SUPPORTING INFORMATION

Transition-Metal-Free Decarboxylative Iodination: New Routes for Decarboxylative Oxidative Cross-Couplings

Gregory J. P. Perry, Jacob M. Quibell and Adyasha Panigrahi and Igor Larrosa*

School of Chemistry, University of Manchester, Oxford Road, Manchester, M13 9PL (UK)

*Corresponding Author: igor.larrosa@manchester.ac.uk

Contents

General Information

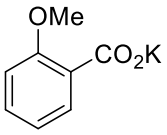
Unless otherwise indicated, all reactions were carried out in 10 mL microwave vials using reagents obtained from commercial sources and used without further purification. K_3PO_4 was kept in a vacuum oven at 200 ºC for 24 h prior to use and stored in a glove box. All other starting materials and solvents were purchased from Acros, Aldrich, Alfa Aesar, Fluorochem, Apollo Scientific and Manchester Organics, and used without further purification unless otherwise stated. Column chromatography was performed on silica gel (40–63 μm) or on a Biotage Isolera Four purification system using pre-packed silica cartridges. $AgNO_3$ impregnated silica gel was prepared by absorbing a solution of $AgNO_3$ in MeCN (10% wt of $AgNO_3$ to silica) on silica. The MeCN was removed under reduced pressure on a rotary evaporator and the silica was further dried under vacuum overnight. Thin layer chromatography (TLC) was carried out on pre-coated silica gel F254 plates with visualization under UV light or using an aqueous basic $KMnO_4$ solution. Melting points were obtained using a Stuart SMP11 apparatus and are uncorrected. IR spectra were recorded using a Thermo Scientific Nicolet iS5 FTIR machine, relevant bands are quoted in cm^{-1}. High resolution mass spectra were performed by the School of Chemistry Mass Spectrometry Service (University of Manchester) employing a Thermo Finnigan MAT95XP or Thermo Exactive Plus EMR spectrometer. Elemental analyses were performed by the School of Chemistry Microanalysis Laboratory (University of Manchester) using a Flash 2000 elemental analyser machine. ^{1}H NMR, ^{19}F NMR and ^{13}C NMR spectra were recorded at 400 or 500 MHz on Bruker machines. ^{1}H NMR are referenced to the residual solvent peak at 7.26 ppm ($CDCl_3$), 2.50 ppm ($(CD_3)_2SO$) or 2.05 ppm ($(CD_3)_2CO$) and quoted in ppm to 2 decimal places with coupling constants (*J*) to the nearest 0.1 Hz. ^{13}C NMR spectra, recorded at 101 MHz or 126 MHz, are referenced to the solvent peak at 77.16 ppm ($CDCl_3$), 39.52 ppm ($(CD_3)_2SO$) or 29.84 ppm ($(CD_3)_2CO$) and quoted in ppm to 1 decimal place with coupling constants (*J*) to the nearest 0.1 Hz. ^{19}F NMR spectra were recorded at 376 or 471 MHz in $CDCl_3$ and quoted in ppm to 2 decimal places and with coupling constants (*J*) to the nearest 0.1 Hz.

General Procedure A for the Decarboxylative Iodination of Aromatic Acids

A flame-dried 10 mL microwave vial was charged with I_2 (507.6 mg, 2.00 mmol, 4.0 equiv), capped and flushed with N_2. The vial was transferred to a glove box, then (hetero)aromatic carboxylic acid (0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (106.1 mg, 0.50 mmol, 1.0 equiv) and anhydrous MeCN (2.5 mL, 0.2 M) were added. The vial was capped, transferred out of the glove box and stirred at the given temperature for the given time. On completion of the reaction, the mixture was cooled to room temperature, then 15% $Na_2S_2O_8$ (aq, 10.0 mL) and sat. Na_2CO_3 (aq, 10 mL) were added. The organic phase was collected by washing with CH_2Cl_2 (3 × 15 mL), dried over $MgSO_4$ and concentrated *in vacuo*. The mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of celite with further washings of pentane/EtOAc (4 × 10 mL, 98:2) Removal of the solvent *in vacuo* gave the desired product.

Note: The reaction can be set up without the use of a glovebox (Table S1, entry 21). The reagents can be weighed on the open bench and the reaction carried out under air. In this case, anhydrous K_3PO_4 was only removed from the vacuum oven immediately prior to weighing. K_3PO_4 is hygroscopic and we found that the yields decrease on prolonged exposure of this reagent to air.

Preparation of Starting Materials

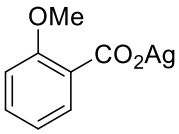


Preparation of potassium 2-methoxybenzoate (K-1a)

Adapted from the reported procedure,[1] a solution of ^{t}BuOK (224.4 mg, 2.00 mmol, 1.0 equiv) in EtOH (5.0 mL) was added dropwise to a solution of 2-methoxybenzoic acid (304.3 mg, 2.00 mmol, 1.0 equiv) in EtOH (5.0 mL) at room temperature. After 1 hour, part of the solvent was removed and Et_2O (20 mL) was added. The mixture was filtered and washed with cold EtOH and cold Et_2O. The resulting solid was dried in a vacuum oven at 70 °C for 12 h to afford the corresponding potassium salt as a white solid (319.6 mg, 84%).

Spectroscopic data matched those previously reported.[2]

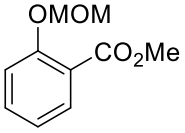
^{1}H NMR (500 MHz, $(CD_3)_2SO$) δ 7.17 (d, *J* = 7.3 Hz, 1H), 7.08 (app t, *J* = 7.7 Hz, 1H), 6.83 (d, *J* = 8.2 Hz, 1H), 6.77 (app t, *J* = 7.3 Hz, 1H), 3.69 (s, 3H); ^{13}C NMR (126 MHz, $(CD_3)_2SO$) δ 170.5, 155.4, 135.0, 127.7, 126.7, 119.6, 111.4, 55.2.



Preparation of ((2-methoxybenzoyl)oxy)silver (Ag-1a)

2-methoxybenzoic acid (60.9 mg, 0.40 mmol, 1.0 equiv) was partially dissolved in water (1.0 mL) before dropwise addition of a solution of NaOH (15.8 mg, 0.396 mmol, 0.99 equiv) in H_2O (0.8 mL). The mixture was stirred at 40 °C for 30 mins until all solids had dissolved in solution. Then a solution of $AgNO_3$ (68.0 mg, 0.40 mmol, 1.0 equiv) in H_2O (1.0 mL) was added dropwise, instantly forming the desired silver benzoate. The mixture was filtered and washed with H_2O and cold acetone. The resulting solid was dried in a vacuum oven at 70 °C for 12 h affording the corresponding silver salt as a white solid (77.7 mg, 75%).

^{1}H NMR (500 MHz, $(CD_3)_2SO$) δ 7.38 (d, *J* = 7.4 Hz, 1H), 7.27 (app t, *J* = 7.8 Hz, 1H), 6.97 (d, *J* = 8.3 Hz, 1H), 6.88 (app t, *J* = 7.4 Hz, 1H), 3.74 (s, 3H); ^{13}C NMR (126 MHz, $(CD_3)_2SO$) δ 171.3, 156.1, 129.7, 129.1, 128.7, 119.8, 111.7, 55.3; IR (ATR) 3004, 1507, 1377, 1102, 744; m.p. 170 - 175 °C with decomposition; Anal. Calcd. for $C_8H_7AgO_3$: C, 37.10; H, 2.72, Ag, 41.65. Found: C, 36.60; H, 2.48, Ag, 39.72; MS (ES$^-$, DMSO) *m/z* 408.9 (40%) [(M + $C_8H_7O_3$)]$^-$.



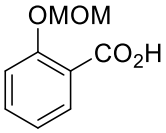
Preparation of methyl 2-(methoxymethoxy)benzoate (Me-1o)

Methyl salicylate (1.30 mL, 10.0 mmol, 1.0 equiv) was dissolved in THF (35 mL) and cooled to 0 °C. NaH (60% dispersion in mineral oil, 800.0 mg, 20 mmol, 2.0 equiv) was added portion wise and the mixture stirred at 0 °C for 30 mins. After this time, chloromethyl methyl ether (1.52 mL, 20 mmol, 2.0 equiv) was added dropwise and the mixture allowed to warm to room temperature over 16 h. After this time the reaction was quenched with H_2O (10 mL) and sat. $NaHCO_3$ (aq, 10 mL). The mixture was extracted with EtOAc (3 × 30 mL), dried over $MgSO_4$, filtered and concentrated *in vacuo* to provide the desired product as a colourless oil (1.94 g, 99%).

Spectroscopic data matched those previously reported.[3]

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.77 (dd, *J* = 7.8, 1.8 Hz, 1H), 7.43 (ddd, *J* = 8.4, 7.5, 1.8 Hz, 1H), 7.19 (d, *J* = 8.4 Hz, 1H), 7.04 (app t, *J* = 7.6 Hz, 1H), 5.25 (s, 2H), 3.89 (s, 3H), 3.52 (s,

3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 166.8, 156.8, 133.4, 131.5, 121.7, 121.5, 116.5, 95.2, 56.4, 52.1.

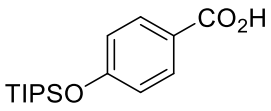


Preparation of 2-(methoxymethoxy)benzoic acid (1o)

Methyl 2-(methoxymethoxy)benzoate (1.94 g, 9.9 mmol, 1.0 equiv) was dissolved in EtOH (15 mL) and aq LiOH (2 M, 6 mL) was added. The mixture was stirred at room temperature for 24 h then sat. Na_2CO_3 was added (10 mL) and the mixture washed with EtOAc (3 × 10 mL). The aqueous phase was acidified to pH 3 with 2 M aq HCl and the mixture was extracted with EtOAc, dried over $MgSO_4$, filtered and concentrated *in vacuo* to provide the desired product as a white solid (1.26 g, 70%).

Spectroscopic data matched those previously reported.[4]

^{1}H NMR (500 MHz, $CDCl_3$) δ 10.70 (broad s, 1H), 8.19 (dd, *J* = 7.9, 1.8 Hz, 1H), 7.55 (ddd, *J* = 9.1, 7.4, 1.8 Hz, 1H), 7.28 (d, *J* = 8.3 Hz, 1H), 7.20 - 7.17 (m, 1H), 5.43 (s, 2H), 3.57 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 165.4, 156.2, 135.2, 133.9, 123.3, 118.4, 115.1, 96.0, 57.3.

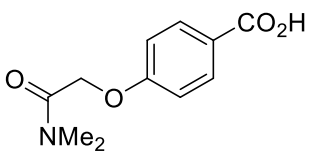


Preparation of 4-((triisopropylsilyl)oxy)benzoic acid (1p)

Silylation:[5] Benzyl 4-hydroxybenzoate (1.14 g, 5.0 mmol, 1.0 equiv), triisopropylchlorosilane (1.2 mL, 5.5 mmol, 1.1 equiv) and DBU (1.1 mL, 7.5 mmol, 1.5 equiv) were mixed in dry DCM (50 mL) at room temperature to afford benzyl 4-((triisopropylsilyl)oxy)benzoate. The reaction mixture was quenched with water and extracted with DCM, which was washed with brine and dried over magnesium sulfate and the solvents were removed *in vacuo* to yield benzyl 4-((triisopropylsilyl)oxy)benzoate as an oily liquid. The crude product was used without further purification *Hydrogenolysis of benzyl 4-((triisopropylsilyl)oxy)benzoate*:[5] A 250 mL oven dried flask was charged with the crude benzyl 4-((triisopropylsilyl)oxy)benzoate (896 mg, 2.3 mmol, 1 equiv), to it Pd/C 10%wt (23 mg, 0.23 mmol, 10 mol%) and dry EtOAc (100mL) was added. The reaction mixture was then flushed and stirred under hydrogen (1 ATM) for 16 h. After the allotted time the reaction mixture was then filtered through Celite with further washings of EtOAc. The filtrate was then basified by Na_2CO_3 sat. and the organic layers removed. The aqueous layer was then acidified to ~pH 2 with HCl (2 M) and the product was extracted with EtOAc (3 x 15 mL) which after removal of the solvents afforded pure 4-((triisopropylsilyl)oxy)benzoic acid as a white solid (1.32 g; 90%).

Spectroscopic data matched those previously reported.[5]

^{1}H NMR (500 MHz, $(CD_3)_2CO$) δ 7.97 (d, *J* = 8.7 Hz, 2H), 7.01 (d, *J* = 8.7 Hz, 2H), 1.32 (dt, *J* = 14.5, 7.3 Hz, 1H), 1.13 (d, *J* = 7.5 Hz, 18H); ^{13}C NMR (126 MHz, $(CD_3)_2CO$) δ 167.4, 161.3, 132.7, 124.6, 120.6, 18.3, 13.5.



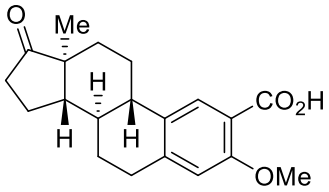
Preparation of 4-(2-(dimethylamino)-2-oxoethoxy)benzoic acid (1q)

Adapted from the reported procedure.[5] *Alkylation*: Benzyl 4-hydroxybenzoate (1.14 g, 5.0 mmol, 1.0 equiv), N,N-dimethyl-2-chloroacetamide (0.6 mL, 5.5 mmol, 1.1 equiv) and potassium carbonate (1.00 g, 7.5 mmol, 1.5 equiv) were mixed in dry DMF (5 mL) and stirred at room

temperature for 16 h to afford. The reaction mixture was quenched with water and extracted with EtOAc (3 x 15 mL), the organic extracts were combined, washed with brine and dried over magnesium sulphate, the solvents were then removed *in vacuo* to yield benzyl 4-(2-(dimethylamino)-2-oxoethoxy)benzoate as an oily liquid. The crude product was used without further purification. *Hydrogenolysis of benzyl 4-(2-(dimethylamino)-2-oxoethoxy)benzoate*: A 250 mL oven dried flask was charged with the 4-(2-(dimethylamino)-2-oxoethoxy)benzoate (720.7 mg, 2.3 mmol 1.0 equiv), to it Pd/C 10%w (23 mg, 0.23 mmol, 10 mol%) and dry EtOAc (100mL) was added. The reaction mixture was flushed and stirred under of hydrogen (1 atm) for 16 h. The reaction mixture was filtered through Celite with further washings of EtOAc. The filtrate was then basified by Na_2CO_3 sat. and the organic layers removed. The aqueous layer was then acidified to ~pH 2 with HCl (2 M) and the product was extracted with EtOAc (3 x 15 mL) which after removal of the solvents afforded pure 4-(2-(dimethylamino)-2-oxoethoxy)benzoic acid (950 mg; 85%).

^{1}H NMR (400 MHz, $(CD_3)_2SO$) δ 12.64 (s, 1H), 7.88 (d, *J* = 8.8 Hz, 2H), 6.99 (d, *J* = 8.9 Hz, 2H), 4.92 (s, 2H), 2.99 (d, *J* = 1.6 Hz, 3H), 2.84 (s, 3H); ^{13}C NMR (101 MHz, $(CD_3)_2SO$) δ 167.4, 167.1, 162.2, 131.6, 123.6, 114.9, 66.0, 35.9, 35.4; m.p. 177-179 °C; IR (ATR) 2927, 1707, 1635, 1603, 1514, 1448, 1234, 1177, 1068, 871, 772; HRMS (EI) *m/z* calcd. $C_{11}H_{13}NO_4$: 223.2280; found $[M]^+$ 222.0763.

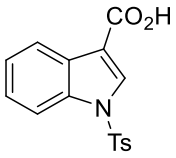
Preparation of (8R,9S,13S,14S)-3-methoxy-13-methyl-17-oxo-7,8,9,11,12,13,14,15,16,17-decahydro-6H-cyclopenta[a]phenanthrene-2-carboxylic acid (methylestrone-2-carboxylic acid, 1af)



Carboxylation: In the glove box, a vial was charged with NaH (60% dispersion in mineral oil, 240.0 mg, 6.0 mmol, 4.0 equiv) estrone (405.6 mg, 1.50 mmol, 1.0 equiv) and 2,4,6-trimethylphenol (204.3 mg, 1.50 mmol, 1.0 equiv). Then anhydrous THF (6 mL) was added and the mixture stirred for 5 min at room temperature. The THF was carefully removed under vacuum and the remaining solid mixture was ground to a fine powder using a spatula before sealing and removing the vial from the glove box. The mixture was purged with CO_2 and reacted under a balloon filled with CO_2 at 185 °C for 16 h. After this time, the reaction mixture was cooled to room temperature, and quenched with H_2O (60 mL). To the mixture was added sat. Na_2CO_3 (aq, 20 mL) and the aqueous phase washed with EtOAc (3 × 30 mL). The aqueous phase was then acidified to pH 2 with 2 M aq HCl and extracted with EtOAc (3 × 30 mL), dried over $MgSO_4$, filtered and concentrated under vacuum. *Methylation*: To the crude mixture was added DMF (20 mL), MeI (1.87 mL, 30.0 mmol, 20.0 equiv) and Na_2CO_3 (1.59 g, 15.0 mmol, 10.0 equiv). The mixture was heated at 100 °C for 48 h. After this time, the reaction was cooled to room temperature and H_2O (60 mL) was added and the mixture extracted with EtOAc (3 × 30 mL). The organic phases were combined then washed with brine (20 mL), dried over $MgSO_4$, filtered and concentrated under vacuum. *Hydrolyisis of ester*: The crude mixture was dissolved in ethanol (6.0 mL), and aqueous NaOH (2 M, 2.0 mL) was added. The mixture was stirred at room temperature for 16 h. After this time, sat. Na_2CO_3 (aq, 20 mL) was added and the aqueous phase washed with EtOAc (3 × 30 mL). The aqueous phase was then acidified to pH 2 with 2 M aq HCl and extracted with EtOAc (3 × 30 mL), dried over $MgSO_4$, filtered and concentrated under vacuum to provide the desired product as a white solid (226.6 mg, 46%).

^{1}H NMR (500 MHz, $(CD_3)_2CO$) δ (1H missing due to overlap with residual solvent peak) 10.78 (broad s, 1H), 7.89 (s, 1H), 6.96 (s, 1H), 4.01 (s, 3H), 2.99 - 2.96 (m, 2H), 2.47 - 2.41 (m, 2H),

2.28 (td, J = 10.7, 3.8 Hz, 1H), 2.12 - 2.06 (m, 2H), 1.90 - 1.87 (m, 1H), 1.72 - 1.42 (m, 6H), 0.91 (s, 3H); ^{13}C NMR (126 MHz, $(CD_3)_2CO$) δ 219.3, 166.3, 157.4, 145.1, 133.9, 130.4, 117.0, 113.3, 56.9, 51.0, 48.4, 44.5, 38.9, 36.1, 32.5, 30.4, 26.9, 26.6, 22.1, 14.1; IR 3282, 2929, 1723, 1710, 1610, 1415, 1259; m.p. 235 - 238 °C; HRMS (EI) *m/z* calcd. $C_{20}H_{24}O_4$ + H: 329.1747; found $[M+H]^+$ 329.1747.



Preparation of 1-tosyl-1*H*-indole-3-carboxylic acid (1al)

Following the reported procedure,[6] to a cooled solution (–78 °C) of 1*H*-indole-3-carboxylic acid (1.50 g, 9.30 mmol, 1.0 equiv) in THF (60.0 mL) was added dropwise *n*-BuLi (1.5 M in hexane, 14.0 mL, 22.0 mmol, 2.3 equiv.). The reaction mixture was stirred at –78 °C for 3 h then a solution of tosyl chloride (4.20 g, 22.00 mmol, 2.3 equiv) in THF (40.0 mL) was added dropwise. The reaction was allowed to warm to room temperature over 12 h. The reaction was quenched with 5% aqueous $NaHSO_4$ (100.0 mL) and extracted with EtOAc. Concentration of the combined organic phases gave a deep purple solid. The solid was filtered and washed with cold EtOAc to provide the desired product as a white solid (1.47 g, 50%).

Spectroscopic data matched those previously reported.[6]

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.40 (s, 1H), 8.18 - 8.15 (m, 1H), 7.99 - 7.97 (m, 1H), 7.86 (d, J = 8.4 Hz, 2H), 7.42 - 7.34 (m, 2H), 7.29 (d, J = 8.6 Hz, 2H), 2.37 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.9, 146.1, 135.1, 134.7, 133.6, 130.4, 127.8, 127.4, 125.7, 124.8, 122.3, 113.5, 112.8, 21.8.

Optimisation of the Decarboxylative Iodination

The general procedure A was applied with I_2 (152.3 mg, 0.60 mmol, 3.0 equiv), 2-methoxybenzoic acid (30.4 mg, 0.20 mmol, 1.0 equiv) and the appropriate base (equivalents given in Table S1) at 100 °C for 4 h. On completion of the reaction, the mixture was cooled to room temperature then 15% $Na_2S_2O_8$ (aq, 2.0 mL), 2 M aq HCl (0.5 mL), $CDCl_3$ (1.0 mL) and CH_2Br_2 (2.8 µL, 0.04 mmol, 0.2 equiv) were added. An aliquot of the organic layer was filtered through a short plug of $MgSO_4$ directly into an NMR tube for analysis.

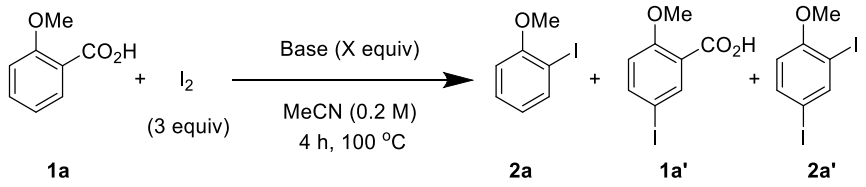
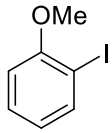


Table S1. Optimisation of the Transition Metal-Free Decarboxylative Iodination.[a]

Entry	Base (equiv)	1a	2a	1a'	2a'
1[b]	–	14	0	74	10
2[c]	–	9	90	2	trace
3	K_3PO_4 (1.0)	4	93	1	trace
4	K_2HPO_4 (2.0)	2	90	trace	trace
5	K_2HPO_4 (1.0)	17	73	4	4
6	KH_2PO_4 (2.0)	95	0	trace	0
7	Li_2CO_3 (1.0)	89	11	trace	0
8	K_2CO_3 (1.0)	64	31	trace	0
9	Na_2CO_3 (1.0)	76	23	trace	0
10	Cs_2CO_3 (1.0)	57	38	trace	trace
11	LiOAc (2.0)	88	12	trace	0
12	KOAc (2.0)	45	38	trace	trace
13	NaOAc (2.0)	30	51	trace	trace
14	CsOAc (2.0)	51	38	trace	trace
15	KTFA (2.0)	57	18	11	2
16	$PhCO_2K$ (2.0)	20	59	trace	trace
17	KO^{t}Bu (2.0)	71	5	0	0
18[d]	K_3PO_4 (1.0)	62	34	0	0
19[e]	K_3PO_4 (1.0)	3	94	1	trace
20[f]	–	94	0	2	0
21[g]	K_3PO_4 (1.0)	2	94	4	trace

[a] Yields determined by ^{1}H NMR using CH_2Br_2 as an internal standard. [b] ((2-Methoxybenzoyl)oxy)silver **Ag-1a** was used in place of 2-methoxybenzoic acid **1a**. [c] Potassium 2-methoxybenzoate **K-1a** was used in place of 2-methoxybenzoic acid **1a**. [d] 1.0 equiv H_2O added. [e] Reaction run in the dark. [f] No base added. [g] Reagents weighed on the open bench and the reaction carried out under air for 16 h.

Experimental details, Spectroscopic data and Analytical data

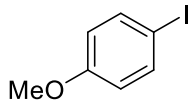


2-iodoanisole (2a)

The general procedure A was applied with I_2 (380.7 mg, 1.50 mmol, 3.0 equiv) and 2-methoxybenzoic acid (76.1 mg, 0.50 mmol, 1.0 equiv) at 100 ºC for 4 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a colourless oil (105.9 mg, 90%) as a mixture with 2,4-diiodoanisole **2a'** (ratio GC-FID **2a**:**2a'** >100:1).

Spectroscopic data matched those previously reported[7]

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.77 (dd, *J* = 7.8, 1.6 Hz, 1H), 7.31 (ddd, *J* = 8.2, 7.4, 1.6 Hz, 1H), 6.83 (dd, *J* = 8.2, 1.4 Hz, 1H), 6.72 (app td, *J* = 7.6, 1.4 Hz, 1H), 3.88 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 158.2, 139.6, 129.7, 122.6, 111.1, 86.1, 56.4.

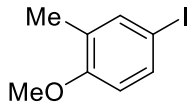


4-iodoanisole (**2b)**

The general procedure A was applied with 4-methoxybenzoic acid (76.1 mg, 0.50 mmol, 1.0 equiv) at 100 ºC for 2 h. The general work-up procedure was applied then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a white solid (108.8 mg, 93%).

Spectroscopic data matched those previously reported.[8]

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 8.3 Hz, 2H), 6.68 (d, *J* = 8.3 Hz, 2H), 3.78 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 159.6, 138.3, 116.5, 82.8, 55.5.

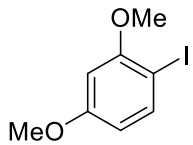


4-iodo-1-methoxy-2-methylbenzene (**2c)**

The general procedure A was applied with 4-methoxy-3-methylbenzoic acid (83.1 mg, 0.50 mmol, 1.0 equiv) at 100 ºC for 4 h. The general work-up procedure gave the desired product as a white solid (122.8 mg, 99%)

Spectroscopic data matched those previously reported.[9]

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.45 - 7.43 (m, 2H), 6.58 (d, *J* = 8.3 Hz, 1H), 3.80 (s, 3H), 2.17 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 157.8, 139.1, 135.6, 129.6, 112.3, 82.6, 55.5, 16.0.

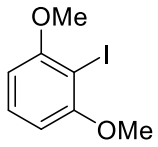


2-iodo-1,5-dimethoxybenzene (2e)

The general procedure A was applied with I_2 (126.9 mg, 1.00 mmol, 2.0 equiv) and 2,4-dimethoxybenzoic acid (91.1 mg, 0.50 mmol, 1.0 equiv) at 23 ºC for 3 h. The general work-up procedure gave the desired product as an off-white solid (126.7 mg, 96%).

Spectroscopic data matched those previously reported.[8]

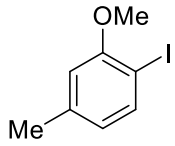
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.62 (d, *J* = 8.6 Hz, 1H), 6.43 (d, *J* = 2.6 Hz, 1H), 6.32 (dd, *J* = 8.6, 2.6 Hz, 1H), 3.85 (s, 3H), 3.80 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 161.5, 159.0, 139.3, 107.1, 99.4, 74.9, 56.4, 55.7.



2-iodo-1,3-dimethoxybenzene (2f)
The general procedure A was applied with 2,6-dimethoxybenzoic acid (91.1 mg, 0.50 mmol, 1.0 equiv) at 23 °C for 2 h. The general work-up procedure gave the desired product as a white solid (125.4 mg, 95%).

Spectroscopic data matched those previously reported.[7]

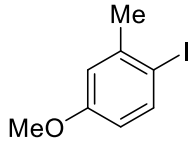
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.26 (t, *J* = 8.3 Hz, 1H), 6.51 (d, *J* = 8.3 Hz, 2H), 3.89 (s, 6H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 159.6, 129.9, 104.1, 77.6, 56.7.



1-iodo-2-methoxy-4-methylbenzene (2g)
The general procedure A was applied with 2-methoxy-4-methylbenzoic acid (83.1 mg, 0.50 mmol, 1.0 equiv) at 50 °C for 4 h. The general work-up procedure gave the desired product as a white solid (112.5 mg, 91%).

Spectroscopic data matched those previously reported.[10]

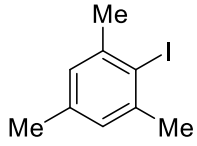
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (d, *J* = 7.9 Hz, 1H), 6.65 (s, 1H), 6.55 (d, *J* = 7.9 Hz, 1H), 3.86 (s, 3H), 2.33 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 158.0, 140.0, 139.1, 123.5, 112.2, 81.9, 56.3, 21.6.



1-iodo-4-methoxy-2-methylbenzene (2h)
The general procedure A was applied with 4-methoxy-2-methylbenzoic acid (83.1 mg, 0.50 mmol, 1.0 equiv) at 50 °C for 4 h. The general work-up procedure gave the desired product as a white solid (114.0 mg, 92%).

Spectroscopic data matched those previously reported.[9]

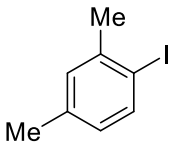
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 (d, *J* = 8.7 Hz, 1H), 6.82 (d, *J* = 3.0 Hz, 1H), 6.49 (dd, *J* = 8.7, 3.0 Hz, 1H), 3.77 (s, 3H), 2.40 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 159.9, 142.4, 139.3, 115.9, 113.4, 89.7, 55.3, 28.3.



2-iodo-1,3,5-trimethylbenzene (2i)
The general procedure A was applied with 2,4,6-trimethylbenzoic acid (82.1 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 6 h. The general work-up procedure gave the desired product as a white solid (114.8 mg, 93%).

Spectroscopic data matched those previously reported.[11]

^{1}H NMR (400 MHz, $CDCl_3$) δ 6.90 (s, 2H), 2.44 (s, 6H), 2.25 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 141.9, 137.4, 128.1, 104.4, 29.6, 20.8.

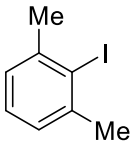


1-iodo-2,4-dimethylbenzene (2j)

The general procedure A was applied with 2,4-dimethylbenzoic acid (76.1 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 9 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a colourless oil (74.3 mg, 64%).

Spectroscopic data matched those previously reported.[12]

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.67 (d, *J* = 8.0 Hz, 1H), 7.07 (s, 1H), 6.70 (d, *J* = 8.0 Hz, 1H), 2.40 (s, 3H), 2.28 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 141.2, 138.8, 138.2, 130.9, 128.5, 97.2, 28.1, 21.0.

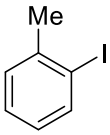


2-iodo-1,3-dimethylbenzene (2k)

The general procedure A was applied with 2,6-dimethylbenzoic acid (76.1 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 9 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a colourless oil (63.8 mg, 55%).

Spectroscopic data matched those previously reported.[13]

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.15 - 7.11 (m, 1H), 7.06 (d, *J* = 7.4 Hz, 2H), 2.48 (s, 6H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 142.2, 127.7, 127.1, 108.6, 29.9.

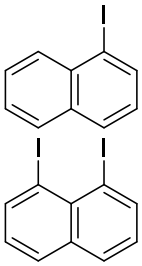


1-iodo-2-methylbenzene (2l)

The general procedure A was applied with I_2 (761.4 mg, 3.00 mmol, 6.0 equiv.) and 2-methylbenzoic acid (68.1 mg, 0.50 mmol, 1.0 equiv) at 140 °C for 16 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a colourless oil (43.6 mg, 40%).

Spectroscopic data matched those previously reported.[13]

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.81 (d, *J* = 7.8 Hz, 1H), 7.24 - 7.24 (m, 2H), 6.89 - 6.84 (m, 1H), 2.43 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 141.5, 139.1, 129.9, 128.3, 127.5, 101.3, 28.3.



1-iodonaphthalene and 1,4-diiodonaphthalene (2m + 2m')

The general procedure A was applied with I_2 (761.4 mg, 3.00 mmol, 6.0 equiv) and 1-napthoic acid (86.1 mg, 0.50 mmol, 1.0 equiv) at 140 °C for 16 h. The general work-up procedure was followed then column chromatography (pentane, 100%) afforded, after removal of the solvent, 1-iodonaphthalene as a colourless oil (72.4 mg, 57%) and 1,8-diiodonaphthalene as a white solid (13.3 mg, 7%).

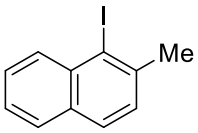
Spectroscopic data matched those previously reported.[14]

1-iodonaphthalene (2m)

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.10 (d, *J* = 7.4 Hz, 2H), 7.85 (d, *J* = 8.2 Hz, 1H), 7.78 (d, *J* = 8.0 Hz, 1H), 7.59 (app t, *J* = 7.6 Hz, 1H), 7.53 (app t, *J* = 7.4 Hz, 1H), 7.19 (app t, *J* = 7.7 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 137.6, 134.5, 134.3, 132.3, 129.1, 128.7, 127.9, 127.0, 126.9, 99.7.

1,4-diiodonaphthalene (2m')

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.42 (d, *J* = 7.4 Hz, 2H), 7.85 (d, *J* = 8.1 Hz, 2H), 7.08 (app t, *J* = 7.7 Hz, 2H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 144.2, 135.9, 132.3, 131.2, 127.1, 96.1.

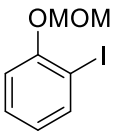


1-iodo-2-methylnaphthalene (2n)

The general procedure A was applied with 2-methyl-1-naphthoic acid (93.1 mg, 0.50 mmol, 1.0 equiv) at 120 °C for 5 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a colourless oil (109.9 mg, 82%) as a mixture with an indeterminable diiodination product **2n'** (ratio GC-FID **2n**:**2n'** >150:1).

Spectroscopic data matched those previously reported.[15]

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.23 (d, *J* = 8.5 Hz, 1H), 7.75 (d, *J* = 7.5 Hz, 1H), 7.72 (d, *J* = 8.3 Hz, 1H), 7.56 (ddd, *J* = 8.4, 6.9, 1.3 Hz, 1H), 7.48 - 7.44 (m, 1H), 7.37 (d, *J* = 8.3 Hz, 1H), 2.71 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 140.9, 135.2, 132.5, 132.3, 128.5, 128.3, 128.1, 127.8, 125.8, 105.8, 30.5.

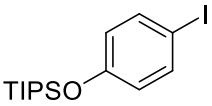


1-iodo-2-(methoxymethoxy)benzene (2o)

The general procedure A was applied with 2-(methoxymethoxy)benzoic acid (91.1 mg, 0.50 mmol, 1.0 equiv) and anhydrous MeCN (5.0 mL, 0.1 M) at 100 °C for 16 h in a flame-dried 25 mL microwave vial. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of basic alumina with further washings of pentane/EtOAc (4 x 10.0 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a colourless oil (59.4 mg, 45%).

Spectroscopic data matched those previously reported.[16]

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.78 (dd, *J* = 7.8, 1.6 Hz, 1H), 7.28 (ddd, *J* = 8.3, 7.4, 1.6 Hz, 1H), 7.07 (dd, *J* = 8.3, 1.4 Hz, 1H), 6.76 (app td, *J* = 7.7, 1.4 Hz, 1H), 5.24 (s, 2H), 3.52 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 156.3, 139.7, 129.6, 123.8, 115.2, 95.2, 87.4, 56.6.

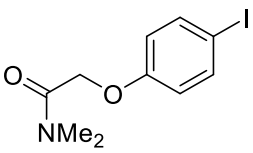


(4-iodophenoxy)triisopropylsilane (2p)

The general procedure A was applied with 4-((triisopropylsilyl)oxy)benzoic acid (147.2 mg, 0.50 mmol, 1.0 equiv) and I_2 (380.7 mg, 1.50 mmol, 3.0 equiv) in dioxane (1.0 M) at 170 °C for 16 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Purification by flash chromatography (hexane) afforded, after removal of the solvent, the desired product as a pale-yellow oil (184.3 mg, 98%).

Spectroscopic data matched those previously reported.[17]

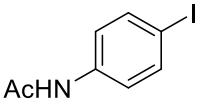
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 (d, *J* = 8.7 Hz, 2H), 6.58 (d, *J* = 8.7 Hz, 2H), 1.24 - 1.10 (m, 3H), 1.01 (d, *J* = 7.2 Hz, 18H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 156.1, 138.3, 122.3, 83.2, 17.9, 12.6.



2-(4-iodophenoxy)-*N*,*N*-dimethylacetamide 4-iodophenoxy)triisopropylsilane (2q)

The general procedure A was applied with 4-(2-(dimethylamino)-2-oxoethoxy)benzoic acid (111.6 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 16 h. The general work-up procedure was followed then the mixture was submitted directly for purification by flash chromatography (DCM/MeOH 98:2) which afforded, after removal of the solvent, the desired product as a white solid (122.0 mg, 80%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 8.5 Hz, 2H), 6.73 (d, *J* = 8.5 Hz, 2H), 4.66 (s, 2H), 3.07 (s, 3H), 2.97 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 167.5, 158.0, 138.4, 117.2, 84.0, 67.5, 36.6, 35.8.; m.p. 62-64 °C; IR (ATR) 2907, 1653, 1484, 1443, 1282, 1244, 1071, 1055, 822, 802; HRMS (EI) *m/z* calcd. $C_{10}H_{12}O_2NINa$: 327.9805; found $[M + Na]^+$ 327.9795.

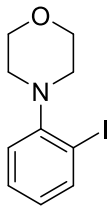


***N*-(4-iodophenyl)acetamide (2r)**

The general procedure A was applied with 4-acetamidobenzoic acid (89.6 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 16 h. The general work-up procedure was followed then column chromatography (hexane:EtOAc:AcOH, 100:0:0 to 80:19:1) afforded, after removal of the solvent, the desired product as a pale-yellow solid (105.7 mg, 81%).

Spectroscopic data matched those previously reported.[18]

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (d, *J* = 8.7 Hz, 2H), 7.29 (d, *J* = 8.7 Hz, 2H), 2.17 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 168.4, 138.1, 137.8, 121.8, 87.6, 24.8.

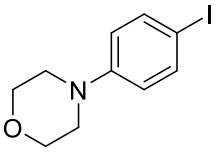


4-(2-iodophenyl)morpholine (2s)

The general procedure A was applied with I_2 (126.9 mg, 1.00 mmol, 2.0 equiv), 2-morpholinobenzoic acid (103.6 mg, 0.50 mmol, 1.0 equiv) and anhydrous MeCN (5.0 mL, 0.1 M) at 23 °C for 3 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 x 10.0 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a colourless oil (76.6 mg, 53%) as a mixture with 4-(2,4-diiodophenyl)morpholine **2s'** (ratio GC-FID **2s**:**2s'** >40:1). Purification by flash chromatography on 10% $AgNO_3$-impregnated silica (hexane/EtOAc, 95:5) afforded, after removal of the solvent, the desired product as a colourless oil (72.3 mg, 50%).

Spectroscopic data matched those previously reported.[19]

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.86 (dd, *J* = 7.9, 1.5 Hz, 1H), 7.33 (ddd, *J* = 7.9, 7.3, 1.5 Hz, 1H), 7.04 (dd, *J* = 8.0, 1.5 Hz, 1H), 6.82 (ddd, *J* = 7.8, 7.4, 1.5 Hz, 1H), 3.91 - 3.89 (m, 4H), 3.01 - 2.99 (m, 4H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 152.2, 140.3, 129.4, 125.8, 121.2, 98.3, 67.4, 52.9.

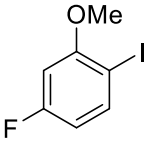


4-(4-iodophenyl)morpholine (2t)

The general procedure A was applied with I_2 (126.9 mg, 1.00 mmol, 2.0 equiv), 4-morpholinobenzoic acid (103.6 mg, 0.50 mmol, 1.0 equiv) and anhydrous MeCN (5.0 mL, 0.1 M) at 23 °C for 4 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 x 10.0 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a white solid (83.8 mg, 58%).

Spectroscopic data matched those previously reported.[20]

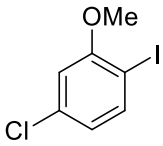
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 (d, *J* = 9.1 Hz, 2H), 6.67 (d, *J* = 9.0 Hz, 2H), 3.86 - 3.83 (m, 4H), 3.13 - 3.11 (m, 4H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 151.0, 138.0, 117.8 ,81.9, 66.9, 49.0.



4-fluoro-1-iodo-2-methoxybenzene (2u)

The general procedure A was applied with 4-fluoro-2-methoxybenzoic acid (85.1 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 6 h. The general work-up procedure gave the desired product as a pale yellow oil (119.7 mg, 95%).

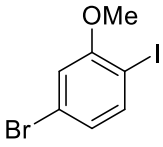
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.69 (dd, *J* = 8.6, 6.5 Hz, 1H), 6.58 (dd, *J* = 10.7, 2.7 Hz, 1H), 6.50 (app td, *J* = 8.3, 2.7 Hz, 1H), 3.87 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 164.2 (d, *J* = 246.9 Hz), 159.4 (d, *J* = 9.9 Hz), 139.7 (d, *J* = 9.4 Hz), 109.4 (d, *J* = 21.9 Hz), 99.8 (d, *J* = 26.5 Hz), 78.9 (d, *J* = 3.5 Hz), 56.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ –110.92 - –110.98 (m, 1F); IR (ATR) 2940, 1599, 1276, 1280, 1037, 1020, 830; HRMS (EI) *m/z* calcd. C_7H_6OFI: 251.9442; found $[M]^+$ 251.9446.



4-chloro-1-iodo-2-methoxybenzene (2v)

The general procedure A was applied with 4-chloro-2-methoxybenzoic acid (93.3 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 6 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a pale yellow oil (128.9 mg, 96%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 (d, *J* = 8.3 Hz, 1H), 6.80 (d, *J* = 2.2 Hz, 1H), 6.73 (dd, *J* = 8.3, 2.2 Hz, 1H), 3.87 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 158.9, 139.9, 135.4, 122.7, 111.8, 83.4, 56.7; IR (ATR) 2928, 1573, 1469, 1388, 12650, 1036, 1013, 867, 835, 796; HRMS (EI) *m/z* calcd. C_7H_6OClI: 267.9146; found $[M]^+$ 267.9133.

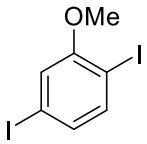


4-bromo-1-iodo-2-methoxybenzene (2w)

The general procedure A was applied with 4-bromo-2-methoxybenzoic acid (115.5 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 6 h. The general work-up procedure was followed then the mixture was dissolved in in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a colourless oil (148.6 mg, 95%).

Spectroscopic data matched those previously reported.[21]

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.60 (d, *J* = 8.3 Hz, 1H), 6.94 (d, *J* = 2.1 Hz, 1H), 6.86 (dd, *J* = 8.3, 2.1 Hz, 1H), 3.87 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 158.9, 140.3, 125.7, 123.1, 114.7, 84.3, 56.7.

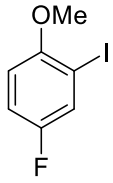


1,4-diiodo-2-methoxybenzene (2x)

The general procedure A was applied with 4-iodo-2-methoxybenzoic acid (139.0 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 6 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as an orange solid (169.2 mg, 94%).

Spectroscopic data matched those previously reported.[22]

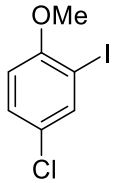
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 (d, *J* = 8.1 Hz, 1H), 7.03 (d, *J* = 1.4 Hz, 1H), 6.97 (dd, *J* = 8.1, 1.4 Hz, 1H), 3.80 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 158.8, 140.7, 131.8, 120.4, 94.1, 85.8, 56.7.



4-fluoro-2-iodo-1-methoxybenzene (2y)

The general procedure A was applied with 5-fluoro-2-methoxybenzoic acid (85.1 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 16 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a pale-yellow oil (98.3 mg, 78%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.50 (dd, *J* = 7.7, 3.0 Hz, 1H), 7.03 (ddd, *J* = 9.0, 7.7, 3.0 Hz, 1H), 6.75 (dd, *J* = 9.0, 4.5 Hz, 1H), 3.85 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 156.9 (d, *J* = 243.3 Hz), 154.9 (d, *J* = 2.4 Hz), 126.3 (d, *J* = 25.1 Hz), 115.7 (d, *J* = 22.6 Hz), 111.1 (d, *J* = 8.1 Hz), 85.4 (d, *J* = 8.6 Hz), 57.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ –122.5 - –122.5 (m, 1F); IR (ATR) 2927 1485, 1259, 904, 726; HRMS (PI) *m/z* calcd. C_7H_6OFI: 251.9442; found $[M]^+$ 251.9434.

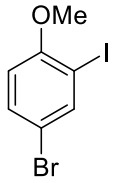


4-chloro-2-iodo-1-methoxybenzene (2z)

The general procedure A was applied with 5-chloro-2-methoxybenzoic acid (93.3 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 16 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a colourless oil (73.8 mg, 55%).

Spectroscopic data matched those previously reported.[12]

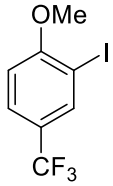
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74 (d, *J* = 2.5 Hz, 1H), 7.27 (dd, *J* = 8.8, 2.5 Hz, 1H), 6.73 (d, *J* = 8.8 Hz, 1H), 3.86 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 157.1, 138.7, 129.4, 126.4, 111.5, 86.2, 56.8.



4-bromo-2-iodo-1-methoxybenzene (2aa)

The general procedure A was applied with 5-bromo-2-methoxybenzoic acid (115.5 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 16 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a pale-yellow oil (43.8 mg, 28%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.87 (d, *J* = 2.4 Hz, 1H), 7.41 (dd, *J* = 8.7, 2.4 Hz, 1H), 6.69 (d, *J* = 8.7 Hz, 1H), 3.86 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 157.6, 141.3, 132.3, 113.5, 112.1, 86.8, 56.7; IR (ATR) 2929, 1471, 1283, 1248, 1041, 802, 619; HRMS (PI) *m/z* calcd. C_7H_6BrOI: (100%) 311.8641 (95%) 313.8621; found $[M]^+$ (100%) 311.8642 (95%) 313.8621.



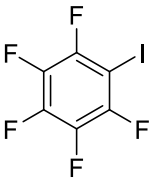
2-iodo-1-methoxy-4-(trifluoromethyl)benzene (2ab)

The general procedure A was applied with 2-methoxy-5-(trifluoromethyl)benzoic acid (110.1 mg, 0.50 mmol, 1.0 equiv) at 120 °C for 16 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of

pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a pale-yellow oil (60.4 mg, 40%).

Spectroscopic data matched those previously reported.[23]

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.01 (d, *J* = 1.7 Hz, 1H), 7.58 (dd, *J* = 8.6, 1.7 Hz, 1H), 6.85 (d, *J* = 8.6 Hz, 1H), 3.93 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 159.6, 135.5 (q, *J* = 3.7 Hz), 125.9 (q, *J* = 3.8 Hz), 123.5 (q, *J* = 33.2 Hz), 122.2 (q, *J* = 271.7 Hz), 109.2, 84.6, 55.5; ^{19}F NMR (471 MHz, $CDCl_3$) δ –61.60.

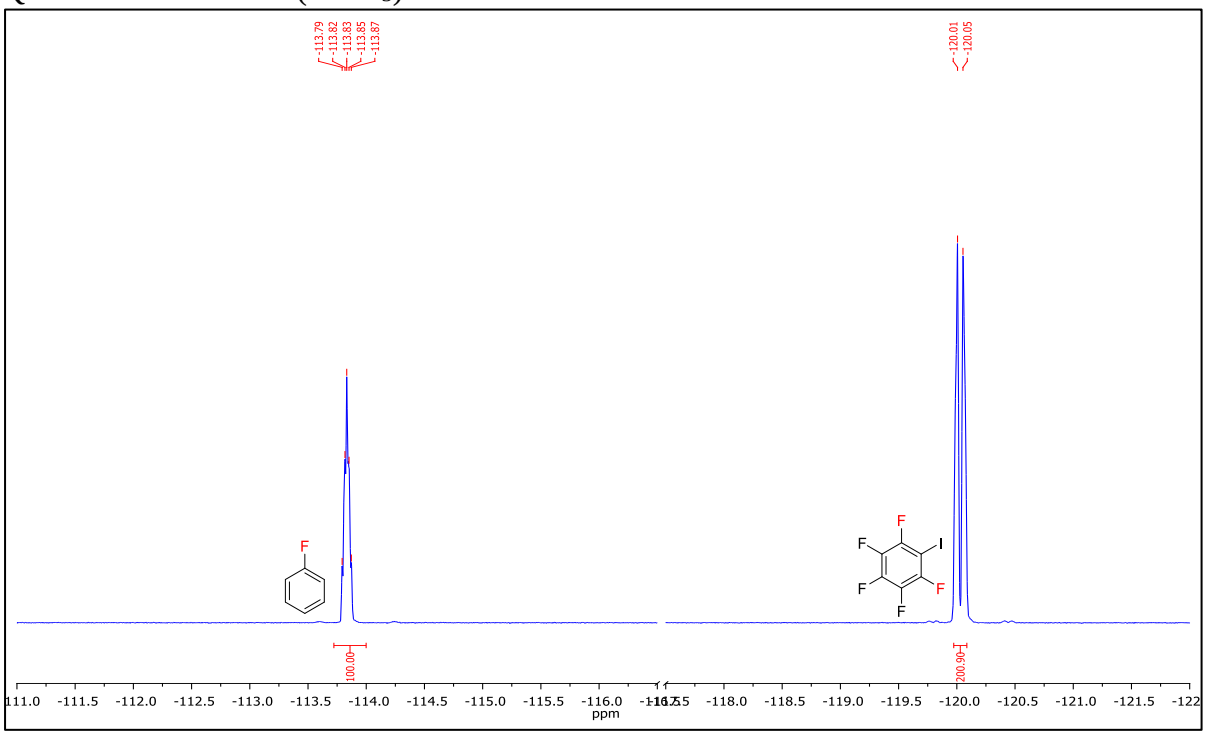


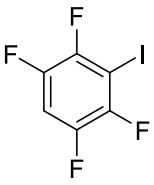
Pentafluoroiodobenzene (2ac)

The general procedure A was applied with pentafluorobenzoic acid (106.0 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 16 h. Then 15% aq. $Na_2S_2O_8$ (2.0 mL), $CDCl_3$ (1.0 mL) and fluorobenzene (46.9 µL, 0.50 mmol, 1.0 equiv) were added. An aliquot (200 µL) of the organic layer was passed through a plug of $MgSO_4$ directly into an NMR tube and diluted with $CDCl_3$ (400 µL) for quantitative ^{19}F NMR analysis to yield the crude product (>99%). Due to the volatility of pentafluoroiodobenzene **2ac**, this product could not be isolated with a yield comparable to the ^{19}F NMR yield.

Spectroscopic data matched those previously reported.[24]

Quantitative ^{19}F NMR ($CDCl_3$)



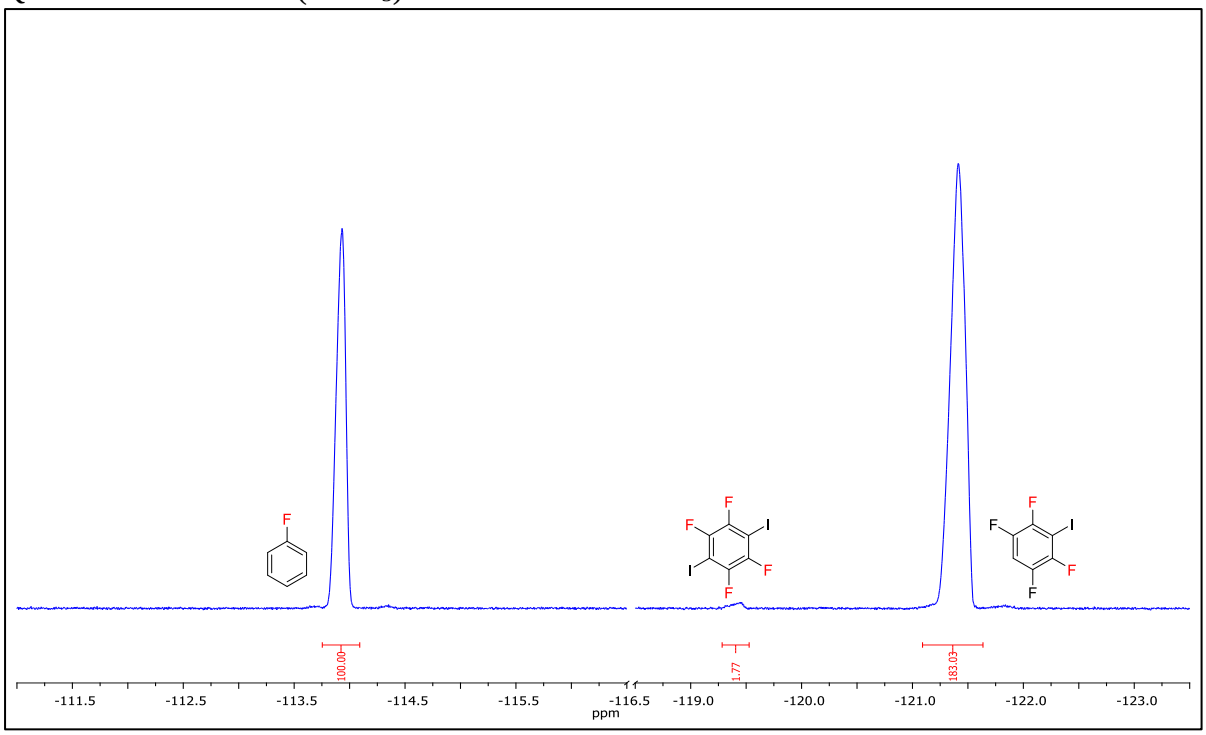


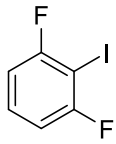
1,2,4,5-tetrafluoro-3-iodobenzene (2ad)

The general procedure A was applied with I_2 (158.6 mg, 1.25 mmol, 2.5 equiv) and 2,3,5,6-tetrafluorobenzoic acid (97.0 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 16 h. Then 15% aq. $Na_2S_2O_8$ (2.0 mL), $CDCl_3$ (1.0 mL) and fluorobenzene (46.9 µL, 0.50 mmol, 1.0 equiv) were added. An aliquot (200 µL) of the organic layer was passed through a plug of $MgSO_4$ directly into an NMR tube and diluted with $CDCl_3$ (400 µL) for quantitative ^{19}F NMR analysis to yield the crude product (92%) as a mixture with 1,2,4,5-tetrafluoro-3,6-diiodobenzene **2ad'** (ratio GC-FID **2ad**:**2ad'** >300:1).Due to the volatility of 1,2,4,5-tetrafluoro-3-iodobenzene **2ad**, this product could not be isolated with a yield comparable to the ^{19}F NMR yield.

Spectroscopic data matched those previously reported.[25]

Quantitative ^{19}F NMR ($CDCl_3$)



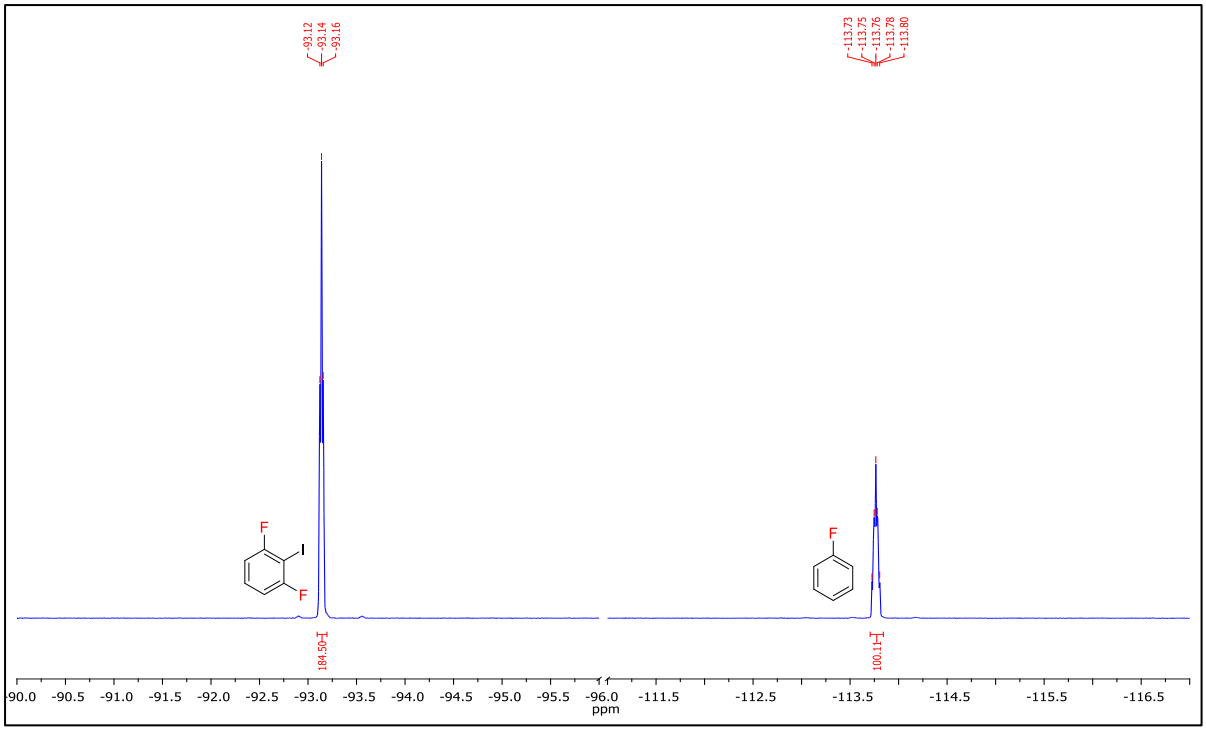


1,3-difluoro-2-iodobenzene (2ae)

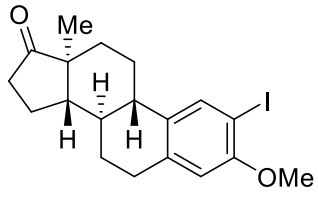
The general procedure A was applied with 2,6-difluorobenzoic acid (79.1 mg, 0.50 mmol, 1.0 equiv) at 100 ^{o}C for 16 h. On completion of the reaction, the mixture was cooled to room temperature then 15% aq. $Na_2S_2O_8$ (2.0 mL), $CDCl_3$ (1.0 mL) and fluorobenzene (46.9 µL, 0.50 mmol, 1.0 equiv) were added. An aliquot (200.0 µL) of the organic layer was passed through a plug of $MgSO_4$ directly into an NMR tube and diluted with $CDCl_3$ (400.0 µL) for quantitative ^{19}F NMR analysis to yield the crude product (92%). Due to the volatility of 1,3-difluoro-2-iodobenzene **2ae**, this product could not be isolated with a yield comparable to the ^{19}F NMR yield.

Spectroscopic data matched those previously reported.[26]

Quantitative ^{19}F NMR ($CDCl_3$)



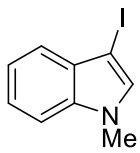
(8R,9S,13S,14S)-2-iodo-3-methoxy-13-methyl-6,7,8,9,11,12,13,14,15,16-decahydro-17H-cyclopenta[a]phenanthren-17-one (2-iodomethylestrone, 2af)



The general procedure A was applied with I_2 (253.8 mg, 1.00 mmol, 4.0 equiv), methyl estrone-2-carboxylic acid **1ae** (82.1 mg, 0.25 mmol, 1.0 equiv), anhydrous K_3PO_4 (53.1 mg, 0.25 mmol, 1.0 equiv) and anhydrous MeCN (2.5 mL, 0.1 M) at 50 ^oC for 16 h. The general work-up procedure gave the desired product as a white solid (94.4 mg, 92%).

Spectroscopic data matched those previously reported.[27]

^1H NMR (500 MHz, ($CDCl_3$) δ 7.65 (s, 1H), 6.55 (s, 1H), 3.84 (s, 3H), 2.88 (dd, *J* = 8.5, 3.7 Hz, 2H), 2.50 (dd, *J* = 19.1, 8.8 Hz, 1H), 2.38 - 2.34 (m, 1H), 2.25 - 2.21 (m, 1H), 2.18 - 2.11 (m, 1H), 2.08 - 2.01 (m, 2H), 1.97 - 1.95 (m, 1H), 1.66 - 1.38 (m, 6H), 0.91 (s, 3H); ^{13}C NMR (126 MHz, ($CDCl_3$) δ 220.8, 156.2, 138.3, 136.6, 134.5, 111.5, 82.9, 56.6, 50.4, 48.1, 43.8, 38.3, 36.0, 31.6, 29.7, 26.5, 26.1, 21.7, 14.0. IR (ATR) 2930, 1736, 1486, 1252, 1049, 730; m.p. 154 - 157 ^oC; HRMS (EI) *m/z* calcd. $C_{19}H_{23}O_2I$ + H: 411.0815; found $[M+H]^+$ 411.0814.

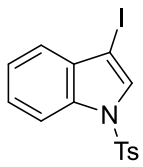


3-iodo-1-methyl-1*H*-indole (2ak)

The general procedure A was applied with I_2 (253.8 mg, 1.00 mmol, 2.0 equiv) and 1-methyl-1*H*-indole-3-carboxylic acid (87.6 mg, 0.50 mmol, 1.0 equiv) at 100 ^oC for 6 h. The general work-up procedure gave the desired product as pale-yellow oil (119.7 mg, 93%).

Spectroscopic data matched those previously reported.[28]

^1H NMR (500 MHz, $(CD_3)_2SO$) δ 7.53 (s, 1H), 7.46 (d, *J* = 8.2 Hz, 1H), 7.28 (d, *J* = 7.9 Hz, 1H), 7.25 - 7.21 (m, 1H), 7.16 - 7.13 (m, 1H), 3.81 (s, 3H); ^{13}C NMR (126 MHz, $(CD_3)_2SO$) δ 136.6, 133.4, 129.7, 122.1, 120.0, 119.9, 110.1, 54.4, 32.7.

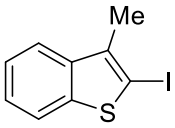


3-iodo-1-tosyl-1*H*-indole (2al)

The general procedure A was applied with I_2 (253.8 mg, 1.00 mmol, 2.0 equiv) and 1-tosyl-1*H*-indole-3-carboxylic acid (157.7 mg, 0.50 mmol, 1.0 equiv) at 100 ^oC for 6 h. The general work-up procedure gave the desired product as an orange solid (172.8 mg, 87%).

Spectroscopic data matched those previously reported.[29]

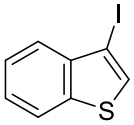
^1H NMR (500 MHz, $CDCl_3$) δ 7.96 (d, *J* = 8.6 Hz, 1H), 7.78 (d, *J* = 7.8 Hz, 2H), 7.70 (s, 1H), 7.38 - 7.35 (m, 2H), 7.32 - 7.29 (m, 1H), 7.24 (d, *J* = 8.0 Hz, 2H), 2.35 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 145.5, 135.0, 134.4, 132.6, 130.2, 129.9, 127.1, 125.8, 124.1, 122.1, 113.5, 67.0, 21.8.



2-iodo-3-methylbenzo[*b*]thiophene (2am)

The general procedure A was applied with I_2 (253.8 mg, 1.00 mmol, 2.0 equiv) and 3-methylbenzo[*b*]thiophene-2-carboxylic acid (96.1 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 6 h. The general work-up procedure gave the desired product as an off-white solid (123.4 mg, 90%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 - 7.73 (m, 1H), 7.68 - 7.65 (m, 1H), 7.34 (app td, *J* = 7.5, 1.4 Hz, 1H), 7.29 (app td, *J* = 7.5, 1.5 Hz, 1H), 2.41 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 143.6, 138.7, 137.3, 124.5, 124.4, 121.8, 121.7, 80.1, 16.3; IR (ATR) 2912, 1422, 916.9, 748, 724, 706; m.p. 51- 53 °C; HRMS (EI) *m/z* calcd. C_9H_7IS: 273.9308; found $[M]^+$ 273.9295.

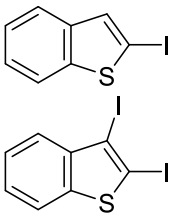


3-iodobenzo[*b*]thiophene (2an)

The general procedure A was applied with benzo[*b*]thiophene-3-carboxylic acid (89.1 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 3 h. The general work-up procedure gave the desired product as a colourless oil (123.5. mg, 95%) as a mixture with 2,3-diiodobenzo[*b*]thiophene **2an'** (ratio GC-FID **2an**:**2an'** >50:1). Purification by flash chromatography on 10% $AgNO_3$-impregnated silica (hexane/EtOAc, 95:5) afforded, after removal of the solvent, the desired product as a colourless oil (118.3 mg, 91%).

Spectroscopic data matched those previously reported.[30]

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.86 (d, *J* = 8.0 Hz, 1H), 7.77 (d, *J* = 8.0 Hz, 1H), 7.61 (s, 1H), 7.48 (app t, *J* = 7.6 Hz, 1H), 7.40 (app t, *J* = 7.8 Hz, 1H); ^{13}C NMR (126 MHz, $CDCl_3$,) δ (1C missing)[27] 140.5, 138.5, 129.3, 125.4, 125.4, 122.6, 78.4.



2-iodobenzo[*b*]thiophene and 2,3-diiodobenzo[*b*]thiophene (2ao + 2ao')

The general procedure A was applied with benzo[*b*]thiophene-2-carboxylic acid (88.4 mg, 0.50 mmol, 1.0 equiv) and anhydrous MeCN (5.0 mL, 0.1 M) at 120 °C for 16 h in a flame-dried 25 mL microwave vial. The general work-up procedure was followed then purification by flash chromatography on 10% $AgNO_3$-impregnated silica (hexane/EtOAc, 95:5) afforded, after removal of the solvent, the desired product as a white solid (88.4 mg, 68%) and 2,3-diiodobenzo[*b*]thiophene **2ao'** as a colourless oil (13.5 mg, 7%).

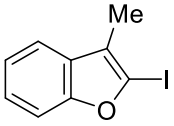
Spectroscopic data matched those previously reported.[31]

2-iodobenzo[b]thiophene (2ao)

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.77 (d, *J* = 7.4 Hz, 1H), 7.72 (d, *J* = 7.4 Hz, 1H), 7.54 (s, 1H), 7.33 - 7.28 (m, 2H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 144.5, 140.9, 133.9, 124.6, 124.5, 122.4, 121.4, 78.5.

2,3-diiodobenzo[b]thiophene (2ao')

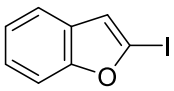
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.72 (d, *J* = 8.0 Hz, 1H), 7.69 (d, *J* = 8.0 Hz, 1H), 7.38 (app t, *J* = 7.5 Hz, 1H), 7.32 (app t, *J* = 7.5 Hz, 1H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 143.9, 141.5, 126.8, 125.9, 125.6, 121.6, 95.2, 89.4.



2-iodo-3-methylbenzofuran (2ap)

The general procedure A was applied with I_2 (253.8 mg, 1.00 mmol, 2.0 equiv) and 3-methylbenzofuran-2-carboxylic acid (88.1 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 16 h. The general work-up procedure gave the desired product as a colourless oil (114.8 mg, 89%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 - 7.41 (m, 2H), 7.24 - 7.21 (m, 2H), 2.22 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 158.1, 129.1, 124.2, 123.2, 122.8, 118.7, 111.0, 97.6, 10.6; IR (ATR) 2917, 1445, 1101, 1081, 741; HRMS (PI) *m/z* calcd. C_9H_7OI: 257.9536; found $[M]^+$ 257.9527.

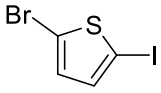


2-iodobenzofuran (2aq)

The general procedure A was applied with benzofuran-2-carboxylic acid (81.1 mg, 0.5 mmol, 1.00 equiv) and anhydrous MeCN (5.0 mL, 0.1 M) at 120 °C for 16 h in a flame-dried 25 mL microwave vial. The general work-up procedure gave the desired product as a pale-yellow oil (85.4 mg, 70%) as a mixture with 2,3-diiodobenzofuran **2aq'** (ratio GC-FID **2aq**:**2aq'** >100:1). Purification by flash chromatography on 10% $AgNO_3$-impregnated silica (hexane/EtOAc, 95:5) afforded, after removal of the solvent, the desired product as a colourless oil (82.8 mg, 68%)

Spectroscopic data matched those previously reported.[25a]

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 - 7.45 (m, 2H), 7.25 - 7.19 (m, 2H), 6.96 (d, *J* = 0.9 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 158.3, 129.3, 124.4, 123.3, 119.8, 117.4, 111.0, 96.0.

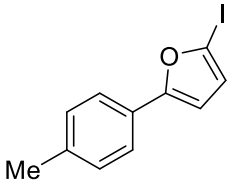


2-bromo-5-iodothiophene (2ar)

The general procedure A was applied with 5-bromothiophene-2-carboxylic acid (103.5 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 16 h. The general work-up procedure gave the desired product as a colourless oil (106.9 mg, 74%).

Spectroscopic data matched those previously reported.[32]

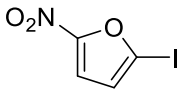
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.04 (d, *J* = 3.8 Hz, 1H), 6.76 (d, *J* = 3.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 137.6, 131.8, 115.3, 72.4.



2-iodo-5-(*p*-tolyl)furan (2as)

The general procedure A was applied with 5-(*p*-tolyl)furan-2-carboxylic acid (101.1 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 16 h. The general work-up procedure gave the desired product as an orange solid (110.8 mg, 78%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.52 (d, *J* = 8.1 Hz, 2H), 7.19 (d, *J* = 8.1 Hz, 2H), 6.60 (d, *J* = 3.4 Hz, 1H), 6.50 (d, *J* = 3.4 Hz, 1H), 2.37 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 159.8, 137.9, 129.5, 127.4, 123.7, 122.3, 107.2, 86.5, 21.4; IR (ATR) 2912, 1508, 1011, 918, 816, 784; m.p. 46 - 48 °C; HRMS (PI) *m/z* calcd. $C_{11}H_9OI$ + H: 284.9771; found $[M+H]^+$ 284.9767.

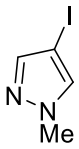


2-iodo-5-nitrofuran (2at)

The general procedure A was applied with I_2 (761.4 mg, 3.00 mmol, 6.0 equiv.) and 5-nitrofuran-2-carboxylic acid (78.5 mg, 0.50 mmol, 1.0 equiv) at 140 ºC for 16 h. The general work-up procedure was followed then column chromatography (100% hexane) gave the desired product as a pale-yellow solid (27.5 mg, 23%).

Spectroscopic data matched those previously reported.[33]

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.19 (d, *J* = 3.7 Hz, 1H), 6.84 (d, *J* = 3.7 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 156.2, 124.2, 113.4, 95.2; IR 3144, 1498, 1419, 1343, 1017, 962, 809; m.p. 69 - 72 ºC; HRMS (EI) *m/z* calcd. $C_4H_2O_3NI$: 238.9074; found $[M]^+$ 238.9067.

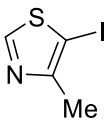


4-iodo-1-methyl-1*H*-pyrazole (2au)

The general procedure A was applied with 1-methyl-1*H*-pyrazole-4-carboxylic acid (1.0 equiv, 0.50 mmol, 63.1 mg) at 100 ºC for 16 h. The general work-up procedure gave the desired product as a white solid (96.7 mg, 93%).

Spectroscopic data matched those previously reported.[34]

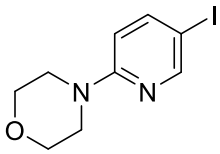
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.48 (s, 1H), 7.39 (s, 1H), 3.91 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 144.5, 134.4, 56.0, 39.4.



5-iodo-4-methylthiazole (2av)

The general procedure A was applied with 4-methylthiazole-5-carboxylic acid (71.5 mg, 0.50 mmol, 1.0 equiv) at 100 ºC for 5 h. The general work-up procedure gave the title product as a colourless oil (86.3. mg, 77%,) as a mixture with 2,5-diiodo-4-methylthiazole **2av'** (ratio GC-FID **2av**:**2av'** >53:1). Column chromatography (5% EtOAc in Hexane) gave the desired product as a colourless oil (76.2 mg, 68%).

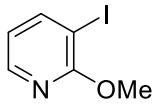
^{1}H NMR (500 MHz, $CDCl_3$) δ 8.83 (s, 1H), 2.51 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 157.9, 157.1, 68.8, 17.7; IR (ATR) 2920, 1504, 1406, 1371, 1289, 971, 924, 838, 789; m.p. 50 - 53 ºC; HRMS (EI) *m/z* calcd. C_4H_4NIS + H: 225.9182; found $[M+H]^+$ 225.9180.



4-(5-iodopyridin-2-yl)morpholine (2aw)

The general procedure A was applied with 6-morpholinonicotinic acid (104.1 mg, 0.50 mmol, 1.0 equiv) at 100 ºC for 6 h. The general work-up procedure gave the desired product as a colourless oil (87.0 mg, 60%)

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.32 (d, *J* = 2.3 Hz, 1H), 7.68 (dd, *J* = 8.9, 2.3 Hz, 1H), 6.47 (d, *J* = 8.9 Hz, 1H), 3.81 - 3.78 (m, 4H), 3.47 - 3.45 (m, 4H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 158.4, 153.7, 145.1, 109.2, 78.1, 66.7, 45.4; IR (ATR) 2849, 1574, 1482, 1241, 1115, 945, 804; m.p. 123 - 127 ºC; HRMS (PI) *m/z* calcd. $C_9H_{11}ON_2I$: 289.9911; found $[M]^+$ 289.9914.

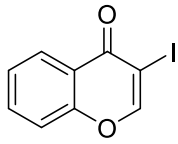


3-iodo-2-methoxypyridine (2ax)

The general procedure A was applied with 2-methoxynicotinic acid (76.5 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 9 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 x 10.0 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a colourless oil (72.8. mg, 62%).

Spectroscopic data matched those previously reported.[35]

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.11 (dd, *J* = 4.9, 1.7 Hz, 1H), 8.02 (dd, *J* = 7.5, 1.7 Hz, 1H), 6.64 (dd, *J* = 7.5, 4.9 Hz, 1H), 3.98 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 162.0, 148.2, 146.6, 118.4, 80.0, 54.8.

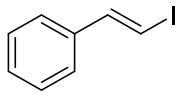


3-iodo-4H-chromen-4-one (2ay)

The general procedure A was applied with 4-oxo-4H-chromene-3-carboxylic acid (95.1 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 6 h. The general work-up procedure gave the desired product as an off-white solid (129.2 mg, 95%).

Spectroscopic data matched those previously reported.[36]

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.29 (s, 1H), 8.23 (ddd, *J* = 8.0, 1.7, 0.4 Hz, 1H), 7.70 (ddd, *J* = 8.7, 7.1, 1.7 Hz, 1H), 7.47 - 7.42 (m, 2H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 173.4, 157.8, 156.2, 134.2, 126.7, 126.1, 121.9, 118.1, 87.0.

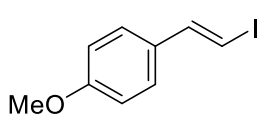


(E)-(2-iodovinyl)benzene (2az)

The general procedure A was applied with cinnamic acid (74.1 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 16 h. The general work-up procedure gave the desired product as a yellow oil (65.6 mg, 57%) as a mixture with (Z)-(2-iodovinyl)benzene **2az*** (ratio ^{1}H NMR **2az**:**2az*** >10:1).

Spectroscopic data matched those previously reported.[37]

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44 (d, *J* = 14.9 Hz, 1H), 7.36 - 7.27 (m, 5H), 6.84 (d, *J* = 14.9 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 145.1, 137.8, 128.9, 128.5, 126.1, 76.8.

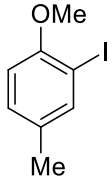


(E)-1-(2-iodovinyl)-4-methoxybenzene (2az')

The general A procedure was applied with (E)-3-(4-methoxyphenyl)acrylic acid (89.1 mg, 0.50 mmol, 1.0 equiv, ~50:1 E/Z isomers) at 100 °C for 16 h. The general work-up procedure gave the desired product as a yellow solid (110.5 mg, 85%) as a mixture with (Z)-1-(2-iodovinyl)-4-methoxybenzene **2az'*** (ratio ^{1}H NMR **2az'**:**2az'*** >23:1).

Spectroscopic data matched those previously reported.[38]

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.36 (d, *J* = 14.9 Hz, 1H), 7.23 (d, *J* = 8.7 Hz, 2H), 6.85 (d, *J* = 8.7 Hz, 2H), 6.63 (d, *J* = 14.9 Hz, 1H), 3.81 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 159.9, 144.5, 130.9, 127.4, 114.2, 73.7, 55.5.

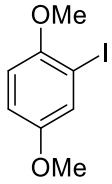


2-iodo-1-methoxy-4-methylbenzene (2B)

The general procedure A was applied with I_2 (253.8 mg, 1.00 mmol, 2.0 equiv) and 2-methoxy-5-methylbenzoic acid (83.1 mg, 0.50 mmol, 1.0 equiv) at 100 ^{o}C for 7 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a colourless oil (94.3 mg, 76%).

Spectroscopic data matched those previously reported.[39]

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.60 (s, 1H), 7.10 (d, *J* = 8.3 Hz, 1H), 6.72 (d, *J* = 8.3 Hz, 1H), 3.85 (s, 3H), 2.26 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 156.2, 139.9, 132.2, 130.1, 110.9, 85.9, 56.5, 20.1.



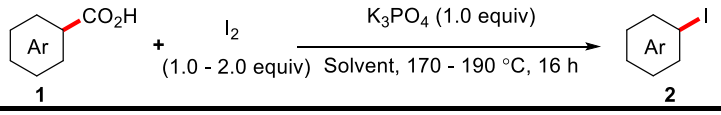
2-iodo-1,4-dimethoxybenzene (2C)

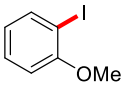
The general procedure A was applied with I_2 (253.8 mg, 1.00 mmol, 2.0 equiv) and 2,5-dimethoxybenzoic acid (91.1 mg, 0.50 mmol, 1.0 equiv) at 100 ^{o}C for 7 h. The general work-up procedure was followed then the mixture was dissolved in pentane/EtOAc (5.0 mL, 98:2) and filtered through a short plug of silica with further washings of pentane/EtOAc (4 × 10 mL, 98:2). Removal of the solvent *in vacuo* gave the desired product as a colourless oil (91.1 mg, 69%) as a mixture with 2,6-diiodo-1,4-dimethoxybenzene **2C'** (ratio GC-FID **2C**:**2C'** >160:1).

Spectroscopic data matched those previously reported.[40]

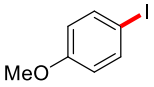
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.34 (s, 1H), 6.86 (d, *J* = 8.9 Hz, 1H), 6.76 (d, *J* = 8.9 Hz, 1H), 3.83 (s, 3H), 3.75 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 154.4, 152.8, 124.9, 114.9, 111.7, 86.2, 57.1, 56.1.

Scheme S1. The scope of the decarboxylative iodination of benzoic acids using low equivalents (1.0 - 2.0 equiv) of I_2.

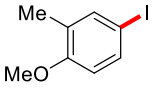




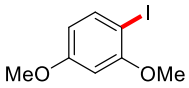
2a 73%
I_2 (1.5 equiv), 170 °C
dioxane (1.0 M)



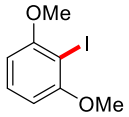
2b 87%
I_2 (2.0 equiv), 170 °C
dioxane (1.0 M)



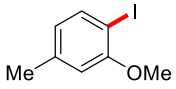
2c 91%
I_2 (1.5 equiv), 170 °C
dioxane (1.0 M)



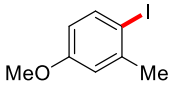
2e 95%
I_2 (1.0 equiv), 170 °C
dioxane (1.0 M)



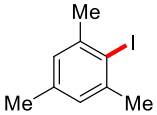
2f 94%
I_2 (1.5 equiv), 170 °C
dioxane (1.0 M)



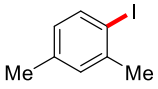
2g 97%
I_2 (1.5 equiv), 150 °C
o-DCB (1.0 M)



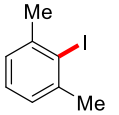
2h 94%
I_2 (1.5 equiv), 170 °C
dioxane (1.0 M)



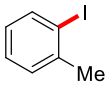
2i 96%
I_2 (2.0 equiv), 170 °C
dioxane (1.0 M)



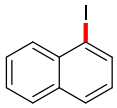
2j 78%
I_2 (2.0 equiv), 170 °C
o-DCB (1.0 M)



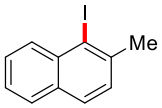
2k 85%
I_2 (2.0 equiv), 170 °C
dioxane (1.0 M)



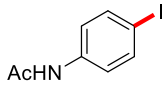
2l 39%
I_2 (2.0 equiv), 170 °C
dioxane (1.0 M)



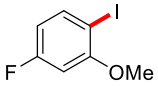
2m 43%
I_2 (2.0 equiv), 170 °C
dioxane (1.0 M)



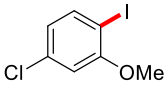
2n 80%
I_2 (1.5 equiv), 170 °C
dioxane (1.0 M)



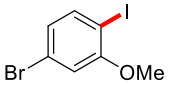
2r 66%
I_2 (2.0 equiv), 170 °C
o-DCB (1.0 M)



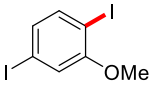
2u 74%
I_2 (2.0 equiv), 190 °C
o-DCB (1.0 M)



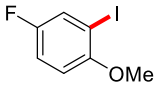
2v 84%
I_2 (1.5 equiv), 170 °C
o-DCB (1.0 M)



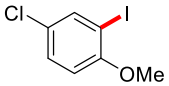
2w 73%
I_2 (1.5 equiv), 170 °C
o-DCB (1.0 M)



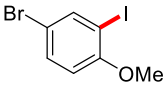
2x 86%
I_2 (2.0 equiv), 170 °C
o-DCB (1.0 M)



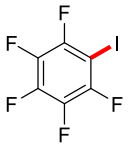
2y 56%
I_2 (2.0 equiv), 170 °C
dioxane (1.0 M)



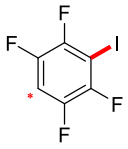
2z 62%
I_2 (2.0 equiv), 170 °C
dioxane (1.0 M)



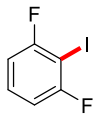
2aa 66%
I_2 (2.0 equiv), 170 °C
dioxane (1.0 M)



2ac 95%
I_2 (1.5 equiv), 190 °C
dioxane (1.0 M)

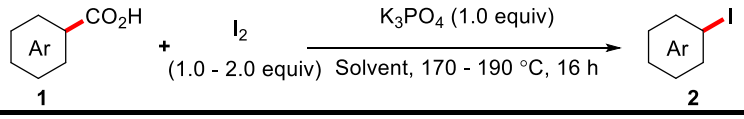


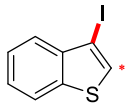
2ad 88% (54:1)
I_2 (1.5 equiv), 190 °C
dioxane (1.0 M)



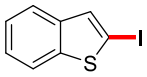
2ae 88%
I_2 (1.5 equiv), 190 °C
dioxane (0.5 M)

Scheme S2. The scope of the decarboxylative iodination of heteroaromatic acids using low equivalents (1.0 - 2.0 equiv) of I_2.

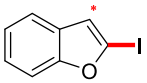




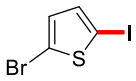
2an 75% (5:1)
I_2 (1.5 equiv), 170 °C
dioxane (1.0 M)



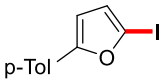
2ao 50%
I_2 (2.0 equiv), 170 °C
dioxane (1.0 M)



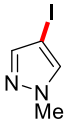
2aq 97% (65:1)
I_2 (2.0 equiv), 170 °C
o-DCB (1.0 M)



2ar 52%
I_2 (2.0 equiv), 170 °C
o-DCB (1.0 M)

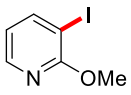


2as 89%
I_2 (2.0 equiv)
MeCN (0.2 M)

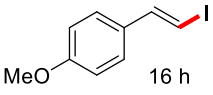


2au 90%
I_2 (1.0 equiv), 170 °C
dioxane (1.0 M)

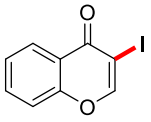
2av 80%
I_2 (2.0 equiv), 140 °C
MeCN (0.2 M)



2ax 66%
I_2 (2.0 equiv), 170 °C
dioxane (1.0 M)



2az' 85% (8:1 E/Z)
I_2 (2.0 equiv), 140 °C,
MeCN (0.2 M)



2ay 73%
I_2 (1.5 equiv), 170 °C
dioxane (1.0 M)

Robustness Screen for the Decarboxylative Iodination of Aromatic Acids

The general procedure A was applied with I_2 (152 mg, 0.60 mmol, 3.0 equiv), 2-methoxybenzoic acid (30 mg, 0.20 mmol, 1.0 equiv) and the appropriate additive (0.20 mmol, 1.0 equiv) at 100 ^oC for 4 h. On completion of the reaction, the mixture was cooled to room temperature then 20% $Na_2S_2O_8$ (aq, 1.0 mL), 10% tartaric acid (aq, 1.0 mL), EtOAc (4.0 ml) and mesitylene (28 µL, 0.20 mmol, 1.0 equiv) were added. An aliquot of the organic layer (0.4 mL) was diluted with EtOAc (2.0 mL) and transferred to a GC vial for analysis.

The yields of product and the recovery of starting material and additive were determined by GC-FID analysis. Calibration of the GC was undertaken using a single point calibration technique of each additive and both the starting material and the product. The calibration for each compound was determined as follows:

1) In a 5.0 mL volumetric flask was made a solution of the compound under investigation (starting material/product/additive, 1.0 mmol) in acetonitrile.
2) In a separate 5.0 mL volumetric flask was made a solution of mesitylene (1.0 mmol) in EtOAc.
3) A 1:1 mixture of both solutions were analysed by GC-FID. Calculating the ratio of the peak for the compound (starting material/product/additive) in question to the standard enables a single point calibration (1:1, 100%)

Entries 2, 25, 27 and 30

In these cases, the additive was not transferred quantitatively using the standard work-up procedure, therefore, this experiment was run in duplicate. The first experiment followed the standard work-up procedure in order to determine the yield of product and recovery of starting material. The second experiment used an alternative work-up procedure in order to determine the recovery of the additive: On completion of the reaction, the mixture was cooled to room temperature and H_2O (0.5 mL), EtOAc (4.0 mL) and mesitylene (28 µL, 0.20 mmol, 1.0 equiv) were added. An aliquot of the organic layer (0.4 mL) was diluted with EtOAc (2.0 mL) and transferred to a GCMS vial for analysis.

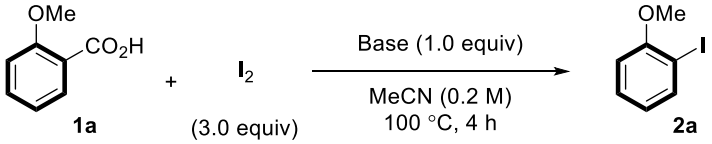
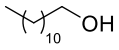
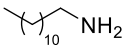
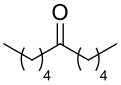
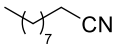
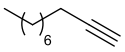
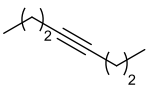
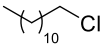
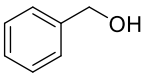
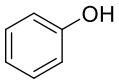
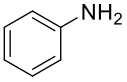
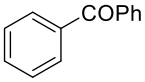
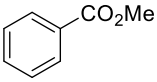
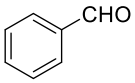
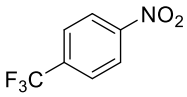


Table S2a. Robustness screen of the Decarboxylative Iodination.

Entry	Additive	Additive Recovery	Yield **2a**	Recovery **1a**
1		✗ 0%	✗ 0%	>99%
2[a]		✗ 0%	✗ 0%	>99%
3		✓ 95%	✓ 77%	11%
4		✓ >99%	✓ 86%	14%
5		✗ 33%	✗ 0%	13%
6		✗ 2%	✗ 2%	>99%
7		✗ 20%	- 39%	40%
8		✓ >99%	✓ 88%	12%
9		✗ 0%	✗ 0%	>99%
10		- 36%	✗ trace	>99%
11		✗ 3%	✗ 3%	>99%
12		✓ >99%	✓ 87%	11%
13		✓ >99%	✓ 90%	0%
14[b]		- 51%	✓ 84%	1%
15		✓ >99%	✓ 89%	2%

Reactions carried out at a 0.2 mmol scale of **1a**. Yields and recoveries determined by crude GC-FID analysis. [a]Alternative work-up procedure followed. [b]1,3-dinitrobenzene used as standard.

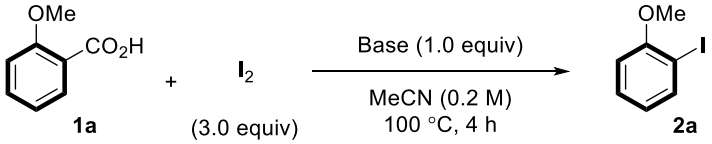
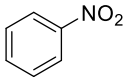
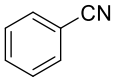
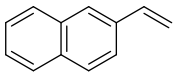
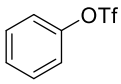
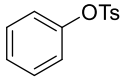
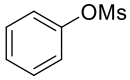
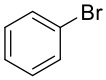
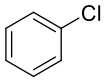
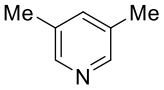
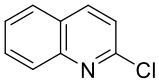
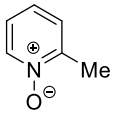
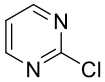
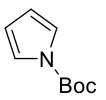
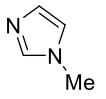


Table S2b. Robustness screen of the Decarboxylative Iodination

Entry	Additive	Additive Recovery	Yield **2a**	Recovery **1a**
16		✓ 94%	✓ 87%	0%
17		✓ >99%	✓ 92%	0%
18		✗ 0%	✗ trace	19%
19		✓ 97%	✓ 80%	0%
20		✓ >99%	✓ 86%	0%
21		✓ >99%	✓ 87%	0%
22		✓ 98%	✓ 90%	0%
23		✓ 96%	✓ 91%	0%
24		✓ >99%	✓ 90%	0%
25[a,b]		- 48%	✓ 72%	20%
26		✓ 94%	✓ 91%	9%
27[a,c]		✗ 25%	- 49%	43%
28		✓ 94%	- 63%	34%
29		✗ 0%	✗ 0%	>99%
30[a]		✗ 0%	✗ 1%	83%

Reactions carried out at a 0.2 mmol scale of **1a**. Yields and recoveries determined by crude GC-FID analysis. [a]Alternative work-up procedure followed. [b]1,3-dinitrobenzene used as standard. [c]No H_2O added in work-up.

Procedure for Multi-Gram Scale Synthesis of 2-Iodo-1,3-dimethoxybenzene (2f)

In a glove box, a flame-dried 1 L pear-shaped flask was charged with 2,6-dimethoxybenzoic acid (10.0 g, 55.0 mmol, 1.0 equiv), anhydrous K_3PO_4 (11.7 g, 55.0 mmol, 1.0 equiv) and anhydrous MeCN (275 mL, 0.2 M). Outside the glove box, a 100 mL flame-dried round-bottomed flask was charged with I_2 (55.8 g, 220.0 mmol, 4.0 equiv) and transferred to the glove box. The I_2 was then added to the mixture in the pear-shaped flask (Figure S1). The mixture was stoppered, transferred out of the glove box and stirred at 23 ^oC for 2 h under a nitrogen balloon (Figure S2). After this time H_2O (800 mL) was added and the reaction triturated with $Na_2S_2O_8$ (60.0 g). The mixture was transferred to a 2 L separating funnel and sat. Na_2CO_3 (aq, 200 mL) and pentane (500 mL) were added. The organic layer was collected and the aqueous layer was further washed with pentane (3 x 200 mL). The organic fractions were dried with $MgSO_4$ (60.0 g) and concentrated *in vacuo* to yield the desired product as a white solid (14.1 g, 97%, Figure S3).

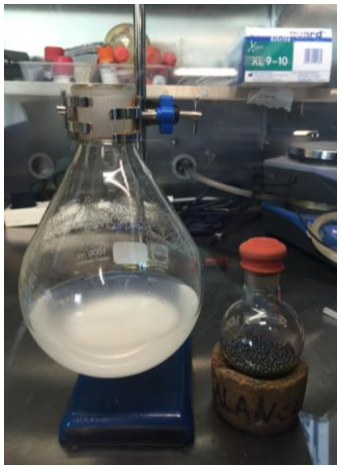


Figure S1. Mixture of **1f**, K_3PO_4 and MeCN; and I_2

Figure S2. Decarboxylative Iodination in progress

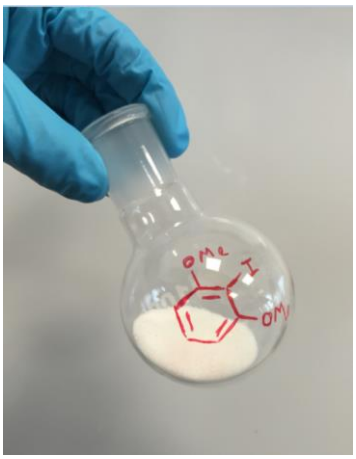
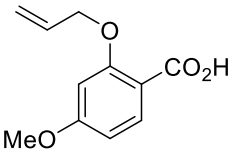


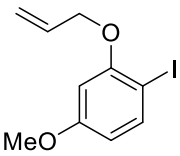
Figure S3. 14.1 g of 2-Iodo-1,3-dimethoxybenzene (**2f**)

Radical clock experiment with 2-(allyloxy)-4-methoxybenzoic acid (1A)



Preparation of 2-(allyloxy)-4-methoxybenzoic acid (1A)
2-Hydroxy-4-methoxybenzoic acid (1.46 g, 8.7 mmol, 1.0 equiv) and allyl bromide (3.0 mL, 34.8 mmol, 4.0 equiv) were dissolved in acetone (25.0 ml). K_2CO_3 (3.91 g, 27.0 mmol, 3.1 equiv) was added, and the reaction mixture was refluxed for 8 h. The salts were filtered off, and the acetone was removed under reduced pressure. Excess allyl bromide was removed by applying high vacuum to the rotary evaporator. The yellowish crude oil was dissolved in ethanol (12.5 ml), and aqueous NaOH (2 M, 5.2 ml) was added. The mixture was stirred overnight at room temperature and then acidified using 2 M aq HCl. The crude product was precipitated by adding ice water and then filtered. Column chromatography (hexane:EtOAc, 8:2) afforded the product as a white solid (1.54 g, 85%).

^{1}H NMR (400 MHz, $(CD_3)_2SO$) δ 12.20 (s, 1H), 7.71 (d, *J* = 8.6 Hz, 1H), 6.61 (d, *J* = 2.3 Hz, 1H), 6.57 (dd, *J* = 8.6, 2.3 Hz, 1H), 6.03 (ddt, *J* = 17.2, 10.6, 4.6 Hz, 1H), 5.52 (dq, *J* = 17.2, 1.8 Hz, 1H), 5.25 (dq, *J* = 10.6, 1.6 Hz, 1H), 4.63 (dt, *J* = 4.6, 1.6 Hz, 2H), 3.80 (s, 3H); ^{13}C NMR (101 MHz, $(CD_3)_2SO$) δ 166.5, 163.5, 159.4, 133.3, 133.3, 117.0, 113.0, 105.4, 100.0, 68.6, 55.5; IR (ATR) 3284, 2928, 1726, 1681, 1604, 1573, 1255, 1021, 1170, 996; m.p. 79 - 83 °C; HRMS (EI) *m/z* calcd. $C_{11}H_{12}O_4$ + H: 209.0808; found $[M+H]^+$ 209.0806.



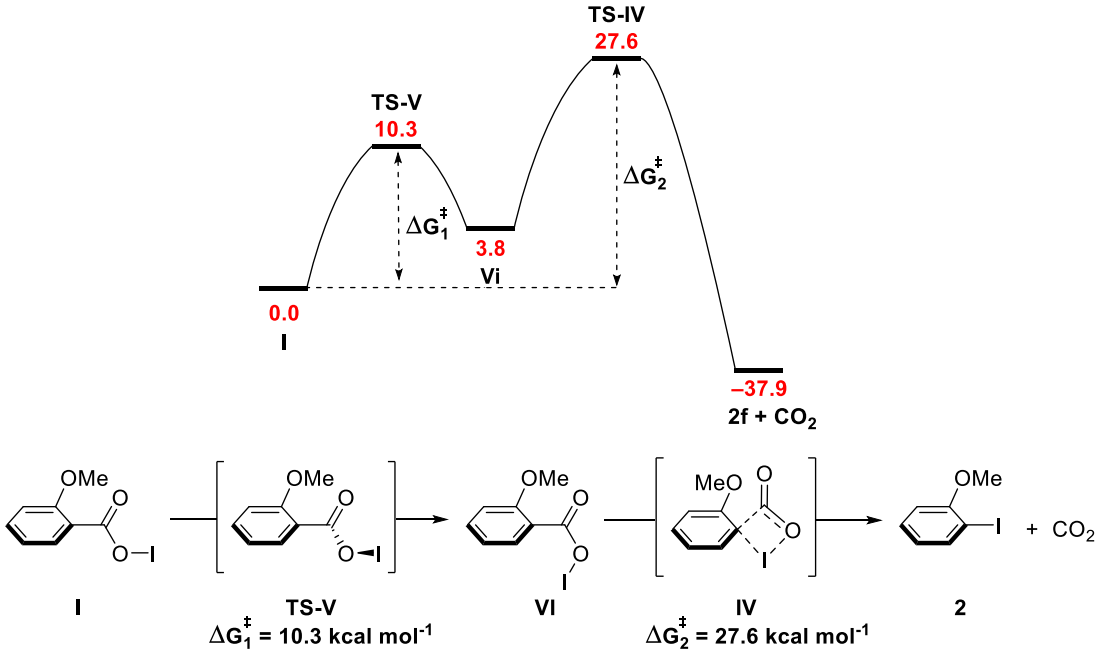
Preparation of 2-(allyloxy)-1-iodo-4-methoxybenzene (2A)
The general procedure A was applied with I_2 (126.9 mg, 1.00 mmol, 2.0 equiv) and 2-(allyloxy)-4-methoxybenzoic acid (104.1 mg, 0.50 mmol, 1.0 equiv) at 100 °C for 2 h. The general work-up procedure gave the desired product as a colourless oil (137.8 mg, 95%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.6 Hz, 1H), 6.42 (d, *J* = 2.7 Hz, 1H), 6.33 (dd, *J* = 8.6, 2.7 Hz, 1H), 6.05 (ddt, *J* = 17.3, 10.6, 4.8 Hz, 1H), 5.53 (dq, *J* = 17.3, 1.7 Hz, 1H), 5.32 (dq, *J* = 10.6, 1.5 Hz, 1H), 4.57 (dt, *J* = 4.8, 1.6 Hz, 2H), 3.78 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 161.3, 158.0, 139.3, 132.6, 117.8, 107.4, 100.7, 75.6, 69.8, 55.6; IR (ATR) 2934, 1576, 1301, 1021, 1166, 1013; HRMS (EI) *m/z* calcd. $C_{10}H_{11}O_2I$ + H: 290.9876; found $[M+H]^+$ 290.9876.

Computational Methods

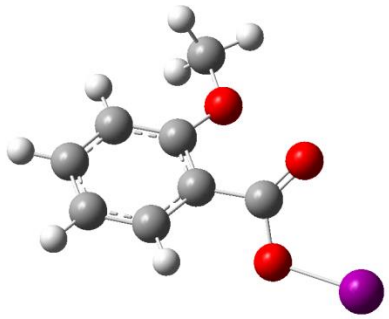
All the calculations were performed at the DFT level with Gaussian 09, revision B.01.[41] All optimisations and single point calculations were performed using the B97D3 functional[42] with the LanL2DZ[43] basis set and ECPs for I atom and 6-31G(d) for all other atoms (C, H, and O).[44] Stationary points were characterized as minima or saddle points by frequencies analysis using an acetonitrile solvent correction. Representative transition states were confirmed to correspond to the desired step by optimization through the intrinsic reaction coordinate (IRC) to starting materials and products.[45] Dispersion corrections where calculated from single point calculations at the optimized geometries using an acetonitrile solvent correction. Gibbs free energies were evaluated at 298 K and 1 atm.

The decarboxylative iodination was modelled starting from the benzoyl hypoiodite **I**. An initial rotation provides intermediate **VI** *via* transition state **TS-V** (ΔG_1 = 10.3 kcal mol^{-1}). The decarboxylation step proceeds from intermediate **VI** *via* transition state **TS-IV** (ΔG_2 = 27.6 kcal mol^{-1}). The resulting overall energy diagram is shown below:



Scheme S3. Energies measured in kcal mol^{-1} for DFT modelling using an acetonitrile solvent correction.

Coordinates and energies of computed structures

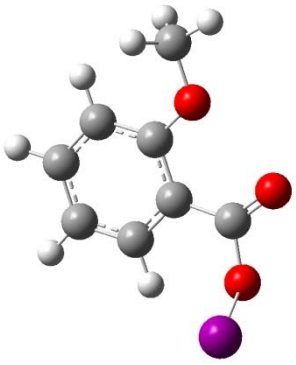


I (minimum)
No imaginary frequencies

E = – 545.792344 a.u.

G = – 545.699140 a.u.

C	-1.39005800	-0.42662800	0.14158800
C	-2.54540500	0.38932900	-0.02894100
C	-1.52425100	-1.82845800	0.17132700
C	-3.80643300	-0.22773800	-0.13491100
C	-2.78099400	-2.43103300	0.07399500
C	-3.91612800	-1.62286100	-0.07946800
H	-2.87327000	-3.51541700	0.11826400
H	-4.90402700	-2.07726200	-0.16109400
O	0.86594900	-0.52770100	-0.37068800
H	-4.70265000	0.37383300	-0.26443500
O	-2.34457700	1.72933400	-0.10276300
C	-3.48936800	2.58044300	-0.27163700
H	-4.18861200	2.47294000	0.57046700
H	-3.09006400	3.59881400	-0.29452100
H	-4.00749300	2.36181600	-1.21697700
C	-0.04659300	0.20129100	0.33509000
O	0.20892200	1.18895800	1.00289100
I	2.85942500	0.00549100	-0.08539500
H	-0.63038600	-2.43656800	0.29645600



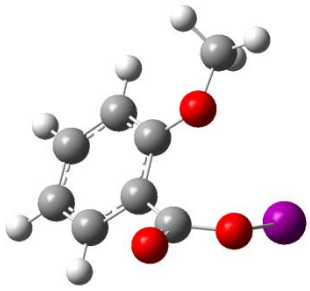
V – rotation transition state (maximum)

One imaginary frequency: *i*61.54 cm^{-1}

E = – 545.777343 a.u.

G = – 545.682755 a.u.

C	-1.10587100	0.21278500	0.45681600
C	-2.39133400	-0.19905300	-0.02506900
C	-0.83610300	1.59640300	0.57542000
C	-3.34076100	0.78303900	-0.37455000
C	-1.78480300	2.55754000	0.23538800
C	-3.03787400	2.14099000	-0.24165900
H	-1.55483300	3.61706700	0.33916200
H	-3.79290000	2.87915400	-0.51437700
O	1.17074800	-0.17994400	1.18881500
H	-4.31919000	0.49118300	-0.74631000
O	-2.62540600	-1.52662500	-0.13503600
C	-3.88939800	-1.96069200	-0.66677300
H	-4.03840400	-1.58205600	-1.68818600
H	-3.83333900	-3.05314800	-0.67894400
H	-4.71919900	-1.63703800	-0.02204700
C	-0.06965100	-0.76995000	0.82510400
O	-0.19302400	-1.97713000	0.92122100
I	2.52897900	0.01304900	-0.34244500
H	0.13818600	1.89645500	0.95223800



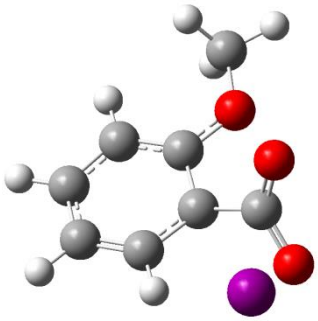
VI (minimum)

No imaginary frequencies

E = – 545.785669 a.u.

G = – 545.692045 a.u.

C	-1.23035600	-0.77280400	0.26960200
C	-1.44179700	0.62273100	0.40899600
C	-2.09969900	-1.53365800	-0.53155300
C	-2.47833500	1.24006300	-0.31211200
C	-3.12726300	-0.91700400	-1.25238800
C	-3.30517200	0.46928000	-1.14110100
H	-3.78109700	-1.51021000	-1.89038900
H	-4.10384400	0.96335800	-1.69519500
O	1.15593800	-1.10671600	0.93207200
H	-2.65197900	2.30974400	-0.22460300
O	-0.61320200	1.26391100	1.27919900
C	-0.67228300	2.69771800	1.34004700
H	-1.64613700	3.03582100	1.72288500
H	0.12061100	2.99105600	2.03433200
H	-0.48474500	3.13794000	0.34982000
C	-0.15530000	-1.48785400	1.00771700
O	-0.34186500	-2.46670200	1.71992400
I	1.88567500	0.15559900	-0.56375600
H	-1.93931900	-2.60920900	-0.60258300



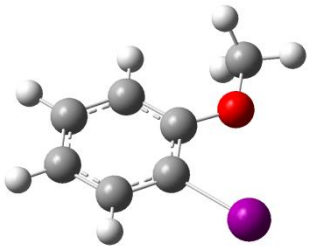
IV – decarboxylative iodination transition state (maximum)

One imaginary frequency: *i*215.16 cm^{-1}

E = – 545.747400 a.u.

G = – 545.655108 a.u.

C	0.48904800	-0.07838600	0.78434500
C	1.57159500	-0.05322800	-0.19656900
C	0.31257700	1.08719900	1.61662100
C	2.27528500	1.13383600	-0.44441100
C	1.04494900	2.23383600	1.38710500
C	2.00251200	2.25887200	0.33905400
H	0.89108900	3.12034400	1.99962500
H	2.55721700	3.17686600	0.14649800
O	-1.30042100	-1.52245300	1.44918200
H	3.03949700	1.18388300	-1.21524500
O	1.77173600	-1.21764500	-0.81009200
C	2.81804000	-1.32155100	-1.80789800
H	3.78732800	-1.05898000	-1.36622900
H	2.80779400	-2.36834300	-2.11876000
H	2.58872400	-0.66539300	-2.65705500
C	-0.02630500	-1.43381100	1.33765700
O	0.80271000	-2.28611300	1.70689200
I	-1.66708300	0.24200500	-0.64261600
H	-0.43463900	1.03443500	2.40651200



2 (minimum)

No imaginary frequencies

E = – 357.359304 a.u.

G = – 357.274131 a.u.

C	-0.31350400	-0.54534900	-0.00001300
C	-0.67712300	-1.89502700	-0.00003800
C	-1.28713000	0.48078500	0.00000000
C	-2.03481100	-2.25137300	-0.00005100
C	-2.64605700	0.10487100	-0.00001400
C	-3.01053200	-1.24799500	-0.00003900
H	-3.42028500	0.86915100	-0.00000600
H	-4.06863700	-1.51085500	-0.00004900
O	-0.84643400	1.76775800	0.00002300
C	-1.82556500	2.81767700	0.00005800
H	-2.45658500	2.77007000	0.89998100
H	-1.25050600	3.74865500	0.00008800
H	-2.45658500	2.77012900	-0.89986900
H	-2.31586700	-3.30416300	-0.00007000
I	1.76255300	-0.03022900	0.00000700
H	0.09296600	-2.66443400	-0.00004700

CO_2 (minimum)

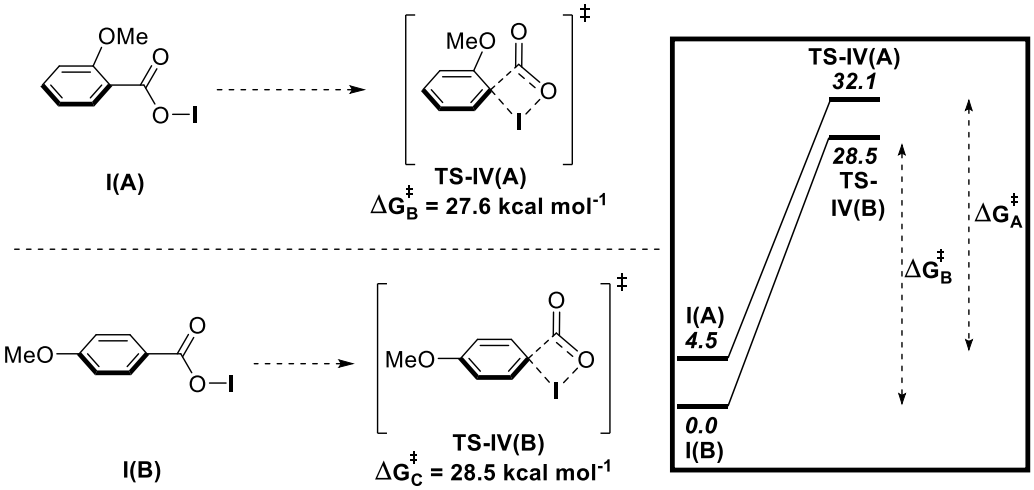
No imaginary frequencies

E = –188.475219 a.u.

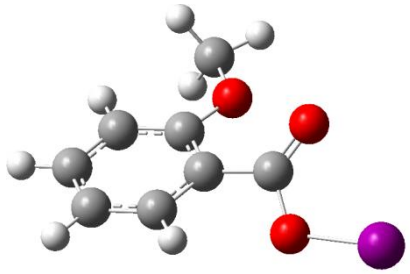
G = –188.482766 a.u.

O	1.17614000	0.05416800	0.00000000
C	0.00000000	0.00058600	0.00000000
O	-1.17614000	-0.05460700	0.00000000

The investigation of a possible *ortho* effect was conducted by comparing the energies of each benzoyl hypoiodite (**I(A)** and **I(B)**) and their respective transition states for decarboxylation (**IV(A)** and **IV(B)**). The results showed that 2-methoxybenzoic acid has a lower barrier to decarboxylation, consistent with a higher reactivity of this substrate under our standard conditions. The *ortho*-substituted hypoiodite **I(A)** is higher in energy than the non-*ortho*-substituted analogue **I(B)** by 4.5 kcal mol^{-1} and the *ortho*-substituted transition state is higher in energy than the non-*ortho*-substituted one by 3.6 kcal mol^{-1}. It is likely that the difference in energy between the *ortho*- and non-*ortho*-substituted species is due to steric destabilization. This shows that if an *ortho*-effect, similar to that observed in transition metal-catalysed decarboxylations, is present in our system, it is of much less significance.



Scheme S4. Energies measured in kcal mol^{-1} for DFT modelling using an acetonitrile solvent correction.



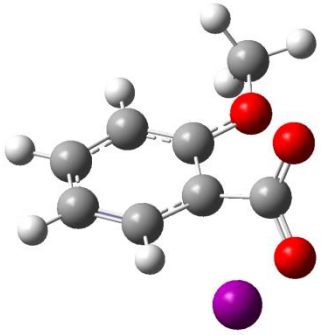
I(A) (minimum)

No imaginary frequencies

E = –545.792344 a.u.

G = –545.699140 a.u.

C	-1.39005800	-0.42662800	0.14158800
C	-2.54540500	0.38932900	-0.02894100
C	-1.52425100	-1.82845800	0.17132700
C	-3.80643300	-0.22773800	-0.13491100
C	-2.78099400	-2.43103300	0.07399500
C	-3.91612800	-1.62286100	-0.07946800
H	-2.87327000	-3.51541700	0.11826400
H	-4.90402700	-2.07726200	-0.16109400
O	0.86594900	-0.52770100	-0.37068800
H	-4.70265000	0.37383300	-0.26443500
O	-2.34457700	1.72933400	-0.10276300
C	-3.48936800	2.58044300	-0.27163700
H	-4.18861200	2.47294000	0.57046700
H	-3.09006400	3.59881400	-0.29452100
H	-4.00749300	2.36181600	-1.21697700
C	-0.04659300	0.20129100	0.33509000
O	0.20892200	1.18895800	1.00289100
I	2.85942500	0.00549100	-0.08539500
H	-0.63038600	-2.43656800	0.29645600



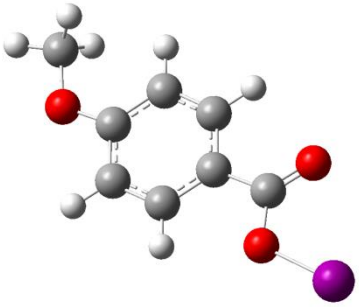
TS-IV(A) – decarboxylative iodination transition state (maximum)

One imaginary frequency: *i*215.16 cm^{-1}

E = –545.747400 a.u.

G = –545.655108 a.u.

C	0.48904800	-0.07838600	0.78434500
C	1.57159500	-0.05322800	-0.19656900
C	0.31257700	1.08719900	1.61662100
C	2.27528500	1.13383600	-0.44441100
C	1.04494900	2.23383600	1.38710500
C	2.00251200	2.25887200	0.33905400
H	0.89108900	3.12034400	1.99962500
H	2.55721700	3.17686600	0.14649800
O	-1.30042100	-1.52245300	1.44918200
H	3.03949700	1.18388300	-1.21524500
O	1.77173600	-1.21764500	-0.81009200
C	2.81804000	-1.32155100	-1.80789800
H	3.78732800	-1.05898000	-1.36622900
H	2.80779400	-2.36834300	-2.11876000
H	2.58872400	-0.66539300	-2.65705500
C	-0.02630500	-1.43381100	1.33765700
O	0.80271000	-2.28611300	1.70689200
I	-1.66708300	0.24200500	-0.64261600
H	-0.43463900	1.03443500	2.40651200



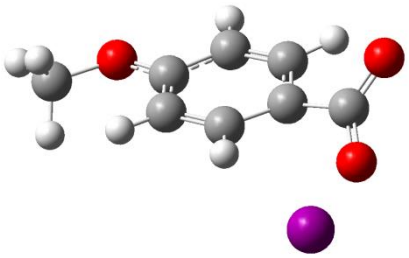
I(B) (minimum)

No imaginary frequencies

E = –545.799034 a.u.

G = –545.706276 a.u.

C	1.01047300	0.21705700	0.00000300
C	1.45770700	-1.12476500	0.00000700
C	1.96311600	1.25530500	-0.00000300
C	2.81740300	-1.41150400	0.00000300
C	3.33049100	0.97711700	-0.00000700
C	3.76743300	-0.36451500	-0.00000500
H	4.04104700	1.79989400	-0.00001400
O	-1.22355900	-0.51007100	-0.00000200
H	3.17366800	-2.44087500	0.00000700
C	-0.42587000	0.59952400	0.00000500
O	-0.84668900	1.74977800	0.00001000
I	-3.25699600	-0.14371700	-0.00000100
H	1.61967500	2.28831700	-0.00000500
O	5.06862900	-0.75308200	-0.00000400
C	6.08142300	0.26745400	0.00000200
H	7.03500300	-0.26898500	0.00001100
H	6.00719600	0.89550800	-0.89981900
H	6.00718200	0.89551300	0.89981900
H	0.73689700	-1.93941900	0.00001200



TS-IV(B) – decarboxylative iodination transition state (maximum)

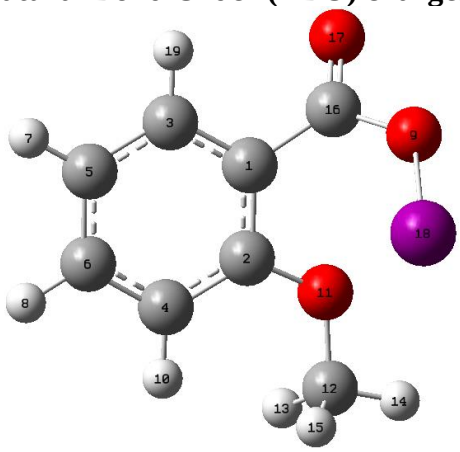
One imaginary frequency: *i*176.92 cm^{-1}

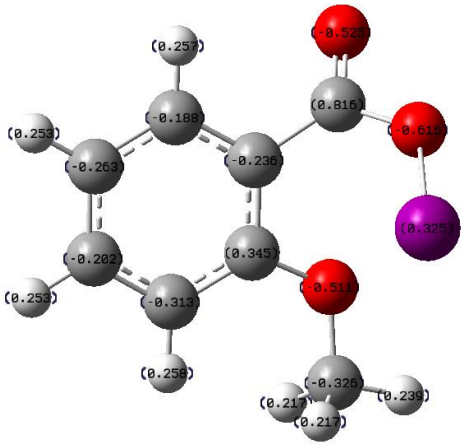
E = –545.752574 a.u.

G = –545.660801 a.u.

C	-0.13366200	1.12942800	-0.07003300
C	0.59525000	1.37038000	1.14187800
C	0.57191500	0.52788000	-1.18336300
C	1.86795100	0.88206800	1.29427600
C	1.87560300	0.08422300	-1.05789300
C	2.52583500	0.22690100	0.19358800
H	2.38059200	-0.36789700	-1.90665700
O	-2.29936600	1.25883000	-1.09510500
H	2.42614000	1.00444400	2.22082700
C	-1.46898800	1.85493000	-0.32791500
O	-1.59806500	2.98848700	0.18885800
I	-1.51757900	-1.20969600	0.17769300
H	0.04742800	0.44526800	-2.13343900
O	3.76366000	-0.17858400	0.45825700
C	4.54872800	-0.82561800	-0.57830600
H	4.69765200	-0.13737100	-1.41913900
H	5.50246500	-1.06040800	-0.10134000
H	4.04656500	-1.74291400	-0.90907400
H	0.10523600	1.92175800	1.94158800

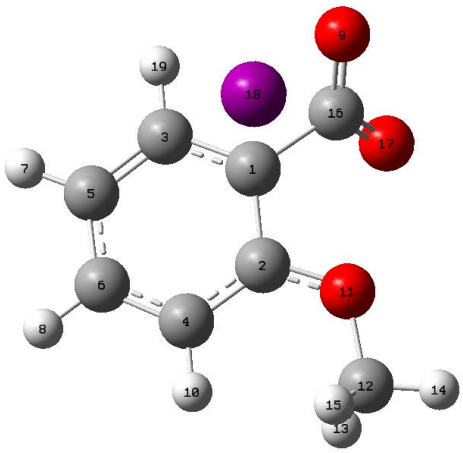
Natural Bond Order (NBO) charges

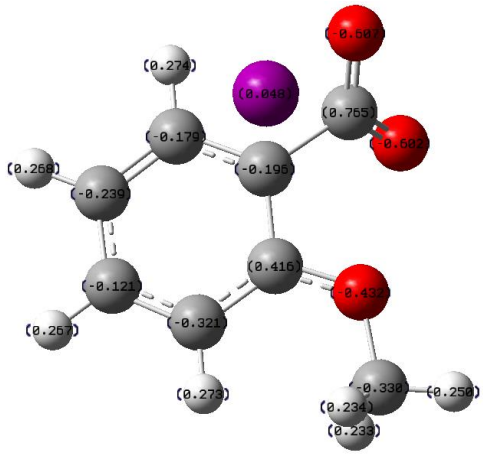




VI(A)

C(1)	–0.236
C(2)	+0.345
C(3)	–0.188
C(4)	–0.313
C(5)	–0.263
C(6)	–0.202
H(7)	+0.253
H(8)	+0.253
O(9)	–0.616
H(10)	+0.258
O(11)	–0.511
C(12)	–0.326
H(13)	+0.217
H(14)	+0.236
H(15)	+0.217
C(16)	+0.816
O(17)	–0.525
I(18)	+0.325
H(19)	+0.257





TS-IV(A)

C(1)	–0.196
C(2)	+0.416
C(3)	–0.179
C(4)	–0.321
C(5)	–0.239
C(6)	–0.121
H(7)	+0.268
H(8)	+0.267
O(9)	–0.607
H(10)	+0.273
O(11)	–0.432
C(12)	–0.330
H(13)	+0.233
H(14)	+0.250
H(15)	+0.234
C(16)	+0.765
O(17)	–0.682
I(18)	+0.048
H(19)	+0.274

Hammett Plot Analysis

For the construction of the Hammett plot, the initial rates of various substituted 2-methoxybenzoc acids were measured (4-fluoro-2-methoxy benzoic acid **1u**, 2-methoxy-5-methylbenzoic acid **1B**, 2,5-dimethoxybenzoic acid **1C**, 4-chloro-2-methoxybenzoic acid **1v**, 4-bromo-2-methoxybenzoic acid **1w** and 5-fluoro-2-methoxybenzoic acid **1y**). 4-fluoro-2-methoxybenzoic acid **1u** was used as k_0. As each substrate contains a 2-methoxy substituent, the sigma values for the corresponding substituted benzoic acids were used as reported in the literature.[46]

General procedure B for the measurement of initial rates for the construction of a Hammett Plot

A flame dried microwave vial was charged with I_2 (609.1 mg, 2.40 mmol, 4.0 equiv), capped and flushed with N_2. The vial was transferred to a glove box, then benzoic acid (0.60 mmol, 1.0 equiv), anhydrous K_3PO_4 (127.4 mg, 0.60 mmol, 1.0 equiv), 4-nitrobenzotrifluoride (28.7 mg, 0.15 mmol, 0.25 equiv) and anhydrous d_3-MeCN (0.6 mL) were added. The vial was capped, transferred out of the glove box and stirred at r.t. for 10 min. Then, anhydrous d_3-MeCN (2.4 mL) that had been preheated to 80 ^oC was added and the vial instantly placed in a heating block set at 85 ^oC. Aliquots (~0.1 mL) were taken at the given time periods via syringe and instantly quenched in a mixture of d_3-MeCN (0.6 mL), trifluoroacetic acid (~20 µL, ~ 15 equiv) and H_2O (~5 µL, ~1.5 equiv). The yield of product and starting material were determined by quantitative ^1H NMR analysis.

4-fluoro-2-methoxybenzoic acid (1u)

The general procedure B was followed with 4-fluoro-2-methoxybenzoic acid (102.1 mg, 0.60 mmol, 1.0 equiv).

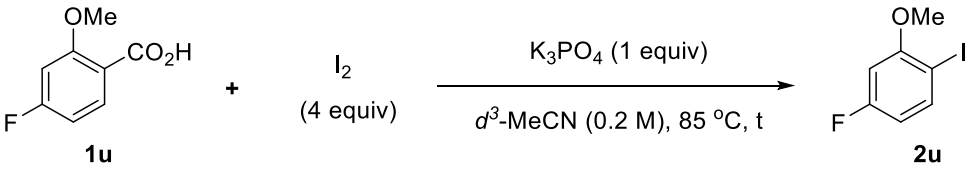
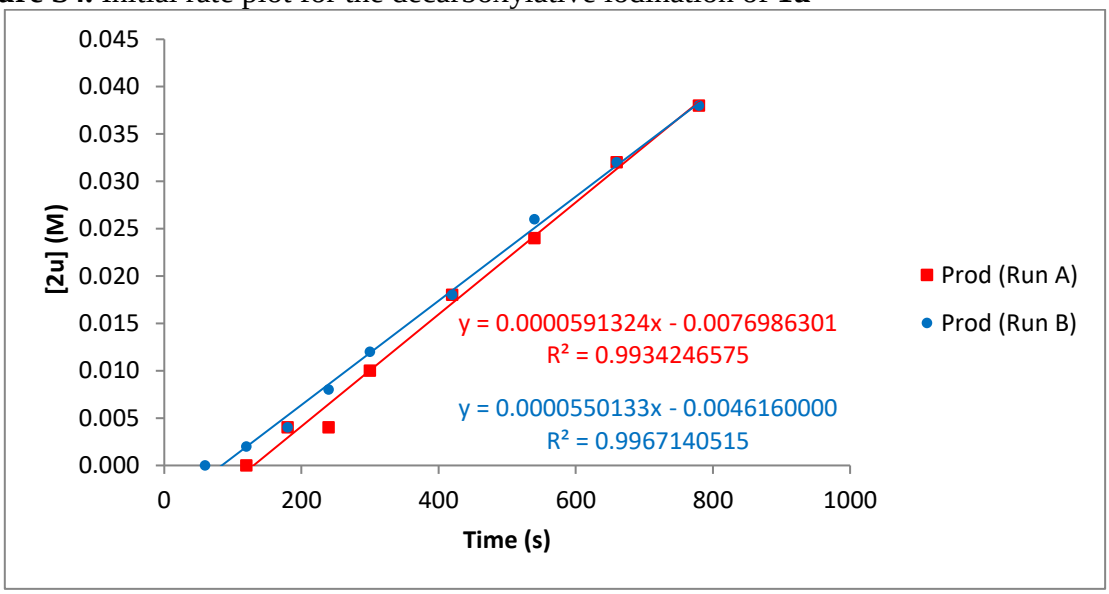


Table S3. Initial rate measurements for the decarboxylative iodination of **1u**

Run A					
Time (s)	1u		2u		Recovery
	Yield (%)	Conc (M)	Yield (%)	Conc (M)	Yield (%)
120	97	0.194	0	0.000	97
180	96	0.192	2	0.004	98
240	94	0.188	2	0.004	96
300	93	0.186	5	0.010	98
420	93	0.186	9	0.018	102
540	84	0.168	12	0.024	96
660	83	0.166	16	0.032	99
780	82	0.164	19	0.038	101

Run B					
Time (s)	1u		2u		Recovery
	Yield (%)	Conc (M)	Yield (%)	Conc (M)	Yield (%)
60	98	0.196	0	0.000	98
120	94	0.188	1	0.002	95
180	92	0.184	2	0.004	94
240	93	0.186	4	0.008	97
300	94	0.188	6	0.012	100
420	91	0.182	9	0.018	100
540	85	0.170	13	0.026	98
660	84	0.168	16	0.032	100
780	81	0.162	19	0.038	100

Figure S4. Initial rate plot for the decarboxylative iodination of **1u**



Average Initial Rate = 5.71 x10^{-5} mol dm^{-3} s^{-1}

2-methoxy-5-methylbenzoic acid (1B)

The general procedure B was followed with 2-methoxy-5-methylbenzoic acid (99.7 mg, 0.60 mmol, 1.0 equiv).

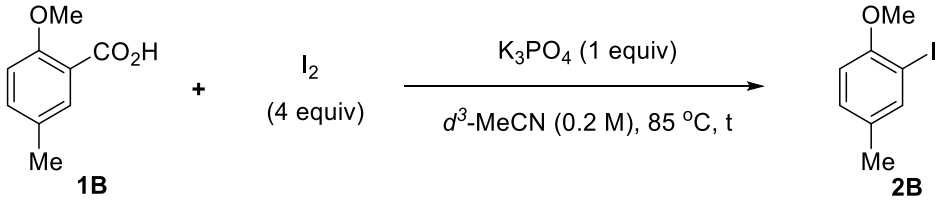
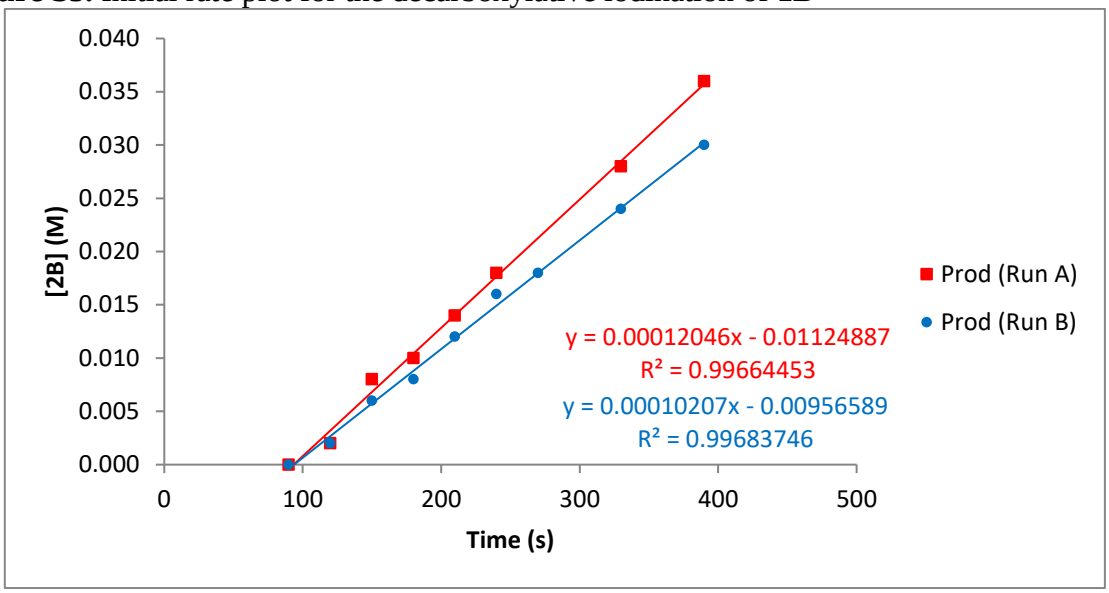


Table S4. Initial rate measurements for the decarboxylative iodination of **1B**

Run A					
Time (s)	1B		2B		Recovery
	Yield (%)	Conc (M)	Yield (%)	Conc (M)	Yield (%)
90	103	0.206	0	0.000	103
120	98	0.196	1	0.002	99
150	97	0.194	4	0.008	101
180	97	0.194	5	0.010	102
210	95	0.190	7	0.014	102
240	91	0.182	9	0.018	100
330	86	0.172	14	0.028	100
390	83	0.166	18	0.036	101

Run B					
Time (s)	1B		2B		Recovery
	Yield (%)	Conc (M)	Yield (%)	Conc (M)	Yield (%)
90	99	0.198	0	0	99
120	96	0.192	1	0.002	97
150	95	0.19	3	0.006	98
180	93	0.186	4	0.008	97
210	91	0.182	6	0.012	97
240	90	0.18	8	0.016	98
270	90	0.18	9	0.018	99
330	86	0.172	12	0.024	98
390	84	0.168	15	0.03	99

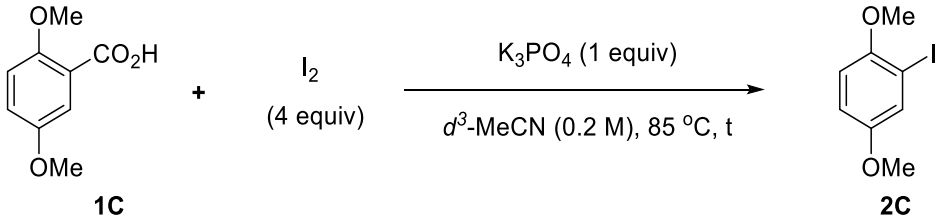
Figure S5. Initial rate plot for the decarboxylative iodination of **1B**



Average Initial Rate = 1.11 x10^{-4} mol $dm^{-3}s^{-1}$

2,5-dimethoxybenzoic acid (1C)

The general procedure B was followed with 2,5-dimethoxybenzoic acid (109.3 mg, 0.60 mmol, 1.0 equiv).



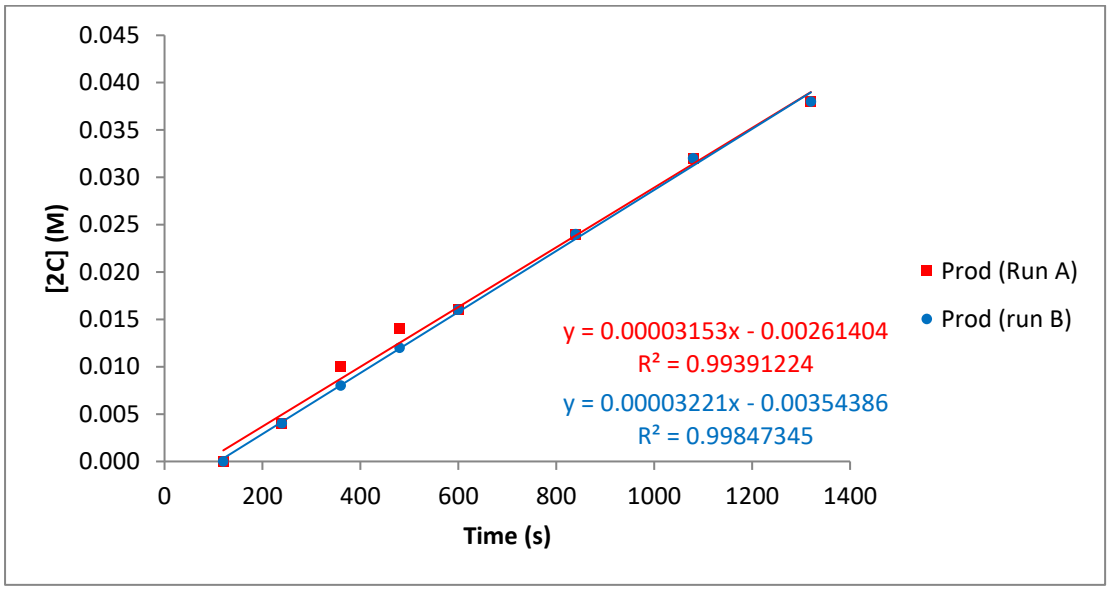
1C 2C

Table S5. Initial rate measurements for the decarboxylative iodination of **1C**

Time (s)	**1C**		**2C**		Recovery
	Yield (%)	Conc (M)	Yield (%)	Conc (M)	Yield (%)
120	60	0.120	0	0.000	60
240	100	0.200	2	0.004	102
360	98	0.196	5	0.010	103
480	94	0.188	7	0.014	101
600	94	0.188	8	0.016	102
840	90	0.180	12	0.024	102
1080	87	0.174	16	0.032	103
1320	83	0.166	19	0.038	102

Time (s)	**1C**		**2C**		Recovery
	Yield (%)	Conc (M)	Yield (%)	Conc (M)	Yield (%)
120	93	0.186	0	0.000	93
240	93	0.186	2	0.004	95
360	92	0.184	4	0.008	96
480	89	0.178	6	0.012	95
600	89	0.178	8	0.016	97
840	85	0.170	12	0.024	97
1080	81	0.162	16	0.032	97
1320	80	0.160	19	0.038	99

Figure S6. Initial rate plot for the decarboxylative iodination of **1C**



Average Initial Rate = 3.19 x10^{-5} mol dm^{-3} s^{-1}

4-chloro-2-methoxybenzoic acid (1v)

The general procedure B was followed with 4-chloro-2-methoxybenzoic acid (112.0 mg, 0.60 mmol, 1.0 equiv).

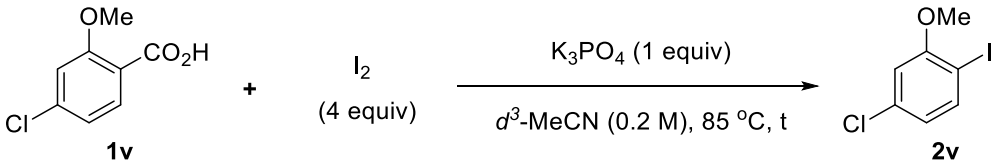
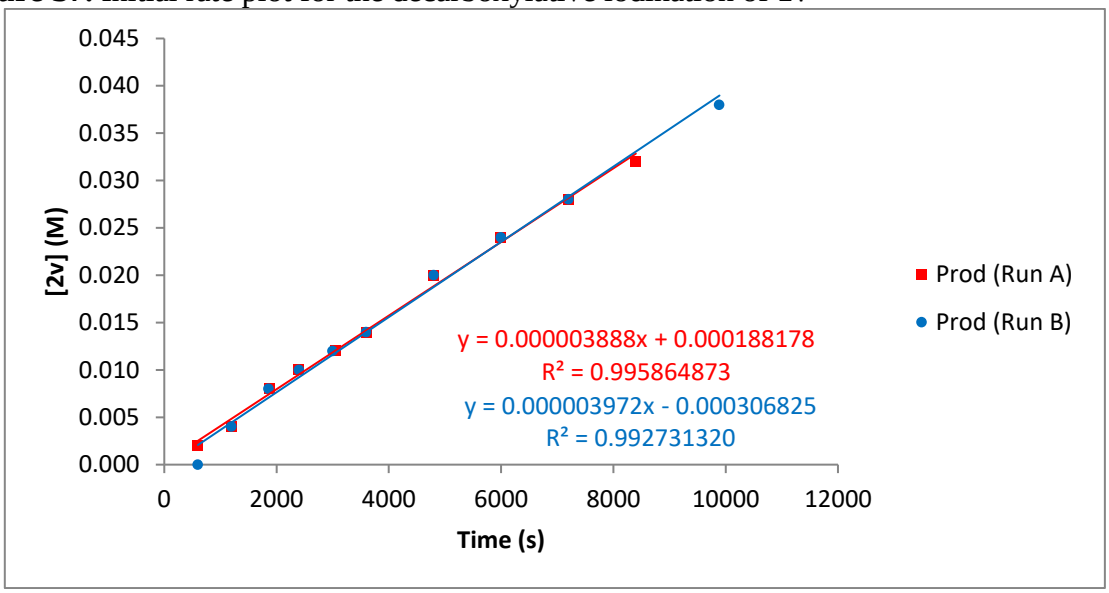


Table S6. Initial rate measurements for the decarboxylative iodination of **1v**

Run A					
Time (s)	1v		2v		Recovery
	Yield (%)	Conc (M)	Yield (%)	Conc (M)	Yield (%)
600	95	0.190	1	0.002	96
1200	88	0.176	2	0.004	90
1870	91	0.182	4	0.008	95
2400	88	0.176	5	0.010	93
3060	87	0.174	6	0.012	93
3600	92	0.184	7	0.014	99
4800	88	0.176	10	0.020	98
6000	85	0.170	12	0.024	97
7200	85	0.170	14	0.028	99
8400	84	0.168	16	0.032	100

Run B					
Time (s)	1v		2v		Recovery
	Yield (%)	Conc (M)	Yield (%)	Conc (M)	Yield (%)
600	94	0.188	0	0.000	94
1200	91	0.182	2	0.004	93
1860	93	0.186	4	0.008	97
2400	91	0.182	5	0.010	96
3000	94	0.188	6	0.012	100
3600	89	0.178	7	0.014	96
4800	88	0.176	10	0.020	98
6000	85	0.170	12	0.024	97
7200	86	0.172	14	0.028	100
9890	78	0.156	19	0.038	97

Figure S7. Initial rate plot for the decarboxylative iodination of **1v**



Average Initial Rate = 3.93 x10^{-6} mol dm^{-3} s^{-1}

4-bromo-2-methoxybenzoic acid (1w)

The general procedure B was followed with 4-bromo-2-methoxybenzoic acid (138.6 mg, 0.60 mmol, 1.0 equiv).

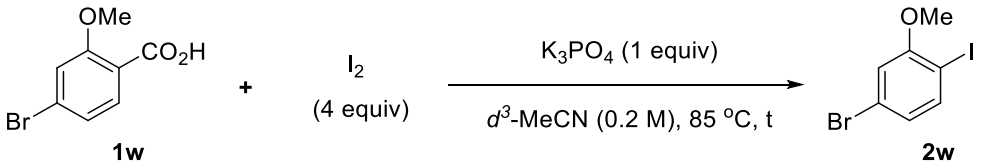
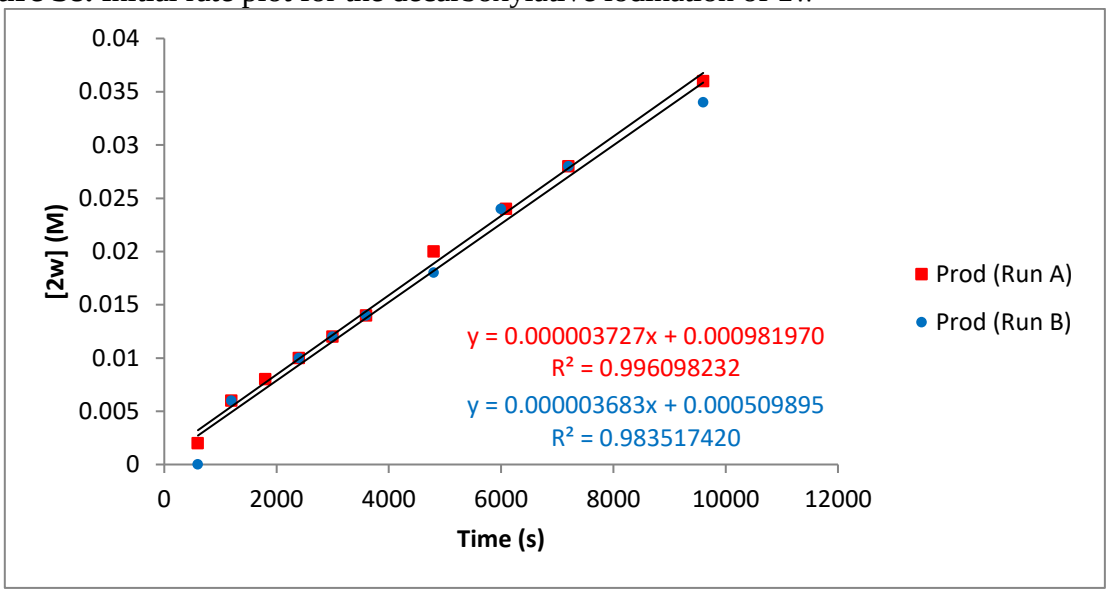


Table S7. Initial rate measurements for the decarboxylative iodination of **1w**

Run A					
Time (s)	1w		2w		Recovery
	Yield (%)	Conc (M)	Yield (%)	Conc (M)	Yield (%)
600	113	0.226	1	0.002	114
1200	116	0.232	3	0.006	119
1800	104	0.208	4	0.008	108
2400	90	0.180	5	0.010	95
3000	87	0.174	6	0.012	93
3600	87	0.174	7	0.014	94
4800	90	0.180	10	0.020	100
6090	88	0.176	12	0.024	100
7200	85	0.170	14	0.028	99
9600	82	0.164	18	0.036	100

Run B					
Time (s)	1w		2w		Recovery
	Yield (%)	Conc (M)	Yield (%)	Conc (M)	Yield (%)
600	107	0.214	0	0	107
1200	98	0.196	3	0.006	101
2400	94	0.188	5	0.01	99
3000	92	0.184	6	0.012	98
3600	91	0.182	7	0.014	98
4800	84	0.168	9	0.018	93
6000	85	0.17	12	0.024	97
7200	83	0.166	14	0.028	97
9600	78	0.156	17	0.034	95

Figure S8. Initial rate plot for the decarboxylative iodination of **1w**



Average Initial Rate = 3.71 x10^{-6} mol dm^{-3} s^{-1}

5-fluoro-2-methoxybenzoic acid (1y)

The general procedure B was followed with 5-fluoro-2-methoxybenzoic acid (102.1 mg, 0.60 mmol, 1.0 equiv).

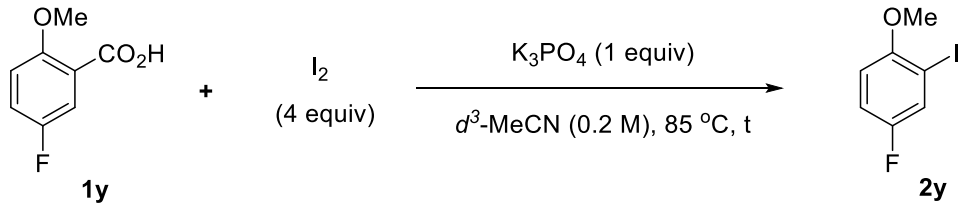
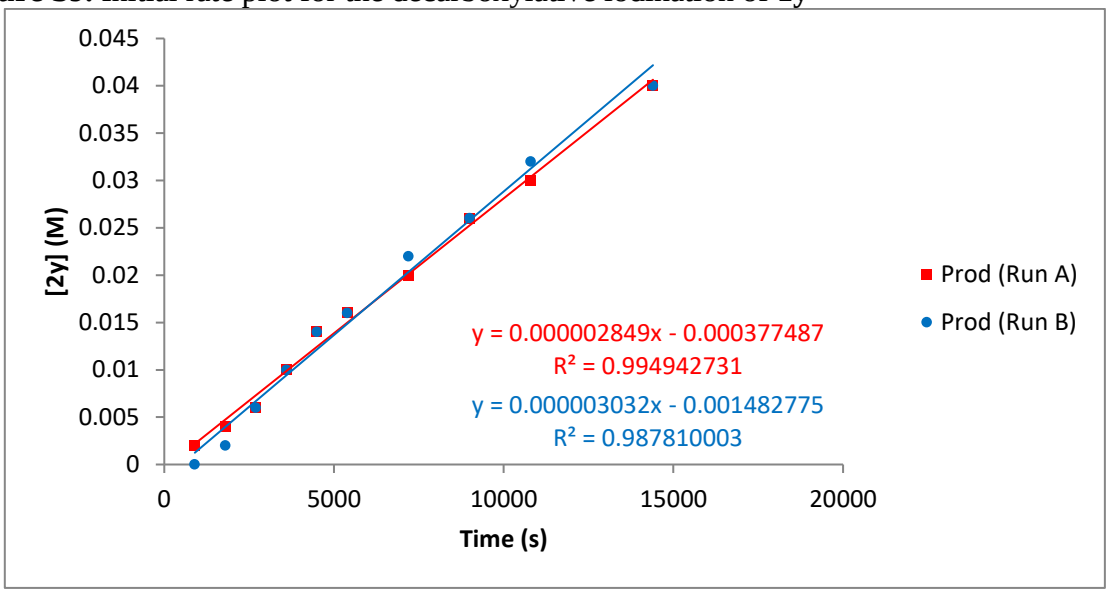


Table S8. Initial rate measurements for the decarboxylative iodination of **1y**

Run A					
Time (s)	1y		2y		Recovery
	Yield (%)	Conc (M)	Yield (%)	Conc (M)	Yield (%)
900	103	0.206	1	0.002	104
1800	101	0.202	2	0.004	103
2700	100	0.2	3	0.006	103
3600	98	0.196	5	0.01	103
4500	97	0.194	7	0.014	104
5400	95	0.19	8	0.016	103
7200	91	0.182	10	0.02	101
9000	89	0.178	13	0.026	102
10800	88	0.176	15	0.03	103
14400	83	0.166	20	0.04	103

Run B					
Time (s)	1y		2y		Recovery
	Yield (%)	Conc (M)	Yield (%)	Conc (M)	Yield (%)
900	103	0.206	0	0	103
1800	102	0.204	1	0.002	103
2700	98	0.196	3	0.006	101
3600	98	0.196	5	0.01	103
4500	95	0.19	7	0.014	102
5400	95	0.19	8	0.016	103
7200	91	0.182	11	0.022	102
9000	90	0.18	13	0.026	103
10800	86	0.172	16	0.032	102
14400	81	0.162	20	0.04	101

Figure S9. Initial rate plot for the decarboxylative iodination of **1y**

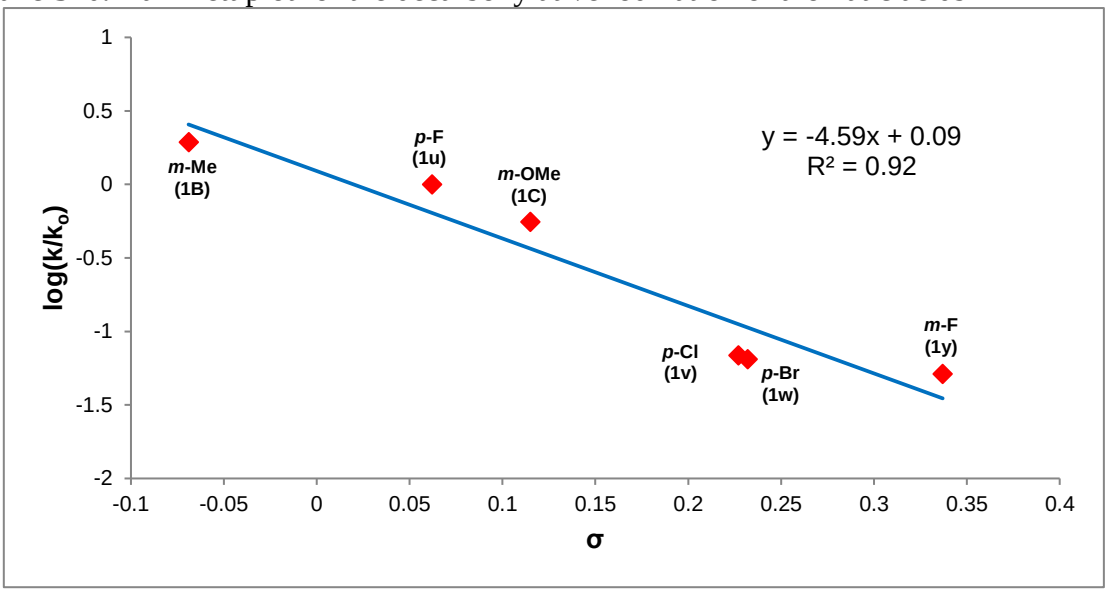


Average Initial Rate = 2.94 x10^{-6} mol dm^{-3} s^{-1}

Table S9. Hammett plot analysis for the decarboxylative iodination of aromatic acids

Acid	σ[42]	Initial rate (mol dm^{-3} s^{-1})	log(k/k_0)
1B (*m*-Me)	-0.069	1.11 x10^{-4}	0.289
1u (*p*-F)	0.062	5.71 x10^{-5}	0.000
1C (*m*-MeO)	0.115	3.19 x10^{-5}	-0.253
1v (*p*-Cl)	0.227	3.93 x10^{-6}	-1.162
1w (*p*-Br)	0.232	3.71 x10^{-6}	-1.187
1y (*m*-F)	0.337	2.94 x10^{-6}	-1.288

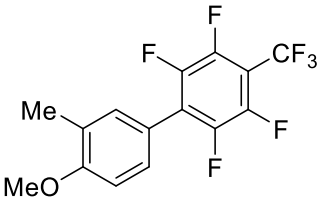
Figure S10. Hammett plot for the decarboxylative iodination of aromatic acids



$\rho = -4.6$

A ρ value of –4.6 suggests a substantial build-up of positive charge on the aromatic ring during the reaction and is of the same order of magnitude as other electrophilic reactions on aromatic compounds.[47]

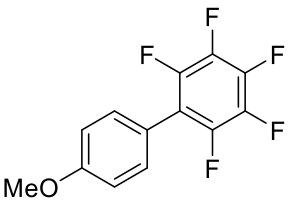
General Procedures for the Decarboxylative Cross-Coupling of Benzoic acids with Arenes



2,3,5,6-tetrafluoro-4'-methoxy-3'-methyl-4-(trifluoromethyl)-1,1'-biphenyl (5a)

In a glove box, a flame-dried 10 mL microwave vial was charged with 4-methoxy-3-methylbenzoic acid (83.1 mg, 0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (106.1 mg, 0.50 mmol, 1.0 equiv) and anhydrous dioxane (0.5 mL, 1.0 M). The vial was transferred out of the glove box and I_2 (209.4 mg, 0.825 mmol, 1.75 equiv) was added under a nitrogen funnel. The vial was capped and the mixture stirred at 170 °C for 16 h. After this time, the vial was cooled to room temperature and Et_3N (87.7. µL, 0.625 mmol, 1.25 equiv) was added. The mixture was then stirred at 170 °C for 6 h. After this time the vial was cooled to room temperature, transferred to a glove box and anhydrous K_3PO_4 (583.6 mg, 2.75 mmol, 5.5 equiv), 1,2,4,5-tetrafluoro-3-(trifluoromethyl)benzene (204.1 µL, 1.5 mmol, 3.0 equiv), CuI (9.5 mg, 0.05 mmol, 10 mol %), 1,10-phenanthroline (9.0 mg, 0.05 mmol, 10 mol %) and pyridine (20.0 µL, 0.25 mmol, 0.5 equiv) were added. The vial was capped, transferred out of the glove box and stirred at 170 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature and filtered through a plug of celite with washings of Et_2O. The mixture was concentrate *in vacuo* and purified by column chromatography (Hexane/EtOAc 100:1) to yield the desired product as a white solid (126.0. mg, 74%).

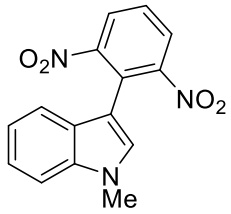
^{1}H NMR (500 MHz, $(CD_3)_2CO$) δ 7.42 (d, *J* = 8.5 Hz, 1H), 7.37 (s, 1H), 7.13 (d, *J* = 8.5 Hz, 1H), 3.93 (s, 3H), 2.25 (s, 3H); ^{13}C NMR (126 MHz, $(CD_3)_2CO$) δ 160.1, 145.3 (dm, *J* = 252.9 Hz, 2C), 132.7, 130.1, 127.7, 126.3 (t, *J* = 17.0 Hz), 122.2 (q, *J* = 273.2 Hz), 118.3, 111.2, 107.7 (qt, *J* = 34.3, 13.0 Hz), 55.9, 16.3; ^{19}F NMR (376 MHz, $CDCl_3$) δ -56.13 (t, *J* = 21.5 Hz, 3F), -141.12 - -141.41 (m, 2F), -141.93 - -142.04 (m, 2F); m.p. 85-88 °C; IR (ATR) 2961, 1489, 1337, 1256, 1144, 984, 736, 713; HRMS (HESI) *m/z* calcd. $C_{15}H_9F_7O$: 338.0536; found $[M]^+$ 338.0532.



2,3,4,5,6-pentafluoro-4'-methoxy-1,1'-biphenyl (5b)

In a glove box, a flame-dried 10 mL microwave vial was charged with 4-methoxybenzoic acid (76.1 mg, 0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (106.1 mg, 0.5 mmol, 1.0 equiv) and anhydrous dioxane (0.5 mL, 1.0 M). The vial was transferred out of the glove box and I_2 (253.8 mg, 1.0 mmol, 2.0 equiv) was added under a nitrogen funnel. The vial was capped and the mixture stirred at 170 °C for 16 h. After this time, the vial was cooled to room temperature and Et_3N (105.3. µL, 0.75 mmol, 1.5 equiv) was added. The mixture was then stirred at 170 °C for 6 h. After this time the vial was cooled to room temperature, transferred to a glove box and anhydrous K_3PO_4 (583.6 mg, 2.75 mmol, 5.5 equiv), pentafluorobenzene (163.2 µL, 1.5 mmol, 3.0 equiv), CuI (9.5 mg, 0.05 mmol, 10 mol %), 1,10-phenanthroline (9.0 mg, 0.05 mmol, 10 mol %), pyridine (20.0 µL, 0.25 mmol, 0.5 equiv) and anhydrous dioxane (0.5 mL, 0.5 M) were added. The vial was capped, transferred out of the glove box and stirred at 170 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature and filtered through a plug of celite with washings of EtOAc. The mixture was concentrate *in vacuo* and purified by column chromatography (Hexane/EtOAc 100:1) to yield the desired product as a white solid (108.3. mg, 79%).

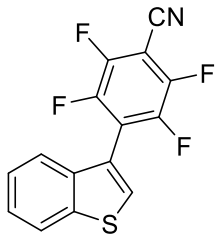
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.37 (d, *J* = 8.5 Hz, 2H), 7.02 (d, *J* = 8.7 Hz, 2H), 3.87 (s, 3H).^{13}C NMR (126 MHz, $CDCl_3$) δ 160.4, 144.3 (dm, *J* = 246.6 Hz), 140.3 (dm, *J* = 253.1 Hz), 138.0 (dm, *J* = 250.3 Hz), 131.6, 118.5, 115.8 (td, *J* = 17.1, 3.8 Hz), 114.4, 55.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ -143.7 (dd, *J* = 23.2, 8.2 Hz, 2F), -156.5 (t, *J* = 21.1 Hz, 1F), -162.5 (app td, *J* = 22.6, 8.2 Hz, 2F).



3-(2,6-dinitrophenyl)-1-methyl-1*H*-indole (5c)

In a glove box, a flame-dried 10 mL microwave vial was charged with 1-methyl-1*H*-indole-3-carboxylic acid (87.6 mg, 0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (106.1 mg, 0.5 mmol, 1.0 equiv) and anhydrous 1,4-dioxane (1.0 mL, 0.5 M). The vial was transferred out of the glove box and I_2 (253.8 mg, 0.50 mmol, 1.0 equiv) was added under a nitrogen funnel. The vial was capped and the mixture stirred at 150 °C for 16 h. Note: Ensure reaction is stirring efficiently to avoid decomposition. After this time, the vial was cooled to room temperature, transferred to a glove box and anhydrous K_3PO_4 (583.7 mg, 2.75 mmol, 5.5 equiv), 1,3-dinitrobenzene (318.2 mg, 1.5 mmol, 3.0 equiv), CuI (9.5 mg, 0.05 mmol, 10 mol %), 1,10-phenanthroline (9.0 mg, 0.05 mmol, 10 mol %) and pyridine (20.2 µL, 0.25 mmol, 0.5 equiv) were added. The vial was capped, transferred out of the glove box and stirred at 150 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature and filtered through a plug of celite with washings of DCM. The mixture was concentrated *in vacuo* and purified by column chromatography (hexane/DCM, 80:20) to yield the desired product as an orange solid (107.0 mg, 72%) as a mixture with 3-(2,4-dinitrophenyl)-1-methyl-1H-indole (>100:1 by GC-FID).

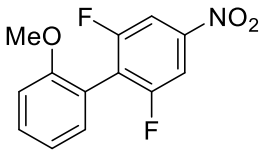
^{1}H NMR (500 MHz, $(CD_3)_2CO$) δ 8.07 (d, *J* = 8.1 Hz, 2H), 7.77 (t, *J* = 8.1 Hz, 1H), 7.34 (d, *J* = 8.2 Hz, 1H), 7.28 (s, 1H), 7.13 - 7.09 (m, 2H), 6.94 (app t, *J* = 7.5 Hz, 1H), 3.77 (s, 3H); ^{13}C NMR (126 MHz, $(CD_3)_2CO$) δ 153.0, 137.8, 130.4, 130.0, 128.0, 127.3, 123.5, 123.2, 121.1, 119.1, 111.1, 104.2, 33.2; m.p. 192 - 196 °C; IR (ATR) 3089, 2936, 1531, 1355, 740. HRMS (APCI) *m/z* calcd. $C_{15}H_{11}O_4N_3$ + H: 298.0822; found $[M+H]^+$ 298.0819.



4-(benzo[b]thiophen-3-yl)-2,3,5,6-tetrafluorobenzonitrile (5d)

In a glove box, a flame-dried 10 mL microwave vial was charged with benzothiophene-3-carboxylic acid (89.1 mg, 0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (106.1 mg, 0.5 mmol, 1.0 equiv) and anhydrous 1,4-dioxane (1.0 mL, 0.5 M). The vial was transferred out of the glove box and I_2 (222.1 mg, 0.875 mmol, 1.75 equiv) was added under a nitrogen funnel. The vial was capped and the mixture stirred at 170 °C for 16 h. After this time, the vial was cooled to room temperature and Et_3N (87.2. µL, 0.625 mmol, 1.25 equiv) was added. The mixture was then stirred at 170 °C for 6 h. After this time, the vial was cooled to room temperature, transferred to a glove box and anhydrous K_3PO_4 (583.7 mg, 2.75 mmol, 5.5 equiv), 2,3,5,6-tetrafluorobenzonitrile (262.6 mg, 1.5 mmol, 3.0 equiv), CuI (9.5 mg, 0.05 mmol, 10 mol %), 1,10-phenanthroline (9.0 mg, 0.05 mmol, 10 mol %) and pyridine (20.2 µL, 0.25 mmol, 0.5 equiv) were added. The vial was capped, transferred out of the glove box and stirred at 150 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature and filtered through a plug of celite with washings of DCM. The mixture was concentrated *in vacuo* and purified by column chromatography (hexane/Et_2O, 80:20) to yield the desired product as an white solid (110.6 mg, 72%).

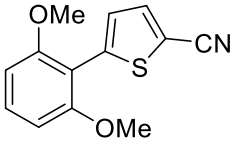
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.02-7.88 (m, 1H), 7.71 (s, 1H), 7.57-7.50 (m, 1H), 7.50-7.39 (m, 2H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 147.61 (ddt, *J* = 262.4, 16.9, 4.1 Hz), 144.3 (ddt, *J* = 251.5, 11.7, 4.8 Hz), 139.8, 136.7, 130.4 (t, *J* = 1.6 Hz), 125.4, 125.3, 123.1, 122.5 (t, *J* = 2.3 Hz), 121.9 (t, *J* = 17.8 Hz), 120.6 (t, *J* = 2.3 Hz), 107.6 (t, *J* = 3.7 Hz), 93.6 (tt, *J* = 17.1, 2.5 Hz); ^{19}F NMR (471 MHz, $CDCl_3$) δ -132.0 (td, *J* = 16.2, 6.6 Hz, 2F), -135.7 (tdd, *J* = 16.2, 6.6, 2.0 Hz, 2F); IR: 2244, 1649, 1518, 1489, 1024, 993, 871; m.p. 150-152 ˚C; HRMS (EI) *m/z* calcd. $C_{15}H_5F_4NS^+$: 307.2656; found $[M]^+$ 307.0073.



2,6-difluoro-2'-methoxy-4-nitro-1,1'-biphenyl (5e)

In a glove box, a flame-dried 10 mL microwave vial was charged with 2-methoxybenzoic acid (76.1 mg, 0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (106.1 mg, 0.5 mmol, 1.0 equiv) and anhydrous *o*-DCB (0.50 mL, 1.0 M). The vial was transferred out of the glove box and I_2 (190.4 mg, 0.75 mmol, 1.50 equiv) was added under a nitrogen funnel. The vial was capped and the mixture stirred at 150 °C for 20 h. After this time, the vial was cooled to room temperature and Et_3N (70.0 µL, 0.50 mmol, 1.0 equiv) and anhydrous K_3PO_4 (265.3 mg, 1.25 mmol, 2.5 equiv) was added in the glove box. The mixture was then stirred at 150 °C for 6 h. After this time the vial was cooled to room temperature, transferred to a glove box and anhydrous K_3PO_4 (106.1 mg, 0.5 mmol, 1.0 equiv), 3,5-difluoronitrobenzene (85.0 µL, 0.75 mmol, 1.5 equiv), CuI (9.5 mg, 0.05 mmol, 10 mol %), 1,10-phenanthroline (9.0 mg, 0.05 mmol, 10 mol %) and pyridine (20.0 µL, 0.25 mmol, 0.5 equiv) were added. The vial was capped, transferred out of the glove box and stirred at 150 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature and filtered through a plug of celite with washings of Et_2O. The mixture was concentrated *in vacuo* and purified by column chromatography (hexane:DCM, 95:5) to yield the desired product as a yellow oil (86.2 mg, 65%) as a mixture with 2,4-difluoro-2'-methoxy-6-nitro-1,1'-biphenyl **5e'** (6.6 mg, 5%).

^{1}H NMR (500 MHz, $(CD_3)_2CO$) δ 7.99 (*major*, d, *J* = 6.7 Hz, 2H), 7.73 (*minor*, app dt, *J* = 8.2, 2.0 Hz, 1H), 7.57 - 7.53 (*minor*, m, 1H), 7.54 - 7.50 (*major*, m, 1H), 7.46 - 7.43 (*minor*, d, *J* = 17.4 Hz, 1H), 7.35 (*major*, d, *J* = 7.4 Hz, 1H), 7.30 (*minor*, d, *J* = 7.5 Hz, 1H), 7.21 (*major*, d, *J* = 8.4 Hz, 1H), 7.11 (*major*, app t, *J* = 7.5 Hz, 1H), 7.11 (*minor*, d, *J* = 8.1 Hz, 1H), 7.07 (*minor*, app t, *J* = 7.5 Hz, 1H), 3.83 (*major*, s, 3H) 3.73 (*minor*, s, 3H); ^{13}C NMR (126 MHz, $(CD_3)_2CO$) δ 162.6 (*minor*, dd, *J* = 134.3, 13.0 Hz), 160.9 (*major*, dd, *J* = 250.6, 8.1 Hz), 160.6 (*minor*, dd, *J* = 133.6, 13.1 Hz), 158.0 (*major*), 157.4 (*minor*), 149.0 (*major*, t, *J* = 11.3 Hz), 132.3 (*major*), 132.1 (*major*), 131.5 (*minor*), 131.5 (*minor*, d, *J* = 1.8 Hz), 123.3 (*major*, t, *J* = 21.3 Hz), 121.5 (*minor*), 121.4 (*major*), 119.3 (*minor*), 118.8 (*minor*, dd, *J* = 21.2, 4.6 Hz), 117.0 (*major*), 115.0 (*minor*), 112.4 (*major*), 112.1 (*minor*), 109.4 (*minor*, dd, *J* = 28.2, 25.5 Hz), 108.8 (*minor*, dd, *J* = 26.9, 3.9 Hz), 108.4 - 108.2 (*major*, m), 56.1 (*major*), 55.8 (*minor*); ^{19}F{^{1}H} NMR (376 MHz, $CDCl_3$) δ –106.09 (*minor*, d, *J* = 7.8 Hz, 1F), –106.59 (*major*, s, 2F), –107.98 (*minor*, d, *J* = 7.8 Hz, 1F); ^{19}F NMR (376 MHz, $CDCl_3$) δ –106.07 - –106.12 (*minor*, m, 1F), –106.59 (*major*, d, *J* = 6.3 Hz, 2F), –107.98 (*minor*, ddd, *J* = 7.9, 7.9, 7.9 Hz, 1F); IR (ATR) 3102, 2840, 1530, 1428, 1348, 1262, 1034, 782, 754; HRMS (EI) *m/z* calcd. $C_{13}H_9F_2NO_3$: 265.0545; found $[M]^+$ 265.0543.

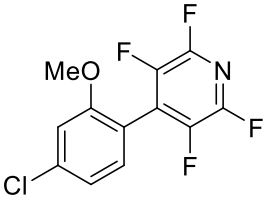


5-(2,6-dimethoxyphenyl)thiophene-2-carbonitrile (5f)

In a glove box, a flame-dried 10 mL microwave vial was charged with 2,6-dimethoxybenzoic acid (91.1 mg, 0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (371.5 mg, 1.75 mmol, 3.5 equiv) and anhydrous *o*-DCB (0.5 mL,

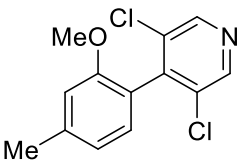
1.0 M). The vial was transferred out of the glove box and I_2 (160.5 mg, 0.625 mmol, 1.25 equiv) was added under a nitrogen funnel. The vial was capped and the mixture stirred at 150 °C for 9 h. After this time, the vial was cooled to room temperature and $^{i}PrNH_2$ (64.0 µL, 0.75 mmol, 1.5 equiv) was added. The mixture was then stirred at 150 °C for 16 h. After this time the vial was cooled to room temperature, transferred to a glove box and anhydrous K_3PO_4 (106.1 mg, 0.5 mmol, 1.0 equiv), 2-thiophenecarbonitrile (70.0 µL, 0.75 mmol, 1.5 equiv), CuI (9.5 mg, 0.05 mmol, 10 mol %), 1,10-phenanthroline (9.0 mg, 0.05 mmol, 10 mol %) and pyridine (20.0 µL, 0.25 mmol, 0.5 equiv) were added. The vial was capped, transferred out of the glove box and stirred at 150 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature and filtered through a plug of celite with washings of Et_2O. The mixture was concentrate *in vacuo* and purified by column chromatography (hexane/EtOAc 90:10) to yield the desired product as a white solid (101.8 mg, 83%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 (d, *J* = 4.1 Hz, 1H), 7.58 (d, *J* = 4.1 Hz, 1H), 7.31 (t, *J* = 8.4 Hz, 1H), 6.67 (d, *J* = 8.4 Hz, 2H), 3.89 (s, 6H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 157.8, 142.2, 136.3, 130.2, 129.0, 115.4, 110.6, 108.3, 104.5, 56.1; m.p. 84 - 87 °C; IR (ATR) 2917, 2848, 2203, 1584, 1471, 1424, 1255, 1099, 723; HRMS (PS) *m/z* calcd. $C_{13}H_{11}O_2NS$ + H: 246.0583; found $[M+H]^+$ 246.0573.



4-(4-chloro-2-methoxyphenyl)-2,3,5,6-tetrafluoropyridine (5g)
In a glove box, a flame-dried 10 mL microwave vial was charged with 4-chloro-2-methoxybenzoic acid (93.3 mg, 0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (106.1 mg, 0.5 mmol, 1.0 equiv) and anhydrous *o*-DCB (0.60 mL, 0.83 M). The vial was transferred out of the glove box and I_2 (380.7 mg, 1.50 mmol, 3.0 equiv) was added under a nitrogen funnel. The vial was capped and the mixture stirred at 150 °C for 16 h. After this time, the vial was cooled to room temperature and Et_3N (209.0 µL, 1.50 mmol, 3.0 equiv) and anhydrous K_3PO_4 (318.4 mg, 1.5 mmol, 3.0 equiv) was added. The mixture was then stirred at 150 °C for 6 h. After this time the vial was cooled to room temperature, transferred to a glove box and anhydrous K_3PO_4 (318.4 mg, 1.5 mmol, 3.0 equiv), 2,3,5,6-tetrafluoropyridine (76.0 µL, 0.75 mmol, 1.5 equiv), CuI (9.5 mg, 0.05 mmol, 10 mol %), 1,10-phenanthroline (9.0 mg, 0.05 mmol, 10 mol %) and pyridine (20.0 µL, 0.25 mmol, 0.5 equiv) were added. The vial was capped, transferred out of the glove box and stirred at 150 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature and filtered through a plug of celite with washings of Et_2O. The mixture was concentrate *in vacuo* and purified by column chromatography (hexane 100%) to yield the desired product as a pale yellow oil (84.6 mg, 58%).

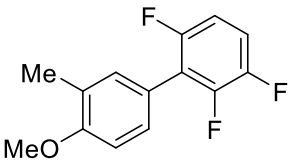
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.21 (d, *J* = 8.2 Hz, 1H), 7.10 (dd, *J* = 8.2, 1.8 Hz, 1H), 7.06 (d, *J* = 1.8 Hz, 1H), 3.85 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 156.5, 142.6 (dm, *J* = 244.8 Hz), 138.8 (dm, *J* = 258.8 Hz), 137.1, 130.8, 129.2 (tt, *J* = 16.8, 3.2 Hz), 120.2, 112.5, 111.6, 55.2; ^{19}F NMR (376 MHz, $CDCl_3$) δ –91.27 - –91.44, (m, 2F), –141.36 - –141.54 (m, 2F); IR (ATR) 2942, 1457, 1255, 964, 893; HRMS (EI) *m/z* calcd. $C_{12}H_6ONClF_4$: 291.0069; found $[M]^+$ 291.0059.



4-(4-chloro-2-methoxyphenyl)-2,3,5,6-tetrafluoropyridine (5h)
In a glove box, a flame-dried 10 mL microwave vial was charged with 2-methoxy-4-methylbenzoic acid (83.1 mg, 0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (106.1 mg, 0.5 mmol, 1.0 equiv) and anhydrous *o*-DCB (0.5 mL, 1.0 M). The vial was transferred out of the glove box and I_2 (127.0 mg, 0.5 mmol, 1.0 equiv) was added under a nitrogen funnel. The vial was capped and the mixture stirred at 150 °C for 16 h. After this time the vial was cooled to room temperature, transferred to a glove box and anhydrous K_3PO_4 (318.4 mg, 1.5 mmol, 3.0 equiv), anhydrous LiO^tBu (160.0 mg, 2.0 mmol, 4.0 equiv), 3,5-dichloropyridine (222 mg µL, 1.5 mmol, 3.0 equiv), CuI (9.5 mg, 0.05 mmol, 10 mol %), 1,10-phenanthroline (9.0 mg, 0.05 mmol, 10 mol %) and pyridine (20.0 µL, 0.25 mmol, 0.5 equiv) were added. The vial was capped, transferred out of the glove box and stirred at 150 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature and filtered through a plug of celite with washings of Et_2O. The mixture was concentrate *in vacuo* and purified by column chromatography (hexane/Et_2O 90:10) to yield the desired product as white solid (99 mg, 74%).

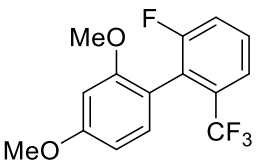
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.55 (s, 2H), 7.00 (d, *J* = 7.6 Hz, 1H), 6.90 (d, *J* = 7.7 Hz, 1H), 6.85 (s, 1H), 3.77 (s, 3H), 2.44 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 156.2, 147.4, 144.8, 141.4, 133.1, 129.8, 121.5, 120.3, 112.3, 55.8, 22.1; IR (ATR) 2918, 1387 1279, 1207, 1171, 1101, 1038, 800; m.p. 62 - 64 ˚C; HRMS (EI) *m/z* calcd. $C_{13}H_{11}NOCl_2$+H: 268.0290; found $[M+H]^+$ 268.0285

General Procedures for the Decarboxylative Cross-Coupling of Two Benzoic acids



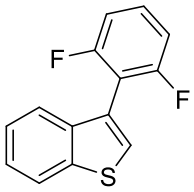
2,3,6-trifluoro-4'-methoxy-3'-methyl-1,1'-biphenyl (8a)
In a glovebox, a flame-dried 10 mL microwave vial was charged with 4-methoxy-3-methylbenzoic acid (83.1 mg, 0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (106.1 mg, 0.50 mmol, 1.0 equiv) and anhydrous 1,4-dioxane (0.5 mL, 1.0 M). The vial was transferred out of the glove box and I_2 (253.8 mg, 1.00 mmol, 2.0 equiv) was added under a nitrogen funnel. The vial was capped and stirred at 170 °C for 16 h. After this time, the vial was cooled to room temperature, transferred to a glove box and Et_3N (104.5 µL, 0.75 mmol, 1.5 equiv) and anhydrous K_3PO_4 (159.2 mg, 0.75 mmol, 1.5 equiv) were added. The mixture was then stirred at 170 °C for 6 h. After this time the vial was cooled to room temperature, transferred to a glove box and anhydrous DMA (0.5 mL, 1.0 M, total volume = 0.5 M), anhydrous K_3PO_4 (318.4 mg, 1.50 mmol, 3.0 equiv), potassium 2,3,6-trifluorobenzoate (321.3 mg, 1.50 mmol, 3.0 equiv), CuI (19.0 mg, 0.10 mmol, 20 mol %) and 1,10-phenanthroline (18.0 mg, 0.10 mmol, 20 mol %) were added. The vial was capped, transferred out of the glove box and stirred at 170 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature and filtered through a plug of celite with washings of DCM. The mixture was concentrated *in vacuo* and purified by silver doped column chromatography (hexane, 100%) to yield the desired product as a white solid (98.4 mg, 78%).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.30 (d, *J* = 8.5 Hz, 1H), 7.27 (d, *J* = 2.0 Hz, 1H), 7.09 (qd, *J* = 9.1, 4.9 Hz, 1H), 7.00 – 6.84 (m, 2H), 3.90 (s, 3H), 2.29 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 158.2, 155.5 (ddd, *J* = 244.0, 4.8, 2.5 Hz), 148.0 (ddd, *J* = 248.9, 14.1, 7.5 Hz), 147.7 (ddd, *J* = 244.3, 13.9, 3.6 Hz), 132.5 (t, *J* = 1.8 Hz), 128.9 (t, *J* = 2.0 Hz), 126.9, 120.4 (dd, *J* = 20.7, 15.2 Hz), 120.1 (d, *J* = 2.0 Hz), 115.1 (ddd, *J* = 19.3, 9.9, 1.0 Hz), 110.8 (ddd, *J* = 25.7, 6.8, 4.2 Hz), 109.9, 55.5, 16.4; ^{19}F NMR (376 MHz, $CDCl_3$) δ –119.9 (dd, *J* = 15.0, 3.1 Hz, 1F), –138.1 (dd, *J* = 21.7, 3.4 Hz, 1F), –142.3 (dd, *J* = 21.6, 15.0 Hz, 1F); m.p. 56-58 °C; IR (ATR) 2955, 1489, 1250, 1232, 809; HRMS (PI) *m/z* calcd. $C_{14}H_{11}F_3O$: 252.0757; found $[M]^+$ 252.0754.



2'-fluoro-2,4-dimethoxy-6'-(trifluoromethyl)-1,1'-biphenyl (8b)
A flame-dried 10 mL microwave vial was charged with I_2 (126.9 mg, 0.50 mmol, 1.0 equiv), capped and flushed with N_2. The vial was transferred to a glove box, then 2,4-dimethoxybenzoic acid (91.1 mg, 0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (106.1 mg, 0.50 mmol, 1.0 equiv) and anhydrous 1,4-dioxane (0.5 mL, 1.0 M) were added. The vial was capped, transferred out of the glove box and stirred at 170 °C for 16 h. After this time the vial was cooled to room temperature, transferred to a glove box and anhydrous DMA (0.5 mL, 1.0 M, total volume = 0.5 M), anhydrous K_3PO_4 (477.6 mg, 2.25 mmol, 4.5 equiv), 2-fluoro-6-(trifluoromethyl)benzoic acid (312.2 mg, 1.50 mmol, 3.0 equiv), CuI (19.0 mg, 0.10 mmol, 20 mol %) and 1,10-phenanthroline (18.0 mg, 0.10 mmol, 20 mol %) were added. The vial was capped, transferred out of the glove box and stirred at 170 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature and filtered through a plug of celite with washings of DCM. The mixture was concentrated *in vacuo* and purified by column chromatography (hexane/Et_2O, 90:10) to yield the desired product as a white solid (65%, 97.6 mg).

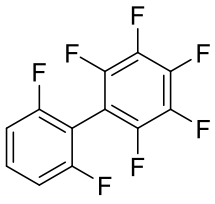
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 (d, *J* = 7.9 Hz, 1H), 7.46-7.40 (m, 1H), 7.29 (app t, *J* = 8.4 Hz, 1H), 7.07 (d, *J* = 8.9 Hz, 1H), 6.57-6.55 (m, 2H), 3.86 (s, 3H), 3.73 (s, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 161.5, 161.0 (d, *J* = 245.4 Hz), 158.4, 131.8 (qd, *J* = 29.7, 3.1 Hz), 129.0 (d, *J* = 8.7 Hz), 125.7 (dq, *J* = 21.5, 1.6 Hz), 123.6 (qd, *J* = 274.1, 3.5 Hz), 121.8 (qd, *J* = 5.2, 3.8 Hz), 118.8 (d, *J* = 23.8 Hz), 113.5, 104.1, 98.9, 55.8, 55.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ –59.01 (s, 3F), –111.38 (dd, *J* = 7.8, 6.0 Hz, 1F); m.p. 98-102 °C; IR (ATR) 3005, 2840 1611, 1516, 1463, 1319, 1161, 1122, 901; HRMS (APCI) *m/z* calcd. $C_{15}H_{12}F_4O_2$ + H: 301.0846; found $[M+H]^+$ 301.0836.



3-(2,6-difluorophenyl)benzo[b]thiophene (8c)

In a glovebox, a flame-dried 10 mL microwave vial was charged with 1-benzothiophene-3-carboxylic acid (89.1 mg, 0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (106.1 mg, 0.50 mmol, 1.0 equiv) and anhydrous 1,4-dioxane (0.5 mL, 1.0 M). The vial was transferred out of the glove box and I_2 (190.4 mg, 0.75 mmol, 1.5 equiv) was added under a nitrogen funnel. The vial was capped and stirred at 170 °C for 16 h. After this time, the vial was cooled to room temperature, Et_3N (69.7 µL, 0.5 mmol, 1.0 equiv) was added. The mixture was then stirred at 170 °C for 6 h. After this time the vial was cooled to room temperature, transferred to a glove box and anhydrous DMA (0.5 mL, 1.0 M, total volume = 0.5 M), anhydrous K_3PO_4 (583.7 mg, 2.75 mmol, 5.5 equiv), potassium 2,6-difluorobenzoate (294.3 mg, 1.50 mmol, 3.0 equiv), CuI (19.0 mg, 0.10 mmol, 20 mol %) and 1,10-phenanthroline (18.0 mg, 0.10 mmol, 20 mol %) were added. The vial was capped, transferred out of the glove box and stirred at 190 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature and filtered through a plug of celite with washings of DCM. The mixture was concentrated *in vacuo* and purified by silver doped column chromatography (hexane, 100%) to yield the desired product as a white solid (47%, 57.9 mg).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96 - 7.94 (m, 1H), 7.64 – 7.52 (m, 2H), 7.47 – 7.33 (m, 3H), 7.07 (t, *J* = 7.7 Hz, 2H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 160.8 (dd, *J* = 249.4, 7.1 Hz), 139.7, 138.2, 129.7 (t, *J* = 10.2 Hz), 127.5, 124.6 (d, *J* = 15.0 Hz), 124.2, 123.1 (t, *J* = 1.6 Hz), 122.8, 112.8 (t, *J* = 20.2 Hz), 111.8 (d, *J* = 13.1 Hz), 111.8 (d, *J* = 25.8 Hz); ^{19}F NMR (376 MHz, $CDCl_3$) δ –110.4 (2F)·; m.p. 40-42 °C; IR (ATR) 1625, 1586, 1458, 1425, 1262, 1233, 998, 757; HRMS (EI) *m/z* calcd. $C_{14}H_8F_2S$+H: 247.2828; found $[M+H]^+$ 247.0380.



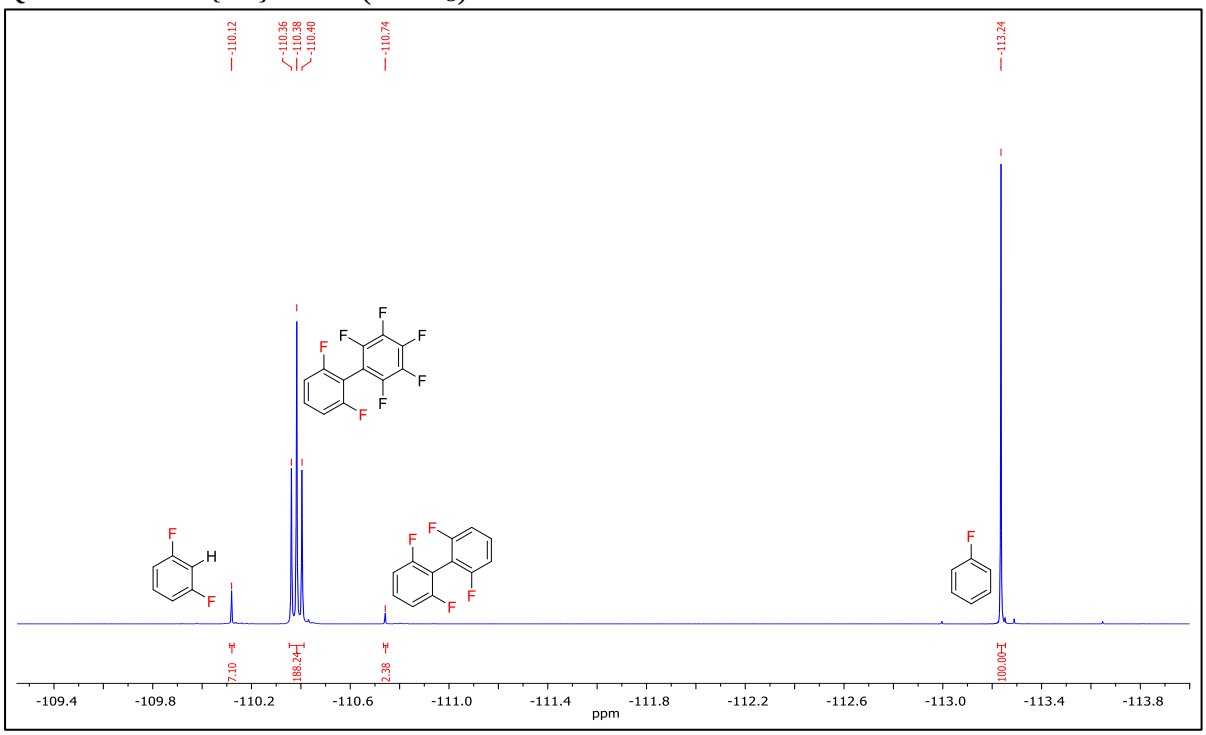
2,2',3,4,5,6,6'-heptafluoro-1,1'-biphenyl (8d)

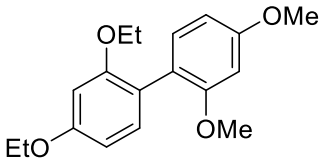
A flame-dried 10 mL microwave vial was charged with I_2 (190.4 mg, 0.75 mmol, 1.5 equiv), capped and flushed with N_2. The vial was transferred to a glove box, then 2,6-difluorobenzoic acid (78.1 mg, 0.50 mmol, 1.0 equiv), anhydrous K_3PO_4 (106.1 mg, 0.50 mmol, 1.0 equiv) and anhydrous 1,4-dioxane (0.5 mL, 1.0 M) were added. The vial was capped, transferred out of the glove box and stirred at 190 °C for 3 h. After this time, the vial was cooled to room temperature and Et_3N (70.0 µL, 0.50 mmol, 1.0 equiv) was added. The mixture was then stirred at 130 °C for 1 h. After this time the vial was cooled to room temperature, transferred to a glove box and anhydrous 1,4-dioxane (0.5 mL, 0.5 M total volume), anhydrous K_3PO_4 (477.6 mg, 2.25 mmol, 4.5 equiv), pentafluorobenzoic acid (318.1 mg, 1.50 mmol, 3.0 equiv), CuI (9.5 mg, 0.05 mmol, 10 mol %) and 1,10-phenanthroline (9.0 mg, 0.05 mmol, 10 mol %) were added. The vial was capped, transferred out of the glove box and stirred at 190 °C for 4 h. After completion of the reaction, the mixture was cooled to room temperature then $CDCl_3$ (1.0 mL)

and fluorobenzene (46.9 µL, 0.50 mmol, 1.0 equiv) were added. An aliquot (200 µL) of the mixture was passed through a plug of Celite® directly into an NMR tube and diluted with $CDCl_3$ (400 µL) for quantitative ^{19}F NMR analysis to yield the crude product (94%). Due to the volatility of 2,2',3,4,5,6,6'-heptafluoro-1,1'-biphenyl this product could not be isolated in a yield comparable to the NMR yield, however, flash column chromatography (100% pentane) did yield the product as a clear oil for analysis (63%, 88.2 mg).

^1H NMR (500 MHz, $CDCl_3$) δ 7.51 - 7.45 (m, 1H), 7.06 (app t, *J* = 8.0 Hz, 2H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 160.5 (dd, *J* = 252.5, 6.1 Hz), 144.7 (dddt, *J* = 250.8, 11.1, 7.4, 3.9 Hz), 141.9 (dtt, *J* = 255.7, 13.4, 5.1 Hz), 137.9 (dm, *J* = 251.4 Hz), 132.3 (t, *J* = 10.2 Hz), 111.9 (dd, *J* = 20.7, 4.5 Hz), 104.6 - 104.9 (m, 2C); ^{19}F NMR (376 MHz, $CDCl_3$) δ –110.17 - –110.25 (m, 2F), –137.89 - –138.01 (m, 2F), –152.57 (t, *J* = 20.9 Hz, 1F), –161.72 - –161.86 (m, 2F); m.p. 52 - 54 °C; IR (ATR) 2918, 1495, 1463, 1010, 981, 775; HRMS (EI) *m/z* calcd. $C_{12}H_3F_7$: 280.0117; found $[M]^+$ 280.0113.

Quantitative $^{19}F\{^1H\}$ NMR ($CDCl_3$)



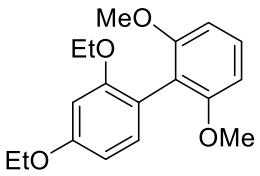


2,4-diethoxy-2',4'-dimethoxy-1,1'-biphenyl (8e)

In a glove box, a flame-dried 10 mL microwave vial was charged with potassium 2,4-diethoxybenzoate (81.9 mg, 0.33 mmol, 1.0 equiv), anhydrous K_3PO_4 (70.0 mg, 0.33 mmol, 1.0 equiv) and anhydrous dioxane (0.33 mL, 1.0 M). The vial was transferred out of the glove box and I_2 (83.8 mg, 0.33 mmol, 1.0 equiv) was added under a nitrogen funnel. The vial was capped and the mixture stirred at 170 °C for 16 h. After this time the vial was cooled to room temperature, transferred to a glove box and $PdCl_2$ (5.3 mg, 0.03 mmol, 9.0 mol %), (*R*)-BINAP (18.7 mg, 0.03 mmol, 9.0 mol %), Ag_2CO_3 (287.5 mg, 1.05 mmol, 3.18 equiv) and DMA (1.67 mL, 0.165 M) were added. The vial was capped, transferred out of the glove box and stirred at 170 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature, quenched with HCl (2M, 10 mL) extracted with EtOAc (3 x 10 mL) dried

over $MgSO_4$ filtered through a plug of celite with washings of EtOAc and concentrated *in vacuo*. The resulting residue was purified by column chromatography (hexane:EtOAc, 9:1) to yield the desired product as a yellow oil (45.9 mg, 46%).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.16-7.12 (m, 2 H), 6.53-6.51 (m, 4 H), 4.05 (q, *J* = 6.9 Hz, 2 H), 3.99 (q, *J* = 6.8 Hz, 2 H), 3.84 (s, 3 H) 3.75 (s, 3 H), 1.43 (t, *J* = 7.0 Hz, 3H), 1.27 (t, *J* = 6.9 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 159.9, 159.3, 158.1, 157.4, 132.0, 131.9, 120.5, 120.5, 104.9, 103.9, 100.5, 98.6, 63.9, 63.5, 55.5, 55.3, 15.0, 14.8; IR (ATR) 2975, 2932, 2368, 1604, 1576, 1494, 1180, 1156, 1036, 819; HRMS (EI) *m/z* calcd. $C_{18}H_{22}O_4$+H: 303.1591; found $[M+H]^+$ 303.1582.

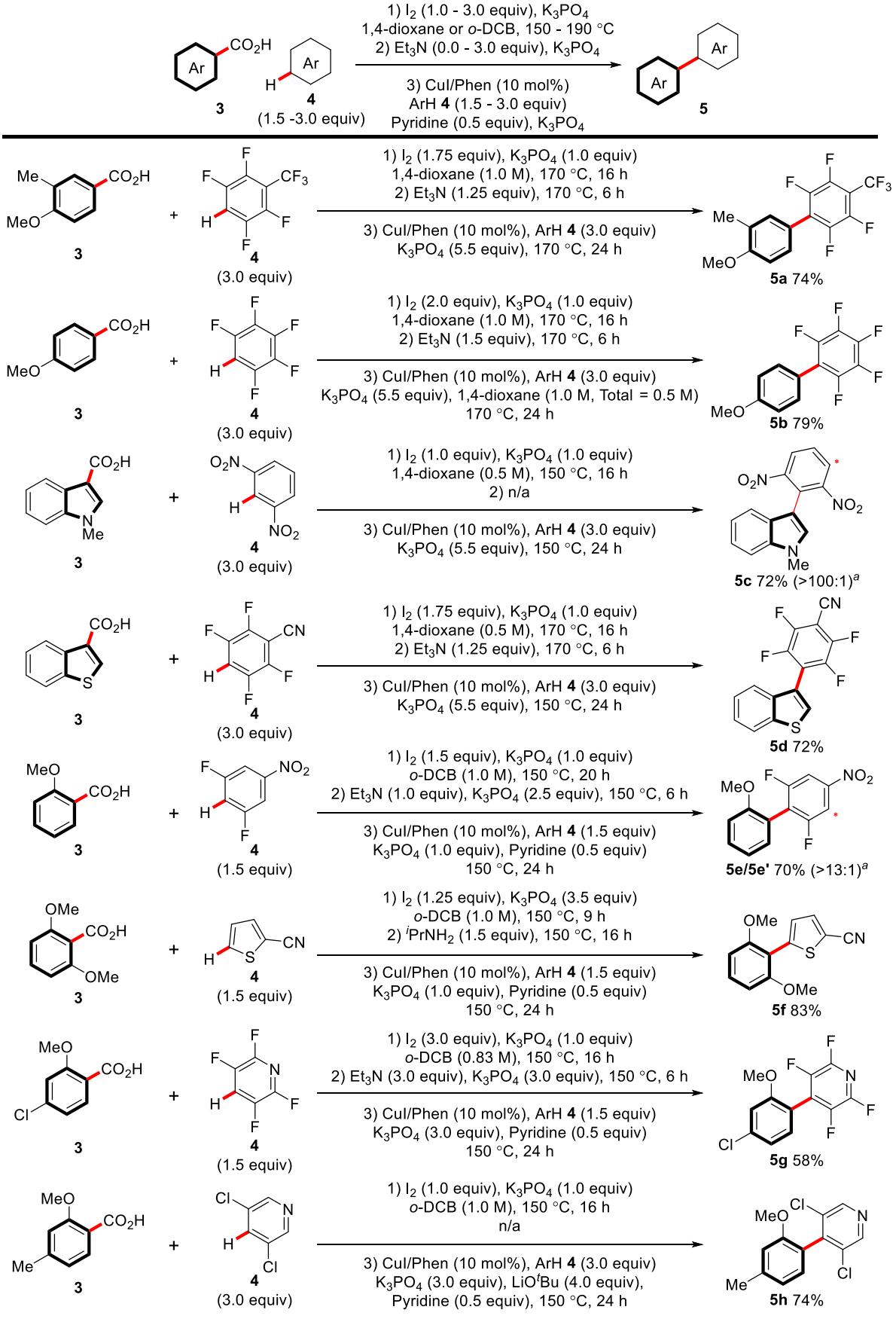


2,4-diethoxy-2',6'-dimethoxy-1,1'-biphenyl (8f)

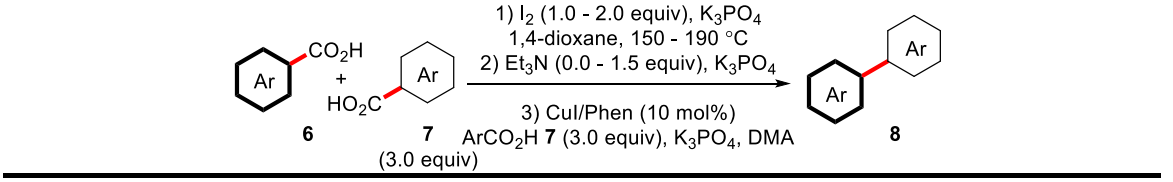
In a glove box, a flame-dried 10 mL microwave vial was charged with potassium 2,4-diethoxybenozate (81.9 mg, 0.33 mmol, 1.0 equiv), anhydrous K_3PO_4 (70.0 mg, 0.33 mmol, 1.0 equiv) and anhydrous dioxane (0.33 mL, 1.0 M). The vial was transferred out of the glove box and I_2 (83.8 mg, 0.33 mmol, 1.0 equiv) was added under a nitrogen funnel. The vial was capped and the mixture stirred at 170 °C for 18 h. After this time the vial was cooled to room temperature, transferred to a glove box and potassium 2,6-dimethoxybenzoate (218.1 mg, 0.99 mmol, 3.0 equiv), $PdCl_2$ (5.3 mg, 0.03 mmol, 9.0 mol %), (*R*)-BINAP (18.7 mg, 0.03 mmol, 9.0 mol %), Ag_2CO_3 (287.5 mg, 1.05 mmol, 3.18 equiv) and DMA (1.67 mL, 0.165 M) were added. The vial was capped, transferred out of the glove box and stirred at 170 °C for 24 h. After completion of the reaction, the mixture was cooled to room temperature, quenched with HCl (2 M, 10 mL) extracted with EtOAc (3 x 10 mL) dried over $MgSO_4$ filtered through a plug of celite with washings of EtOAc and concentrated *in vacuo*. The resulting residue was purified by column chromatography (hexane:EtOAc, 9:1) to yield the desired product as a yellow oil (55.5 mg, 56%).

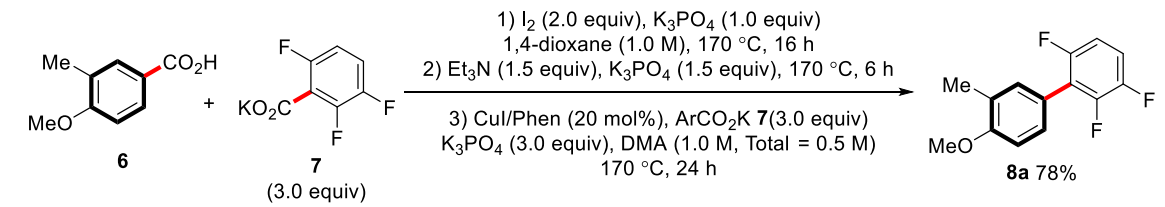
^{1}H NMR (500 MHz, $CDCl_3$) δ 7.26 (app t, *J* = 8.3, 1H), 7.08 (d, *J* = 7.9 Hz, 1H), 6.63 (d, *J* = 8.3 Hz, 2H), 6.55-6.53 (m, 2H), 4.06 (q, *J* = 7.0 Hz, 2H), 3.98 (q, *J* = 7.0 Hz, 2H), 3.73 (s, 6H), 1.43 (t, *J* = 7.0 Hz, 3H), 1.21 (t, *J* = 7.0 Hz, 3H); ^{13}C NMR (126 MHz, $CDCl_3$) δ 159.5, 158.4, 157.8, 132.5, 128.4, 116.3, 116.3, 105.1, 104.1, 100.8, 64.1, 63.4, 56.0, 15.1, 14.9; IR (ATR) 2958, 2161, 1678, 1598, 1248, 840, 754; HRMS (EI) *m/z* calcd. $C_{18}H_{22}O_4$+H: 303.1591; found $[M+H]^+$ 303.1578.

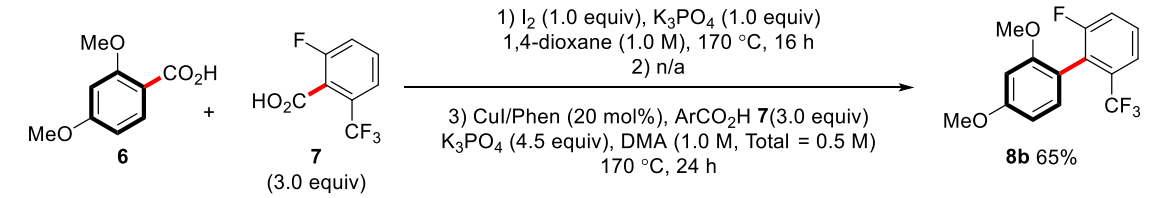
Scheme S5. Summary of the conditions for the decarboxylative oxidative cross-coupling between benzoic acids and arenes.

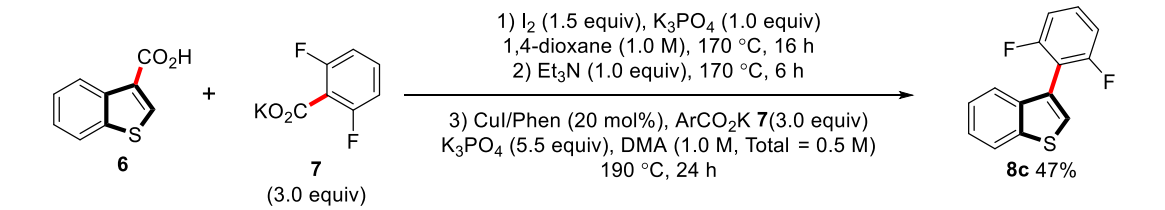


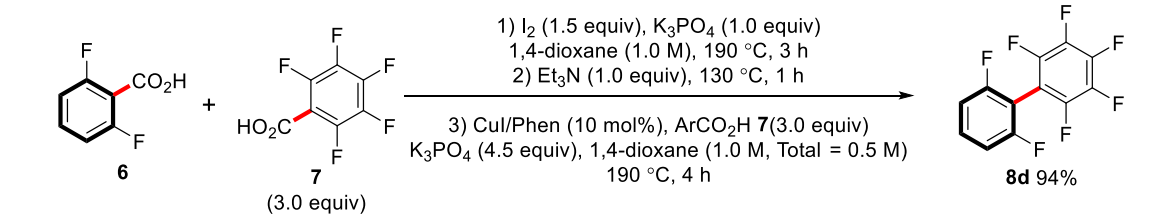
Scheme S6. Summary of the conditions for the decarboxylative oxidative cross-coupling between two benzoic acids.

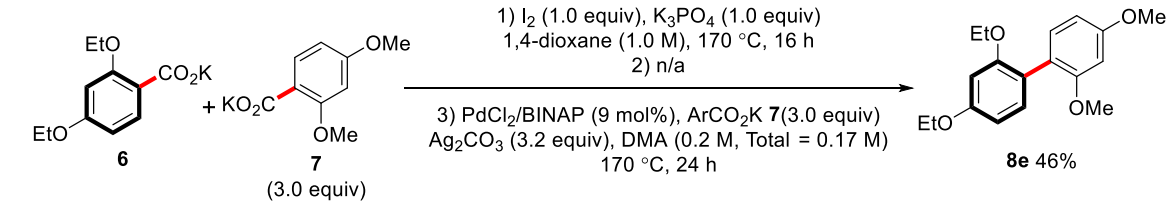


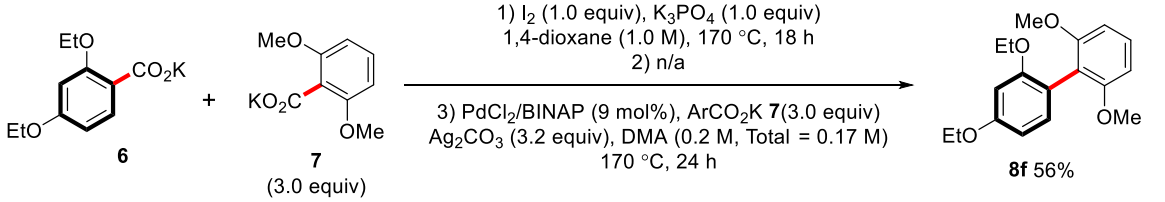








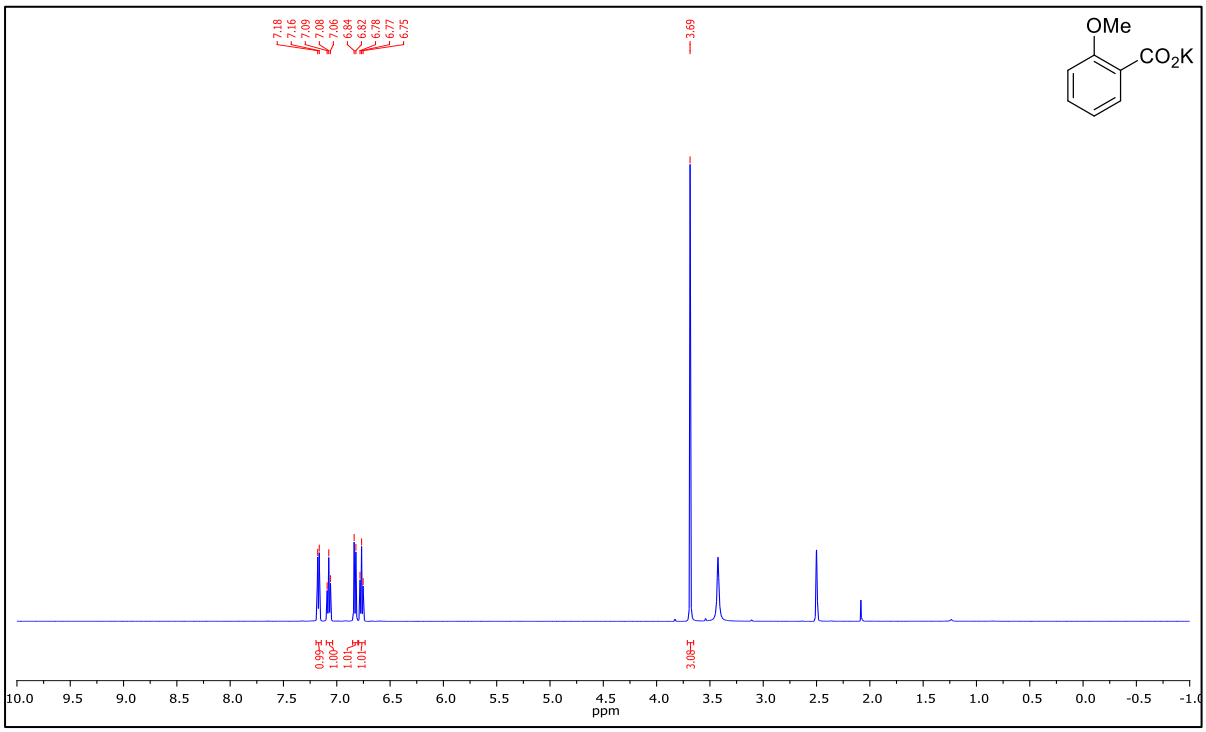




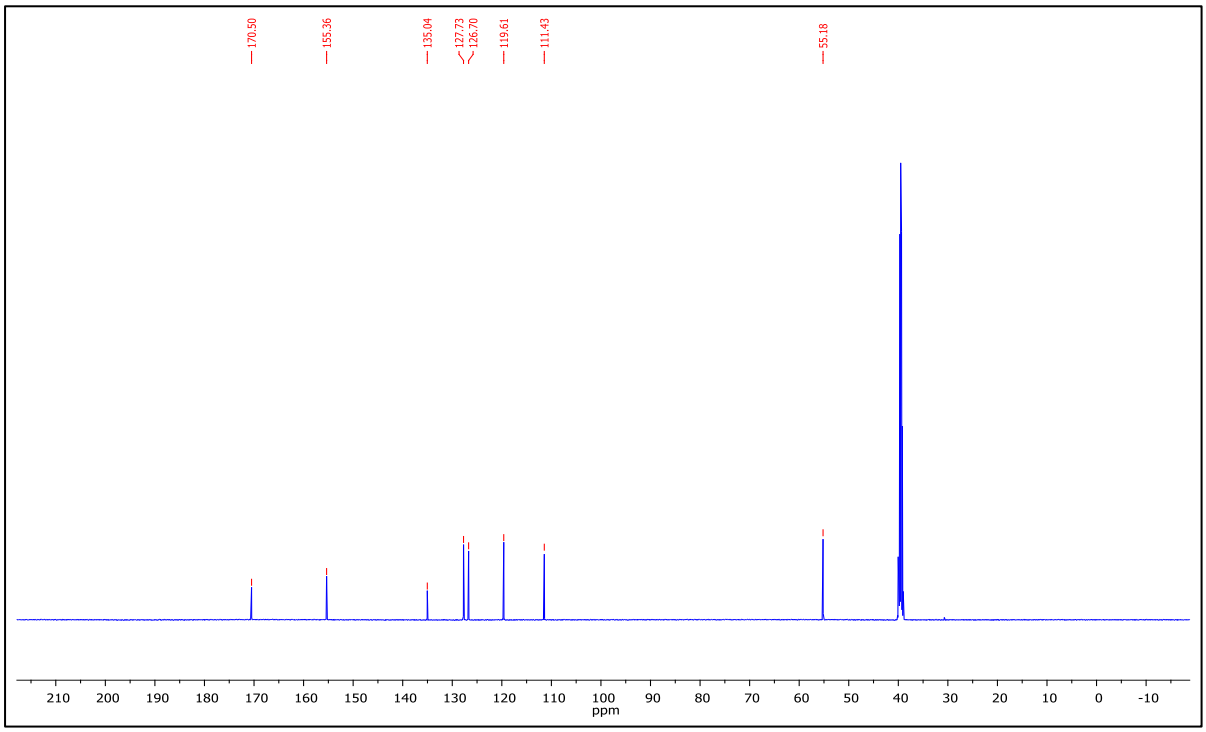
NMR Spectra

Potassium 2-methoxybenzoate (K-1a)

^{1}H NMR ($(CD_3)_2SO$)

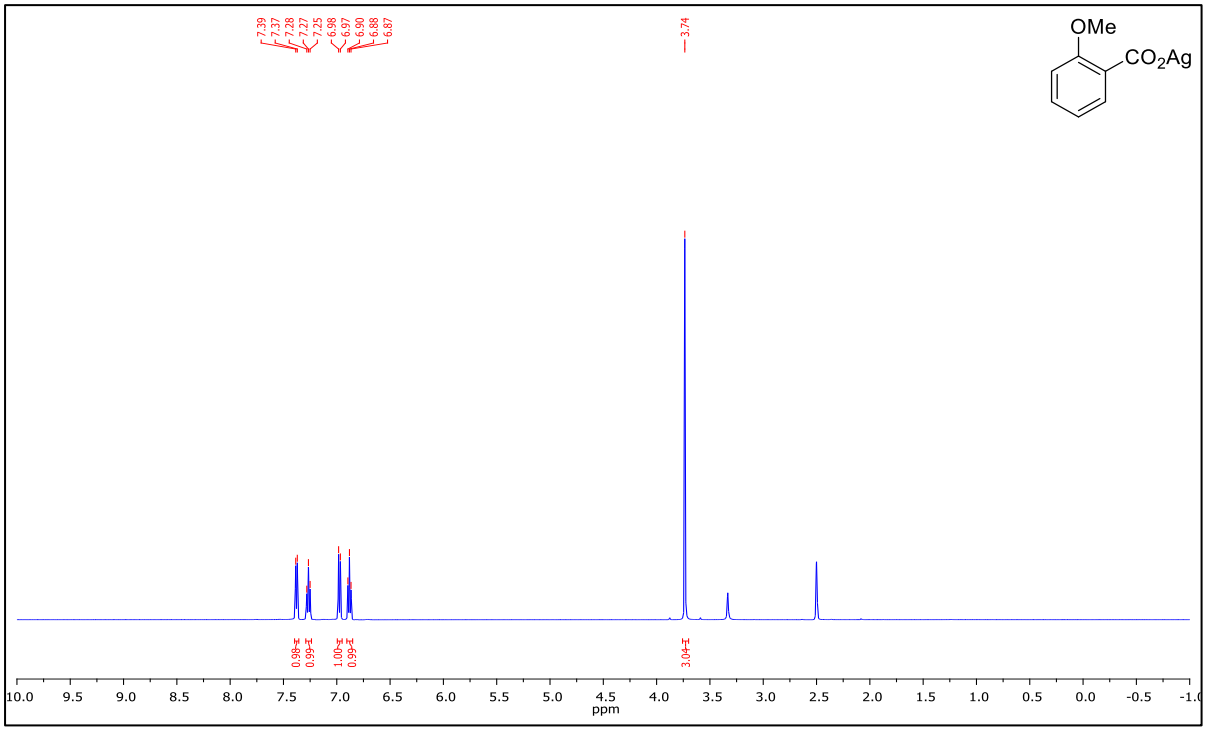


^{13}C NMR ($(CD_3)_2SO$)

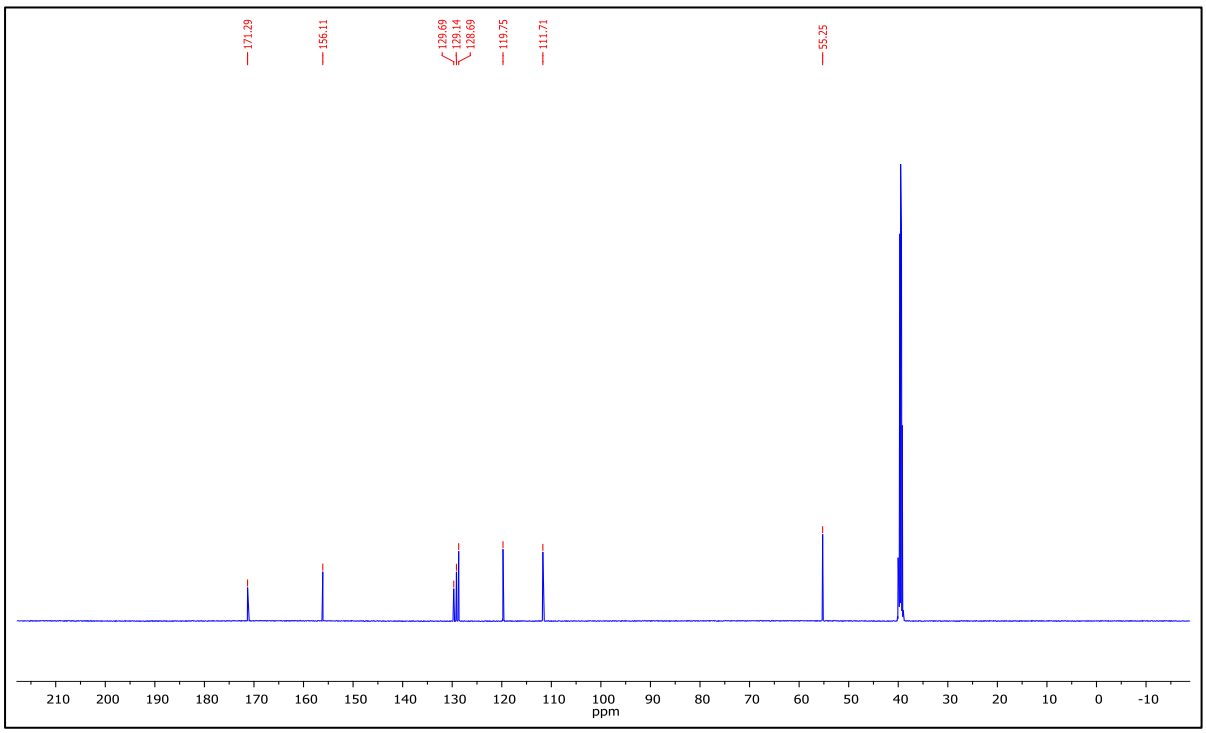


((2-methoxybenzoyl)oxy)silver (Ag-1a)

^{1}H NMR ($(CD_3)_2SO$)

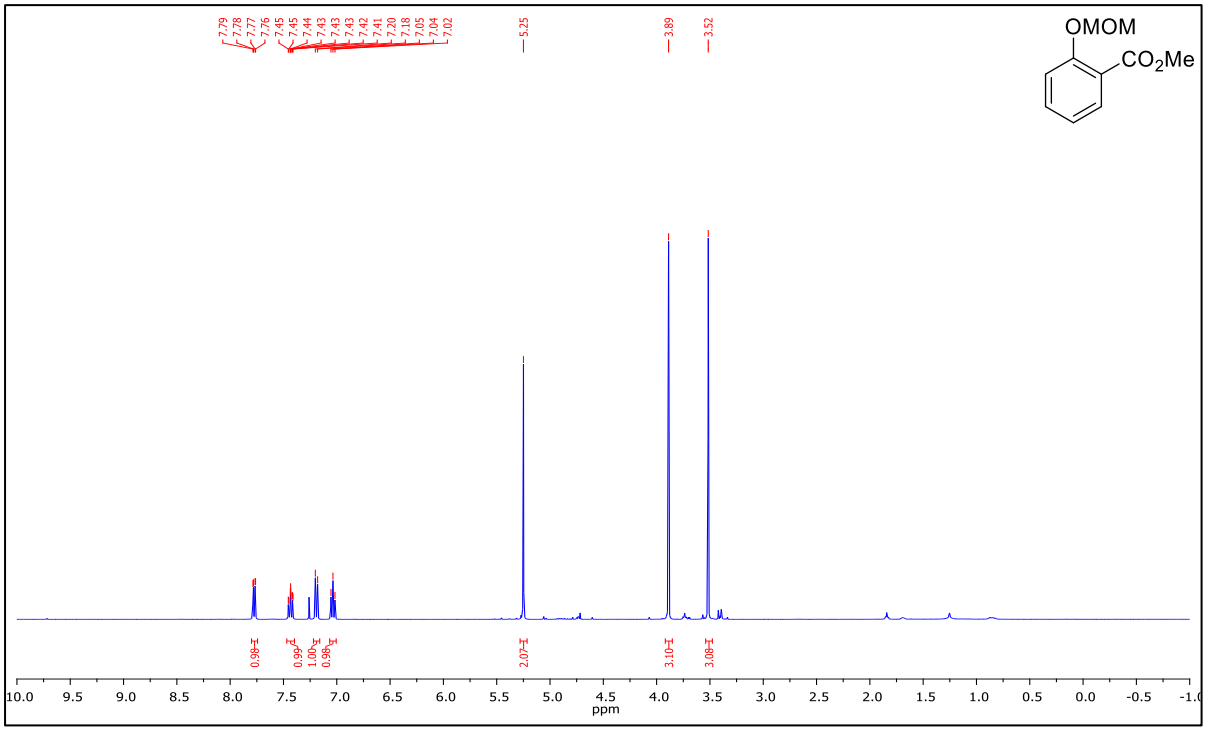


^{13}C NMR ($(CD_3)_2SO$)

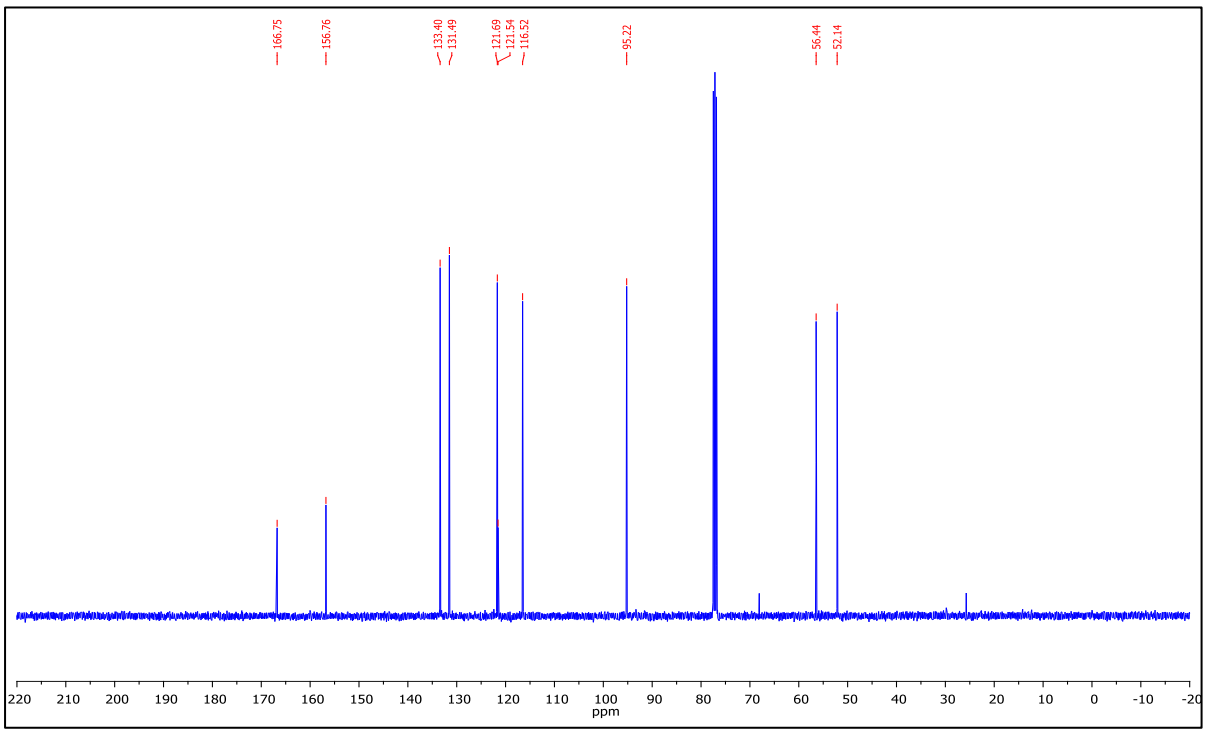


Methyl 2-(methoxymethoxy)benzoate (Me-1o)

^{1}H NMR ($CDCl_3$)

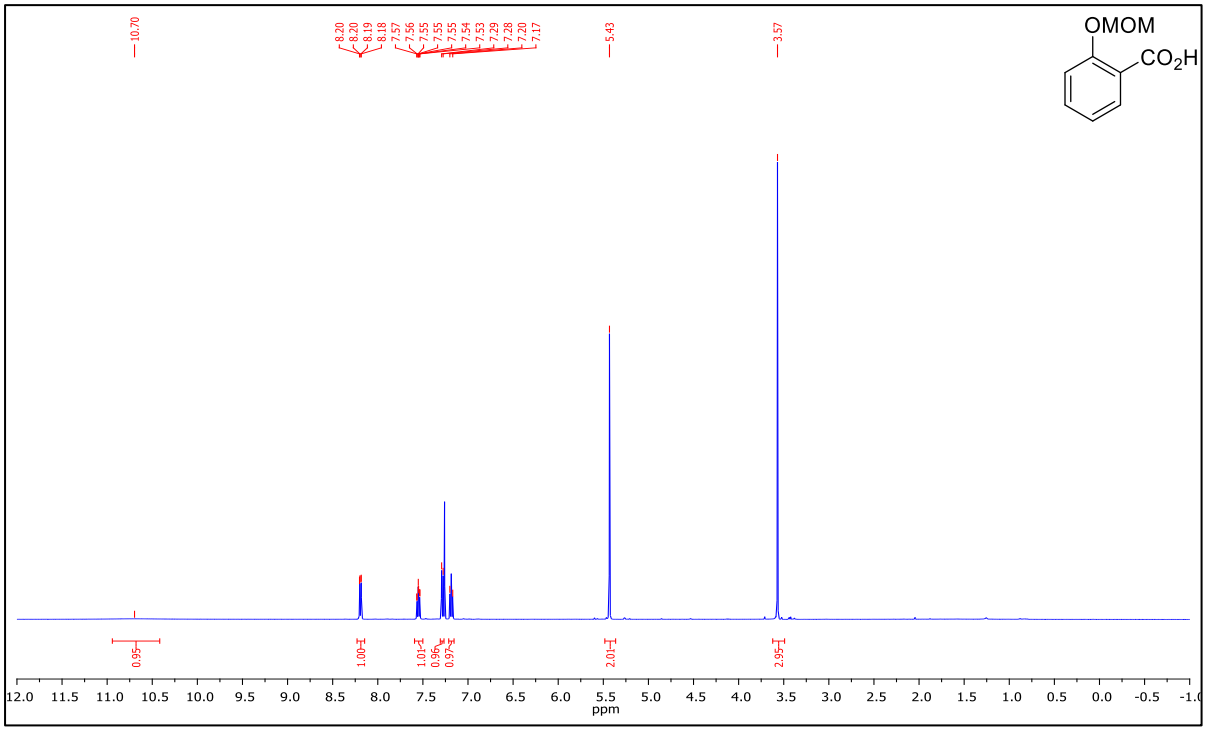


^{13}C NMR ($CDCl_3$)

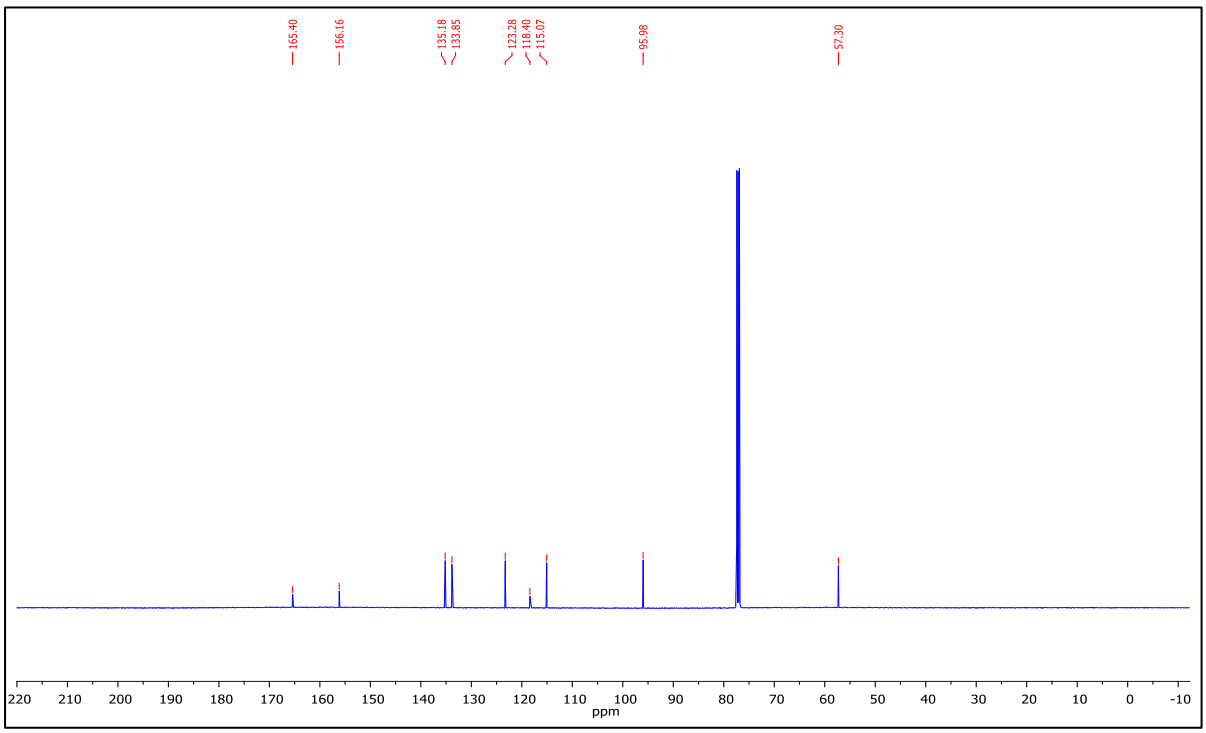


2-(methoxymethoxy)benzoic acid (1o)

^{1}H NMR ($CDCl_3$)

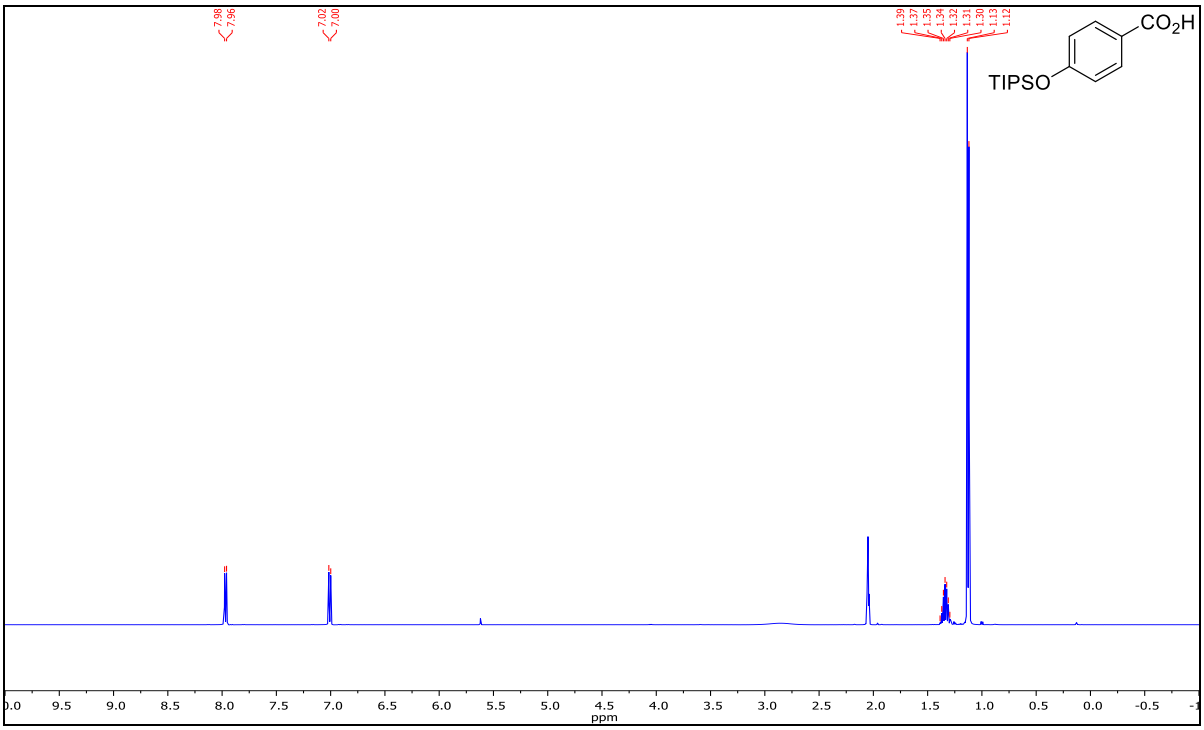


^{13}C NMR ($CDCl_3$)

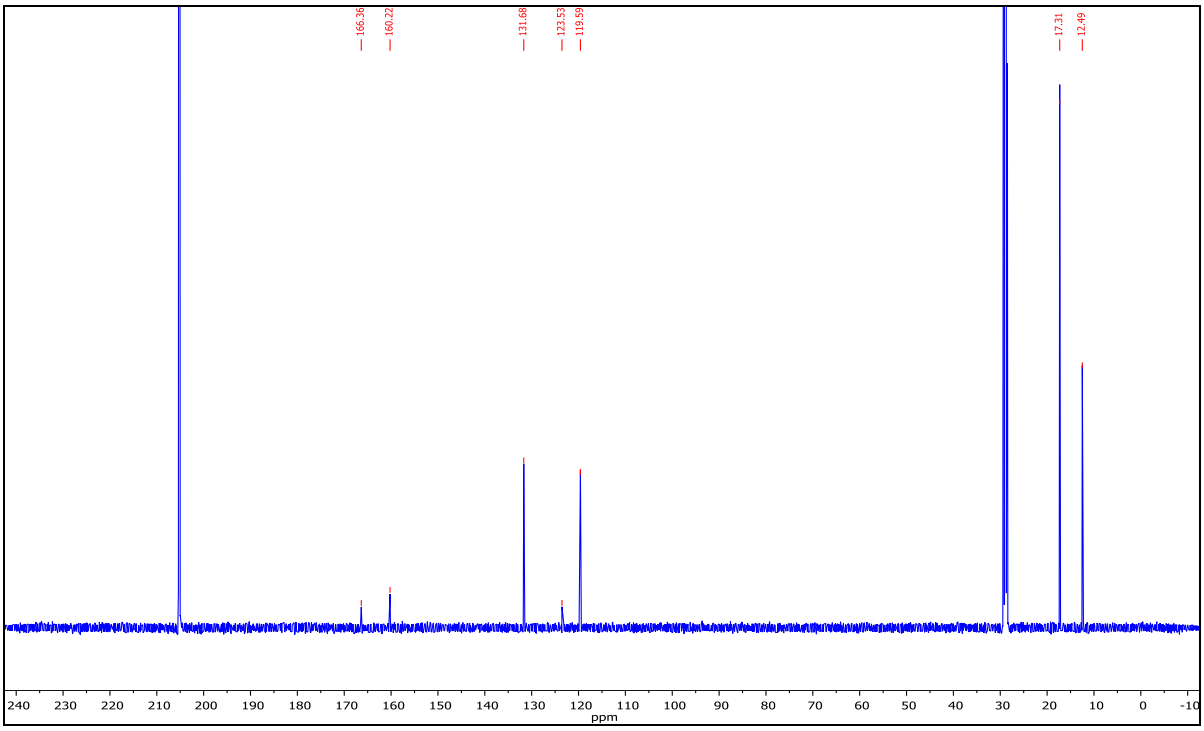


4-((triisopropylsilyl)oxy)benzoic acid (1p)

^{1}H NMR ($(CD_3)_2CO$)

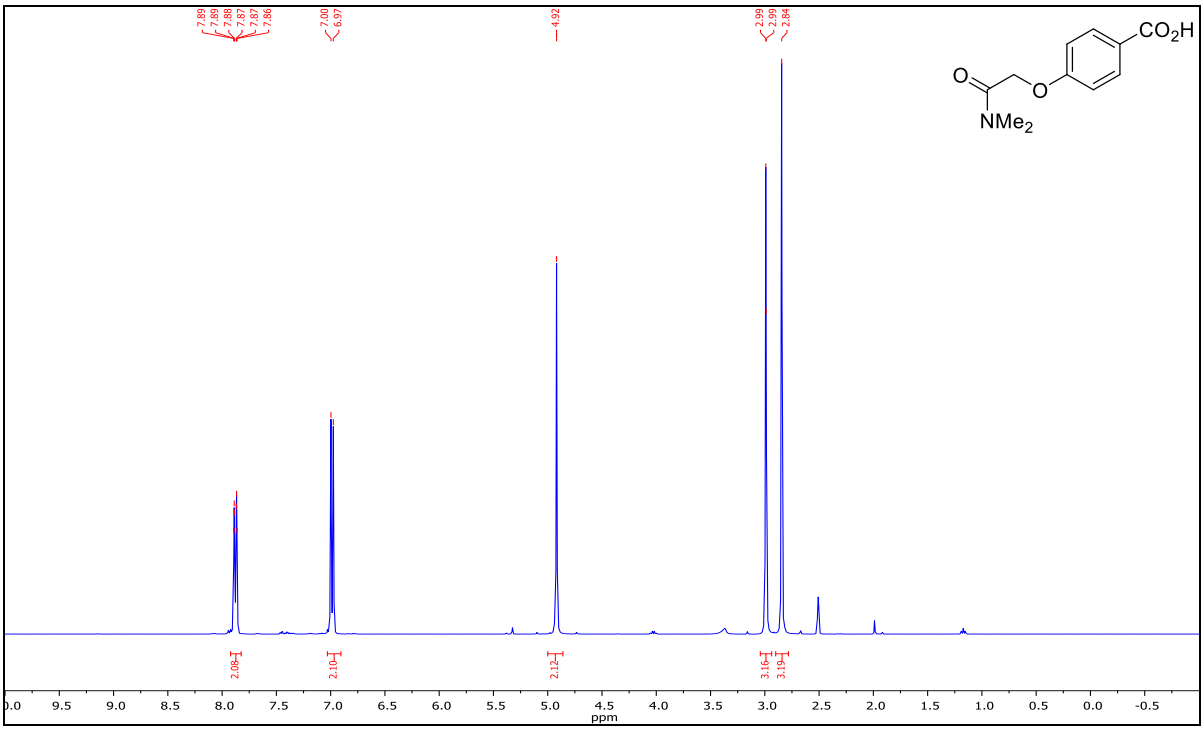


^{13}C NMR ($(CD_3)_2CO$)

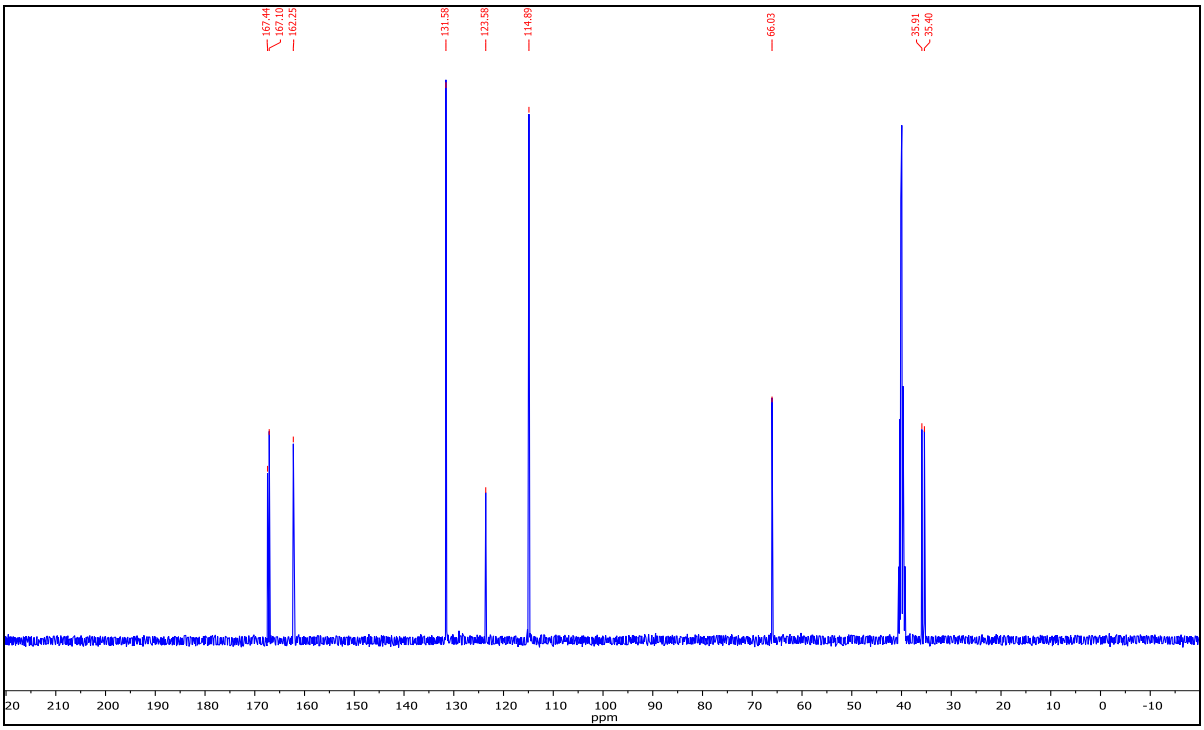


4-(2-(dimethylamino)-2-oxoethoxy)benzoic acid (1q)

^{1}H NMR ($(CD_3)_2SO$)

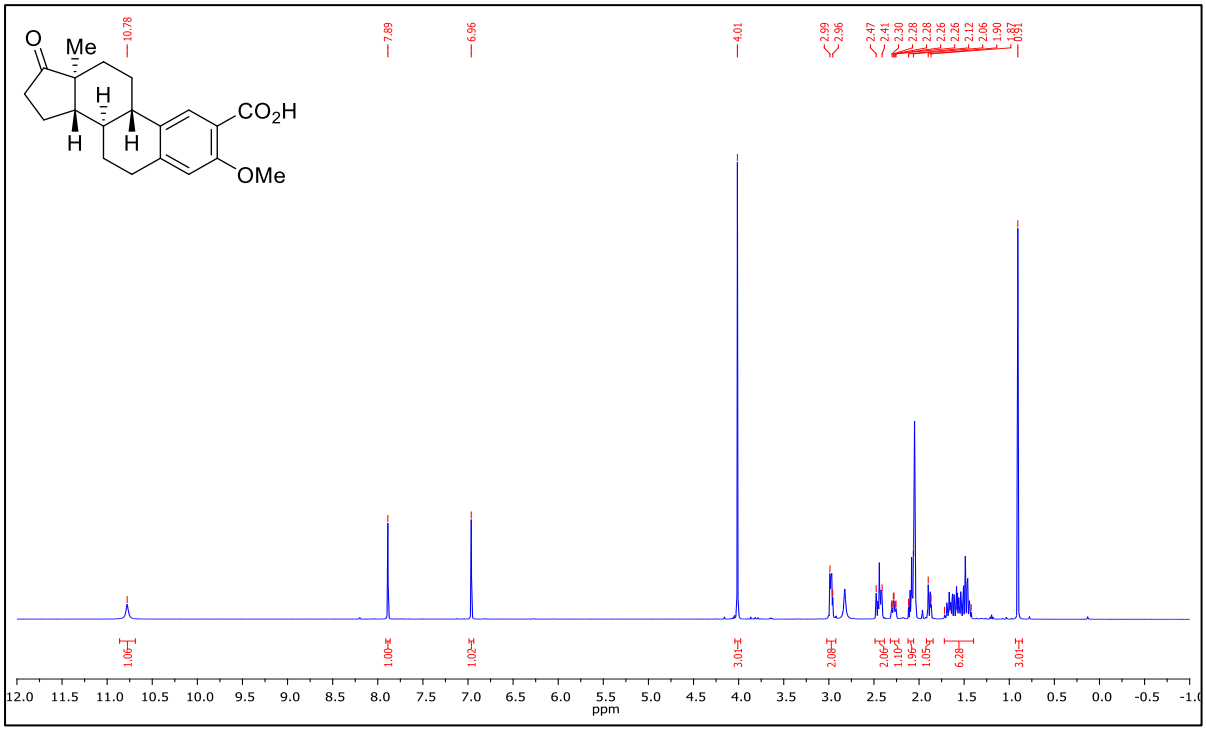


^{13}C NMR ($(CD_3)_2SO$)

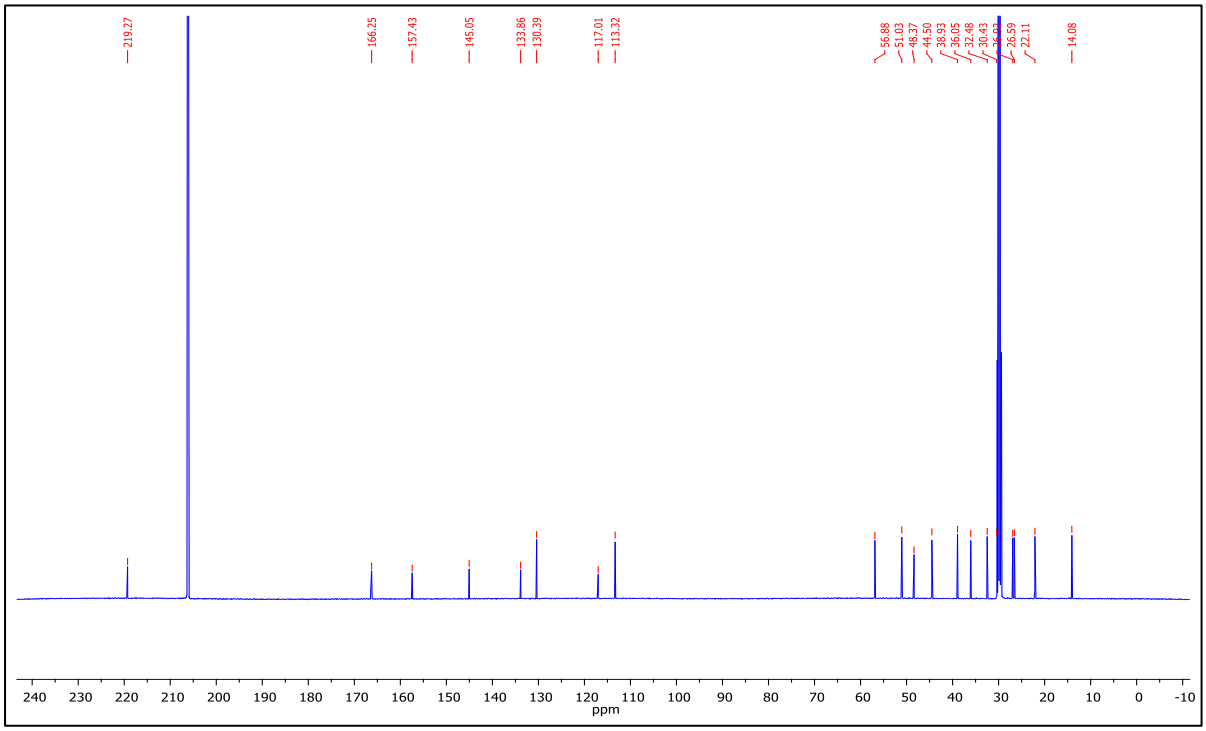


(8R,9S,13S,14S)-3-methoxy-13-methyl-17-oxo-7,8,9,11,12,13,14,15,16,17-decahydro-6H-cyclopenta[a]phenanthrene-2-carboxylic acid (methylestrone-2-carboxylic acid, 1af)

^{1}H NMR ($(CD_3)_2CO$)

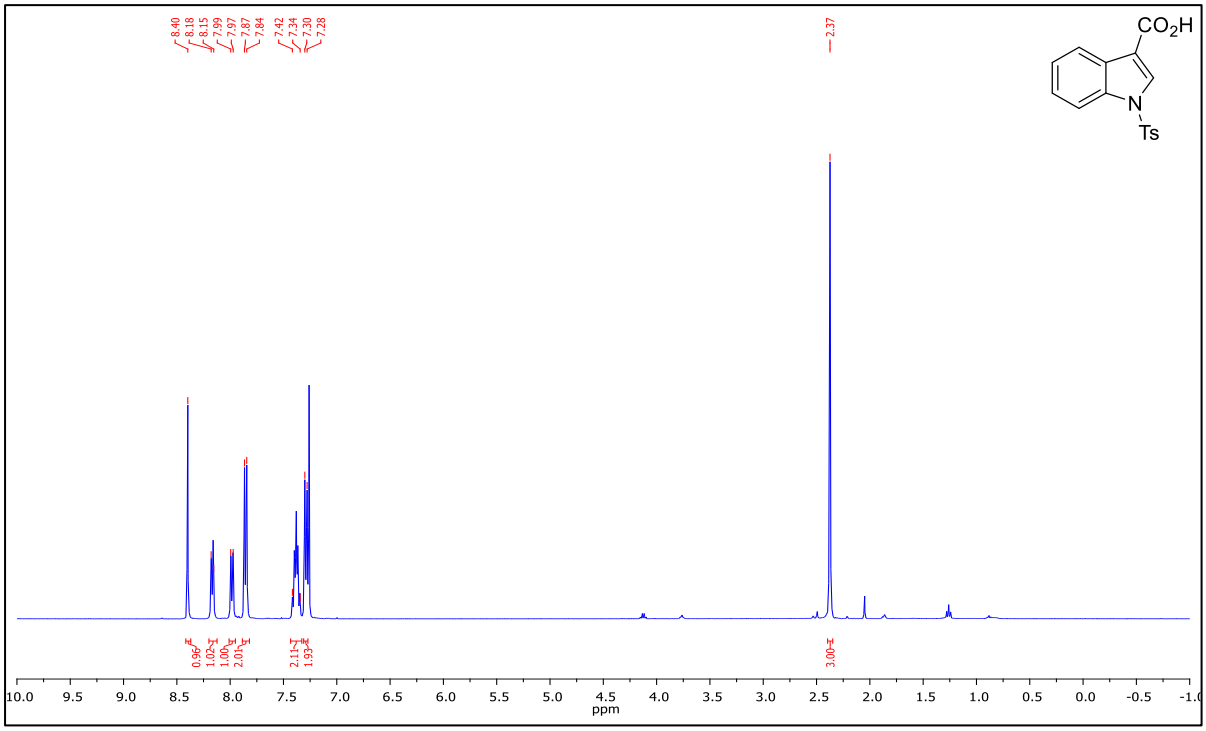


^{13}C NMR ($(CD_3)_2CO$)

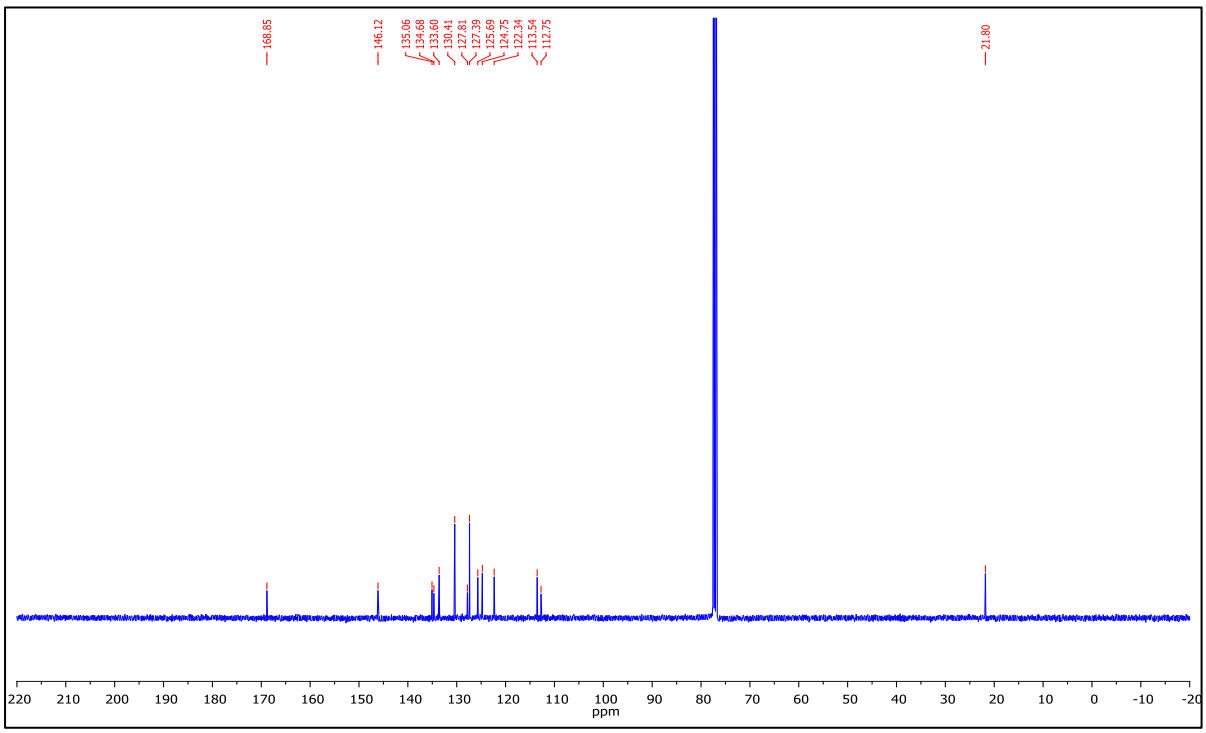


1-tosyl-1H-indole-3-carboxylic acid (1al)

^{1}H NMR ($CDCl_3$)

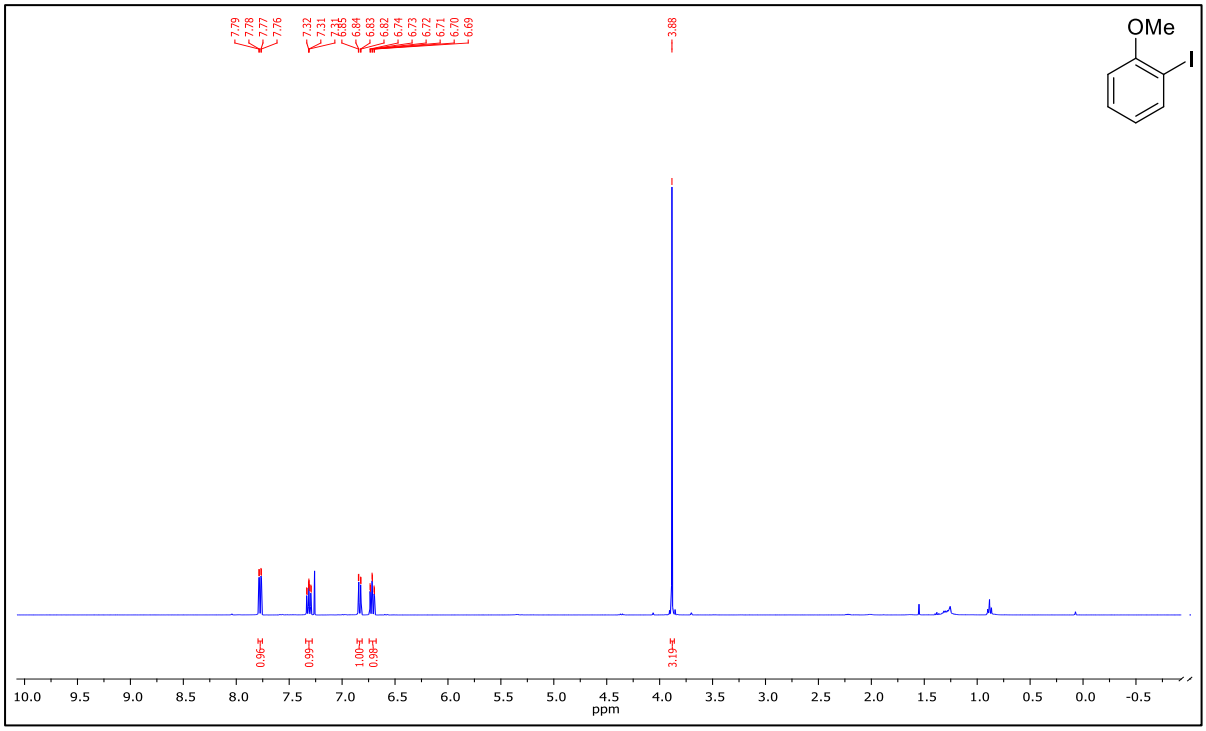


^{13}C NMR ($CDCl_3$)

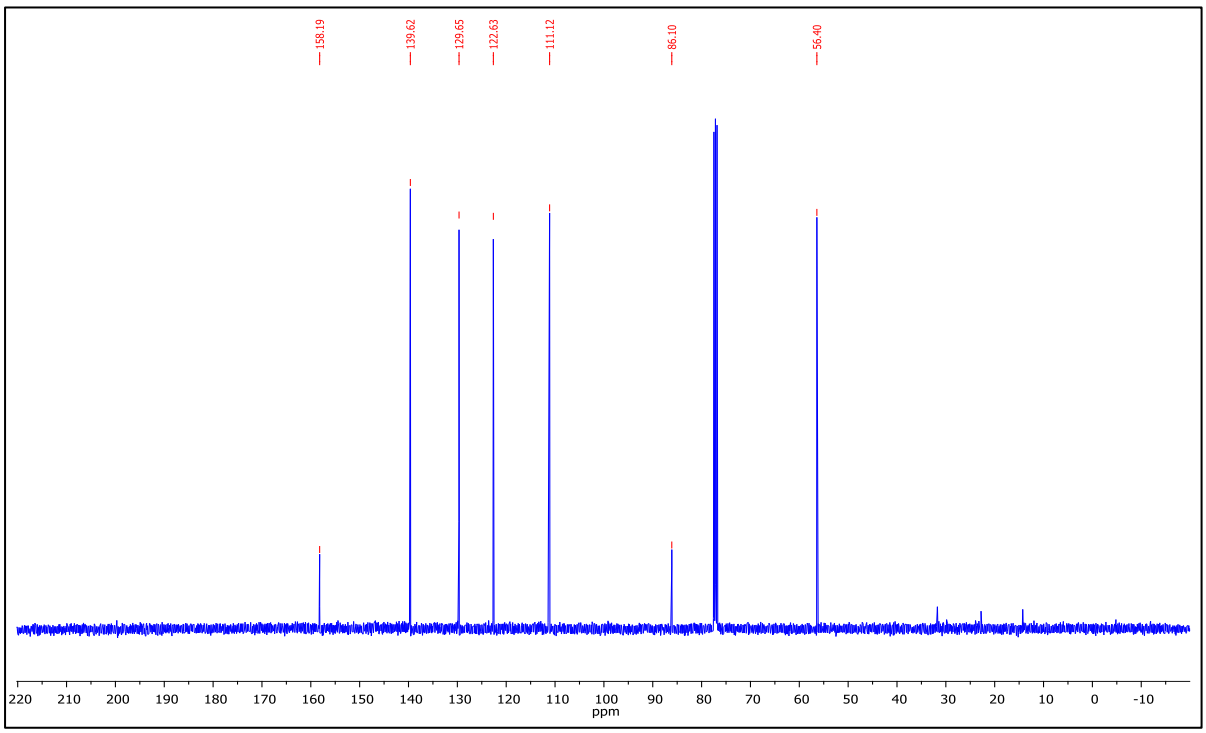


2-iodoanisole (2a)

^{1}H NMR ($CDCl_3$)

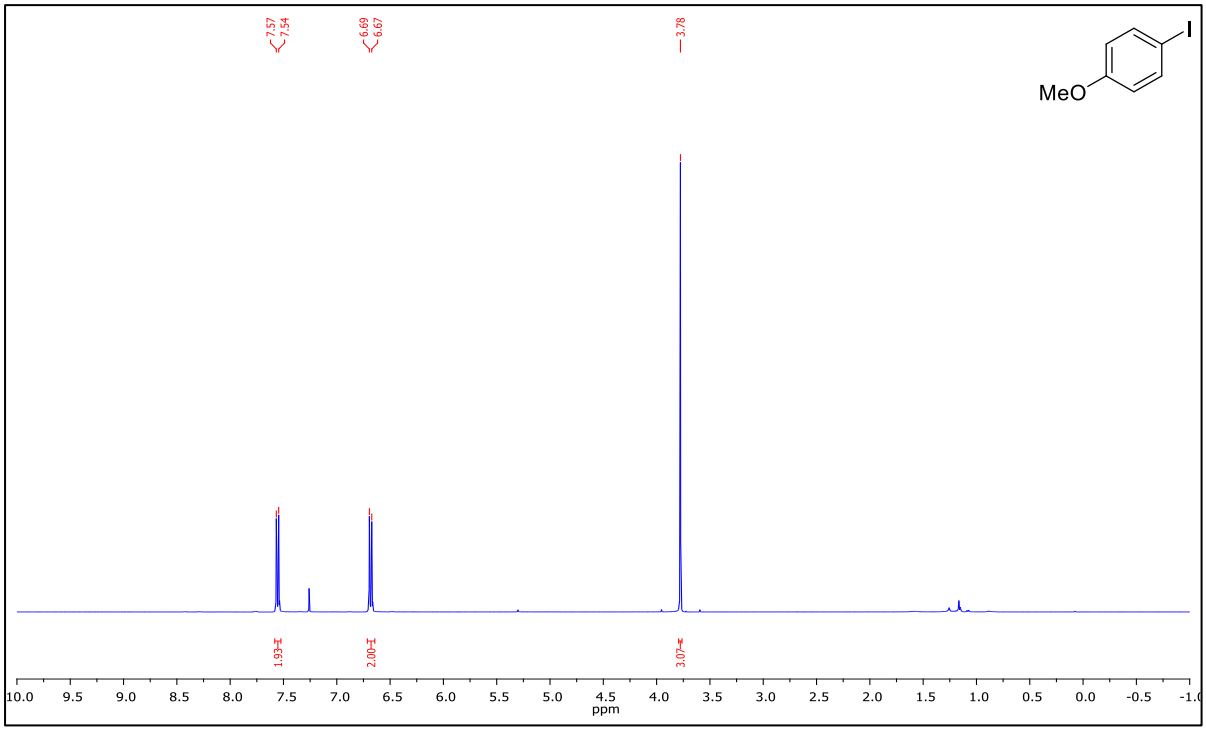


^{13}C NMR ($CDCl_3$)

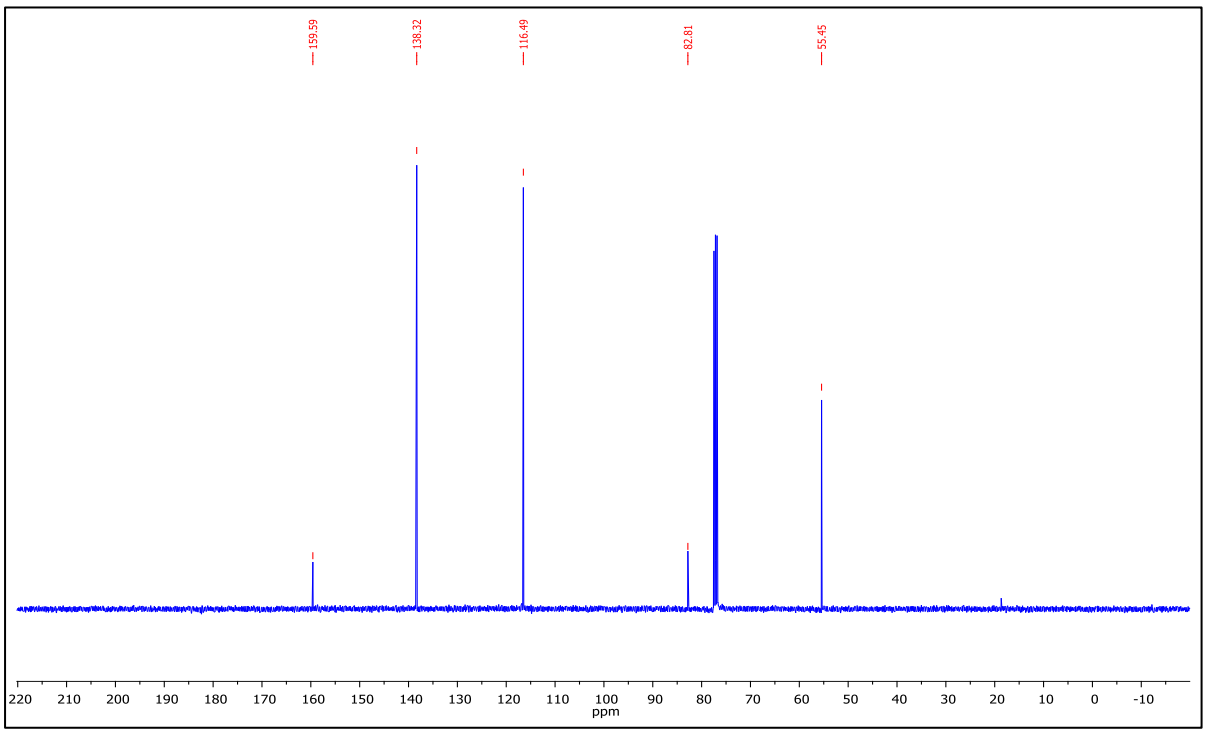


4-iodoanisole (2b)

^{1}H NMR ($CDCl_3$)

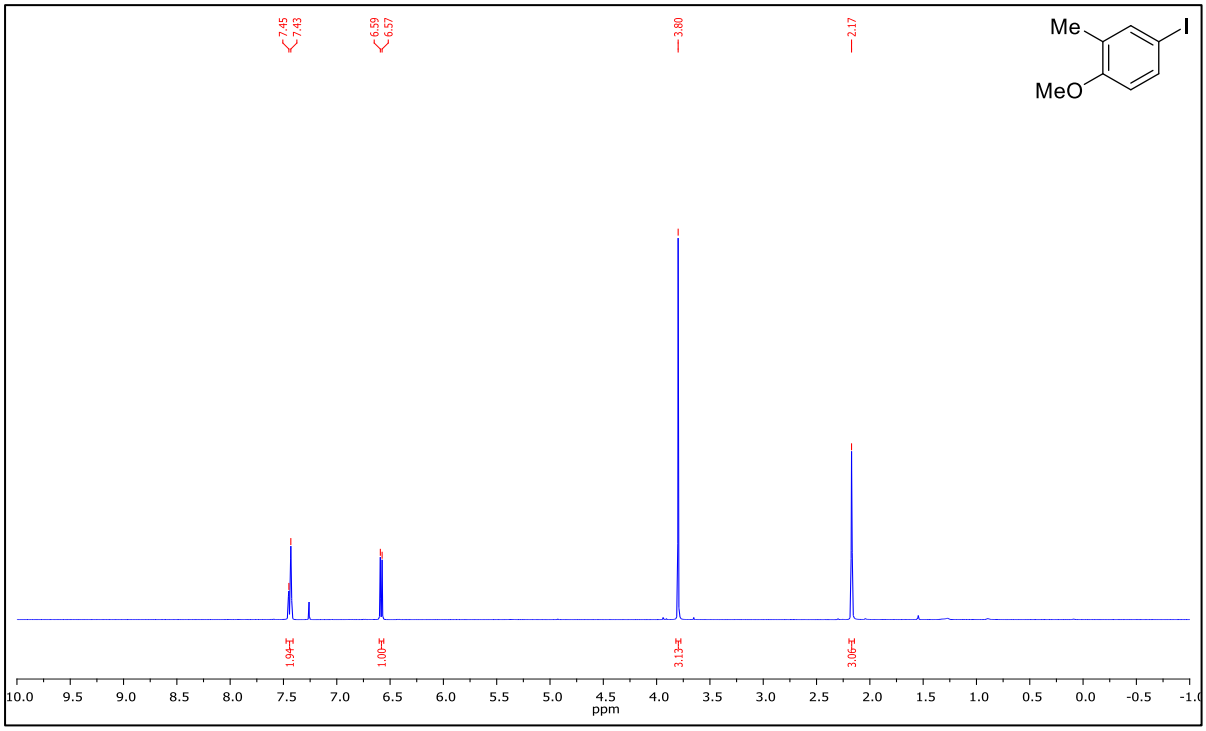


^{13}C NMR ($CDCl_3$)

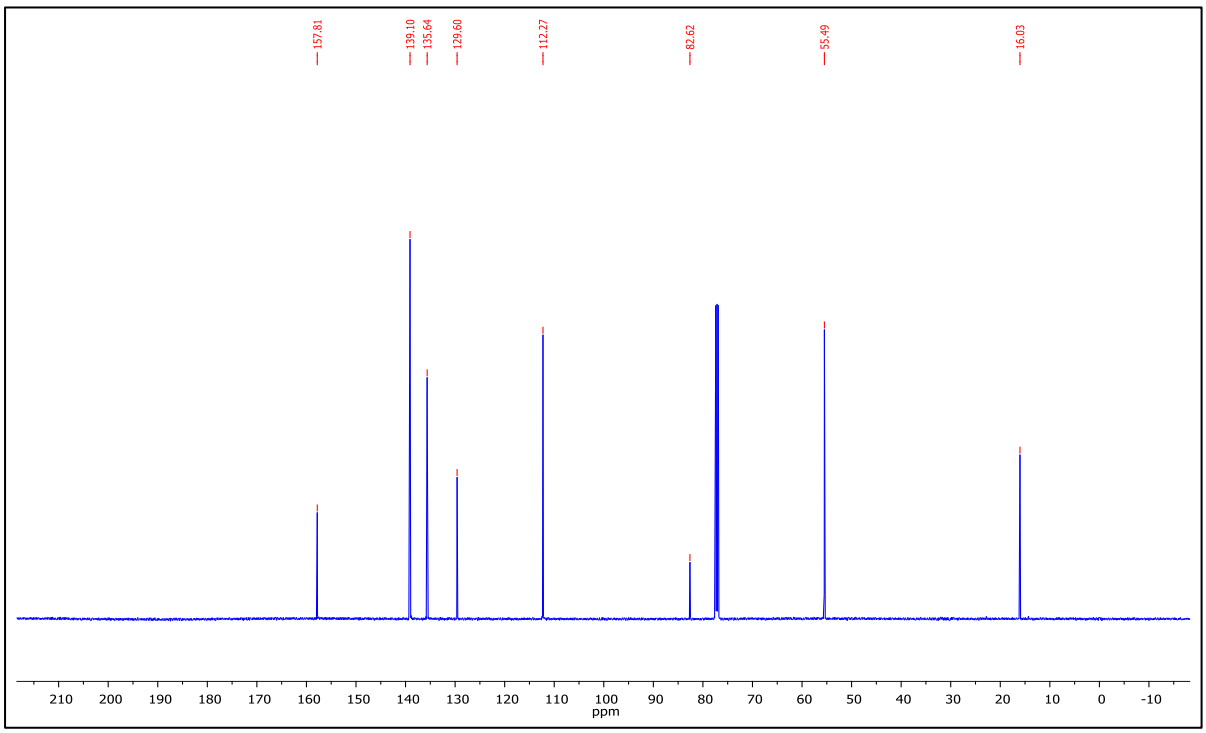


4-iodo-1-methoxy-2-methylbenzene (2c)

^{1}H NMR ($CDCl_3$)

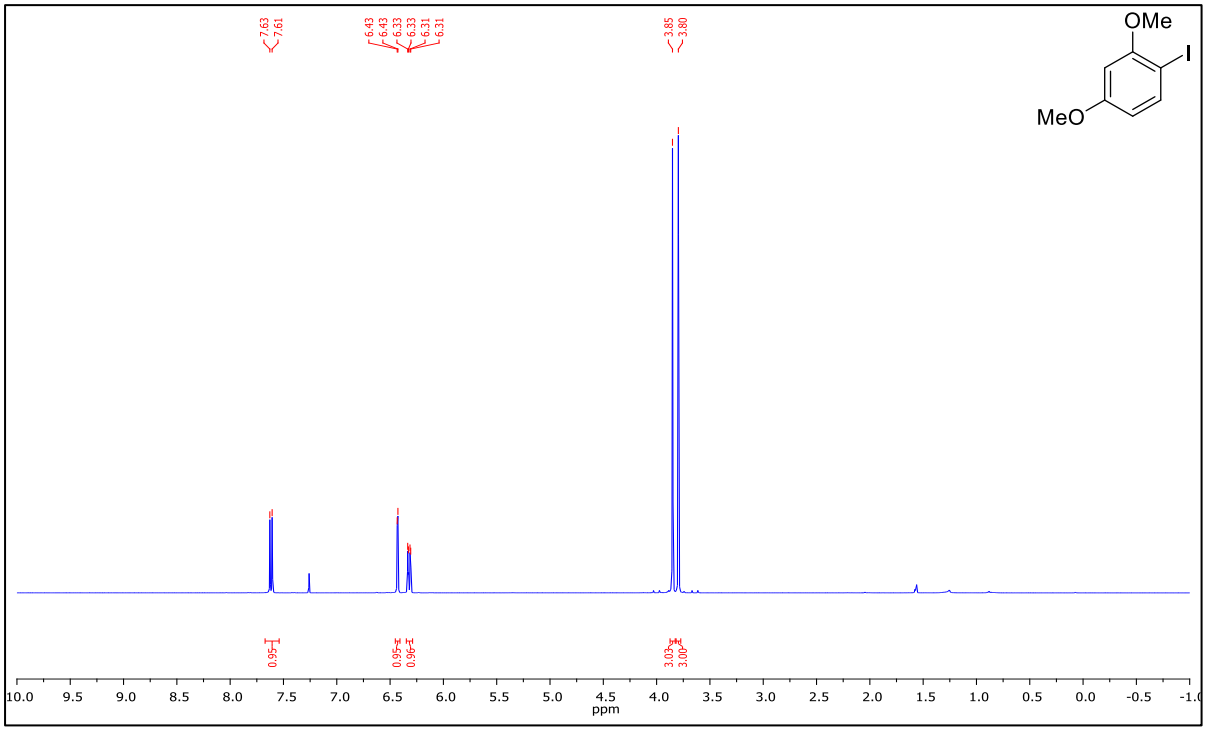


^{13}C NMR ($CDCl_3$)

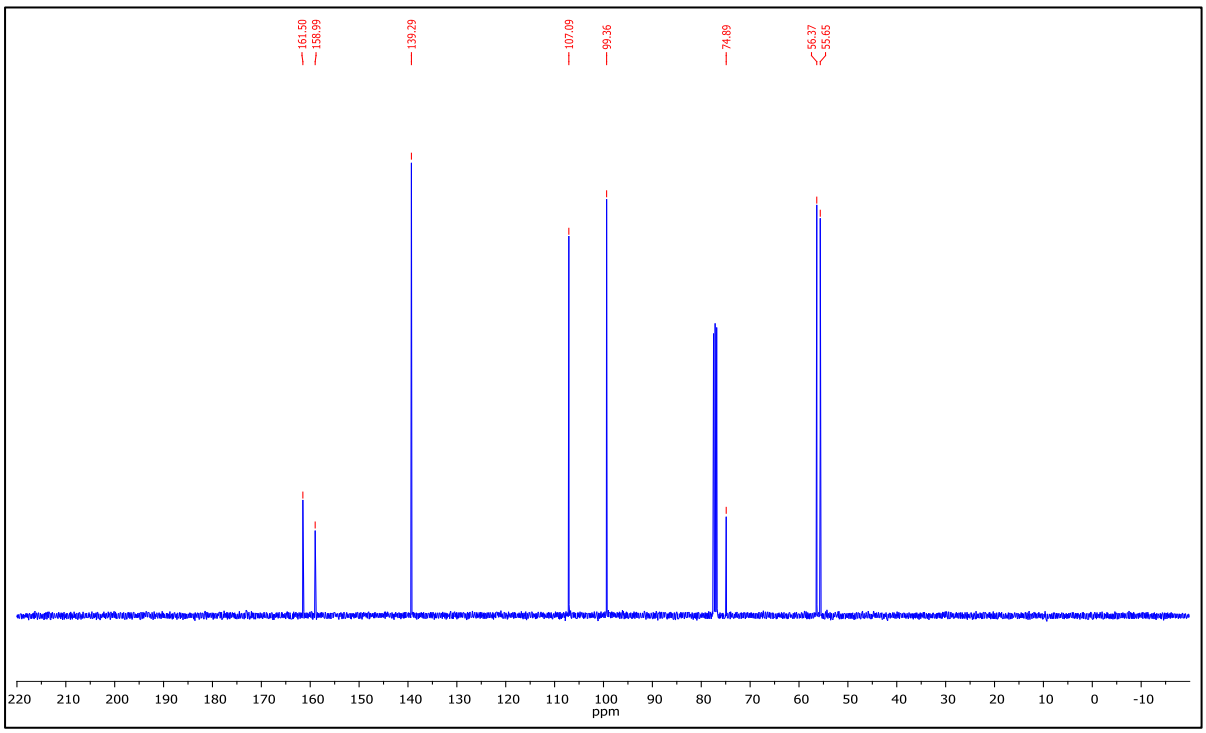


2-iodo-1,5-dimethoxybenzene (2e)

^{1}H NMR ($CDCl_3$)

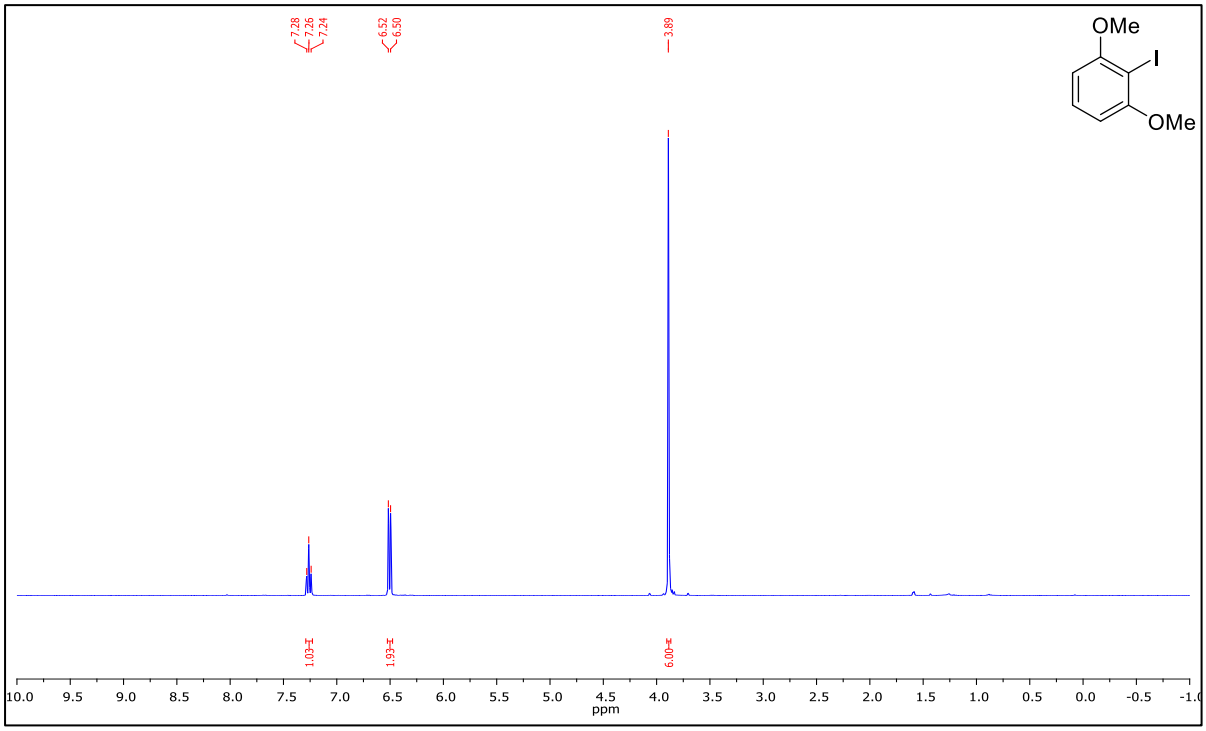


^{13}C NMR ($CDCl_3$)

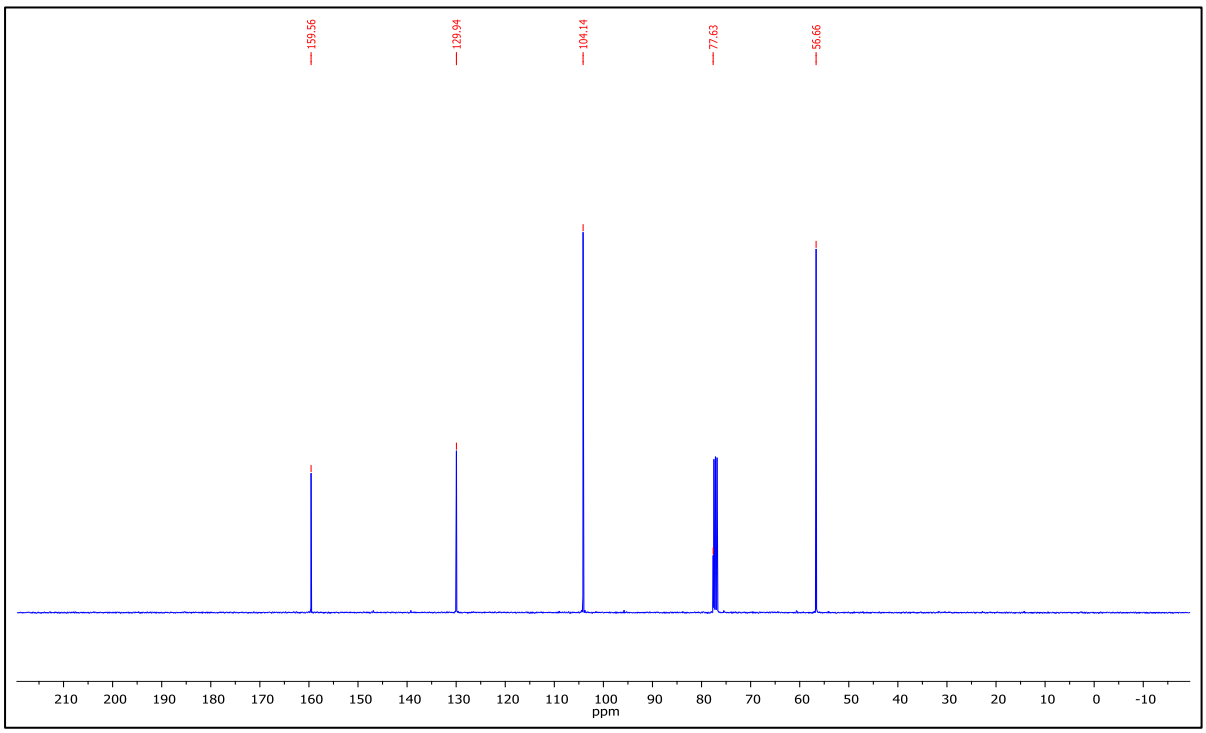


2-iodo-1,3-dimethoxybenzene (2f)

^{1}H NMR ($CDCl_3$)

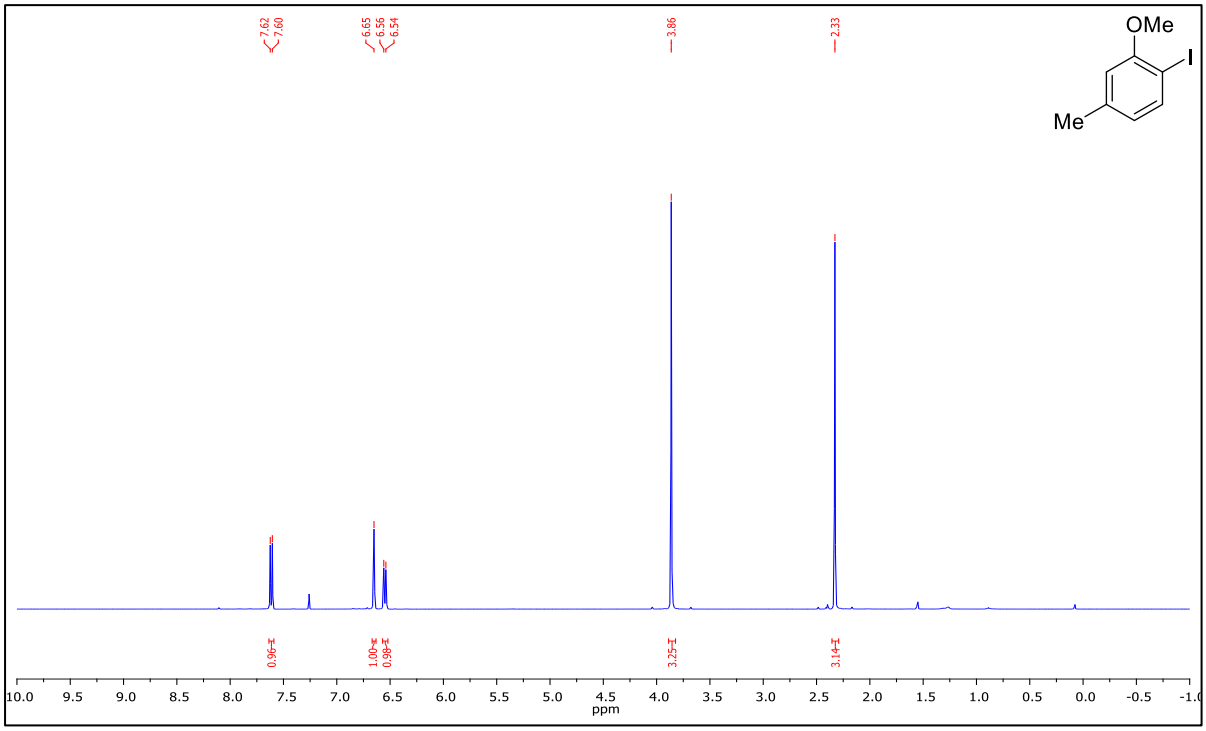


^{13}C NMR ($CDCl_3$)

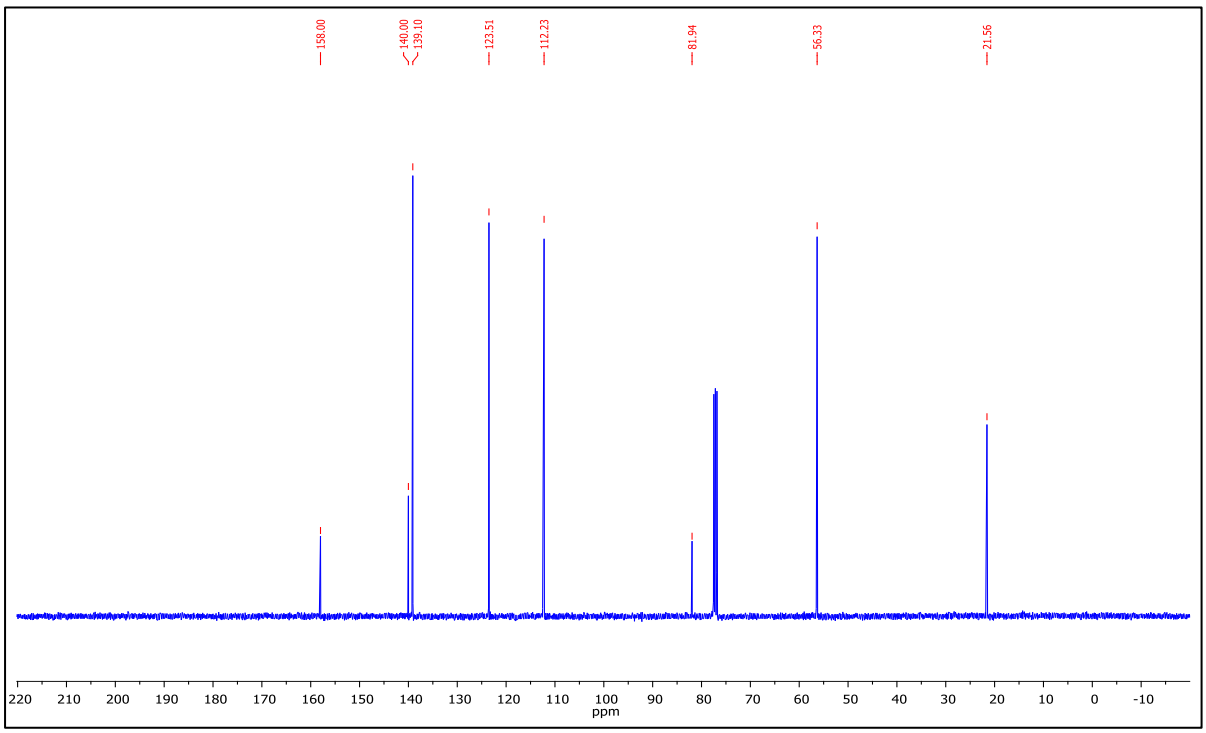


1-iodo-2-methoxy-4-methylbenzene (2g)

^{1}H NMR ($CDCl_3$)

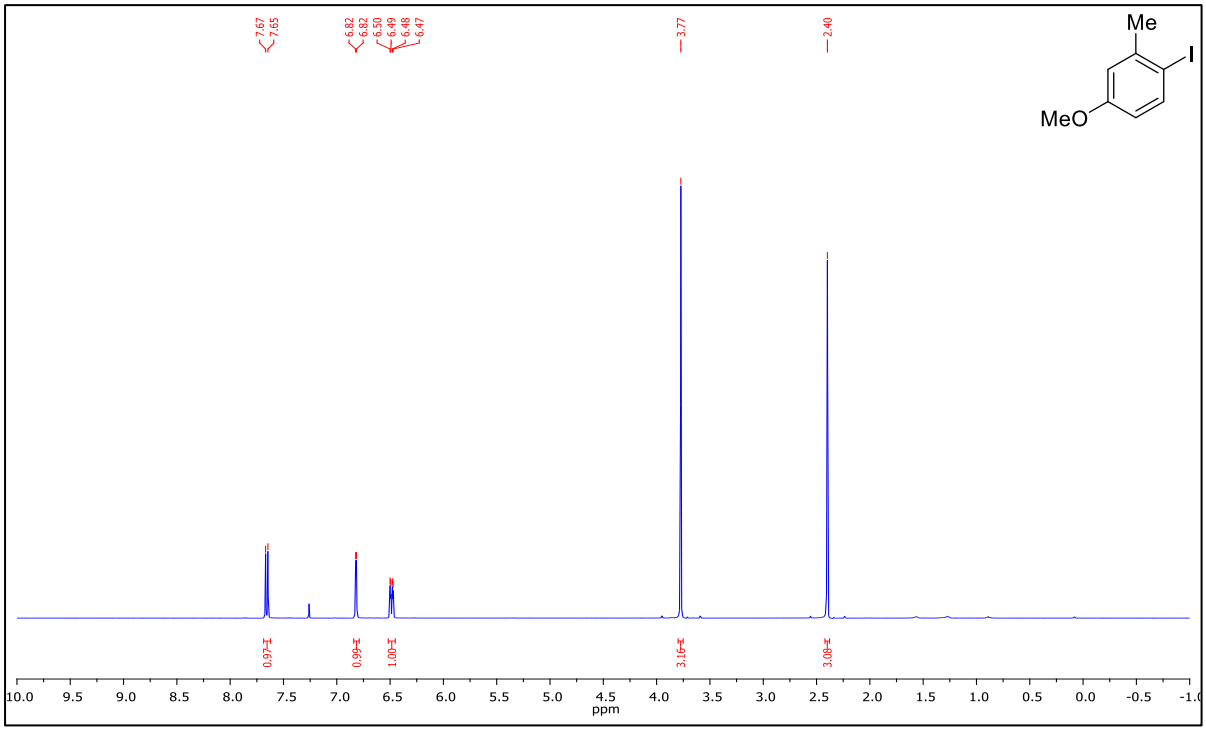


^{13}C NMR ($CDCl_3$)

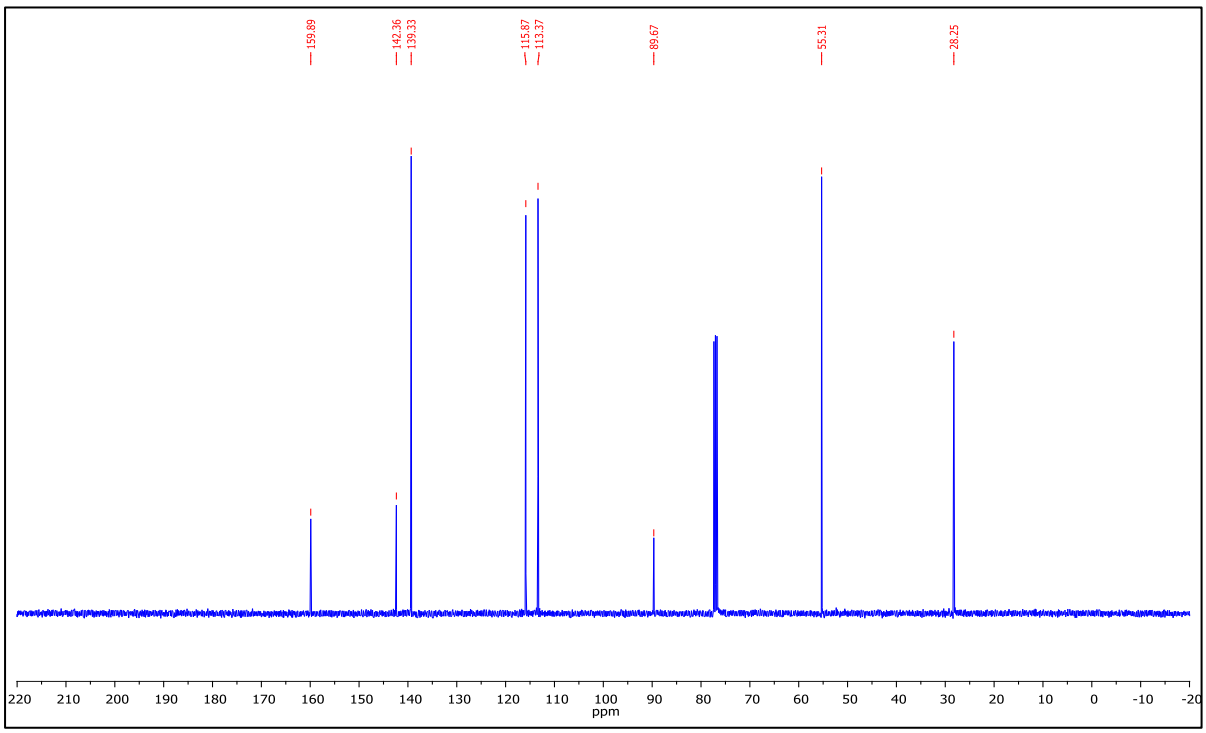


1-iodo-4-methoxy-2-methylbenzene (2h)

^{1}H NMR ($CDCl_3$)

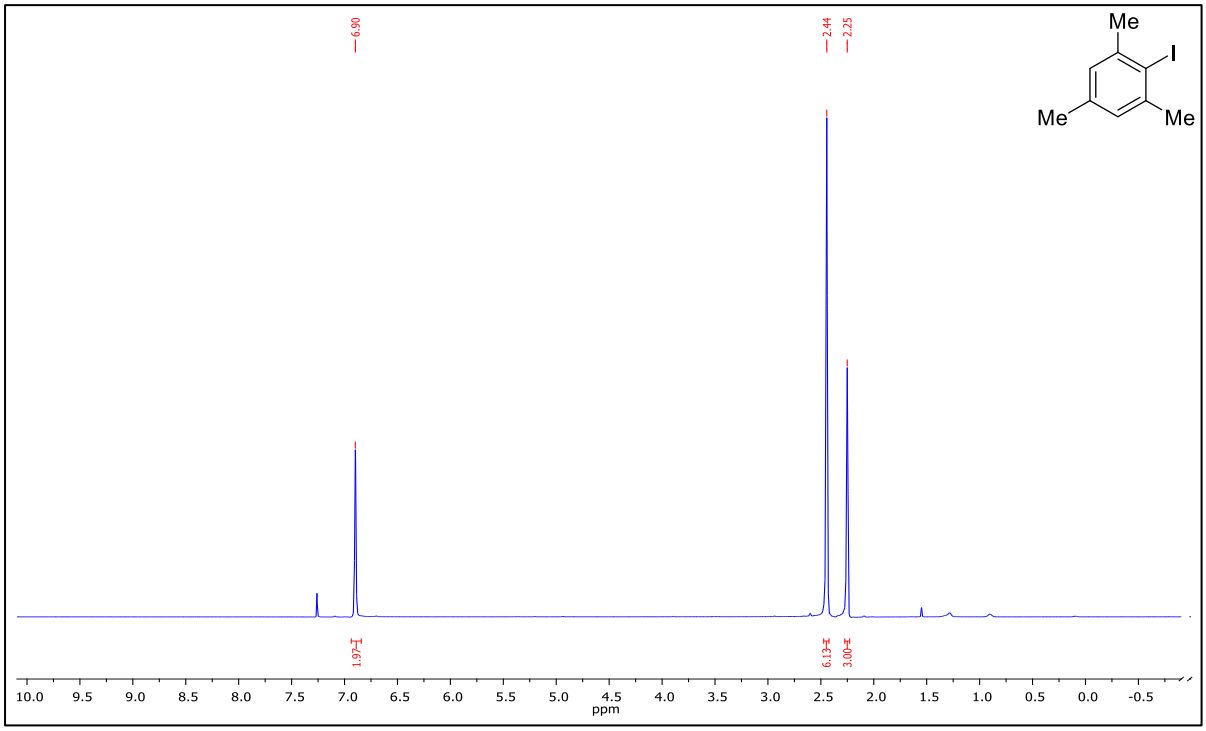


^{13}C NMR ($CDCl_3$)

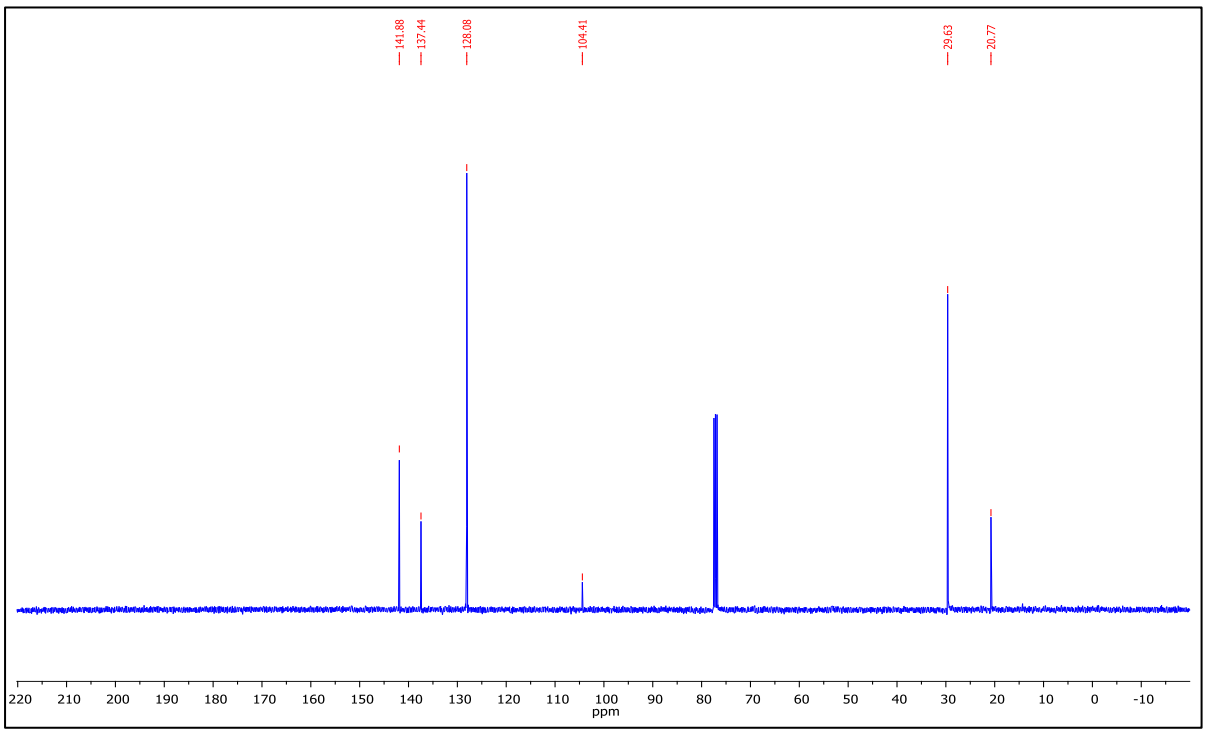


2-iodo-1,3,5-trimethylbenzene (2i)

^{1}H NMR ($CDCl_3$)

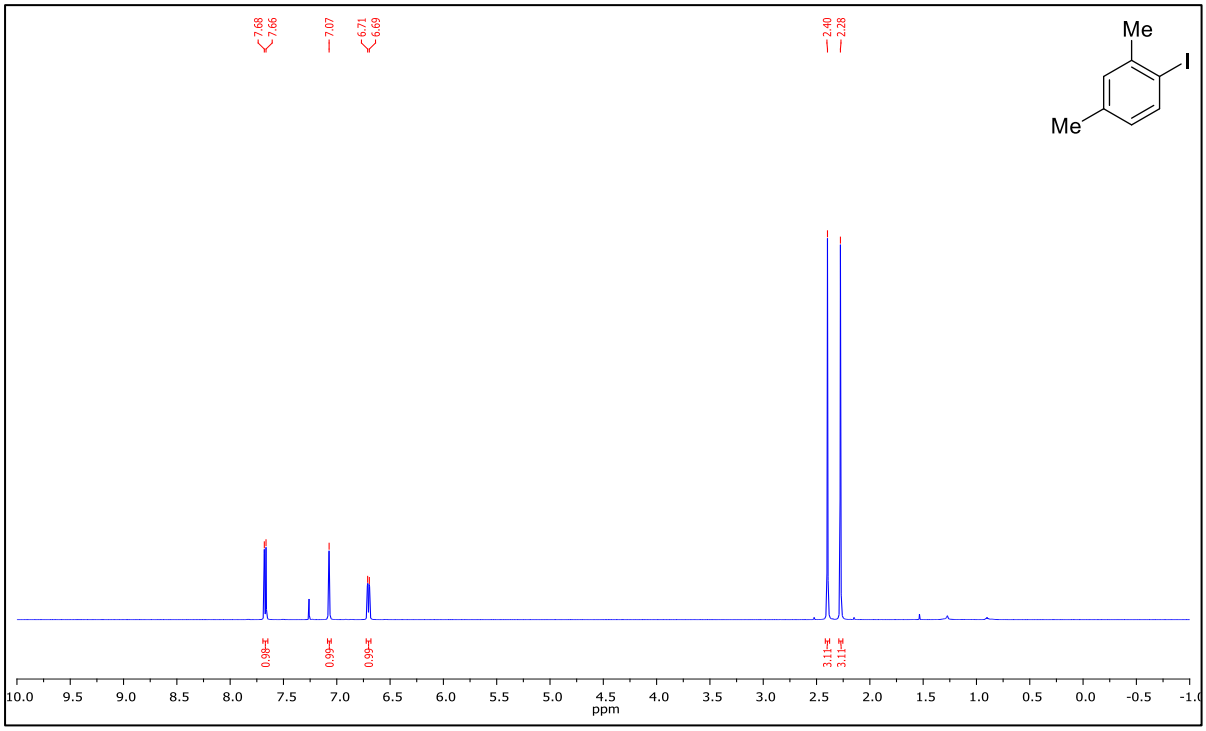


^{13}C NMR ($CDCl_3$)

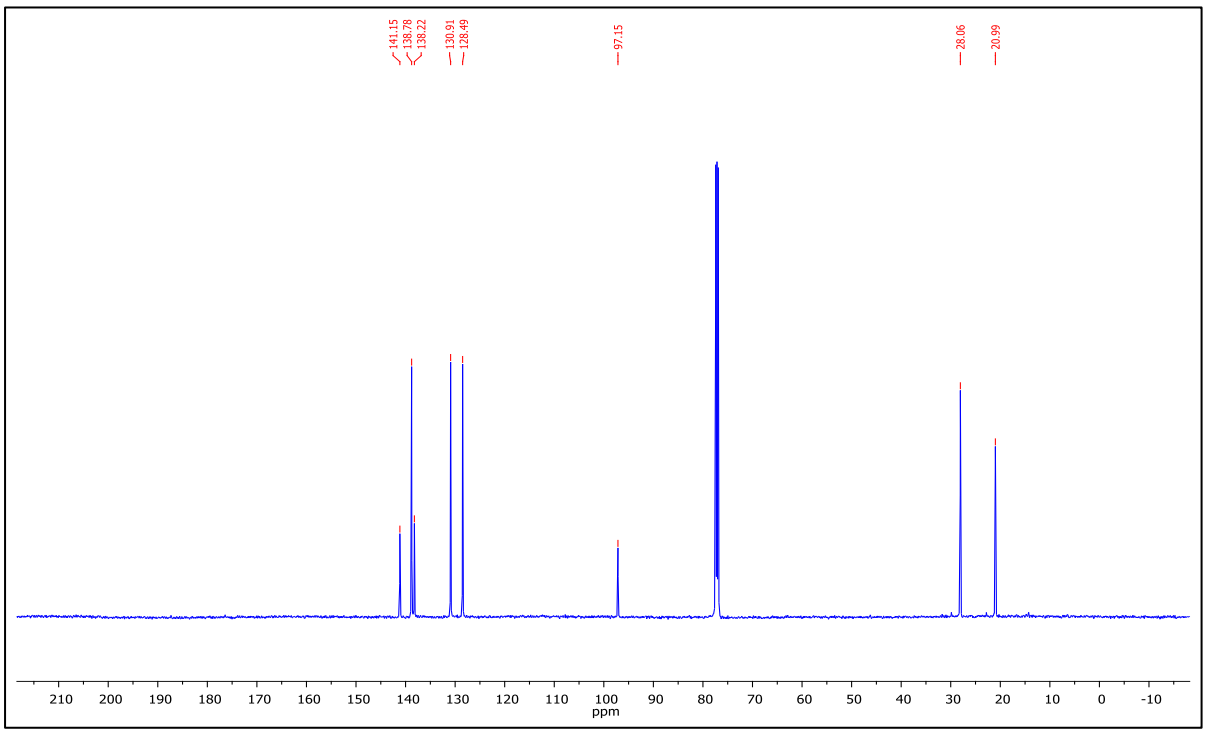


1-iodo-2,4-dimethylbenzene (2j)

^{1}H NMR ($CDCl_3$)

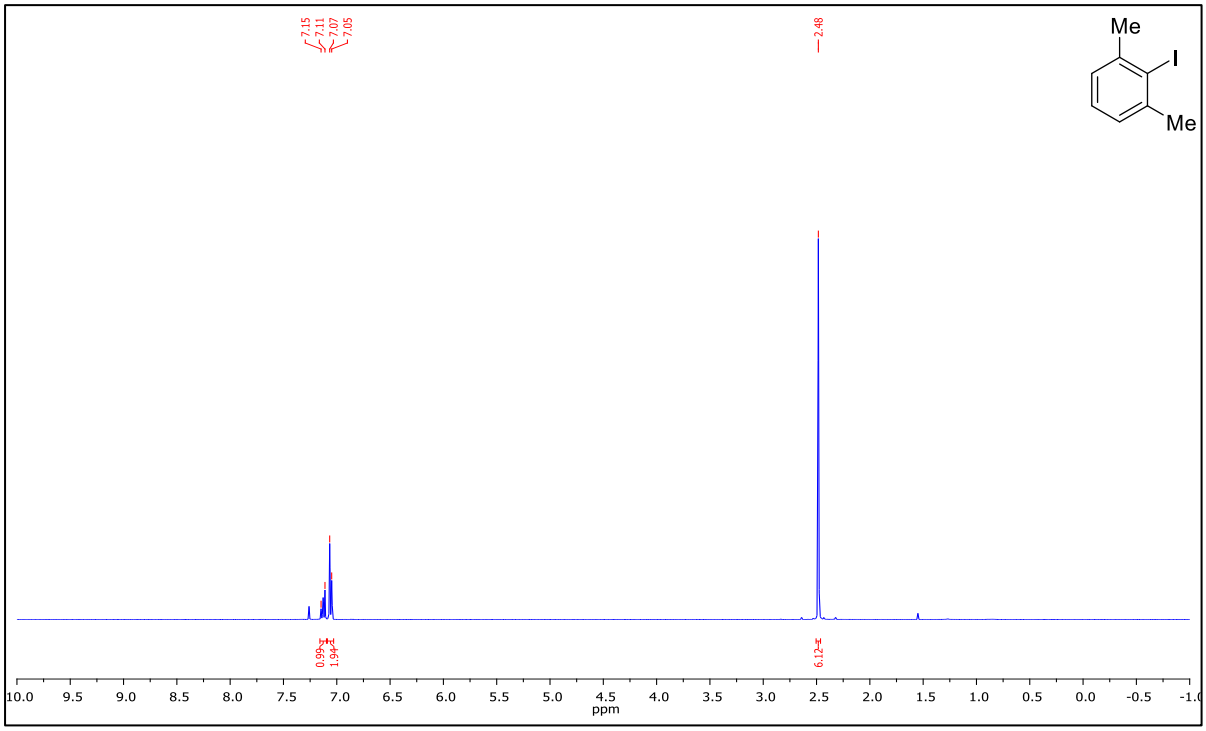


^{13}C NMR ($CDCl_3$)

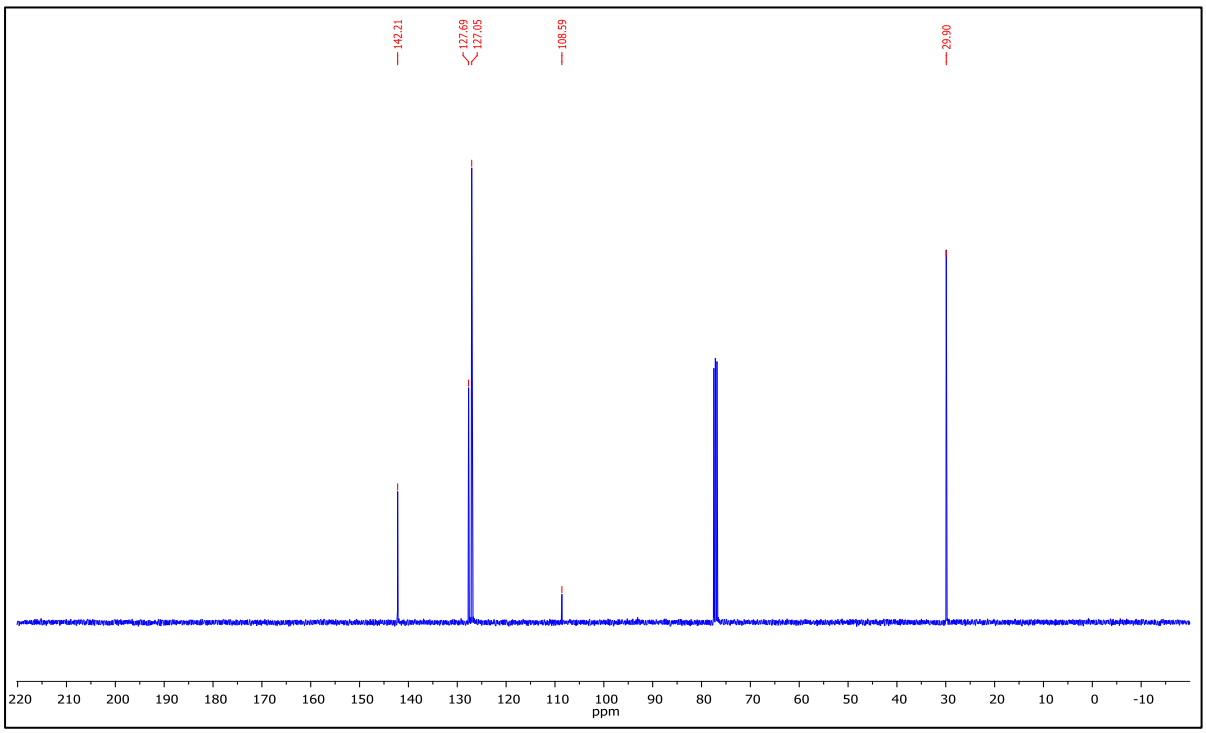


2-iodo-1,3-dimethylbenzene (2k)

^{1}H NMR ($CDCl_3$)

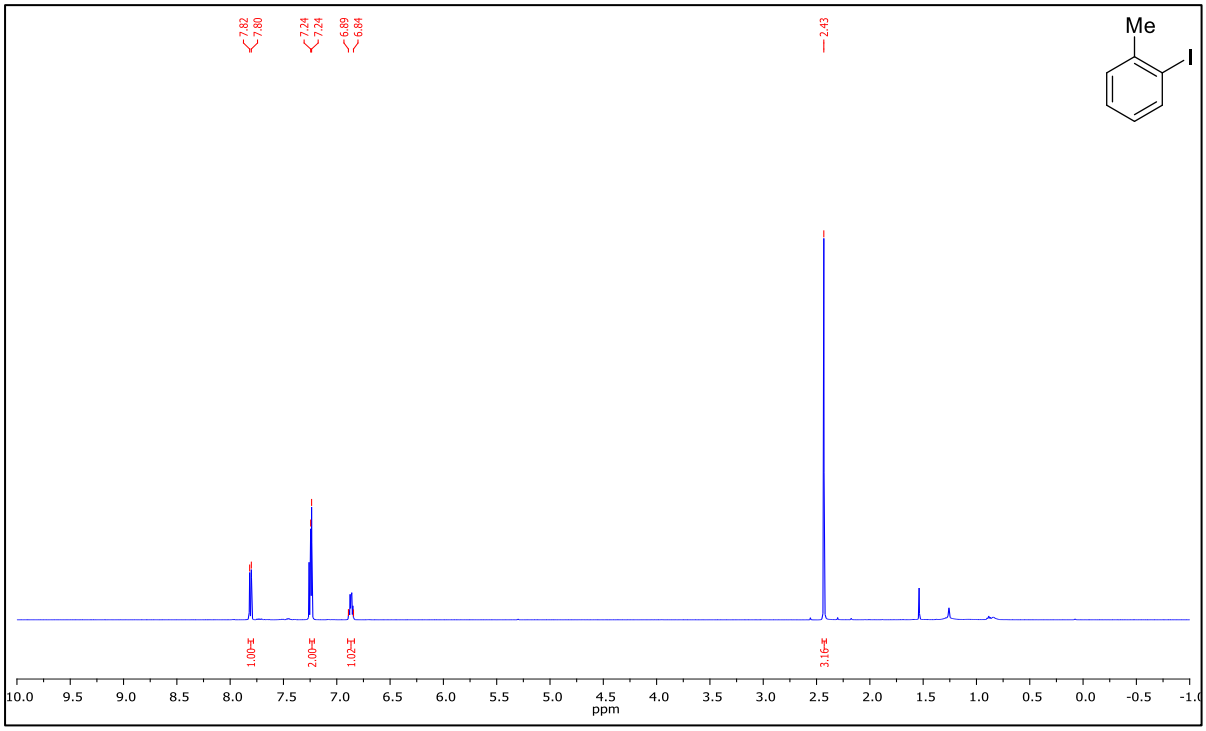


^{13}C NMR ($CDCl_3$)

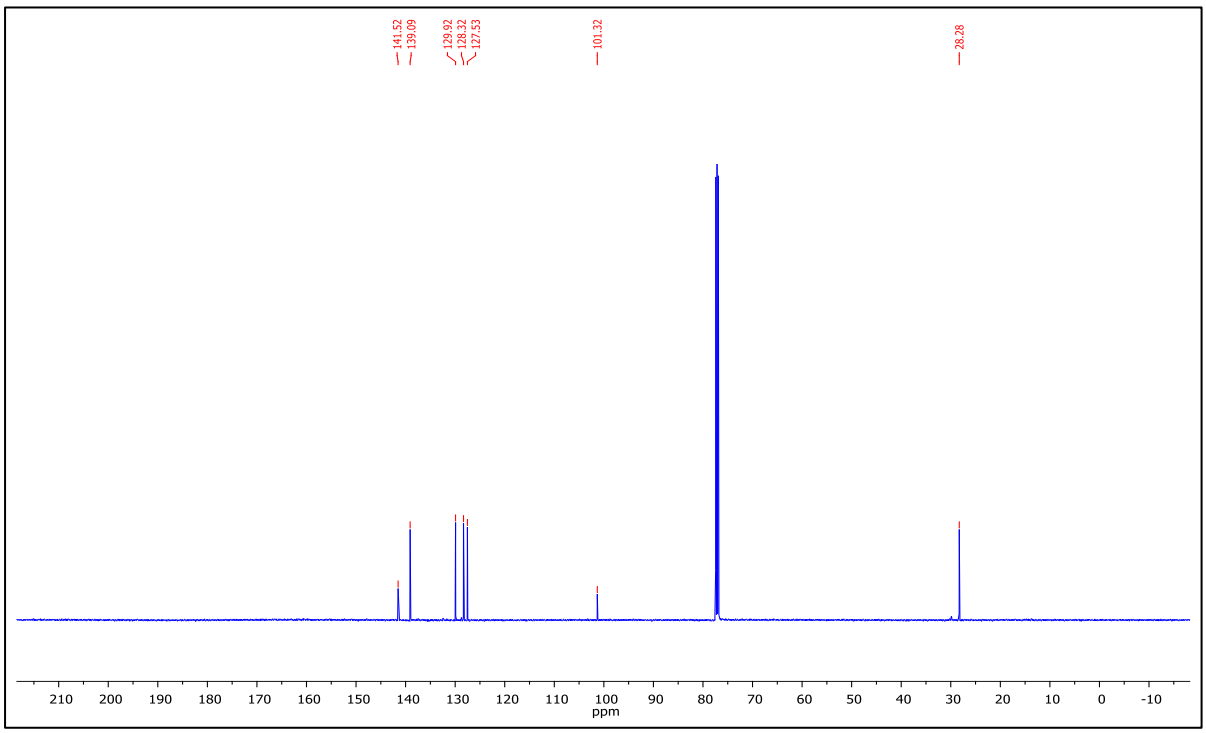


1-iodo-2-methylbenzene (2l)

^{1}H NMR ($CDCl_3$)

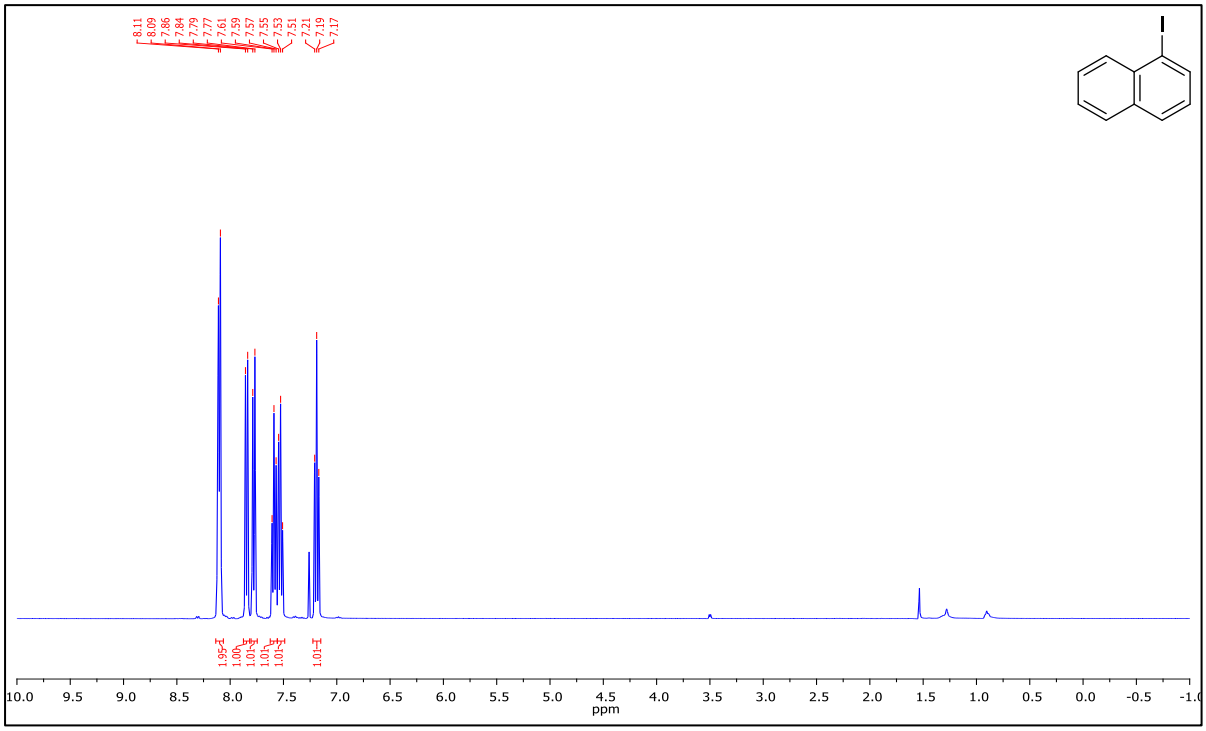


^{13}C NMR ($CDCl_3$)

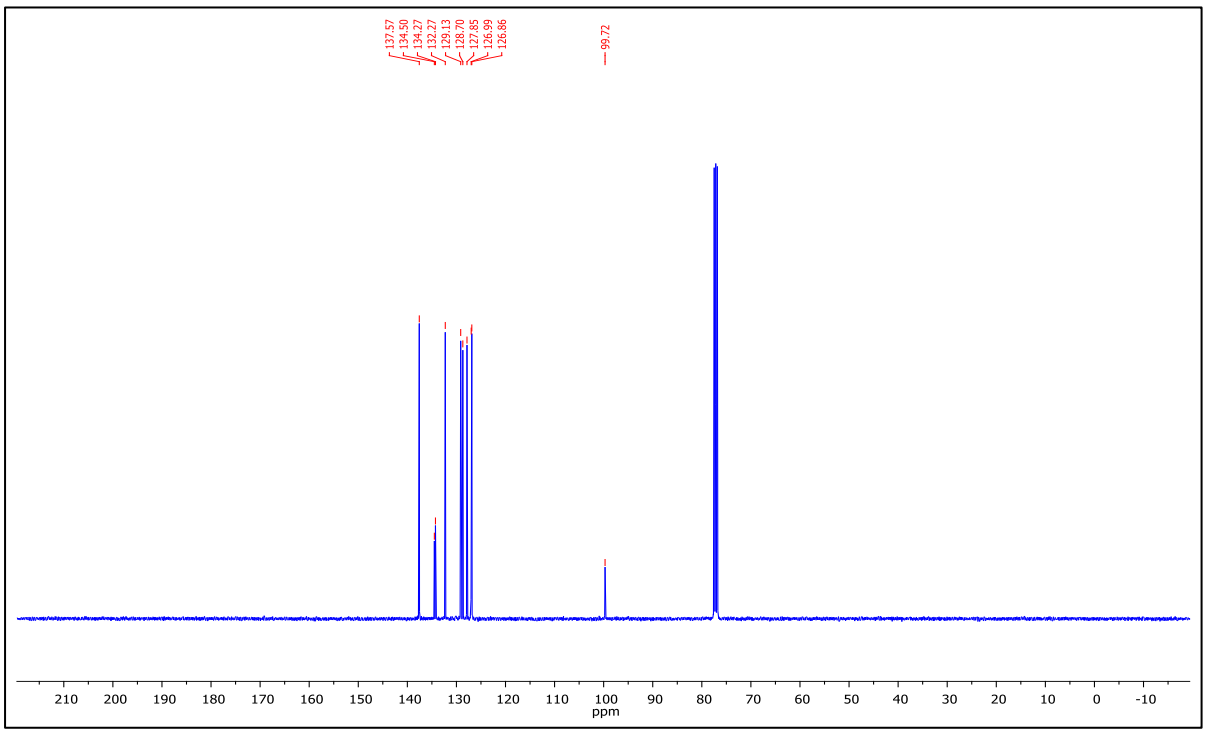


1-iodonaphthalene (2m)

^{1}H NMR ($CDCl_3$)

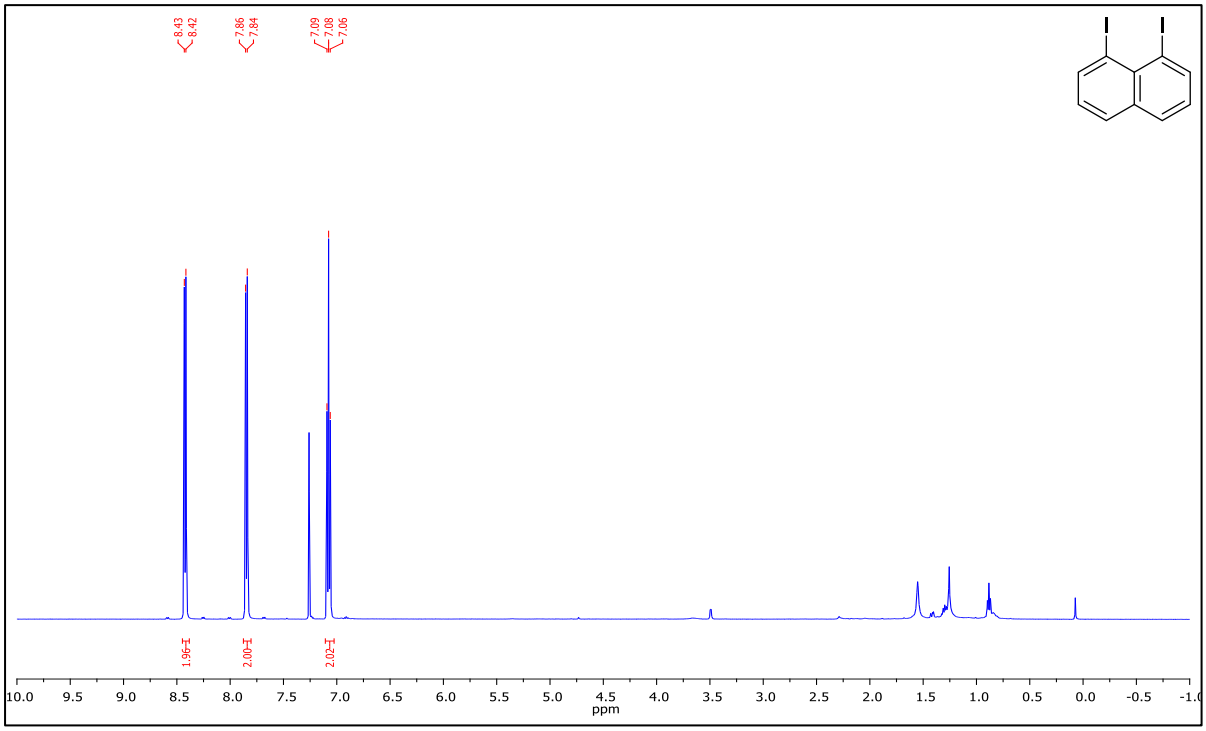


^{13}C NMR ($CDCl_3$)

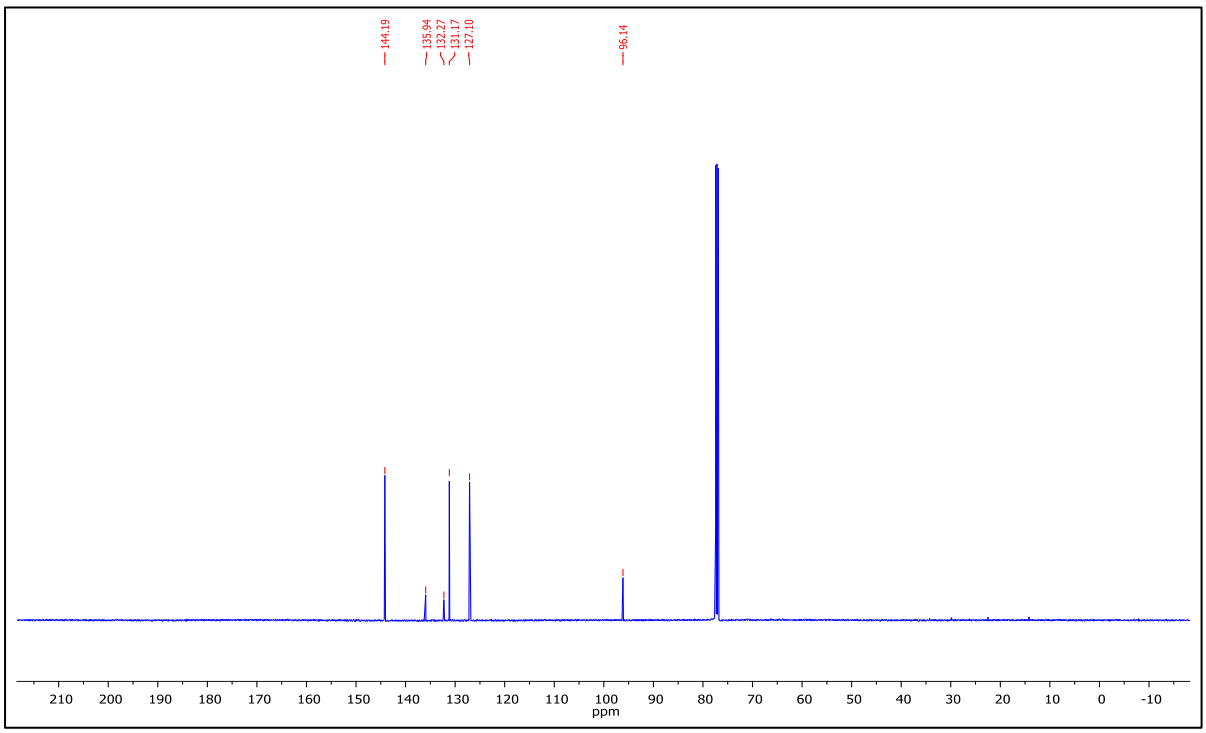


1,4-diiodonaphthalene (2m')

^{1}H NMR ($CDCl_3$)

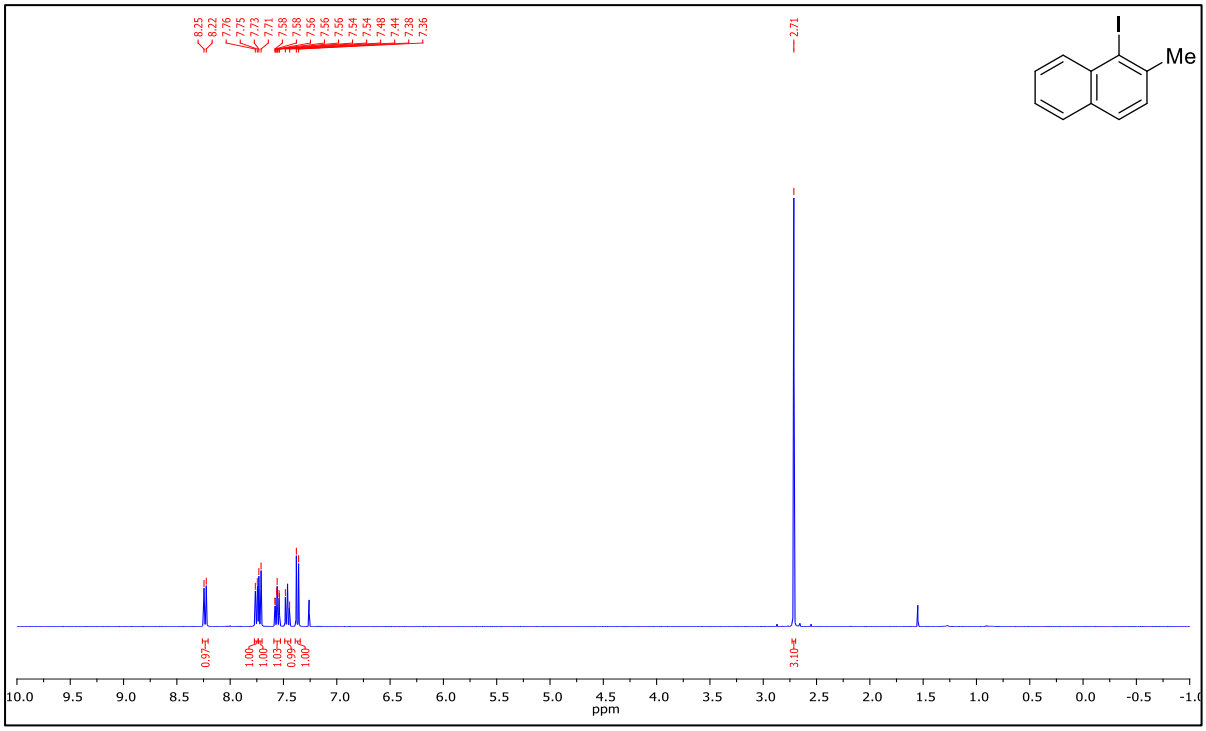


^{13}C NMR ($CDCl_3$)

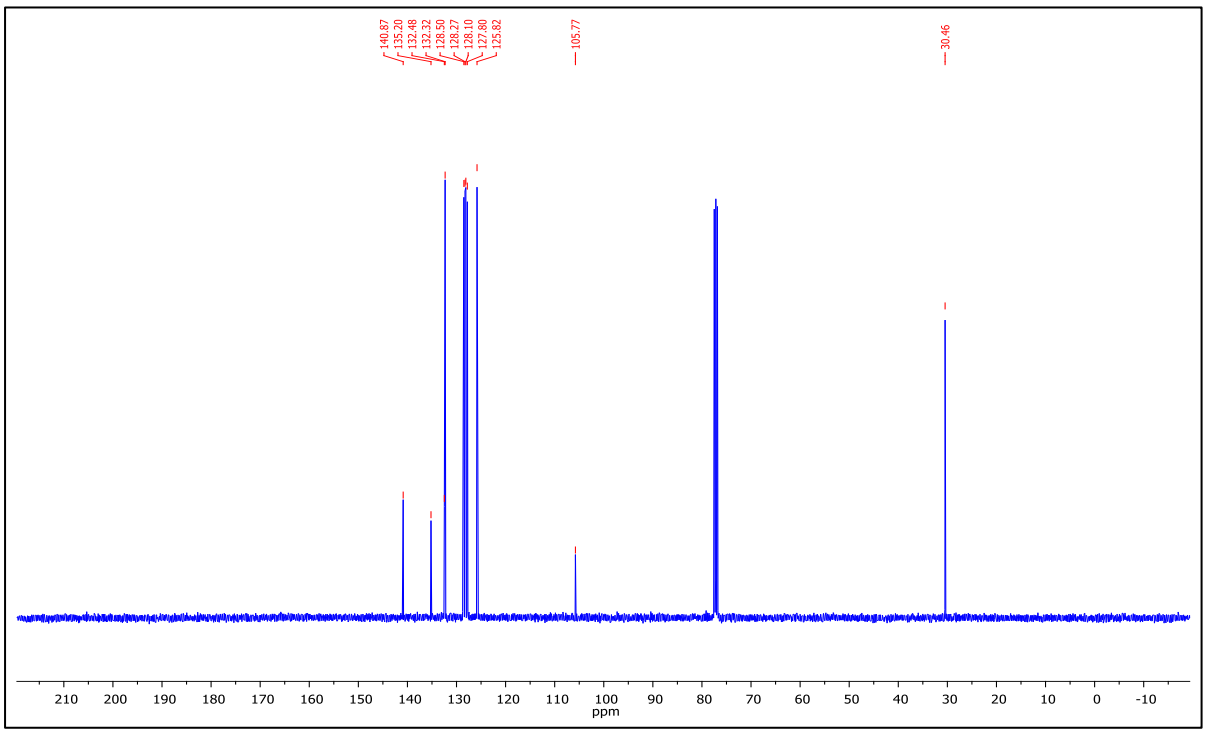


1-iodo-2-methylnaphthalene (2n)

^{1}H NMR ($CDCl_3$)

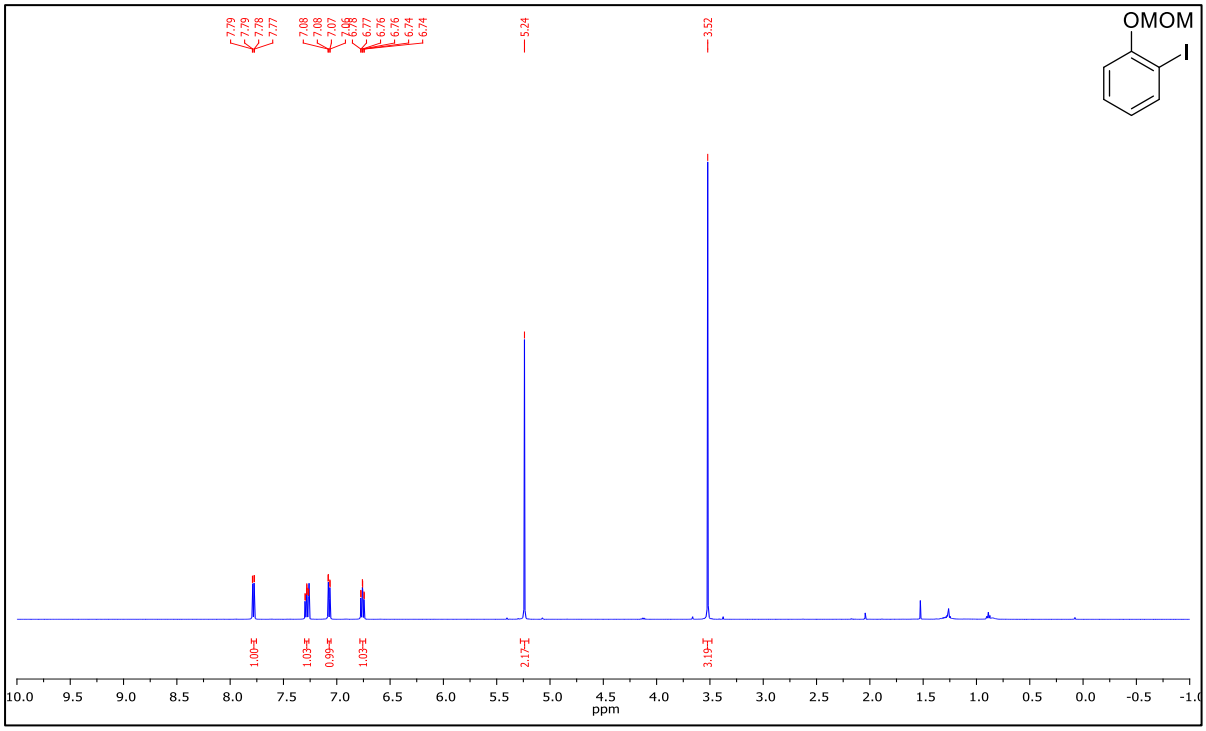


^{13}C NMR ($CDCl_3$)

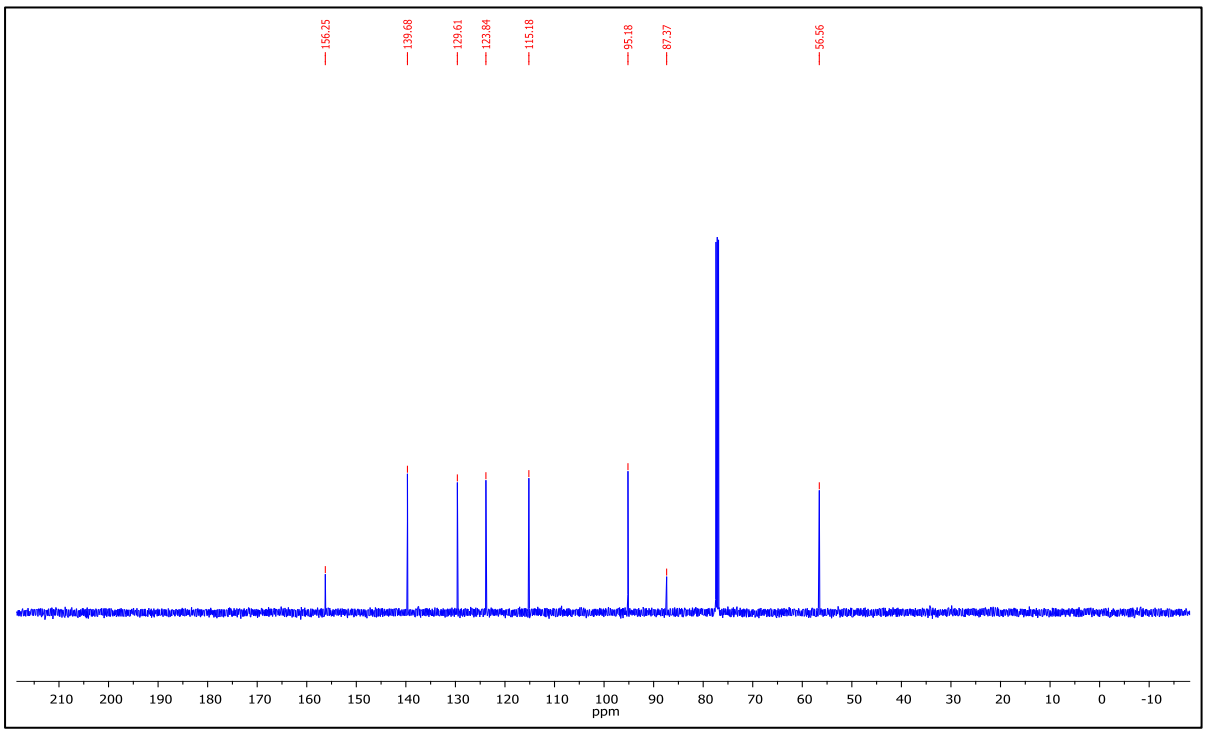


1-iodo-2-(methoxymethoxy)benzene (2o)

^{1}H NMR ($CDCl_3$)

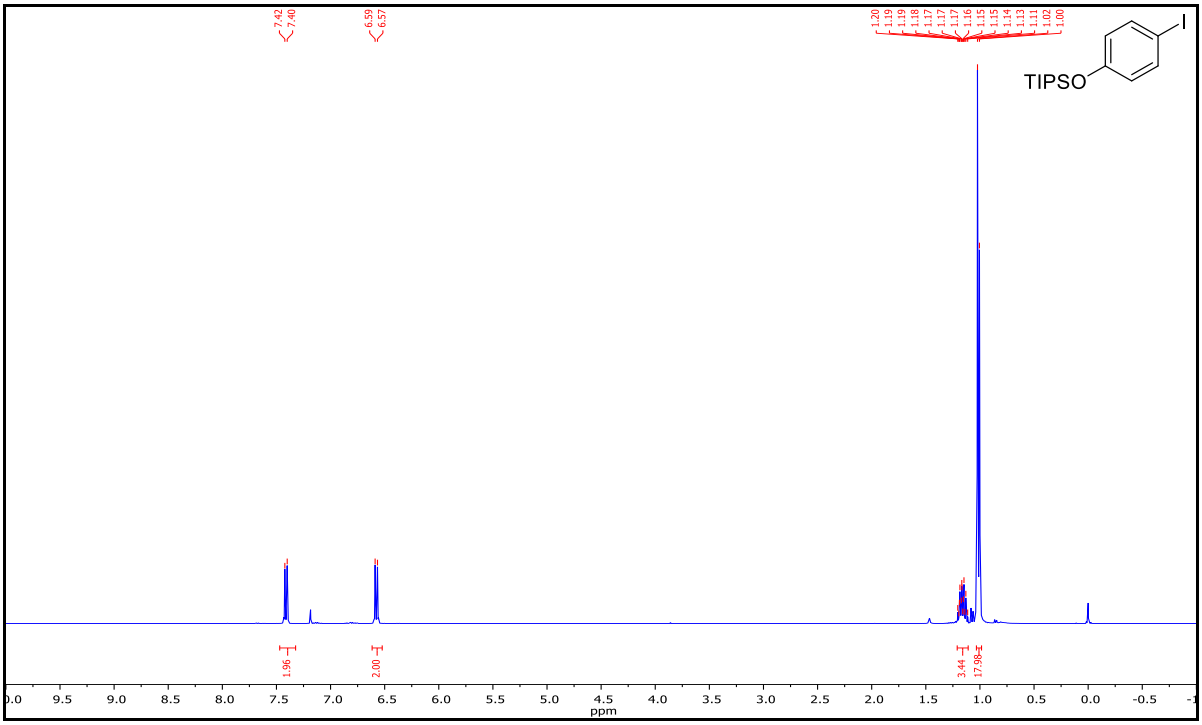


^{13}C NMR ($CDCl_3$)

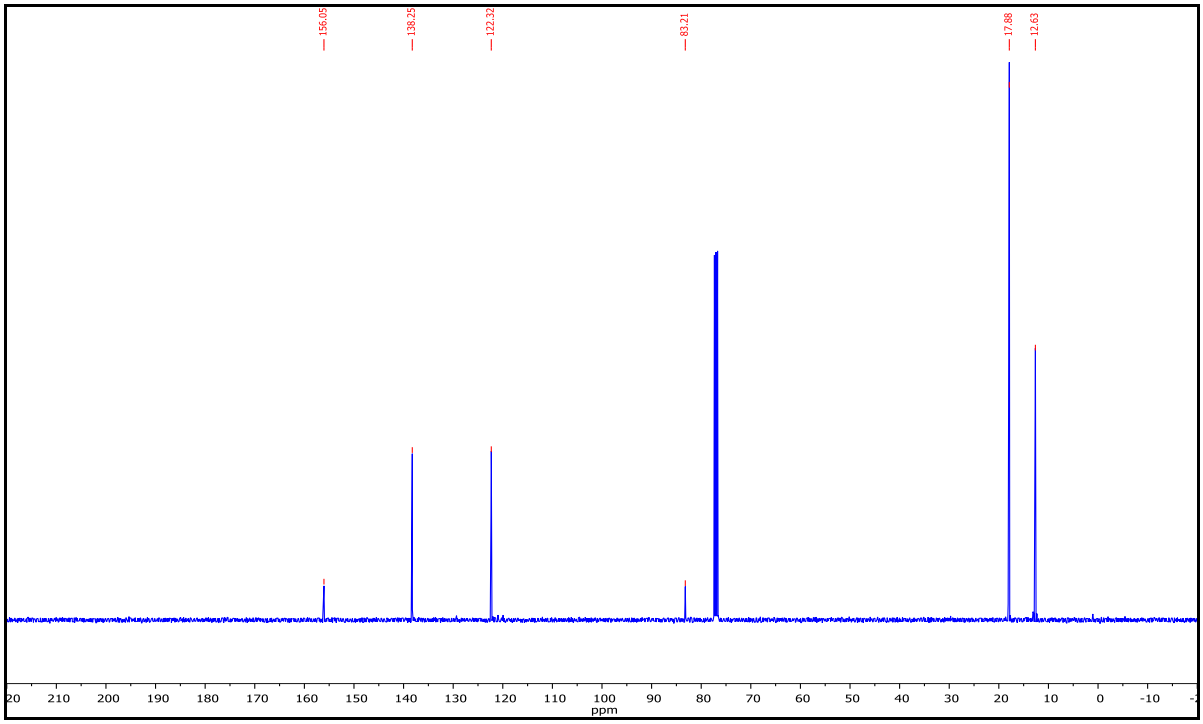


(4-iodophenoxy)triisopropylsilane (2p)

^{1}H NMR ($CDCl_3$)

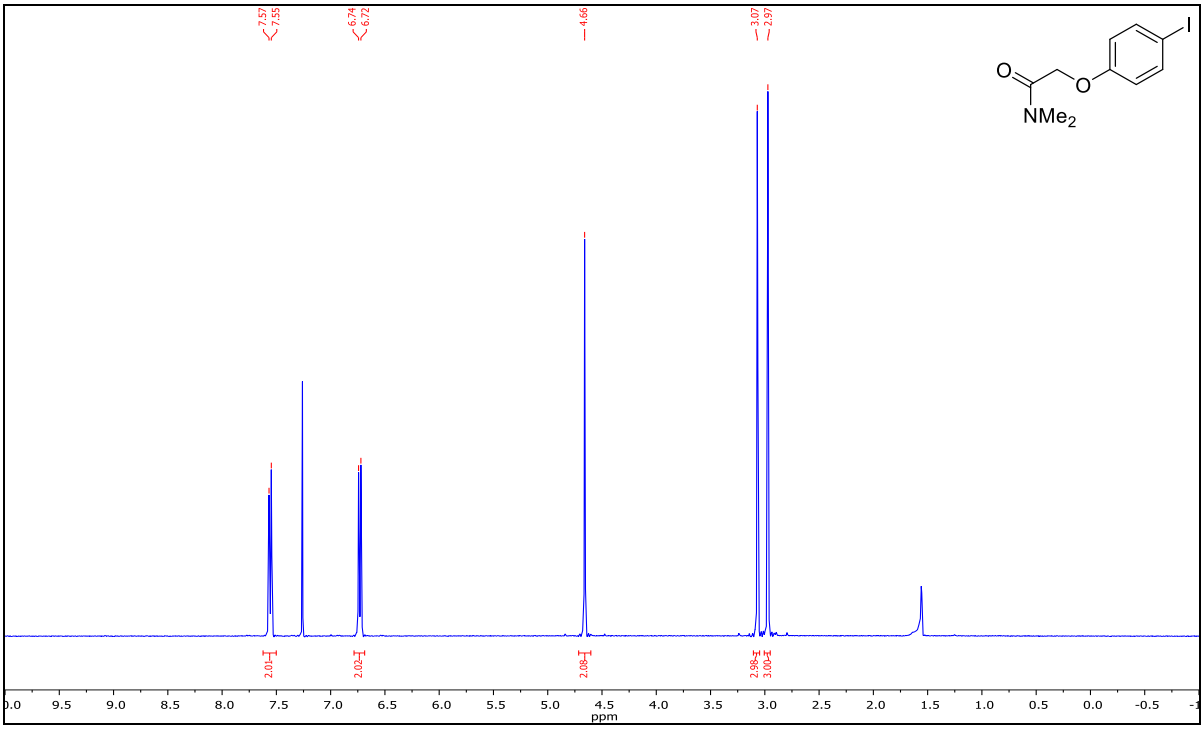


^{13}C NMR ($CDCl_3$)

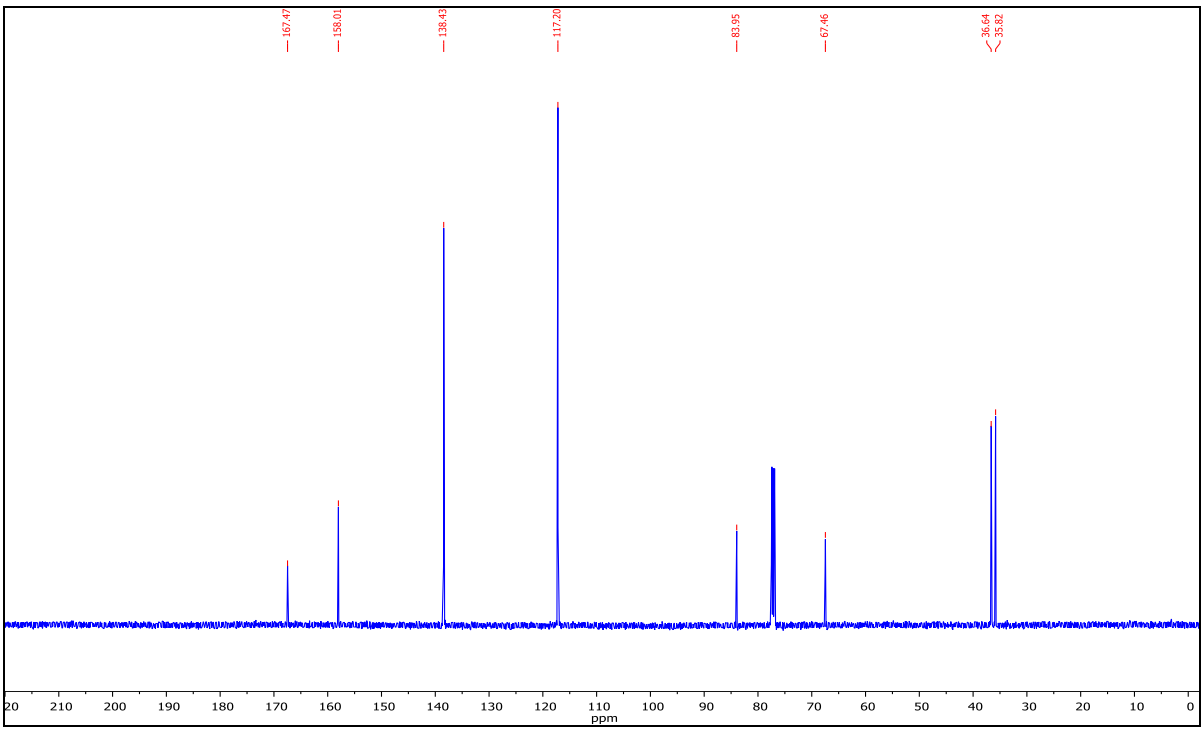


2-(4-iodophenoxy)-*N*,*N*-dimethylacetamide 4-iodophenoxy)triisopropylsilane (2q)

^{1}H NMR ($CDCl_3$)

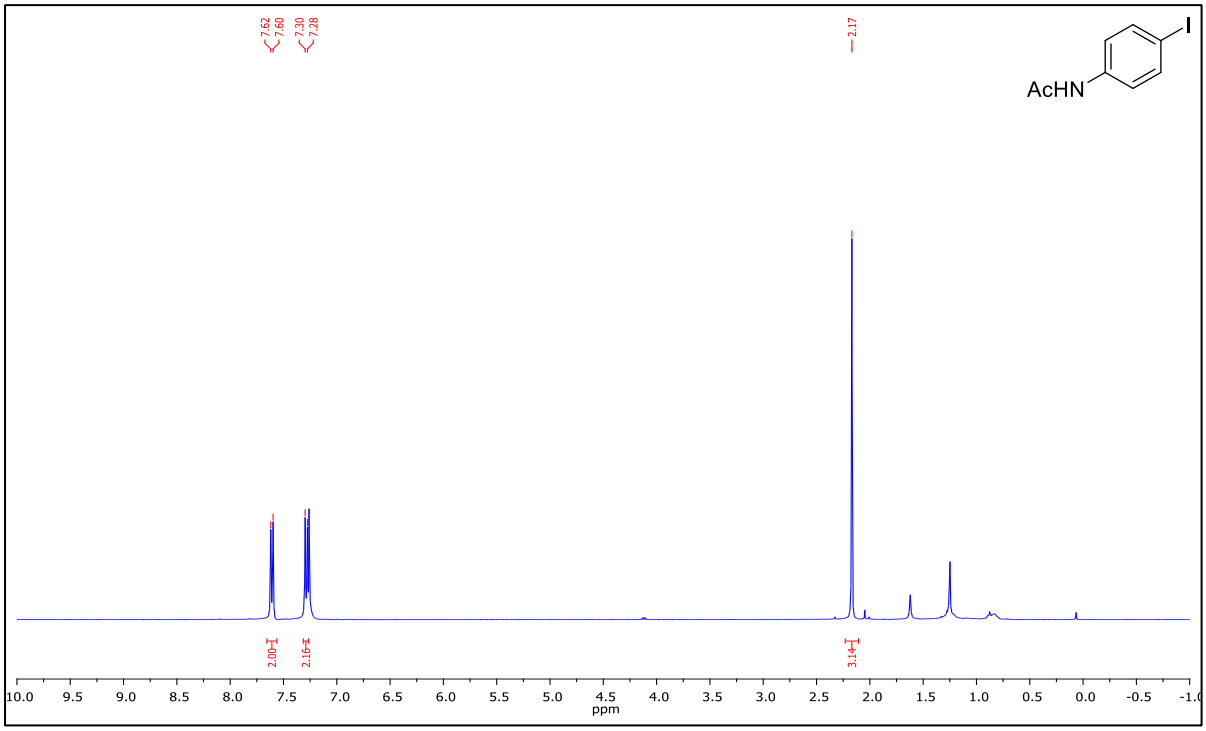


^{13}C NMR ($CDCl_3$)

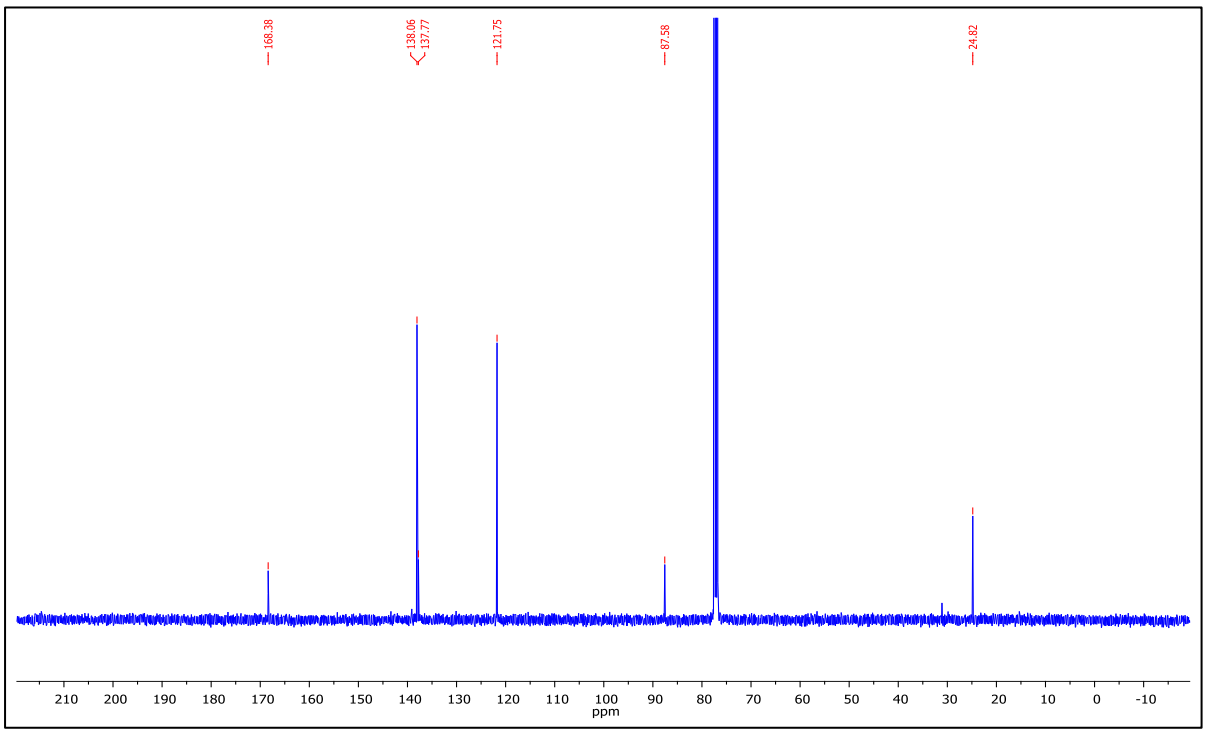


N-(4-iodophenyl)acetamide (2r)

^{1}H NMR ($CDCl_3$)

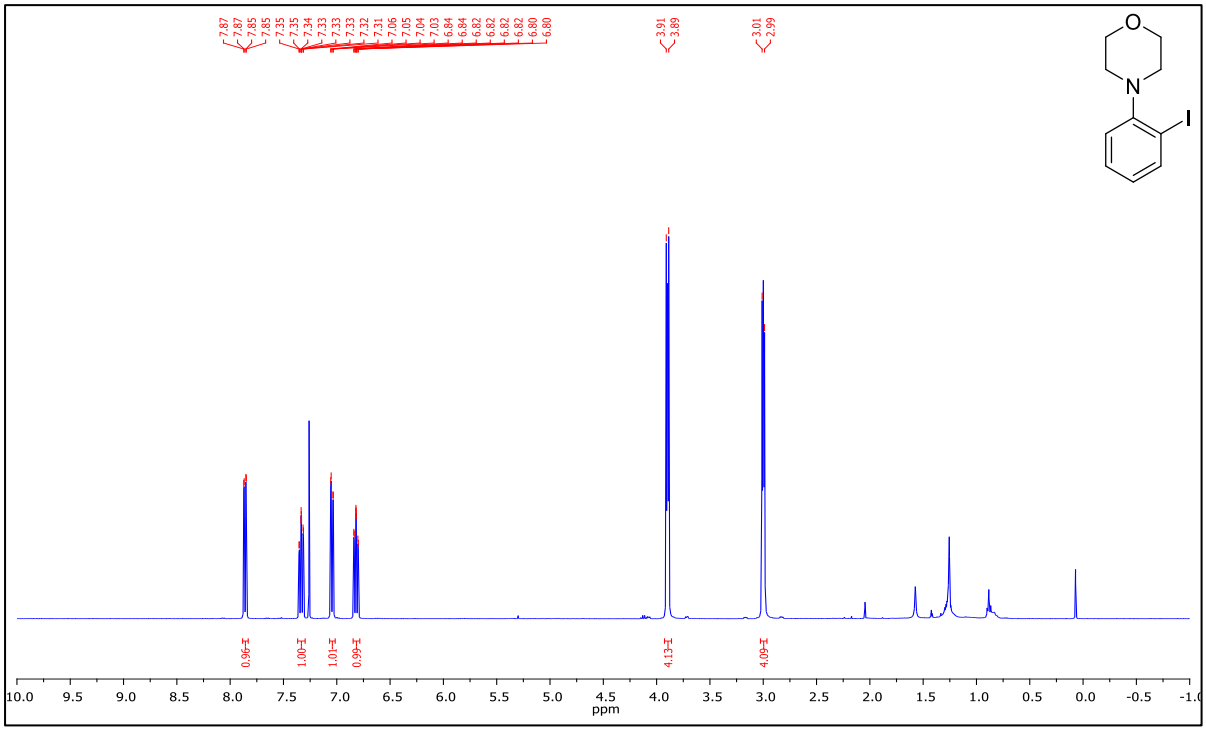


^{13}C NMR ($CDCl_3$)

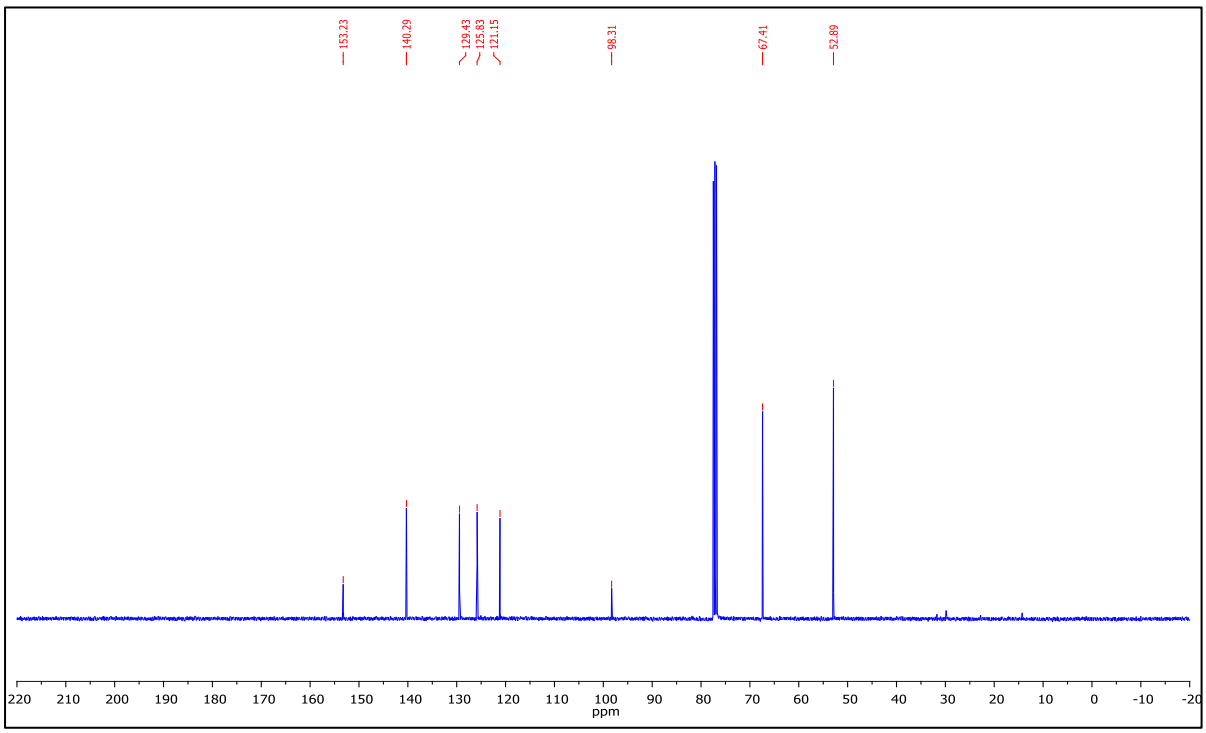


4-(2-iodophenyl)morpholine (2s)

^{1}H NMR ($CDCl_3$)

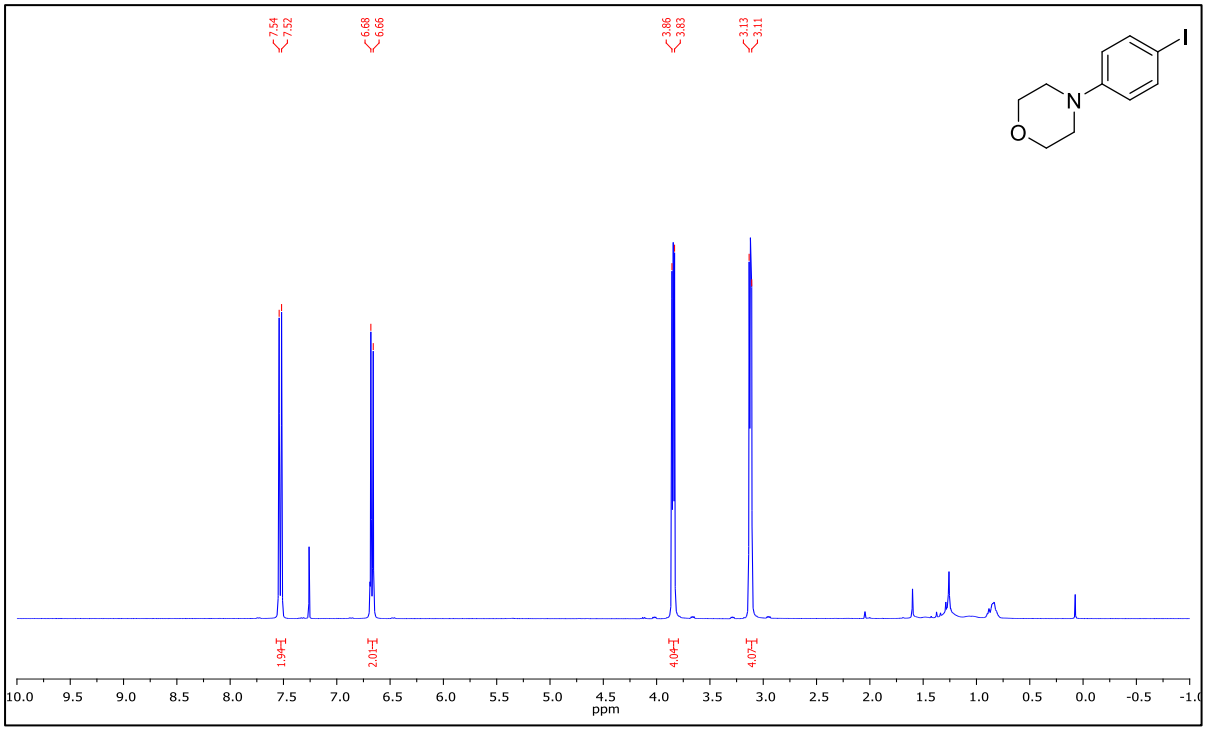


^{13}C NMR ($CDCl_3$)

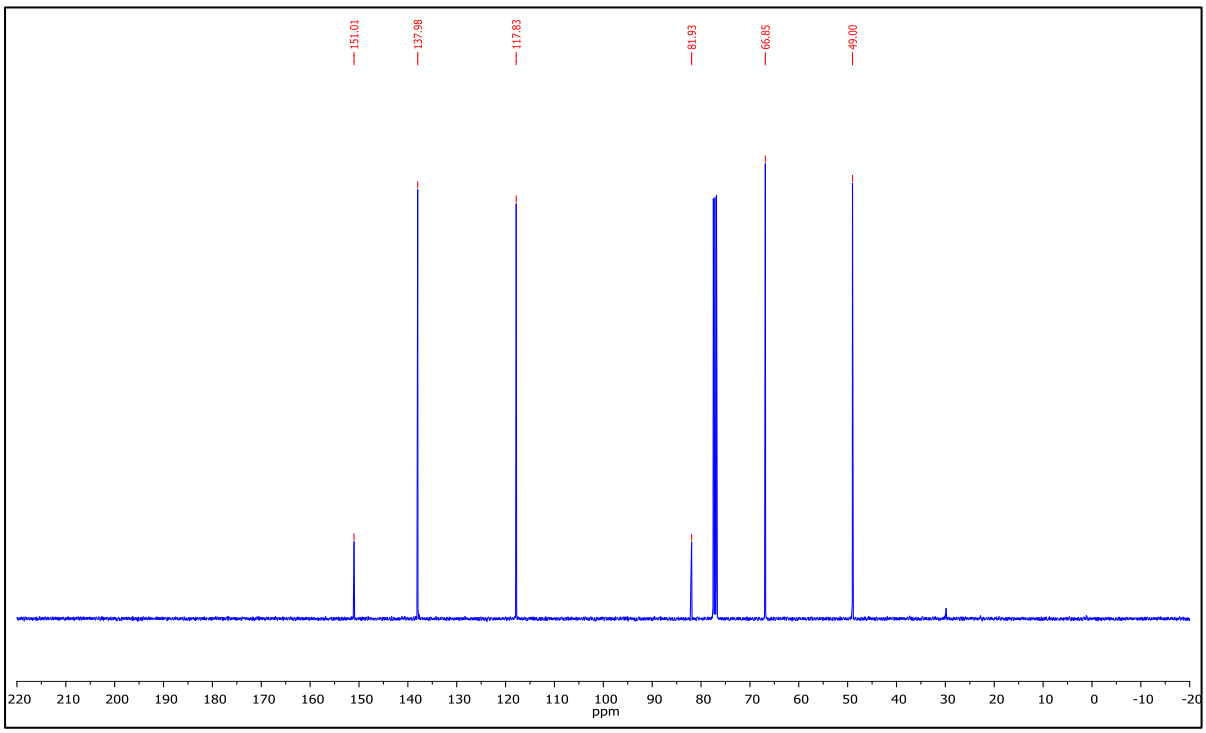


4-(4-iodophenyl)morpholine (2t)

^{1}H NMR ($CDCl_3$)

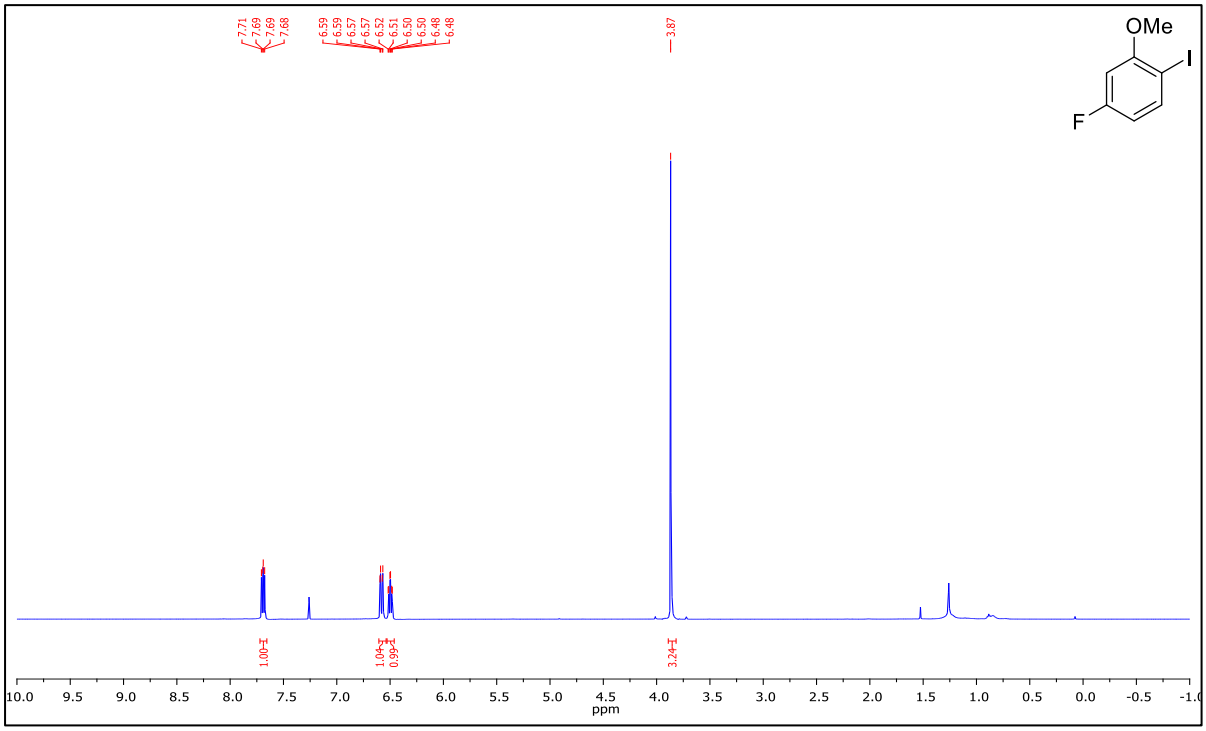


^{13}C NMR ($CDCl_3$)

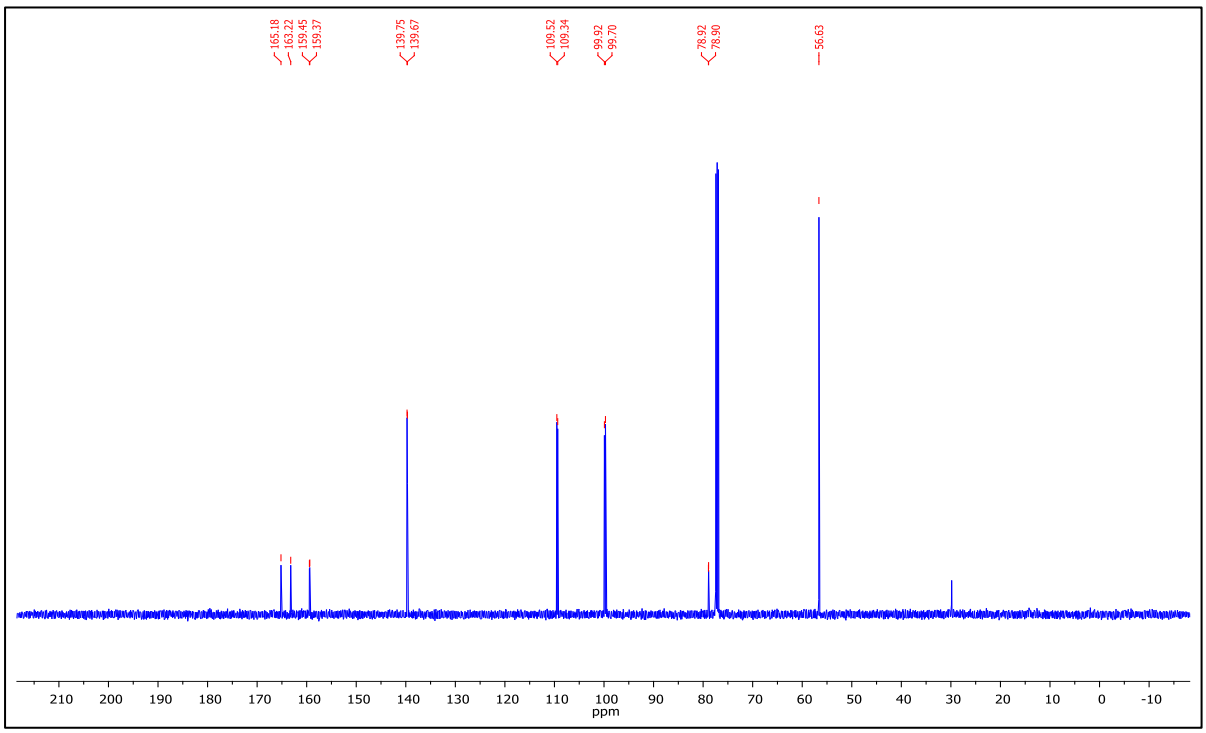


4-fluoro-1-iodo-2-methoxybenzene (2u)

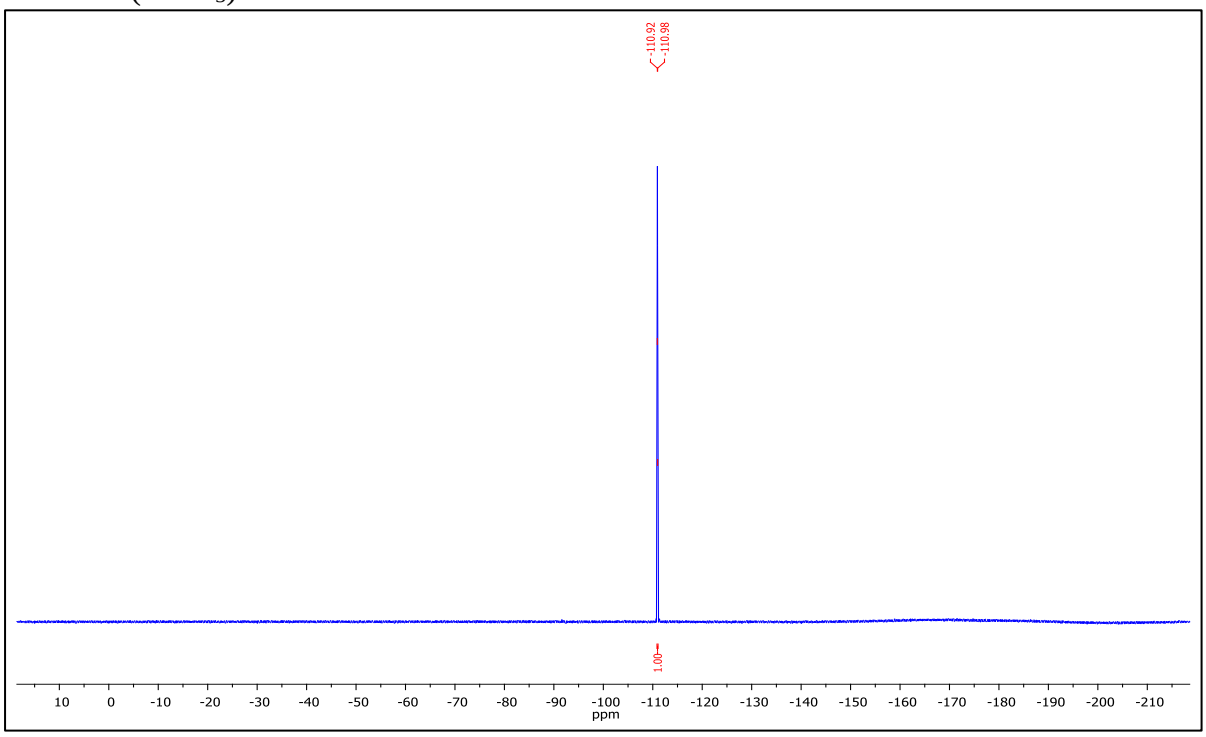
^{1}H NMR ($CDCl_3$)



^{13}C NMR ($CDCl_3$)

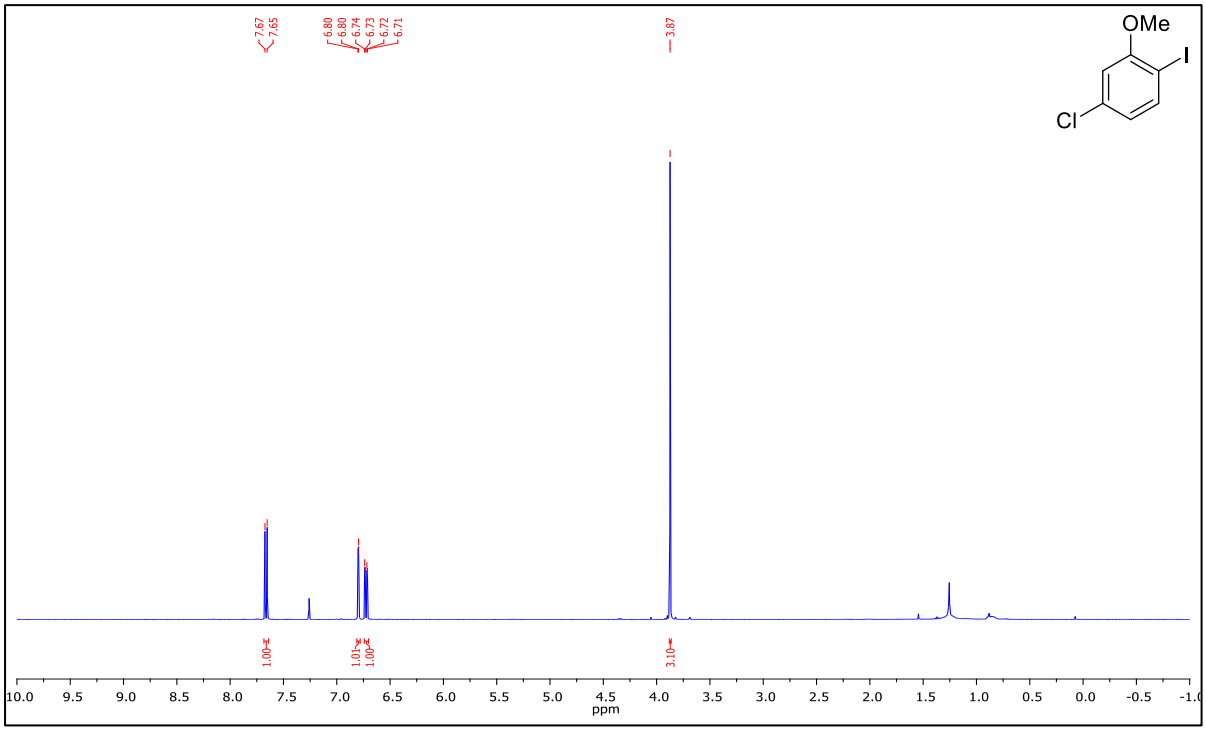


^{19}F NMR ($CDCl_3$)

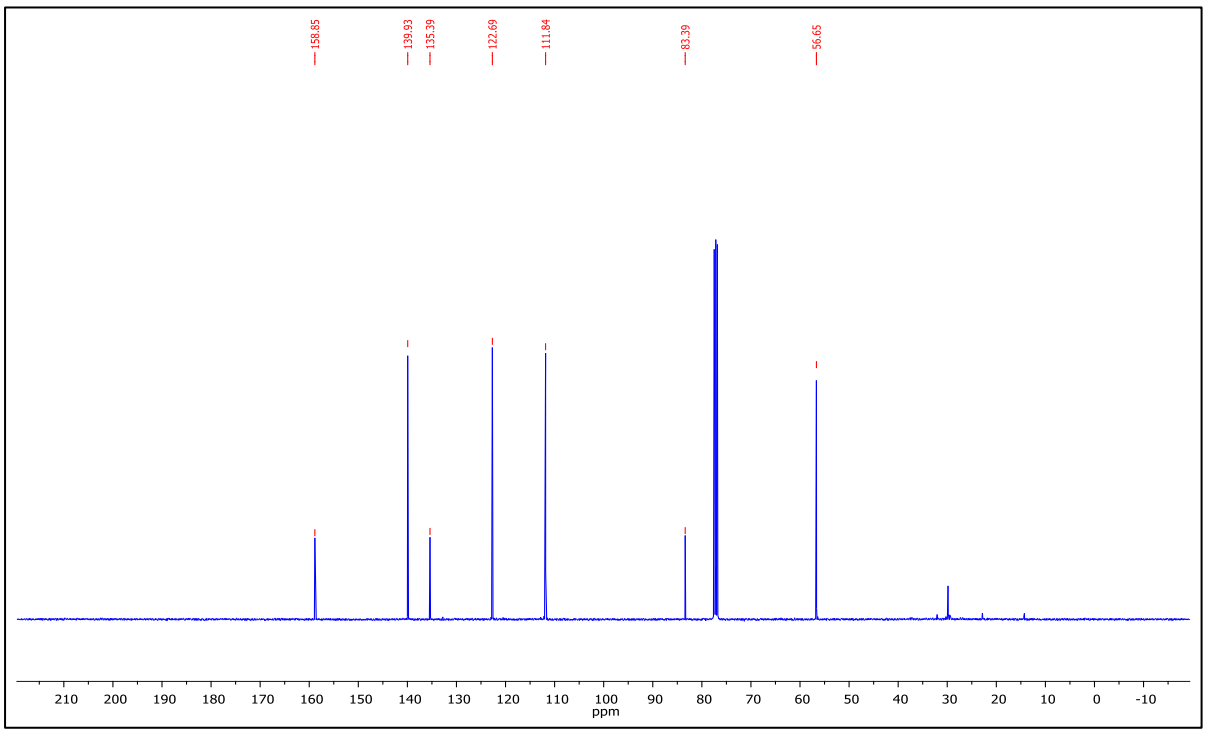


4-chloro-1-iodo-2-methoxybenzene (2v)

^{1}H NMR ($CDCl_3$)

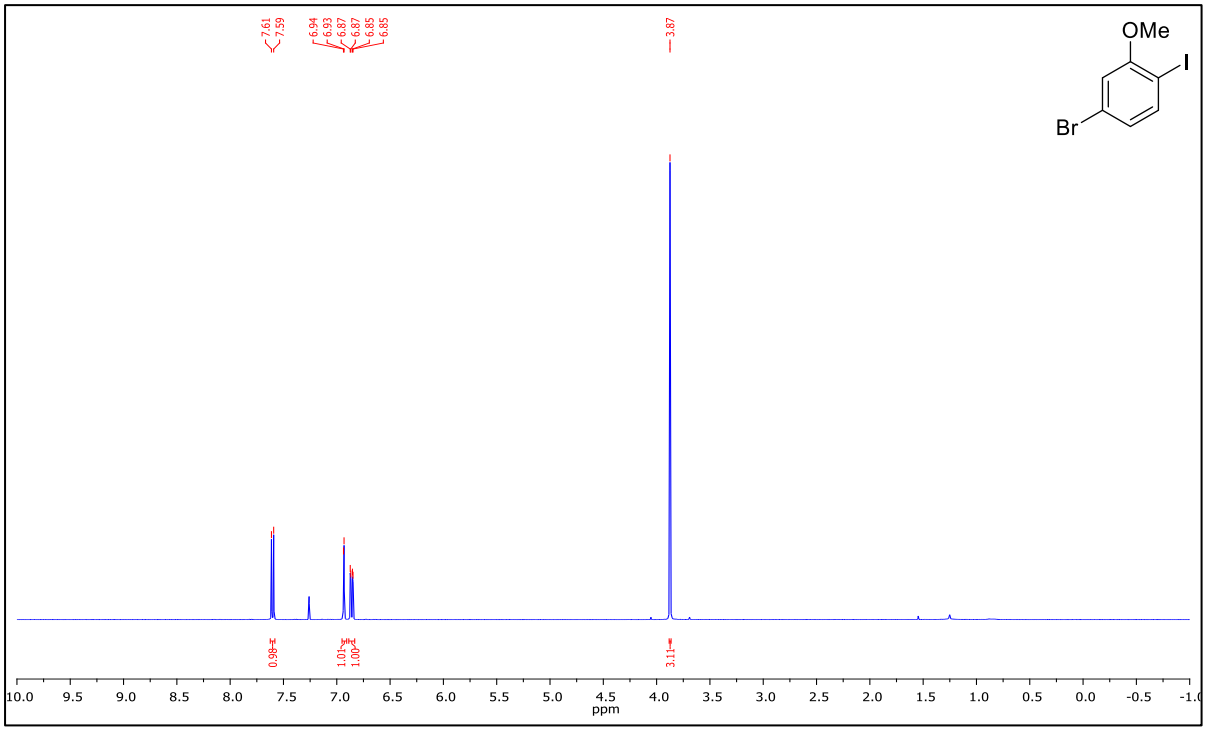


^{13}C NMR ($CDCl_3$)

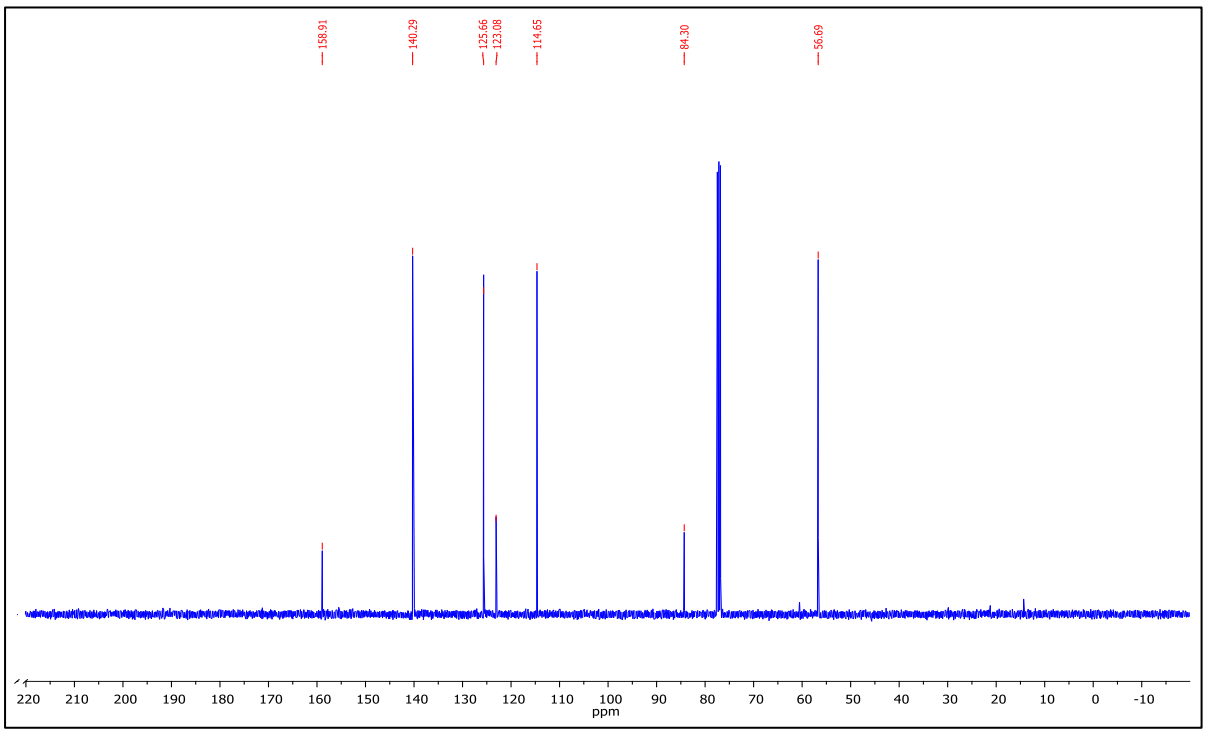


4-bromo-1-iodo-2-methoxybenzene (2w)

^{1}H NMR ($CDCl_3$)

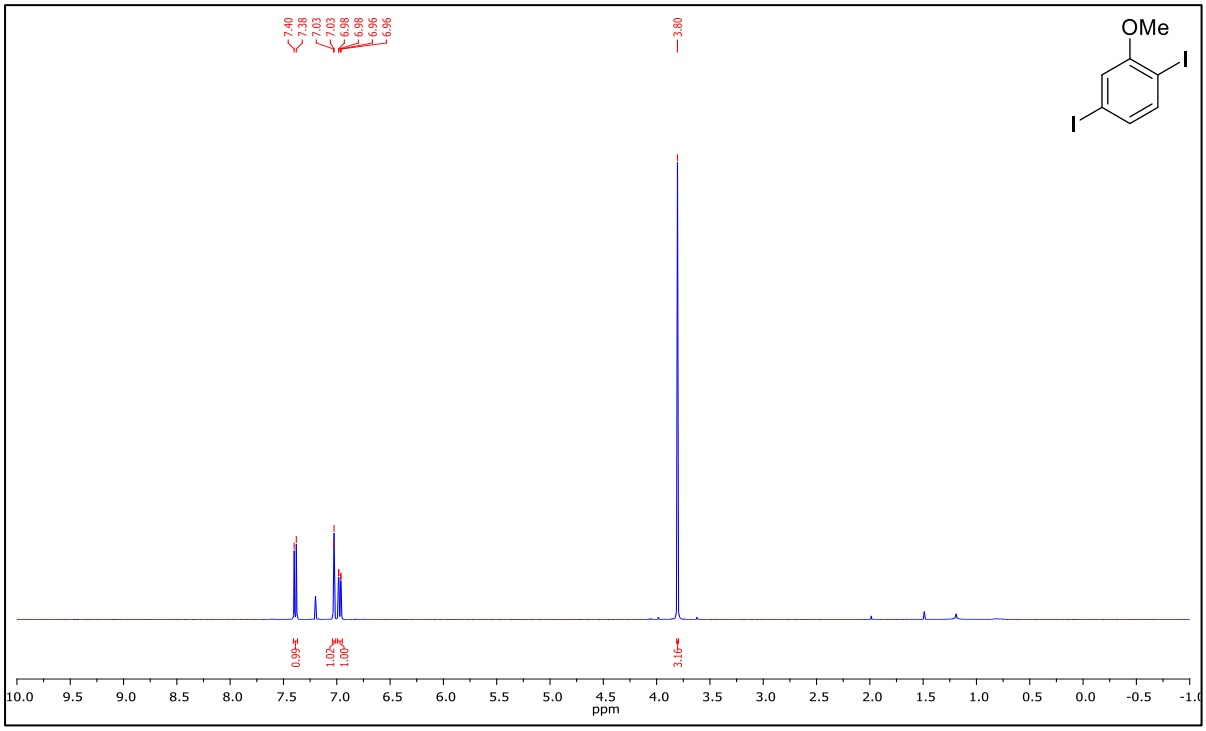


^{13}C NMR ($CDCl_3$)

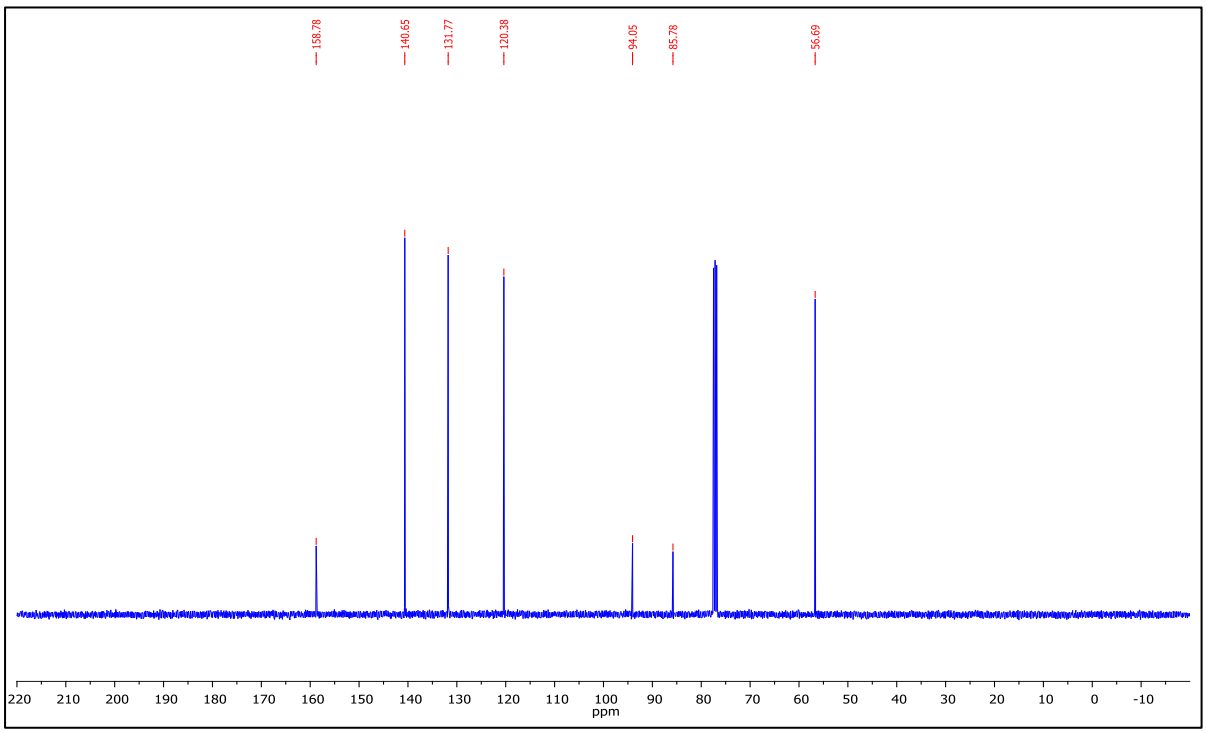


1,4-diiodo-2-methoxybenzene (2x)

^{1}H NMR ($CDCl_3$)

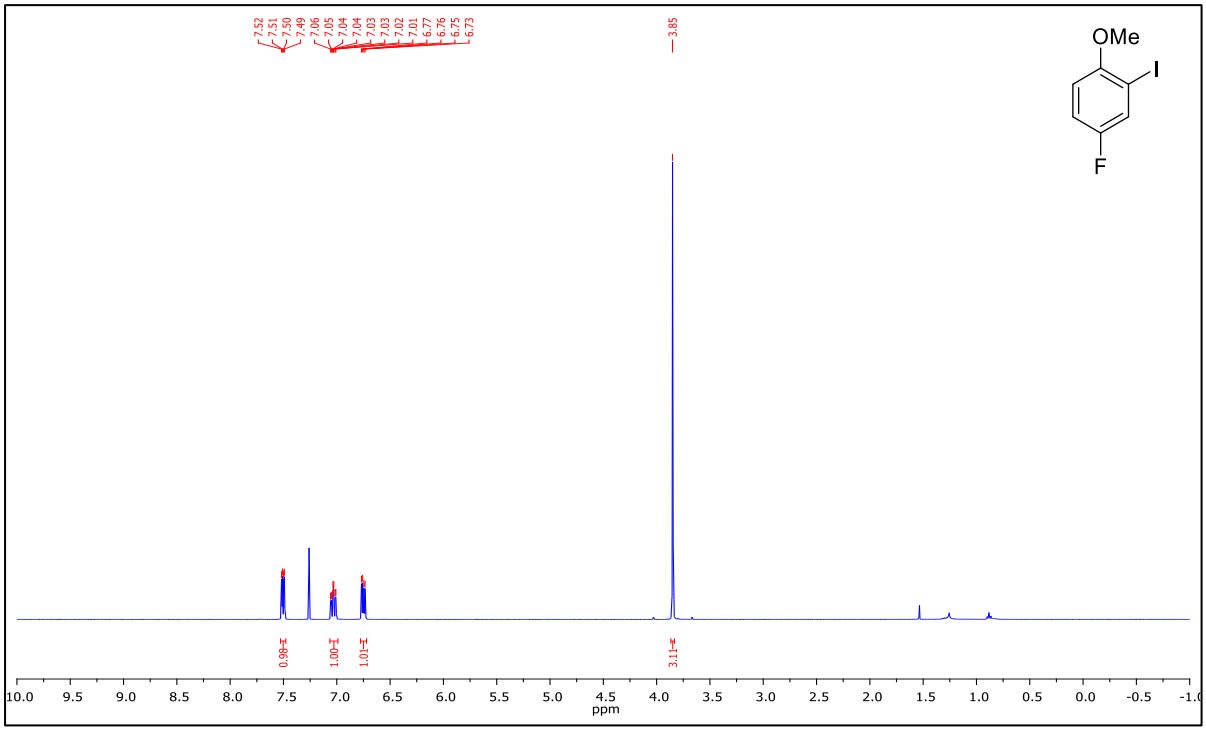


^{13}C NMR ($CDCl_3$)

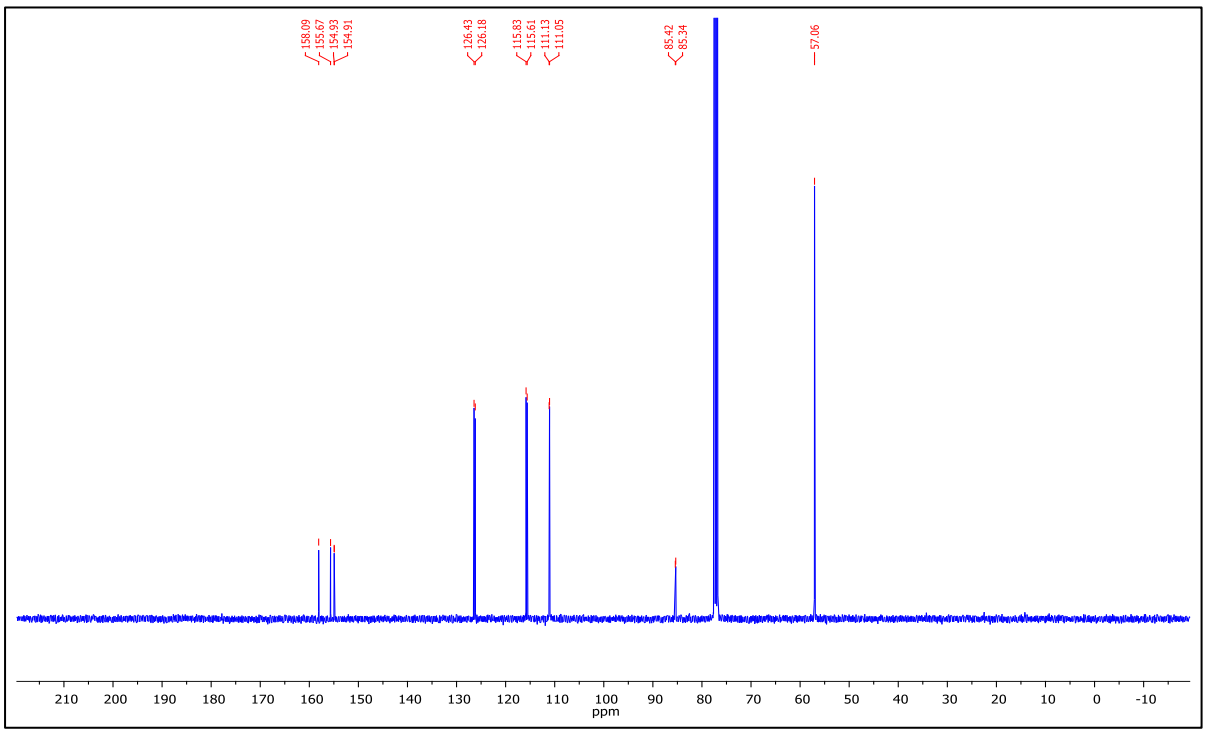


4-fluoro-2-iodo-1-methoxybenzene (2y)

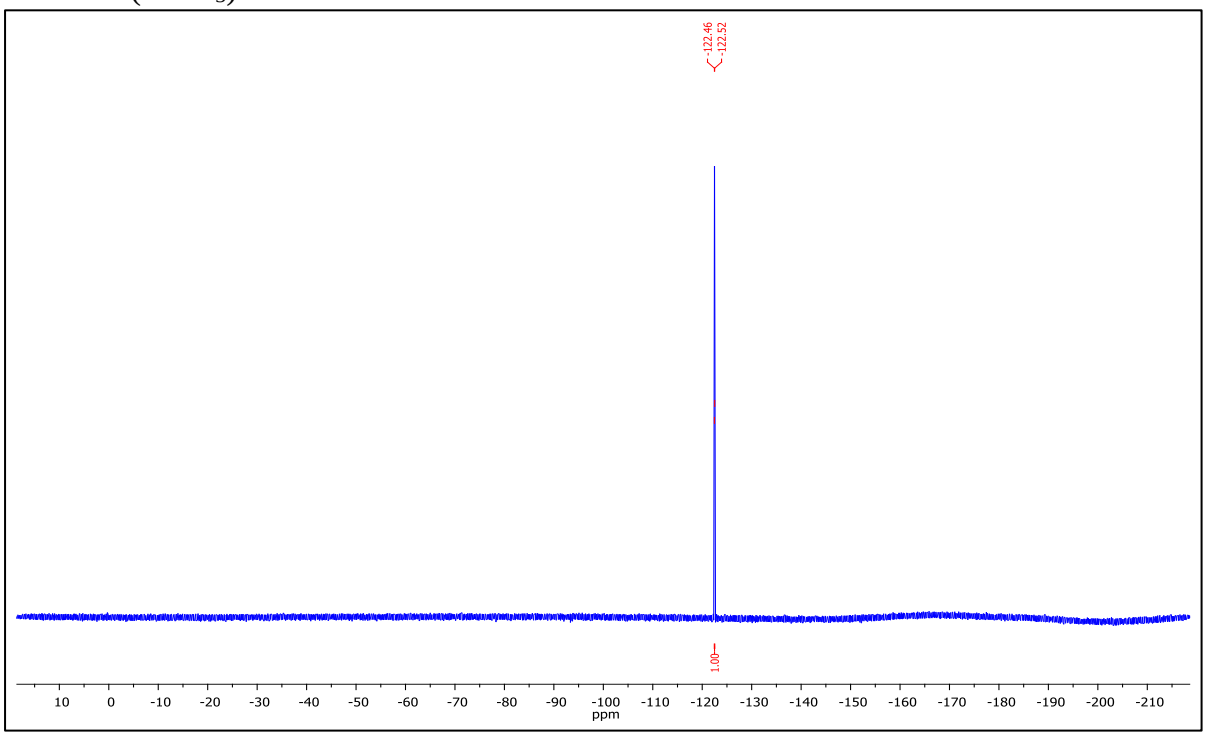
^{1}H NMR ($CDCl_3$)



^{13}C NMR ($CDCl_3$)

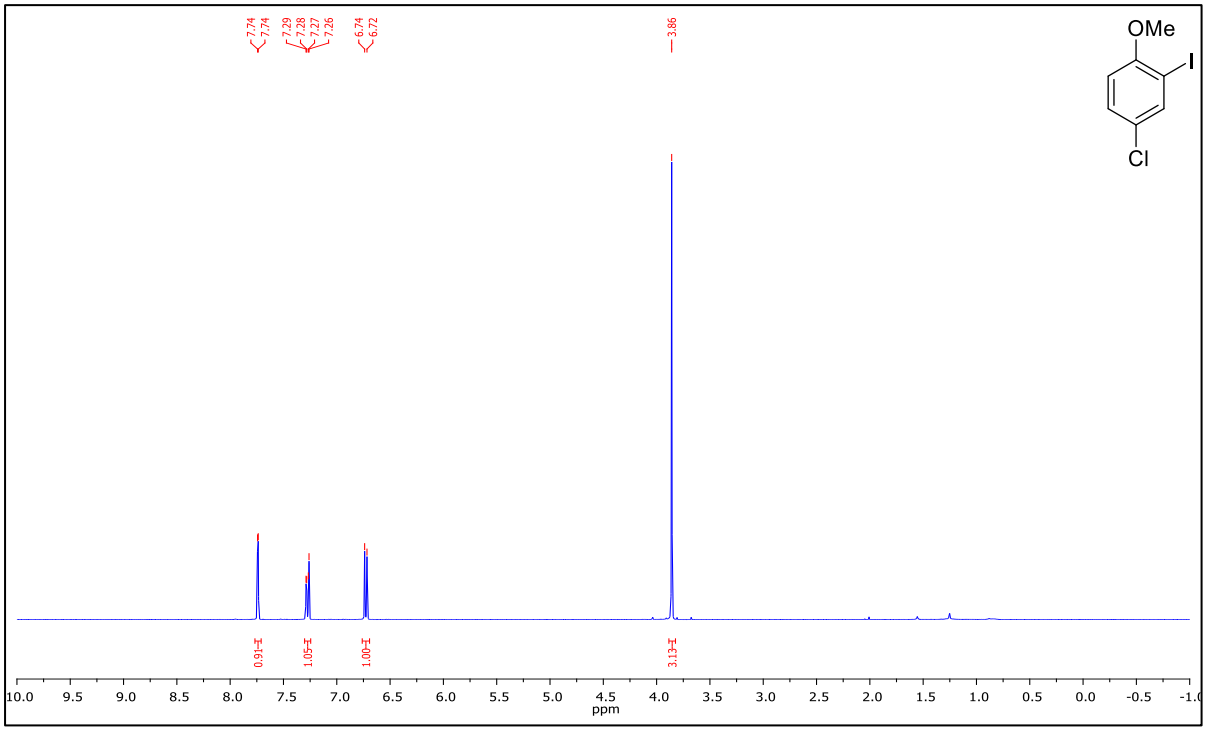


^{19}F NMR ($CDCl_3$)

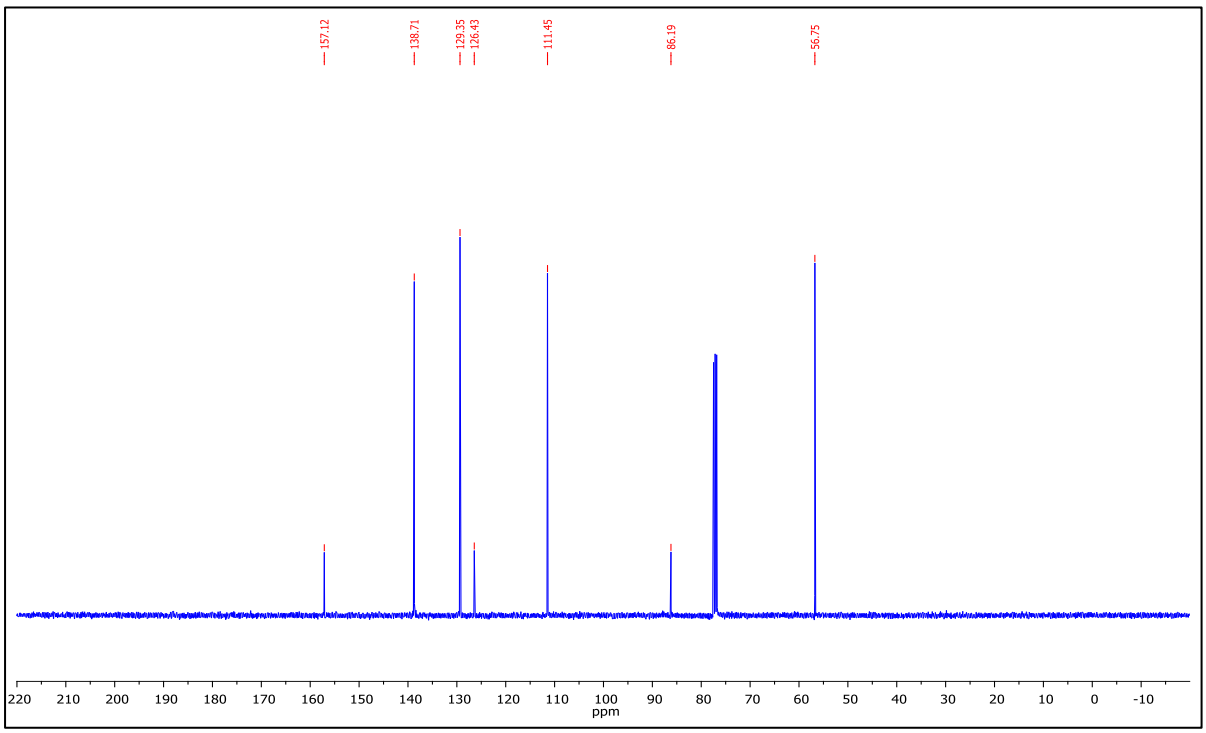


4-chloro-2-iodo-1-methoxybenzene (2z)

^{1}H NMR ($CDCl_3$)

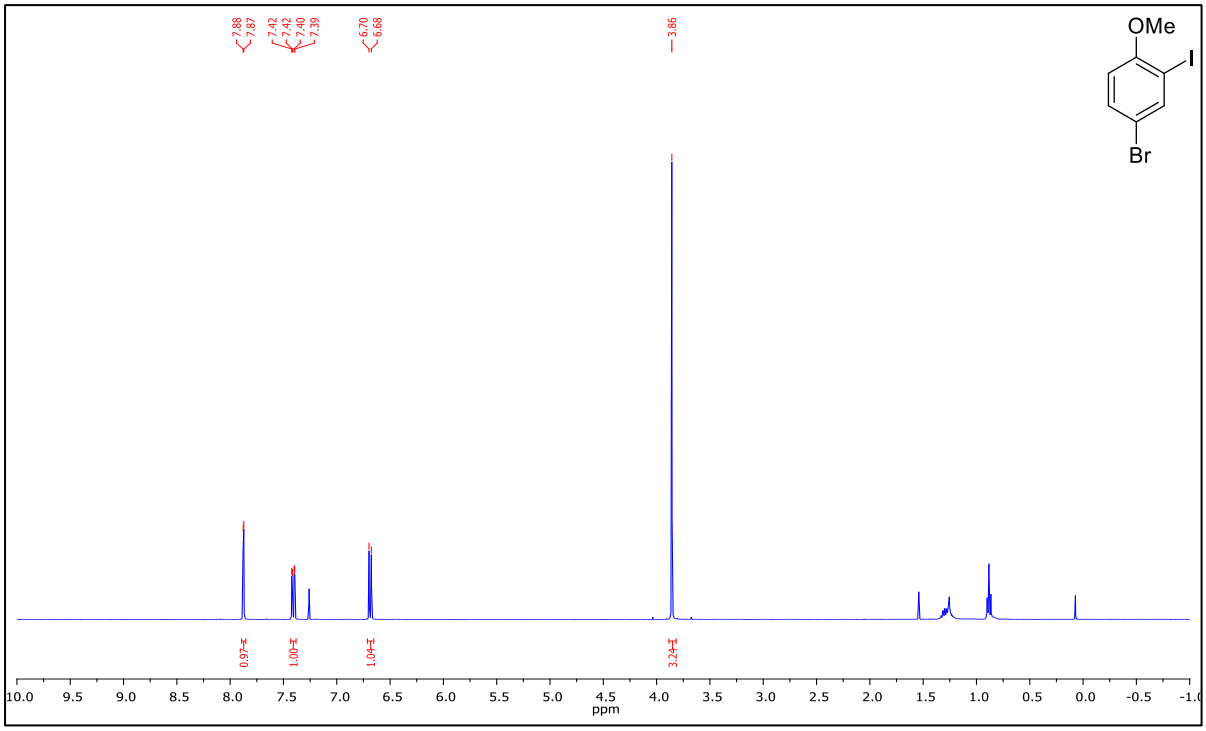


^{13}C NMR ($CDCl_3$)

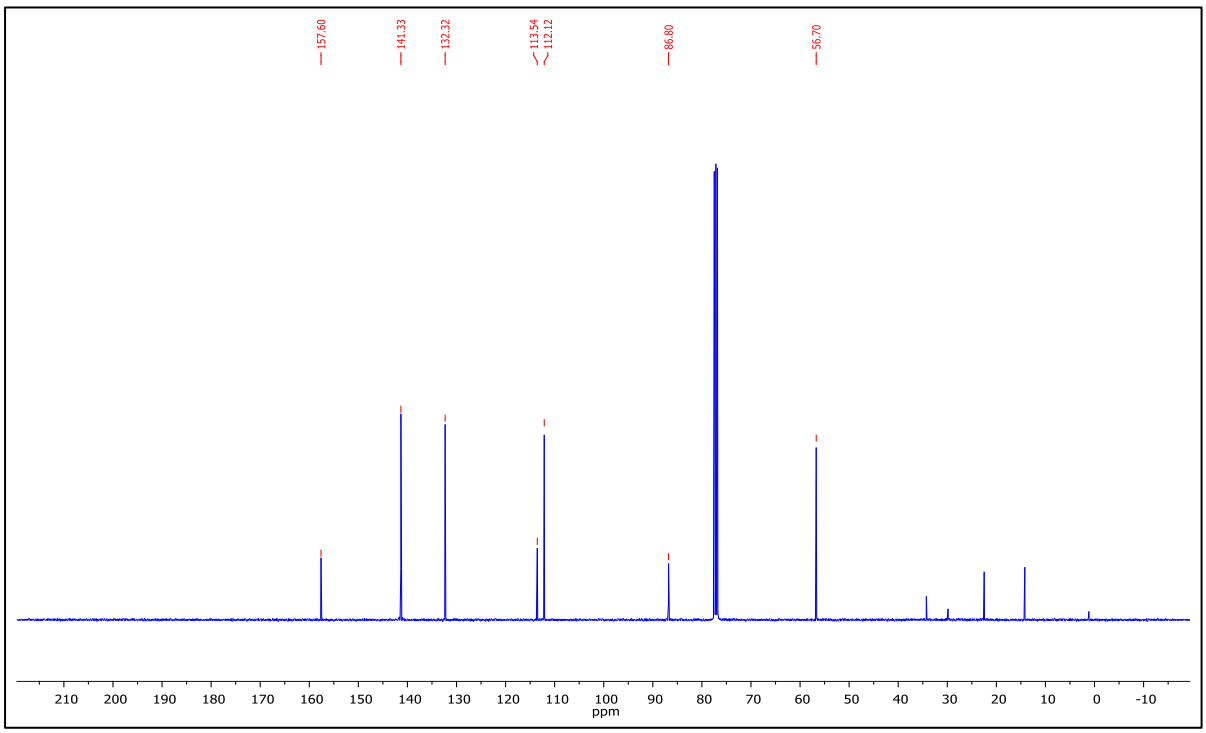


4-bromo-2-iodo-1-methoxybenzene (2aa)

^{1}H NMR ($CDCl_3$)

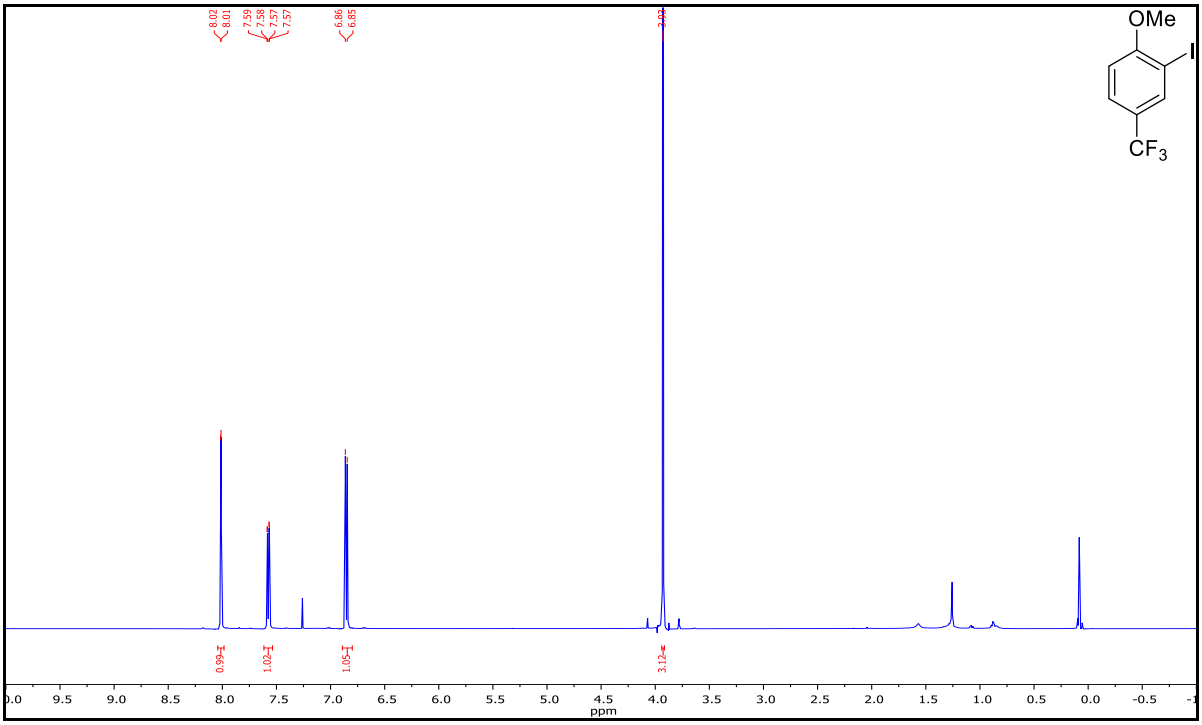


^{13}C NMR ($CDCl_3$)

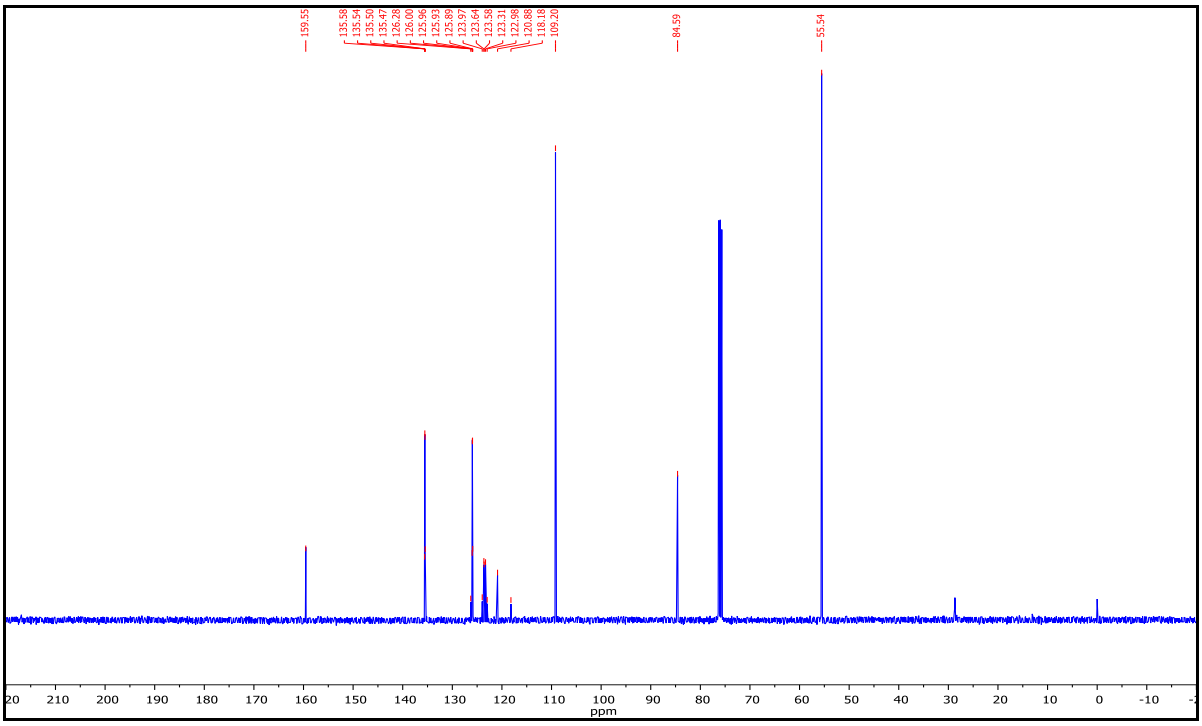


2-iodo-1-methoxy-4-(trifluoromethyl)benzene (2ab)

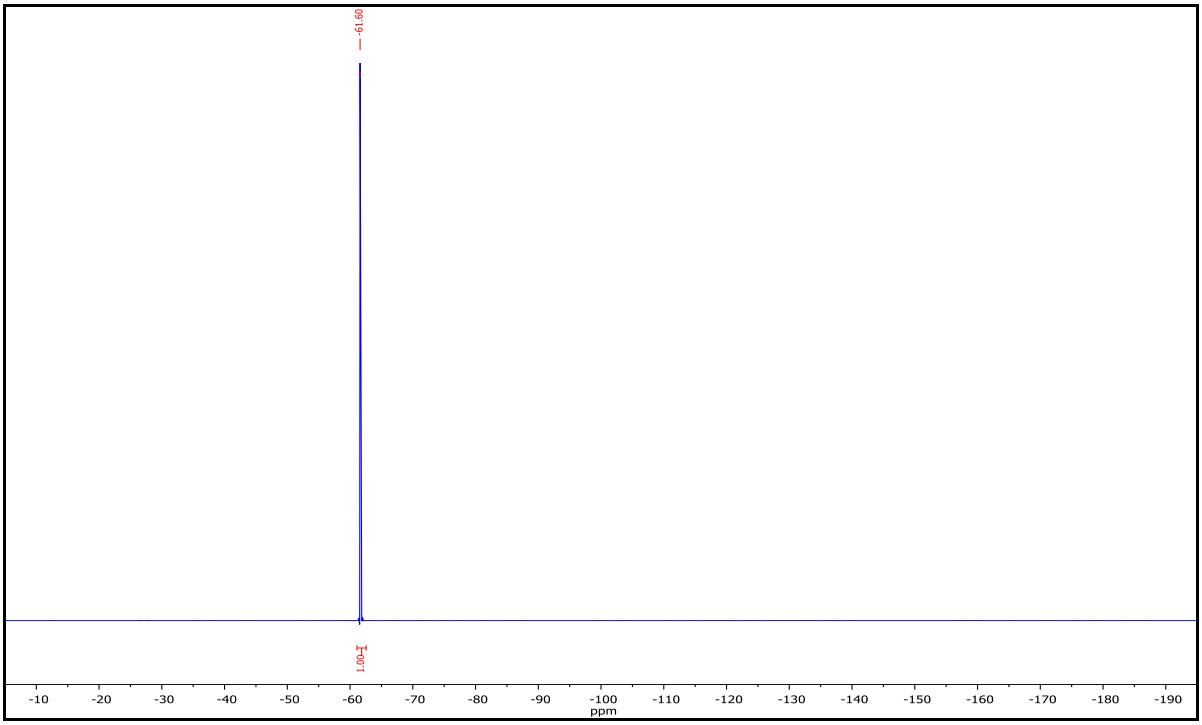
^{1}H NMR ($CDCl_3$)



^{13}C NMR ($CDCl_3$)

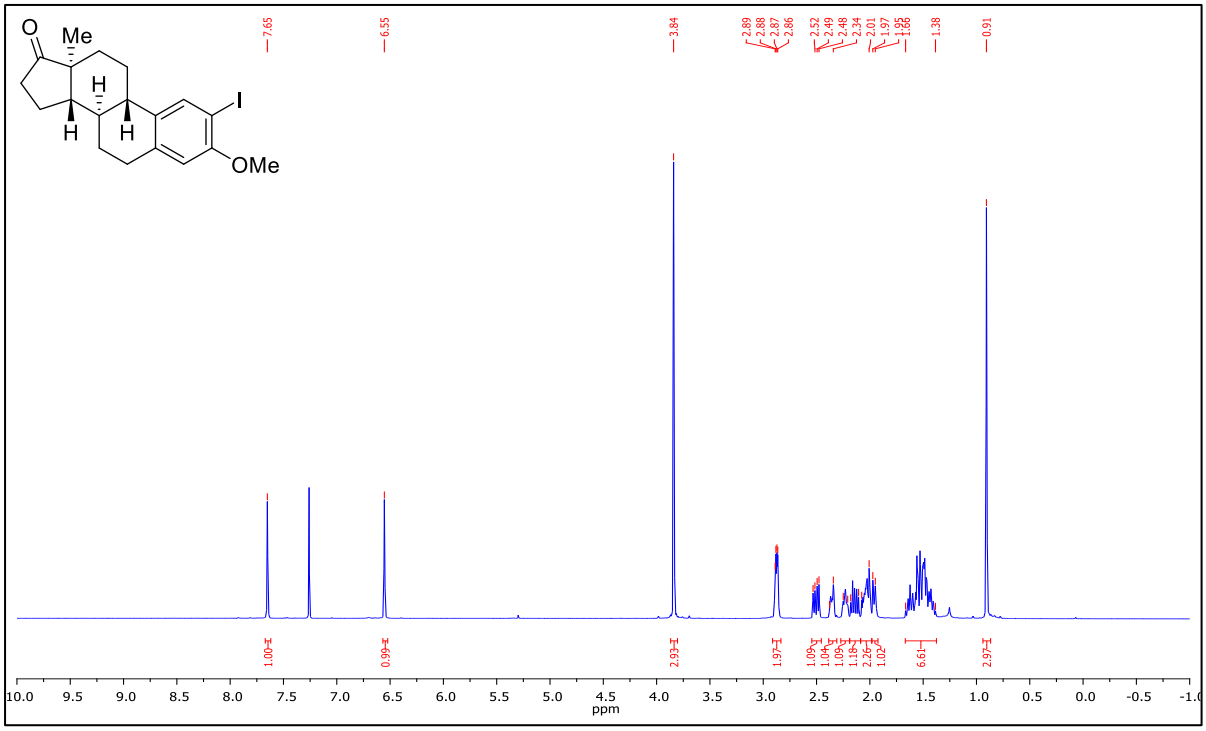


^{19}F NMR ($CDCl_3$)

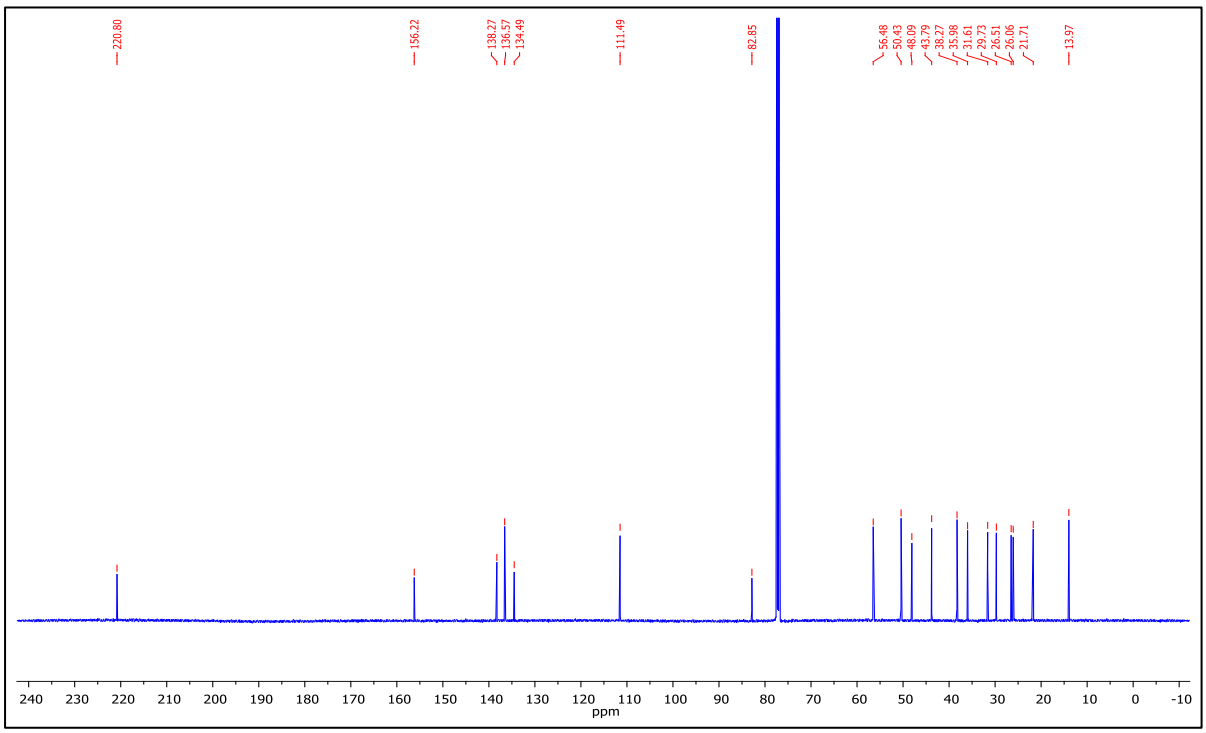


(8R,9S,13S,14S)-2-iodo-3-methoxy-13-methyl-6,7,8,9,11,12,13,14,15,16-decahydro-17H-cyclopenta[a]phenanthren-17-one (2-iodomethylestrone, 2af)

^{1}H NMR ($CDCl_3$)

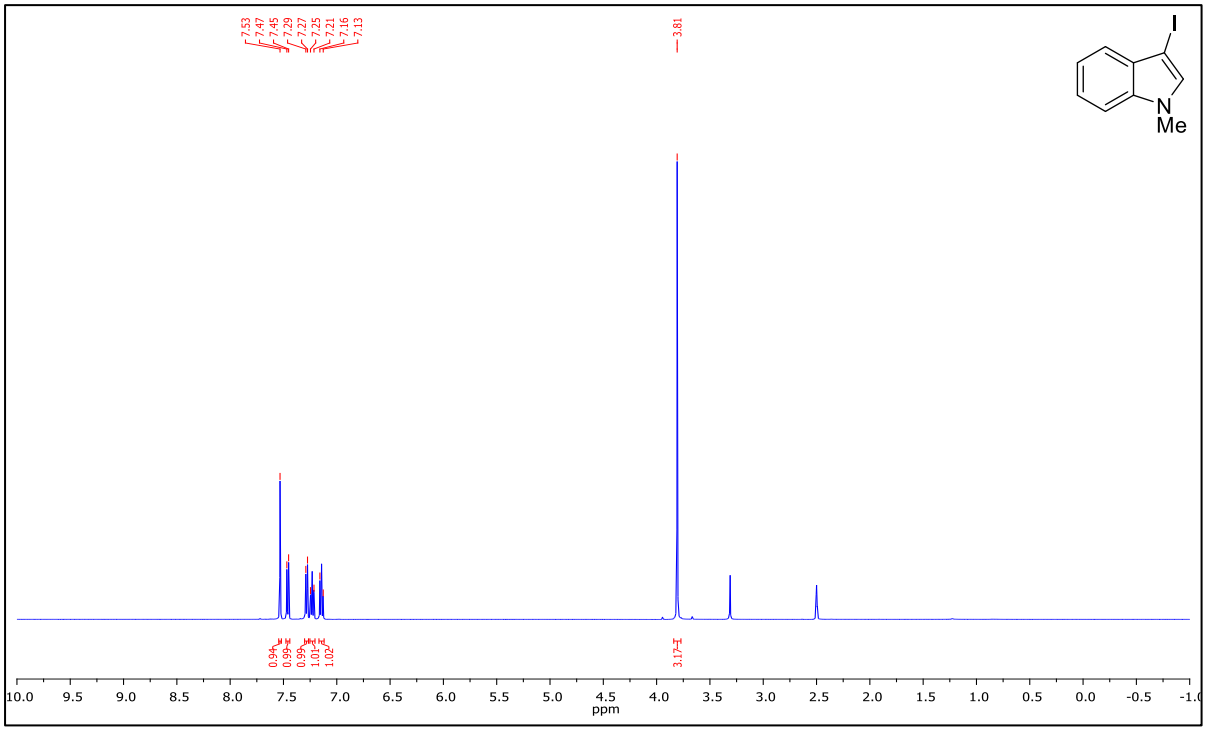


^{13}C NMR ($CDCl_3$)

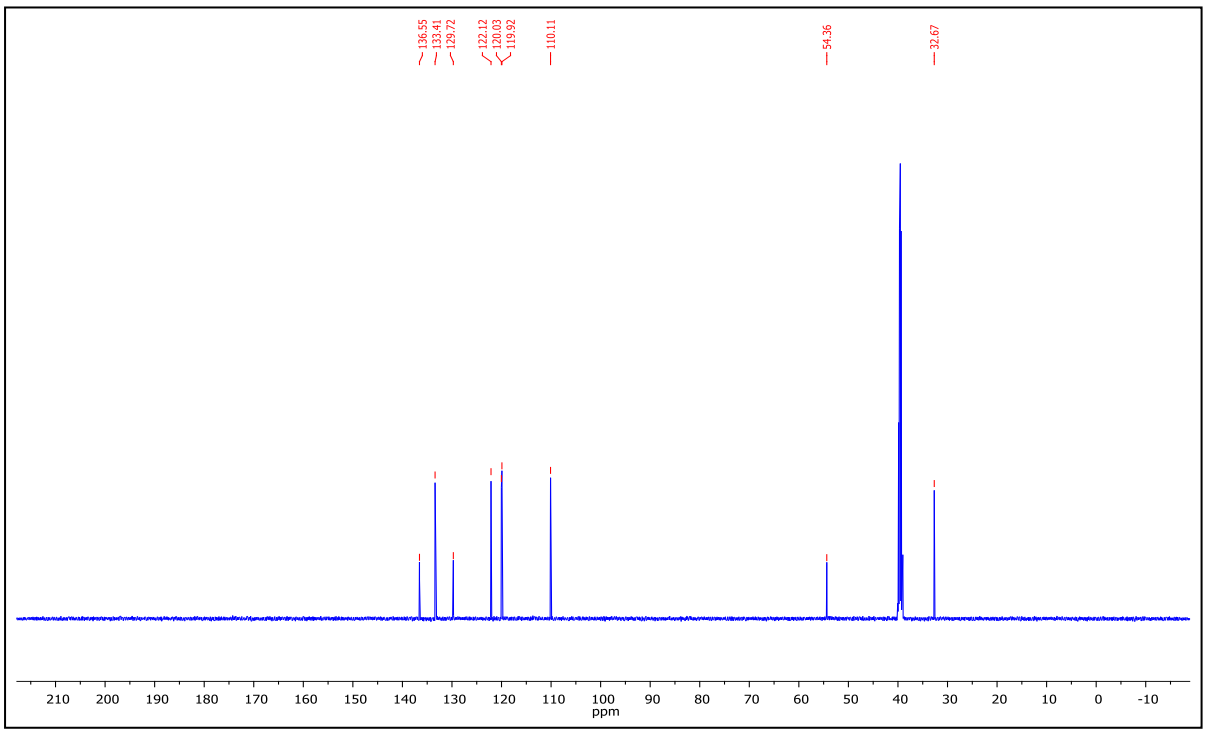


3-iodo-1-methyl-1H-indole (2ak)

^{1}H NMR ((CD$_3$)$_2$SO)

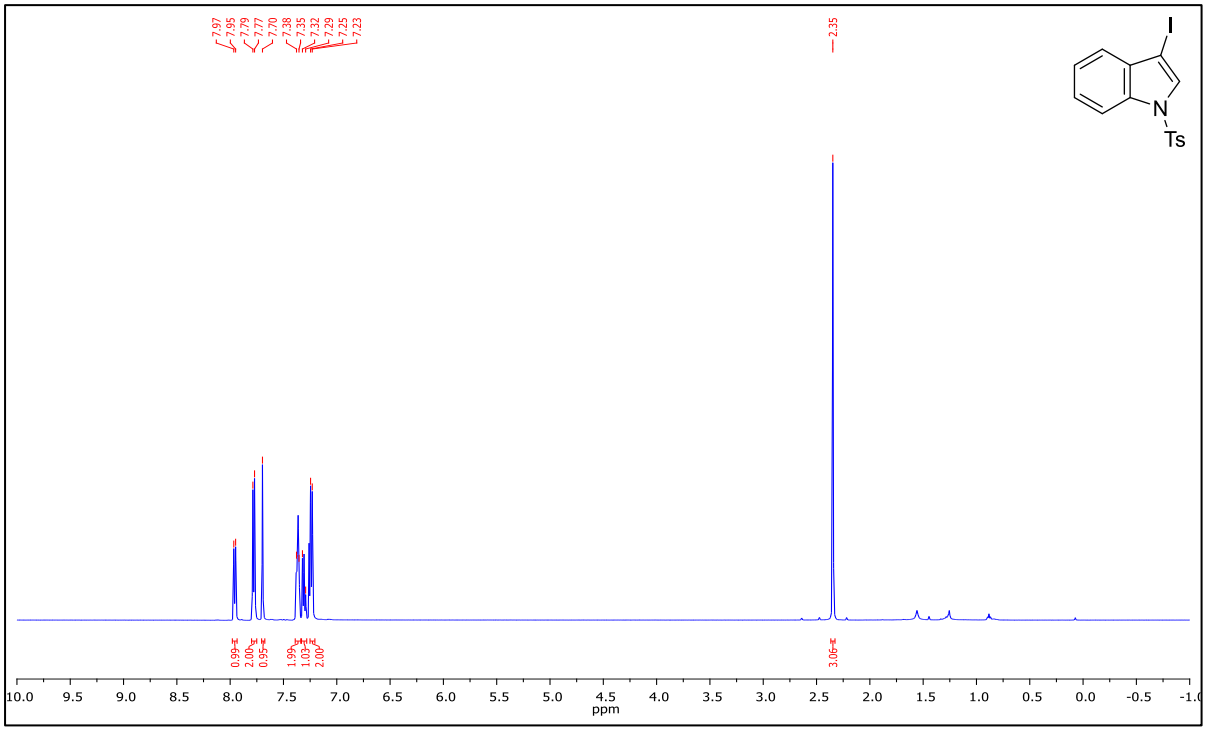


^{13}C NMR ((CD$_3$)$_2$SO)

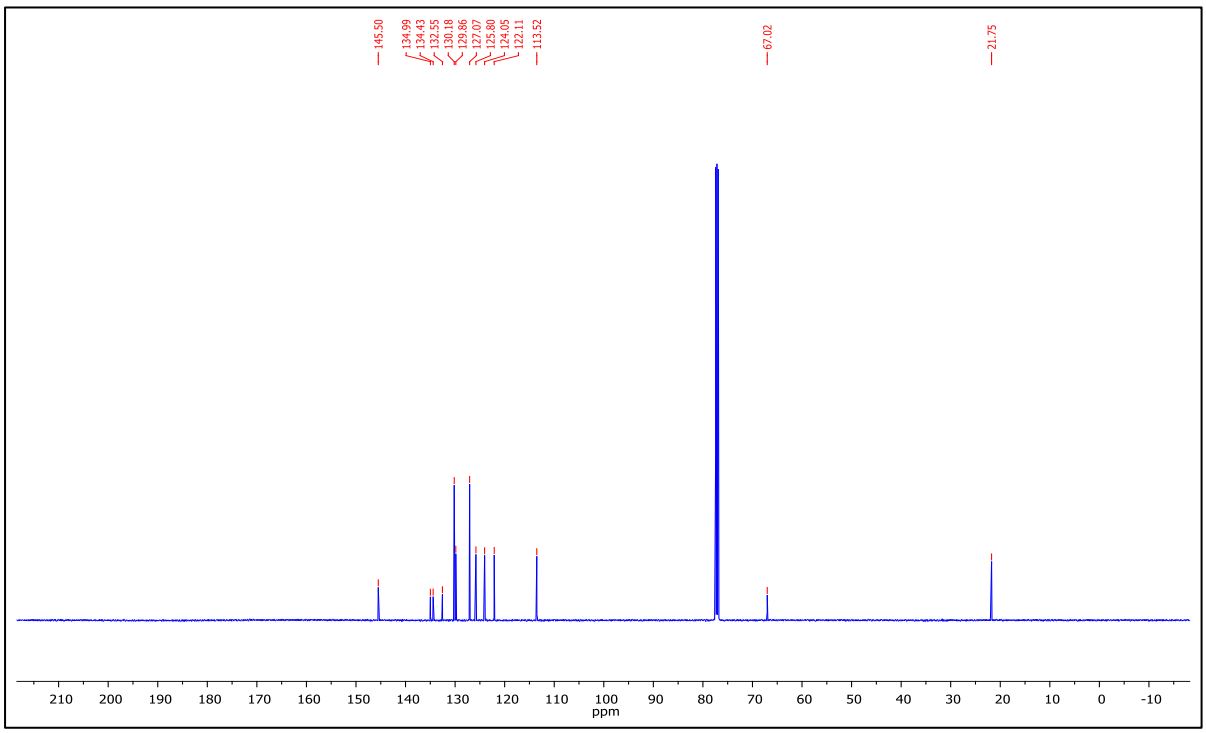


3-iodo-1-tosyl-1H-indole (2al)

^{1}H NMR ($CDCl_3$)

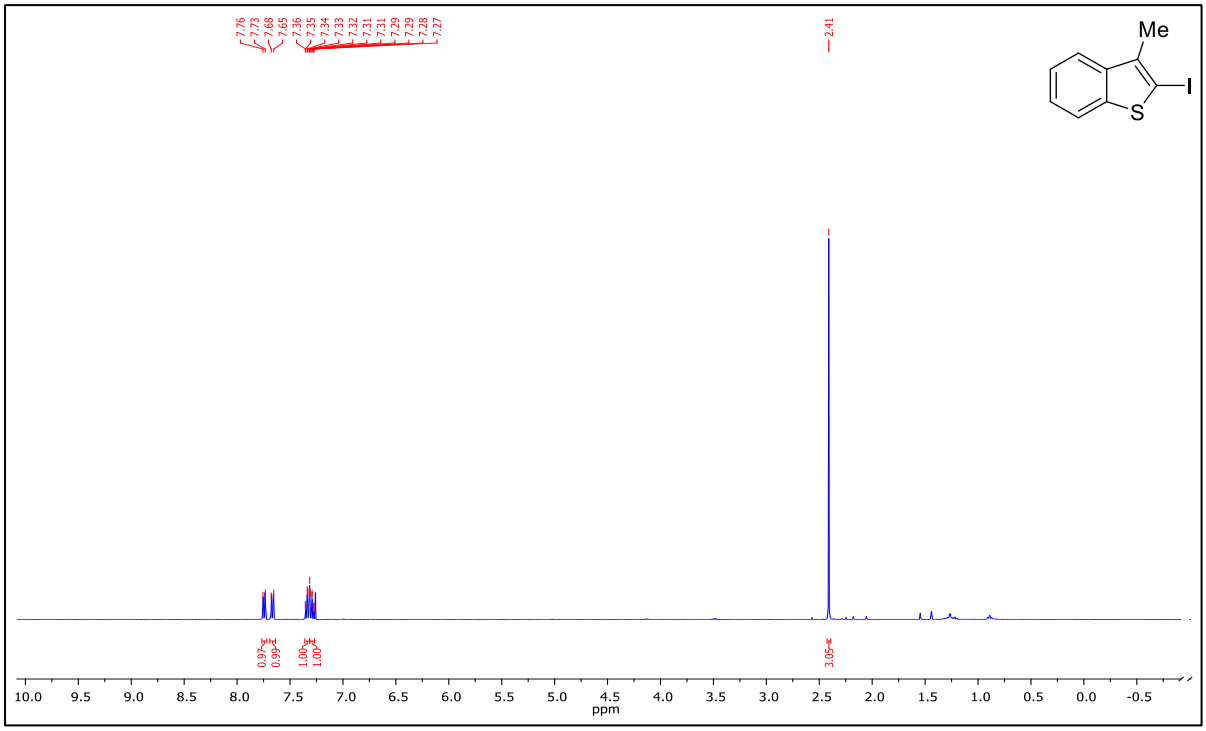


^{13}C NMR ($CDCl_3$)

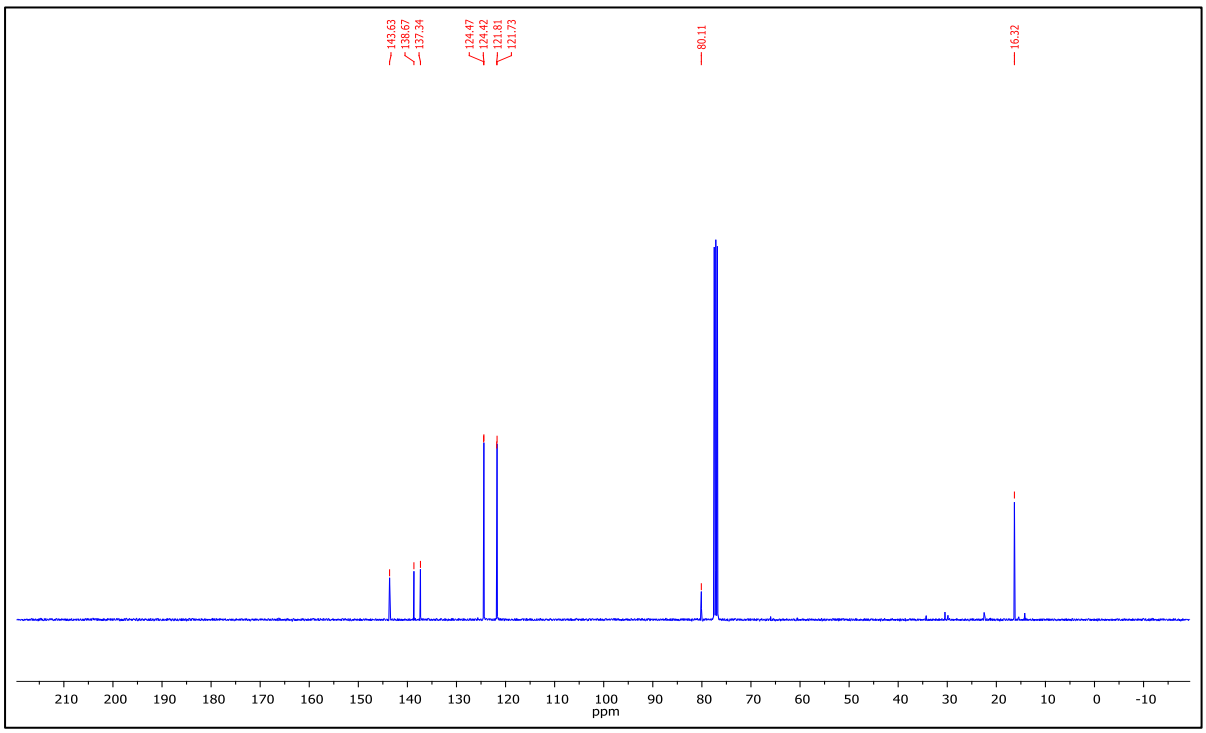


2-iodo-3-methylbenzo[*b*]thiophene (2am)

^{1}H NMR ($CDCl_3$)

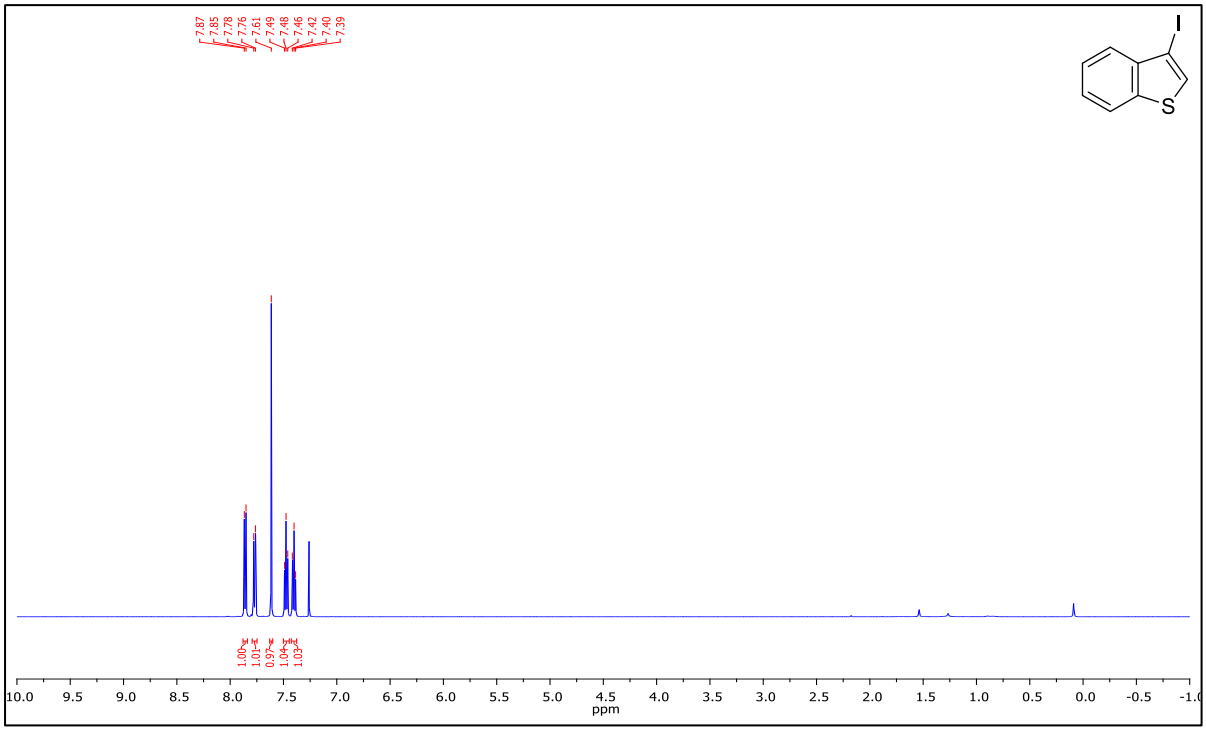


^{13}C NMR ($CDCl_3$)

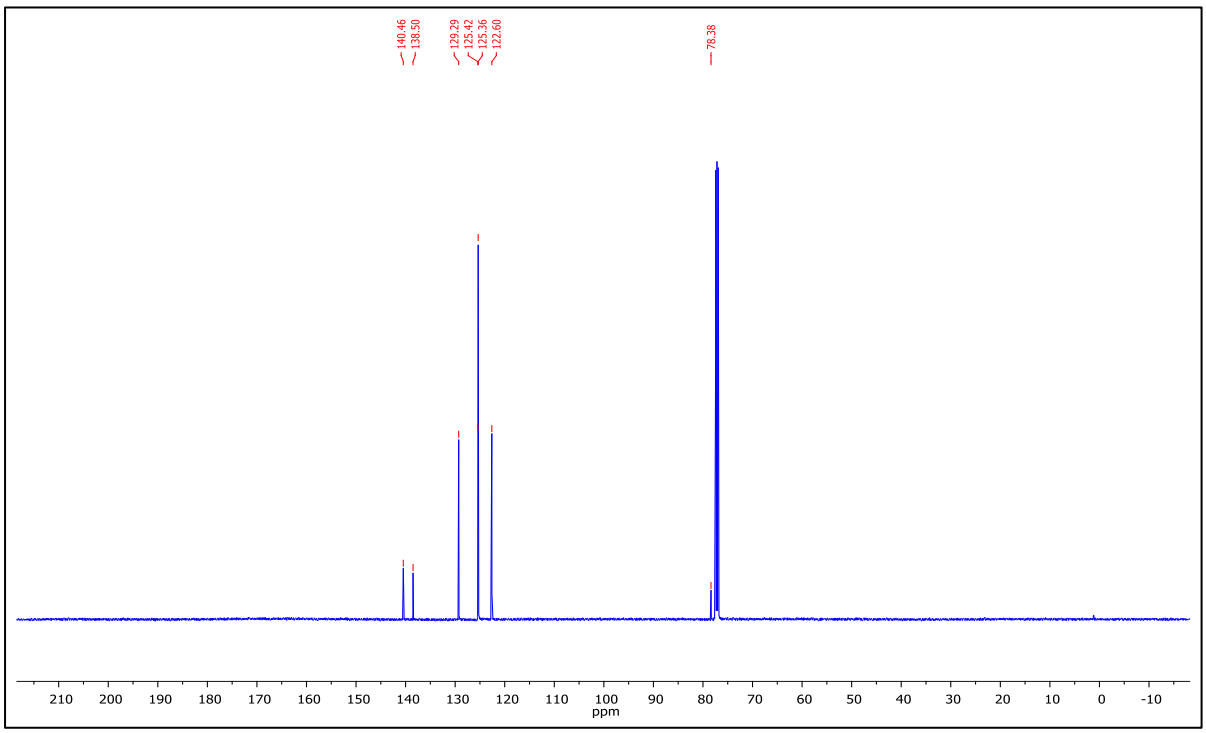


3-iodobenzo[b]thiophene (2an)

^{1}H NMR ($CDCl_3$)

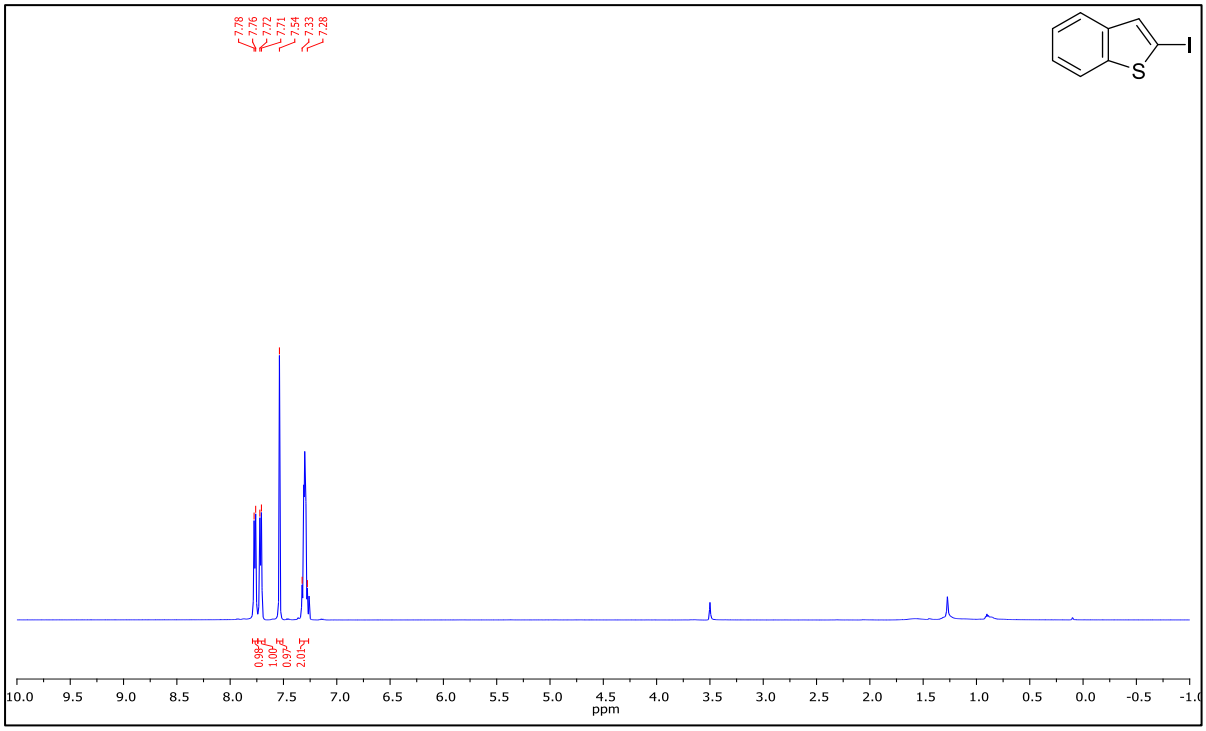


^{13}C NMR ($CDCl_3$)

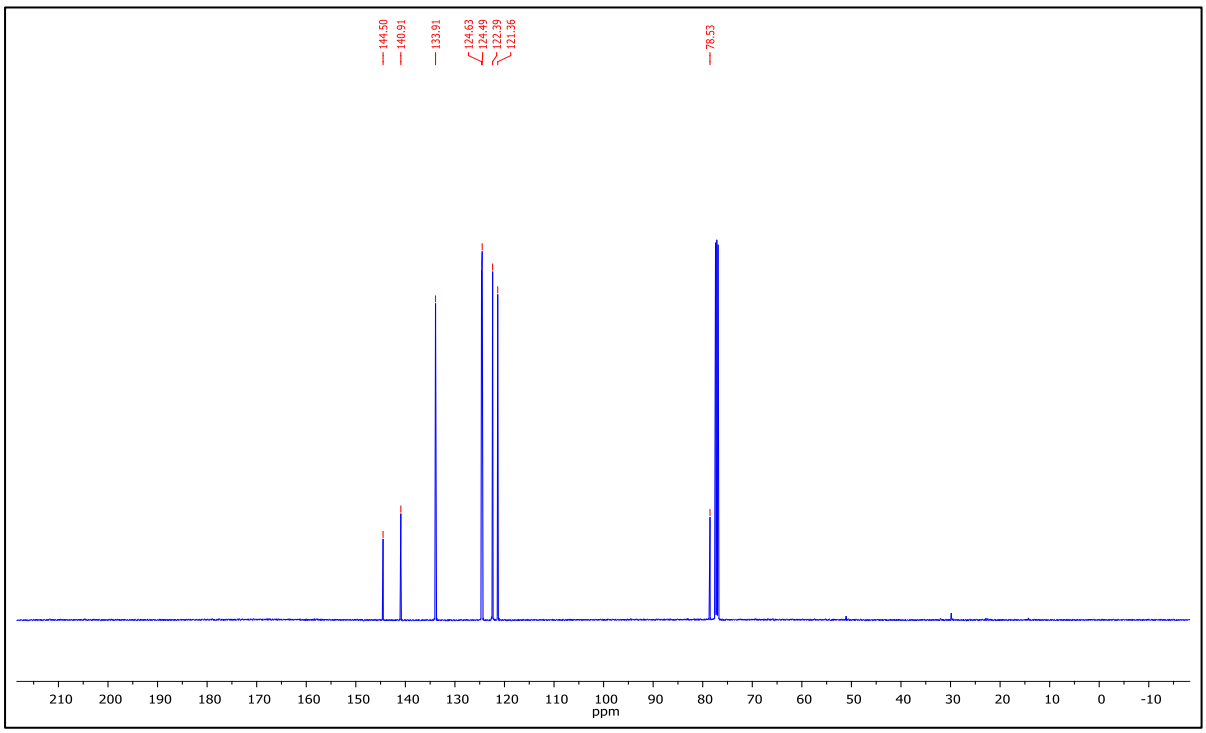


2-iodobenzo[b]thiophene (2ao)

^{1}H NMR ($CDCl_3$)

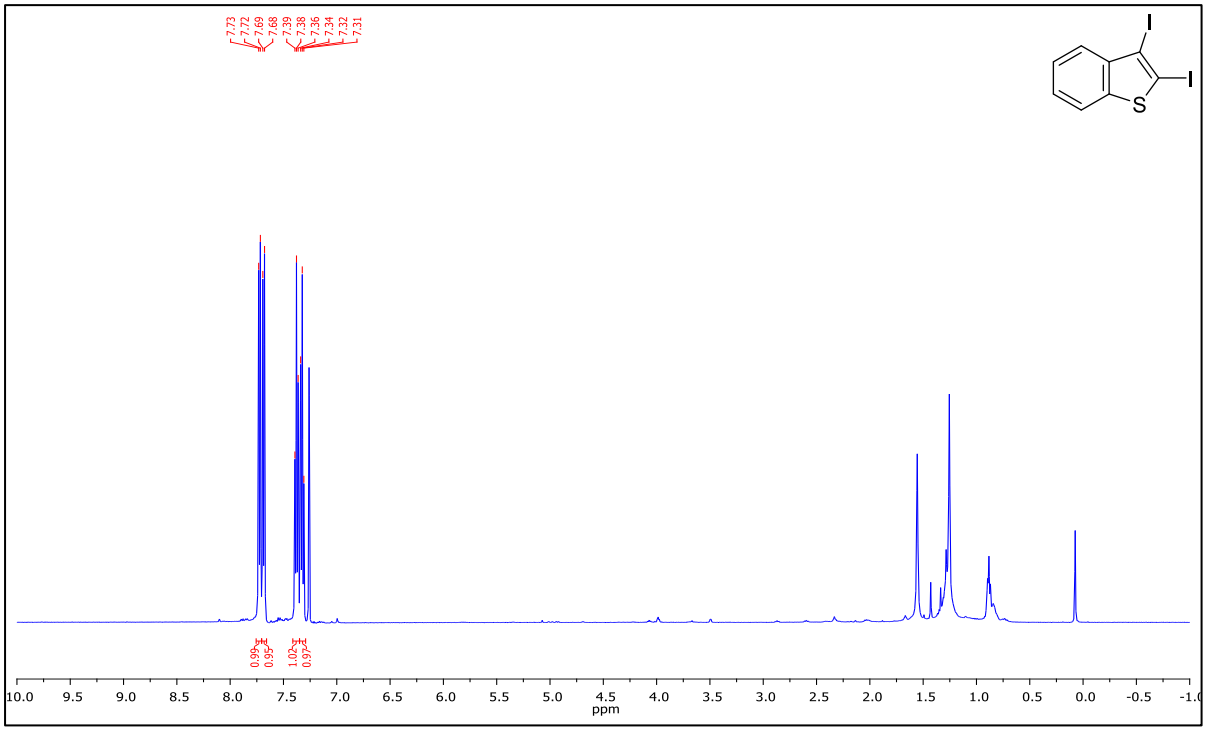


^{13}C NMR ($CDCl_3$)

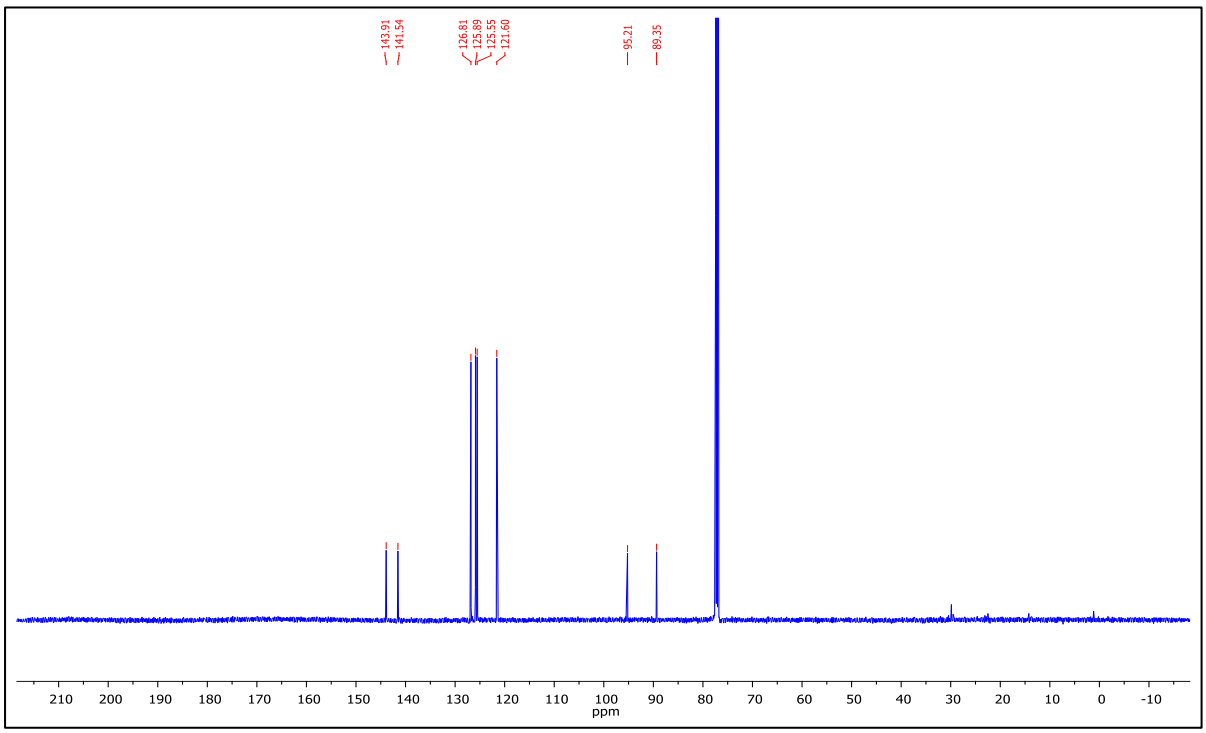


2,3-diiodobenzo[b]thiophene (2ao')

^{1}H NMR ($CDCl_3$)

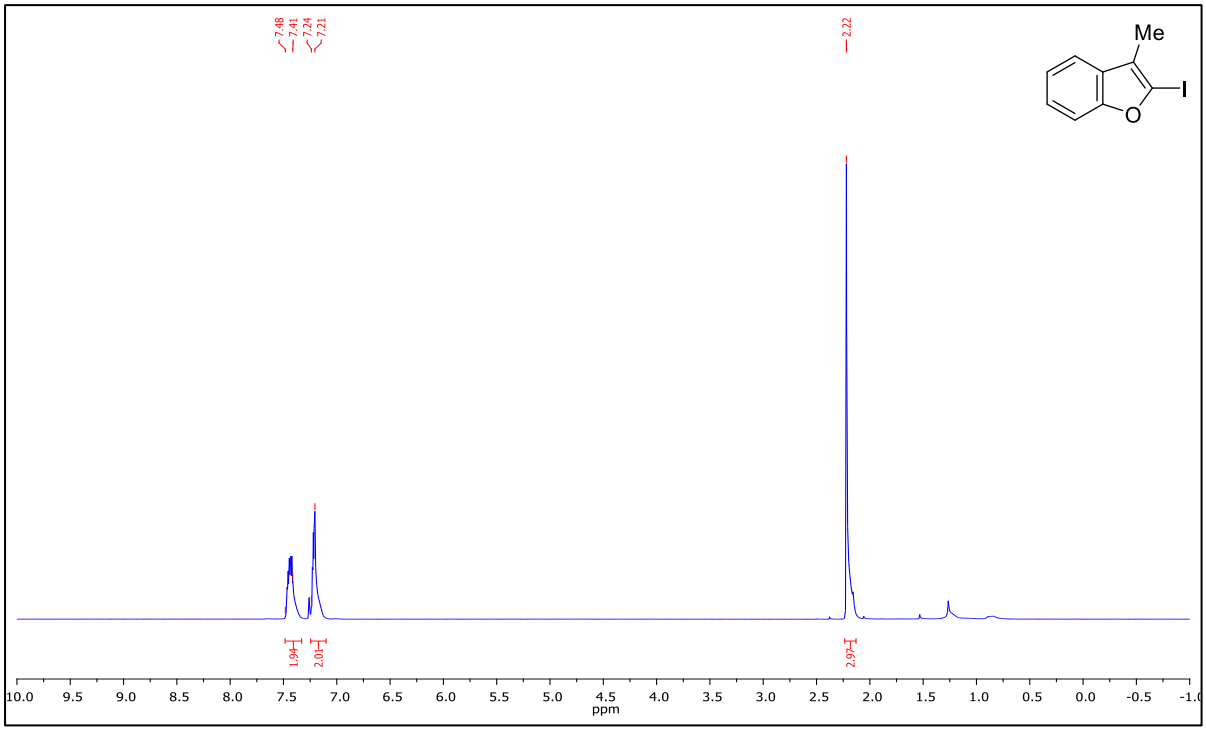


^{13}C NMR ($CDCl_3$)

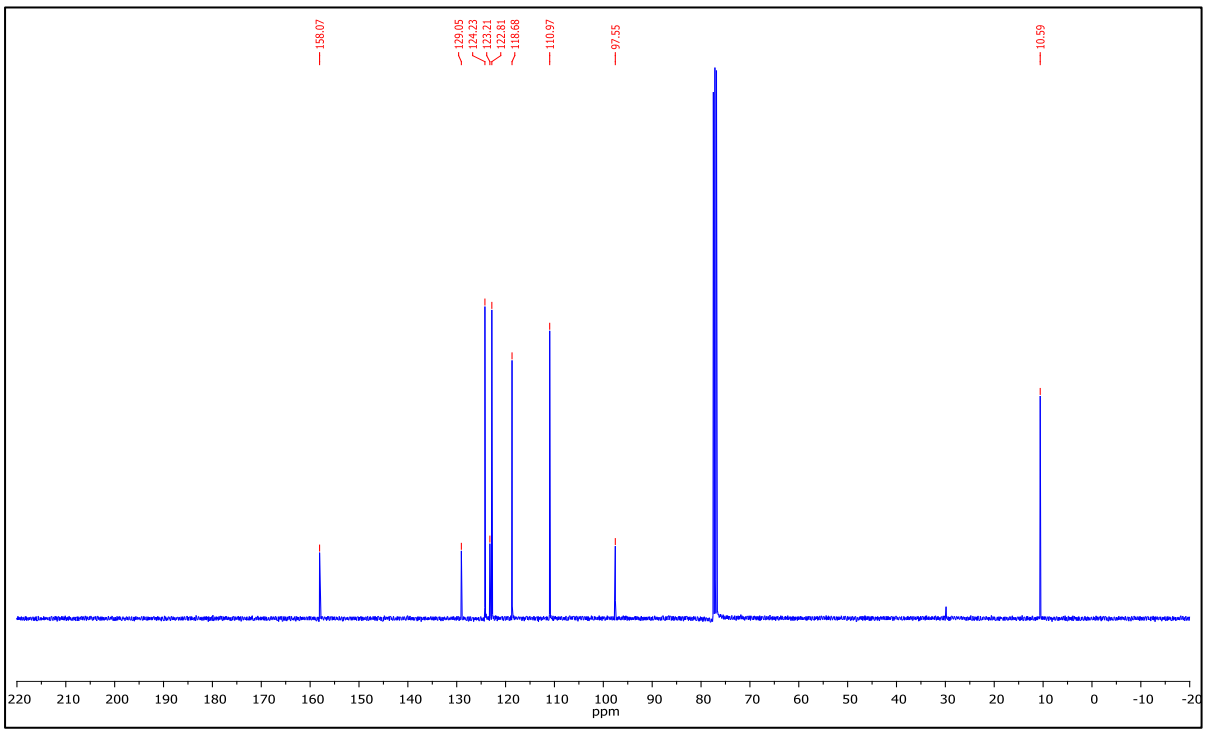


2-iodo-3-methylbenzofuran (2ap)

^{1}H NMR ($CDCl_3$)

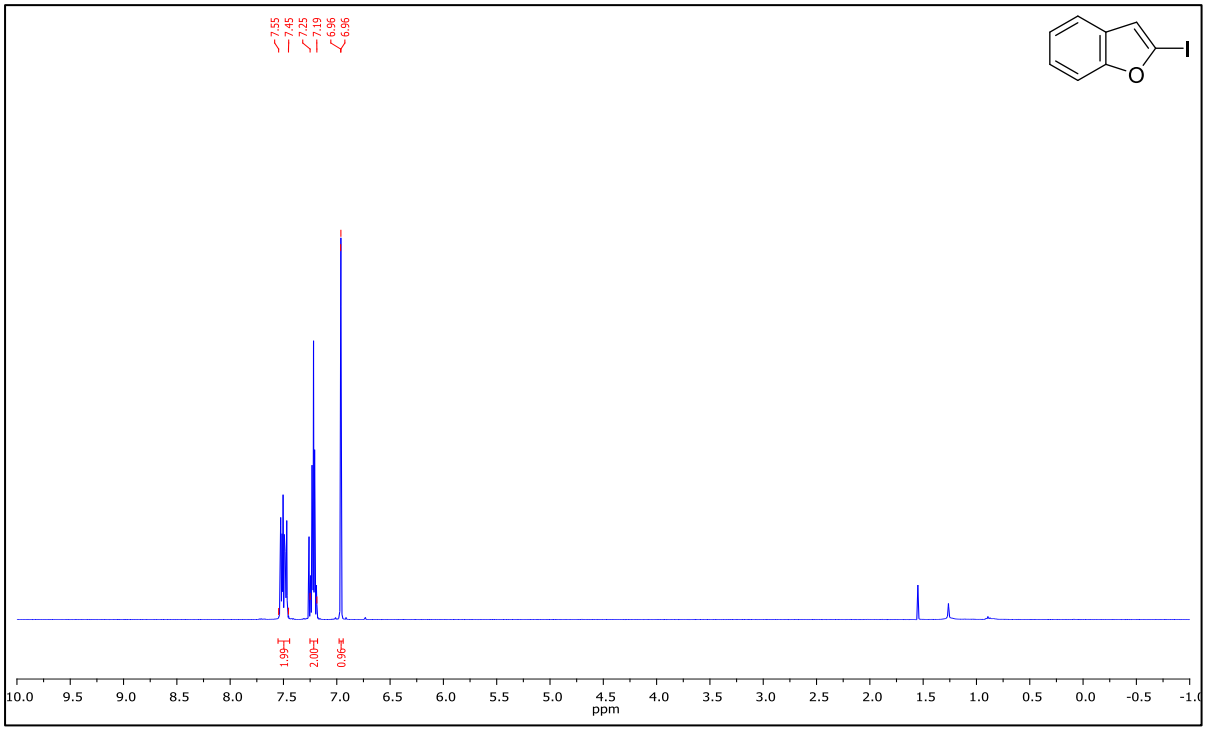


^{13}C NMR ($CDCl_3$)

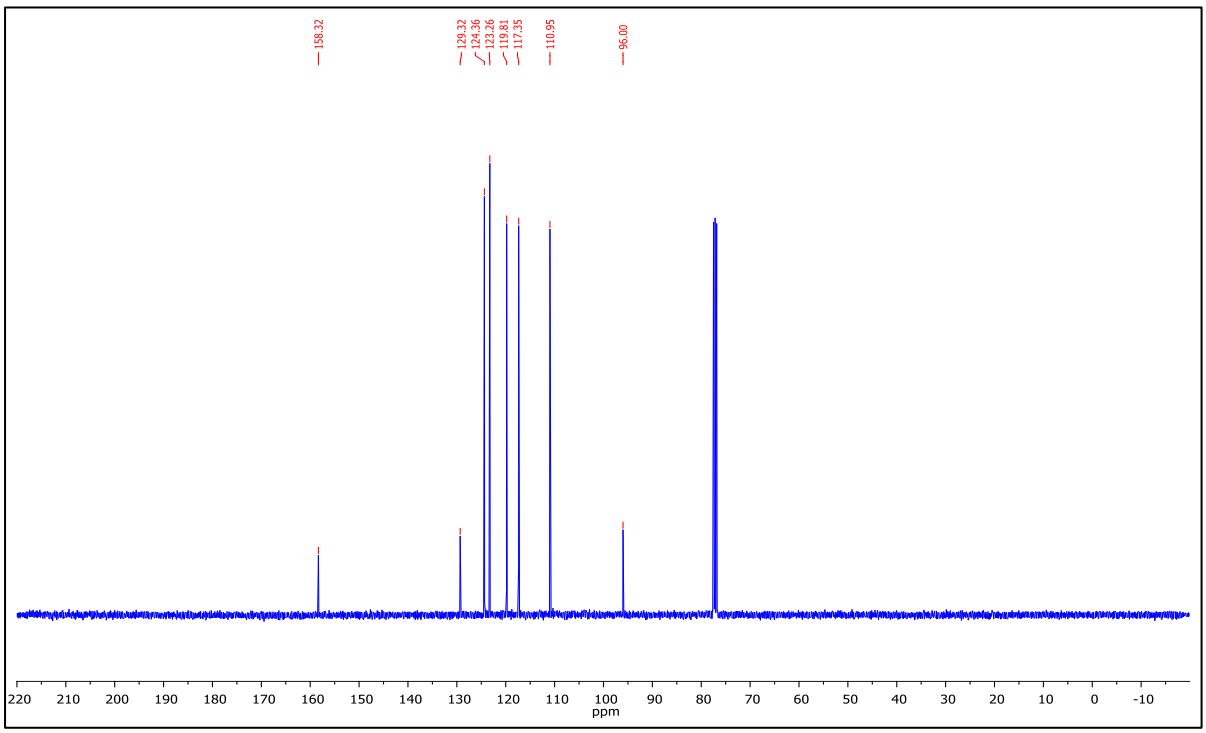


2-iodobenzofuran (2aq)

^{1}H NMR ($CDCl_3$)

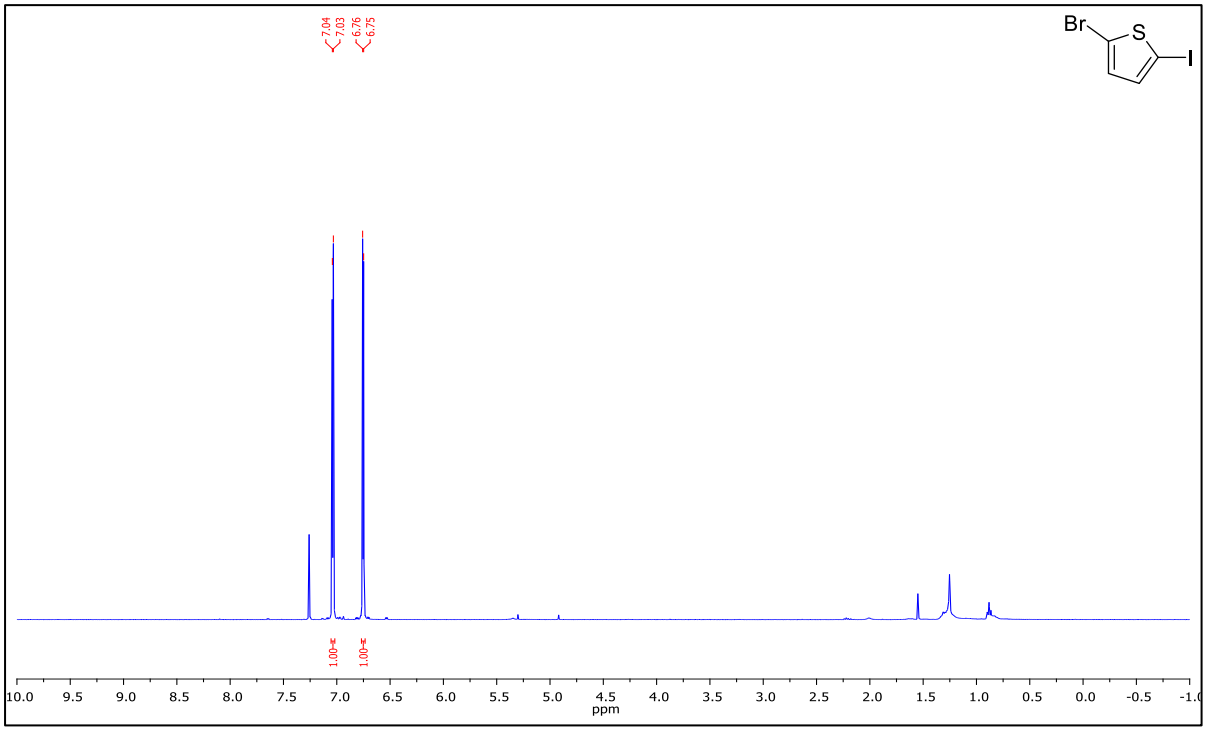


^{13}C NMR ($CDCl_3$)

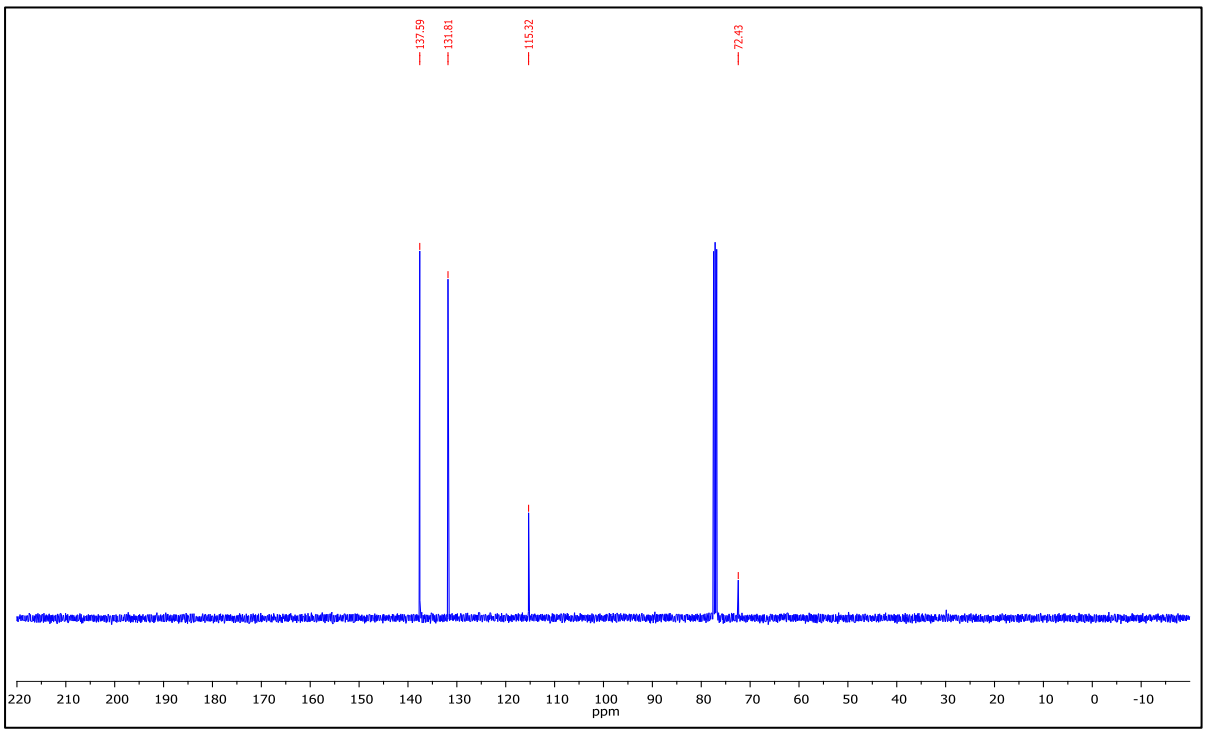


2-bromo-5-iodothiophene (2ar)

^{1}H NMR ($CDCl_3$)

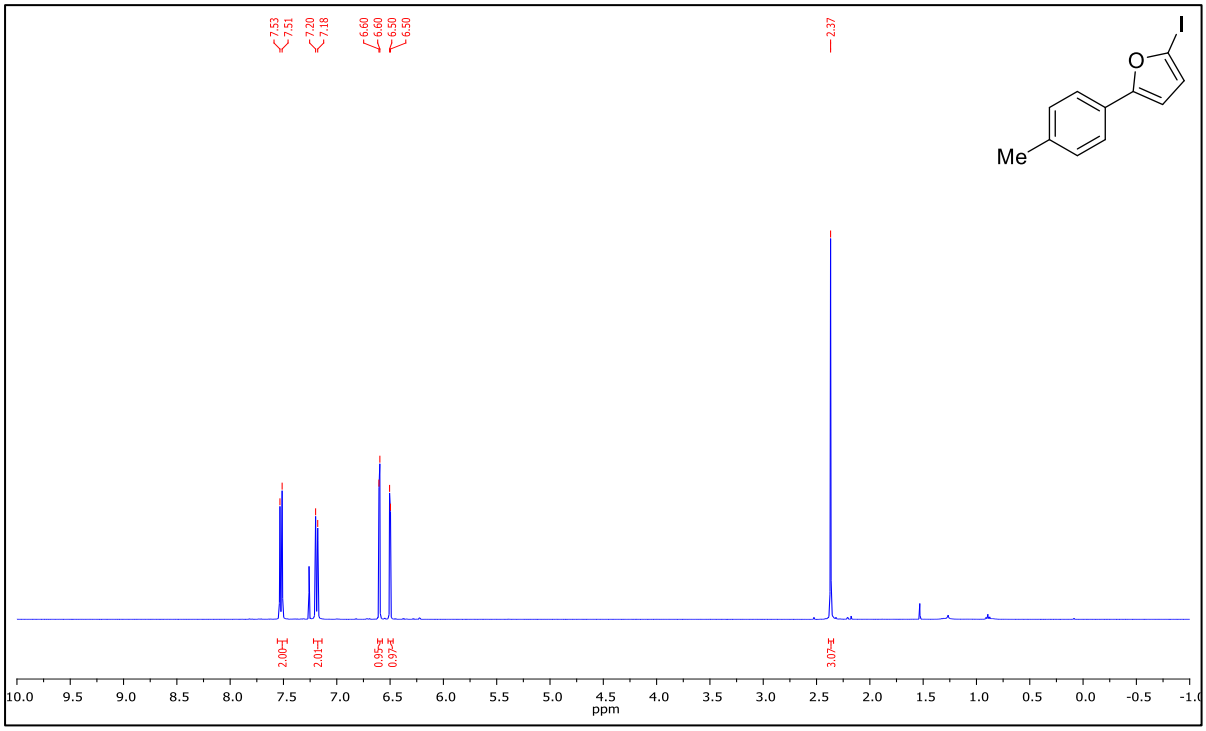


^{13}C NMR ($CDCl_3$)

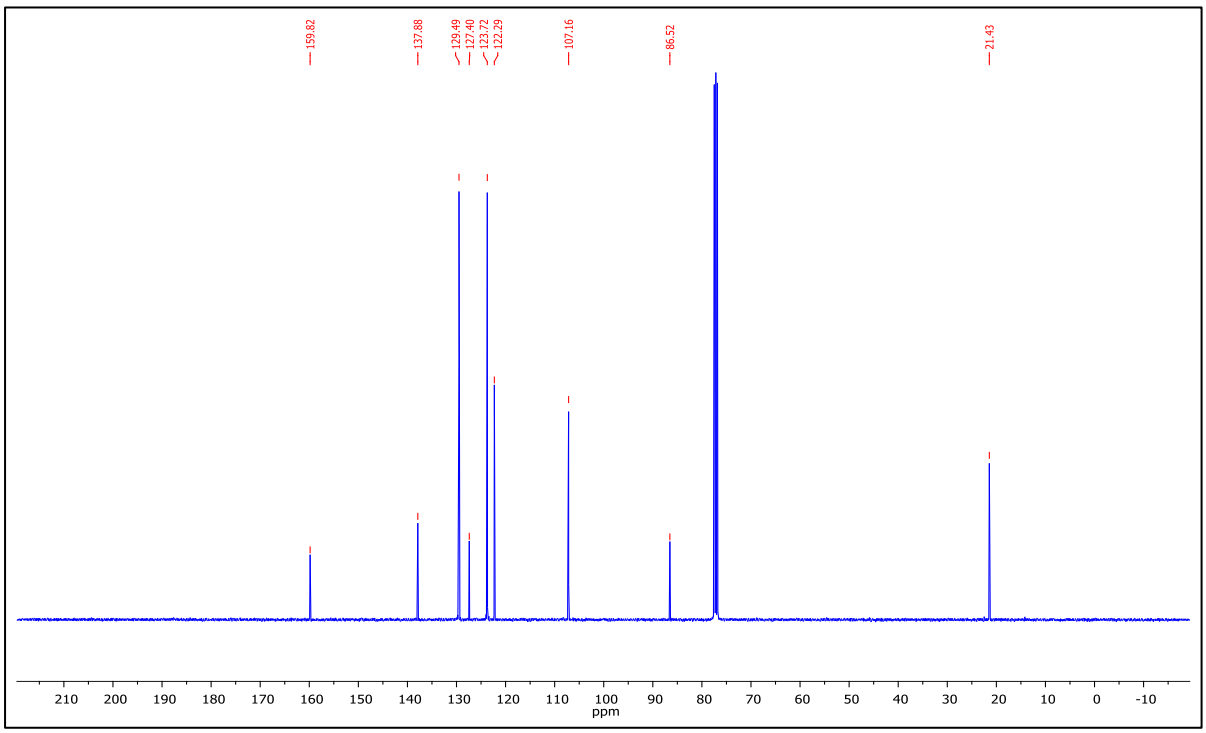


2-iodo-5-(*p*-tolyl)furan (2as)

^{1}H NMR ($CDCl_3$)

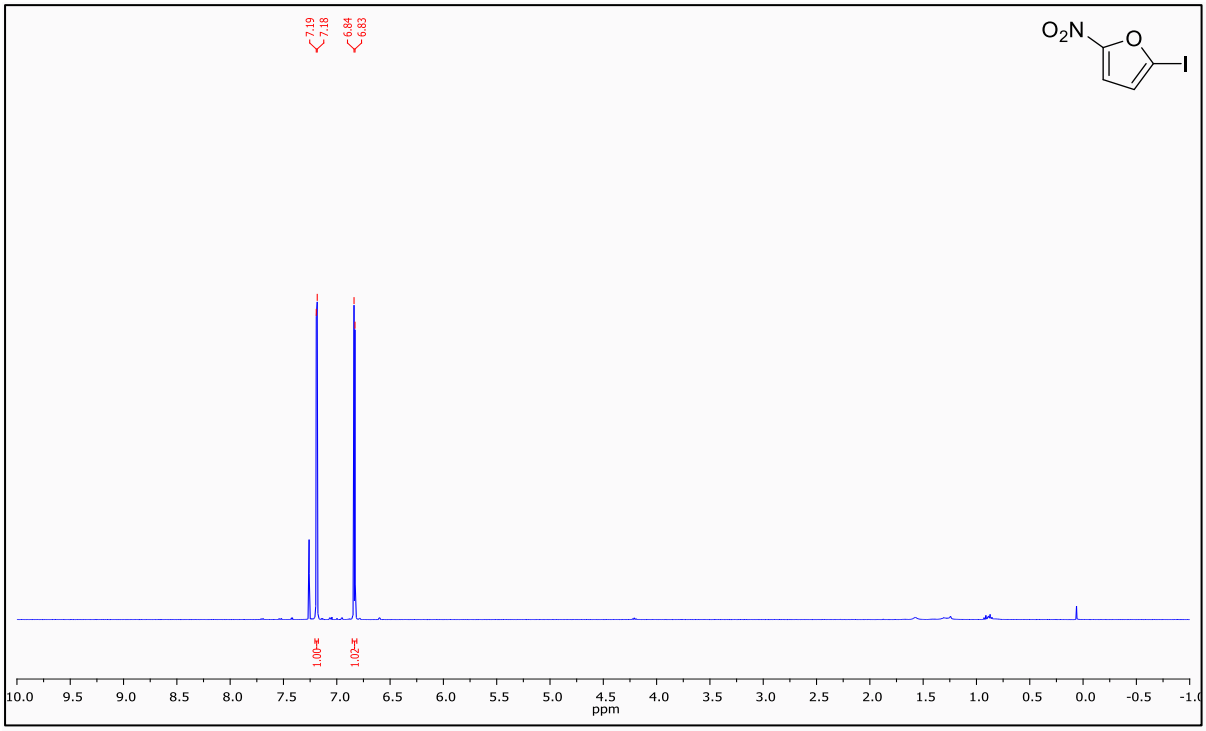


^{13}C NMR ($CDCl_3$)

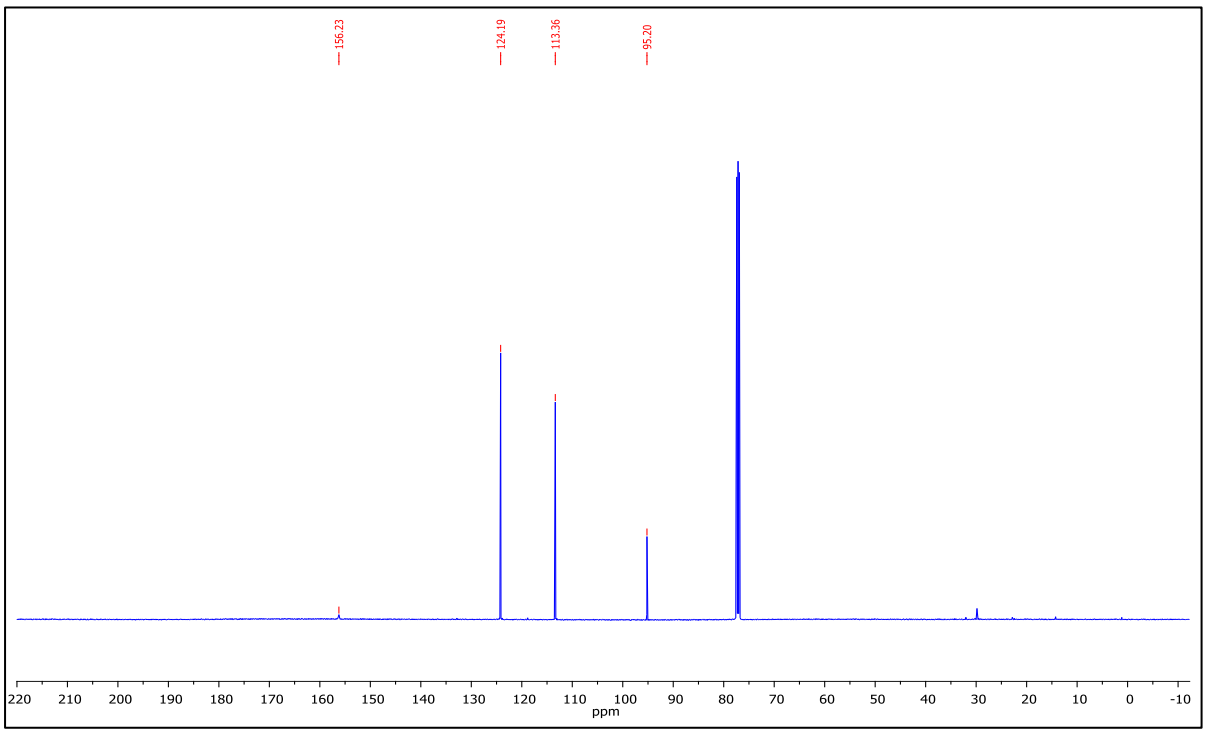


2-iodo-5-nitrofuran (2at)

^{1}H NMR ($CDCl_3$)

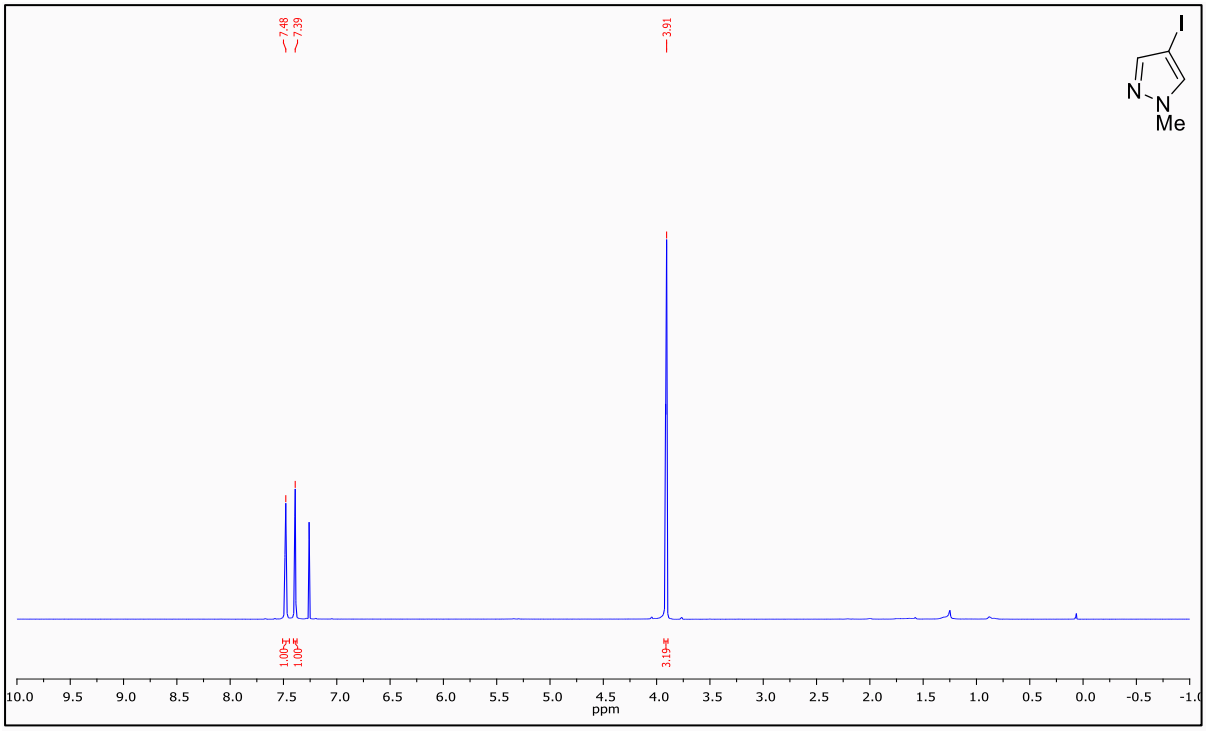


^{13}C NMR ($CDCl_3$)

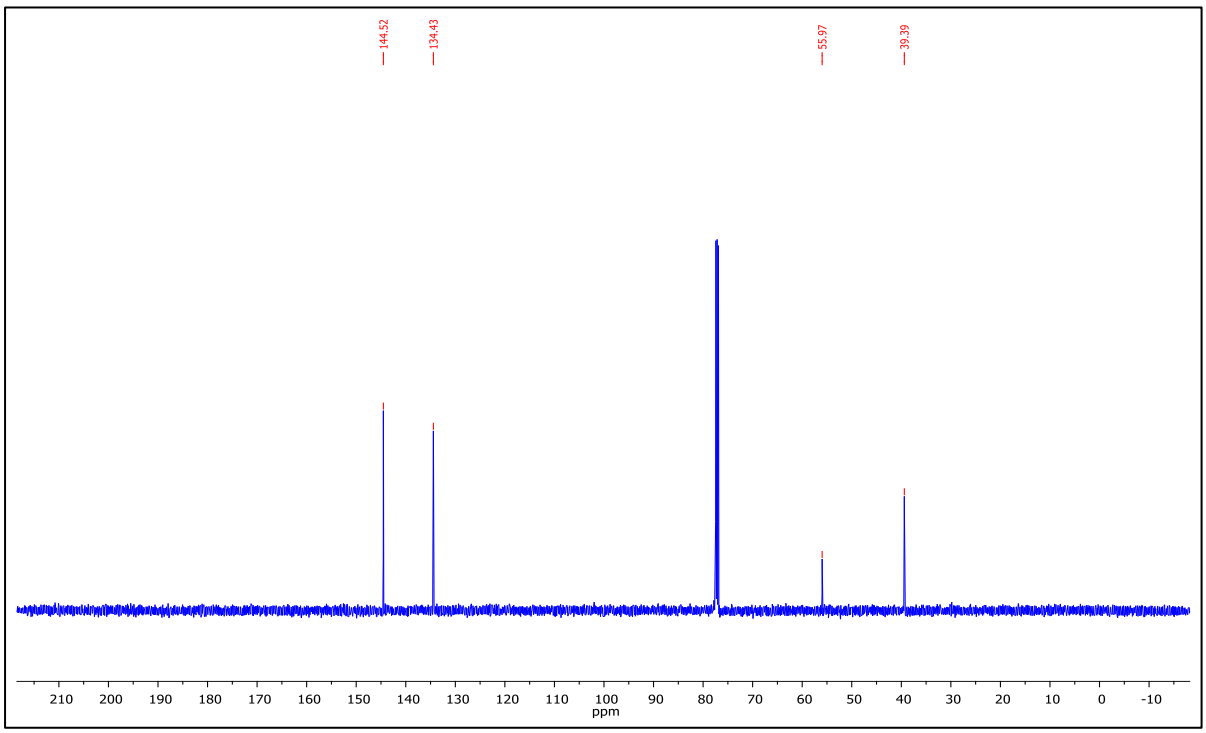


4-iodo-1-methyl-1H-pyrazole (2au)

^{1}H NMR ($CDCl_3$)

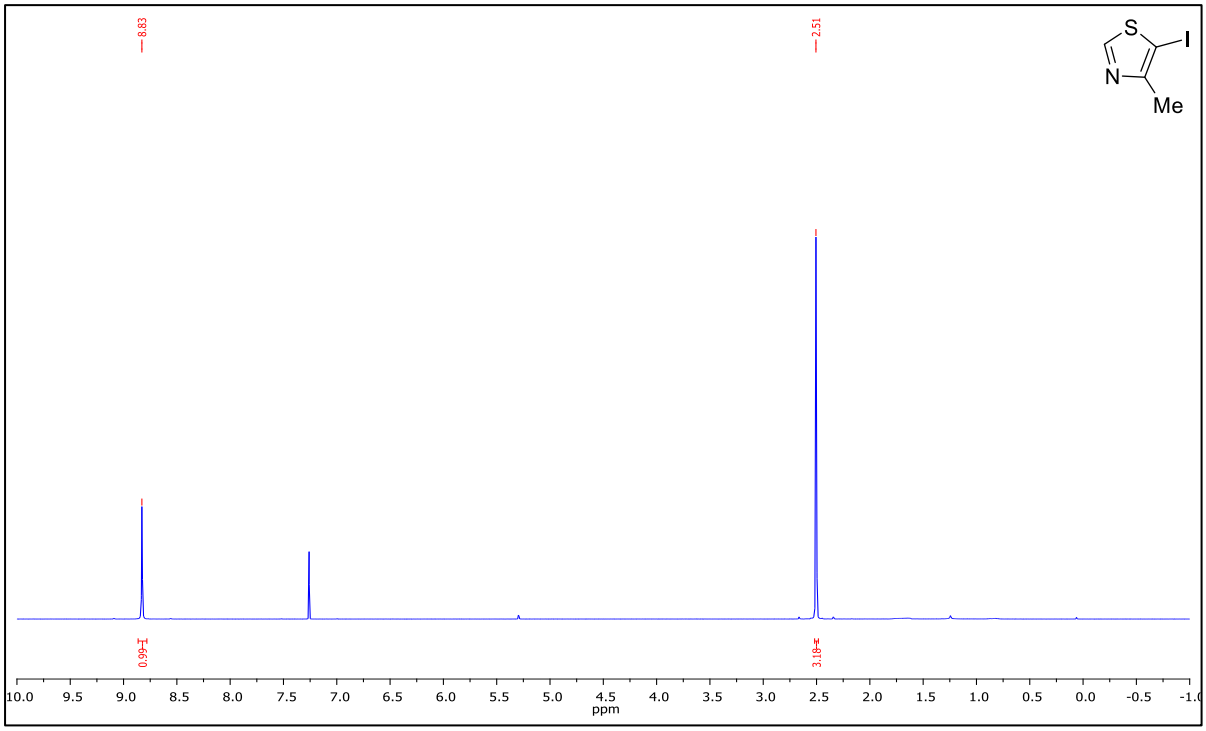


^{13}C NMR ($CDCl_3$)

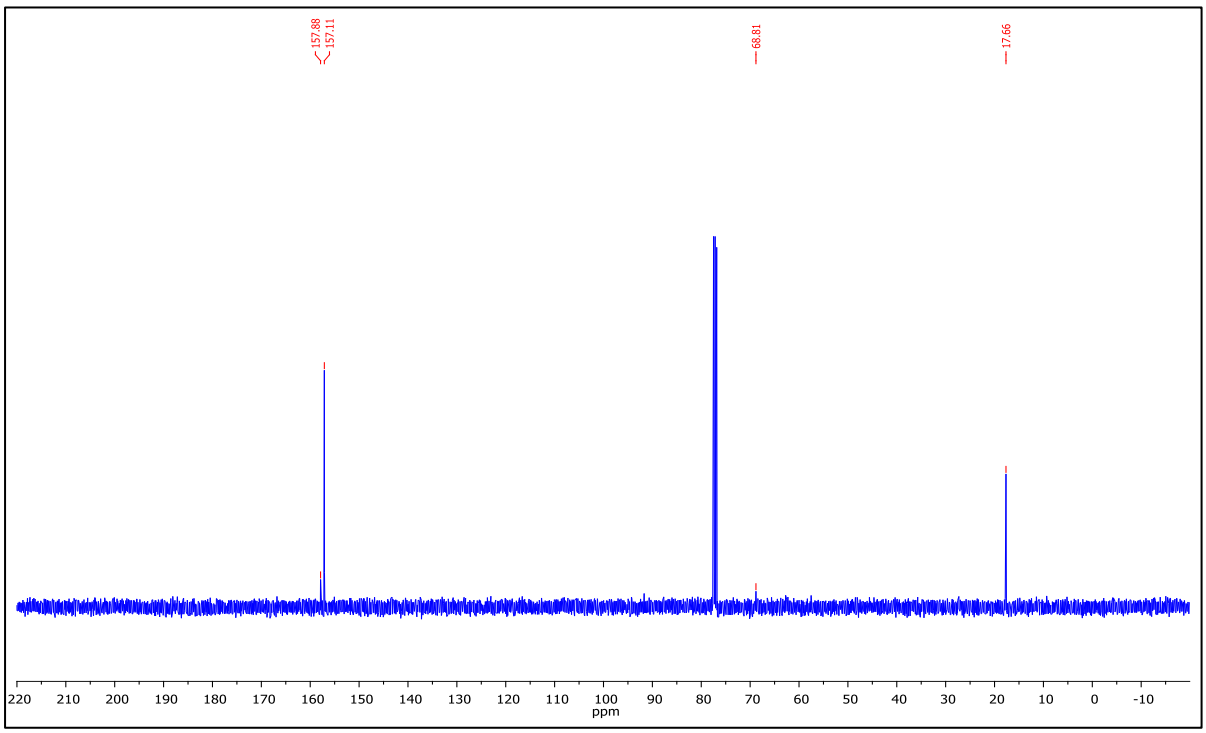


5-iodo-4-methylthiazole (2av)

^{1}H NMR ($CDCl_3$)

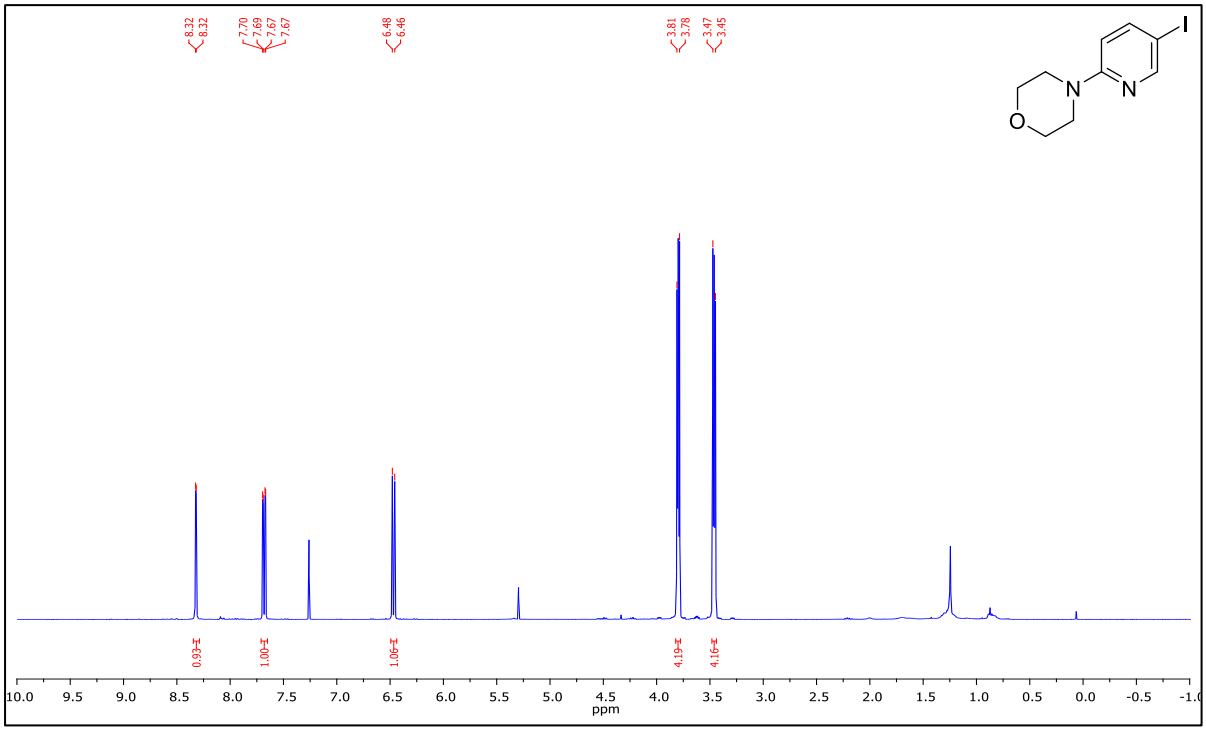


^{13}C NMR ($CDCl_3$)

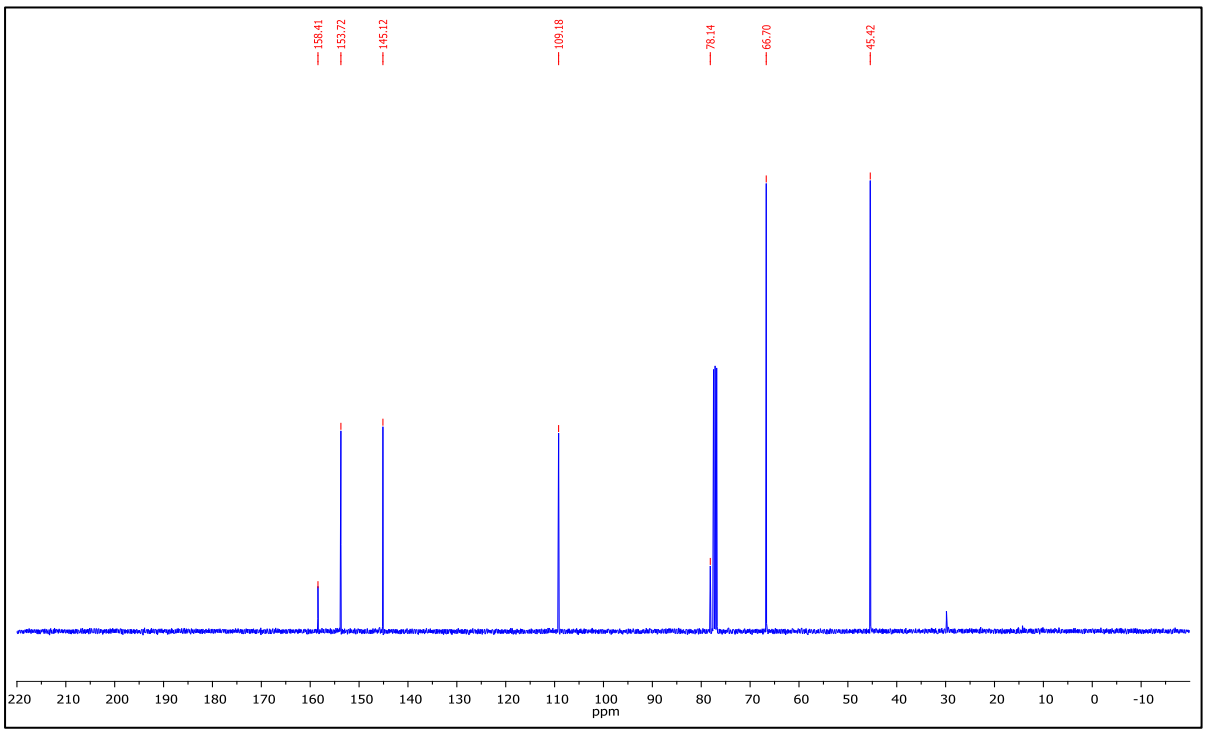


4-(5-iodopyridin-2-yl)morpholine (2aw)

^{1}H NMR ($CDCl_3$)

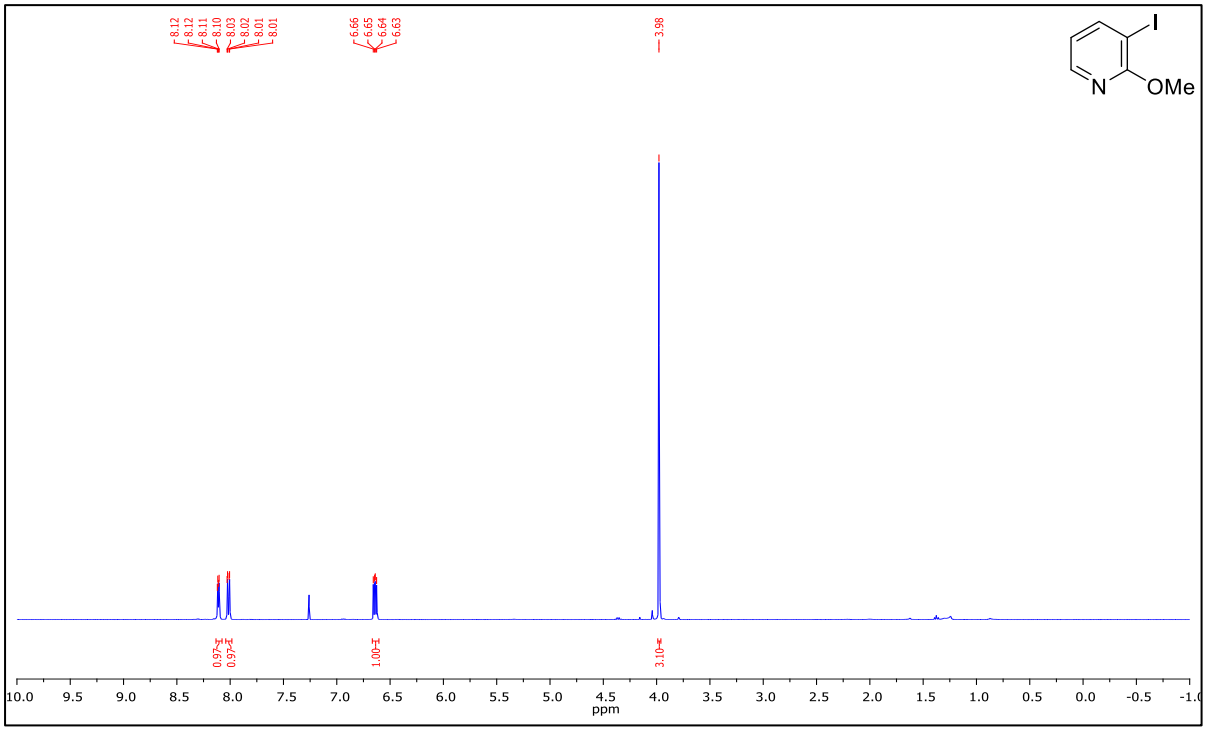


^{13}C NMR ($CDCl_3$)

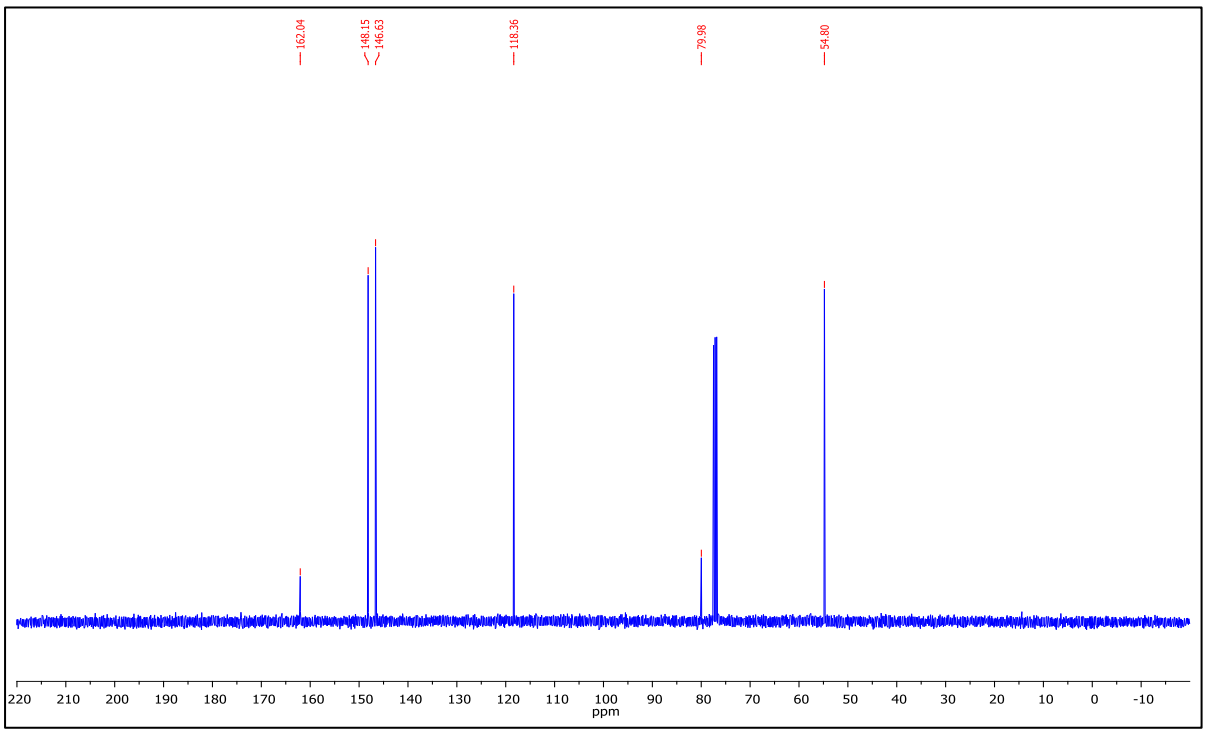


3-iodo-2-methoxypyridine (2ax)

^{1}H NMR ($CDCl_3$)

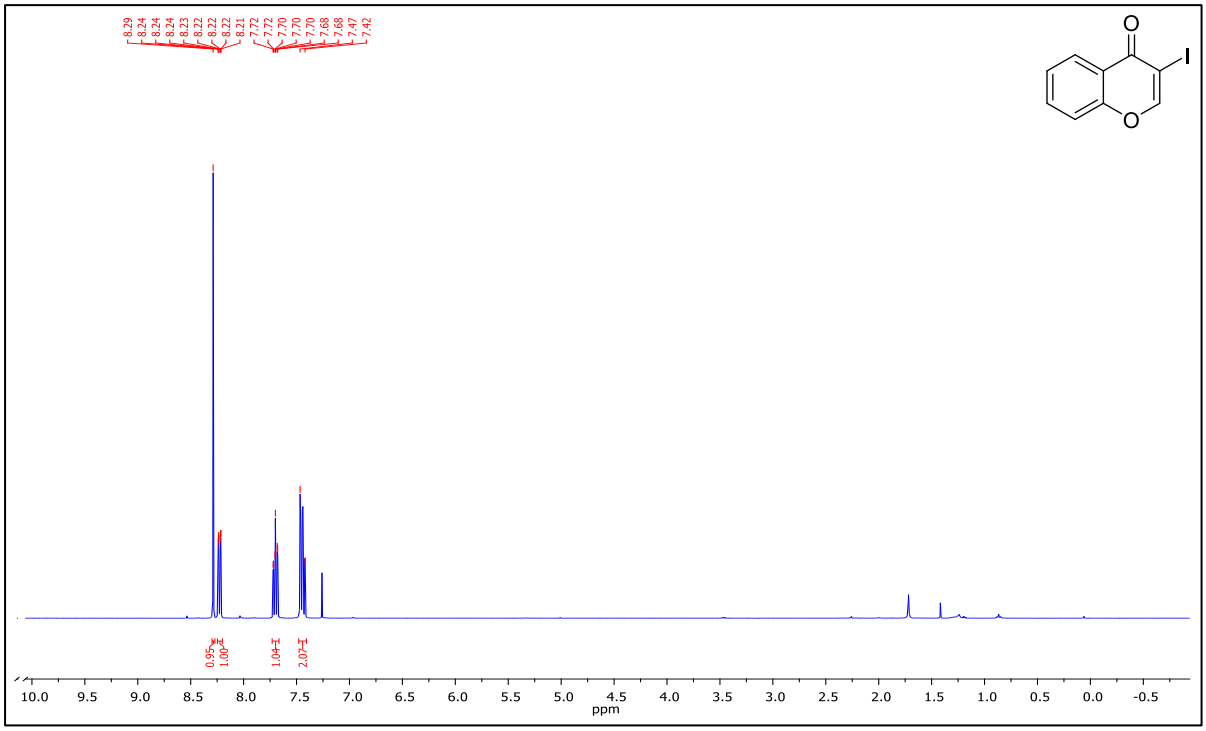


^{13}C NMR ($CDCl_3$)

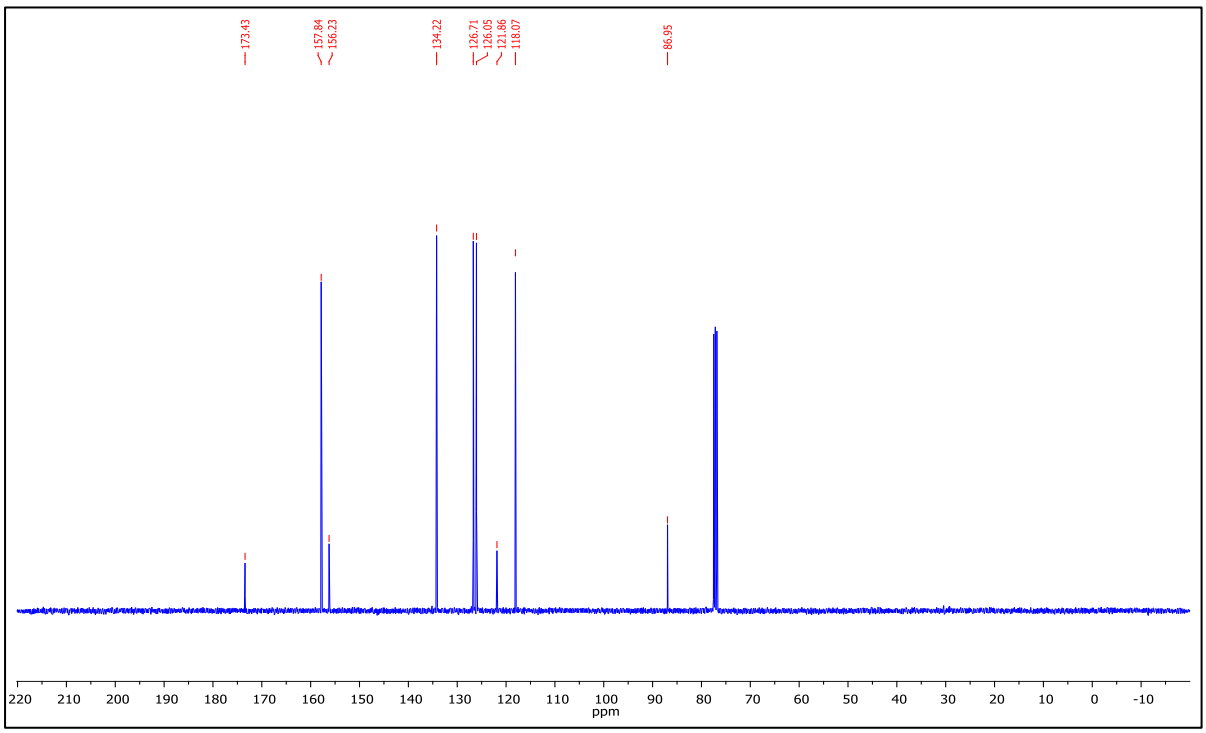


3-iodo-4H-chromen-4-one (2ay)

^{1}H NMR ($CDCl_3$)

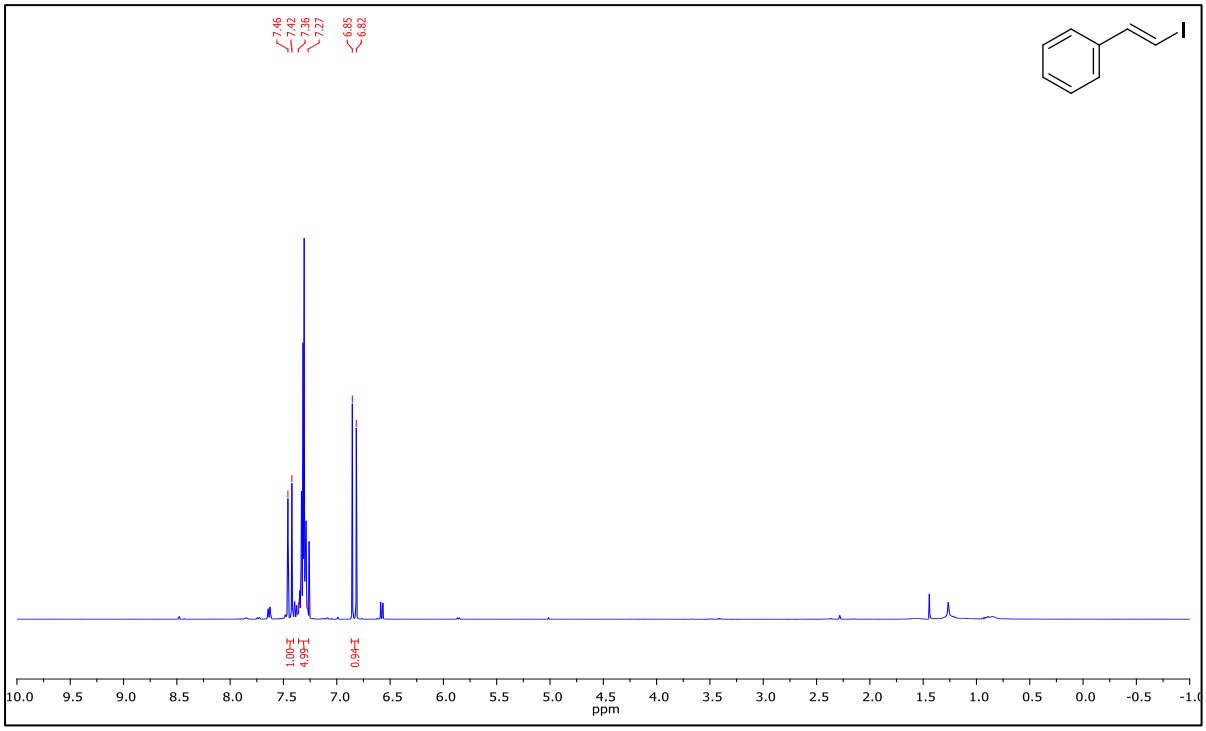


^{13}C NMR ($CDCl_3$)

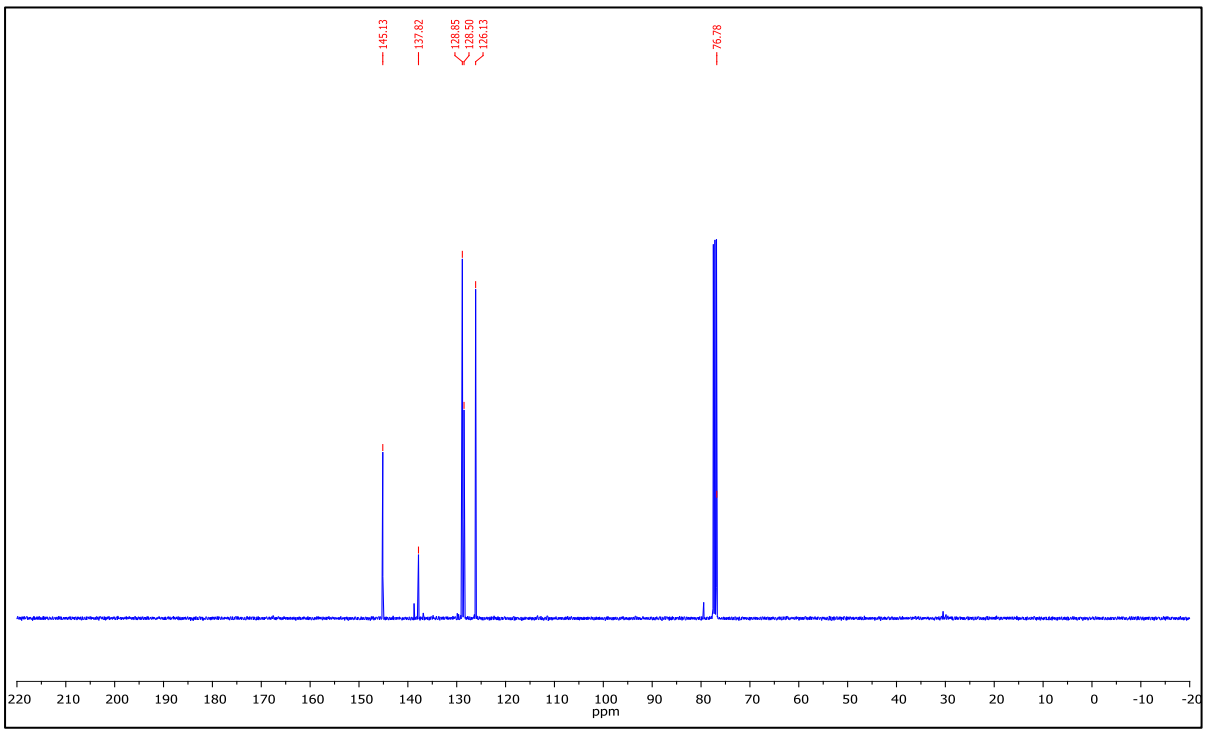


(E)-(2-iodovinyl)benzene (10:1, E/Z) (2az)

^{1}H NMR ($CDCl_3$)

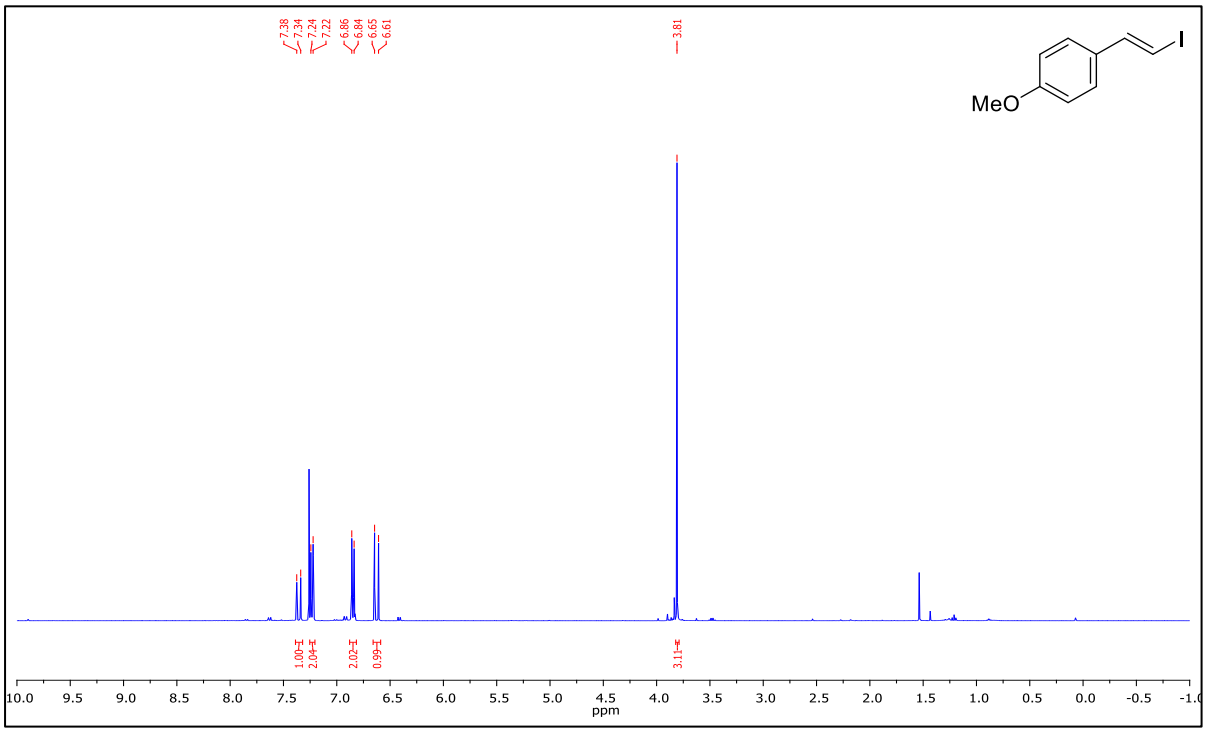


^{13}C NMR ($CDCl_3$)

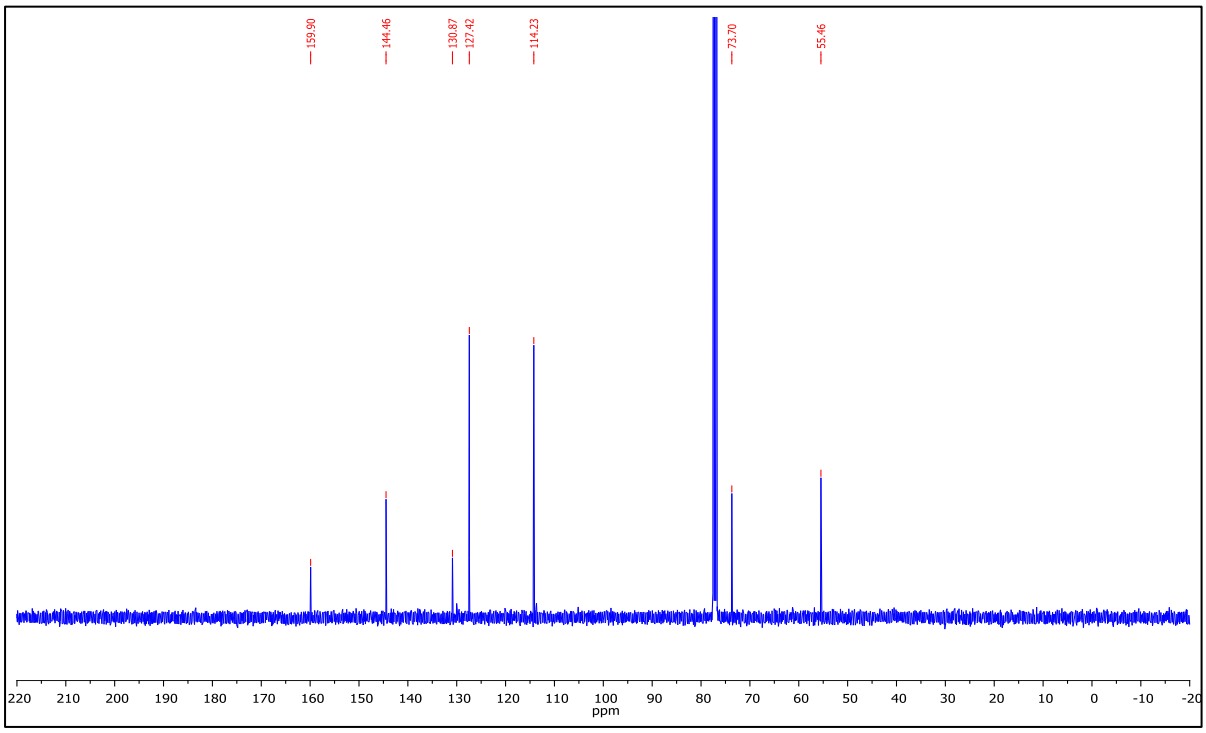


(E)-1-(2-iodovinyl)-4-methoxybenzene (23:1, E/Z) (2az')

^{1}H NMR ($CDCl_3$)

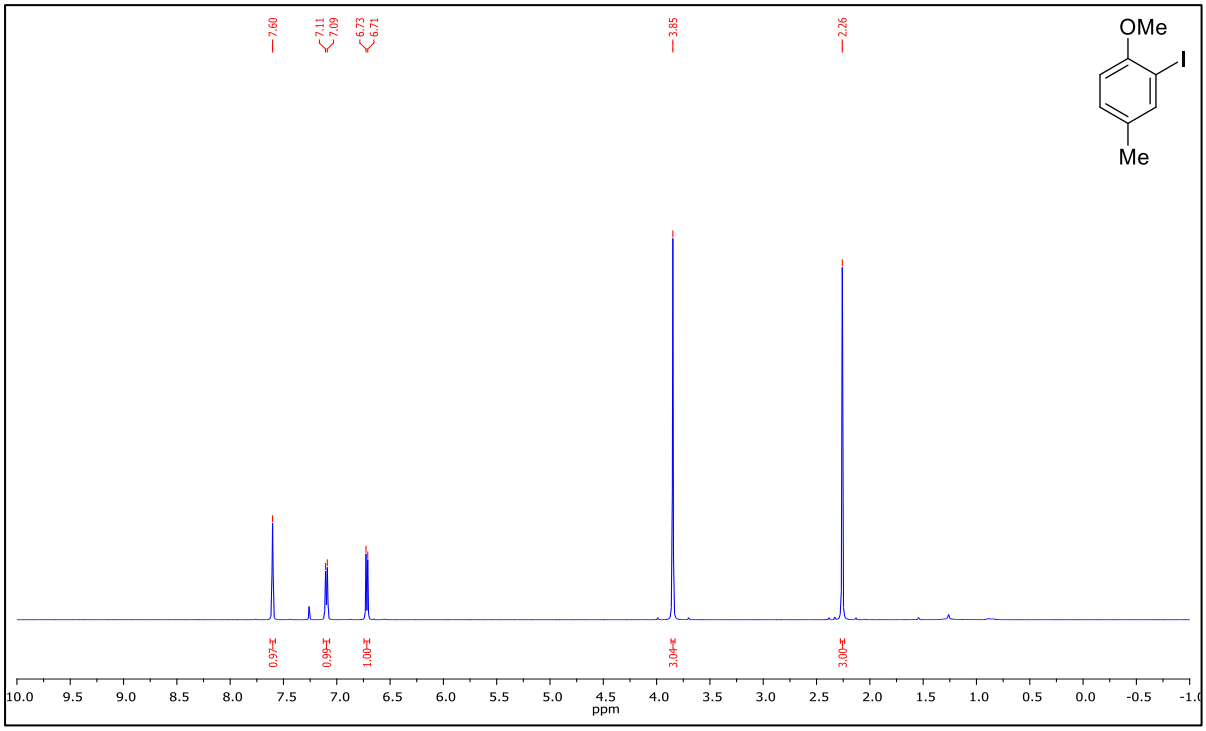


^{13}C NMR ($CDCl_3$)

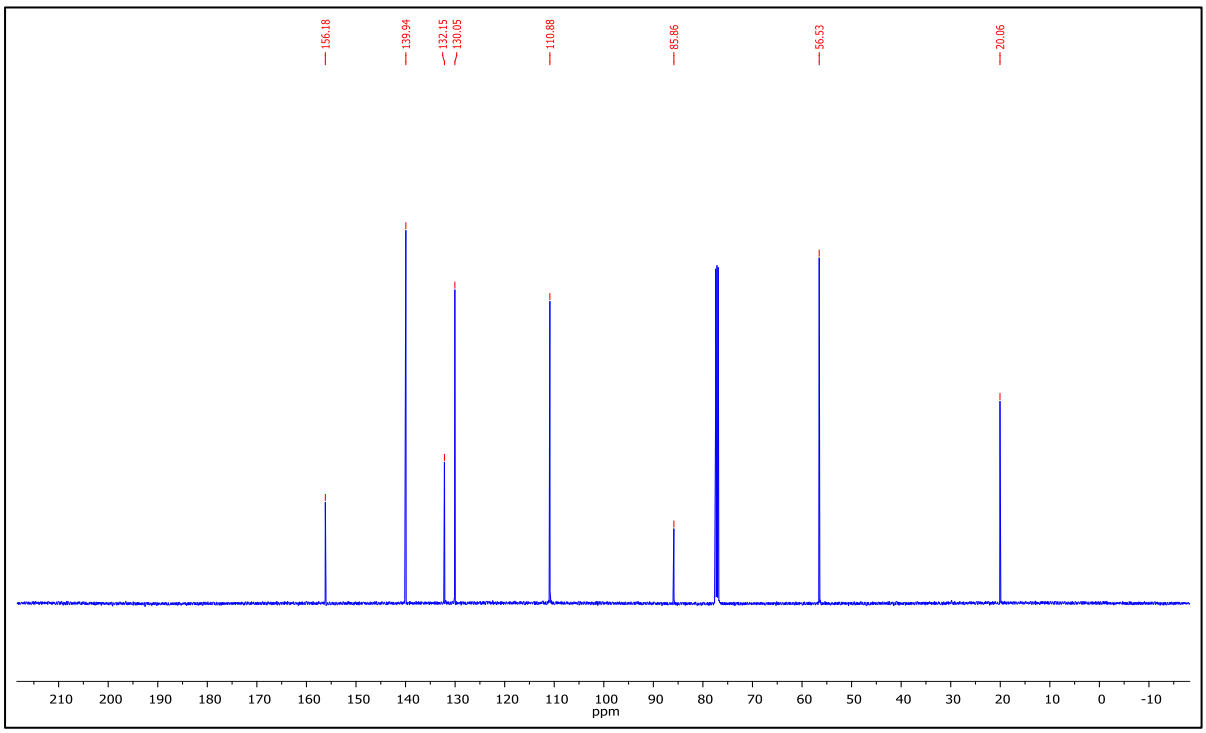


2-iodo-1,4-dimethoxybenzene (2B)

^{1}H NMR ($CDCl_3$)

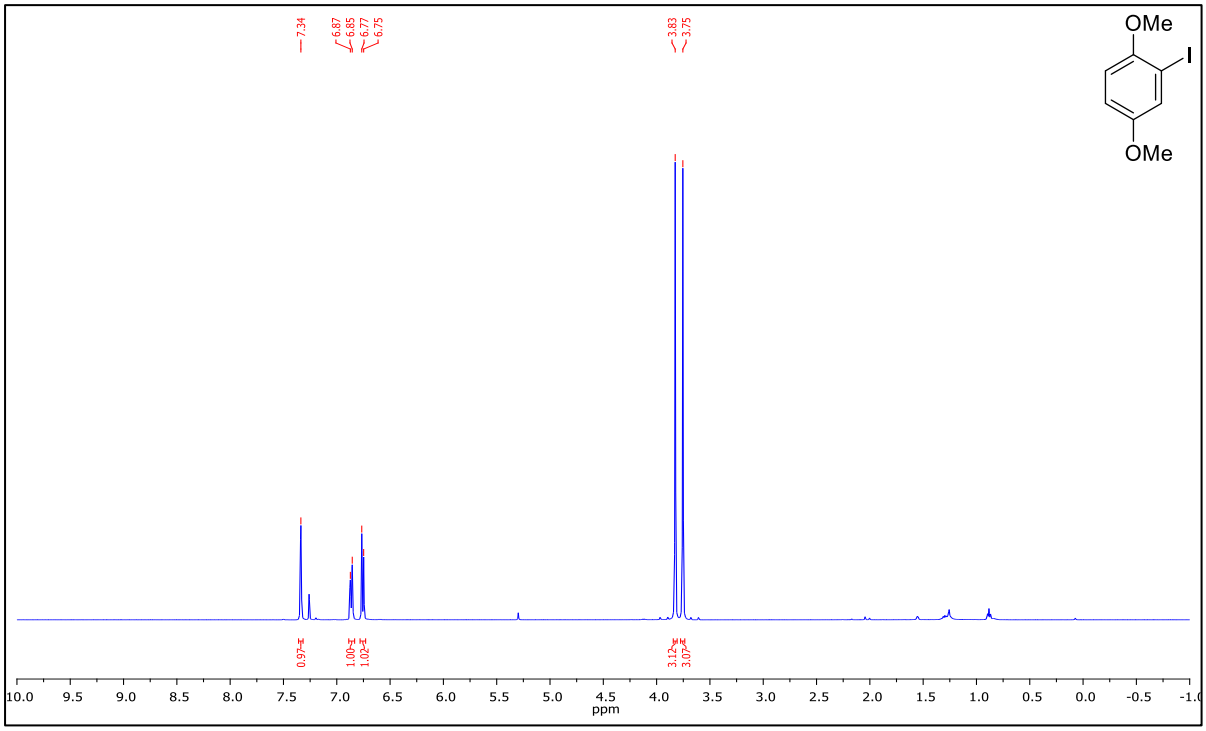


^{13}C NMR ($CDCl_3$)

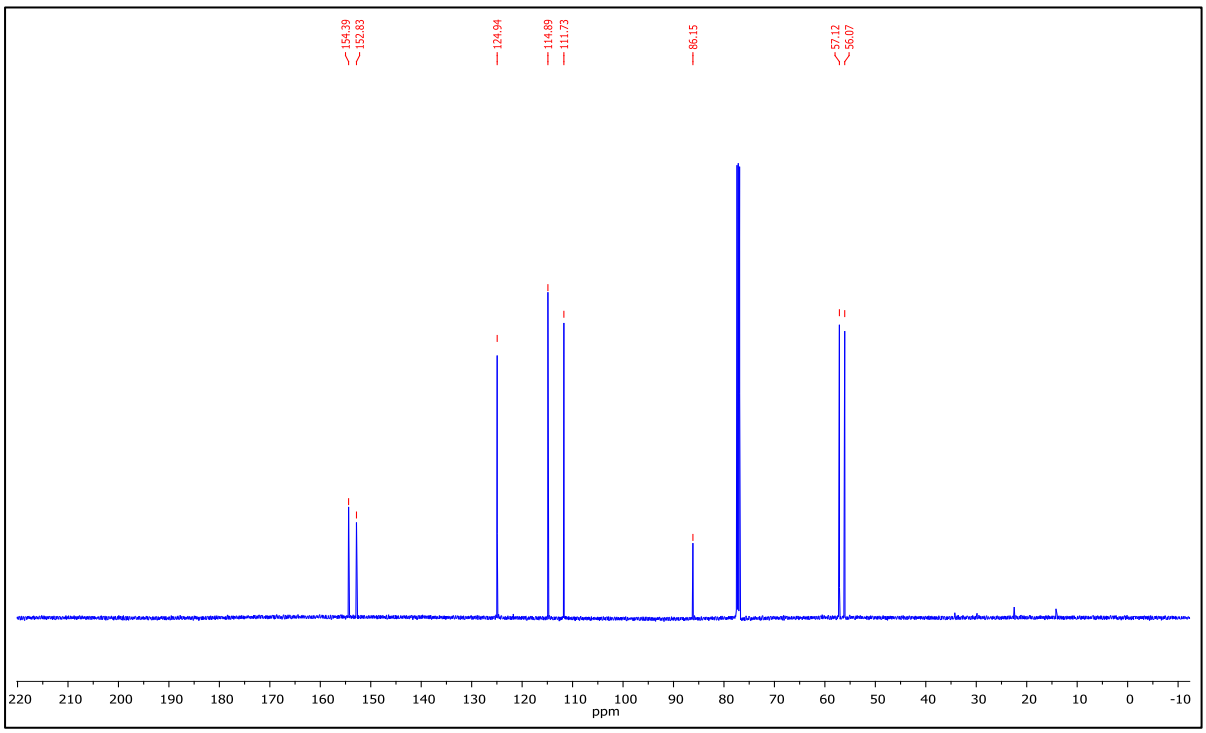


2-iodo-1,4-dimethoxybenzene (2C)

^{1}H NMR ($CDCl_3$)

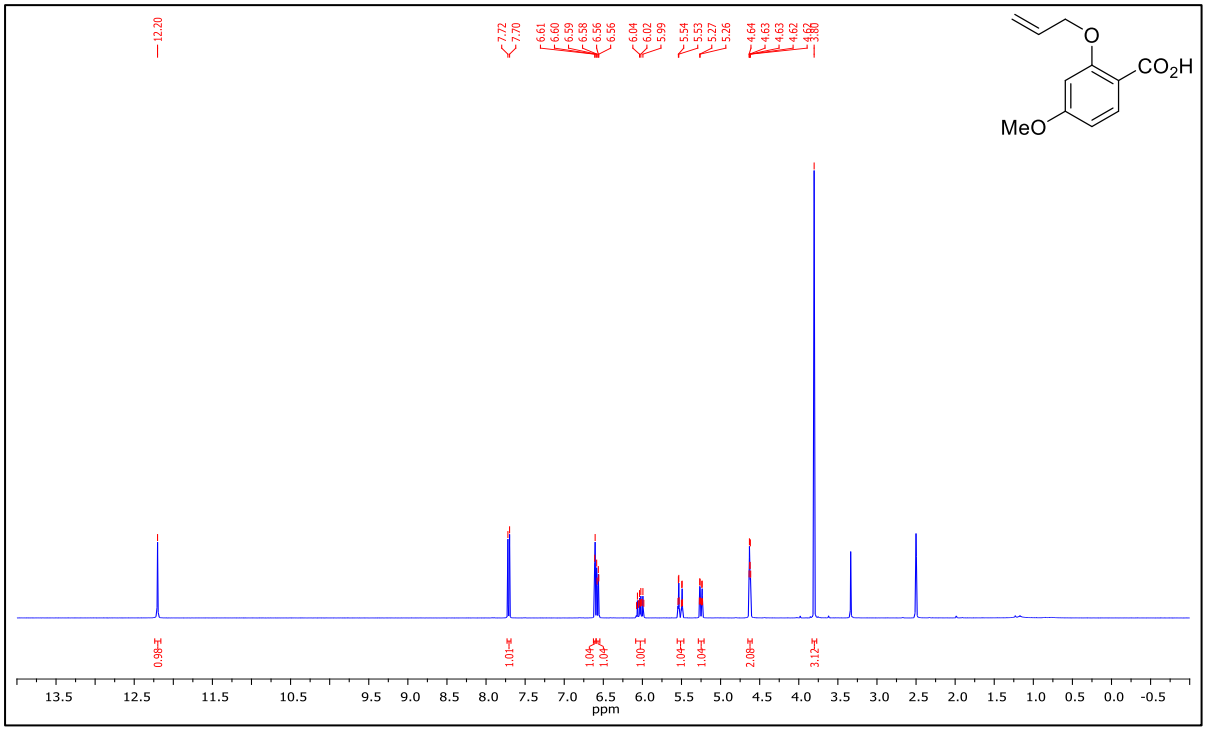


^{13}C NMR ($CDCl_3$)

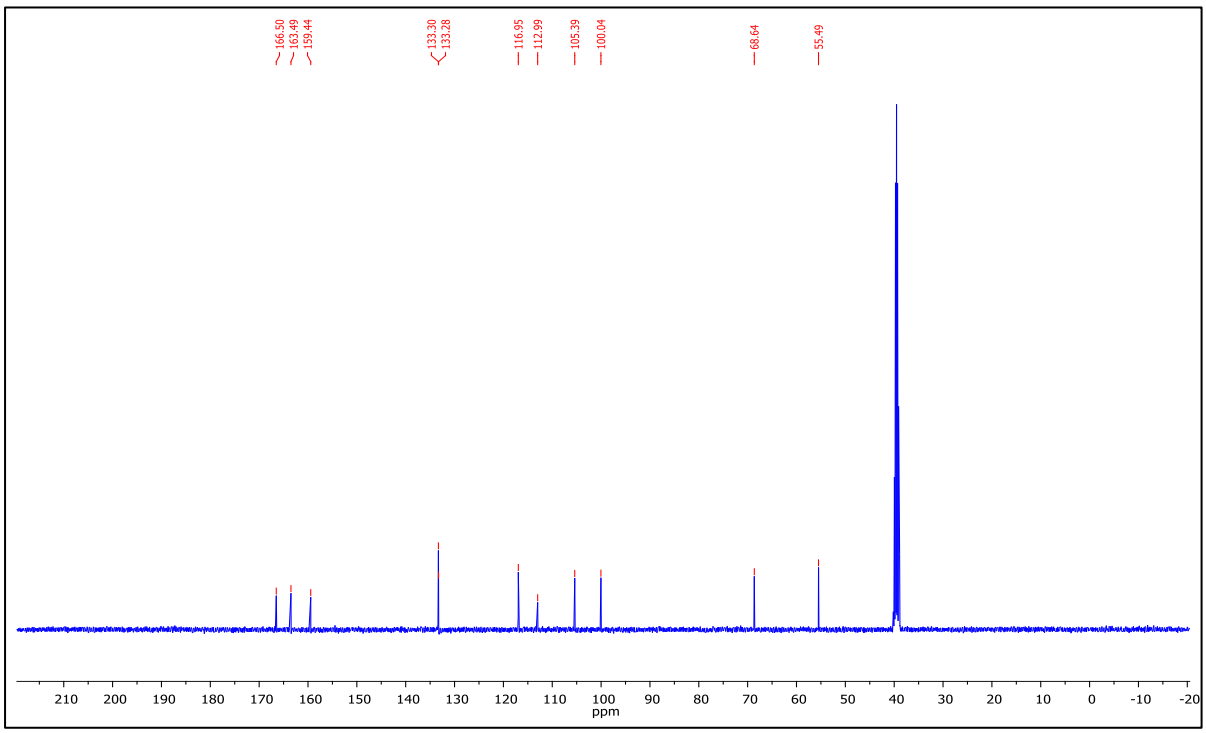


2-(allyloxy)-4-methoxybenzoic acid (1A)

^{1}H NMR ((CD$_3$)$_2$SO)

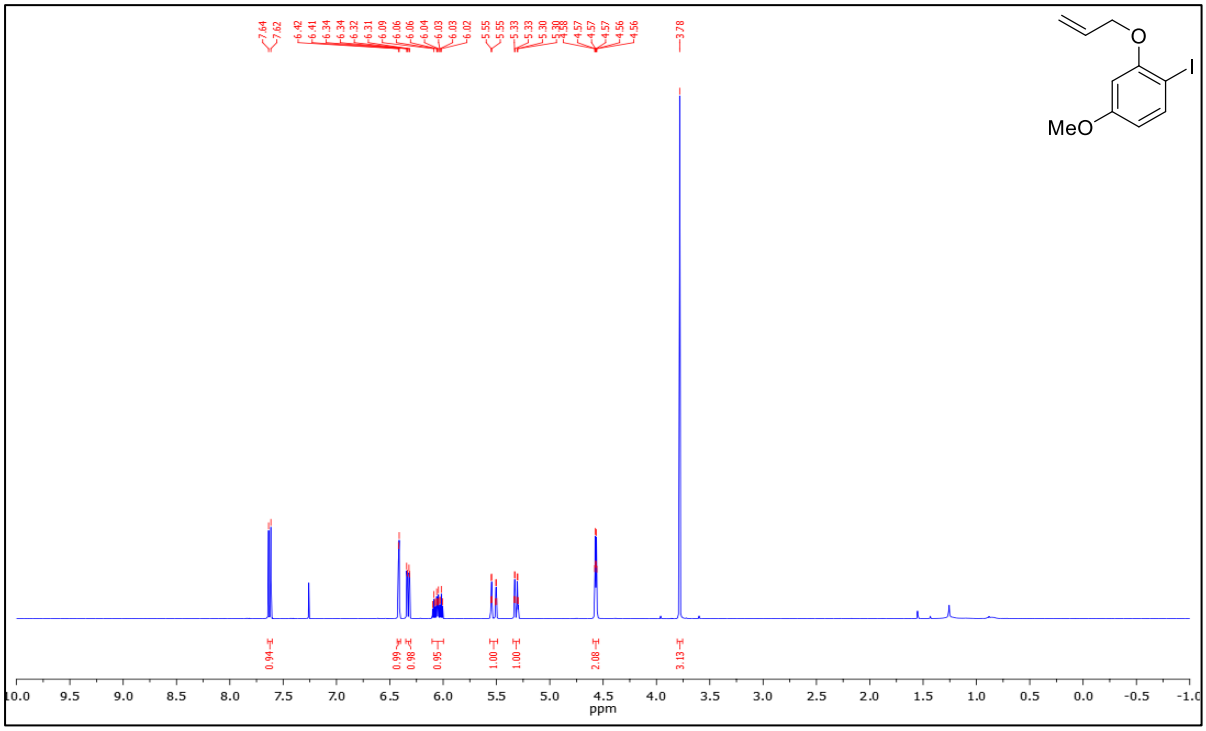


^{13}C NMR ((CD$_3$)$_2$SO)

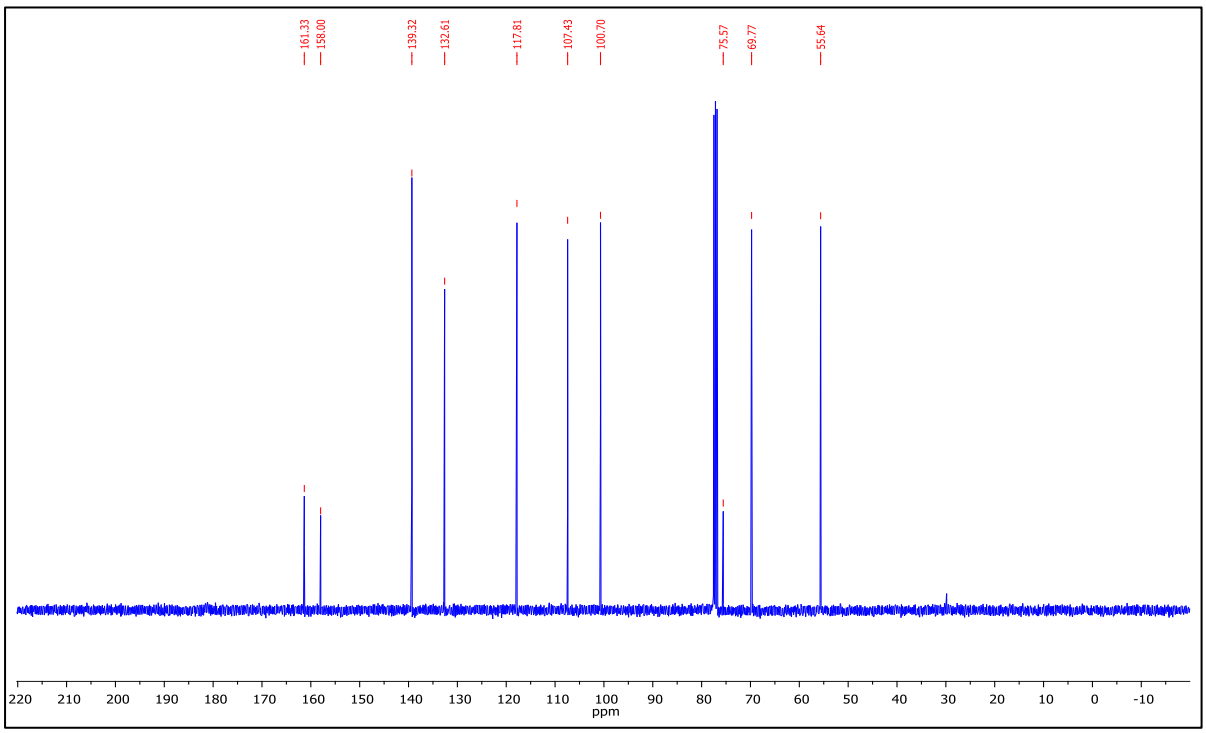


2-(allyloxy)-1-iodo-4-methoxybenzene (2A)

^{1}H NMR ($CDCl_3$)

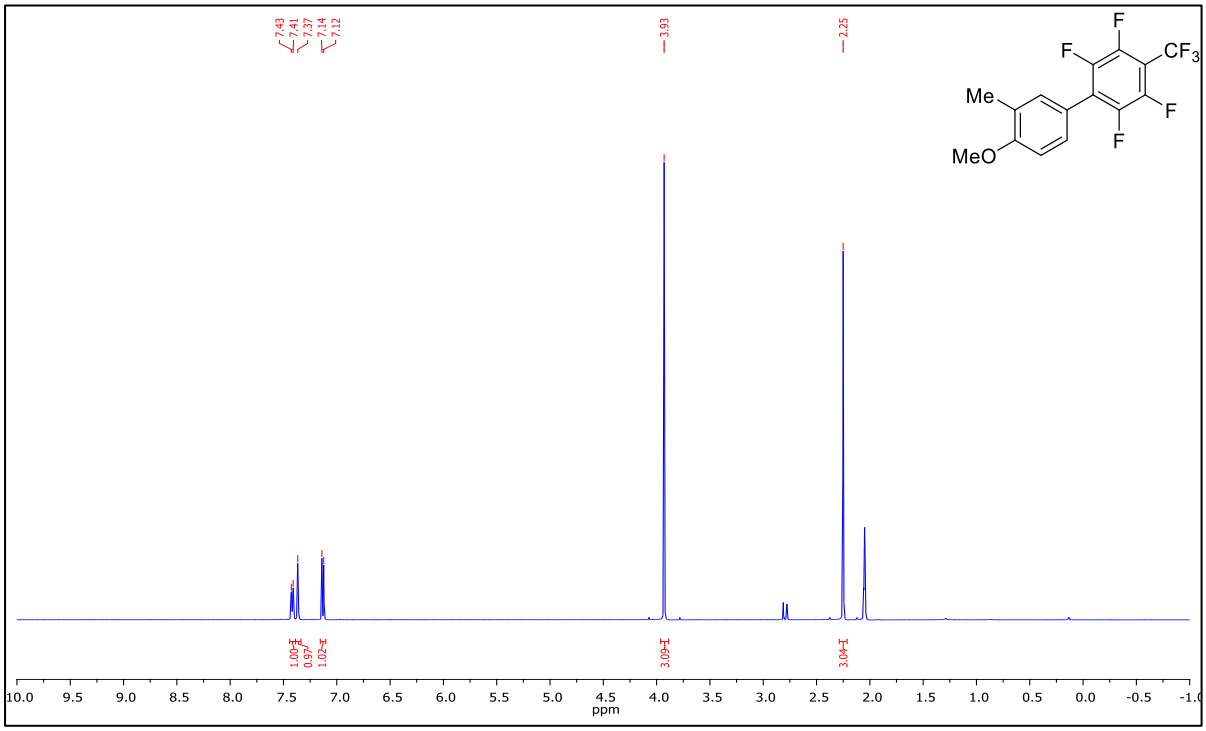


^{13}C NMR ($CDCl_3$)

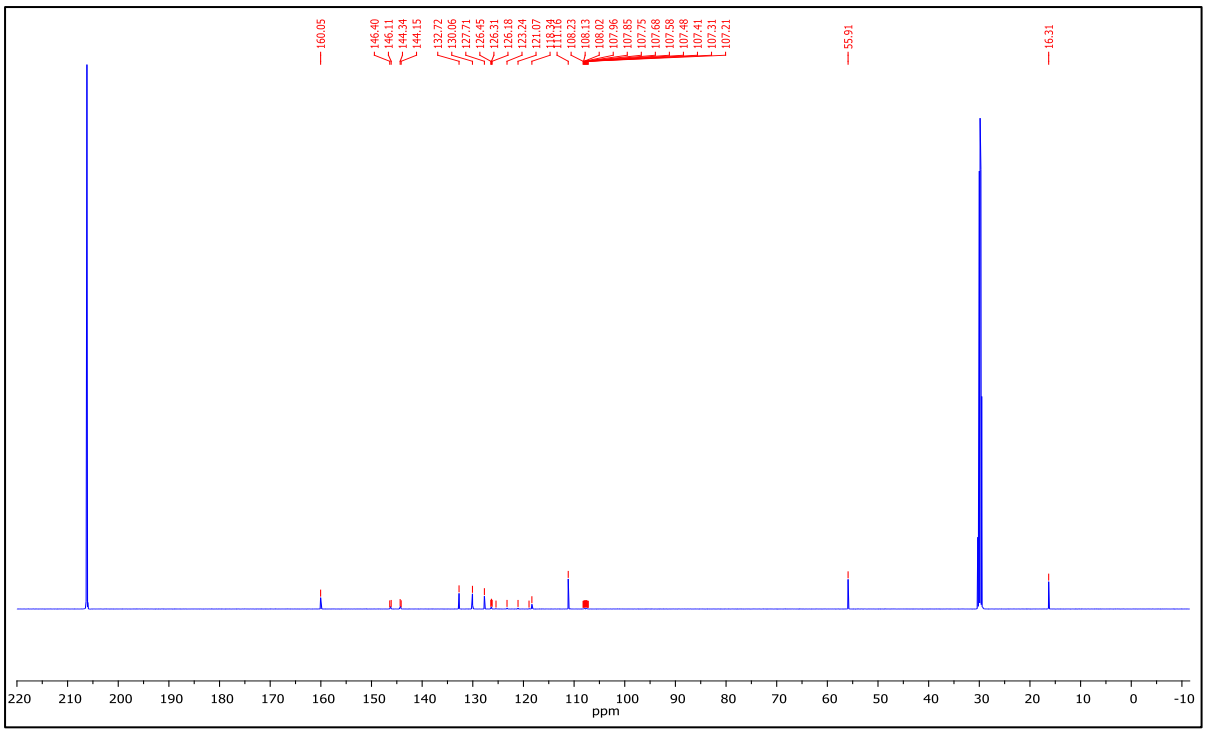


2,3,5,6-tetrafluoro-4'-methoxy-3'-methyl-4-(trifluoromethyl)-1,1'-biphenyl (5a)

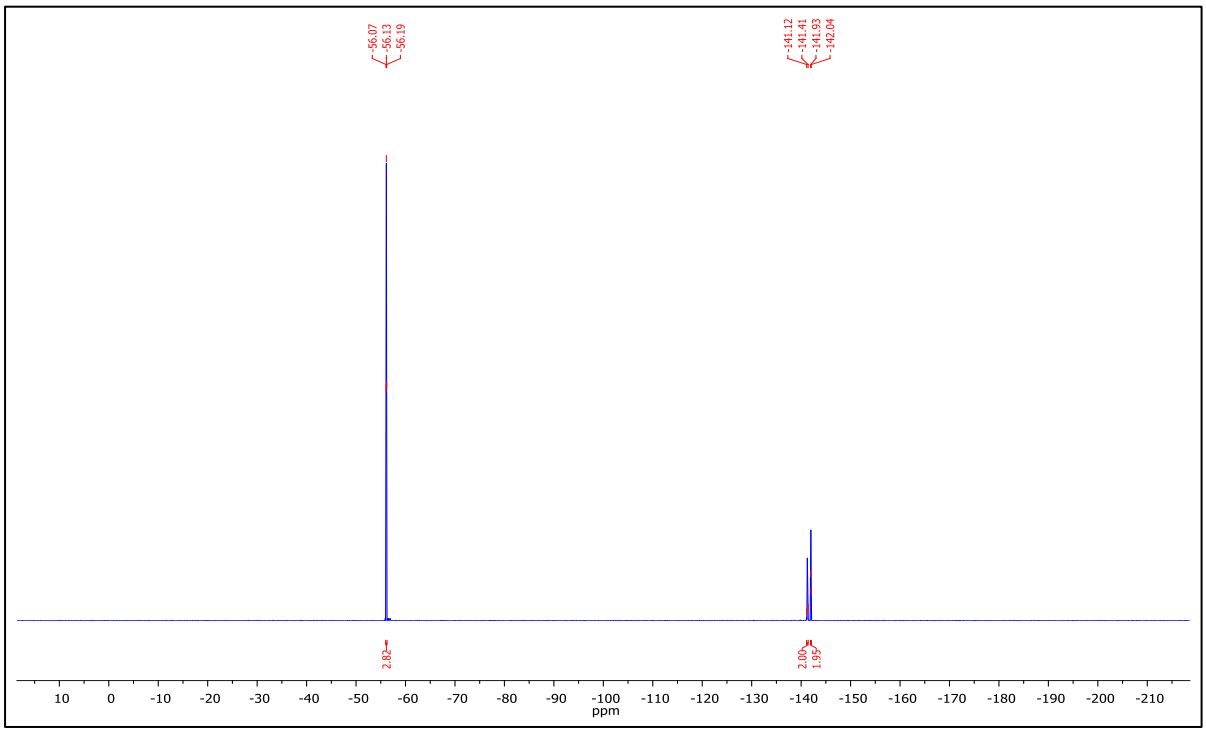
^{1}H NMR ($(CD_3)_2CO$)



^{13}C NMR ($(CD_3)_2CO$)

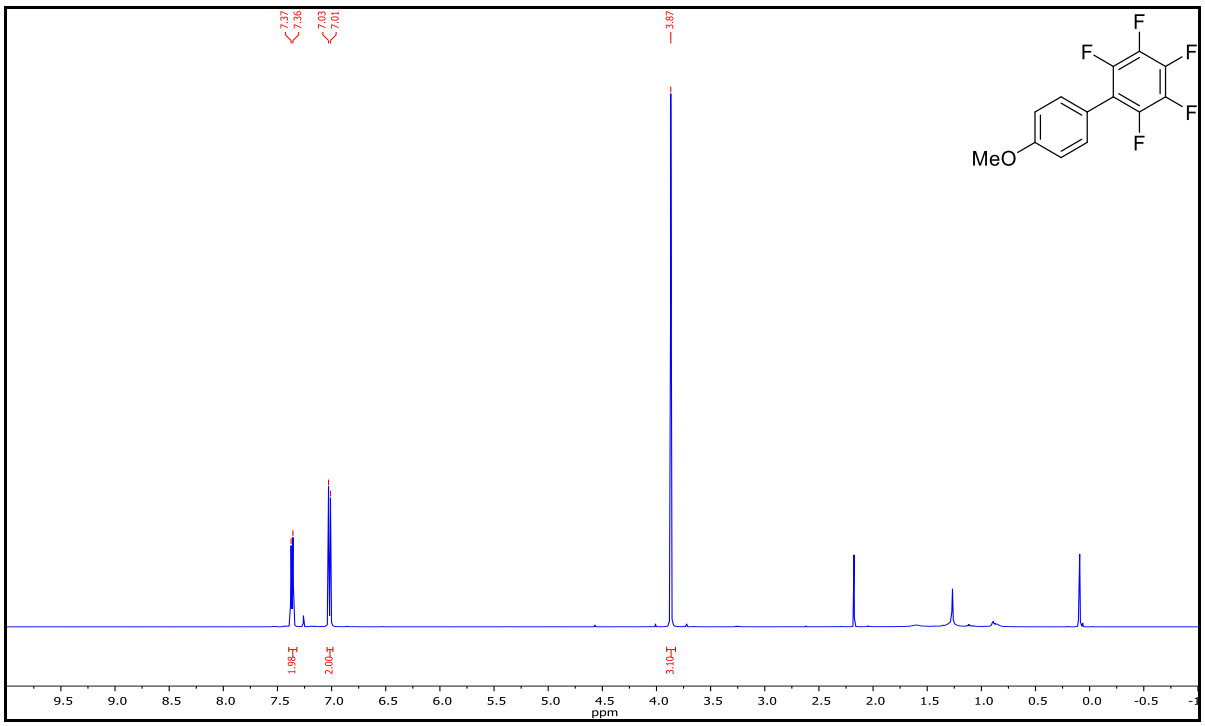


^{19}F NMR ($CDCl_3$)

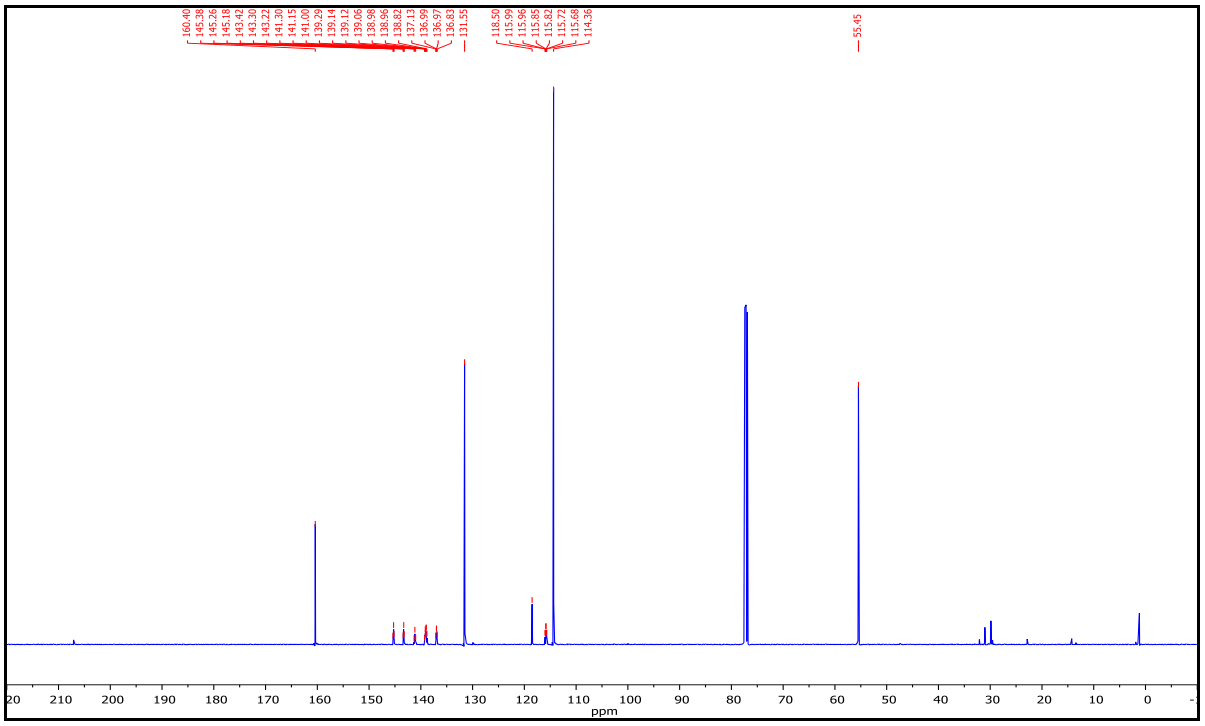


2,3,4,5,6-pentafluoro-4'-methoxy-1,1'-biphenyl (5b)

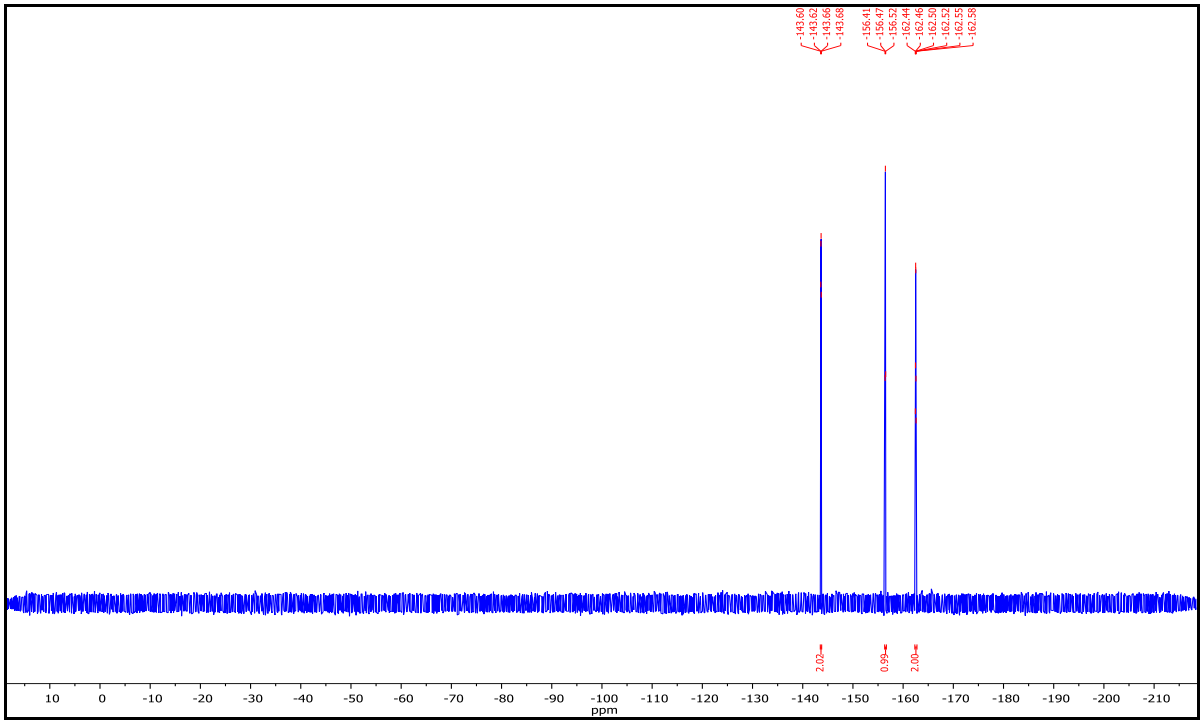
^{1}H NMR ($CDCl_3$)



^{13}C NMR ($CDCl_3$)

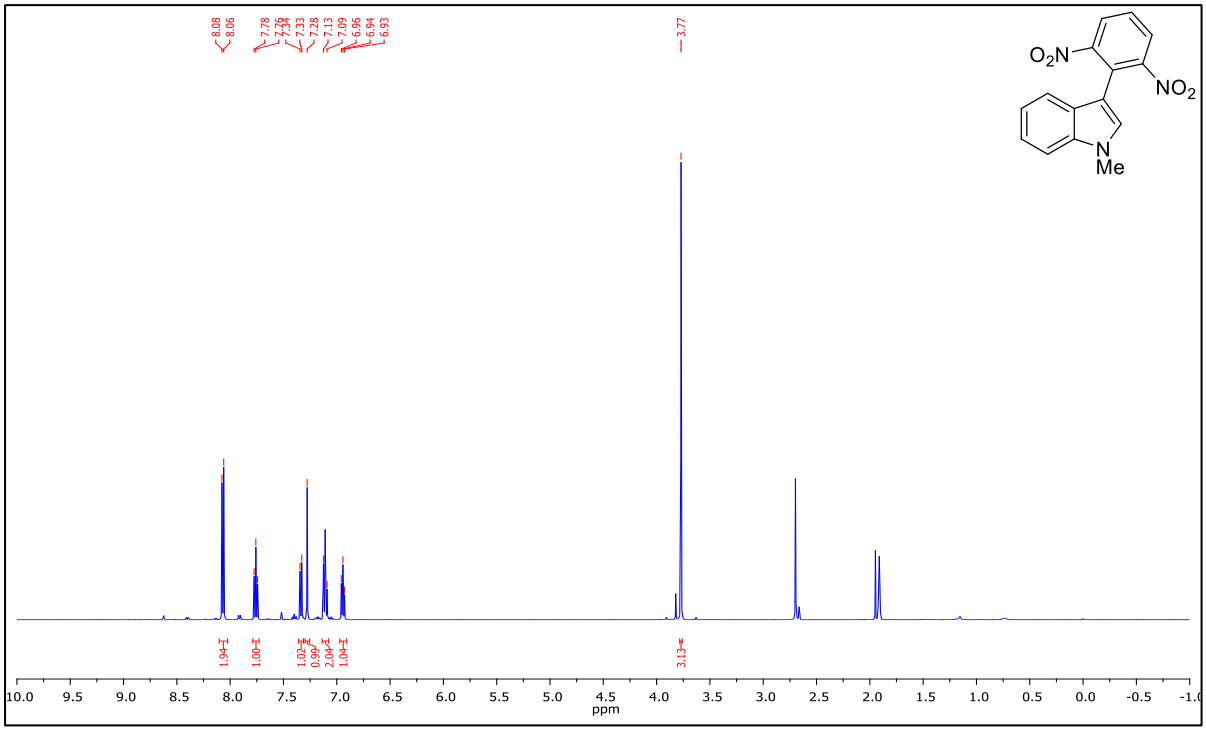


^{19}F NMR ($CDCl_3$)

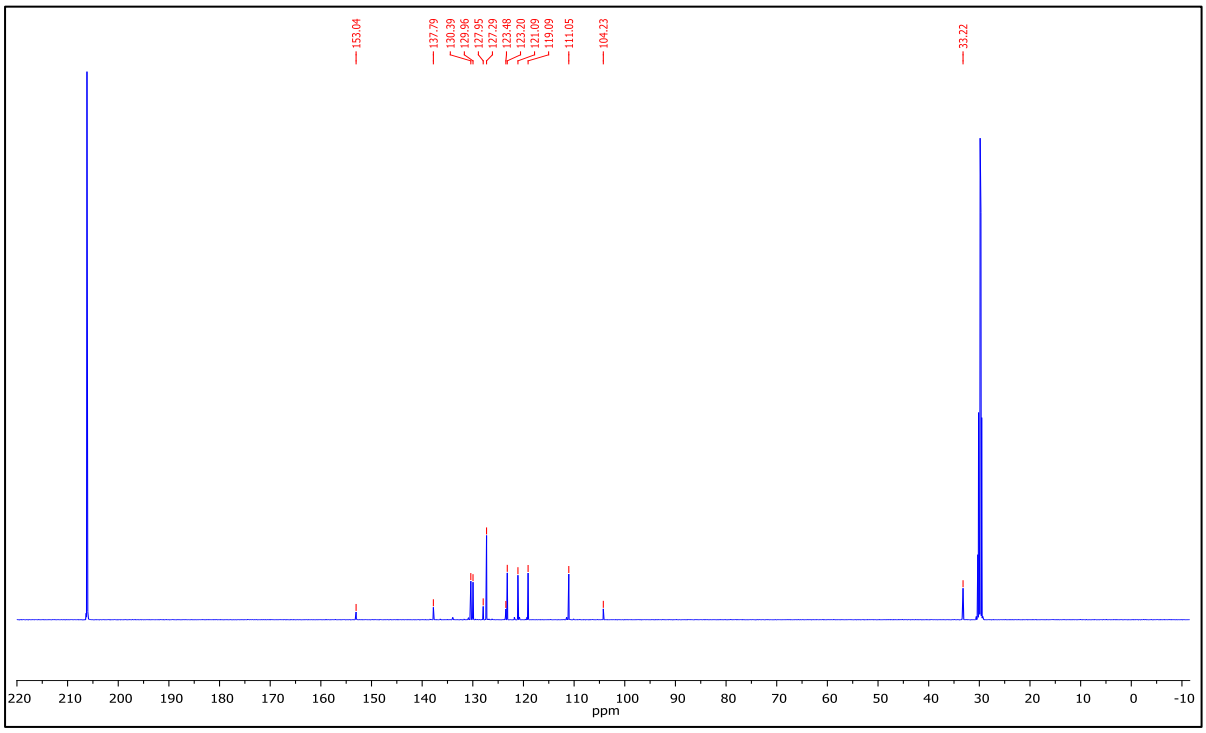


3-(2,6-dinitrophenyl)-1-methyl-1*H*-indole (5c)

^{1}H NMR ((CD$_3$)$_2$CO)

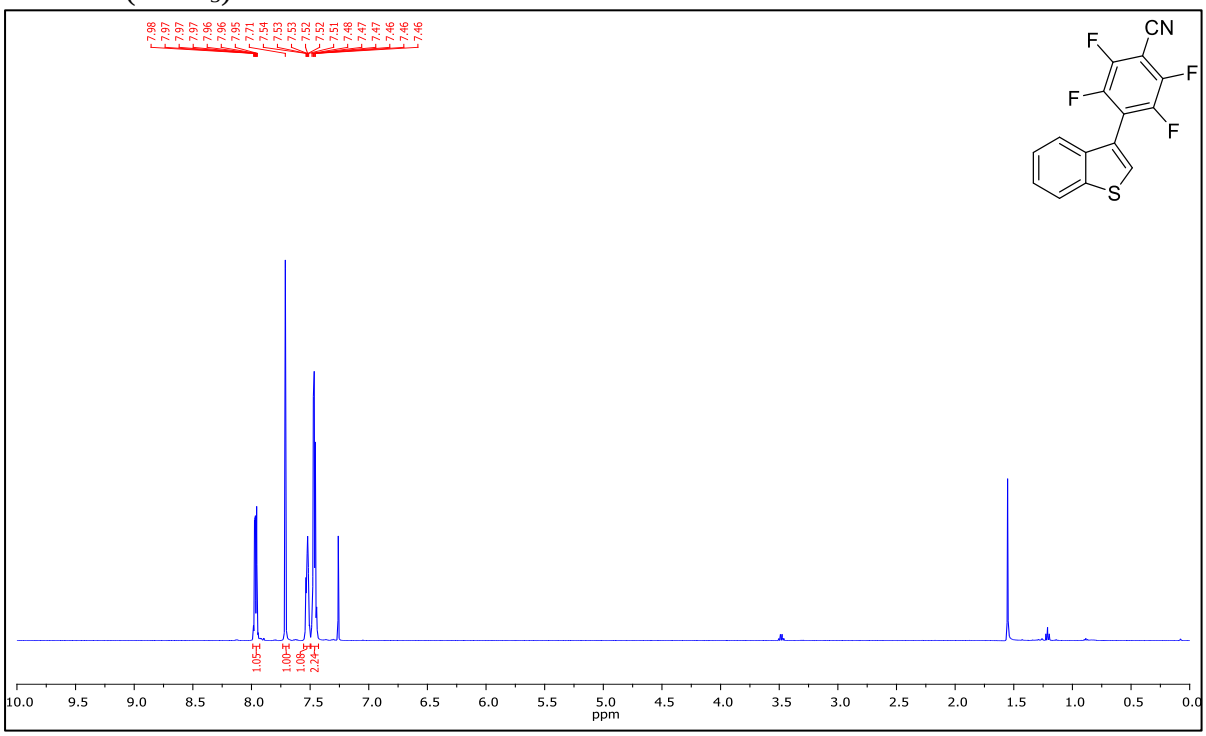


^{13}C NMR ((CD$_3$)$_2$CO)

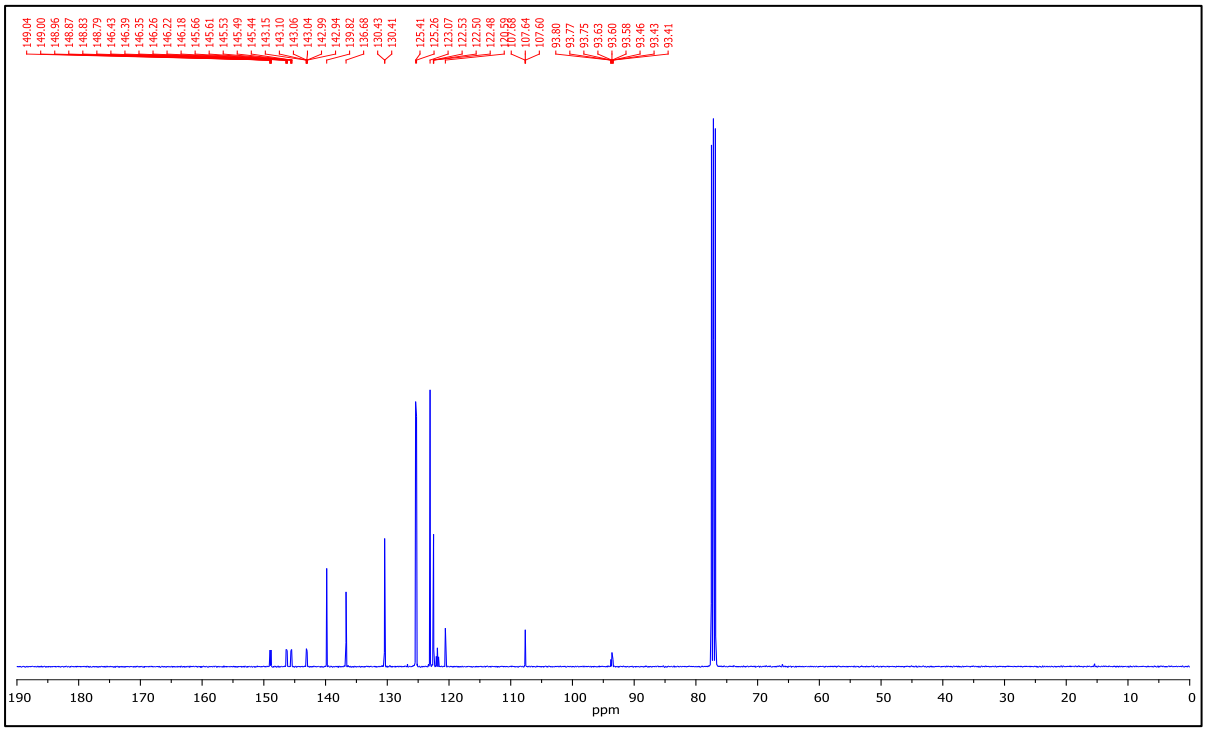


4-(benzo[b]thiophen-3-yl)-2,3,5,6-tetrafluorobenzonitrile (5d)

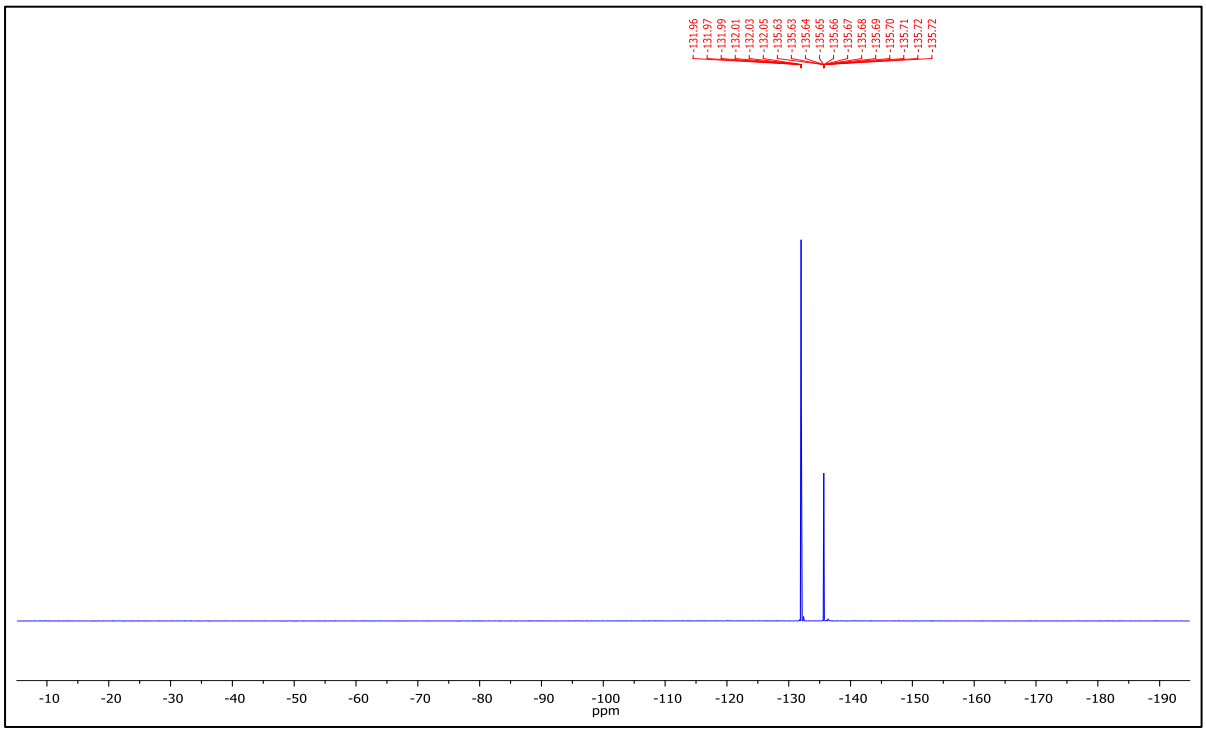
^{1}H NMR ($CDCl_3$)



^{13}C NMR ($CDCl_3$)

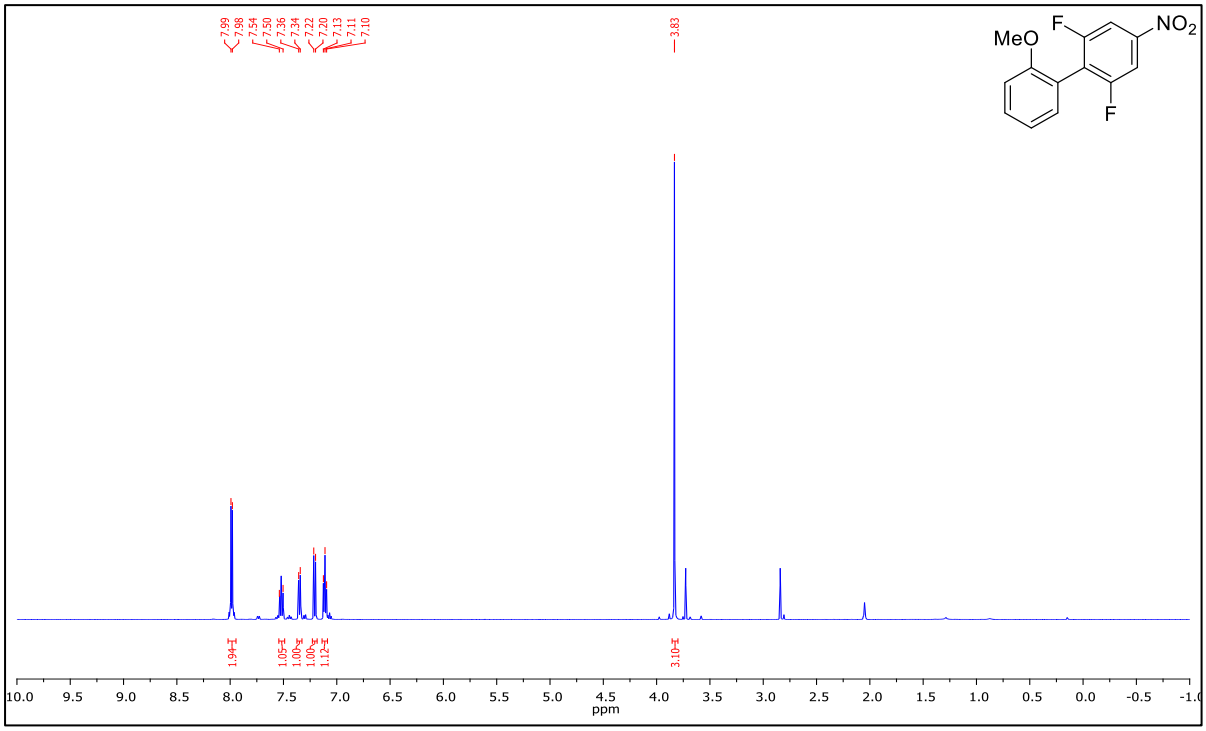


^{19}F NMR ($CDCl_3$)

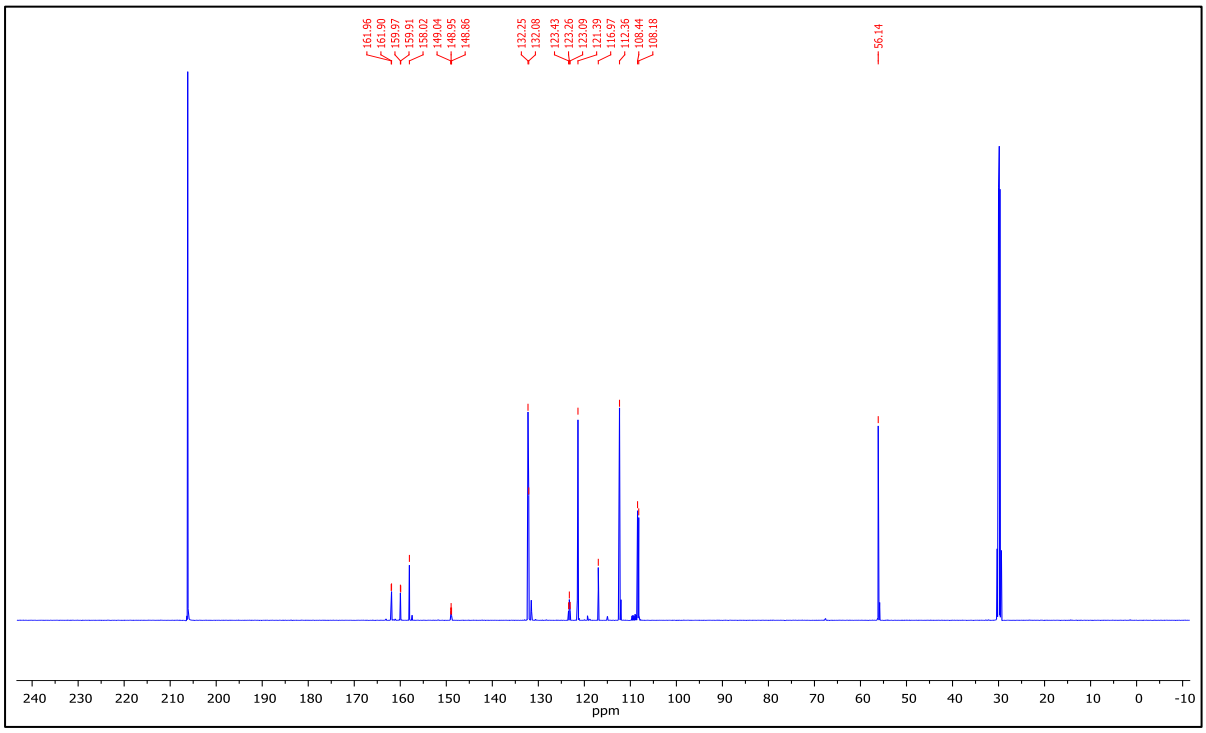


2,6-difluoro-2'-methoxy-4-nitro-1,1'-biphenyl (5e)

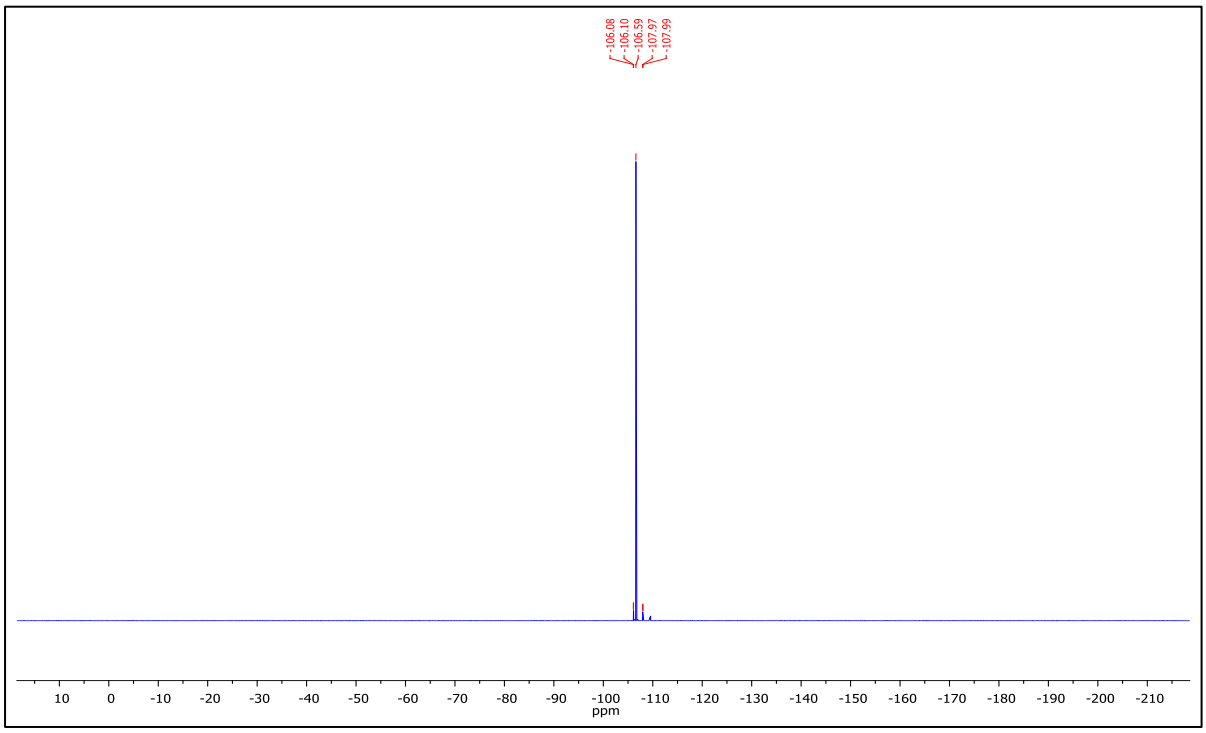
^{1}H NMR ((CD$_3$)$_2$CO)



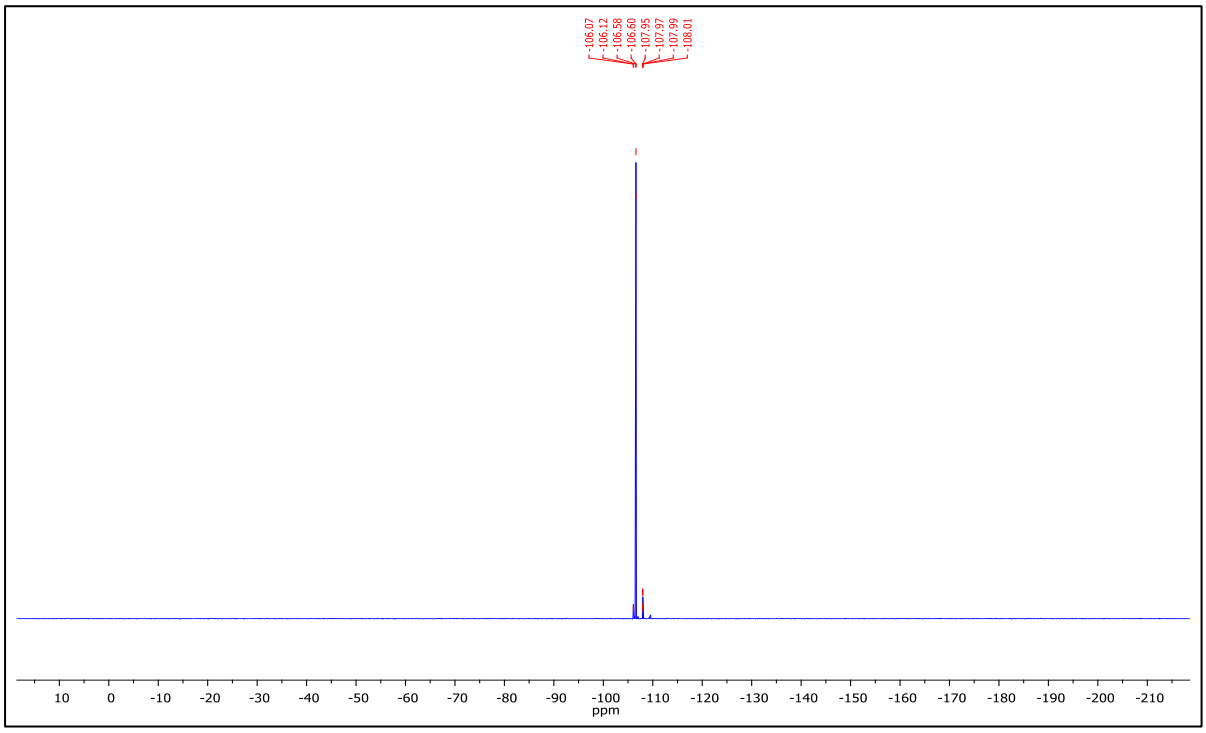
^{13}C NMR ((CD$_3$)$_2$CO)



$^{19}F\{^{1}H\}$ NMR ($CDCl_3$)

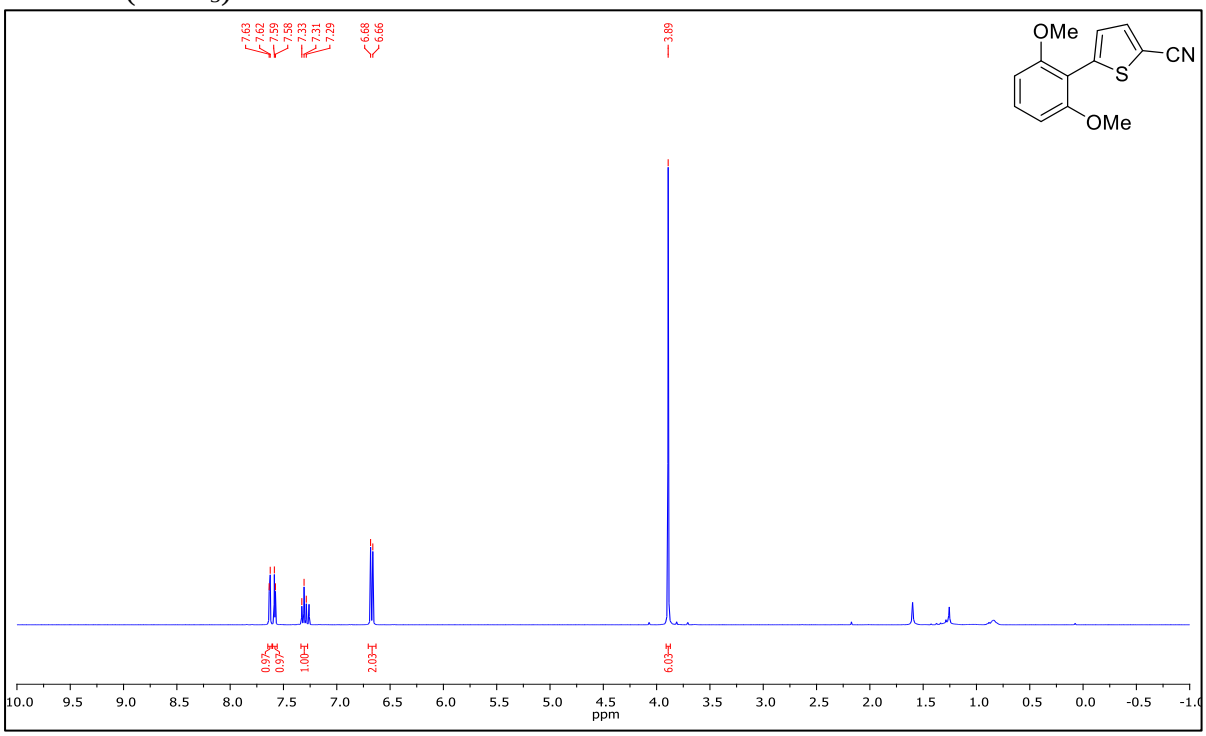


^{19}F NMR ($CDCl_3$)

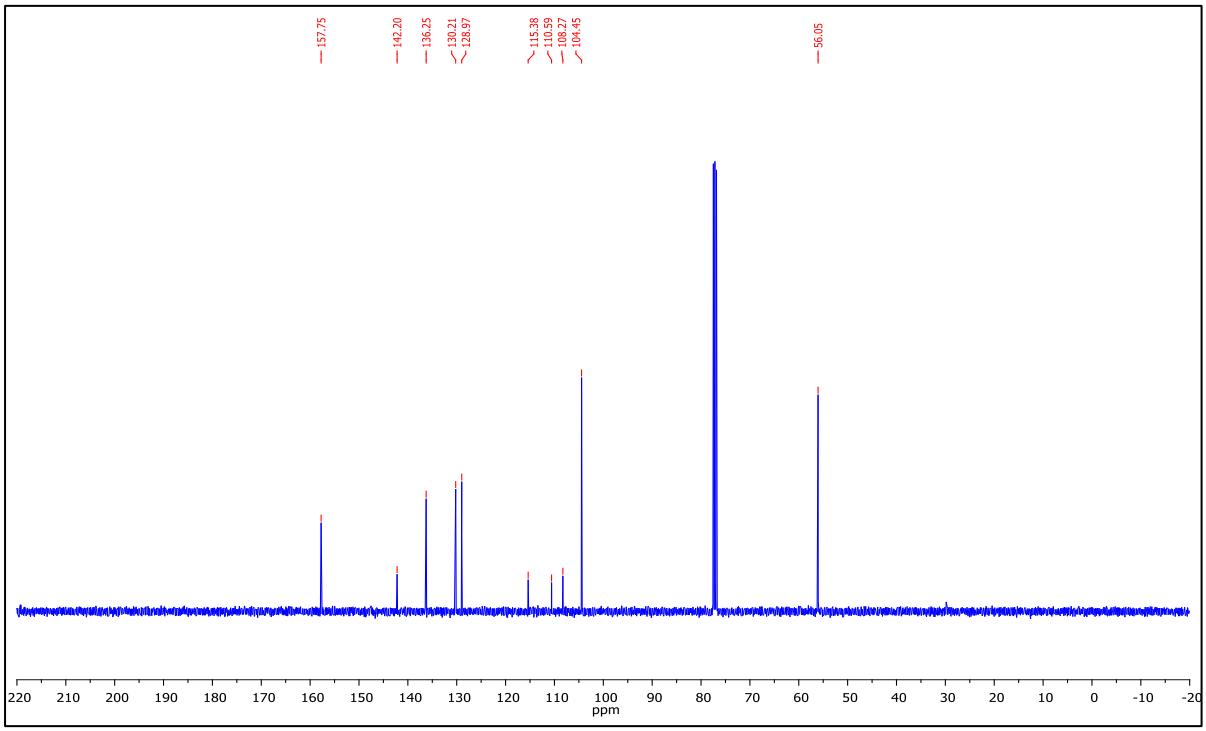


5-(2,6-dimethoxyphenyl)thiophene-2-carbonitrile (5f)

^{1}H NMR ($CDCl_3$)

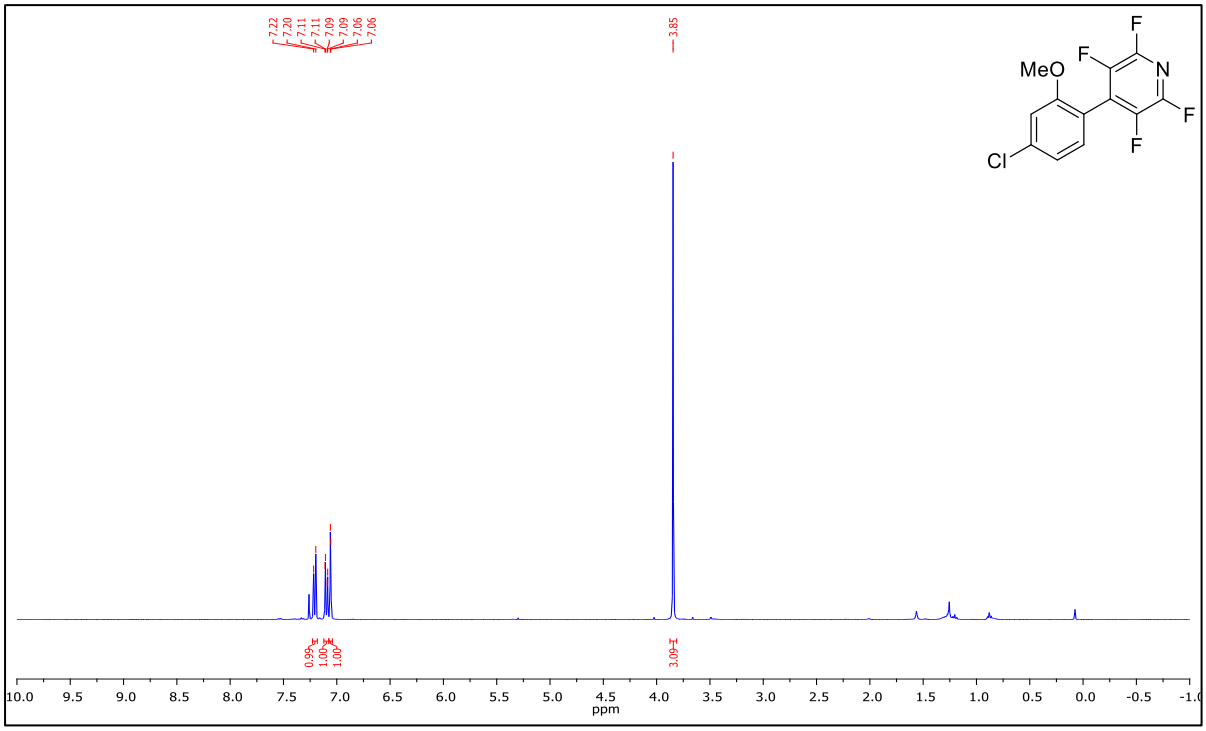


^{13}C NMR ($CDCl_3$)

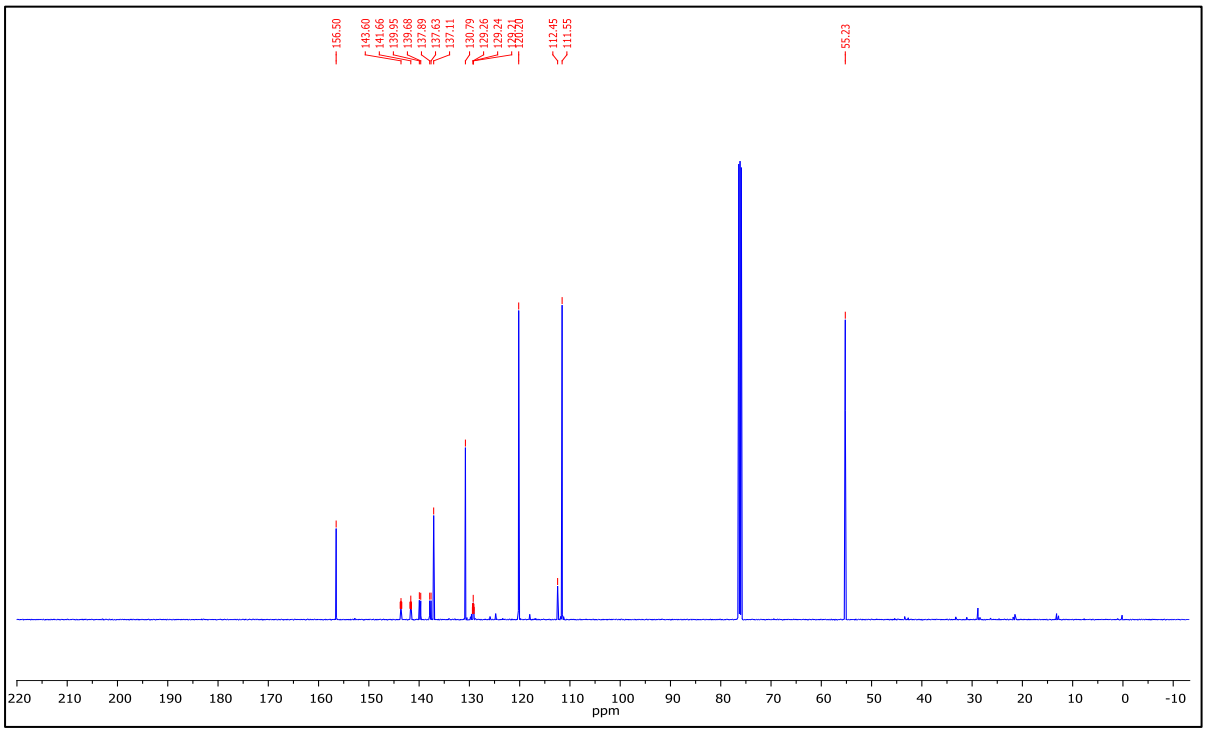


4-(4-chloro-2-methoxyphenyl)-2,3,5,6-tetrafluoropyridine (5g)

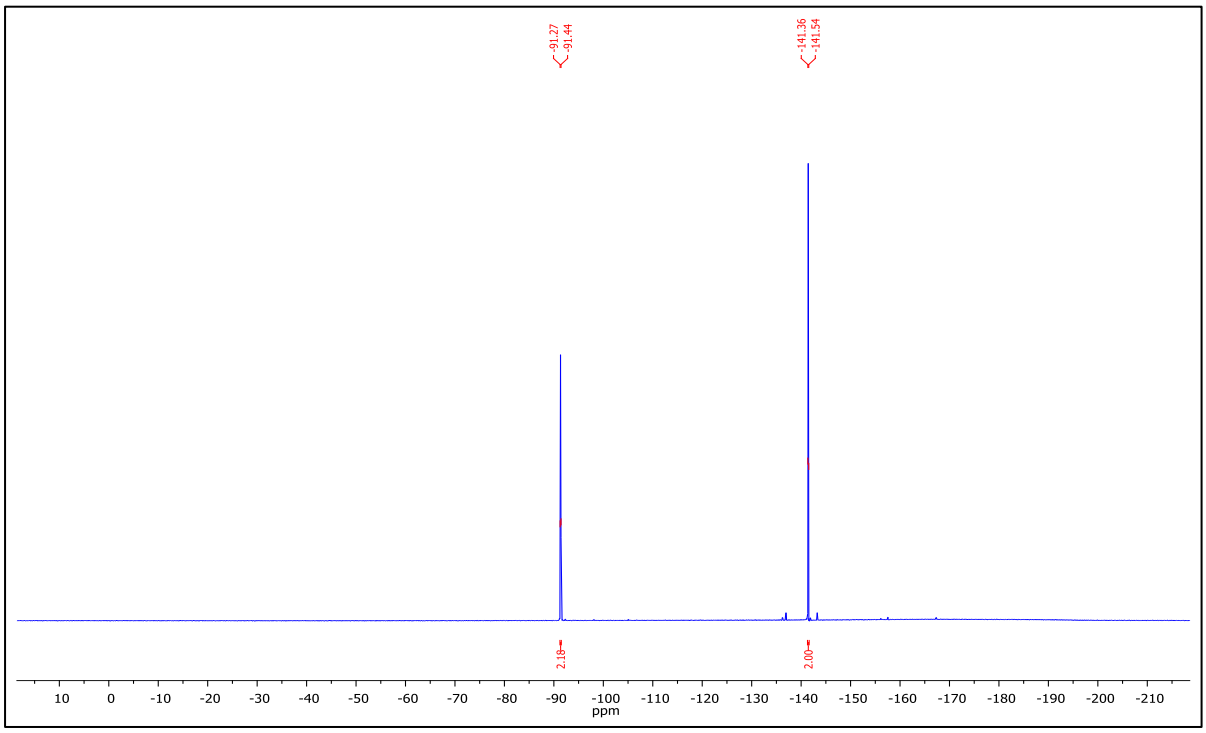
^{1}H NMR ($CDCl_3$)



^{13}C NMR ($CDCl_3$)

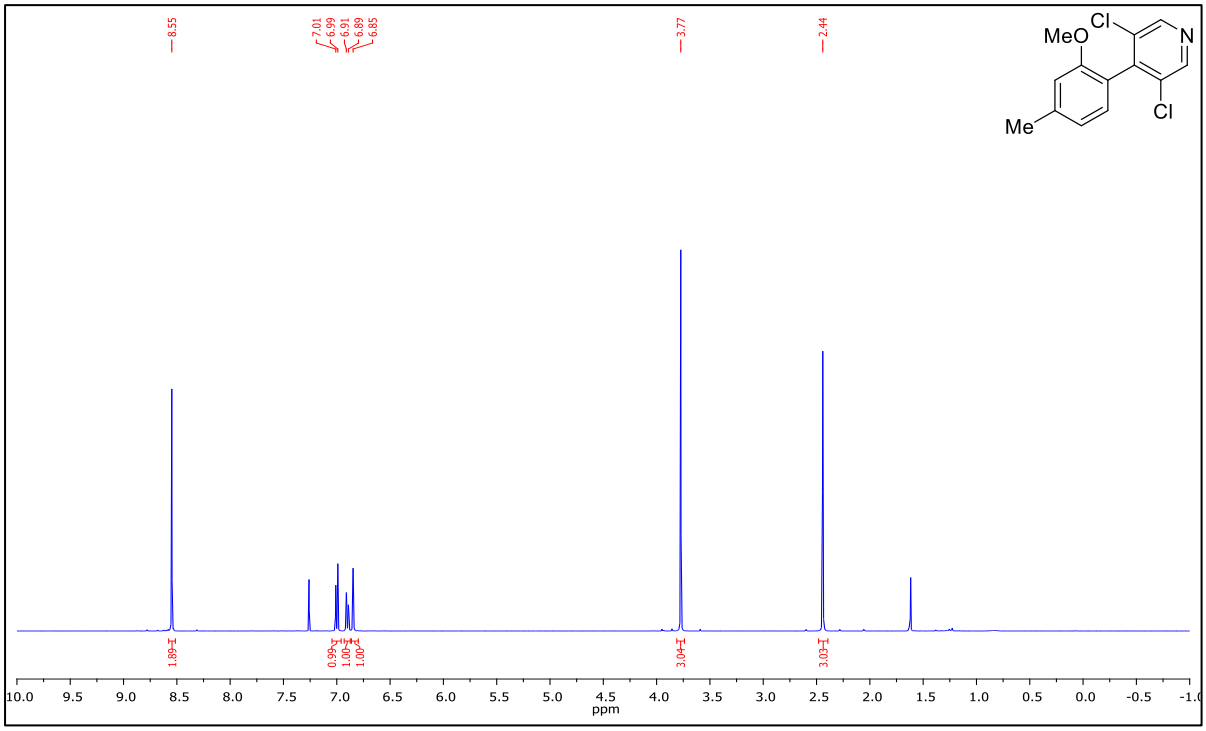


^{19}F NMR ($CDCl_3$)

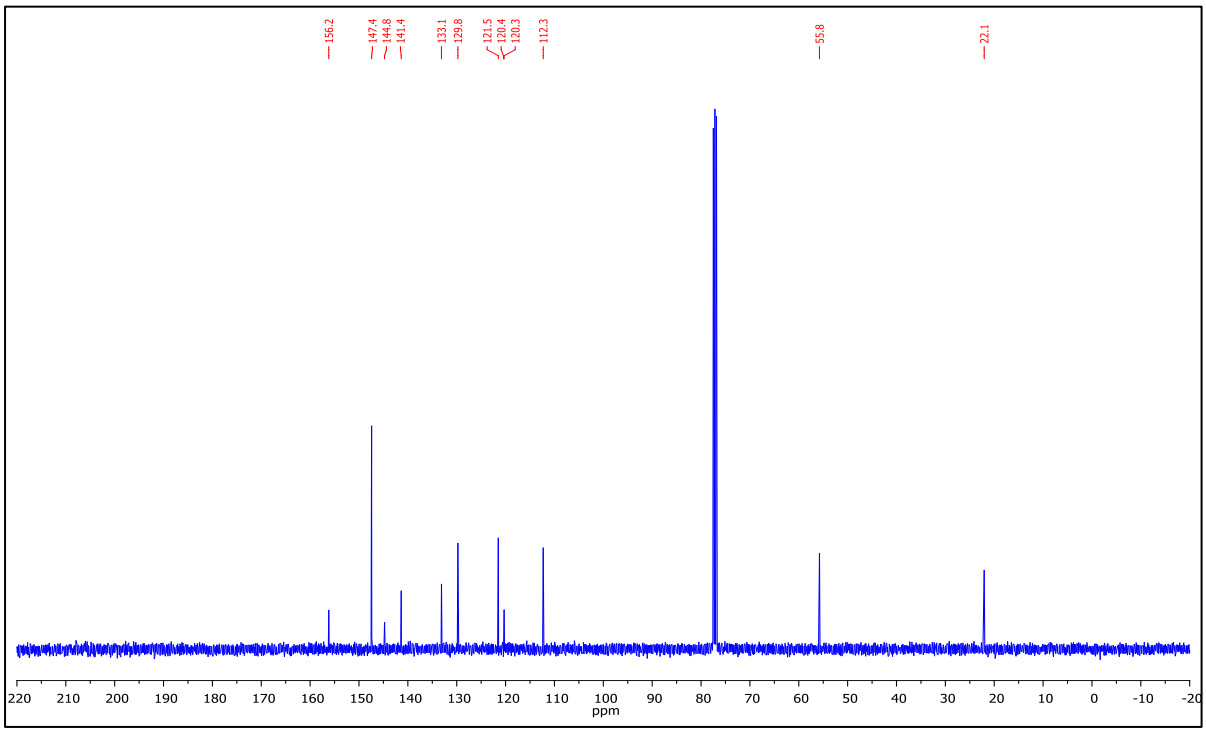


4-(4-chloro-2-methoxyphenyl)-2,3,5,6-tetrafluoropyridine (5h)

^{1}H NMR ($CDCl_3$)

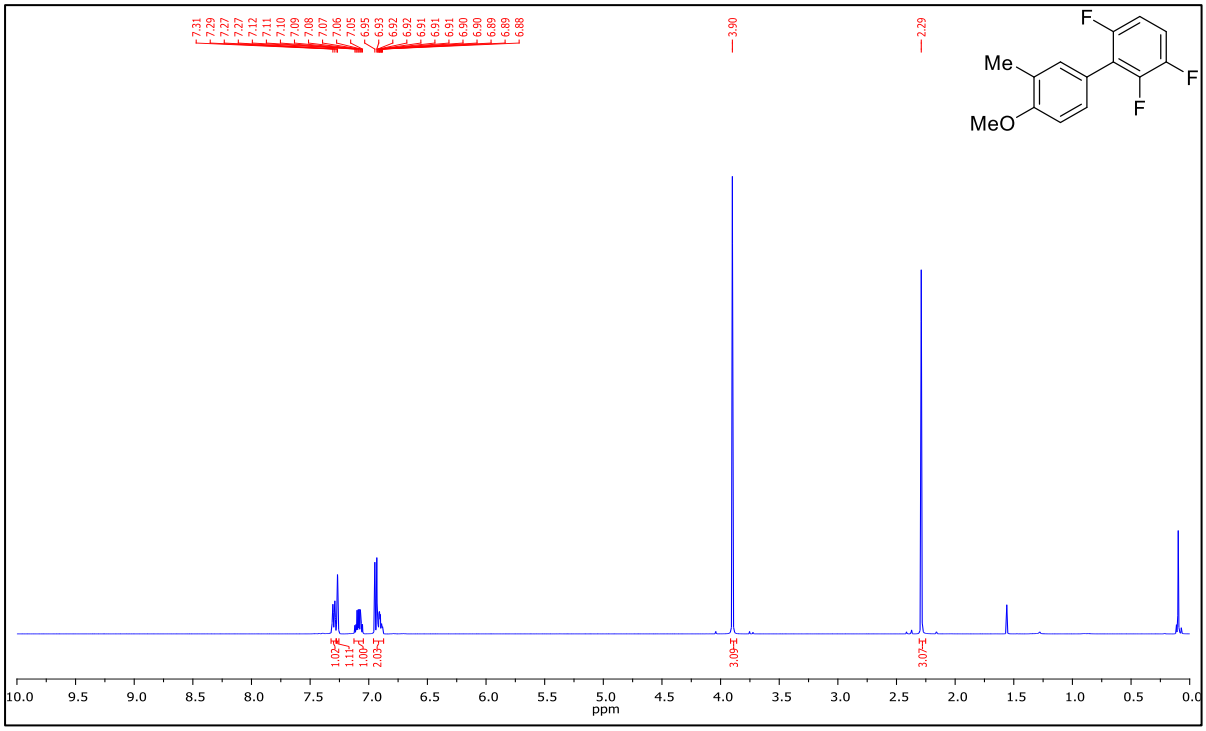


^{13}C NMR ($CDCl_3$)

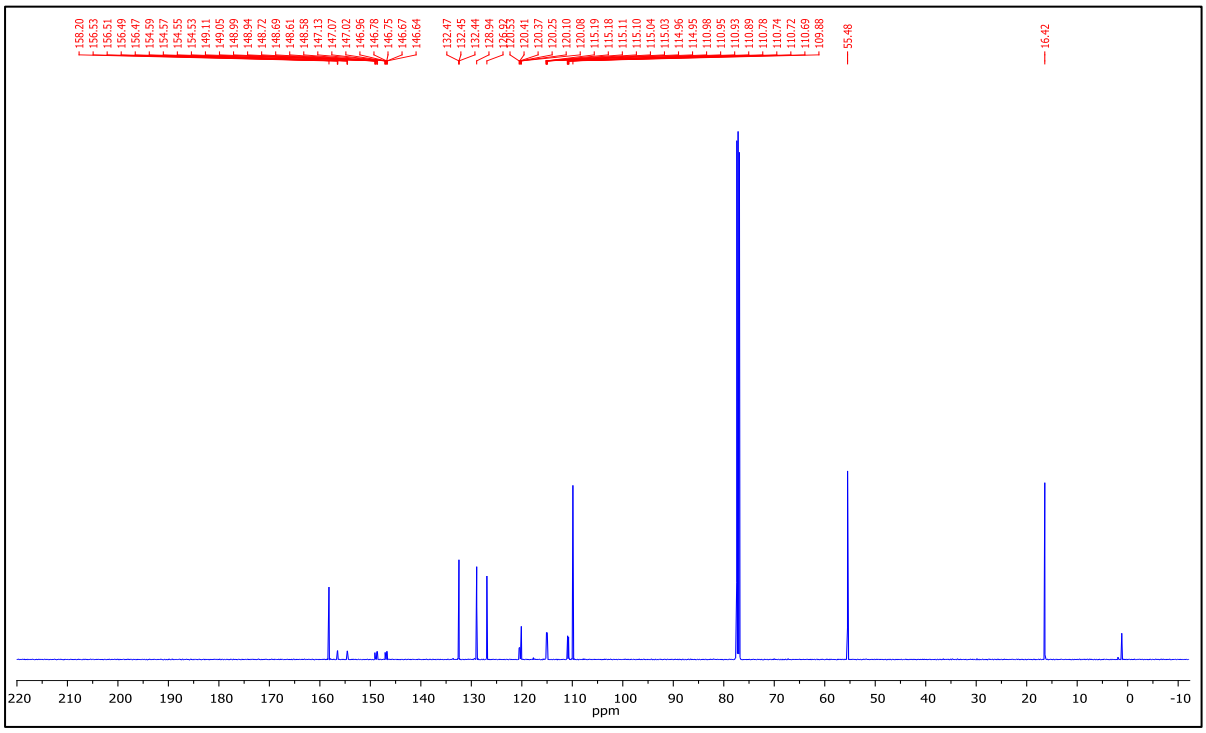


2,3,6-trifluoro-4'-methoxy-3'-methyl-1,1'-biphenyl (8a)

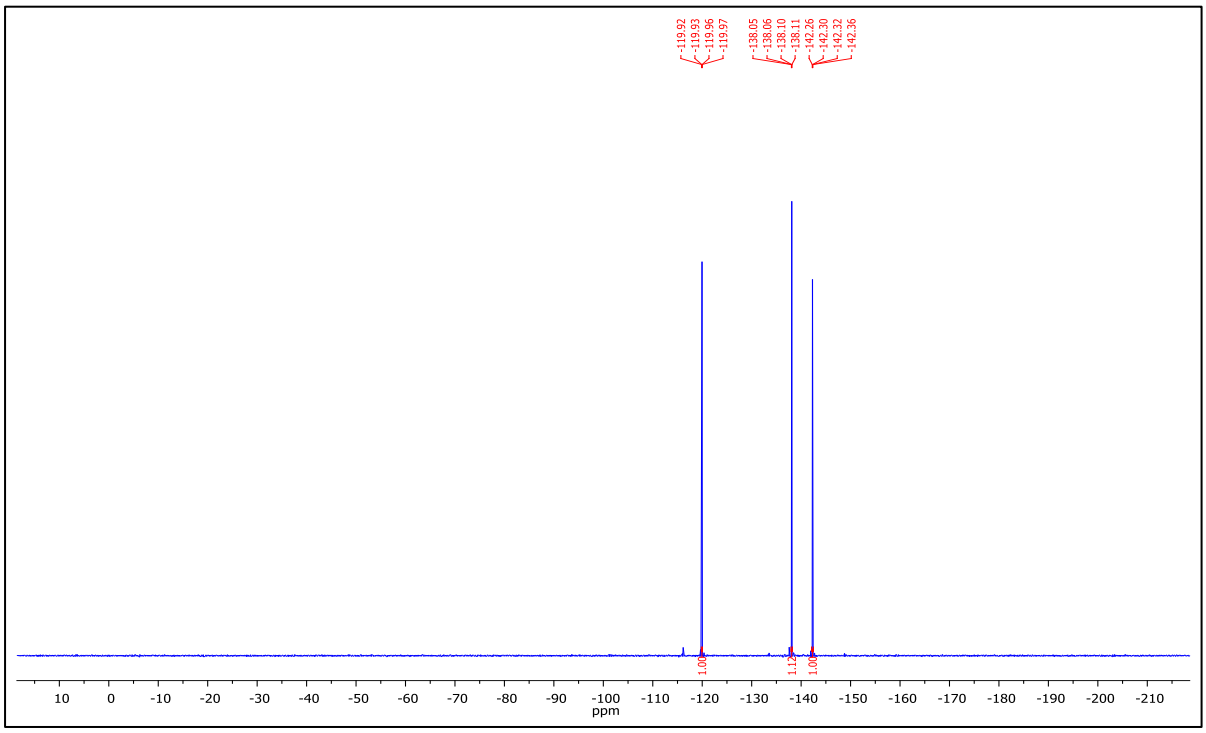
^{1}H NMR ($CDCl_3$)



^{13}C NMR ($CDCl_3$)

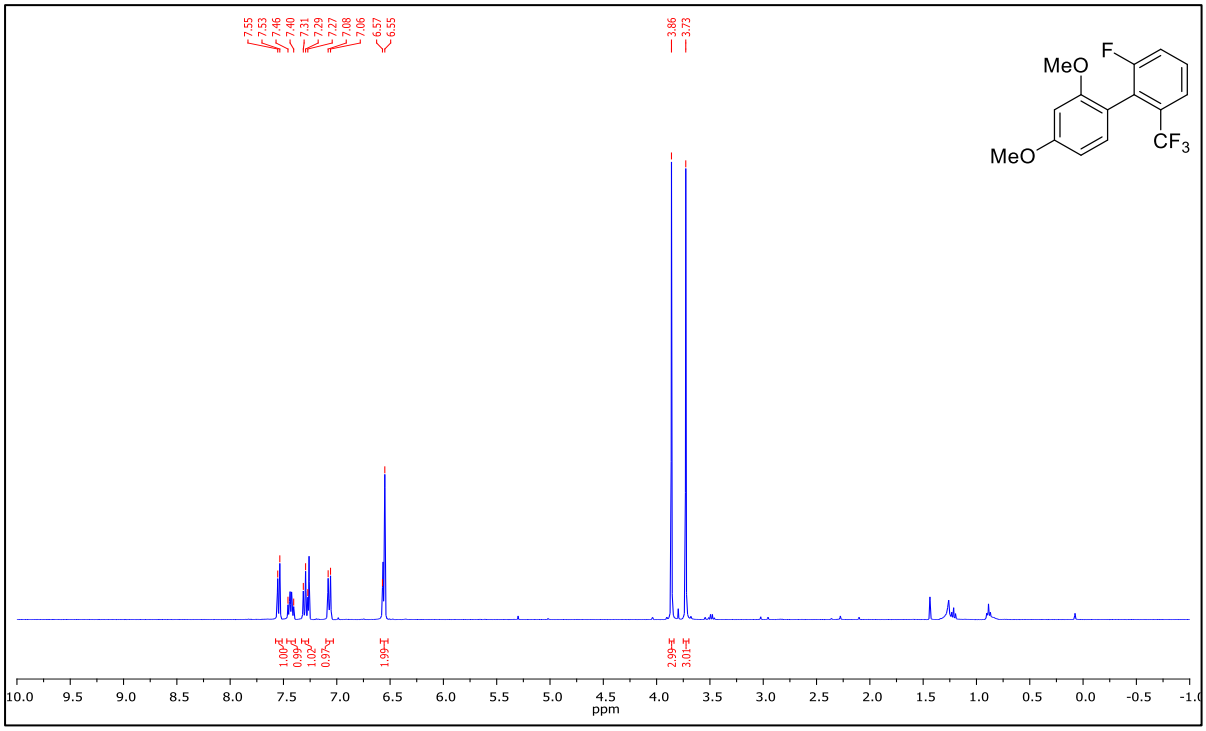


^{19}F NMR ($CDCl_3$)

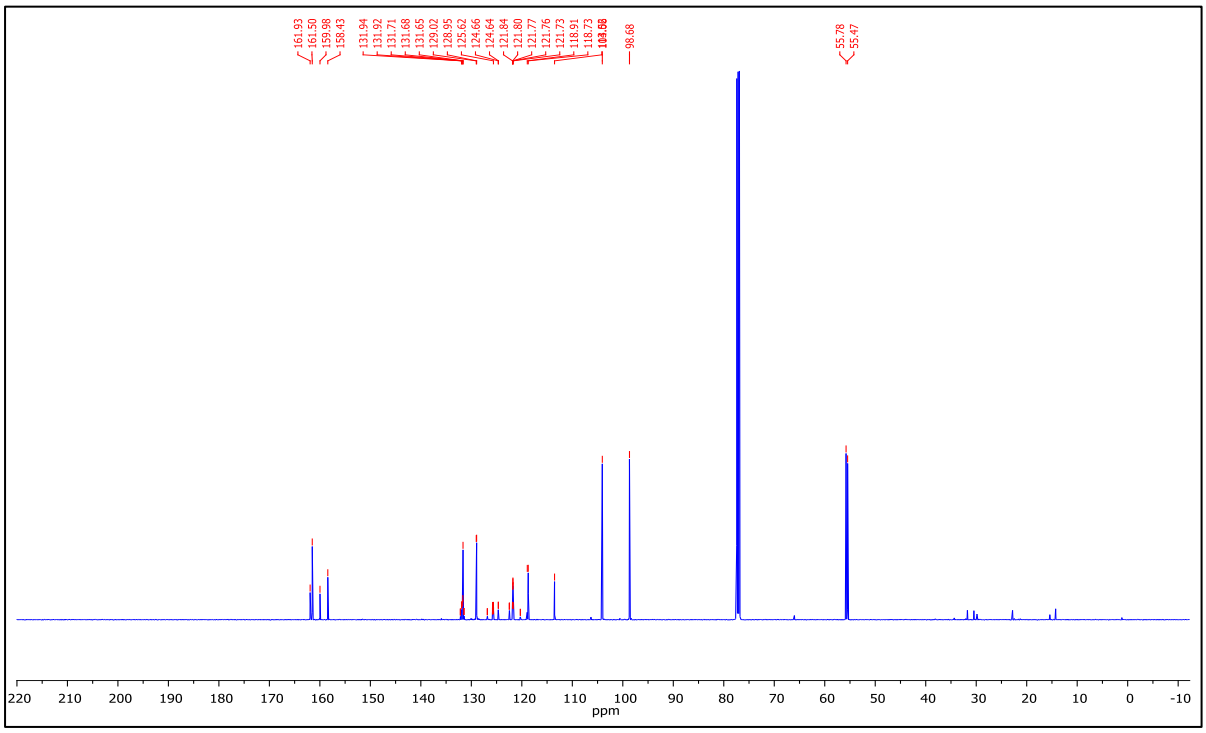


2'-fluoro-2,4-dimethoxy-6'-(trifluoromethyl)-1,1'-biphenyl (8b)

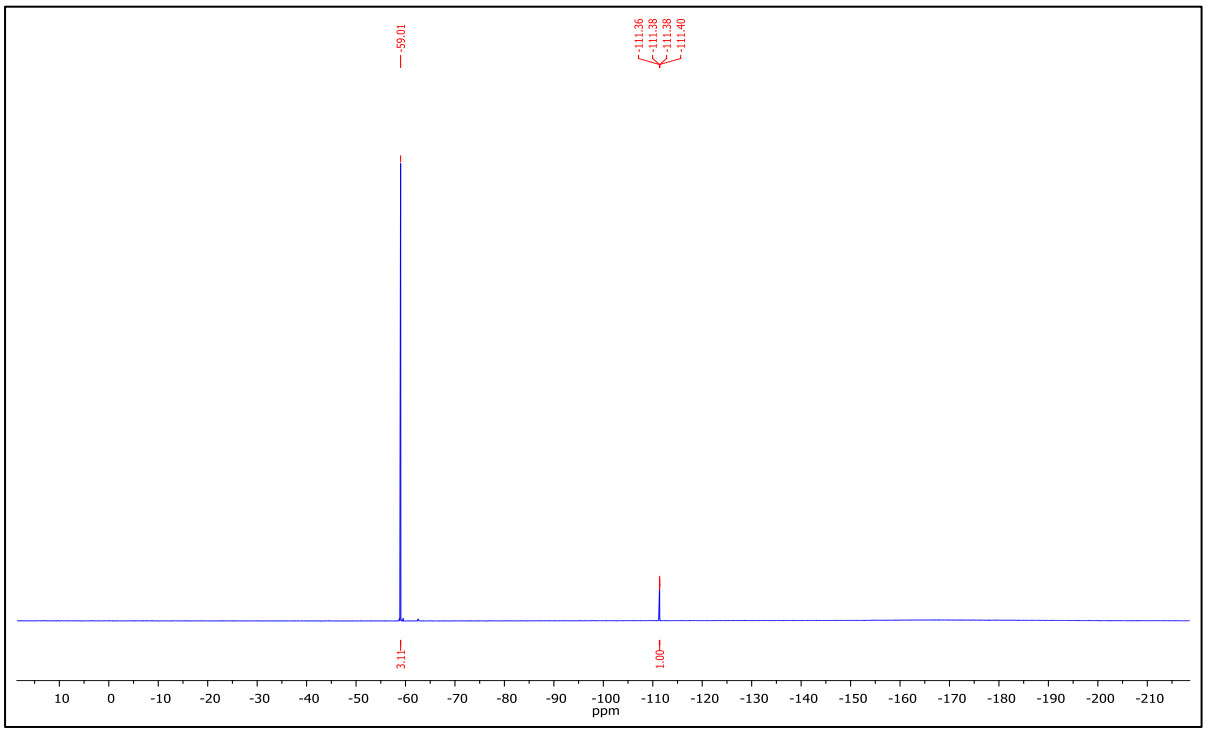
^{1}H NMR ($CDCl_3$)



^{13}C NMR ($CDCl_3$)

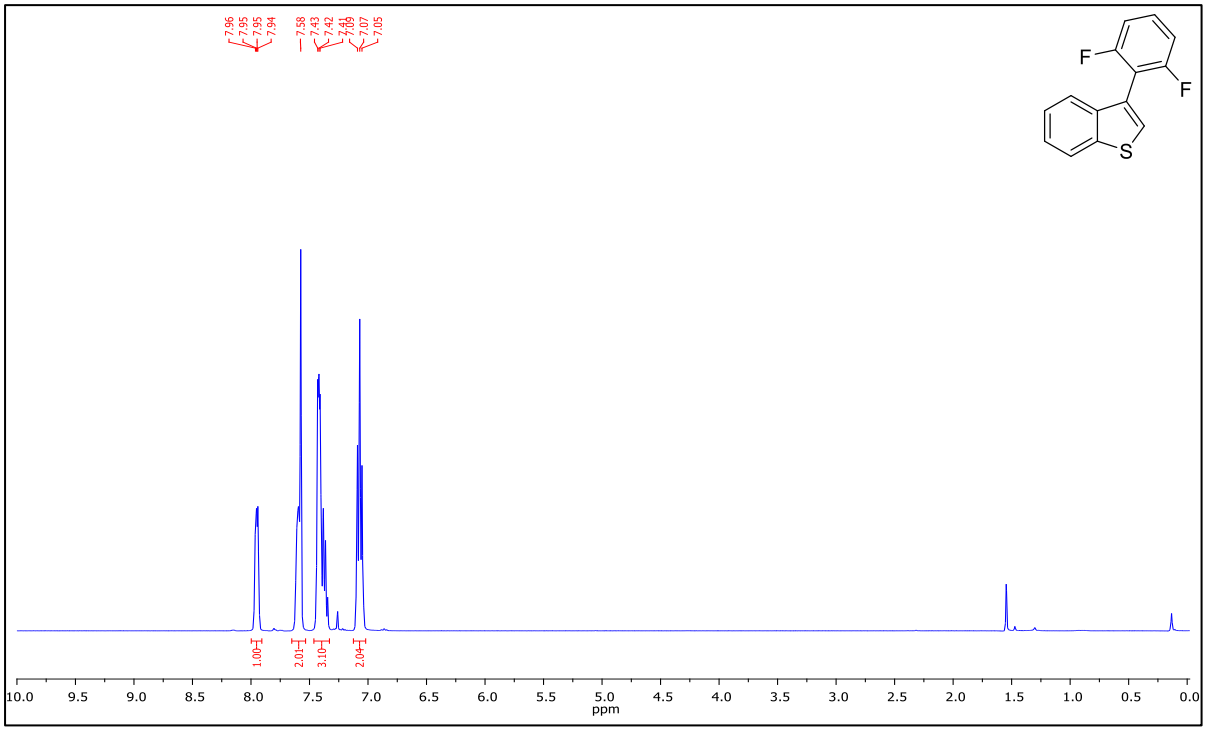


^{19}F NMR ($CDCl_3$)

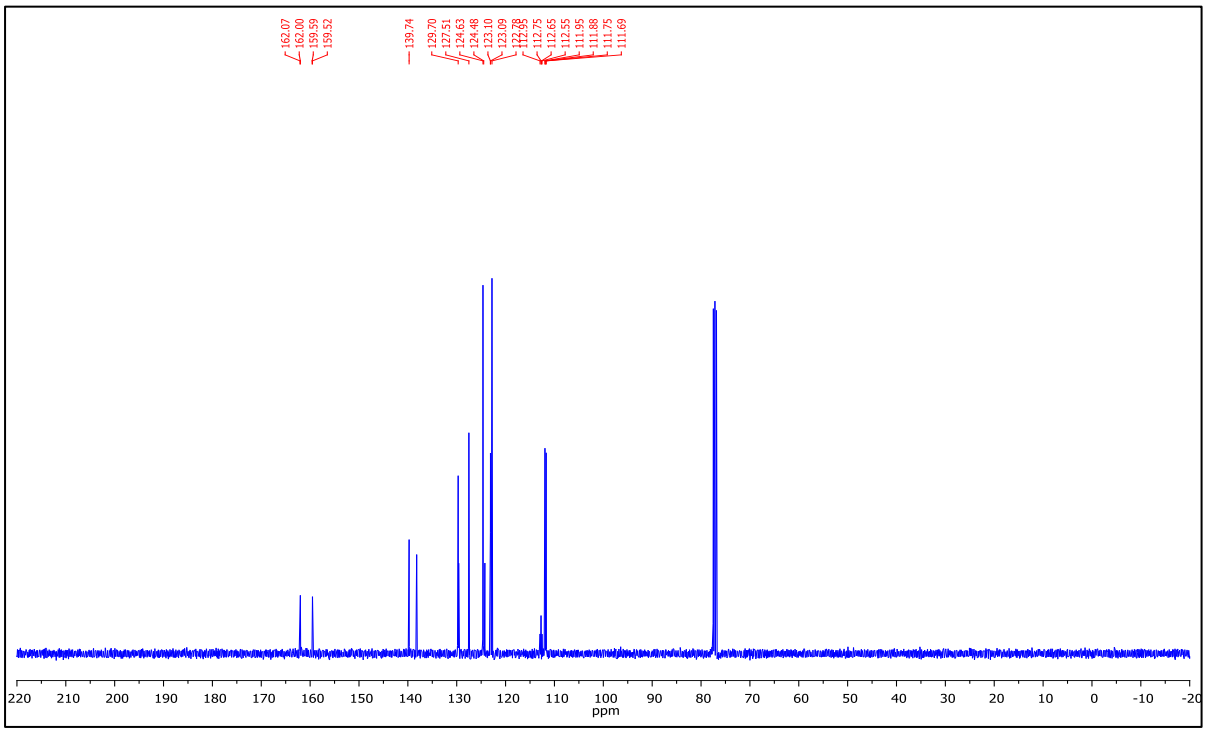


3-(2,6-difluorophenyl)benzo[b]thiophene (8c)

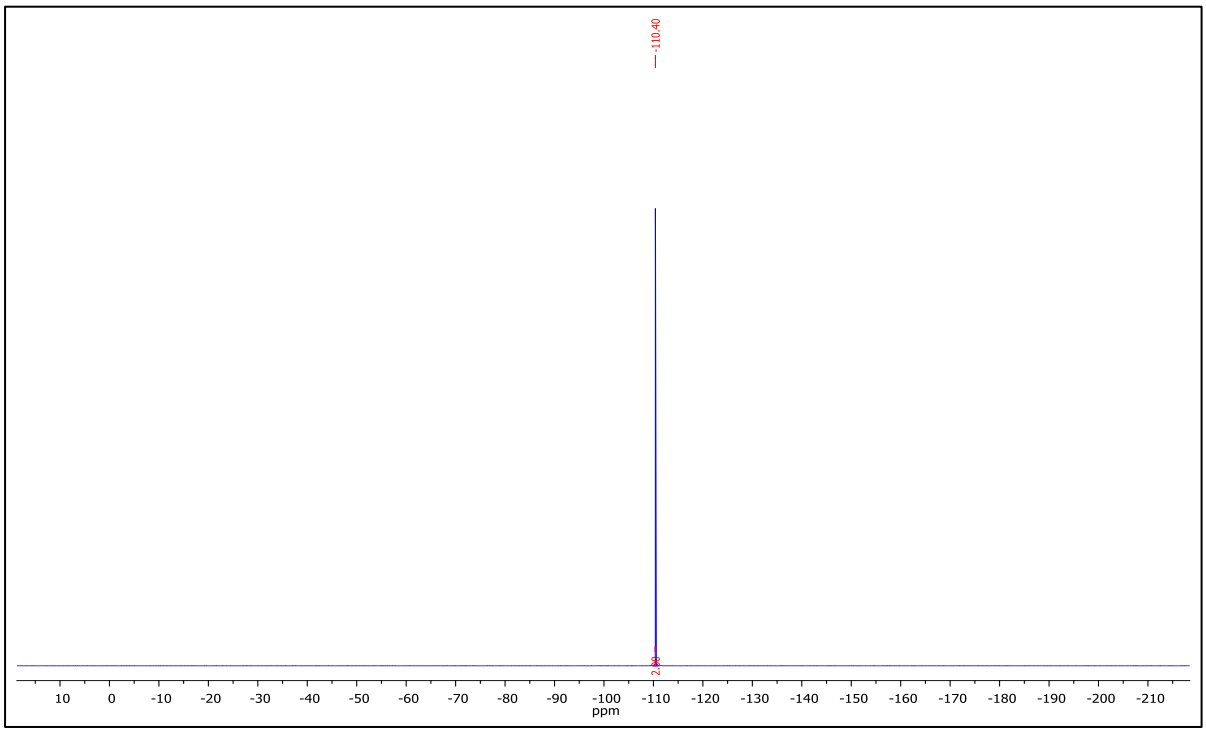
^{1}H NMR ($CDCl_3$)



^{13}C NMR ($CDCl_3$)

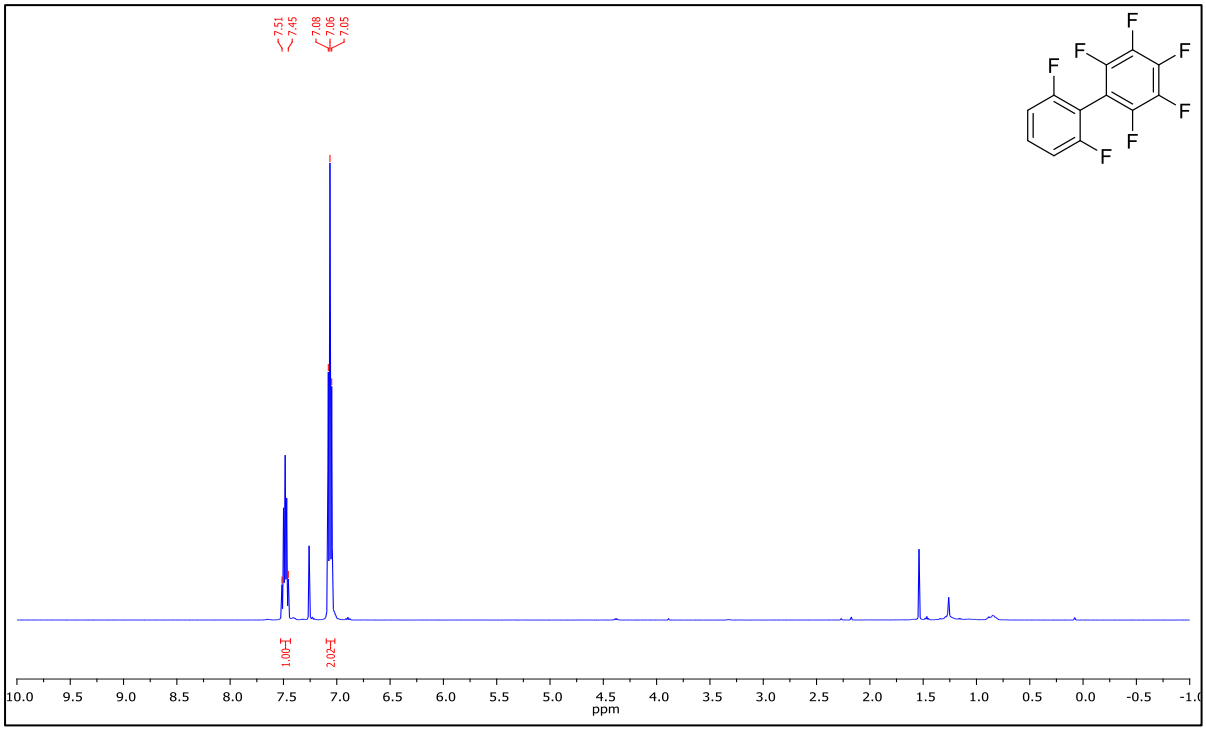


^{19}F NMR ($CDCl_3$)

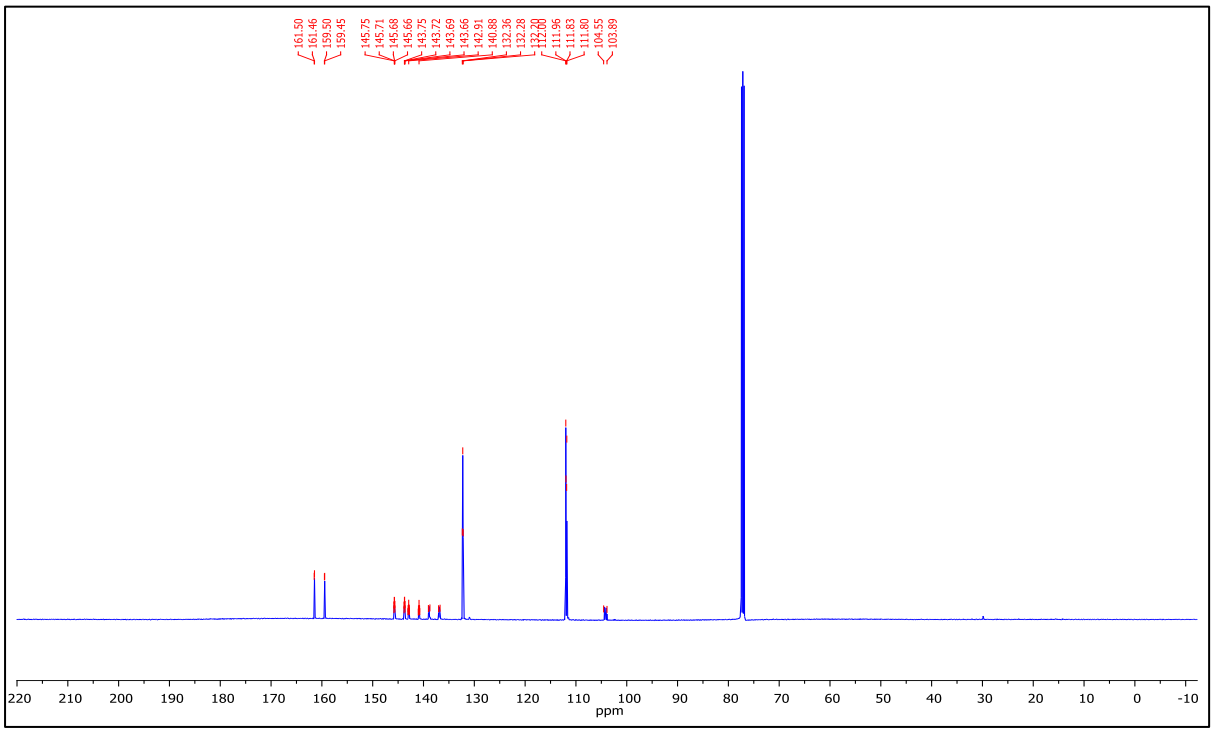


2,2',3,4,5,6,6'-heptafluoro-1,1'-biphenyl (8d)

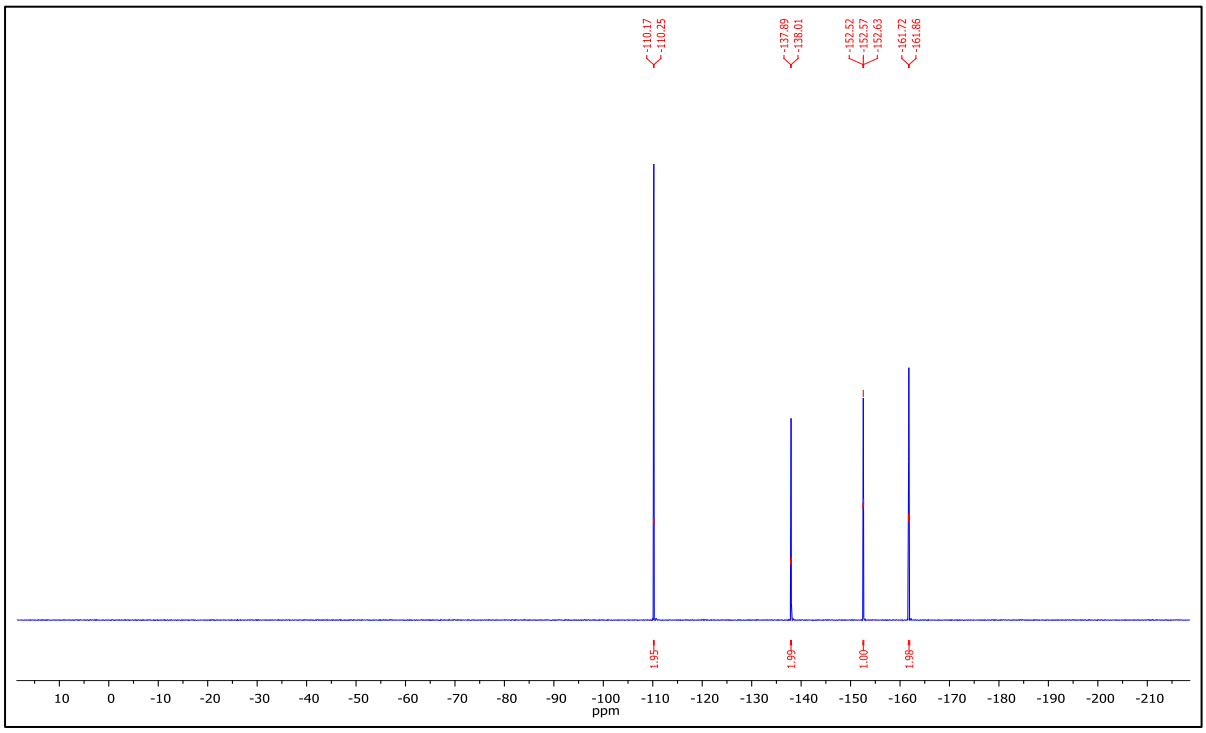
^{1}H NMR ($CDCl_3$)



^{13}C NMR ($CDCl_3$)

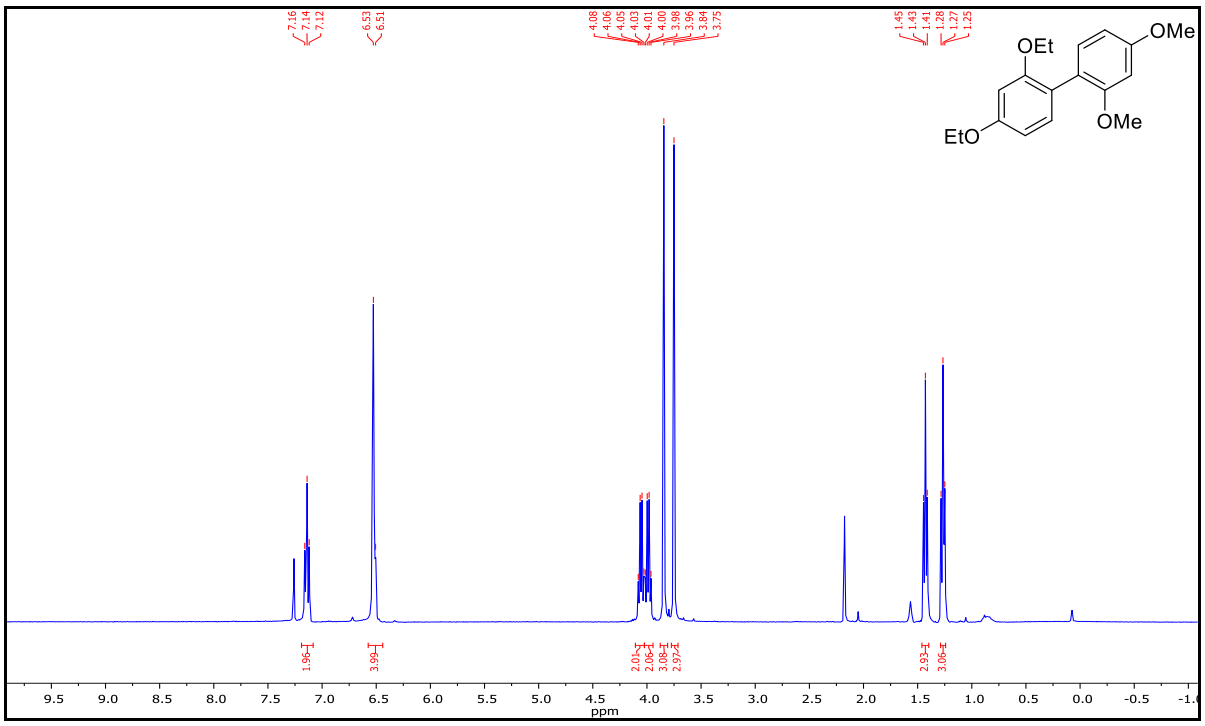


^{19}F NMR ($CDCl_3$)

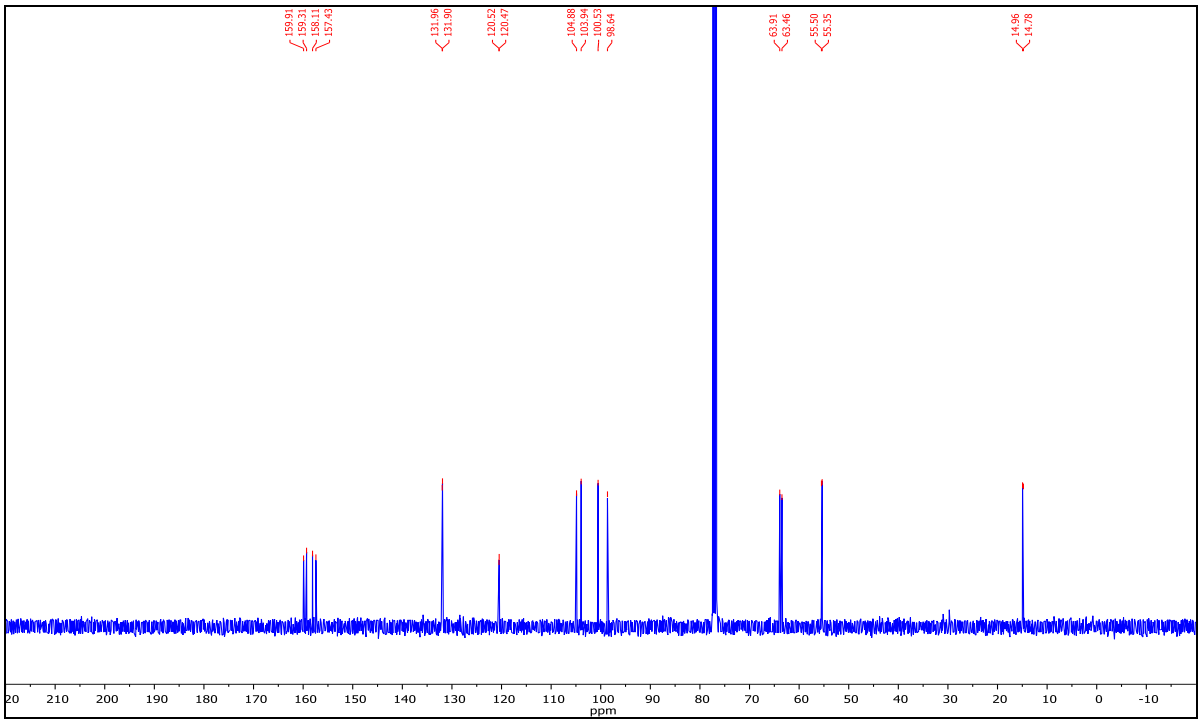


2,4-diethoxy-2',4'-dimethoxy-1,1'-biphenyl (8e)

^{1}H NMR ($CDCl_3$)

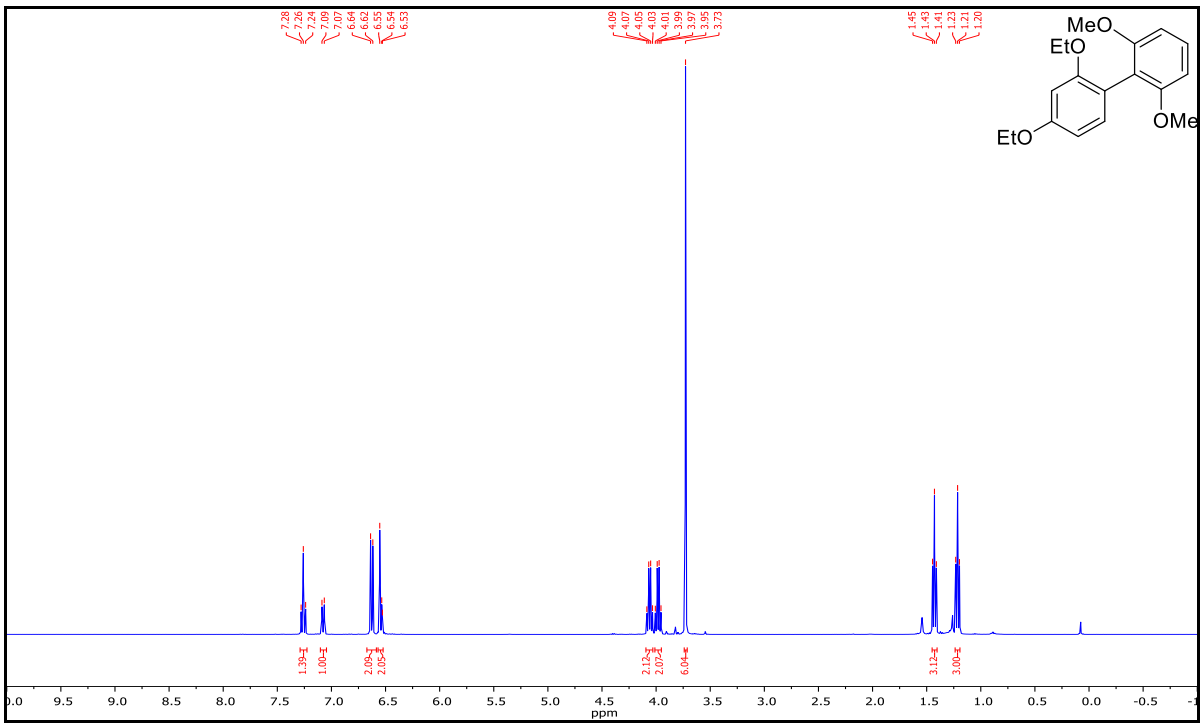


^{13}C NMR ($CDCl_3$)

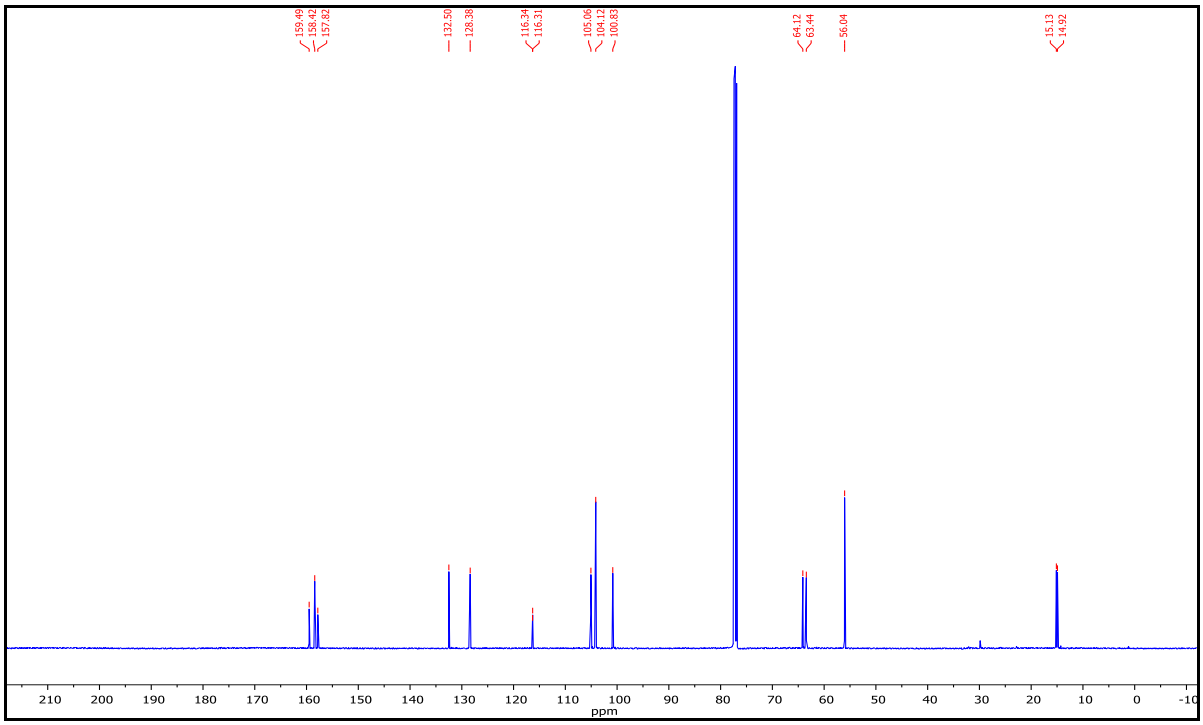


2,4-diethoxy-2',6'-dimethoxy-1,1'-biphenyl (8f)

^{1}H NMR ($CDCl_3$)



^{13}C NMR ($CDCl_3$)



References

[1] J. Cornella, M. Rosillo-Lopez, I. Larrosa, *Adv. Synth. Catal.* **2011**, *353*, 1359 - 1366.
[2] M. Kalinowska, R. Świsłocka, W. Lewandowski, *J. Mol. Struct.* **2006**, *792-793*, 130 - 138.
[3] J. Vannada, E. M. Bennett, D. J. Wilson, H. I. Boshoff, C. E. Barry, III, C. C. Aldrich, *Org. Lett.* **2006**, *8*, 4707 - 4710.
[4] R. V. Somu, D. J. Wilson, E. M. Bennett, H. I. Boshoff, L. Celia, B. J. Beck, C. E. Barry, III, C. C. Aldrich, *J. Med. Chem.* **2006**, *49*, 7623 - 7635.
[5] S. E. Varjosaari, J. P. Hess, P. Suating, J. M. Price, T. M. Gilbert, M. J. Adler, *Tet. Lett.* **2015**, *56*, 642 - 645.
[6] K. C. Miles, C. Le, J. P. Stambuli, *Chem. Eur. J.* **2014**, *20*, 11336 - 11339.
[7] M. Uchiyama, H. Naka, Y. Matsumoto, T. Ohwada, *J. Am. Chem. Soc.* **2004**, *126*, 10526 - 10527.
[8] Y. -L. Ren, H. Shang, J. Wang, X. Tian, S. Zhao, Q. Wang, F. Li, *Adv. Synth. Catal.* **2013**, *355*, 3437 - 3442.
[9] R. C. Samanta, H. Yamamoto, *Chem. Eur. J.* **2015**, *21*, 11976 - 11979.
[10] R. S. Coleman, J. M. Guernon, J. T. Roland, *Org. Lett.* **2000**, *2*, 277 - 280.
[11] Q. Liu, Y. Lan, J. Liu, G. Li, Y. -D. Wu, A. Lei, *J. Am. Chem. Soc.* **2009**, *131*, 10201 - 10210.
[12] B. Hu, W. H. Miller, K. D. Neumann, E. J. Linstad, S. G. DiMagno, *Chem. Eur. J.* **2015**, *21*, 6394 - 6398.
[13] L. Niu, H. Zhang, H. Yang, H. Fu, *Synlett*, **2014**, *25*, 995 - 1000.
[14] X. Liu, Q. Yi, Y. Han, Z. Liang, C. Shen, Z. Zhou, J. -L. Sun, Y. Li, W. Du, R. Cao, *Angew. Chem. Int. Ed.* **2015**, *54*, 1846 - 1850.
[15] J. N. Moorthy, K. Senapati, S. Kumar, *J. Org. Chem.* **2009**, *74*, 6287 - 6290.
[16] M. C. B. Jaimes, V. Weingand, F. Rominger, A. S. K. Hashmi, *Chem. Eur. J.* **2013**, *19*, 12504 - 12511.
[17] F. Mitzel, S. FitzGerald, A. Beeby, R. Faust, *Chem. Eur. J.* **2003**, *9*, 1233-1241.
[18] P. Debnath, M. Baeten, N. Lefèvre, S. Van Daele, B. U. W. Maes, *Adv. Synth. Catal.* **2013**, *357*, 197 - 209.
[19] W. Hao, J. Wei, W. Geng, W. -X Zhang, Z. Xi, *Angew. Chem. Int. Ed.* **2014**, *53*, 14533 - 14537.
[20] N. Matsuda, K. Hirano, T. Satoh, M. Miura, *Angew. Chem. Int. Ed.* **2012**, *51*, 3642 - 3645.
[21] D. W. Lin, T. Masuda, M. B. Biskup, J. D. Nelson, P. S. Baran, *J. Org. Chem.* **2011**, *76*, 1013 - 1030.
[22] J. A. Flygare, T.H. Pillow, B. Safina, V. Verma, B. Q. Wei, W. Denny, A. Giddens, H. Lee, G. –L. Lu, C. Miller, G. Rewcastle, M. Tercel, M. Bonnet, **2015**, Patent WO2015/23355 A1.
[23] Y.E. Türkmen, V. H. Rawal, *J. Org. Chem.* **2013**, *78*, 8340 - 8353
[24] H. Takezawa, T. Murase, G. Resnati, P. Metrangolo, M. Fujita, *Angew. Chem. Int. Ed.* **2015**, *54*, 8411 - 8414.
[25] G. B. Deacon, D. Tunaley, *Aust. J. Chem.* **1979**, *32*, 737 - 753.
[26] T. Rausis, M. Schlosser, *Eur. J. Org. Chem.* **2002**, *19*, 3351 - 3358.
[27] I. Bacsa, R Jójárt, G. Schnieder, J. Wölfling, P. Maróti, B. E. Herman, M. Szécsi, E. Mernyák, *Steroids*, **2015**, *104*, 230 - 236.
[28] J. Kim, H. Kim, S. Chang, *Org. Lett.* **2012**, *14*, 3924 - 3927.
[29] T. Stark, M. Suhartono, M. W. Göbel, M. Lautens, *Synlett*, **2014**, *24*, 2730 - 2734.
[30] T. Kesharwani, C. T. Kornman, A. L. Tonnaer, A. D. Royappa, *Tet. Lett.* **2016**, *57*, 411 - 414.

[31] a) J. Zheng, J. -H. Lin, X. -Y. Deng, and J. -C. Xiao, *Org. Lett.* **2015**, *17*, 532 - 535; b) S. Mehta, R. C. Larock, *J. Org. Chem.* **2010**, *75*, 1652 - 1658.
[32] J. Wippich, I. Schnapperelle, T. Bach, *Chem. Commun.* **2014**, *51*, 3166 - 3168.
[33] a) Y. Y. Popelis, É. É. Liepin'sh, Y. P. Stradyn', *Chem. Heterocycl. Compd.* **1980**, *16*, 116-123; b) V. N. Novikov, S. V. Borodaev, *Chem. Heterocycl. Compd.* **1976**, *12*, 1091-1093.
[34] S. Song, X. Sun, X. Li,Y. Yuan, N. Jiao, *Org. Lett.* **2015**, *17*, 2886 - 2889.
[35] S. E. Baillie, T. D. Bluemke, W. Clegg, A. R. Kennedy, J. Klett, L. Russo, M. de Tullio,E. Hevia, *Chem. Commun.* **2014**, *50*, 12859 - 12862.
[36] L. Klier, T. Bresser, T. A. Nigst, K. Karaghiosoff, P. Knochel, *J. Am. Chem. Soc.* **2012**, *134*, 13584 - 13587.
[37] L. Li, W. Liu, H. Zheng, X. Mu, G. Cosa, Z. Mi, C. -J. Li, *J. Am. Chem. Soc.* **2015**, *137*, 8328 – 8331.
[38] I. S. Makarov, T. Kuwahara, X. Jusseau, I. Ryu,.A. T. Lindhardt, T. Skrydstrup, *J. Am. Chem. Soc.* **2015**, *137*, 14043 - 14046.
[39] R. Ma, C. -B. Huang, A. -H. Liu, X. -D. Li, L. -N. He, *Catal. Sci. Technol.* **2014**, *4*, 4308 - 4312.
[40] Y. Yamaguchi, Y. Matsubara, T. Ochi, T. Wakamiya, Z. -I Yoshida, *J. Am. Chem. Soc.* **2008**, *130*, 13867 - 13869.
[41] Frisch, M. J.; Trucks, G. W.; Schlegel, H. B.; Scuseria, G. E.; Robb, M. A.; Cheeseman, J. R.; Scalmani, G.; Barone, V.; Mennucci, B.; Petersson, G. A.; Nakatsuji, H.; Caricato, M.; Li, X.; Hratchian, H. P.; Izmaylov, A. F.; Bloino, J.; Zheng, G.; Sonnenberg, J. L.; Hada, M.; Ehara, M.; Toyota, K.; Fukuda, R.; Hasegawa, J.; Ishida, M.; Nakajima, T.; Honda, Y.; Kitao, O.; Nakai, H.; Vreven, T.; Montgomery, Jr., J. A.; Peralta, J. E.; Ogliaro, F.; Bearpark, M.; Heyd, J. J.; Brothers, E.; Kudin, K. N.; Staroverov, V. N.; Keith, T.; Kobayashi, R.; Normand, J.; Raghavachari, K.; Rendell, A.; Burant, J. C.; Iyengar, S. S.; Tomasi, J.; Cossi, N.; Rega, N.; Millam, J. M.; Klene, M.; Knox, J. E.; Cross, J. B.; Bakken, V.; Adamo, C.; Jaramillo, J.; Gomperts, R.; Stratmann, R. E.; Yazyev, O.; Austin, A. J.; Cammi, R.; Pomelli, C.; Ochterski, J. W.; Martin, R. L.; Morokuma, K.; Zakrzewski, V. G.; Voth, G. A.; Salvador, P.; Dannenberg, J. J.; Dapprich, S.; Daniels, A. D.; Farkas, O.; Foresman, J. B.; Ortiz, J. V.; Cioslowski, J.; Fox, D. J. Gaussian, Inc., Wallingford CT, **2010**.

[42] a) Grimme, S. *J. Comp. Chem.* **2006**, *27*, 1787–1799; b) Grimme, S.; Ehrlich, S.; Goerigk, L. *J. Comp. Chem.* **2011**, *32*, 1456–1465.

[43] a) Dunning Jr., T. H.; Hay, P. J. in *Modern Theoretical Chemistry*, Ed. H. F. Schaefer III, Vol. 3 (Plenum, New York, **1977**) 1–28; b) Hay, P. J.; Wadt, W. R. *J. Chem. Phys.* **1985**, *82*, 270–283; c) Wadt, W. R.; Hay, P. J. *J. Chem. Phys.* **1985**, *82*, 284–298; d) Hay, P. J.; Wadt, W. R. *J. Chem. Phys.* **1985**, *82*, 299–310.

[44] a) Hariharan, P. C.; Pople, J. A. *Mol. Phys.* **1974**, *27*, 209–214; b) Francl, M. M.; Pietro, W. J.; Hehre, W. J.; Binkley, J. S.; DeFrees, D. J.; Pople, J. A.; Gordon, M. S. *J. Chem. Phys.* **1982**, *77*, 3654–3665; c) Rassolov, V. A.; Ratner, M. A.; Pople, J. A.; Redfern, P. C.; Curtiss, L. A., *J. Comp. Chem.* **2001**, *22*, 976–984.

[45] a) Fukui, K., *Acc. Chem. Res.* **1981**, *14*, 363–368; b) Hratchian, H. P.; Schlegel, H. B., *J. Chem. Theor. Comput.* **2005**, *1*, 61–69.

[46] a) L. P. Hammett, *J. Am. Chem. Soc.* **1937**, *59*, 96 - 103; b) C. Hansch, A. Leo, R. W. Taft, *Chem. Rev.* **1991**, *91*, 165 - 195.
[47] Y. Okamoto, H. C. Brown, *J. Org. Chem.* **1957**, *22*, 485 - 494.