Supporting Information for

Iron-Catalyzed Aerobic Difunctionalization of Alkenes: Highly Efficient C-S and C-C Bond Formation**

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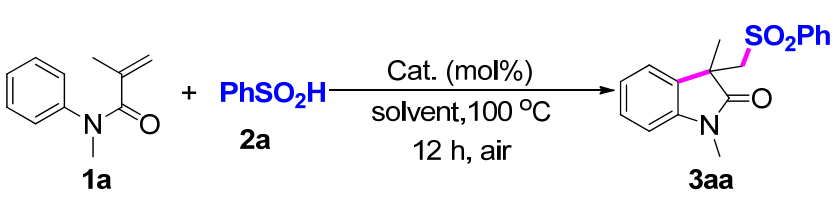
General Remarks

All commercially available compounds were purchased from Sigma-Aldrich, Alfa-Aesar and Acros (with the exception of anhydrous $FeCl_2$ purchased from Strem) and used as received. TFA and other solvents were from Beijing Ouhe and Beijing Chemical Works and used as received without further purification. Reactions were performed without regard for exclusion of ambient air or moisture in a schlenk tube under standard conditions (specific reaction conditions are described below). Analysis of crude reaction mixture was done on an Agilent 7890 GC System with an Agilent 5975 Mass Selective Detector. Products were purified by flash chromatography or by preparative thin-layer chromatography on silica gel. ^{1}H-NMR spectra were recorded on a Bruker AVIII-400 spectrometers. Chemical shifts (in ppm) were were calibrated with $CDCl_3$ (tetramethylsilane, δ = 0 ppm) and DMSO(δ = 2.54 ppm). ^{13}C-NMR spectra were obtained by using the same NMR spectrometers and were calibrated with $CDCl_3$ (δ = 77.00 ppm) and DMSO(δ = 40.45 ppm.) Mass spectra were recorded using a PE SCLEX QSTAR spectrometer. High resolution mass spectra were obtained with a Bruker APEX IV Fourier transform ion cyclotron resonance mass spectrometer using electrospray ionisation (ESI). Fourier-transform infrared (FTIR) spectra were obtained with a Nicolet Nexus 470 Fourier transform infrared spectrometer.

Table S1. Screening with Different Reaction Conditions for the direct oxysulfonylation of activated alkynes.[a]

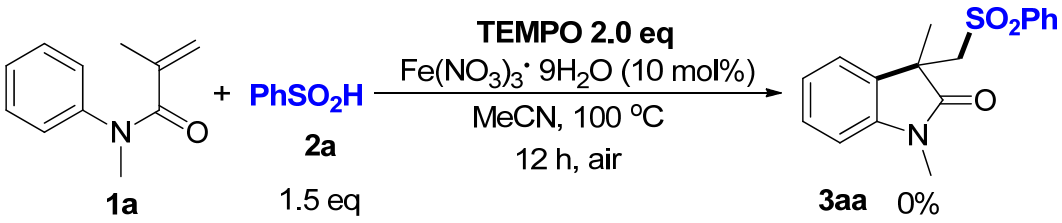


entry	Cat. (mol%)	solvent	yield of **3aa**(%)[b]
1	$Fe(NO_3)_3 \cdot 9H_2O$ (5)	MeCN	48
2	$Fe(NO_3)_3 \cdot 9H_2O$ (10)	MeCN	77
3	$Fe(NO_3)_3 \cdot 9H_2O$ (20)	MeCN	63
4	$Fe(NO_3)_3 \cdot 9H_2O$ (10)	DCE	53
5	$Fe(NO_3)_3 \cdot 9H_2O$ (10)	$CHCl_3$	49
6	$Fe(NO_3)_3 \cdot 9H_2O$ (10)	THF	70
7	$Fe(NO_3)_3 \cdot 9H_2O$ (10)	DMSO	trace
8	$Fe(NO_3)_3 \cdot 9H_2O$ (10)	DMF	trace
9	$Fe(NO_3)_3 \cdot 9H_2O$ (10)	HOAc	trace
10	$Fe(NO_3)_3 \cdot 9H_2O$ (10)	toluene	44
11	$Fe(NO_3)_3 \cdot 9H_2O$ (10)	TFA	ND
12[c]	**$Fe(NO_3)_3 \cdot 9H_2O$ (10)**	**MeCN**	**94**
13[d]	$Fe(NO_3)_3 \cdot 9H_2O$ (10)	MeCN	38
14	$FeCl_3$ (10)	MeCN	trace
15	$NiCl_2$ (10)	MeCN	trace
16	$AuCl_3$ (10)	MeCN	ND
17	$PtCl_2$ (10)	MeCN	trace
18	$AgNO_3$ (10)	MeCN	49
19	$Cu(NO_3)_2$ (10)	MeCN	32
20	$Pd(OAc)_2$ (10)	MeCN	trace
21	TEMPO (10)	MeCN	trace
22	NHPI (10)	MeCN	trace
23	none	MeCN	16

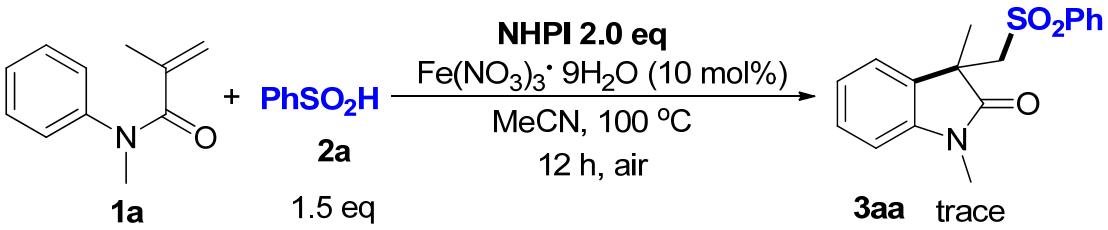
[a] Reaction conditions are as follows: **1a** (0.2 mmol), **2a** (0.4 mmol), solvent (2 mL), stirred at 100 °C under air for 12 h. [b] Isolated yields. [c] 0.3 mmol $PhSO_2H$ (**2a**) was used. [d] The reaction was carried out under Ar.

Mechanistic Studies

Eq S1

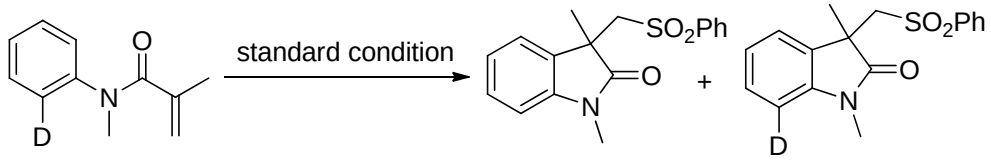


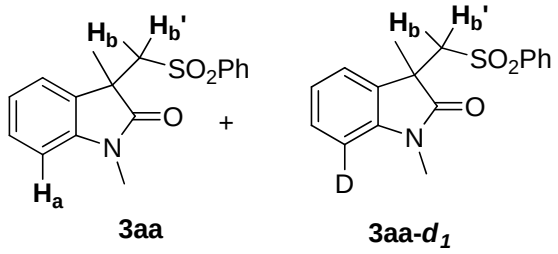
Eq S2



Eq. S3 **Competing kinetic isotope effect (KIE) experiment:**

a) Intramolecular KIE experiment: **1a-*d*1** were synthesized deuterium substrates according the literature procedure.[S5] In a Schlenk tube, **1a-*d*1** (35.5 mg, 0.20 mmol), $PhSO_2H$ **2a** (43 mg, 0.3mmol) were added, then MeCN (2 mL) were added. The mixture was allowed to stir at 100℃ for 12 hours (monitored by TLC). After substrate was consumed, the reaction was cooled to room temperature and the solvent was removed under vacuum, the residue was purified by column chromatography to give the product **3aa** and **3aa-*d*1**. The products were under 1H-NMR analysis (Figure S1).





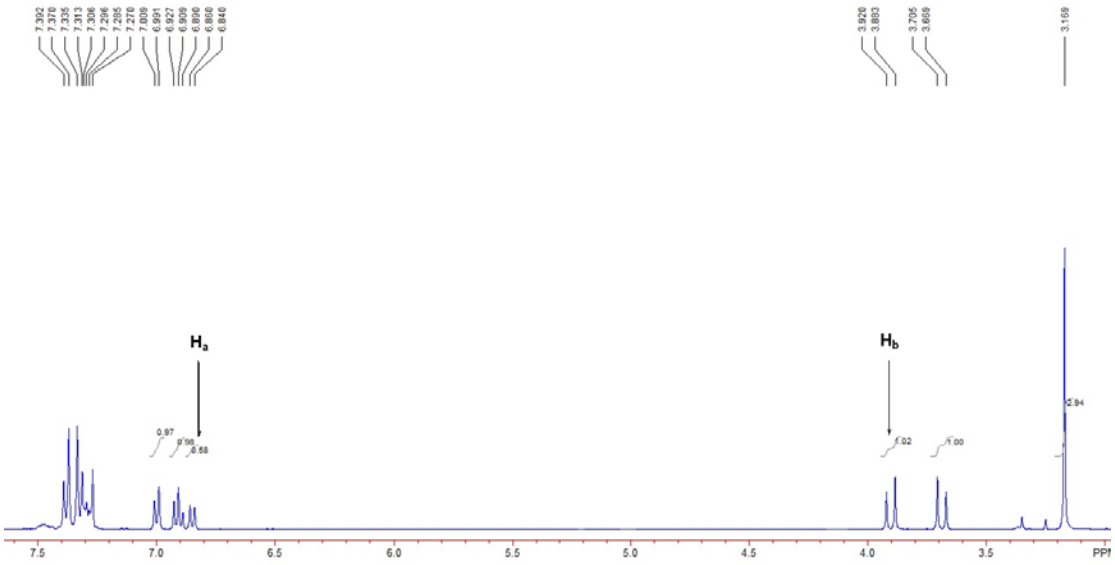
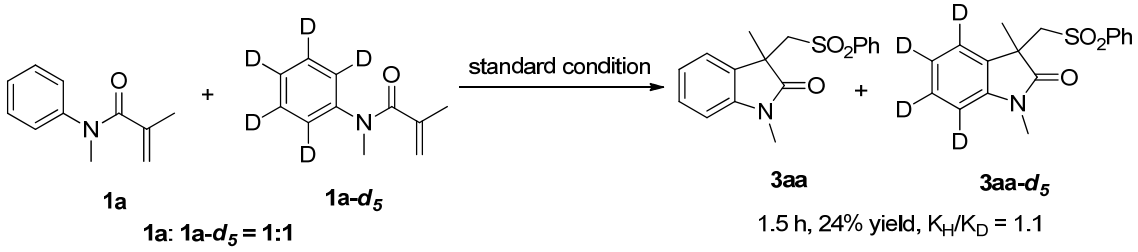
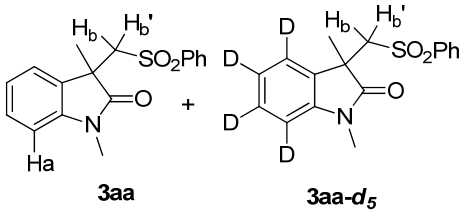


Figure S1 Intramolecular KIE experiment

b) Intermolecular KIE experiment: **1a-*d*$_5$** were synthesized deuterium substrates according the literature procedure.[S5] In a Schlenk tube, **1a** (17.5 mg, 0.1 mmol), **1a-*d*$_5$** (18.0 mg, 0.1 mmol), $PhSO_2H$ **2a** (43 mg, 0.3mmol) were added, then MeCN (2 mL) were added. The mixture was allowed to stir at 100℃ for 12 hours (monitored by TLC). After substrate was consumed, the reaction was cooled to room temperature and the solvent was removed under vacuum, the residue was purified by column chromatography to give the product **3aa** and **3aa-*d*$_5$**. The products were under ^{1}H-NMR analysis (Figure S2).





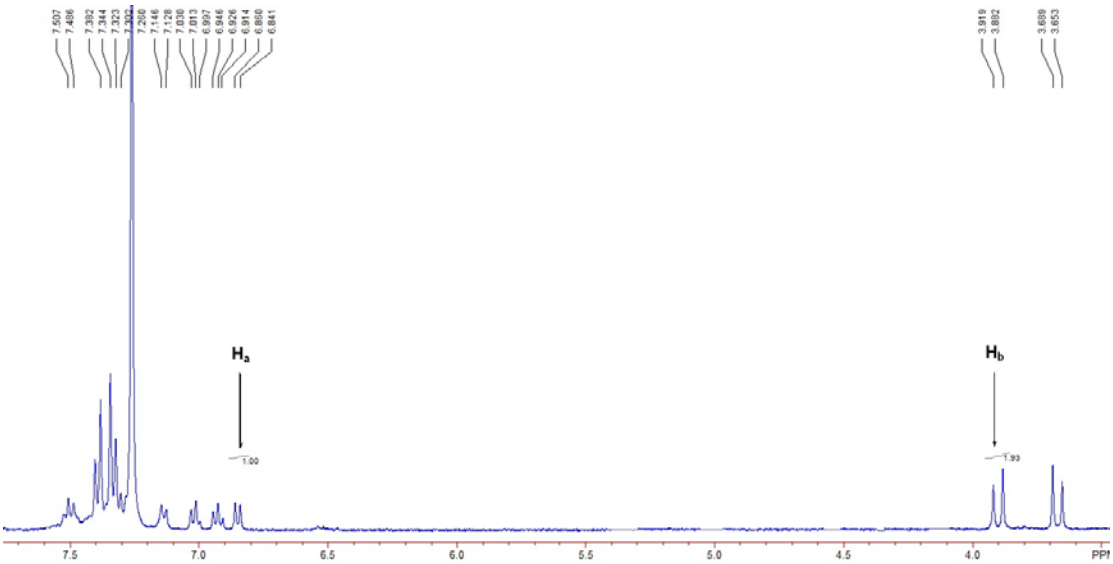
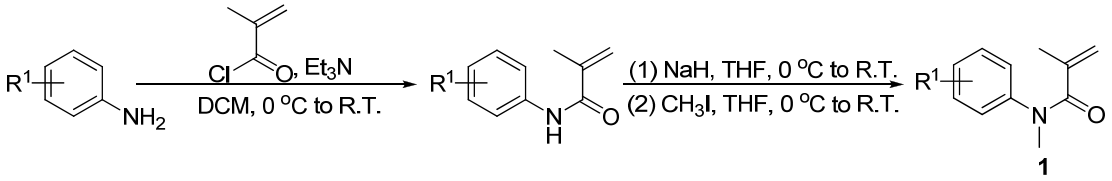


Figure S2 Intermolecular KIE experiment

Experimental Section:

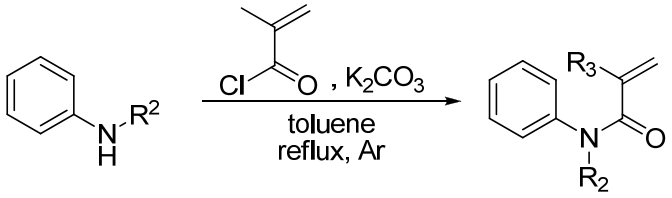
Typical Procedure for the Synthesis of Substrates

Method A: Substrate 1 was prepared according to literatures.[s2]



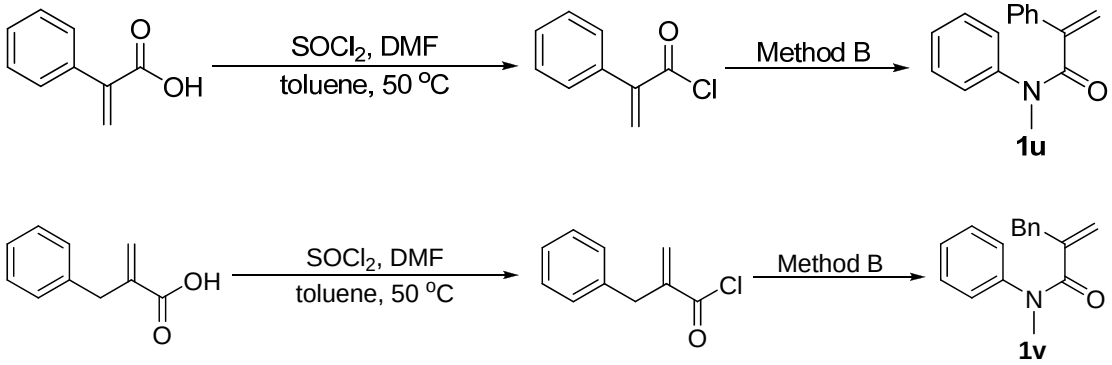
1

Method B: Substrate 1 was prepared according to literature.[s3]

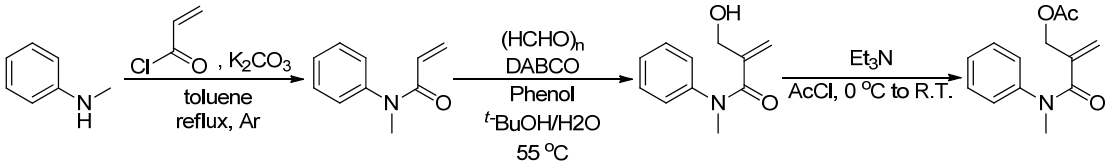


1a, **1b**, **1c**, **1x**

Substrates 1u and 1v were prepared according to literatures.[s3, s4]



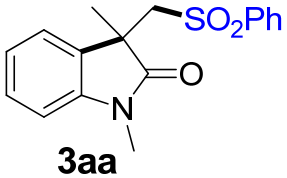
Substrate 1w was prepared according to literature.[s2]



General Procedure for the Synthesis of Oxindoles

1 (0.2 mmol) and 2 (0.4 mmol or 0.3 mmol), and $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) were added to a Schlenk tube with a magnetic bar. 2.0 mL MeCN was added and the mixture was heated to 100 °C for 12 hours (or 24 hours). The reaction mixture was diluted with EtOAc (5 mL) and filtered. The filtrate was concentrated *in vacuo* giving the resulting material, which was purified by column chromatography to give product 3.

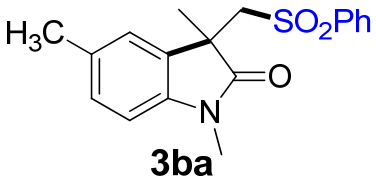
Characterization of new compounds.



3aa

1) **1, 3-Dimethyl-3-((phenylsulfonyl)methyl)indolin-2-one (3aa)**

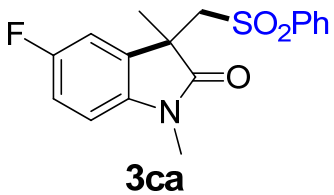
The reaction of **1a** (35.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (43 mg, 0.3 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 59.2 mg (94%) of **3aa**; **3aa**: white solid; Mp: 159.3-161.9 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.55-7.48 (m, 3H); 7.38 (t, J = 8.0 Hz, 2H); 7.28 (d, J = 8.0 Hz, 1H); 7.03 (d, J = 7.6 Hz, 1H); 6.88-6.84 (m, 2H); 3.88 (d, J = 14.4 Hz, 1H, CH_2); 3.70 (d, J = 14.4 Hz, 1H, CH_2); 3.17 (s, 3H); 1.39 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 177.5; 143.2; 139.8; 133.3; 129.4; 128.8; 128.5; 127.7; 123.9; 122.4; 108.3; 61.7; 45.5; 26.4; 25.4. IR (neat): ν = 2974; 1711; 1613; 1309; 753; cm^{-1}. FTMS: calc. for $C_{17}H_{17}NO_3S$ $(M+H)^+$, 316.1002; found, 316.0996.



3ba

2) **1, 3, 5-Trimethyl-3-((phenylsulfonyl)methyl)indolin-2-one (3ba)**

The reaction of **1b** (38.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 56.2 mg (85%) of **3ba**; **3ba**: white solid; Mp: 148.8-151.0 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.53-7.49 (m, 1H); 7.42-7.40 (m, 2H); 7.35-7.31 (m, 2H); 7.03 (d, J = 8.0 Hz, 1H); 6.74 (d, J = 8.0 Hz, 1H); 6.63 (s, 1H); 3.90 (d, J = 14.4 Hz, 1H, CH_2); 3.69 (d, J = 14.4 Hz, 1H, CH_2); 3.18 (s, 3H); 2.11 (s, 3H); 1.35 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 177.4; 141.0; 139.9; 133.0; 131.7; 129.2; 128.9; 128.6; 127.6; 124.6; 108.0; 61.8; 45.5; 26.5; 25.3; 20.8. IR (neat): ν = 2967; 1720; 1706; 1306; 1151; cm^{-1}. FTMS: calc. for $C_{18}H_{19}NO_3S$ $(M+H)^+$, 330.1158; found, 330.1149.

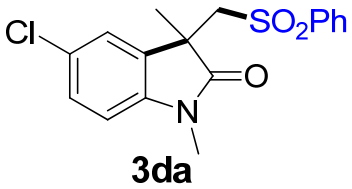


3ca

3) **5-Fluoro-1, 3-dimethyl-3-((phenylsulfonyl)methyl)indolin-2-one (3ca)**

The reaction of **1c** (40.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 60.1 mg (90%) of **3ca**; **3ca**: white solid; Mp: 168.6-169.4 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.59-7.50 (m, 3H); 7.41 (t, J = 8.0 Hz, 2H); 7.01-6.93 (m, 1H); 6.80-6.73 (m, 2H); 3.86 (d, J = 14.4 Hz, 1H, CH_2); 3.67 (d, J = 14.4 Hz, 1H, CH_2); 3.18 (s, 3H); 1.38 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 177.2; 159.0 (d, J = 240 Hz); 139.8; 139.3 (d, J = 1.6 Hz); 133.5; 131.1 (d, J = 8.9 Hz); 128.9; 127.6; 114.9 (d, J = 24.0 Hz); 112.2 (d, J = 24.7 Hz); 108.8 (d, J = 7.7 Hz); 61.6; 46.0; 26.6; 25.2. IR (neat): ν = 2970; 1710;

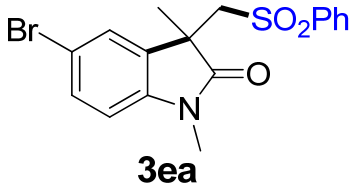
1497; 1150; 862; cm^{-1}. FTMS: calc. for $C_{17}H_{16}FNO_3S$ $(M+H)^+$, 334.0908; found, 334.0902.



3da

4) **5-Chloro-1, 3-dimethyl-3-((phenylsulfonyl)methyl)indolin-2-one (3da)**

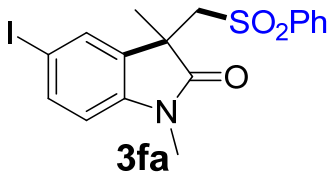
The reaction of **1d** (42.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 61.4 mg (88%) of **3da**; **3da**: white solid; Mp: 147.6-148.9 ℃. ^1H NMR ($CDCl_3$, 400 MHz): 7.59-7.55 (m, 1H); 7.47-7.43(m, 2H); 7.40-7.37 (m, 2H); 7.22 (d, J = 8.4 Hz, 1H); 6.81-6.78 (m, 2H); 3.88 (d, J = 14.4 Hz, 1H, CH_2); 3.69 (d, J = 14.4 Hz, 1H, CH_2); 3.20 (s, 3H); 1.36 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 177.1; 142.0; 139.6; 133.6; 131.0; 128.8; 128.6; 127.7; 127.5; 124.4; 109.3; 61.6; 45.6; 26.6; 25.1. IR (neat): ν = 2969; 1726; 1612; 1491; 1154; cm^{-1}. FTMS: calc. for $C_{17}H_{16}ClNO_3S$ $(M+H)^+$, 350.0612; found, 350.0605.



3ea

5) **5-Bromo-1, 3-dimethyl-3-((phenylsulfonyl)methyl)indolin-2-one (3ea)**

The reaction of **1e** (51.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 71.5 mg (91%) of **3ea**; **3ea**: yellow solid; Mp: 161.8-163.1 ℃. ^1H NMR ($CDCl_3$, 400 MHz): 7.58 (d, J = 7.2 Hz, 1H); 7.46-7.44 (m, 2H); 7.41-7.34 (m, 3H); 6.90 (d, J = 1.2 Hz, 1H); 6.75 (d, J = 8.0 Hz, 1H); 3.89 (d, J = 14.4 Hz, 1H, CH_2); 3.69 (d, J = 14.4 Hz, 1H, CH_2); 3.21 (s, 3H); 1.36 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 177.0; 142.5; 139.6; 133.6; 131.5; 131.3; 128.9; 127.4; 127.1; 115.0; 109.8; 61.6; 45.6; 26.6; 25.1. IR (neat): ν = 2982; 2929; 1733; 1462; 541; cm^{-1}. FTMS: calc. for $C_{17}H_{16}BrNO_3S$ $(M+H)^+$, 394.0107; found, 394.0107.

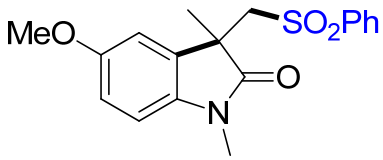


3fa

6) **5-Iodo-1, 3-dimethyl-3-((phenylsulfonyl)methyl)indolin-2-one (3fa)**

The reaction of **1f** (61.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 84.5 mg (96%) of **3fa**; **3fa**: white solid; Mp: 173.0-174.6 ℃. ^1H NMR ($CDCl_3$, 400 MHz): 7.61 (d, J = 7.2 Hz, 1H); 7.54 (d, J = 8.0 Hz, 1H); 7.44-7.36 (m, 4H); 7.04 (d, J = 1.2 Hz, 1H); 6.65 (d, J = 8.0 Hz, 1H); 3.88 (d, J = 14.4 Hz, 1H, CH_2); 3.69 (d, J = 14.4 Hz, 1H, CH_2); 3.20 (s, 3H); 1.34 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 176.8; 143.2; 139.5; 137.4; 133.8; 132.5; 131.6; 128.9; 127.4; 110.4; 85.1; 61.6; 45.4; 26.6; 25.1.

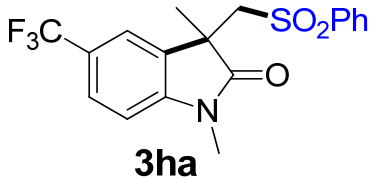
IR (neat): ν = 2969; 1711; 1604; 1487; 1344; 1154; cm^{-1}. FTMS: calc. for $C_{17}H_{16}INO_3S$ $(M+H)^+$, 441.9968; found, 441.9960.



3ga

7) **5-Methoxy-1, 3-dimethyl-3-((phenylsulfonyl)methyl)indolin-2-one (3ga)**

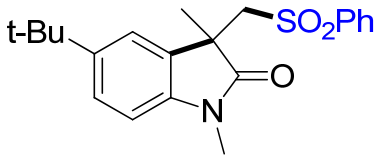
The reaction of **1g** (41.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 40.1 mg (58%) of **3ga**; **3ga**: white solid; Mp: 129.1-131.4 ℃. ^1H NMR ($CDCl_3$, 400 MHz): 7.53-7.46 (m, 3H); 7.39-7.35 (m, 2H); 6.81-6.75 (m, 2H); 6.55 (d, J = 2.4 Hz, 1H); 3.88 (d, J = 14.4 Hz, 1H); 3.67 (d, J = 14.4 Hz, 1H); 3.65 (s, 3H); 3.16 (s, 3H); 1.38 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 177.2; 155.8; 140.0; 136.7; 133.2; 130.6; 128.8; 127.8; 113.3; 111.0; 108.7; 61.8; 55.5; 46.0; 26.6; 25.3. IR (neat): ν = 2928; 1714; 1602; 1503; 1152; cm^{-1}. FTMS: calc. for $C_{18}H_{19}NO_4S$ $(M+H)^+$, 346.1108; found, 346.1111.



3ha

8) **1, 3-Dimethyl-3-((phenylsulfonyl)methyl)-5-(trifluoromethyl)indolin-2-one (3ha)**

The reaction of **1h** (49.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 54.0 mg (71%) of **3ha**; **3ha**: yellow solid; Mp: 145.4-147.2 ℃. ^1H NMR ($CDCl_3$, 400 MHz): 7.55-7.51 (m, 2H); 7.46-7.44 (m, 2H); 7.38-7.34 (m, 2H); 7.11 (s, 1H); 6.95 (d, J = 8.0 Hz, 1H); 3.93(d, J = 14.8 Hz, 1H, CH_2); 3.76 (d, J = 14.4 Hz, 1H, CH_2); 3.27 (s, 3H); 1.40 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 177.6; 146.4; 139.7; 133.6; 129.3; 129.0; 126.5 (q, J = 4.0 Hz); 126.2 (q, J = 253 Hz);124.9 (q, J = 33.2 Hz); 122.9; 120.8 (q, J = 3.0 Hz); 108.2; 61.7; 45.4; 26.7; 25.1. IR (neat): ν = 2975; 2934; 1724; 1624; 1506; cm^{-1}. FTMS: calc. for $C_{18}H_{16}NF_3O_3S$ $(M+H)^+$, 384.0876; found, 384.0867.

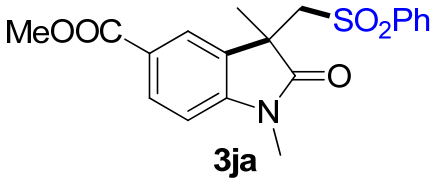


3ia

9) **5-(tert-Butyl)-1, 3-dimethyl-3-((phenylsulfonyl)methyl)indolin-2-one (3ia)**

The reaction of **1i** (46.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 45.0 mg (61%) of **3ia**; **3ia**: yellow solid; Mp: 55.4-57.3 ℃. ^1H NMR ($CDCl_3$, 400 MHz): 7.52-7.47 (m, 3H); 7.38-7.34 (m, 2H); 7.32-7.30 (m, 1H); 7.18 (s, 1H); 6.77 (d, J = 8.4 Hz , 1H); 3.87 (d, J = 14.4 Hz, 1H); 3.72 (d, J = 14.8 Hz, 1H, CH_2); 3.13 (s, 3H); 1.41 (s, 3H); 1.25 (s, 9H). ^{13}C NMR ($CDCl_3$, 100 MHz): 177.8; 145.6; 140.8; 140.0; 133.4;

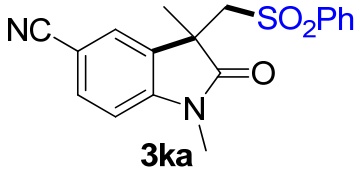
128.8; 128.2; 127.8; 125.3; 121.5; 107.8; 61.9; 45.8; 34.4; 31.5; 26.4; 25.4. IR (neat): ν = 2964; 2905; 1716; 1501; 1148; 571; cm^{-1}. FTMS: calc. for $C_{21}H_{25}NO_3S$ $(M+H)^+$, 372.1628; found, 372.1621.



3ja

10) **1, 3-Dimethyl-2-oxo-3-((phenylsulfonyl)methyl)indoline-5-carboxylate (3ja)**

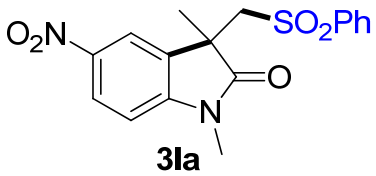
The reaction of **1j** (47.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 50.2 mg (70%) of **3ja**; **3ja**: white solid; Mp: 148.6-149.8 ℃. ^1H NMR ($CDCl_3$, 400 MHz): 8.00 (dd, J = 8.4 Hz, J = 1.6 Hz, 1H); 7.49-7.42 (m, 4H); 7.35-7.28 (m, 2H); 6.91 (d, J = 8.0 Hz, 1H); 3.94 (d, J = 14.4 Hz, 1H, CH_2); 3.85 (s, 3H); 3.78 (d, J = 14.8 Hz, 1H, CH_2); 3.27 (s, 3H); 1.39 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 177.9; 166.2; 147.5; 139.8; 133.1; 131.2; 129.1; 128.9; 127.4; 125.0; 124.3; 108.0; 61.6; 51.9; 45.2; 26.8; 25.1. IR (neat): ν = 2971; 1728; 1703; 1617; 1273; cm^{-1}. FTMS: calc. for $C_{19}H_{19}NO_5S$ $(M+H)^+$, 374.1057; found, 374.1058.



3ka

11) **1, 3-Dimethyl-2-oxo-3-((phenylsulfonyl)methyl)indoline-5-carbonitrile (3ka)**

The reaction of **1k** (40.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 50.3 mg (74%) of **3ka**; **3ka**: white solid; Mp: 173.1-175.4 ℃. ^1H NMR ($CDCl_3$, 400 MHz): 7.63-7.58 (m, 2H); 7.51-7.41 (m, 4H); 7.12 (s, 1H); 6.96 (d, J = 8.4 Hz, 1H); 3.91 (d, J = 14.8 Hz, 1H, CH_2); 3.76 (d, J = 14.8 Hz, 1H, CH_2); 3.28 (s, 3H); 1.40 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 177.4; 147.2; 139.6; 133.83; 133.80; 130.4; 129.1; 127.4; 127.2; 118.7; 108.8; 105.6; 61.4; 45.2; 26.8; 25.0. IR (neat): ν = 2225; 1731; 1618; 1500; 1151; cm^{-1}. FTMS: calc. for $C_{18}H_{16}N_2O_3S$ $(M+H)^+$, 341.0954; found, 341.0951.

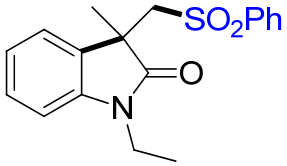


3la

12) **1, 3-Dimethyl-5-nitro-3-((phenylsulfonyl)methyl)indolin-2-one (3la)**

The reaction of **1l** (44.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 62.6 mg (87%) of **3la**; **3la**: yellow solid; Mp: 198.6-200.3 ℃. ^1H NMR (d_6-DMSO, 400 MHz): 8.12 (dd, J = 8.4 Hz, J = 2.4 Hz, 1H); 7.90 (d, J = 2.4 Hz, 1H); 7.52-7.48 (m, 1H); 7.38-7.24 (m, 4H); 7.21 (d, J = 8.8 Hz, 1H); 4.64 (d, J = 15.2 Hz, 1H, CH_2); 3.82 (d, J = 14.8 Hz, 1H, CH_2); 3.24 (s, 3H); 1.33 (s, 3H).^{13}C NMR (d_6-DMSO,

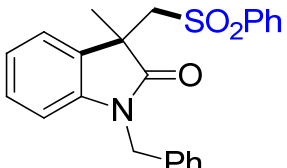
100 MHz): 177.6; 149.2; 142.2; 139.4; 133.0; 130.0; 128.8; 126.9; 125.5; 120.0; 108.6; 59.8; 44.9; 26.7; 24.0. IR (neat): ν = 3058; 1728; 1615; 1513; 1136; cm^{-1}. FTMS: calc. for $C_{17}H_{16}N_2O_5S$ $(M+H)^+$, 361.0853; found, 361.0852.



3ma

13) **1-Ethyl-3-methyl-3-((phenylsulfonyl)methyl)indolin-2-one (3ma)**

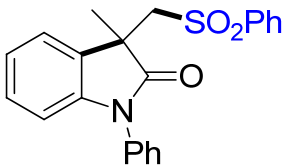
The reaction of **1m** (38.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (42 mg, 0.3 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 59.4 mg (90%) of **3ma**; **3ma**: white solid; Mp: 172.5-173.6 ℃. ^1H NMR ($CDCl_3$, 400 MHz): 7.53-7.48 (m, 3H); 7.35 (t, J = 8.0 Hz, 2H); 7.24 (t, J = 7.6 Hz, 1H); 6.95 (d, J = 7.6 Hz, 1H); 6.87 (d, J = 7.6 Hz, 1H); 6.81 (t, J = 7.6 Hz, 1H); 3.87 (d, J = 14.4 Hz, 1H, CH_2); 3.83-3.75 (m, 1H); 3.72-3.68 (m, 2H); 1.37 (s, 3H); 1.31 (t, J = 7.2 Hz, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 177.1; 142.2; 140.0; 133.2; 129.6; 128.8; 128.4; 127.5; 123.9; 122.2; 108.4; 61.6; 45.4; 34.8; 25.4; 12.1. IR (neat): ν = 2976; 1711; 1613; 1472; 1127; 754; cm^{-1}. FTMS: calc. for $C_{18}H_{19}NO_3S$ $(M+H)^+$, 330.1158; found, 330.1159.



3na

14) **1-Benzyl-3-methyl-3-((phenylsulfonyl)methyl)indolin-2-one (3na)**

The reaction of **1n** (50.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (42 mg, 0.3 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 66.4 mg (85%) of **3na**; **3na**: colorless oil; ^1H NMR ($CDCl_3$, 400 MHz): 7.54-7.50 (m, 3H); 7.38-7.30 (m, 6H); 7.27-7.25 (m, 1H); 7.14-7.10 (m, 1H); 7.00-6.98 (m, 1H); 6.82-6.78 (m, 1H); 6.70 (d, J = 8.0 Hz, 1H); 4.99 (d, J = 15.6 Hz, 1H, CH_2); 3.79 (d, J = 16.0 Hz, 1H, CH_2); 3.93 (d, J = 14.8 Hz, 1H, CH_2); 3.75 (d, J = 14.4 Hz, 1H, CH_2); 1.44 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 177.8; 142.3; 140.0; 135.7; 133.3; 129.4; 128.9; 128.6; 128.4; 127.7; 127.5; 127.3; 123.8; 122.5; 109.5; 61.5; 45.6; 44.2; 25.9. IR (neat): ν = 3031; 2974; 1719; 1612; 748; cm^{-1}. FTMS: calc. for $C_{23}H_{21}NO_3S$ $(M+H)^+$, 392.1315; found, 392.1320.

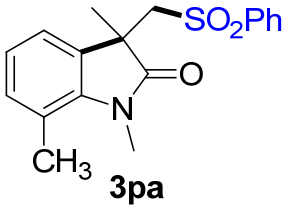


3oa

15) **3-Methyl-1-phenyl-3-((phenylsulfonyl)methyl)indolin-2-one (3oa)**

The reaction of **1o** (47.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (42 mg, 0.3 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 65.1 mg (86%) of **3oa**; **3oa**: white solid; Mp:

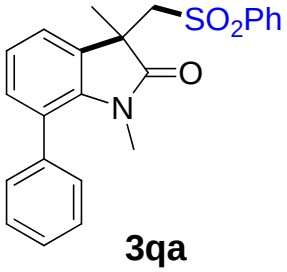
210.1-212.9 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.55-7.51 (m, 7H); 7.49-7.33 (m, 3H); 7.17 (t, *J* = 8.0 Hz, 1H); 6.95 (d, *J* = 7.2 Hz, 1H); 6.82 (t, *J* = 8.0 Hz, 2H); 3.98 (d, *J* = 14.4 Hz, 1H, CH_2); 3.79 (d, *J* = 14.4 Hz, 1H, CH_2); 1.49 (s, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz): 177.3; 143.6; 140.3; 134.5; 133.2; 129.6; 129.2; 129.0; 128.4; 128.2; 127.5; 126.8; 123.8; 122.8; 109.6; 62.3; 45.6; 25.6. IR (neat): *v* = 3038; 2946; 1728; 1637; 733; cm^{-1}. FTMS: calc. for $C_{22}H_{19}NO_3S$ $(M+H)^+$, 378.1158; found, 378.1162.



3pa

16) **1, 3, 7-Trimethyl-3-((phenylsulfonyl)methyl)indolin-2-one (3pa)**

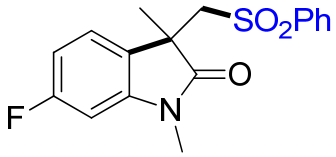
The reaction of **1p** (38.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 25.0 mg (38%) of **3pa**; **3pa**: yellow solid; Mp: 160.0-161.3 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.56-7.50 (m, 3H); 7.41-7.36 (m, 2H); 7.00 (d, *J* = 6.8 Hz, 1H); 6.88 (d, *J* = 6.8 Hz, 1H); 6.78 (t, *J* = 7.2 Hz, 1H); 3.89 (d, *J* = 14.8 Hz, 1H, CH_2); 3.65 (d, *J* = 14.4 Hz, 1H, CH_2); 3.44 (s, 3H); 2.58 (s, 3H); 1.35 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 178.4; 141.1; 140.0; 133.3; 132.3; 128.8; 127.9; 127.8; 122.4; 121.9; 120.0; 62.2; 45.0; 29.9; 25.9; 19.0. IR (neat): *v* = 2981; 1709; 1649; 1141; 1082; cm^{-1}. FTMS: calc. for $C_{18}H_{19}NO_3S$ $(M+H)^+$, 330.1158; found, 330.1154.



3qa

17) **1, 3-Dimethyl-7-phenyl-3-((phenylsulfonyl)methyl)indolin-2-one (3qa)**

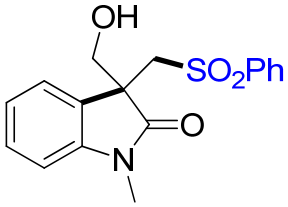
The reaction of **1q** (50.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 43.0 mg (55%) of **3qa**; **3qa**: yellow solid; Mp: 207.6-210.0 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.57-7.49 (m, 5H); 7.47-7.37 (m, 5H); 7.91 (dd, *J* = 7.6 Hz, *J* = 1.2 Hz, 1H); 7.01 (dd, *J* = 7.6 Hz, *J* = 1.2 Hz, 1H); 6.87 (t, *J* = 7.6 Hz, 1H); 3.92 (d, *J* = 14.8 Hz, 1H, CH_2); 3.73 (d, *J* = 14.4 Hz, 1H, CH_2); 2.70 (s, 3H); 1.43 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 178.7; 140.2; 138.7; 133.3; 131.5; 130.3; 129.4; 128.9; 128.2; 127.7; 127.6; 126.3; 125.8; 122.9; 121.8; 62.1; 45.0; 30.6; 25.7; IR (neat): *v* = 2977; 1714; 1684; 1307; 1147; cm^{-1}. FTMS: calc. for $C_{23}H_{21}NO_3S$ $(M+H)^+$, 392.1319; found, 392.1310.



3ra

18) **6-Fluoro-1, 3-dimethyl-3-((phenylsulfonyl)methyl)indolin-2-one (3ra)**

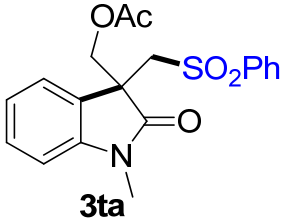
The reaction of **1r** (39.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 60.1 mg (87%) of **3ra**; **3ra**: white solid; Mp: 177.2-179.6 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.59-7.54 (m, 3H); 7.43-7.39 (m, 2H); 7.16 (dd, J = 7.6Hz, J = 1.2 Hz, 1H); 7.69 (d, J = 1.2 Hz, 1H); 6.85 (d, J = 8.4 Hz, 1H); 3.87 (d, J = 14.8 Hz, 1H, CH_2); 3.69 (d, J = 14.8 Hz, 1H, CH_2); 3.20 (s, 3H); 1.41 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 177.4; 144.5 (d, J = 1.6 Hz); 140.8 (d, J = 216.0 Hz); 133.6; 131.0; 129.1 (d, J = 20.7 Hz); 127.6 (d, J = 6.2 Hz); 121.6; 119.1; 118.1; 108.8; 61.6; 45.9; 26.7; 25.2; IR (neat): ν = 2975; 1726; 1621; 1496; 1085; 687; cm^{-1}. MS (70 eV): m/z (%). 333.1 (M^+, 100).



3sa

19) **3-(Hydroxymethyl)-1-methyl-3-((phenylsulfonyl)methyl)indolin-2-one (3sa)**

The reaction of **1s** (38.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 36.4 mg (55%) of **3sa**; **3sa**: white solid; Mp: 172.4-174.6 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.57-7.54 (m, 3H); 7.40 (t, J = 7.6 Hz, 2H); 7.33 (t, J = 8.0 Hz, 1H); 7.10 (d, J = 7.6 Hz, 1H); 6.96-6.87 (m, 2H); 4.08 (d, J = 14.8 Hz, 1H, CH_2); 3.88 (d, J = 14.8 Hz, 1H, CH_2); 3.72 (d, J = 10.8 Hz, 1H, CH_2); 3.64 (d, J = 11.2 Hz, 1H, CH_2); 3.20 (s, 3H); 2.63 (brs, 1H). ^{13}C NMR ($CDCl_3$, 100 MHz): 176.3; 143.9; 140.0; 133.4; 129.2; 128.9; 127.7; 125.5; 124.7; 122.7; 108.6; 67.5; 58.2; 50.8; 26.5; IR (neat): ν = 3434; 2924; 1706; 1616; 1307; 1147; cm^{-1}. FTMS: calc. for $C_{17}H_{17}NO_4S$ $(M+H)^+$, 332.0951; found, 332.0943.

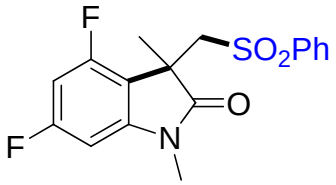


3ta

20) **1-Methyl-2-oxo-3-((phenylsulfonyl)methyl)indolin-3-yl)methyl acetate (3ta)**

The reaction of **1t** (47.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 47.8 mg (64%) of **3ta**; **3ta**: white solid; Mp: 178.3-180.9 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.58-7.50 (m, 3H); 7.40 (t, J = 7.6 Hz, 2H); 7.33 (t, J = 7.6 Hz, 1H); 7.09 (d, J = 7.6Hz, 1H); 6.93-6.85 (m, 2H); 4.31 (d, J = 14.8 Hz, 1H, CH_2); 4.03 (d, J = 14.8 Hz, 1H, CH_2); 3.94 (d, J = 17.6 Hz, 1H, CH_2); 3.88 (d, J = 18.4 Hz, 1H, CH_2); 3.17

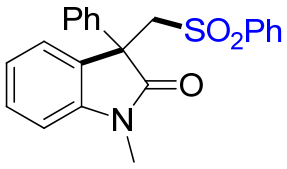
(s, 3H); 1.97 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 174.3; 169.9; 143.9; 139.7; 133.5; 129.4; 128.9; 127.8; 125.2; 125.1; 122.5; 108.5; 67.1; 58.0; 49.2; 26.6; 20.5; IR (neat): ν = 2936; 1746; 1719; 1616; 1471; 751; cm^{-1}. FTMS: calc. for $C_{19}H_{19}NO_5S$ $(M+H)^+$, 374.1057; found, 374.1060.



3ua

21) **4, 6-Difluoro-1, 3-dimethyl-3-((phenylsulfonyl)methyl)indolin-2-one (3ua)**

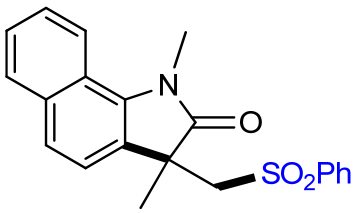
The reaction of **1u** (42.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 57.2 mg (81%) of **3ua**; **3ua**: yellow solid; Mp: 155.1-156.4 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.58-7.54 (m, 3H); 7.43 (t, J = 7.6 Hz, 2H); 6.46 (d, J = 8.0 Hz, 1H); 6.24-6.20 (m, 1H); 3.88 (d, J = 14.4 Hz, 1H, CH_2); 3.83 (d, J = 14.4 Hz, 1H, CH_2); 3.20 (s, 3H); 1.42 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 177.3; 162.8 (dd, J = 260.0 Hz, J = 13.0 Hz); 160.1 (dd, J = 261.1 Hz, J = 14.4 Hz); 145.9 (d, J = 12.1 Hz); 139.4; 129.3; 129.0 (d, J = 7.1 Hz); 128.1; 127.6; 97.7 (t, J = 26.2 Hz); 93.7 (dd, J = 27.0 Hz, J = 3.5 Hz); 60.7; 44.3; 27.1; 23.6;. IR (neat): ν = 2974; 1718; 1654; 1318; 766; cm^{-1}. FTMS: calc. for $C_{17}H_{15}F_2NO_3S$ $(M+H)^+$, 352.0814; found, 352.0813.



3va

22) **1-Methyl-3-phenyl-3-((phenylsulfonyl)methyl)indolin-2-one (3va)**

The reaction of **1v** (38.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 52.8 mg (70%) of **3va**; **3va**: yellow solid; Mp: 185.1-188.4 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.91 (d, J = 7.2 Hz, 2H); 7.79-7.70 (m, 4H); 7.54-7.50 (m, 3H); 7.45-7.41 (m, 2H); 7.00 (d, J = 8.4 Hz, 3H); 4.27 (s, 1H); 3.26 (s, 1H); 3.20 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 168.9; 142.4; 133.8; 133.3; 129.8; 129.3; 129.1; 128.9; 128.7; 128.6; 128.0; 127.9; 127.8; 127.7; 127.2; 59.5; 43.0; 38.0. IR (neat): ν = 3058; 2988; 1713; 1613; 757; cm^{-1}. MS (70 eV): m/z (%). 377.1 (M^+, 100).

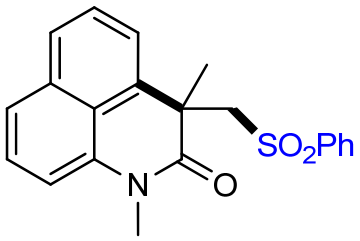


3wa

23) **1, 3-Dimethyl-3-((phenylsulfonyl)methyl)-1H-benzo[g]indol-2(3H)-one (3wa)**

The reaction of **1w** (45.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg,

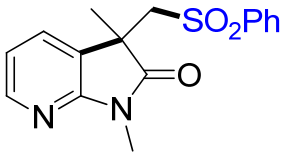
0.02 mmol) in MeCN (2 mL) afforded 40.1 mg (55%) of **3wa**; **3wa**: white solid; Mp: 199.3-200.8 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 8.64 (d, *J* = 8.4 Hz, 1H); 8.41 (d, *J* = 8.4 Hz, 1H); 7.56-7.49 (m, 3H); 7.44-7.40 (m, 3H); 7.39-7.32 (m, 2H); 7.05 (d, *J* = 8.4 Hz, 1H); 4.61 (d, *J* = 14.4 Hz, 1H, CH_2); 3.96 (d, *J* = 14.4 Hz, 1H, CH_2); 3.62 (s, 3H); 1.68 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 171.1; 142.1; 141.1; 140.5; 134.6; 133.4; 129.6; 129.0; 127.4; 126.9; 126.0; 125.3; 122.9; 119.4; 107.2; 65.9; 45.6; 33.5; 30.6; IR (neat): *v* = 3058; 2977; 1655; 1585; 1387; 1141; cm^{-1}. FTMS: calc. for $C_{21}H_{19}NO_3S$ $(M+H)^+$,; 366.1158; found, 366.1155.



3wa'

24) **1, 3-Dimethyl-3-((phenylsulfonyl)methyl)-1H-benzo[de]quinolin-2(3H)-one (3wa')**

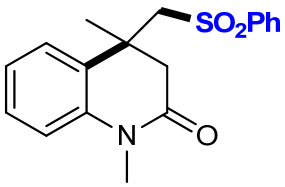
The reaction of **1w** (45.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 15.3 mg (21%) of **3wa'**; **3wa'**: yellow solid; Mp: 210.6-212.5 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.64 (d, *J* = 8.0 Hz, 1H); 7.50 (d, *J* = 8.0 Hz, 1H); 7.44 (t, *J* = 7.6 Hz, 2H); 7.40 (d, *J* = 7.6 Hz, 2H); 7.24-7.16 (m, 4H); 6.97 (d, *J* = 7.6 Hz, 1H); 4.62 (d, *J* = 14.8 Hz, 1H, CH_2); 3.92 (d, *J* = 14.4 Hz, 1H, CH_2); 3.50 (s, 3H); 1.63 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 170.8; 140.4; 136.2; 133.3; 133.2; 132.9; 128.6; 127.5; 126.7; 126.5; 126.4; 123.6; 122.6; 119.1; 108.8; 65.7; 45.5; 33.6; 29.9. IR (neat): *v* = 2928; 1710; 1676; 1528; 1149; cm^{-1}. FTMS: calc. for $C_{21}H_{19}NO_3S$ $(M+H)^+$, 366.1158; found, 366.1149.



3xa

25) **1, 3-Dimethyl-3-((phenylsulfonyl)methyl)-1H-pyrrolo[2,3-b]pyridin-2(3H)-one (3xa)**

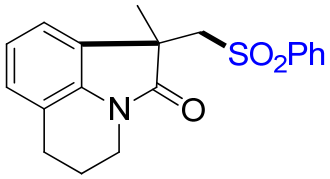
The reaction of **1x** (35.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 45.5 mg (72%) of **3xa**; **3xa**: yellow solid; Mp: 166.4-169.1 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 8.22 (dd, *J* = 5.2 Hz, *J* = 1.6 Hz, 1H); 7.63-7.57 (m, 3H); 7.54-7.43 (m, 3H); 6.90 (dd, *J* = 7.2 Hz, *J* = 5.6 Hz, 1H); 3.85 (d, *J* = 14.8 Hz, 1H, CH_2); 3.68 (d, *J* = 14.4 Hz, 1H, CH_2); 3.22 (s, 3H); 1.45 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 177.3; 147.5; 139.7; 133.7; 132.0; 129.2; 128.0; 127.8; 120.9; 118.2; 61.1; 45.3; 25.6; 24.8. IR (neat): *v* = 2964; 1718; 1622; 1588; 841; cm^{-1}. FTMS: calc. for $C_{16}H_{16}N_2O_3S$ $(M+H)^+$, 317.0954; found, 317.0953.



3ya

26) **1, 4-Dimethyl-4-((phenylsulfonyl)methyl)-3,4-dihydroquinolin-2(1H)-one (3ya)**

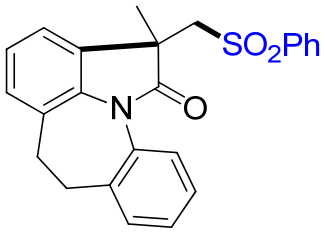
The reaction of **1y** (38.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 53.5 mg (81%) of **3ya**; **3ya**: brown solid; Mp: 132.3-134.8 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.63 (d, J = 7.2 Hz, 2H); 7.56-7.52 (m, 1H); 7.43-7.39 (m, 3H); 7.25-7.21 (m, 1H); 7.10-7.06 (m, 1H); 6.81 (d, J = 8.0 Hz, 1H); 3.40 (d, J = 14.8 Hz, 1H, CH_2); 3.28 (d, J = 14.4 Hz, 1H, CH_2); 3.22 (s, 3H); 2.96 (d, J = 16.0 Hz, 1H, CH_2); 2.58 (d, J = 16.0 Hz, 1H, CH_2); 1.78 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 168.2; 140.7; 139.2; 133.2; 129.6; 129.0; 128.6; 127.3; 126.0; 123.4; 115.0; 61.9; 44.2; 36.1; 29.2; 24.8. IR (neat): ν = 2919; 1677; 1599; 1368; 1130; 750; cm^{-1}. FTMS: calc. for $C_{18}H_{19}NO_3S$ $(M+H)^+$, 330.1158; found, 330.1155.



3za

27) **1-Methyl-1-((phenylsulfonyl)methyl)-5,6-dihydro-1H-pyrrolo[3,2,1-ij]quinolin-2(4H)-one, (3za)**

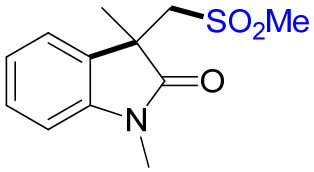
The reaction of **1z** (40.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (42 mg, 0.3 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 50.8 mg (74%) of **3za**; **3za**: white solid; Mp: 141.6-143.1 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.56-7.52 (m, 3H); 7.40-7.37 (m, 2H); 7.02 (dd, J = 7.6 Hz, J = 0.8 Hz, 1H); 6.91 (d, J = 7.6 Hz, 1H); 6.79 (t, J = 8.0 Hz, 1H); 3.84 (d, J = 14.4 Hz, 1H); 3.72-3.60 (m, 3H); 2.80-2.76 (m, 2H), 2.04-1.97 (m, 2H); 1.41 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 176.4; 140.0; 139.0; 133.3; 128.8; 128.1; 127.7; 127.2; 121.91; 121.89; 120.3; 61.7; 46.7; 39.0; 25.0; 24.5; 20.9. IR (neat): ν = 2974; 1711; 1613; 1309; 753; cm^{-1}. FTMS: calc. for $C_{19}H_{19}NO_3S$ $(M+H)^+$, 342.1158; found, 342.1152.



5

28)**7-Methyl-7-((phenylsulfonyl)methyl)-11,12-dihydrobenzo[6,7]azepino[3,2,1-hi]indol-6(7H)-one (5)**

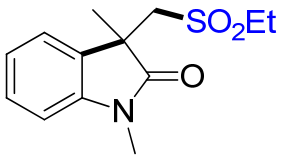
The reaction of **4** (53.0 mg, 0.2 mmol), $PhSO_2H$ **2a** (56 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 55.2 mg (68%) of **5**; **5**: brown solid; Mp: 240.3-242.1 ℃. ^1H NMR ($CDCl_3$, 400 MHz): 7.91-7.87 (m, 1H); 7.59-7.54 (m, 4H); 7.36-7.29 (m, 3H); 7.22-7.19 (m, 2H); 6.99 (d, J = 8.4 Hz, 1H); 6.73 (d, J = 7.6 Hz, 1H); 4.03 (d, J = 14.4 Hz, 1H, CH_2); 3.78 (d, J = 14.8 Hz, 1H, CH_2); 3.08-3.02 (m, 4H); 1.45 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 178.0; 140.2; 136.7; 134.3; 133.2; 130.4; 129.6; 129.3; 129.2; 128.9; 128.1; 127.6; 126.59; 126.55; 126.53; 122.2; 121.2; 67.6; 45.4; 33.72; 33.69; 26.4. IR (neat): ν = 2976; 2926; 1722; 1449; 1321; cm^{-1}. FTMS: calc. for $C_{24}H_{21}NO_3S$ $(M+H)^+$, 404.1315; found, 404.1315.



3ab

29) **1, 3-Dimethyl-3-((methylsulfonyl)methyl)indolin-2-one (3ab)**

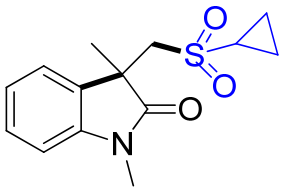
The reaction of **1a** (35.0 mg, 0.2 mmol), $MeSO_2H$ **2b** (48 mg, 0.6 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 32.4 mg (64%) of **3ab**; **3ab**: white solid; Mp: 116.0-117.5 ℃. ^1H NMR ($CDCl_3$, 400 MHz): 7.37-7.33 (m, 2H); 7.12 (t, J = 7.6 Hz, 1H); 6.92 (d, J = 7.6 Hz, 1H); 3.72 (d, J = 14.8 Hz, 1H, CH_2); 3.60 (d, J = 14.8 Hz, 1H, CH_2); 3.26 (s, 3H); 2.61 (s, 3H); 1.46 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 177.7; 143.4; 130.0; 129.1; 123.4; 122.6; 108.9; 60.7; 45.5; 43.2; 26.5; 24.9. IR (neat): ν = 2929; 1714; 1613; 1154; 1123; 756; cm^{-1}. FTMS: calc. for $C_{12}H_{15}NO_3S$ $(M+H)^+$, 254.0845; found, 254.0840.



3ac

30) **3-((Ethylsulfonyl)methyl)-1,3-dimethylindolin-2-one (3ac)**

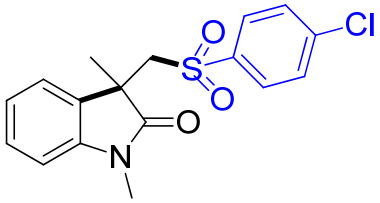
The reaction of **1a** (35.0 mg, 0.2 mmol), $EtSO_2H$ **2c** (40 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 44.2 mg (83%) of **3ac**; **3ac**: colorless oil; ^1H NMR ($CDCl_3$, 400 MHz): 7.38-7.32 (m, 2H); 7.11 (t, J = 7.6 Hz, 1H); 6.91 (d, J = 8.0 Hz, 1H); 3.64 (d, J = 14.4 Hz, 1H, CH_2); 3.54 (d, J = 14.4 Hz, 1H, CH_2); 3.26 (s, 3H); 2.76-2.66 (m, 2H); 1.46 (s, 3H). 1.26 (t, J = 7.6 Hz, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz): 177.9; 143.2; 130.2; 128.9; 123.4; 122.5; 108.7; 57.7; 49.4; 45.4; 26.5; 24.9; 6.27. IR (neat): ν = 2976; 2940; 1713; 1613; 1122; 758; cm^{-1}. FTMS: calc. for $C_{13}H_{17}NO_3S$ $(M+H)^+$, 268.1002; found, 268.0998.



3ad

31) **3-((Cyclopropylsulfonyl)methyl)-1,3-dimethylindolin-2-one (3ad)**

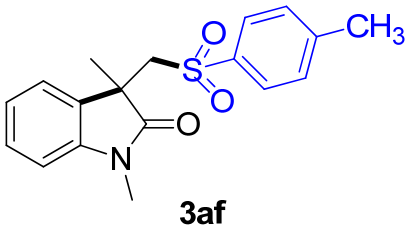
The reaction of **1a** (35.0 mg, 0.2 mmol), cyclopropanesulfinic acid **2d** (42.4 mg, 0.4 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 48.5 mg (87%) of **3ad**; **3ad**: colorless oil; ^{1}H NMR ($CDCl_3$, 400 MHz): 7.39-7.31 (m, 2H); 7.10 (dd, J = 7.2 Hz, J = 1.2 Hz, 1H); 6.91 (d, J = 8.0 Hz, 1H); 3.77 (d, J = 14.4 Hz, 1H, CH_2); 3.62 (d, J = 14.4 Hz, 1H, CH_2); 3.26 (s, 3H); 2.01-1.95 (m, 1H); 1.46 (s, 3H); 1.04-0.99 (m, 2H); 0.88-0.83 (m, 2H). ^{13}C NMR ($CDCl_3$, 100 MHz): 177.9; 143.3; 130.3; 128.9; 123.7; 122.4; 108.7; 59.8; 45.4; 31.4; 26.5; 25.0; 5.9; 5.12; 5.06. IR (neat): v = 2973; 1715; 1613; 1123; 758; cm^{-1}. FTMS: calc. for $C_{14}H_{17}NO_3S$ $(M+H)^+$, 280.1002; found, 280.1004.



3ae

32) **3-(((4-Chlorophenyl)sulfonyl)methyl)-1,3-dimethylindolin-2-one (3ae)**

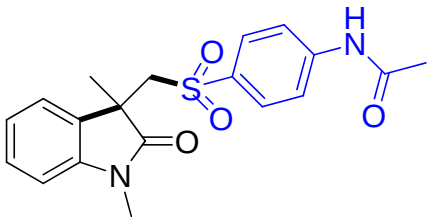
The reaction of **1a** (35.0 mg, 0.2 mmol), 4-chlorobenzenesulfinic acid **2e** (53.1 mg, 0.3 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 54.0 mg (77%) of **3ae**; **3ae**: white solid; Mp: 168.5-170.9 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.38-7.29 (m, 5H); 6.98 (d, J = 7.2 Hz, 1H); 6.91-6.84 (m, 2H); 3.91 (d, J = 14.4 Hz, 1H, CH_2); 3.70 (d, J = 14.8 Hz, 1H, CH_2); 3.17 (s, 3H); 1.38 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 177.4; 143.2; 140.0; 138.2; 129.2; 129.1; 129.0; 128.7; 123.9; 122.4; 108.4; 61.8; 45.4; 26.4; 25.4. IR (neat): v = 2973; 2929; 1715; 1613; 1087; cm^{-1}. FTMS: calc. for $C_{17}H_{16}ClNO_3S$ $(M+H)^+$, 350.0612; found, 350.0607.



3af

33) **1, 3-Dimethyl-3-(tosylmethyl)indolin-2-one (3af)**

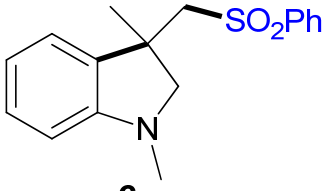
The reaction of **1a** (35.0 mg, 0.2 mmol), 4-methylbenzenesulfinic acid **2f** (46.8 mg, 0.3 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 57.0 mg (87%) of **3af**; **3af**: white solid; Mp: 131.6-133.4 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.36 (d, J = 8.4 Hz, 2H); 7.29-7.25 (m, 1H); 7.15 (d, J = 8.0 Hz, 2H); 7.06 (d, J = 7.2 Hz, 1H); 6.92-6.88 (m, 1H); 6.84 (d, J = 7.6 Hz, 1H); 3.85 (d, J = 14.4 Hz, 1H, CH_2); 3.67 (d, J = 14.8 Hz, 1H, CH_2); 3.15 (s, 3H); 2.38 (s, 3H); 1.38 (s, 3H).^{13}C NMR ($CDCl_3$, 100 MHz): 177.5; 144.2; 143.1; 136.9; 129.45; 129.36; 128.4; 127.7; 124.0; 122.3; 108.3; 61.8; 45.5; 26.4; 25.4; 21.4. IR (neat): v = 2967; 1727; 1696; 1613; 1153; 755; cm^{-1}. FTMS: calc. for $C_{18}H_{19}NO_3S$ $(M+H)^+$, 330.1158; found, 330.1153.



3ag

34) ***N*-(4-(((1, 3-dimethyl-2-oxoindolin-3-yl)methyl)sulfonyl)phenyl)acetamide (3ag)**

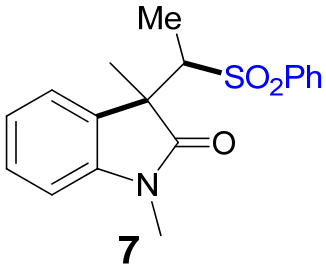
The reaction of **1a** (35.0 mg, 0.2 mmol), 4-Acetamidobenzenesulfinic acid **2g** (60 mg, 0.3 mmol), $Fe(NO_3)_3 \cdot 9H_2O$ (8 mg, 0.02 mmol) in MeCN (2 mL) afforded 46 mg (62%) of **3ag**; **3ag**: white solid; Mp: 212.1-214.2 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 8.31 (s, 1H); 7.53 (d, J = 8.4 Hz, 2H); 7.34-7.25 (m, 3H); 7.04 (d, J = 7.2 Hz, 1H); 6.92-6.84 (m, 2H); 3.86 (d, J = 14.4 Hz, 1H, CH_2); 3.69 (d, J = 14.4 Hz, 1H, CH_2); 3.15 (s, 3H); 2.16 (s, 3H); 1.37 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 177.8; 169.2; 143.1; 133.8; 129.3; 128.9; 128.7; 124.0; 123.1; 122.6; 119.1; 108.5; 61.9; 45.6; 26.6; 25.6; 24.6. IR (neat): ν = 3585; 3326; 2969; 1725; 1590; 841; cm^{-1}. FTMS: calc. for $C_{19}H_{20}N_2O_4S$ $(M+H)^+$, 373.1216; found, 373.1212.



6

34) **1, 3-Dimethyl-3-((phenylsulfonyl)methyl)indoline (6)**

6: yellow oil ; ^{1}H NMR ($CDCl_3$, 400 MHz): 7.91-7.88 (m, 2H); 7.63-7.59 (m, 1H); 7.54-7.50 (m, 2H); 7.09 (td, J = 7.6 Hz, J = 1.2 Hz, 1H); 6.94 (d, J = 7.6 Hz, 1H); 6.65 (td, J = 7.6 Hz, J = 0.8 Hz, 1H); 6.47 (d, J = 7.6 Hz, 1H); 3.88 (d, J = 9.6 Hz, 1H); 3.37 (d, J = 14.0 Hz, 1H); 3.30 (d, J = 14.0 Hz, 1H); 3.13 (d, J = 9.6 Hz, 1H); 2.76 (s, 3H); 1.68 (s, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 151.7; 141.4; 135.9; 133.5; 129.2; 128.6; 127.5; 121.9; 118.1; 107.7; 66.3; 63.2; 43.5; 35.5; 23.7. FTMS: calc. for $C_{17}H_{19}NO_2S$ $(M+H)^+$, 302.1209; found, 302.1205.

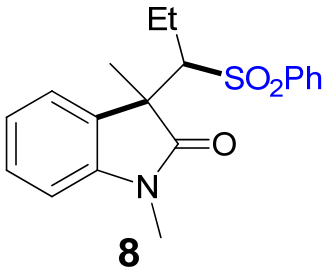


7

35) **1, 3-Dimethyl-3-(-1-(phenylsulfonylethyl)indolin-2-one (7)**

7: yellow oil ; ^{1}H NMR ($CDCl_3$, 400 MHz): 7.96 (d, J = 8.4 Hz, 2H); 7.85 (d, J = 8.8 Hz, 2H); 7.81 (d, J = 8.0 Hz, 1H); 7.53 (t, J = 7.6 Hz, 2H); 7.11 (t, J = 8.4 Hz, 1H); 6.86 (d, J = 7.6 Hz, 1H); 3.75 (q, J = 7.2 Hz, 1H, CH); 3.22 (s, 3H); 3.06 (s, 3H); 1.73 (d, J = 8.0 Hz, 3H). ^{13}C NMR ($CDCl_3$, 100 MHz): 178.2; 133.7; 133.5; 129.4; 129.1; 128.5; 128.3; 127.3; 126.6; 123.0; 108.0;

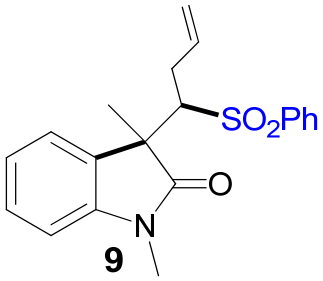
63.9; 44.4; 26.4; 23.6; 12.3; IR (neat): ν = 2929; 1710; 1305; 1149; 745; cm^{-1}. FTMS: calc. for $C_{18}H_{19}NO_3S$ $(M+H)^+$, 330.1158; found, 330.1157.



8

36) **1, 3-Dimethyl-3-(1-(phenylsulfonyl)propyl)indolin-2-one (8)**

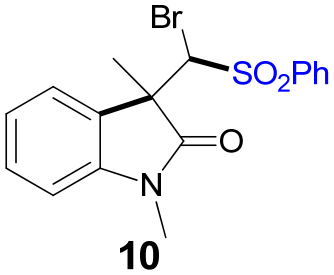
8: colorless oil ; ^1H NMR ($CDCl_3$, 400 MHz): 7.67-7.65 (m, 2H); 7.64-7.54 (m, 1H); 7.44 (t, J = 7.2 Hz, 2H); 7.36-7.28 (m, 2H); 7.04-7.00 (m, 1H); 6.90 (d, J = 8.0 Hz, 1H); 3.80 (t, J = 5.6 Hz, 1H, CH); 3.24 (s, 3H); 2.31-2.23 (m, 2H); 1.41 (s, 3H). 0.98 (t, J = 7.6 Hz, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz): 179.5; 143.5; 140.1; 133.3; 130.2; 128.8; 128.6; 128.5; 124.1; 122.2; 108.7; 71.7; 48.8; 26.6; 25.0; 19.6; 14.6. IR (neat): ν = 2969; 1714; 1612; 1304; 1147; 753; cm^{-1}. FTMS: calc. for $C_{19}H_{21}NO_3S$ $(M+H)^+$, 344.1315; found, 344.1307.



9

37) **1, 3-Dimethyl-3-(1-(phenylsulfonyl)but-3-en-1-yl)indolin-2-one (9)**

9: yellow oil ; ^1H NMR ($CDCl_3$, 400 MHz): 7.67 (d, J = 7.2 Hz, 2H); 7.55 (d, J = 7.6 Hz, 1H); 7.44 (t, J = 7.6 Hz, 2H); 7.35 (t, J = 7.2 Hz, 2H); 7.06 (t, J = 7.6 Hz, 1H); 6.91 (d, J = 7.6 Hz, 1H); 5.70-5.60 (m, 1H, CH); 5.06 (dd, J = 17.2 Hz, J = 1.2 Hz, 1H); 4.97 (dd, J = 10.0 Hz, J = 1.2 Hz, 1H); 4.01 (t, J = 6.0 Hz, 1H); 3.25 (s, 3H); 2.99-2.96 (m, 2H); 1.41 (s, 3H).; ^{13}C NMR ($CDCl_3$, 100 MHz): 179.5; 143.5; 139.6; 135.0; 133.4; 130.1; 128.8; 128.7; 128.5; 124.3; 122.3; 117.8; 108.8; 69.6; 48.8; 30.6; 26.7; 25.2; FTMS: calc. for $C_{20}H_{21}NO_3S$ $(M+H)^+$, 356.1315; found, 356.1315.

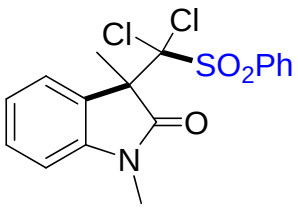


10

38) **3-(Bromo(phenylsulfonyl)methyl)-1,3-dimethylindolin-2-one (10)**

10: white solid; Mp: 176.3-178.6 ℃. ^1H NMR ($CDCl_3$, 400 MHz): 7.70 (d, J = 8.0 Hz, 2H); 7.63-7.59 (m, 1H); 7.44 (t, J = 7.6 Hz, 1H); 7.47-7.43 (m, 2H); 7.38 (t, J = 8.0 Hz, 1H); 7.03 (t, J = 7.6 Hz, 1H); 6.95 (d, J = 7.6 Hz, 1H); 5.42 (s, 1H, CH); 3.31 (s, 3H); 1.55 (s, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz): 176.7; 143.2; 136.7; 134.2; 129.8; 129.3; 128.8; 128.1; 124.8; 122.5; 108.8;

71.0; 49.0; 27.4; 26.8. IR (neat): ν = 2976; 1720; 1656; 1304; 653; cm^{-1}. FTMS: calc. for $C_{17}H_{16}BrNO_3S$ $(M+H)^+$, 394.0107.; found, 394.0104.



11

39) **3-(Dichloro(phenylsulfonyl)methyl)-1,3-dimethylindolin-2-one (11)**

11: white solid; Mp: 164.8-166.9 ℃. ^{1}H NMR ($CDCl_3$, 400 MHz): 7.91 (d, J = 7.2 Hz, 2H); 7.67-7.63 (m, 2H); 7.50-7.47 (m, 2H); 7.38 (t, J = 8.0 Hz, 1H); 7.04 (t, J = 8.0 Hz, 1H); 6.92 (d, J = 8.0 Hz, 1H); 3.30 (s, 3H). 1.84 (s, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz): 173.0; 143.0; 134.8; 133.7; 132.2; 129.7; 128.4; 127.8; 126.0; 122.4; 108.5; 102.9; 53.8; 26.8; 23.3. IR (neat): ν = 2967; 1718; 1645; 1304; 688. MS (70 eV): m/z (%). 383.0 (M^+, 100).

References:

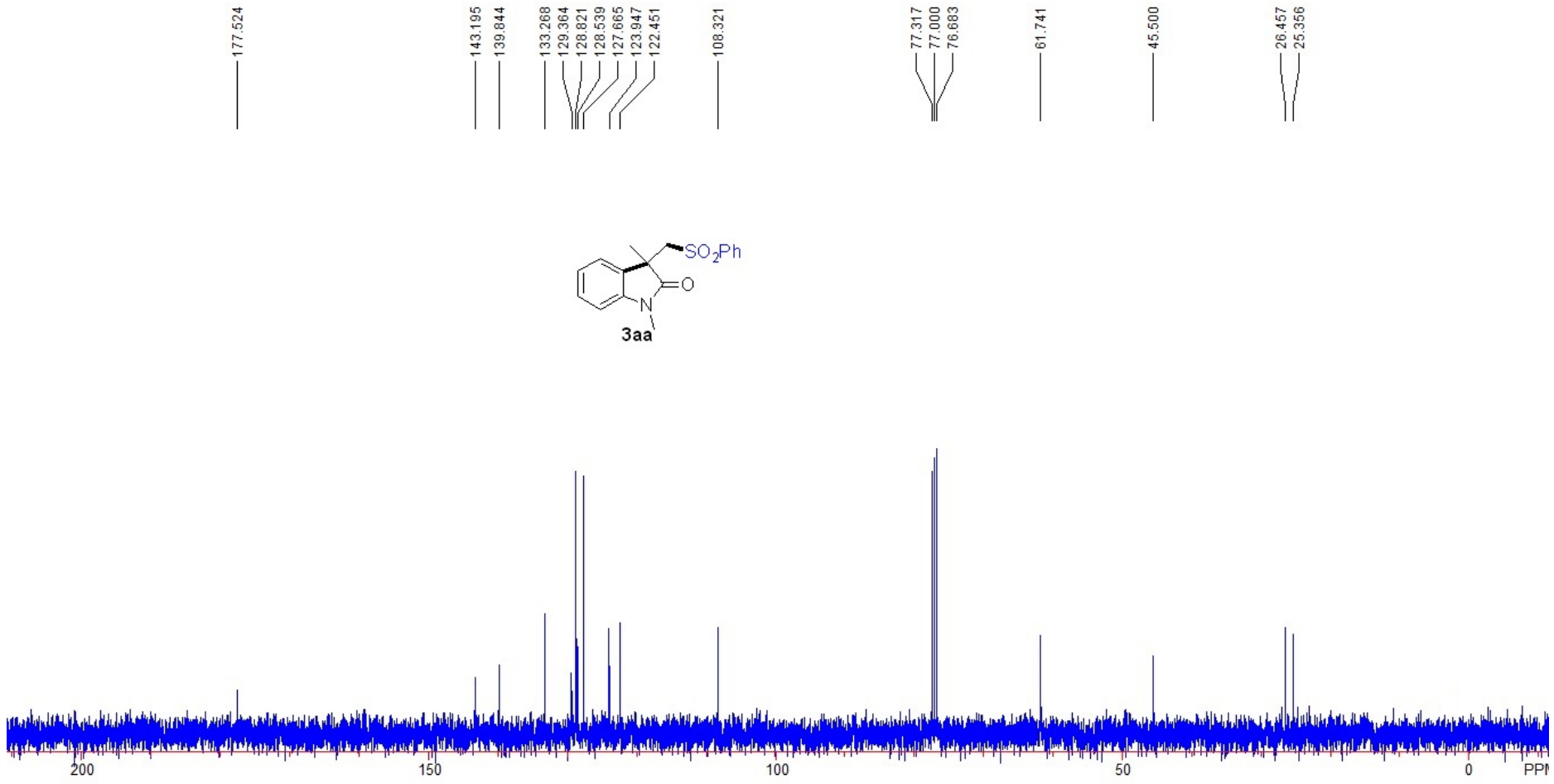
S1. G. C. Tsui, Q. Glenadel, C. Lau, M. Lautens, *Org. Lett*. **2011**, *13*, 208.

S2. A. Pinto, Y. Jia, L. Neuville, J. Zhu, *Chem. Eur. J*. **2007**, *13*, 961.

S3. A. A.-L. Ayitou, J. Sivaguru, *Chem. Commun*. **2011**, *47*, 2568.

S4. Q.-Q. Zhang; J.-H. Xie, X.-H. Yang, J.-B. Xie, Q.-L. Zhou, *Org. Lett*. **2012**, *14*, 6158.

S5.(a) A. Pinto, L. Neuville, P. Retailleau, J. Zhu, *Org. Lett.* **2006**, *8*, 4927-4930; (b) I. J. S. Fairlamb, A. R. Kapdi, A. F. Lee, G. P. Mcglacken, F. Weissburger, A. H. M. de Vries, L. S. van de Vondervoort, *Chem. Eur. J*. **2006**, *12*, 8750-8761.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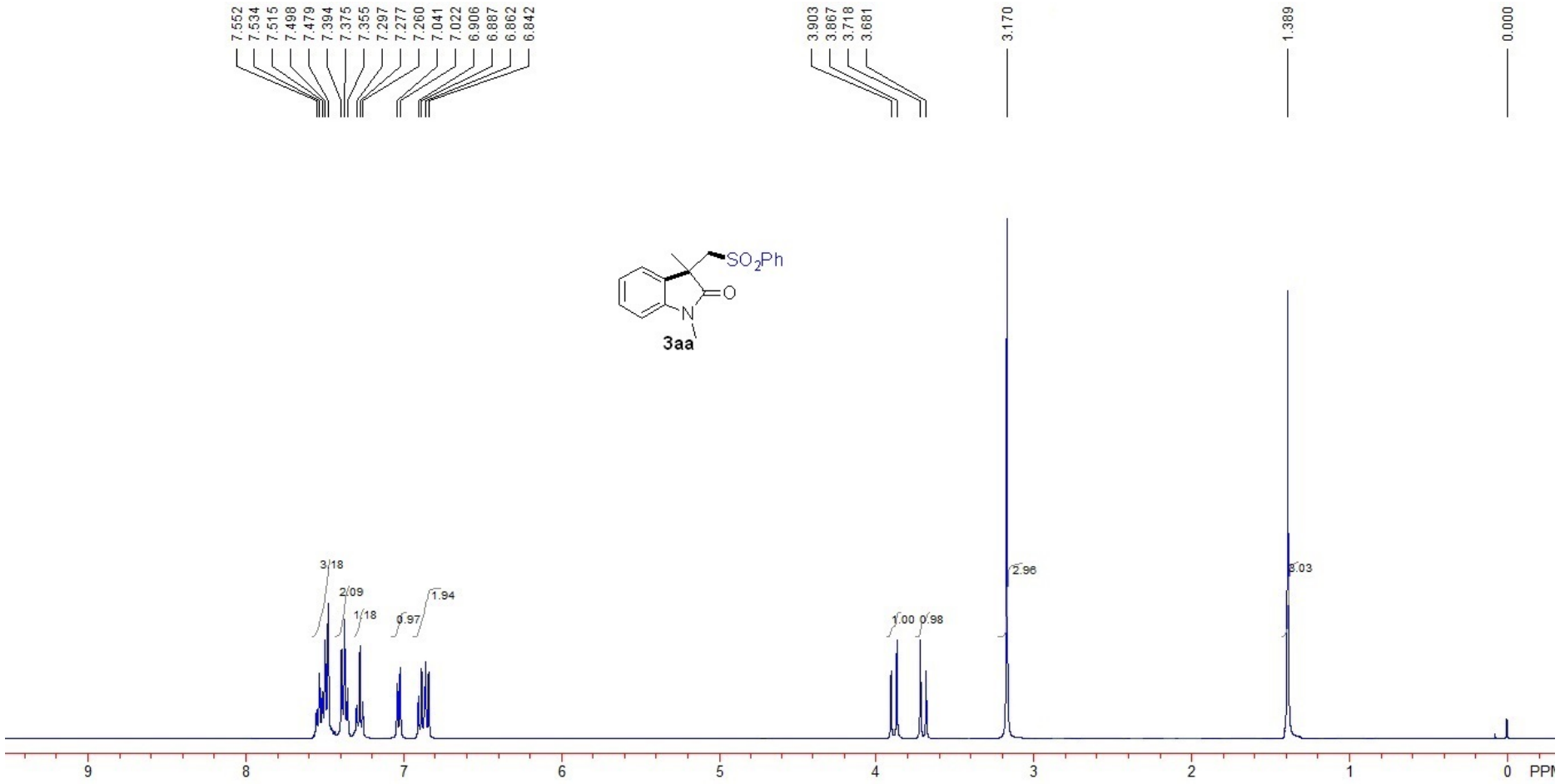
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6.887
6.862
6.842
3.903
3.867
3.718
3.681
3.170
1.389
0.000
SO2Ph
O
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3aa
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2.09
1.18
0.97
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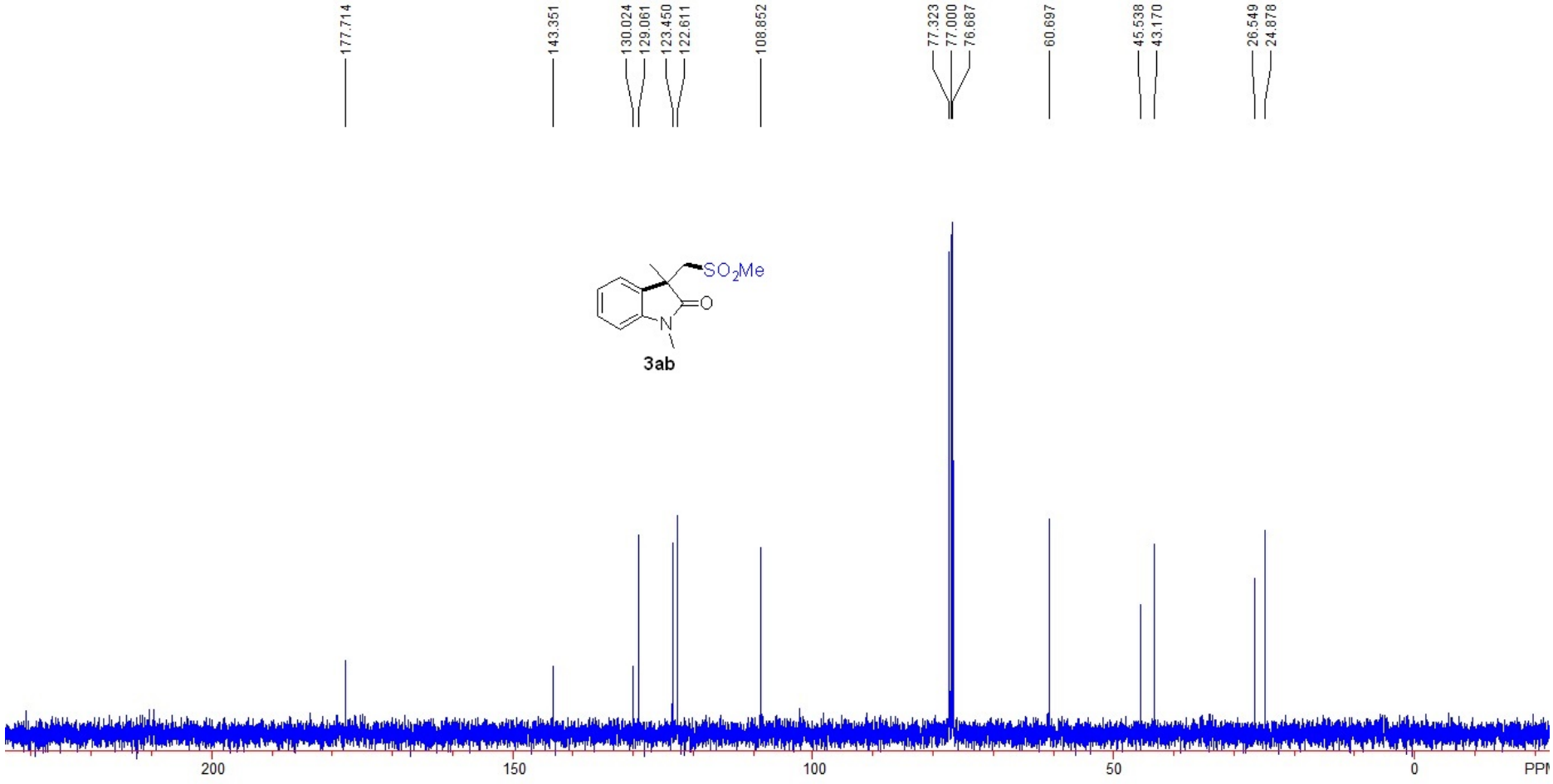
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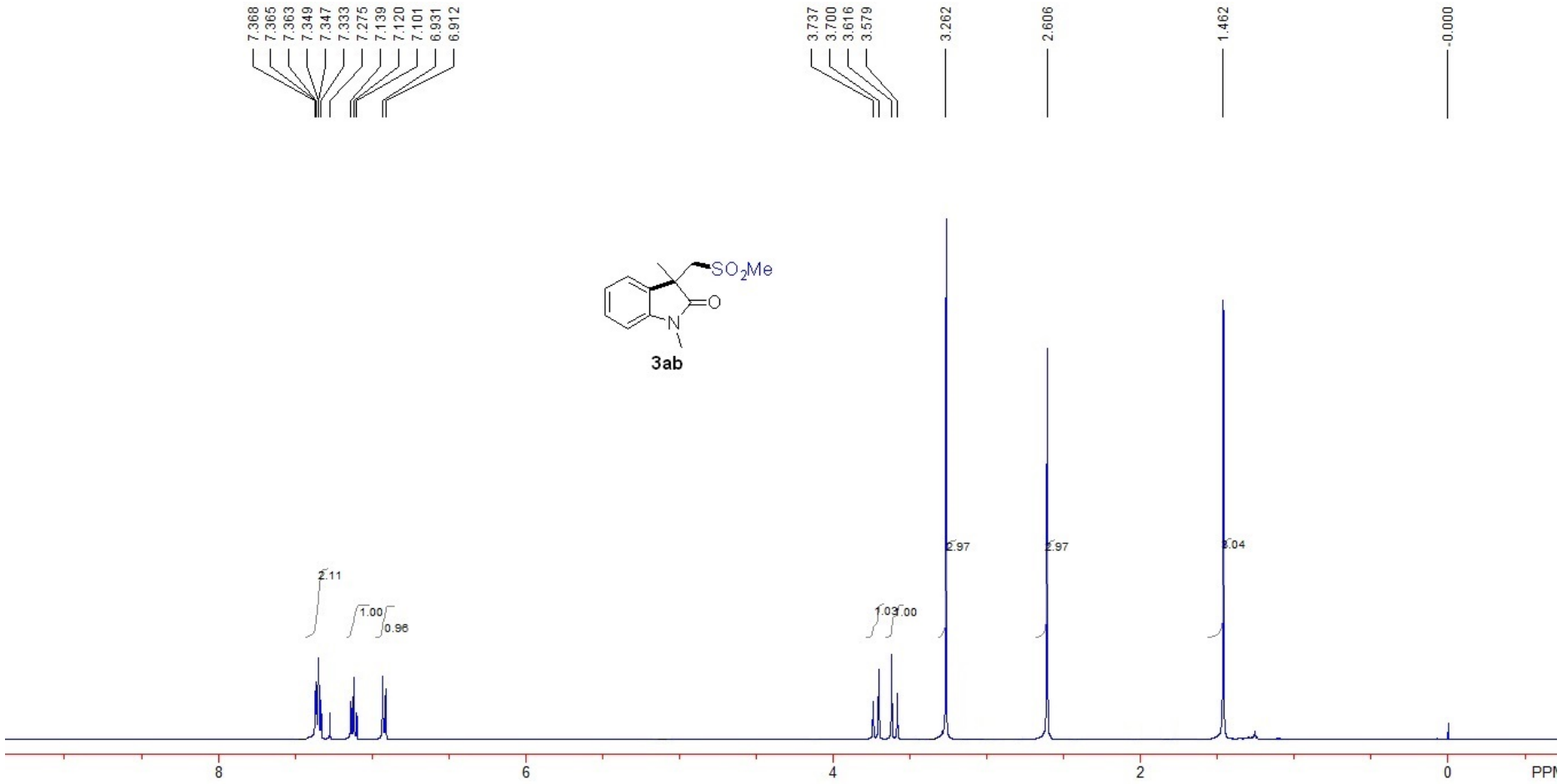
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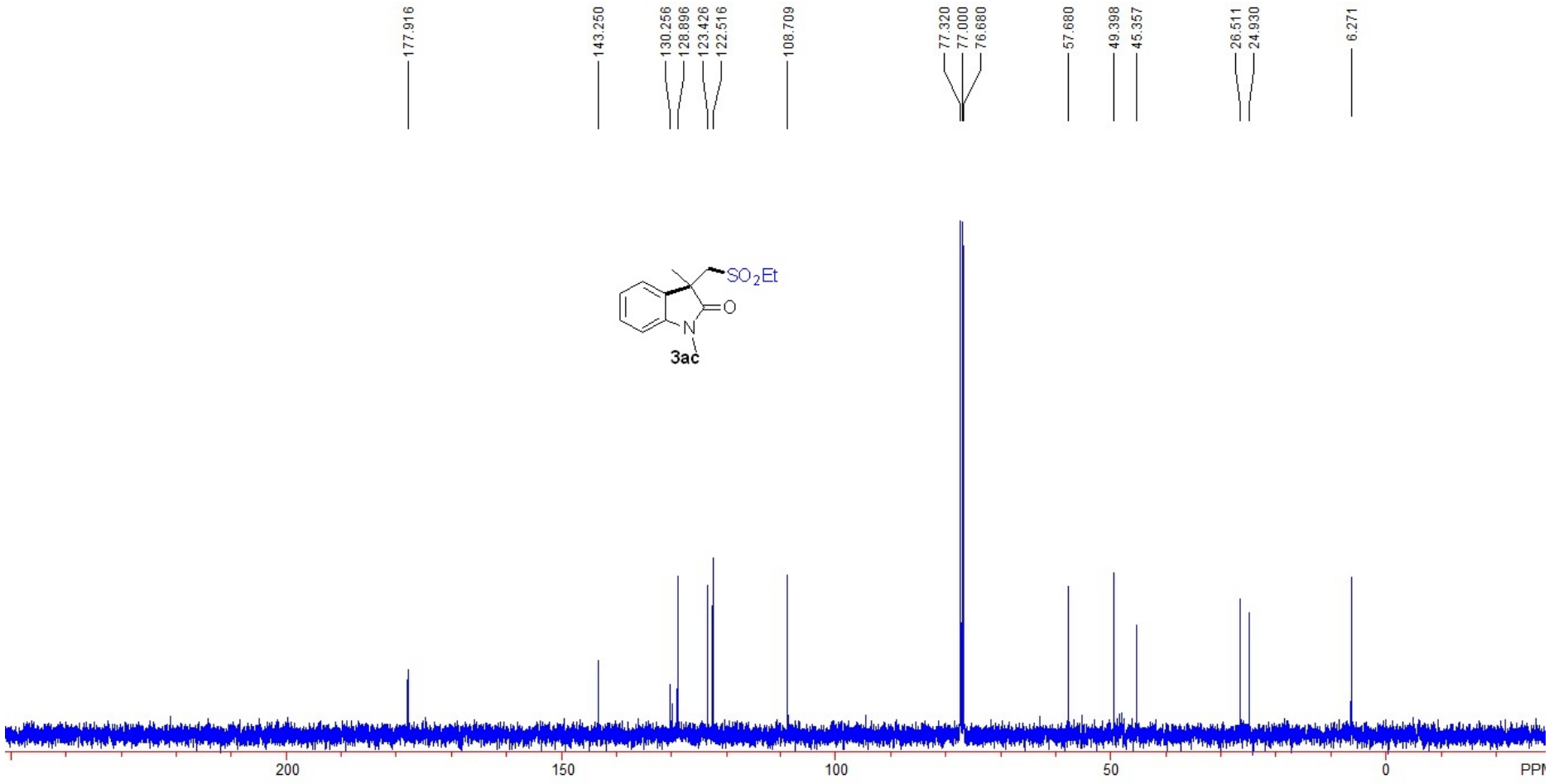
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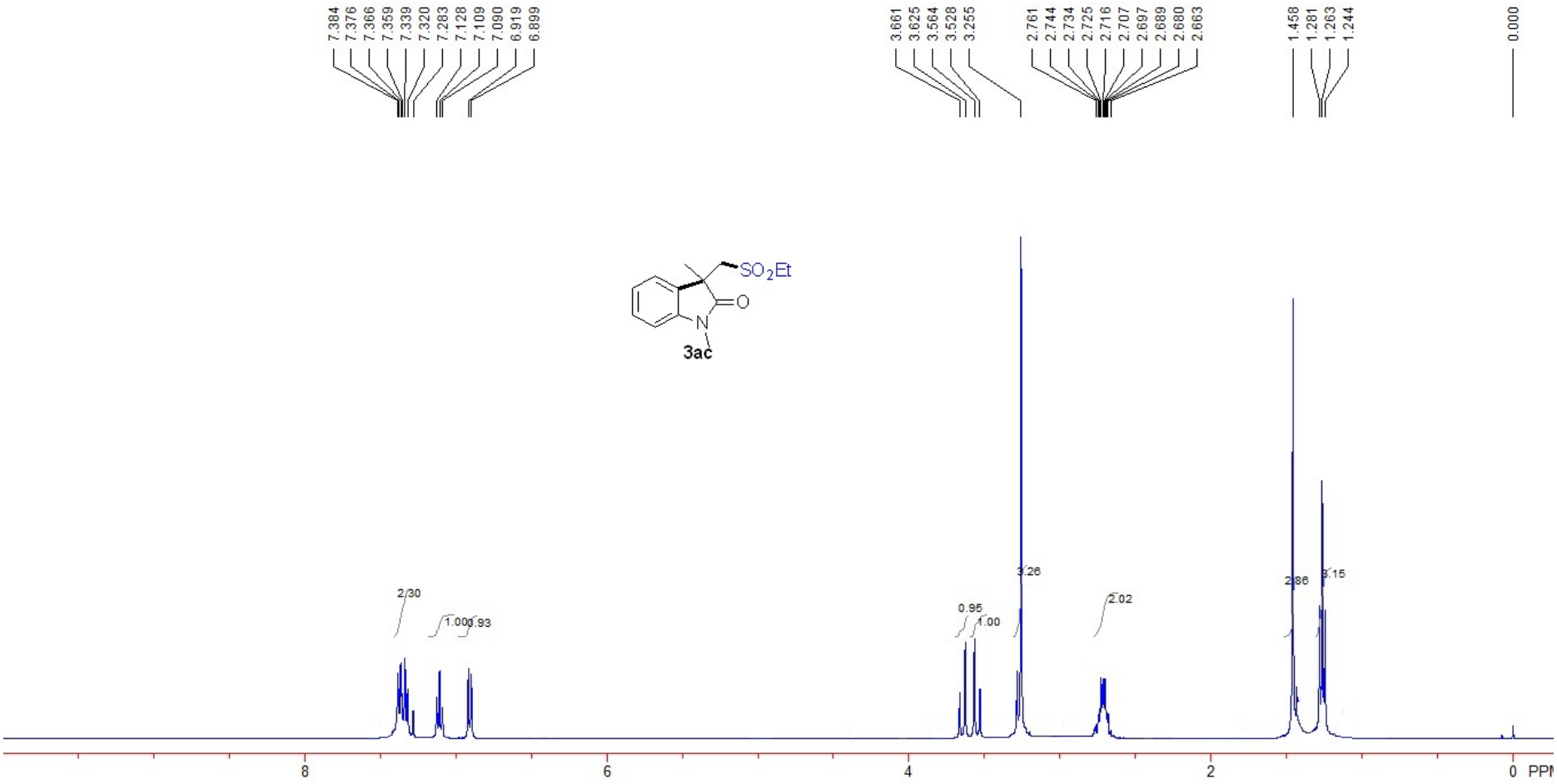
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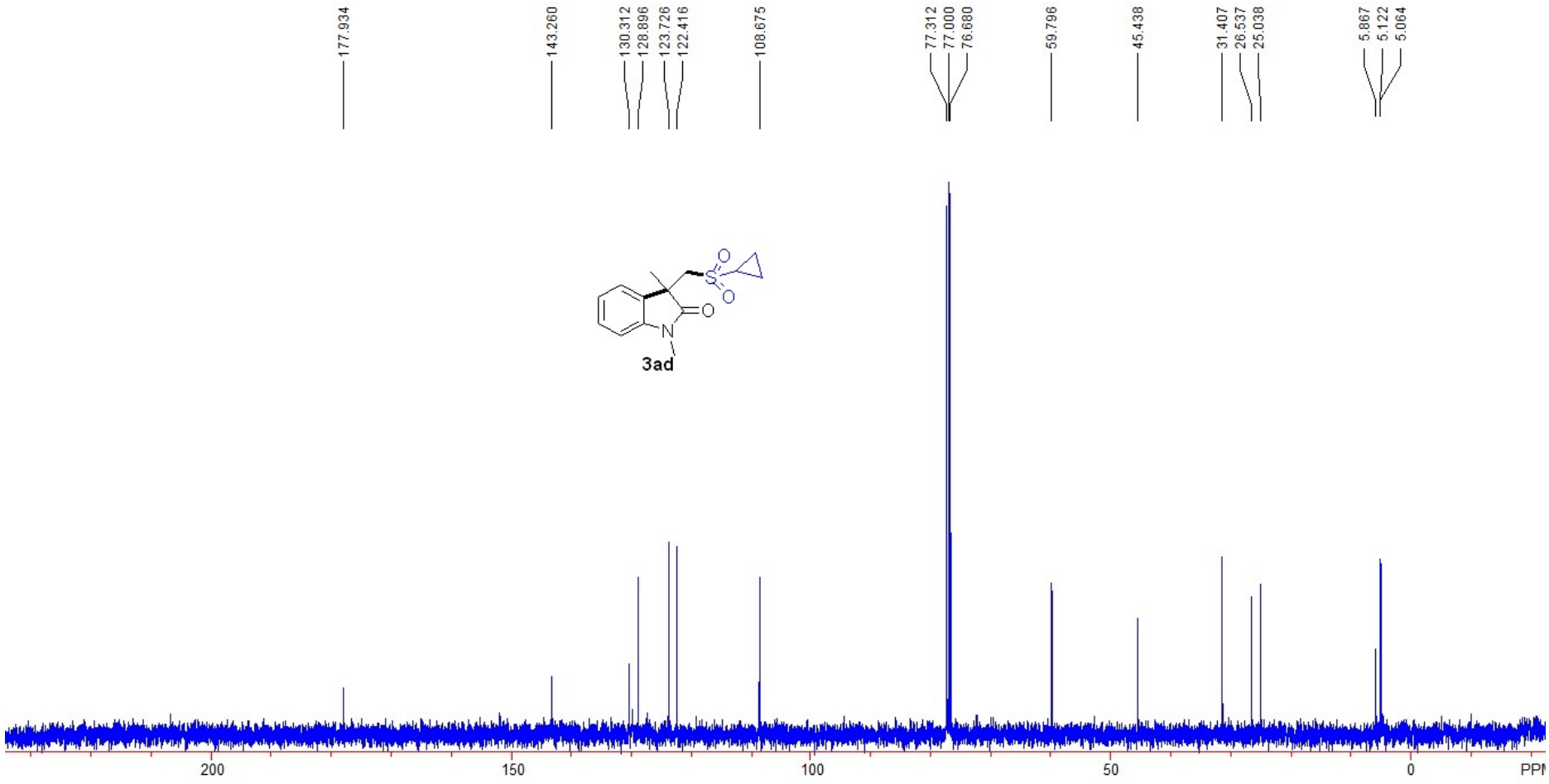
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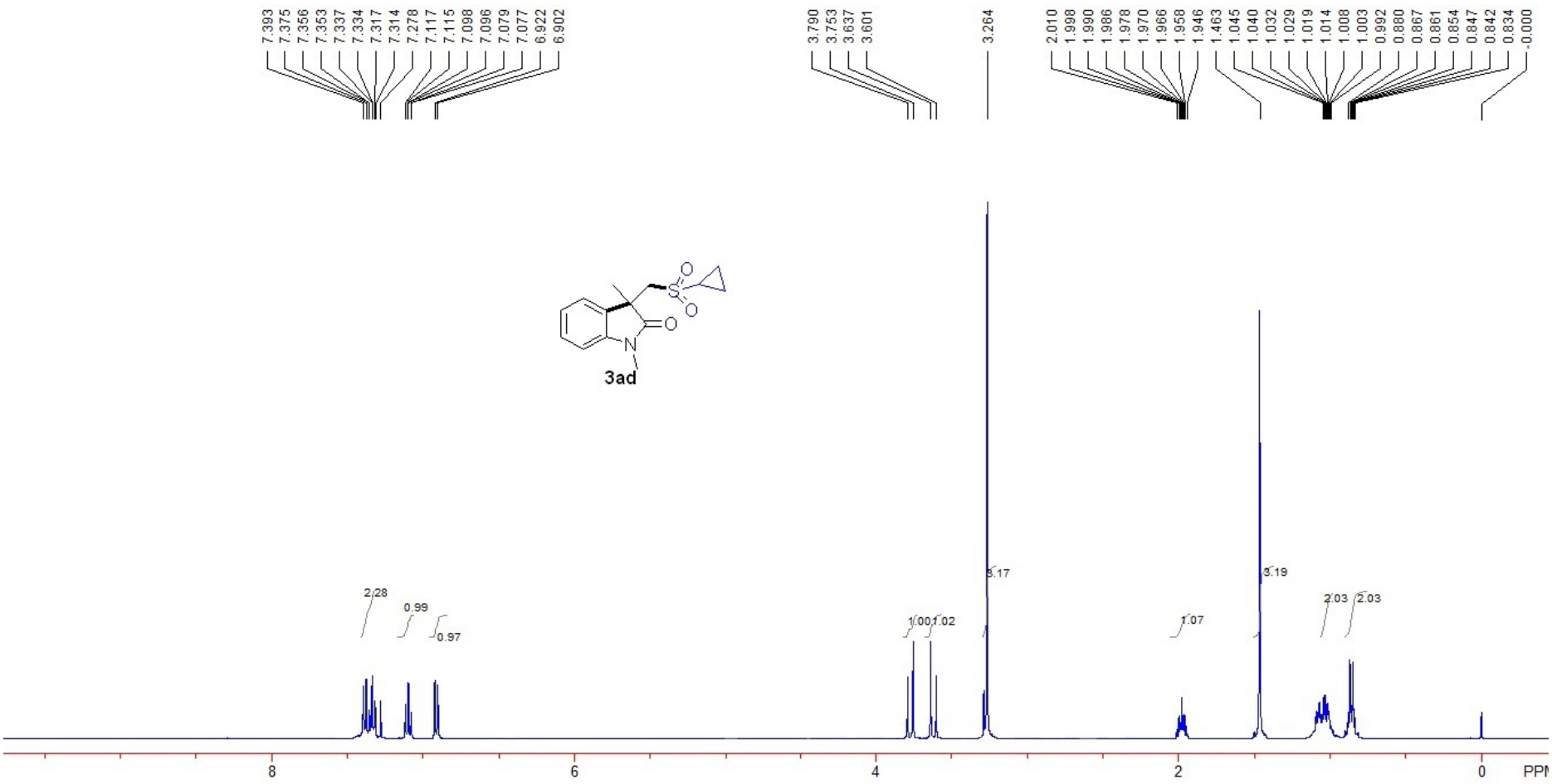
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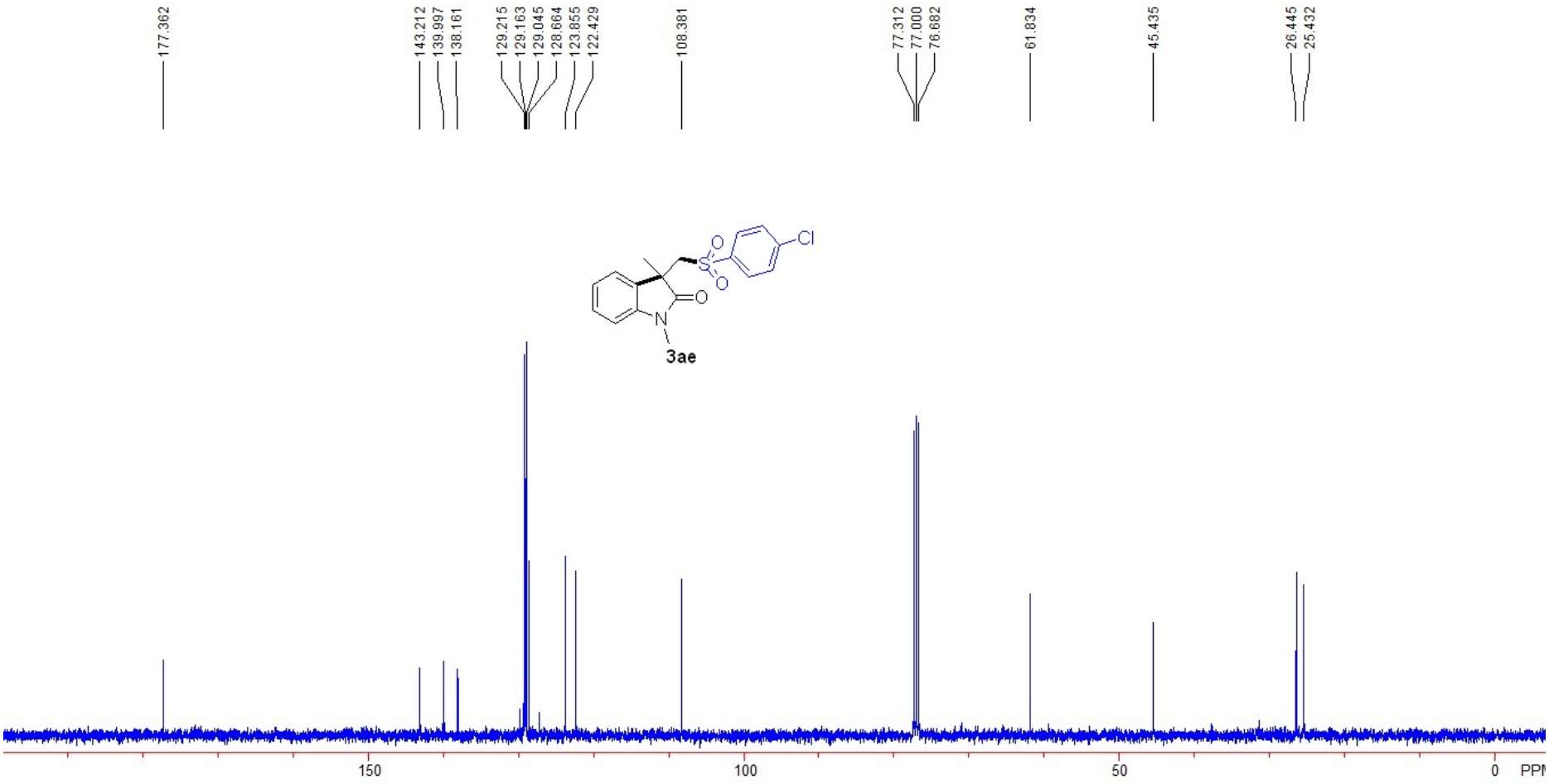
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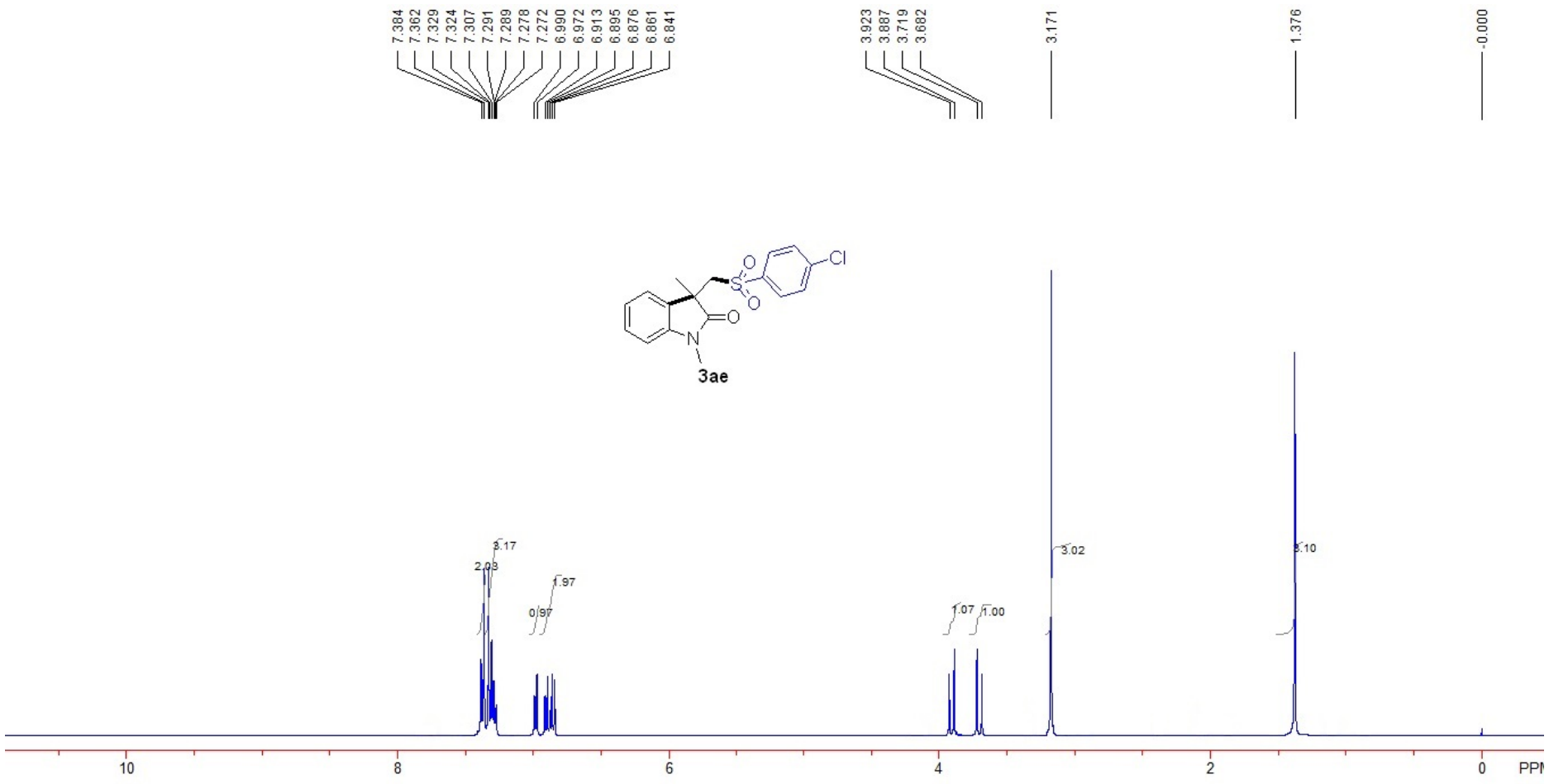
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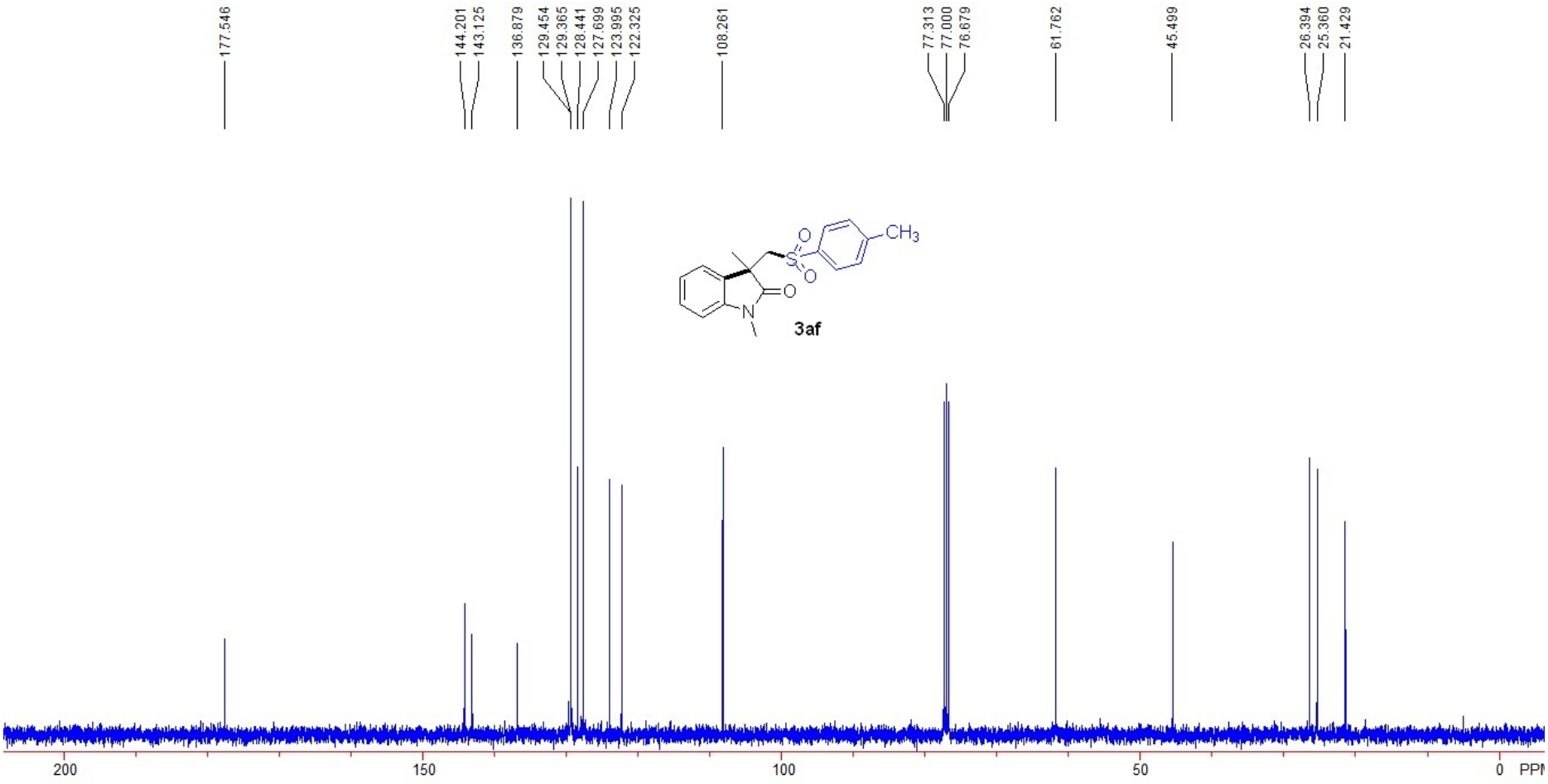
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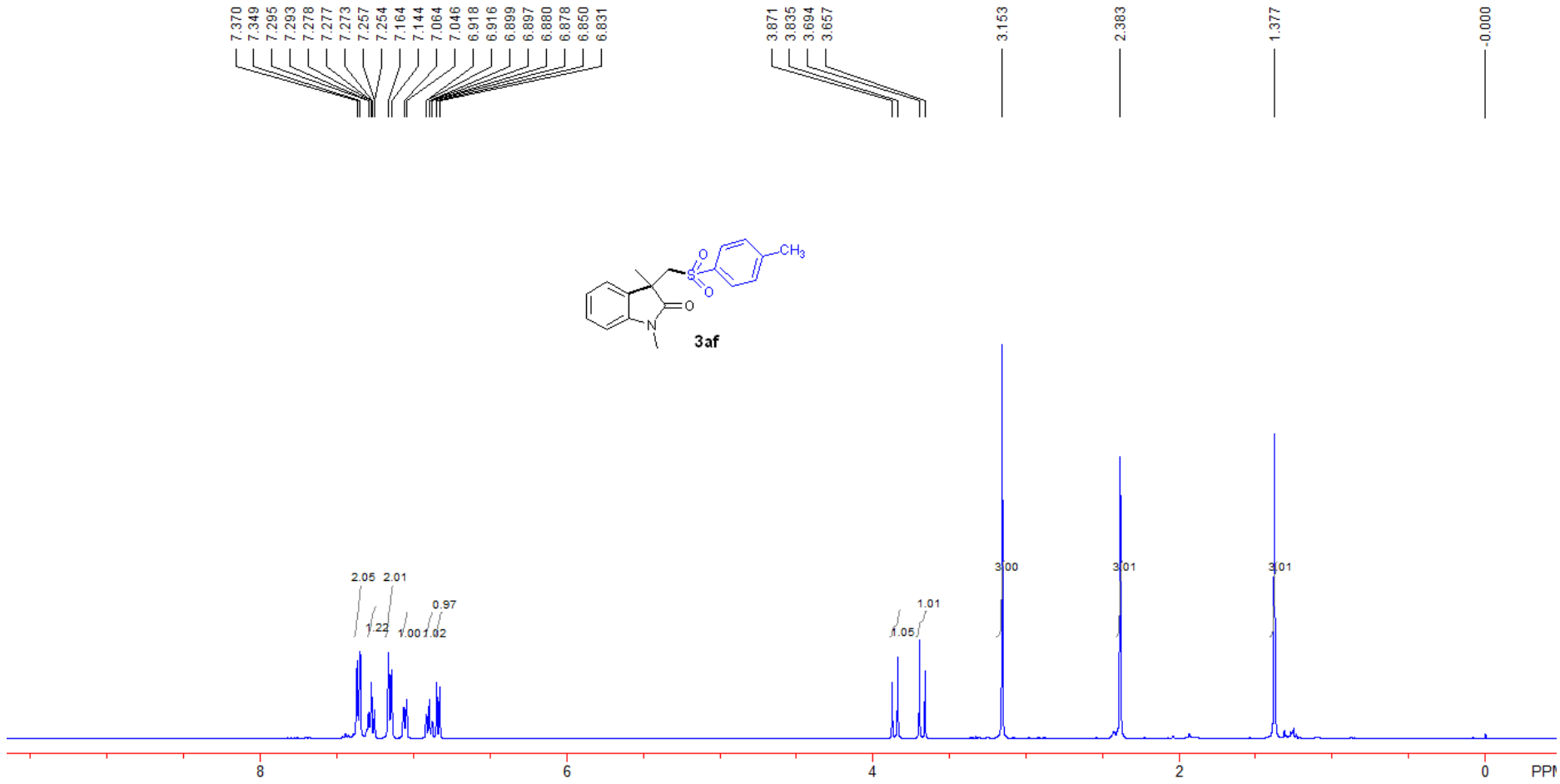
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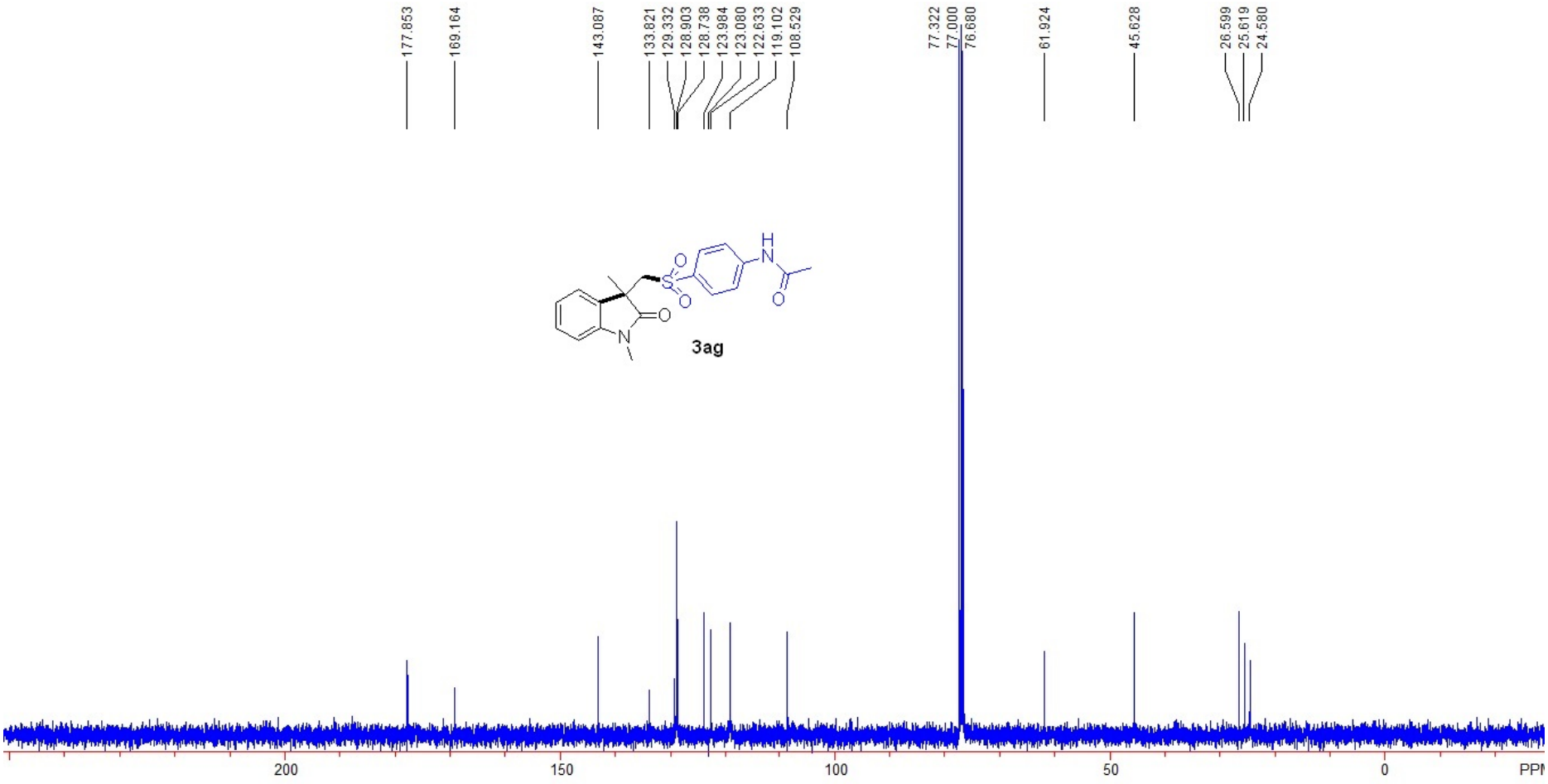
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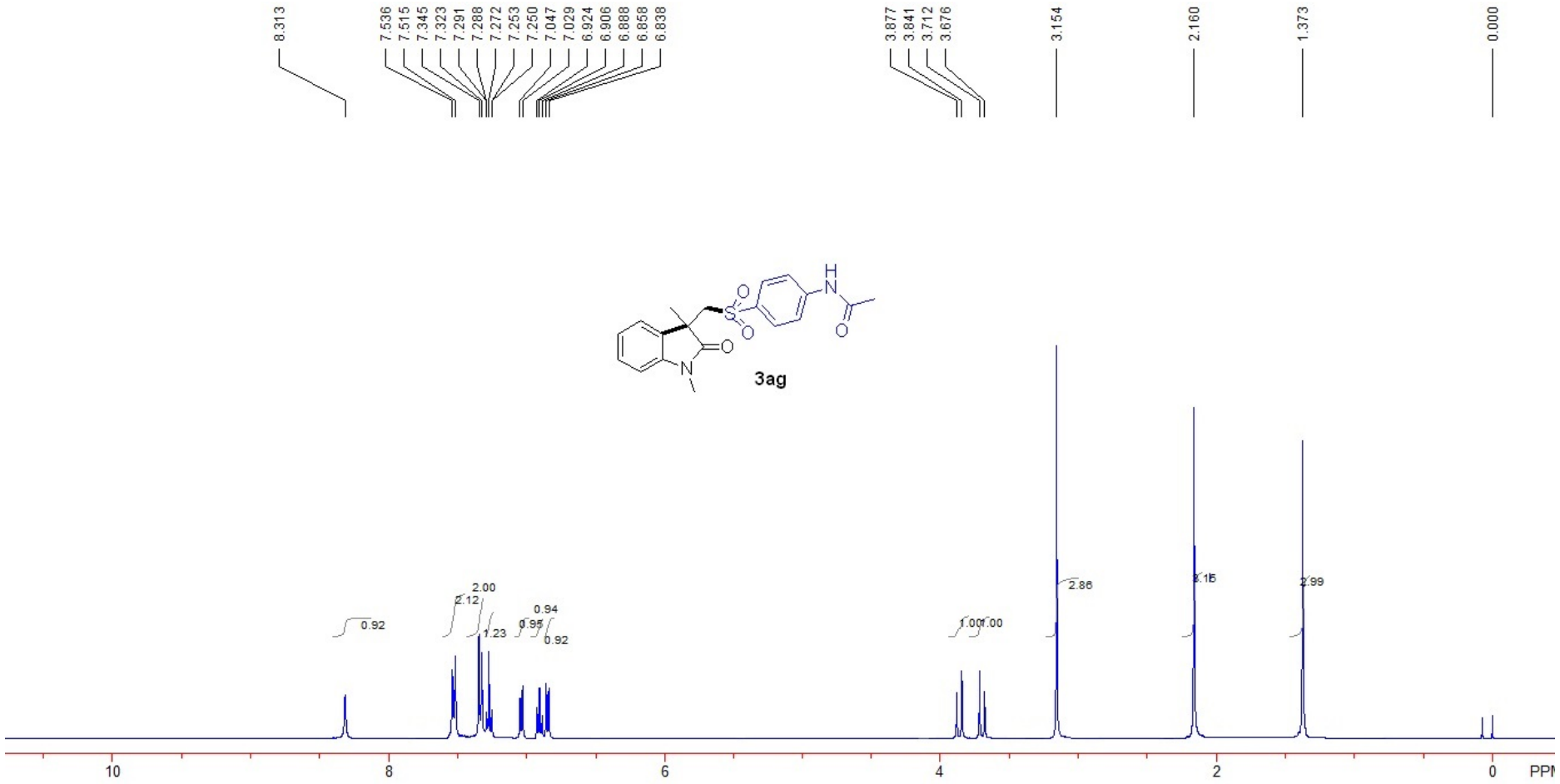
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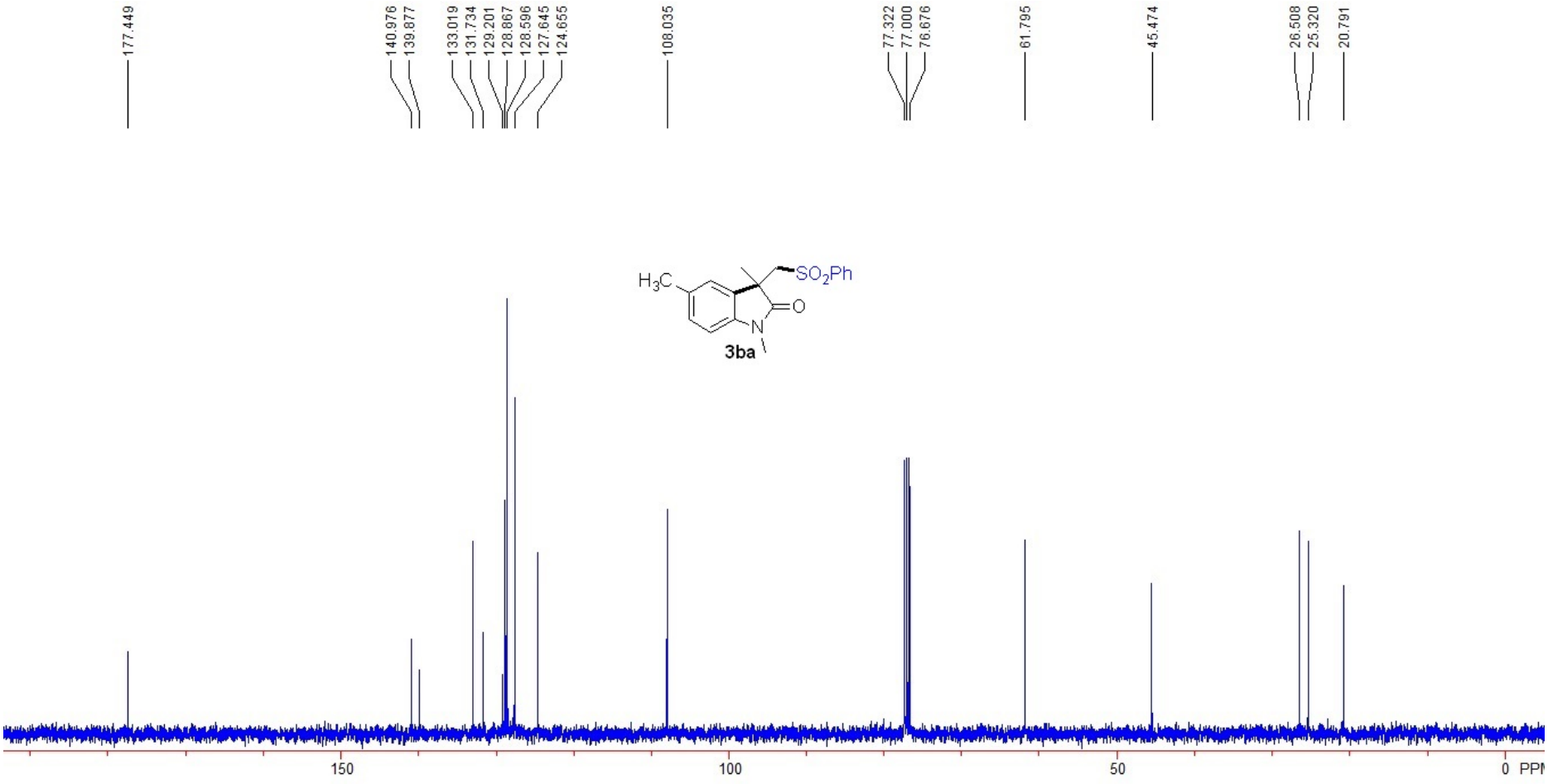
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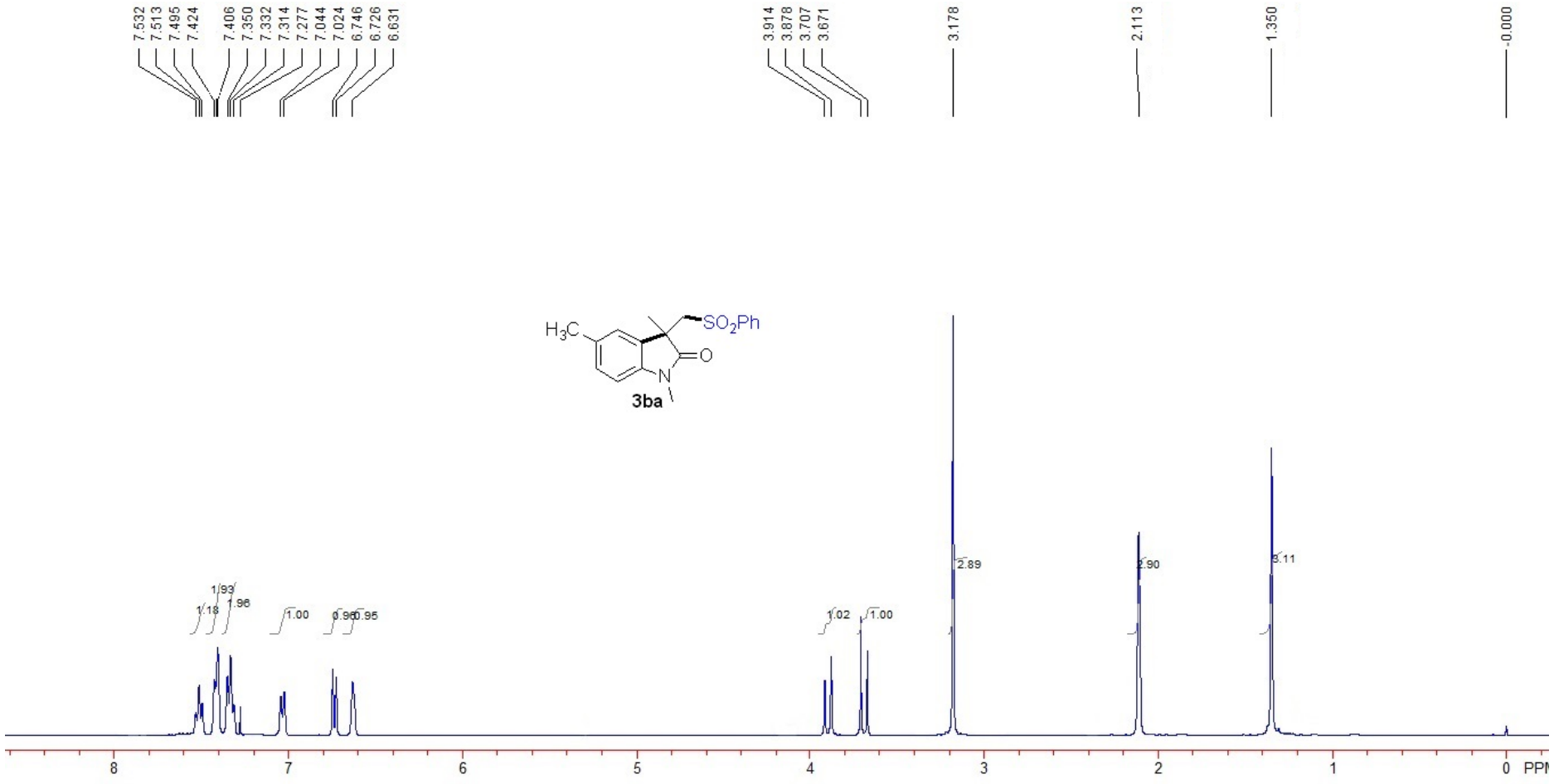
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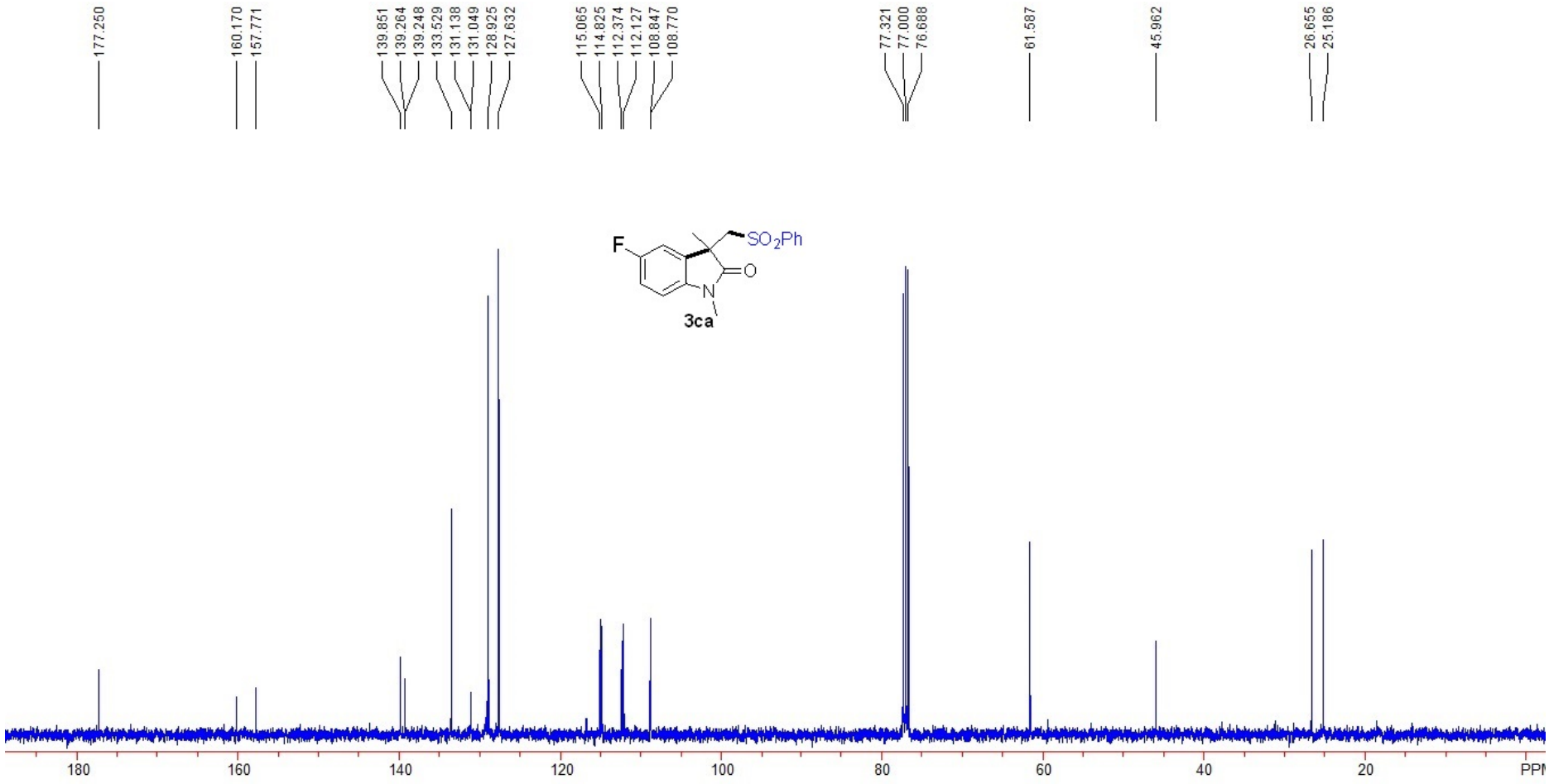
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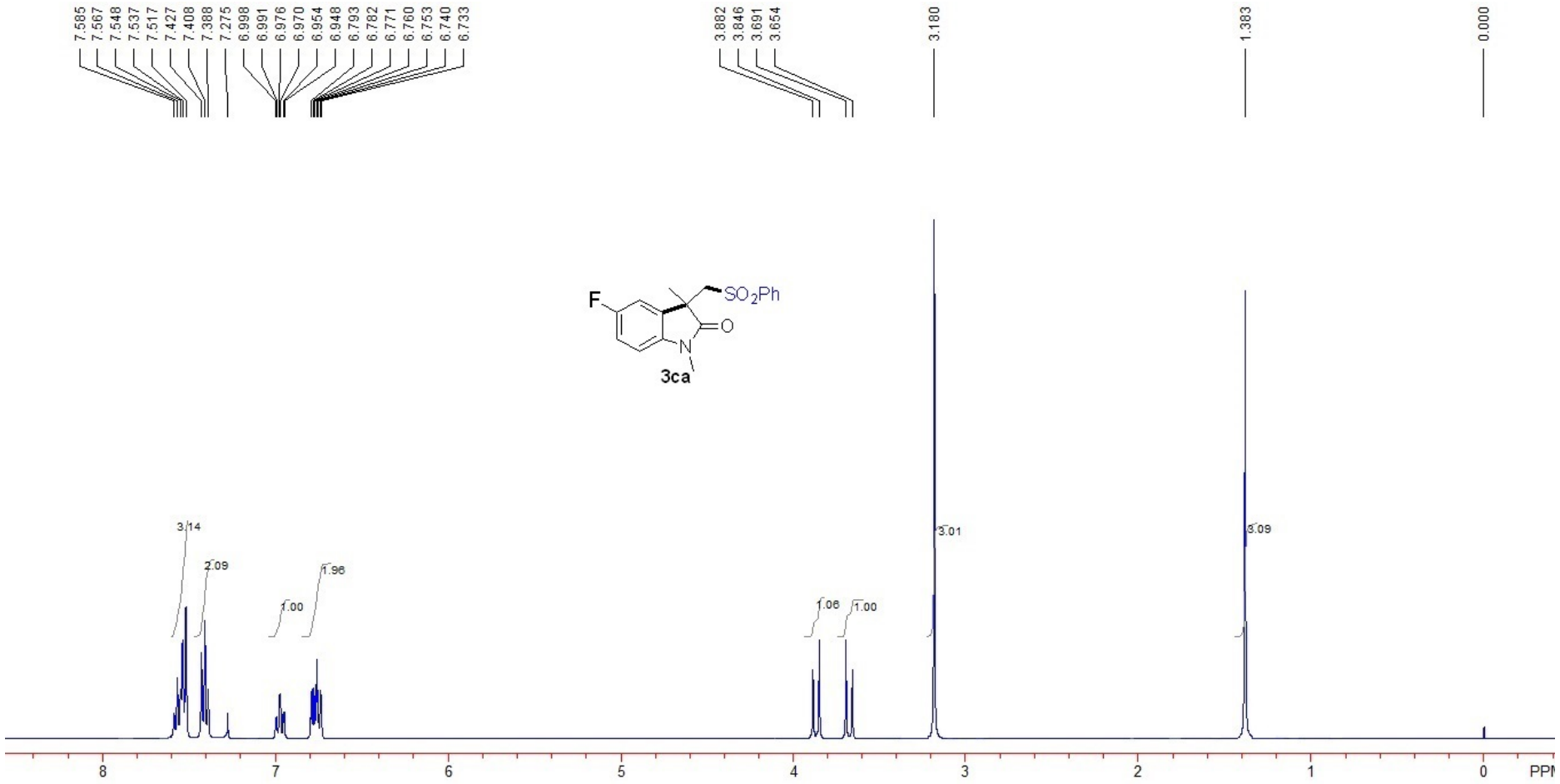
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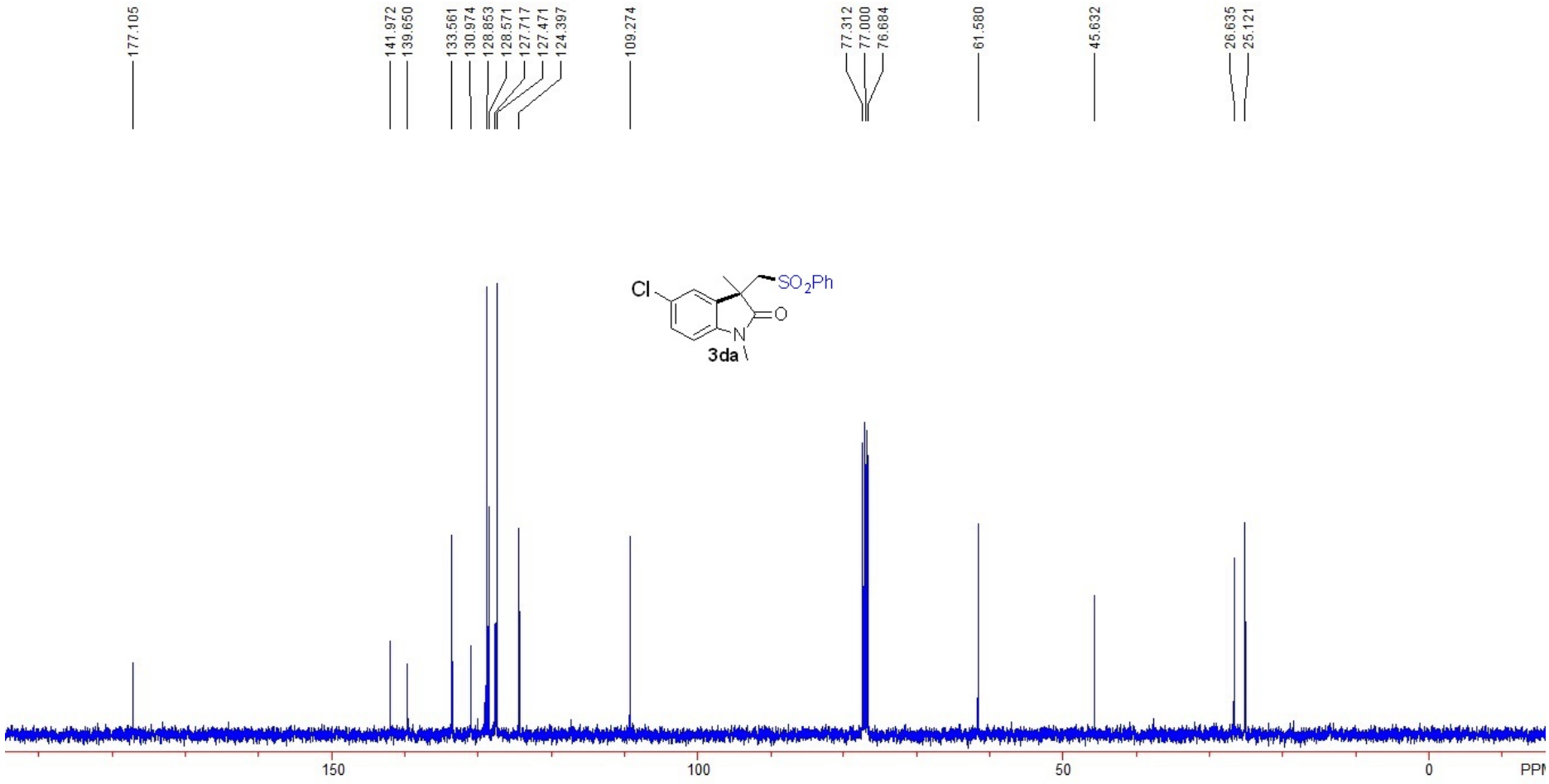
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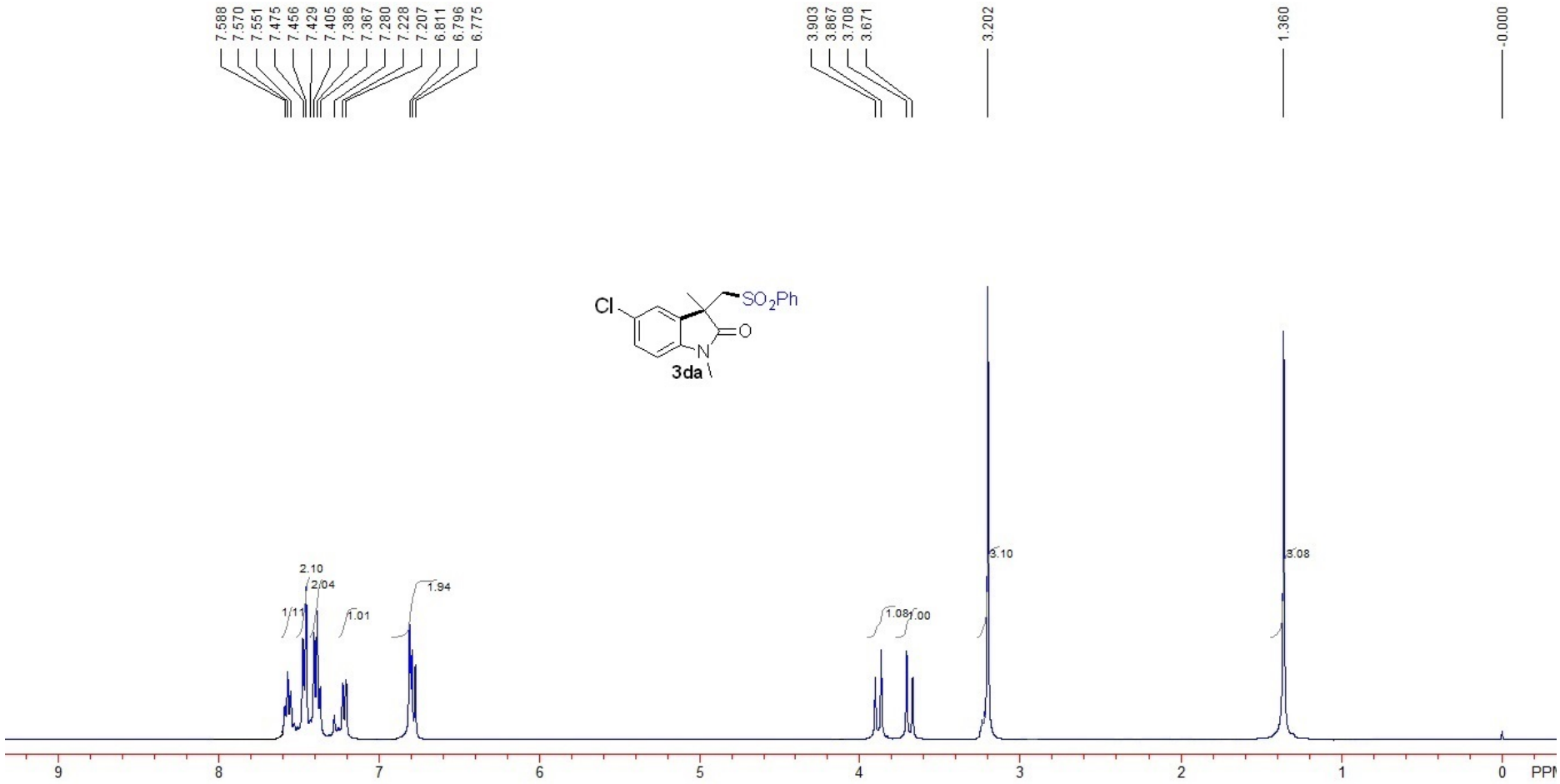
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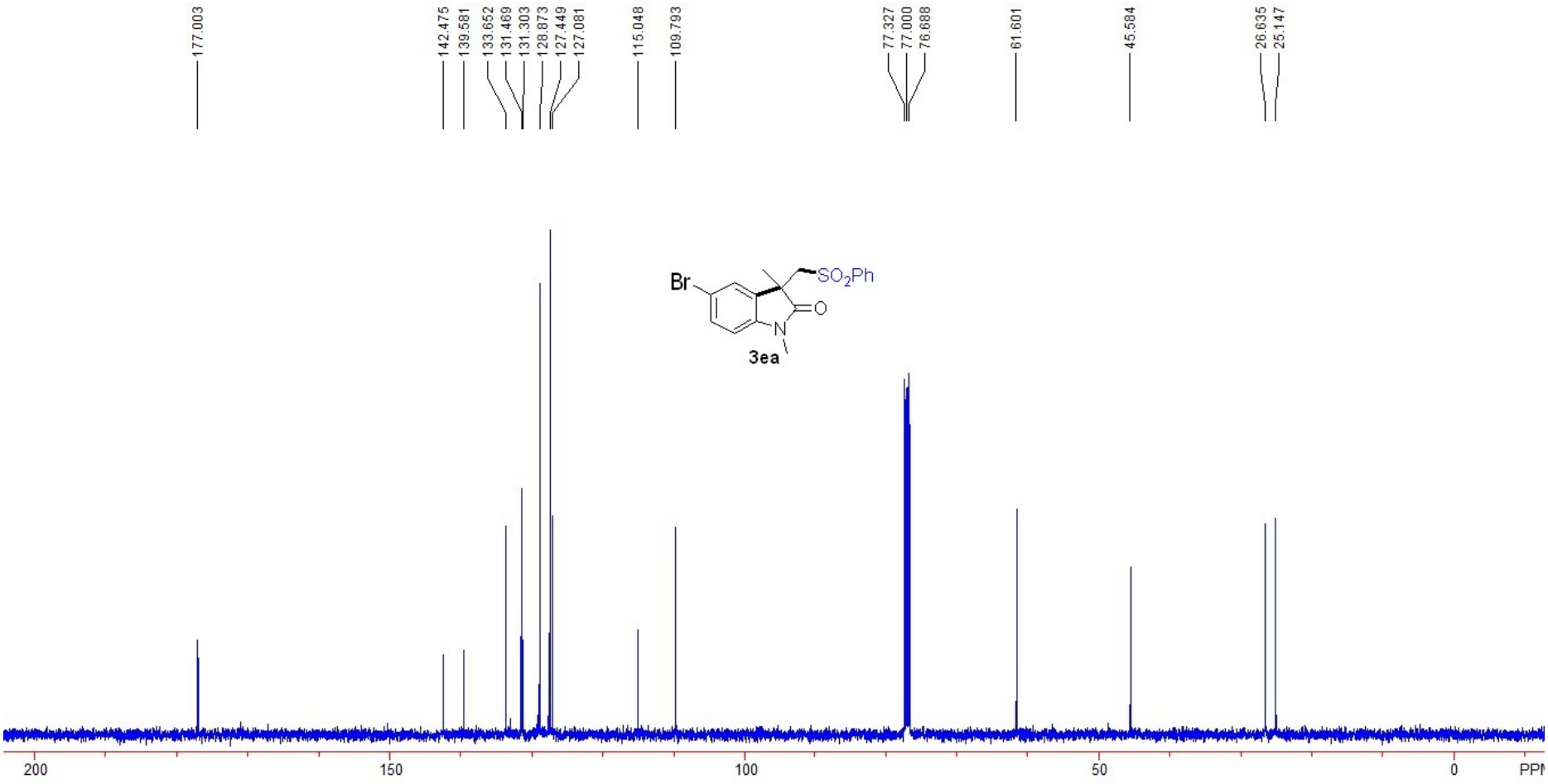
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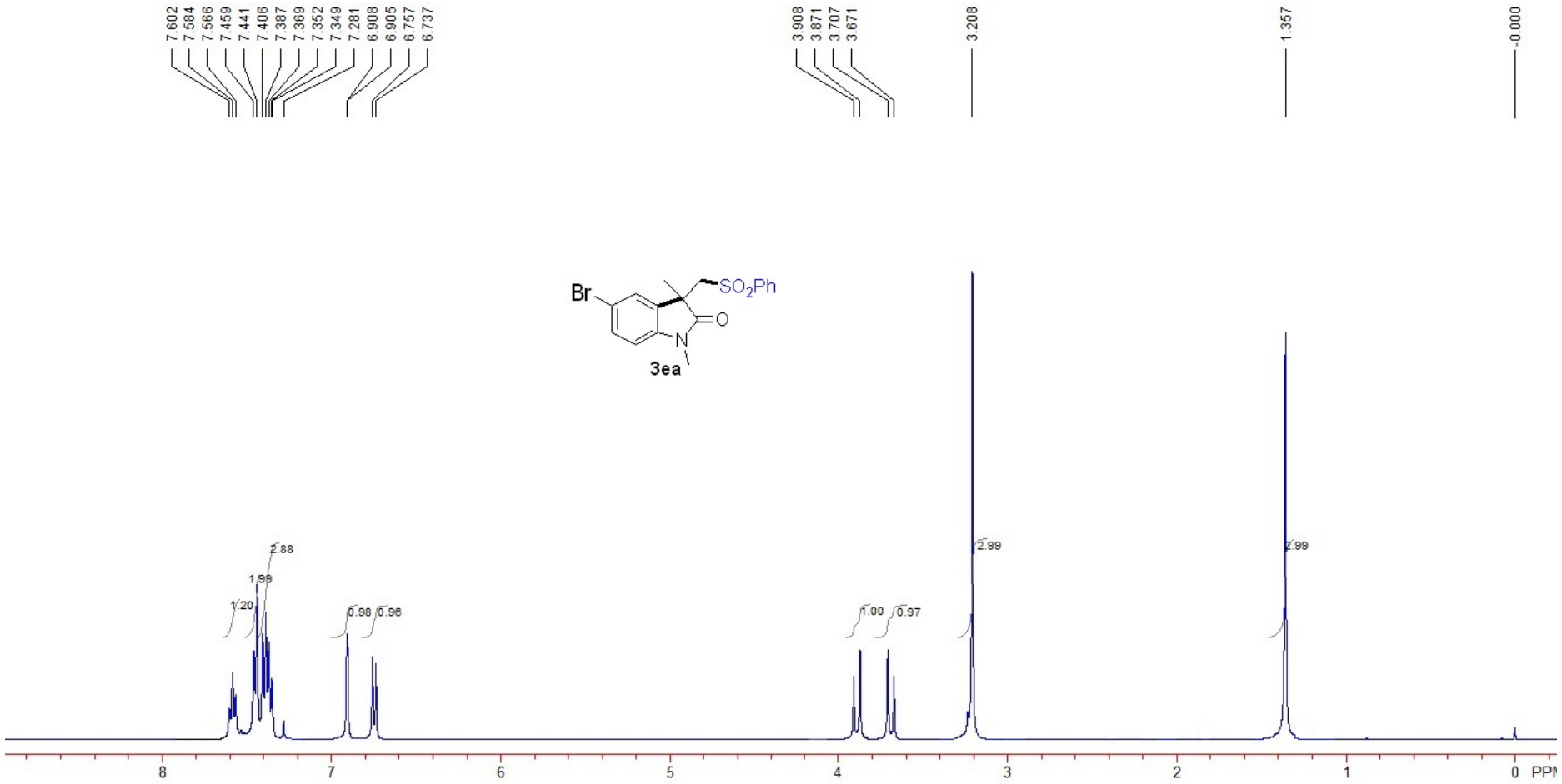
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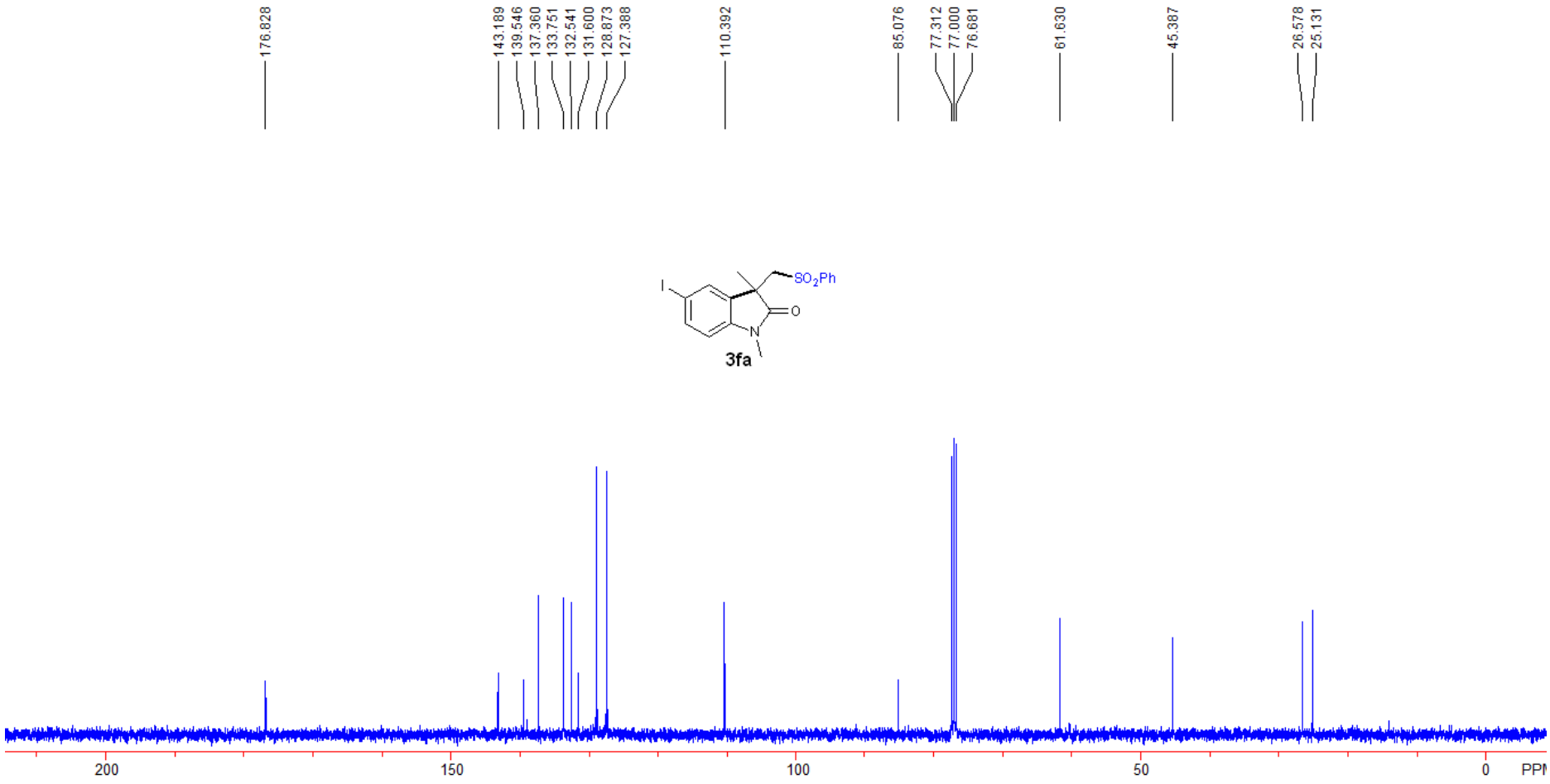
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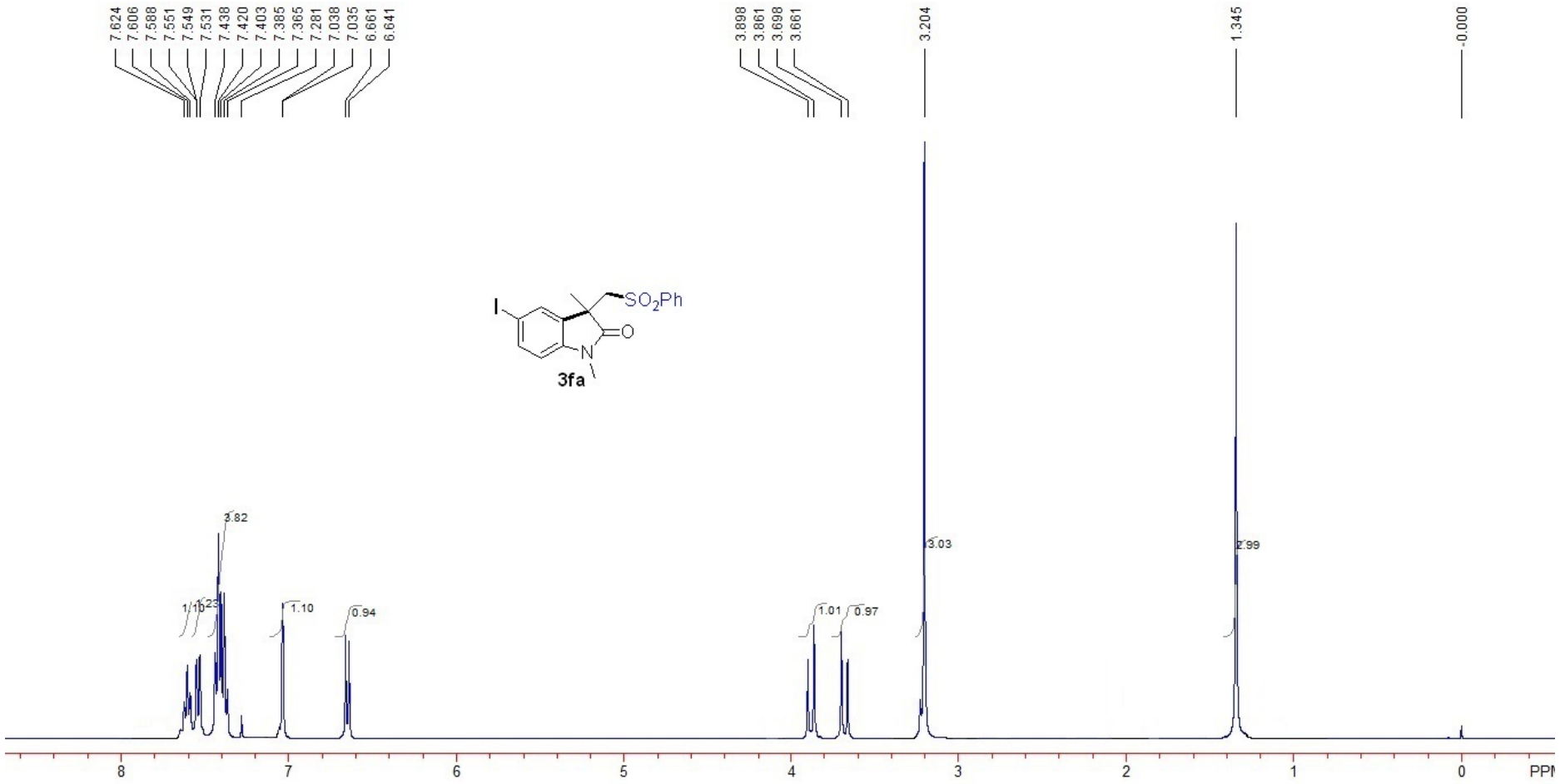
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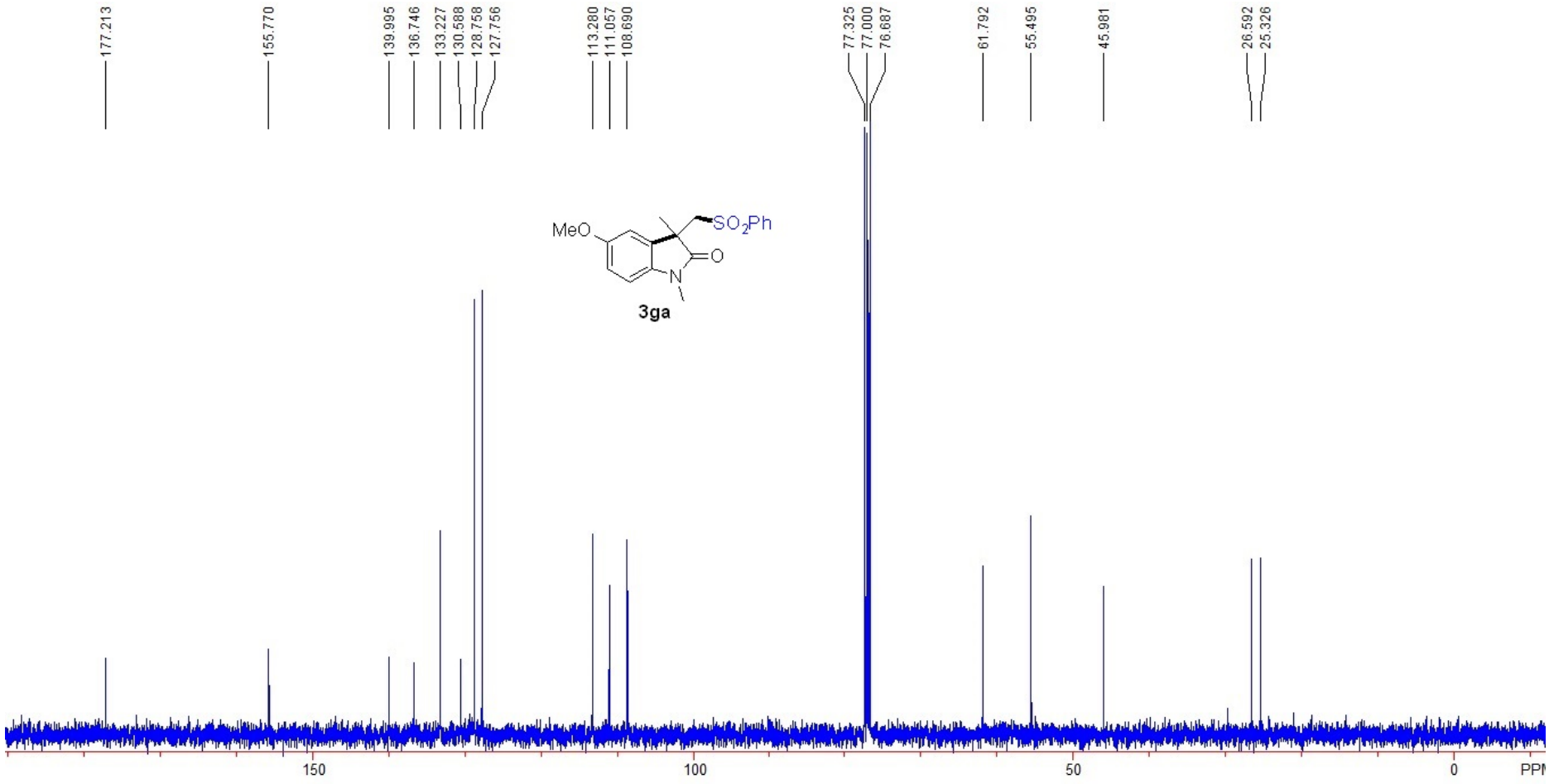
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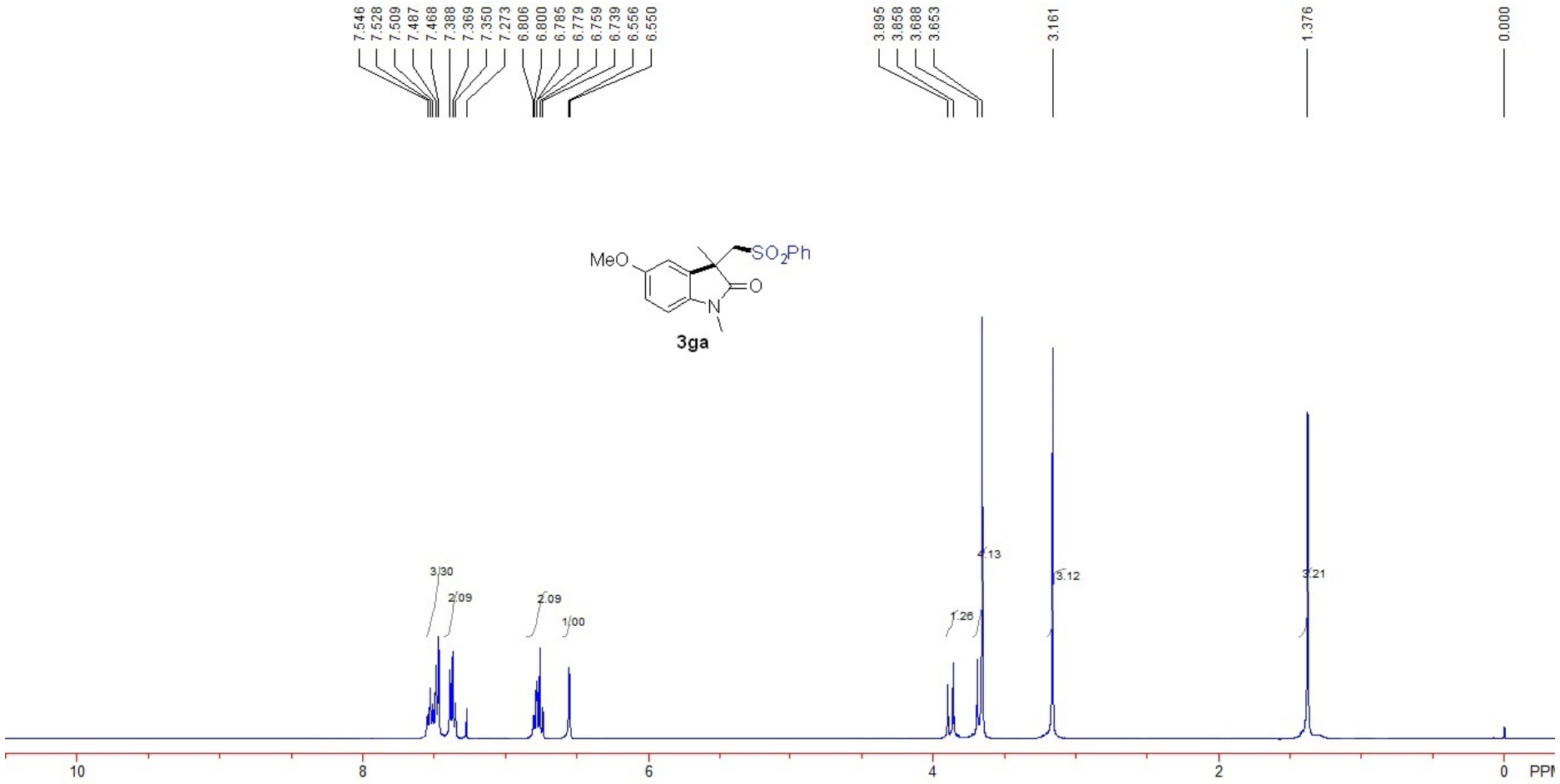
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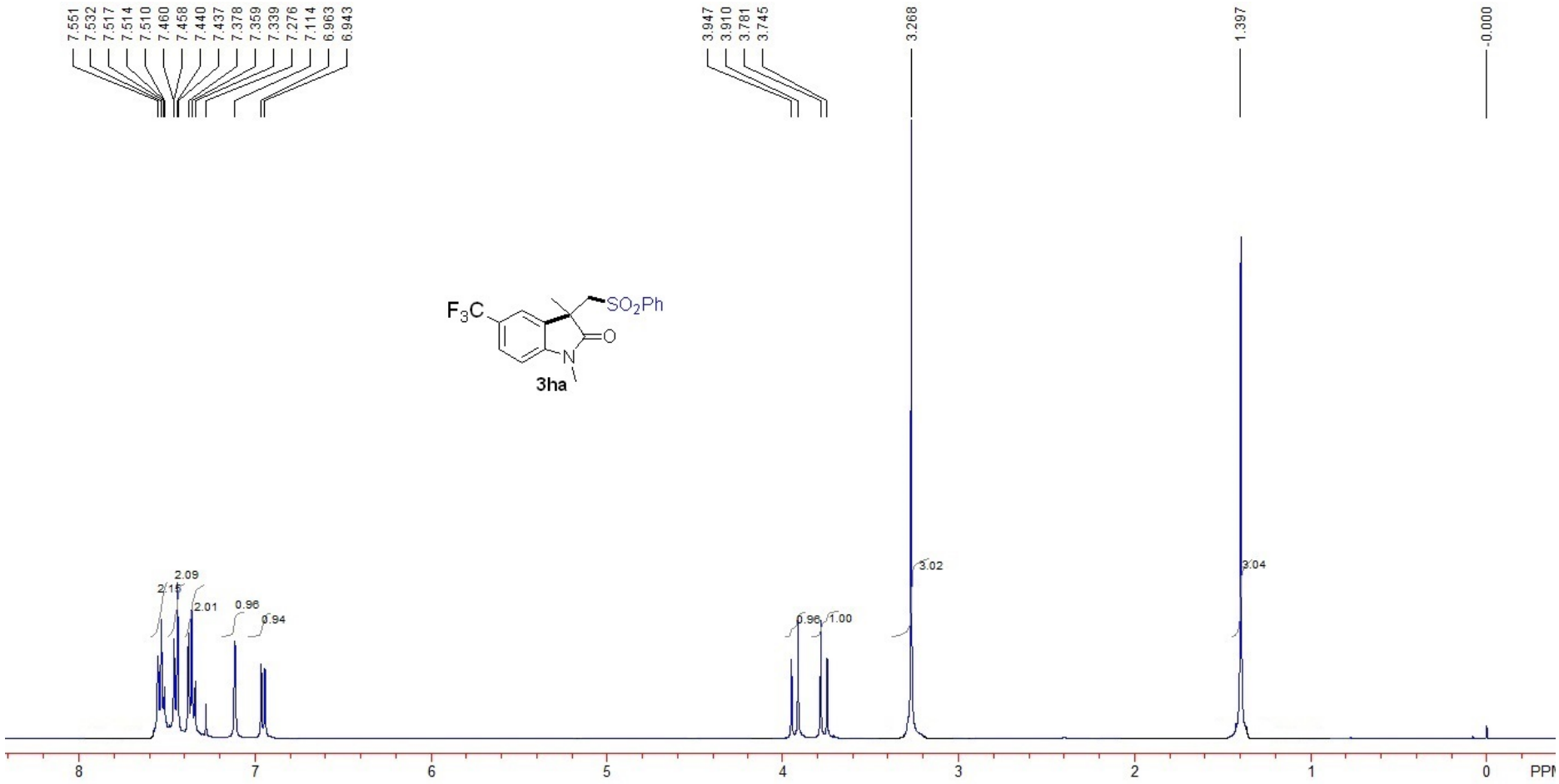
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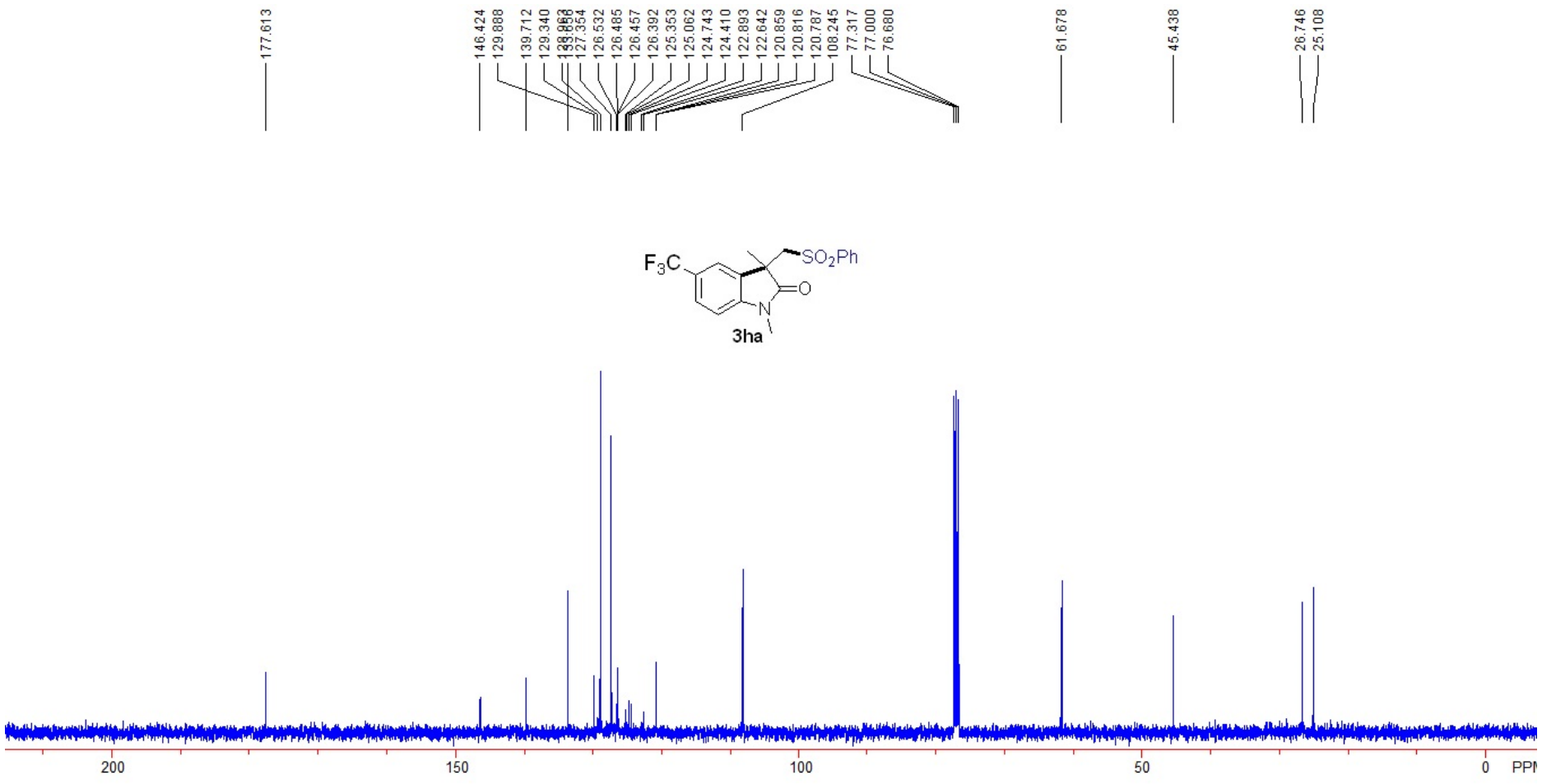
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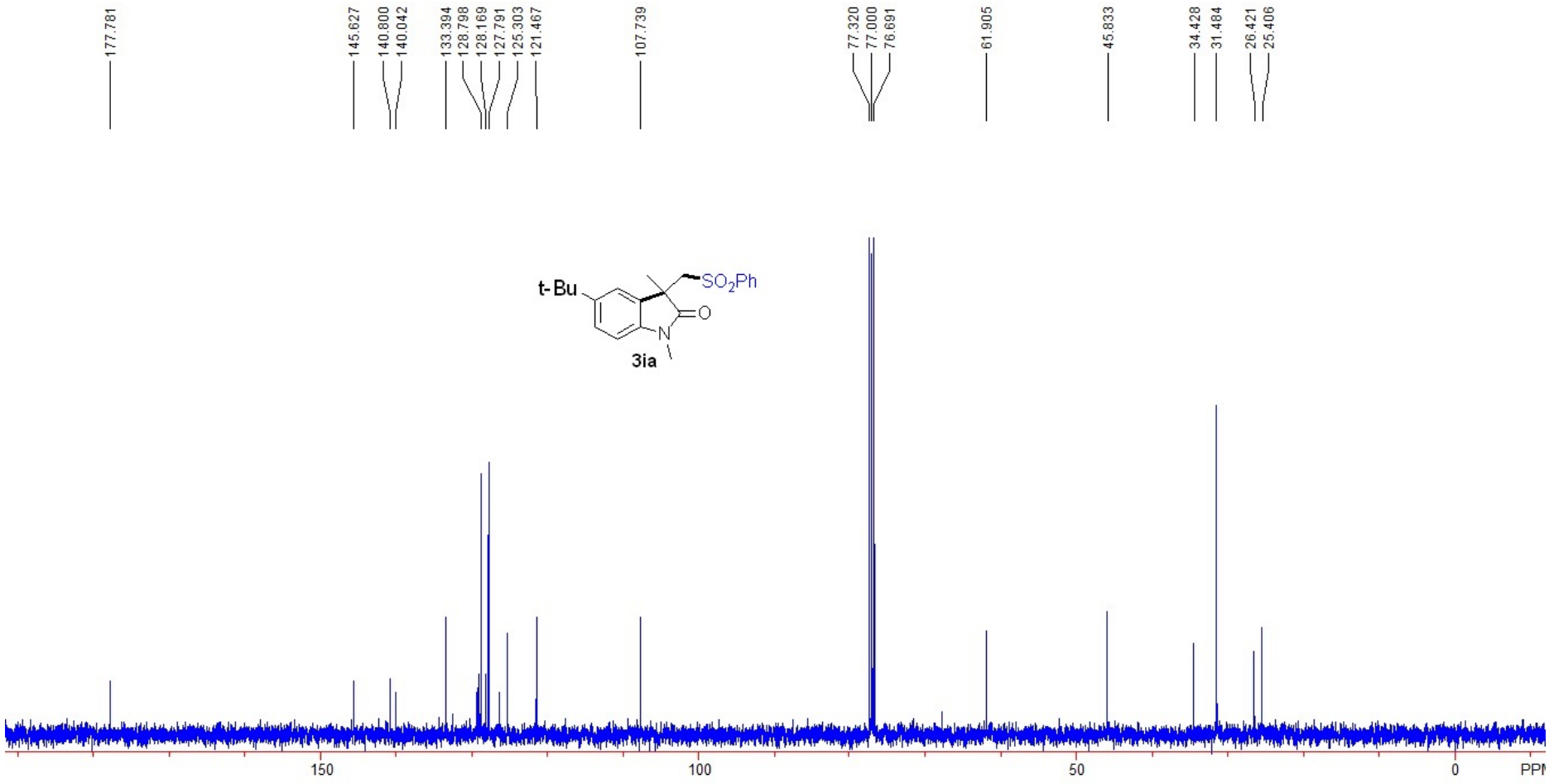
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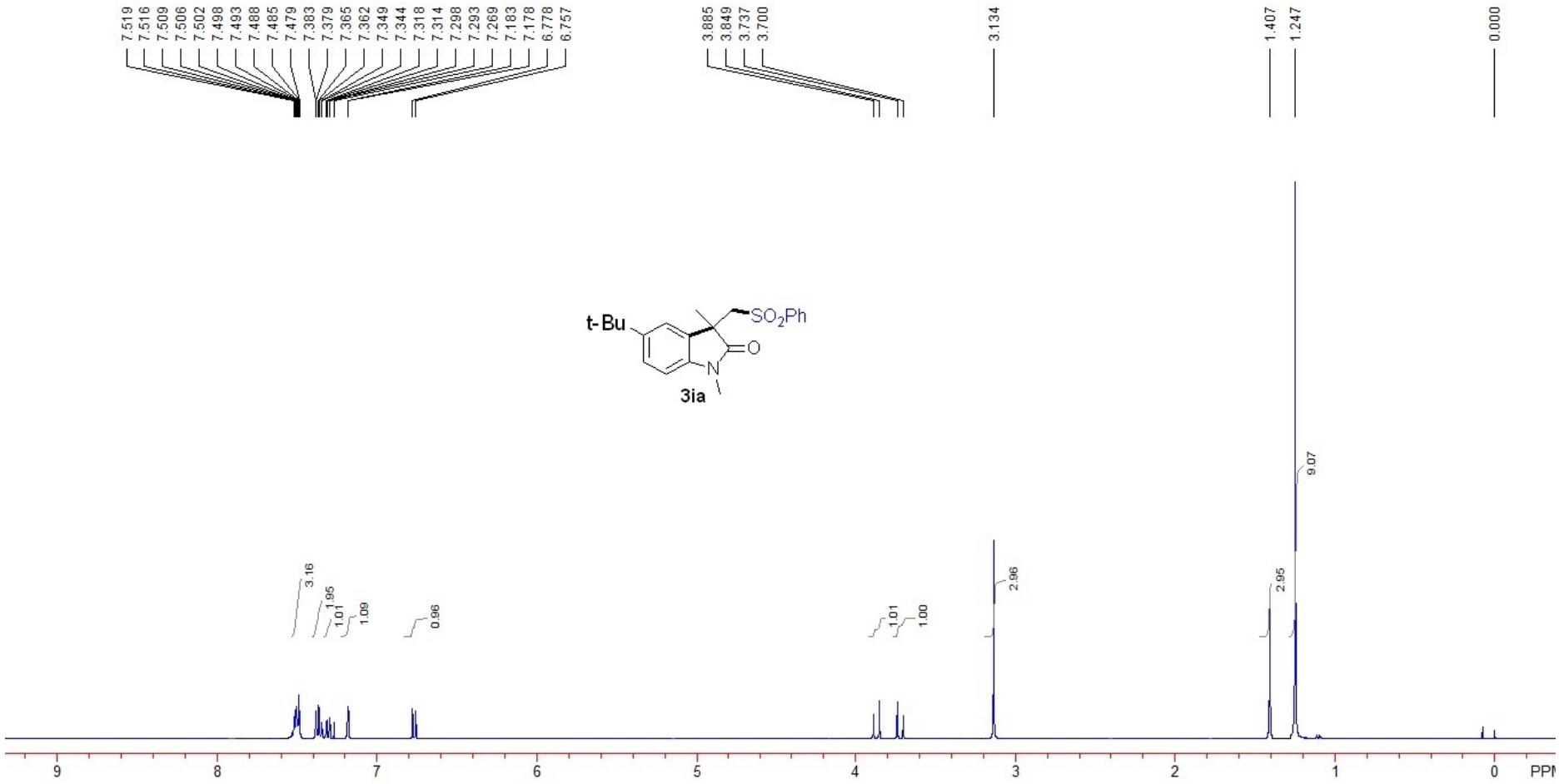
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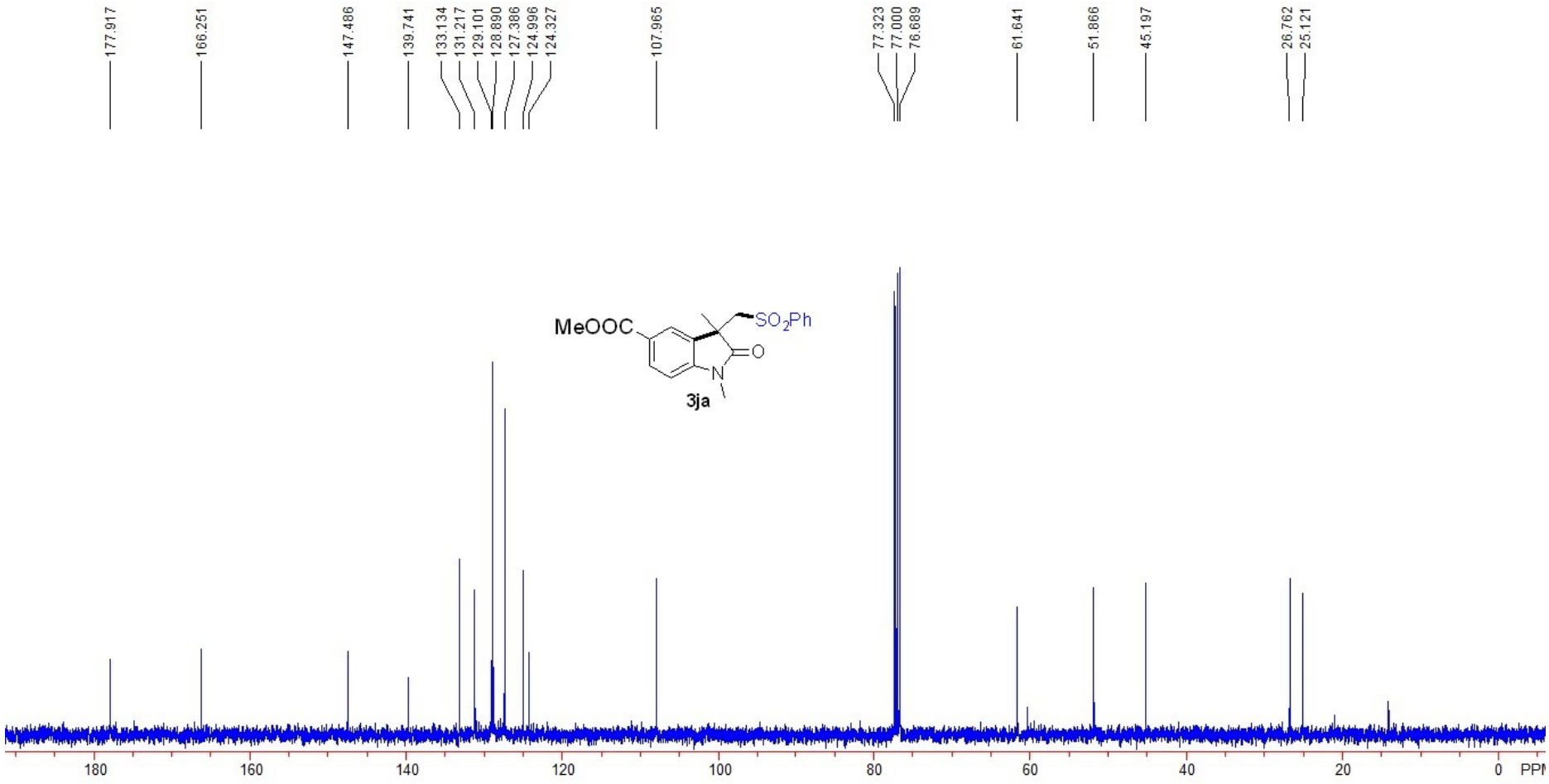
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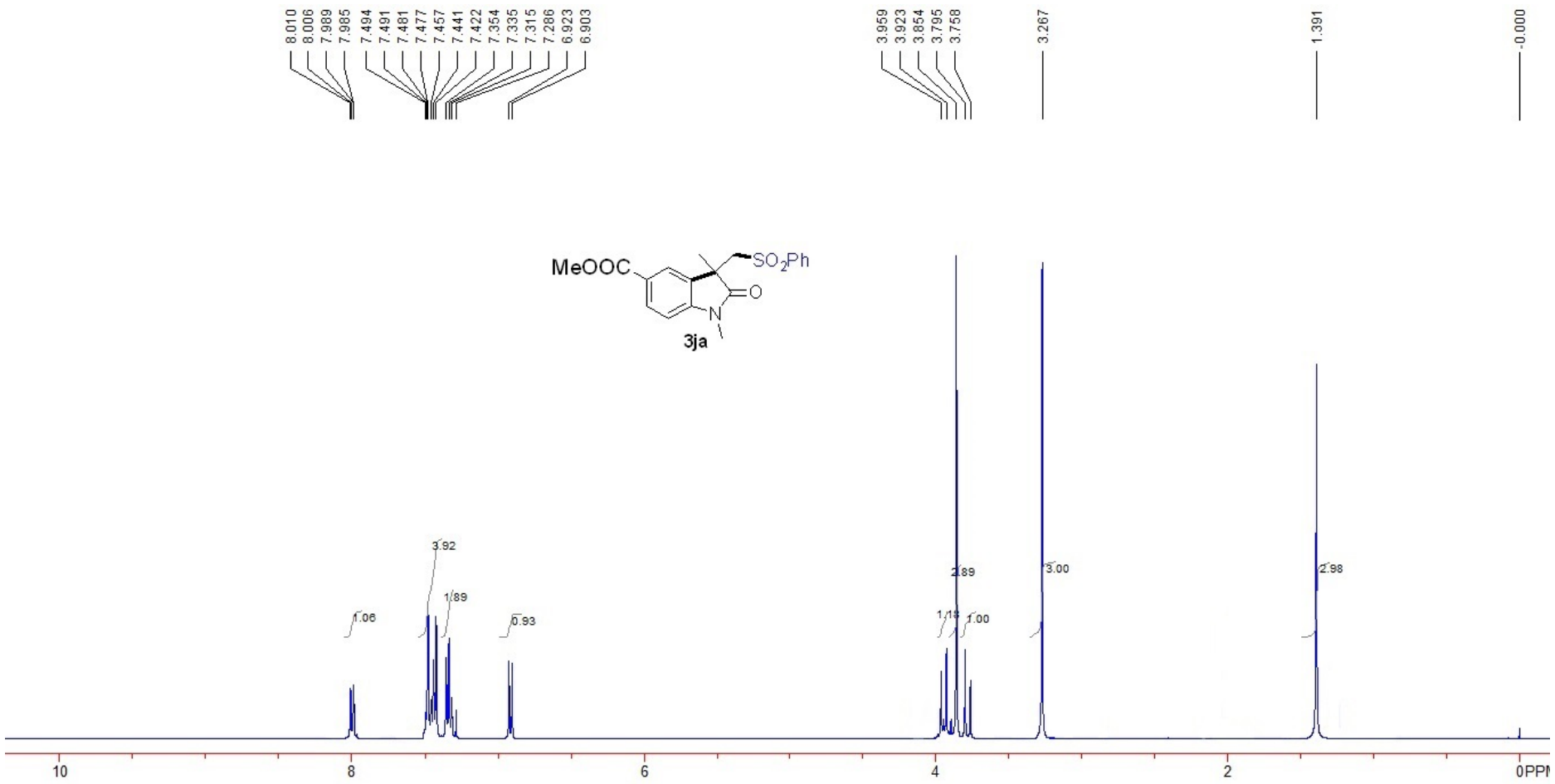
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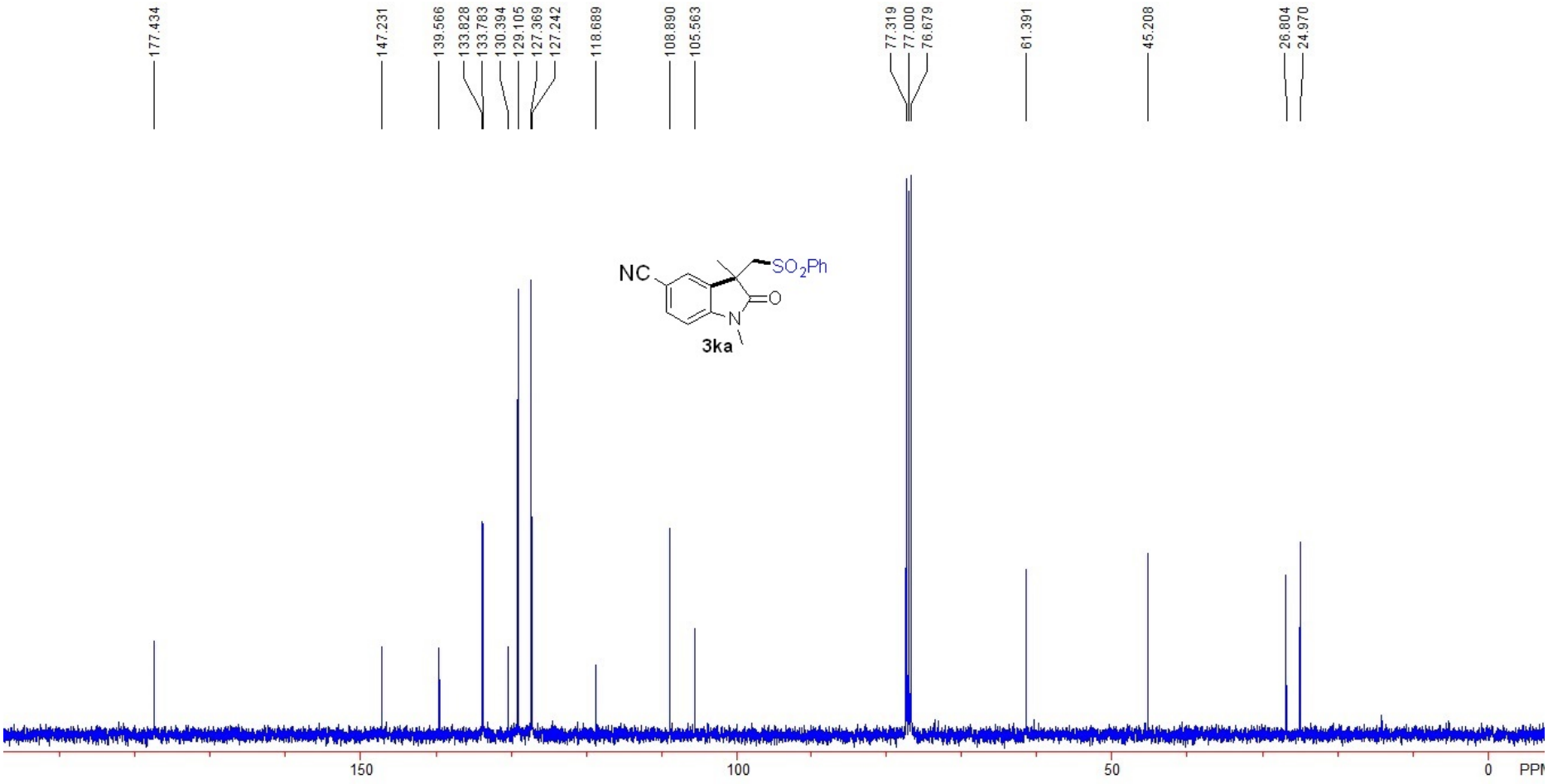
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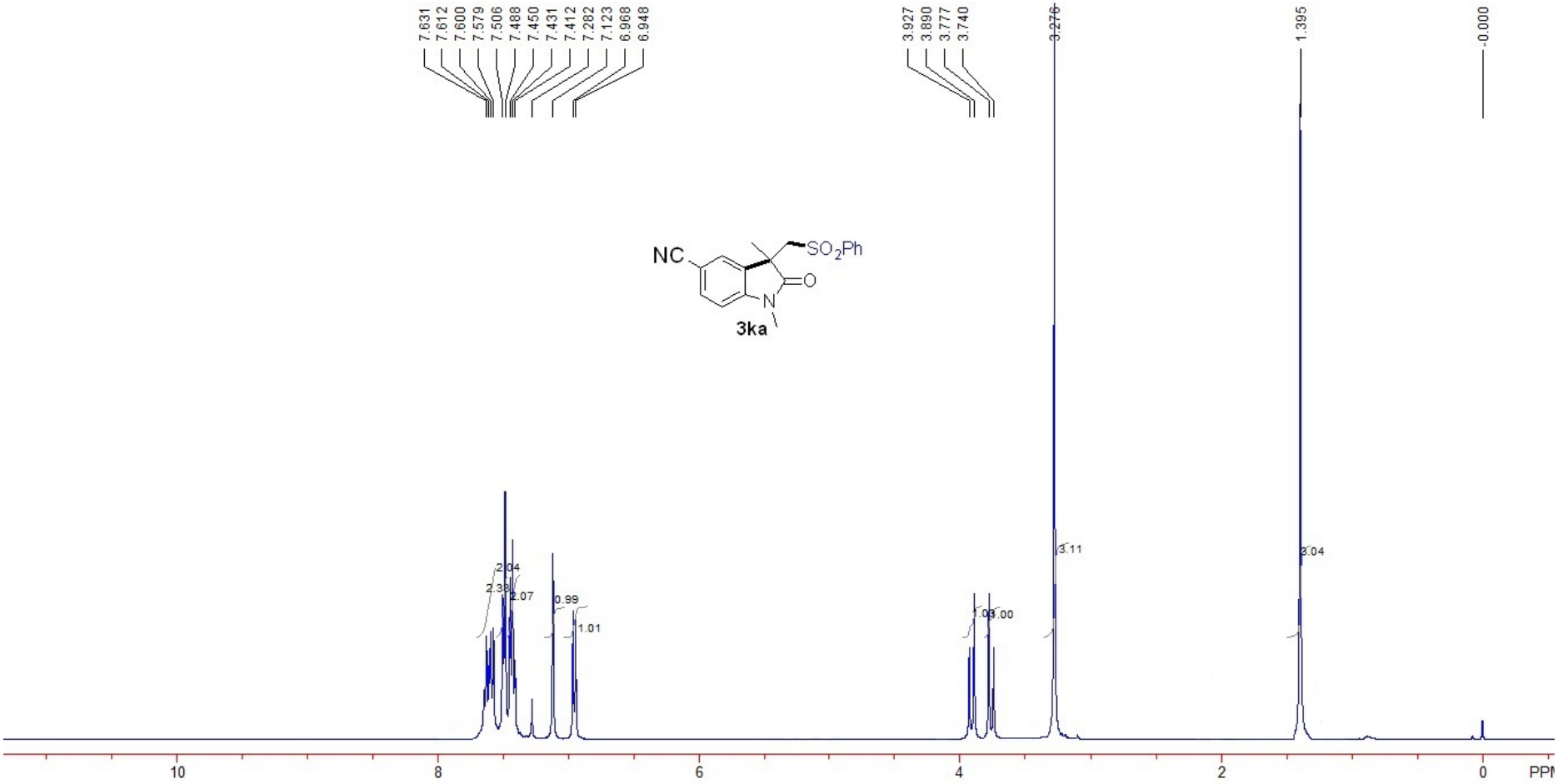
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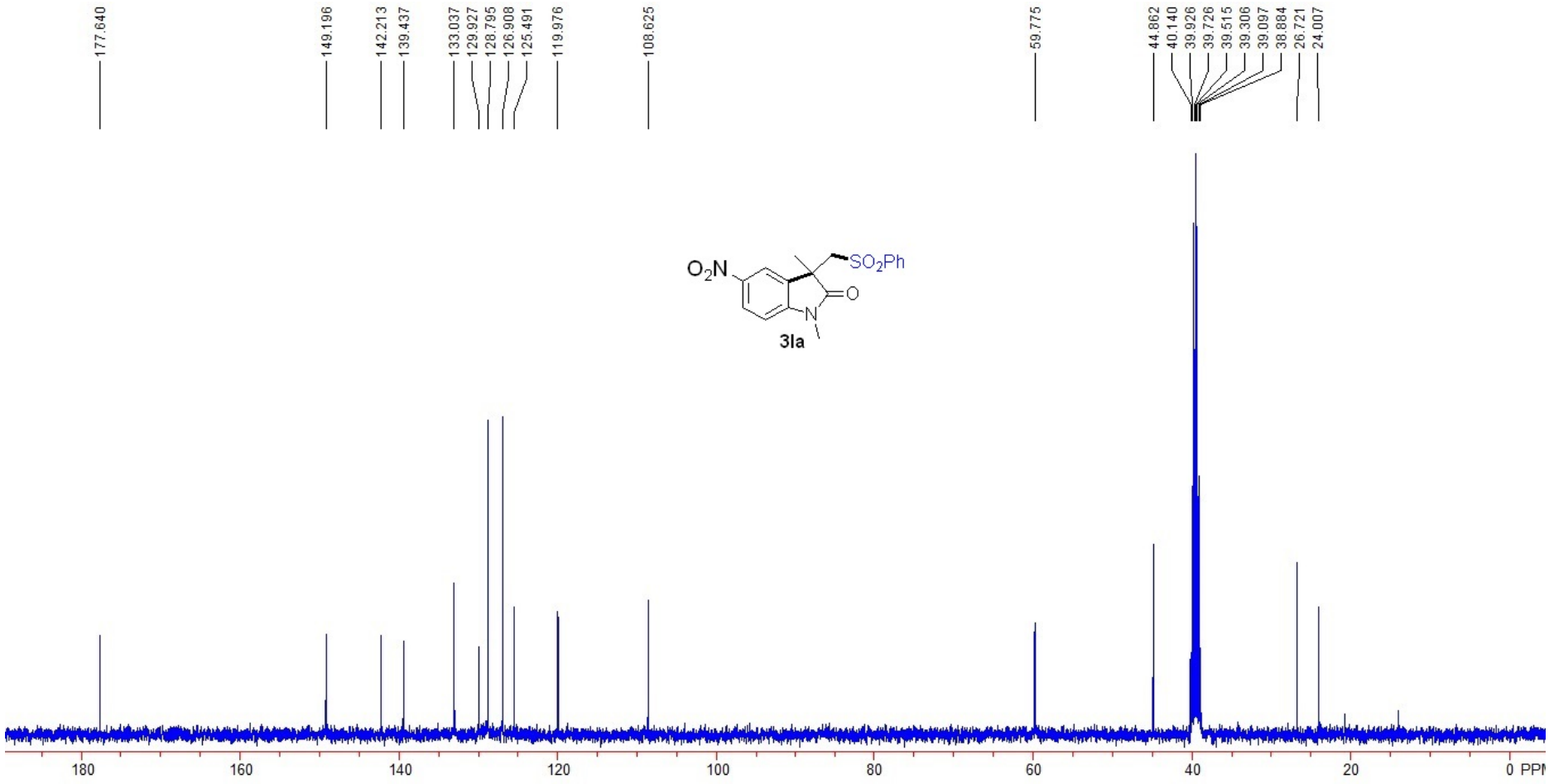
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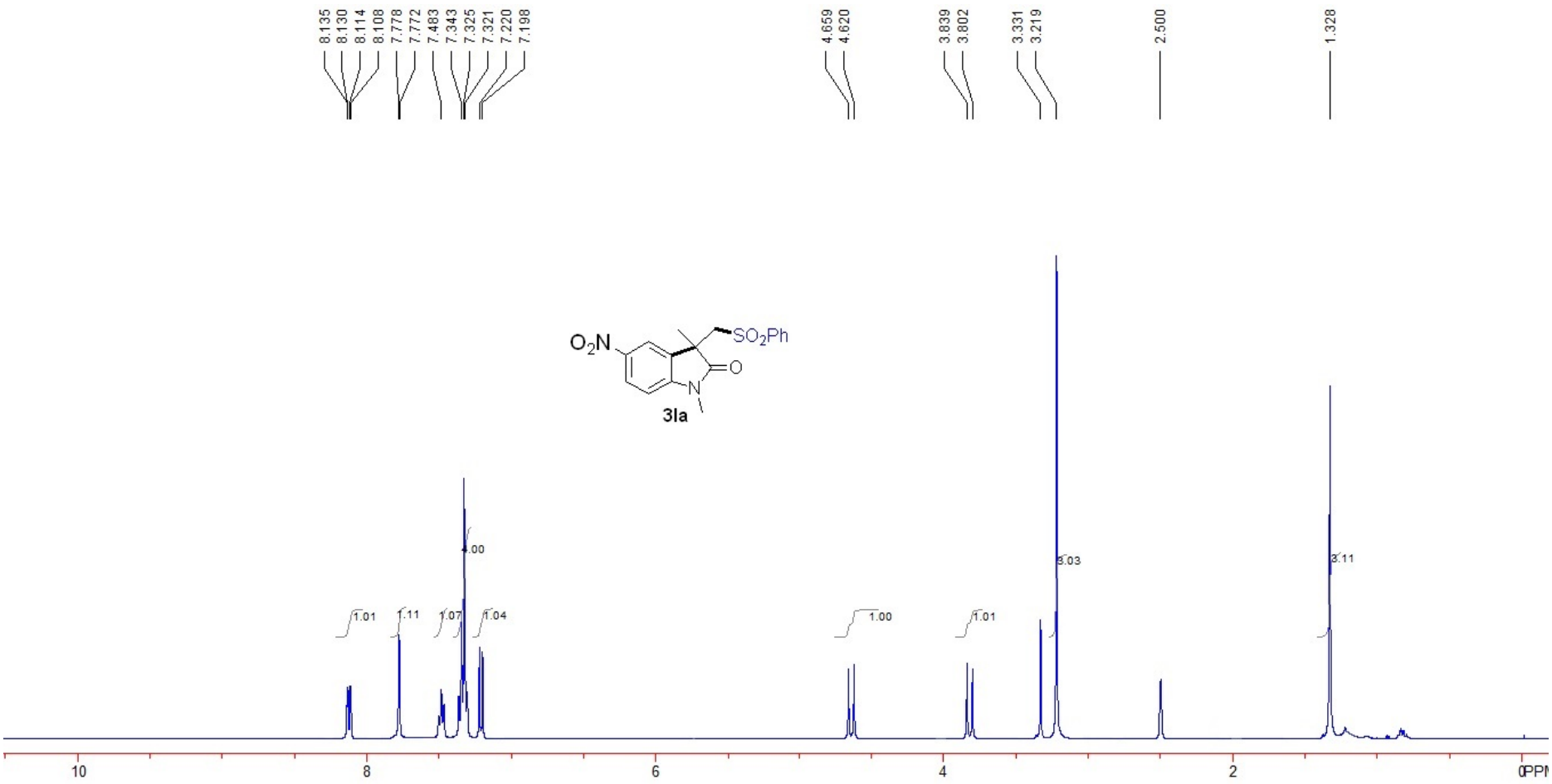
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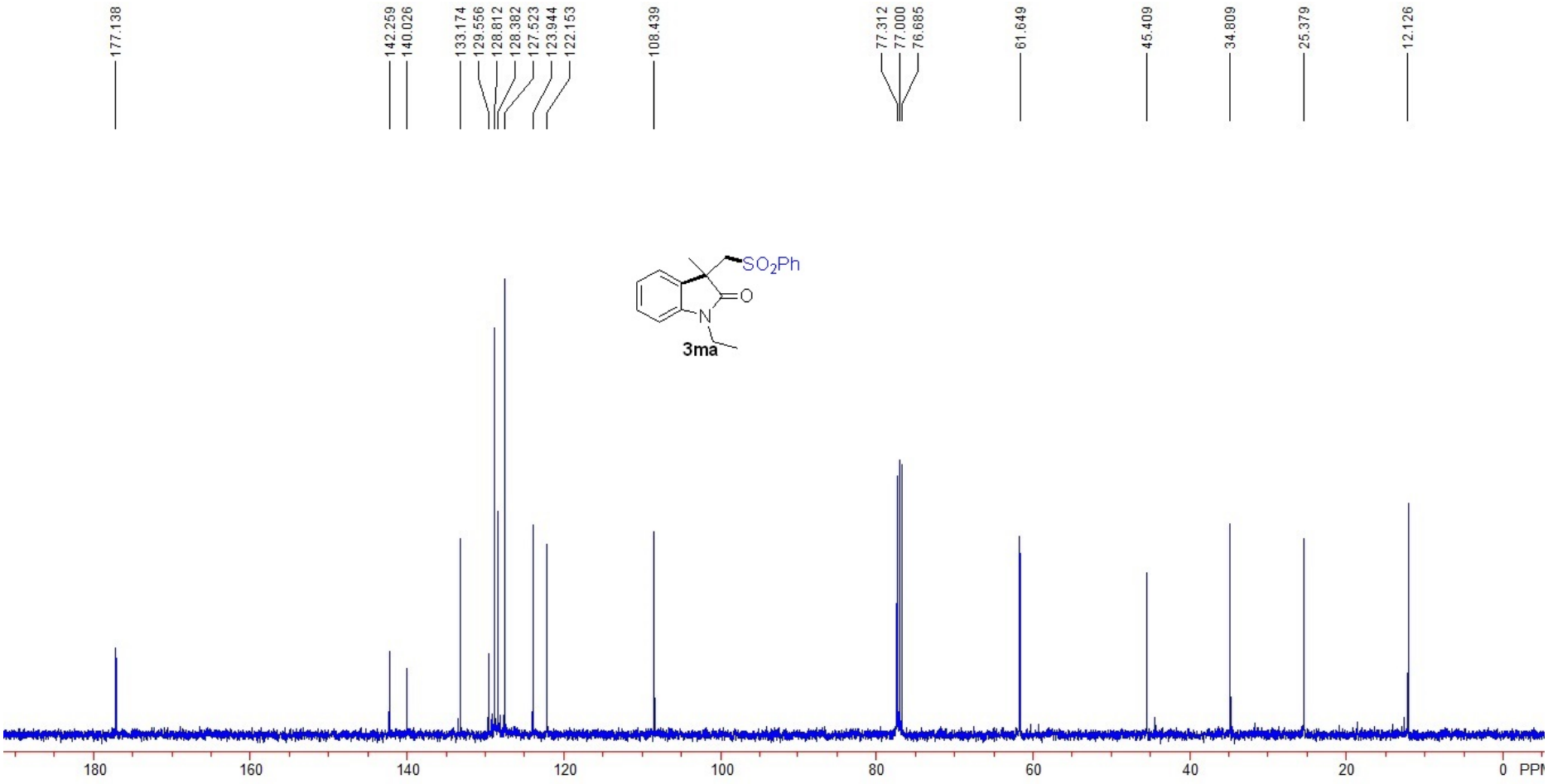
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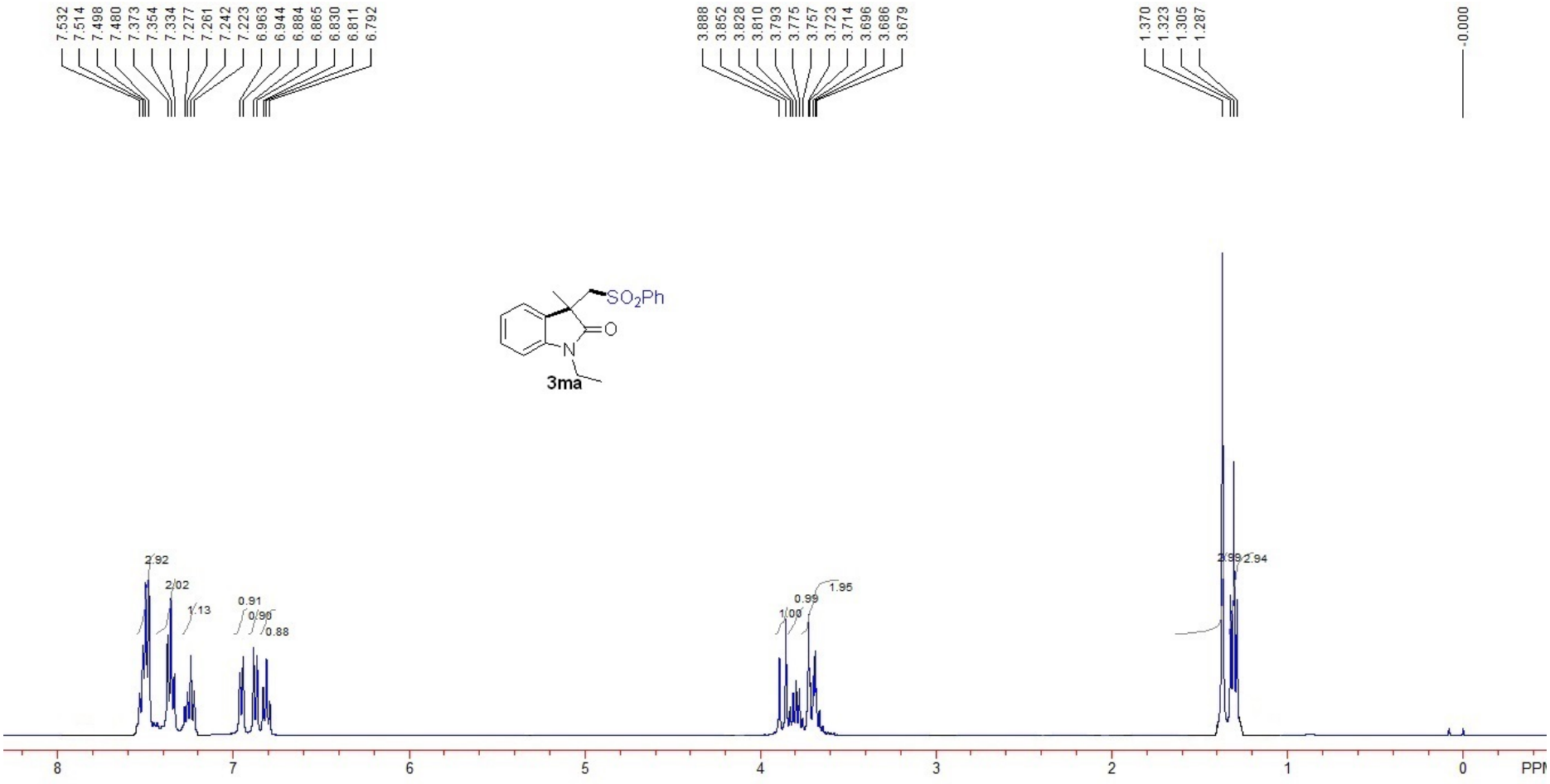
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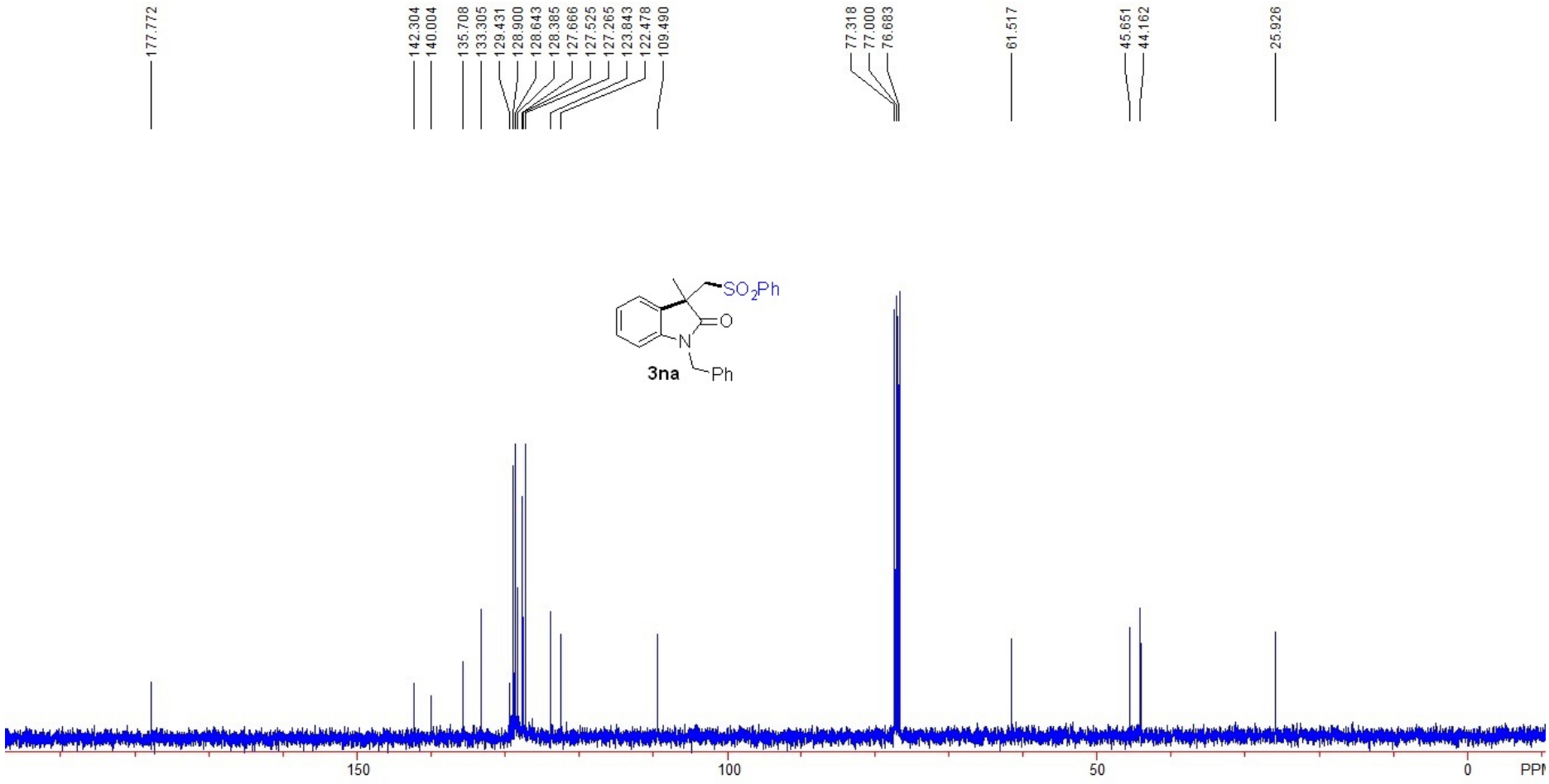
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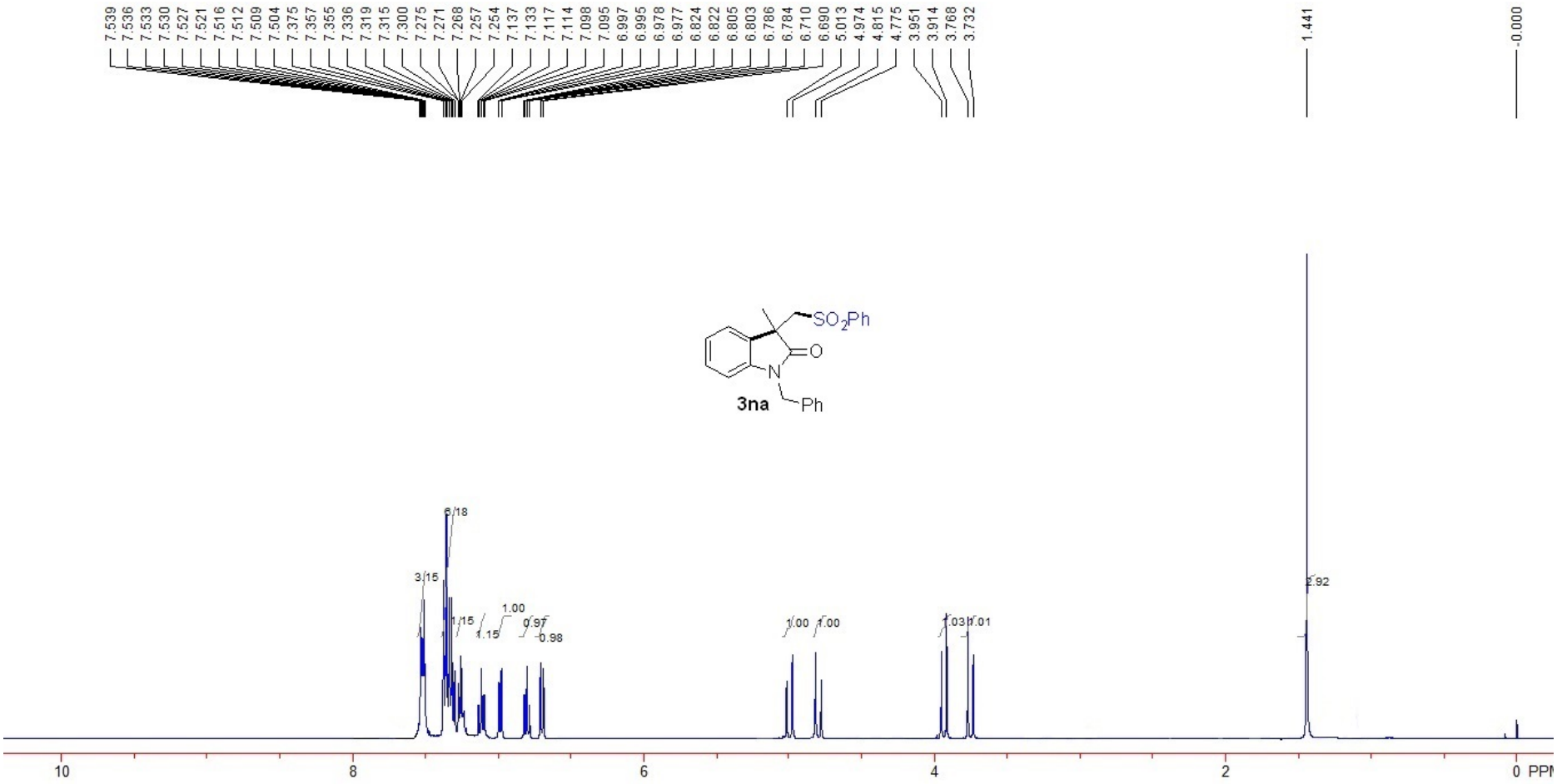
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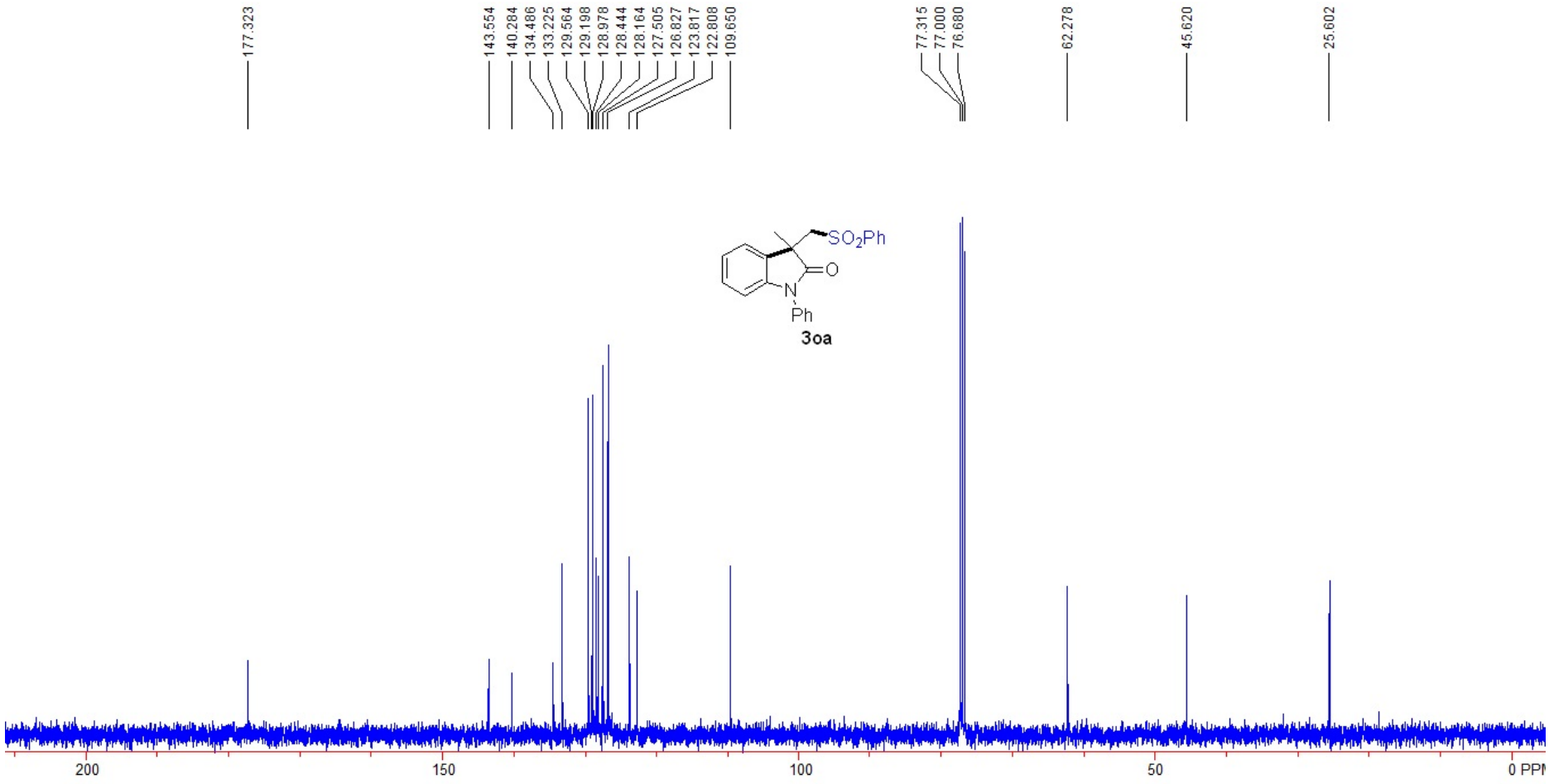
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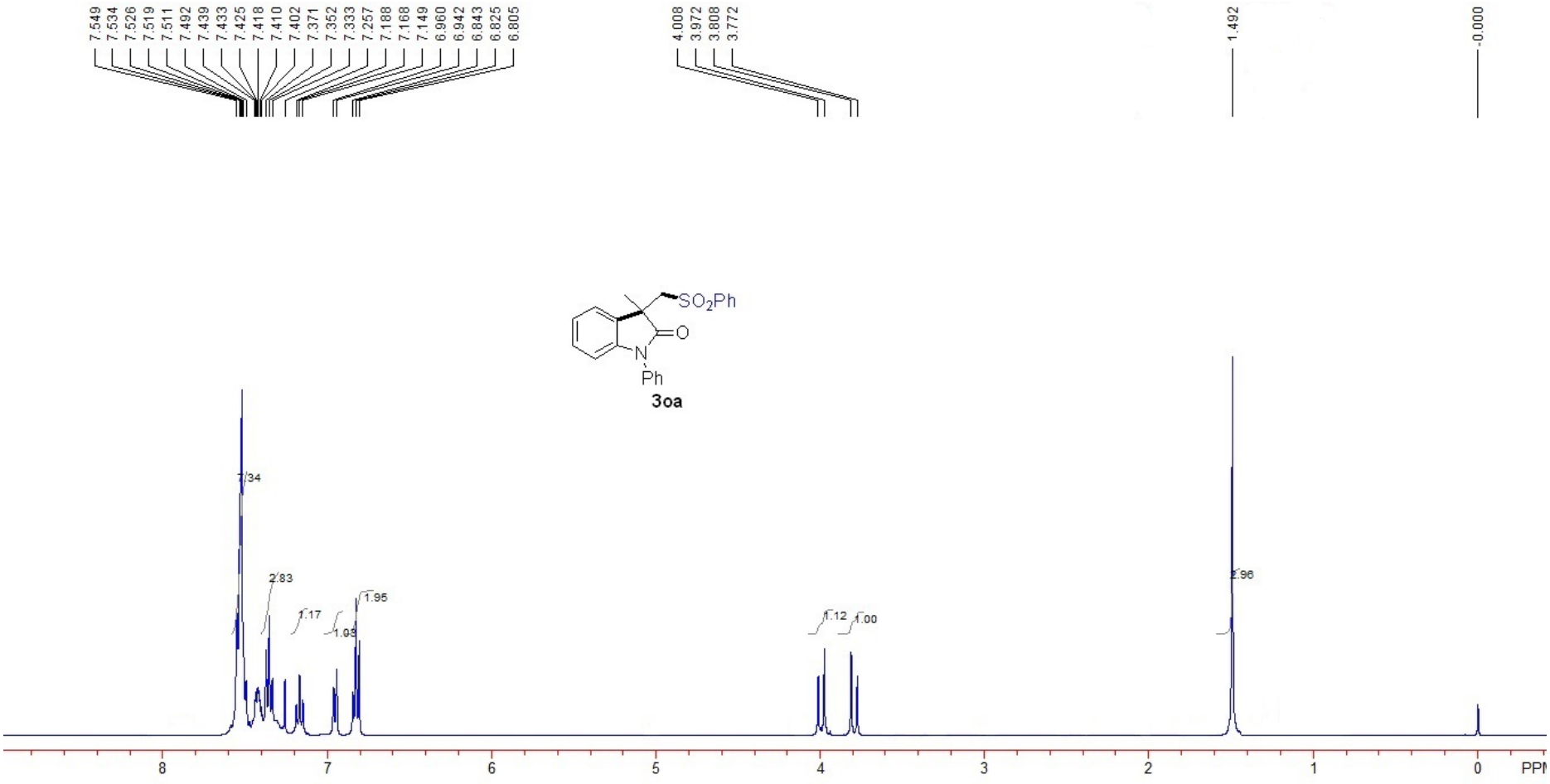
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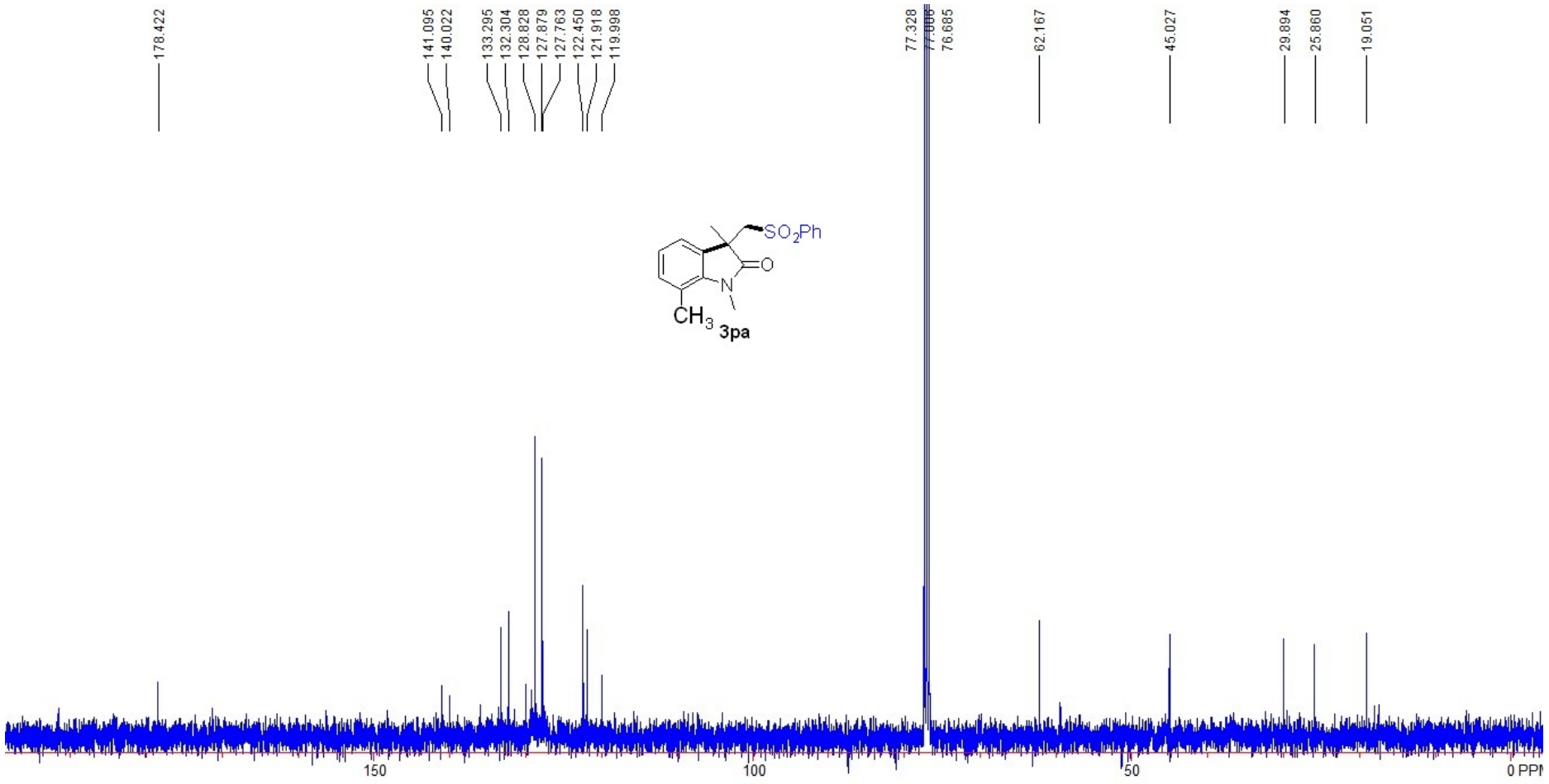
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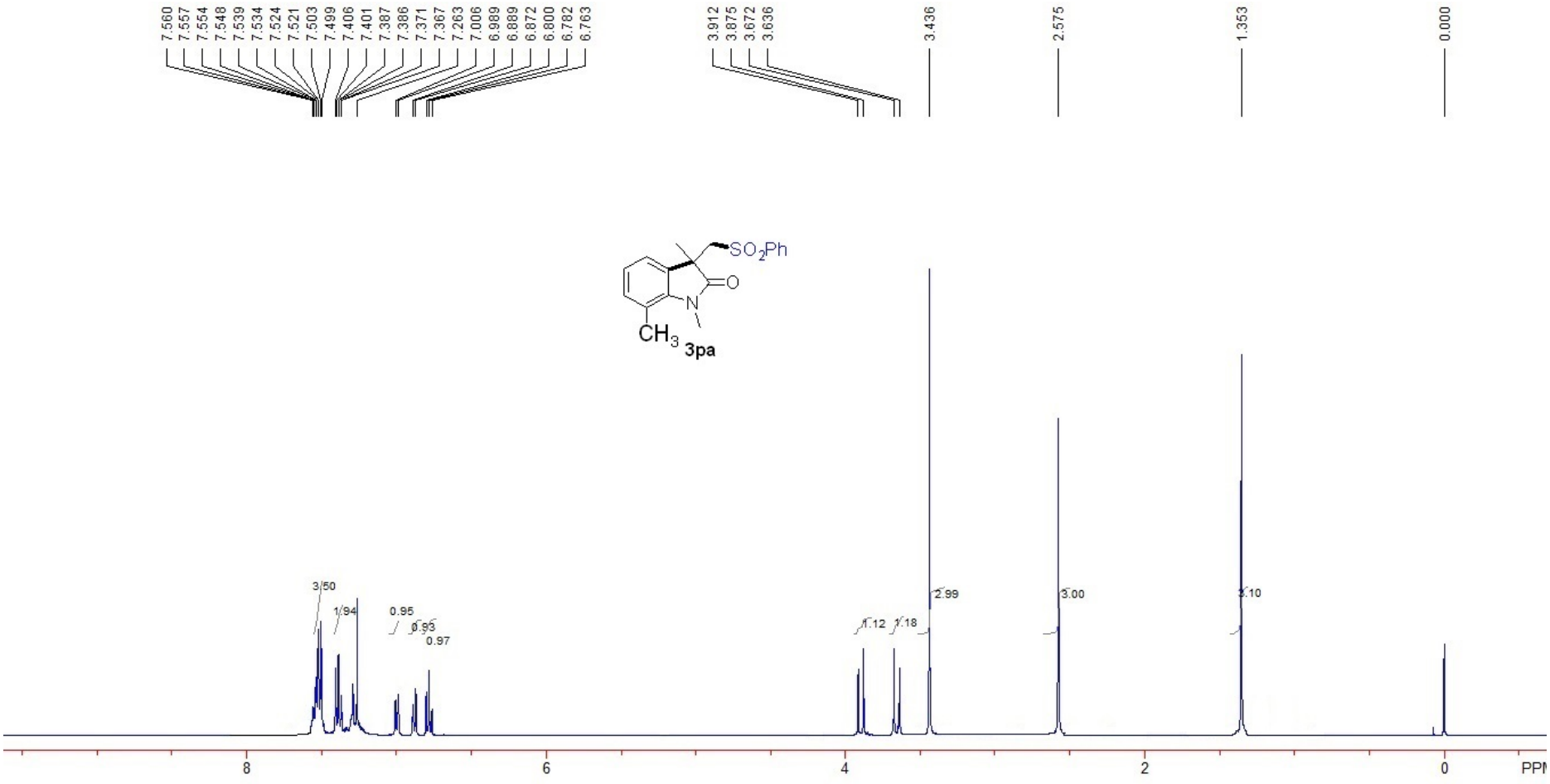
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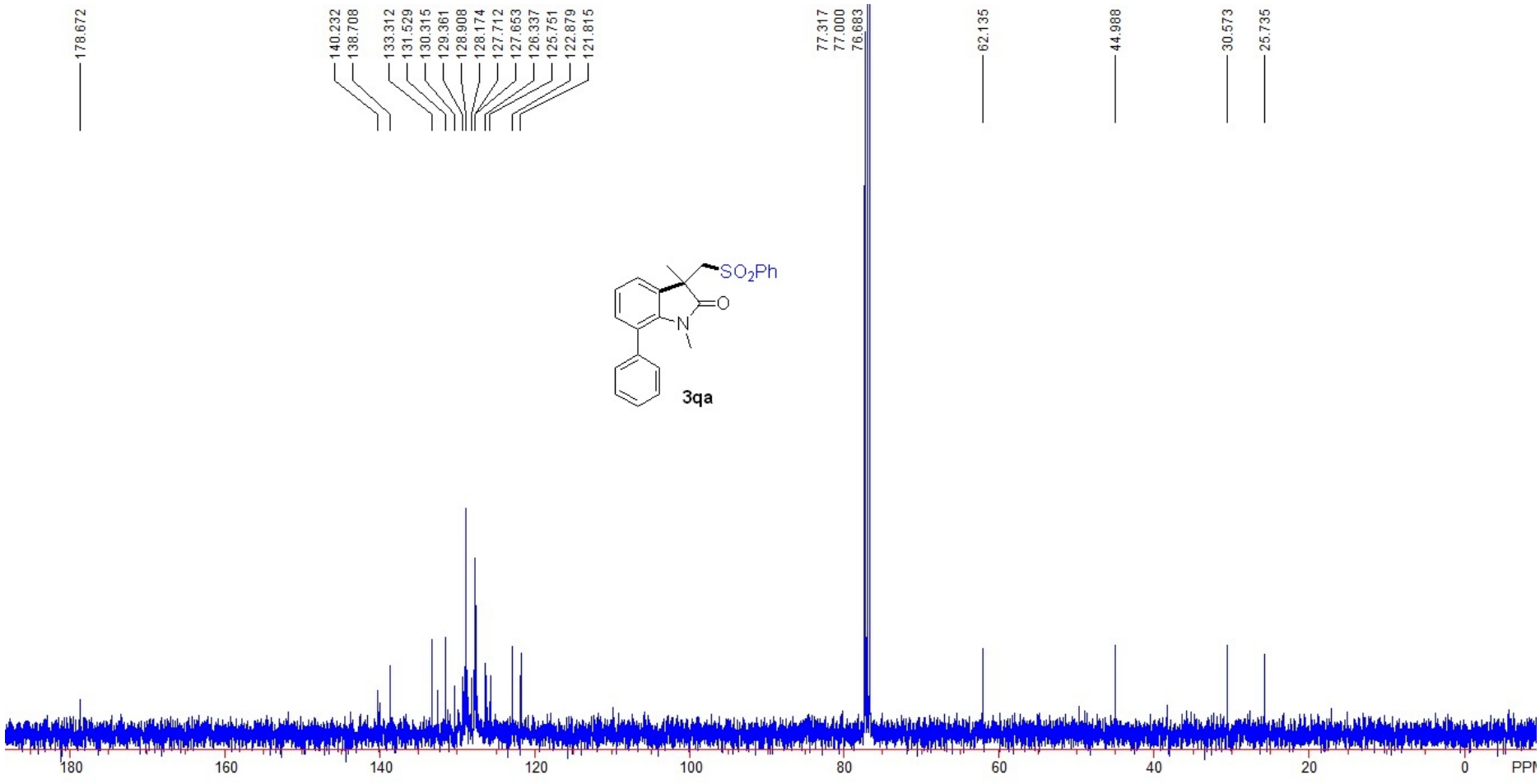
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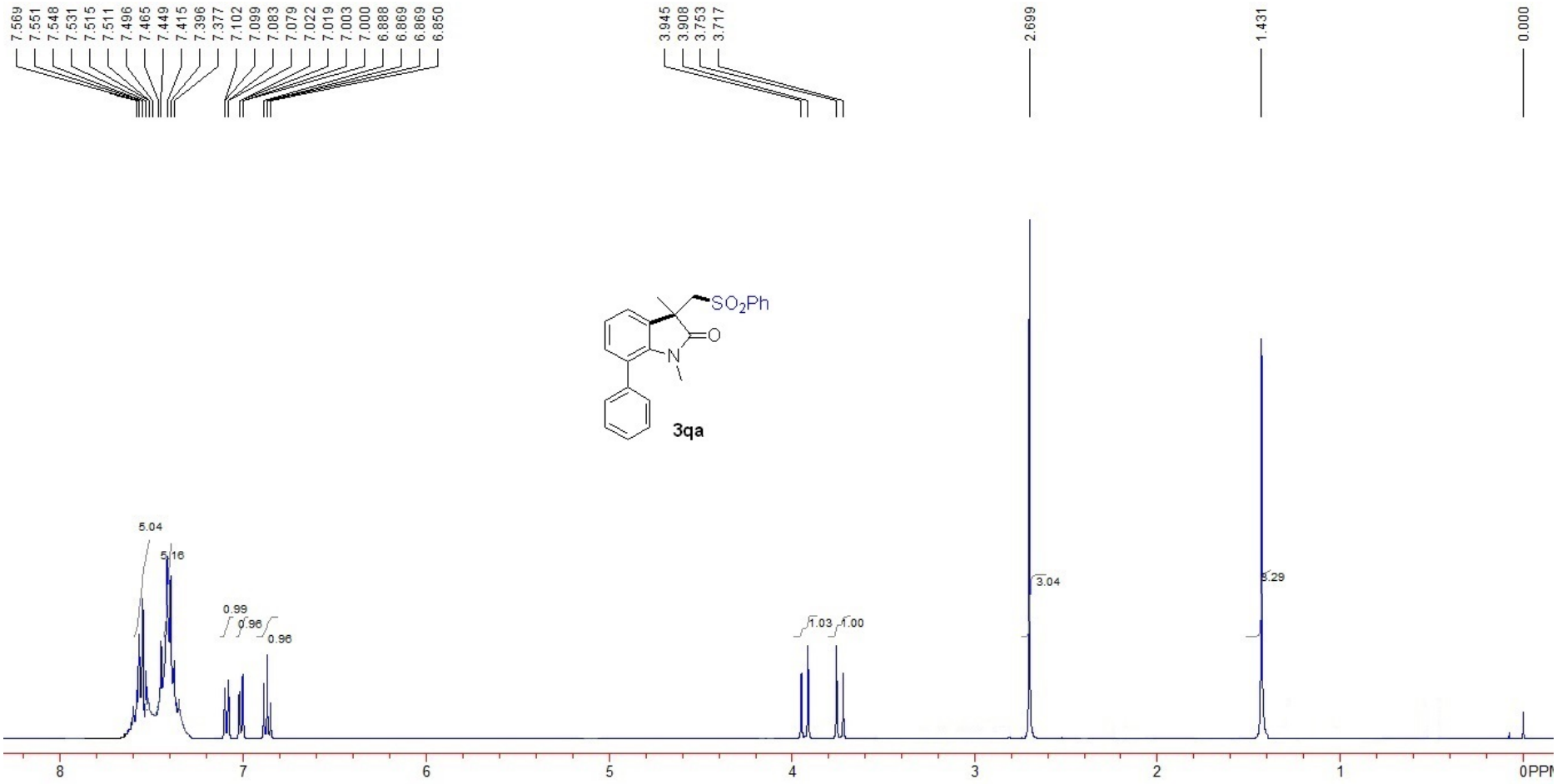
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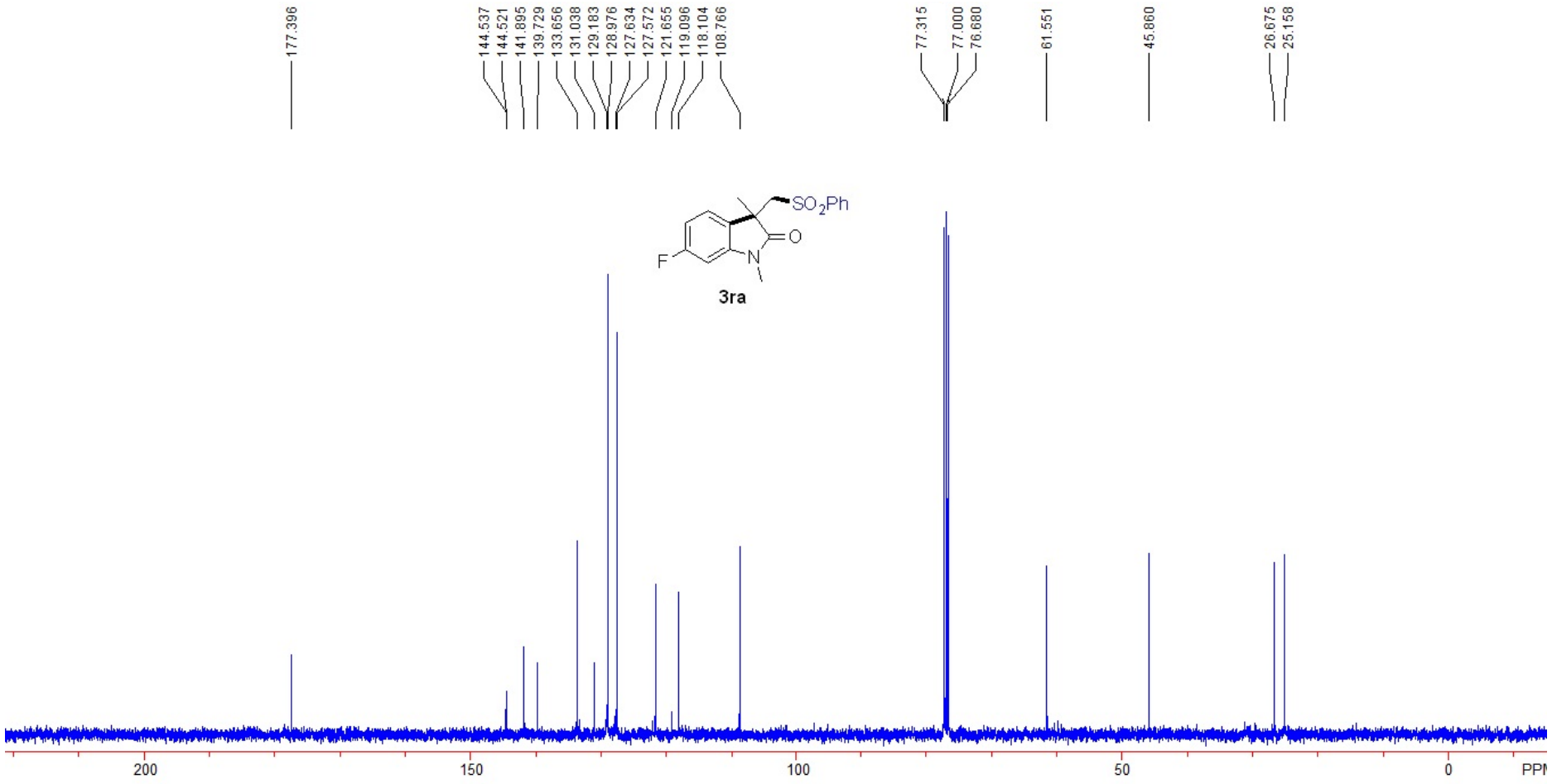
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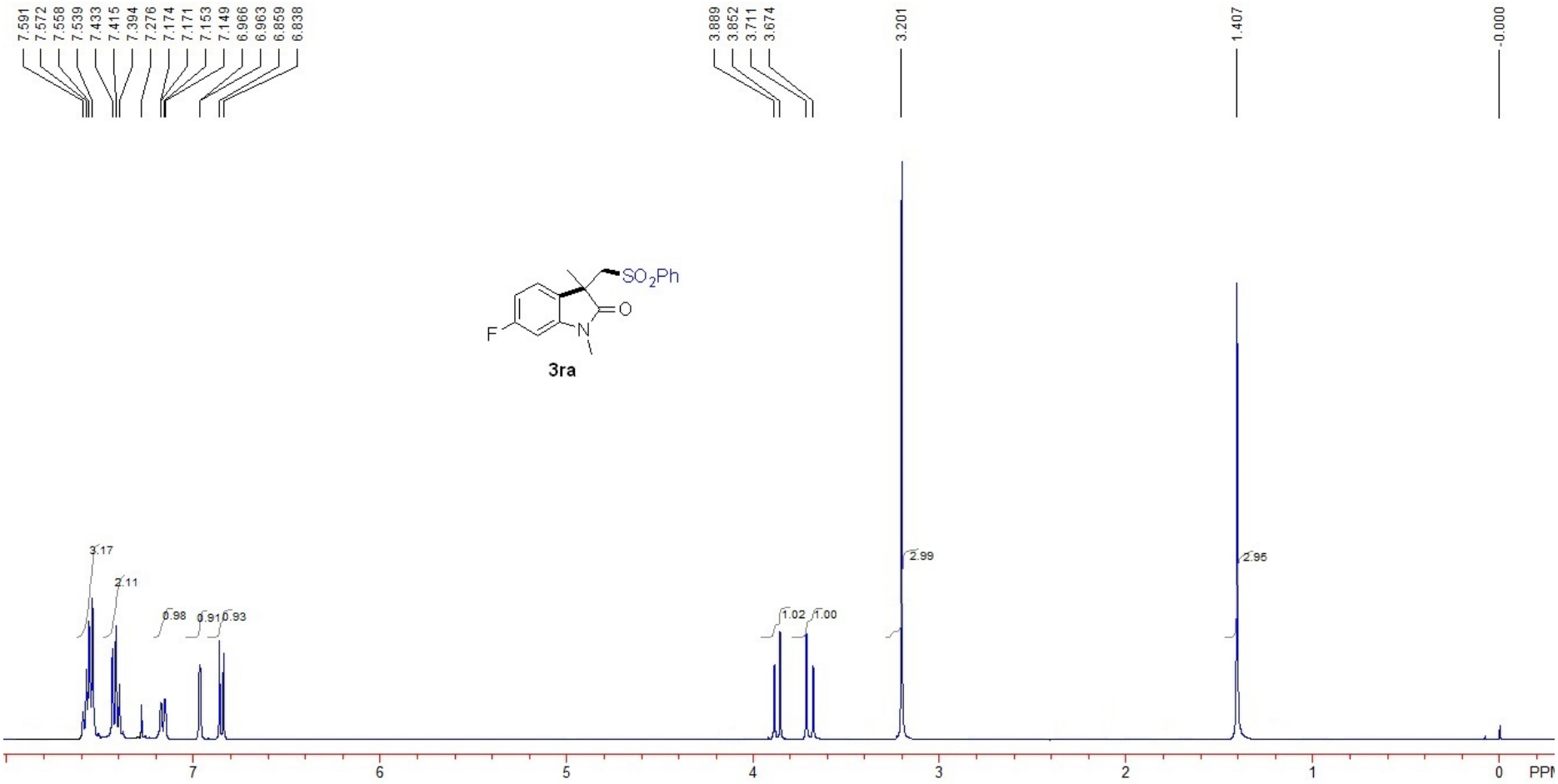
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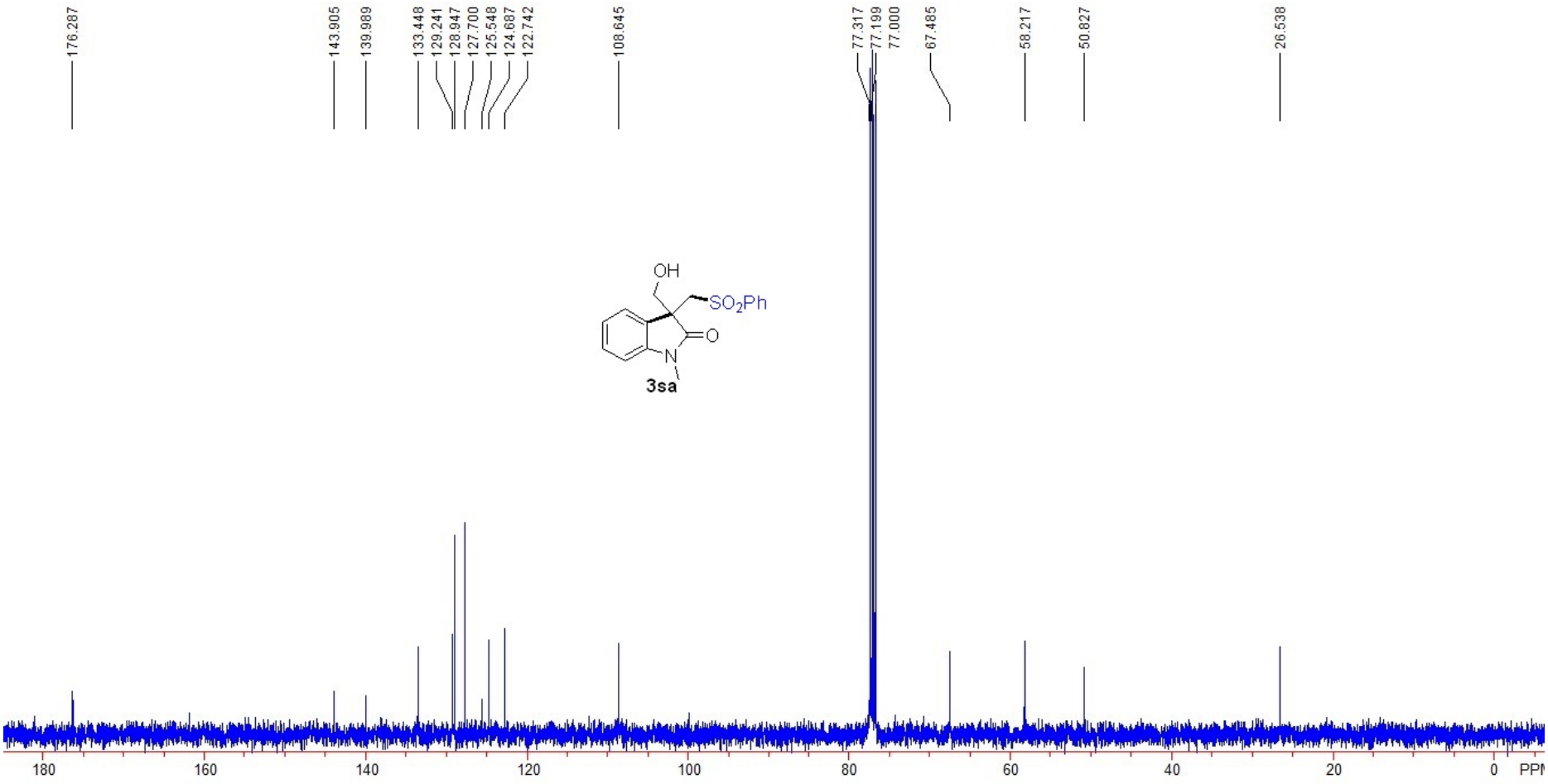
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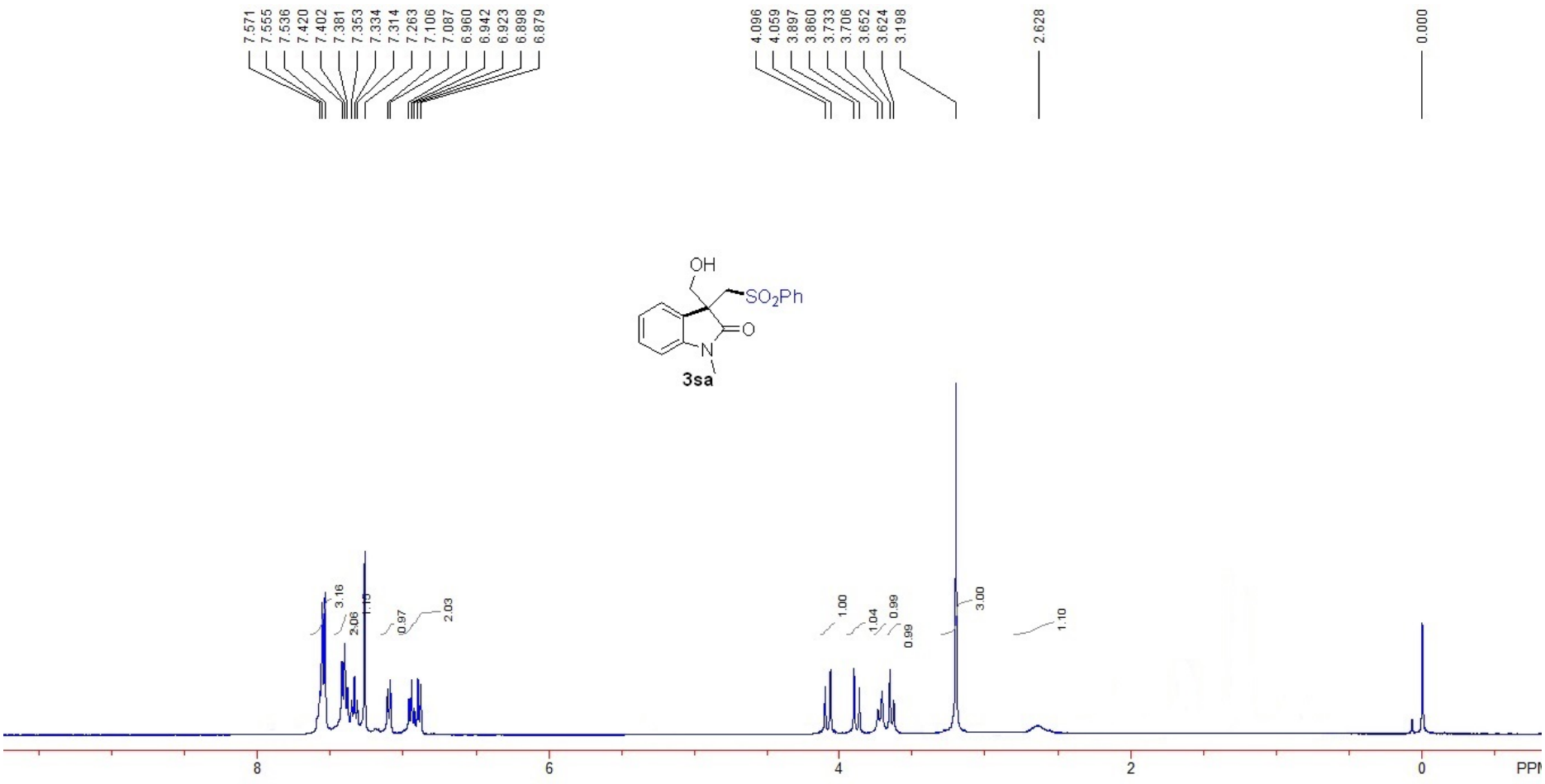
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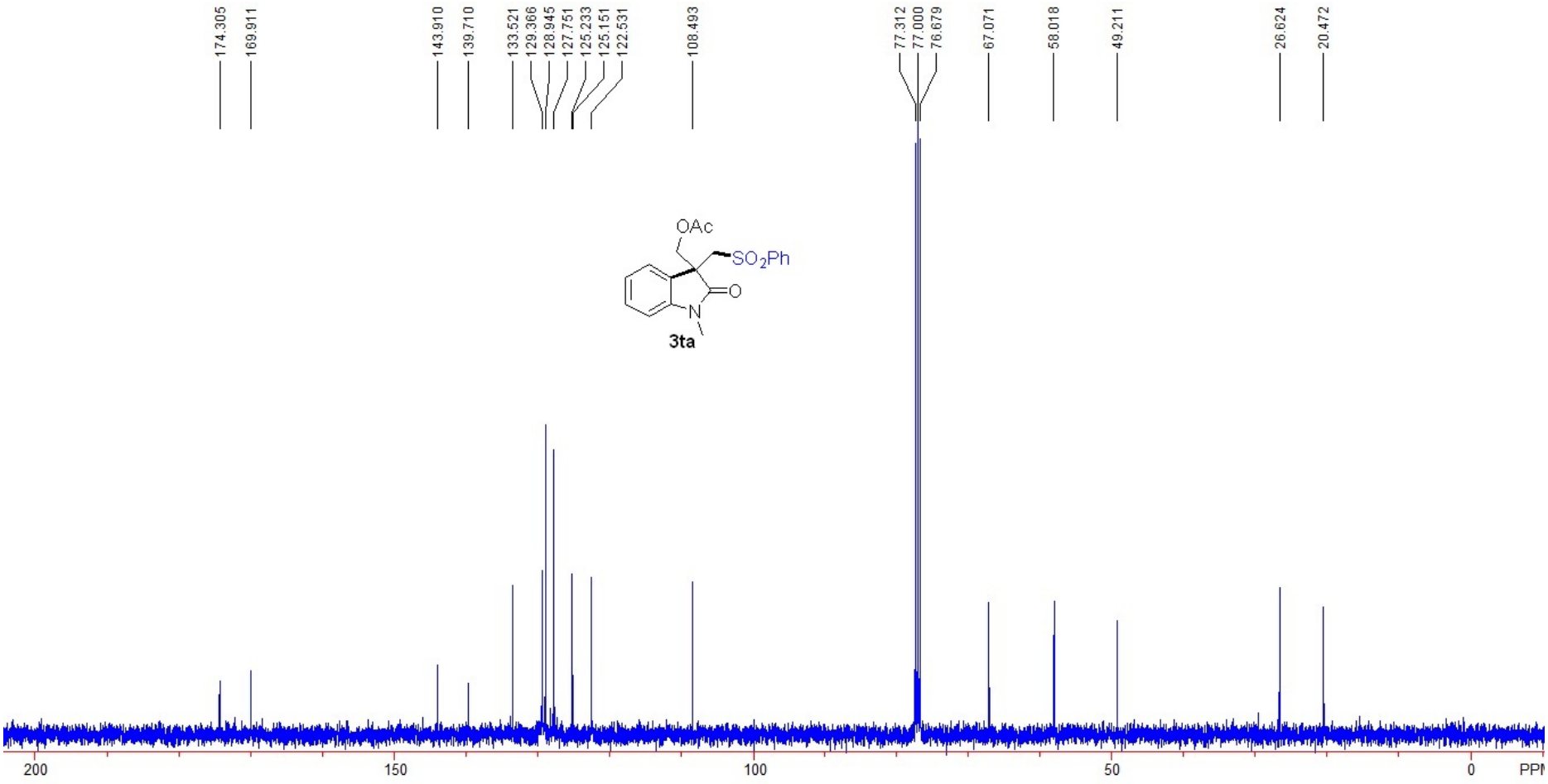
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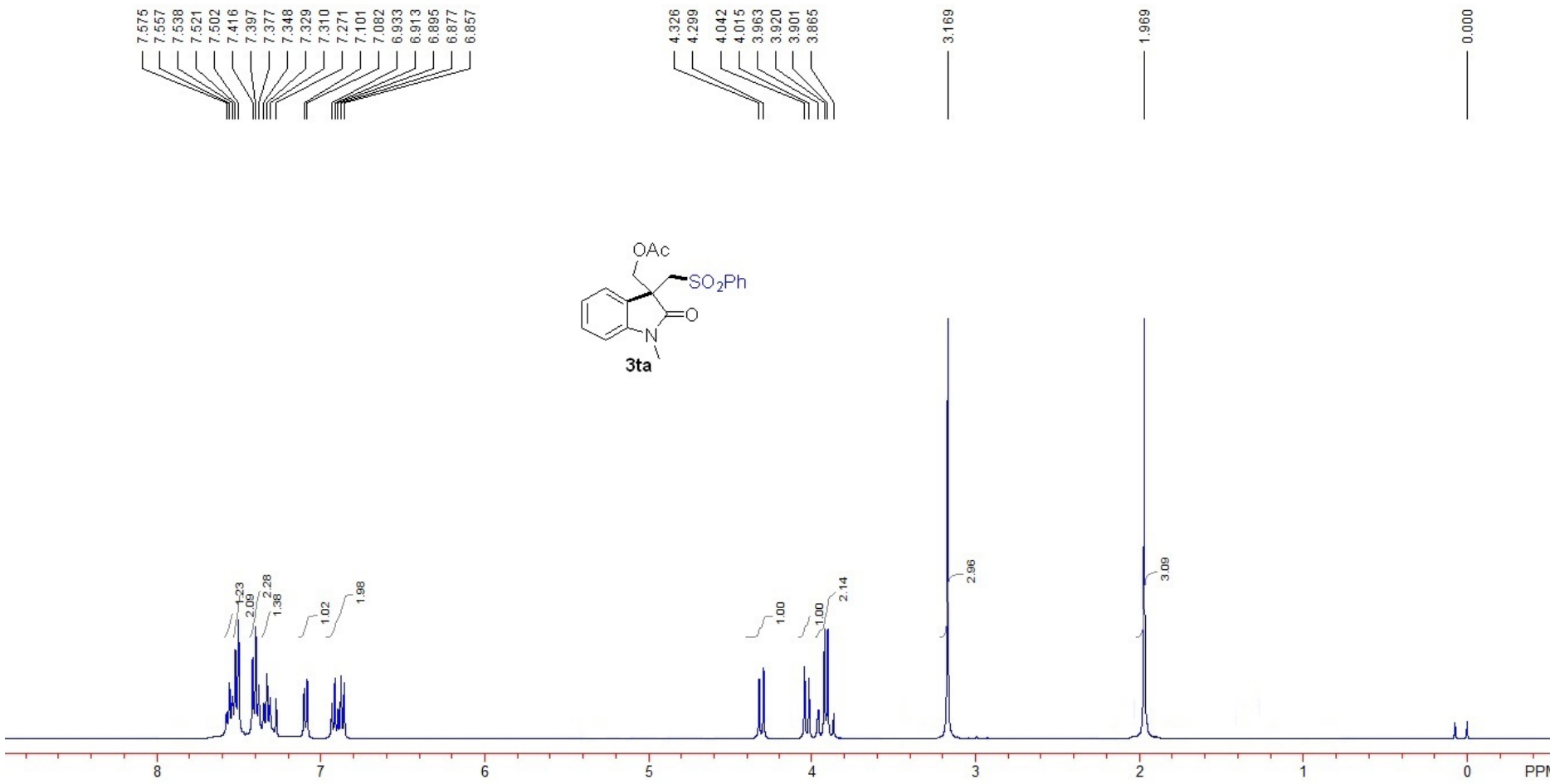
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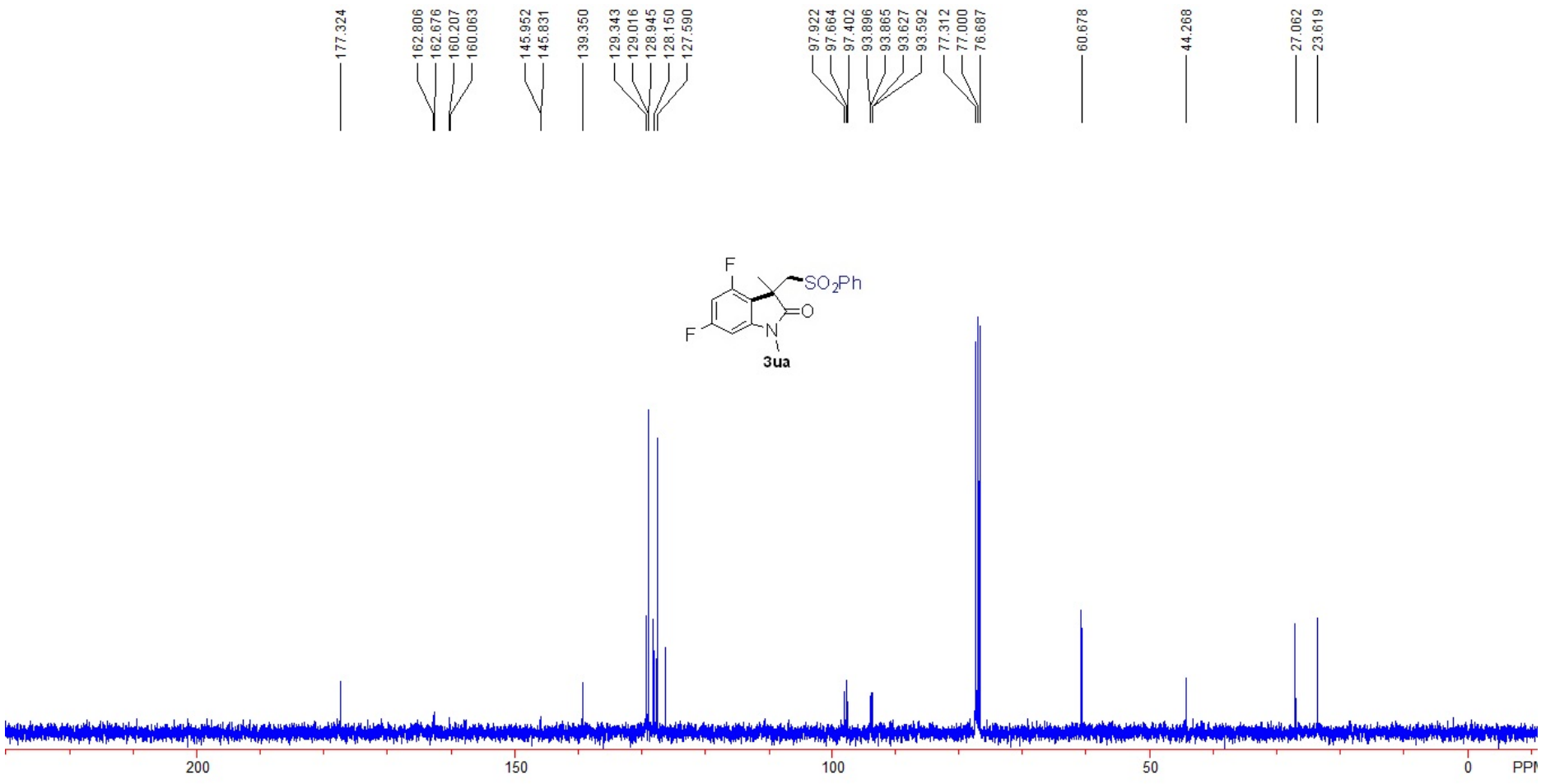
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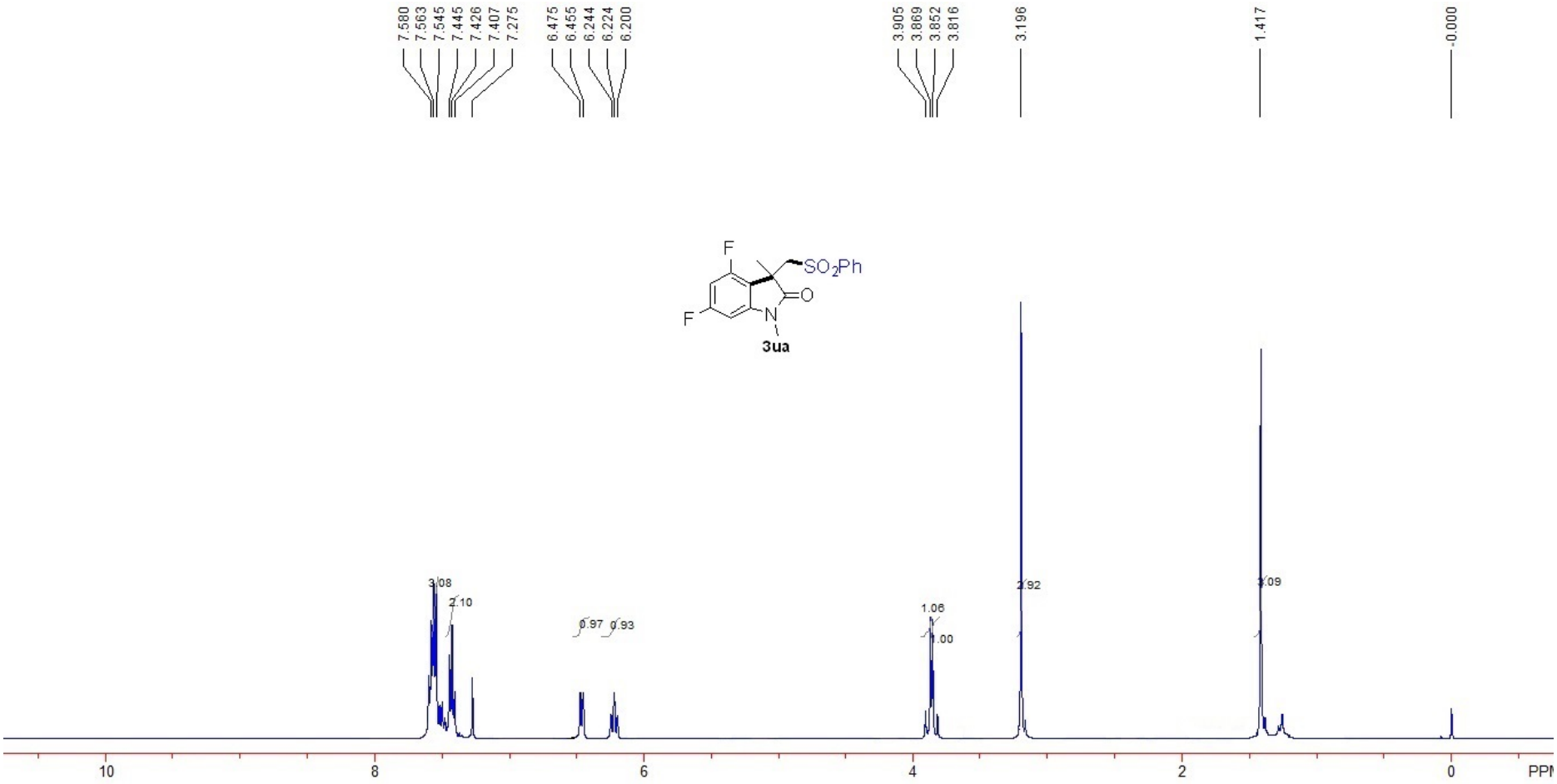
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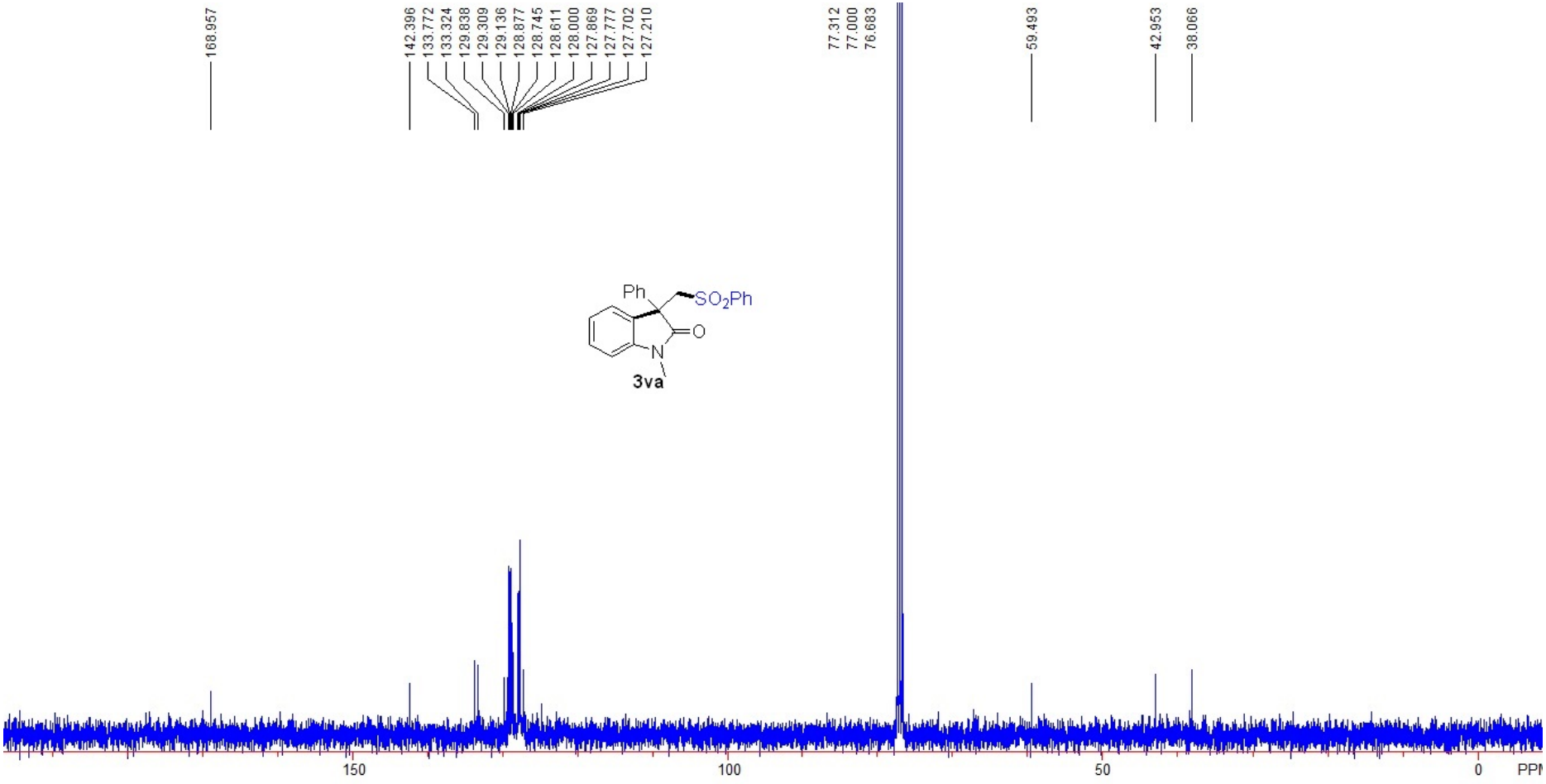
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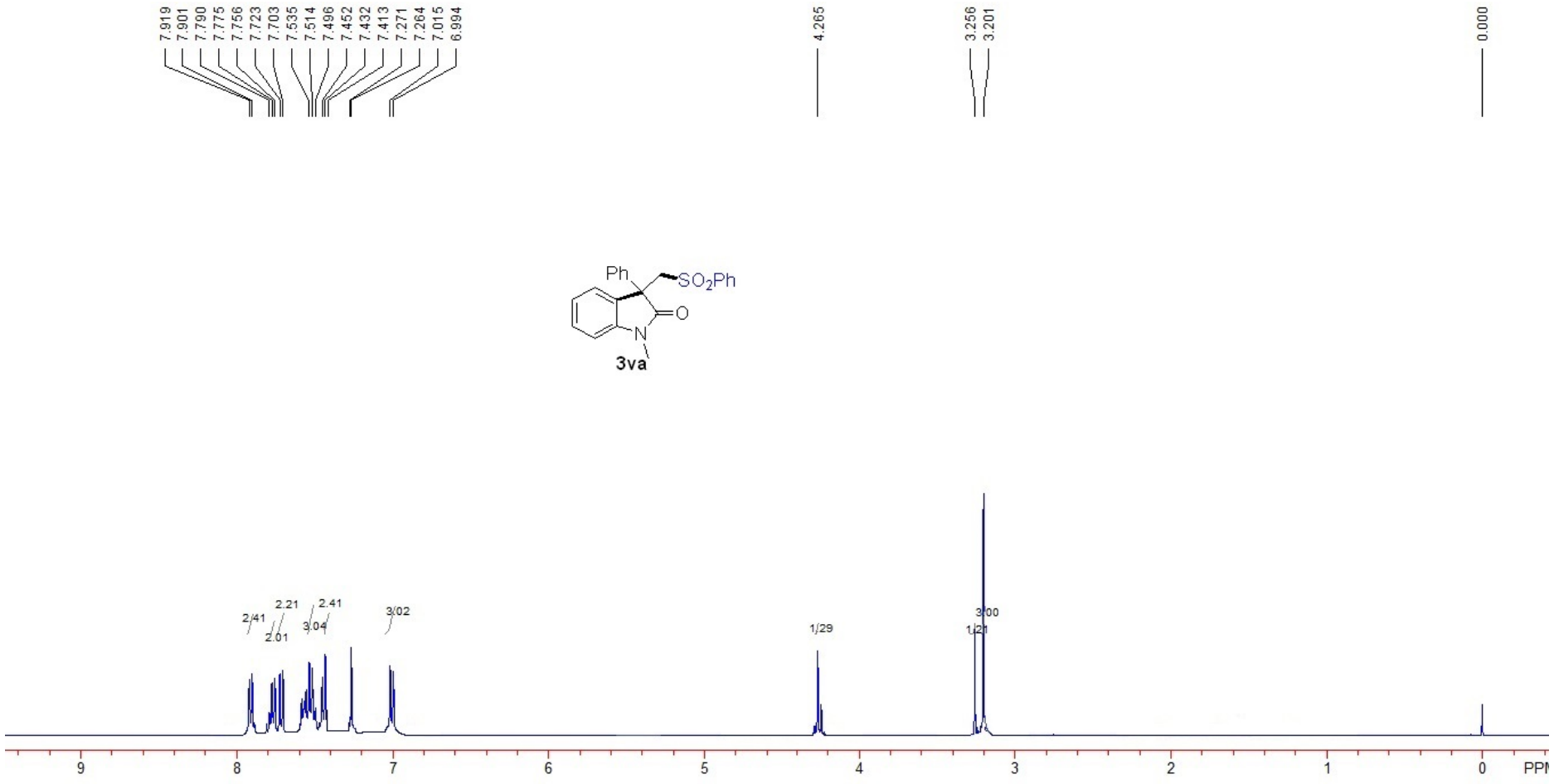
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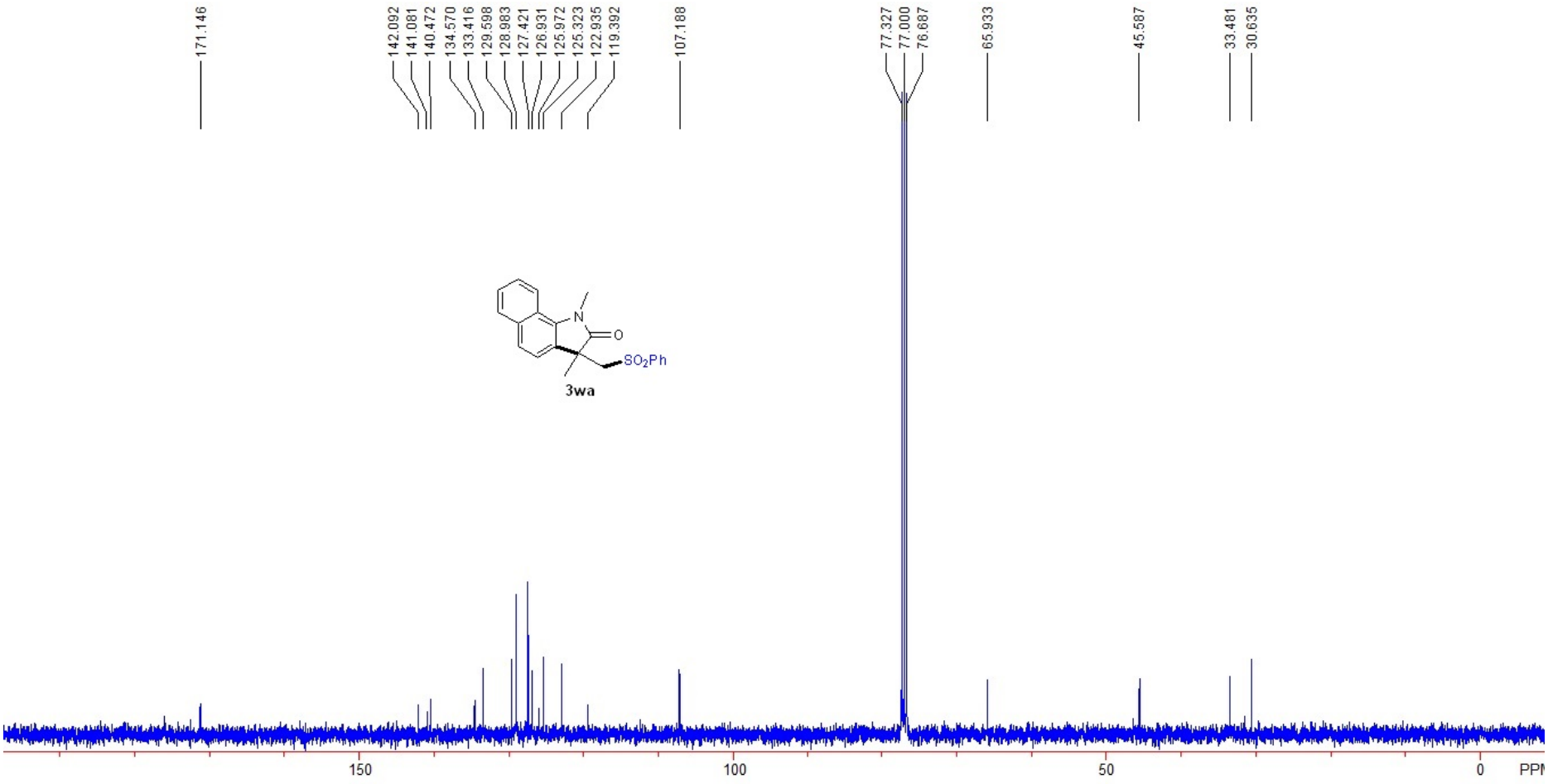
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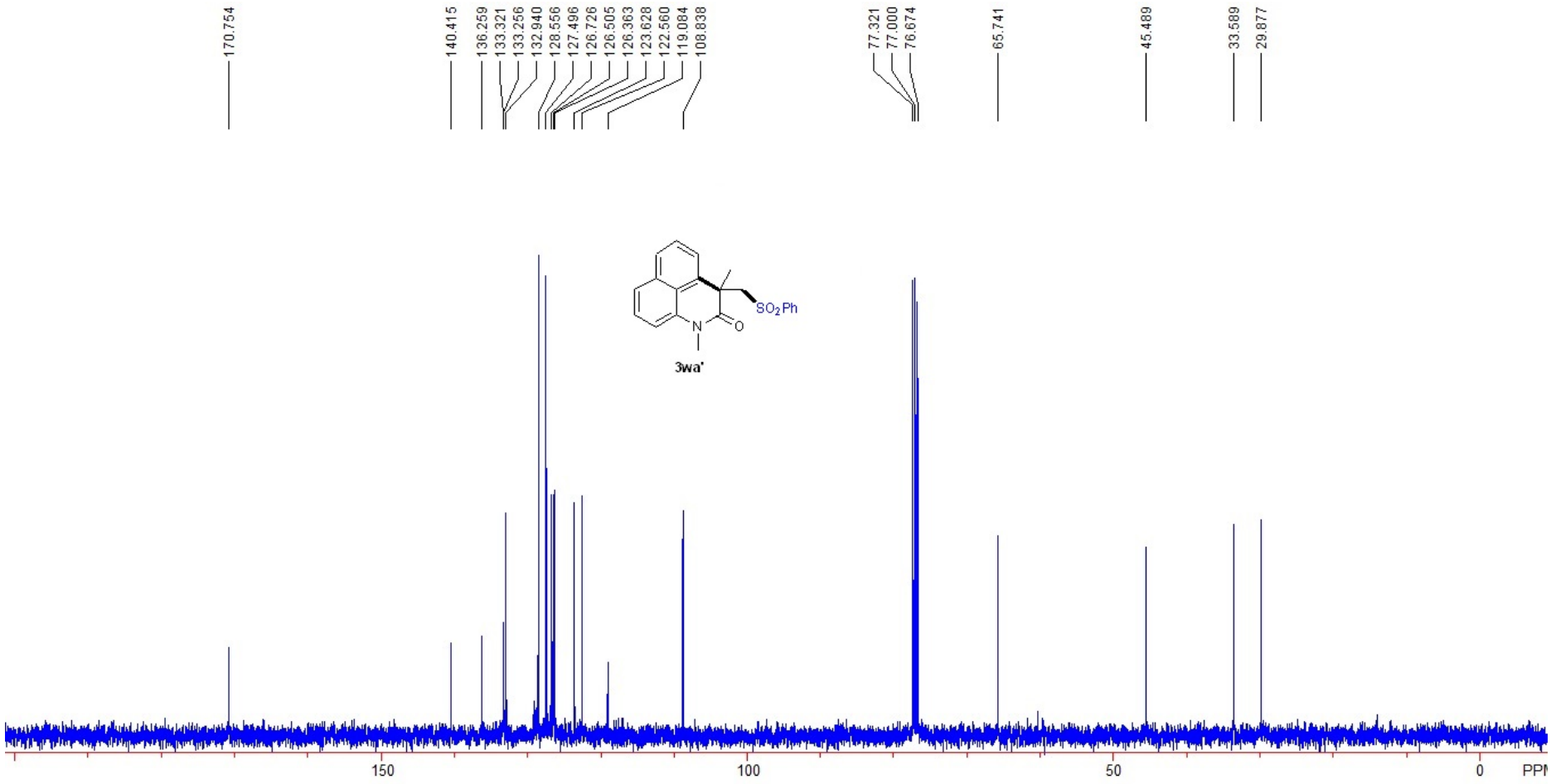
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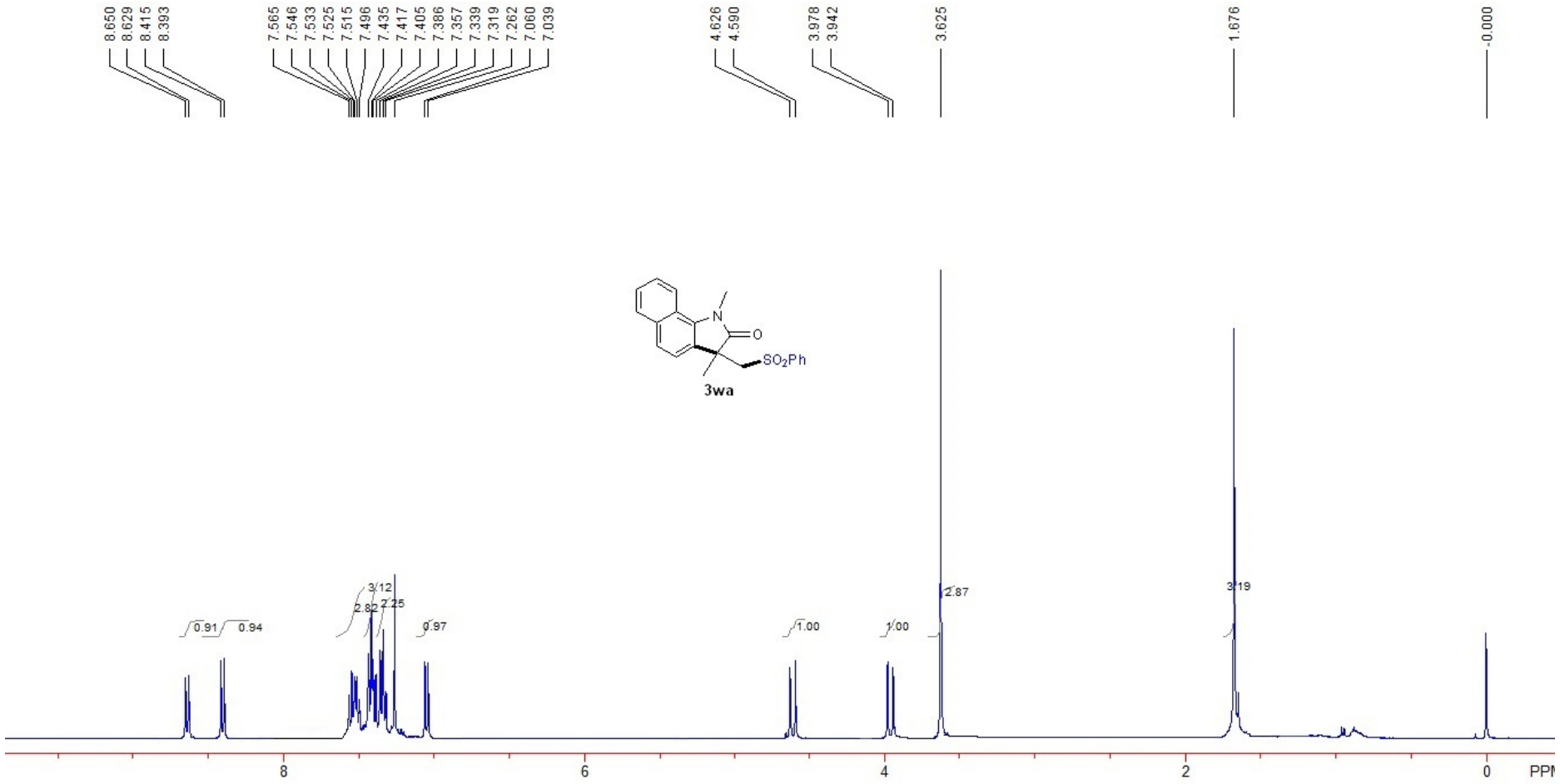
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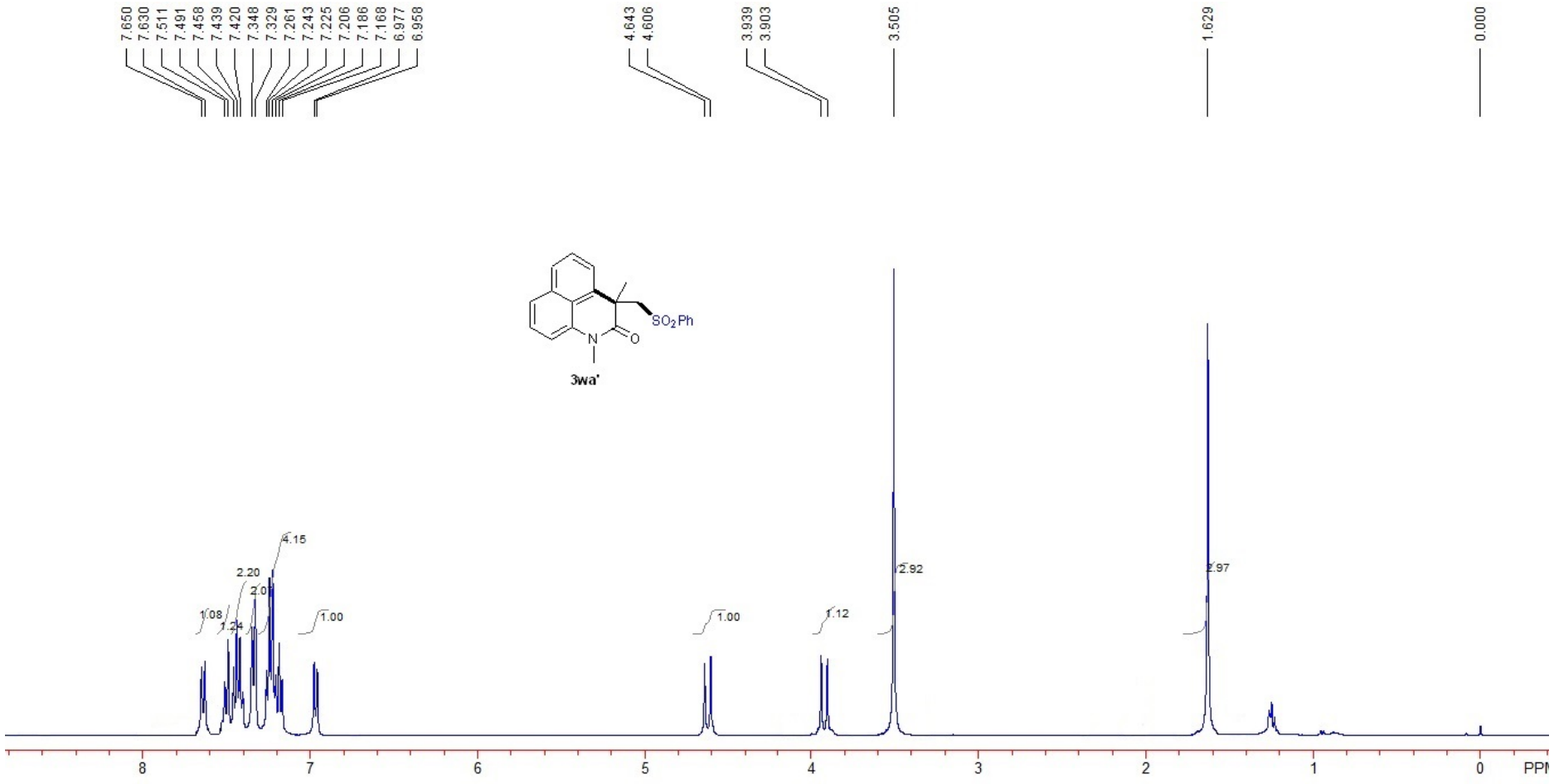
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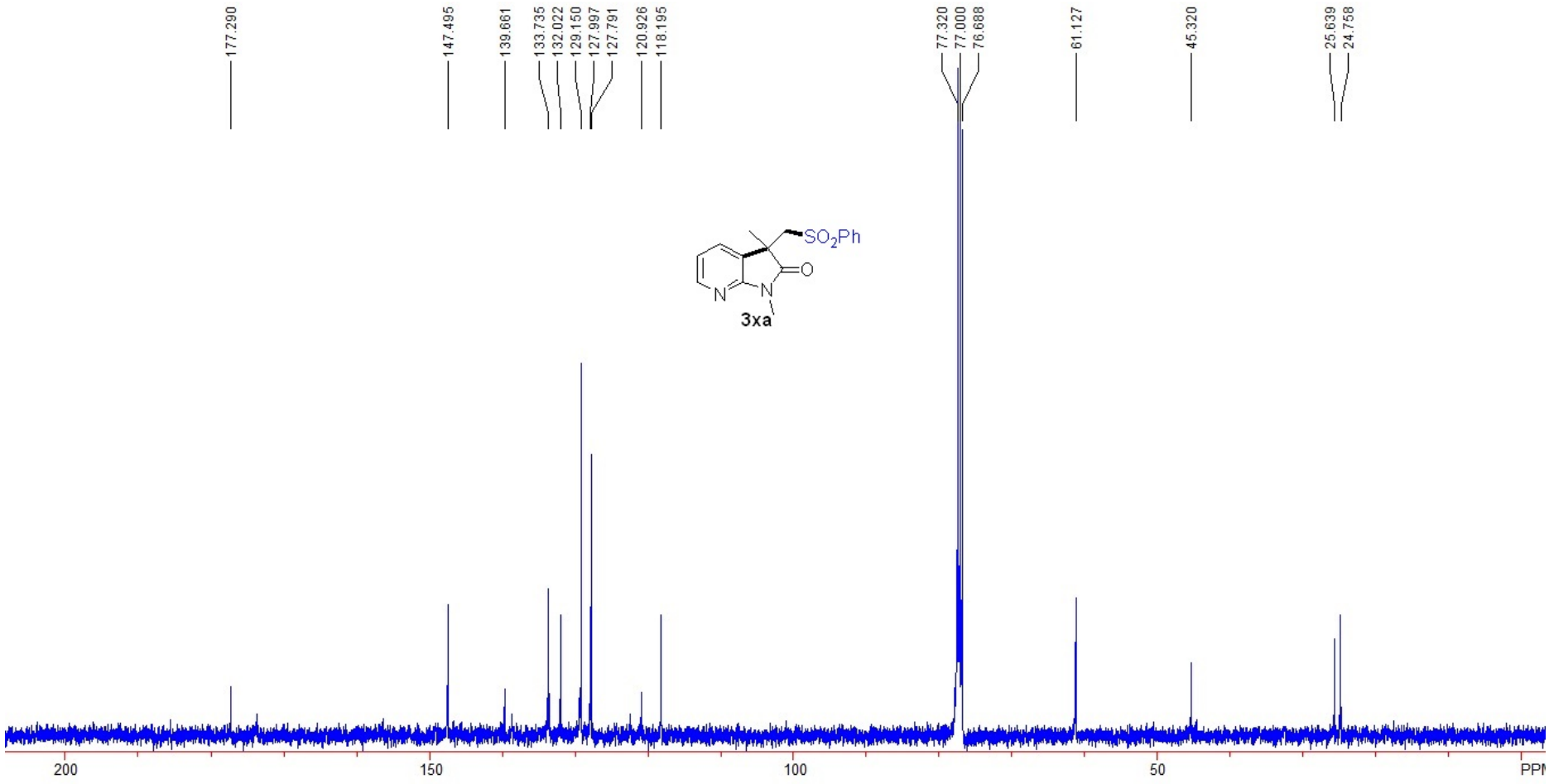
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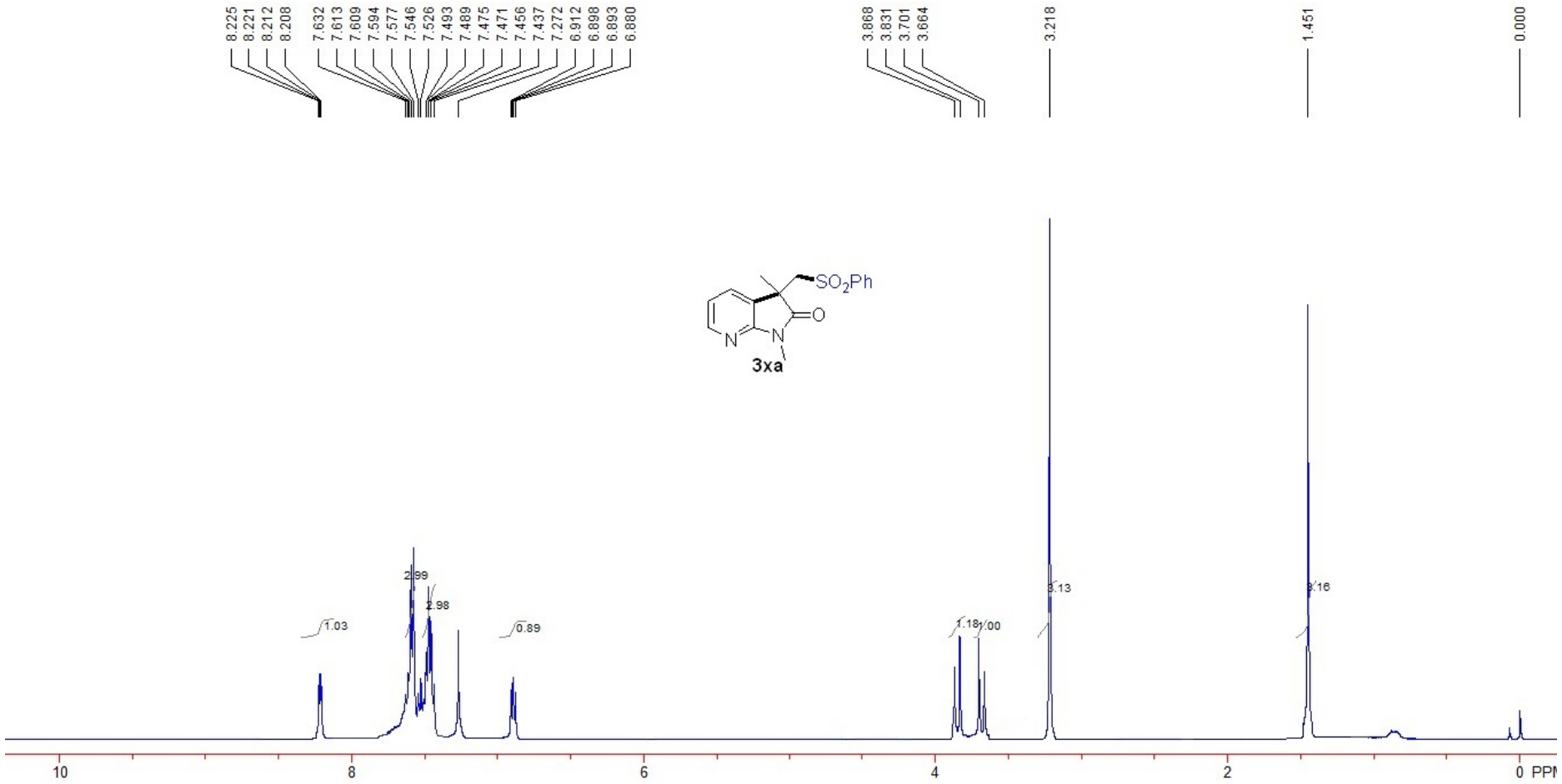
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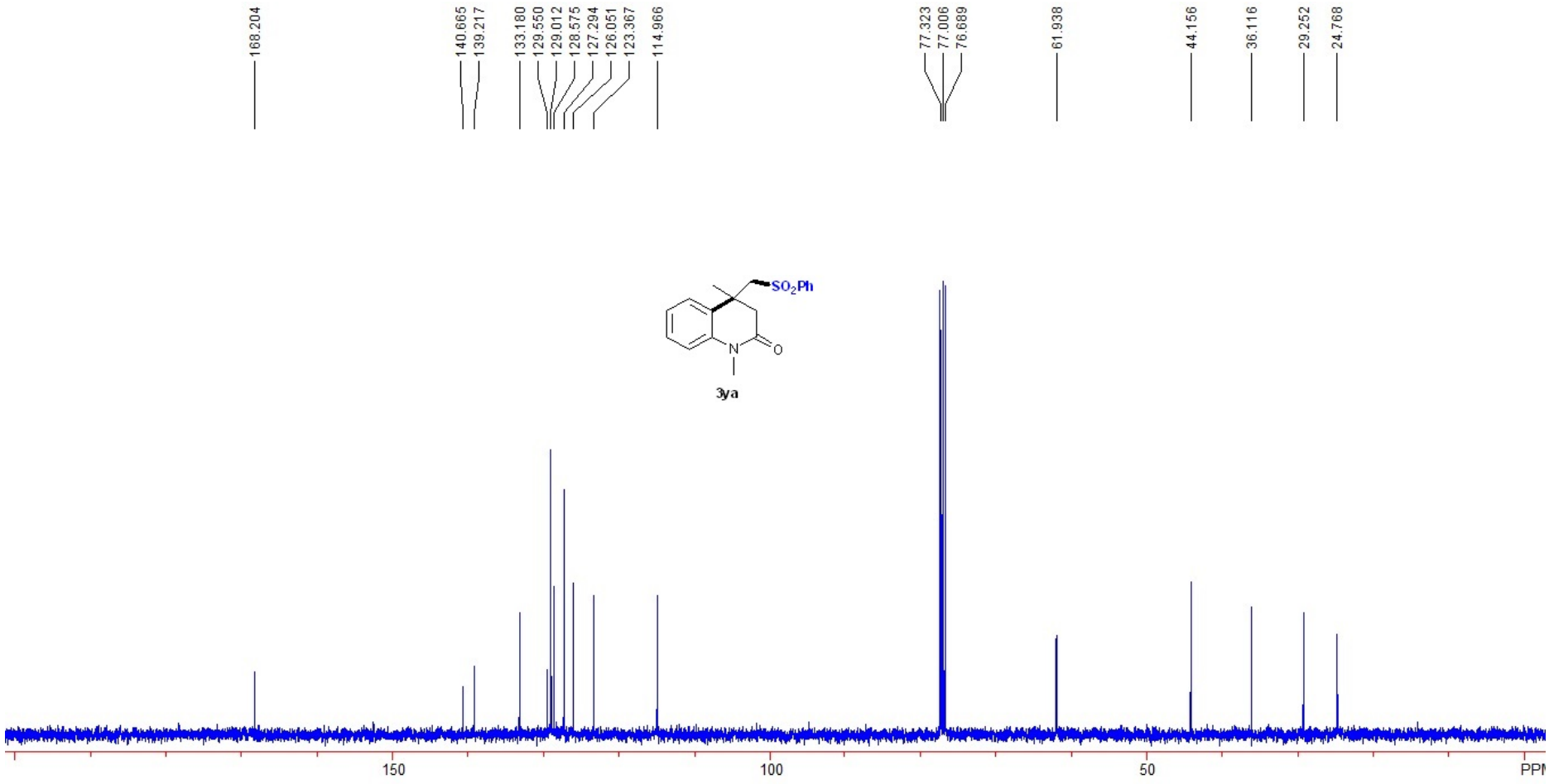
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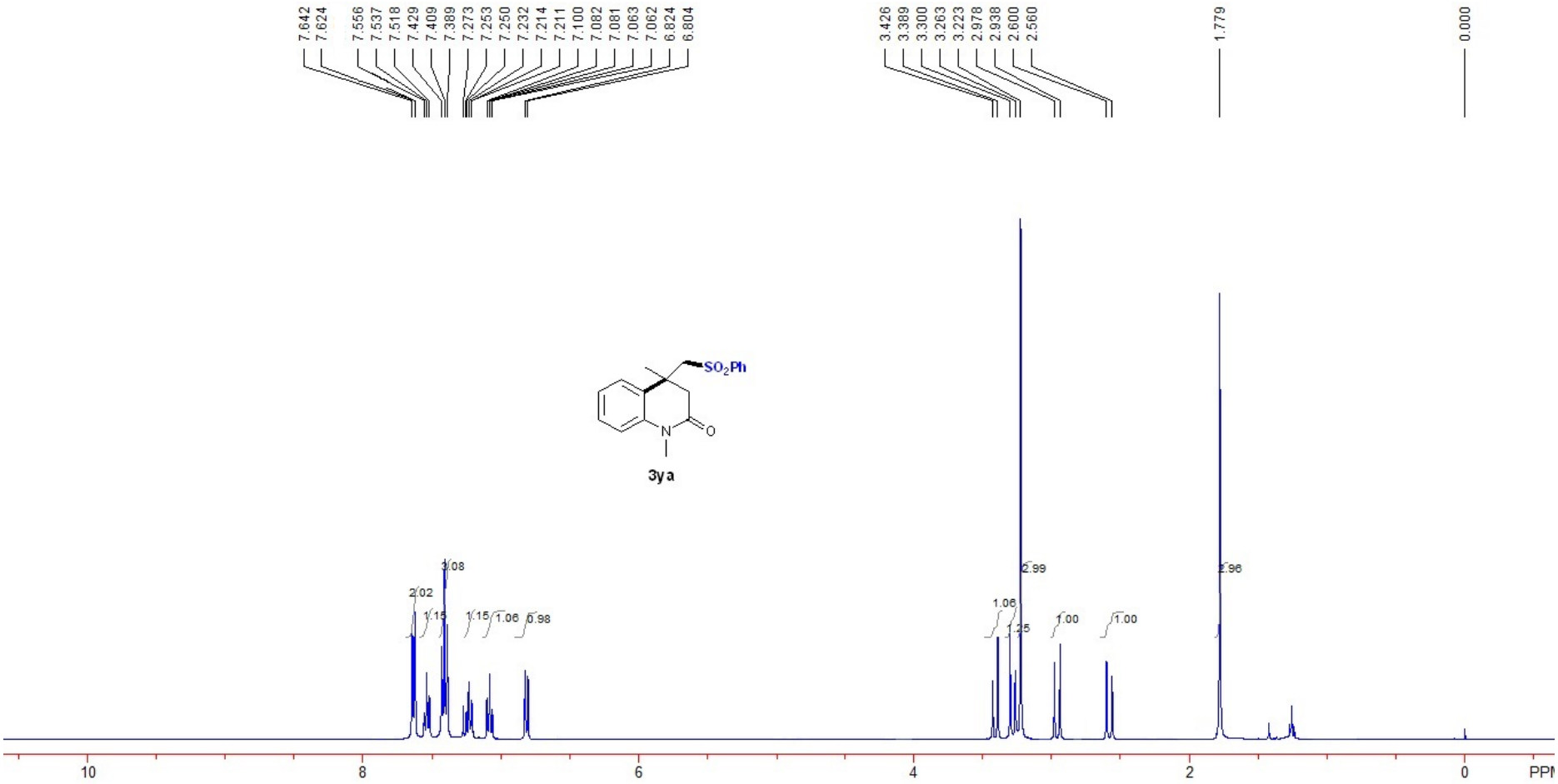
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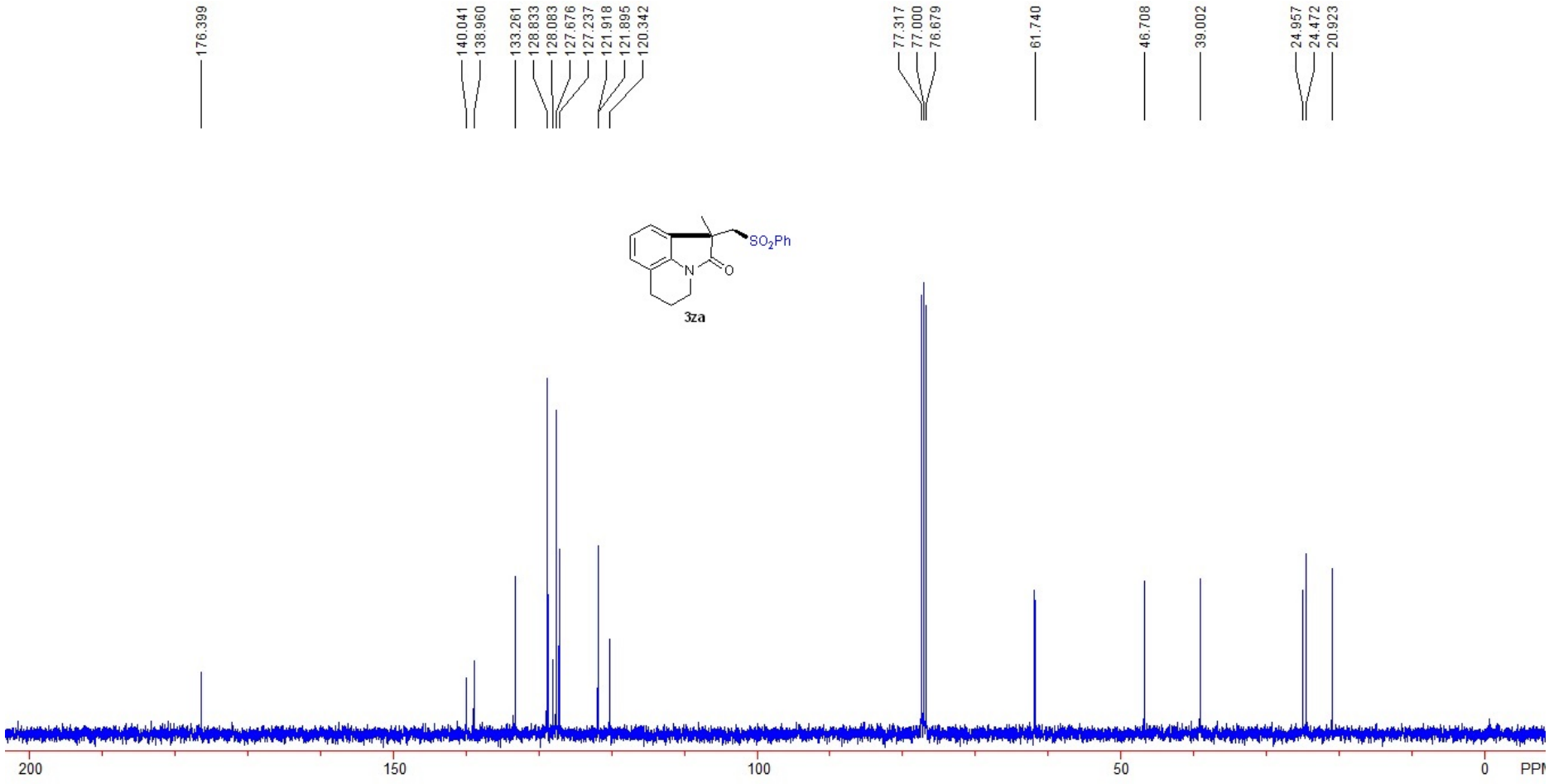
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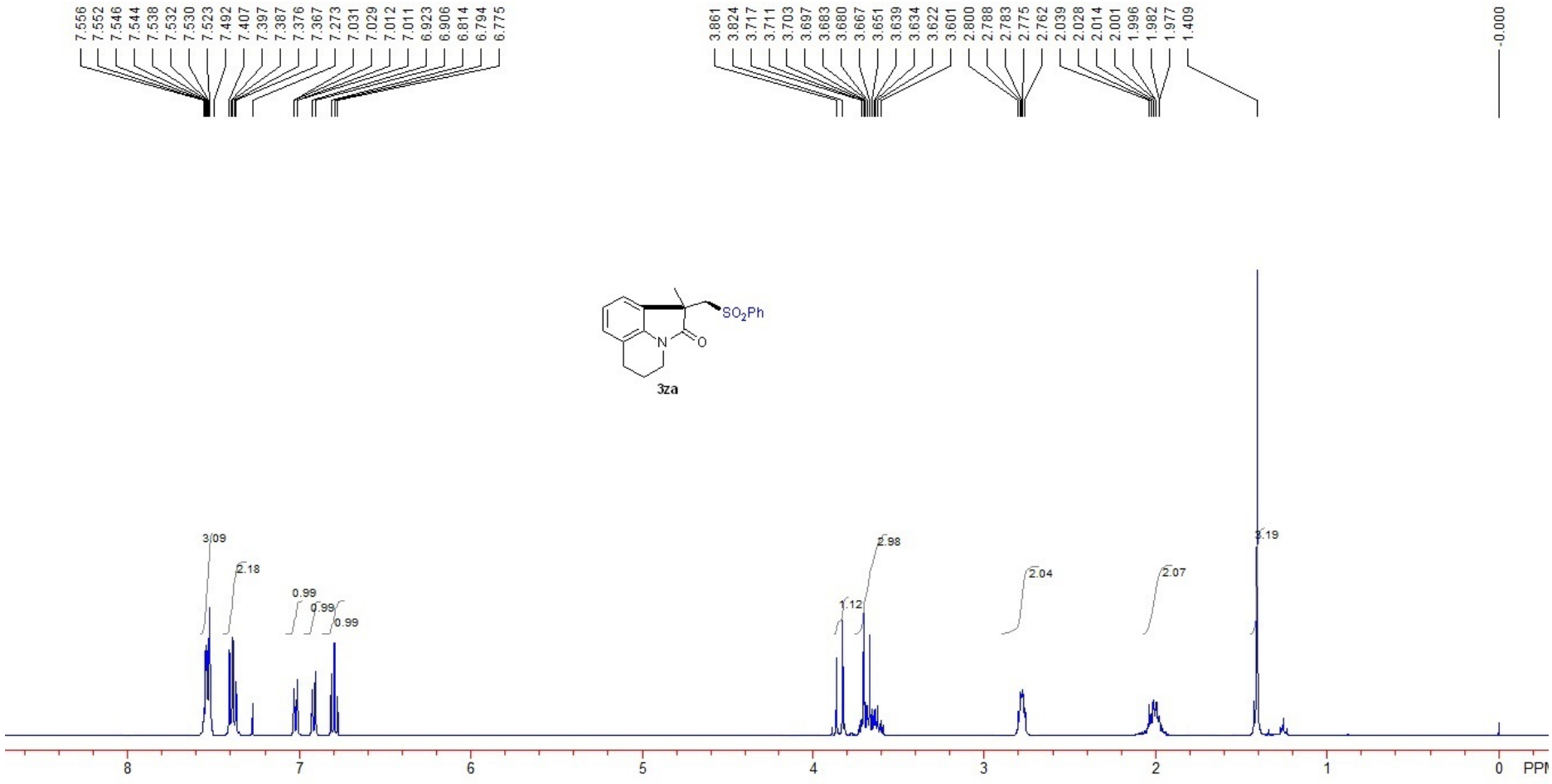
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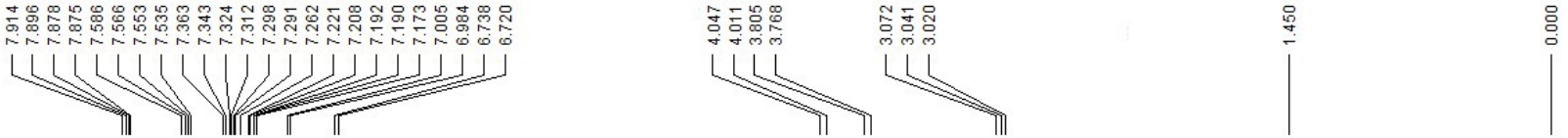
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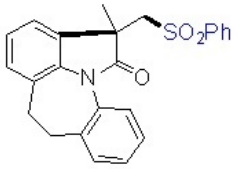
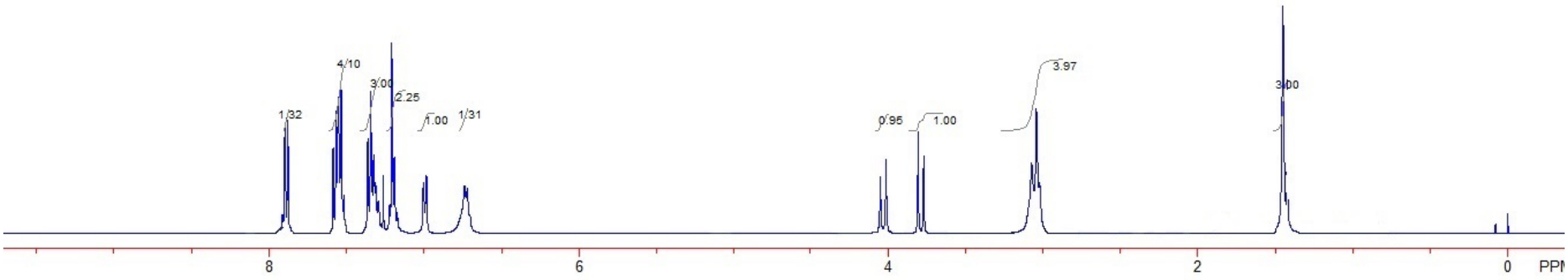

SO2Ph
N
O

5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1.00
3.97
3.00
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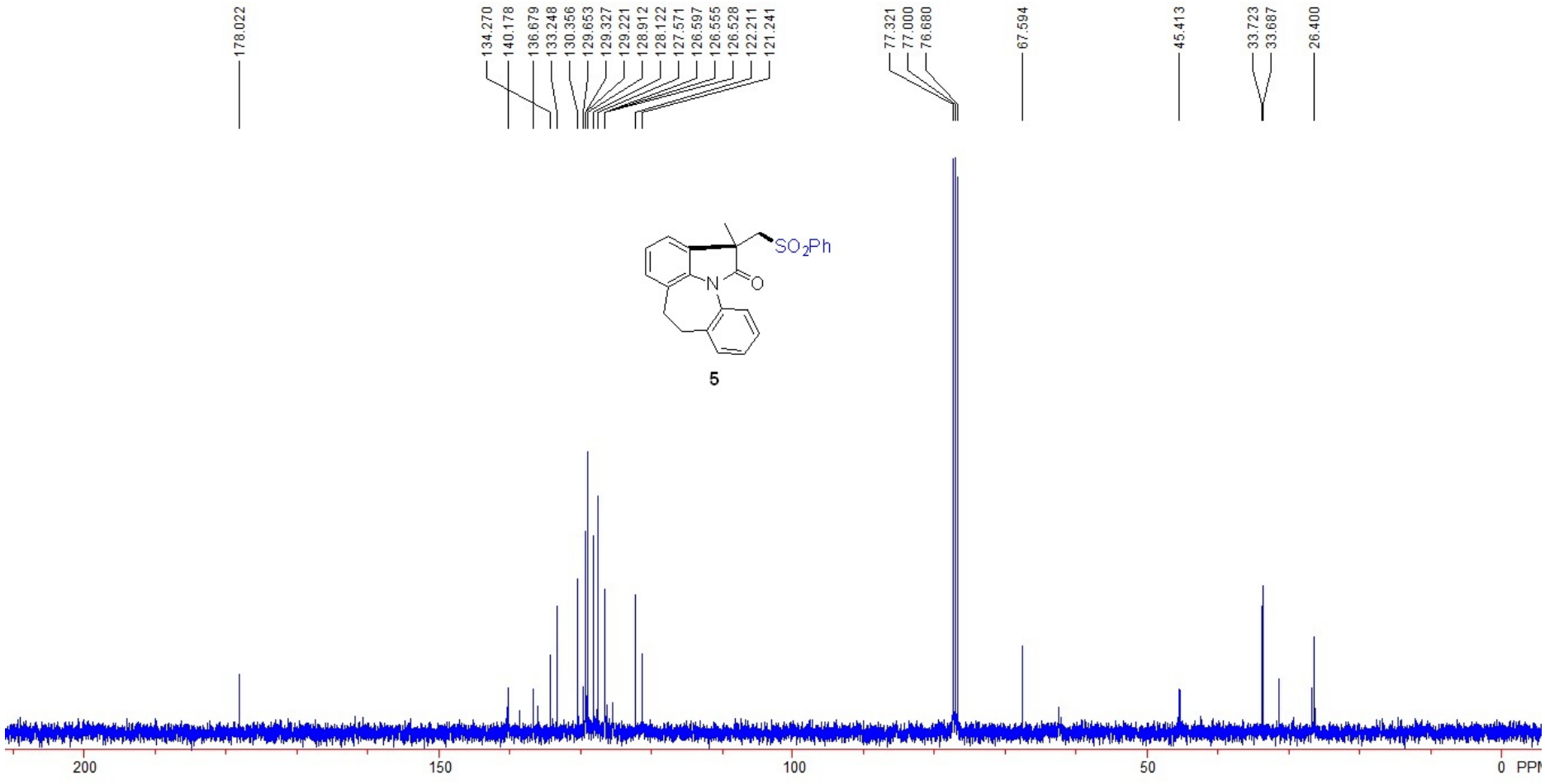
6
4
2
0
PPM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129.221
128.912
128.122
127.571
126.597
126.555
126.528
122.211
121.241
77.321
77.000
76.680
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33.723
33.687
26.400
SO2Ph
N
O
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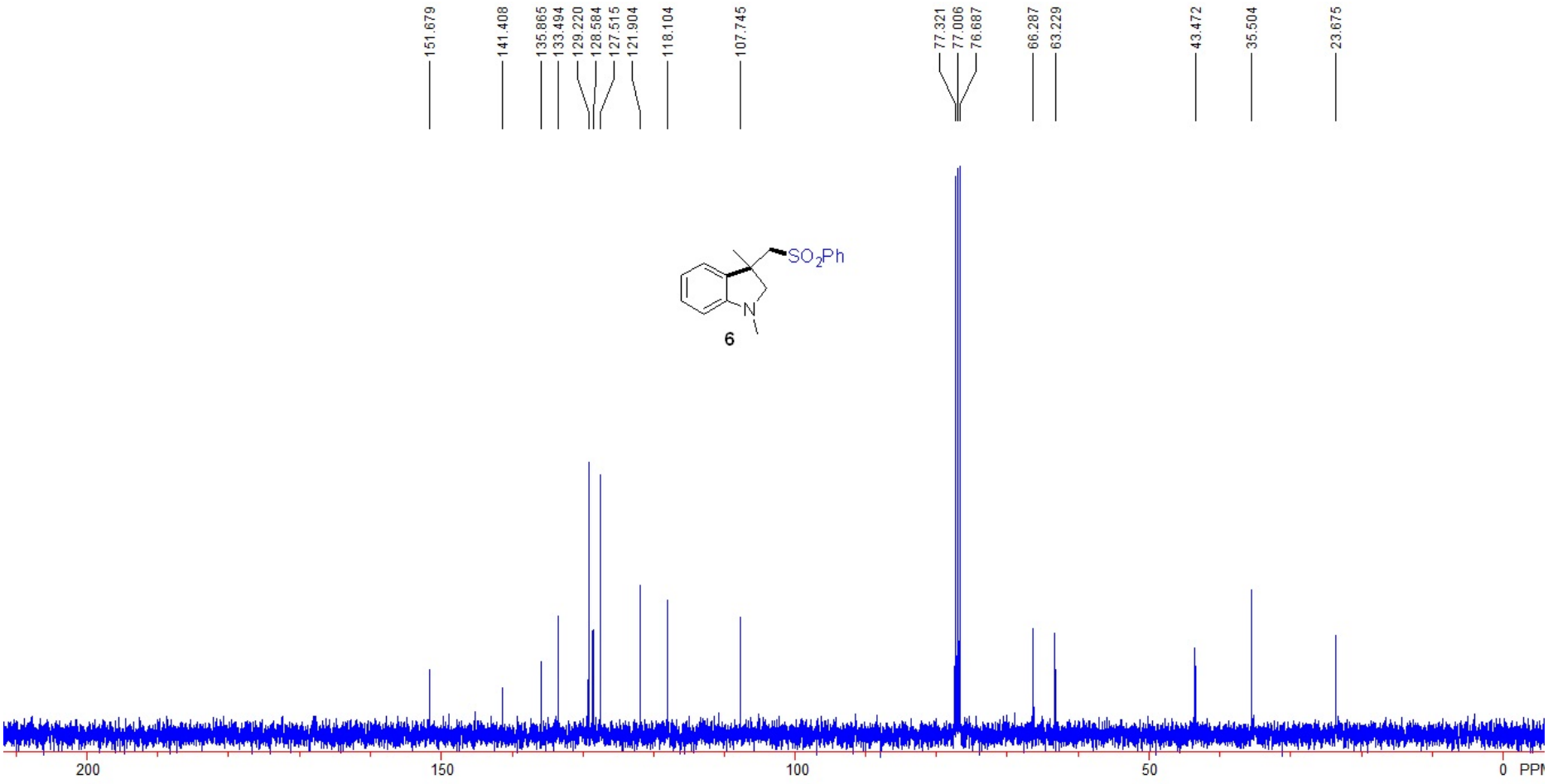
150
100
50
0 PPM

5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121.904
118.104
107.745
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63.229
43.472
35.504
23.675
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N
6
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150
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50
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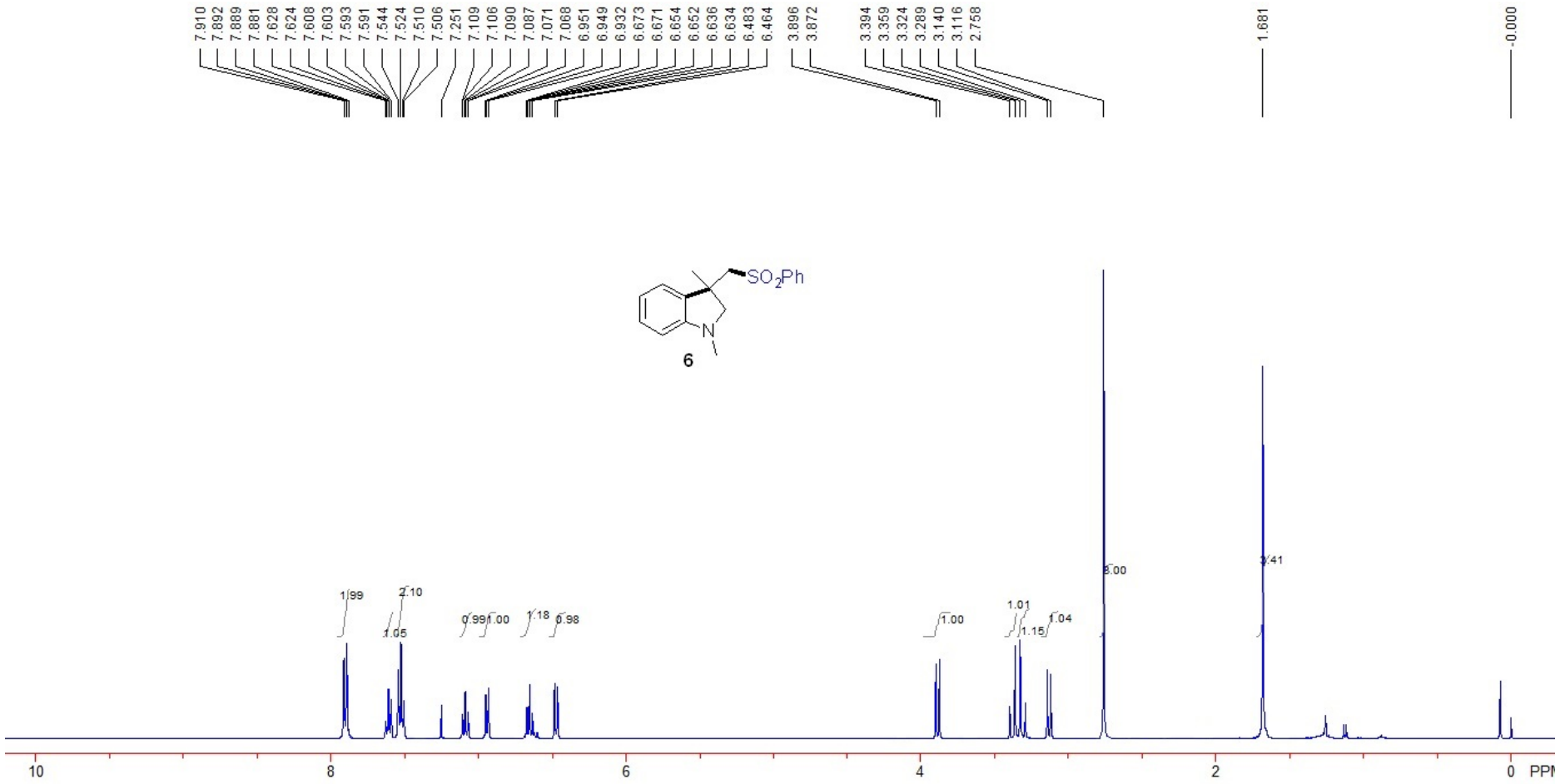
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7.889
7.881
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7.608
7.603
7.593
7.591
7.544
7.524
7.510
7.506
7.251
7.109
7.106
7.090
7.087
7.071
7.068
6.951
6.949
6.932
6.673
6.671
6.654
6.652
6.636
6.634
6.483
6.464
3.896
3.872
3.394
3.359
3.324
3.289
3.140
3.116
2.758
1.681
0.000
SO2Ph
N
6
1.99
2.10
1.05
0.99
1.00
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1.01
1.15
1.04
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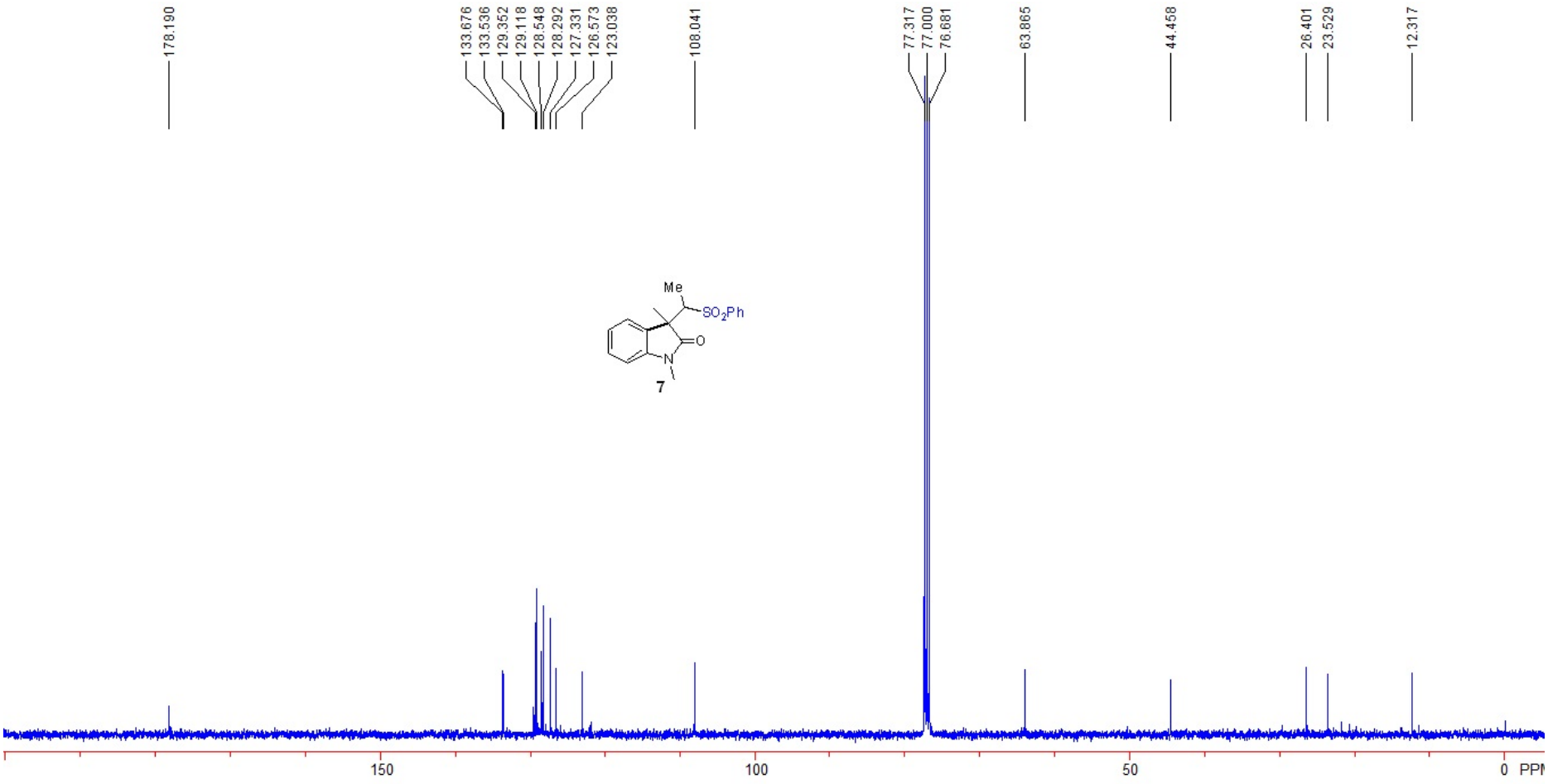
10
8
6
4
2
0
PPM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129.118
128.548
128.292
127.331
126.573
123.038
108.041
77.317
77.000
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26.401
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Me
SO2Ph
O
N
7
150
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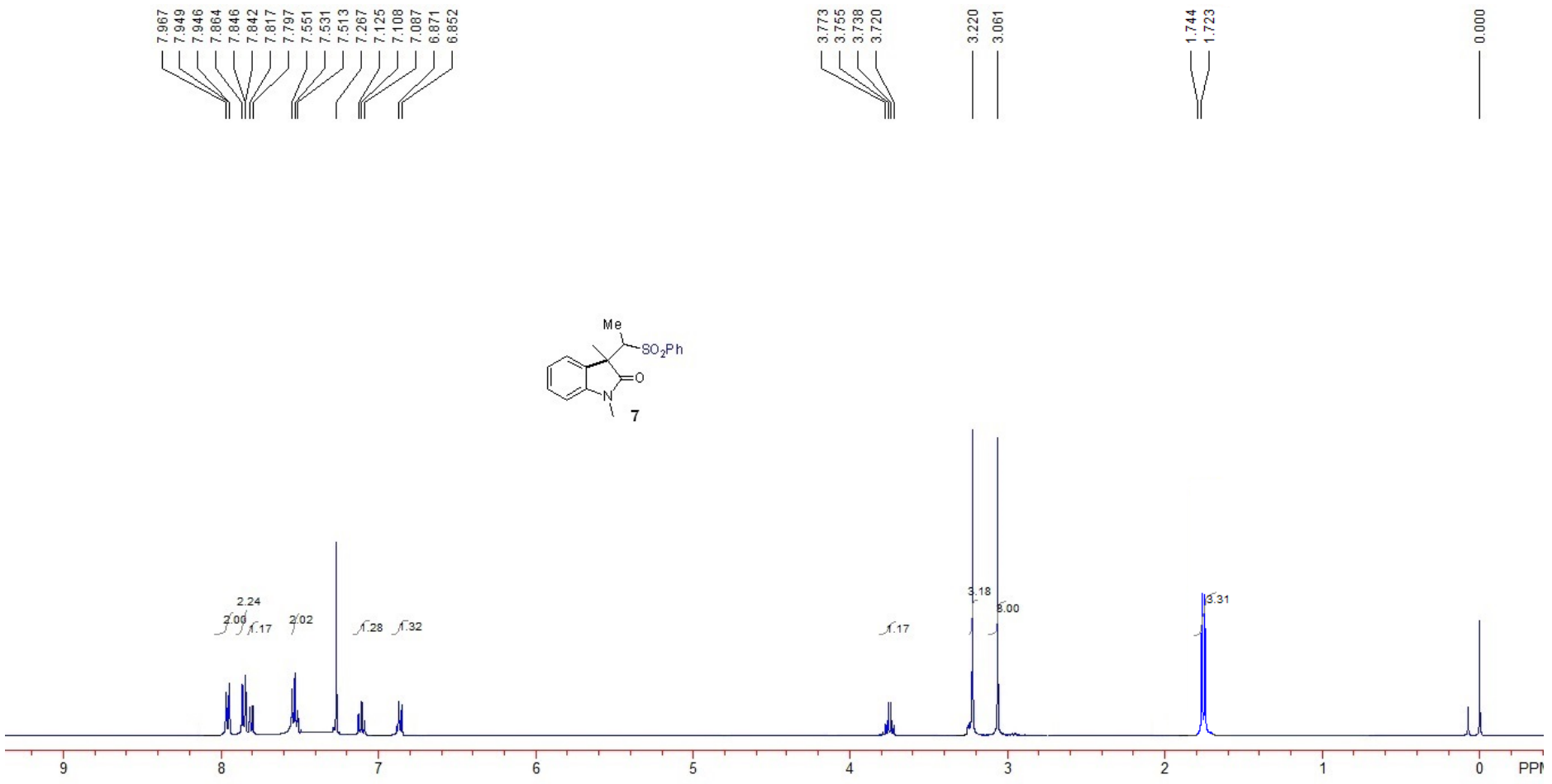
50
0 PPM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7.797
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7.531
7.513
7.267
7.125
7.108
7.087
6.871
6.852
3.773
3.755
3.738
3.720
3.220
3.061
1.744
1.723
0.000
Me
SO2Ph
O
N
7
2.24
2.00
1.17
2.02
1.28
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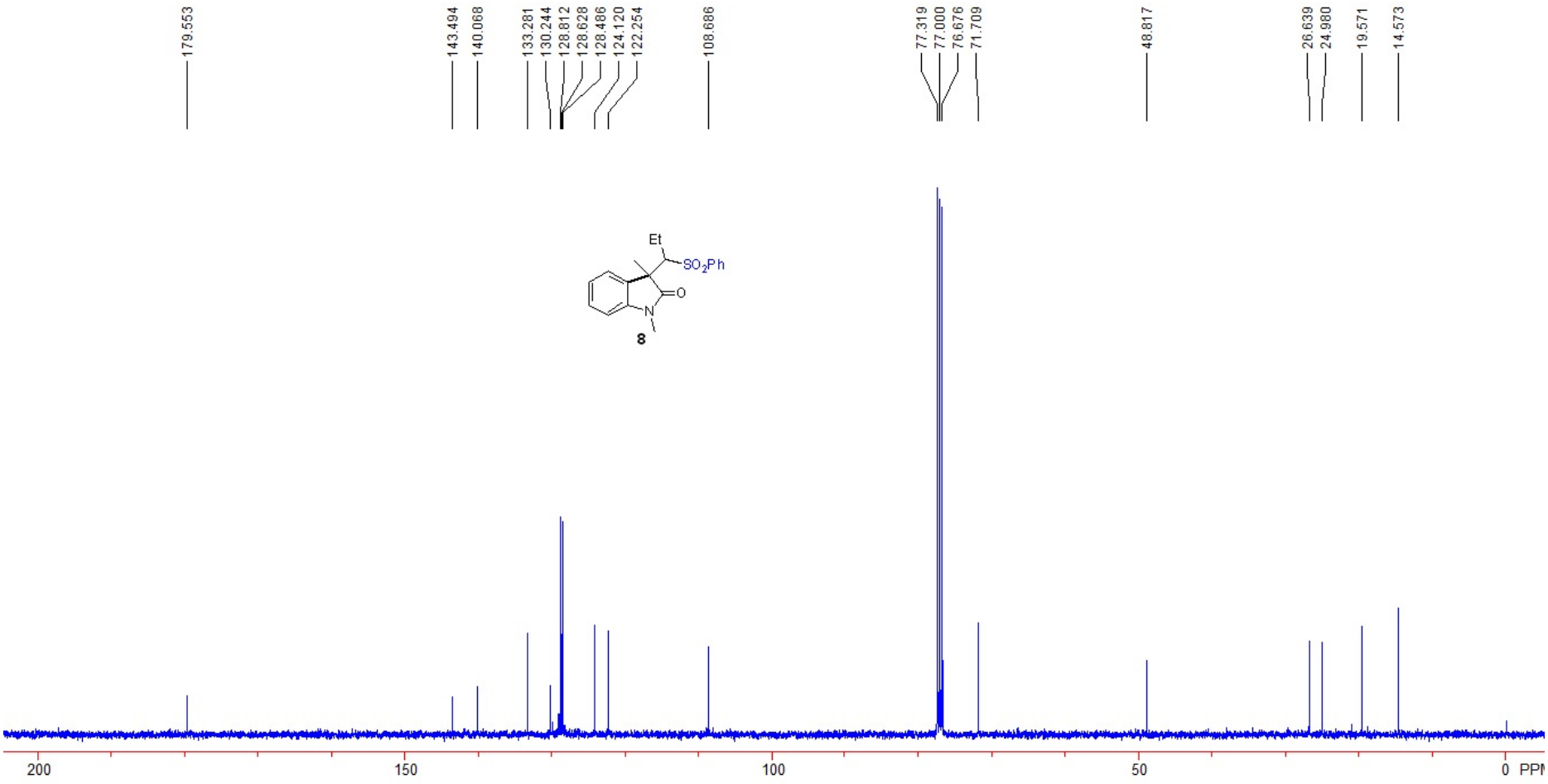
1.17
3.18
3.00
3.31
9
8
7
6
5
4
3
2
1
0
PPM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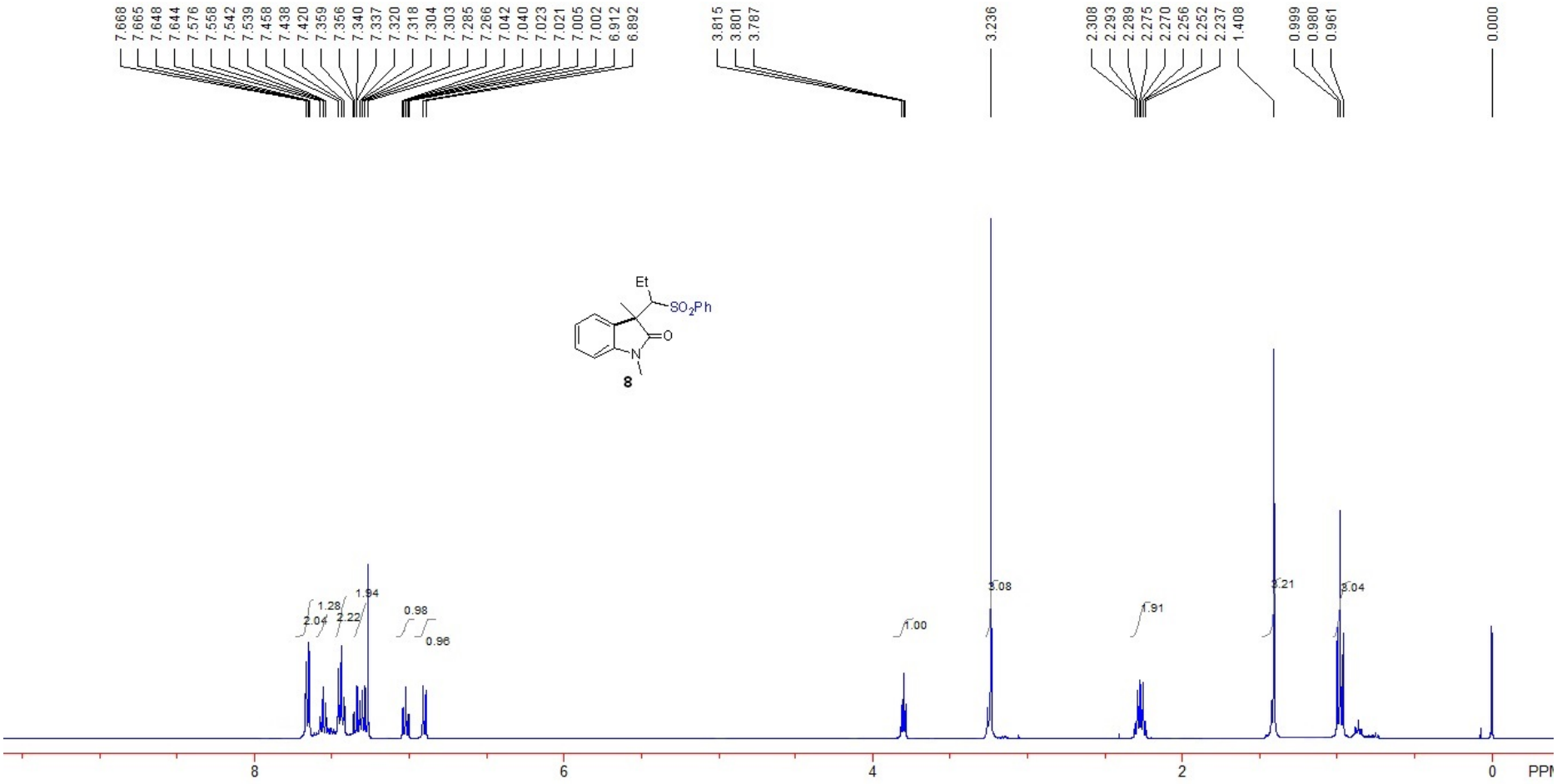
128.812
128.628
128.486
124.120
122.254
108.686
77.319
77.000
76.676
71.709
48.817
26.639
24.980
19.571
14.573
Et
SO2Ph
O
N
8
200
150
100
50
0 PPM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7.539
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7.356
7.340
7.337
7.320
7.318
7.304
7.303
7.285
7.266
7.042
7.040
7.023
7.021
7.005
7.002
6.912
6.892
3.815
3.801
3.787
3.236
2.308
2.293
2.289
2.275
2.270
2.256
2.252
2.237
1.408
0.999
0.980
0.961
0.000
Et
SO2Ph
O
N
8
2.04
1.28
2.22
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0.98
0.96
1.00
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1.91
3.21
3.04
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4
2
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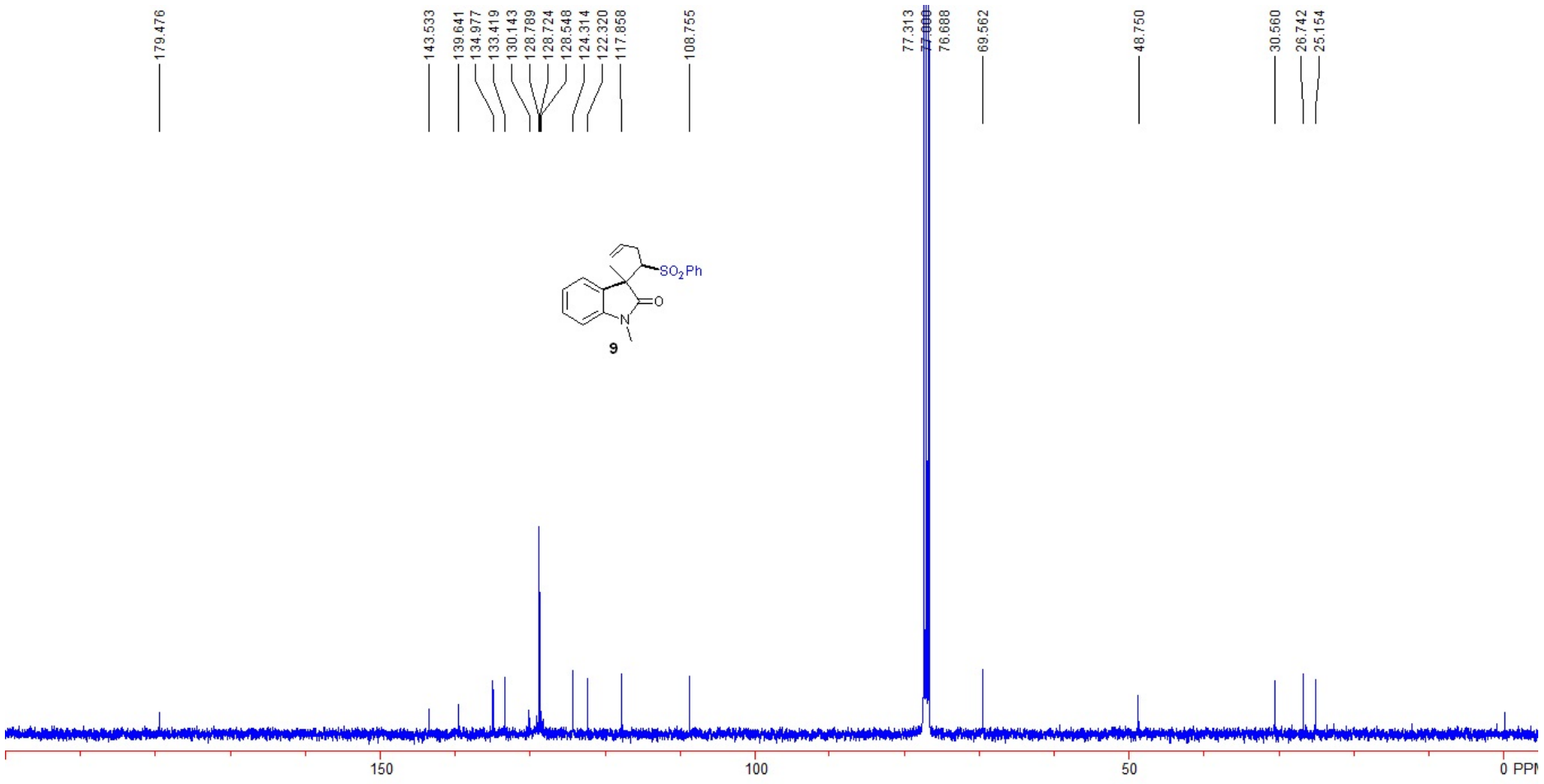
PPM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124.314
122.320
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108.755
77.313
77.000
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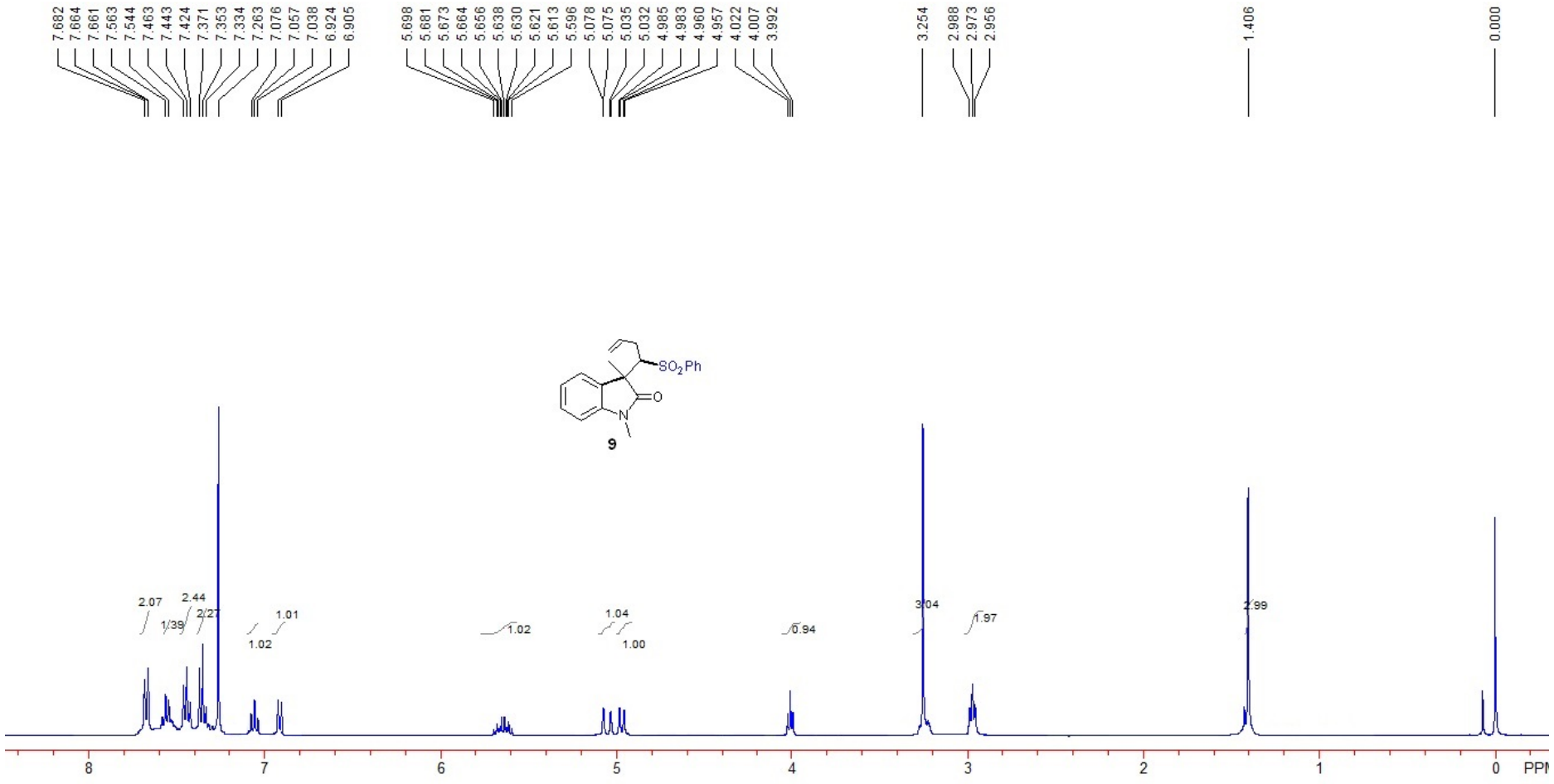
30.560
26.742
25.154
SO2Ph
O
N
9
150
100
50
0 PPM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7.463
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7.353
7.334
7.263
7.076
7.057
7.038
6.924
6.905
5.698
5.681
5.673
5.664
5.656
5.638
5.630
5.621
5.613
5.596
5.078
5.075
5.035
5.032
4.985
4.983
4.960
4.957
4.022
4.007
3.992
3.254
2.988
2.973
2.956
1.406
0.000
SO2Ph
O
N
9
2.07
2.44
1.39
2.27
1.01
1.02
1.02
1.04
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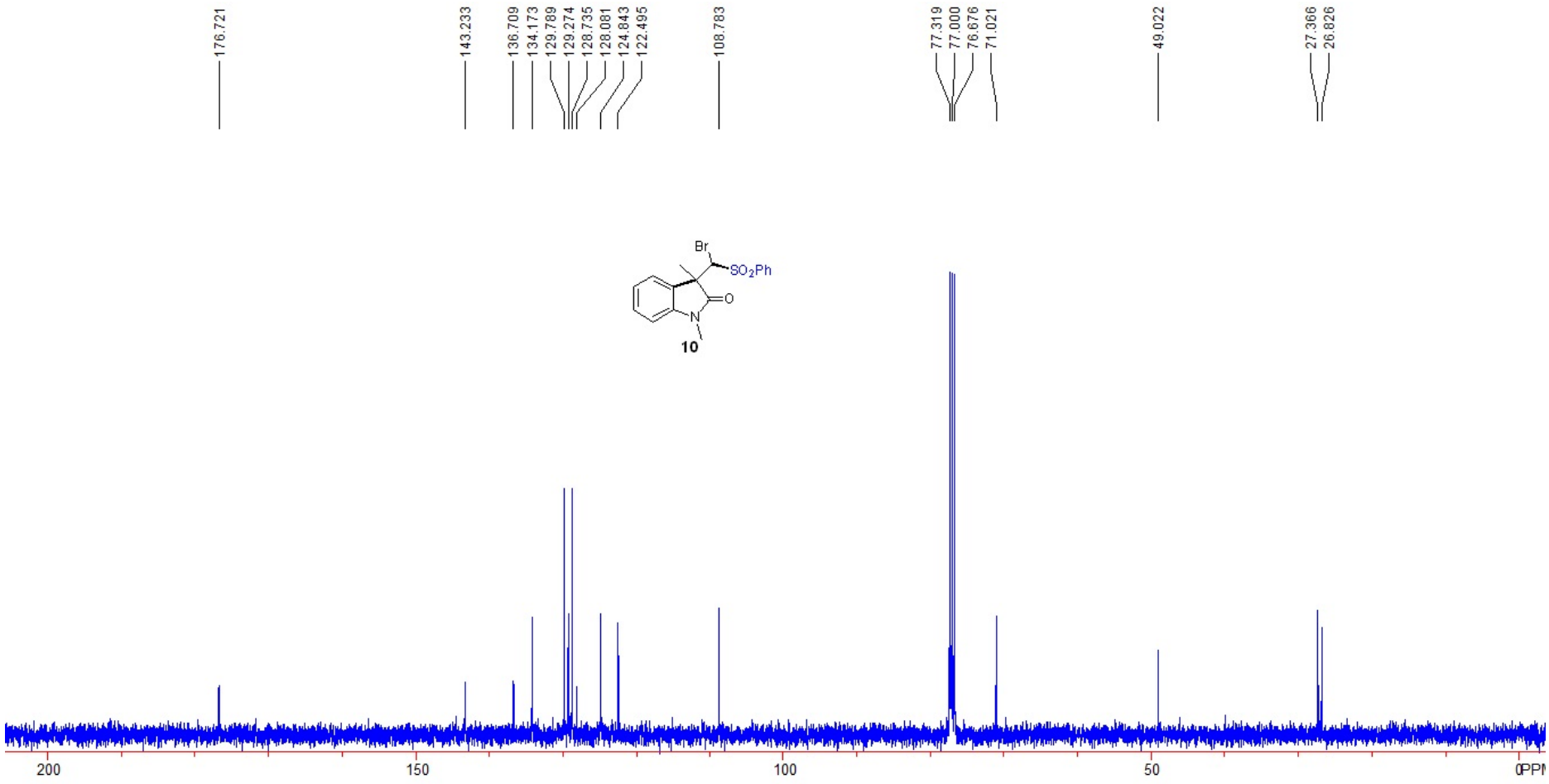
8
7
6
5
4
3
2
1
0
PPM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122.495
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77.000
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27.366
26.826
Br
SO2Ph
O
N
10
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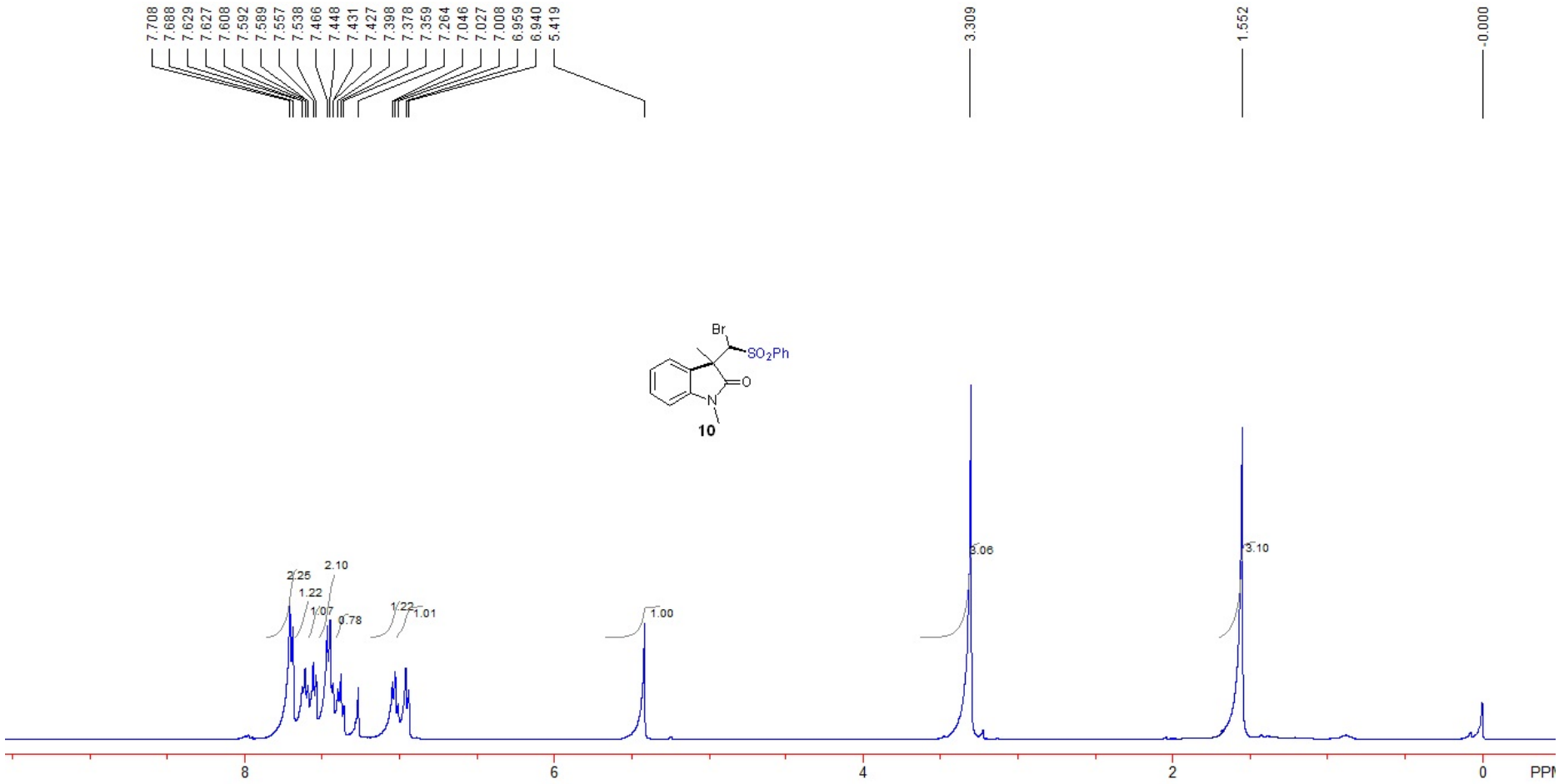
50
0
PPM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7.466
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7.431
7.427
7.398
7.378
7.359
7.264
7.046
7.027
7.008
6.959
6.940
5.419
3.309
1.552
-0.000
Br
SO2Ph
O
N
10
2.25
1.22
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1.22
1.01
1.00
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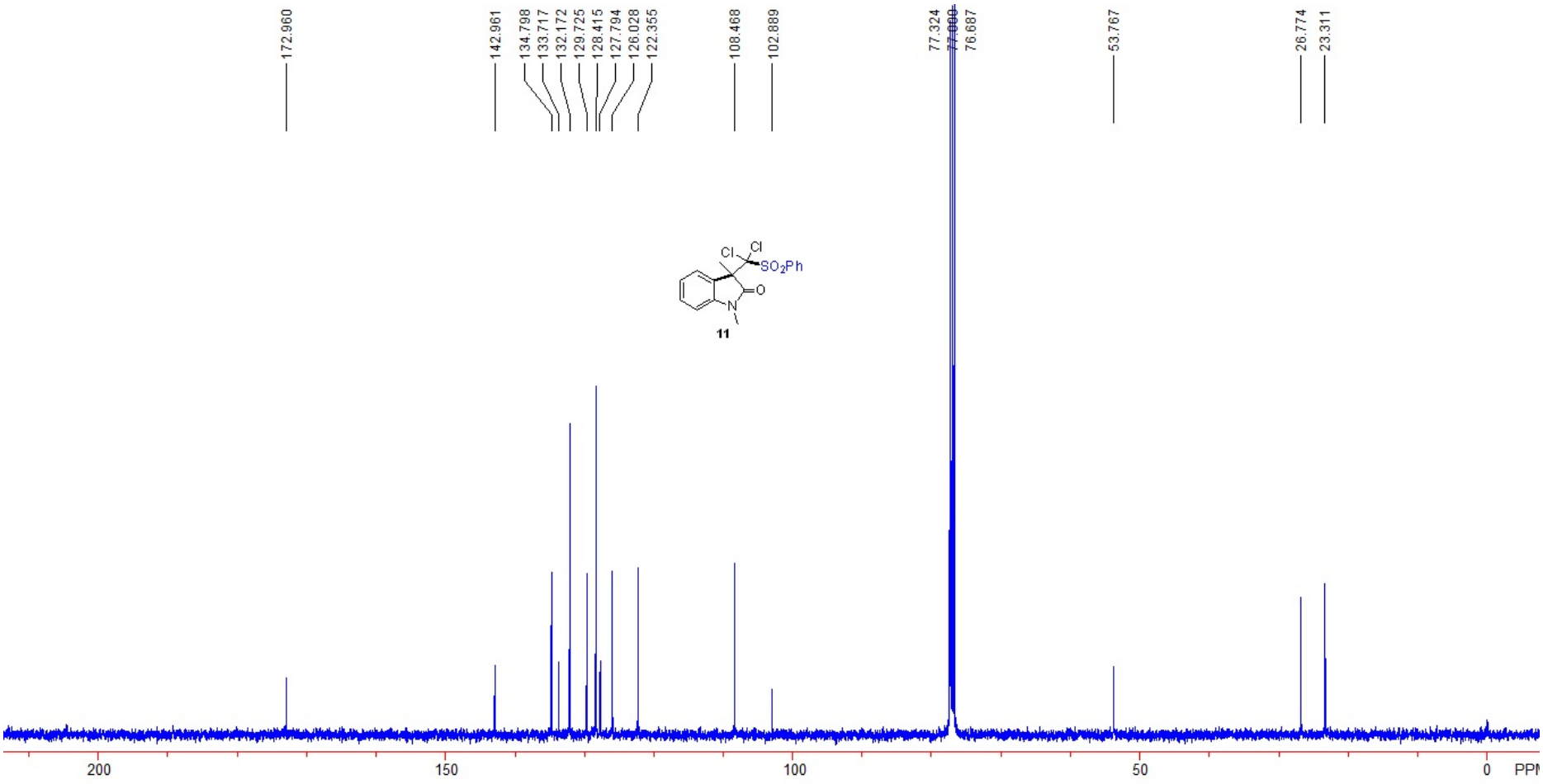
3.10
8
6
4
2
0
PPM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122.355
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102.889
77.324
77.000
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26.774
23.311
Cl
Cl
SO2Ph
O
N
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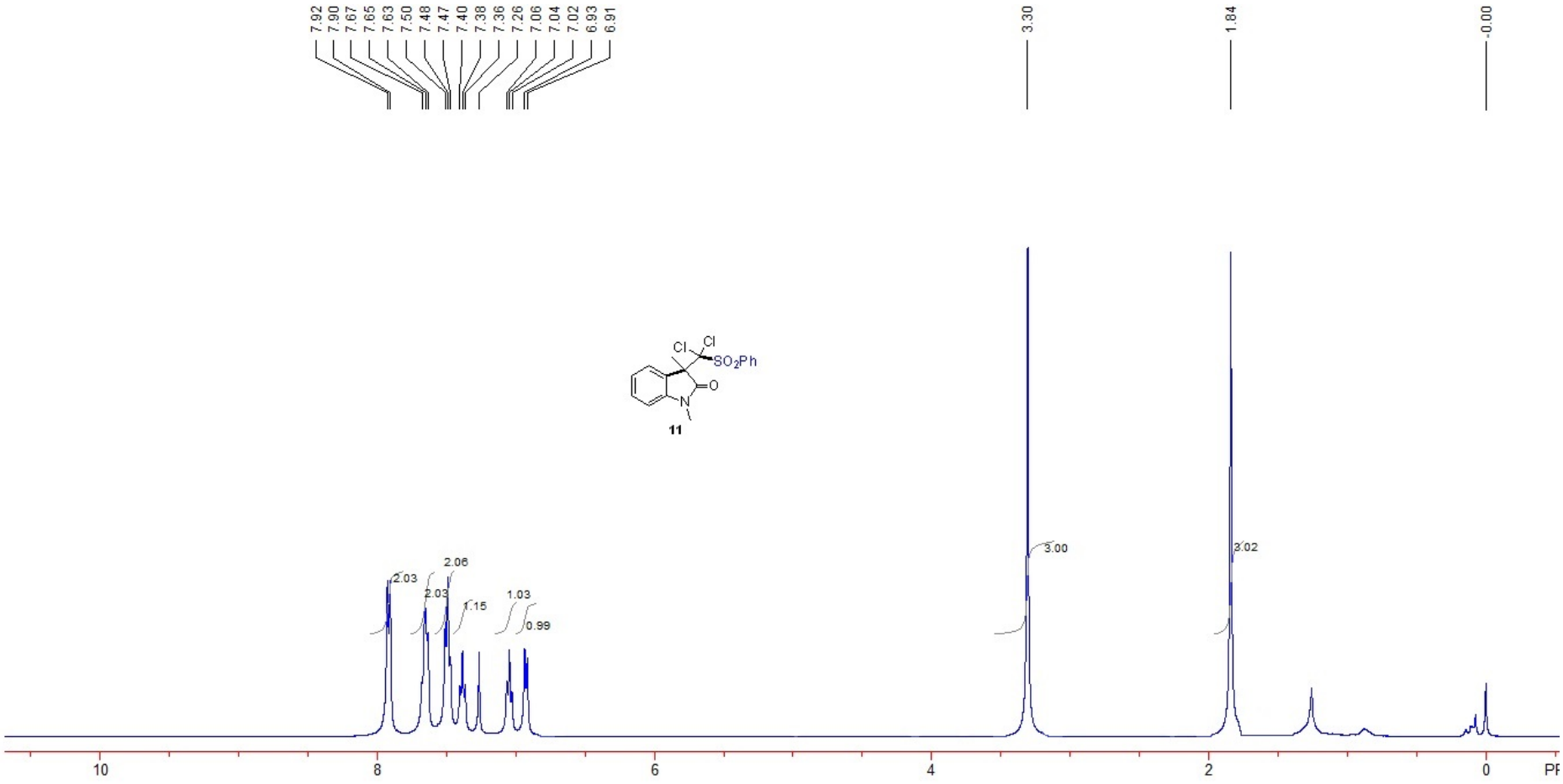
100
50
0
PPM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7.47
7.40
7.38
7.36
7.26
7.06
7.04
7.02
6.93
6.91
3.30
1.84
-0.00
Cl
Cl
SO2Ph
O
N
11
2.03
2.03
2.06
1.15
1.03
0.99
3.00
3.02
10
8
6
4
2
0
PF

X-ray structures of **3aa**