Supplementary Information

Organo-Initiator Enabled Undirected C–H Amination of Arenes

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Table of Contents

1. General Information

All commercial materials were purchased from Sigma-Aldrich, Adamas-beta, Energy Chemical, and BidePharm. Unless otherwise noted, they were used without further purification. All reactions were conducted using oven-dried glassware. Reactions were monitored by thin-layer chromatography, which was performed on silica gel GF254 plates purchased from Xinnuo New Materials Company. Visualization was accomplished with UV light (254 nm), iodine, or phosphomolybdic acid. Product purification was done by either flash column chromatography with silica gel (200-300 mesh), or preparative thin-layer chromatography with plates (Silica, 1000 μm, 20 x 20 cm, GF254) from Xinnuo New Materials Company. ^{1}H, ^{13}C, and ^{19}F NMR spectra were collected on a Bruker 400MHz or Varian 400MHz spectrometers at ambient temperature. Chemical shifts (δ) are reported in parts per million (ppm), coupling constants (J) are reported in Hz, and multiplicity is described using the following abbreviations: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, br = broad, or combinations thereof. Regioisomeric ratios were measured by integration of ^{1}H NMR spectra of product mixtures. High resolution mass was obtained from Agilent 6224 Accurate-Mass TOF LC/MS spectrometer using a positive electrospray ionization (ESI^{+}). Infrared spectra were collected on a Bruker Optik GmbH Tensor 27 FT-IR Spectrometer.

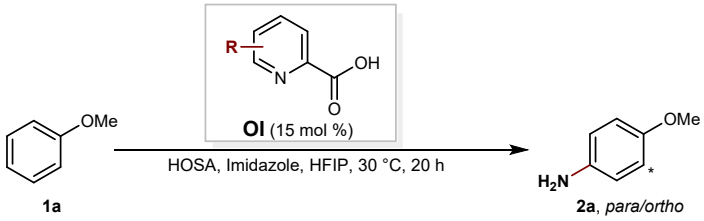
2. Reaction Optimization

General Procedure for Reaction Optimization:

To a oven dried 4 mL vial was added the following reagents: base (0.26 mmol, 1.3 equiv.), organo-initiator (0.03 mmol, 15 mol%), anisole (0.2 mmol, 1.0 equiv.), and a magnetic stir bar. To this mixture, 1,1,1,3,3,3-hexafluoroisopropanol (1.0 mL) was added, and the vial was cooled at -15 °C for 15 minutes. Subsequently, HOSA (0.3 mmol, 1.5 equiv.) was added, and the mixture was stirred at 30 °C for 20 hours.

After completion of the reaction, the mixture was transferred to a 20 mL vial containing a saturated aqueous solution of Na_2CO_3 (8 mL). The resulting mixture was extracted with DCM (3 x 10 mL). The combined organic phases were dried over anhydrous Na_2SO_4 and concentrated under vacuum. The isomer distribution and yield of the corresponding products was determined by ^{1}H NMR analysis of the crude reaction mixture using mesitylene as the internal standard.

Table S1. Evaluation of Organo-initiators



1a

2a, *para/ortho*

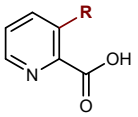
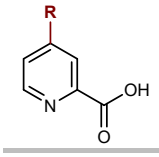
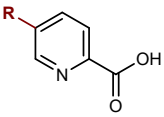
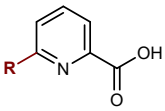
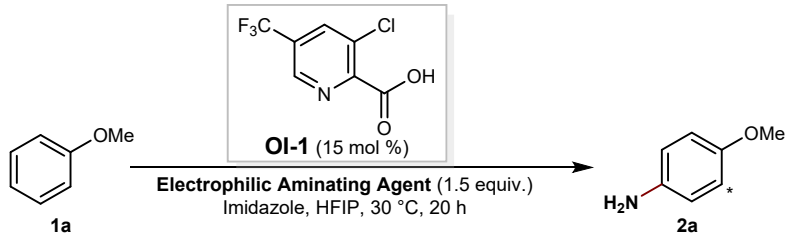
	–NO$_2$	–CF$_3$	–CO$_2$H	–Cl	–H	–Me	–OMe
	44%, 1.5/1.0	54%, 1.5/1.0	54%, 1.6/1.0	65%, 1.5/1.0	56%, 1.7/1.0	57%, 1.5/1.0	62%, 1.7/1.0
	48%, 1.8/1.0	61%, 1.7/1.0	41%, 2.5/1.0	64%, 1.7/1.0	56%, 1.7/1.0	44%, 2.1/1.0	13%, --
	48%, 1.6/1.0	66%, 2.1/1.0	56%, 1.7/1.0	57%, 1.6/1.0	56%, 1.7/1.0	55%, 2.2/1.0	3%, --
	2%, --	2%, --	0%, --	10%, --	56%, 1.7/1.0	4%, --	55%, 2.1/1.0

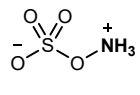
Table S2. Evaluation of Hydroxylamine Derivatives



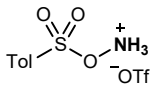
1a

2a

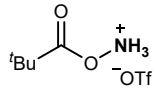
Electrophilic Aminating Agents



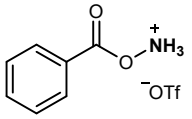
w/ **OI-1**, 76%, 1.9/1.0
w/o **OI-1**, N.D.



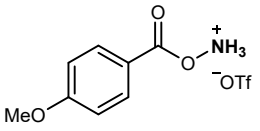
w/ **OI-1**, 12%, --
w/o **OI-1**, 8%, --



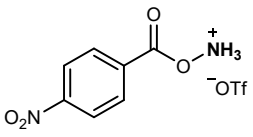
w/ **OI-1**, 27%, 1.7/1.0
w/o **OI-1**, 11%, --



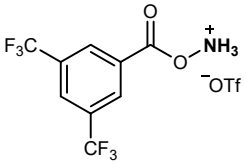
w/ **OI-1**, 37%, 1.5/1.0
w/o **OI-1**, 10%, --



w/ **OI-1**, 35%, 2.0/1.0
w/o **OI-1**, 7%, --

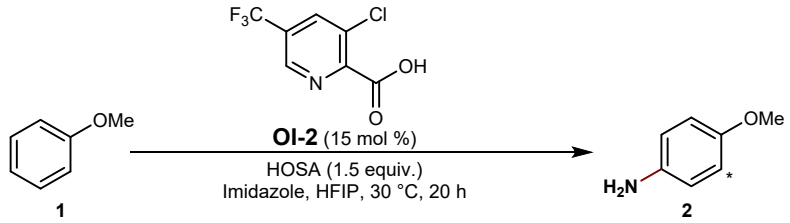


w/ **OI-1**, 58%, 1.4/1.0
w/o **OI-1**, 6%, --



w/ **OI-1**, 64%, 1.6/1.0
w/o **OI-1**, 10%, --

Table S3. Control Experiments



Entry	**Variations**	**Yield**	**r.r.**
1	None	76%	1.9/1.0
2	No 5-(trifluoromethyl)pyridine-2-carboxylic acid	N.D.	-
3	No HOSA	N.D.	-
4	No imidazole	N.D.	

3. General Procedures for C–H Amination Reactions

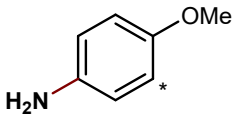
General Procedure A:

In a glove box, to a 4 mL vial was added imidazole (0.26 mmol, 1.3 equiv.), 3-chloro-5-trifluoromethyl-pyridine-2-carboxylic acid (**OI-1**) or 5-trifluoromethyl-pyridine-2-carboxylic acid (**OI-2**) (0.03 mmol, 0.15 equiv.), arene substrate (0.2 mmol, 1.0 equiv.), and 1,1,1,3,3,3 -hexafluoroisopropanol (1.0 mL). The mixture was cooled at -15 °C for 15 minutes before HOSA (0.3 mmol, 1.5 equiv.) was added. After stirring at 30 °C for 20 hours, the reaction mixture was transferred to a 20 mL vial containing a saturated aqueous solution of Na_2CO_3 (8 mL). The resulting mixture was extracted with DCM (3 x 10 mL). The combined organic phases were dried over anhydrous Na_2SO_4 and concentrated under vacuum. The crude mixture was then purified by rapid column chromatography to obtain the desired product. (*Note: The reaction is **not** sensitive to air or moisture and proceeds smoothly when conducted in open air. However, the aminating agent HOSA is quite hygroscopic, which can cause weighing issues if used in air.*)

General Procedure B:

In a glove box, to a 4 mL vial was added BTMG (0.08 mmol, 0.4 equiv.), 3-chloro-5-trifluoromethylpyridine-2-carboxylic acid (**OI-1**) (0.03 mmol, 0.15 equiv.), arene substrate (0.2 mmol, 1.0 equiv.), and 1,1,1,3,3,3 -hexafluoroisopropanol (1.0 mL). The mixture was cooled at -15 °C for 15 minutes before HOSA (0.3 mmol, 1.5 equiv.) was added. After stirring at 30 °C for 20 hours, the reaction mixture was transferred to a 20 mL vial containing a saturated aqueous solution of Na_2CO_3 (8 mL). The resulting mixture was extracted with DCM (3 x 10 mL). The combined organic phases were dried over anhydrous Na_2SO_4 and concentrated under vacuum. The crude mixture was then purified by rapid column chromatography to obtain the desired product.

4. Product Characterization



2a, 74%,1.9/1.0

Following general procedure **A** using **OI-1**.

Ortho:

Yellow oil;

R_f =0.60 (20% ethyl acetate/hexane)

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.82 – 6.78 (m, 2H), 6.76 – 6.71 (m, 2H), 3.86 (s, 3H), 3.79 (brs, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 147.5, 136.2, 121.2, 118.6, 115.2, 110.6, 55.6.

IR (neat, cm^{-1}) *v* 3453, 1629, 1435, 1384, 1353, 1122, 999, 861, 776, 619, 542.

HRMS: calcd. for $[M+H]^+$ $C_7H_{10}NO^+$ = 124.0757, found: 124.0757.

Para:

Yellow solid;

R_f =0.29 (20% ethyl acetate/hexane)

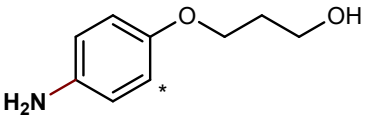
^{1}H NMR (400 MHz, $CDCl_3$) δ 6.75 (d, *J* = 8.8 Hz, 2H), 6.65 (d, *J* = 8.8 Hz, 2H), 3.75 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 152.9, 140.0, 116.6, 114.9, 55.9.

IR (neat, cm^{-1}) *v* 3450, 1637, 1512, 1384, 1353, 1236, 1120, 998, 949, 824, 619, 514.

HRMS: calcd. for $[M+H]^+$ $C_7H_{10}NO^+$ = 124.0757, found: 124.0702.

The characterization data matched the ones found in the literature (*Adv. Synth. Catal.* 2021, ***363***, 2783−2795).



2b, 56%, 2.7/1.0

Following general procedure **A** using **OI-1**.

Ortho:

Brown oil;

R_f = 0.22 (40% ethyl acetate/hexane)

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.83 – 6.78 (m, 2H), 6.74 – 6.70 (m, 2H), 4.15 (t, *J* = 6.0 Hz, 2H), 3.88 (t, *J* = 6.0 Hz, 2H), 2.10 – 2.04 (m, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 146.6, 136.4, 121.5, 118.8, 115.4, 112.0, 66.0,

60.5, 32.3.

IR (neat, cm^{-1}) *v* 3454, 1599, 1505, 1384, 1353, 1268, 1221, 1081, 993, 854, 743, 621, 542.

HRMS: calcd. for $[M+H]^+$ $C_9H_{14}NO_2^+$ = 168.1020, found: 168.1018.

Para:

Yellow solid;

$\mathbf{R_f}$ =0.29 (60% ethyl acetate/hexane)

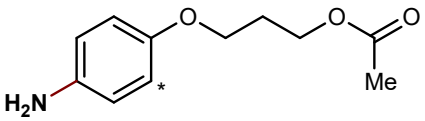
^{1}H NMR (400 MHz, $CDCl_3$) δ 6.75 (d, *J* = 8.6 Hz, 2H), 6.63 (d, *J* = 8.6 Hz, 2H), 4.05 (t, *J* = 5.9 Hz, 2H), 3.84 (t, *J* = 5.8 Hz, 2H), 2.94 (brs, 2H), 2.03 – 1.97 (m, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 152.0, 140.3, 116.5, 115.8, 66.9, 61.0, 32.2.

IR (neat, cm^{-1}) *v* 3451, 3346, 2964, 2903, 1600, 1516, 1355, 1239, 1124, 1099, 1066, 1000, 820, 519.

HRMS: calcd. for $[M+H]^+$ $C_9H_{14}NO_2^+$ = 168.1019, found: 168.1016.

The characterization data matched the ones found in the literature (*Tetrahedron.* 2004, ***60***, 121−130).



2c, 66%, 3.5/1.0

Following general procedure **A** using **OI-1**.

Ortho:

Brown oil;

$\mathbf{R_f}$ = 0.31 (20% ethyl acetate/hexane)

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.82 – 6.78 (m, 2H), 6.74 – 6.69 (m, 2H), 4.28 (t, *J* = 6.2 Hz, 2H), 4.09 (t, *J* = 6.2 Hz, 2H), 2.18 – 2.12 (m, 2H), 2.06 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 171.2, 146.4, 136.4, 121.5, 118.6, 115.3, 111.6, 64.7, 61.5, 28.8, 21.1.

IR (neat, cm^{-1}) *v* 3453, 2831, 1735, 1597, 1506, 1458, 1384, 1364, 1244, 1138, 1055, 776, 741, 544.

HRMS: calcd. for $[M+H]^+$ $C_{11}H_{16}NO_3^+$ = 210.1125, found: 210.1122.

Para:

Brown oil;

$\mathbf{R_f}$ = 0.10 (20% ethyl acetate/hexane)

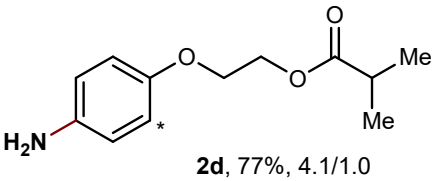
^{1}H NMR (400 MHz, $CDCl_3$) δ 6.73 (d, *J* = 8.7 Hz, 2H), 6.63 (d, *J* = 8.7 Hz, 2H), 4.24 (t, *J* = 6.4 Hz, 2H), 3.96 (t, *J* = 6.2 Hz, 2H), 3.25 (brs, 2H), 2.11 – 2.03 (m, 5H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 171.2, 152.0, 140.2, 116.5, 115.8, 65.1, 61.5,

28.8, 21.1.

IR (neat, cm^{-1}) *v* 3449, 1732, 1602, 1511, 1385, 1356, 1233, 1126, 1002, 953, 826, 544, 518.

HRMS: calcd. for $[M+H]^+$ $C_{11}H_{16}NO_3^+$ = 210.1125, found: 210.1123.



2d, 77%, 4.1/1.0

Following general procedure **A** using **OI-1**.

Ortho:

Yellow oil;

$\mathbf{R_f}$ = 0.69 (30% ethyl acetate/hexane)

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.84 – 6.78 (m, 2H), 6.74 – 6.68 (m, 2H), 4.46 (t, *J* = 9.2 Hz, 2H), 4.20 (t, *J* = 9.2 Hz, 2H), 3.78 (brs, 2H), 2.59 (hept, *J* = 7.2 Hz, 1H), 1.18 (d, *J* = 7.0 Hz, 6H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 177.3, 146.2, 136.8, 122.0, 118.5, 115.4, 112.3, 66.9, 62.8, 34.1, 19.1.

IR (neat, cm^{-1}) *v* 3452, 1726, 1598, 1505, 1385, 1353, 1141, 1068, 1000, 542, 515.

HRMS: calcd. for $[M+H]^+$ $C_{12}H_{18}NO_3^+$ = 224.1282, found: 224.1281.

Para:

Brown oil;

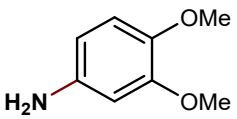
$\mathbf{R_f}$ = 0.33 (30% ethyl acetate/hexane)

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.75 (d, *J* = 8.6 Hz, 2H), 6.63 (d, *J* = 8.6 Hz, 2H), 4.38 – 4.36 (m, 2H), 4.10 – 4.08 (m, 2H), 3.32 (brs, 2H), 2.59 (hept, *J* = 7.0 Hz, 1H), 1.17 (d, *J* = 7.0 Hz, 6H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 177.3, 151.8, 140.6, 116.5, 116.2, 67.0, 62.9, 34.0, 19.1.

IR (neat, cm^{-1}) *v* 3423, 2972, 2943, 1727, 1634, 1512, 1468, 1385, 1349, 1238, 1122, 622, 515.

HRMS: calcd. for $[M+H]^+$ $C_{12}H_{18}NO_3^+$ = 224.1281, found: 224.1278.



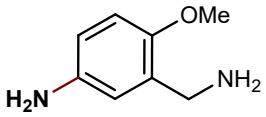
2e, 55%

Following general procedure **A** using **OI-1**.

Brown solid;

R_f =0.52 (50% ethyl acetate/hexane)
^{1}H NMR (400 MHz, $CDCl_3$) δ 6.70 (d, *J* = 8.4 Hz, 1H), 6.31 (d, *J* = 2.5 Hz, 1H), 6.23 (dd, *J* = 8.4, 2.6 Hz, 1H), 3.82 (s, 3H), 3.80 (s, 3H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 149.9, 142.3, 140.7, 113.1, 106.5, 100.8, 56.7, 55.8.
IR (neat, cm^{-1}) *v* 3451, 1596, 1512, 1461, 1384, 1353, 1278, 1164, 1124, 1024, 999, 949, 846, 680, 617, 541.
HRMS: calcd. for $[M+H]^+$ $C_8H_{12}NO_2^+$ = 154.0863, found: 154.0805.

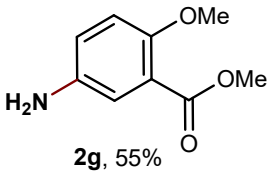
The characterization data matched the ones found in the literature (*Org. Lett.* 2023, ***25***, 2548−2553).



2f, 58%

Following general procedure **B**.
Yellow oil;
R_f = 0.16 (10% methanol/ dichloromethane)
^{1}H NMR (400 MHz, CD_3OD) δ 6.78 (d, *J* = 8.6 Hz, 1H), 6.69 – 6.66 (m, 2H), 3.78 (s, 3H), 3.73 (s, 2H).
^{13}C NMR (101 MHz, CD_3OD) δ 152.2, 141.6, 130.2, 118.6, 116.9, 112.6, 56.1, 42.3.
IR (neat, cm^{-1}) *v* 3454, 1637, 1502, 1384, 1352, 1094, 1115, 992, 619, 513.
HRMS (ESI) *m/z* calculated for $C_8H_{13}N_2O$ $[M+H^+]$: 153.1023, found:153.1011.

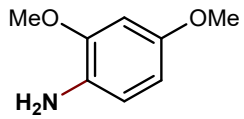
The characterization data matched the ones found in the literature (*ACS Med. Chem. Lett.* 2019, ***10***, 1628−1634).



2g, 55%

Following general procedure **A** using **OI-1**.
Yellow oil;
R_f = 0.31 (20% ethyl acetate/hexane)
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.14 (s, 1H), 6.81 (s, 2H), 3.86 (s, 3H), 3.81 (s, 3H), 3.49 (brs, 2H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 166.9, 152.5, 139.7, 120.7, 120.4, 118.2, 114.2, 56.9, 52.1.
IR (neat, cm^{-1}) *v* 3444, 1612, 1502, 1436, 1384, 1319, 1137, 1080, 1002, 878, 545.
HRMS: calcd. for $[M+H]^+$ $C_9H_{12}NO_3^+$ = 182.0812, found:188.0808.

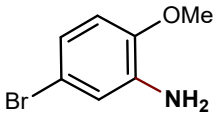
The characterization data matched the ones found in the literature (*Org. Lett.* 2020, ***22***, 2931−2934).



2h, 56%

Following general procedure **A** using **OI-1**.
Brown solid;
$\mathbf{R_f}$ = 0.30 (30% ethyl acetate/hexane)
^{1}H NMR (400 MHz, $CDCl_3$) δ 6.65 (d, *J* = 8.4 Hz, 1H), 6.45 (d, *J* = 2.2 Hz, 1H), 6.35 (dd, *J* = 8.4, 2.1 Hz, 1H), 3.83 (s, 3H), 3.75 (s, 3H), 3.51 (brs, 2H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 153.5, 148.5, 129.9, 115.3, 104.3, 99.5, 55.9, 55.6.
IR (neat, cm^{-1}) *v* 3418, 1598, 1514, 1452, 1384, 1353, 1240, 1205, 1153, 834, 619.,
HRMS: calcd. for $[M+H]^+$ $C_8H_{12}NO_2^+$ = 154.0863, found: 154.0802.

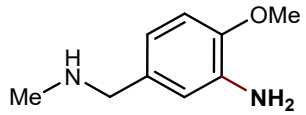
The characterization data matched the ones found in the literature (*Chem. Eur. J.* 2017, ***23***, 563−567).



2i, 55%

Following general procedure **A** using **OI-1**.
Yellow solid;
$\mathbf{R_f}$ = 0.55 (20% ethyl acetate/hexane)
^{1}H NMR (400 MHz, $CDCl_3$) δ 6.82 – 6.79 (m, 2H), 6.62 (d, *J* = 7.9 Hz, 1H), 3.82 (brs, 5H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 146.4, 137.8, 120.7, 117.4, 113.3, 111.7, 55.7.
IR (neat, cm^{-1}) *v* 3460, 3371, 1613, 1501, 1461, 1419, 1276, 1225, 1181, 1093, 1019, 855, 795, 608.
HRMS: calcd. for $[M+H]^+$ $C_7H_9BrNO^+$ = 201.9863, found:201.9859.

The characterization data matched the ones found in the literature (*ACS Catal.* 2016, ***6***, 8162−8165).



2j, 90%

Following general procedure **B**.

Brown oil;

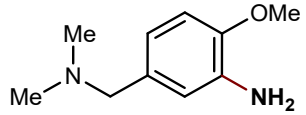
R_f = 0.48 (10% methanol/ dichloromethane)

^{1}H NMR (400 MHz, CD_3OD) δ 6.78 (d, *J* = 8.1 Hz, 1H), 6.72 (d, *J* = 2.0 Hz, 1H), 6.65 (dd, *J* = 8.1, 2.0 Hz, 1H), 3.82 (s, 3H), 3.55 (s, 2H), 2.34 (s, 3H).

^{13}C NMR (101 MHz, CD_3OD) δ 148.5, 137.6, 132.6, 119.8, 116.9, 111.4, 56.0, 35.2.

IR (neat, cm^{-1}) *v*3451, 2832, 1598, 1440, 1385, 1355, 1282, 1139, 1001, 618, 542.

HRMS: calcd. for $[M+H]^+$ $C_9H_{15}N_2O^+$ = 167.1179, found:167.1176.



2k, 74%

Following general procedure **B**.

Brown oil;

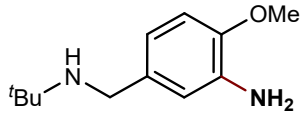
R_f = 0.21 (10% methanol/ dichloromethane)

^{1}H NMR (400 MHz, CD_3OD) δ6.79 (d, *J* = 8.2 Hz, 1H), 6.72 (d, *J* = 2.0 Hz, 1H), 6.64 (dd, *J* = 8.1, 2.0 Hz, 1H), 3.83 (s, 3H), 3.38 (s, 2H), 2.25 (s, 6H).

^{13}C NMR (101 MHz, CD_3OD) δ 148.8, 137.6, 130.3, 121.1, 117.9, 111.2, 64.5, 56.0, 44.8.

IR (neat, cm^{-1}) ν 3453, 1621, 1515, 1441, 1384, 1228, 1001, 619, 541.

HRMS: calcd. for $[M+H]^+$ $C_{10}H_{17}N_2O^+$ = 181.1336, found: 188.1333.



2l, 93%

Following general procedure **B**.

Brown oil;

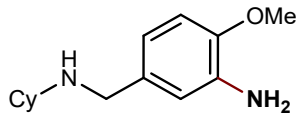
R_f = 0.38 (10% methanol/ dichloromethane)

^{1}H NMR (400 MHz, CD_3OD) δ6.79 (d, *J* = 8.2 Hz, 1H), 6.74 (d, *J* = 2.0 Hz, 1H), 6.68 (dd, *J* = 8.2, 2.0 Hz, 1H), 3.82 (s, 3H), 3.58 (s, 2H), 1.20 (s, 9H).

^{13}C NMR (101 MHz, CD_3OD) δ 148.4, 137.7, 133.1, 119.9, 117.0, 111.4, 56.0, 52.4, 47.5, 28.4.

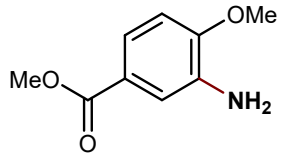
IR (neat, cm^{-1}) *v* 3688, 3331, 2962, 2867, 1718, 1619, 1516, 1466, 1441, 1287, 1228, 1032, 802.

HRMS: calcd. for $[M+H]^+$ $C_{12}H_{21}N_2O^+$ = 209.1649, found: 209.1623.



2m, 72%

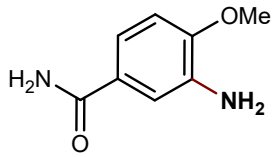
Following general procedure **B**.
Brown oil;
$\mathbf{R_f}$ = 0.50 (10% methanol/ dichloromethane)
^{1}H NMR (400 MHz, CD_3OD) δ6.78 (d, *J* = 8.2 Hz, 1H), 6.73 (d, *J* = 2.0 Hz, 1H), 6.65 (dd, *J* = 8.1, 2.0 Hz, 1H), 3.82 (s, 3H), 3.62 (s, 2H), 2.49 – 2.41 (m, 1H), 1.94 – 1.92 (m, 2H), 1.76 – 1.72 (m, 2H), 1.65 – 1.62 (m, 1H), 1.27 – 1.10 (m, 5H).
^{13}C NMR (101 MHz, CD_3OD) δ 148.4, 137.6, 133.2, 119.8, 116.8, 111.4, 57.6, 56.0, 50.9, 33.6, 27.2, 26.2.
IR (neat, cm^{-1}) *v* 3470, 3368, 2927, 2851, 1618, 1515, 1448, 1263, 991, 738.
HRMS: calcd. for $[M+H]^+$ $C_{14}H_{23}N_2O^+$ = 235.1805, found: 235.1802.



2n, 64%

Following general procedure A using **OI-1**.
A 2.0 mmol scale reaction was also successfully conducted, yielding **2n** with an isolated yield of 59% (215 mg).
Yellow solid;
$\mathbf{R_f}$ = 0.38 (20% ethyl acetate/hexane)
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.46 (d, *J* = 8.5 Hz, 1H), 7.38 (s, 1H), 6.78 (d, *J* = 8.4 Hz, 1H), 3.89 (s, 3H), 3.85 (s, 3H), 3.81 (brs, 2H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 167.3, 151.0, 136.0, 122.9, 121.1, 115.6, 109.5, 55.7, 51.9.
IR (neat, cm^{-1}) *v* 3430, 2972, 2845, 1709, 1620, 1517, 1444, 1354, 1256, 1107, 1021, 876, 820, 761, 632.
HRMS: calcd. for $[M+H]^+$ $C_9H_{12}NO_3^+$ = 182.0812, found:182.0807.

The characterization data matched the ones found in the literature (*ACS Catal.* 2016, ***6***, 8162−8165).

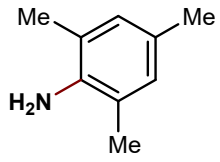


2o, 53%

Following general procedure **A** using **OI-1**.
White solid;
$\mathbf{R_f}$ = 0.19 (80% ethyl acetate/hexane)
^{1}H NMR (400 MHz, CD_3OD) δ 7.26 – 7.24 (m, 2H), 6.87 (d, *J* = 8.9 Hz, 1H), 3.89 (s, 3H).
^{13}C NMR (101 MHz, CD_3OD) δ 172.8, 151.9, 137.9, 127.3, 119.5, 115.3, 110.6, 56.1.

IR (neat, cm^{-1}) *v* 3443, 2923, 2832, 1598, 1447, 1384, 1357, 1145, 1001, 875, 775, 622, 543.
HRMS: calcd. for $[M+H]^+$ $C_8H_{11}N_2O_2^+$ = 167.0816, found: 167.0809.

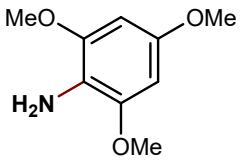
The characterization data matched the ones found in the literature (*Asian J. Chem.* 2016, ***28***, 2177−2180).



2p, 75%

Following general procedure **A** using **OI-2**.
Colorless oil.
$\mathbf{R_f}$ = 0.65 (20% ethyl acetate/hexane)
^{1}H NMR (400 MHz, $CDCl_3$) δ 6.80 (s, 2H), 3.46 (brs, 2H), 2.24 (s, 3H), 2.19 (s, 6H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 140.2, 128.9, 127.2, 122.0, 20.5, 17.7.
IR (neat, cm^{-1}) *v* 3455, 3389, 3007, 2923, 1626, 1605, 1490, 1443, 1380, 1364, 1306, 1251, 1155, 1009, 865, 561.
HRMS: calcd. for $[M+H]^+$ $C_9H_{14}N^+$ = 136.1121, found: 136.1116.

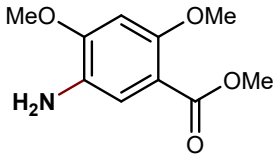
The characterization data matched the ones found in the literature (*Adv. Synth. Catal.* 2021, ***363***, 2783−2795).



2q, 59%

Following general procedure **A** using **OI-1**.
Yellow solid;
$\mathbf{R_f}$ = 0.29 (30% ethyl acetate/hexane)
^{1}H NMR (400 MHz, $CDCl_3$) δ 6.17 (s, 2H), 3.83 (s, 6H), 3.76 (s, 3H), 3.18 (brs, 2H)
^{13}C NMR (101 MHz, $CDCl_3$) δ 152.6, 148.2, 118.9, 91.4, 55.9.
IR (neat, cm^{-1}) *v* 3448, 2832, 1611, 1511, 1452, 1364, 1147, 1001, 853, 776, 620, 544.
HRMS: calcd. for $[M+H]^+$ $C_9H_{14}NO_3^+$ = 184.0969, found:184.0908.

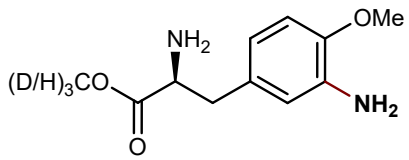
The characterization data matched the ones found in the literature (*Chem. Eur. J.* 2017, ***23***, 563−567).



2r, 48%

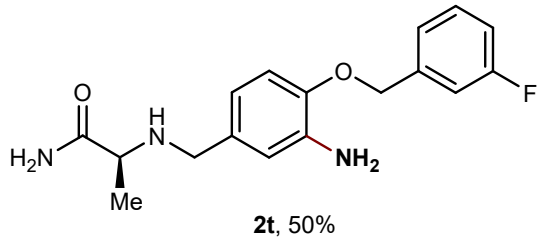
Following general procedure **A** using **OI-1**.
Brown solid;
$\mathbf{R_f}$ = 0.30 (20% ethyl acetate/hexane)
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.26 (s, 1H), 6.45 (s, 1H), 3.89 (s, 3H), 3.86 (s, 3H), 3.83 (s, 3H), 3.27 (brs, 2H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 166.4, 154.5, 151.9, 129.3, 117.9, 111.6, 97.3, 57.4, 55.7, 51.8.
IR (neat, cm^{-1}) *v* 3447, 2948, 2838, 1710, 1597, 1518, 1436, 1414, 1384, 1296, 1081, 1027, 782, 542.
HRMS: calcd. for $[M+H]^+$ $C_{10}H_{14}NO_4^+$ = 212.0918, found:212.0910.

The characterization data matched the ones found in the literature (*J. Polym. Sci., Part A: Polym. Chem. 2016, **54**, 1731–1741*).



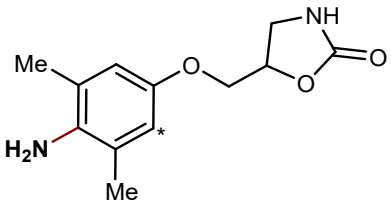
2s, 60%
(from *L*-tyrosine)

Following general procedure **B**.
Yellow oil;
$\mathbf{R_f}$ = 0.23 (80% ethyl acetate/hexane)
^{1}H NMR (400 MHz, CD_3OD) δ 6.75 (d, *J* = 8.2 Hz, 1H), 6.58 (d, *J* = 2.1 Hz, 1H), 6.50 (dd, *J* = 8.2, 2.1 Hz, 1H), 3.80 (s, 3H), 3.68 (s, 3H), 3.64 (t, *J* = 6.4 Hz, 1H), 2.86 (dd, *J* = 13.5, 5.9 Hz, 1H), 2.76 (dd, *J* = 13.5, 6.9 Hz, 1H).
^{13}C NMR (101 MHz, CD_3OD) δ 176.3, 148.2, 137.7, 130.5, 120.3, 117.3, 111.5, 56.7, 56.0, 52.4, 41.1.
IR (neat, cm^{-1}) *v* 3646, 3361, 2962, 1732, 1916, 1515, 1442, 1284, 1229, 1086, 1028, 799, 759.
HRMS: calcd. for $[M+H]^+$ $C_{11}H_{17}N_2O_3^+$ = 225.1234, found: 225.1239.



2t, 50%
(from safinamide)

Following general procedure **B**.
Brown solid;
$\mathbf{R_f}$ = 0.34 (10% methanol/ dichloromethane)
^{1}H NMR (400 MHz, CD_3OD) δ 7.40 – 7.34 (m, 1H), 7.26 (d, *J* = 7.7 Hz, 1H), 7.21 (d, *J* = 10.0 Hz, 1H), 7.03 (t, *J* = 8.6 Hz, 1H), 6.85 – 6.73 (m, 2H), 6.63 (d, *J* = 7.4 Hz, 1H), 5.11 (s, 2H), 3.62 (d, *J* = 12.6 Hz, 1H), 3.48 (d, *J* = 12.6 Hz, 1H), 3.24 (q, *J* = 6.9 Hz, 1H), 1.26 (d, *J* = 6.9 Hz, 3H).
^{13}C NMR (101 MHz, CD_3OD) δ 180.2, 164.4 (d, $J_{C\text{-}F}$ = 243.2 Hz), 147.1, 141.8 (d, $J_{C\text{-}F}$ = 7.4 Hz), 138.1, 133.3, 131.3 (d, $J_{C\text{-}F}$ = 8.3 Hz), 124.0 (d, $J_{C\text{-}F}$ = 2.9 Hz), 119.6, 117.1, 115.4(d, $J_{C\text{-}F}$ = 21.2 Hz), 115.0 (d, $J_{C\text{-}F}$ = 22.0 Hz), 113.3, 70.5 (d, $J_{C\text{-}F}$ = 1.8 Hz), 57.5, 52.4, 19.5.
^{19}F NMR (376 MHz, CD_3OD) δ -115.3.
IR (neat, cm-1) ν 3673, 3299, 3183, 1678, 1619, 1515, 1489, 1449, 1382, 1257, 1169, 900, 704, 580.
HRMS: calcd. for $[M+H]^+$ $C_{17}H_{21}FN_3O_2^+$ = 318.1613, found: 318.1610.



2u, 50%, 1.5/1.0
(from metaxalone)

Following general procedure **A** using **OI-1**.

Ortho:

Brown solid;

$\mathbf{R}_f$ = 0.20 (5% methanol/ dichloromethane)

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.57 (s, 1H), 6.51 (s, 1H), 6.03 (brs, 1H), 5.01 – 4.95 (m, 1H), 4.19 – 4.11 (m, 2H), 3.77 (t, *J* = 8.8 Hz, 1H), 3.60 (dd, *J* = 8.8, 6.0 Hz, 1H), 3.39 (brs, 2H), 2.23 (s, 3H), 2.13 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 159.7, 145.4, 132.1, 127.3, 124.4, 123.4, 111.0, 74.5, 69.2, 42.7, 21.0, 17.3.

IR (neat, cm^{-1}) *v* 3453, 1597, 1439, 1384, 1353, 1296, 1251, 1068, 1000, 619, 542.

HRMS: calcd. for $[M+H]^+$ $C_{12}H_{17}N_2O_3^+$ = 237.1234, found: 237.1233.

Para:

Brown solid;

$\mathbf{R}_f$ = 0.10 (2% methanol/ dichloromethane)

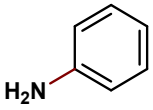
^{1}H NMR (400 MHz, $CDCl_3$) δ 6.56 (s, 2H), 5.79 (brs, 1H), 4.94 – 4.88 (m, 1H), 4.10 – 4.02 (m, 2H), 3.73 (t, *J* = 8.8 Hz, 1H), 3.59 (dd, *J* = 8.8, 6.2 Hz, 1H), 3.37 (brs, 2H), 2.16 (s, 6H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 159.7, 150.6, 137.3, 123.3, 115.2, 74.5, 69.0, 42.9, 18.1.

IR (neat, cm^{-1}) ν 3453, 1730, 1597, 1486, 1439, 1384, 1353, 1139, 1068, 999, 859, 542, 515.

HRMS: calcd. for $[M+H]^+$ $C_{12}H_{17}N_2O_3^+$ = 237.1234, found: 237.1233.

The characterization data matched the ones found in the literature (*Chem. Eur. J.* 2017, ***23***, 563−567).



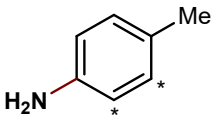
2v, 78%

Following general procedure **A** using **OI-2**.

Yellow oil;

R_f = 0.53 (20% ethyl acetate/hexane)
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.19 (t, *J* = 7.8 Hz, 2H), 6.79 (t, *J* = 7.3 Hz, 1H), 6.71 (d, *J* = 7.9 Hz, 2H), 3.48 (br s, 2H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 146.5, 129.4, 118.6, 115.2.
IR (neat, cm^{-1}) *v* 3450, 1637, 1384, 1353, 1094, 999, 862, 777, 619, 540.

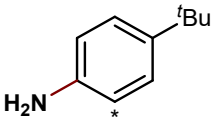
The characterization data matched the ones found in the literature (*Adv. Synth. Catal.* 2021*, **363**, 2783 – 2795*).



2w, 80%,
2.5/1.0/1.6 (*p*/*m*/*o*)

Following general procedure **A** using **OI-2**.
Orange oil.
R_f = 0.34 (10% ethyl acetate/hexane)
***o*-toluidine:**
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.09 – 7.07 (m, 2H), 6.74 (t, *J* = 7.4 Hz, 1H), 6.70 (d, *J* = 7.6 Hz, 1H), 3.41 (brs, 2H), 2.19 (s, 3H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 144.6, 130.5, 127.1, 122.4, 118.7, 115.0, 17.5.
***m*-toluidine:**
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.06 (t, *J* = 7.6 Hz, 1H), 6.61 (d, *J* = 7.6 Hz, 1H), 6.54 – 6.51 (m, 2H), 3.41 (br s, 2H), 2.29 (s, 3H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 146.4, 139.2, 129.3, 119.5, 116.0, 112.3, 21.5.
***p*-toluidine:**
^{1}H NMR (400 MHz, $CDCl_3$) δ 6.99 (d, *J* = 7.9 Hz, 2H), 6.63 (d, *J* = 8.3 Hz, 2H), 3.41 (br s, 2H), 2.27 (s, 3H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 143.9, 129.9, 128.0, 115.4, 20.6.
IR (neat, cm^{-1}) *v* 3448, 1600, 1384, 1353, 1094, 999, 862, 777, 619, 540.
HRMS: calcd. for $[M+H]^+$ $C_7H_{10}N^+$ = 108.0808, found: 108.0810.

The characterization data matched the ones found in the literature (*ACS Catal.* 2016, ***6***, 8162−8165).



2x, 71%, 2.5/1.0

Following general procedure **A** using **OI-2**.
Brown oil.

R_f = 0.65(20% ethyl acetate/hexane)

3-(*tert*-butyl)aniline:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.12 (t, *J* = 7.8 Hz, 1H), 6.82 (d, *J* = 7.8 Hz, 1H), 6.75 (t, *J* = 2.2 Hz, 1H), 6.53 (dd, *J* = 7.8, 2.2 Hz, 1H), 1.31 (s, 9H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 152.6, 146.1, 129.1, 116.0, 112.6, 112.5, 34.7, 31.4.

4-(*tert*-butyl)aniline:

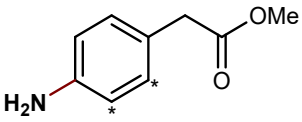
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.20 (d, *J* = 8.6 Hz, 2H), 6.66 (d, *J* = 8.6 Hz, 2H), 1.30 (s, 9H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.9, 141.6, 126.2, 115.1, 34.0, 31.7.

IR (neat, cm^{-1}) *v* 3670, 3343, 2962, 1719, 1621, 1516, 1363, 1265, 1189, 828, 702, 546.

HRMS: calcd. for $[M+H]^+$ $C_{10}H_{16}N^+$ = 150.1278, found: 150.1272.

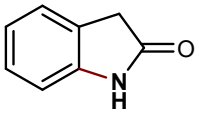
The characterization data matched the ones found in the literature (*Org. Lett.* 2020, ***22***, 2931−2934).



2y, 76%,
1.4/1.2/1.0 (*p*/*m*/*o*)

Following general procedure **A** using **OI-2**.

Ortho:



Brown solid;

R_f = 0.24 (30% ethyl acetate/hexane)

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.39 (brs, 1H), 7.27 – 7.17 (m, 2H), 7.01 (t, *J* = 7.5 Hz, 1H), 6.91 (d, *J* = 7.9 Hz, 1H), 3.55 (s, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 178.4, 142.8, 128.0, 125.4, 124.7, 122.4, 110.0, 36.5.

IR (neat, cm^{-1}) ν 3448, 3271, 1680, 1617, 1469, 1386, 1324, 1265, 1198, 1095, 949, 901, 862, 740, 674, 597, 532.

HRMS: calcd. for $[M+K]^+$ $C_8H_7KNO^+$ = 172.0160, found: 172.0940.

The characterization data matched the ones found in the literature (*Org. Lett.* 2009, ***11***, 1345−1348).

The *meta*- and *para*- isomers were isolated as inseparable mixtures.

Brown oil.

R_f =0.40 (30% ethyl acetate/hexane)

***Meta*:**

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.10 (t, *J* = 7.7 Hz, 1H), 6.66 (d, *J* = 7.7 Hz, 1H), 6.61 (s, 1H), 6.59 (d, *J* = 7.8 Hz, 1H), 3.68 (s, 3H), 3.53 (s, 2H).

Para:

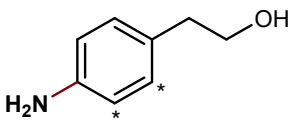
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.06 (d, *J* = 8.1 Hz, 2H), 6.64 (d, *J* = 8.2 Hz, 2H), 3.67 (s, 3H), 3.51 (s, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 172.8, 172.3, 146.8, 145.6, 135.2, 130.2, 129.6, 123.9, 119.5, 116.0, 115.4, 114.0, 52.2, 52.1, 41.3, 40.4.

IR (neat, cm^{-1}) *v* 3459, 3236, 2962, 1730, 1622, 1518, 1495, 1463, 1360, 1265, 1144, 955, 872, 830, 772, 733, 692, 620, 521.

HRMS: calcd. for $[M+H]^+$ $C_9H_{12}NO_2^+$ = 166.0863, found: 166.0858.

The characterization data matched the ones found in the literature (*Adv. Synth. Catal.* 2012*, **354**,* 1879−1884).



2z, 72%,
2.0/1.1/1.0 (*p*/*m*/*o*)

Following general procedure **A** using **OI-2**.

Yellow solid.

R_f = 0.50 (40% ethyl acetate/hexane)

Ortho:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.06 – 7.04 (m, 2H), 6.76 (t, *J* = 7.4 Hz, 1H), 6.69 (d, *J* = 7.8 Hz, 1H), 3.87 (t, *J* = 6.2 Hz, 2H), 3.58 (brs, 2H), 2.79 – 2.77 (m, 2H).

Meta:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.10 (t, *J* =7.4 Hz, 1H), 6.62 (d, *J* = 8.0 Hz, 1H), 6.58 – 6.53 (m, 2H), 6.55 (s, 1H), 3.81 (t, *J* = 6.6 Hz, 2H), 3.58 (brs, 2H), 2.76 – 2.73 (m, 2H).

Para:

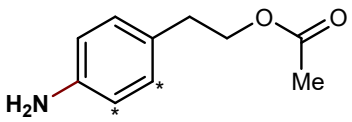
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.06 (d, *J* = 8.3 Hz, 2H), 6.70 (d, *J* = 8.3 Hz, 2H), 3.78 (t, *J* = 6.5 Hz, 2H), 3.58 (brs, 2H), 2.78 – 2.75 (m, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) 146.7, 145.3, 144.9, 139.8, 130.7, 130.0, 129.6, 128.4, 127.8, 124.4, 119.4, 119.2, 116.3, 115.9, 115.5, 113.5, 64.0, 63.7, 63.3, 39.3, 38.4, 34.8.

IR (neat, cm^{-1}) ν 3355, 3030, 2932, 2876, 1625, 1516, 1495, 1459, 1263, 1168, 1044, 1016, 823, 755, 698, 563, 470.

HRMS: calcd. for $[M+H]^+$ $C_8H_{12}NO^+$ = 138.0914, found: 138.0910.

The characterization data matched the ones found in the literature (*ACS Catal.* 2016, ***6***, 8162−8165).



2aa, 84%,
2.3/1.6/1.0 (*p*/*m*/*o*)

Following general procedure **A** using **OI-2**.

Ortho:

Brown oil;

$\mathbf{R}_f$ = 0.20 (10% ethyl acetate/hexane)

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.09 – 7.02 (m, 2H), 6.74 – 6.69 (m, 2H), 4.25 (t, *J* = 7.5 Hz, 2H), 3.86 (brs, 2H), 2.85 (t, *J* = 7.5 Hz, 2H), 2.08 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 171.6, 145.1, 130.5, 128.1, 121.6, 118.7, 115.9, 63.8, 31.1, 21.2.

IR (neat, cm^{-1}) ν 3455, 2822, 1598, 1510, 1384, 1354, 1135, 1000, 855, 776, 618.

HRMS (ESI) *m/z* calculated for $[M+H^+]$ $C_{10}H_{14}NO_2^+$: 180.1020, found:180.1013

The *meta*- and *para*- isomers were isolated as inseparable mixtures.

Brown oil.

$\mathbf{R}_f$ = 0.10 (10% ethyl acetate/hexane)

Meta:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.08 (t, *J* = 7.7 Hz, 1H), 6.61 (d, *J* = 7.0 Hz, 1H), 6.57 – 6.54 (m, 2H), 4.26 (t, *J* = 7.2 Hz, 2H), 2.85 (t, *J* = 7.9 Hz, 2H), 2.04 (s, 3H).

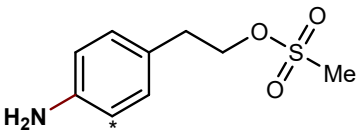
Para:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.00 (d, *J* = 8.0 Hz, 2H), 6.63 (d, *J* = 8.1 Hz, 2H), 4.21 (t, *J* = 7.2 Hz, 2H), 2.82 (t, *J* = 7.2 Hz, 2H), 2.03 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 171.2, 146.6, 145.0, 139.1, 129.8, 129.5, 127.8, 119.2, 115.7, 115.4, 113.5, 65.5, 65.1, 35.2, 34.3, 21.1.

IR (neat, cm^{-1}) ν 3415, 2957, 1731, 1620, 1518, 1386, 1365, 1243, 1032, 828, 698, 608, 481.

HRMS: calcd. for $[M+H]^+$ $C_{10}H_{14}NO_2^+$ = 180.1020, found: 180.1014.



2ab, 47%, 1.2/1.0

Following general procedure **A** using **OI-2**.
The products were isolated as mixtures of *meta*- and *para*- isomers.
Yellow oil.
$\mathbf{R}_f$ = 0.25 (40% ethyl acetate/hexane)

Meta:

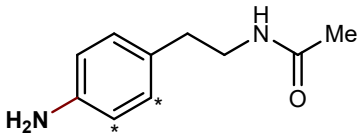
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.10 (t, *J* = 7.7 Hz, 1H), 6.62 (d, *J* = 7.6 Hz, 1H), 6.60 – 6.55 (m, 2H), 4.39 (t, *J* = 7.0 Hz, 2H), 3.54 (brs, 2H), 2.95 (t, *J* = 7.0 Hz, 2H), 2.85 (s, 3H).

Para:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.01 (d, *J* = 8.3 Hz, 2H), 6.66 (d, *J* = 8.4 Hz, 2H), 4.35 (t, *J* = 7.0 Hz, 2H), 3.54 (brs, 2H), 2.93 (t, *J* = 7.0 Hz, 2H), 2.83 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 146.7, 145.2, 137.6, 130.0, 129.8, 126.3, 119.3, 115.8, 115.6, 114.0, 71.0, 70.6, 37.4, 35.7, 34.9.
IR (neat, cm^{-1}) ν 3474, 3413, 1639, 1618, 1384 , 1351, 1114, 991, 779, 619, 477.
HRMS: calcd. for $[M+H]^+$ $C_9H_{14}NO_3S^+$ = 216.0689, found: 216.0685.

The characterization data of *para*-isomer matched the one found in the literature (*Nat. Chem.* 2011, ***3***, *146−153*).



2ac, 84%,
3.1/1.8/1.0 (*p*/*m*/*o*)

Following general procedure **A** using **OI-2** and BTMG.

The products were isolated as mixtures of regioisomers.
Brown oil.
$\mathbf{R}_f$ = 0.15 (80% ethyl acetate/hexane)

Ortho:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.04 (t, *J* = 6.6 Hz, 1H), 6.99 – 6.96 (m, 1H), 6.70 – 6.65 (m, 2H), 6.25 (brs, 1H), 3.72 (brs, 2H), 3.49 – 3.34 (m, 2H), 2.73 – 2.64 (m, 2H), 1.95 (s, 3H).

Meta:

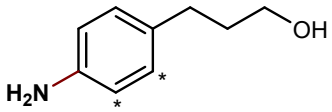
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.07 (t, *J* = 7.5 Hz, 1H), 6.57 – 6.51 (m, 2H), 6.50 (s, 1H), 5.74 (brs, 1H), 3.72 (brs, 2H), 3.49 – 3.34 (m, 2H), 2.73 – 2.64 (m, 2H), 1.90 (s, 3H).

Para:

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.95 (d, *J* = 7.6 Hz, 2H), 6.62 (d, *J* = 7.2 Hz, 2H), 5.70 (brs, 1H), 3.72 (brs, 2H), 3.49 – 3.34 (m, 2H), 2.73 – 2.64 (m, 2H), 1.90 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 171.0, 170.2, 146.8, 145.2, 145.0, 140.2, 130.2, 129.6, 128.7, 127.8, 123.0, 118.9, 118.4, 115.8, 115.5, 115.4, 113.4, 41.0, 40.6, 39.5, 35.6, 34.7, 31.7, 23.3, 23.2.
IR (neat, cm^{-1}) ν 3419, 1638, 1517, 1495, 1437, 1276, 1198, 1099, 994, 699, 607.
HRMS: calcd. for $[M+H]^+$ $C_{10}H_{15}N_2O^+$ = 179.1179, found: 179.1174.

The characterization data of *para*-isomer matched the one found in the literature (*Eur. J. Org. Chem.* 2018*, 2995−3000*).



2ad, 71%,
2.9/1.4/1.0 (*p*/*m*/*o*)

Following general procedure **A** using **OI-2**.

The products were isolated as mixtures of regioisomers.
Brown oil.
$\mathbf{R}_f$ = 0.40 (50% ethyl acetate/hexane)

Ortho:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.05 – 7.03 (m, 2H), 6.76 (t, *J* = 7.4 Hz, 1H), 6.69 (d, *J* = 7.8 Hz, 1H), 3.68 – 3.61 (m, 2H), 3.39 (brs, 2H), 2.65 – 2.56 (m, 2H), 1.86 – 1.84 (m, 2H).

Meta:

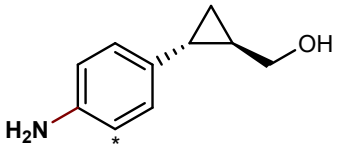
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.09 – 7.06 (m, 1H), 6.65 – 6.59 (m, 1H), 6.53 (s, 1H), 6.52 (d, *J* = 6.8 Hz, 1H), 3.68 – 3.61 (m, 2H), 3.39 (brs, 2H), 2.65 – 2.56 (m, 2H), 1.83 – 1.79 (m, 2H).

Para:

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.99 (d, *J* = 8.0 Hz, 2H), 6.63 (d, *J* = 8.0 Hz, 2H), 3.68 – 3.61 (m, 2H), 3.39 (brs, 2H), 2.65 – 2.56 (m, 2H), 1.85 – 1.83 (m, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 146.5, 144.3, 143.2, 132.0, 129.9, 129.4, 129.3, 127.2, 126.6, 119.4, 118.9, 116.2, 115.5, 115.4, 112.9, 62.4, 61.6, 34.6, 34.1, 32.2, 32.1, 31.3, 26.9.
IR (neat, cm^{-1}) ν 3145, 2936, 2858, 1618, 1495, 1458, 1384, 1353, 1264, 1157, 1060,827, 753, 550, 510.
HRMS: calcd. for $[M+H]^+$ $C_9H_{14}NO^+$ = 152.1070, found:152.1061.

The characterization data of *ortho*- and *meta*-isomer matched the one found in the literature (*Organometallics* 2022*, **41,*** 1743−1747; *Angew. Chem. Int. Ed.* 2022, ***61***, e202115846.).



2ae, 70%, 5.4/1.0

Following general procedure **A** using **OI-2**.

The products were isolated as mixtures of meta- and para- isomers.
Yellow oil.
$\mathbf{R}_f$ = 0.13 (30% ethyl acetate/hexane)

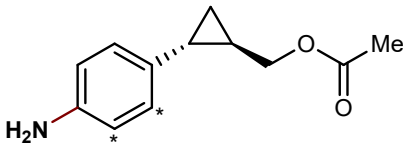
Meta:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.04 (t, *J* = 7.8 Hz, 1H), 6.50 – 6.47 (m, 2H), 6.39 (s, 1H), 3.62 – 3.53 (m, 2H), 1.75 – 1.70 (m, 1H), 1.45 – 1.40 (m, 1H), 0.94 – 0.89 (m, 2H).

Para:

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.89 (d, *J* = 8.2 Hz, 2H), 6.60 (d, *J* = 8.2 Hz, 2H), 3.62 – 3.53 (m, 2H), 1.75 – 1.70 (m, 1H), 1.38 – 1.30 (m, 1H), 0.86 – 0.80 (m, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 144.3, 132.4, 129.4, 127.1, 116.3, 115.4, 112.8, 66.8, 66.6, 25.2, 24.6, 21.4, 20.8, 13.7, 13.1.
IR (neat, cm^{-1}) ν 3366, 3002, 2923, 2870, 1619, 1519, 1459, 1265, 1019, 827, 546.
HRMS: calcd. for $[M+H]^+$ $C_{10}H_{14}NO^+$ = 164.1070, found:164.1071.



2af, 75%,
5.3/1.0/1.2 (*p*/*m*/*o*)

Following general procedure **A** using **OI-2**.

Ortho:

Yellow oil;
$\mathbf{R}_f$ = 0.20 (20% ethyl acetate/hexane)
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.06 (t, *J* = 7.7 Hz, 1H), 7.00 (d, *J* = 7.5 Hz, 1H), 6.71 – 6.67 (m, 2H), 4.50 – 4.46 (m, 1H), 3.76 – 3.71 (m, 1H), 2.11 (s, 3H), 1.70 – 1.66 (m, 1H), 1.24 – 1.20 (m, 1H), 1.11 – 1.06 (m, 1H), 0.91 – 0.87 (m, 1H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 171.1, 146.4, 128.6, 127.8, 124.9, 118.1, 114.8, 68.9, 29.8, 21.2, 18.5, 10.0.
IR (neat, cm^{-1}) ν 3451, 1739, 1602, 1498, 1454, 1384, 1364, 1135, 1023, 850, 677.
HRMS (ESI) *m/z* calculated for $[M+H^+]$ $C_{12}H_{16}NO_2^+$: 206.1176, found: 206.1167.

The ***meta-*** and ***para-*** isomers were isolated as inseparable mixtures.
Yellow oil.
$\mathbf{R}_f$ = 0.36 (40% ethyl acetate/hexane)

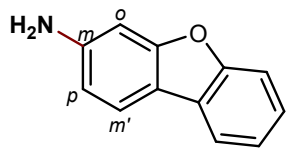
Meta:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.05 (t, *J* = 7.7 Hz, 1H), 6.52 – 6.45 (m, 2H), 6.40 (s, 1H), 4.03 (d, *J* = 7.2 Hz, 2H), 2.07 (s, 3H), 1.82 – 1.77 (m, 1H), 1.49 – 1.44 (m, 1H), 0.99 – 0.94 (m, 2H).

Para:

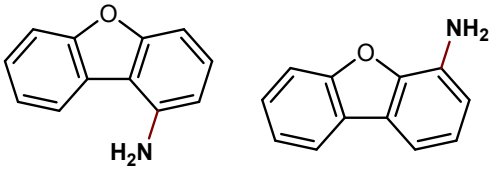
^{1}H NMR (400 MHz, $CDCl_3$) δ 6.89 (d, *J* = 8.2 Hz, 2H), 6.61 (d, *J* = 8.3 Hz, 2H), 4.03 (d, *J* = 7.2 Hz, 2H), 2.07 (s, 3H), 1.82 – 1.77 (m, 1H), 1.40 – 1.32 (m, 1H), 0.93 – 0.84 (m, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 171.4, 146.6, 144.5, 143.4, 131.9, 129.4, 127.2, 116.3, 115.3, 112.8, 112.8, 68.4, 68.2, 29.8, 21.9, 21.2, 21.2, 20.7, 13.9, 13.3.
IR (neat, cm^{-1}) ν 3460, 3018, 2948, 1733, 1622, 1520, 1499, 1379, 1240, 1128, 1026, 826, 607.
HRMS: calcd. for $[M+H]^+$ $C_{12}H_{16}NO_2^+$ = 206.1176, found: 206.1179.



2ag, 85%,
1.6/3.2/1.0/1.3 (*o*/*m*//m'/*p*)

Following general procedure **A** using **OI-1**.



(*inseparable mixtures*)

White solid;

$\mathbf{R}_f$ =0.69 (20% ethyl acetate/hexane)

dibenzo[b,d]furan-1-amine:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, *J* = 7.6 Hz, 1H), 7.56 (d, *J* = 8.2 Hz, 1H), 7.47 – 7.32 (m, 2H), 7.26 (t, *J* = 8.0 Hz, 1H), 7.03 (d, *J* = 8.2 Hz, 1H), 6.64 (d, *J* = 7.9 Hz, 1H), 2.94 (brs, 2H).

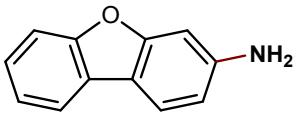
dibenzo[b,d]furan-4-amine:

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 (d, *J* = 7.7 Hz, 1H), 7.56 (d, *J* = 8.2 Hz, 2H), 7.48 – 7.32 (m, 3H), 7.16 (t, *J* = 7.7 Hz, 1H), 6.83 (d, *J* = 7.3 Hz, 1H), 2.94 (brs, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 157.5, 156.1, 155.6, 145.0, 142.6, 132.0, 128.2, 127.0, 125.9, 125.0, 124.7, 124.0, 123.6, 122.8, 122.7, 121.1, 120.8, 113.2, 111.8, 111.5, 110.7, 109.1, 102.1.

IR (neat, cm^{-1}) *v* 3446, 2810, 2720, 1590, 1380, 1350, 1130, 1120, 754, 664.

HRMS: calcd. for $[M+H]^+$ $C_{12}H_{12}NO^+$ = 184.0757, found: 184.0754.



dibenzo[b,d]furan-3-amine:

White solid;

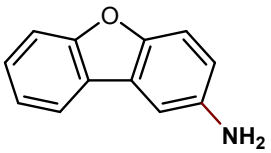
$\mathbf{R}_f$ =0.63 (20% ethyl acetate/hexane)

^{1}H NMR (400 MHz, $CDCl_3$) δ. 7.76 (dd, *J* = 7.2, 1.6 Hz, 1H), 7.66 (d, *J* = 8.1 Hz, 1H), 7.45 (d, *J* = 7.9 Hz, 1H), 7.32 – 7.27 (m, 1H), 7.26 – 7.22 (m, 1H), 6.82 (d, *J* = 2.0 Hz, 1H), 6.66 (dd, *J* = 8.0, 2.0 Hz, 1H), 3.83 (brs, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 158.0, 156.0, 146.8, 125.3, 124.9, 122.7, 121.4, 119.4, 115.8, 111.4, 111.3, 97.6.

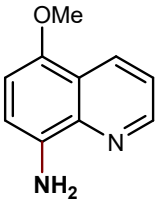
IR (neat, cm^{-1}) *v* 3600, 3452, 3410, 1630, 1595, 1380, 1350, 770, 760, 619.

HRMS: calcd. for $[M+H]^+$ $C_{12}H_{12}NO^+$ = 184.0757, found: 184.0757.



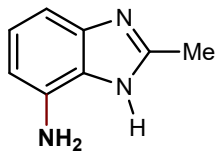
dibenzo[b,d]furan-2-amine:
White solid;
R_f =0.47 (20% ethyl acetate/hexane)
^{1}H NMR (400 MHz, $CDCl_3$) δ. 7.86 (d, *J* = 7.7 Hz, 1H), 7.51 (d, *J* = 8.2 Hz, 1H), 7.42 (t, *J* = 7.7 Hz, 1H), 7.36 (d, *J* = 8.6 Hz, 1H), 7.29 (t, *J* = 7.4 Hz, 1H), 7.24 (s, 1H), 6.83 (dd, *J* = 8.7, 2.4 Hz, 1H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 156.9, 150.5, 142.1, 127.1, 125.0, 124.4, 122.4, 120.7, 115.9, 112.1, 111.8, 106.2.
IR (neat, cm^{-1}) *v* 3530, 3430, 3390, 1620, 1590, 1380, 1350, 765, 690, 620.
HRMS: calcd. for $[M+H]^+$ $C_{12}H_{12}NO^+$ = 184.0757, found: 184.0747.

Isomer characterized was according to the literature (*ACS Catal*. 2016, ***6***, 8162−8165).



2ah, 58%

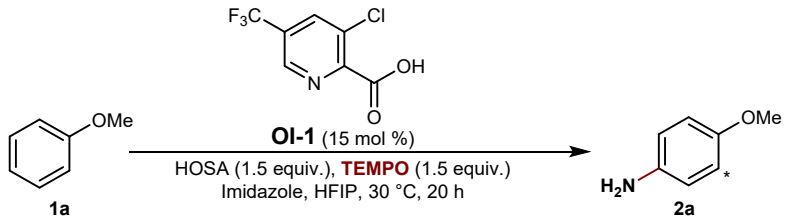
Following general procedure **A** using **OI-1**.
[$MsONH_3OTf$] was used as the aminating agent.
Brown solid;
R_f =0.45 (20% ethyl acetate/hexane)
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.80 (dd, *J* = 4.2, 1.8 Hz, 1H), 8.51 (dd, *J* = 8.5, 1.8 Hz, 1H), 7.37 (dd, *J* = 8.5, 4.2 Hz, 1H), 6.87 (d, *J* = 8.2 Hz, 1H), 6.72 (d, *J* = 8.2 Hz, 1H), 4.05 (brs, 2H), 3.92 (s, 3H).
^{13}C NMR (101 MHz, $CDCl_3$) δ 148.1, 147.2, 139.1, 137.4, 131.0, 121.2, 120.5, 109.9, 105.5, 56.0.
IR (neat, cm^{-1}) *v*.3450, 3380, 2880, 1614, 1580, 1380, 1352, 780, 670, 650.
HRMS: calcd. for $[M+H]^+$ $C_{10}H_{11}N_2O^+$ = 175.0866, found: 175.0897.



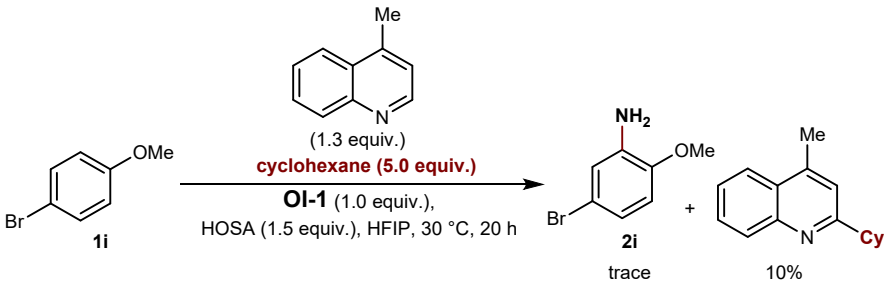
2ai, 50%

Following general procedure **A** using **OI-2**.
[$MsONH_3OTf$] was used as the aminating agent.
Brown solid;
$\mathbf{R_f}$ =0.16 (100% ethyl acetate)
^{1}H NMR (400 MHz, CD_3OD) δ 6.95 (t, *J* = 7.8 Hz, 1H), 6.80 (d, *J* = 8.1 Hz, 1H), 6.52 (d, *J* = 7.7 Hz, 1H), 2.54 (s, 3H).
^{13}C NMR (101 MHz, CD_3OD) δ 150.7, 137.7, 137.6, 130.9, 124.5, 108.1, 103.1, 14.1.
IR (neat, cm^{-1}) *v* 3460, 3350, 1620, 1595, 1382, 1348, 790, 680, 620.
HRMS: calcd. for $[M+H]^+$ $C_8H_{10}N_3^+$ = 148.0869, found: 148.0839.

5. Mechanistic Experiments



In a glove box, to a 4 mL vial was added imidazole (17.7 mg, 0.26 mmol, 1.3 equiv.), 3-chloro-5-trifluoromethyl-pyridine-2-carboxylic acid (**OI-1**) (6.8 mg, 0.03 mmol, 0.15 equiv.), anisole (22 µL, 0.2 mmol, 1.0 equiv.), and 1,1,1,3,3,3 -hexafluoroisopropanol (1.0 mL). The mixture was cooled at -15 °C for 15 minutes before HOSA (33.9 mg, 0.3 mmol, 1.5 equiv.) and **TEMPO** (46.9 mg, 0.3 mmol, 1.5 equiv.) was added. After stirring at 30 °C for 20 hours, the reaction mixture was transferred to a 20 mL vial containing a saturated aqueous solution of Na_2CO_3 (8 mL). The resulting mixture was extracted with DCM (3 x 10 mL). The combined organic phases were dried over anhydrous Na_2SO_4 and concentrated under vacuum. The result was analyzed by ^{1}H NMR spectrum of the crude reaction mixture using mesitylene as the internal standard.



In a glove box, to a 4 mL vial was added lepidine (37.2 mg, 0.26 mmol, 1.3 equiv.), 3-chloro-5-trifluoromethyl-pyridine-2-carboxylic acid (**OI-1**) (45.1 mg, 0.2 mmol, 1.0 equiv.), anisole (25 µL, 0.2 mmol, 1.0 equiv.), **cyclohexane** (108 µL, 1.0 mmol, 5.0 equiv.) and 1,1,1,3,3,3 -hexafluoroisopropanol (1.0 mL). The mixture was cooled at -15 °C for 15 minutes before HOSA (33.9 mg, 0.3 mmol, 1.5 equiv.). After stirring at 30 °C for 20 hours, the reaction mixture was transferred to a 20 mL vial containing a saturated aqueous solution of Na_2CO_3 (8 mL). The resulting mixture was extracted with DCM (3 x 10 mL). The combined organic phases were dried over anhydrous Na_2SO_4 and concentrated under vacuum. The result was analyzed by ^{1}H NMR spectrum of the crude reaction mixture using mesitylene as the internal standard, showing only trace amount of **2i**. However, a Minisci-type byproduct, 2-cyclohexanyl-lepidine, was isolated in about 10% yield via rapid column chromatography.

Yellow oil;

R_f =0.64 (10% ethyl acetate/hexane)

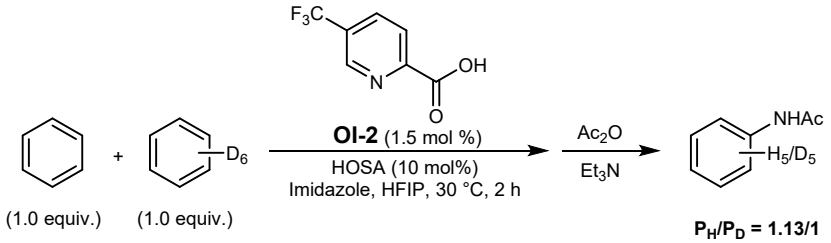
^{1}H NMR (400 MHz, CDCl3). δ 8.05 (d, *J* = 8.4 Hz, 1H), 7.93 (d, *J* = 8.3 Hz, 1H), 7.68-7.64 (m, 1H), 7.50-7.46 (m, 1H), 7.16 (s, 1H), 2.91-2.84 (m, 1H), 2.67 (s, 3H), 2.03-1.99 (m, 2H), 1.92-1.86 (m, 2H), 1.81-1.76 (m, 1H), 1.67-1.57 (m, 2H), 1.52-1.41 (m, 2H), 1.39-1.30 (m, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 166.6, 147.7, 144.4, 129.5, 129.0, 127.1, 125.5, 123.7, 120.3, 47.7, 32.9, 26.7, 26.2, 19.0.

IR (neat, cm^{-1}) *v* 2922, 2850, 1598, 1446, 1380, 1288, 1030, 862, 759, 682.

HRMS: calcd. for $[M+H]^+$ $C_{16}H_{20}N^+$ = 226.1590, found: 226.1586.

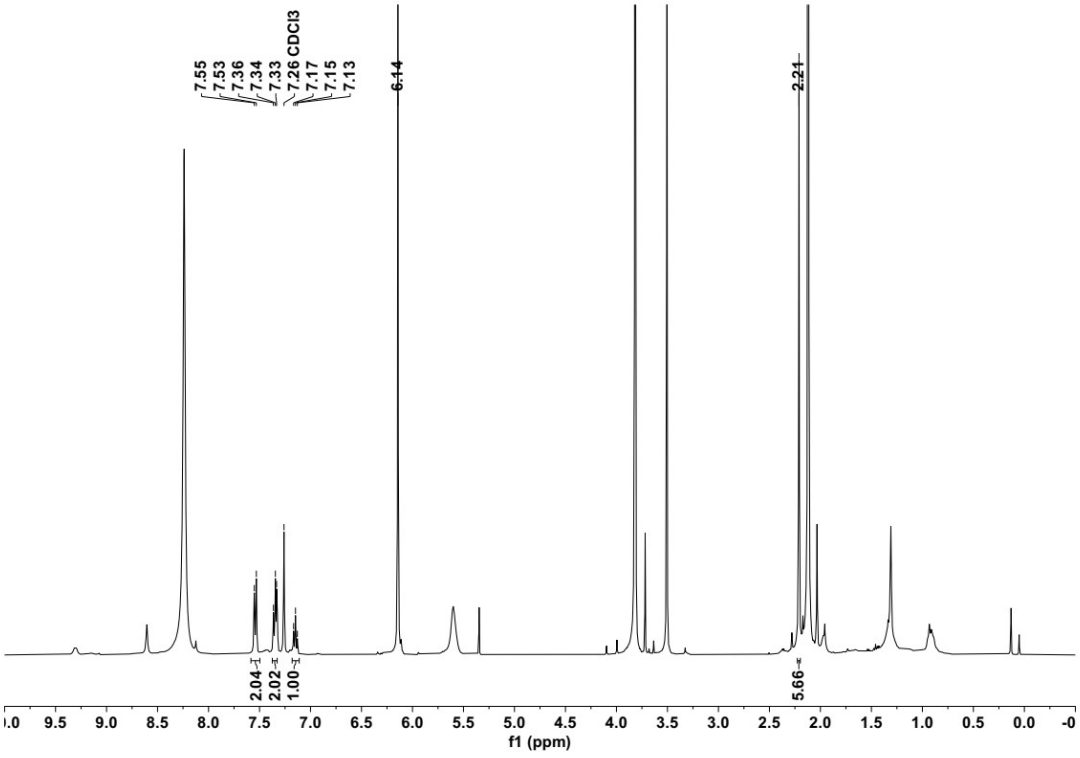
The product characterization data matched the ones found in the literature. (*ACS Catal*. 2017, *7*, 4057-4061).

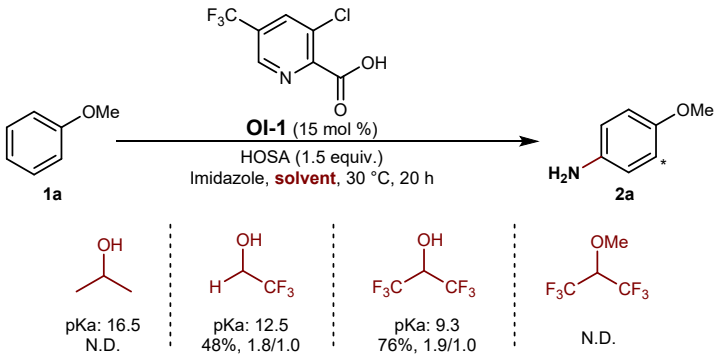


In a glove box, to a 4 mL vial was added imidazole (5.4 mg, 0.08 mmol, 0.08 equiv.), 5-trifluoromethyl-pyridine-2-carboxylic acid (**OI-2**) (3.4 mg, 0.015 mmol,

0.015 equiv.), benzene (78 mg, 1.0 mmol, 1.0 equiv.), benzene-d_6 (84 mg, 1.0 mmol, 1.0 equiv.), and 1,1,1,3,3,3 -hexafluoroisopropanol (1.0 mL). The mixture was cooled at -15 °C for 15 minutes before HOSA (11.3 mg, 0.1 mmol, 0.1 equiv) was added. After stirring at 30 °C for **2 hours**, the reaction mixture was transferred to a 20 mL vial containing a saturated aqueous solution of Na_2CO_3 (8 mL). The resulting mixture was extracted with DCM (3 x 10 mL). The combined organic phases were dried over anhydrous Na_2SO_4 and concentrated under vacuum.

To the crude mixture was then diluted with DCM (1.5 mL), Ac_2O (471 µL, 5.0 mmol) and Et_3N (695 µL, 5.0 mmol) was added. The mixture was stirred for 2 hours at room temperture until full conversion, determined by TLC analysis. Then, a saturated aqueous solution of Na_2CO_3 (8 mL) was added, and the resulting mixture was extracted with DCM (3 x 10 mL). The combined organic phases were dried over anhydrous Na_2SO_4 and concentrated under vacuum. The crude product was purified via flash column chromatography to afford the desired N-acetylaniline. The P_H/P_D ratio were determined by ^1H NMR analysis as shown below.





In a glove box, to a 4 mL vial was added imidazole (17.7 mg, 0.26 mmol, 1.3 equiv.), 3-chloro-5-trifluoromethyl-pyridine-2-carboxylic acid (**OI-1**) (6.8 mg, 0.03 mmol, 0.15 equiv.), anisole (22 μL, 0.2 mmol, 1.0 equiv.), and **solvent** (1.0 mL). The mixture was cooled at -15 °C for 15 minutes before HOSA (33.9 mg, 0.3 mmol, 1.5 equiv.) was added. After stirring at 30 °C for 20 hours, the reaction mixture was transferred to a 20 mL vial containing a saturated aqueous solution of Na_2CO_3 (8 mL). The resulting mixture was extracted with DCM (3 x 10 mL). The combined organic phases were dried over anhydrous Na_2SO_4 and concentrated under vacuum. The isomer distribution and yield of the corresponding products was determined by ^1H NMR analysis of the crude reaction mixture using mesitylene as the internal standard.

Proposed Reaction Mechanism

Based on the aforementioned mechanistic studies and insights from our previous work (*J. Am. Chem. Soc.*, 2024, **146**, 1735−1741.), we propose the following reaction mechanism.

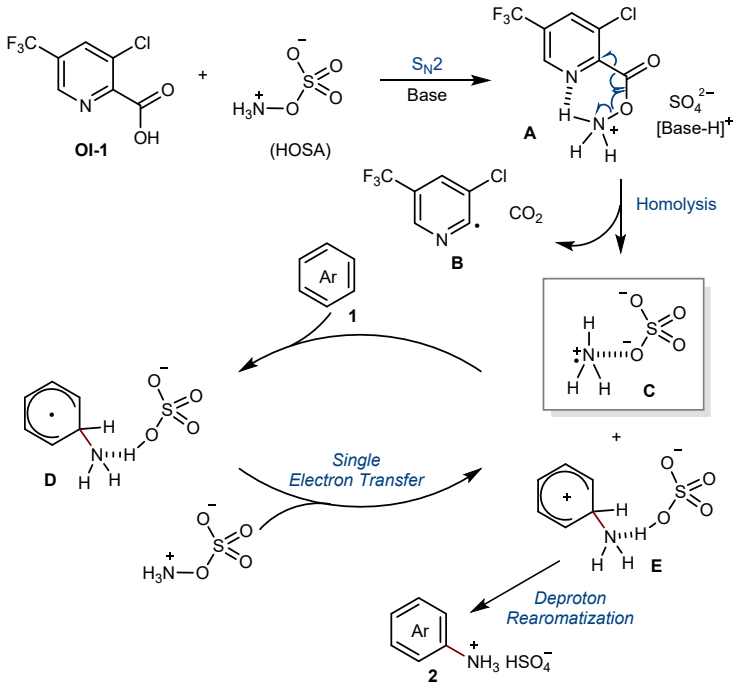
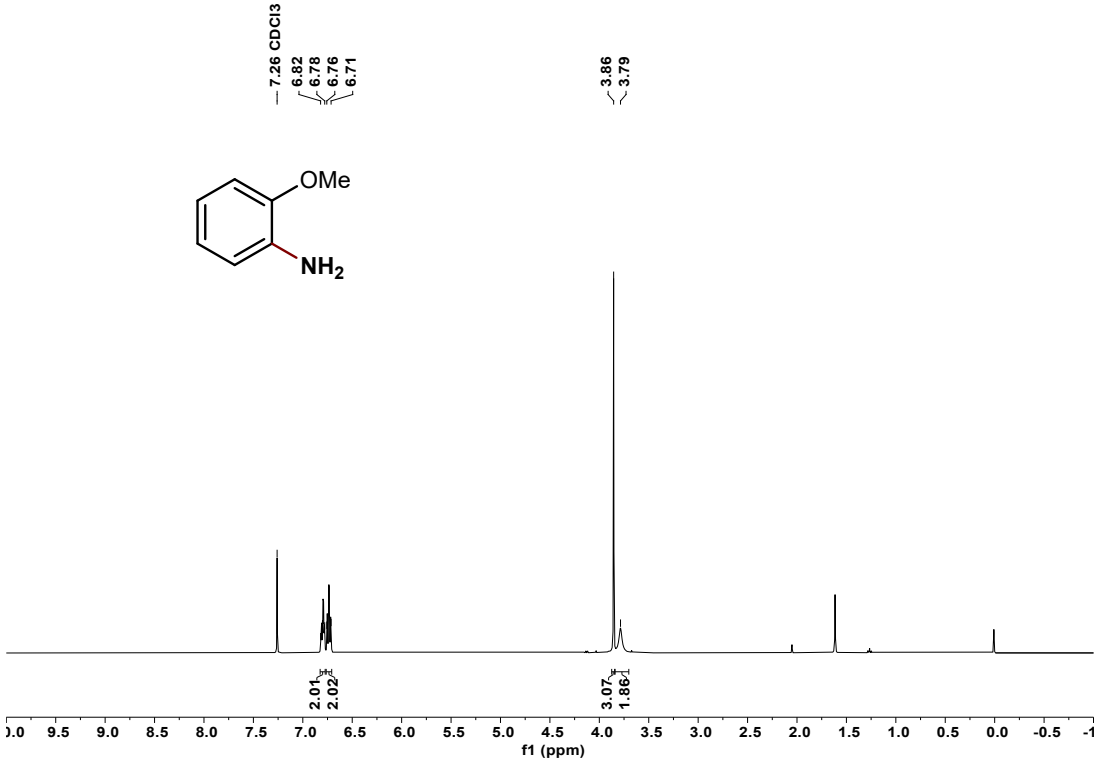


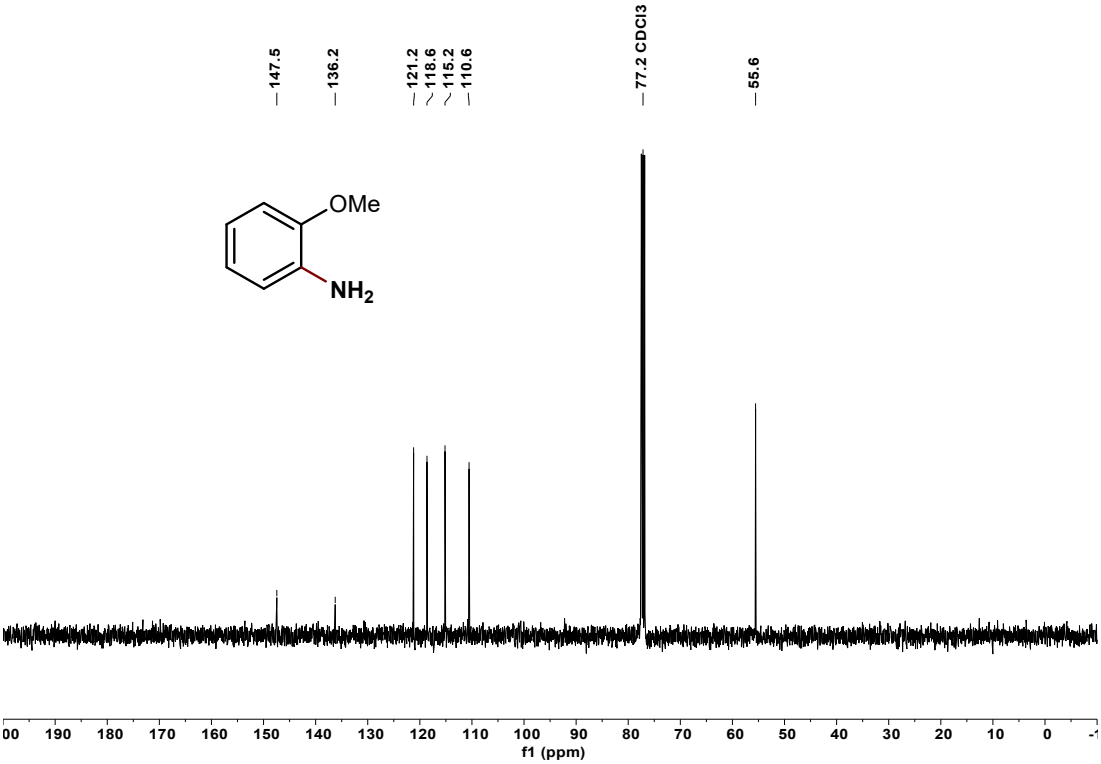
Figure S1. Proposed reaction mechanism

6. NMR Spectra

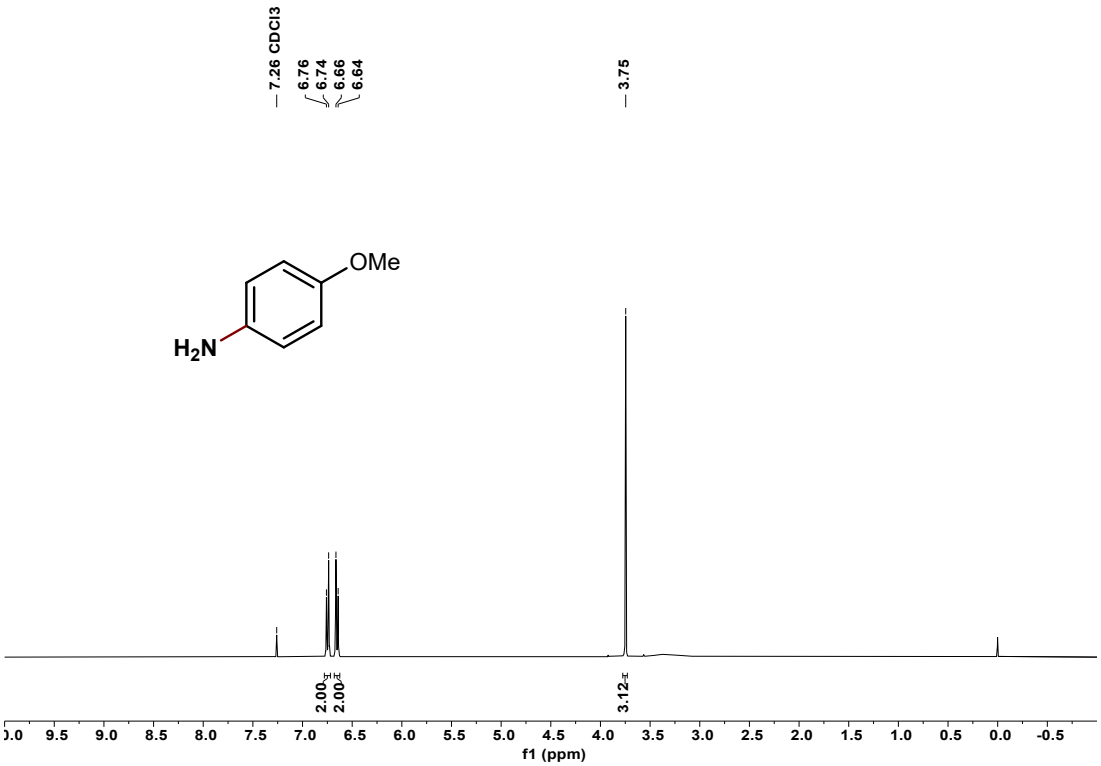
^{1}H NMR (400 MHz, $CDCl_3$)



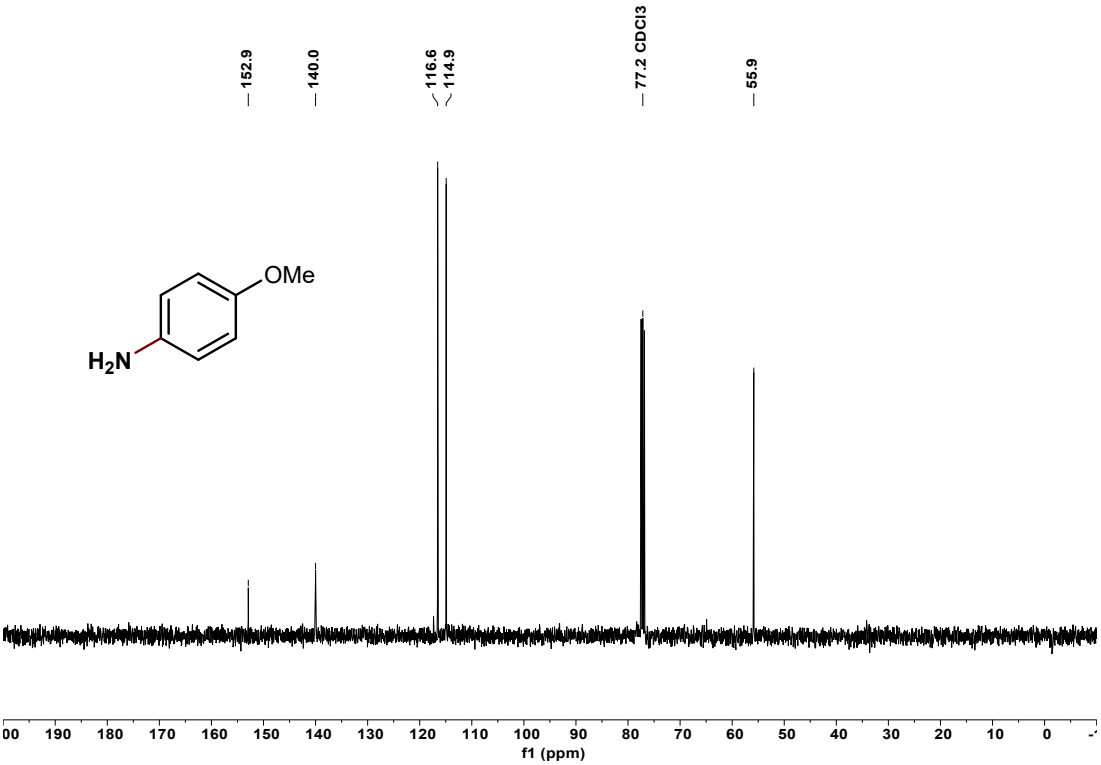
^{13}C NMR (101 MHz, $CDCl_3$)



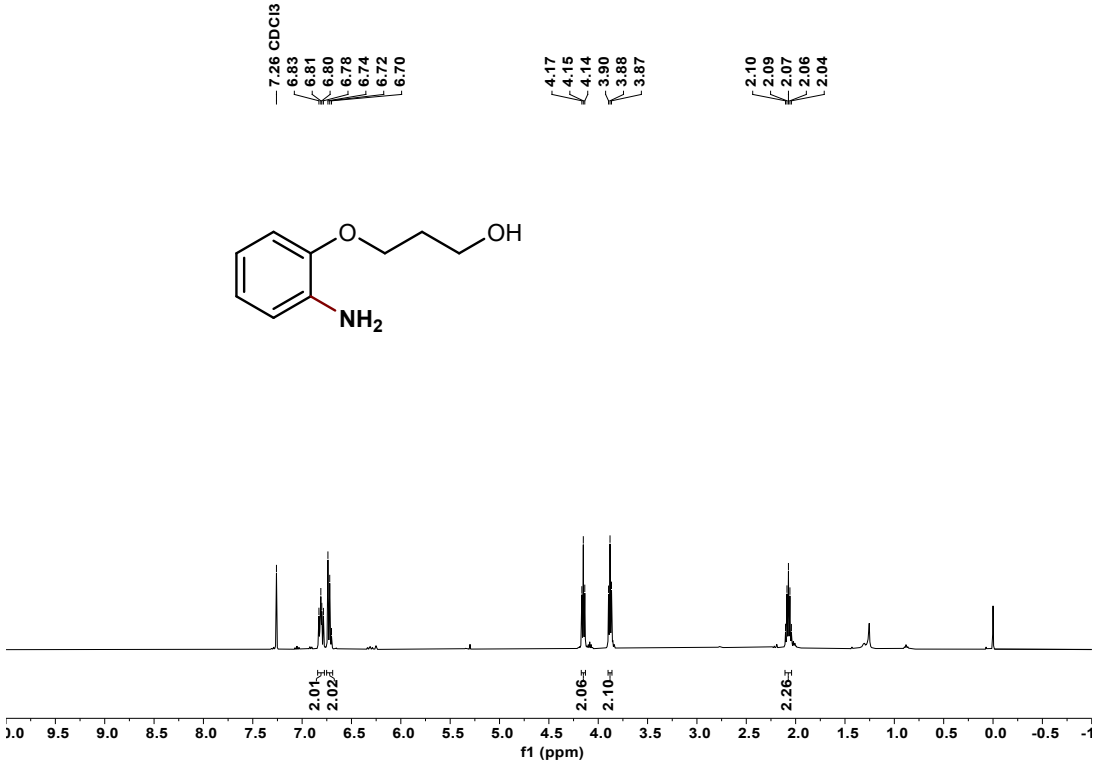
^{1}H NMR (400 MHz, $CDCl_3$)



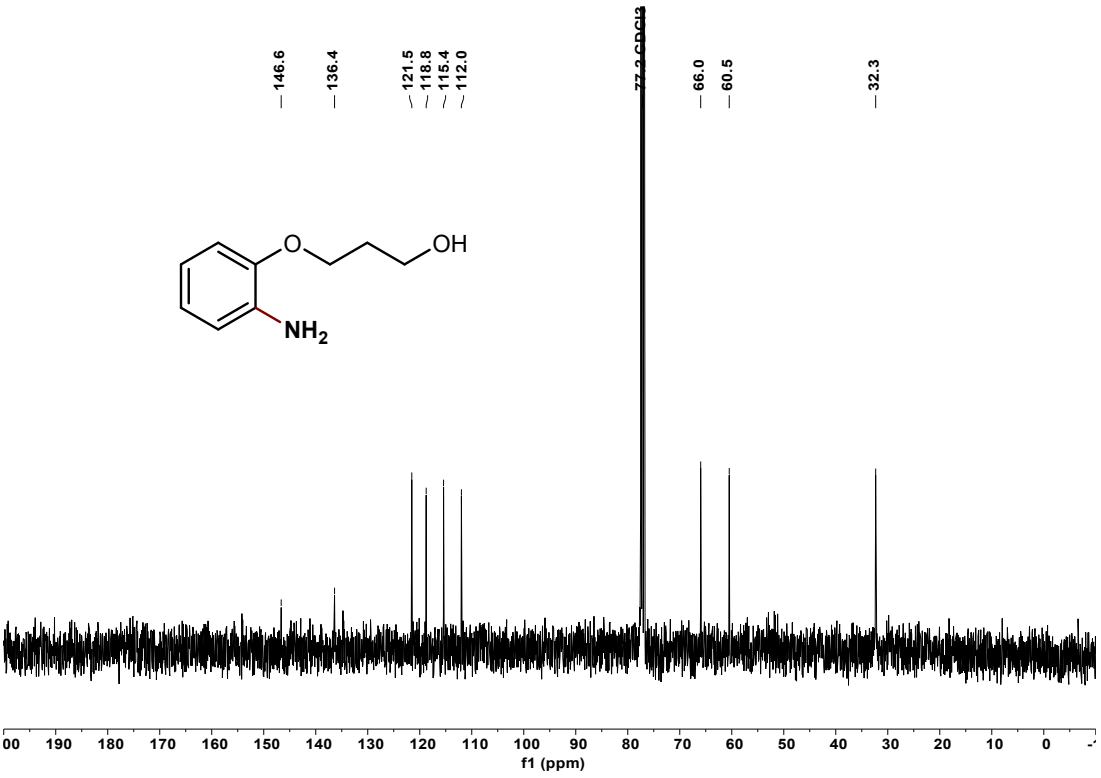
^{13}C NMR (101 MHz, $CDCl_3$)



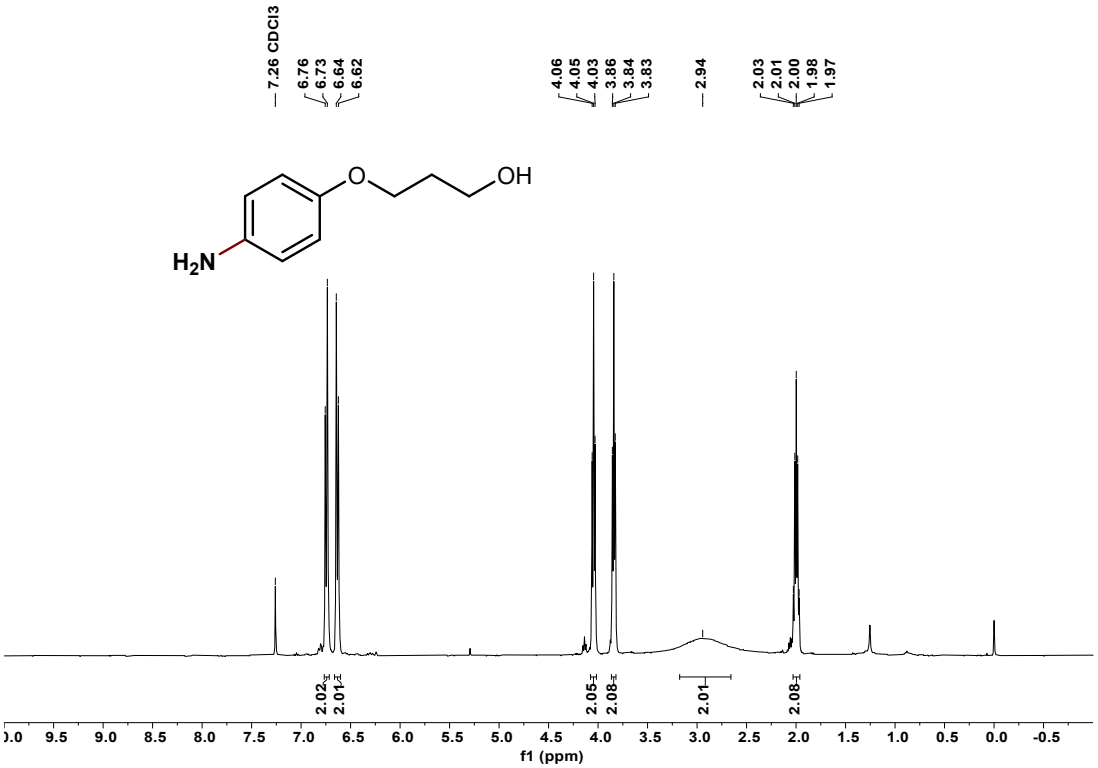
^{1}H NMR (400 MHz, $CDCl_3$)



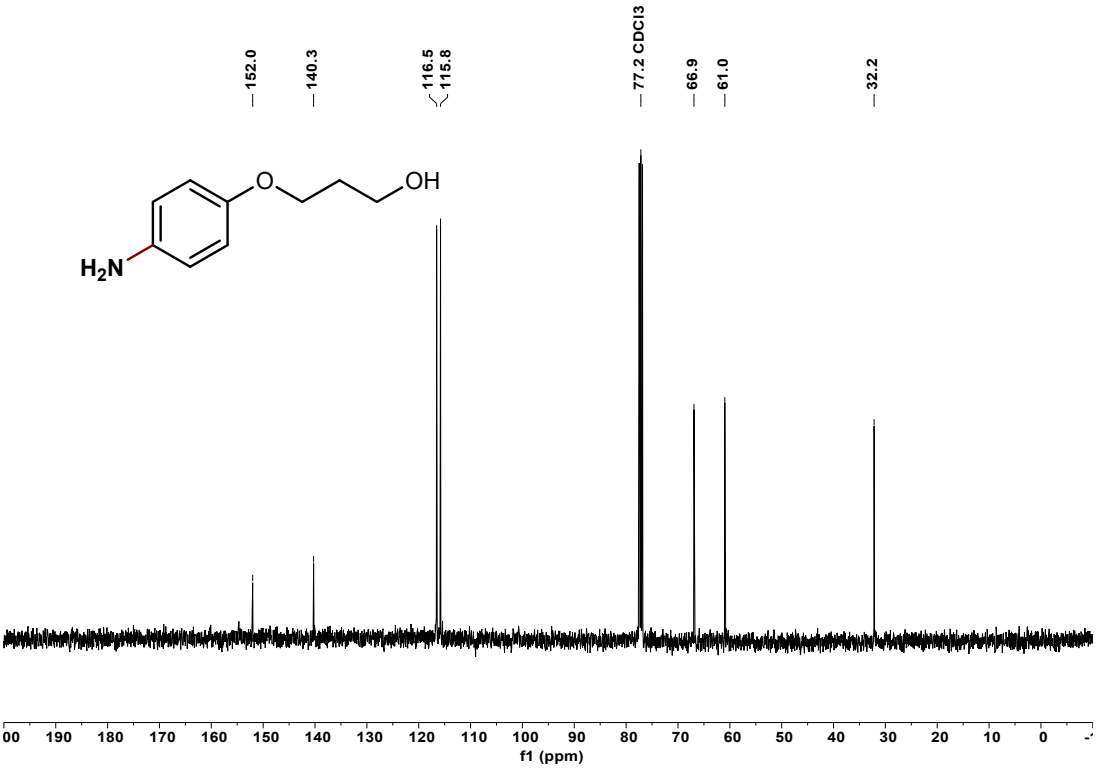
^{13}C NMR (101 MHz, $CDCl_3$)



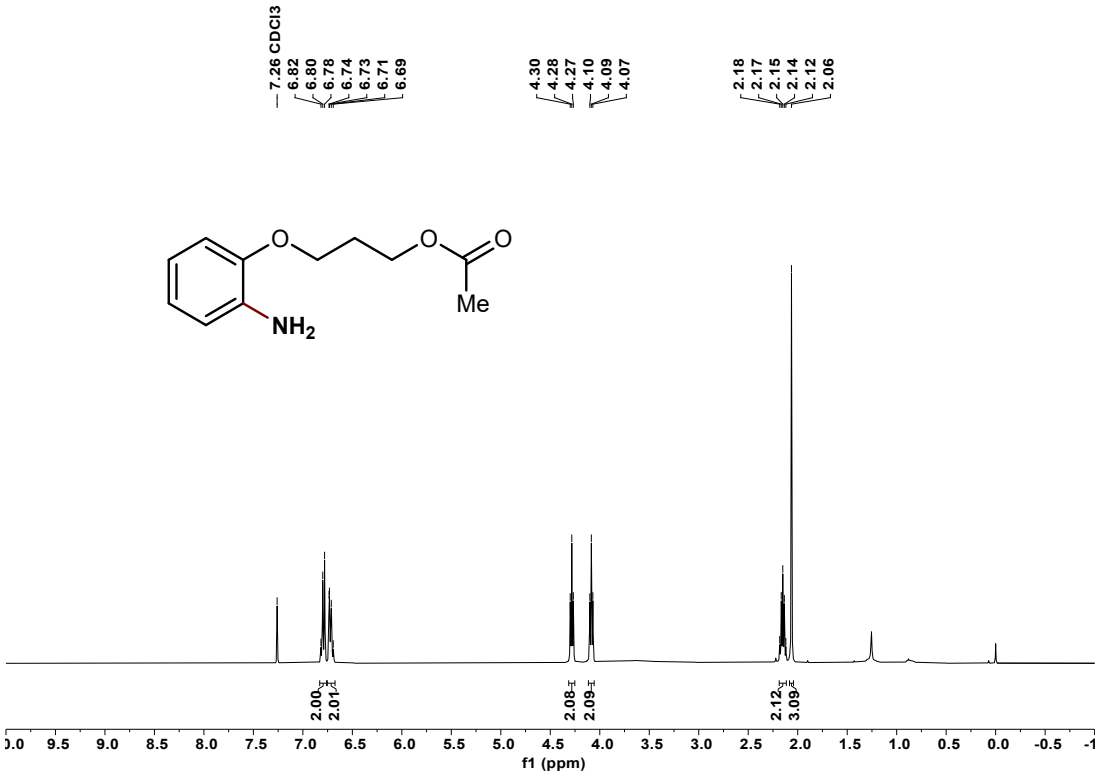
^{1}H NMR (400 MHz, $CDCl_3$)



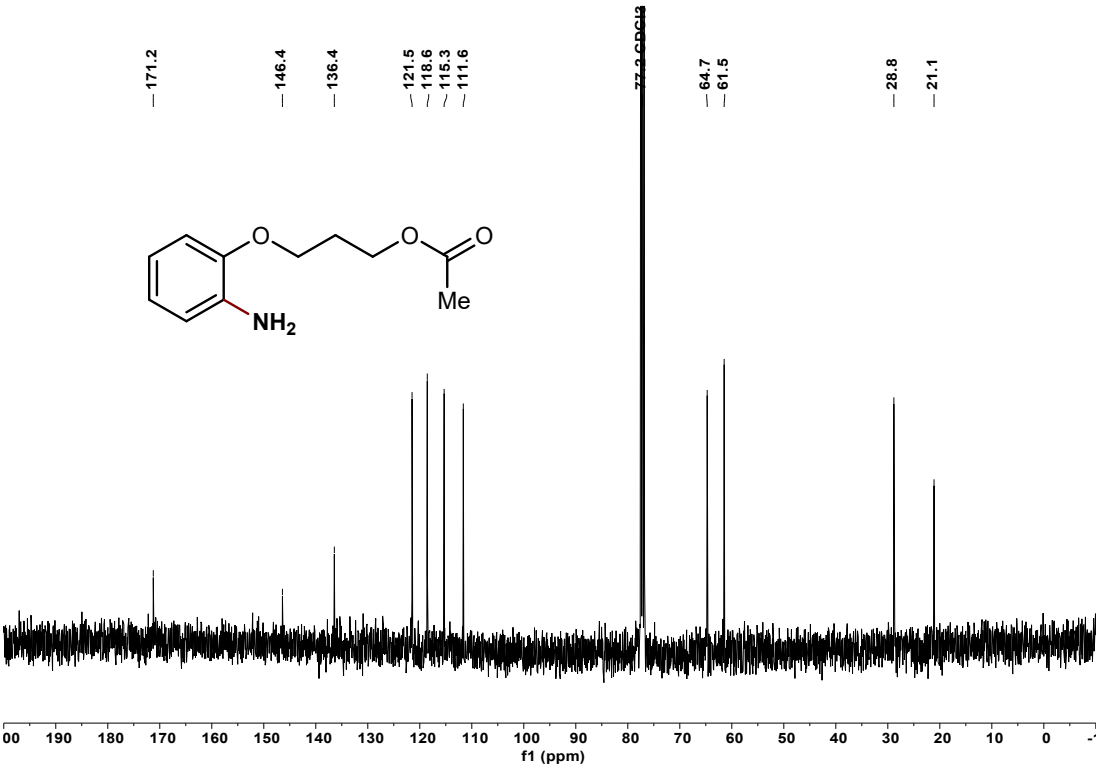
^{13}C NMR (101 MHz, $CDCl_3$)



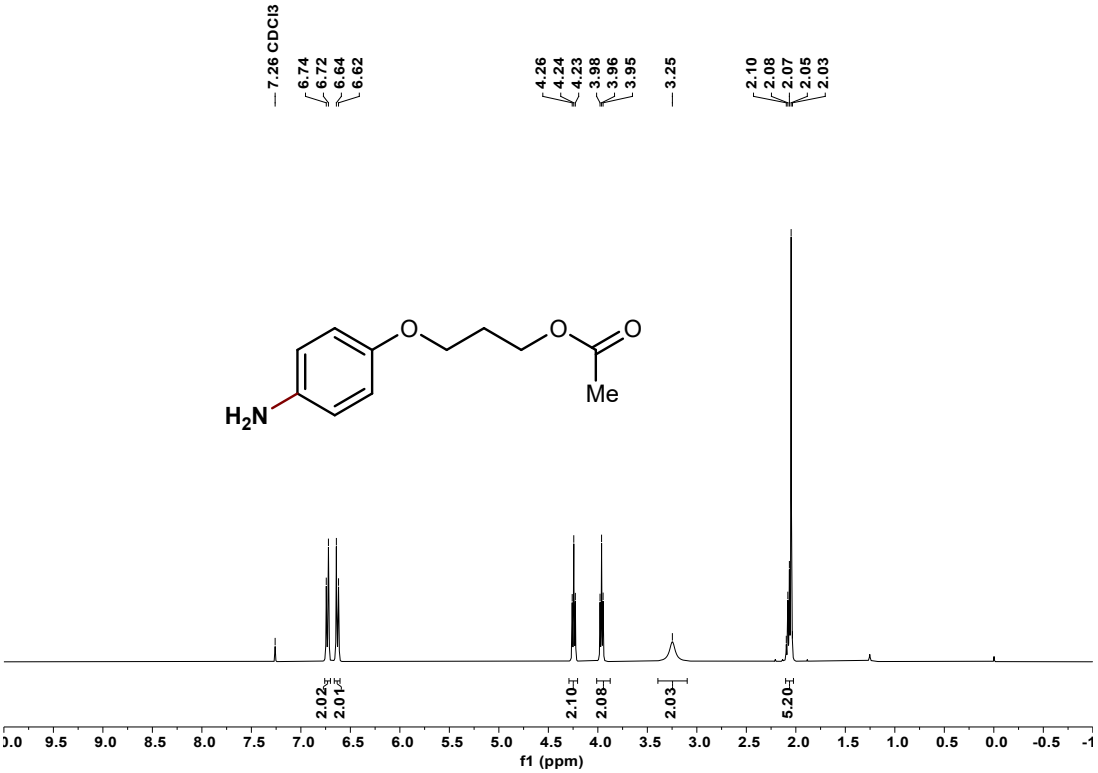
^{1}H NMR (400 MHz, $CDCl_3$)



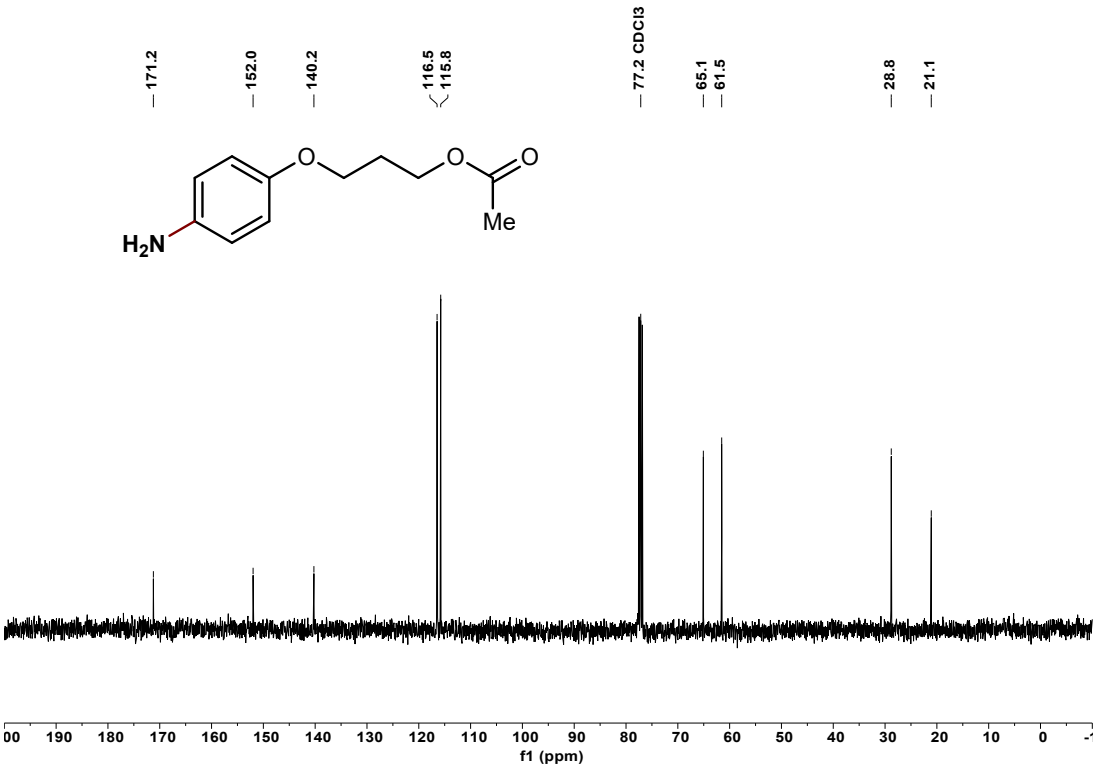
^{13}C NMR (101 MHz, $CDCl_3$)



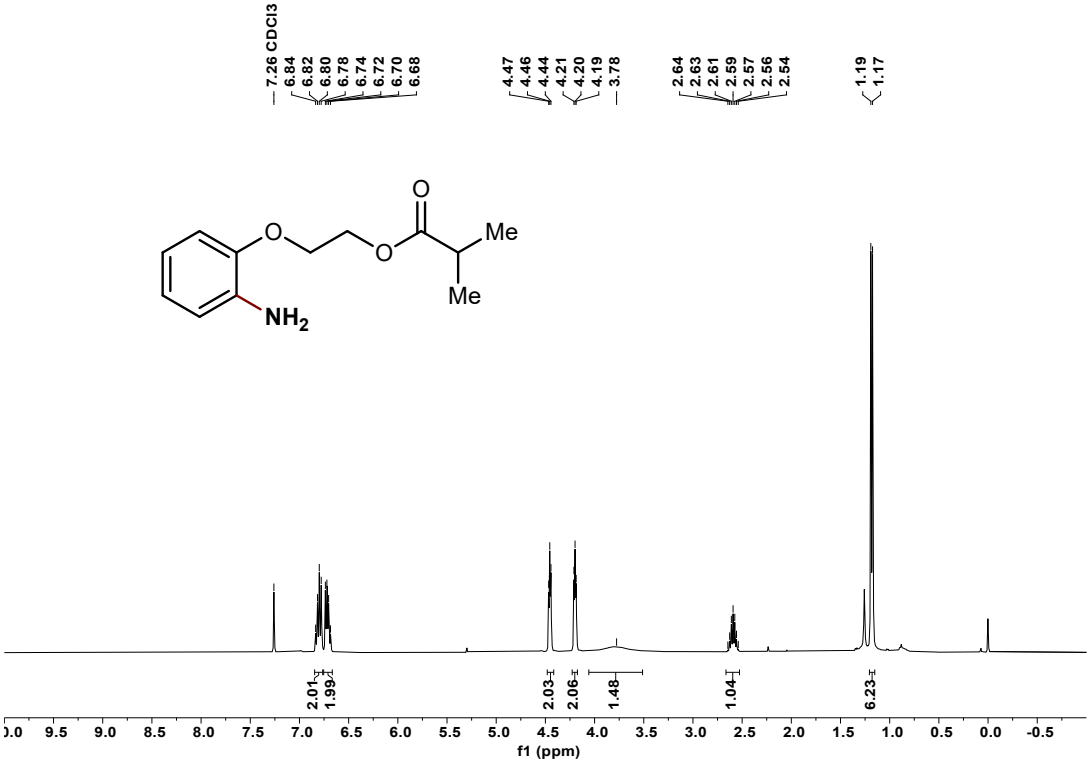
^{1}H NMR (400 MHz, $CDCl_3$)



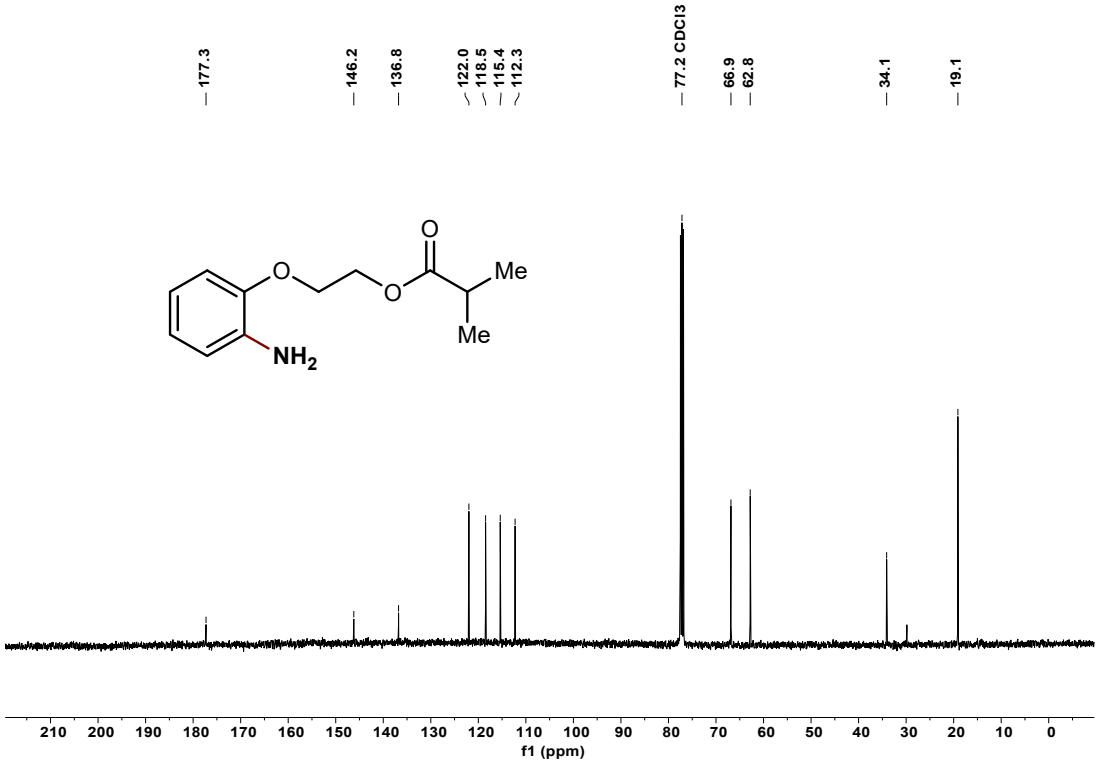
^{13}C NMR (101 MHz, $CDCl_3$)



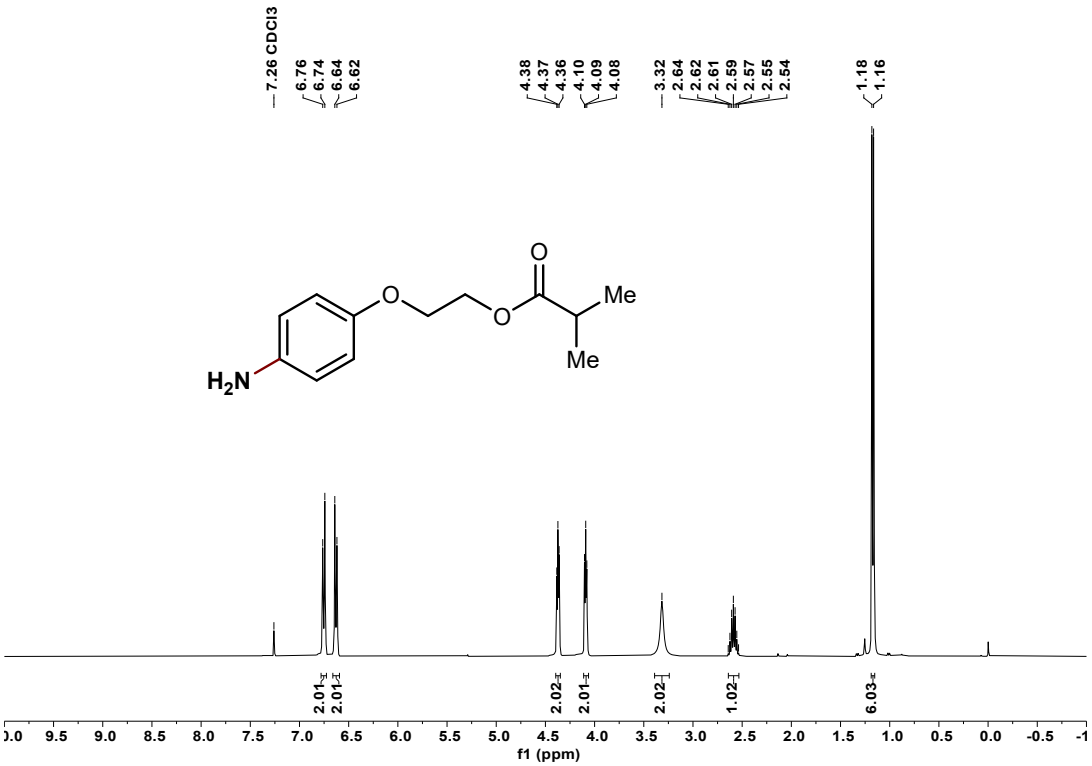
^{1}H NMR (400 MHz, $CDCl_3$)



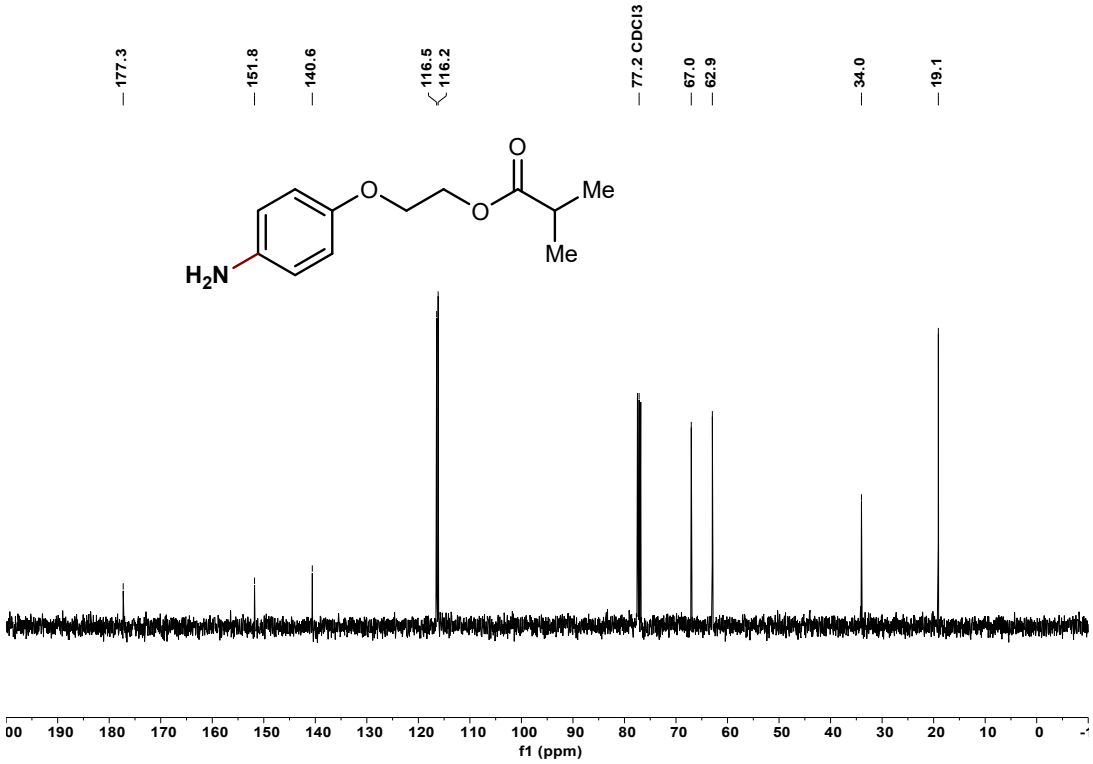
^{13}C NMR (101 MHz, $CDCl_3$)



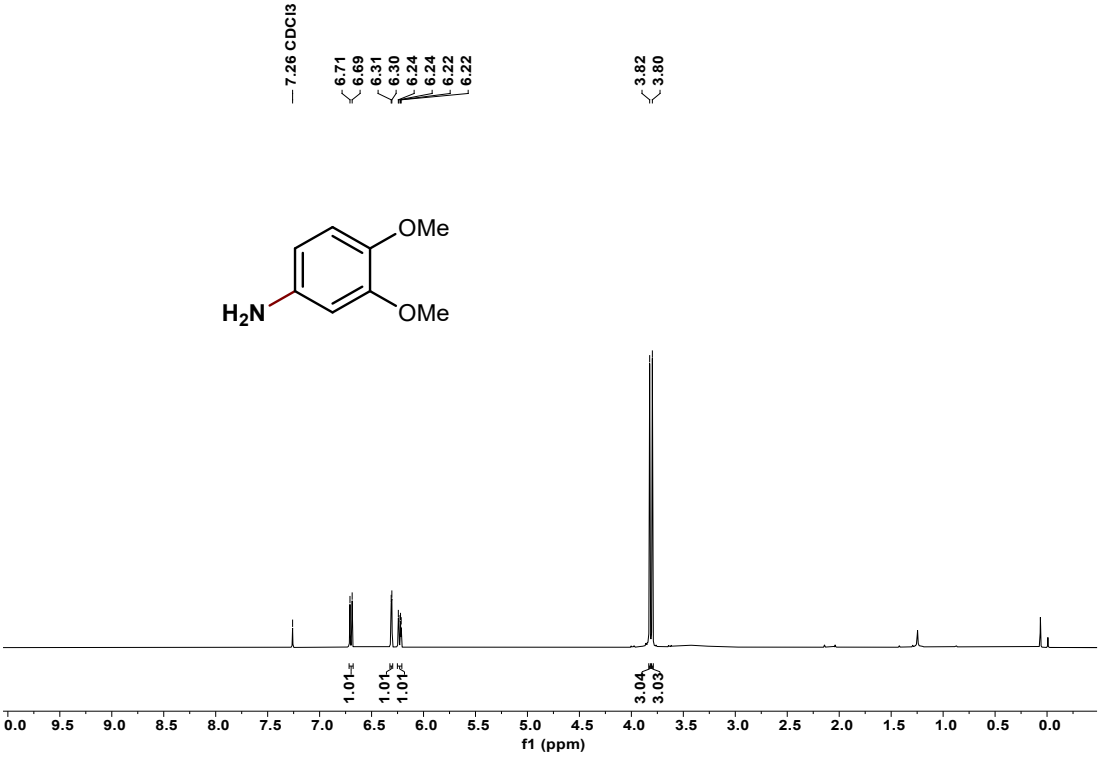
^{1}H NMR (400 MHz, $CDCl_3$)



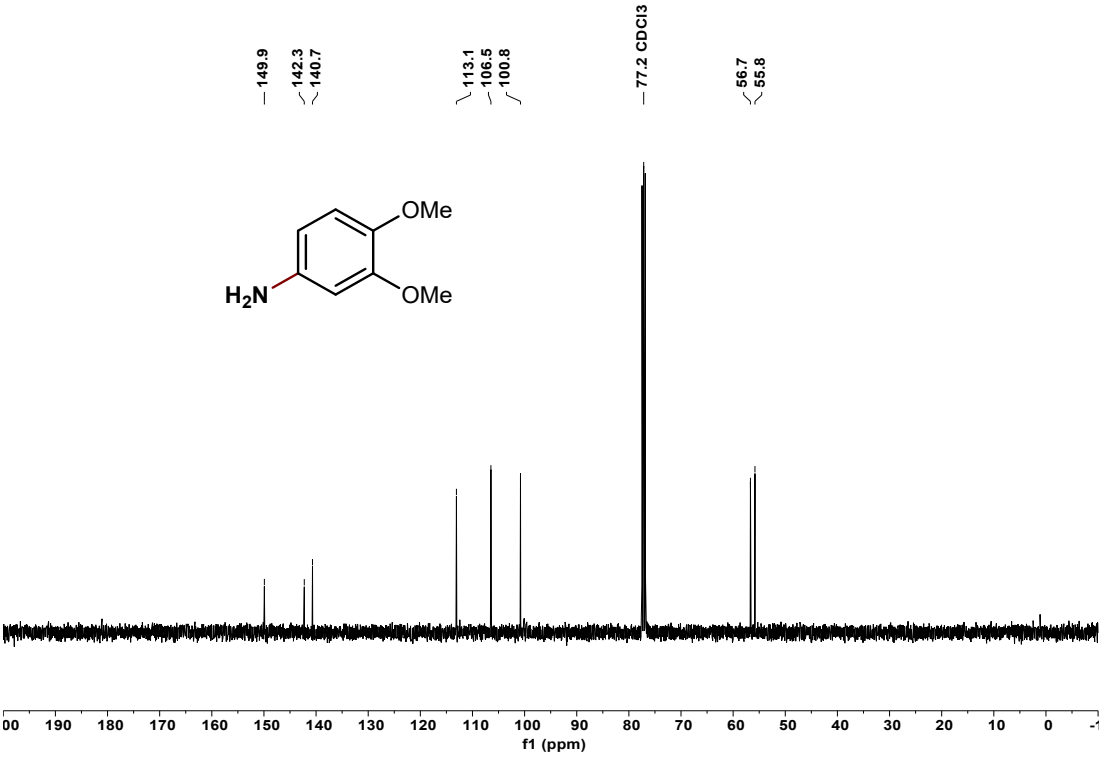
^{13}C NMR (101 MHz, $CDCl_3$)



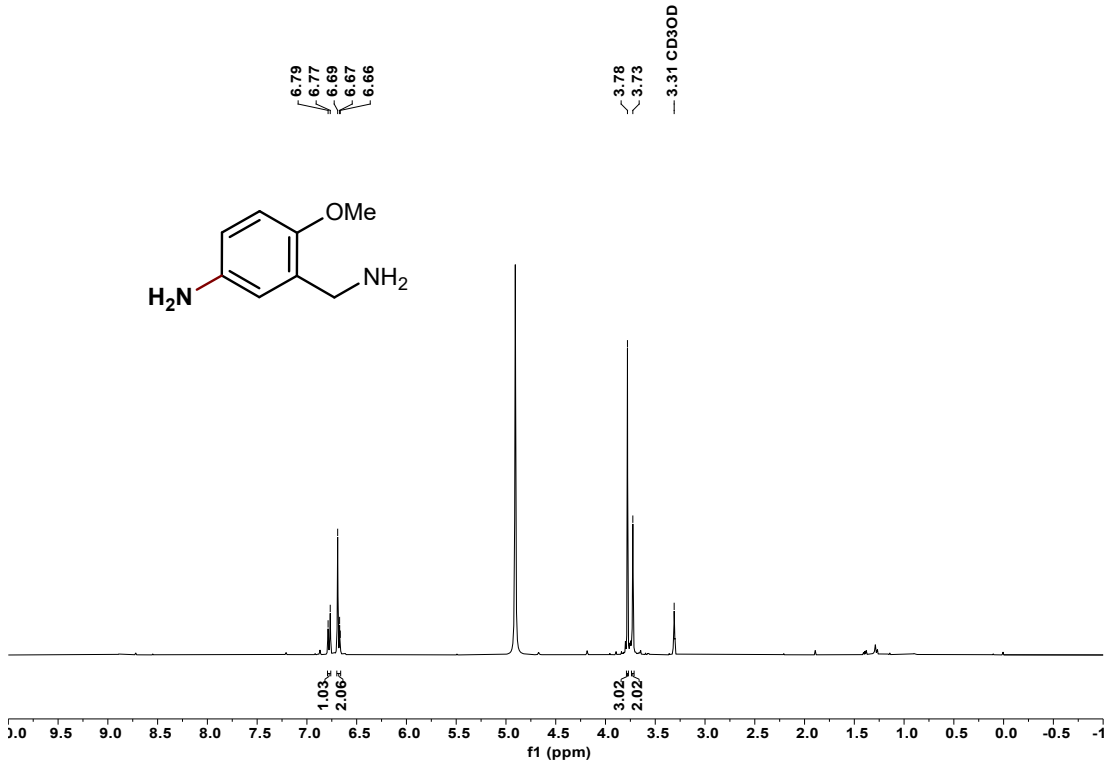
^{1}H NMR (400 MHz, $CDCl_3$)



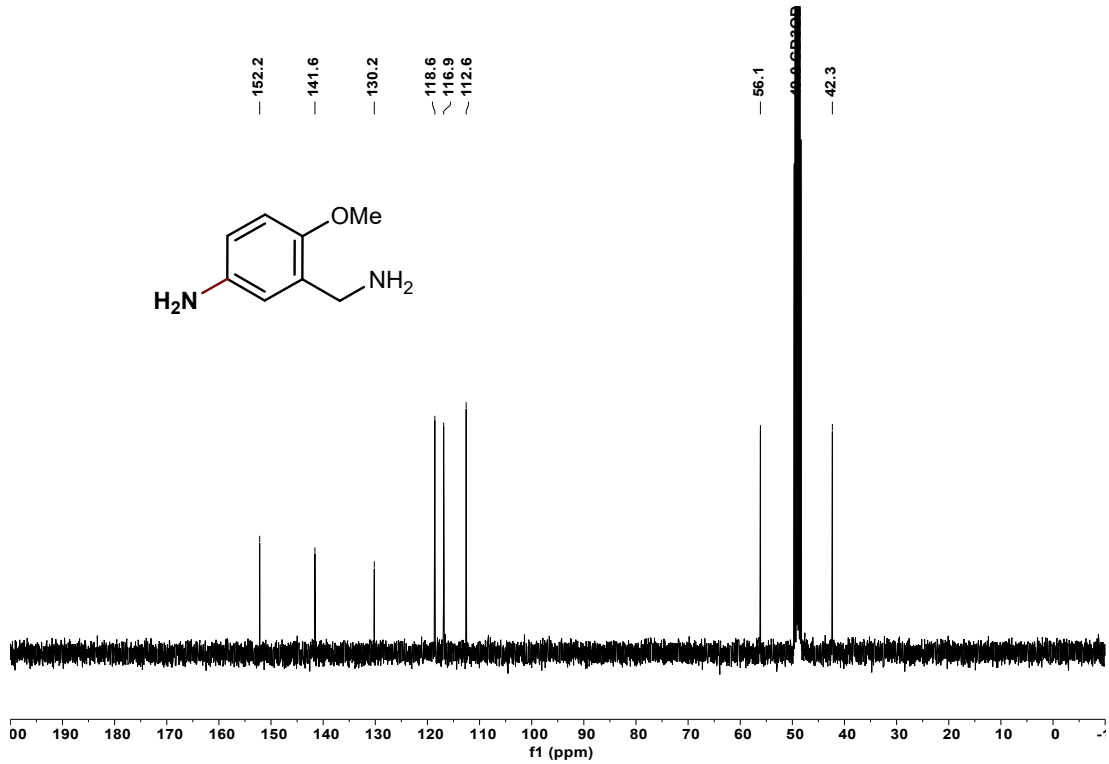
^{13}C NMR (101 MHz, $CDCl_3$)



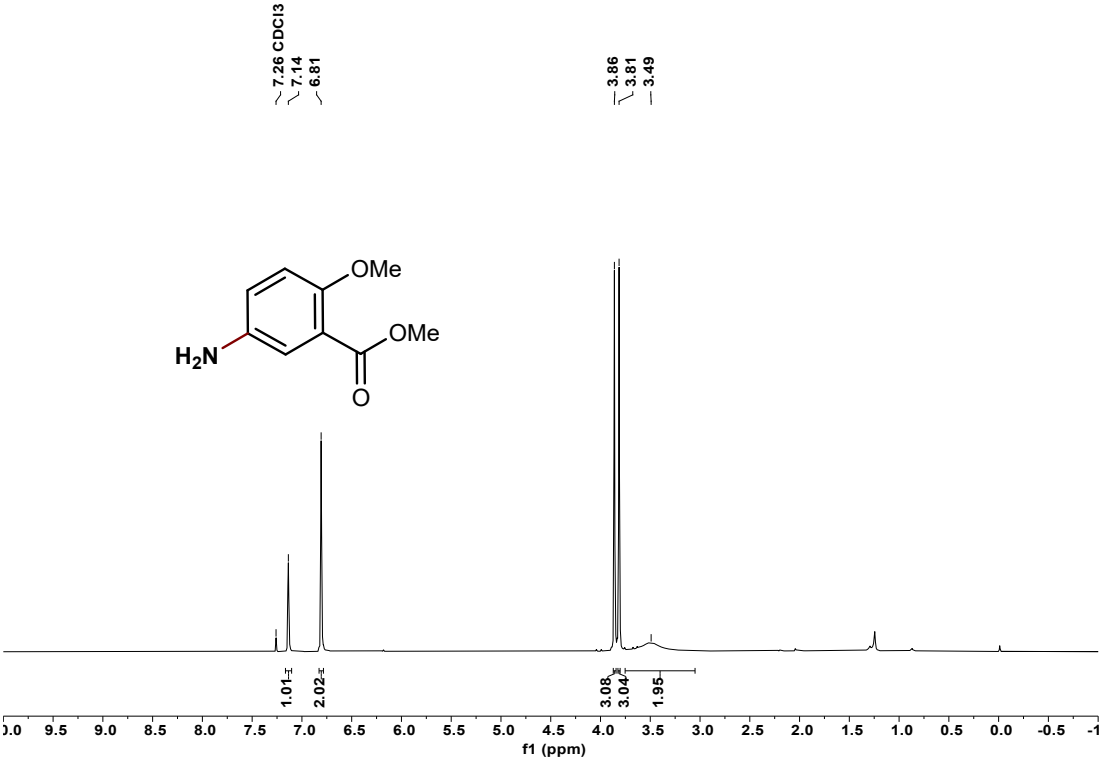
^{1}H NMR (400 MHz, CD_3OD)



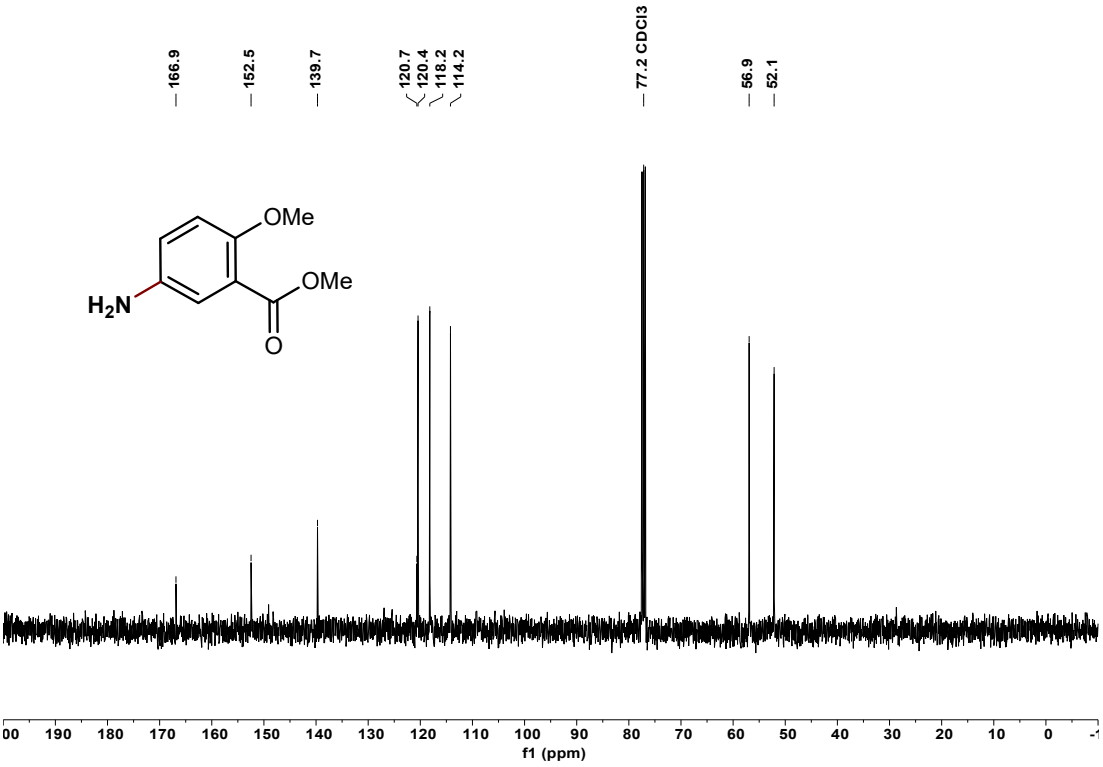
^{13}C NMR (101 MHz, CD_3OD)



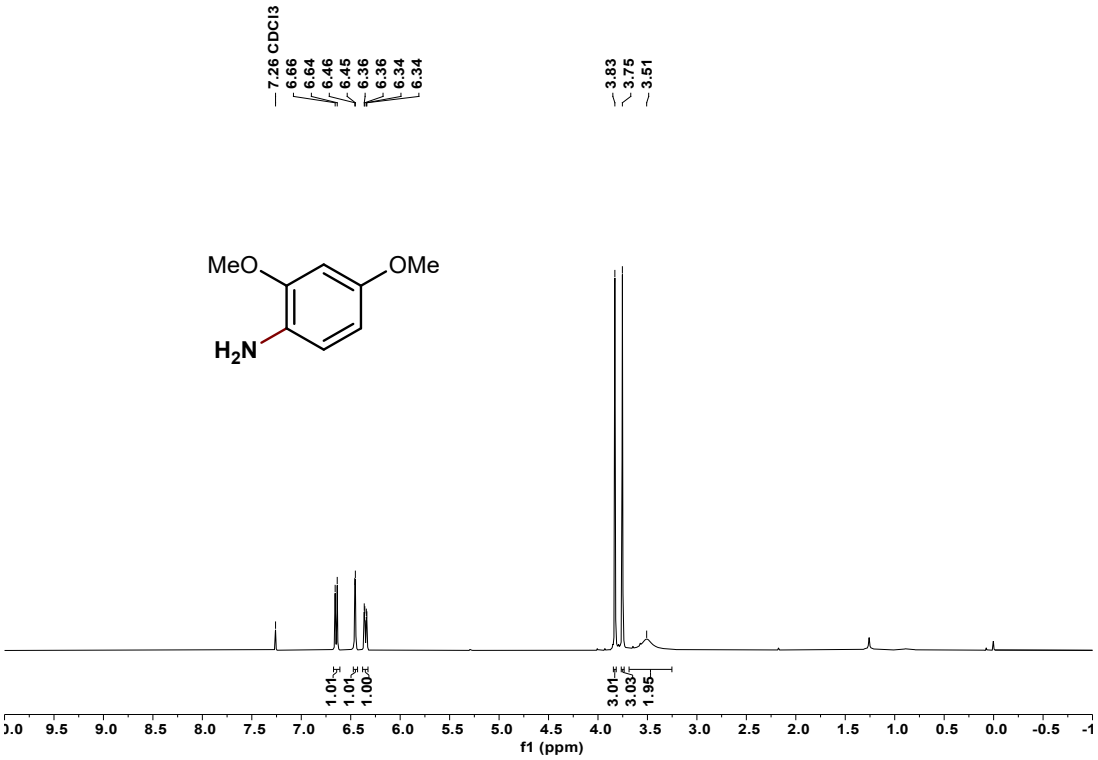
^{1}H NMR (400 MHz, $CDCl_3$)



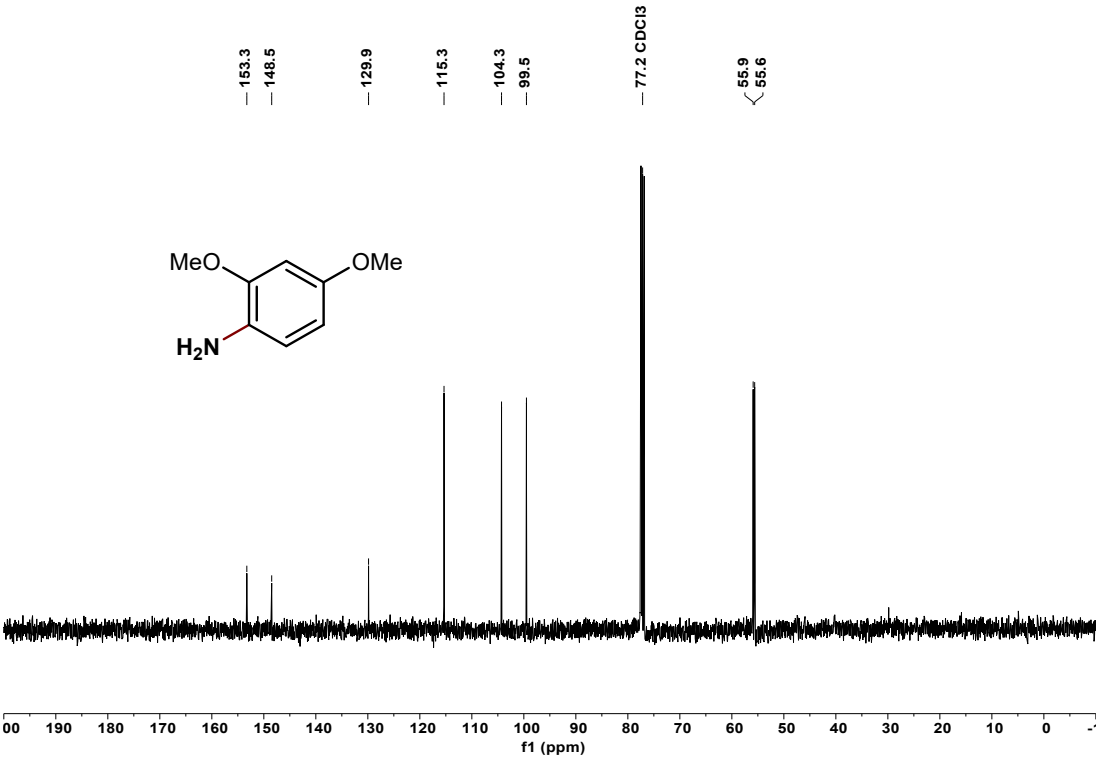
^{13}C NMR (101 MHz, $CDCl_3$)



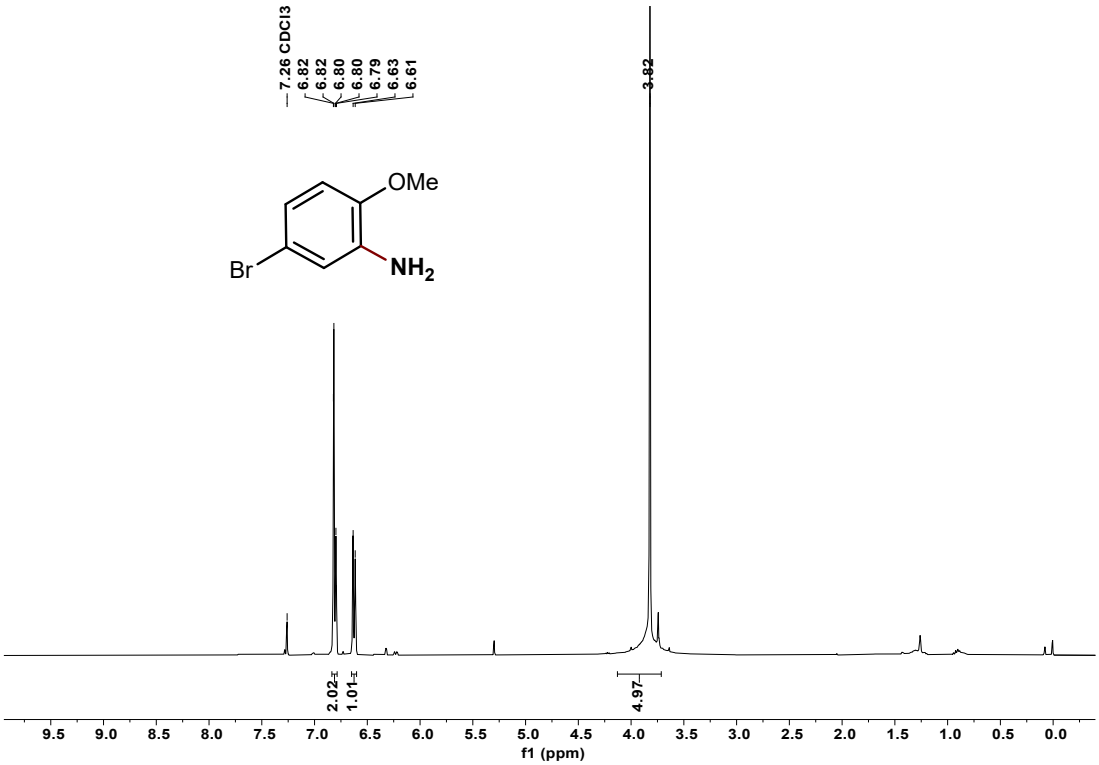
^{1}H NMR (400 MHz, $CDCl_3$)



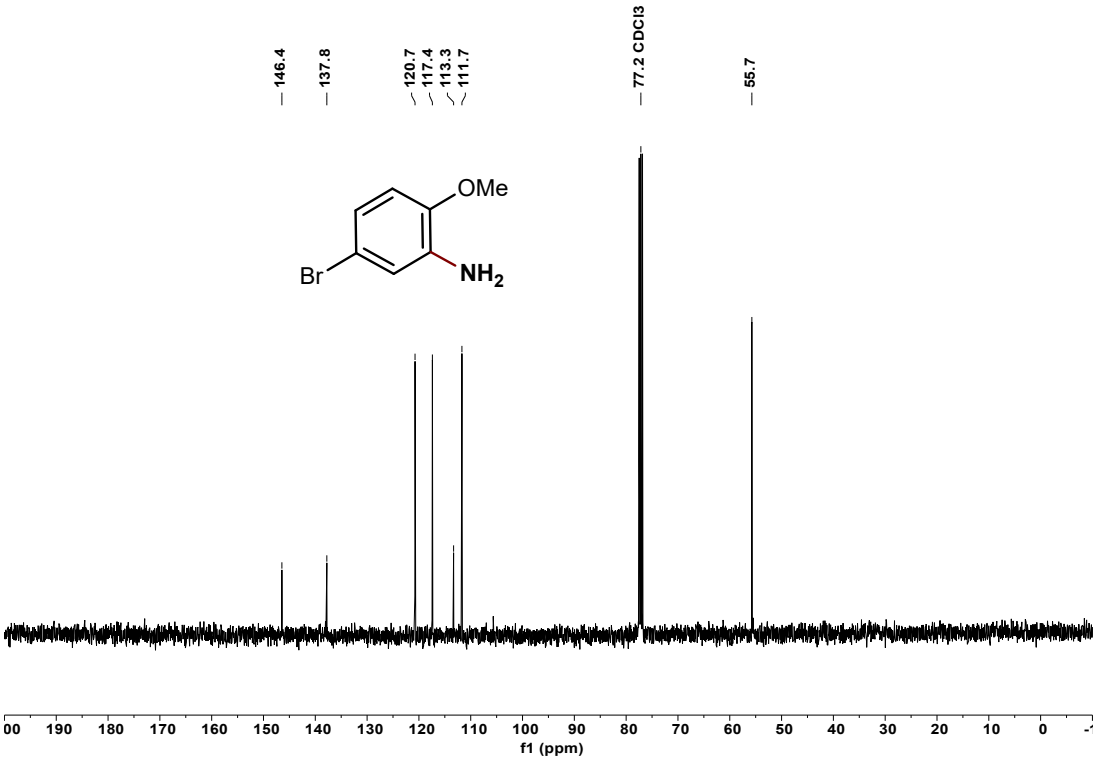
^{13}C NMR (101 MHz, $CDCl_3$)



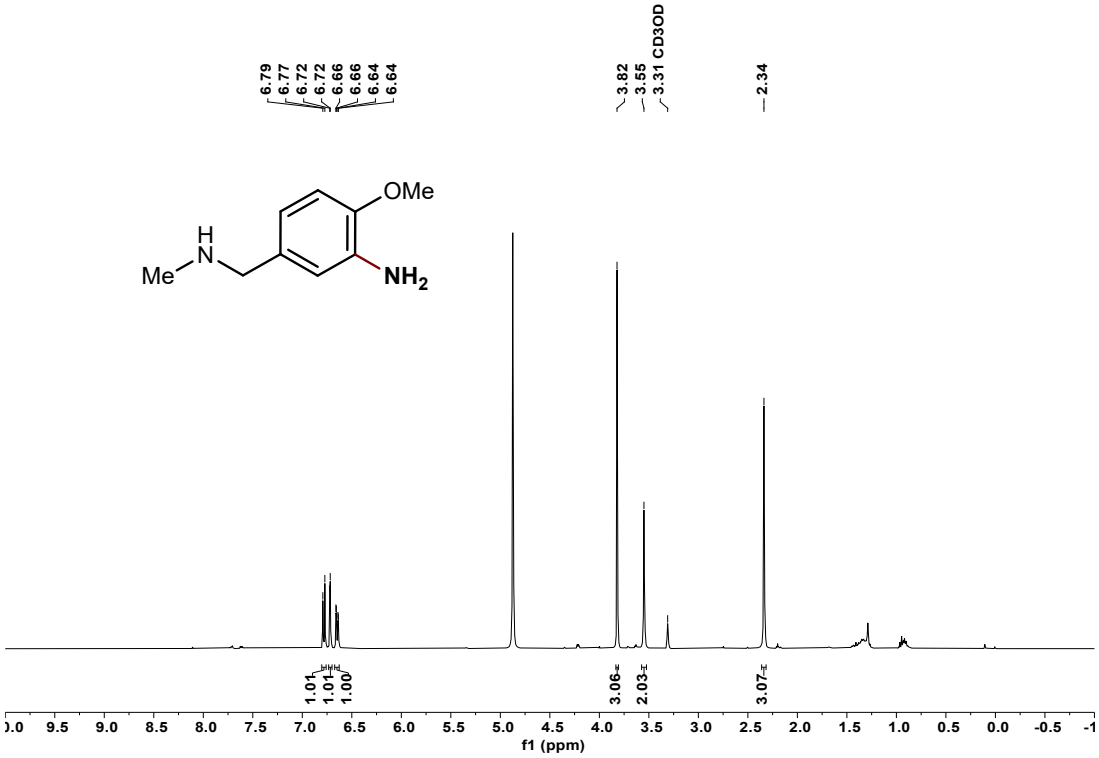
^{1}H NMR (400 MHz, $CDCl_3$)



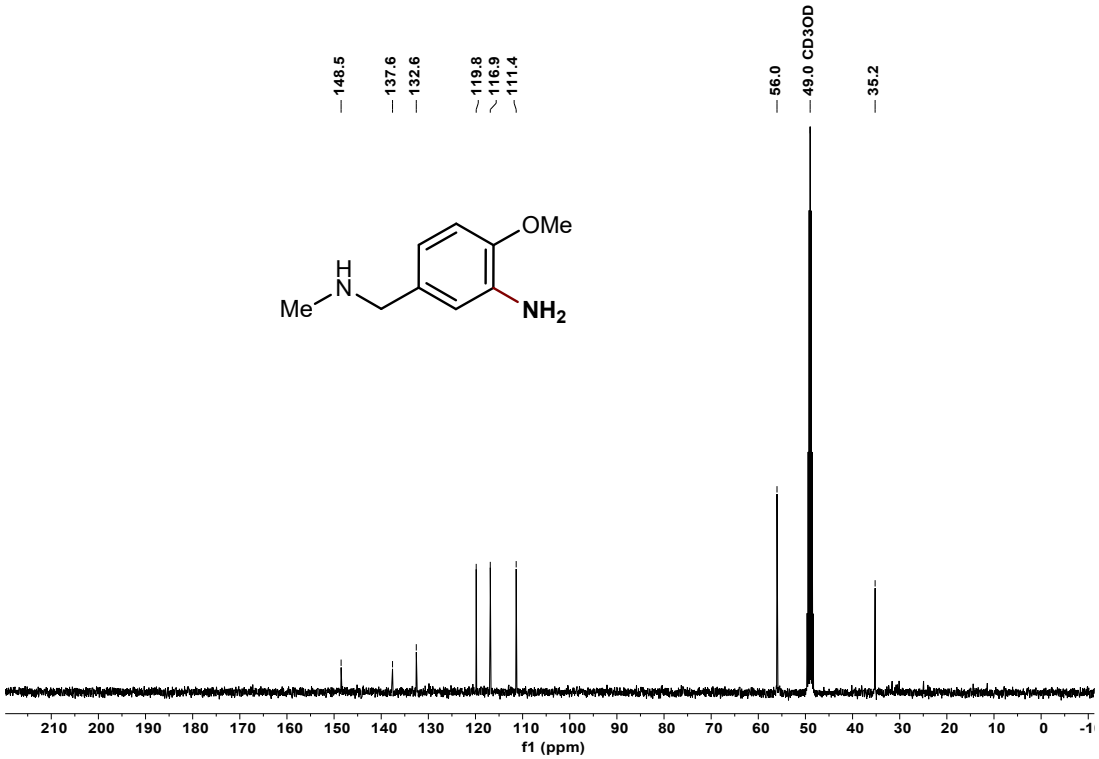
^{13}C NMR (101 MHz, $CDCl_3$)



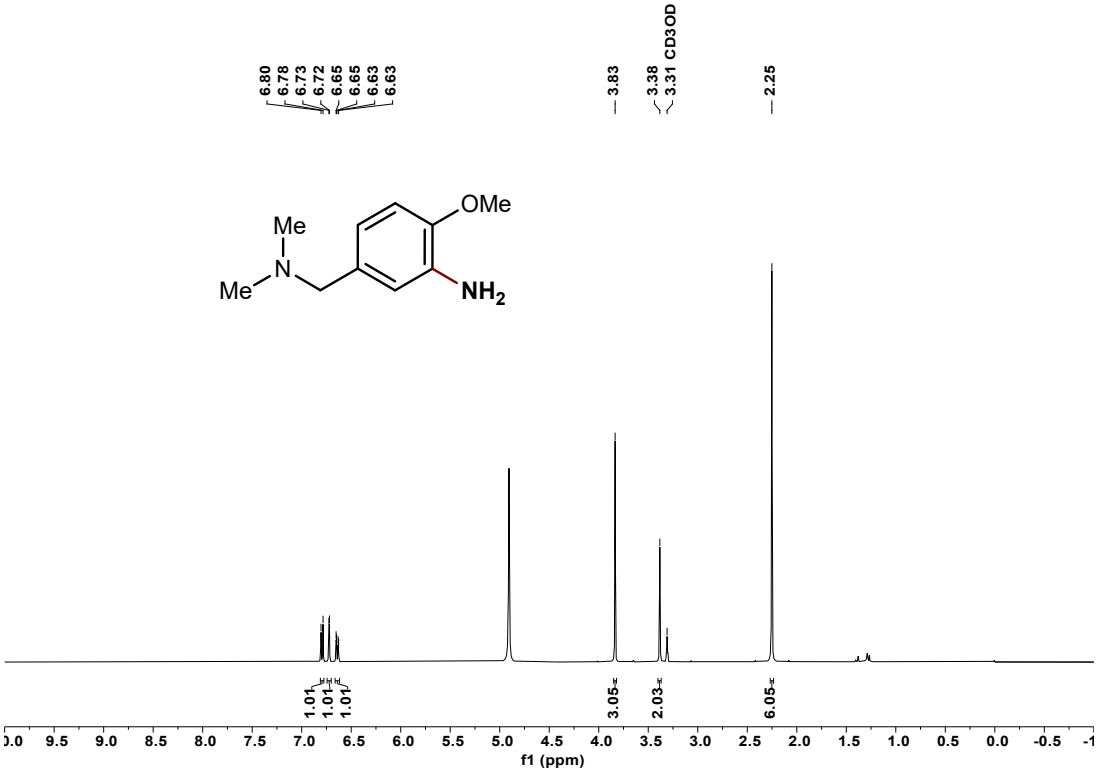
^{1}H NMR (400 MHz, CD_3OD)



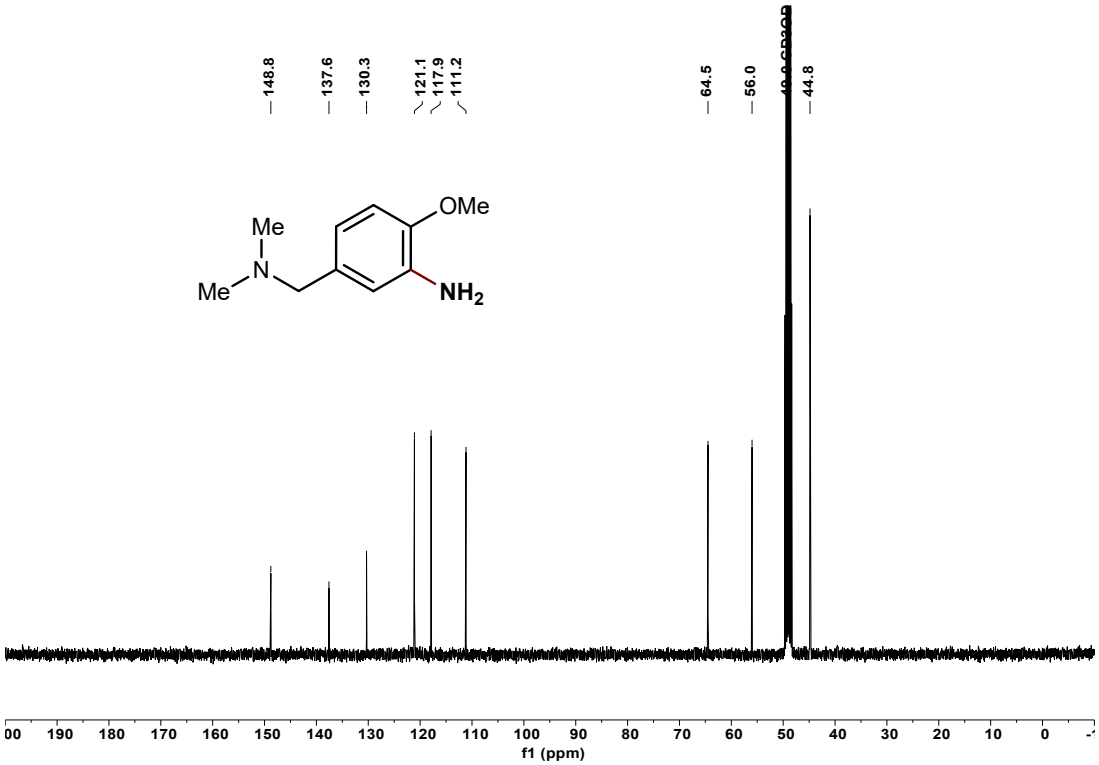
^{13}C NMR (101 MHz, CD_3OD)



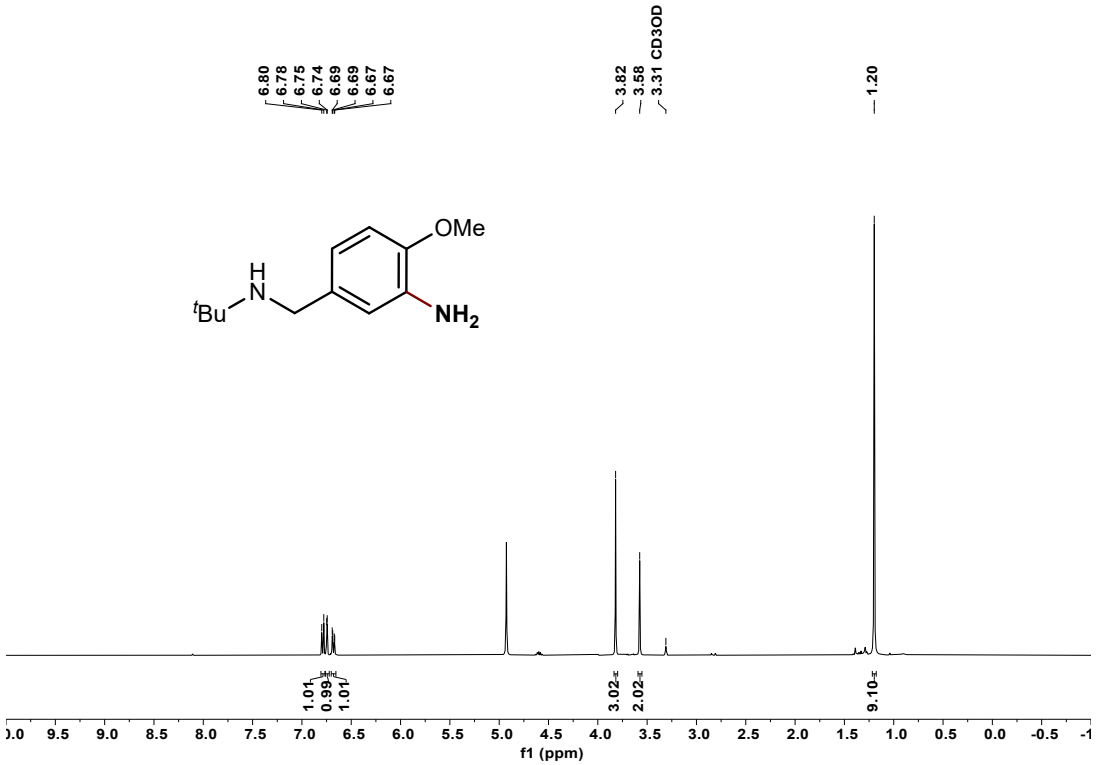
^{1}H NMR (400 MHz, CD_3OD)



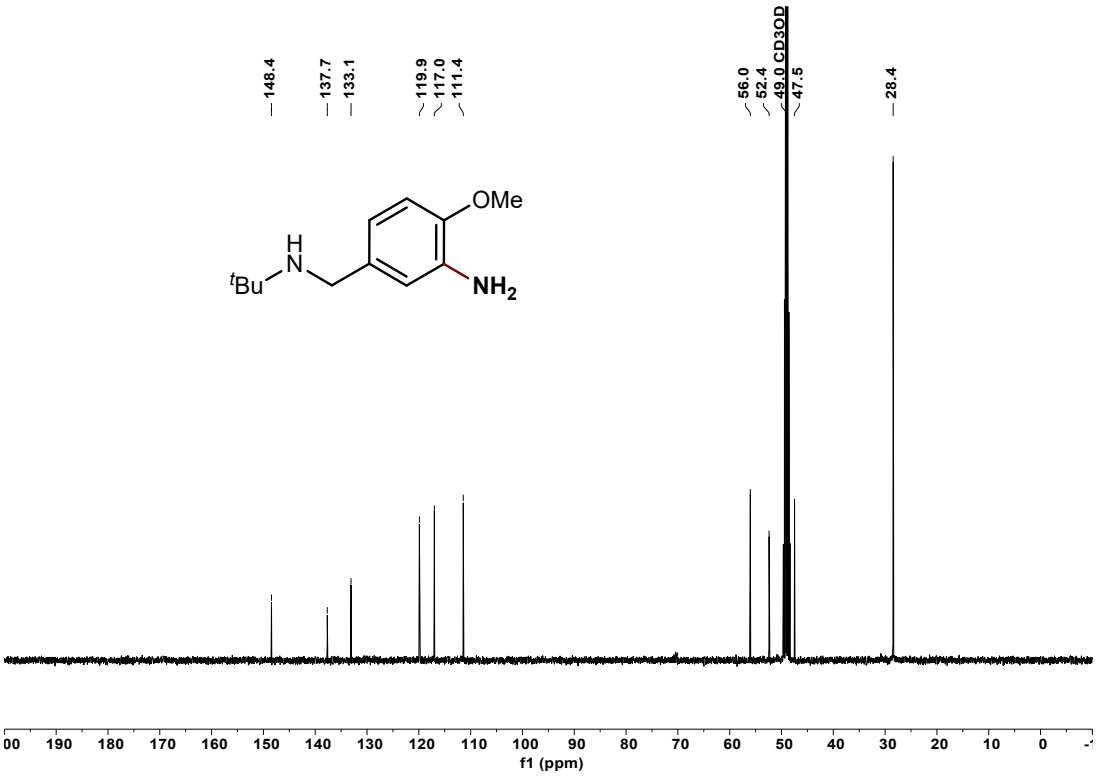
^{13}C NMR (101 MHz, CD_3OD)



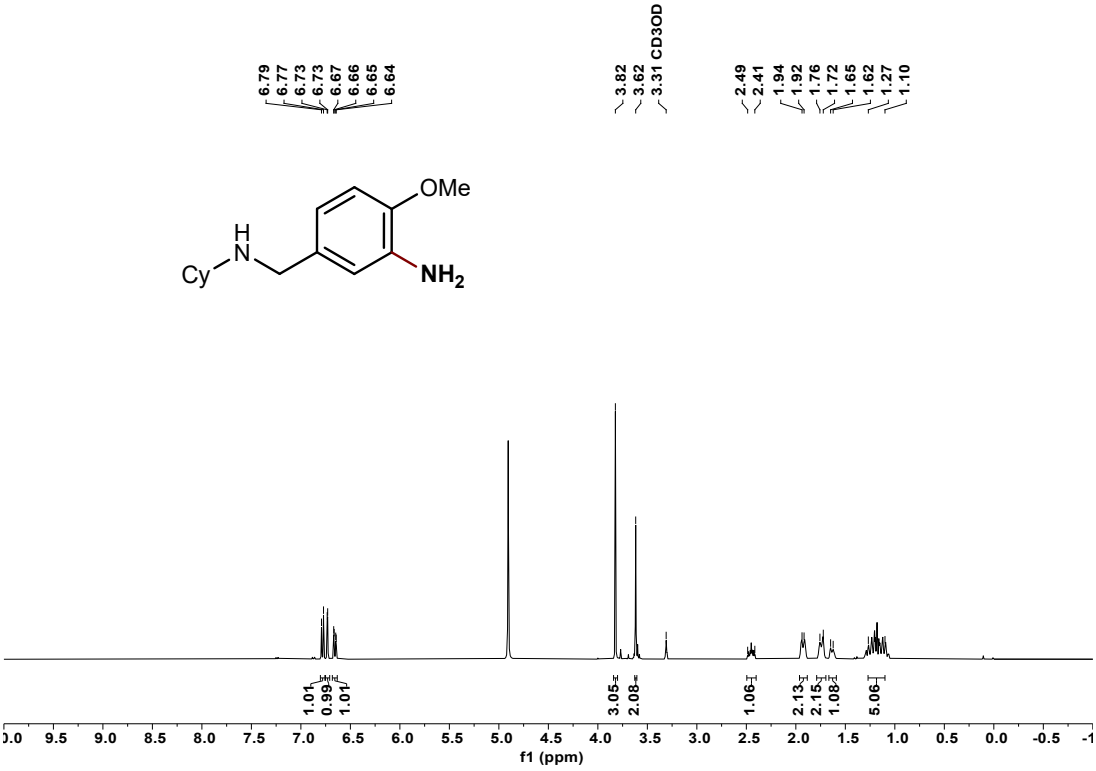
^{1}H NMR (400 MHz, CD_3OD)



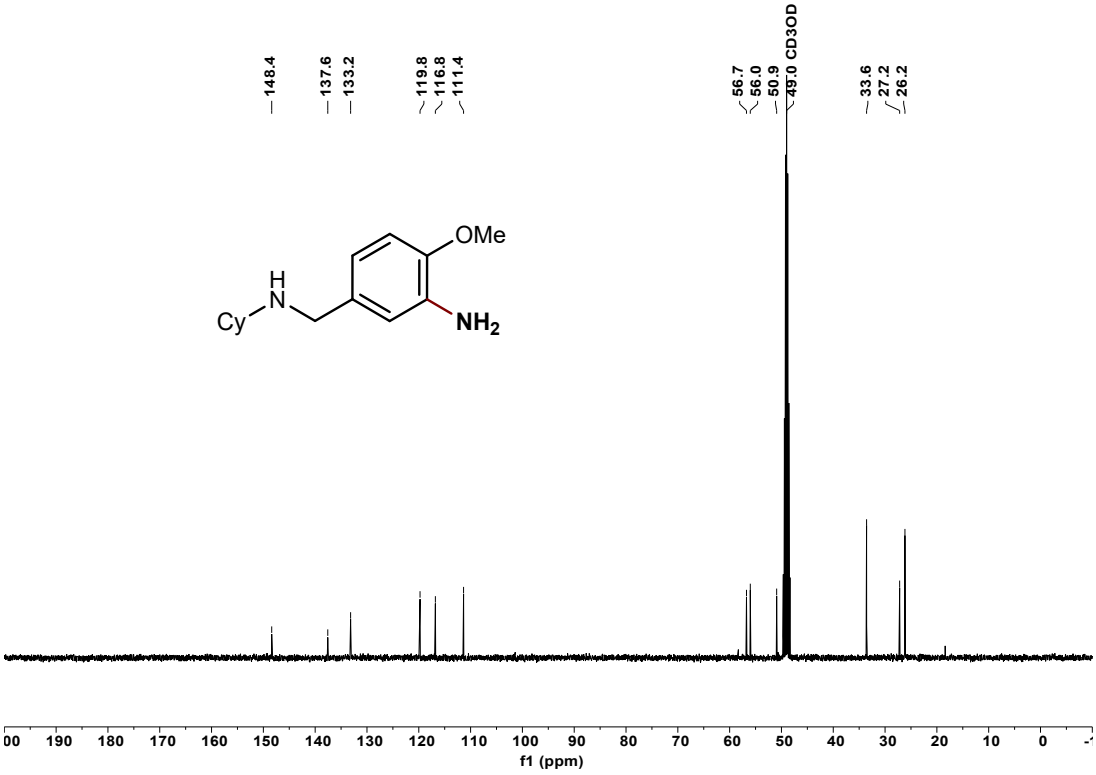
^{13}C NMR (101 MHz, CD_3OD)



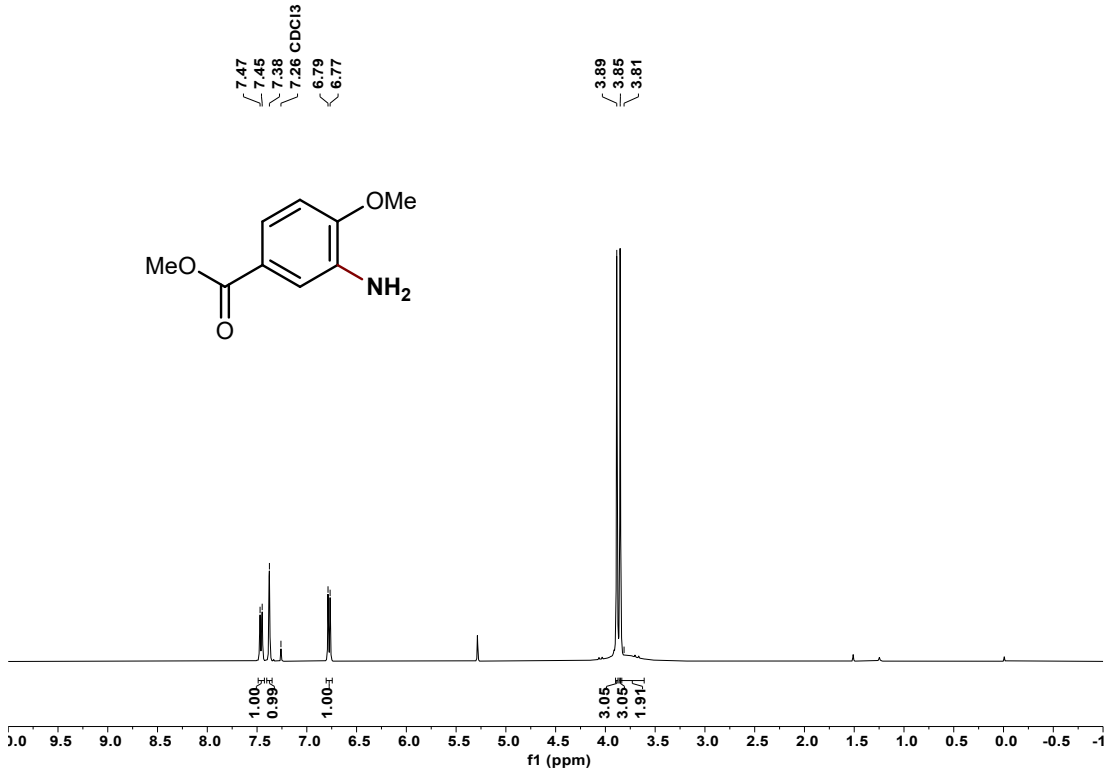
^{1}H NMR (400 MHz, CD_3OD)



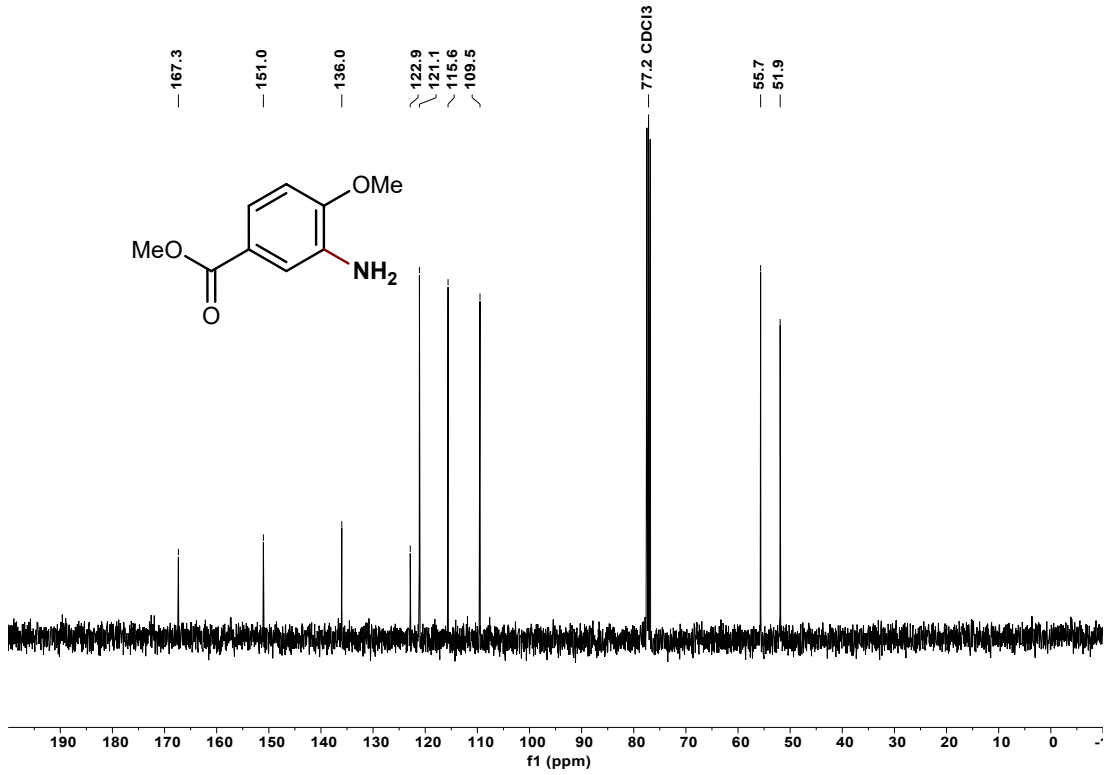
^{13}C NMR (101 MHz, CD_3OD)



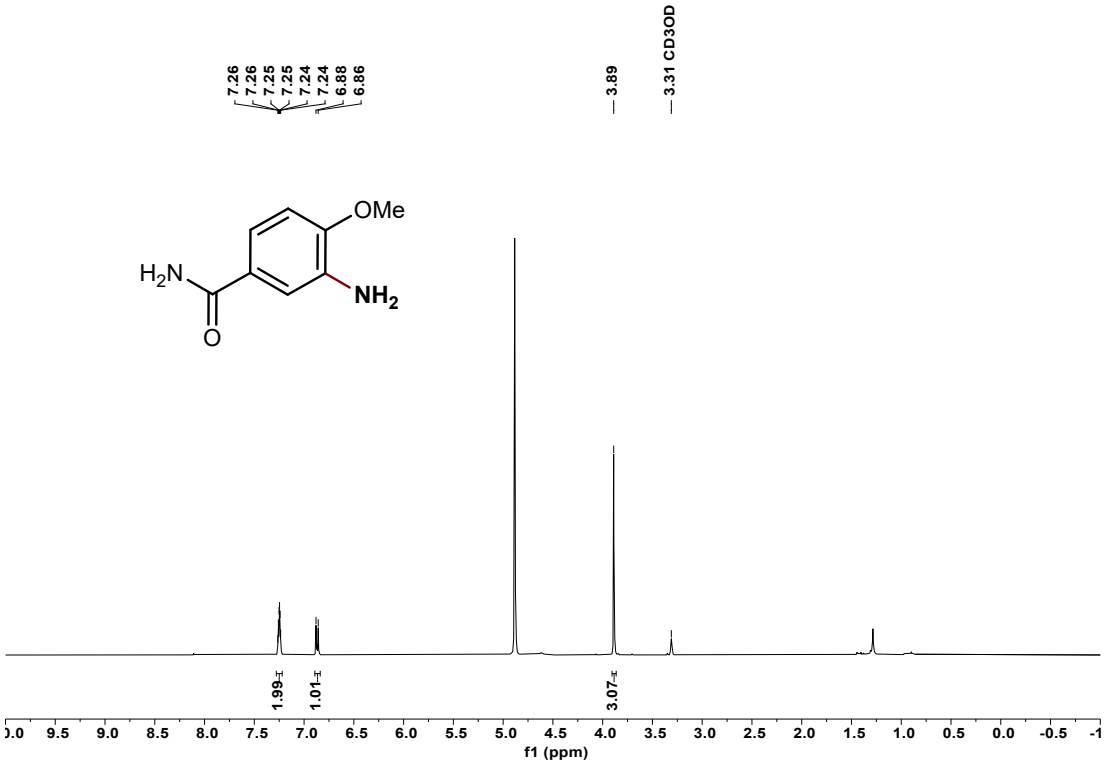
^{1}H NMR (400 MHz, $CDCl_3$)



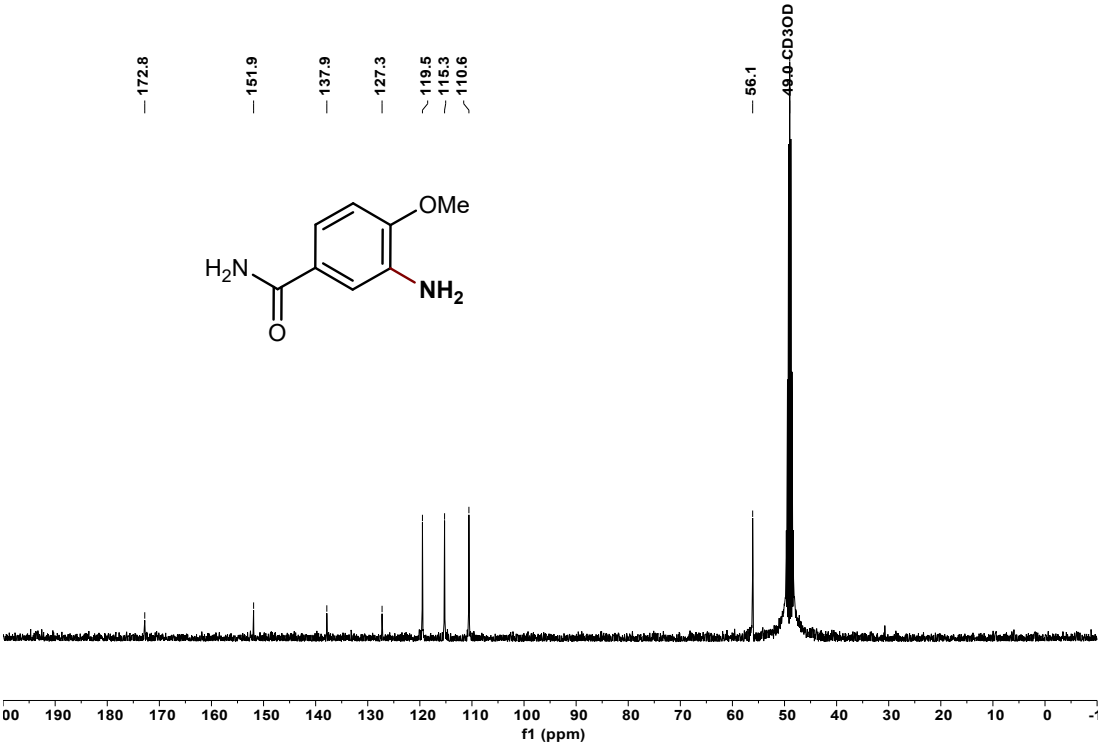
^{13}C NMR (101 MHz, $CDCl_3$)



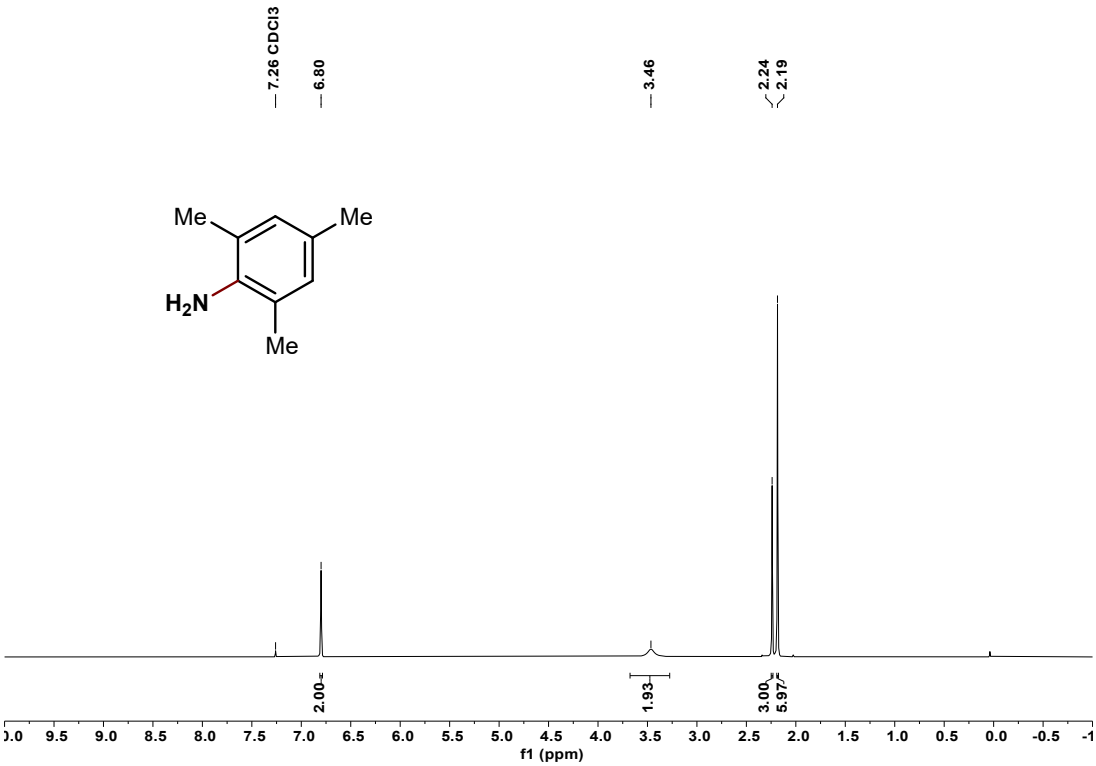
^{1}H NMR (400 MHz, CD_3OD)



^{13}C NMR (101 MHz, CD_3OD)



^{1}H NMR (400 MHz, $CDCl_3$)



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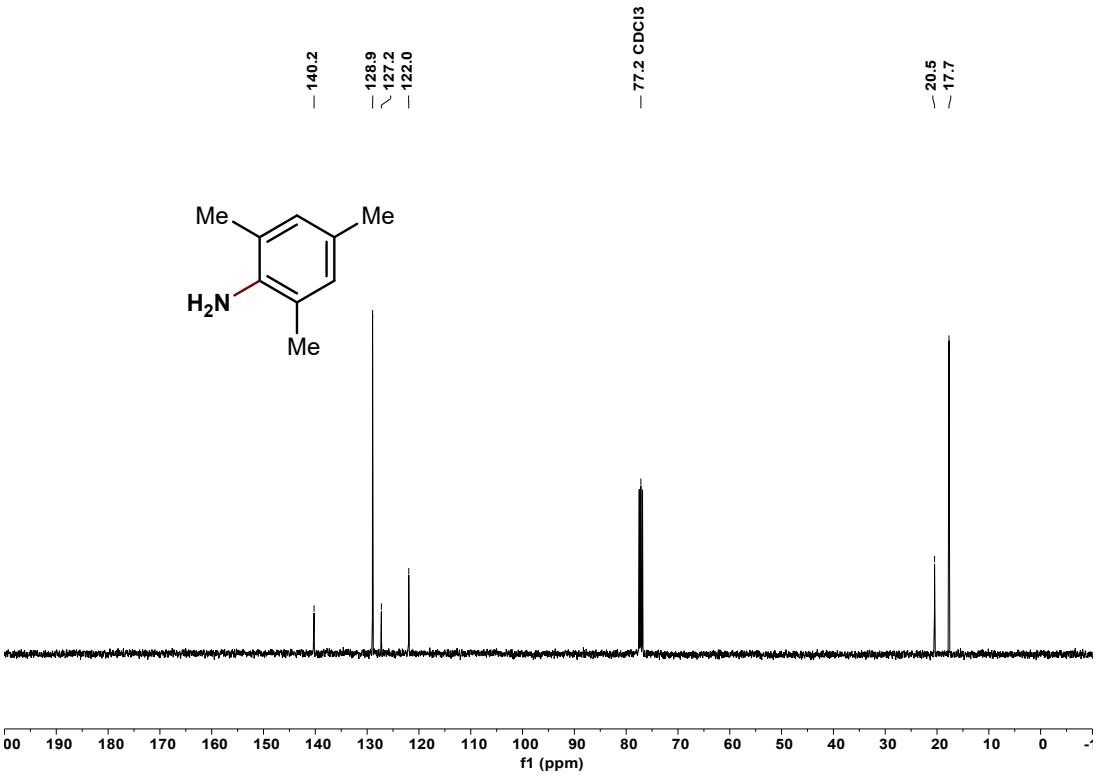
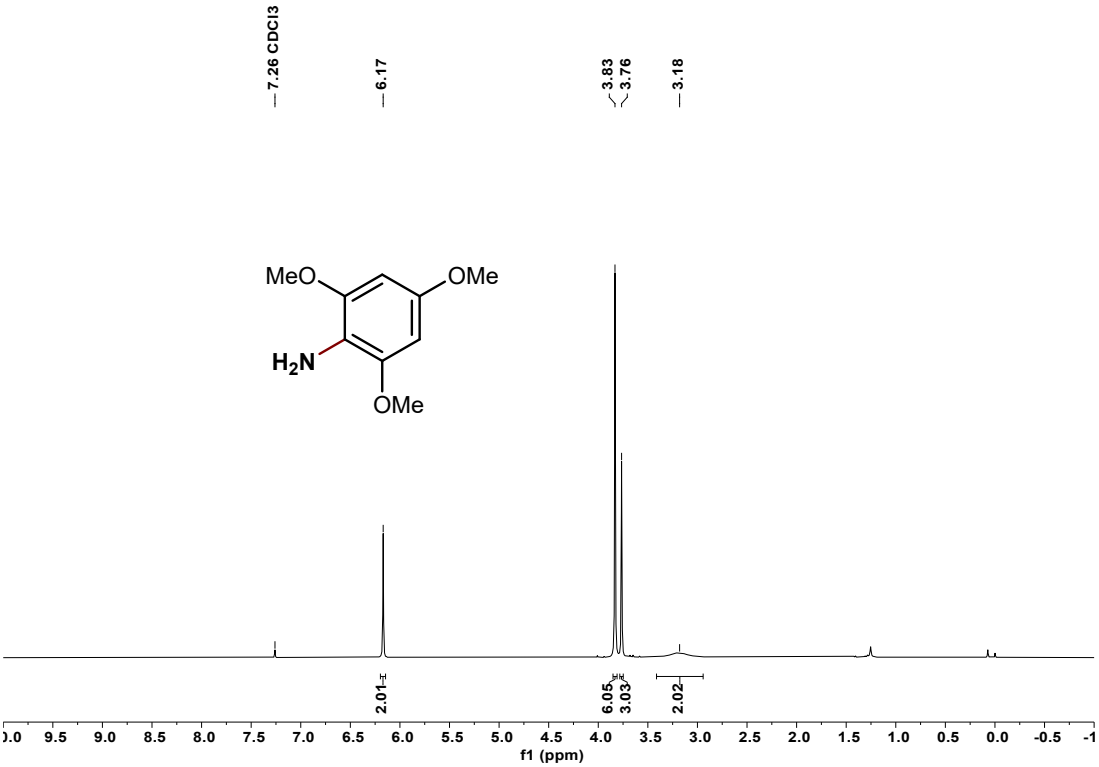
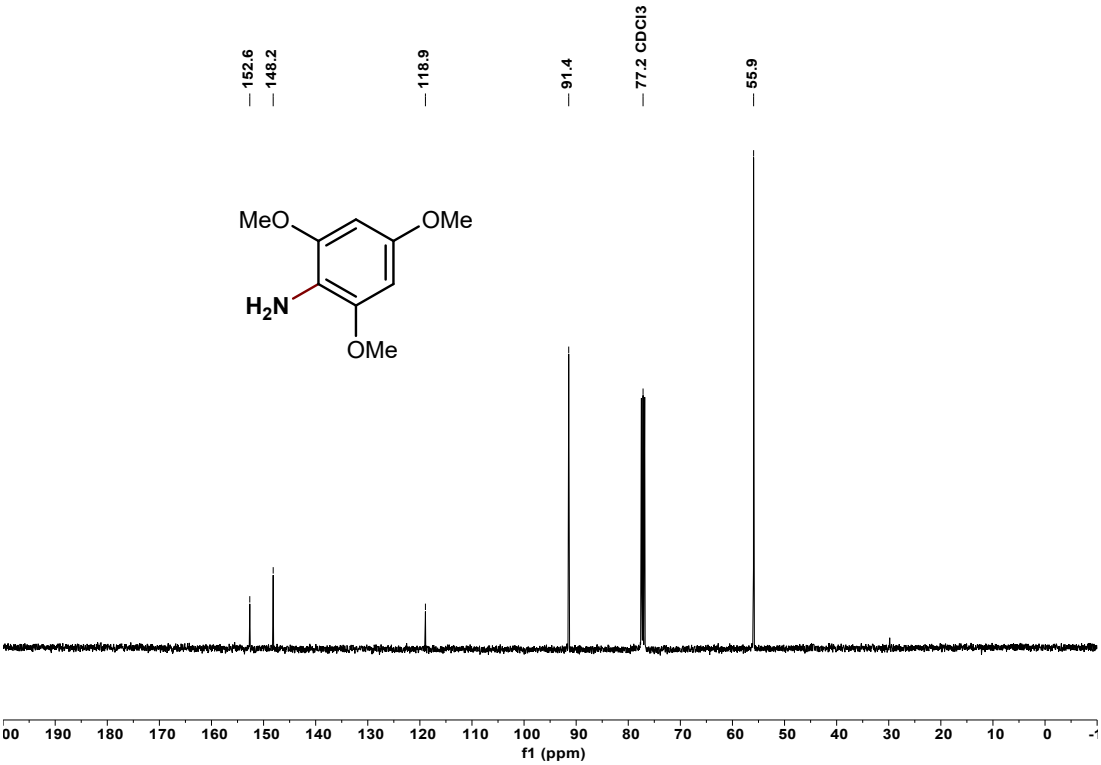


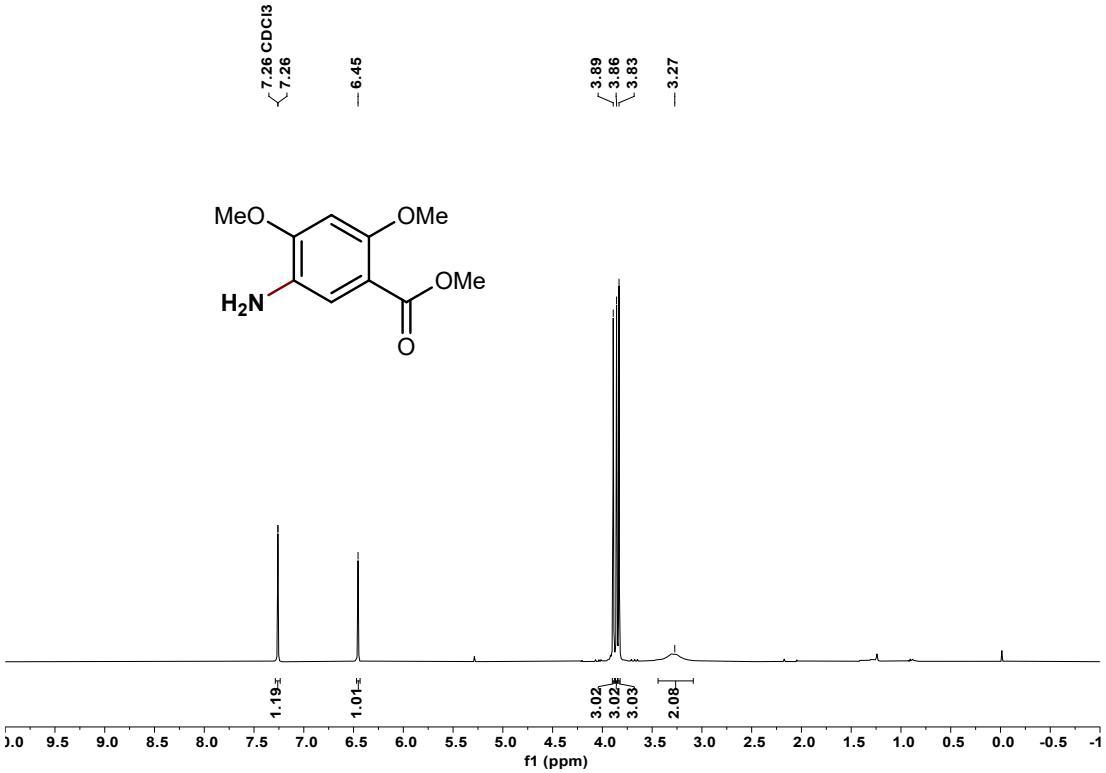
^{1}H NMR (400 MHz, $CDCl_3$)



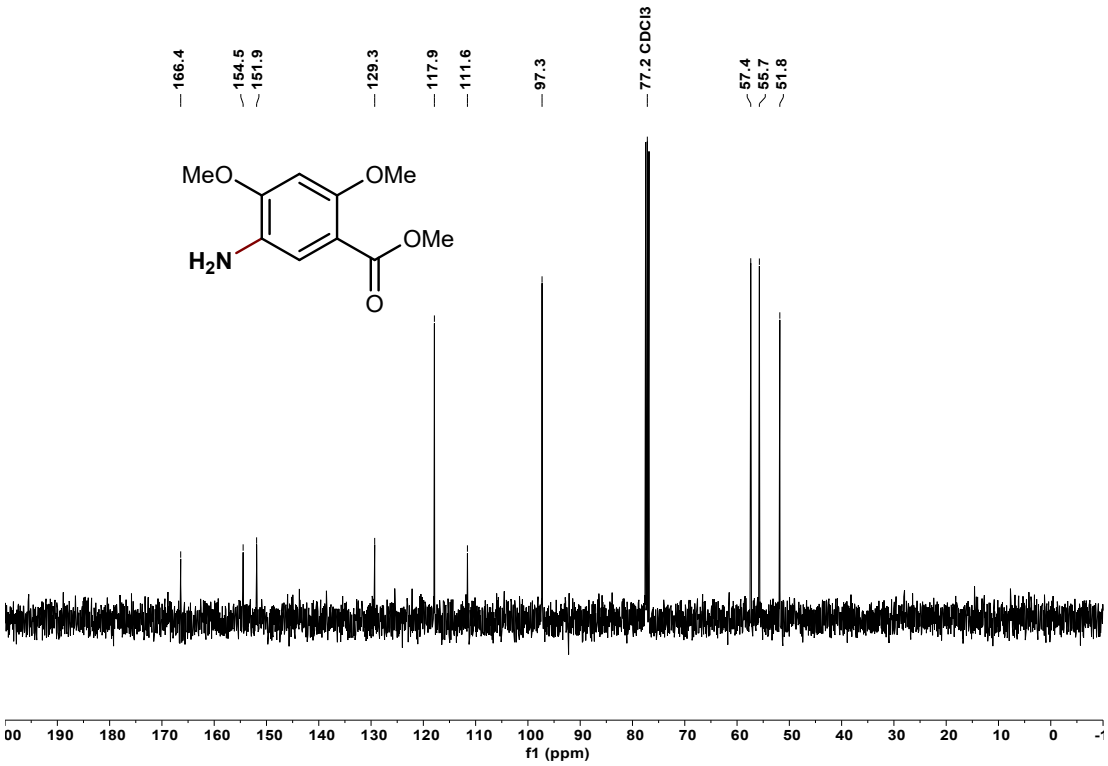
^{13}C NMR (101 MHz, $CDCl_3$)



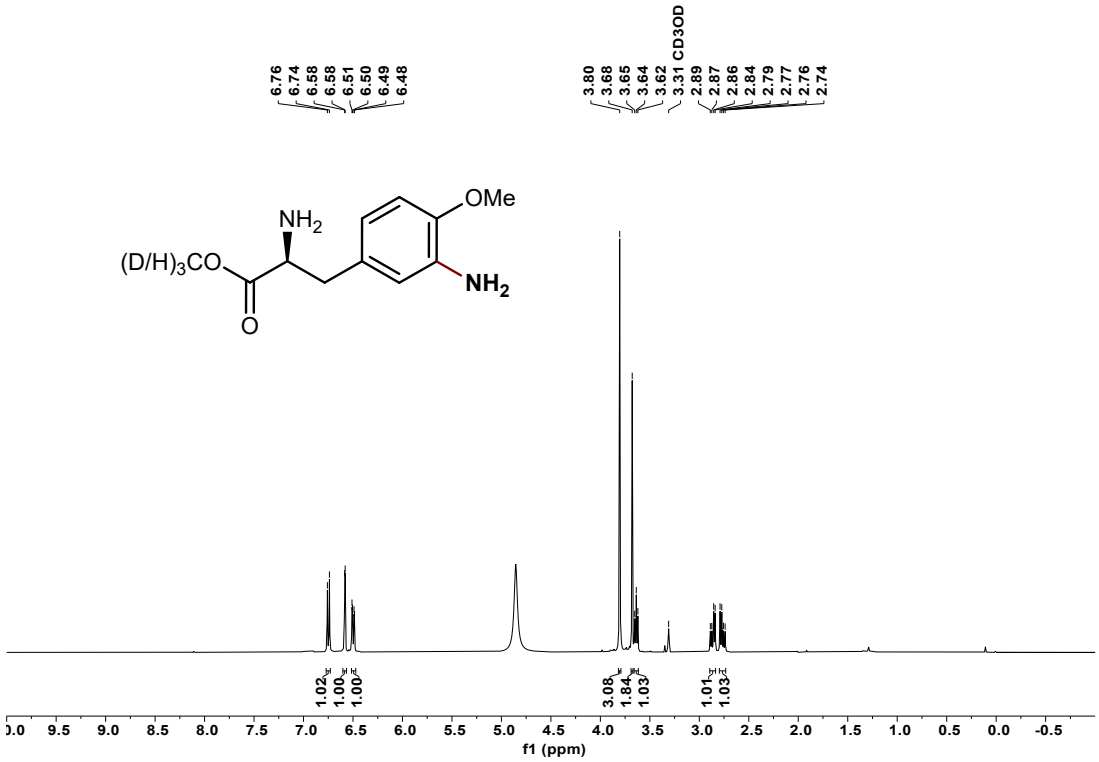
^{1}H NMR (400 MHz, $CDCl_3$)



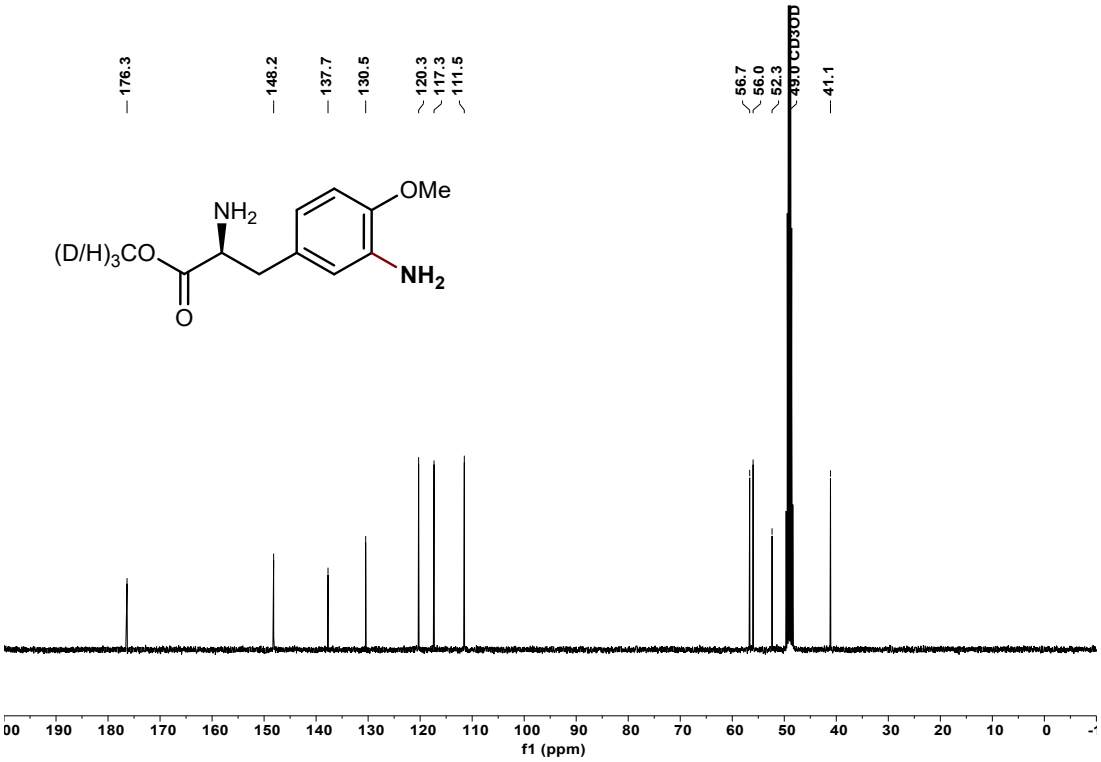
^{13}C NMR (101 MHz, $CDCl_3$)



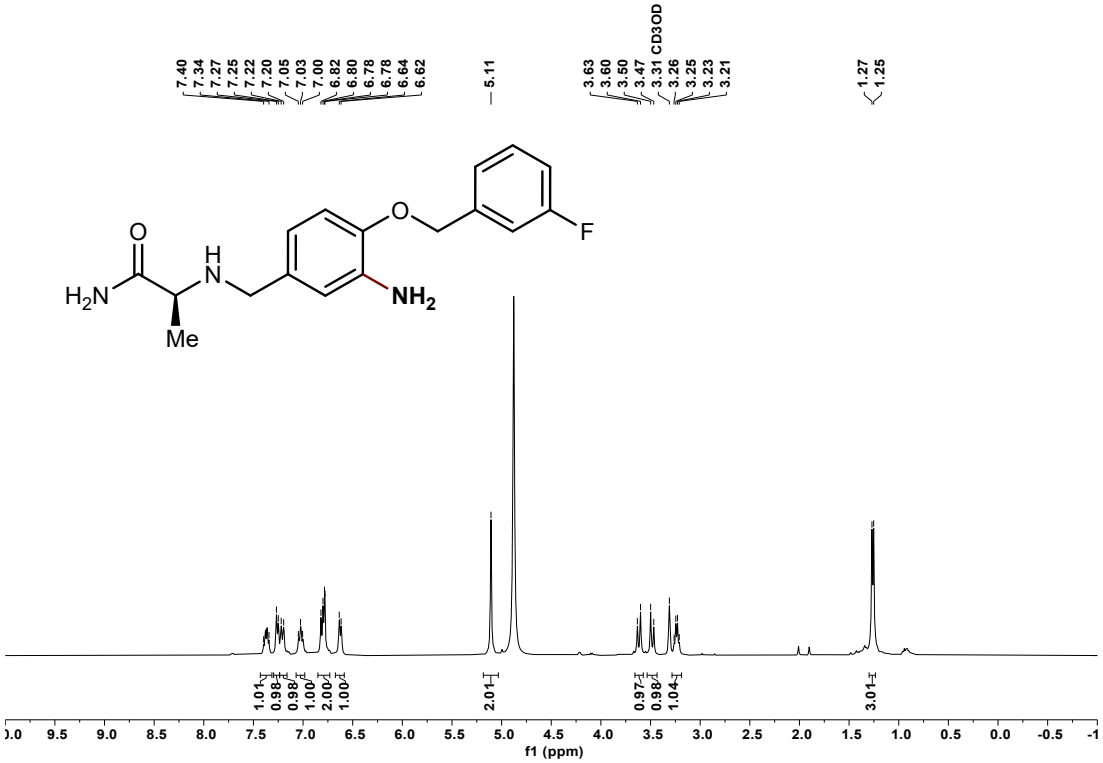
^{1}H NMR (400 MHz, CD_3OD)



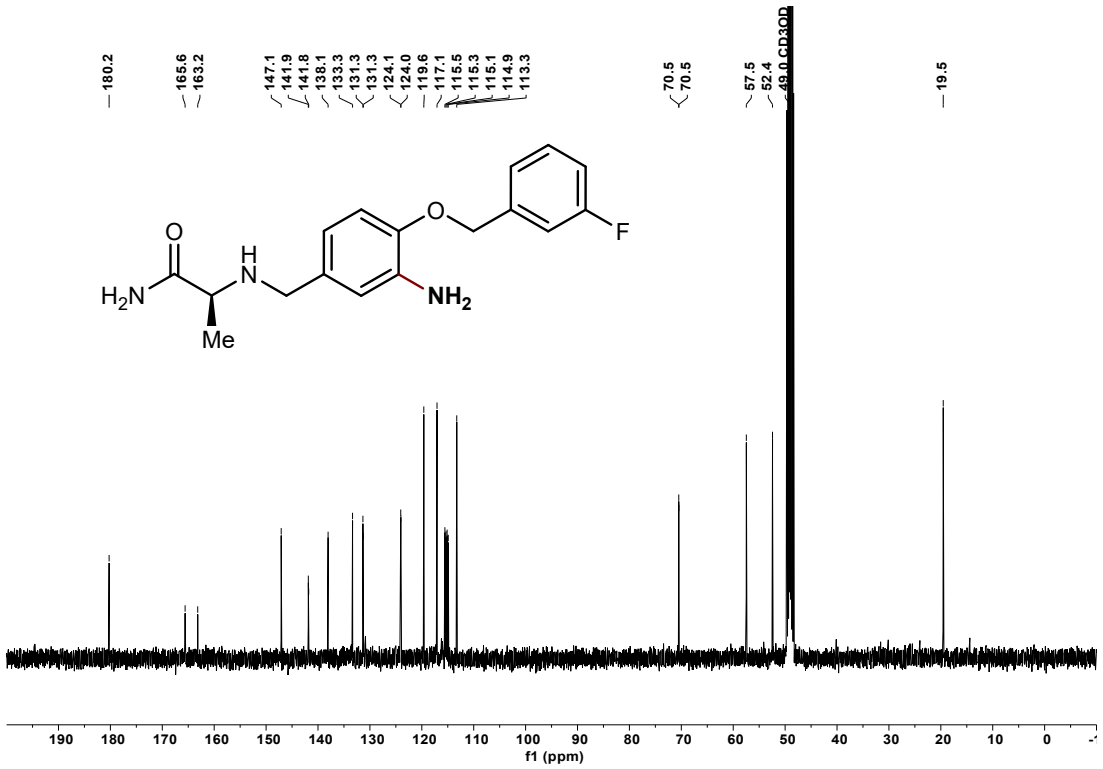
^{13}C NMR (101 MHz, CD_3OD)



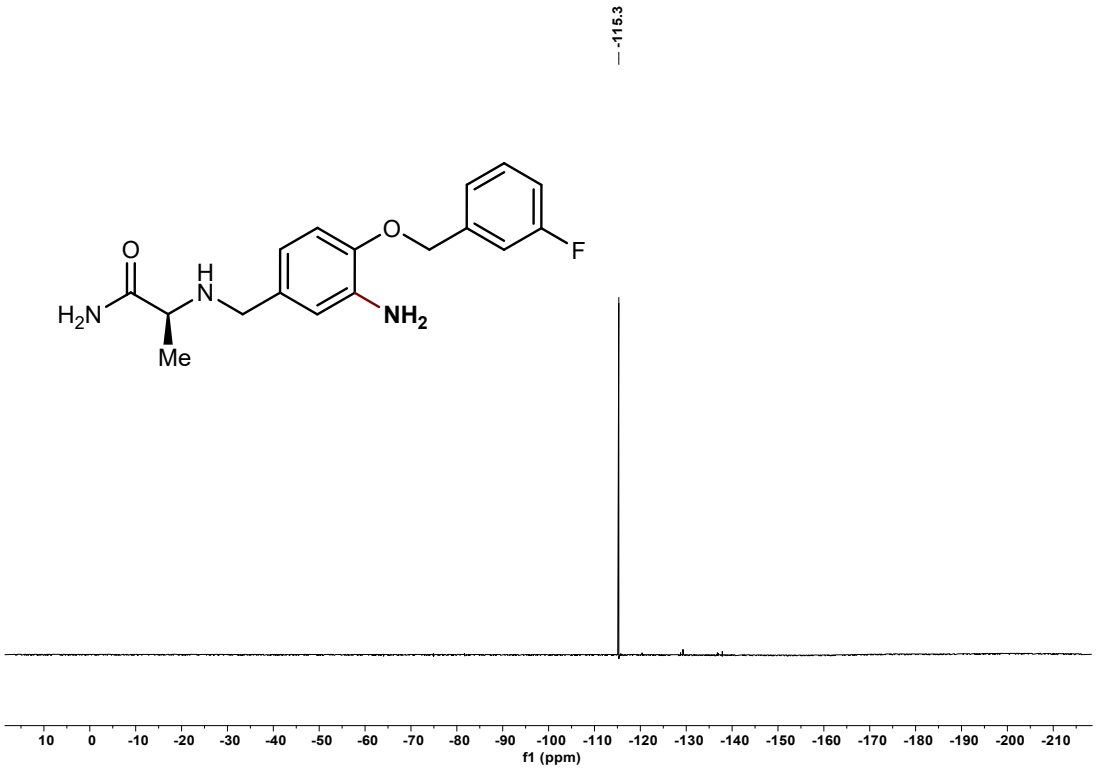
^{1}H NMR (400 MHz, CD_3OD)



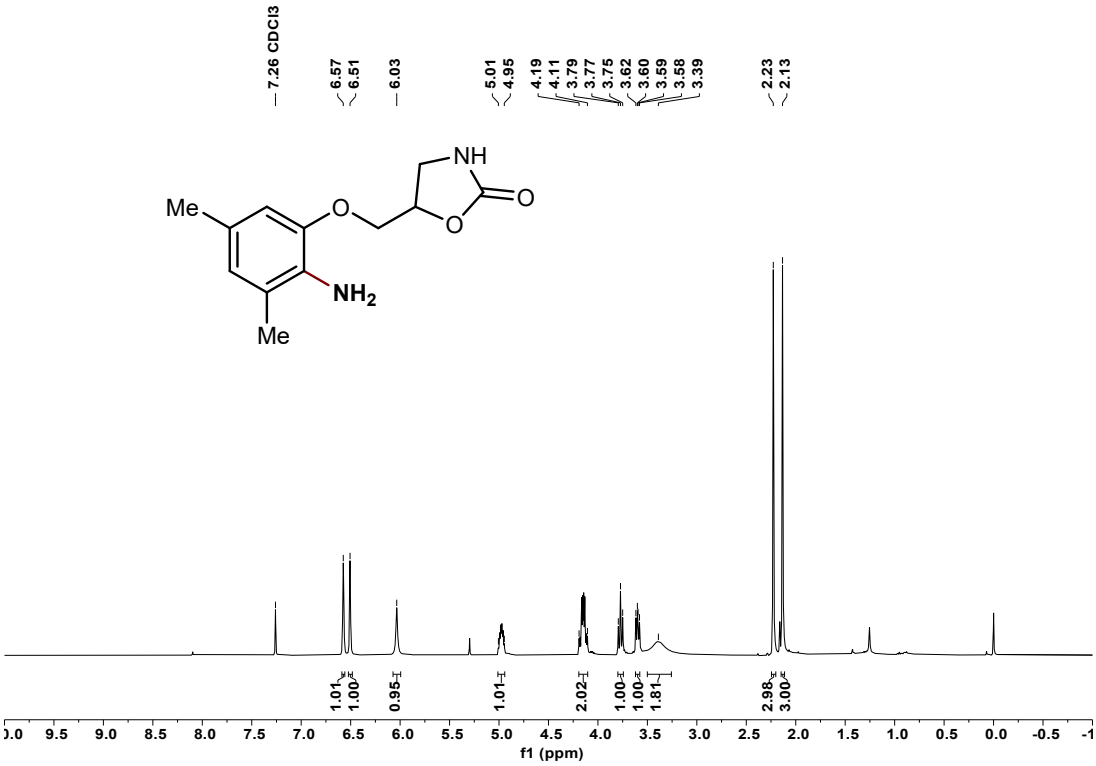
^{13}C NMR (101 MHz, CD_3OD)



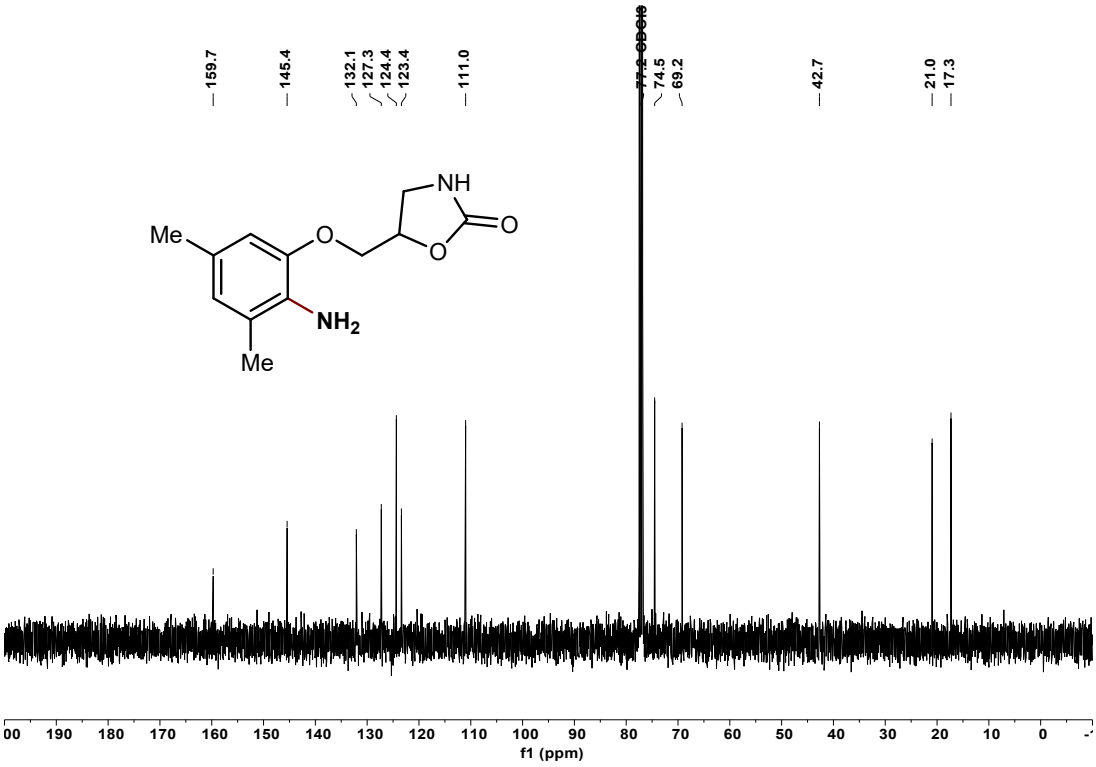
^{19}F NMR (376 MHz, CD_3OD)



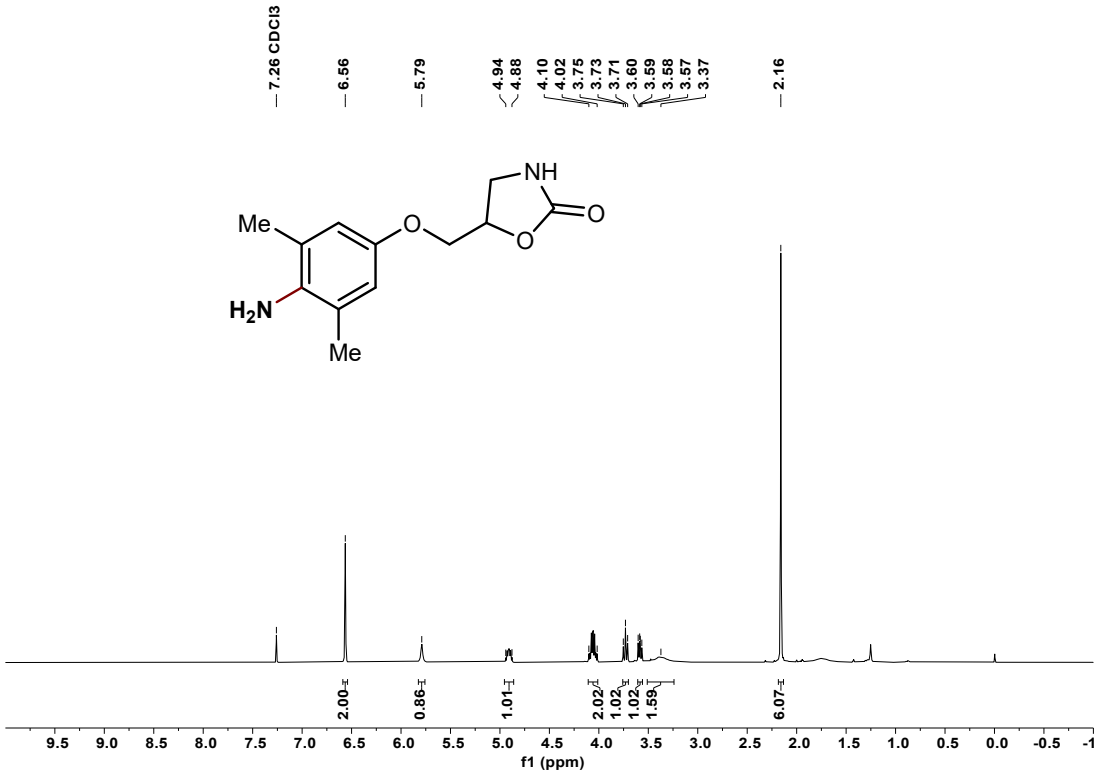
^{1}H NMR (400 MHz, $CDCl_3$)



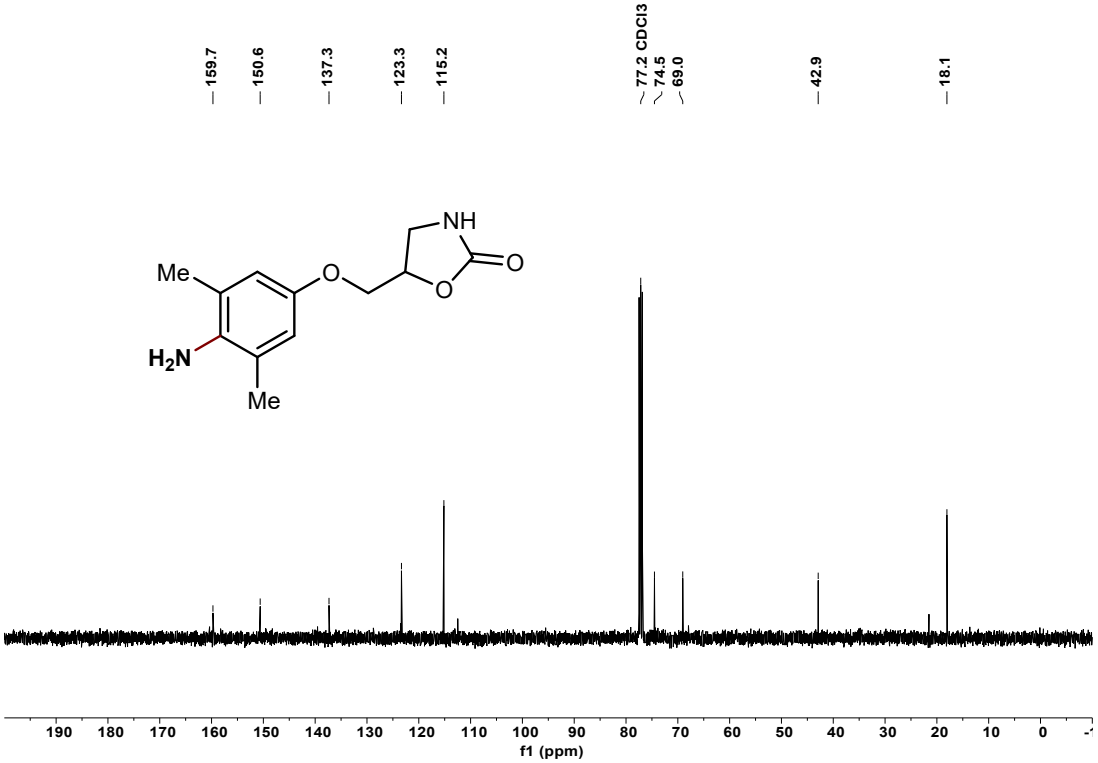
^{13}C NMR (101 MHz, $CDCl_3$)



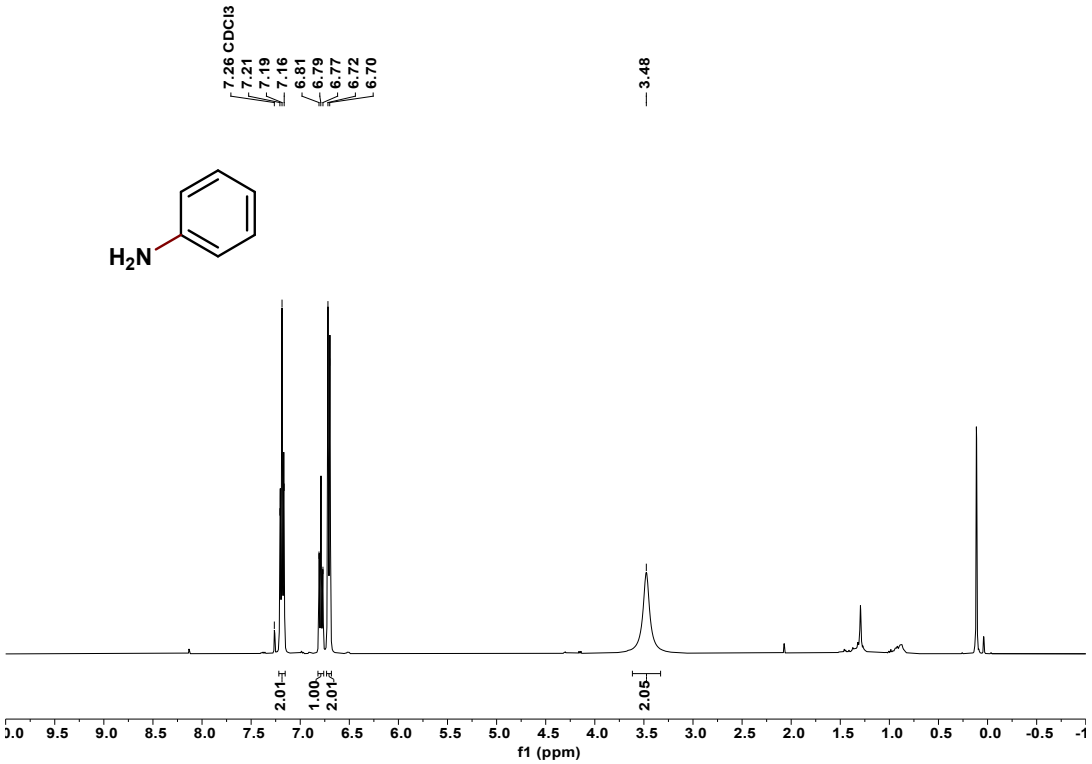
^{1}H NMR (400 MHz, $CDCl_3$)



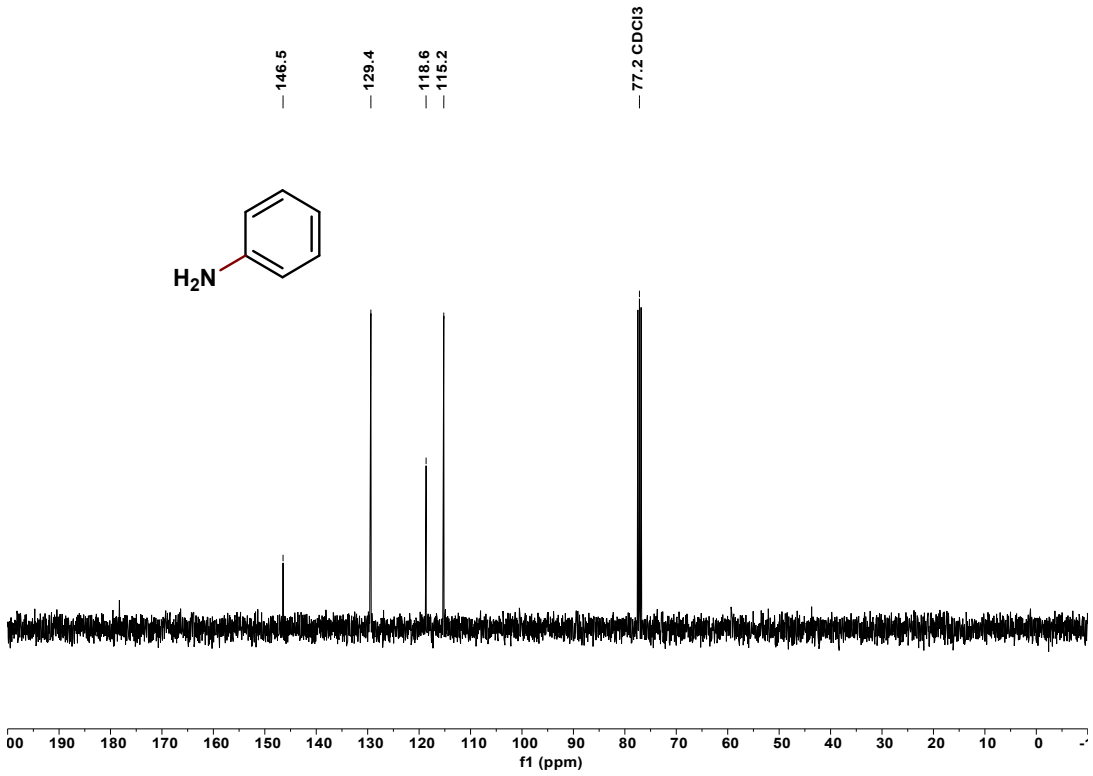
^{13}C NMR (101 MHz, $CDCl_3$)



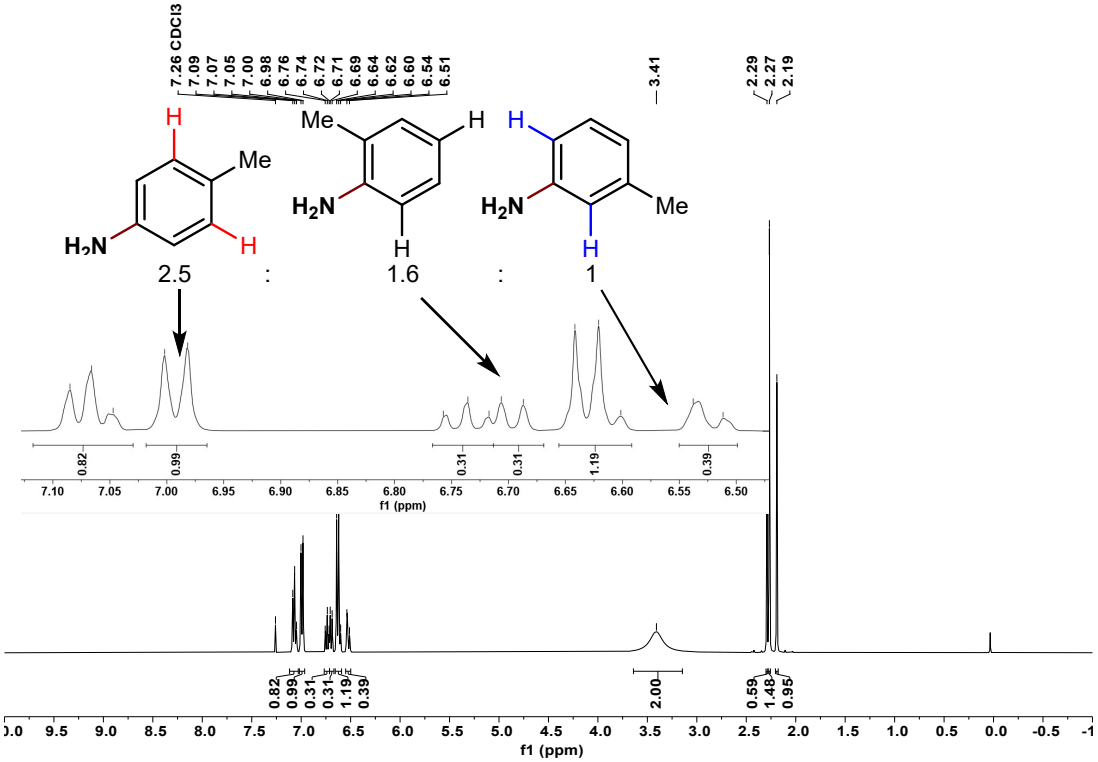
^{1}H NMR (400 MHz, $CDCl_3$)



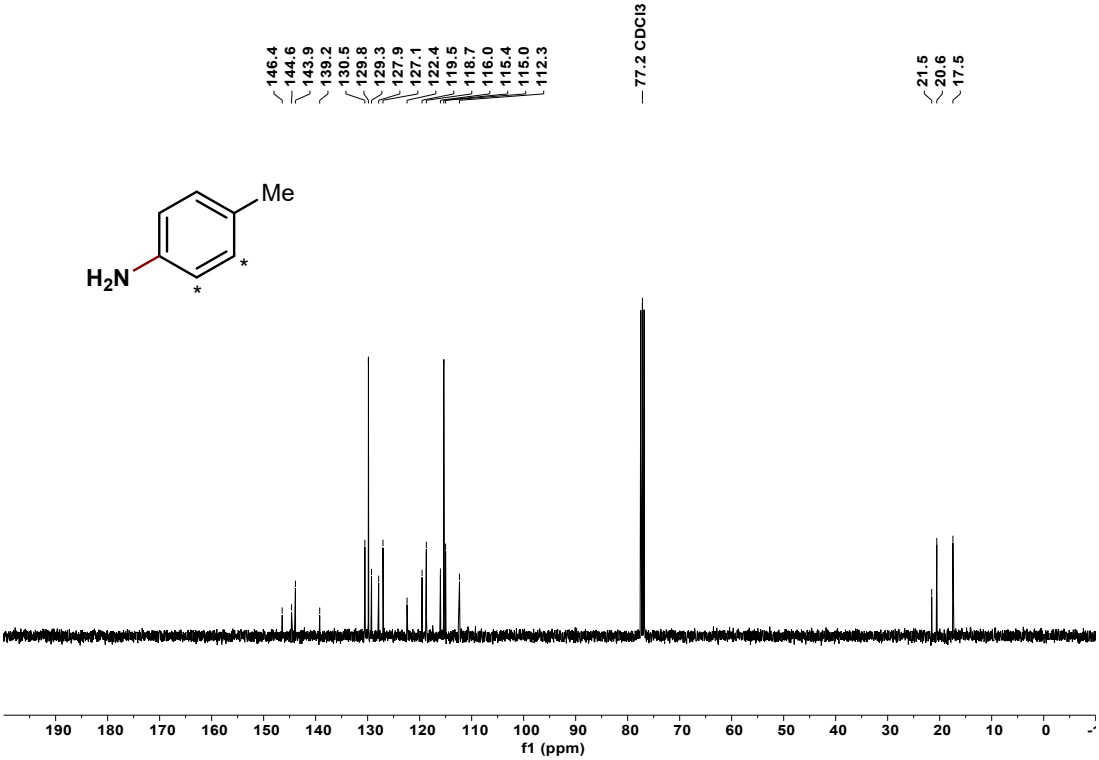
^{13}C NMR (101 MHz, $CDCl_3$)



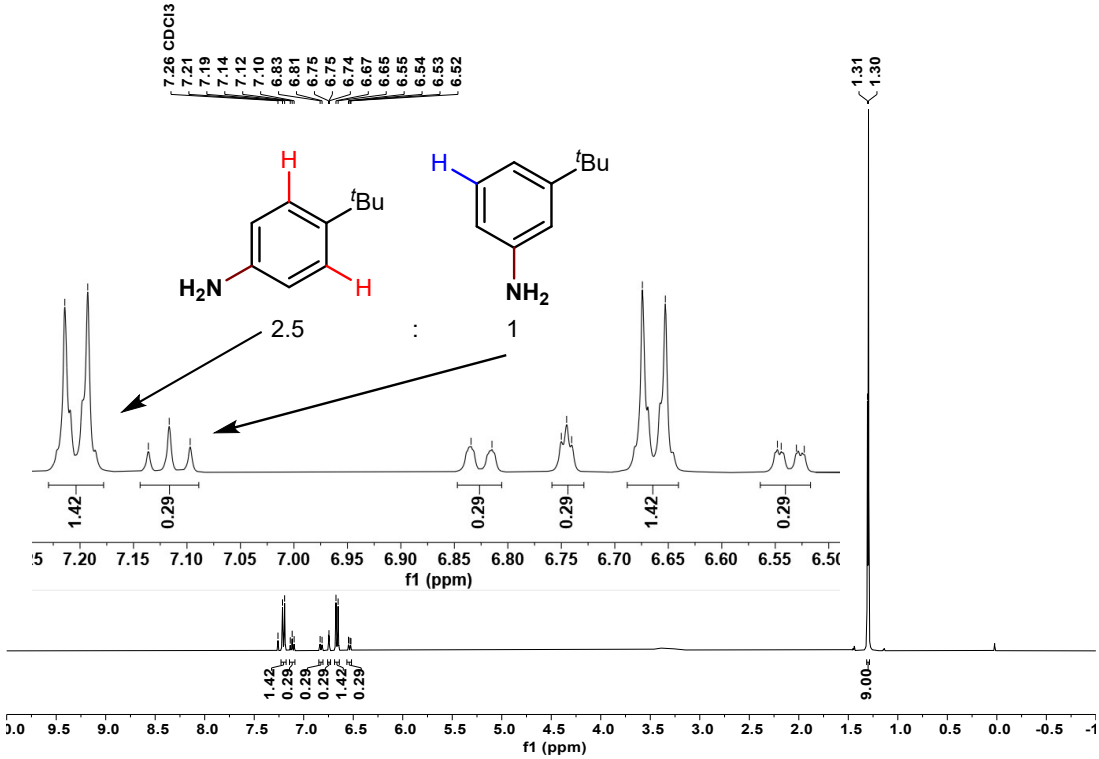
^{1}H NMR (400 MHz, $CDCl_3$)



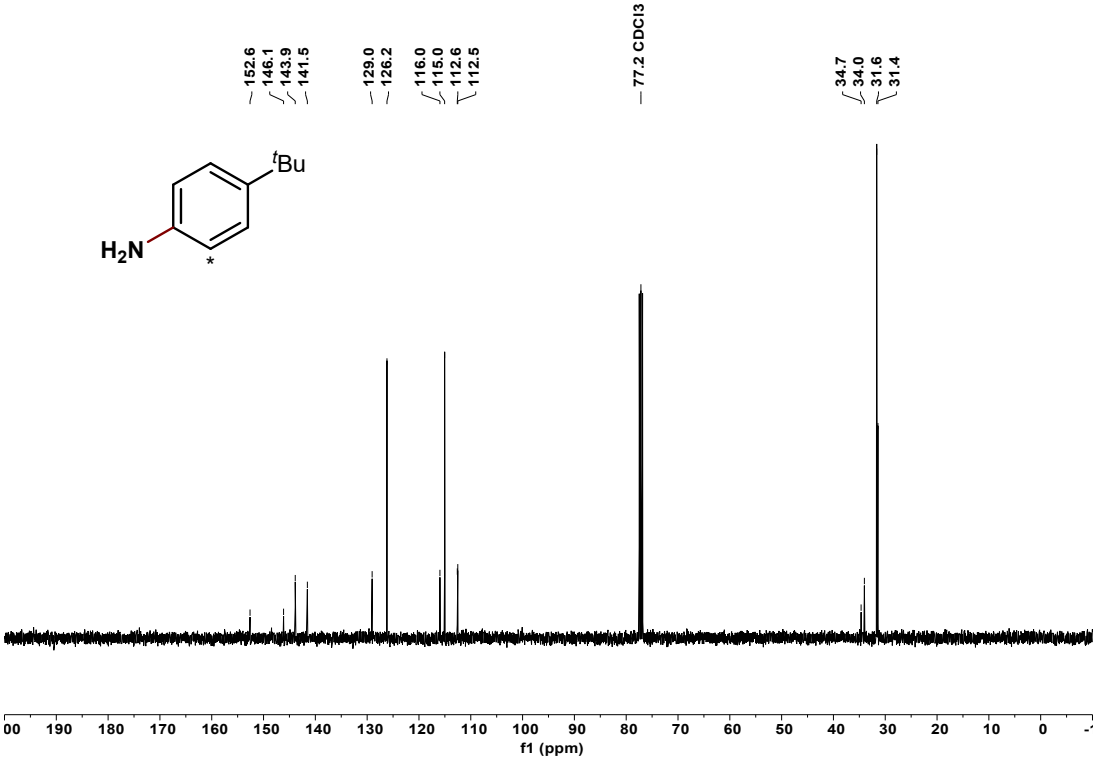
^{13}C NMR (101 MHz, $CDCl_3$)



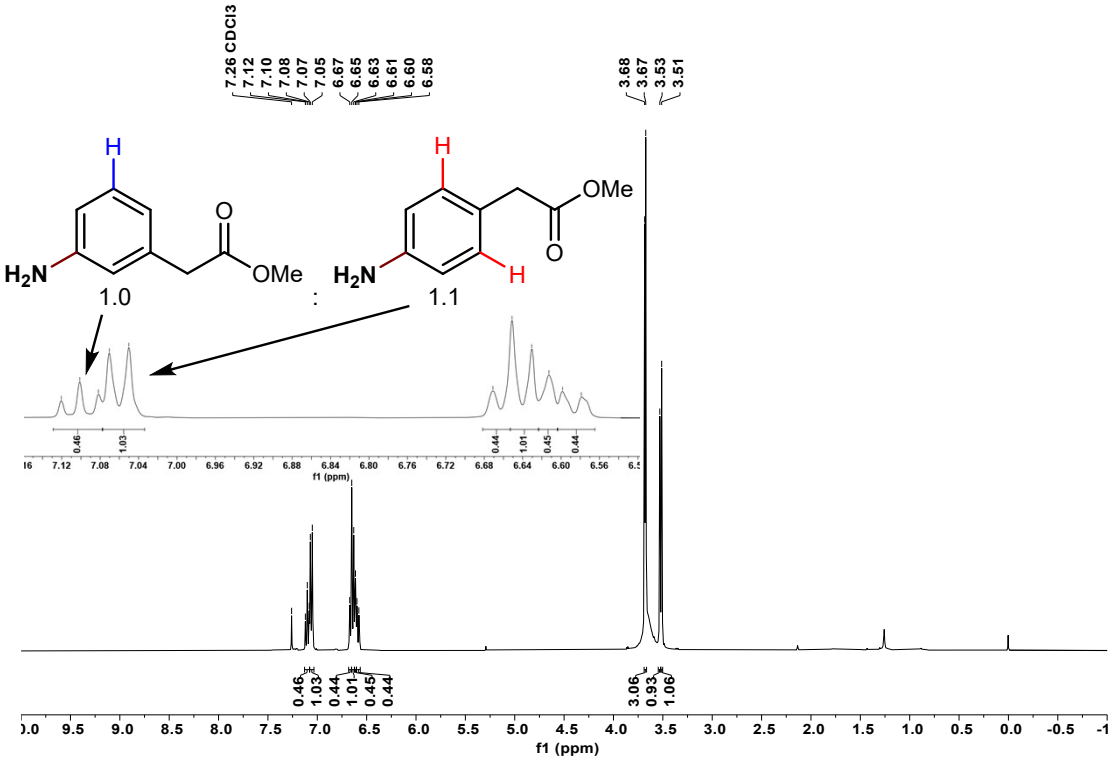
^{1}H NMR (400 MHz, $CDCl_3$)



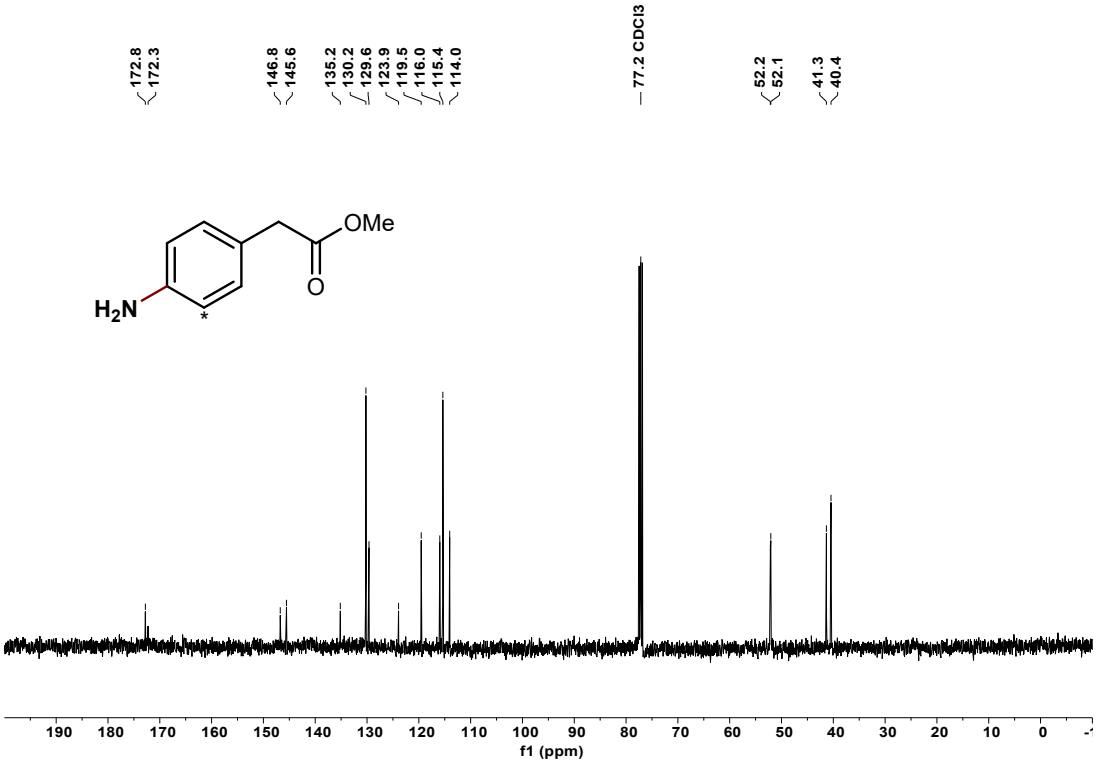
^{13}C NMR (101 MHz, $CDCl_3$)



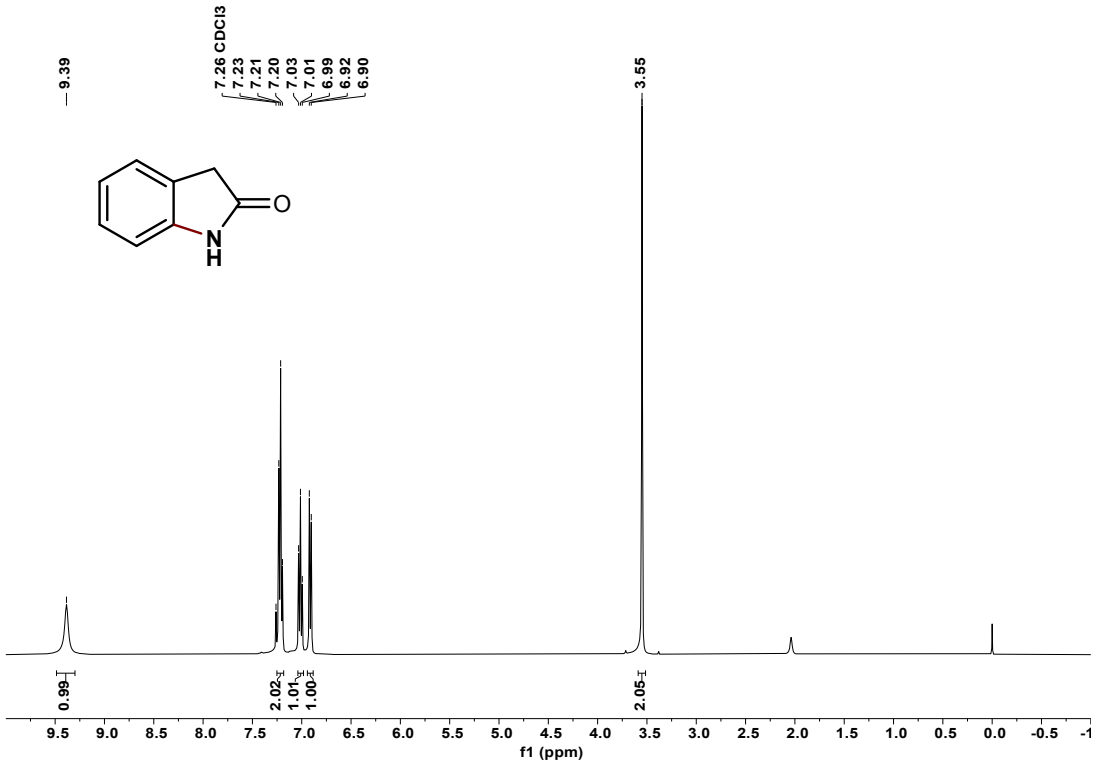
^{1}H NMR (400 MHz, $CDCl_3$)



^{13}C NMR (101 MHz, $CDCl_3$)



^{1}H NMR (400 MHz, $CDCl_3$)



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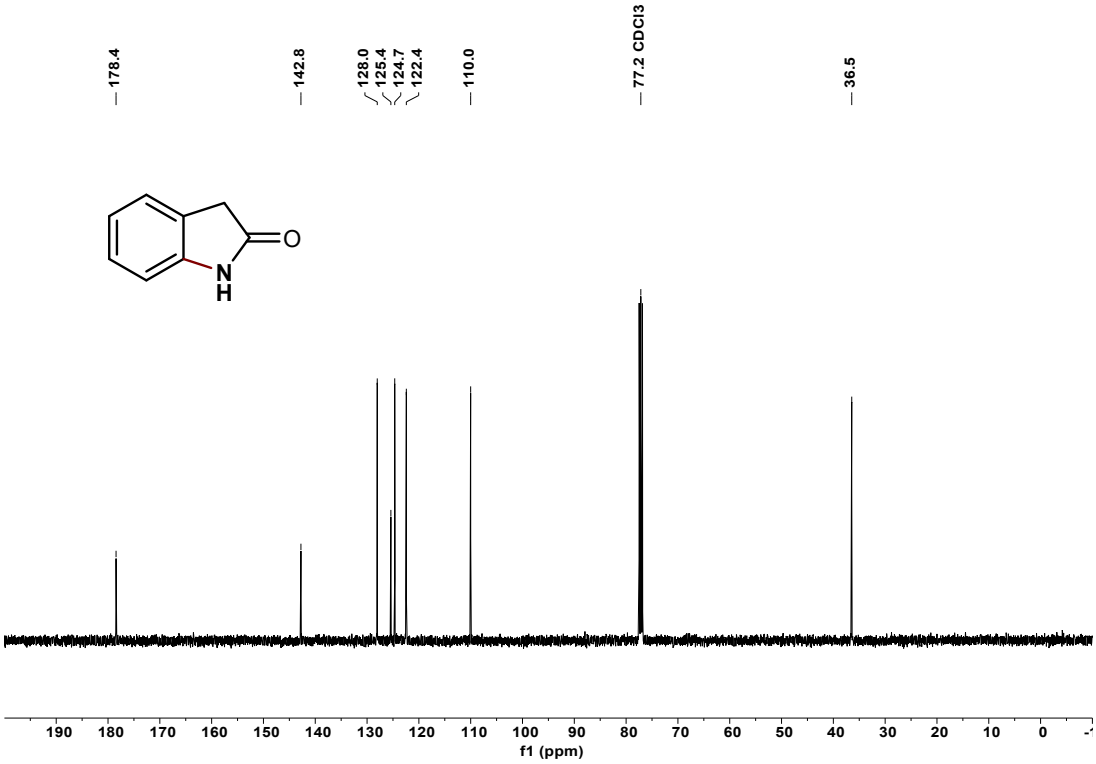

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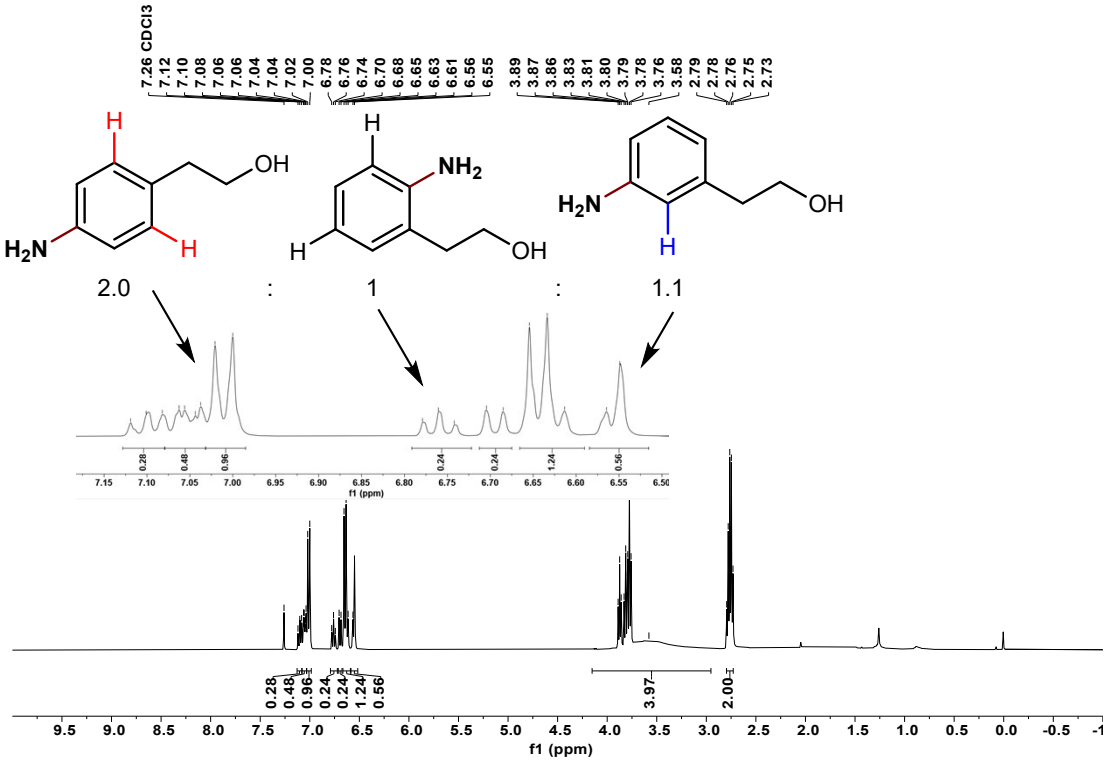

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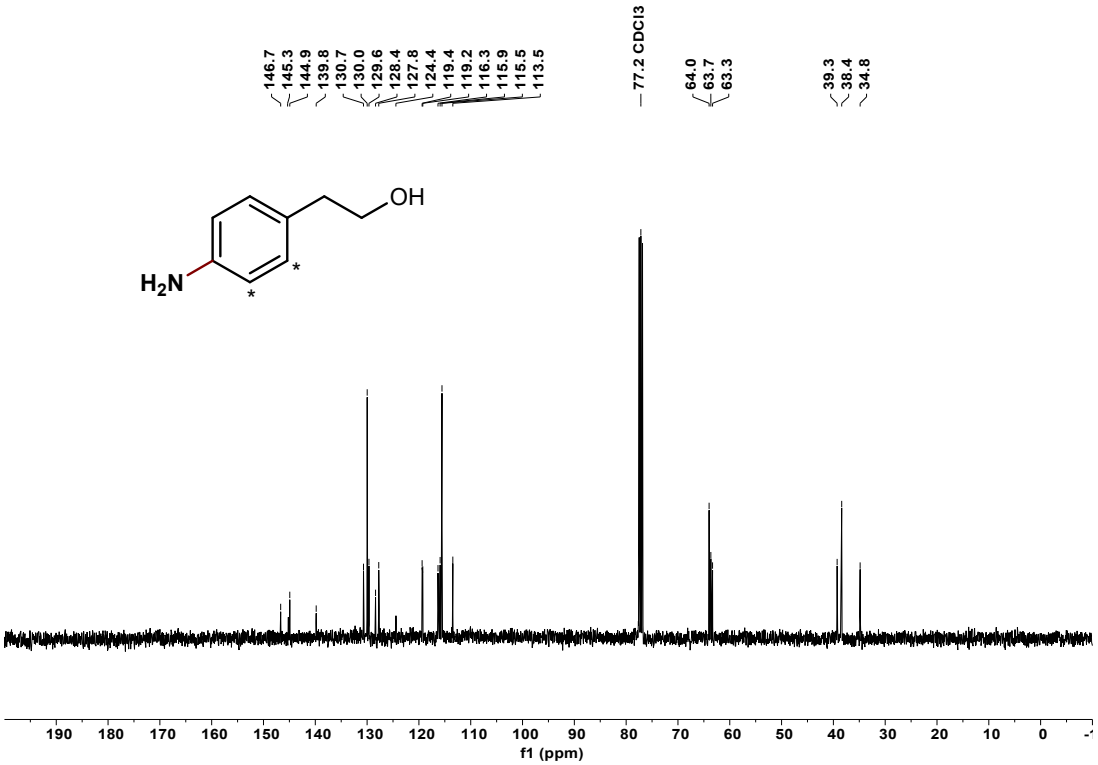

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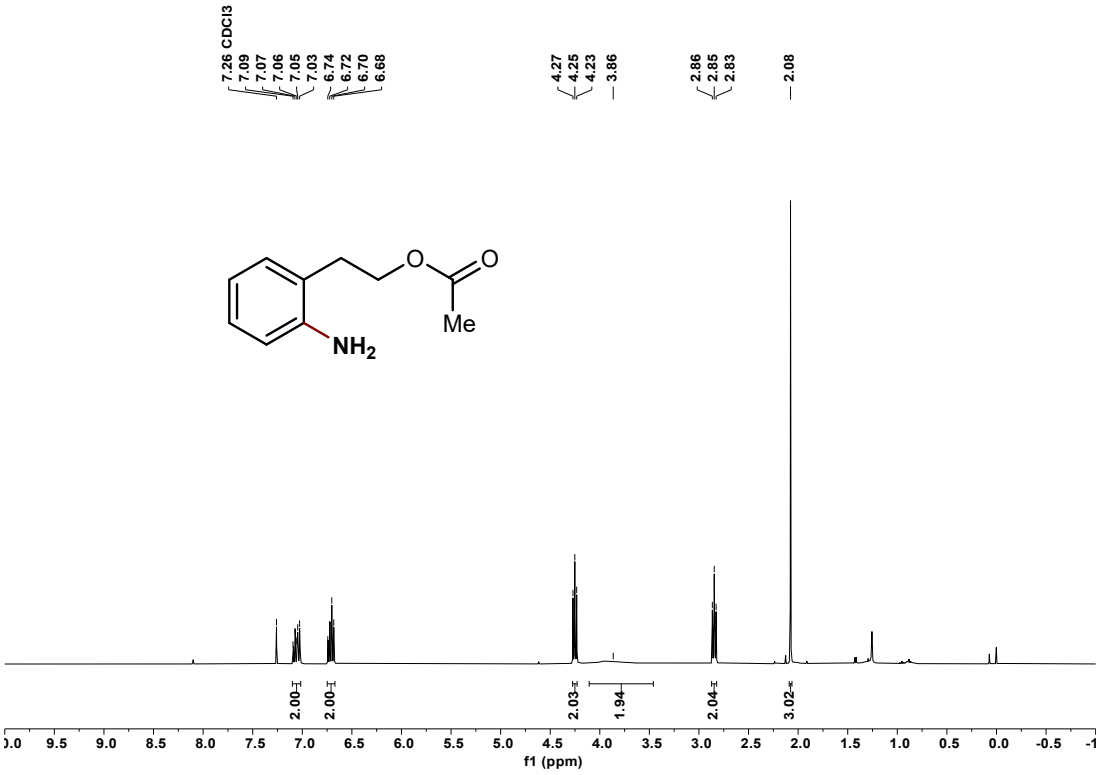
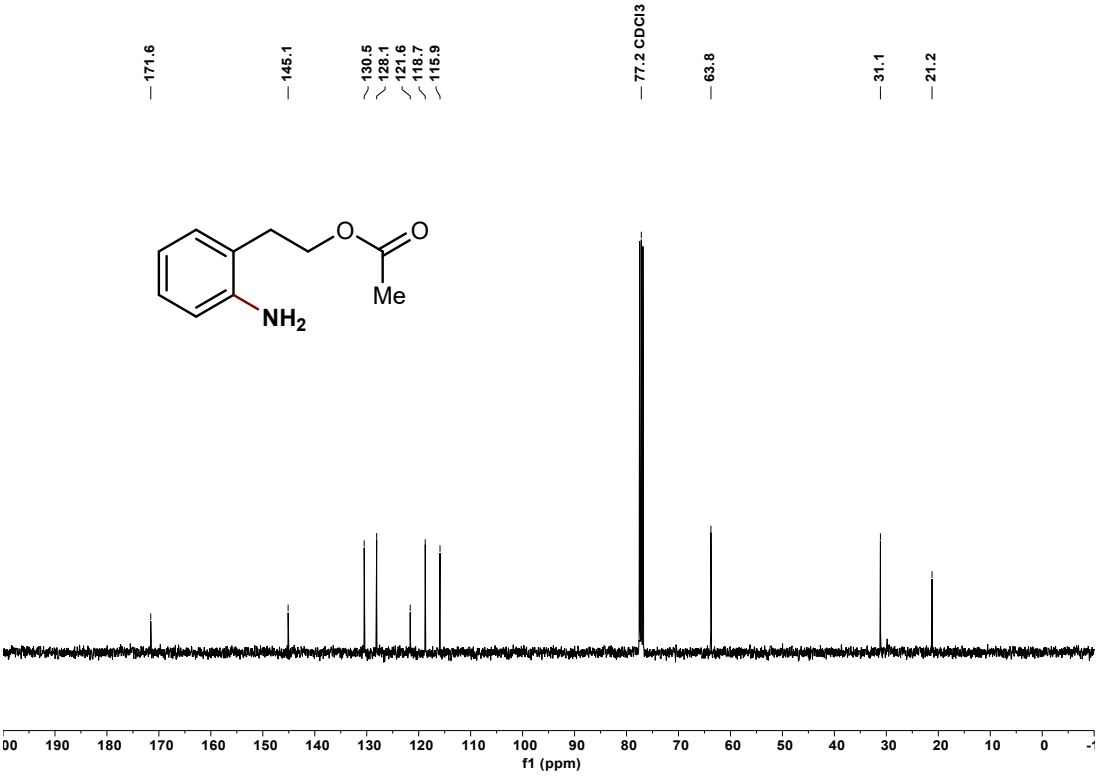
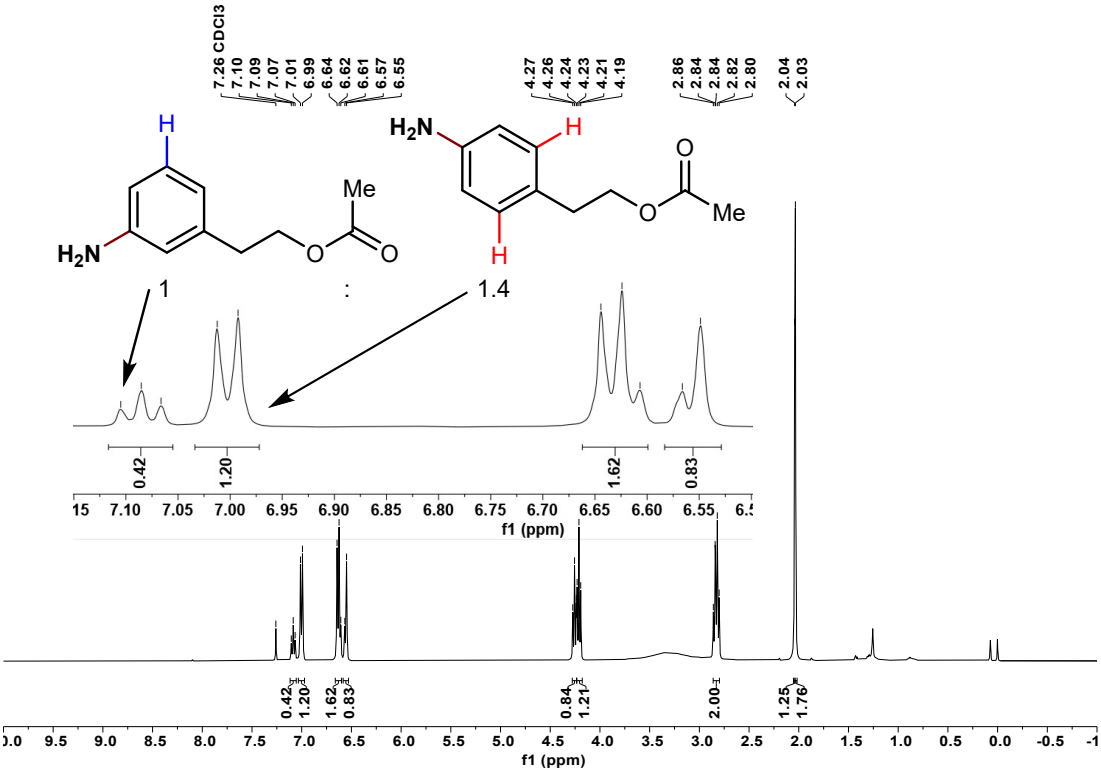


^{13}C NMR (101 MHz, $CDCl_3$)



^{1}H NMR (400 MHz, $CDCl_3$)



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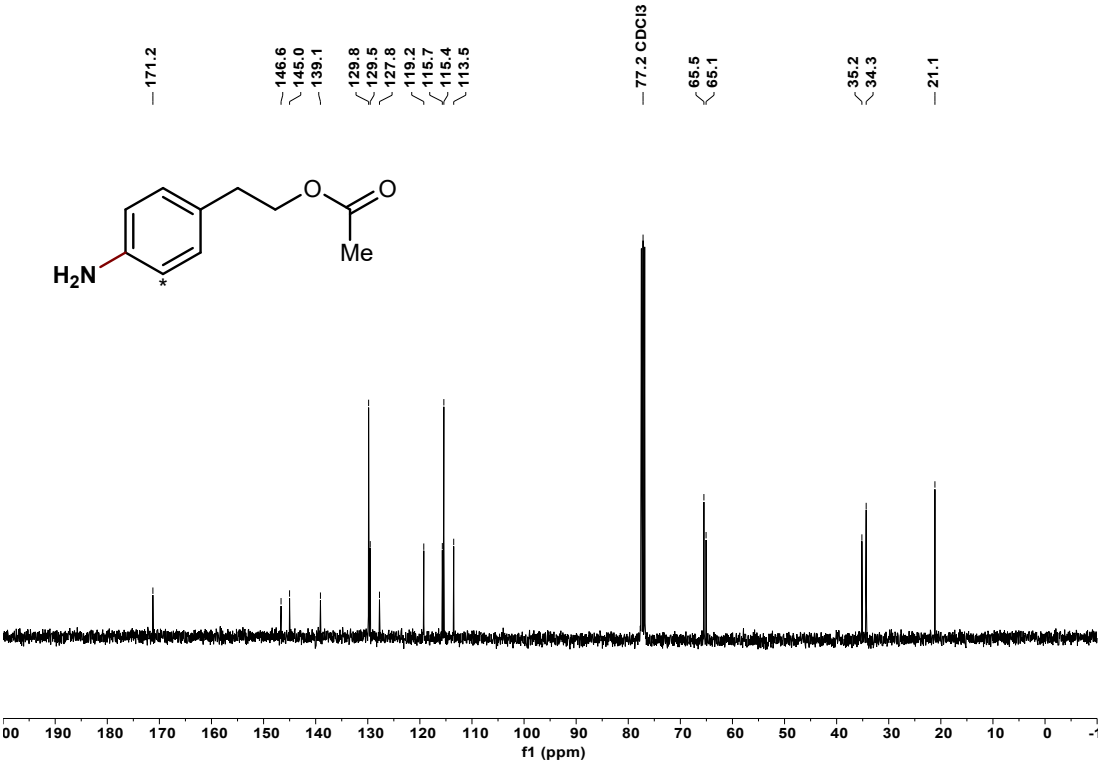

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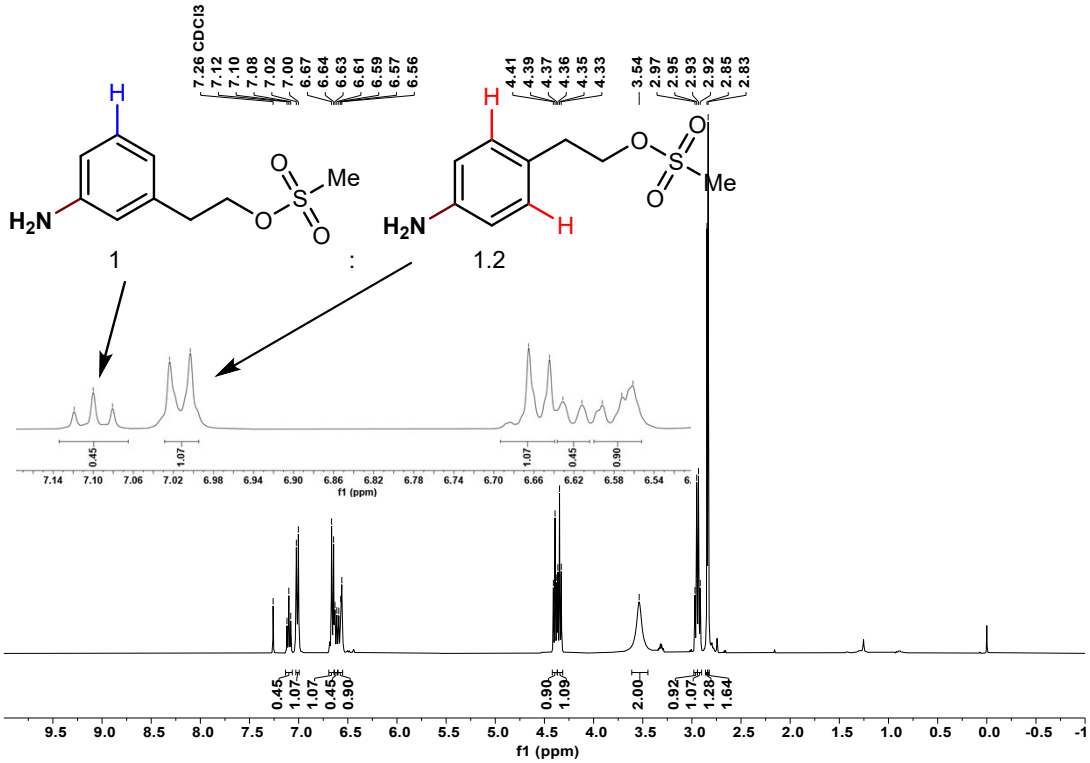

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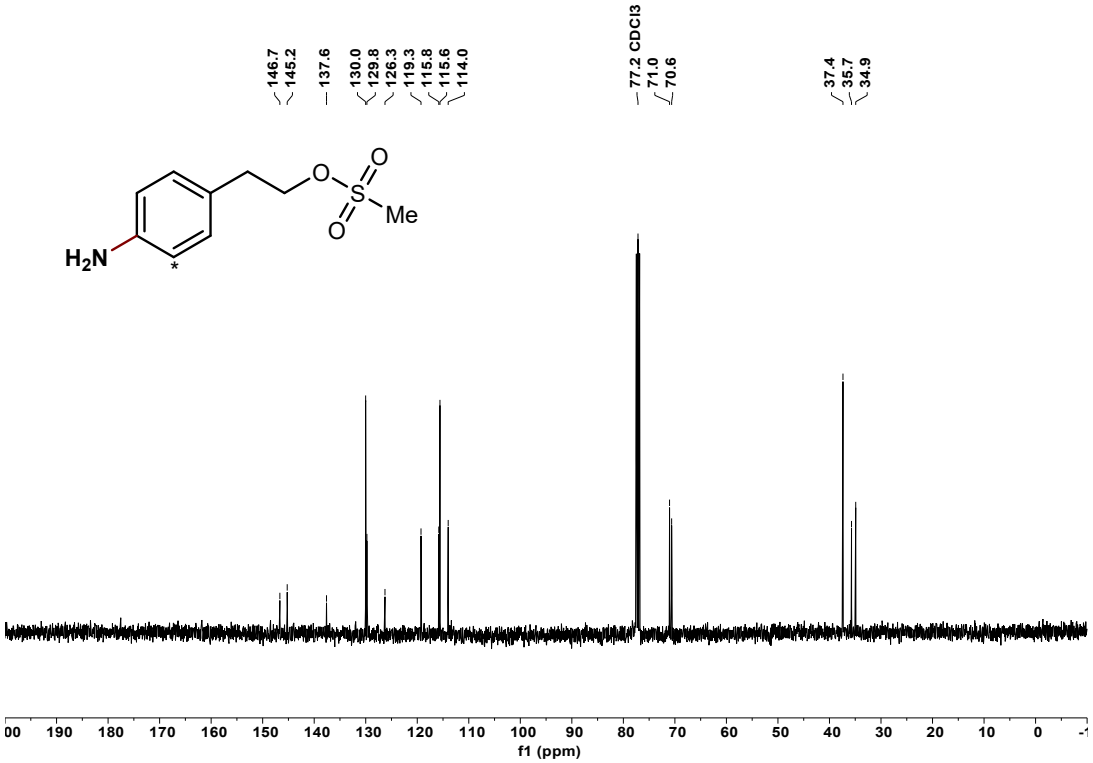

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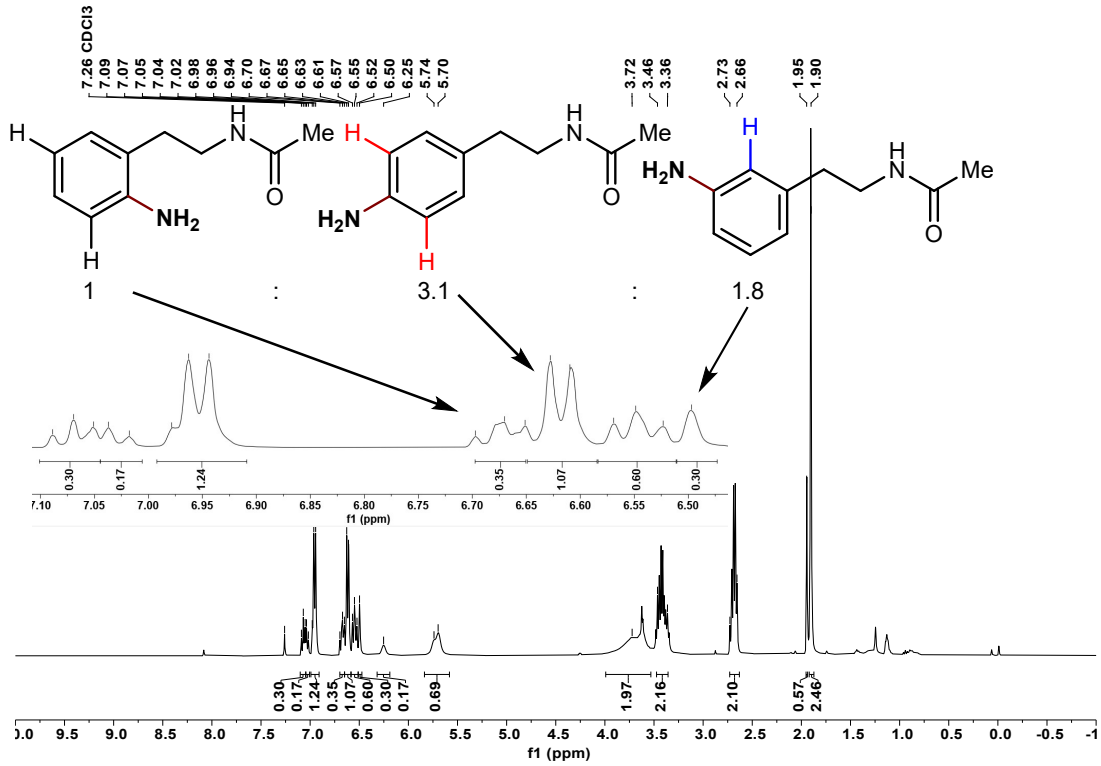
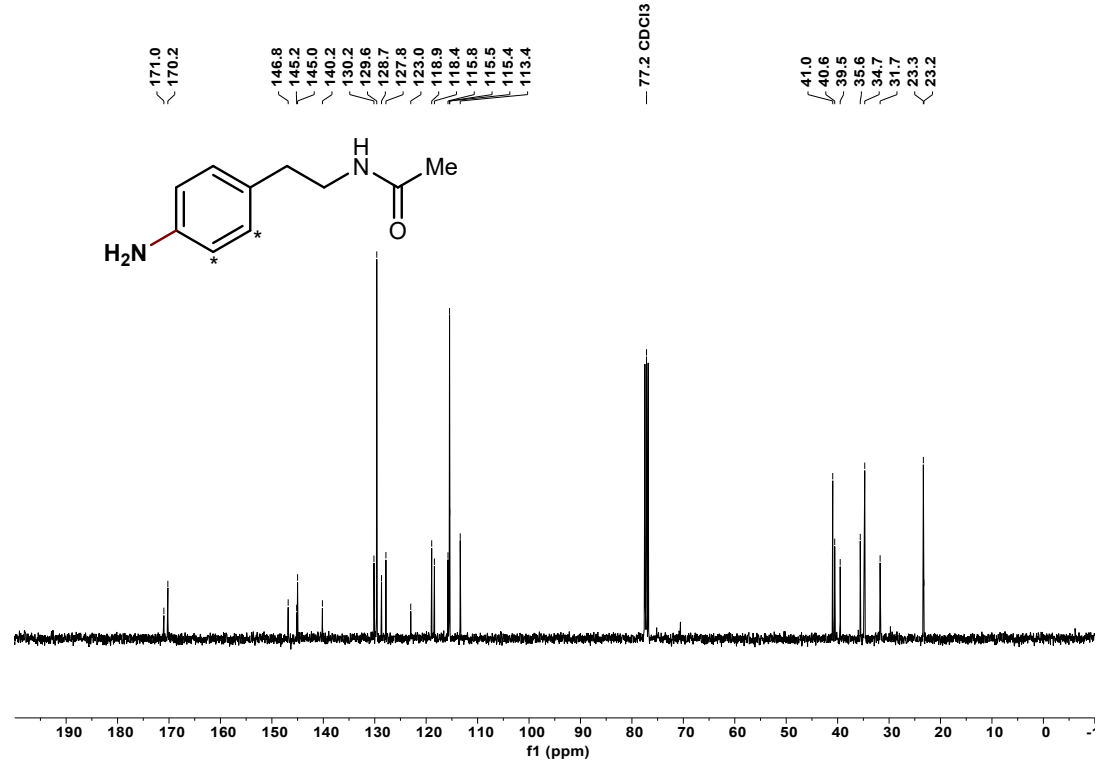


^{13}C NMR (101 MHz, $CDCl_3$)



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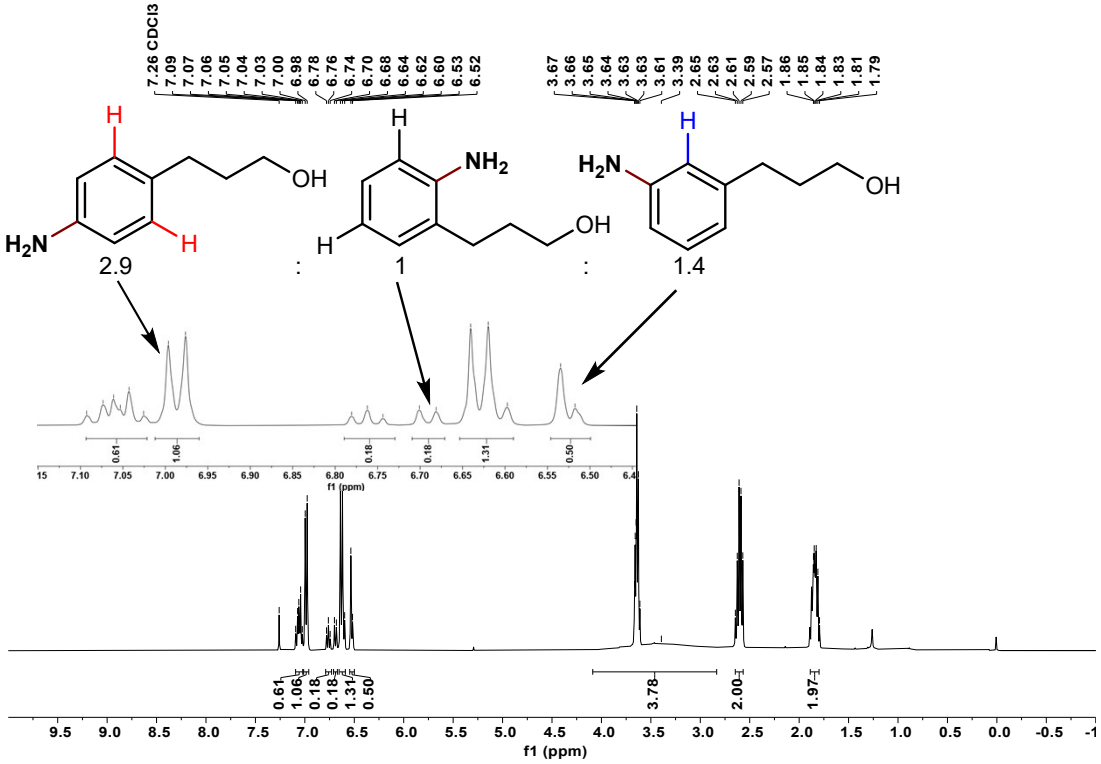

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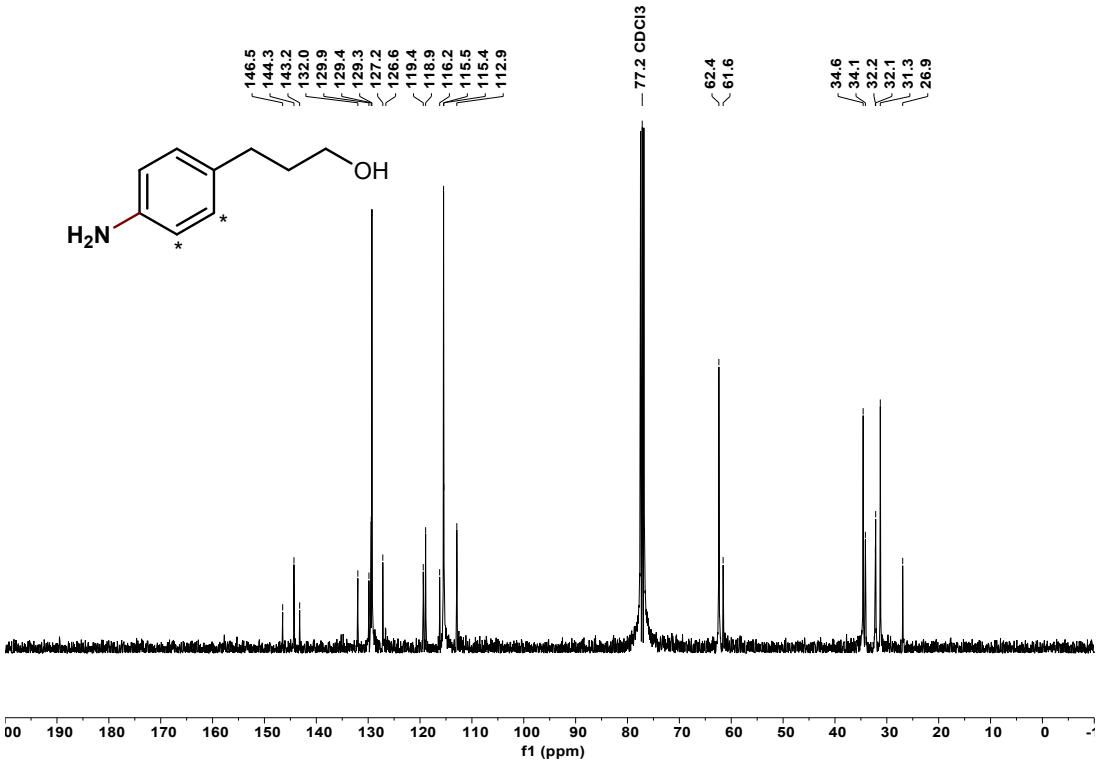

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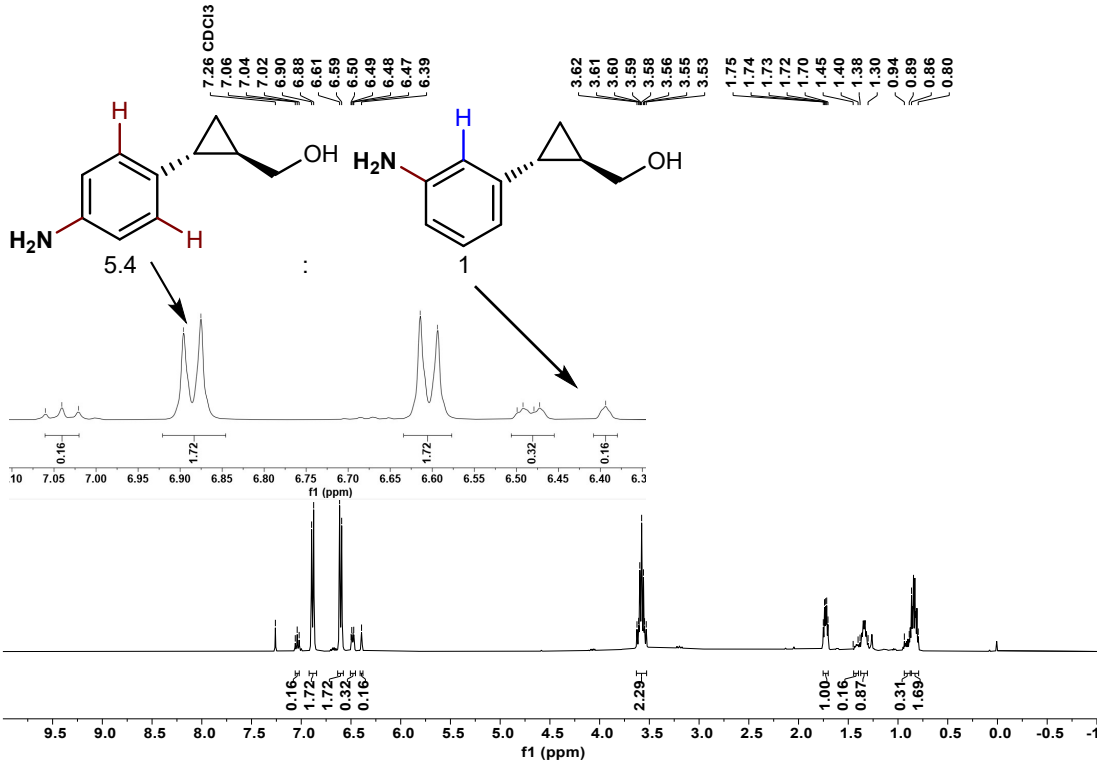

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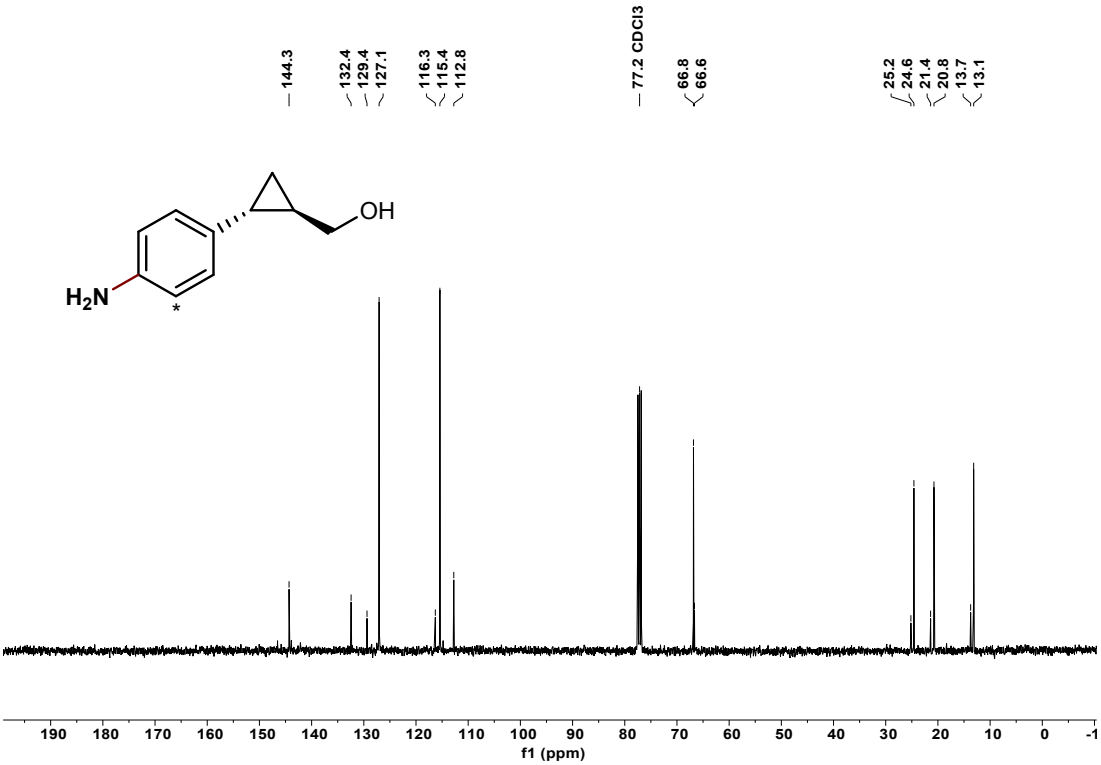

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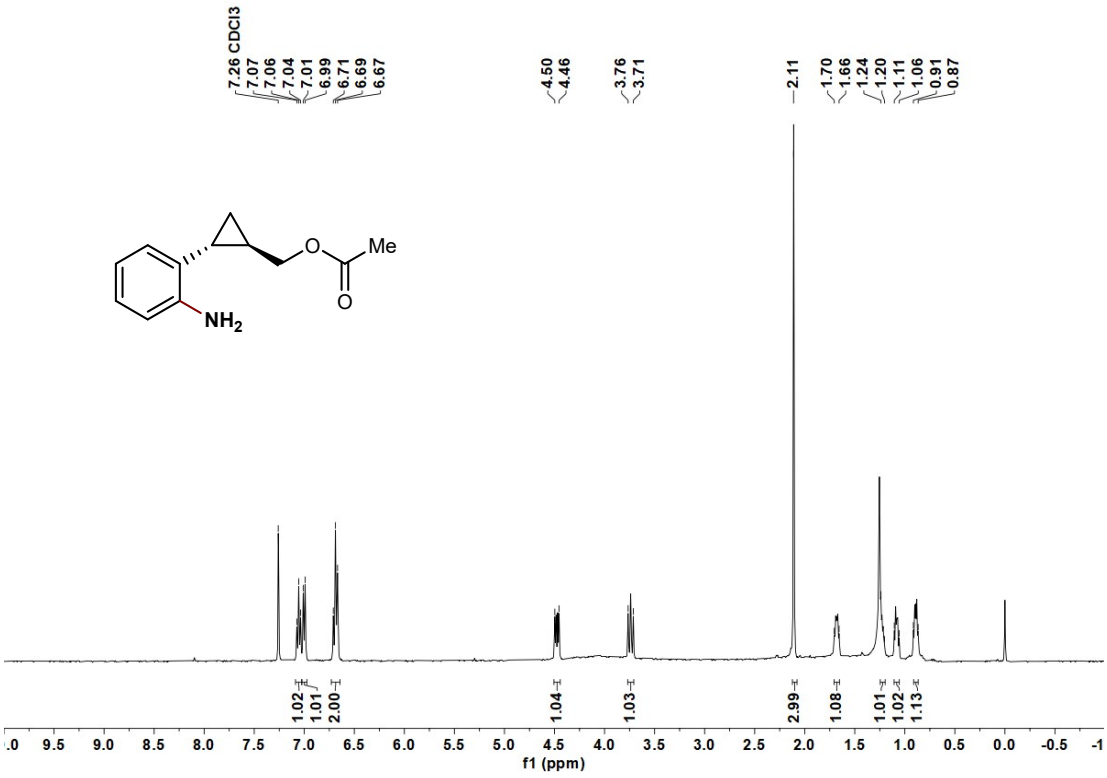

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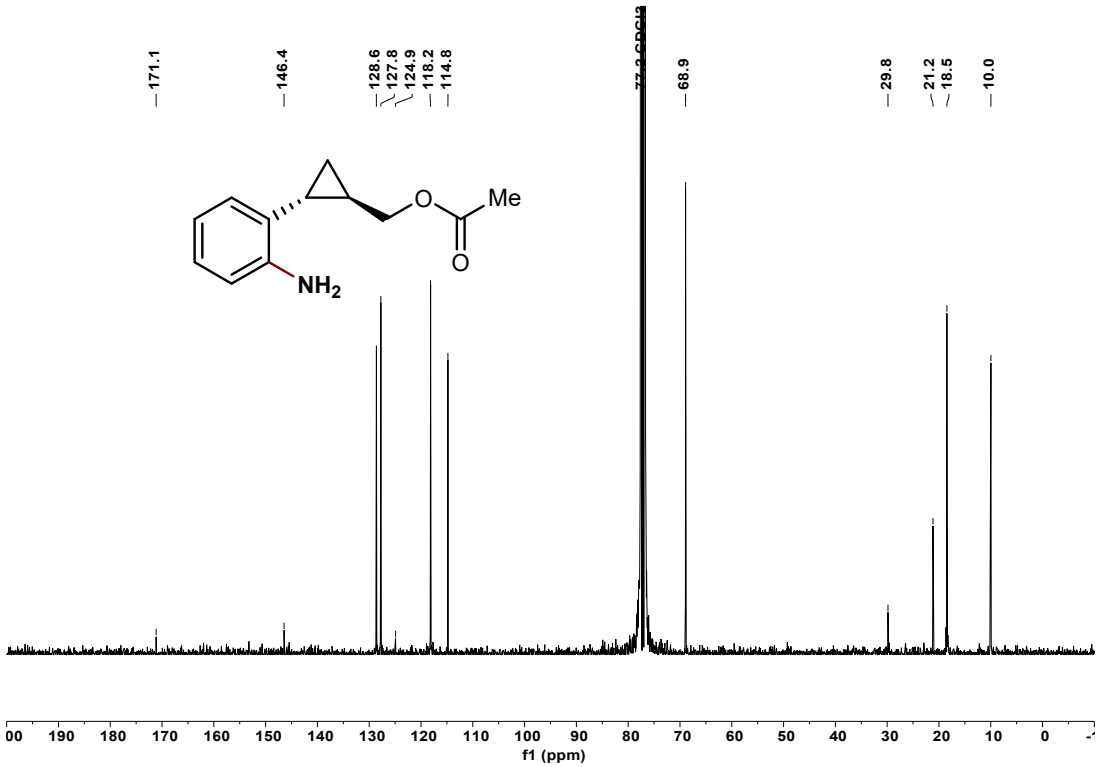

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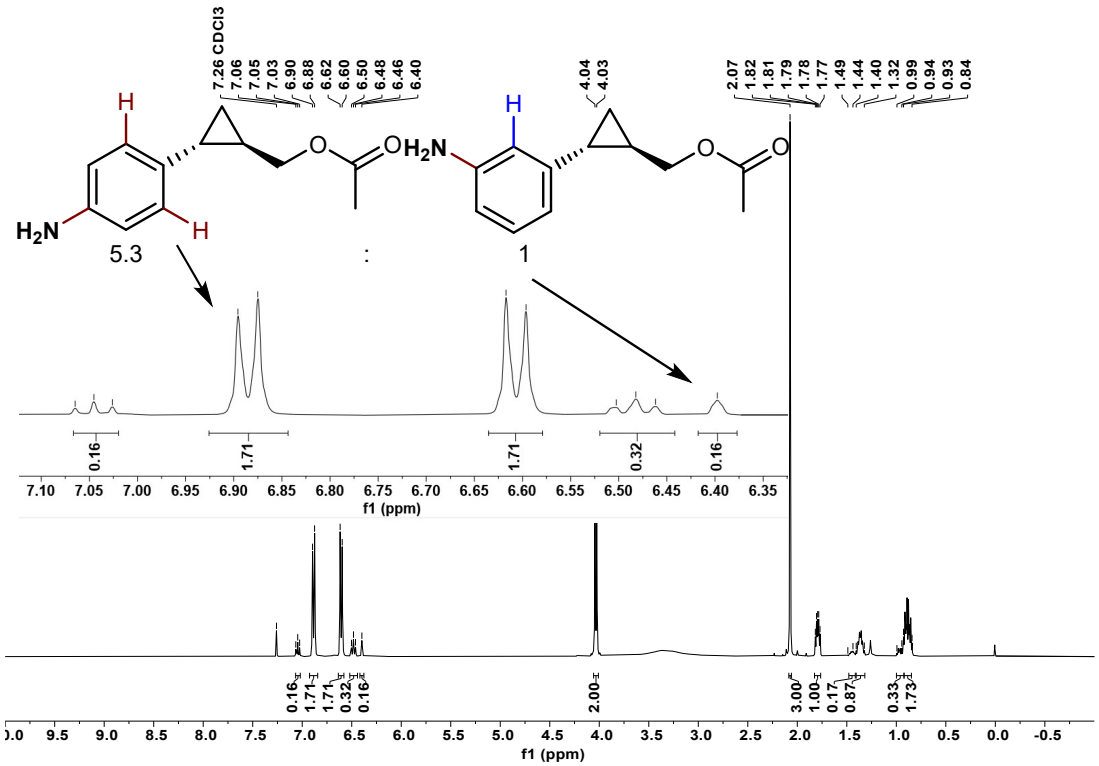
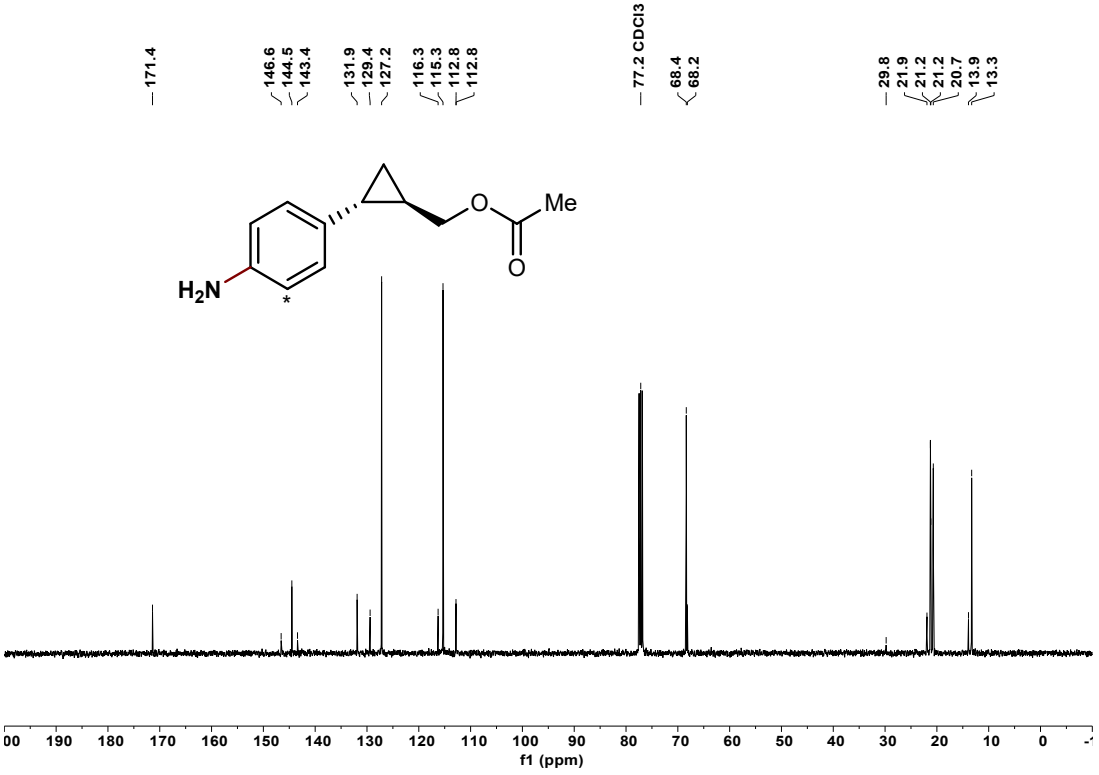


^{13}C NMR (101 MHz, $CDCl_3$)



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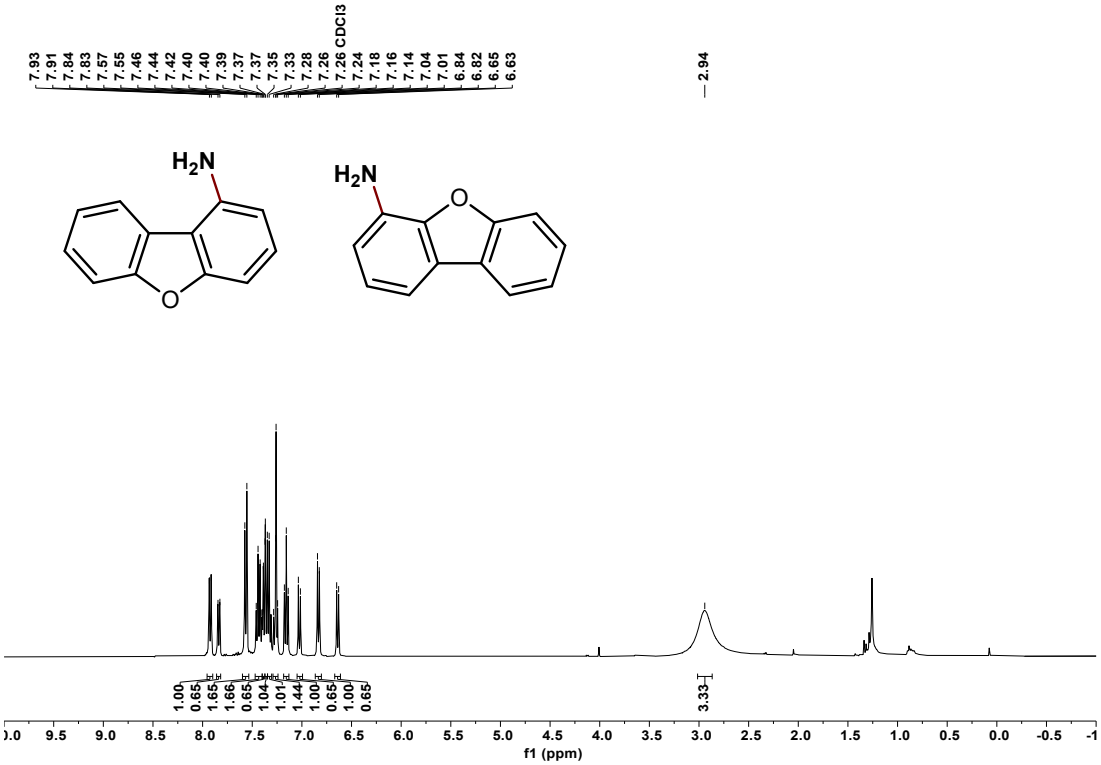
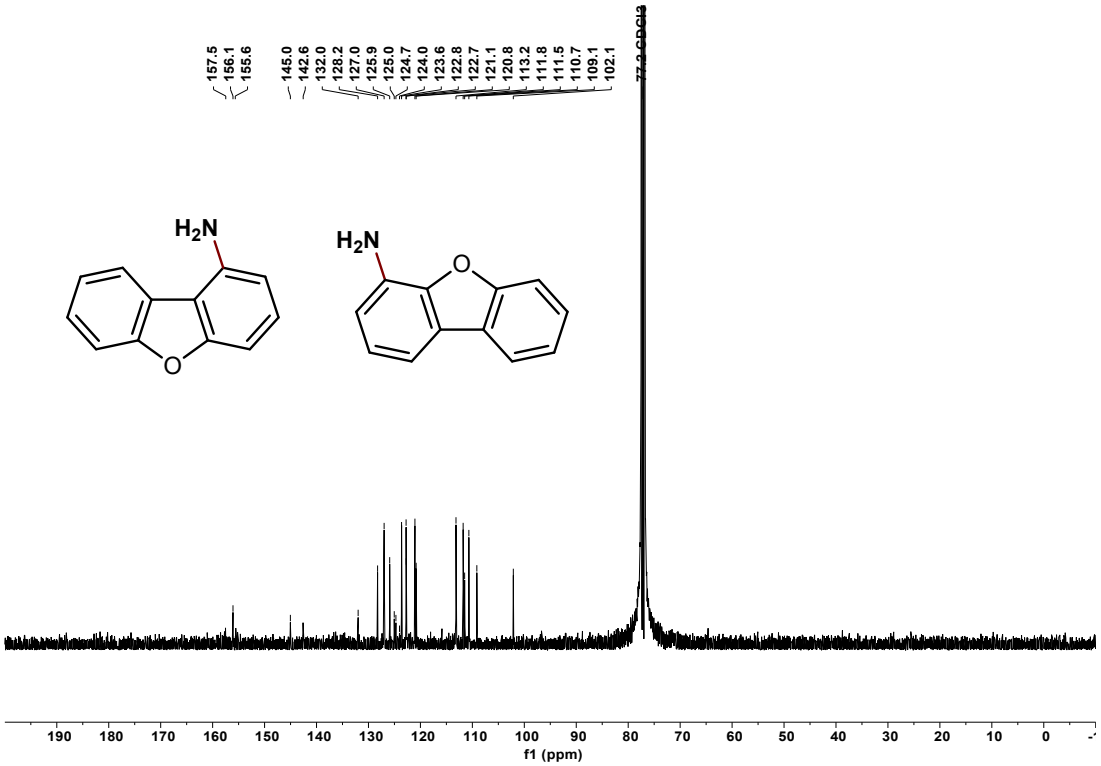
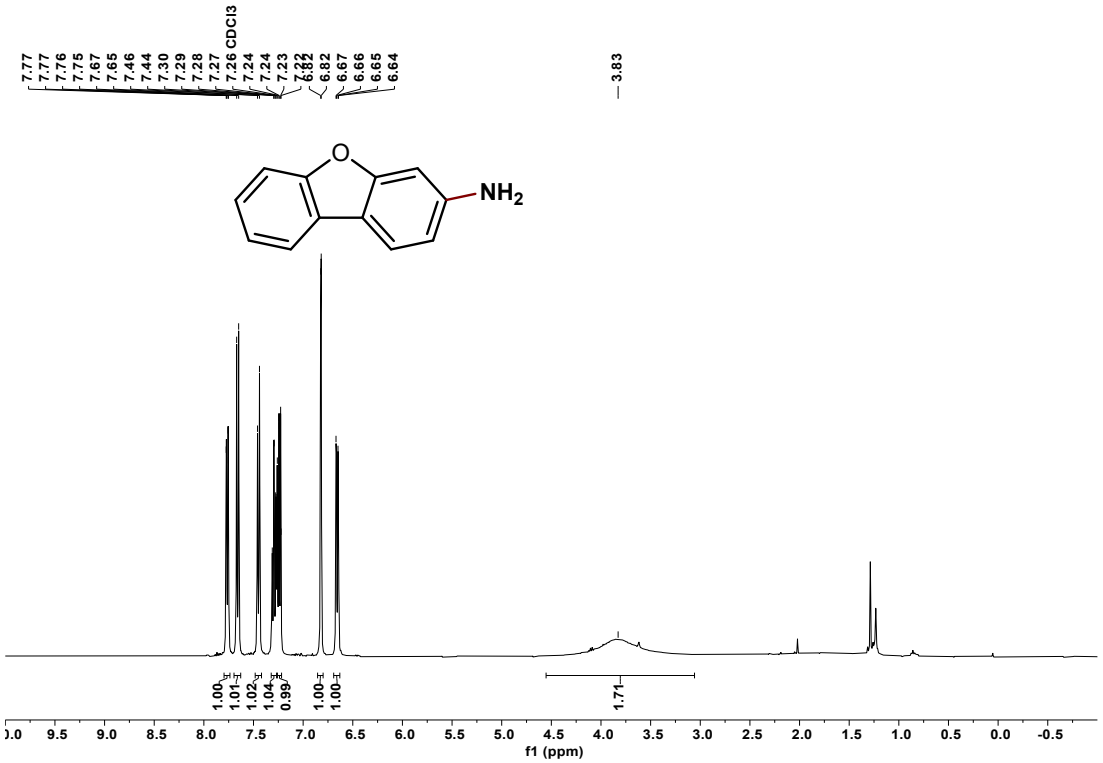


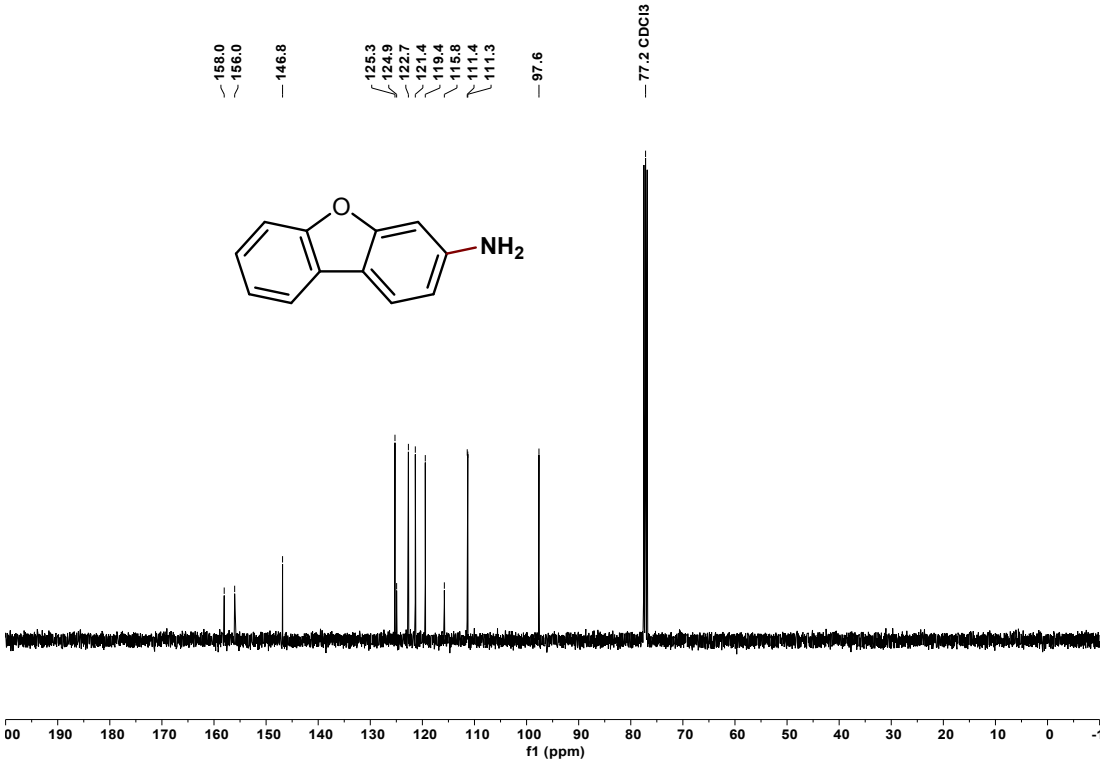
^{13}C NMR (101 MHz, $CDCl_3$)



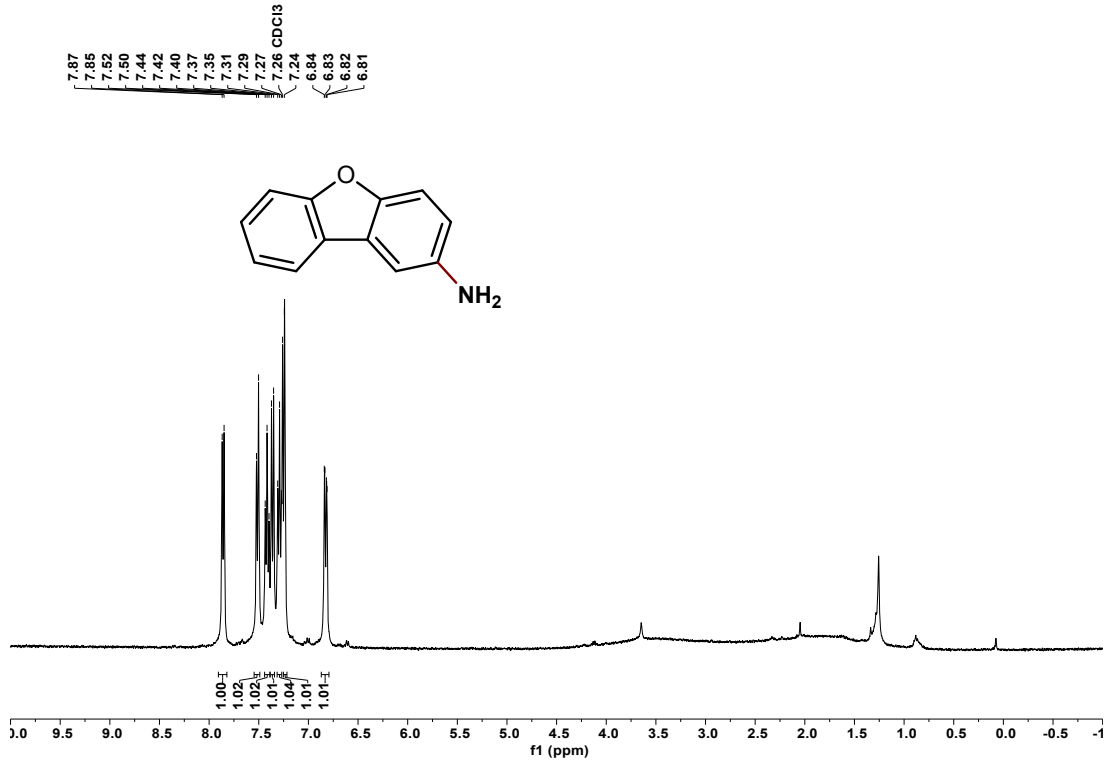
^{1}H NMR (400 MHz, $CDCl_3$)



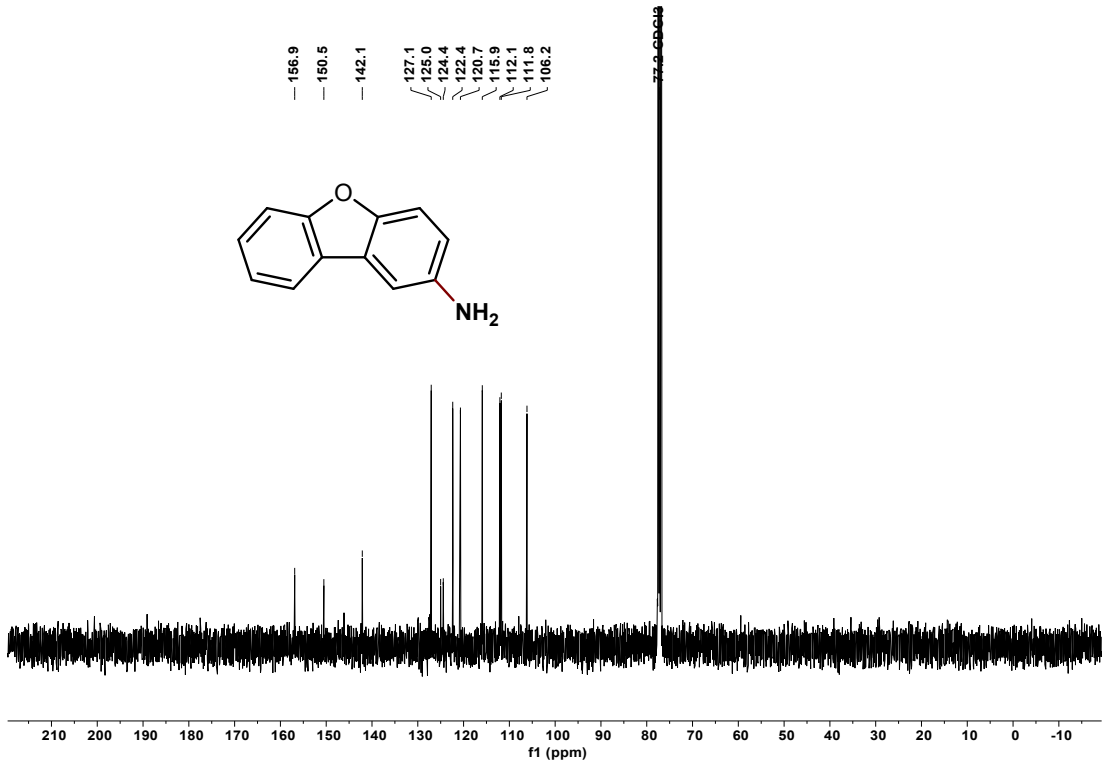
^{13}C NMR (101 MHz, $CDCl_3$)



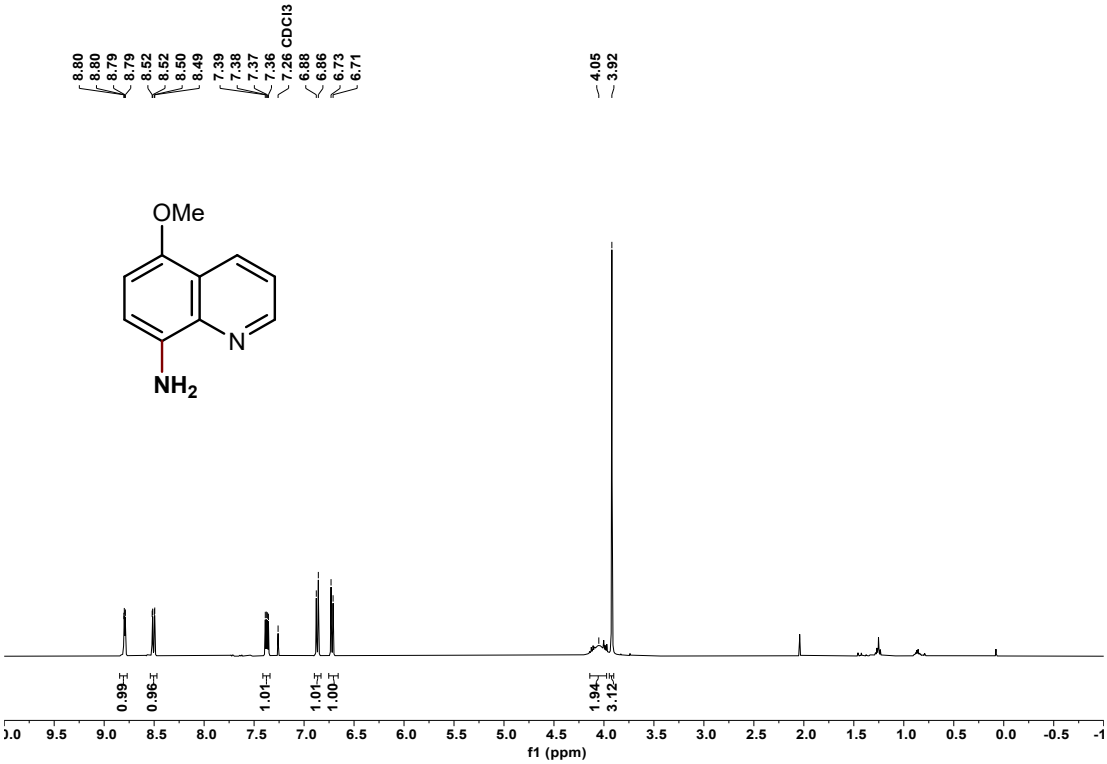
^{1}H NMR (400 MHz, $CDCl_3$)



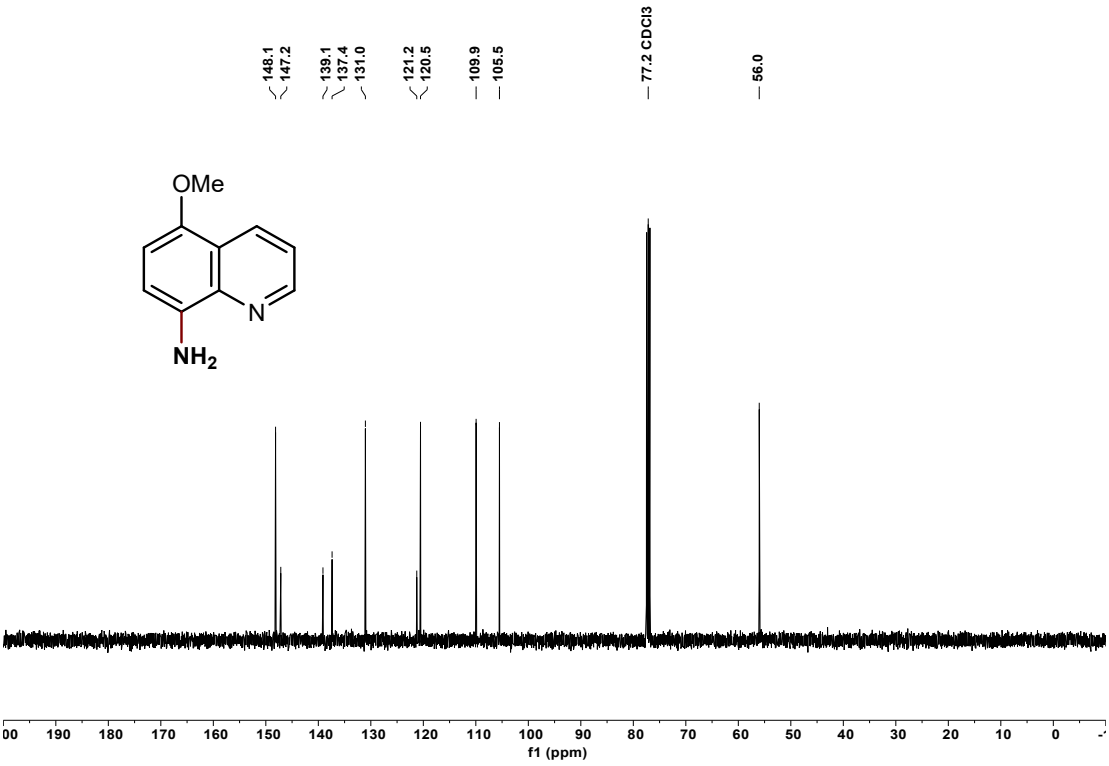
^{13}C NMR (101 MHz, $CDCl_3$)



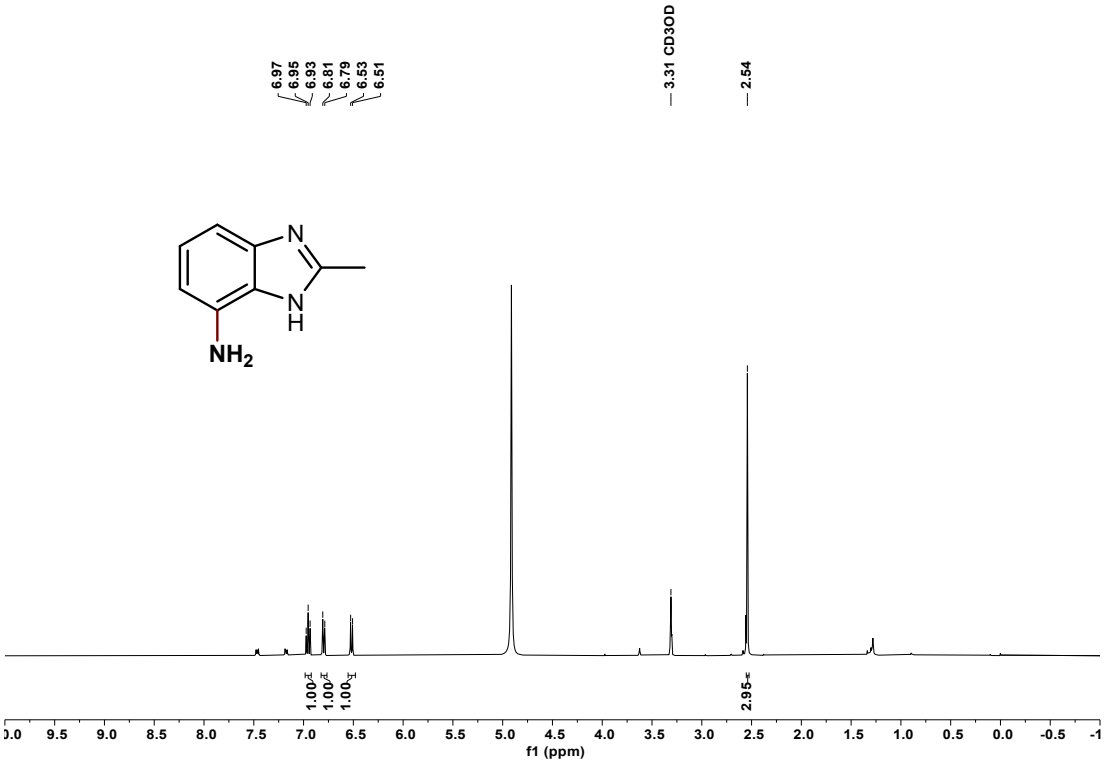
^{1}H NMR (400 MHz, $CDCl_3$)



^{13}C NMR (101 MHz, $CDCl_3$)



^{1}H NMR (400 MHz, CD_3OD)



^{13}C NMR (101 MHz, CD_3OD)