Supporting Information

A Novel Chiral Surfactant-Type Metallomicellar Catalyst for Asymmetric Michael Addition in Water

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1. General Information

^1H NMR and ^{13}C NMR were recorded on a 400MHz Nuclear Magnetic Resonance Spectrometer (^1H NMR: 400MHz, ^{13}C NMR: 100MHz) using TMS as internal reference. The chemical shifts (δ) and coupling constants (J) were expressed in ppm and Hz, respectively. UV-Vis Spectrophotometry was carried out on infrared spectrometer. HPLC analysis was carried out on HPLC with a multiple wavelength detector by commercial chiral columns. Optical rotations were measured on a Polarimeter. HRMS (ESI) were recorded on a Q-TOF Premier. Commercially available compounds were used without further purification. Solvents were purified according to the standard procedures unless otherwise noted.

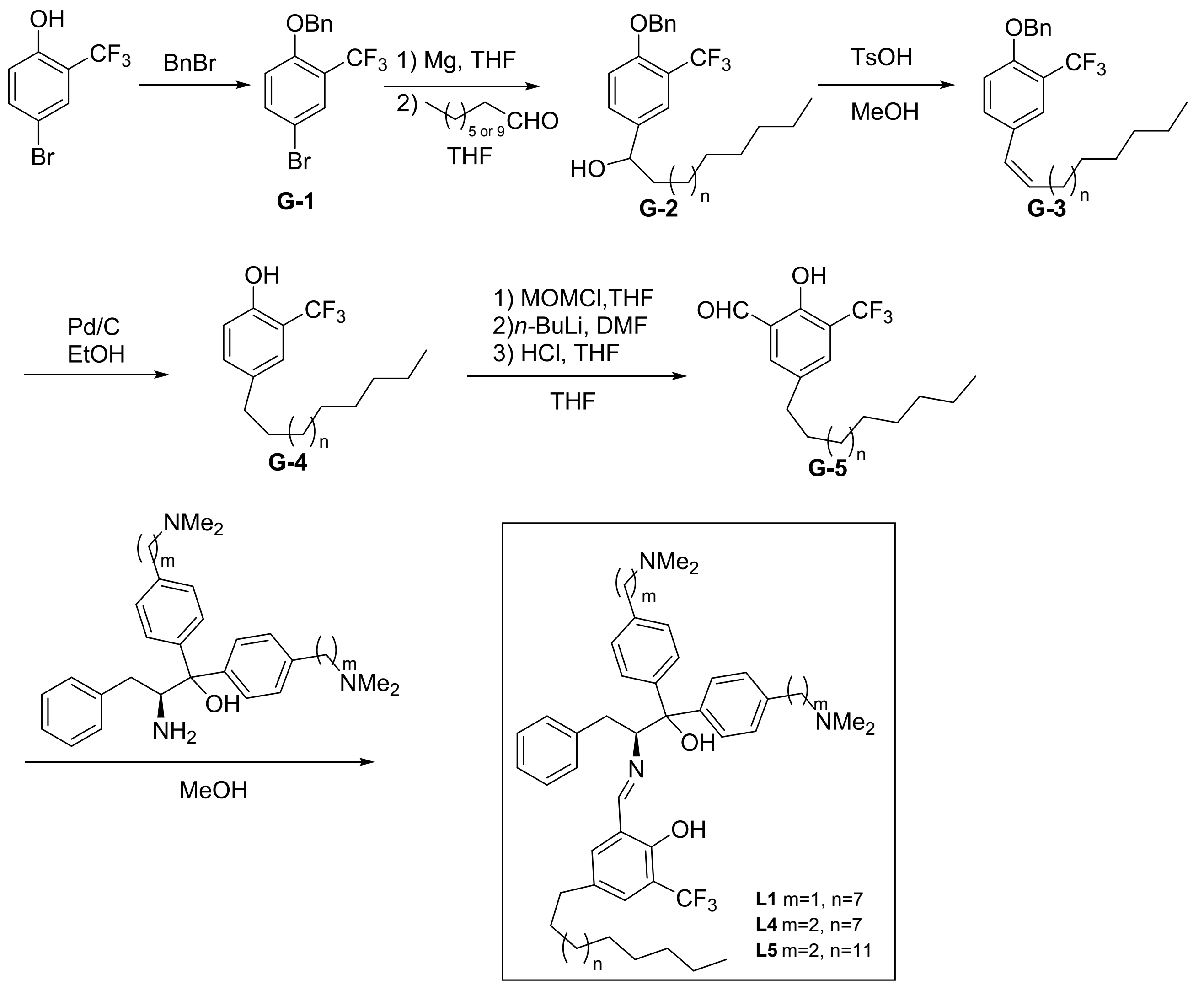
L2 and L3 were synthetized according to literature as show in S24[1]. Substrates of **2** were synthetized according to literature as show in S24[2].

2. General procedure for the preparation of L

a) Preparation for ligand L1, L4, L5

4-bromo-2-(trifluoromethyl)phenol (60 mmol) was added to a oven dried Schlenck flask under nitrogen. Then anhydrous THF (100 mL) and DMF (10 mL) was added as solvent. The solution was cooled to 0°C and NaH (90 mmol) was added, the resulting solution was kept at this temperature for 1 h, then benzyl bromide was (65 mmol) was added slowly, the cooling bath was removed, allowing the reaction mixture to warm up to room temperature overnight. Finally, the reaction mixture was quenched with water (10 mL) and extracted with Et_2O (3 × 50 mL), the organic layers were combined and dried over anhydrous Na_2SO_4 and concentrated in vacuo. The crude product **G-1** was obtained as a colorless oil and used for the next step without purification.

To a round bottom flask was added magnesium strips (70.0 mmol), one small crystal of iodine, and 1-(benzyloxy)-4-bromo-2-(trifluoromethyl)benzene (**G-1**) (5 mmol) in dry THF (15 mL). The reaction mixture was stirred at reflux to start the reaction. A solution of 1-(benzyloxy)-4-bromo-2-(trifluoromethyl)benzene (**G-1**) (55 mmol) in dry THF (50 ml) was added dropwise over 30 min. After addition, the reaction mixture was continued to stirring at reflux for 1.0 hours and cooled to room temperature. Then a solution of long-chain aldehyde (55 mmol) in dry THF (30 ml) was added dropwise to the Grignard reagent at room temperature over 30 min. The resulting mixture was further stirred overnight and was then quenched with saturated aqueous solution of NH_4Cl. The product was extracted with ethyl acetate and the combined organic phase was dried over Na_2SO_4. The solvent was evaporated under reduced pressure and the crude product **G-2** was used for next step without purification.



L

The alcohol product **G-2** obtained was dissolved in toluene (100 mL), and *p*-toluenesulfonic acid (catalytic amount) was added and the solution was heated to 90-100°C until the alcohol disappeared from TLC analysis. The reaction was then cooled to room temperature and quenched by saturated ammonium chloride solution, extracted by ether (100 mL × 3), dried over $MgSO_4$. Then, the reaction was filtered, concentrated in vacuo to give the alkene crude product **G-3**.

The crude alkene product was dissolved in ethyl alcohol (80 mL), Pd/C (5%) was added, and the solution was then purged with hydrogen balloon for 15 minutes and then went overnight under hydrogen balloon. Then, the reaction was filtered over a short path of celite, concentrated in vacuo, and the crude mixture was purified by flash column chromatography (hexane) to afford product **G-4**.

Sodium hydride (2.80 g of a 60% dispersion in mineral oil, 70 mmol) was washed with hexane and transferred to a 2-neck 250 mL round bottom flask under an atmosphere of N_2. After addition of anhydrous THF (50 mL) the slurry was cooled with stirring to 0˚C. To the resulting grey suspension was added dropwise a solution of **G-4** in anhydrous THF (25 mL) at such a rate that the evolution of hydrogen did not become too vigorous. After complete addition the ice bath was removed and the brown reaction mixture stirred for 1 hour. Chloromethylmethyl ether (5.5 mL, 70 mmol) was added dropwise and the resulting white suspension stirred overnight. Ice/water (100 mL) was added cautiously and the mixture extracted with Et_2O (3 × 100 mL). The combined Et_2O extracts were washed with NaOH (2M, 50 mL), HCl (2M, 50 mL), and brine (50 mL). The solution was dried over $MgSO_4$ and the solvent was removed in vacuo to yield a colourless liquid. To a solution of the colourless liquid in anhydrous THF (100 mL) at -78˚C under an atmosphere of N_2 was added *n*-butyllithium (24.0 mL of a 2.5 M solution, 60 mmol) dropwise with stirring. After an additional hour stirring at this temperature, a solution of anhydrous DMF (5.5 mL, 70 mmol) in anhydrous THF (10 mL) was added to the mixture and the resulting solution was allowed to warm to room temperature and stirred overnight. The yellow solution was hydrolysed by the addition of water (150 mL) and the mixture extracted with Et_2O (3 × 150 mL). The combined Et_2O extracts were then washed with 2M HCl (100 mL) and brine (100 mL), dried over $MgSO_4$ and the solvent was removed in vacuo to yield the corresponding aldehyde. Corresponding aldehyde was dissolved in THF (100 mL) and concentrated HCl (10 mL) was added. The mixture was heated to 50°C for 4 hours, at which stage TLC analysis (silica, CH_2Cl_2) indicated the complete disappearance of starting material. The mixture extracted with Et_2O (3 × 50 mL). The combined Et_2O extracts were then washed with brine (100 mL), dried over $MgSO_4$ and the solvent was removed in vacuo to yield the crude salicylaldehyde derivative **G-5**.

To a solution of chiral amino alcohol (2 mmol) in methanol (10 mL) was added corresponding salicylaldehyde derivative (2 mmol). The solution was stirred for 2 h at room temperature then the solvent was removed under reduced pressure. The residue was purified by silica gel column chromatography (CH_2Cl_2/MeOH = 5/1 as eluent) to give the corresponding Schiff base ligand **L1, L4, L5**.

b) Preparation for ligand L2

To a round bottom flask was added magnesium strips (0.36 g, 15 mmol), one small crystal of iodine, and 4-bromo-*N, N*-dimethylbenzylamine in dry THF (25 mL). The reaction mixture was stirred at reflux to start the reaction. A solution of 4-bromo-*N, N*-dimethylbenzylamine (3.20 g, 15 mmol) in dry THF (5 ml) was added dropwise over 30 min. After addition, the reaction mixture was continued to stirring at reflux for 2 hours and cooled to room temperature. Then a solution of methyl (*tert*-butoxycarbonyl)-*L*-phenylalaninate (1.40 g, 5 mmol) in dry THF (5 ml) was added dropwise to the Grignard reagent at room temperature over 30 min. The resulting mixture was further stirred overnight and was then quenched with saturated aqueous solution of NH_4Cl. The product was extracted with ethyl acetate and the combined organic phase was dried over Na_2SO_4. The solvent was evaporated under reduced pressure and the crude product was used for next step without purification.

The crude product in CH_2Cl_2 (15 mL) was added 2,2,2-Trifluoroacetic acid (10 mL), then the reaction mixture was stirred at room temperature for 5h and concentrated under reduced pressure. To the residue was added aqueous HCl (2 M, 5.0 mL) and the mixture was extracted with ethyl acetate (3 x 5 mL). The aqueous layer was basified with aqueous buffer solution of NH_3 (1 M)/NH_4Cl (1 M) and extracted with dichloromethane (3 x 10 mL). The combined organic phases were dried over anhydrous sodium sulfate and concentrated under reduced pressure, the crude product was purified by column chromatography (CH_2Cl_2/MeOH/NEt_3 = 100:10:1) to give product

To a solution of chiral amino alcohol (2 mmol) in methanol (10 mL) was added salicylaldehyde derivative (2 mmol). The solution was stirred for 2 h at room temperature then the solvent was removed under reduced pressure. The residue was purified by silica gel column chromatography (CH_2Cl_2/MeOH = 5/1 as eluent) to give the corresponding Schiff base ligand **L2** quantitatively as yellow foam.

c) Preparation for ligand L3

To a round bottom flask was added magnesium strips (0.36 g, 15 mmol), one small crystal of iodine, and 2-(4-bromophenyl)-*N*, *N*-dimethylethan-1-amine in dry THF (25 mL). The reaction mixture was stirred at reflux to start the reaction. A solution of 2-(4-bromophenyl)-*N*, *N*-dimethylethan-1-amine (3.41 g, 15 mmol) in dry THF (5 ml) was added dropwise over 30 min. After addition, the reaction mixture was continued to stirring at reflux for 2 hours and cooled to room temperature. Then a solution of methyl (*tert*-butoxycarbonyl)-*L*-phenylalaninate (1.40 g, 5 mmol) in dry THF (5 ml) was added dropwise to the Grignard reagent at room temperature over 30 min. The resulting mixture was further stirred overnight and was then quenched with saturated aqueous solution of NH_4Cl. The product was extracted with ethyl acetate and the combined organic phase was dried over Na_2SO_4. The solvent was evaporated under reduced pressure and the crude product was purified by silica gel column chromatography (CH_2Cl_2/MeOH/NEt_3 = 100:10:1) to give tert-butyl (1, 1-bis(4-(2-(dimethylamino)ethyl)phenyl)-1-hydroxy-3-phenylpropan-2-yl)carbamate as a colorless oil (2.37g, 87% yield). The product in CH_2Cl_2 (15 mL) was added 2,2,2-Trifluoroacetic acid (10 mL), then the reaction mixture was stirred at room temperature for 5 h and concentrated under reduced pressure. To the residue was added aqueous HCl (2 M, 5.0 mL) and the mixture was extracted with ethyl acetate (3 x 5 mL). The aqueous layer was basified with aqueous buffer solution of NH_3 (1 M)/NH_4Cl (1 M) and extracted with dichloromethane (3 x 10 mL). The combined organic phases were dried over anhydrous sodium sulfate and concentrated under reduced pressure, the crude product was used for next step without purification.

To a solution of chiral amino alcohol (2 mmol) in methanol (10 mL) was added salicylaldehyde derivative (2 mmol). The solution was stirred for 2 h at room temperature then the solvent was removed under reduced pressure. The residue was purified by silica gel column chromatography (CH_2Cl_2/MeOH = 5/1 as eluent) to give the corresponding Schiff base ligand **L3** quantitatively as yellow foam.

3. General procedure for the reaction

A mixture of **L4** (0.02 mmol, 14.6 mg), $Zn(NO_3)_2$ (0.02 mmol, 3.7 mg) in water (1.0 mL) was stirred for 1 h at ambient atmosphere. $CHCl_3$ (50 μL) as the oil phase of emulsion was then added to generate the emulsified system. 2-Enoylpyridine 1-oxides and indoles were added to the emulsion and kept at 25 °C for 24 h and the organic phase was separated after demulsification by adding a small amount of dilute hydrochloric acid (1 M, 0.4 mL), the resulting solution was concentrated under reduced pressure, the residue was purified by column chromatograph to afford Michael adducts.

4. Mechanism study

(1) TEM and SEM analyses

1) Preparation of samples

Catalyst: **L4** (7.2 mg, 0.01 mmol) and $Zn(NO_3)_2$ (3.6 mg 0.01 mmol) were dissolved in 1 mL of H_2O. The mixture was stirred at 25°C for 1 h. $CHCl_3$ (50 μL) as the oil phase of emulsion was then added to generate the emulsified system. The mixture was stirred at 25°C for 1 h.

Reaction mixture: After preparing the catalyst, indole (11.7 mg 0.1 mmol) and 2-Enoylpyridine 1-oxide (22.5 mg 0.1 mmol) were added to the solution. Then the solution was stirred at 25°C for 1 h.

A drop of the colloidal aqueous suspensions was deposited on a carbon-coated copper grid. Then the excess solution was immediately removed with the help of filter paper. The grid was dried in air and then observed by TEM and SEM.

2) SEM analyses (Fig S1)

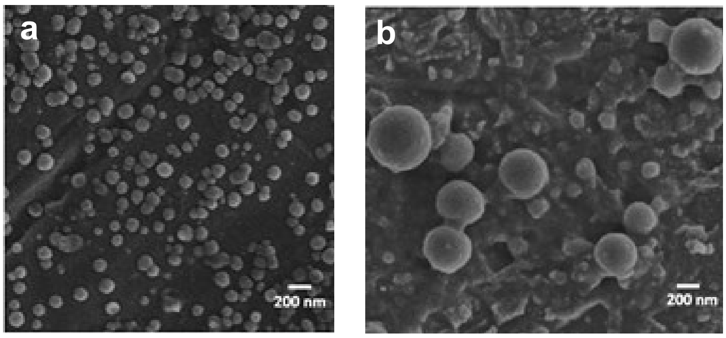


Fig S1a. Metallomicelles of precatalyst (**Zn-L4**); Fig S1b. Metallomicelles of reaction mixture

3). TEM analyses (Fig S2)

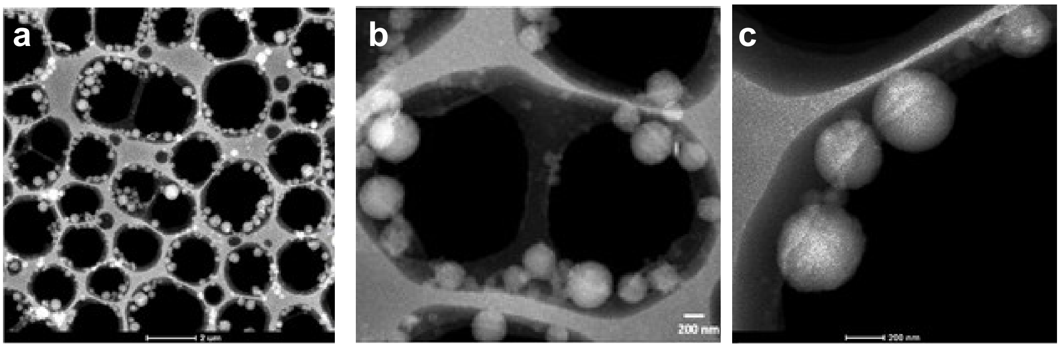


Fig S2. Metallomicelles of reaction mixture

(2) XPS analyses

a) Preparation of samples

Sample 1: Zn $(NO_3)_2$.

Sample 2: the pre-catalyst was prepared by mixing **L4** (0.02 mmol) and Zn $(NO_3)_2$ (0.02 mmol) in water only and stirred for two hours at ambient atmosphere, then evaporated in vacuum.

Sample 3: the pre-catalyst was prepared by mixing **L4** (0.02 mmol) and Zn $(NO_3)_2$ (0.02 mmol) in water (1 ml) and stirred for one hour at ambient atmosphere. $CHCl_3$ (50 µL) as the oil phase of emulsion was then added to generate the emulsified system. The water of the metallomicellar catalytic system was removed by anhydrous $MgSO_4$. The oil phase was separated, evaporated in vacuum to obtain the precatalyst.

Sample 4: the pre-catalyst was prepared by mixing **L4** (0.02 mmol) and Zn $(NO_3)_2$ (0.02 mmol) in $CHCl_3$ only and stirred for two hours at ambient atmosphere, then evaporated in vacuum.

The spectra of the XPS was as showed in Fig S3. The results showed that the binding energy of the Zn 2P of the precatalyst was decreased compared to that of $Zn(NO_3)_2$, which indicated that electronic density of the Zn^{2+} was increased. This increasement should come from the coordination with the oxygen of the **L4**.

b) Spectra of XPS (Fig S3).

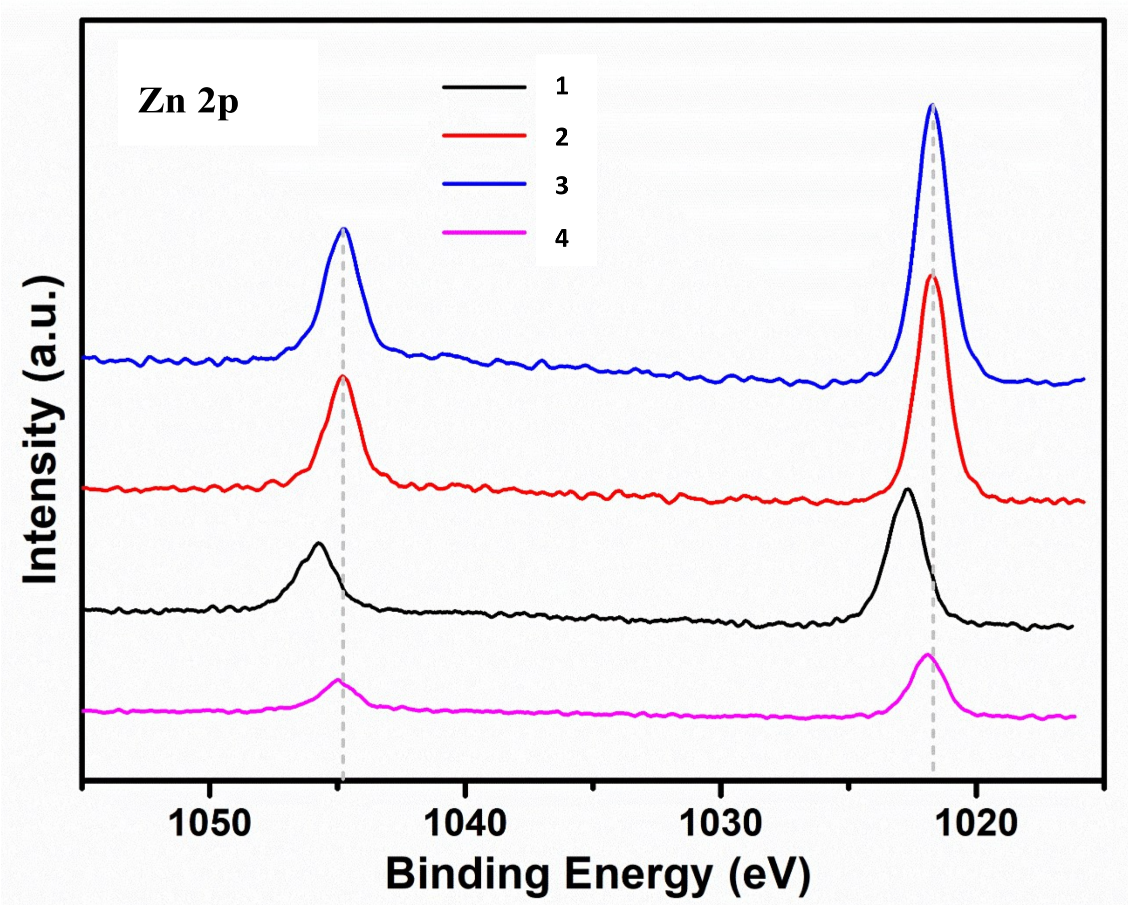


Fig S3 Analyses of XPS

(3) The detection of [1]H NMR to confirm the formation of two ammonium salts

The micellar catalytic system was prepared by mixing ligand **4** (0.02 mmol) and $Zn(NO_3)_2$ (0.02 mmol) in water (1 mL) and stirred for one hour at ambient atmosphere. $CDCl_3$ (50 μL) as the oil phase of emulsion was then added to generate the emulsified system. The water of the metallomicellar catalytic system was removed by anhydrous $MgSO_4$. The oil phase was separated, evaporated in vacuum to obtain the precatalyst, which was characterized by ^1H NMR.

^1H NMR response of the precatalyst and ligand **4** was listed in Fig S4. It was found that chemical shifts of the methyl groups attached to the N presented in lower field compared to that of **L4**, which can be ascribed to the electron-withdrawing effect of the generated ammonium salts.

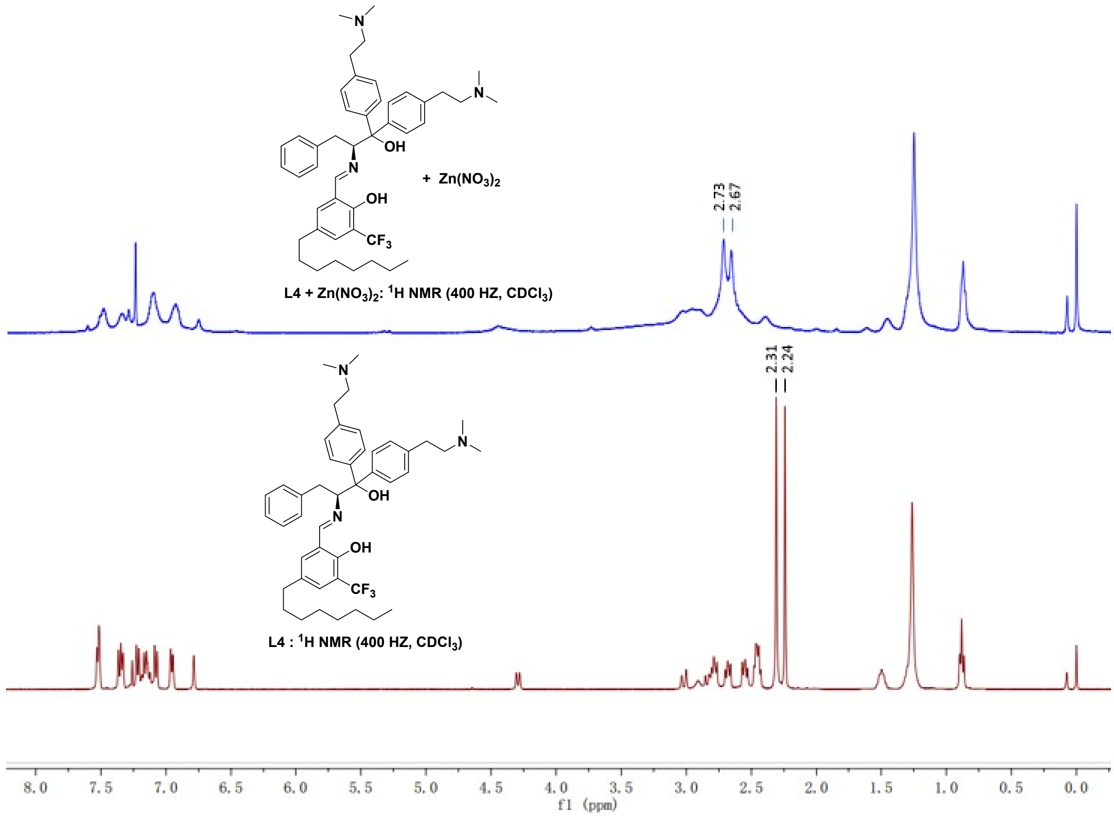
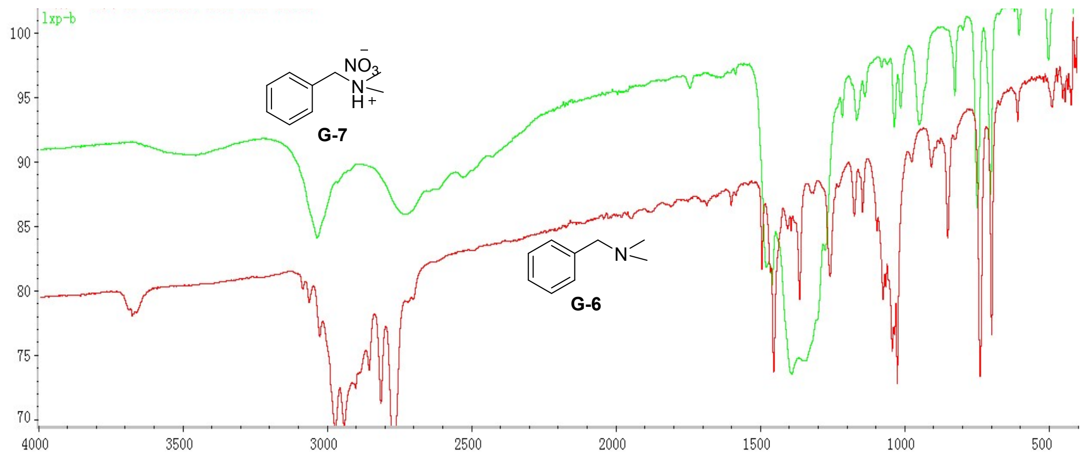


Fig S4 ^{1}H NMR of the precatalyst (**Zn-L4**)

(4) The detection of IR to confirm the formation of the ammonium salts

The test of IR to confirm the formation of ammonium salts was shown in Fig S5. The infra-red absorption peak of ammonium salt group could be observed at 1250-1450 cm^{-1} through comparative analyses of the difference between tertiary amine **G-6** and the corresponding nitrate **G-7**. As to the test of a similar catalytic system (**L2**+Zn(NO_3)$_2$), a strong absorption peak was found at the same wavelength range, that directly revealed the formation of ammonium salts.



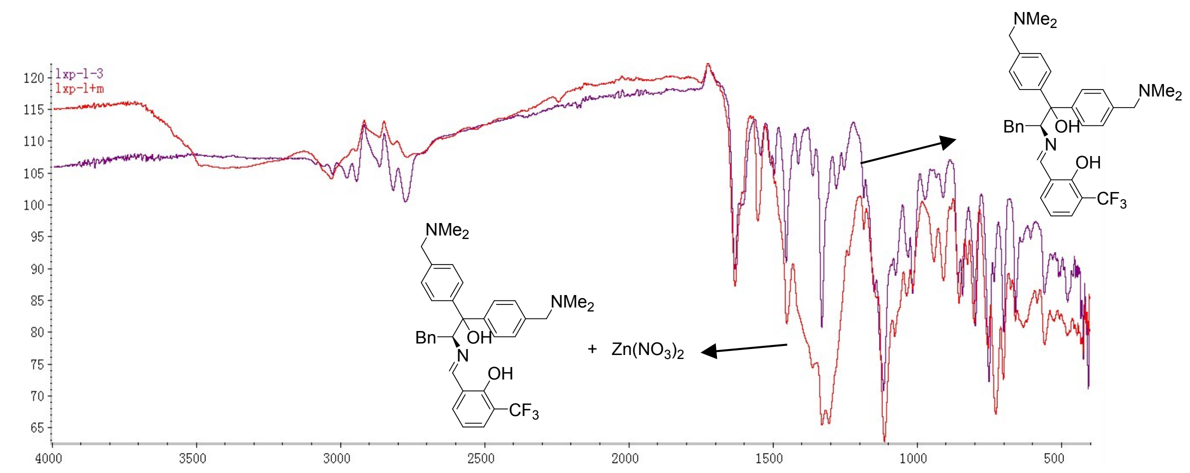


Fig S5 IR test of the formation of two ammonium salts

(5) The pH detection

1. General procedure for the pH analyse

(a) Zinc salt (0.01 mmol) was dissolved in 1 mL of H_2O, and the obtained aqueous solution was directly tested by Portable pH meter (Model: S2-Meter, Manufacturer: Mettler-Toledo).

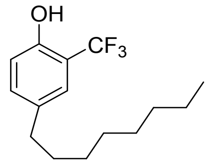
(b) Zinc salt (0.01 mmol) and **L4** (0.01 mmol) was dissolved in 1 mL of H_2O. The mixture was stirred at 25°C for 1 h and the obtained aqueous solution was directly tested by Portable pH meter (Model: S2-Meter, Manufacturer: Mettler-Toledo).

(c) Zinc salt (0.01 mmol) and **L4** (0.01 mmol) was dissolved in 1 mL of H_2O. The mixture was stirred at 25°C for 1 h. $CHCl_3$ (50 μL) as the oil phase of emulsion was then added to generate the emulsified system. The mixture was stirred at 25°C for 1 h and the obtained emulsion was directly tested by Portable pH meter (Model: S2-Meter, Manufacturer: Mettler-Toledo).

2. Results of the pH test

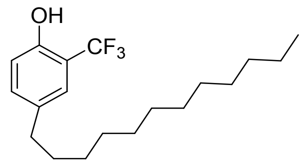
Zinc salt / pH / Procedure	(a)	(b)	(c)
$Zn(NO_3)_2$	5.45	6.10	5.43
ZnF_2	5.68	6.32	5.51
$ZnCl_2$	5.69	6.14	5.54
$ZnBr_2$	5.40	6.15	5.64
$ZnSO_4$	5.56	6.13	5.62

5. Experimental data of the reaction



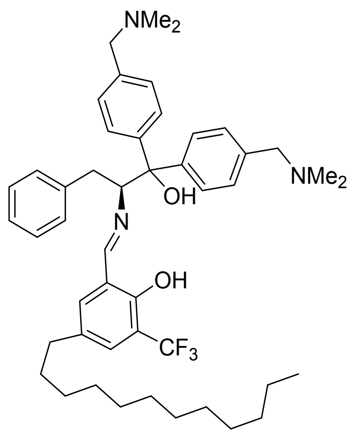
4-octyl-2-(trifluoromethyl) phenol

87% yield over four steps. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.29 (s, 1H), 7.23-7.19 (d, J = 8.4 Hz, 1H), 6.91-6.83 (d, J = 8.4 Hz, 1H), 5.43 (s, 1H), 2.56 (t, J = 7.6 Hz, 2H), 1.70-1.51(m, 2H), 1.40-1.15 (m, 10H), 0.88 (t, J = 6.8 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 151.4, 135.3, 133.4, 128.4-120.2 (q, J = 270.5 Hz), 126.3, 117.6, 116.5-115.6 (q, J = 29.7 Hz), 34.9, 31.9, 31.5, 29.4, 29.24, 29.16, 22.7, 14.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ -60.7; HRMS (ESI) m/z calcd for $C_{15}H_{22}F_3O$ $[M+H]^+$ 275.1623, found 275.1628.



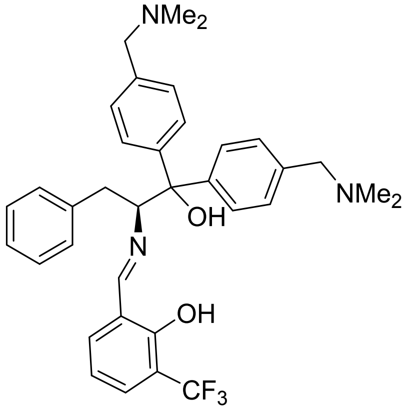
4-dodecyl-2-(trifluoromethyl) phenol

85% yield over four steps. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.29 (s, 1H), 7.24-7.18 (d, J = 8.4 Hz, 1H), 6.90-6.83 (d, J = 8.4 Hz, 1H), 5.31 (s, 1H), 2.56 (t, J = 7.6 Hz, 2H), 1.70-1.51(m, 2H), 1.40-1.20 (m, 18H), 0.88 (t, J = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 151.3, 135.4, 133.4, 128.4-120.2 (q, J = 270.5 Hz), 126.3, 117.6, 116.5-115.6 (q, J = 29.7 Hz), 34.9, 31.9, 31.5, 29.68, 29.66, 29.6, 29.5, 29.4, 29.2, 22.7, 14.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ -60.6; HRMS (ESI) m/z calcd for $C_{19}H_{30}F_3O$ $[M+H]^+$ 331.2249, found 331.2235.



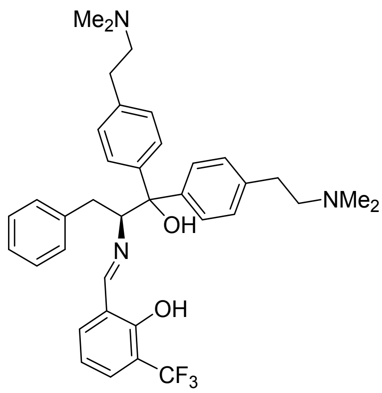
(*S*, *E*)-2-(((1,1-bis(4-((dimethylamino)methyl)phenyl)-1-hydroxy-3-phenylpropan-2-yl)imino) methyl)-4-dodecyl-6-(trifluoromethyl)phenol (L1)

^{1}H NMR (400 MHz, $CDCl_3$): δ 13.55 (br, 1H), 7.61-7.30 (m, 8H), 7.20-7.10 (m, 5H), 7.00-6.94 (m, 2H), 6.80-6.70 (m, 1H), 4.35-4.29 (m, 1H), 3.50-3.24 (m, 4H), 3.04-2.80 (m, 3H), 2.46-2.41 (m, 2H), 2.27 (s, 6H), 2.11 (s, 6H), 1.53-1.46 (m, 2H), 1.26 (s, 18H), 0.88 (t, J = 6.9 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.9, 157.4, 144.1, 142.8, 138.8, 137.7, 137.4, 134.5, 132.0, 129.7, 129.3, 129.2, 128.4, 127.7, 126.4, 126.0, 125.9, 125.0-122.3 (q, J = 270.9 Hz), 118.8, 117.6-117.0 (q, J = 30.3 Hz), 79.7, 78.9, 63.9, 63.8, 45.4, 45.2, 37.3, 34.6, 31.9, 31.4, 29.7, 29.65, 29.57, 29.44, 29.36, 29.1, 22.7, 14.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.4; $[\alpha]_D^{25}$ -66.8 (c 1.0, $CHCl_3$); HRMS (ESI) m/z calcd for $C_{47}H_{63}F_3N_3O_2$ $[M+H]^+$ 758.4872, found 758.4878.



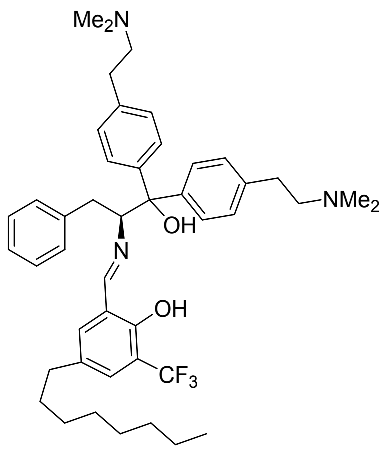
(*S*,*E*)-2-(((1,1-bis(4-((dimethylamino)methyl)phenyl)-1-hydroxy-3-phenylpropan-2-yl)imino)methyl)-6-(trifluoromethyl)phenol (L2)

^{1}H NMR (400 MHz, $CDCl_3$): δ 13.91 (br, 1 H), 7.64-7.30 (m, 8 H), 7.20-7.11 (m, 5 H), 7.00-6.94 (m, 3 H), 6.80-6.70 (m, 1 H), 4.35-4.31 (m, 1 H), 3.51-3.22 (m, 4 H), 3.10-3.01 (m, 2 H), 2.91-2.79 (m, 1 H), 2.24 (s, 6 H), 2.11 (s, 6 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.8, 160.0, 144.0, 142.7, 138.7, 137.7, 137.4, 135.1, 129.9, 129.7, 129.3, 129.2, 128.5, 126.5, 126.0, 125.9, 124.9-122.2 (q, J = 270.0 Hz), 118.8, 118.4-117.5 (q, J = 30.0 Hz), 117.3, 79.6, 78.7, 63.9, 63.7, 45.4, 45.2, 37.2; ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.6.



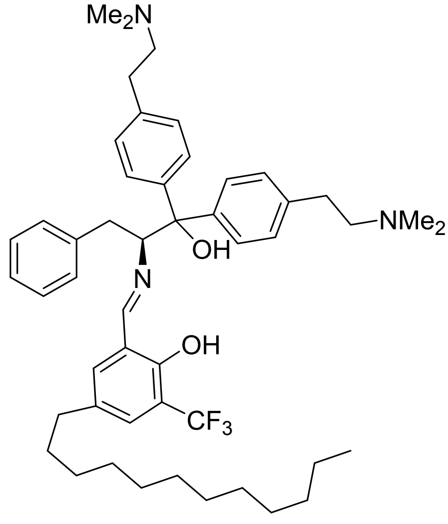
(*S*,*E*)-2-(((1,1-bis(4-(2-(dimethylamino)ethyl)phenyl)-1-hydroxy-3-phenylpropan-2-yl)imino)methyl)-6-(trifluoromethyl)phenol (L3)

^{1}H NMR (400 MHz, $CDCl_3$): δ 7.54-7.50 (m, 4 H), 7.40-7.31 (m, 2 H), 7.25-7.00 (m, 8 H), 7.05-6.91 (m, 3 H), 6.81-6.70 (m, 1 H), 4.31 (d, J = 8.9 Hz, 1 H), 3.38 (br, 1 H), 3.08-3.01 (d, J = 13.0 Hz, 1 H), 2.88-2.72 (m, 4 H), 2.71-2.64 (m, 2 H), 2.62-2.51 (m, 2 H), 2.50-2.41 (m, 2 H), 2.30 (s, 6 H), 2.23 (s, 6 H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.6, 160.5, 142.9, 141.8, 139.0, 138.9, 138.7, 135.2, 130.0, 129.7, 128.8, 128.6, 128.4, 126.5, 126.3, 126.1, 125.0-122.3 (q, J = 270.9 Hz), 118.8, 118.2-117.9 (q, J = 30.4 Hz), 117.1, 79.4, 78.5, 61.2, 61.1, 45.3, 45.2, 37.3, 33.7, 33.5; ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.6.



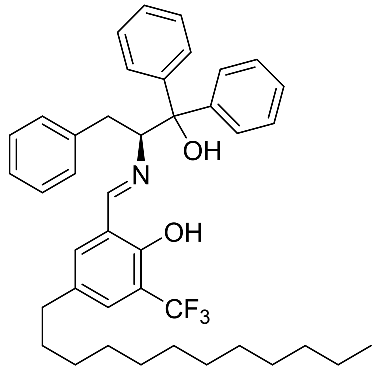
(*S*, *E*)-2-(((1,1-bis(4-(2-(dimethylamino)ethyl)phenyl)-1-hydroxy-3-phenylpropan-2-yl)imino) methyl)-4-octyl-6-(trifluoromethyl)phenol (L4)

^{1}H NMR (400 MHz, $CDCl_3$): δ 13.63 (br, 1 H), 7.53-7.33 (m, 6 H), 7.25-7.00 (m, 7 H), 7.00-6.90 (m, 2 H), 6.80-6.78 (m, 1 H), 4.35-4.27 (m, 1 H), 3.27-3.00 (m, 2 H), 2.90-2.70 (m, 3 H), 2.69-2.63 (m, 2 H), 2.55-2.40 (m, 6 H),2.29 (s, 6 H), 2.22 (s, 6 H), 1.52-1.46 (m, 2 H), 1.26 (s, 10 H), 0.88 (t, J = 6.9 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.7, 157.7, 143.0, 141.9, 139.1, 139.0, 138.9, 134.6, 131.9, 129.7, 129.0, 128.7, 128.6, 128.4, 126.4, 126.3, 126.1, 125.1-122.4 (q, J = 271.0 Hz), 118.8, 117.9-117.3 (q, J = 30.0 Hz), 79.5, 78.8, 61.4, 61.2, 45.42, 45.36, 37.4, 34.7, 33.8, 33.7, 31.9, 31.4, 29.4, 29.2, 29.1, 22.7, 14.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.3; $[\alpha]_D^{25}$ -88.6 (c 1.0, $CHCl_3$); HRMS (ESI) m/z calcd for $C_{45}H_{59}F_3N_3O_2$ $[M+H]^+$ 730.4559, found 730.4551.



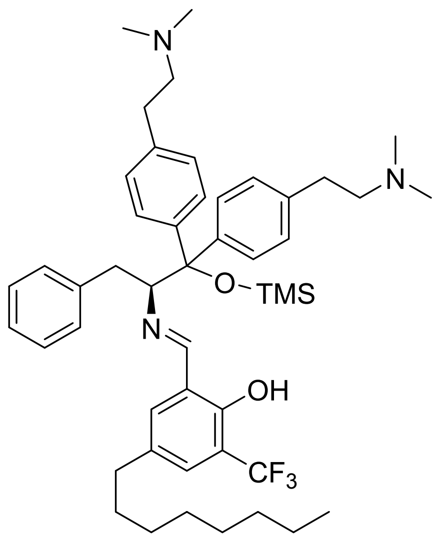
(*S*, *E*)-2-(((1,1-bis(4-(2-(dimethylamino)ethyl)phenyl)-1-hydroxy-3-phenylpropan-2-yl)imino) methyl)-4-dodecyl-6-(trifluoromethyl)phenol (L5)

^{1}H NMR (400 MHz, $CDCl_3$): δ 13.59 (br, 1 H), 7.53-7.30 (m, 6 H), 7.23-7.00 (m, 7 H), 6.98-6.90 (m, 2 H), 6.80-6.78 (m, 1 H), 4.35-4.27 (m, 1 H), 3.10-2.90 (m, 2 H), 2.86-2.70 (m, 3 H), 2.69-2.65 (m, 2 H), 2.55-2.40 (m, 6 H),2.30 (s, 6 H), 2.23 (s, 6 H), 1.52-1.47 (m, 2 H), 1.26 (s, 18 H), 0.88 (t, J = 6.6 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 165.8, 157.5, 143.0, 141.8, 139.1, 139.0, 138.9, 134.5, 132.0, 129.7, 128.7, 128.6, 128.4, 126.4, 126.2, 126.0, 125.0-122.3 (q, J = 270.9 Hz), 118.8, 117.9-117.3 (q, J = 30.6 Hz), 79.5, 78.8, 61.3, 61.2, 45.42, 45.36, 37.4, 34.6, 33.8, 33.7, 31.9, 31.4, 29.66, 29.65, 29.58, 29.43, 29.35, 29.1, 22.7, 14.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.4; $[\alpha]_D^{25}$ -73.8 (c 1.0, $CHCl_3$); HRMS (ESI) m/z calcd for $C_{49}H_{67}F_3N_3O_2$ $[M+H]^+$ 786.5185, found 786.5192.



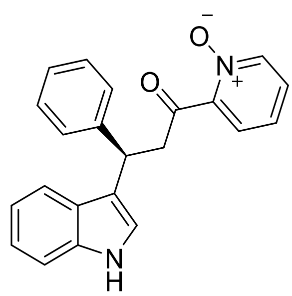
(*S*, *E*)-4-dodecyl-2-(((1-hydroxy-1,1,3-triphenylpropan-2-yl)imino)methyl)-6-(trifluoromethyl) phenol (L6)

^{1}H NMR (400 MHz, $CDCl_3$): δ 13.53 (br, 1 H), 7.65-7.32 (m, 8 H), 7.30-7.09 (m, 6 H), 6.97-6.94 (m, 2 H), 6.79 (s, 1 H), 4.37-4.32 (m, 1 H), 3.04-3.00 (m, 1 H), 2.90-2.82 (m, 2 H), 2.48-2.42 (m, 2 H), 1.50 (s, 2 H), 1.26 (s, 18 H), 0.88 (t, J = 6.6 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$): δ 166.0, 157.4, 145.3, 144.0, 138.8, 134.6, 132.1, 129.8, 128.6, 128.4, 127.2, 127.1, 126.4, 126.1, 126.0, 125.0, 122.3, 118.7, 117.6, 117.3 79.7, 78.7, 37.3, 34.6, 32.0, 31.4, 29.7, 29.67, 29.6, 29.5, 29.4, 29.1, 22.7, 14.2; ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.4; $[\alpha]_D^{25}$ -116.6 (c 1.0, $CHCl_3$); HRMS (ESI) m/z calcd for $C_{41}H_{48}F_3NO_2$ $[M+H]^+$ 644.3715, found 644.3701.



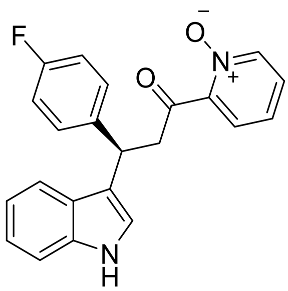
(*S*, *E*)-2-(((1,1-bis(4-(2-(dimethylamino)ethyl)phenyl)-3-phenyl-1-((trimethylsilyl)oxy)propan-2-yl)imino)methyl)-4-octyl-6-(trifluoromethyl)phenol (L7)

^{1}H NMR (400 MHz, $CDCl_3$) δ 13.59 (br, 1 H), 7.72 (s, 1H), 7.54-7.52 (2H), 7.47-7.11 (m, 10H), 6.99-6.96 (2H), 6.91 (s, 1H), 4.23- 4.19 (d, 1H), 3.38-3.33 (2H), 2.93-2.83 (m, 4H), 2.71-2.66 (m, 4H), 2.66-2.52 (t, 2H), 2.40-2.38 (12H), 1.52 (2H), 1.27 (10 H), 0.90-0.86 (3H), -0.18 (9H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.8, 140.4, 140.2, 139.1, 139.0, 134.4, 131.4, 130.8, 129.5, 129.3, 129.1, 128.2, 127.8, 126.1, 118.8, 82.4, 61.0, 60.9, 45.1, 44.9, 37.8, 34.5, 33.4, 33.3, 31.7, 31.3, 29.3, 29.1, 29.0, 22.5, 13.9, 1.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.3; HRMS (ESI) m/z calcd for $C_{48}H_{66}F_3N_3O_2Si$ $[M+H]^+$ 802.4955, found 802.4961.



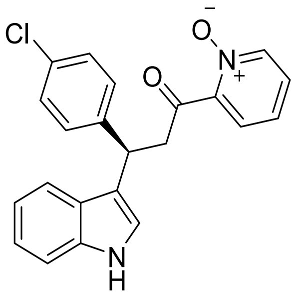
(*R*)-2-(3-(1H-indol-3-yl)-3-phenylpropanoyl)pyridine 1-oxide (4a)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 90% yield. $[\alpha]_D^{25}$ = 19.2 (*c* = 1.0, THF, 94% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min,254 nm; t_R = 26.50 min (major) and 31.25 min (minor); ^{1}H NMR(400 MHz, $CDCl_3$) δ 8.29-8.01 (m, 2H), 7.50-7.35 (m, 1H), 7.32-7.18 (m, 6H), 7.15-6.90 (m, 6H), 4.93 (t, *J* = 7.6 Hz, 1H), 4.11-4.05 (dd, *J* = 16.8, 7.2 Hz, 1H), 3.99-3.93 (dd, *J* = 16.4, 7.6 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.1, 147.1, 143.9, 140.1, 136.5, 128.4, 127.9, 127.5, 126.7, 126.5, 126.4, 125.7, 122.1, 121.6, 119.5, 119.4, 118.7, 111.1, 49.1, 38.6.



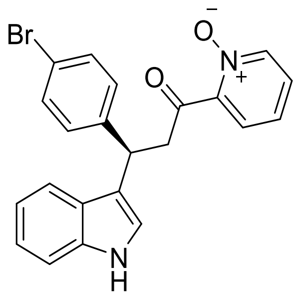
(*R*)-2-(3-(4-fluorophenyl)-3-(1H-indol-3-yl)propanoyl)pyridine 1-oxide (4b)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 95% yield. $[\alpha]_D^{25}$ = 11.7 (*c* = 1.0, in THF, 91% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 25.15 min (major) and 32.66 min (minor); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.29-8.08 (m, 2H), 7.41-7.32 (m, 1H), 7.30-7.18 (m, 5H), 7.15-7.01 (m, 3H), 7.01-6.90 (m, 1H), 6.90-6.80 (m, 2H), 4.93 (t, *J* = 7.6 Hz, 1H), 4.09-4.03 (dd, *J* = 16.8, 7.6 Hz, 1H), 3.99-3.92 (dd, *J* = 16.8, 8.0 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 196.7, 162.6-160.2 (d, *J* = 242.7 Hz), 146.9, 140.2, 139.7-139.6 (d, *J* = 3.2 Hz), 136.6, 129.4-129.3 (d, *J* = 7.9Hz), 127.7, 126.7, 126.5, 125.7, 122.2, 121.6, 119.44-119.37 (d, *J* = 6.2 Hz), 118.6, 115.2, 115.0, 111.1, 49.2, 37.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ -113.7.



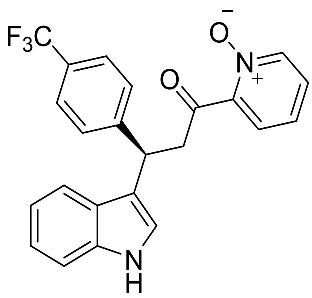
(*R*)-2-(3-(4-chlorophenyl)-3-(1H-indol-3-yl)propanoyl)pyridine 1-oxide (4c)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 94% yield. $[\alpha]_D^{25}$ = 17.9 (c=1.0, THF, 97% ee). HPLC on Daicel Chiralpak AD-H column, n-hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 26.97 min (major) and 36.95 min(minor); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.21-8.11 (m, 2H), 7.32-7.18 (m, 1H), 7.22-6.95 (m, 10 H), 6.95-6.80 (m, 1H), 4.85 (t, *J* = 7.6 Hz, 1H), 4.02-3.96 (dd, *J* = 16.8, 7.6 Hz, 1H), 3.92-3.85 (dd, *J* = 16.4, 8.0 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 195.5, 145.8, 141.5, 139.2, 135.5, 130.9, 128.3, 127.4, 126.7, 125.7, 125.4, 124.7, 121.2, 120.6, 118.4, 118.3, 117.2, 110.1, 47.9, 36.7.



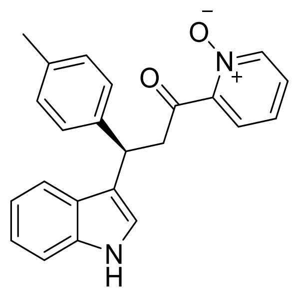
(*R*)-2-(3-(4-bromophenyl)-3-(1H-indol-3-yl)propanoyl)pyridine 1-oxide (4d)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 95% yield. $[\alpha]_D^{25}$ = 16.1 (*c* = 1.0, THF, 97% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 30.13 min (major) and 41.18 min (minor); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.20-8.11 (m, 2H), 7.42-6.93 (m, 12 H), 4.92 (t, *J* = 7.6 Hz, 1H), 4.10-4.04 (dd, *J* = 16.8, 7.6 Hz, 1H), 4.00-3.93 (dd, *J* = 16.4, 8.0 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 196.4, 146.8, 143.0, 140.3, 136.5, 131.4, 129.7, 127.8, 126.8, 126.5, 125.6, 122.3, 121.6, 120.1, 119.5, 119.3, 118.2, 111.0, 48.9, 37.8.



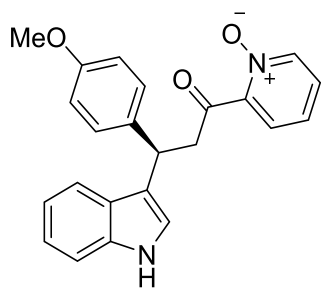
(*R*)-2-(3-(1H-indol-3-yl)-3-(4-(trifluoromethyl)phenyl)propanoyl)pyridine 1-oxide (4e)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 93% yield. $[\alpha]_D^{25}$ = 10.5 (*c* = 1.0, THF, 95% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 18.65 min (major) and 23.85 min (minor);^{1}H NMR (400 MHz, DMSO-d_6) δ 10.95 (s, 1H), 8.33-8.31 (d, *J* = 6.4 Hz, 1H), 7.61-7.50 (m, 5H),7.39-7.27 (m, 5 H), 7.03 (t, *J* = 7.5 Hz, 1H), 6.89 (t, *J* = 7.8 Hz, 1H), 4.95-4.90 (m, 1H), 4.09-4.07 (m, 1H), 4.03-3.88 (m, 1H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 197.3, 150.0, 146.6, 140.6, 136.9, 129.0, 128.9-120.8 (q, *J* = 270.0 Hz), 127.6-126.7 (q, *J* = 30.0 Hz), 126.6, 126.4, 126.3, 125.54, 125.50, 122.8, 121.6, 118.9, 117.0, 111.9, 79.6, 48.1, 37.9. ^{19}F NMR (376 MHz, DMSO-d_6) δ -60.7; HRMS (ESI) m/z calcd for $C_{23}H_{17}F_3N_2NaO_2$ $[M+Na]^+$ 433.1140, found 433.1136.



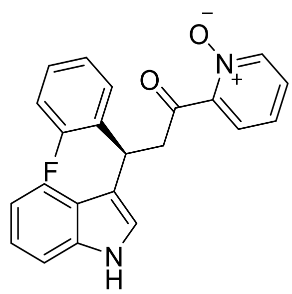
(*R*)-2-(3-(1H-indol-3-yl)-3-(p-tolyl)propanoyl)pyridine 1-oxide (4f)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 95% yield. $[\alpha]_D^{25}$ = 7.3 (c = 1.0, THF, 93% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 25.29 min (major) and 32.69 min (minor); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.16-8.14 (d, J = 5.6 Hz, 1H), 8.01 (s, 1 H), 7.45-7.42 (d, J = 7.6 Hz, 1H), 7.32-6.90 (m, 11H), 4.89 (t, J = 6.8 Hz, 1H), 4.11-4.04 (dd, J = 16.0, 7.2 Hz, 1H), 3.97-3.91 (dd, J = 16.0, 8.0 Hz, 1H), 2.26(s, 3H) ;^{13}C NMR (100 MHz, $CDCl_3$) δ 197.2, 140.8, 136.5, 135.8, 129.1, 127.7, 127.5, 126.7, 126.6, 125.6, 122.1, 121.5, 119.5, 119.4, 119.1, 111.0, 49.1, 38.1, 21.0.



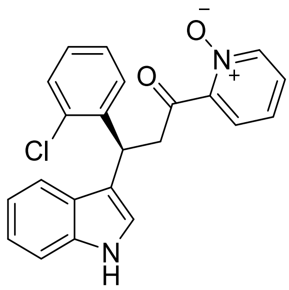
(*R*)-2-(3-(1H-indol-3-yl)-3-(4-methoxyphenyl)propanoyl)pyridine 1-oxide (4g)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 92% yield. $[\alpha]_D^{25}$ = 17.0 (c = 1.0, THF, 87% ee). HPLC on Daicel Chiralpak AD-H column, *n*-hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 40.92 min (major) and 47.16 min (minor); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.20-8.09 (m, 2H), 7.45-7.39 (m, 1 H), 7.30-6.95 (m, 9H), 6.80-6.69 (m, 2H), 4.88 (t, J = 8.0 Hz, 1H), 4.08-4.03 (dd, J = 16.0, 7.2 Hz, 1H), 3.96-3.90 (dd, J = 16.0, 8.0 Hz, 1H), 3.72 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.3, 158.0, 147.2, 140.1, 136.6, 136.0, 128.9, 127.5, 126.7, 126.5, 125.6, 122.0, 121.5, 119.5, 119.3, 119.1, 114.4, 113.7, 111.1, 55.2, 49.2, 37.8.



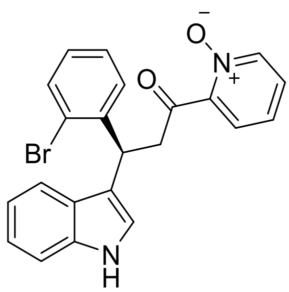
(*S*)-2-(3-(2-fluorophenyl)-3-(1H-indol-3-yl)propanoyl)pyridine 1-oxide (4h)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 89% yield. $[\alpha]_D^{25}$ = -13.3 (*c* = 1.0, THF, 93% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 25.86 min (major) and 35.89 min (minor); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.22 (s, 1H), 8.06-8.05 (d, *J* = 6.4 Hz, 1H), 7.44-7.42 (d, *J* = 7.9 Hz, 1H), 7.20-7.13 (m, 4H), 7.05-7.01 (m, 4H), 6.95-6.85 (m, 3H), 5.19 (t, *J* = 7.6 Hz, 1H), 4.17-4.10 (dd, *J* = 17.0, 7.6 Hz, 1H), 3.89-3.83 (dd, *J* = 17.0, 7.8 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 196.4, 161.7-159.3 (d, *J* = 244.1 Hz), 146.8, 140.2, 136.4, 130.8-130.6 (d, *J* = 13.9 Hz), 129.5-129.4 (d, *J* = 4.2 Hz), 128.0-127.9 (d, *J* = 7.6 Hz), 127.7, 126.6, 125.8, 124.2-124.1 (d, *J* = 3.3 Hz), 122.1, 121.9, 119.4, 119.2, 117.6, 115.5, 115.3, 111.2, 47.7, 31.2; ^{19}F NMR (376 MHz, $CDCl_3$) δ -118.6.



(*S*)-2-(3-(2-chlorophenyl)-3-(1H-indol-3-yl)propanoyl)pyridine 1-oxide (4i)

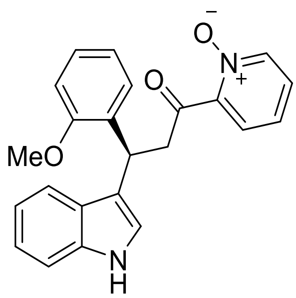
The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 90% yield. $[\alpha]_D^{25}$ = -73.7 (*c* = 1.0, THF, 90% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 23.73 min (major) and 30.57 min (minor); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.27 (s, 1H), 8.15-8.12 (m, 1H), 7.49-7.47 (d, *J* = 7.9 Hz, 1H), 7.35-7.16 (m, 5H), 7.15-6.95 (m, 6H), 5.46 (t, *J* = 7.6 Hz, 1H), 4.27-4.21 (dd, *J* = 17.0, 8.3 Hz, 1H), 3.83-3.77 (dd, *J* = 17.0, 6.9 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 196.3, 146.9, 141.1, 140.2, 136.5, 133.5, 129.5, 129.3, 127.7, 127.6, 127.0, 126.7, 126.6, 125.9, 122.3, 122.1, 119.5, 117.6, 111.2, 47.8, 34.6.



(*S*)-2-(3-(2-bromophenyl)-3-(1H-indol-3-yl)propanoyl)pyridine 1-oxide (4j)

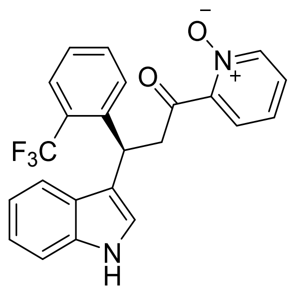
The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 94% yield. $[\alpha]_D^{25}$ = -49.6 (*c* = 1.0, THF, 92%

ee). HPLC on Chiralpak OD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 24.74 min (major) and 31.36 min (minor); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.40 (s, 1H), 8.12-8.11 (d, J = 4.2 Hz, 1H), 7.51-7.47 (m, 2H), 7.25-6.94 (m, 10H), 5.43 (t, J = 7.0 Hz, 1H), 4.26-4.20 (dd, J = 16.8, 8.4 Hz, 1H), 3.79-3.73 (dd, J = 16.6, 6.2 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 196.2, 142.8, 136.6, 132.9, 129.5, 128.0, 127.6 126.7, 126.5, 124.4, 122.4, 122.1, 119.6, 119.4, 117.5, 111.2, 48.0, 37.5.



(*S*)-2-(3-(1H-indol-3-yl)-3-(2-methoxyphenyl)propanoyl)pyridine 1-oxide (4k)

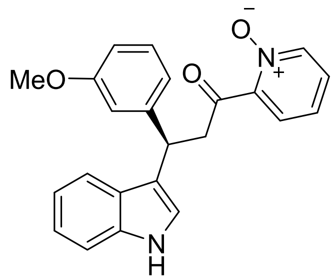
The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 91% yield. $[\alpha]_D^{25}$ = 16.6 (c = 1.0, THF, 84% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 27.7 min (minor) and 38.5 min (major); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.30 (s, 1H), 8.10-8.09 (d, J = 6.4,1H), 7.51-7.49 (d, J = 7.9 Hz, 1H), 7.25-6.94 (m, 9H), 6.80-6.72 (m, 2H), 5.35 (t, J = 7.7 Hz, 1H), 4.18-4.12 (dd, J = 8.3, 16.4 Hz, 1H), 3.85-3.70 (dd, J = 7.3,16.4 Hz, 1H), 3.76 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.5, 156.7, 147.3, 140.0, 136.5, 131.9, 128.6, 127.4, 127.3, 127.0, 126.3, 125.6, 122.1, 121.9, 120.6, 119.6, 119.2, 118.4, 111.0, 110.5, 55.4, 47.7, 31.4; HRMS (ESI) m/z calcd for $C_{23}H_{20}N_2NaO_3$ $[M+Na]^+$ 395.1372, found 395.1366.



(*R*)-2-(3-(1H-indol-3-yl)-3-(2-(trifluoromethyl)phenyl)propanoyl)pyridine 1-oxide (4l)

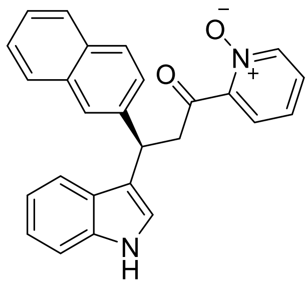
The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 93% yield. $[\alpha]_D^{25}$ = 17.3 (c = 1.0, THF, 90% ee). HPLC on Chiralpak OD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 21.11 min (major) and 29.88 min (minor);^{1}H NMR (400 MHz, $CDCl_3$) δ 8.28 (s, 1H), 8.16-8.14 (d, J = 6.4 Hz, 1H), 7.65-7.62 (d, J = 7.6 Hz, 1H),7.41-6.94 (m, 11 H), 5.46-5.42 (dd, J = 4.4, 9.9 Hz, 1H), 4.45-4.38 (dd, J = 10, 17.8 Hz, 1H), 3.55-3.48 (dd, J = 4.5,17.8 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$)

δ 195.5, 146.8, 143.1, 140.3, 136.7, 132.0, 129.9, 128.9-120.7 (q, J = 272.4 Hz), 127.9-127.1 (q, J = 26.7 Hz), 127.8, 126.7, 126.6, 126.4, 126.0, 125.9-125.8 (q, J = 6.0 Hz), 122.6, 122.1, 119.5, 119.4, 117.7, 111.1, 49.1, 33.6; ^{19}F NMR (376 MHz, $CDCl_3$) δ -125.2; HRMS (ESI) m/z calcd for $C_{23}H_{17}F_3N_2NaO_2$ $[M+Na]^+$ 433.1140, found 433.1138.



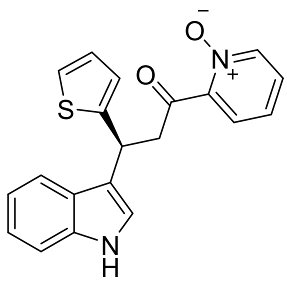
(*R*)-2-(3-(1H-indol-3-yl)-3-(3-methoxyphenyl)propanoyl)pyridine 1-oxide (4m)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 92% yield. $[\alpha]_D^{25}$ = 13.4 (c = 1.0, THF, 90% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 30.98 min (major) and 33.44 min (minor);^{1}H NMR (400 MHz, $CDCl_3$) δ 8.17 (s, 1H), 8.15-8.12 (d, J = 6.4, 1H), 7.47-7.44 (d, J = 7.9 Hz, 1H), 7.29-6.85 (m, 10H), 6.69-6.65 (dd, J = 2.0, 8.1 Hz, 1H), 4.91 (t, J = 7.7 Hz, 1H), 4.11-4.04 (dd, J = 7.6, 16.6 Hz, 1H), 3.98-3.91 (dd, J = 8.0 Hz, 16.6, 1H), 3.70 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.1, 159.6, 147.1, 145.5, 140.1, 136.5, 129.3, 127.5, 126.7, 126.6, 125.6, 122.1, 121.6, 120.4, 119.43, 119.38, 118.6, 113.8, 111.6, 111.1, 55.1, 49.0, 38.6; HRMS (ESI) m/z calcd for $C_{23}H_{20}N_2NaO_3$ $[M+Na]^+$ 395.1372, found 395.1367.



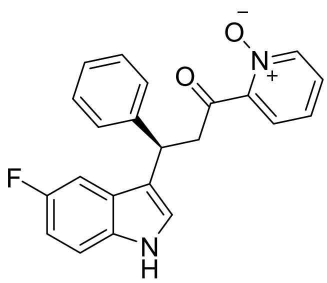
(*R*)-2-(3-(1H-indol-3-yl)-3-(naphthalen-2-yl)propanoyl)pyridine 1-oxide (4n)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 95% yield. $[\alpha]_D^{25}$ = -36.4 (c = 1.0, THF, 97% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 40.64 min (minor) and 46.06 min (major); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.21-8.01 (m, 2H), 7.80-7.61 (m, 4H), 7.48-7.31 (m, 4H), 7.30-7.19 (m, 2H), 7.12-6.88 (m, 5H), 5.10 (t, J = 7.7 Hz, 1H), 4.20-3.89 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.0, 147.0, 141.3,140.1, 136.5, 133.4, 132.3, 128.1, 127.8, 127.5, 126.7, 126.62, 126.57, 126.1, 125.9, 125.6, 125.4, 122.1, 121.7, 119.5, 119.4, 118.7, 111.0, 48.9, 38.7.



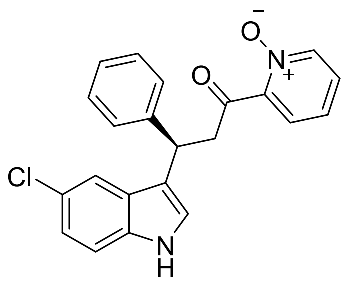
(*S*)-2-(3-(1H-indol-3-yl)-3-(thiophen-2-yl)propanoyl)pyridine 1-oxide (4o)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 88% yield. $[\alpha]_D^{25}$ = 19.3 (*c* = 1.0, THF, 92% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 29.11 min (major) and 31.26 min (minor); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.20 (s, 1H), 8.06-8.04 (d, *J* = 6.2, 1H), 7.47-7.44 (d, *J* = 7.9 Hz, 1H), 7.22-6.75 (m, 10H), 5.17 (t, *J* = 7.5, 1H), 4.10-4.03 (dd, *J* = 7.3, 16.6 Hz, 1H), 3.99-3.92 (dd, *J* = 7.9, 16.6 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 196.5, 148.4, 146.9, 140.1, 136.4, 127.7, 126.6,126.5, 126.3, 125.7, 124.3, 123.6, 122.2, 121.8, 119.5, 119.3, 118.5, 111.2, 50.0, 33.9; HRMS (ESI) m/z calcd for $C_{20}H_{16}N_2NaO_2S$ $[M+Na]^+$ 371.0830, found 371.0827.



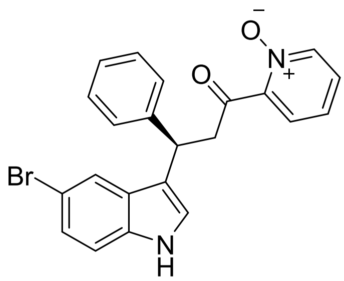
(*R*)-2-(3-(5-fluoro-1H-indol-3-yl)-3-phenylpropanoyl)pyridine 1-oxide (4p)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 95% yield. $[\alpha]_D^{25}$ = 20.1 (*c* = 1.0, THF, 96% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 20.78 min (major) and 23.09 min (minor); ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.98(s, 1H), 8.33-8.31 (d, *J* = 6.4 Hz, 1H), 7.55-7.50 (m, 1 H), 7.38-7.00 (m, 10H), 6.89-6.83 (m, 1H), 4.76-4.71 (t, *J* = 7.8 Hz, 1H), 4.05-3.98 (dd, *J* = 8.0, 16.8 Hz, 1H), 3.81-3.74 (dd, *J* = 7.4, 16.9 Hz, 1H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 197.6, 158.1-155.8 (d, *J* = 229.7 Hz), 146.8, 144.7, 140.5, 133.5, 128.9, 128.7, 128.1, 126.95-126.85 (d, *J* = 9.6 Hz), 126.5, 126.30, 126.25, 124.7, 118.1-118.0 (d, *J* = 4.9 Hz), 112.8-112.7 (d, *J* = 9.8 Hz), 109.7-109.4 (d, *J* = 26.1 Hz), 103.8-103.6 (d, *J* = 23.0 Hz), 48.4, 38.0; ^{19}F NMR (376 MHz, DMSO-d_6) δ -124.4.



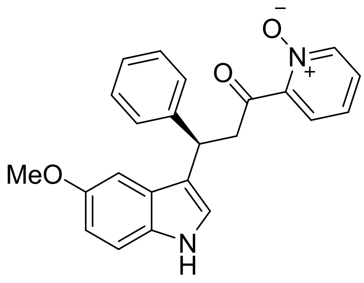
(*R*)-2-(3-(5-chloro-1H-indol-3-yl)-3-phenylpropanoyl)pyridine 1-oxide (4q)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 92% yield. $[\alpha]_D^{25}$= 40.0 (*c* = 1.0, THF, 98% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 19.15 min (major) and 22.02 min (minor); ^{1}H NMR (400 MHz, DMSO-d_6) δ 11.09 (s, 1H), 8.33-8.31 (d, *J* = 6.4 Hz, 1H), 7.55-7.50 (m, 1 H), 7.42-6.95 (m, 11H), 4.76-4.71 (t, *J* = 7.8 Hz, 1H), 4.04-3.98 (dd, *J* = 8.4, 17.0 Hz, 1H), 3.79-3.73 (dd, *J* = 7.2, 16.8 Hz, 1H); ^{13}C NMR (400 MHz, DMSO-d_6) δ 197.6, 146.7, 144.7, 140.6, 135.3, 128.9, 128.7, 128.1, 127.9, 126.6, 126.34, 126.29, 124.5, 123.4, 121.4, 118.2, 117.7, 113.4, 48.5, 37.8.



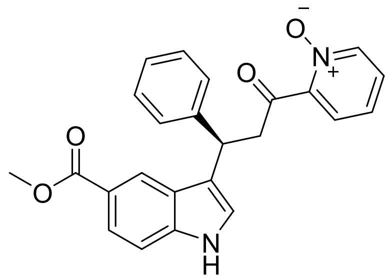
(*R*)-2-(3-(5-bromo-1H-indol-3-yl)-3-phenylpropanoyl)pyridine 1-oxide (4r)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 93% yield. $[\alpha]_D^{25}$ = 55.4 (*c* = 1.0, THF, 98% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 19.25 min (major) and 22.64 min (minor); ^{1}H NMR (400 MHz, DMSO-d_6) δ 11.1 (s, 1H), 8.34-8.32 (d, *J* = 6.4 Hz, 1H), 7.60-7.08 (m, 12H), 4.79-4.75 (t, *J* = 7.6 Hz, 1H), 4.04-3.98 (dd, *J* = 8.2, 17.0 Hz, 1H), 3.79-3.73 (dd, *J* = 7.2, 16.9 Hz, 1H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 197.5, 146.8, 144.7, 140.6, 135.5, 128.9, 128.7, 128.6, 128.1, 126.6, 126.4, 126.3, 124.4, 124.0, 121.2, 117.6, 113.9, 111.4, 48.5, 37.8.



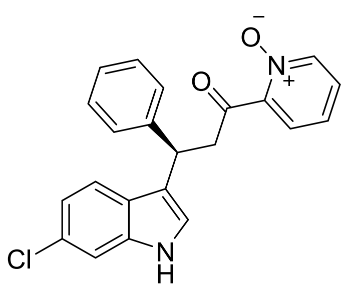
(*R*)-2-(3-(5-methoxy-1H-indol-3-yl)-3-phenylpropanoyl)pyridine 1-oxide (4s)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 90% yield. $[\alpha]_D^{25}$ = 36.4 (*c* = 1.0, THF, 90% ee). HPLC on Daicel Chiralpak AD-H column, n-hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 27.49 min (major) and 33.57 min (minor); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.16-8.11 (m, 2H), 7.35-6.98 (m, 10H), 6.85-6.84 (d, *J* = 2.4 Hz, 1H), 6.77-6.74 (m, 1H), 4.87 (t, *J* = 7.8 Hz, 1H), 4.11-4.05 (dd, *J* = 7.6, 16.4 Hz, 1H), 3.96-3.90 (dd, *J* = 8.0, 16.4 Hz, 1H), 3.72 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 197.2, 153.7, 147.1, 143.8, 140.0, 131.7, 128.4, 127.9, 127.6, 127.1, 126.5, 126.4, 125.7, 122.4, 118.3, 122.2, 111.8, 101.3, 55.8, 49.0, 38.6.



(*R*)-2-(3-(5-acetyl-1H-indol-3-yl)-3-phenylpropanoyl)pyridine 1-oxide (4t)

The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 90% yield. $[\alpha]_D^{25}$ = 33.1 (*c* = 1.0, THF, 83% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R = 22.27 min (major) and 25.50 min (minor); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.72 (s, 1H), 8.12 (s, 1H), 8.09-8.07 (d, *J* = 4.8 Hz, 1H), 7.74-7.71 (dd, *J* = 1.4, 8.6 Hz, 1H), 7.24-7.01 (m, 10H), 4.91 (t, *J* = 7.6 Hz, 1H), 4.03-3.96 (dd, *J* = 7.6, 16.9 Hz, 1H), 3.94-3.87 (dd, *J* = 7.8, 16.6 Hz, 1H), 3.79 (s, 3H);^{13}C NMR (100 MHz, $CDCl_3$) δ 196.6, 168.2, 146.9, 143.5, 140.2, 139.1, 128.5, 127.8, 127.7, 126.6, 126.5, 126.3, 125.9, 123.5, 123.0, 122.2, 121.4, 120.1, 110.9, 51.9, 49.2, 38.1; HRMS (ESI) m/z calcd for $C_{24}H_{20}NaN_2O_4$ $[M+Na]^+$ 423.1321, found 423.1315.



(*R*)-2-(3-(6-chloro-1H-indol-3-yl)-3-phenylpropanoyl)pyridine 1-oxide (4u)

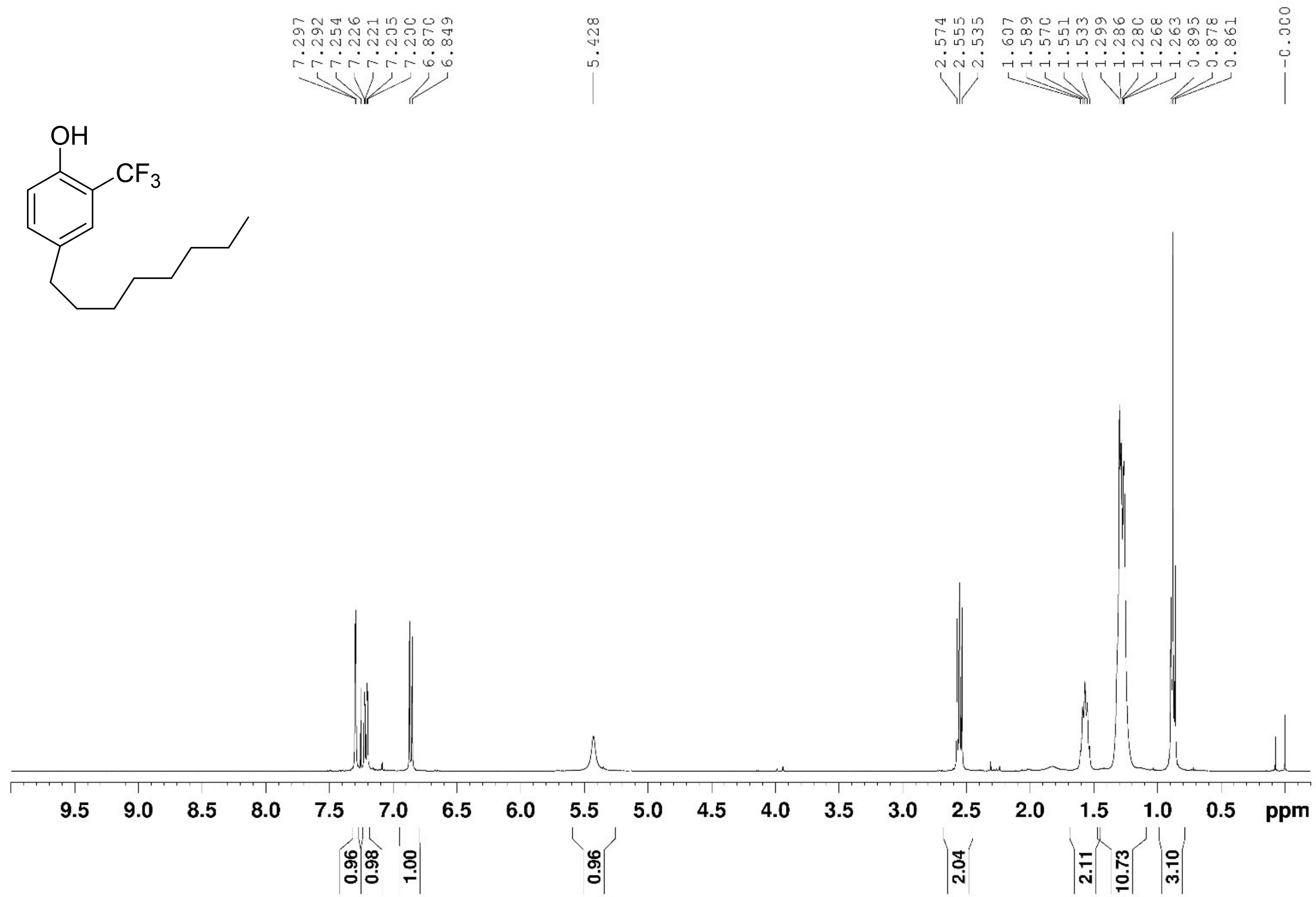
The title compound was prepared according to the general working procedure and purified by column chromatography to give the product as a white solid in 93% yield. $[\alpha]_D^{25}$ = 36.5 (*c* = 1.0, THF, 96% ee). HPLC on Chiralpak AD-H column, hexane/2-propanol = 80:20, flow rate 1.0 mL/min, 254 nm; t_R

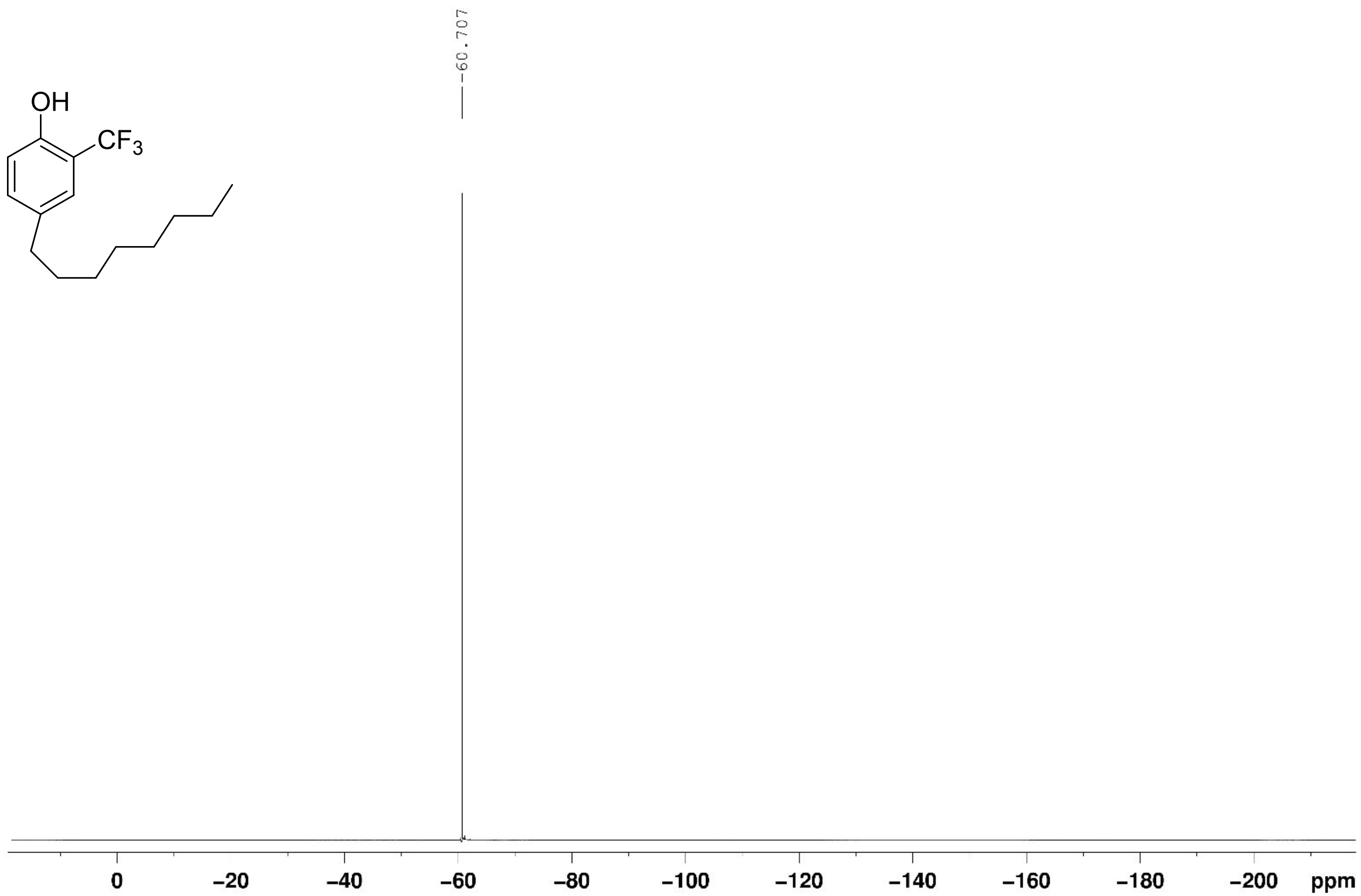
= 26.41 min (major) and 30.16 min (minor);^{1}H NMR (400 MHz, $CDCl_3$) δ 8.22 (s, 1H), 8.17-8.15 (d, *J* = 6.4 Hz, 1H), 7.31-7.08 (m, 11 H), 6.95-6.92 (dd, *J* = 1.8, 8.5 Hz, 1H), 4.90 (t, *J* = 7.7 Hz, 1H), 4.12-4.05 (dd, *J* = 7.6, 16.9 Hz, 1H), 3.95-3.88 (dd, *J* = 7.8,16.6 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 196.8, 147.0, 143.5, 140.2, 136.9, 128.5, 128.0, 127.8, 127.7, 126.6, 126.5, 125.8, 125.3, 122.2, 120.4, 120.1, 119.0, 111.0, 49.0, 38.3; HRMS (ESI) m/z calcd for $C_{22}H_{17}ClN_2NaO_2$ $[M+Na]^+$ 399.0876, found 399.0873.

References

1. Y. Gui, Y. Li, J. Sun, Z. Zha, Z. Wang, *J. Org. Chem*. 2018, **83**, 7491-7499.
2. P. Singh, V. Singh, *Org. Lett.* 2008, **10**, 4121–4124.

6. Copies of ^{1}H NMR, ^{19}F NMR and ^{13}C NMR Spectra





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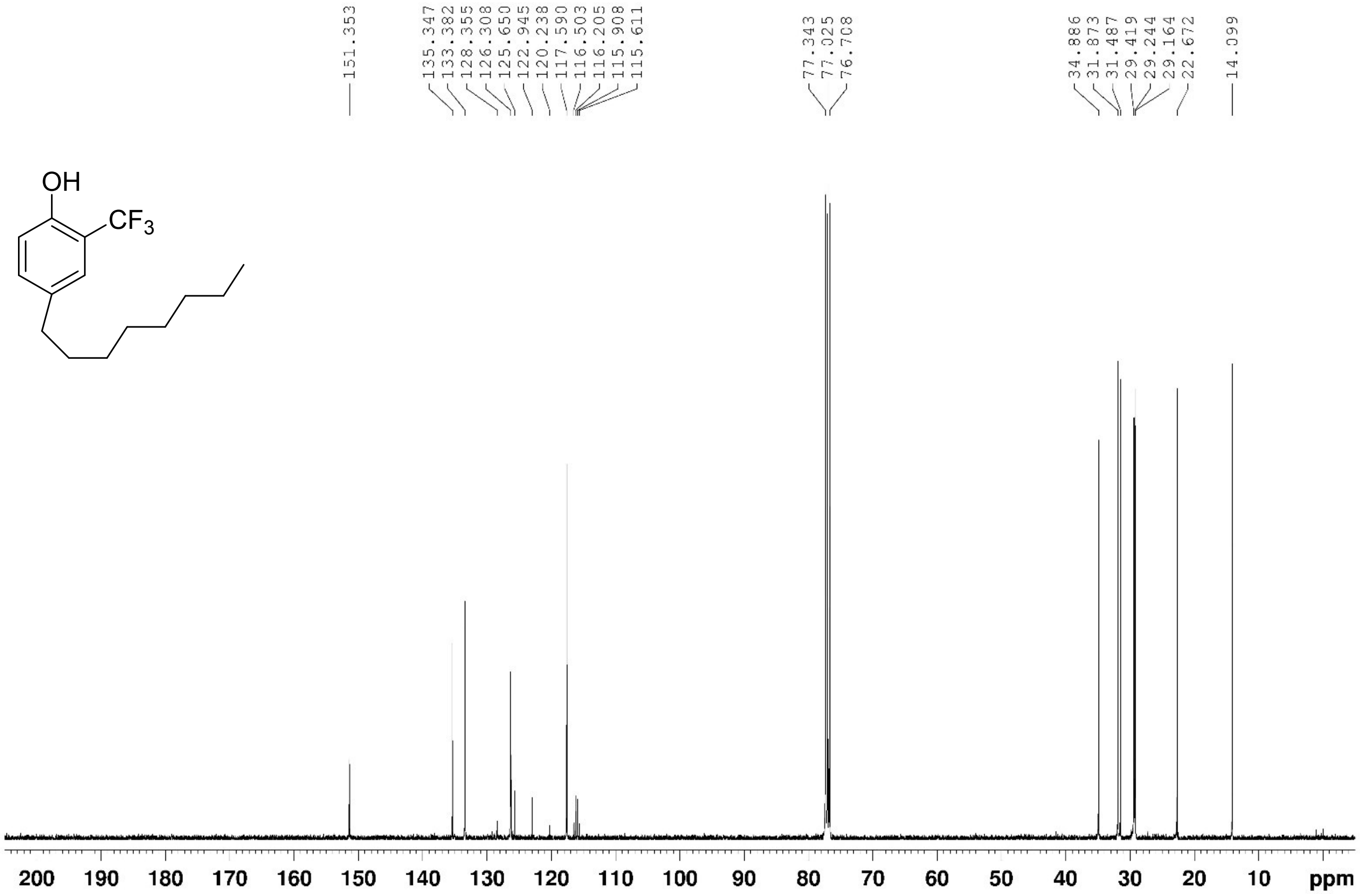
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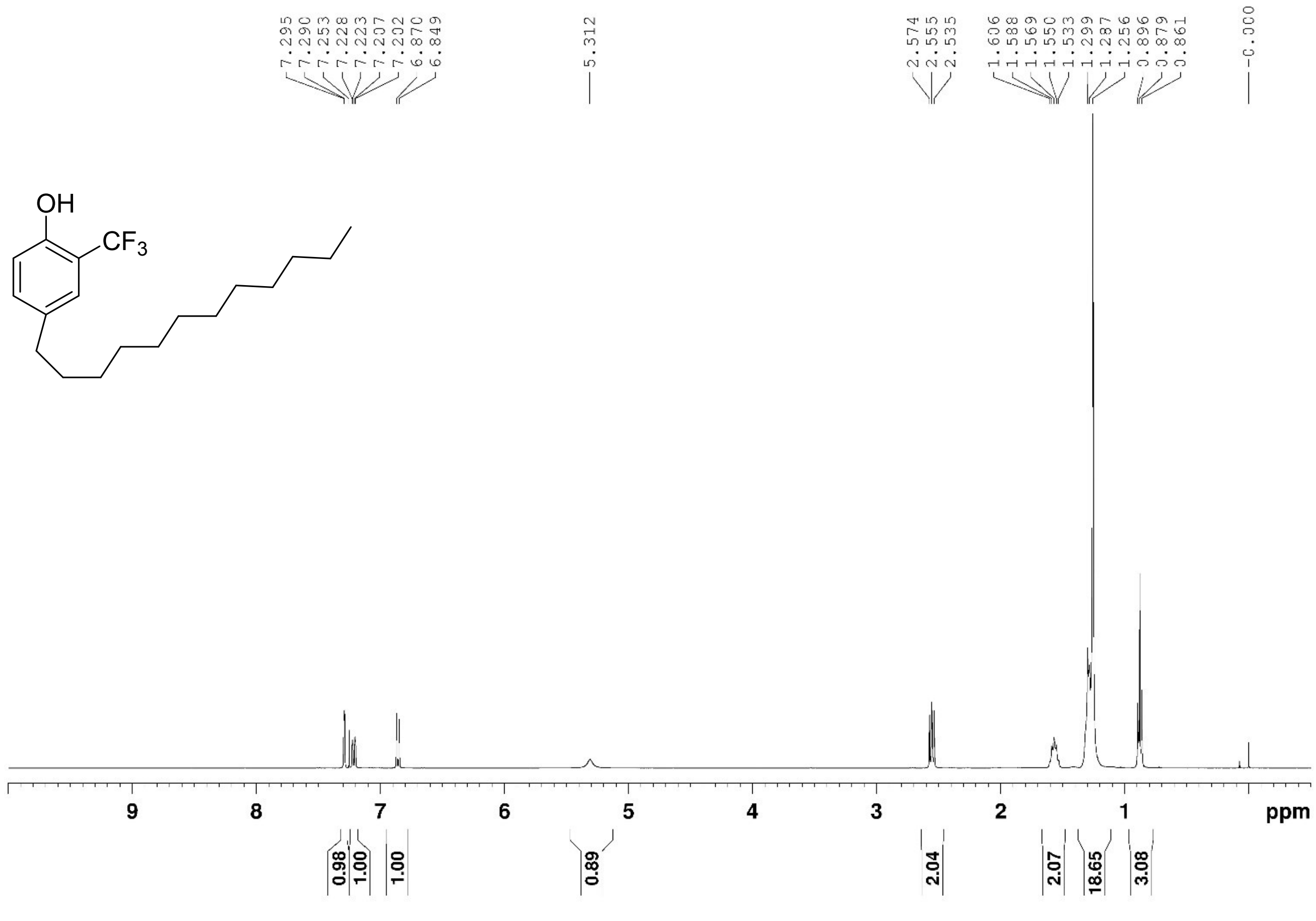
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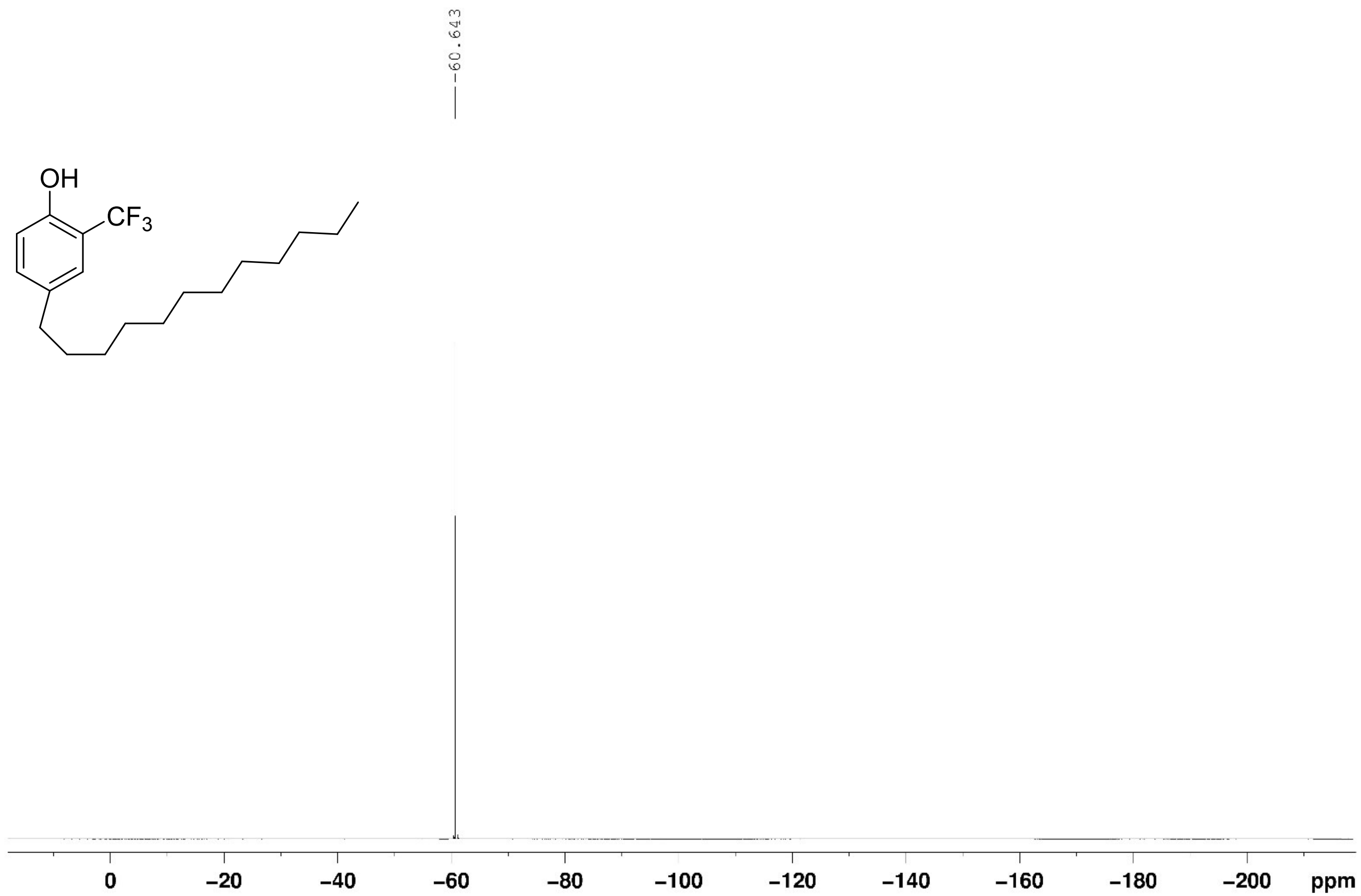

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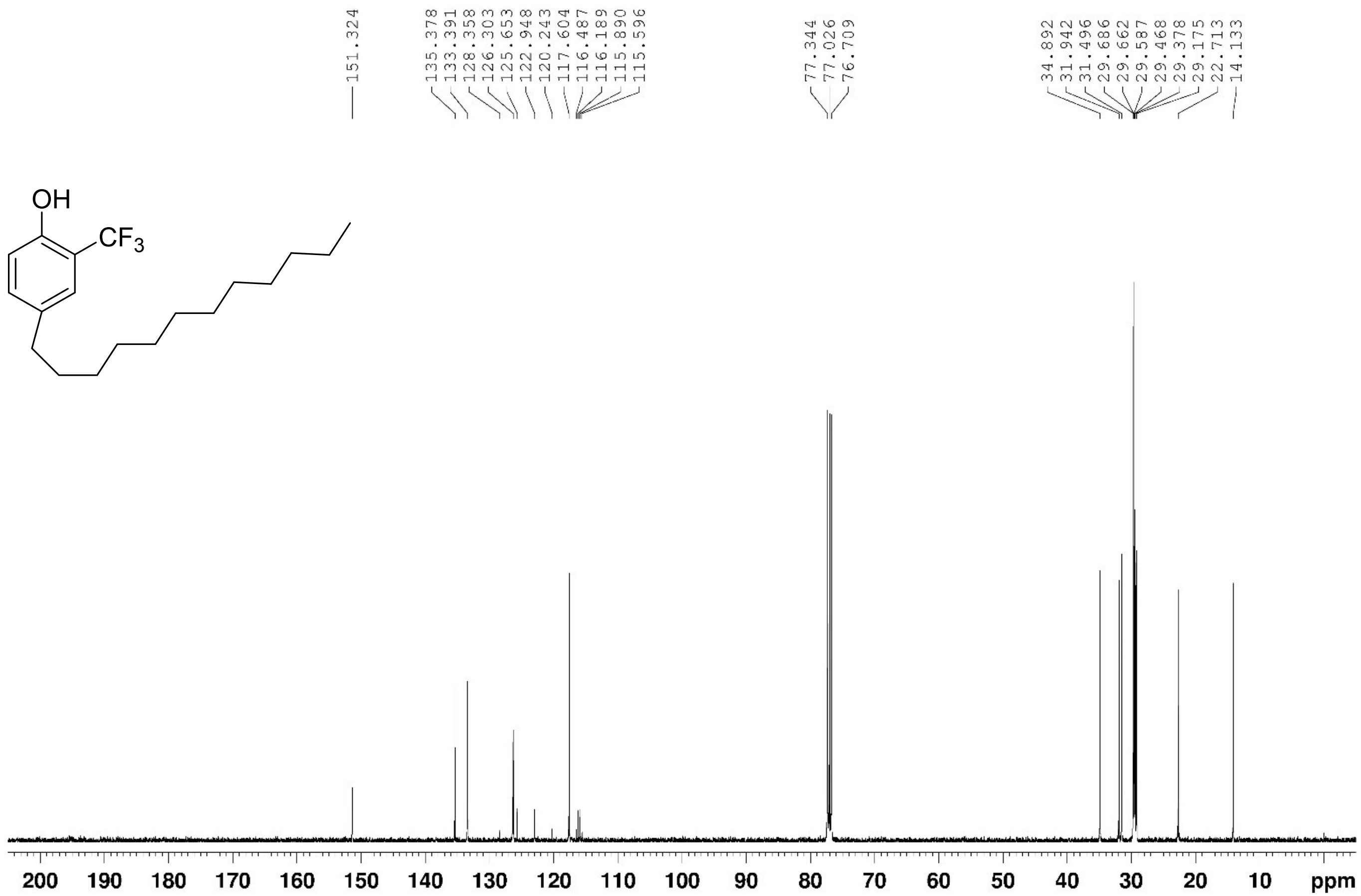

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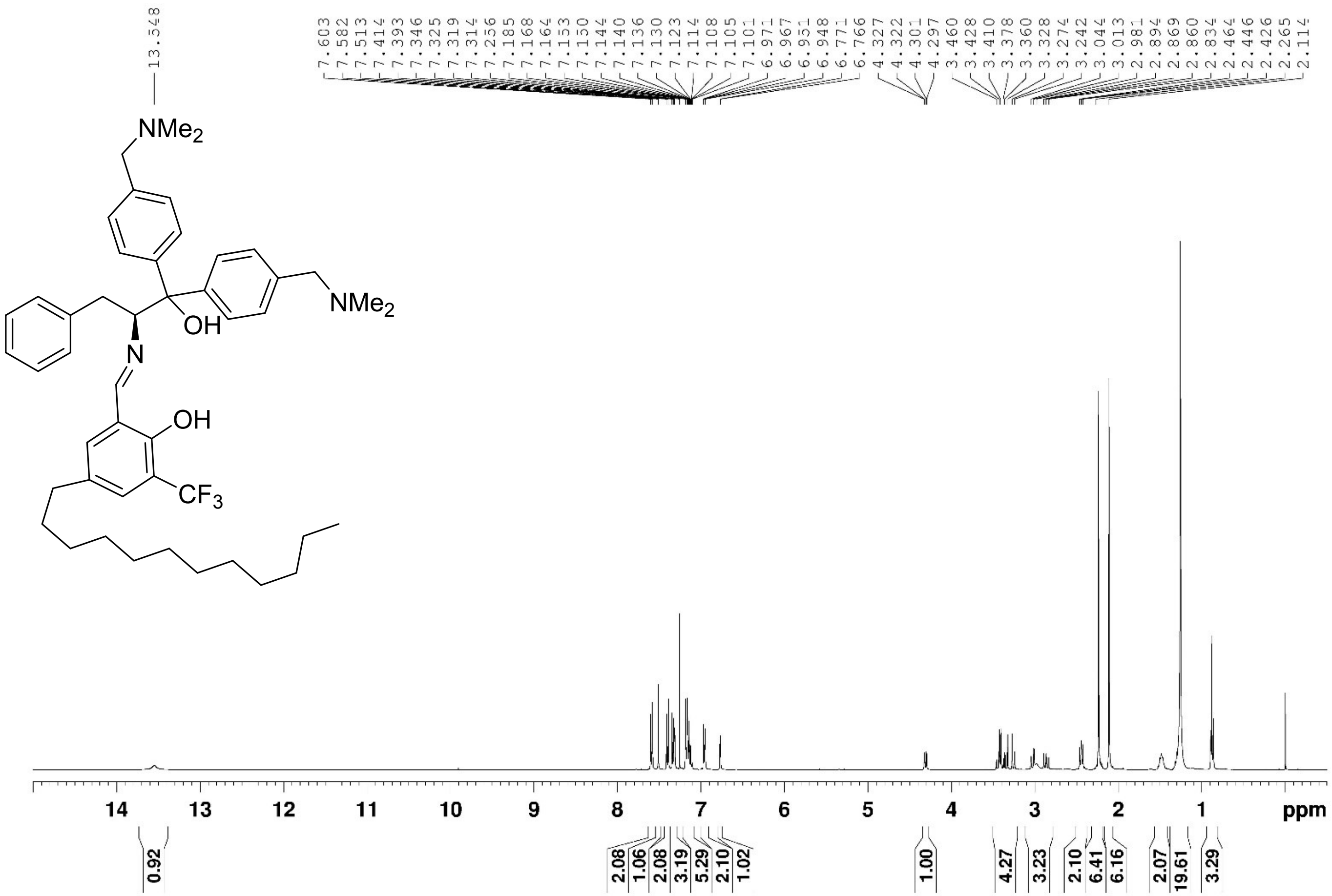
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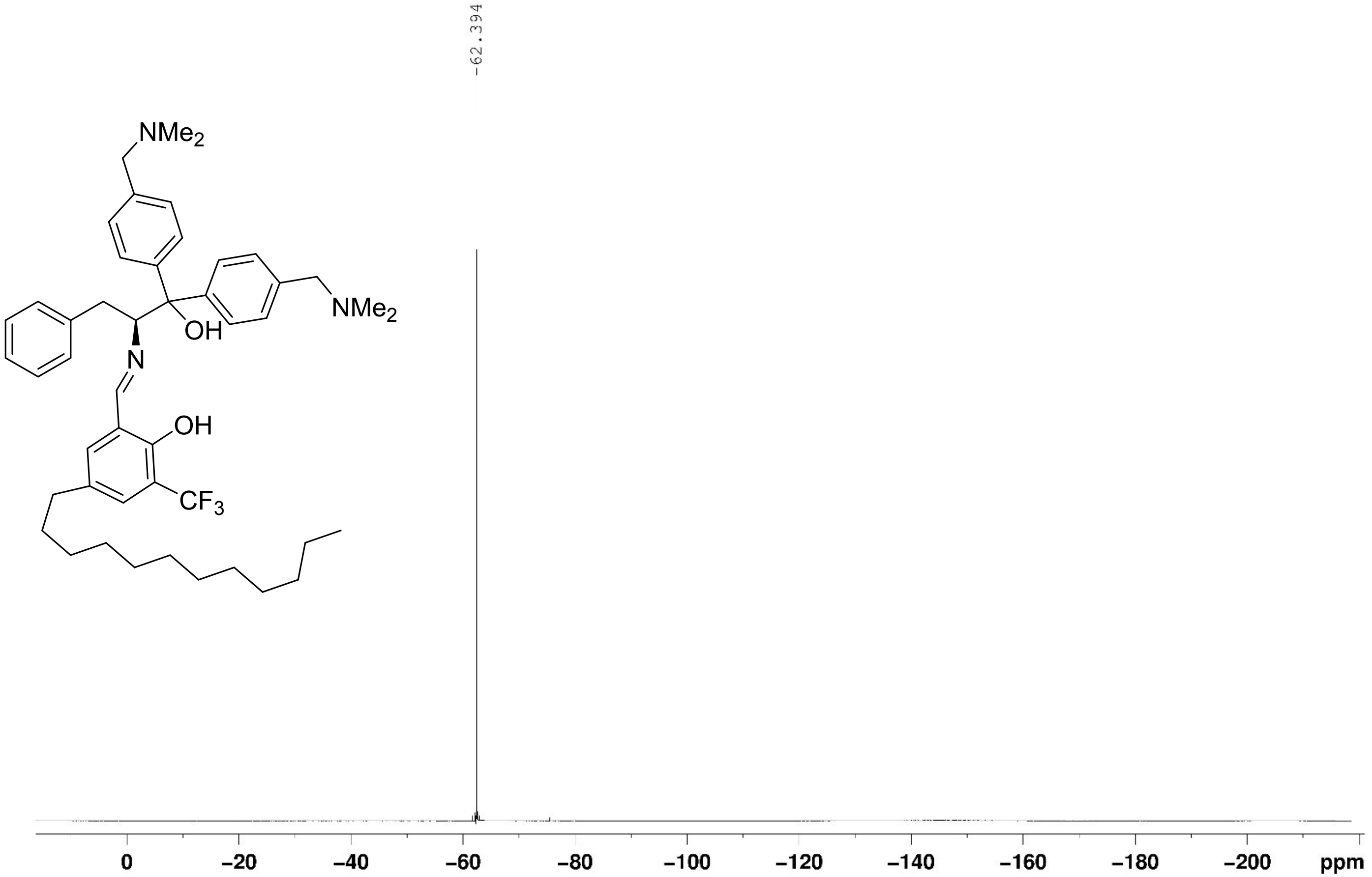

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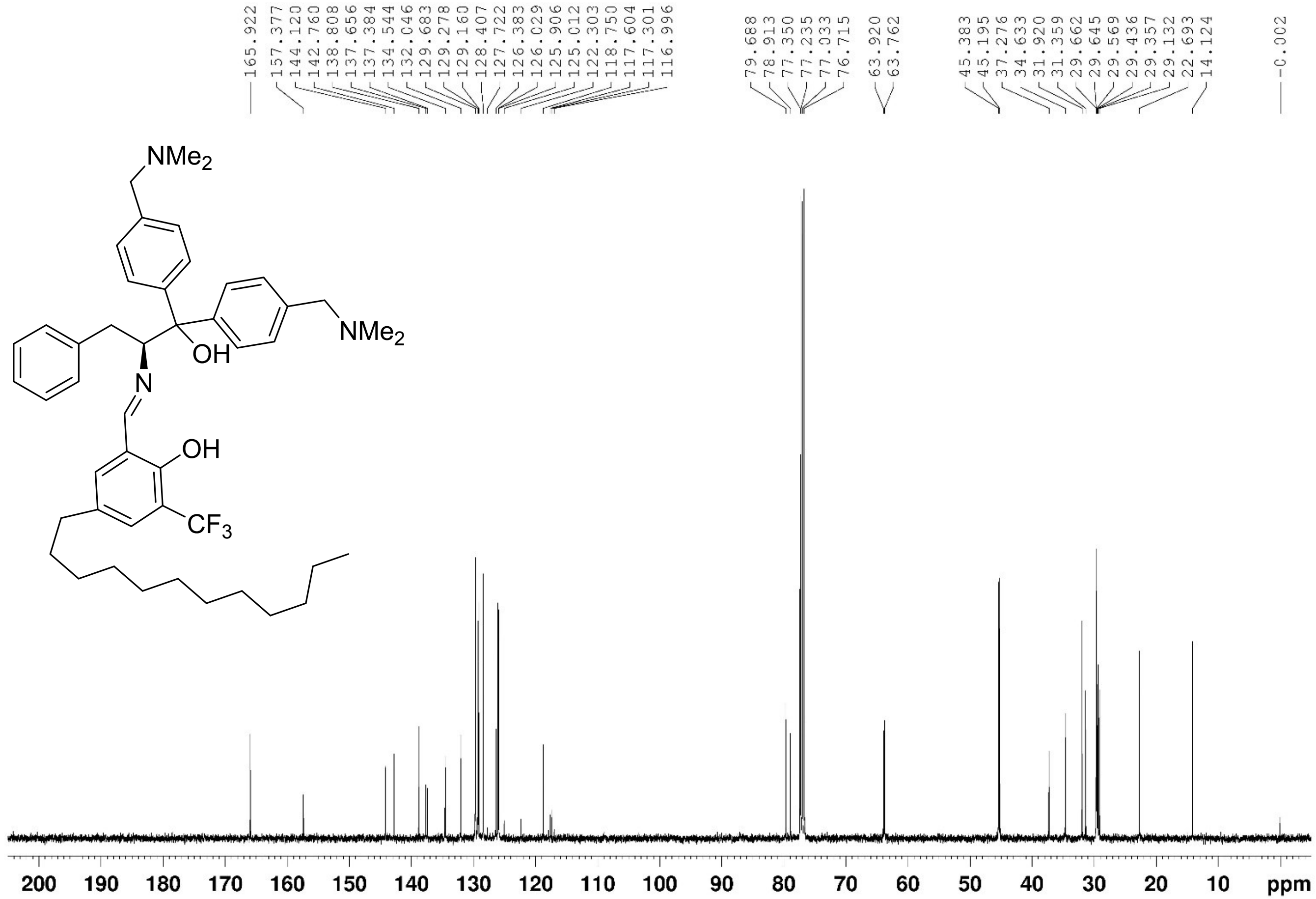
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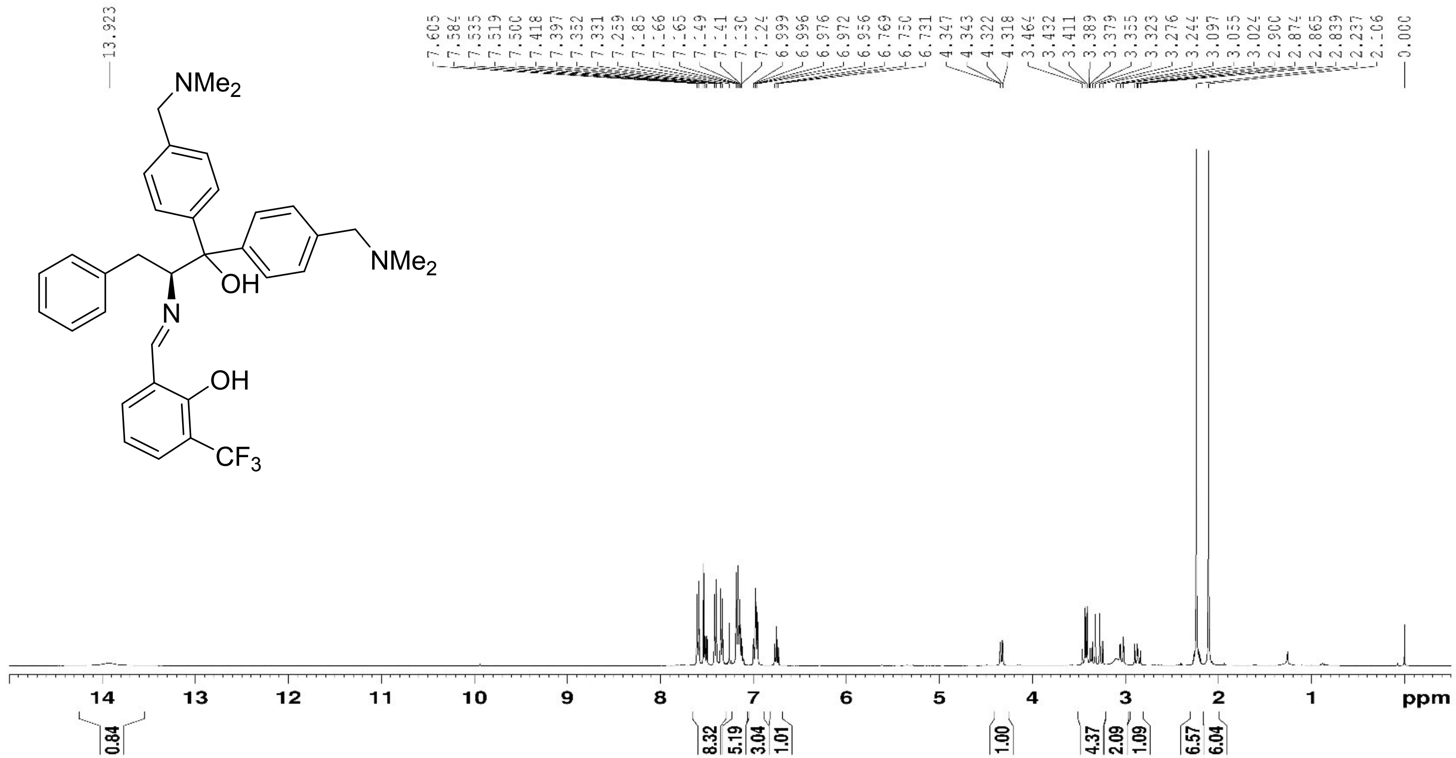
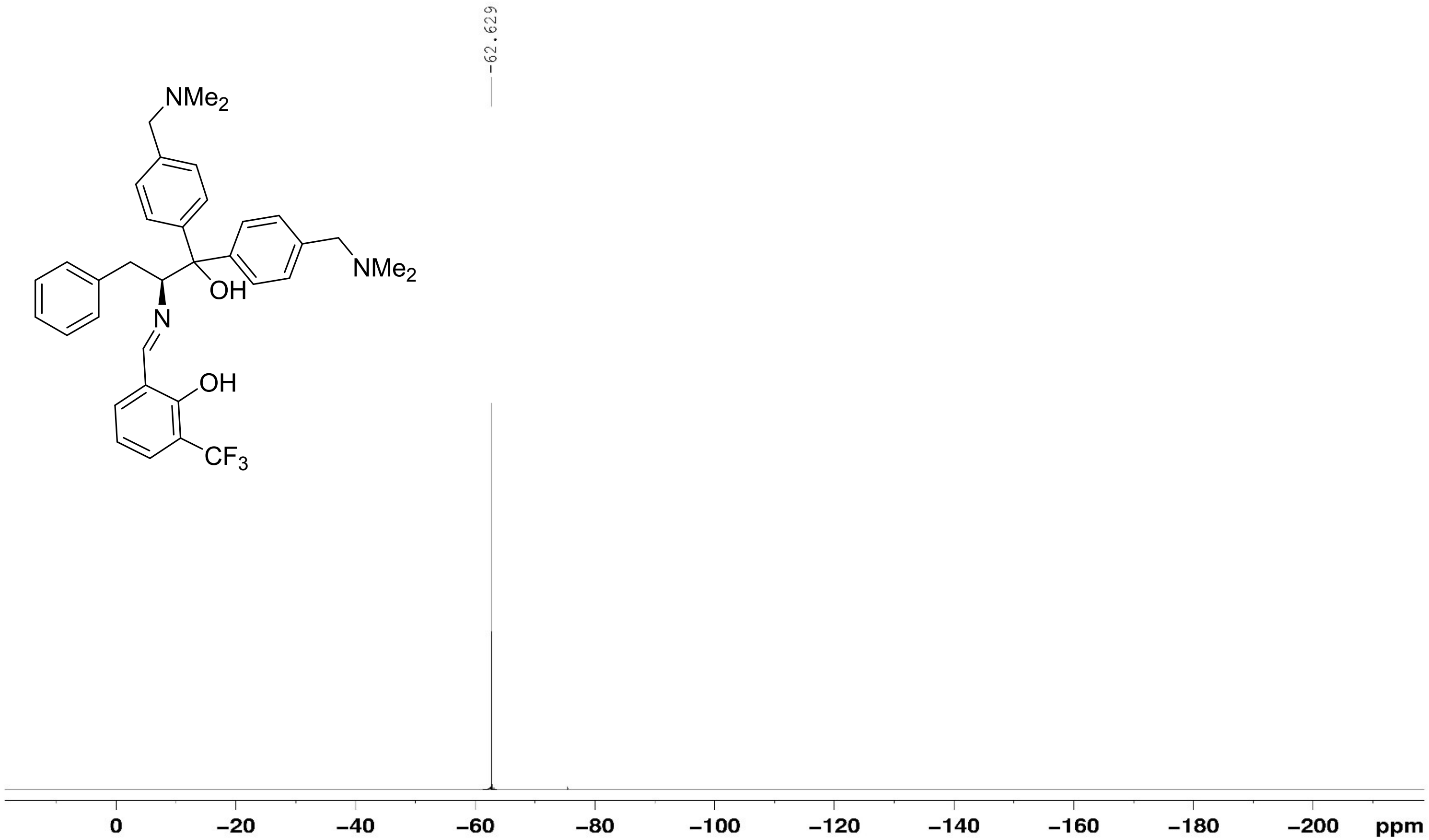
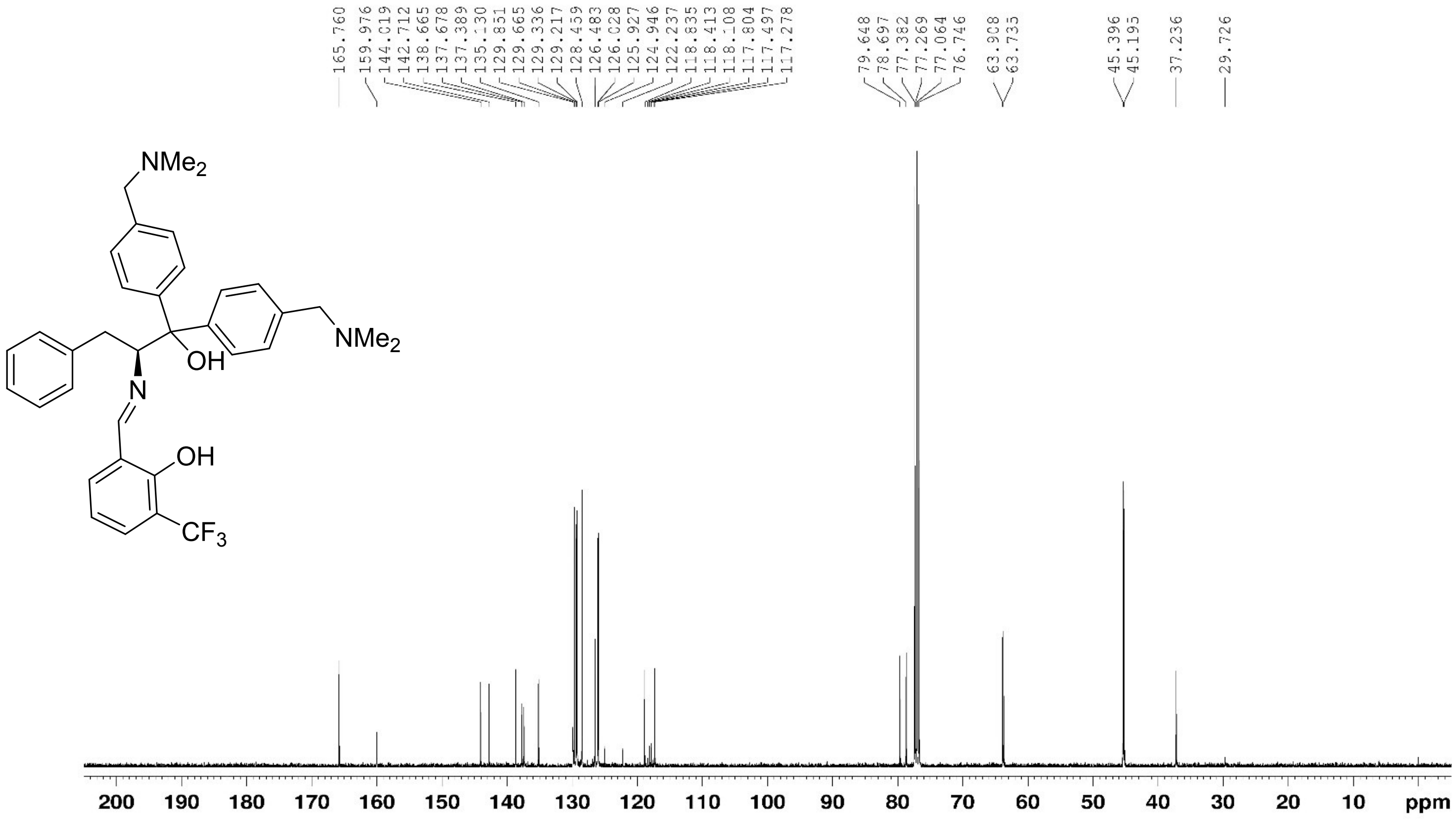
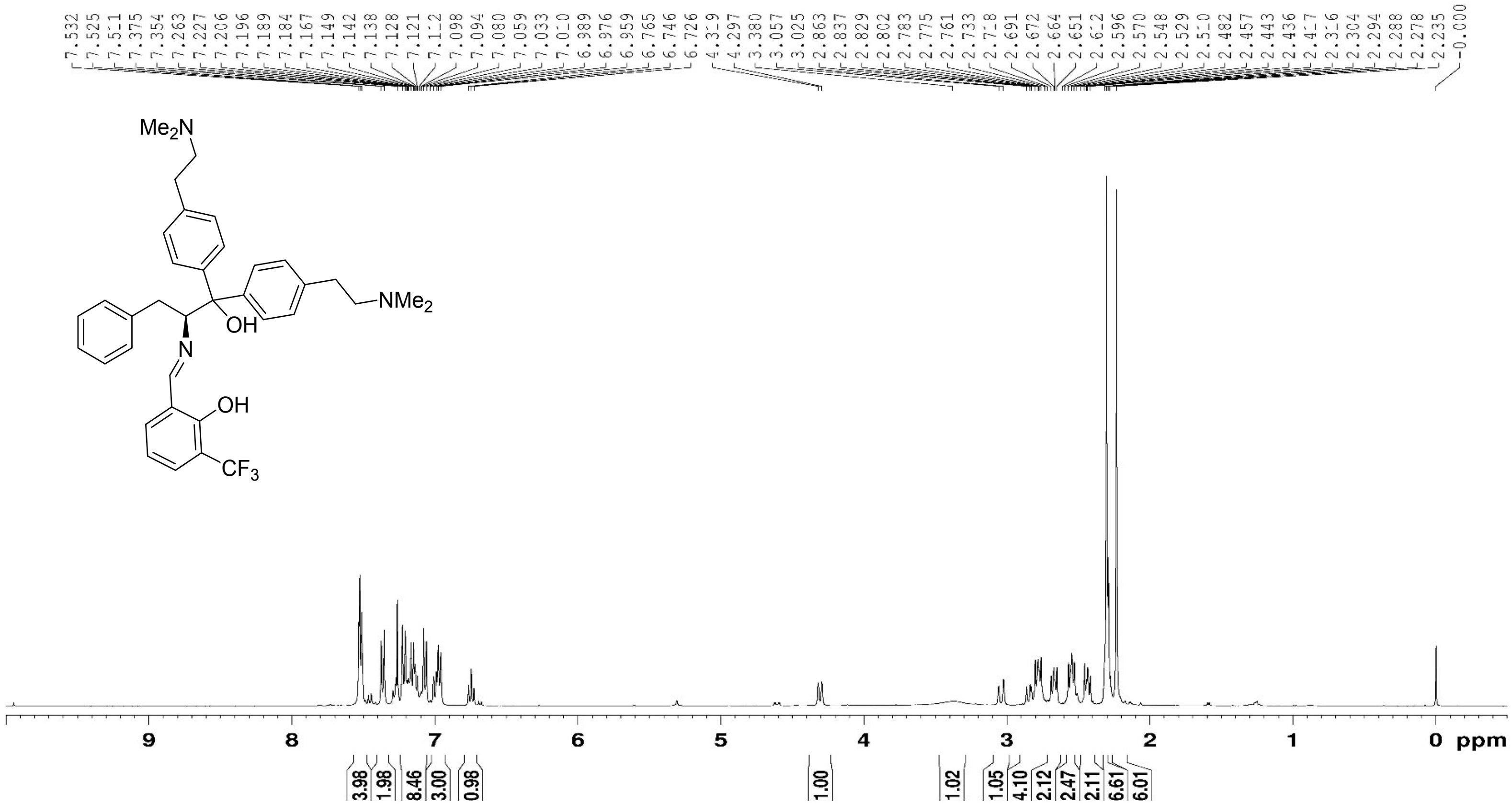
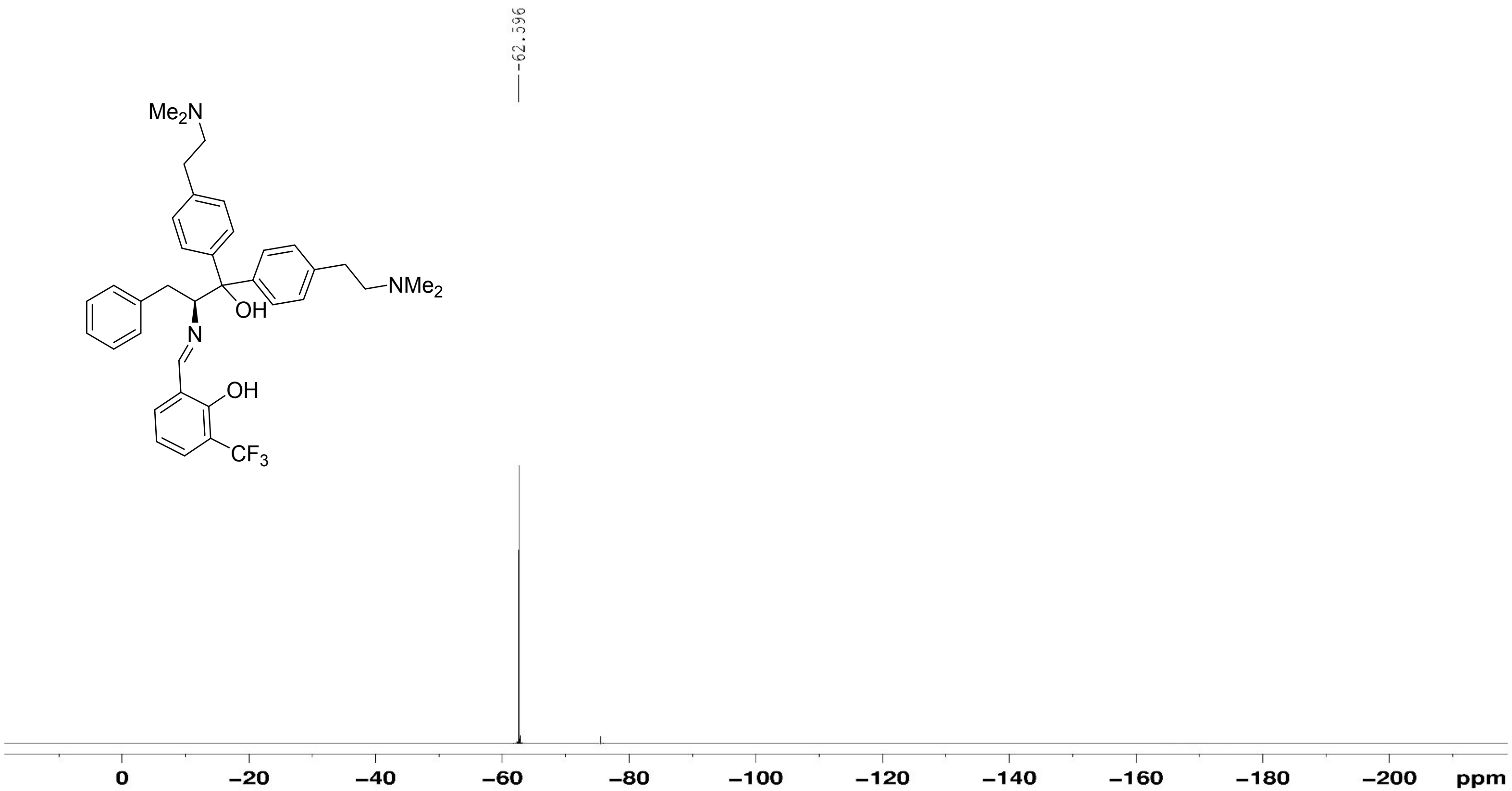
OH
CF3
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm




−62.629
NMe2
NMe2
OH
N
OH
CF3
0
−20
−40
−60
−80
−100
−120
−140
−160
−180
−200
ppm


165.760
159.976
144.019
142.712
138.665
137.678
137.389
135.130
129.851
129.665
129.336
129.217
128.459
126.483
126.028
125.927
124.946
122.237
118.835
118.413
118.108
117.804
117.497
117.278
79.648
78.697
77.382
77.269
77.064
76.746
63.908
63.735
45.396
45.195
37.236
29.726
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm


7.532
7.525
7.375
7.354
7.263
7.227
7.206
7.196
7.189
7.184
7.167
7.149
7.142
7.138
7.128
7.121
7.098
7.094
7.080
7.059
7.033
6.989
6.976
6.959
6.765
6.746
6.726
4.297
3.380
3.057
3.025
2.863
2.837
2.829
2.802
2.783
2.775
2.761
2.733
2.691
2.672
2.664
2.651
2.596
2.570
2.548
2.529
2.482
2.457
2.443
2.436
2.304
2.294
2.288
2.278
2.235
-0.000
Me$_2$N
NMe$_2$
OH
N
OH
CF$_3$
9
8
7
6
5
4
3
2
1
0 ppm
3.98
1.98
8.46
3.00
0.98
1.00
1.02
1.05
4.10
2.12
2.47
2.11
6.61
6.01


-62.596
Me2N
NMe2
OH
N
OH
CF3
0
−20
−40
−60
−80
−100
−120
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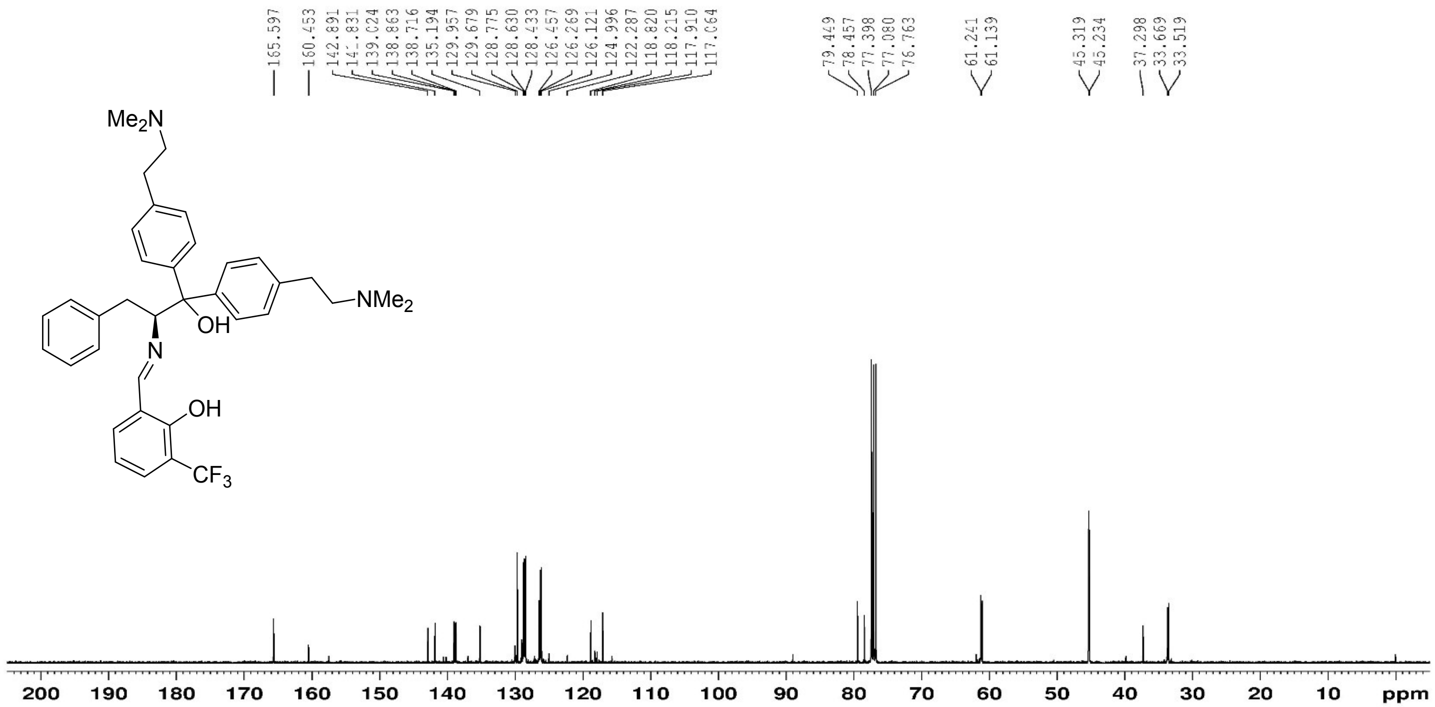
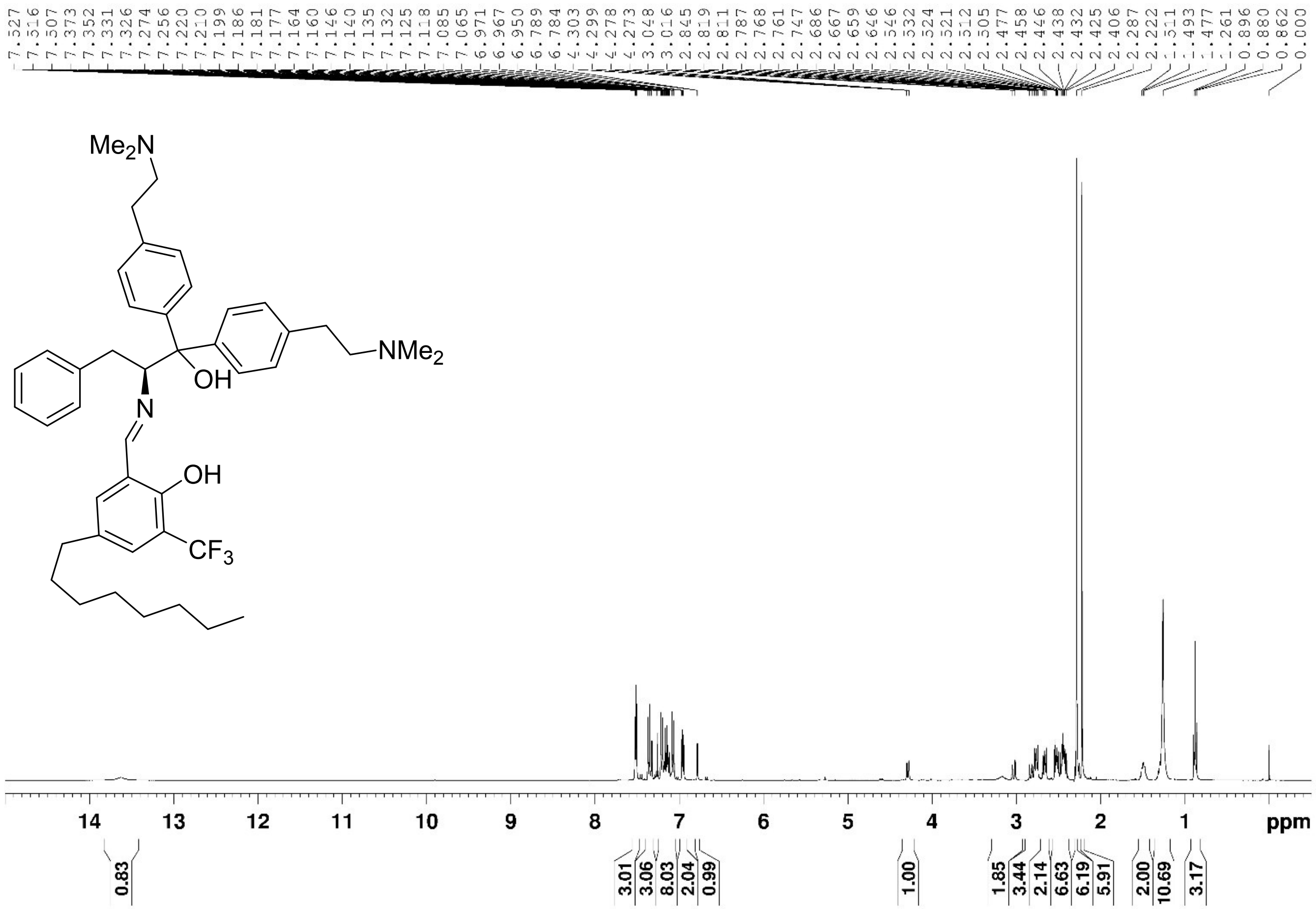
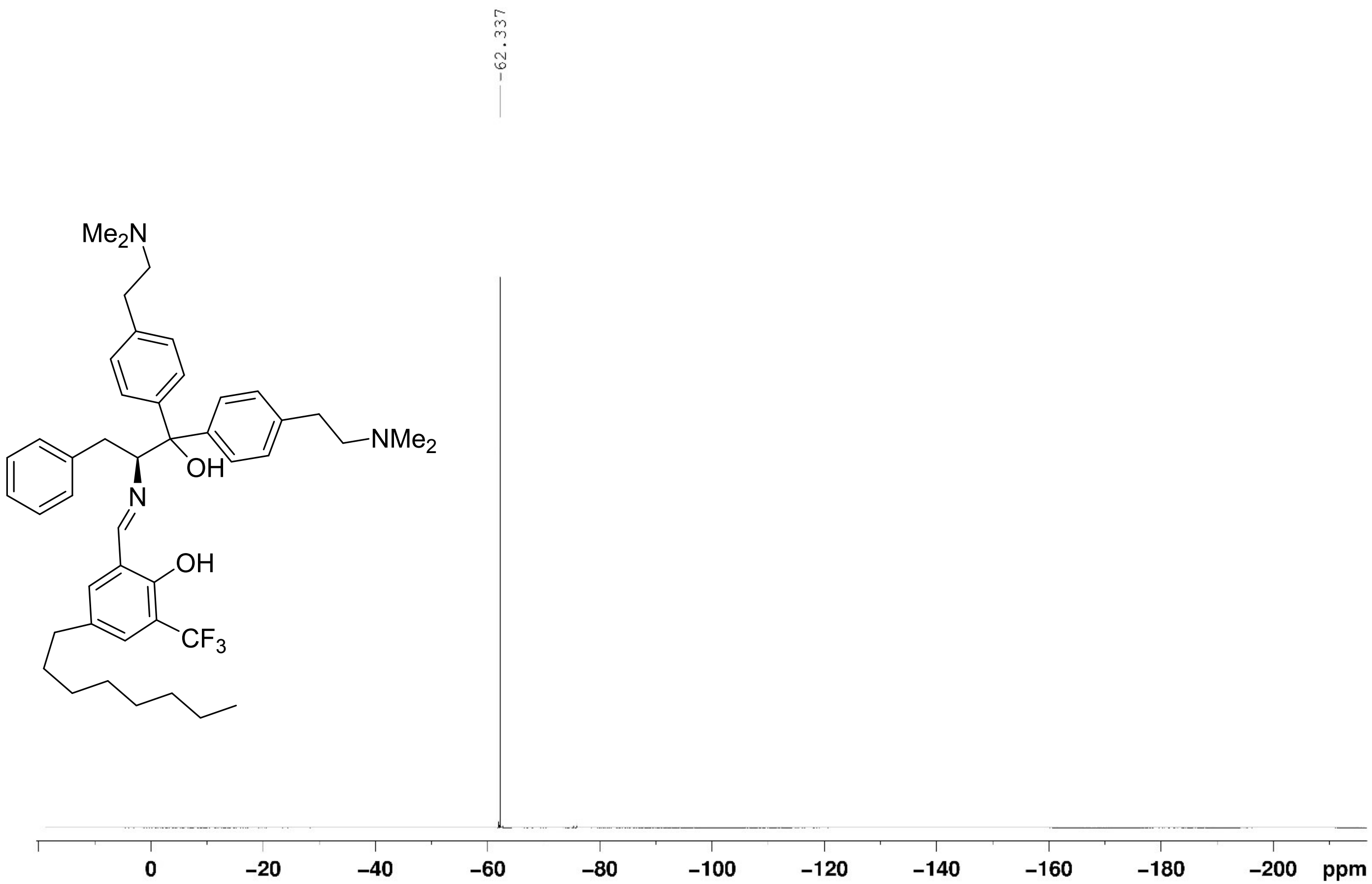
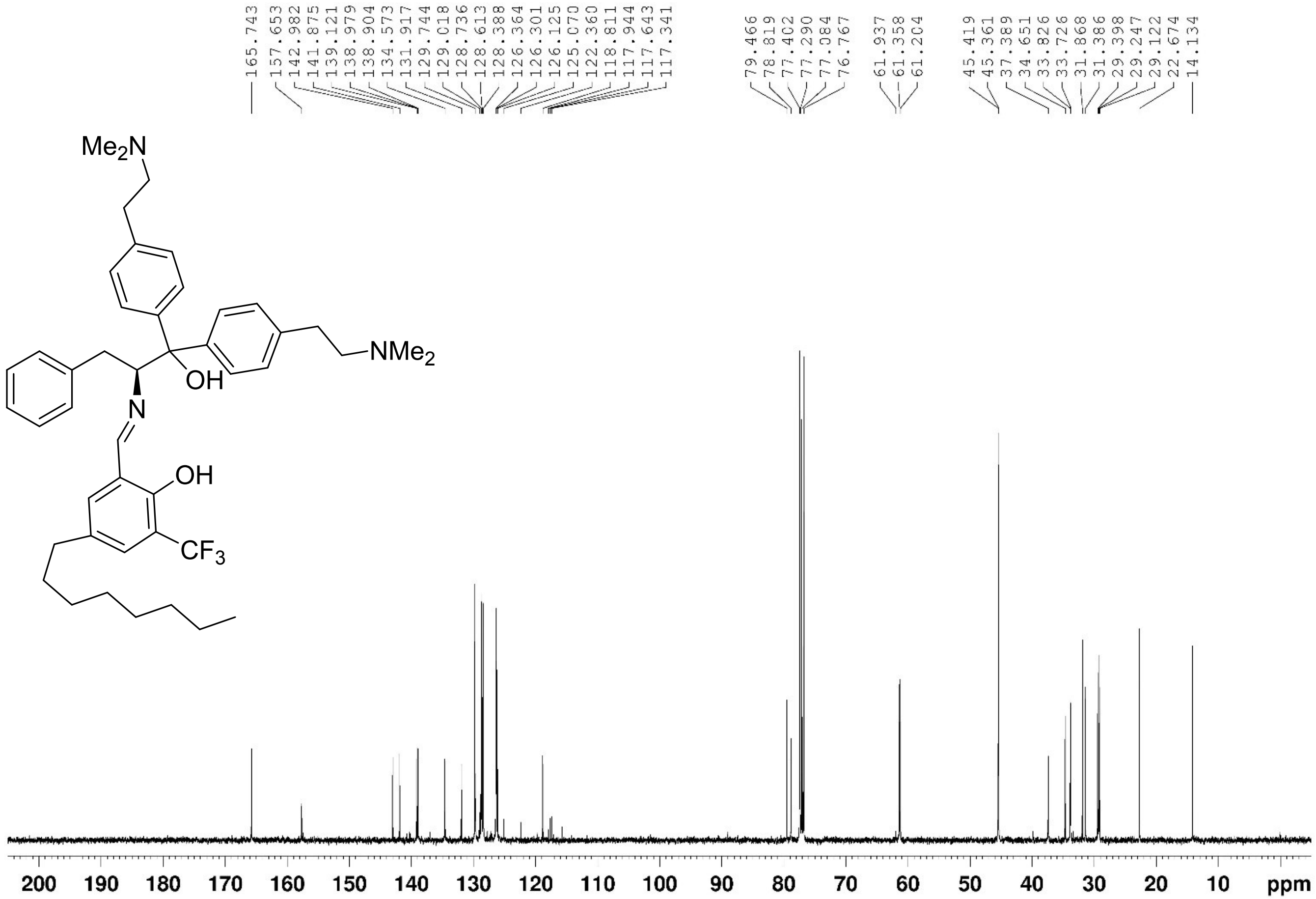
−160
−180
−200
ppm

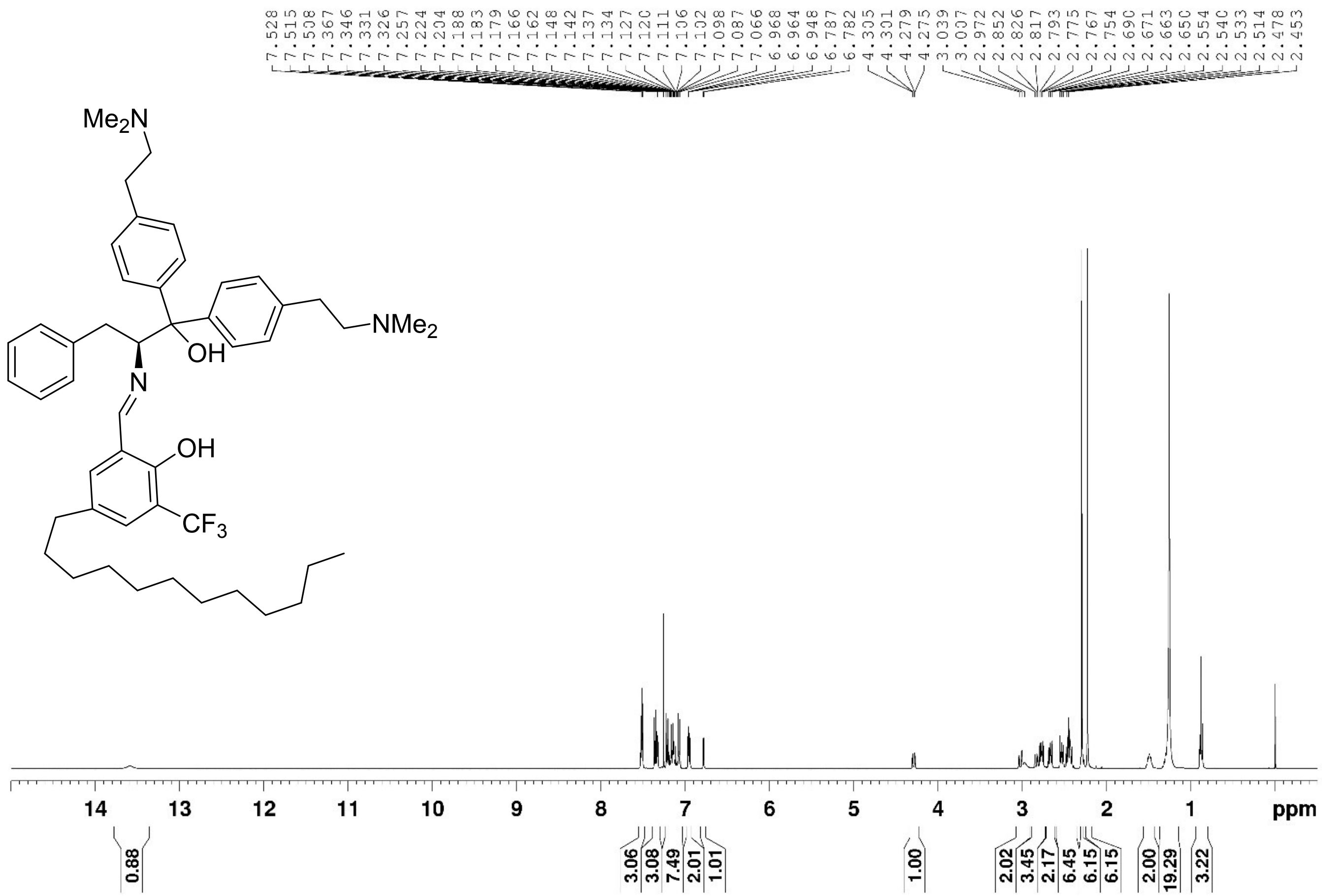


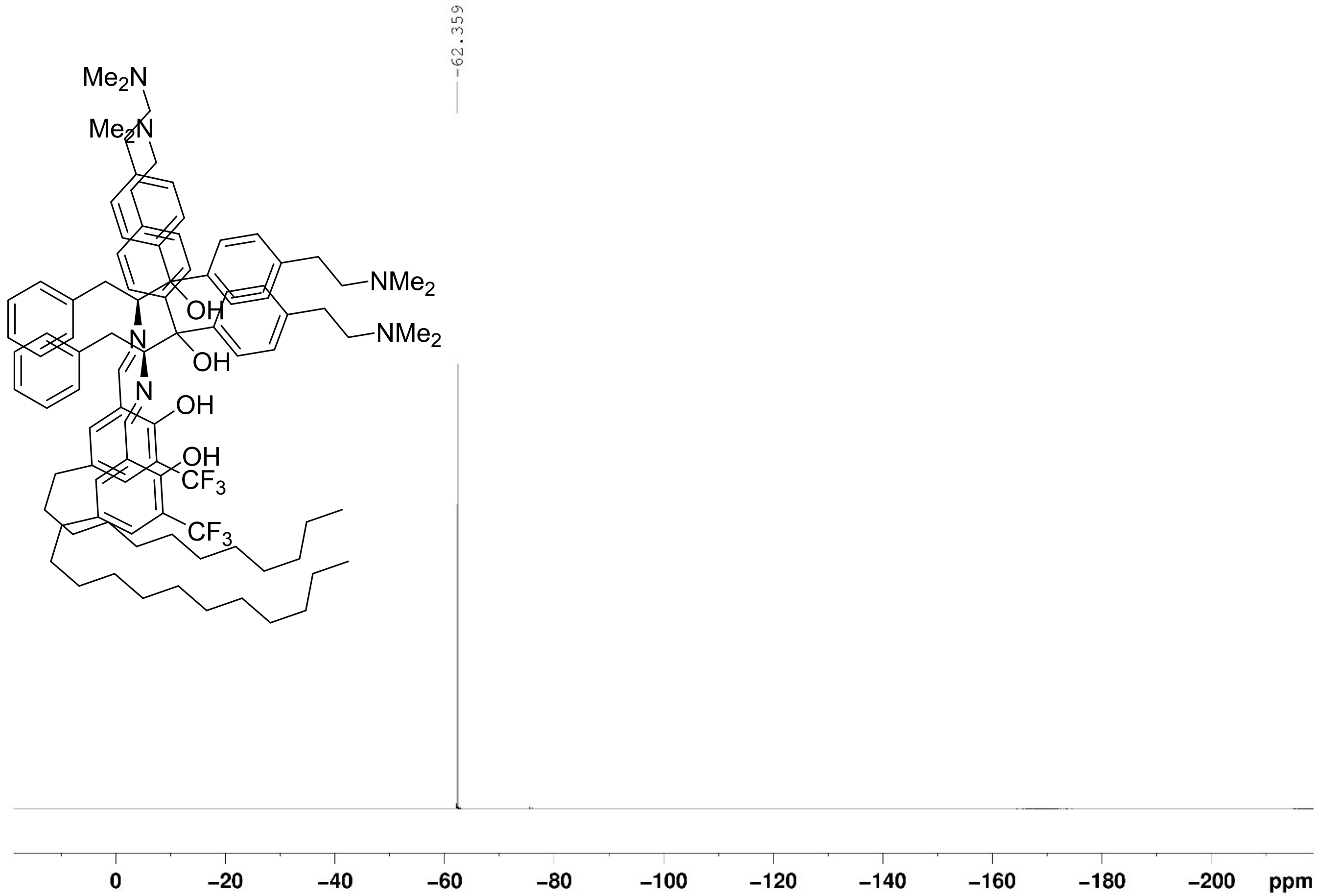

7.527
7.516
7.507
7.373
7.352
7.331
7.326
7.274
7.256
7.220
7.210
7.199
7.186
7.181
7.177
7.164
7.160
7.146
7.140
7.135
7.132
7.125
7.118
7.085
7.065
6.971
6.967
6.950
6.789
6.784
4.303
4.299
4.278
4.273
3.048
3.016
2.845
2.819
2.811
2.787
2.768
2.761
2.747
2.686
2.667
2.659
2.646
2.546
2.532
2.524
2.521
2.512
2.505
2.477
2.458
2.446
2.438
2.432
2.425
2.406
2.287
2.222
1.511
1.493
1.477
1.261
0.896
0.880
0.862
0.000
Me2N
OH
N
NMe2
OH
CF3
14
13
12
11
10
9
8
7
6
5
4
3
2
1
ppm
0.83
3.01
3.06
8.03
2.04
0.99
1.00
1.85
3.44
2.14
6.63
6.19
5.91
2.00
10.69
3.17

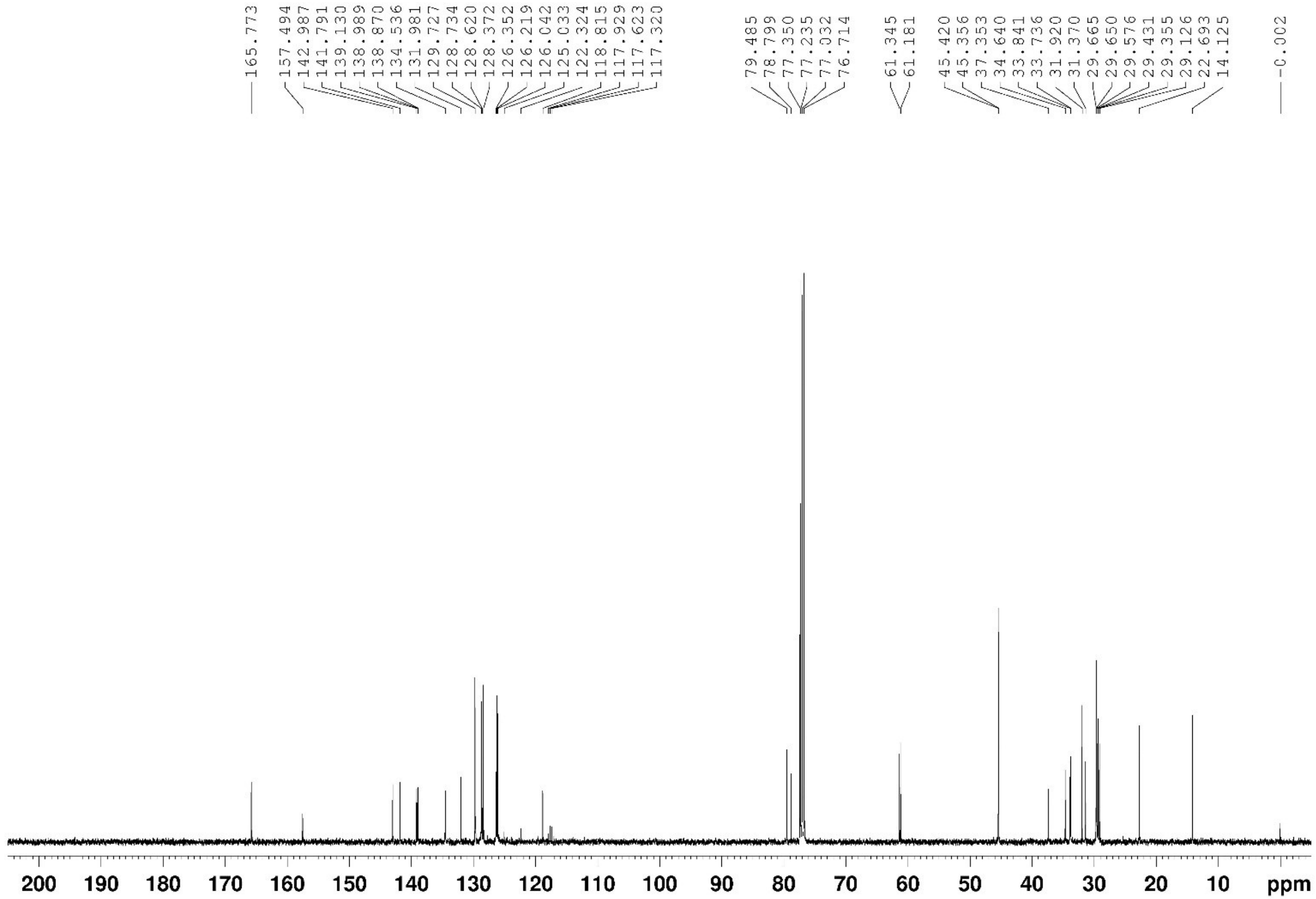


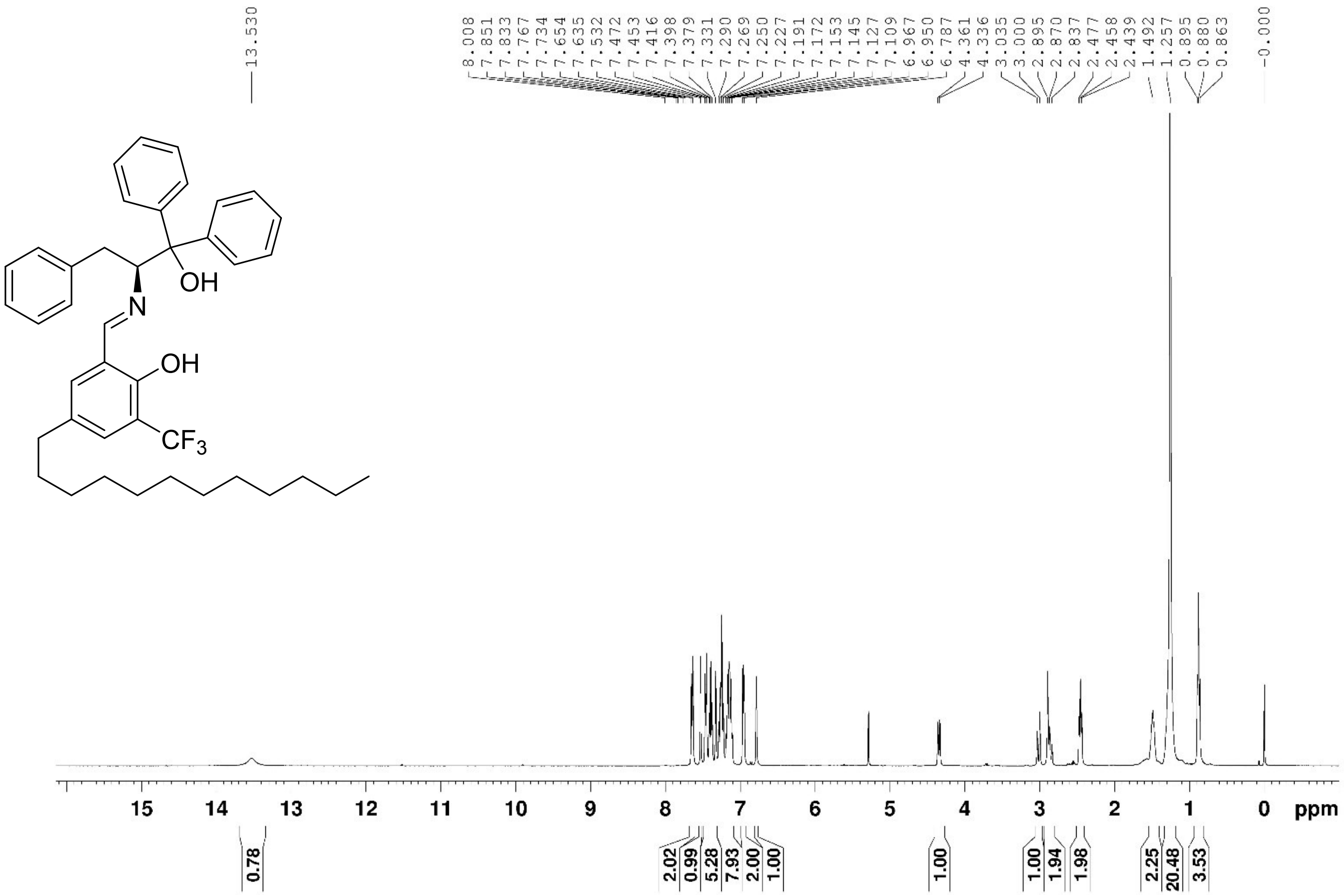
Me2N
NMe2
OH
N
OH
CF3
-62.337
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
ppm

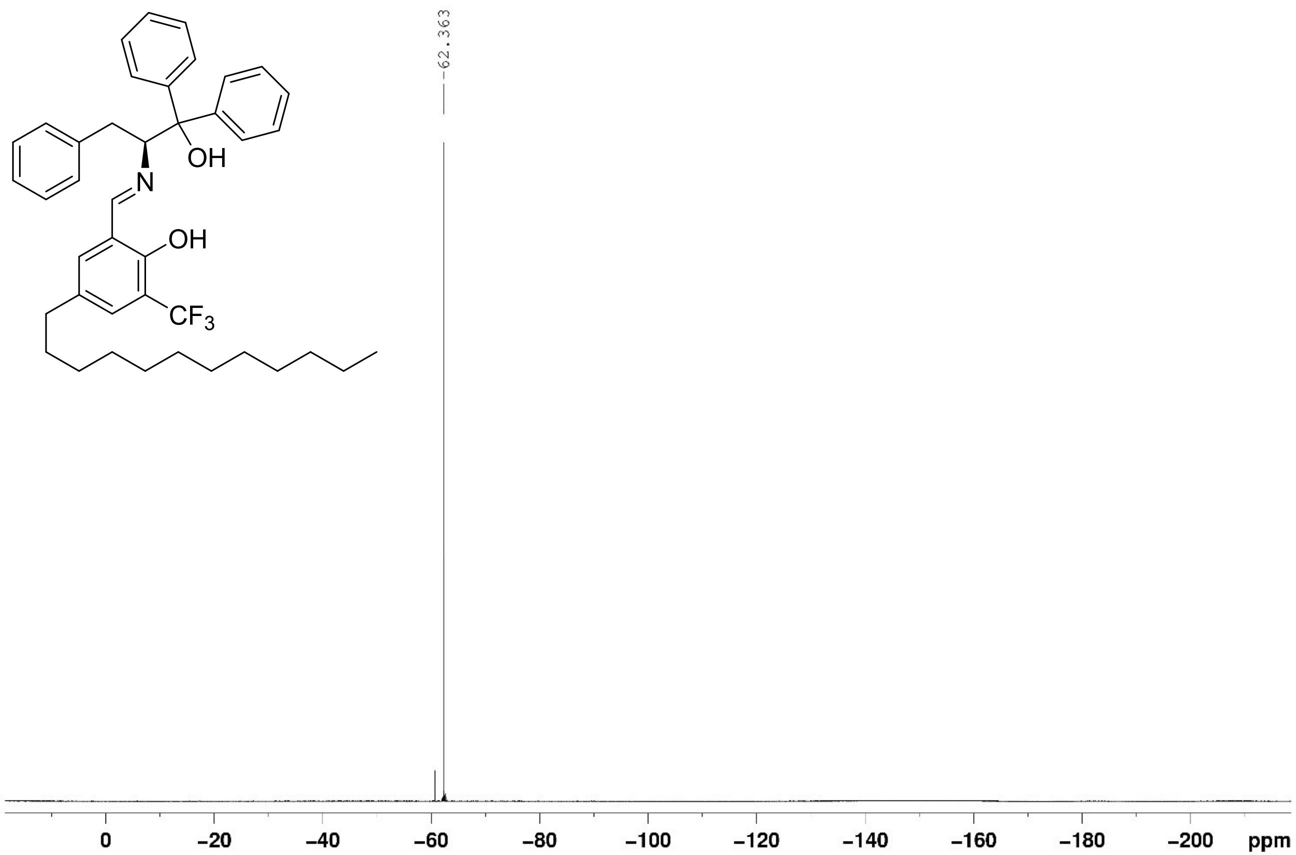

165.743
157.653
142.982
141.875
139.121
138.979
138.904
134.573
131.917
129.744
129.018
128.736
128.613
128.388
126.364
126.301
126.125
125.070
122.360
118.811
117.944
117.643
117.341
79.466
78.819
77.402
77.290
77.084
76.767
61.937
61.358
61.204
45.419
45.361
37.389
34.651
33.826
33.726
31.868
31.386
29.398
29.247
29.122
22.674
14.134
Me2N
NMe2
OH
N
OH
CF3
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm


Me2N
NMe2
OH
N
OH
CF3
ppm

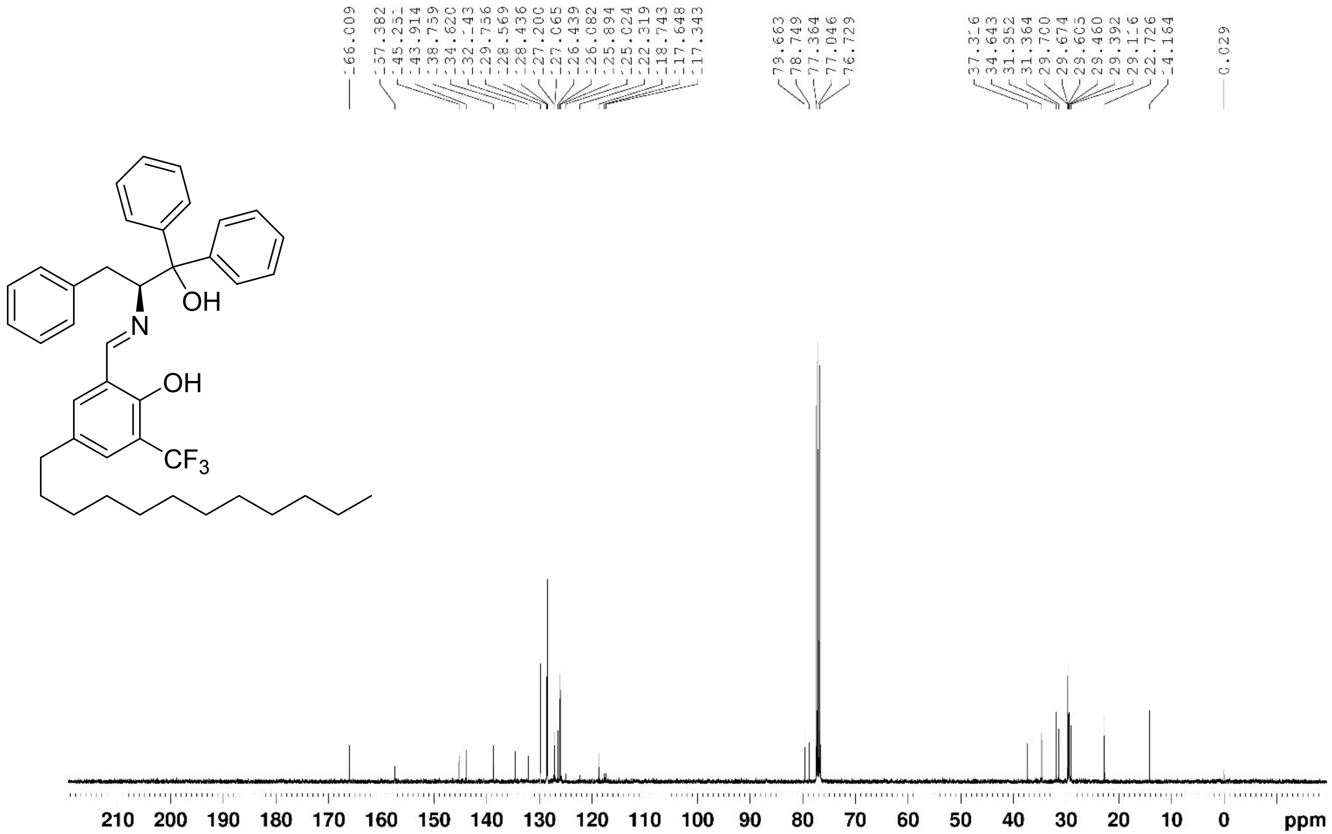

-62.359
Me2N
Me2N
NMe2
NMe2
OH
OH
N
N
OH
OH
CF3
CF3
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
ppm


165.773
157.494
142.987
141.791
139.130
138.989
138.870
134.536
131.981
129.727
128.734
128.620
128.372
126.352
126.219
126.042
125.033
122.324
118.815
117.929
117.623
117.320
79.485
78.799
77.350
77.235
77.032
76.714
61.345
61.181
45.420
45.356
37.353
34.640
33.841
33.736
31.920
31.370
29.665
29.650
29.576
29.431
29.355
29.126
22.693
14.125
-0.002
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

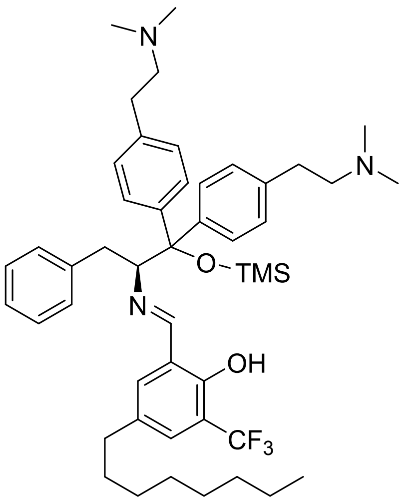


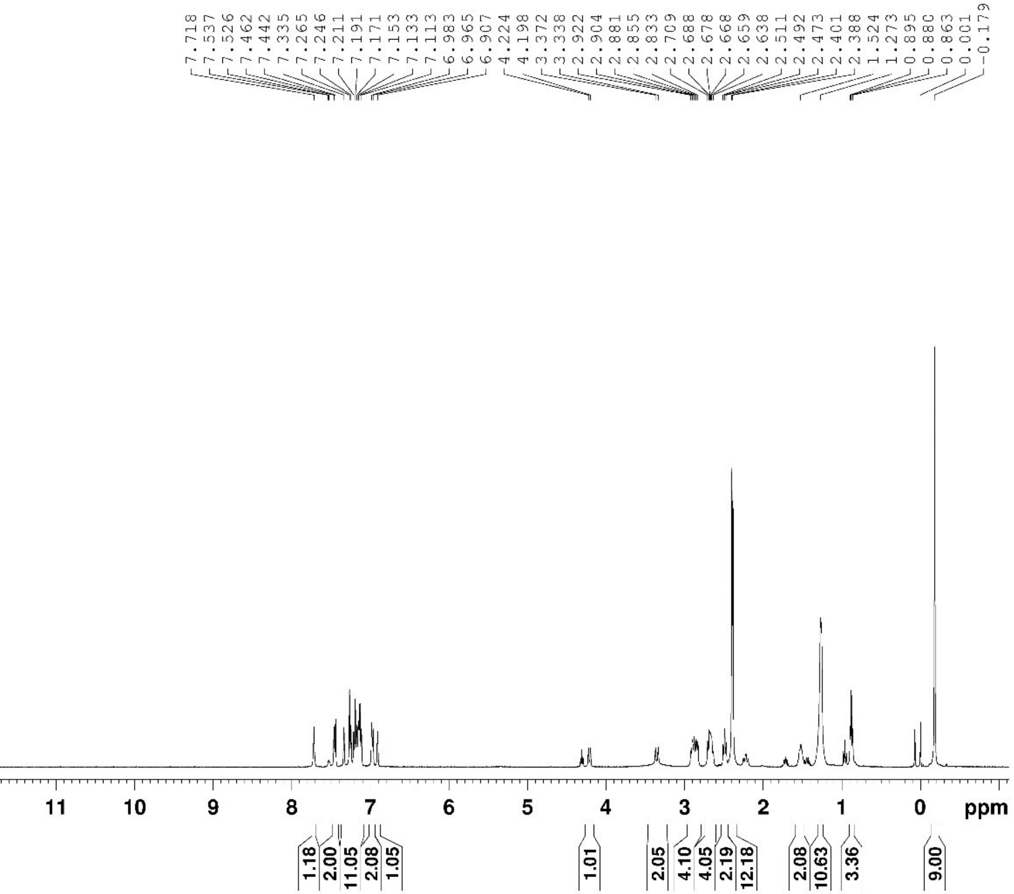


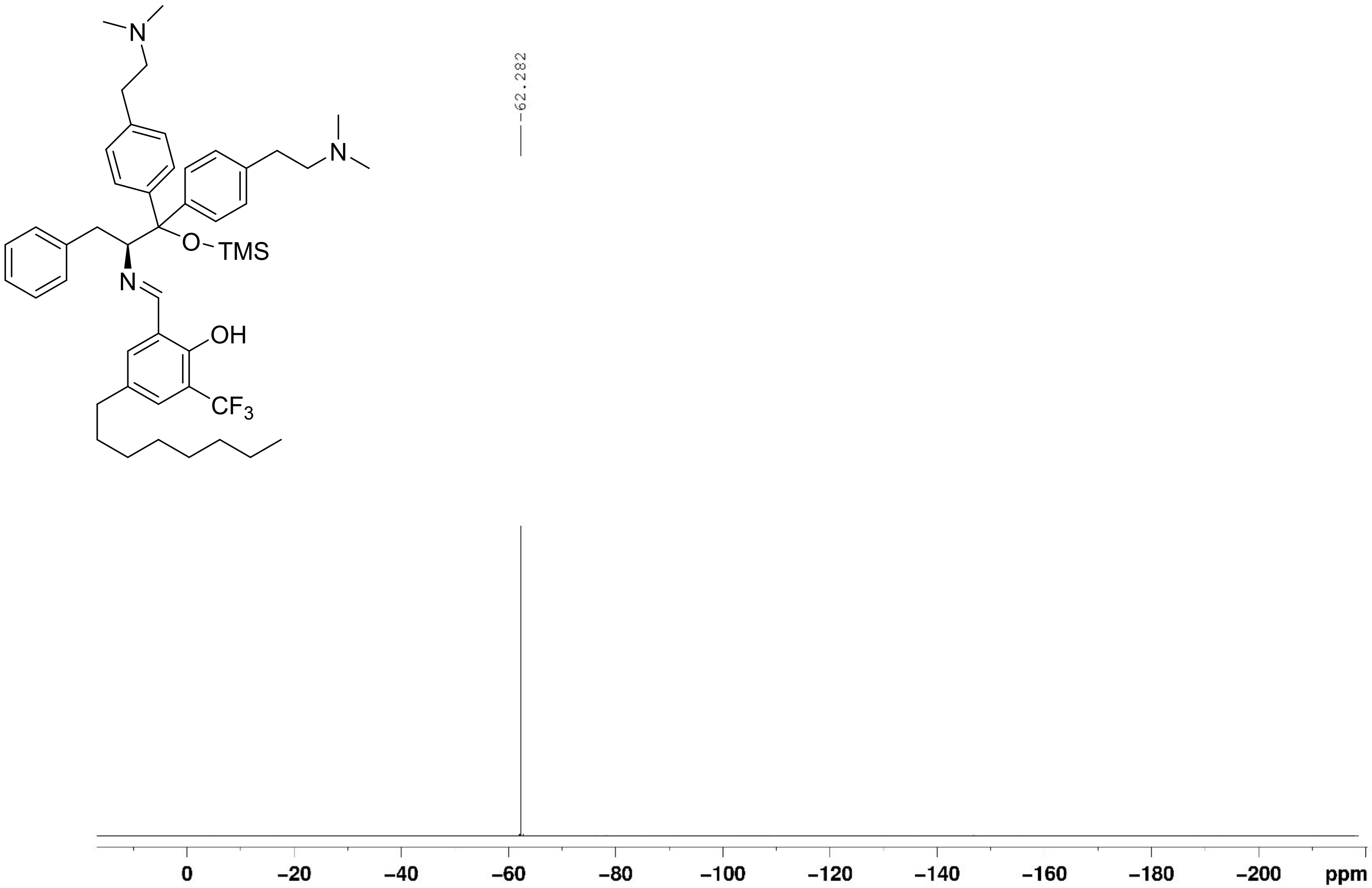
OH
N
OH
CF3
-62.363
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
ppm

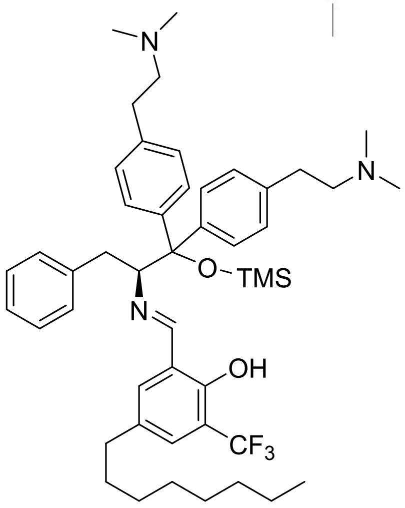


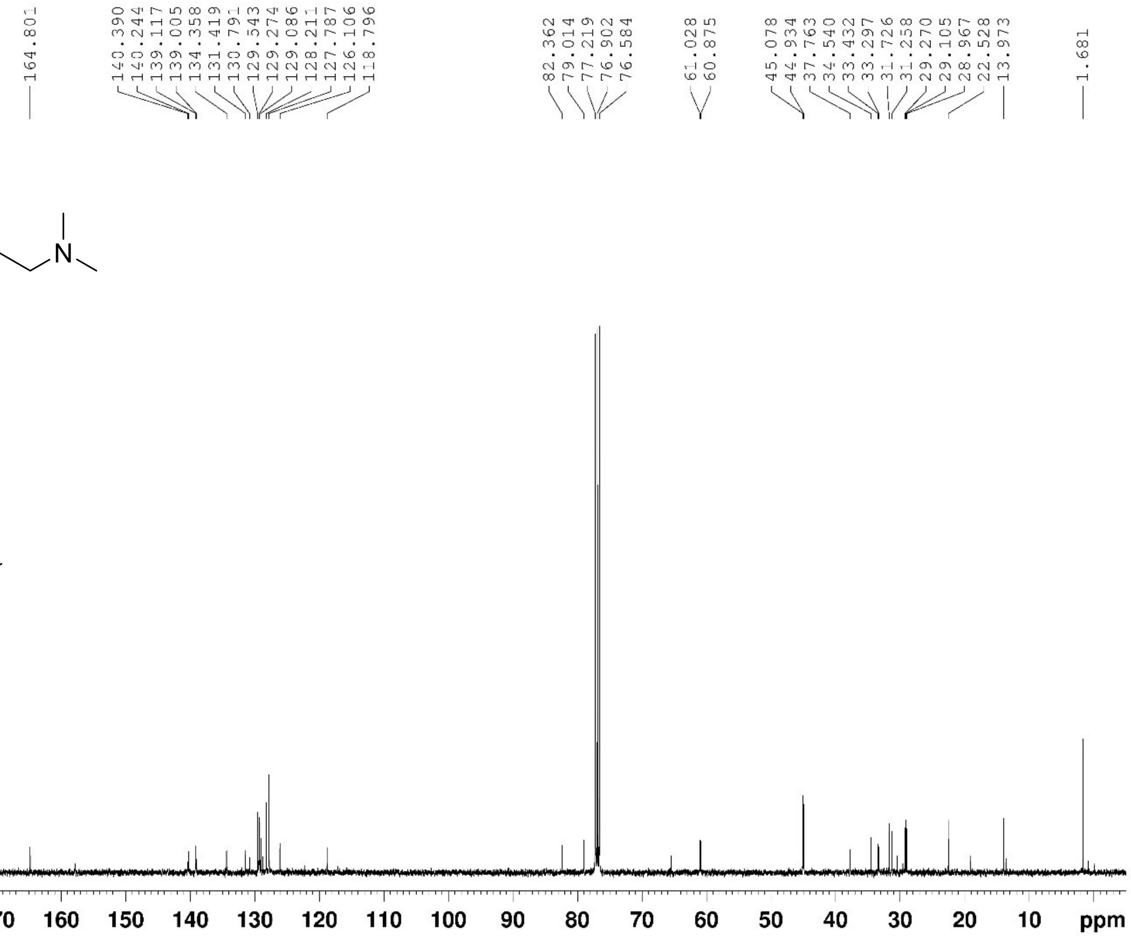
OH
N
OH
CF_3
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

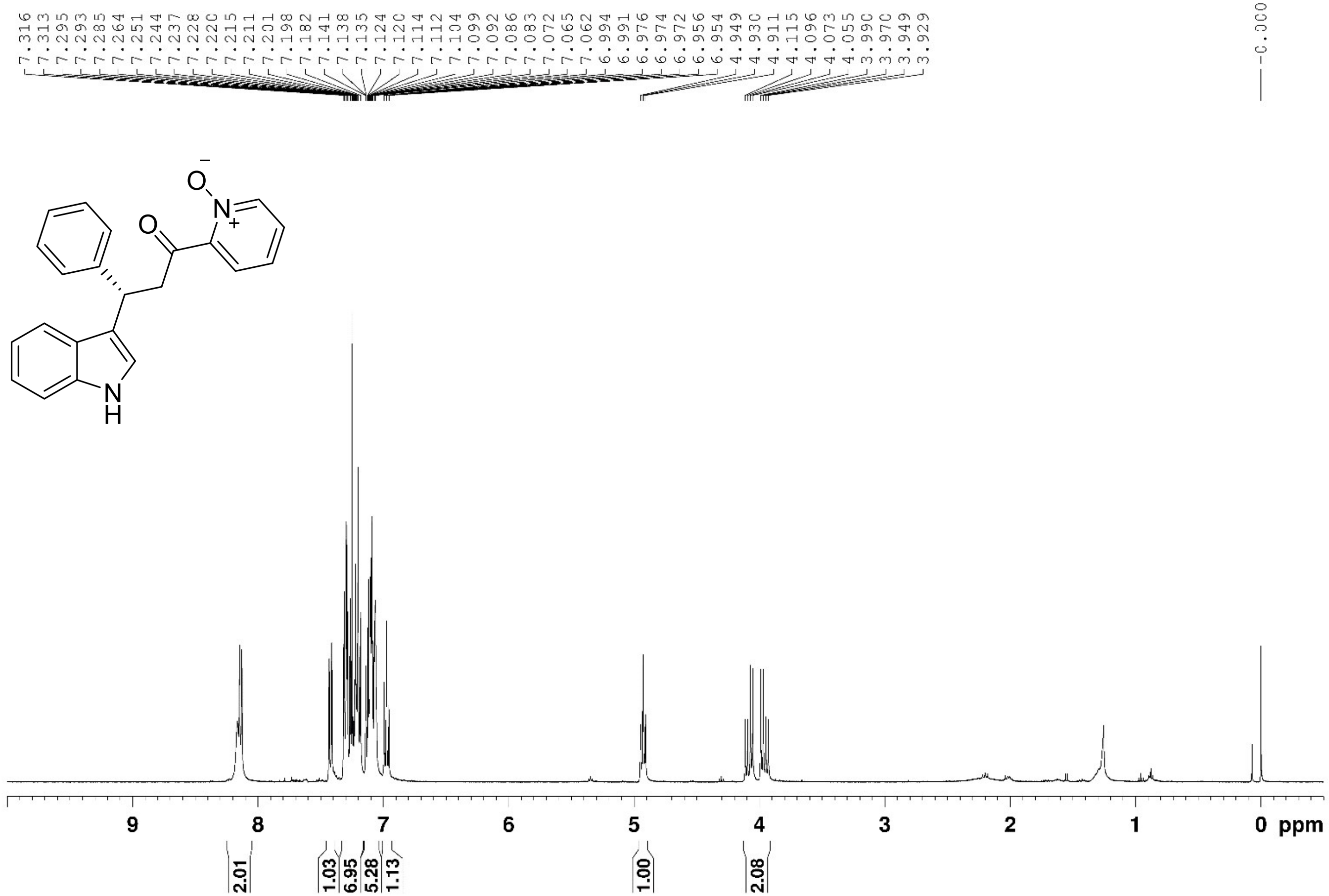

N
N
O-TMS
N
OH
CF3

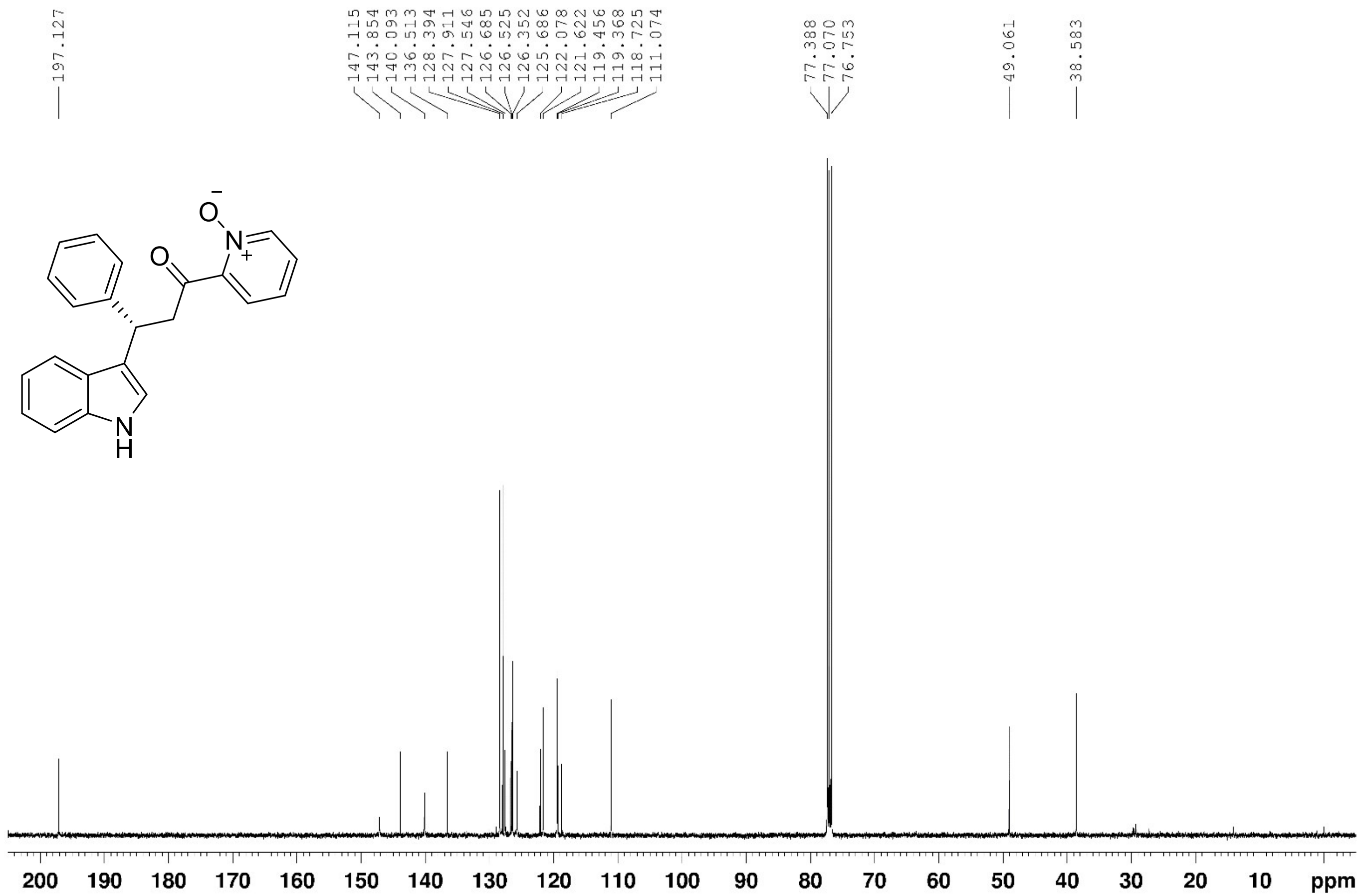

7.718
7.537
7.526
7.462
7.442
7.335
7.265
7.246
7.211
7.191
7.171
7.153
7.133
7.113
6.983
6.965
6.907
4.224
4.198
3.372
3.338
2.922
2.904
2.881
2.855
2.833
2.709
2.688
2.678
2.668
2.659
2.638
2.511
2.492
2.473
2.401
2.388
1.524
1.273
0.895
0.880
0.863
0.001
-0.179
15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 ppm
0.88
1.18
2.00
11.05
2.08
1.05
1.01
2.05
4.10
4.05
2.19
12.18
2.08
10.63
3.36
9.00

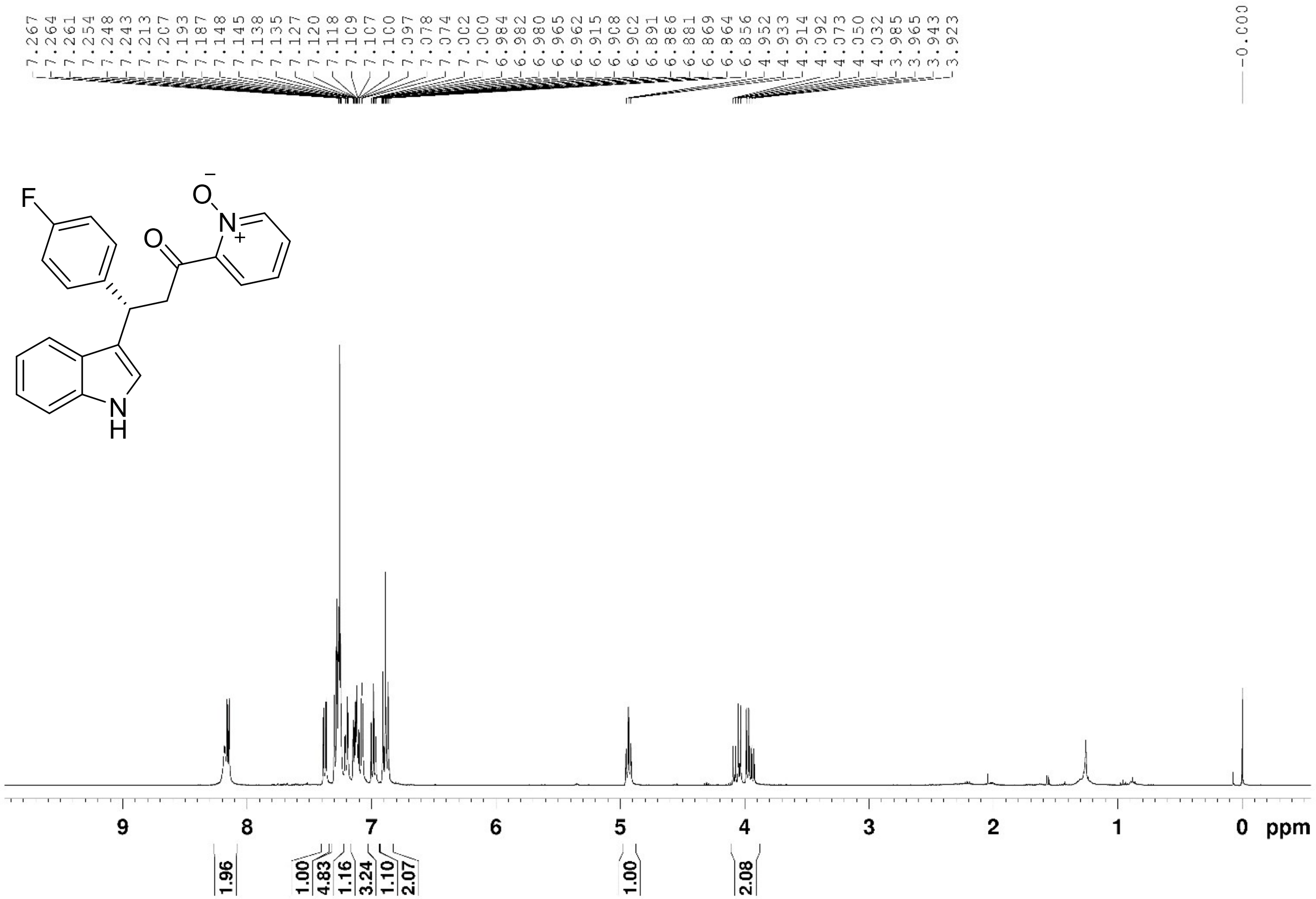

N
N
O
TMS
N
OH
CF3
-62.282
0
−20
−40
−60
−80
−100
−120
−140
−160
−180
−200
ppm

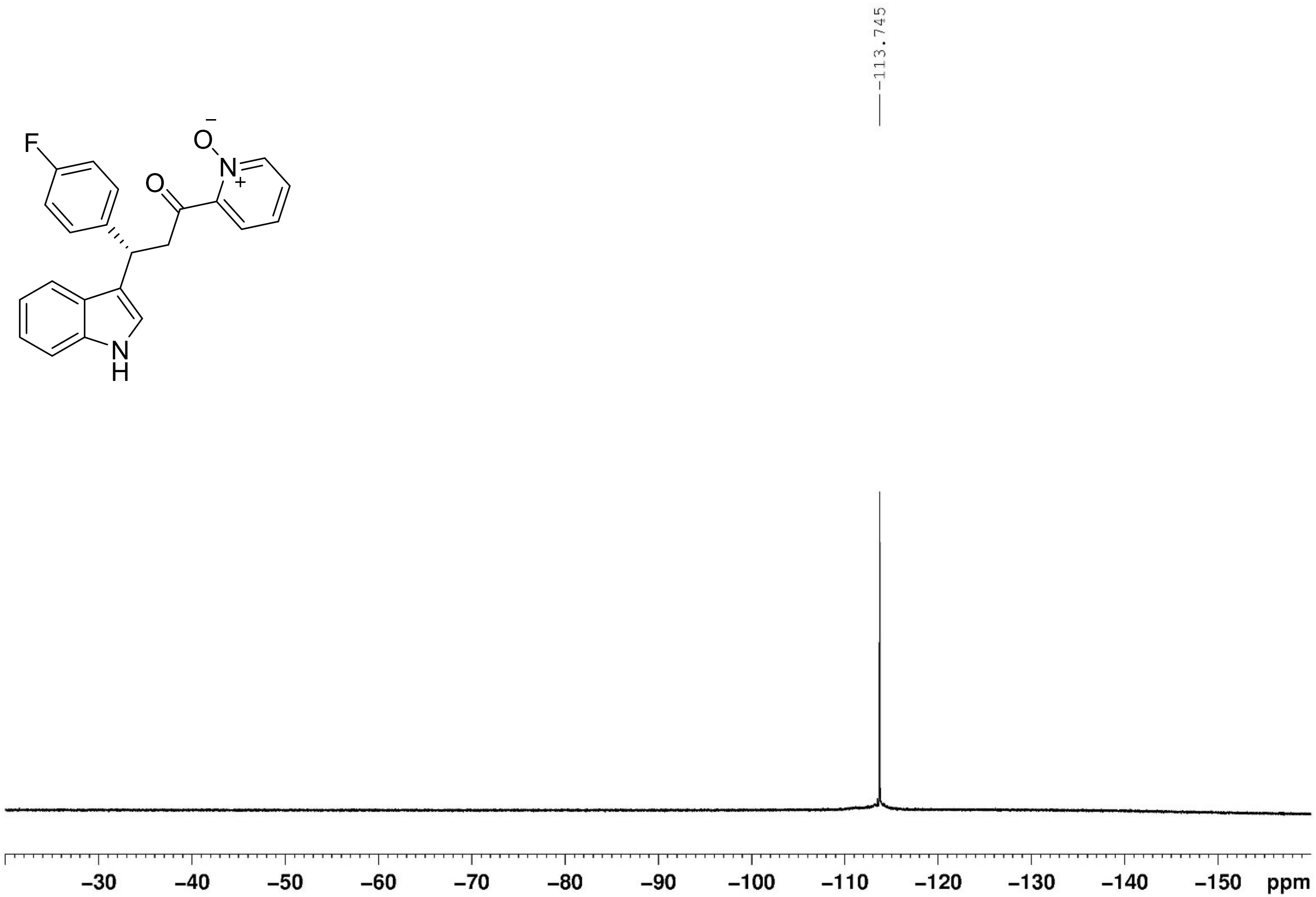

N
N
O
TMS
N
OH
CF3

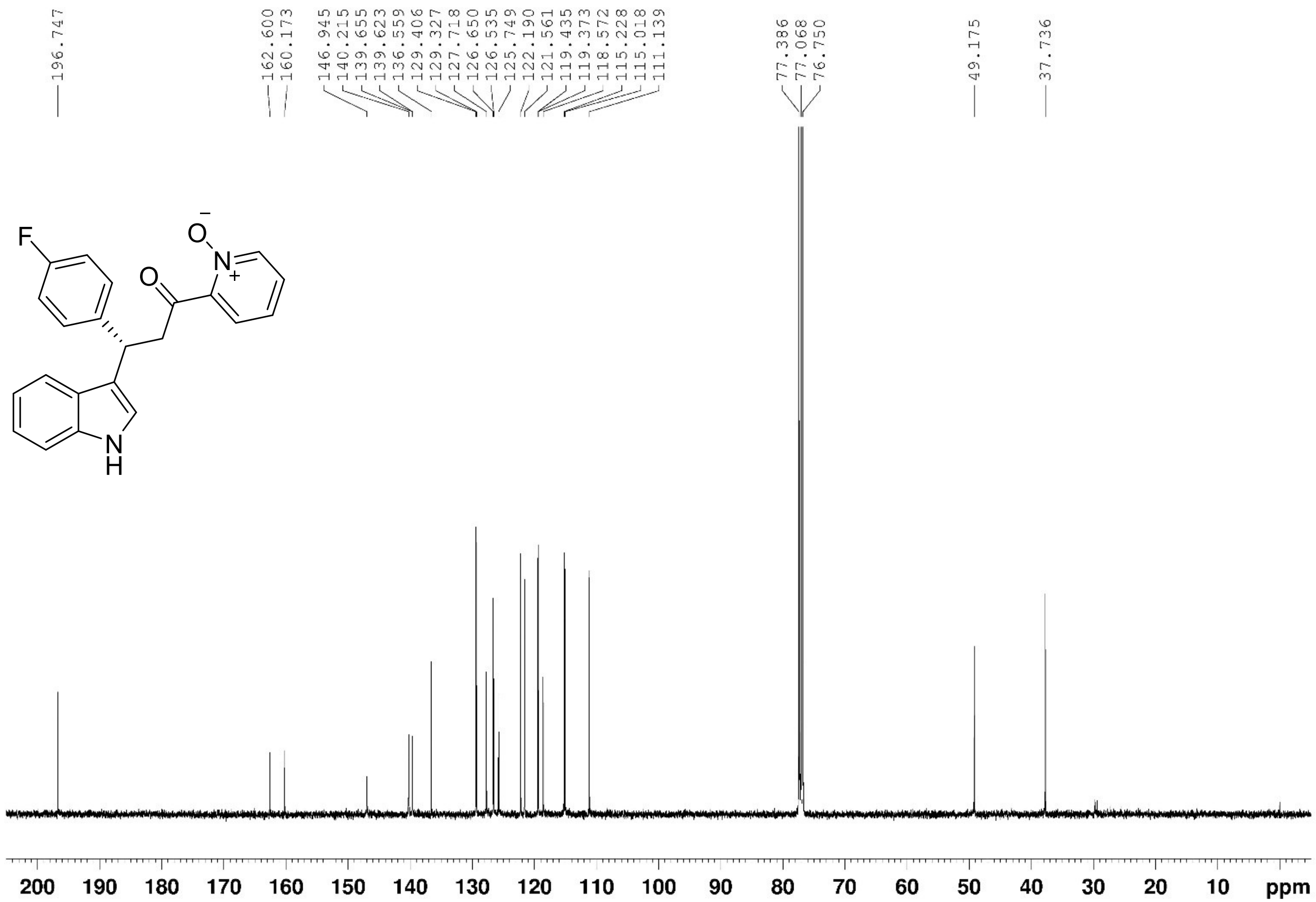

164.801
140.390
140.244
139.117
139.005
134.358
131.419
130.791
129.543
129.274
129.086
128.211
127.787
126.106
118.796
82.362
79.014
77.219
76.902
76.584
61.028
60.875
45.078
44.934
37.763
34.540
33.432
33.297
31.726
31.258
29.270
29.105
28.967
22.528
13.973
1.681
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

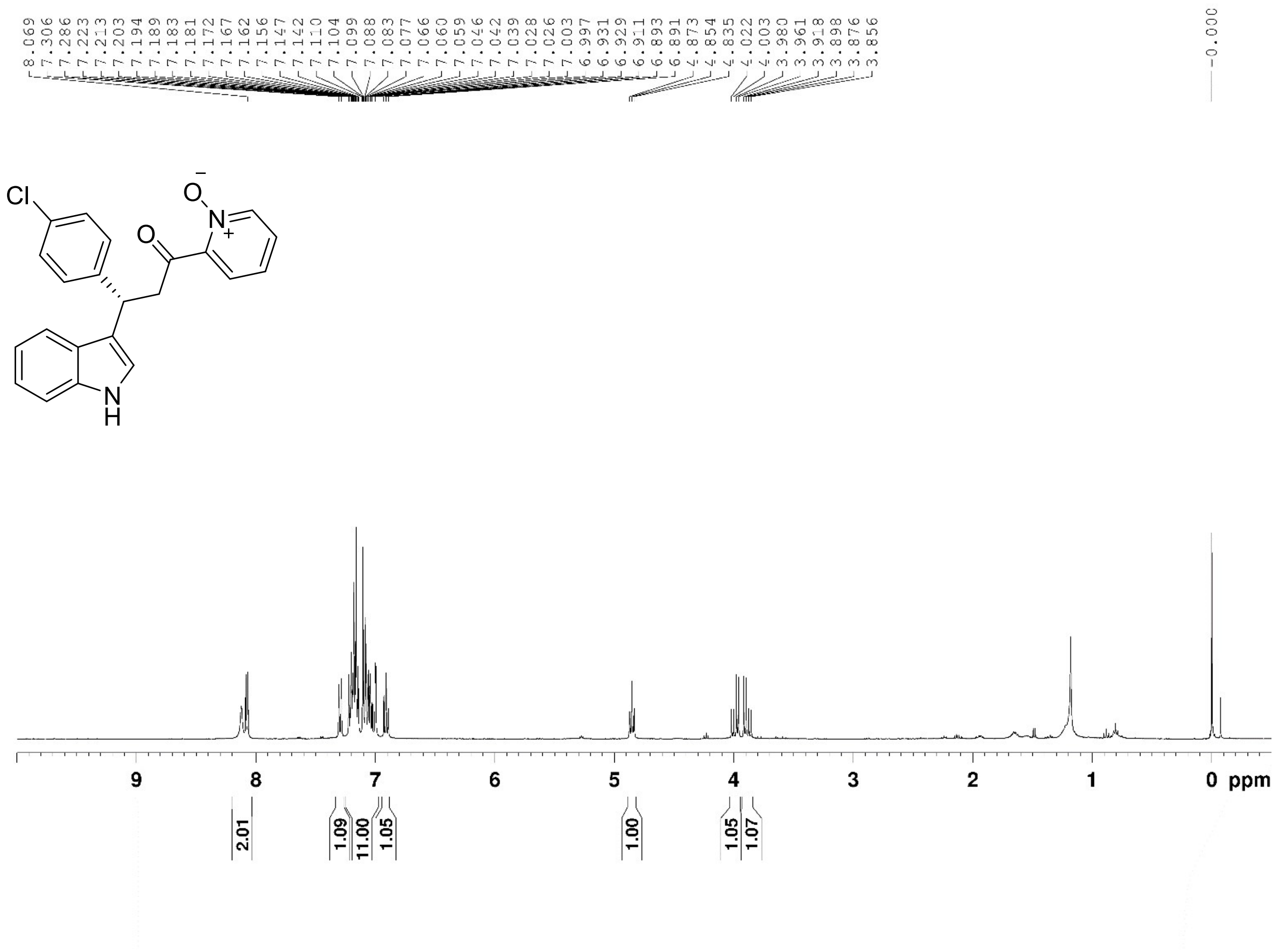

7.316 7.313 7.295 7.293 7.285 7.264 7.251 7.244 7.237 7.228 7.220 7.215 7.211 7.201 7.198 7.182 7.141 7.138 7.135 7.124 7.120 7.114 7.112 7.104 7.099 7.092 7.086 7.083 7.072 7.065 7.062 6.994 6.991 6.976 6.974 6.972 6.956 6.954 4.949 4.930 4.911 4.115 4.096 4.073 4.055 3.990 3.970 3.949 3.929
0.000
O
N
O
NH
9 8 7 6 5 4 3 2 1 0 ppm
2.01 1.03 6.95 5.28 1.13 1.00 2.08


197.127
147.115
143.854
140.093
136.513
128.394
127.911
127.546
126.685
126.525
126.352
125.686
122.078
121.622
119.456
119.368
118.725
111.074
77.388
77.070
76.753
49.061
38.583
O
N
+
O
N
H
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

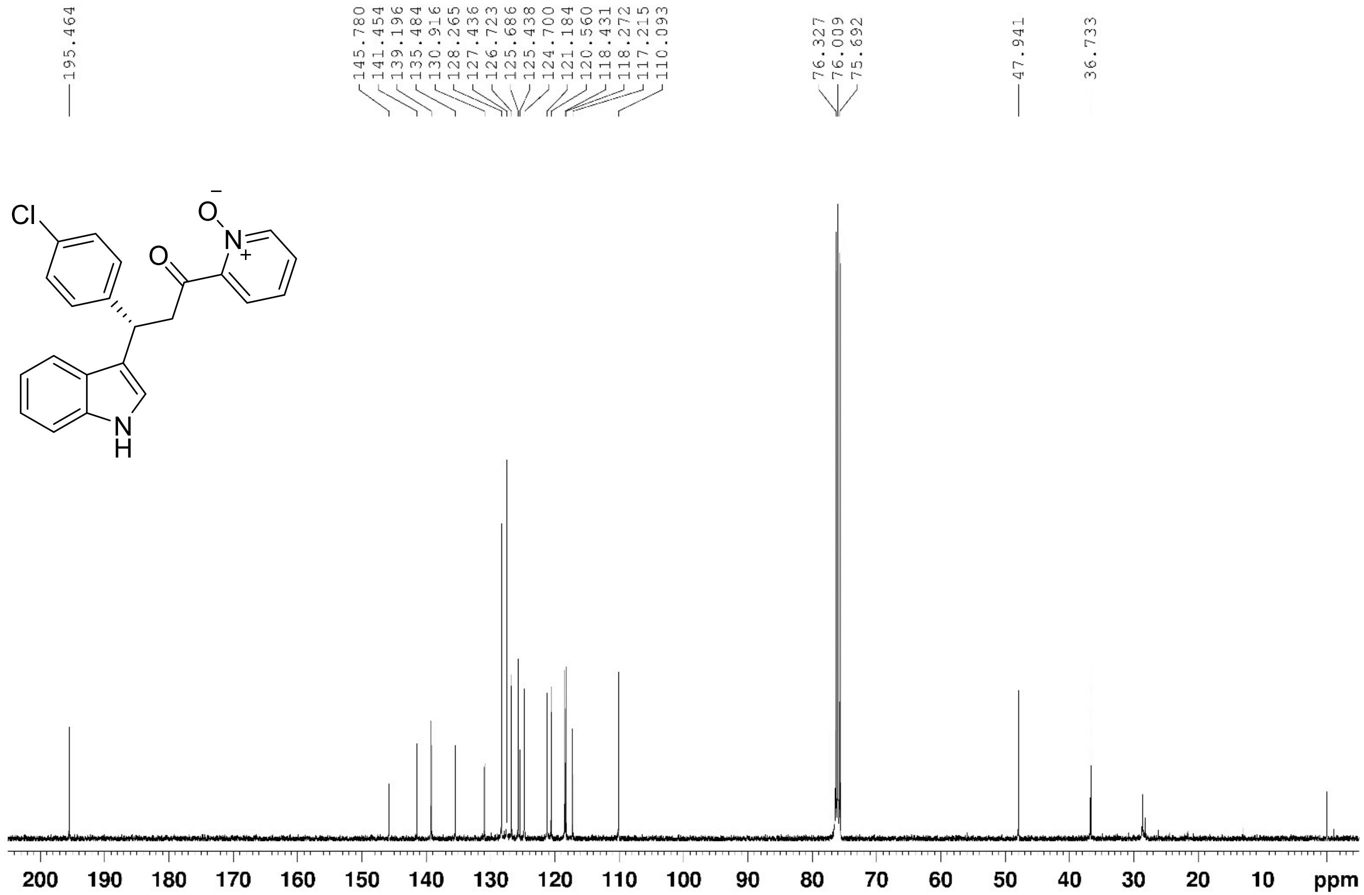

7.267
7.264
7.261
7.254
7.248
7.243
7.213
7.207
7.193
7.187
7.148
7.145
7.138
7.135
7.127
7.120
7.118
7.109
7.107
7.100
7.097
7.078
7.074
7.002
7.000
6.984
6.982
6.980
6.965
6.962
6.915
6.908
6.902
6.891
6.886
6.881
6.869
6.864
6.856
4.952
4.933
4.914
4.092
4.073
4.050
4.032
3.985
3.965
3.943
3.923
0.000
F
O
N
+
O
N
H
9
8
7
6
5
4
3
2
1
0
ppm
1.96
1.00
4.83
1.16
3.24
1.10
2.07
1.00
2.08


-113.745
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
-150
ppm

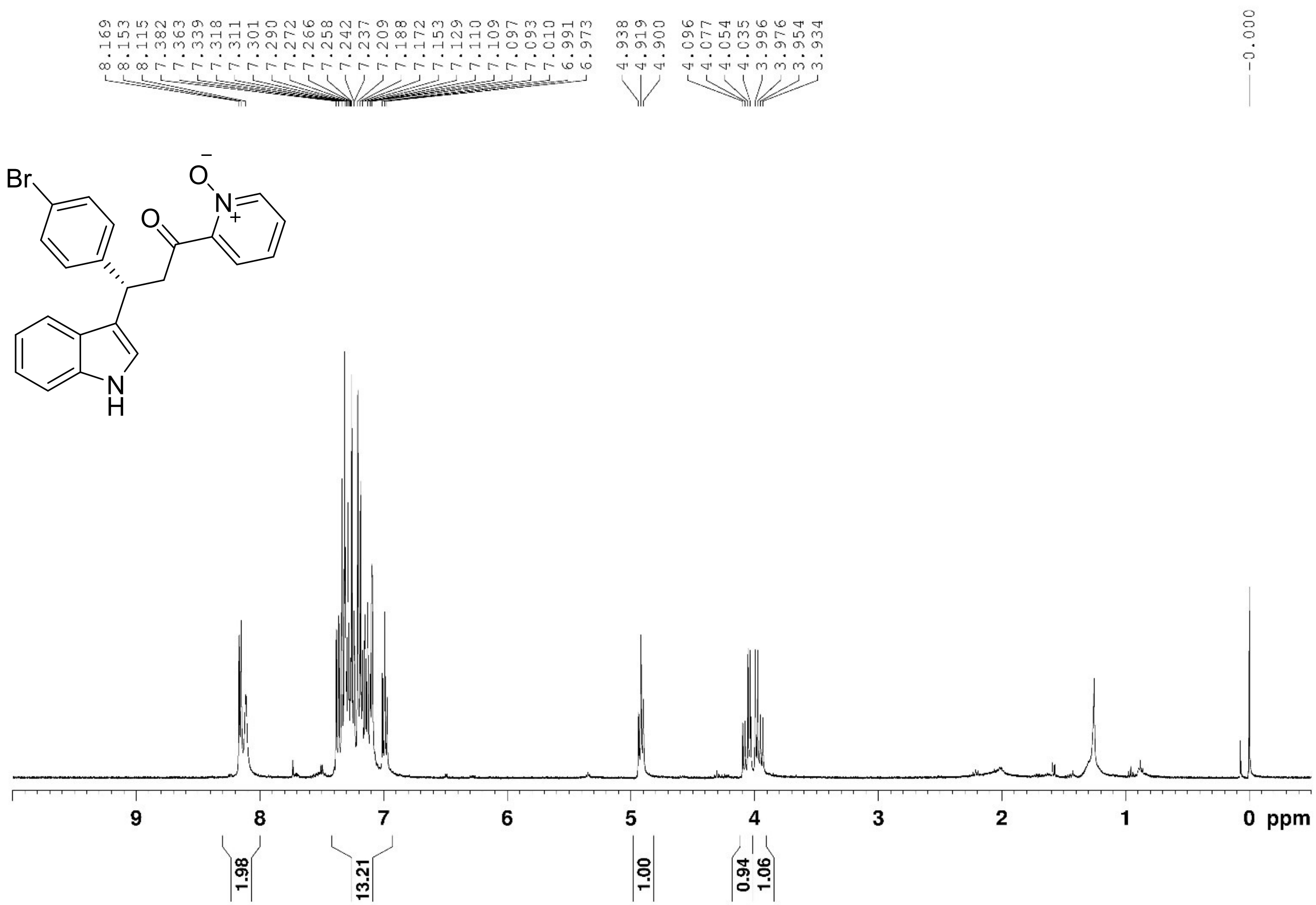

196.747
162.600
160.173
146.945
140.215
139.655
139.623
136.559
129.406
129.327
127.718
126.650
126.535
125.749
122.190
121.561
119.435
119.373
118.572
115.228
115.018
111.139
77.386
77.068
76.750
49.175
37.736
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

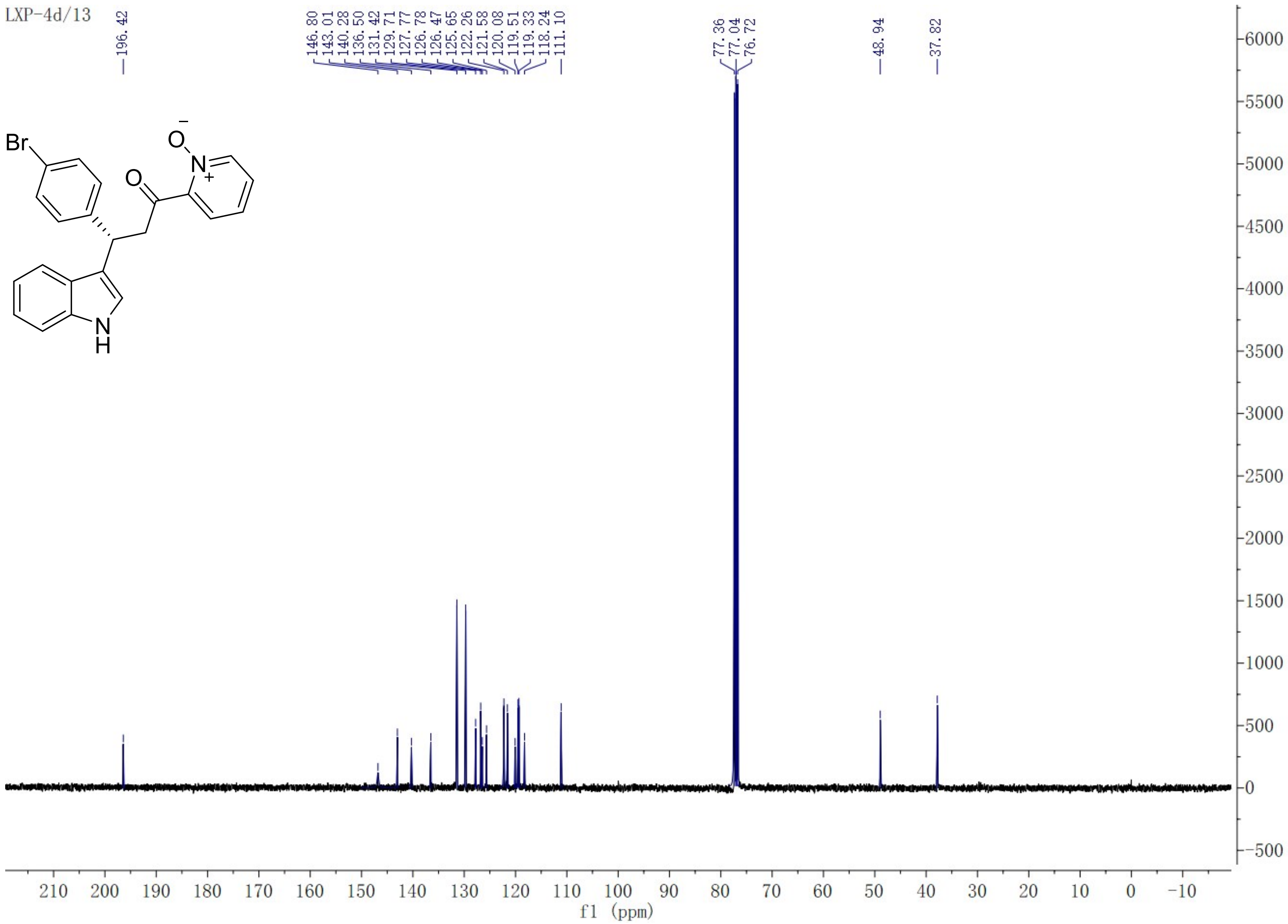


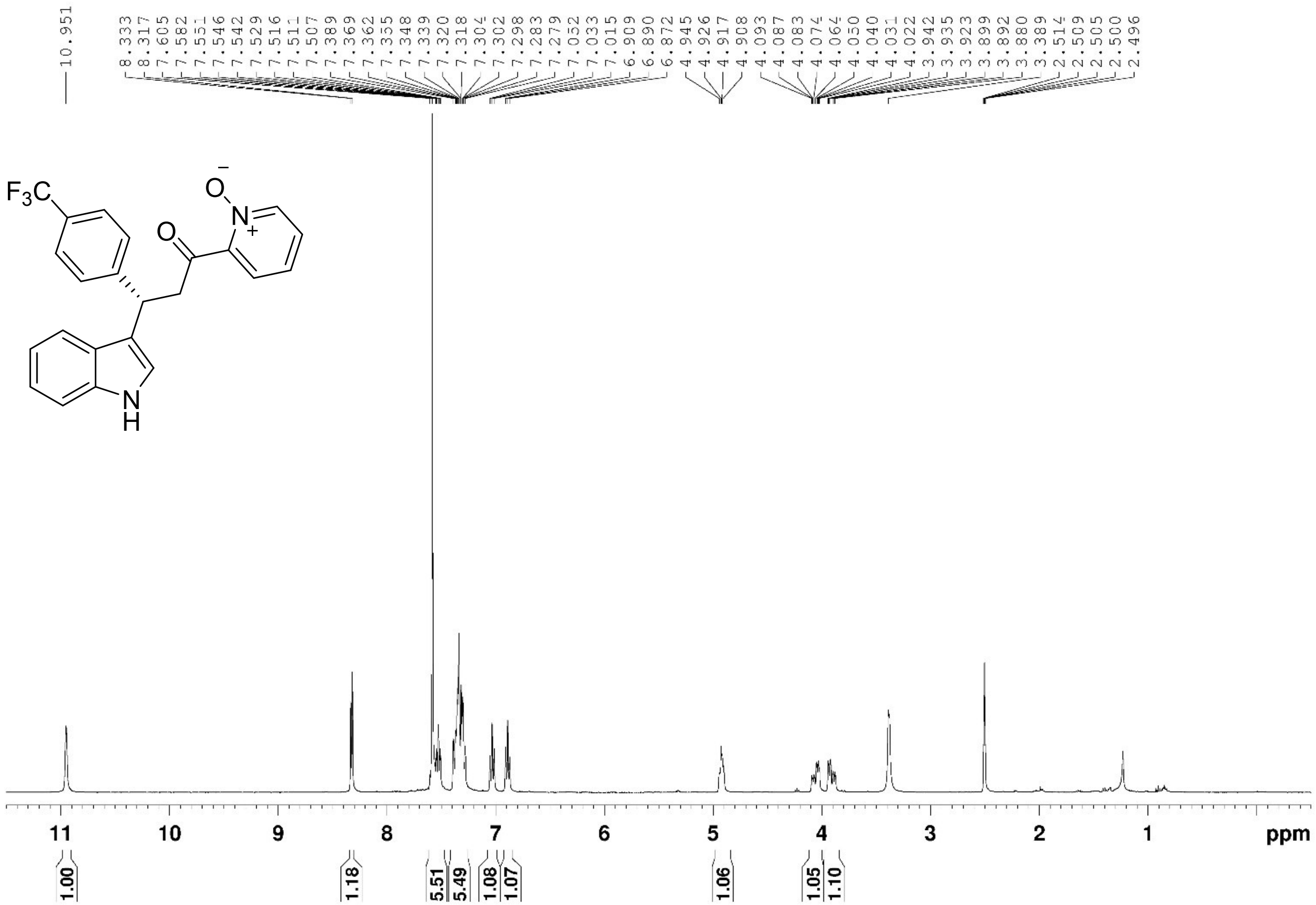
Cl
O
N
+
O
N
H
8.069 7.306 7.286 7.223 7.213 7.203 7.194 7.189 7.183 7.181 7.172 7.167 7.162 7.156 7.147 7.142 7.110 7.104 7.099 7.088 7.083 7.077 7.066 7.060 7.046 7.042 7.039 7.028 7.026 7.003 6.997 6.931 6.929 6.911 6.893 6.891 4.873 4.854 4.835 4.022 4.003 3.980 3.961 3.918 3.898 3.876 3.856
0.000
9 8 7 6 5 4 3 2 1 0 ppm
2.01
1.09
11.00
1.05
1.00
1.05
1.07



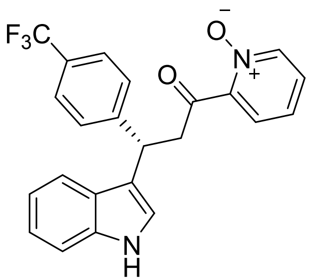
195.464
145.780
141.454
139.196
135.484
130.916
128.265
127.436
126.723
125.686
125.438
124.700
121.184
120.560
118.431
118.272
117.215
110.093
76.327
76.009
75.692
47.941
36.733
Cl
O
N
+
O
H
N
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm

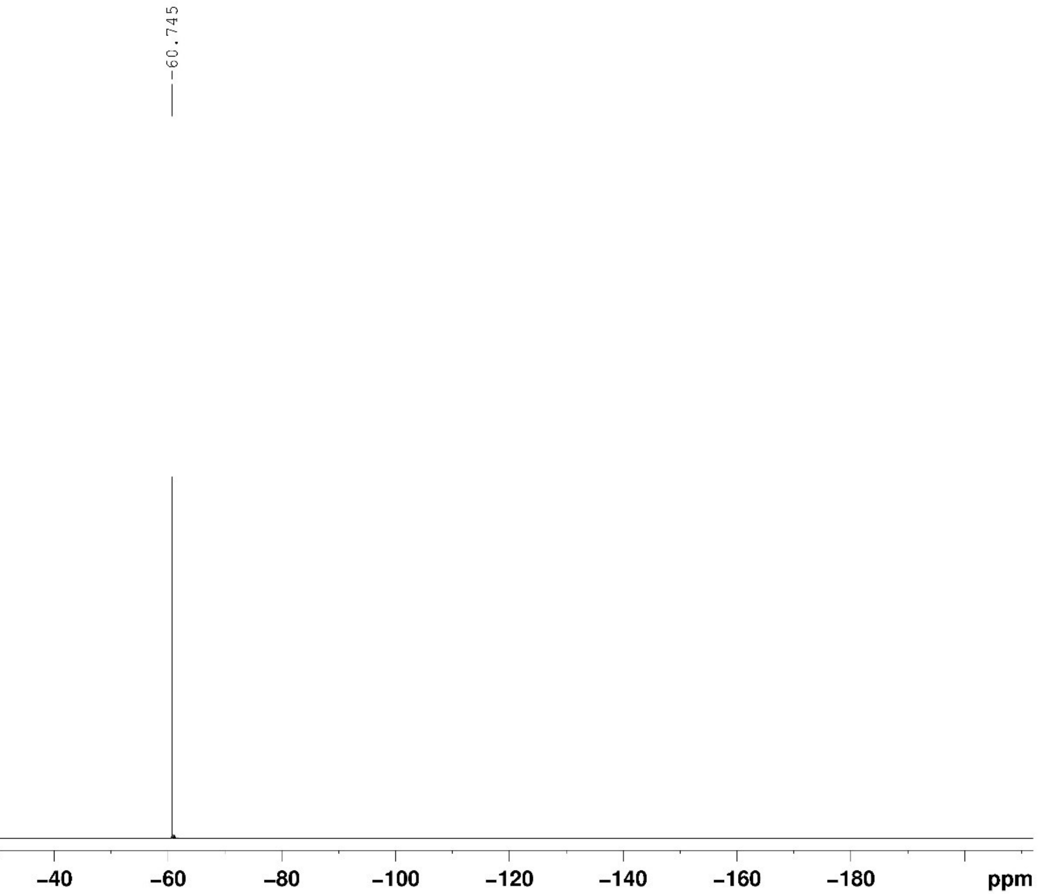

8.169
8.153
8.115
7.382
7.363
7.339
7.318
7.311
7.301
7.290
7.272
7.266
7.258
7.242
7.237
7.209
7.188
7.172
7.153
7.129
7.110
7.109
7.097
7.093
7.010
6.991
6.973
4.938
4.919
4.900
4.096
4.077
4.054
4.035
3.996
3.976
3.954
3.934
-0.000
Br
O
N
+
O
N
H
9
8
7
6
5
4
3
2
1
0 ppm
1.98
13.21
1.00
0.94
1.06

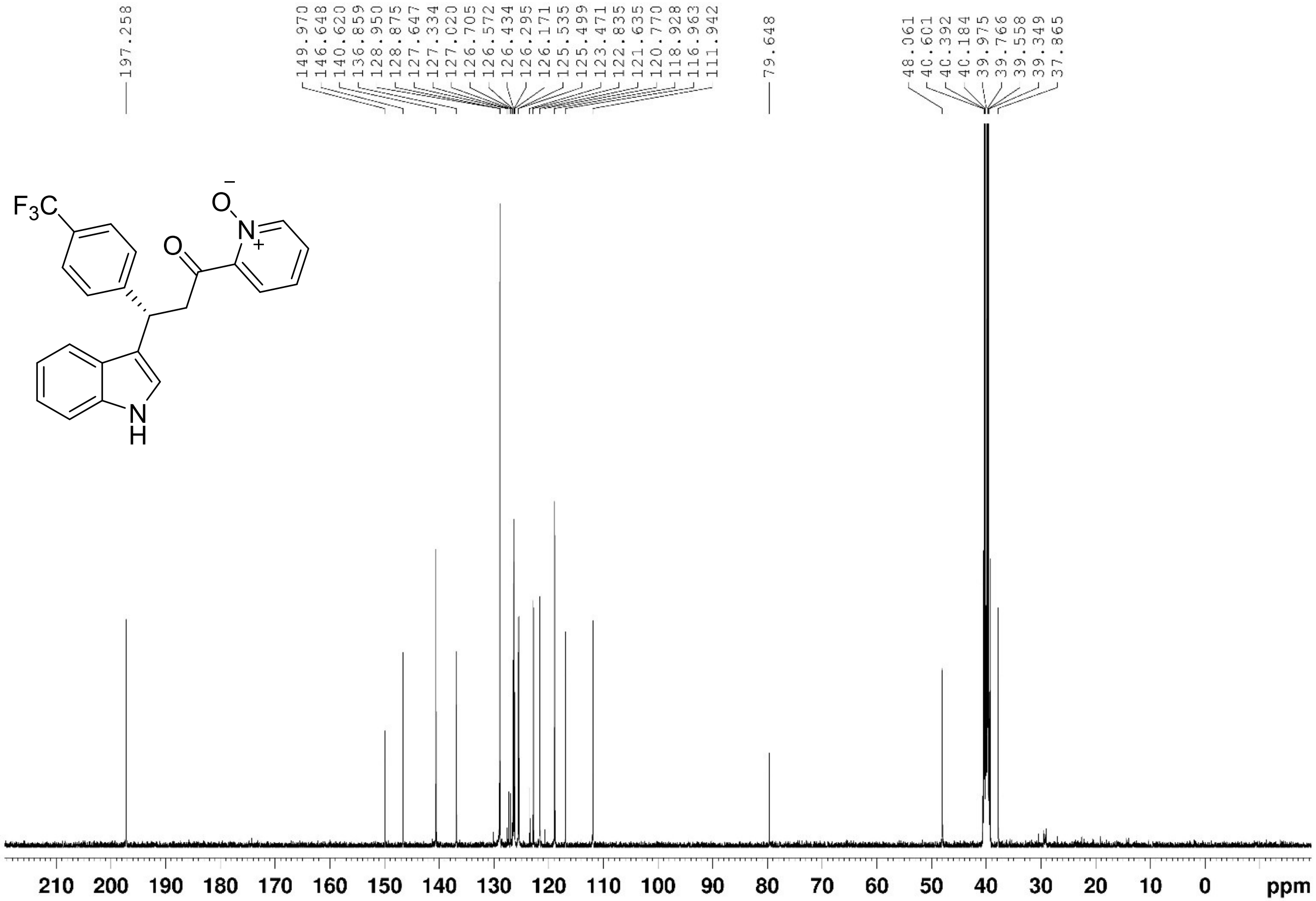

LXP-4d/13
196.42
146.80
143.01
140.28
136.50
131.42
129.71
127.77
126.78
126.47
125.65
122.26
121.58
120.08
119.51
119.33
118.24
111.10
77.36
77.04
76.72
48.94
37.82
Br
O
N
+
H
N
f1 (ppm)



F3C
O
N+
O
NH




-60.745
20
0
−20
−40
−60
−80
−100
−120
−140
−160
−180
ppm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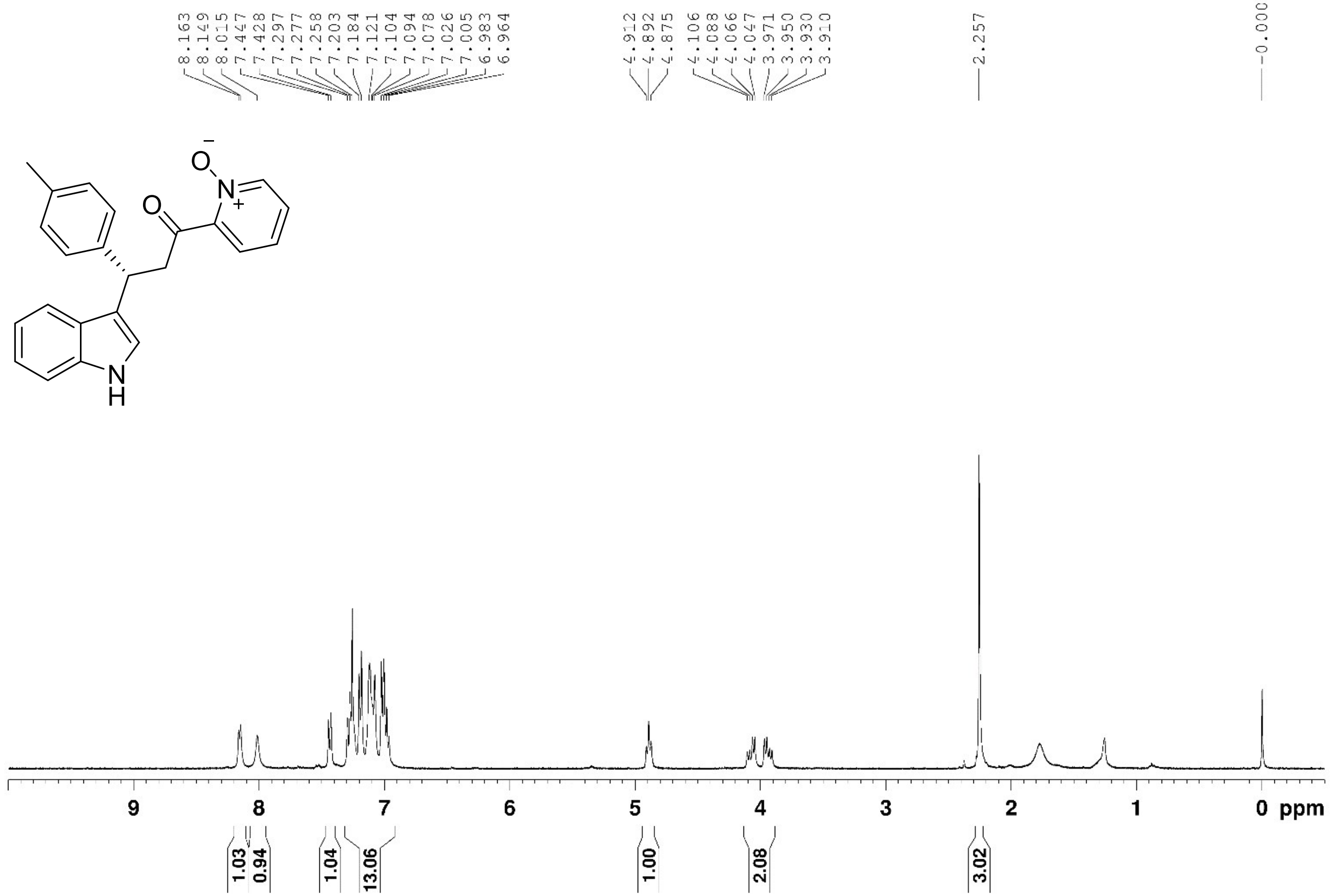
149.970
146.648
140.620
136.859
128.950
128.875
127.647
127.334
127.020
126.705
126.572
126.434
126.295
126.171
125.535
125.499
123.471
122.835
121.635
120.770
118.928
116.963
111.942
79.648
48.061
40.601
40.392
40.184
39.975
39.766
39.558
39.349
37.865
F3C
O
N+
NH
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm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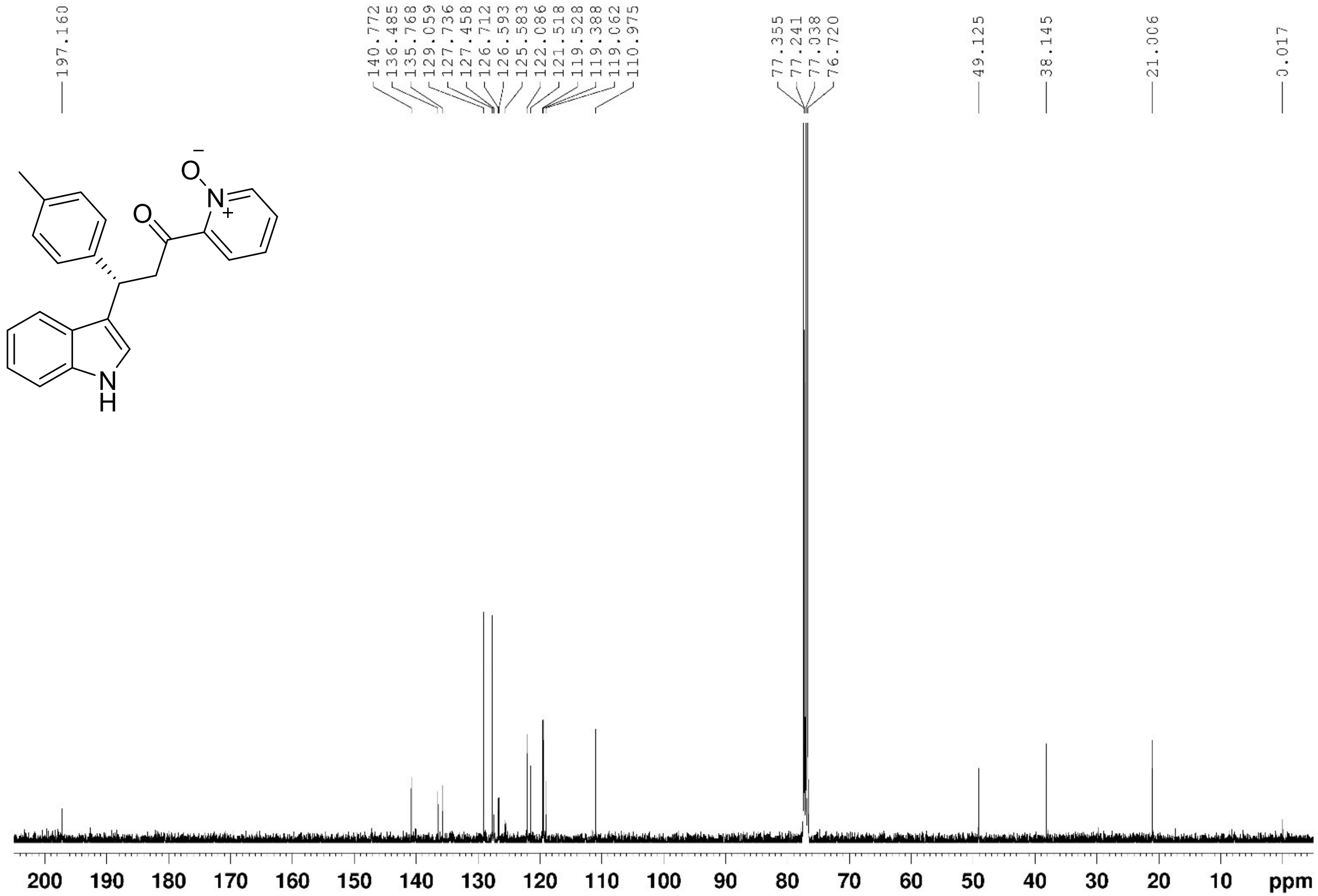
8.149
8.015
7.447
7.428
7.297
7.277
7.258
7.203
7.184
7.121
7.104
7.094
7.078
7.026
7.005
6.983
6.964
4.912
4.892
4.875
4.106
4.088
4.066
4.047
3.971
3.950
3.930
3.910
2.257
0.000
O
N+
O
N
H
9
8
7
6
5
4
3
2
1
0 ppm
1.03
0.94
1.04
13.06
1.00
2.08
3.02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126.712
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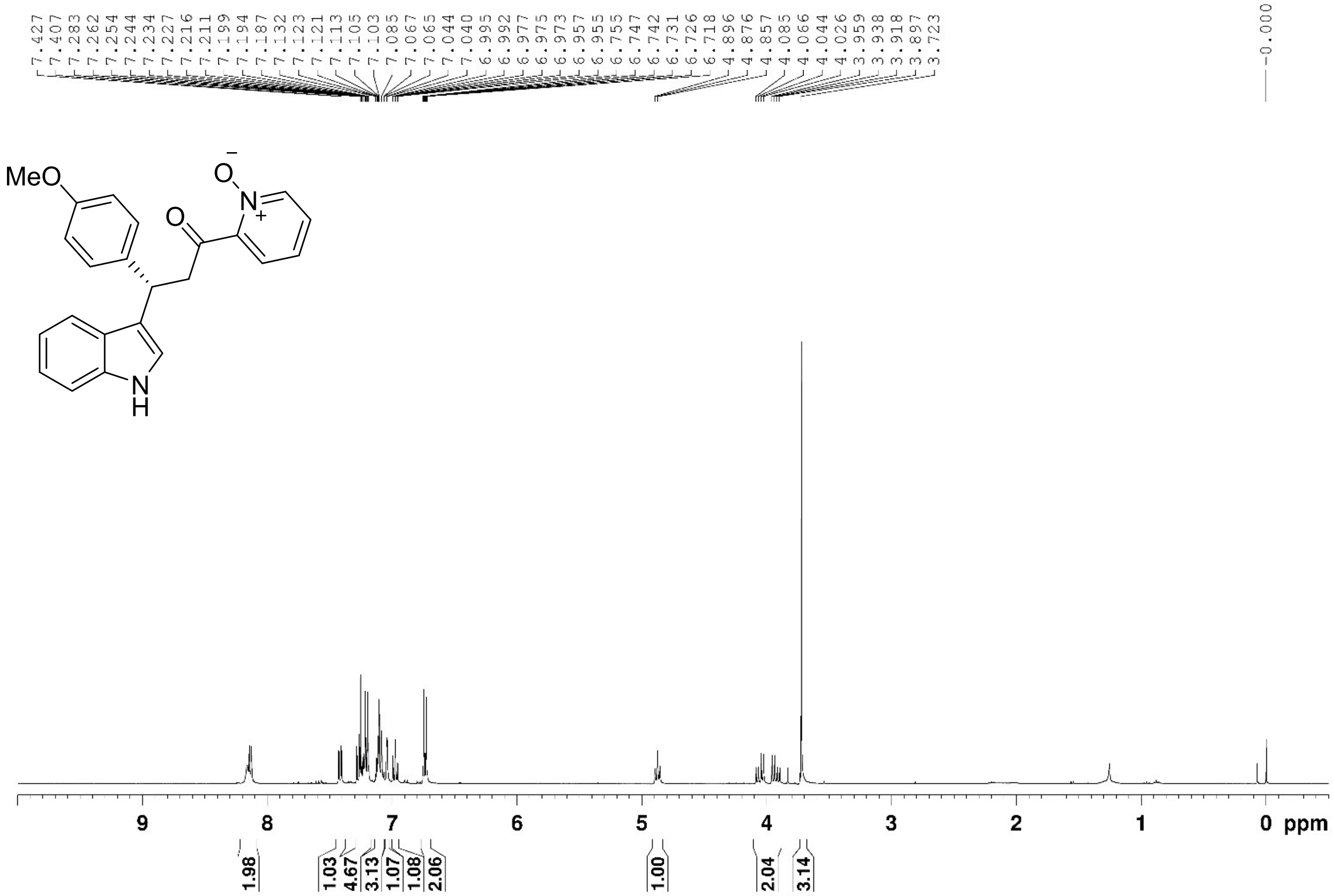
125.583
122.086
121.518
119.528
119.388
119.062
110.975
77.355
77.241
77.038
76.720
49.125
38.145
21.006
0.017
O
N
+
NH
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm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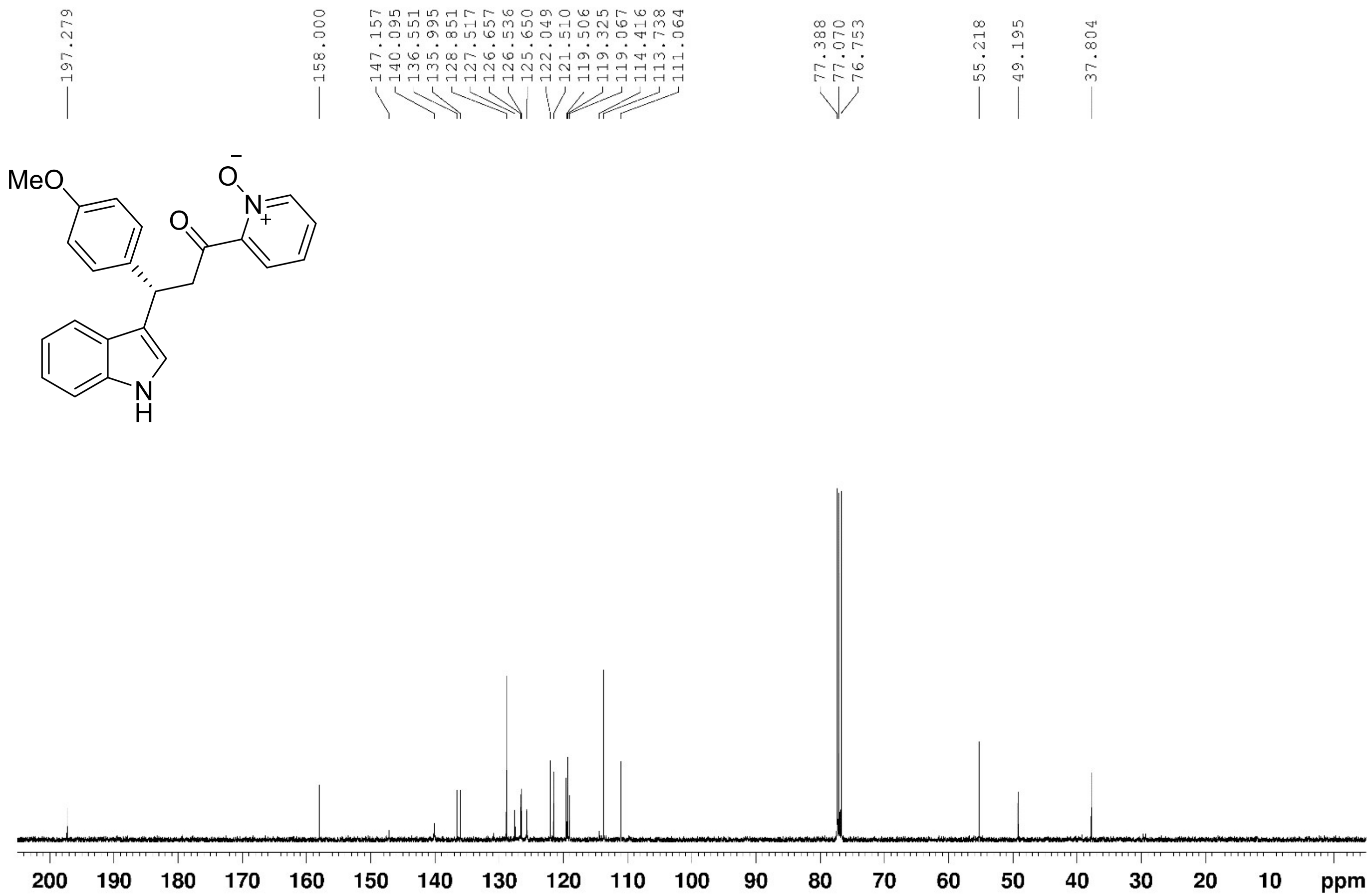
7.407
7.283
7.262
7.254
7.244
7.234
7.227
7.216
7.211
7.199
7.194
7.187
7.132
7.123
7.121
7.113
7.105
7.103
7.085
7.067
7.065
7.044
7.040
6.995
6.992
6.977
6.975
6.973
6.957
6.955
6.755
6.747
6.742
6.731
6.726
6.718
4.896
4.876
4.857
4.085
4.066
4.044
4.026
3.959
3.938
3.918
3.897
3.723
-0.000
MeO
O
N
+
H
N
9
8
7
6
5
4
3
2
1
0 ppm
1.98
1.03
4.67
3.13
1.07
1.08
2.06
1.00
2.04
3.14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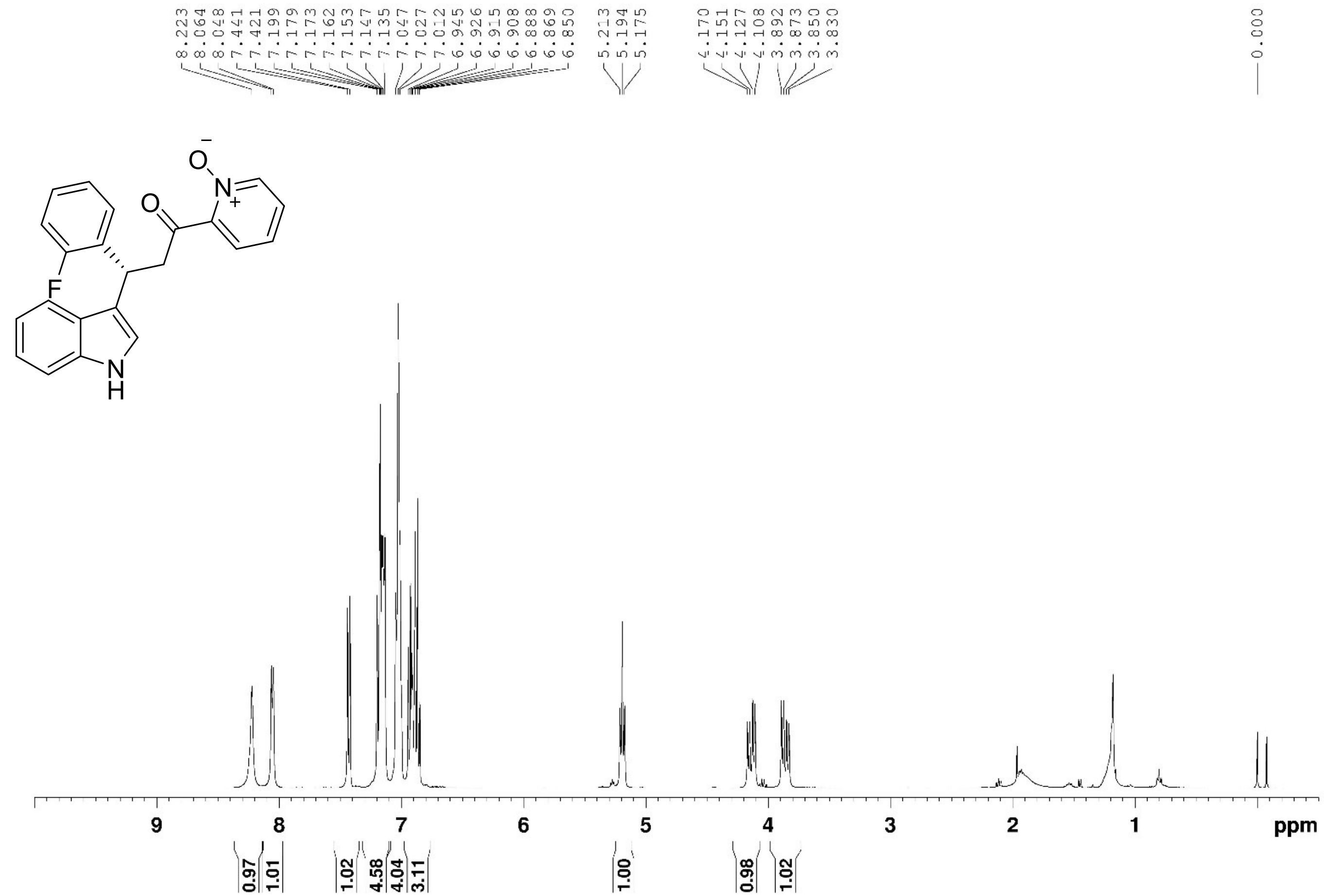
147.157
140.095
136.551
135.995
128.851
127.517
126.657
126.536
125.650
122.049
121.510
119.506
119.325
119.067
114.416
113.738
111.064
77.388
77.070
76.753
55.218
49.195
37.804
MeO
O
N
+
H
N
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
ppm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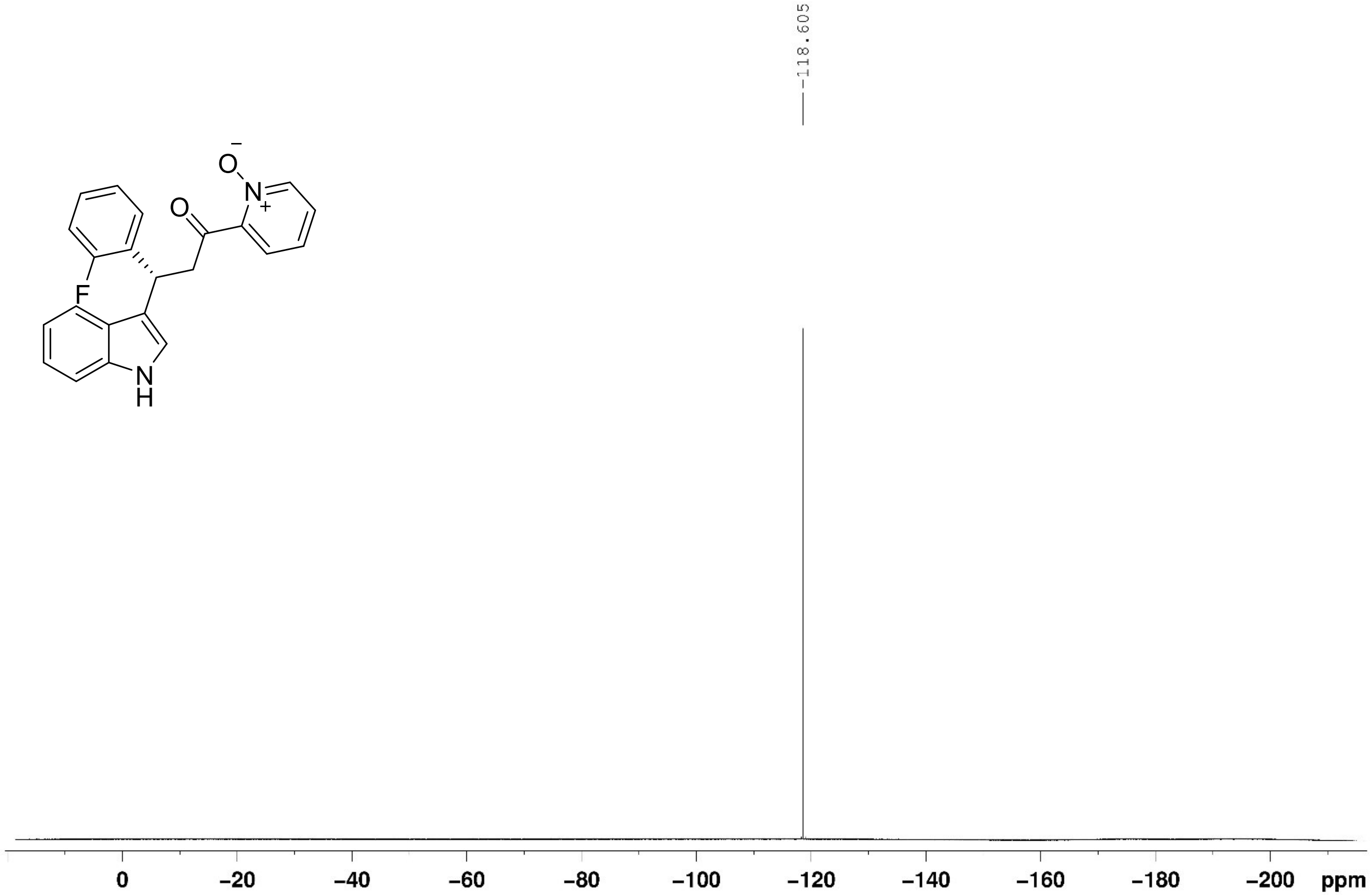
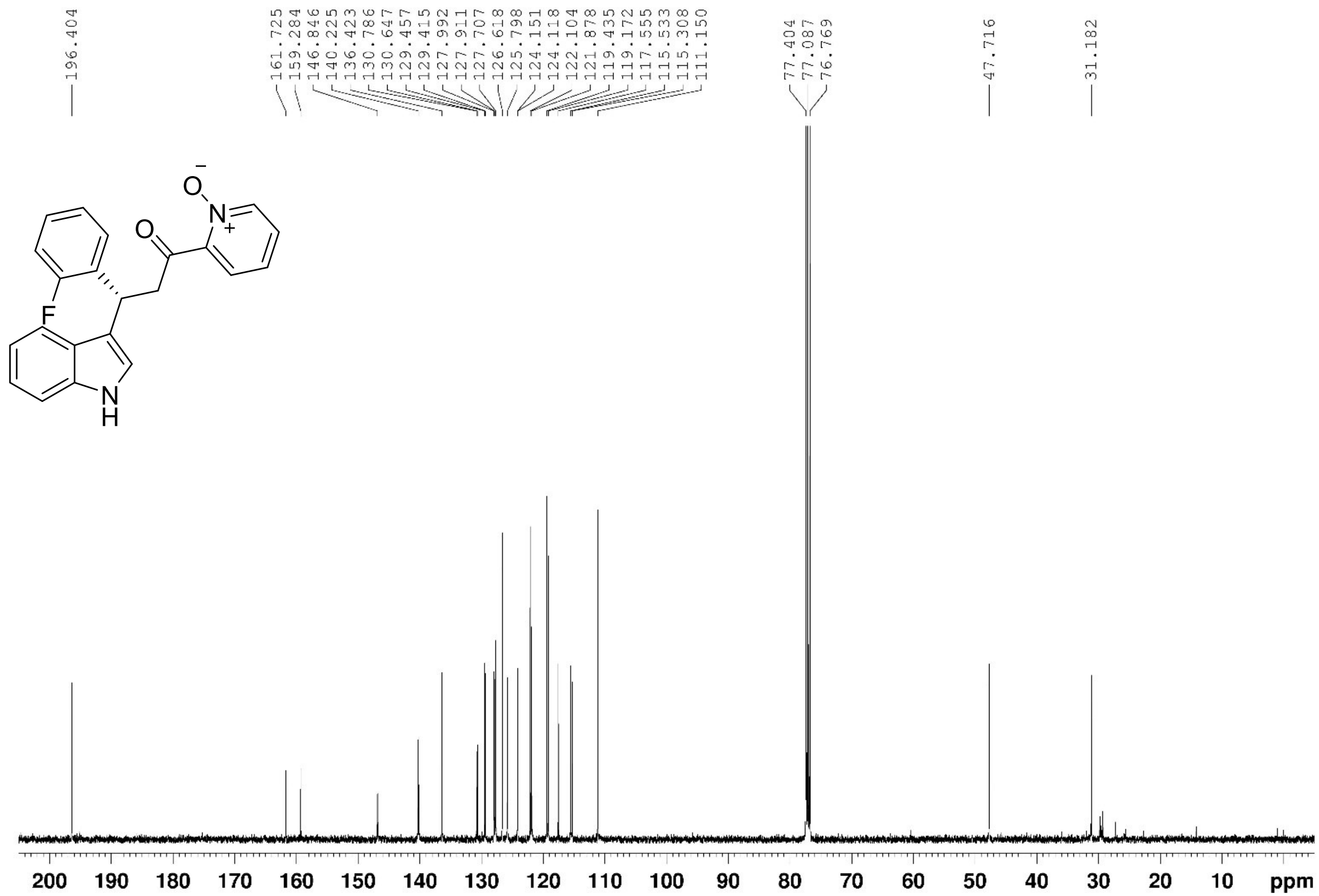
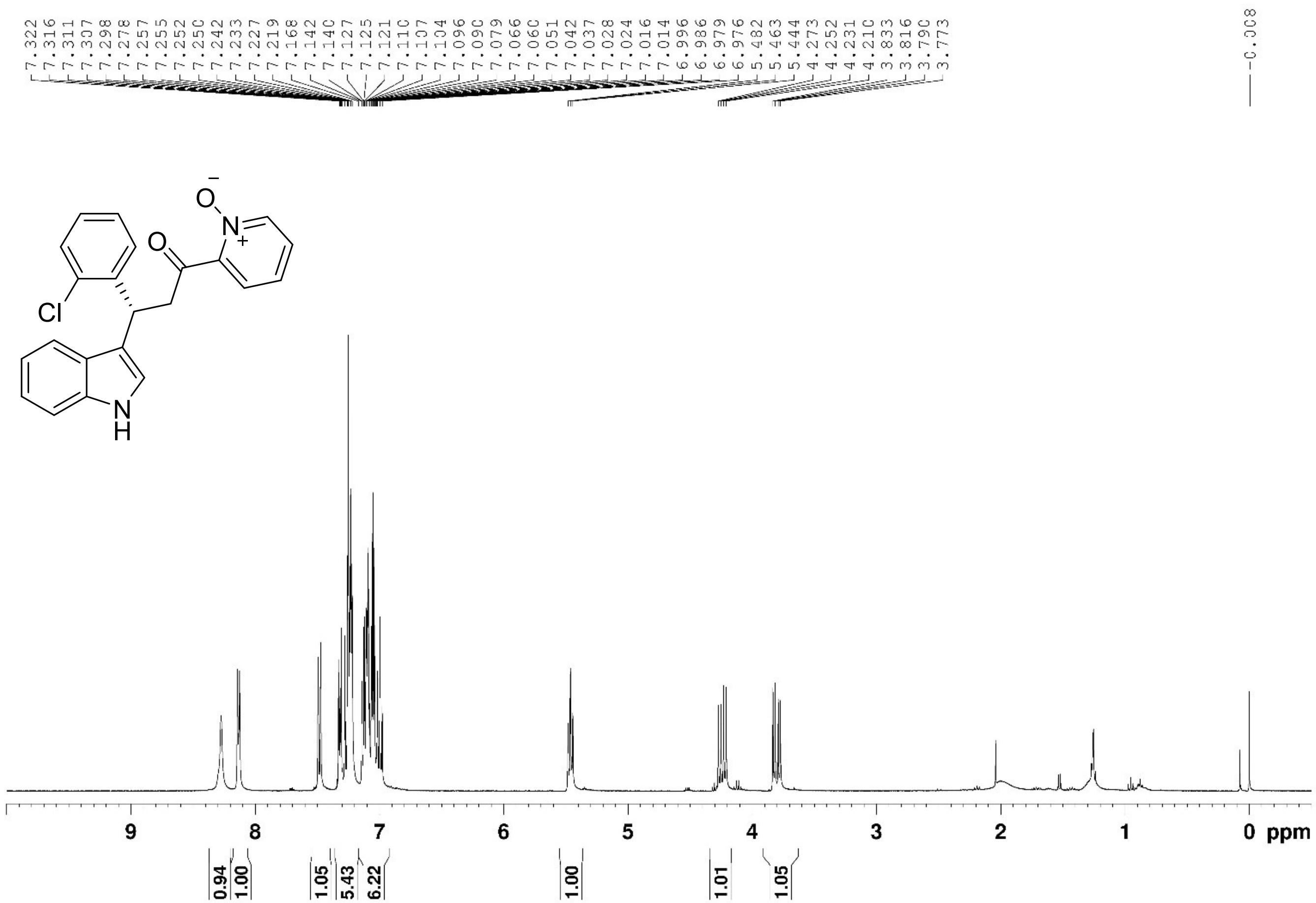
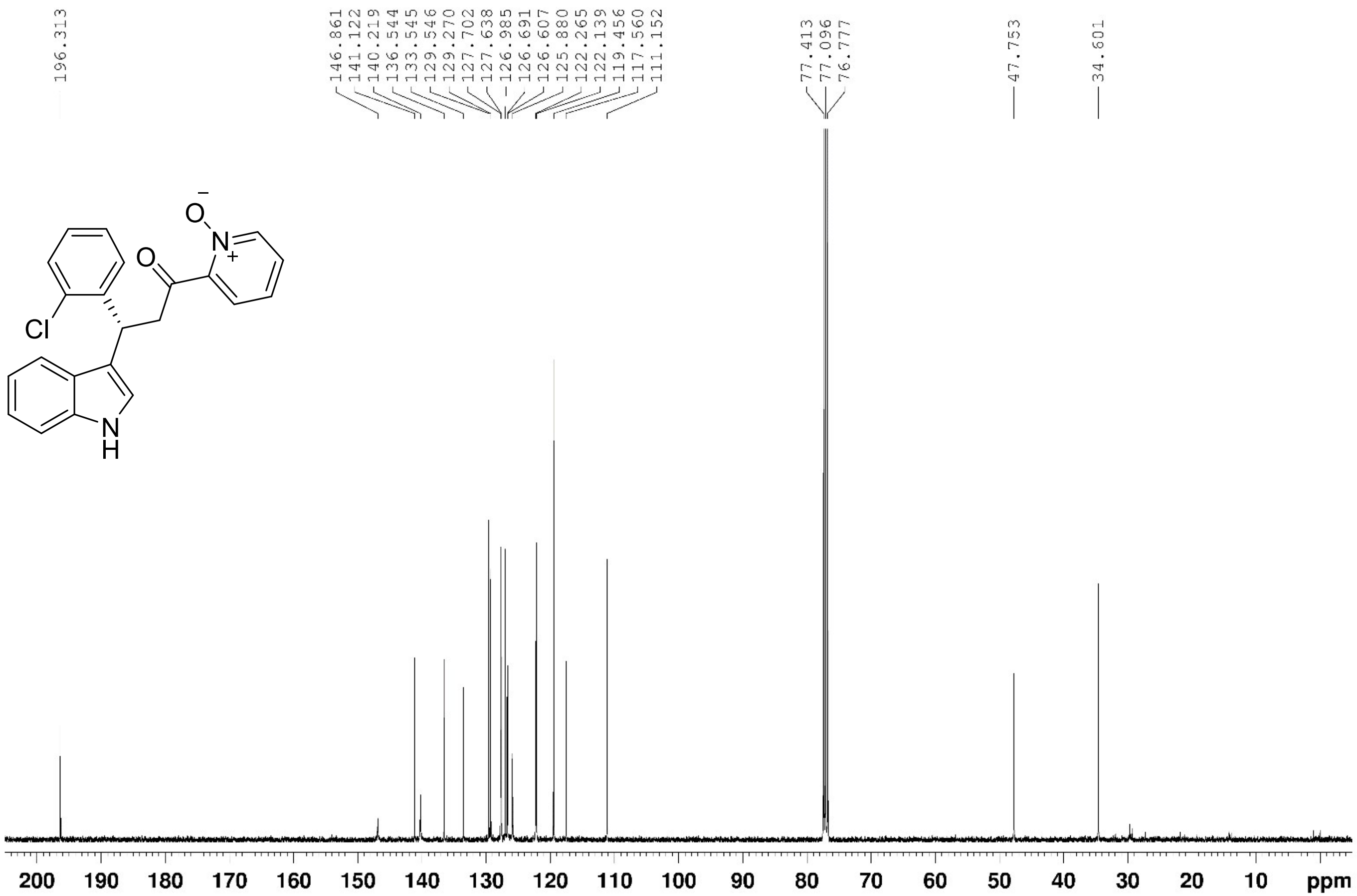
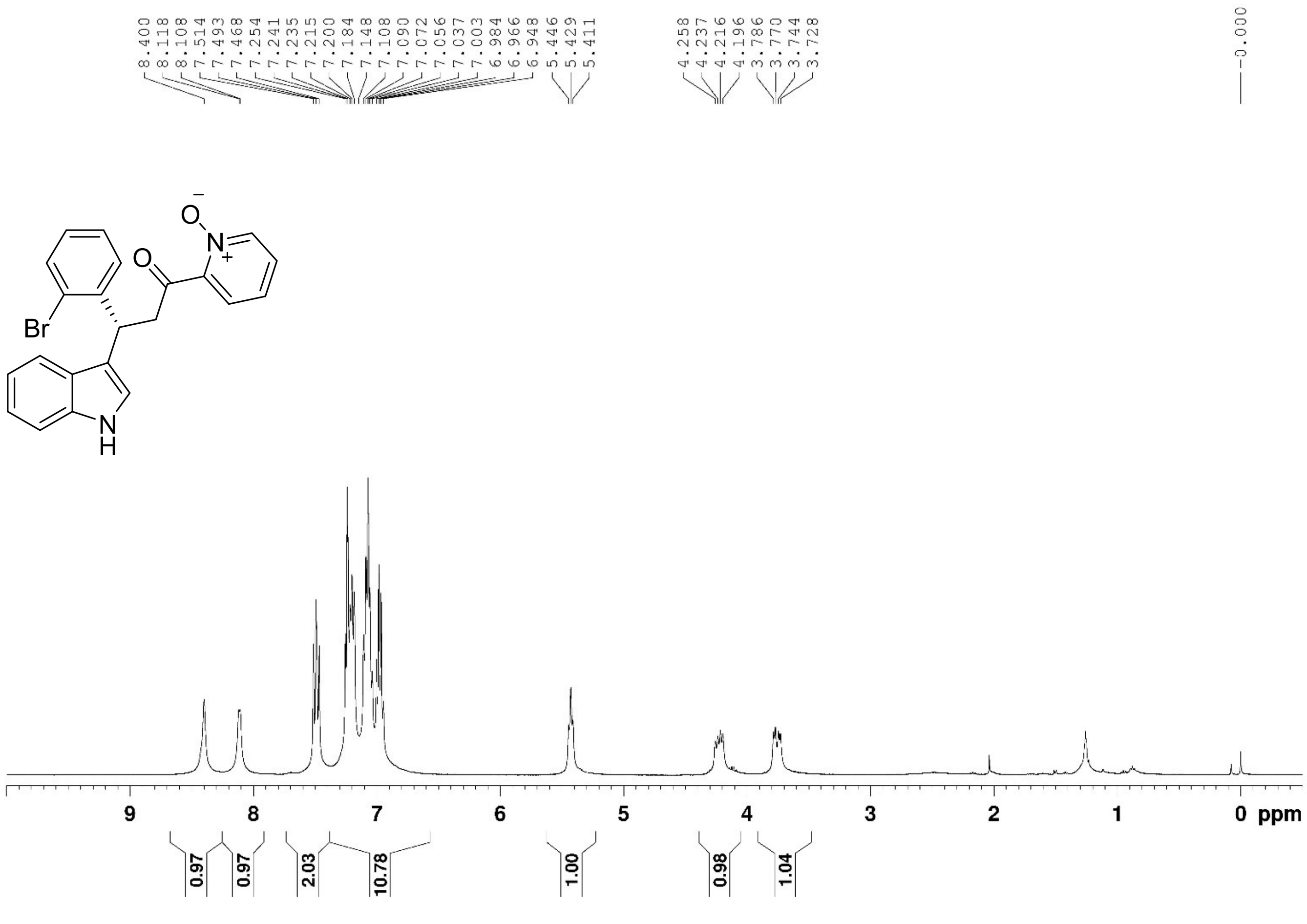
8.064
8.048
7.441
7.421
7.199
7.179
7.173
7.162
7.153
7.147
7.135
7.047
7.027
7.012
6.945
6.926
6.915
6.908
6.888
6.869
6.850
5.213
5.194
5.175
4.170
4.151
4.127
4.108
3.892
3.873
3.850
3.830
0.000
O
N
+
O
F
N
H
9
8
7
6
5
4
3
2
1
ppm
0.97
1.01
1.02
4.58
4.04
3.11
1.00
0.98
1.02

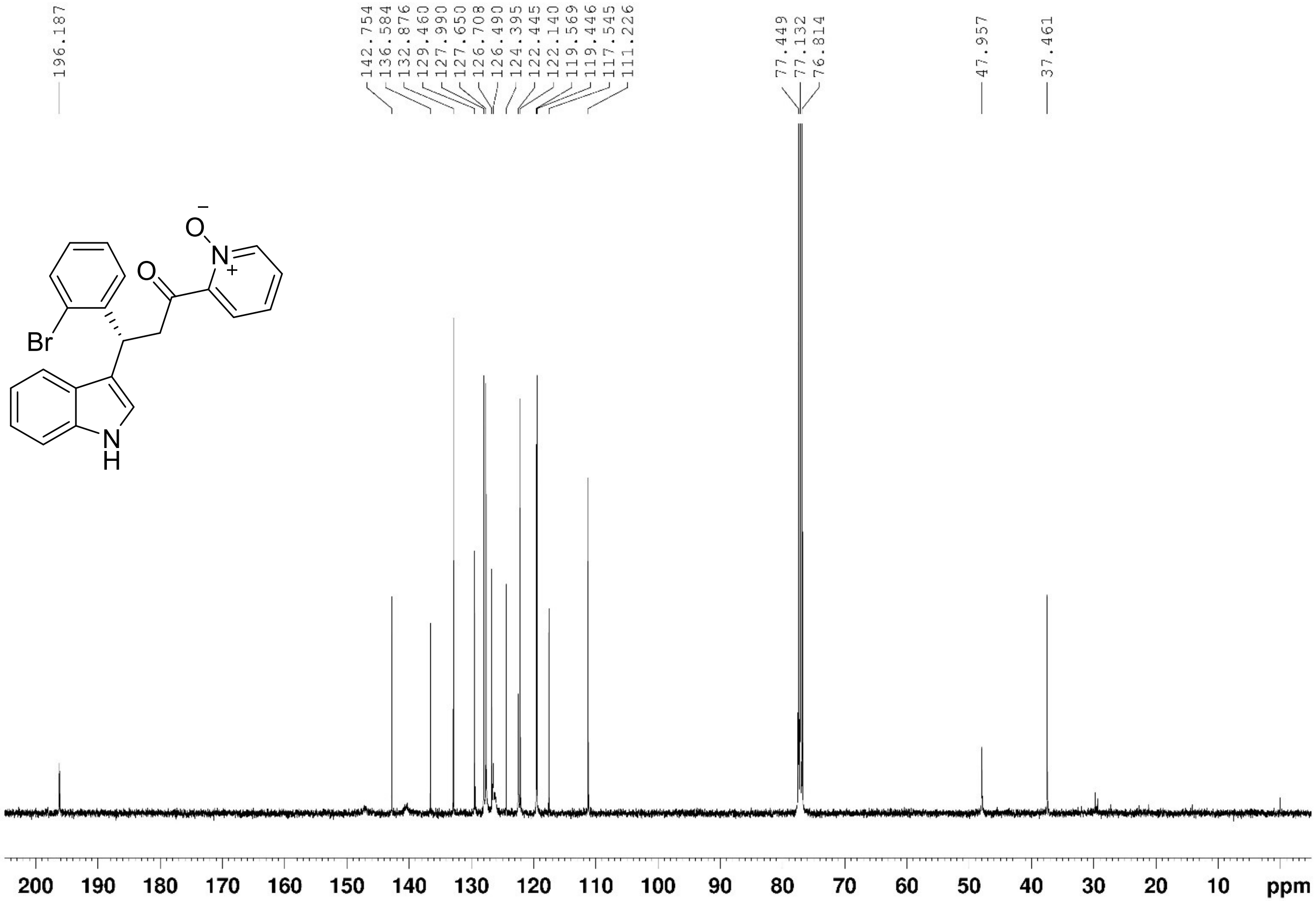

-118.605
O
N
+
−
O
F
N
H
0
−20
−40
−60
−80
−100
−120
−140
−160
−180
−200
ppm

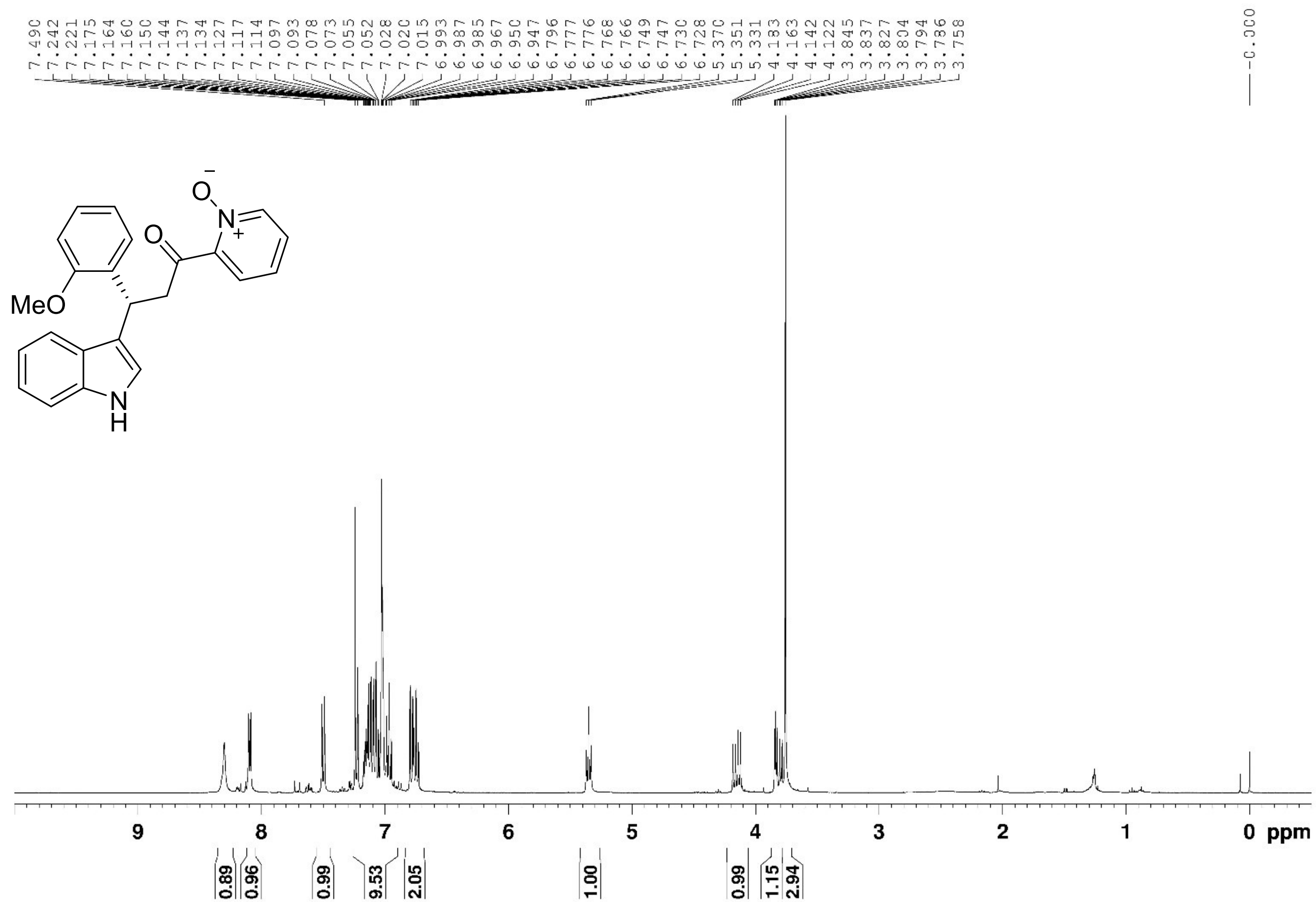

196.404
161.725
159.284
146.846
140.225
136.423
130.786
130.647
129.457
129.415
127.992
127.911
127.707
126.618
125.798
124.151
124.118
122.104
121.878
119.435
119.172
117.555
115.533
115.308
111.150
77.404
77.087
76.769
47.716
31.182
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

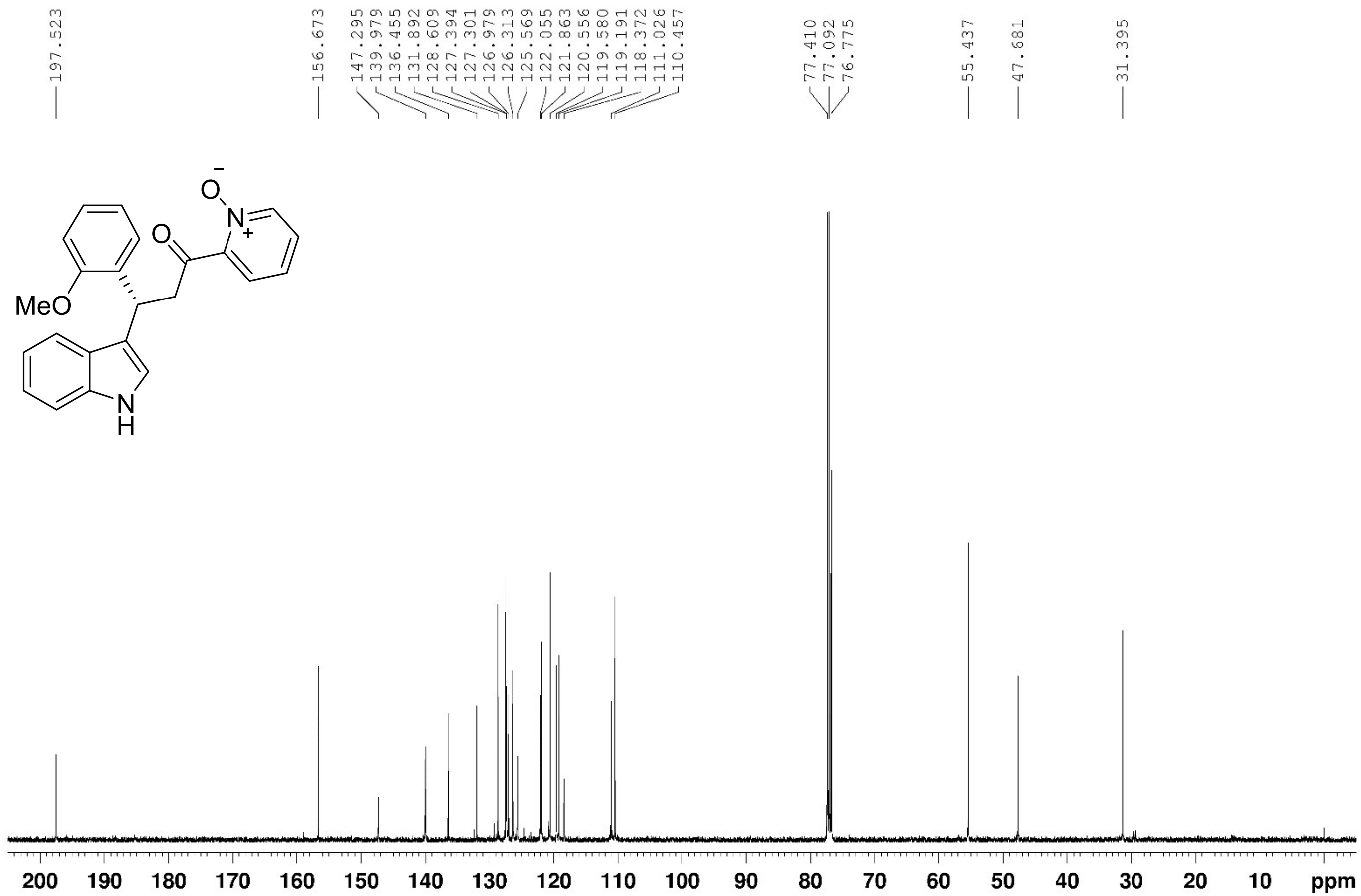

7.322
7.316
7.311
7.307
7.298
7.278
7.257
7.255
7.252
7.250
7.242
7.233
7.227
7.219
7.168
7.142
7.140
7.127
7.125
7.121
7.110
7.107
7.104
7.096
7.090
7.079
7.066
7.060
7.051
7.042
7.037
7.028
7.024
7.016
7.014
6.996
6.986
6.979
6.976
5.482
5.463
5.444
4.273
4.252
4.231
4.210
3.833
3.816
3.790
3.773
0.008
9
8
7
6
5
4
3
2
1
0 ppm
0.94
1.00
1.05
5.43
6.22
1.00
1.01
1.05

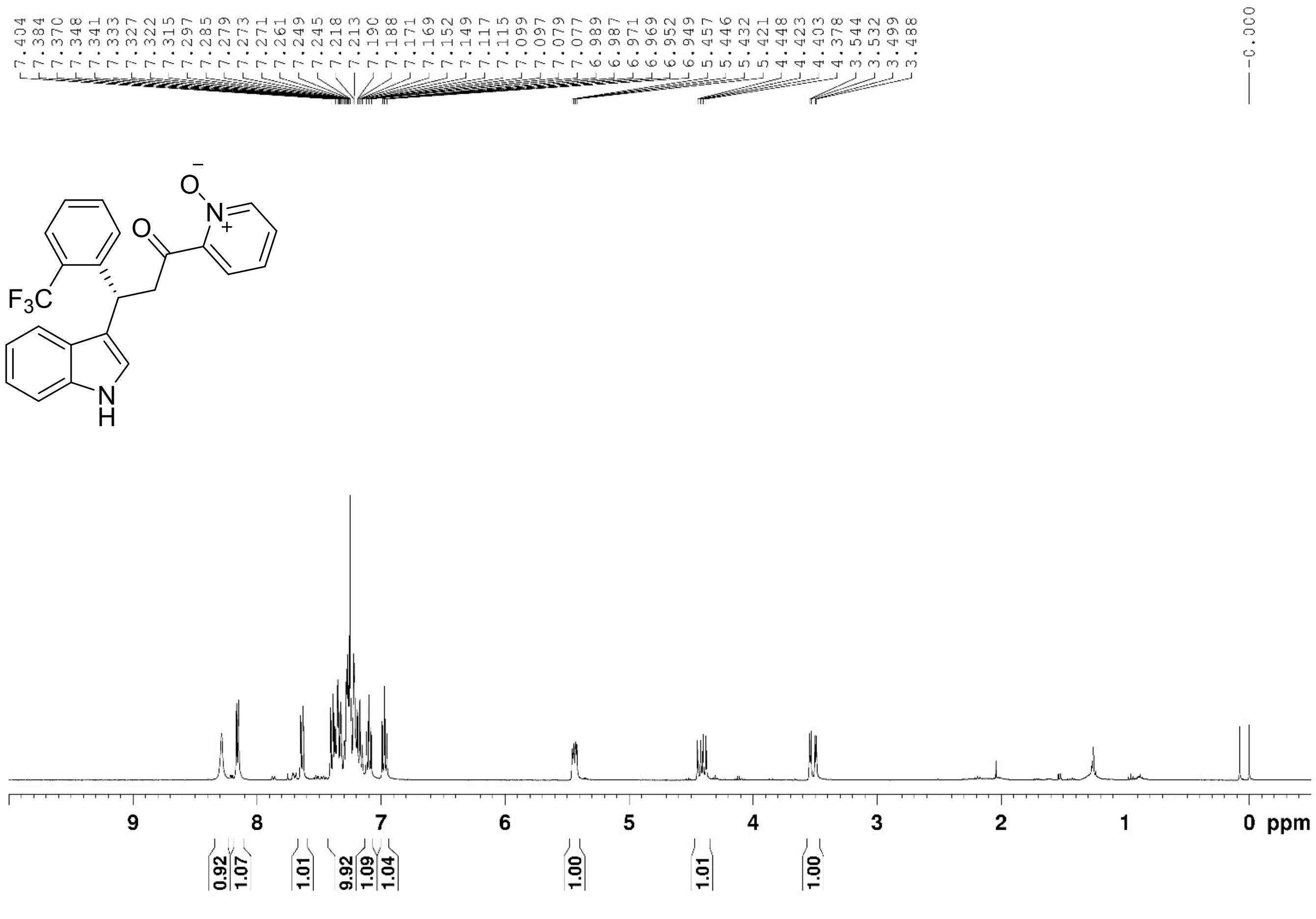

196.313
146.861
141.122
140.219
136.544
133.545
129.546
129.270
127.702
127.638
126.985
126.691
126.607
125.880
122.265
122.139
119.456
117.560
111.152
77.413
77.096
76.777
47.753
34.601
Cl
O
N
H
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

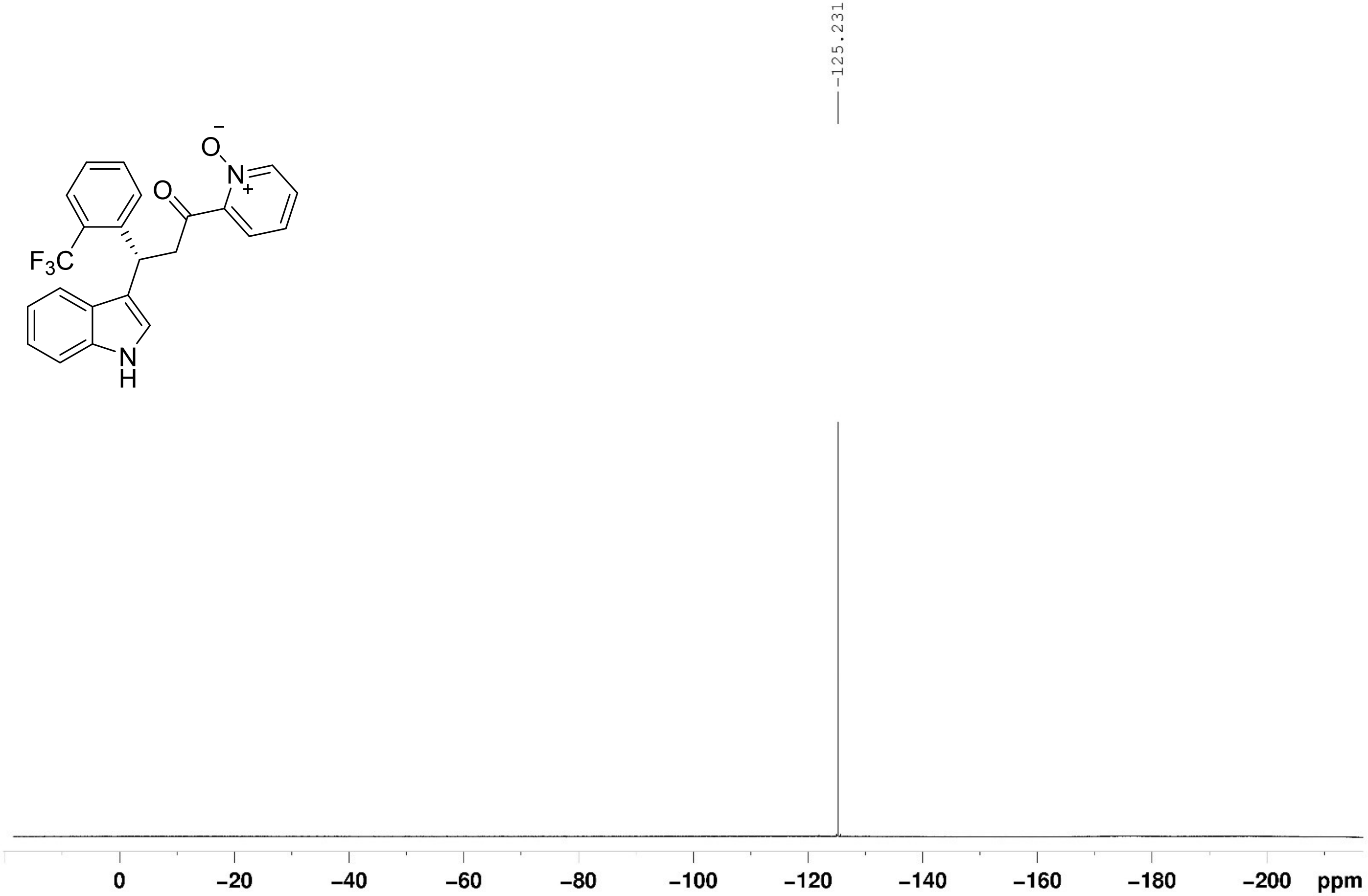

8.400
8.118
8.108
7.514
7.493
7.468
7.254
7.241
7.235
7.215
7.200
7.184
7.148
7.108
7.090
7.072
7.056
7.037
7.003
6.984
6.966
6.948
5.446
5.429
5.411
4.258
4.237
4.216
4.196
3.786
3.770
3.744
3.728
0.000
Br
O
N
+
NH
9
8
7
6
5
4
3
2
1
0 ppm
0.97
0.97
2.03
10.78
1.00
0.98
1.04

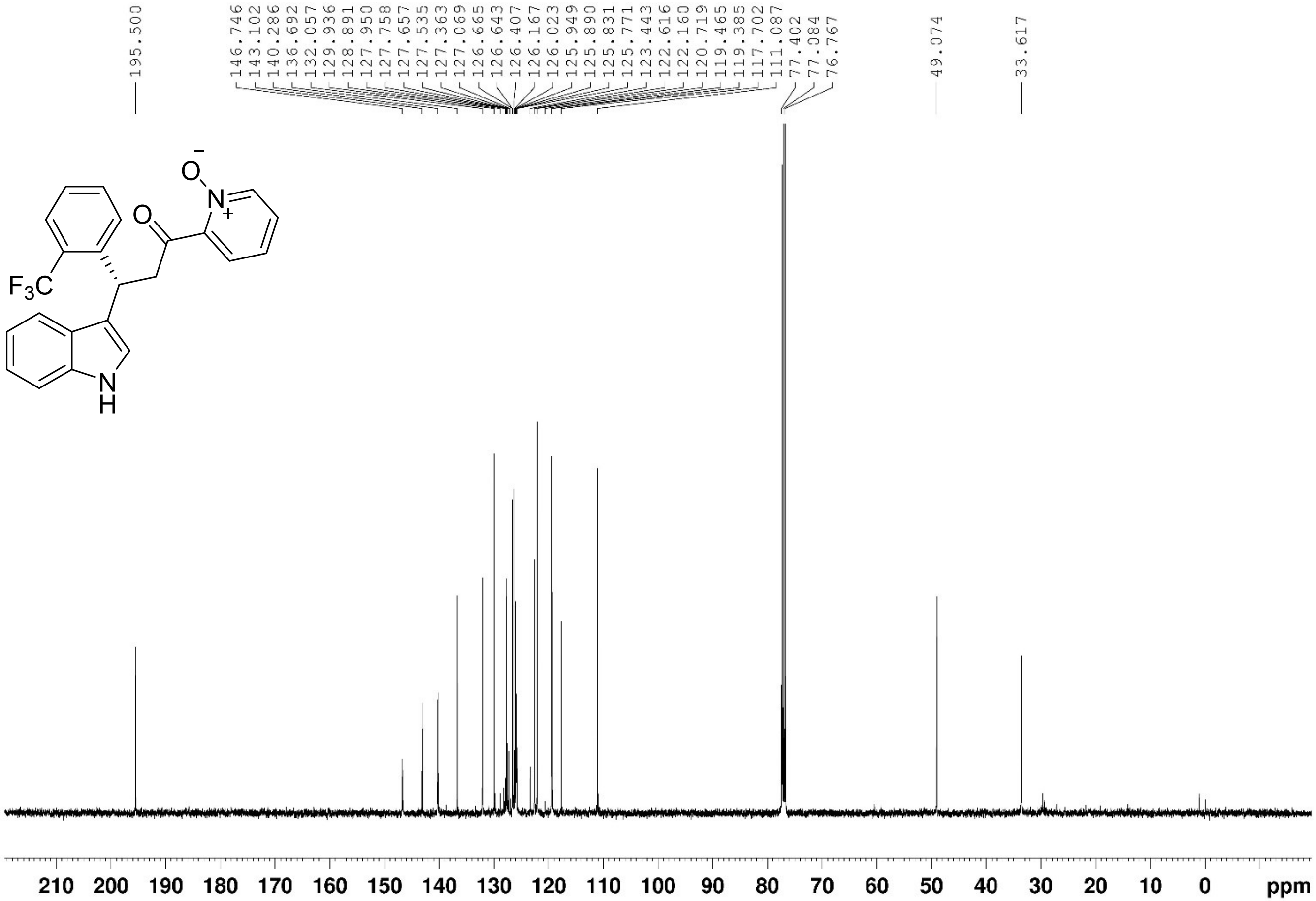

196.187
142.754
136.584
132.876
129.460
127.990
127.650
126.708
126.490
124.395
122.445
122.140
119.569
119.446
117.545
111.226
77.449
77.132
76.814
47.957
37.461
O
N
+
–
O
Br
N
H
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm



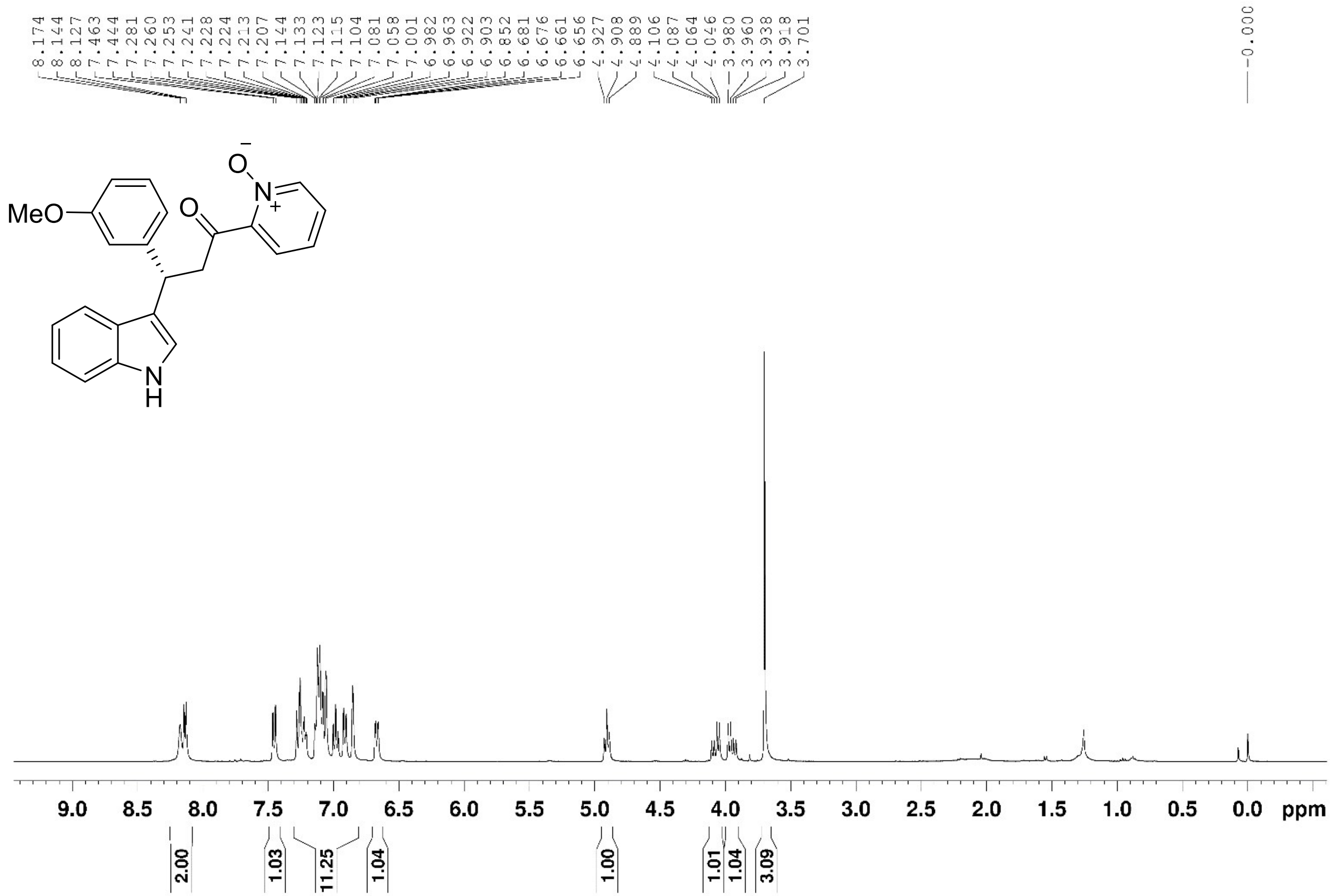

197.523
156.673
147.295
139.979
136.455
131.892
128.609
127.394
127.301
126.979
126.313
125.569
122.055
121.863
120.556
119.580
119.191
118.372
111.026
110.457
77.410
77.092
76.775
55.437
47.681
31.395
O
N+
O
MeO
N
H
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

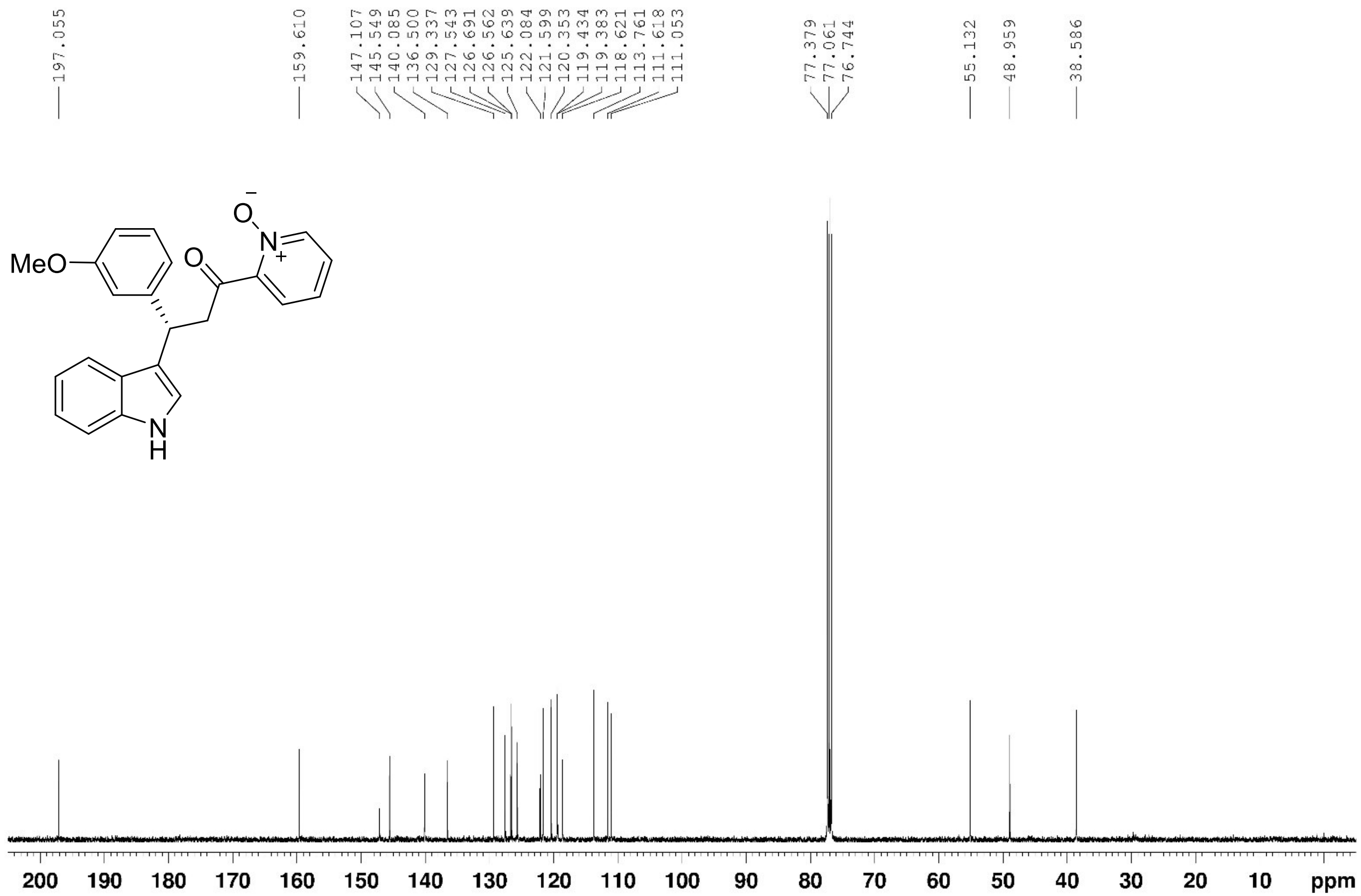



-125.231
F3C
O
N+
O
N
H
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
-200
ppm



195.500
146.746
143.102
140.286
136.692
132.057
129.936
128.891
127.950
127.758
127.657
127.535
127.363
127.069
126.665
126.643
126.407
126.167
126.023
125.949
125.890
125.831
125.771
123.443
122.616
122.160
120.719
119.465
119.385
117.702
111.087
77.402
77.084
76.767
49.074
33.617
O
N
+
F3C
NH
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

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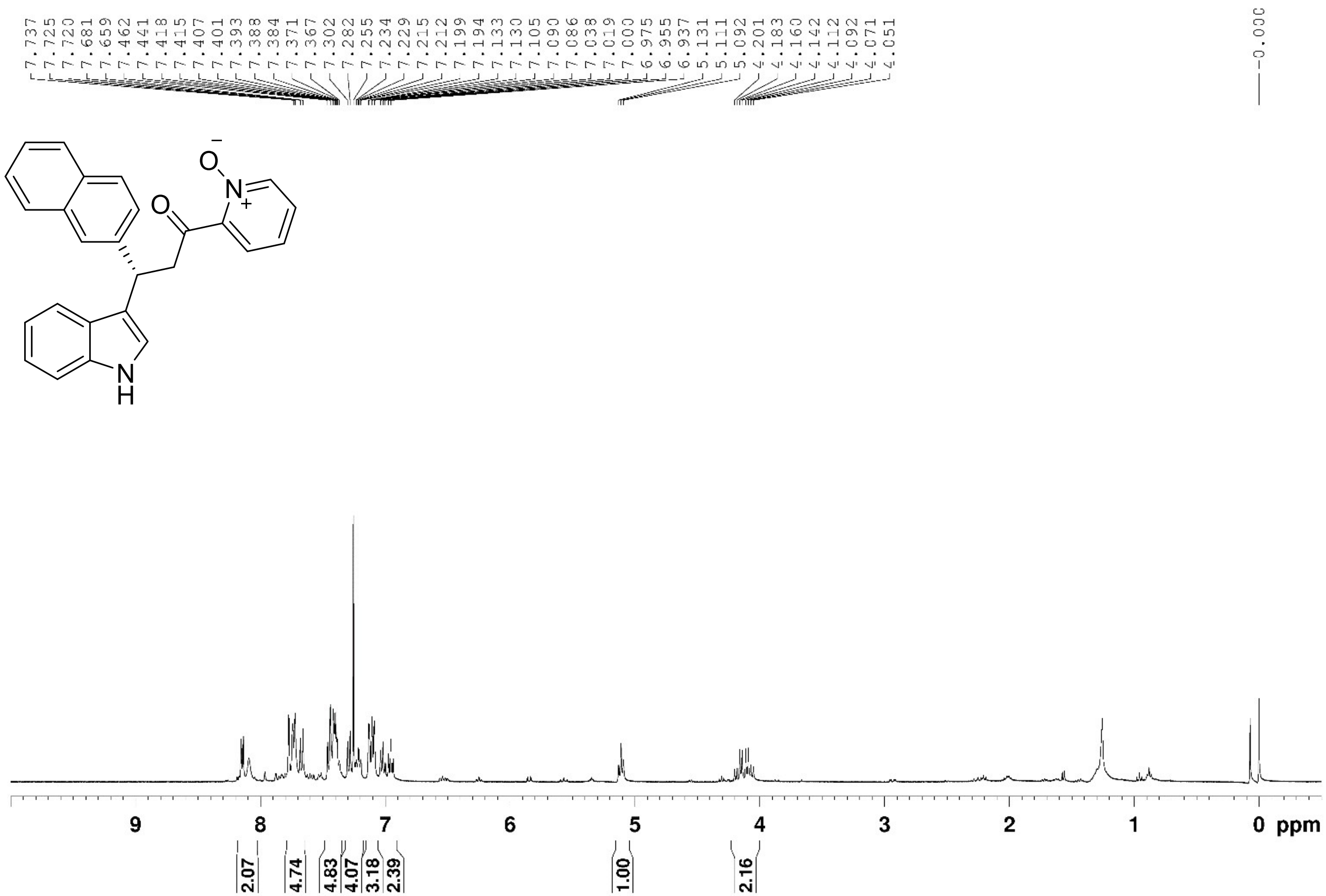
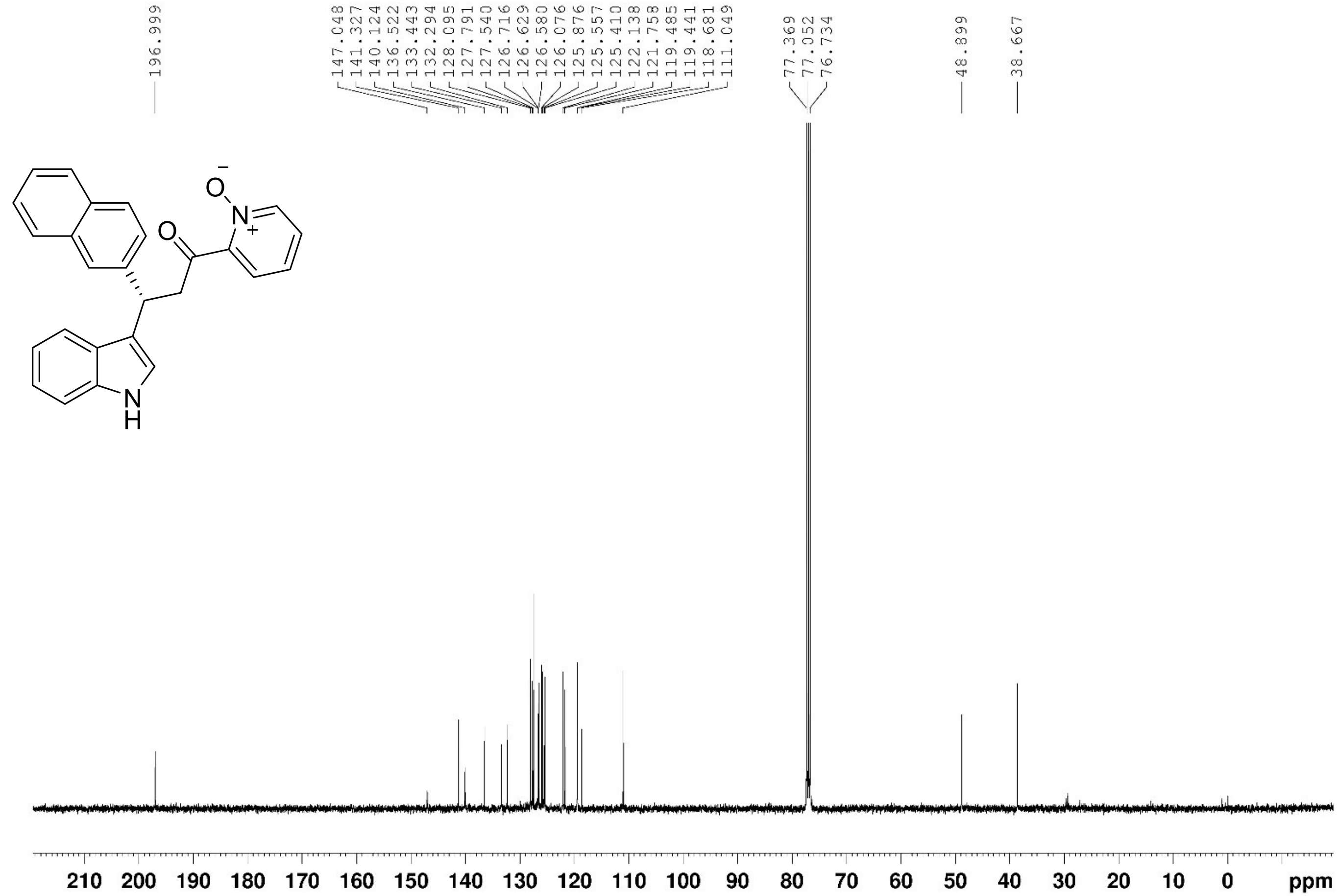
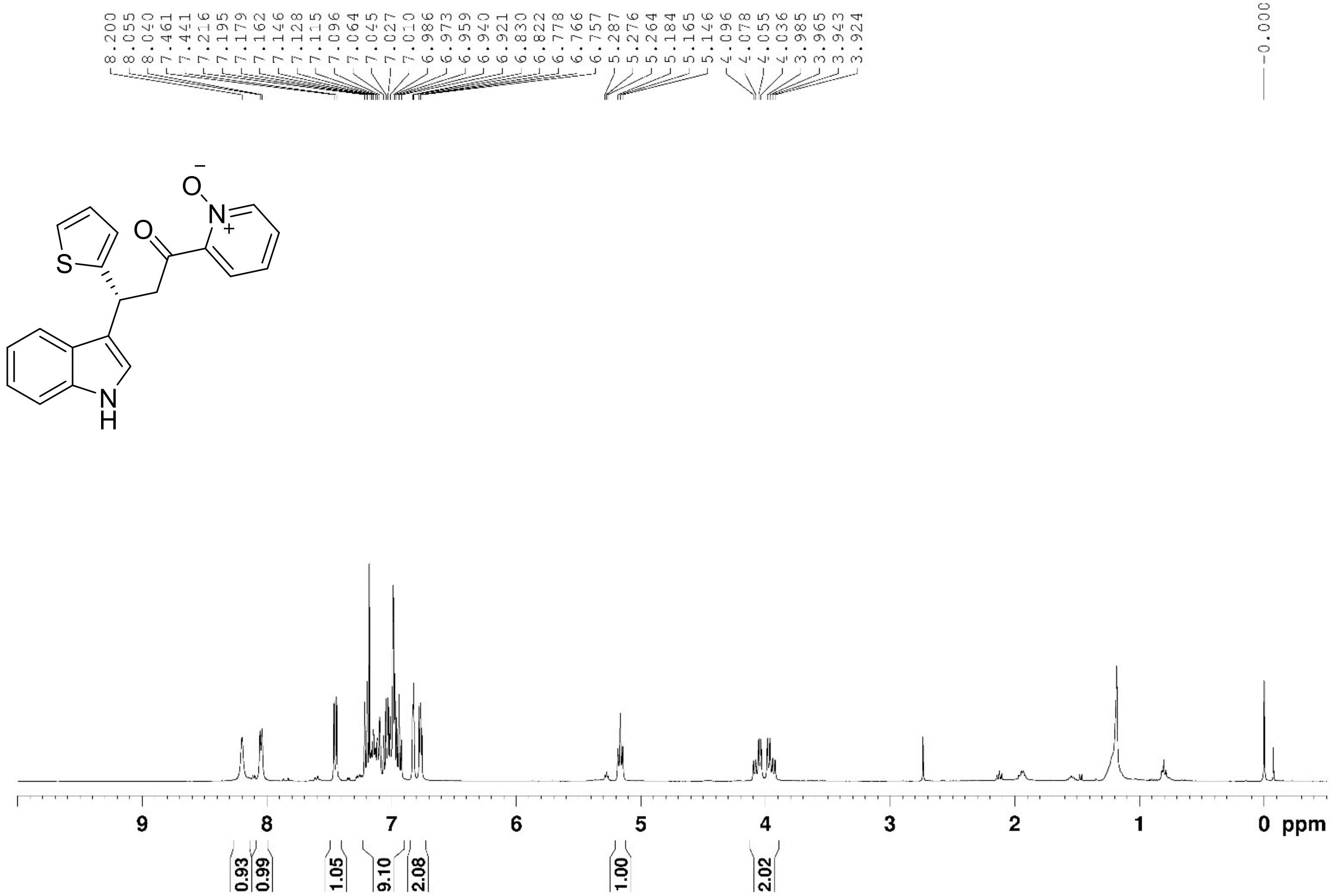
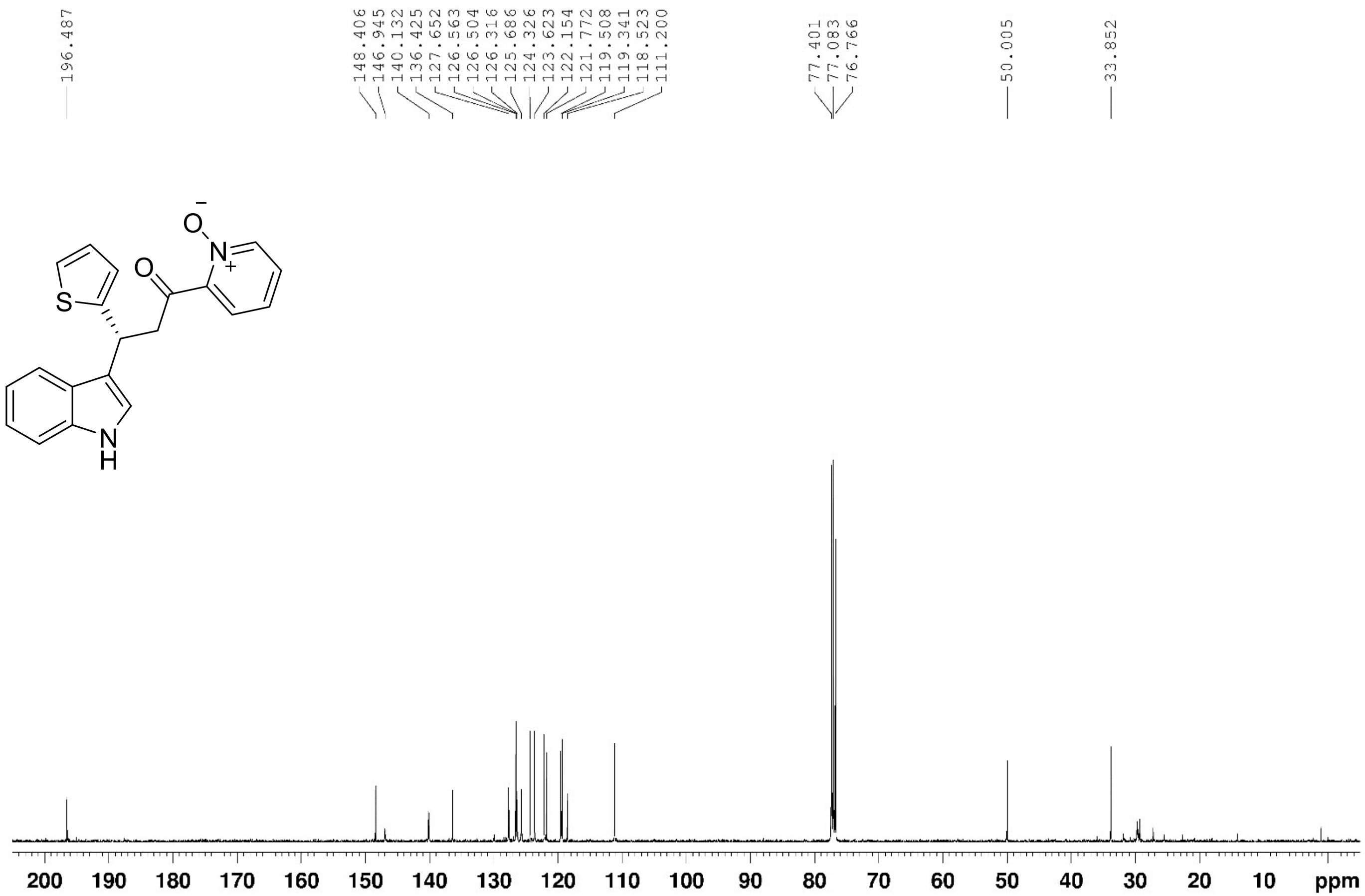
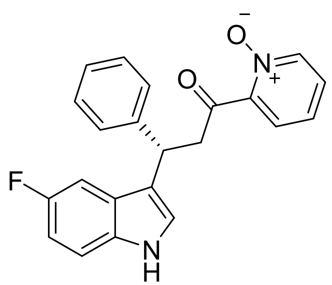
159.610
147.107
145.549
140.085
136.500
129.337
127.543
126.691
126.562
125.639
122.084
121.599
120.353
119.434
119.383
118.621
113.761
111.618
111.053
77.379
77.061
76.744
55.132
48.959
38.586
MeO
O
N
+
O
N
H
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

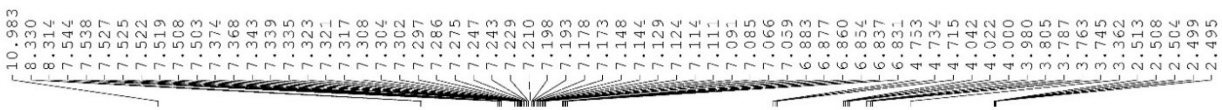

7.737
7.725
7.720
7.681
7.659
7.462
7.441
7.418
7.415
7.407
7.401
7.393
7.388
7.384
7.371
7.367
7.302
7.282
7.255
7.234
7.229
7.215
7.212
7.199
7.194
7.133
7.130
7.105
7.090
7.086
7.038
7.019
7.000
6.975
6.955
6.937
5.131
5.111
5.092
4.201
4.183
4.160
4.142
4.112
4.092
4.071
4.051
0.000
O
N+
NH
9
8
7
6
5
4
3
2
1
0 ppm
2.07
4.74
4.83
4.07
3.18
2.39
1.00
2.16


196.999
147.048
141.327
140.124
136.522
133.443
132.294
128.095
127.791
127.540
126.716
126.629
126.580
126.076
125.876
125.557
125.410
122.138
121.758
119.485
119.441
118.681
111.049
77.369
77.052
76.734
48.899
38.667
O
N
+
O
N
H
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm


8.200
8.055
8.040
7.461
7.441
7.216
7.195
7.179
7.162
7.146
7.128
7.115
7.096
7.064
7.045
7.027
7.010
6.986
6.973
6.959
6.940
6.921
6.830
6.822
6.778
6.766
6.757
5.287
5.276
5.264
5.184
5.165
5.146
4.096
4.078
4.055
4.036
3.985
3.965
3.943
3.924
0.000
O
N+
S
O
H
N
9
8
7
6
5
4
3
2
1
0 ppm
0.93
0.99
1.05
9.10
2.08
1.00
2.02


196.487
148.406
146.945
140.132
136.425
127.652
126.563
126.504
126.316
125.686
124.326
123.623
122.154
121.772
119.508
119.341
118.523
111.200
77.401
77.083
76.766
50.005
33.852
O
N
S
H
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm


O
N
+
F
NH
O


10.983
8.330
8.314
7.544
7.538
7.527
7.525
7.522
7.519
7.508
7.503
7.374
7.368
7.343
7.339
7.335
7.323
7.321
7.317
7.308
7.304
7.302
7.297
7.286
7.275
7.247
7.243
7.229
7.210
7.198
7.193
7.178
7.173
7.148
7.144
7.129
7.124
7.114
7.111
7.091
7.085
7.066
7.059
6.883
6.877
6.860
6.854
6.837
6.831
4.753
4.734
4.715
4.042
4.022
4.000
3.980
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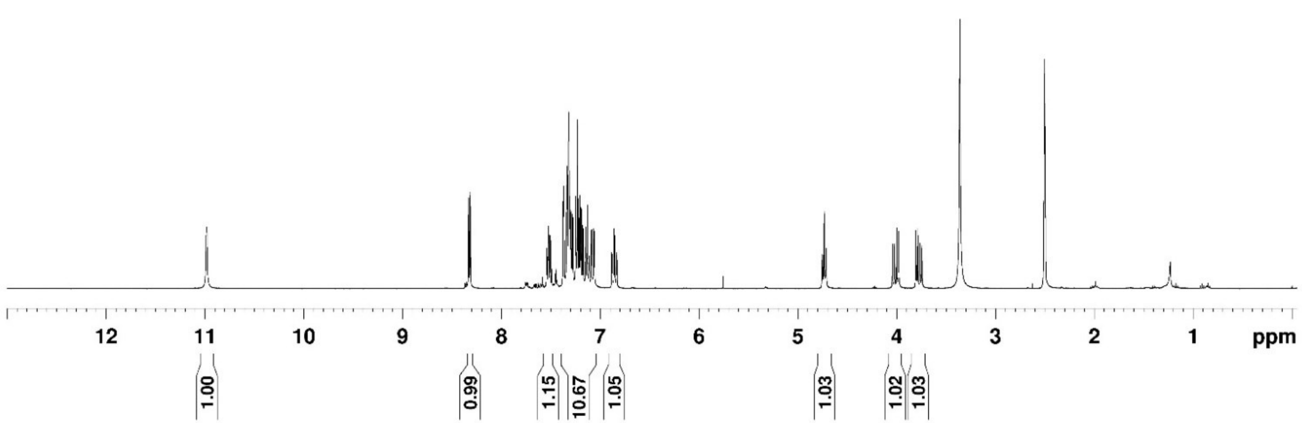
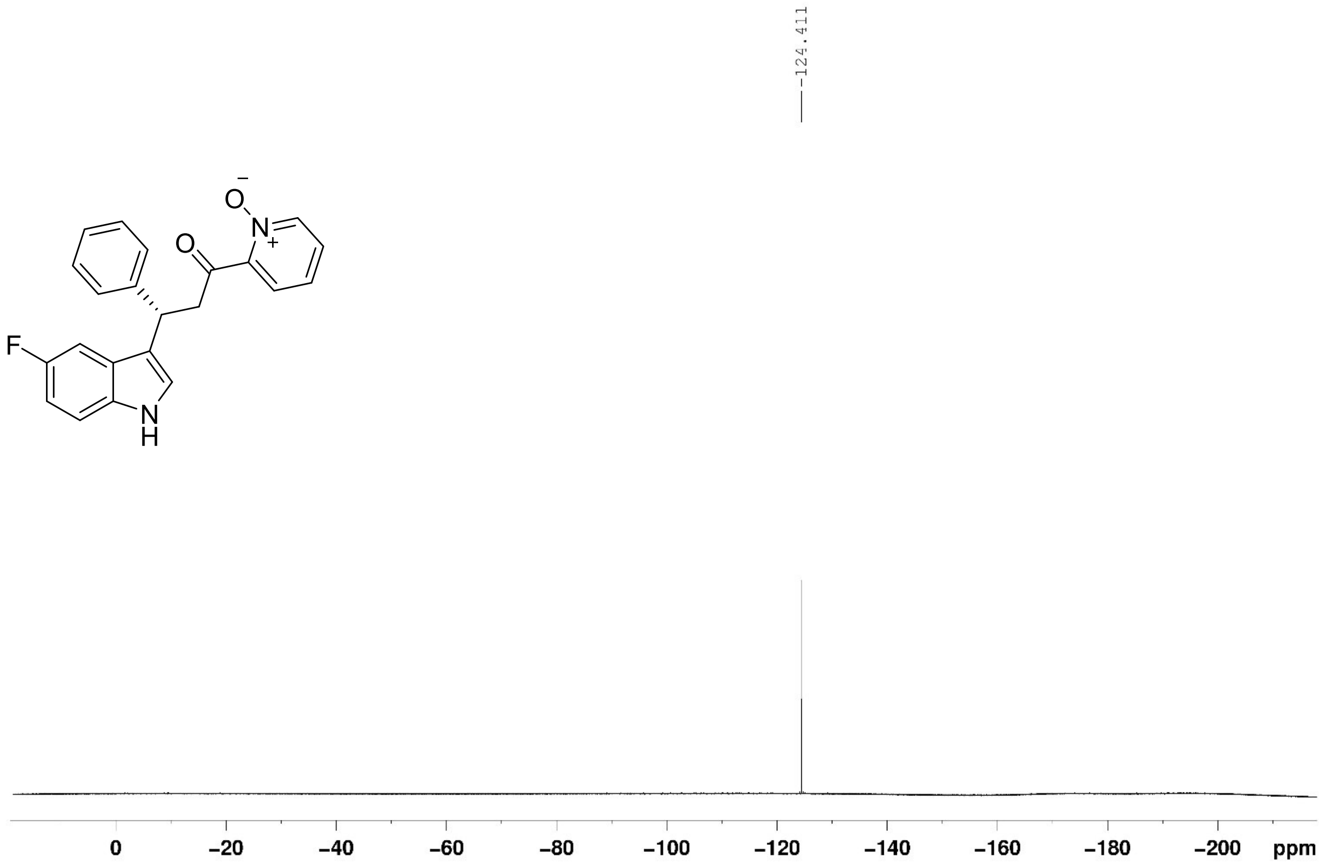
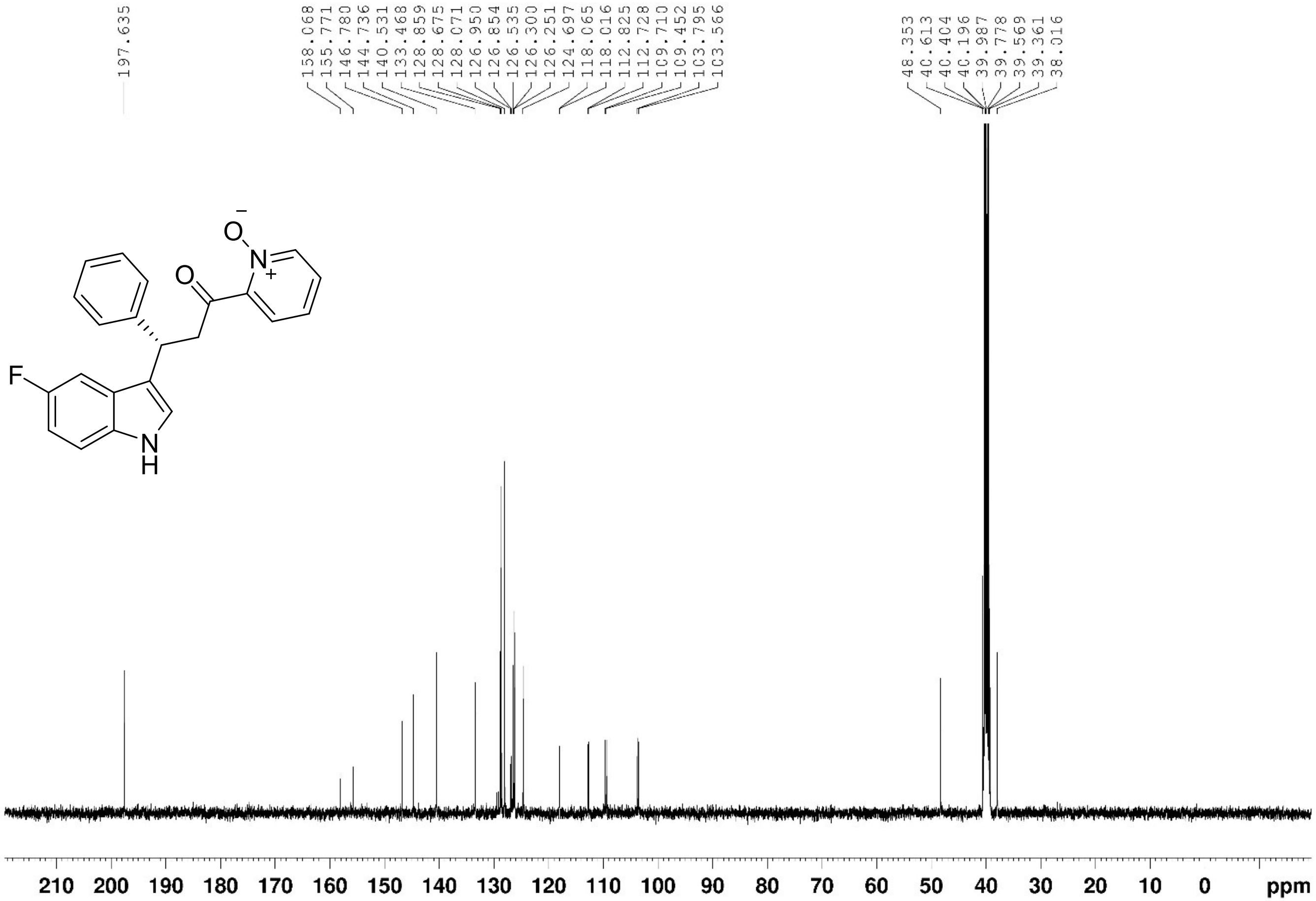
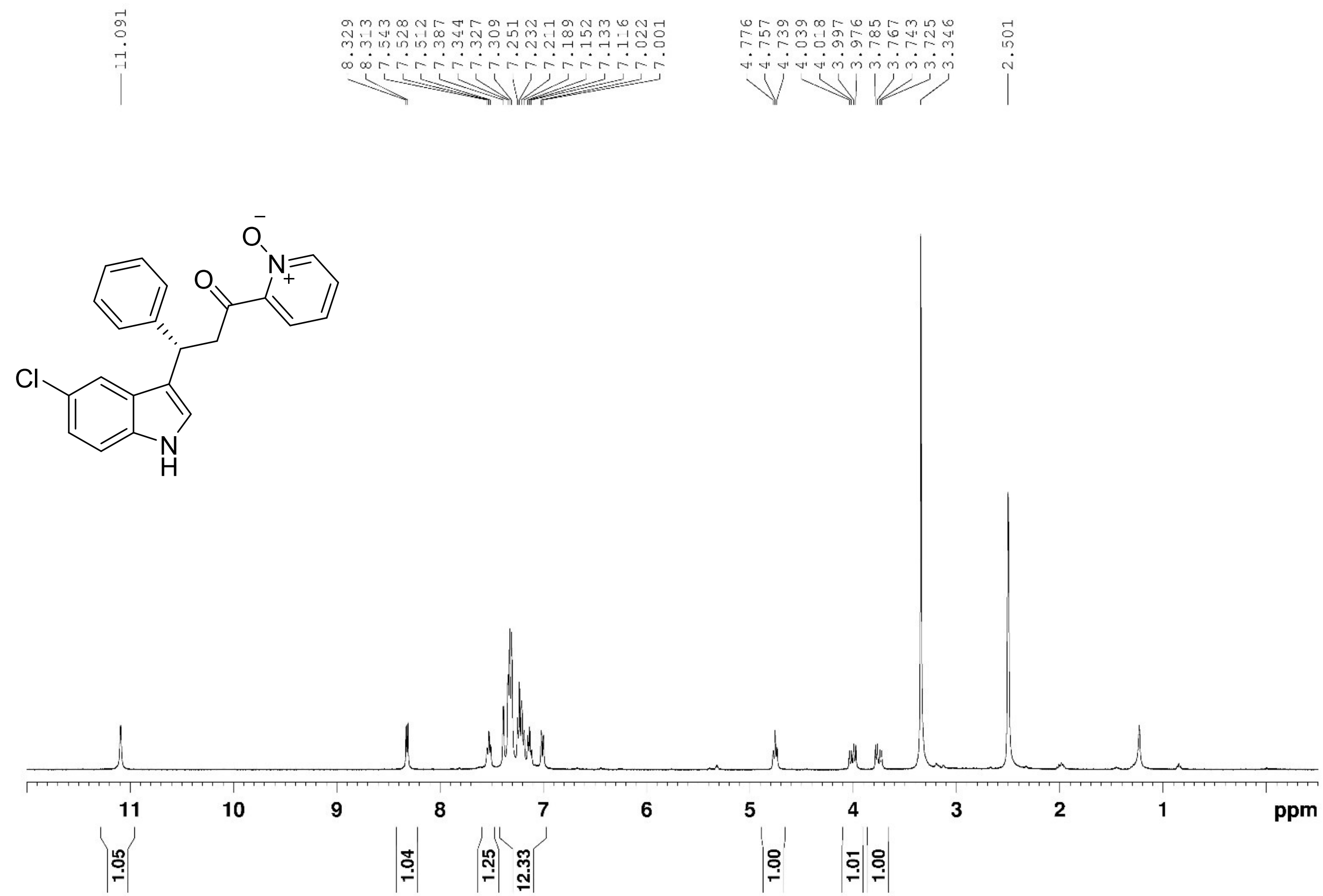
3.787
3.763
3.745
3.362
2.513
2.508
2.504
2.499
2.495

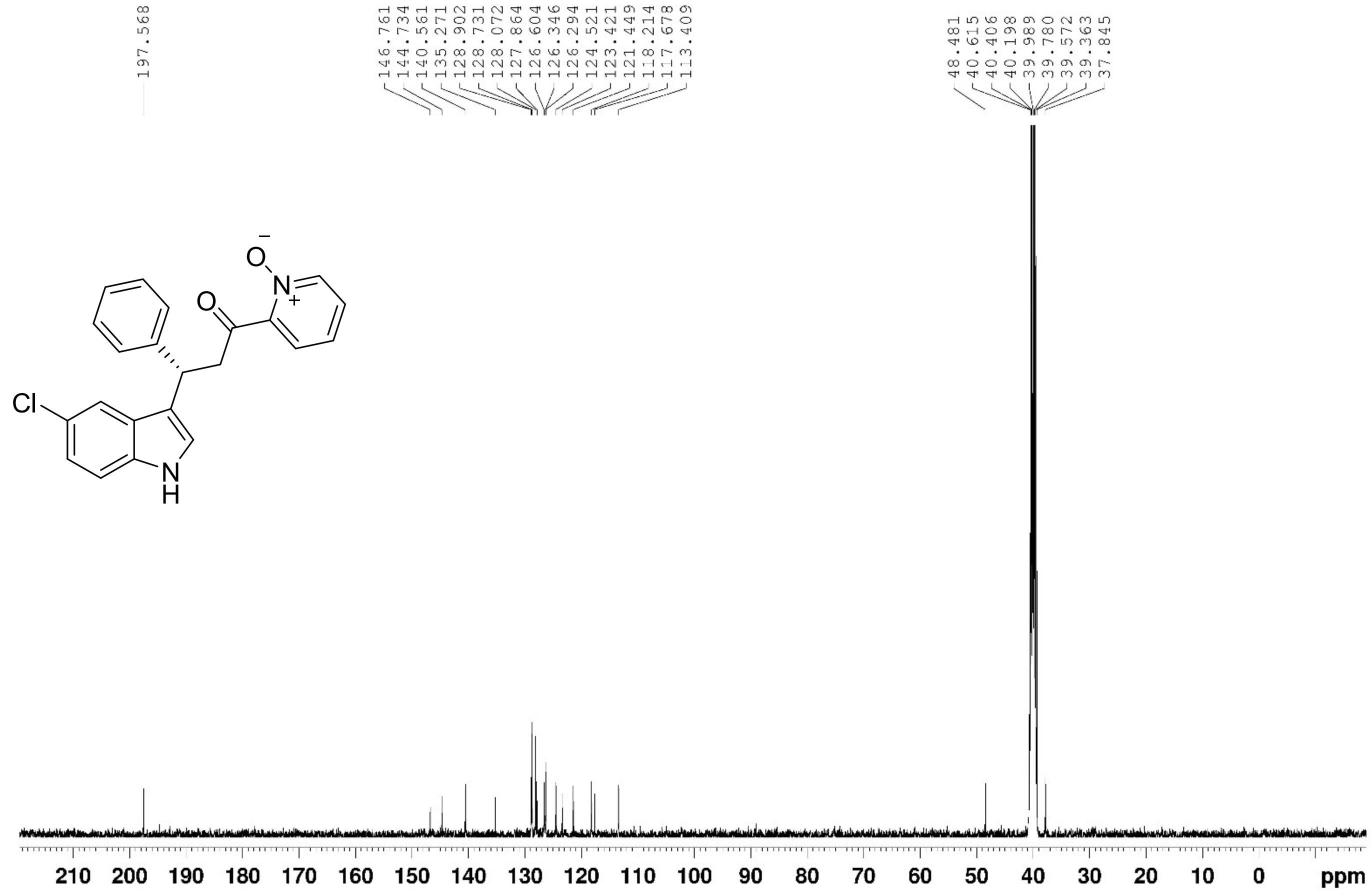

12
11
10
9
8
7
6
5
4
3
2
1
ppm
1.00
0.99
1.15
10.67
1.05
1.03
1.02
1.03


-124.411
0
−20
−40
−60
−80
−100
−120
−140
−160
−180
−200
ppm


197.635
158.068
155.771
146.780
144.736
140.531
133.468
128.859
128.675
128.071
126.950
126.854
126.535
126.300
126.251
124.697
118.065
118.016
112.825
112.728
109.710
109.452
103.795
103.566
48.353
40.613
40.404
40.196
39.987
39.778
39.569
39.361
38.016
F
N
H
O
O
N
+
−
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm



11.091
8.329
7.543
7.528
7.387
7.344
7.327
7.309
7.251
7.232
7.189
7.152
7.133
7.022
7.001
4.776
4.757
4.739
4.039
3.997
3.976
3.785
3.767
3.743
3.725
3.346
2.501
Cl
O
N
H
ppm
1.05
1.04
1.25
12.33
1.00
1.01
1.00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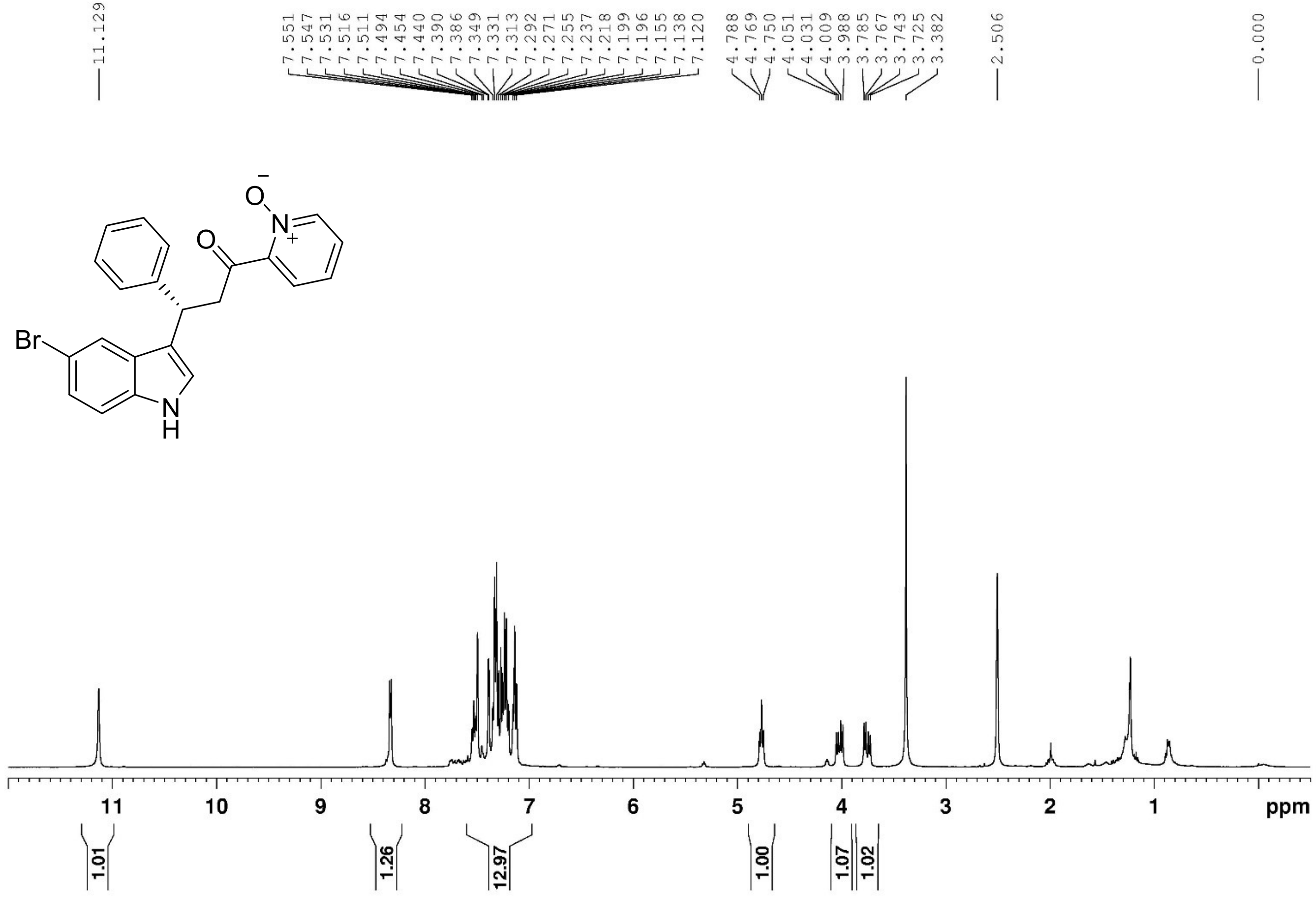
144.734
140.561
135.271
128.902
128.731
128.072
127.864
126.604
126.346
126.294
124.521
123.421
121.449
118.214
117.678
113.409
48.481
40.615
40.406
40.198
39.989
39.780
39.572
39.363
37.845
Cl
O
N
+
H
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm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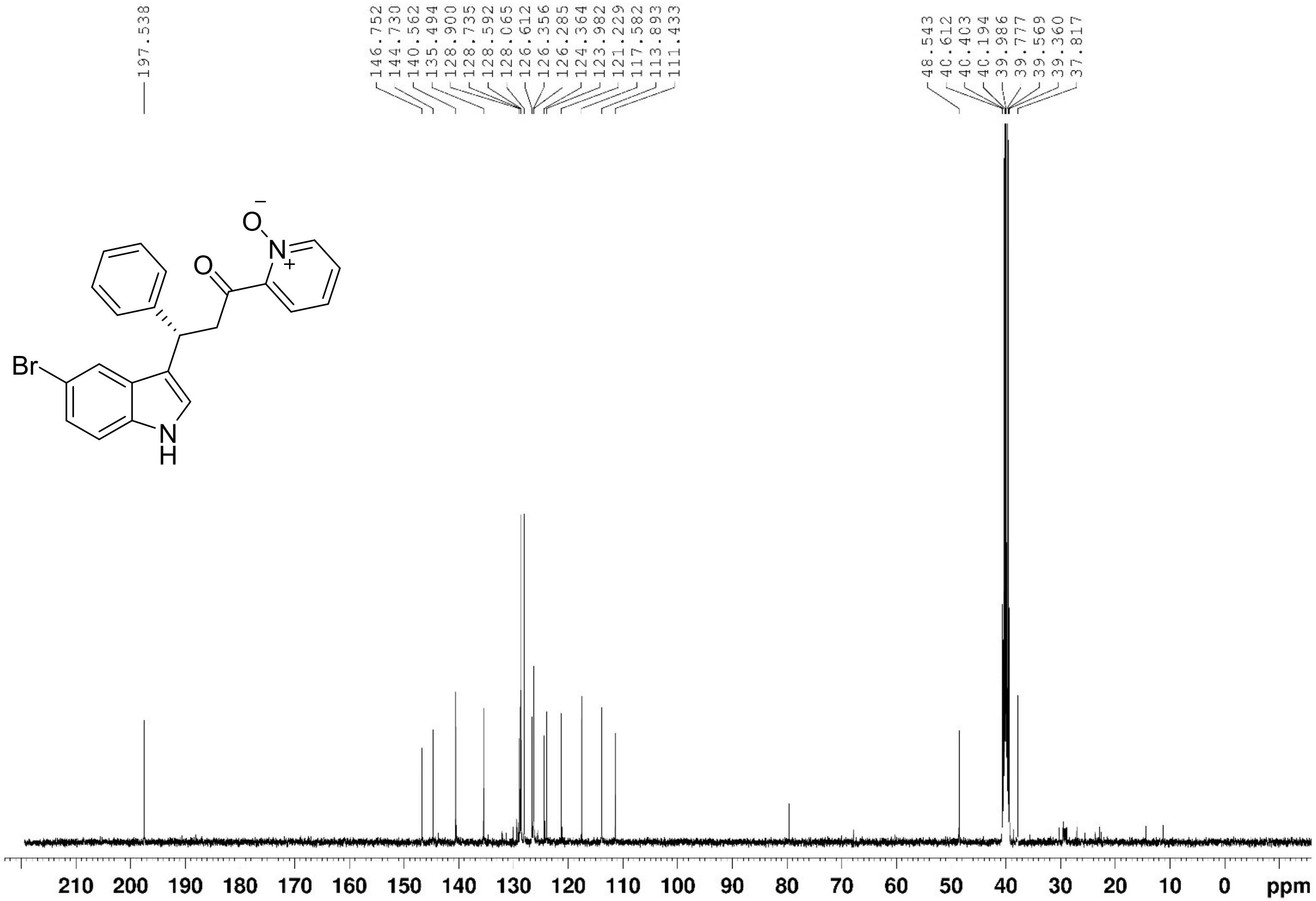
7.547
7.531
7.516
7.511
7.494
7.454
7.440
7.390
7.386
7.349
7.331
7.313
7.292
7.271
7.255
7.237
7.218
7.199
7.196
7.155
7.138
7.120
4.788
4.769
4.750
4.051
4.031
4.009
3.988
3.785
3.767
3.743
3.725
3.382
2.506
0.000
Br
O
N
H
11
10
9
8
7
6
5
4
3
2
1
ppm
1.01
1.26
12.97
1.00
1.07
1.02



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128.735
128.592
128.065
126.612
126.356
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124.364
123.982
121.229
117.582
113.893
111.433
48.543
40.612
40.403
40.194
39.986
39.777
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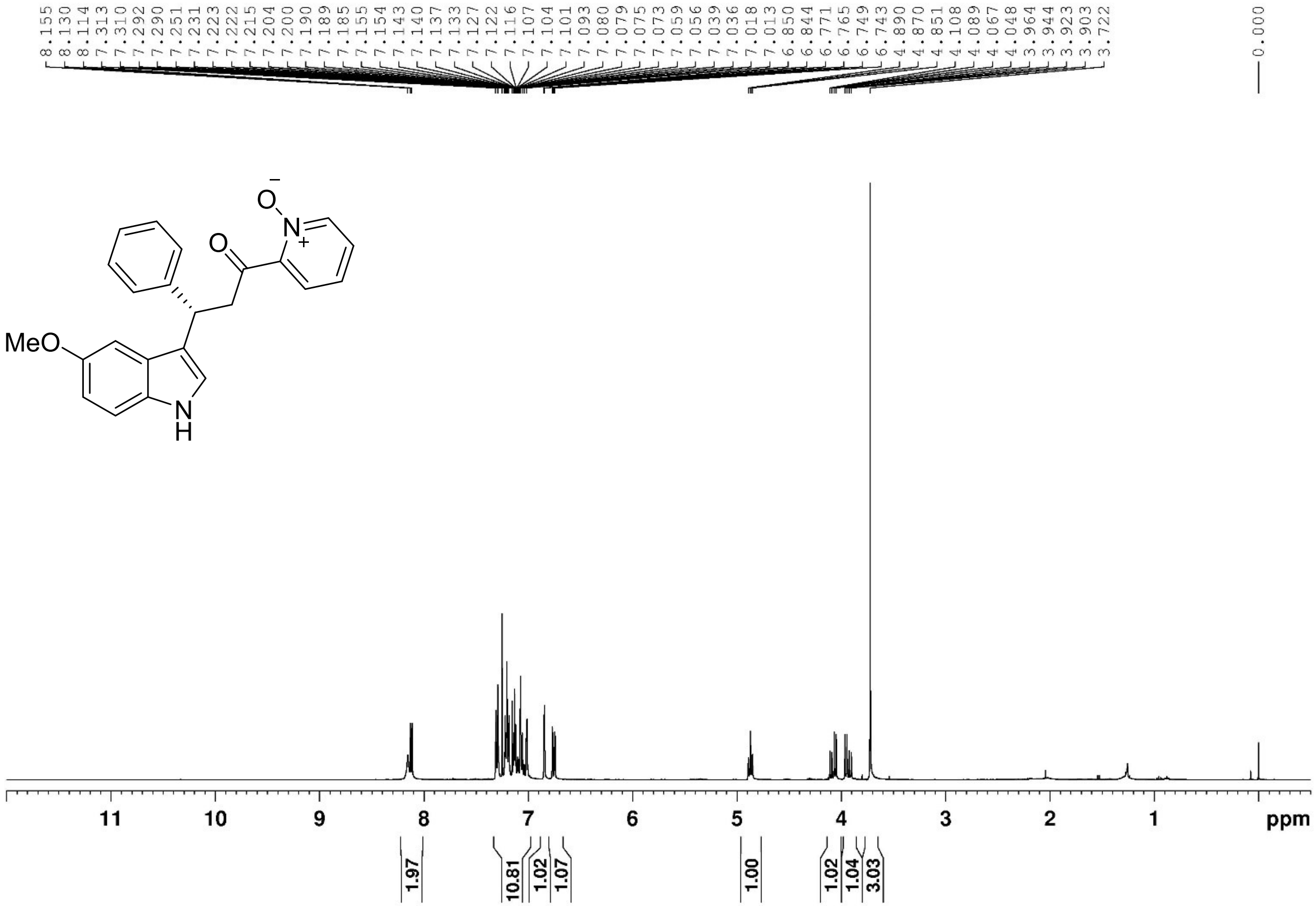
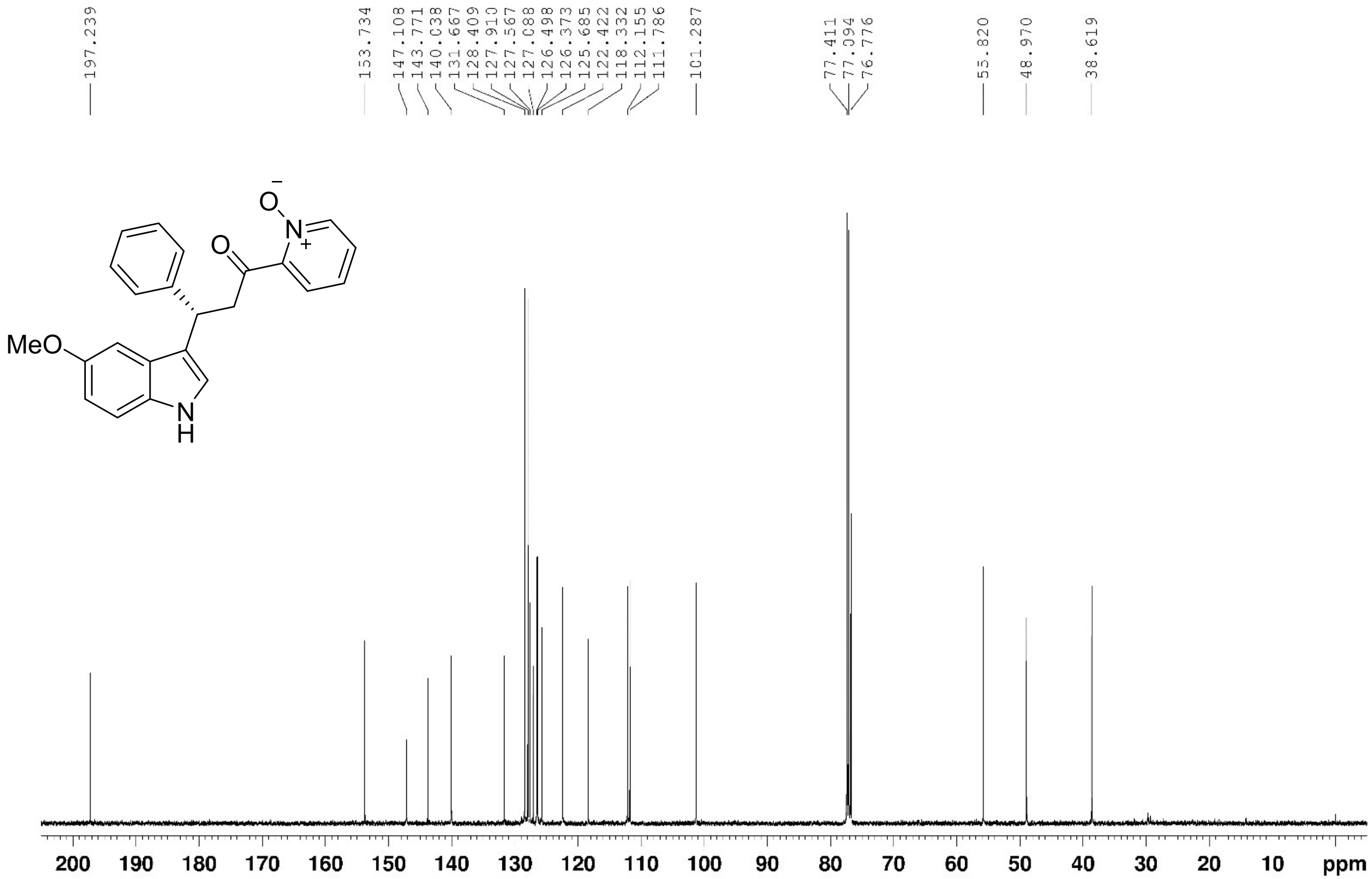
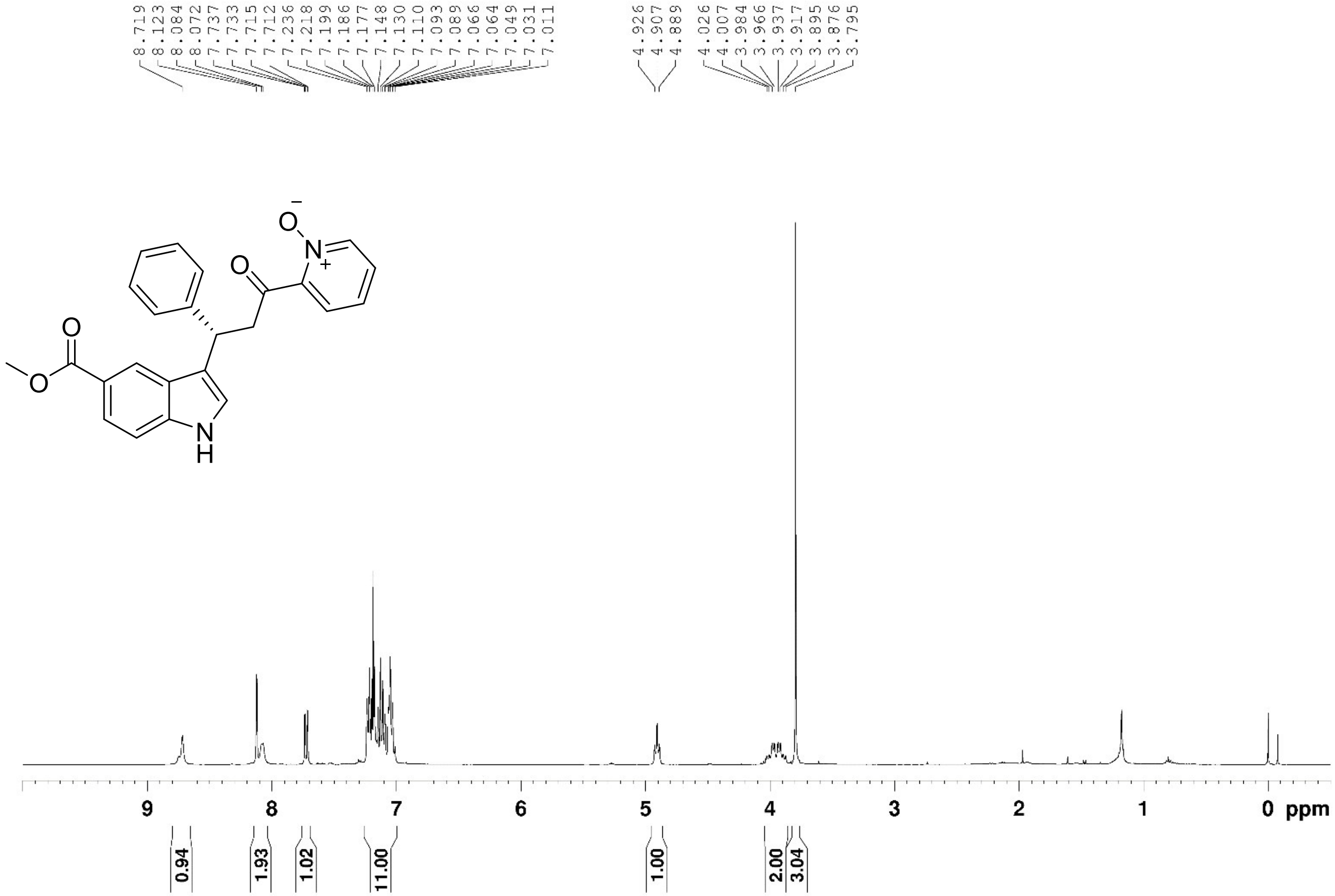
39.360
37.817
Br
O
N+
H
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm


8.155
8.130
8.114
7.313
7.310
7.292
7.290
7.251
7.231
7.223
7.222
7.215
7.204
7.200
7.190
7.189
7.185
7.155
7.154
7.143
7.140
7.137
7.133
7.127
7.122
7.116
7.107
7.104
7.101
7.093
7.080
7.079
7.075
7.073
7.059
7.056
7.039
7.036
7.018
7.013
6.850
6.844
6.771
6.765
6.749
6.743
4.890
4.870
4.851
4.108
4.089
4.067
4.048
3.964
3.944
3.923
3.903
3.722
0.000
MeO
N
H
O
N
+
O
−
11
10
9
8
7
6
5
4
3
2
1
ppm
1.97
10.81
1.02
1.07
1.00
1.02
1.04
3.03



O
N
+
MeO
N
H
197.239
153.734
147.108
143.771
140.038
131.667
128.409
127.910
127.567
127.088
126.498
126.373
125.685
122.422
118.332
112.155
111.786
101.287
77.411
77.094
76.776
55.820
48.970
38.619
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm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7.737
7.733
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7.712
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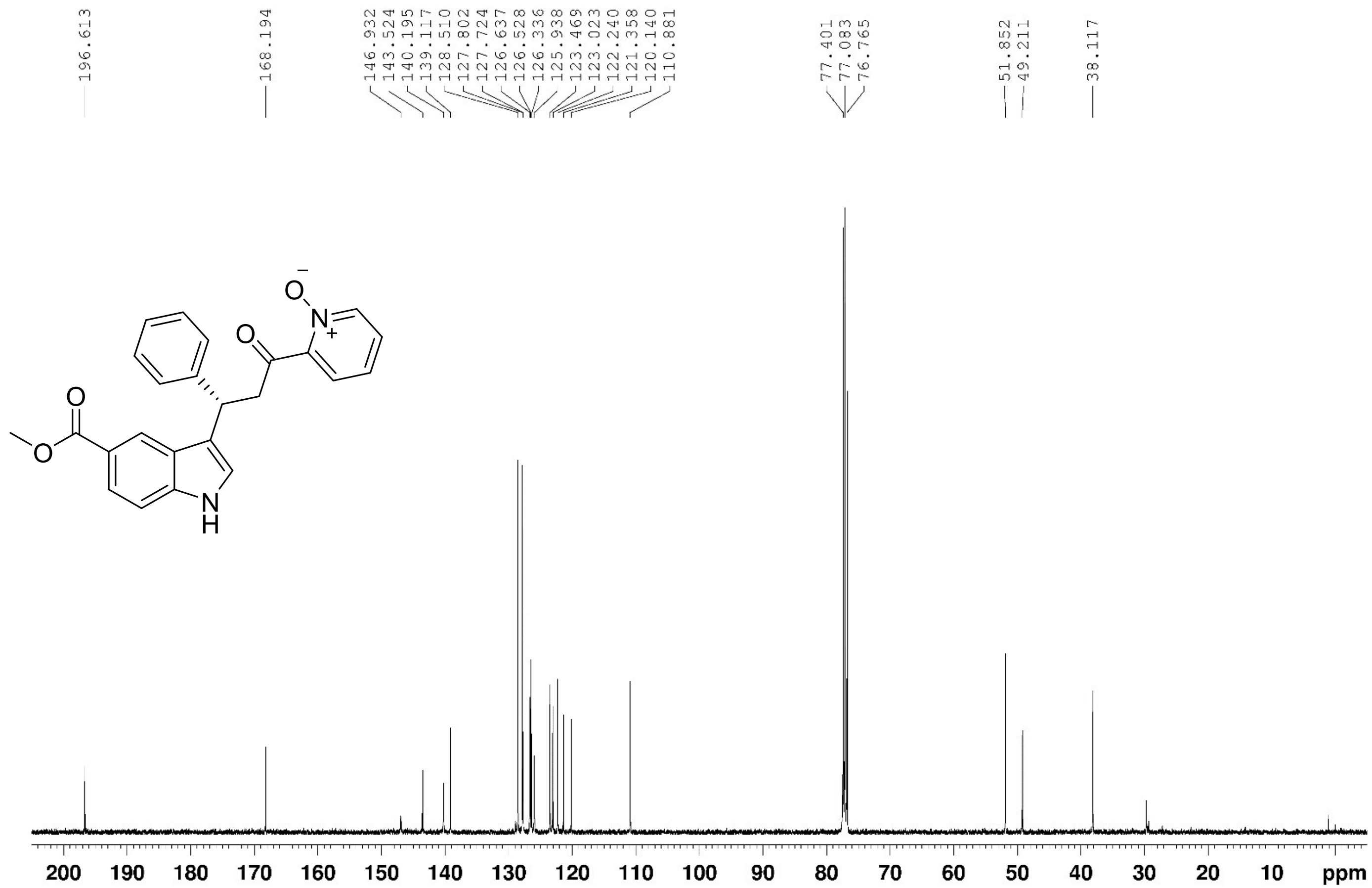
7.218
7.199
7.186
7.177
7.148
7.130
7.110
7.093
7.089
7.066
7.064
7.049
7.031
7.011
4.926
4.907
4.889
4.026
4.007
3.984
3.966
3.937
3.917
3.895
3.876
3.795
O
N+
O
O
O
NH
9
8
7
6
5
4
3
2
1
0 ppm
0.94
1.93
1.02
11.00
1.00
2.00
3.04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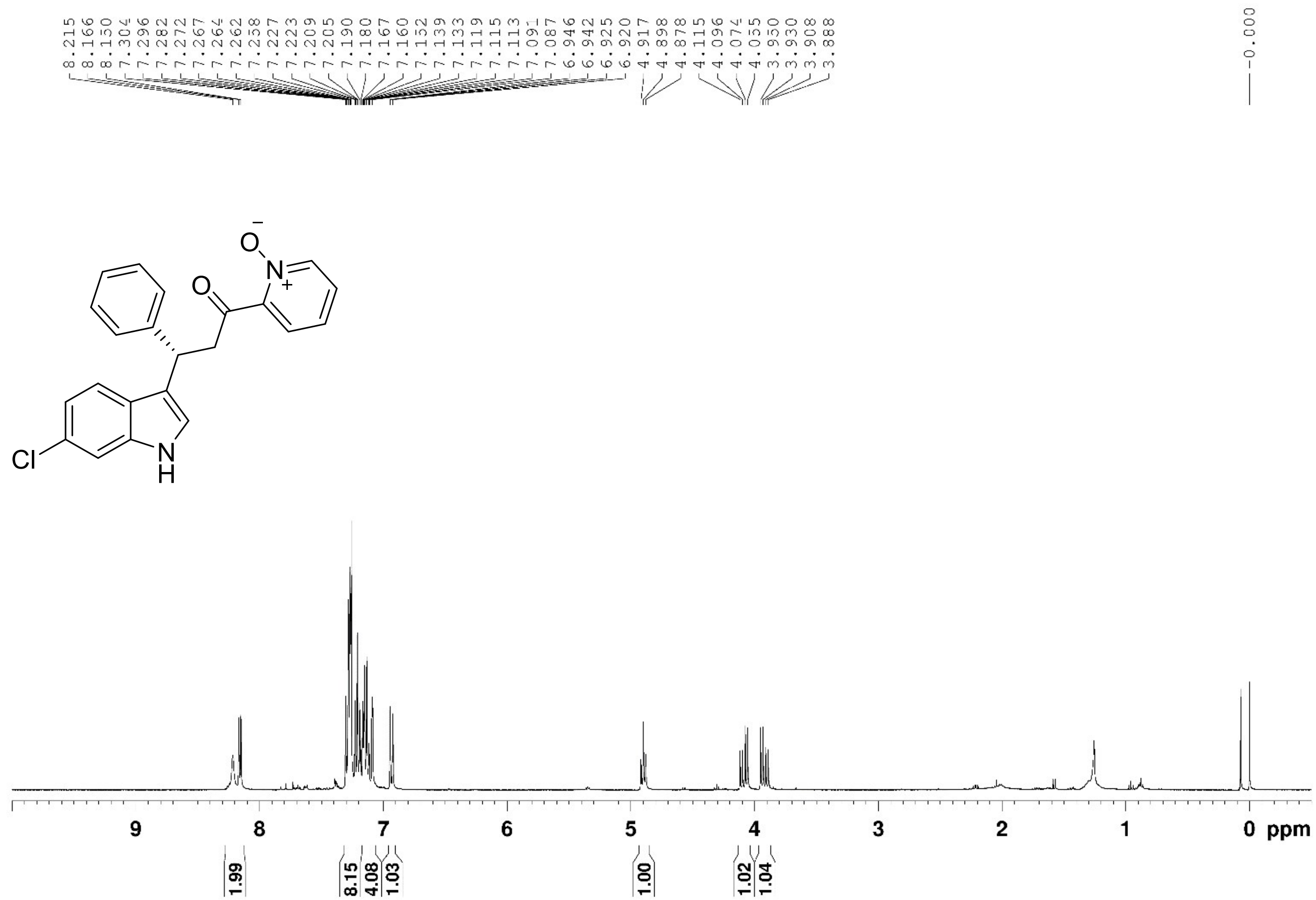
146.932
143.524
140.195
139.117
128.510
127.802
127.724
126.637
126.528
126.336
125.938
123.469
123.023
122.240
121.358
120.140
110.881
77.401
77.083
76.765
51.852
49.211
38.117
O
N
+
O
O
O
NH
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm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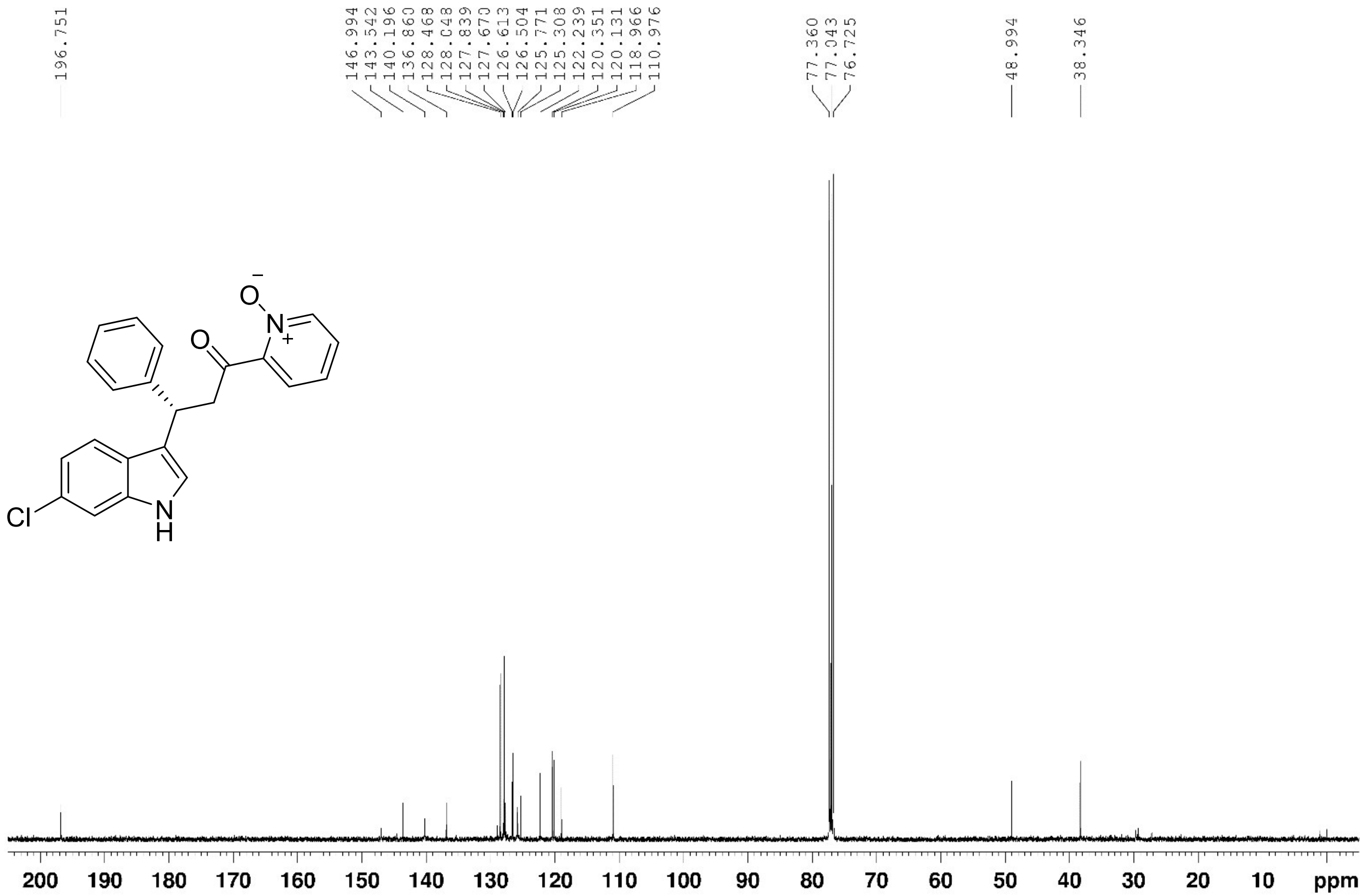
7.296
7.282
7.272
7.267
7.264
7.262
7.258
7.227
7.223
7.209
7.205
7.190
7.180
7.167
7.160
7.152
7.139
7.133
7.119
7.115
7.113
7.091
7.087
6.946
6.942
6.925
6.920
4.917
4.898
4.878
4.115
4.096
4.074
4.055
3.950
3.930
3.908
3.888
0.000
O
N
+
O
Cl
N
H
9
8
7
6
5
4
3
2
1
0 ppm
1.99
8.15
4.08
1.03
1.00
1.02
1.04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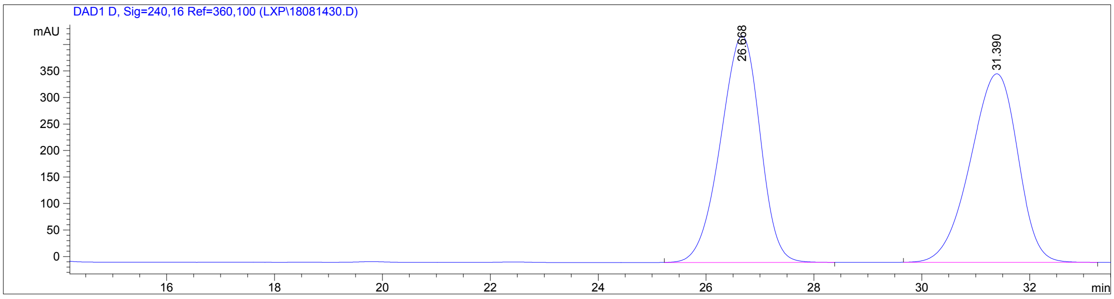
127.839
127.670
126.613
126.504
125.771
125.308
122.239
120.351
120.131
118.966
110.976
77.360
77.043
76.725
48.994
38.346
O
N
+
O
Cl
N
H
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 ppm

7. Copies of HPLC Traces

4a

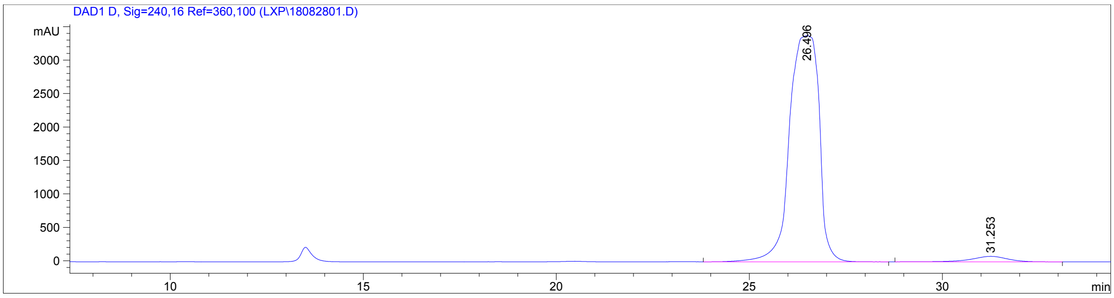


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	26.668	BB	0.7982	2.17536e4	427.09064	50.0074
2	31.390	BB	0.9614	2.17472e4	355.64304	49.9926

Totals : 4.35008e4 782.73367

Results obtained with enhanced integrator!



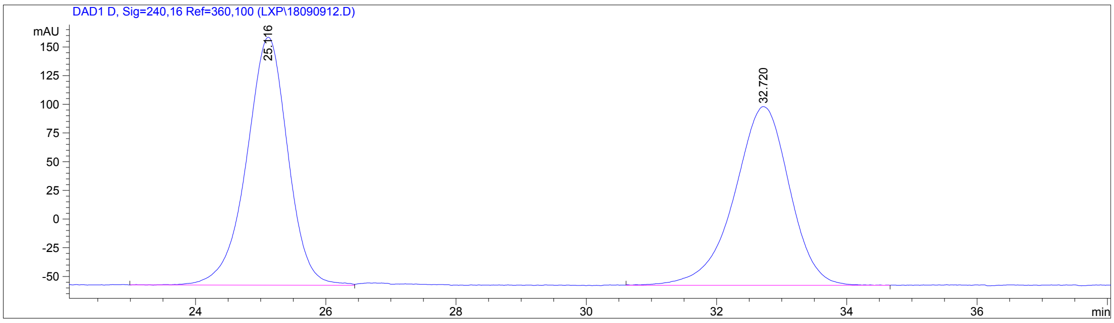
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	26.496	VB	0.8746	1.80353e5	3379.63232	97.0775
2	31.253	BP	0.9935	5429.47998	81.89258	2.9225

Totals : 1.85782e5 3461.52490

Results obtained with enhanced integrator!

4b

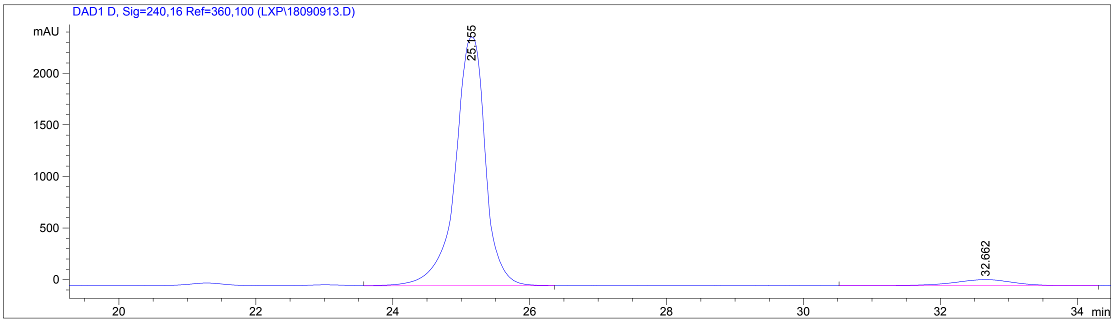


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	25.116	VV	0.6698	9516.56641	216.06914	50.9274
2	32.720	BP	0.8954	9169.95801	155.63040	49.0726

Totals : 1.86865e4 371.69954

Results obtained with enhanced integrator!



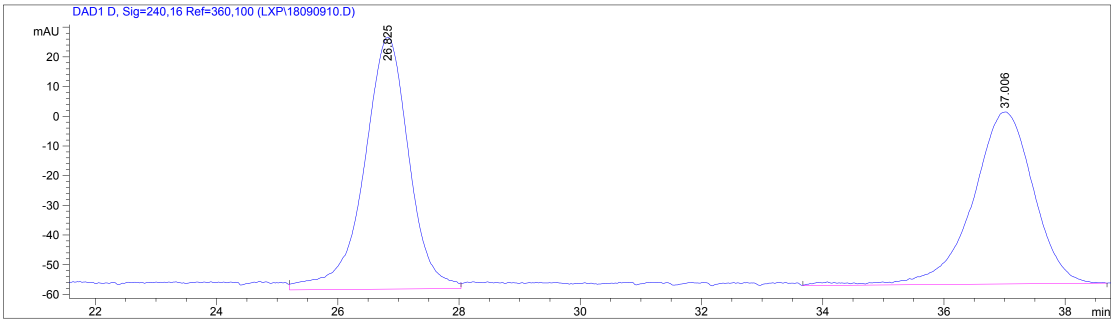
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	25.155	VV	0.4595	7.34546e4	2410.69580	95.4372
2	32.662	VB	0.8615	3511.81470	58.40101	4.5628

Totals : 7.69664e4 2469.09681

Results obtained with enhanced integrator!

4c

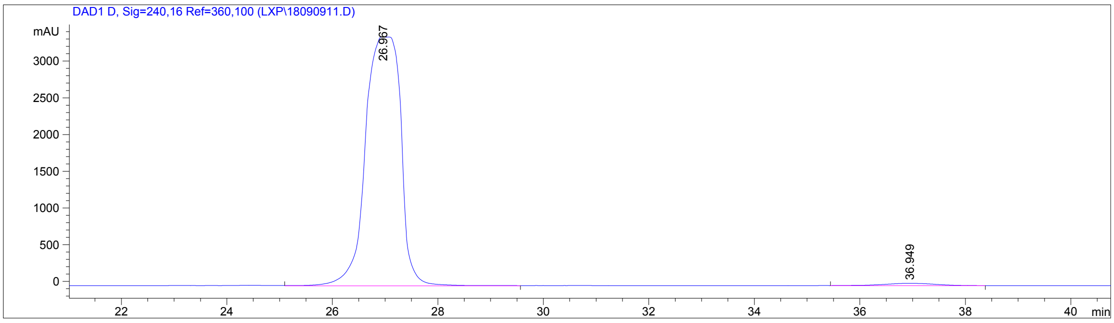


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	26.825	VV	0.7778	4348.51074	84.85949	51.8095
2	37.006	VBA	1.0383	4044.76196	57.95084	48.1905

Totals : 8393.27271 142.81033

Results obtained with enhanced integrator!



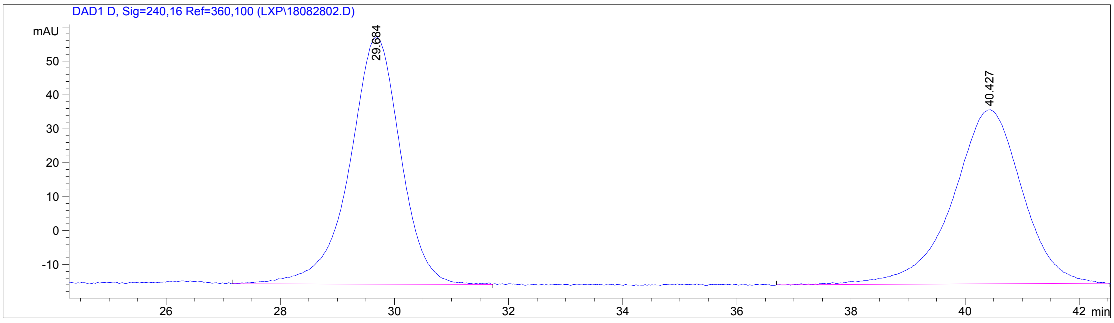
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	26.967	VV	0.6546	1.57520e5	3386.75244	98.5055
2	36.949	VV	0.9573	2389.81201	33.29876	1.4945

Totals : 1.59910e5 3420.05120

Results obtained with enhanced integrator!

4d

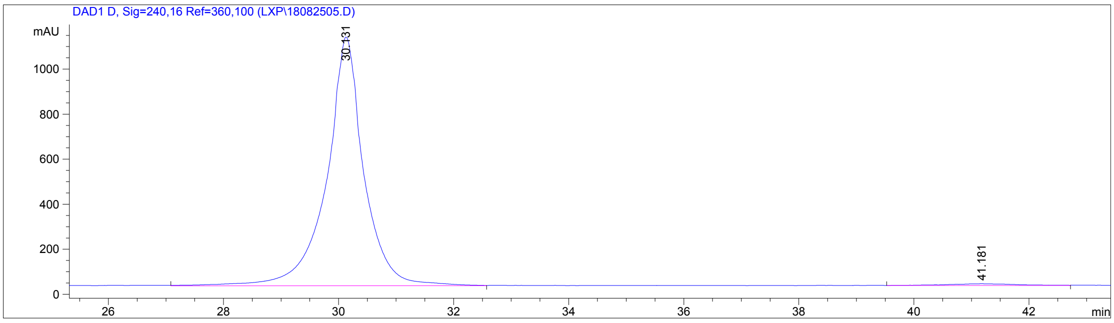


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	29.684	VB	0.9463	4513.34863	72.89516	50.9745
2	40.427	PV	1.2149	4340.78711	51.31431	49.0255

Totals : 8854.13574 124.20947

Results obtained with enhanced integrator!



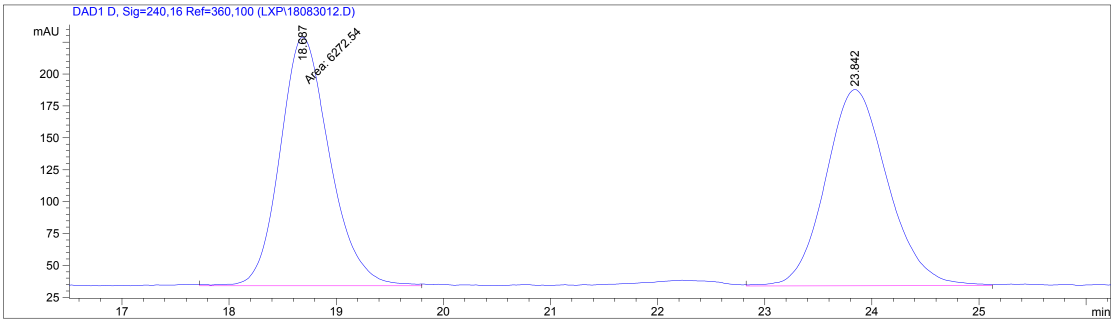
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	30.131	VV	0.6103	4.97986e4	1103.86926	98.5906
2	41.181	VV	1.0746	711.88721	7.87502	1.4094

Totals : 5.05105e4 1111.74428

Results obtained with enhanced integrator!

4e

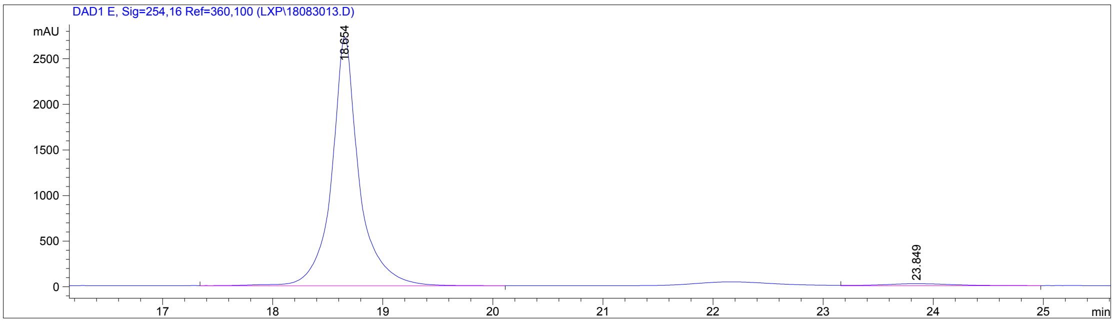


Signal 5: DAD1 E, Sig=254,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.690	VB	0.4918	3175.78882	94.55867	50.5529
2	23.841	VV	0.6271	3106.32153	75.02407	49.4471

Totals : 6282.11035 169.58274

Results obtained with enhanced integrator!



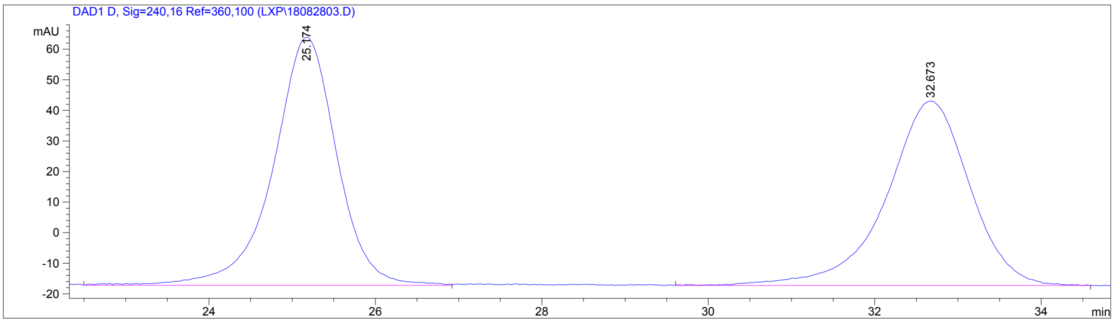
Signal 5: DAD1 E, Sig=254,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.654	VB	0.2396	4.76252e4	2729.20068	97.7478
2	23.849	VV	0.6324	1097.33411	22.60127	2.2522

Totals : 4.87226e4 2751.80196

Results obtained with enhanced integrator!

4f

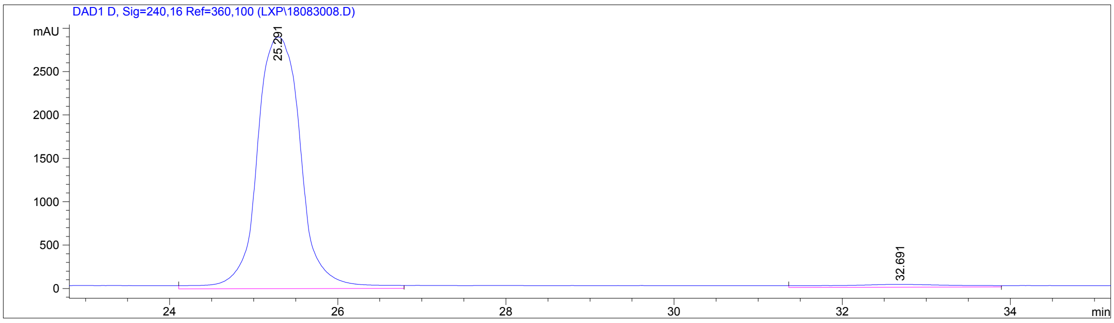


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	25.174	VB	0.7935	4322.22266	81.13294	50.6807
2	32.673	BP	1.0141	4206.12500	60.27697	49.3193

Totals : 8528.34766 141.40992

Results obtained with enhanced integrator!



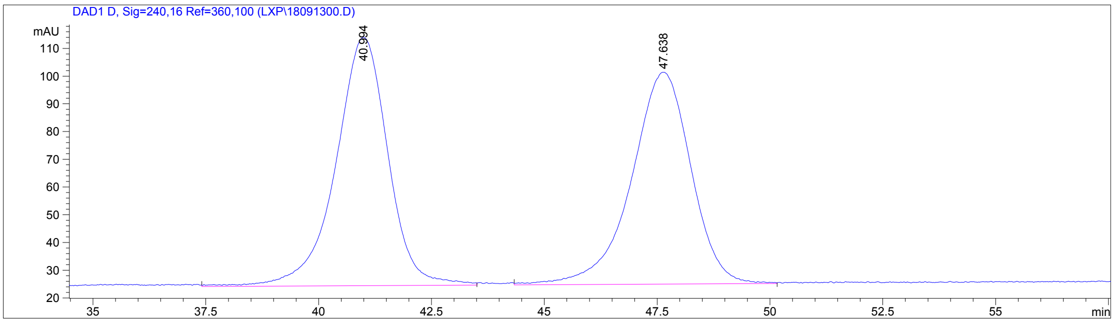
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	25.291	VV	0.5732	1.04703e5	2900.22632	96.7215
2	32.691	VV	1.3906	3549.05542	32.38370	3.2785

Totals : 1.08252e5 2932.61002

Results obtained with enhanced integrator!

4g

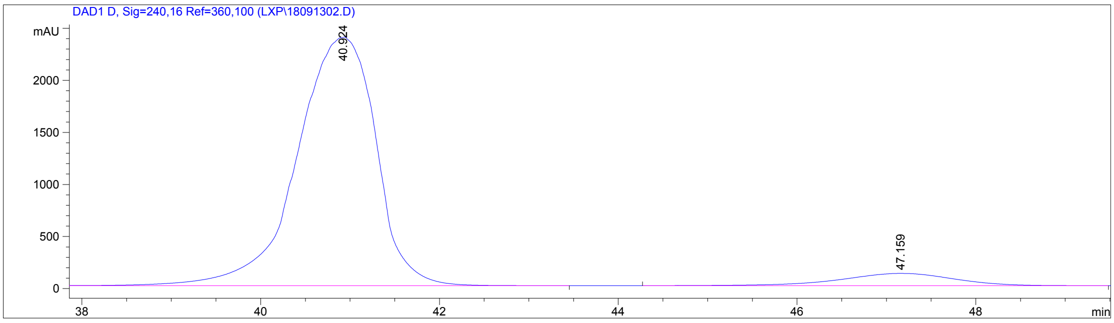


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	40.994	VB	1.1918	7220.98193	89.64089	50.6599
2	47.638	VB	1.1816	7032.86084	76.42580	49.3401

Totals : 1.42538e4 166.06670

Results obtained with enhanced integrator!



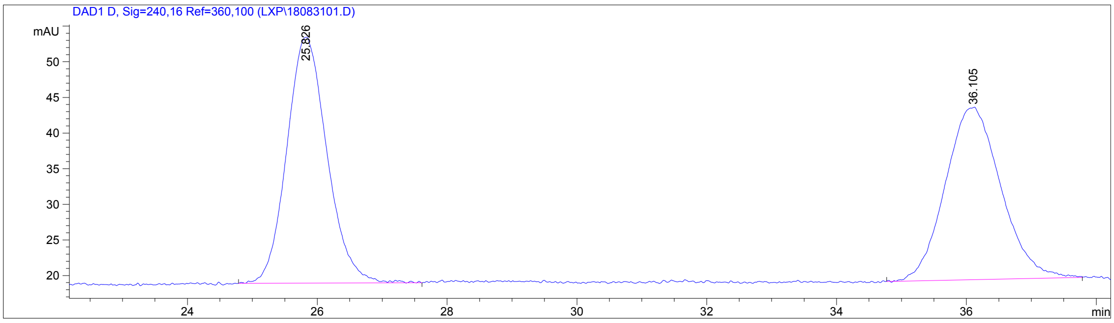
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	40.924	VB	0.9231	1.46090e5	2383.41162	93.3621
2	47.159	BBA	1.2820	1.03867e4	118.10255	6.6379

Totals : 1.56477e5 2501.51417

Results obtained with enhanced integrator!

4h

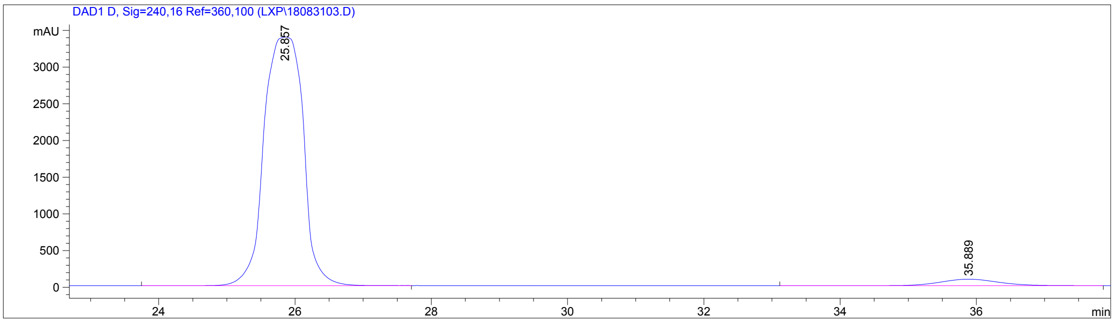


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	25.826	BP	0.6474	1489.26562	34.51617	50.8356
2	36.105	BB	0.7999	1440.30945	24.14571	49.1644

Totals : 2929.57507 58.66189

Results obtained with enhanced integrator!



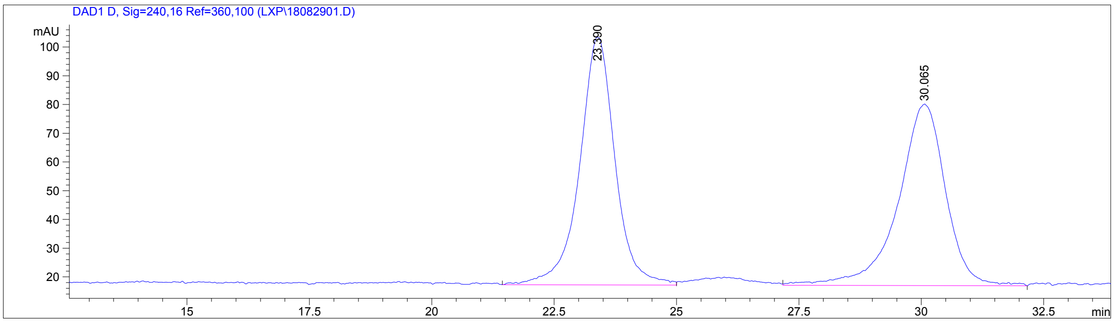
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	25.857	VB	0.6562	1.34848e5	3389.43872	96.2683
2	35.889	VB	0.9158	5227.13623	88.14563	3.7317

Totals : 1.40075e5 3477.58435

Results obtained with enhanced integrator!

4i

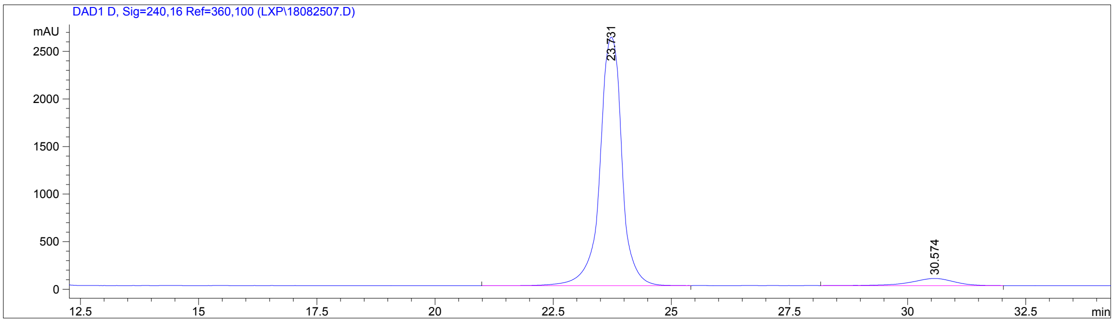


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	23.390	VV	0.7556	4343.30322	86.23058	50.4732
2	30.065	VP	0.9955	4261.86523	63.14269	49.5268

Totals : 8605.16846 149.37327

Results obtained with enhanced integrator!



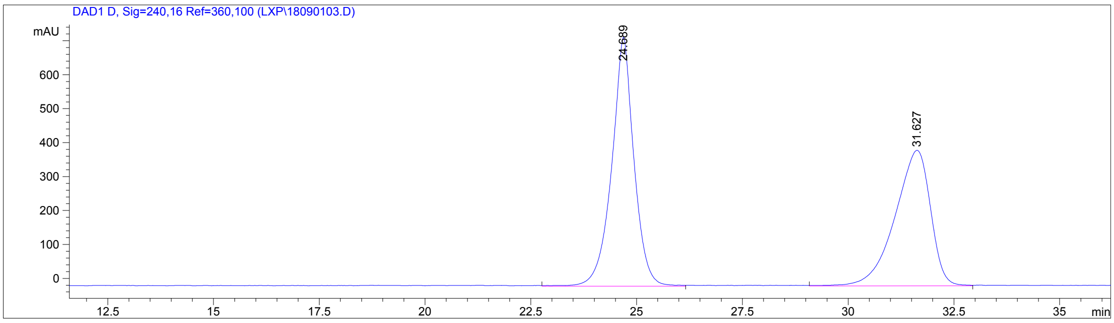
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	23.731	VV	0.4986	8.48079e4	2613.64648	94.4740
2	30.574	VV	0.9520	4960.56787	76.15070	5.5260

Totals : 8.97685e4 2689.79718

Results obtained with enhanced integrator!

4j

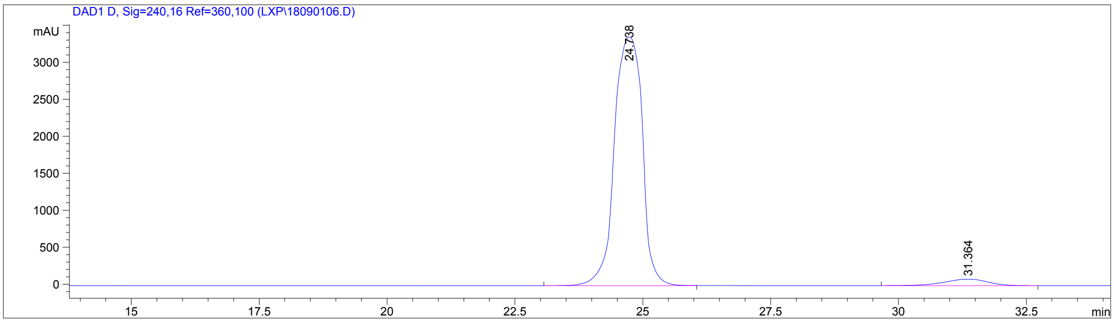


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	24.689	VV	0.5066	2.67934e4	732.81940	53.4324
2	31.627	VV	0.8860	2.33510e4	399.48334	46.5676

Totals : 5.01444e4 1132.30273

Results obtained with enhanced integrator!



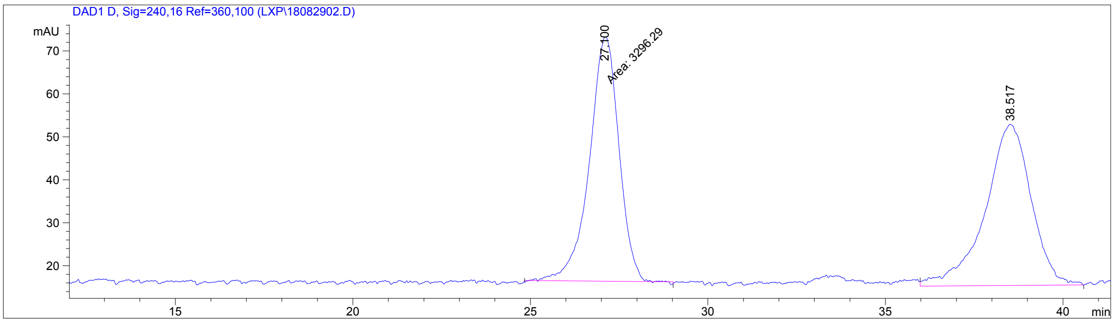
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	24.738	VV	0.6182	1.27403e5	3361.64380	95.9749
2	31.364	VV	0.8968	5343.19482	88.44862	4.0251

Totals : 1.32746e5 3450.09242

Results obtained with enhanced integrator!

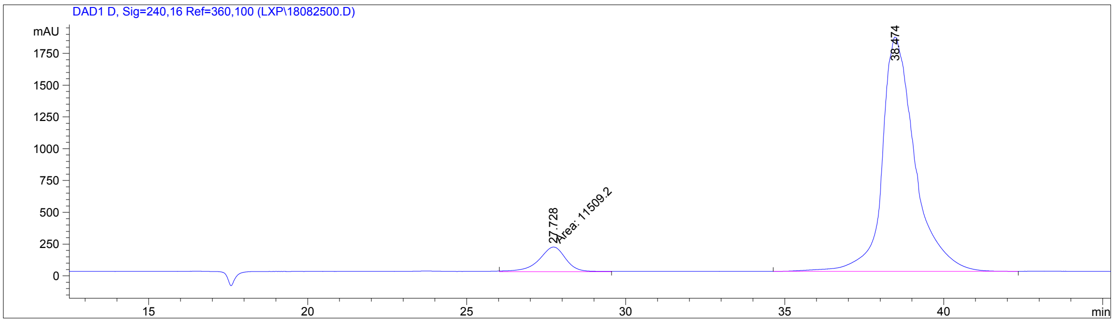
4k



Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	27.100	MM	0.9671	3296.28906	56.80935	49.4226
2	38.517	VP	1.1055	3373.31226	37.49756	50.5774
Totals :				6669.60132	94.30691	

Results obtained with enhanced integrator!

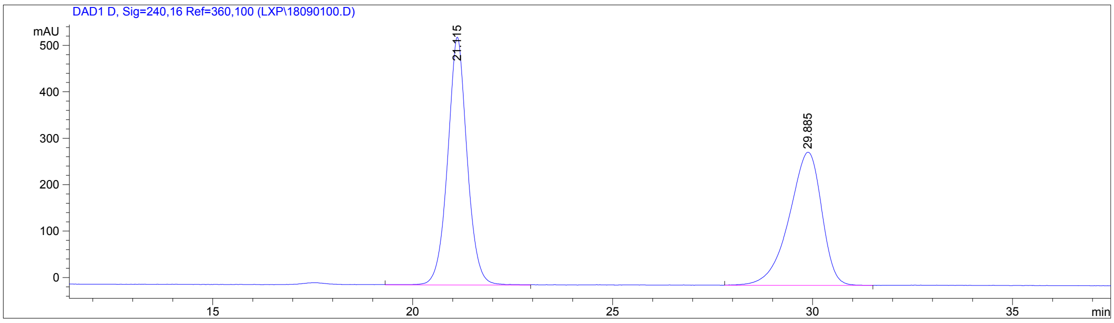


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	27.728	MM	0.9871	1.15092e4	194.32687	8.0239
2	38.474	BB	0.8921	1.31928e5	1840.94043	91.9761
Totals :				1.43437e5	2035.26730	

Results obtained with enhanced integrator!

4l

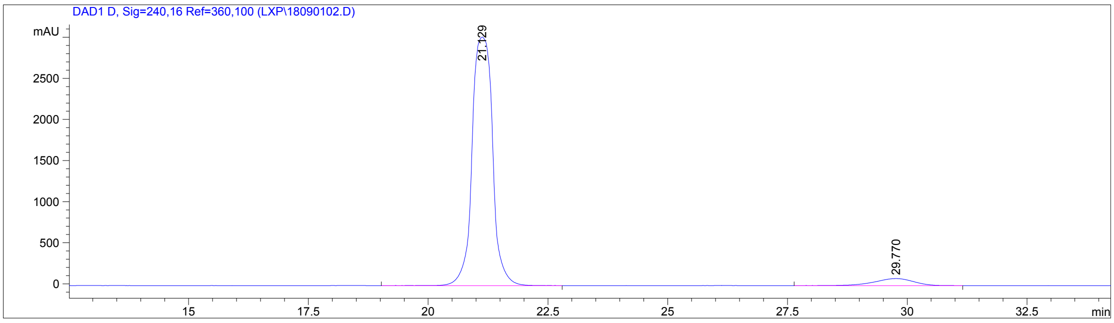


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	21.115	BB	0.5038	1.81073e4	533.78015	52.6108
2	29.885	BB	0.8671	1.63102e4	286.97375	47.3892

Totals : 3.44175e4 820.75391

Results obtained with enhanced integrator!



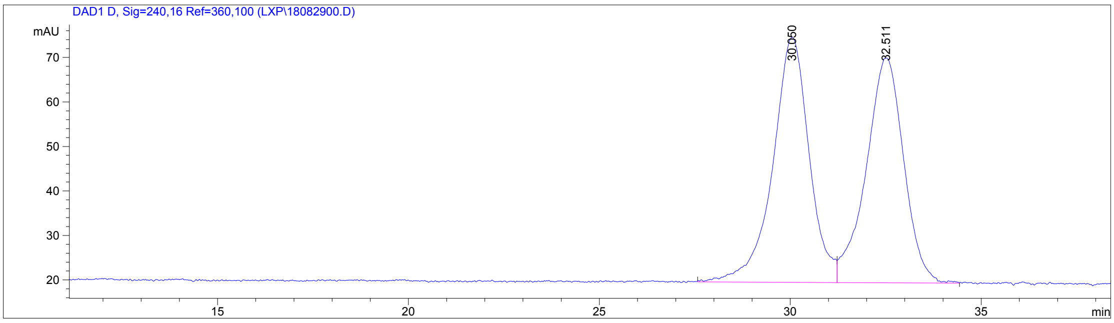
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	21.129	VV	0.4792	9.00437e4	3025.81274	94.6387
2	29.770	VV	0.8949	5100.94482	86.63347	5.3613

Totals : 9.51446e4 3112.44621

Results obtained with enhanced integrator!

4m

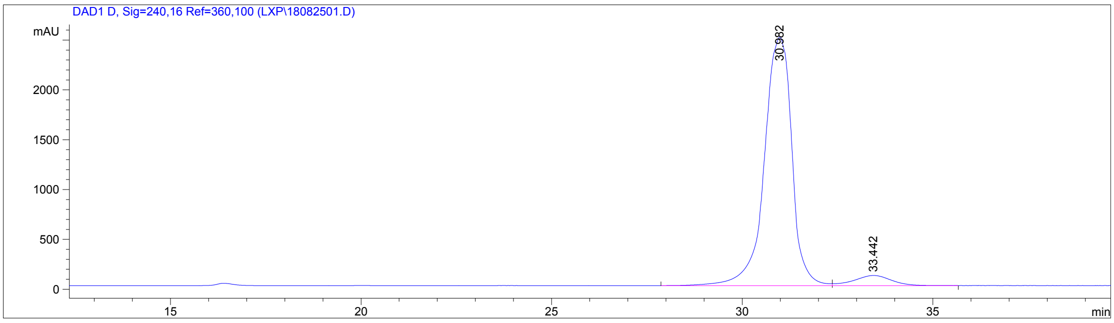


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	30.050	BV	0.9771	3651.51489	55.10719	51.3386
2	32.511	VB	1.0235	3461.09302	50.50610	48.6614

Totals : 7112.60791 105.61329

Results obtained with enhanced integrator!



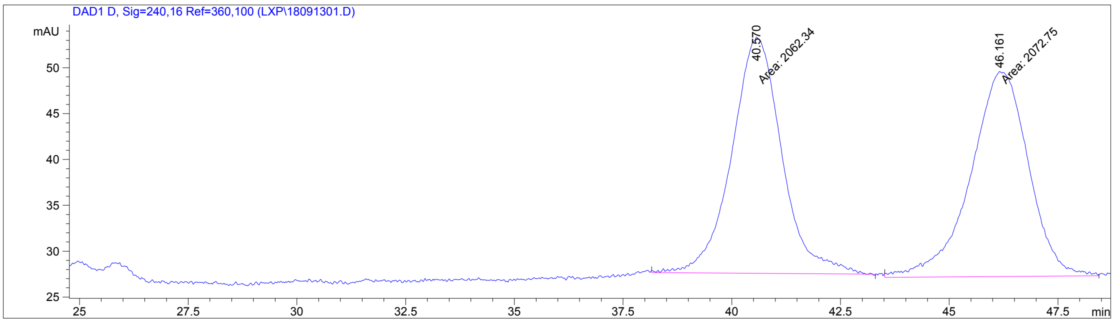
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	30.982	BV	0.7773	1.25172e5	2494.95068	94.7893
2	33.442	VP	1.0148	6880.89111	101.51363	5.2107

Totals : 1.32053e5 2596.46432

Results obtained with enhanced integrator!

4n

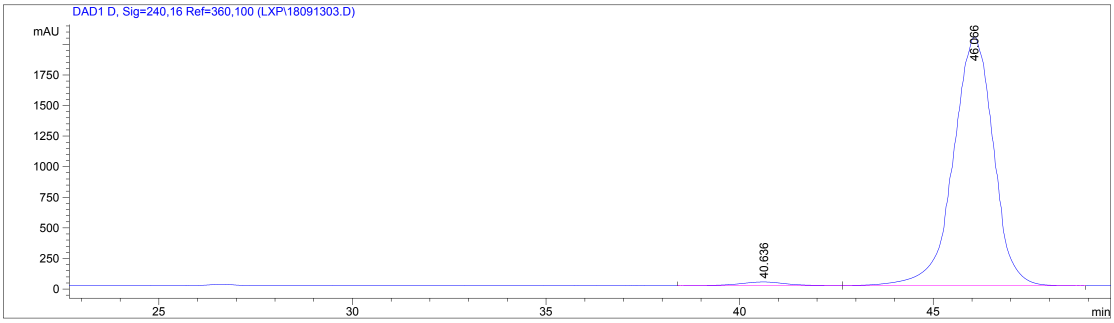


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	40.570	MM	1.3343	2062.33643	25.75996	49.8741
2	46.161	MM	1.5440	2072.74536	22.37351	50.1259

Totals : 4135.08179 48.13347

Results obtained with enhanced integrator!



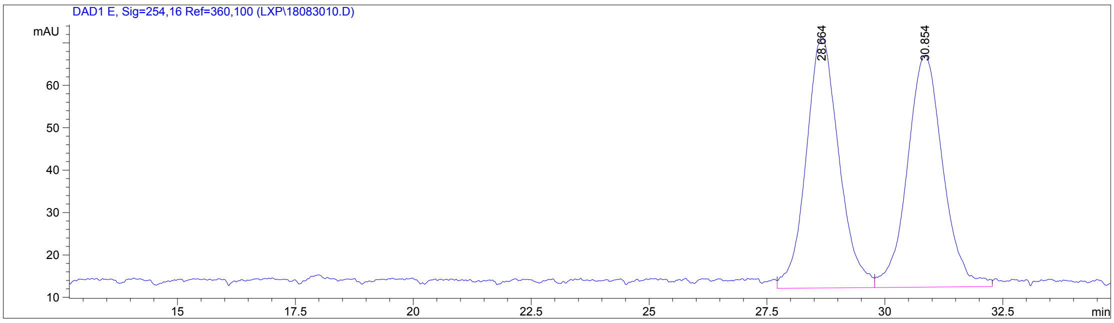
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	40.636	BV	1.0591	2482.18506	29.94384	1.6698
2	46.066	VB	0.9077	1.46171e5	2030.90881	98.3302

Totals : 1.48654e5 2060.85265

Results obtained with enhanced integrator!

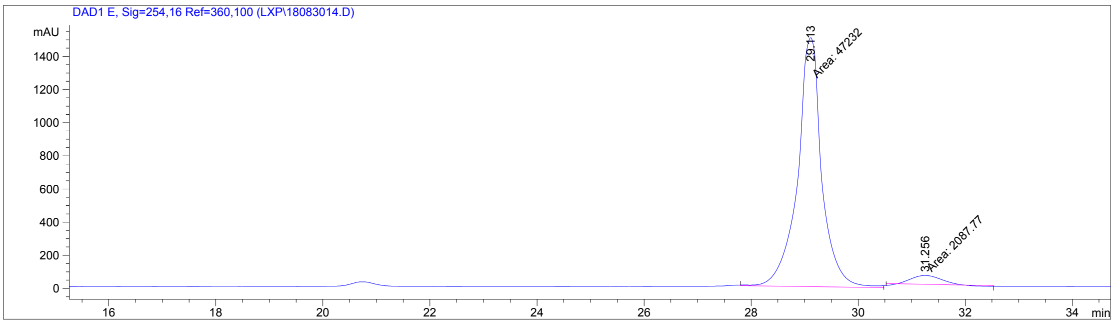
4o



Signal 5: DAD1 E, Sig=254,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	28.664	VV	0.6615	2857.62573	59.16293	49.8885
2	30.854	VB	0.7244	2870.40332	54.68626	50.1115
Totals :				5728.02905	113.84919	

Results obtained with enhanced integrator!

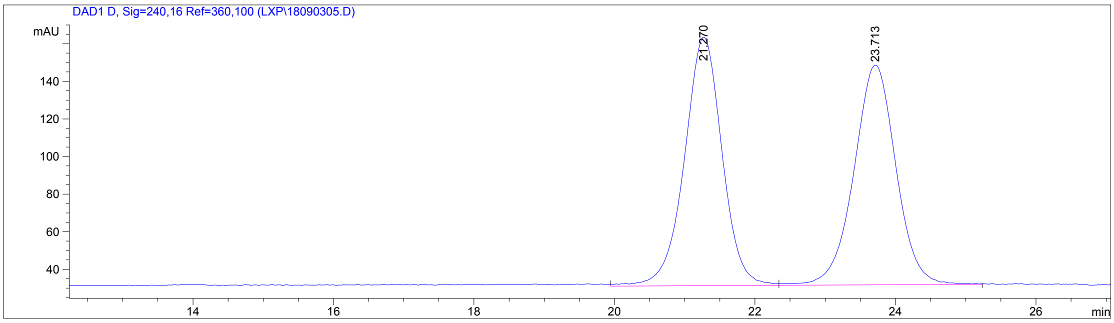


Signal 5: DAD1 E, Sig=254,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	29.113	MM	0.5242	4.72320e4	1501.66919	95.7669
2	31.256	MM	0.6523	2087.77319	53.34237	4.2331
Totals :				4.93198e4	1555.01156	

Results obtained with enhanced integrator!

4p

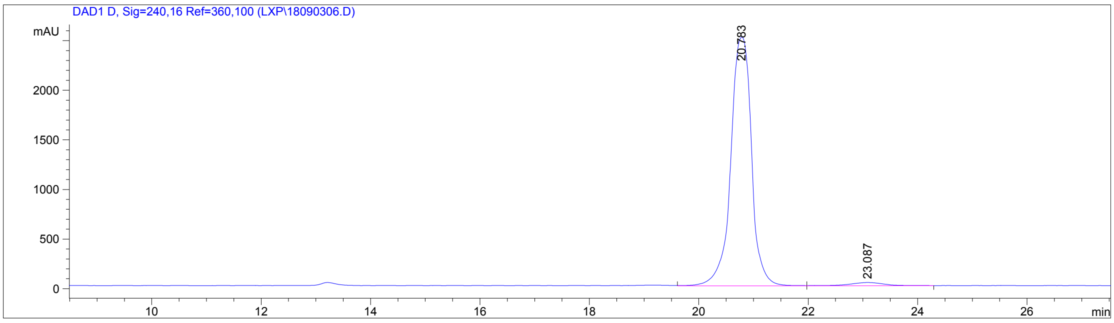


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	21.270	VV	0.5715	4935.80664	132.23991	50.3572
2	23.713	VB	0.6379	4865.79004	116.83361	49.6428

Totals : 9801.59668 249.07352

Results obtained with enhanced integrator!



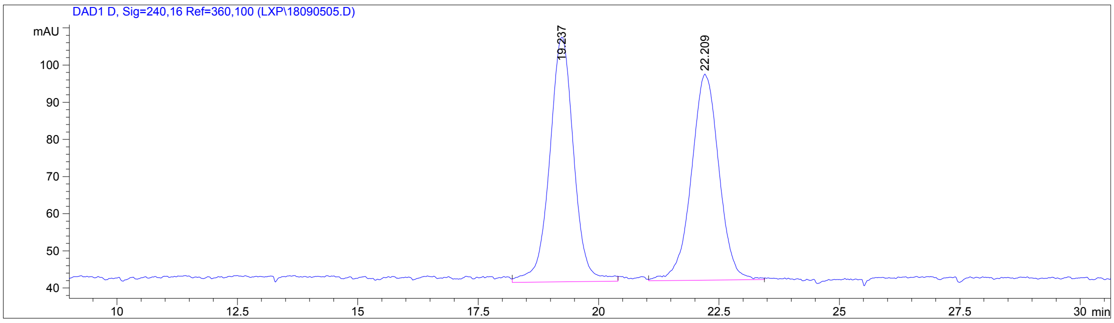
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	20.783	VV	0.4184	6.58387e4	2507.28467	97.7939
2	23.087	VV	0.6880	1485.22034	32.82004	2.2061

Totals : 6.73239e4 2540.10471

Results obtained with enhanced integrator!

4q

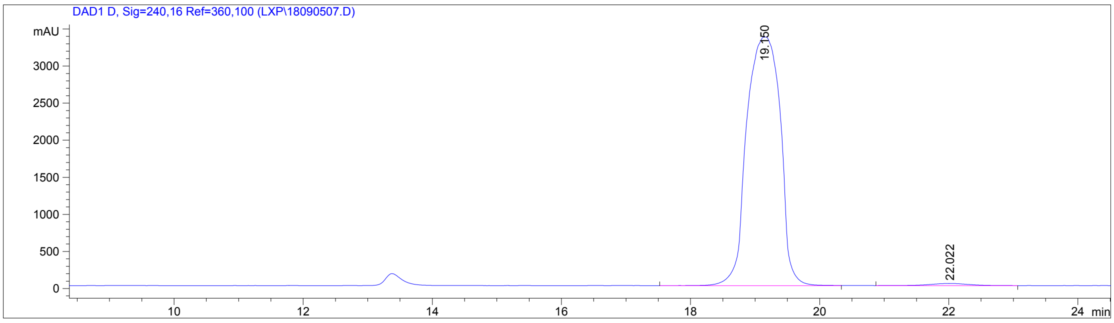


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.237	VB	0.5307	2294.94604	65.83404	50.9639
2	22.209	VB	0.6088	2208.13745	55.42449	49.0361

Totals : 4503.08350 121.25853

Results obtained with enhanced integrator!



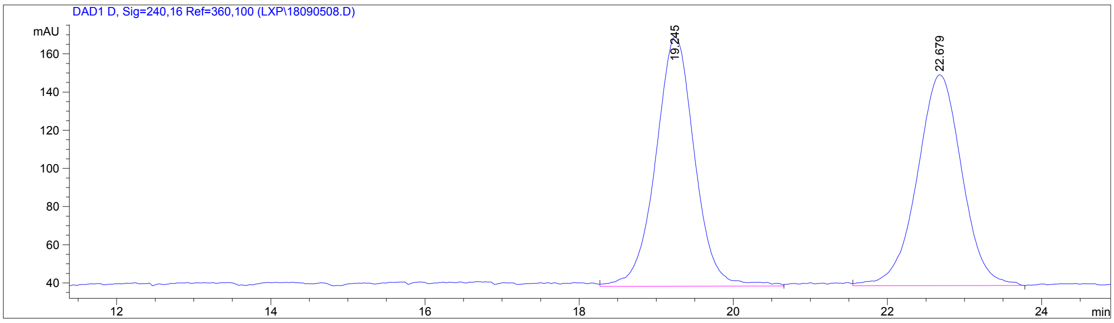
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.150	VV	0.6211	1.21045e5	3353.40576	98.8826
2	22.022	VV	0.6662	1367.77979	29.00519	1.1174

Totals : 1.22413e5 3382.41095

Results obtained with enhanced integrator!

4r

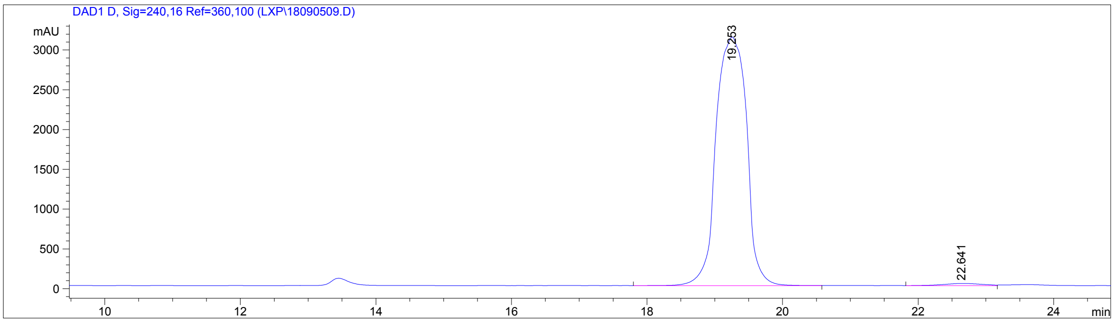


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.245	VV	0.5384	4591.45605	130.53687	50.7190
2	22.679	VP	0.6191	4461.27441	110.47253	49.2810

Totals : 9052.73047 241.00940

Results obtained with enhanced integrator!



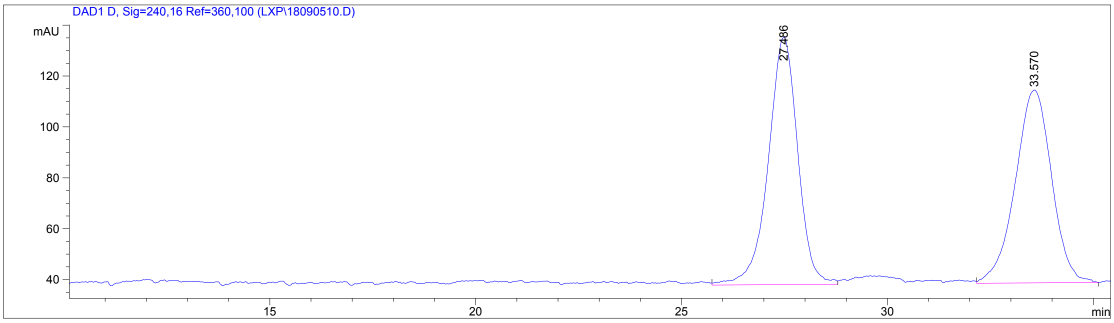
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.253	VV	0.5248	9.76993e4	3124.35278	98.8646
2	22.641	VV	0.6252	1121.99121	27.20411	1.1354

Totals : 9.88213e4 3151.55690

Results obtained with enhanced integrator!

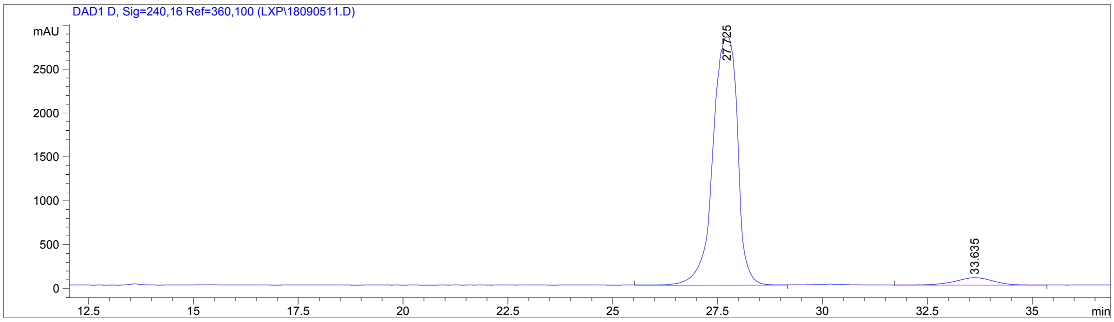
4s



Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	27.486	VV	0.7495	4844.80615	97.20631	51.0472
2	33.570	VP	0.9514	4646.02295	75.76279	48.9528

Totals : 9490.82910 172.96911



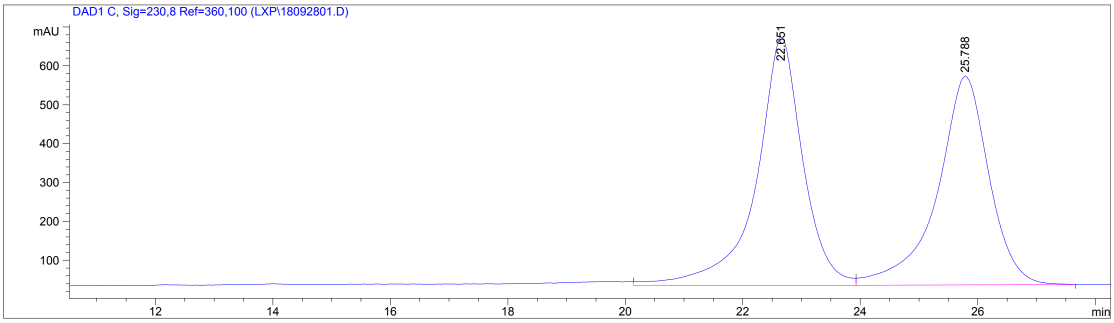
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	27.725	VV	0.6525	1.15605e5	2830.39673	95.2864
2	33.635	VV	0.9784	5718.66406	86.59795	4.7136

Totals : 1.21323e5 2916.99467

Results obtained with enhanced integrator!

4t

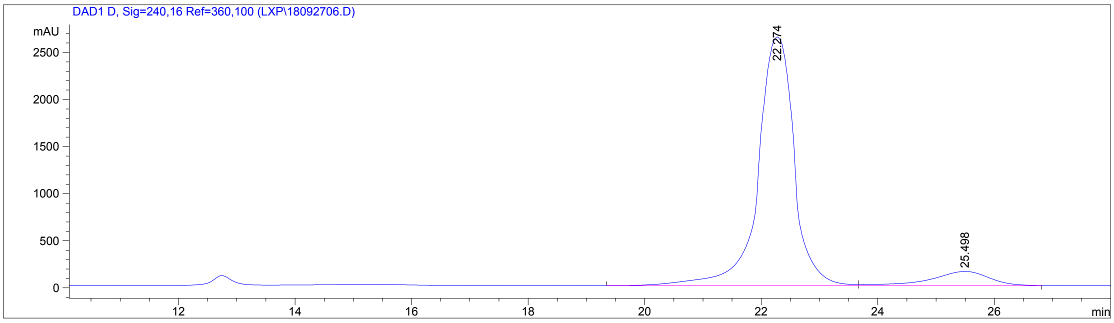


Signal 3: DAD1 C, Sig=230,8 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.651	VV	0.7808	3.53936e4	638.42169	51.8832
2	25.788	VV	0.8907	3.28242e4	537.35980	48.1168

Totals : 6.82179e4 1175.78149

Results obtained with enhanced integrator!



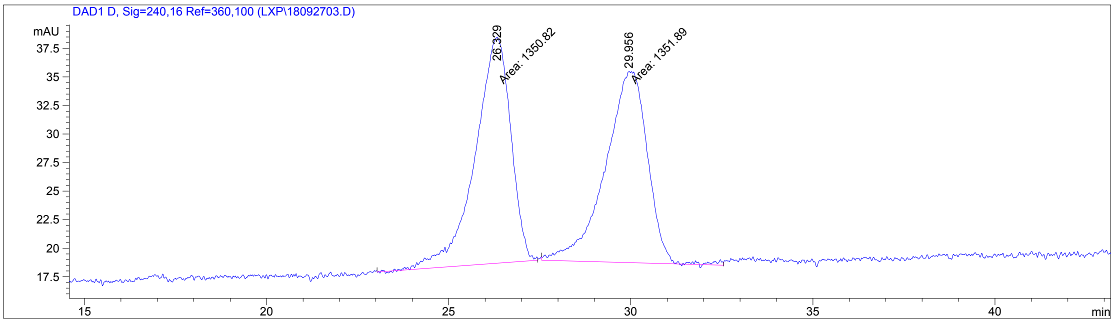
Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.274	VV	0.6903	1.13648e5	2639.62012	91.6391
2	25.498	VV	1.0203	1.03689e4	150.40215	8.3609

Totals : 1.24017e5 2790.02226

Results obtained with enhanced integrator!

4u

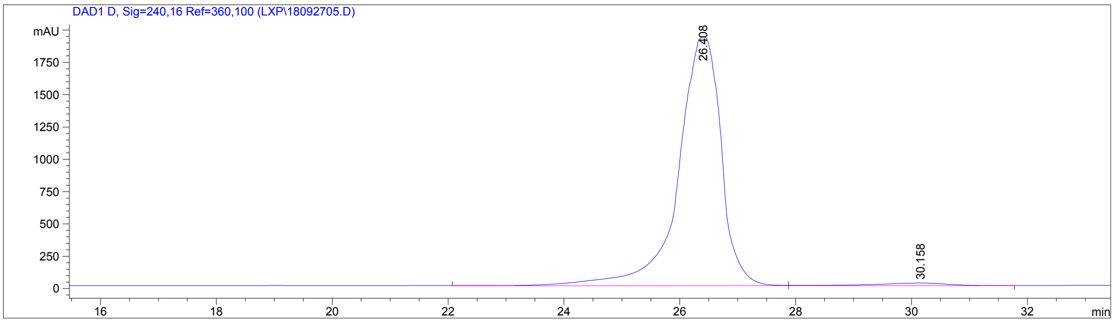


Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	26.329	MM	1.1371	1350.81702	19.79937	49.9801
2	29.956	MM	1.3453	1351.89160	16.74867	50.0199

Totals : 2702.70862 36.54804

Results obtained with enhanced integrator!



Signal 4: DAD1 D, Sig=240,16 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	26.408	VV	0.7098	9.92306e4	1923.82410	98.0575
2	30.158	VV	1.1641	1965.76746	20.92301	1.9425

Totals : 1.01196e5 1944.74710

Results obtained with enhanced integrator!