Supporting Information

Shining Light for Organophotocatalysed Direct Site-selective Sulfonylation of Anilides

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1. General information

Commercial-grade reagents, solvents, and starting materials such as aryl sulfonyl chlorides, anilines, and carboxylic acids of pure analytical grades were purchased from Sigma-Aldrich and GLR innovations and used as purchased without further purification unless otherwise stated. Commercially available 7 mL screw cap vials fitted with PTFE/silicone septa were purchased from Sigma-Aldrich for performing the reaction. Chromatographic purification of products was undertaken on silica gel (230-400 mesh) using a proper eluent system. For thin-layer chromatography (TLC) analysis throughout this work, Merck pre-coated TLC plates (silica gel 60 GF_{254}, 0.25 mm) were used and visualized with UV light and developed using an ethanol solution of phosphomolybdic acid or basic aqueous potassium permanganate ($KMnO_4$) stain solutions. Organic solutions were concentrated under vacuum pressure using a rotary evaporator. The ^{1}H (400 MHz and 500 MHz) and ^{13}C (101 MHz and 126 MHz) nuclear magnetic resonance spectra were recorded on 400 MHz and 500 MHz spectrometers. Chemical shifts (δ) for ^{1}H and ^{13}C are reported in parts per million (ppm) relative to internal standard tetramethylsilane (tetramethylsilane @ 0 ppm) and residual solvent peak in the NMR solvent (for ^{1}H NMR (DMSO @ 2.50 ppm and $CHCl_3$ @ 7.26 ppm), for ^{13}C NMR (DMSO @ 39.52 ppm and $CHCl_3$ @ 77.16 ppm). Coupling constants are given in Hertz (Hz). The following abbreviations are used to indicate the multiplicity: s, singlet; d, doublet; q, quartet; p, pentet; sept, septet; m, multiplet; br, broad signal. Ultraviolet-visible experiments were recorded on a SHIMADZU-UV-1900i instrument using HPLC-grade ethyl acetate (EtOAc). The fluorescence emission spectra were carried out on a model Fluoromax-4 (Horiba Scientific) spectrofluorometer using HPLC grade EtOAc. High-resolution mass spectra (HRMS) were recorded on a Mass Spectrometry Unit using electrospray ionization-time of flight (ESI-TOF) reflectron experiments.

2. General procedure for the synthesis of aryl amide derivatives

In a 100 mL round bottom flask, a solution of aniline derivatives (1.0 equiv.), carboxylic acids (1.1 equiv.), and DMAP (10 mol%) in dry DCM (0.33 M) were cooled to 0 °C. Subsequently, DCC (1.5 equiv.) was mixed with the cooled reaction mixture. After that, the ice bath was removed and allowed to stir overnight. The reaction mixture was quenched with HCl (1M). Then, the reaction mixture was washed with $NaHCO_3$ and extracted with EtOAc three times. Then, the organic layer was dried over anhydrous Na_2SO_4, filtered, and concentrated in rotary evaporation. The purification

of resultant residues was achieved by column chromatography to get the desired aryl amide derivatives.

3. Reaction Set-up:

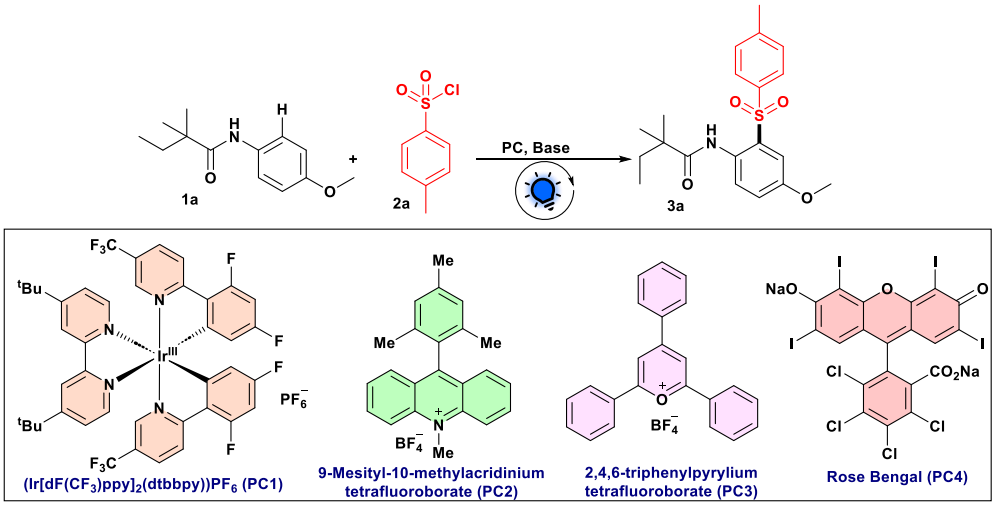
The light setup for the photochemical reaction is shown in Figure S-01. The photochemical reactions were carried out under blue light irradiation using a light set-up (Kessil® PR160-440 nm lamp with a fan kit) with 100% intensity connected with a compact fan to maintain ambient temperature. The approximate distance between the glass vial and the Kessil LED was measured to be 4 cm.

Figure S-01: Light set-up.

4. General procedure for the photochemical sulfonylation:

In a 7 mL glass vial having a septum cap with a magnetic stirring bead, aryl amides (0.2 mmol), aryl sulfonyl chlorides (0.3 mmol), cesium carbonate (0.24 mmol) and PC4 (2 mol%, 2 mg) were added, and then 2 mL of DCE solvent was added. The reaction mixtures were irradiated with a Kessil® PR160-440 nm lamp with a cooling fan at a distance of 4 cm and stirred for 24 hours under an argon atmosphere. After the completion, the reaction mixture was quenched and extracted with EtOAc. Then, the organic layer was dried over anhydrous Na_2SO_4, filtered, and concentrated in rotary evaporation. The resultant residue was purified using hexane/EtOAc by column chromatography to achieve the desired sulfonylated anilide products.

5. Optimization studies for the photochemical sulfonylation:



Entry	Photocatalyst	Solvent	Base	Yield (%)[a,b]
1	PC1	DCE	Na_2CO_3	50
2	PC1	DCE	K_2CO_3	55
3	PC2	DCE	K_2CO_3	trace
4	PC3	DCE	K_2CO_3	n.r.
5	PC4	DCE	K_2CO_3	86
6	PC4	DCE	KOAc	trace
7	PC4	DCE	DIPEA	trace
8	**PC4**	**DCE**	**Cs_2CO_3**	**92**
9	PC4	MeCN	Cs_2CO_3	trace
10	PC4	^{t}BuOH	Cs_2CO_3	trace
11	PC4	EtOAc	Cs_2CO_3	40
12	PC4	DCE	-	n.r.
13	-	DCE	Cs_2CO_3	n.r.
14[c]	PC4	DCE	Cs_2CO_3	n.r.
15[d]	PC4	DCE	Cs_2CO_3	n.r.

[a]Reaction conditions: Unless otherwise specified, **1a** (0.2 mmol), **2a** (0.3 mmol), Rose bengal (2 mol%, 2 mg), and Cs_2CO_3 (0.24 mmol) in 2 mL DCE irradiated with a Kessil blue LED (440 nm) for 24 h under argon atmosphere. [b]yields determined by Gas chromatography using benzophenone as the internal standard. [c]Reaction performed under aerobic conditions. [d]Irradiation with 526 nm green LED.

6. Unsuccessful substrates

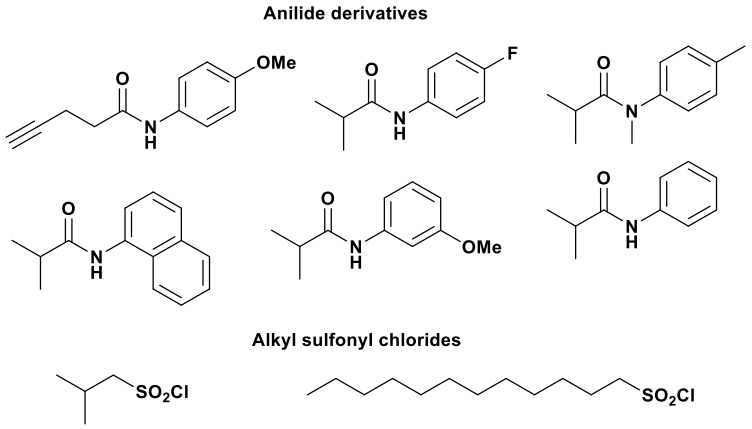


Figure S-02: Unsuccessful substrates.

7. Radical inhibition experiments

In a 7 mL glass vial having a septum cap with a magnetic stirring bead, *N*-(4-methoxyphenyl)-2,2-dimethyl butanamide (0.2 mmol), 4-methylbenzene sulfonyl chloride (0.3 mmol), cesium carbonate (0.24 mmol), BHT (0.4 mmol) and **PC4** (2 mol%, 2 mg) were added, and then 2 mL of DCE solvent was added. The reaction mixture was irradiated with a Kessil® PR160-440 nm lamp with a cooling fan at a distance of 4 cm and stirred for 24 hours under an argon atmosphere. After completion of the reaction, an aliquot portion of the reaction mixture was subjected to HRMS (Figure S-03). We were able to detect the radical-BHT adduct (**4**). The HRMS data of BHT-adduct of radical intermediate is given below (Figure S-03).

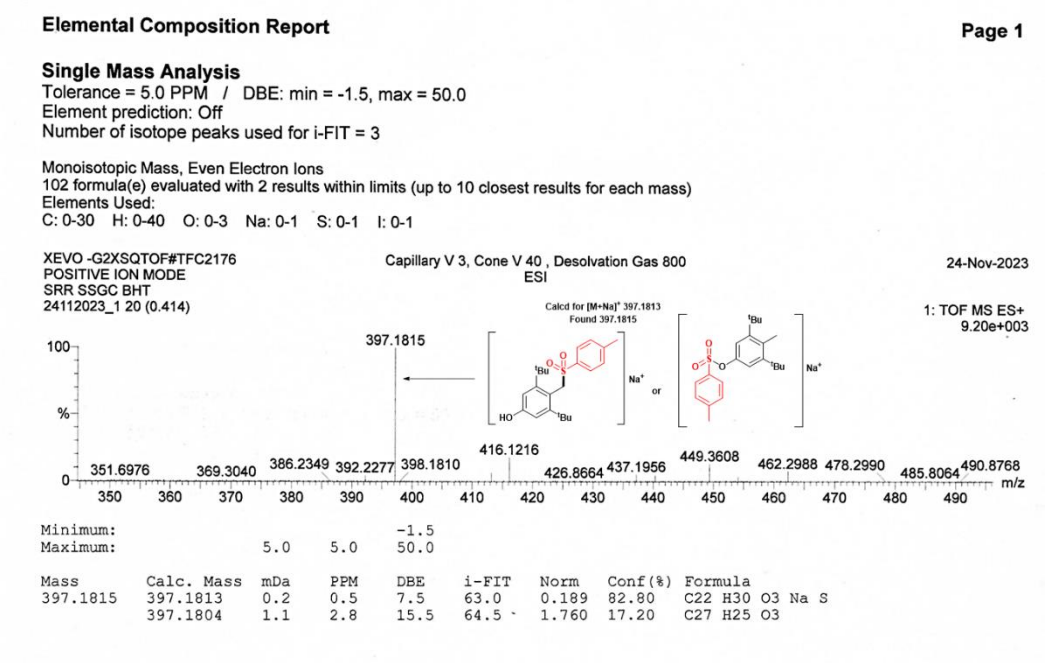


Figure S-03: HRMS data of BHT-adduct radical (**4**).

8. Radical trapping experiments

In a 7 mL glass vial having a septum cap with a magnetic stirring bead, *N*-(4-methoxyphenyl)-2,2-dimethyl butanamide (0.2 mmol), 4-methylbenzene sulfonyl chloride (0.3 mmol), cesium carbonate (0.24 mmol), 1,1-diphenylethylene (0.4 mmol), and **PC4** (2 mol%, 2 mg) were added, and then 2 mL of DCE solvent was added. The reaction mixtures were irradiated with a Kessil® PR160-440 nm lamp with a cooling fan at a distance of 4 cm and stirred for 24 hours under an argon atmosphere. After completion of the reaction, an aliquot portion of the reaction mixture was subjected to HRMS (Figure S-04). The HRMS data of radical adduct (**5**) is given below (Figure S-04).

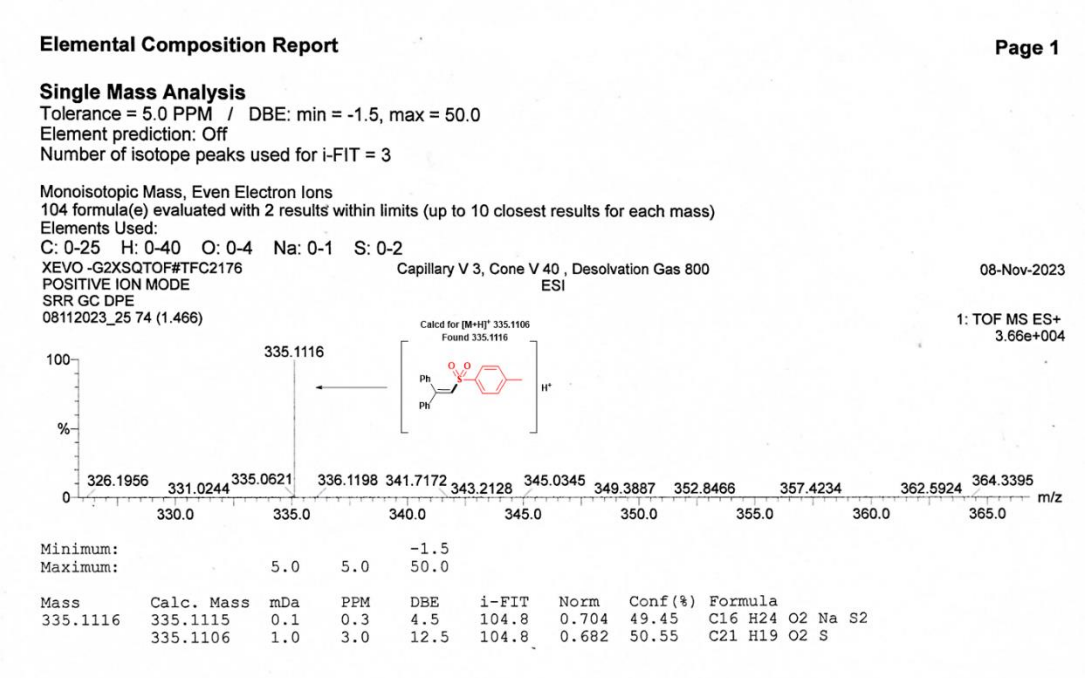


Figure S-04: HRMS data of radical intermediate adduct (**5**).

9. Switch on/off experiment

In six different glass vials (**A-F**) having a septum cap with a magnetic stirring bead, *N*-(4-methoxyphenyl)-2,2-dimethyl butanamide (0.2 mmol), 4-methylbenzene sulfonyl chloride (0.3 mmol), cesium carbonate (0.24 mmol), and **PC4** (2 mol%, 2 mg) were added, and then 2 mL of DCE solvent was added. The reaction mixtures were irradiated with a Kessil® PR160-440 nm lamp with a cooling fan at a distance of 4 cm and stirred for 24 hours under an argon atmosphere. After the 6-hour vial-A was removed, and for the remaining vials (**B-F**), the light source was switched off with continuous stirring for the next 6 hours. The vial-**A** reaction mixture was quenched and extracted with EtOAc. Then, the analytical sample solution was prepared using benzophenone as an internal standard and diluted up to 1 mL with CH_3CN. This resultant solution was further analyzed in GC to obtain the yield of the sulfonylated product. After 6 hours in dark conditions, the vial-**B** was removed, and the remaining vials (**C-F**) were subjected to 6 hours of light. The vial-**B** reaction mixture was quenched and extracted with EtOAc, and again, an analytical sample solution was prepared (as mentioned earlier) and analyzed similarly, to obtain the yield of the sulfonylated product. This ON-OFF cycle was repeated with the remaining four vials (**C-F**), as represented in Figure S-05a. The yield of **3a** of all the six sets of reaction (Vial **A-F**) was plotted with respect to time, as shown in the adjoining figure (Figure S-05b).

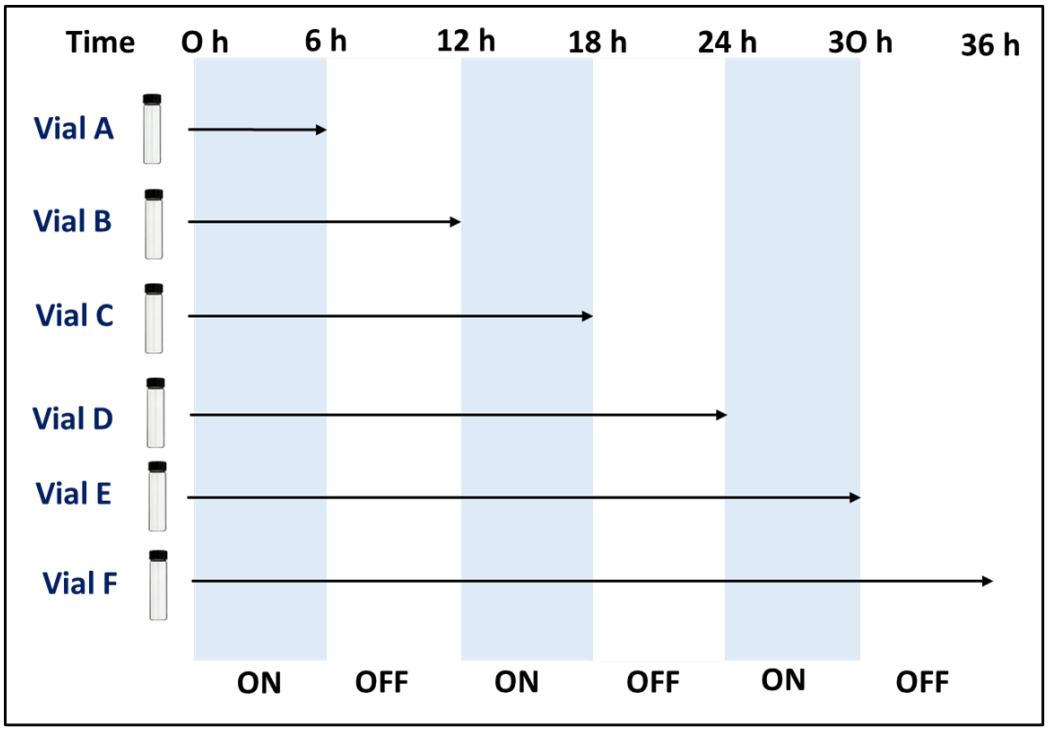


Figure S-05a: Graphical representation of ON-OFF experiments

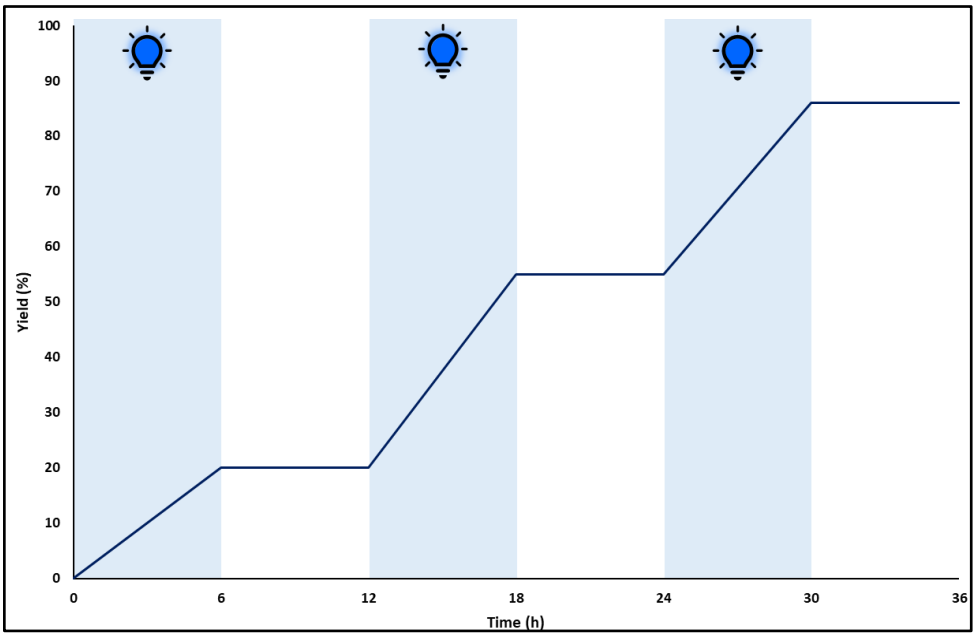
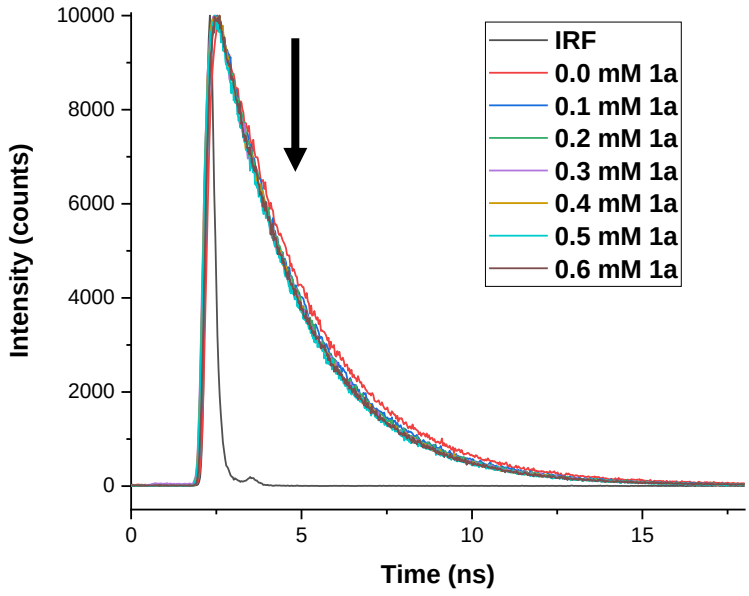


Figure S-05b: Switch on/off experiment

10. Fluorescence Lifetime Quenching Experiment and Stern-Volmer Studies:

Fluorescence Excited state lifetime measurements were performed using a time-correlated single photon counting (TCSPC) spectrophotometer (Fluotime 300, PicoQuant, Germany). The instrument response function (IRF) was obtained through the use of a scattering Ludox solution. The sample of **PC4** (3.75 mM) in ethyl acetate was excited at 485 nm using a nanosecond-pulsed diode laser. The nanosecond fluorescence lifetime decays were deconvoluted using Fluofit software. The lifetime decay of the sample was collected at 550 nm (emission maxima) with a 5 nm emission slit width where the peak counts were normalized to 10000 counts. The lifetime decay was fit in one exponential. For each fluorescence lifetime quenching experiment, 2 µL of **1a** (0.1 M in ethyl acetate) and **2a** (0.15 M in ethyl acetate) were added individually to **PC4** solution (3.75 mM) taken in a 2000 µL fluorescence cuvette, and lifetime quenching spectra were recorded after each sequential addition.

A) Fluorescence lifetime quenching studies for 3.75 mM PC4 in ethyl acetate with increasing concentration of 1a as the quencher (addition from 0 to 0.6 mM).



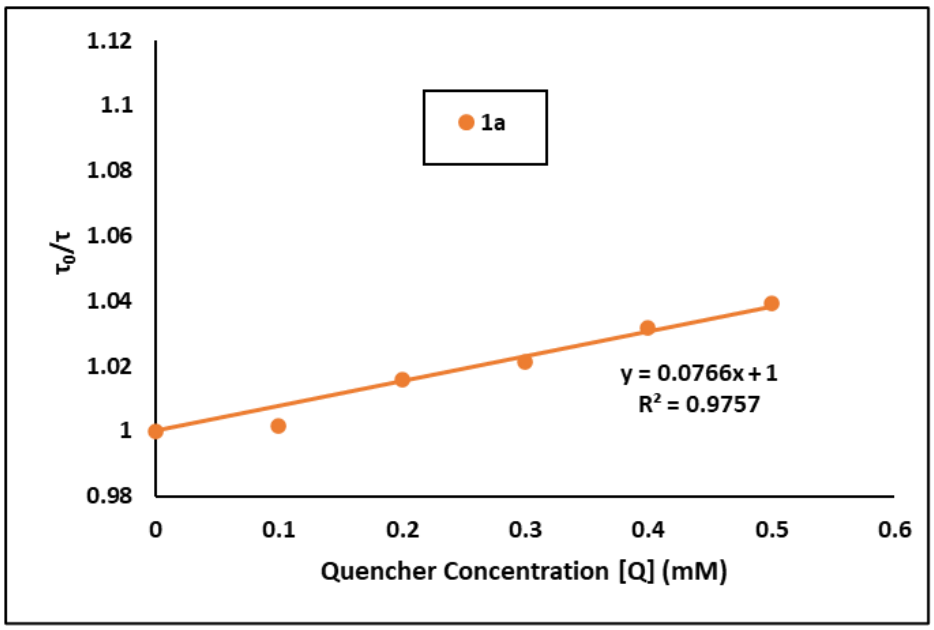
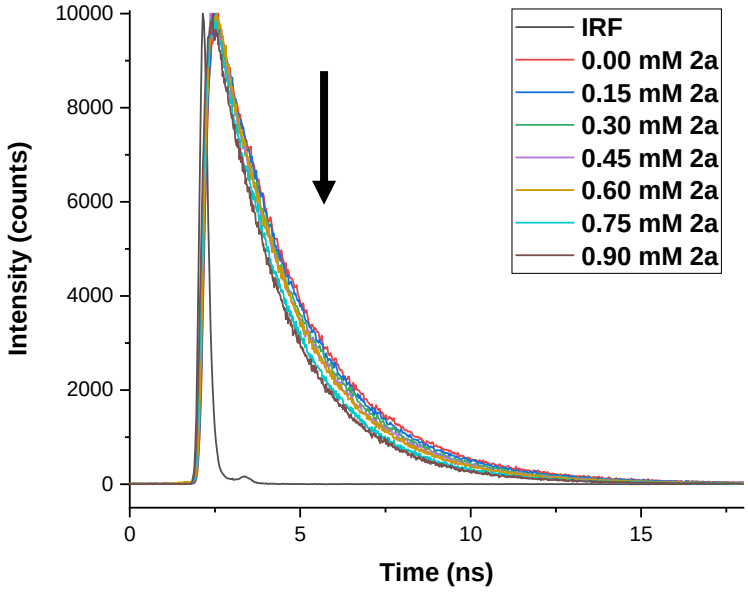


Figure S-06: (a) Fluorescence lifetime quenching spectra **(b)** Stern-Volmer plot of solution of 3.75 mM **PC4** in ethyl acetate with increasing concentration of **1a** as the quencher.

B) Fluorescence lifetime quenching studies for 3.75 mM PC4 in ethyl acetate with increasing concentration of 2a as the quencher (addition from 0 to 0.9 mM).



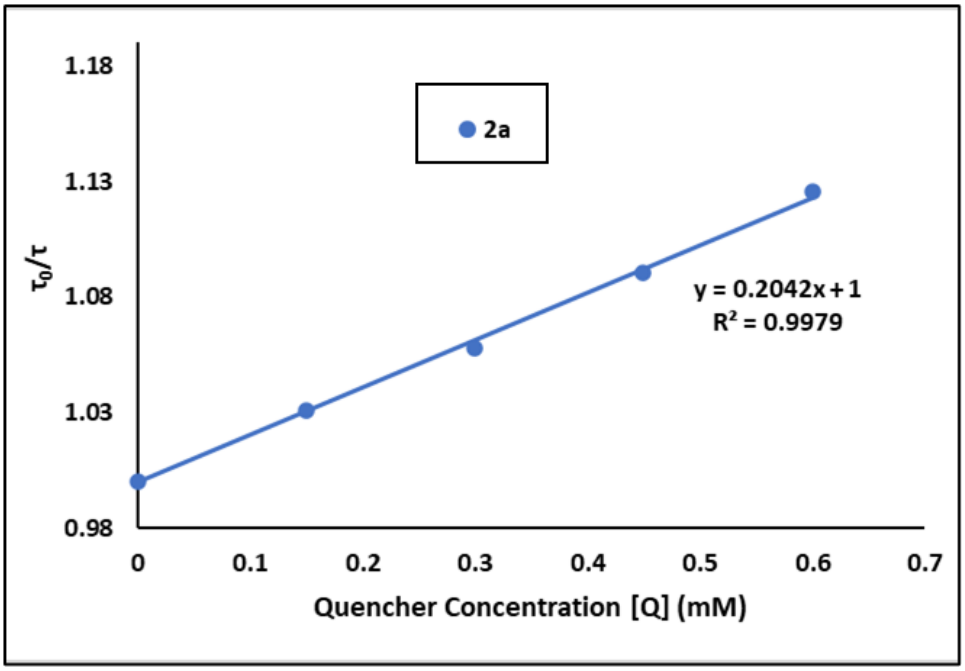


Figure S-07: (a) Fluorescence lifetime quenching spectra **(b)** Stern-Volmer plot of solution of 3.75 mM **PC4** in ethyl acetate with increasing concentration of **2a** as the quencher.

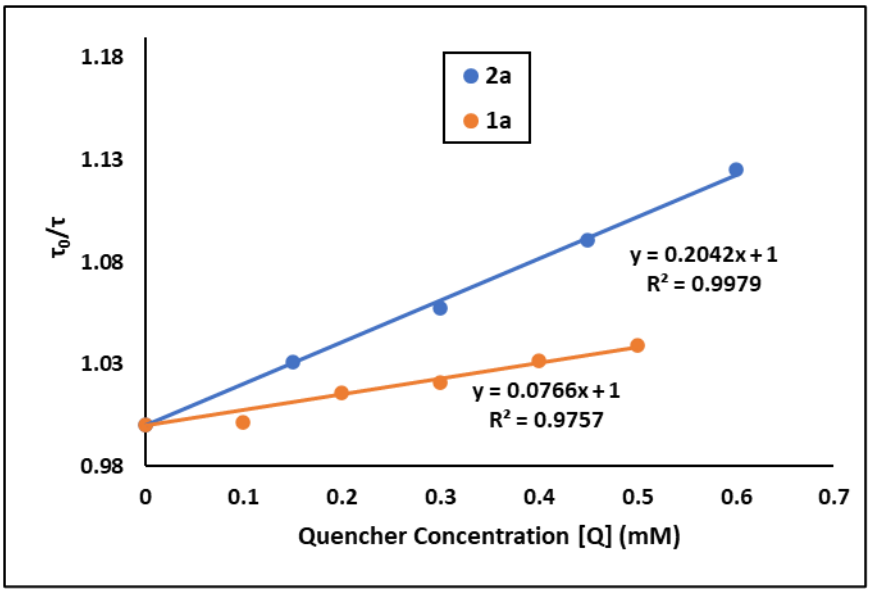


Figure S-08: Combined Stern-Volmer plot of solution of 3.75 mM **PC4** in ethyl acetate with increasing concentration of **1a** (Orange line), **2a** (Blue line) as the quencher.

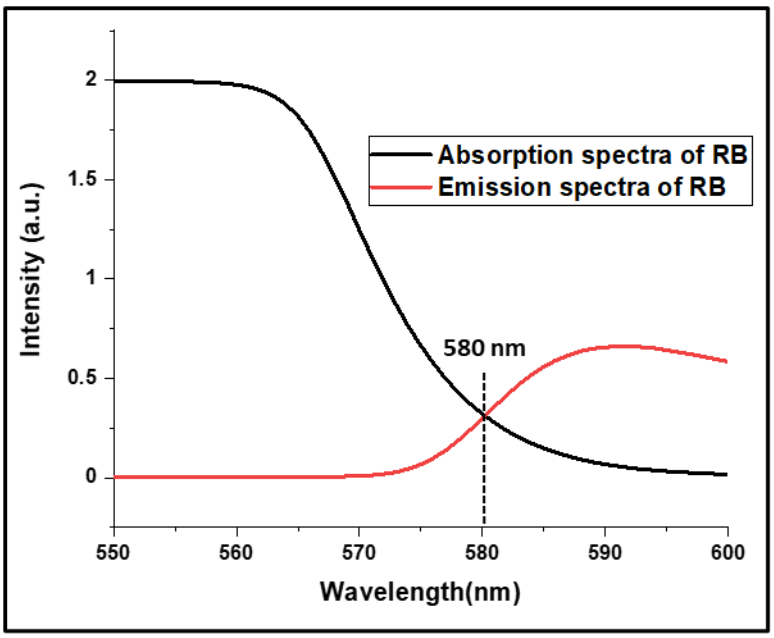


Figure S-09: Absorption plot (Black line) and emission plot (Red line) of Rose Bengal.

11. Cyclic Voltammetry

The cyclic voltammetry (CV) experiments were carried out using a Metrohm Autolab PGSTAT204 potentiostat. All the voltammograms were recorded in dry MeCN under air at room temperature using $^{n}Bu_4NPF_6$ (0.1 M) as a supporting electrolyte. All the measurements were carried out in a three-electrode cell employed with a glassy carbon working electrode (disk, diameter: 3mm), a coiled platinum wire counter electrode, and an Ag/AgCl reference electrode. The working electrode was polished using the alumina-water slurry in a figure-eight polishing motion and washed with deionized water and acetone before each measurement. Other electrodes were washed with acetone and dried before each experiment. Experiments were conducted at room temperature after bubbling with argon for 5 min. IUPAC convention was used to plot all the CV graphs. (Figure S-10a-d).

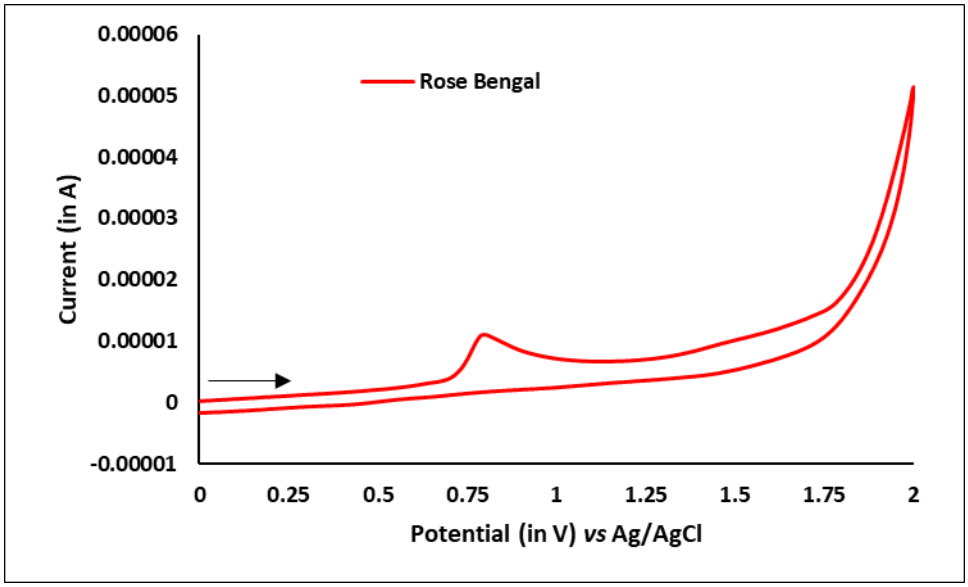


Fig. S10a: Cyclic voltammetry curves of 1 mM of Rose Bengal in 0.1 M $TBAPF_6$ in CH_3CN. Sweep rate: 0.1 V/s. E^{ox} ($RB^{\cdot+}$/RB) = +0.80 V.

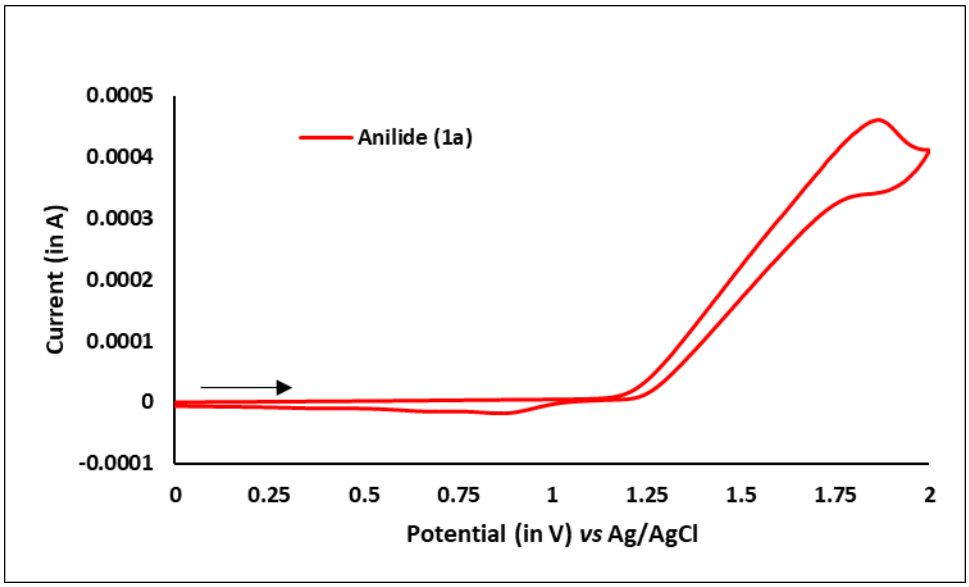


Fig. S10b: Cyclic voltammetry curves of 0.1 M of **1a** in 0.1 M $TBAPF_6$ in CH_3CN. Sweep rate: 0.1 V/s. E^{ox} (**1a**) = +1.87 V.

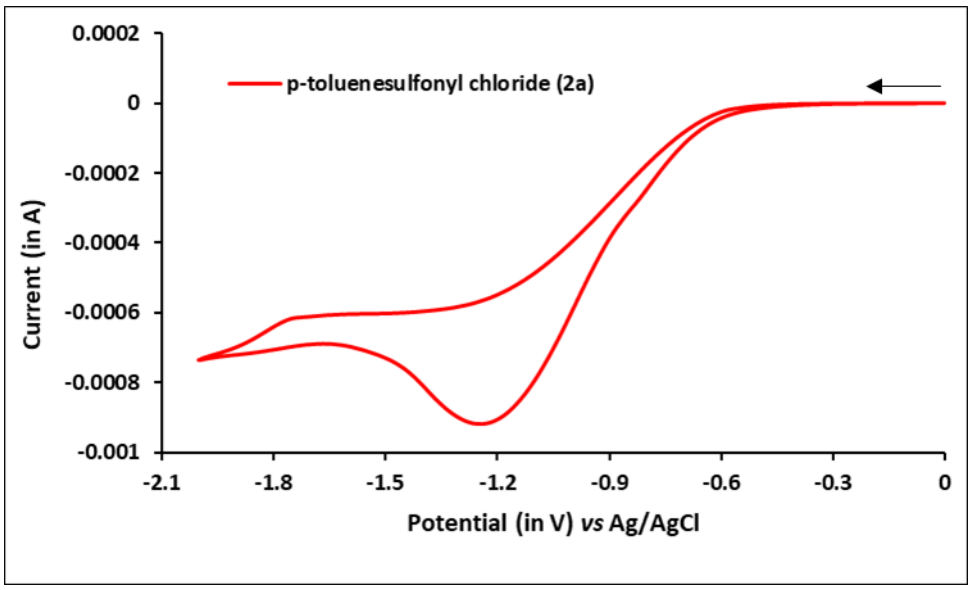


Fig. S10c: Cyclic voltammetry curves of 0.1 M of **2a** in 0.1 M $TBAPF_6$ in CH_3CN. Sweep rate: 0.1 V/s. E^{red} (**2a**) = -1.25 V.

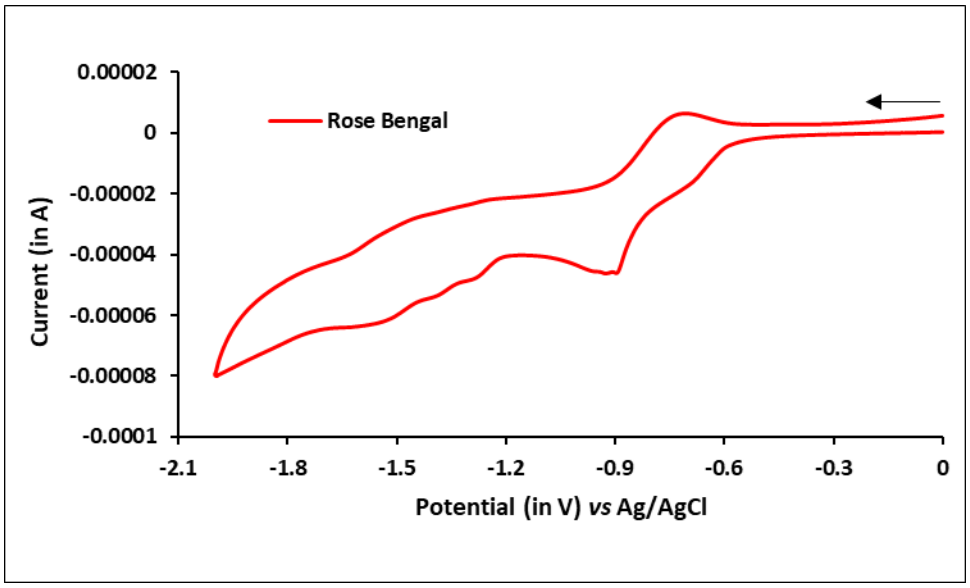


Fig. S10d: Cyclic voltammetry curves of 10 mM of Rose Bengal in 0.1 M $TBAPF_6$ in CH_3CN. Sweep rate: 0.1 V/s. E^{red} ($RB/RB^{\bullet-}$) = -0.92 V.

Evaluation of the Excited State Potential of Rose Bengal using Rehm-Weller equation

Using the data collected from the cyclic voltammetry studies and from the intersection of absorption and emission spectra (Figure S-09, λ = 580 nm) of the **RB**, we could estimate the redox potential of the excited photocatalyst (**RB***) employing the following Rehm-Weller equation:

$E(RB^{\cdot+}/RB^{*}) = E(RB^{\cdot+}/RB) - E_{0\text{-}0}(RB^{*}/RB)$

From the intersection of absorption and normalized emission spectra of **RB**, the value of

$E_{0\text{-}0}$(RB*/RB) was found to be 2.14 eV at 580 nm. Also, the value of E ($RB^{\cdot+}$ /RB) is 0.80 V from the cyclic voltammetry graph.

E($RB^{\cdot+}$ /RB*) = 0.80 – 2.14 = - 1.34 V (vs Ag/AgCl).

12. Crystallographic Data:

Sample preparation: For single-crystal X-ray diffraction studies, crystallisation of compound **3i** was carried out at room temperature using EtOAc/Heptane as a solvent system.

Molecular structure determination of compounds 3i: Single crystal X-ray diffraction data of crystals for compound **3i** were collected using a Bruker APEX-II CCD diffractometer equipped with a 3-axis goniometer. The crystals were covered with Paratone–N oil and mounted on a glass capillary. The data were collected at room temperature using Mo Kα radiation (λ = 0.71073). The measured intensities were reduced to F^2 and corrected for absorption with SAINT. Structure solutions were accomplished by direct methods and refined by full matrix least-square on F^2 using OLEX2. Non-hydrogen atoms were refined anisotropically. All non-hydrogen atoms were refined anisotropically. The position of hydrogen atoms were fixed according to a riding model and was refined isotropically. Images were created with the program Mercury. The crystal structure has been deposited to Cambridge Crystallographic Data Centre and allocated deposition number (**3i**: CCDC 2333703).

1. **Crystal data and structure refinement for SS_PS2450_0ma_a.**

Identification code	SS_PS2450_0ma_a
Empirical formula	$C_{18}H_{21}NO_4S$
Formula weight	347.42
Temperature/K	303(2)
Crystal system	monoclinic
Space group	P 1 21/c 1
a/Å	14.641(3)
b/Å	10.835(2)
c/Å	12.117(2)
α/°	90
β/°	107.599(8)
γ/°	90
Volume/$Å^3$	1832.3(6)
Z	4
$\rho_{calc}g/cm^3$	1.259
μ/mm^{-1}	0.197

F(000)	736
Radiation	MoKα (λ = 0.71073)
2Θ range for data collection/°	2.380 to 26.391
Index ranges	-18 ≤ h ≤ 18, -13 ≤ k ≤ 13, -15 ≤ l ≤ 15
Reflections collected	3752
Data/restraints/parameters	3752/0/221
Goodness-of-fit on F^2	1.018
R (reflections)	0.0416 (2820)
wR2 (reflections)	0.1219 (3752)
S	1.018
Npar	221

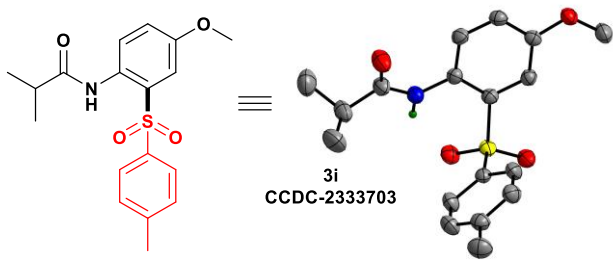


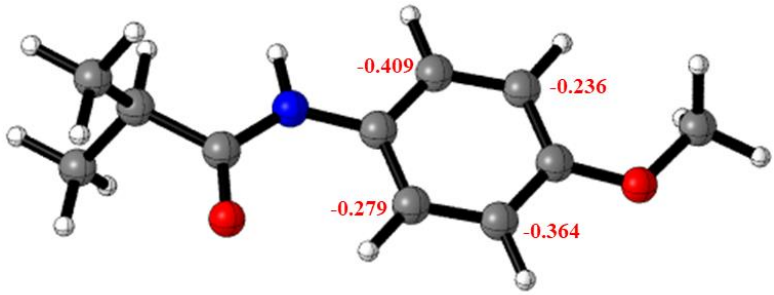
Figure S11: Crystal structure of compound **3i**. Thermal ellipsoids are shown at the 35% level

13. Computational studies:

Computational methods: All the structures were optimized using the density functional theory (DFT) with B3LYP method employing 6-31+G(d,p) basis set.[1] Each structure was first optimized, and then vibrational frequencies were calculated to ensure the located minima (characterized by zero frequency) and to obtain the zero-point energy (ZPE) corrections to the energies and Merz-Kollman (ESP) charges. All quantum mechanical calculations were performed using standard quantum chemistry programs as implemented in the Gaussian 09 software suite, and for structure visualization, CYLview software was used.[2-3] Cartesian coordinates for the optimized structures and their zero-point energy corrected total energies in Hartree.

Calculations of ESP charges with B3LYP method employing 6-31+G(d,p) basis set considering SMD[4]

N-(4-methoxyphenyl)isobutyramide (1i)



Electronic Energy (EE) = -633.482709 **Hartree**

Zero-Point Energy Correction = 0.244433 **Hartree**

Thermal Correction to Enthalpy = 0.259583 **Hartree**

Thermal Correction to Free Energy = 0.202901 **Hartree**

Entropy (S) = 119.296 **cal/mol-kelvin**

Temperature (T) = 298.150 **kelvin**

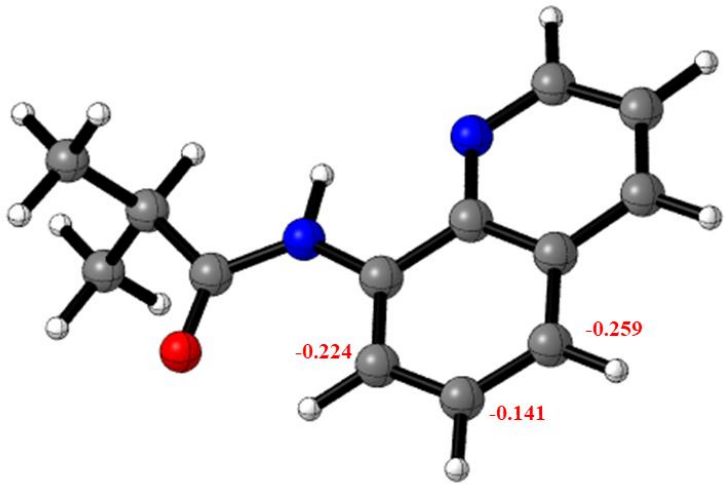
Charge = 0

Spin = Singlet

O	4.30125800	-0.59692500	-0.00456300
O	-2.20743200	-1.45252300	-0.08767200

N	-1.17073800	0.59377300	-0.09628900
H	-1.35737000	1.58918600	-0.08719200
C	1.12452300	1.30476600	0.03075300
C	2.50061100	1.06565700	0.05635900
H	3.17927500	1.90650600	0.13476800
C	2.97793800	-0.24953200	-0.01972700
C	2.06038100	-1.30476700	-0.12097700
H	2.43411600	-2.32282000	-0.17903200
C	0.68823300	-1.06504000	-0.14643800
H	-0.00555600	-1.89044100	-0.22188000
C	0.20285200	0.25334000	-0.07062700
C	5.27478700	0.44011100	0.13859100
H	6.24397300	-0.06085300	0.13542500
H	5.14675200	0.97794200	1.08543200
H	5.23091200	1.14924300	-0.69670500
C	-2.27207700	-0.21799600	-0.09330900
C	-3.61444200	0.51944700	-0.08100000
H	-3.43067700	1.59137100	-0.22406400
C	-4.50411500	0.02084800	-1.23019000
H	-5.45645600	0.56218300	-1.22913200
H	-4.71672700	-1.04745800	-1.12164700
H	-4.02756200	0.17641900	-2.20468400
C	-4.29703700	0.32378100	1.28565800
H	-5.24650600	0.86931600	1.31254000
H	-3.67134900	0.69447700	2.10538900
H	-4.50723300	-0.73551100	1.46758400
H	0.76486800	2.32925400	0.09151800

N-(quinolin-8-yl)isobutyramide (1y)



Electronic Energy (EE) = -688.650376 **Hartree**

Zero-Point Energy Correction = 0.246985 **Hartree**

Thermal Correction to Enthalpy = 0.261983 **Hartree**

Thermal Correction to Free Energy = 0.205173 **Hartree**

Entropy (S) = 119.566 **cal/mol-kelvin**

Temperature (T) = 298.150 **kelvin**

Charge = 0

Spin = Singlet

O	-2.17153800	-1.49220400	-0.42611000
C	-2.22542300	-0.32967800	-0.01415200
C	-3.55526000	0.39433700	0.20391500
H	-3.34816600	1.44851100	0.42282700
C	-4.42101200	0.31773900	-1.06274900
H	-5.36374100	0.85207500	-0.90304900
H	-4.65459000	-0.72196500	-1.31333200
H	-3.91617000	0.77124400	-1.92313100
C	-4.27771400	-0.21892200	1.41861000
H	-5.22389300	0.30415900	1.59466800
H	-3.67342400	-0.14045500	2.32923600

H	-4.50015000	-1.27712400	1.24466900
C	0.23798000	0.04247800	0.26806700
C	1.16425600	1.05777500	0.69625800
C	0.72275900	-1.19084300	-0.14176300
C	2.56512800	0.77780800	0.69114000
C	2.11567900	-1.44947600	-0.13763400
H	0.02992400	-1.95478700	-0.46505900
C	1.50469500	3.20191300	1.48275000
C	3.43376000	1.81604100	1.11903100
C	3.02627900	-0.49768300	0.26627400
H	2.46024900	-2.42652000	-0.46425800
C	2.90890500	3.02679200	1.51411400
H	1.06898200	4.15000600	1.79139900
H	4.50614900	1.63959200	1.12795200
H	4.09291200	-0.70388000	0.26599000
H	3.54640600	3.84010500	1.84555100
N	0.66031300	2.26145400	1.09191700
N	-1.11400300	0.40727900	0.30446600
H	-1.25908700	1.35852700	0.63089600

14. Characterization data of the synthesized compounds:

***N*-(4-methoxy-2-tosylphenyl)-2,2-dimethylbutanamide (3a):** yield 92% (69.1 mg); Colourless liquid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.61 (s, 1H), 8.40 (d, *J* = 9.2 Hz, 1H), 7.70 (d, *J* = 8.3 Hz, 2H), 7.51 (d, *J* = 3.0 Hz, 1H), 7.27 (d, *J* = 8.1 Hz, 2H), 7.10 (dd, *J* = 9.2, 3.0 Hz, 1H), 3.83 (s, 3H), 2.38 (s, 3H), 1.64 (q, *J* = 7.5 Hz, 2H), 1.26 (s, 6H), 0.84 (t, *J* = 7.5 Hz, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 176.4, 155.5, 144.8, 138.2, 130.9, 130.0, 128.3, 126.7, 124.4, 121.0, 113.9, 55.9, 43.8, 33.9, 24.9, 21.6, 9.3. **HRMS-ESI:** calcd for $C_{20}H_{25}NO_4NaS$ $[M+Na]^+$ 398.1402, found 398.1389.

***N*-(4-methoxy-2-((4-methoxyphenyl)sulfonyl)phenyl)isobutyramide (3b):** yield 76% (55.2 mg); White solid, Hexane/EtOAc = 94/6, **^{1}H NMR** (400 MHz, $CDCl_3$) δ 9.33 (s, 1H), 8.27 (d, *J* = 9.1 Hz, 1H), 7.74 (d, *J* = 9.0 Hz, 2H), 7.48 (d, *J* = 3.0 Hz, 1H), 7.08-7.04 (m, 1H), 6.92 (d, *J* = 9.0 Hz, 2H), 3.81 (s, 6H), 2.53 (sept, *J* = 6.9 Hz, 1H), 1.23 (d, *J* = 6.9 Hz, 6H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 175.2, 163.9, 155.7, 134.0, 132.4, 130.3, 129.2, 124.8, 120.8, 114.7, 113.6, 56.0, 55.8, 37.2, 19.6. **HRMS-ESI:** calcd for $C_{18}H_{22}NO_5S$ $[M+H]^+$ 364.1219, found 364.1215.

***N*-(2-((4-ethylphenyl)sulfonyl)-4-methoxyphenyl)isobutyramide (3c):** yield 62% (44.8 mg); Colourless liquid, Hexane/EtOAc = 94/6, **^{1}H NMR** (400 MHz, $CDCl_3$) δ 9.33 (s, 1H), 8.29 (d, *J* = 9.1 Hz, 1H), 7.72 (d, *J* = 8.5 Hz, 2H), 7.53 (d, *J* = 3.0 Hz, 1H), 7.30 (d, *J* = 8.6 Hz, 2H), 7.09 (dd, *J* = 9.1, 3.1 Hz, 1H), 3.83 (s, 3H), 2.68 (q, *J* = 7.6 Hz, 2H), 2.59-2.49 (m, 1H), 1.23-1.19 (m, 9H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 175.2, 155.7, 151.0, 138.2, 130.4, 129.1, 129.0, 127.1, 124.8, 121.0, 113.7, 56.0, 37.2, 29.0, 19.5, 15.1. **HRMS-ESI:** calcd for $C_{19}H_{23}NO_4SNa$ $[M+H]^+$ 384.1245, found 384.1239.

***N*-(2-((4-fluorophenyl)sulfonyl)-4-methoxyphenyl)-2,2-dimethylbutanamide (3d):** yield 71% (53.9 mg); Colourless liquid, Hexane/EtOAc = 96/4, **^{1}H NMR** (400 MHz, $CDCl_3$) δ 9.53 (s, 1H), 8.40 (d, *J* = 9.2 Hz, 1H), 7.83 (dd, *J* = 8.8, 5.0 Hz, 2H), 7.49 (d, *J* = 3.0 Hz, 1H), 7.18-7.11 (m, 3H), 3.84 (s, 3H), 1.63 (q, *J* = 7.5 Hz, 2H), 1.25 (s, 6H), 0.84 (t, *J* = 7.5 Hz, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 176.4, 165.7 (d, *J* = 257.0 Hz), 155.6, 137.3 (d, *J* = 3.4 Hz), 131.0, 129.6 (d, *J* = 9.6 Hz), 127.8, 124.8, 121.4, 116.8 (d, *J* = 22.8 Hz), 114.0, 56.0, 43.8, 34.0, 25.0, 9.4. **^{19}F NMR** (376 MHz, $CDCl_3$) δ -103.2. **HRMS-ESI:** calcd for $C_{19}H_{22}NO_4NaSF$ $[M+Na]^+$ 402.1151, found 402.1152.

***N*-(2-((3-chlorophenyl)sulfonyl)-4-methoxyphenyl)isobutyramide (3e):** yield 62% (45.6 mg); White solid, Hexane/EtOAc = 96/4, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.20 (s, 1H), 8.30 (d, *J* = 9.1 Hz, 1H), 7.84 (s, 1H), 7.67 (d, *J* = 7.8 Hz, 1H), 7.53 (dd, *J* = 14.0, 5.1 Hz, 2H), 7.43 (t, *J* = 8.0 Hz,

1H), 7.14 (dd, *J* = 9.1, 2.9 Hz, 1H), 3.85 (s, 3H), 2.55 (dt, *J* = 13.7, 6.9 Hz, 1H), 1.24 (d, *J* = 6.9 Hz, 6H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 175.2, 155.9, 142.7, 135.8, 134.0, 132.9, 130.9, 130.6, 127.0, 125.3, 125.1, 121.6, 113.9, 56.1, 37.2, 19.6. **HRMS-ESI:** calcd for $C_{17}H_{18}ClNO_4SNa$ $[M+Na]^+$ 390.0537, found 390.0543.

***N*-(2-((4-bromo-2-methylphenyl)sulfonyl)-4-methoxyphenyl)-2,2-dimethylbutanamide (3f):** yield 73% (66.3 mg); White solid, Hexane/EtOAc = 96/4, **^{1}H NMR** (400 MHz, $CDCl_3$) δ 9.53 (s, 1H), 8.40 (d, *J* = 9.2 Hz, 1H), 7.66-7.62 (m, 2H), 7.49-7.45 (m, 2H), 7.12 (dd, *J* = 9.2, 3.0 Hz, 1H), 3.84 (s, 3H), 2.41 (s, 3H), 1.63 (q, *J* = 7.5 Hz, 2H), 1.26 (d, *J* = 2.1 Hz, 6H), 0.84 (t, *J* = 7.5 Hz, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 176.4, 155.6, 140.2, 140.0, 133.6, 131.5, 131.1, 128.5, 127.7, 125.4, 124.7, 121.4, 114.1, 56.0, 43.8, 34.0, 25.0, 23.3, 9.4. **HRMS-ESI:** calcd for $C_{20}H_{24}NO_4NaSBr$ $[M+Na]^+$ 476.0507, found 476.0507.

***N*-(4-methoxy-2-(naphthalen-1-ylsulfonyl)phenyl)-2,2-dimethylbutanamide (3g):** yield 74% (60.9 mg); White solid, Hexane/EtOAc = 94/6, **^{1}H NMR** (400 MHz, $CDCl_3$) δ 9.69 (s, 1H), 8.43 (d, *J* = 9.2 Hz, 2H), 7.93-7.86 (m, 3H), 7.72-7.58 (m, 4H), 7.12 (dd, *J* = 9.2, 3.1 Hz, 1H), 3.85 (s, 3H), 1.63 (q, *J* = 7.5 Hz, 2H), 1.26 (s, 6H), 0.79 (t, *J* = 7.5 Hz, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 176.4, 155.5, 137.9, 135.2, 132.0, 131.2, 130.0, 129.5, 129.4, 128.1, 128.1, 128.0, 127.9, 124.5, 121.7, 121.2, 114.2, 56.0, 43.8, 34.0, 25.0, 9.3. **HRMS-ESI:** calcd for $C_{23}H_{26}NO_4S$ $[M+H]^+$ 412.1583, found 412.1574.

***N*-(4-methoxy-2-(thiophen-2-ylsulfonyl)phenyl)-2,2-dimethylbutanamide (3h):** yield 82% (60.3 mg); Colourless liquid, Hexane/EtOAc = 96/4, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.63 (s, 1H), 8.44 (d, *J* = 9.0 Hz, 1H), 7.62 (d, *J* = 1.8 Hz, 2H), 7.51 (s, 1H), 7.08 (dd, *J* = 25.5, 6.4 Hz, 2H), 3.83 (s, 3H), 1.67 (d, *J* = 7.1 Hz, 2H), 1.30 (s, 6H), 0.89 (t, *J* = 6.9 Hz, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 176.6, 155.6, 142.5, 133.9, 132.9, 130.9, 128.8, 127.9, 124.5, 121.5, 113.3, 56.0, 43.9, 34.1, 25.0, 9.4. **HRMS-ESI:** calcd for $C_{17}H_{22}NO_4S_2$ $[M+H]^+$ 368.0990, found 368.0984.

***N*-(4-methoxy-2-tosylphenyl)isobutyramide (3i):** yield 68% (47.2 mg); White solid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.33 (s, 1H), 8.30 (d, *J* = 9.1 Hz, 1H), 7.71 (d, *J* = 8.2 Hz, 2H), 7.52 (d, *J* = 2.9 Hz, 1H), 7.28 (d, *J* = 8.2 Hz, 2H), 7.10 (dd, *J* = 9.1, 2.9 Hz, 1H), 3.84 (s, 3H), 2.55 (dt, *J* = 13.8, 6.9 Hz, 1H), 2.39 (s, 3H), 1.23 (d, *J* = 6.9 Hz, 6H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 175.2, 155.7, 144.9, 138.1, 130.5, 130.1, 129.1, 127.0, 124.9, 121.0, 113.7, 56.0, 37.2, 21.7, 19.6. **HRMS-ESI:** calcd for $C_{18}H_{21}NO_4SNa$ $[M+Na]^+$ 370.1089, found 370.1084.

***N*-(4-methoxy-2-((4-methoxyphenyl)sulfonyl)phenyl)pivalamide (3j):** yield 72% (54.3 mg); Colourless liquid, Hexane/EtOAc = 94/6, **^{1}H NMR** (400 MHz, $CDCl_3$) δ 9.64 (s, 1H), 8.36 (d, *J* = 9.2 Hz, 1H), 7.74 (d, *J* = 9.0 Hz, 2H), 7.48 (d, *J* = 3.0 Hz, 1H), 7.08 (dd, *J* = 9.2, 3.0 Hz, 1H), 6.93 (d, *J* = 9.0 Hz, 2H), 3.82 (s, 6H), 1.30 (s, 9H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 177.0, 163.8, 155.5, 132.7, 130.8, 129.1, 129.0, 124.6, 120.8, 114.7, 113.8, 55.9, 55.8, 40.0, 27.6. **HRMS-ESI:** calcd for $C_{19}H_{24}NO_5S$ $[M+H]^+$ 378.1375, found 378.1374.

***N*-(4-methoxy-2-((4-methoxyphenyl)sulfonyl)phenyl)-2,2-dimethylbutanamide (3k):** yield 87% (68.1 mg); Colourless liquid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.63 (s, 1H), 8.41 (d, *J* = 9.2 Hz, 1H), 7.76 (d, *J* = 8.9 Hz, 2H), 7.48 (d, *J* = 3.0 Hz, 1H), 7.09 (dd, *J* = 9.2, 3.0 Hz, 1H), 6.93 (d, *J* = 8.9 Hz, 2H), 3.83 (s, 6H), 1.65 (q, *J* = 7.5 Hz, 2H), 1.28 (s, 6H), 0.86 (t, *J* = 7.4 Hz, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 176.4, 163.8, 155.5, 132.8, 130.8, 129.0, 128.8, 124.4, 120.8, 114.7, 113.8, 56.0, 55.8, 43.8, 34.0, 25.0, 9.4. **HRMS-ESI:** calcd for $C_{20}H_{25}NO_5SNa$ $[M+Na]^+$ 414.1351, found 414.1346.

***N*-(4-methoxy-2-((4-methoxyphenyl)sulfonyl)phenyl)cyclohexanecarboxamide (3m):** yield 56% (45.2 mg); Colourless liquid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.33 (s, 1H), 8.28 (d, *J* = 9.1 Hz, 1H), 7.75 (d, *J* = 8.9 Hz, 2H), 7.48 (d, *J* = 2.9 Hz, 1H), 7.07 (dd, *J* = 9.1, 3.0 Hz, 1H), 6.93 (d, *J* = 8.9 Hz, 2H), 3.83 (s, 3H), 3.82 (s, 3H), 2.29-2.24 (m, 1H), 1.95-1.93 (m, 2H), 1.86-1.83 (m, 2H), 1.73-1.71 (m, 1H), 1.53-1.46 (m, 2H), 1.38-1.28 (m, 3H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 174.3, 163.9, 155.6, 132.4, 130.3, 129.3, 126.9, 124.9, 120.8, 114.7, 113.5, 56.0, 55.9, 47.0, 29.6, 25.8, 25.8. **HRMS-ESI:** calcd for $C_{21}H_{25}NNaO_5S$ $[M+Na]^+$ 426.1351, found 426.1336.

***N*-(4-methoxy-2-tosylphenyl)-2-phenylacetamide (3n):** yield 81% (64.1 mg); Sticky white solid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.32 (s, 1H), 8.30 (d, *J* = 9.1 Hz, 1H), 7.48-7.43 (m, 3H), 7.40-7.35 (m, 5H), 7.13 (d, *J* = 8.1 Hz, 2H), 7.06 (dd, *J* = 9.2, 3.0 Hz, 1H), 3.81 (s, 3H), 3.73 (s, 2H), 2.36 (s, 3H).**^{13}C NMR** (101 MHz, $CDCl_3$) δ 169.2, 155.8, 144.7, 137.7, 134.1, 130.0, 129.7, 129.3, 127.8, 127.0, 124.6, 121.9, 120.8, 114.2, 113.6, 55.9, 45.6, 21.7. **HRMS-ESI:** calcd for $C_{22}H_{21}NO_4NaS$ $[M+Na]^+$ 418.1089, found 418.1082.

***N*-(4-methoxy-2-tosylphenyl)acetamide (3o):** yield 65% (41.5 mg); Sticky white solid, Hexane/EtOAc = 94/6, **^{1}H NMR** (400 MHz, $CDCl_3$) δ 9.13 (s, 1H), 8.15 (d, *J* = 9.1 Hz, 1H), 7.71 (d, *J* = 8.4 Hz, 2H), 7.53 (d, *J* = 2.9 Hz, 1H), 7.29 (d, *J* = 8.0 Hz, 2H), 7.09 (dd, *J* = 9.1, 3.0 Hz, 1H), 3.84 (s, 3H), 2.40 (s, 3H), 2.17 (s, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 168.1, 156.0, 145.1,

137.8, 130.2, 130.1 129.9, 127.2, 125.4, 120.9, 113.5, 56.0, 24.9, 21.7. **HRMS-ESI:** calcd for $C_{16}H_{18}NO_4S$ $[M+H]^+$ 320.0957, found 320.0948.

***N*-(4-methoxy-2-tosylphenyl)pent-4-enamide (3p):** yield 76% (54.6 mg); Colourless liquid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.23 (s, 1H), 8.23 (d, *J* = 9.0 Hz, 1H), 7.71 (d, *J* = 8.0 Hz, 2H), 7.52 (s, 1H), 7.28 (d, *J* = 7.9 Hz, 2H), 7.09 (dd, *J* = 9.1, 2.8 Hz, 1H), 5.84 (dd, *J* = 14.5, 8.2 Hz, 1H), 5.07 (dd, *J* = 35.9, 13.6 Hz, 2H), 3.84 (s, 3H), 2.46 (s, 4H), 2.40 (s, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 170.3, 155.9, 145.0, 137.9, 136.7, 130.2, 129.4, 127.1, 125.1, 121.0, 117.2, 116.0, 113.6, 56.0, 37.3, 29.3, 21.7. **HRMS-ESI:** calcd for $C_{19}H_{22}NO_4S$ $[M+H]^+$ 360.1269, found 360.1261.

***N*-(4-methoxy-2-((4-methoxyphenyl)sulfonyl)phenyl)pent-4-enamide (3q):** yield 77% (57.8 mg); Colourless liquid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.25 (s, 1H), 7.89 (d, *J* = 8.8 Hz, 1H), 7.76 (d, *J* = 8.7 Hz, 2H), 7.50 (s, 1H), 7.08 (dd, *J* = 8.5, 3.8 Hz, 1H), 6.95 (d, *J* = 8.7 Hz, 2H), 5.85 (dd, *J* = 14.5, 8.4 Hz, 1H), 5.08 (dd, *J* = 37.0, 13.5 Hz, 2H), 3.84 (s, 3H), 3.83 (s, 3H), 2.47 (s, 4H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 170.3, 166.2, 163.9, 155.9, 136.7, 134.0, 129.4, 125.1, 120.8, 116.0, 115.2, 114.8, 113.5, 56.0, 55.8, 37.3, 29.3. **HRMS-ESI:** calcd for $C_{19}H_{22}NO_5S$ $[M+H]^+$ 376.1219, found 376.1209.

***N*-(2-((4-methoxyphenyl)sulfonyl)-4-methylphenyl)isobutyramide (3r):** yield 70% (48.6 mg); Colourless liquid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.58 (s, 1H), 8.32 (d, *J* = 7.8 Hz, 1H), 7.77-7.75 (m, 3H), 7.34 (d, *J* = 8.1 Hz, 1H), 6.94 (d, *J* = 8.8 Hz, 2H), 3.83 (s, 3H), 2.58 (sept, 6.7 Hz, 1H), 2.35 (s, 3H), 1.26 (d, *J* = 6.8 Hz, 6H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 175.4, 163.8, 135.6, 134.7, 134.0, 132.8, 129.5, 129.2, 127.9, 122.8, 114.7, 55.8, 37.4, 20.9, 19.6. **HRMS-ESI:** calcd for $C_{18}H_{21}NO_4SNa$ $[M+Na]^+$ 370.1089, found 370.1084.

***N*-(4-methoxy-2-((4-methoxyphenyl)sulfonyl)-6-methylphenyl)isobutyramide (3s):** yield 81% (61.1 mg); Semi white solid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 7.89 (s, 1H), 7.69 (d, *J* = 8.9 Hz, 2H), 7.52 (d, *J* = 2.9 Hz, 1H), 7.01 (d, *J* = 2.7 Hz, 1H), 6.91 (d, *J* = 8.9 Hz, 2H), 3.85 (s, 3H), 3.82 (s, 3H), 2.45 (sept, 6.9 Hz, 1H), 2.15 (s, 3H), 1.14 (d, *J* = 6.9 Hz, 6H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 174.4, 163.6, 157.6, 140.2, 136.1, 132.2, 129.1, 127.1, 122.2, 114.5, 112.1, 56.0, 55.8, 36.0, 19.5, 18.9. **HRMS-ESI:** calcd for $C_{19}H_{23}NO_5NaS$ $[M+Na]^+$ 400.1195, found 400.1188.

***N*-(4-(tert-butyl)-2-((4-methoxyphenyl)sulfonyl)phenyl)isobutyramide (3t):** yield 72% (56.1 mg); Off-white solid, Hexane/EtOAc = 94/6, **^{1}H NMR** (400 MHz, $CDCl_3$) δ 9.53 (s, 1H), 8.31 (d,

J = 8.7 Hz, 1H), 7.97 (d, *J* = 2.4 Hz, 1H), 7.74 (d, *J* = 9.1 Hz, 2H), 7.55 (dd, *J* = 8.7, 2.4 Hz, 1H), 6.93 (d, *J* = 9.0 Hz, 2H), 3.82 (s, 3H), 2.57 (sept, *J* = 6.9 Hz, 1H), 1.30 (s, 9H), 1.24 (d, *J* = 6.9 Hz, 6H). **^{13}C NMR** (101 MHz, $CDCl_3$) δ 175.4, 163.7, 147.4, 134.6, 132.9, 132.1, 129.2, 127.7, 126.0, 122.7, 114.7, 55.8, 37.4, 34.8, 31.2, 19.6. **HRMS-ESI:** calcd for $C_{21}H_{27}NNaO_4S$ $[M+Na]^+$ 412.1558, found 412.1551.

***N*-(4-isopropoxy-2-tosylphenyl)isobutyramide (3u):** yield 75% (56.25 mg); light yellow liquid, Hexane/EtOAc = 94/6, **^{1}H NMR** (400 MHz, $CDCl_3$ δ 9.32 (s, 1H), 8.26 (d, *J* = 9.1 Hz, 1H), 7.70 (d, *J* = 8.3 Hz, 2H), 7.51 (d, *J* = 2.9 Hz, 1H), 7.27 (d, *J* = 9.2 Hz, 2H), 7.07 (dd, *J* = 9.1, 3.0 Hz, 1H), 4.55 (dt, *J* = 12.1, 6.0 Hz, 1H), 2.54 (dt, *J* = 13.8, 6.9 Hz, 1H), 2.39 (s, 3H), 1.33 (d, *J* = 6.0 Hz, 6H), 1.23 (d, *J* = 6.9 Hz, 6H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 175.2, 154.0, 144.9, 138.0, 130.1, 130.1, 129.1, 127.0, 124.8, 122.7, 116.0, 71.0, 37.2, 22.0, 21.7, 19.6. **HRMS-ESI:** calcd for $C_{20}H_{25}NO_4NaS$ $[M+Na]^+$ 398.1402, found 398.1387.

***N*-(4-(4-methoxyphenoxy)-2-tosylphenyl)isobutyramide (3v):** yield 77% (67.7 mg); White solid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.45 (s, 1H), 8.32 (d, *J* = 9.1 Hz, 1H), 7.69 (d, *J* = 8.3 Hz, 2H), 7.59 (d, *J* = 2.9 Hz, 1H), 7.29 (d, *J* = 8.1 Hz, 2H), 7.11 (dd, *J* = 9.1, 2.9 Hz, 1H), 6.92 (dd, *J* = 25.7, 9.1 Hz, 4H), 3.82 (s, 3H), 2.57 (dt, *J* = 13.8, 6.9 Hz, 1H), 2.41 (s, 3H), 1.25 (d, *J* = 6.9 Hz, 6H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 175.3, 156.5, 154.4, 149.5, 145.1, 137.8, 131.8, 130.2, 129.3, 127.2, 124.7, 123.9, 120.8, 118.1, 115.2, 55.8, 37.3, 21.8, 19.6. **HRMS-ESI:** calcd for $C_{24}H_{25}NO_5NaS$ $[M+Na]^+$ 462.1351, found 462.1346.

***N*-(4-(methylthio)-2-tosylphenyl)isobutyramide (3w):** yield 63% (45.8 mg); Colourless liquid, Hexane/EtOAc = 94/6, **^{1}H NMR** (400 MHz, $CDCl_3$) δ 9.53 (s, 1H), 8.37 (d, *J* = 8.8 Hz, 1H), 7.87 (d, *J* = 2.3 Hz, 1H), 7.71 (d, *J* = 8.4 Hz, 2H), 7.42 (dd, *J* = 8.8, 2.3 Hz, 1H), 7.29 (d, *J* = 8.5 Hz, 2H), 2.60-2.53 (m, 1H), 2.50 (s, 3H), 2.40 (s, 3H), 1.24 (d, *J* = 6.9 Hz, 6H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 175.4, 145.1, 137.9, 134.6, 134.5, 133.2, 130.2, 128.4, 127.2, 127.0, 123.3, 31.1, 21.7, 19.5, 16.4. **HRMS-ESI:** calcd for $C_{18}H_{21}NO_3NaS_2$ $[M+Na]^+$ 386.0861, found 386.0846.

***N*-(5-tosylquinolin-8-yl)isobutyramide (3y):** yield 62% (45.7 mg); White solid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 10.12 (s, 1H), 9.04 (dd, *J* = 8.7, 1.5 Hz, 1H), 8.89 (d, *J* = 8.4 Hz, 1H), 8.82 (dd, *J* = 4.2, 1.5 Hz, 1H), 8.50 (d, *J* = 8.4 Hz, 1H), 7.81 (d, *J* = 8.3 Hz, 2H), 7.55 (dd, *J* = 8.7, 4.2 Hz, 1H), 7.25 (d, *J* = 7.3 Hz, 2H), 2.78 (dt, *J* = 13.8, 6.9 Hz, 1H), 2.36 (s, 3H), 1.34 (d, *J* = 6.9 Hz, 6H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 176.3, 148.7, 144.2, 140.1, 139.2, 138.3, 133.6,

132.2, 130.0, 129.1, 127.4, 124.4, 123.4, 114.2, 37.4, 21.7, 19.7. **HRMS-ESI:** calcd for $C_{20}H_{20}N_2O_3NaS$ $[M+Na]^+$ 391.1092, found 391.1093.

***N*-(5-(thiophen-2-ylsulfonyl)quinolin-8-yl)isobutyramide (3z):** yield 53% (38.2 mg); White solid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 9.90 (s, 1H), 8.81-8.79 (m, 2H), 8.16 (dd, *J* = 8.2, 1.4 Hz, 1H), 7.73 (dd, *J* = 3.7, 1.0 Hz, 1H), 7.65 (dd, *J* = 4.9, 1.0 Hz, 1H), 7.55-7.50 (m, 1H), 7.45 (dd, *J* = 8.2, 4.2 Hz, 1H), 7.08 (dd, *J* = 4.7, 4.0 Hz, 1H), 2.77 (dt, *J* = 13.8, 6.9 Hz, 1H), 1.36 (d, *J* = 6.9 Hz, 6H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 175.9, 148.3, 143.7, 138.6, 136.5, 134.8, 134.0, 133.4, 128.1, 127.9, 127.6, 121.7, 121.4, 116.5, 37.3, 19.9. **HRMS-ESI:** calcd for $C_{17}H_{16}N_2NaO_3S_2$ $[M+Na]^+$ 383.0500, found 383.0500.

***N*-(5-(naphthalen-1-ylsulfonyl)quinolin-8-yl)isobutyramide (3aa):** yield 57% (46.1 mg); White solid, Hexane/EtOAc = 94/6, **^{1}H NMR** (500 MHz, $CDCl_3$) δ 10.13 (s, 1H), 9.10 (d, *J* = 8.7 Hz, 1H), 8.93 (d, *J* = 8.4 Hz, 1H), 8.80 (d, *J* = 4.1 Hz, 1H)., 8.60 (d, *J* = 8.2 Hz, 2H), 7.97 (d, *J* = 7.4 Hz, 1H), 7.88-7.83 (m, 2H), 7.79-7.77 (m, 1H), 7.63-7.58 (m, 2H), 7.53 (dd, *J* = 8.7, 4.2 Hz, 1H), 2.78 (dt, *J* = 13.8, 6.9 Hz, 1H), 1.34 (d, *J* = 6.9 Hz, 6H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 176.4, 148.7, 140.3, 139.0, 138.3, 135.1, 133.5, 132.6, 132.2, 129.8, 129.5, 129.3, 128.6, 128.5, 128.1, 127.8, 124.4, 123.4, 122.4, 114.3, 37.4, 19.7. **HRMS-ESI:** calcd for $C_{23}H_{20}N_2NaO_3S$ $[M+Na]^+$ 427.1092, found 427.1082.

15. References:

1. E. Torres and G. A. DiLabio, *J. Phys. Chem. Lett.*, 2012, **3**, 1738–1744.

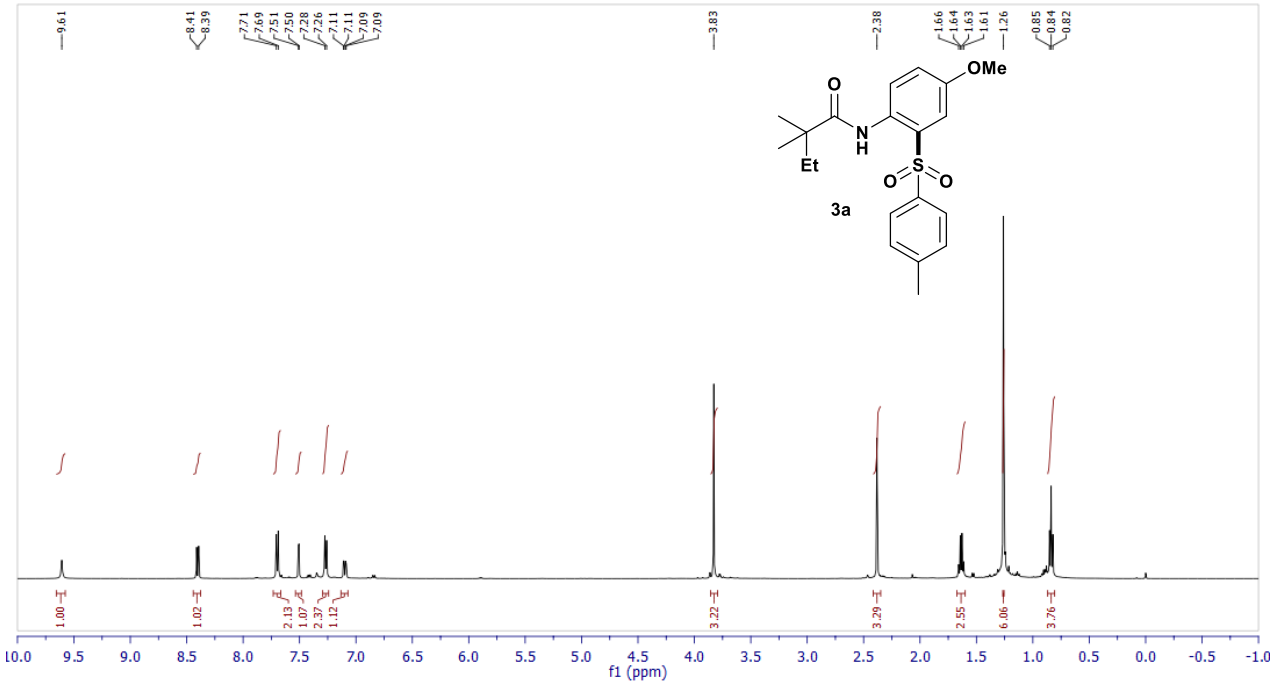
2. M. J. Frisch, G. W. Trucks, H. B. Schlegel, G. E. Scuseria, M. a. Robb, J. R. Cheeseman, G. Scalmani, V. Barone, G. a. Petersson, H. Nakatsuji, X. Li, M. Caricato, a. V. Marenich, J. Bloino, B. G. Janesko, R. Gomperts, B. Mennucci, H. P. Hratchian, J. V. Ortiz, a. F. Izmaylov, J. L. Sonnenberg, Williams, F. Ding, F. Lipparini, F. Egidi, J. Goings, B. Peng, A. Petrone, T. Henderson, D. Ranasinghe, V. G. Zakrzewski, J. Gao, N. Rega, G. Zheng, W. Liang, M. Hada, M. Ehara, K. Toyota, R. Fukuda, J. Hasegawa, M. Ishida, T. Nakajima, Y. Honda, O. Kitao, H. Nakai, T. Vreven, K. Throssell, J. a. Montgomery Jr., J. E. Peralta, F. Ogliaro, M. J. Bearpark, J. J. Heyd, E. N. Brothers, K. N. Kudin, V. N. Staroverov, T. a. Keith, R. Kobayashi, J. Normand, K. Raghavachari, a. P. Rendell, J. C. Burant, S. S. Iyengar, J. Tomasi, M. Cossi, J. M. Millam, M. Klene, C. Adamo, R. Cammi, J. W. Ochterski, R. L. Martin, K. Morokuma, O. Farkas, J. B. Foresman, D. J. Fox, **2016**, Gaussian 16, Revision C.01, Gaussian, Inc., Wallin.

3. CYLview, 1.0b; C.Y.Legault, UniversitedeSherbrooke **2009** (http://www.cylview.org).

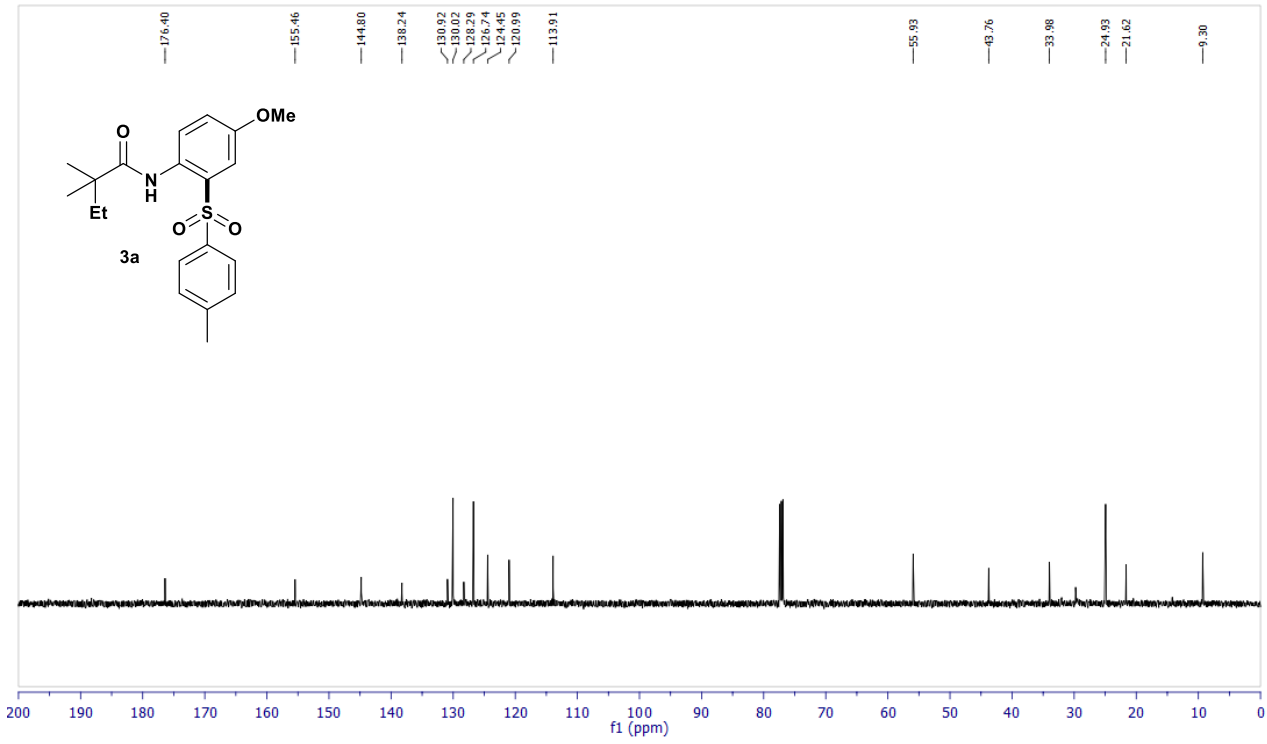
4. A. V Marenich, C. J. Cramer and D. G. Truhlar, *J. Phys. Chem. B.*, 2009, **113**, 6378–6396.

16. ^{1}H and ^{13}C NMR Spectra:

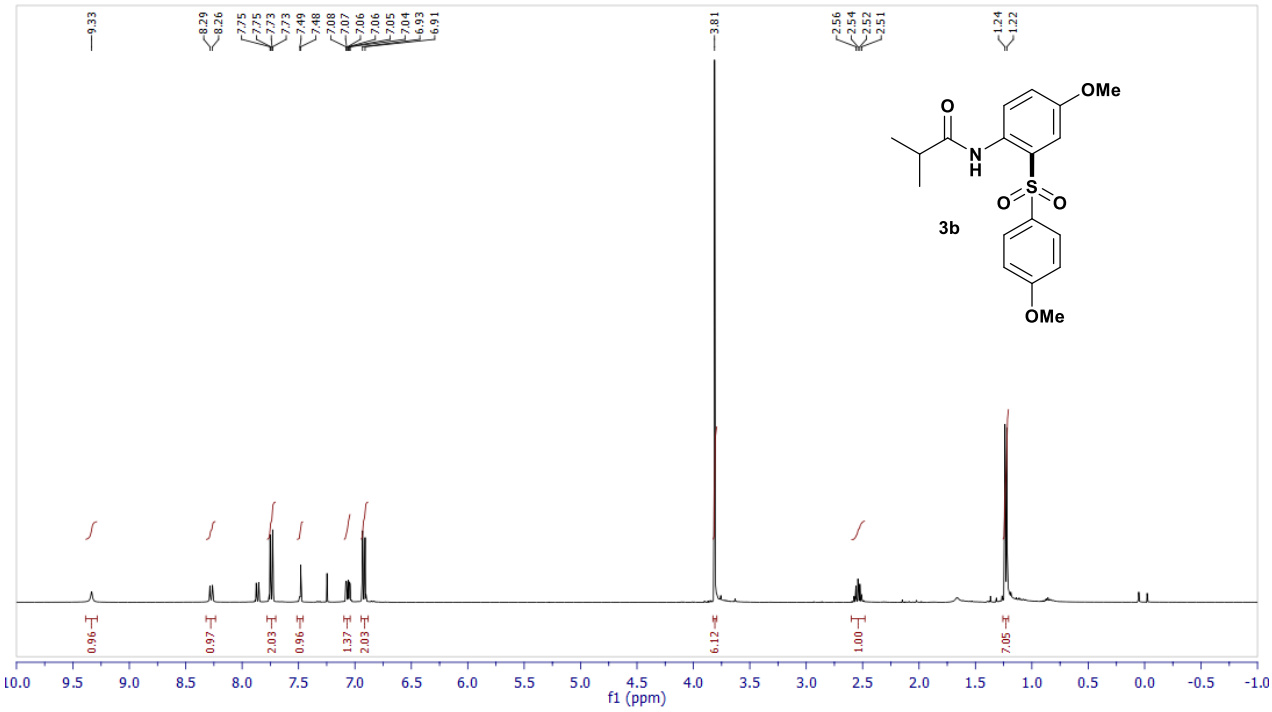
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3a**



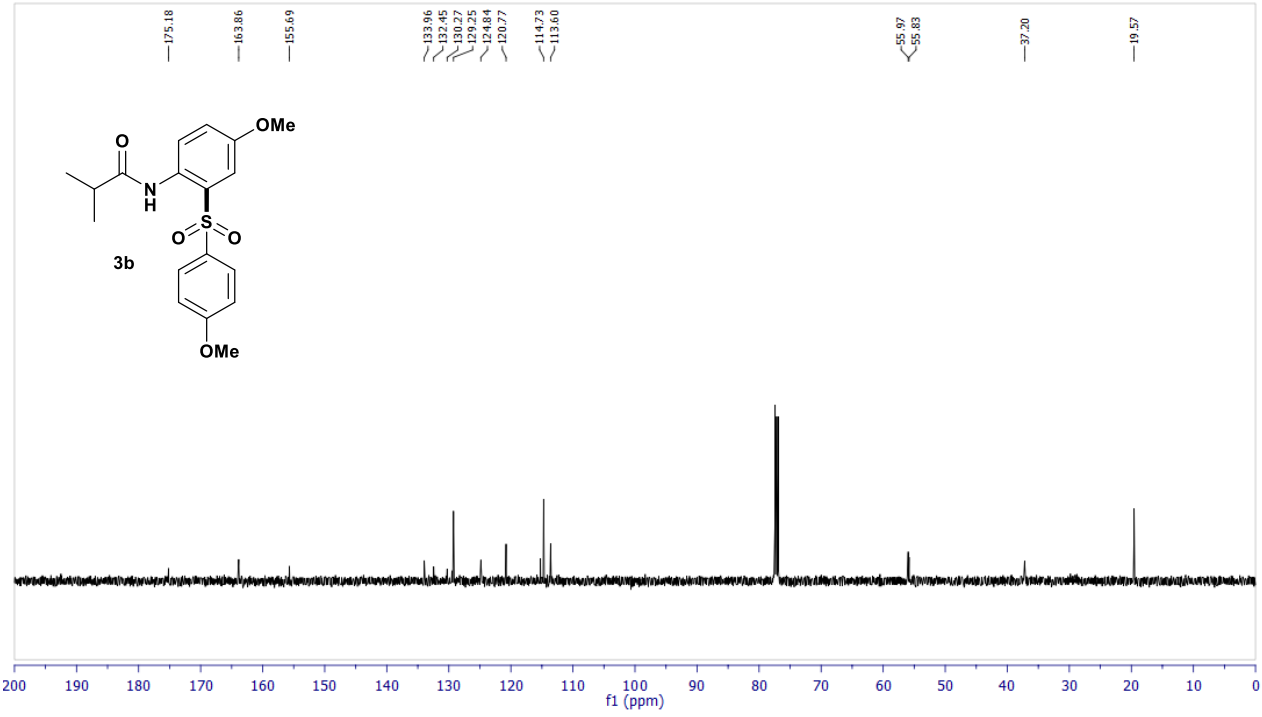
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3a**



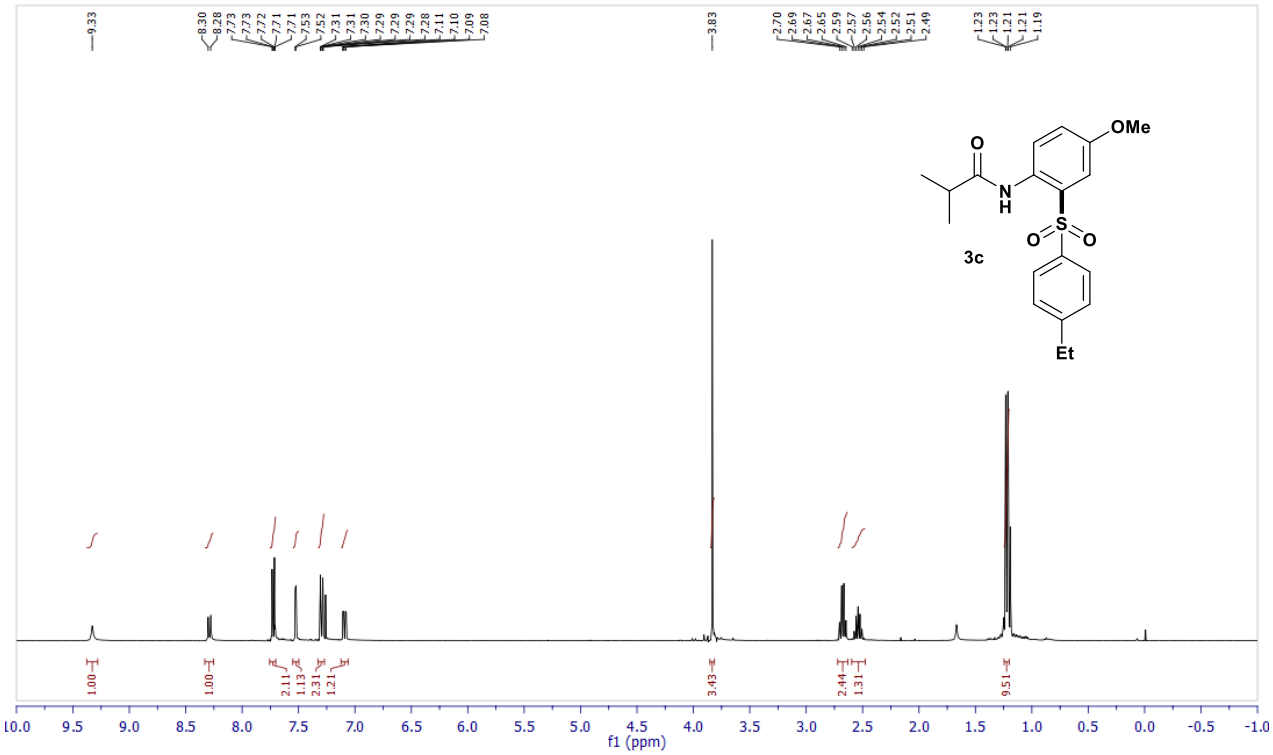
^{1}H NMR (400 MHz, $CDCl_3$) of compound **3b**



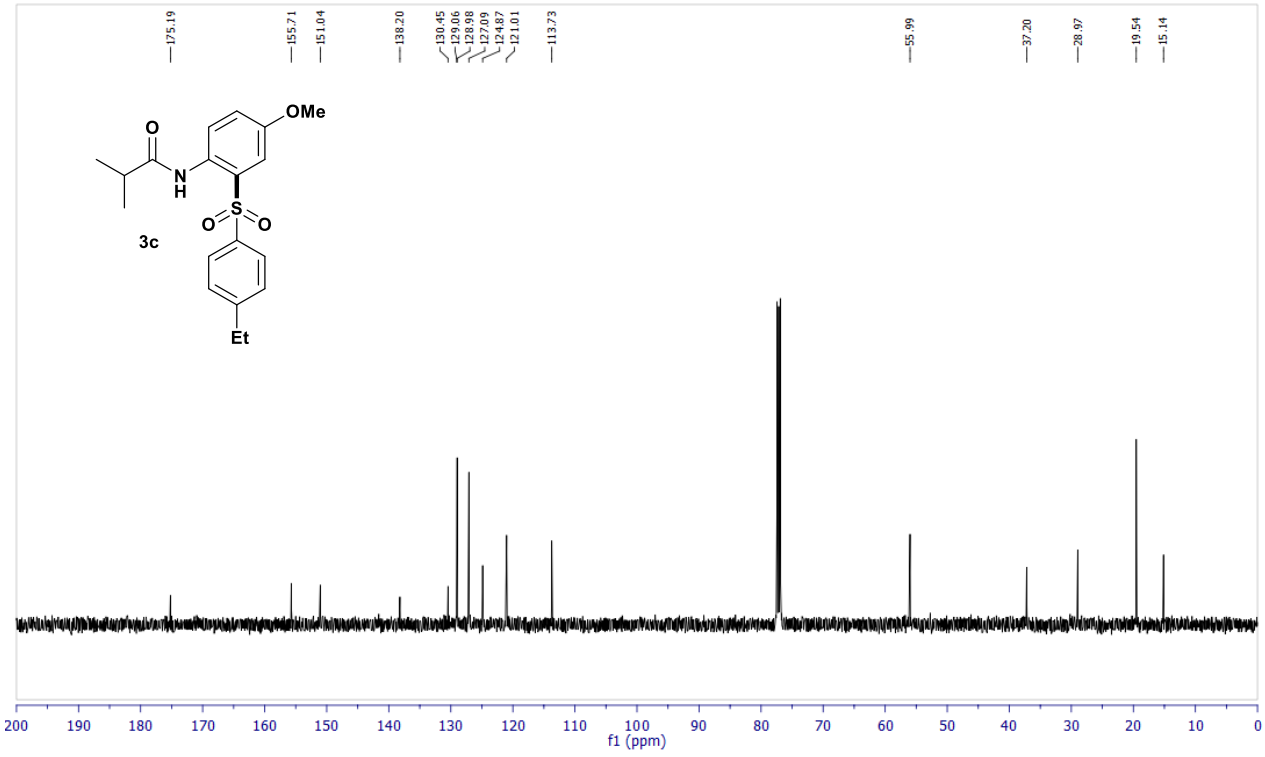
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3b**



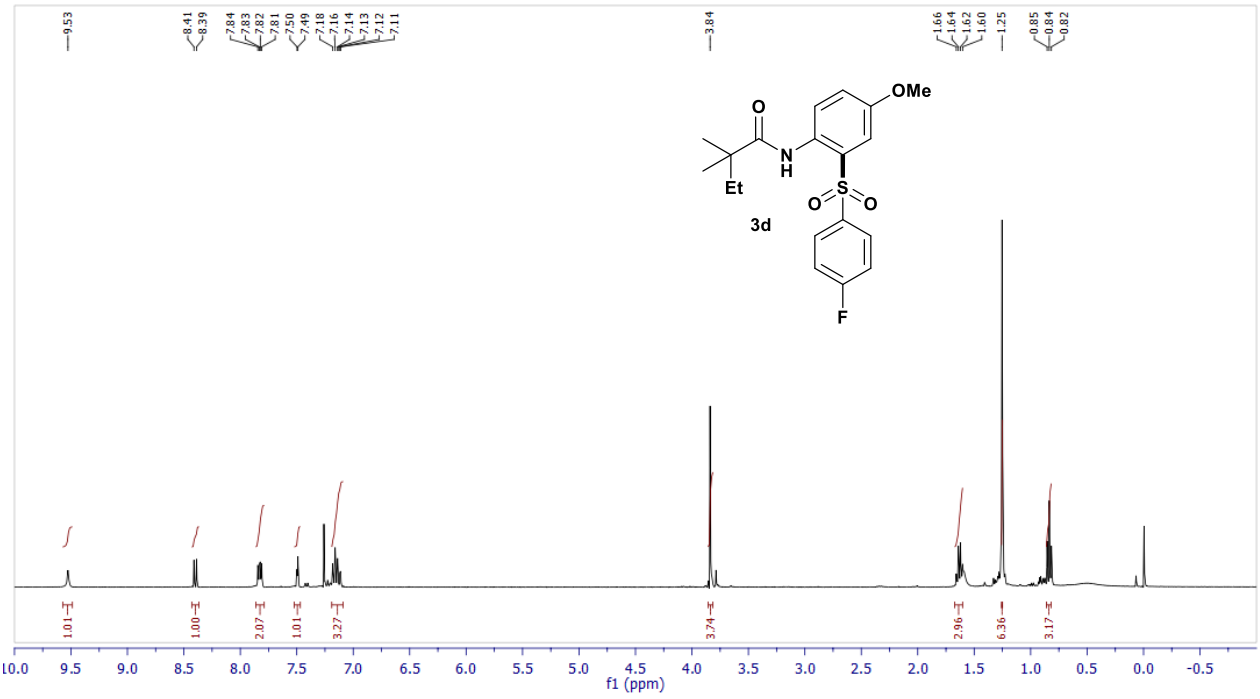
^{1}H NMR (400 MHz, $CDCl_3$) of compound **3c**



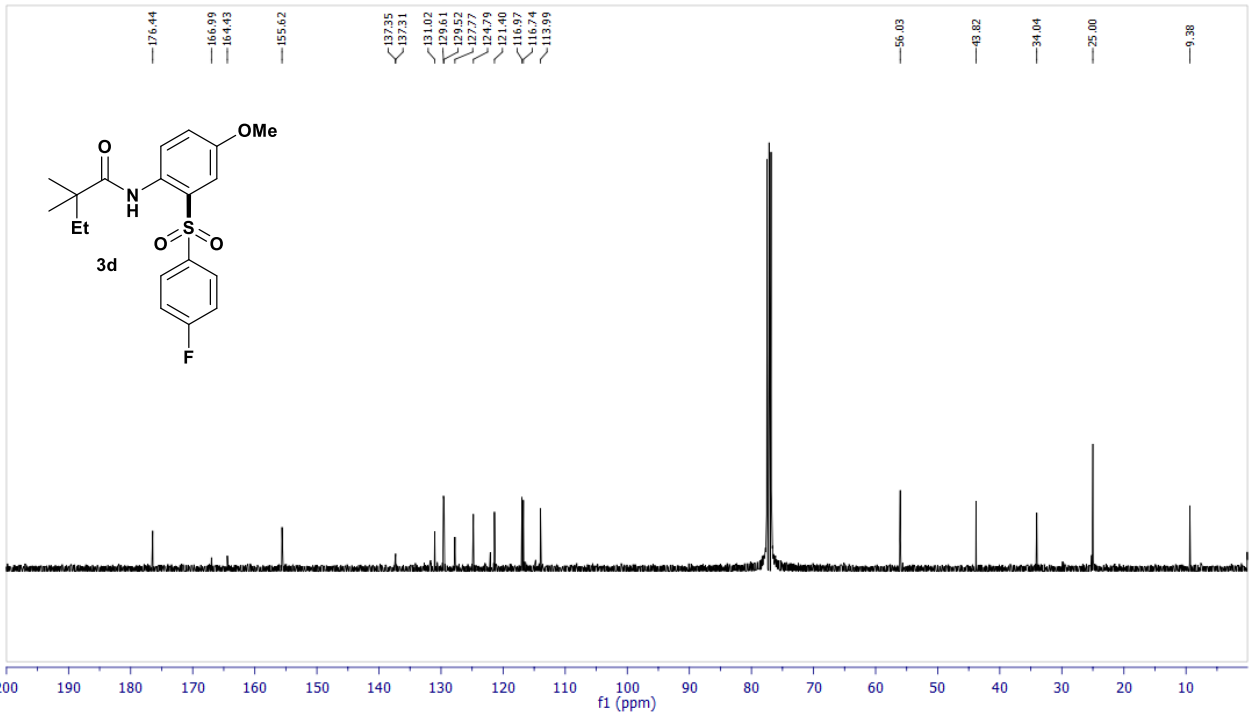
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3c**



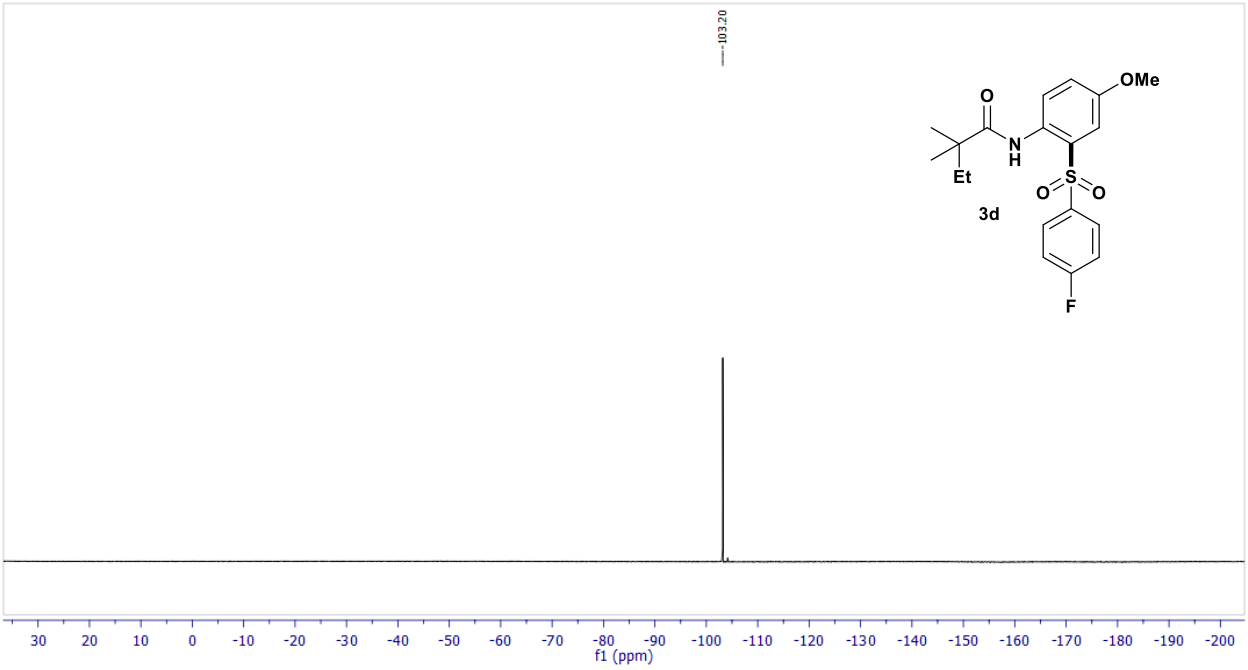
^{1}H NMR (400 MHz, $CDCl_3$) of compound **3d**



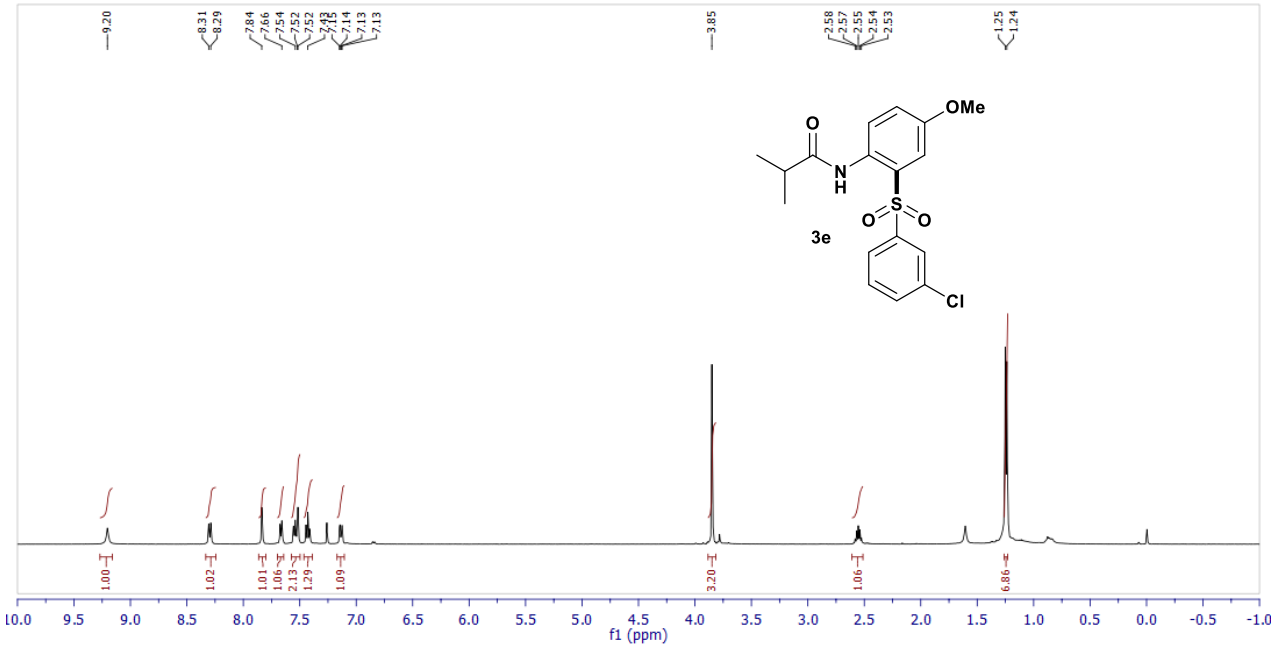
^{13}C NMR (101 MHz, $CDCl_3$) of compound **3d**



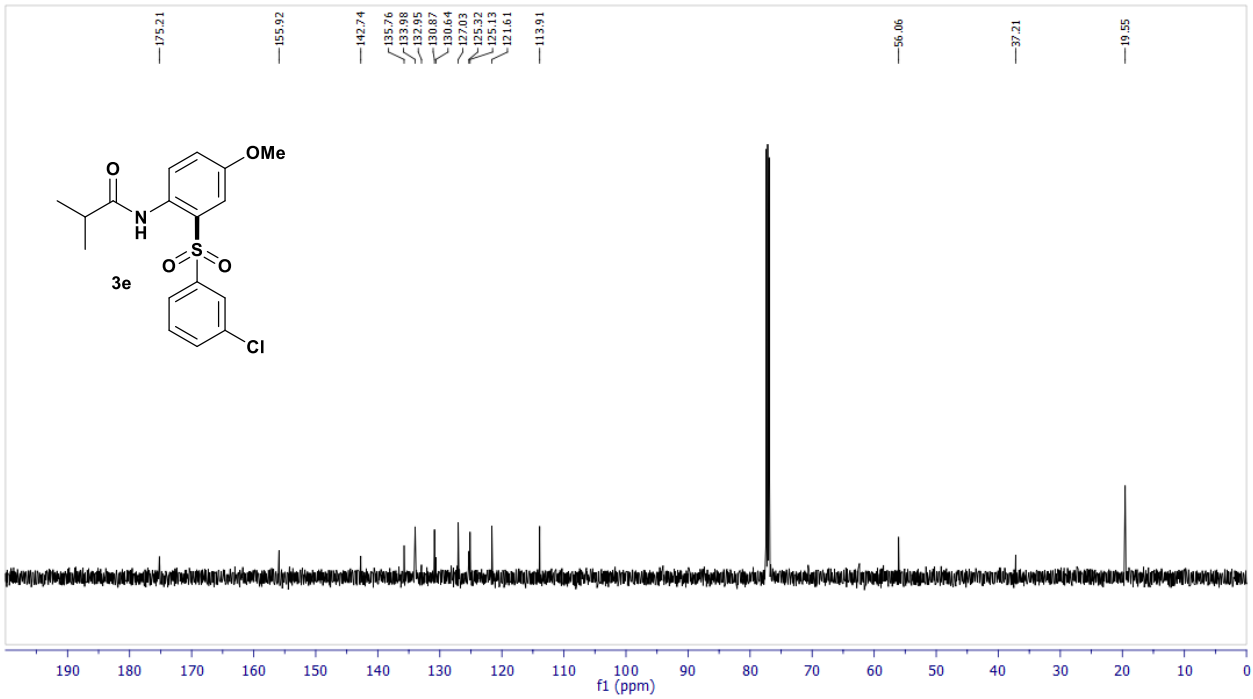
^{19}F NMR (376 MHz, $CDCl_3$) of compound **3d**



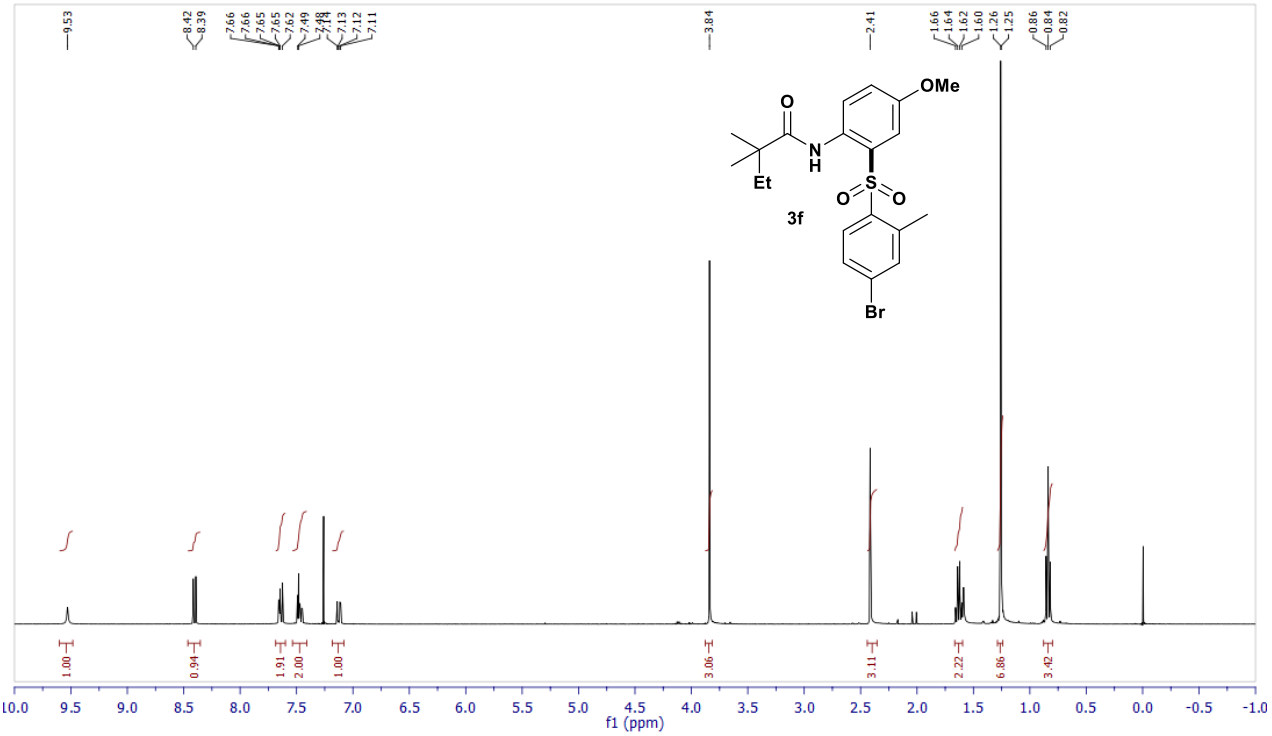
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3e**



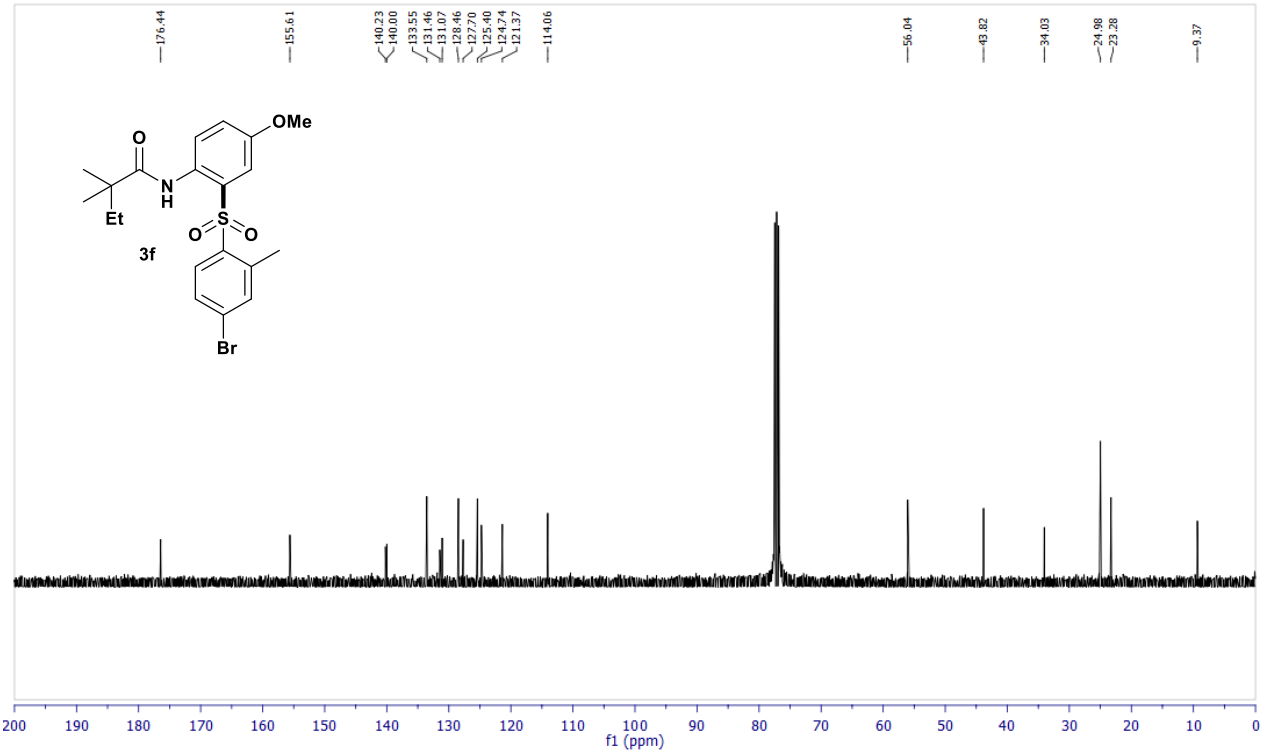
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3e**



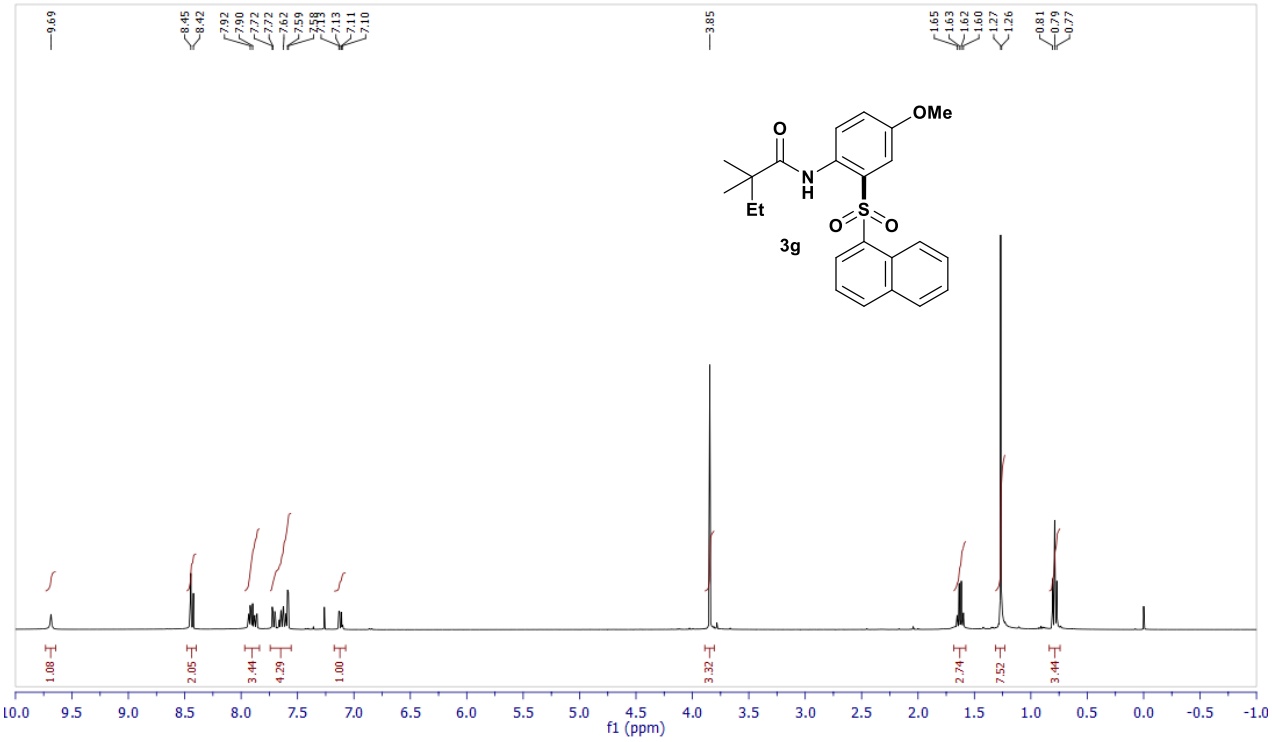
^{1}H NMR (400 MHz, $CDCl_3$) of compound **3f**



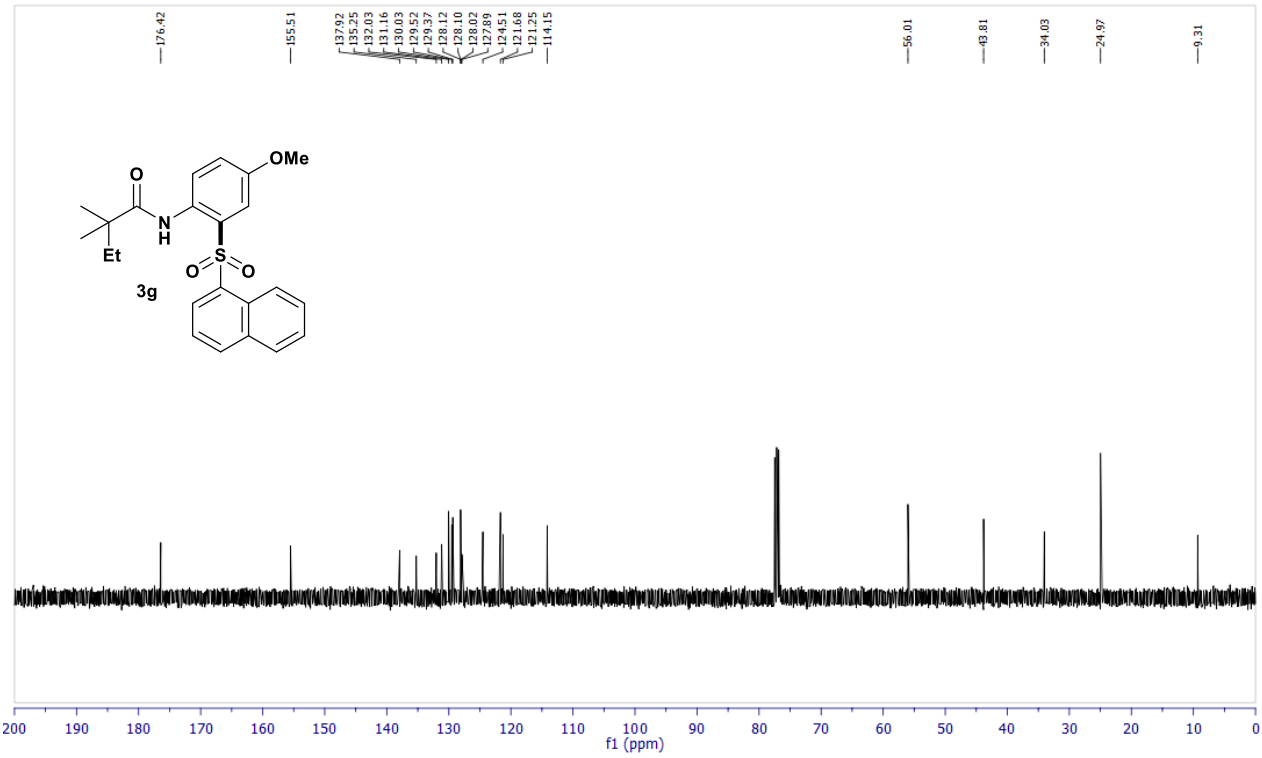
^{13}C NMR (101 MHz, $CDCl_3$) of compound **3f**



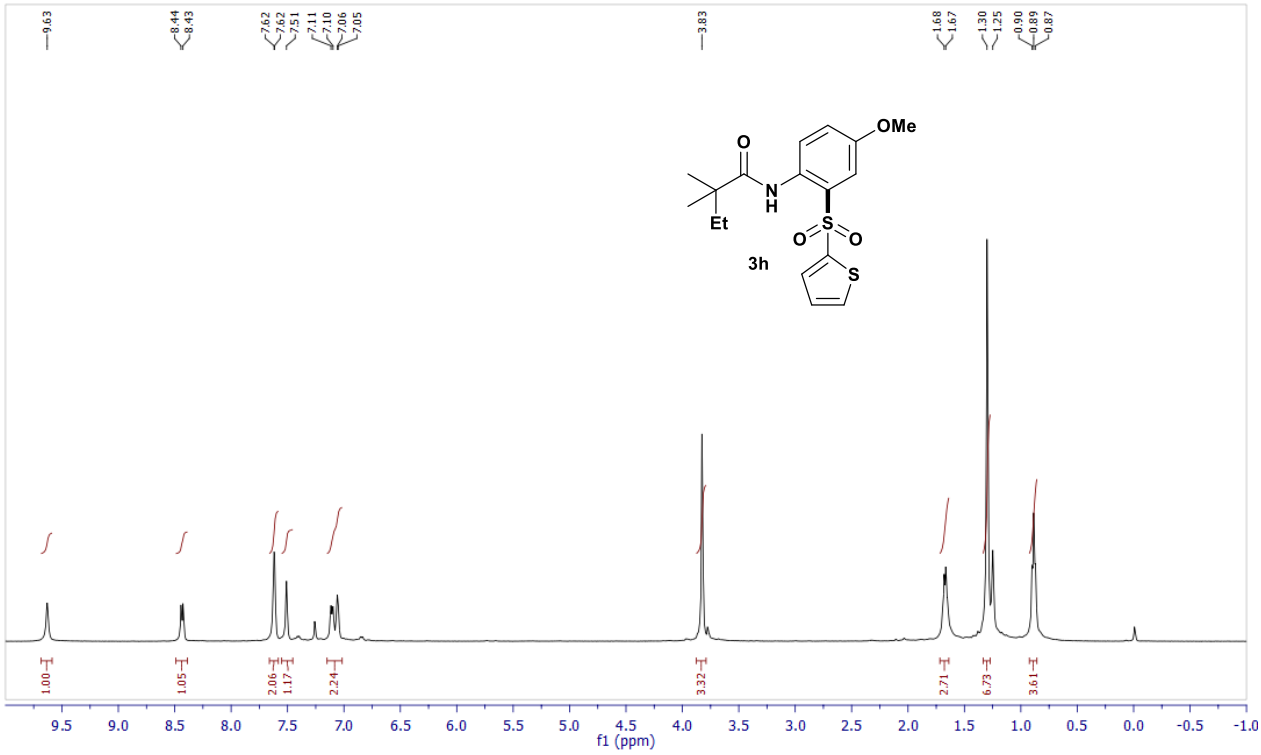
^{1}H NMR (400 MHz, $CDCl_3$) of compound **3g**



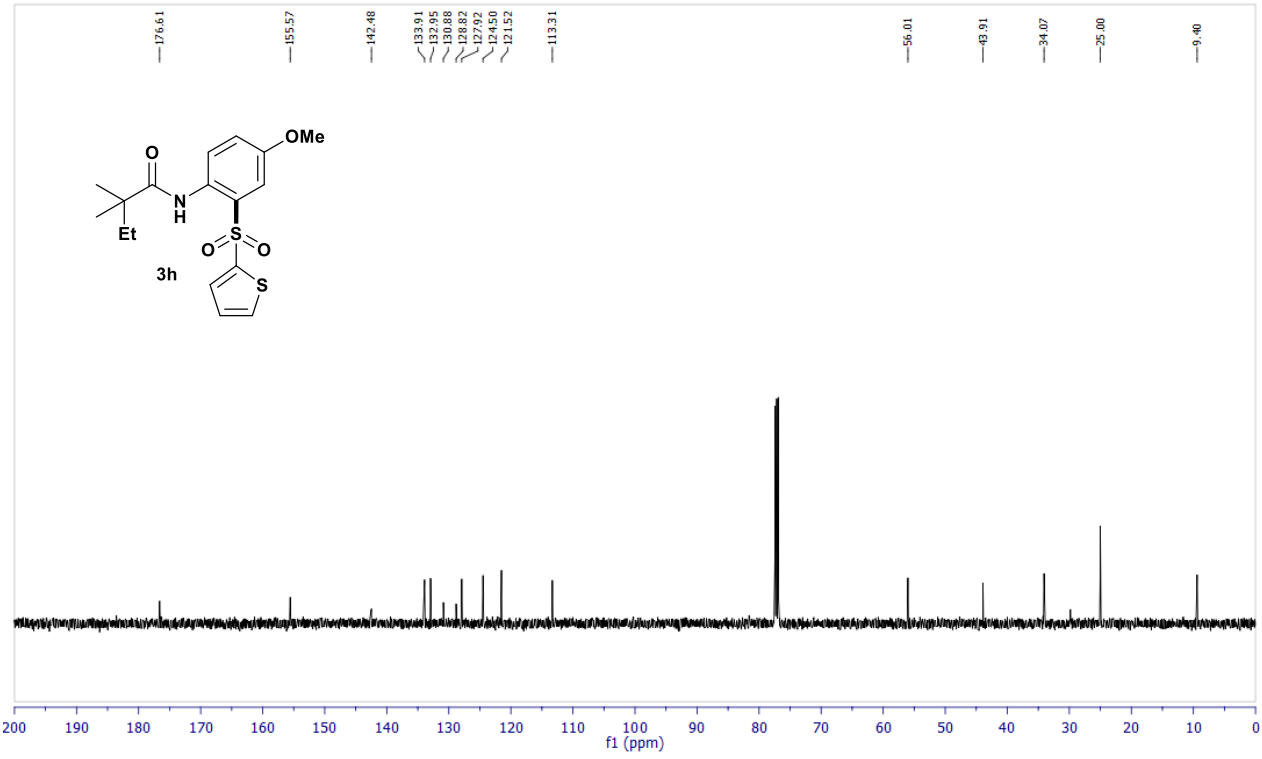
^{13}C NMR (101 MHz, $CDCl_3$) of compound **3g**



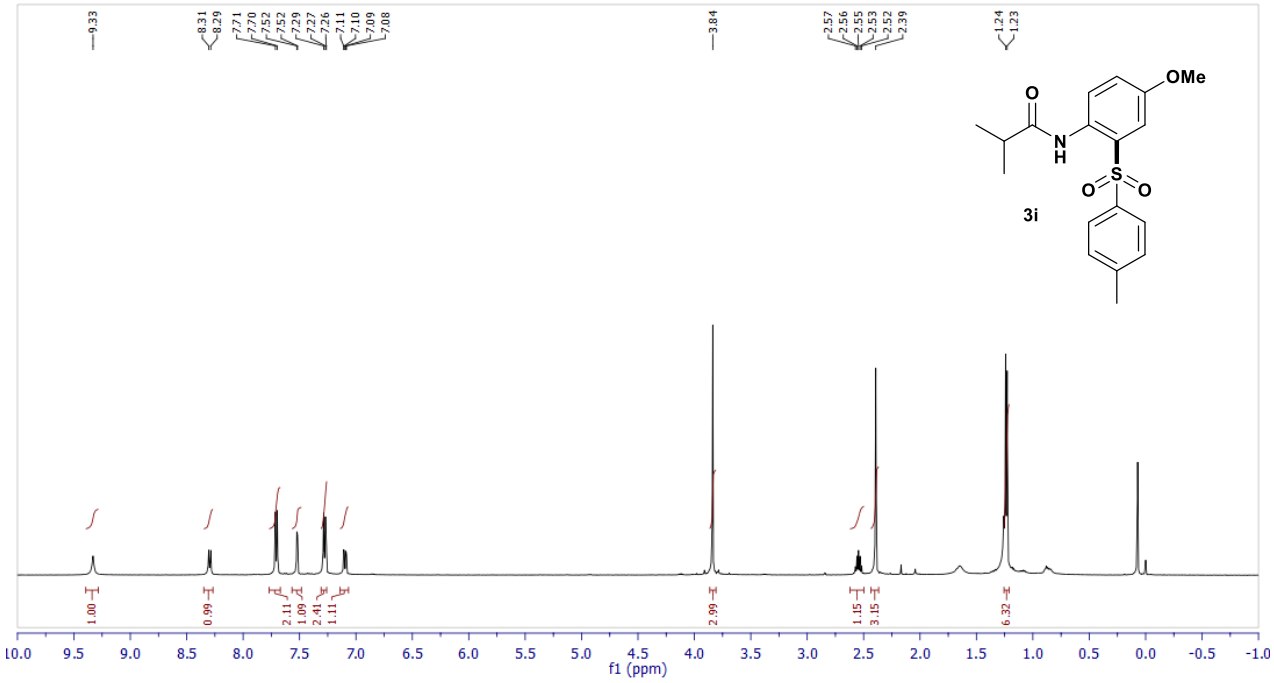
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3h**



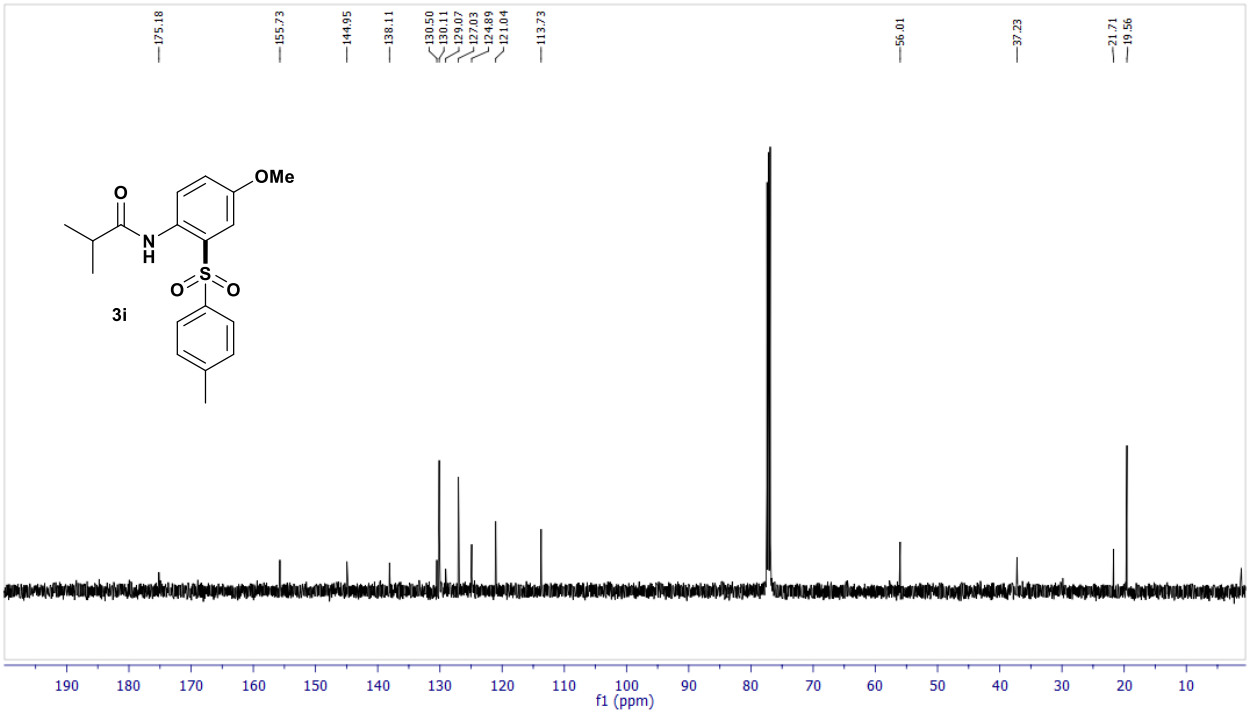
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3h**



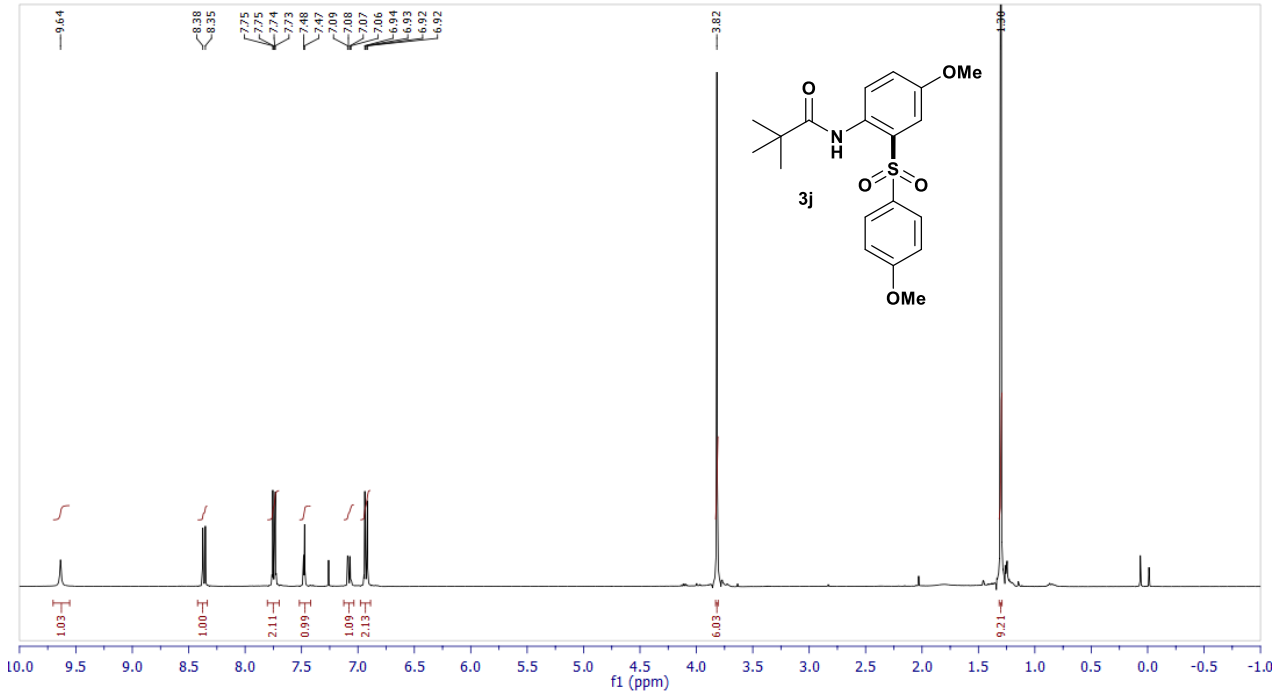
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3i**



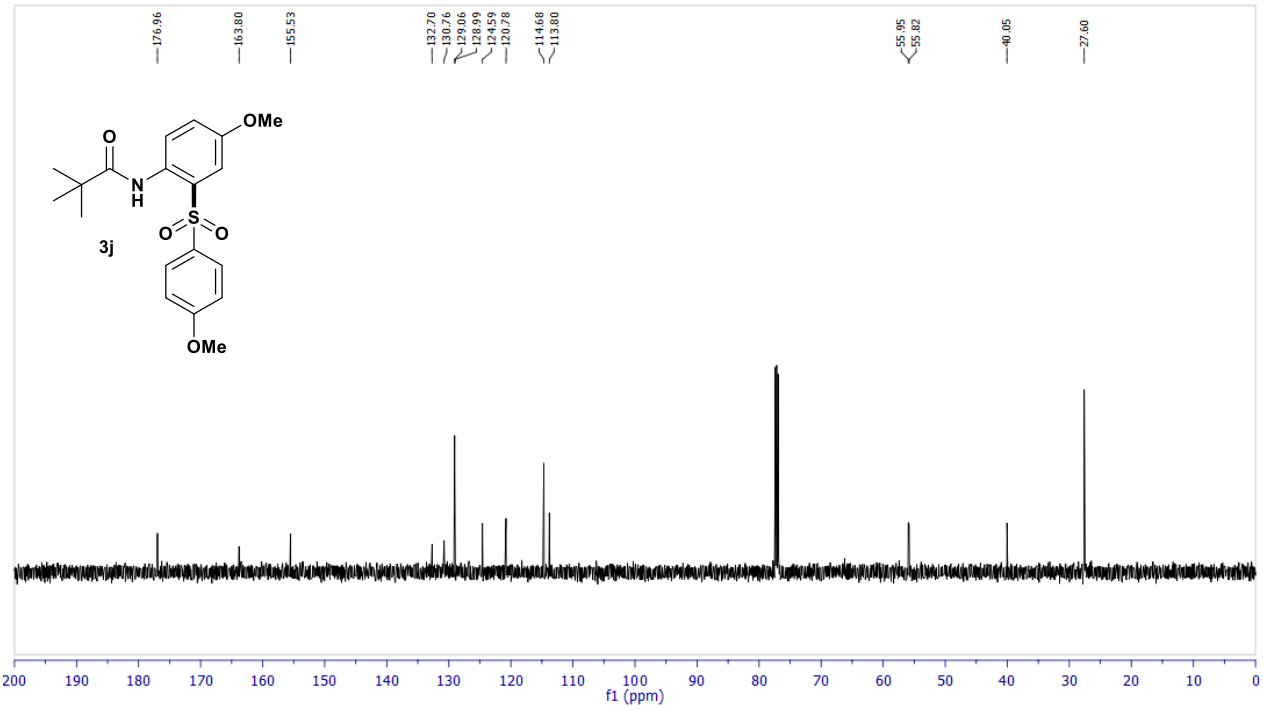
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3i**



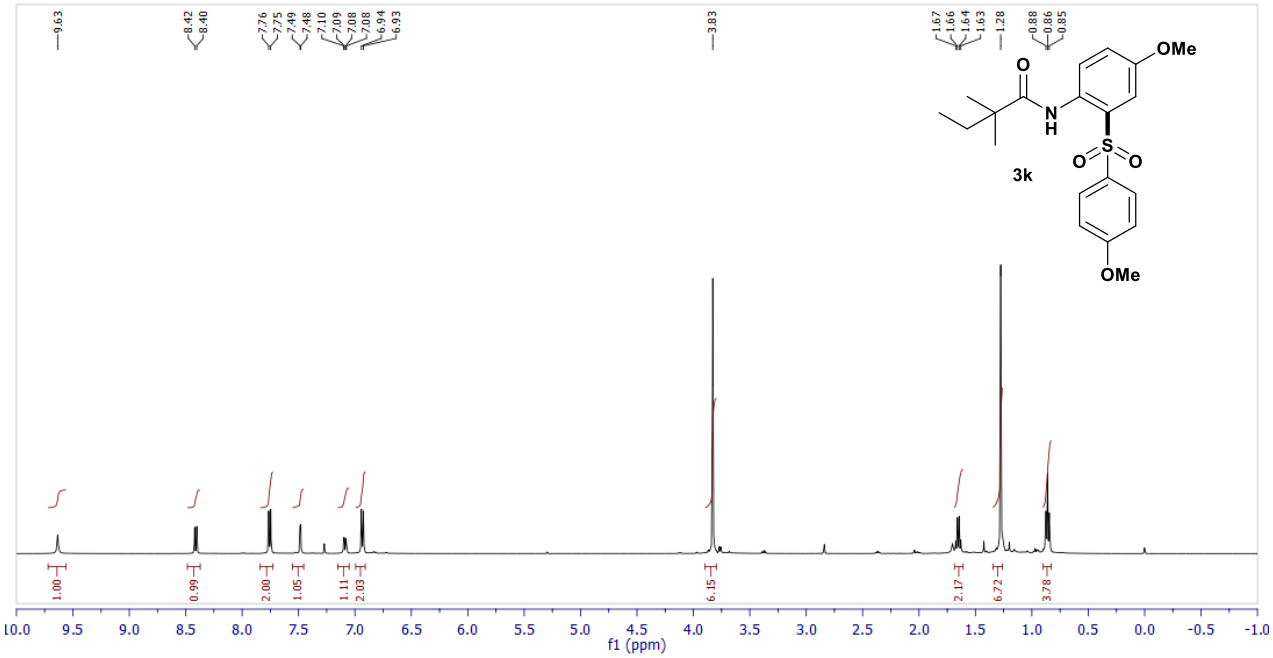
^{1}H NMR (400 MHz, $CDCl_3$) of compound **3j**



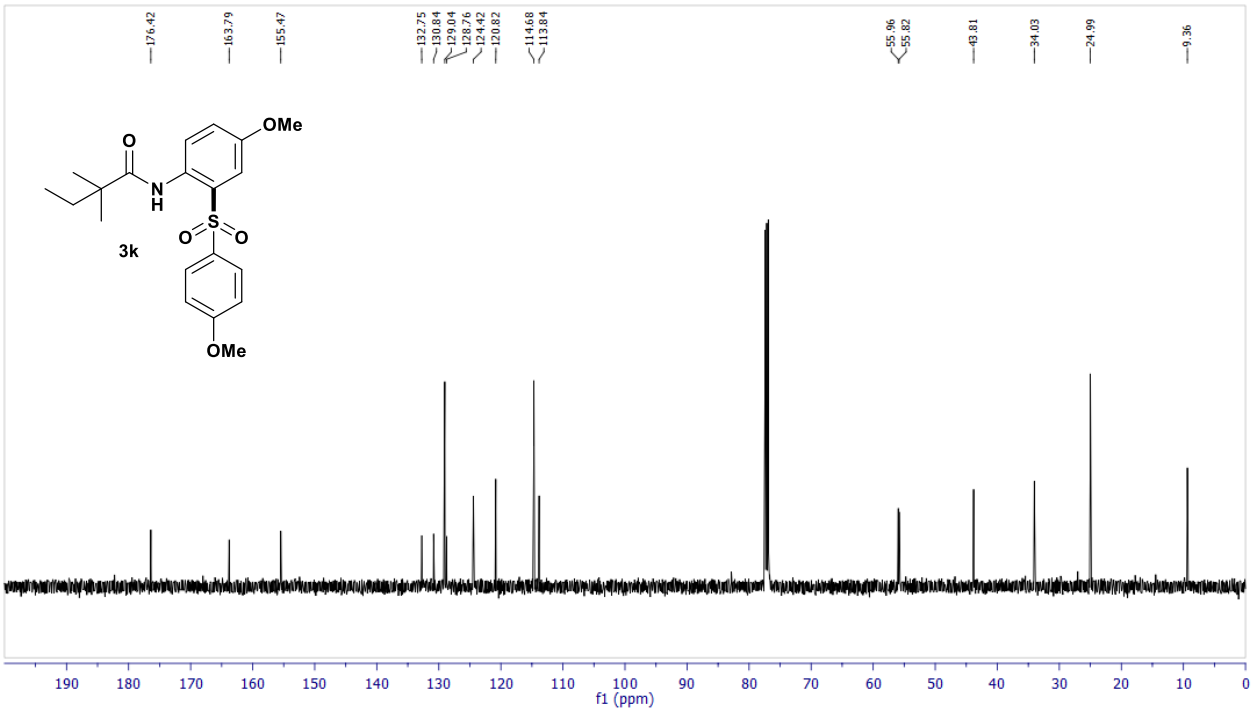
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3j**



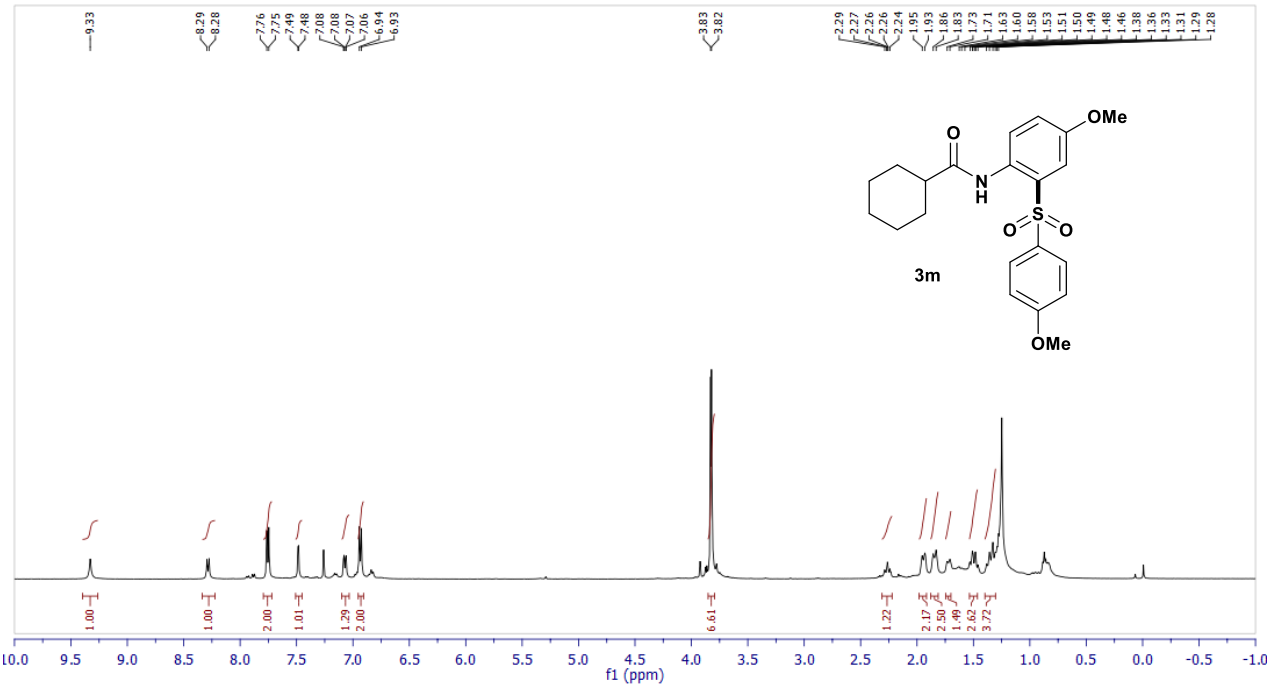
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3k**



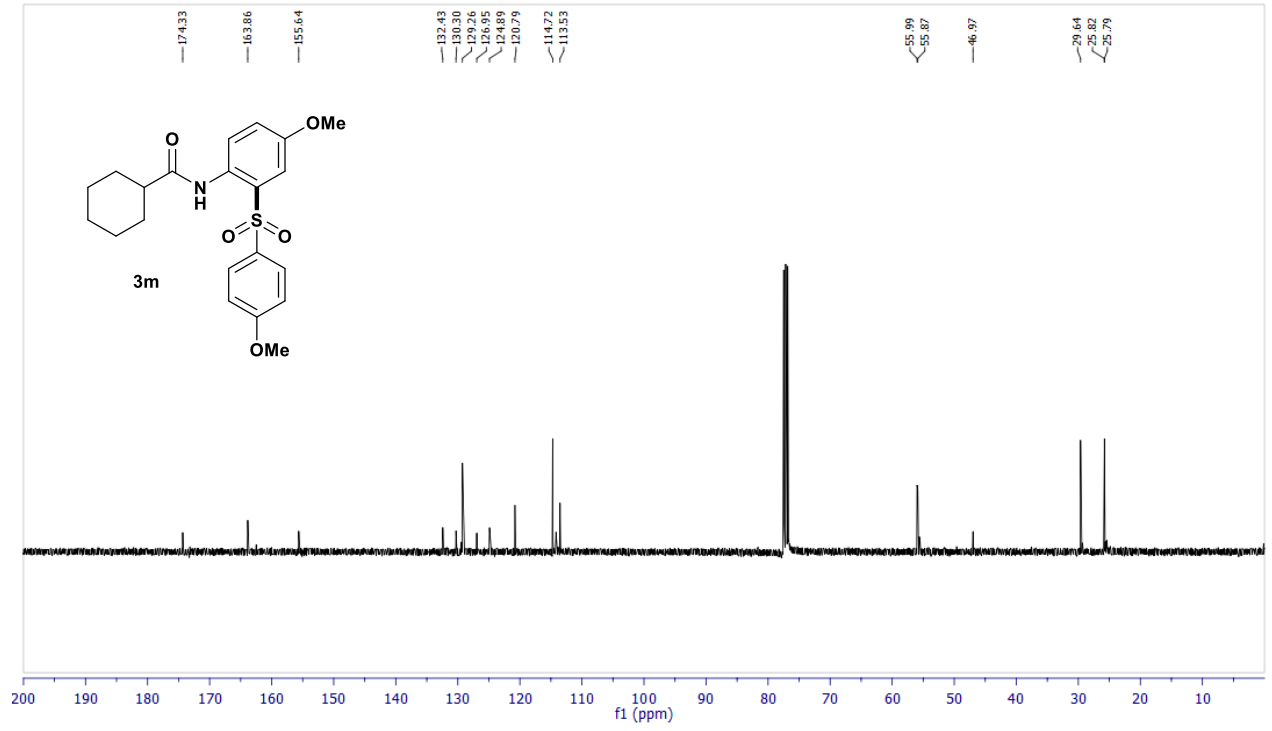
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3k**



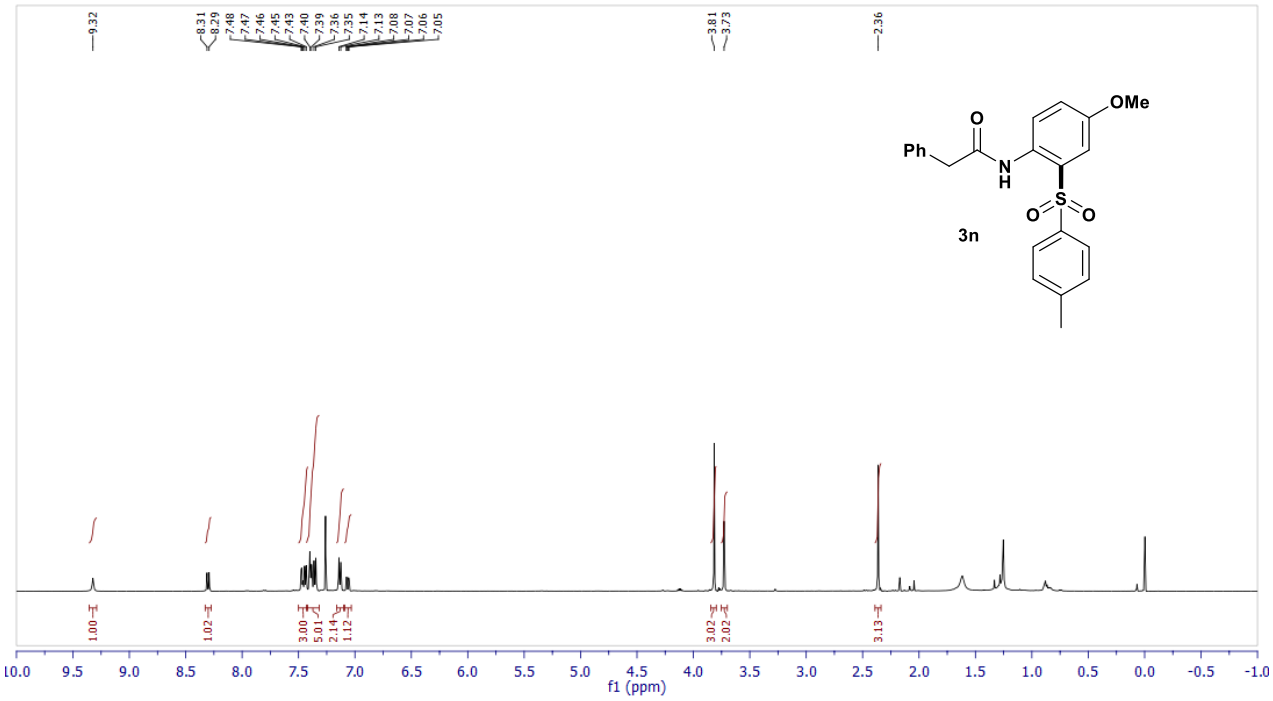
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3m**



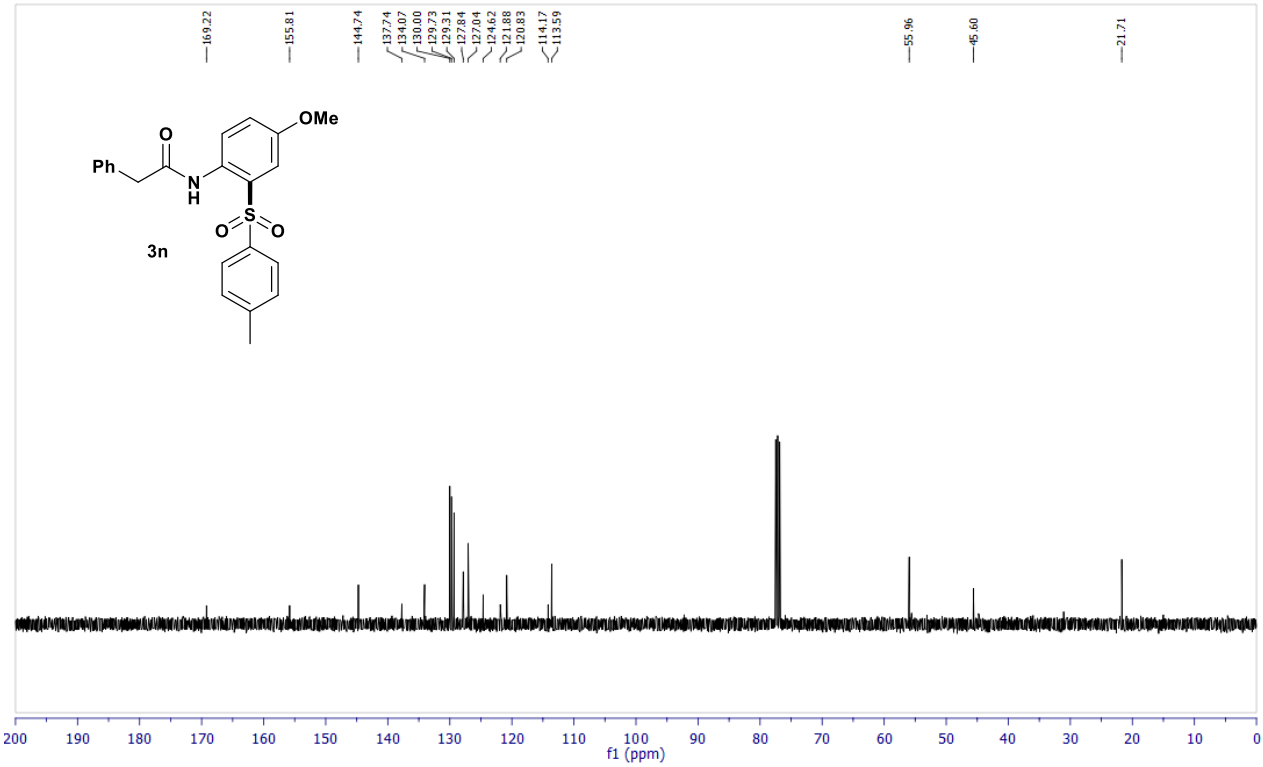
^{13}C NMR (101 MHz, $CDCl_3$) of compound **3m**



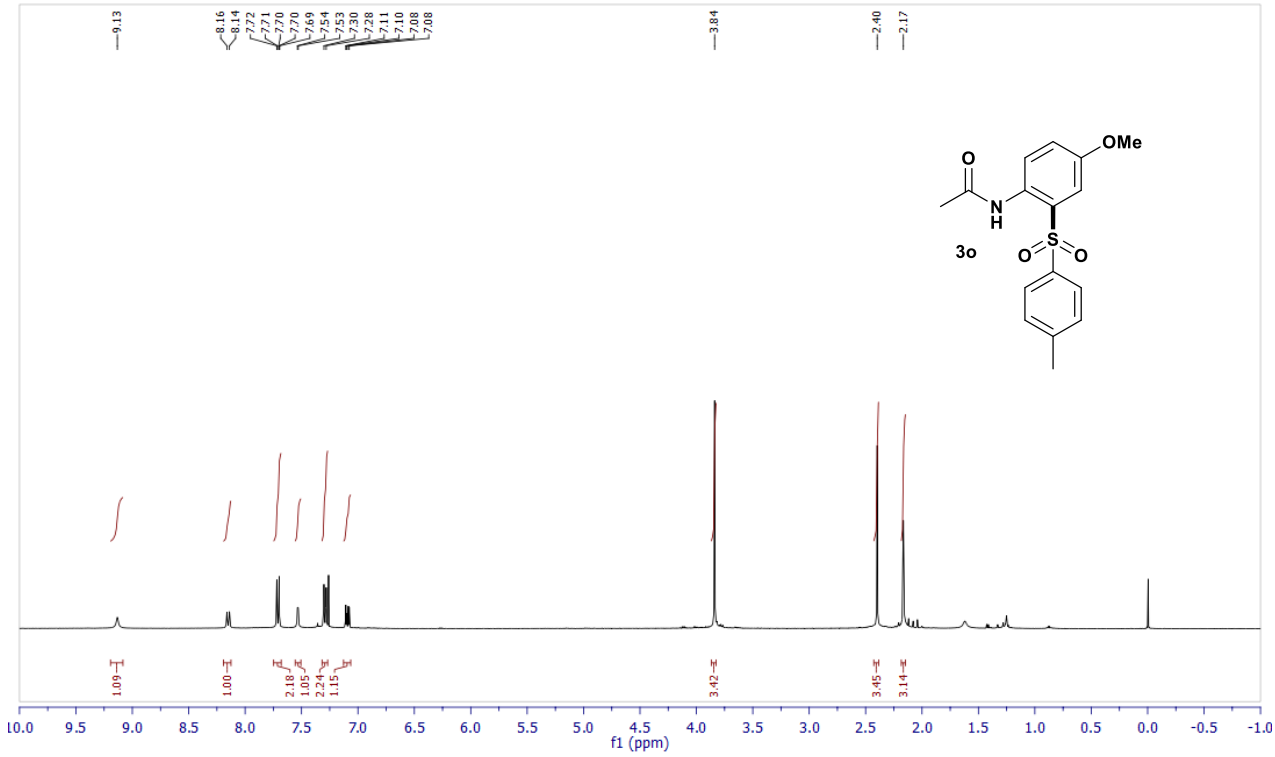
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3n**



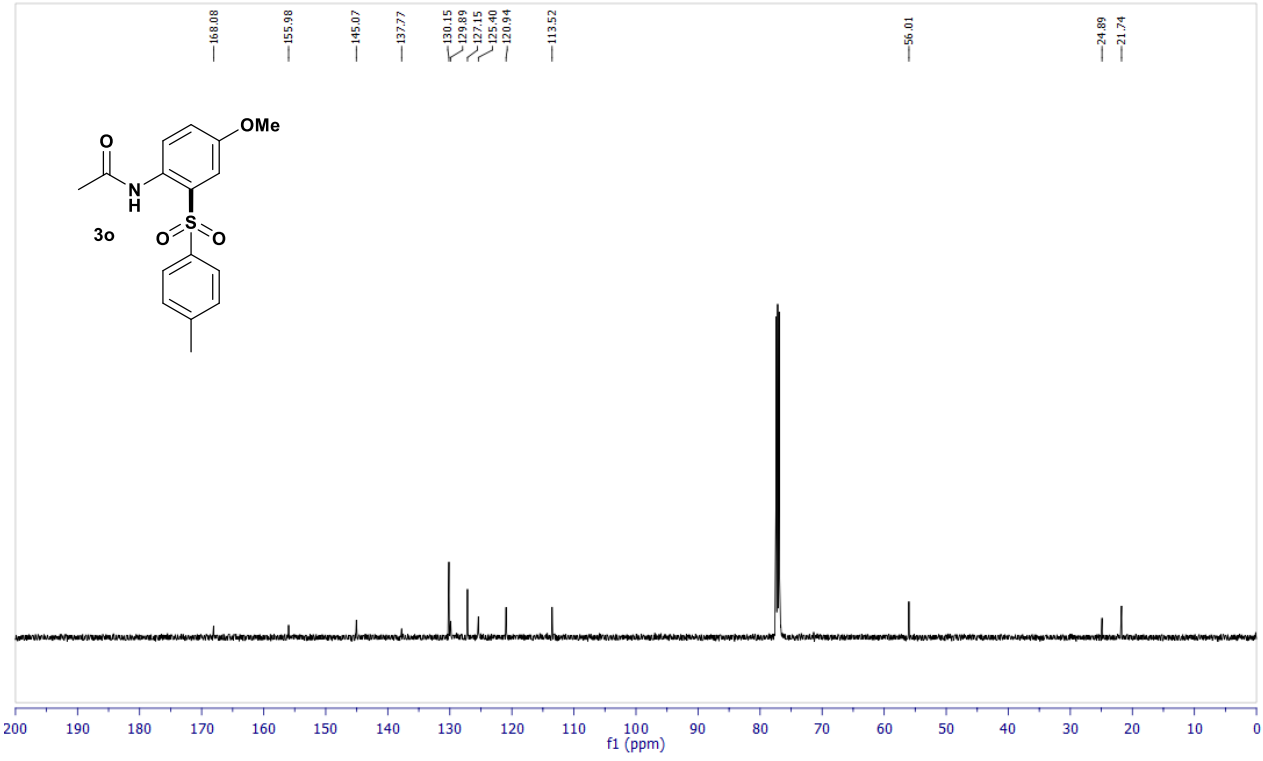
^{13}C NMR (101 MHz, $CDCl_3$) of compound **3n**



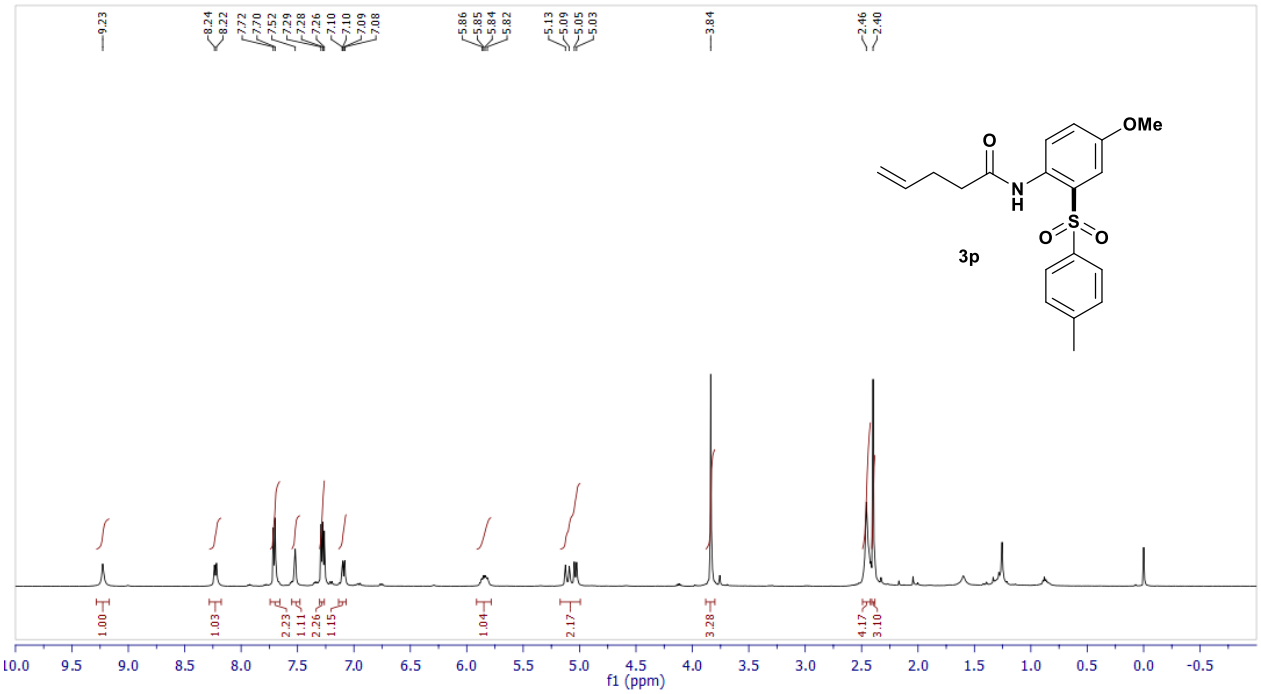
^{1}H NMR (400 MHz, $CDCl_3$) of compound **3o**



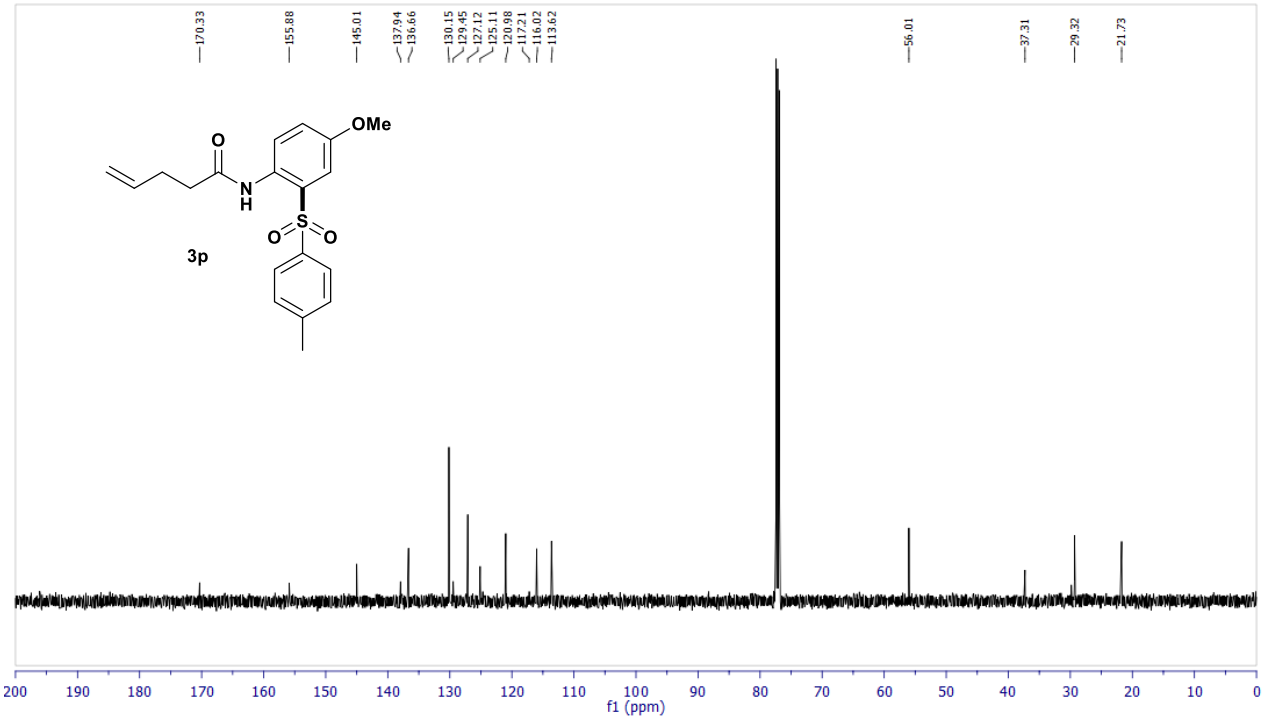
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3o**



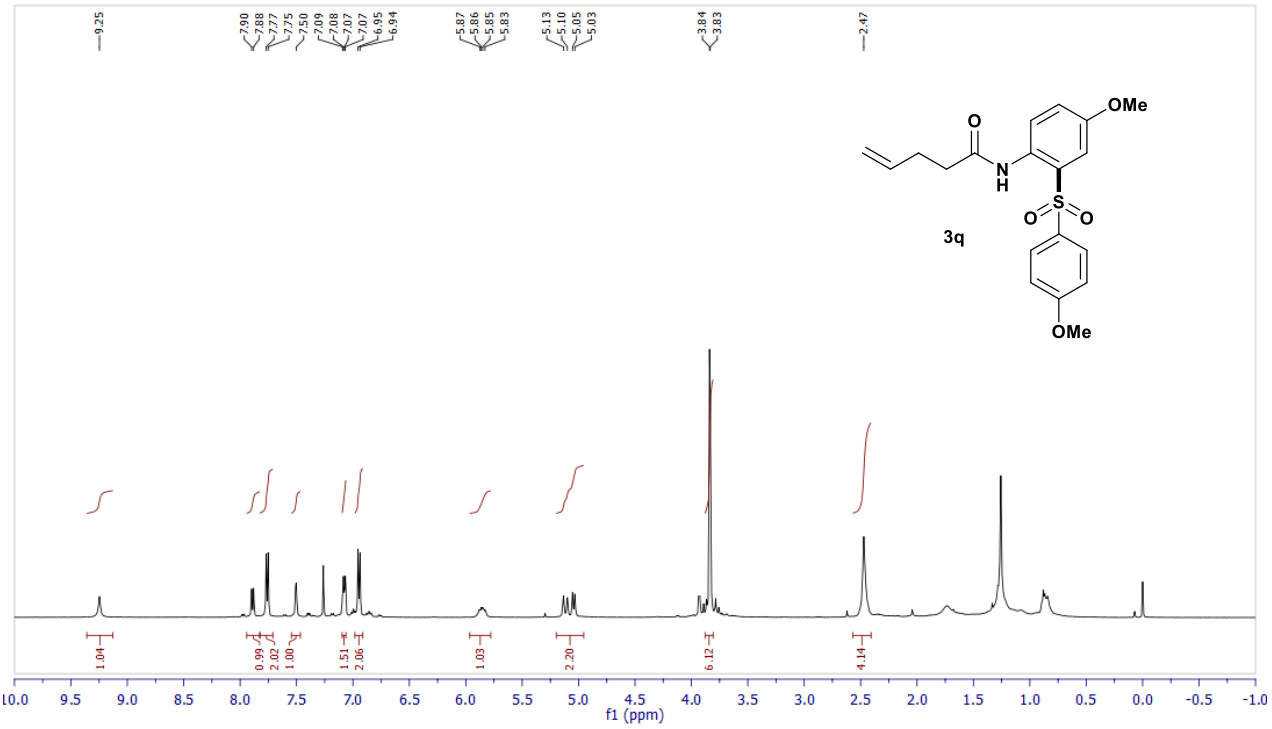
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3p**



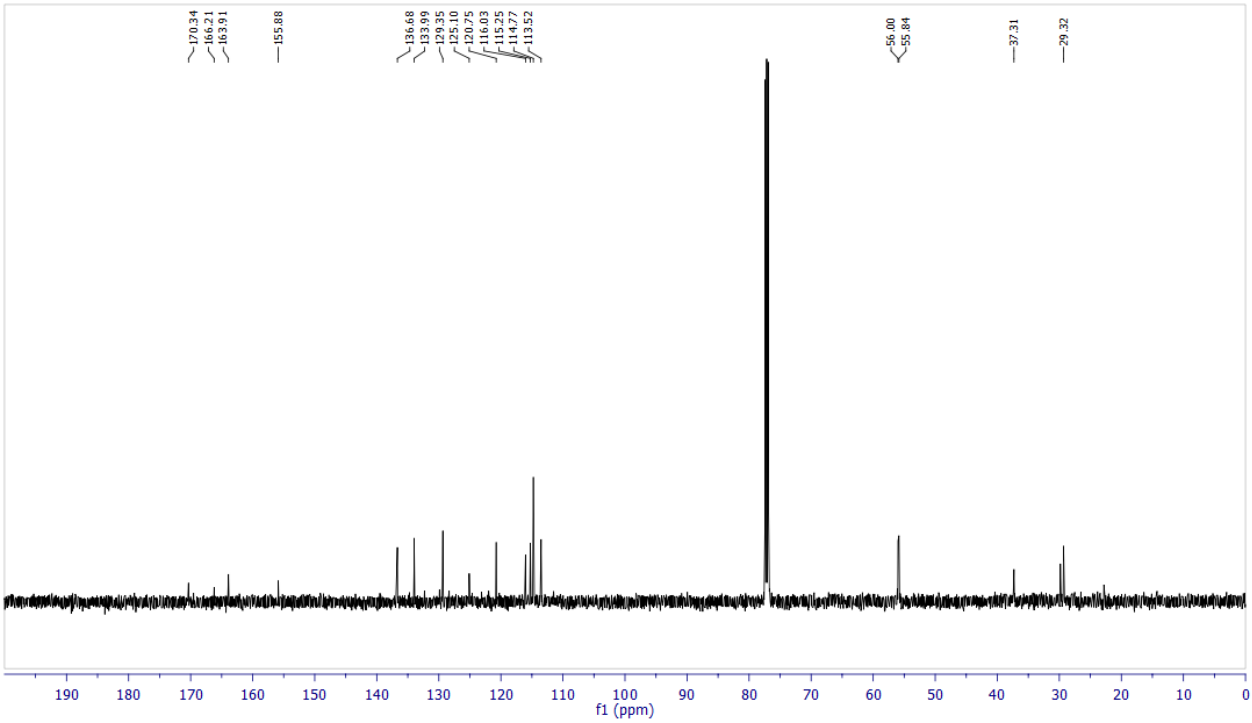
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3p**



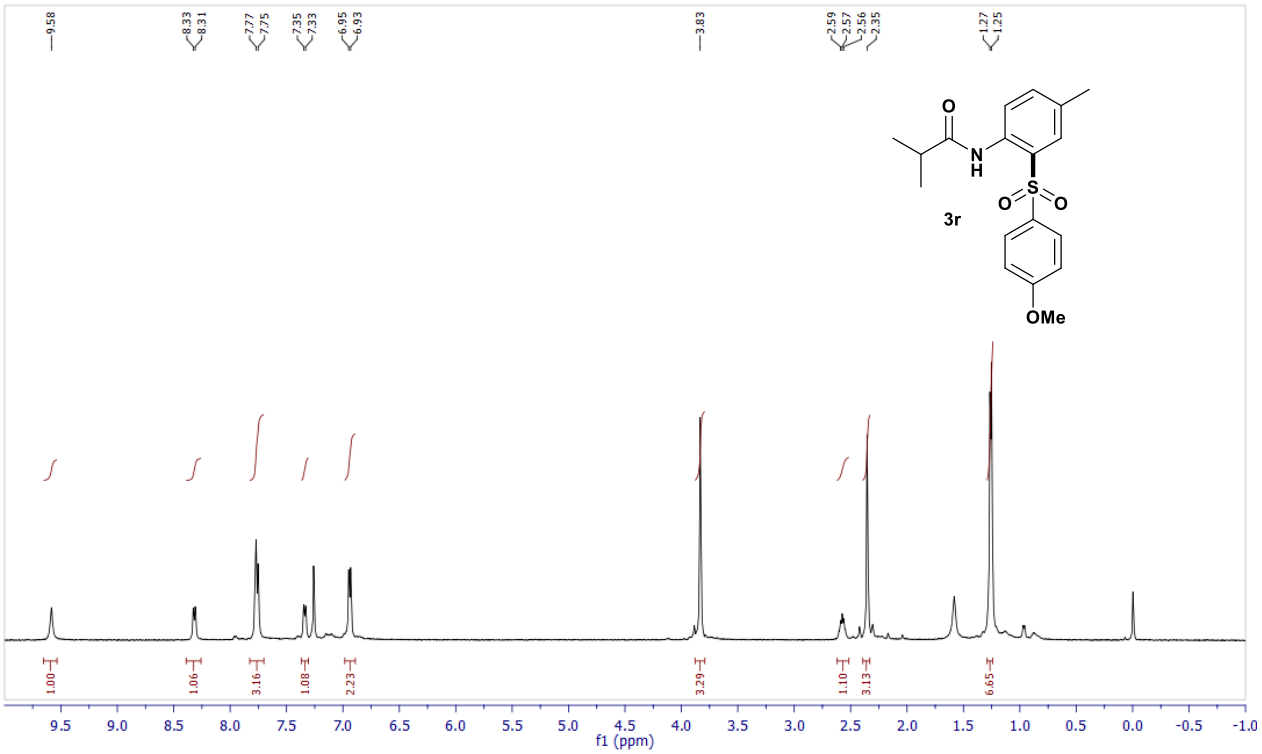
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3q**



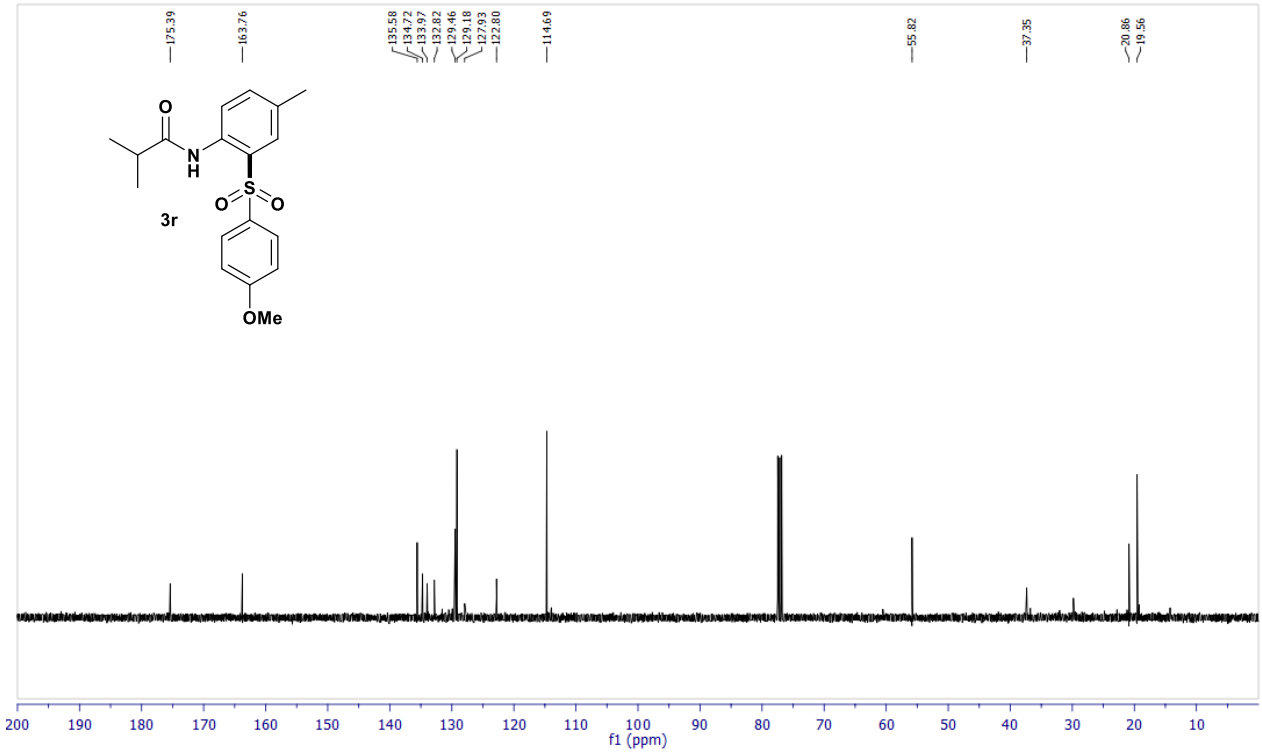
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3q**



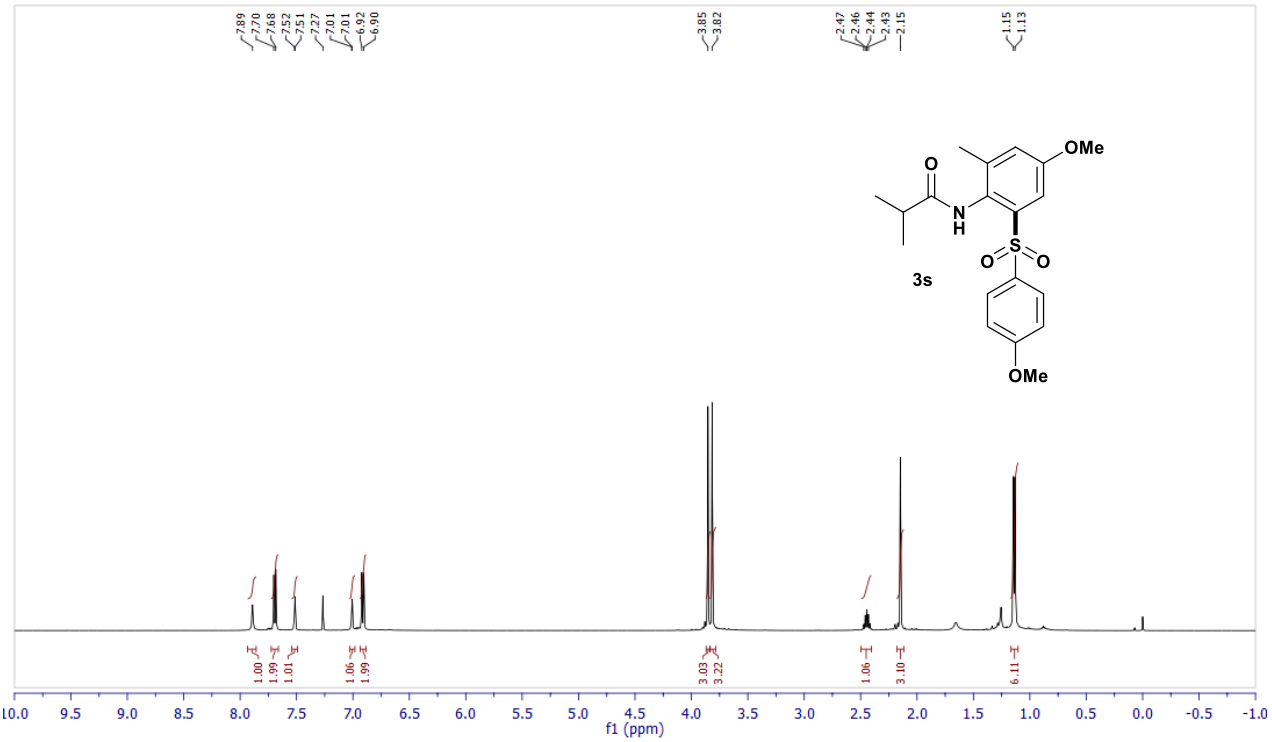
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3r**



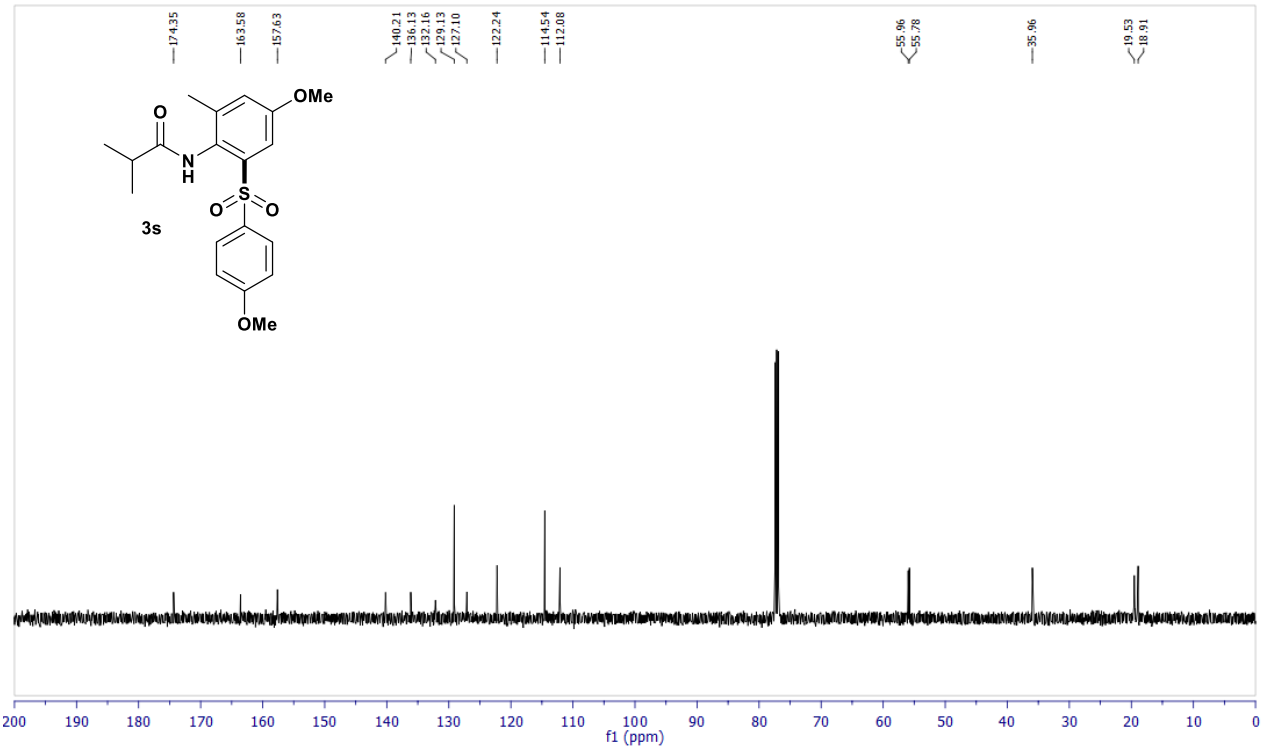
^{13}C NMR (101 MHz, $CDCl_3$) of compound **3r**



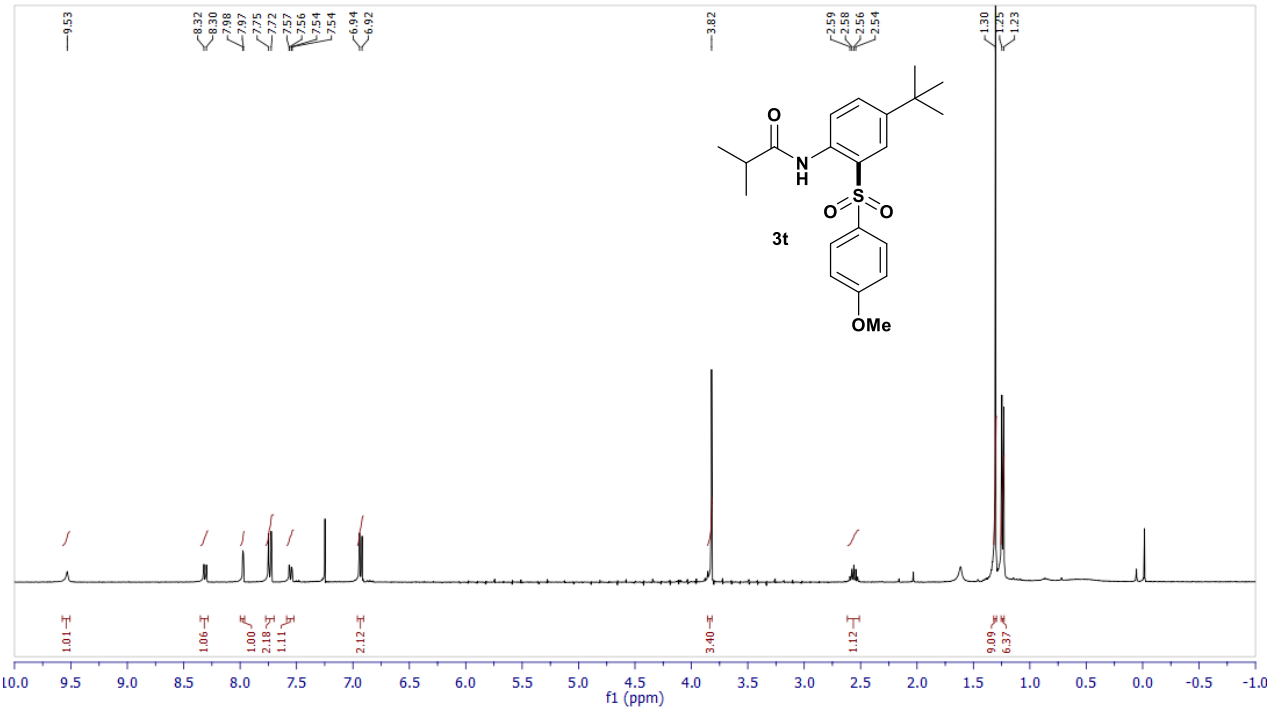
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3s**



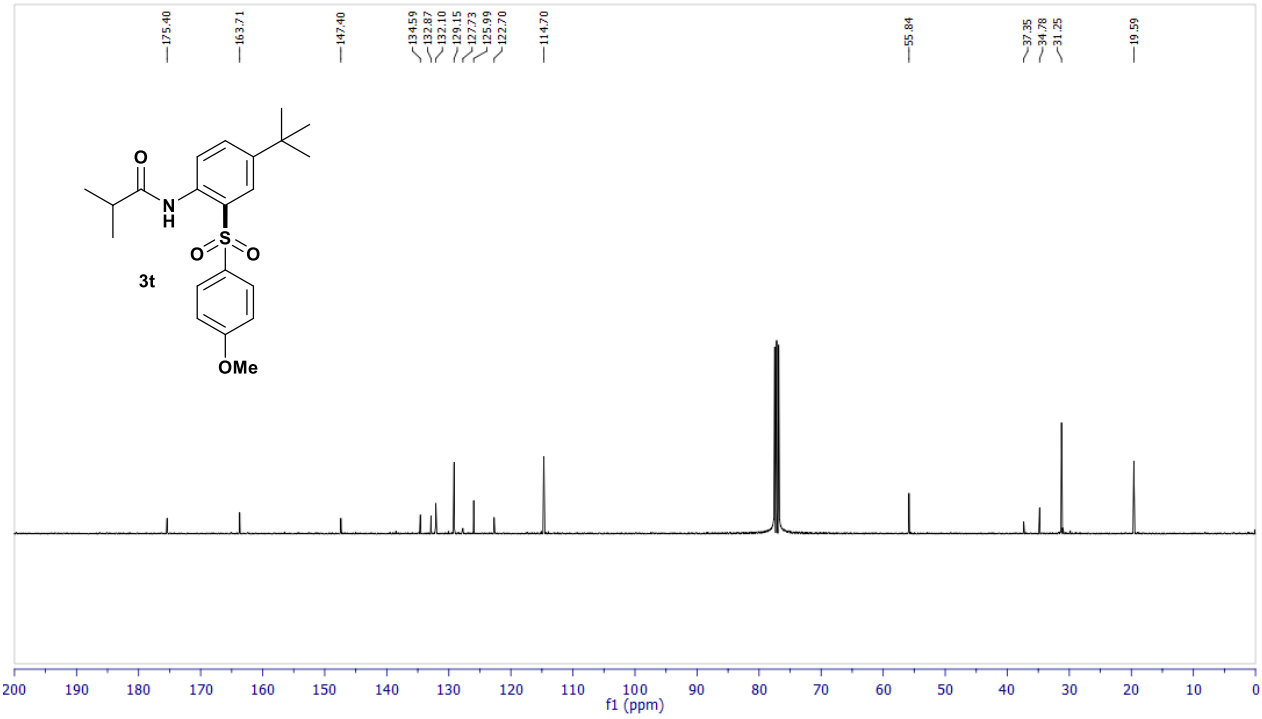
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3s**



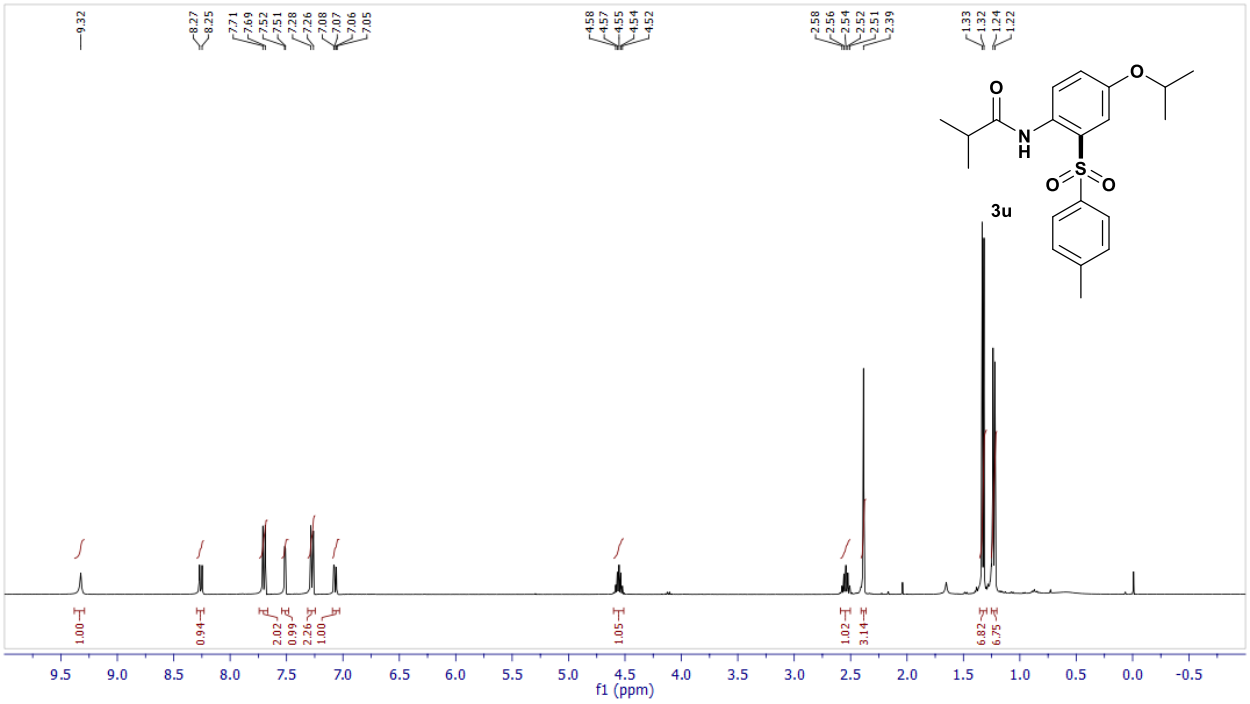
^{1}H NMR (400 MHz, $CDCl_3$) of compound **3t**



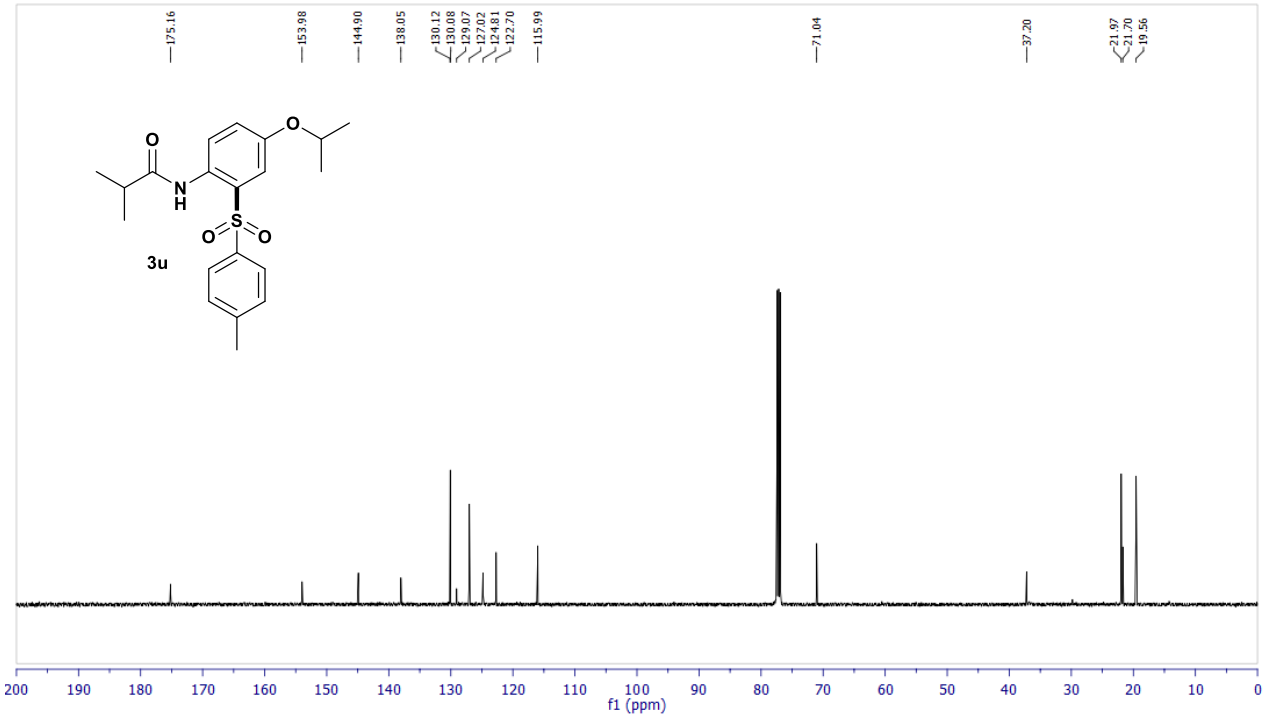
^{13}C NMR (101 MHz, $CDCl_3$) of compound **3t**



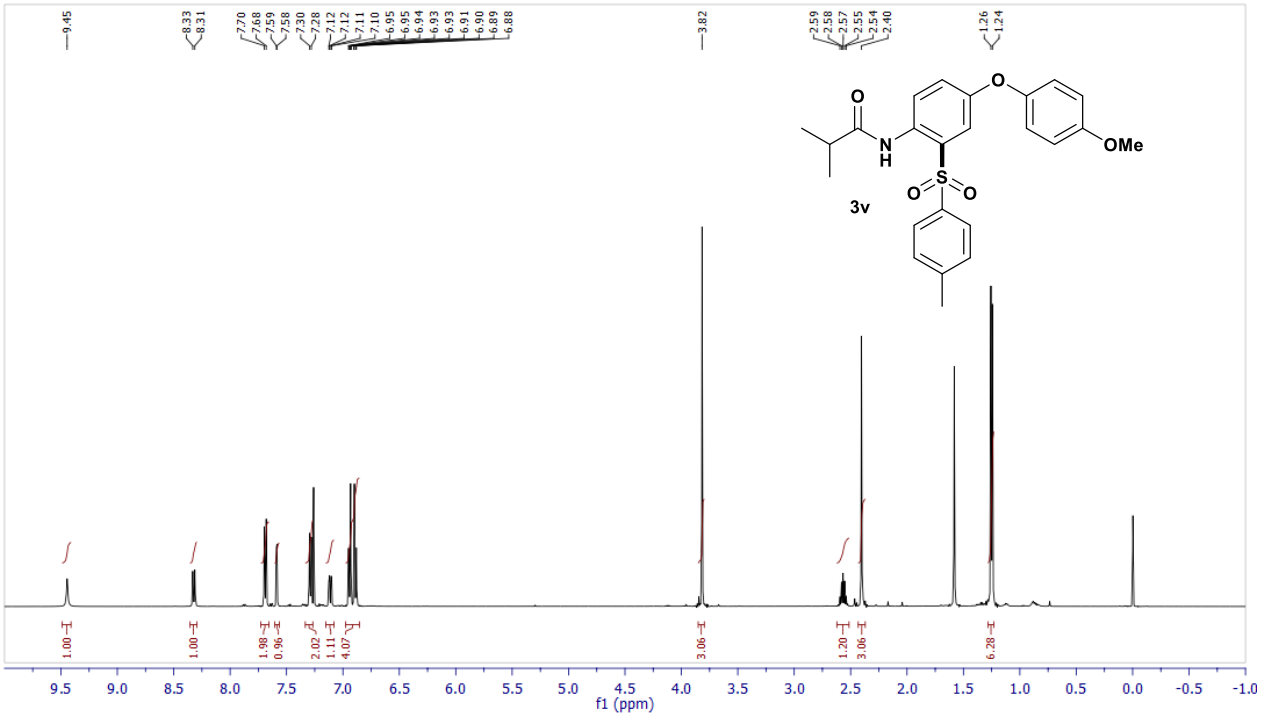
^{1}H NMR (400 MHz, $CDCl_3$) of compound **3u**



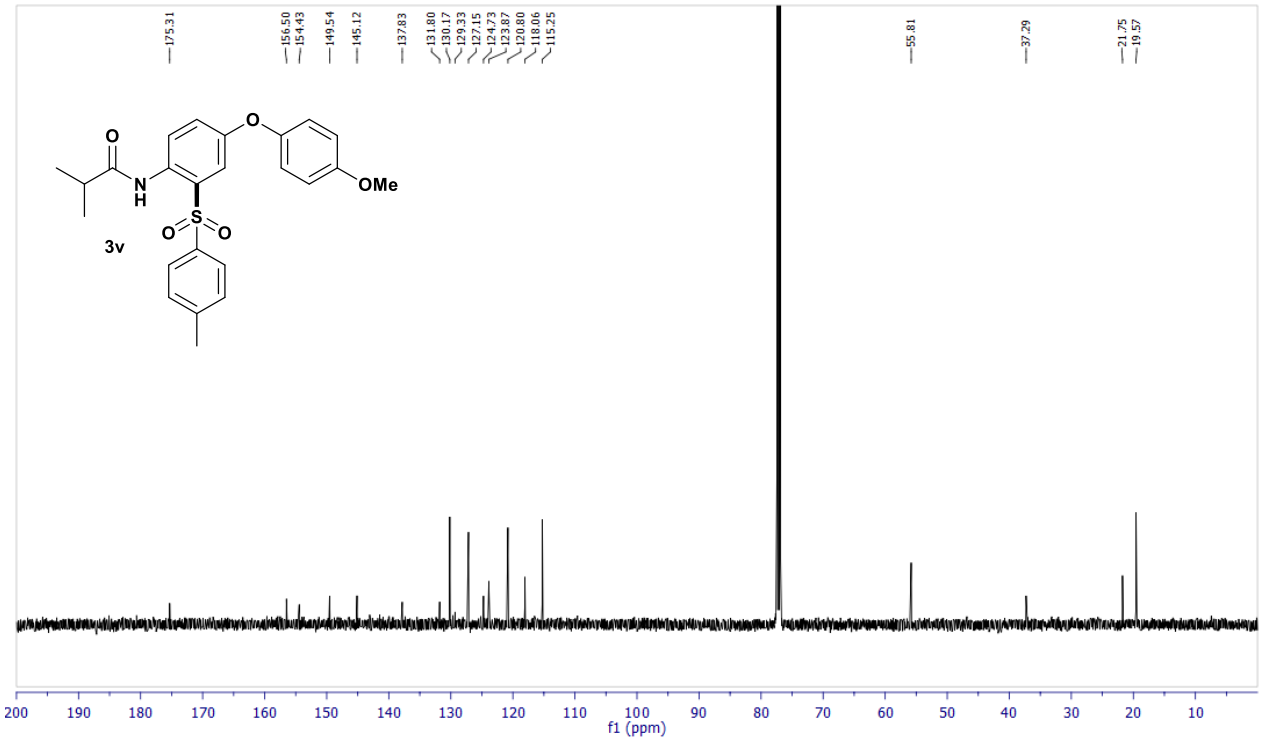
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3u**



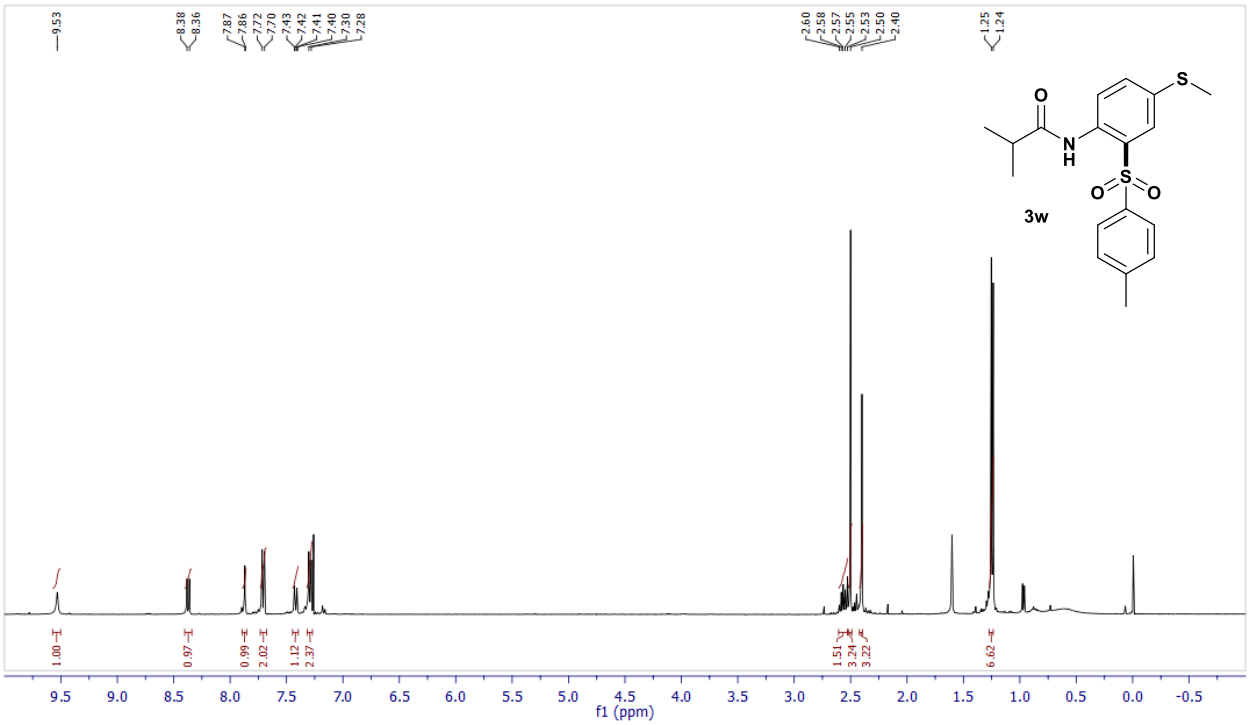
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3v**



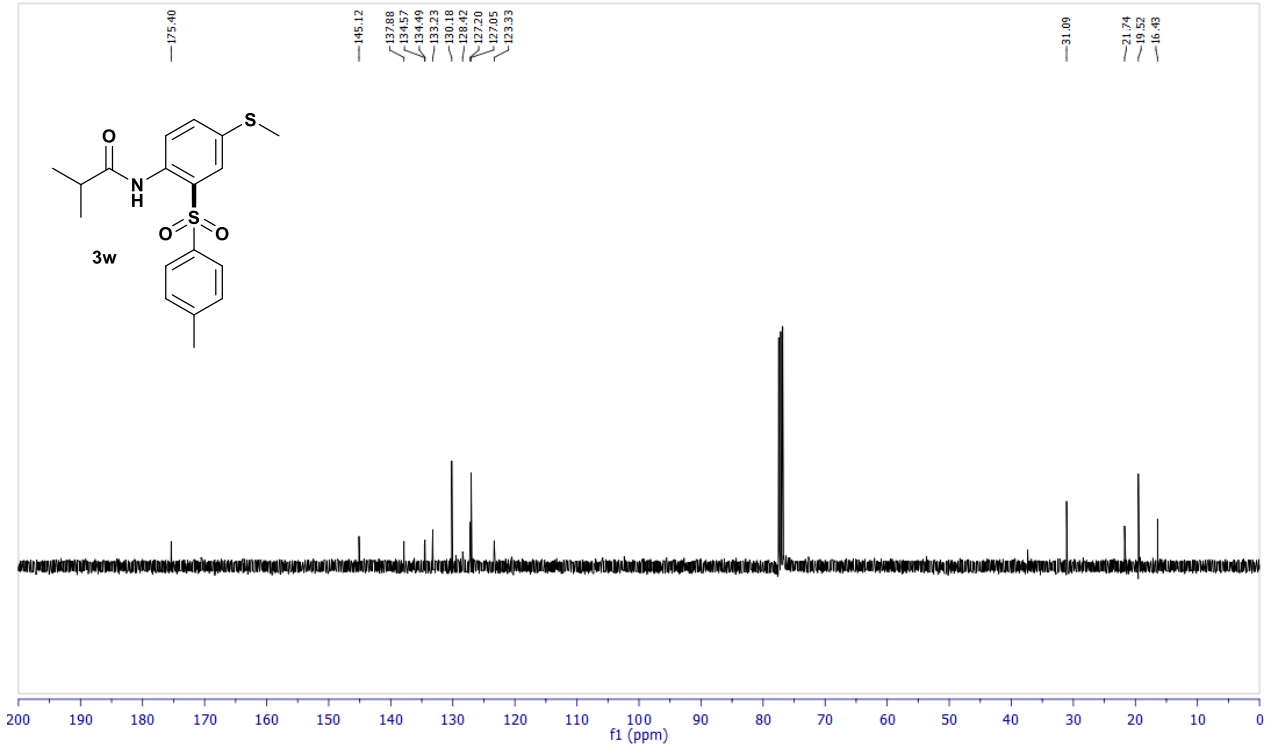
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3v**



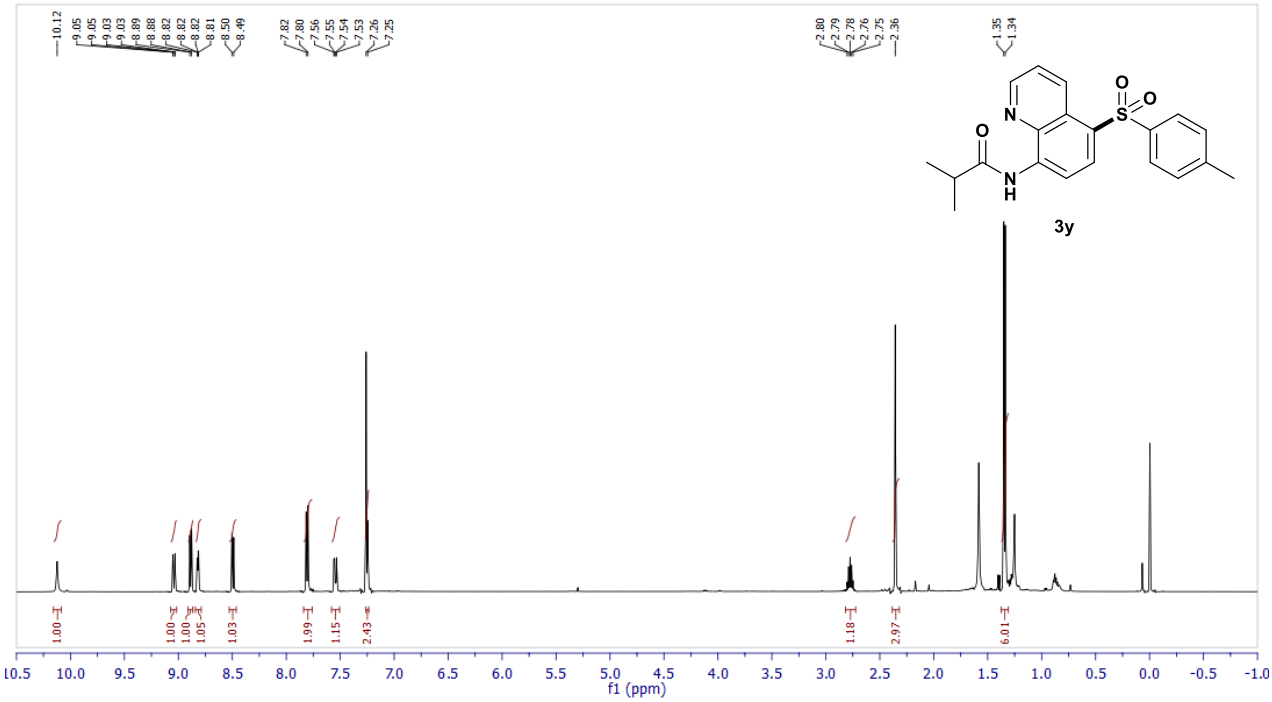
^{1}H NMR (400 MHz, $CDCl_3$) of compound **3w**



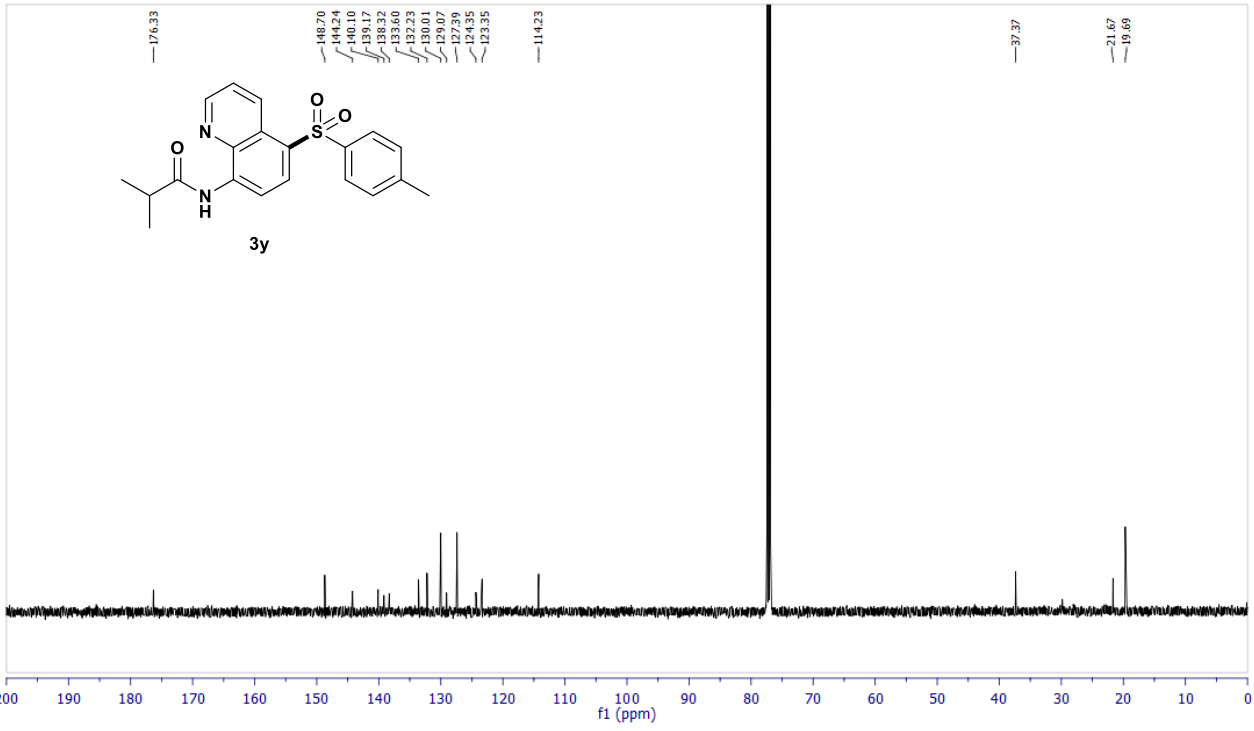
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3w**



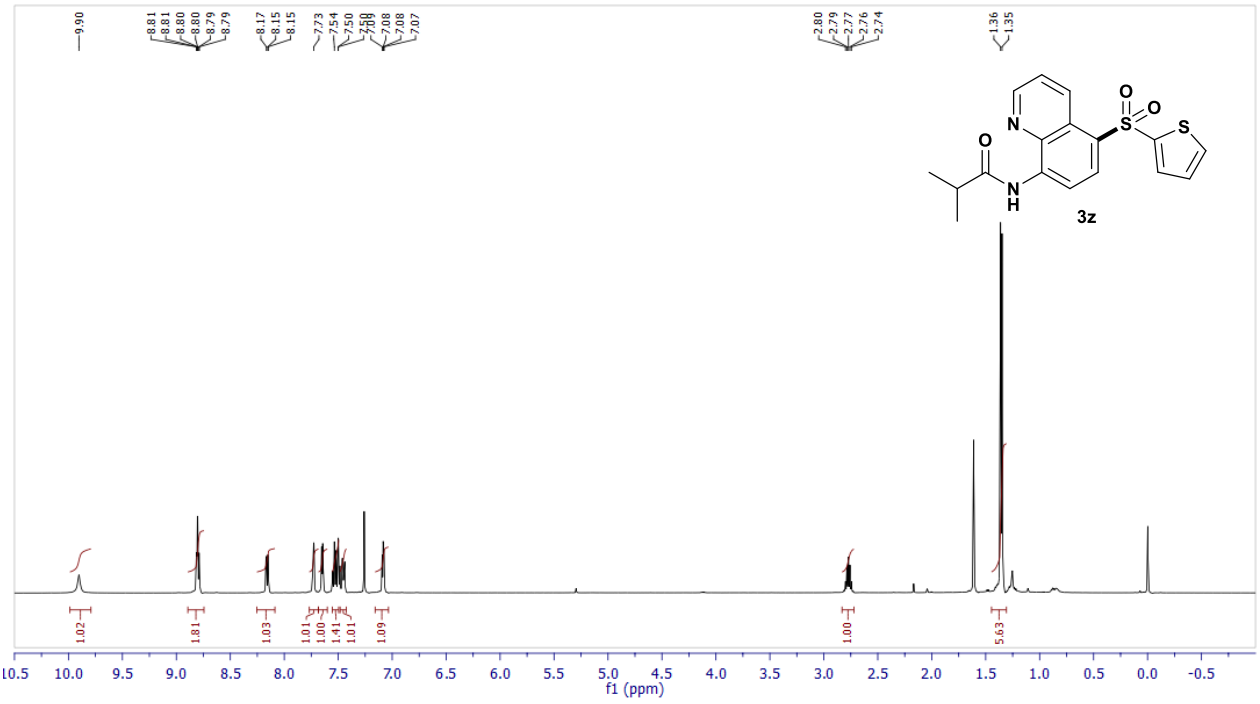
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3y**



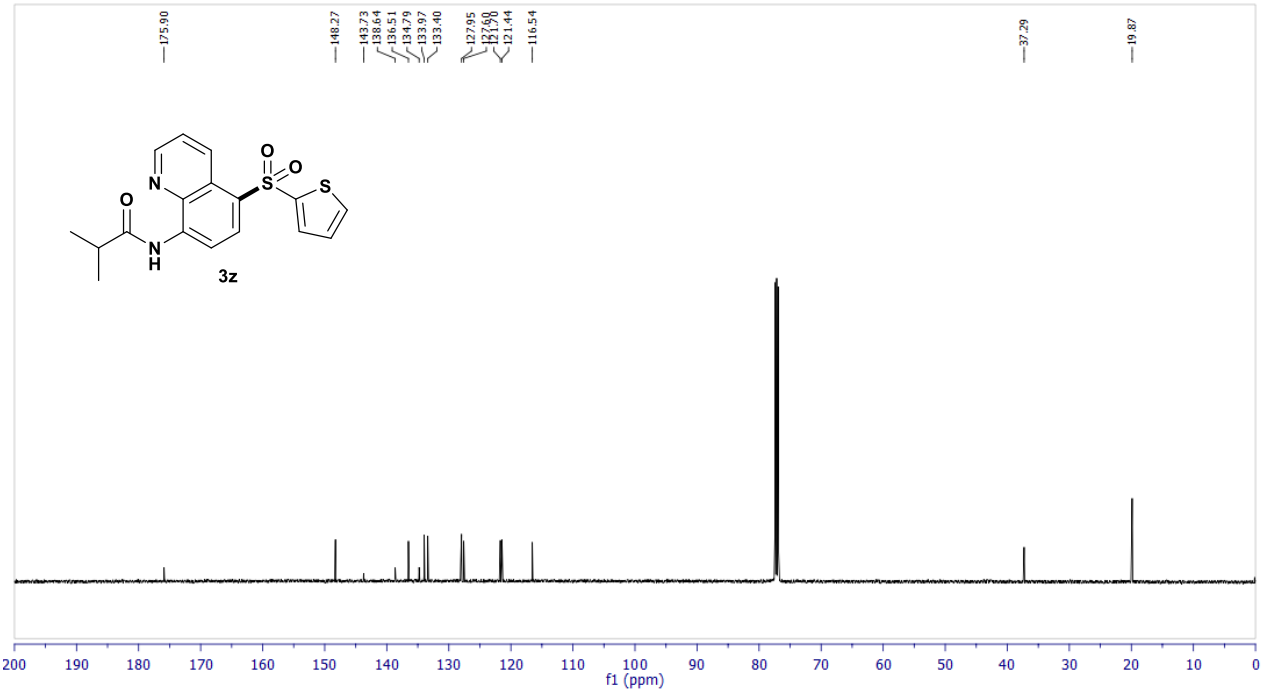
^{13}C NMR (126 MHz, $CDCl_3$) of compound **3y**



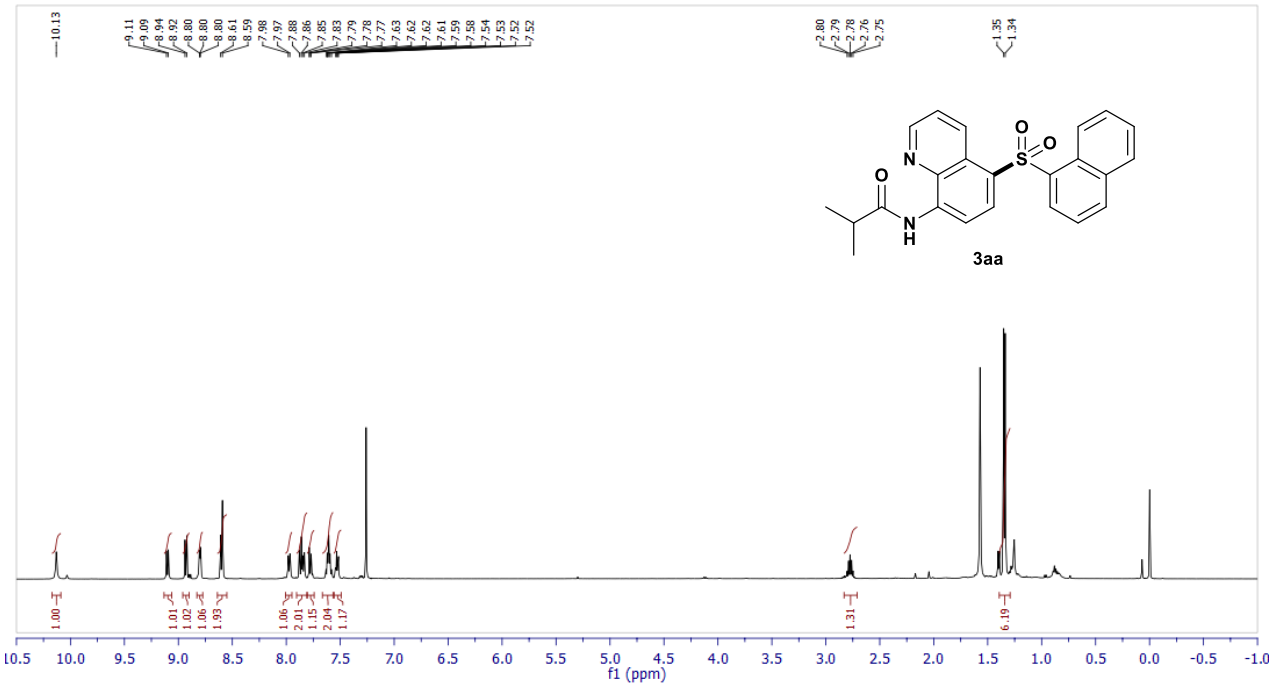
^{1}H NMR (500 MHz, $CDCl_3$) of compound **3z**



^{13}C NMR (126 MHz, $CDCl_3$) of compound **3z**



^{1}H NMR (500 MHz, $CDCl_3$) of compound **3aa**



^{13}C NMR (126 MHz, $CDCl_3$) of compound **3aa**