

Ketosulfonylmethylenation and Sulfonylethylenation of
Imidazoheterocycles with Dimethylformamide as Methylene Source
Tao Guo,^a Penghua Hu,^a Yu Liu,^a Panke Zhang,^{*b} Yunhui Zhao^{*c} and Congjun Zhu^{*a}

^a *School of Chemistry and Chemical Engineering, Henan University of Technology,
Zhengzhou, Henan 450001, P. R. China*

^b *Green Catalysis Center, College of Chemistry, Henan Advanced Institute of Technology,
Zhengzhou University, Zhengzhou 450001, PR China.*

^c *School of Chemistry and Chemical Engineering, Hunan University of Science and
Technology, Xiangtan, Hunan 411201, P. R. China*

Supplementary Information

Table of Content

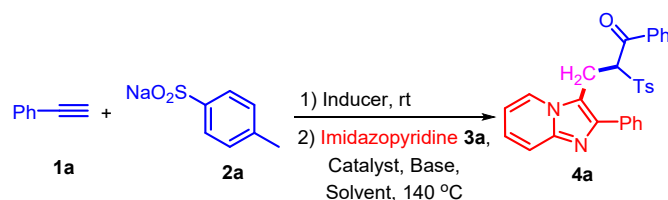
1 General Experimental.....	2
2 Optimization of the reaction conditions	2
3 Deacylation and α -Allylation	4
4 Control experiments.....	4
5 General procedure for the synthesis of 3-ketosulfonylmethylenated heterocycles 4, 6 and 3-sulfonylethylated imidazoheterocycles 9.....	4
6 X-ray diffraction analysis of compound 4j	25
7 Copies of ¹ H and ¹³ C NMR Spectra	28

1 General Experimental

Unless otherwise mentioned, all materials were commercially obtained and used without further purification. imidazoheterocycles (**3**)¹ were synthesized according to previously described methods. The ¹H NMR, ¹³C NMR, and ¹⁹F NMR spectra were recorded at 500 MHz, 126 MHz, 471 MHz, respectively, on a Bruker AM500 MHz with chemical shift values in ppm relative to TMS (δ H 0.00 and δ C 0.0) as internal standard. The coupling constants *J*, are reported in Hertz (Hz). All melting points were determined on a SGW X-4A melting point instrument without correction. High-resolution mass spectra (HRMS) were recorded on Q-Exactive plus Orbitrap (ESI) or HP-5989A instrument.. Infrared spectra (IR) were recorded on Spectrum TWO. Reactions were monitored by thin layer chromatography (TLC), on glass plates coated with silica gel with Fluorescent indicator (Huanghai, HSGF254) and visualized with UV light at 254 nm. Flash chromatography was performed on silica gel (Huanghai, 300-400) using petroleum ether (PE)-ethyl acetate (EA) as eluent. The structure of product **3c** (CCDC file number 2181031) was further confirmed by X-ray diffraction collected on a diffractometer with graphite-monochromated Cu K α radiation.

2 Optimization of the reaction conditions

Table S1. Optimization of the reaction with alkynes/sodium sulfite

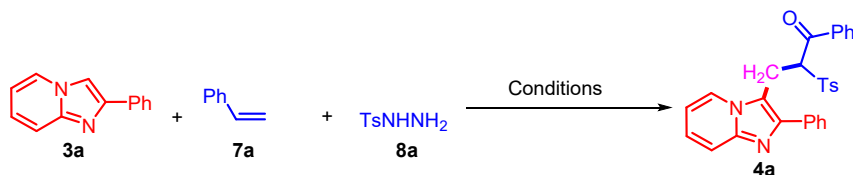


Entry ^a	Inducer	Catalyst (0.2 equiv.)	Base (2 equiv.)	Solvent (2 mL)	Temperature (°C)	Yield (%) ^b
1	I ₂	CoCl ₂ ·6H ₂ O	Na ₂ CO ₃	DMF	140	43
2	I ₂	CoCl ₂ ·6H ₂ O	Na ₂ CO ₃	DMSO	140	22
3	I ₂	CoCl ₂ ·6H ₂ O	Na ₂ CO ₃	DMAc	140	29
4	TBAI	CoCl ₂ ·6H ₂ O	Na ₂ CO ₃	DMF	140	0
5	NaI	CoCl ₂ ·6H ₂ O	Na ₂ CO ₃	DMF	140	0
6	I ₂	CoCl ₂ ·6H ₂ O	--	DMF	140	0
7	I ₂	--	Na ₂ CO ₃	DMF	140	0
8	I ₂	CoCl ₂ ·6H ₂ O	NaHCO ₃	DMF	140	67
9	I ₂	CoCl ₂ ·6H ₂ O	LiOBu	DMF	140	32
10	I ₂	CoCl ₂ ·6H ₂ O	KOAc	DMF	140	75
11	I₂	CoCl₂·6H₂O	NaOAc·3H₂O	DMF	140	86
12	I ₂	Co(OAc) ₂	NaOAc·3H ₂ O	DMF	140	43
13	I ₂	Co(acac) ₂	NaOAc·3H ₂ O	DMF	140	72
14	I ₂	Co(C ₂ O ₄) ₂	NaOAc·3H ₂ O	DMF	140	56
15	I ₂	Co(C ₂ O ₄) ₂	NaOAc·3H ₂ O	DMF	140	56
16	I ₂	Fe(acac) ₂	NaOAc·3H ₂ O	DMF	140	46
17	I ₂	Cu(OTf) ₂	NaOAc·3H ₂ O	DMF	140	0
18	I ₂	Ni(acac) ₂	NaOAc·3H ₂ O	DMF	140	0

19	I ₂	CoCl ₂ ·6H ₂ O	NaOAc·3H ₂ O	DMF	150	84
20	I ₂	CoCl ₂ ·6H ₂ O	NaOAc·3H ₂ O	DMF	130	62
21 ^c	I ₂	CoCl ₂ ·6H ₂ O	NaOAc·3H ₂ O	DMF	140	65
22 ^d	I ₂	CoCl ₂ ·6H ₂ O	NaOAc·3H ₂ O	DMF	140	0

^aReaction conditions: **1a** (0.4 mmol), **2a** (0.4 mmol), inducer (1.5 equiv.), and solvent in air reacted at room temperature for 3 h, followed by addition of **3a** (0.2 mmol), catalyst (0.2 equiv.), and base (2 equiv.) under stirring at 140 °C for another 12 h. ^bIsolated yield. ^c CoCl₂·6H₂O (0.1 equiv.) was used. ^dUnder N₂.

Table S2 Optimization of the reaction conditions with styrene/sulfonylhydrazide



Entry ^a	Inducer	Oxidant	Catalyst (0.2 equiv.)	Base (2 equiv.)	Solvent (2 mL)	Temperature (°C)	Yield (%) ^b
1	I ₂	--	CoCl ₂ ·6H ₂ O	NaOAc·3H ₂ O	DMF	140	0
2	I ₂	DTBP	CoCl ₂ ·6H ₂ O	NaOAc·3H ₂ O	DMF	140	64
3	I ₂	TBHP	CoCl ₂ ·6H ₂ O	NaOAc·3H ₂ O	DMF	140	46
4	I ₂	K ₂ S ₂ O ₈	CoCl ₂ ·6H ₂ O	NaOAc·3H ₂ O	DMF	140	trace
5	I ₂	DTBP	Co(acac) ₂	NaOAc·3H ₂ O	DMF	140	53
6	I ₂	DTBP	Cu(OTf) ₂	NaOAc·3H ₂ O	DMF	140	0
7	I ₂	DTBP	Ni(acac) ₂	NaOAc·3H ₂ O	DMF	140	0
8	I ₂	DTBP	FeCl ₂	NaOAc·3H ₂ O	DMF	140	35
9	I ₂	DTBP	FeCl ₃ ·6H ₂ O	NaOAc·3H ₂ O	DMF	140	78
10	I₂	DTBP	Fe(acac)₃	NaOAc·3H₂O	DMF	140	83
11	I ₂	DTBP	Fe(acac) ₃	Na ^t OBu	DMF	140	46
12	I ₂	DTBP	Fe(acac) ₃	KOH	DMF	140	57
13	I ₂	DTBP	Fe(acac) ₃	NaOAc·3H ₂ O	DMSO	140	51
14	I ₂	DTBP	Fe(acac) ₃	NaOAc·3H ₂ O	DMAc	140	44
15	I ₂	DTBP	Fe(acac) ₃	NaOAc·3H ₂ O	DMF	130	64
16	I ₂	DTBP	Fe(acac) ₃	NaOAc·3H ₂ O	DMF	150	80
17	NaI	DTBP	Fe(acac) ₃	NaOAc·3H ₂ O	DMF	140	27
18	TBAI	DTBP	Fe(acac) ₃	NaOAc·3H ₂ O	DMF	140	16

^a Reaction conditions: **3a** (0.2 mmol), **7a** (0.5 mmol), **8a** (0.5 mmol), I₂ (1.5 equiv.), DTBP (3 equiv.), Fe(acac)₃ (0.2 equiv.), NaOAc·3H₂O (2 equiv.), and solvent in air reacted at room temperature for 3 h, followed by stirring at 140 °C for 12 h. ^b Isolated yield.

3 Deacylation and α -Allylation

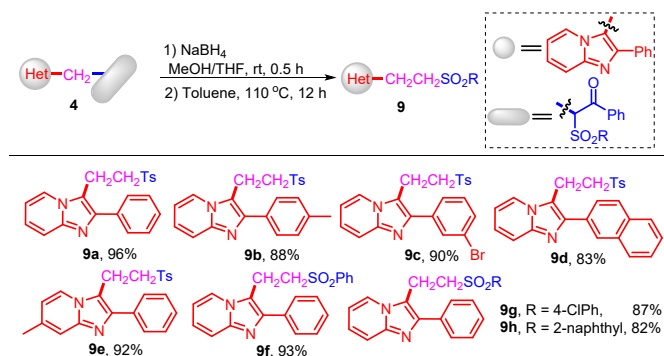


Figure S1 Deacylation reveals the ethylene group.

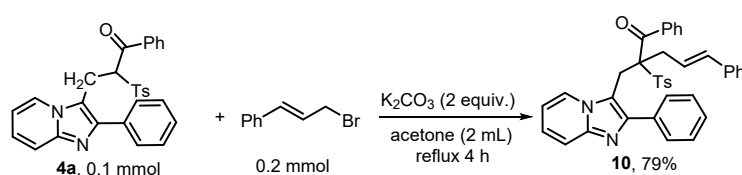


Figure S2 α -Allylation of 4a.

4 Control experiments

Treatment of **1a**, **2a**, and I_2 in DMF afforded intermediate **11** in 93% yield. The addition of $NaOAc \cdot 3H_2O$ transformed **11** into ketosulfone **12** (Figure S1a). The reaction of **7a** and **8a** without $Fe(acac)_3$ afforded **12** at a 63% yield (Figure S1b). Furthermore, the combination reaction of **12** and **3a** at 140 °C with $CoCl_2 \cdot 6H_2O$ or $Fe(acac)_3$ provided **4a** with yields of 91% and 88%, respectively (Figure S1c), indicating that **11** and **12** could be plausible reaction intermediates.

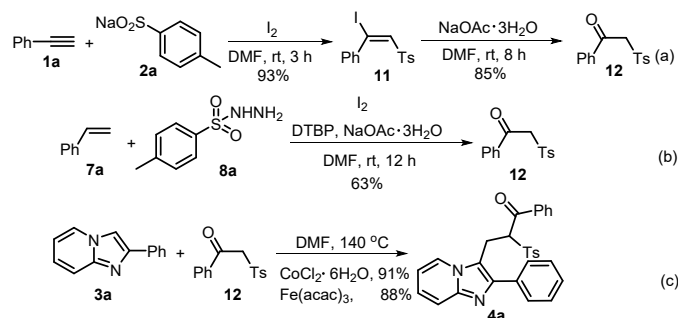


Figure S3 Control experiments

5 General procedure for the synthesis of 3-ketosulfonylmethylenated heterocycles **4**, **6** and 3-sulfonylethylated imidazoheterocycles **9**

General procedure for synthesis of desired products **4/6** with Co-catalysts, alkynes and sodium sulfite

2 mL DMF, alkynes (**1**, 0.4 mmol (2.0 equiv.)), sodium sulfite (**2**, 0.4 mmol (2.0 equiv.)), and I_2 (76.1 mg, 0.3 mmol (1.5 equiv.)) were added into the dry thick-walled glass pressure tube and stirred in air at room temperature for 3 h, followed by adding imidazoheterocycles (**5**, 0.2 mmol) or indoles/naphthols (0.2 mmol), $CoCl_2 \cdot 6H_2O$ (9.5 mg, 0.04 mmol), $NaOAc \cdot 3H_2O$ (54.4 mg, 0.4 mmol)

(2.0 equiv.) and stirring at in a preheated oil bath at 140 °C for in air for another 12 h. Then the reaction was cooled down to room temperature, diluted with 20 mL ethyl acetate and washed with 10 mL H₂O. The aqueous layer was extracted twice with ethyl acetate (5 mL) and the combined organic phase was dried over Na₂SO₄. After evaporation of the solvents the residue was purified by flash column chromatography (silica gel, petroleum ether–ethyl acetate, 2:1 to 1:1) to afford the desired products **4** or **6**.

General procedure for synthesis of desired products **4** with Fe-catalysts, styrenes and sulfonylhydrazides

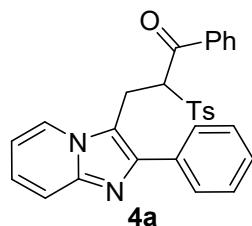
2 mL DMF, styrenes (**7**, 0.5 mmol (2.5 equiv.)), sodium sulfite (**8**, 0.5 mmol (2.5 equiv.)), I₂ (76.1 mg, 0.3 mmol (1.5 equiv.)), DTBP (87.7 mg, 0.6mmol (3.0 equiv.)), Fe(acac)₃ (14.1 mg, 0.04mmol), NaOAc·3H₂O (54.4 mg, 0.4 mmol (2.0 equiv.)) and I₂ (0.3 mmol (1.5 equiv.)) were added into the dry thick-walled glass pressure tube and stirred in air at toom temperature for 3 h, followed by stirring at in a preheated oil bath at 140 °C for in air for another 12 h. Then the reaction was cooled down to room temperature, diluted with 20 mL ethyl acetate and washed with 10 mL H₂O. The aqueous layer was extracted twice with ethyl acetate (5 mL) and the combined organic phase was dried over Na₂SO₄. After evaporation of the solvents the residue was purified by flash column chromatography (silica gel, petroleum ether–ethyl acetate, 2:1 to 1:1) to afford the desired products **4**.

General procedure for synthesis of desired products **9**.

1 mL THF and 1 mL MeOH, **4** (0.1 mmol), and NaBH₄ (0.1 mmol (3.8 mg, 1.0 equiv.)) were added into the dry thick-walled glass pressure tube and stirred in air at toom temperature for 30 minutes. After the evaporation of the solution, 2 mL of dry toluene was added, followed by stirring in a preheated oil bath at 110 °C for 12 h. Then the reaction was cooled down to room temperature, diluted with 20 mL ethyl acetate and washed with 10 mL H₂O. The aqueous layer was extracted twice with ethyl acetate (5 mL) and the combined organic phase was dried over Na₂SO₄. After evaporation of the solvents the residue was purified by flash column chromatography (silica gel, petroleum ether–ethyl acetate, 2:1 to 1:1) to afford the desired products **9**.

General procedure for synthesis of desired products **10**.

2 mL of acetone, **4a** (48.1 mg, 0.1mmol), K₂CO₃ (27.6 mg, 0.2 mmol (2.0 equiv.)), cinnamyl bromide (39.4 mg, 0.2 mmol (2.0 equiv.)) were added into the dry thick-walled glass pressure tube and stirred in air in a preheated oil bath at 60 °C for 4 h. Then the reaction was cooled down to room temperature, diluted with 20 mL ethyl acetate and washed with 10 mL H₂O. The aqueous layer was extracted twice with ethyl acetate (5 mL) and the combined organic phase was dried over Na₂SO₄. After evaporation of the solvents the residue was purified by flash column chromatography (silica gel, petroleum ether–ethyl acetate, 2:1 to 1:1) to afford the desired products **10**.



1-phenyl-3-(2-phenylimidazo[1,2-a]pyridin-3-yl)-2-tosylpropan-1-one

4a was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

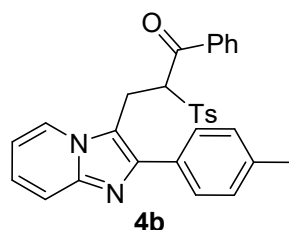
Yellow solid, mp 165-167 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.15 (d, *J* = 7.0 Hz, 1H), 7.64 – 7.63 (m, 2H), 7.58 (d, *J* = 8.0 Hz, 2H), 7.48 (d, *J* = 9.0 Hz, 1H), 7.43 – 7.37 (m, 4H), 7.29 (d, *J* = 7.5 Hz, 2H), 7.23 (d, *J* = 8.0 Hz, 2H), 7.16 (t, *J* = 7.5 Hz, 2H), 7.12 – 7.08 (m, 1H), 6.80 (t, *J* = 6.5 Hz, 1H), 5.37 (t, *J* = 7.0 Hz, 1H), 3.98 (d, *J* = 7.5 Hz, 2H), 2.38 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 191.9, 145.7, 144.8, 143.2, 136.4, 134.1, 133.9, 133.7, 129.8, 129.1, 128.8, 128.4, 128.0, 127.8, 124.4, 123.4, 117.3, 114.2, 112.4, 66.7, 22.1, 21.6.

IR (KBr): 2920, 1680, 1445, 1326, 1302, 1143, 1052, 743, 700, 678 cm⁻¹.

HRMS for C₂₉H₂₅N₂O₃S⁺ (M+H)⁺: calcd. 481.15804, found 481.15820.



1-phenyl-3-(2-(p-tolyl)imidazo[1,2-a]pyridin-3-yl)-2-tosylpropan-1-one

4b was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

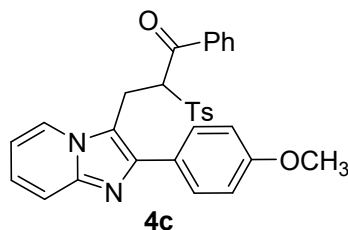
Yellow solid, mp 128-130 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.13 (d, *J* = 7.0 Hz, 1H), 7.59 (d, *J* = 8.0 Hz, 2H), 7.54 (d, *J* = 8.0 Hz, 2H), 7.47 (d, *J* = 9.0 Hz, 1H), 7.41 (t, *J* = 7.5 Hz, 1H), 7.33 (d, *J* = 8.0 Hz, 2H), 7.26 – 7.17 (m, 6H), 7.10 (d, *J* = 7.5 Hz, 1H), 6.80 (d, *J* = 6.5 Hz, 1H), 5.39 – 5.37 (m, 1H), 4.00 – 3.91 (m, 2H), 2.43 (s, 3H), 2.42 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 192.1, 145.7, 144.8, 143.4, 137.9, 136.5, 134.0, 133.7, 131.2, 129.8, 129.6, 129.3, 128.6, 128.5, 127.8, 124.4, 123.4, 117.3, 113.9, 112.4, 66.9, 22.3, 21.7, 21.4

IR (KBr): 2923, 1673, 1593, 1254, 1215, 1148, 1082, 932, 803, 679 cm⁻¹.

HRMS for C₃₀H₂₇N₂O₃S⁺ (M+H)⁺: calcd. 495.17369, found 495.17404.



3-(2-(4-methoxyphenyl)imidazo[1,2-a]pyridin-3-yl)-1-phenyl-2-tosylpropan-1-one

4c was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

Yellow solid, mp 66-68 °C.

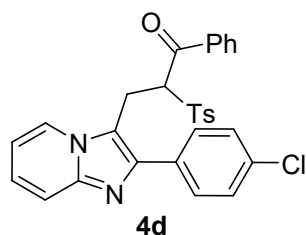
¹H NMR (500 MHz, CDCl₃) δ 8.12 (d, *J* = 7.0 Hz, 1H), 7.59 (t, *J* = 7.5 Hz, 4H), 7.46 (d, *J* = 9.0 Hz, 1H), 7.41 (t, *J* = 7.5 Hz, 1H), 7.33 (d, *J* = 8.0 Hz, 2H), 7.25 (d, *J* = 8.5 Hz, 2H), 7.19 (d, *J* = 7.5 Hz, 2H), 7.11 – 7.08 (m, 1H), 6.95 (d, *J* = 9.0 Hz, 2H), 6.80 (d, *J* = 7.0 Hz, 1H), 5.39 – 5.36 (m, 1H), 3.98 – 3.92 (m, 2H), 3.87 (s, 3H), 2.40 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 192.0, 159.5, 145.7, 144.7, 143.1, 136.4, 134.0, 133.8, 129.8, 129.3,

129.1, 128.5, 128.5, 126.5, 124.3, 123.4, 117.1, 114.3, 113.5, 112.4, 66.8, 55.3, 22.2, 21.7

IR (KBr): 2922, 1676, 1447, 1302, 1250, 1145, 736, 682 cm^{-1} .

HRMS for $\text{C}_{30}\text{H}_{27}\text{N}_2\text{O}_4\text{S}^+$ ($\text{M}+\text{H}$)⁺: calcd. 511.16860, found 511.16824.



3-(2-(4-chlorophenyl)imidazo[1,2-a]pyridin-3-yl)-1-phenyl-2-tosylpropan-1-one

4d was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

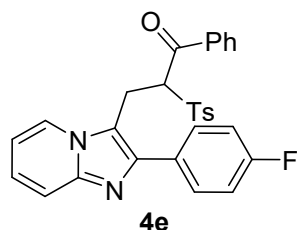
Yellow solid, mp 174-176 °C.

^1H NMR (500 MHz, CDCl_3) δ 8.16 (d, $J = 7.0$ Hz, 1H), 7.62 – 7.58 (m, 4H), 7.48 (d, $J = 9.0$ Hz, 1H), 7.43 (t, $J = 7.0$ Hz, 1H), 7.38 – 7.35 (m, 4H), 7.28 (d, $J = 8.0$ Hz, 2H), 7.21 (d, $J = 7.5$ Hz, 2H), 7.14 (t, $J = 8.0$ Hz, 1H), 6.83 (t, $J = 7.0$ Hz, 1H), 5.30 – 5.28 (m, 1H), 4.02 – 3.93 (m, 2H), 2.43 (s, 3H).

^{13}C NMR (126 MHz, CDCl_3) δ 191.9, 145.9, 144.9, 142.2, 136.3, 134.2, 134.0, 133.6, 132.6, 129.9, 129.3, 129.1, 129.0, 128.6, 128.5, 124.8, 123.5, 117.4, 114.5, 112.7, 67.0, 22.2, 21.8.

IR (KBr): 2919, 1676, 1596, 1310, 1273, 1141, 1088, 822, 726, 685 cm^{-1} .

HRMS for $\text{C}_{29}\text{H}_{24}\text{ClN}_2\text{O}_3\text{S}^+$ ($\text{M}+\text{H}$)⁺: calcd. 515.11907, found 515.11938.



3-(2-(4-fluorophenyl)imidazo[1,2-a]pyridin-3-yl)-1-phenyl-2-tosylpropan-1-one

4e was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

Yellow solid, mp 174-176 °C.

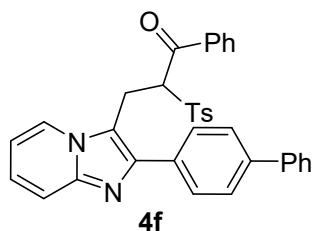
^1H NMR (500 MHz, CDCl_3) δ 8.16 (d, $J = 7.0$ Hz, 1H), 7.63 – 7.60 (m, 4H), 7.48 (d, $J = 9.0$ Hz, 1H), 7.42 (t, $J = 7.5$ Hz, 1H), 7.35 (d, $J = 7.5$ Hz, 2H), 7.27 (d, $J = 8.0$ Hz, 2H), 7.21 (t, $J = 7.5$ Hz, 2H), 7.15 – 7.09 (m, 3H), 6.83 (t, $J = 7.0$ Hz, 1H), 5.31 – 5.29 (m, 1H), 4.01 – 3.93 (m, 2H), 2.41 (s, 3H).

^{13}C NMR (126 MHz, CDCl_3) δ 191.9, 162.6 (d, $J_{\text{C-F}} = 246.4$ Hz), 145.9, 144.9, 142.5, 136.3, 134.1, 133.6, 130.2 (d, $J_{\text{C-F}} = 2.6$ Hz), 129.9, 129.7 (d, $J_{\text{C-F}} = 8.3$ Hz), 129.3, 128.6, 128.5, 124.7, 123.5, 117.4, 115.8 (d, $J_{\text{C-F}} = 20.6$ Hz), 114.1, 112.7, 66.9, 22.1, 21.7.

^{19}F NMR (470 MHz, CDCl_3): δ -113.41.

IR (KBr): 2922, 1678, 1595, 1497, 1324, 1220, 1147, 855, 738, 669 cm^{-1} .

HRMS for $\text{C}_{29}\text{H}_{24}\text{FN}_2\text{O}_3\text{S}^+$ ($\text{M}+\text{H}$)⁺: calcd. 499.14862, found 499.14868.



3-(2-([1,1'-biphenyl]-4-yl)imidazo[1,2-a]pyridin-3-yl)-1-phenyl-2-tosylpropan-1-one

4f was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

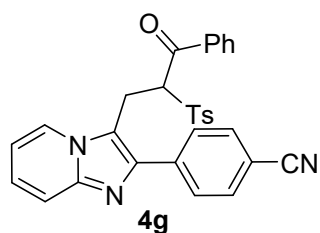
Yellow solid, mp 109-111 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.15 (d, *J* = 7.0 Hz, 1H), 7.74 (d, *J* = 8.0 Hz, 2H), 7.66 (t, *J* = 9.0 Hz, 4H), 7.60 (d, *J* = 7.5 Hz, 2H), 7.48 (t, *J* = 8.0 Hz, 3H), 7.39 – 7.33 (m, 4H), 7.21 (d, *J* = 8.0 Hz, 2H), 7.15 (t, *J* = 7.5 Hz, 2H), 7.10 (t, *J* = 8.0 Hz, 1H), 6.79 (t, *J* = 7.0 Hz, 1H), 5.44 – 5.41 (m, 1H), 4.04 – 3.97 (m, 2H), 2.35 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 192.0, 145.7, 144.8, 142.7, 140.5, 140.3, 136.3, 134.0, 133.7, 132.9, 129.8, 129.1, 128.9, 128.5, 128.4, 128.1, 127.5, 127.3, 126.9, 124.5, 123.4, 117.2, 114.4, 112.5, 66.8, 22.2, 21.6.

IR (KBr): 2924, 1678, 1595, 1453, 1285, 1147, 1083, 737, 706 cm⁻¹.

HRMS for C₃₅H₂₉N₂O₃S⁺ (M+H)⁺: calcd. 557.18934, found 557.18915.



4-(3-(3-oxo-3-phenyl-2-tosylpropyl)imidazo[1,2-a]pyridin-2-yl)benzonitrile

4g was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

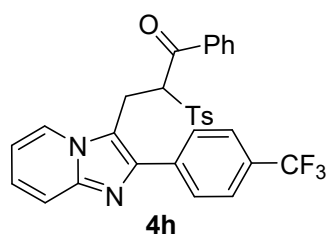
Yellow solid, mp 190-192 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.10 (d, *J* = 7.0 Hz, 1H), 7.74 (d, *J* = 8.0 Hz, 2H), 7.59 (d, *J* = 8.0 Hz, 2H), 7.55 (d, *J* = 8.0 Hz, 2H), 7.42 (d, *J* = 9.0 Hz, 1H), 7.35 (t, *J* = 7.0 Hz, 1H), 7.29 (d, *J* = 7.5 Hz, 2H), 7.20 (d, *J* = 8.0 Hz, 2H), 7.15 – 7.09 (m, 3H), 6.79 (t, *J* = 7.0 Hz, 1H), 5.2 – 5.17 (m, 1H), 3.99 – 3.90 (m, 2H), 2.35 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 191.7, 146.1, 145.2, 141.2, 138.7, 136.2, 134.3, 133.3, 132.5, 130.0, 129.5, 128.6, 128.5, 128.2, 125.3, 123.6, 118.9, 117.7, 115.8, 113.2, 111.3, 67.1, 22.3, 21.8.

IR (KBr): 2922, 2225, 1694, 1381, 1203, 1089, 1045, 879, 766 cm⁻¹.

HRMS for C₃₀H₂₄N₃O₃S⁺ (M+H)⁺: calcd. 506.15329, found 506.15280.



1-phenyl-2-tosyl-3-(2-(4-(trifluoromethyl)phenyl)imidazo[1,2-a]pyridin-3-yl)propan-1-one

4h was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

Yellow solid, mp 172-174 °C.

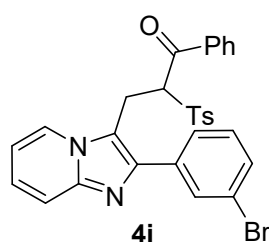
¹H NMR (500 MHz, CDCl₃) δ 8.20 (d, *J* = 6.5 Hz, 1H), 7.78 (d, *J* = 8.0 Hz, 2H), 7.65 – 7.61 (m, 4H), 7.51 (d, *J* = 9.0 Hz, 1H), 7.43 (t, *J* = 7.0 Hz, 1H), 7.35 (d, *J* = 8.0 Hz, 2H), 7.28 (d, *J* = 7.0 Hz, 2H), 7.22 – 7.16 (m, 3H), 6.87 (t, *J* = 6.5 Hz, 1H), 5.29 – 5.27 (m, 1H), 4.07 – 3.98 (m, 2H), 2.43 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 191.8, 146.1, 145.1, 141.8, 137.7, 136.3, 134.3, 133.6, 130.0, 129.8 (q, *J*_{C-F} = 32.5 Hz), 129.4, 128.7, 128.5, 128.1, 125.7 (q, *J*_{C-F} = 3.4 Hz), 125.1, 124.2 (q, *J*_{C-F} = 270.3 Hz), 123.7, 117.7, 115.3, 113.0, 67.1, 22.3, 21.7.

¹⁹F NMR (470 MHz, CDCl₃): δ -62.42.

IR (KBr): 2921, 1673, 1625, 1324, 1255, 1138, 1073, 746, 727, 680 cm⁻¹.

HRMS for C₃₀H₂₄F₃N₂O₃S⁺ (M+H)⁺: calcd. 549.14542, found 549.14569.



3-(2-(3-bromophenyl)imidazo[1,2-a]pyridin-3-yl)-1-phenyl-2-tosylpropan-1-one

4i was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

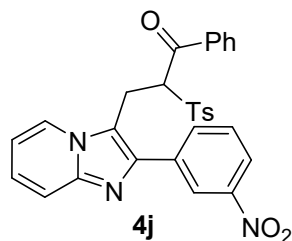
Yellow solid, mp 80-82 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.17 (d, *J* = 7.0 Hz, 1H), 7.79 (m, 1H), 7.58 – 7.54 (m, 3H), 7.51 – 7.48 (m, 2H), 7.43 (t, *J* = 7.0 Hz, 1H), 7.34 (d, *J* = 7.5 Hz, 2H), 7.28 – 7.19 (m, 5H), 7.14 (t, *J* = 7.5 Hz, 1H), 6.84 (d, *J* = 7.0 Hz, 1H), 5.32 (t, *J* = 7.0 Hz, 1H), 3.96 (d, *J* = 7.0 Hz, 2H), 2.39 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 191.8, 145.8, 144.9, 141.8, 136.2, 136.2, 134.1, 133.6, 131.2, 131.0, 130.2, 129.9, 129.2, 128.6, 128.5, 126.1, 124.9, 123.6, 123.1, 117.5, 114.8, 112.8, 66.8, 22.1, 21.7.

IR (KBr): 2923, 1677, 1622, 1549, 1352, 1145, 1092, 732, 682 cm⁻¹.

HRMS for C₂₉H₂₄BrN₂O₃S⁺ (M+H)⁺: calcd. 559.06855, found 559.06873.



3-(2-(3-nitrophenyl)imidazo[1,2-a]pyridin-3-yl)-1-phenyl-2-tosylpropan-1-one

4j was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

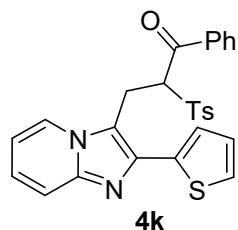
Yellow solid, mp 171-173 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.45 (s, 1H), 8.24 – 8.20 (m, 2H), 7.97 (d, *J* = 7.5 Hz, 1H), 7.63 – 7.53 (m, 4H), 7.45 (t, *J* = 7.5 Hz, 1H), 7.40 (d, *J* = 7.5 Hz, 2H), 7.28 (d, *J* = 8.0 Hz, 2H), 7.22 (t, *J* = 8.0 Hz, 3H), 6.92 (t, *J* = 7.0 Hz, 1H), 5.28 – 5.25 (m, 1H), 4.08 – 3.97 (m, 2H), 2.43 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 191.6, 148.5, 146.2, 145.2, 141.2, 136.2, 135.9, 134.4, 133.6, 133.2, 130.0, 129.8, 129.4, 128.7, 128.5, 125.4, 123.6, 123.1, 122.7, 117.8, 115.3, 113.3, 67.1, 22.3, 21.8.

IR (KBr): 2921, 1672, 1523, 1347, 1283, 1146, 738, 703, 682 cm^{-1} .

HRMS for $\text{C}_{29}\text{H}_{24}\text{N}_3\text{O}_5\text{S}^+$ ($\text{M}+\text{H}$) $^+$: calcd. 526.14312, found 526.14325.



1-phenyl-3-(2-(thiophen-2-yl)imidazo[1,2-a]pyridin-3-yl)-2-tosylpropan-1-one

4k was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

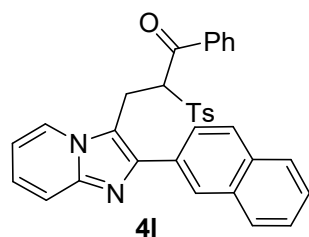
Yellow solid, mp 220-222 $^{\circ}\text{C}$.

^1H NMR (500 MHz, CDCl_3) δ 8.14 (d, $J = 7.0$ Hz, 1H), 7.70 (d, $J = 8.0$ Hz, 2H), 7.48 – 7.40 (m, 5H), 7.38 (d, $J = 5.0$ Hz, 1H), 7.31 (d, $J = 8.0$ Hz, 2H), 7.21 (t, $J = 7.5$ Hz, 2H), 7.15 – 7.13 (m, 1H), 7.09 (t, $J = 7.5$ Hz, 1H), 6.78 (t, $J = 7.0$ Hz, 1H), 5.55 – 5.52 (m, 1H), 4.02 – 3.96 (m, 2H), 2.43 (s, 3H).

^{13}C NMR (126 MHz, CDCl_3) δ 192.5, 146.0, 144.9, 138.3, 137.4, 136.5, 134.2, 133.5, 130.0, 129.6, 128.6, 128.3, 126.0, 124.9, 124.2, 123.6, 117.1, 113.3, 112.6, 66.5, 22.4, 21.8.

IR (KBr): 2921, 1672, 1523, 1347, 1283, 1145, 738, 703, 682 cm^{-1} .

HRMS for $\text{C}_{27}\text{H}_{23}\text{N}_2\text{O}_3\text{S}_2^+$ ($\text{M}+\text{H}$) $^+$: calcd. 487.11446, found 487.11465.



3-(2-(naphthalen-2-yl)imidazo[1,2-a]pyridin-3-yl)-1-phenyl-2-tosylpropan-1-one

4l was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

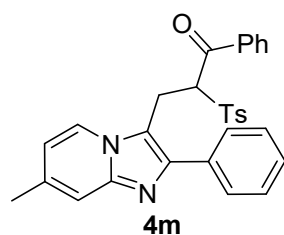
Yellow solid, mp 160-162 $^{\circ}\text{C}$.

^1H NMR (500 MHz, CDCl_3) δ 8.18 – 8.16 (m, 2H), 7.91 – 7.87 (m, 4H), 7.54 – 7.51 (m, 5H), 7.33 (t, $J = 7.5$ Hz, 1H), 7.25 (d, $J = 7.5$ Hz, 2H), 7.16 – 7.11 (m, 3H), 7.06 (t, $J = 7.5$ Hz, 2H), 6.81 (t, $J = 7.0$ Hz, 1H), 5.44 – 5.42 (m, 1H), 4.14 – 4.00 (m, 2H), 2.36 (s, 3H).

^{13}C NMR (126 MHz, CDCl_3) δ 192.1, 145.7, 145.0, 143.1, 136.3, 134.0, 133.7, 133.5, 132.9, 131.5, 129.8, 129.2, 128.6, 128.5, 128.5, 128.4, 127.7, 126.9, 126.5, 126.4, 125.6, 124.6, 123.5, 117.4, 114.7, 112.6, 66.9, 22.3, 21.7.

IR (KBr): 2921, 1678, 1594, 1408, 1303, 1146, 1082, 812, 793, 753 cm^{-1} .

HRMS for $\text{C}_{33}\text{H}_{27}\text{N}_2\text{O}_3\text{S}^+$ ($\text{M}+\text{H}$) $^+$: calcd. 531.17369, found 531.17407.



3-(7-methyl-2-phenylimidazo[1,2-a]pyridin-3-yl)-1-phenyl-2-tosylpropan-1-one

4m was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

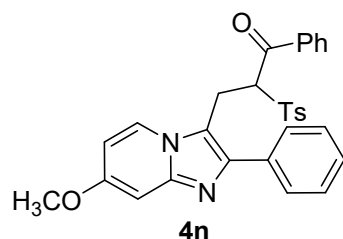
Yellow solid, mp 152-154 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.05 (d, *J* = 7.0 Hz, 1H), 7.63 – 7.58 (m, 4H), 7.42 – 7.38 (m, 4H), 7.31 – 7.24 (m, 5H), 7.18 (t, *J* = 7.5 Hz, 2H), 6.66 (d, *J* = 7.0 Hz, 1H), 5.35 (t, *J* = 7.0 Hz, 1H), 3.95 (d, *J* = 7.0 Hz, 2H), 2.41 (s, 3H), 2.34 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 192.0, 145.7, 145.3, 142.8, 136.5, 135.6, 134.1, 134.0, 133.8, 129.9, 129.3, 128.9, 128.5, 128.5, 128.0, 127.8, 122.7, 115.7, 115.2, 113.7, 66.8, 22.1, 21.7, 21.3.

IR (KBr): 1669, 1587, 1445, 1326, 1307, 1171, 1034, 851, 760, 716 cm⁻¹.

HRMS for C₃₀H₂₇N₂O₃S⁺ (M+H)⁺: calcd. 495.17369, found 495.17398.



3-(7-methoxy-2-phenylimidazo[1,2-a]pyridin-3-yl)-1-phenyl-2-tosylpropan-1-one

4n was purified by silica gel chromatography (petroleum ether/ethyl acetate = 1:1 to 1:2).

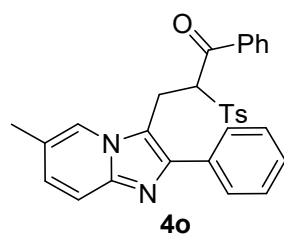
Yellow solid, mp 228-230 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.99 (d, *J* = 7.5 Hz, 1H), 7.65 – 7.61 (m, 4H), 7.45 – 7.39 (m, 4H), 7.34 (d, *J* = 7.5 Hz, 2H), 7.29 (d, *J* = 8.0 Hz, 2H), 7.21 (t, *J* = 7.5 Hz, 2H), 6.76 (d, *J* = 2.0 Hz, 1H), 6.56 – 6.54 (m, 1H), 5.38 – 5.35 (m, 1H), 3.97 – 3.87 (m, 2H), 3.80 (s, 3H), 2.44 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 192.2, 157.9, 146.4, 145.8, 142.6, 136.6, 134.2, 134.1, 133.8, 129.9, 129.4, 128.9, 128.6, 128.6, 127.9, 127.7, 124.1, 113.2, 107.6, 94.6, 67.1, 55.6, 22.3, 21.8.

IR (KBr): 2921, 2852, 1651, 1447, 1211, 1172, 1080, 945, 704, 682 cm⁻¹.

HRMS for C₃₀H₂₇N₂O₄S⁺ (M+H)⁺: calcd. 511.16860, found 511.16873.



3-(6-methyl-2-phenylimidazo[1,2-a]pyridin-3-yl)-1-phenyl-2-tosylpropan-1-one

4o was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

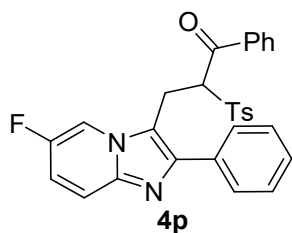
Yellow solid, mp 110-112 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.93 (s, 1H), 7.59 (d, *J* = 7.5 Hz, 4H), 7.42 – 7.38 (m, 5H), 7.29 – 7.24 (m, 4H), 7.18 (t, *J* = 7.5 Hz, 2H), 6.97 (d, *J* = 9.0 Hz, 1H), 5.38 – 5.35 (m, 1H), 4.02 – 3.91 (m, 2H), 2.41 (s, 3H), 2.35 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 192.0, 145.7, 144.0, 143.1, 136.5, 134.3, 134.0, 134.0, 129.9, 129.2, 128.8, 128.5, 128.0, 127.9, 127.7, 122.2, 121.1, 116.8, 114.0, 66.7, 22.2, 21.8, 18.6.

IR (KBr): 2920, 2851, 1678, 1446, 1312, 1182, 1148, 803, 707 cm⁻¹.

HRMS for $C_{30}H_{27}N_2O_3S^+$ ($M+H$)⁺: calcd. 495.17369, found 495.17386.



3-(6-fluoro-2-phenylimidazo[1,2-a]pyridin-3-yl)-1-phenyl-2-tosylpropan-1-one

4p was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

Yellow solid, mp 170-172 °C.

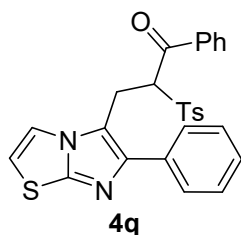
¹H NMR (500 MHz, CDCl₃) δ 8.11 (m, 1H), 7.63 – 7.58 (m, 4H), 7.47 – 7.40 (m, 5H), 7.32 (d, *J* = 8.0 Hz, 2H), 7.25 (d, *J* = 8.0 Hz, 2H), 7.19 (t, *J* = 7.5 Hz, 2H), 7.06 – 7.02 (m, 1H), 5.36 – 5.34 (m, 1H), 3.97 – 3.87 (m, 2H), 2.41 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 191.8, 153.3 (d, *J*_{C-F} = 235.5 Hz), 145.8, 144.5 (d, *J*_{C-F} = 1.4 Hz), 142.5, 136.3, 134.1, 133.7 (d, *J*_{C-F} = 25.9 Hz), 129.9, 129.2, 128.9, 128.6, 128.5, 128.3, 127.8, 117.8 (d, *J*_{C-F} = 8.9 Hz), 116.5 (d, *J*_{C-F} = 24.9 Hz), 115.8 (d, *J*_{C-F} = 2.1 Hz), 110.6, 110.3, 66.7, 22.2, 21.7.

¹⁹F NMR (470 MHz, CDCl₃): δ -138.99.

IR (KBr): 2922, 1674, 1592, 1506, 1447, 1299, 1212, 1112, 874, 679 cm⁻¹.

HRMS for $C_{29}H_{24}FN_2O_3S^+$ ($M+H$)⁺: calcd. 499.14862, found 499.14865.



1-phenyl-3-(6-phenylimidazo[2,1-b]thiazol-5-yl)-2-tosylpropan-1-one

4q was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

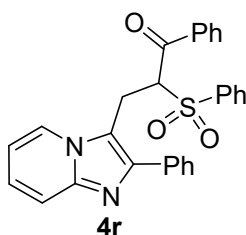
Yellow solid, mp 147-149 °C..

¹H NMR (500 MHz, CDCl₃) δ 7.60 (t, *J* = 8.0 Hz, 4H), 7.48 – 7.44 (m, 4H), 7.39 (t, *J* = 7.0 Hz, 2H), 7.35 – 7.33 (m, 1H), 7.28 – 7.23 (m, 4H), 6.75 (d, *J* = 4.5 Hz, 1H), 5.36 – 5.34 (m, 1H), 3.95 – 3.80 (m, 2H), 2.43 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 192.2, 148.7, 145.8, 144.2, 136.6, 134.3, 134.2, 133.8, 129.9, 129.3, 128.9, 128.7, 128.7, 127.6, 126.9, 117.8, 116.1, 112.5, 67.4, 23.9, 21.8.

IR (KBr): 2921, 1671, 1596, 1322, 1205, 1149, 1082, 783, 761, 678 cm⁻¹.

HRMS for $C_{27}H_{23}N_2O_3S_2^+$ ($M+H$)⁺: calcd. 487.11446, found 487.11459.



1-phenyl-3-(2-phenylimidazo[1,2-a]pyridin-3-yl)-2-(phenylsulfonyl)propan-1-one

4r was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

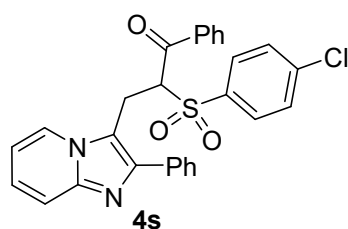
Yellow solid, mp 69-71 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.16 (d, *J* = 7.0 Hz, 1H), 7.69 (d, *J* = 7.5 Hz, 2H), 7.63 – 7.58 (m, 3H), 7.49 – 7.37 (m, 7H), 7.27 (d, *J* = 7.5 Hz, 2H), 7.16 (d, *J* = 7.5 Hz, 2H), 7.13 – 7.10 (t, *J* = 7.5 Hz, 1H), 6.82 (t, *J* = 6.5 Hz, 1H), 5.38 (t, *J* = 7.5 Hz, 1H), 4.00 (d, *J* = 7.0 Hz, 2H).

¹³C NMR (126 MHz, CDCl₃) δ 191.8, 144.9, 143.3, 136.9, 136.3, 134.5, 134.1, 129.2, 129.1, 128.9, 128.5, 128.4, 128.1, 127.9, 124.5, 123.5, 117.4, 114.1, 112.5, 66.6, 22.1.

IR (KBr): 2920, 1676, 1479, 1309, 1145, 1081, 863, 769, 679 cm⁻¹.

HRMS for C₂₈H₂₃N₂O₃S⁺ (M+H)⁺: calcd. 467.14239, found 467.14218.



2-((4-chlorophenyl)sulfonyl)-1-phenyl-3-(2-phenylimidazo[1,2-a]pyridin-3-yl)propan-1-one

4s was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

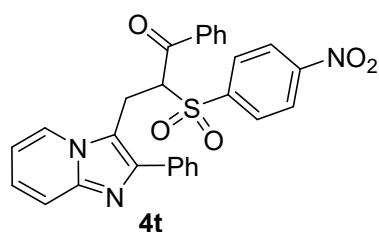
Yellow solid, mp 160-162 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.13 (d, *J* = 7.0 Hz, 1H), 7.65 – 7.59 (m, 4H), 7.51 – 7.48 (m, 1H), 7.46 – 7.40 (m, 6H), 7.29 – 7.27 (m, 2H), 7.21 – 7.18 (m, 2H), 7.15 – 7.11 (m, 1H), 6.83 (td, *J* = 7.0, 1.0 Hz, 1H), 5.38 – 5.35 (m, 1H), 4.03 – 3.92 (m, 2H).

¹³C NMR (126 MHz, CDCl₃) δ 191.8, 145.0, 143.5, 141.4, 136.2, 135.1, 134.3, 134.1, 130.7, 129.5, 129.0, 128.7, 128.5, 128.2, 128.0, 124.6, 123.4, 117.5, 113.9, 112.7, 66.9, 22.2.

IR (KBr): 2923, 2887, 1645, 1379, 1087, 7044, 879, 709 cm⁻¹.

HRMS for C₂₈H₂₂ClN₂O₃S⁺ (M+H)⁺: calcd. 501.10342, found 501.10364.



2-((4-nitrophenyl)sulfonyl)-1-phenyl-3-(2-phenylimidazo[1,2-a]pyridin-3-yl)propan-1-one

4t was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

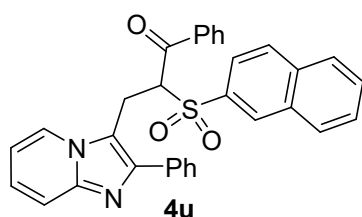
Yellow solid, mp 167-169 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.22 (d, *J* = 9.0 Hz, 2H), 8.08 (d, *J* = 7.0 Hz, 1H), 7.80 (d, *J* = 9.0 Hz, 2H), 7.62 – 7.60 (m, 2H), 7.49 – 7.40 (m, 5H), 7.31 – 7.28 (m, 2H), 7.21 (t, *J* = 7.5 Hz, 2H), 7.15 – 7.12 (m, 1H), 6.83 (td, *J* = 7.0, 1.0 Hz, 1H), 5.43 – 5.41 (m, 1H), 4.08 – 4.04 (m, 1H), 3.92 – 3.87 (m, 1H).

¹³C NMR (126 MHz, CDCl₃) δ 191.4, 151.0, 144.9, 143.6, 142.1, 135.9, 134.6, 133.9, 130.6, 129.0, 128.8, 128.5, 128.4, 127.9, 124.7, 124.2, 123.2, 117.5, 113.5, 112.7, 66.9, 22.3.

IR (KBr): 2922, 1676, 1593, 1530, 1333, 1150, 1080, 733, 700 cm⁻¹.

HRMS for C₂₈H₂₂N₃O₅S⁺ (M+H)⁺: calcd. 512.12747, found 512.12750.



2-(naphthalen-2-ylsulfonyl)-1-phenyl-3-(2-phenylimidazo[1,2-a]pyridin-3-yl)propan-1-one

4u was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

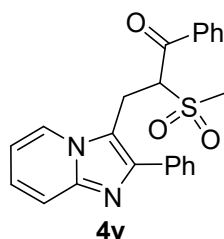
Yellow solid, mp 87-89 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.24 (s, 1H), 8.17 (d, *J* = 7.0 Hz, 1H), 7.88 (t, *J* = 8.5 Hz, 3H), 7.69 – 7.57 (m, 5H), 7.45 (d, *J* = 9.0 Hz, 1H), 7.33 – 7.29 (m, 6H), 7.13 – 7.08 (m, 3H), 6.81 (t, *J* = 7.0 Hz, 1H), 5.46 – 5.43 (m, 1H), 4.08 – 4.01 (m, 2H).

¹³C NMR (126 MHz, CDCl₃) δ 191.9, 144.9, 143.3, 136.5, 135.6, 134.1, 134.0, 133.9, 131.9, 131.3, 129.8, 129.6, 129.5, 128.9, 128.5, 128.5, 128.1, 128.0, 127.9, 124.6, 123.5, 123.3, 117.4, 114.3, 112.6, 66.9, 22.2.

IR (KBr): 2919, 1677, 1593, 1445, 1314, 1145, 749, 680 cm⁻¹.

HRMS for C₃₂H₂₅N₂O₃S⁺ (M+H)⁺: calcd. 517.15804, found 517.15808.



2-(methylsulfonyl)-1-phenyl-3-(2-phenylimidazo[1,2-a]pyridin-3-yl)propan-1-one

4v was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

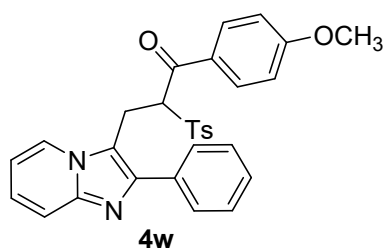
Yellow solid, mp 178-180 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.20 (d, *J* = 7.0 Hz, 1H), 7.66 (d, *J* = 7.0 Hz, 2H), 7.55 (d, *J* = 9.0 Hz, 1H), 7.48 (t, *J* = 7.5 Hz, 3H), 7.44 – 7.40 (m, 3H), 7.25 (t, *J* = 8.0 Hz, 2H), 7.19 (t, *J* = 8.0 Hz, 1H), 6.90 (d, *J* = 7.0 Hz, 1H), 5.15 (d, *J* = 9.0 Hz, 1H), 4.16 – 4.03 (m, 2H), 3.02 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 193.4, 145.1, 144.0, 136.0, 134.7, 133.8, 128.9, 128.8, 128.7, 128.4, 128.2, 124.8, 123.2, 117.8, 113.8, 113.0, 66.1, 38.3, 23.3.

IR (KBr): 2921, 2852, 1680, 1447, 1304, 1141, 962, 787, 743 cm⁻¹.

HRMS for C₂₃H₂₁N₂O₃S⁺ (M+H)⁺: calcd. 405.12674, found 405.12680.



1-(4-methoxyphenyl)-3-(2-phenylimidazo[1,2-a]pyridin-3-yl)-2-tosylpropan-1-one

4w was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

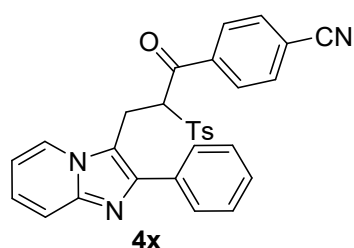
Yellow solid, mp 75-77 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.14 (d, *J* = 7.0 Hz, 1H), 7.65 (d, *J* = 7.0 Hz, 2H), 7.60 (d, *J* = 8.0 Hz, 2H), 7.47 (d, *J* = 9.0 Hz, 1H), 7.43 – 7.38 (m, 3H), 7.33 (d, *J* = 8.5 Hz, 2H), 7.25 (d, *J* = 8.0 Hz, 2H), 7.09 (d, *J* = 7.5 Hz, 1H), 6.78 (t, *J* = 6.5 Hz, 1H), 6.64 (d, *J* = 9.0 Hz, 2H), 5.32 – 5.29 (m, 1H), 3.98 – 3.91 (m, 2H), 3.72 (s, 3H), 2.40 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 189.8, 164.3, 145.6, 144.8, 143.2, 134.1, 133.7, 131.1, 129.7, 129.4, 129.2, 128.8, 128.0, 127.9, 124.4, 123.5, 117.2, 114.4, 113.7, 112.4, 66.4, 55.5, 22.2, 21.7.

IR (KBr): 2921, 1645, 1380, 1247, 1088, 1044, 879, 619 cm⁻¹.

HRMS for C₃₀H₂₇N₂O₄S⁺ (M+H)⁺: calcd. 511.16860, found 511.16849.



4-(3-(2-phenylimidazo[1,2-a]pyridin-3-yl)-2-tosylpropanoyl)benzonitrile

4x was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

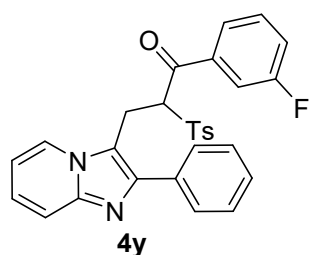
Yellow solid, mp 104-106 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.11 (d, *J* = 7.0 Hz, 1H), 7.57 – 7.54 (m, 4H), 7.50 – 7.46 (m, 3H), 7.40 – 7.39 (m, 3H), 7.32 (d, *J* = 8.5 Hz, 2H), 7.28 (d, *J* = 8.0 Hz, 2H), 7.16 – 7.13 (m, 1H), 6.84 (t, *J* = 6.5 Hz, 1H), 5.33 – 5.31 (m, 1H), 3.98 – 3.91 (m, 2H), 2.44 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 191.1, 146.2, 145.0, 143.2, 139.2, 134.0, 133.4, 132.3, 130.0, 129.2, 129.0, 128.8, 128.3, 127.9, 124.7, 123.3, 117.5, 117.5, 117.0, 113.8, 112.7, 67.1, 22.1, 21.8.

IR (KBr): 2923, 2886, 2205, 1651, 1380, 1256, 1045, 879, 614 cm⁻¹.

HRMS for C₃₀H₂₄N₃O₃S⁺ (M+H)⁺: calcd. 506.15329, found 506.15375.



1-(3-(2-phenylimidazo[1,2-a]pyridin-3-yl)-2-tosylpropan-1-one)-3-fluorophenyl

4y was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

Yellow solid, mp 170-172 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.14 (d, *J* = 7.0 Hz, 1H), 7.61 – 7.56 (m, 4H), 7.49 (d, *J* = 9.0 Hz, 1H), 7.43 – 7.39 (m, 3H), 7.25 (d, *J* = 8.0 Hz, 2H), 7.17 – 7.08 (m, 3H), 7.01 (d, *J* = 7.5 Hz, 1H), 6.96 (d, *J* = 9.0 Hz, 1H), 6.83 (td, *J* = 7.0, 1.0 Hz, 1H), 5.31 – 5.28 (m, 1H), 4.01 – 3.94 (m, 2H), 2.41 (s, 3H).

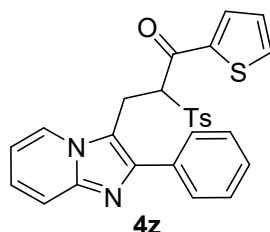
¹³C NMR (126 MHz, CDCl₃) δ 190.8 (d, *J*_{C-F} = 2.3 Hz), 162.4 (d, *J*_{C-F} = 248.3 Hz), 145.9, 144.9, 143.3,

138.3 (d, $J_{C-F} = 6.5$ Hz), 134.0, 133.6, 130.2 (d, $J_{C-F} = 8.0$ Hz), 129.9, 129.2, 128.9, 128.1, 127.9, 124.6, 124.3 (d, $J_{C-F} = 2.7$ Hz), 123.4, 121.0 (d, $J_{C-F} = 20.9$ Hz), 117.4, 115.0 (d, $J_{C-F} = 22.8$ Hz), 114.0, 112.6, 67.0, 22.0, 21.7.

^{19}F NMR (470 MHz, CDCl_3): δ -111.33.

IR (KBr): 2920, 1682, 1590, 1441, 1303, 1258, 1142, 791, 723, 669 cm^{-1} .

HRMS for $\text{C}_{29}\text{H}_{24}\text{FN}_2\text{O}_3\text{S}^+$ (M+H) $^+$: calcd. 499.14862, found 499.14896.



3-(2-phenylimidazo[1,2-a]pyridin-3-yl)-1-(thiophen-2-yl)-2-tosylpropan-1-one

4z was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

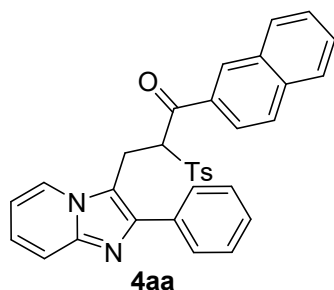
Yellow solid, mp 174-176 $^{\circ}\text{C}$.

^1H NMR (500 MHz, CDCl_3) δ 8.16 (d, $J = 7.0$ Hz, 1H), 7.67 – 7.63 (m, 4H), 7.55 – 7.52 (m, 2H), 7.45 – 7.39 (m, 3H), 7.29 (d, $J = 8.0$ Hz, 2H), 7.17 – 7.14 (m, 1H), 7.01 – 7.00 (m, 1H), 6.87 – 6.83 (m, 2H), 5.10 – 5.07 (m, 1H), 4.02 – 3.92 (m, 2H), 2.44 (s, 3H).

^{13}C NMR (126 MHz, CDCl_3) δ 183.7, 145.9, 145.0, 143.6, 143.4, 136.5, 134.4, 134.0, 133.7, 129.9, 129.5, 128.9, 128.5, 128.2, 128.0, 124.7, 123.6, 117.5, 114.3, 112.7, 69.0, 22.2, 21.8.

IR (KBr): 2921, 1654, 1516, 1411, 1328, 1259, 1146, 1071, 831, 725 cm^{-1} .

HRMS for $\text{C}_{27}\text{H}_{23}\text{N}_2\text{O}_3\text{S}_2^+$ (M+H) $^+$: calcd. 487.11446, found 487.11472.



1-(naphthalen-2-yl)-3-(2-phenylimidazo[1,2-a]pyridin-3-yl)-2-tosylpropan-1-one

4aa was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

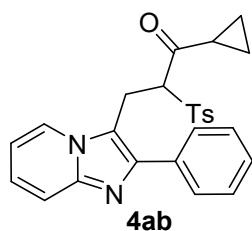
Yellow solid, mp 95-97 $^{\circ}\text{C}$.

^1H NMR (500 MHz, CDCl_3) δ 8.19 (d, $J = 6.5$ Hz, 1H), 7.70 – 7.67 (m, 3H), 7.61 – 7.54 (m, 4H), 7.52 – 7.43 (m, 8H), 7.14 (d, $J = 8.0$ Hz, 2H), 7.08 (t, $J = 7.5$ Hz, 1H), 6.81 (t, $J = 6.5$ Hz, 1H), 5.57 – 5.54 (m, 1H), 4.08 – 4.05 (m, 2H), 2.24 (s, 3H).

^{13}C NMR (126 MHz, CDCl_3) δ 191.6, 145.7, 144.9, 143.2, 135.6, 134.3, 133.8, 131.8, 131.0, 129.8, 129.1, 129.1, 128.9, 128.4, 128.1, 128.1, 127.6, 126.9, 124.4, 123.5, 123.3, 117.4, 114.4, 112.5, 66.8, 21.9, 21.5.

IR (KBr): 2920, 1672, 1625, 1594, 1355, 1317, 1083, 810, 750, 703 cm^{-1} .

HRMS for $\text{C}_{33}\text{H}_{27}\text{N}_2\text{O}_3\text{S}^+$ (M+H) $^+$: calcd. 531.17369, found 531.17383.



1-cyclopropyl-3-(2-phenylimidazo[1,2-a]pyridin-3-yl)-2-tosylpropan-1-one

4ab was purified by silica gel chromatography (petroleum ether/ethyl acetate = 1:1 to 1:2).

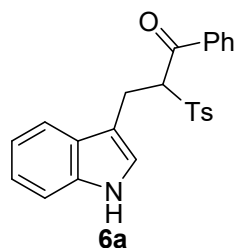
Yellow solid, mp 141-143 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.08 (d, *J* = 6.5 Hz, 1H), 7.69 (m, 4H), 7.57 (d, *J* = 9.5 Hz, 1H), 7.42 (t, *J* = 7.5 Hz, 2H), 7.37 – 7.33 (m, 3H), 7.19 – 7.16 (m, 1H), 6.83 (t, *J* = 7.0 Hz, 1H), 4.53 – 4.51 (m, 1H), 3.94 – 3.79 (m, 2H), 2.46 (s, 3H), 1.86 – 1.81 (m, 1H), 0.90 – 0.86 (m, 1H), 0.72 – 0.68 (m, 2H), 0.53 – 0.49 (m, 1H).

¹³C NMR (126 MHz, CDCl₃) δ 201.6, 145.9, 145.0, 143.5, 134.1, 133.8, 130.0, 129.2, 128.8, 128.0, 128.0, 124.6, 123.6, 117.6, 114.3, 112.5, 73.0, 23.1, 21.8, 21.3, 14.1, 13.1.

IR (KBr): 2917, 1679, 1447, 1305, 1142, 963, 783, 689 cm⁻¹.

HRMS for C₂₆H₂₅N₂O₃S⁺ (M+H)⁺: calcd. 445.15804, found 445.15823.



3-(1H-indol-3-yl)-1-phenyl-2-tosylpropan-1-one

6a was purified by silica gel chromatography (petroleum ether/ethyl acetate = 4:1 to 2:1).

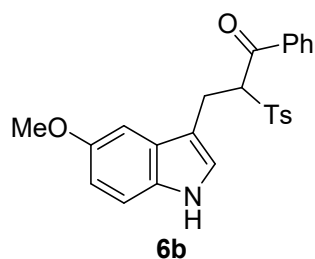
Yellow solid, mp 173-175 °C.

¹H NMR (500 MHz, DMSO-*d*₆) δ 10.8 (s, 1H), 7.90 (d, *J* = 7.5 Hz, 2H), 7.79 (d, *J* = 8.0 Hz, 2H), 7.58 (t, *J* = 7.5 Hz, 1H), 7.45 (d, *J* = 8.0 Hz, 2H), 7.43 – 7.40 (m, 3H), 7.25 (d, *J* = 8.0 Hz, 1H), 7.05 – 7.02 (m, 2H), 6.97 (t, *J* = 7.0 Hz, 1H), 6.02 – 5.99 (m, 1H), 3.55 – 3.49 (m, 1H), 3.70 – 3.34 (m, 1H), 2.42 (s, 3H).

¹³C NMR (126 MHz, DMSO-*d*₆) δ 192.2, 145.2, 136.8, 135.9, 134.0, 133.9, 129.8, 129.3, 128.9, 128.6, 126.5, 123.5, 121.2, 118.7, 117.9, 111.5, 108.3, 68.2, 23.2, 21.1.

IR (KBr): 2923, 1673, 1594, 1457, 1289, 1128, 1201, 1084, 866, 744 cm⁻¹.

HRMS for C₂₄H₂₀NO₃S⁻ (M-H)⁻: calcd. 402.11584, found 402.11649.



3-(5-methoxy-1H-indol-3-yl)-1-phenyl-2-tosylpropan-1-one

6b was purified by silica gel chromatography (petroleum ether/ethyl acetate = 4:1 to 2:1).

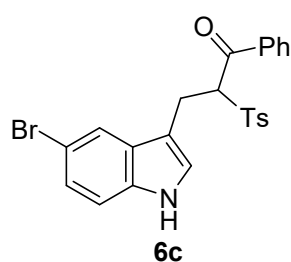
Yellow solid, mp 168-170 °C.

¹H NMR (500 MHz, DMSO-d₆) δ 10.7 (s, 1H), 7.95 (d, *J* = 7.5 Hz, 2H), 7.87 (d, *J* = 8.0 Hz, 2H), 7.58 (d, *J* = 7.5 Hz, 1H), 7.46 – 7.41 (m, 4H), 7.18 (d, *J* = 8.5 Hz, 1H), 7.00 (d, *J* = 1.5 Hz, 1H), 6.82 (d, *J* = 1.5 Hz, 1H), 6.71 (dd, *J* = 8.5, 2.0 Hz, 1H), 5.97 (dd, *J* = 11.5, 2.5 Hz, 1H), 3.75 (s, 3H), 3.61 – 3.56 (m, 1H), 3.36 – 3.33 (m, 1H), 2.39 (s, 3H).

¹³C NMR (126 MHz, DMSO-d₆) δ 192.6, 153.7, 145.7, 137.3, 134.7, 134.4, 131.5, 130.3, 129.7, 129.4, 129.1, 127.3, 124.6, 112.7, 112.0, 108.6, 100.0, 68.7, 55.7, 23.9, 21.6.

IR (KBr): 2922, 1678, 1593, 1447, 1316, 1206, 1145, 1071, 746 cm⁻¹.

HRMS for C₂₅H₂₂NO₄S⁻ (M-H)⁻: calcd. 432.12641, found 432.12585



3-(5-bromo-1H-indol-3-yl)-1-phenyl-2-tosylpropan-1-one

6c was purified by silica gel chromatography (petroleum ether/ethyl acetate = 3:1 to 1:1).

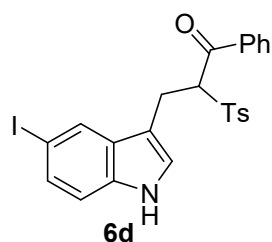
Yellow solid, mp 171-173 °C.

¹H NMR (500 MHz, CDCl₃) δ 11.0 (s, 1H), 7.94 (d, *J* = 7.5 Hz, 2H), 7.82 (d, *J* = 8.5 Hz, 2H), 7.57 (d, *J* = 7.5 Hz, 1H), 7.54 – 7.52 (m, 1H), 7.45 – 7.40 (m, 4H), 7.24 (d, *J* = 8.5 Hz, 1H), 7.16 – 7.13 (m, 2H), 6.61 (dd, *J* = 11.5, 3.0 Hz, 1H), 3.56 – 3.51 (m, 1H), 3.38 – 3.35 (m, 1H), 2.40 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 192.3, 145.2, 136.8, 134.6, 134.1, 134.0, 129.8, 129.3, 129.0, 128.6, 128.4, 125.3, 123.7, 120.4, 113.5, 111.4, 108.4, 68.4, 23.0, 21.2.

IR (KBr): 2924, 2883, 1651, 1381, 1207, 1087, 1044, 879, 627 cm⁻¹.

HRMS for C₂₄H₁₉BrNO₃S⁻ (M-H)⁻: calcd. 480.02635, found 480.02612



3-(5-iodo-1H-indol-3-yl)-1-phenyl-2-tosylpropan-1-one

6d was purified by silica gel chromatography (petroleum ether/ethyl acetate = 3:1 to 1:1).

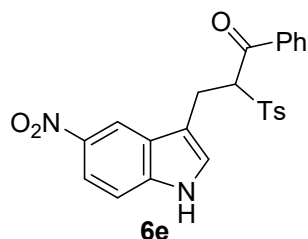
Yellow solid, mp 180-182 °C.

¹H NMR (500 MHz, DMSO-d₆) δ 11.0 (s, 1H), 7.94 (d, *J* = 7.5 Hz, 2H), 7.81 (d, *J* = 8.0 Hz, 2H), 7.67 (s, 1H), 7.57 (t, *J* = 7.5 Hz, 1H), 7.46 – 7.40 (m, 4H), 7.28 (d, *J* = 8.5 Hz, 1H), 7.12 (d, *J* = 8.0 Hz, 1H), 7.06 (s, 1H), 6.00 (dd, *J* = 11.0, 2.5 Hz, 1H), 3.52 – 3.37 (m, 1H), 3.33 – 3.03 (m, 1H), 2.31 (s, 3H).

¹³C NMR (126 MHz, DMSO-d₆) δ 192.7, 145.7, 137.3, 135.4, 134.5, 134.5, 130.3, 129.8, 129.6, 129.5, 129.1, 127.0, 125.3, 114.4, 108.5, 83.0, 68.8, 23.5, 21.7.

IR (KBr): 2921, 1664, 1595, 1273, 1446, 1240, 1077, 746, 683 cm^{-1} .

HRMS for $\text{C}_{24}\text{H}_{19}\text{INO}_3\text{S}^-$ (M-H): calcd. 528.01248, found 528.01251.



3-(5-nitro-1H-indol-3-yl)-1-phenyl-2-tosylpropan-1-one

6e was purified by silica gel chromatography (petroleum ether/ethyl acetate = 5:1 to 3:1).

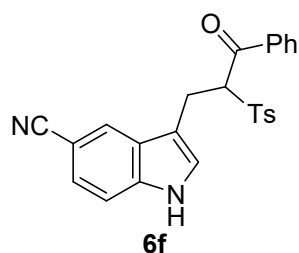
Yellow solid, mp 194-196 $^{\circ}\text{C}$.

^1H NMR (500 MHz, DMSO-d_6) δ 11.6 (s, 1H), 8.39 (d, $J = 2.0$ Hz, 1H), 7.94 – 7.91 (m, 3H), 7.78 (d, $J = 8.0$ Hz, 2H), 7.58 (t, $J = 7.5$ Hz, 1H), 7.46 – 7.39 (m, 5H), 7.32 (d, $J = 2.0$ Hz, 1H), 6.11 – 6.08 (m, 1H), 3.59 – 3.53 (m, 1H), 3.44 – 3.41 (m, 1H), 2.42 (s, 3H).

^{13}C NMR (126 MHz, DMSO-d_6) δ 192.3, 145.3, 140.5, 139.0, 136.7, 134.0, 134.0, 129.8, 129.2, 129.0, 128.6, 127.8, 125.9, 116.6, 115.6, 111.9, 111.5, 68.3, 22.8, 21.1.

IR (KBr): 2923, 1653, 1329, 1141, 1079, 811, 738, 680 cm^{-1} .

HRMS for $\text{C}_{24}\text{H}_{19}\text{N}_2\text{O}_5\text{S}^-$ (M-H): calcd. 447.10092, found 447.10168.



3-(3-oxo-3-phenyl-2-tosylpropyl)-1H-indole-5-carbonitrile

6f was purified by silica gel chromatography (petroleum ether/ethyl acetate = 5:1 to 3:1).

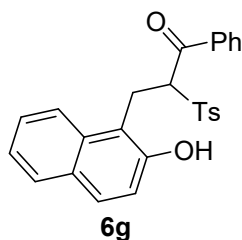
Yellow solid, mp 81-83 $^{\circ}\text{C}$.

^1H NMR (500 MHz, DMSO-d_6) δ 11.4 (s, 1H), 7.91 (d, $J = 7.5$ Hz, 2H), 7.78 – 7.77 (m, 3H), 7.62 (d, $J = 8.0$ Hz, 1H), 7.57 (t, $J = 7.5$ Hz, 1H), 7.43 – 7.39 (m, 5H), 7.32 (dd, $J = 8.0, 1.0$ Hz, 1H), 6.10 (dd, $J = 11.0, 3.0$ Hz, 1H), 3.59 – 3.54 (m, 1H), 3.44 – 3.40 (m, 1H), 2.38 (s, 3H).

^{13}C NMR (126 MHz, DMSO-d_6) δ 192.2, 145.2, 136.7, 134.6, 134.0, 134.0, 129.8, 129.6, 129.3, 128.9, 128.6, 128.5, 121.4, 120.6, 119.4, 116.5, 109.6, 102.6, 68.2, 22.8, 21.1.

IR (KBr): 2922, 2217, 1675, 1594, 1301, 1233, 1144, 1082, 747, 711 cm^{-1} .

HRMS for $\text{C}_{25}\text{H}_{19}\text{N}_2\text{O}_3\text{S}^-$ (M-H): calcd. 427.11109, found 427.11047



3-(2-hydroxynaphthalen-1-yl)-1-phenyl-2-tosylpropan-1-one

6g was purified by silica gel chromatography (petroleum ether/ethyl acetate = 4:1 to 2:1).

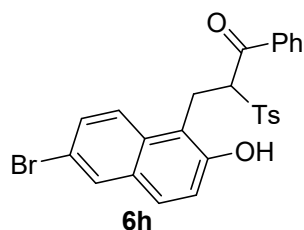
Yellow solid, mp 173-175 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.87 (d, *J* = 8.5 Hz, 1H), 7.74 – 7.70 (m, 5H), 7.58 – 7.51 (m, 2H), 7.45 (t, *J* = 7.5 Hz, 1H), 7.34 – 7.31 (m, 3H), 7.26 (t, *J* = 7.5 Hz, 2H), 7.01 (d, *J* = 8.5 Hz, 1H), 6.90 (s, 1H), 5.62 – 5.59 (m, 1H), 3.88 – 3.84 (m, 1H), 3.76 – 3.70 (m, 1H), 2.44 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 194.5, 152.0, 146.0, 136.4, 134.6, 133.1, 132.7, 129.9, 129.8, 129.7, 129.6, 129.4, 129.0, 128.6, 127.4, 123.5, 121.7, 119.2, 113.0, 69.6, 23.6, 21.8.

IR (KBr): 2923, 1676, 1595, 1438, 1287, 1209, 1138, 992, 808, 742 cm⁻¹.

HRMS for C₂₆H₂₁O₄S⁻ (M-H): calcd. 429.11551, found 429.11618.



3-(6-bromo-2-hydroxynaphthalen-1-yl)-1-phenyl-2-tosylpropan-1-one

6h was purified by silica gel chromatography (petroleum ether/ethyl acetate = 4:1 to 2:1).

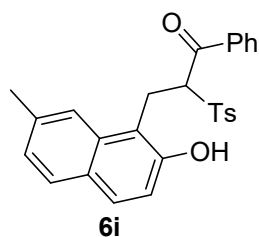
Yellow solid, mp 165-167 °C.

¹H NMR (500 MHz, DMSO-*d*₆) δ 10.2 (s, 1H), 7.94 (d, *J* = 1.5 Hz, 1H), 7.84 (d, *J* = 8.0 Hz, 2H), 7.70 (d, *J* = 11.0 Hz, 1H), 7.59 – 7.56 (m, 3H), 7.53 – 7.50 (m, 2H), 7.45 (d, *J* = 8.0 Hz, 2H), 7.33 (t, *J* = 7.5 Hz, 2H), 7.06 (d, *J* = 9.5 Hz, 1H), 5.81 – 5.78 (m, 1H), 3.81 – 3.76 (m, 1H), 3.55 – 3.52 (m, 1H), 2.42 (s, 3H).

¹³C NMR (126 MHz, DMSO-*d*₆) δ 192.3, 153.7, 145.2, 136.9, 134.5, 133.8, 131.2, 130.0, 129.9, 129.3, 129.2, 128.6, 128.1, 128.1, 124.7, 118.6, 115.3, 113.4, 66.9, 23.9, 21.2.

IR (KBr): 2922, 1675, 1501, 1273, 1199, 808, 753, 668 cm⁻¹.

HRMS for C₂₆H₂₀BrO₄S⁻ (M-H): calcd. 507.02602, found 507.02655.



3-(2-hydroxy-7-methylnaphthalen-1-yl)-1-phenyl-2-tosylpropan-1-one

6i was purified by silica gel chromatography (petroleum ether/ethyl acetate = 4:1 to 2:1).

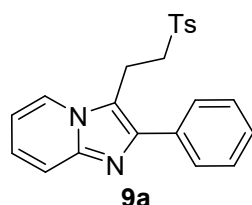
Yellow solid, mp 202-204 °C.

¹H NMR (500 MHz, DMSO-*d*₆) δ 9.87 (s, 1H), 7.91 (d, *J* = 8.0 Hz, 2H), 7.59 – 7.48 (m, 7H), 7.36 (s, 1H), 7.32 (t, *J* = 7.5 Hz, 2H), 7.06 (d, *J* = 8.5 Hz, 1H), 6.89 (d, *J* = 9.0 Hz, 1H), 5.69 (dd, *J* = 10.0, 2.0 Hz, 1H), 3.86 – 3.81 (m, 1H), 3.49 – 3.45 (m, 1H), 2.43 (s, 3H), 2.37 (s, 3H).

¹³C NMR (126 MHz, DMSO-*d*₆) δ 192.3, 153.4, 145.3, 137.1, 135.7, 134.7, 133.8, 132.8, 130.1, 129.3, 128.7, 128.6, 128.4, 128.2, 126.3, 124.6, 121.1, 116.5, 112.2, 67.2, 24.1, 22.0, 21.3.

IR (KBr): 2924, 2881, 1650, 1381, 1087, 1044, 879, 763 cm⁻¹.

HRMS for C₂₇H₂₃O₄S⁻ (M-H)⁻: calcd. 443.13116, found 443.13104.



2-phenyl-3-(2-tosylethyl)imidazo[1,2-a]pyridine

9a was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

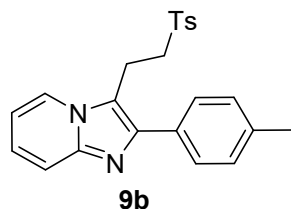
Yellow solid, mp 180-182 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.84 (d, *J* = 6.5 Hz, 1H), 7.66 (d, *J* = 8.0 Hz, 2H), 7.51 (d, *J* = 9.0 Hz, 1H), 7.47 (d, *J* = 7.0 Hz, 2H), 7.28 – 7.23 (m, 5H), 7.10 (t, *J* = 7.5 Hz, 1H), 6.77 (t, *J* = 7.0 Hz, 1H), 3.46 – 3.43 (m, 2H), 3.28 – 3.25 (m, 2H), 2.36 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 145.2, 144.8, 143.3, 135.4, 134.0, 130.1, 128.7, 128.0, 127.9, 127.9, 124.4, 122.7, 117.8, 115.3, 112.8, 53.2, 21.7, 17.7.

IR (KBr) 2920, 1595, 1449, 1358, 1288, 1138, 1085, 812, 777, 730 cm⁻¹.

HRMS for C₂₂H₂₁N₂O₂S⁺ (M+H)⁺: calcd. 377.13183, found 377.13199.



2-(p-tolyl)-3-(2-tosylethyl)imidazo[1,2-a]pyridine

9b was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

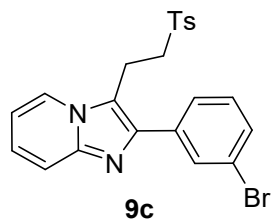
Yellow solid, mp 203-205 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.84 (d, *J* = 7.0 Hz, 1H), 7.67 (d, *J* = 8.0 Hz, 2H), 7.51 (d, *J* = 9.0 Hz, 1H), 7.37 (d, *J* = 7.5 Hz, 2H), 7.26 (d, *J* = 8.0 Hz, 2H), 7.12 – 7.07 (m, 3H), 6.77 (t, *J* = 7.0 Hz, 1H), 3.46 – 3.43 (m, 2H), 3.29 – 3.25 (m, 2H), 2.38 (s, 3H), 2.30 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 145.2, 144.8, 143.4, 137.7, 135.5, 131.2, 130.1, 129.5, 128.0, 127.7, 124.3, 122.6, 117.8, 115.0, 112.8, 53.2, 21.8, 21.3, 17.8.

IR (KBr) 2920, 1501, 1404, 1355, 1290, 1232, 1142, 1084, 822, 734 cm⁻¹.

HRMS for C₂₃H₂₃N₂O₂S⁺ (M+H)⁺: calcd. 391.14748, found 391.14713



2-(3-bromophenyl)-3-(2-tosylethyl)imidazo[1,2-a]pyridine

9c was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

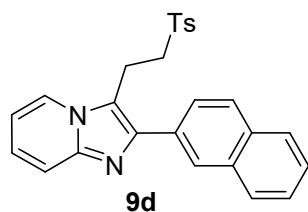
Yellow solid, mp 181-183 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.87 (d, *J* = 7.0 Hz, 1H), 7.72 (s, 1H), 7.63 (d, *J* = 8.0 Hz, 2H), 7.50 (d, *J* = 9.0 Hz, 1H), 7.35 (t, *J* = 7.5 Hz, 2H), 7.24 (d, *J* = 8.0 Hz, 2H), 7.14 – 7.10 (m, 2H), 6.79 (t, *J* = 7.0 Hz, 1H), 3.45 – 3.42 (m, 2H), 3.28 – 3.24 (m, 2H), 2.36 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 145.3, 144.9, 141.7, 136.2, 135.3, 131.0, 130.8, 130.2, 127.8, 126.1, 124.8, 123.0, 122.8, 117.9, 115.7, 113.1, 53.1, 21.7, 17.7.

IR (KBr) 1592, 1505, 1355, 1298, 1284, 1150, 1086, 891, 807, 731 cm⁻¹.

HRMS for C₂₂H₂₀BrN₂O₂S⁺ (M+H)⁺: calcd. 455.04234, found 455.04208



2-(naphthalen-2-yl)-3-(2-tosylethyl)imidazo[1,2-a]pyridine

9d was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

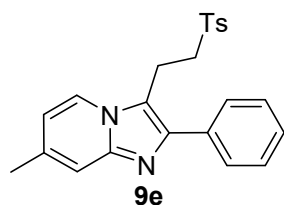
Yellow solid, mp 199-201 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.97 (s, 1H), 7.90 (d, *J* = 6.5 Hz, 1H), 7.75 (d, *J* = 8.0 Hz, 2H), 7.72 – 7.71 (m, 1H), 7.68 – 7.64 (m, 3H), 7.57 (d, *J* = 9.0 Hz, 1H), 7.42 – 7.41 (m, 2H), 7.21 (d, *J* = 8.0 Hz, 2H), 7.15 (t, *J* = 8.0 Hz, 1H), 6.81 (d, *J* = 7.0 Hz, 1H), 3.57 – 3.54 (m, 2H), 3.32 – 3.29 (m, 2H), 2.35 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 145.3, 145.1, 143.3, 135.5, 133.5, 132.9, 131.5, 130.2, 128.5, 128.4, 128.0, 127.8, 126.9, 126.4, 126.4, 125.8, 124.6, 122.7, 118.0, 115.7, 113.0, 53.3, 21.8, 18.0.

IR (KBr) 2923, 1496, 1363, 1299, 1230, 1145, 1083, 889, 861, 757 cm⁻¹.

HRMS for C₂₆H₂₃N₂O₂S⁺ (M+H)⁺: calcd. 427.14748, found 427.14731



7-methyl-2-phenyl-3-(2-tosylethyl)imidazo[1,2-a]pyridine

9e was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

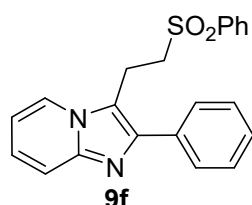
Yellow solid, mp 195-197 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.75 (d, *J* = 7.0 Hz, 1H), 7.68 (d, *J* = 8.0 Hz, 2H), 7.48 – 7.46 (m, 2H), 7.29 – 7.22 (m, 6H), 6.63 (dd, *J* = 7.0, 1.0 Hz, 1H), 3.45 – 3.42 (m, 2H), 3.28 – 3.25 (m, 2H), 2.39 (s, 3H), 2.33 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 145.2, 145.1, 142.8, 135.4, 134.2, 130.1, 128.7, 128.0, 127.8, 127.7, 121.9, 116.2, 115.4, 114.6, 53.3, 21.7, 21.3, 17.7.

IR (KBr) 2922, 1444, 1359, 1308, 1232, 1140, 1086, 816, 772, 693 cm⁻¹.

HRMS for C₂₃H₂₃N₂O₂S⁺ (M+H)⁺: calcd. 391.14748, found 391.14749



2-phenyl-3-(2-(phenylsulfonyl)ethyl)imidazo[1,2-a]pyridine

9f was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

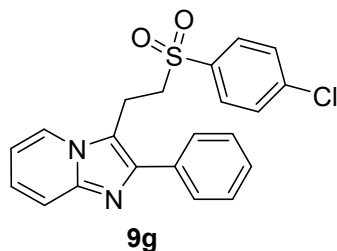
Yellow solid, mp 180-182 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.86 (d, *J* = 8.0 Hz, 1H), 7.78 (d, *J* = 7.5 Hz, 2H), 7.59 (d, *J* = 7.5 Hz, 1H), 7.52 (d, *J* = 9.0 Hz, 1H), 7.48 – 7.45 (m, 4H), 7.29 – 7.22 (m, 3H), 7.13 – 7.10 (m, 1H), 6.80 – 6.77 (m, 1H), 3.49 – 3.46 (m, 2H), 3.31- 3.27 (m, 2H).

¹³C NMR (126 MHz, CDCl₃) δ 144.9, 143.4, 138.4, 134.1, 134.0, 129.5, 128.8, 128.0, 127.9, 124.5, 122.6, 117.9, 115.1, 112.9, 53.1, 17.7.

IR (KBr) 2921, 1597, 1447, 1358, 1295, 1235, 1083, 804, 731 cm⁻¹.

HRMS for C₂₁H₁₉N₂O₂S⁺ (M+H)⁺: calcd. 363.11617, found 363.11624



3-(2-((4-chlorophenyl)sulfonyl)ethyl)-2-phenylimidazo[1,2-a]pyridine

9g was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

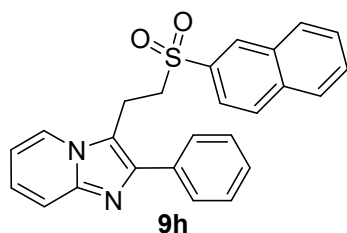
Yellow solid, mp 203-205 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.89 (d, *J* = 7.0 Hz, 1H), 7.67 (d, *J* = 8.5 Hz, 2H), 7.54 (d, *J* = 9.0 Hz, 1H), 7.49 – 7.47 (m, 2H), 7.41 (d, *J* = 8.5 Hz, 2H), 7.33 – 7.28 (m, 3H), 7.16 – 7.13 (m, 1H), 6.82 (t, *J* = 6.5 Hz, 1H), 3.52 – 3.48 (m, 2H), 3.31 – 3.28 (m, 2H).

¹³C NMR (126 MHz, CDCl₃) δ 144.9, 143.5, 141.0, 136.9, 134.0, 129.8, 129.4, 128.9, 128.1, 127.9, 124.5, 122.6, 118.0, 115.0, 113.0, 53.3, 17.7.

IR (KBr) 2920, 1581, 1394, 1358, 1321, 1147, 1086, 836, 766 cm⁻¹.

HRMS for C₂₁H₁₈ClN₂O₂S⁺ (M+H)⁺: calcd. 397.07720, found 397.07721



3-(2-(naphthalen-2-ylsulfonyl)ethyl)-2-phenylimidazo[1,2-a]pyridine

9h was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

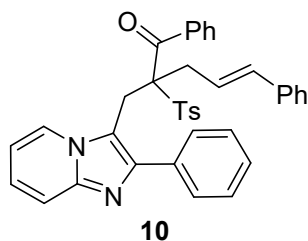
Yellow solid, mp 176-178 °C.

¹H NMR (500 MHz, CDCl₃) δ 8.30 (s, 1H), 7.85 – 7.80 (m, 4H), 7.65 (dd, *J* = 8.5, 1.5 Hz, 1H), 7.57 (t, *J* = 7.5 Hz, 1H), 7.51 (t, *J* = 7.5 Hz, 1H), 7.42 – 7.37 (m, 3H), 7.13 – 7.08 (m, 3H), 7.02 (t, *J* = 7.5 Hz, 1H), 6.71 (t, *J* = 6.5 Hz, 1H), 3.48 – 3.44 (m, 2H), 3.35 – 3.32 (m, 2H).

¹³C NMR (126 MHz, CDCl₃) δ 144.7, 143.2, 135.3, 135.1, 133.9, 132.0, 129.8, 129.7, 129.5, 129.5, 128.6, 128.0, 127.9, 127.8, 127.7, 124.4, 122.6, 122.3, 117.7, 115.1, 112.7, 53.1, 17.7.

IR (KBr) 2995, 1502, 1449, 1361, 1237, 1145, 1128, 1071, 817, 734 cm⁻¹.

HRMS for C₂₅H₂₁N₂O₂S⁺ (M+H)⁺: calcd. 413.13183, found 413.13150



(E)-1,5-diphenyl-2-((2-phenylimidazo[1,2-a]pyridin-3-yl)methyl)-2-tosylpent-4-en-1-one

Yellow solid, mp 79-81 °C.

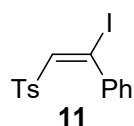
10 was purified by silica gel chromatography (petroleum ether/ethyl acetate = 2:1 to 1:1).

¹H NMR (500 MHz, CDCl₃) δ 8.40 (d, *J* = 6.5 Hz, 1H), 7.77 (d, *J* = 7.0 Hz, 2H), 7.46 (d, *J* = 9.0 Hz, 1H), 7.37 – 7.32 (m, 3H), 7.28 – 7.22 (m, 3H), 7.19 – 7.14 (m, 3H), 6.99 – 6.95 (m, 7H), 6.88 (d, *J* = 8.0 Hz, 2H), 6.70 (t, *J* = 7.0 Hz, 1H), 5.86 (d, *J* = 16.0 Hz, 1H), 5.35 – 5.29 (m, 1H), 4.43 (s, 2H), 3.75 (d, *J* = 6.5 Hz, 2H), 2.22 (s, 3H).

¹³C NMR (126 MHz, CDCl₃) δ 165.9, 144.4, 143.9, 143.2, 138.8, 135.7, 135.2, 134.8, 131.4, 130.3, 130.2, 129.1, 129.0, 128.6, 128.5, 128.2, 127.9, 127.5, 126.9, 126.7, 124.6, 123.7, 122.8, 118.9, 117.4, 117.0, 112.0, 70.2, 22.7, 21.5

IR (KBr) 1612, 1590, 1488, 1306, 1250, 1149, 1126, 1070, 965, 772 cm⁻¹.

HRMS for C₃₈H₃₃N₂O₃S⁺ (M+H)⁺: calcd. 597.22064, found .597.22089



(E)-1-((2-iodo-2-phenylvinyl)sulfonyl)-4-methylbenzene²

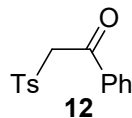
Yellow solid, mp 78-80 °C.

¹H NMR (500 MHz, CDCl₃) δ 7.44 (d, *J* = 8.0 Hz, 2H), 7.36 (s, 1H), 7.30 – 7.25 (m, 3H), 7.23 – 7.21

(m, 2H), 7.17 (d, $J = 8.5$ Hz, 2H), 2.37 (s, 3H).

^{13}C NMR (126 MHz, CDCl_3) δ 144.6, 141.3, 139.7, 137.3, 129.8, 129.7, 128.0, 127.9, 127.7, 114.3, 21.7.

IR (KBr): 2922, 2179, 1584, 1441, 1326, 1140, 1082, 858, 766, 748 cm^{-1} .



1-phenyl-2-tosylethan-1-one³

Yellow solid, mp 99-101 °C.

^1H NMR (500 MHz, CDCl_3) δ 7.93 – 7.91 (m, 2H), 7.75 (d, $J = 8.5$ Hz, 2H), 7.58 (t, $J = 8.5$ Hz, 1H), 7.44 (t, $J = 8.0$ Hz, 2H), 7.30 (d, $J = 8.0$ Hz, 2H), 4.73 (s, 2H), 2.41 (s, 3H).

^{13}C NMR (126 MHz, CDCl_3) δ 188.2, 145.3, 135.8, 135.7, 134.3, 129.8, 129.3, 128.8, 128.6, 63.5, 21.7.

IR (KBr): 2923, 1676, 1595, 1447, 1317, 1269, 1147, 992, 823, 736 cm^{-1} .

6 X-ray diffraction analysis of compound 4j

Sample preparation:

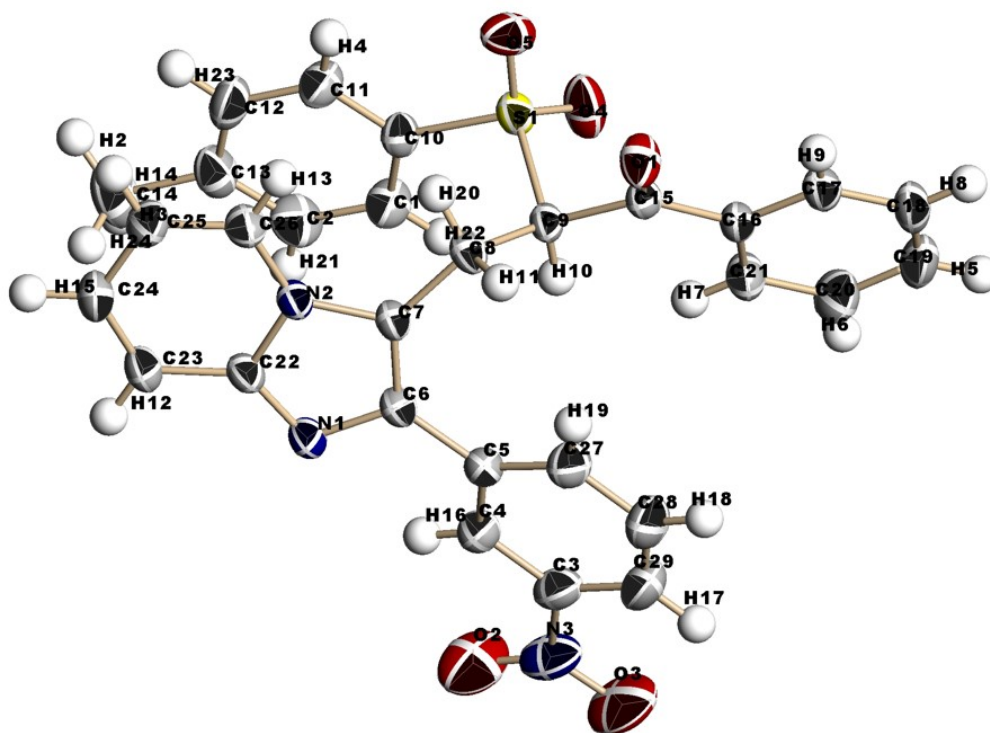
The method for crystal growth is slow volatilization using petroleum ether (PE)-ethyl acetate (EA) mixture as a solvent.

Crystal measurement for compound 4j:

A specimen of $\text{C}_{29}\text{H}_{23}\text{N}_3\text{O}_5\text{S}$, approximate dimensions 0.150 mm x 0.200 mm x 0.250 mm, was used for the X-ray crystallographic analysis. The X-ray intensity data were measured ($\lambda = 0.71073$ Å).

The integration of the data using a triclinic unit cell yielded a total of 31127 reflections to a maximum θ angle of 27.55° (0.77 Å resolution), of which 5555 were independent (average redundancy 5.603, completeness = 97.9%, $R_{\text{int}} = 6.02\%$, $R_{\text{sig}} = 4.41\%$) and 4432 (79.78%) were greater than $2\sigma(F^2)$. The final cell constants of $a = 7.1153(4)$ Å, $b = 12.1904(7)$ Å, $c = 14.8931(8)$ Å, $\alpha = 79.211(2)^\circ$, $\beta = 77.257(2)^\circ$, $\gamma = 80.078(2)^\circ$, volume = 1226.09(12) Å³, are based upon the refinement of the XYZ-centroids of reflections above 20 $\sigma(I)$. The calculated minimum and maximum transmission coefficients (based on crystal size) are 0.9560 and 0.9740.

The structure was solved and refined using the Bruker SHELXTL Software Package, using the space group P -1, with $Z = 2$ for the formula unit, $\text{C}_{29}\text{H}_{23}\text{N}_3\text{O}_5\text{S}$. The final anisotropic full-matrix least-squares refinement on F^2 with 344 variables converged at $R1 = 4.23\%$, for the observed data and $wR2 = 11.50\%$ for all data. The goodness-of-fit was 1.030. The largest peak in the final difference electron density synthesis was 0.345 $e^{-}/\text{Å}^3$ and the largest hole was -0.380 $e^{-}/\text{Å}^3$ with an RMS deviation of 0.054 $e^{-}/\text{Å}^3$. On the basis of the final model, the calculated density was 1.424 g/cm^3 and $F(000)$, 548 e^{-} .



Plots are drawn at 50% probability level.

Table S3. Crystal data and structure refinement for **4j**

Identification code	20220910ge1
Chemical formula	C ₂₉ H ₂₃ N ₃ O ₅ S
Formula weight	525.56 g/mol
Temperature	294(2) K
Wavelength	0.71073 Å
Crystal size	0.150 x 0.200 x 0.250 mm
Crystal system	triclinic
Space group	P -1
Unit cell dimensions	a = 7.1153(4) Å α = 79.211(2)° b = 12.1904(7) Å β = 77.257(2)° c = 14.8931(8) Å γ = 14.8931(8)°
Volume	1226.09(12) Å ³
Z	2
Density (calculated)	1.424 g/cm ³
Absorption coefficient	0.180 mm ⁻¹
F(000)	548
Theta range for data collection	2.39 to 27.55°
Index ranges	-9 ≤ h ≤ 9, -15 ≤ k ≤ 15, -18 ≤ l ≤ 19
Reflections collected	31127
Independent reflections	5555 [R(int) = 0.0602]
Max. and min. transmission	0.9740 and 0.9560
Structure solution technique	direct methods
Structure solution program	SHELXT 2018/2 (Sheldrick, 2018)

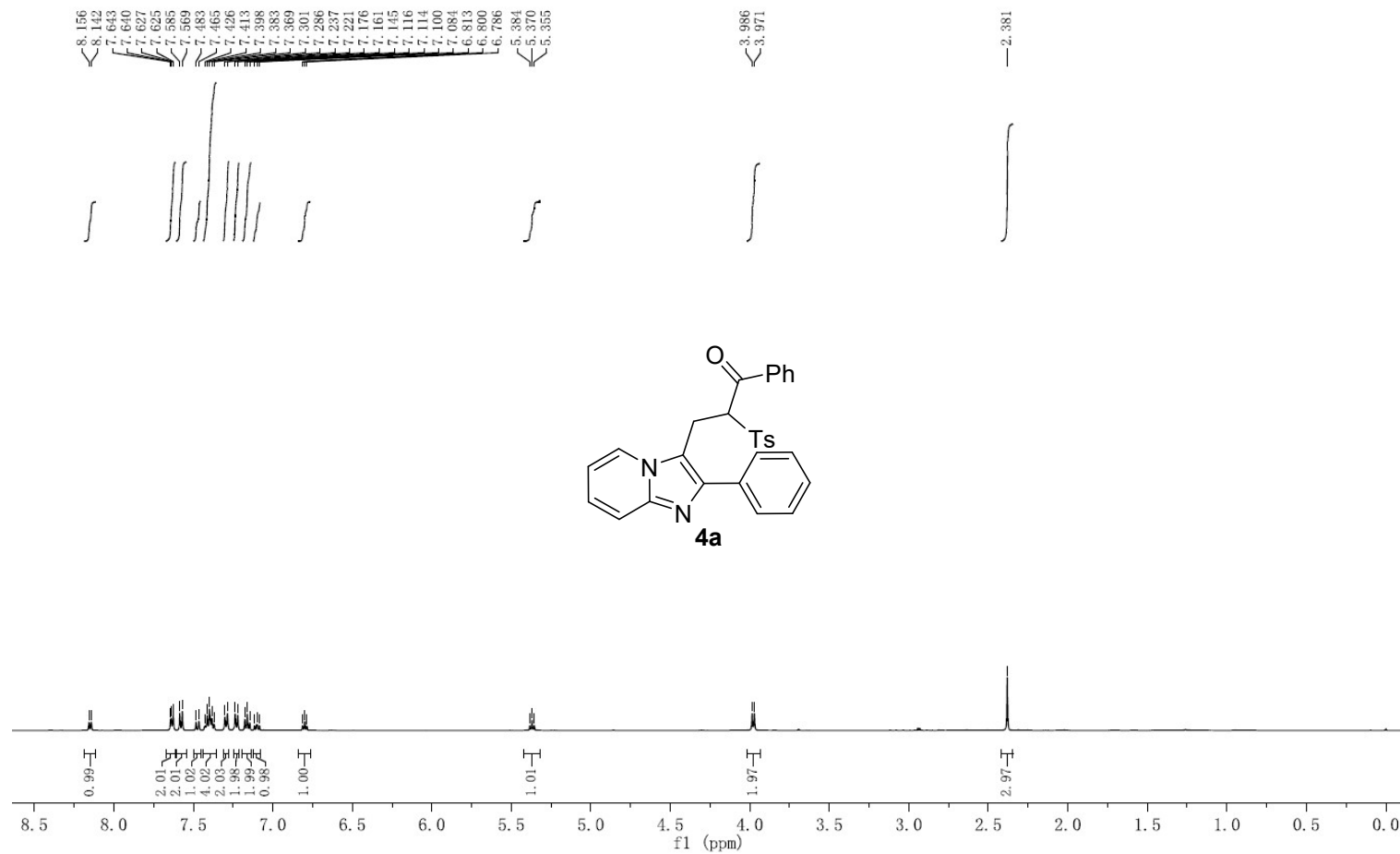
Refinement method	Full-matrix least-squares on F ²
Refinement program	SHELXL-2018/3 (Sheldrick, 2018)
Function minimized	$\Sigma w(F_o^2 - F_c^2)^2$
Data / restraints / parameters	5555 / 0 / 344
Goodness-of-fit on F ²	1.030
Δ/σ_{\max}	0.001
Final R indices	4432 data; I>2 σ (I) R1 = 0.0423, wR2 = 0.1072 all data R1 = 0.0580, wR2 = 0.1150
Weighting scheme	w=1/[$\sigma^2(F_o^2)+(0.0647P)^2+0.1359P$] where P=(F _o ² +2F _c ²)/3
Largest diff. peak and hole	0.345 and -0.380 eÅ ⁻³
R.M.S. deviation from mean	0.054 eÅ ⁻³

Reference:

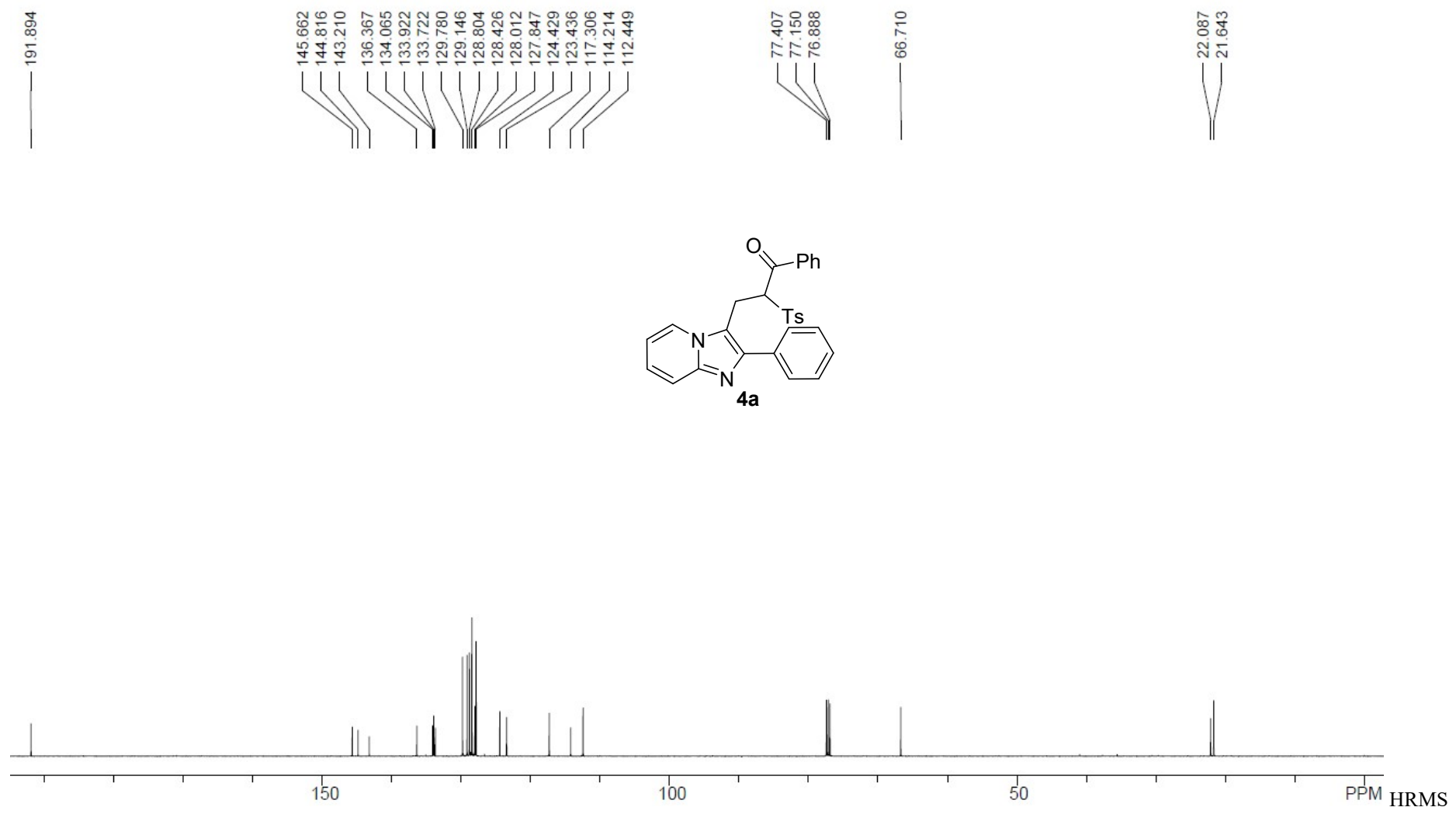
- (1) Mohan, D. C.; Donthiri, R. R.; Rao, S. N.; Adimurthya, S. Copper(I) iodide-catalysed aerobic oxidative synthesis of imidazo[1,2-a]pyridines from 2-aminopyridines and methyl ketones, *Adv. Synth. Catal.* **2013**, 355, 2217-2221.
- (2) Zhou, C.; Zeng, X. Iodosulfonylation of alkynes under ultrasound irradiation, *Synthesis*, **2021**, 53, 4614-4620.
- (3) Reddy, R. J.; Kumar, J. J.; Kumari, A. H. Unprecedented reactivity of β -iodovinyl sulfones: an efficient synthesis of β -keto sulfones and β -keto thiosulfones. *Eur. J. Org. Chem.*, **2019**, 3771-3775.

7 Copies of ^1H and ^{13}C NMR Spectra

^1H NMR (500 MHz, CDCl_3) of **4a**

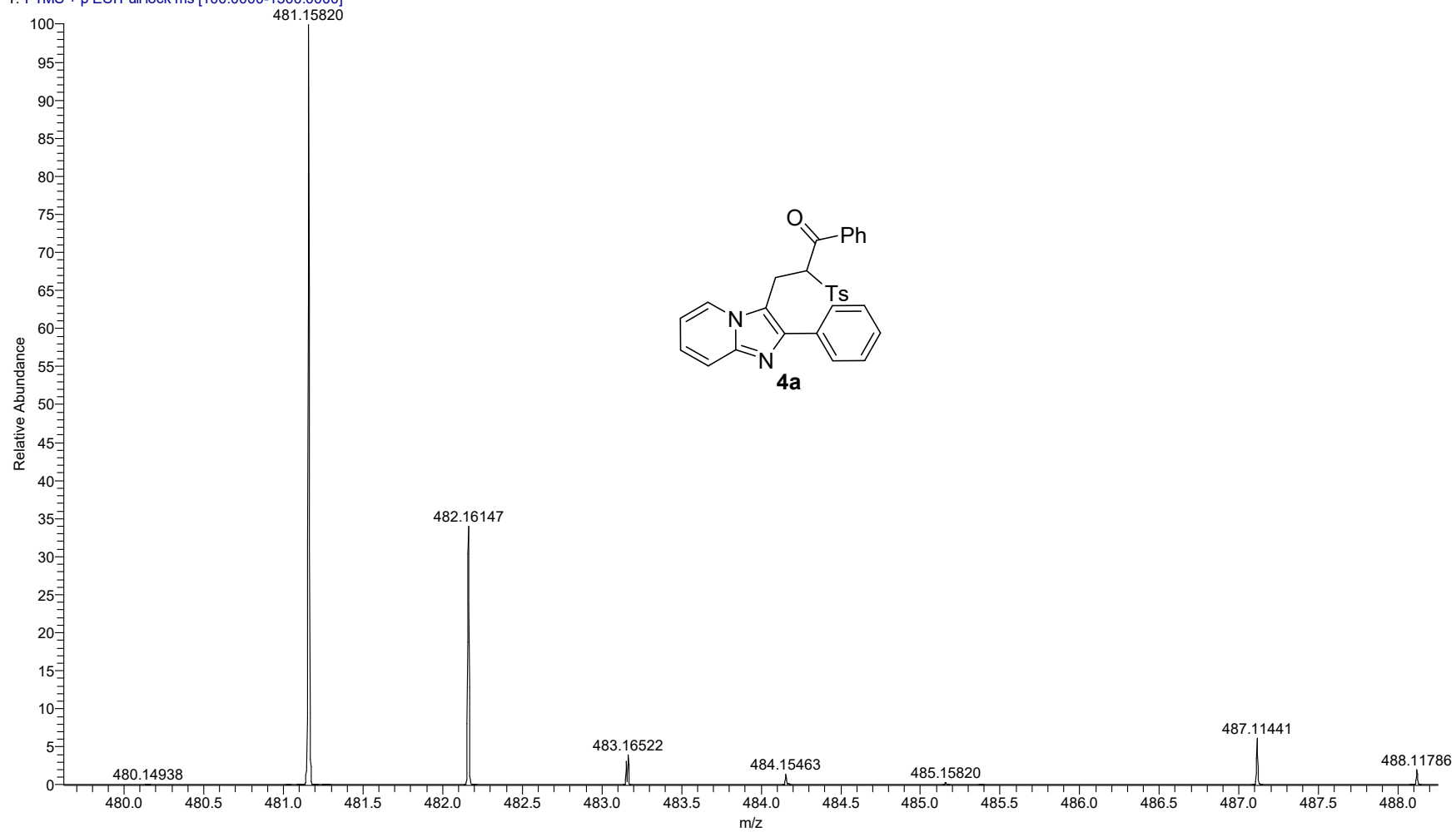


^{13}C NMR (126 MHz, CDCl_3) of **4a**

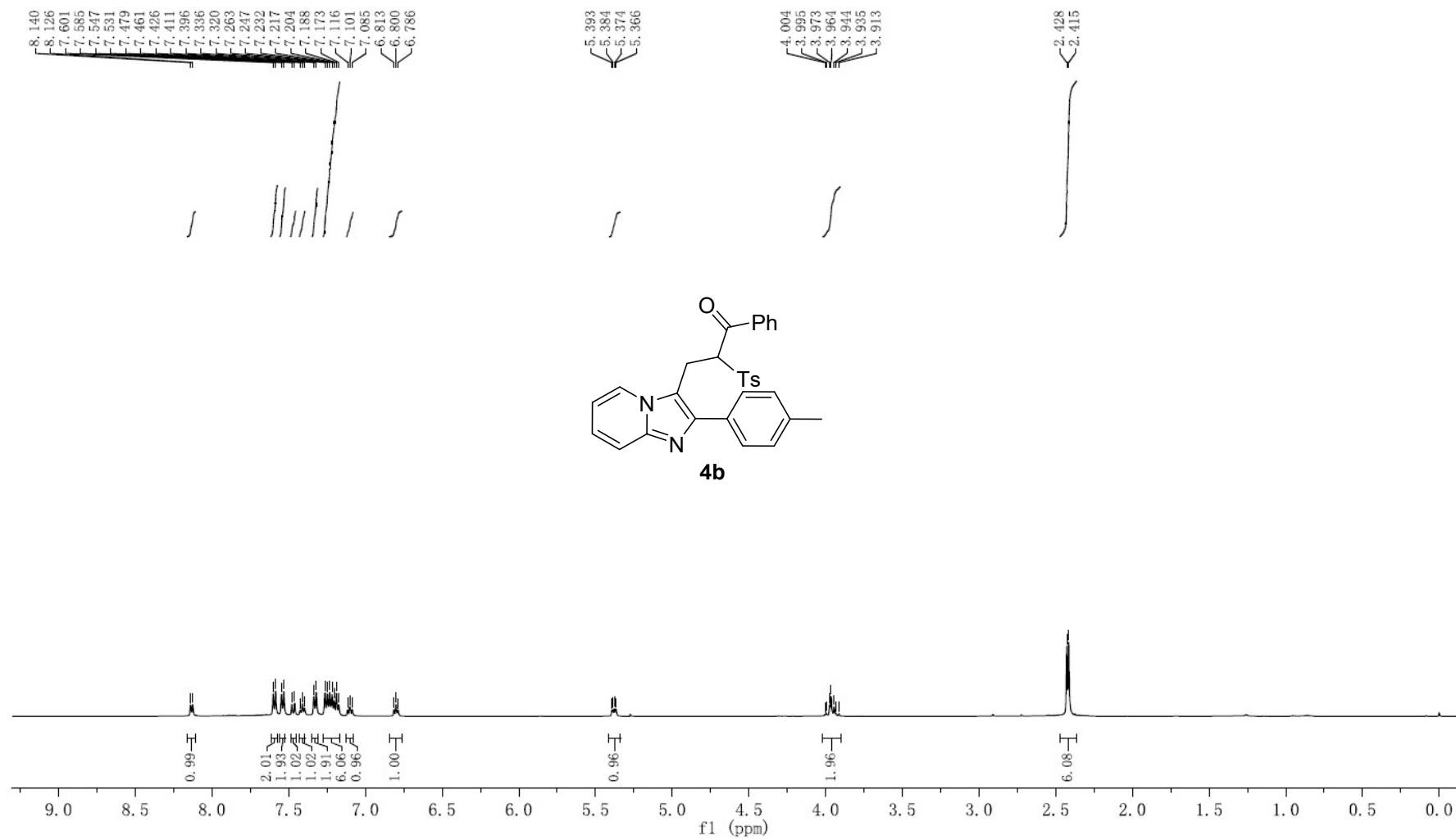


(ESI) of **4a**

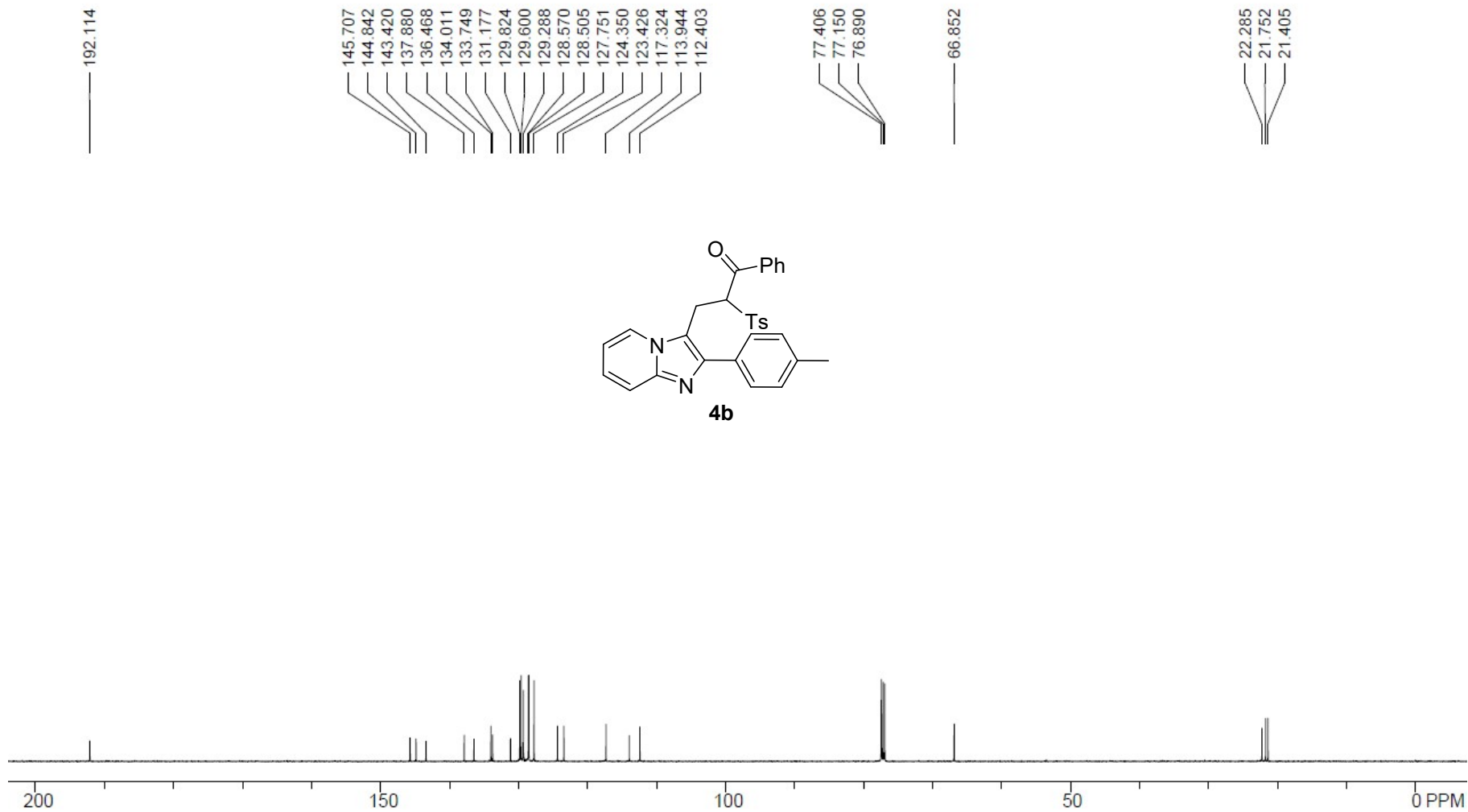
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T: FTMS + p ESI Full lock ms [100.0000-1500.0000]



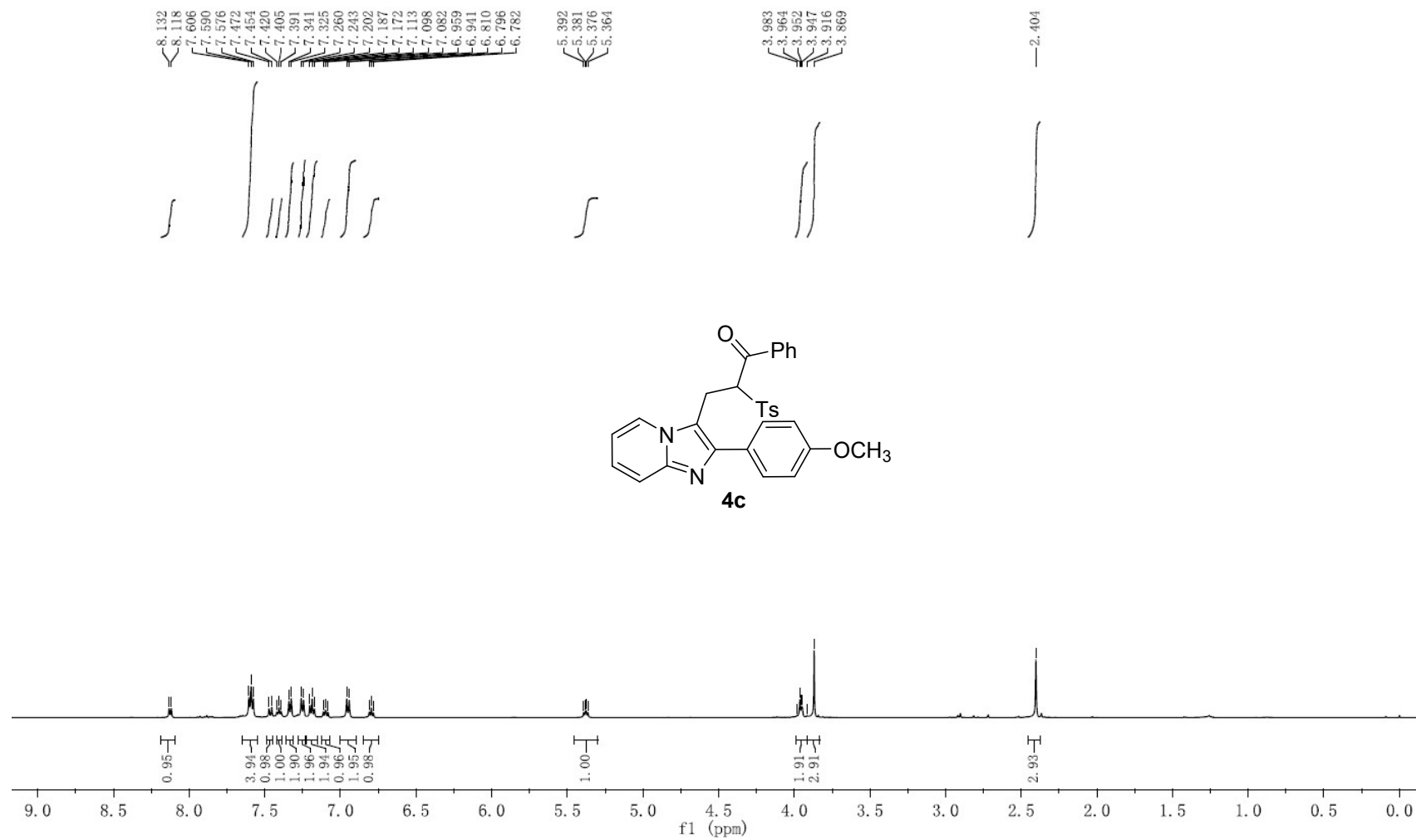
¹H NMR (500 MHz, CDCl₃) of **4b**



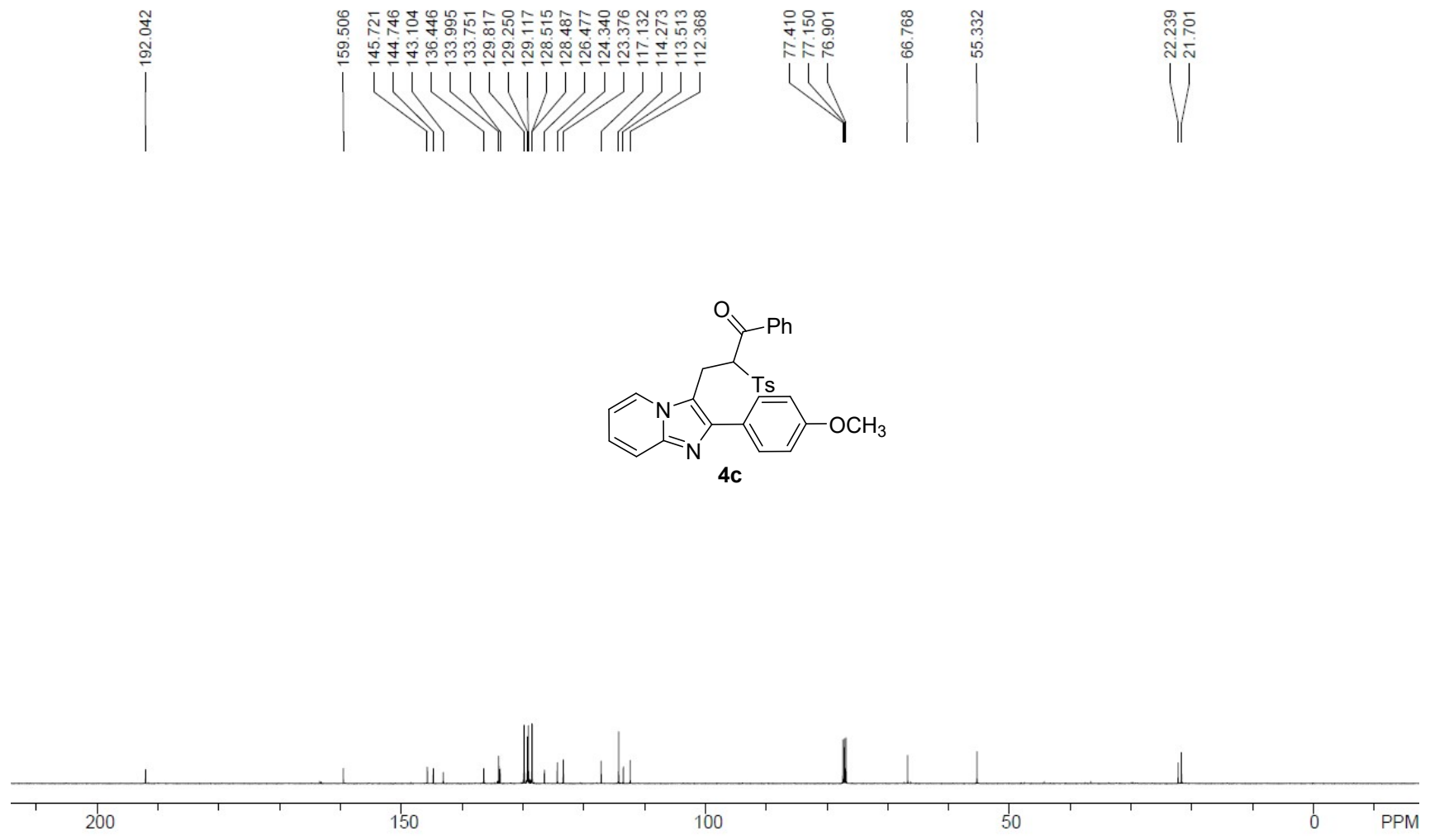
^{13}C NMR (126 MHz, CDCl_3) of **4b**



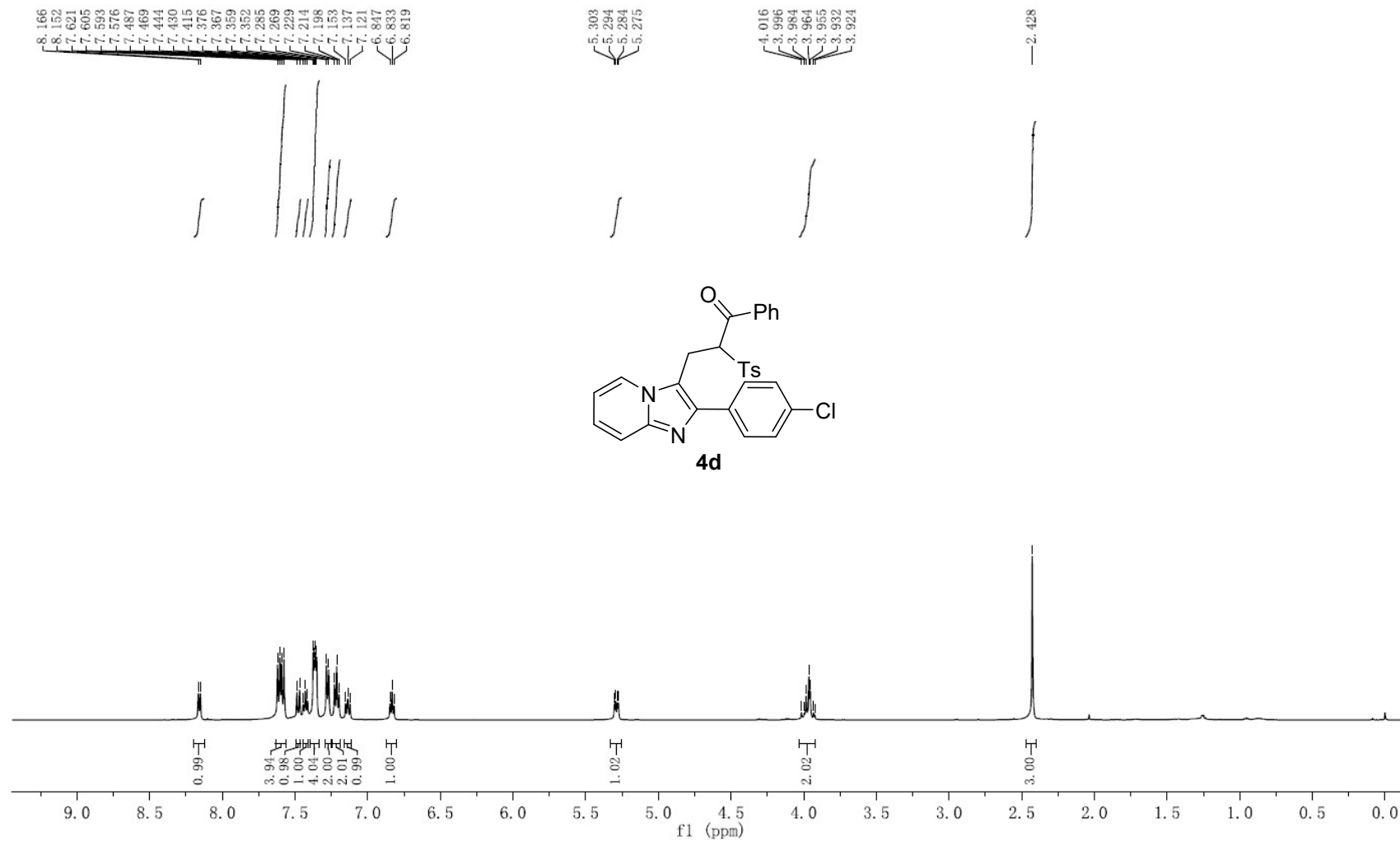
^1H NMR (500 MHz, CDCl_3) of **4c**



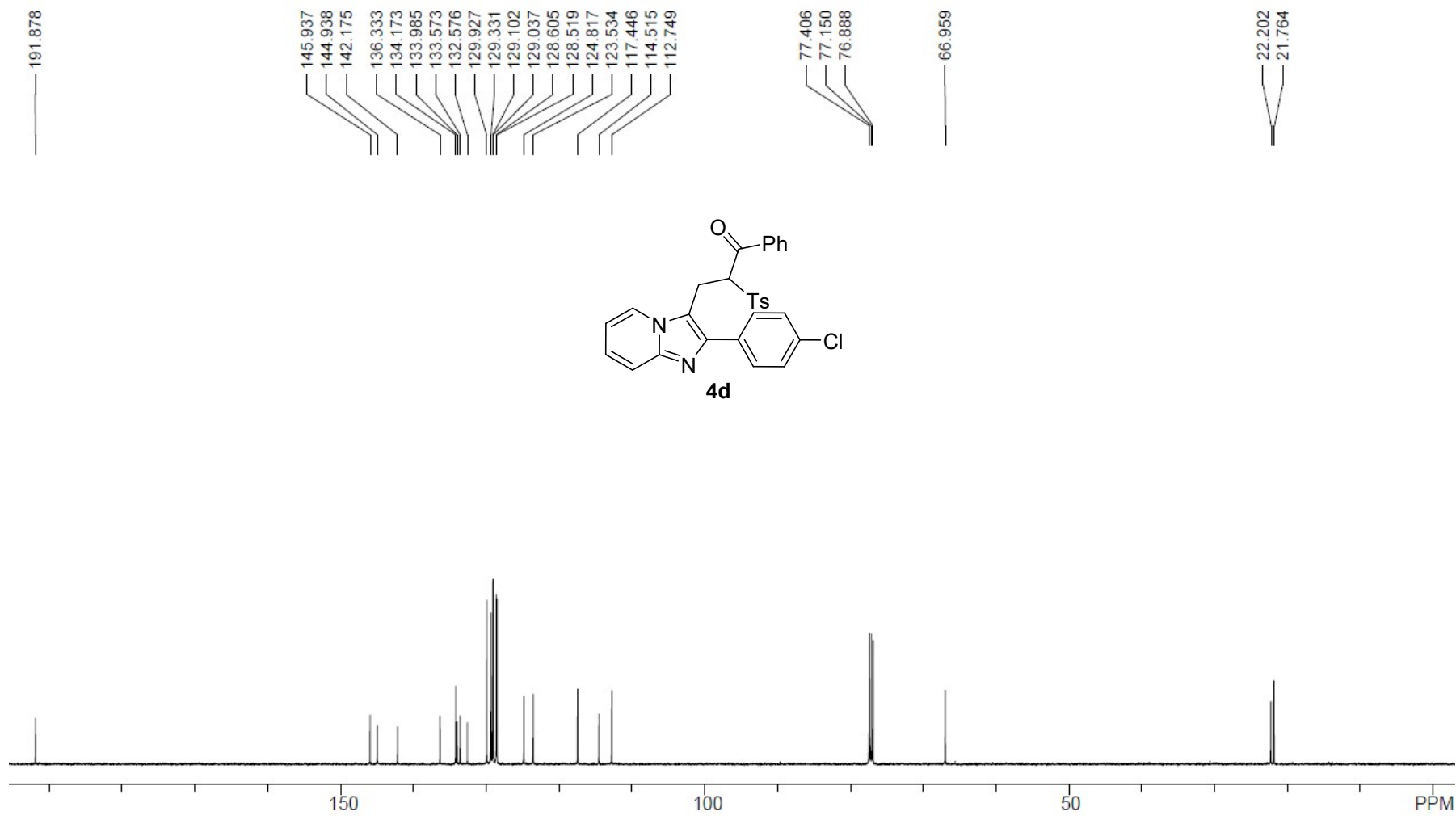
^{13}C NMR (126 MHz, CDCl_3) of **4c**



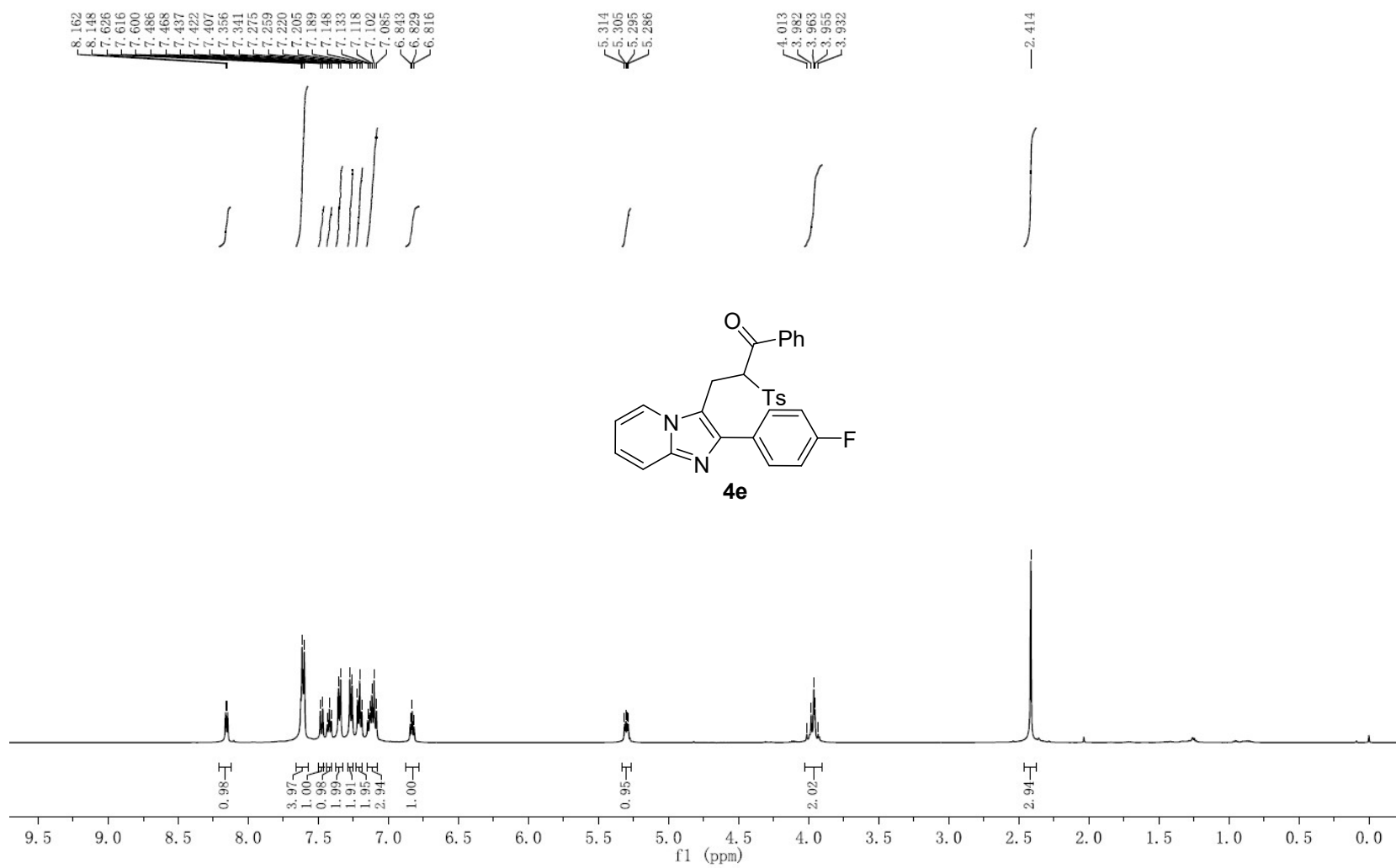
^1H NMR (500 MHz, CDCl_3) of **4d**



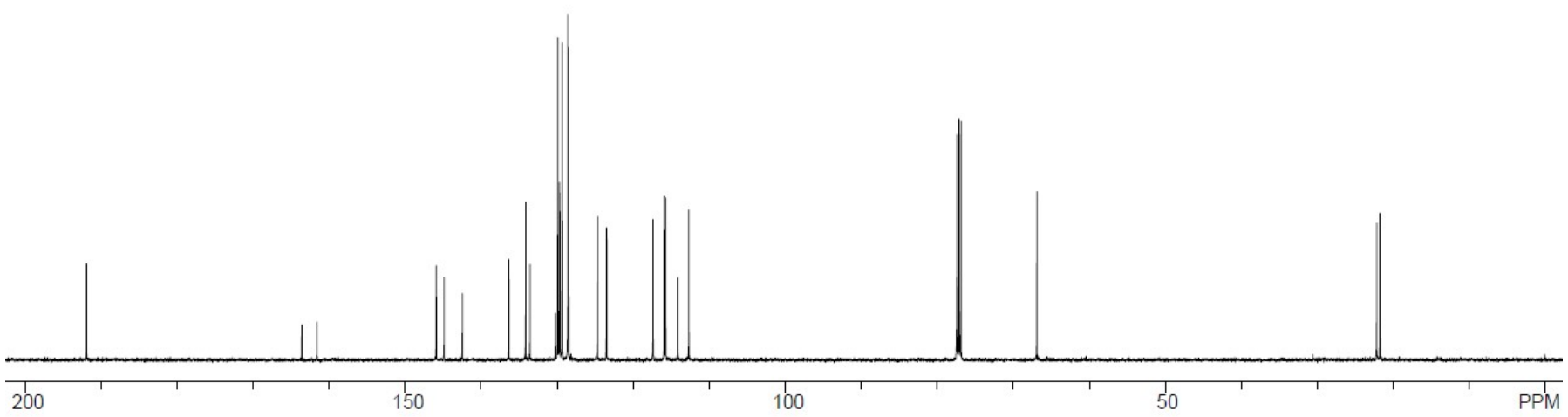
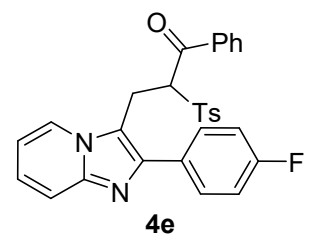
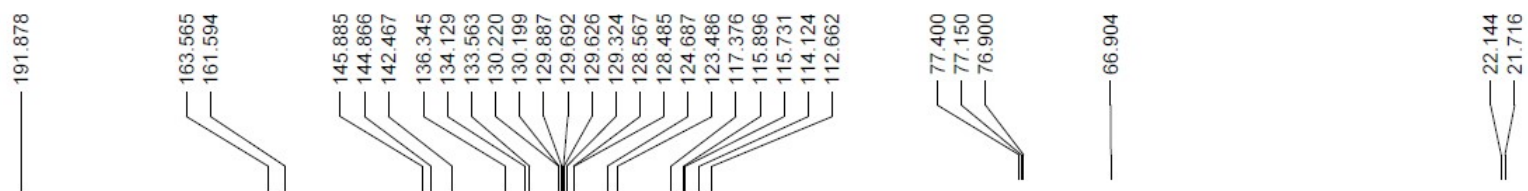
^{13}C NMR (126 MHz, CDCl_3) of **4d**



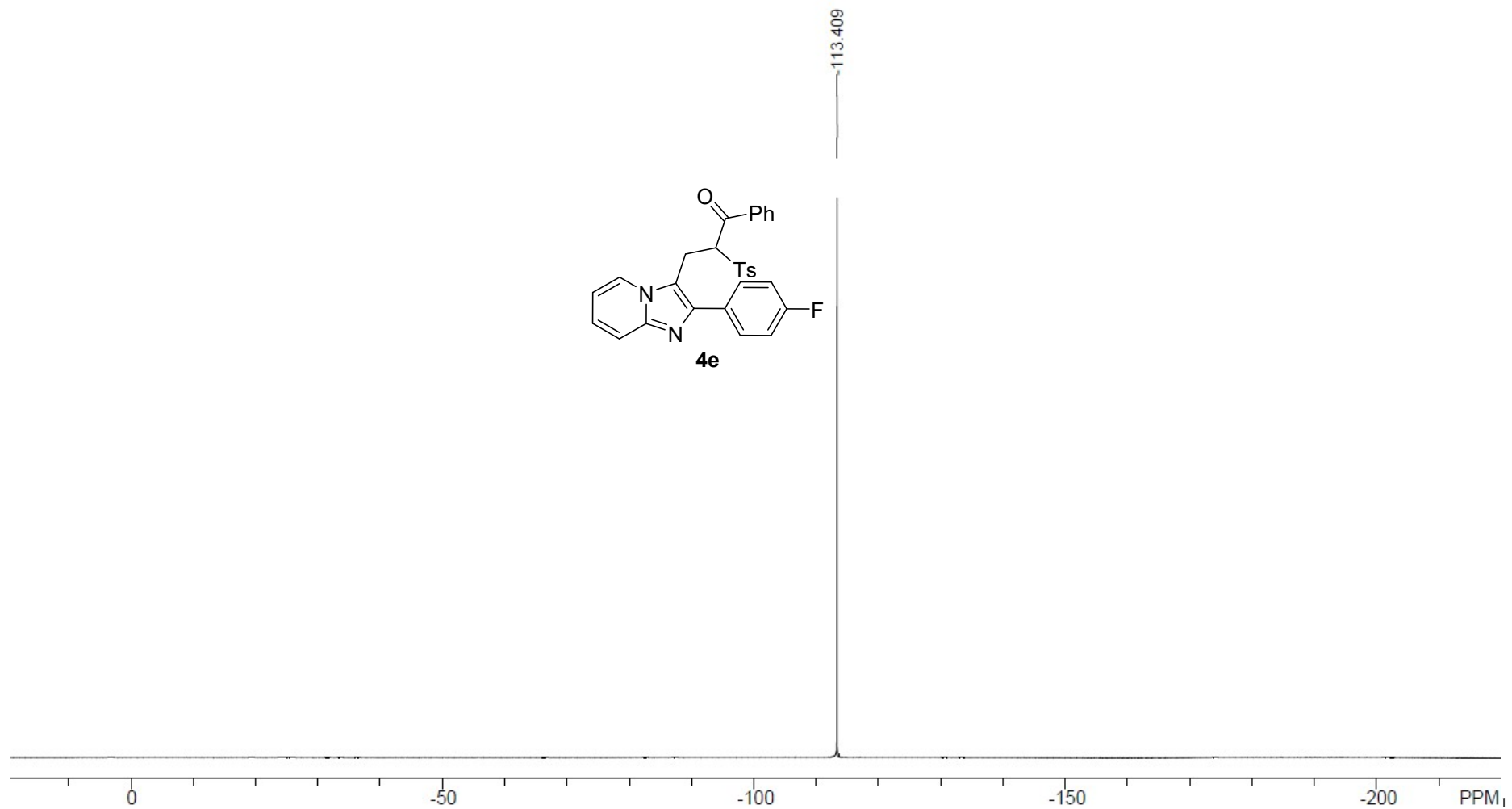
¹H NMR (500 MHz, CDCl₃) of **4e**



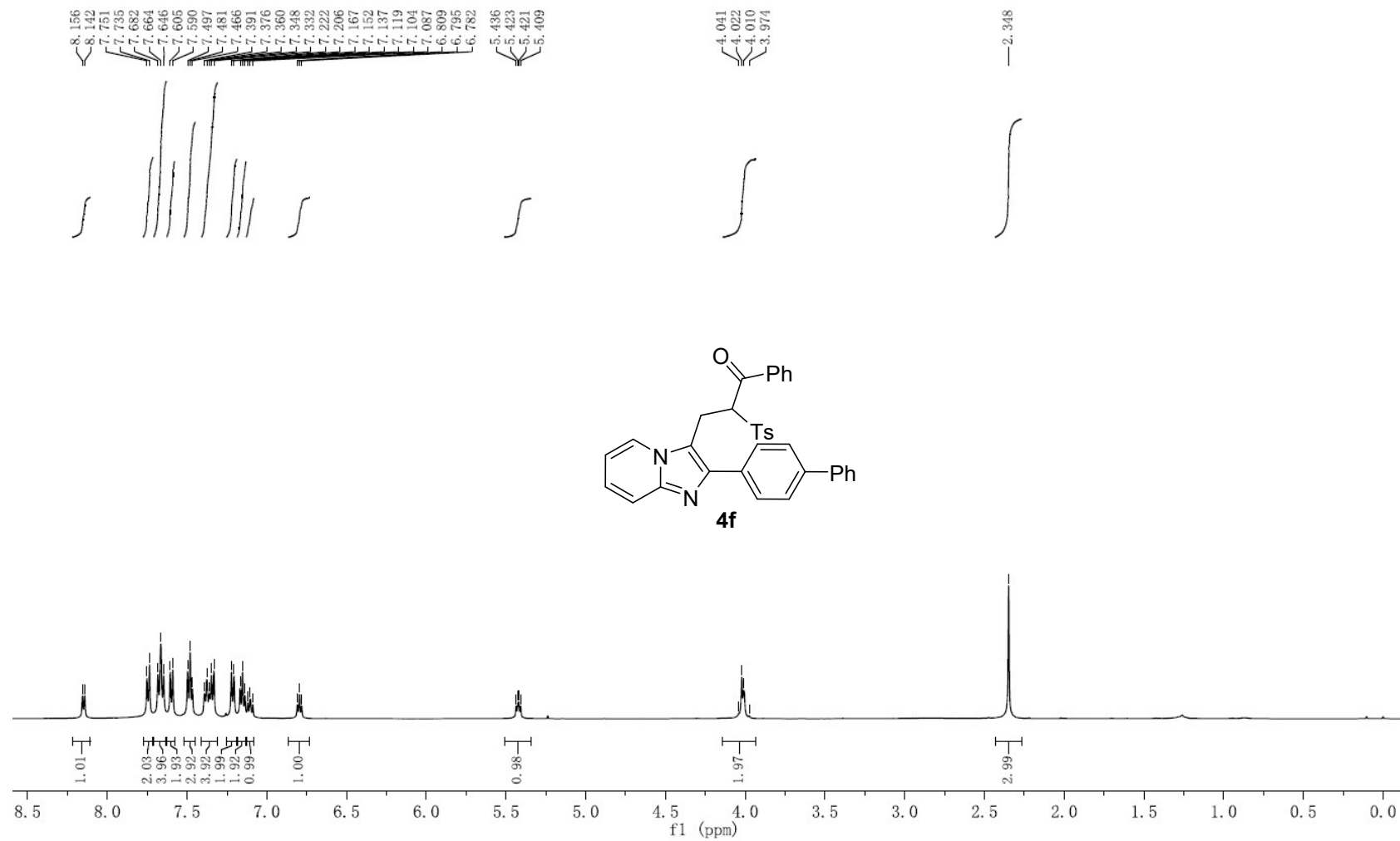
^{13}C NMR (126 MHz, CDCl_3) of **4e**



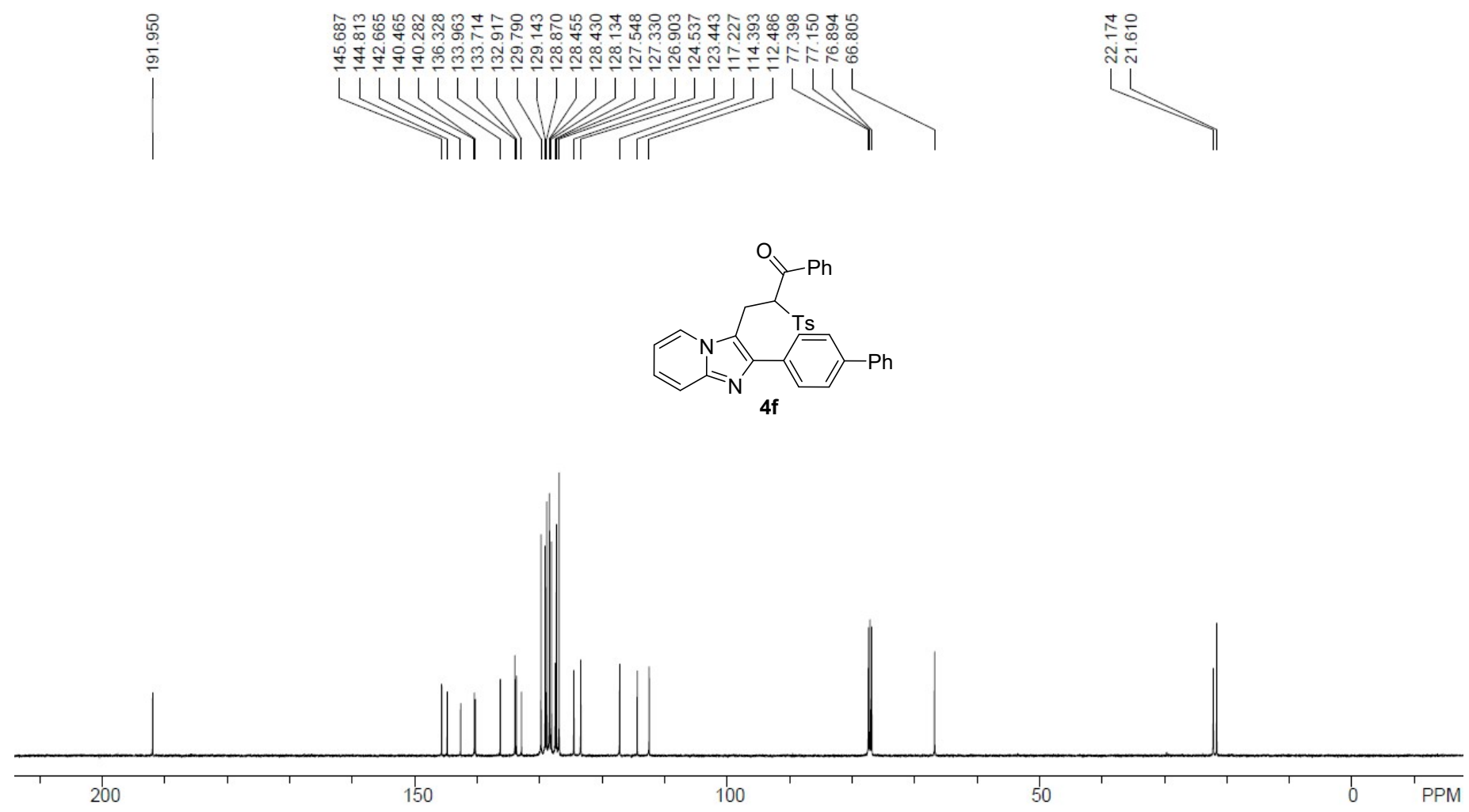
^{19}F NMR (471 MHz, CDCl_3) of **4e**



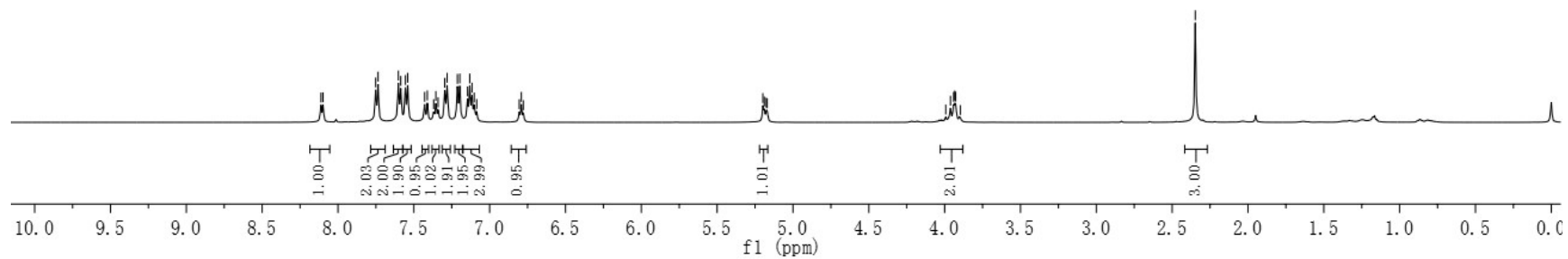
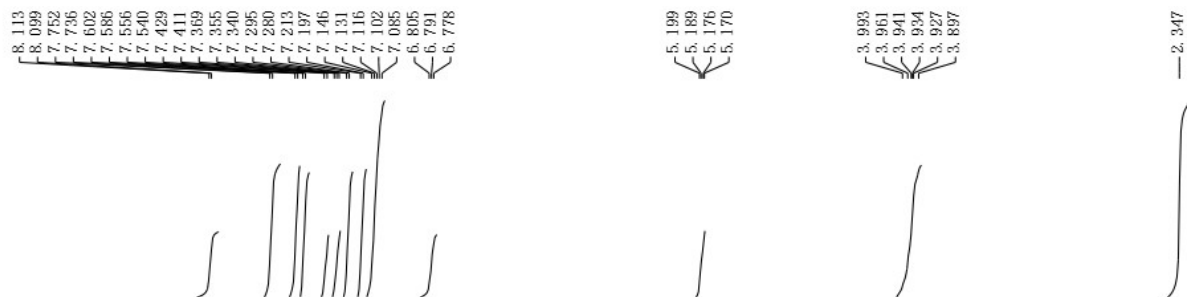
H NMR (500 MHz, CDCl₃) of **4f**



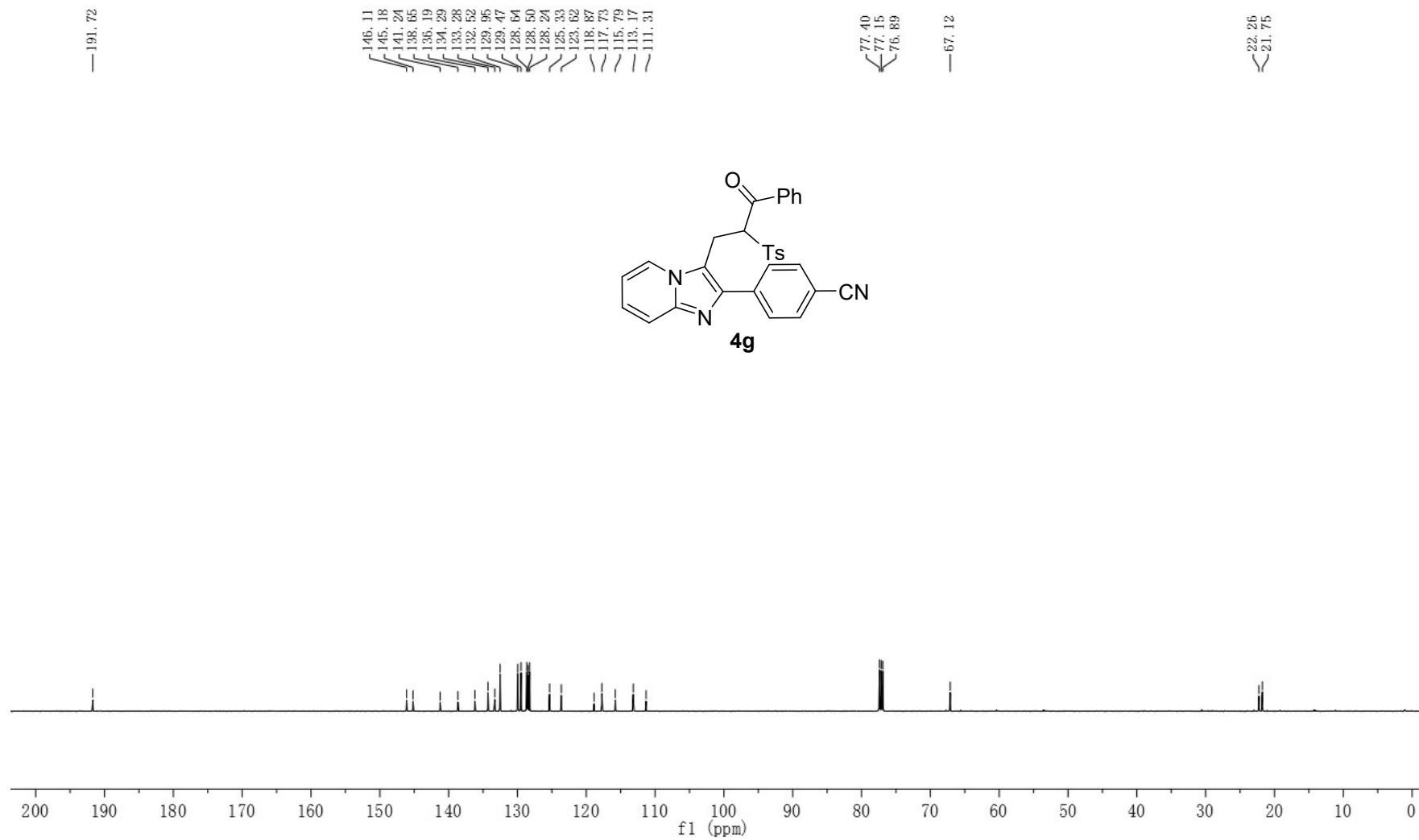
^{13}C NMR (126 MHz, CDCl_3) of **4f**



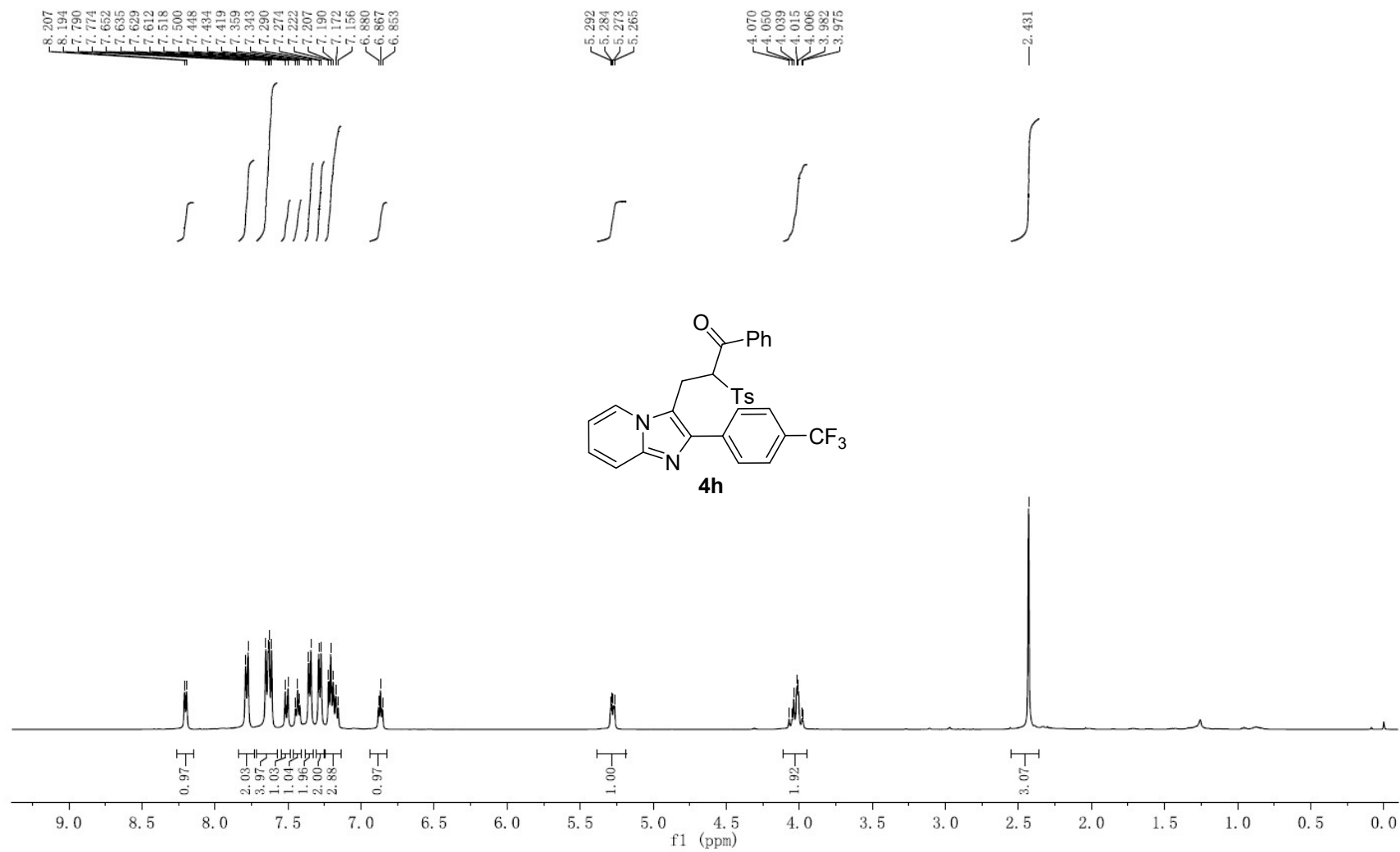
¹H NMR (500 MHz, CDCl₃) of **4g**



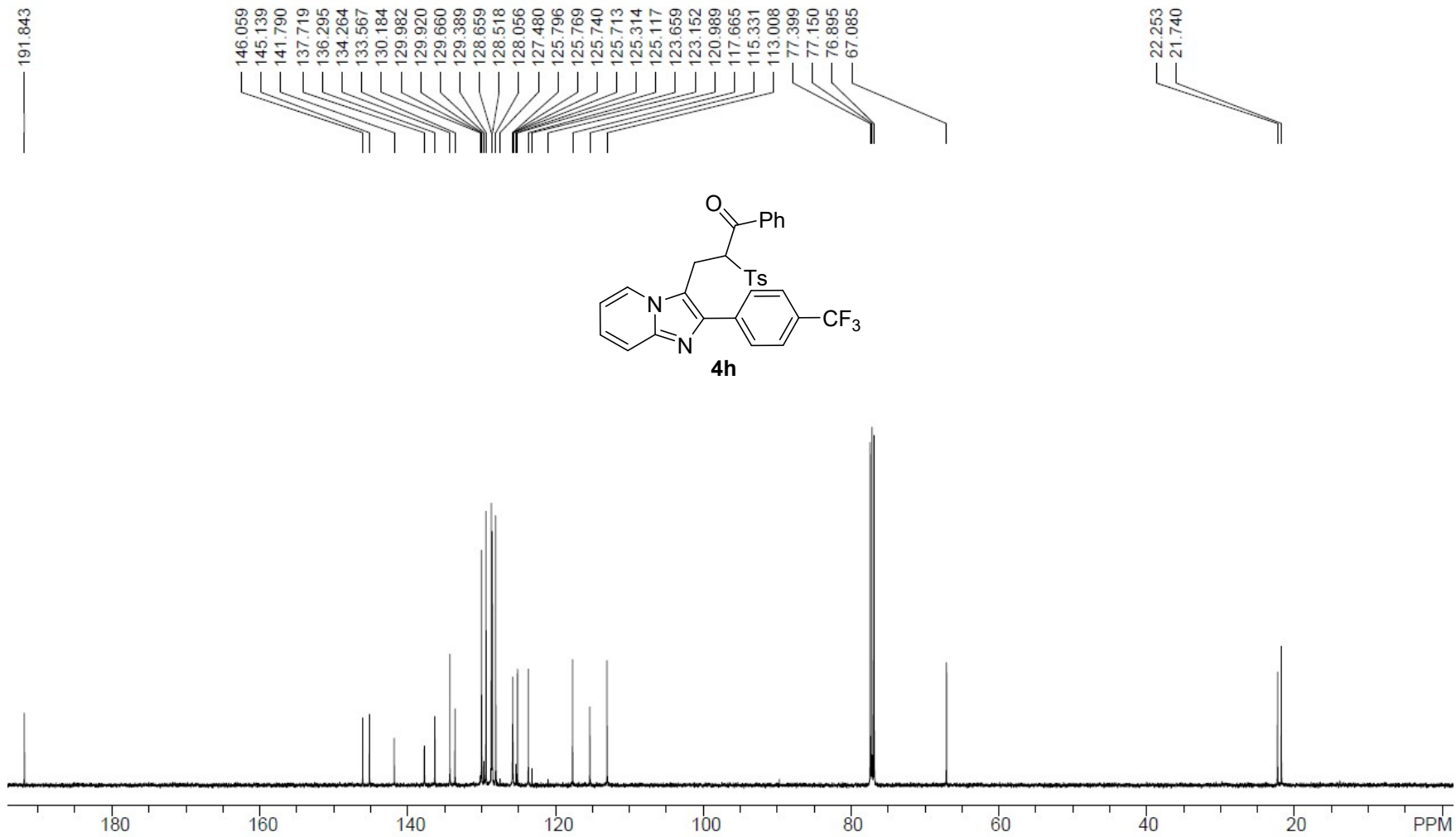
^{13}C NMR (126 MHz, CDCl_3) of **4g**



¹H NMR (500 MHz, CDCl₃) of **4h**

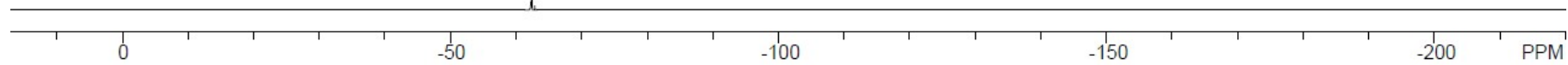
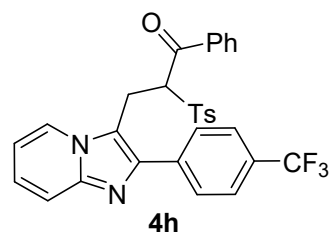


^{13}C NMR (126 MHz, CDCl_3) of **4h**

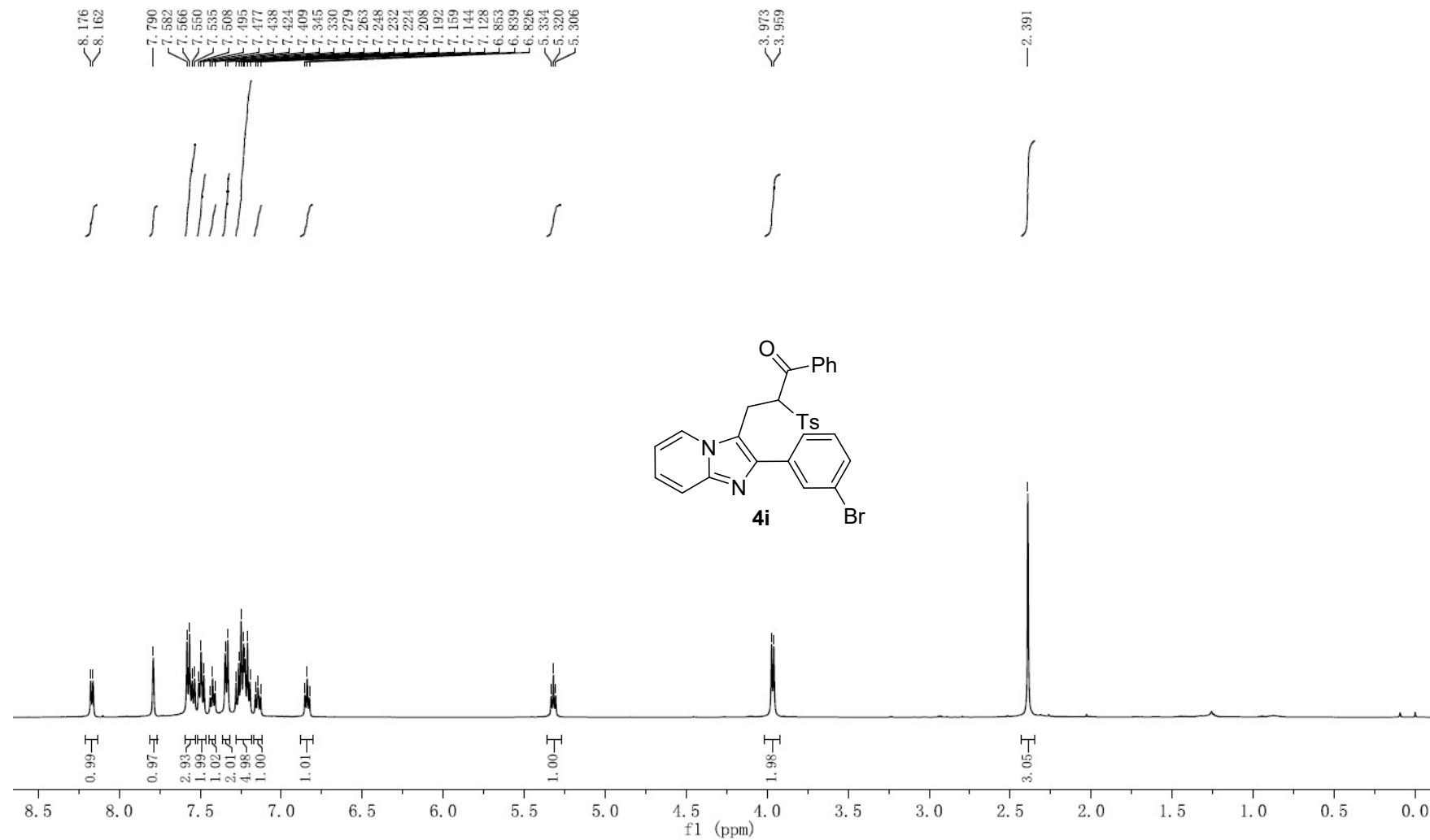


^{19}F NMR (471 MHz, CDCl_3) of **4h**

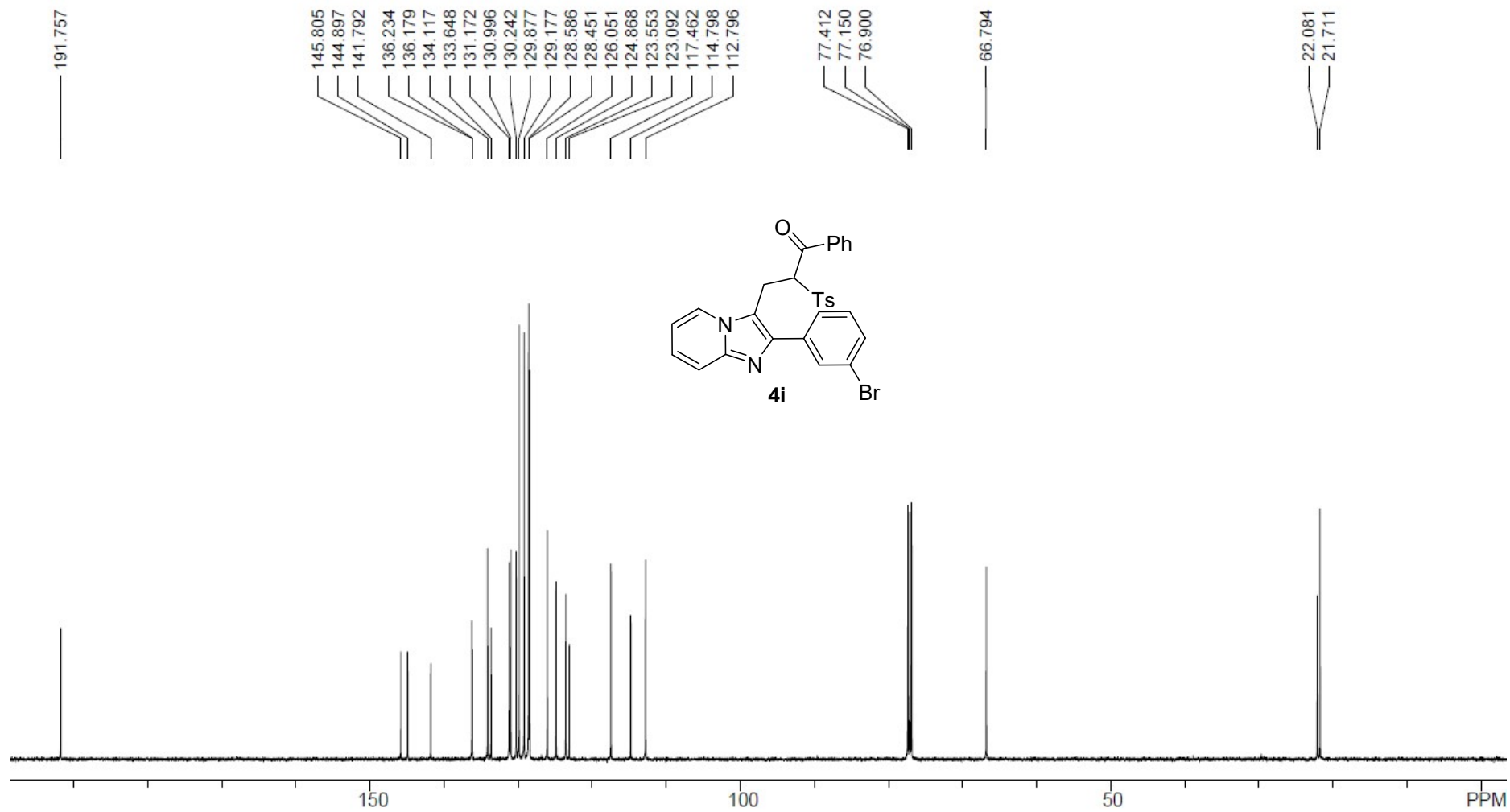
62.417



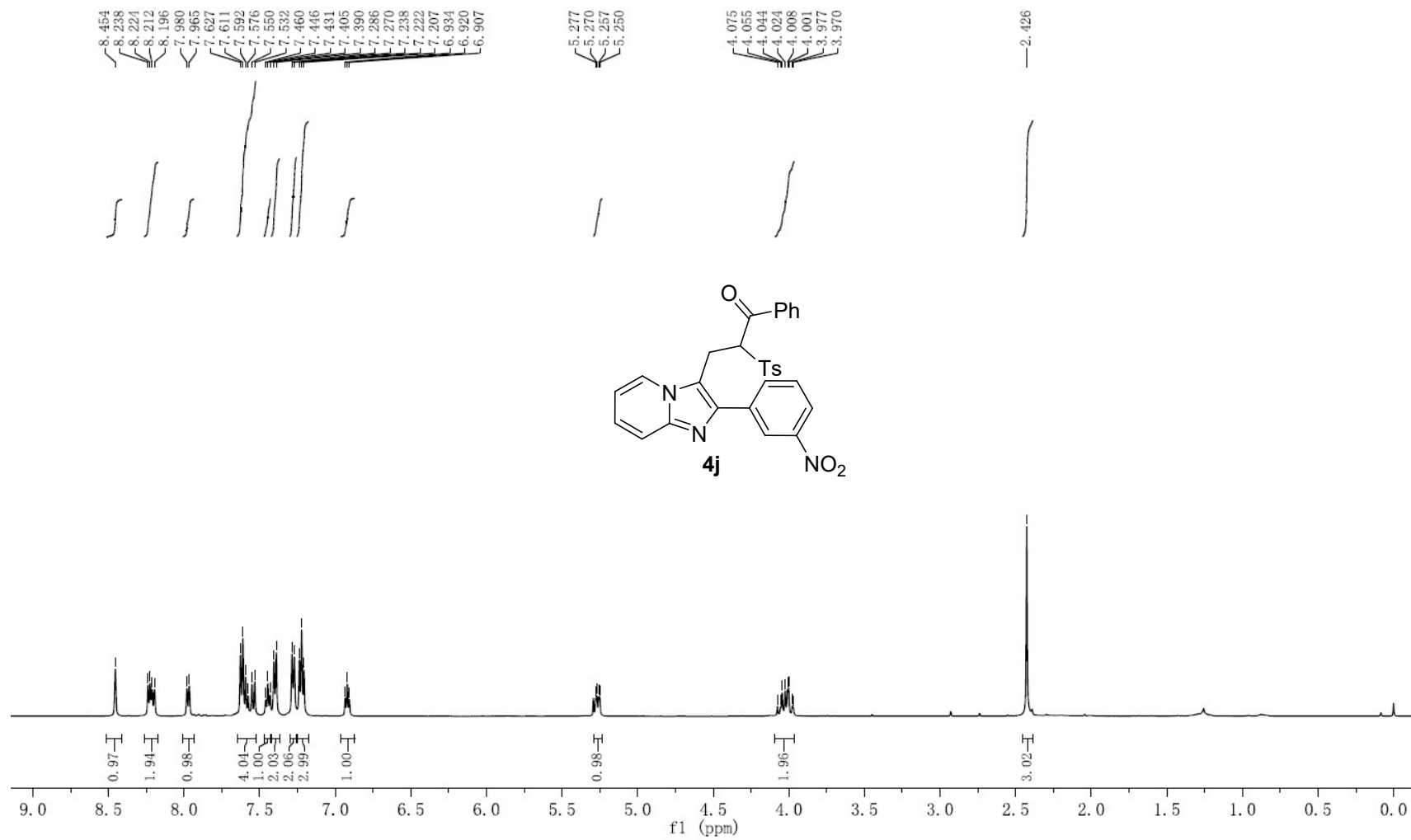
¹H NMR (500 MHz, CDCl₃) of **4i**



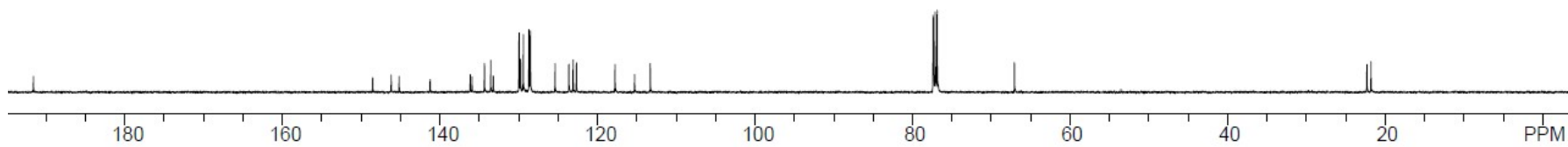
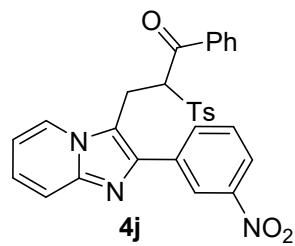
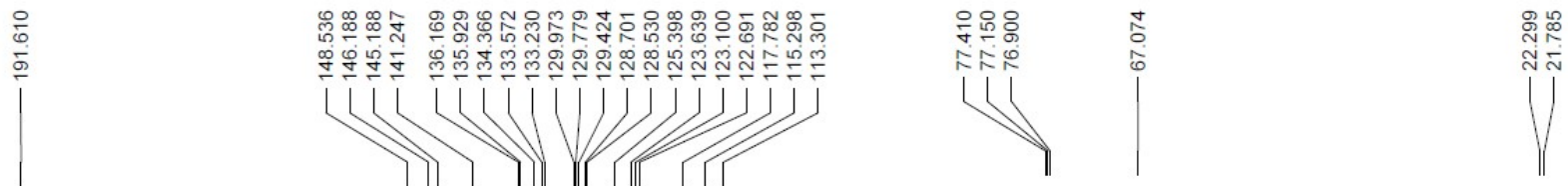
^{13}C NMR (126 MHz, CDCl_3) of **4i**



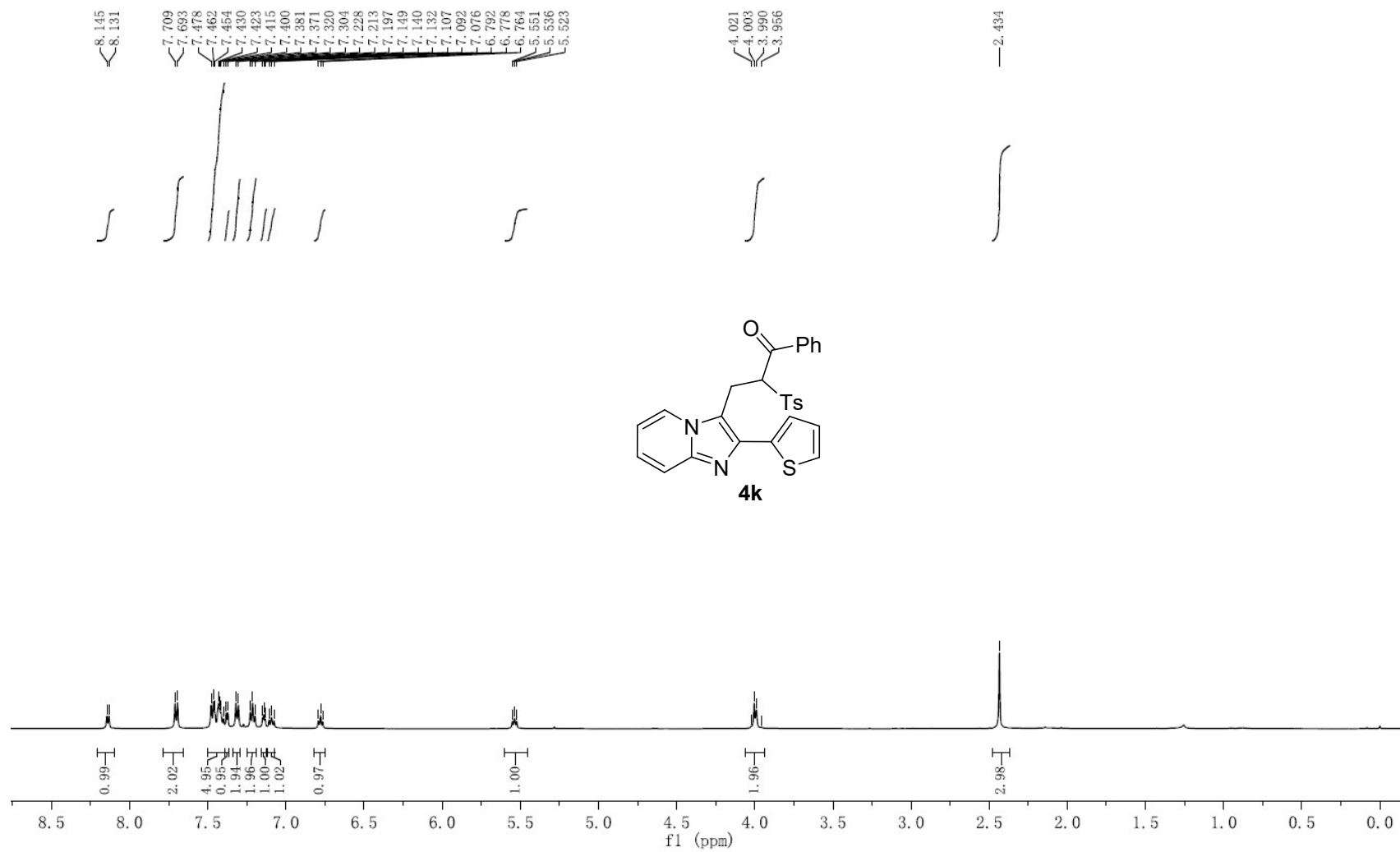
¹H NMR (500 MHz, CDCl₃) of **4j**



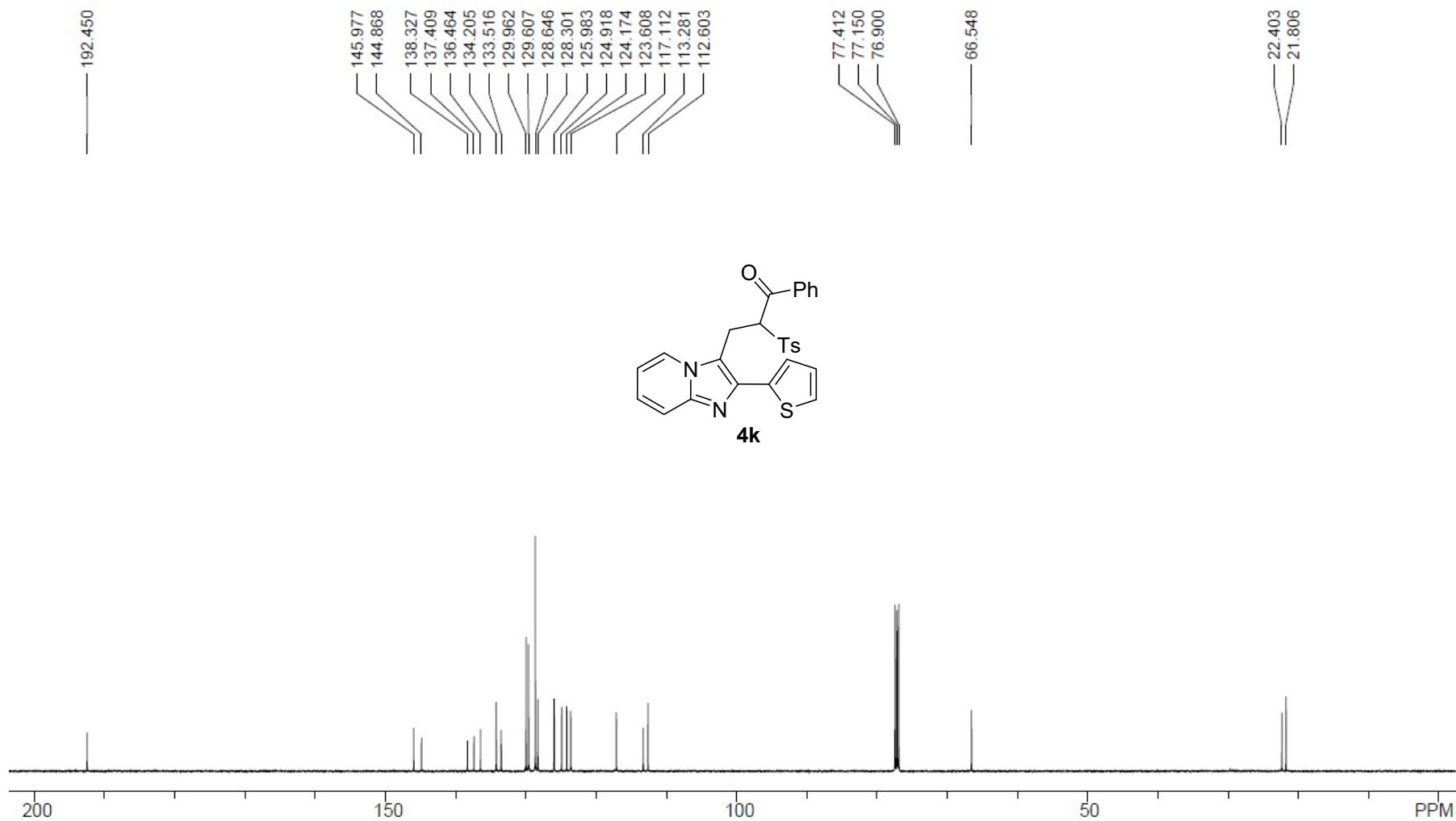
^{13}C NMR (126 MHz, CDCl_3) of **4j**



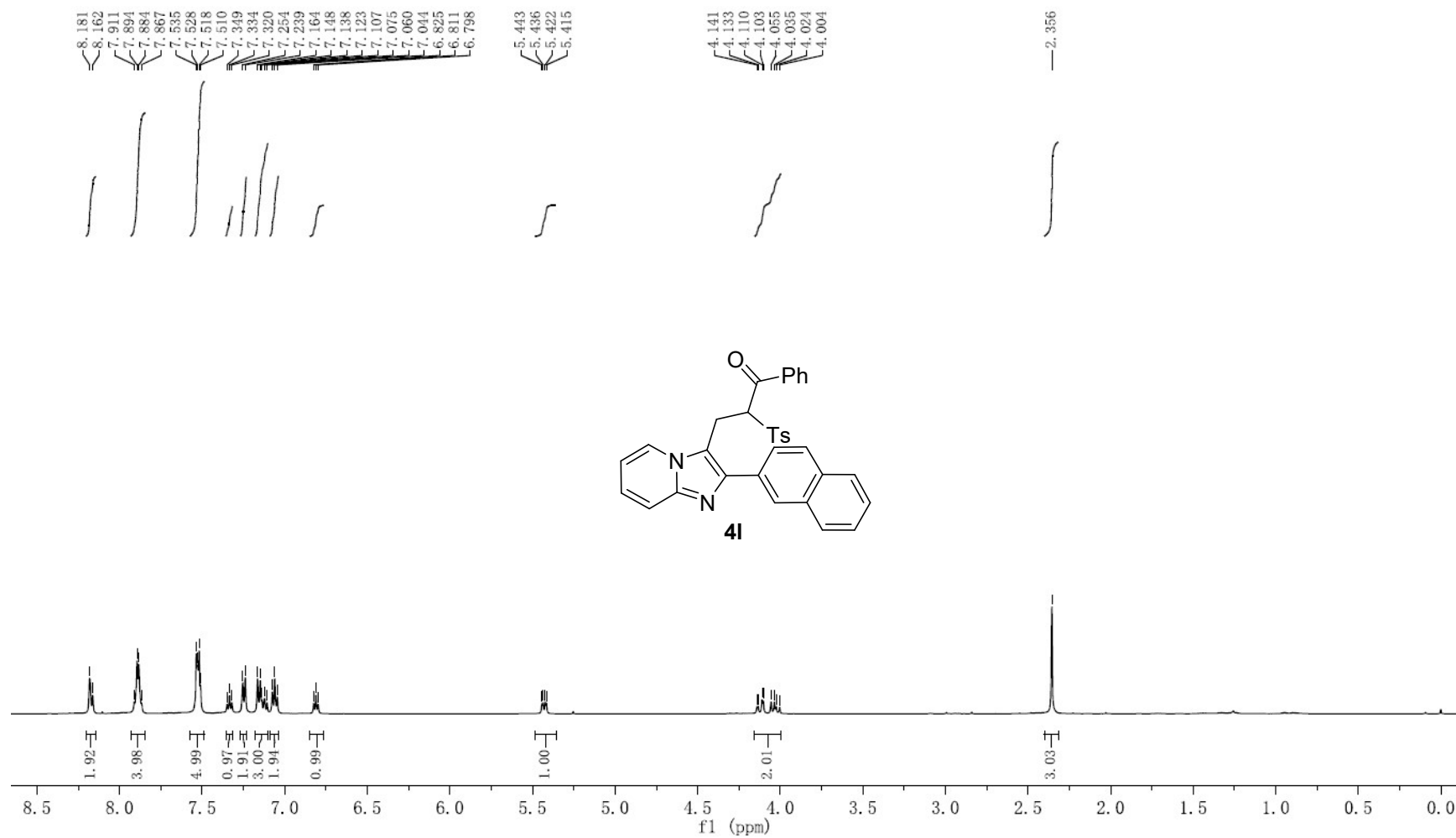
¹H NMR (500 MHz, CDCl₃) of **4k**



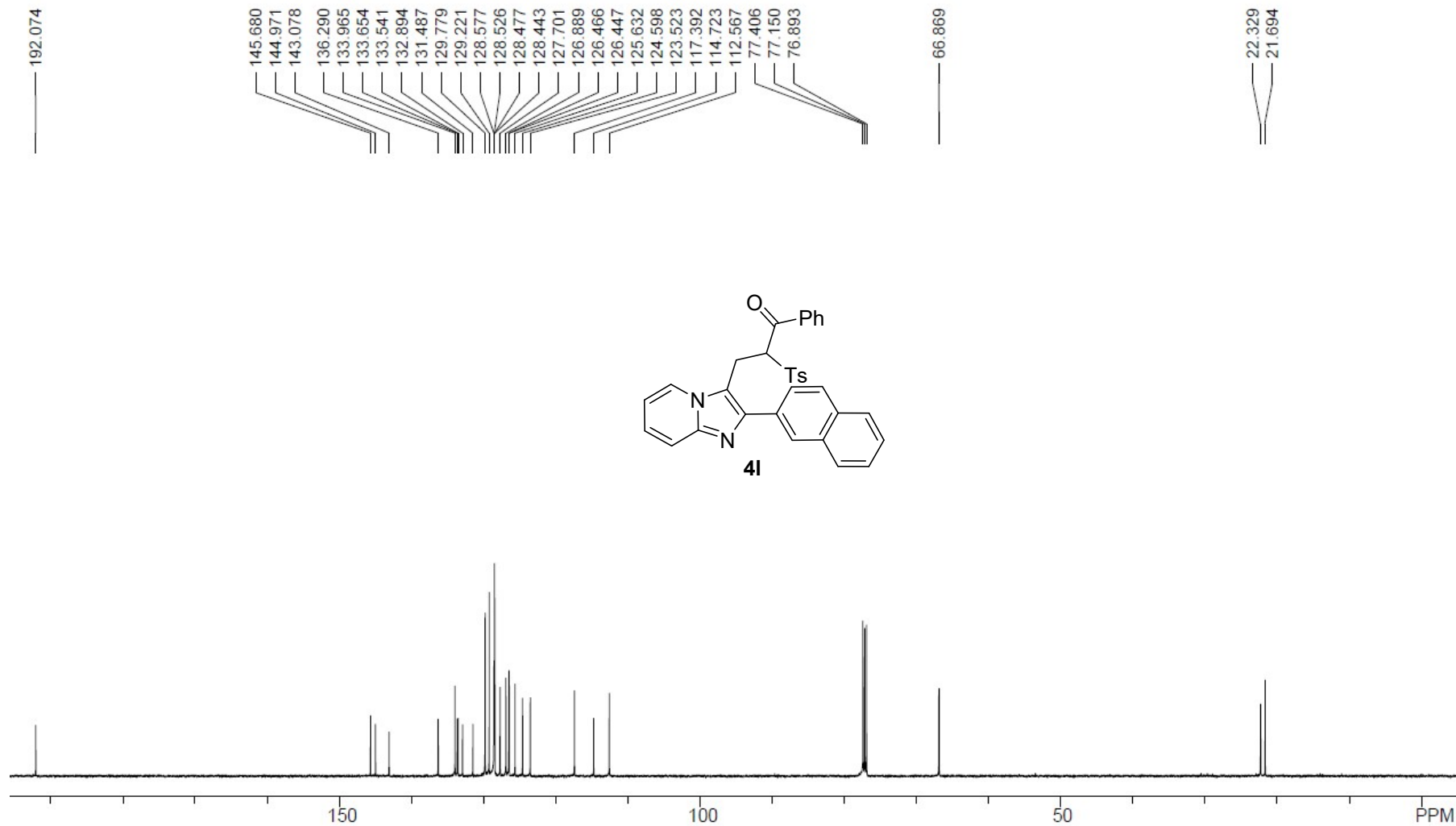
^{13}C NMR (126 MHz, CDCl_3) of **4k**



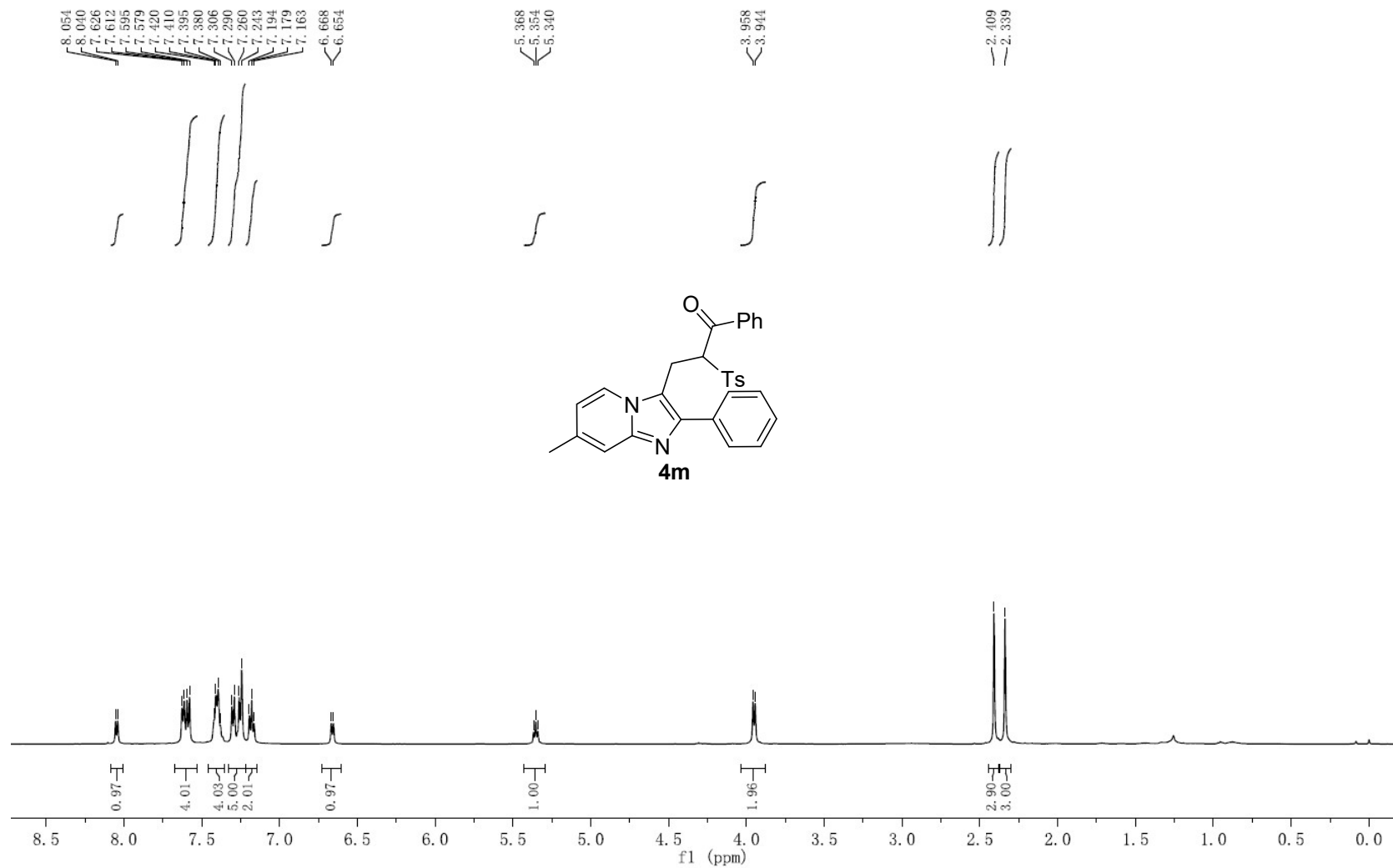
¹H NMR (500 MHz, CDCl₃) of **4l**



^{13}C NMR (126 MHz, CDCl_3) of **41**



¹H NMR (500 MHz, CDCl₃) of **4m**



^{13}C NMR (126 MHz, CDCl_3) of **4m**

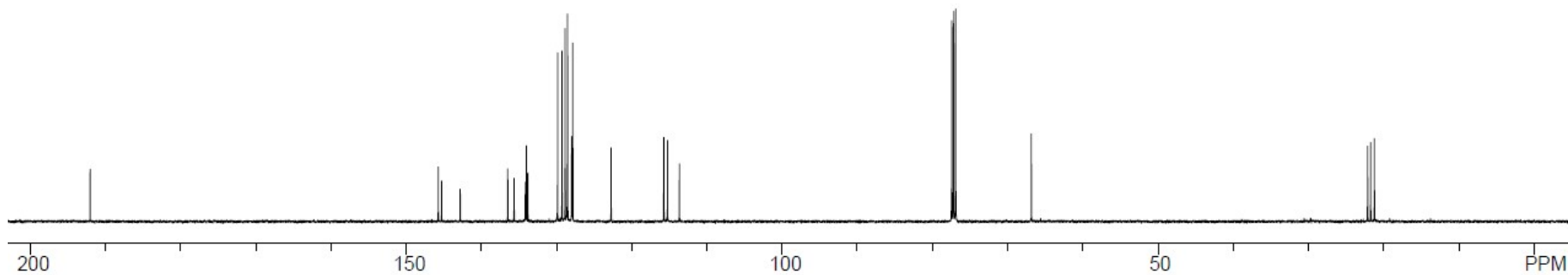
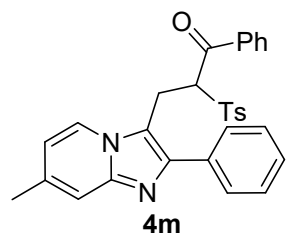
192.031

145.730
145.278
142.799
136.485
135.636
134.148
133.995
133.787
129.859
129.268
128.858
128.540
128.527
127.983
127.844
122.732
115.722
115.235
113.656

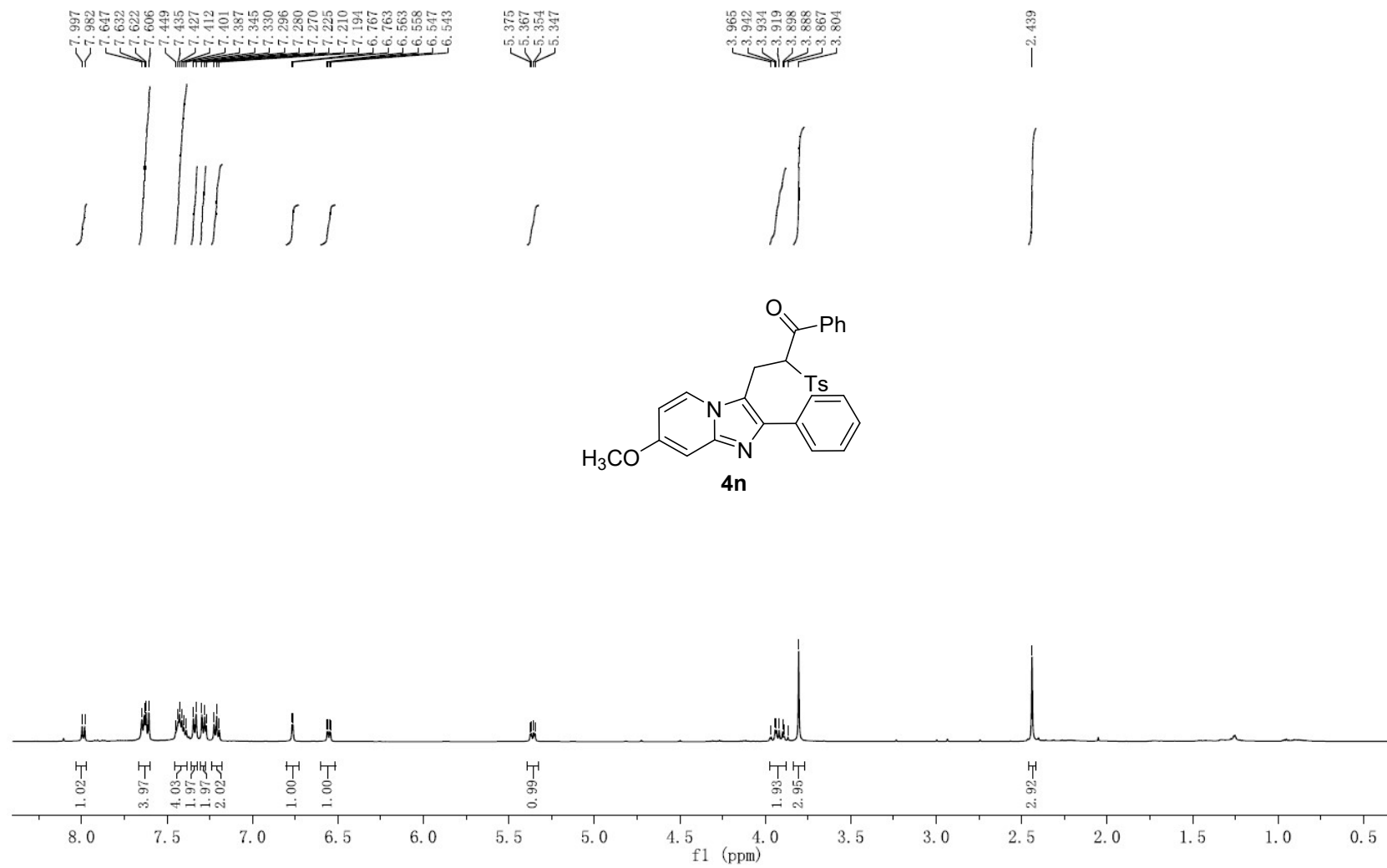
77.409
77.150
76.900

66.833

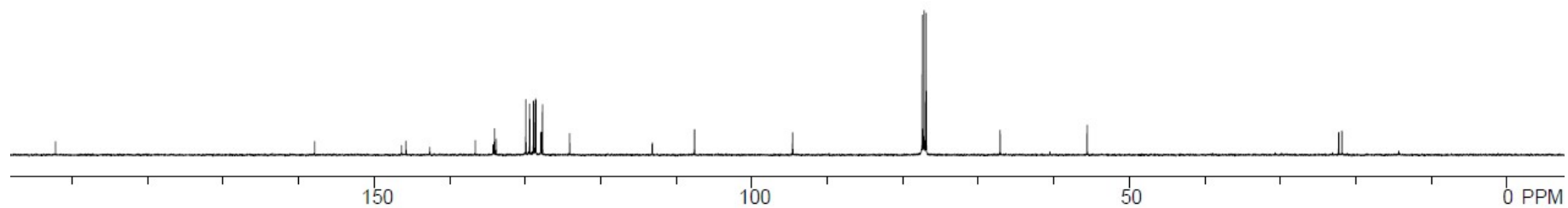
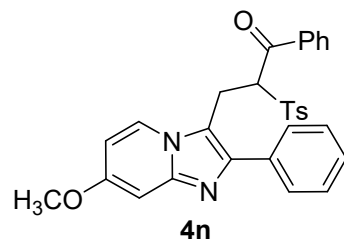
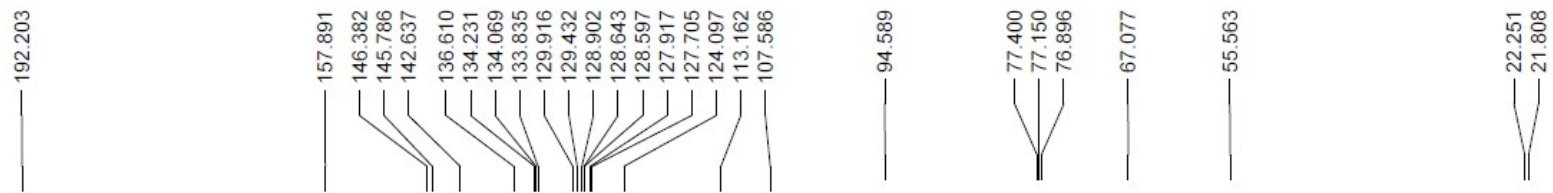
22.149
21.740
21.263



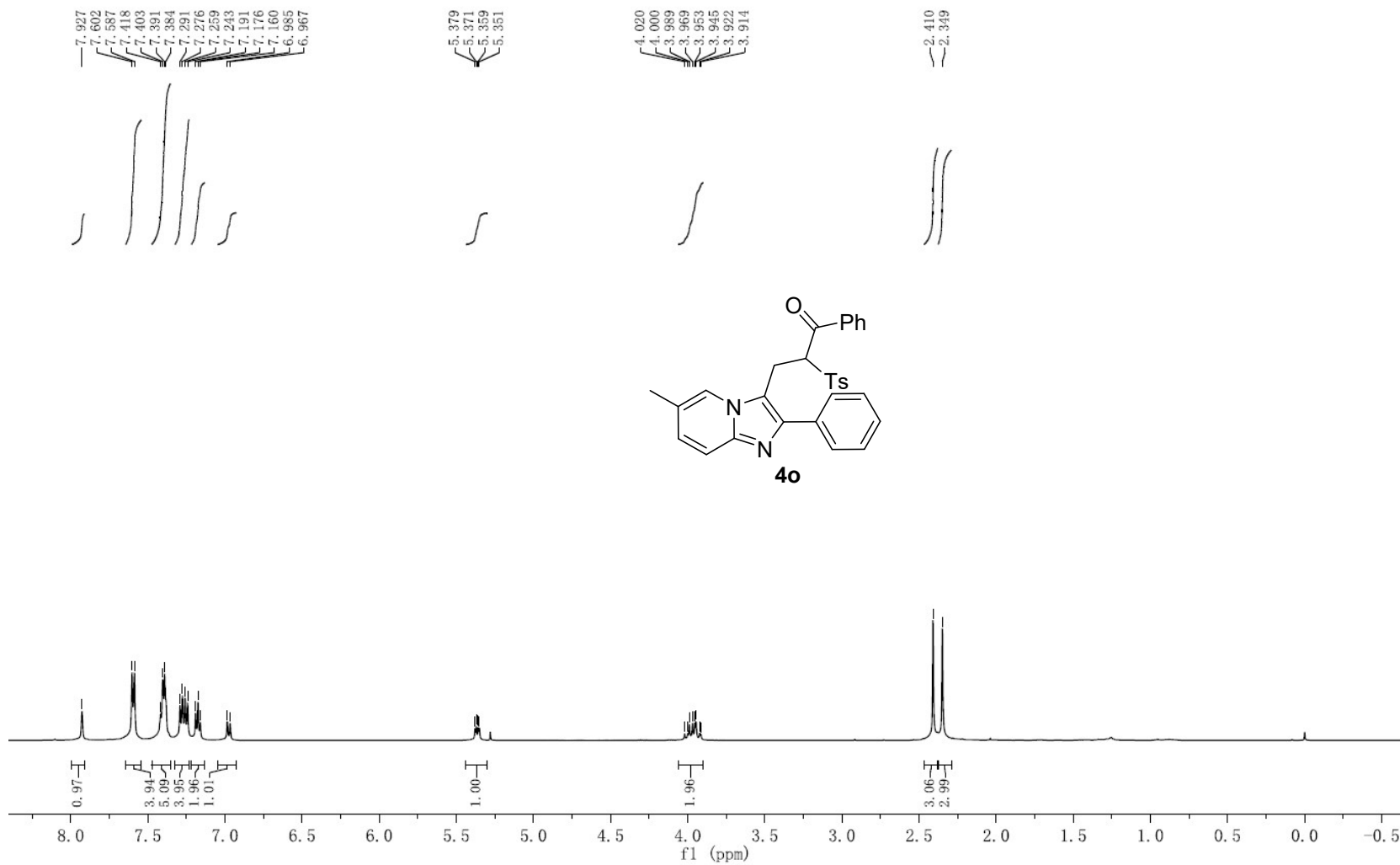
¹H NMR (500 MHz, CDCl₃) of **4n**



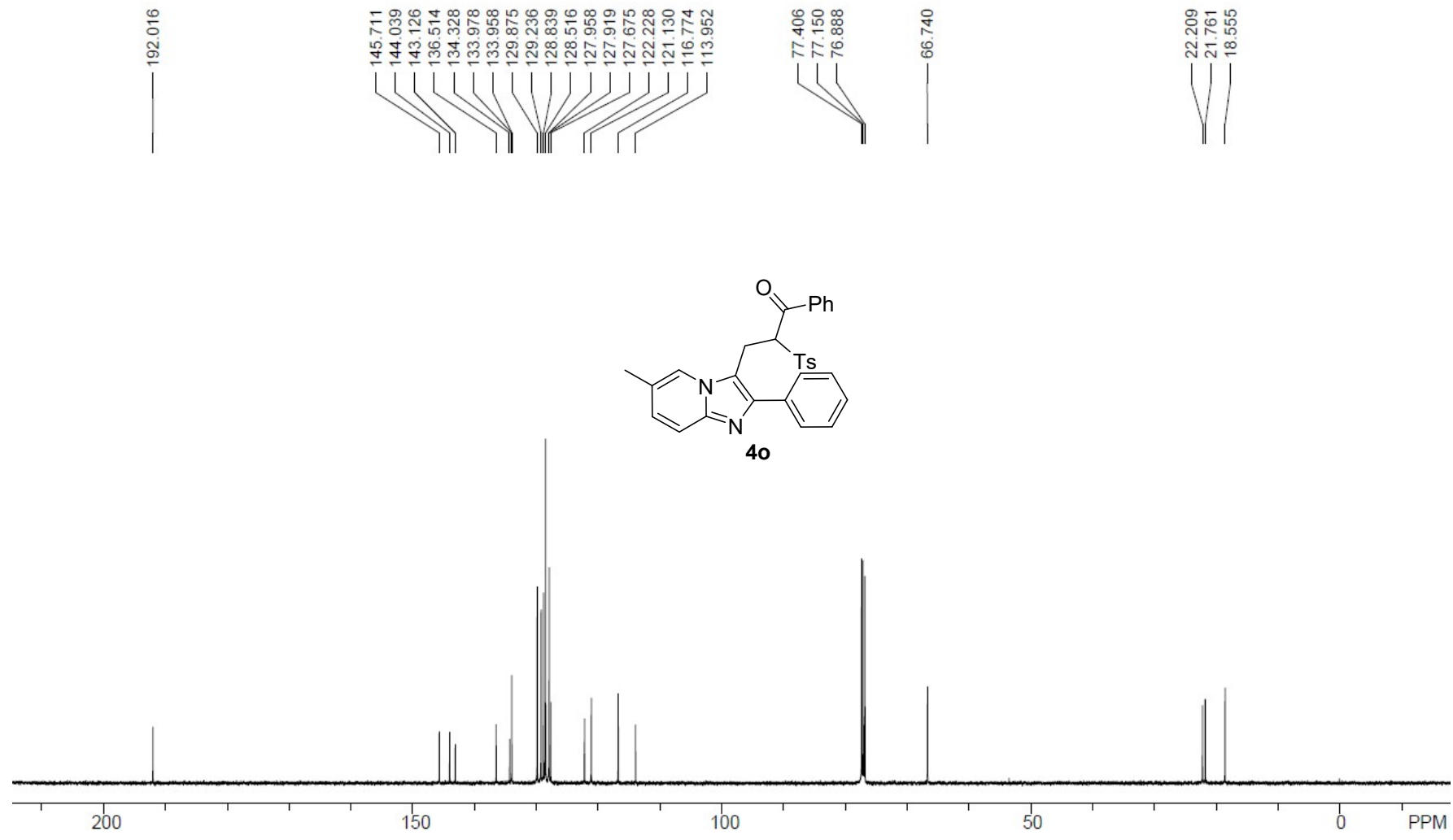
^{13}C NMR (126 MHz, CDCl_3) of **4n**



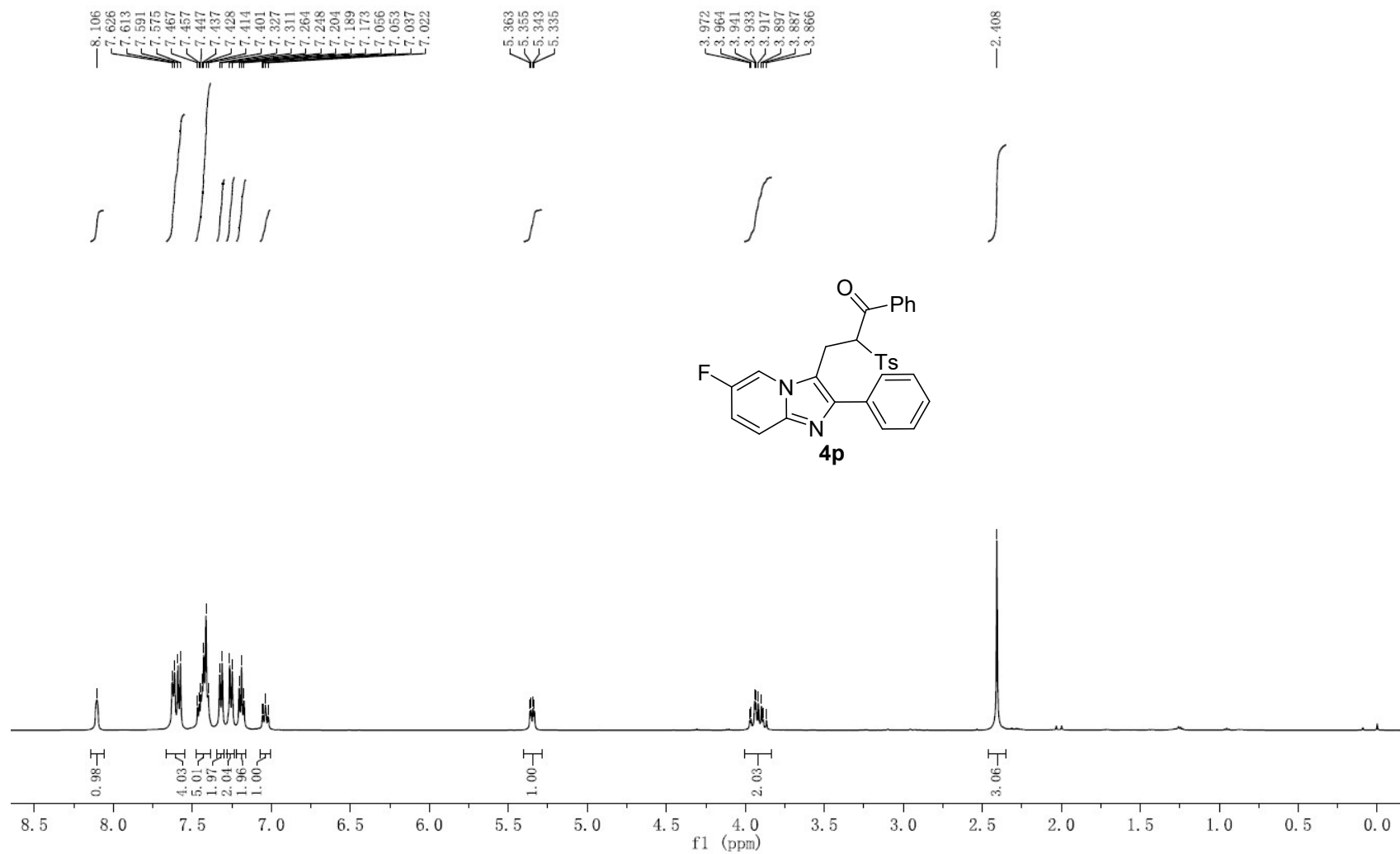
¹H NMR (500 MHz, CDCl₃) of **4o**



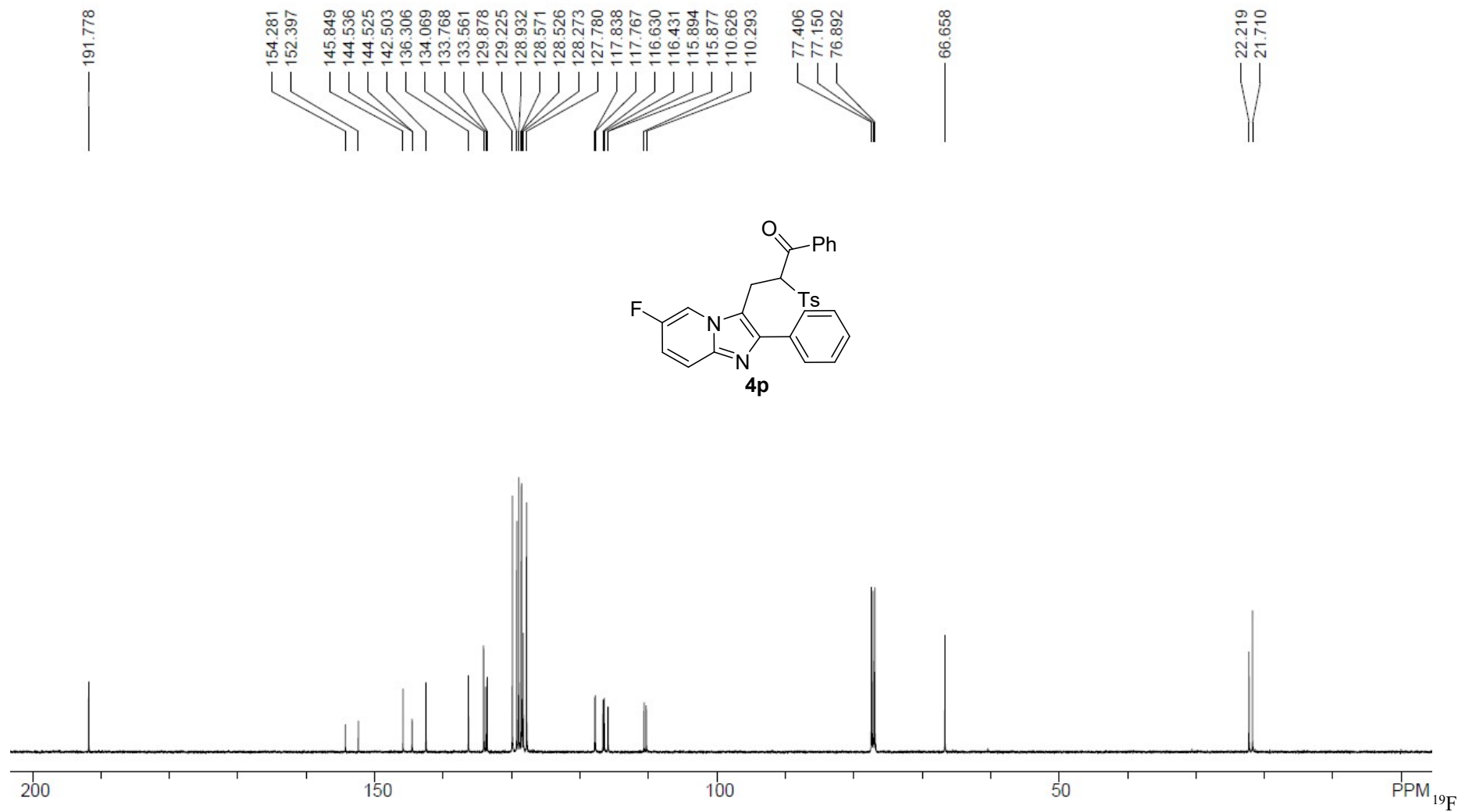
^{13}C NMR (126 MHz, CDCl_3) of **4o**



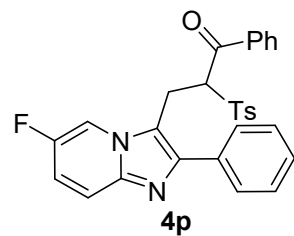
¹H NMR (500 MHz, CDCl₃) of **4p**



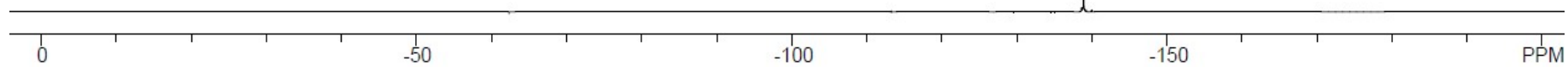
^{13}C NMR (126 MHz, CDCl_3) of **4p**



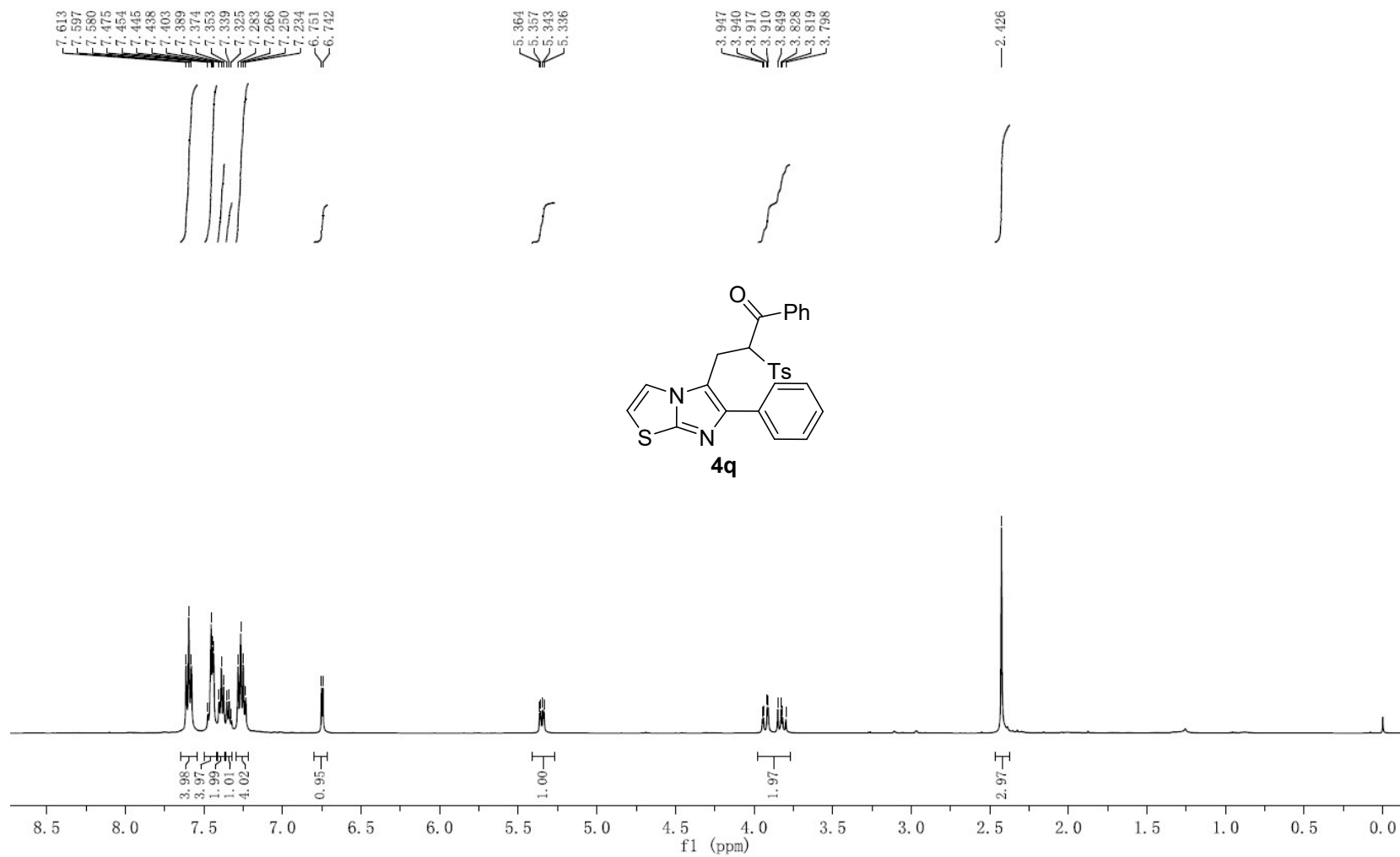
NMR (471 MHz, CDCl₃) of **4p**



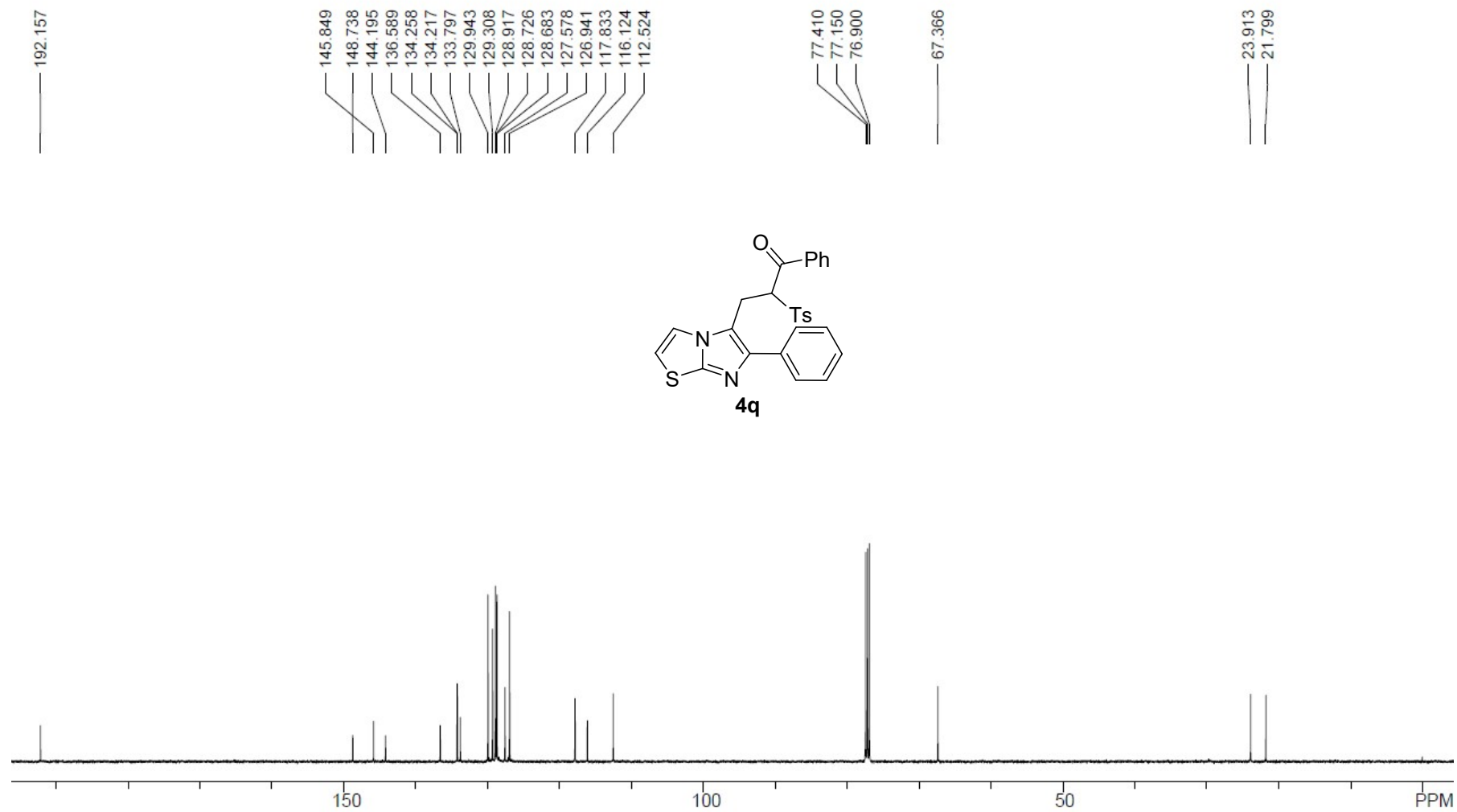
138.993



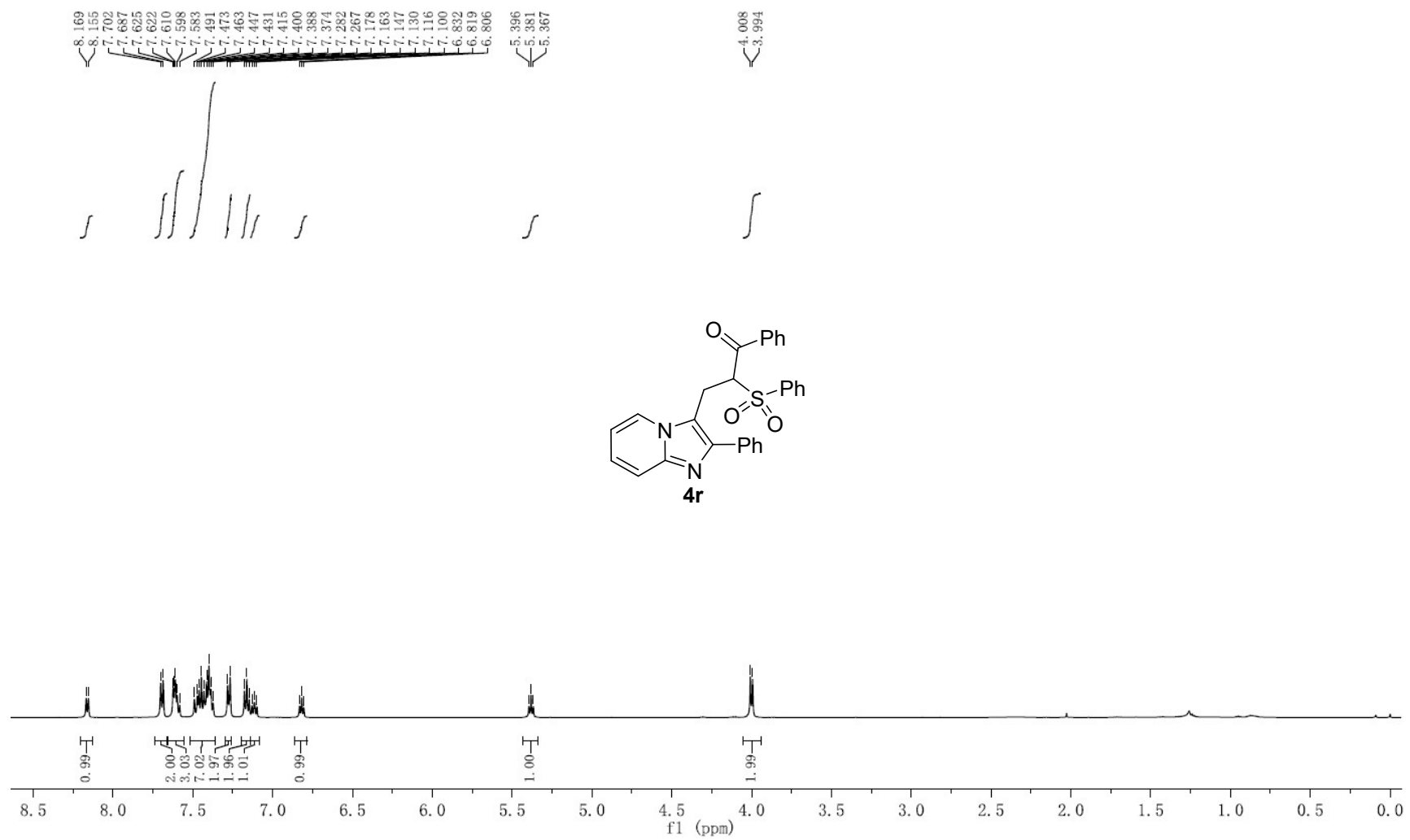
¹H NMR (500 MHz, CDCl₃) of **4q**



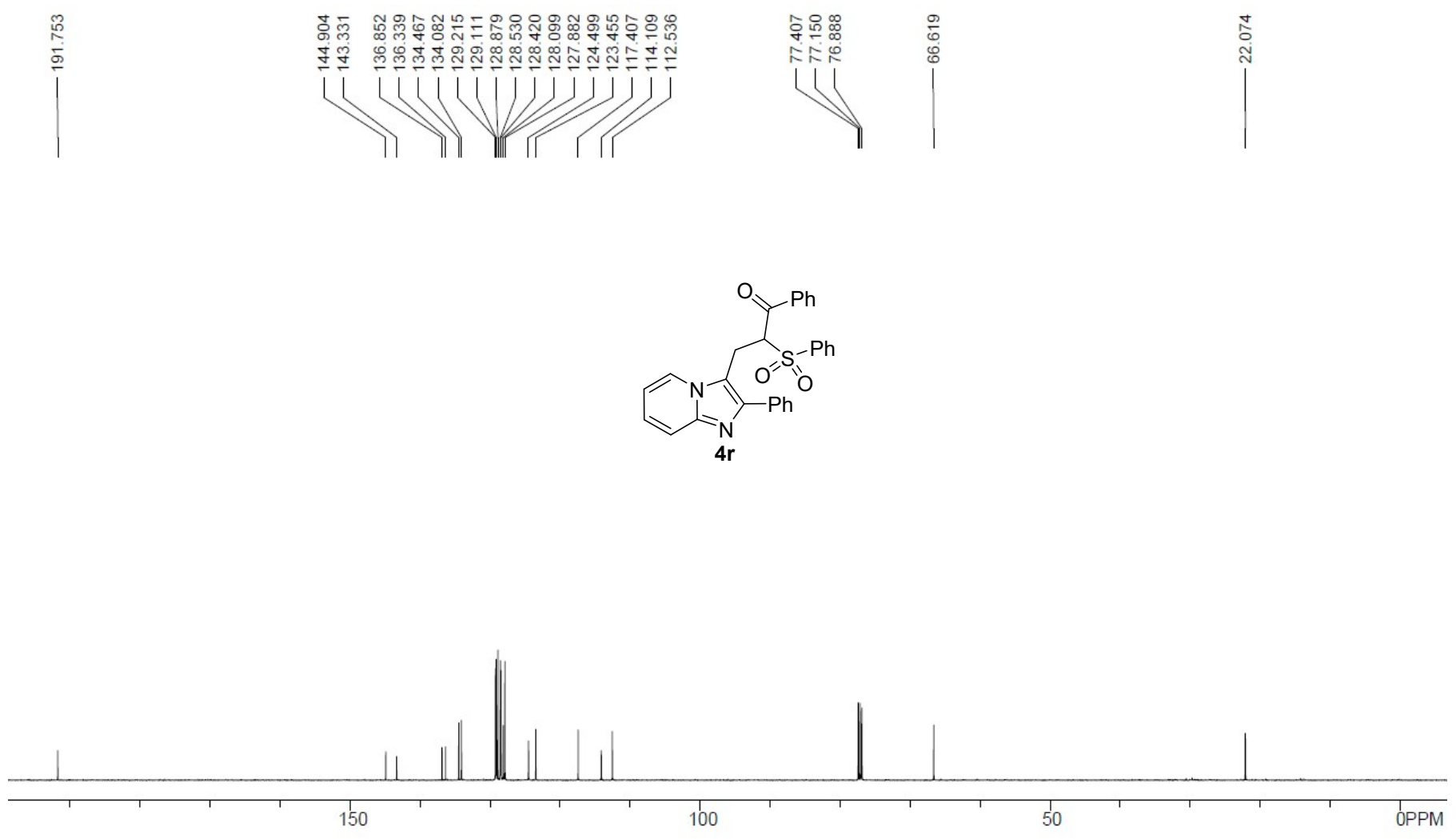
^{13}C NMR (126 MHz, CDCl_3) of **41**



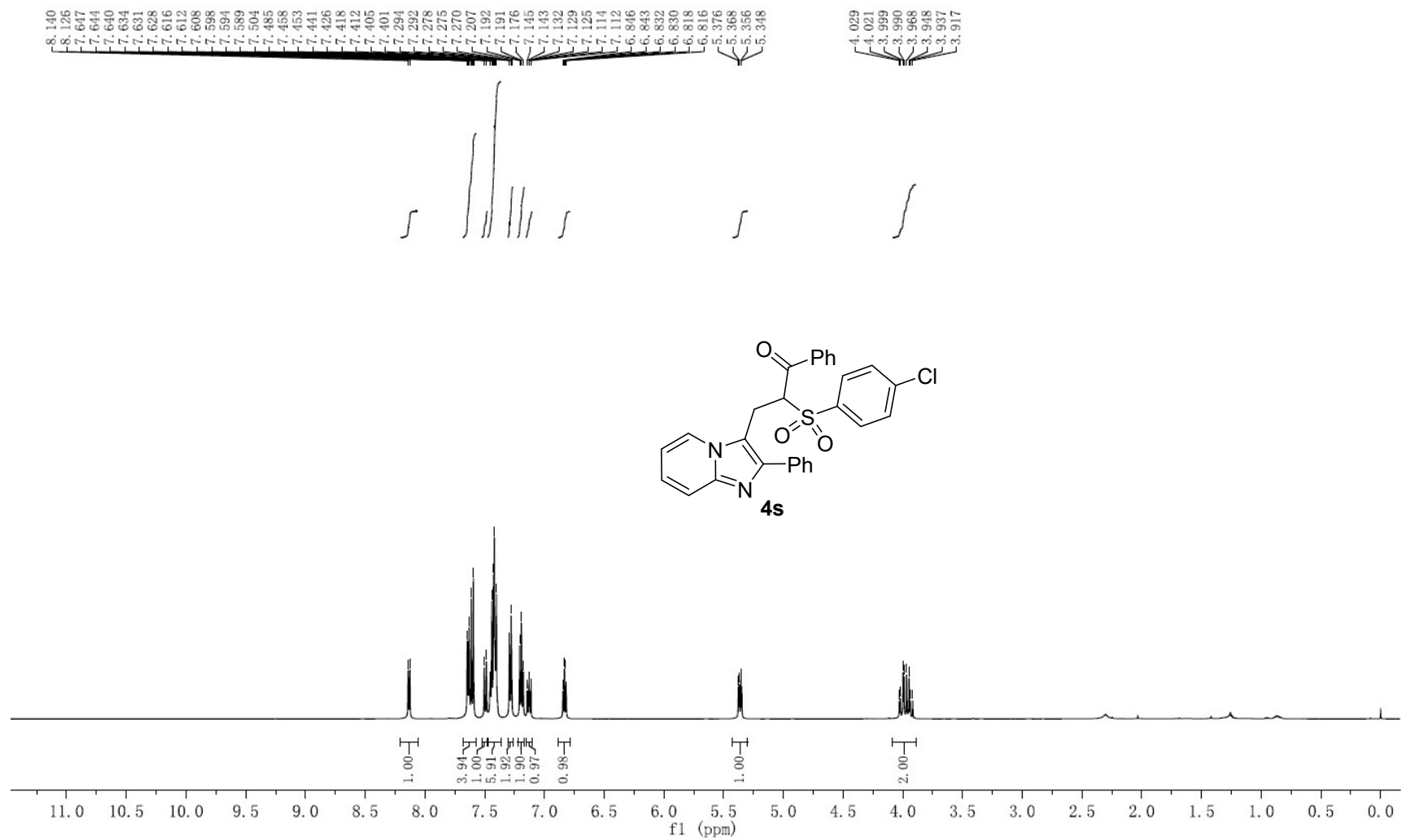
¹H NMR (500 MHz, CDCl₃) of **4r**



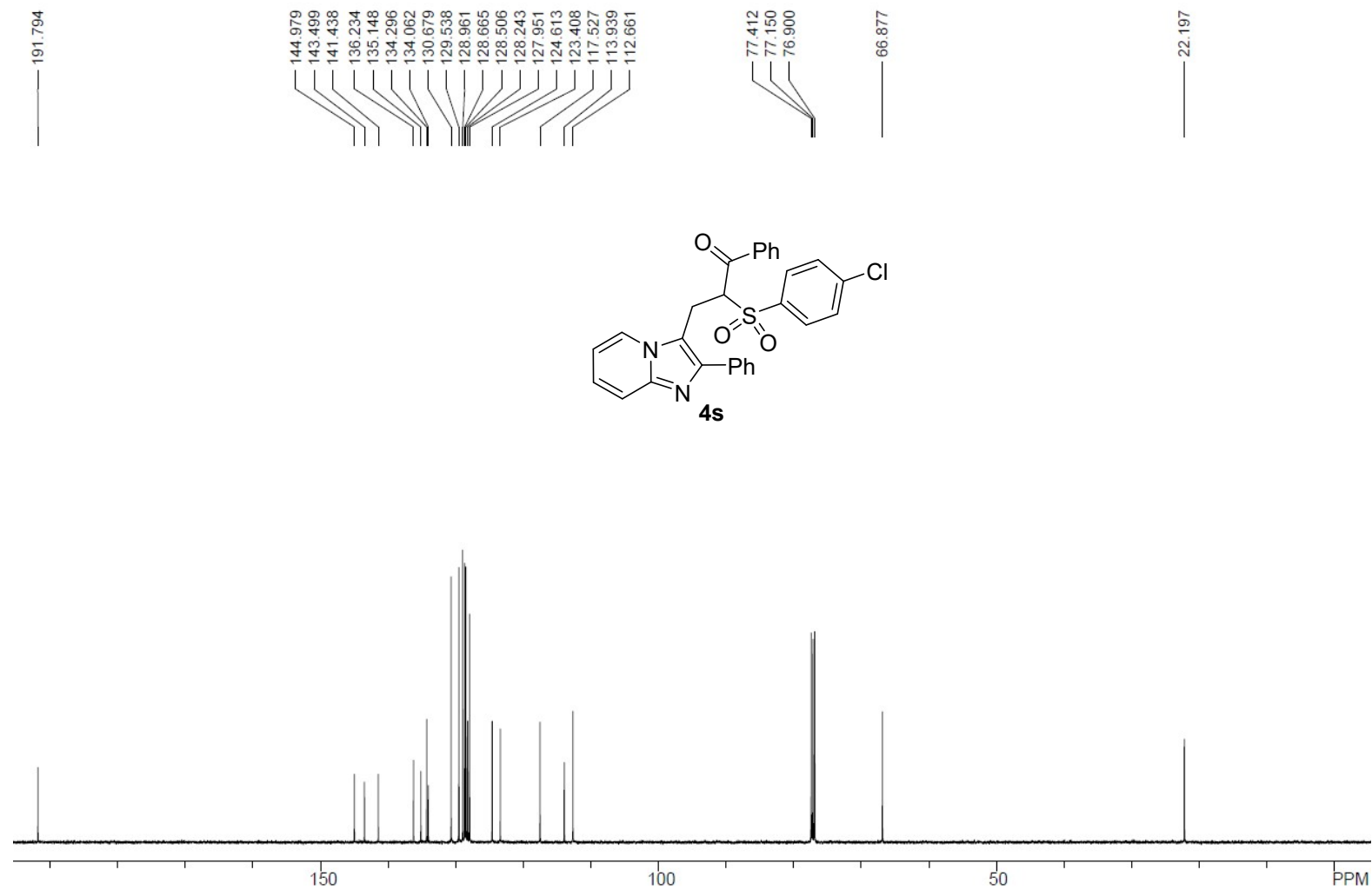
^{13}C NMR (126 MHz, CDCl_3) of **4r**



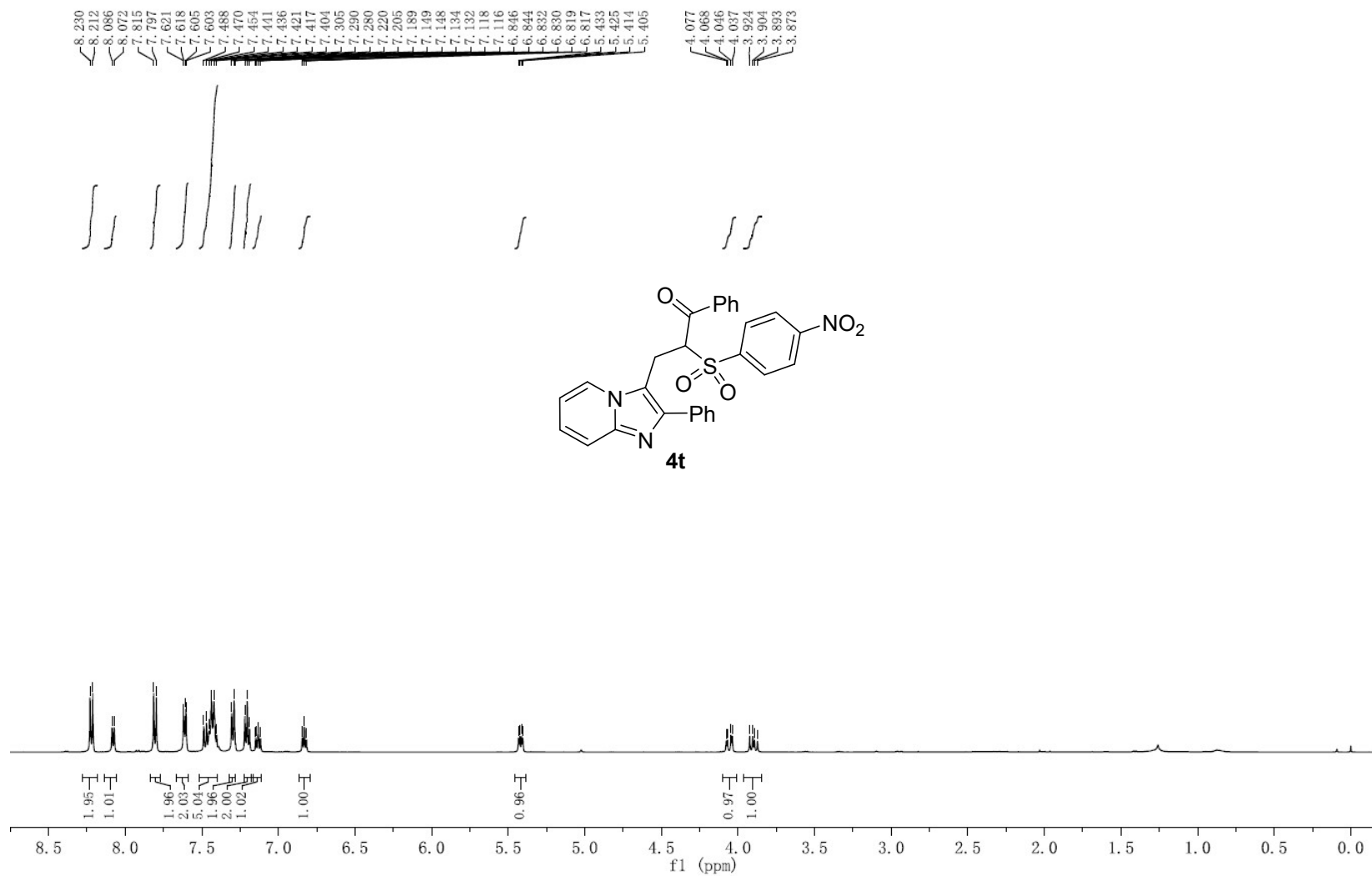
^1H NMR (500 MHz, CDCl_3) of **4s**



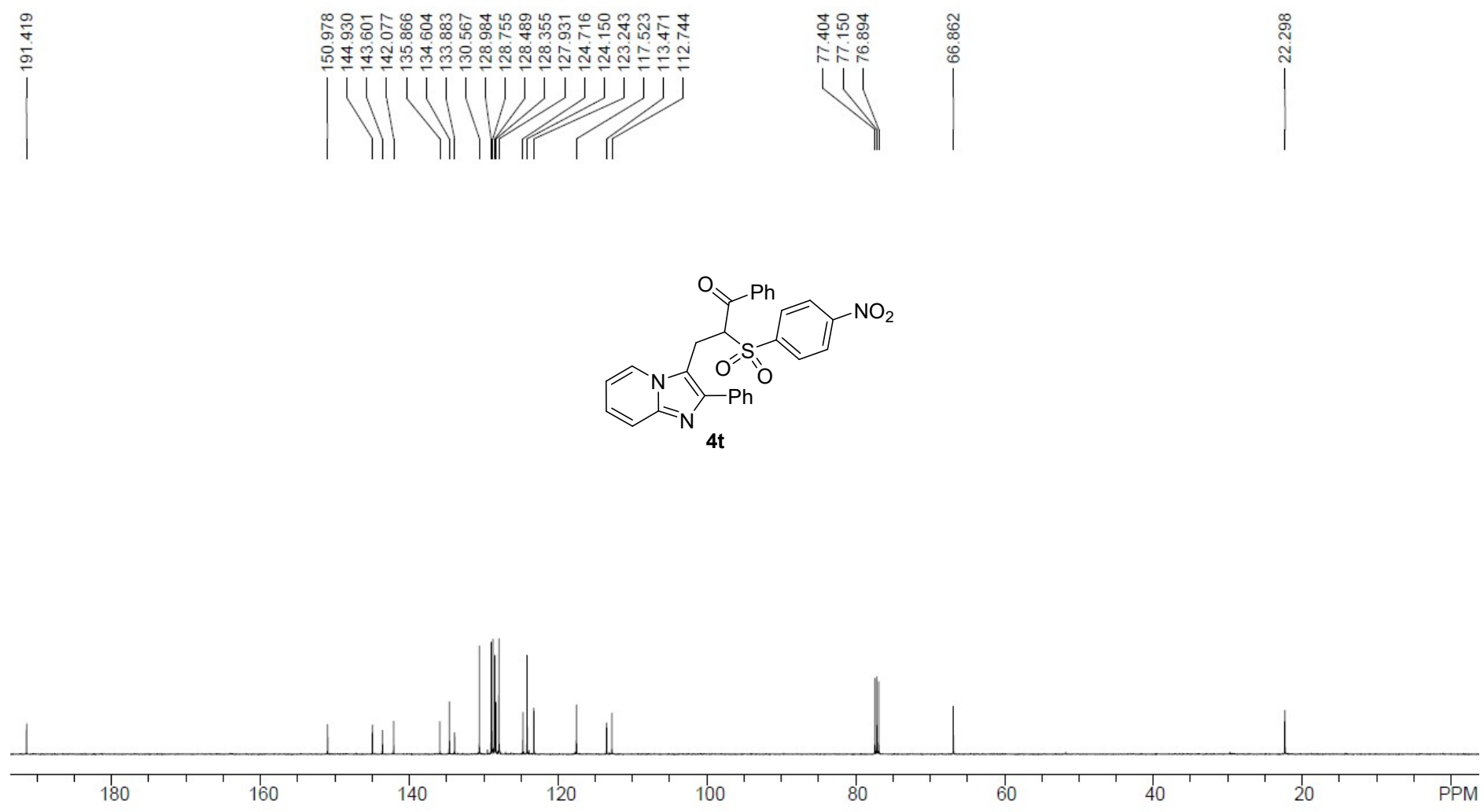
^{13}C NMR (126 MHz, CDCl_3) of **4s**



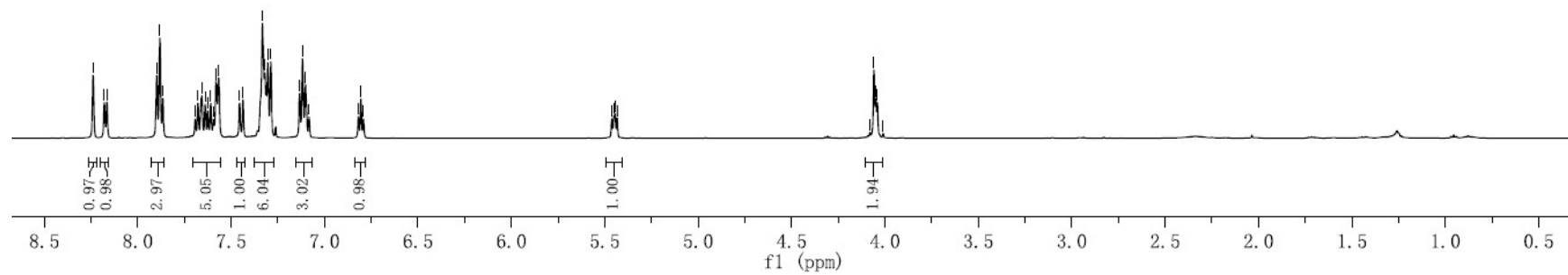
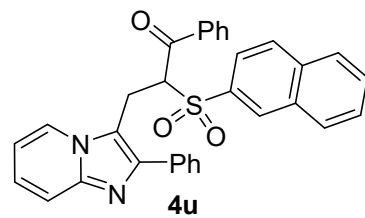
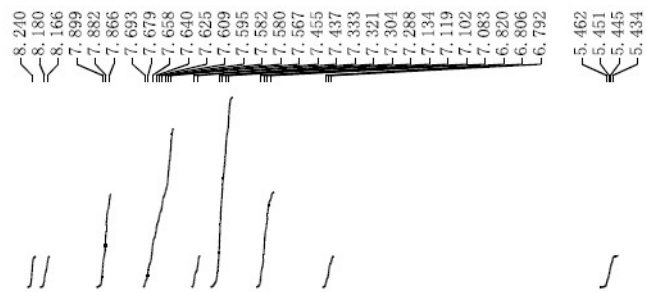
¹H NMR (500 MHz, CDCl₃) of **4t**



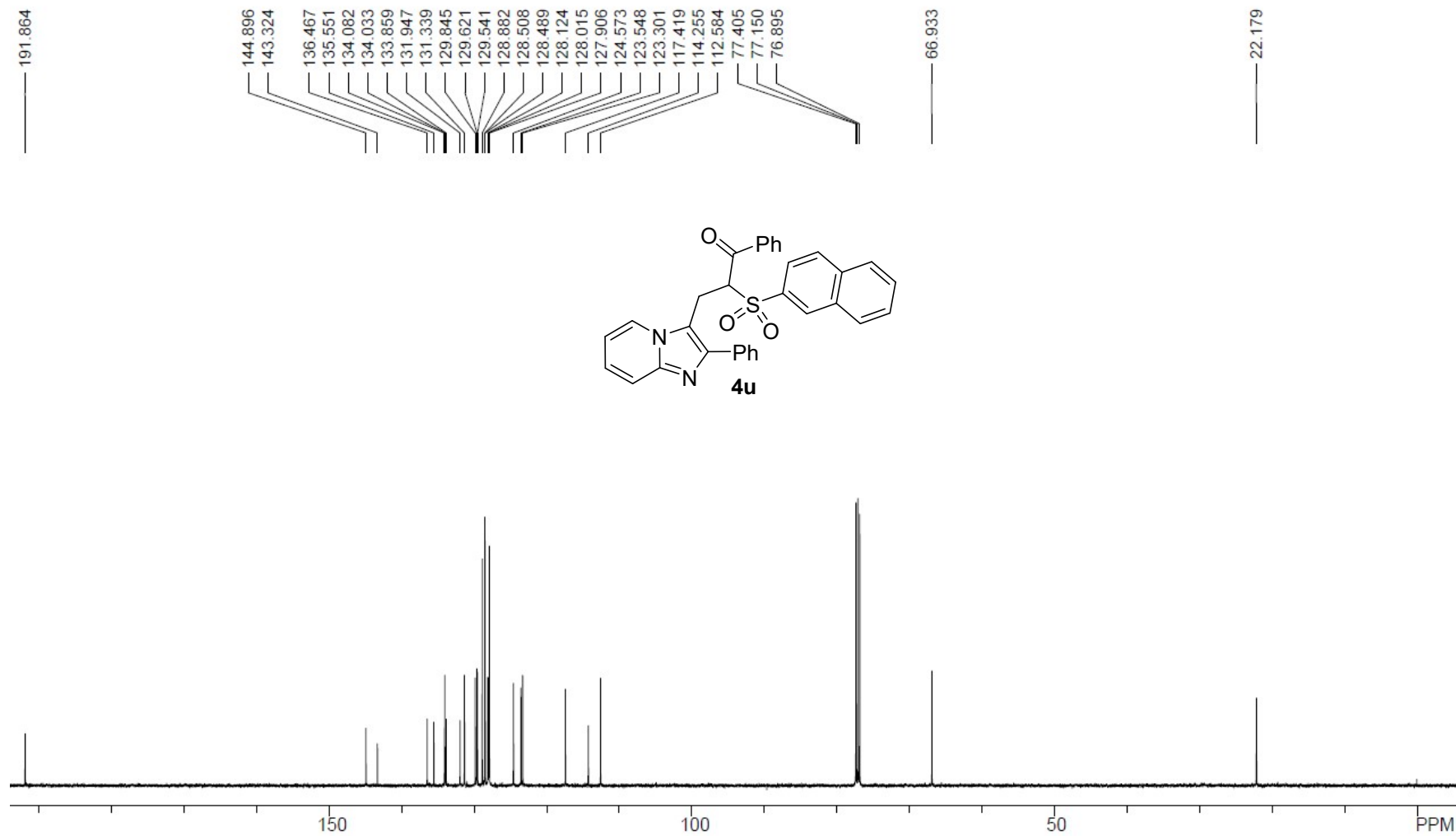
^{13}C NMR (126 MHz, CDCl_3) of **4t**



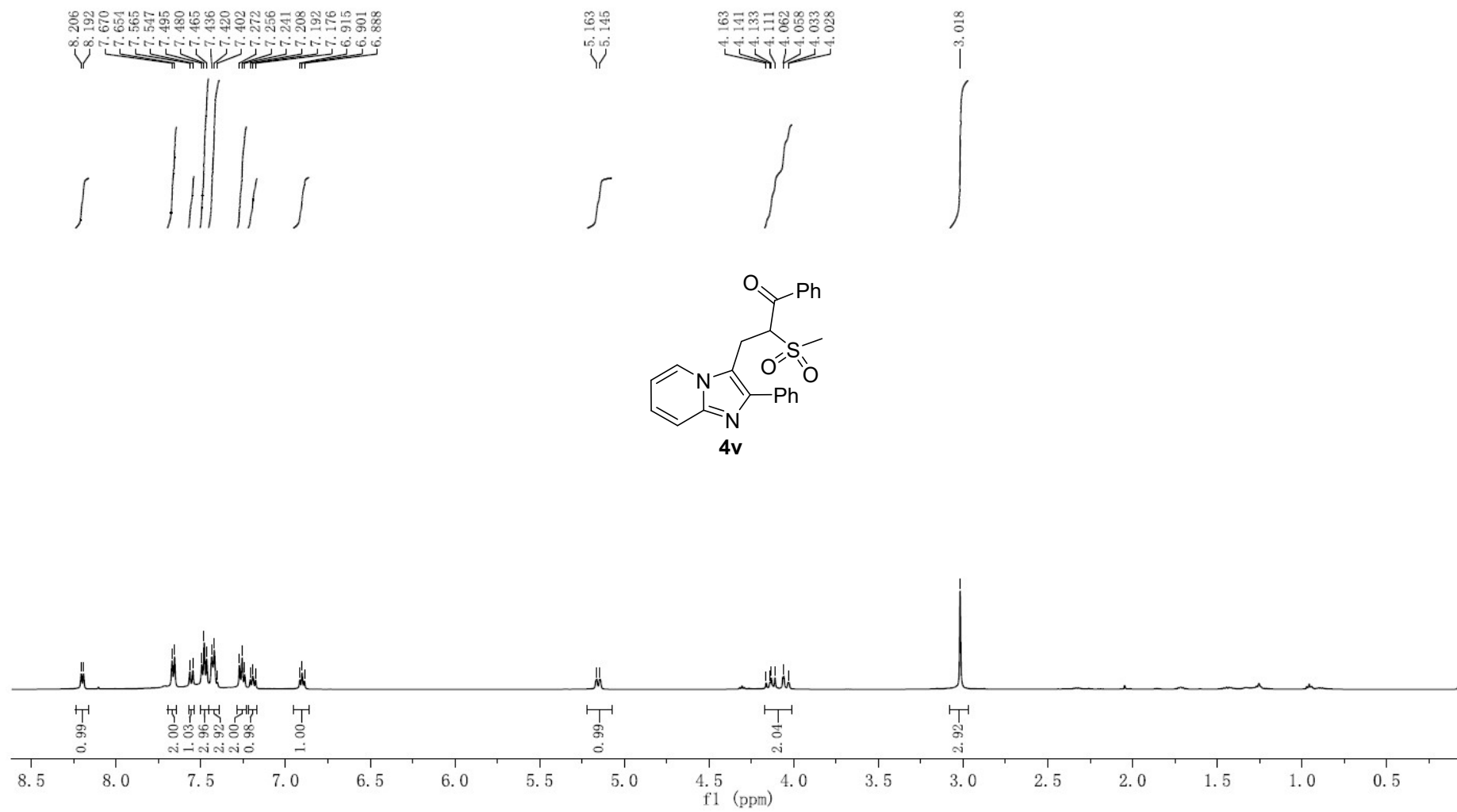
¹H NMR (500 MHz, CDCl₃) of **4u**



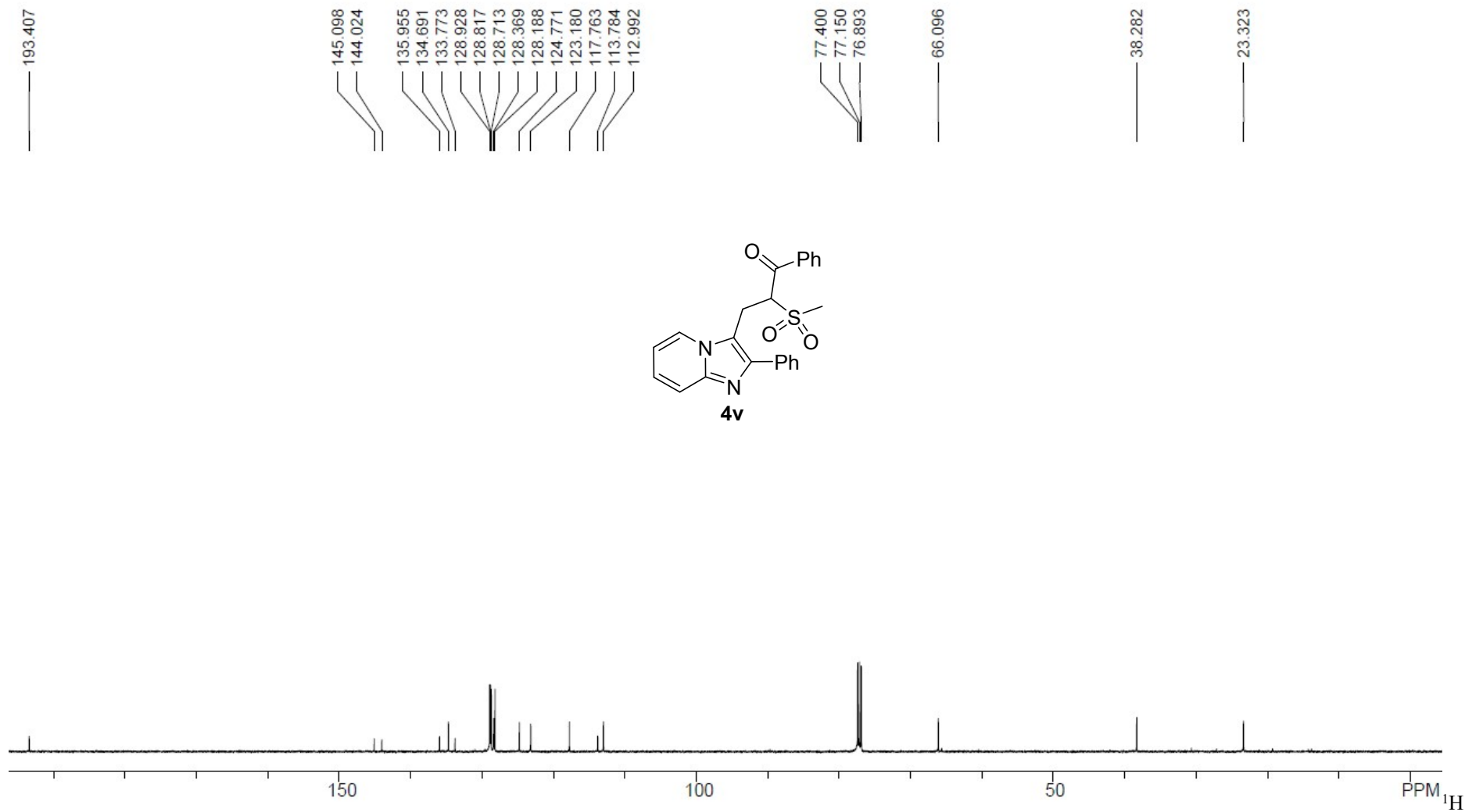
^{13}C NMR (126 MHz, CDCl_3) of **4u**



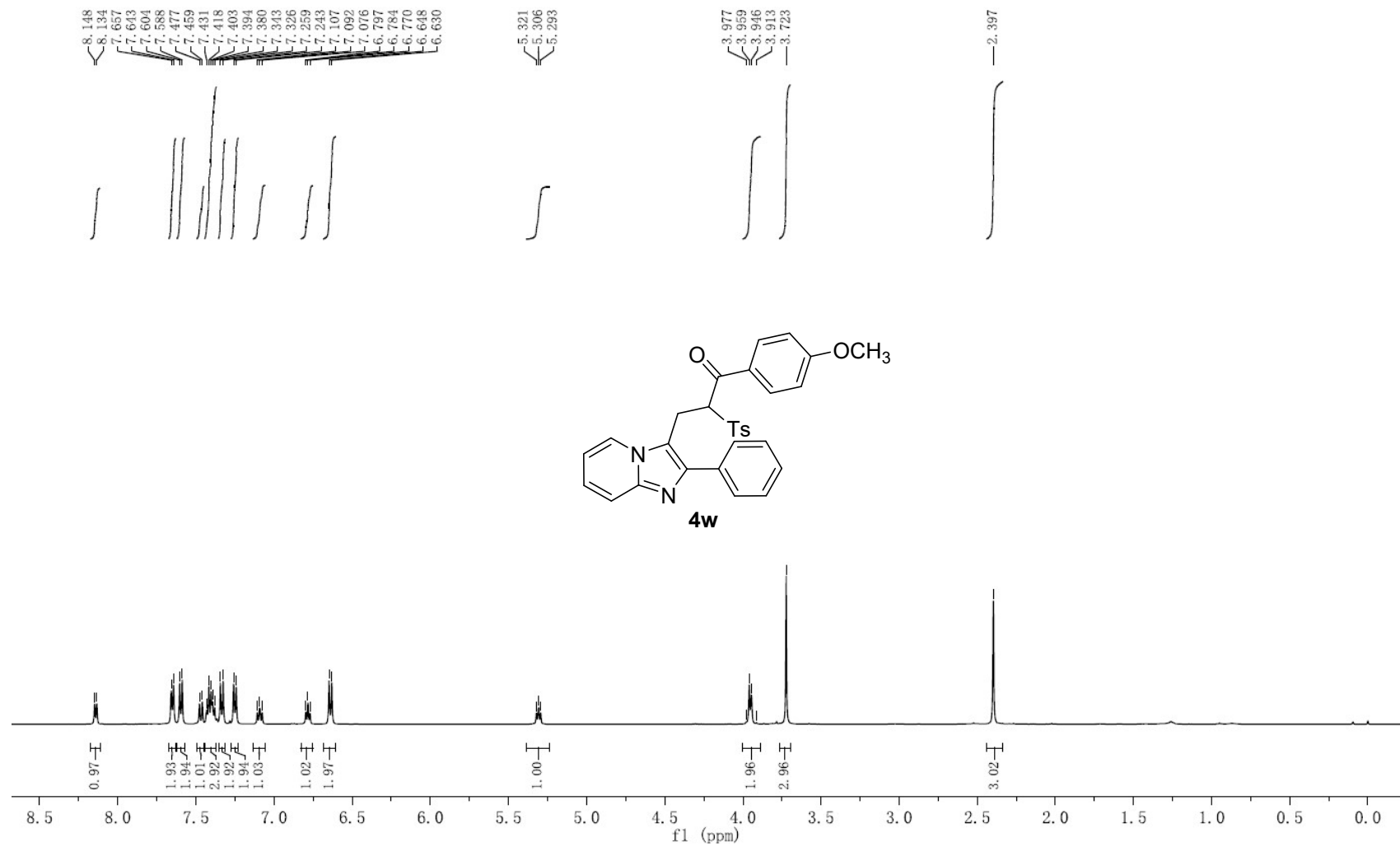
^1H NMR (500 MHz, CDCl_3) of **4v**



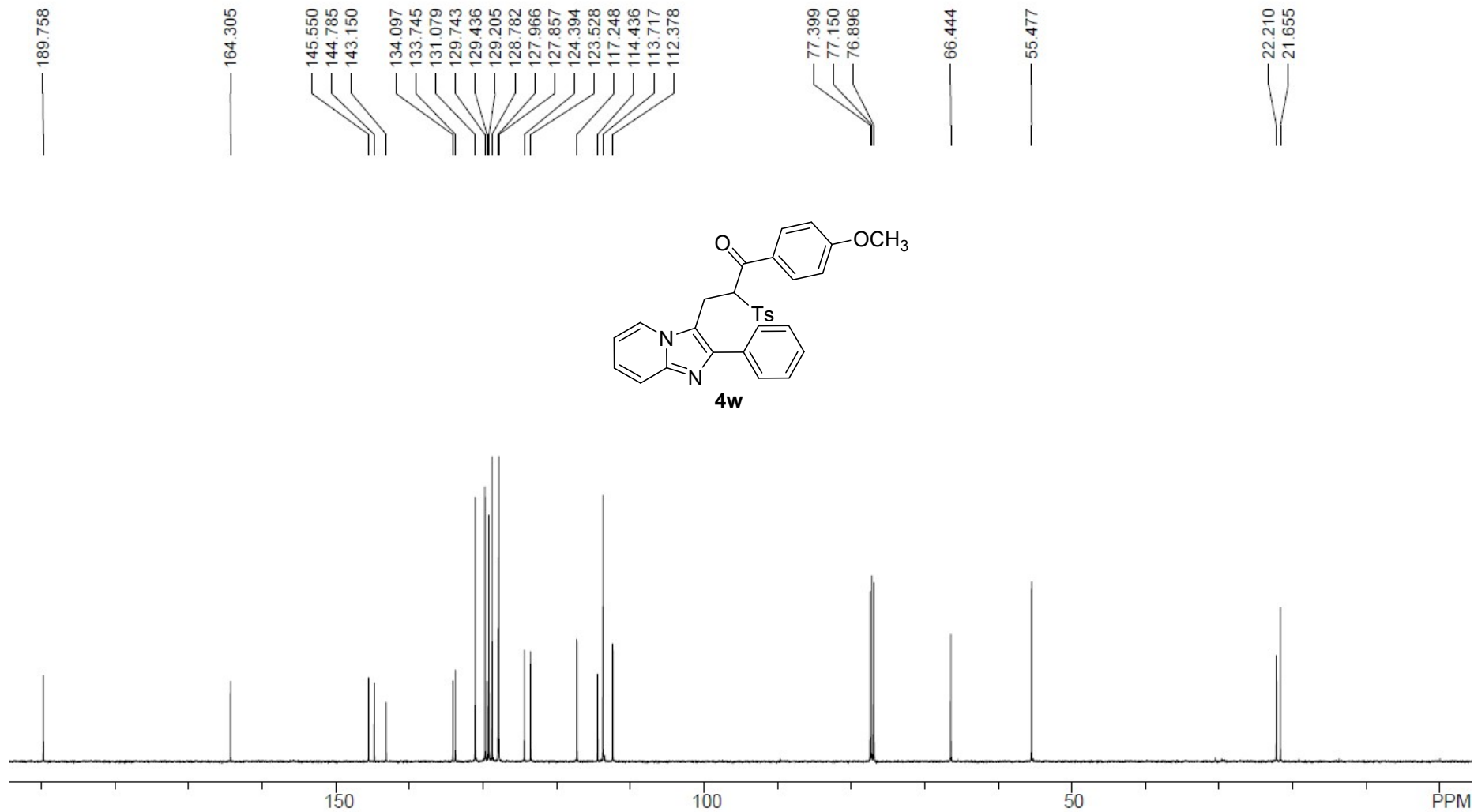
^{13}C NMR (126 MHz, CDCl_3) of **4v**



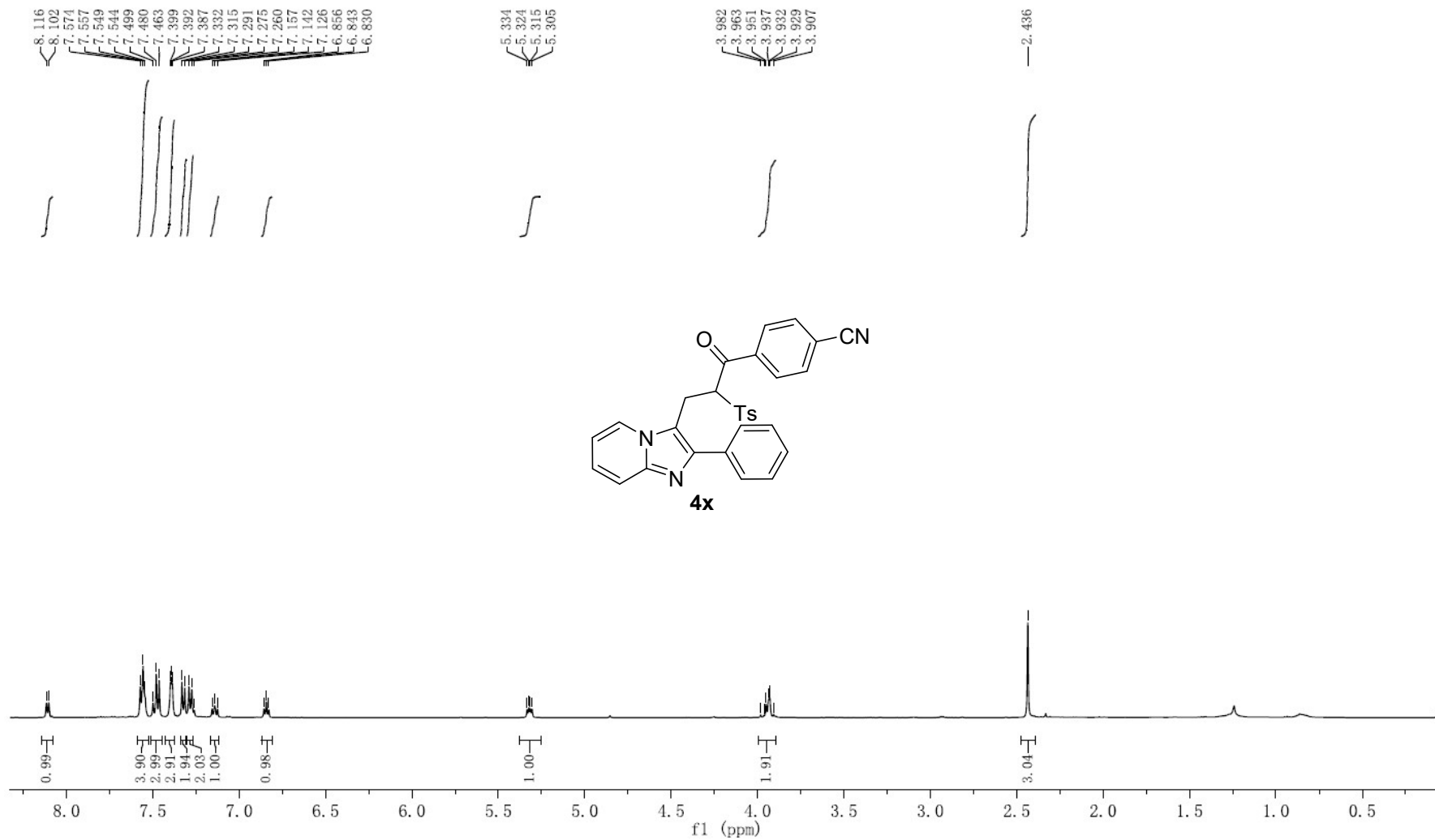
NMR (500 MHz, CDCl₃) of **4w**



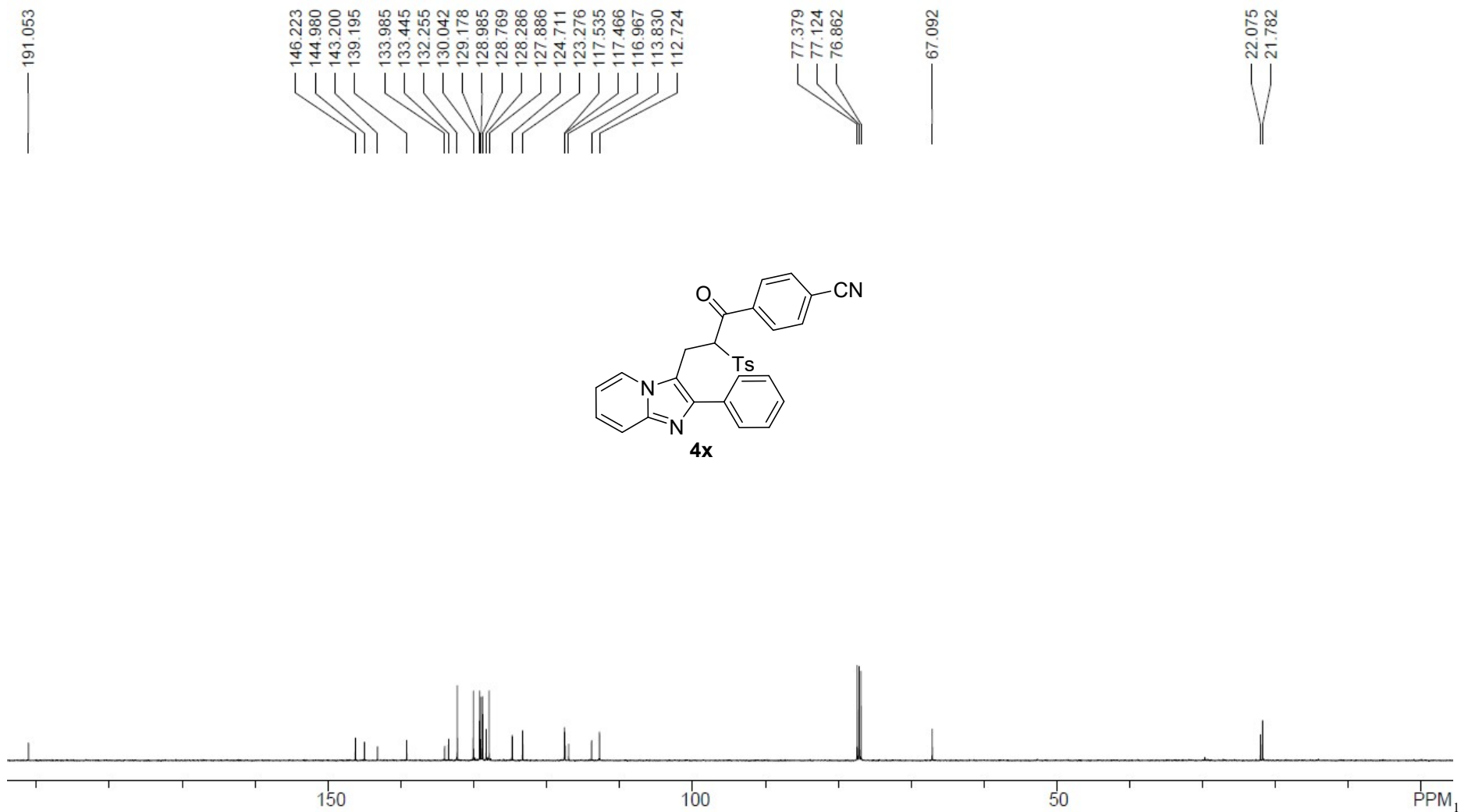
^{13}C NMR (126 MHz, CDCl_3) of **4w**



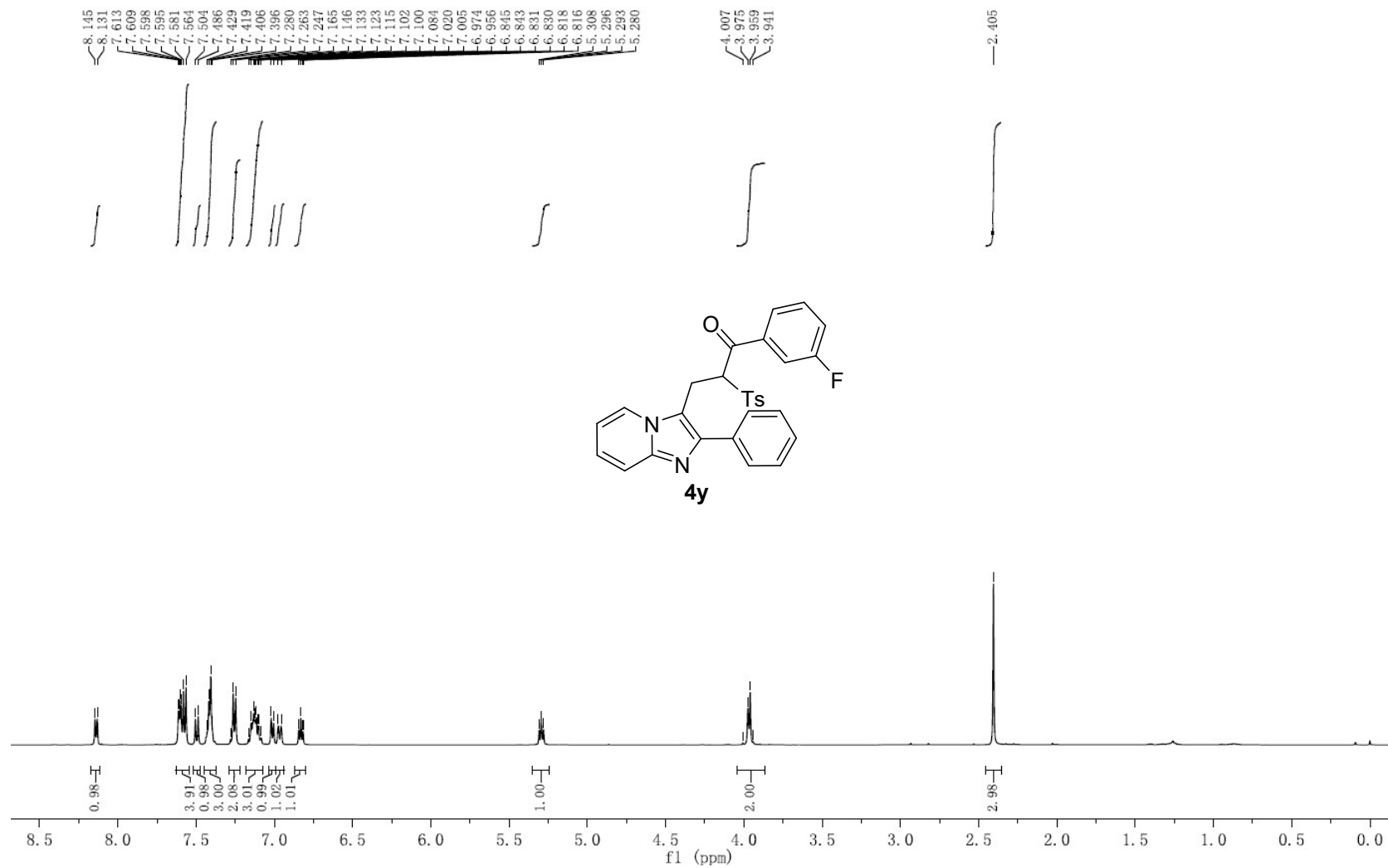
¹H NMR (500 MHz, CDCl₃) of **4x**



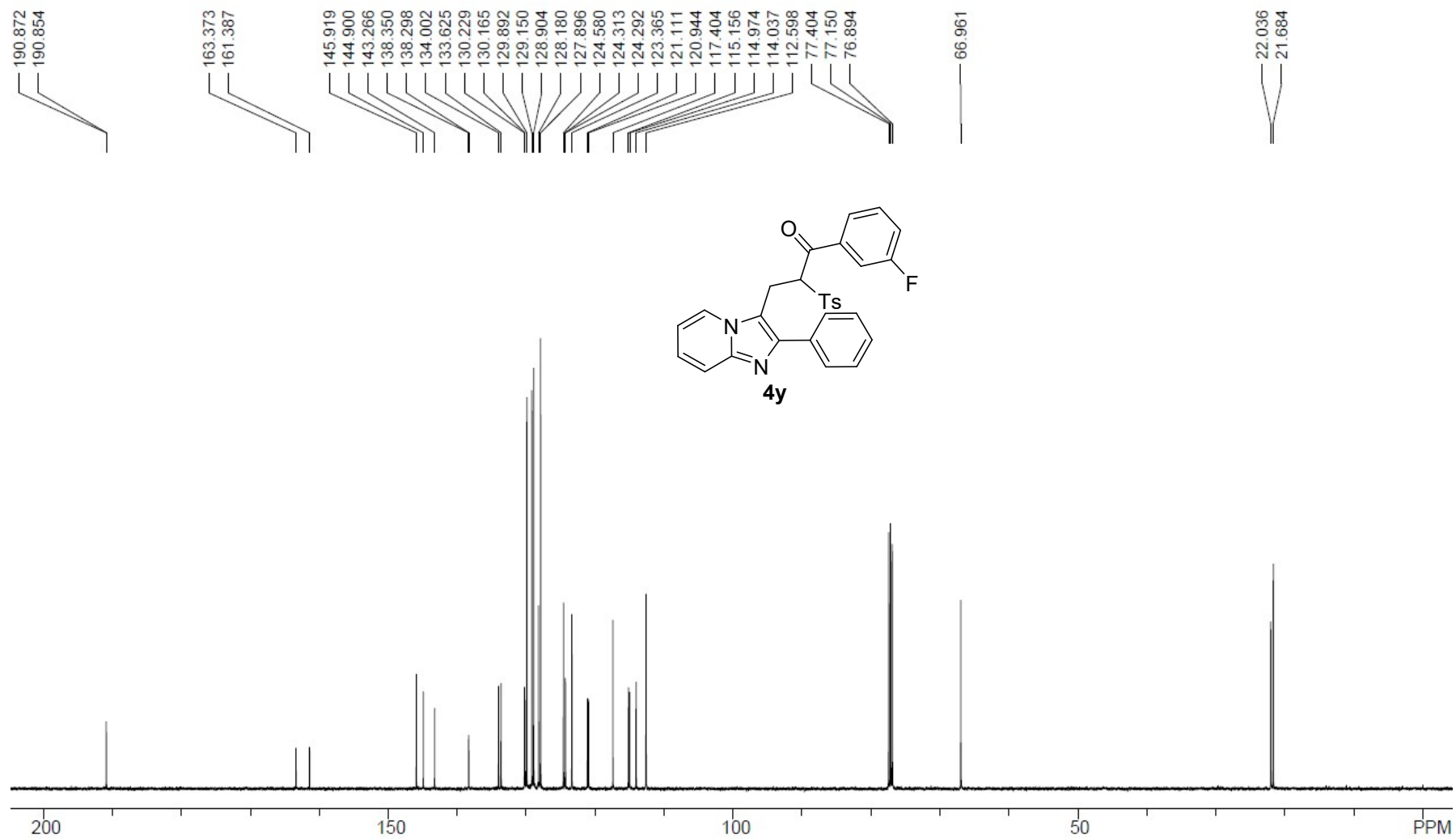
^{13}C NMR (126 MHz, CDCl_3) of **4x**



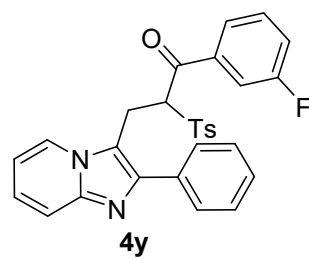
H NMR (500 MHz, CDCl₃) of **4y**



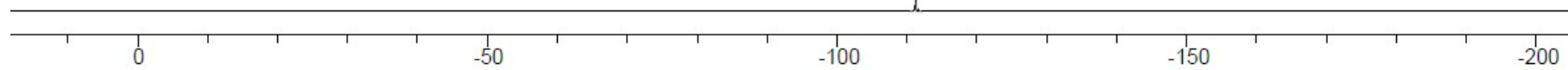
^{13}C NMR (126 MHz, CDCl_3) of **4y**



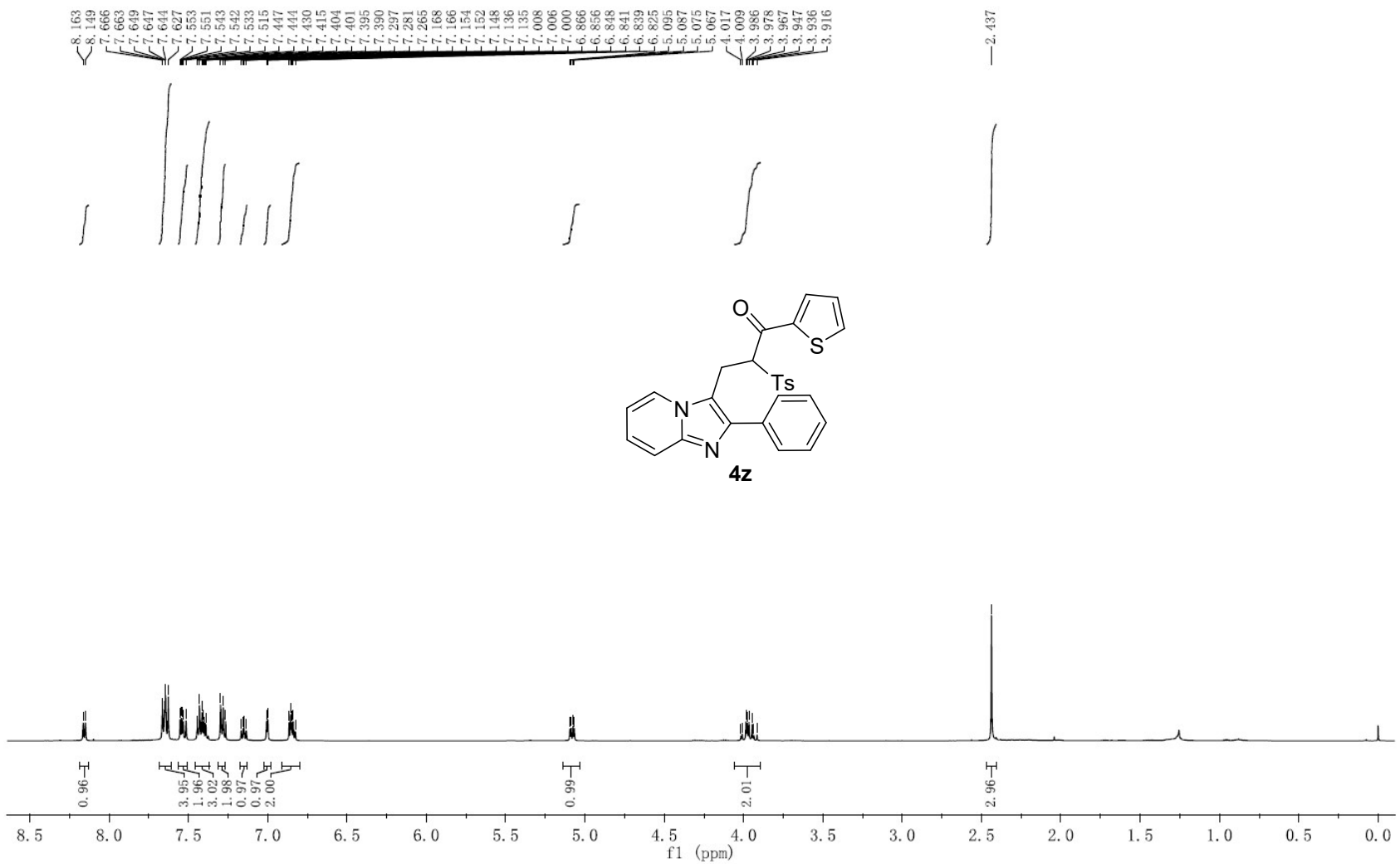
^{19}F NMR (471 MHz, CDCl_3) of **4y**



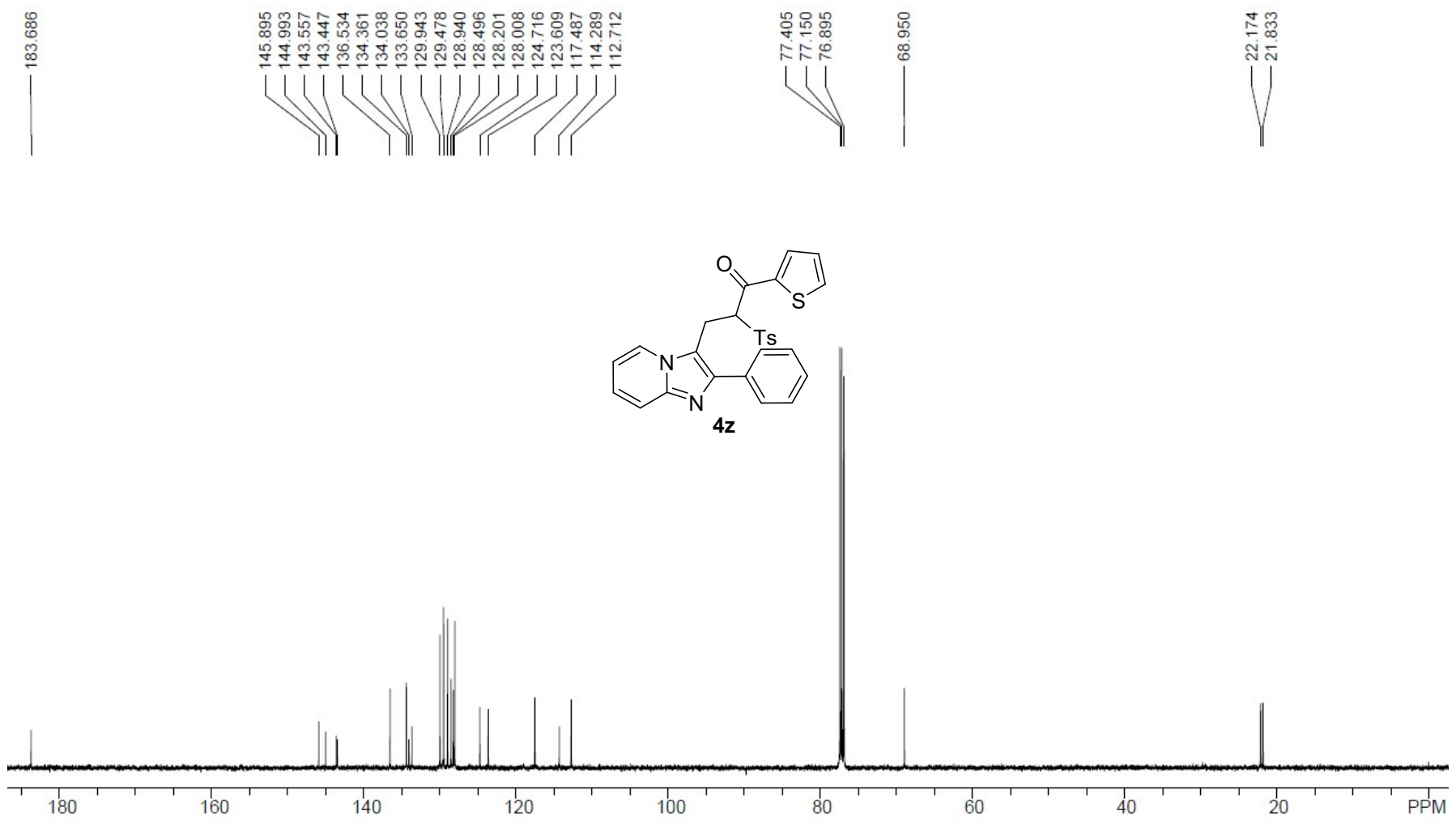
111.325



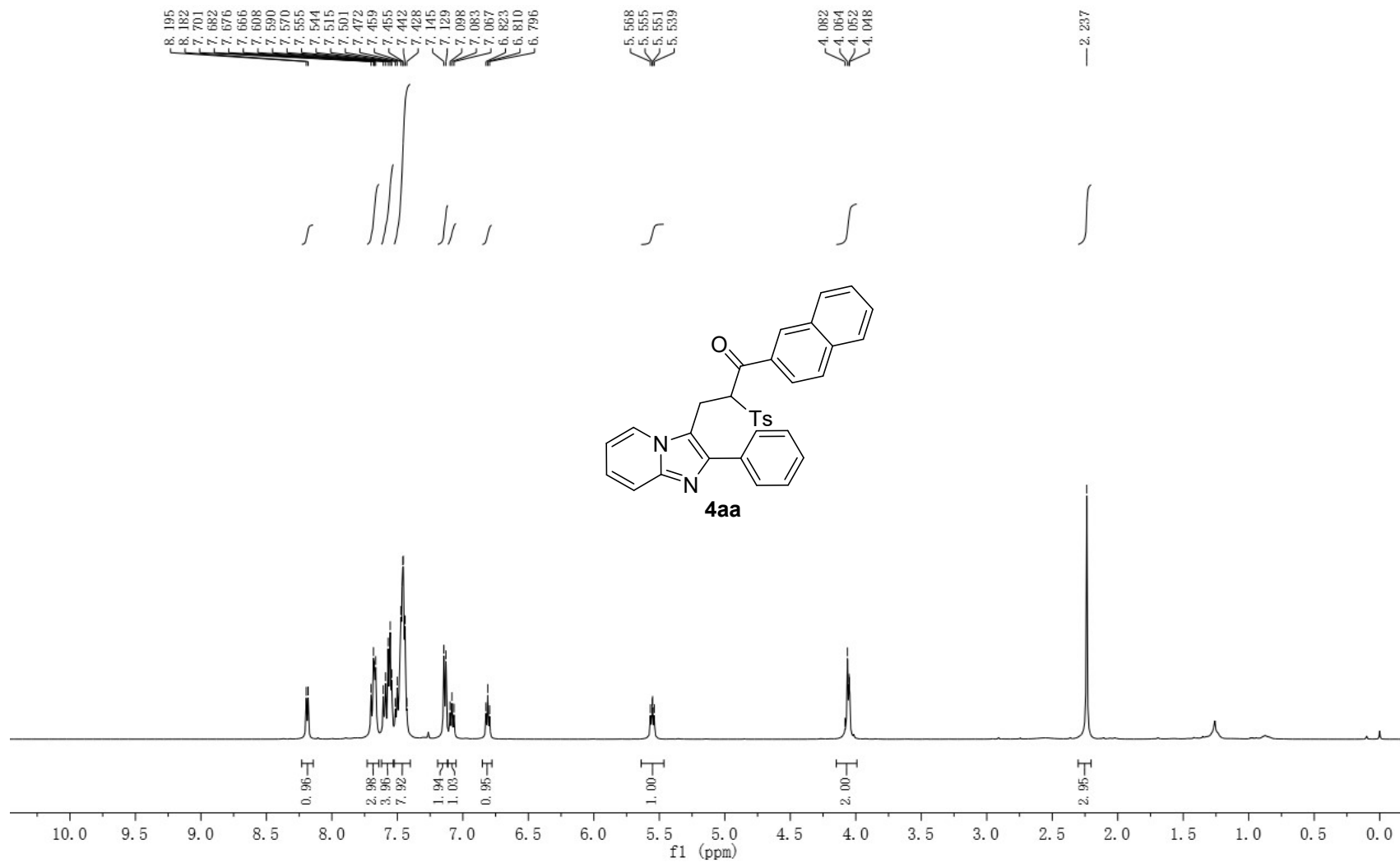
¹H NMR (500 MHz, CDCl₃) of **4z**



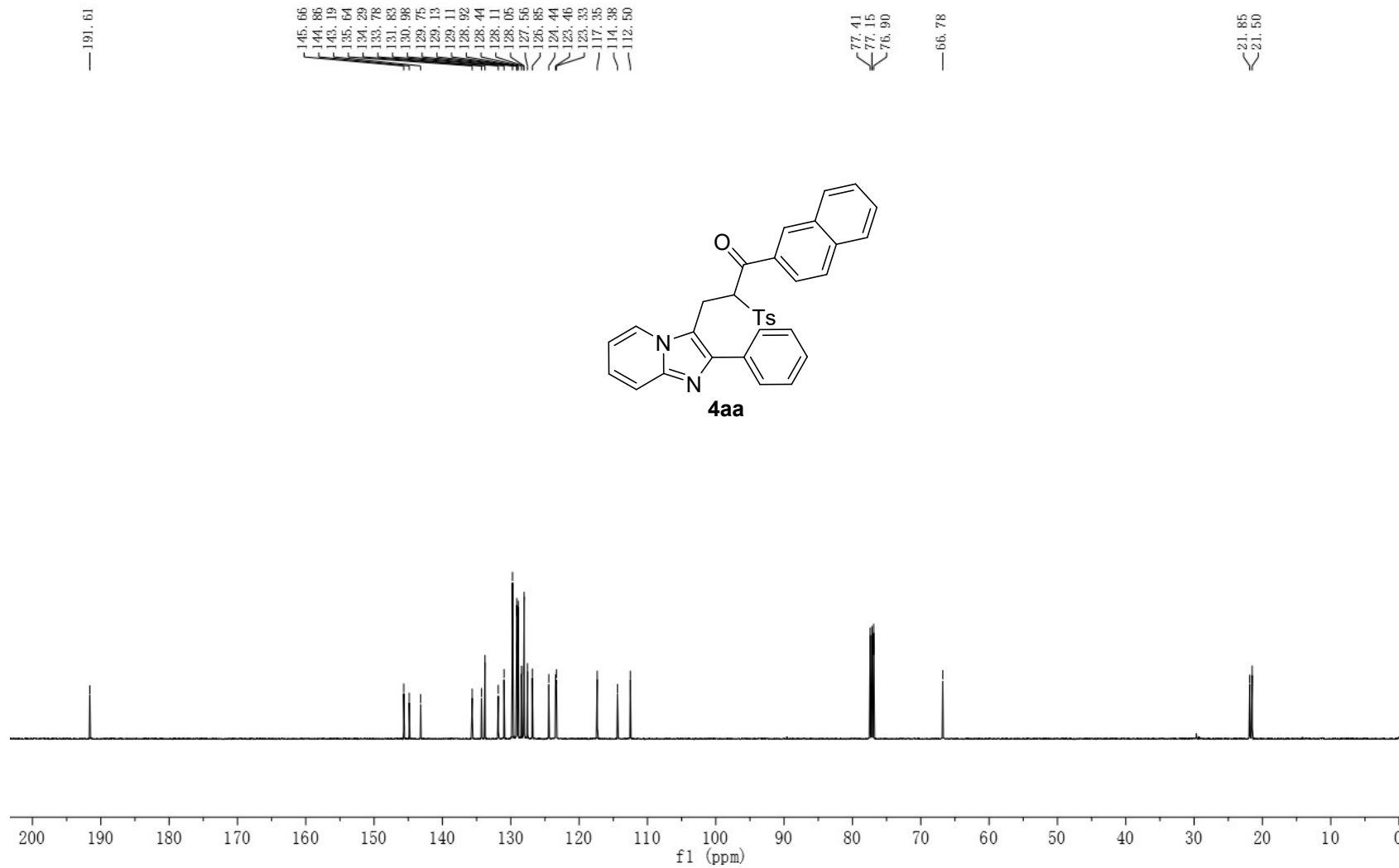
^{13}C NMR (126 MHz, CDCl_3) of **4z**



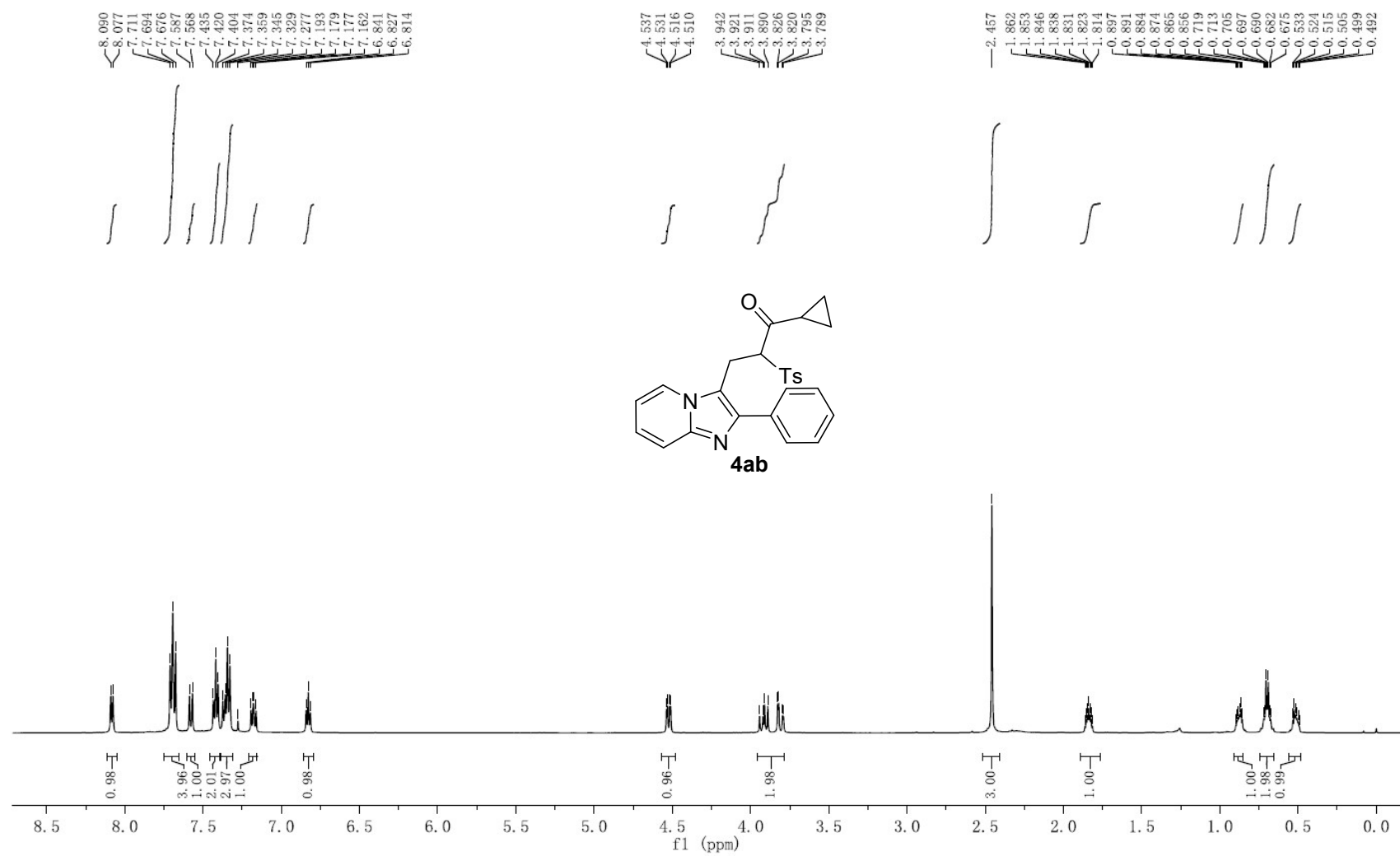
$^1\text{H NMR}$ (500 MHz, CDCl_3) of **4aa**



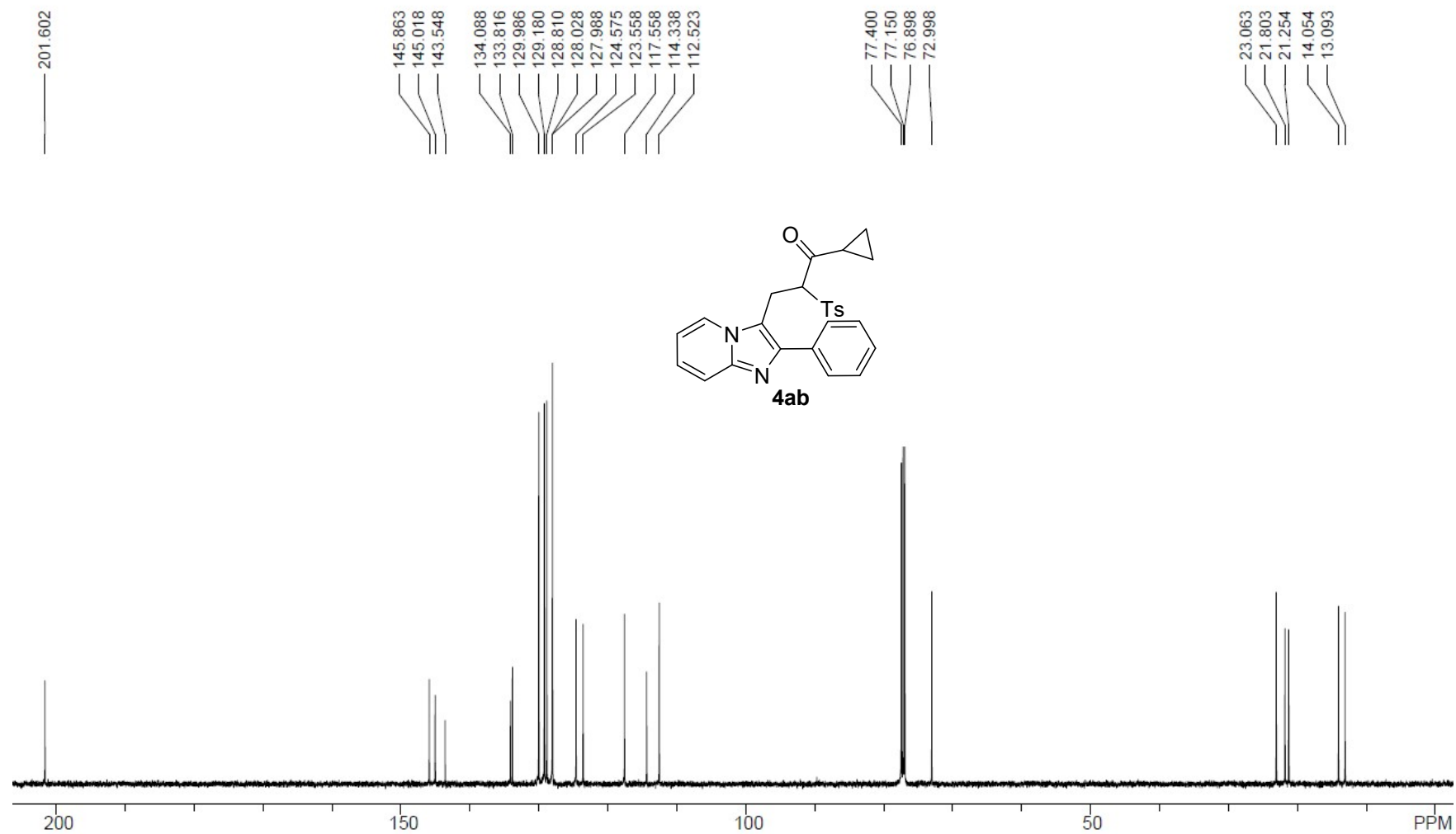
^{13}C NMR (126 MHz, CDCl_3) of **4aa**



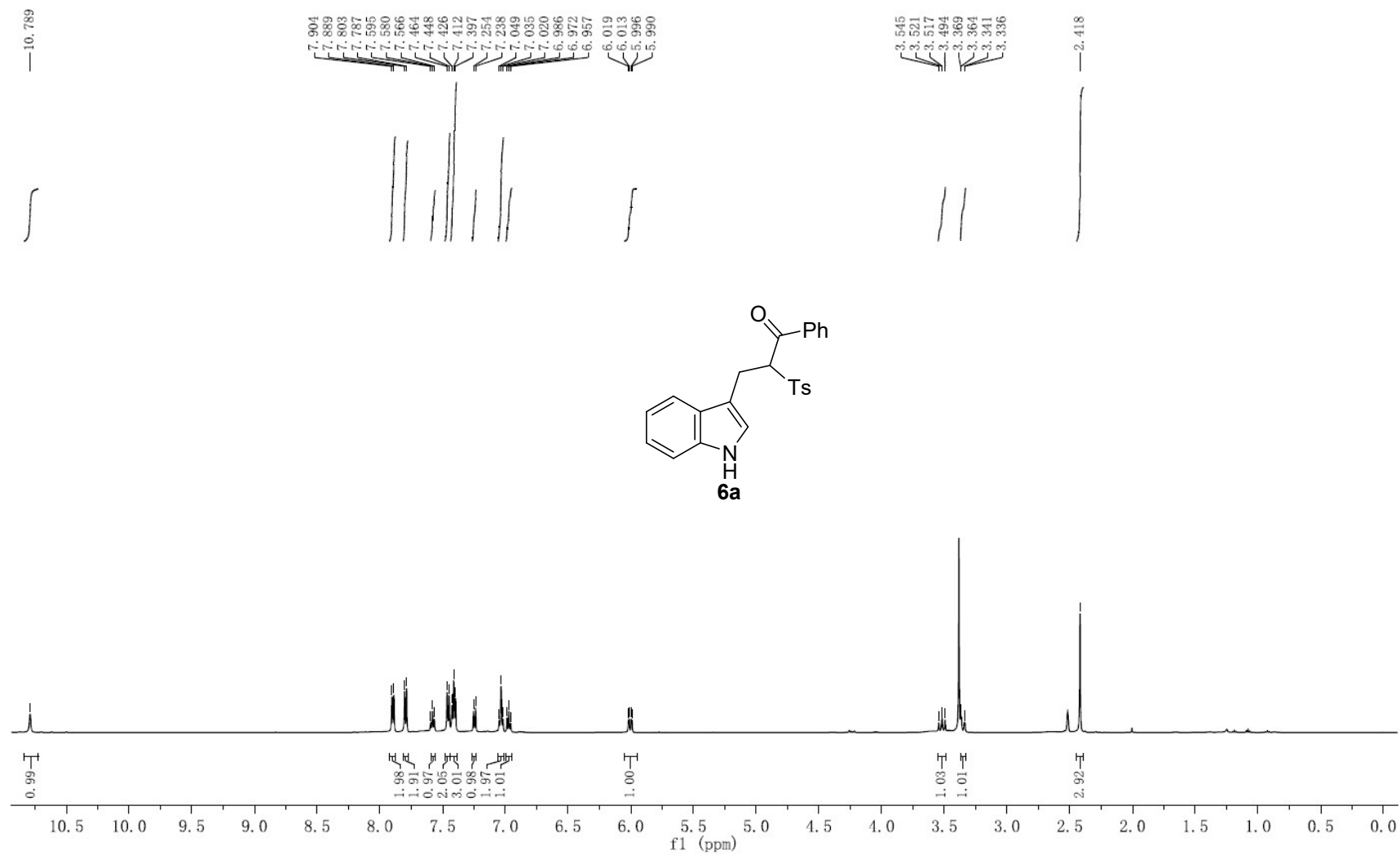
¹H NMR (500 MHz, CDCl₃) of **4ab**



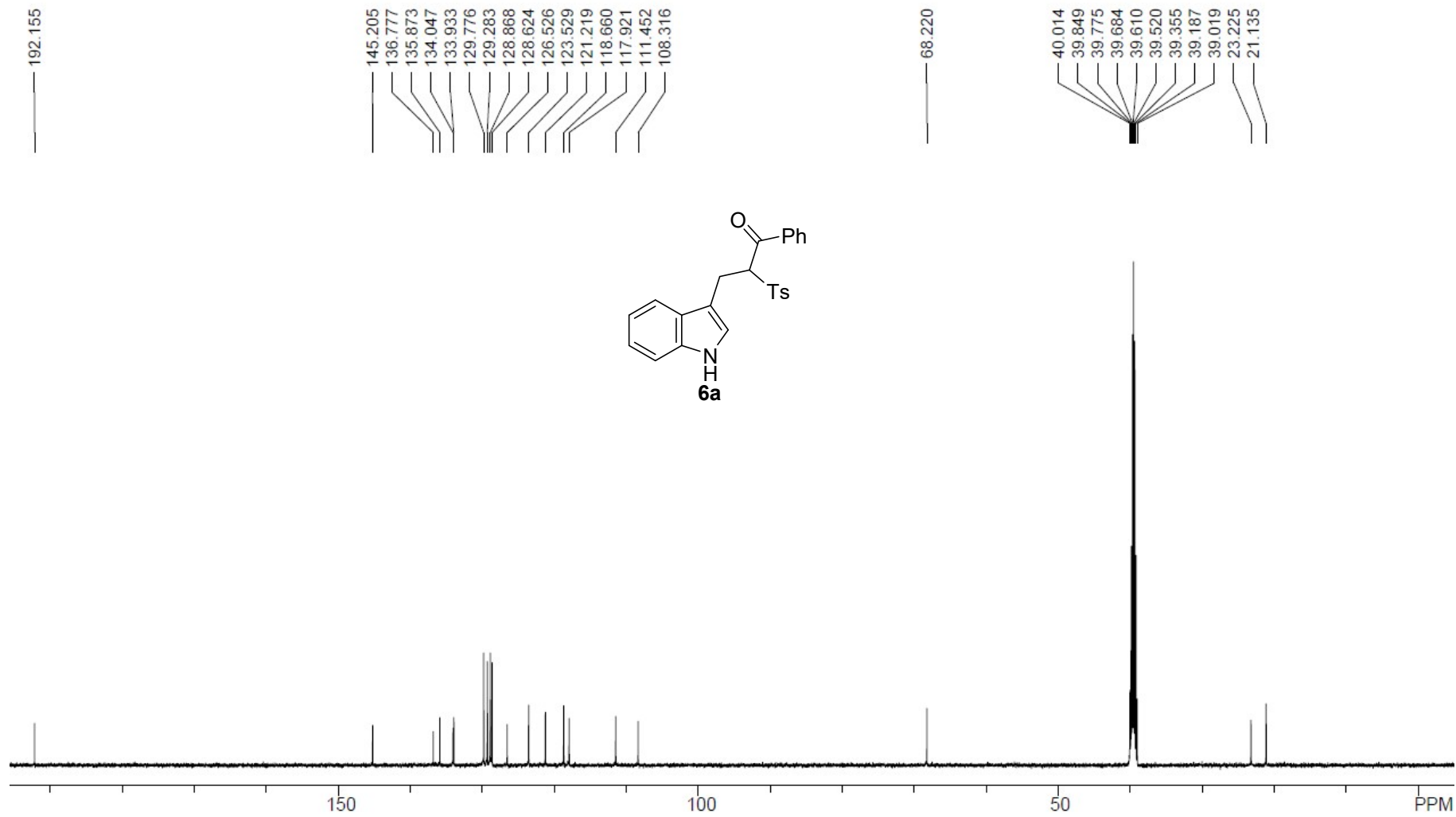
^{13}C NMR (126 MHz, CDCl_3) of **4ab**



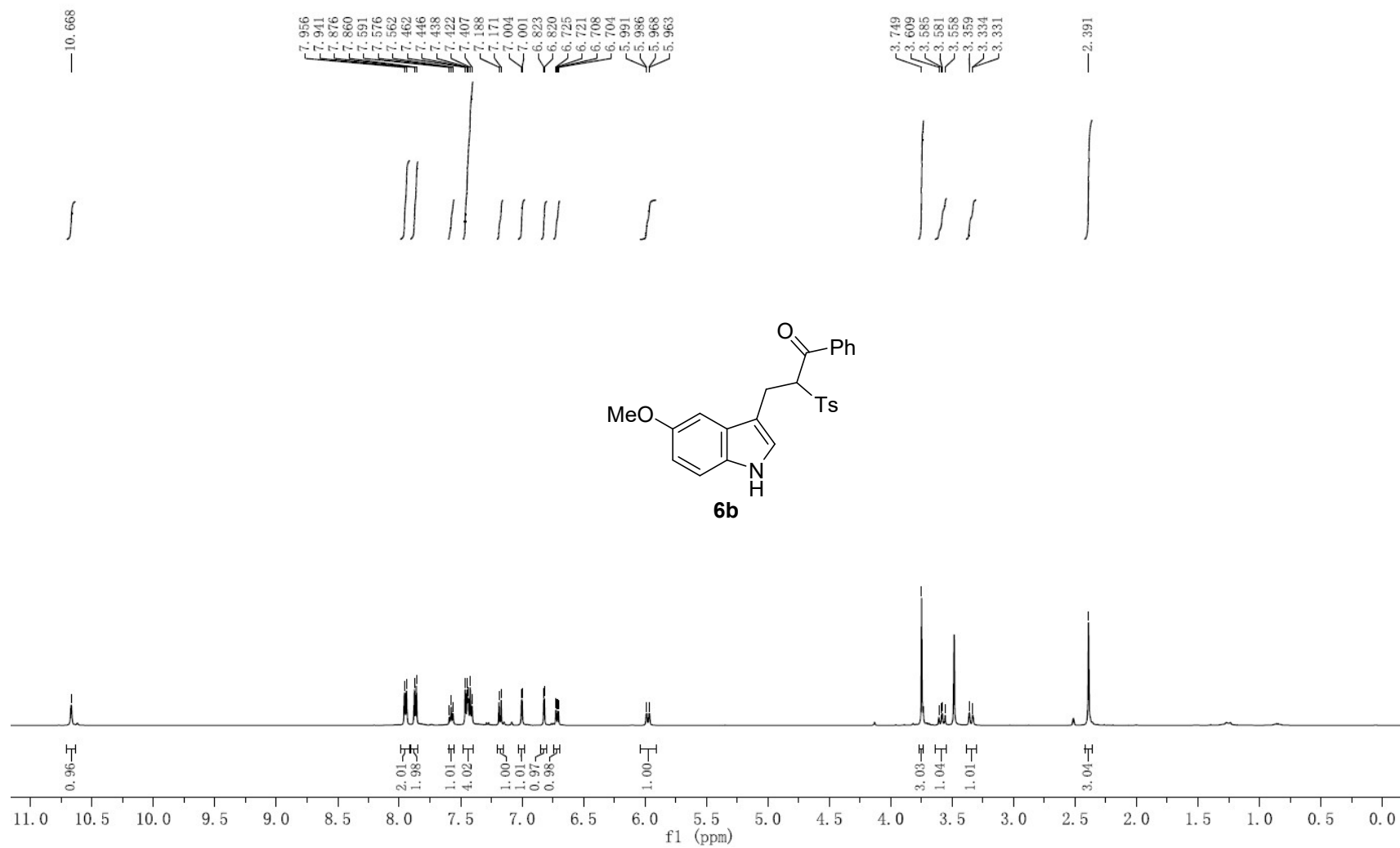
¹H NMR (500 MHz, DMSO-d₆) of **6a**



^{13}C NMR (126 MHz, DMSO- d_6) of **6a**



¹H NMR (500 MHz, DMSO-d₆) of **6b**



^{13}C NMR (126 MHz, DMSO-d_6) of **6b**

—192.647

—153.679

—145.679

—137.307

—134.743

—134.425

—131.522

—130.299

—129.712

—129.385

—129.116

—127.278

—124.589

—112.687

—111.983

—108.572

—99.983

—68.687

—55.742

—40.460

—40.293

—40.126

—39.959

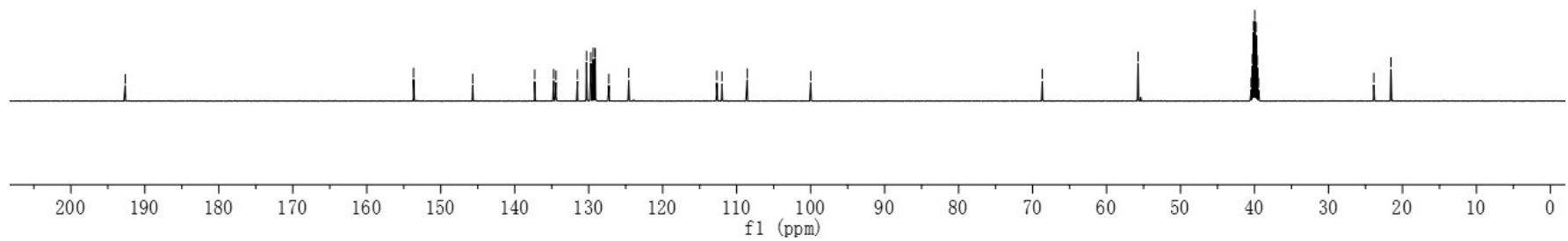
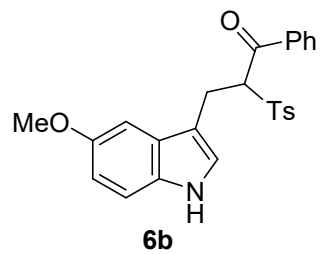
—39.792

—39.625

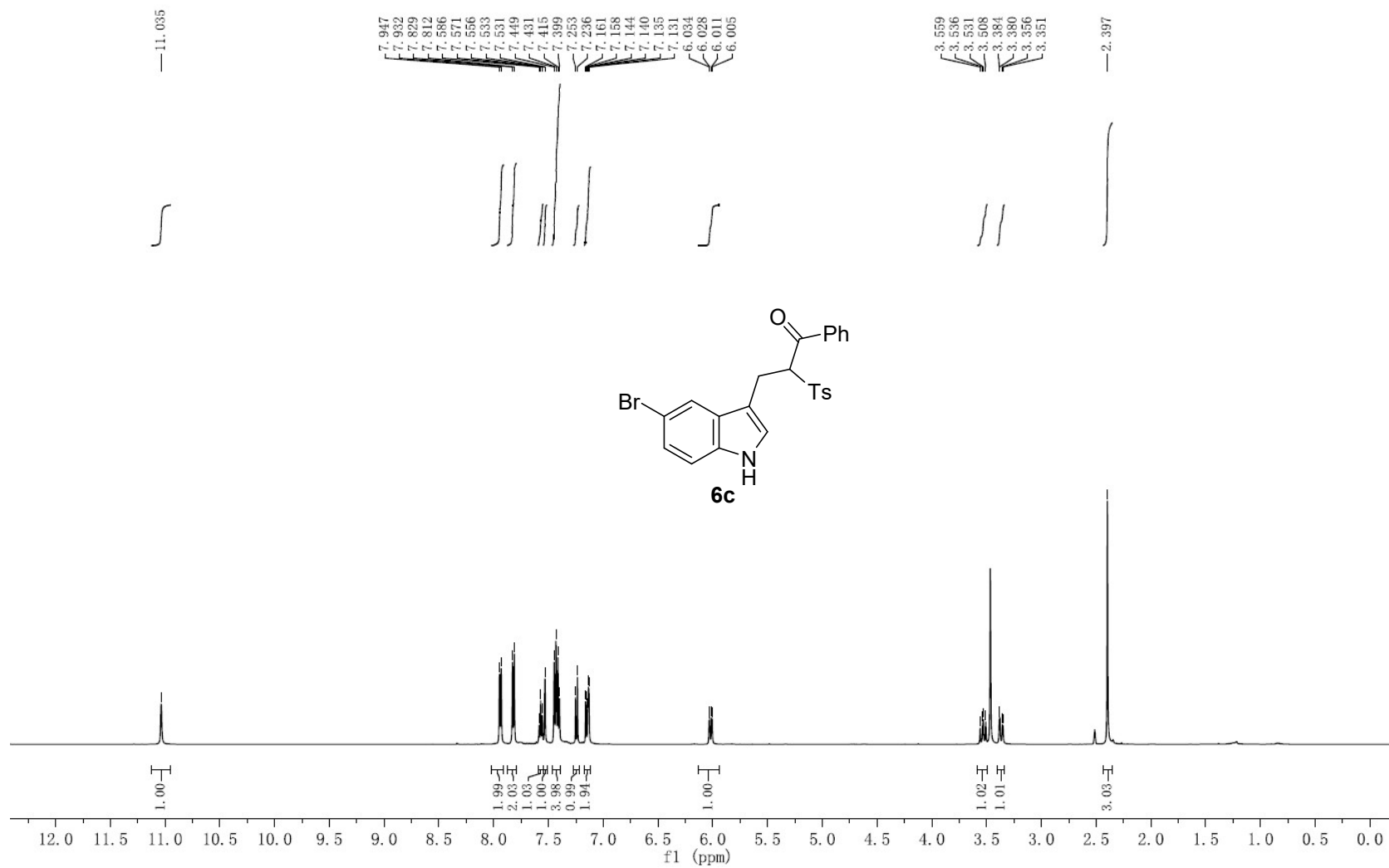
—39.458

—23.876

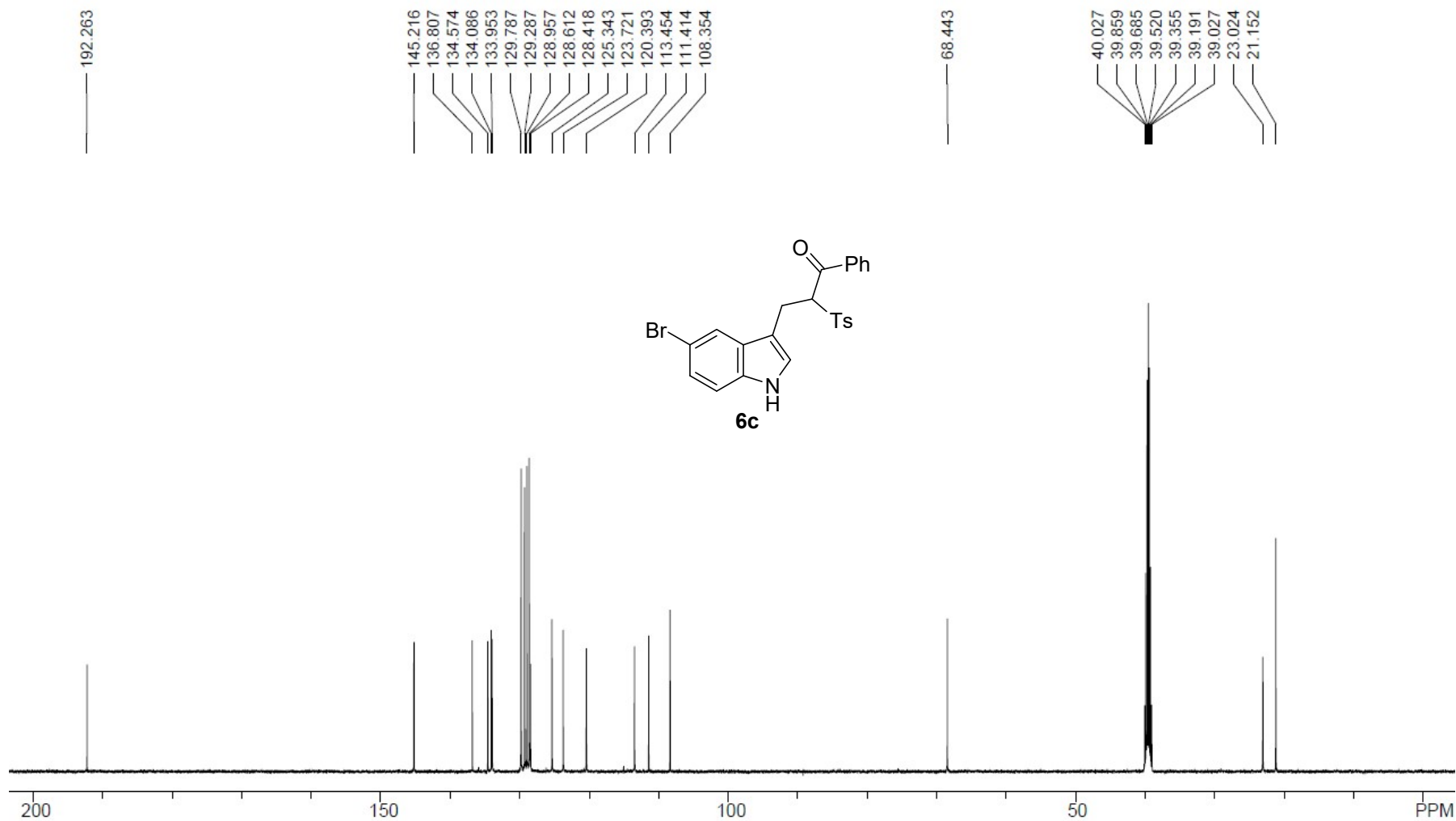
—21.560



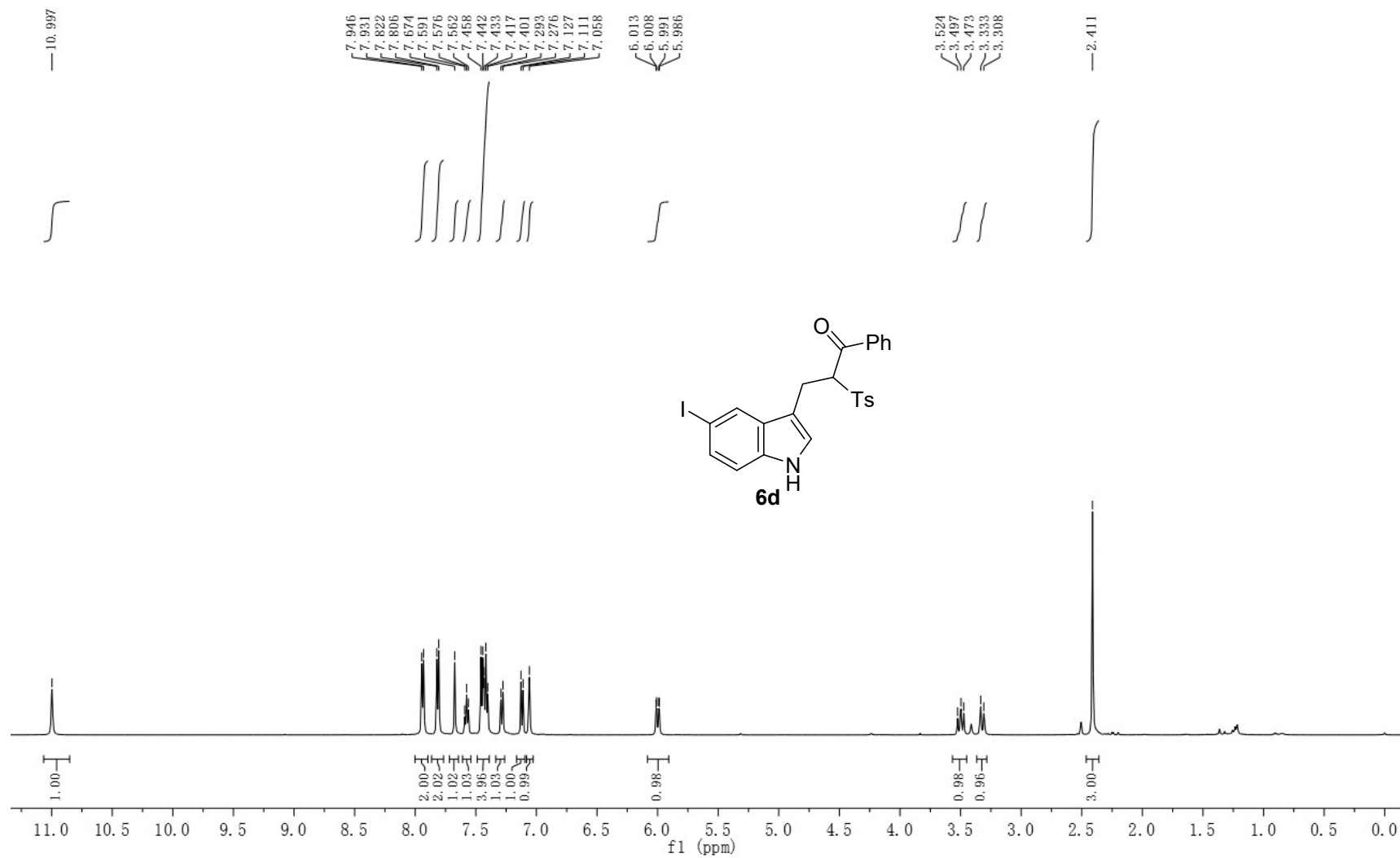
¹H NMR (500 MHz, DMSO-d₆) of **6c**



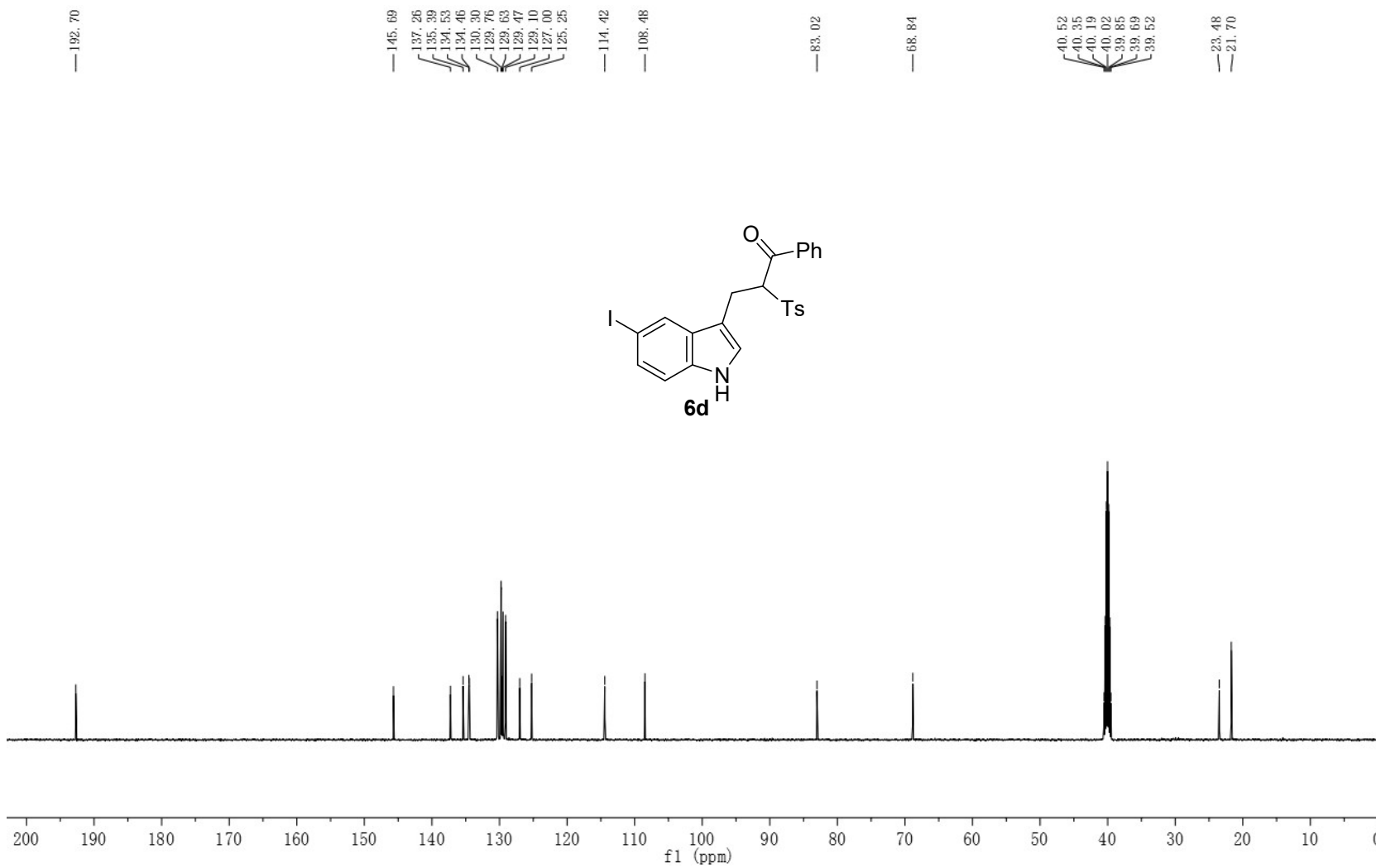
^{13}C NMR (126 MHz, DMSO-d_6) of **6c**



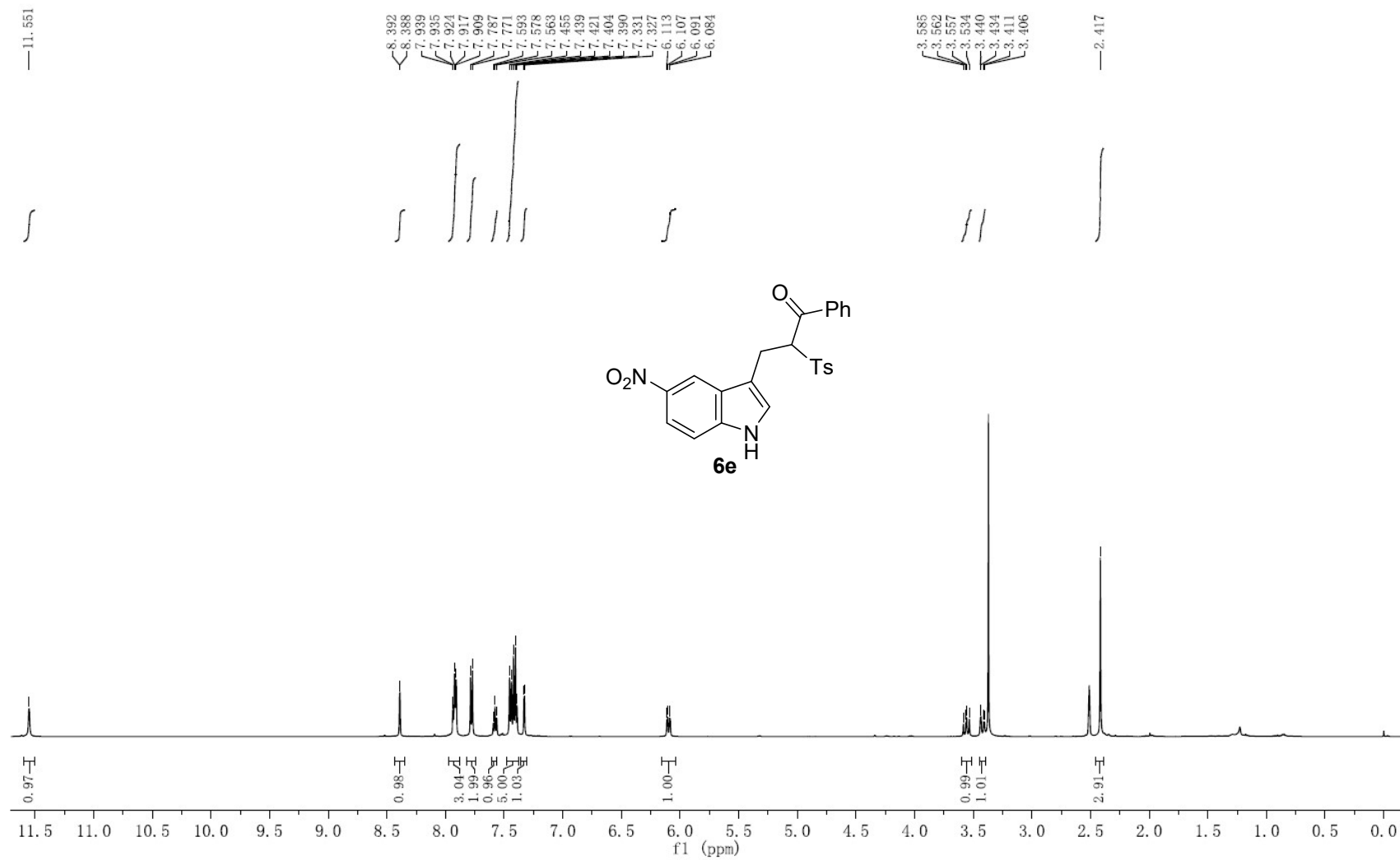
¹H NMR (500 MHz, DMSO-d₆) of **6d**



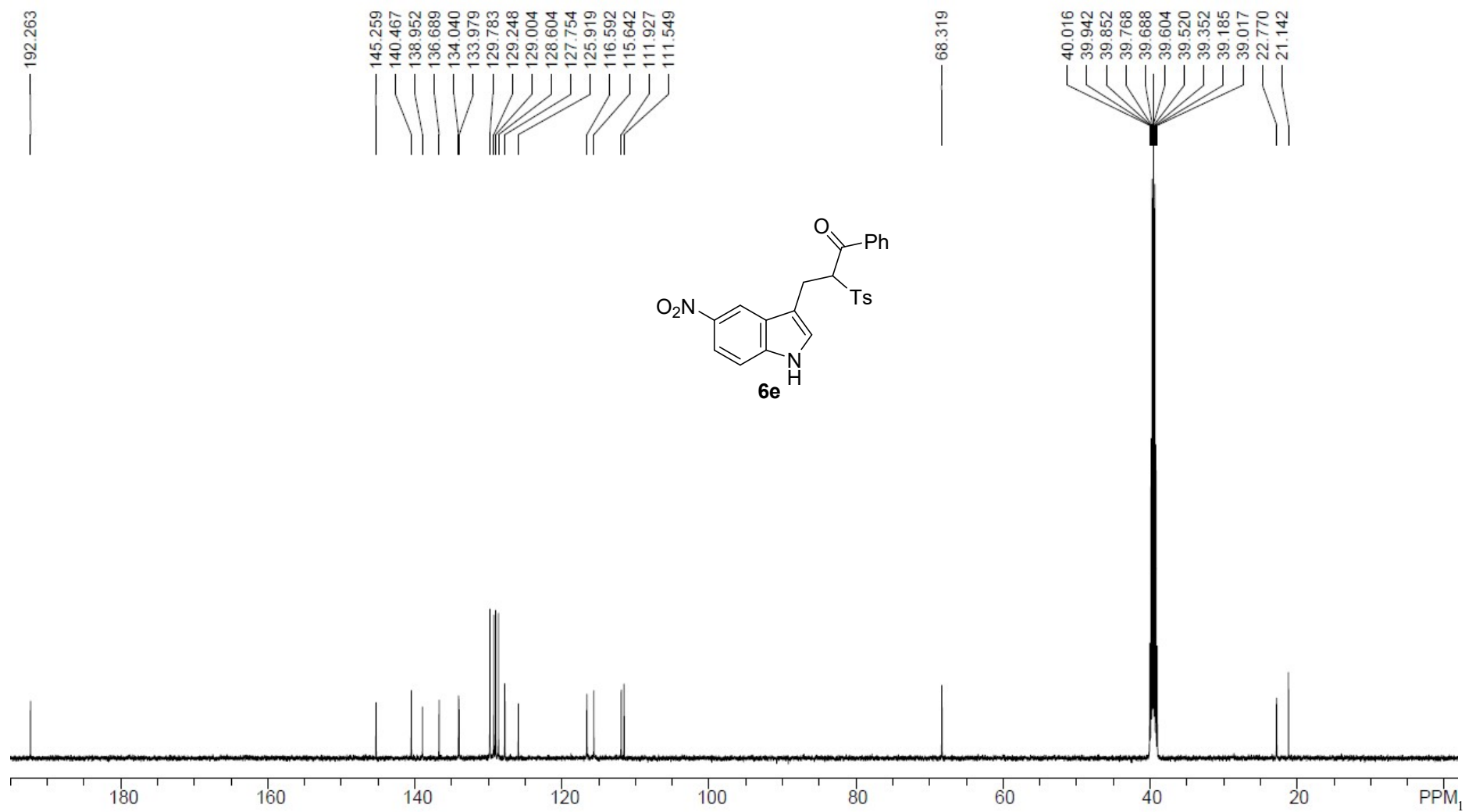
^{13}C NMR (126 MHz, DMSO-d_6) of **6d**



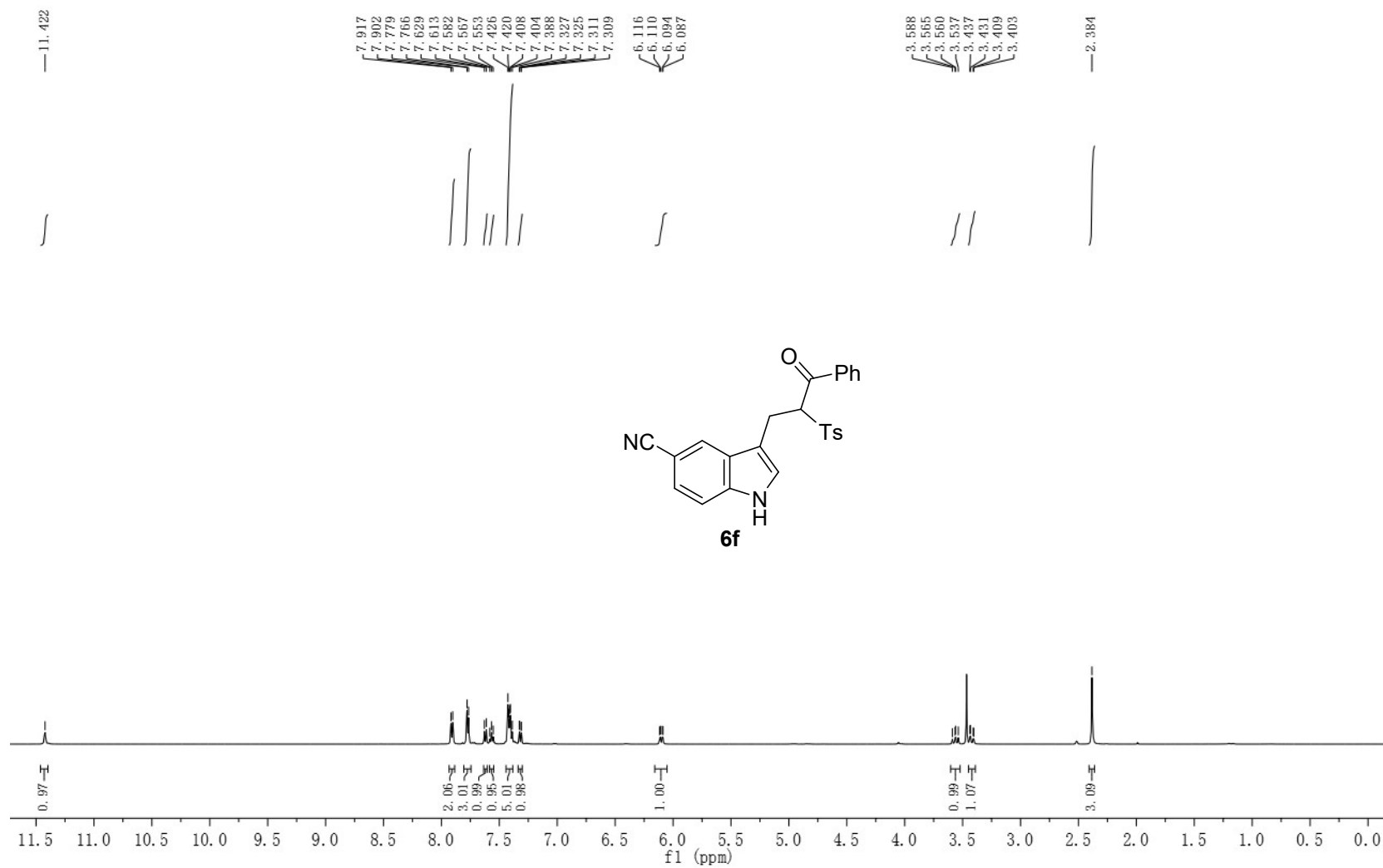
¹H NMR (500 MHz, DMSO-d₆) of **6e**



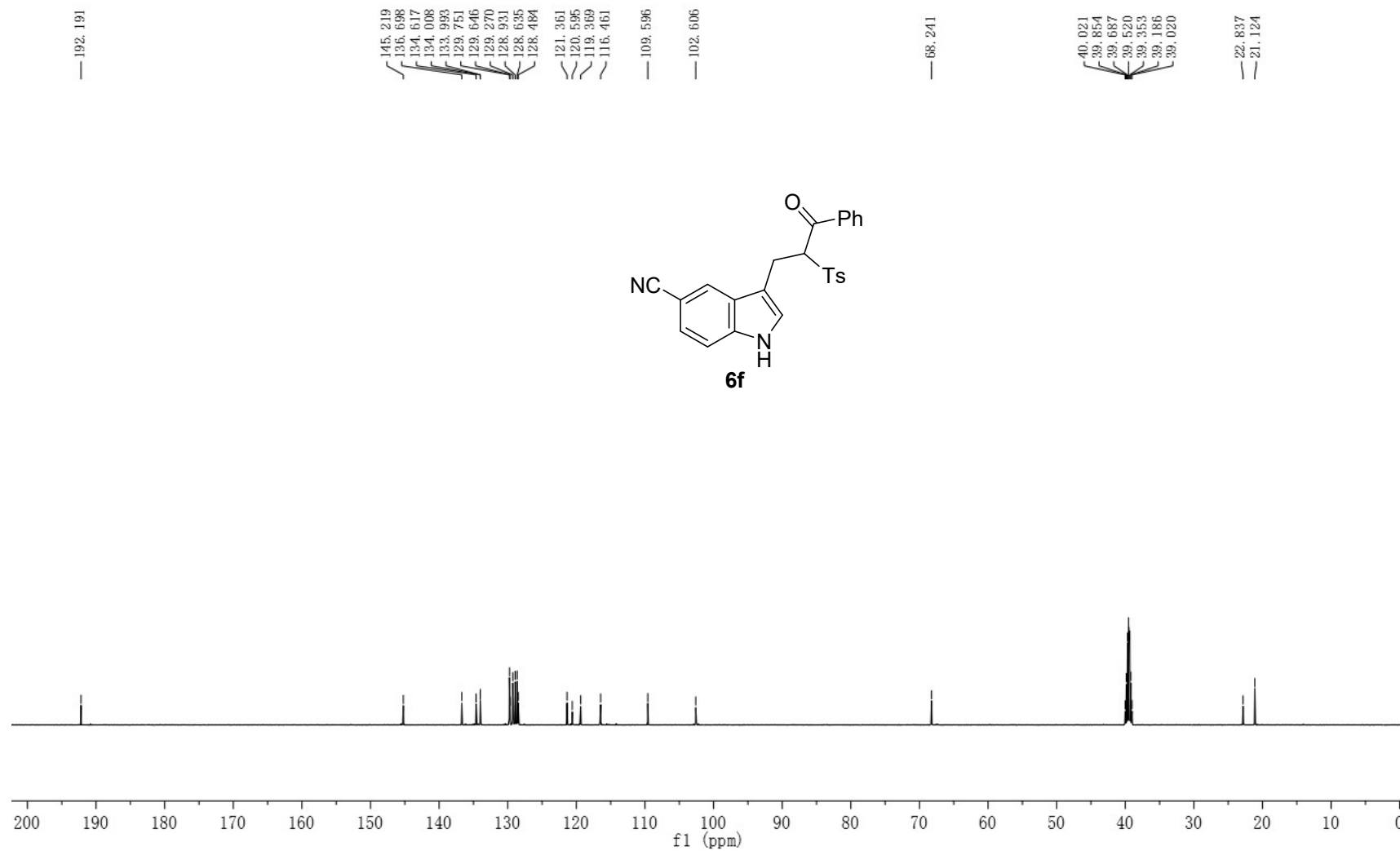
^{13}C NMR (126 MHz, DMSO- d_6) of **6e**



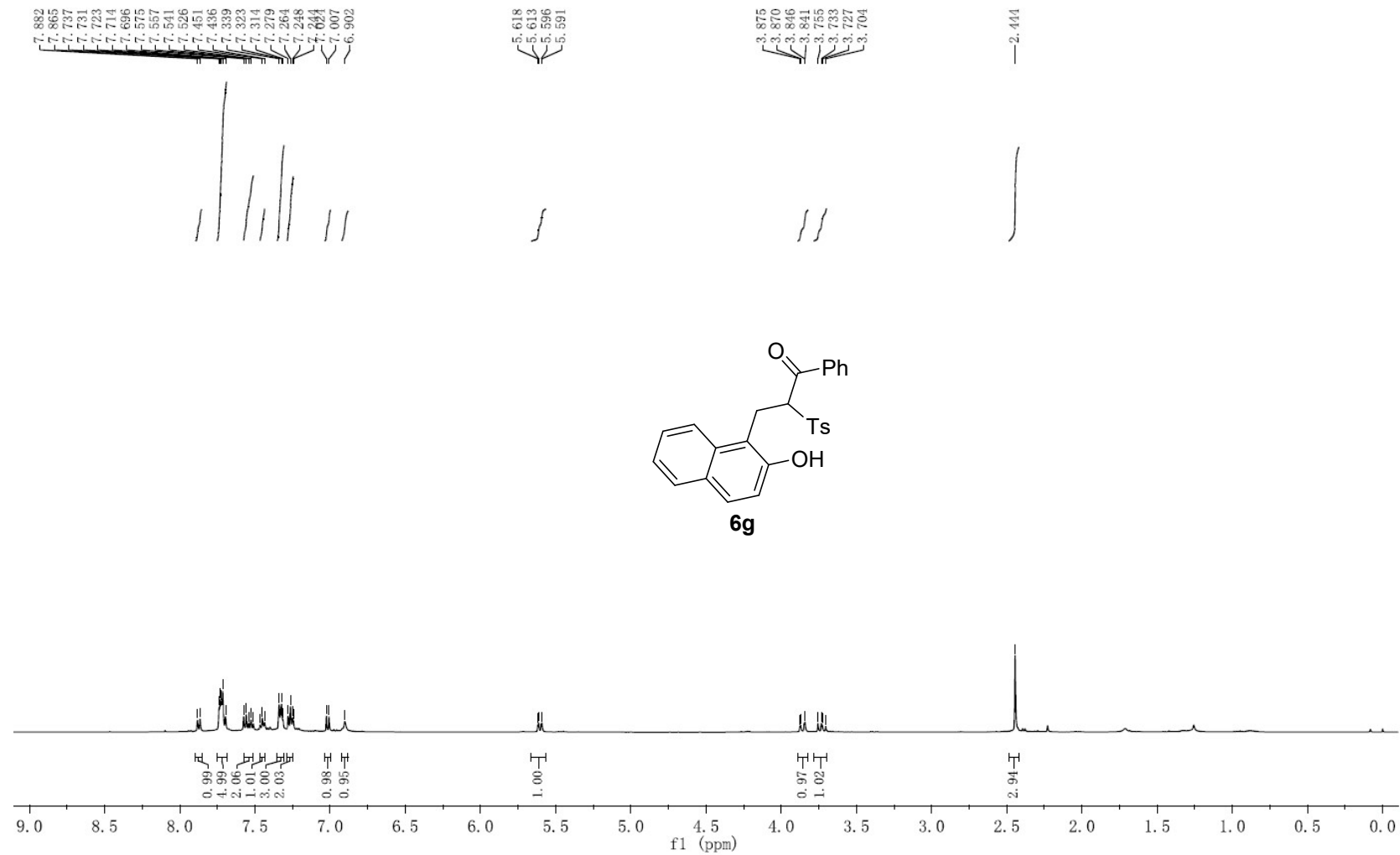
H NMR (500 MHz, DMSO-d₆) of **6f**



^{13}C NMR (126 MHz, DMSO-d_6) of **6f**



¹H NMR (500 MHz, CDCl₃) of **6g**



^{13}C NMR (126 MHz, CDCl_3) of **6g**

194.515

152.011

146.006

136.433

134.555

133.062

132.721

129.936

129.767

129.697

129.590

129.430

128.964

128.576

127.392

123.458

121.684

119.215

113.032

77.400

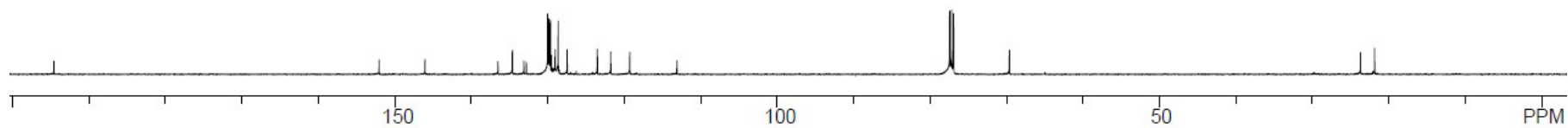
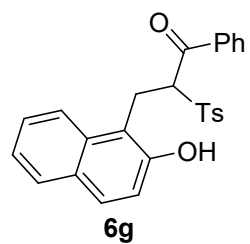
77.150

76.898

69.555

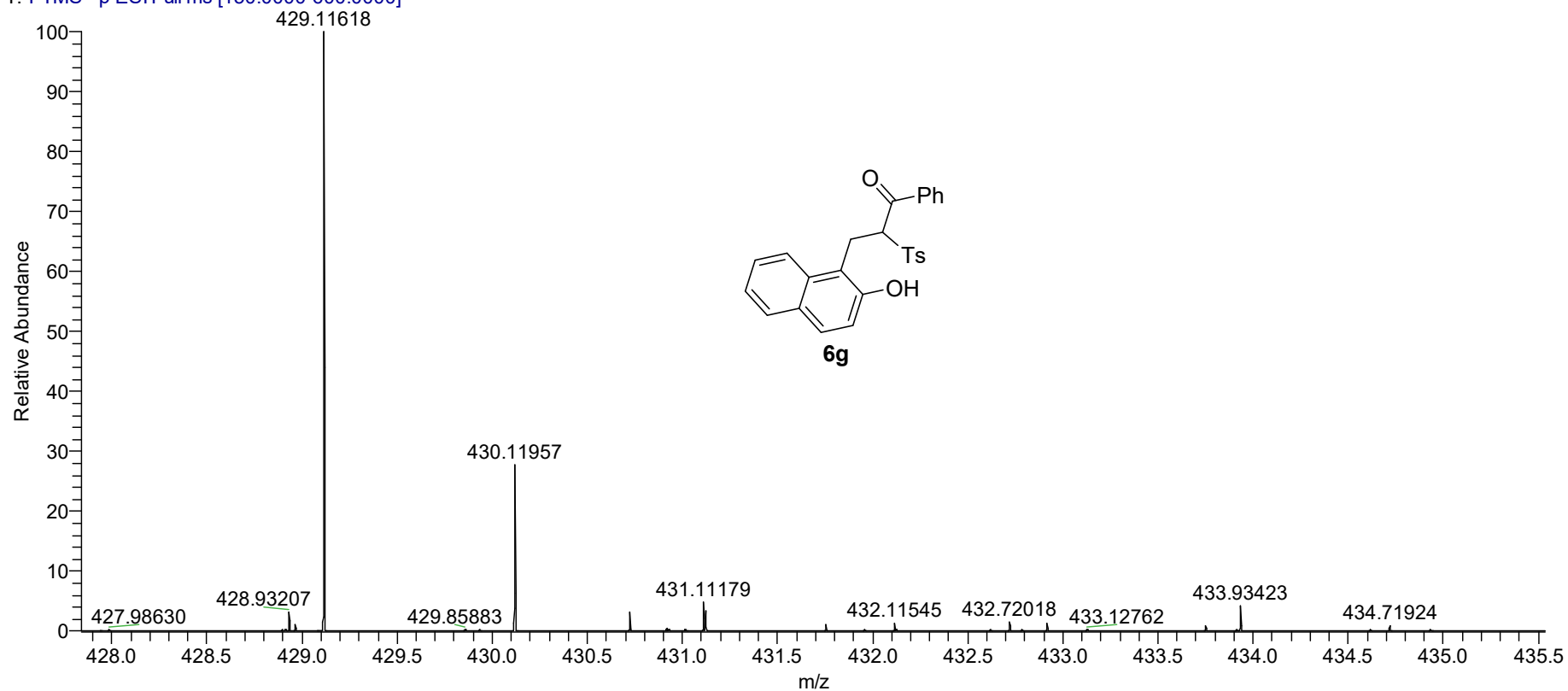
23.621

21.788

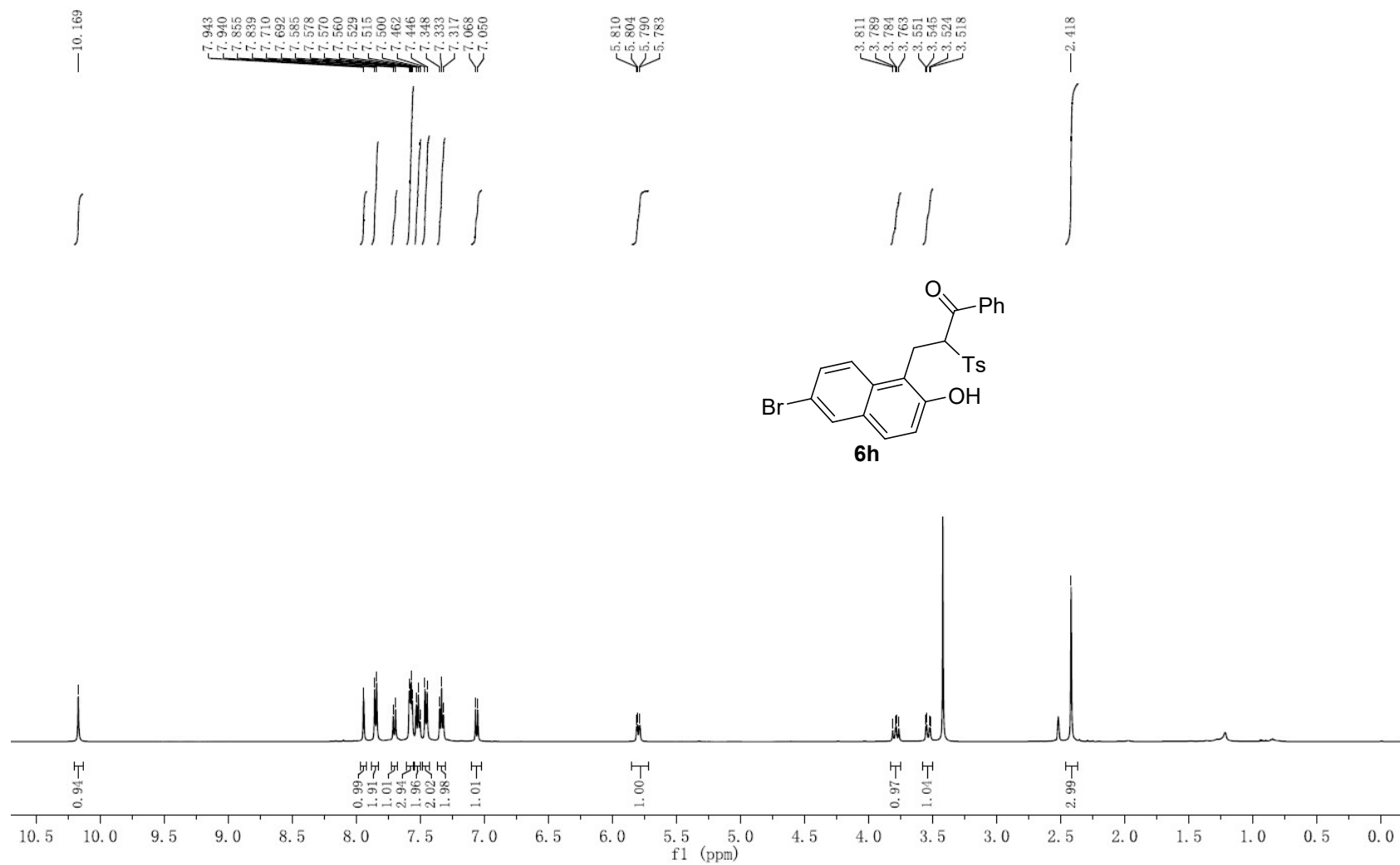


HRMS (ESI) of **6g**

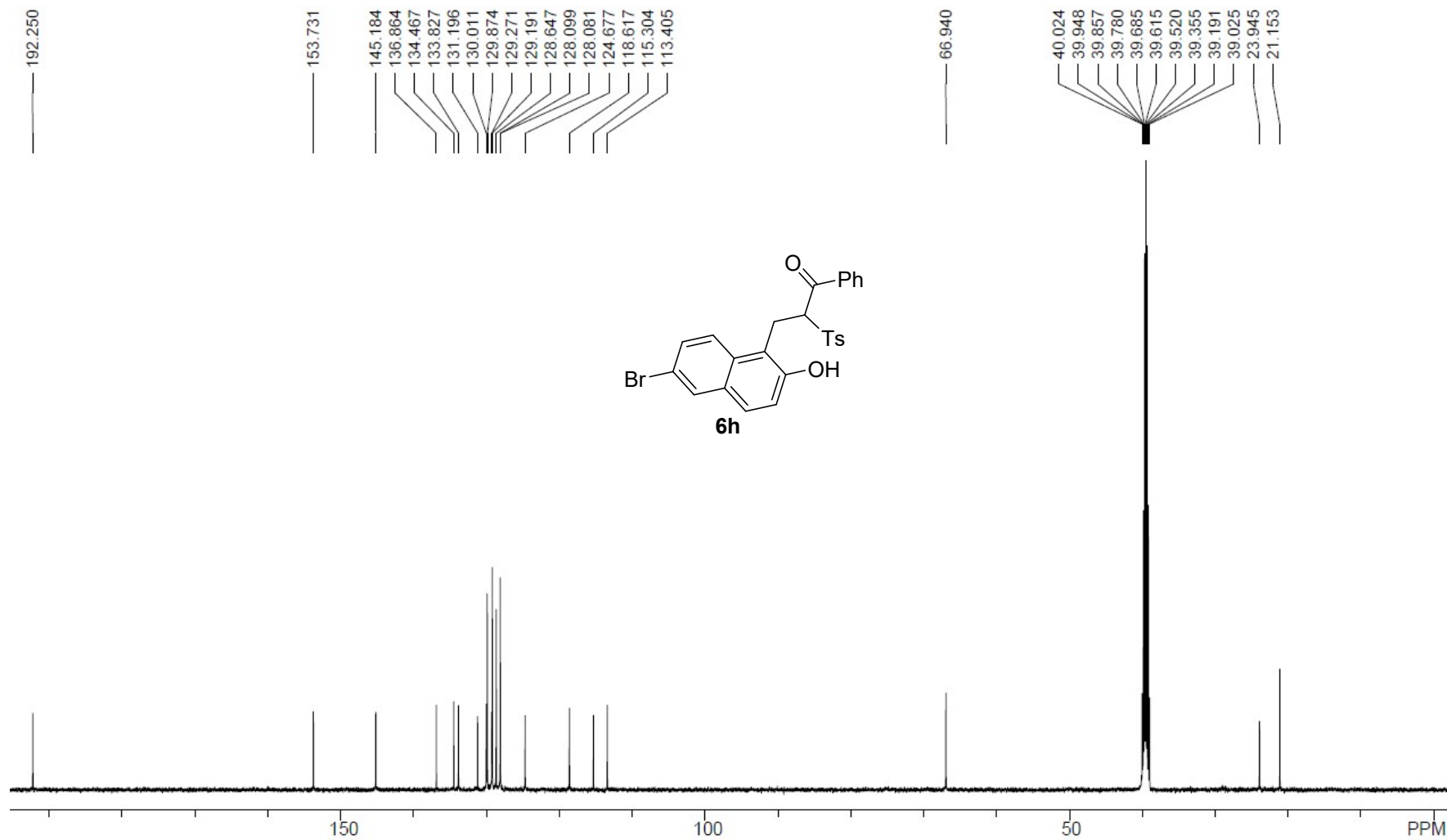
ms2 133.4-2000_220707155742 #10 RT: 0.09 AV: 1 NL: 7.59E6
T: FTMS - p ESI Full ms [150.0000-600.0000]



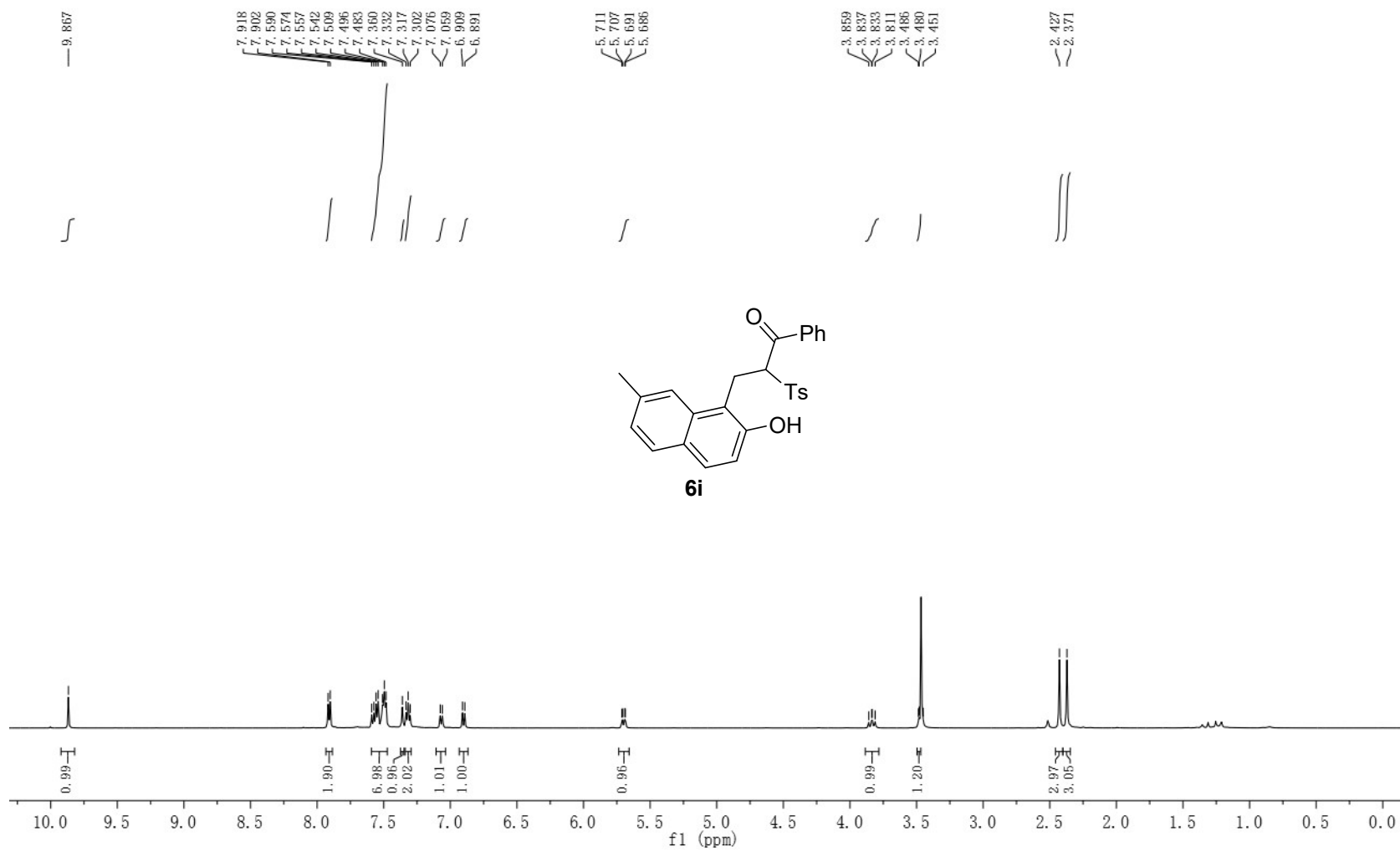
¹H NMR (500 MHz, DMSO-d₆) of **6h**



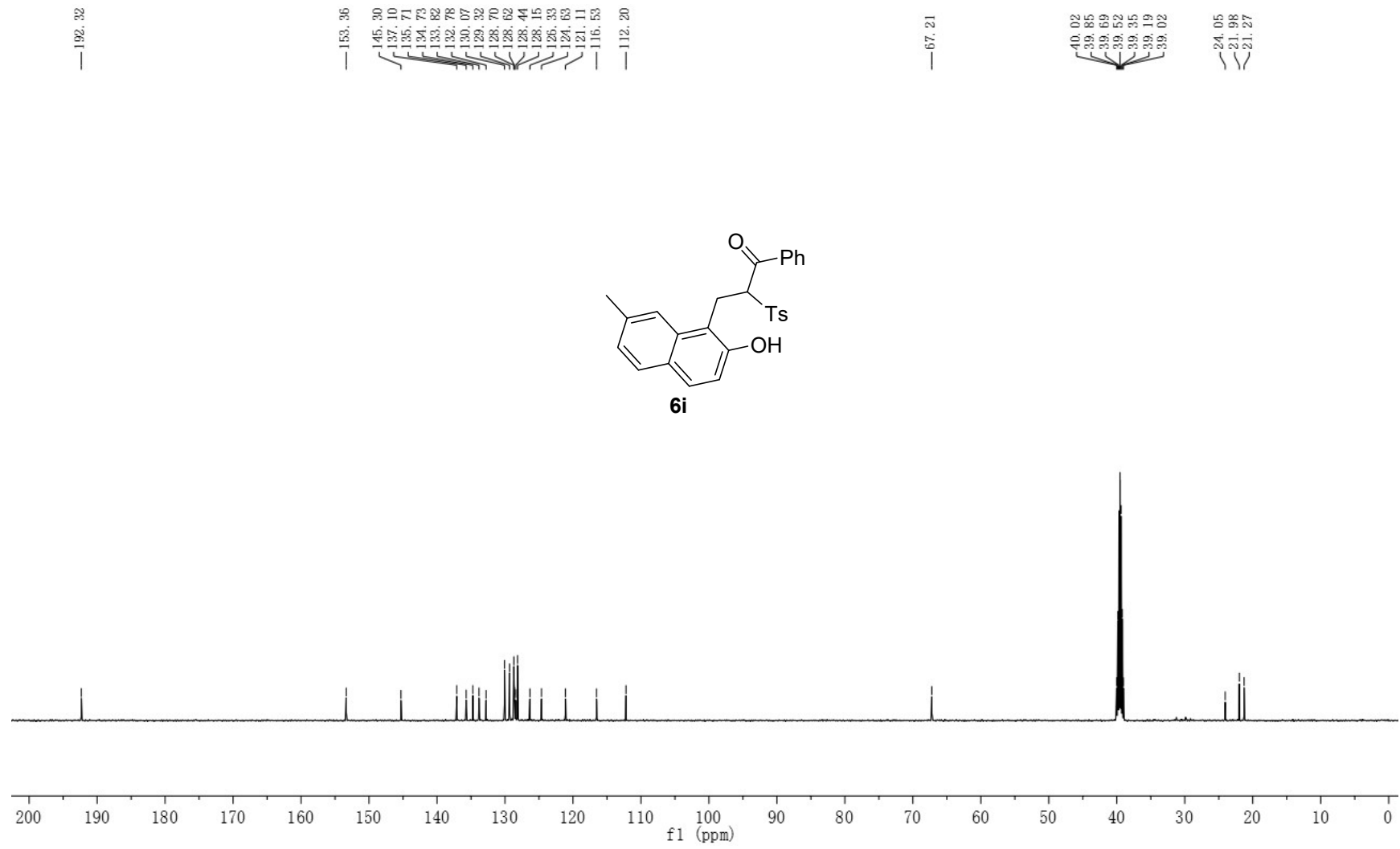
^{13}C NMR (126 MHz, DMSO- d_6) of **6h**



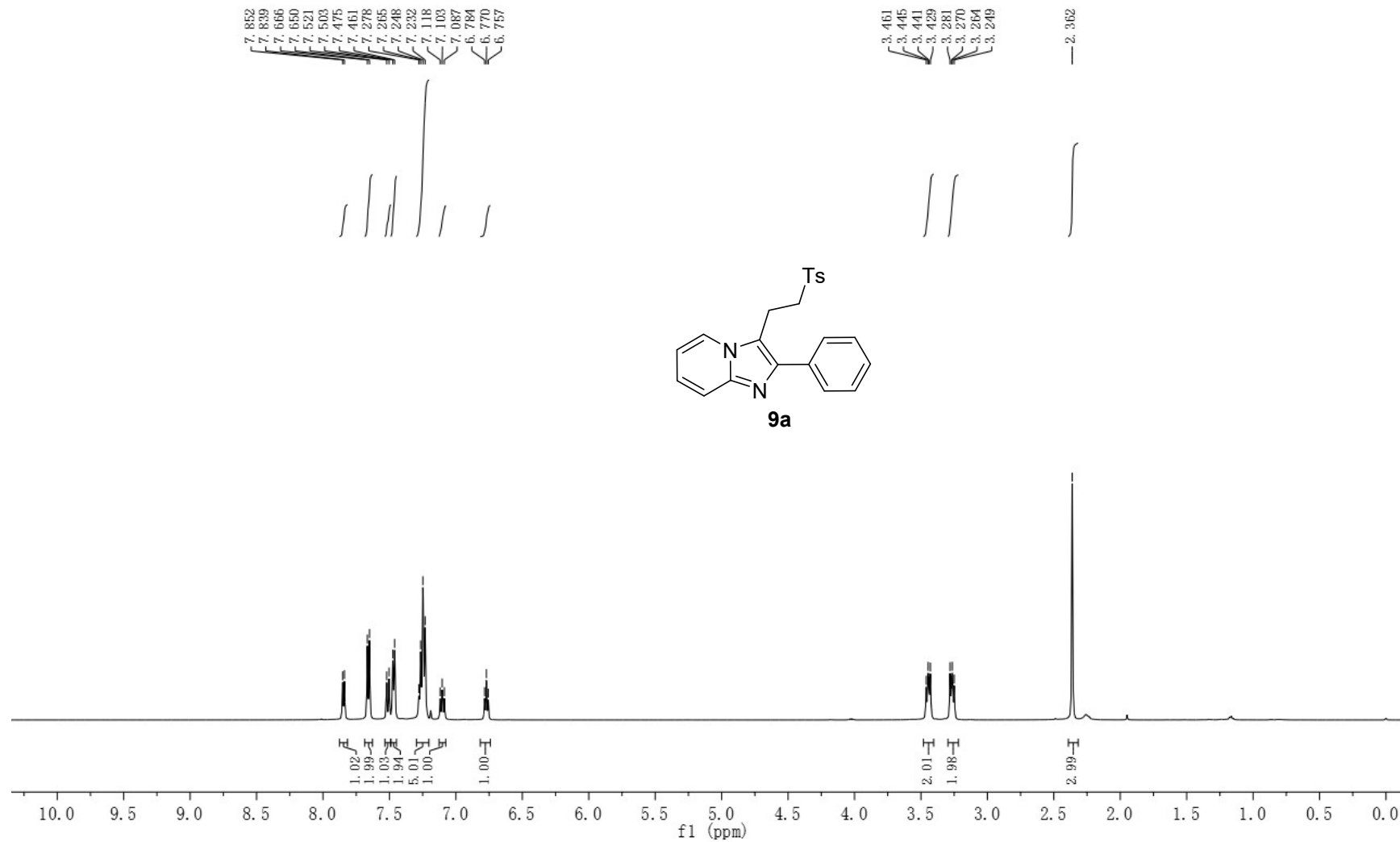
^1H NMR (500 MHz, DMSO- d_6) of **6i**



^{13}C NMR (126 MHz, DMSO- d_6) of **6i**



¹H NMR (500 MHz, CDCl₃) of **9a**



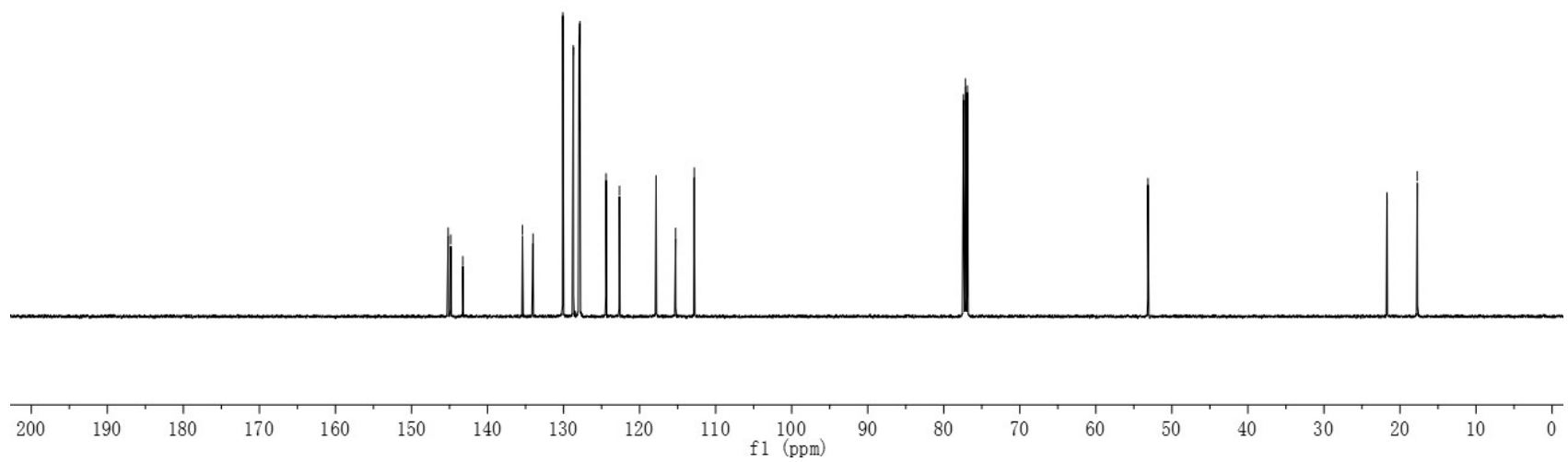
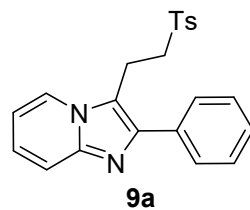
^{13}C NMR (126 MHz, CDCl_3) of **9a**

145.18
144.83
143.25
135.40
134.02
130.09
128.72
127.96
127.87
127.85
124.41
122.65
117.83
115.27
112.81

77.40
77.15
76.90

53.15

21.71
17.73



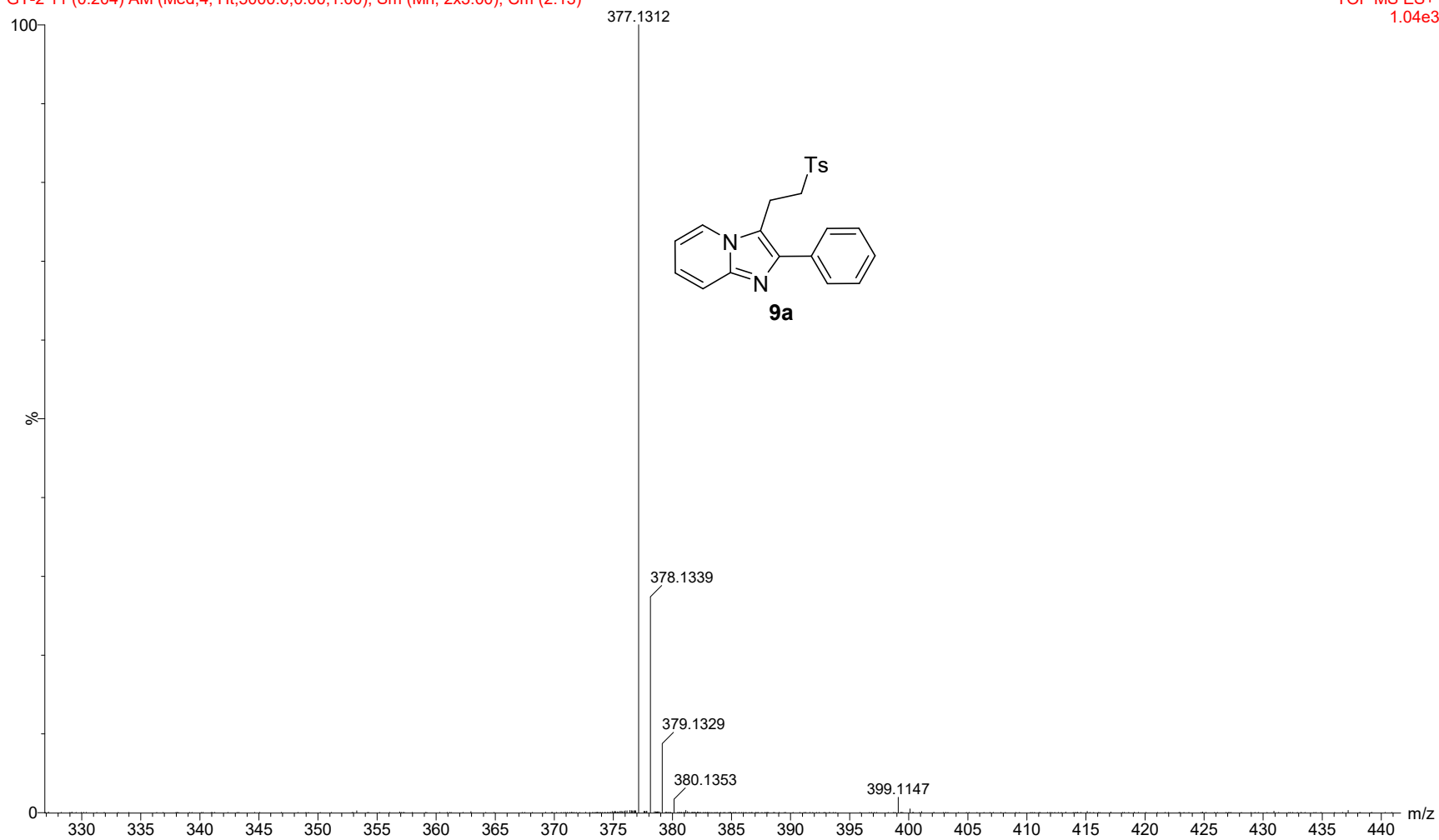
HRMS (ESI) of **9a**

1

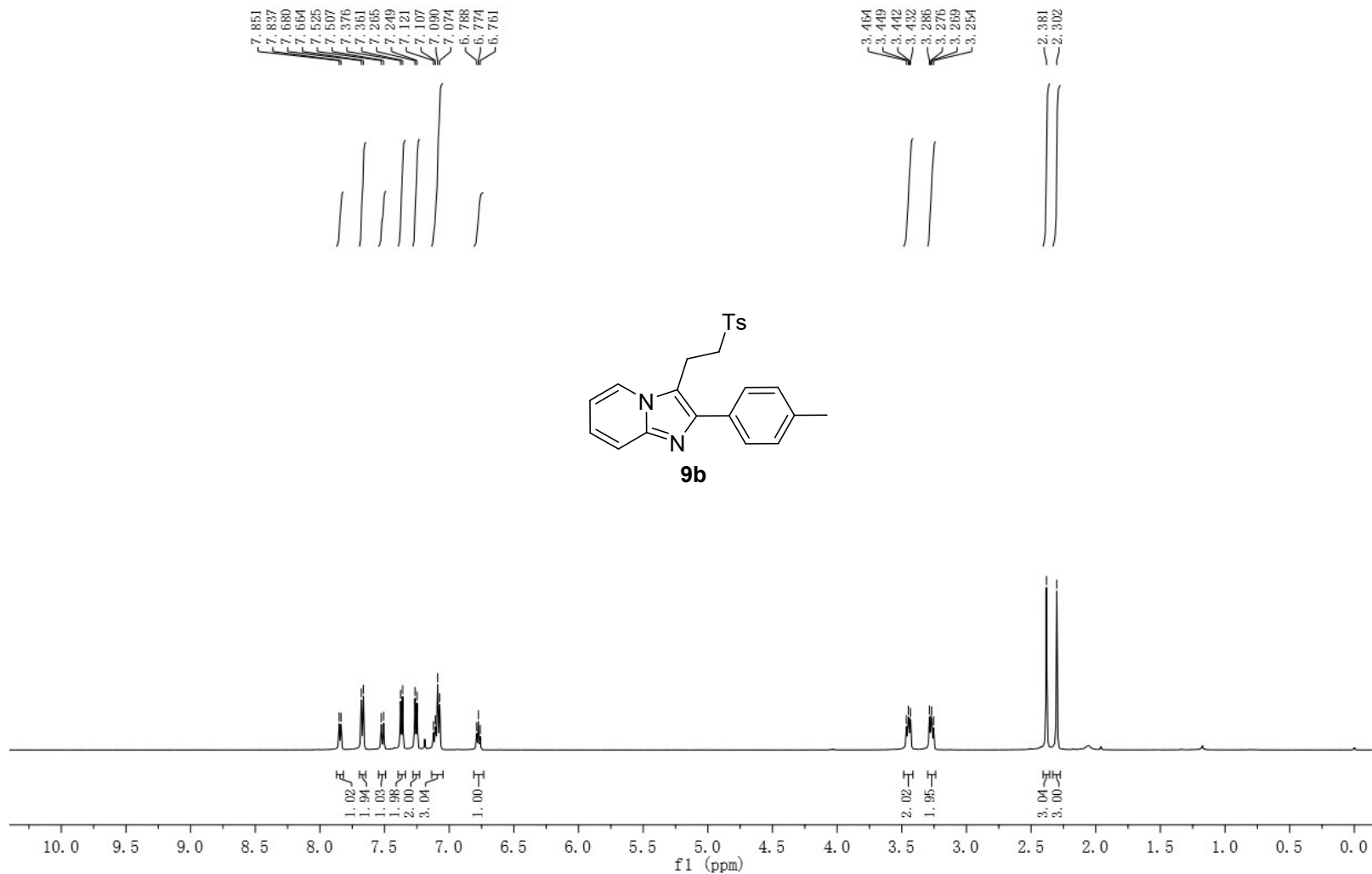
GT-2 11 (0.204) AM (Med,4, Ht,5000.0,0.00,1.00); Sm (Mn, 2x3.00); Cm (2:13)

07-Jun-2023

TOF MS ES+
1.04e3



¹H NMR (500 MHz, CDCl₃) of **9b**



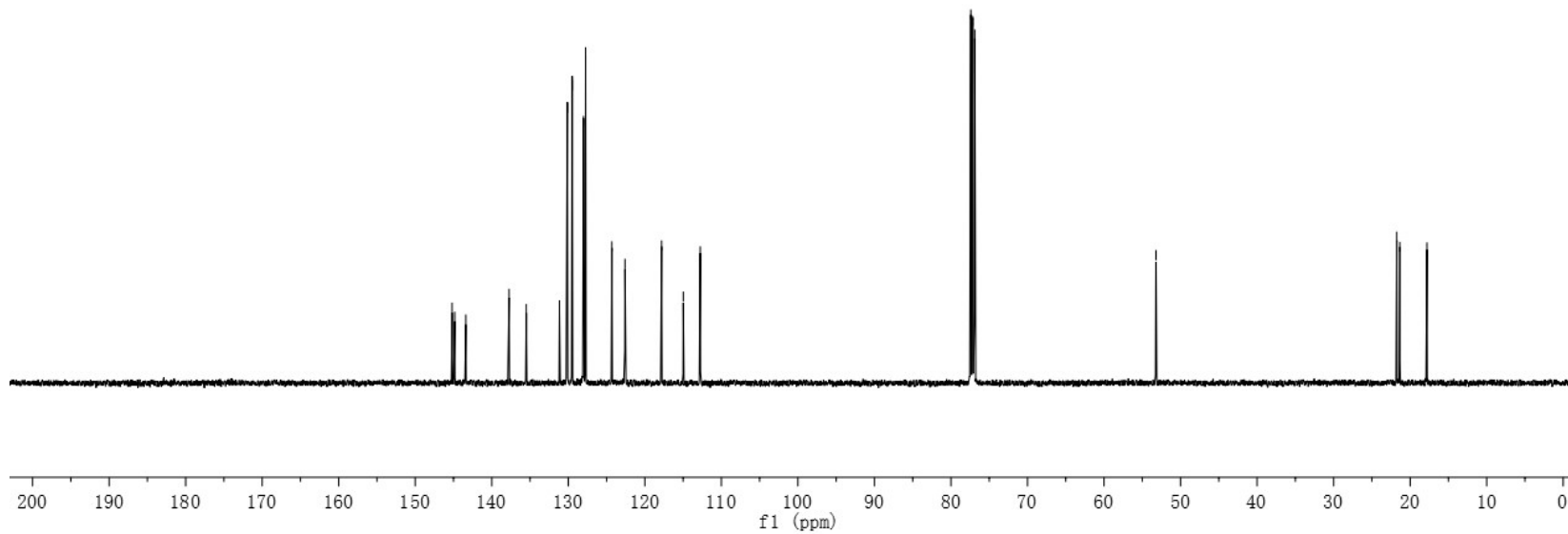
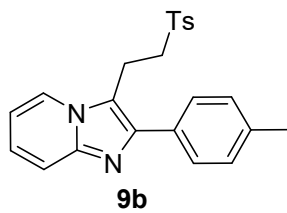
^{13}C NMR (126 MHz, CDCl_3) of **9b**

145.186
144.835
143.391
137.738
135.494
131.151
130.131
129.499
128.019
127.742
124.313
122.596
117.813
114.973
112.755

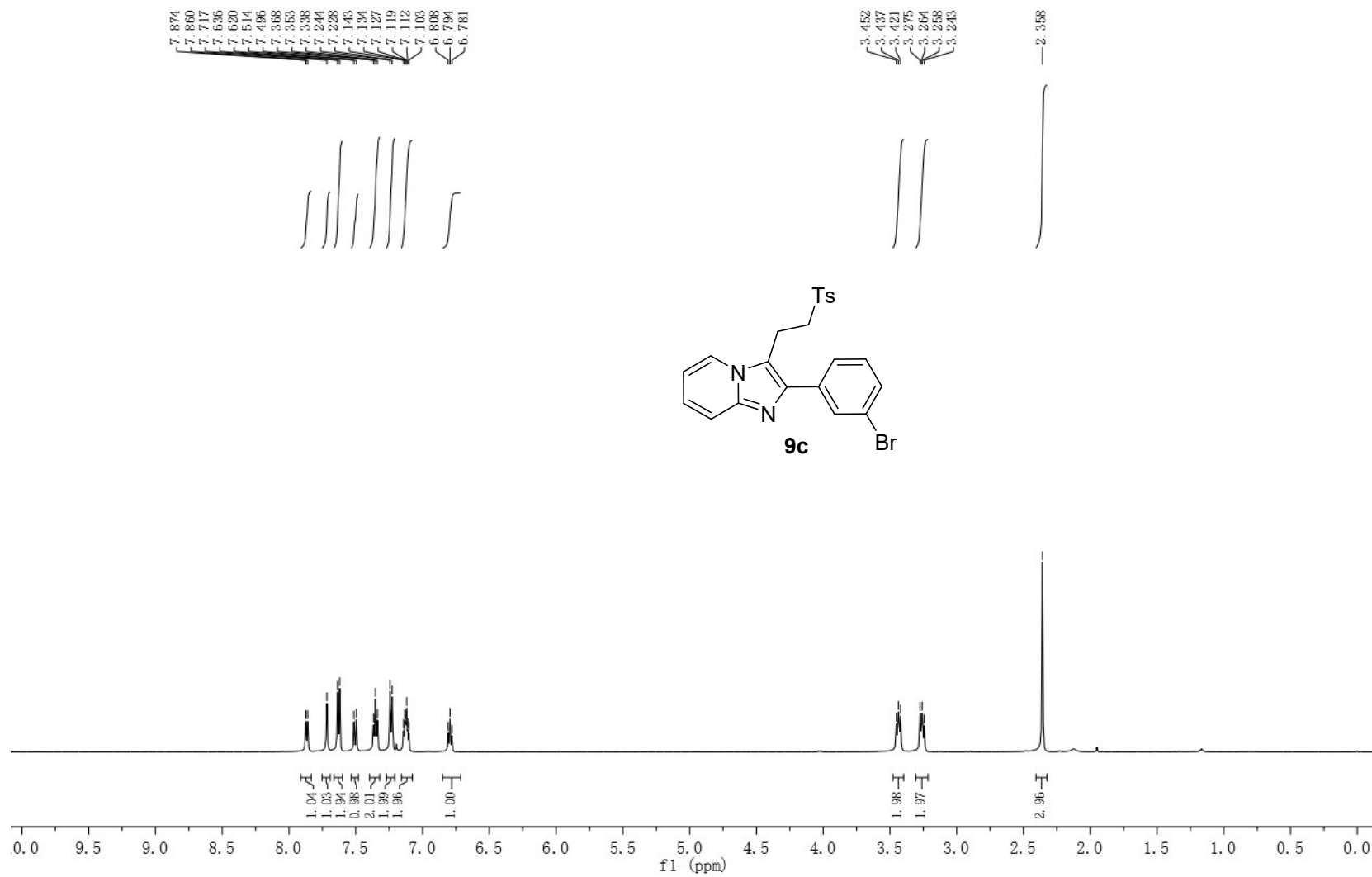
77.404
77.150
76.895

53.208

21.752
21.349
17.803



¹H NMR (500 MHz, CDCl₃) of **9c**



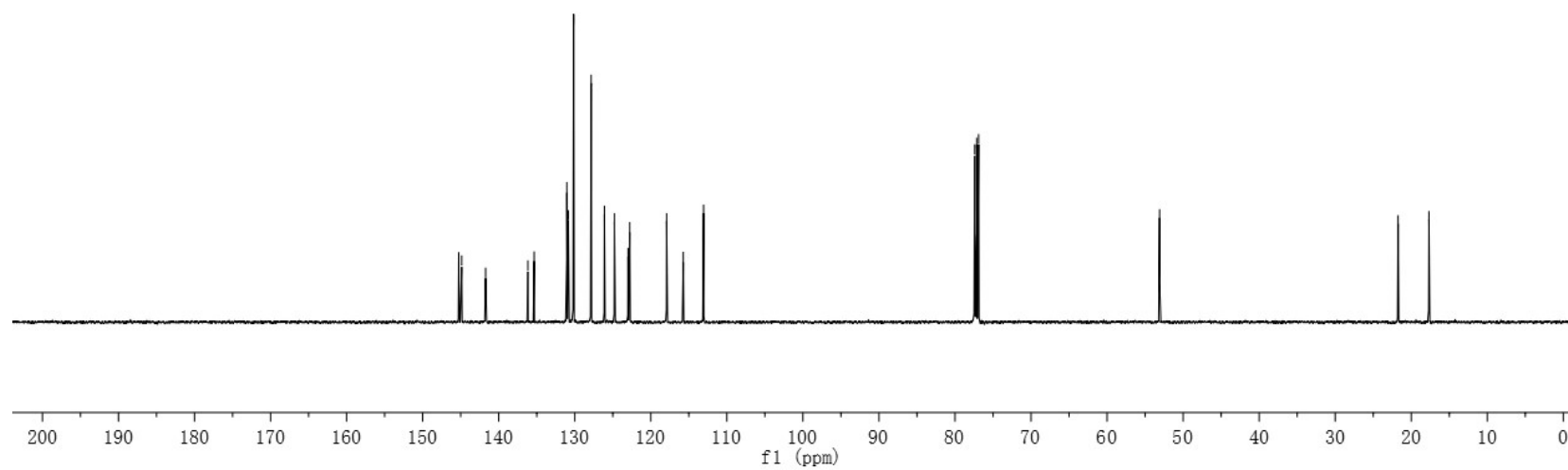
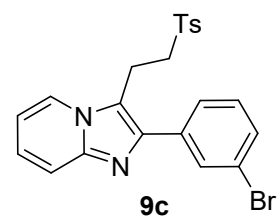
^{13}C NMR (126 MHz, CDCl_3) of **9c**

145.250
144.869
141.726
136.164
135.335
131.039
130.841
130.160
127.847
126.097
124.783
122.995
122.780
117.915
115.733
113.057

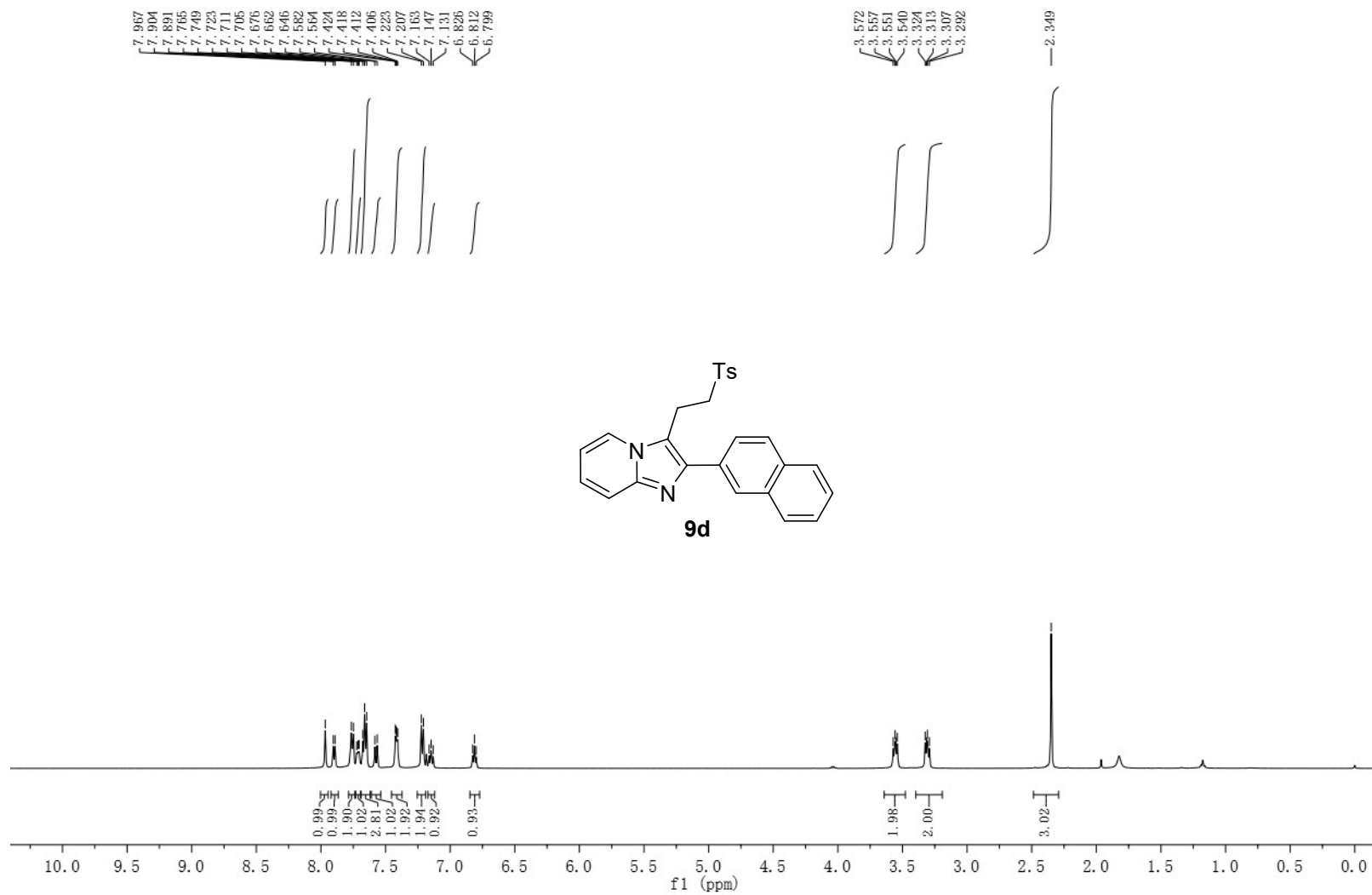
77.405
77.150
76.896

53.097

21.736
17.676



¹H NMR (500 MHz, CDCl₃) of **9d**



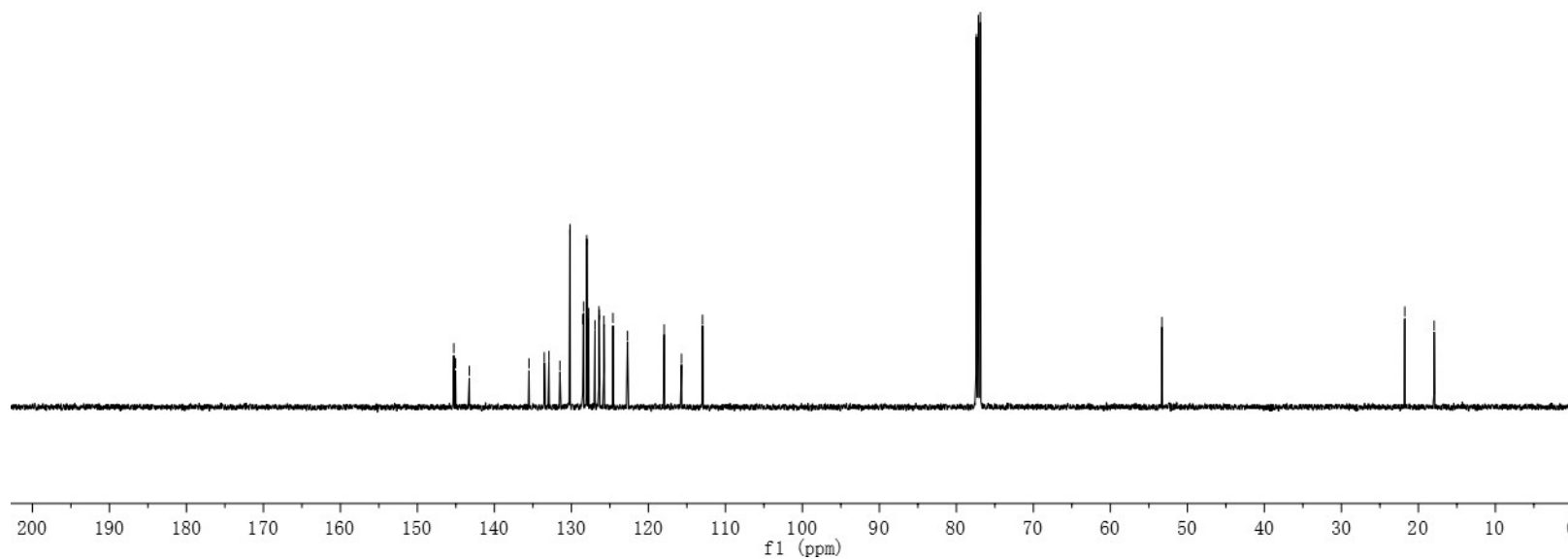
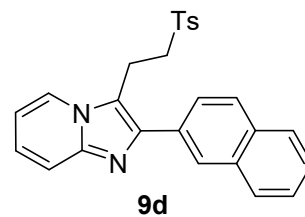
^{13}C NMR (126 MHz, CDCl_3) of **9d**

145.267
145.050
143.263
135.507
133.518
132.918
131.490
130.179
128.510
128.418
128.008
127.760
126.935
126.415
126.388
125.774
124.605
122.710
117.956
115.701
112.970

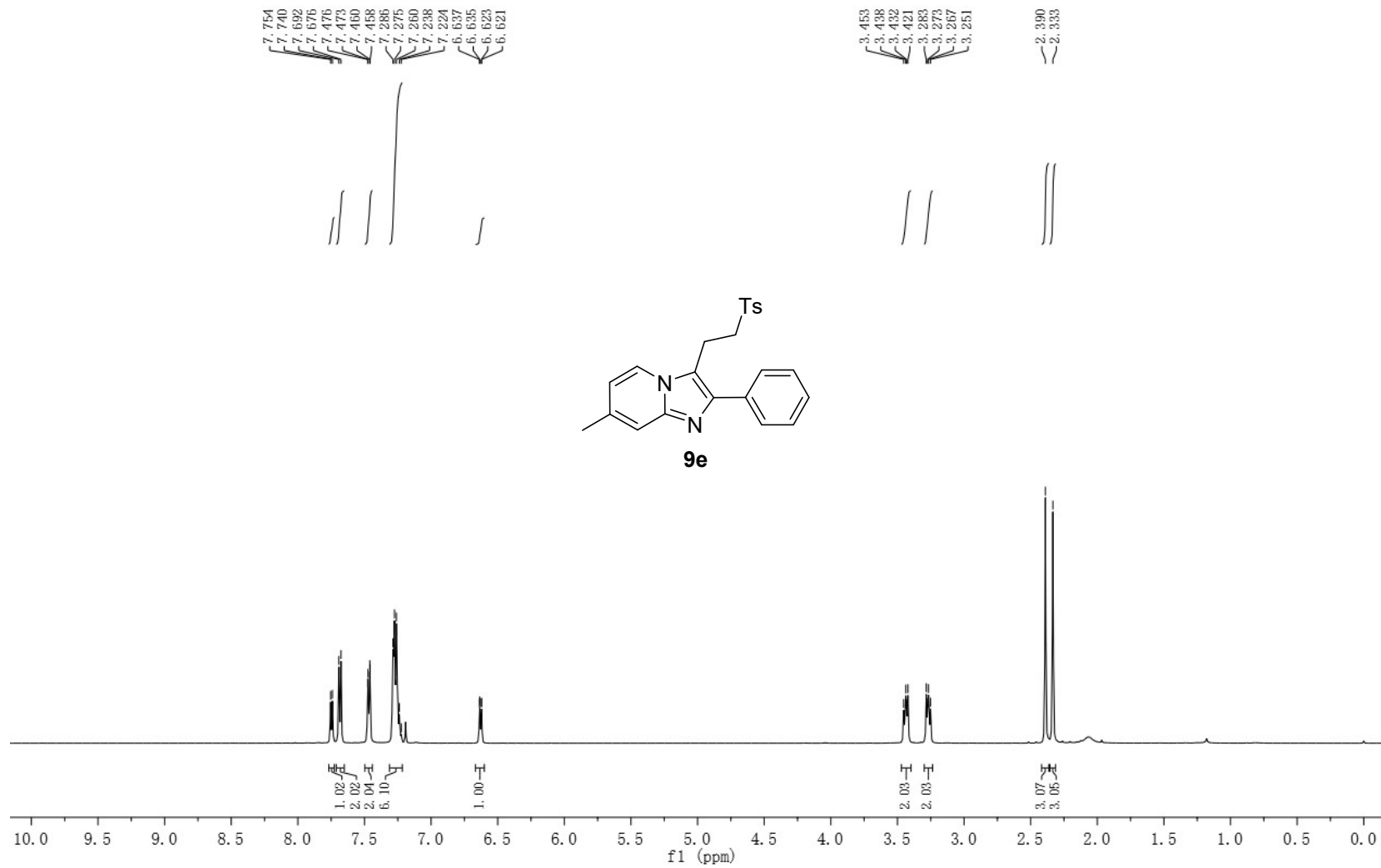
77.404
77.150
76.896

53.303

21.763
17.950



¹H NMR (500 MHz, CDCl₃) of **9e**



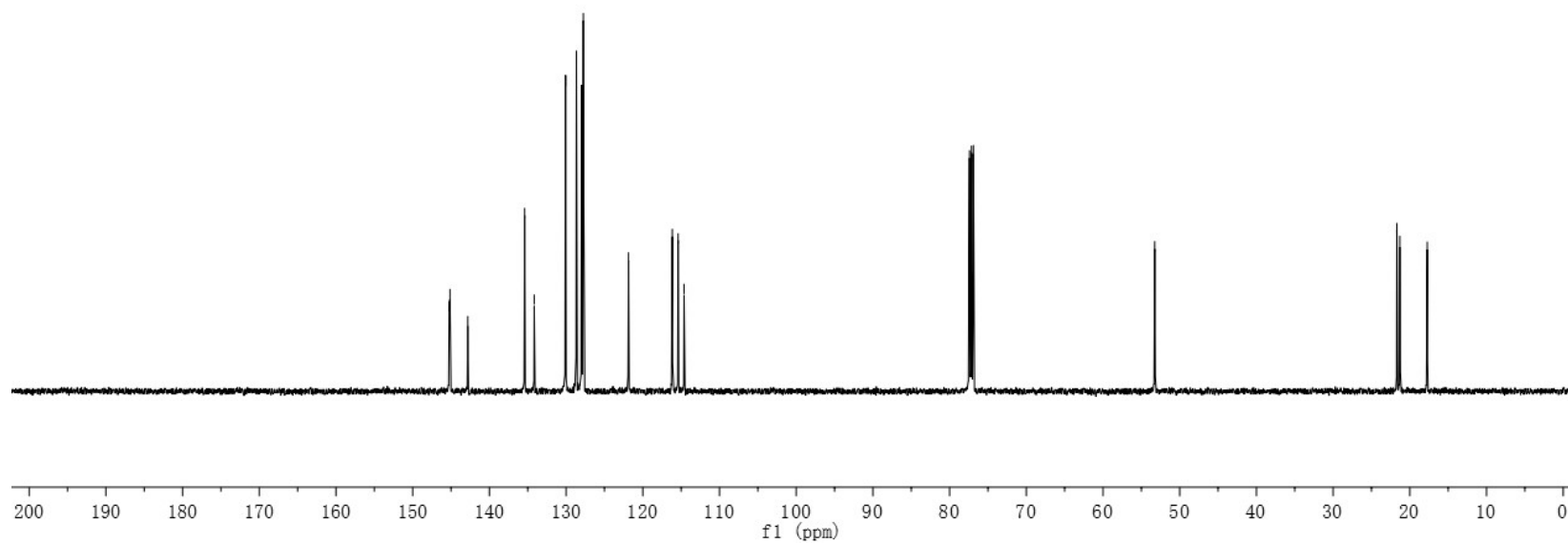
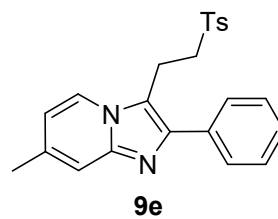
^{13}C NMR (126 MHz, CDCl_3) of **9e**

145.24
145.14
142.82
135.41
134.15
130.08
128.66
127.97
127.75
127.69
121.87
116.15
115.39
114.62

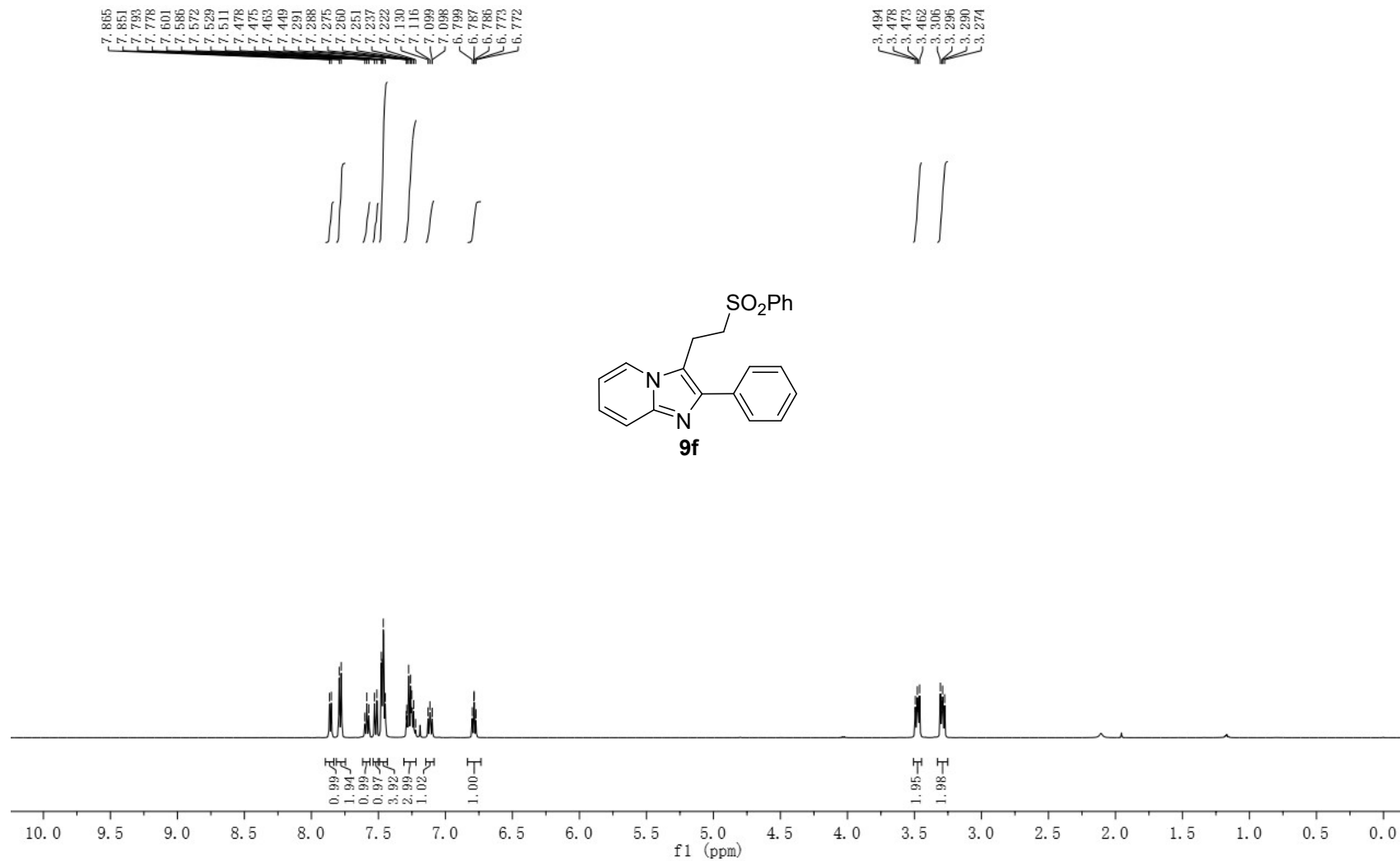
77.41
77.15
76.90

53.26

21.69
21.30
17.73



¹H NMR (500 MHz, CDCl₃) of **9f**



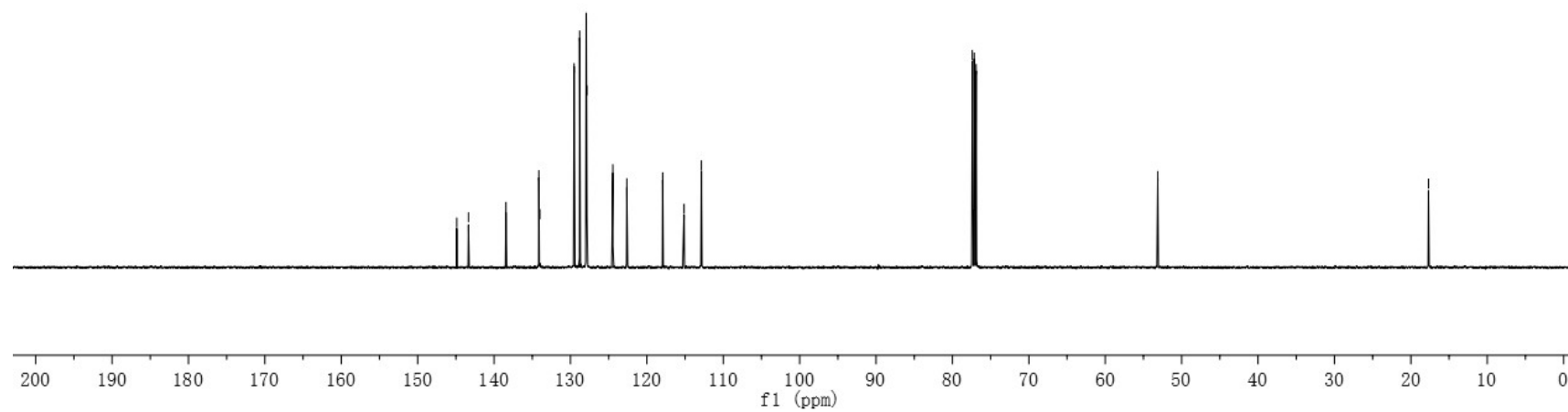
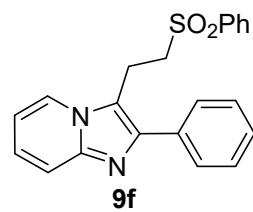
^{13}C NMR (126 MHz, CDCl_3) of **9f**

144.88
143.35
138.44
134.14
134.02
129.53
128.80
127.95
127.85
124.45
122.53
117.93
115.13
112.87

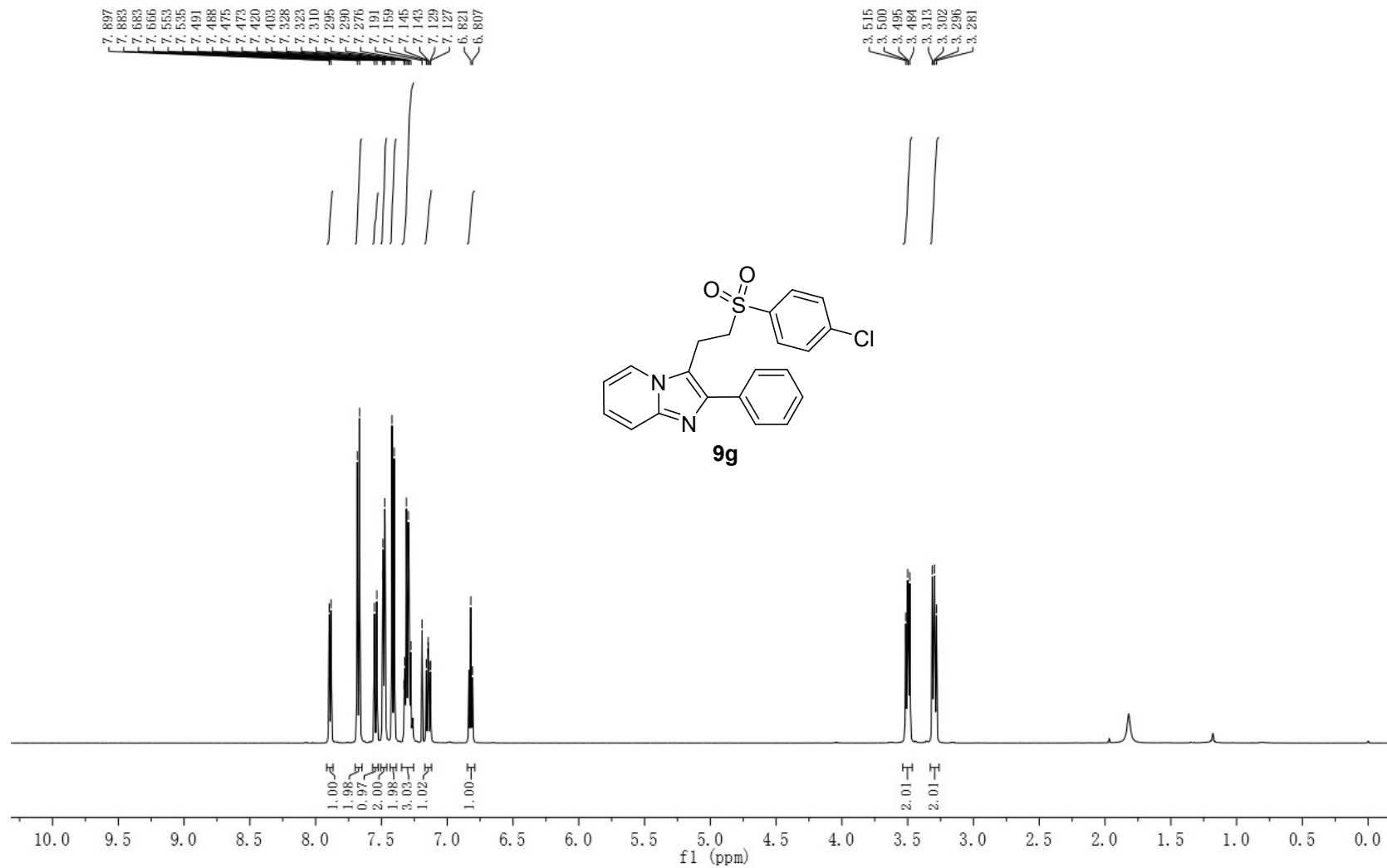
77.40
77.15
76.90

53.13

17.68



¹H NMR (500 MHz, CDCl₃) of **9g**



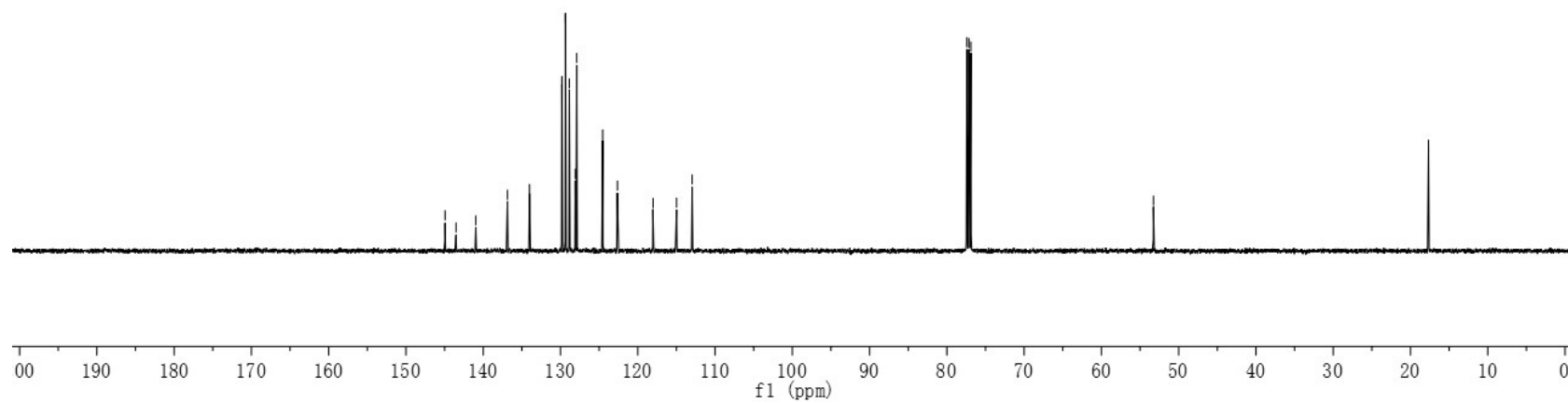
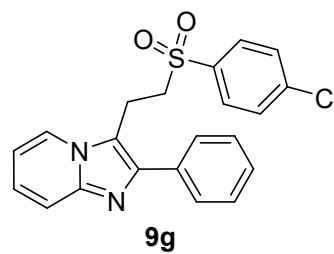
^{13}C NMR (126 MHz, CDCl_3) of **9g**

144.94
143.52
140.96
136.87
134.01
129.82
129.35
128.86
128.10
127.90
124.54
122.63
118.02
114.98
112.96

77.40
77.15
76.89

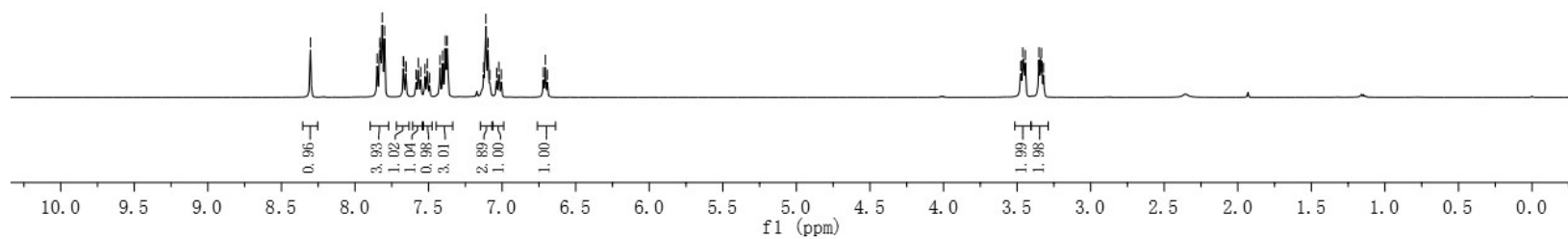
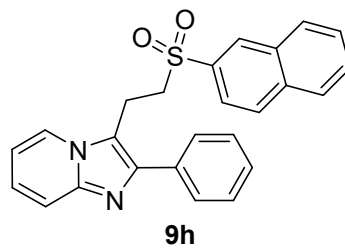
53.26

17.67



¹H NMR (500 MHz, CDCl₃) of **9h**

8.303
7.849
7.832
7.825
7.815
7.799
7.672
7.669
7.655
7.652
7.584
7.570
7.554
7.524
7.508
7.483
7.422
7.404
7.386
7.373
7.125
7.111
7.096
7.084
7.037
7.022
7.006
6.719
6.706
6.683
3.475
3.461
3.456
3.444
3.351
3.341
3.334
3.320



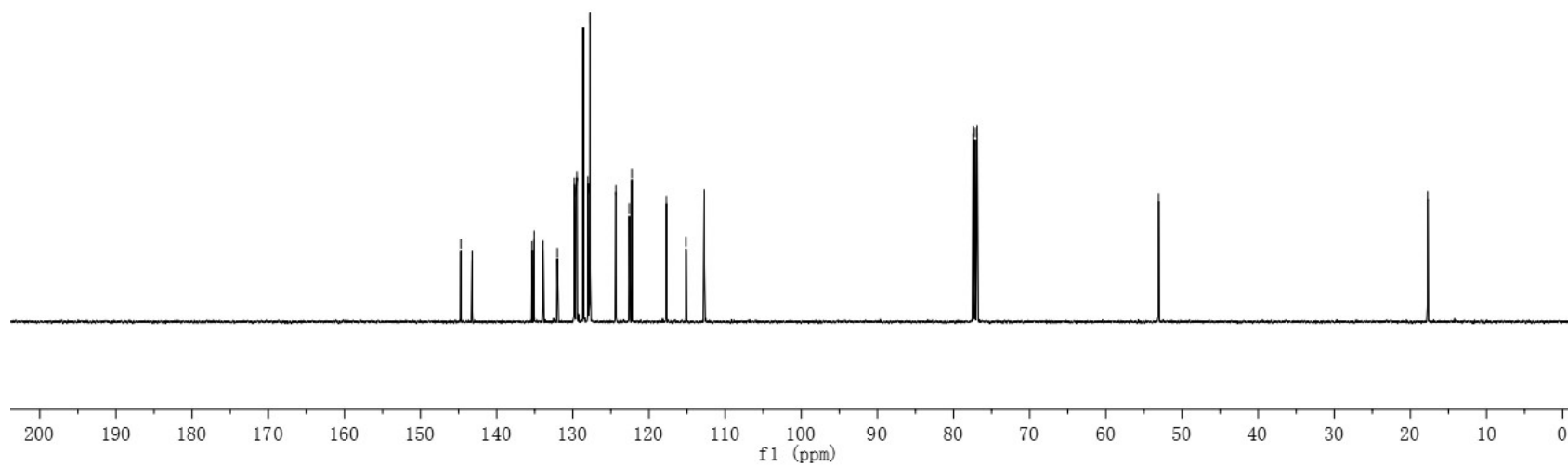
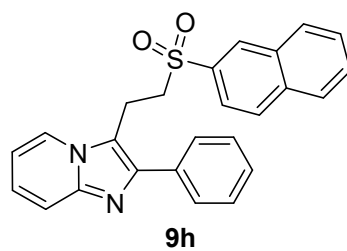
^{13}C NMR (126 MHz, CDCl_3) of **9h**

144.715
143.214
135.335
135.075
133.903
132.031
129.796
129.742
129.548
129.456
128.617
128.010
127.879
127.814
127.737
124.350
122.591
122.255
117.715
115.145
112.738

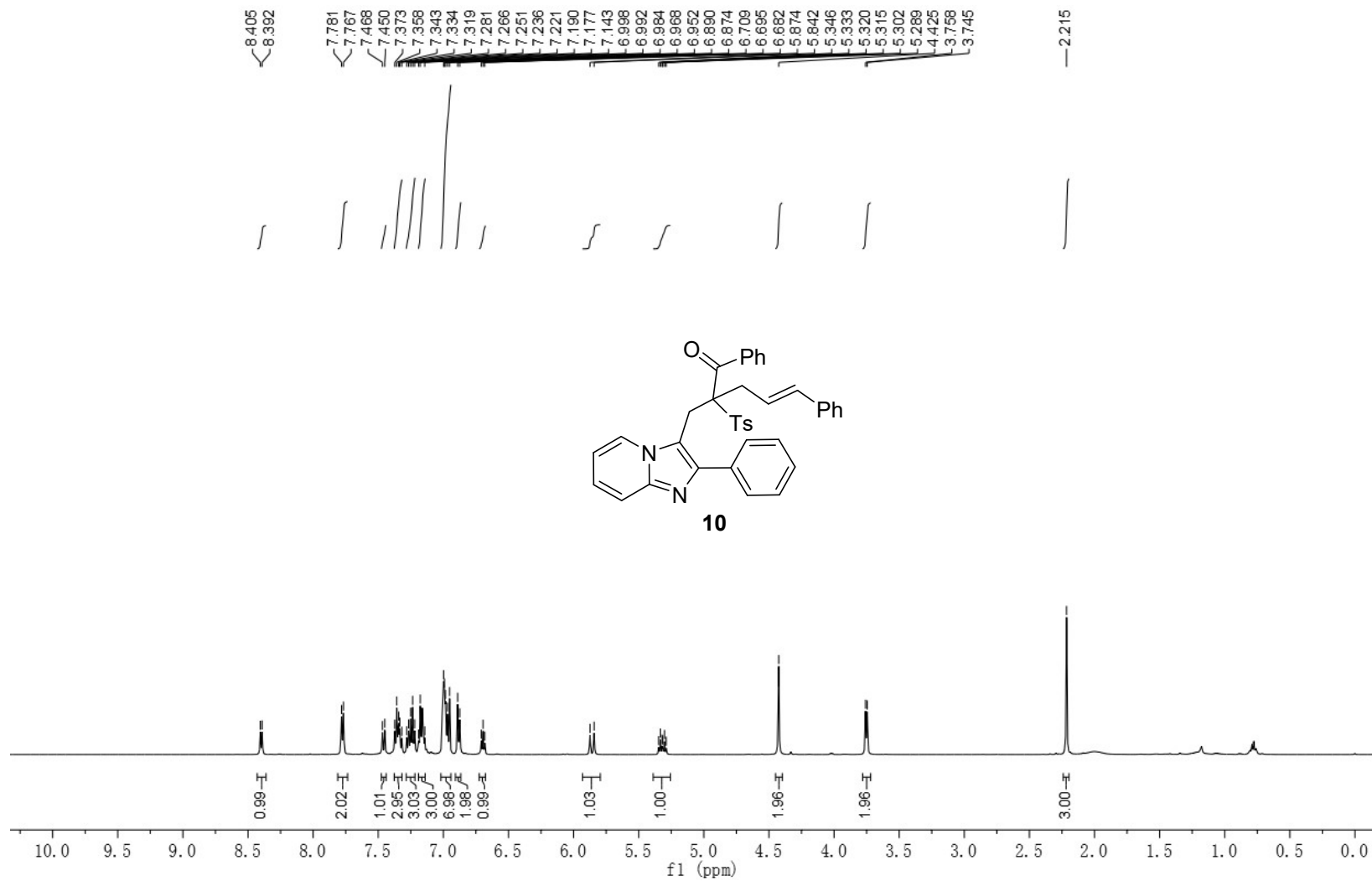
77.405
77.150
76.895

53.063

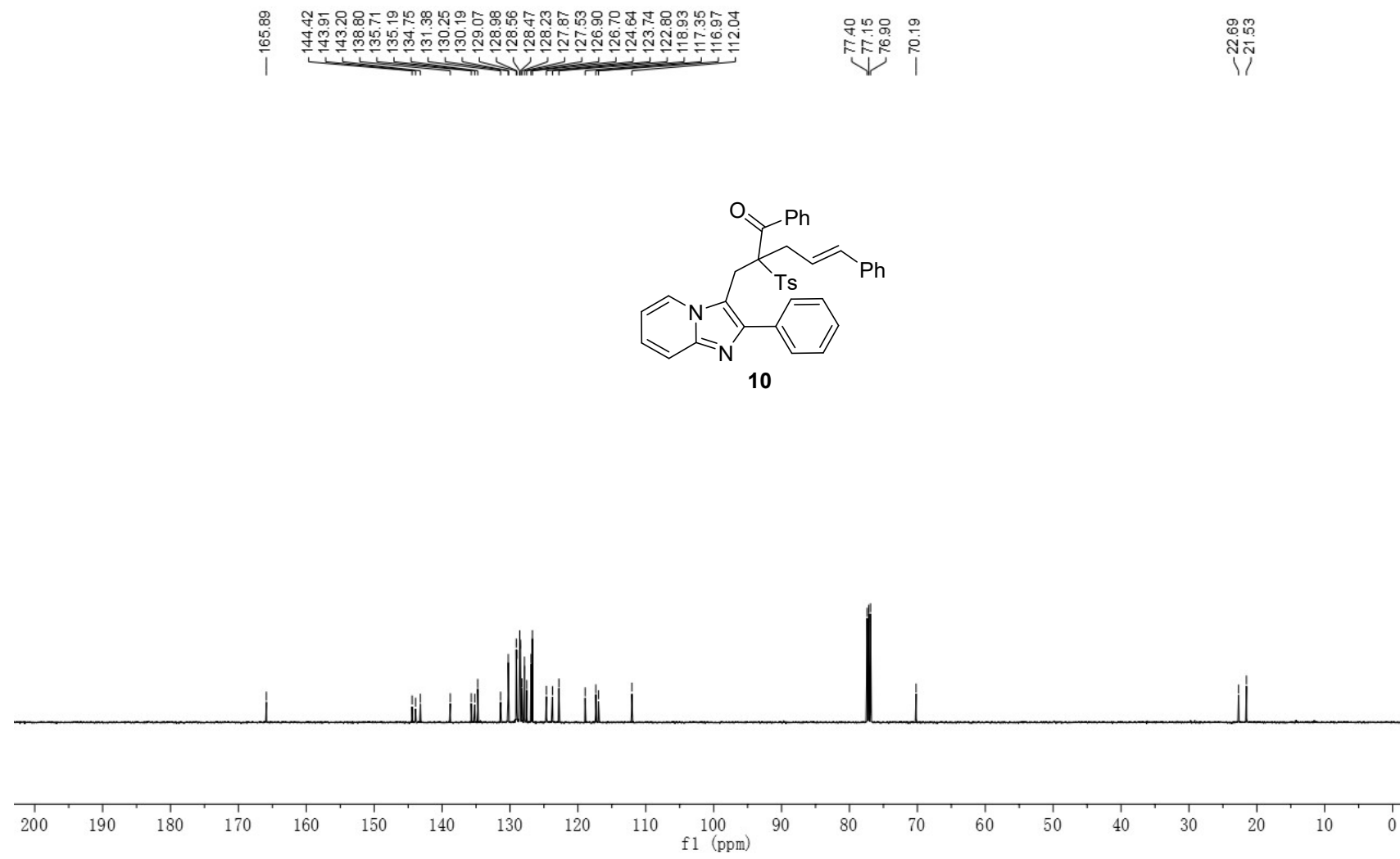
17.732



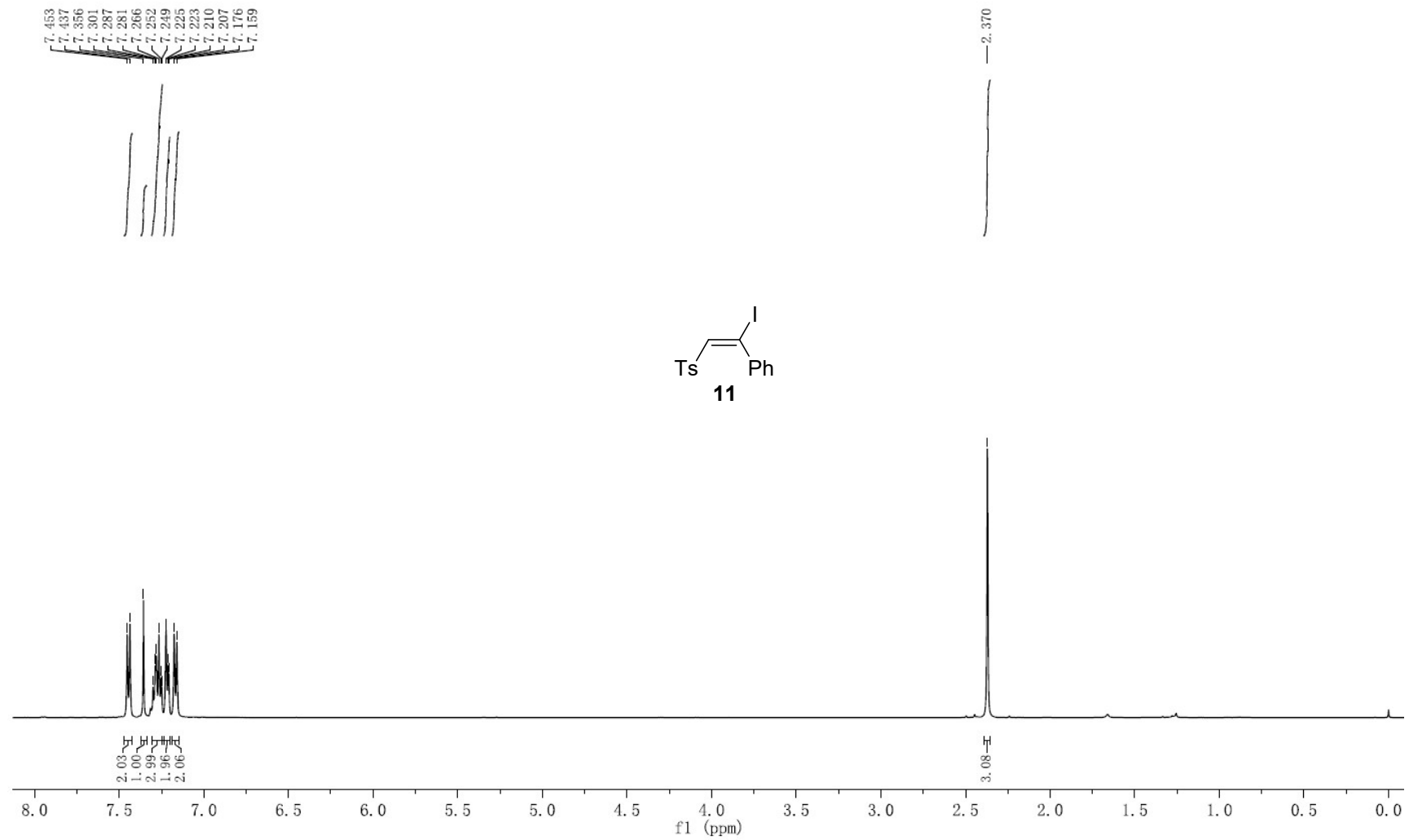
¹H NMR (500 MHz, CDCl₃) of **10**



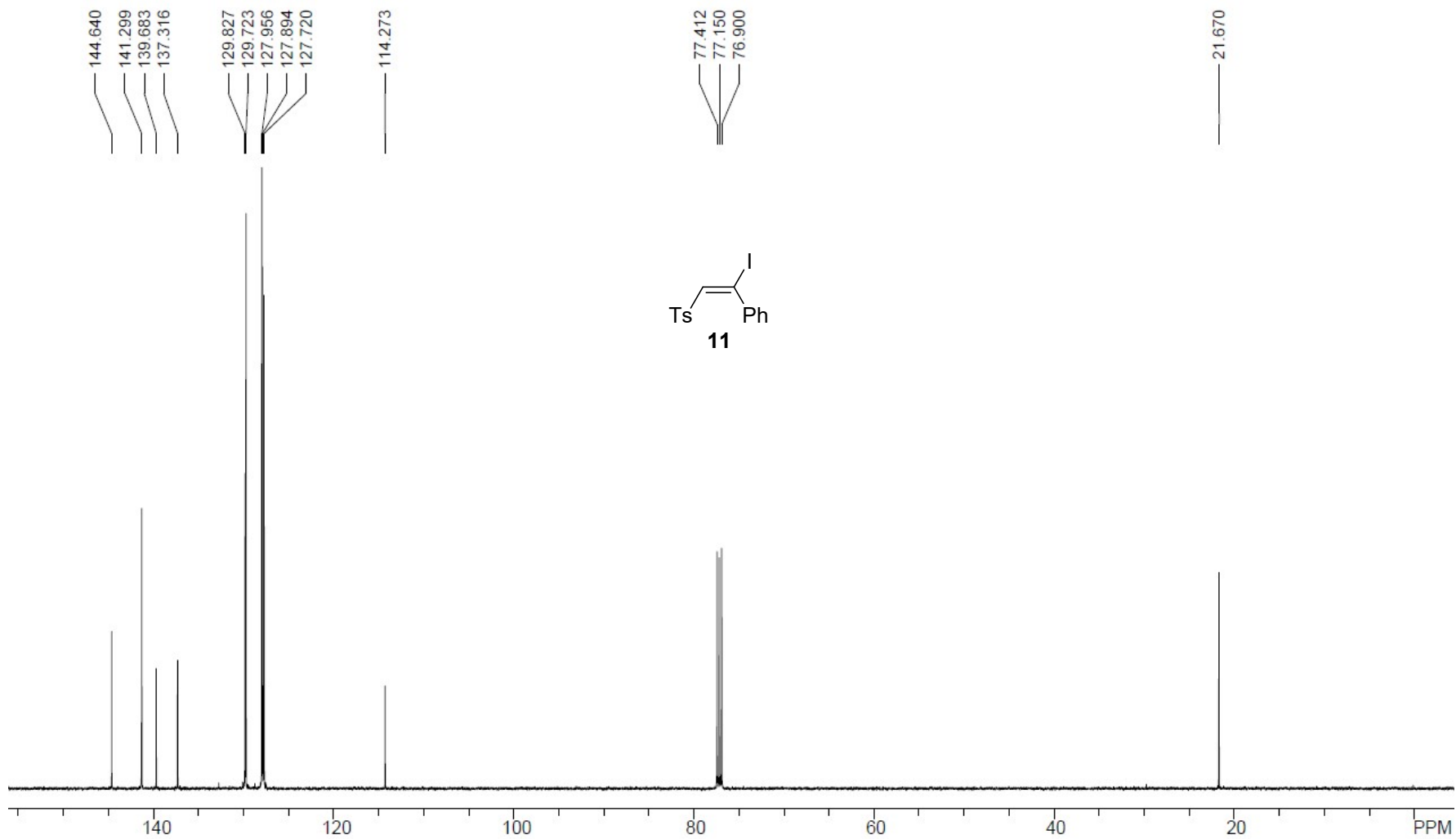
^{13}C NMR (126 MHz, CDCl_3) of **10**



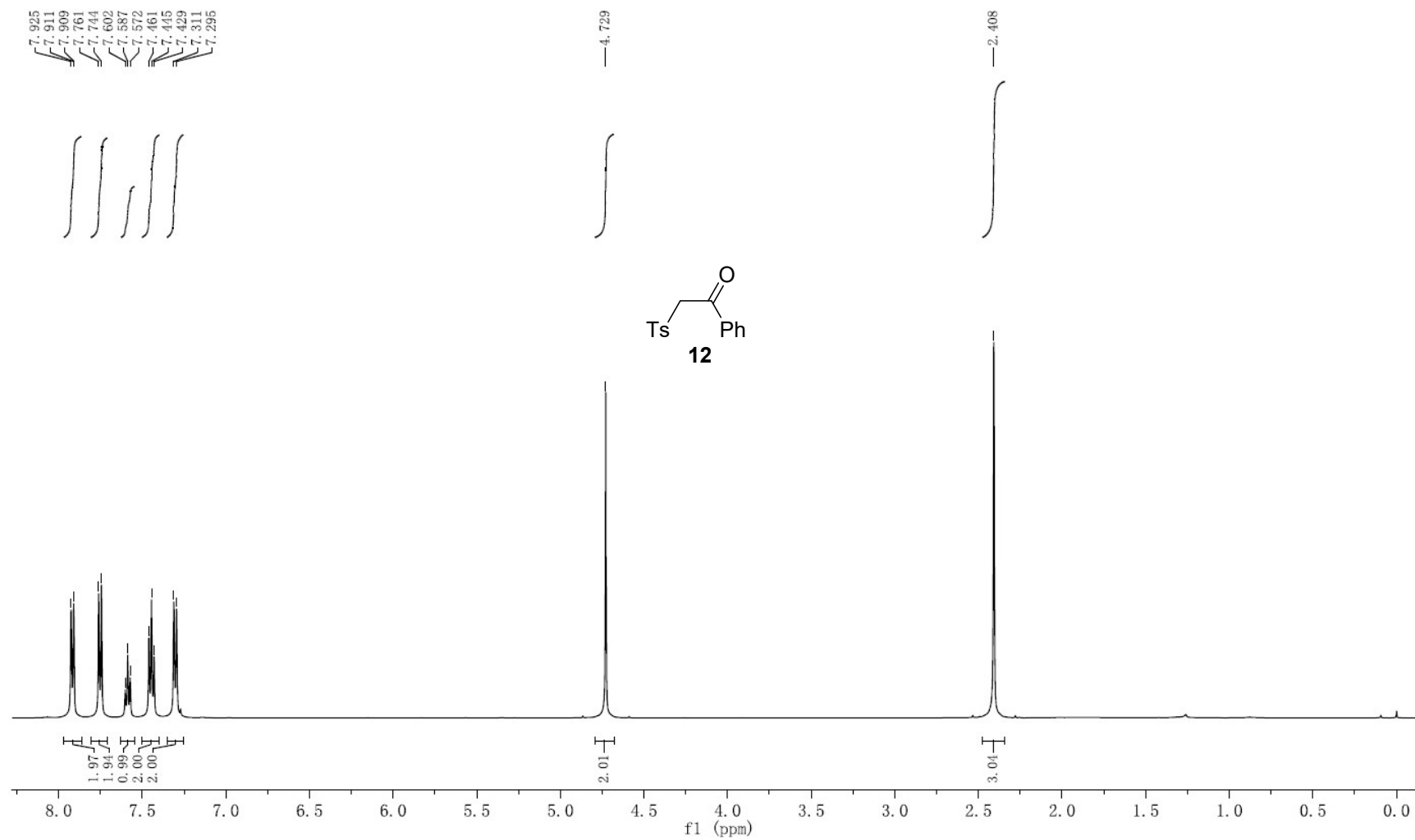
¹H NMR (500 MHz, CDCl₃) of **11a**



^{13}C NMR (126 MHz, CDCl_3) of **11a**



¹H NMR (500 MHz, CDCl₃) of **12a**



^{13}C NMR (126 MHz, CDCl_3) of **12a**

