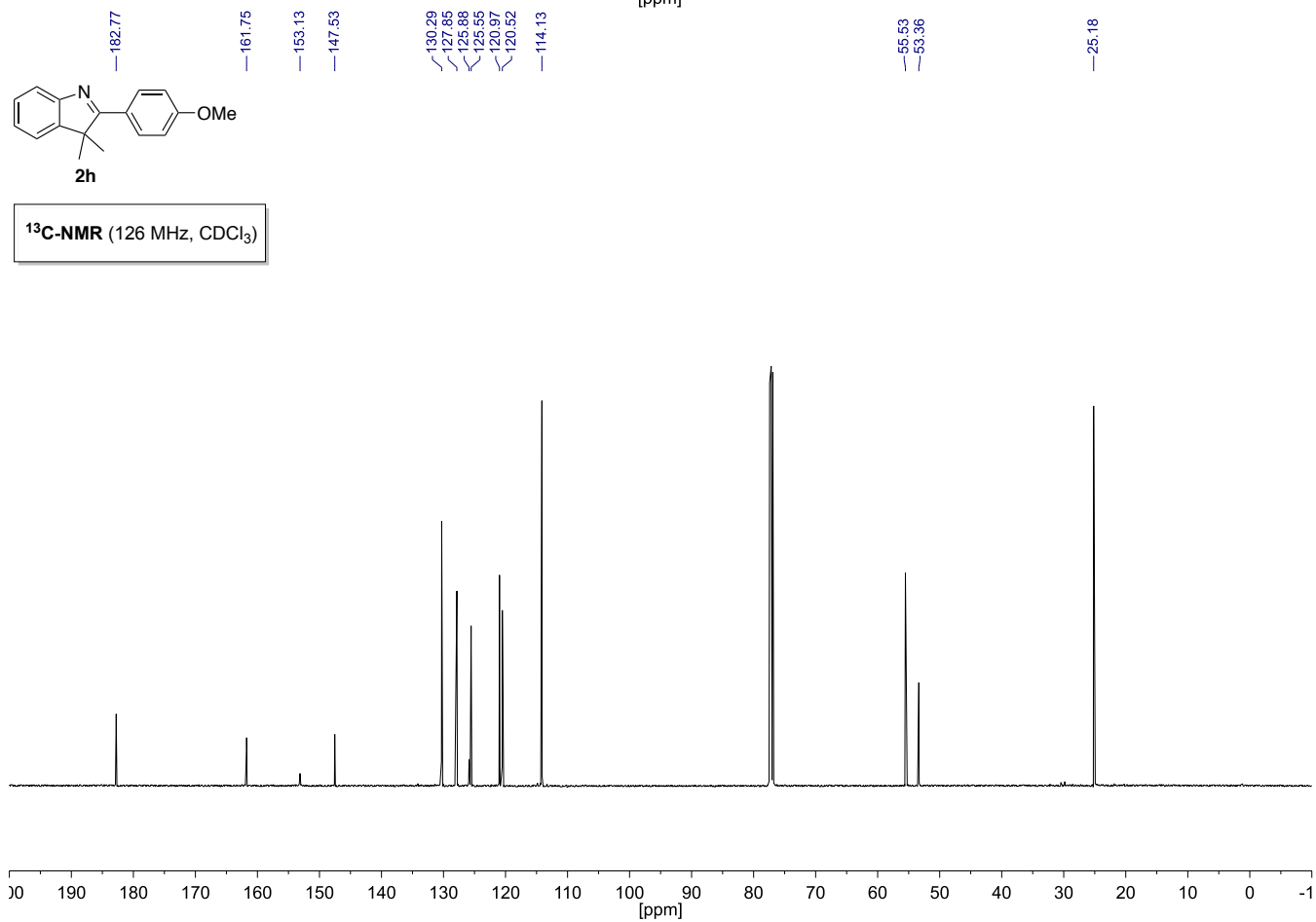
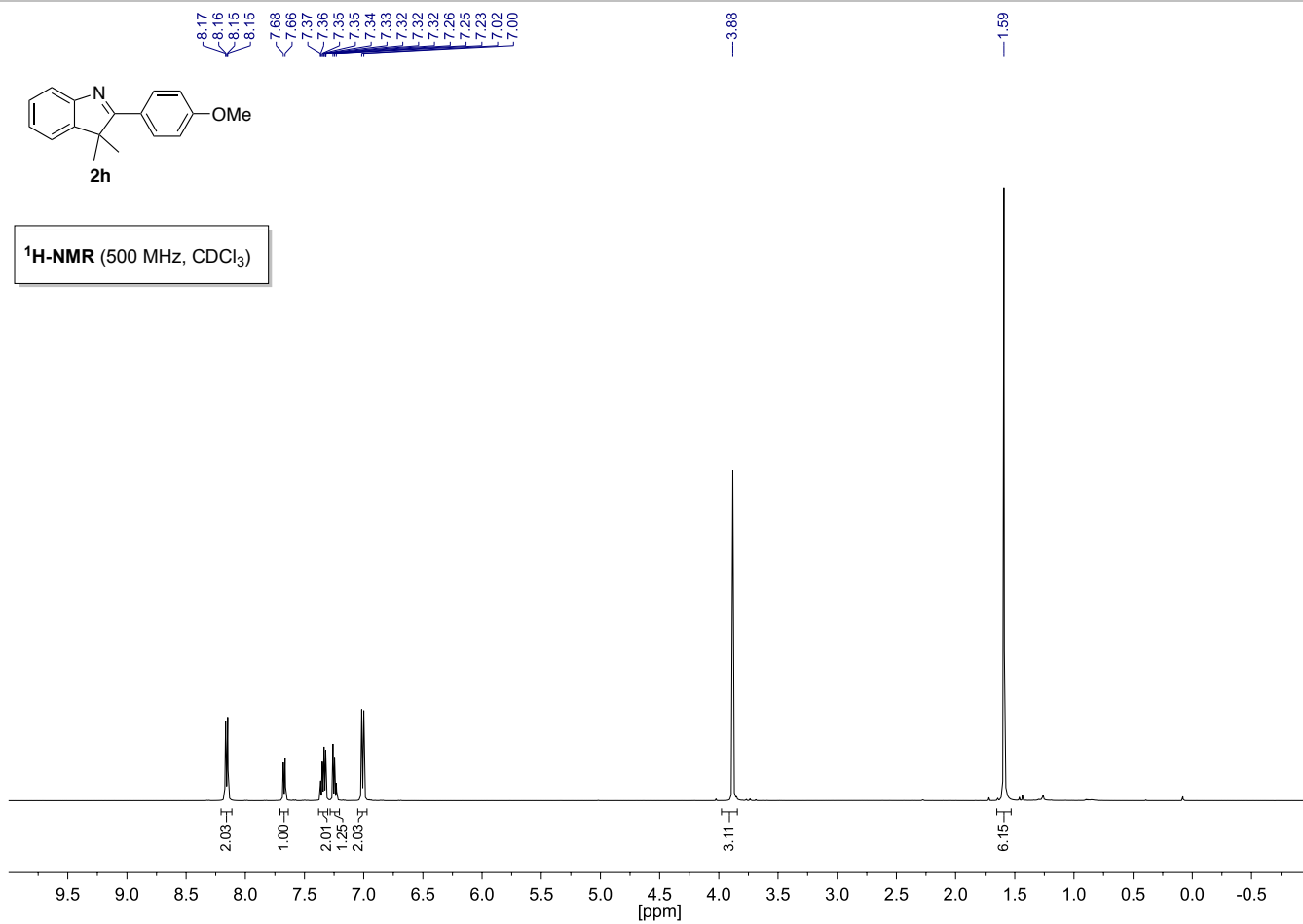
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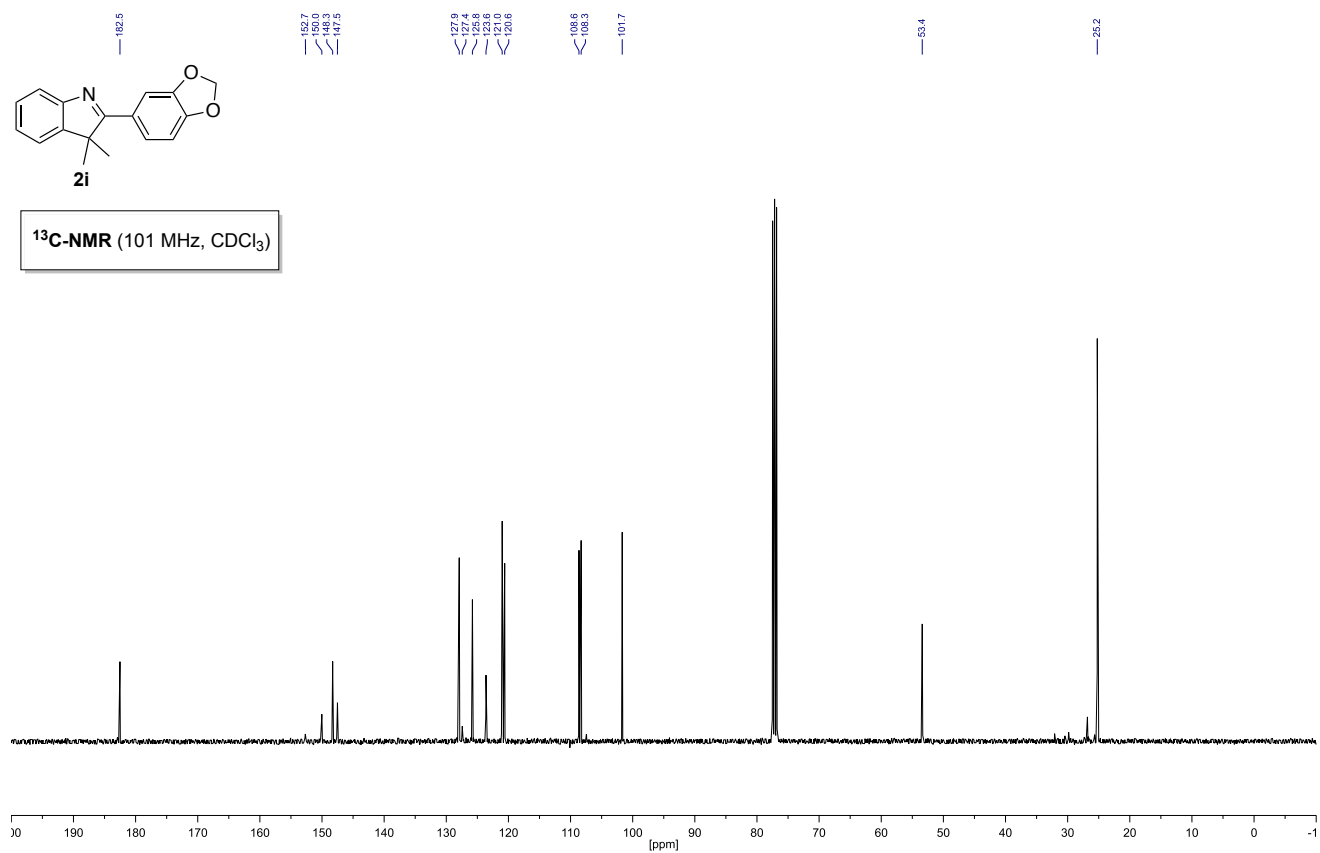
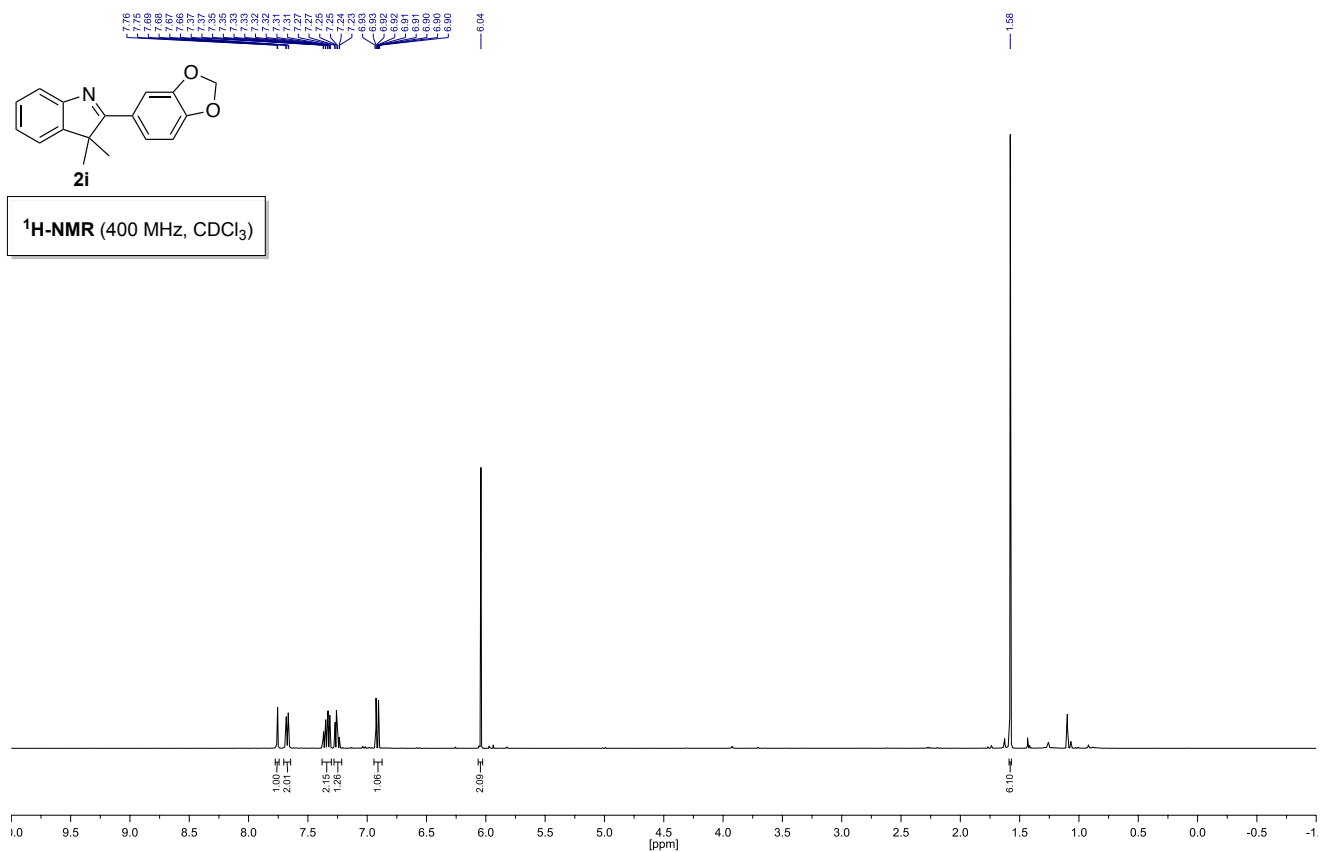
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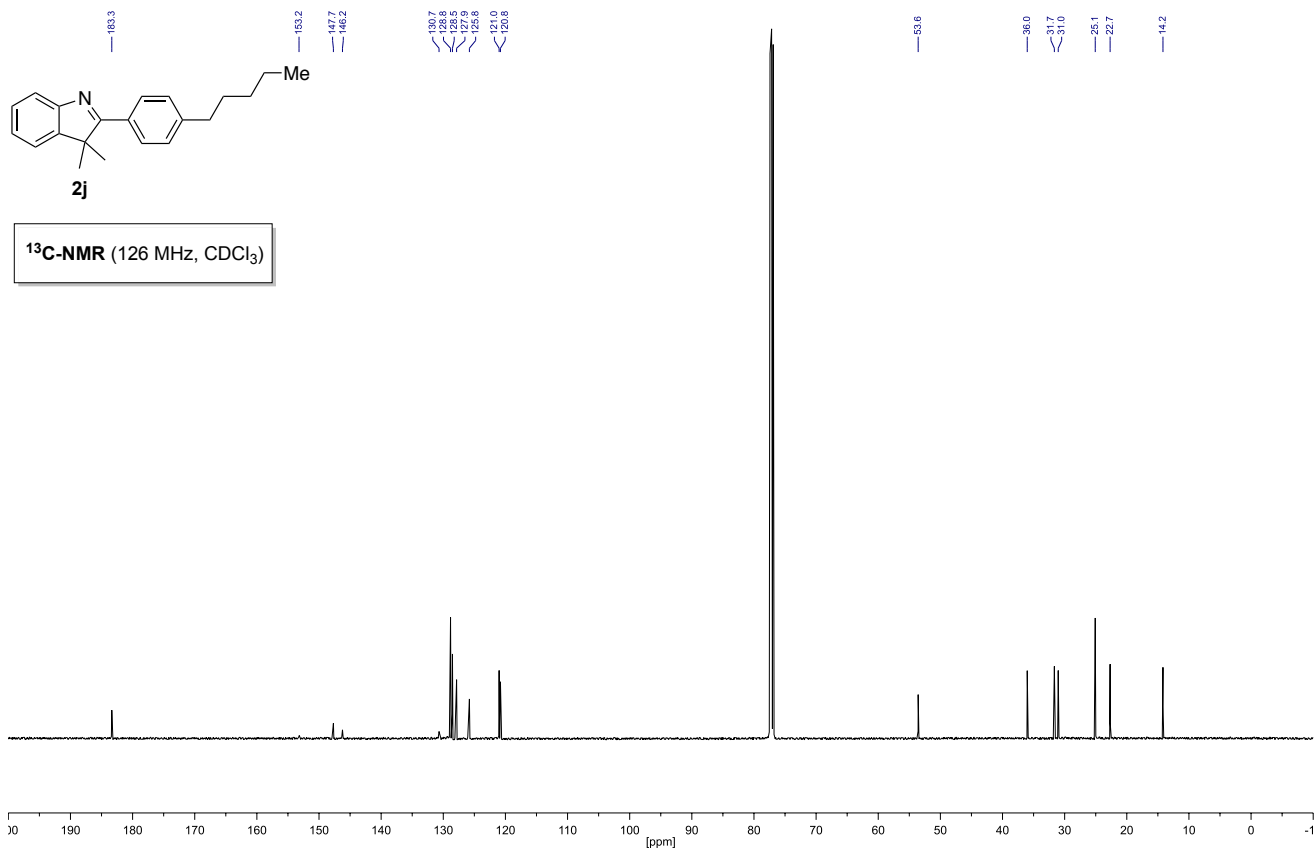
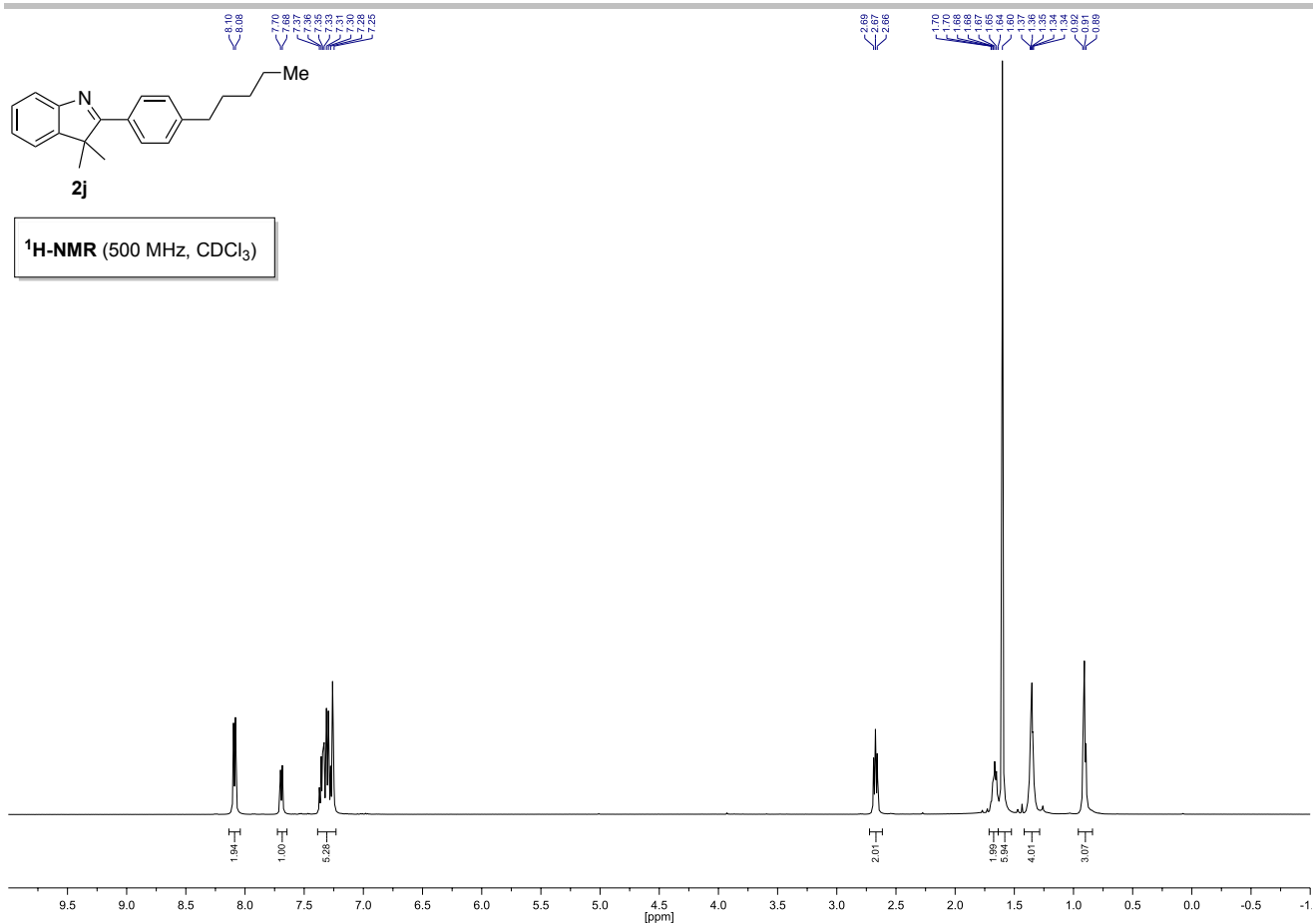
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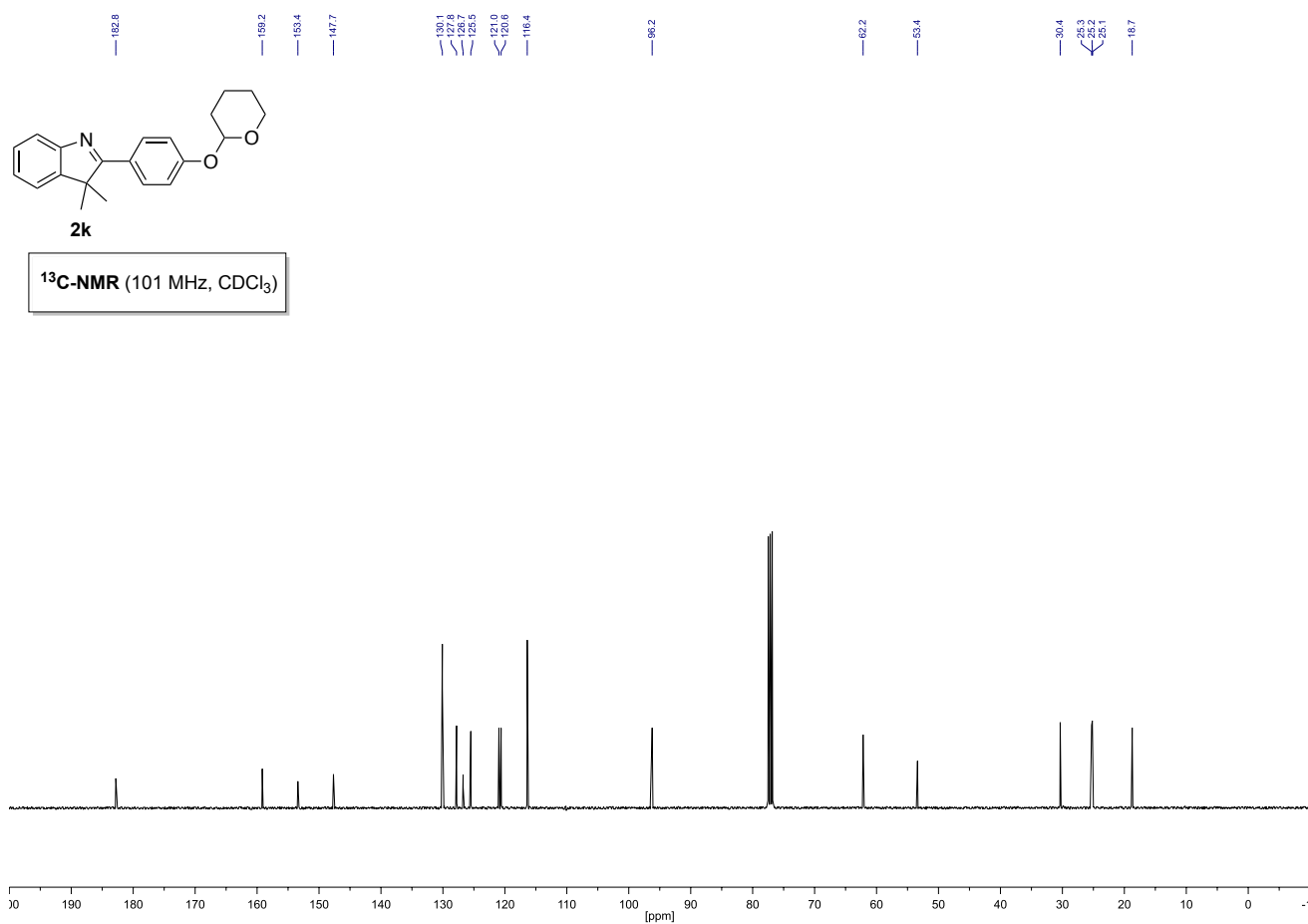
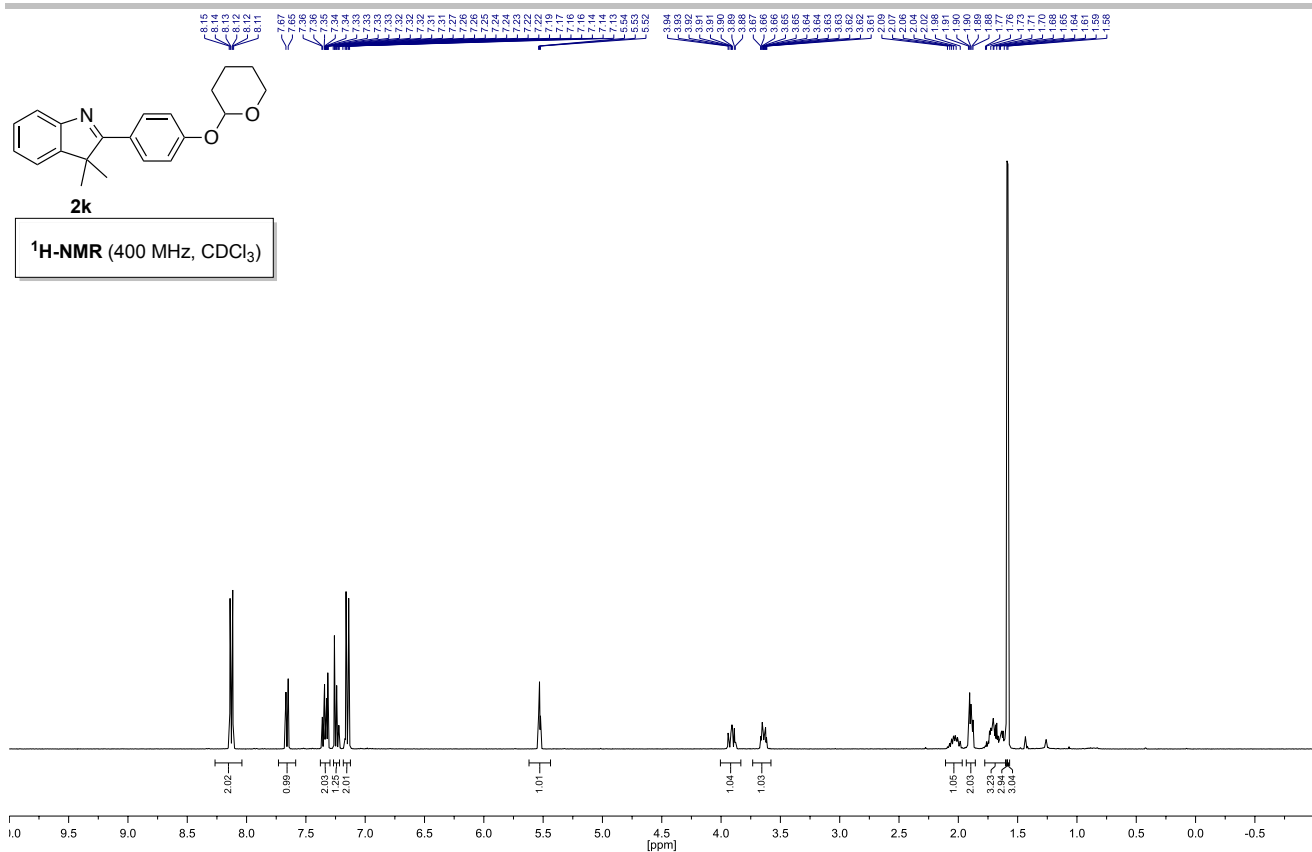
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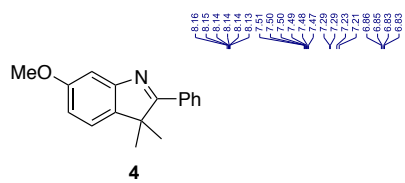
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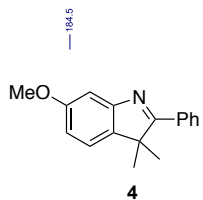
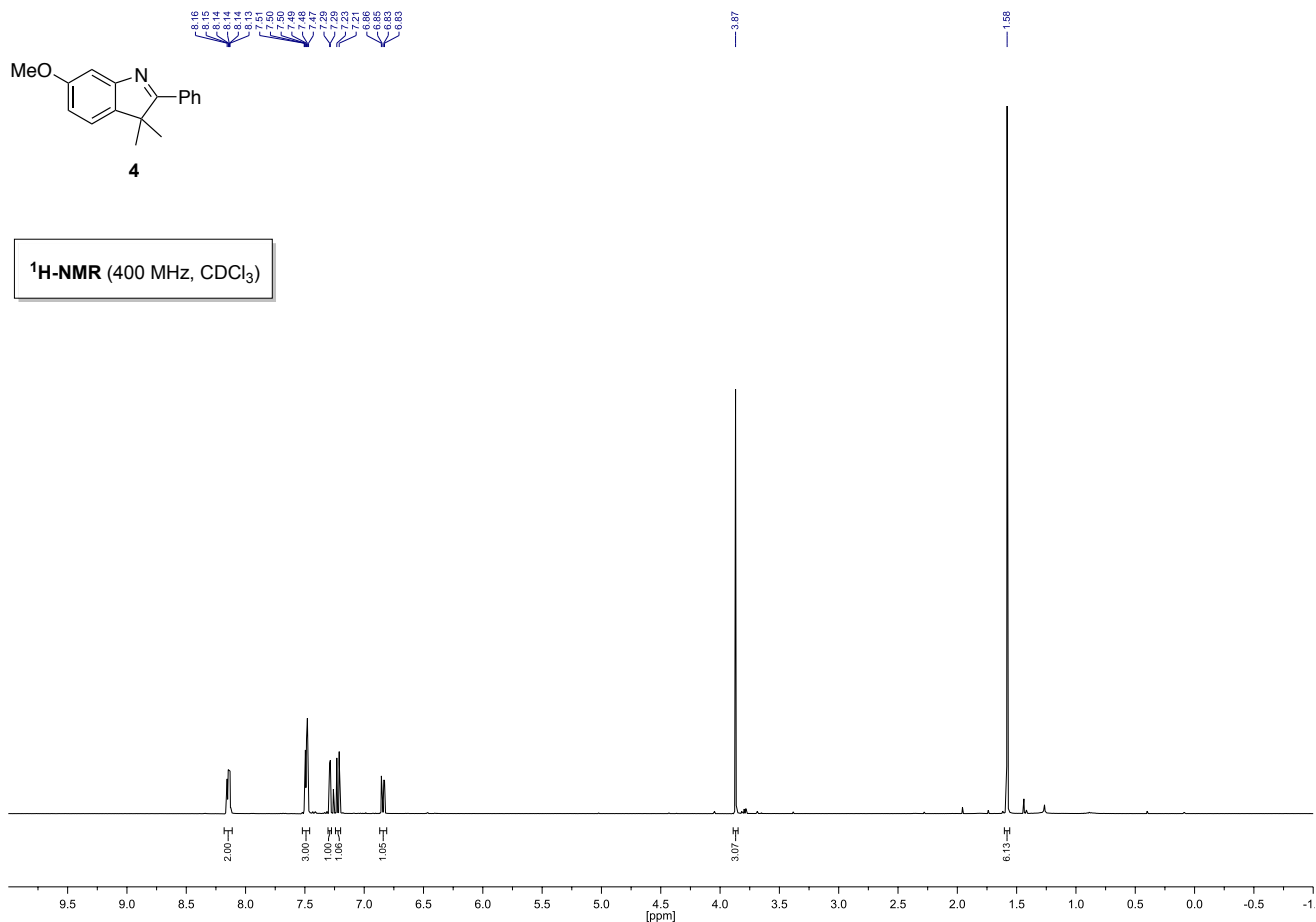
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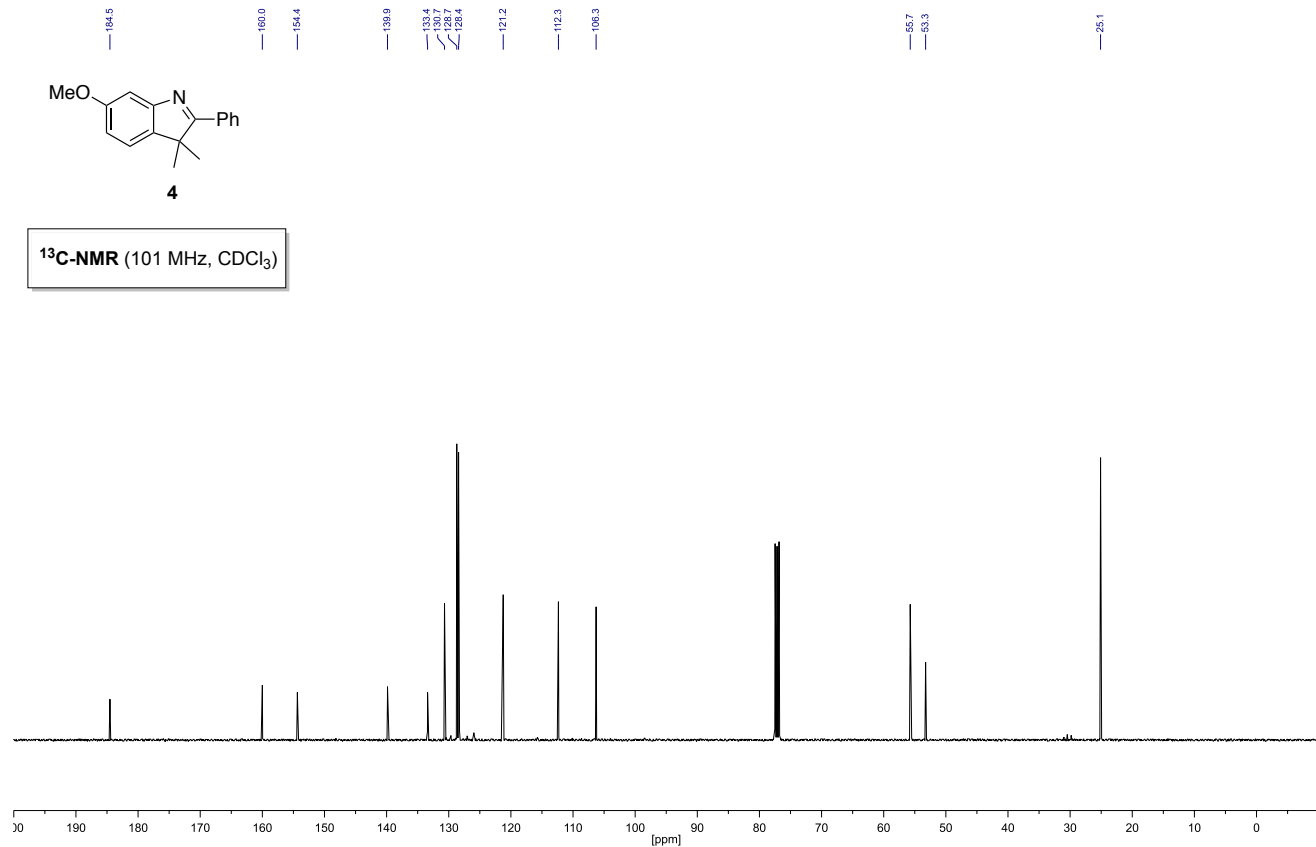
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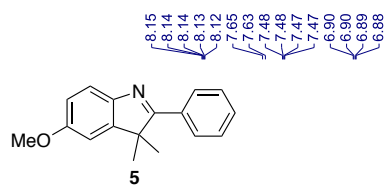
¹H-NMR (400 MHz, CDCl₃)



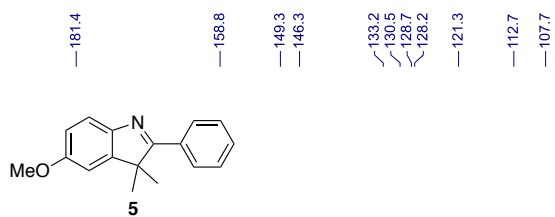
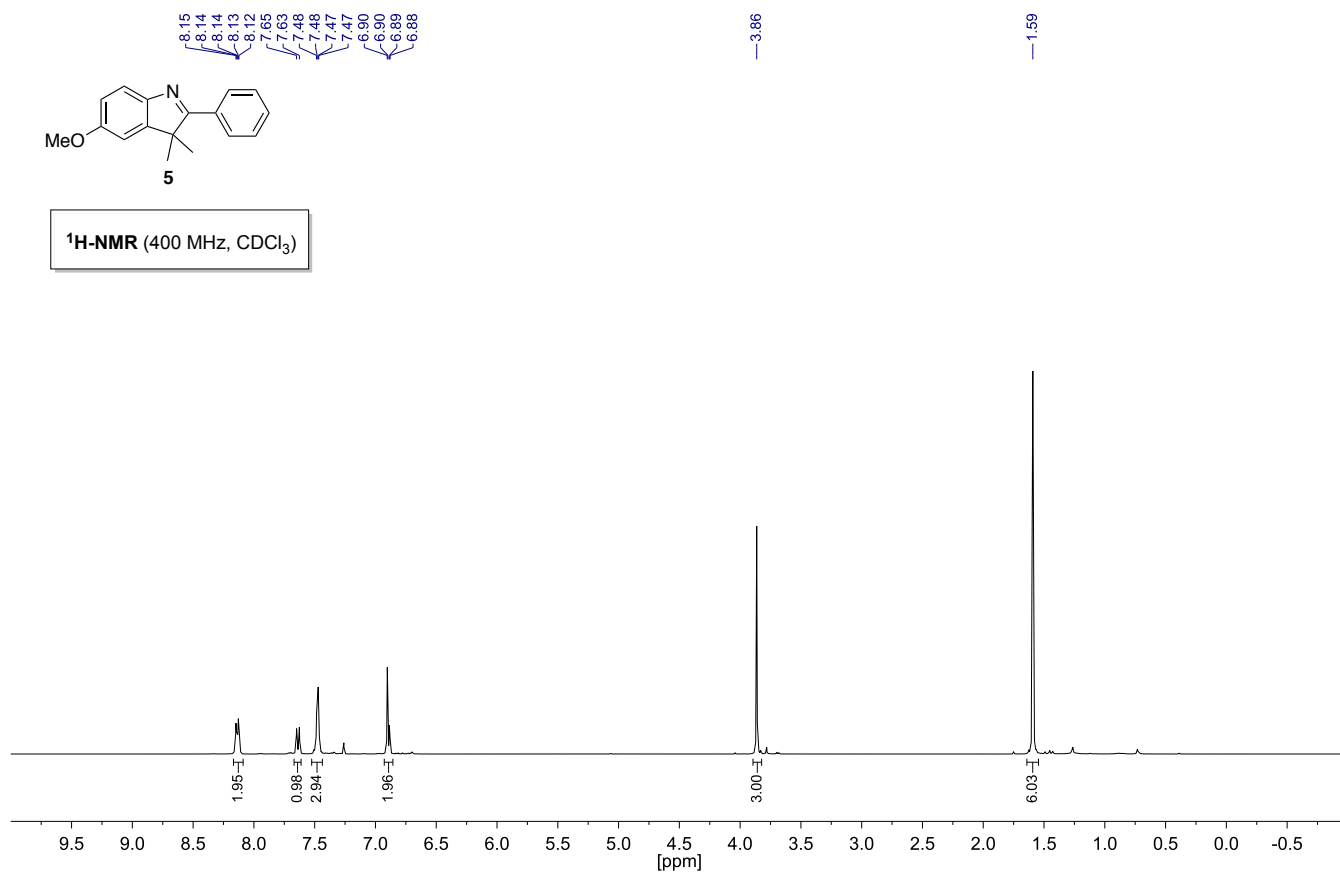
¹³C-NMR (101 MHz, CDCl₃)



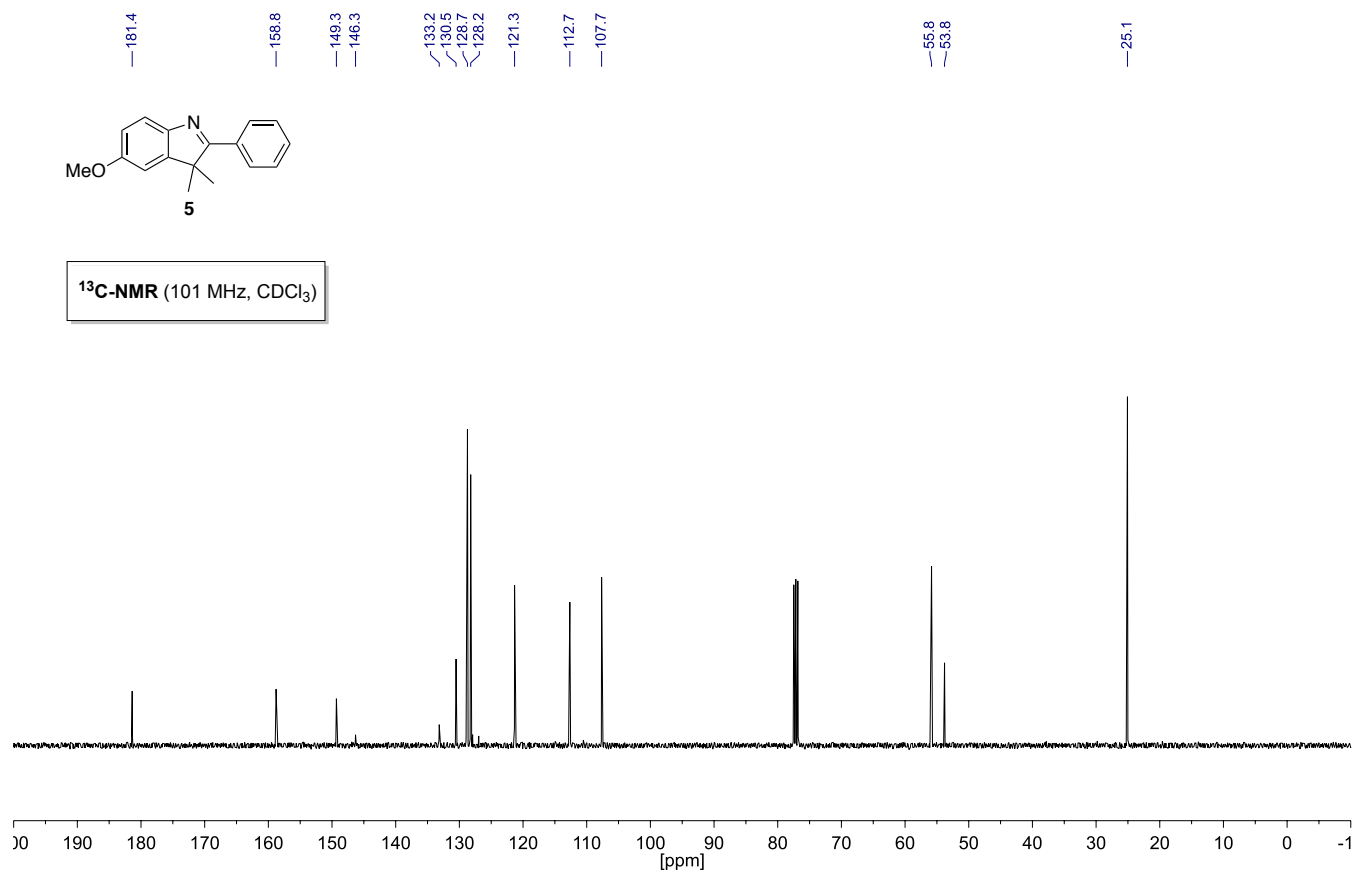
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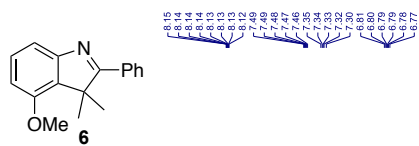
¹H-NMR (400 MHz, CDCl₃)



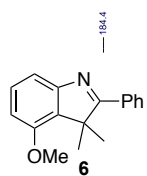
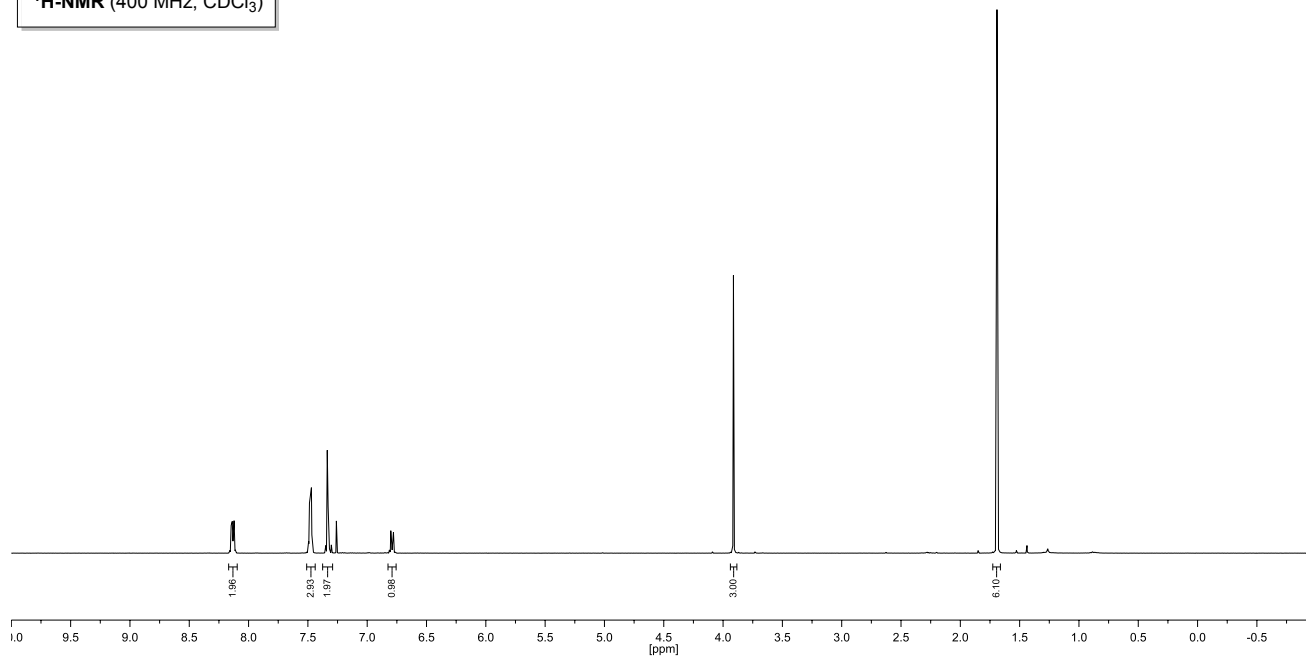
¹³C-NMR (101 MHz, CDCl₃)



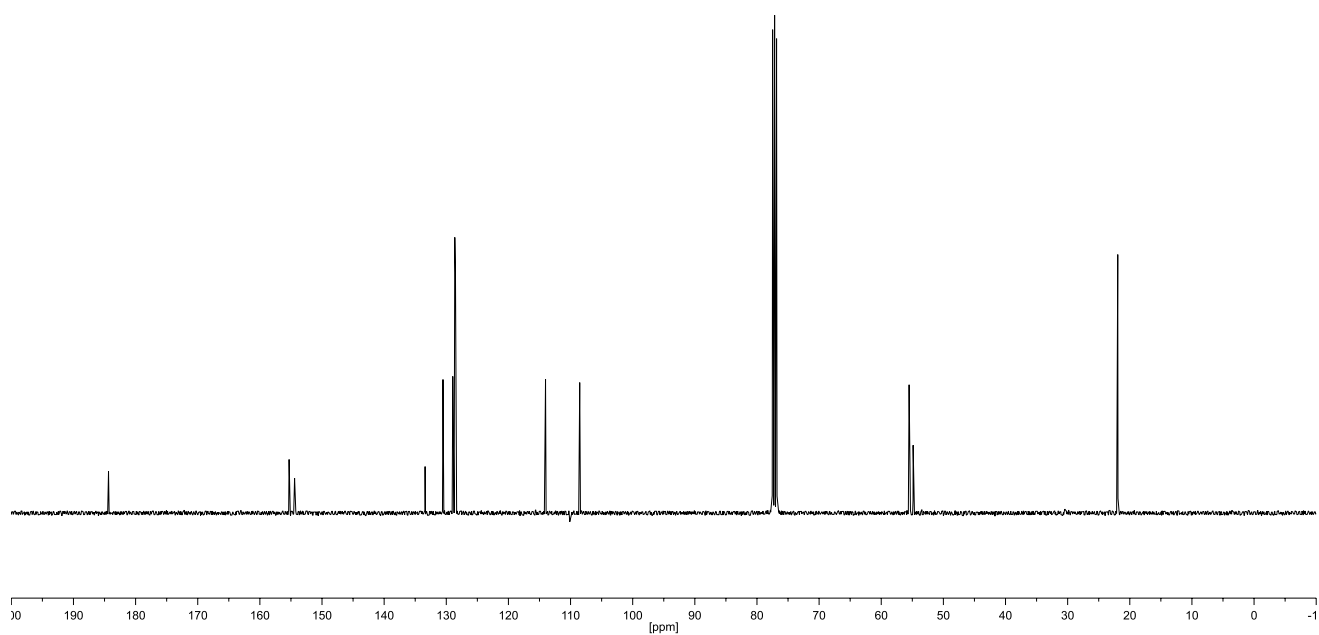
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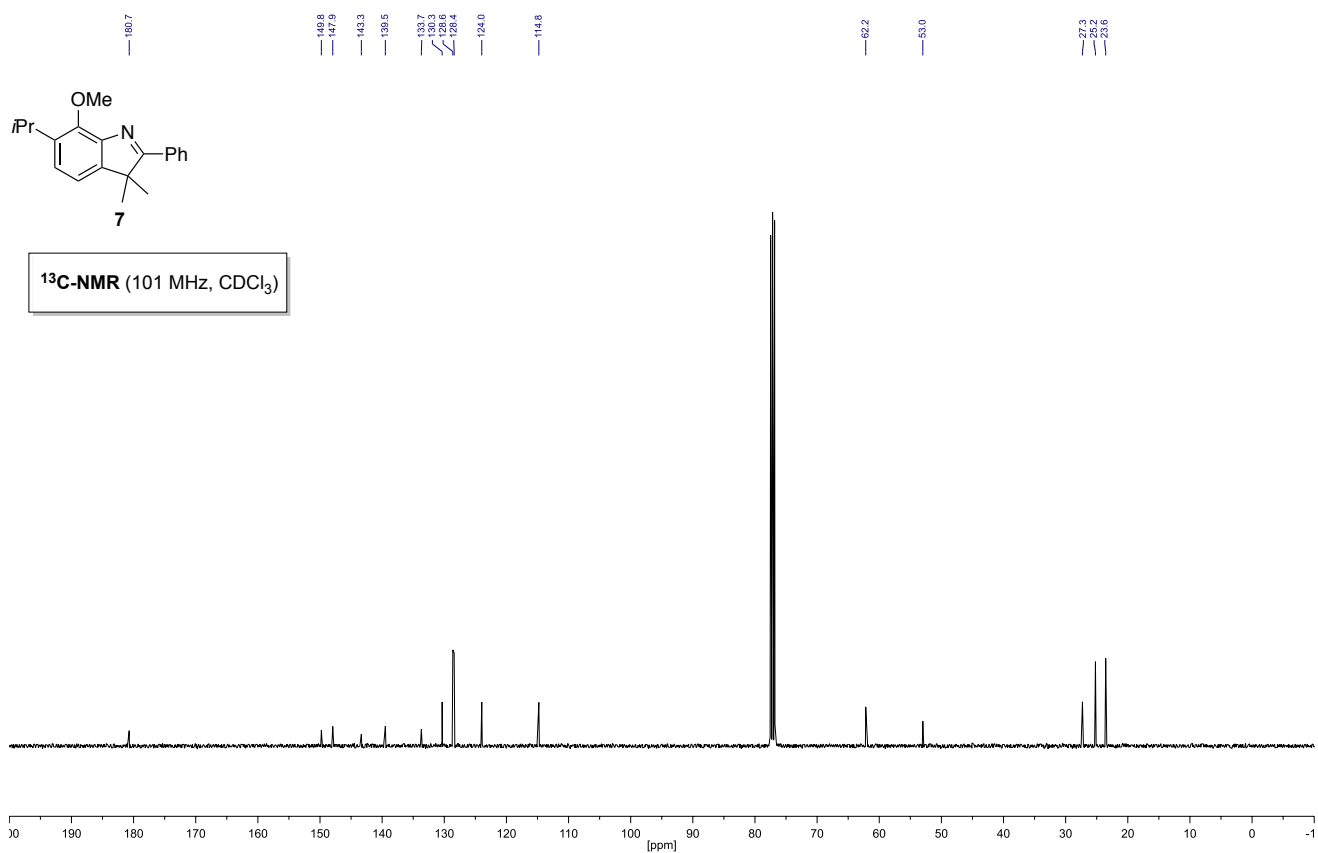
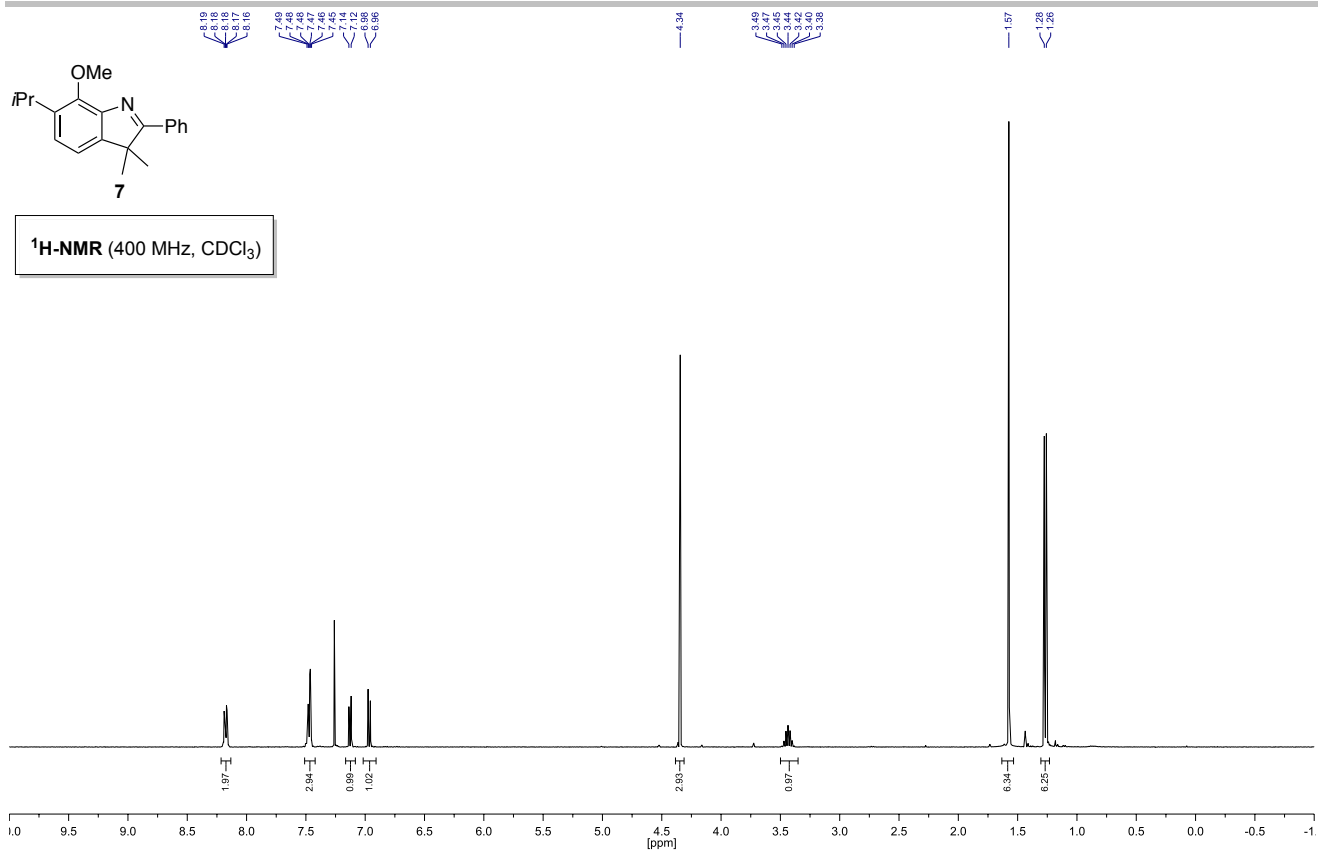
¹H-NMR (400 MHz, CDCl₃)



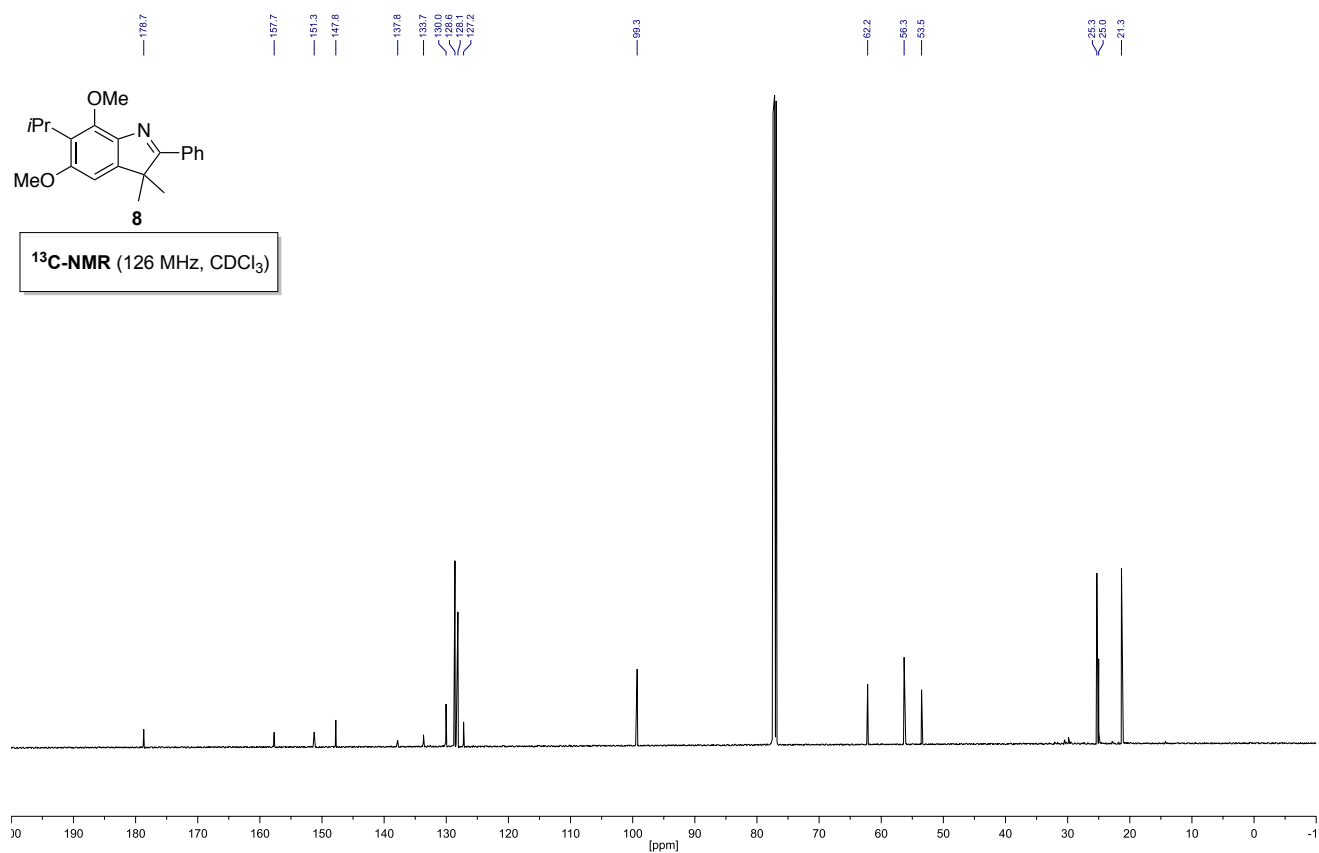
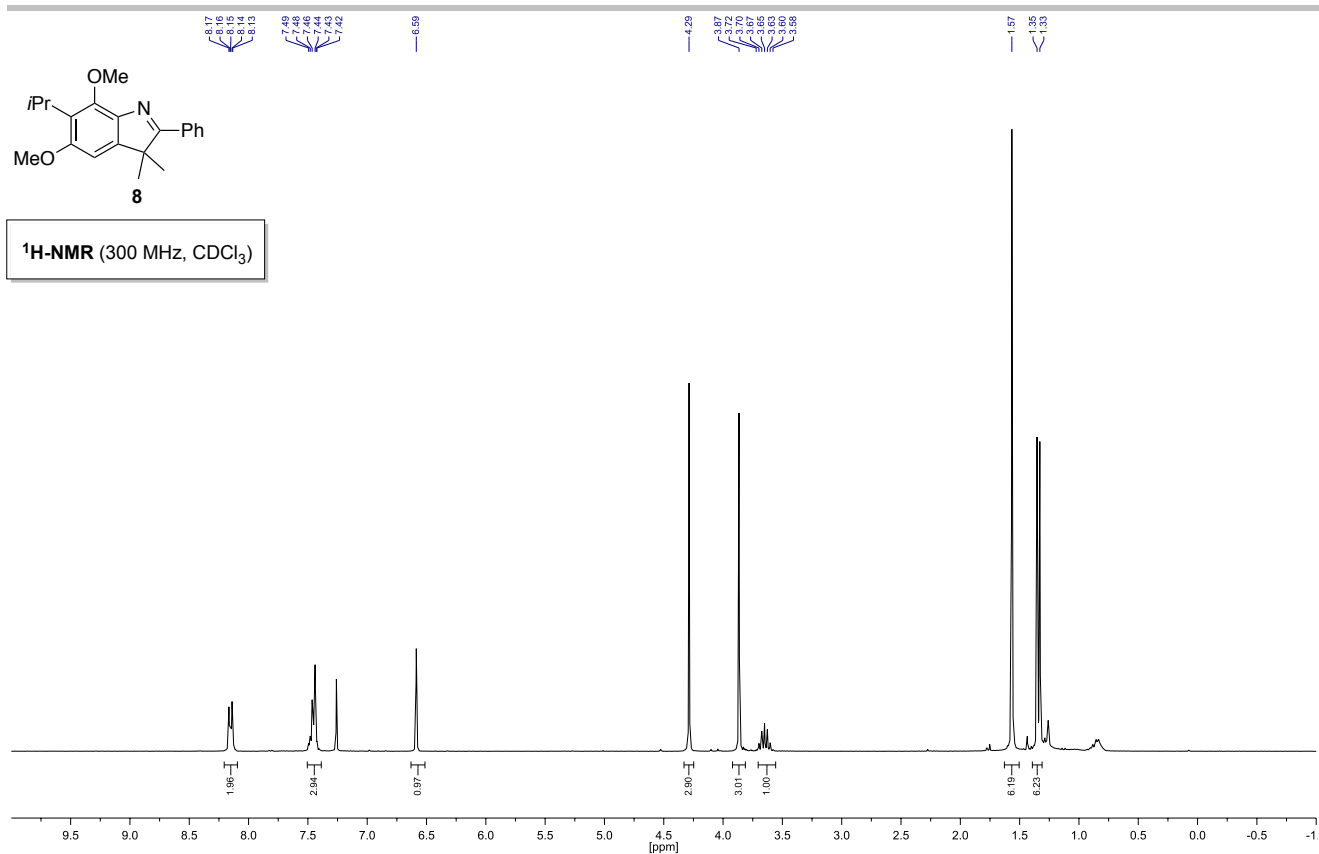
¹³C-NMR (101 MHz, CDCl₃)



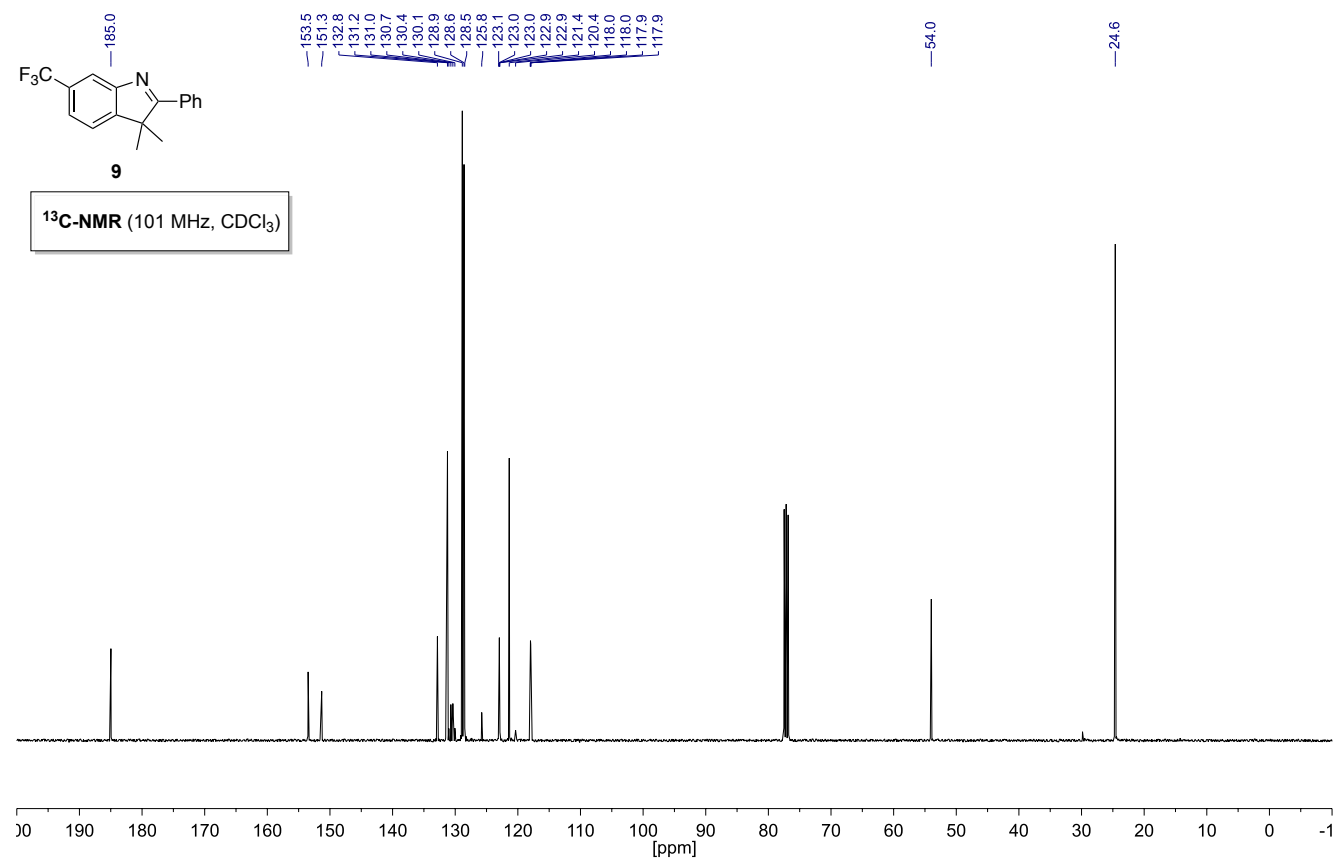
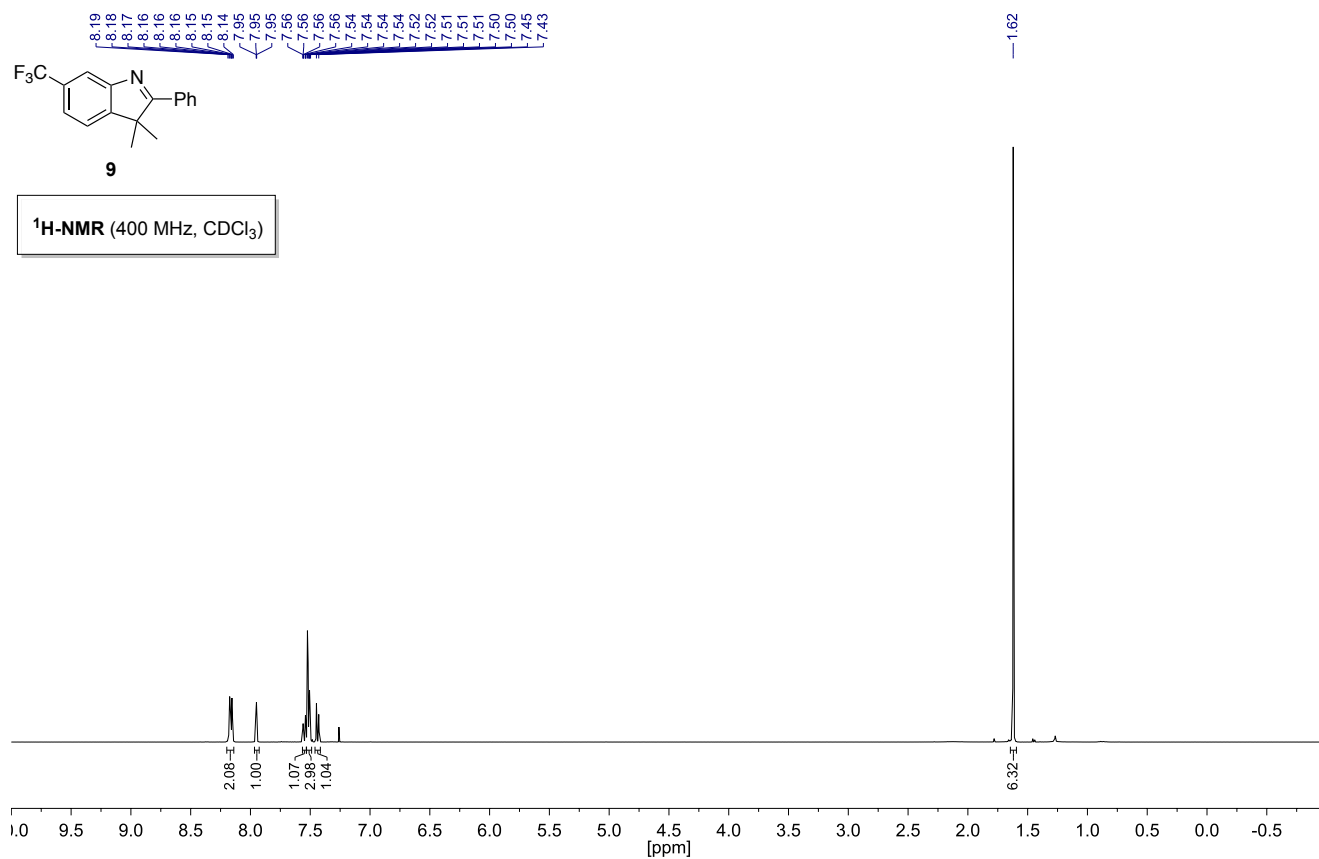
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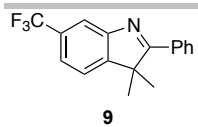
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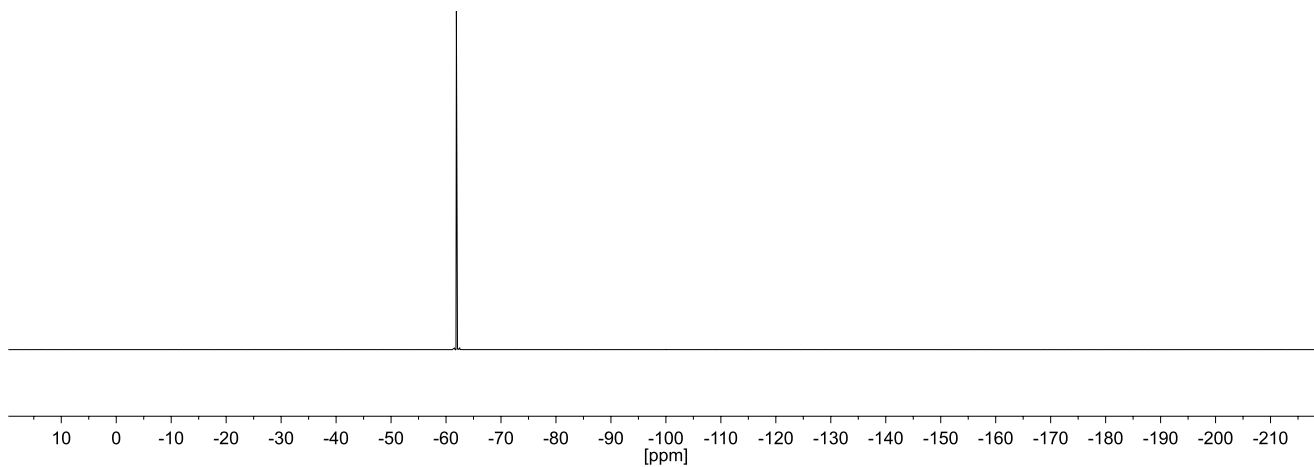
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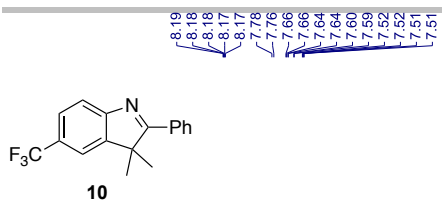
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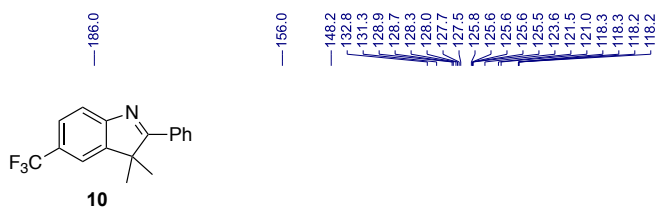
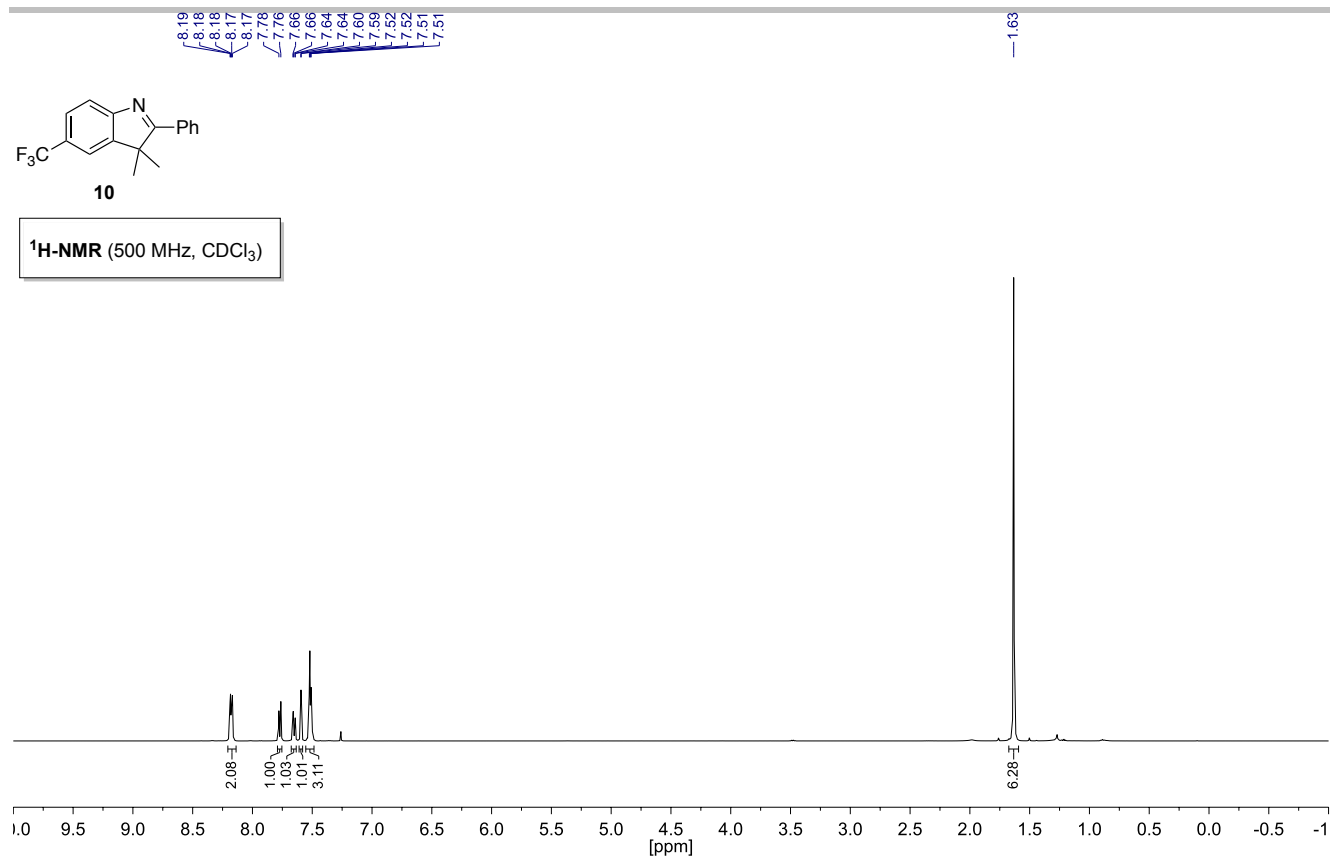
^{19}F -NMR (282 MHz, CDCl_3)



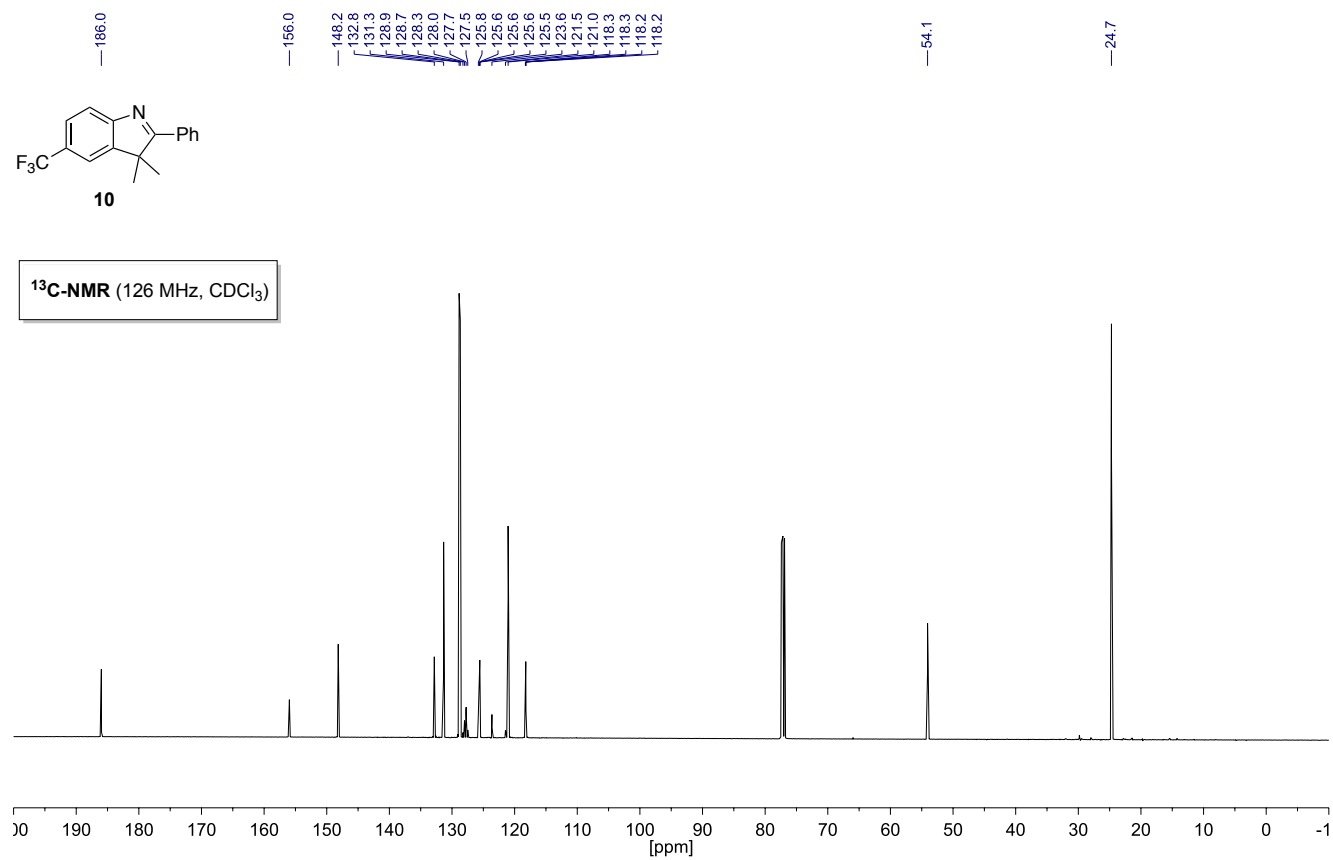
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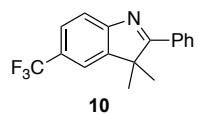
¹H-NMR (500 MHz, CDCl₃)



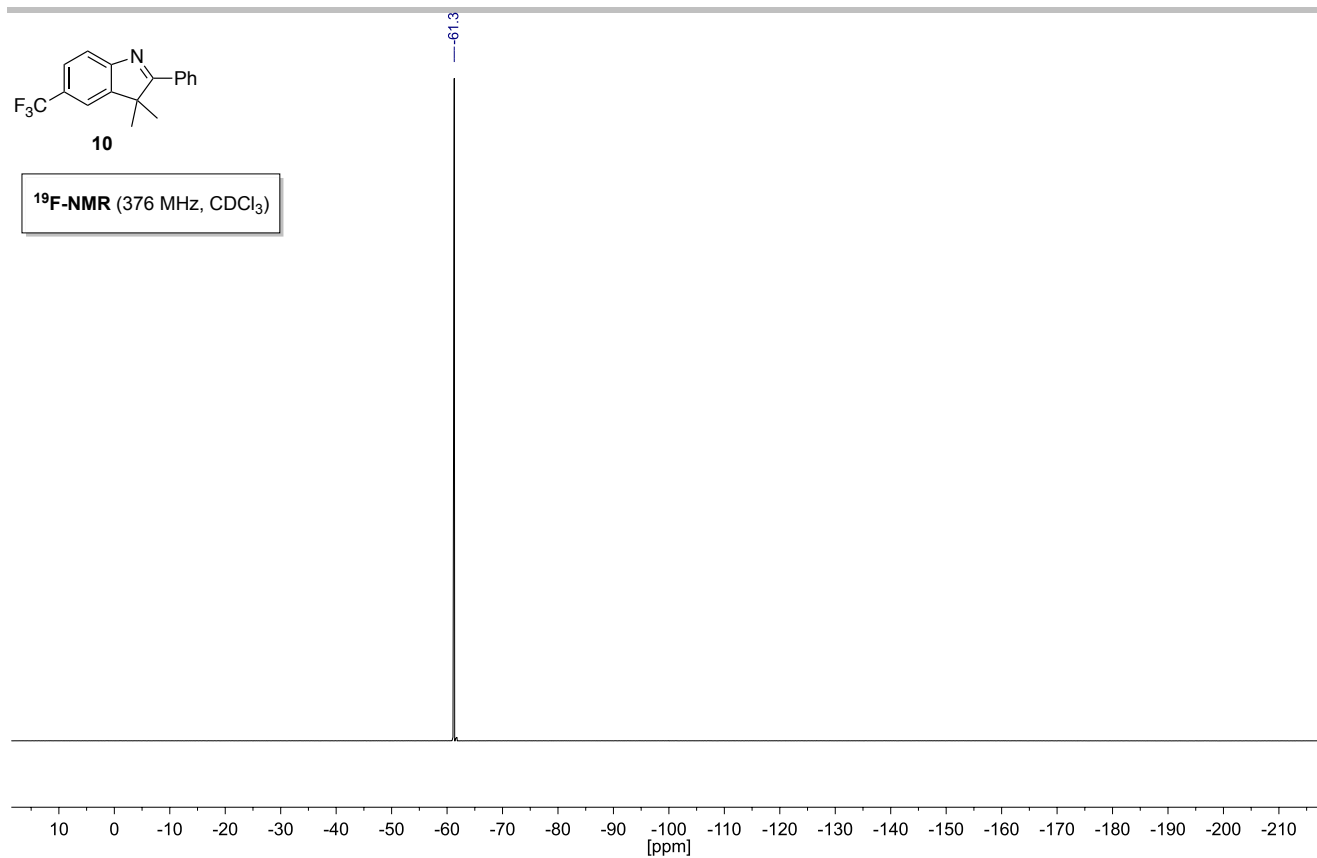
¹³C-NMR (126 MHz, CDCl₃)



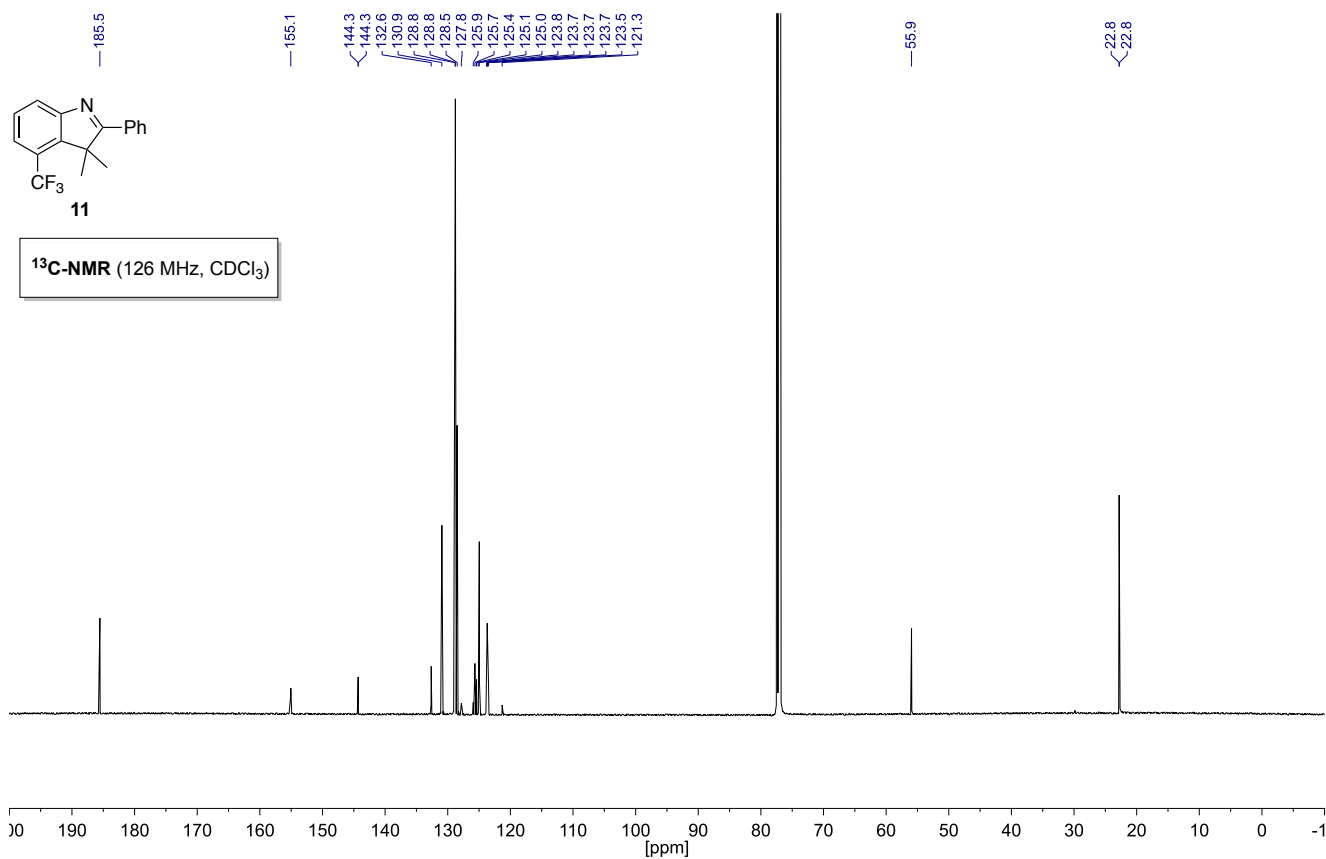
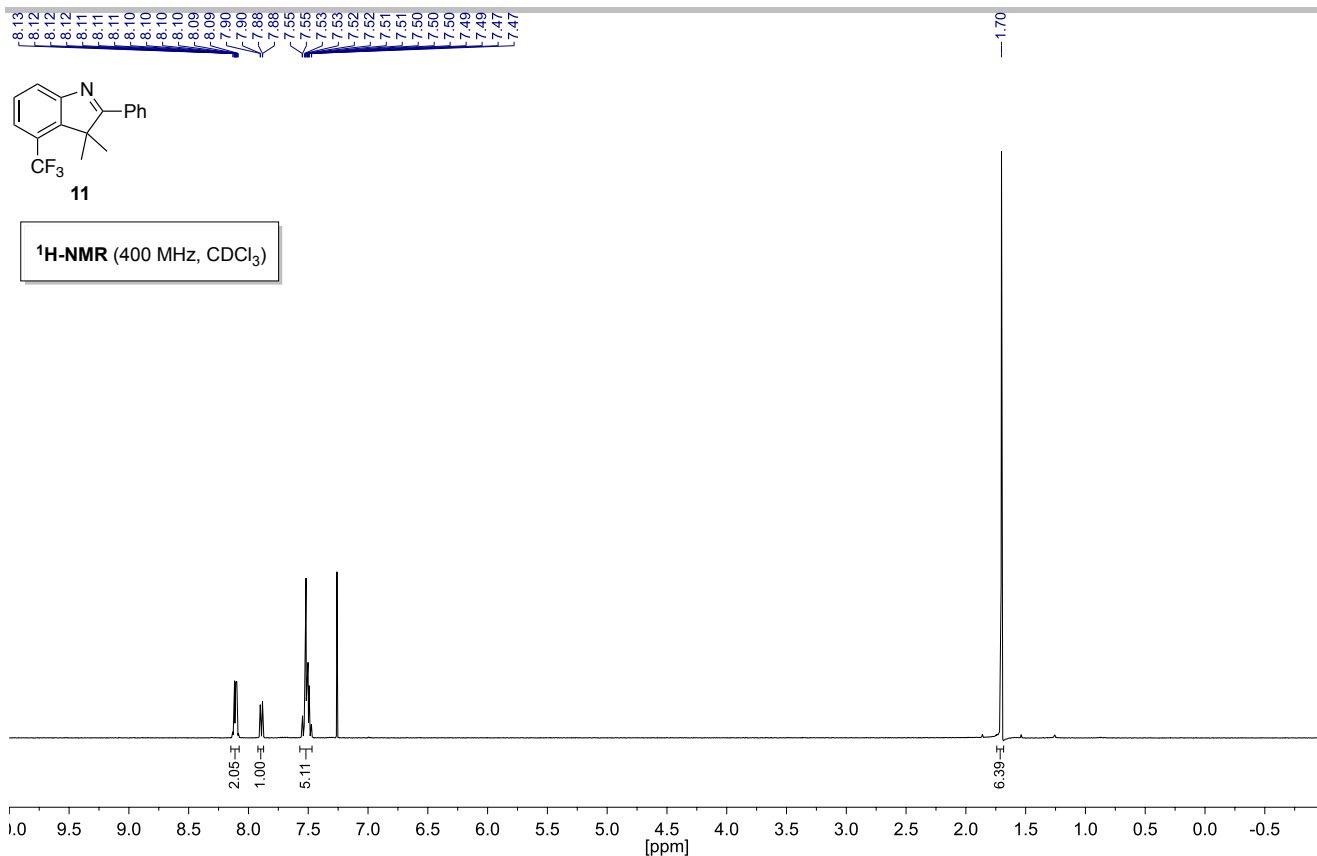
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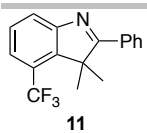
¹⁹F-NMR (376 MHz, CDCl₃)



SUPPORTING INFORMATION



SUPPORTING INFORMATION

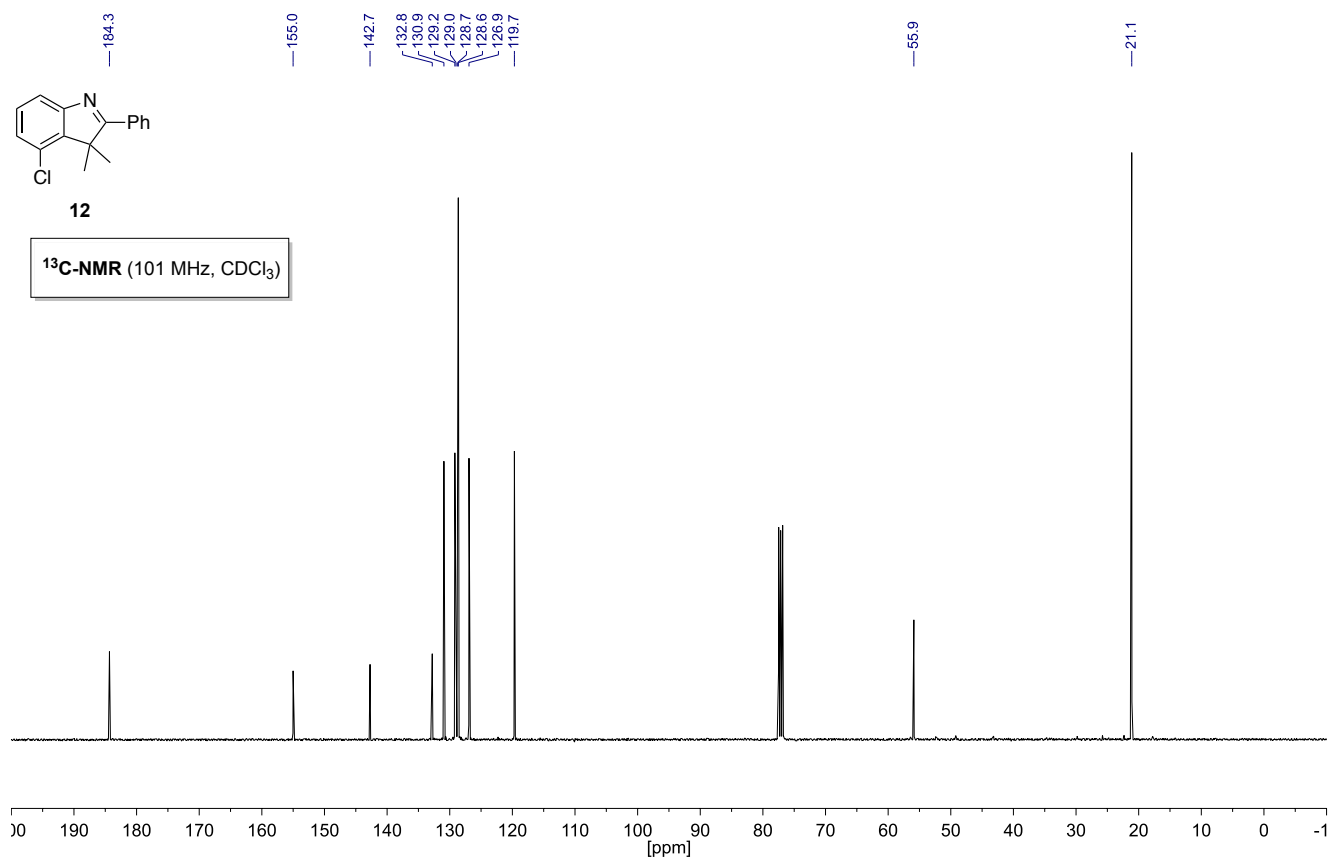
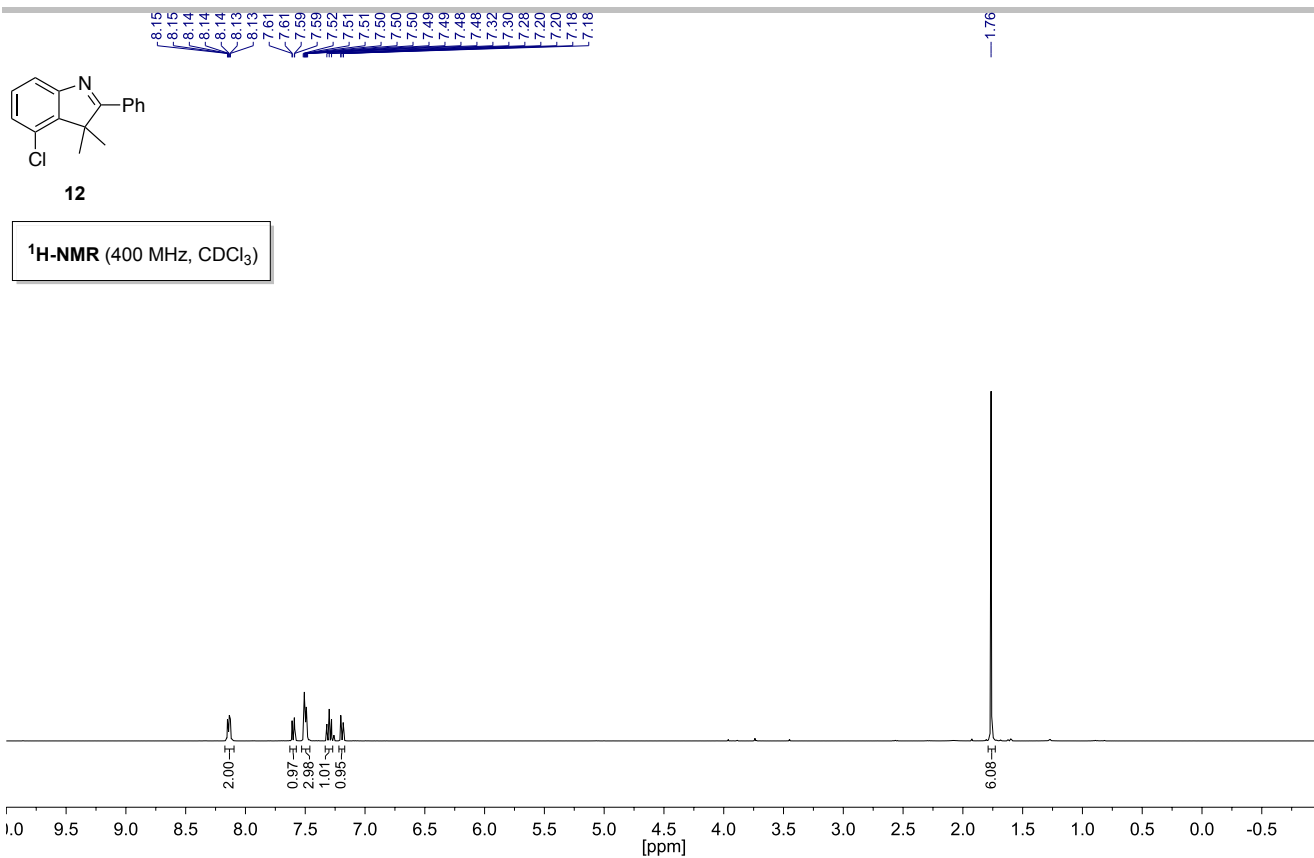


11

¹⁹F-NMR (376 MHz, CDCl₃)

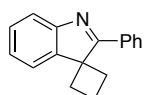


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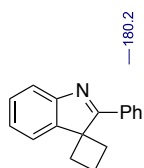
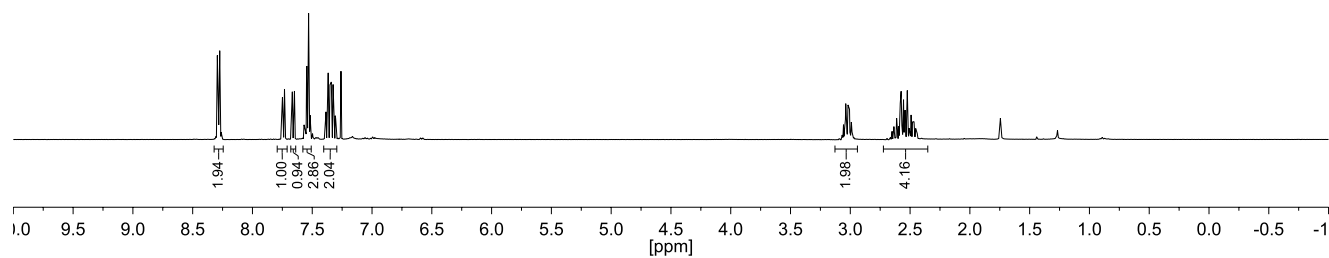
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8.29 8.29 8.29 8.28 8.28 8.28 8.27 7.75 7.75 7.75 7.73 7.73 7.67 7.67 7.67 7.65 7.65 7.65 7.56 7.56 7.55 7.55 7.55 7.54 7.54 7.54 7.54 7.53 7.53 7.53 7.52 7.52 7.51 7.39 7.39 7.37 7.37 7.35 7.35 7.34 7.34 7.34 7.33 7.32 7.32 7.31 7.31 3.04 3.04 3.04 3.03 3.03 3.02 3.02 3.01 3.01 2.89 2.89 2.61 2.61 2.58 2.58 2.58 2.57 2.57 2.57 2.56 2.56 2.55 2.55 2.54 2.54 2.52 2.48 2.47



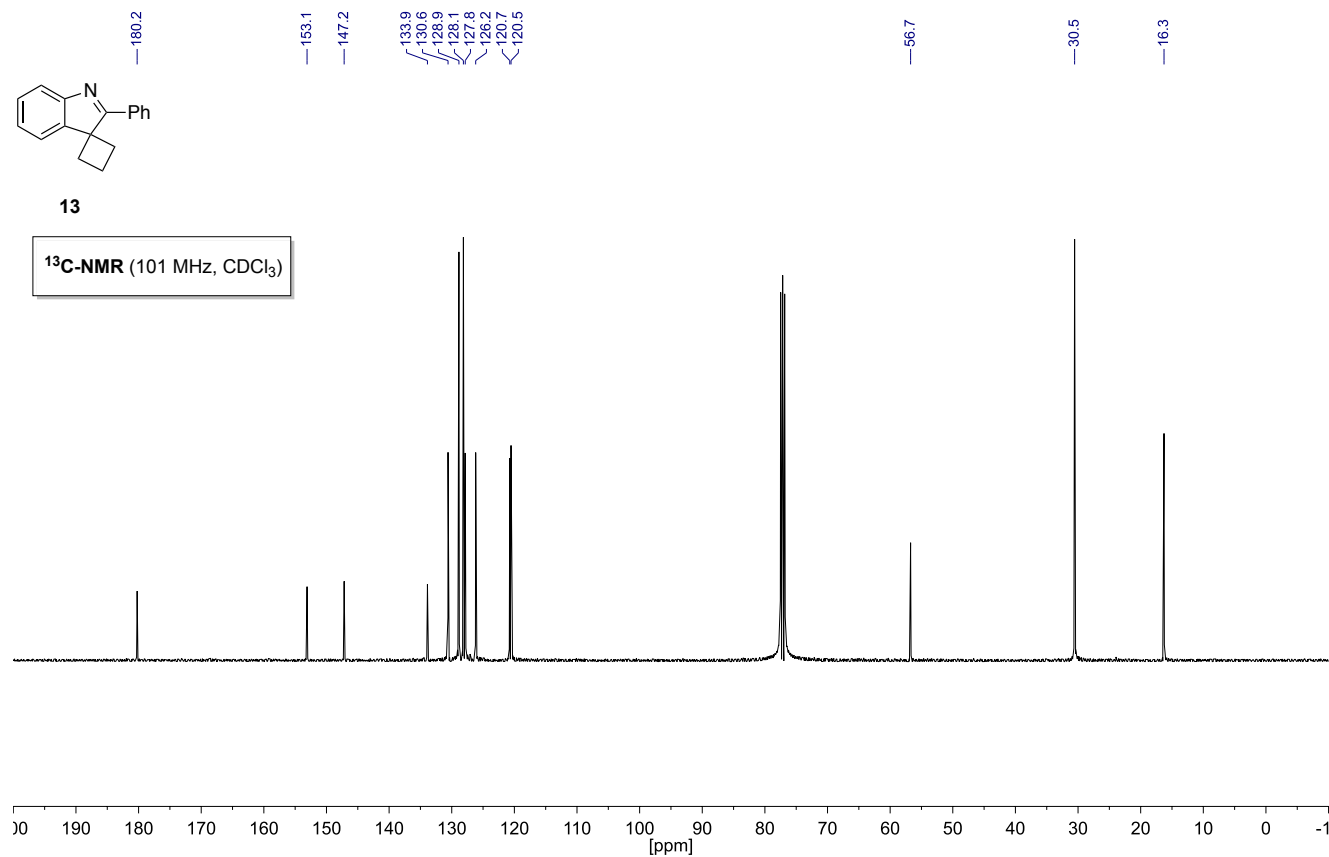
13

¹H-NMR (400 MHz, CDCl₃)



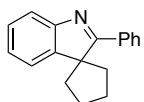
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¹³C-NMR (101 MHz, CDCl₃)



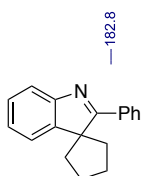
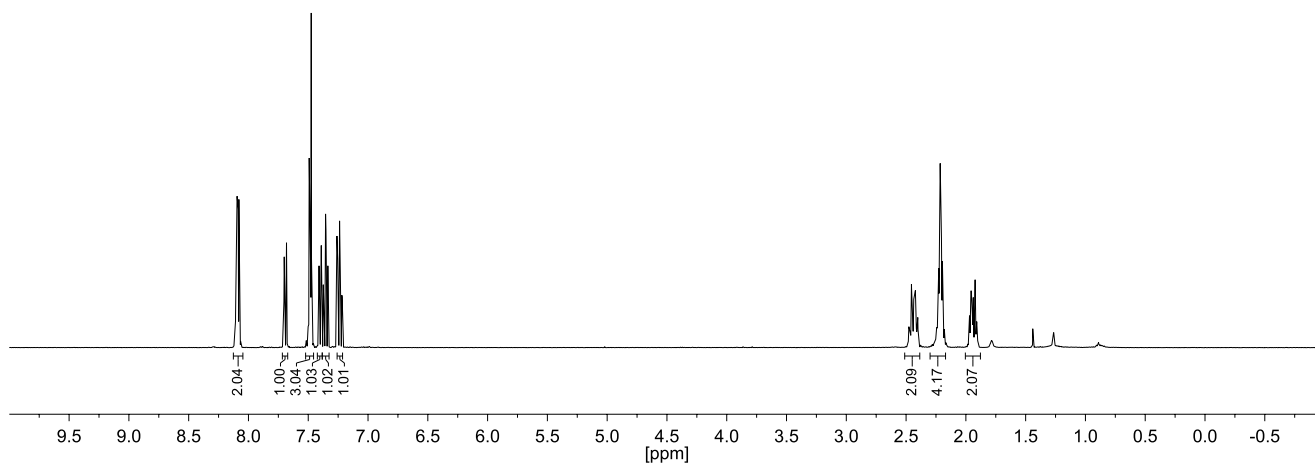
SUPPORTING INFORMATION

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8.10
8.10
8.09
8.08
8.08
7.70
7.70
7.68
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7.50
7.50
7.49
7.49
7.48
7.48
7.47
7.47
7.41
7.41
7.41
7.39
7.39
7.39
7.37
7.37
7.36
7.35
7.34
7.33
7.26
7.25
7.24
7.24
7.22
7.22
2.46
2.46
2.45
2.44
2.44
2.44
2.42
2.42
2.24
2.23
2.23
2.22
2.22
2.22
2.21
2.21
2.20
2.20
2.20
2.19
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1.95
1.95
1.94
1.94
1.93
1.92
1.92



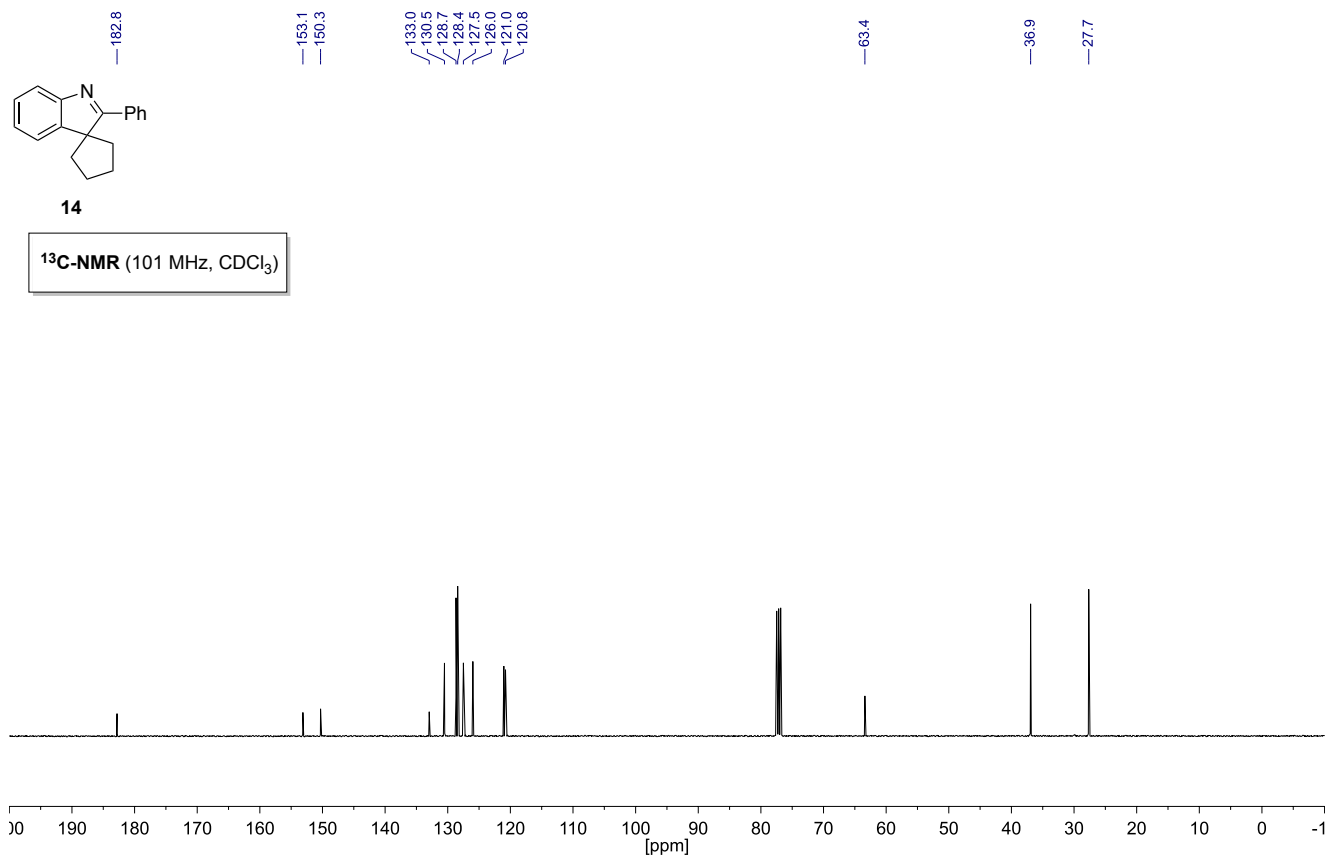
14

¹H-NMR (400 MHz, CDCl₃)

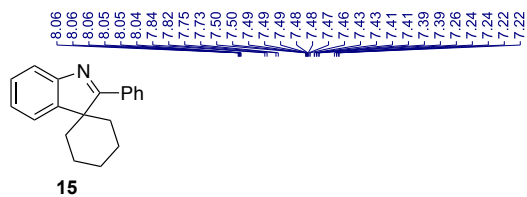


14

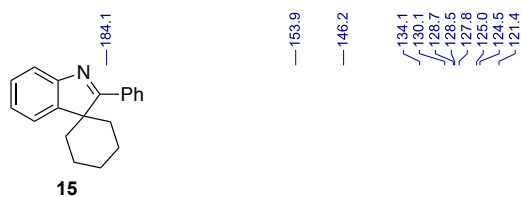
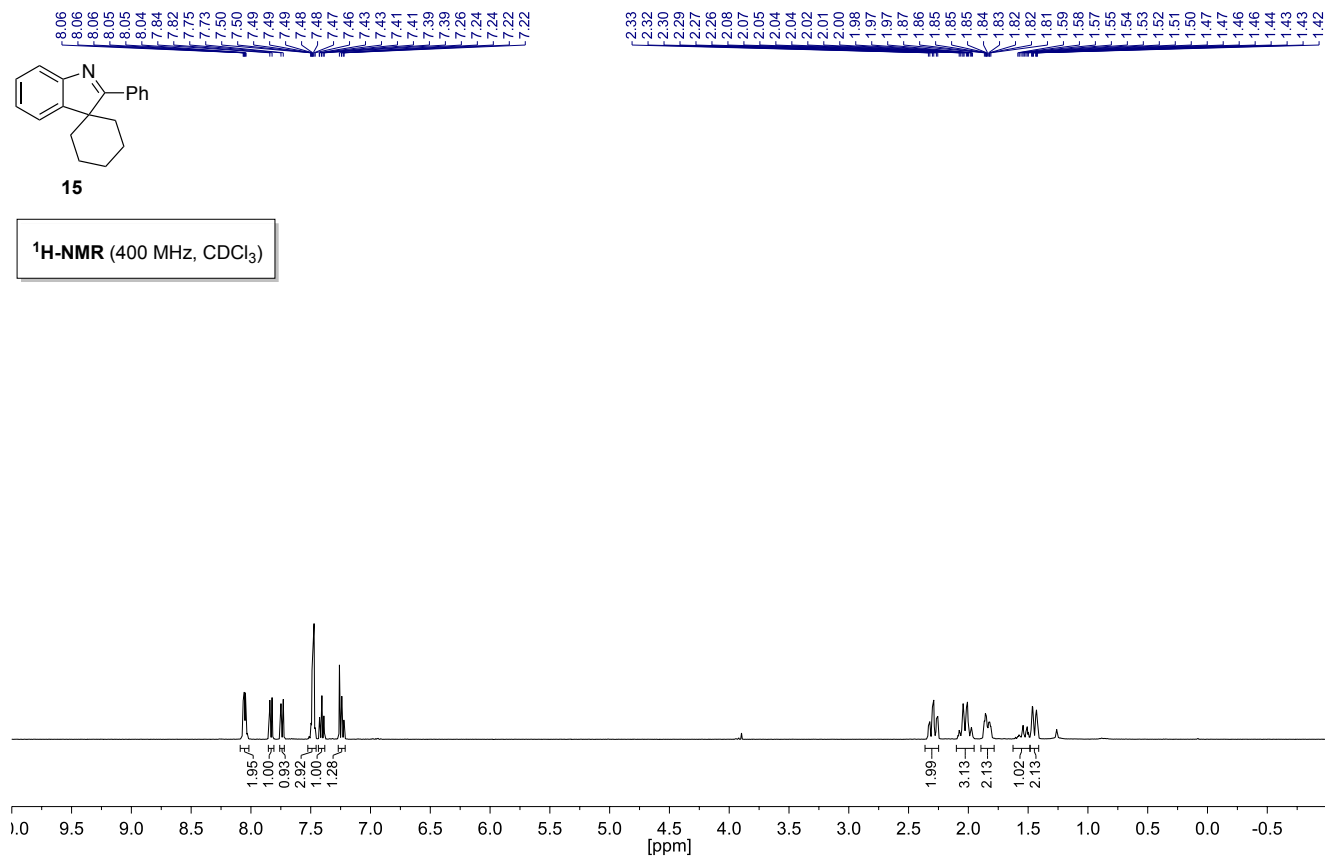
¹³C-NMR (101 MHz, CDCl₃)



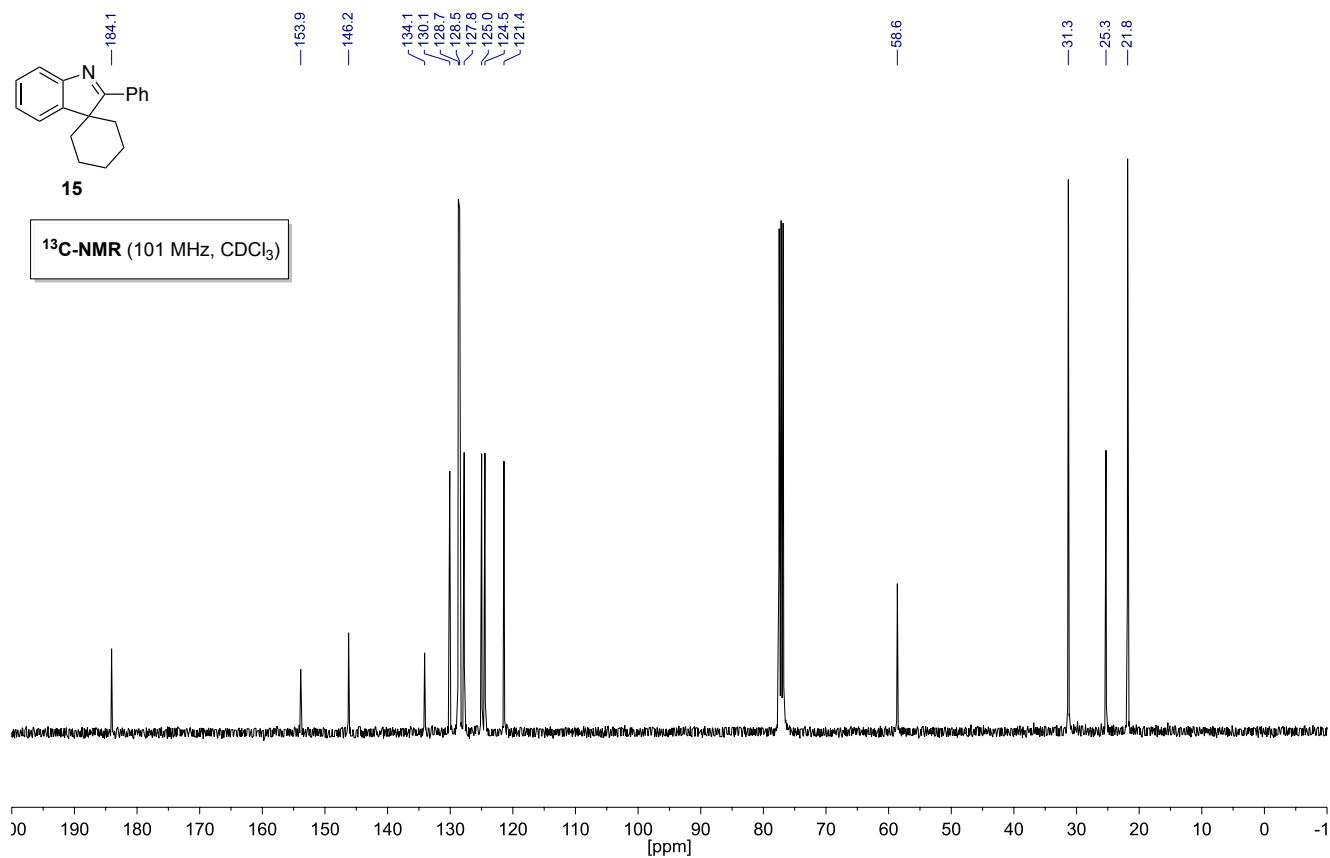
SUPPORTING INFORMATION



¹H-NMR (400 MHz, CDCl₃)

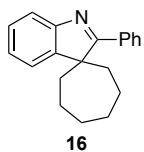


¹³C-NMR (101 MHz, CDCl₃)

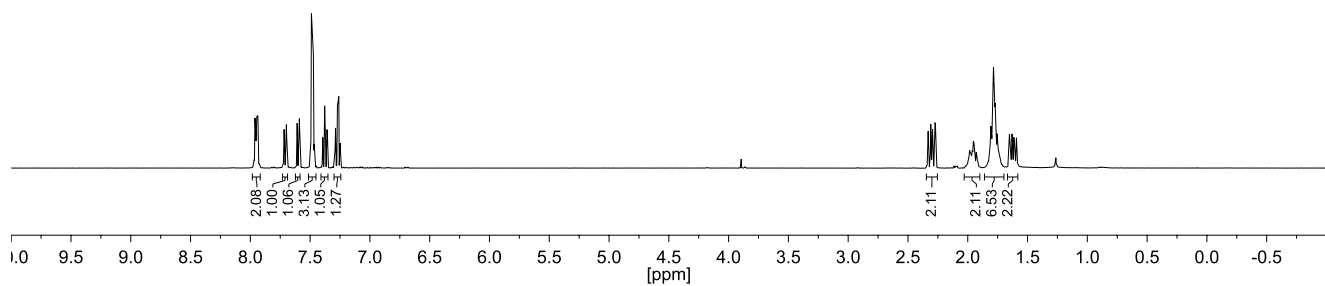


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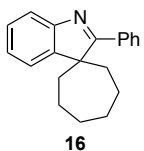
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7.95
7.95
7.94
7.94
7.93
7.72
7.72
7.70
7.70
7.61
7.61
7.59
7.59
7.59
7.49
7.49
7.48
7.48
7.48
7.45
7.47
7.47
7.40
7.38
7.38
7.36
7.36
7.29
7.29
7.27
7.27
7.26
7.25
7.25
2.34
2.33
2.31
2.31
2.30
2.29
2.27
2.27
1.99
1.98
1.98
1.96
1.95
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1.80
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1.78
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1.63
1.63
1.61
1.59
1.59



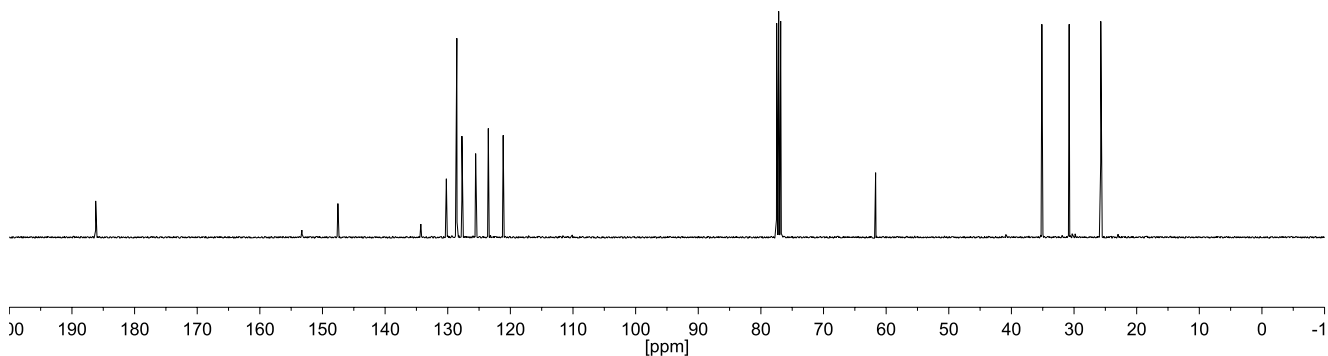
¹H-NMR (400 MHz, CDCl₃)



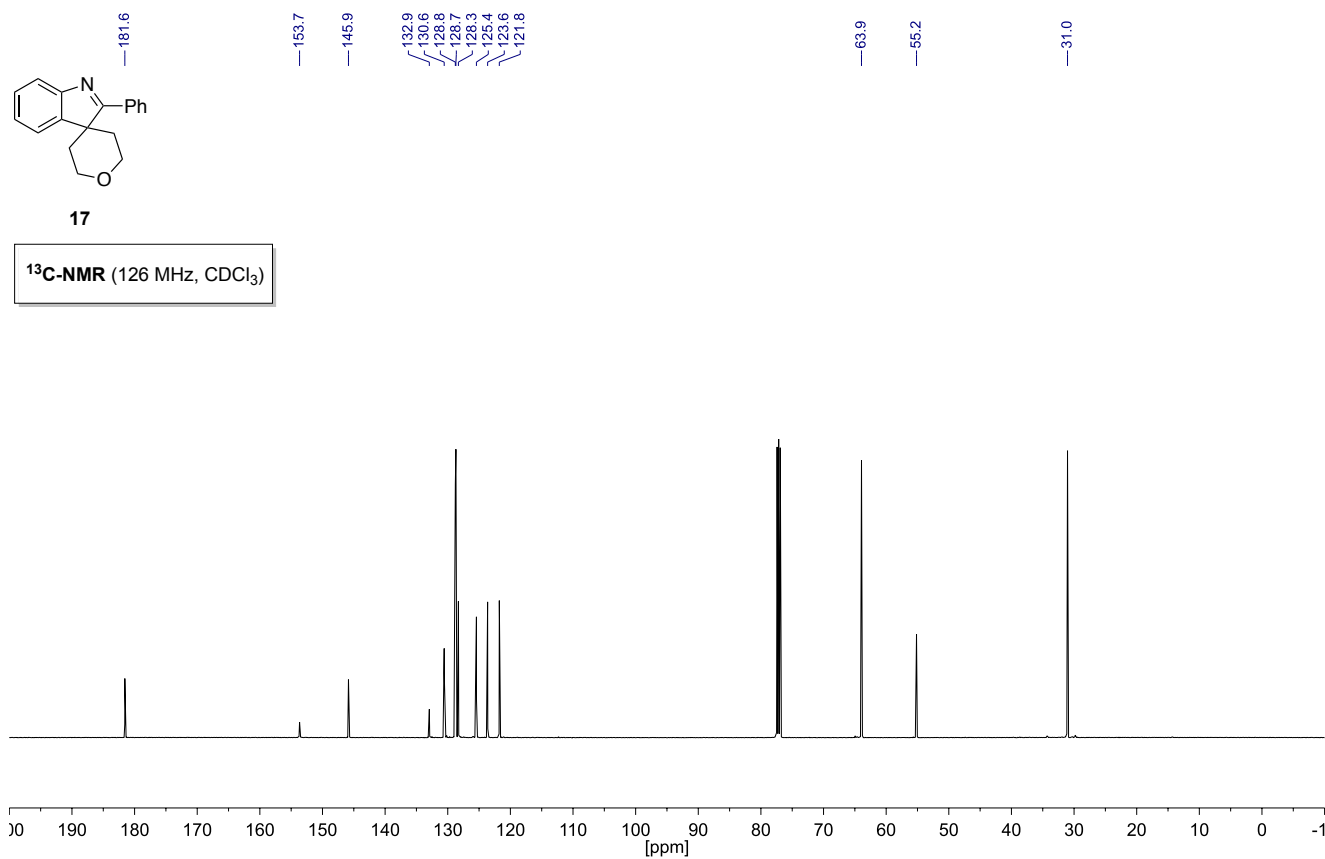
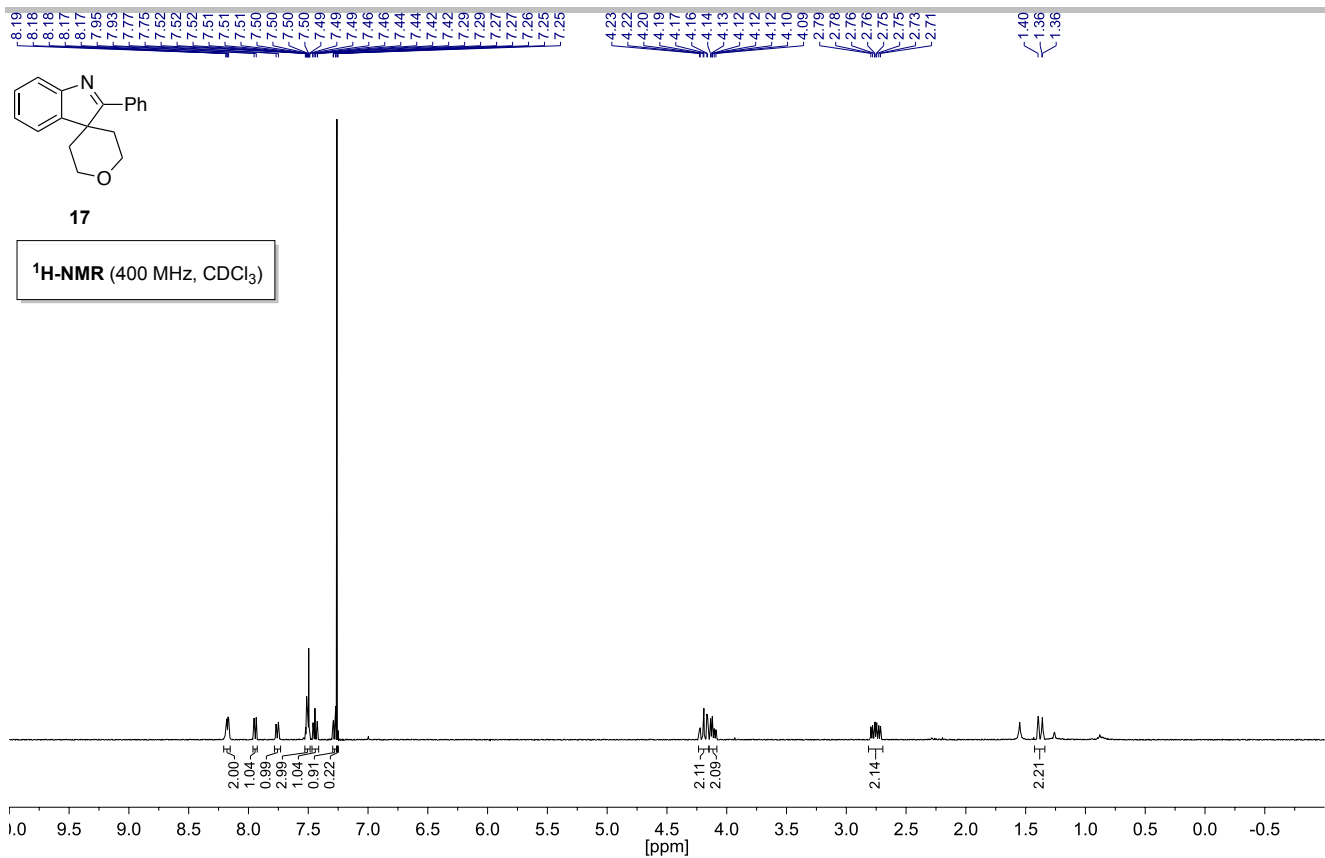
186.2
153.3
147.5
134.3
130.2
128.7
128.5
127.7
125.5
123.5
121.1
61.7
35.1
30.8
25.7



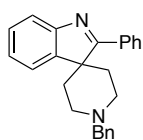
¹³C-NMR (126 MHz, CDCl₃)



SUPPORTING INFORMATION

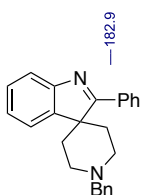
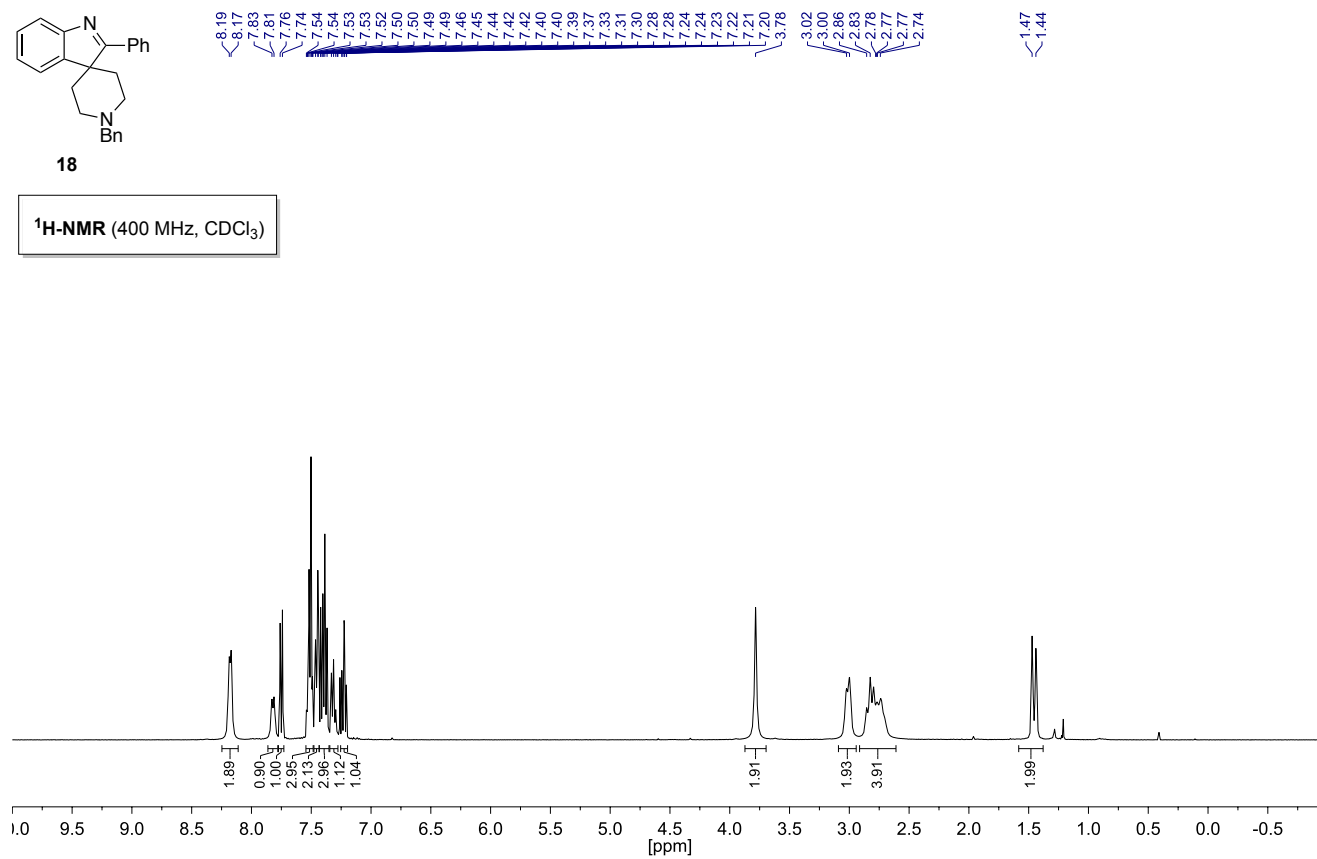


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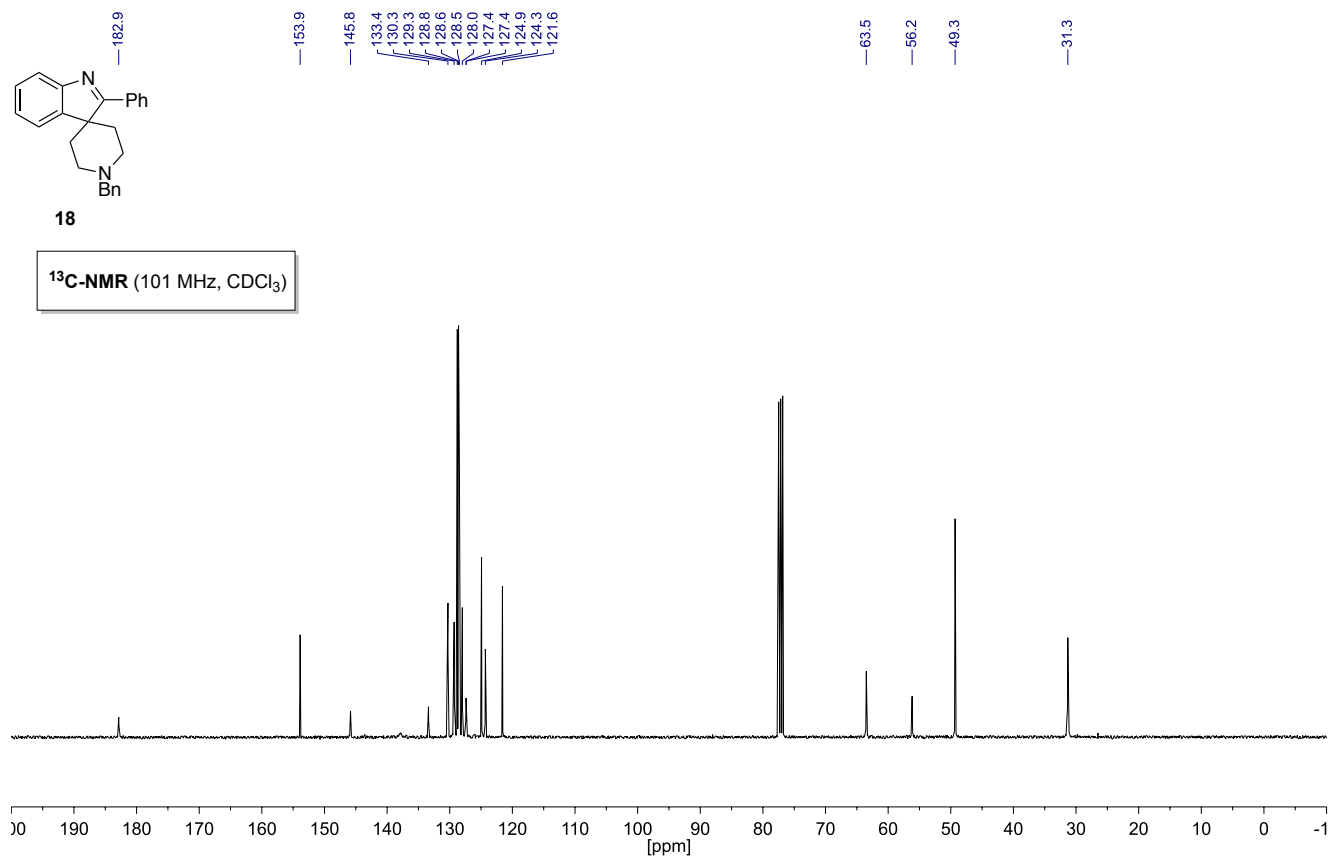
18

¹H-NMR (400 MHz, CDCl₃)

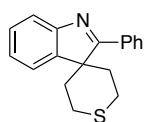


18

¹³C-NMR (101 MHz, CDCl₃)



SUPPORTING INFORMATION

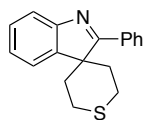
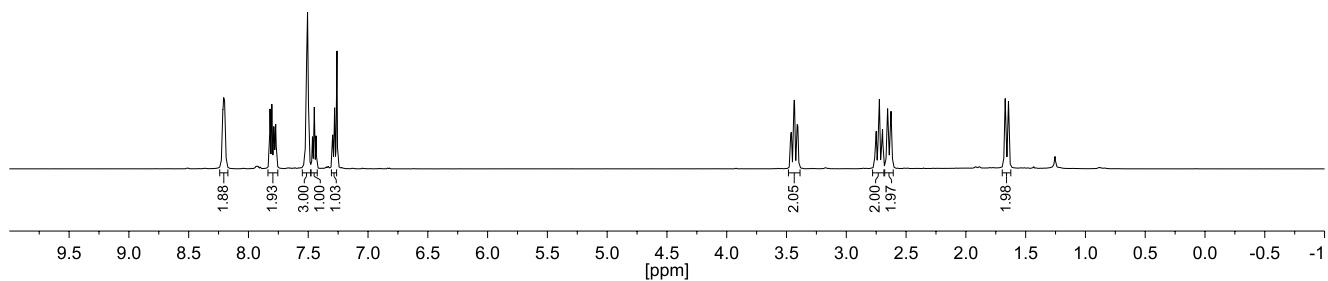


19

¹H-NMR (500 MHz, CDCl₃)

8.22
8.21
8.20
8.20
7.82
7.80
7.79
7.77
7.53
7.52
7.52
7.51
7.51
7.50
7.49
7.49
7.47
7.45
7.43
7.30
7.28
7.26

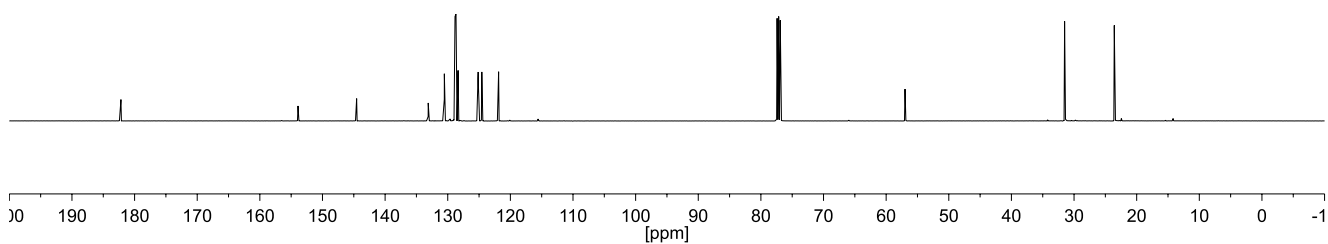
3.46
3.46
3.44
3.43
3.41
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2.75
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2.72
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2.65
2.63
1.67
1.64



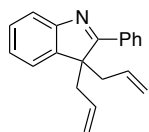
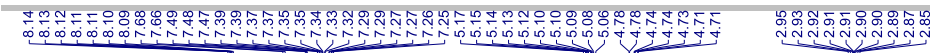
19

¹³C-NMR (126 MHz, CDCl₃)

182.2
153.9
144.5
133.1
130.5
128.8
128.7
128.4
125.1
124.6
121.9
57.0
31.5
23.6

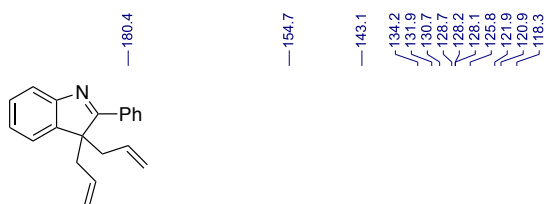
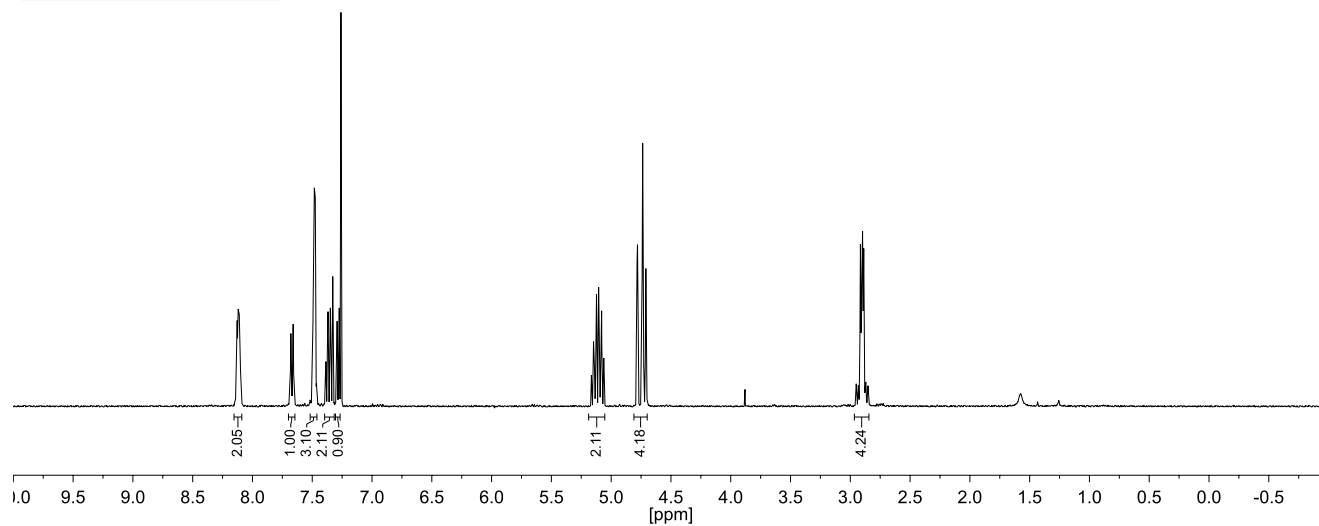


SUPPORTING INFORMATION



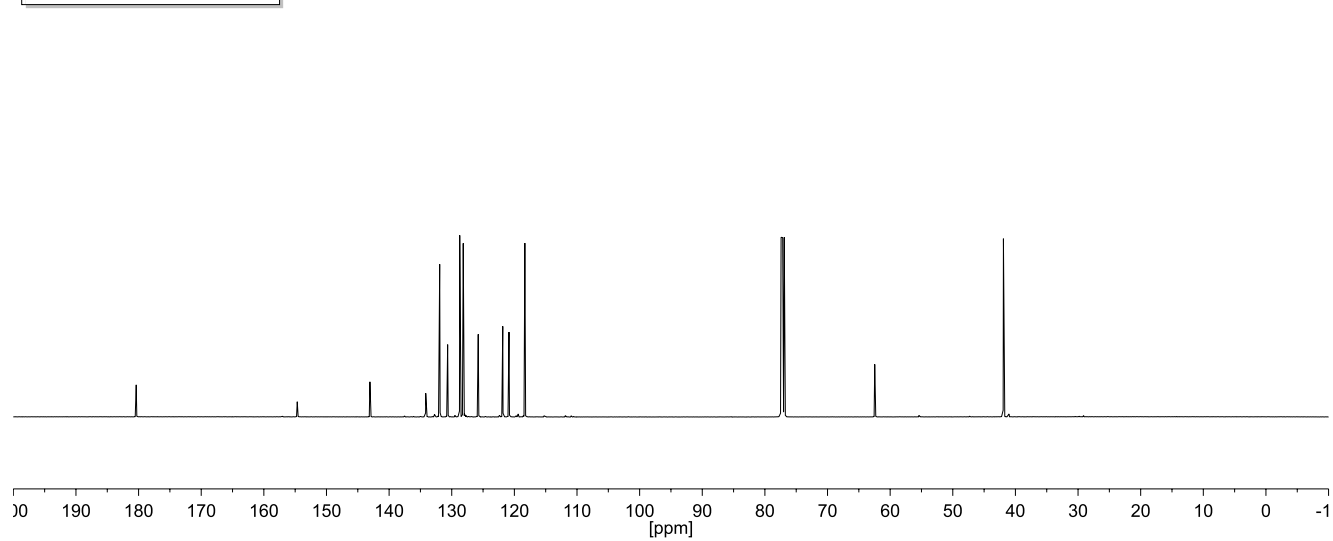
20

¹H-NMR (400 MHz, CDCl₃)

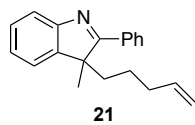


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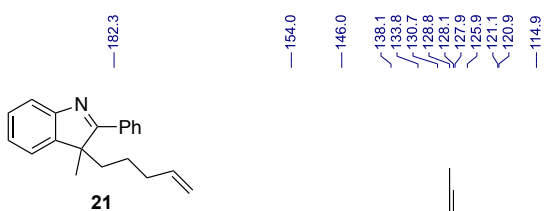
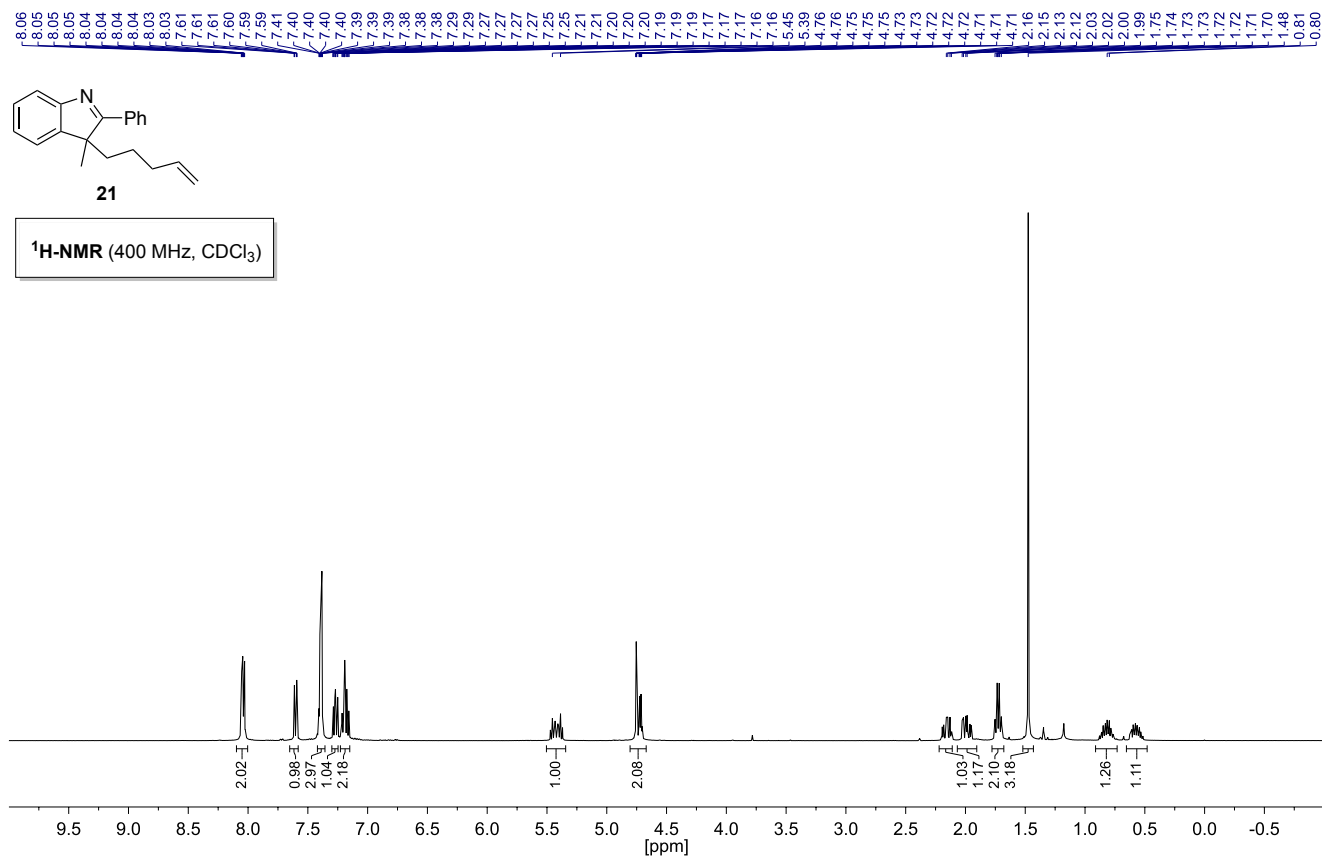
¹³C-NMR (126 MHz, CDCl₃)



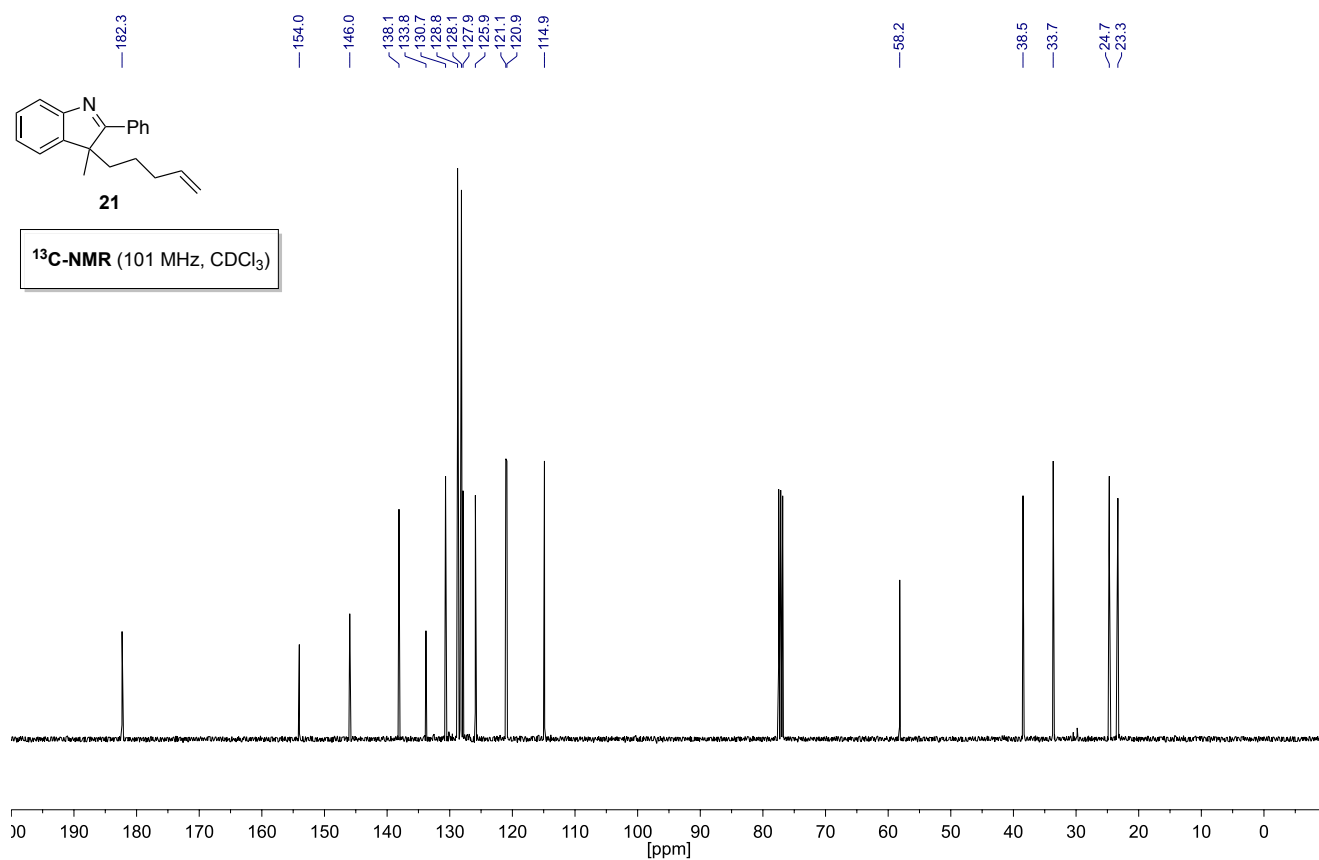
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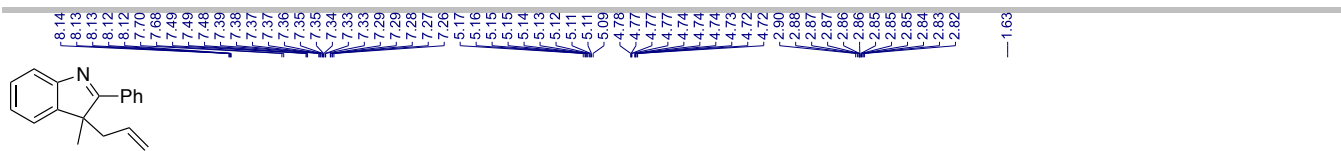
¹H-NMR (400 MHz, CDCl₃)



¹³C-NMR (101 MHz, CDCl₃)

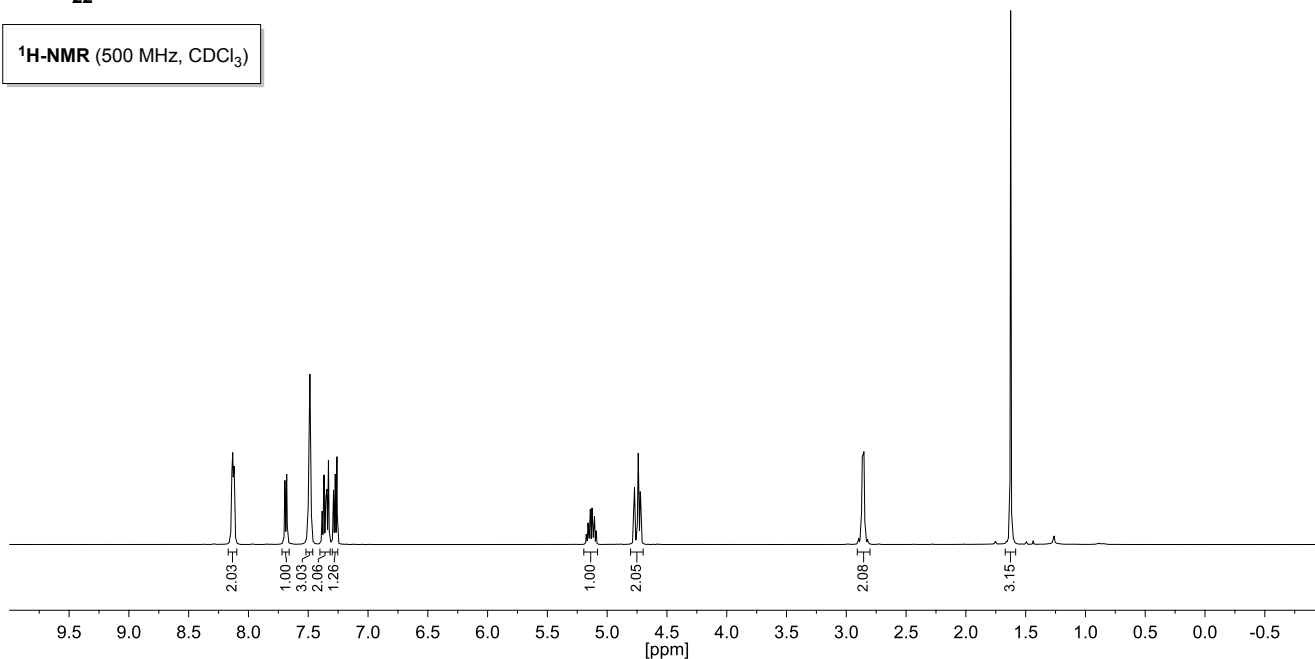


SUPPORTING INFORMATION



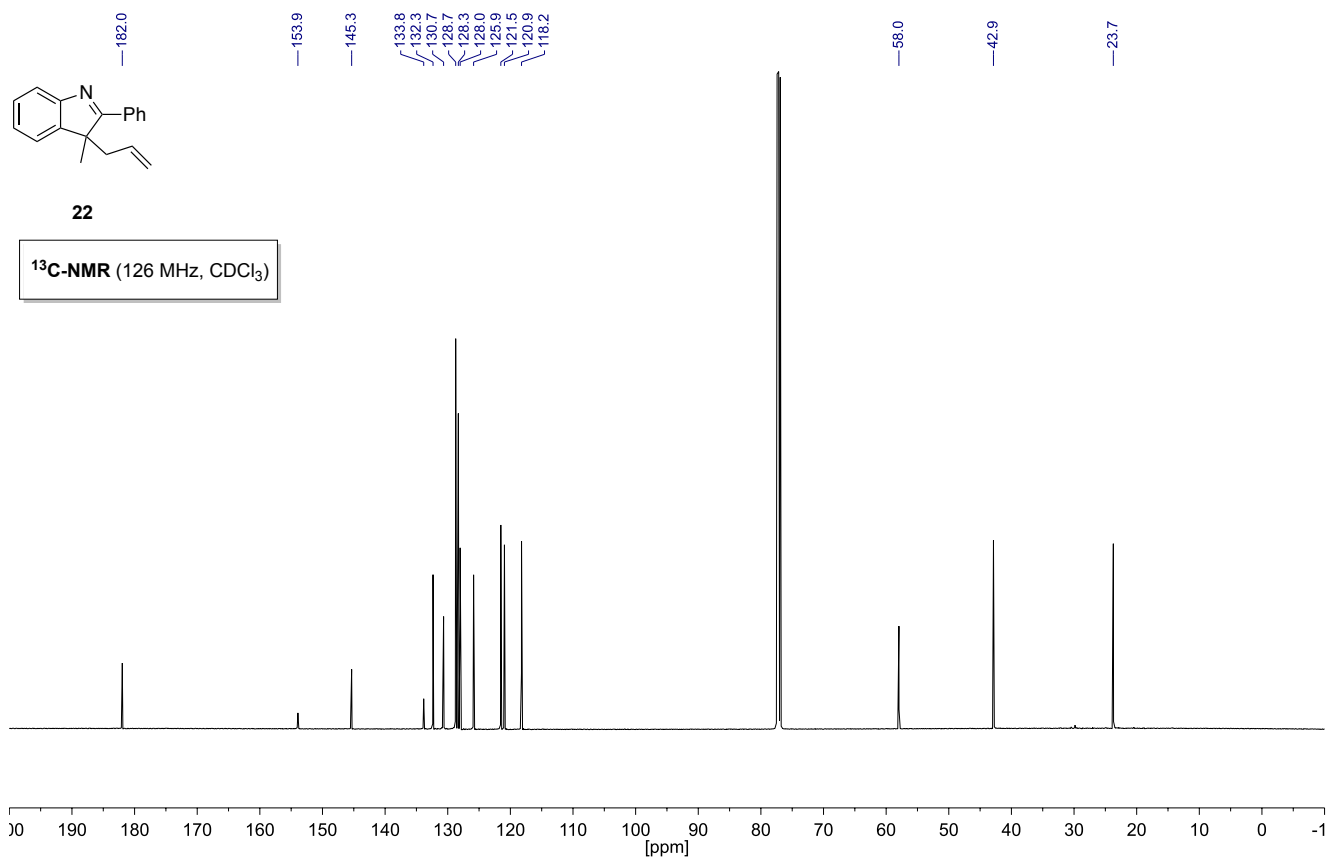
22

¹H-NMR (500 MHz, CDCl₃)

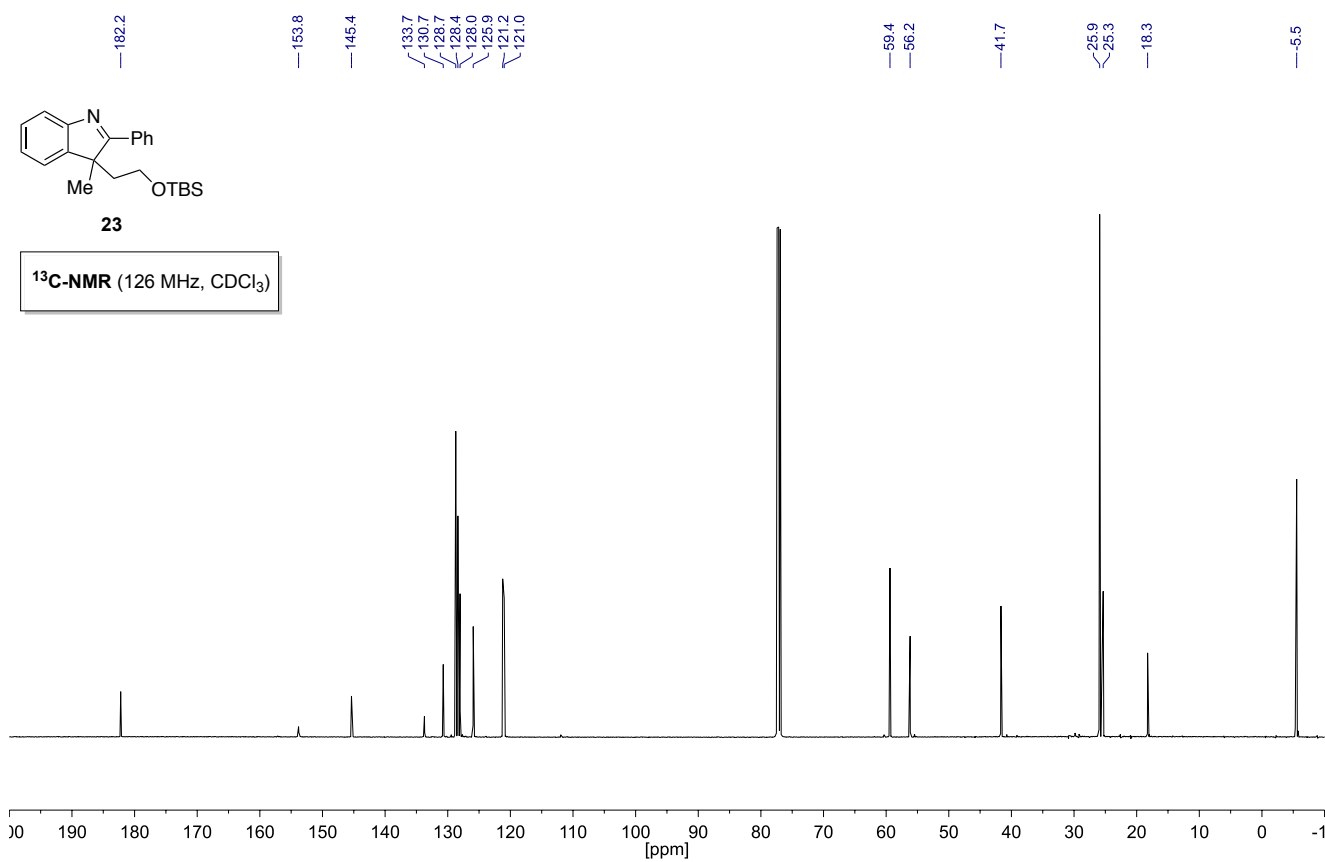
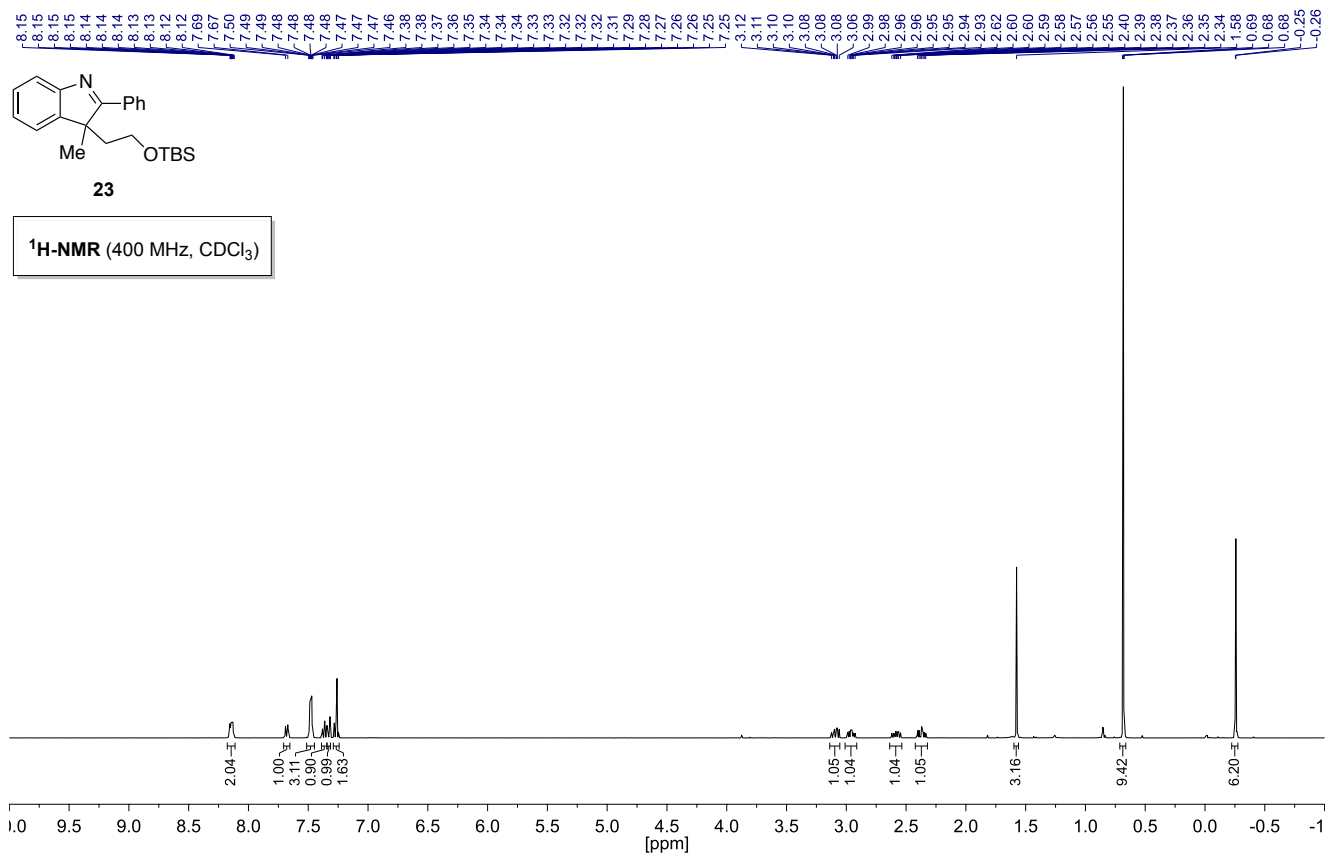


22

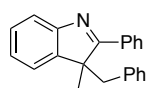
¹³C-NMR (126 MHz, CDCl₃)



SUPPORTING INFORMATION



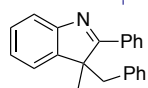
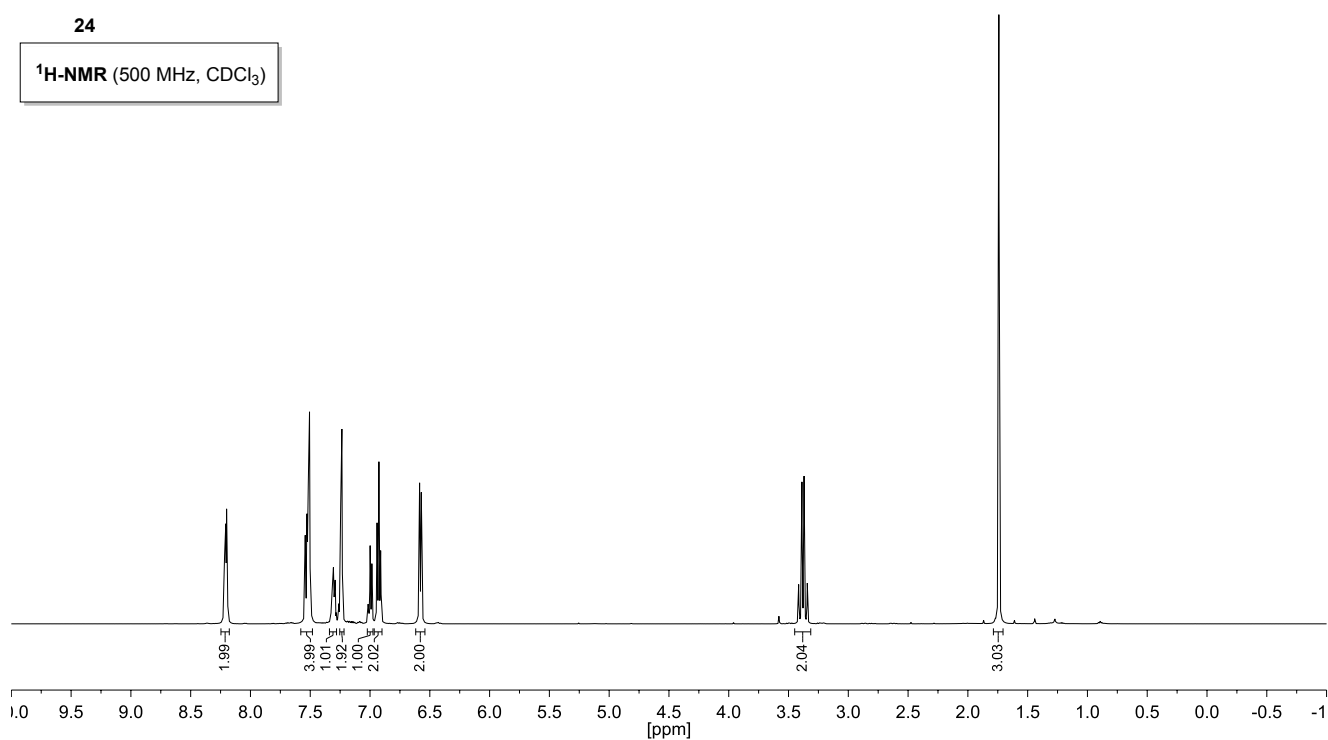
SUPPORTING INFORMATION



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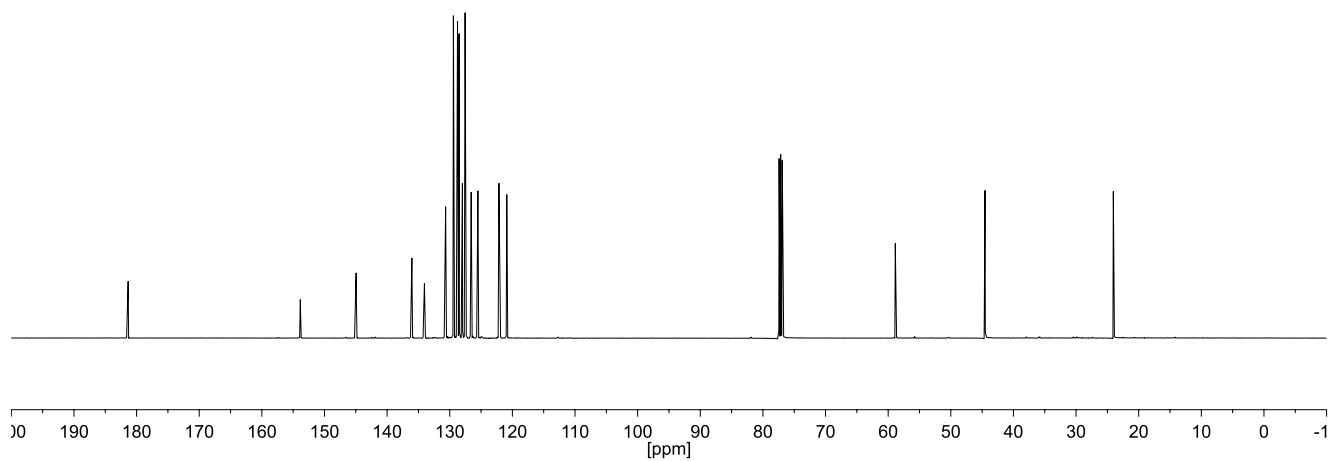
¹H-NMR (500 MHz, CDCl₃)



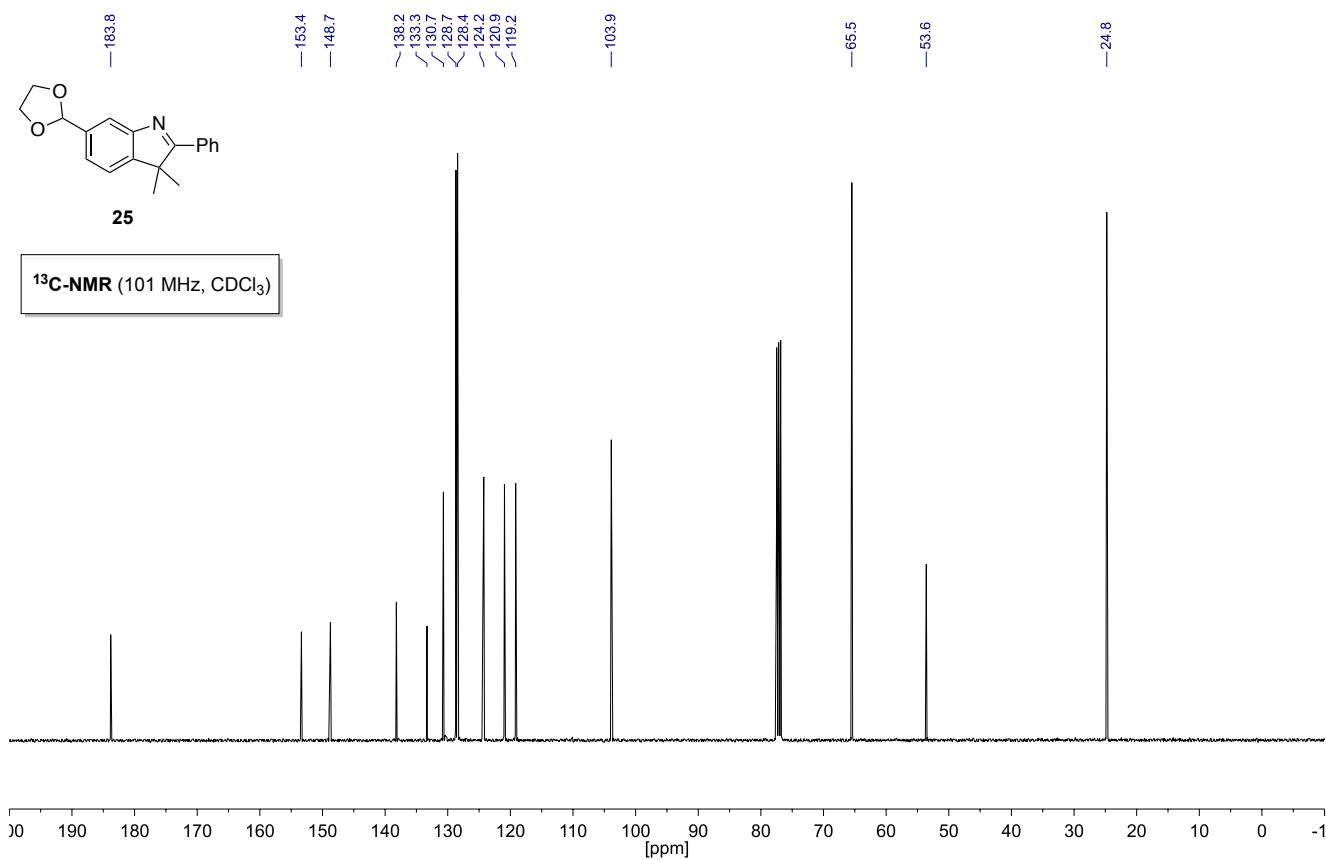
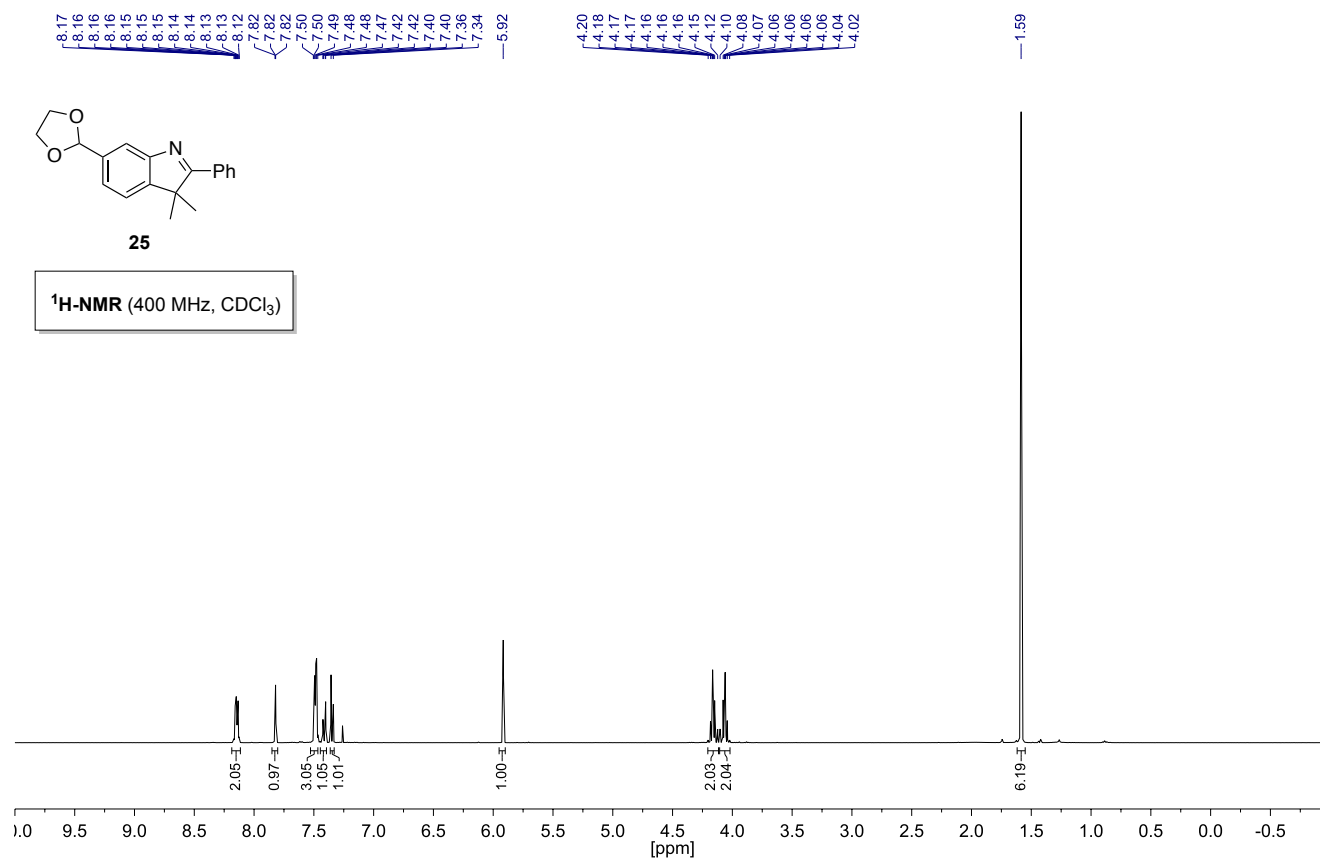
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134.0
130.7
129.4
128.8
128.5
128.0
127.6
126.6
125.5
122.1
120.9
58.9
44.5
24.1

24

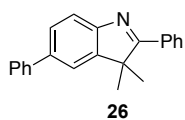
¹³C-NMR (126 MHz, CDCl₃)



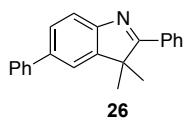
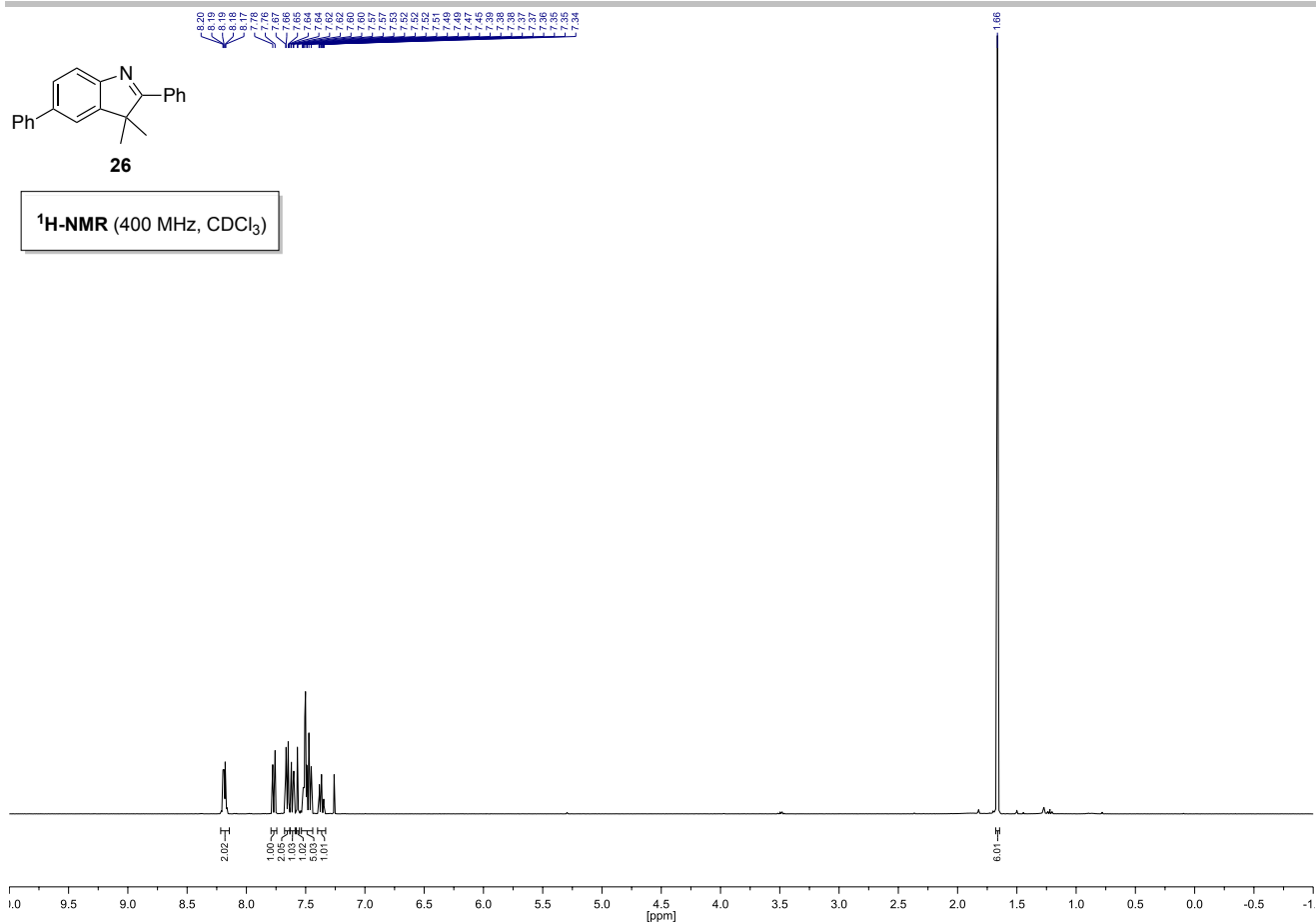
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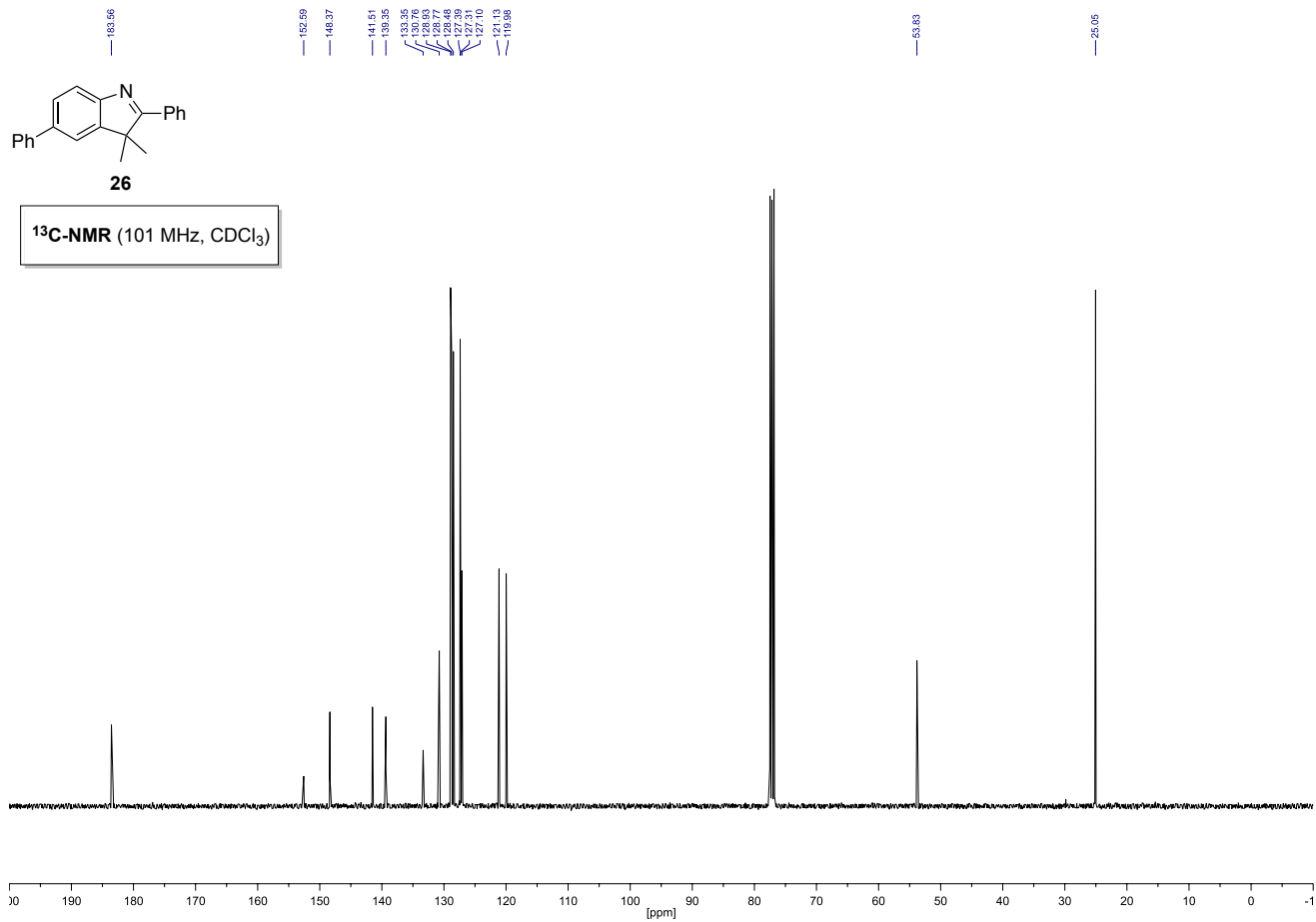
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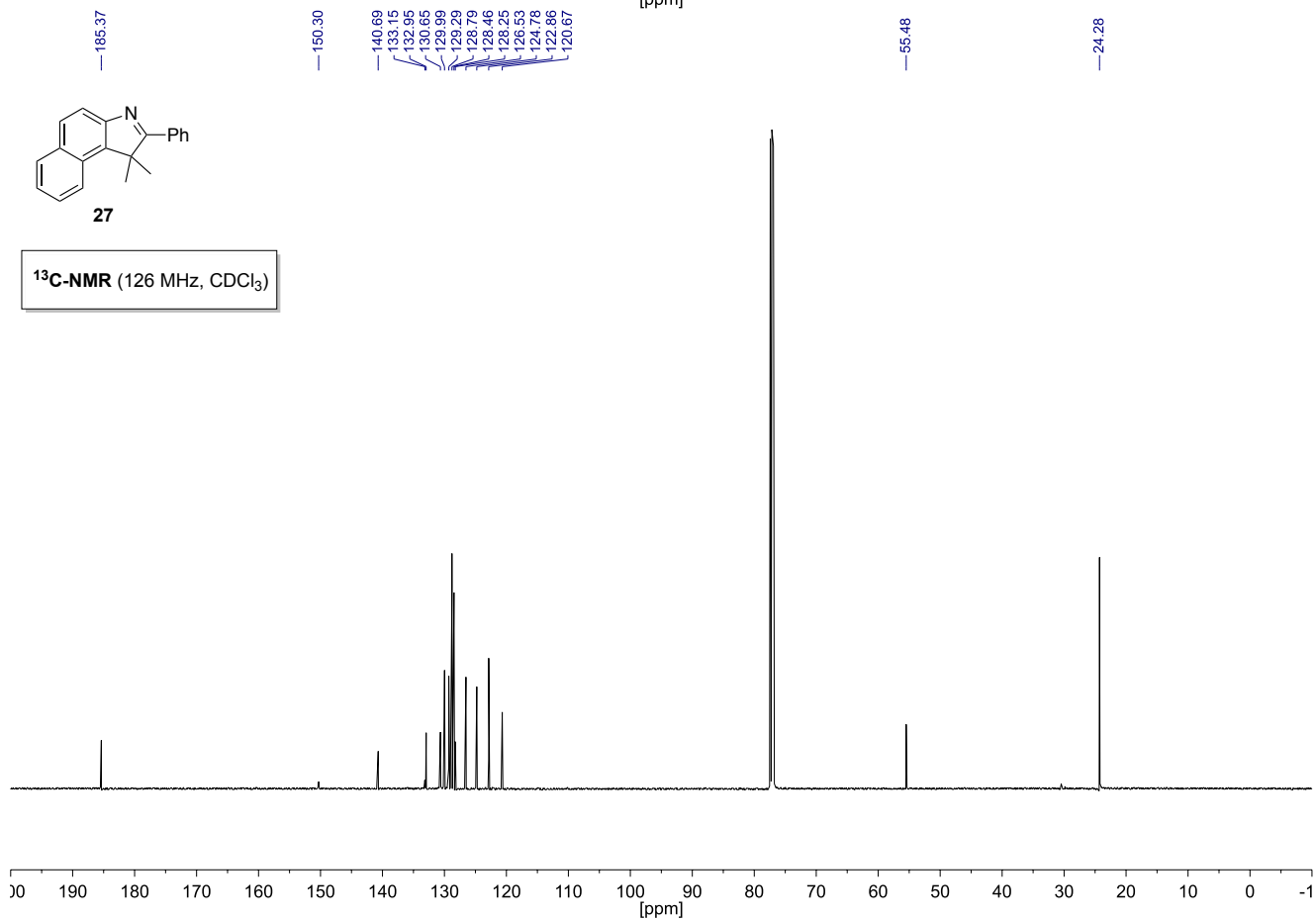
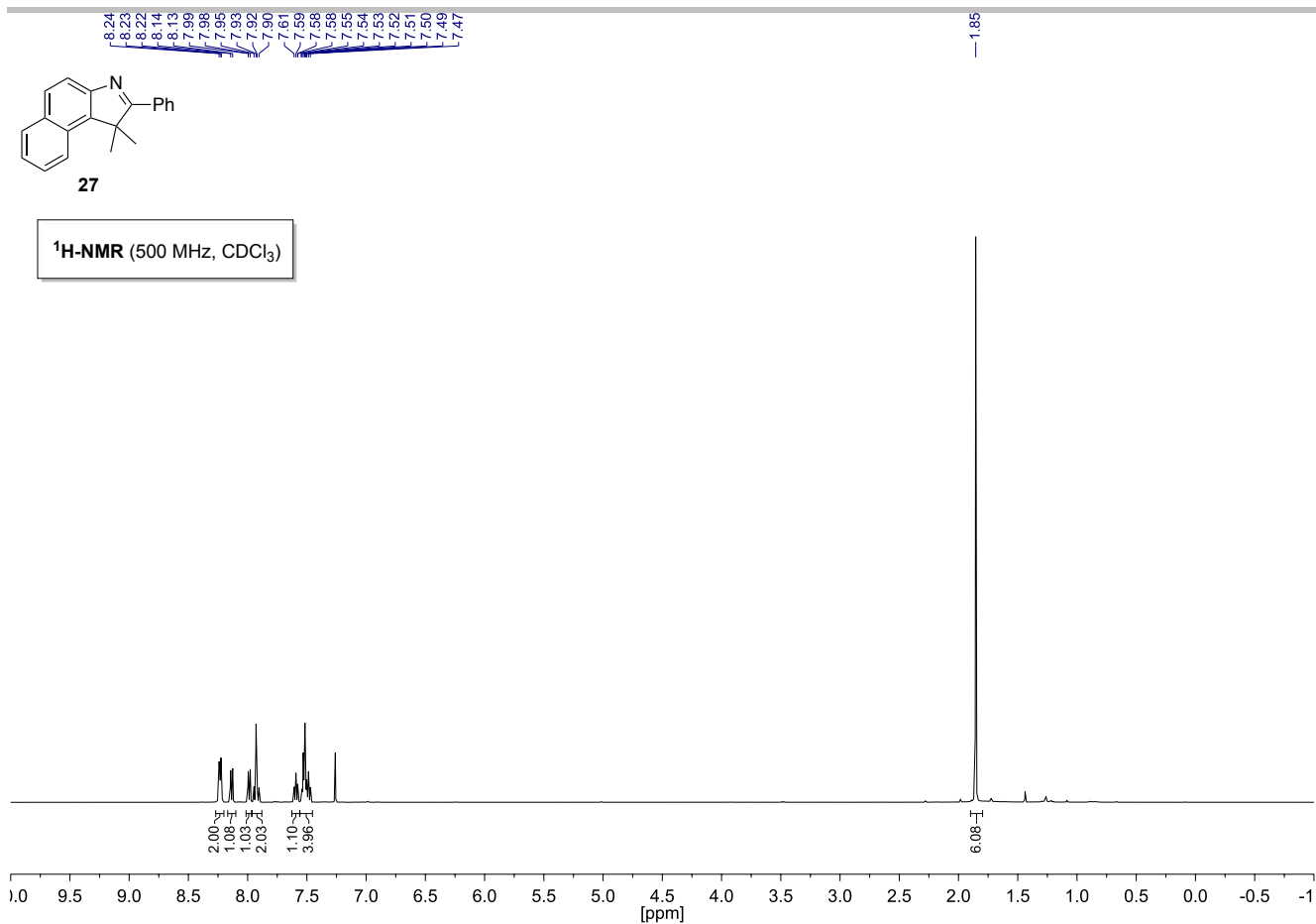
¹H-NMR (400 MHz, CDCl₃)



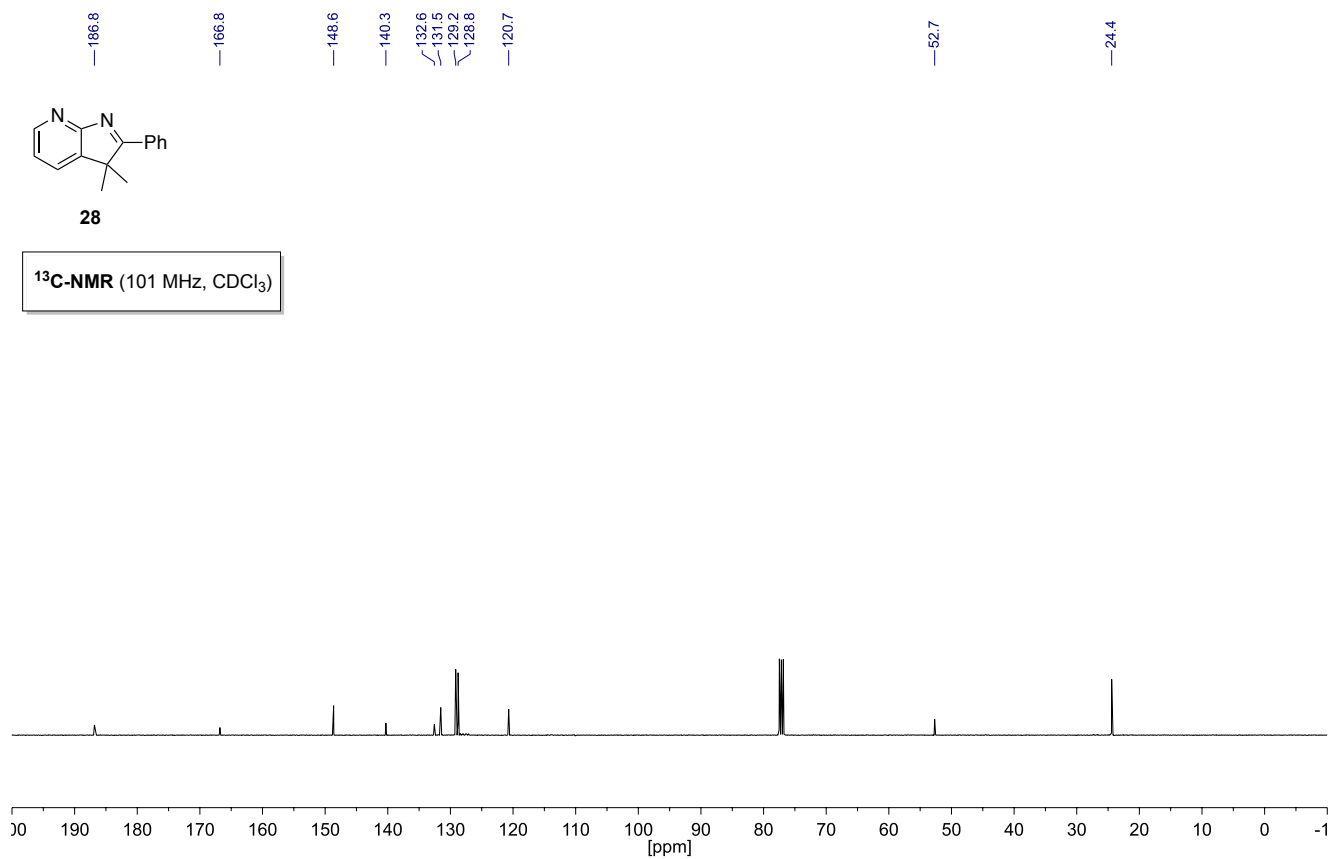
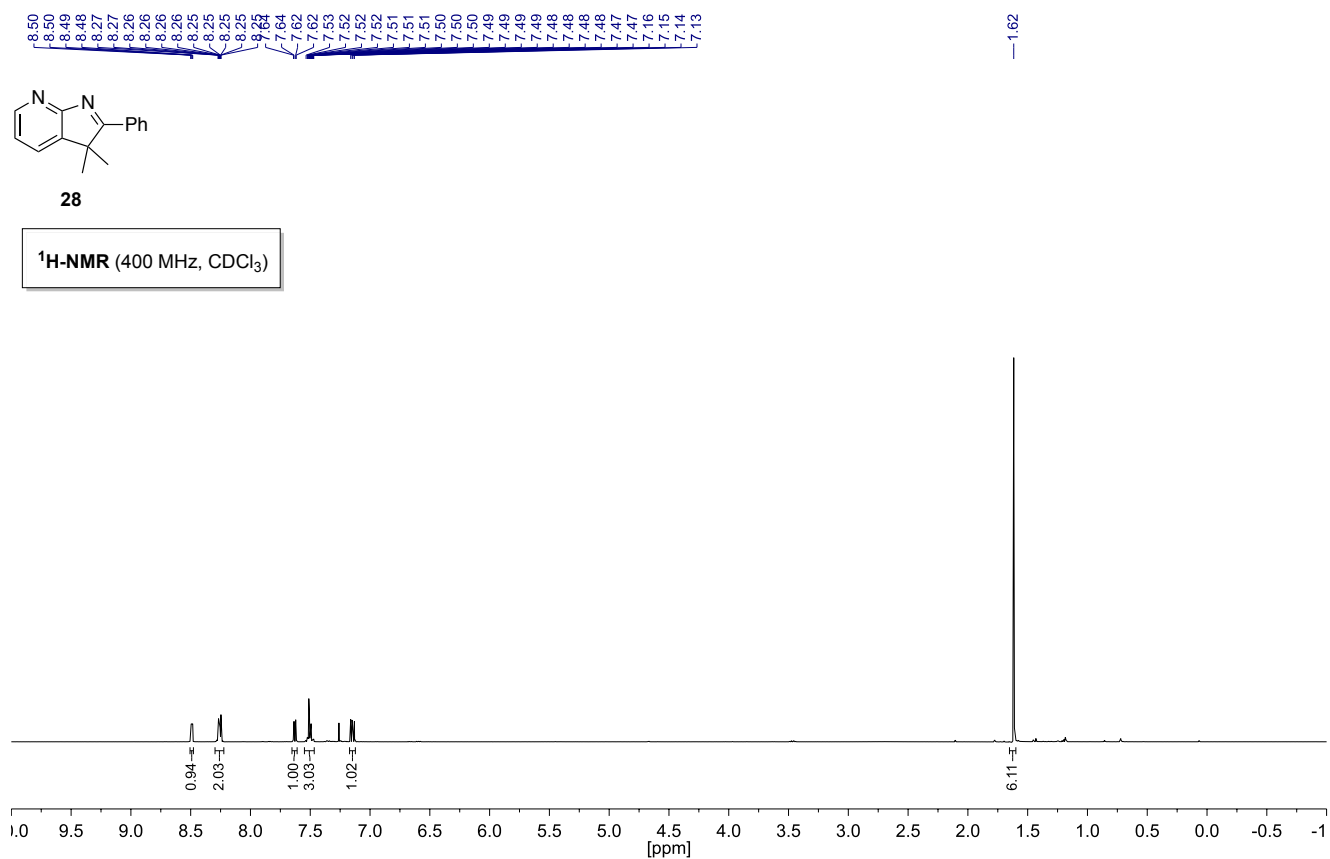
¹³C-NMR (101 MHz, CDCl₃)



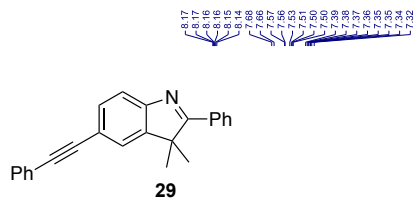
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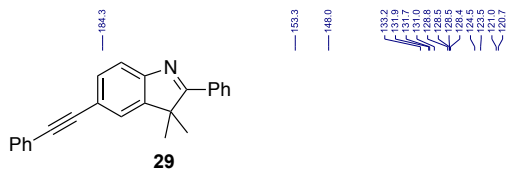
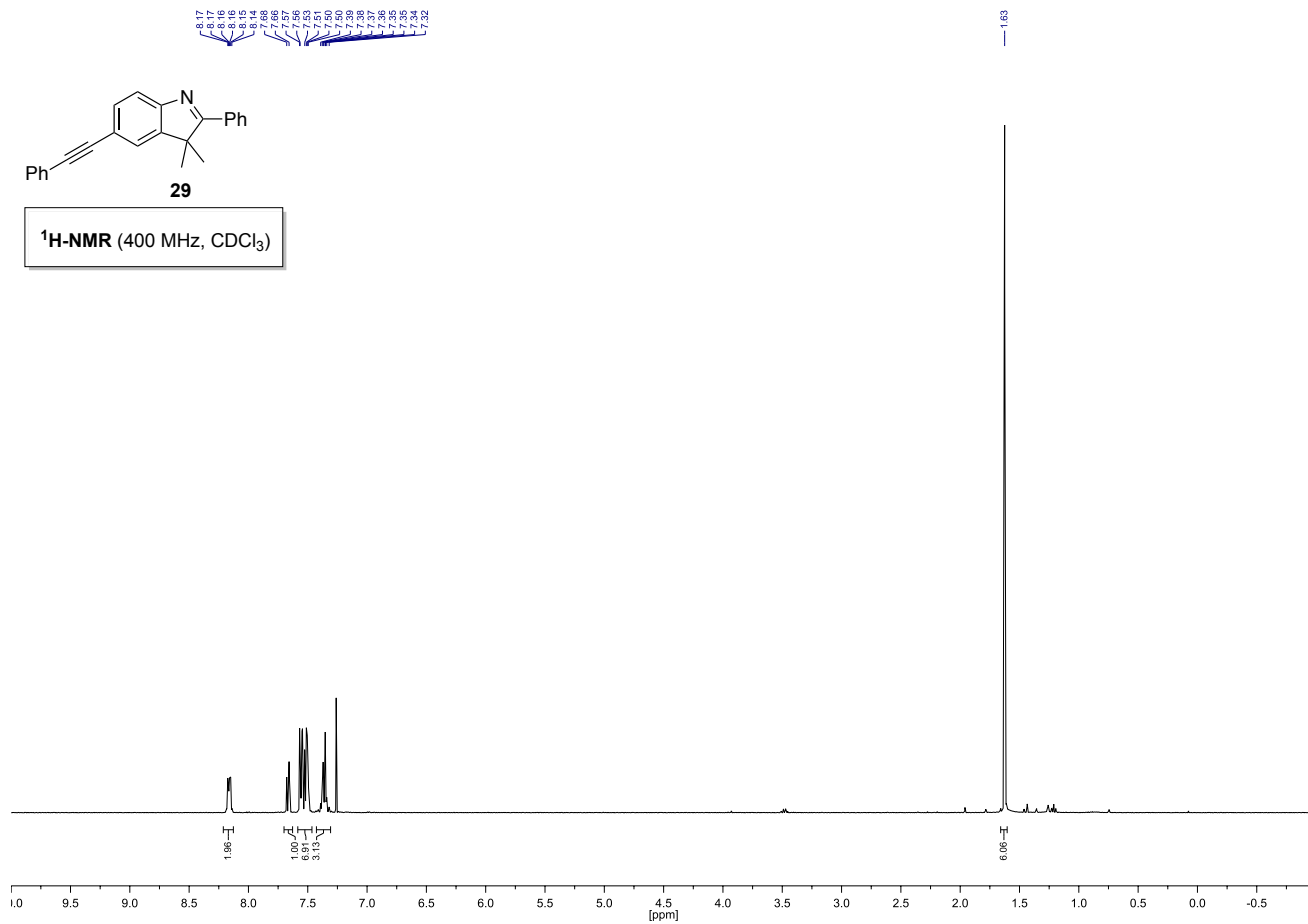
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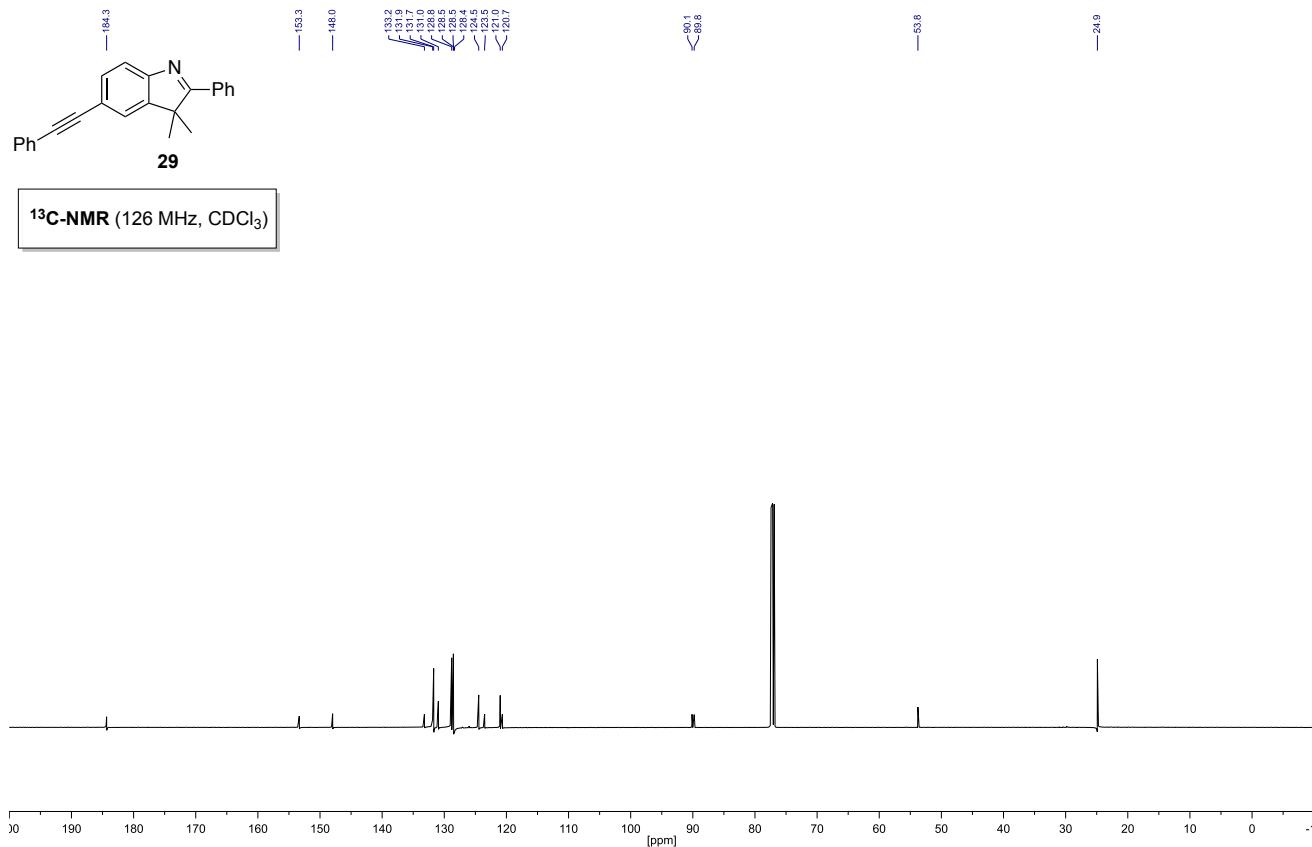
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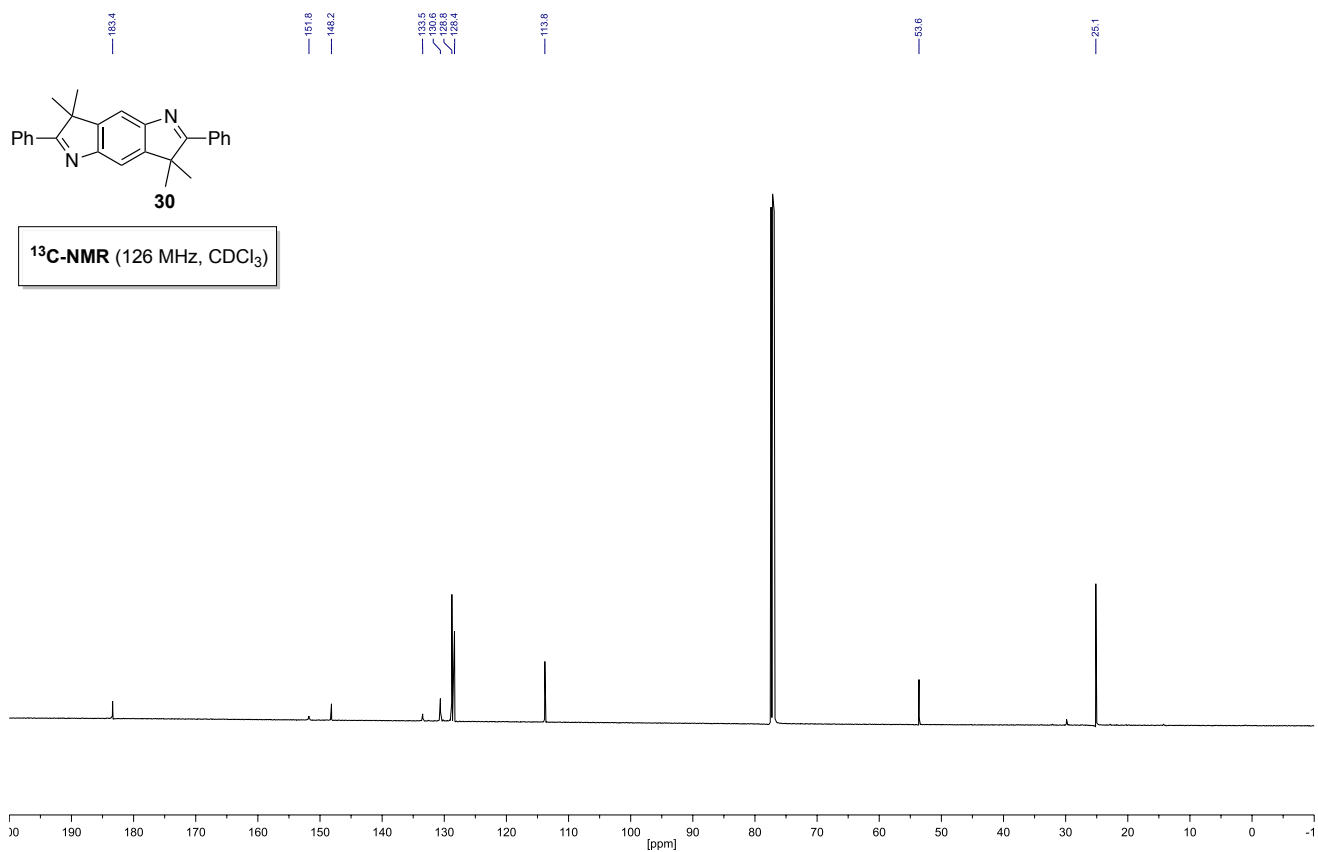
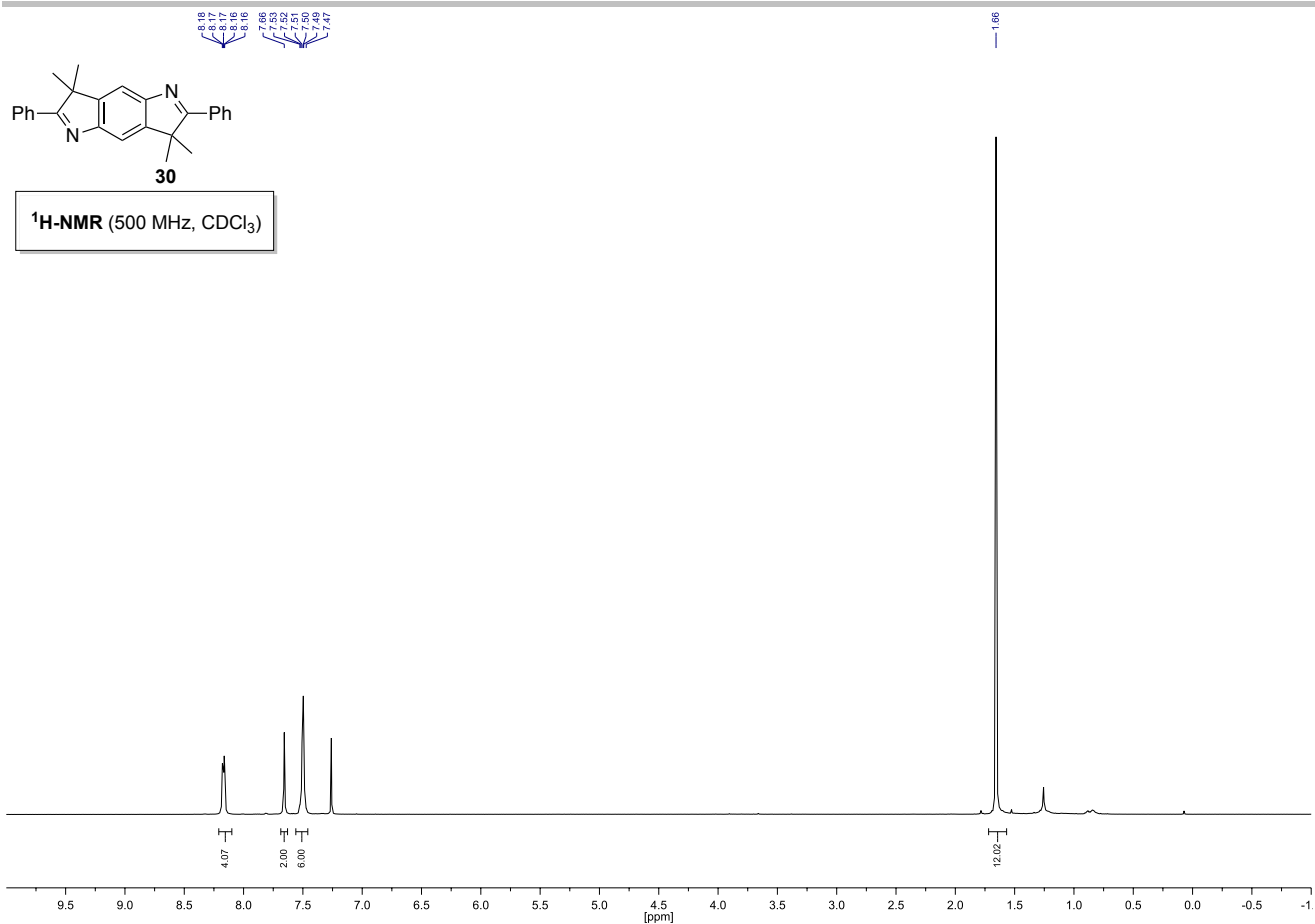
¹H-NMR (400 MHz, CDCl₃)



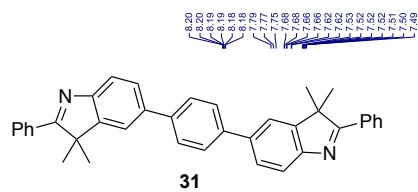
¹³C-NMR (126 MHz, CDCl₃)



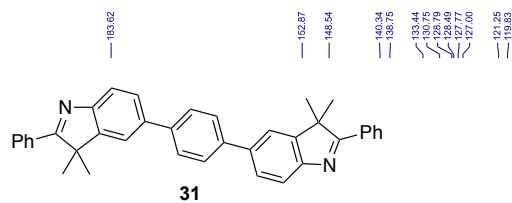
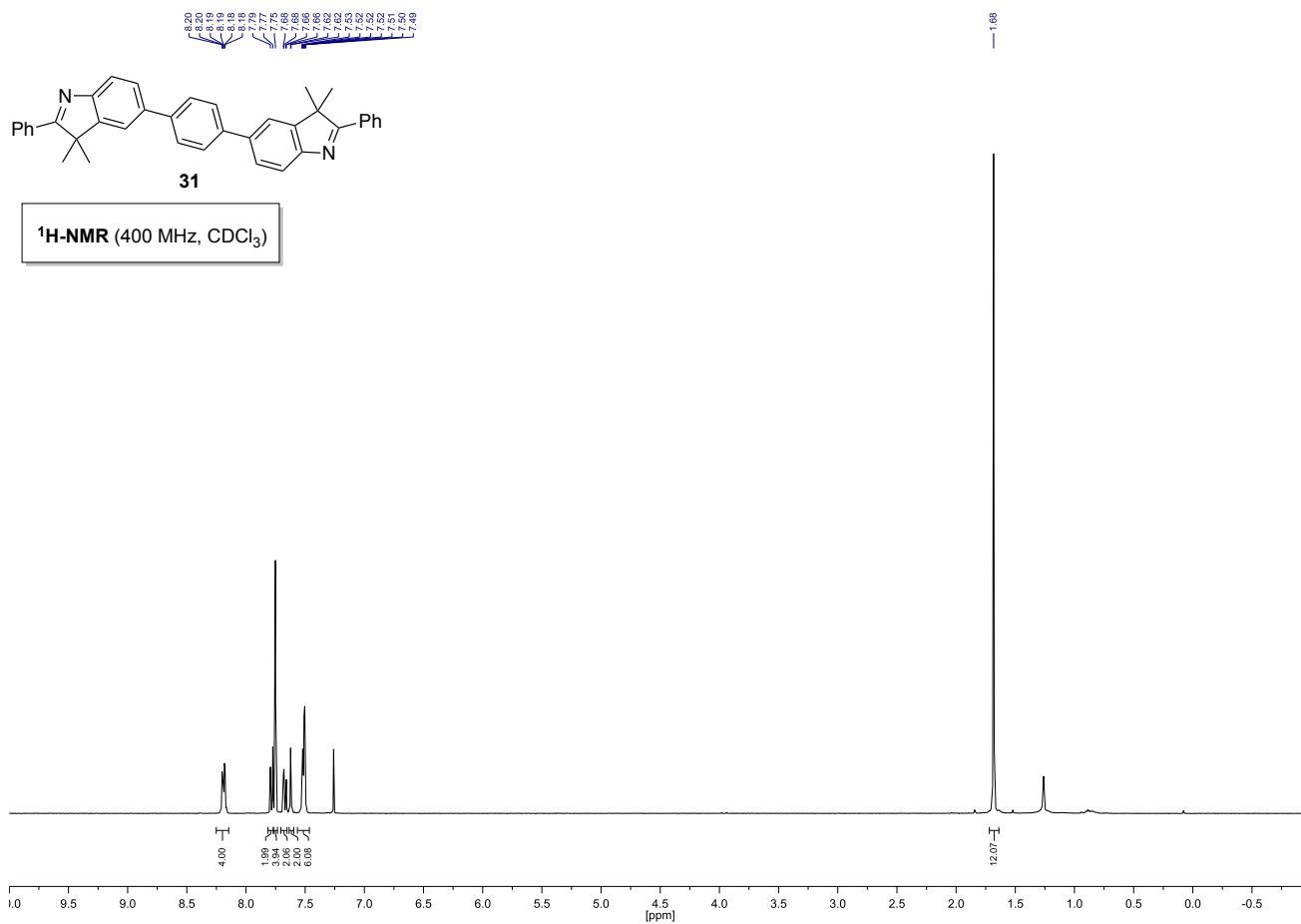
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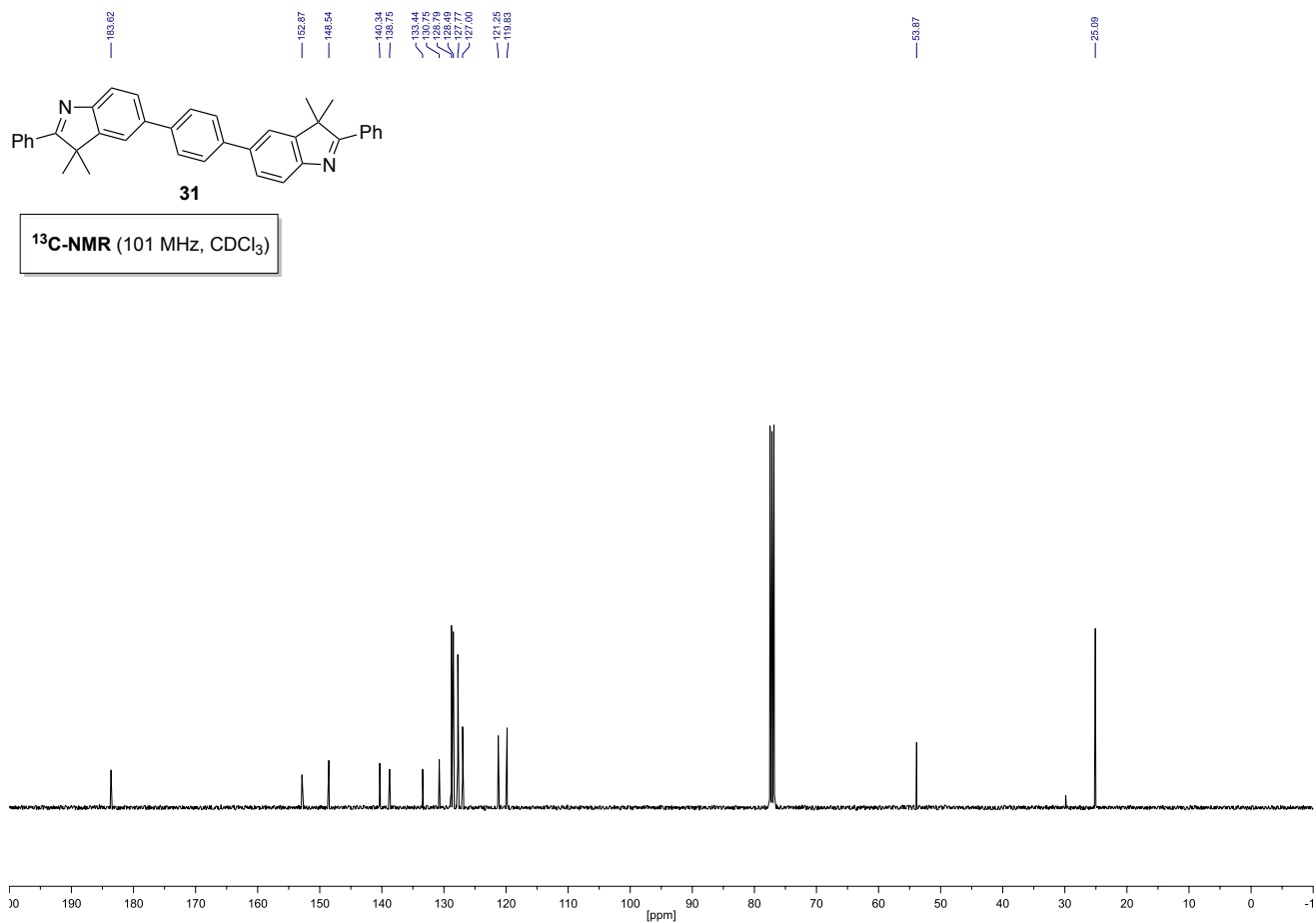
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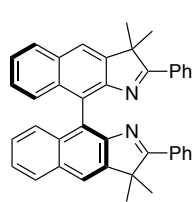
¹H-NMR (400 MHz, CDCl₃)



¹³C-NMR (101 MHz, CDCl₃)

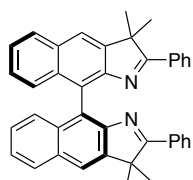
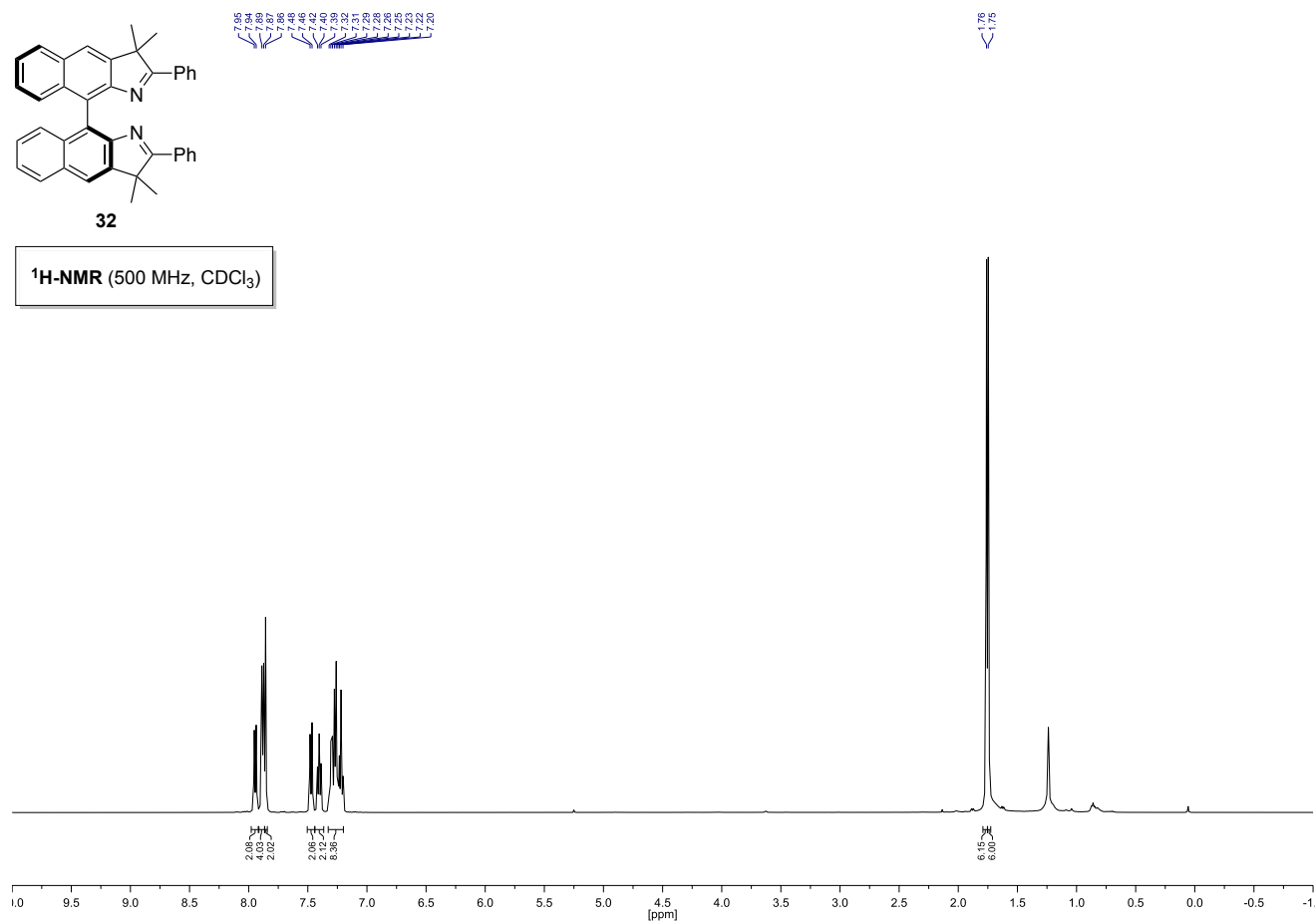


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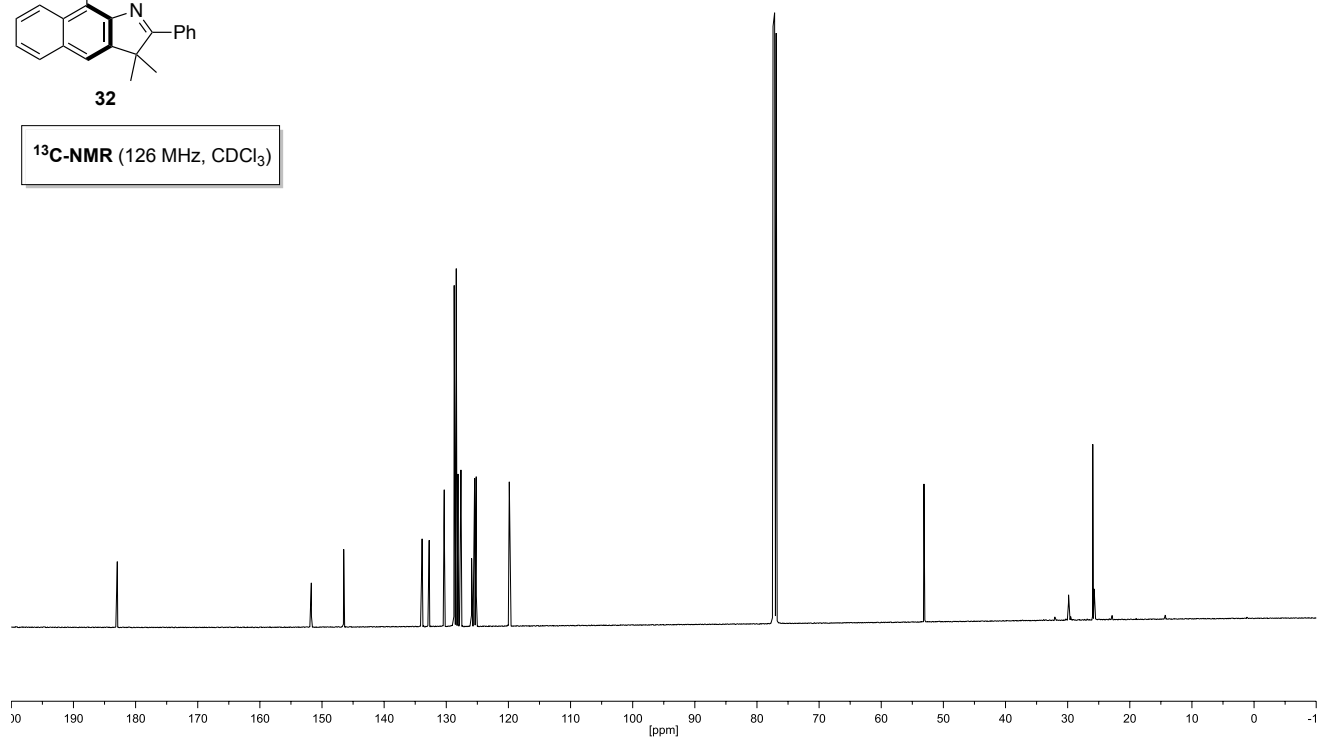
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¹H-NMR (500 MHz, CDCl₃)



32

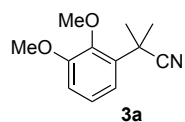
¹³C-NMR (126 MHz, CDCl₃)



SUPPORTING INFORMATION

5.2 NMR spectra of the nitriles and their precursors

SUPPORTING INFORMATION

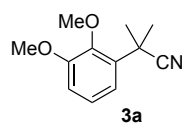
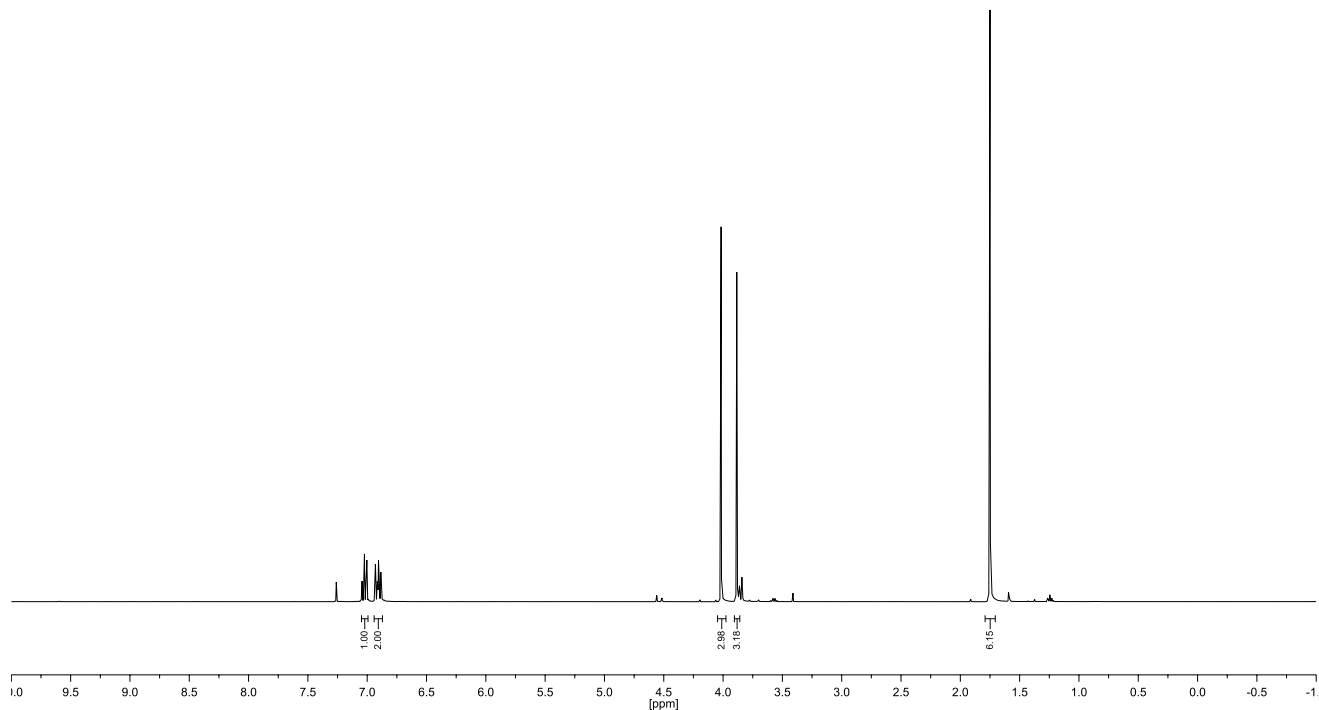


7.702
7.700
6.933
6.931
6.911
6.909
6.889
6.888

4.02
3.88

1.75

¹H-NMR (400 MHz, CDCl₃)



153.3

147.5

134.4

126.6

123.5

117.3

112.7

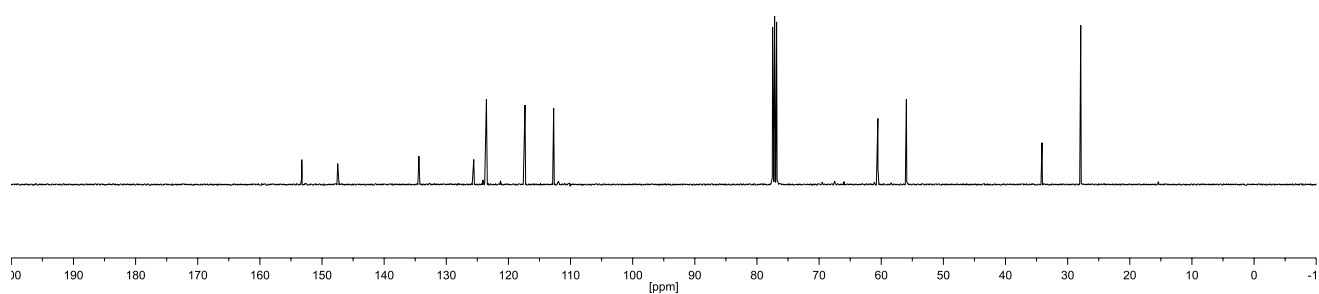
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56.0

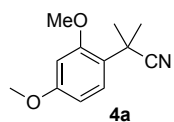
34.1

27.9

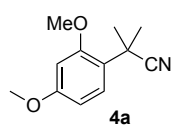
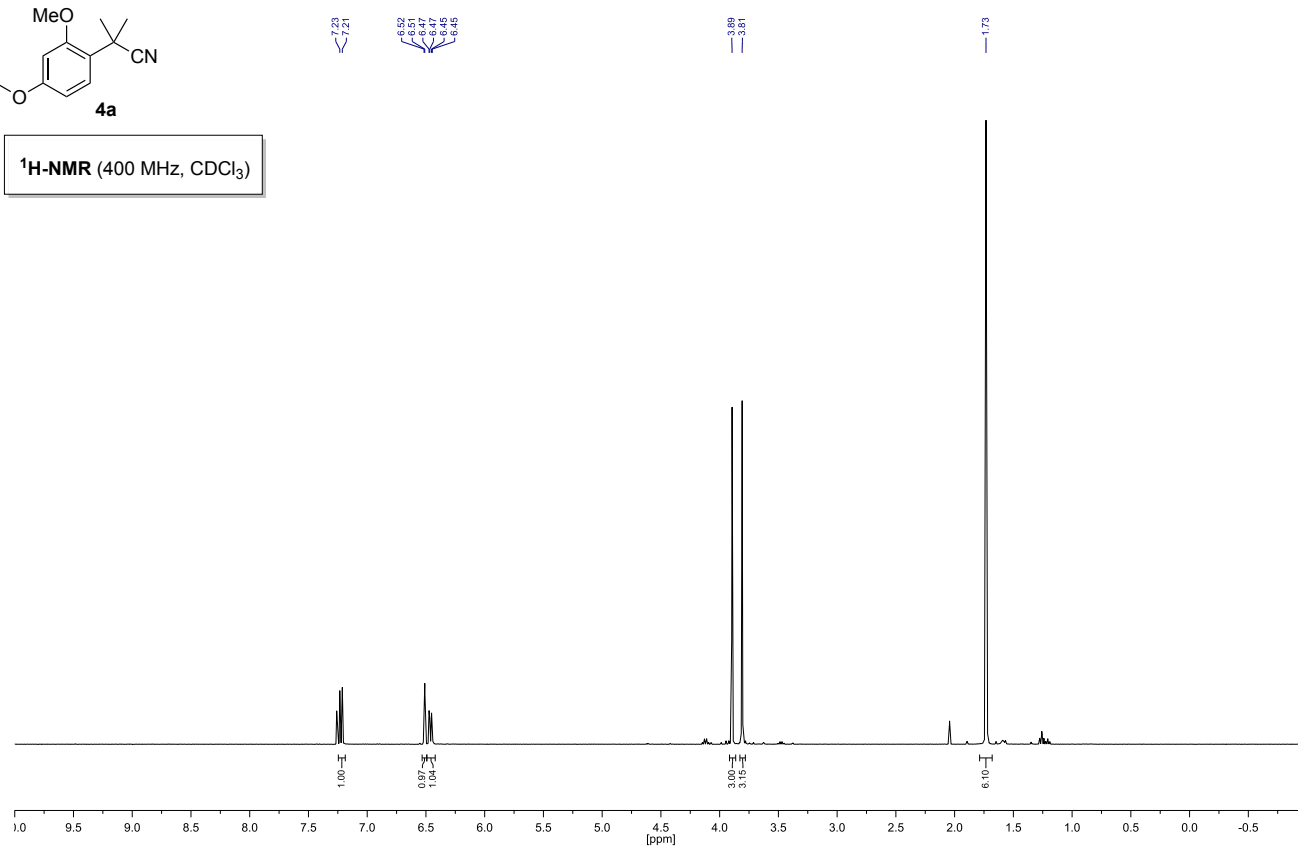
¹³C-NMR (101 MHz, CDCl₃)



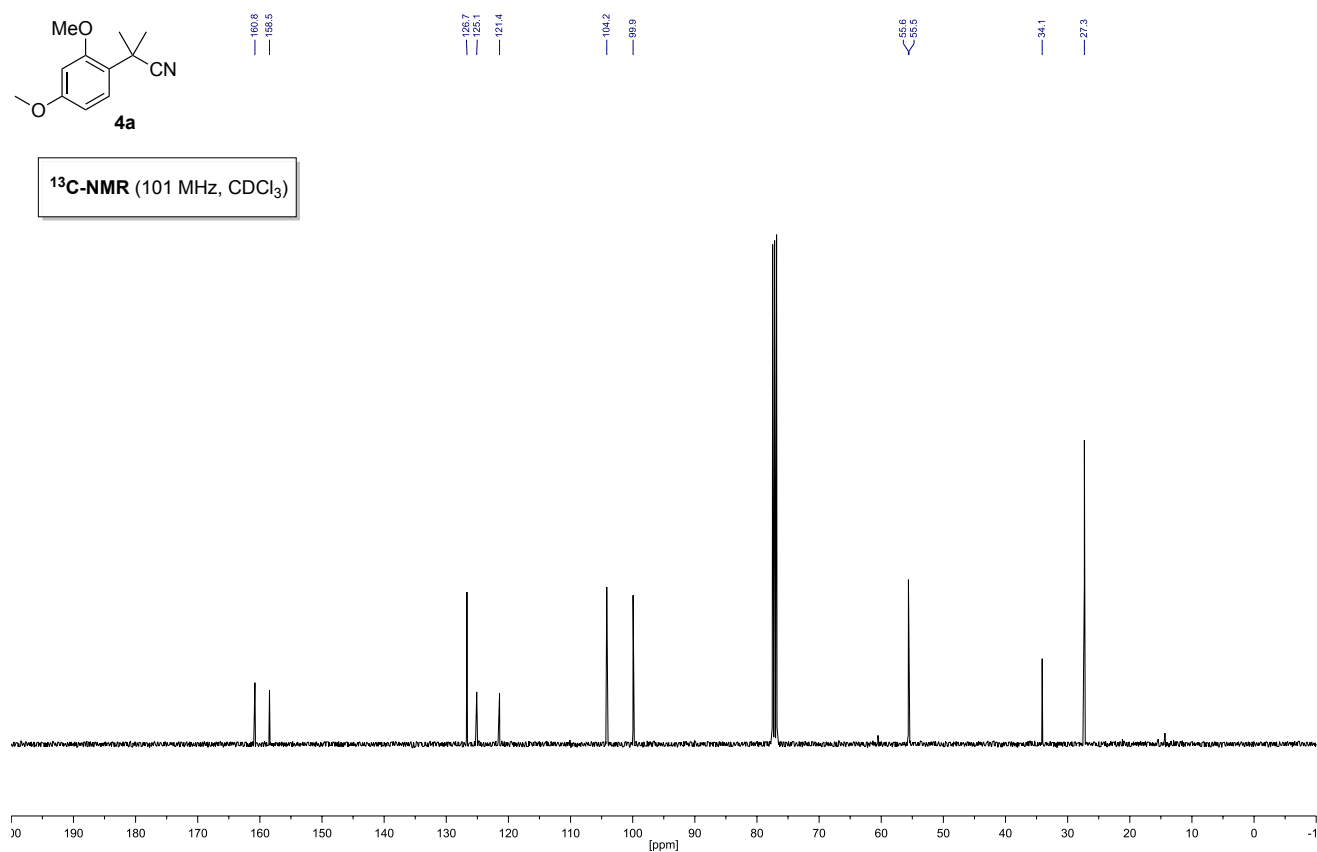
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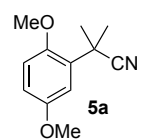
¹H-NMR (400 MHz, CDCl₃)



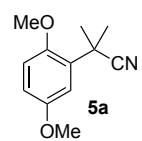
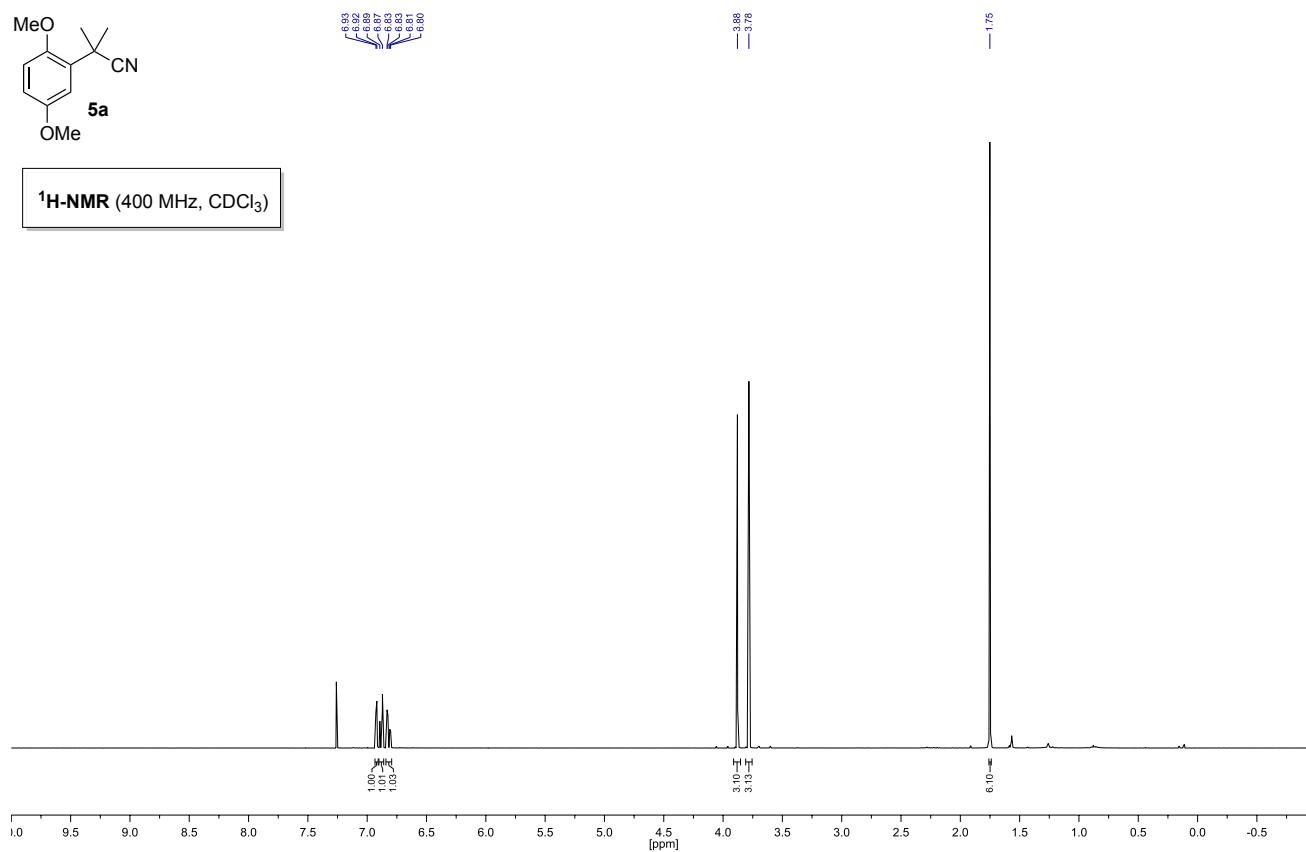
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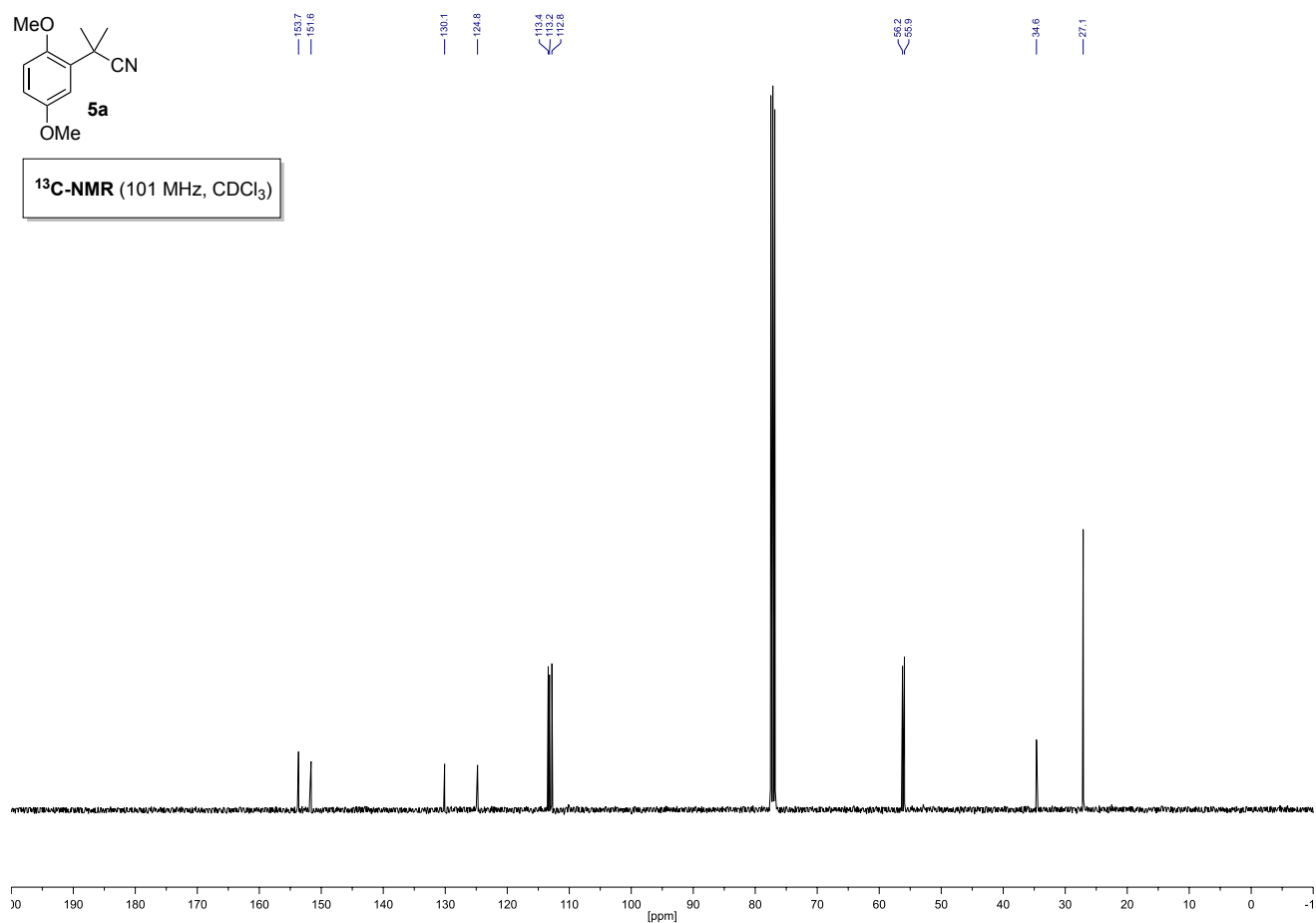
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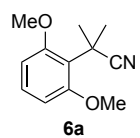
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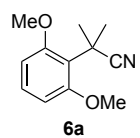
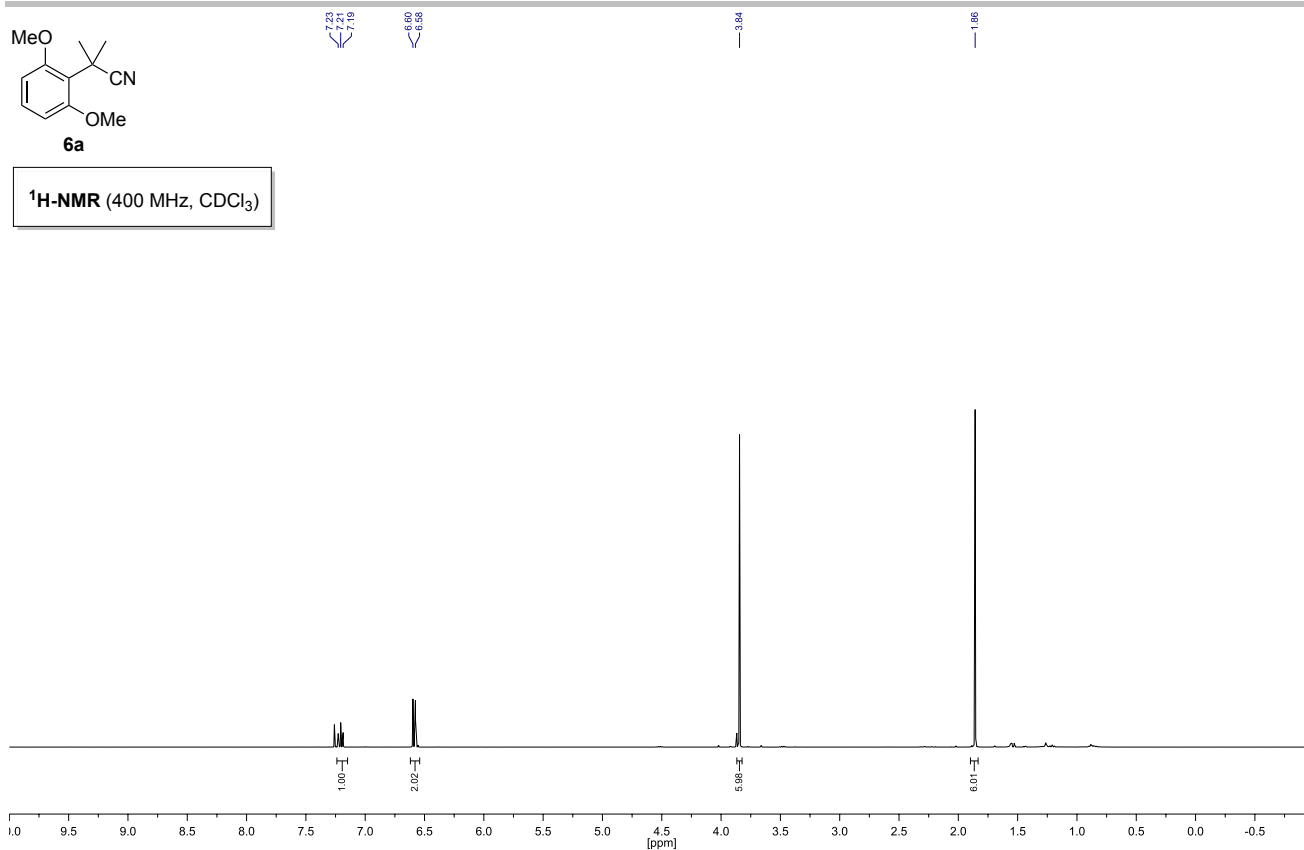
¹³C-NMR (101 MHz, CDCl₃)



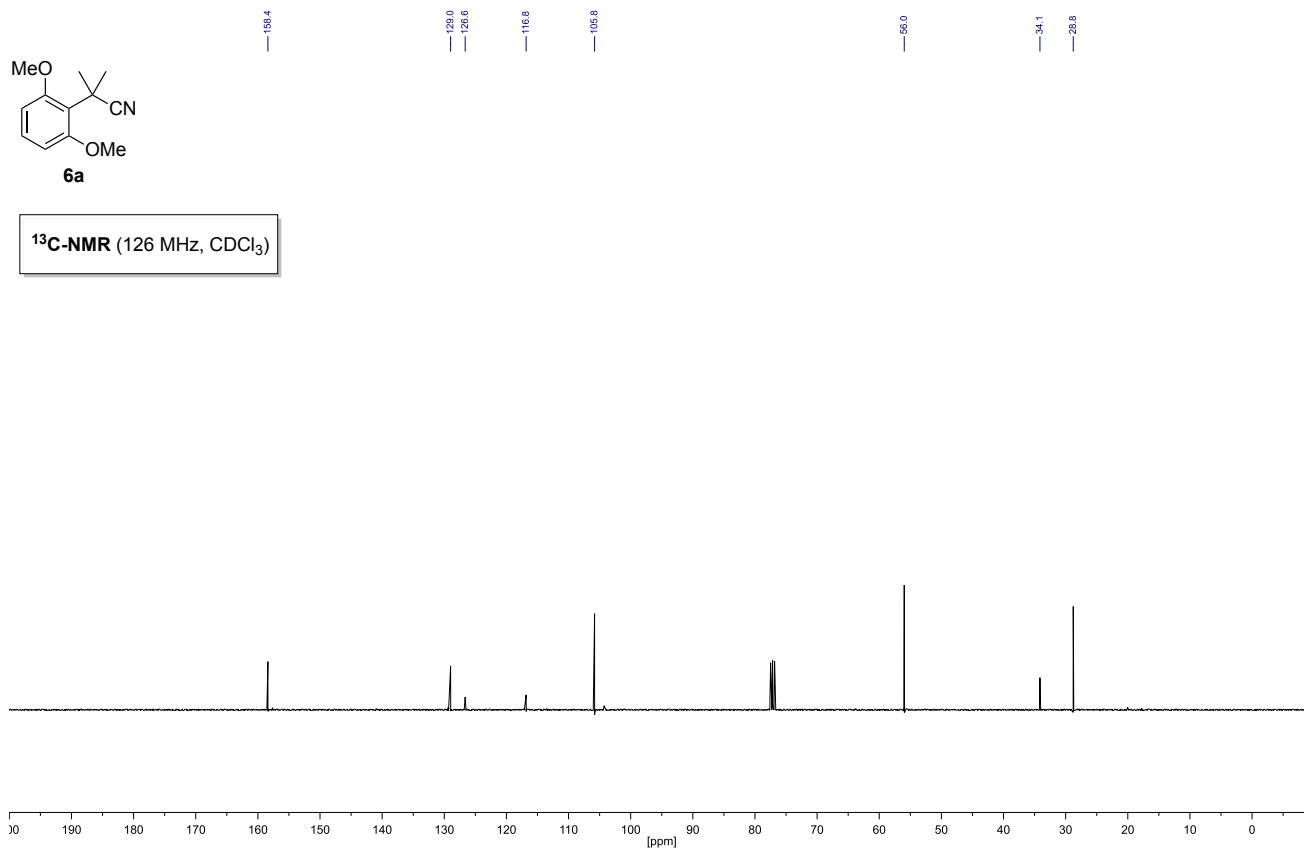
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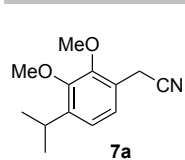
¹H-NMR (400 MHz, CDCl₃)



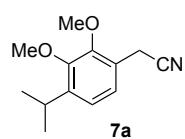
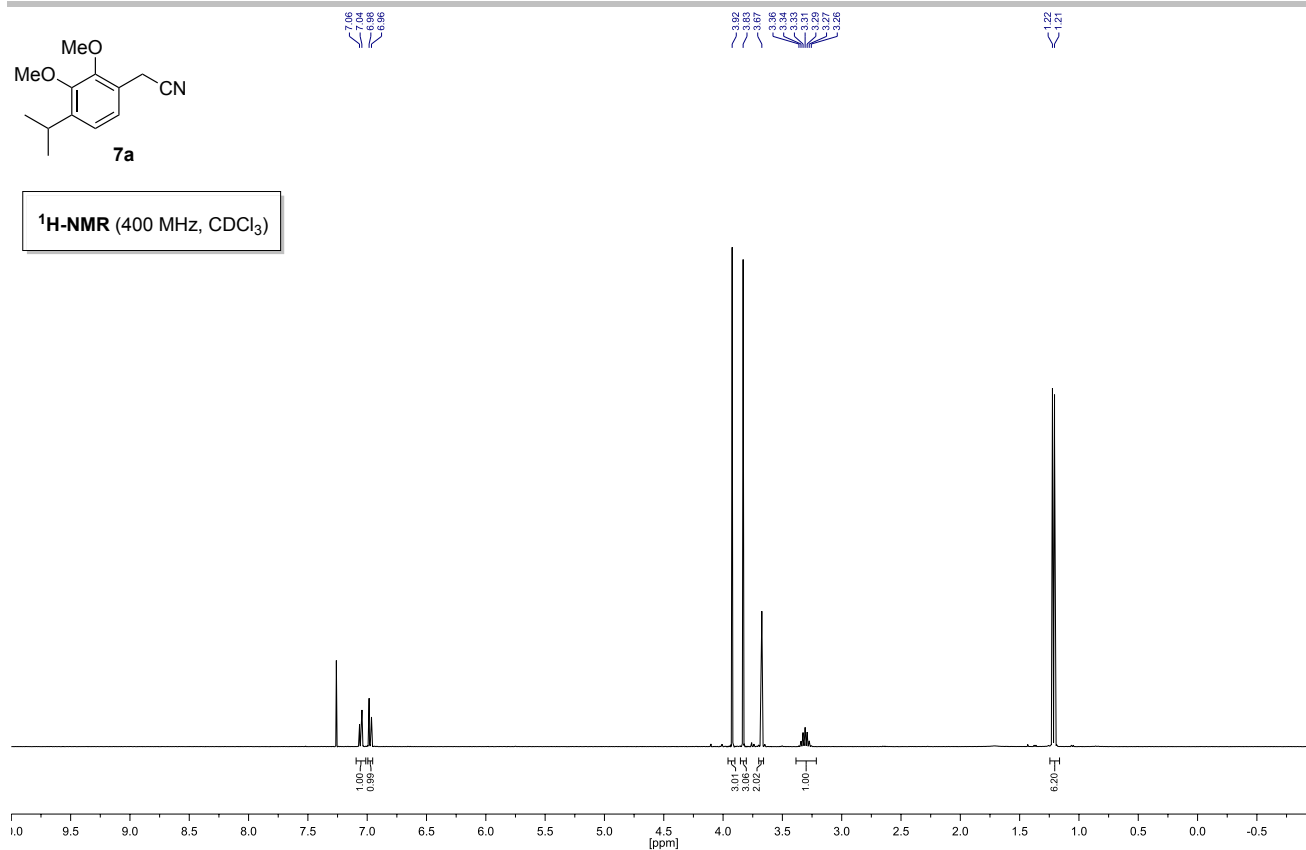
¹³C-NMR (126 MHz, CDCl₃)



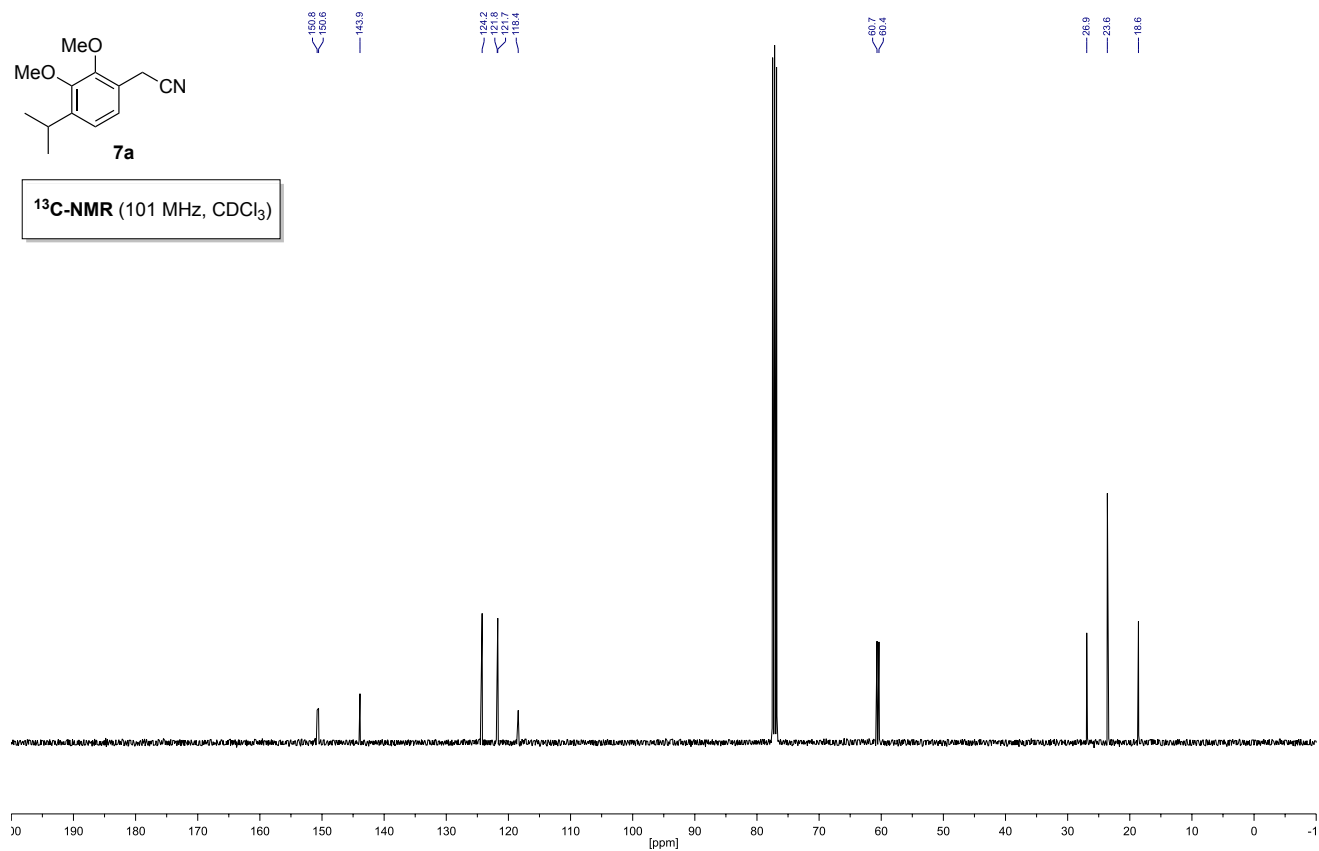
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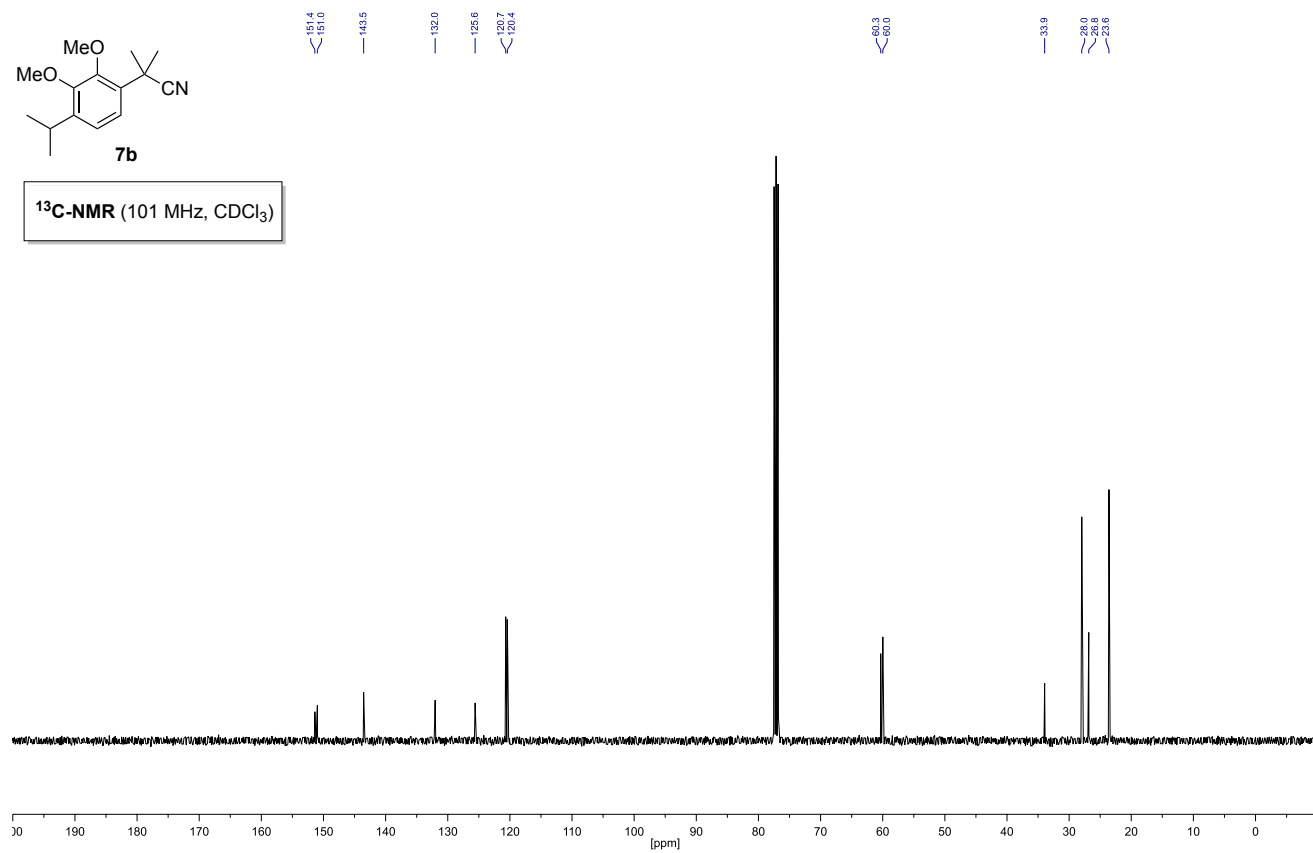
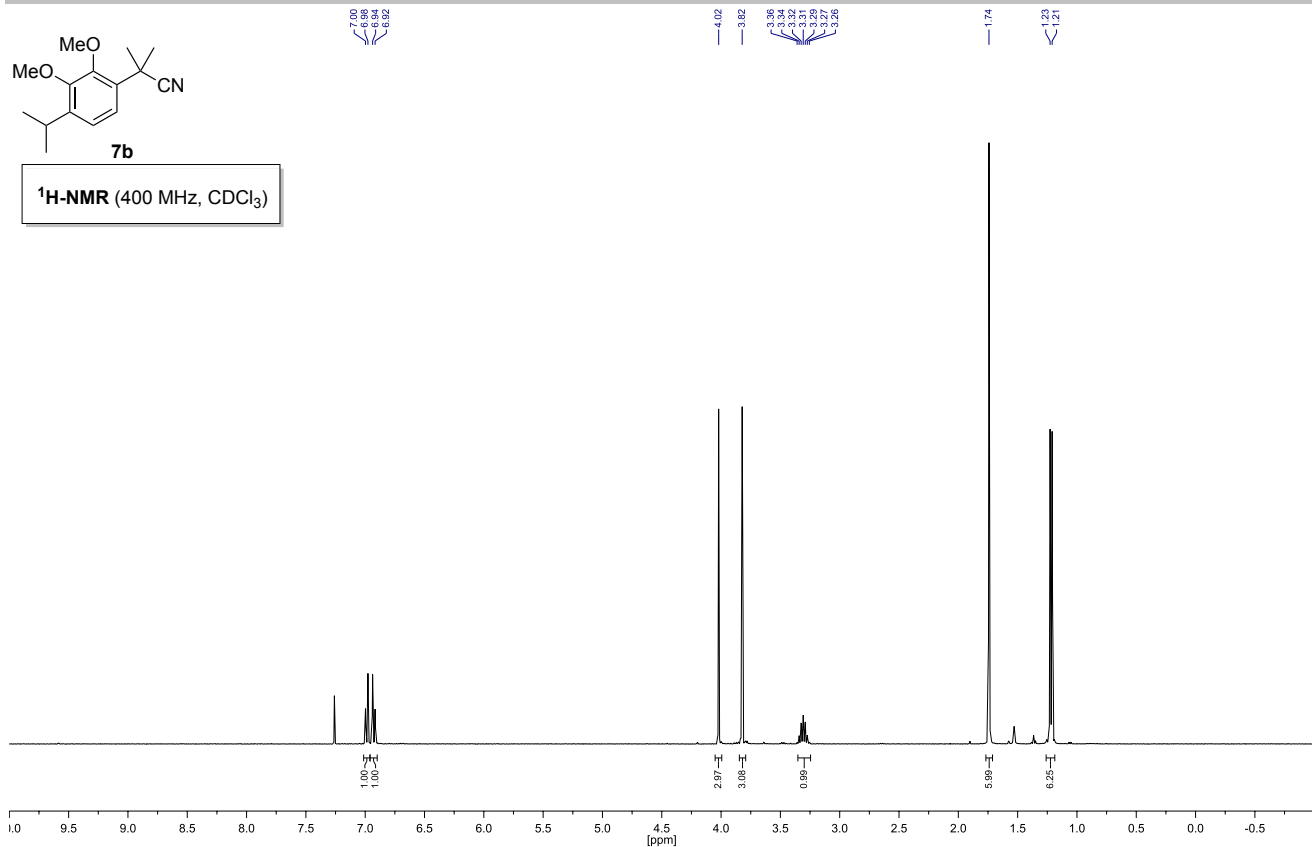
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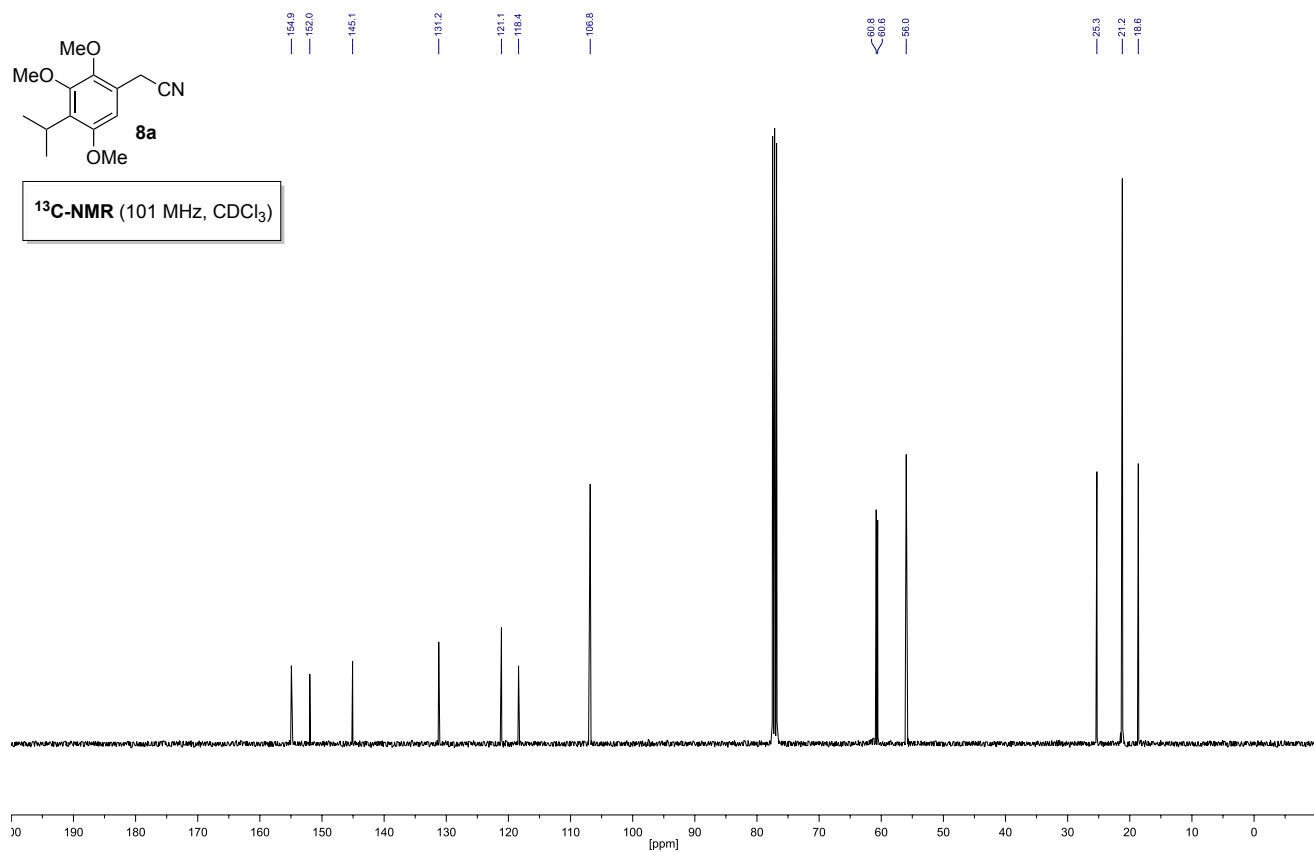
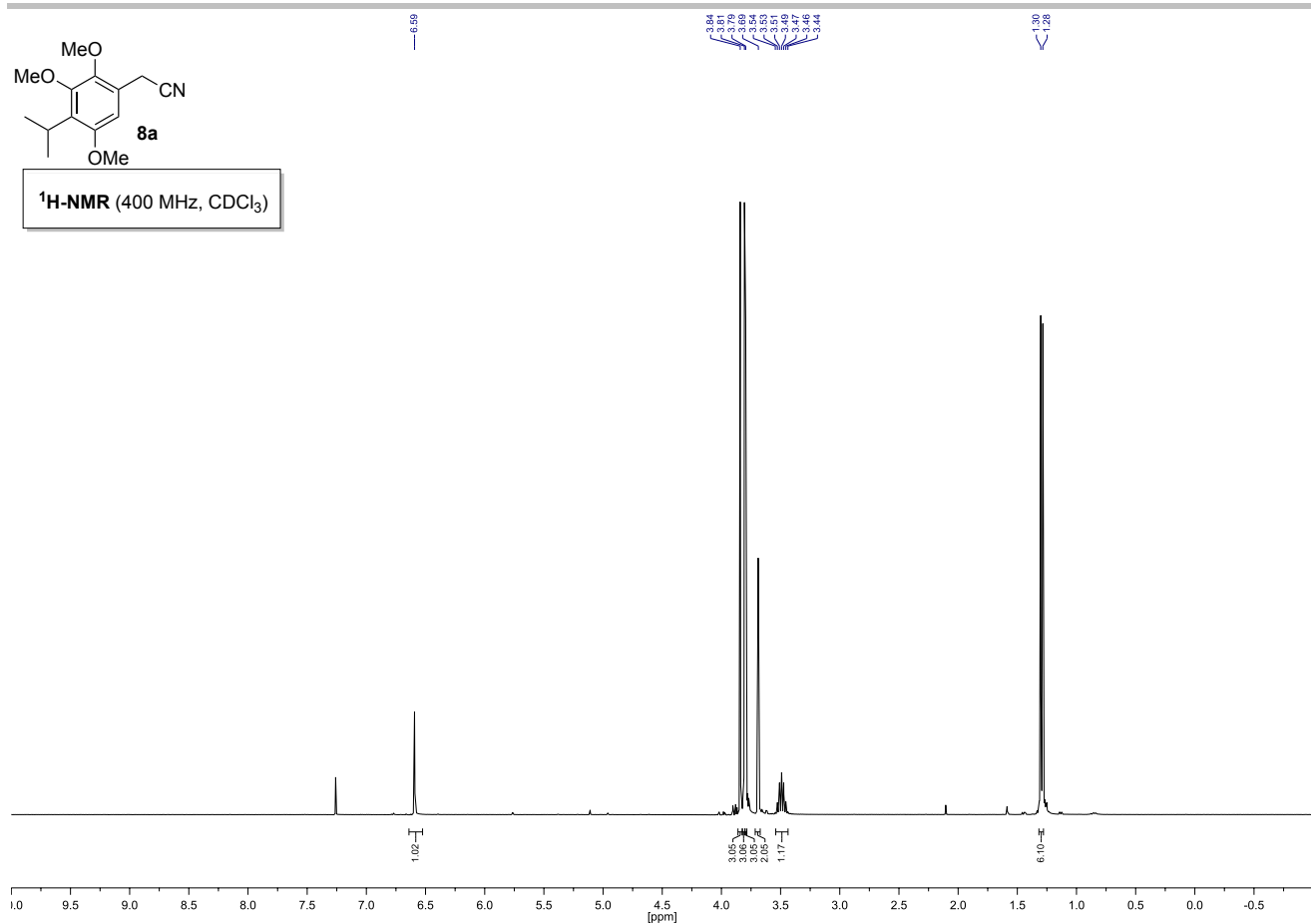
¹³C-NMR (101 MHz, CDCl₃)



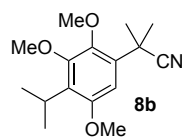
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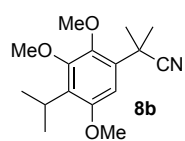
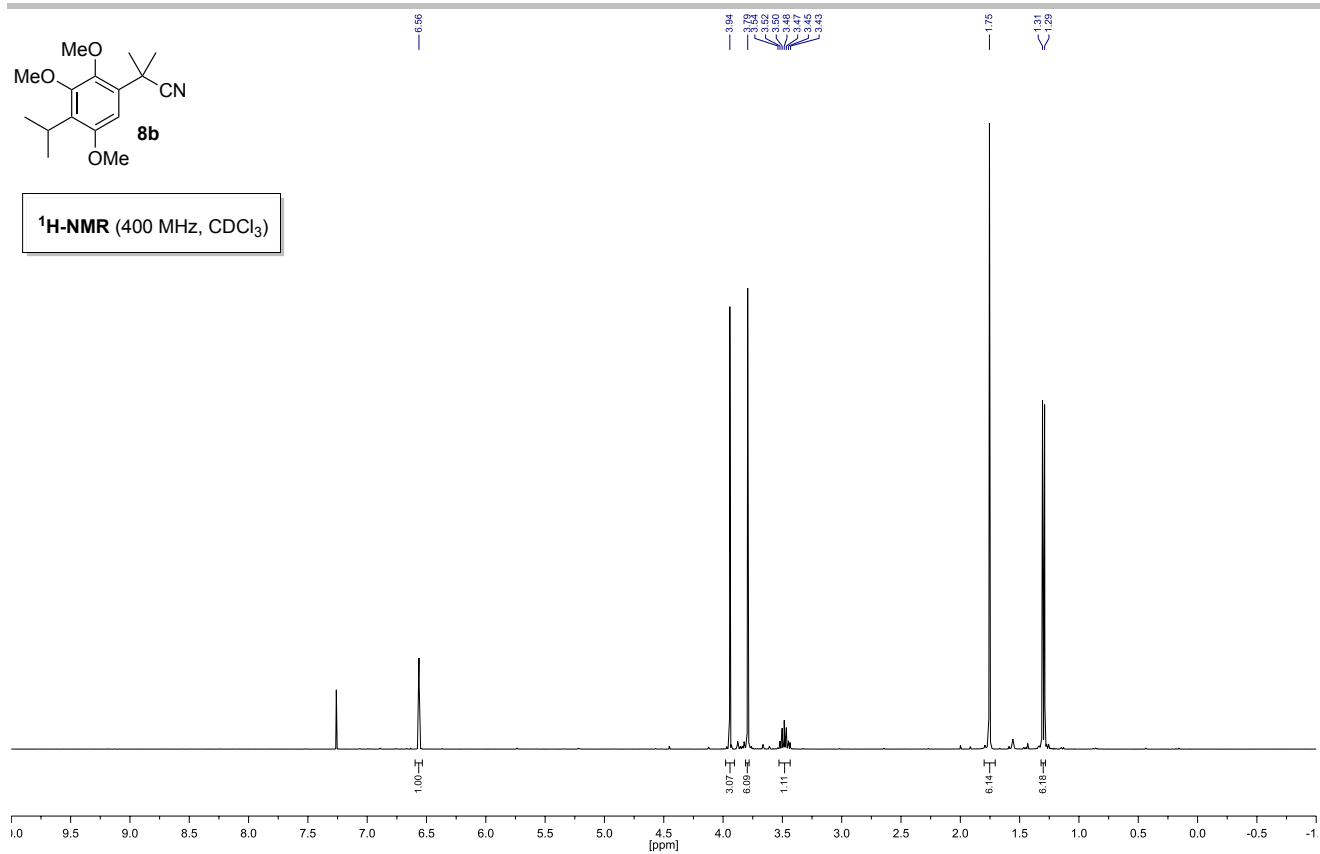
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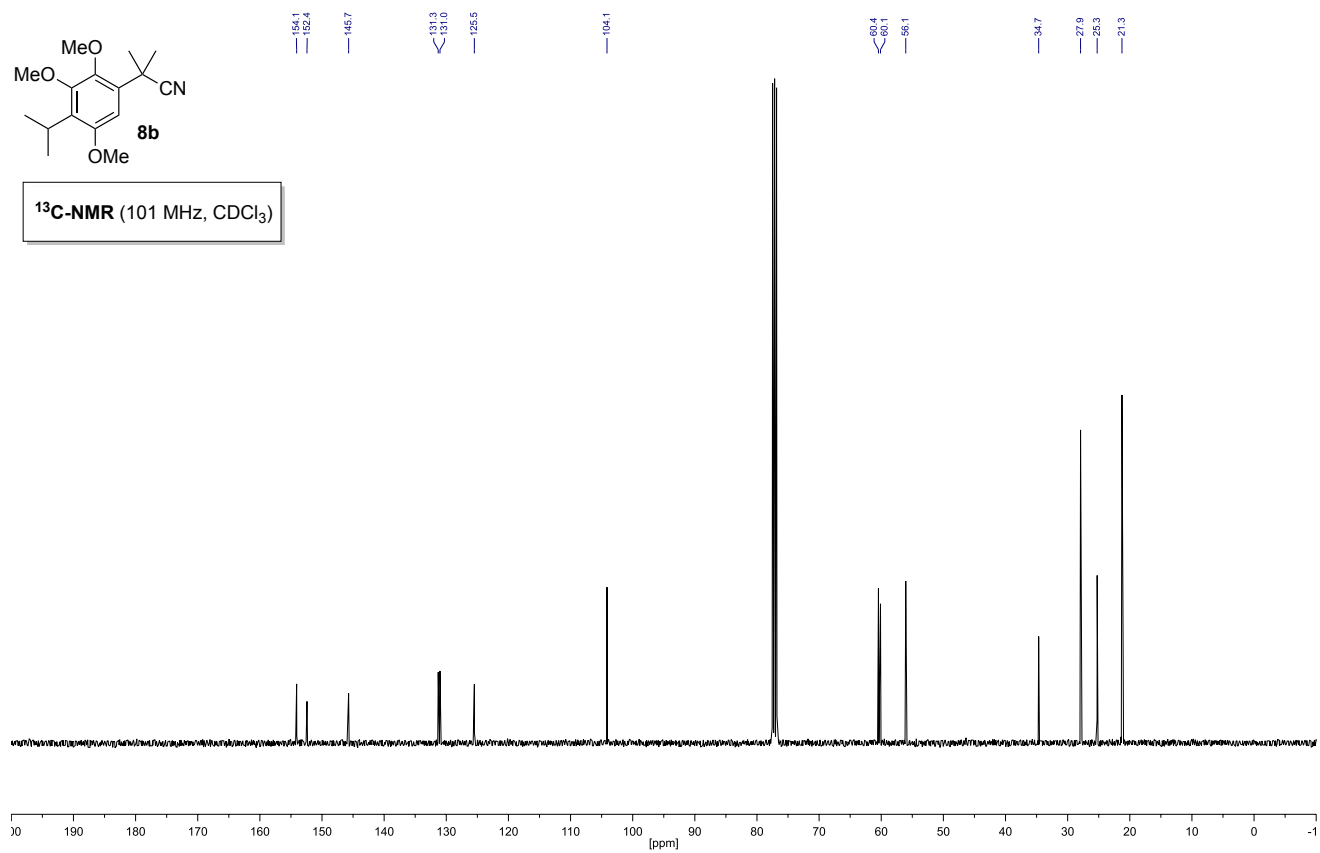
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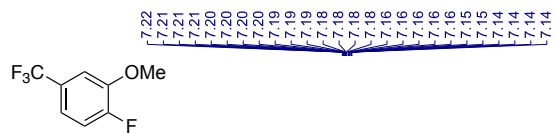
¹H-NMR (400 MHz, CDCl₃)



¹³C-NMR (101 MHz, CDCl₃)

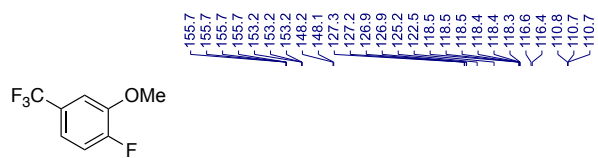
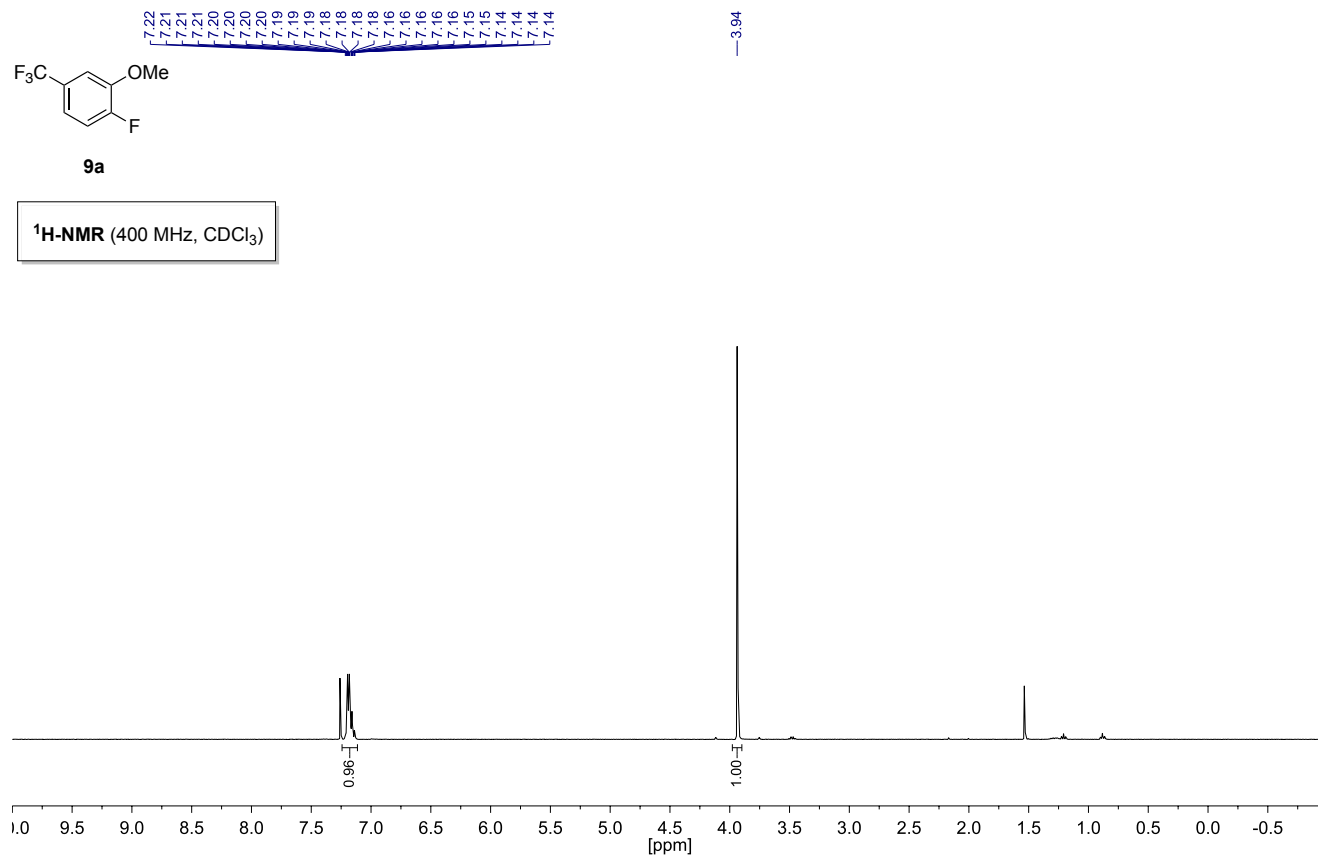


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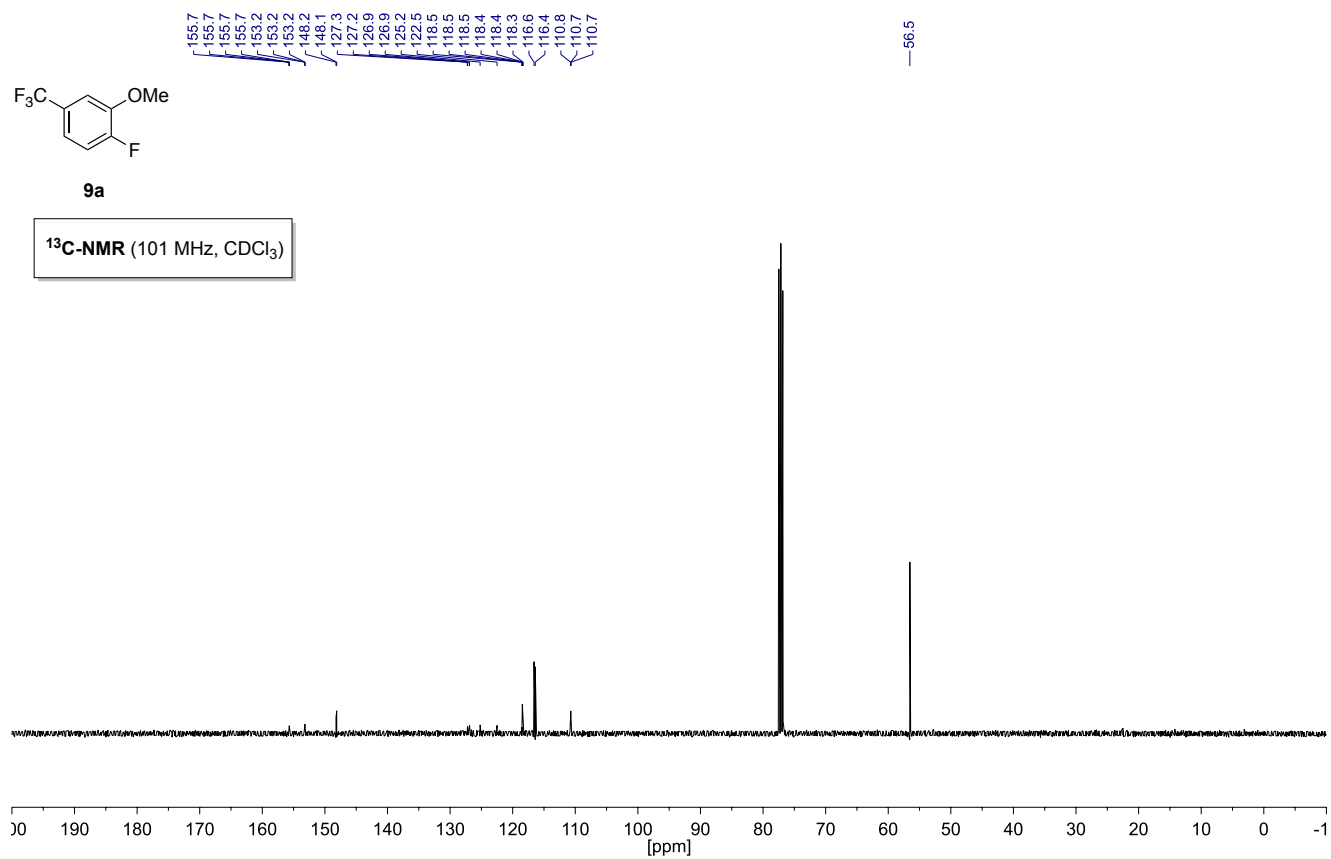
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¹H-NMR (400 MHz, CDCl₃)

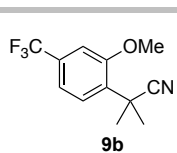


9a

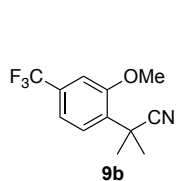
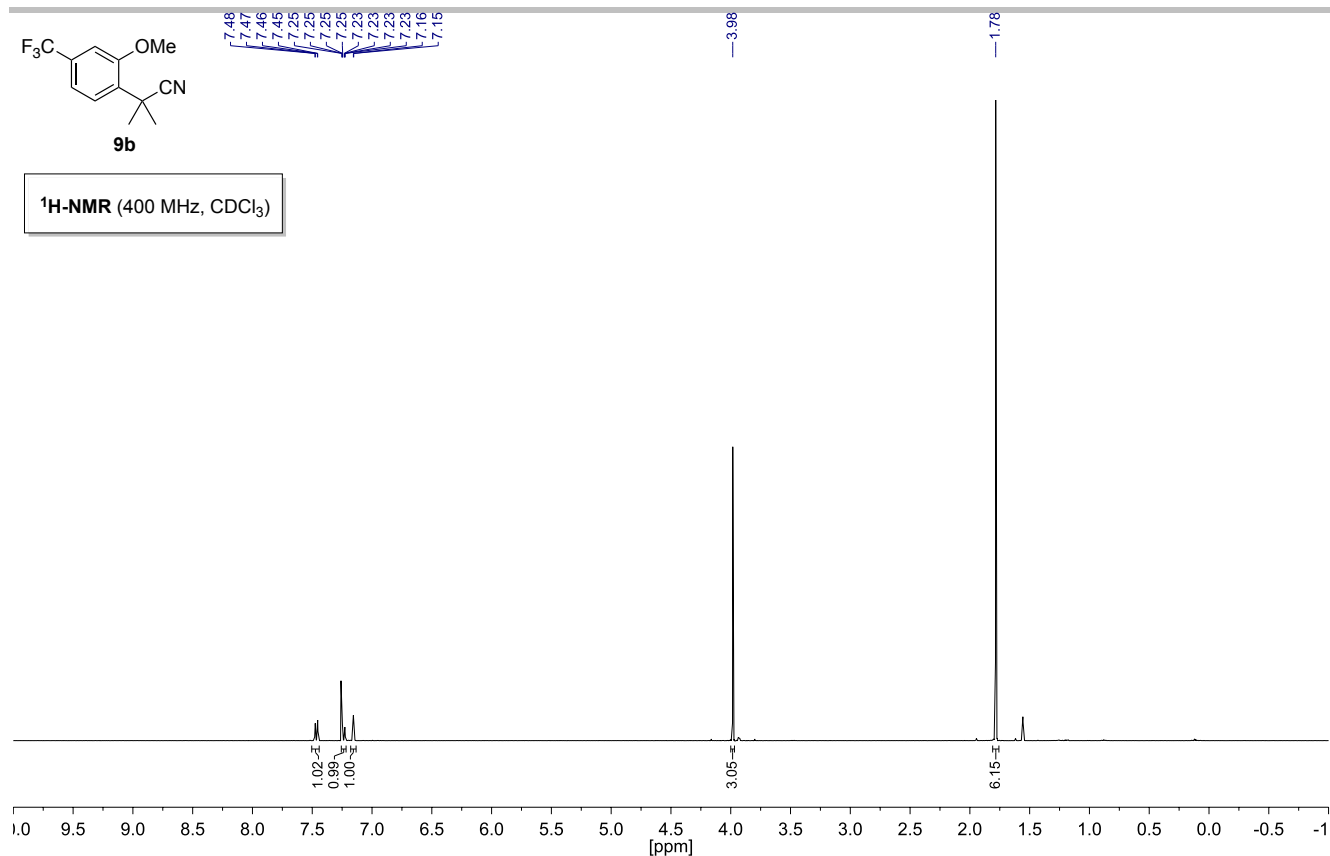
¹³C-NMR (101 MHz, CDCl₃)



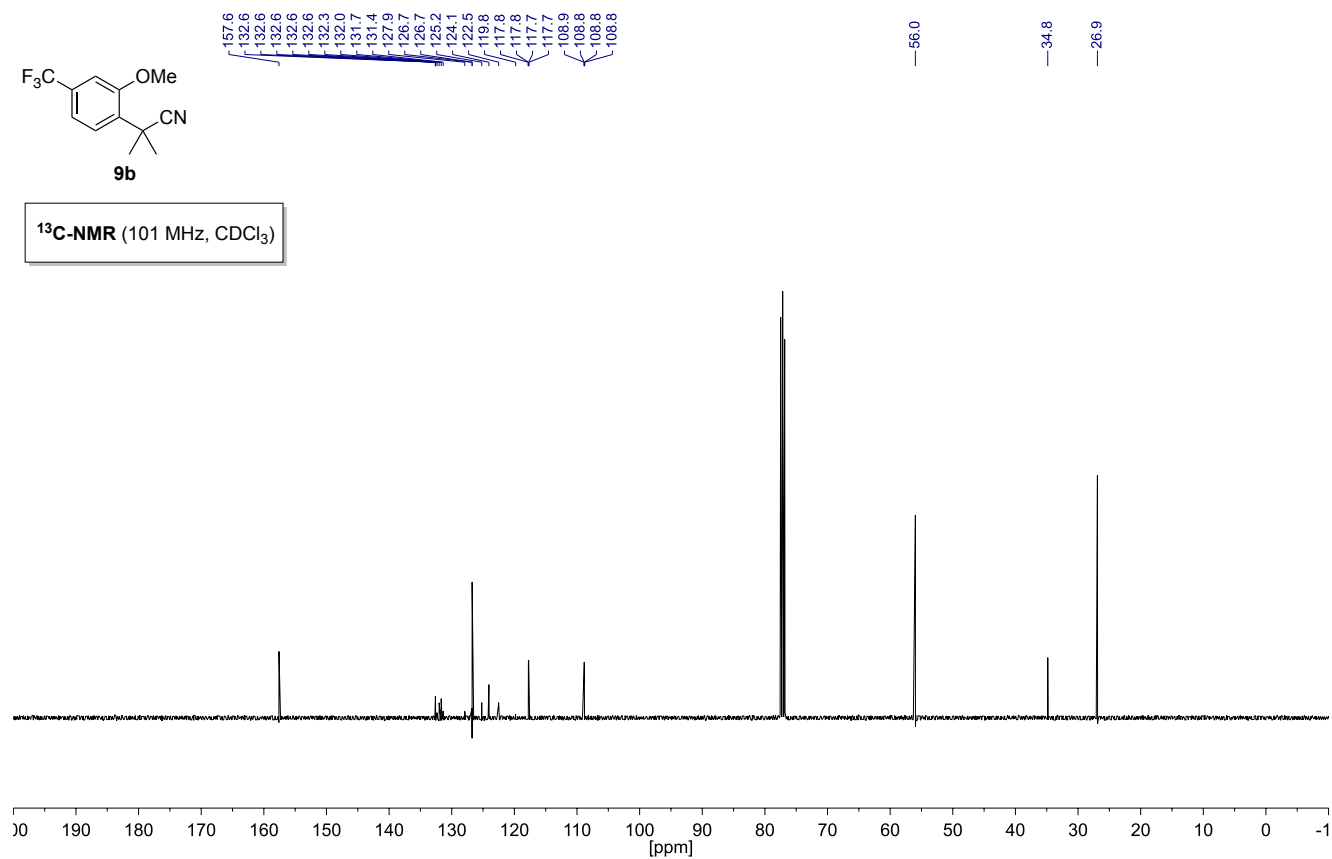
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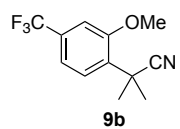
¹H-NMR (400 MHz, CDCl₃)



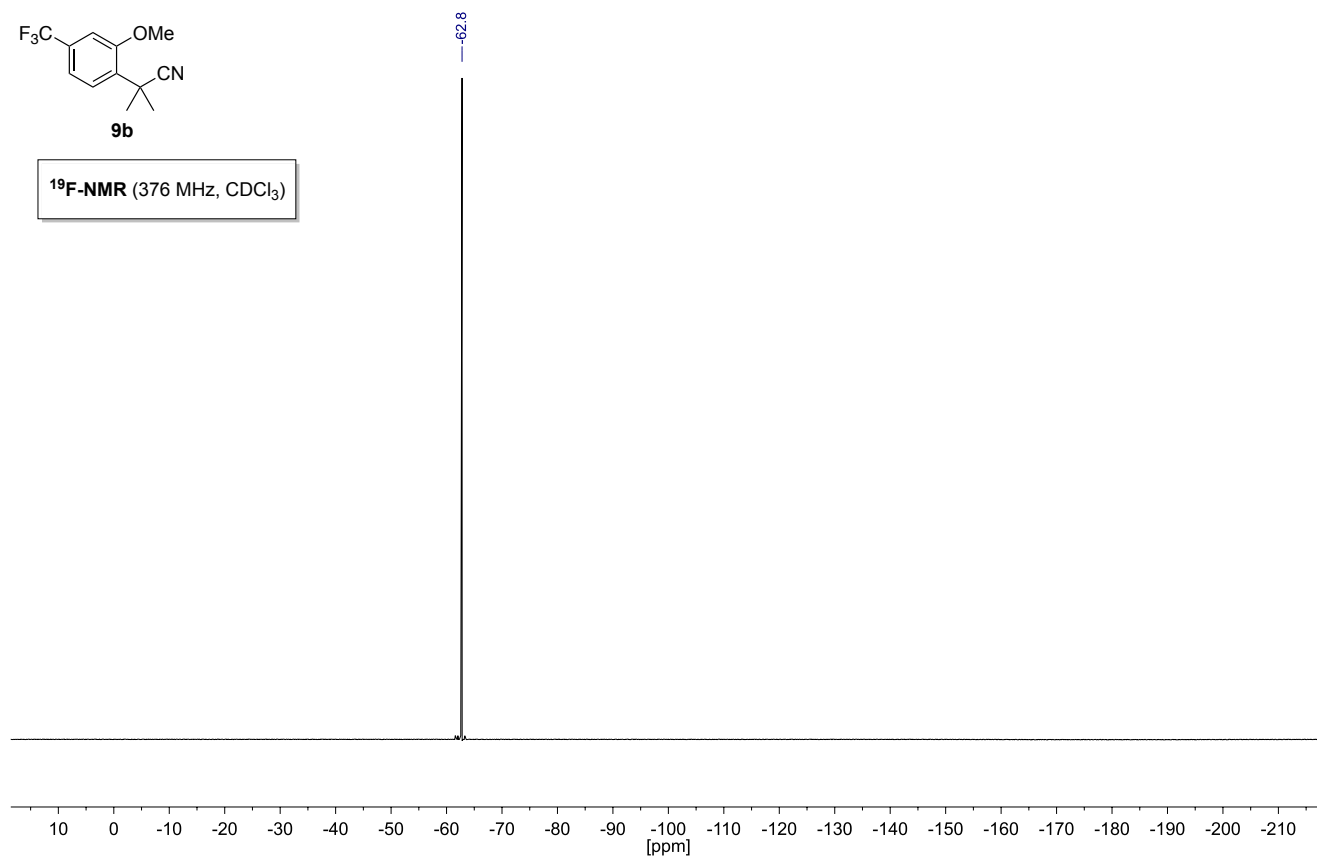
¹³C-NMR (101 MHz, CDCl₃)



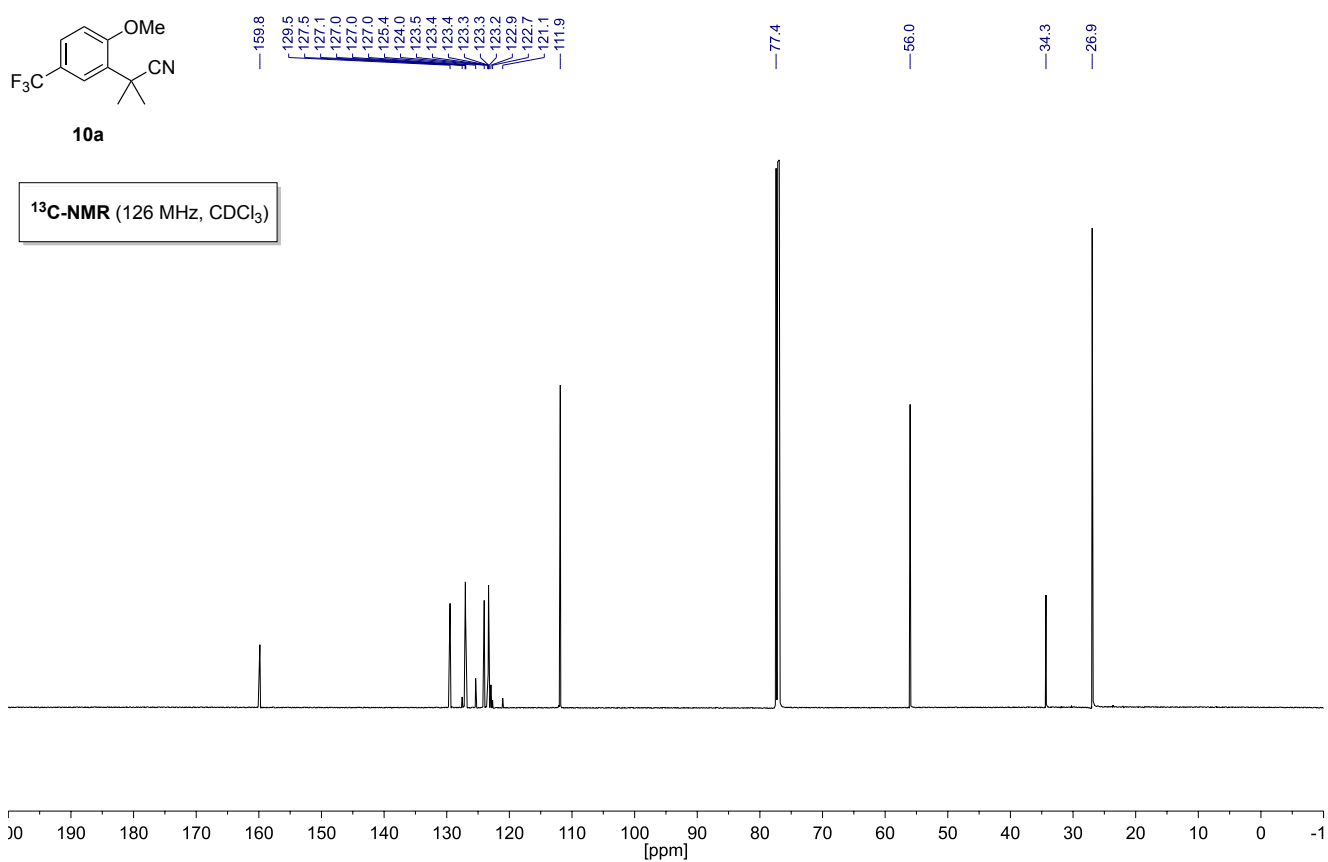
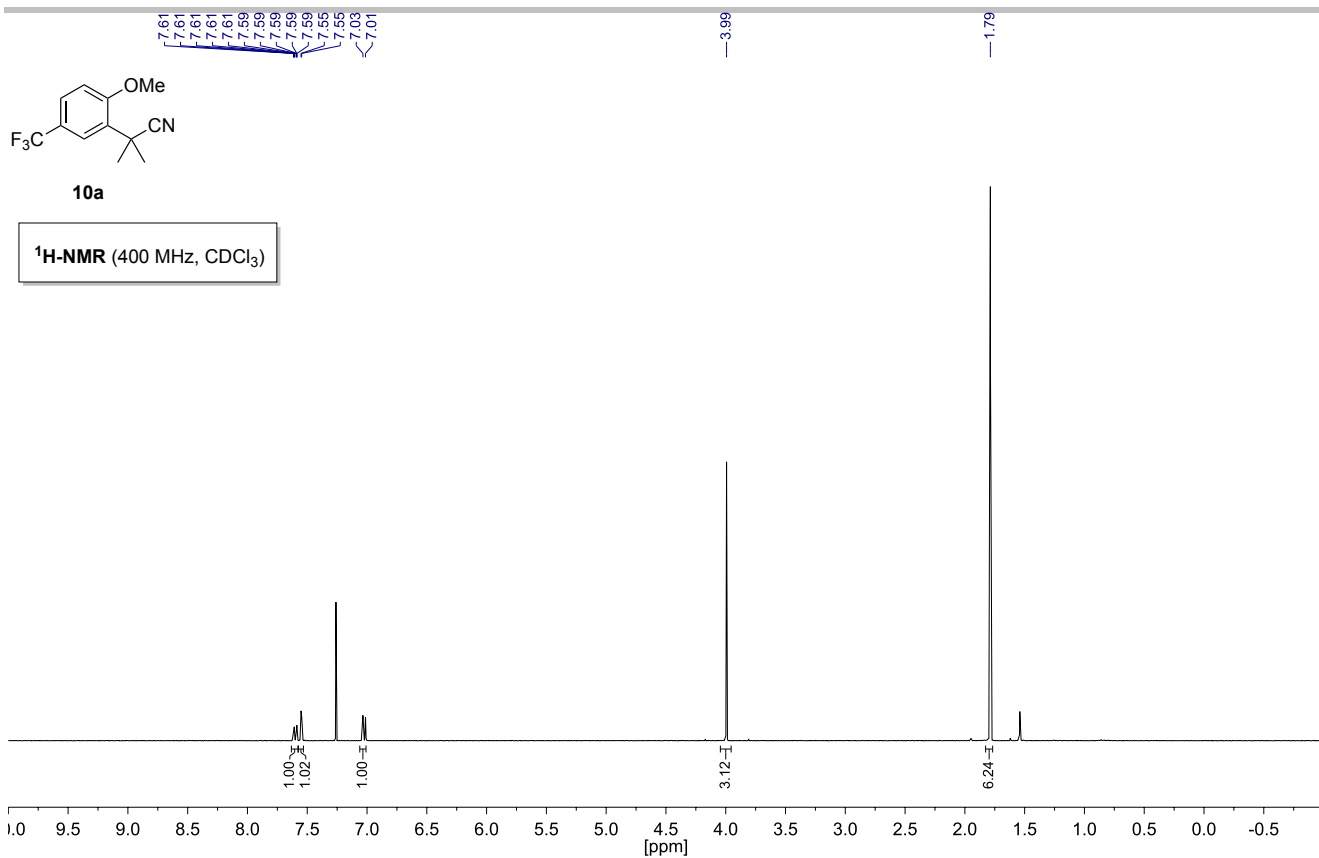
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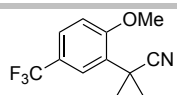
^{19}F -NMR (376 MHz, CDCl_3)



SUPPORTING INFORMATION

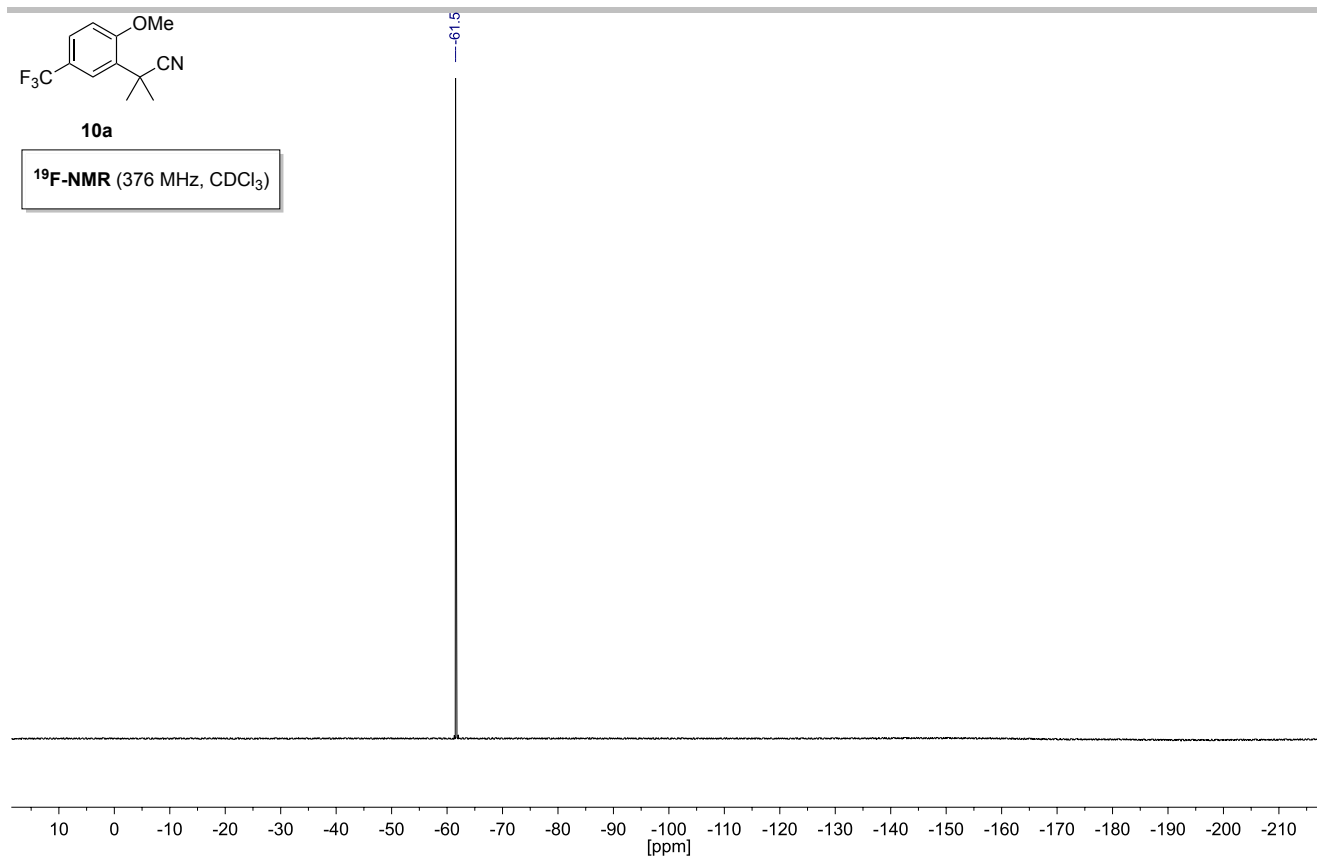


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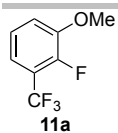


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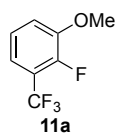
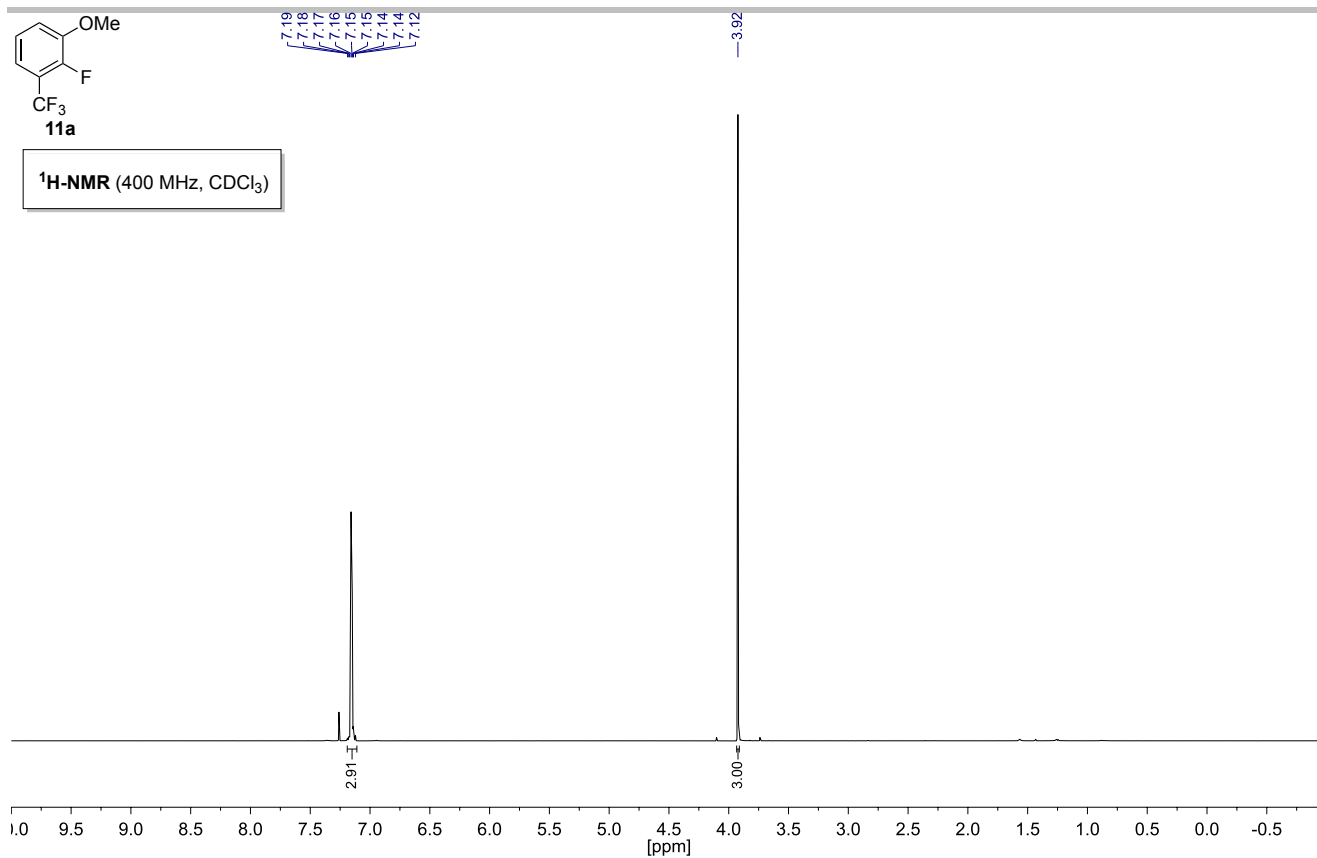
^{19}F -NMR (376 MHz, CDCl_3)



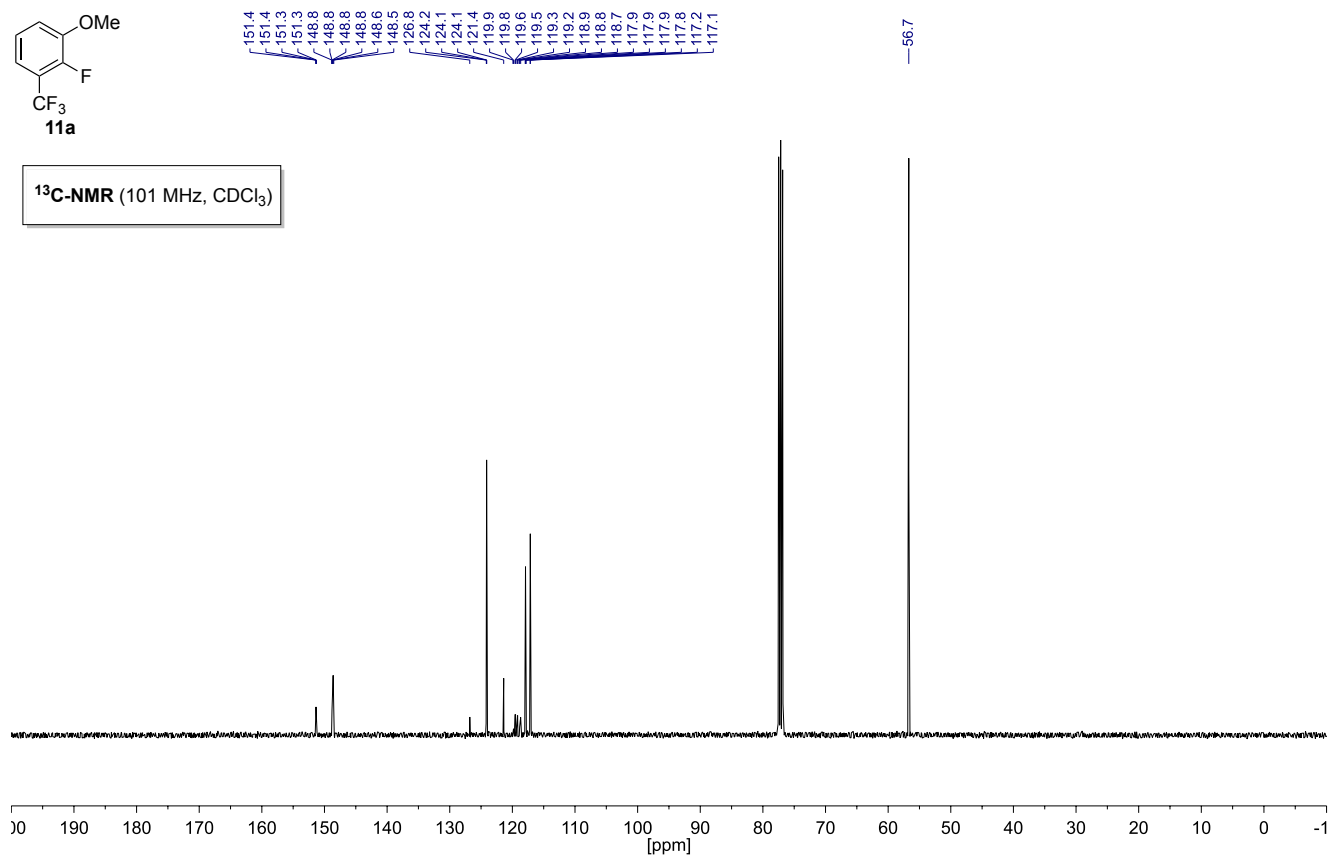
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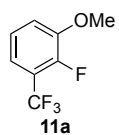
¹H-NMR (400 MHz, CDCl₃)



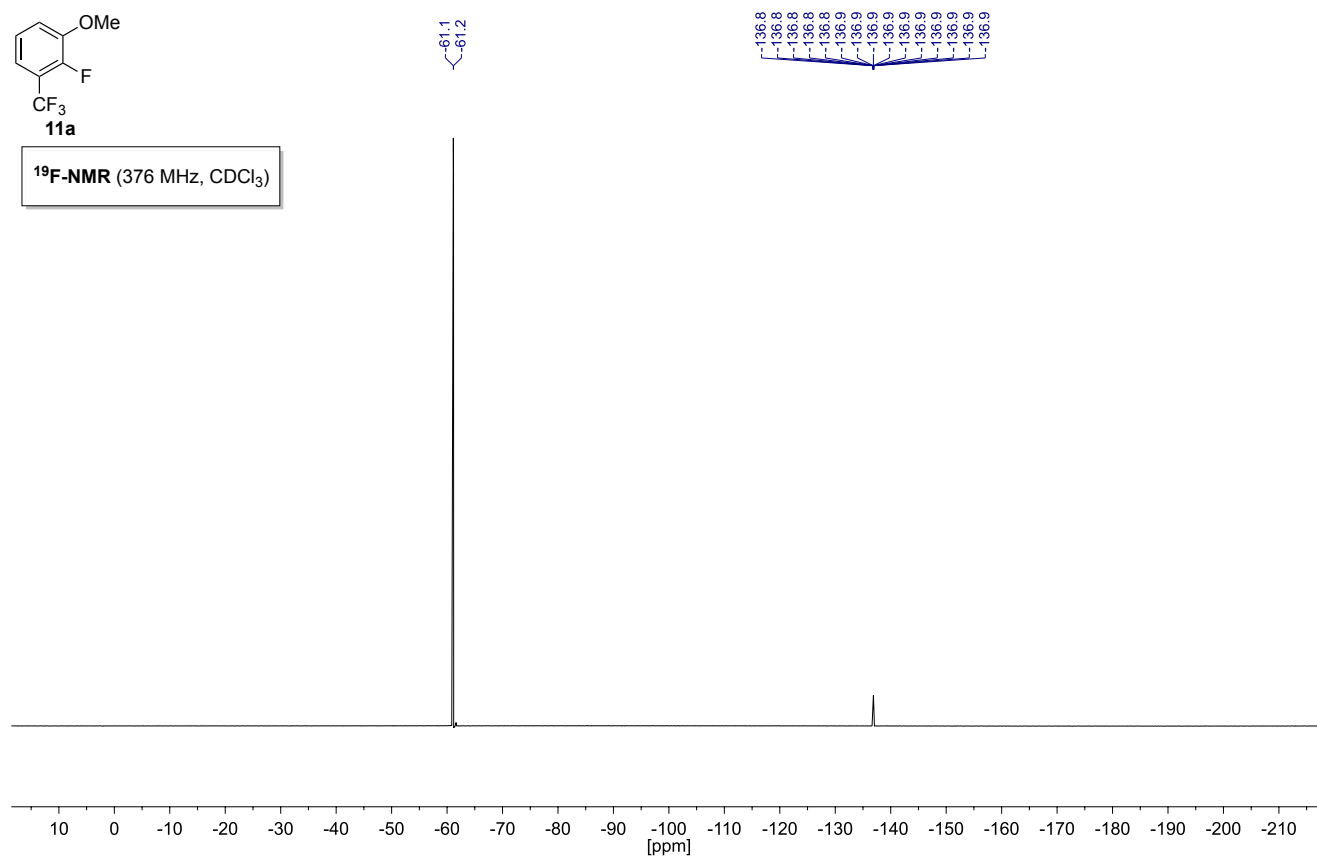
¹³C-NMR (101 MHz, CDCl₃)



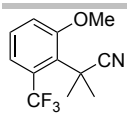
SUPPORTING INFORMATION



¹⁹F-NMR (376 MHz, CDCl₃)

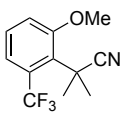
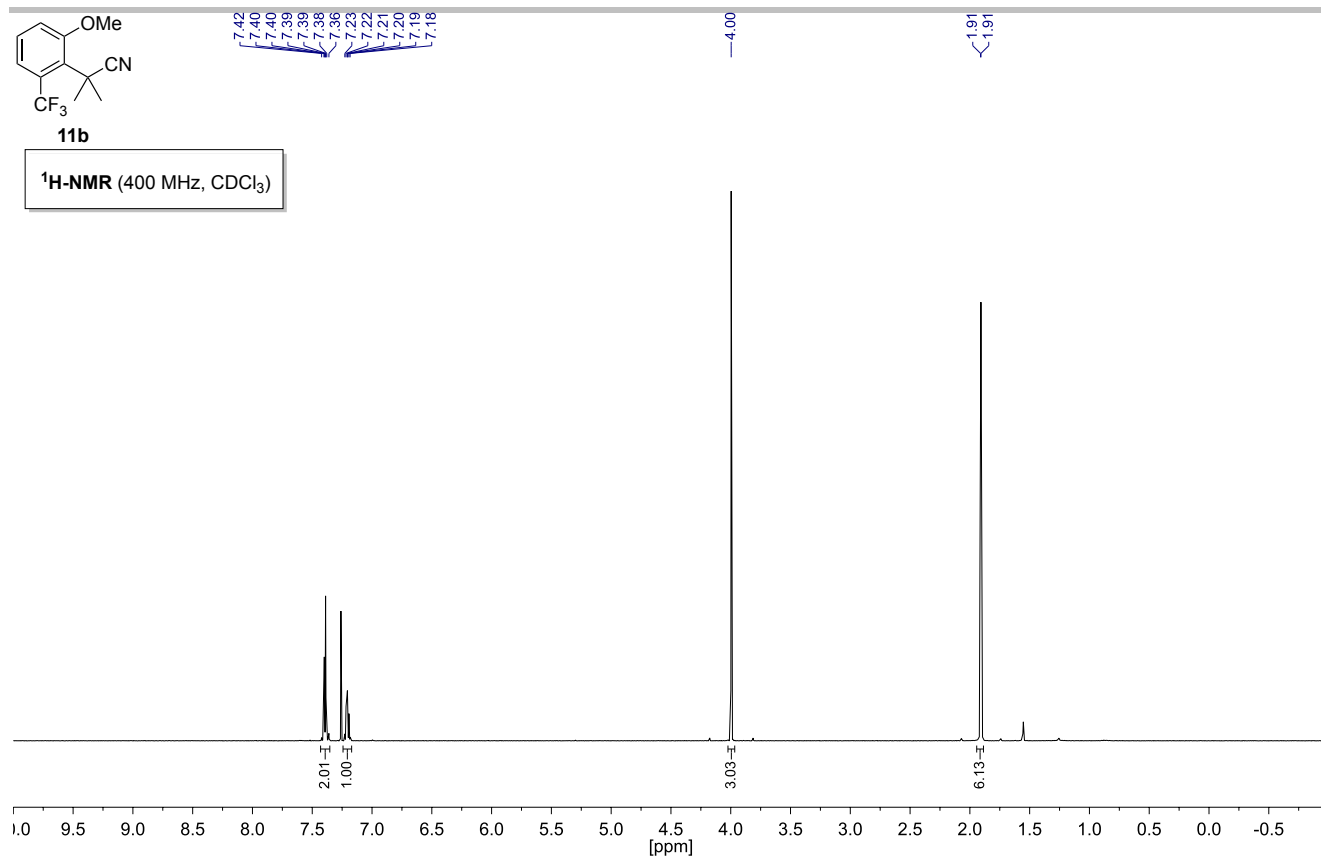


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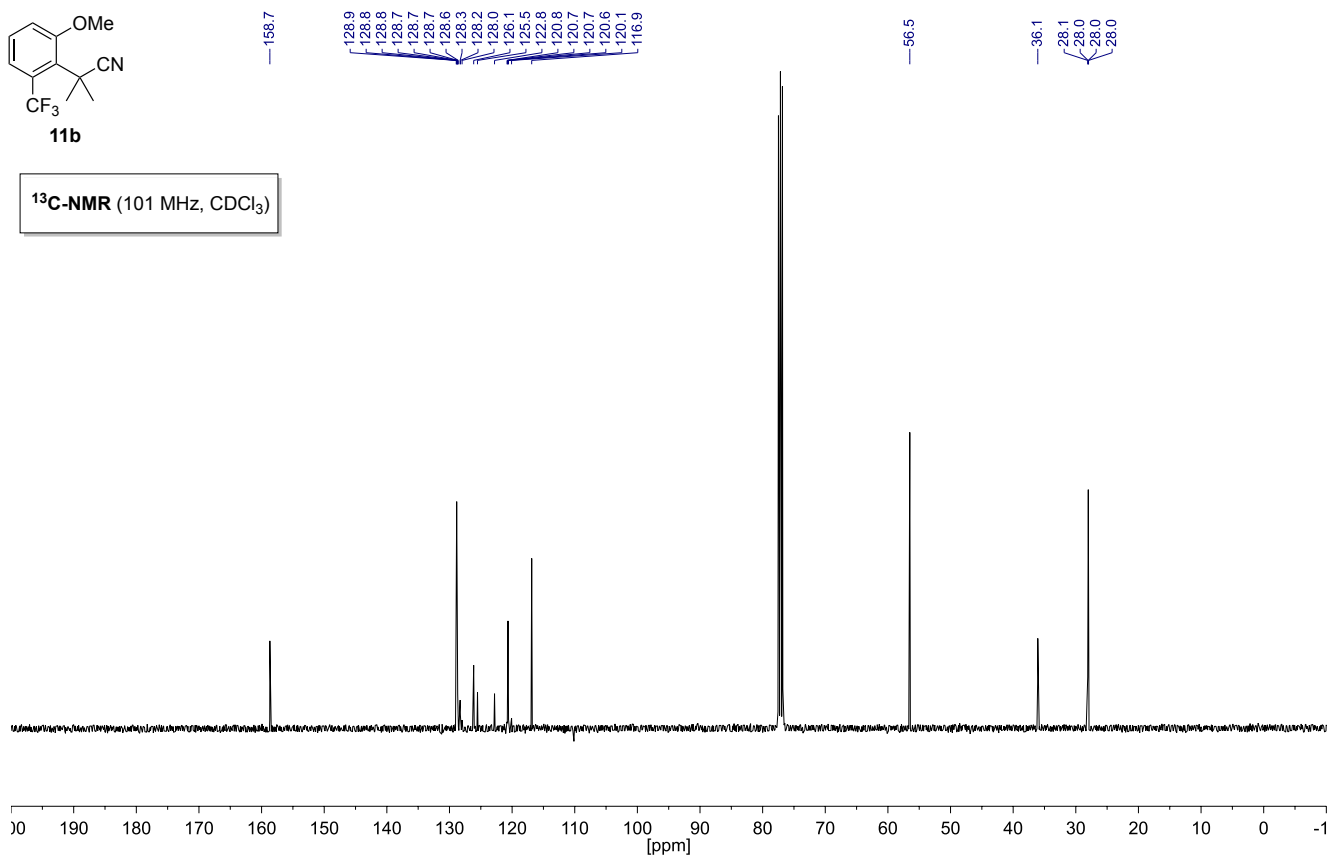
11b

¹H-NMR (400 MHz, CDCl₃)

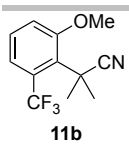


11b

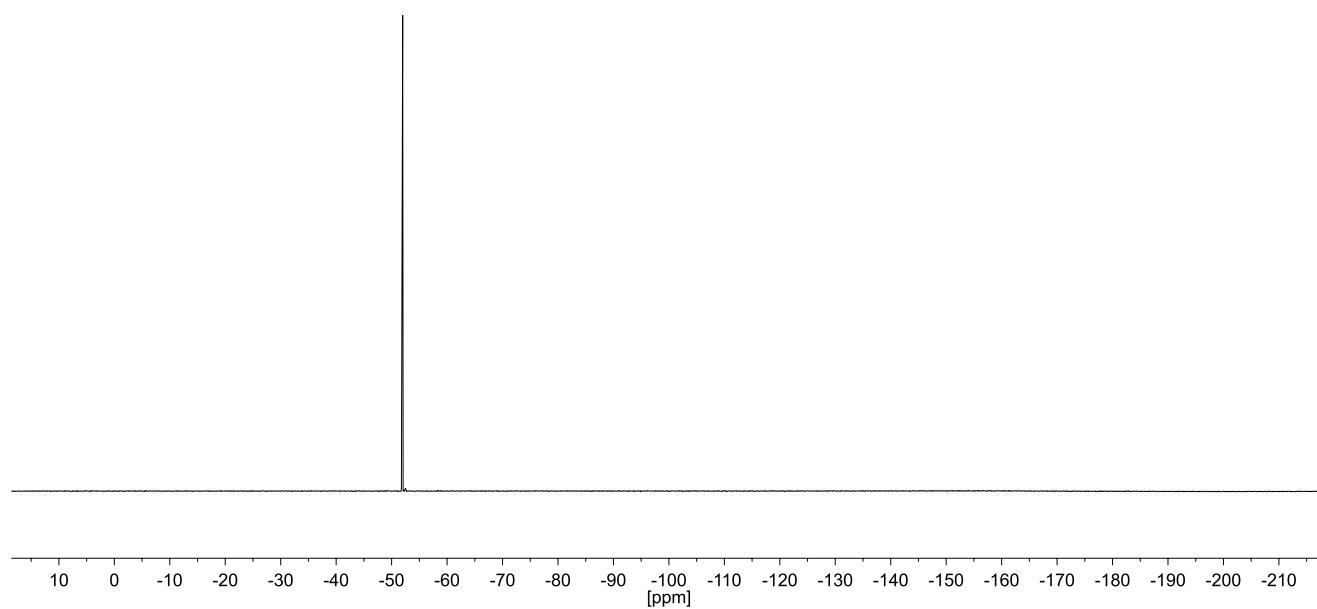
¹³C-NMR (101 MHz, CDCl₃)



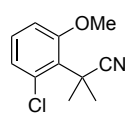
SUPPORTING INFORMATION



¹⁹F-NMR (376 MHz, CDCl₃)

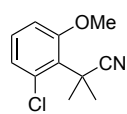
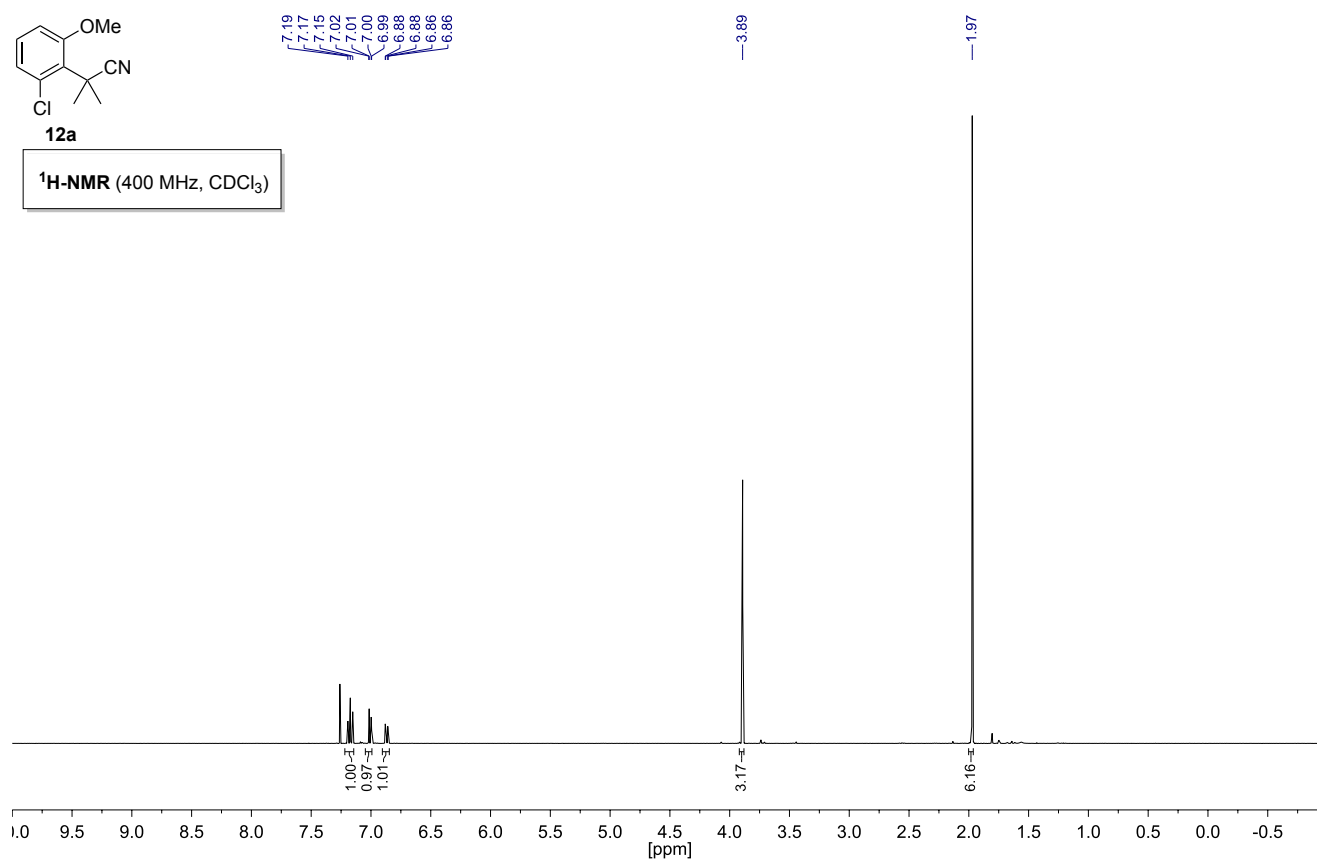


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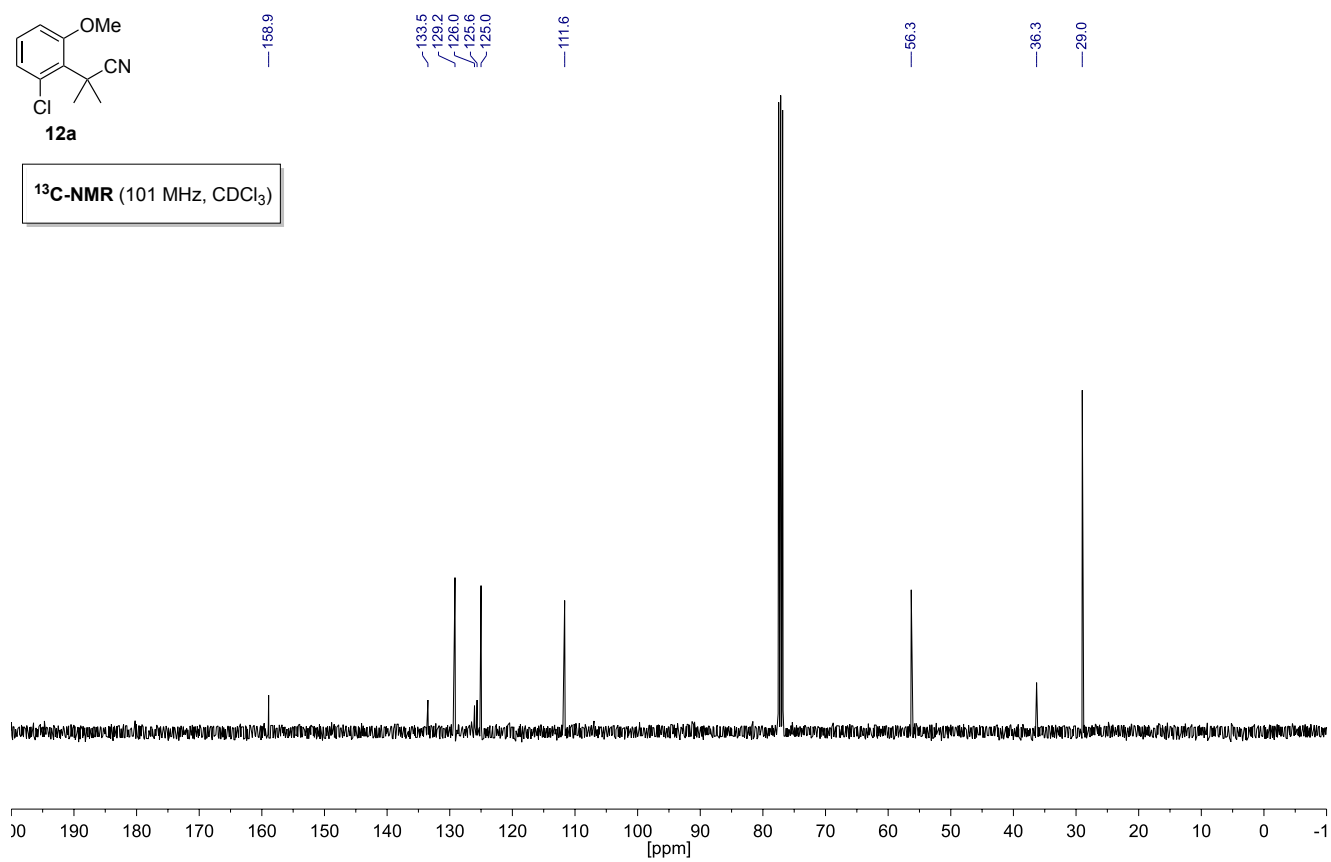
12a

¹H-NMR (400 MHz, CDCl₃)

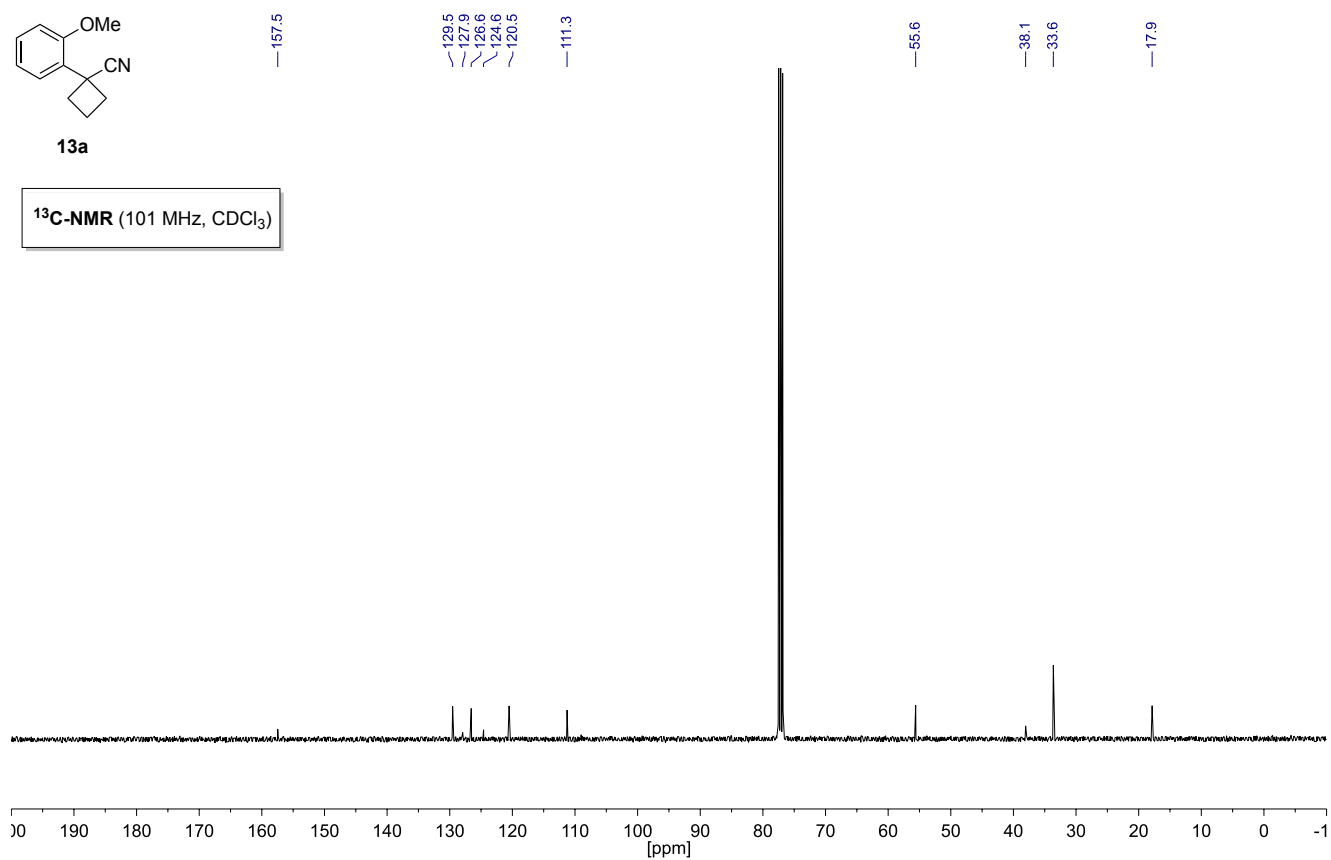
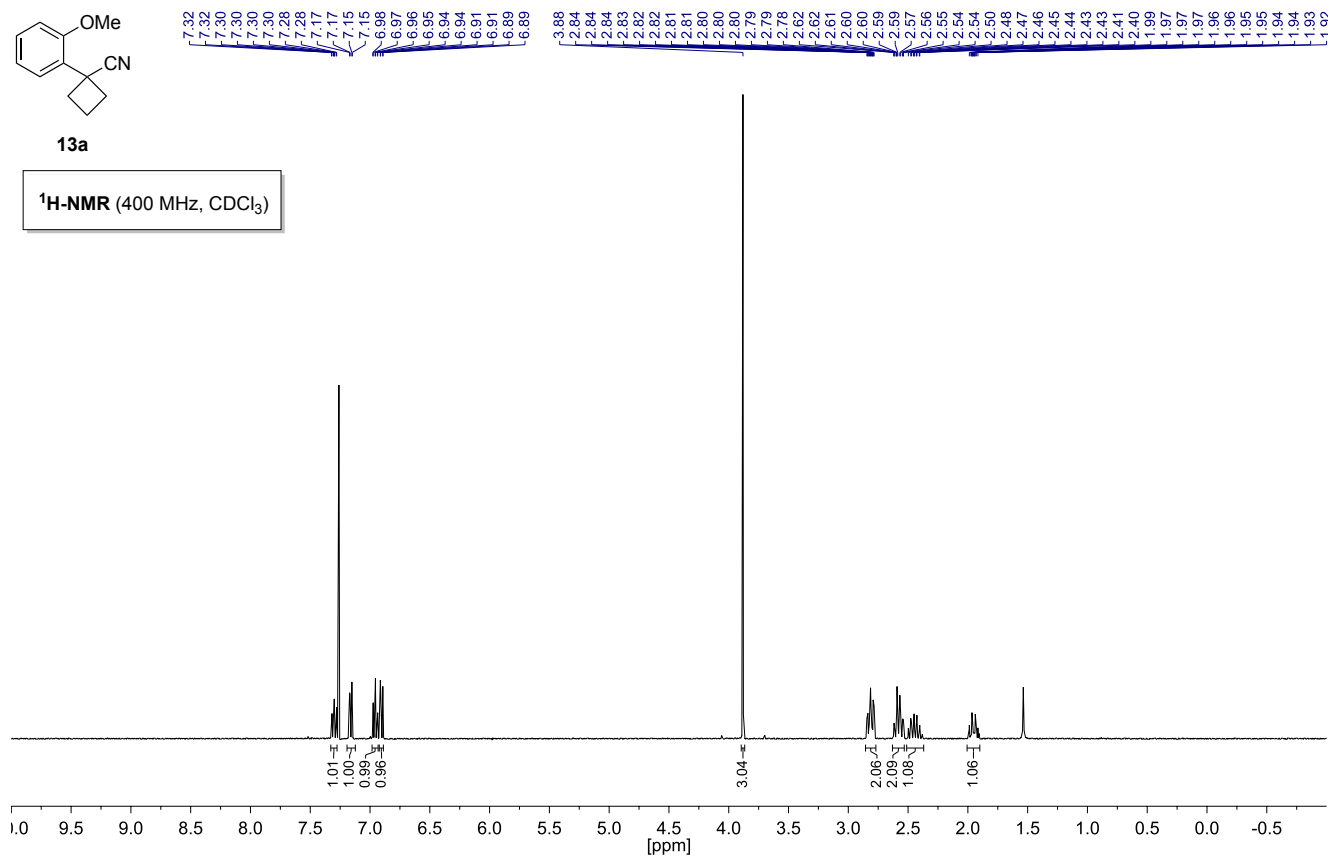


12a

¹³C-NMR (101 MHz, CDCl₃)

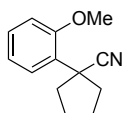


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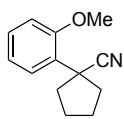
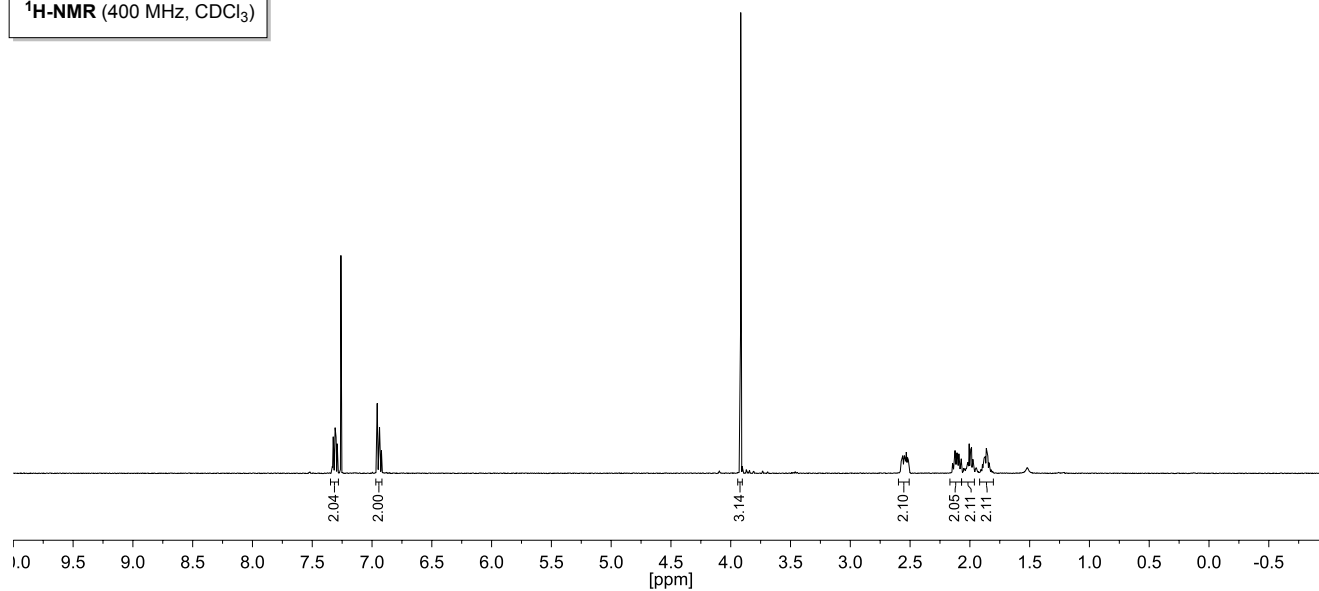
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7.33 7.32 7.31 7.30 7.29 7.28 7.27 7.26 7.25 7.24 7.23 7.22 7.21 7.20 7.19 7.18 7.17 7.16 7.15 7.14 7.13 7.12 7.11 7.10 7.09 7.08 7.07 7.06 7.05 7.04 7.03 7.02 7.01 2.00 1.99 1.98 1.96 1.97 1.95 1.91 1.90 1.89 1.88 1.87 1.86 1.85 1.84 1.83



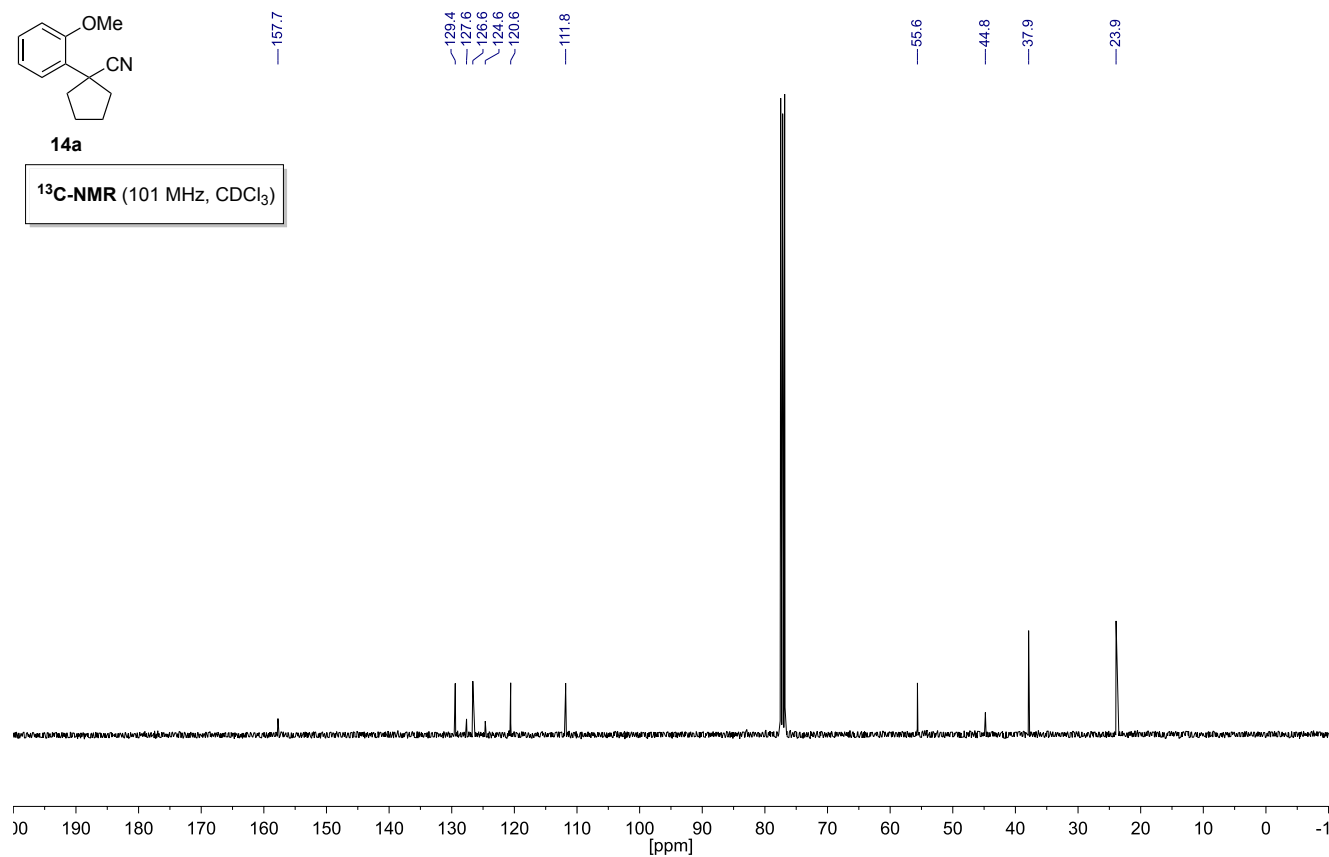
14a

¹H-NMR (400 MHz, CDCl₃)

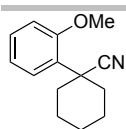


14a

¹³C-NMR (101 MHz, CDCl₃)

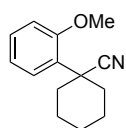
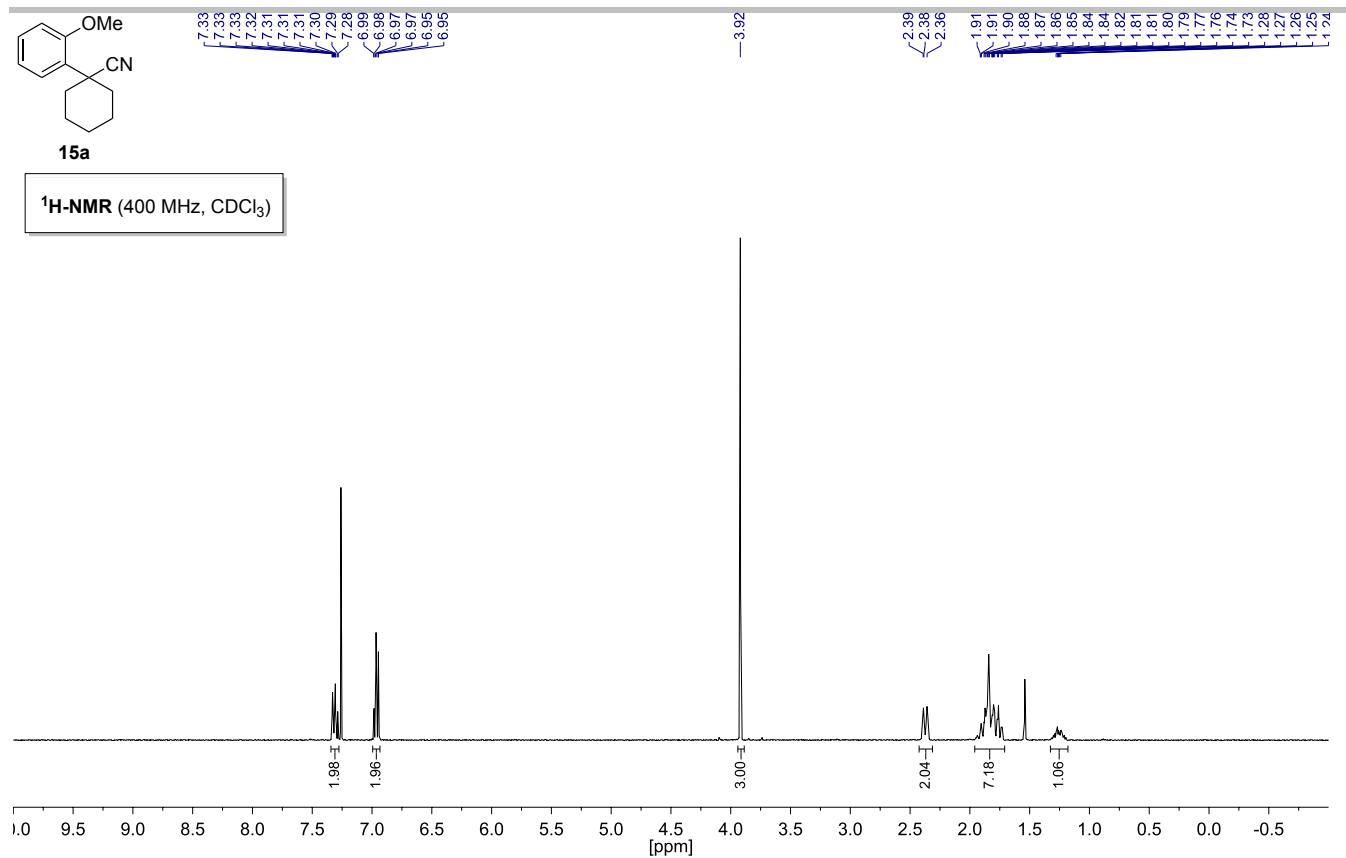


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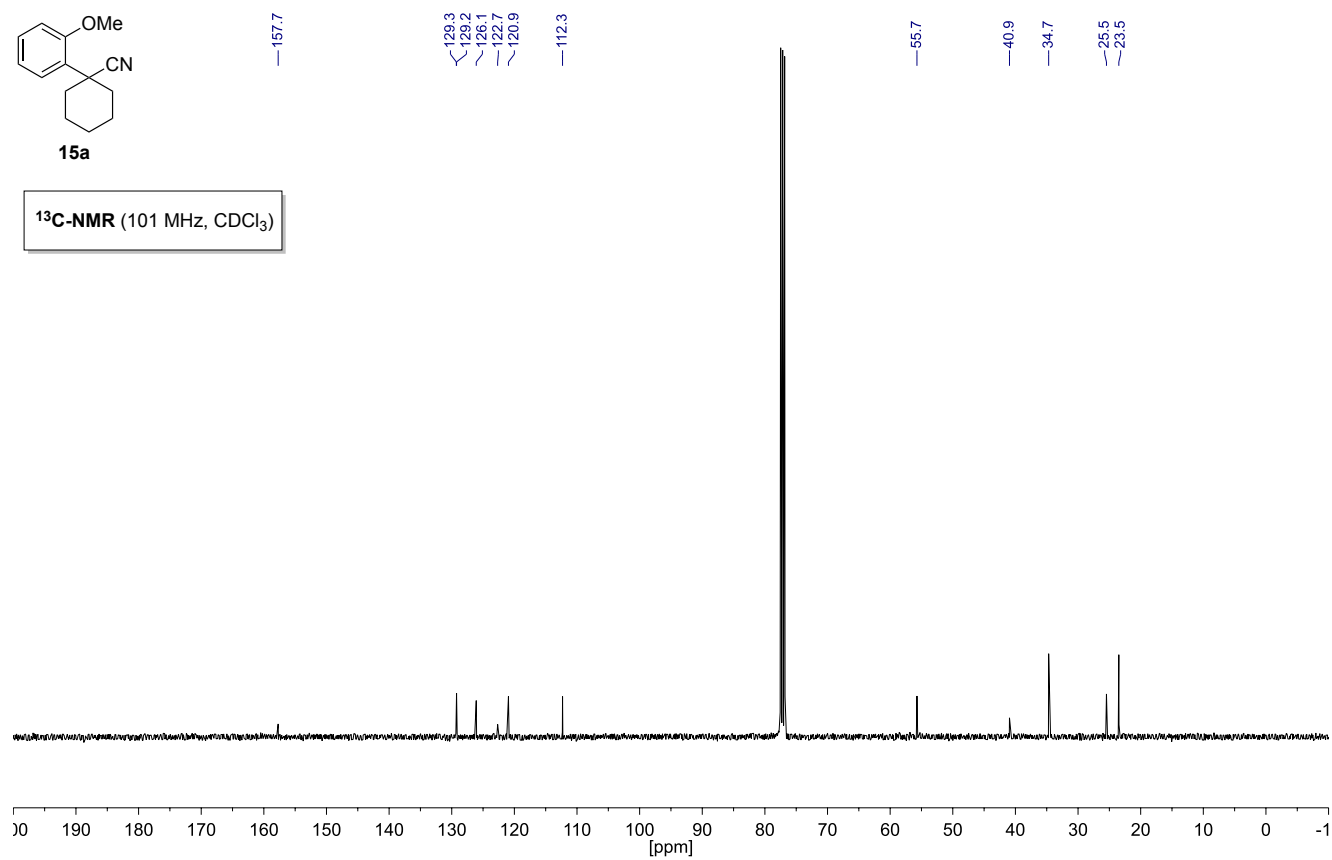
15a

¹H-NMR (400 MHz, CDCl₃)

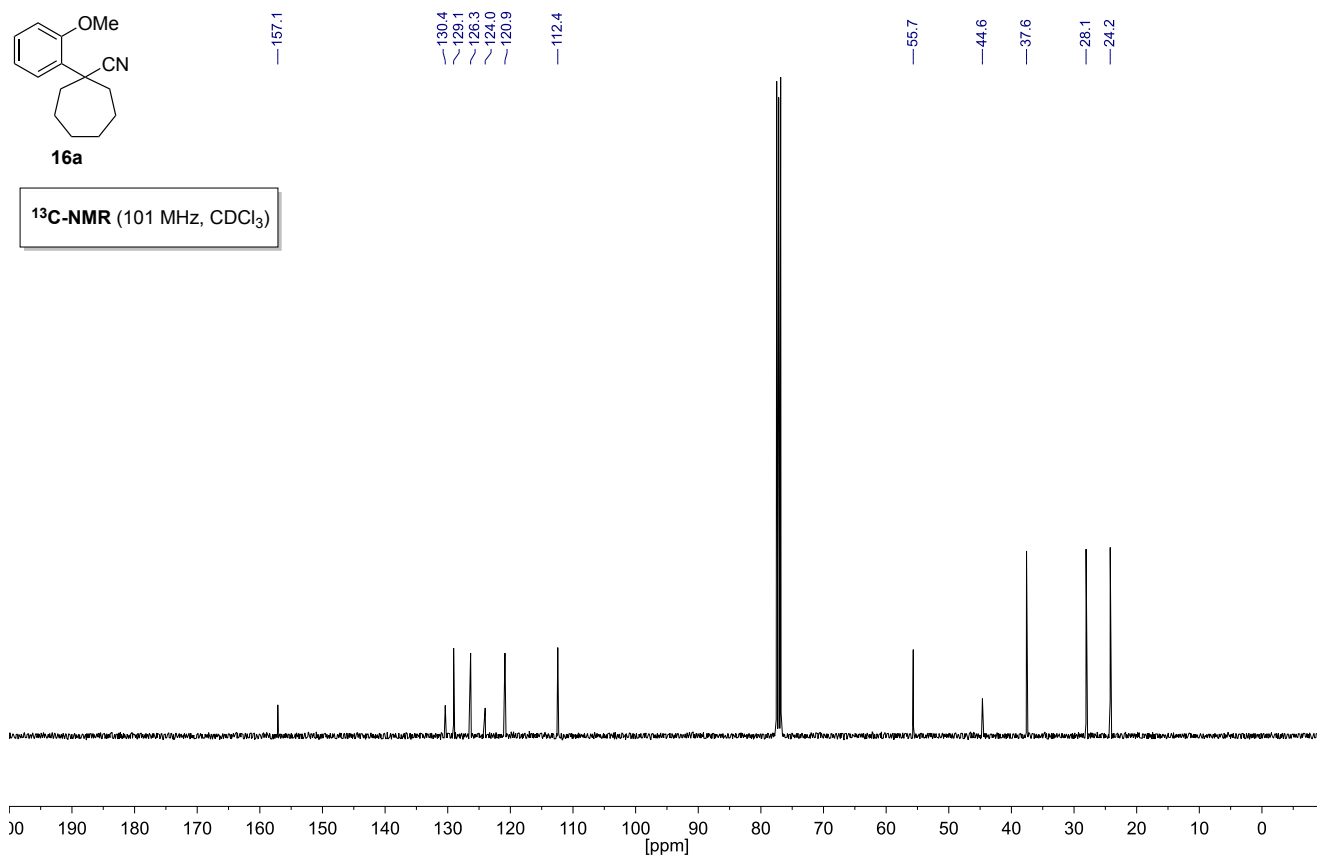
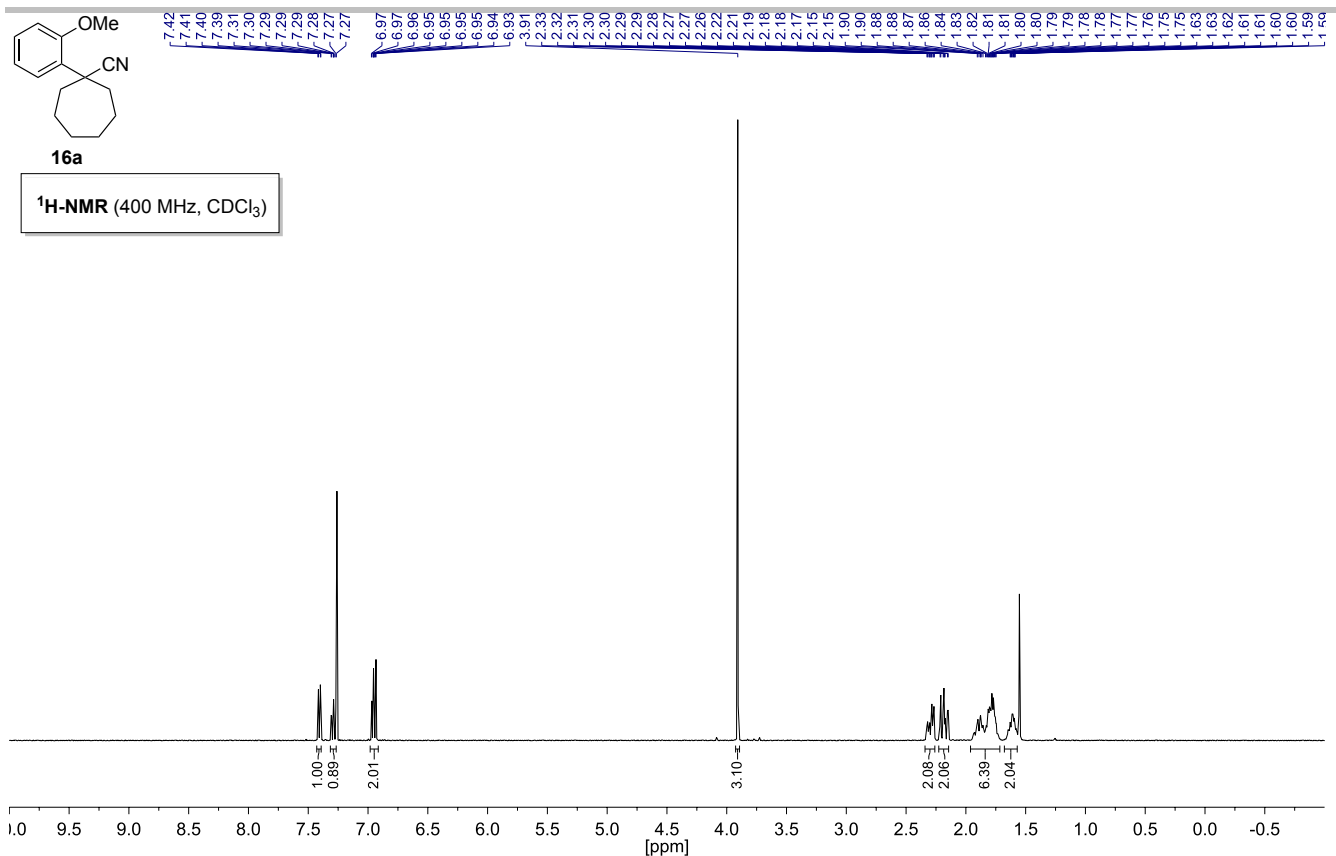


15a

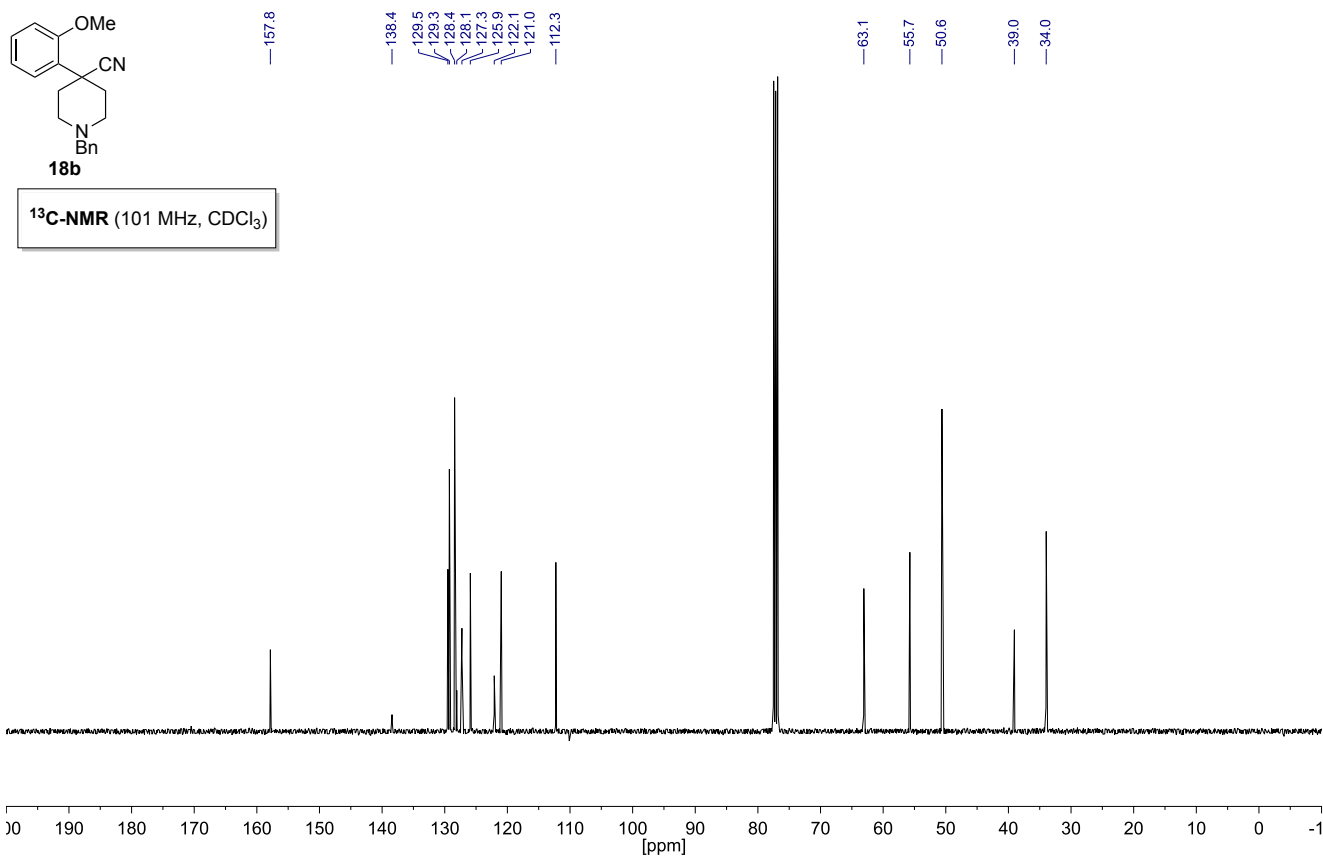
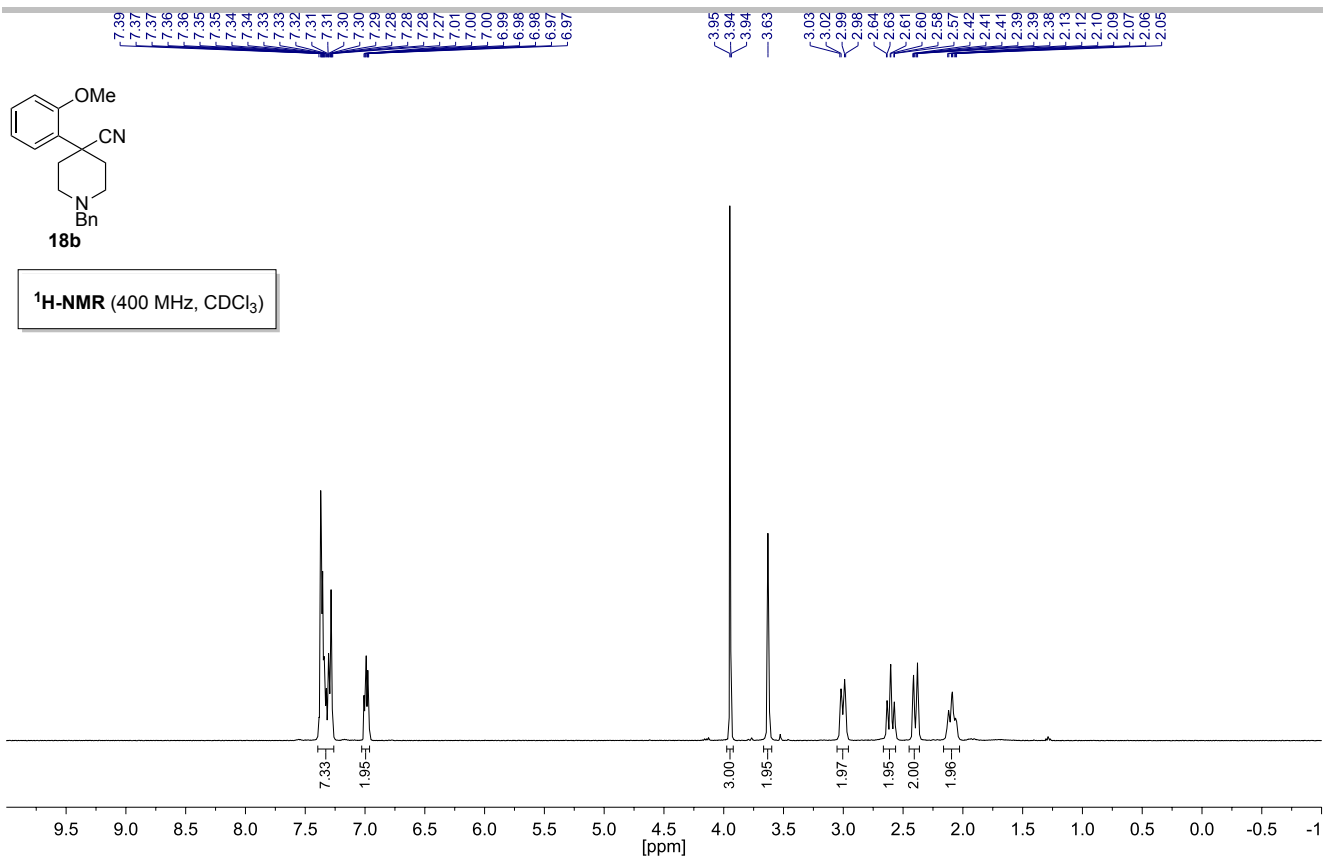
¹³C-NMR (101 MHz, CDCl₃)



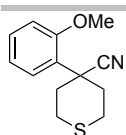
SUPPORTING INFORMATION



SUPPORTING INFORMATION

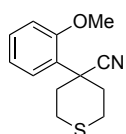
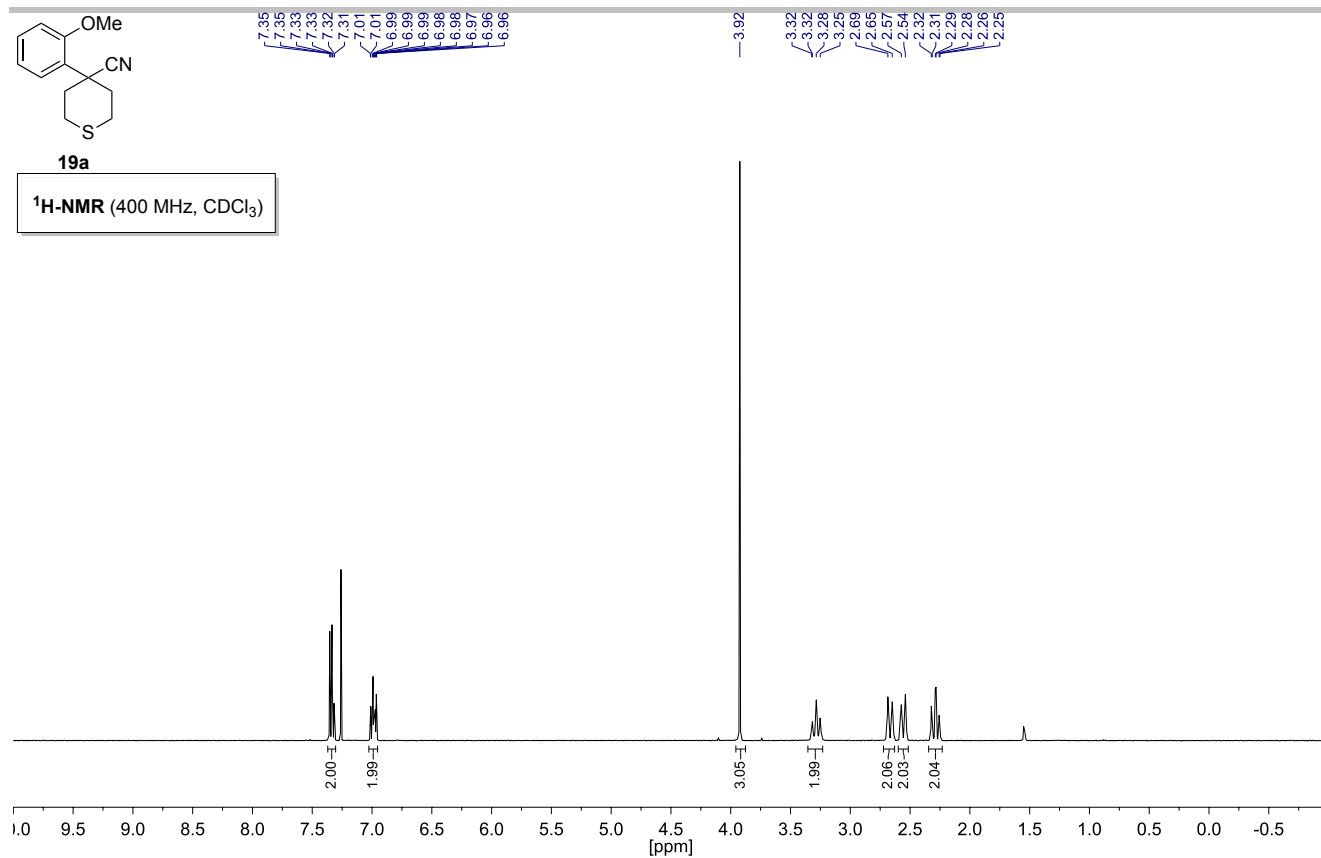


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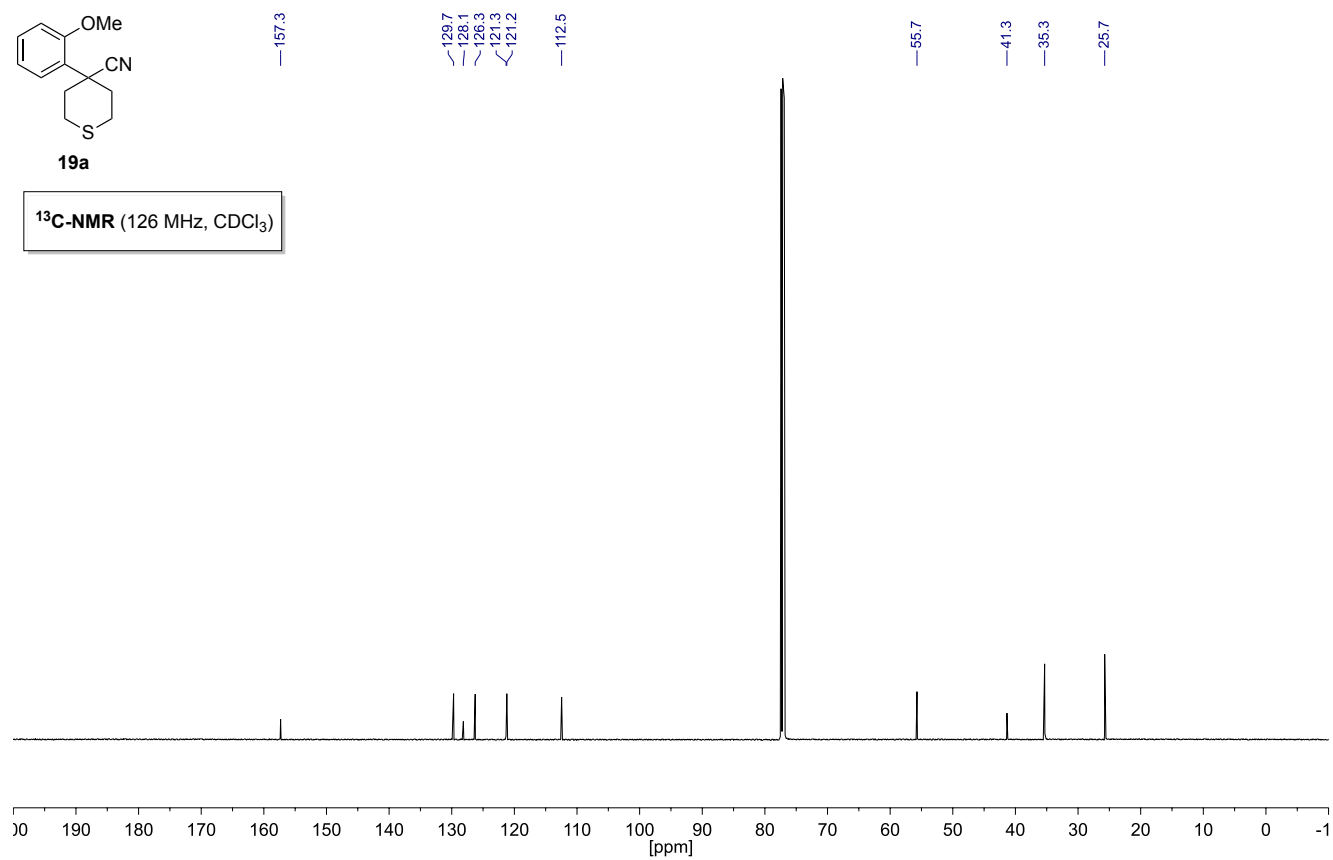
19a

¹H-NMR (400 MHz, CDCl₃)

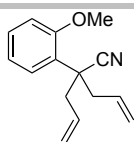


19a

¹³C-NMR (126 MHz, CDCl₃)

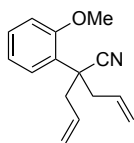
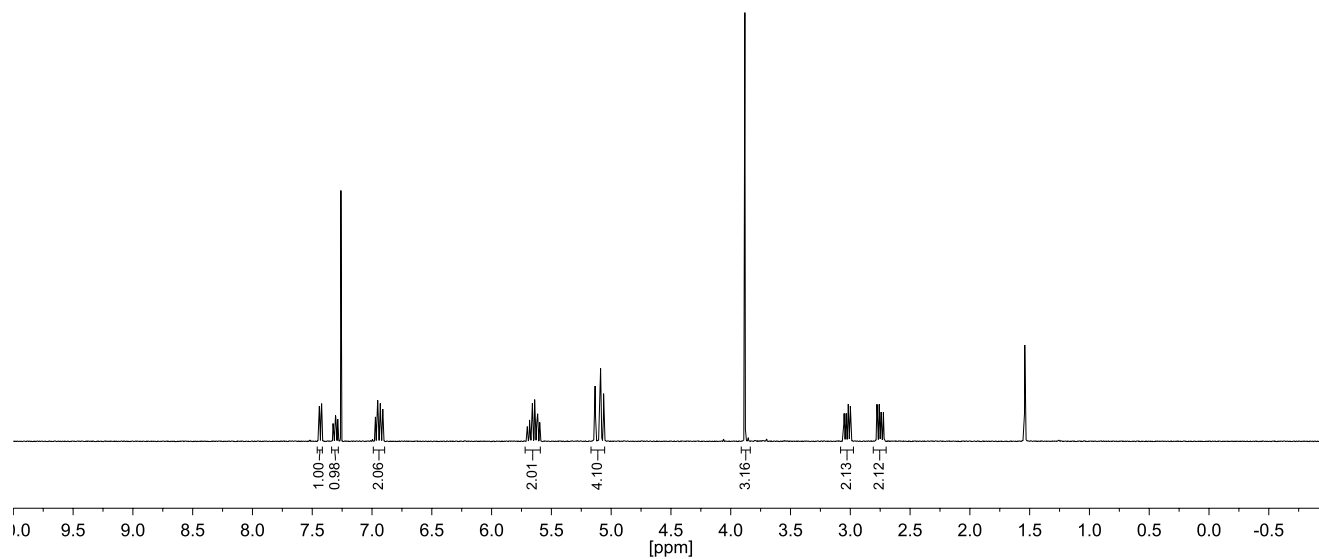


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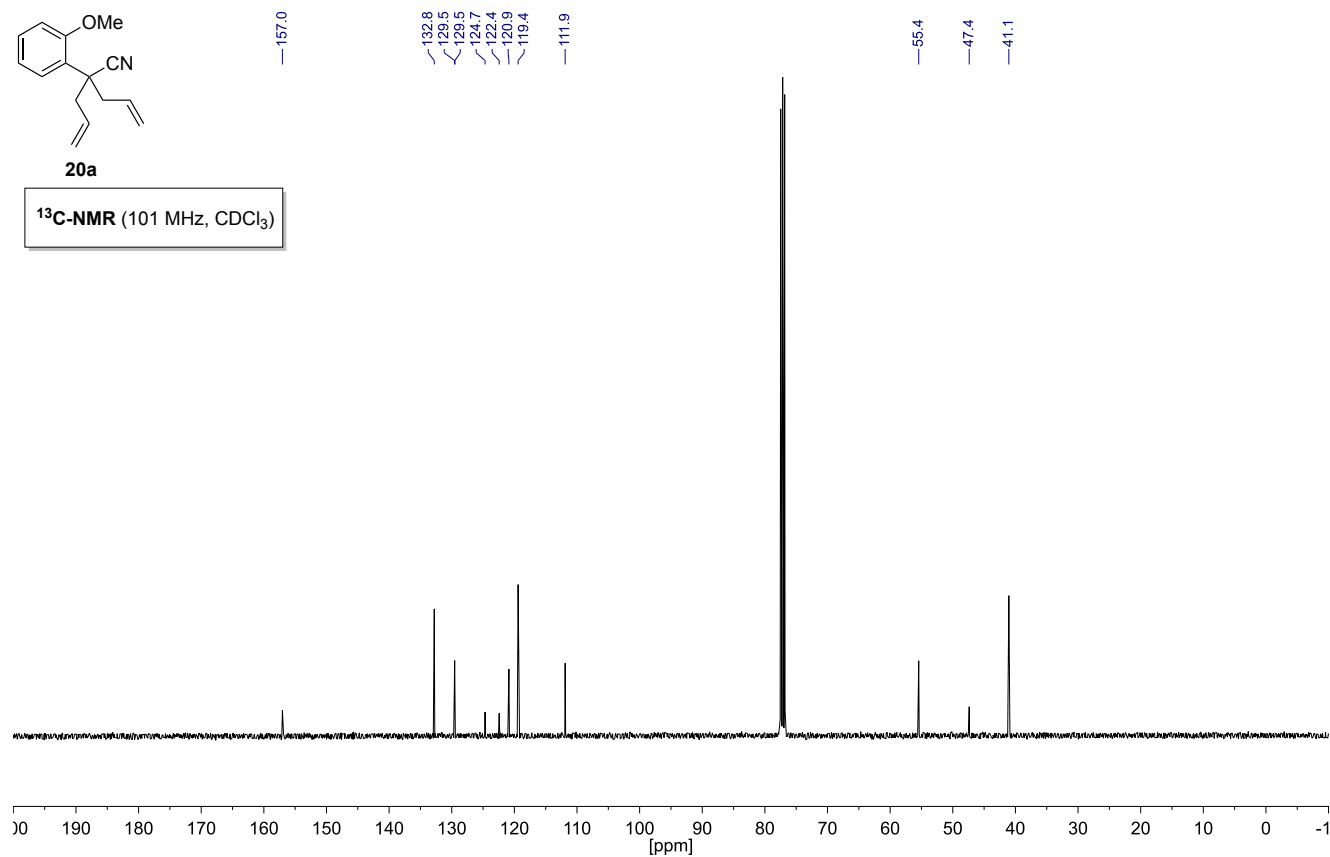
20a

¹H-NMR (400 MHz, CDCl₃)



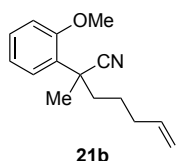
20a

¹³C-NMR (101 MHz, CDCl₃)



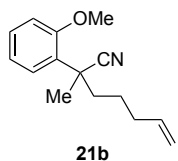
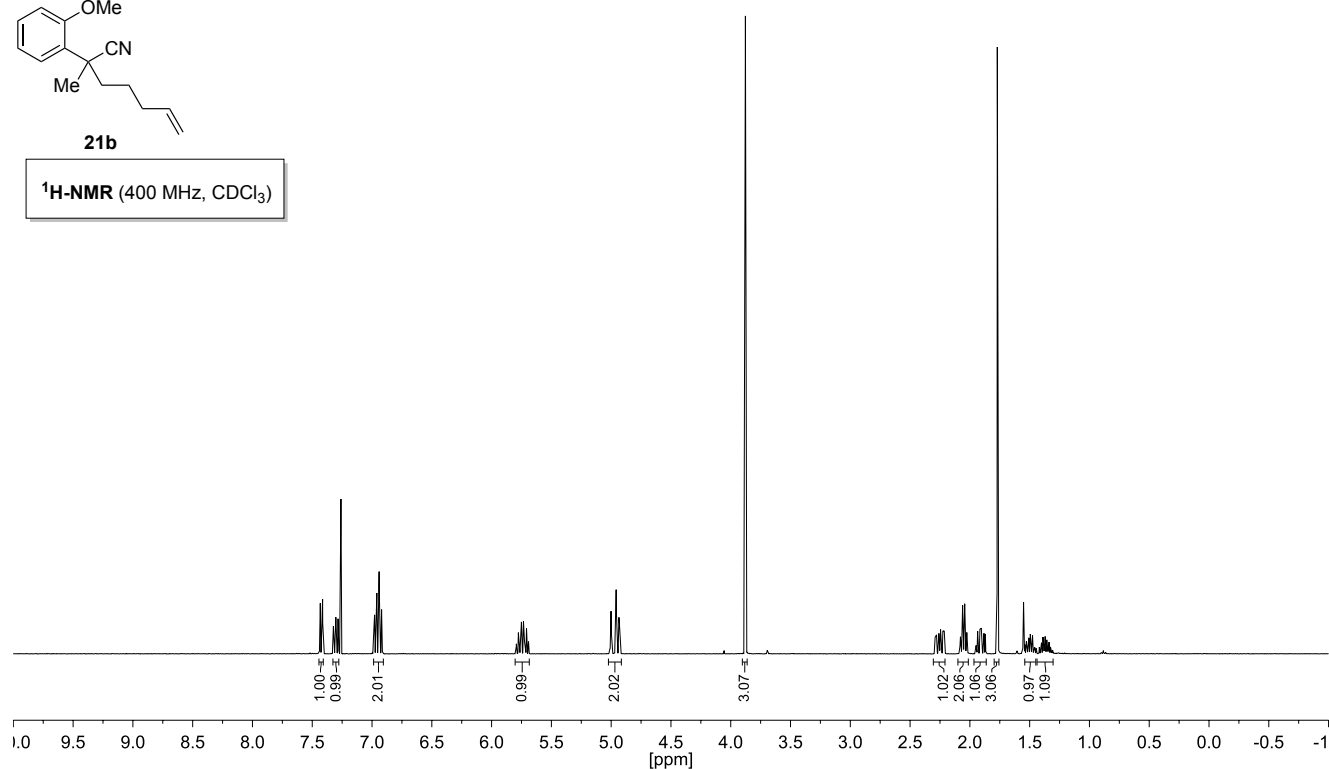
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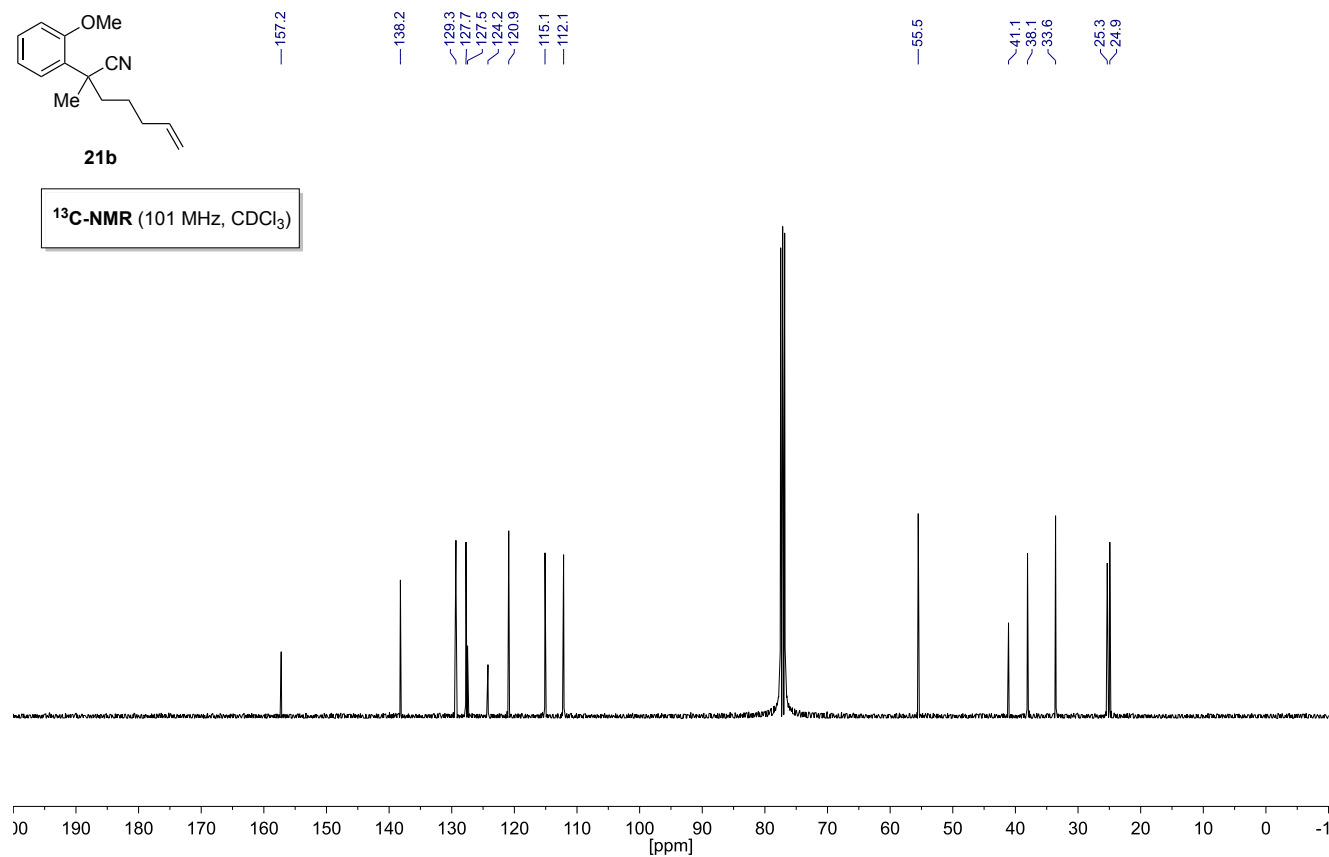
21b

¹H-NMR (400 MHz, CDCl₃)

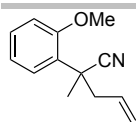


21b

¹³C-NMR (101 MHz, CDCl₃)

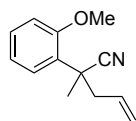
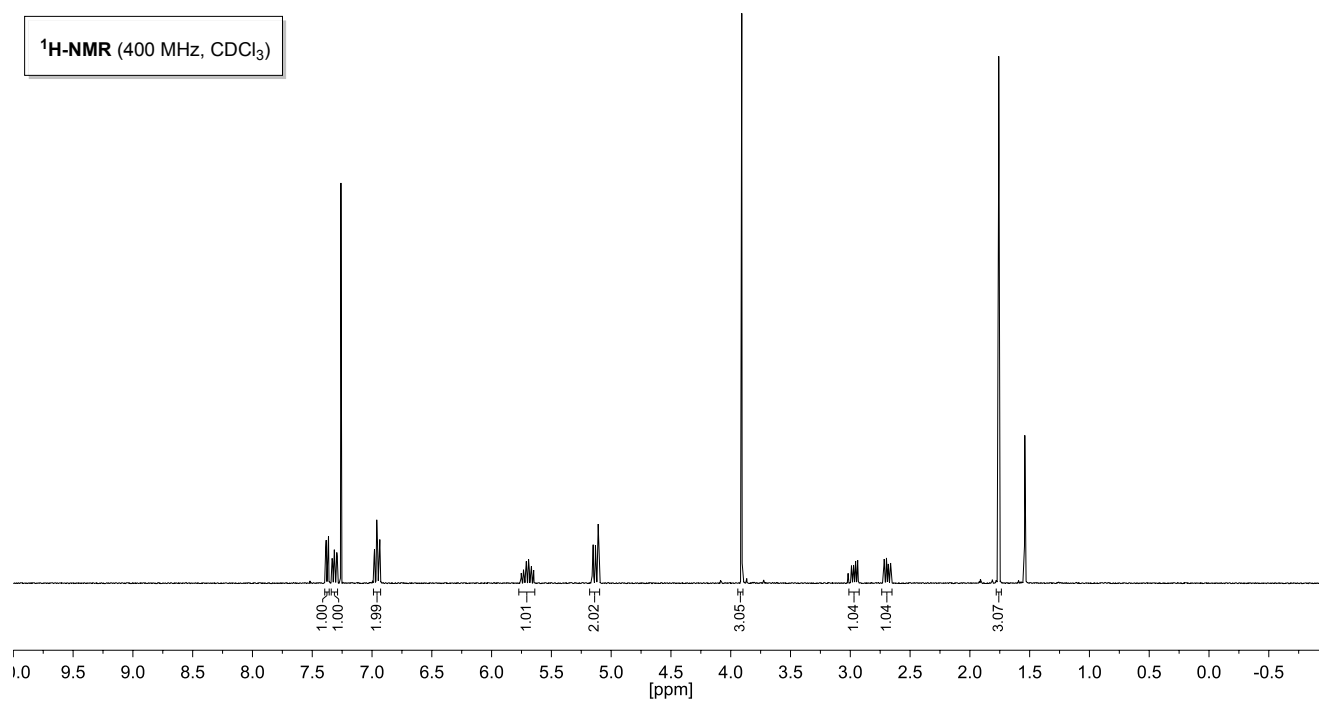


SUPPORTING INFORMATION



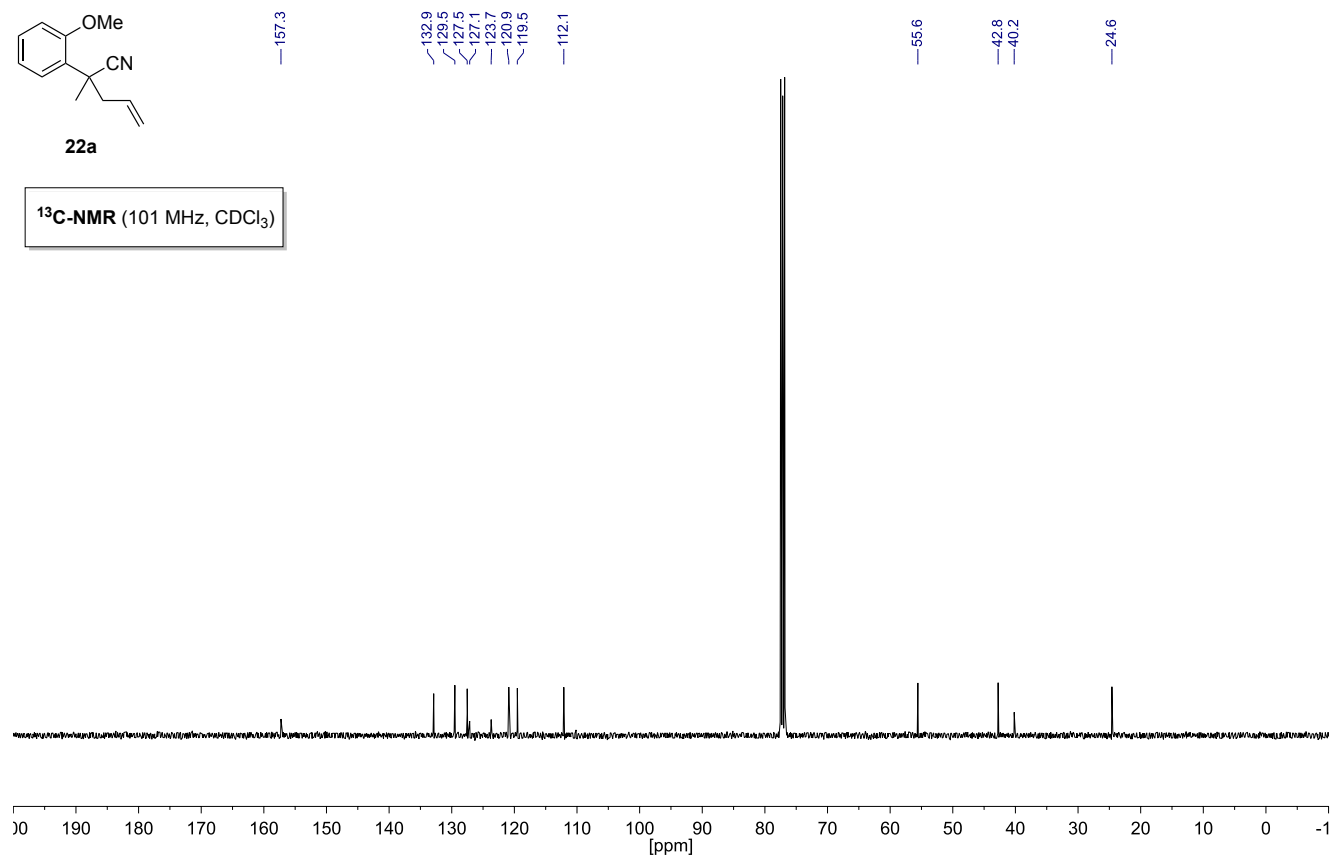
22a

¹H-NMR (400 MHz, CDCl₃)

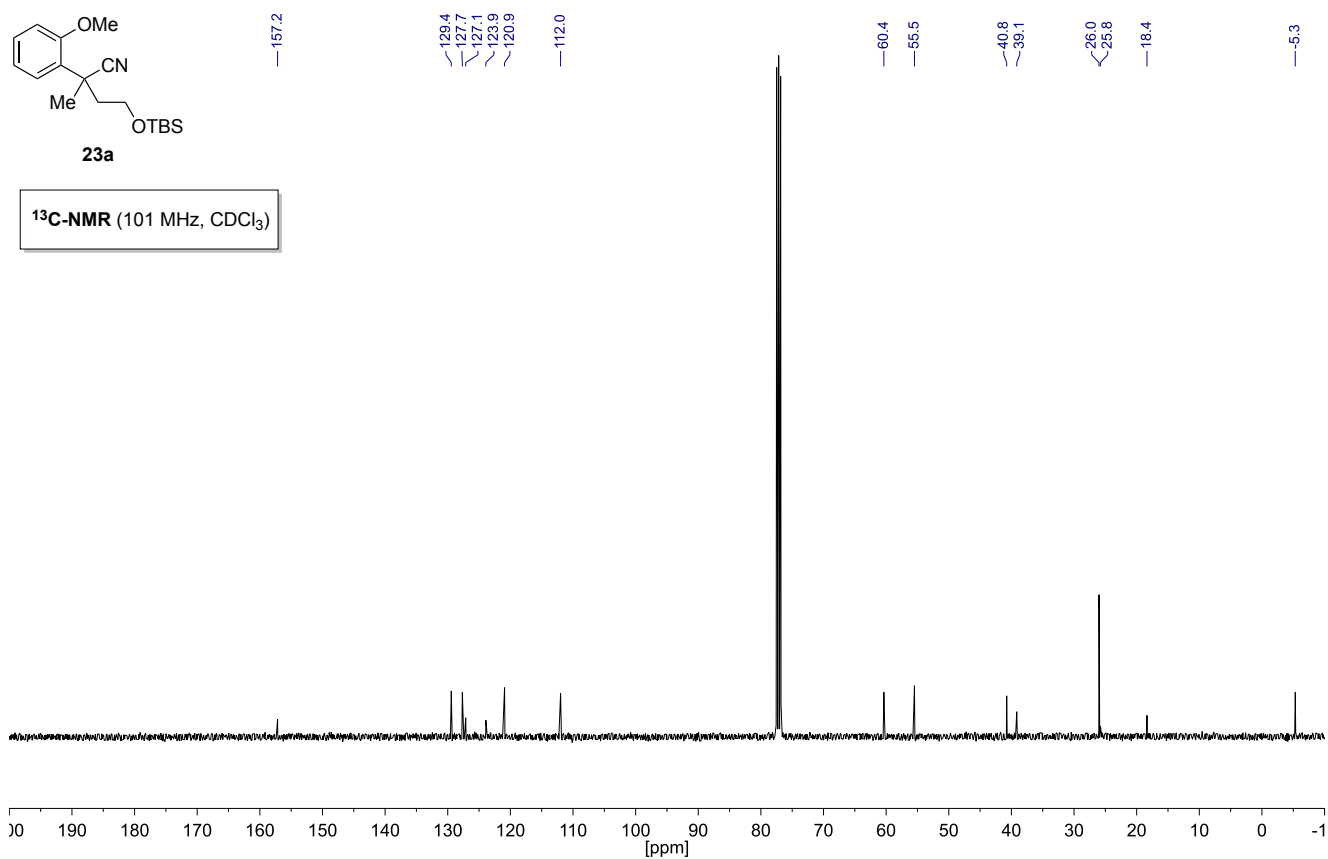
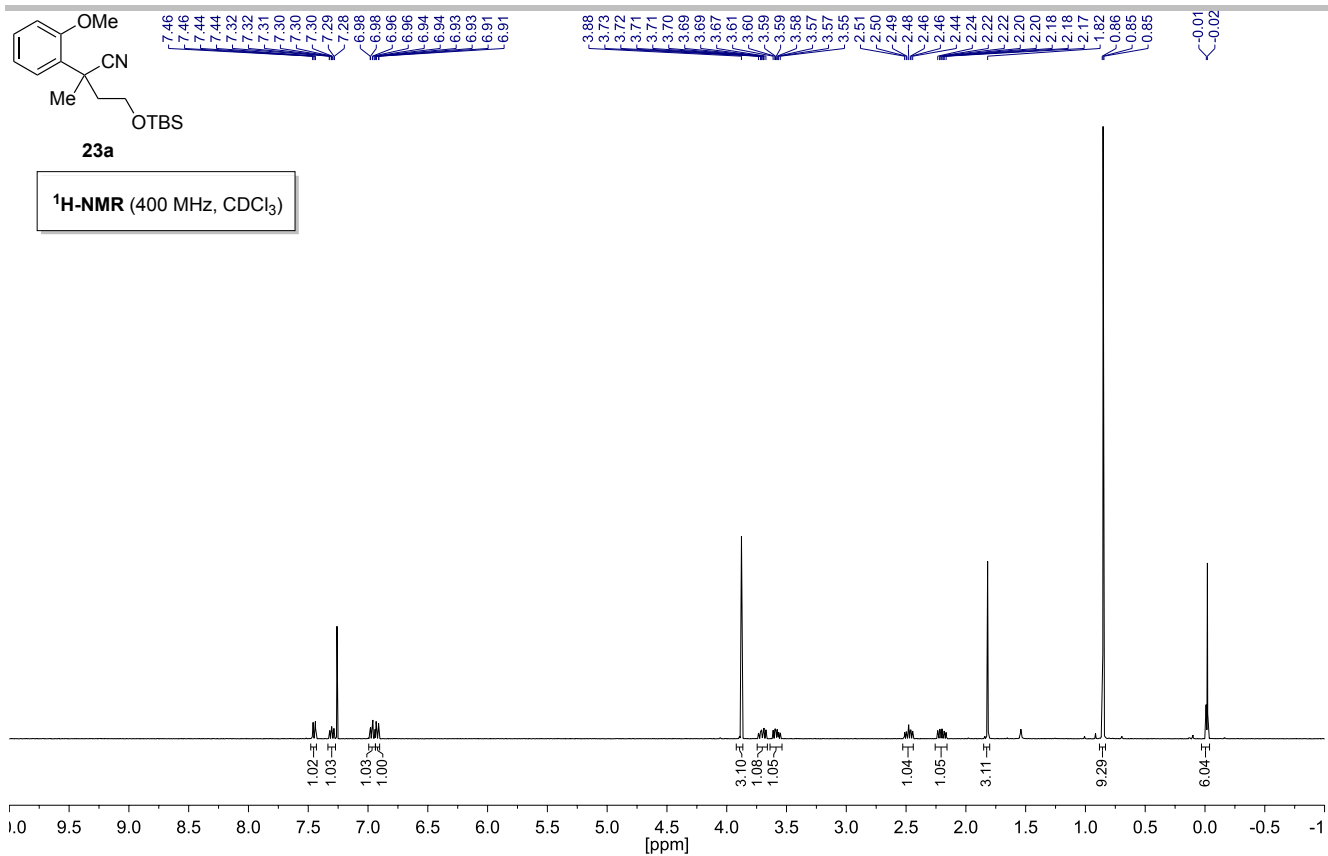


22a

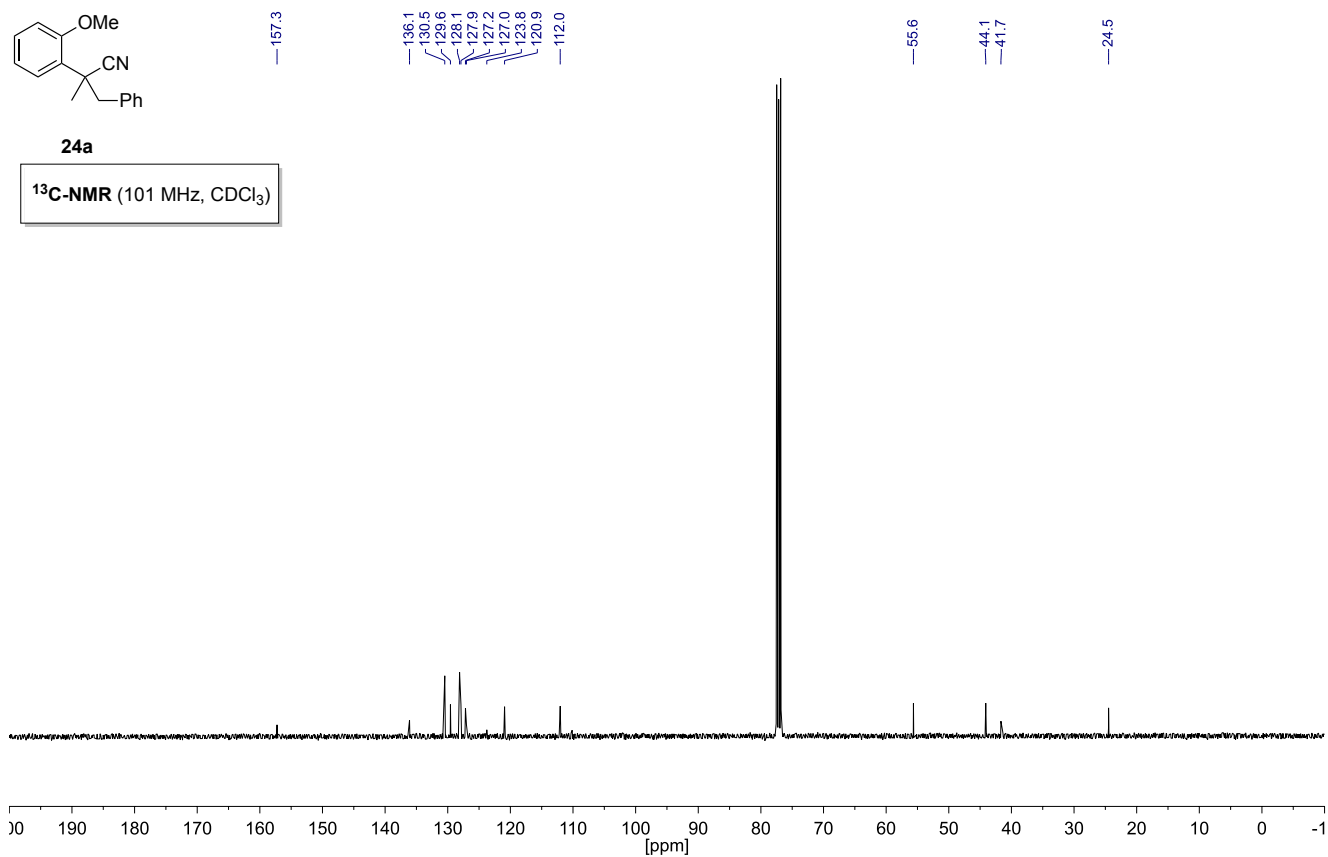
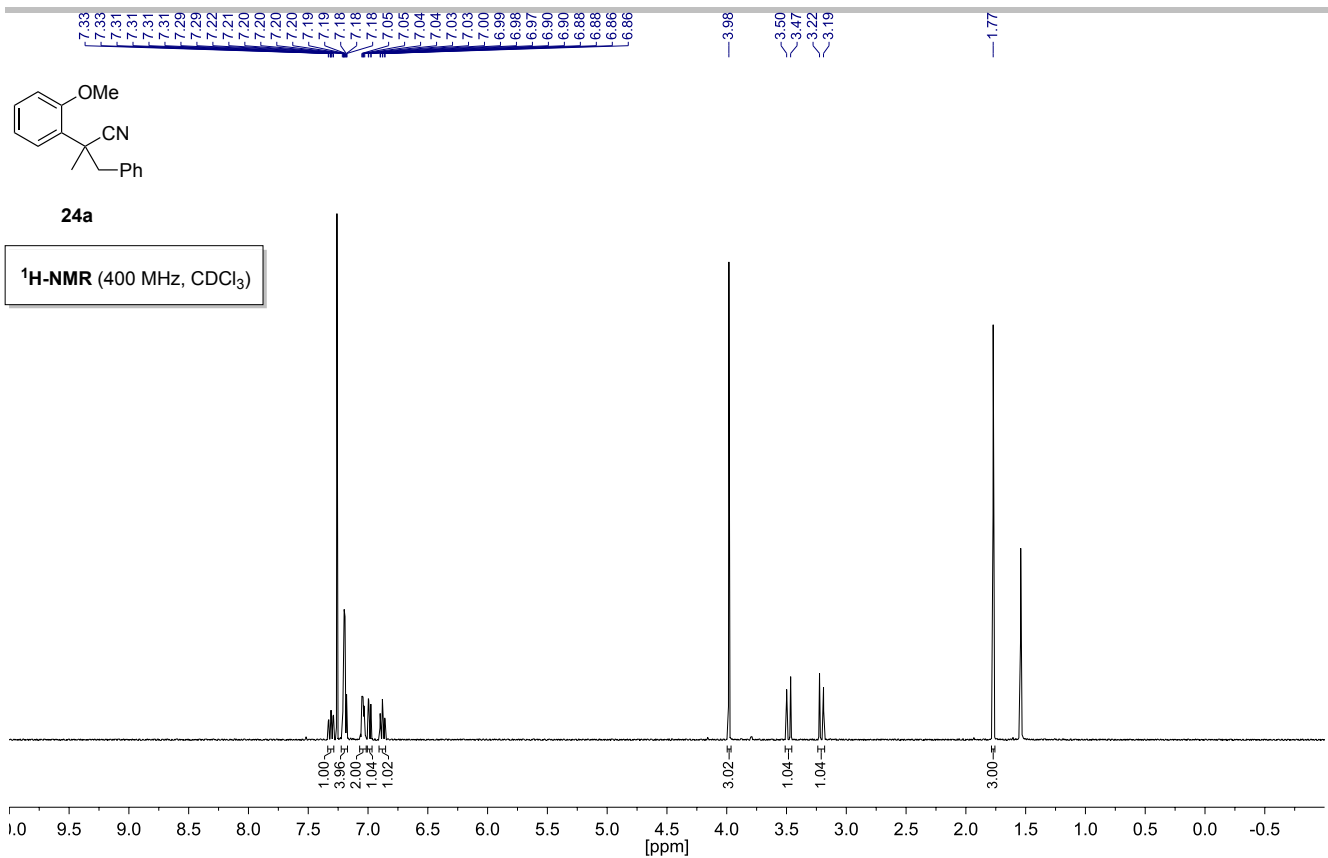
¹³C-NMR (101 MHz, CDCl₃)



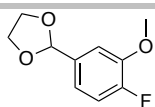
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SUPPORTING INFORMATION

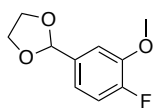
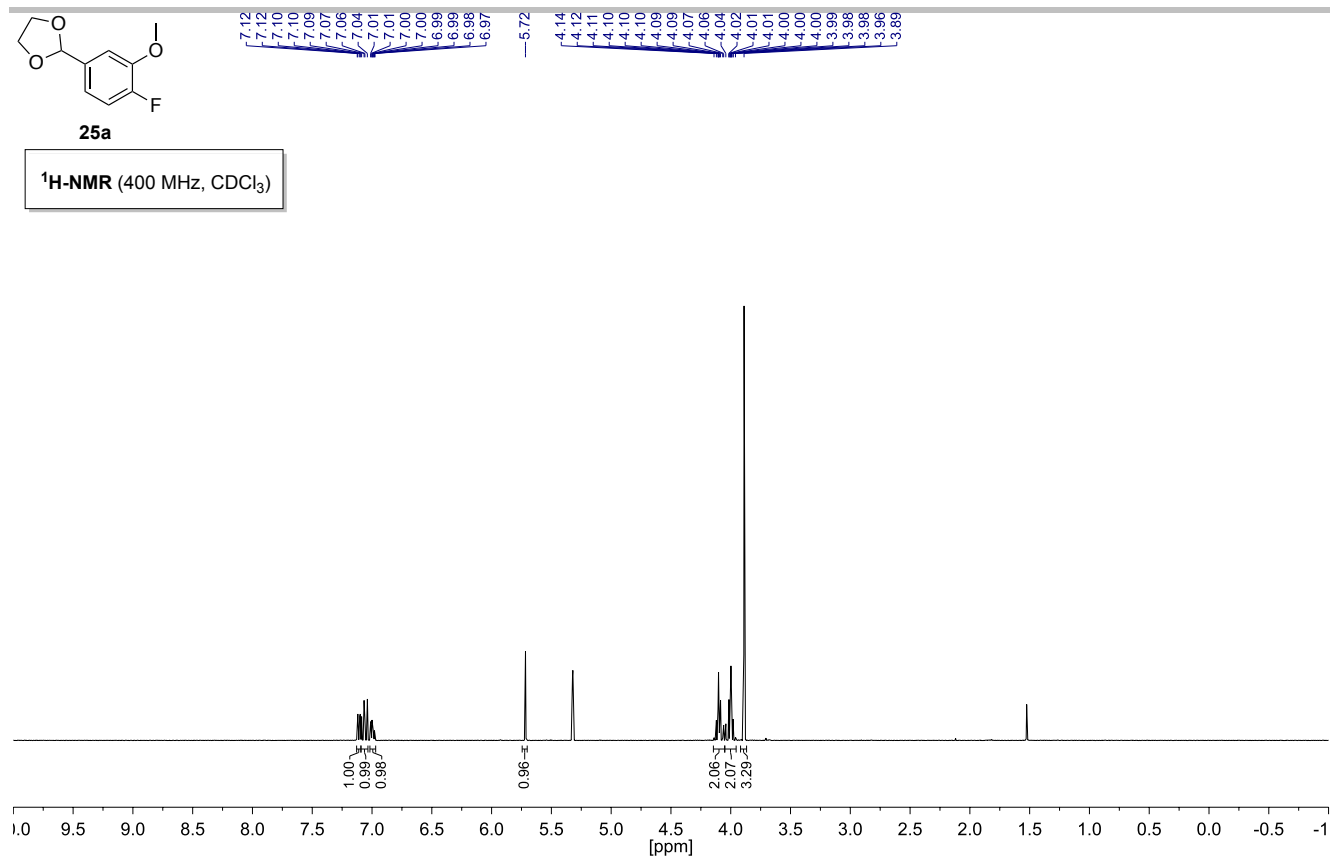


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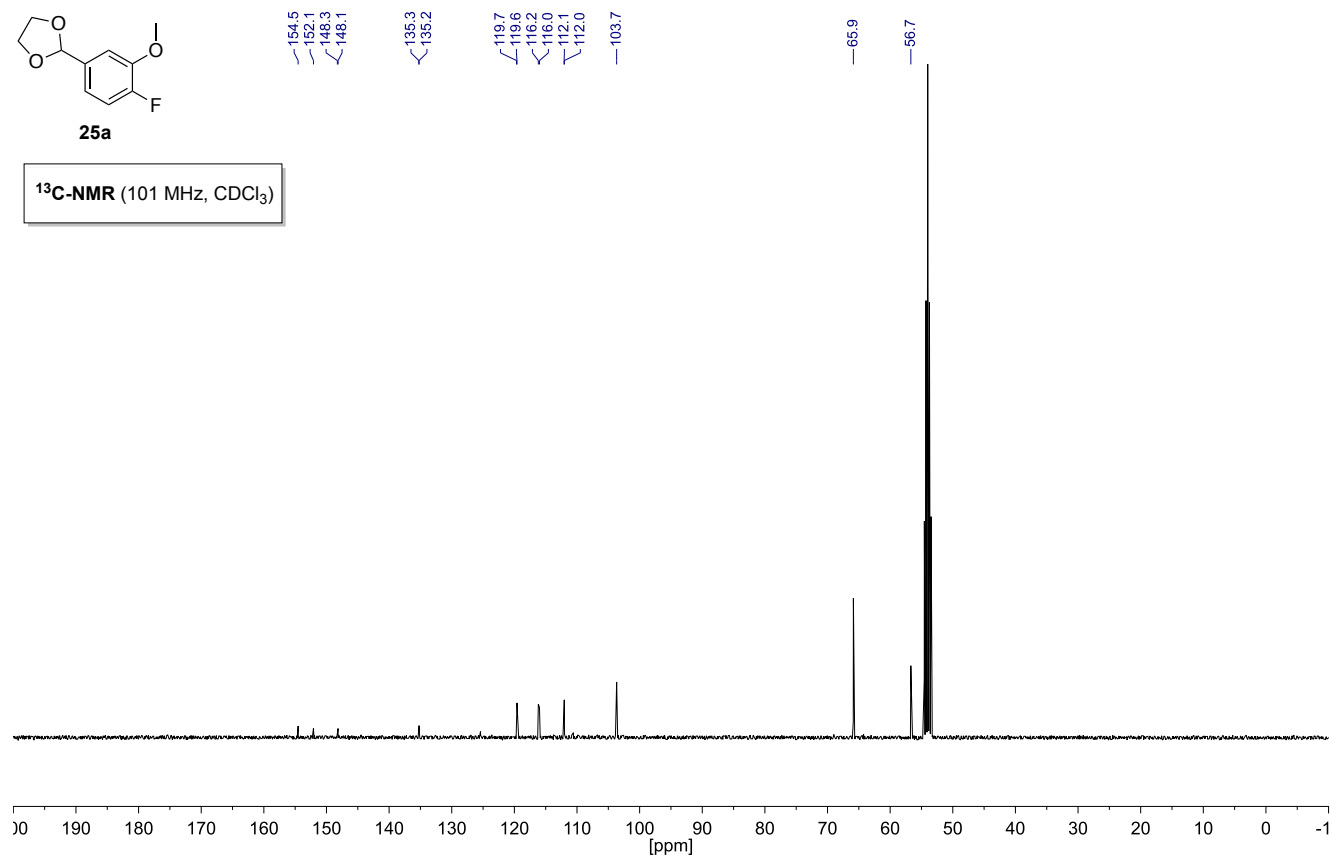
25a

¹H-NMR (400 MHz, CDCl₃)

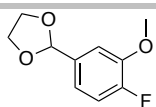


25a

¹³C-NMR (101 MHz, CDCl₃)

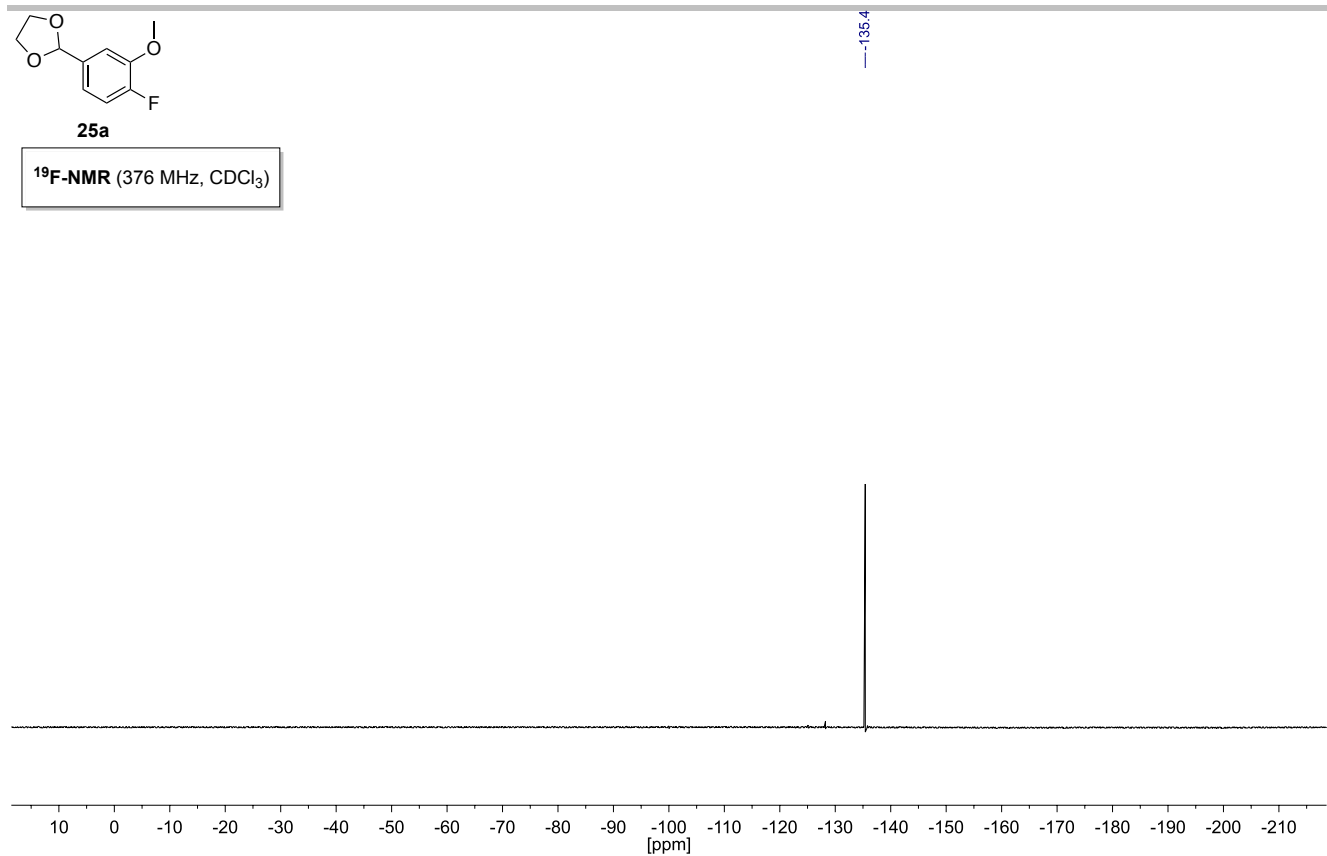


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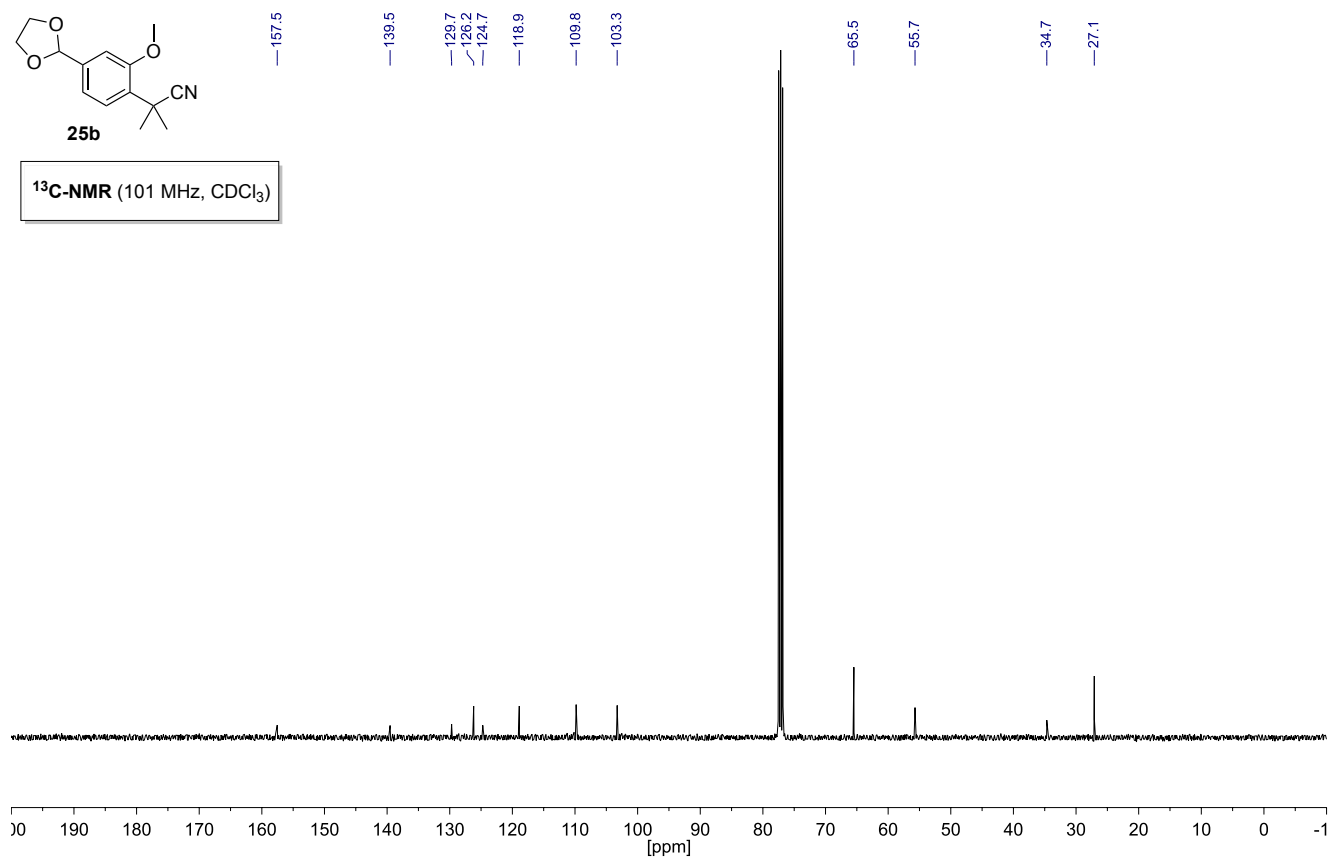
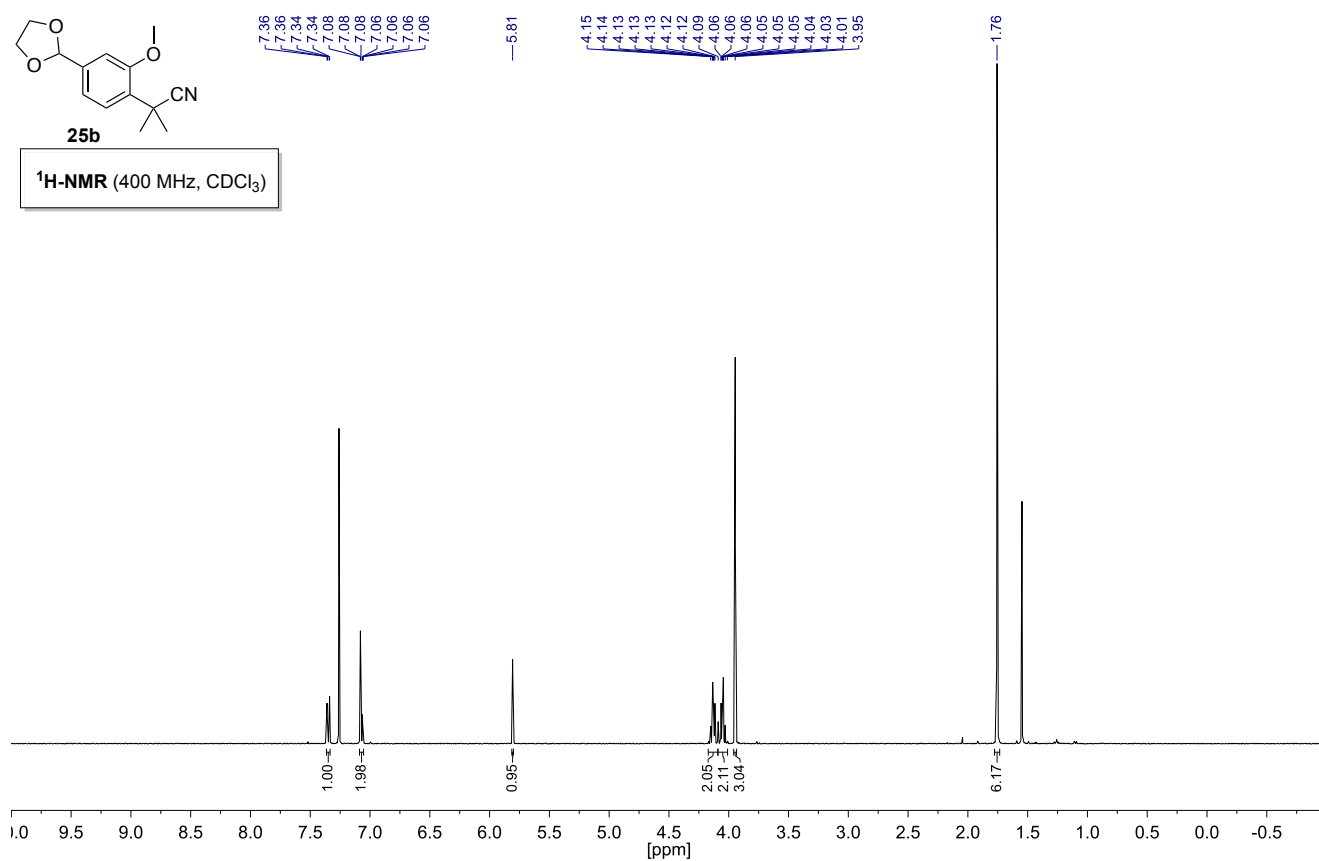


25a

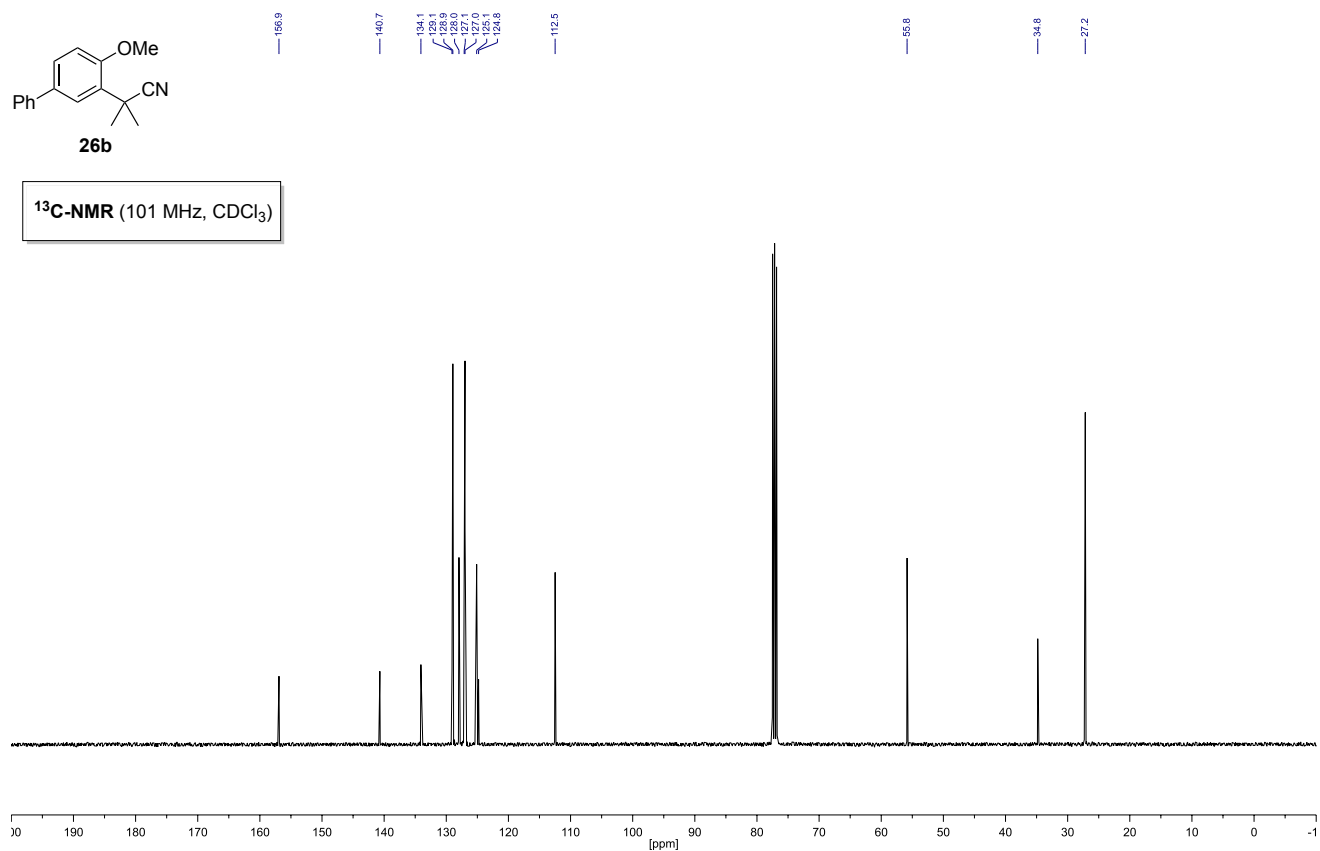
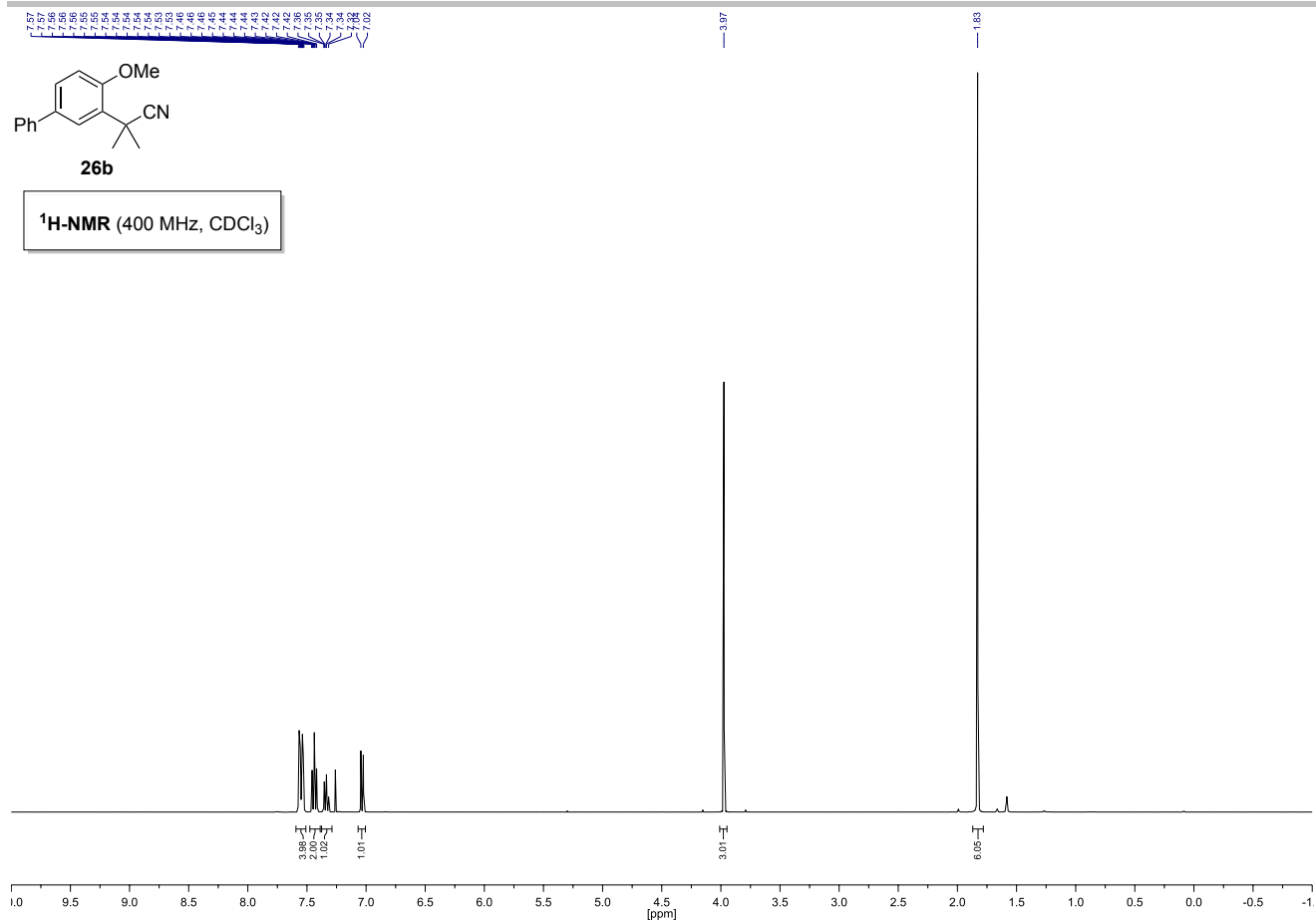
^{19}F -NMR (376 MHz, CDCl_3)



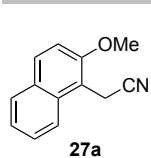
SUPPORTING INFORMATION



SUPPORTING INFORMATION



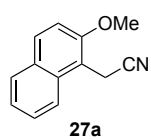
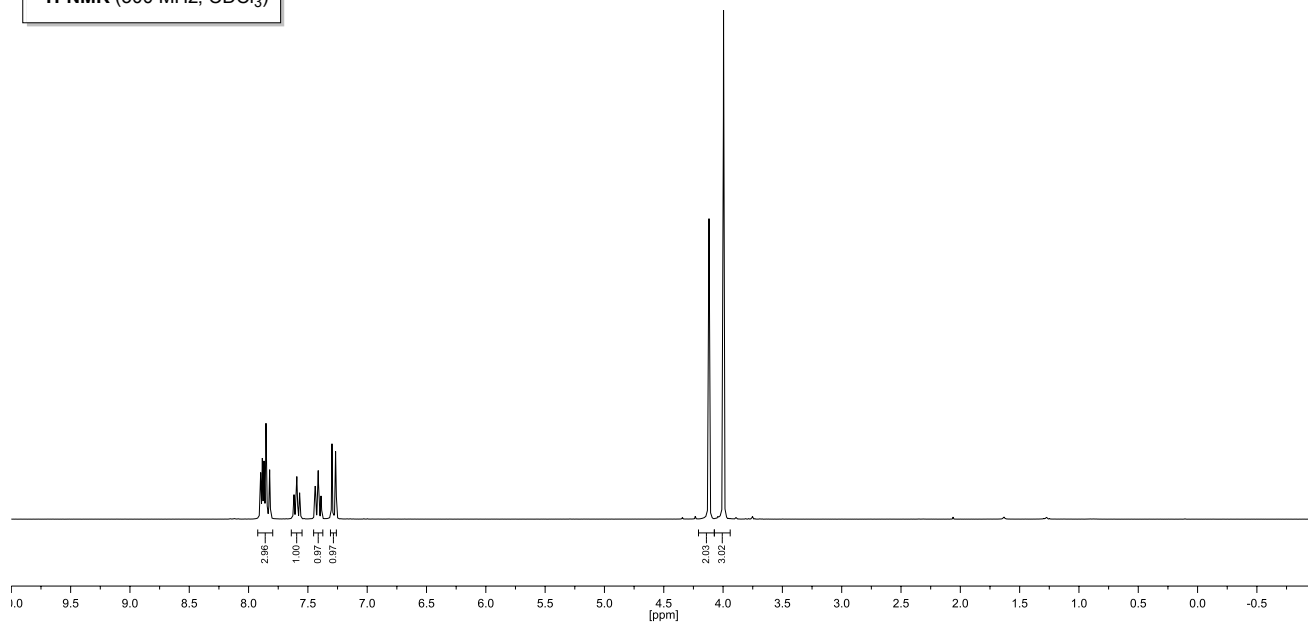
SUPPORTING INFORMATION



7.80
7.888
7.87
7.82
7.62
7.60
7.59
7.44
7.44
7.39
7.27

4.12
4.00

¹H-NMR (300 MHz, CDCl₃)



154.7

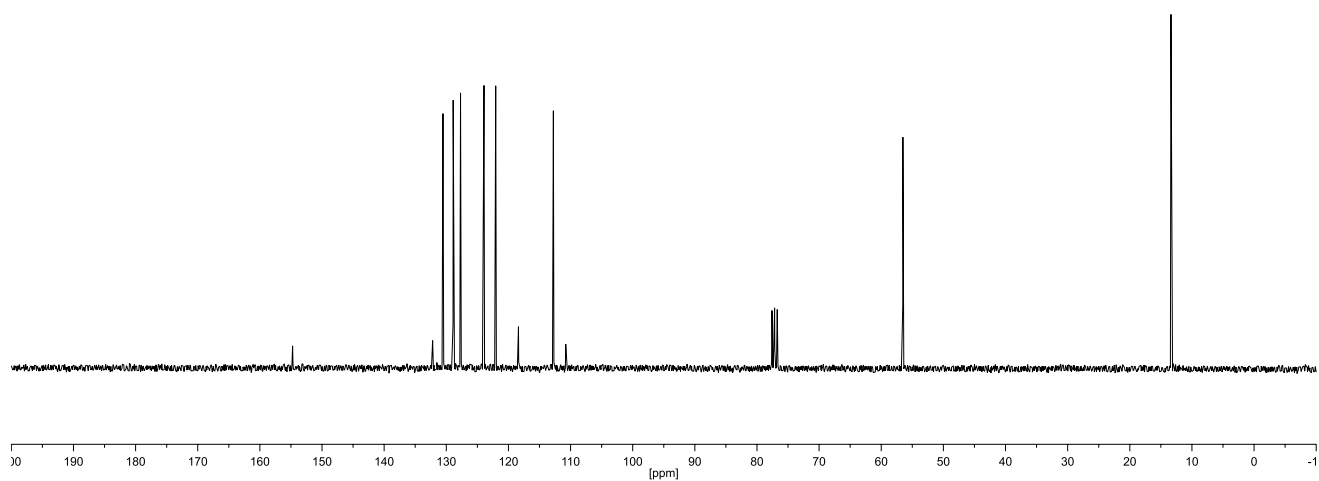
132.2
131.5
129.0
127.7
123.9
122.0
118.4

113.8
113.8

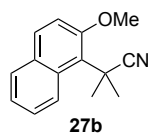
56.5

13.4

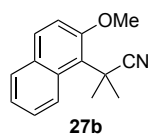
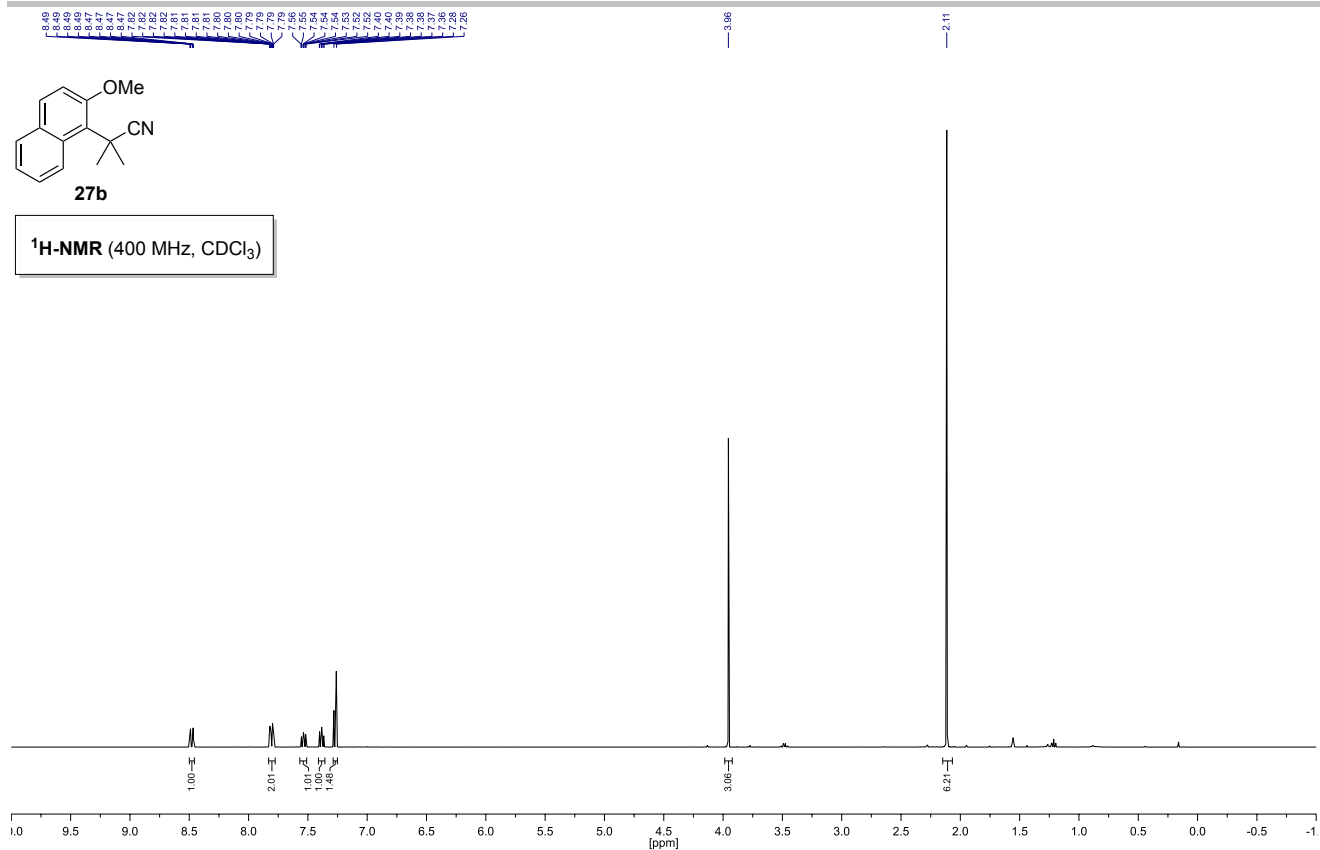
¹³C-NMR (75 MHz, CDCl₃)



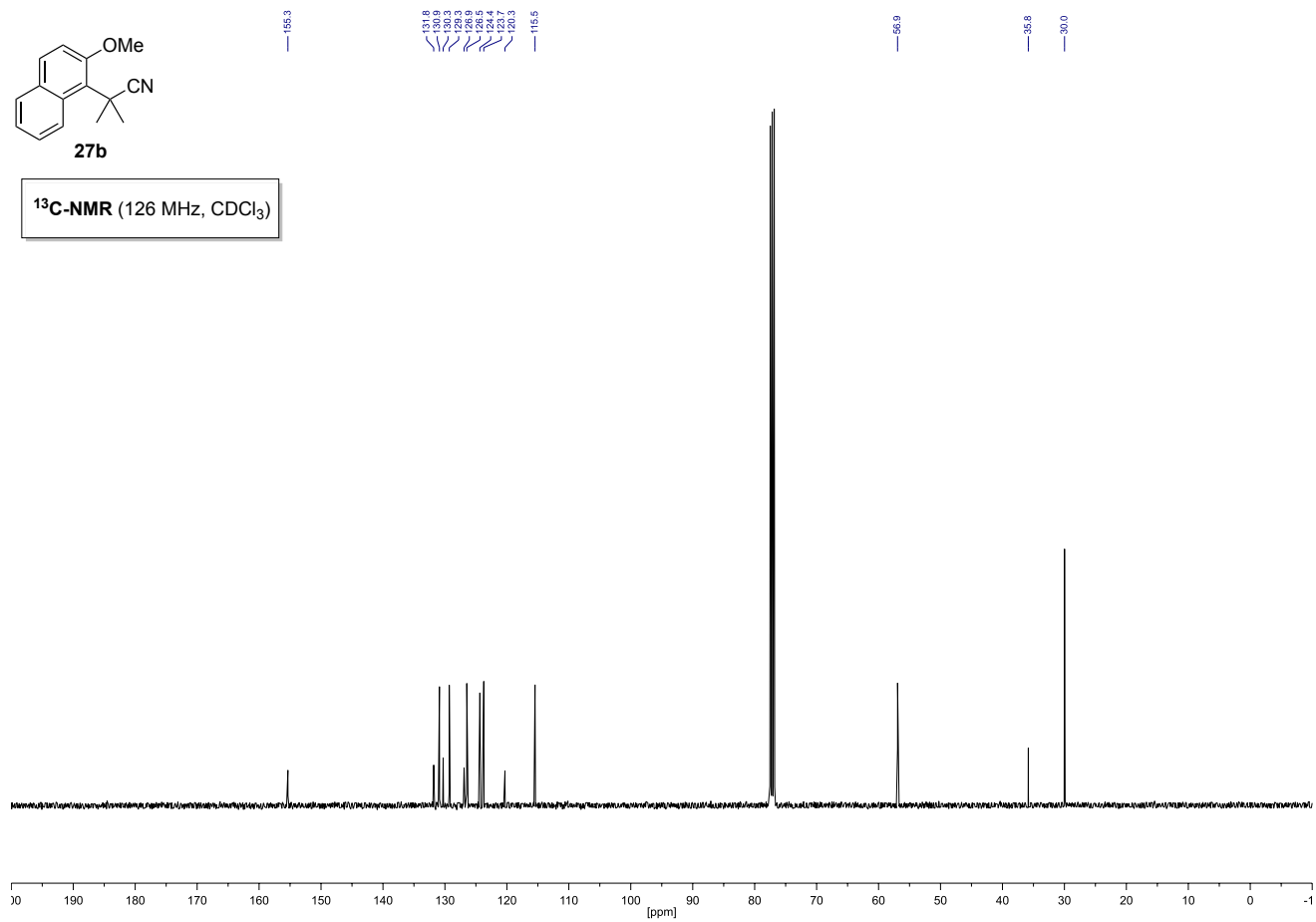
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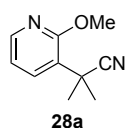
¹H-NMR (400 MHz, CDCl₃)



¹³C-NMR (126 MHz, CDCl₃)



SUPPORTING INFORMATION



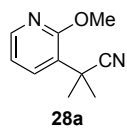
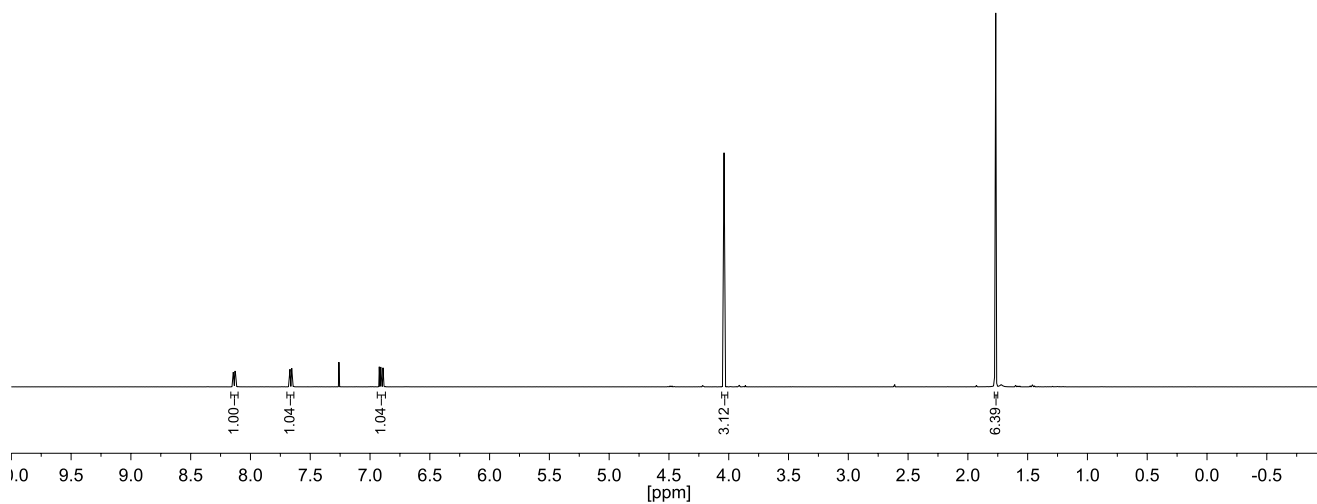
8.14
8.14
8.13
8.13
7.67
7.67
7.66
7.66

6.92
6.91
6.90
6.89

4.04

1.77

¹H-NMR (400 MHz, CDCl₃)



161.0

146.5

135.0

123.9

123.2

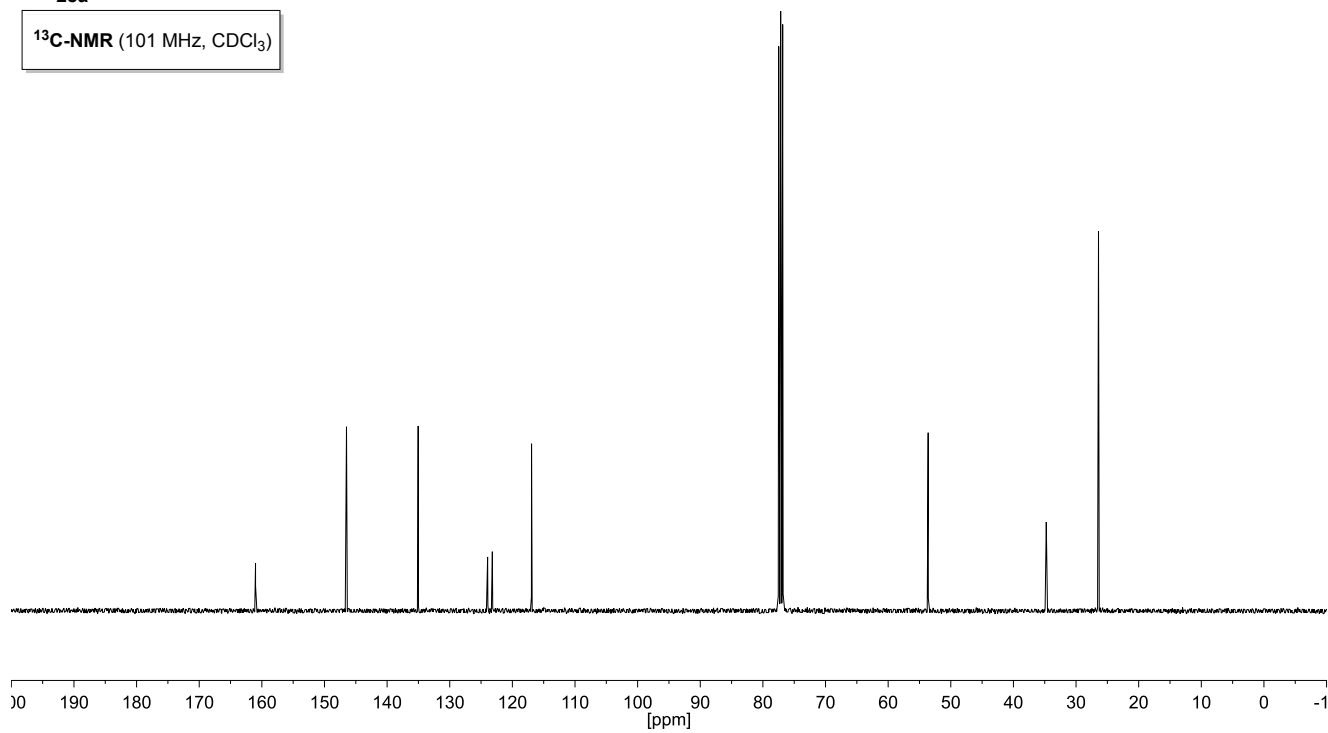
116.9

53.6

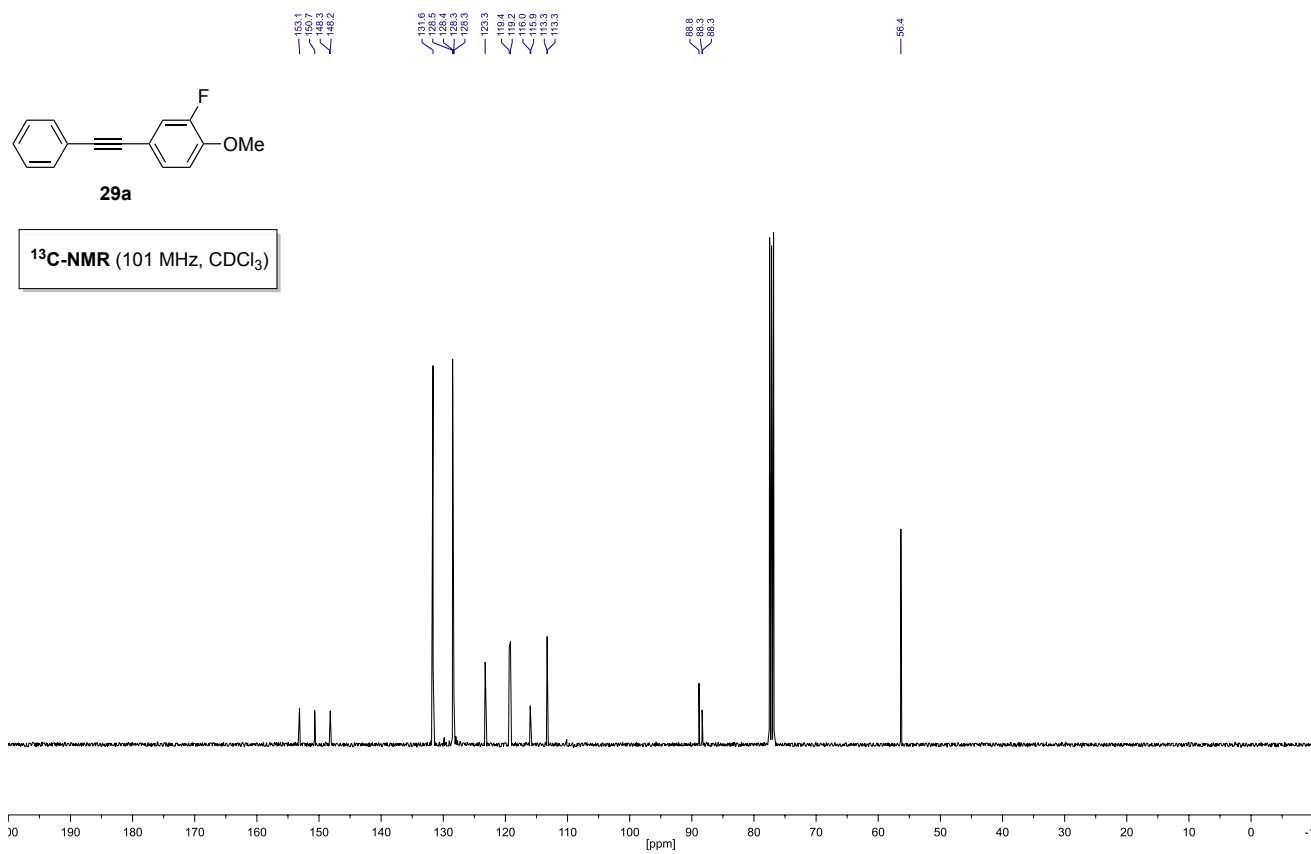
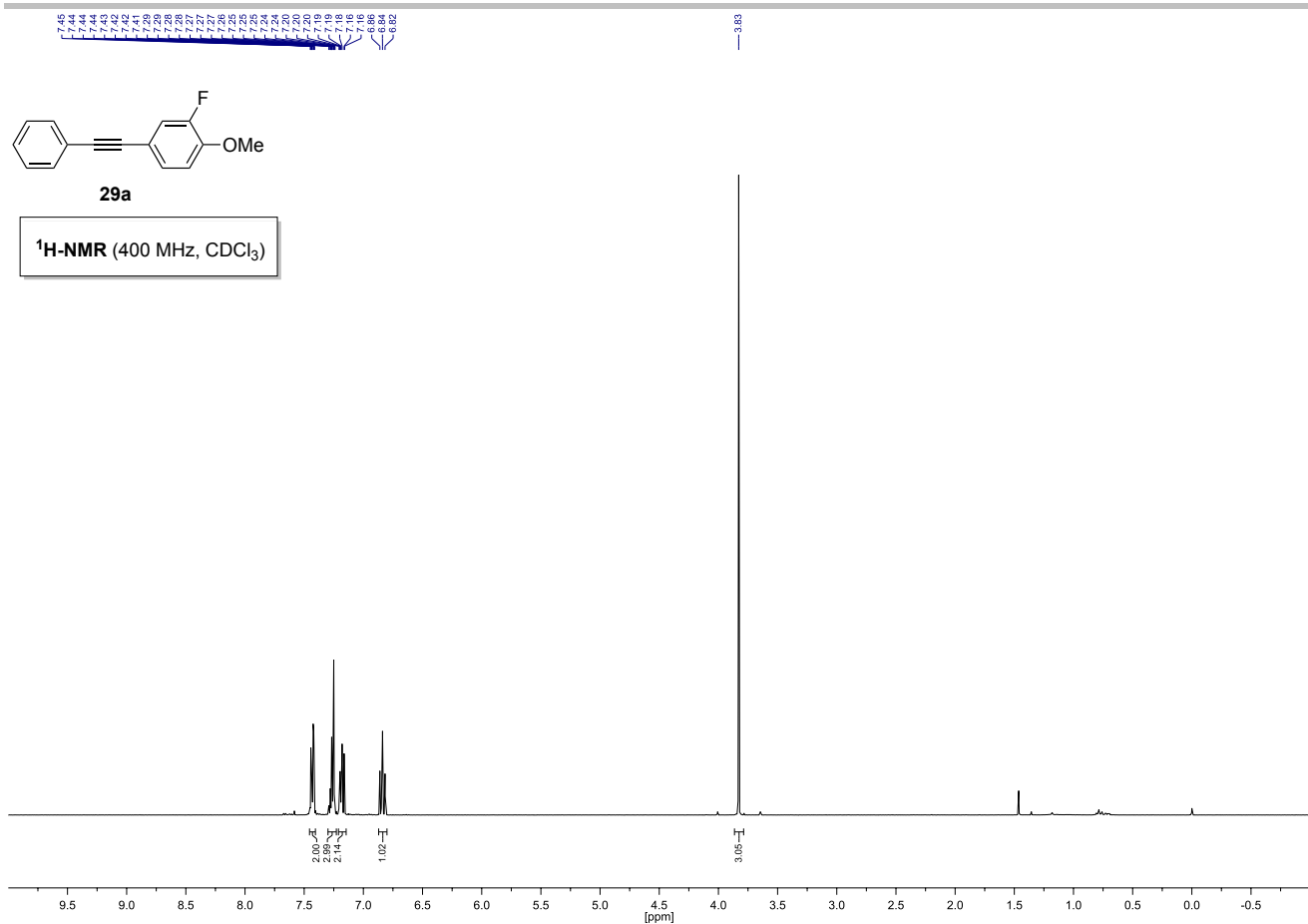
34.8

26.4

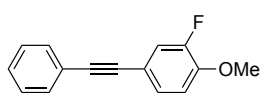
¹³C-NMR (101 MHz, CDCl₃)



SUPPORTING INFORMATION

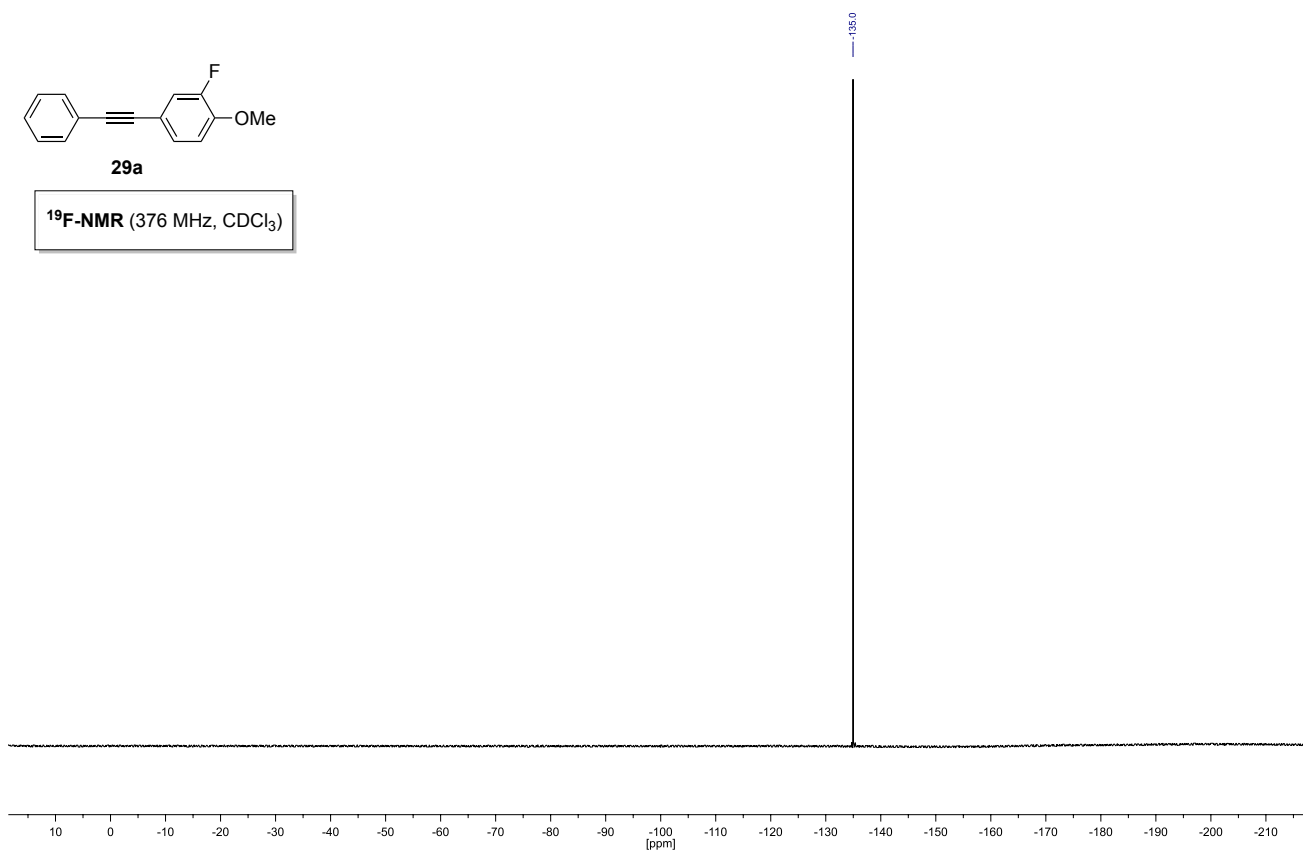


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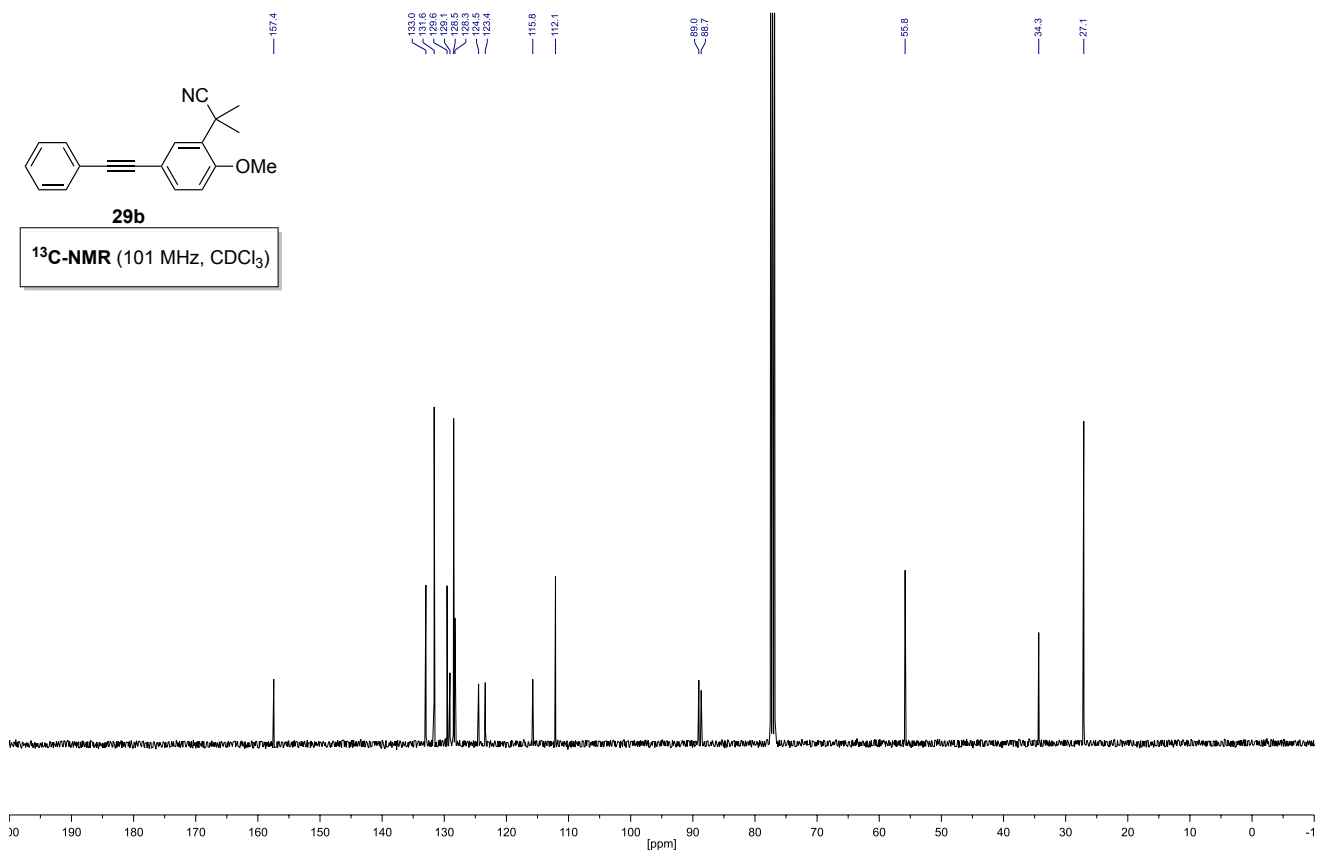
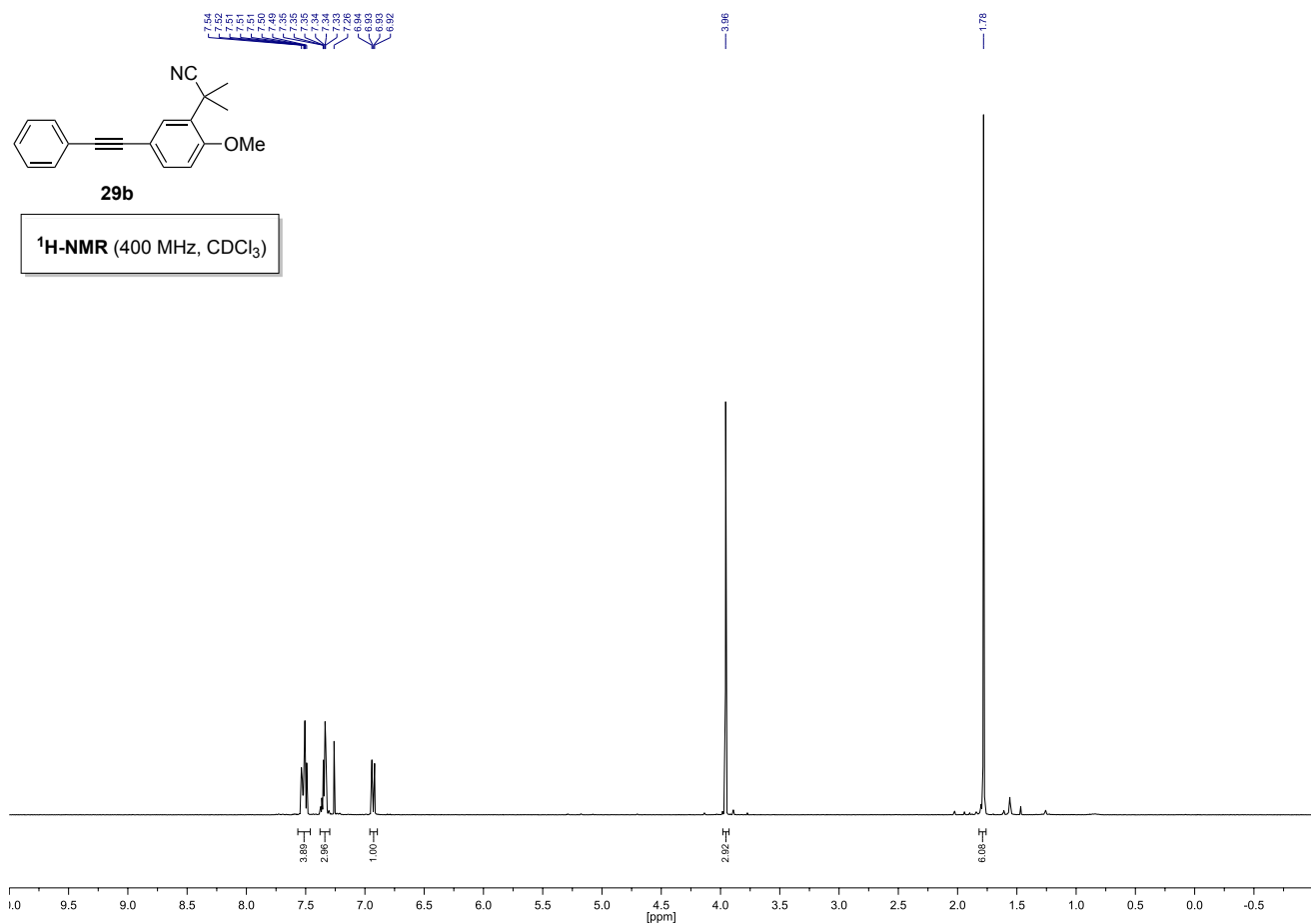


29a

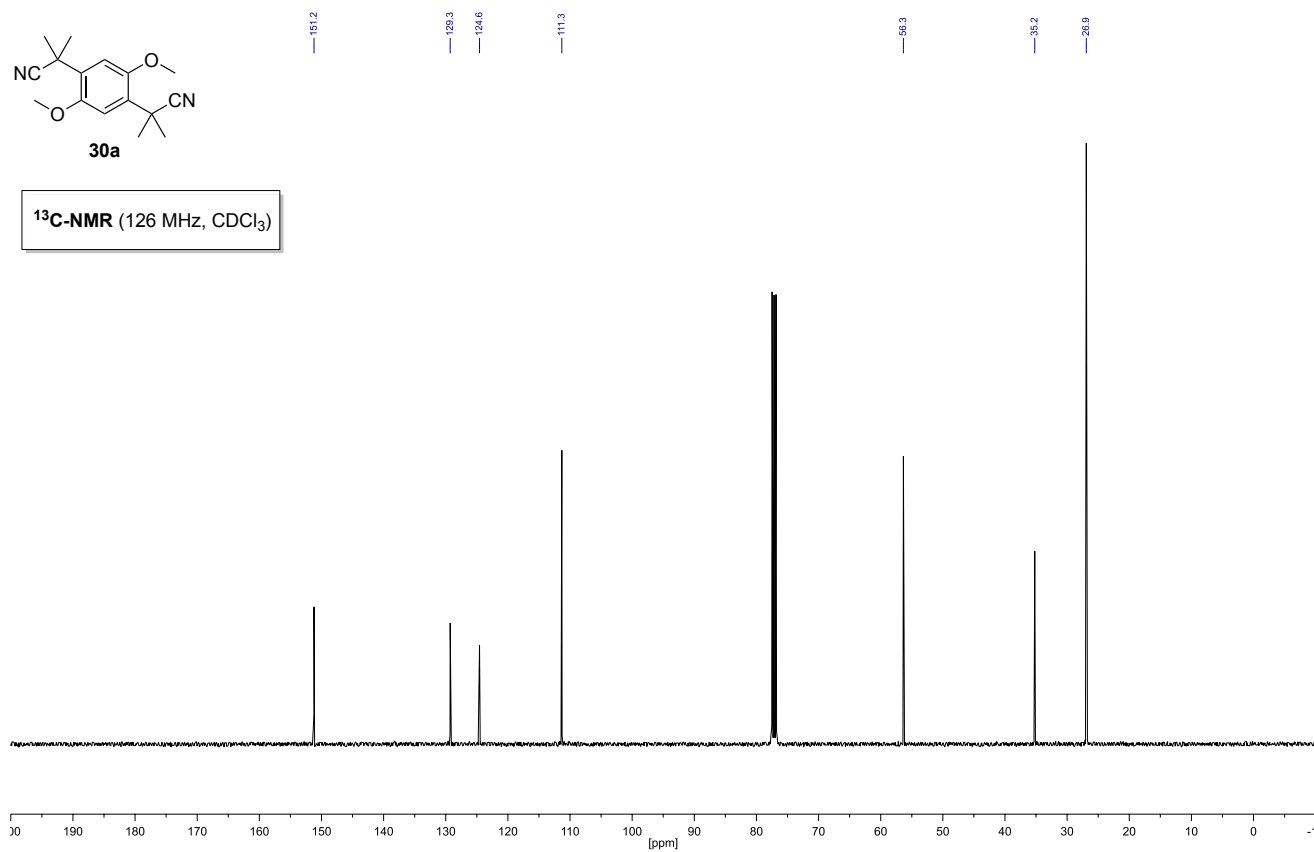
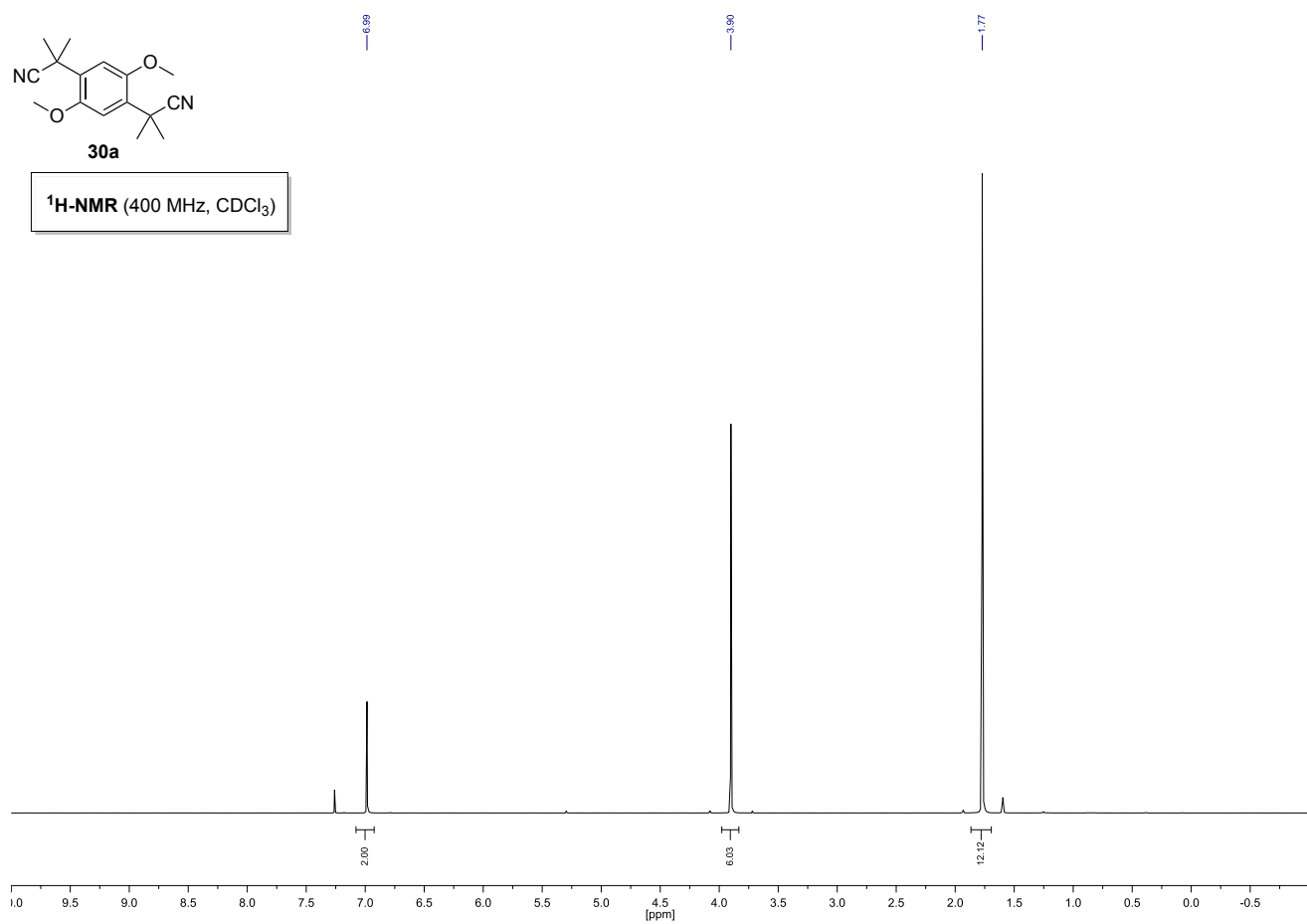
^{19}F -NMR (376 MHz, CDCl_3)



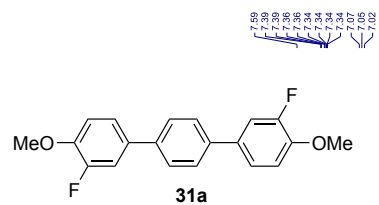
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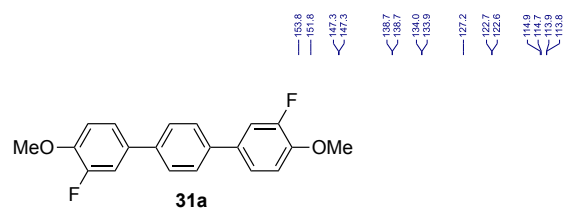
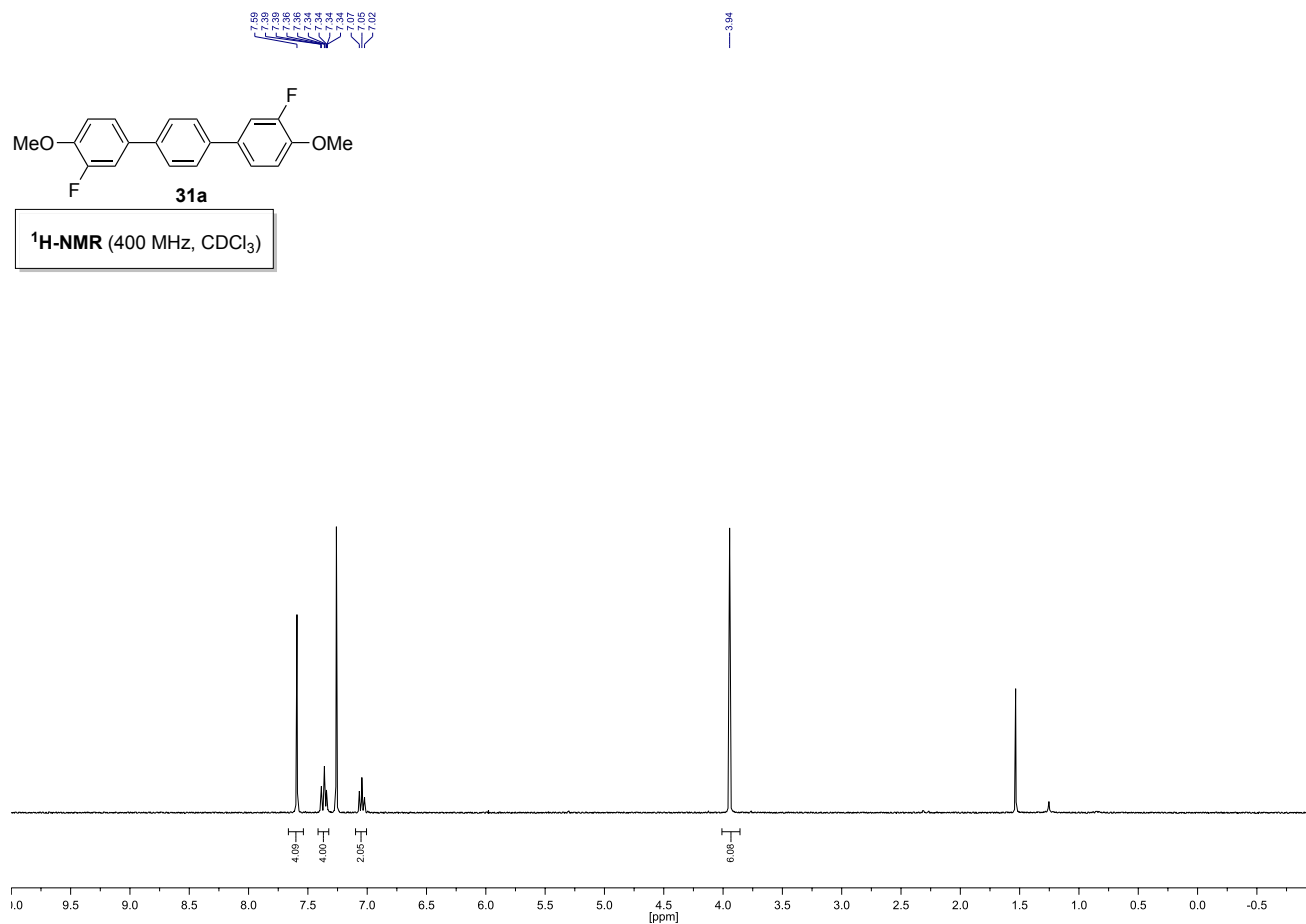
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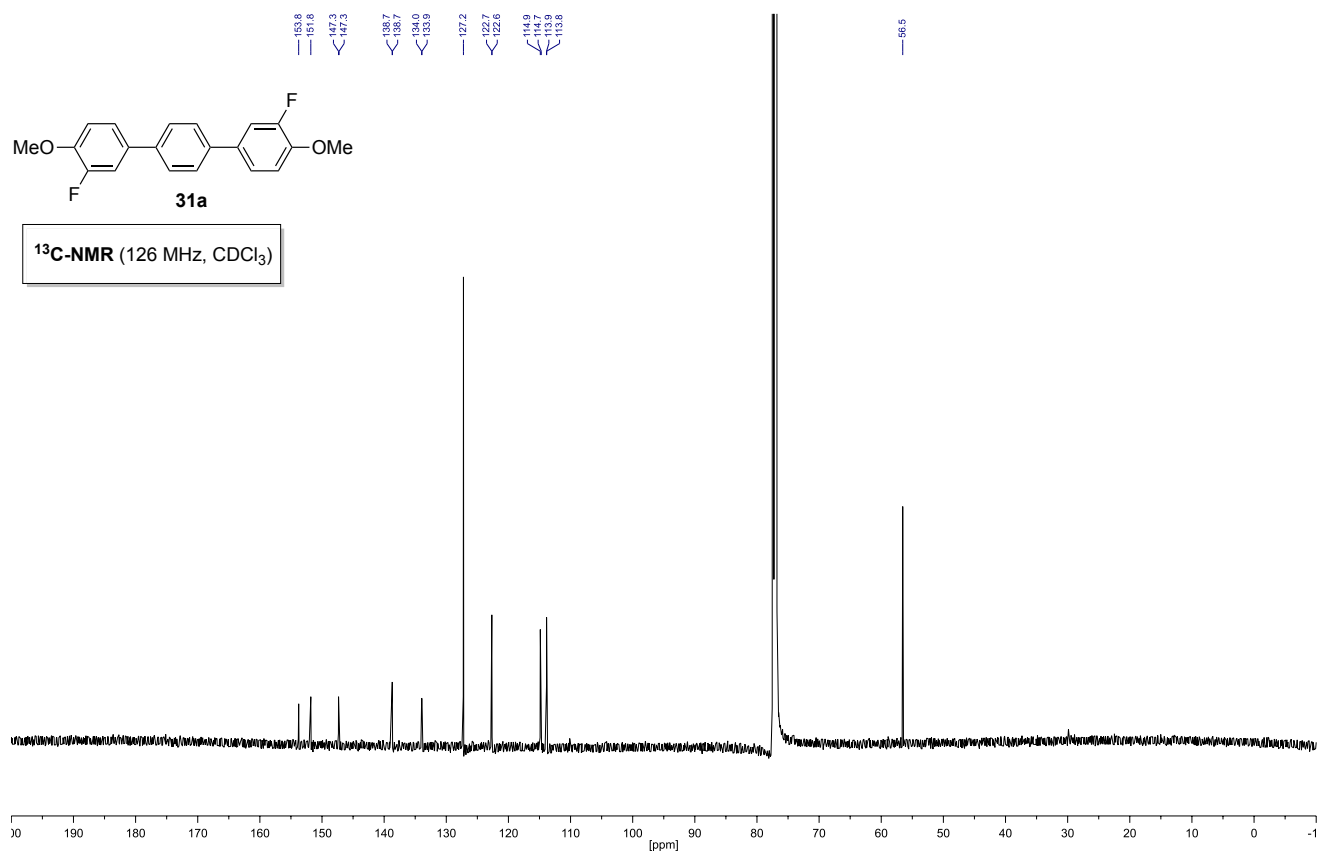
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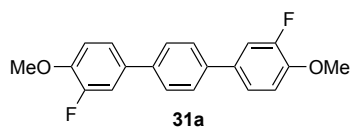
¹H-NMR (400 MHz, CDCl₃)



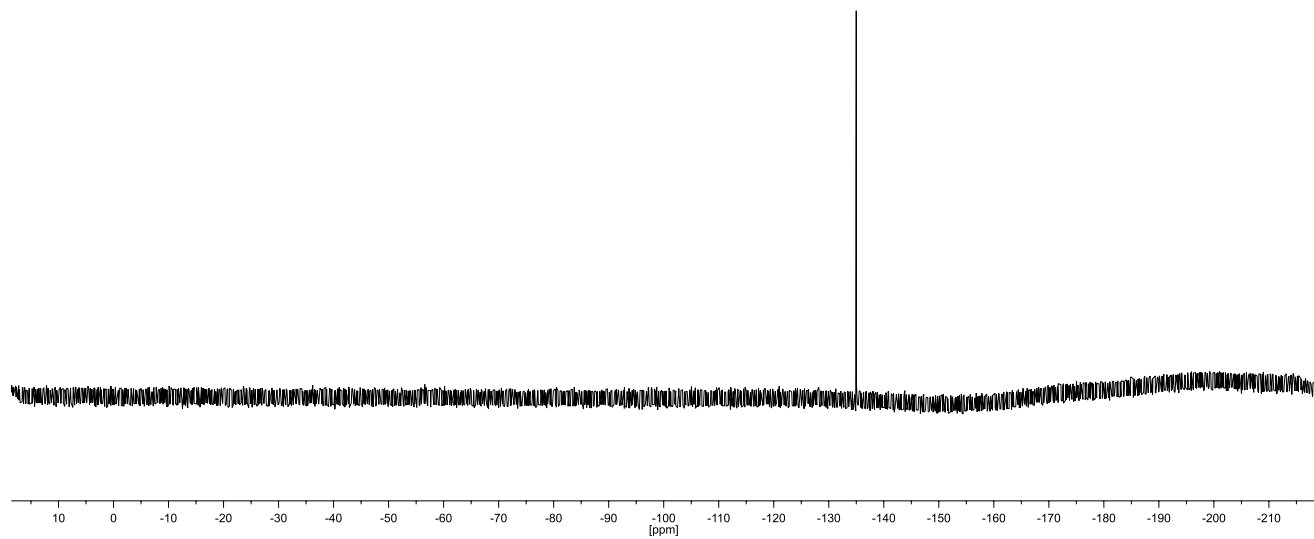
¹³C-NMR (126 MHz, CDCl₃)



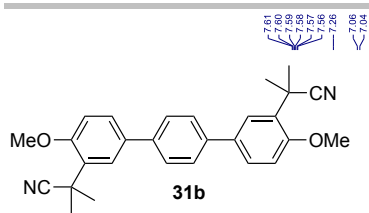
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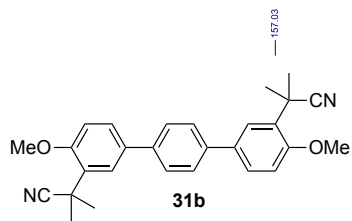
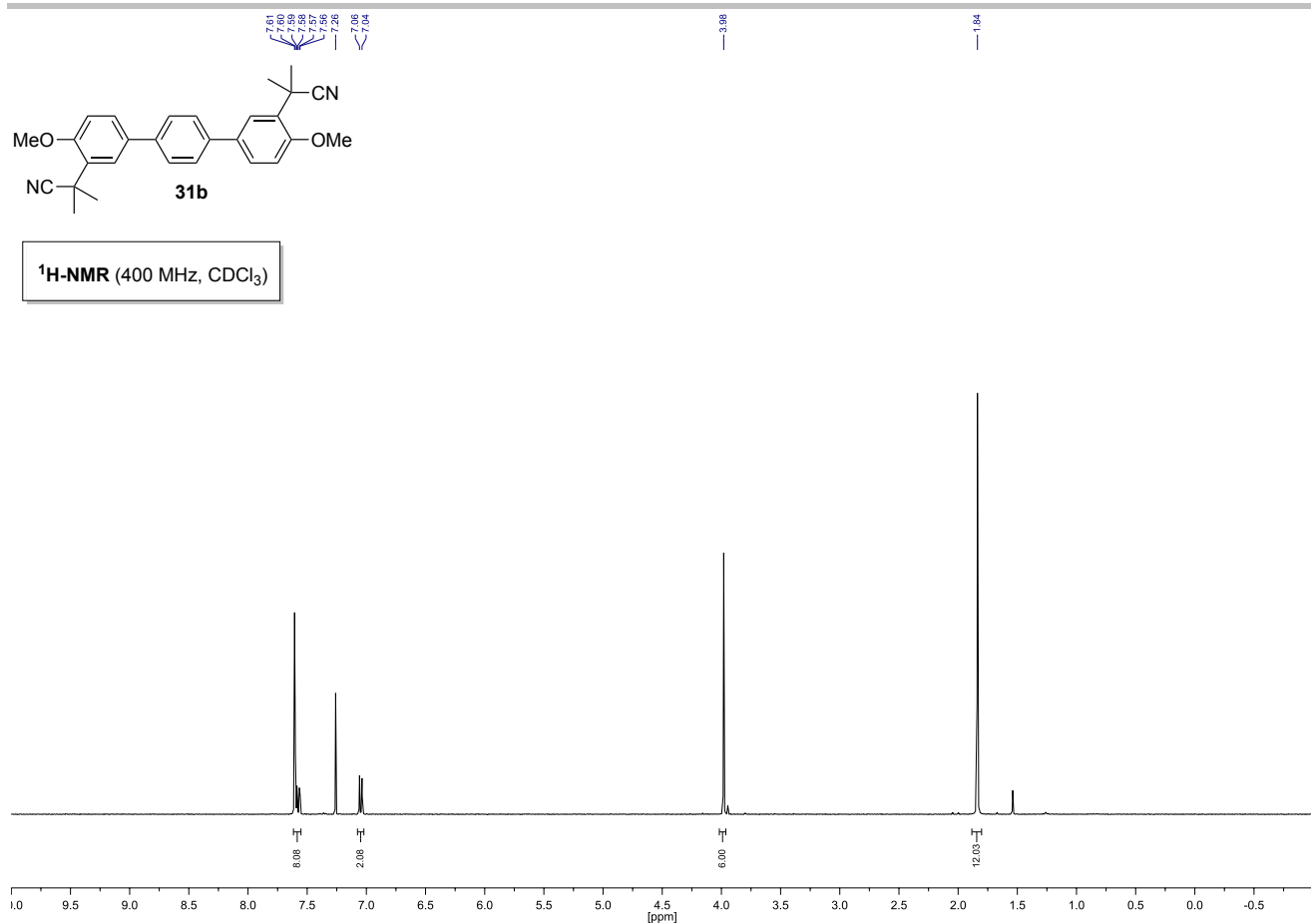
¹⁹F-NMR (376 MHz, CDCl₃)



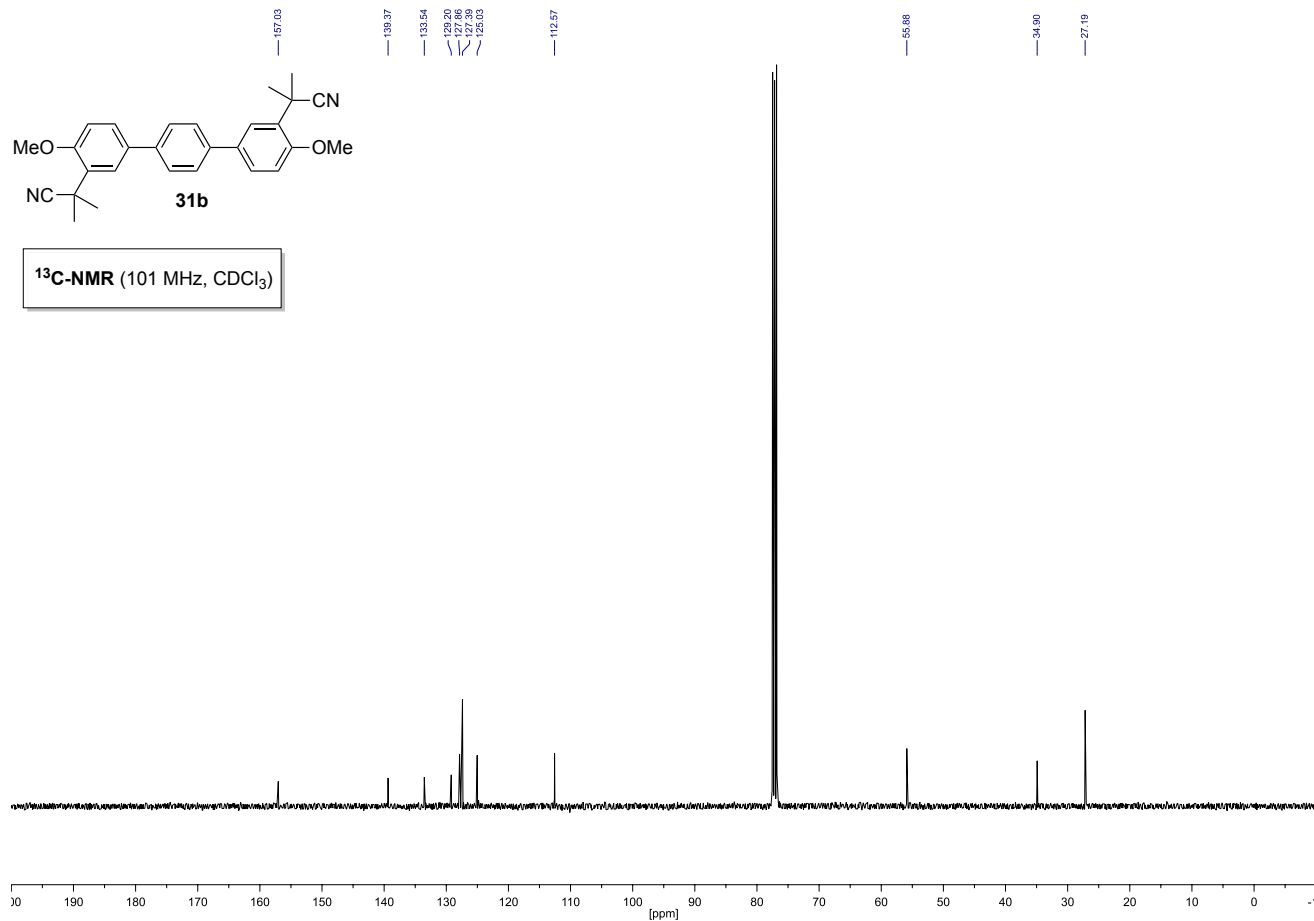
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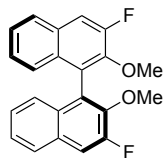
¹H-NMR (400 MHz, CDCl₃)



¹³C-NMR (101 MHz, CDCl₃)

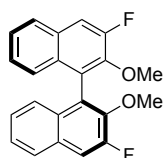
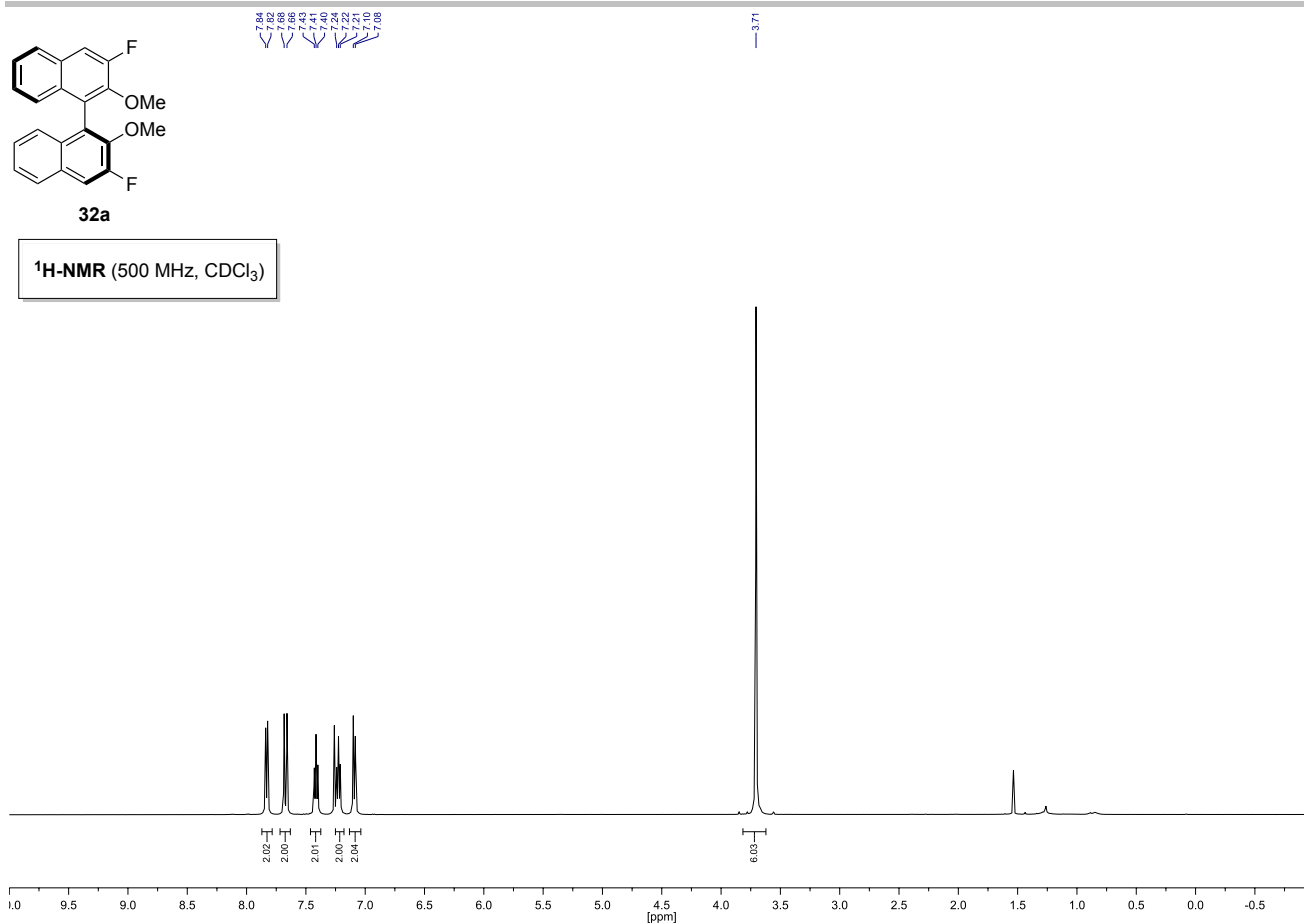


SUPPORTING INFORMATION



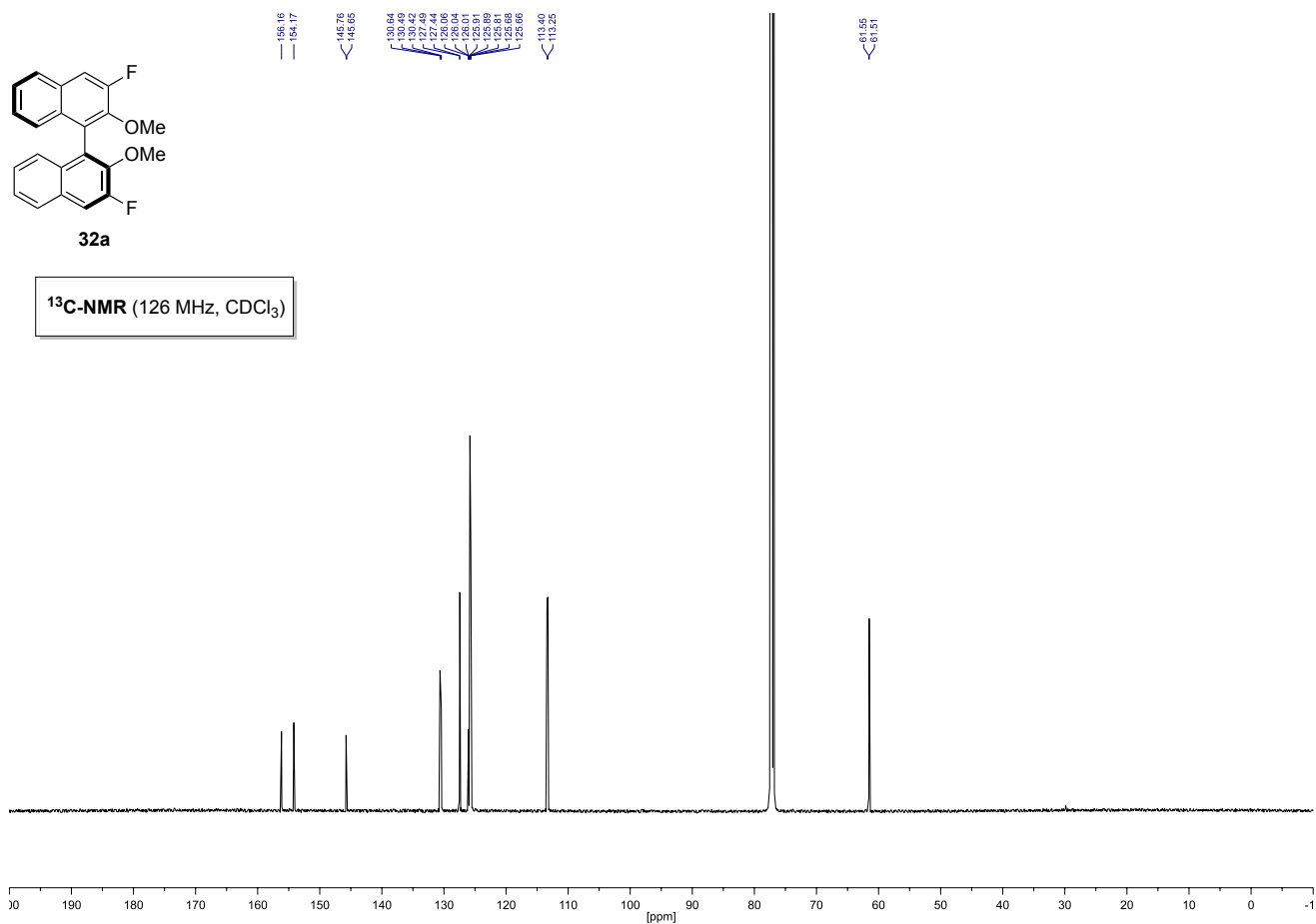
32a

¹H-NMR (500 MHz, CDCl₃)

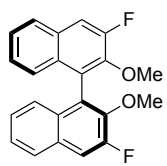


32a

¹³C-NMR (126 MHz, CDCl₃)

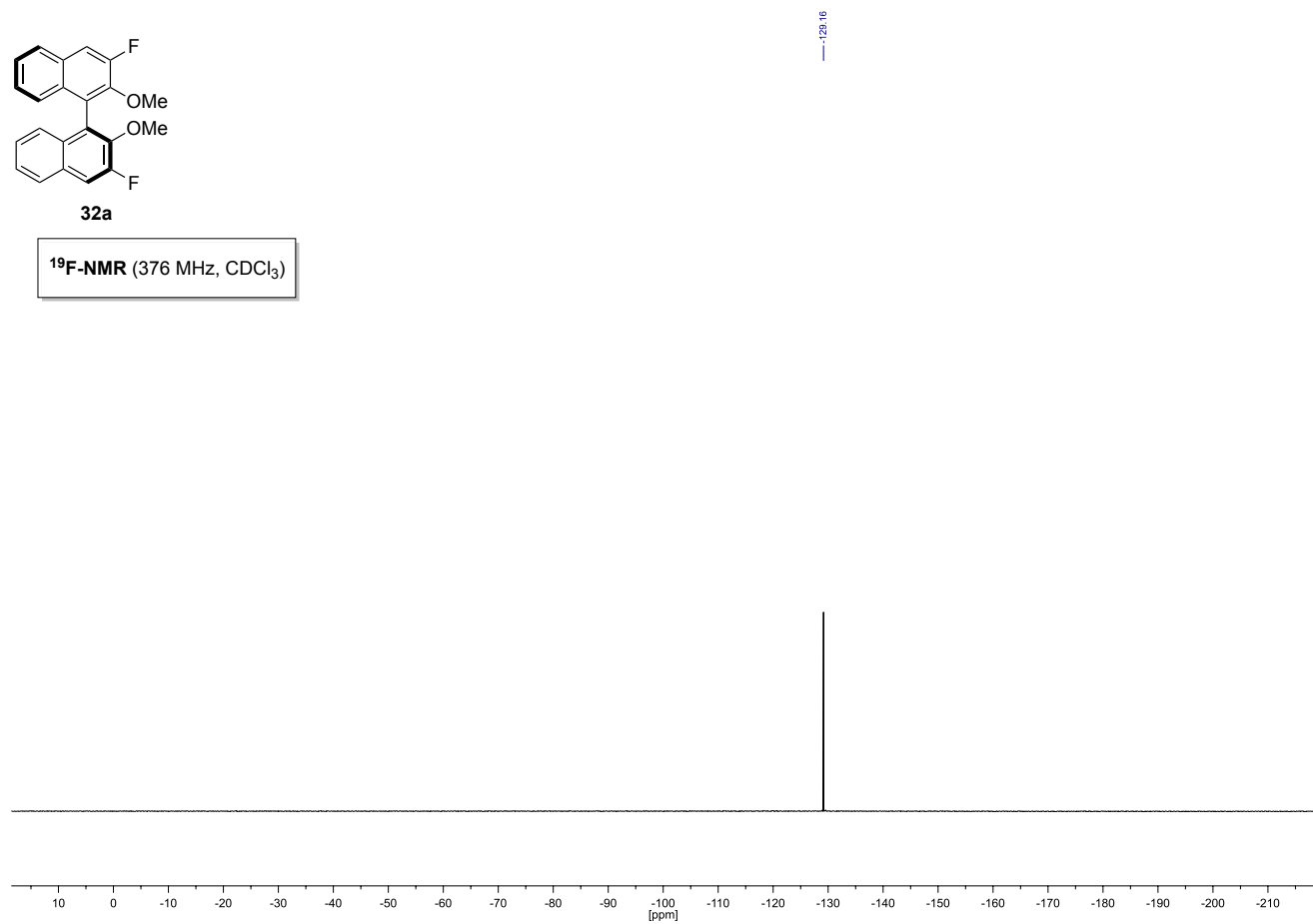


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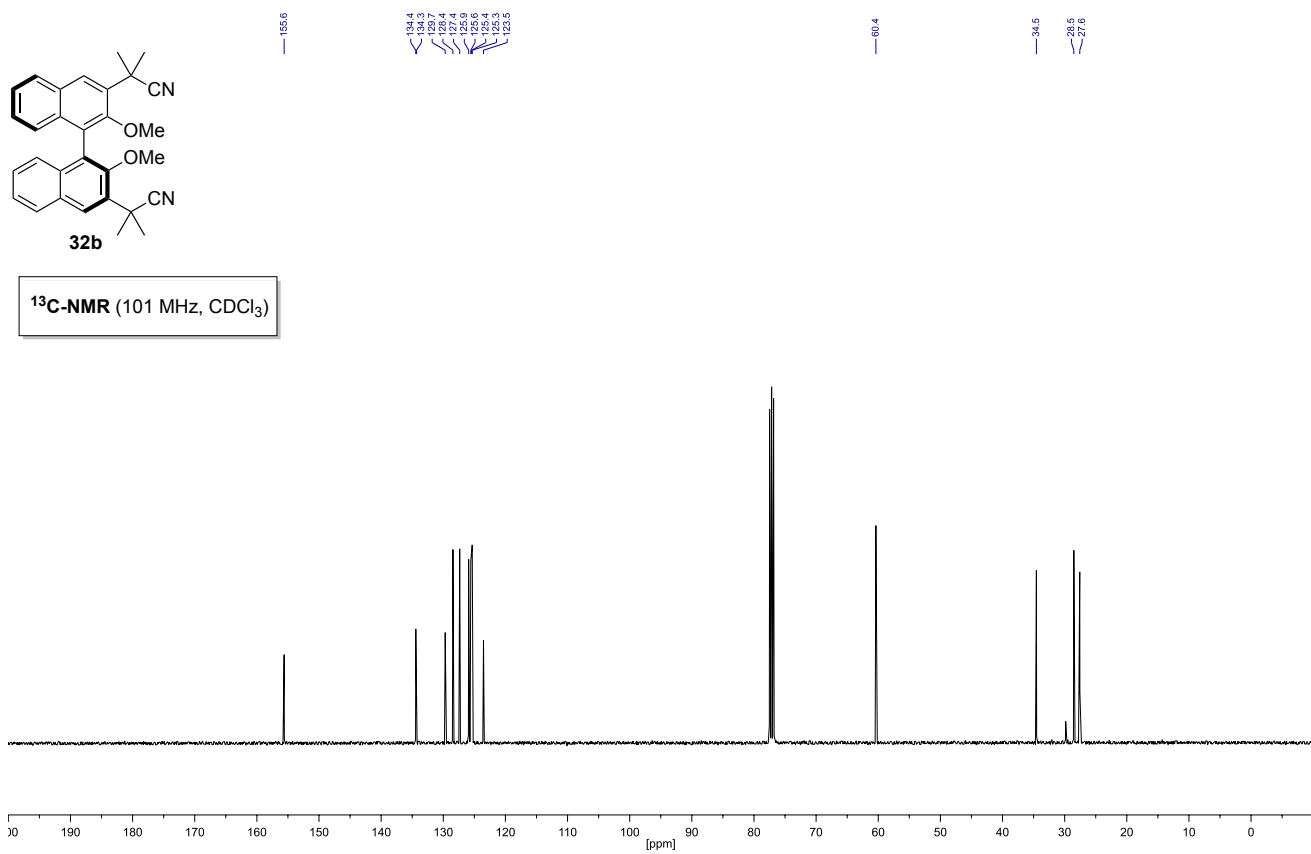
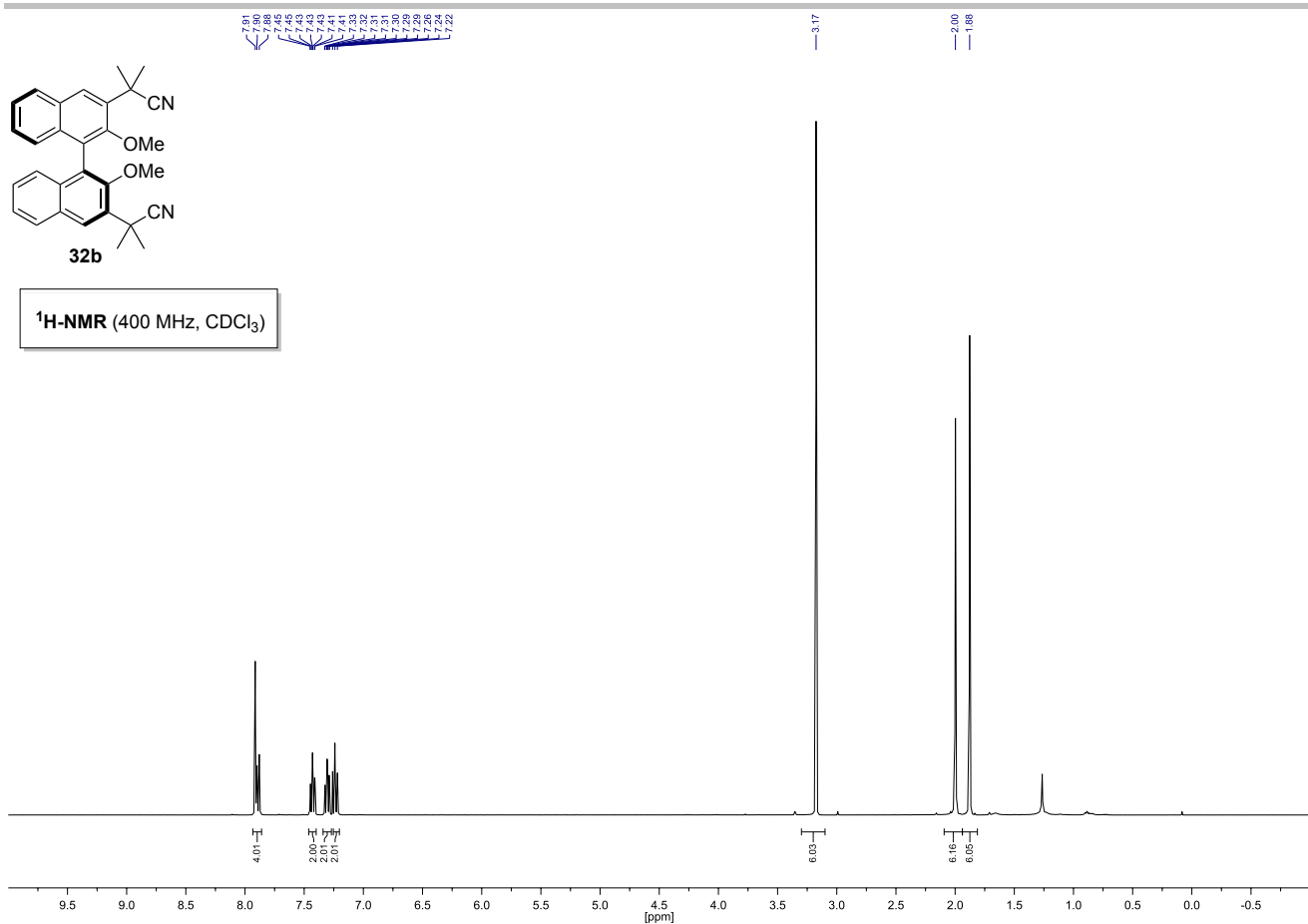


32a

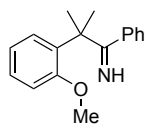
^{19}F -NMR (376 MHz, CDCl_3)



SUPPORTING INFORMATION

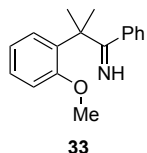
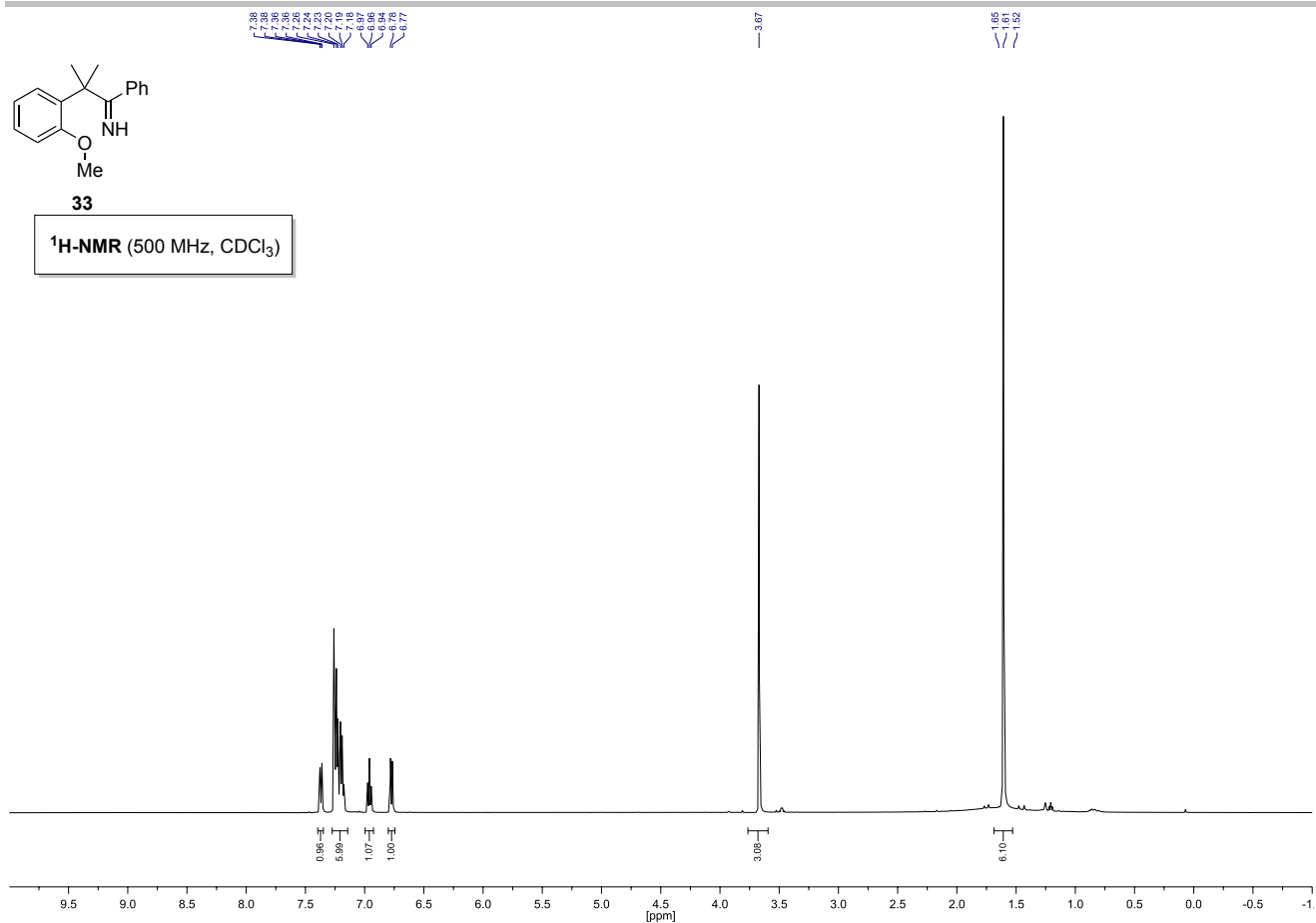


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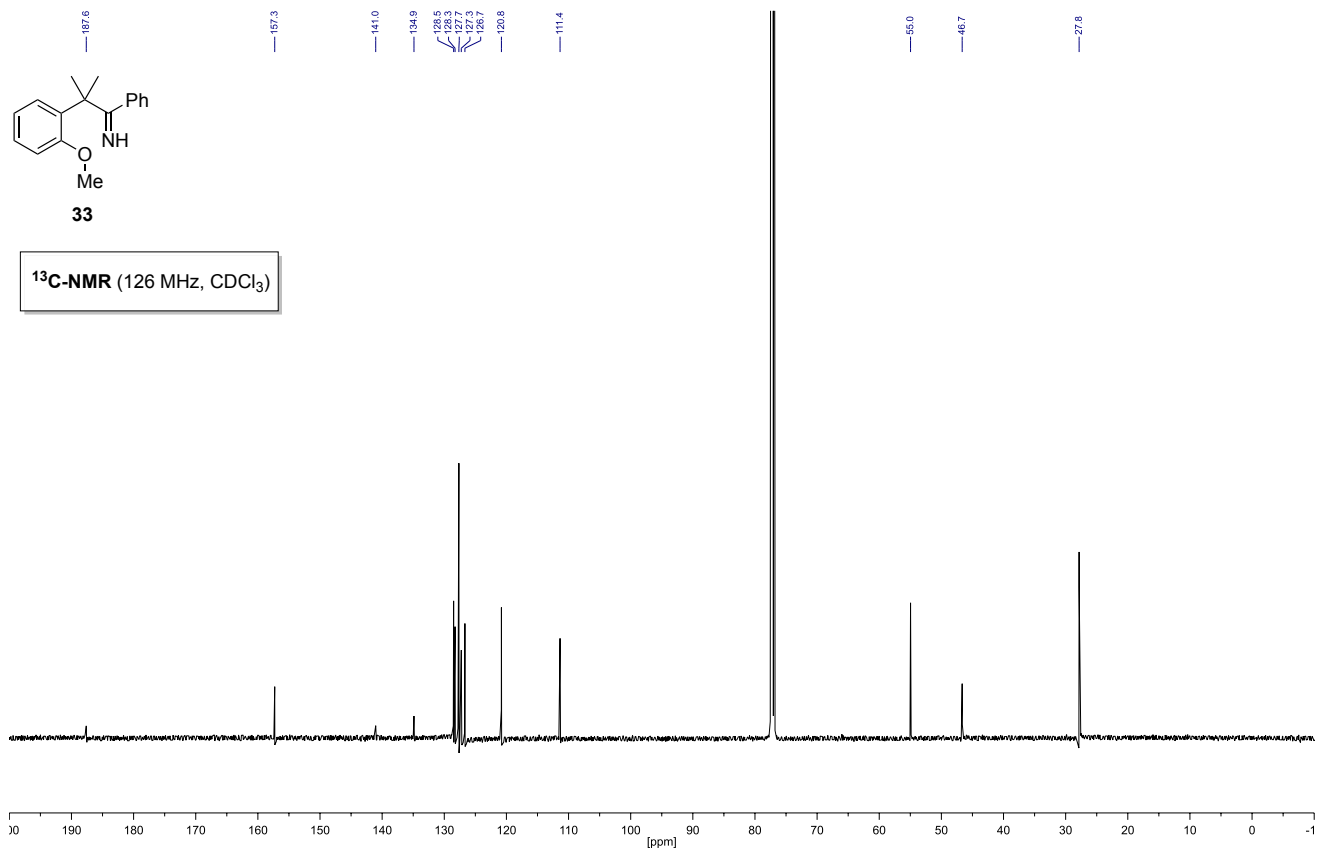
33

¹H-NMR (500 MHz, CDCl₃)

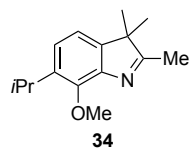


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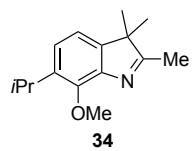
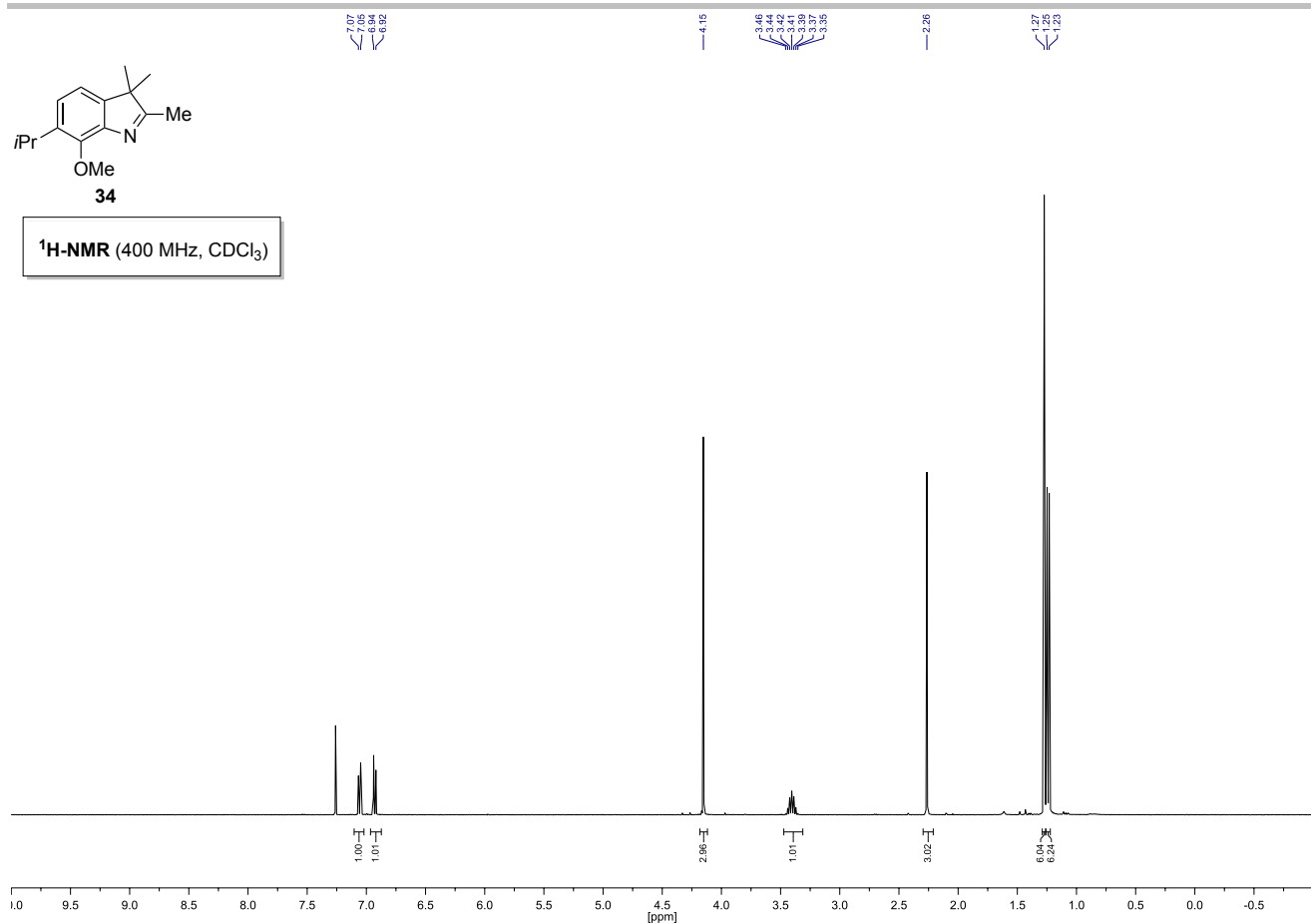
¹³C-NMR (126 MHz, CDCl₃)



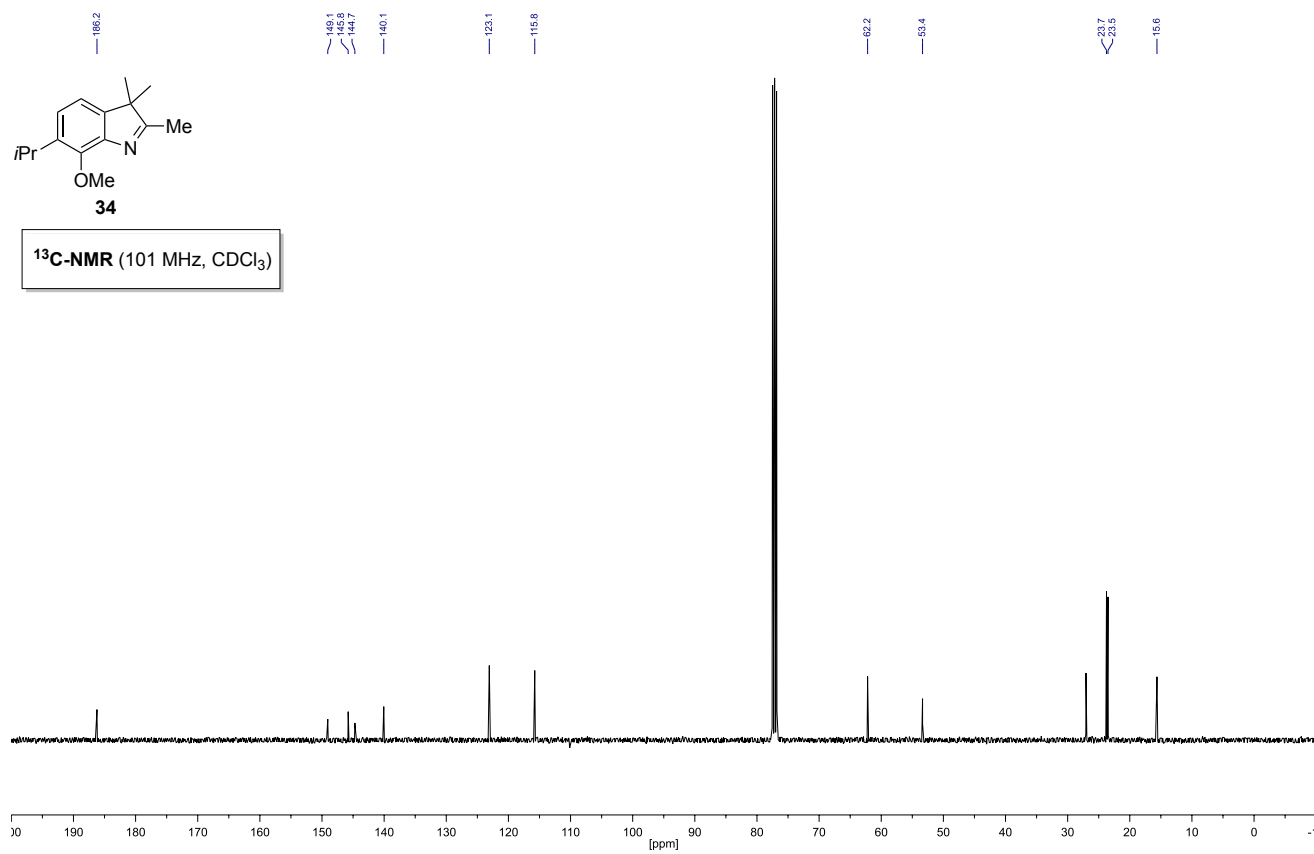
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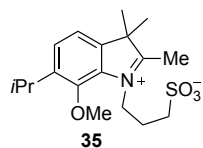
¹H-NMR (400 MHz, CDCl₃)



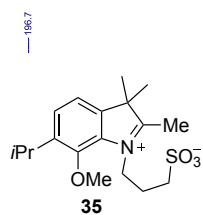
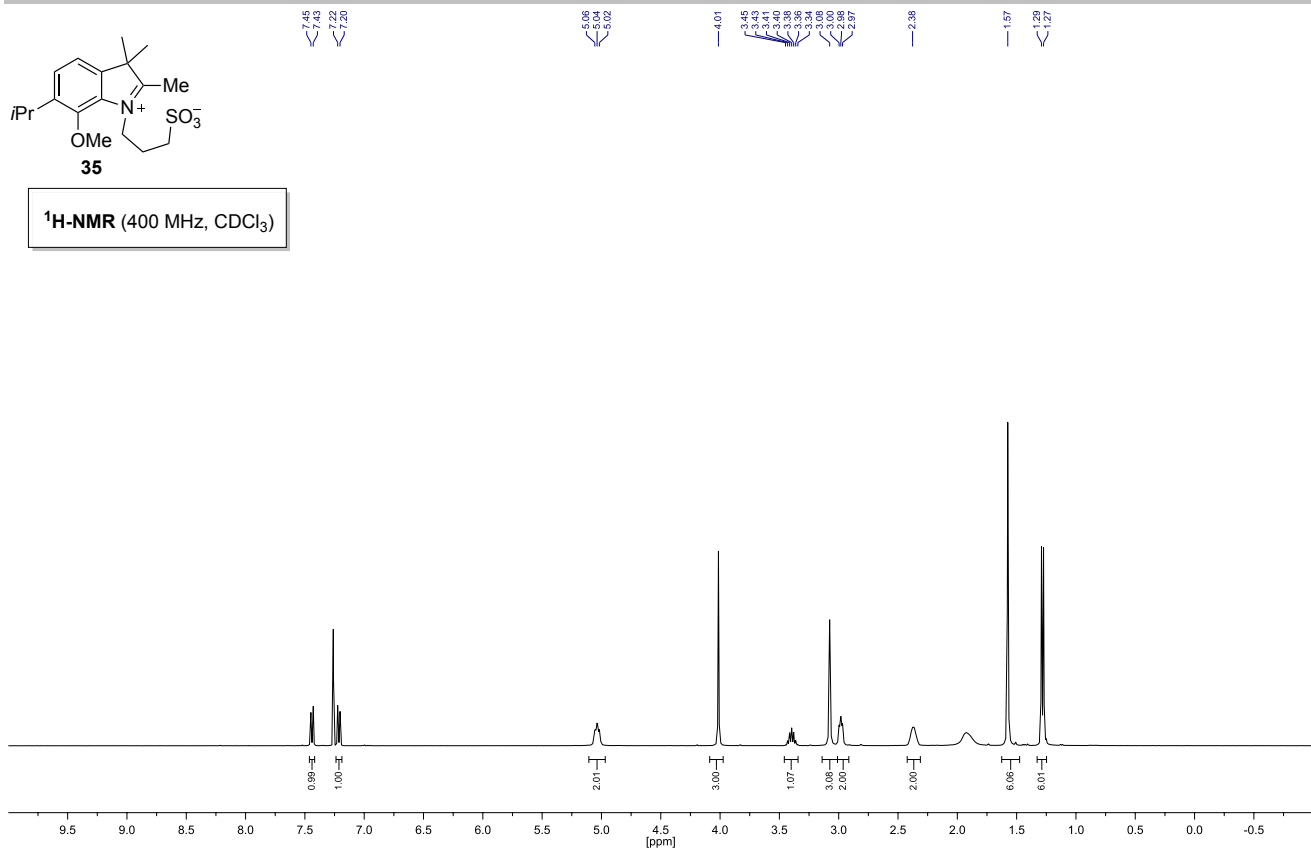
¹³C-NMR (101 MHz, CDCl₃)



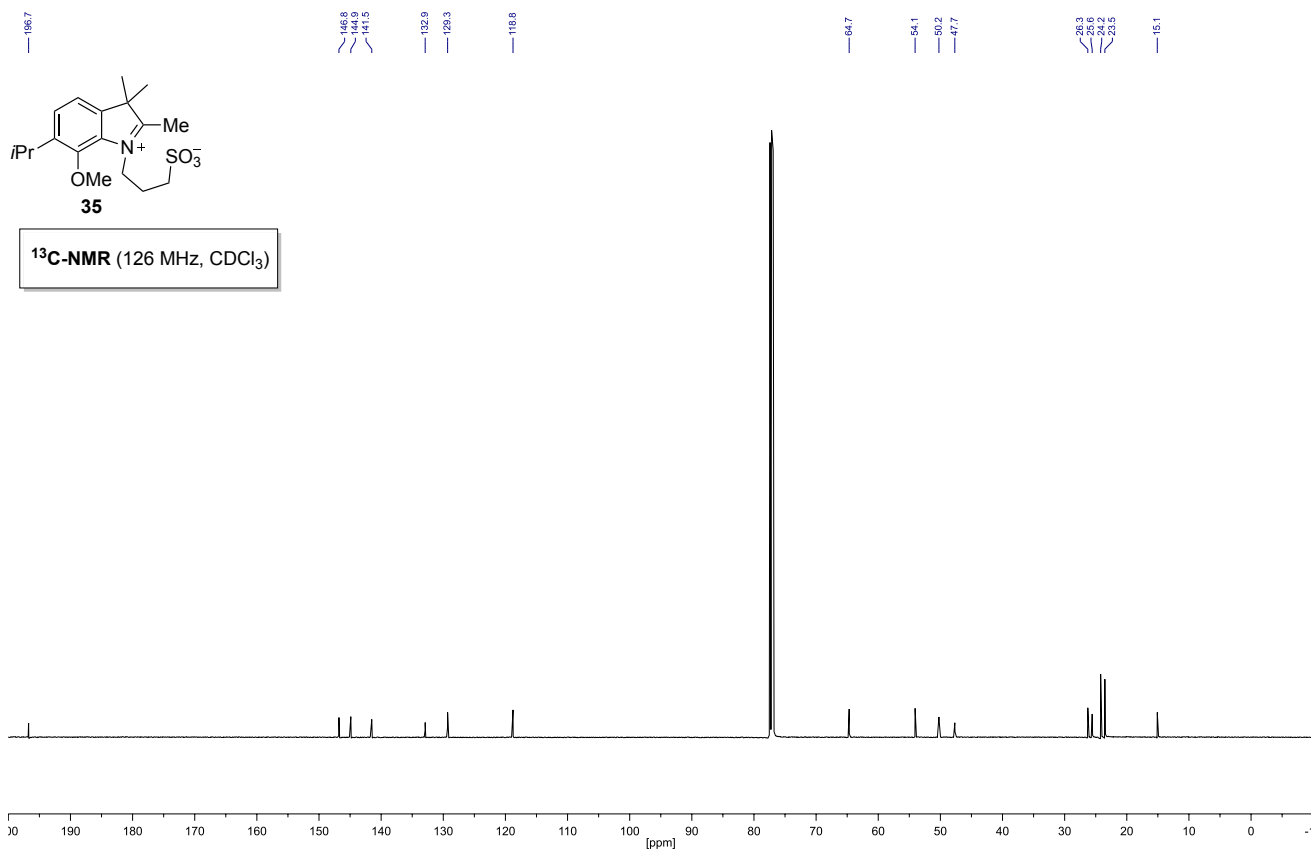
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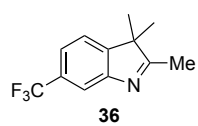
¹H-NMR (400 MHz, CDCl₃)



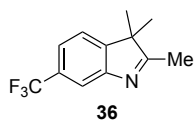
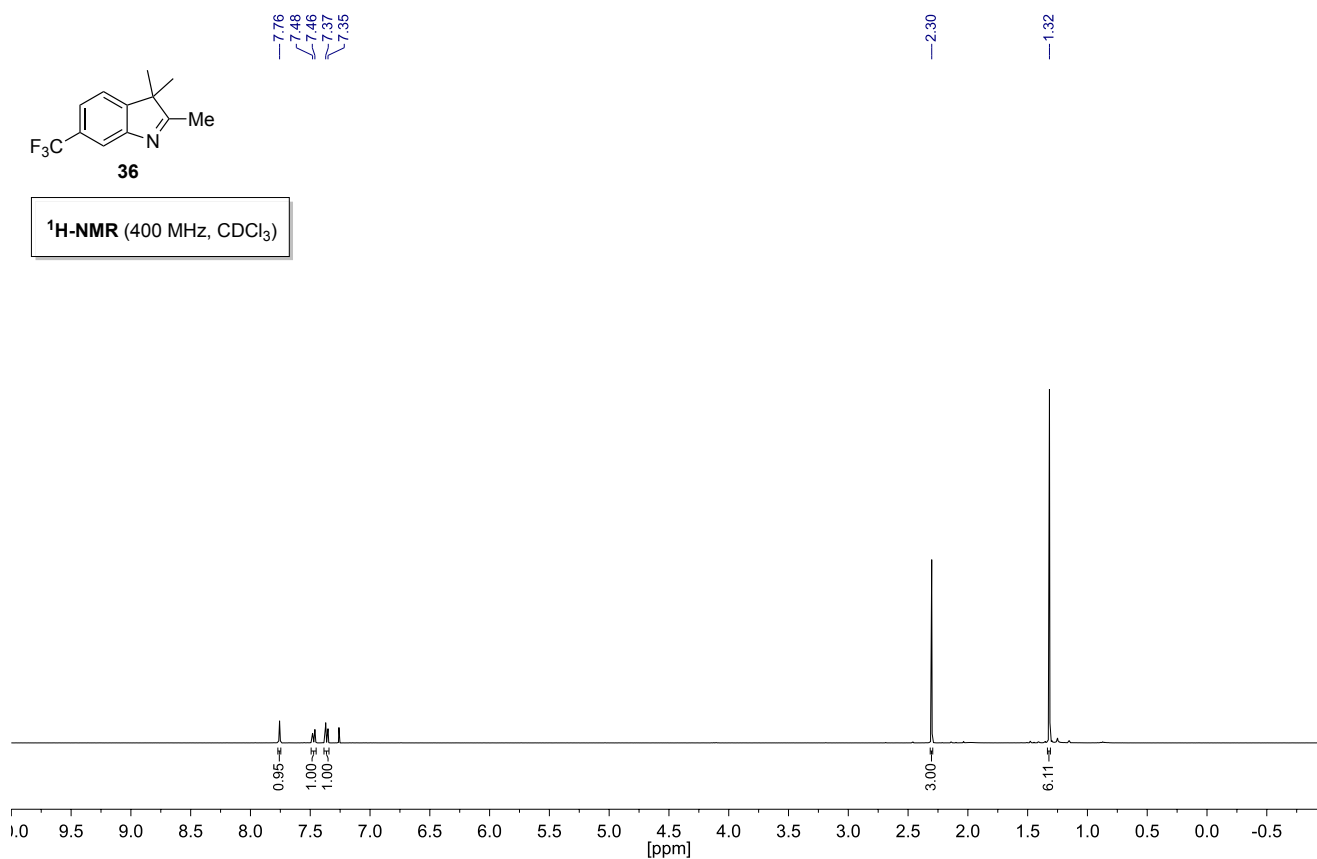
¹³C-NMR (126 MHz, CDCl₃)



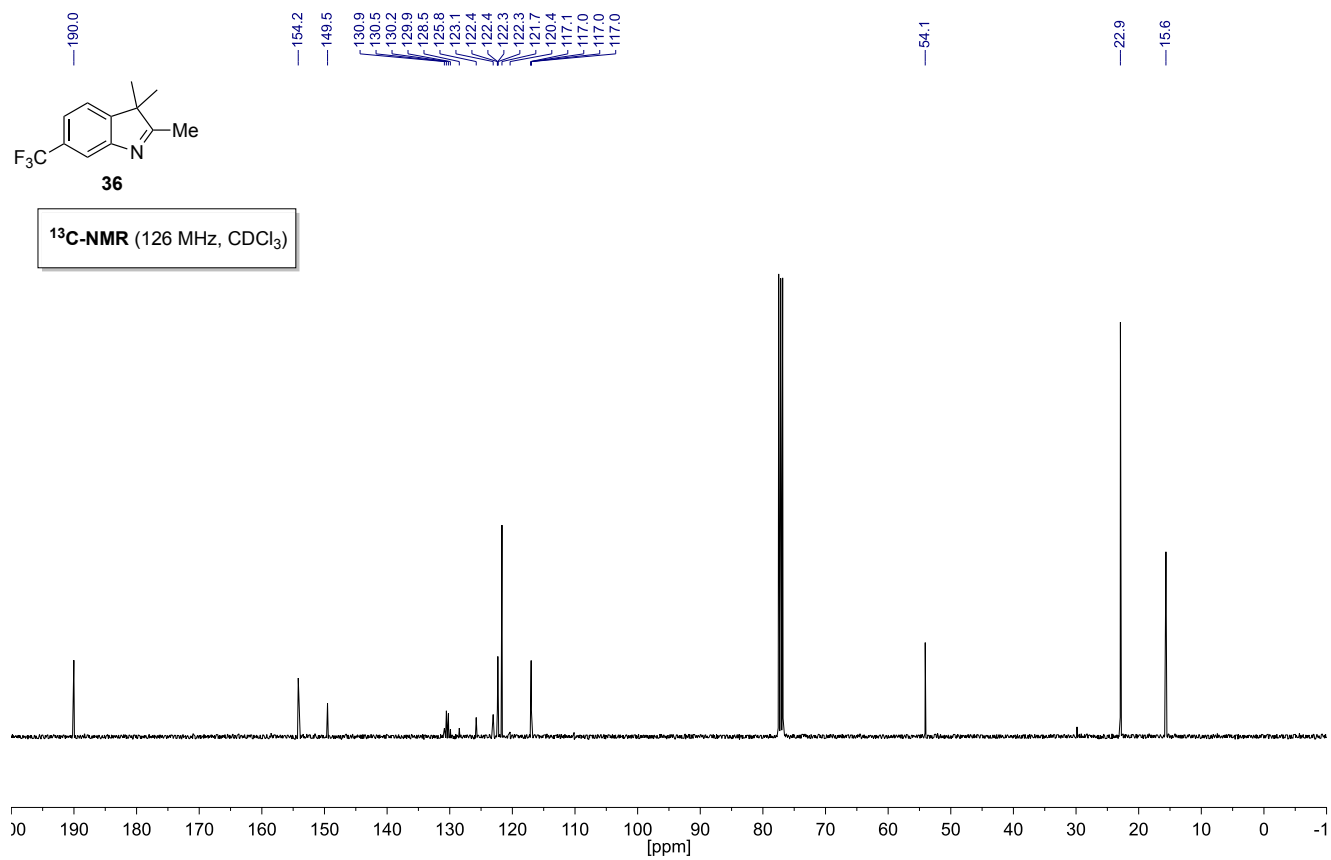
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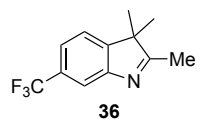
¹H-NMR (400 MHz, CDCl₃)



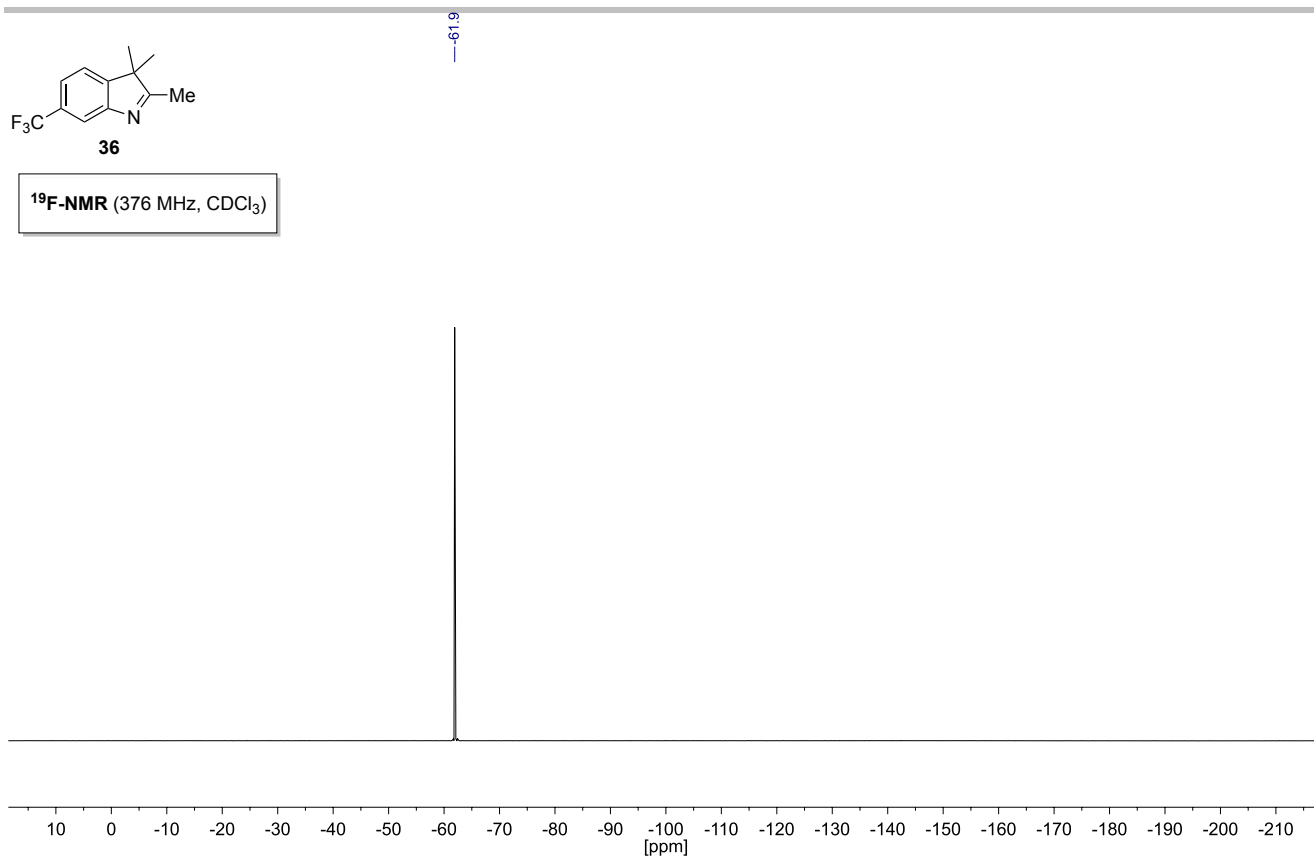
¹³C-NMR (126 MHz, CDCl₃)



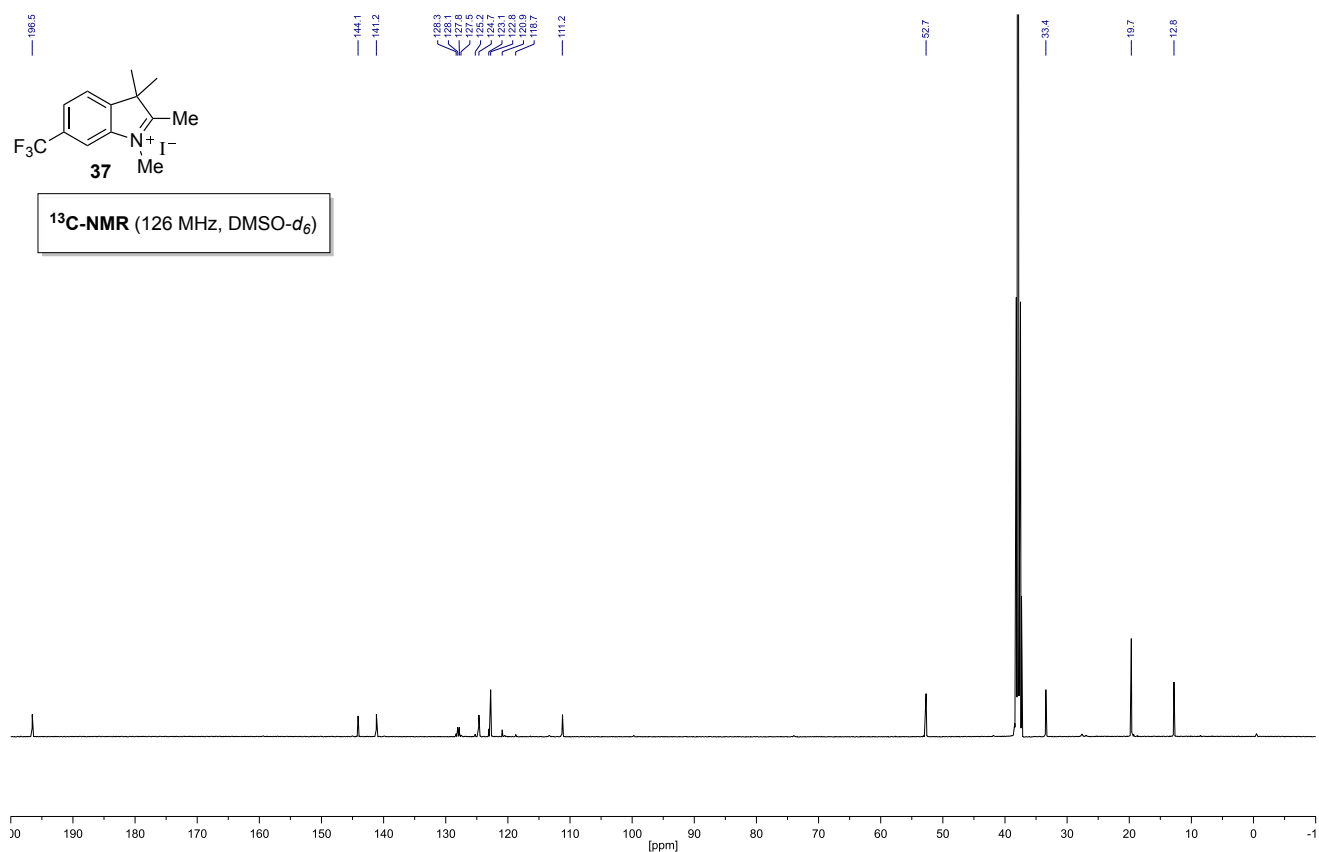
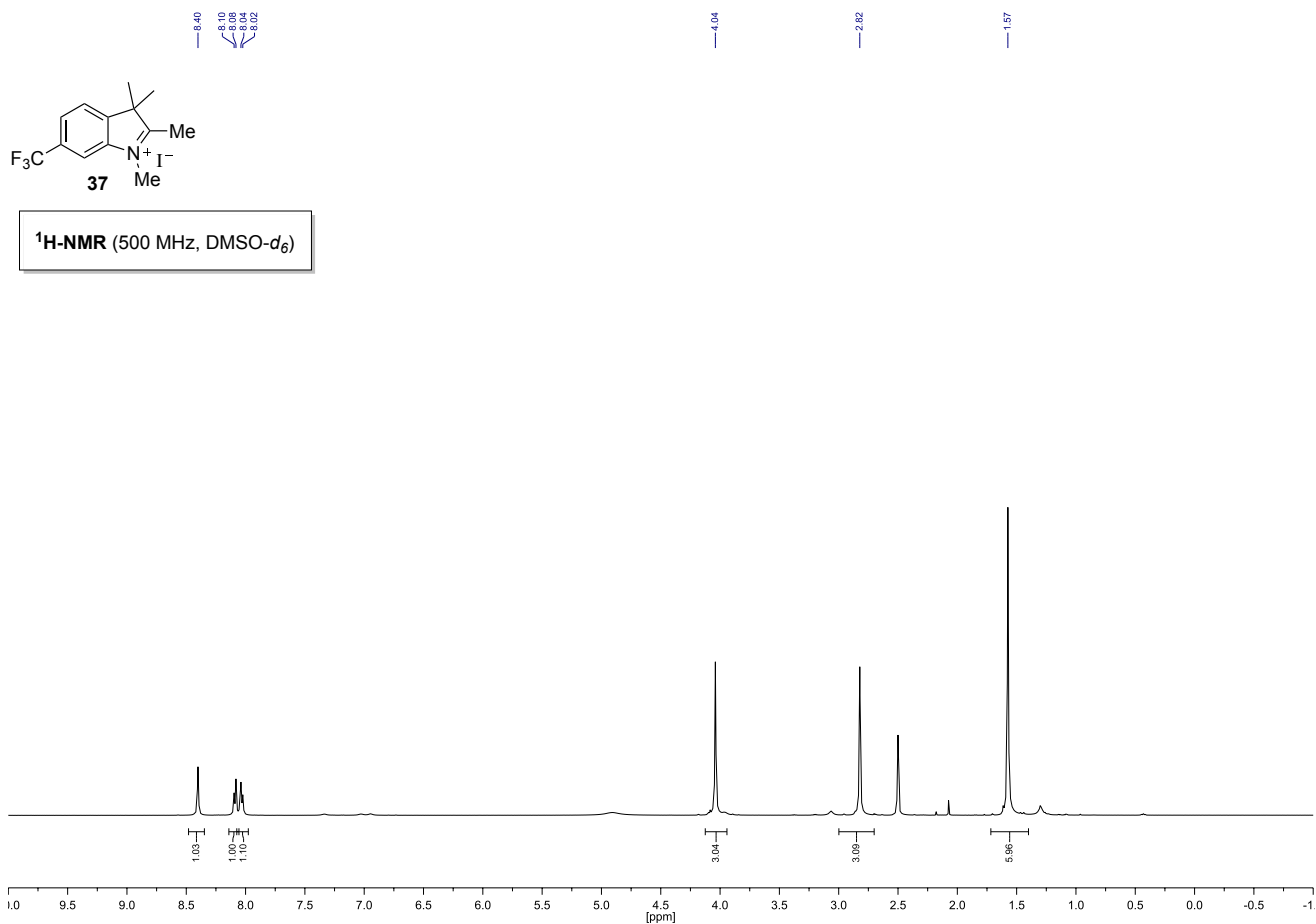
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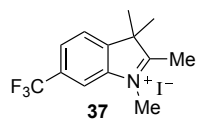
¹⁹F-NMR (376 MHz, CDCl₃)



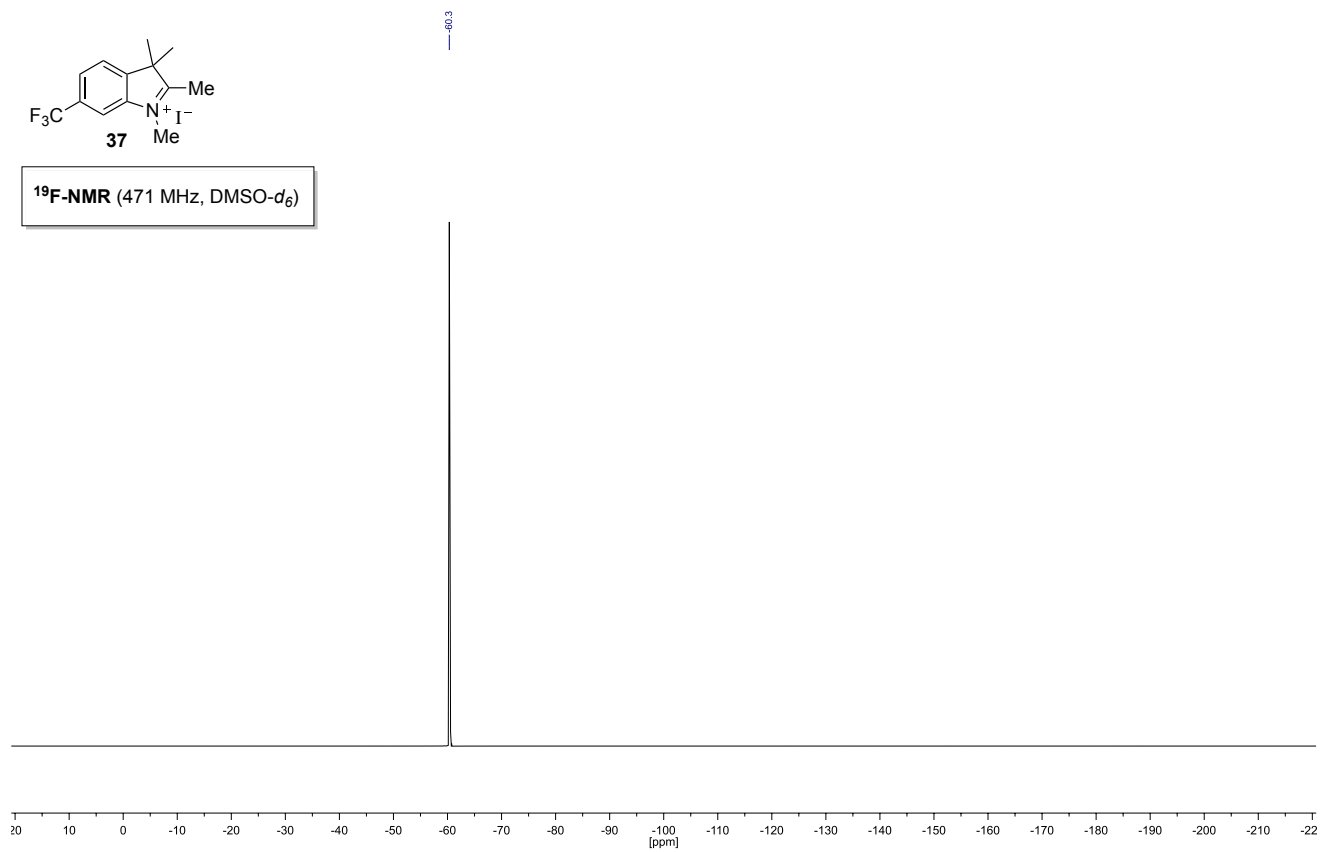
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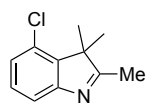
SUPPORTING INFORMATION



¹⁹F-NMR (471 MHz, DMSO-*d*₆)

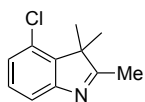
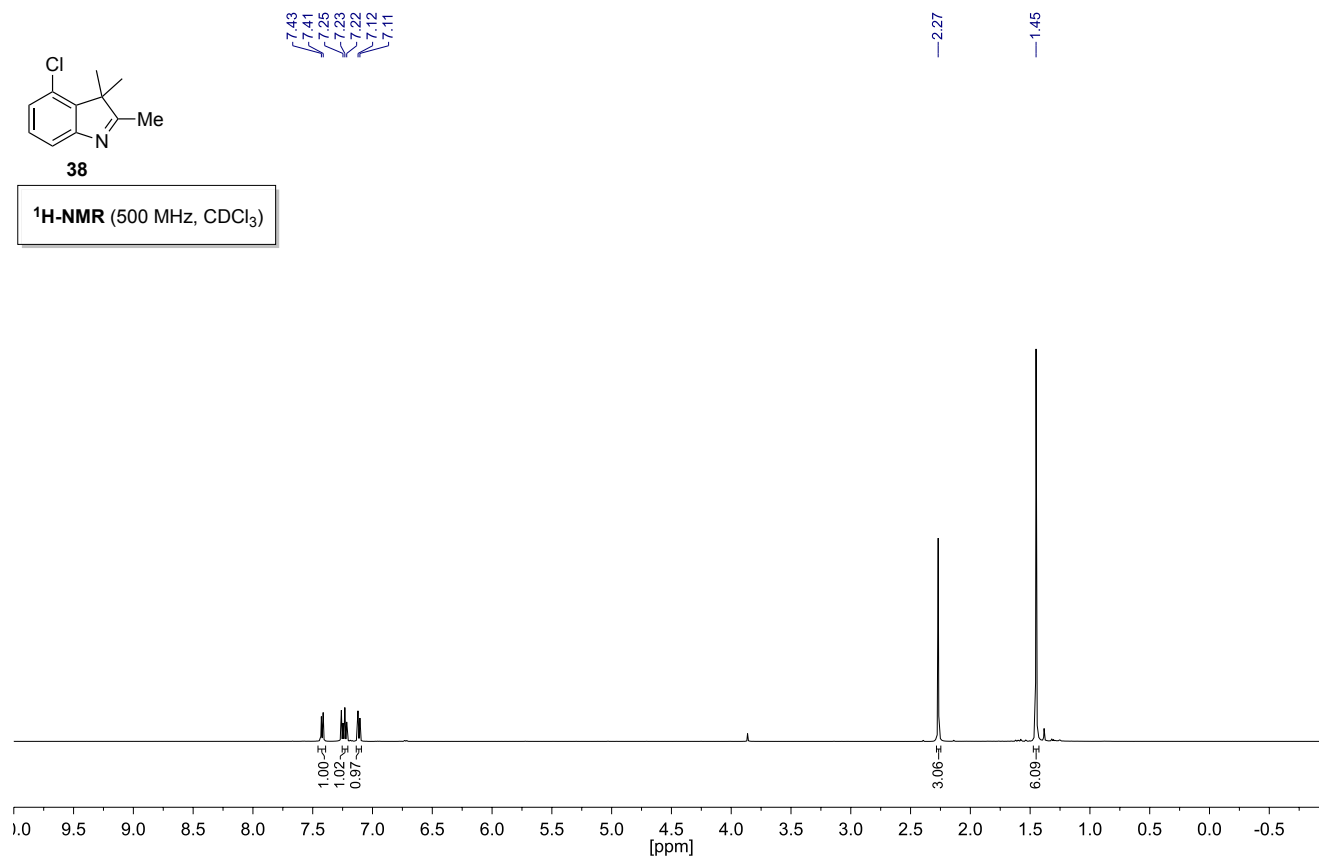


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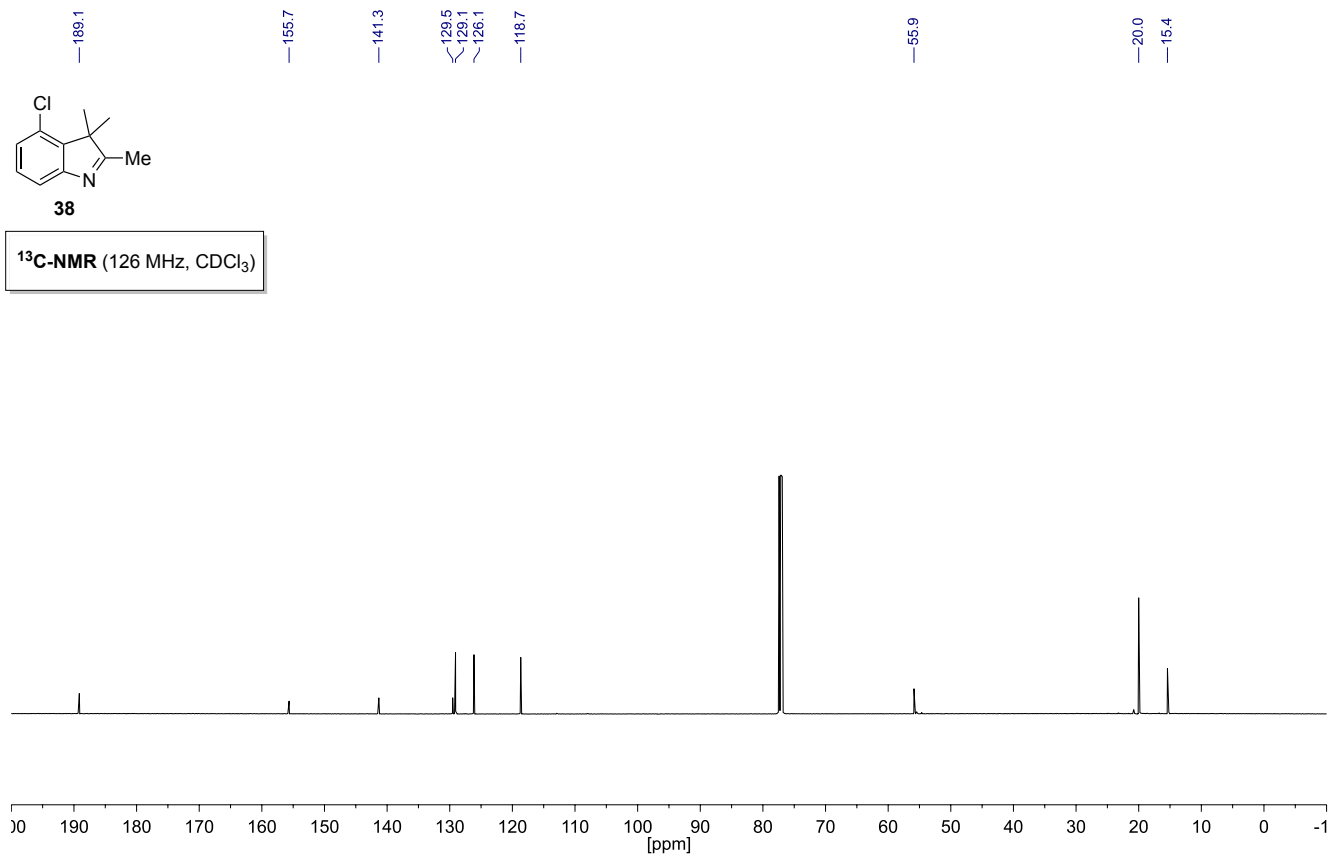
38

¹H-NMR (500 MHz, CDCl₃)

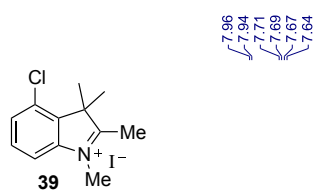


38

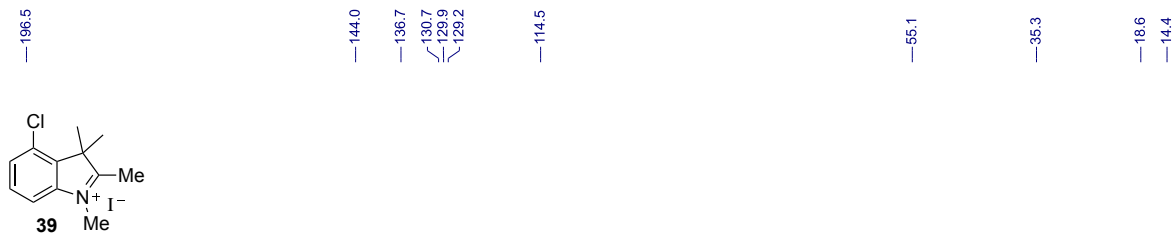
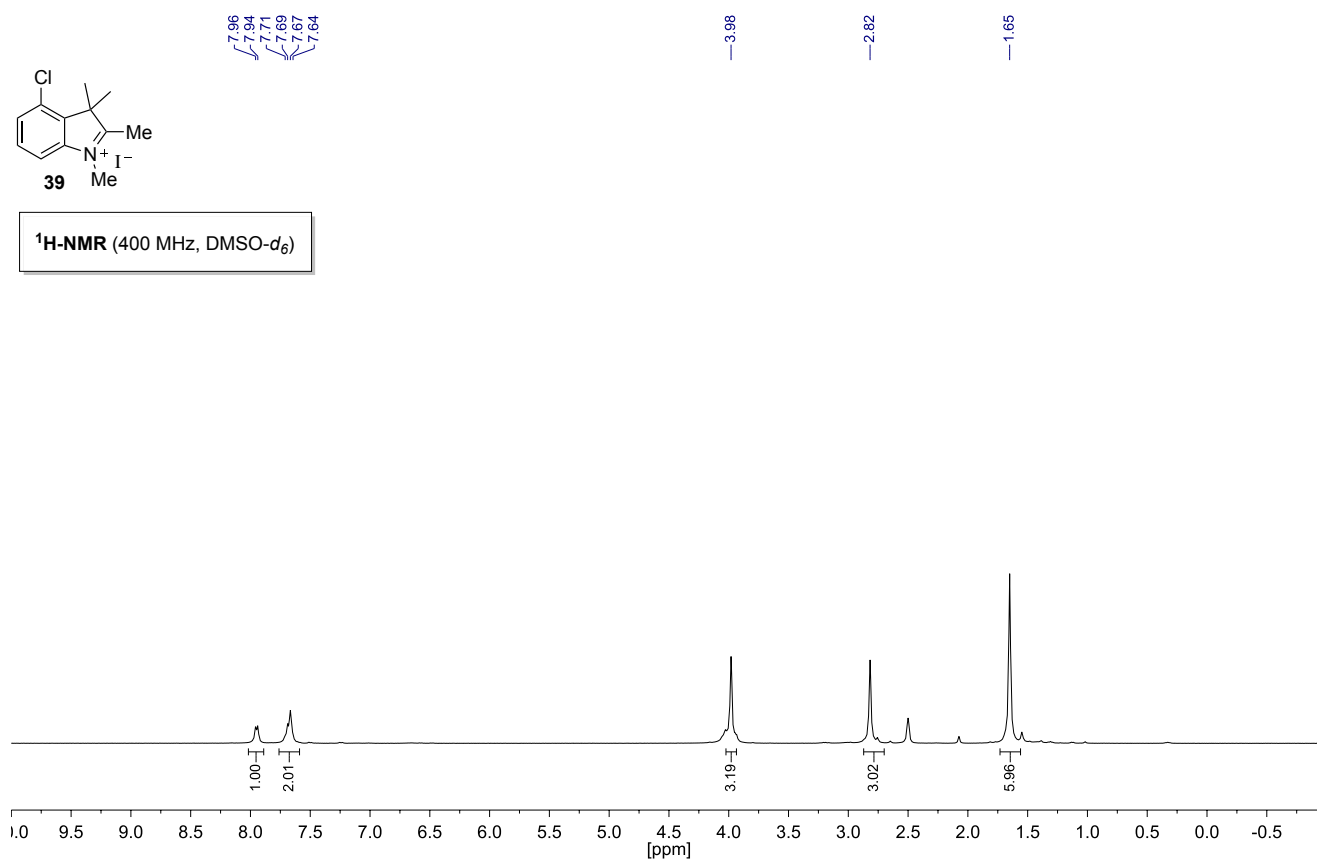
¹³C-NMR (126 MHz, CDCl₃)



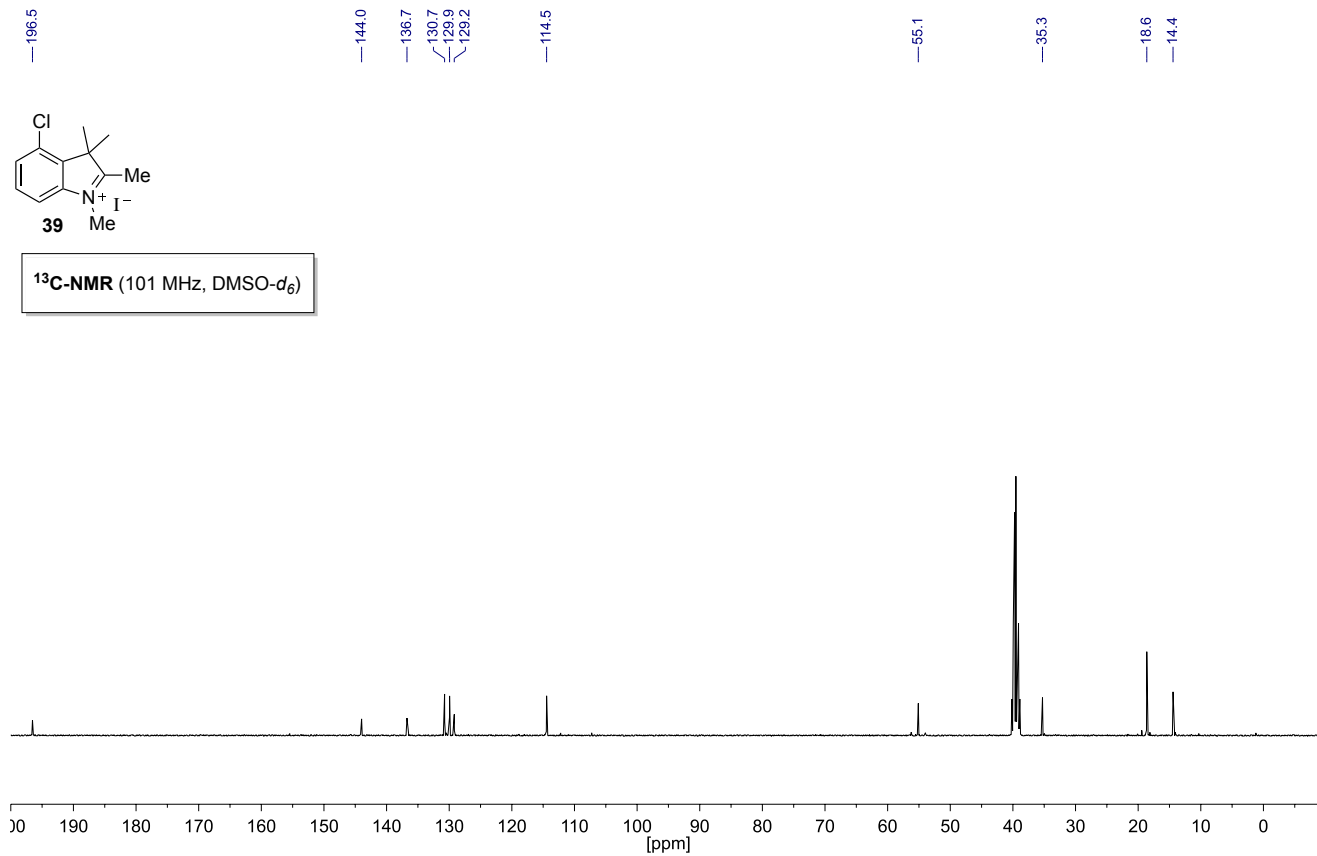
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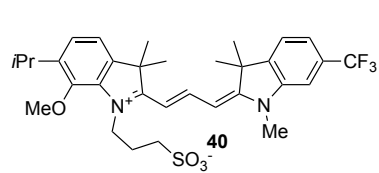
¹H-NMR (400 MHz, DMSO-*d*₆)



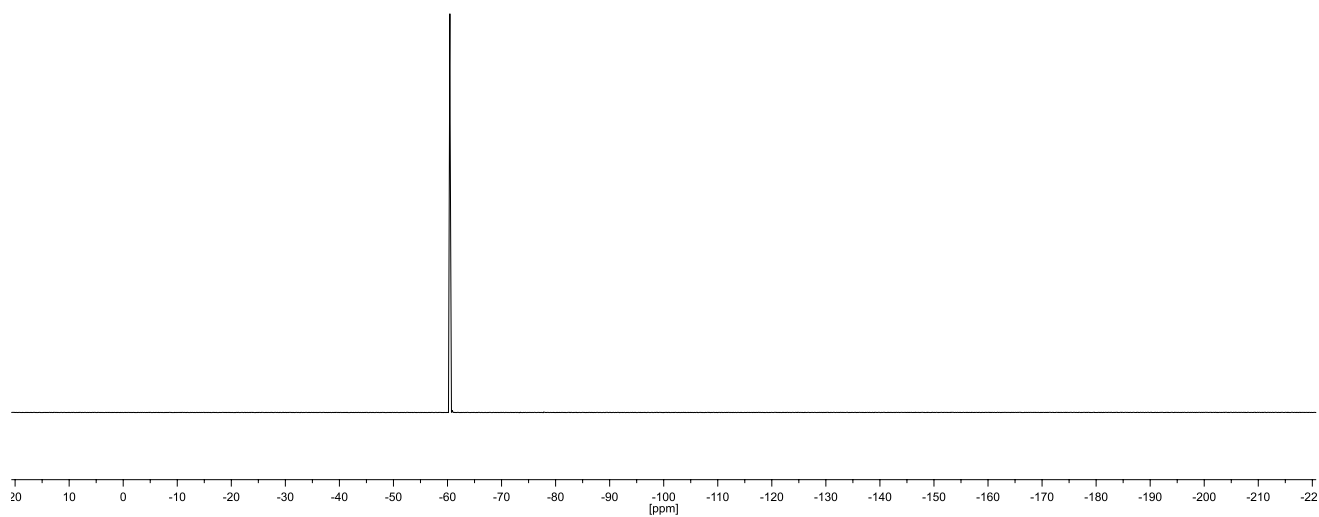
¹³C-NMR (101 MHz, DMSO-*d*₆)



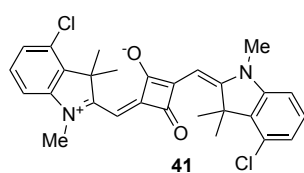
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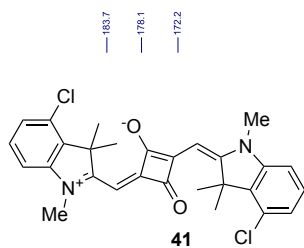
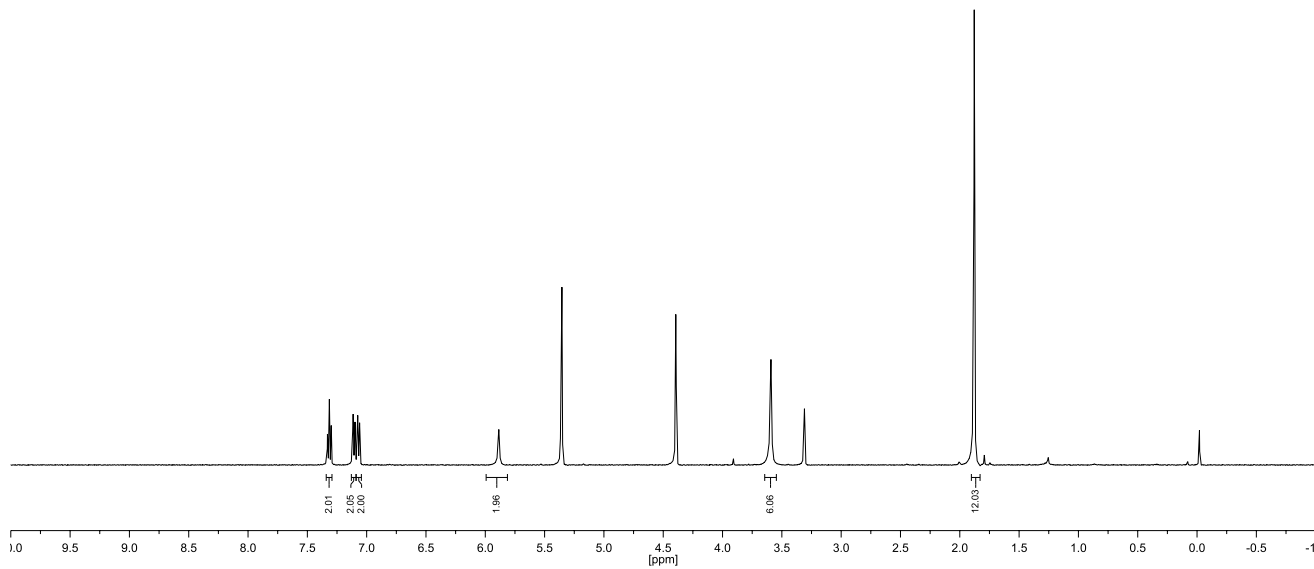
¹⁹F-NMR (471 MHz, DMSO-*d*₆)



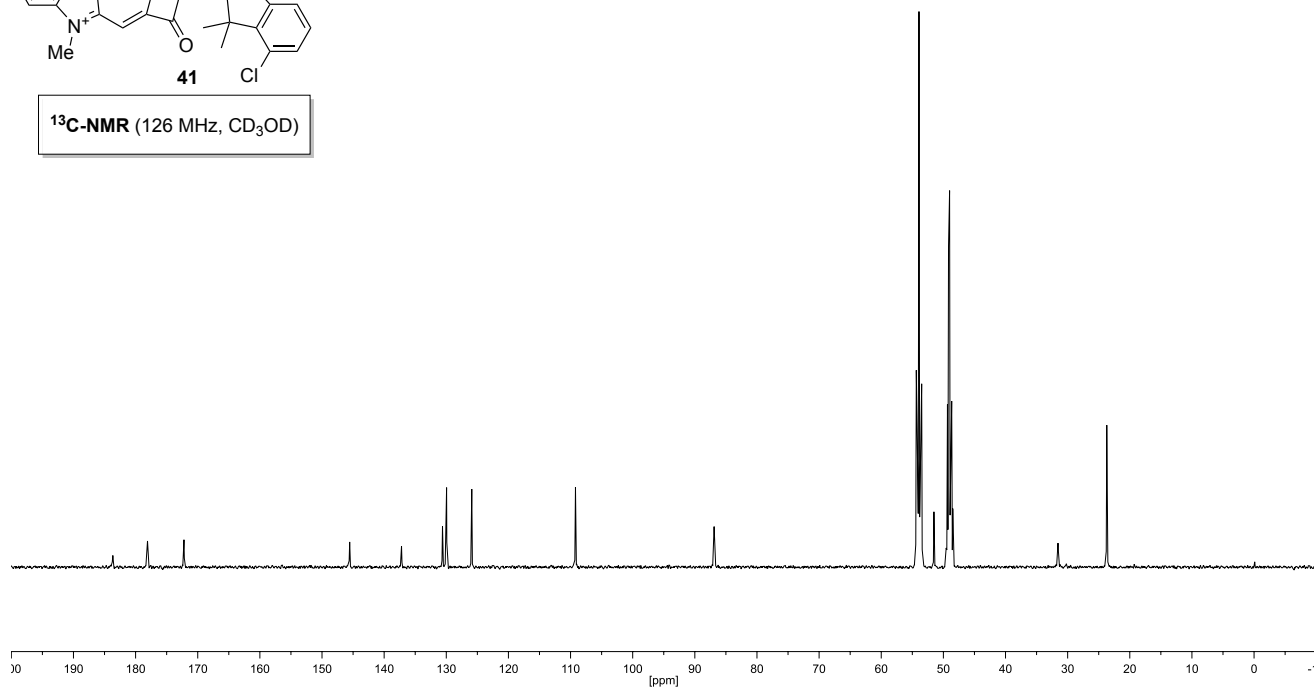
SUPPORTING INFORMATION



¹H-NMR (500 MHz, CD₃OD)



¹³C-NMR (126 MHz, CD₃OD)



6. References

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