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Chelation-Controlled Stereospecific Ring-Opening Arylation of *α*-Aminoaryl-Tethered Alkylidenecyclopropanes: Stereoselective Synthesis of Polysubstituted Conjugated Dienes

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Supporting Information

Table of Contents

1. General Information

Reagents, solvents, and analytical methods:

All reactions were carried out under a nitrogen atmosphere unless otherwise stated. Starting materials were synthesized according to existing methods. All reagents were purchased from TCI, Energy Chemical, and Bidepharm and used without purification. ^{1}H NMR spectra were recorded in $CDCl_3$ on a Bruker Ascend 500 spectrometer (500 MHz), and chemical shifts (δ values) were reported in parts per million (ppm) relative to internal tetramethylsilane standard (TMS, 0 ppm). The number of protons (n) for a given resonance is reported as nH. Coupling constants (J) were given in Hertz (Hz). ^{13}C NMR spectra were recorded in $CDCl_3$ on a Bruker Ascend 500 spectrometer (126 MHz) relative to internal $CDCl_3$ standard (77.16 ppm). ^{19}F NMR spectra were recorded in $CDCl_3$ on a Bruker Ascend 500 spectrometer (471 MHz). The following abbreviations were used to describe peak splitting patterns when appropriate: s = singlet, d = doublet, dd = double doublet, ddd = double doublet of doublets, t = triplet, dt = double triplet, q = quatriplet, m = multiplet. All highresolution mass spectra (HRMS) were obtained on a Thermo Scientific™ Q Exactive™ UHMR (Ultra High Mass Range) Hybrid Quadrupole-Orbitrap™ mass spectrometer.

2. Preparation of the Starting Materials.

2.1 Synthesis of 1a-1k

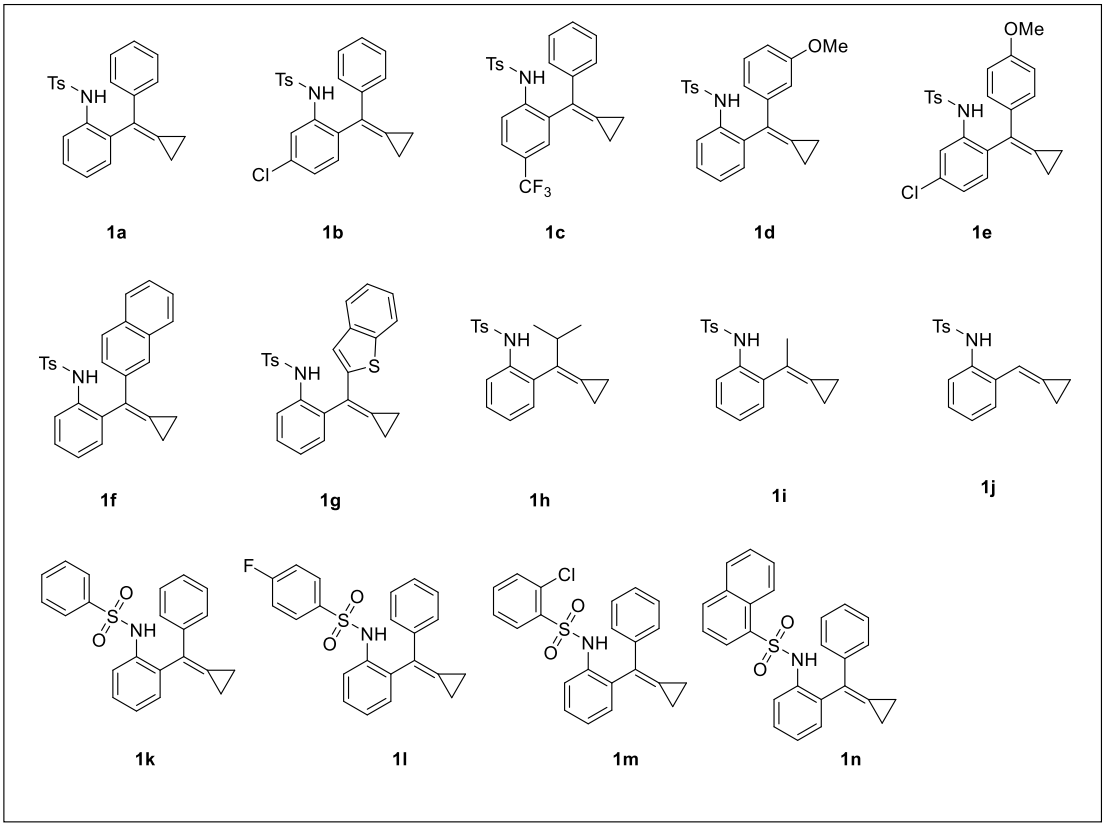


Figure S1 Substrates of ACPs

Compounds **1a**[1], **1b**[2], **1d**[3], **1f**[3], **1h**[3], **1m**[3], **1n**[3] were prepared according to the previous literatures.

Figure S2 Unsuccessful substrates

2.2 Synthesis of 2a-2z

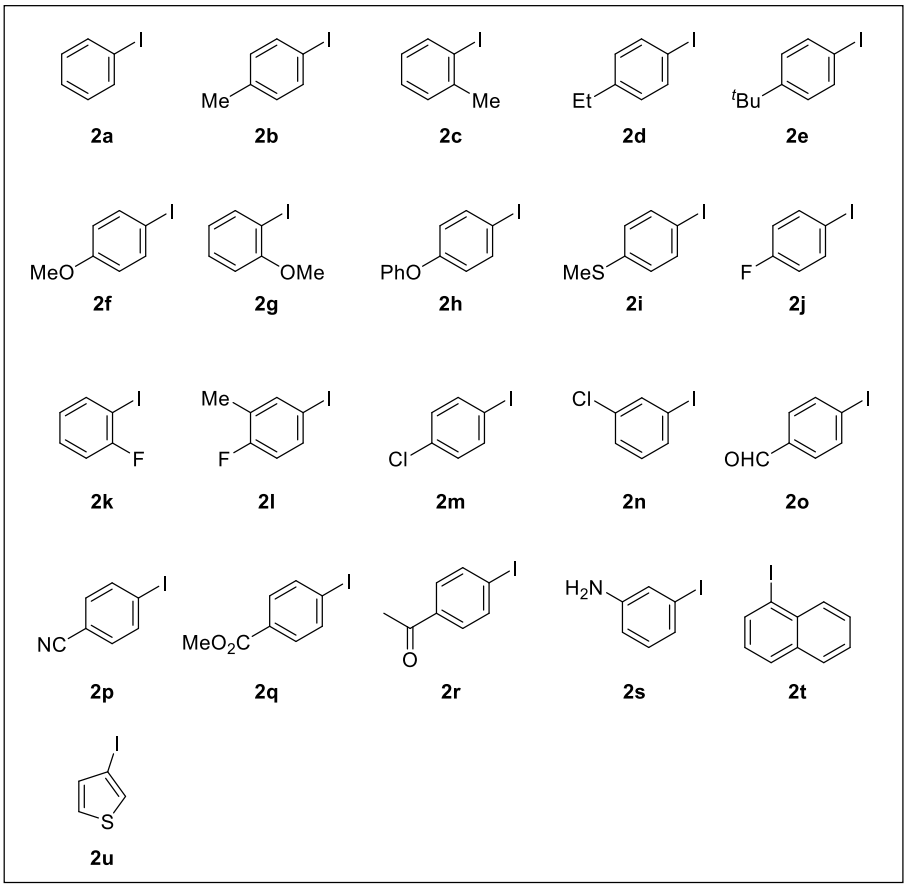


Figure S3 Substrates of nitrobenzene

Compounds **2a**-**2u** are commercially available.

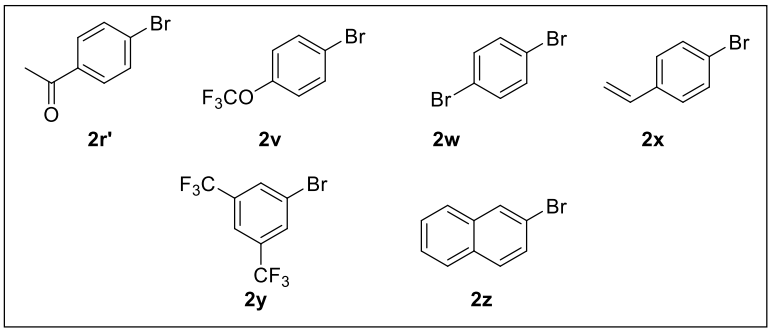


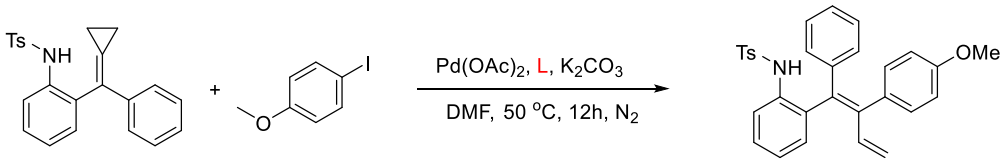
Figure S4 Substrates of nitrobenzene

Compounds **2r'**-**2z** are commercially available.

3. Optimization of the Reaction Conditions

3.1 Optimization of the Reaction Conditions for the Ring Opening Arylation.

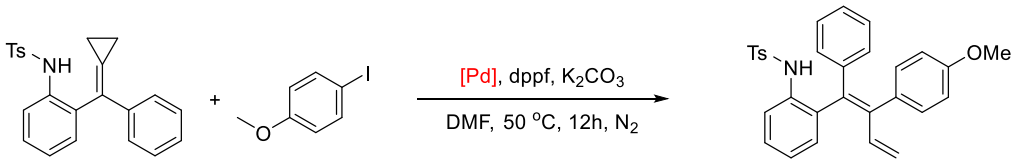
Table S1. Screening of Ligand [a]



Entry	Ligand	Yield (%)[b]
1	PPh_3	50
2	PCy_3	trace
3	2,2-bpy	ND.
4	4,4-*t*Bu-2,2-bpy	ND.
5	$BuPAd_2$	30
	dppf	75
6	dppp	64
7	DPEphos	72
8	Xantphos	70

[a] Reaction conditions: **1a** (0.2 mmol), **2f** (0.24 mmol), $Pd(OAc)_2$ (10 mol%), L, K_2CO_3 (2.0 eq.), DMF (2 mL), N_2 atmosphere, 50 °C for 12 h. [b] Isolated yield.

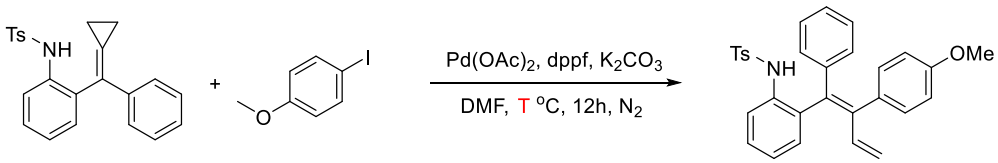
Table S2. Screening of Catalyst [a]



Entry	Catalyst	Yield (%)[b]
1	$PdCl_2$	23
2	$Pd(acac)_2$	19
3	$Pd(TFA)_2$	67
4	$Pd(MeCN)_2Cl_2$	59
	$Pd(OAc)_2$	75
5	$Pd(MeCN)_4(BF_4)_2$	64

[a] Reaction conditions: **1a** (0.2 mmol), **2f** (0.24 mmol), catalyst, dppf (10 mol%), K_2CO_3 (2.0 eq.), DMF (2 mL), N_2 atmosphere, 50 °C for 12 h. [b] Isolated yield.

Table S3. Screening of the temperature [a]

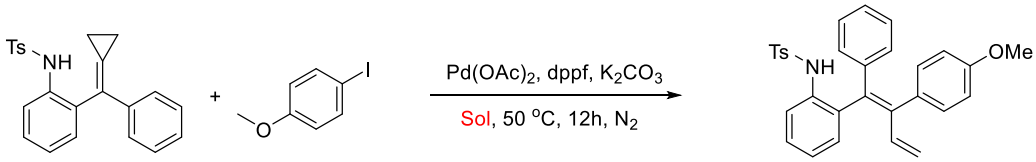


Entry	Temp.	Yield (%)[b]

1	40 °C	60
2	50 °C	74
3	60 °C	58

[a] Reaction conditions: **1a** (0.2 mmol), **2f** (0.24 mmol), $Pd(OAc)_2$ (10 mol%), dppf (10 mol%), K_2CO_3 (2.0 eq.), DMF (2 mL), N_2 atmosphere, T °C for 12 h. [b] Isolated yield.

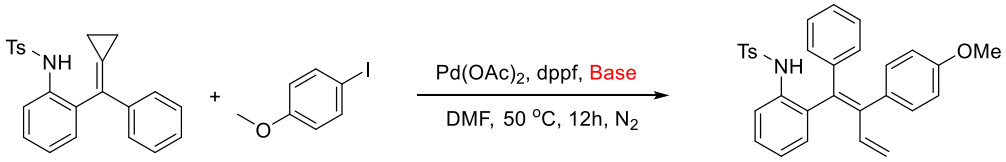
Table S4. Screening of solvent [a]



Entry	Solvent	Yield (%)[b]
1	THF	trace
2	DME	23
3	Tol.	22
4	DMSO	14
5	MeCN	30
6	DCM	trace
7	DMAc	70
8	DMF	75
9	NMP	73

[a] Reaction conditions: **1a** (0.2 mmol), **2f** (0.24 mmol), $Pd(OAc)_2$ (10 mol%), dppf (10 mol%), K_2CO_3 (2.0 eq.), Solvent (2 mL), N_2 atmosphere, 50 °C for 12 h. [b] Isolated yield.

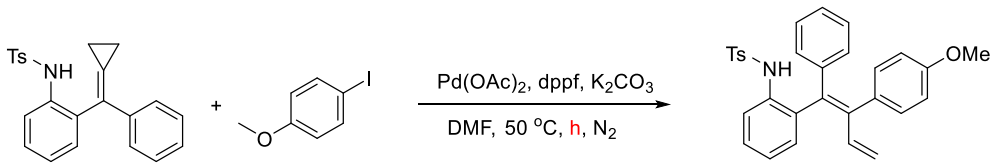
Table S5. Screening of the Base [a]



Entry	Base	Yield (%)[b]
1	NEt_3	trace
2	*t*-BuONa	65
3	pyridine	trace
4	*t*-BuOLi	63
5	Na_2CO_3	53
6	K_2CO_3	75
7	Cs_2CO_3	70
8	*t*-BuOK	72

[a] Reaction conditions: **1a** (0.2 mmol), **2f** (0.24 mmol), $Pd(OAc)_2$ (10 mol%), dppf (10 mol%), Base (2.0 eq.), DMF (2 mL), N_2 atmosphere, 50 °C for 12 h. [b] Isolated yield.

Table S6. Screening of the time [a]

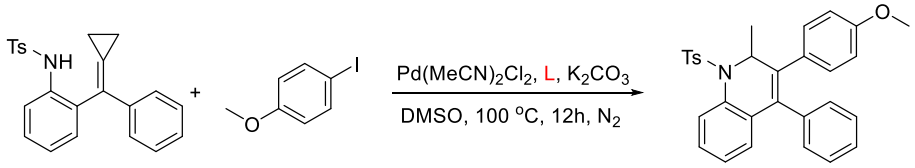


Entry	Time	Yield (%)[b]
1	12	75
2	8	82
3	6	82
4	4	78

[a] Reaction conditions: **1a** (0.2 mmol), **2f** (0.24 mmol), $Pd(OAc)_2$ (10 mol%), dppf (10 mol%), K_2CO_3 (2.0 eq.), DMF (2 mL), N_2 atmosphere, 50 °C for t h. [b] Isolated yield.

3.2 Optimization of the Reaction Conditions for the Synthesis of Dihydroquinolines.

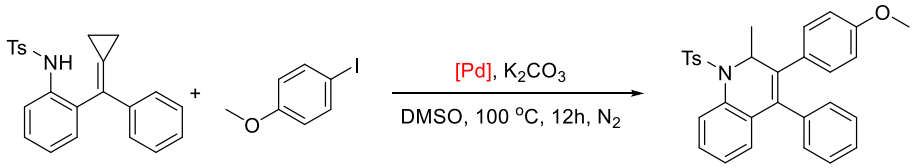
Table S7. Screening of the Ligand [a]



Entry	Ligand	Yield (%)[b]
1	None	70
2	BINAP	30
3	2,2-bpy	69
4	$BuPAd_2$	60
5	dppp	70
6	DPEphos	trace
7	Xantphos	67

[a] Reaction conditions: **1a** (0.2 mmol), **2f** (0.24 mmol), $Pd(OAc)_2$ (10 mol%), L, K_2CO_3 (2.0 eq.), DMF (2 mL), N_2 atmosphere, 100 °C for 12 h. [b] Isolated yield.

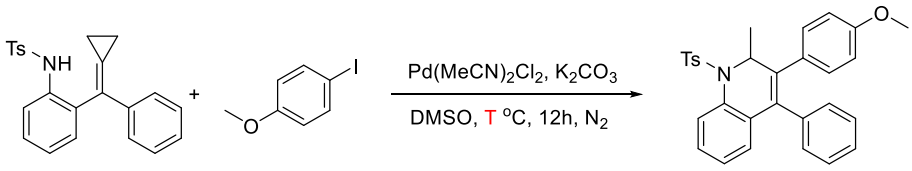
Table S8. Screening of the Catalyst [a]



Entry	Catalyst	Yield (%)[b]
1	PdI_2	45
2	$Pd(acac)_2$	68
3	$Pd(OAc)_2$	50
4	$Pd(MeCN)_2Cl_2$	70
5	$Pd(dba)_2$	52
6	$Pd(dppf)Cl_2$	46

[a] Reaction conditions: **1a** (0.2 mmol), **2f** (0.24 mmol), catalyst, K_2CO_3 (2.0 eq.), DMSO (2 mL), N_2 atmosphere, 100 °C for 12 h. [b] Isolated yield.

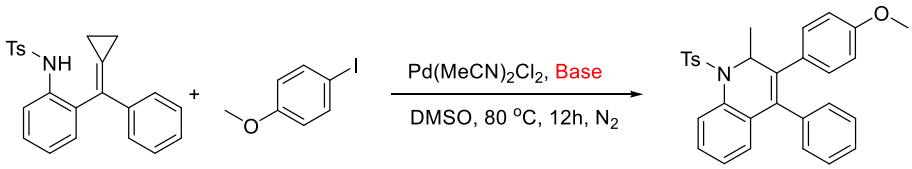
Table S9. Screening of reaction temperature [a]



Entry	Temp.	Yield (%)[b]
1	60 °C	67
2	80 °C	78
3	90 °C	73
4	100 °C	70

[a] Reaction conditions: **1a** (0.2 mmol), **2f** (0.24 mmol), $Pd(MeCN)_2Cl_2$ (10 mol%), K_2CO_3 (2.0 eq.), DMSO (2 mL), N_2 atmosphere, T °C for 12 h. [b] Isolated yield.

Table 10. Screening of the Base [a]

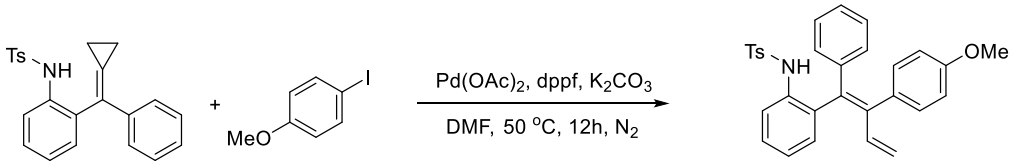


Entry	Base	Yield (%)[b]
1	DIPEA	86
2	*t*-BuOLi	ND
3	Na_2CO_3	70
4	K_2CO_3	78
5	*t*-BuOK	ND

[a] Reaction conditions: **1a** (0.2 mmol), **2f** (0.24 mmol), $Pd(MeCN)_2Cl_2$ (10 mol%), L, Base (2.0 eq.), DMF (2 mL), N_2 atmosphere, 80 °C for 12 h. [b] Isolated yield.

4. General Procedure

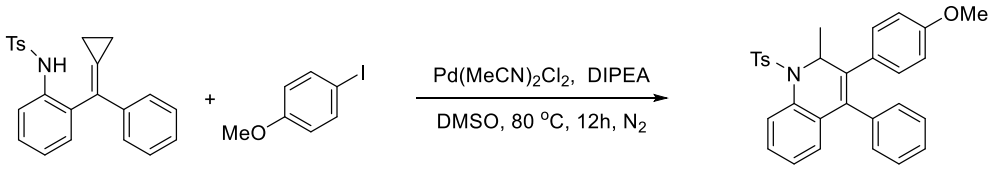
4.1 General Procedure A.



In a glove box, to an oven-dried 15 mL reaction tube which equipped with a magnetic stir bar was added **1** (0.2 mmol, 1 eq.), **2** (0.24 mmol, 1.2 eq.), $Pd(OAc)_2$ (10 mol%), dppf (10 mol%) K_2CO_3 (0.4 mmol, 2 eq.) DMF (2 mL). The reaction tube was then sealed with a screw-top septum cap, removed from the glove box and placed in a heating block that was preheated to 50 °C. After a time period of 8 h. The mixture was concentrated under reduced pressure and the residue was purified

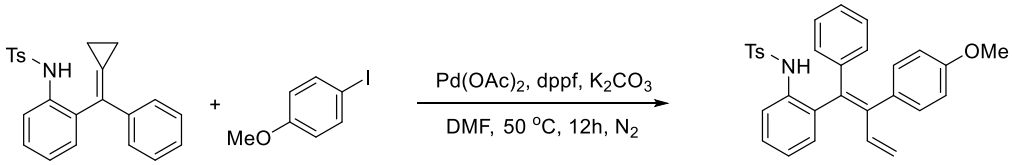
by flash chromatography on silica gel eluting with petroleum ether / EtOAc (v/v = 10:1 to 5:1) to afford the products **3**.

4.2 General Procedure B.



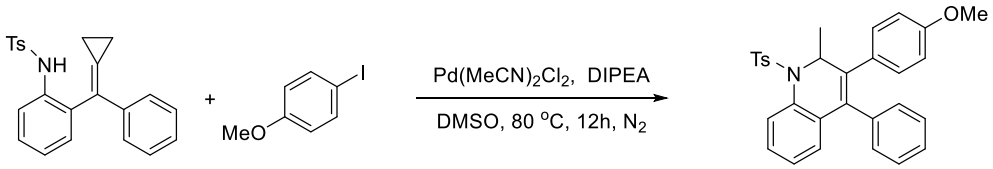
In a glove box, to an oven-dried 15 mL reaction tube which equipped with a magnetic stir bar was added **1** (0.2 mmol, 1 eq.), **2** (0.24 mmol, 1.2 eq.), $Pd(MeCN)_2Cl_2$ (10 mol%), DIPEA (0.4 mmol, 2 eq.) DMSO (2 mL). The reaction tube was then sealed with a screw-top septum cap, removed from the glove box and placed in a heating block that was preheated to 80 °C. After a time period of 12 h.The mixture was concentrated under reduced pressure and the residue was purified by flash chromatography on silica gel eluting with petroleum ether / EtOAc (v/v = 10:1 to 5:1) to afford the products **4**.

4.3 A 1mmol synthesis of 3af.



In a glove box, to an oven-dried 15 mL reaction tube which equipped with a magnetic stir bar was added **1a** (1 mmol, 1 eq.), **2f** (1.2 mmol, 1.2 eq.), $Pd(OAc)_2$ (10 mol%), dppf (10 mol%) K_2CO_3 (2 mmol, 2 eq.) DMF (10 mL). The reaction tube was then sealed with a screw-top septum cap, removed from the glove box and placed in a heating block that was preheated to 50 °C. After a time period of 8 h. The mixture was concentrated under reduced pressure and the residue was purified by flash chromatography on silica gel eluting with petroleum ether / EtOAc (v/v = 10:1 to 5:1) to afford the products **3af** (385 mg, 80%）.

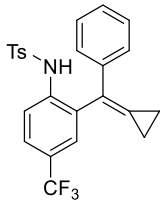
4.4 A 1mmol synthesis of 4af.



In a glove box, to an oven-dried 15 mL reaction tube which equipped with a magnetic stir bar was added **1a** (1 mmol, 1 eq.), **2f** (1.2 mmol, 1.2 eq.), $Pd(MeCN)_2Cl_2$ (10 mol%), DIPEA (2 mmol, 2 eq.) DMSO (10 mL). The reaction tube was then sealed with a screw-top septum cap, removed from the glove box and placed in a heating block that was preheated to 80 °C. After a time period of 12 h.The mixture was concentrated under reduced pressure and the residue was purified by flash chromatography on silica gel eluting with petroleum ether / EtOAc (v/v = 10:1 to 5:1) to afford the products **4af** (409 mg, 85%).

5. Characterization Data of the Corresponding Products

Materials

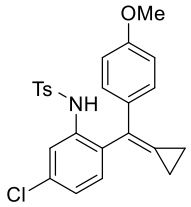


N-(2-(cyclopropylidene(phenyl)methyl)-4-(trifluoromethyl)phenyl)-4-methylbenzenesulfonamide (**1c**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **1c** was obtained as a white solid (80 mg, 90%), R_f=0.45 (PE/EA=10/1).

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.00 (d, *J* = 1.8 Hz, 1H), 7.47 – 7.41 (m, 2H), 7.35 (d, *J* = 1.8 Hz, 1H), 7.22 (dd, *J* = 20.9, 8.5 Hz, 4H), 7.15 – 7.08 (m, 4H), 6.60 (s, 1H), 2.38 (s, 3H), 1.59 – 1.57 (m, 2H), 0.99 – 0.92 (m, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 144.1, 137.6, 135.8, 135.2, 131.2, 129.6, 128.9, 128.9, 127.9, 127.3, 126.2, 124.6, 121.2, 121.1, 117.3, 117.2, 21.5, 5.9, 1.7.

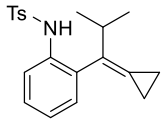


N-(5-chloro-2-(cyclopropylidene(4-methoxyphenyl)methyl)phenyl)-4-methylbenzenesulfonamide (**1e**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **1e** was obtained as a white solid (78 mg, 89%), R_f=0.40 (PE/EA=8/1).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.74 (d, *J* = 2.1 Hz, 1H), 7.46 (d, *J* = 8.3 Hz, 2H), 7.15 – 7.10 (m, 2H), 7.09 – 7.04 (m, 3H), 6.99 (d, *J* = 8.2 Hz, 1H), 6.77 – 6.72 (m, 2H), 6.52 (s, 1H), 3.82 (s, 3H), 2.38 (s, 3H), 1.55 – 1.45 (m, 2H), 0.94 – 0.83 (m, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 159.2, 143.9, 136.0, 135.6, 133.9, 131.6, 130.6, 130.6, 129.5, 127.5, 127.2, 125.8, 124.8, 124.1, 120.5, 114.1, 55.3, 21.6, 5.7, 1.6.

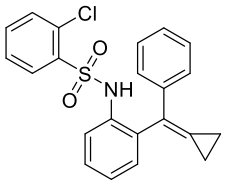


N-(2-(1-cyclopropylidene-2-methylpropyl)phenyl)-4-methylbenzenesulfonamide (**1h**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **1h** was obtained as a white solid (63 mg, 92%), R_f=0.58 (PE/EA=15/1).

^{1}H NMR (500 MHz, Chloroform-*d*) δ 7.70 (d, *J* = 8.2 Hz, 2H), 7.61 (d, *J* = 8.3 Hz, 1H), 7.25 – 7.16 (m, 3H), 7.04 – 6.97 (m, 2H), 6.78 (s, 1H), 2.48 – 2.39 (m, 1H), 2.37 (s, 3H), 1.38 (td, *J* = 7.4, 1.4 Hz, 2H), 0.98 (d, *J* = 6.9 Hz, 6H), 0.80 (ddd, *J* = 9.2, 5.9, 1.4 Hz, 2H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 144.2, 143.6, 139.7, 139.6, 135.9, 134.4, 130.8, 130.4, 129.30, 129.28, 129.0, 127.1, 124.9, 124.7, 124.4, 123.7, 122.1, 121.9, 121.6, 121.5, 29.7, 21.4, 6.4, 3.5.

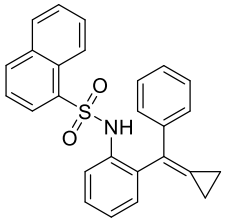


2-chloro-*N*-(2-(cyclopropylidene(phenyl)methyl)phenyl)benzenesulfonamide (**1m**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **1k** was obtained as a white solid (67 mg, 85%), R_f=0.43 (PE/EA=10/1).

^{1}H NMR (400 MHz, Chloroform-d) δ 7.97 (dd, J = 7.8, 1.7 Hz, 1H), 7.67 (d, J = 8.2 Hz, 1H), 7.39 – 7.34 (m, 1H), 7.32 – 7.20 (m, 9H), 7.16 – 7.05 (m, 2H), 7.01 (s, 1H), 1.67 – 1.61 (m, 2H), 0.98 – 0.92 (m, 2H).

^{13}C NMR (101 MHz, CDCl3) δ 138.5, 137.0, 134.2, 133.9, 132.7, 132.0, 131.5, 130.9, 128.7, 128.4, 127.6, 127.2, 127.0, 126.6, 125.7, 125.1, 121.7, 77.5, 77.2, 76.8, 29.8, 6.2, 1.7.



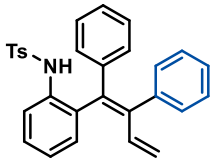
N-(2-(cyclopropylidene(phenyl)methyl)phenyl)naphthalene-1-sulfonamide (**1n**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **1l** was obtained as a white solid (72 mg, 87%), R_f=0.52 (PE/EA=15/1).

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.16 (d, *J* = 1.9 Hz, 1H), 7.87 – 7.77 (m, 3H), 7.72 (d, *J* = 8.7 Hz, 1H), 7.60 (dddd, *J* = 24.4, 8.1, 6.9, 1.4 Hz, 2H), 7.47 (dd, *J* = 8.7, 1.9 Hz, 1H), 7.33 (td, *J* = 7.8, 1.7 Hz, 1H), 7.16 – 7.00 (m, 7H), 6.54 (s, 1H), 1.41 – 1.32 (m, 2H), 0.81 – 0.68 (m, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 138.5, 136.3, 135.0, 134.4, 132.8, 132.1, 130.9, 129.4, 129.03, 128.98, 128.7, 128.7, 128.6, 127.9, 127.89, 127.7, 127.6, 126.3, 125.6, 125.2, 122.5, 121.8, 5.7, 1.7.

Products



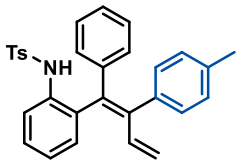
(*E*)-*N*-(2-(1,2-Diphenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3aa**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3aa** was obtained as a white solid (78 mg, 87%), R_f=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.33 – 7.27 (m, 6H), 7.14 – 7.06 (m, 7H), 7.03 – 6.96 (m, 3H), 6.91 – 6.82 (m, 2H), 6.74 (td, *J* = 7.5, 1.2 Hz, 1H), 6.69 (s, 1H), 5.32 (dd, *J* = 10.8, 1.5 Hz, 1H), 5.03 (dd, *J* = 17.3, 1.5 Hz, 1H), 2.35 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 137.1, 136.3, 134.5, 132.5, 132.2, 130.4, 130.3, 129.6, 128.5, 128.1, 127.9, 127.3, 127.3, 123.3, 120.7, 118.0, 77.4, 77.1, 76.7, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{29}H_{26}NO_2S^+$ 452.1679; Found 452.1671.



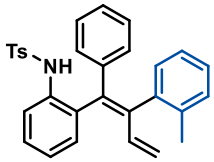
(*E*)-4-Methyl-*N*-(2-(1-phenyl-2-(*p*-tolyl)buta-1,3-dien-1-yl)phenyl)benzenesulfonamide (**3ab**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ab** was obtained as a white solid (88 mg, 95%), R_f=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.34 – 7.26 (m, 6H), 7.09 (d, *J* = 8.0 Hz, 2H), 7.05 – 7.03 (m, 2H), 7.02 – 6.98 (m, 1H), 6.95 – 6.90 (m, 4H), 6.87 – 6.82 (m, 2H), 6.77 (td, *J* = 7.5, 1.1 Hz, 1H), 6.71 (s, 1H), 5.30 (dd, *J* = 10.8, 1.5 Hz, 1H), 5.05 (dd, *J* = 17.3, 1.5 Hz, 1H), 2.35 (s, 3H), 2.25 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.6, 142.5, 140.2, 137.3, 136.9, 136.4, 135.7, 134.2, 132.9, 132.3, 130.4, 129.6, 128.7, 128.4, 127.9, 127.8, 127.3, 123.4, 120.4, 118.3, 21.6, 21.3.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{28}NO_2S^+$ 466.1835; Found 466.1827.



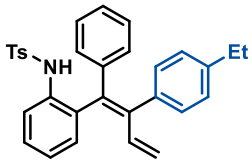
(*E*)-4-methyl-*N*-(2-(1-phenyl-2-(*o*-tolyl)buta-1,3-dien-1-yl)phenyl)benzenesulfonamide (**3ac**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ac** was obtained as a white solid (87 mg, 94%, E/Z = 8:1), R_f=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.37 – 7.28 (m, 4H), 7.26 – 7.23 (m, 2H), 7.21 – 7.17 (m, 2H), 7.08 – 7.03 (m, 4H), 6.99 – 6.85 (m, 5H), 6.75 – 6.69 (m, 2H), 5.25 (dd, *J* = 10.6, 1.6 Hz, 1H), 4.81 (dd, *J* = 17.2, 1.6 Hz, 1H), 2.34 (s, 3H), 2.23 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.6, 136.1, 136.1, 135.9, 134.4, 130.3, 129.9, 129.7, 129.5, 129.3, 128.6, 128.2, 128.0, 127.9, 127.9, 127.4, 127.3, 127.3, 127.2, 122.9, 119.9, 117.3, 21.5, 20.21.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{28}NO_2S^+$ 466.1835; Found 466.1827.



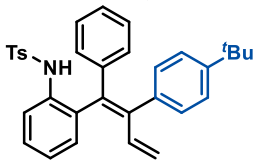
(*E*)-*N*-(2-(2-(4-Ethylphenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3ad**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ad** was obtained as a white solid (76mg, 79%), R_f=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.35 – 7.28 (m, 5H), 7.07 (dd, *J* = 20.7, 7.3 Hz, 5H), 7.03 – 6.90 (m, 6H), 6.87 – 6.80 (m, 2H), 6.70 (s, 1H), 5.30 (d, *J* = 10.7 Hz, 1H), 5.06 (d, *J* = 17.3 Hz, 1H), 2.55 (q, *J* = 7.6 Hz, 2H), 2.35 (s, 3H), 1.17 (t, *J* = 7.6 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.6, 143.3, 142.6, 140.3, 137.3, 136.39, 136.36 135.9, 134.3, 132.9, 132.3, 130.4, 130.4, 129.6, 128.4, 127.9, 127.8, 127.4, 127.3, 123.4, 120.5, 118.3, 28.5, 21.6, 15.2.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{31}H_{30}NO_2S^+$ 480.1992; Found 480.1998.



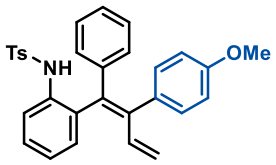
(*E*)-*N*-(2-(2-(4-(Tert-butyl)phenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3ae**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ae** was obtained as a white solid (95mg, 94%), R_f=0.48 (PE/EA=10/1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.37 – 7.27 (m, 6H), 7.13 – 7.04 (m, 6H), 6.99 (ddd, *J* = 8.5, 7.2, 1.7 Hz, 1H), 6.94 – 6.90 (m, 2H), 6.89 – 6.79 (m, 2H), 6.74 (td, *J* = 7.4, 1.2 Hz, 1H), 6.69 (s, 1H), 5.30 (dd, *J* = 10.7, 1.6 Hz, 1H), 5.08 (dd, *J* = 17.3, 1.6 Hz, 1H), 2.35 (s, 3H), 1.24 (s, 9H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 150.2, 143.5, 142.6, 140.2, 137.3, 136.5, 136.4, 135.7, 134.3, 133.0, 132.3, 130.4, 130.1, 129.6, 128.4, 127.9, 127.8, 127.3, 124.8, 123.4, 120.5, 118.4, 34.5, 31.3, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{33}H_{34}NO_2S^+$ 508.2305; Found 508.2296.



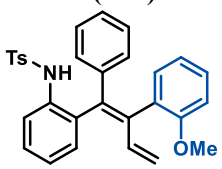
(*E*)-*N*-(2-(2-(4-Methoxyphenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamid (**3af**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3af** was obtained as a white solid (80 mg, 82%), R_f=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.35 – 7.26 (m, 6H), 7.12 – 7.07 (m, 2H), 7.05 – 6.95 (m, 5H), 6.88 – 6.75 (m, 3H), 6.71 (s, 1H), 6.69 – 6.65 (m, 2H), 5.31 (dd, *J* = 10.8, 1.6 Hz, 1H), 5.08 (dd, *J* = 17.2, 1.6 Hz, 1H), 3.74 (s, 3H), 2.35 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 158.7, 143.6, 142.2, 140.3, 137.4, 136.4, 136.3, 134.2, 132.9, 132.3, 132.3, 131.8, 130.9, 130.4, 130.2, 129.7, 129.6, 128.4, 128.1, 127.9, 127.8, 127.3, 127.3, 123.5, 120.3, 118.3, 113.6, 113.4, 55.1, 21.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{28}NO_3S^+$ 482.1784; Found 482.1776.



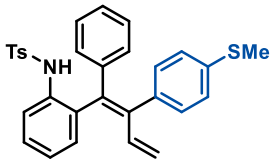
(*E*)-*N*-(2-(2-(2-methoxyphenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamid (**3ag**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ag** was obtained as a white solid (72mg, 75%), R_f=0.48 (PE/EA=10/1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 (s, 1H), 7.36 (d, *J* = 7.1 Hz, 3H), 7.26 – 7.10 (m, 4H), 7.10 – 7.01 (m, 2H), 7.00 – 6.72 (m, 9H), 5.24 – 5.12 (m, 1H), 4.82 (d, *J* = 17.2 Hz, 1H), 3.87 (s, 3H), 2.34 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 136.2, 134.4, 132.4, 131.5, 130.3, 129.5, 128.8, 127.9, 127.7, 127.4, 127.2, 123.2, 120.4, 118.9, 118.1, 110.6, 55.5, 26.9, 21.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{28}NO_3S^+$ 482.1784; Found 482.1776.



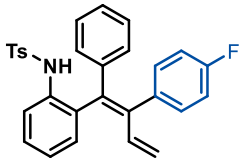
(*E*)-4-methyl-*N*-(2-(2-(4-(methylthio)phenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)benzenesulfonamide (**3ai**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ai** was obtained as a white solid (95 mg, 95 %), Rf=0.62(PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.31 – 7.23 (m, 6H), 7.09 – 7.03 (m, 4H), 7.00 – 6.94 (m, 3H), 6.91 (d, *J* = 8.4 Hz, 2H), 6.85 – 6.77 (m, 2H), 6.74 (td, *J* = 7.5, 1.1 Hz, 1H), 6.66 (s, 1H), 5.28 (dd, *J* = 10.7, 1.5 Hz, 1H), 5.03 (dd, *J* = 17.3, 1.5 Hz, 1H), 2.39 (s, 3H), 2.32 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.6, 142.0, 139.9, 137.6, 137.1, 136.6, 136.3, 135.4, 134.4, 132.5, 132.2, 130.9, 130.30 129.6, 128.5, 128.2, 127.9, 127.3, 125.6, 123.5, 120.5, 118.1, 29.7, 21.6, 15.3.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{28}NO_2S_2^+$ 489.1556; Found 489.1546.



(*E*)-*N*-(2-(2-(4-Fluorophenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3aj**)

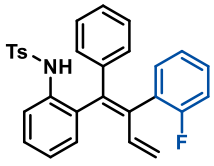
The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1),**3aj** was obtained as a white solid (83 mg, 88%), Rf=0.48 (PE/EA=10/1).

1H NMR (500 MHz, CDCl3) δ 7.32 (dd, J = 9.9, 7.6 Hz, 6H), 7.14 – 7.08 (m, 4H), 7.03 – 6.94 (m, 3H), 6.90 – 6.74 (m, 5H), 6.66 (s, 1H), 5.33 (dd, J = 10.7, 1.4 Hz, 1H), 5.02 (dd, J = 17.3, 1.4 Hz, 1H), 2.35 (s, 3H).

13C NMR (126 MHz, CDCl3) δ 162.8, 160.8, 143.7, 141.8, 139.6, 137.1, 136.9, 136.2, 134.8, 134.7, 134.6, 132.2, 132.1, 132.2, 130.2, 129.6, 128.6, 128.2, 128.1, 127.3, 123.4, 120.7, 117.9, 115.0, 114.8, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{29}H_{25}FNO_2S^+$ 470.1585; Found 470.1576.

^{19}F NMR (377 MHz, CDCl3) δ -114.41 – -114.48 (m).



(*E*)-*N*-(2-(2-(2-Fluorophenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3ak**)

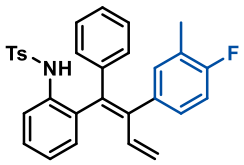
The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ak** was obtained as a white solid (83 mg, 88%), Rf=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.38 – 7.27 (m, 6H), 7.18 (d, *J* = 7.3 Hz, 2H), 7.14 – 7.09 (m, 1H), 7.07 (d, *J* = 8.1 Hz, 2H), 7.01 – 6.88 (m, 6H), 6.76 (td, *J* = 7.6, 1.2 Hz, 2H), 5.28 (dd, *J* = 10.6, 1.3 Hz, 1H), 4.92 (dt, *J* = 17.2, 1.2 Hz, 1H), 2.34 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.7, 139.9, 138.7, 136.9, 136.9, 136.9, 136.5, 134.3, 133.3, 131.9, 130.3, 129.6, 129.4, 128.4, 128.2, 127.9, 127.3, 125.9, 124.7, 123.8, 120.1, 118.9, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{29}H_{25}FNO_2S^+$ 470.1585; Found 470.1576.

^{19}F NMR (377 MHz, $CDCl_3$) δ -113.09.



(*E*)-*N*-(2-(2-(4-Fluoro-3-methylphenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3al**)

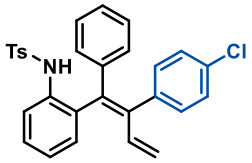
The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1),**3al** was obtained as a white solid (86 mg, 89%), Rf=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.35 – 7.27 (m, 6H), 7.09 (dd, *J* = 8.0, 1.4 Hz, 4H), 7.02 (ddd, *J* = 8.5, 7.3, 1.7 Hz, 1H), 6.91 (t, *J* = 7.9 Hz, 1H), 6.86 – 6.81 (m, 2H), 6.81 – 6.75 (m, 1H), 6.71 – 6.64 (m, 3H), 5.32 (dd, *J* = 10.7, 1.4 Hz, 1H), 5.04 (dd, *J* = 17.3, 1.5 Hz, 1H), 2.35 (s, 3H), 2.17 (d, *J* = 1.8 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.7, 141.5, 139.7, 136.9, 136.8, 136.2, 134.5, 132.2, 132.0, 130.94(d, *J* = 21.76 Hz), 130.2, 130.0, 129.6, 128.9, 128.5, 128.3, 128.1, 128.1, 127.3, 127.3, 125.9, 125.9, 123.4, 120.7, 118.0, 117.0, 116.8, 21.61 (d, *J* = 63.24 Hz), 14.37 (d, *J* = 13.56 Hz)

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{27}FNO_2S^+$ 484.1741; Found 484.1738.

^{19}F NMR (471 MHz, $CDCl_3$) δ -117.89 – -117.97 (m).



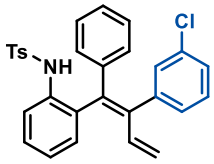
(*E*)-*N*-(2-(2-(4-chlorophenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3am**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3am** was obtained as a white solid (89 mg, 92%), Rf=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32 (ddd, *J* = 10.4, 5.9, 3.2 Hz, 6H), 7.14 – 7.06 (m, 6H), 7.02 (ddd, *J* = 8.5, 7.3, 1.8 Hz, 1H), 6.93 (d, *J* = 8.4 Hz, 2H), 6.88 – 6.74 (m, 3H), 6.64 (s, 1H), 5.33 (dd, *J* = 10.8, 1.4 Hz, 1H), 5.01 (dd, *J* = 17.3, 1.3 Hz, 1H), 2.36 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.8, 141.6, 139.6, 137.4, 137.2, 136.9, 136.2, 134.6, 133.1, 132.1, 132.0, 131.8, 130.2, 129.6, 128.6, 128.4, 128.2, 127.3, 123.4, 120.8, 117.9, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{29}H_{25}ClNO_2S^+$ 486.1289; Found 486.1287.



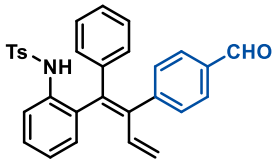
(*E*)-*N*-(2-(2-(3-chlorophenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (3**an**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3an** was obtained as a white solid (82 mg, 85%), Rf=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.38 – 7.28 (m, 6H), 7.18 – 7.13 (m, 2H), 7.12 – 7.07 (m, 4H), 7.02 (q, *J* = 7.5 Hz, 2H), 6.89 – 6.82 (m, 3H), 6.77 (td, *J* = 7.5, 1.1 Hz, 1H), 6.63 (s, 1H), 5.35 (dd, *J* = 10.7, 1.3 Hz, 1H), 5.03 (dd, *J* = 17.3, 1.3 Hz, 1H), 2.35 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.7, 141.5, 140.9, 139.4, 137.4, 136.6, 136.2, 134.7, 133.6, 131.9, 131.9, 130.4, 130.2, 129.6, 129.4, 128.7, 128.6, 128.4, 128.3, 127.4, 127.3, 123.4, 120.9, 117.9, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{29}H_{25}ClNO_2S^+$ 486.1289; Found 486.1287.



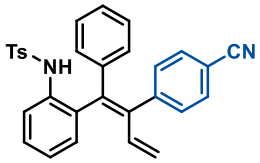
(*E*)-*N*-(2-(2-(4-formylphenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3ao**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ao** was obtained as a white solid (91 mg, 95%), Rf=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 9.90 (s, 1H), 7.62 (d, *J* = 8.1 Hz, 2H), 7.38 – 7.28 (m, 6H), 7.17 (dd, *J* = 8.0, 1.9 Hz, 4H), 7.10 (d, *J* = 8.0 Hz, 2H), 7.04 – 6.96 (m, 1H), 6.89 (dd, *J* = 17.3, 10.8 Hz, 1H), 6.80 (dd, *J* = 7.6, 1.7 Hz, 1H), 6.75 – 6.70 (m, 1H), 6.62 (s, 1H), 5.36 (dd, *J* = 10.7, 1.2 Hz, 1H), 4.97 (dd, *J* = 17.4, 1.2 Hz, 1H), 2.36 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 191.8, 145.9, 143.8, 141.8, 139.1, 137.81, 136.6, 136.1, 134.9, 134.8, 132.0, 131.7, 131.1, 130.2, 129.6, 129.3, 128.7, 128.6, 128.4, 127.3, 123.4, 121.1, 117.9, 21.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{26}NO_3S^+$ 480.1628; Found 480.1619.



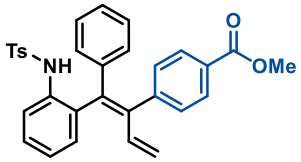
(*E*)-*N*-(2-(2-(4-cyanophenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3ap**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ap** was obtained as a white solid (86 mg, 90%), Rf=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.41 – 7.29 (m, 8H), 7.21 – 7.15 (m, 2H), 7.12 – 7.08 (m, 4H), 7.03 (ddd, *J* = 8.6, 6.9, 2.1 Hz, 1H), 6.87 (dd, *J* = 17.4, 10.8 Hz, 1H), 6.79 – 6.72 (m, 2H), 6.57 (s, 1H), 5.37 (dd, *J* = 10.8, 1.1 Hz, 1H), 4.94 (dd, *J* = 17.4, 1.1 Hz, 1H), 2.36 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 144.4, 143.9, 141.3, 138.9, 138.2, 136.4, 136.1, 134.9, 131.9, 131.7, 131.5, 131.2, 130.2, 129.6, 128.84, 128.79, 128.6, 127.3, 123.5, 121.2, 118.8, 117.9, 110.9, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{25}N_2O_2S^+$ 477.1631; Found 477.1621.



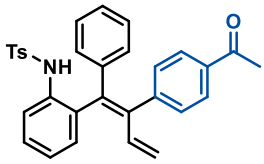
Methyl(*E*)-4-(1-(2-((4-methylphenyl)sulfonamido)phenyl)-1-phenylbuta-1,3-dien-2-yl)benzoate (**3aq**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3aq** was obtained as a white solid (93 mg, 92%), Rf=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.79 (d, *J* = 8.0 Hz, 2H), 7.49 – 7.28 (m, 7H), 7.16 – 7.10 (m, 4H), 7.03 (d, *J* = 8.0 Hz, 2H), 6.85 (dd, *J* = 17.3, 10.8 Hz, 1H), 6.75 – 6.66 (m, 2H), 6.64 (s, 1H), 5.36 (d, *J* = 10.8 Hz, 1H), 4.97 (d, *J* = 17.3 Hz, 1H), 3.89 (s, 3H), 2.38 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 166.8, 144.2, 143.8, 142.6, 138.8, 136.5, 136.3, 135.8, 135.7, 134.1, 132.9, 130.3, 130.2, 130.1, 129.7, 129.3, 129.0, 128.8, 128.5, 127.3, 123.5, 121.5, 117.8, 52.2, 26.9, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{31}H_{28}NO_4S^+$ 510.1734 Found 510.1725.



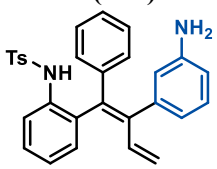
(*E*)-*N*-(2-(2-(4-acetylphenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3ar**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ar** was obtained as a white solid (92 mg, 93%), Rf=0.48 (PE/EA=10/1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 – 7.69 (m, 2H), 7.36 – 7.22 (m, 8H), 7.18 – 7.13 (m, 2H), 7.08 (d, *J* = 8.0 Hz, 2H), 7.01 – 6.87 (m, 2H), 6.84 (dd, *J* = 7.7, 1.6 Hz, 1H), 6.76 – 6.69 (m, 2H), 5.36 (dd, *J* = 10.8, 1.3 Hz, 1H), 5.02 (dd, *J* = 17.3, 1.3 Hz, 1H), 2.47 (s, 3H), 2.34 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 198.1, 143.7, 142.0, 139.4, 139.4, 137.3, 136.8, 136.7, 136.1, 135.0, 134.7, 131.98, 131.96, 130.9, 130.2, 129.6, 128.7, 128.4, 128.3, 128.2, 127.2, 127.0, 123.4, 121.0, 117.6, 26.7, 21.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{31}H_{28}NO_3S^+$ 494.1784 Found 494.1775.



(*E*)-*N*-(2-(2-(3-aminophenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3as**)

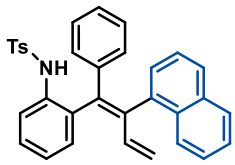
The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3as** was obtained as a white solid (81mg, 87%), Rf=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.34 (d, *J* = 8.4 Hz, 2H), 7.33 – 7.23 (m, 4H), 7.12 – 7.04 (m, 4H), 6.99 (ddd, *J* = 8.4, 7.3, 1.6 Hz, 1H), 6.93 (t, *J* = 7.7 Hz, 1H), 6.88 (dd, *J* = 7.7, 1.7 Hz, 1H), 6.86 –

6.76 (m, 2H), 6.73 (s, 1H), 6.52 – 6.42 (m, 3H), 5.31 (dd, *J* = 10.8, 1.6 Hz, 1H), 5.12 (dd, *J* = 17.2, 1.6 Hz, 1H), 3.09 (s, 2H), 2.34 (s, 3H).

^{13}C NMR (126 MHz, CDCl$_3$) δ 145.5, 143.6, 142.7, 140.1, 139.9, 136.9, 136.5, 136.4, 134.3, 132.9, 132.1, 130.4, 129.6, 128.9, 128.4, 128.1, 127.8, 127.3, 123.4, 121.3, 120.6, 118.3, 117.4, 114.5, 21.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{29}H_{27}N_2O_2S^+$ 467.1788 Found 467.1781.



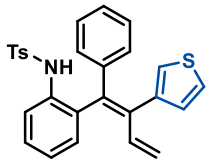
(*E*)-4-methyl-*N*-(2-(2-(naphthalen-1-yl)-1-phenylbuta-1,3-dien-1-yl)phenyl)benzenesulfonamide (**3at**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3at** was obtained as a white solid (87 mg, 87%), Rf=0.48 (PE/EA=10/1).

^{1}H NMR (500 MHz, CDCl$_3$) δ 7.87 – 7.71 (m, 2H), 7.64 (s, 1H), 7.47 – 7.29 (m, 8H), 7.25 – 7.17 (m, 3H), 7.11 – 7.01 (m, 4H), 6.89 – 6.73 (m, 3H), 6.45 (s, 1H), 5.23 (dd, *J* = 10.6, 1.5 Hz, 1H), 4.71 (dd, *J* = 17.2, 1.4 Hz, 1H), 2.34 (s, 3H).

^{13}C NMR (101 MHz, CDCl$_3$) δ 143.54, 143.50, 138.5, 134.5, 133.4, 132.3, 131.8, 130.7, 130.3, 129.5, 129.36, 129.0, 128.4, 128.1, 127.8, 127.6, 127.3, 127.2, 126.4, 125.5, 124.8, 122.8, 121.0, 117.2, 21.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{33}H_{28}NO_2S^+$ 502.1835; Found 502.1829.



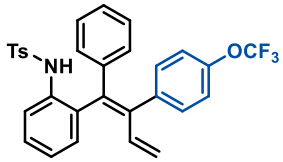
(*E*)-4-methyl-*N*-(2-(1-phenyl-2-(thiophen-3-yl)buta-1,3-dien-1-yl)phenyl)benzenesulfonamide (**3au**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3au** was obtained as a white solid (81 mg, 89%), Rf=0.52 (PE/EA=10/1).

^{1}H NMR (400 MHz, CDCl$_3$) δ 7.42 – 7.36 (m, 3H), 7.32 – 7.26 (m, 3H), 7.16 – 7.02 (m, 6H), 6.89 – 6.73 (m, 5H), 6.66 (s, 1H), 5.35 (dd, *J* = 10.8, 1.5 Hz, 1H), 5.26 (dd, *J* = 17.2, 1.5 Hz, 1H), 2.37 (s, 3H).

^{13}C NMR (126 MHz, CDCl$_3$) δ 143.7, 139.9, 138.7, 136.9, 136.9, 136.8, 136.5, 134.3, 133.3, 131.8, 130.3, 129.6, 129.5, 128.4, 128.2, 127.9, 127.3, 125.9, 124.7, 123.7, 120.1, 118.9, 21.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{27}H_{24}NO_2S_2^+$ 458.1243 Found 458.1238.



(*E*)-4-methyl-*N*-(2-(1-phenyl-2-(4-(trifluoromethoxy)phenyl)buta-1,3-dien-1-yl)phenyl)benzenesulfonamide (**3av**)

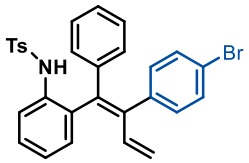
The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3av** was obtained as a white solid (99 mg, 92%), Rf=0.56 (PE/EA=10/1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 – 7.30 (m, 6H), 7.20 – 7.13 (m, 2H), 7.10 (d, *J* = 8.1 Hz, 2H), 7.05 – 6.98 (m, 3H), 6.97 – 6.84 (m, 3H), 6.84 – 6.71 (m, 2H), 6.65 (s, 1H), 5.35 (dd, *J* = 10.8, 1.4 Hz, 1H), 5.02 (dd, *J* = 17.3, 1.4 Hz, 1H), 2.35 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 148.2, 148.1, 143.8, 141.5, 139.4, 137.6, 137.4, 136.8, 136.2, 134.7, 132.0, 131.9, 131.9, 130.2, 129.6, 128.7, 128.4, 128.3, 127.3, 123.4, 120.8, 120.1, 117.9, 26.9, 21.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{25}FNO_3S^+$ 536.1502 Found 536.1496.

^{19}F NMR (377 MHz, $CDCl_3$) δ -58.00.

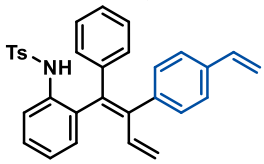


(*E*)-*N*-(2-(2-(4-bromophenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3aw**)

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.32 (ddt, *J* = 10.7, 8.7, 2.9 Hz, 6H), 7.24 (d, *J* = 8.4 Hz, 2H), 7.15 – 7.09 (m, 4H), 7.02 (ddd, *J* = 8.6, 7.3, 1.8 Hz, 1H), 6.89 – 6.80 (m, 4H), 6.77 (td, *J* = 7.5, 1.1 Hz, 1H), 6.64 (s, 1H), 5.33 (dd, *J* = 10.7, 1.4 Hz, 1H), 5.01 (dd, *J* = 17.3, 1.3 Hz, 1H), 2.36 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.7, 141.6, 139.5, 137.9, 137.1, 136.8, 136.2, 134.5, 132.1, 132.0, 131.9, 131.1, 130.2, 129.6, 128.6, 128.4, 128.2, 127.2, 123.4, 121.3, 120.8, 117.8, 21.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{29}H_{25}BrNO_2S^+$ 531.4801 Found 531.4806.



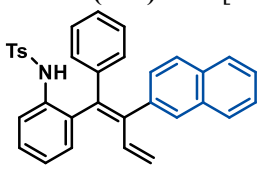
(*E*)-4-methyl-*N*-(2-(1-phenyl-2-(4-vinylphenyl)buta-1,3-dien-1-yl)phenyl)benzenesulfonamide (**3ax**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ax** was obtained as a white solid (91 mg, 95%), Rf=0.62(PE/EA=10/1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 – 7.65 (m, 2H), 7.63 – 7.57 (m, 2H), 7.45 – 7.40 (m, 2H), 7.36 – 7.26 (m, 5H), 7.22 (d, *J* = 8.1 Hz, 1H), 7.16 (td, *J* = 8.0, 1.7 Hz, 3H), 7.02 (d, *J* = 8.1 Hz, 2H), 6.96 – 6.87 (m, 3H), 6.79 (s, 1H), 6.70 (td, *J* = 7.5, 1.1 Hz, 1H), 5.36 (dd, *J* = 10.7, 1.5 Hz, 1H), 5.06 (dd, *J* = 17.3, 1.4 Hz, 1H), 2.33 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.6, 142.3, 140.0, 138.5, 137.1, 136.7, 136.5, 136.4, 136.3, 134.4, 132.5, 132.2, 130.7, 130.3, 129.6, 128.5, 128.2, 128.0, 127.3, 125.8, 123.4, 120.6, 118.1, 113.9, 21.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{31}H_{28}NO_2S^+$ 478.1835; Found 478.1837.



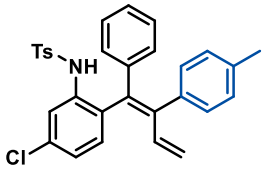
(*E*)-4-methyl-*N*-(2-(2-(naphthalen-2-yl)-1-phenylbuta-1,3-dien-1-yl)phenyl)benzenesulfonamide (**3az**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3az** was obtained as a white solid (92 mg, 91 %), Rf=0.62(PE/EA=10/1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 – 7.65 (m, 2H), 7.63 – 7.57 (m, 2H), 7.45 – 7.40 (m, 2H), 7.36 – 7.26 (m, 5H), 7.22 (d, *J* = 8.1 Hz, 1H), 7.16 (td, *J* = 8.0, 1.7 Hz, 3H), 7.02 (d, *J* = 8.1 Hz, 2H), 6.96 – 6.87 (m, 3H), 6.79 (s, 1H), 6.70 (td, *J* = 7.5, 1.1 Hz, 1H), 5.36 (dd, *J* = 10.7, 1.5 Hz, 1H), 5.06 (dd, *J* = 17.3, 1.4 Hz, 1H), 2.33 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.6, 142.5, 140.0, 137.2, 137.1, 136.5, 136.3, 134.4, 133.0, 132.4, 132.4, 132.2, 130.3, 129.7, 129.5, 128.52, 128.47, 128.2, 128.1, 128.0, 127.54, 127.45, 127.2, 126.0, 125.9, 123.4, 120.8, 117.9, 21.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{33}H_{28}NO_2S^+$ 502.1835 Found 502.1829.



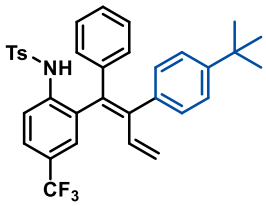
(*E*)-*N*-(5-chloro-2-(1-phenyl-2-(p-tolyl)buta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3bb**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1),**3bb** was obtained as a white solid (92mg, 92%), Rf=0.57 (PE/EA=10/1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 (d, *J* = 1.9 Hz, 1H), 7.35 – 7.25 (m, 5H), 7.12 (d, *J* = 8.1 Hz, 2H), 7.04 (dt, *J* = 6.7, 1.6 Hz, 2H), 6.96 (d, *J* = 7.9 Hz, 2H), 6.91 – 6.74 (m, 5H), 6.72 (d, *J* = 1.5 Hz, 1H), 5.32 (dd, *J* = 10.7, 1.5 Hz, 1H), 5.06 (dd, *J* = 17.3, 1.6 Hz, 1H), 2.37 (s, 3H), 2.27 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.9, 143.2, 139.7, 137.2, 137.1, 135.9, 135.5, 135.4, 135.2, 133.6, 133.8, 131.6, 130.3, 130.2, 129.7, 128.9, 128.6, 128.0, 127.3, 123.6, 120.9, 118.6, 26.9, 21.6, 21.3.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{27}ClNO_2S^+$ 500.1446 Found 500.1439.



(*E*)-*N*-(2-(2-(4-(tert-butyl)phenyl)-1-phenylbuta-1,3-dien-1-yl)-4-(trifluoromethyl)phenyl)-4-methylbenzenesulfonamide (**3ce**)

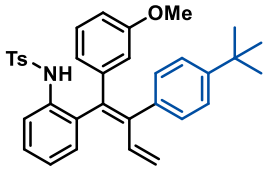
The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ce** was obtained as a white solid (107mg, 93%), Rf=0.54 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.65 – 7.59 (m, 1H), 7.37 – 7.28 (m, 5H), 7.14 – 7.05 (m, 6H), 6.96 (dd, *J* = 7.8, 1.6 Hz, 1H), 6.92 – 6.81 (m, 4H), 6.79 (s, 1H), 5.37 (dd, *J* = 10.7, 1.5 Hz, 1H), 5.12 (dd, *J* = 17.3, 1.5 Hz, 1H), 2.35 (s, 3H), 1.23 (s, 9H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 150.7, 144.1, 143.9, 139.2, 136.7, 135.7, 135.2, 135.1, 134.9, 132.7, 130.7, 130.3, 130.1, 129.9, 129.7, 128.7, 128.2, 127.4, 127.3, 124.9, 121.7, 119.7, 114.8, 34.5, 31.2, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{34}H_{33}F_3NO_2S^+$ 576.2179 Found 576.2175.

^{19}F NMR (377 MHz, $CDCl_3$) δ -62.89.



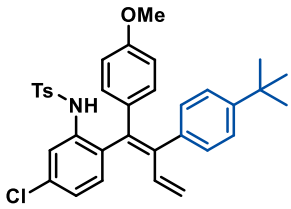
(*E*)-*N*-(2-(2-(4-(tert-butyl)phenyl)-1-(3-methoxyphenyl)buta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3de**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3de** was obtained as a white solid (93mg, 87%), Rf=0.51 (PE/EA=10/1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.33 (dd, *J* = 8.5, 2.0 Hz, 3H), 7.22 (d, *J* = 7.9 Hz, 1H), 7.13 – 7.05 (m, 4H), 6.98 (td, *J* = 8.3, 7.8, 1.7 Hz, 1H), 6.91 – 6.68 (m, 8H), 6.58 (t, *J* = 2.1 Hz, 1H), 5.30 (dd, *J* = 10.7, 1.7 Hz, 1H), 5.06 (dd, *J* = 17.3, 1.6 Hz, 1H), 3.70 (s, 3H), 2.34 (s, 3H), 1.23 (s, 9H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 159.6, 150.1, 143.5, 142.9, 141.5, 137.3, 136.3, 136.2, 135.7, 134.6, 132.7, 132.2, 130.1, 129.5, 129.4, 127.9, 127.3, 124.7, 123.8, 122.9, 120.5, 118.1, 115.4, 113.8, 55.2, 34.4, 31.2, 21.5.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{34}H_{36}NO_3S^+$538.2410 Found 538.2416.



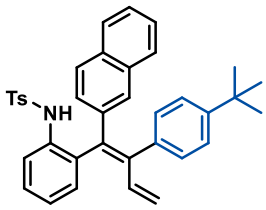
(*E*)-*N*-(2-(2-(4-(tert-butyl)phenyl)-1-(4-methoxyphenyl)buta-1,3-dien-1-yl)-5-chlorophenyl)-4-methylbenzenesulfonamide (**3ee**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ee** was obtained as a white solid (103 mg, 90 %), Rf=0.62(PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.42 (t, *J* = 1.2 Hz, 1H), 7.37 (d, *J* = 8.3 Hz, 2H), 7.12 (t, *J* = 7.8 Hz, 4H), 6.94 (d, *J* = 8.7 Hz, 2H), 6.88 – 6.82 (m, 3H), 6.78 (d, *J* = 8.7 Hz, 2H), 6.75 – 6.67 (m, 3H), 5.30 (dd, *J* = 10.8, 1.6 Hz, 1H), 5.05 (dd, *J* = 17.3, 1.6 Hz, 1H), 3.86 (s, 3H), 2.37 (s, 3H), 1.25 (s, 9H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 159.4, 150.3, 143.9, 142.4, 137.3, 136.0, 135.7, 135.6, 134.8, 133.4, 133.2, 131.9, 131.6, 131.5, 130.0, 129.6, 127.3 124.9, 123.4, 120.5, 118.3, 113.9, 55.3, 34.5, 31.3, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{34}H_{35}ClNO_3S^+$ 572.2021 Found 572.2017.



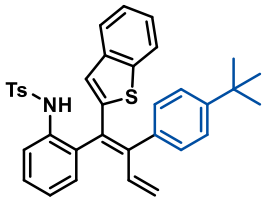
(*E*)-*N*-(2-(2-(4-(tert-butyl)phenyl)-1-(naphthalen-2-yl)buta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3fe**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3fe** was obtained as a white solid (100 mg, 90 %, E/Z = 3:1), Rf=0.43 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.88 (dd, *J* = 8.0, 1.4 Hz, 1H), 7.72 (dd, *J* = 8.4, 2.9 Hz, 2H), 7.54 (ddd, *J* = 6.3, 3.9, 1.5 Hz, 2H), 7.46 (dd, *J* = 8.2, 1.2 Hz, 1H), 7.27 – 7.24 (m, 1H), 7.20 – 7.17 (m, 3H), 7.13 (d, *J* = 8.3 Hz, 2H), 7.04 – 7.00 (m, 2H), 6.95 – 6.88 (m, 2H), 6.82 – 6.79 (m, 2H), 6.78 (d, *J* = 8.0 Hz, 1H), 6.71 – 6.65 (m, 2H), 5.36 (dd, *J* = 10.7, 1.6 Hz, 1H), 5.15 (dd, *J* = 17.2, 1.5 Hz, 1H), 2.20 (s, 3H), 1.28 (s, 9H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 150.2, 143.31, 143.29, 137.6, 137.2, 136.3, 135.9, 135.8, 134.7, 133.2, 132.9, 132.8, 132.3, 130.9, 130.0, 129.5, 129.4, 129.2, 128.3, 128.1, 127.9, 127.9, 127.6, 127.0, 126.9, 126.6, 126.4, 125.1, 124.8, 123.4, 120.8, 118.3, 34.5, 31.3, 21.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{37}H_{36}NO_2S^+$ 558.2461 Found 558.2465.



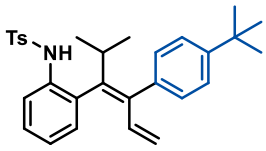
(*E*)-*N*-(2-(1-(benzo[b]thiophen-2-yl)-2-(4-(tert-butyl)phenyl)buta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3ge**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ge** was obtained as a white solid (103 mg,91 %, E,Z = 6:1), Rf=0.49 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.85 (dd, *J* = 8.2, 1.4 Hz, 1H), 7.69 (dd, *J* = 8.3, 3.2 Hz, 2H), 7.51 (td, *J* = 3.7, 3.1, 1.4 Hz, 2H), 7.18 – 7.14 (m, 3H), 7.10 (d, *J* = 8.3 Hz, 2H), 7.01 – 6.98 (m, 2H), 6.93 – 6.85 (m, 2H), 6.79 – 6.73 (m, 2H), 6.66 (d, *J* = 8.0 Hz, 2H), 5.33 (dd, *J* = 10.7, 1.6 Hz, 1H), 5.12 (dd, *J* = 17.2, 1.6 Hz, 1H), 2.17 (s, 3H), 1.25 (s, 9H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 150.2, 143.31, 143.29, 137.6, 137.2, 136.3, 135.9, 135.8, 134.7, 133.1, 132.9, 132.8, 132.3, 130.0, 129.5, 129.4, 129.1, 128.3, 128.1, 127.92, 127.87, 127.6, 126.9, 126.5, 126.4, 124.8, 123.4, 120.9, 118.3, 34.5, 21.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{35}H_{34}NO_2S_2^+$ 564.2104 Found 564.2114.



(*E*)-*N*-(2-(4-(4-(tert-butyl)phenyl)-2-methylhexa-3,5-dien-3-yl)phenyl)-4-methylbenzenesulfonamide (**3he**)

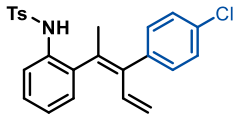
The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3he** was obtained as a white solid (85 mg, 90 %), Rf=0.67 (PE/EA=10/1).

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82 (d, *J* = 8.3 Hz, 2H), 7.58 (d, *J* = 8.3 Hz, 1H), 7.44 (d, *J* = 8.3 Hz, 2H), 7.25 – 7.20 (m, 3H), 7.12 (d, *J* = 8.2 Hz, 2H), 7.04 (dd, *J* = 4.1, 0.8 Hz, 2H), 6.83 (s, 1H), 5.86 (dd, *J* = 17.1, 10.6 Hz, 1H), 4.81 (dd, *J* = 10.6, 1.7 Hz, 1H), 4.59 (dd, *J* = 17.1, 1.7 Hz, 1H),

2.75 (p, *J* = 6.9 Hz, 1H), 2.37 (s, 3H), 1.38 (s, 9H), 0.92 (d, *J* = 6.9 Hz, 3H), 0.70 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 150.0, 143.9, 141.7, 140.9, 136.7, 136.8, 135.4, 134.9, 130.4, 129.6, 129.0, 128.2, 127.7, 126.9, 125.3, 122.7, 119.2, 115.9, 34.6, 32.4, 31.5, 22.1, 21.6, 20.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{36}NO_2S^+$ 474.2461 Found 474.2465.



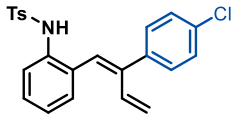
(*E*)-*N*-(2-(3-(4-chlorophenyl)penta-2,4-dien-2-yl)phenyl)-4-methylbenzenesulfonamide (**3im**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3im** was obtained as a white solid (75 mg, 88 %), Rf=0.45 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.58 (d, *J* = 8.3 Hz, 2H), 7.26 – 7.21 (m, 3H), 7.06 – 7.01 (m, 3H), 7.00 – 6.90 (m, 3H), 6.87 – 6.83 (m, 2H), 6.41 (s, 1H), 5.31 (dd, *J* = 10.8, 1.4 Hz, 1H), 4.86 (dd, *J* = 17.2, 1.4 Hz, 1H), 2.39 (s, 3H), 1.83 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$)δ 144.0, 139.4, 136.5, 134.5, 134.4, 132.6, 132.3, 131.4, 129.7, 129.6, 128.1, 127.9, 127.2, 124.1, 119.5, 119.5, 21.6, 20.4.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{24}H_{23}ClNO_2S^+$424.1210; Found 424.1201.



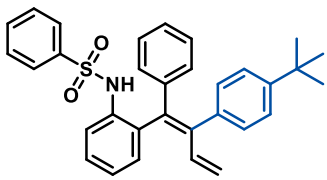
(*E*)-*N*-(2-(2-(4-chlorophenyl)buta-1,3-dien-1-yl)phenyl)-4-methylbenzenesulfonamide (**3jm**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3jm** was obtained as a white solid (74 mg, 90 %), Rf=0.47 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.4 Hz, 2H), 7.33 (dd, *J* = 8.1, 1.2 Hz, 1H), 7.25 (d, *J* = 8.2 Hz, 2H), 7.19 (d, *J* = 8.4 Hz, 2H), 7.08 (td, *J* = 7.7, 1.5 Hz, 1H), 6.87 – 6.81 (m, 3H), 6.62 (dd, *J* = 7.8, 1.5 Hz, 1H), 6.57 – 6.48 (m, 2H), 6.21 (s, 1H), 5.24 (d, *J* = 10.7 Hz, 1H), 4.97 (d, *J* = 17.3 Hz, 1H), 2.40 (s, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 144.0, 143.8, 139.7, 136.7, 134.8, 134.0, 133.5, 131.1, 130.3, 130.1, 129.7, 128.7, 128.2, 127.3, 125.9, 125.3, 123.4, 118.1, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{23}H_{21}ClNO_2S^+$410.1054; Found 410.1056.



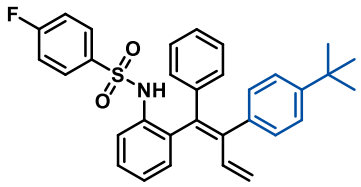
(*E*)-*N*-(2-(2-(4-(Tert-butyl)phenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)benzenesulfonamide (**3ke**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1),**3ke** was obtained as a white solid (88mg, 89%),Rf=0.54 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.49 – 7.43 (m, 3H), 7.34 – 7.27 (m, 6H), 7.15 – 7.09 (m, 2H), 7.09 – 7.03 (m, 2H), 6.99 (ddd, *J* = 8.5, 7.3, 1.7 Hz, 1H), 6.96 – 6.91 (m, 2H), 6.89 – 6.80 (m, 2H), 6.78 – 6.69 (m, 2H), 5.31 (dd, *J* = 10.7, 1.6 Hz, 1H), 5.08 (dd, *J* = 17.3, 1.6 Hz, 1H), 1.24 (s, 9H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 150.2, 140.2, 137.2, 135.7, 132.7, 132.3, 130.3, 130.1, 128.9, 128.5, 127.9, 127.8, 127.2, 124.8, 123.4, 120.5, 118.2, 31.2.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{32}H_{32}NO_2S^+$ 494.2075; Found 494.2076.



(*E*)-*N*-(2-(2-(4-(tert-butyl)phenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-4-fluorobenzenesulfonamide (**3le**)

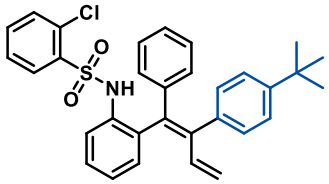
The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3le** was obtained as a white solid (89 mg, 87%), Rf=0.52 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.43 – 7.39 (m, 2H), 7.34 – 7.28 (m, 4H), 7.15 – 7.11 (m, 2H), 7.09 – 7.05 (m, 2H), 7.03 – 6.98 (m, 1H), 6.97 – 6.91 (m, 4H), 6.88 – 6.80 (m, 2H), 6.78 (dd, *J* = 7.5, 1.2 Hz, 1H), 6.71 (s, 1H), 5.32 (dd, *J* = 10.8, 1.6 Hz, 1H), 5.08 (dd, *J* = 17.3, 1.6 Hz, 1H), 1.24 (s, 9H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 166.1, 164.0, 150.3, 142.8, 140.1, 137.1, 136.1, 135.6, 134.1, 133.1, 132.4, 130.3, 130.0, 129,97, 129.92, 128.3 128.0, 127.9, 124.8, 123.7, 120.8, 118.2, 116.2, 116.0, 34.5, 31.2, 29.7.

^{19}F NMR (377 MHz, $CDCl_3$) δ -105.04 (dd, *J* = 8.9, 4.1 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{32}H_{31}FNO_2S^+$ 512.2054 Found 512.2045.



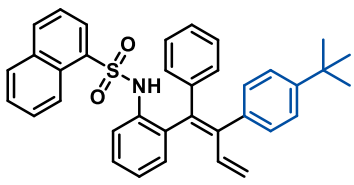
(*E*)-*N*-(2-(2-(4-(tert-butyl)phenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)-2-chlorobenzenesulfonamide (**3me**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3me** was obtained as a white solid (94 mg, 90 %), Rf=0.56 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.03 (dd, *J* = 7.8, 1.6 Hz, 1H), 7.49 – 7.43 (m, 1H), 7.40 – 7.35 (m, 2H), 7.25 (dd, *J* = 4.9, 1.8 Hz, 3H), 7.16 (d, *J* = 8.3 Hz, 2H), 7.07 – 7.01 (m, 5H), 6.96 (ddd, *J* = 8.4, 7.1, 1.8 Hz, 1H), 6.92 (d, *J* = 1.7 Hz, 1H), 6.90 – 6.80 (m, 3H), 5.31 (dd, *J* = 10.8, 1.6 Hz, 1H), 5.12 (dd, *J* = 17.2, 1.6 Hz, 1H), 1.25 (s, 9H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 150.4, 141.6, 140.7, 138.1, 137.7, 136.7, 135.7, 135.0, 133.8, 133.4, 132.7, 132.2, 131.9, 131.2, 130.7, 130.5, 128.2, 127.8, 127.7, 127.1, 124.9, 124.9, 124.4, 120.5, 119.9, 34.5, 31.4, 31.3, 26.9.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{32}H_{31}ClNO_2S^+$ 529.1759 Found 529.1750.



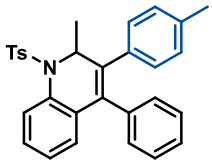
(*E*)-*N*-(2-(2-(4-(tert-butyl)phenyl)-1-phenylbuta-1,3-dien-1-yl)phenyl)naphthalene-1-sulfonamide (**3ne**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **3ne** was obtained as a white solid (98 mg, 90 %), Rf=0.45 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.24 (d, *J* = 1.9 Hz, 1H), 7.85 (ddd, *J* = 23.6, 8.1, 1.3 Hz, 2H), 7.72 (d, *J* = 8.7 Hz, 1H), 7.60 (dddd, *J* = 20.6, 8.1, 6.9, 1.4 Hz, 2H), 7.44 (dd, *J* = 8.3, 1.1 Hz, 1H), 7.35 (dd, *J* = 8.7, 1.9 Hz, 1H), 7.22 – 7.16 (m, 1H), 7.13 – 7.07 (m, 2H), 7.03 – 6.96 (m, 5H), 6.87 – 6.81 (m, 3H), 6.81 – 6.70 (m, 3H), 5.31 (dd, *J* = 10.7, 1.6 Hz, 1H), 5.07 (dd, *J* = 17.2, 1.6 Hz, 1H), 1.20 (s, 9H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 150.1, 142.6, 140.1, 137.3, 136.5, 136.4, 135.7, 134.9, 134.2, 133.4, 132.4, 132.0, 130.3, 130.1, 129.4, 129.3, 128.9, 128.9, 128.3, 128.0, 127.9, 127.8, 127.4, 124.7, 123.7, 122.3, 120.5, 118.9, 34.4, 31.2, 26.9.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{36}H_{34}NO_2S^+$ 544.2305; Found 544.2295.



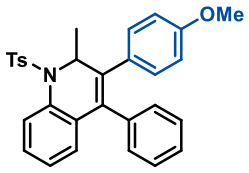
2-Methyl-4-phenyl-3-(*p*-tolyl)-1-tosyl-1,2-dihydroquinoline (**4ab**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4ab** was obtained as a white solid (68 mg, 75 %), Rf=0.45 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.87 (dd, *J* = 8.1, 1.3 Hz, 1H), 7.32 (td, *J* = 7.7, 1.5 Hz, 1H), 7.25 (s, 1H), 7.16 – 7.09 (m, 5H), 7.07 (d, *J* = 8.1 Hz, 2H), 6.89 (d, *J* = 7.9 Hz, 2H), 6.76 (dd, *J* = 7.9, 1.5 Hz, 1H), 6.71 – 6.66 (m, 2H), 6.45 (s, 2H), 5.24 (q, *J* = 6.8 Hz, 1H), 2.36 (s, 3H), 2.24 (s, 3H), 1.38 (d, *J* = 6.9 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.3, 137.6, 136.8, 136.1, 135.4, 132.1, 131.8, 131.7, 130.6, 129.1, 128.6, 128.5, 128.0, 127.9, 127.8, 127.4, 126.9, 126.4, 126.4, 55.4, 29.7, 21.42, 2.12, 19.7.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{28}NO_2S^+$ 466.6110; Found 466.6115.



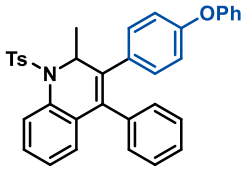
3-(4-methoxyphenyl)-2-methyl-4-phenyl-1-tosyl-1,2-dihydroquinoline (**4af**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4af** was obtained as a white solid (82 mg, 86%), Rf=0.47 (PE/EA=10/1).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.86 (dd, *J* = 8.0, 1.3 Hz, 1H), 7.32 (td, *J* = 7.7, 1.5 Hz, 1H), 7.26 – 7.23 (m, 2H), 7.17 – 7.09 (m, 4H), 7.06 (d, *J* = 8.0 Hz, 2H), 6.77 – 6.70 (m, 3H), 6.65 – 6.57 (m, 2H), 6.45 (s, 2H), 5.23 (q, *J* = 6.8 Hz, 1H), 3.74 (s, 3H), 2.36 (s, 3H), 1.38 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 158.4, 143.3, 137.8, 136.3, 136.1, 131.9, 131.8, 131.4, 130.7, 130.6, 129.9, 129.1, 128.0, 127.7, 127.4, 126.9, 126.4, 113.1, 77.3, 77.0, 76.7, 55.4, 55.1, 21.4, 19.7.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{28}NO_3S^+$ 482.1712; Found 482.1716.



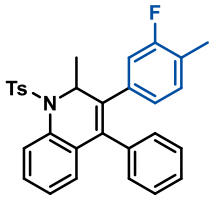
2-methyl-3-(4-phenoxyphenyl)-4-phenyl-1-tosyl-1,2-dihydroquinoline (**4ah**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1),4ah was obtained as a white solid (97 mg, 89%), Rf=0.48 (PE/EA=10/1)

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.88 (dd, *J* = 8.0, 1.3 Hz, 1H), 7.34 (tt, *J* = 7.8, 2.3 Hz, 3H), 7.29 – 7.24 (m, 2H), 7.17 – 7.05 (m, 7H), 7.01 – 6.94 (m, 2H), 6.80 – 6.69 (m, 5H), 6.47 (s, 2H), 5.24 (q, *J* = 6.8 Hz, 1H), 2.35 (s, 3H), 1.41 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 156.6, 156.3, 143.4, 137.5, 136.1, 136.0, 133.2, 132.1, 132.1, 131.6, 130.6, 130.1, 129.8, 129.1, 128.0, 127.9, 127.4, 127.1, 126.5, 126.4, 123.6, 119.3, 117.6, 55.3, 26.9, 21.4, 19.7.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{35}H_{30}NO_3S^+$ 544.1941; Found 544.1937.



3-(3-fluoro-4-methylphenyl)-2-methyl-4-phenyl-1-tosyl-1,2-dihydroquinoline (**4ak**)

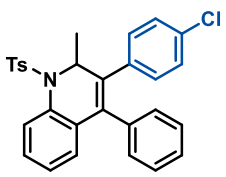
The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4ak** was obtained as a white solid (82 mg, 85%), Rf=0.48 (PE/EA=10/1)

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.87 (d, *J* = 8.0 Hz, 1H), 7.34 (td, *J* = 7.7, 1.5 Hz, 1H), 7.28 – 7.23 (m, 2H), 7.21 – 7.06 (m, 6H), 6.91 (t, *J* = 8.0 Hz, 1H), 6.77 (dd, *J* = 7.9, 1.5 Hz, 1H), 6.61 – 6.38 (m, 3H), 6.28 (dd, *J* = 11.4, 1.8 Hz, 1H), 5.17 (q, *J* = 6.8 Hz, 1H), 2.37 (s, 3H), 2.16 (d, *J* = 1.8 Hz, 3H), 1.39 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 161.7, 159.3, 143.5, 137.87(d, *J* = 31.16 Hz), 137.2, 136.1, 135.43(d, *J* = 27.84 Hz), 132.7, 132.2, 131.4, 130.71(d, *J* = 22.28 Hz), 130.4, 129.2, 128.2, 128.09, 128.06, 127.3, 127.2, 126.7, 126.5, 123.93,(d, *J* = 12.72 Hz), 123.7, 123.6, 115.5, 115.24 55.3, 21.4, 19.7, 14.3, 14.25(d, *J* = 21.84 Hz)

^{19}F NMR (377 MHz, $CDCl_3$) δ -117.68 (dd, *J* = 11.2, 8.3 Hz).

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{27}FNO_2S^+$ 484.1741; Found 484.1738.



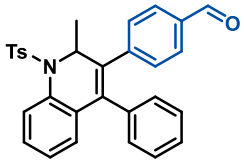
3-(4-chlorophenyl)-2-methyl-4-phenyl-1-tosyl-1,2-dihydroquinoline (**4am**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4am** was obtained as a white solid (86 mg, 87%), Rf=0.48 (PE/EA=10/1)

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.88 (dd, *J* = 8.0, 1.3 Hz, 1H), 7.35 (td, *J* = 7.7, 1.5 Hz, 1H), 7.28 – 7.23 (m, 2H), 7.18 – 7.03 (m, 8H), 6.79 (dd, *J* = 7.8, 1.5 Hz, 1H), 6.73 – 6.68 (m, 2H), 6.46 (s, 2H), 5.19 (q, *J* = 6.8 Hz, 1H), 2.37 (s, 3H), 1.39 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.5, 137.2, 136.9, 136.1, 135.5, 132.9, 132.8, 132.2, 131.2, 130.4, 130.0, 129.9, 128.3, 128.14, 128.06, 128.0,127.26, 127.30, 126.7, 126.5, 55.1, 26.9, 21.4, 19.7.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{29}H_{24}ClNO_2S^+$ 487.1323; Found 487.1313.



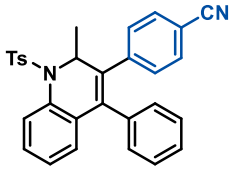
4-(2-methyl-4-phenyl-1-tosyl-1,2-dihydroquinolin-3-yl)benzaldehyde (**4ao**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4ao** was obtained as a white solid (84 mg, 88%), Rf=0.48 (PE/EA=10/1)

^{1}H NMR (400 MHz, $CDCl_3$) δ 9.89 (s, 1H), 7.90 (dd, *J* = 8.0, 1.3 Hz, 1H), 7.63 – 7.57 (m, 2H), 7.38 (d, *J* = 1.5 Hz, 1H), 7.27 – 7.23 (m, 2H), 7.19 – 7.07 (m, 6H), 6.94 – 6.88 (m, 2H), 6.82 (dd, *J* = 7.9, 1.5 Hz, 1H), 6.47 (s, 2H), 5.24 (q, *J* = 6.8 Hz, 1H), 2.37 (s, 3H), 1.42 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 191.6, 144.8, 143.6, 136.8, 136.1, 135.4, 134.6, 134.4, 132.4, 131.0, 130.4, 129.3, 129.2, 129.1, 128.7, 128.2, 128.1, 127.5, 127.3, 127.0, 126.6, 55.0, 21.4, 19.8.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{26}NO_3S^+$ 480.1628; Found 480.1621.



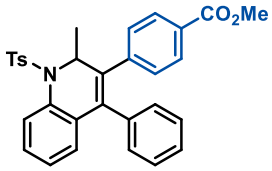
4-(2-methyl-4-phenyl-1-tosyl-1,2-dihydroquinolin-3-yl)benzonitrile (**4ap**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4ap** was obtained as a white solid (78mg, 82%), Rf=0.48 (PE/EA=10/1)

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.89 (dd, *J* = 8.1, 1.3 Hz, 1H), 7.43 – 7.35 (m, 3H), 7.25 – 7.06 (m, 8H), 6.88 – 6.77 (m, 3H), 6.45 (s, 2H), 5.19 (q, *J* = 6.8 Hz, 1H), 2.37 (s, 3H), 1.42 (d, *J* = 3.5 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 143.7, 143.3, 136.5, 136.1, 134.7, 134.7, 132.4, 131.6, 130.8, 130.3, 129.3, 129.3, 128.9, 128.3, 128.1, 127.7, 127.3, 127.0, 126.7, 118.6, 110.6, 77.4, 77.1, 76.7, 54.8, 26.9, 21.5, 19.8.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{30}H_{25}N_2O_2S^+$ 477.1631; Found 477.1626.



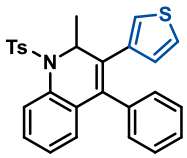
methyl 4-(2-methyl-4-phenyl-1-tosyl-1,2-dihydroquinolin-3-yl)benzoate (**4aq**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4aq** was obtained as a white solid (84 mg, 83 %), Rf=0.62 (PE/EA=10/1)

^{1}H NMR (500 MHz, CDCl$_3$CDCl$_3$CDCl$_3$) δ 7.90 (dd, *J* = 8.1, 1.2 Hz, 1H), 7.76 (d, *J* = 8.3 Hz, 2H), 7.40 – 7.35 (m, 1H), 7.24 (s, 1H), 7.16 – 7.08 (m, 5H), 6.82 (dd, *J* = 8.4, 2.3 Hz, 3H), 6.47 (s, 2H), 5.23 (q, *J* = 6.8 Hz, 1H), 3.87 (s, 3H), 1.43 (d, *J* = 3.5 Hz, 3H).

^{13}C NMR (101 MHz, CDCl$_3$) δ 166.7, 143.6, 143.2, 136.9, 136.1, 135.6, 133.8, 132.4, 131.2, 130.4, 129.2, 129.0, 128.7, 128.5, 128.4, 128.1, 127.4, 127.3, 126.8, 126.5, 55.0, 52.1, 21.4, 19.76.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{31}H_{26}NO_4S^+$ 509.1661; Found 509.1668.



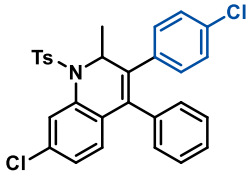
2-methyl-4-phenyl-3-(thiophen-3-yl)-1-tosyl-1,2-dihydroquinoline (**4at**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1),**4at** was obtained as a white solid (82mg, 90%), Rf=0.48 (PE/EA=10/1)

^{1}H NMR (500 MHz, CDCl$_3$) δ 7.84 (dd, *J* = 8.1, 1.3 Hz, 1H), 7.31 (td, *J* = 7.7, 1.5 Hz, 1H), 7.28 – 7.16 (m, 5H), 7.09 (td, *J* = 7.6, 1.3 Hz, 1H), 7.03 – 6.98 (m, 3H), 6.80 (dd, *J* = 3.0, 1.4 Hz, 1H), 6.65 (dd, *J* = 7.8, 1.5 Hz, 1H), 6.63 – 6.29 (m, 2H), 6.25 (dd, *J* = 5.2, 1.4 Hz, 1H), 5.36 (q, *J* = 6.9 Hz, 1H), 2.35 (s, 3H), 1.41 (d, *J* = 6.9 Hz, 3H).

^{13}C NMR (126 MHz, CDCl$_3$) δ 143.5, 138.9, 138.1, 135.8, 131.8, 131.7, 131.3, 130.9, 130.2, 128.9, 128.5, 128.2, 127.8, 127.51, 127.45, 127.4, 126.6, 126.5, 124.3, 123.7, 54.9, 21.4, 19.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{27}H_{24}NO_2S_2^+$ 458.1243; Found 458.1234.



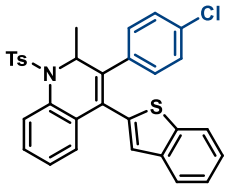
7-chloro-3-(4-chlorophenyl)-2-methyl-4-phenyl-1-tosyl-1,2-dihydroquinoline (**4bm**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4bm** was obtained as a white solid (90 mg, 87 %), Rf=0.48 (PE/EA=10/1)

^{1}H NMR (500 MHz, CDCl$_3$) δ 7.90 (d, *J* = 2.2 Hz, 1H), 7.29 (d, *J* = 8.4 Hz, 2H), 7.19 – 7.05 (m, 8H), 6.72 (d, *J* = 8.4 Hz, 1H), 6.67 (d, *J* = 8.6 Hz, 2H), 6.45 (s, 2H), 5.18 (q, *J* = 6.8 Hz, 1H), 2.38 (s, 3H), 1.39 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (126 MHz, CDCl$_3$) δ 143.8, 136.7, 136.5, 135.9, 135.6, 133.6, 133.4, 133.1, 132.3, 130.3, 129.90, 129.86, 129.3, 128.3, 128.1, 127.8, 127.7, 127.5, 127.3, 126.7, 55.2, 21.5, 19.8.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{29}H_{24}Cl_2NO_2S^+$521.0933; Found 521.0938.



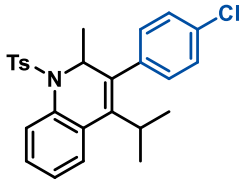
4-(benzo[b]thiophen-2-yl)-3-(4-chlorophenyl)-2-methyl-1-tosyl-1,2-dihydroquinoline (**4gm**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4gm** was obtained as a white solid (85 mg, 90 %), Rf=0.62 (PE/EA=10/1)

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.89 (dd, *J* = 8.1, 1.3 Hz, 1H), 7.73 – 7.66 (m, 1H), 7.62 – 7.57 (m, 1H), 7.39 (td, *J* = 7.6, 1.5 Hz, 1H), 7.33 – 7.26 (m, 3H), 7.25 (s, 1H), 7.18 (td, *J* = 7.6, 1.3 Hz, 1H), 7.15 – 7.08 (m, 5H), 6.91 – 6.86 (m, 2H), 6.56 (s, 1H), 5.20 (q, *J* = 6.8 Hz, 1H), 2.41 (s, 3H), 1.39 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.7, 140.5, 139.4, 139.3, 138.4, 136.4, 135.9, 133.6, 132.1, 130.6, 129.5, 129.5, 128.7, 128.3, 128.1, 127.1, 126.8, 126.6, 125.9, 125.9, 124.4, 124.3, 123.5, 122.1, 55.4, 26.9, 21.6, 19.3.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{31}H_{25}ClNO_2S_2^+$543.1010; Found 543.1016.



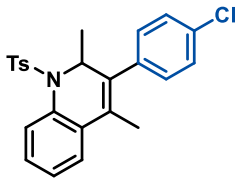
3-(4-chlorophenyl)-4-isopropyl-2-methyl-1-tosyl-1,2-dihydroquinoline (**4hm**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4hm** was obtained as a white solid (85 mg, 90 %), Rf=0.62 (PE/EA=10/1)

^{1}H NMR (500 MHz, $CDCl_3$)δ 7.80 (dd, J = 8.1, 1.1 Hz, 1H), 7.35 – 7.30 (m, 3H), 7.27 (d, J = 2.2 Hz, 1H), 7.26 – 7.20 (m, 2H), 7.11 (d, J = 8.2 Hz, 2H), 7.05 (dd, J = 7.6, 1.5 Hz, 1H), 6.88 (d, J = 8.1 Hz, 2H), 6.28 (s, 1H), 5.41 (q, J = 6.9 Hz, 1H), 2.24 (s, 3H), 1.20 (d, J = 6.9 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.6, 138.4, 138.3, 136.7, 135.1, 133.5, 133.4, 130.2, 129.7, 129.3, 128.7, 128.6, 127.7, 127.3, 126.2, 125.7, 77.4, 77.2, 76.9, 56.1, 29.3, 23.2, 21.5, 20.6, 17.9.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{26}H_{27}ClNO_2S^+$453.1523; Found 453.1520.



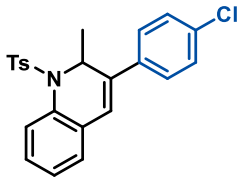
3-(4-chlorophenyl)-2,4-dimethyl-1-tosyl-1,2-dihydroquinoline (**4im**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4im** was obtained as a white solid (74 mg, 87 %), Rf=0.59 (PE/EA=10/1)

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.77 (dd, *J* = 7.8, 1.4 Hz, 1H), 7.38 – 7.32 (m, 3H), 7.29 (td, *J* = 7.5, 1.4 Hz, 1H), 7.25 – 7.20 (m, 3H), 7.09 – 7.04 (m, 2H), 7.00 (d, *J* = 8.0 Hz, 2H), 5.06 (q, *J* = 6.8 Hz, 1H), 2.26 (s, 3H), 1.56 (s, 3H), 1.02 (d, *J* = 6.9 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 143.5, 138.6, 135.5, 135.5, 134.1, 132.0, 129.4, 129.0, 128.9, 128.3, 1, 126.98, 126.96, 126.9, 126.6, 119.7, 77.4, 77.2, 76.9, 52.5, 21.6.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{24}H_{23}ClNO_2S^+$424.1210; Found 424.1201.



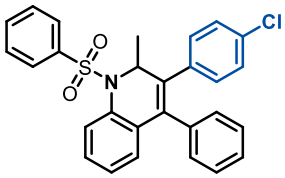
3-(4-chlorophenyl)-2-methyl-1-tosyl-1,2-dihydroquinoline (**4jm**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4jm** was obtained as a white solid (68 mg, 83 %), Rf=0.69 (PE/EA=10/1)

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80 (dd, *J* = 8.1, 1.1 Hz, 1H), 7.35 – 7.30 (m, 3H), 7.27 (d, *J* = 2.2 Hz, 1H), 7.26 – 7.20 (m, 2H), 7.11 (d, *J* = 8.2 Hz, 2H), 7.05 (dd, *J* = 7.6, 1.5 Hz, 1H), 6.88 (d, *J* = 8.1 Hz, 2H), 6.28 (s, 1H), 5.41 (q, *J* = 6.9 Hz, 1H), 2.24 (s, 3H), 1.20 (d, *J* = 6.9 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 197.5, 143.6, 143.4, 136.9, 136.0, 135.5, 135.3, 133.9, 132.4, 131.2, 130.4, 129.2, 128.9, 128.6, 128.2, 128.1, 127.8, 127.4, 127.3, 126.9, 126.6, 55.0, 26.9, 26.6, 21.5, 19.8.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{23}H_{21}ClNO_2S^+$410.1054; Found 410.1056.



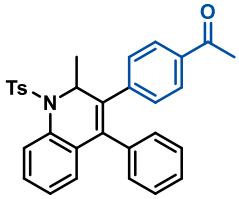
3-(4-chlorophenyl)-2-methyl-4-phenyl-1-(phenylsulfonyl)-1,2-dihydroquinoline (**4km**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4m** was obtained as a white solid (85 mg, 90 %), Rf=0.62 (PE/EA=10/1)

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.90 (dd, *J* = 8.1, 1.3 Hz, 1H), 7.51 (tt, *J* = 7.3, 1.3 Hz, 1H), 7.42 – 7.34 (m, 3H), 7.34 – 7.28 (m, 2H), 7.18 – 7.11 (m, 4H), 7.07 – 7.01 (m, 2H), 6.78 (dd, *J* = 7.9, 1.5 Hz, 1H), 6.67 – 6.62 (m, 2H), 6.48 (s, 2H), 5.19 (q, *J* = 6.8 Hz, 1H), 1.42 (d, *J* = 2.1 Hz, 3H).

^{13}C NMR (126 MHz, $CDCl_3$) δ 139.1, 137.0, 136.9, 135.3, 133.1, 132.9, 132.7, 132.1, 131.3, 130.4, 129.9, 128.7, 128.4, 128.2, 128.0, 127.9, 127.3, 127.2, 126.8, 126.6, 55.2, 26.9, 19.7.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{28}H_{23}ClNO_2S^+$473.1133; Found 473.1124.



1-(4-(2-methyl-4-phenyl-1-tosyl-1,2-dihydroquinolin-3-yl)phenyl)ethan-1-one (**4ar**)

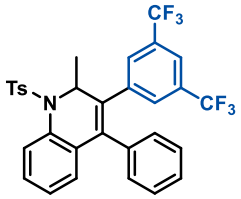
The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4ar** was obtained as a white solid (87 mg, 88 %), Rf=0.62 (PE/EA=10/1)

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.89 (dd, *J* = 8.1, 1.3 Hz, 1H), 7.67 (d, *J* = 8.4 Hz, 2H), 7.37 (td, *J* = 7.7, 1.5 Hz, 1H), 7.24 (d, *J* = 8.3 Hz, 2H), 7.19 – 7.05 (m, 6H), 6.89 – 6.83 (m, 2H), 6.80 (dd, *J* =

7.8, 1.5 Hz, 1H), 6.46 (s, 2H), 5.24 (q, *J* = 6.8 Hz, 1H), 2.53 (s, 3H), 2.37 (s, 3H), 1.42 (d, *J* = 2.8 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 197.5, 143.6, 143.4, 136.9, 136.0, 135.5, 135.3, 133.9, 132.4, 131.2, 130.4, 129.2, 128.9, 128.6, 128.2, 128.1, 127.8, 127.4, 127.3, 126.9, 126.6, 55.0, 26.9, 26.6, 21.5, 19.8.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{31}H_{28}ClNO_3S^+$494.1712; Found 494.1719.



3-(3,5-bis(trifluoromethyl)phenyl)-2-methyl-4-phenyl-1-tosyl-1,2-dihydroquinoline (**4ay**)

The title compound was prepared via the general procedure, after purification by silica gel column chromatorgraph (PE/EA=4/1), **4ay** was obtained as a white solid (100 mg, 85%), Rf=0.62 (PE/EA=10/1)

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 (d, *J* = 8.0 Hz, 1H), 7.57 (s, 1H), 7.47 – 7.38 (m, 1H), 7.23 – 7.08 (m, 8H), 7.04 (s, 2H), 6.84 (dd, *J* = 7.7, 1.5 Hz, 1H), 6.46 (s, 2H), 5.16 (q, *J* = 6.8 Hz, 1H), 2.37 (s, 3H), 1.50 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 144.0, 140.6, 136.2, 136.1, 135.8, 132.8, 132.5, 131.2, 130.9, 130.7, 130.3, 129.4, 129.2, 128.7, 128.6, 128.4, 128.3, 127.9, 127.2, 127.1, 126.8, 124.4, 121.7, 120.6, 120.6, 120.5, 54.6, 21.3, 20.1.

^{19}F NMR (377 MHz, $CDCl_3$) δ -63.15.

HRMS (ESI) m/z: $[M+H]^+$ Calcd for $C_{31}H_{24}F_6NO_2S^+$588.1426; Found 588.1418.

6. X-ray Crystal Structure Determination of the Products

To grow the crystals used to collect the X-ray data for **3af**, the following method was used: the sample was dissolved with 2 mL petroleum ether and 2 mL DCM in a small vial, which was kept aside at room temperature to obtain crystals.

A suitable crystal was selectedon a ROD, Synergy Custom system, HyPix diffractometer. The crystal was kept at 297.00(2) K during data collection. Using Olex2, the structure was solved with the ShelXT structure solution program using Intrinsic Phasing and refined with the ShelXL refinement package using Least Squares minimisation. The data have been deposited at the Cambridge Crystallographic Data Center (CCDC 2394222).

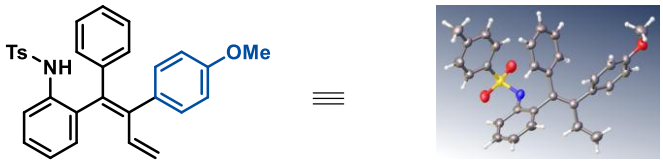


Figure S5. The X-ray Diffraction Configuration of **3af**.

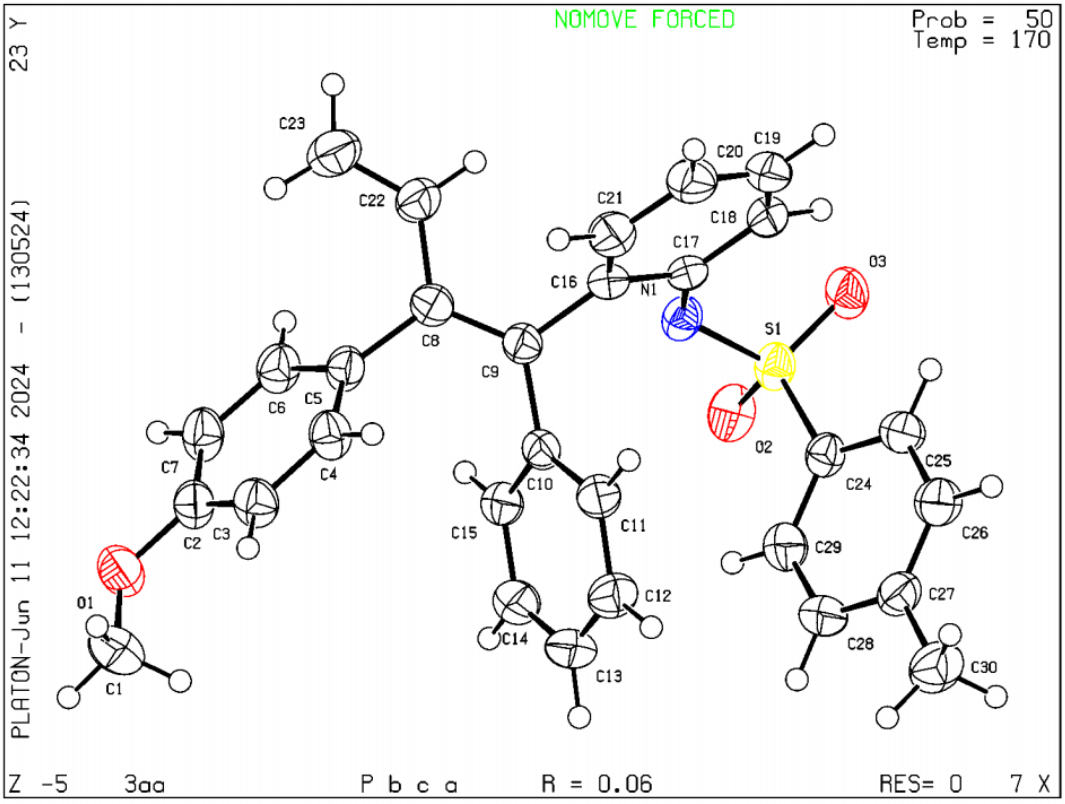


Table S8. Crystallographic data for compounds **3af**

Identification code	3af
Empirical formula	$C_{30}H_{27}NO_3S$
Formula weight	480.58
Temperature/K	170
Crystal system	orthorhombic
Space group	P b c a
a/Å	9.9310(5)

b/Å	18.7108(11)
c/Å	26.5948(14)
α/°	90
β/°	90
γ/°	90
Volume/Å3	4941.8(5)
Z	8
ρcalcg/cm3	1.292
μ/mm-1	0.164
F(000)	2024.0
Crystal size/mm3	0.09 × 0.06 × 0.04
2Θ range for data collection/°	4.616 to 52.894
Index ranges	$-12 \leq h \leq 11$, $-20 \leq k \leq 23$, $-33 \leq l \leq 32$
Reflections collected	26513
Independent reflections	5066 [Rint = 0.0892, Rsigma = 0.0678]
Data/restraints/parameters	5066/0/319
Goodness-of-fit on F2	1.034
Final R indexes [I>=2σ (I)]	R1 = 0.0567, wR2 = 0.1227
Final R indexes [all data]	R1 = 0.1105, wR2 = 0.1497
Largest diff. peak/hole / e Å-3	0.50/-0.28

To grow the crystals used to collect the X-ray data for **4af**, the following method was used: the sample was dissolved with 2 mL petroleum ether and 2 mL DCM in a small vial, which was kept aside at room temperature to obtain crystals.

A suitable crystal was selectedon a ROD, Synergy Custom system, HyPix diffractometer. The crystal was kept at 297.00(2) K during data collection. Using Olex2, the structure was solved with the ShelXT structure solution program using Intrinsic Phasing and refined with the ShelXL refinement package using Least Squares minimisation. The data have been deposited at the Cambridge Crystallographic Data Center (CCDC 2394187).

Figure S6. The X-ray Diffraction Configuration of **4af**.

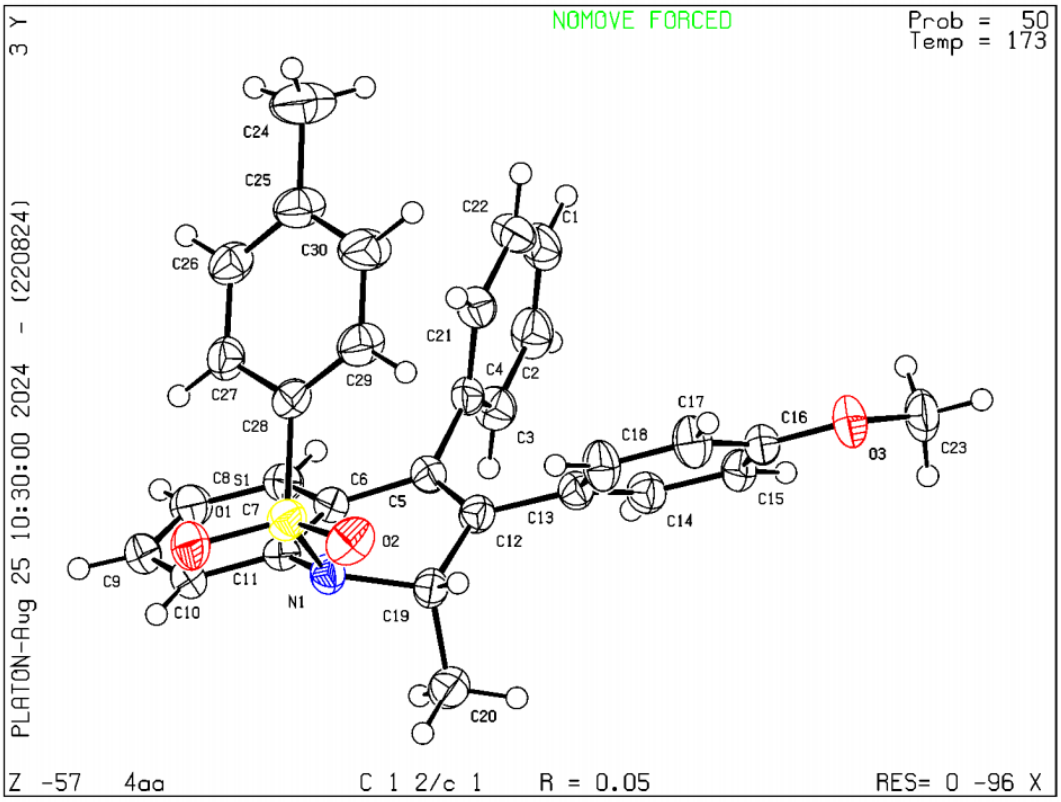


Table S9. Crystallographic data for compounds **4af**

Identification code	4af
Empirical formula	$C_{30}H_{27}NO_3S$
Formula weight	481.58
Temperature/K	173
Crystal system	monoclinic
Space group	C2/c
a/Å	18.3210(6)

b/Å	9.2639(3)
c/Å	30.2884(12)
α/°	90
β/°	105.4480(10)
γ/°	90
Volume/Å3	4954.9(3)
Z	8
ρcalcg/cm3	1.291
μ/mm-1	0.163
F(000)	2032.0
Crystal size/mm3	0.15 × 0.06 × 0.05
2Θ range for data collection/°	4.614 to 52.8
Index ranges	-22 ≤ h ≤ 22, -11 ≤ k ≤ 11, -33 ≤ l ≤ 37
Reflections collected	28179
Independent reflections	5071 [Rint = 0.0877, Rsigma = 0.0580]
Data/restraints/parameters	5071/0/319
Goodness-of-fit on F2	1.075
Final R indexes [I>=2σ (I)]	R1 = 0.0548, wR2 = 0.1472
Final R indexes [all data]	R1 = 0.0873, wR2 = 0.1734
Largest diff. peak/hole / e Å-3	0.27/-0.41

7 Reference

[1] Gu, X. T.; Shen, J. H.; Xu, Z. Y.; Liu, J. X.; Shi. M.; Wei, Y. *Angew. Chem. Int. Ed.* **2014**, *38*, e202409463

[2] Jiang, B.; Liu, J. X.; Wei, Y.; Shi, M. *Org. Lett.* **2018**, *20*, 19, 6229-6233

[3] Li, M.; Wei, Y.; Shi, M. *Org. Chem. Front.,* **2023**, *10*, 440-447

8 Spectroscopic Data of Products

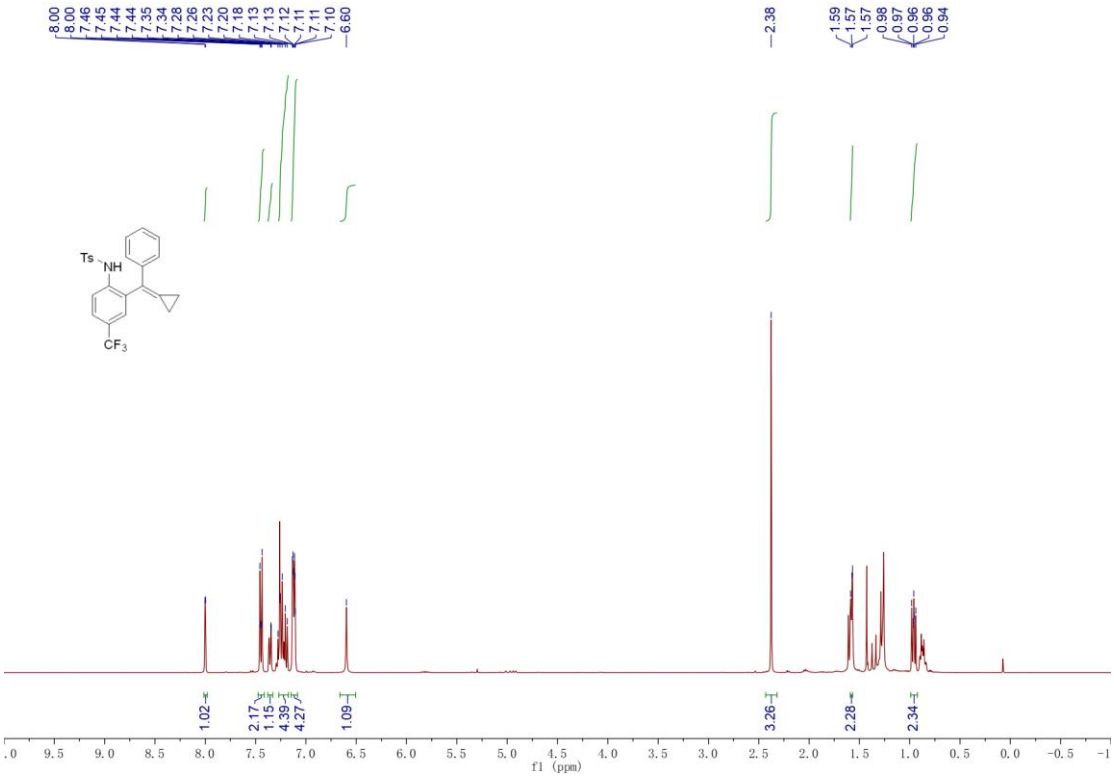


Figure S7. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 1c

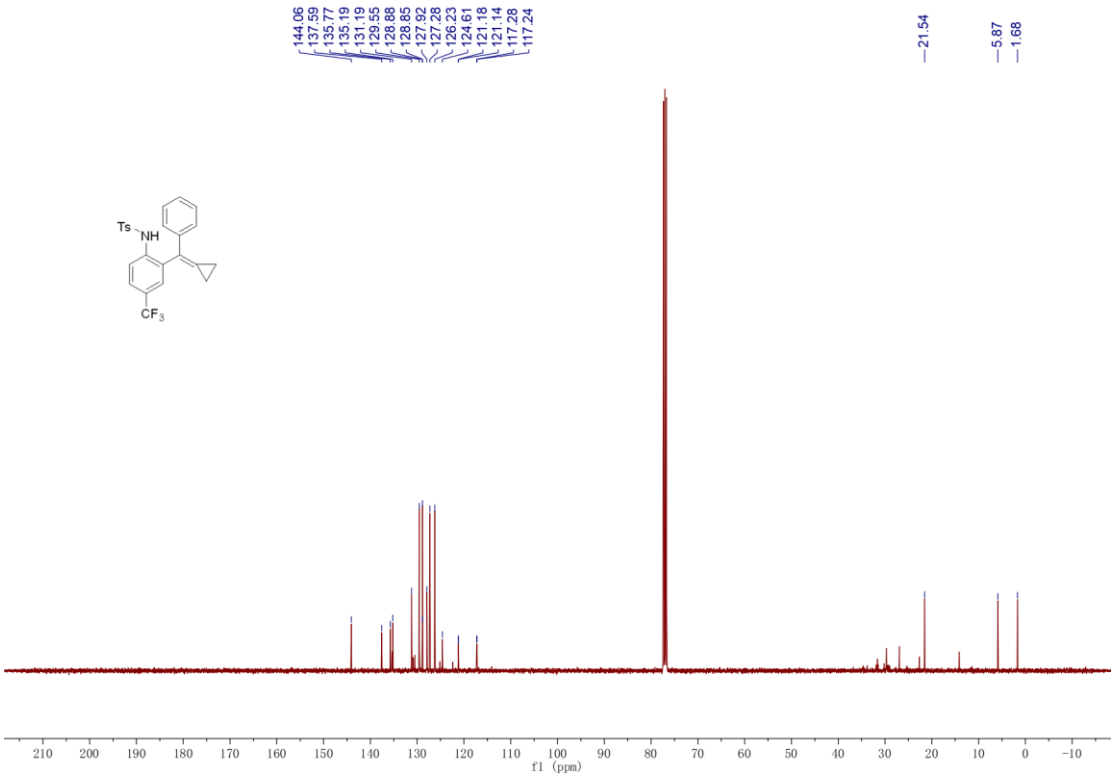


Figure S8. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 1c

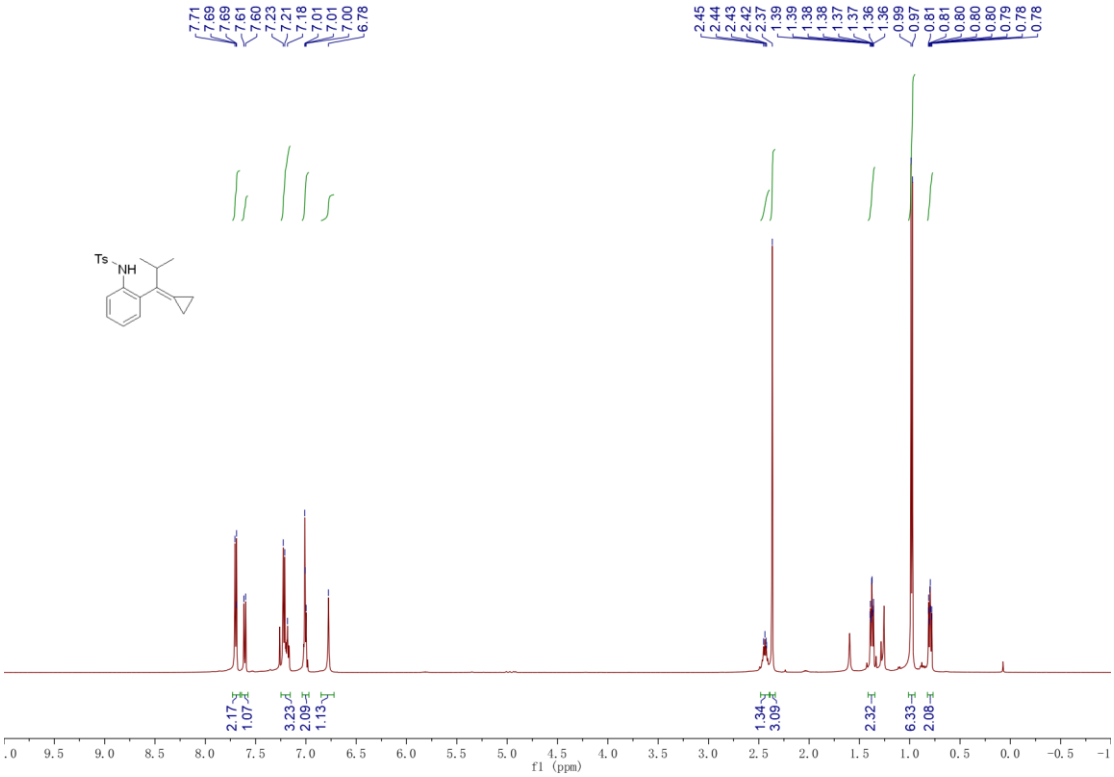


Figure S9. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 1h

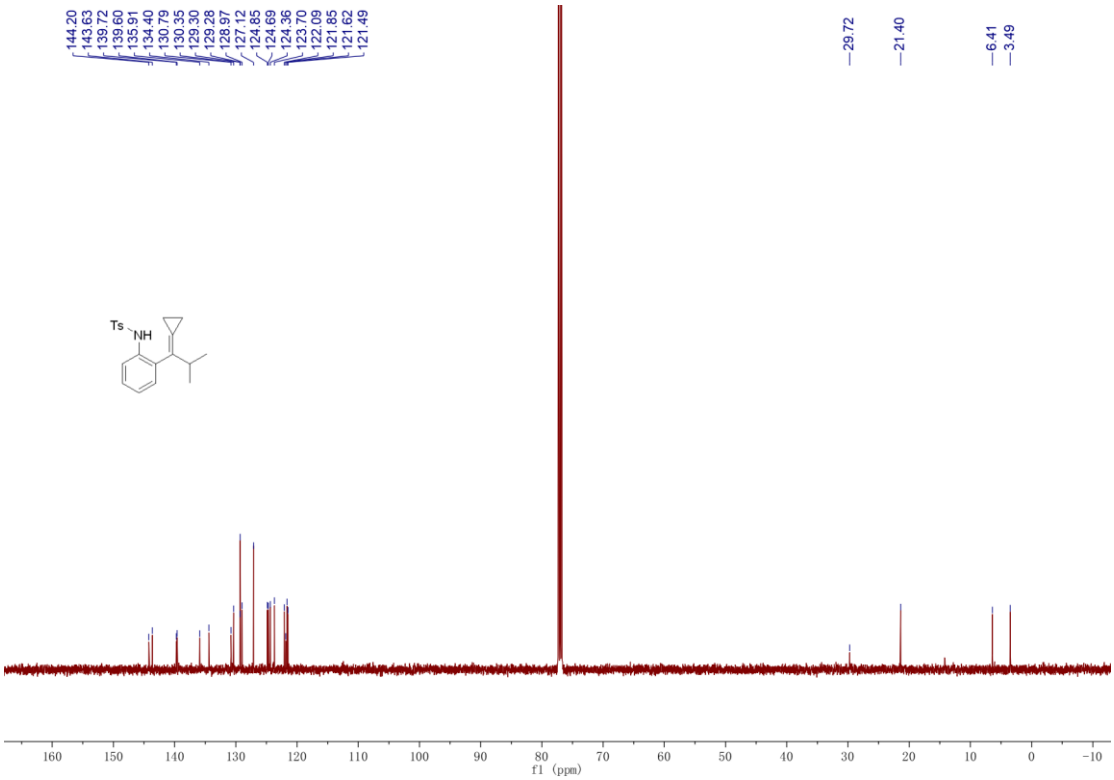


Figure S10. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 1h

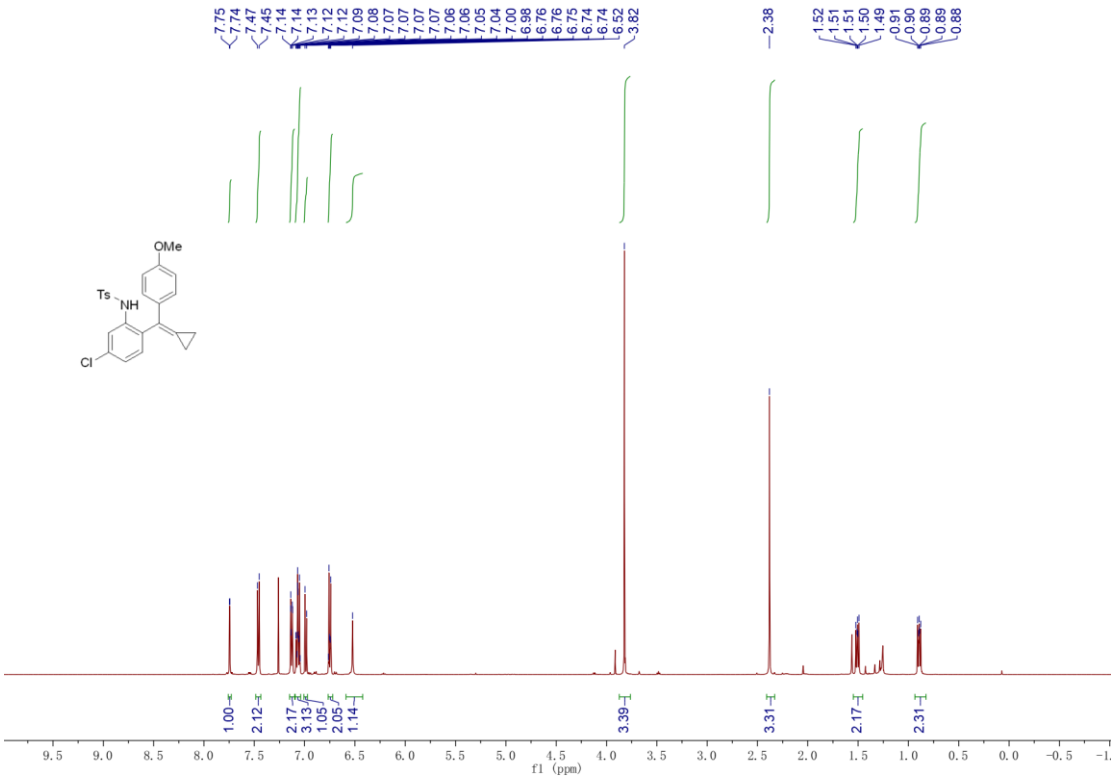


Figure S11. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 1e

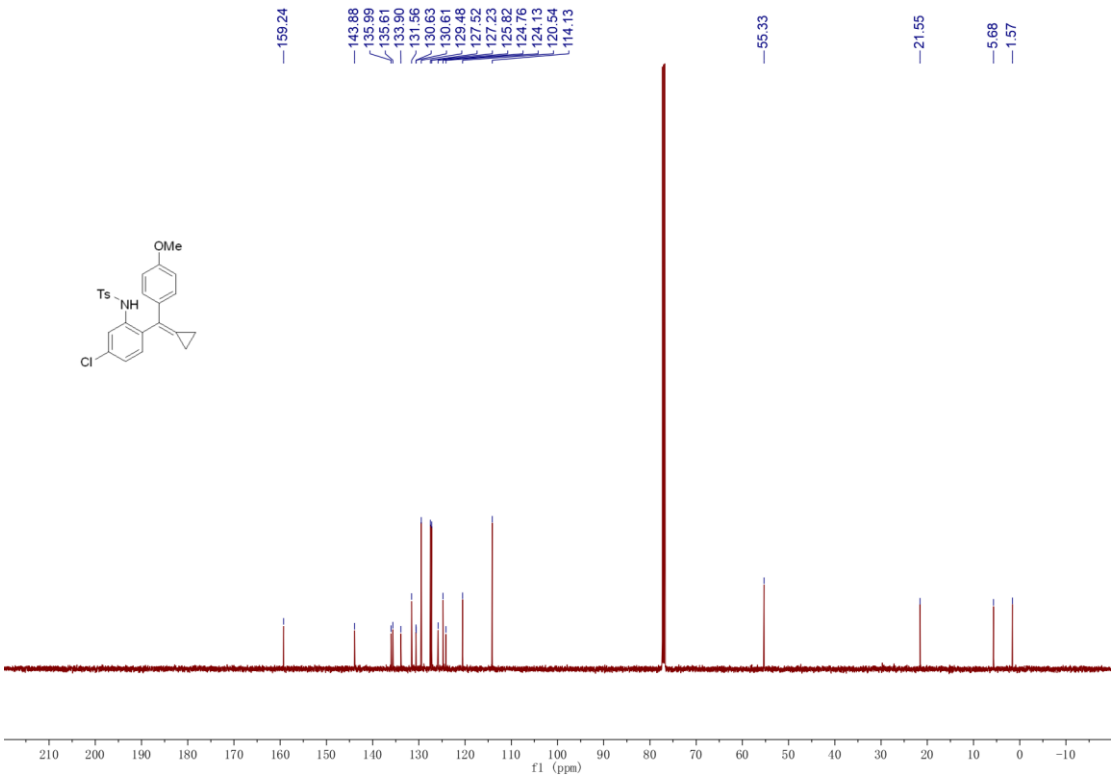


Figure S12. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 1e

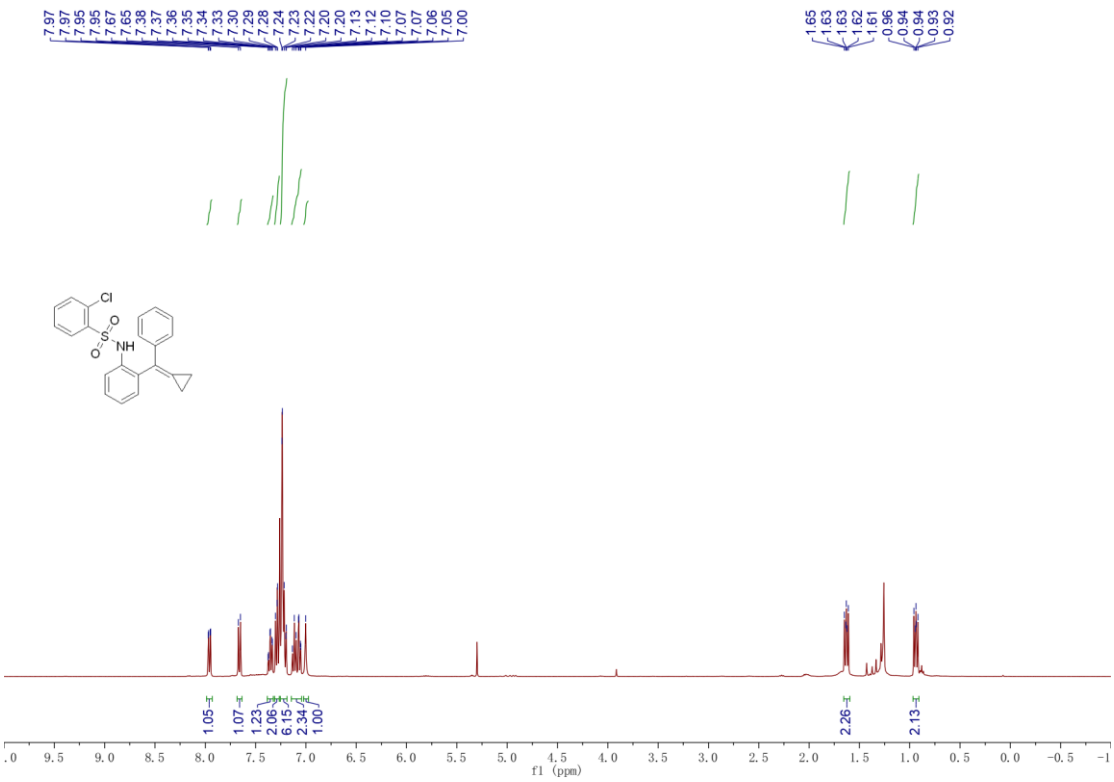


Figure S13. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 1k

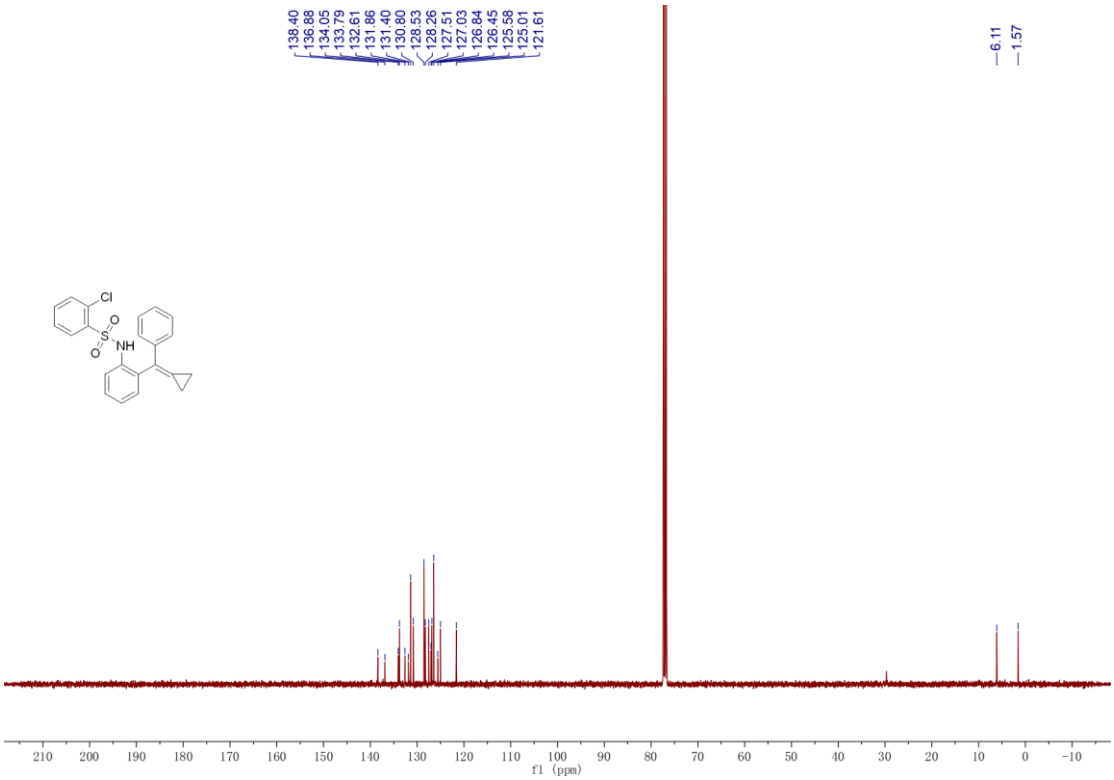


Figure S14. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 1k

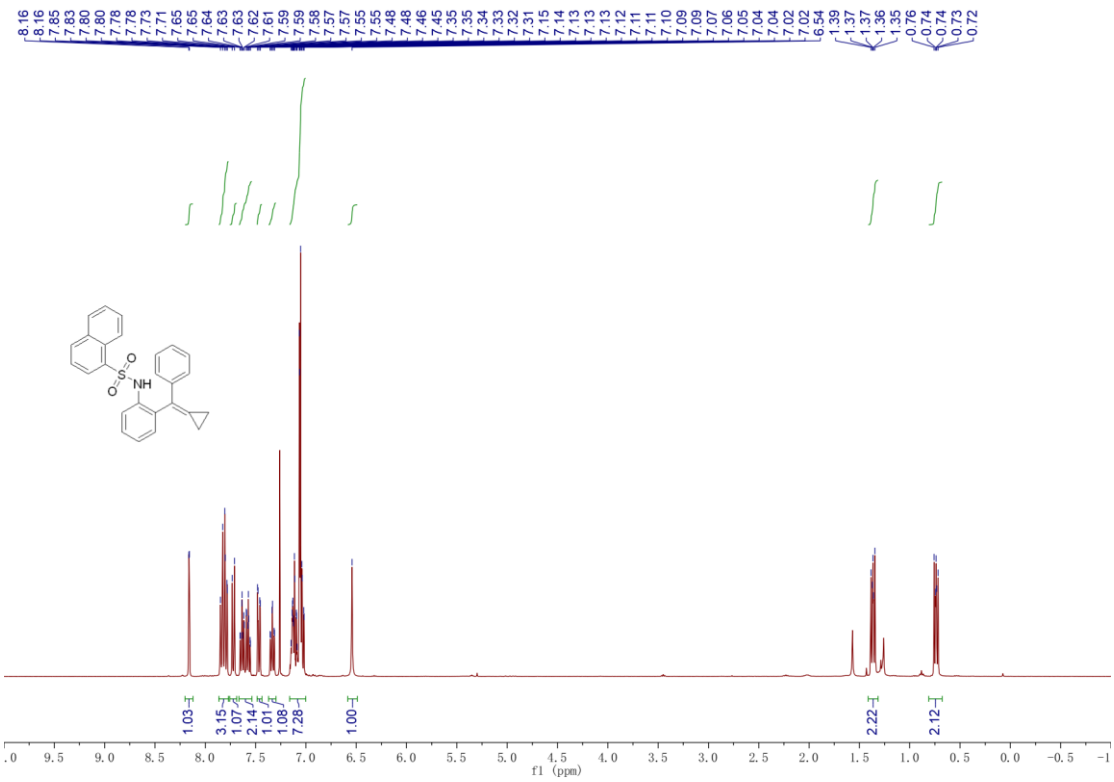


Figure S15. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 1e

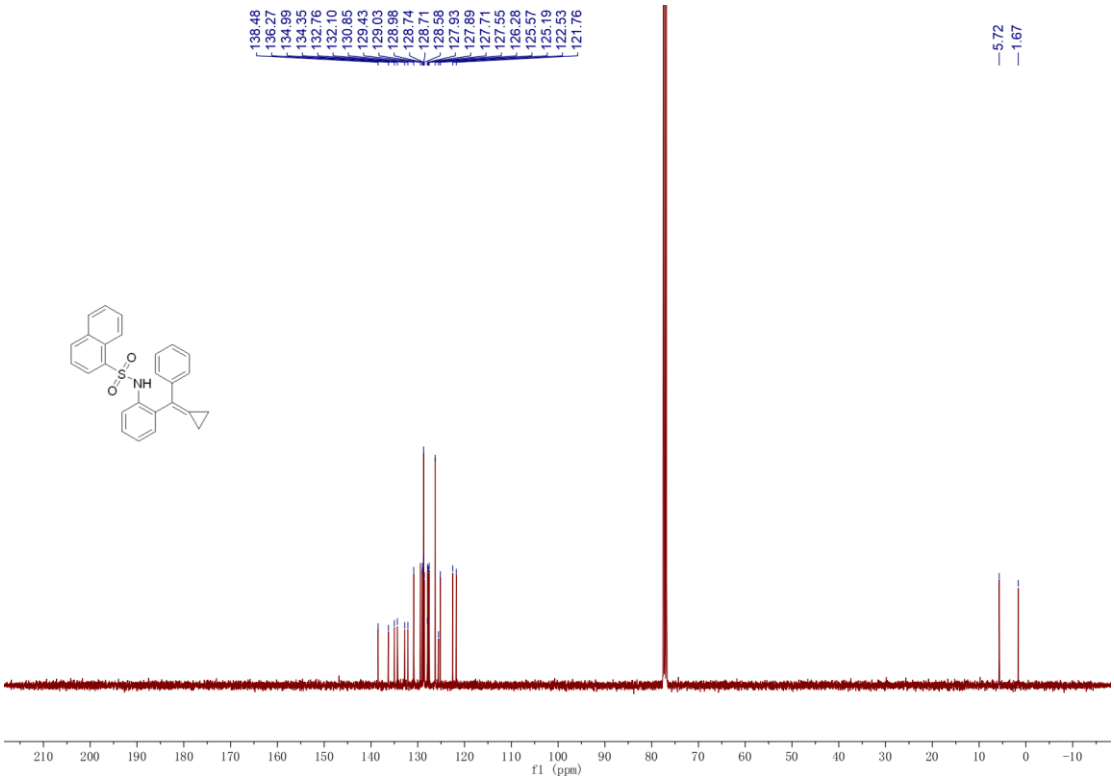


Figure S16. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 1e

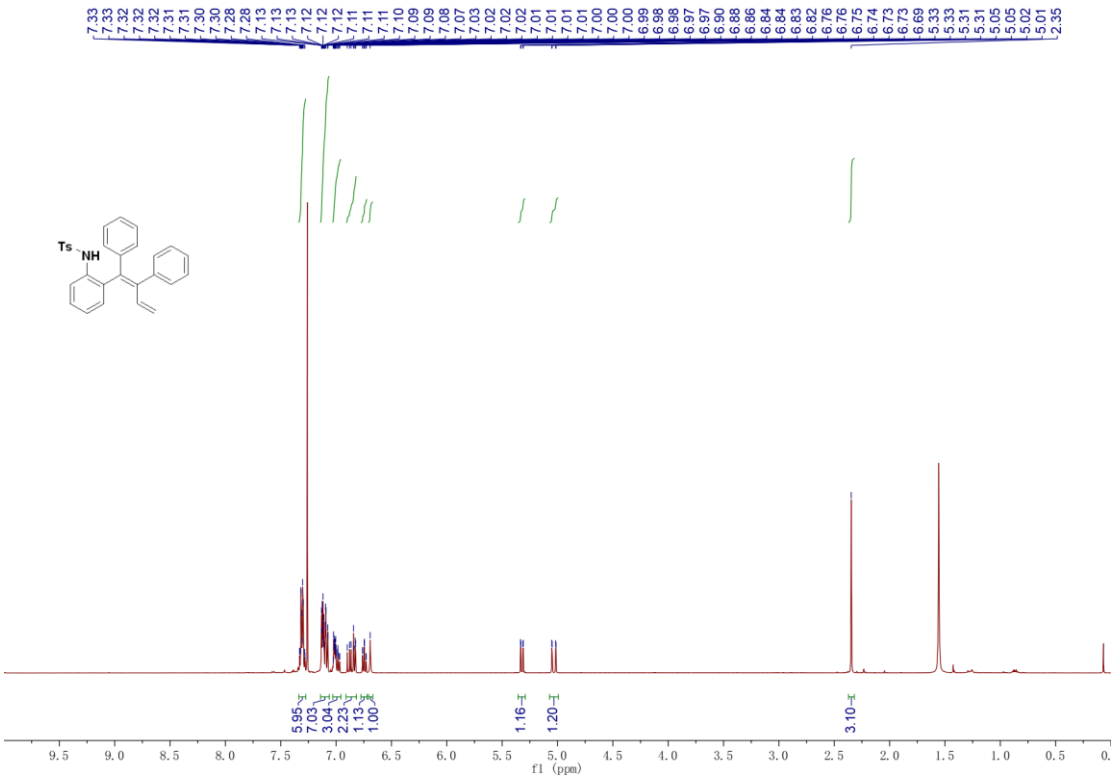


Figure S17. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3aa

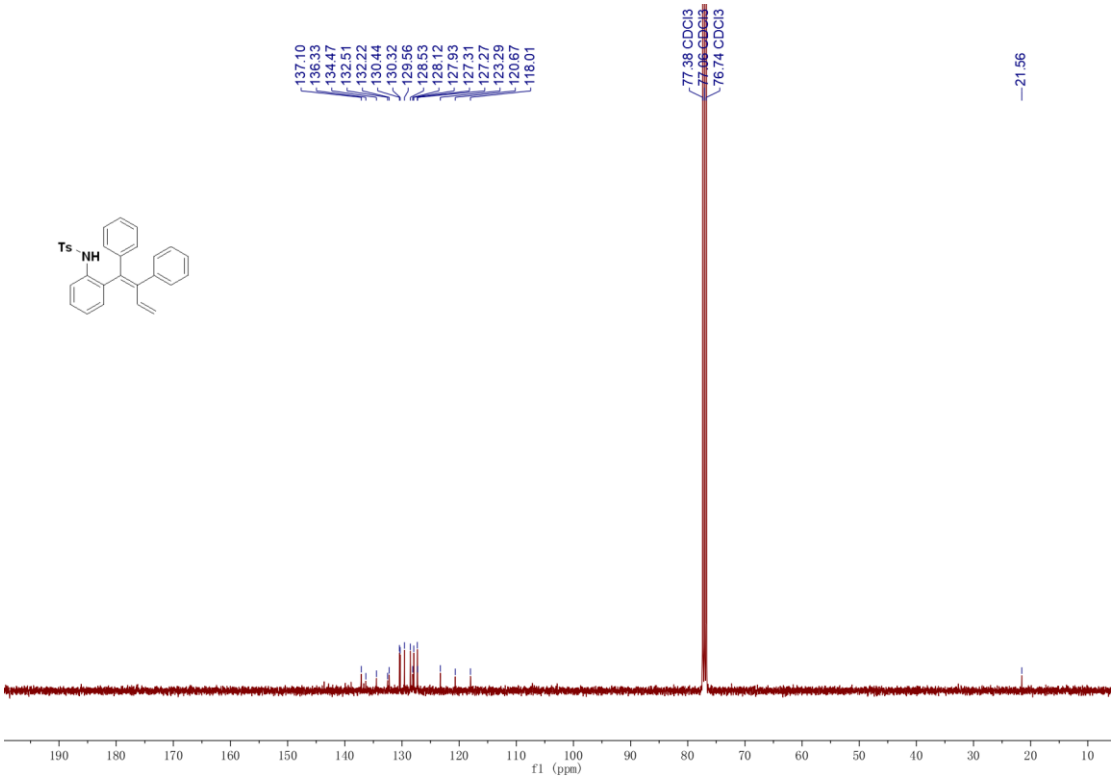


Figure S18. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3aa

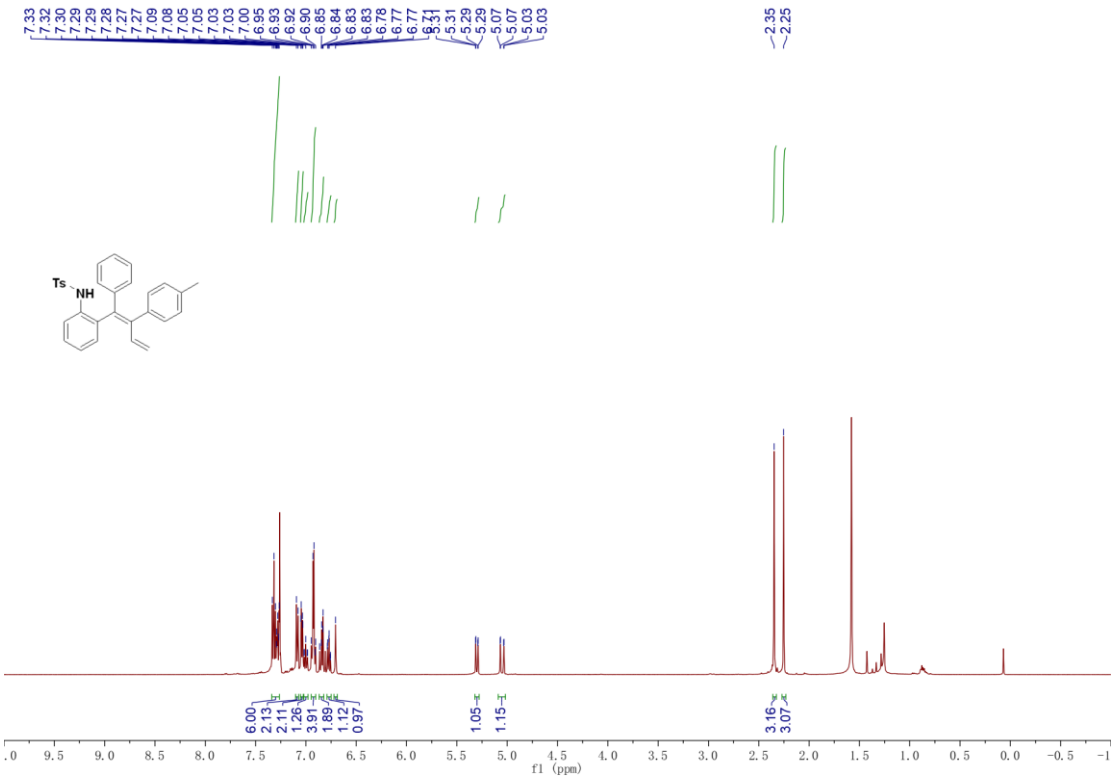


Figure S19. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ab

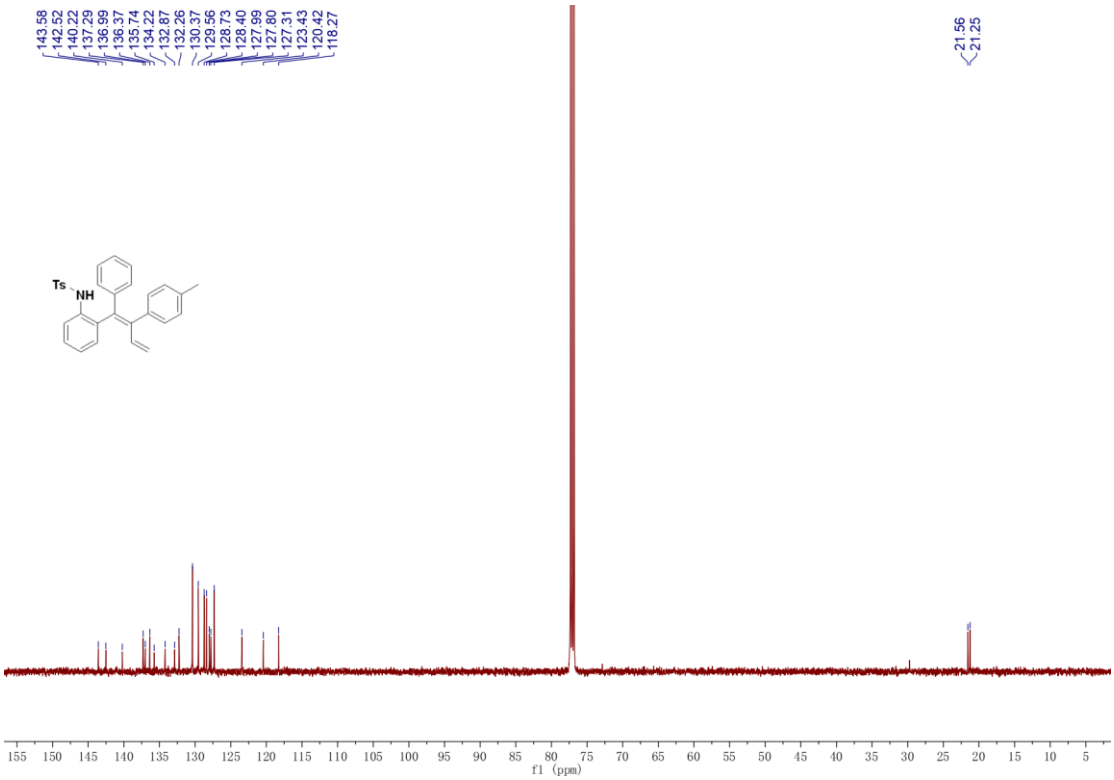


Figure S20. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ab

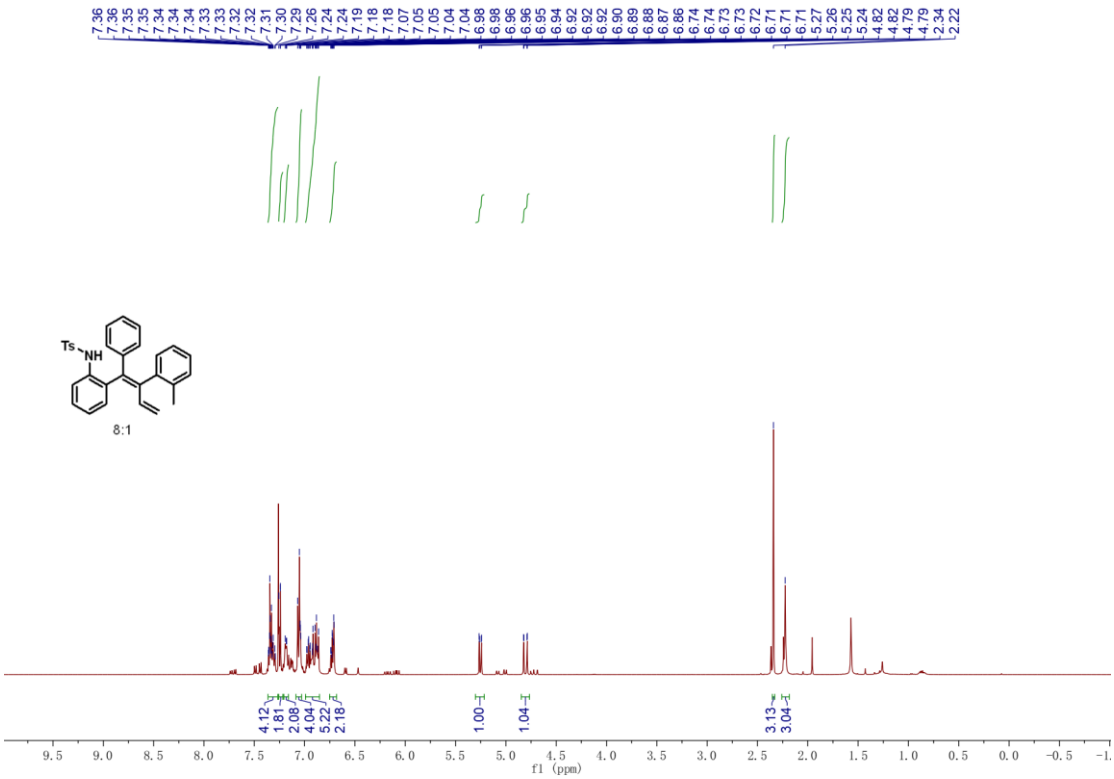


Figure S21. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ac

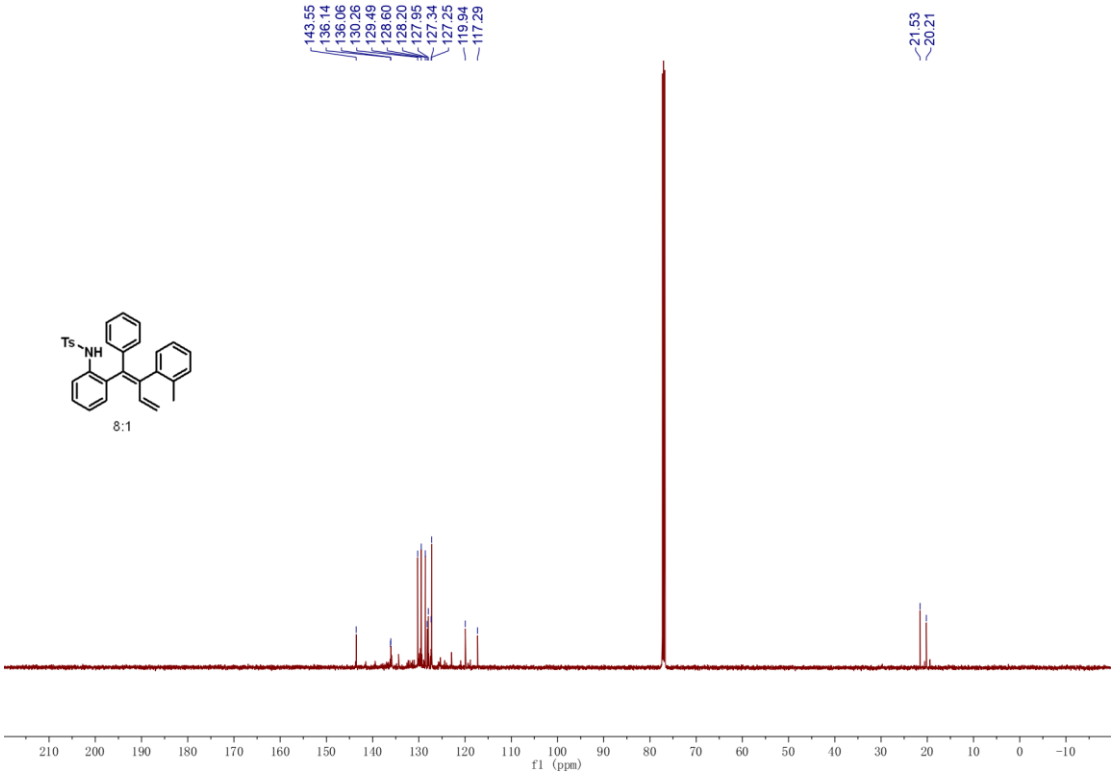


Figure S22. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ac

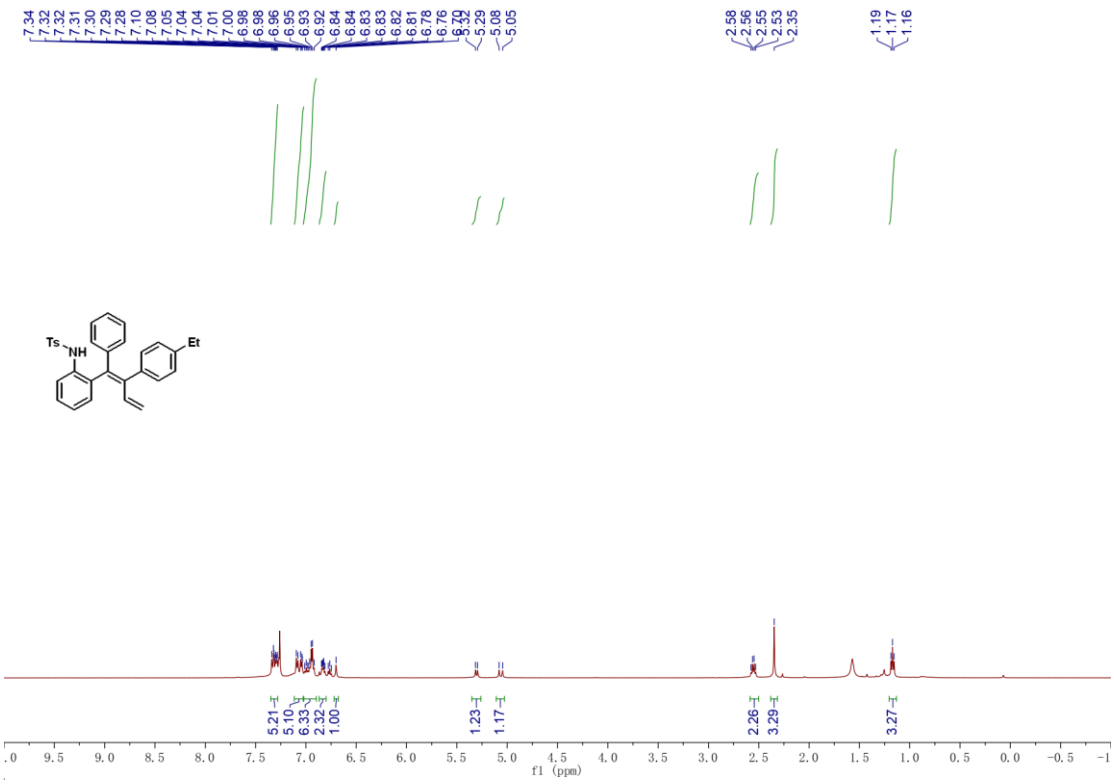


Figure S23. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ad

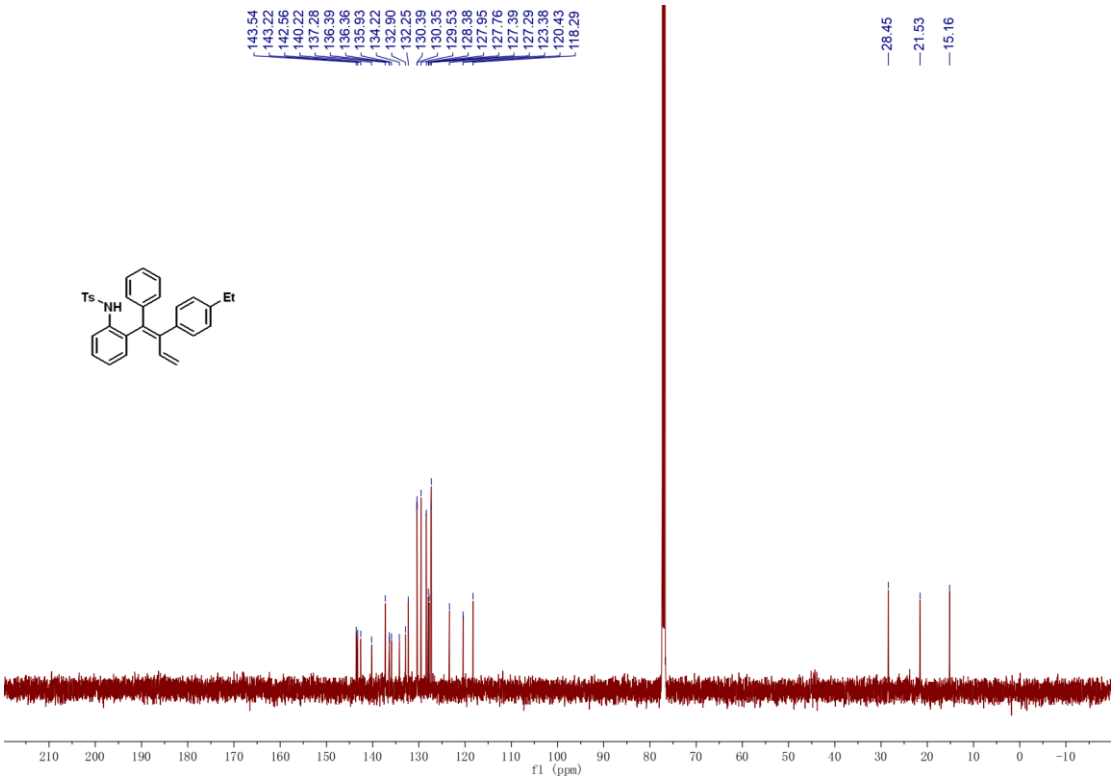


Figure S24. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ad

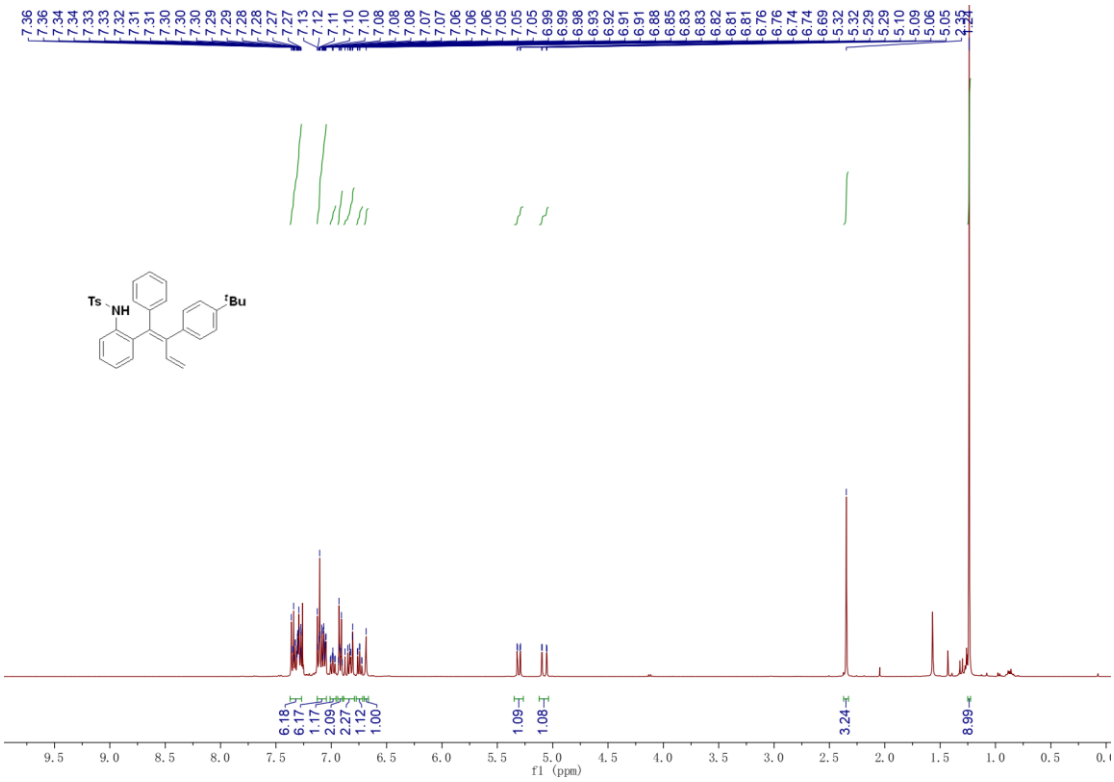


Figure S25. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ae

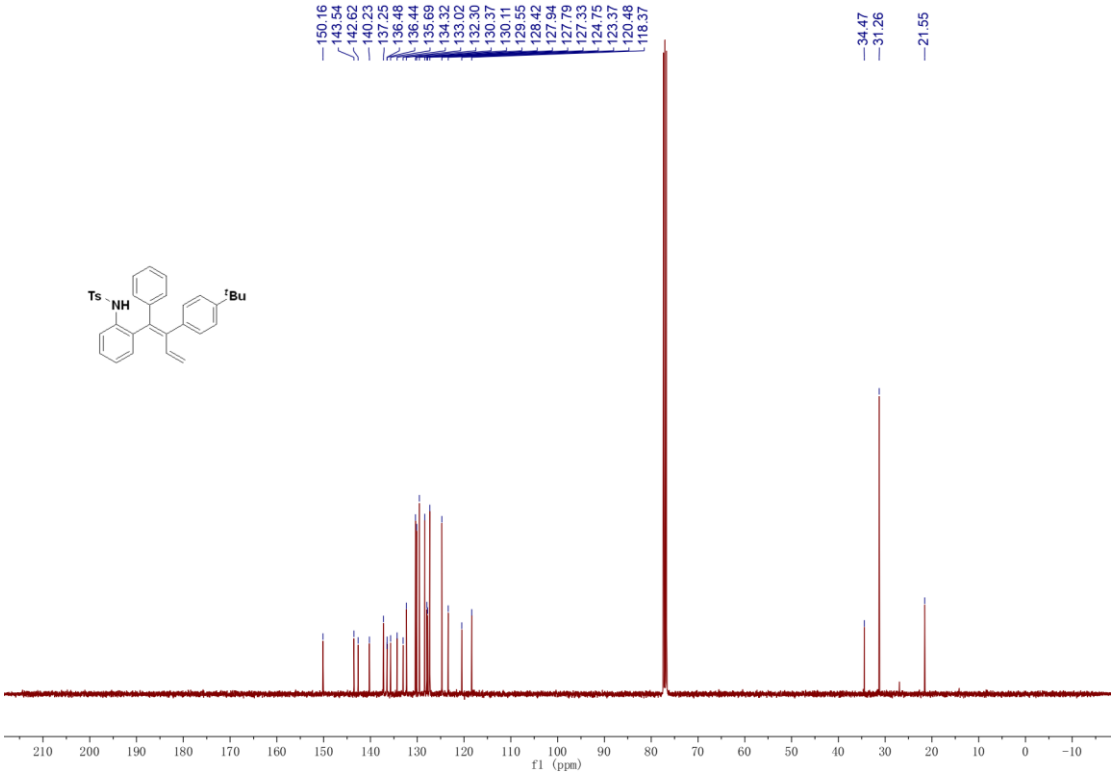


Figure S26. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ae

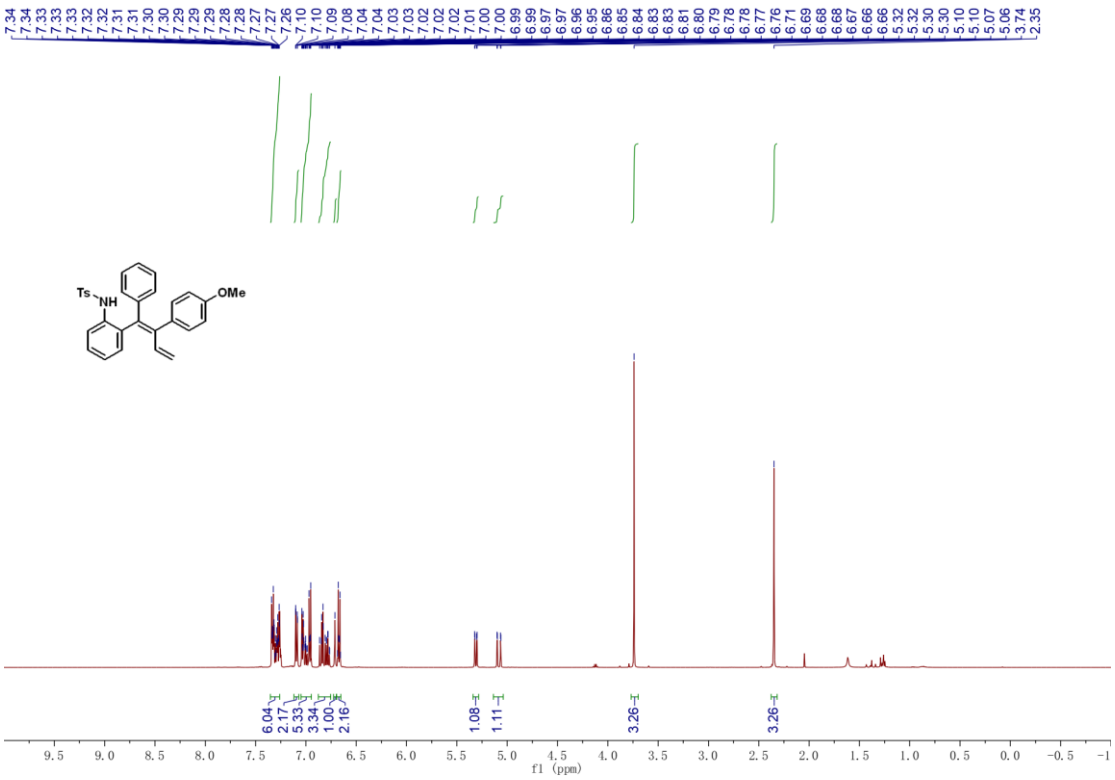


Figure S27. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3af

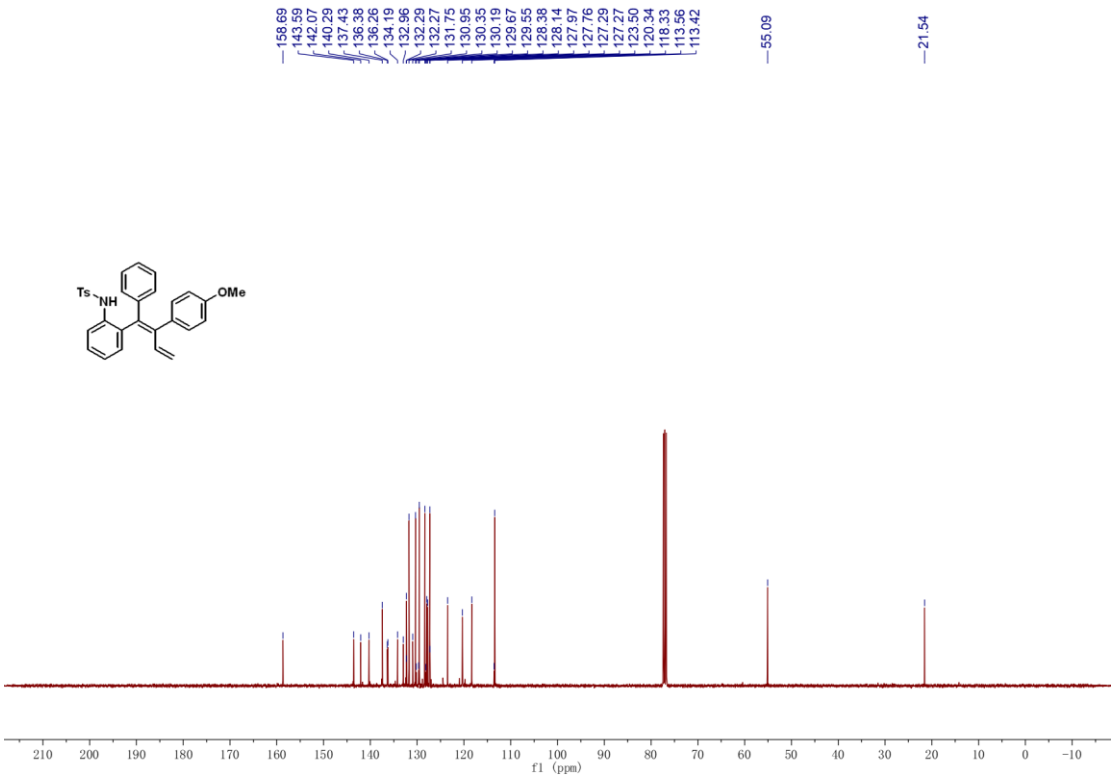


Figure S28. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3af

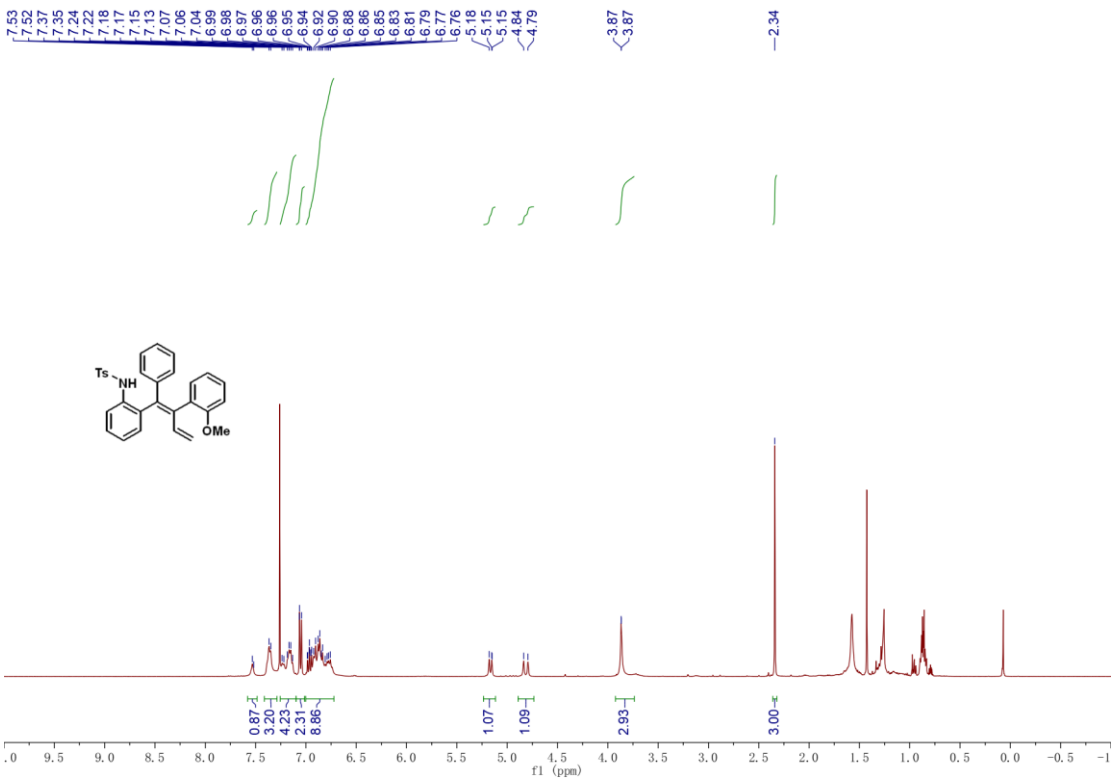


Figure S29. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ag

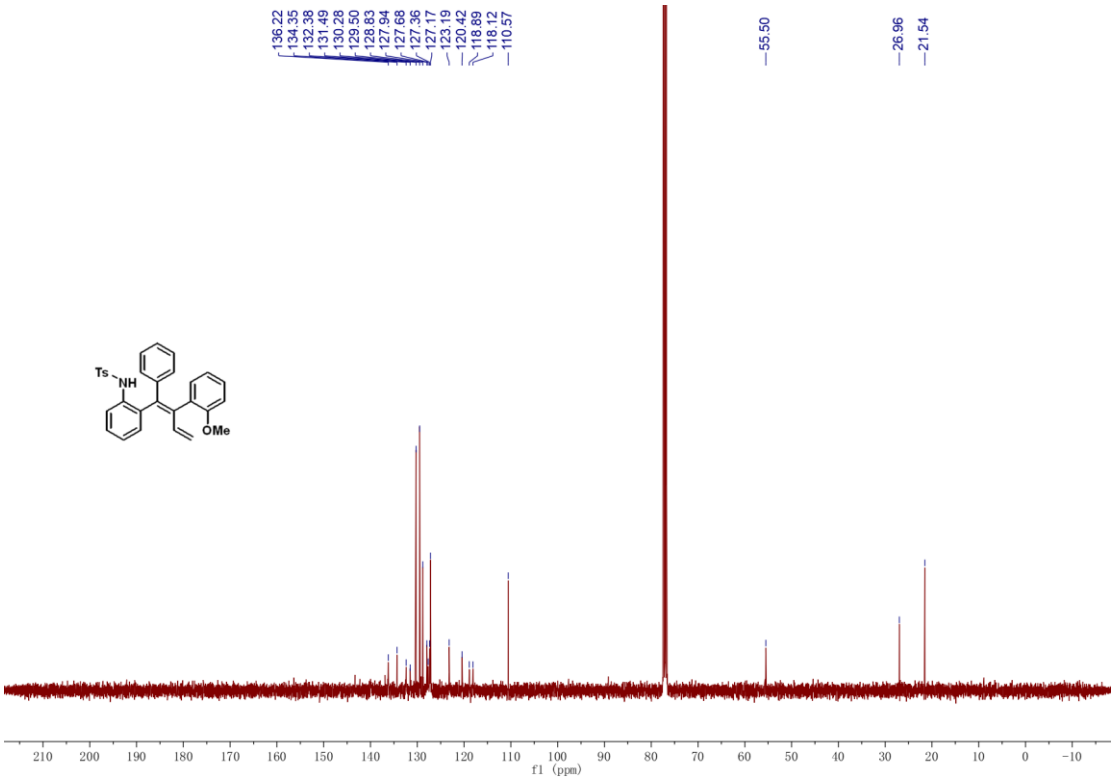


Figure S30. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ag

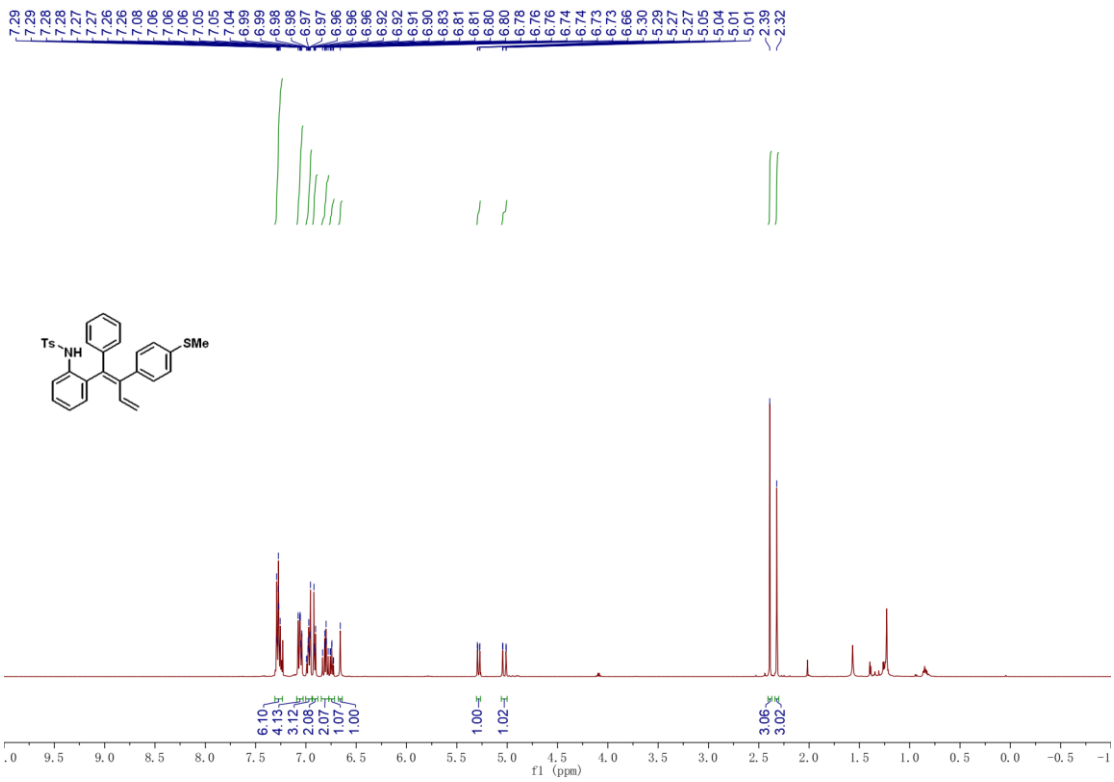


Figure S31. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ai

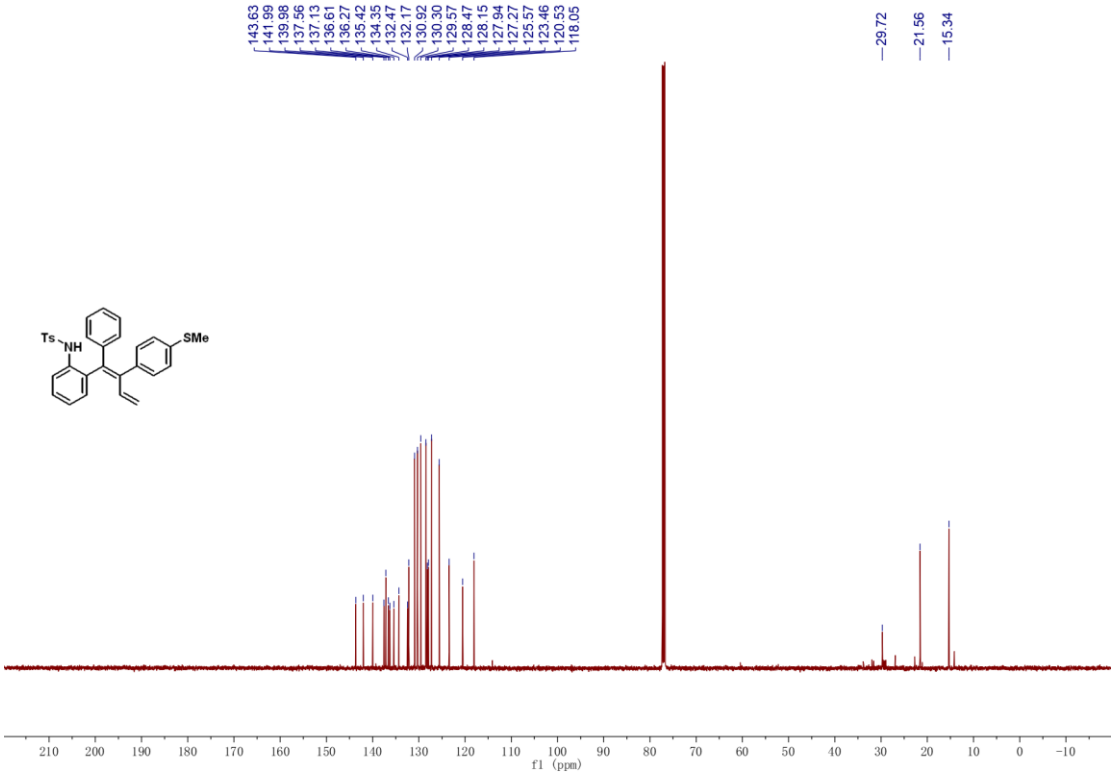


Figure S32. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ai

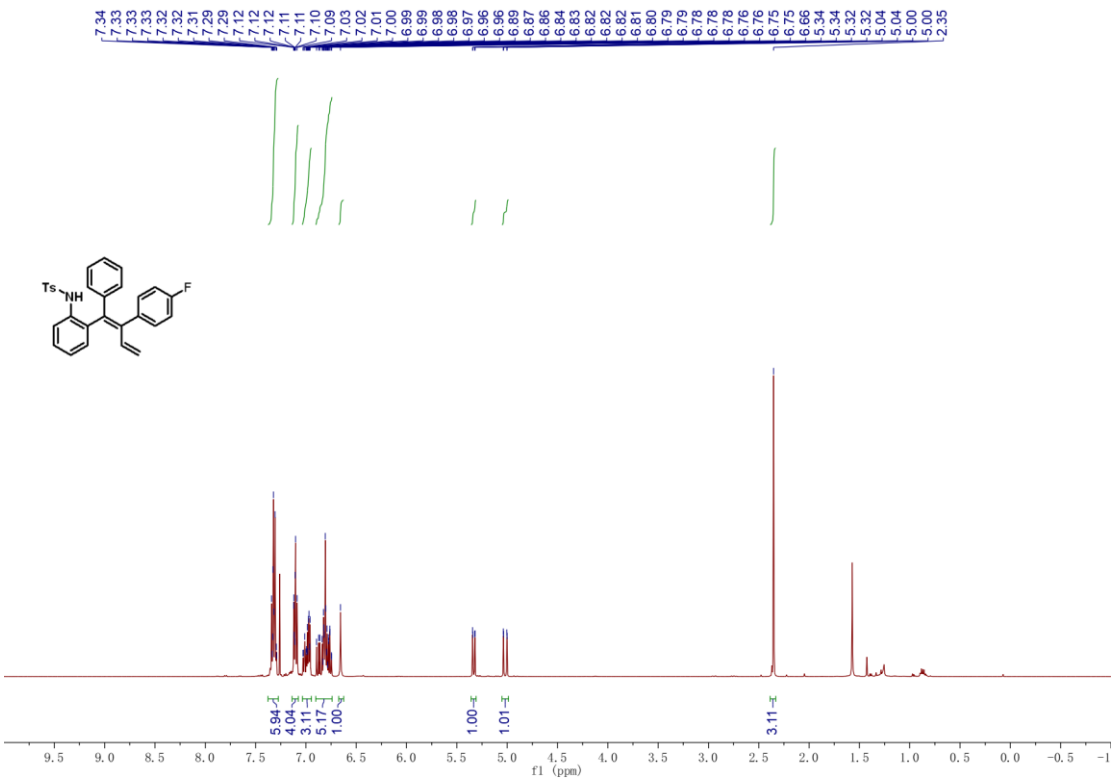


Figure S33. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3aj

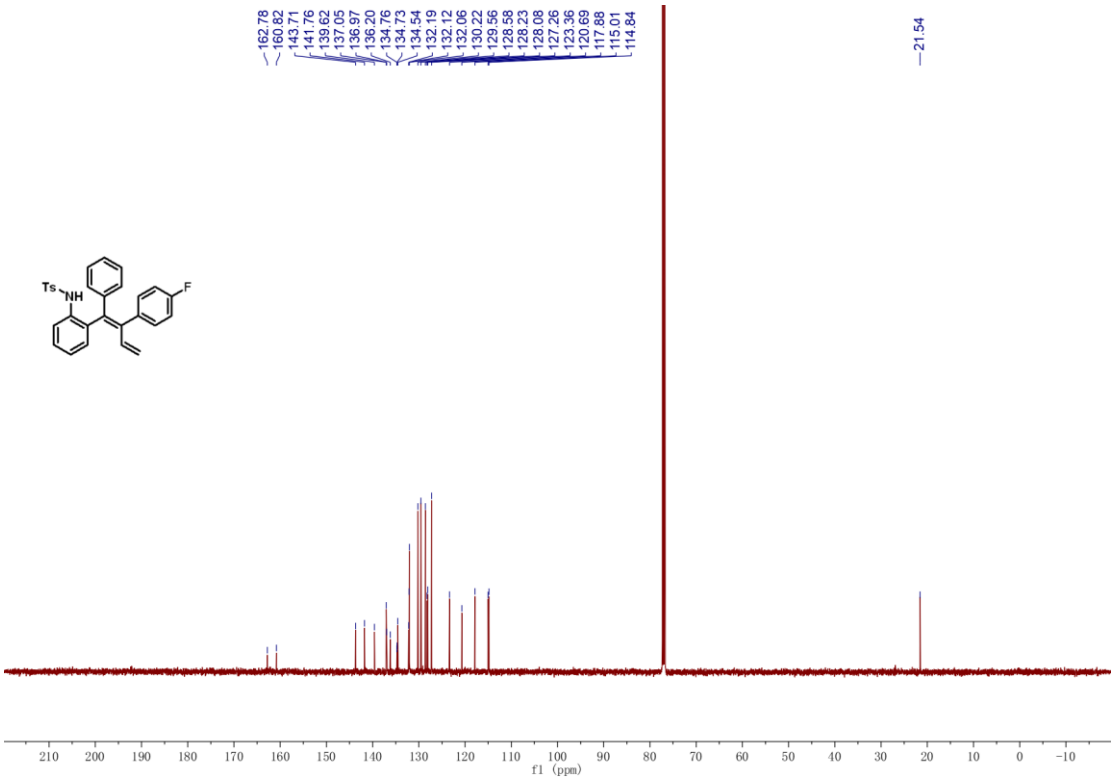


Figure S34. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3aj

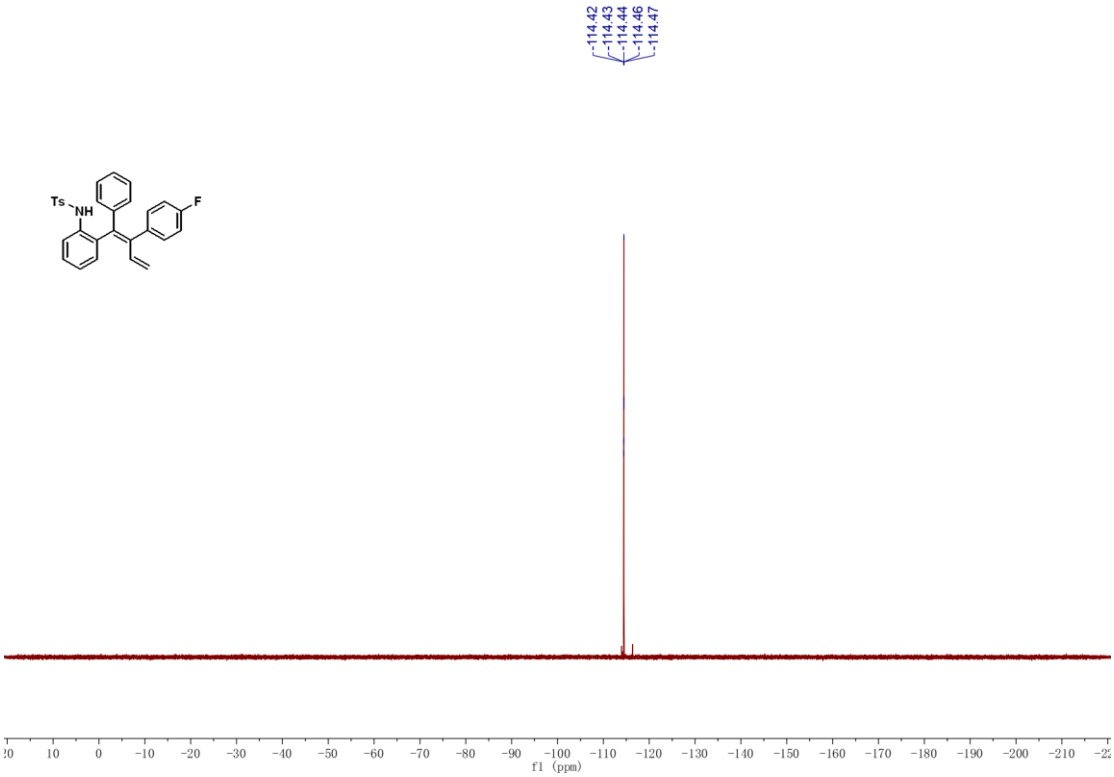


Figure S35. ^{19}F NMR (377 MHz, Chloroform-d) spectrum of 3aj

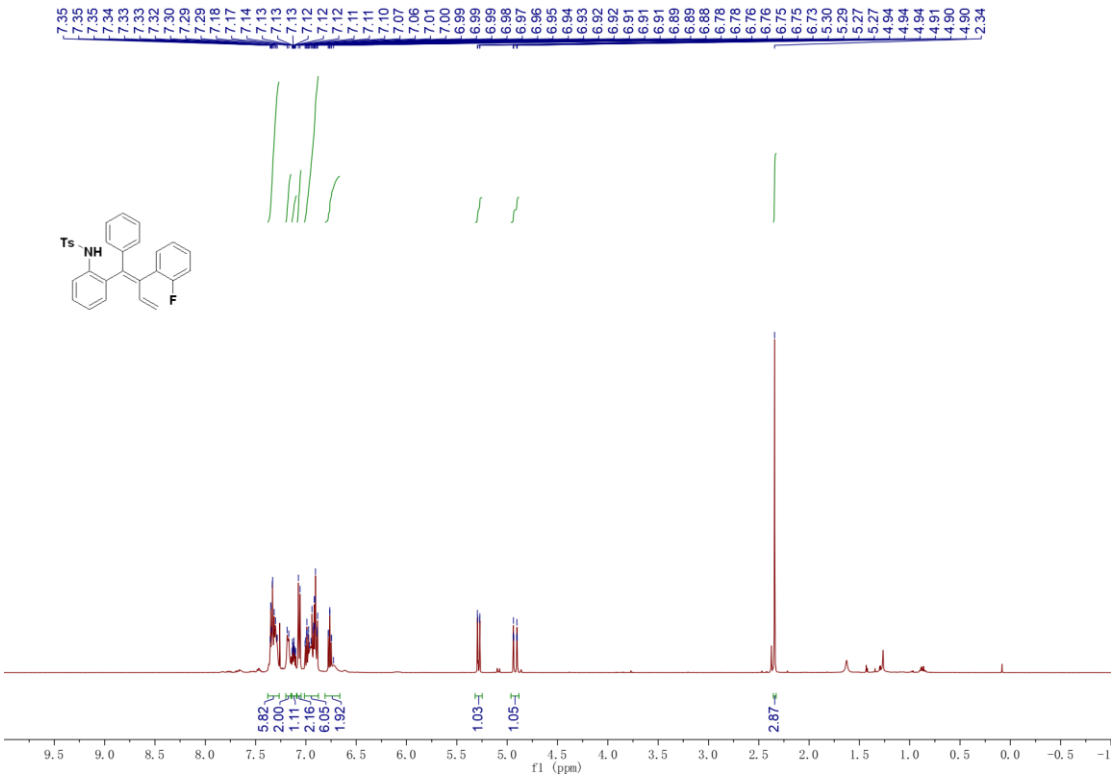


Figure S36. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ak

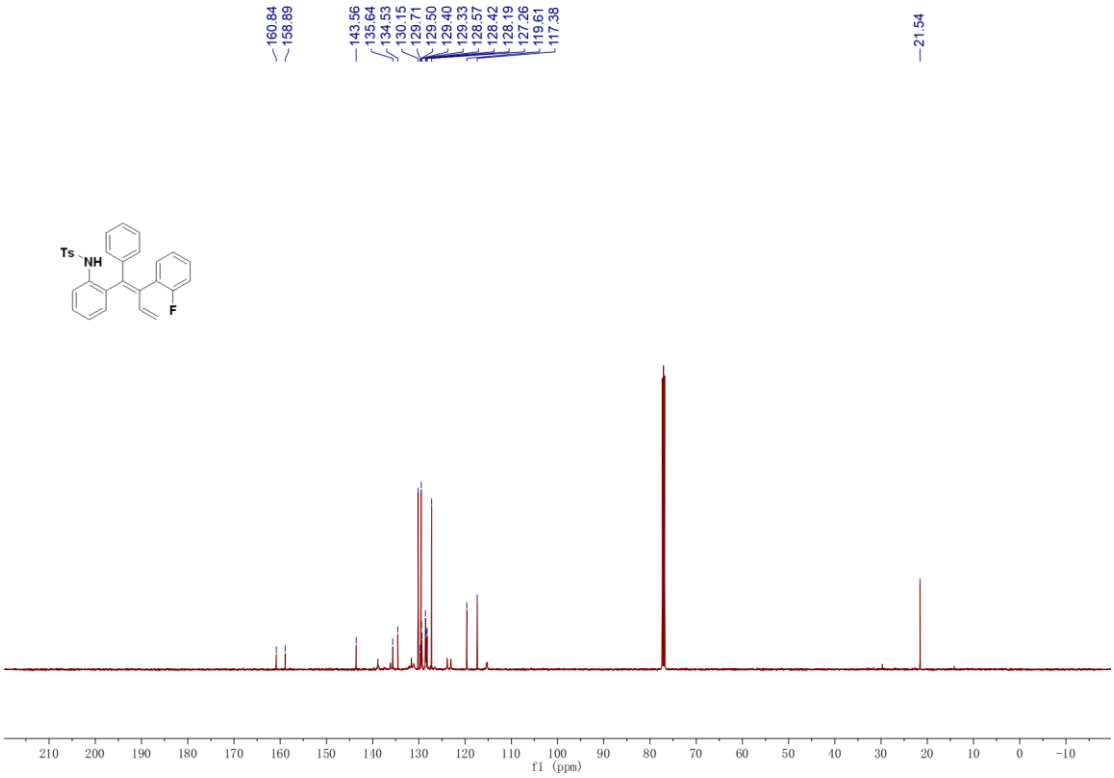


Figure S37. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ak

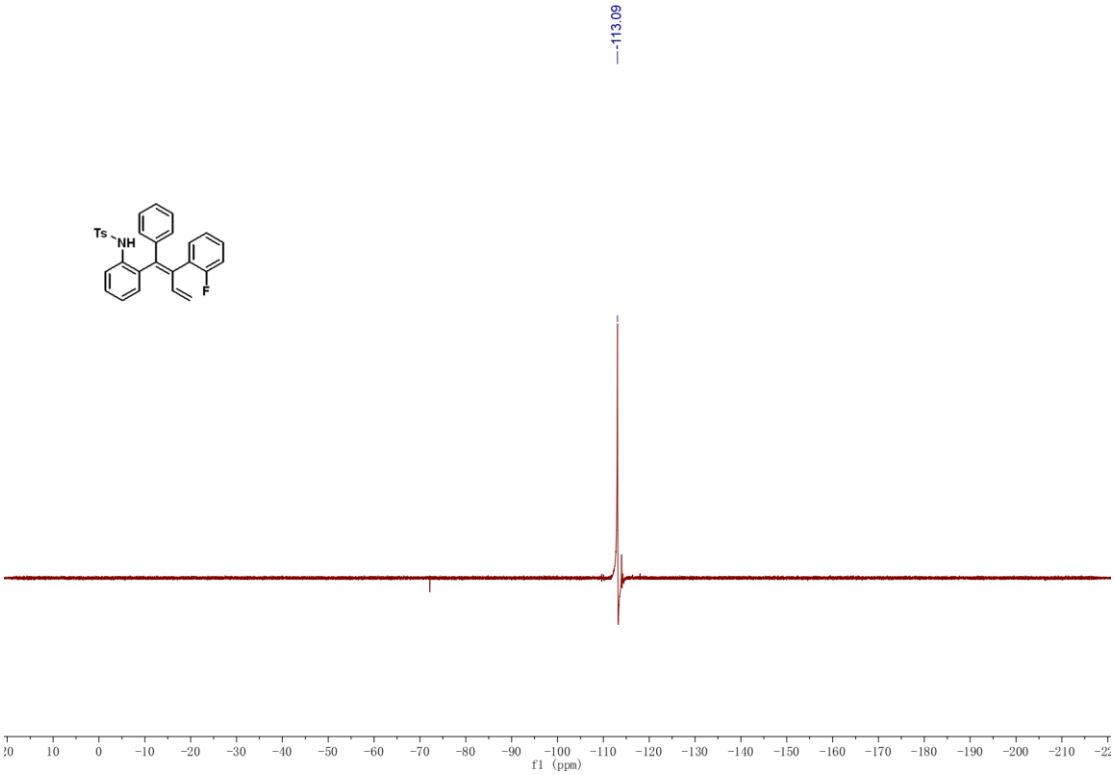


Figure S38. ^{19}F NMR (377 MHz, Chloroform-*d*) spectrum of 3ak

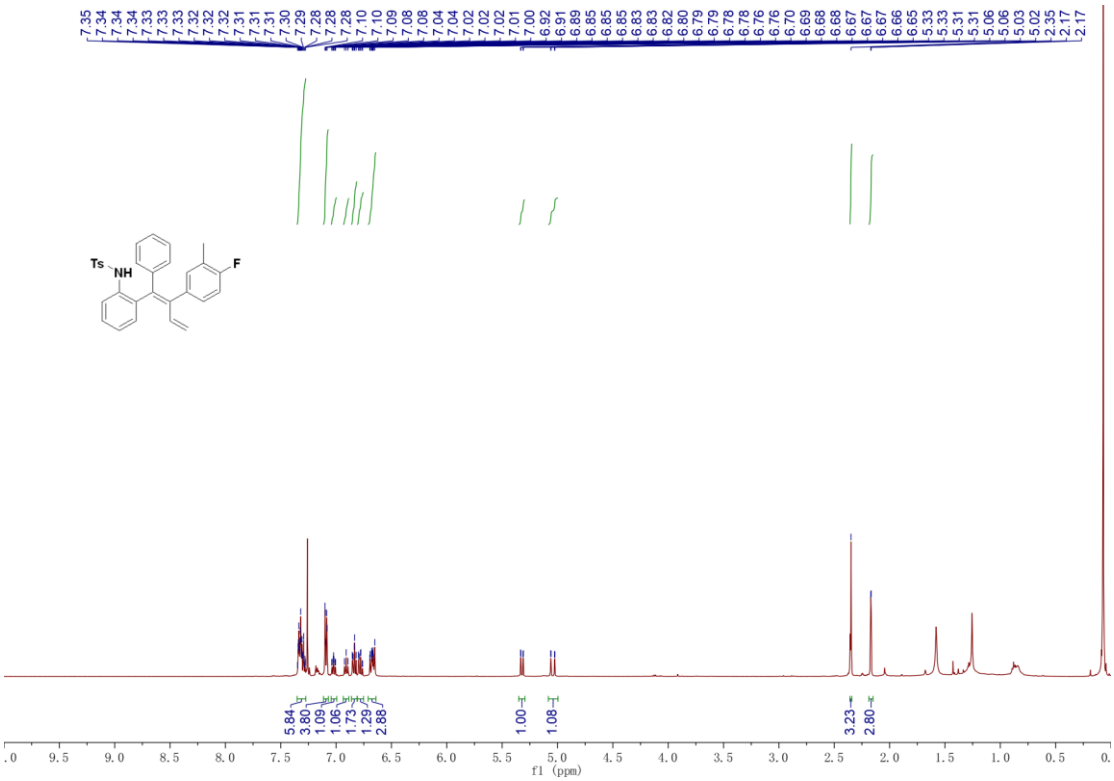


Figure S39. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3al

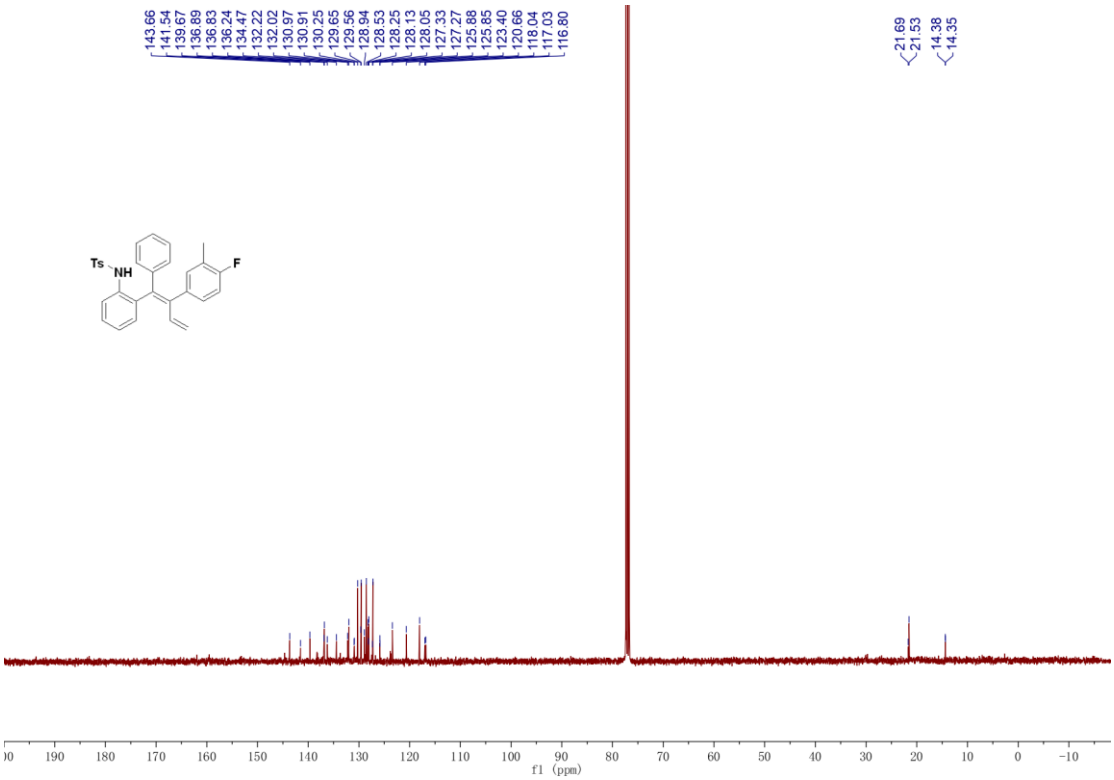


Figure S40. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3al

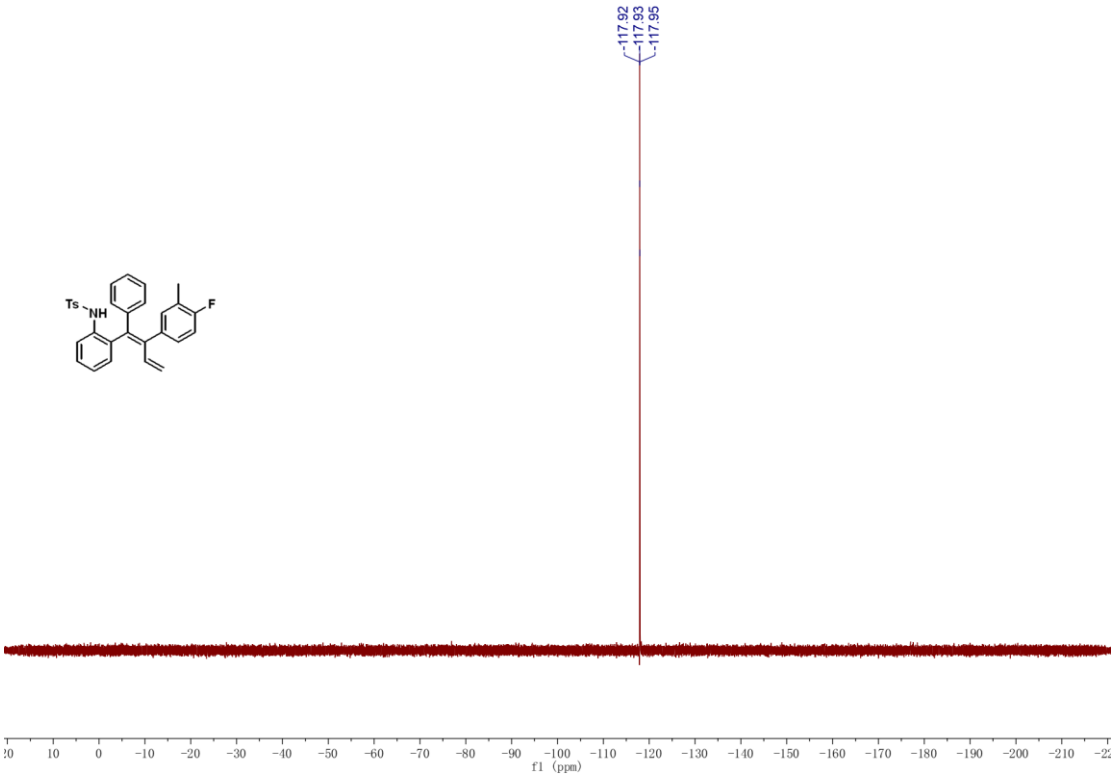


Figure S41. ^{19}F NMR (377 MHz, Chloroform-*d*) spectrum of 3al

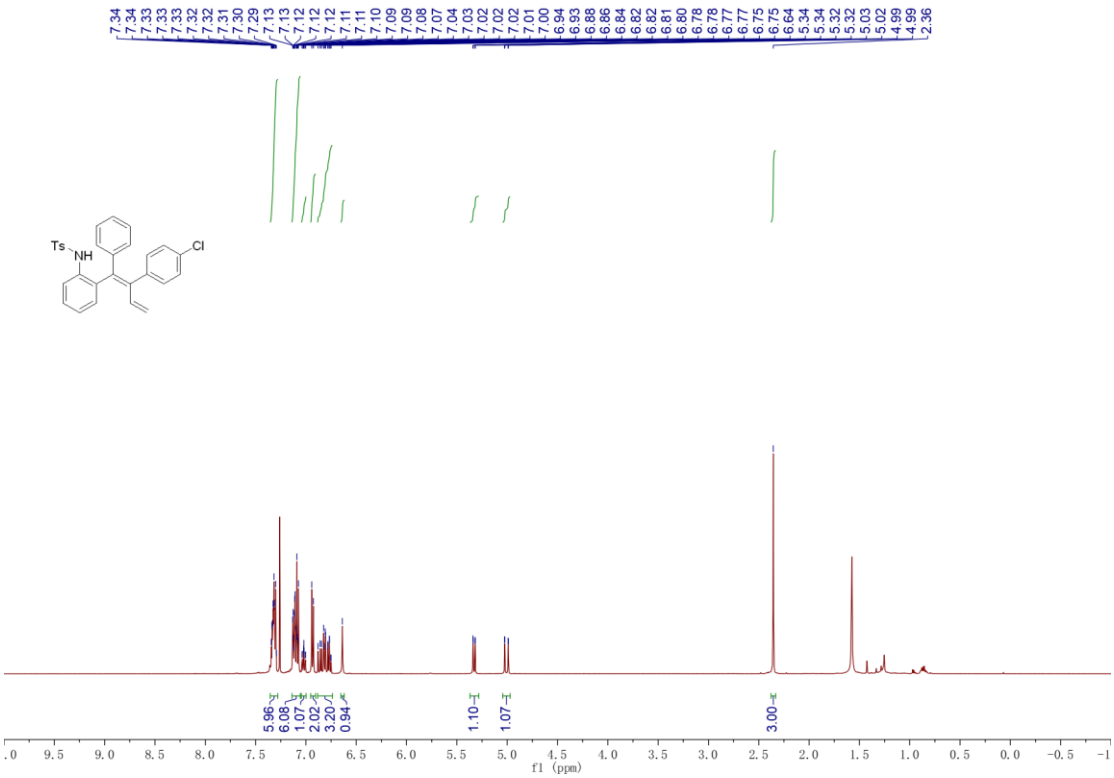


Figure S42. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3am

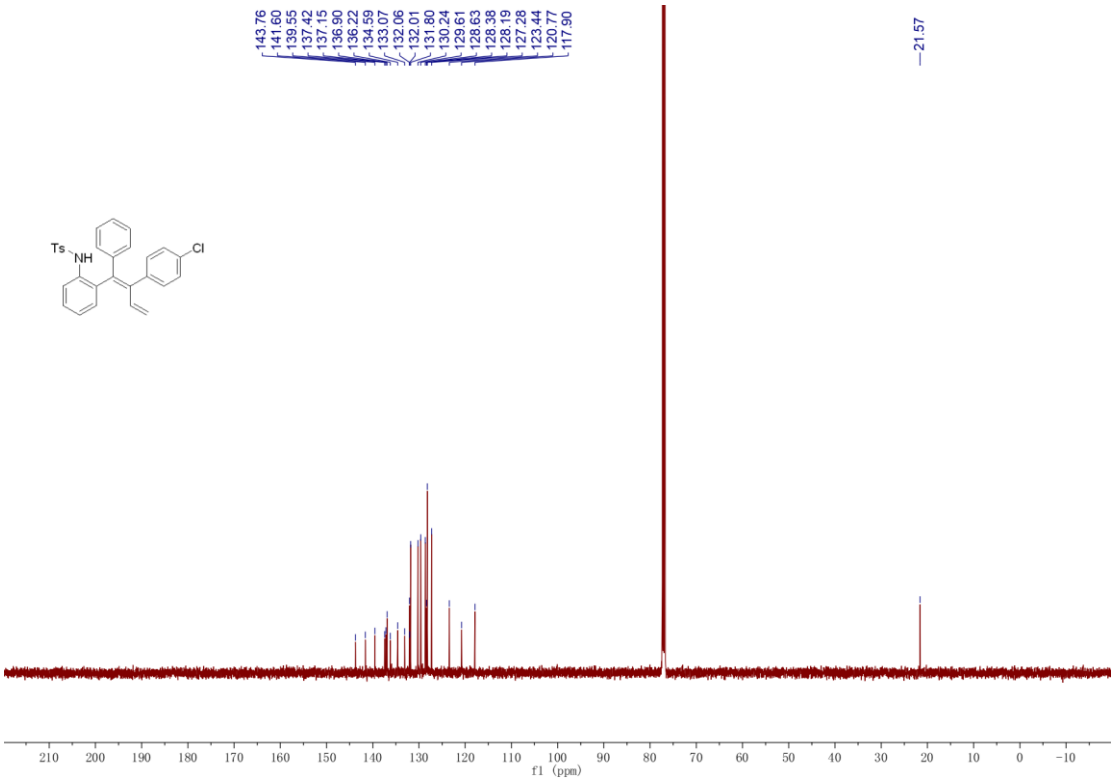


Figure S43. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3am

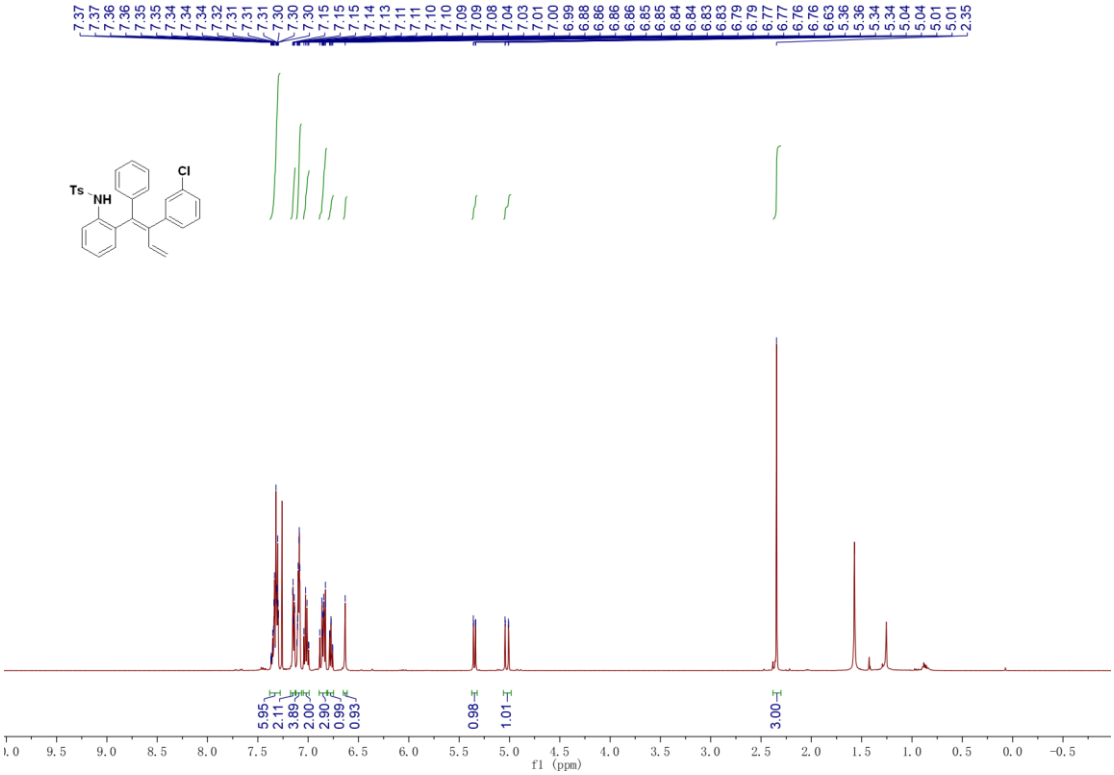


Figure S44. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3an

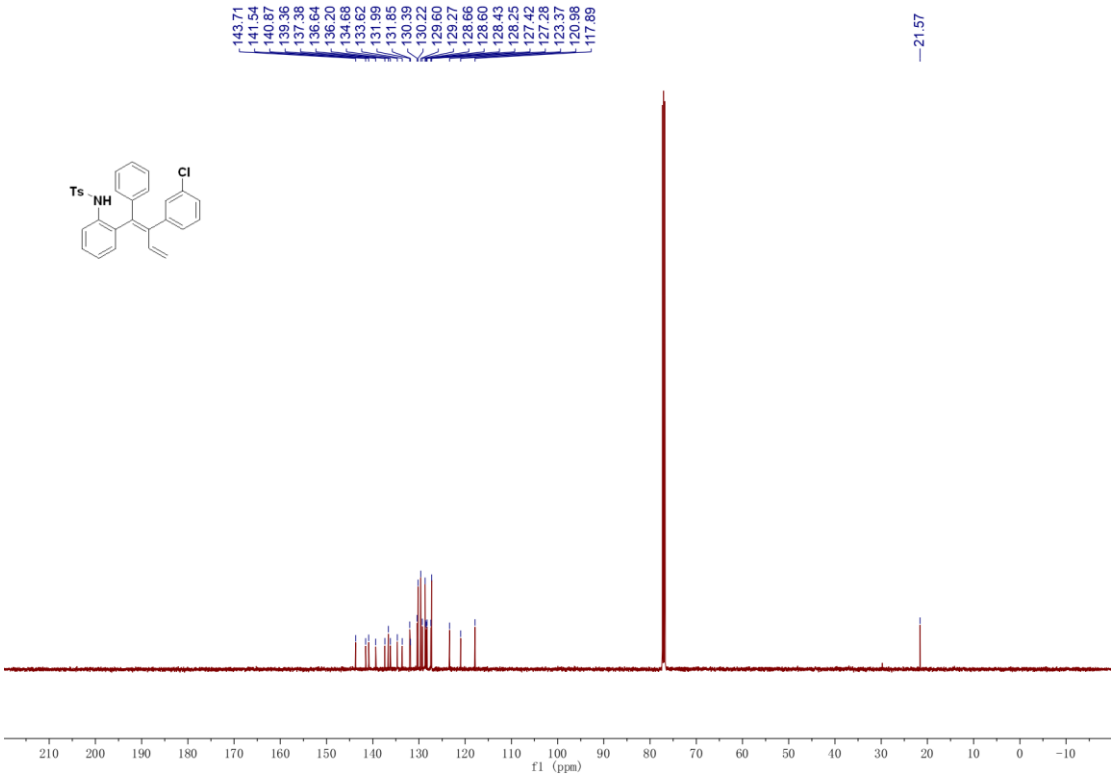


Figure S45. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3an

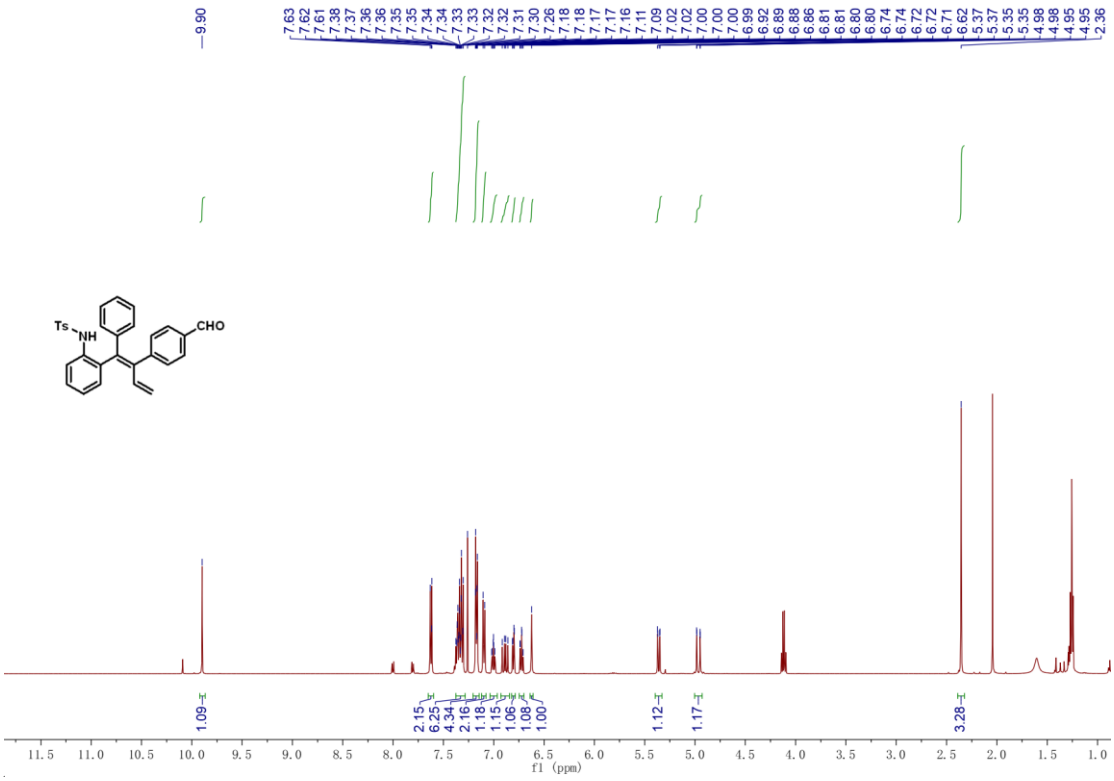


Figure S46. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ao

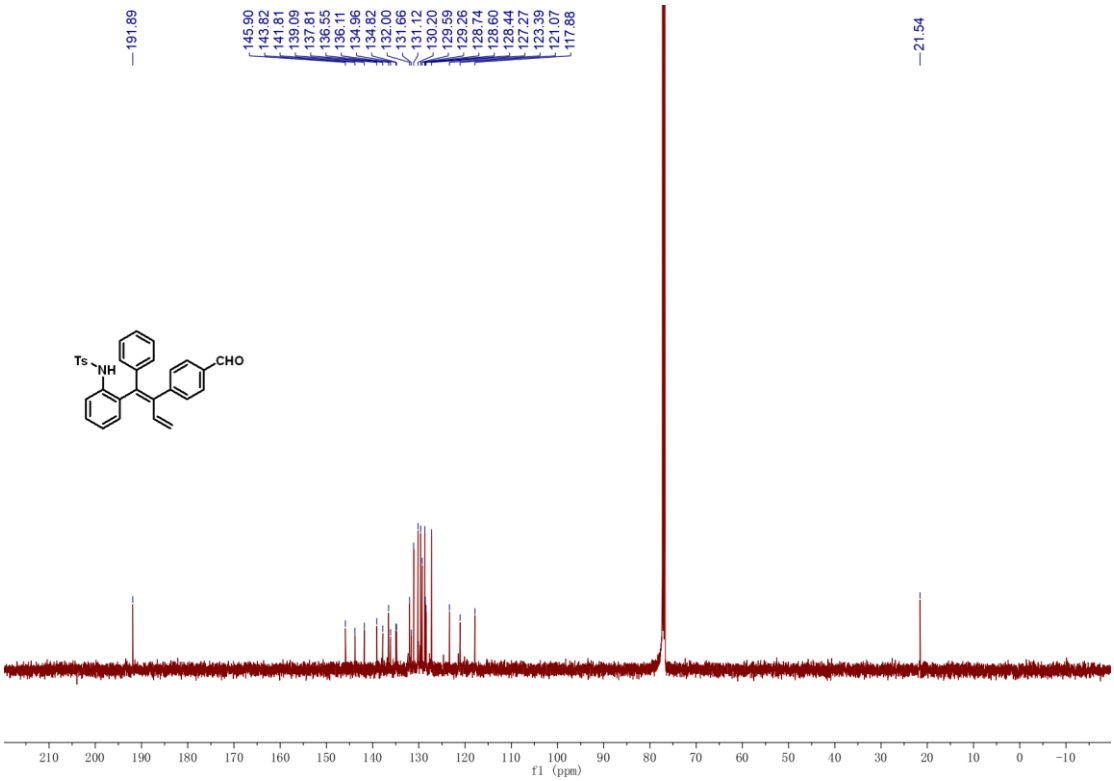


Figure S47. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ao

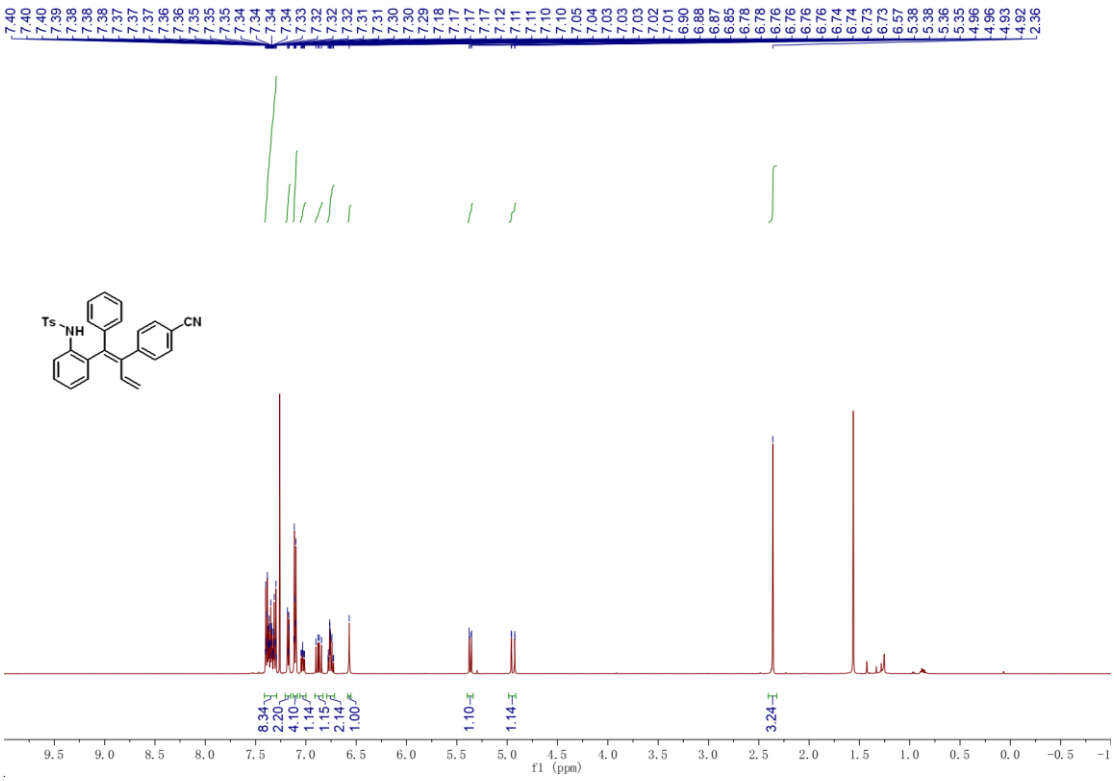


Figure S48. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ap

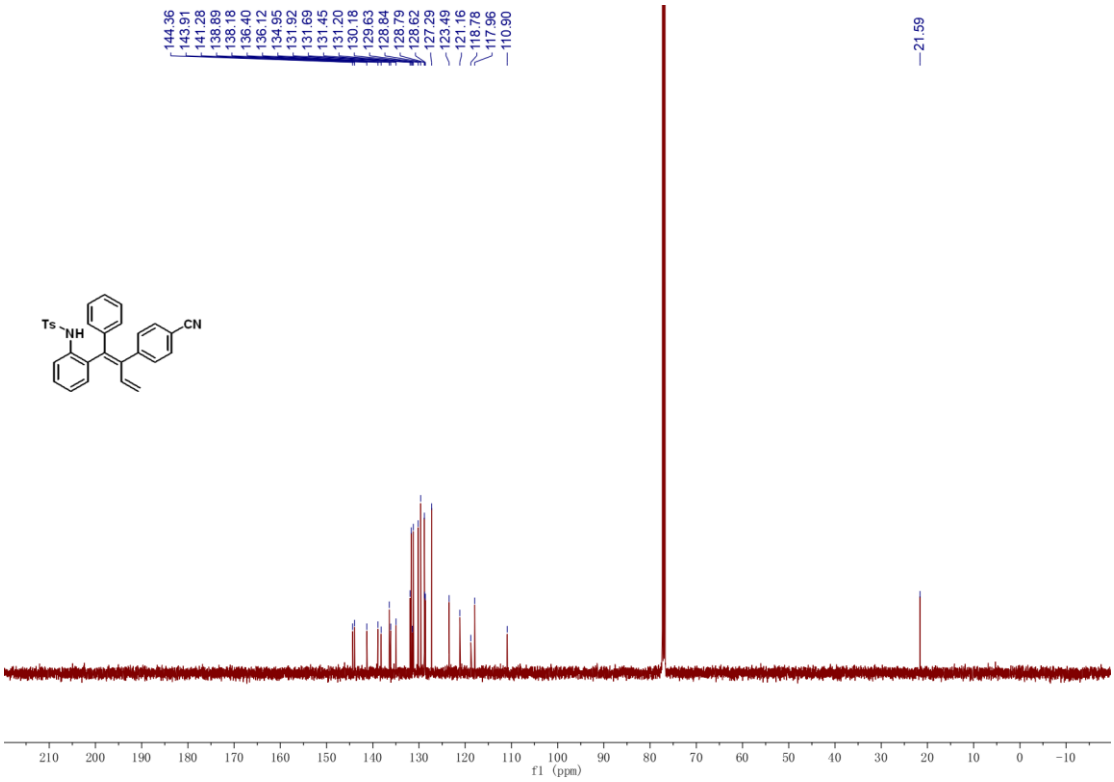


Figure S49. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ap

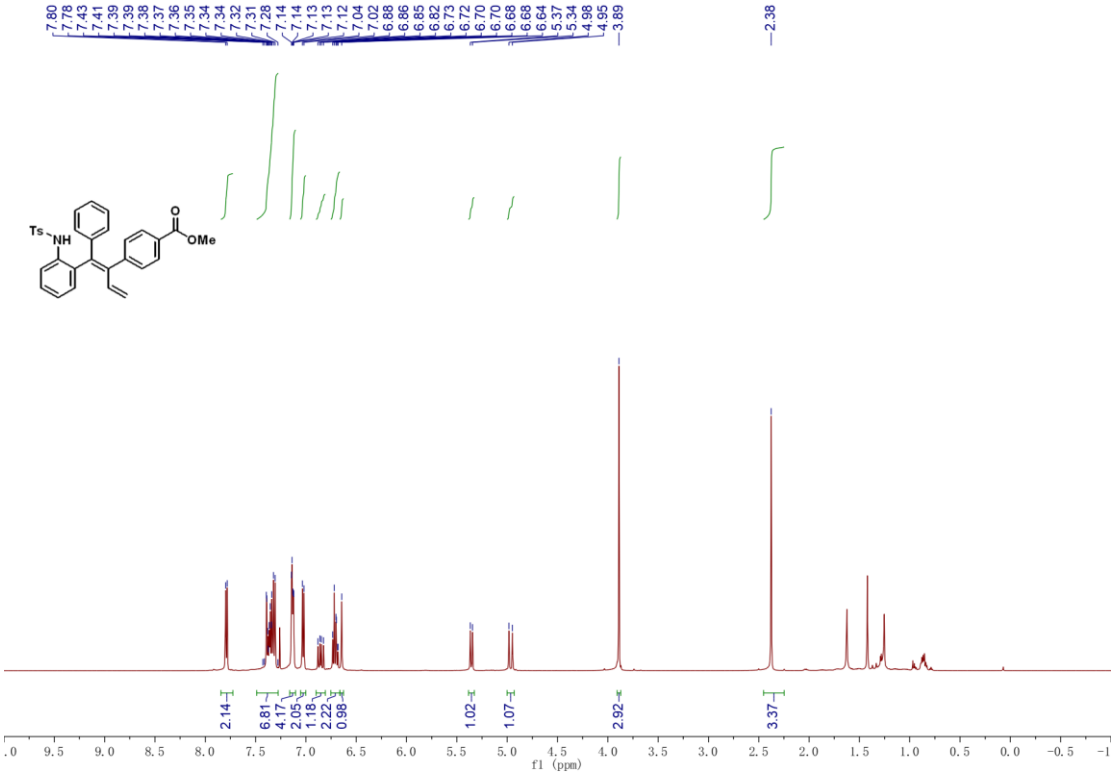


Figure S50. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3aq

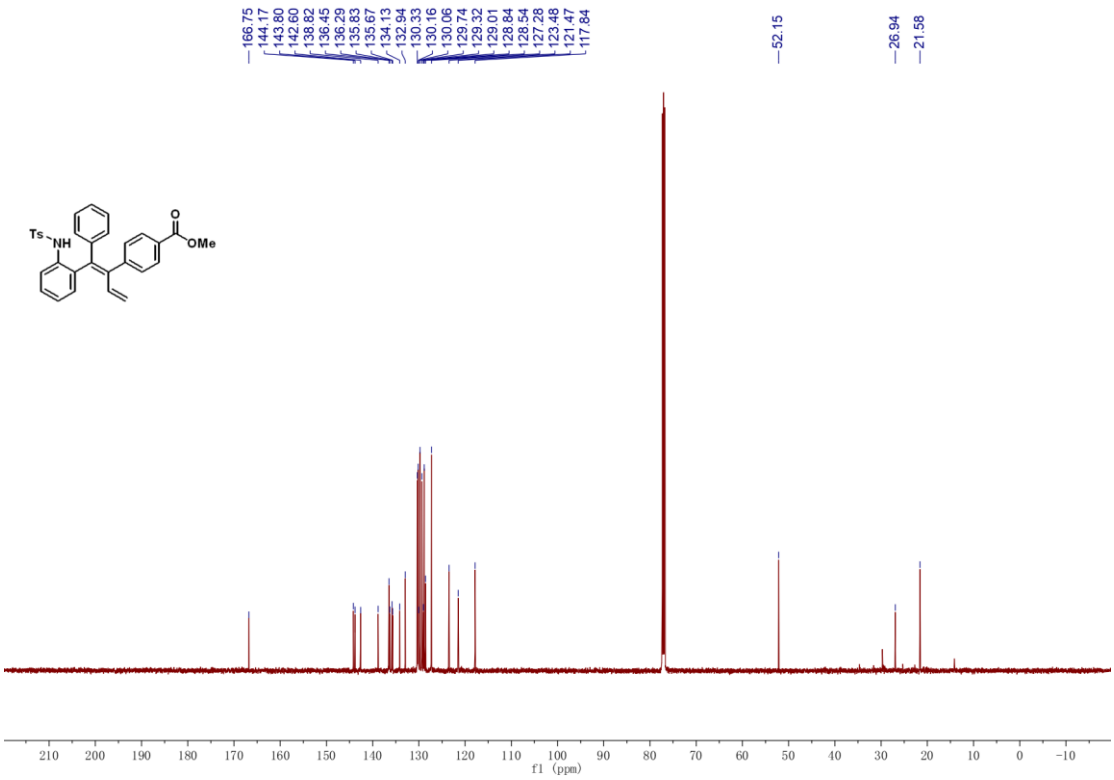


Figure S51. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3aq

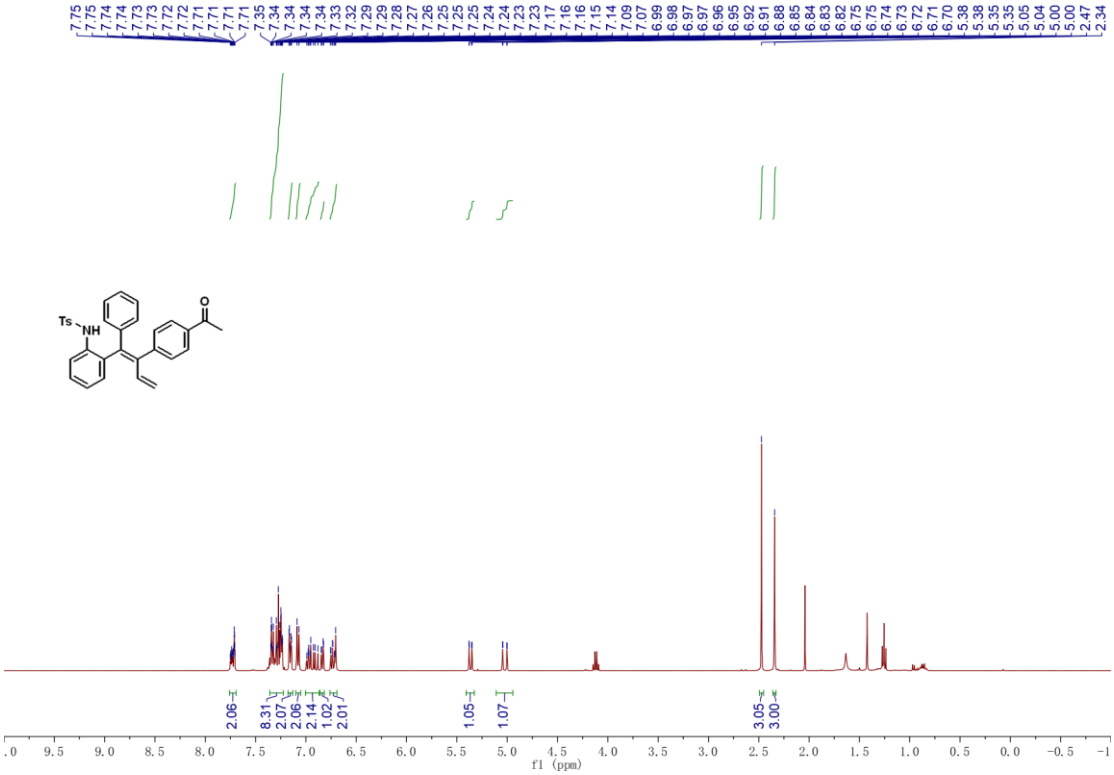


Figure S52. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ar

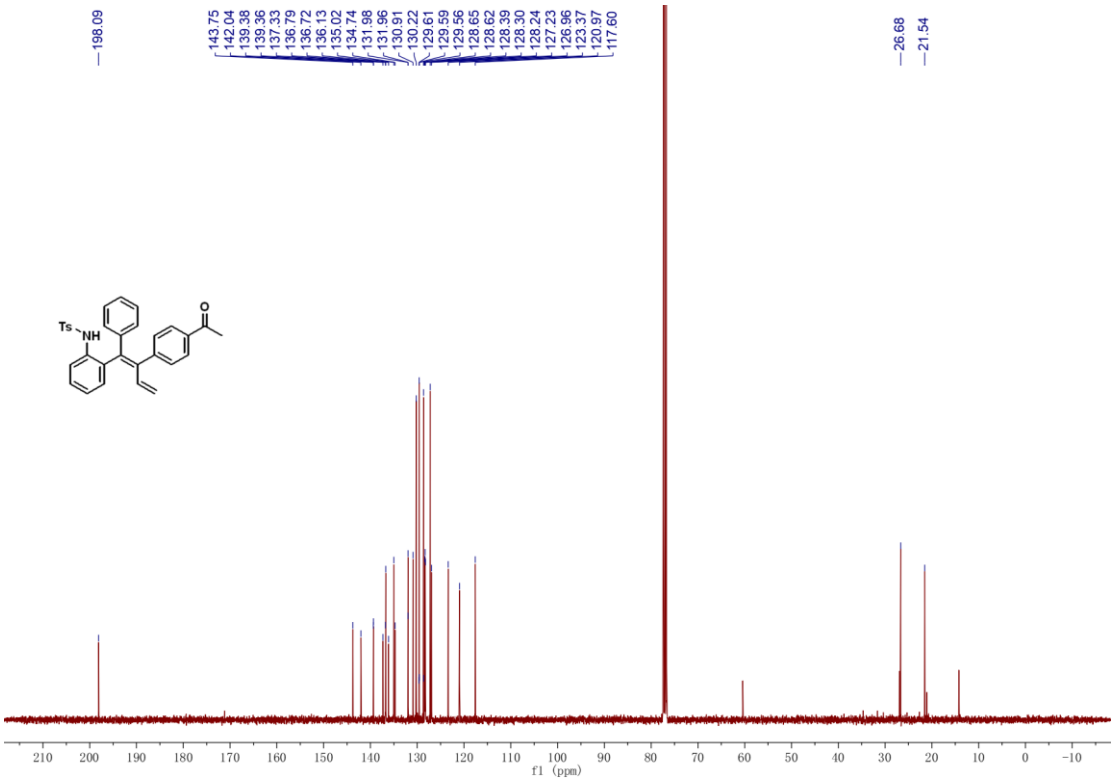


Figure S53. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ar

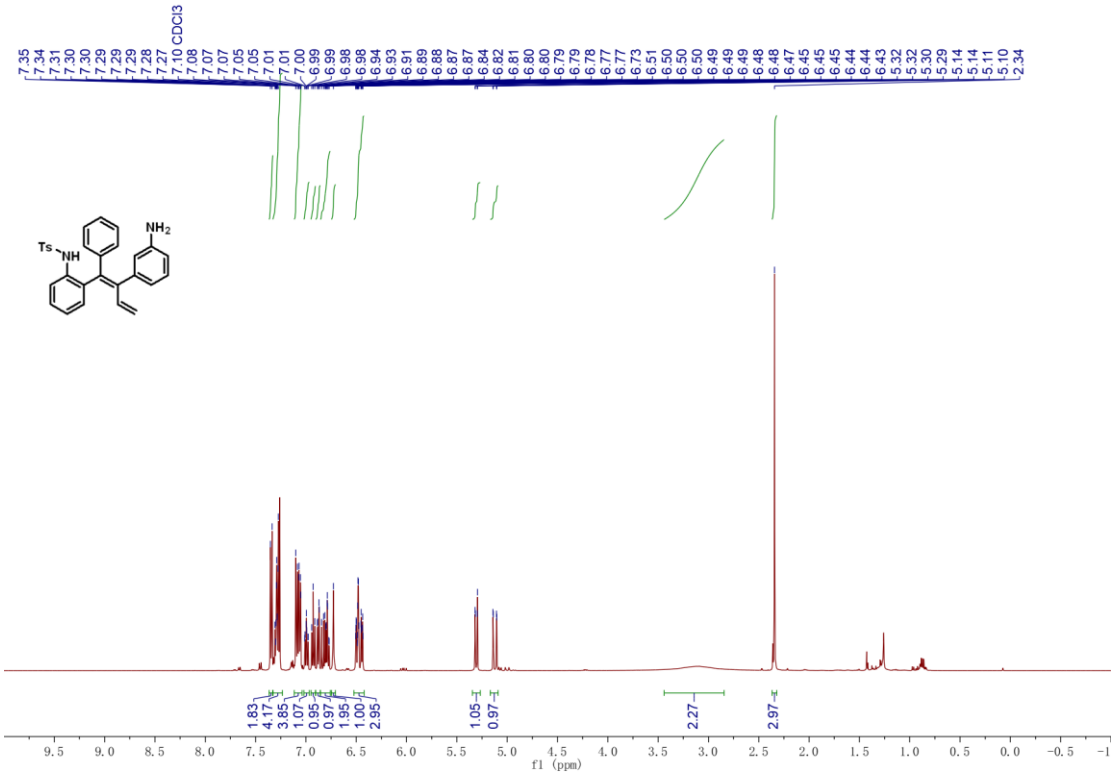


Figure S54. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3as

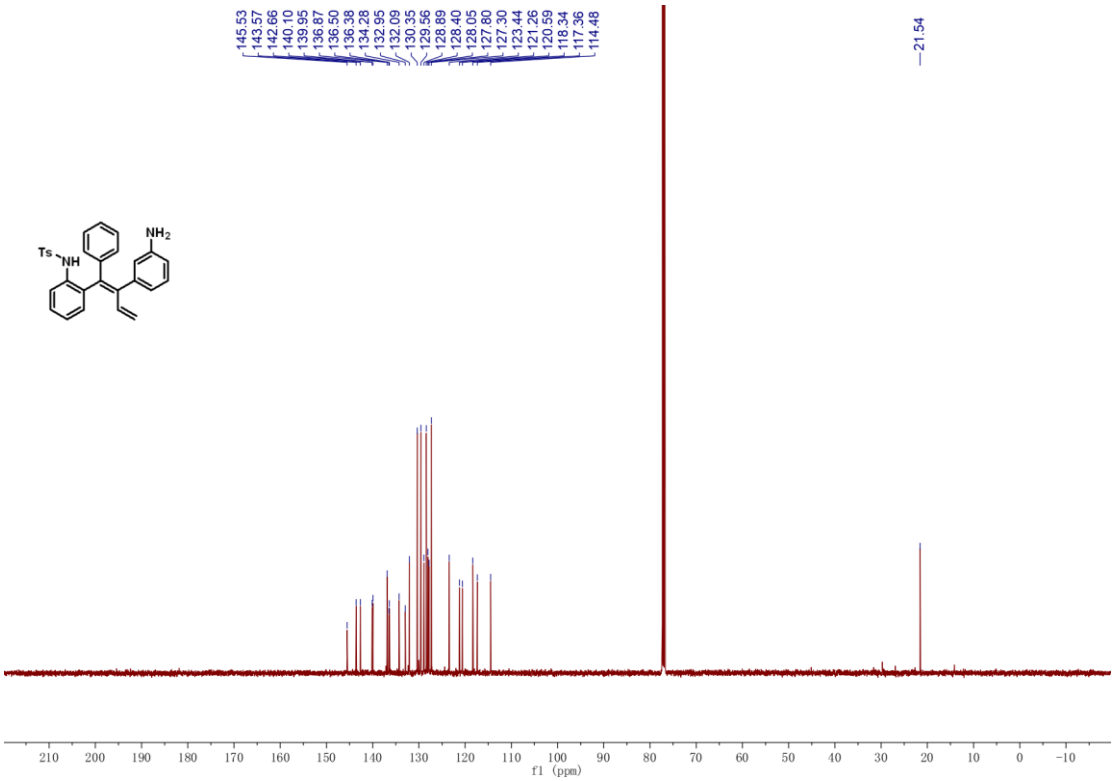


Figure S55. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3as

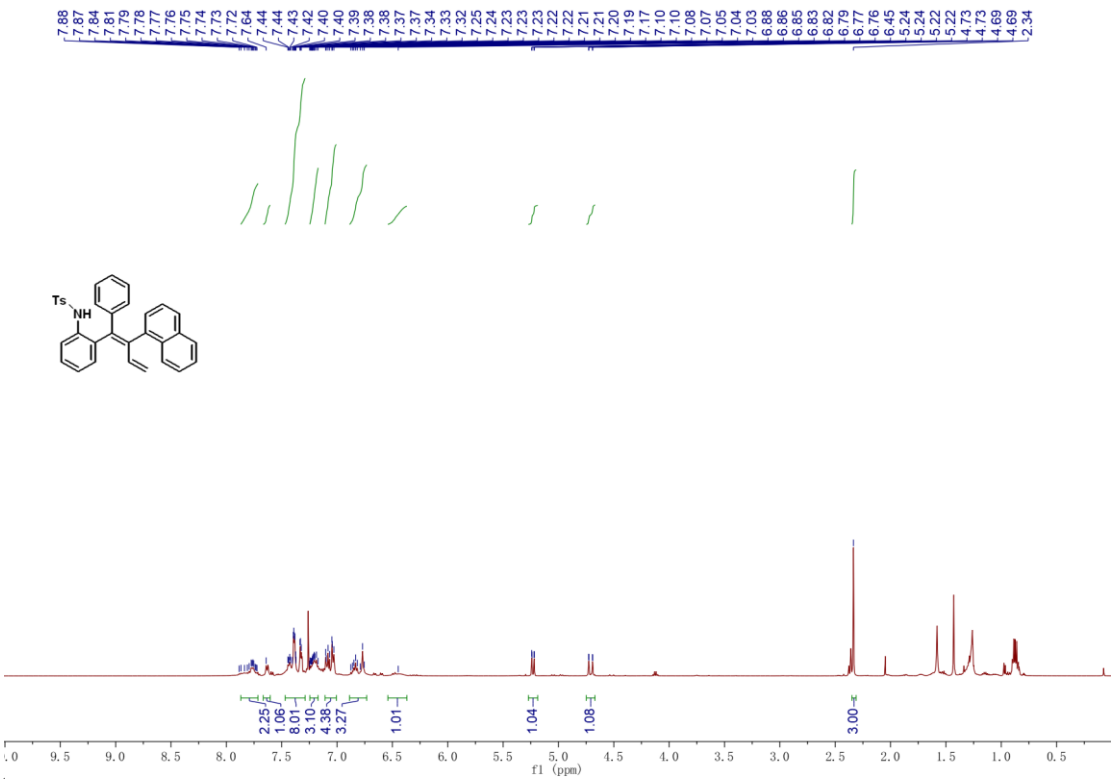


Figure S56. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3at

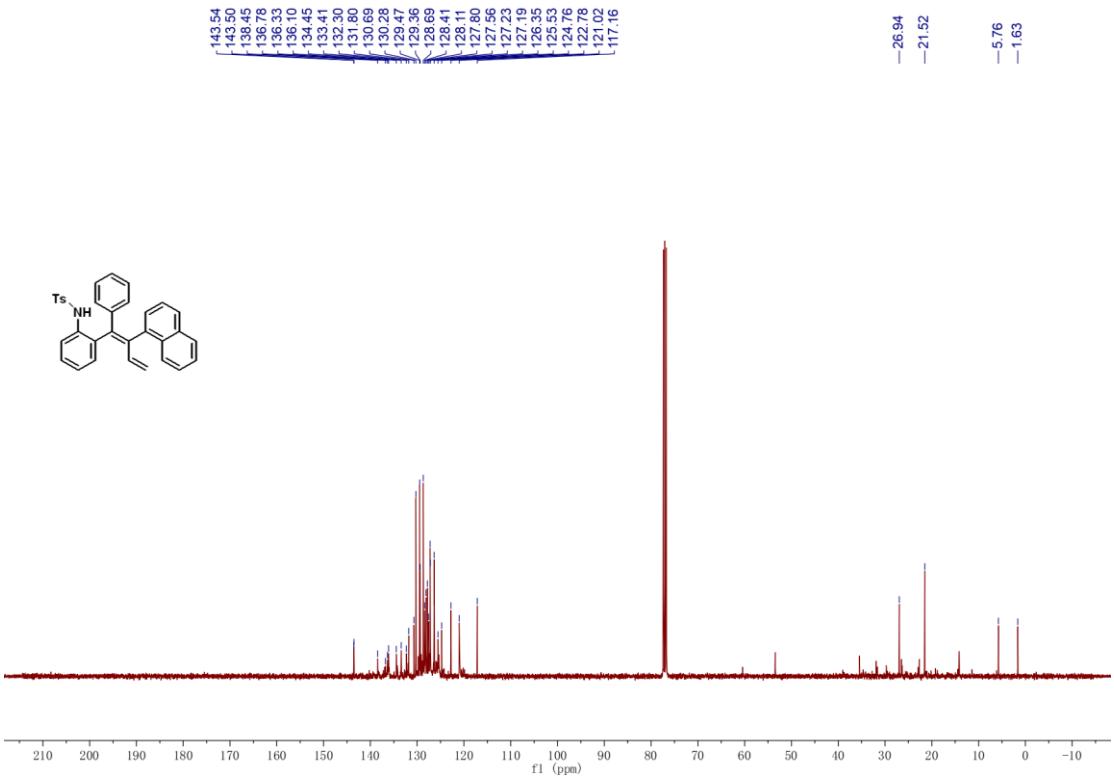


Figure S57. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3at

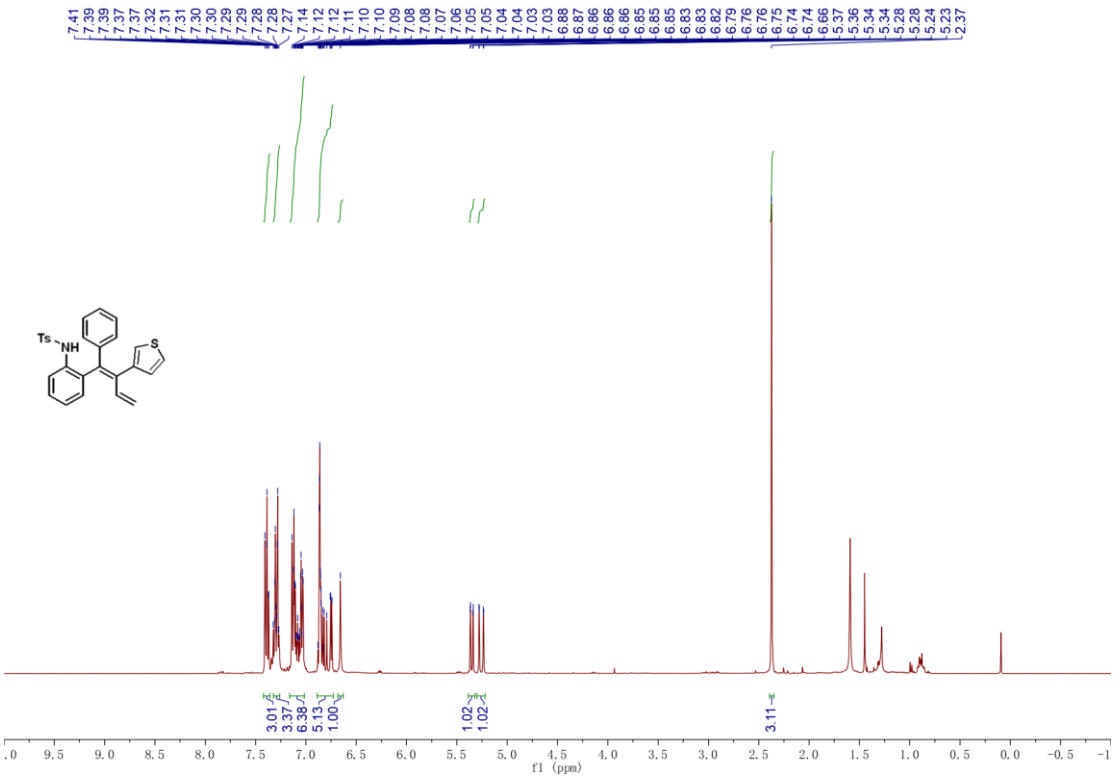


Figure S58. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3au

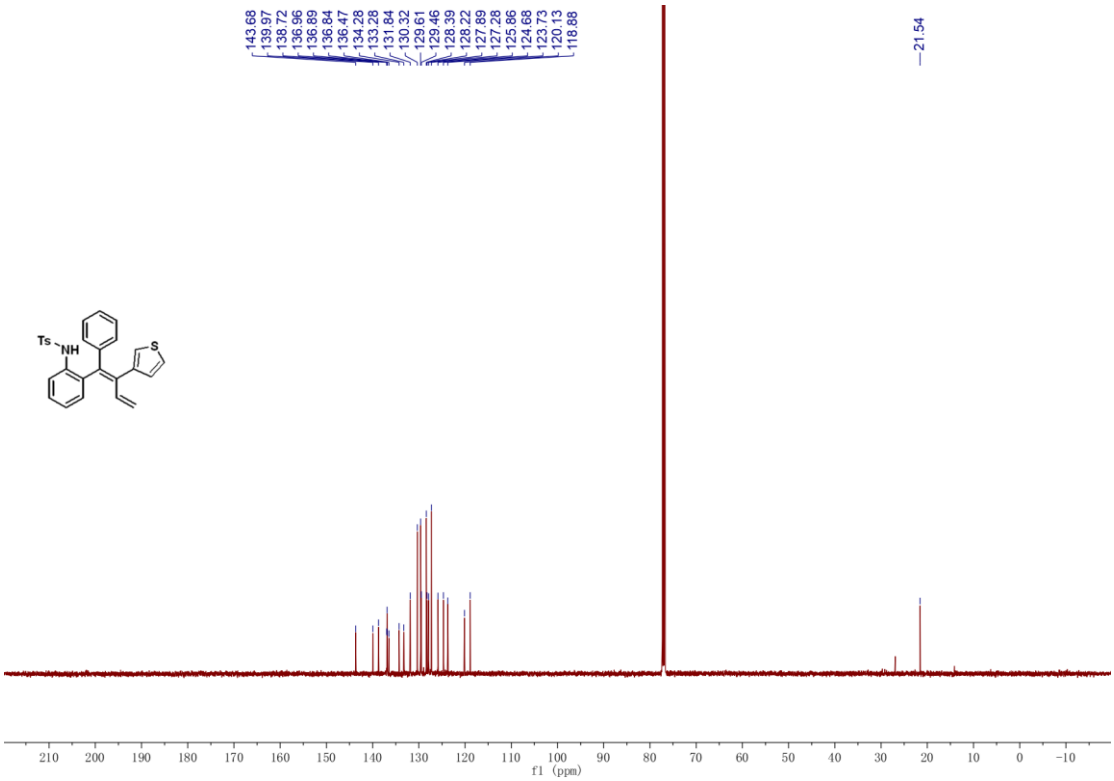


Figure S59. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3au

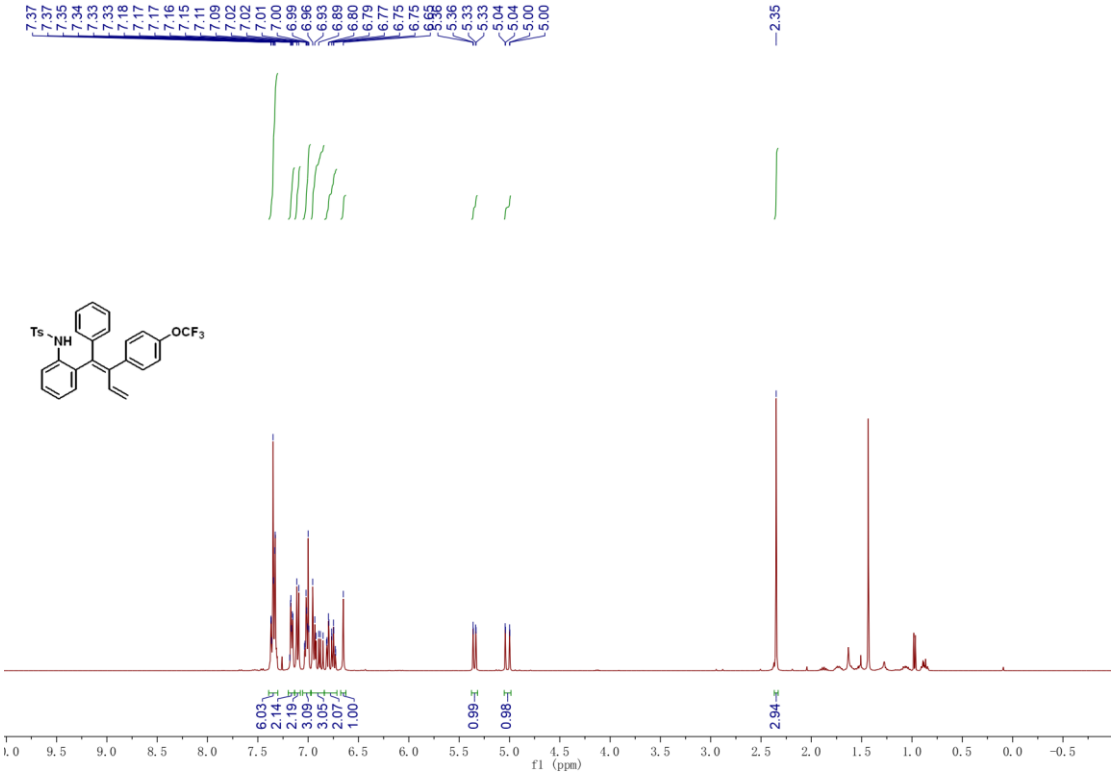


Figure S60. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3av

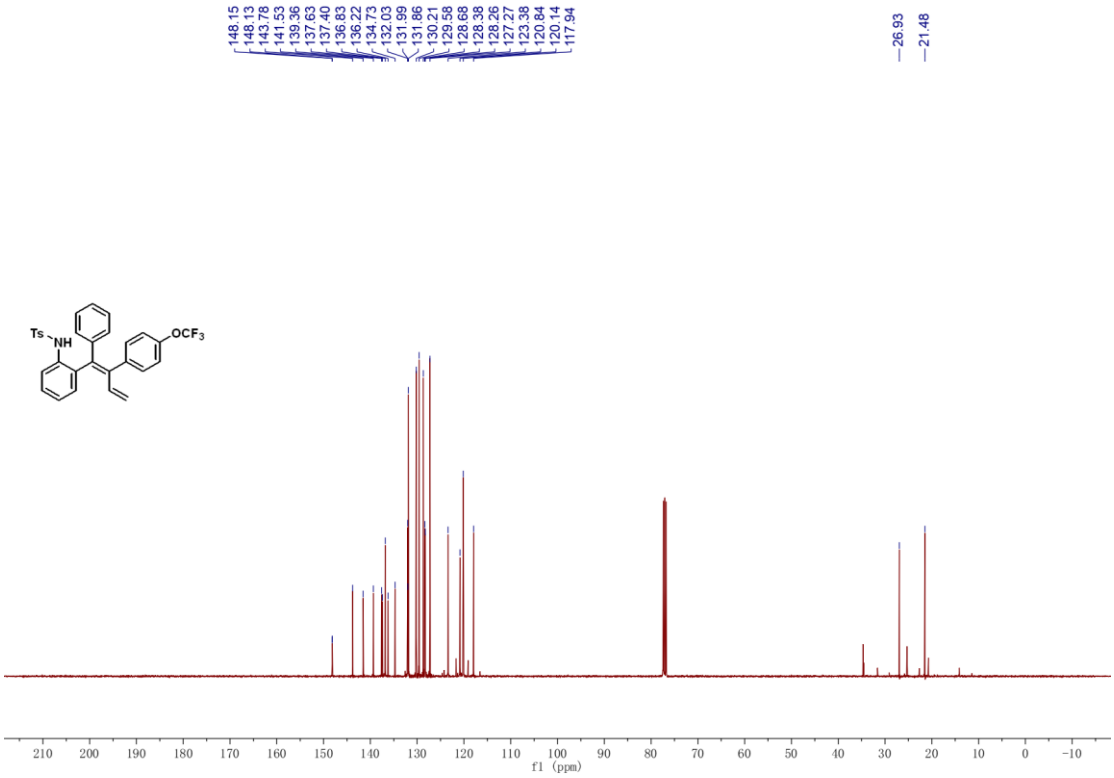


Figure S61. 13C NMR (126 MHz, $CDCl_3$) spectrum of 3av

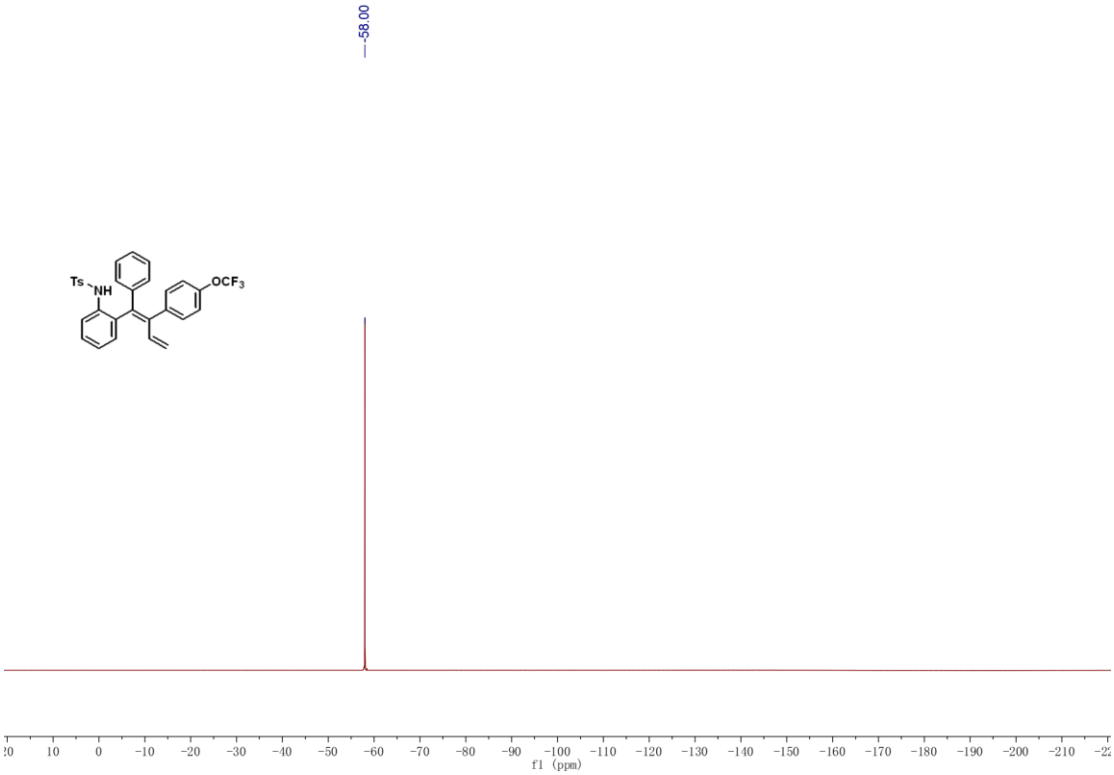


Figure S62. ^{19}F NMR (377 MHz,$CDCl_3$) spectrum of 3av

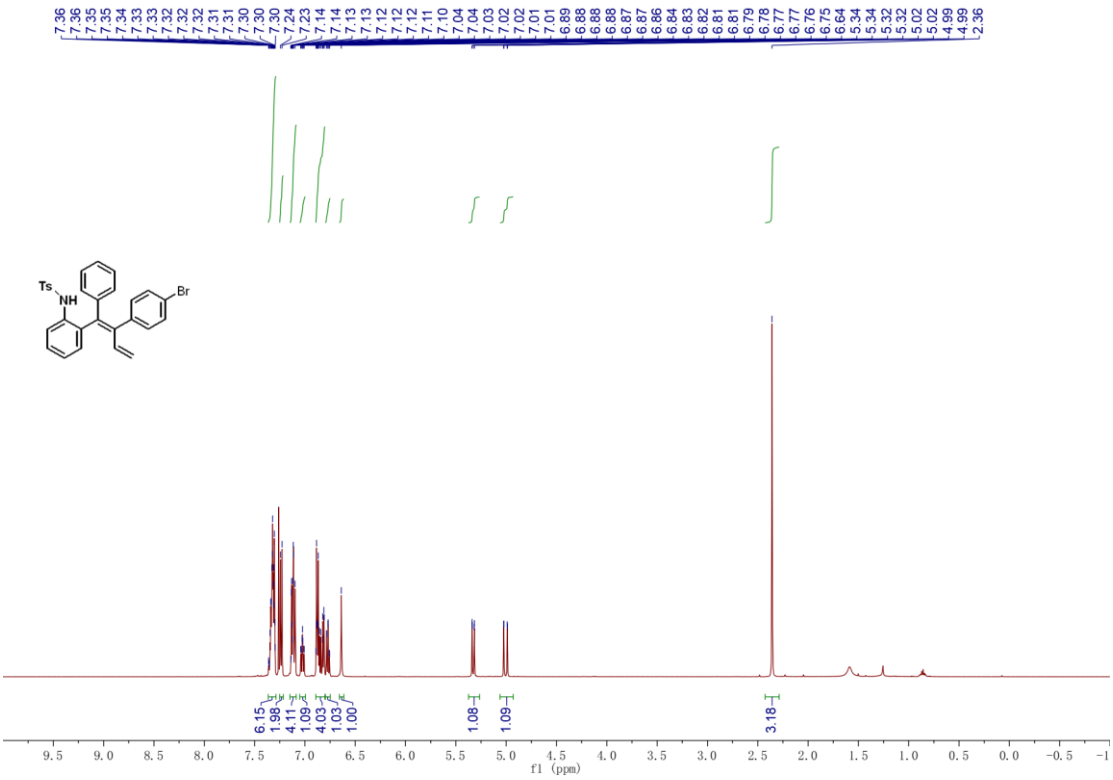


Figure S63. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3aw

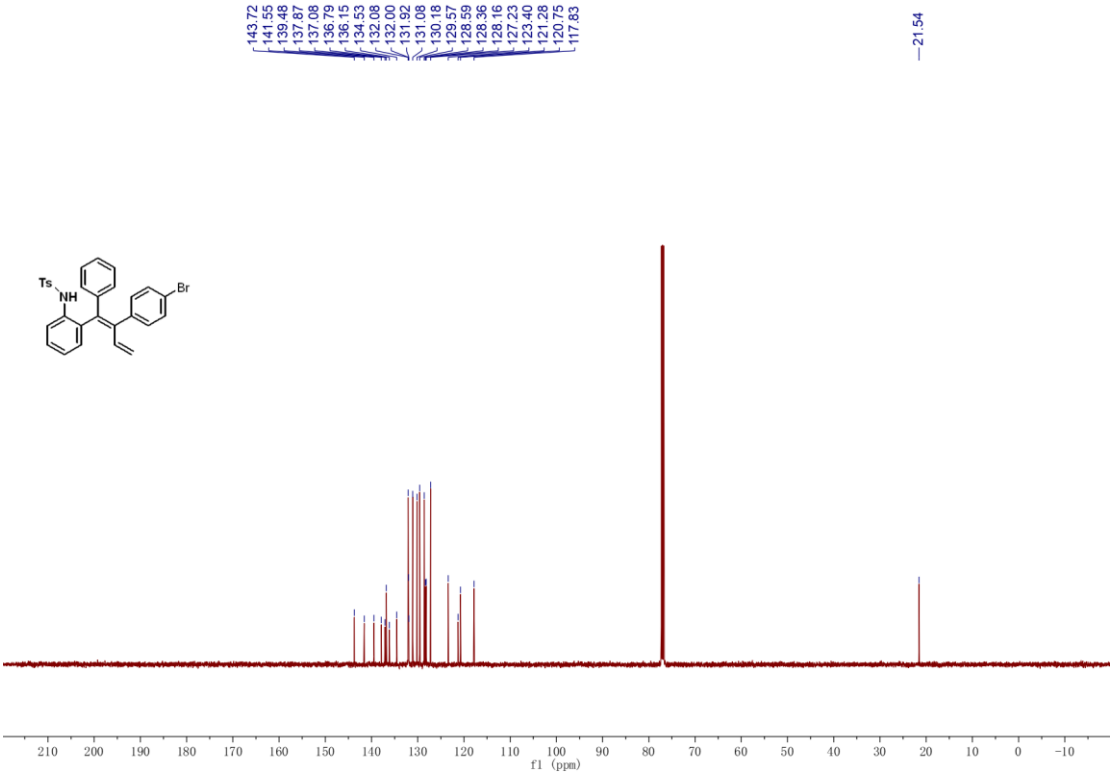


Figure S64. 13C NMR (126 MHz, $CDCl_3$) spectrum of 3aw

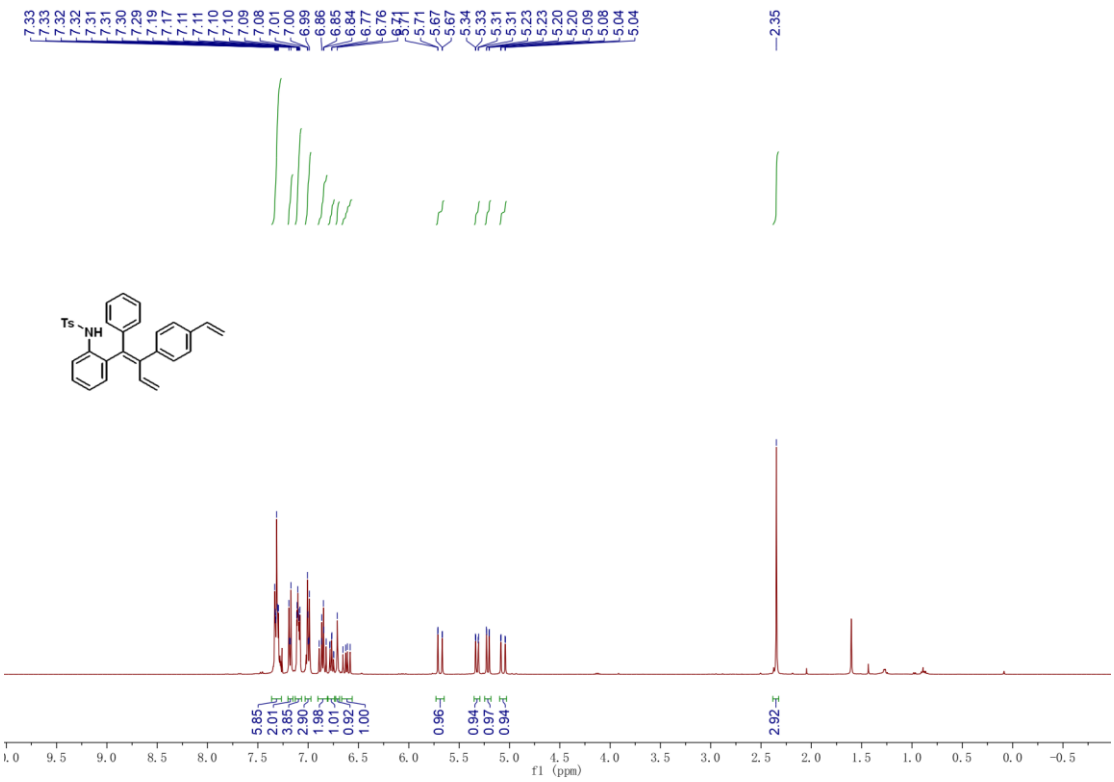


Figure S65. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ax

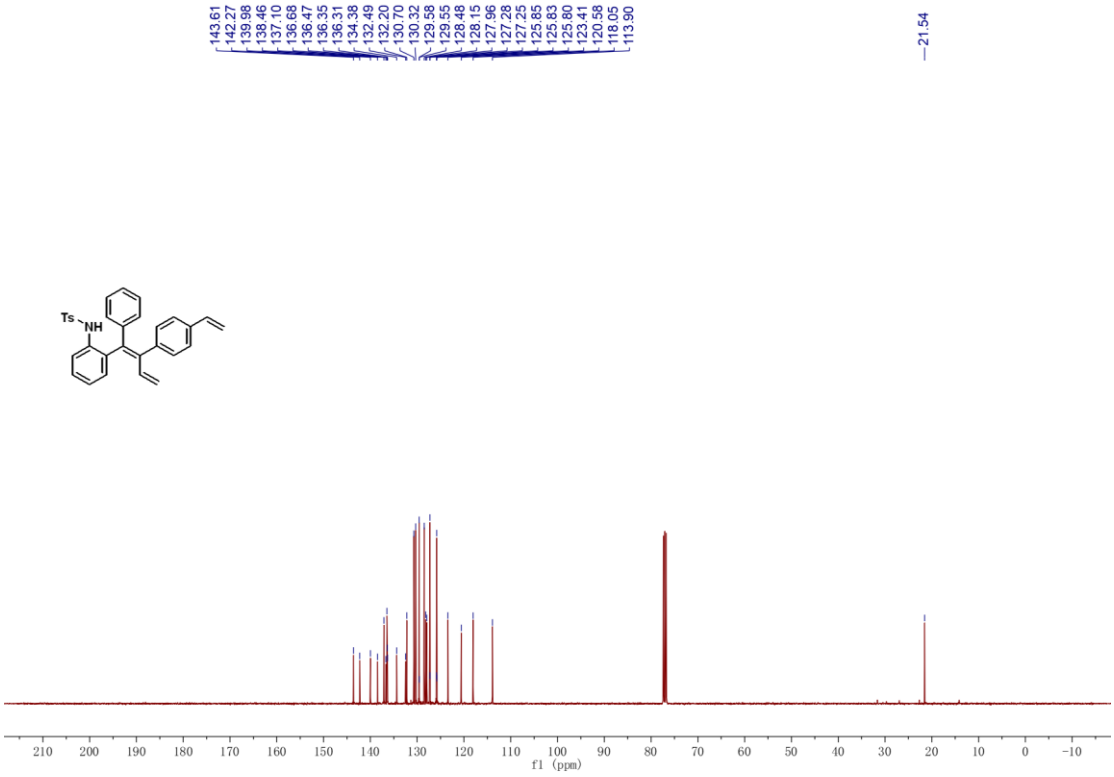


Figure S66. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ax

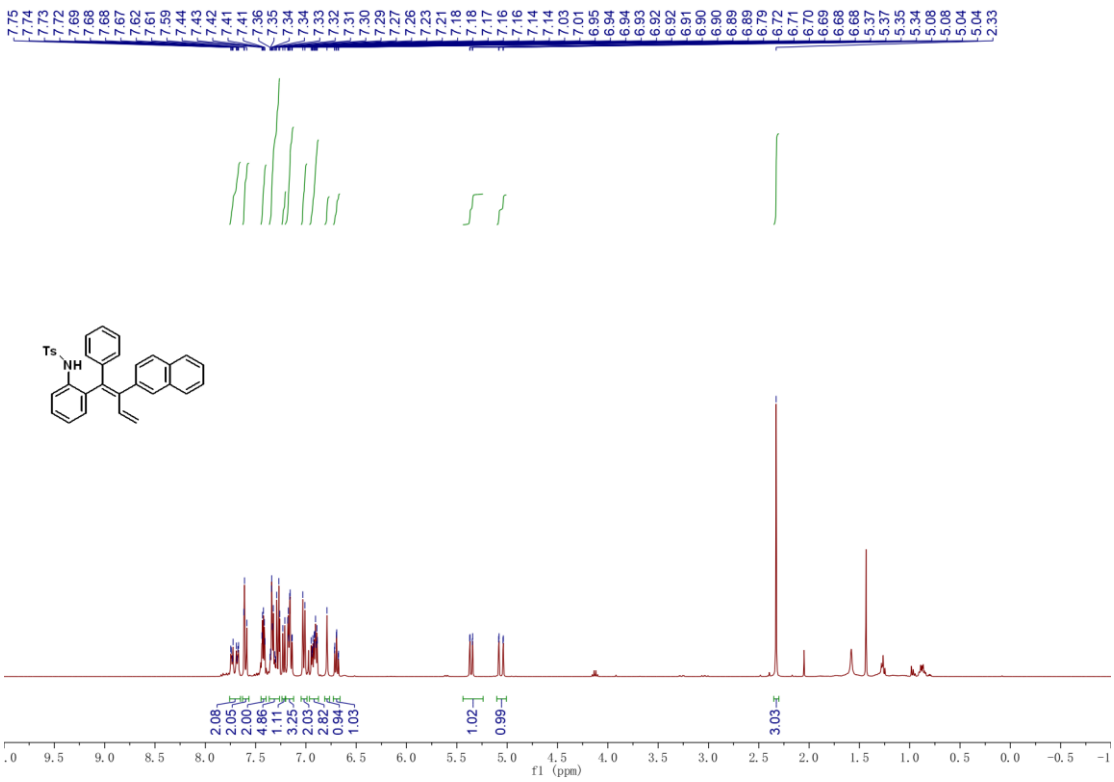


Figure S67. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3az

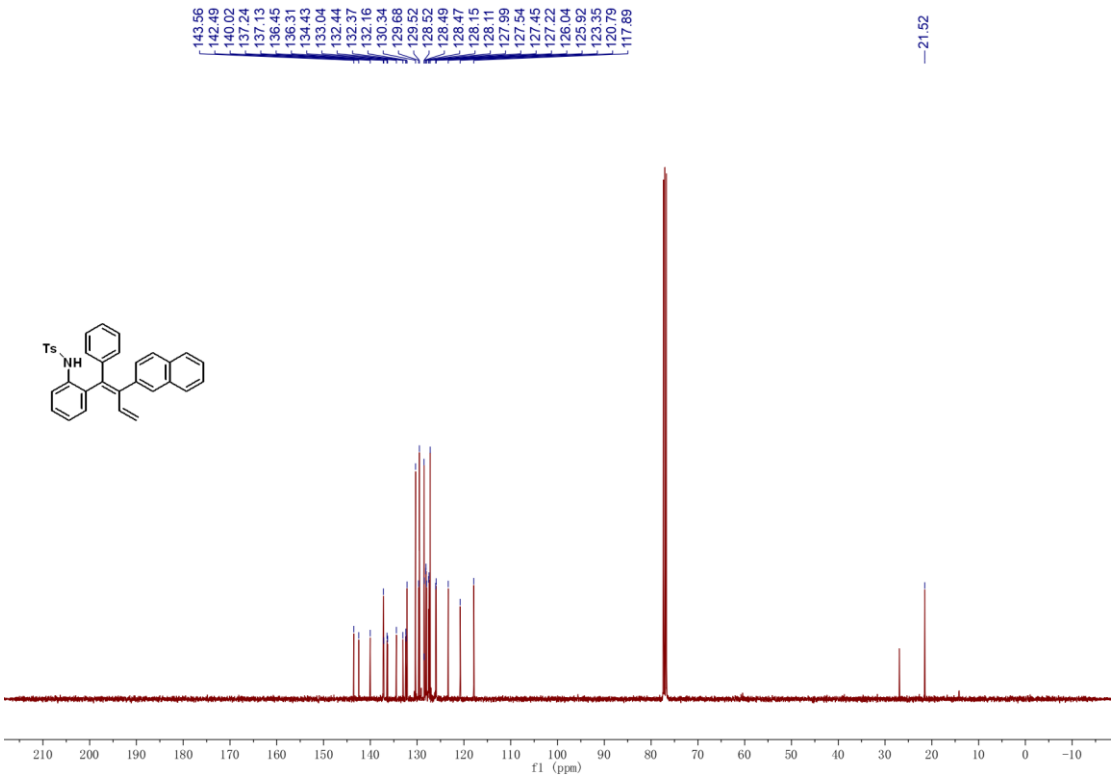


Figure S68. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3az

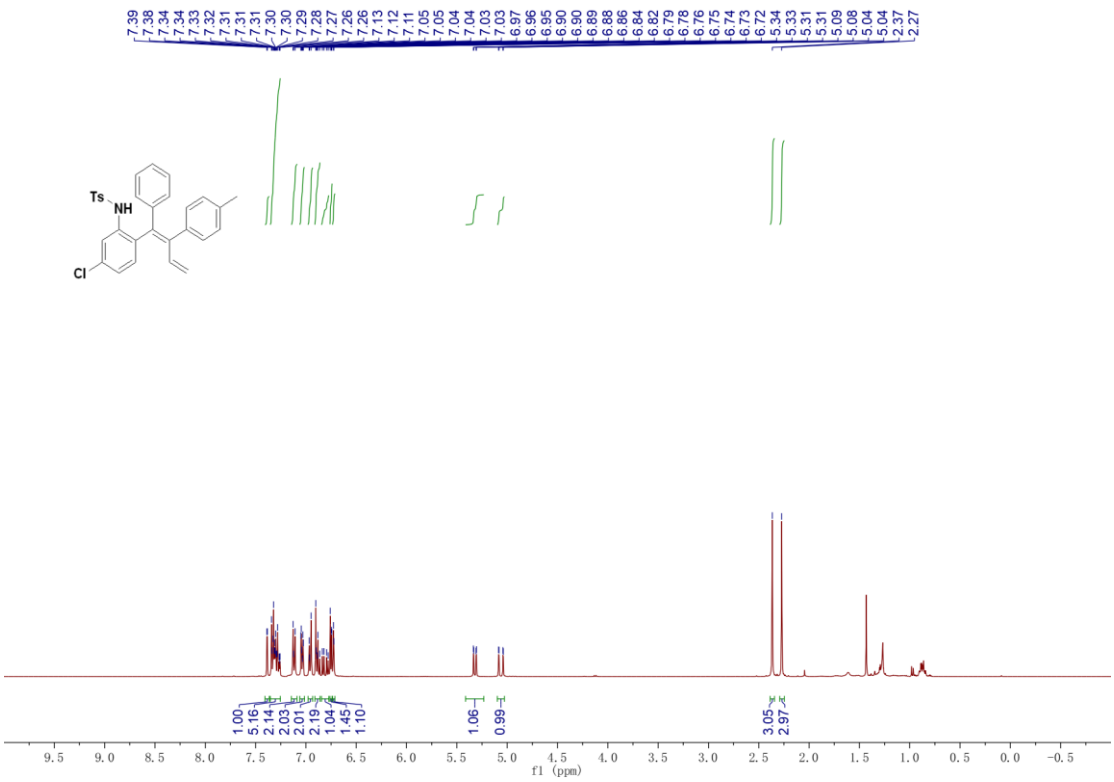


Figure S69. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3bb

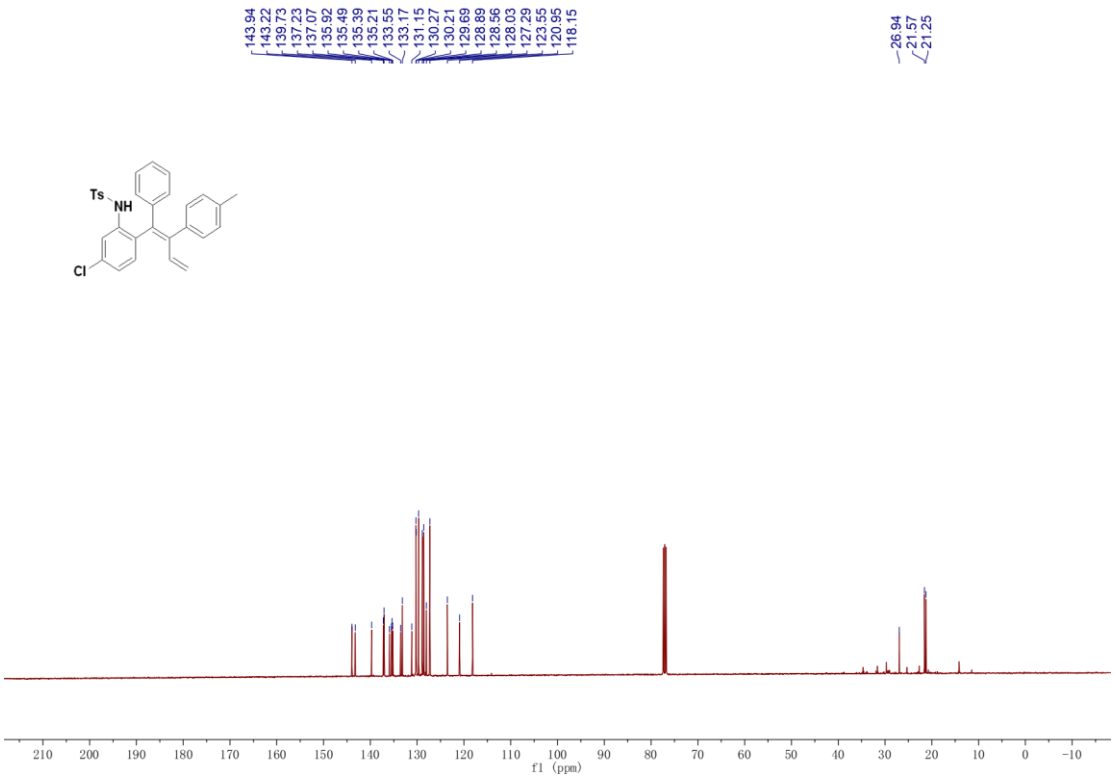


Figure S70. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3bb

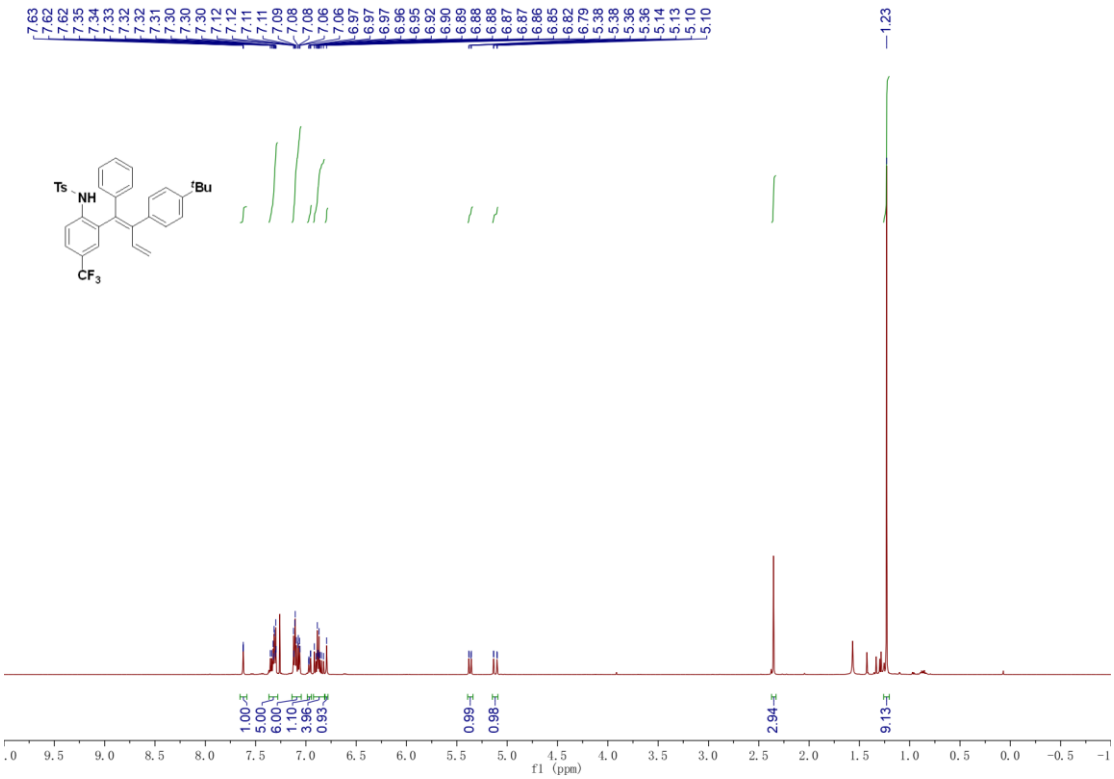


Figure S71. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ce

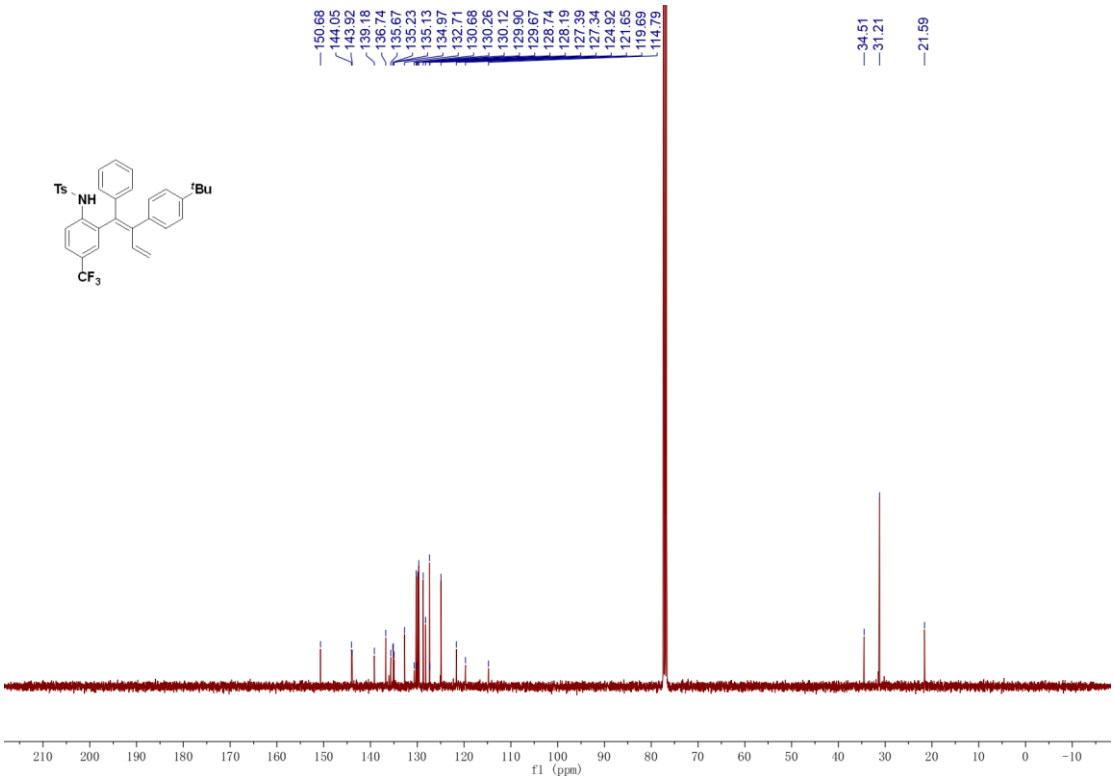


Figure S72. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ce

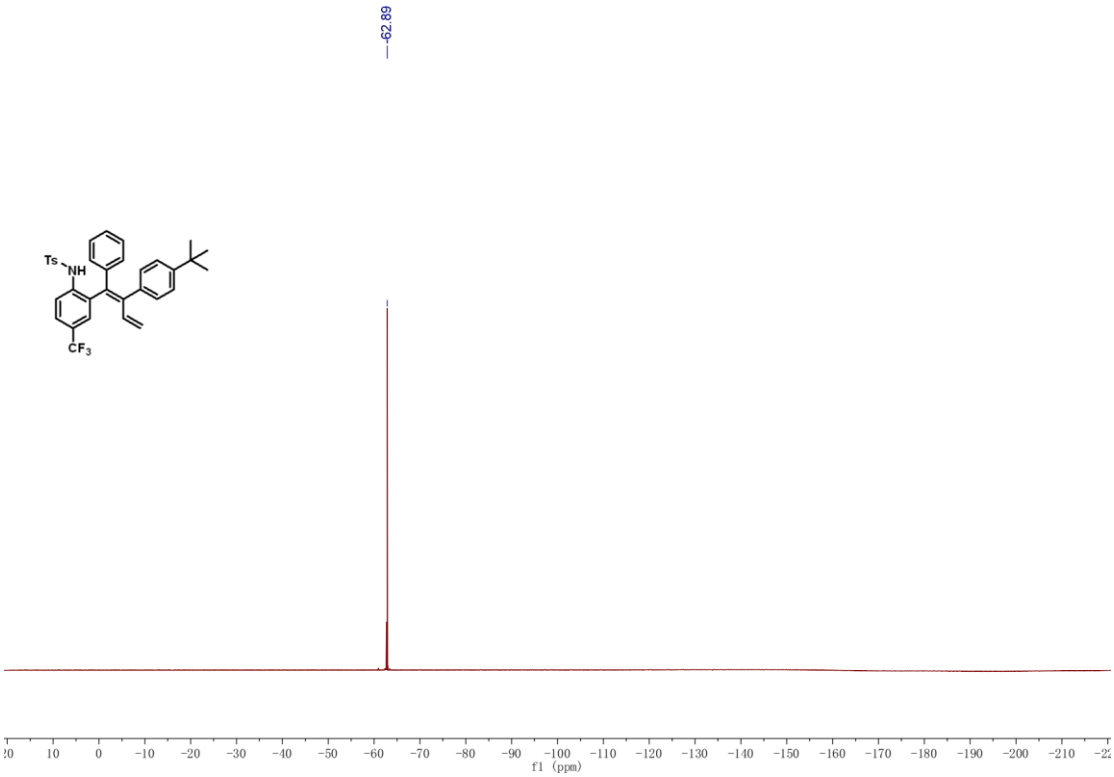


Figure S73. ^{19}F NMR (377 MHz, $CDCl_3$) spectrum of 3ce

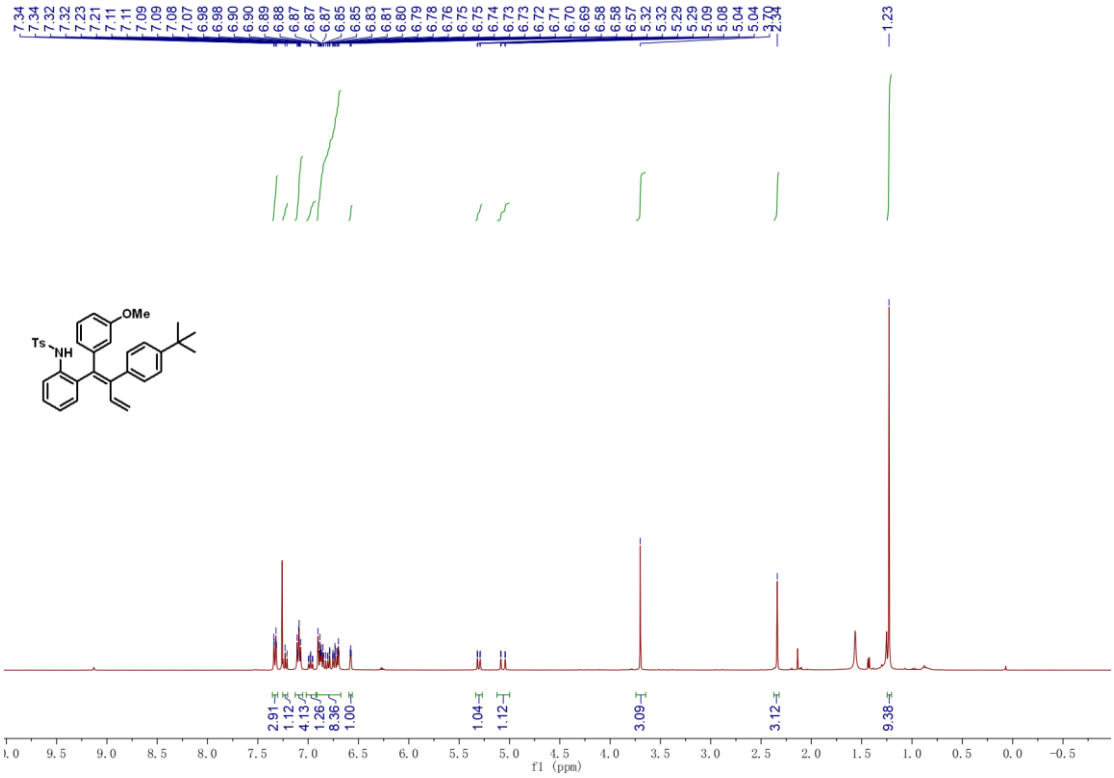


Figure S74. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3de

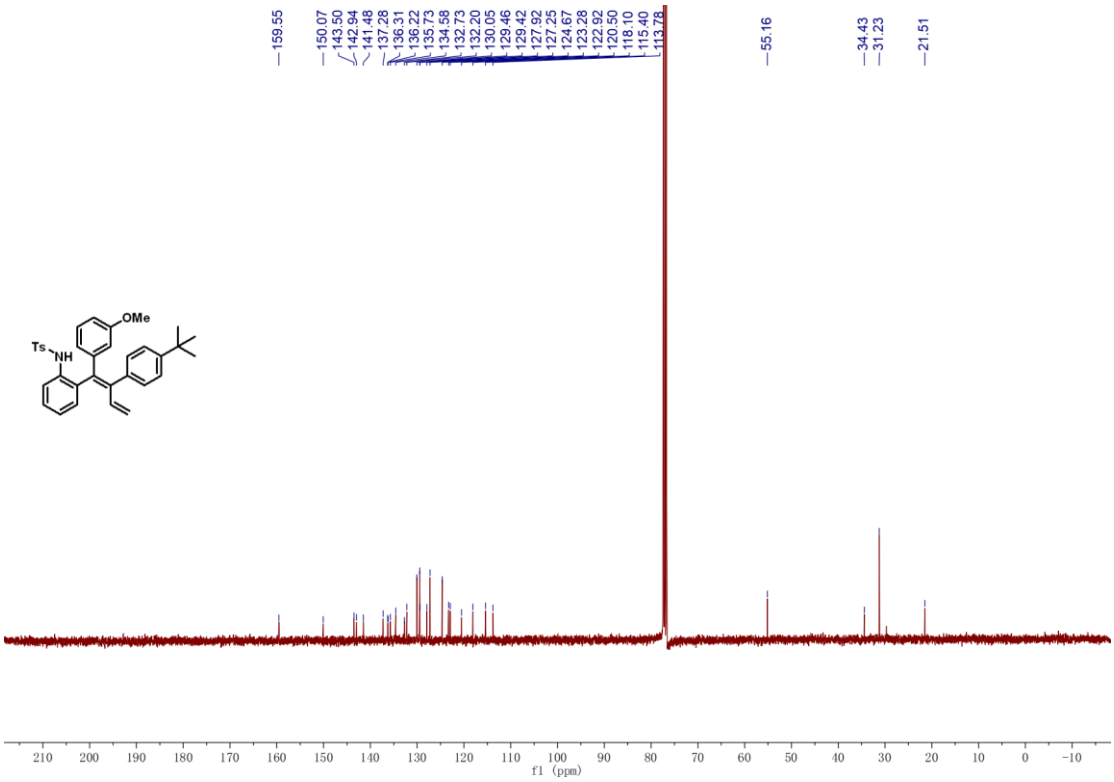


Figure S75. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3de

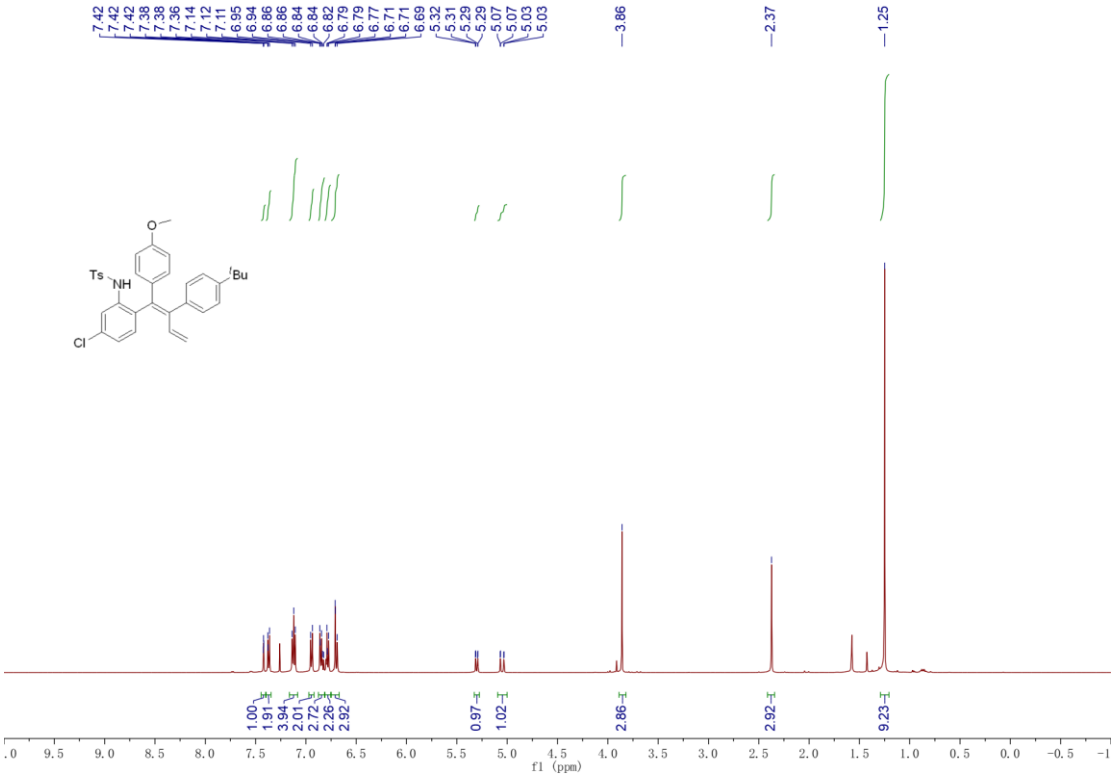


Figure S76. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ee

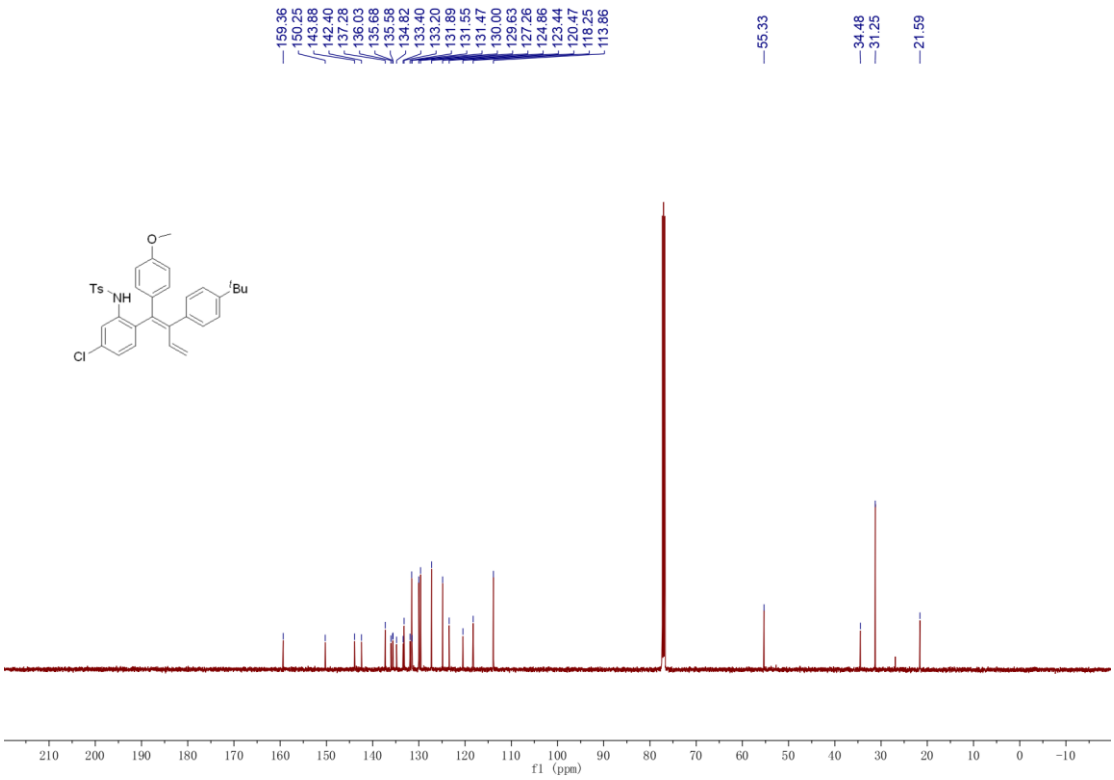


Figure S77. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ee

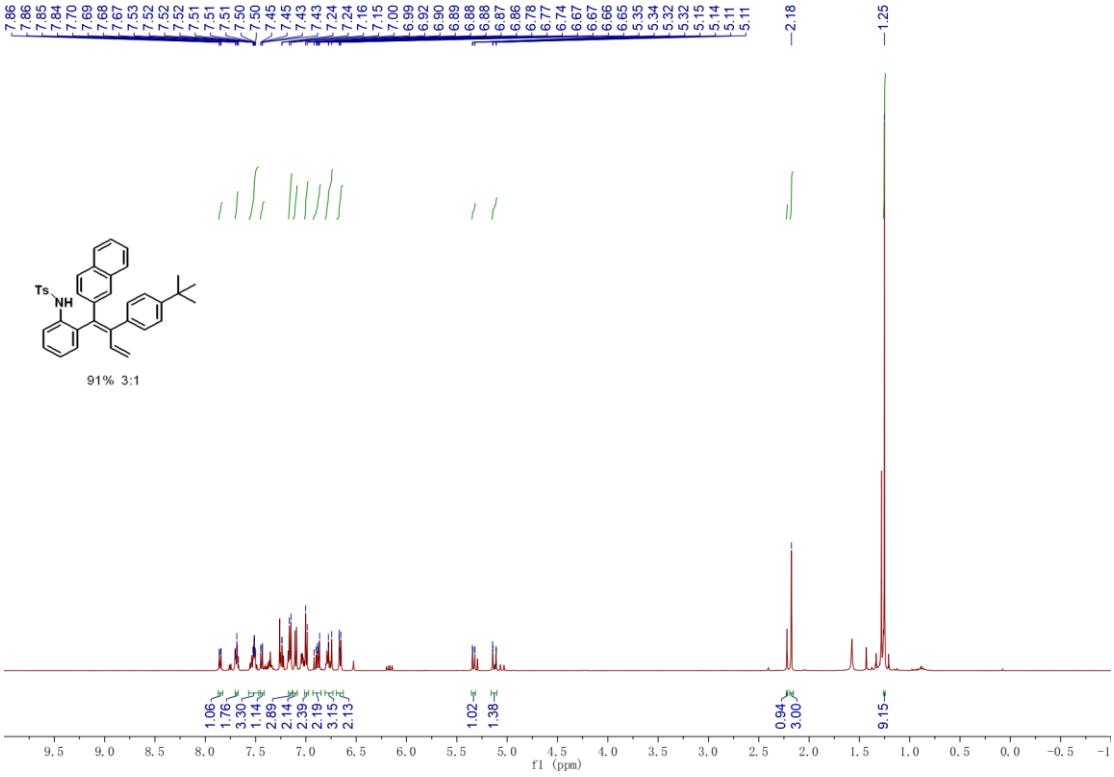


Figure S78. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3fe

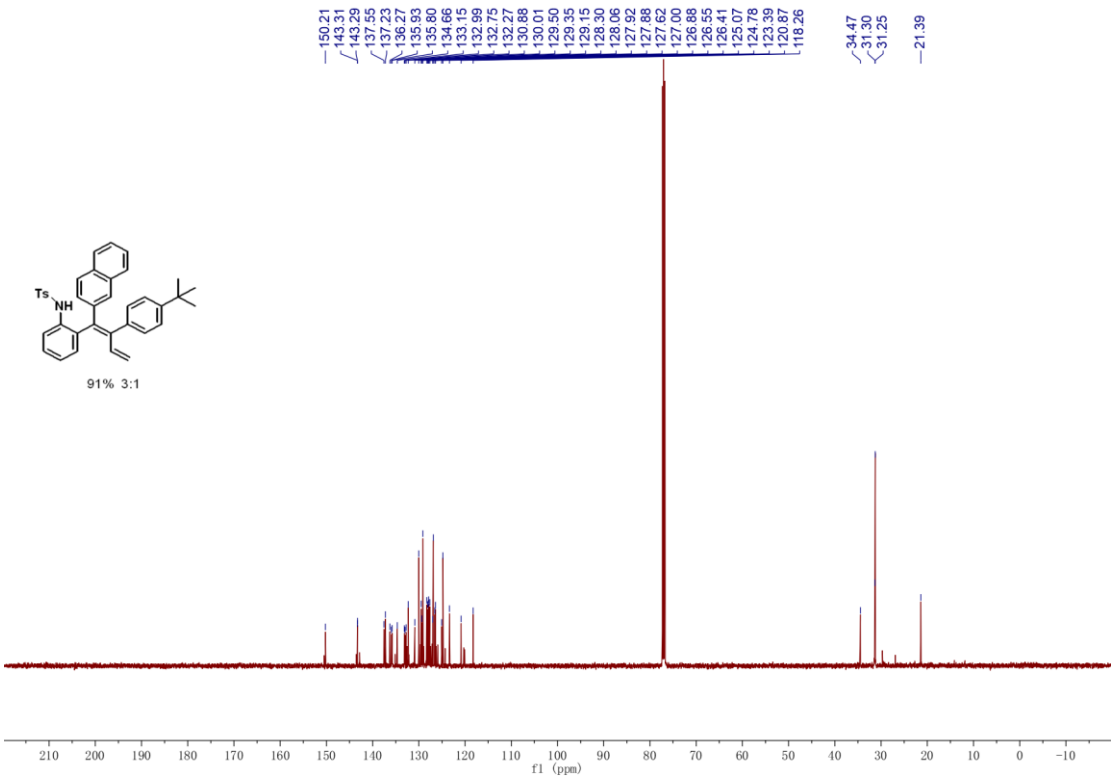


Figure S79. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3fe

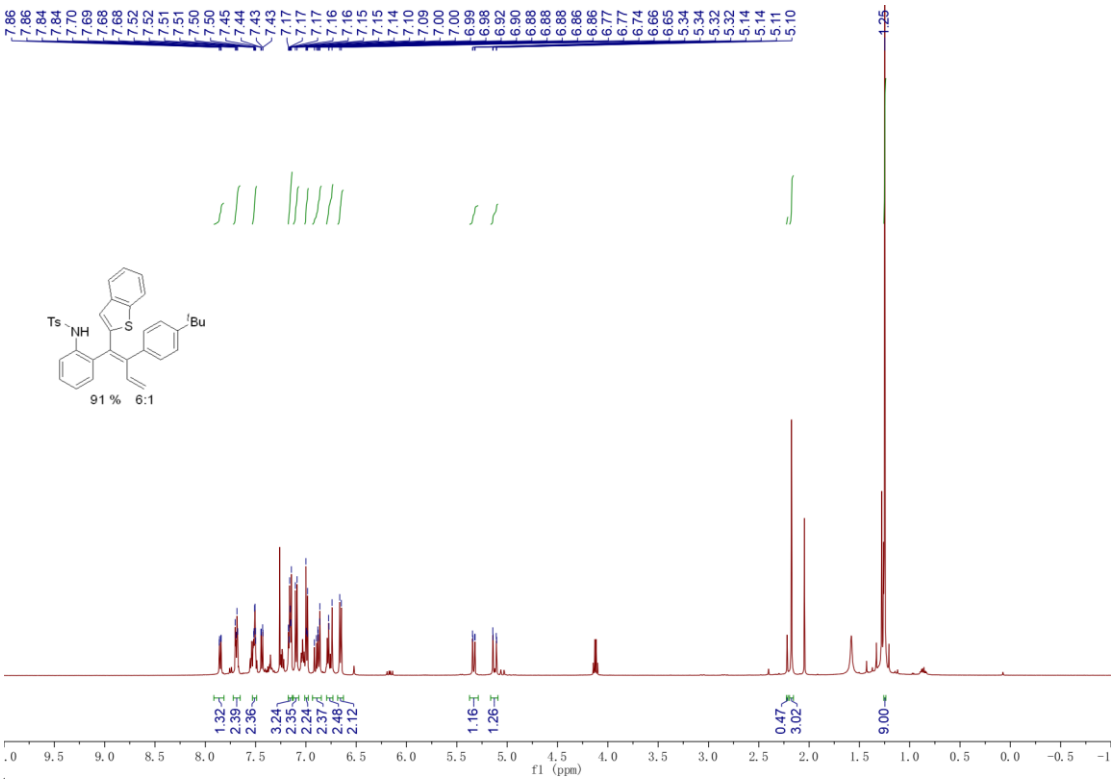


Figure S80. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ge

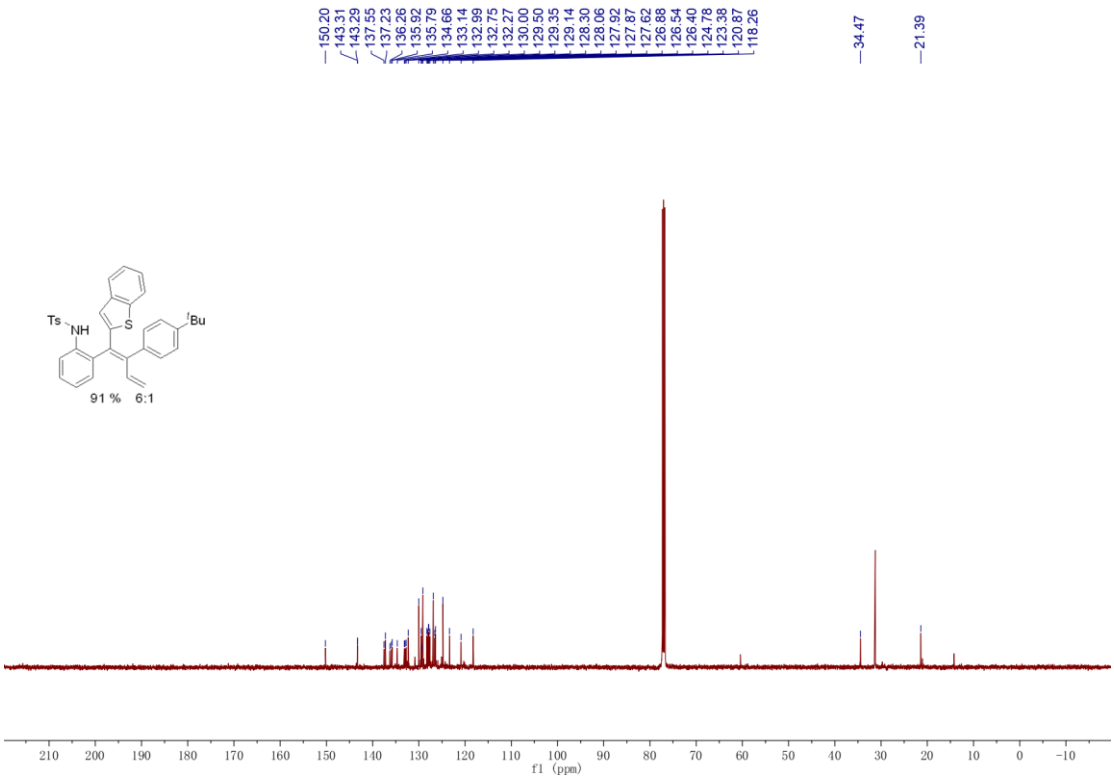


Figure S81. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ge

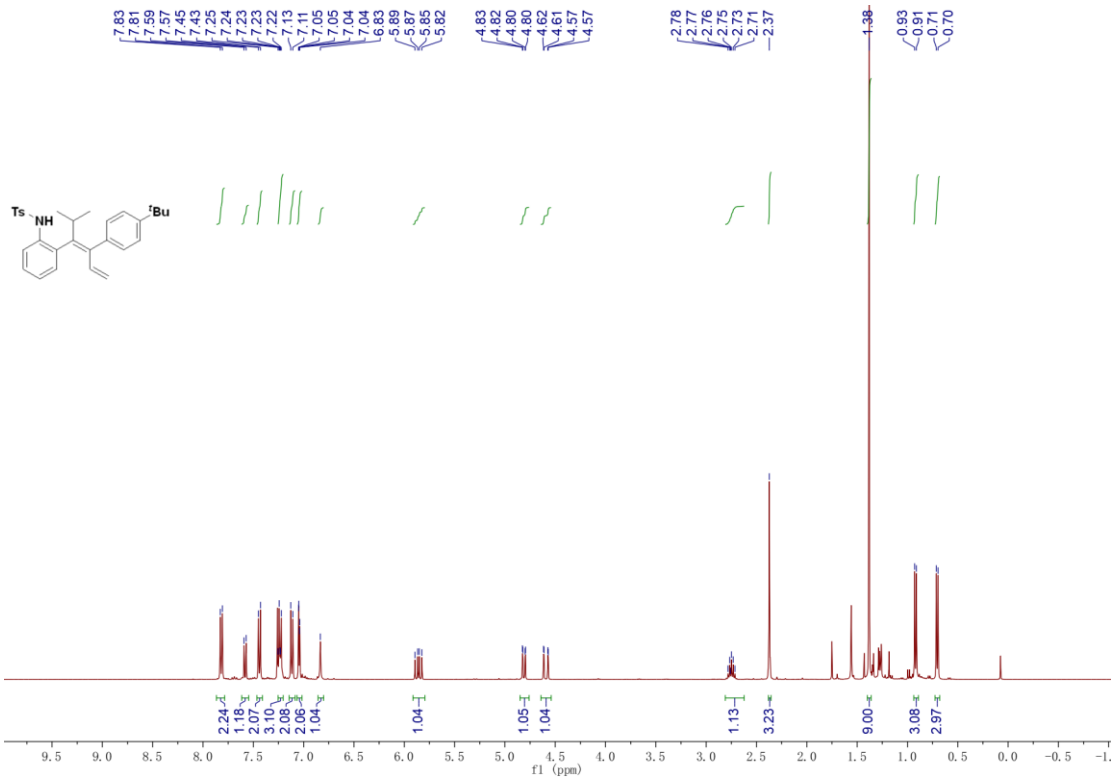


Figure S82. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3he

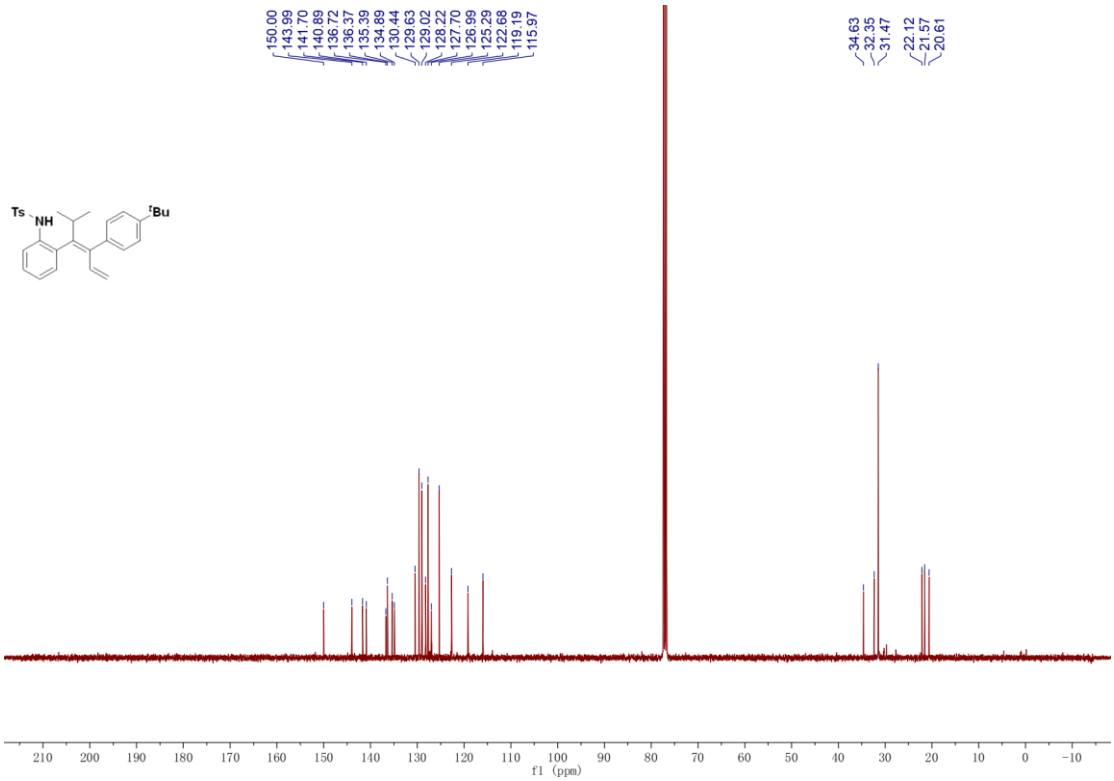


Figure S83. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3he

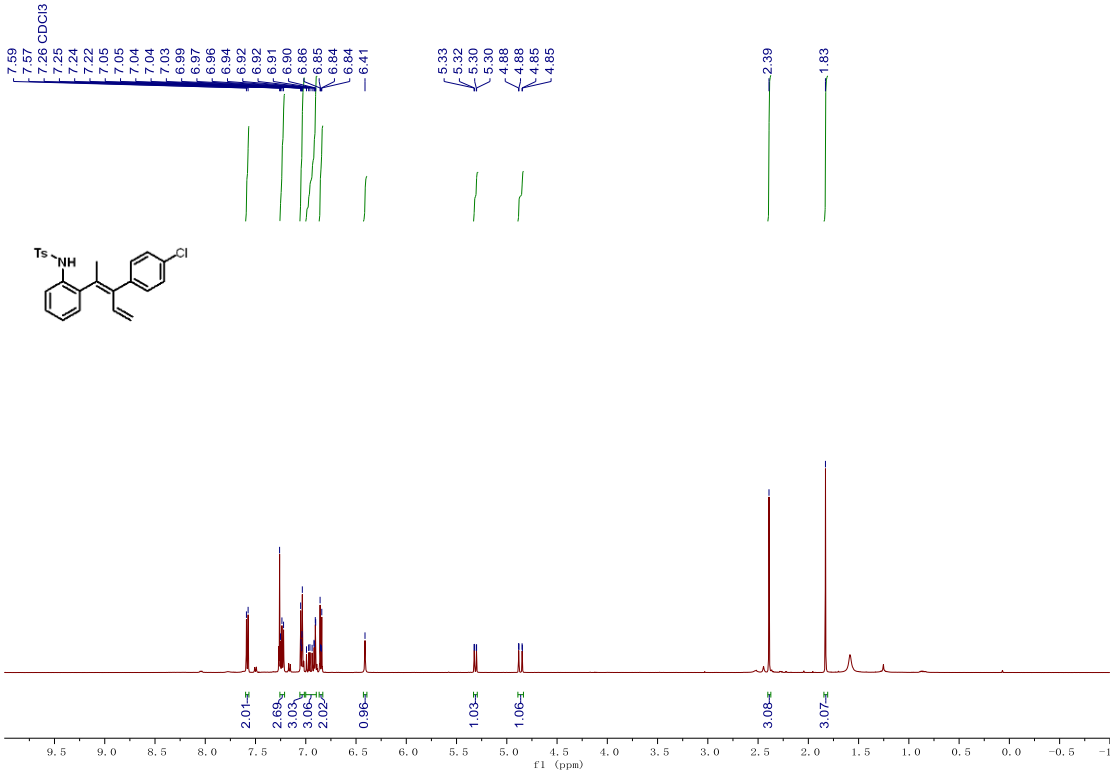


Figure S84. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3im

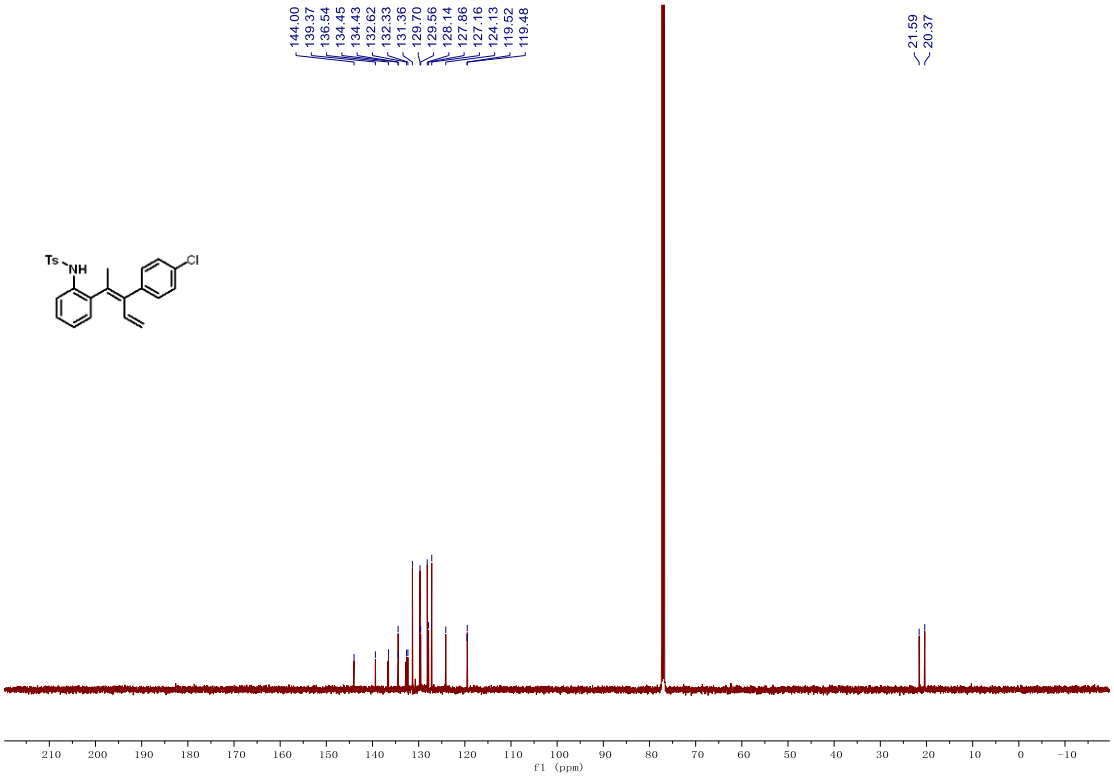


Figure S85. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3im

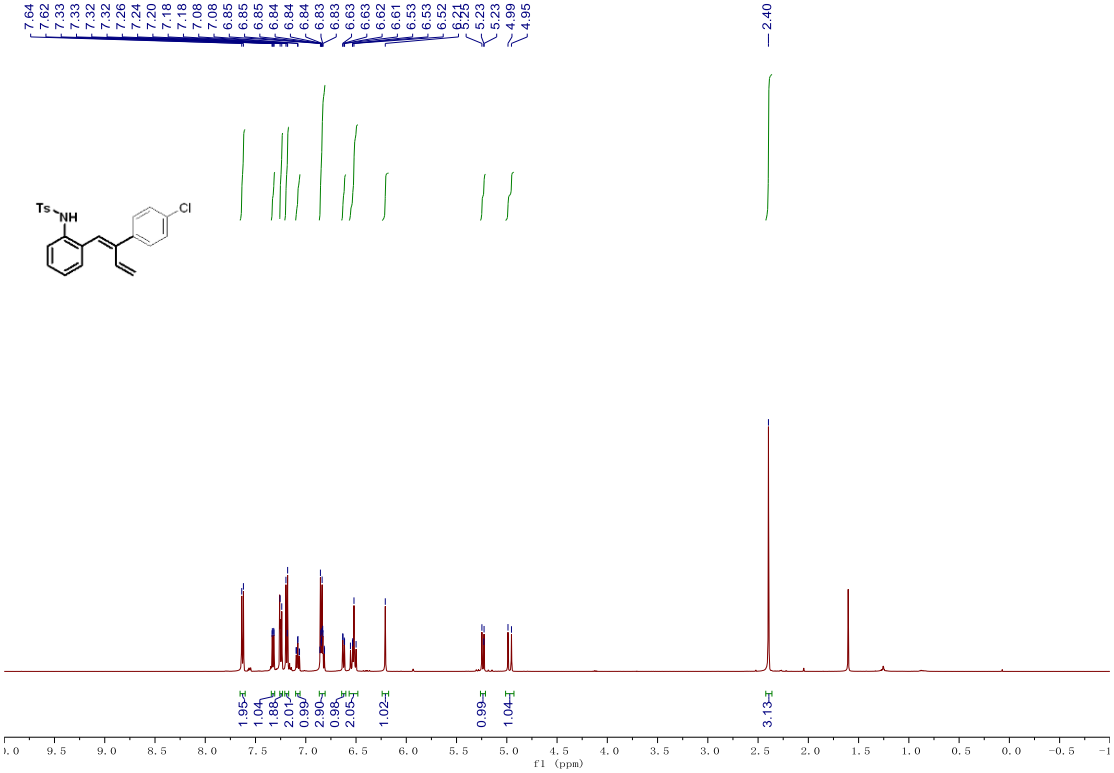


Figure S86. 1H NMR (500 MHz, $CDCl_3$) spectrum of 3jm

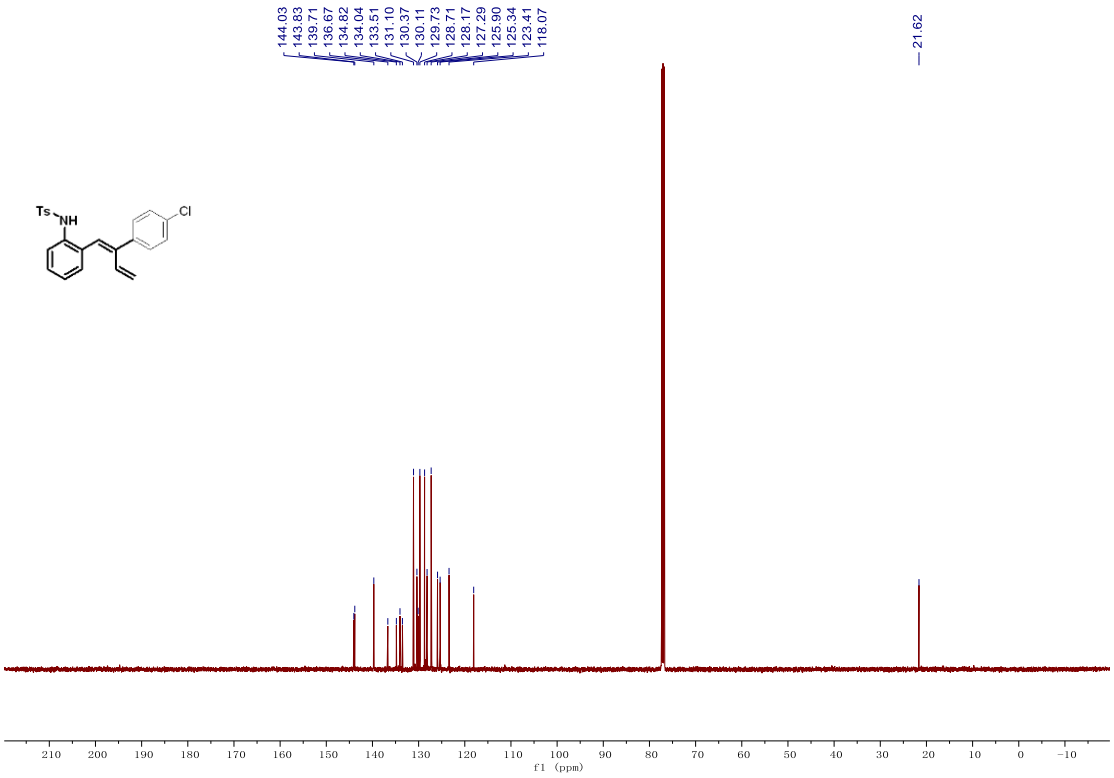


Figure S87. 13C NMR (126 MHz, $CDCl_3$) spectrum of 3jm

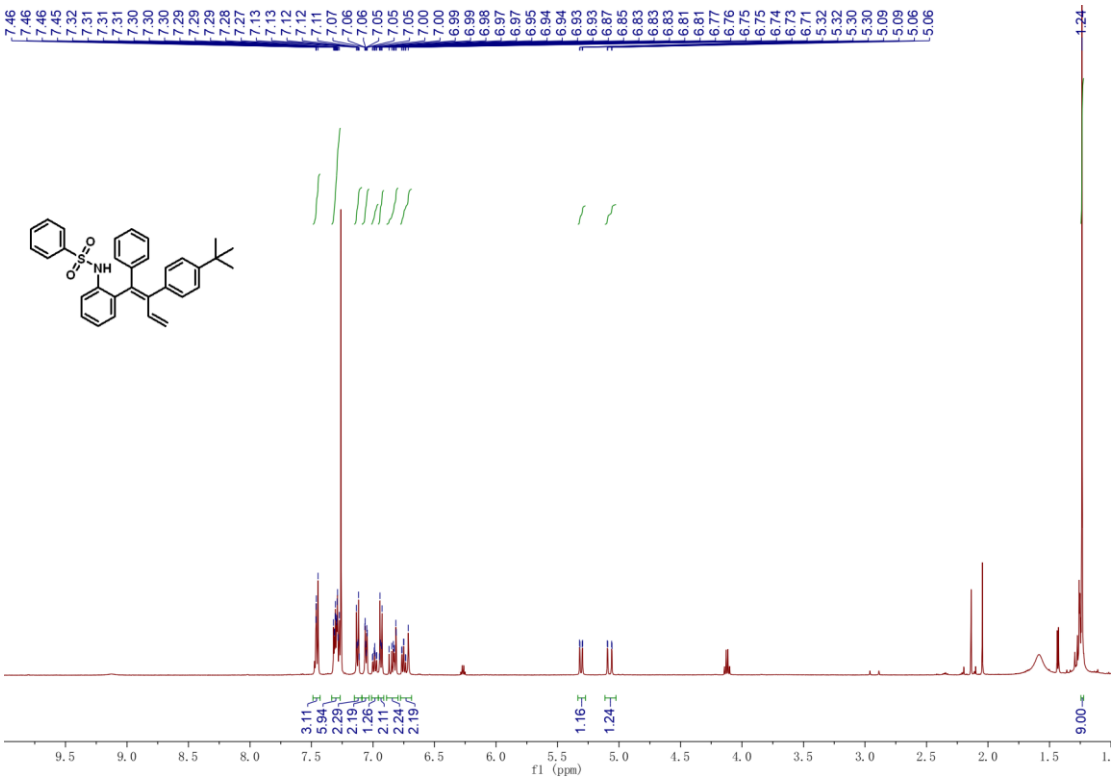


Figure S88. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ke

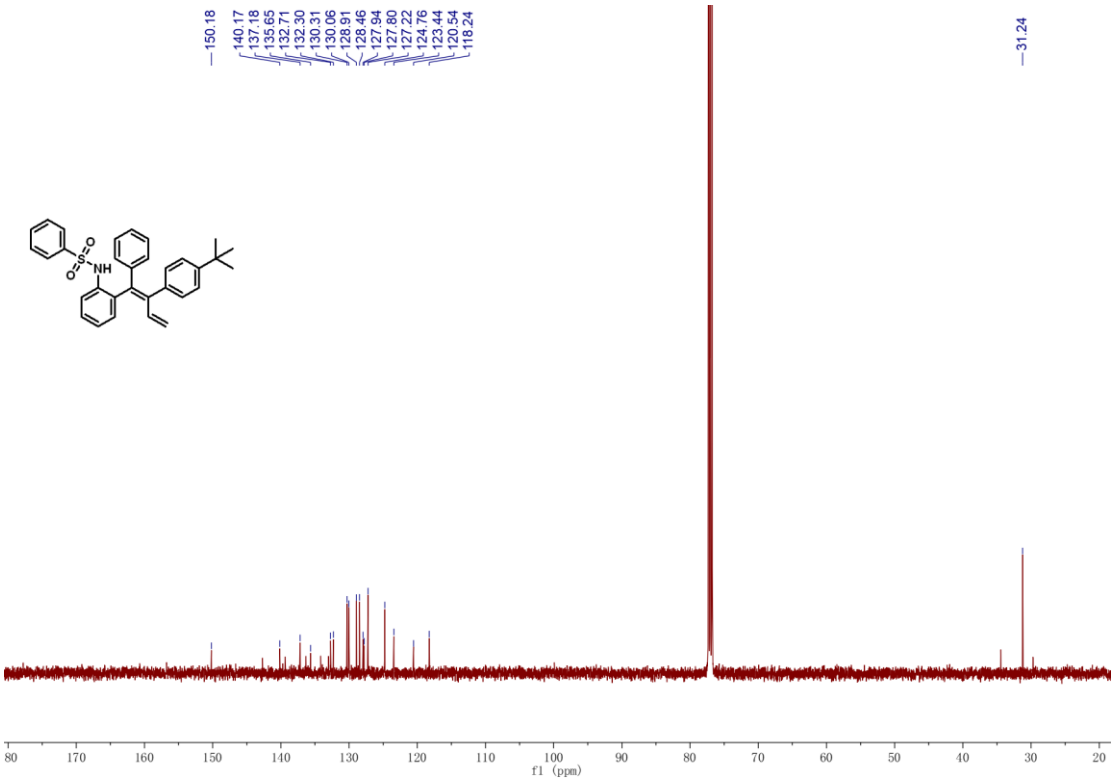


Figure S89. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ke

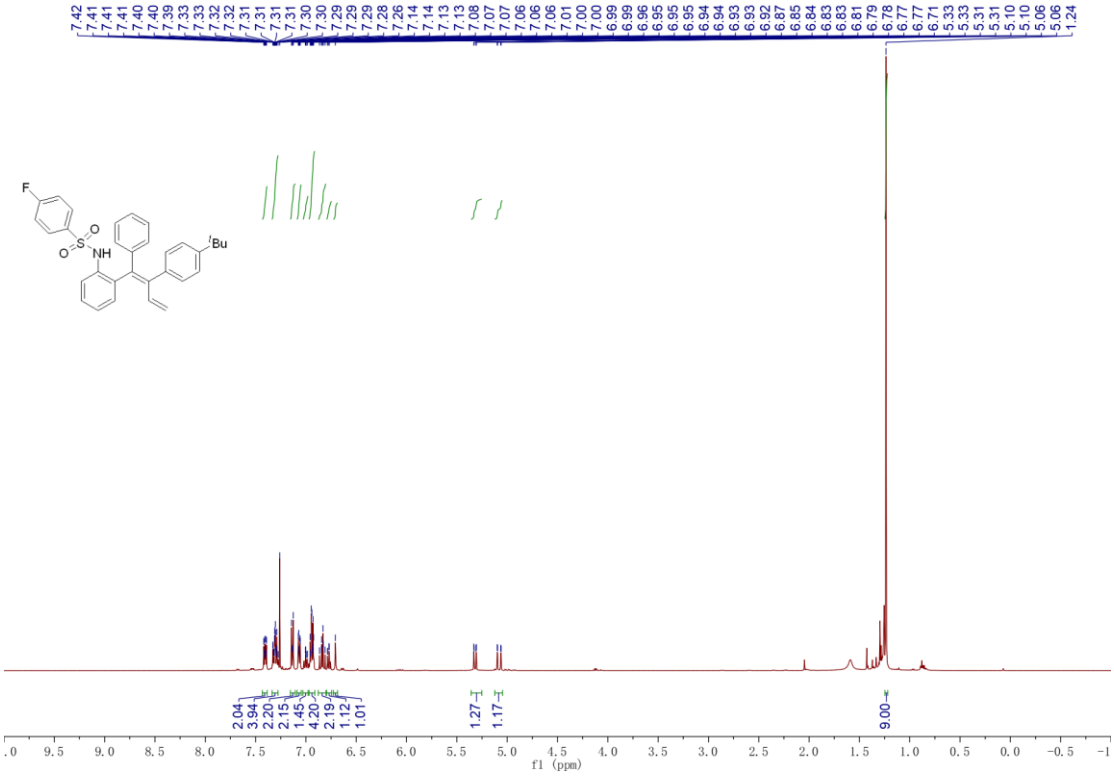


Figure S90. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3le

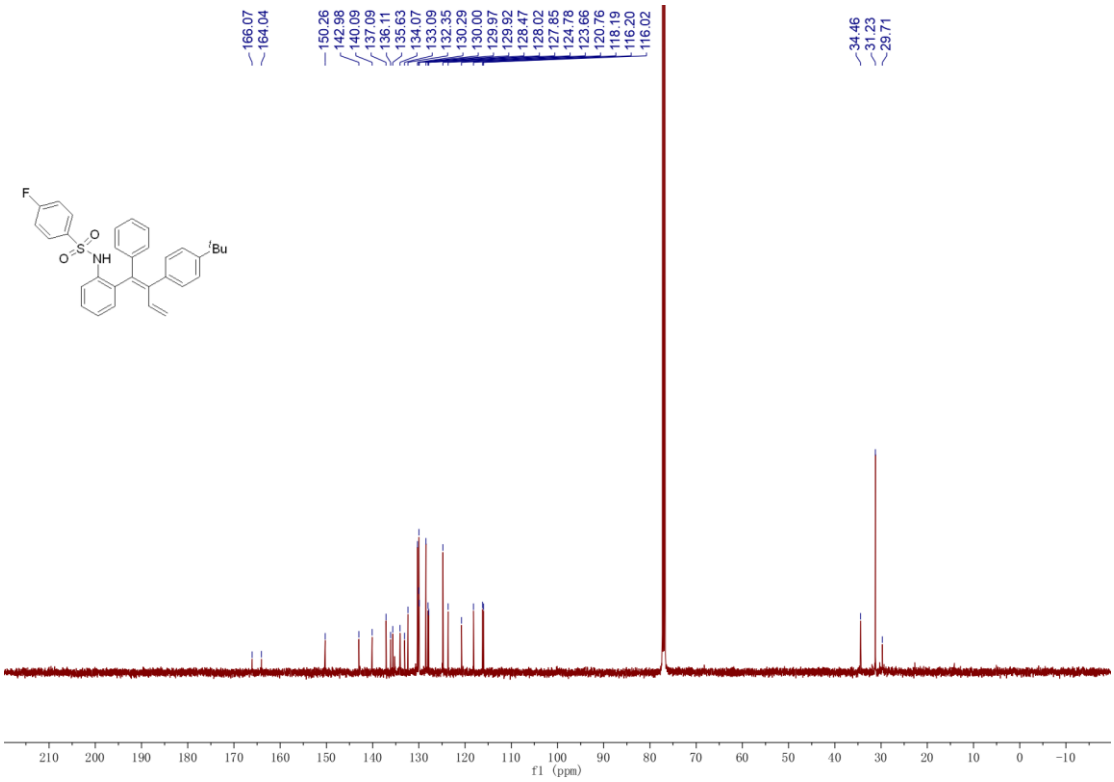


Figure S91. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3le

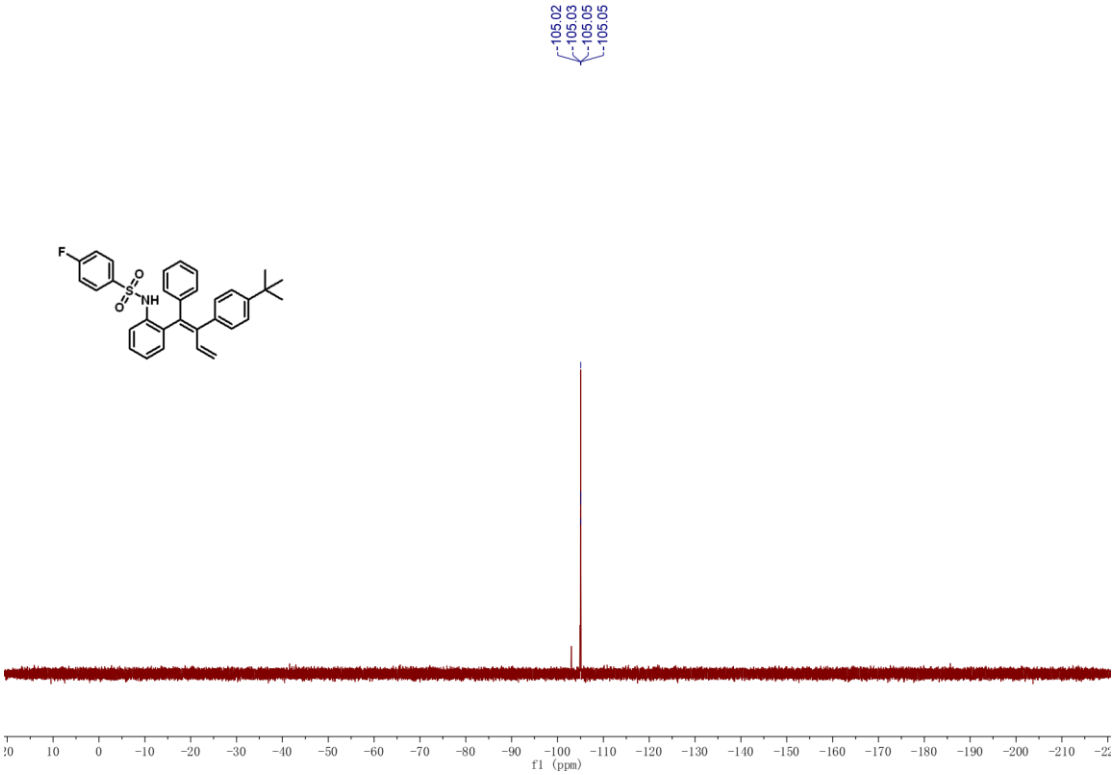


Figure S92. ^{19}F NMR (377 MHz,$CDCl_3$) spectrum of 3le

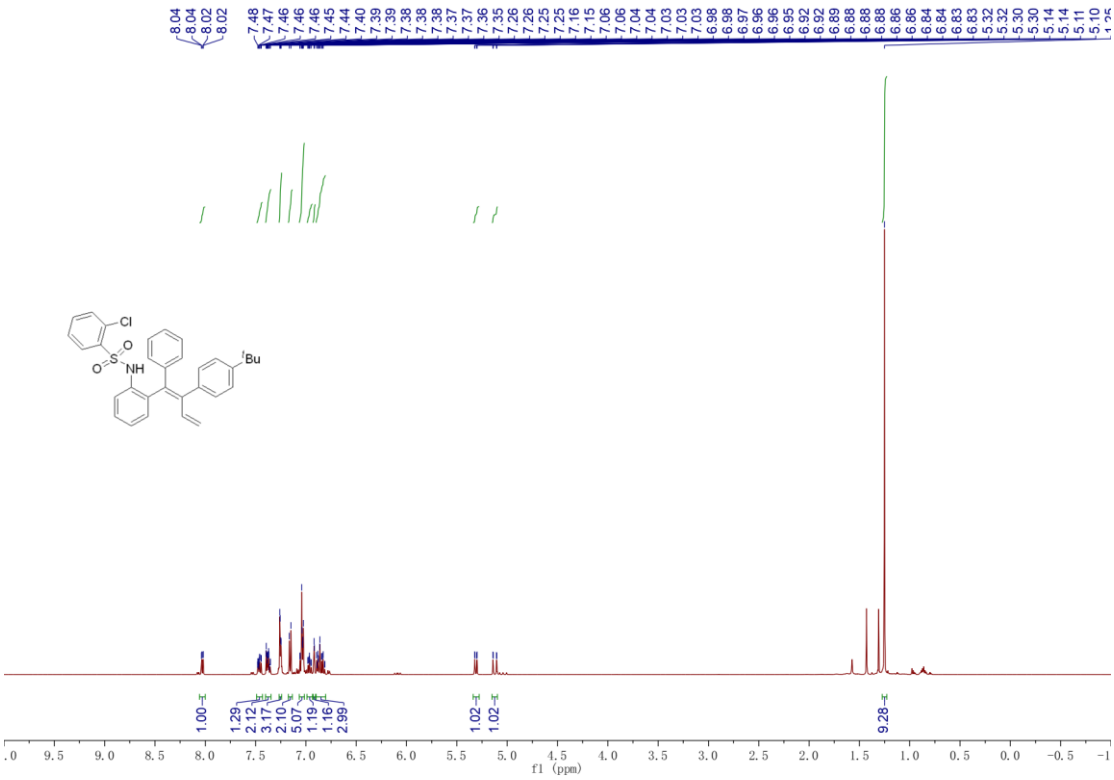


Figure S93. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3me

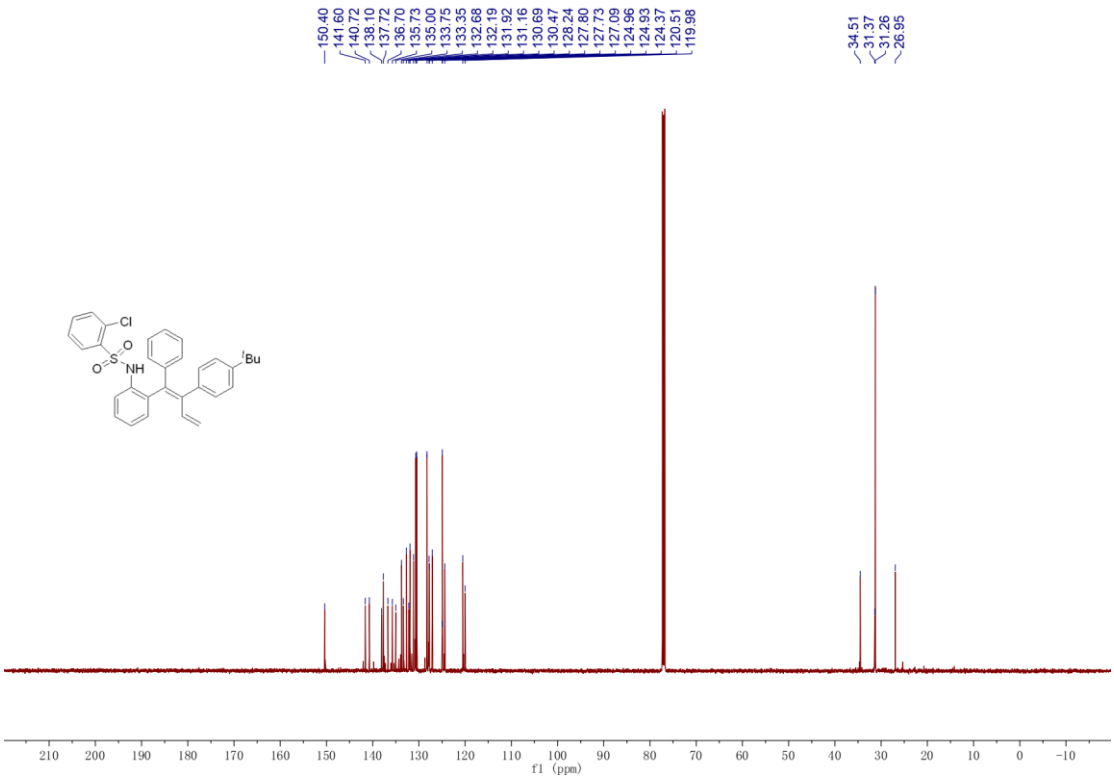


Figure S94. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3me

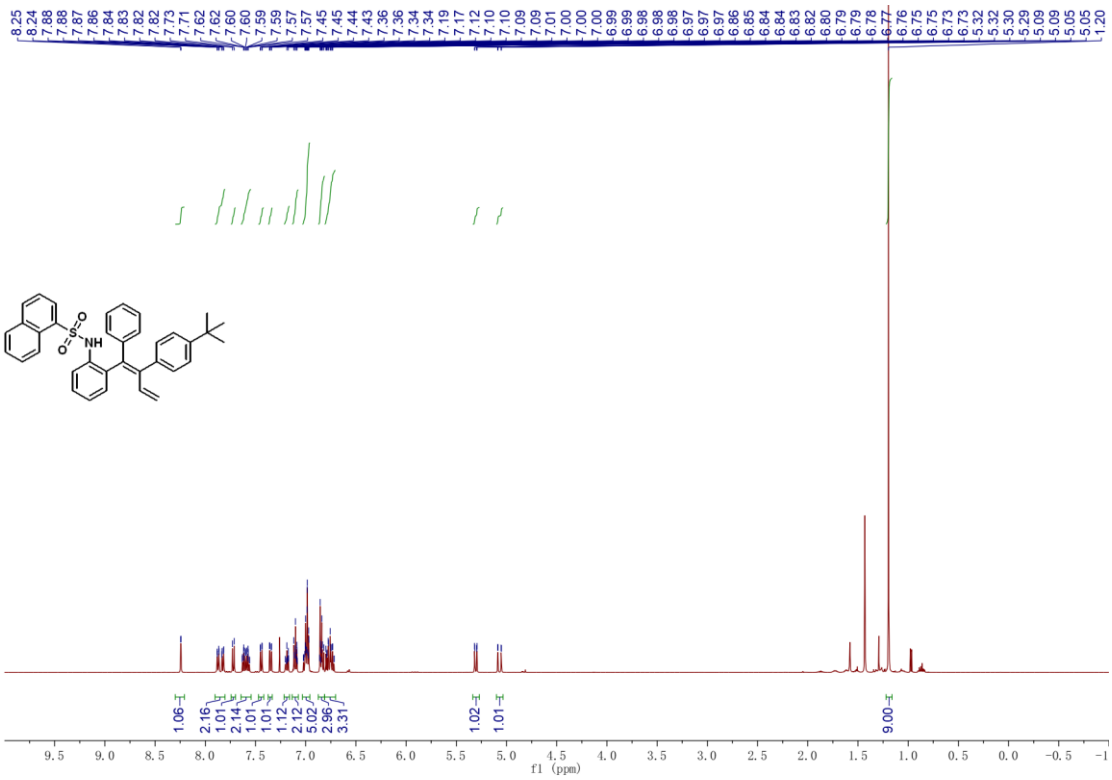


Figure S95. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 3ne

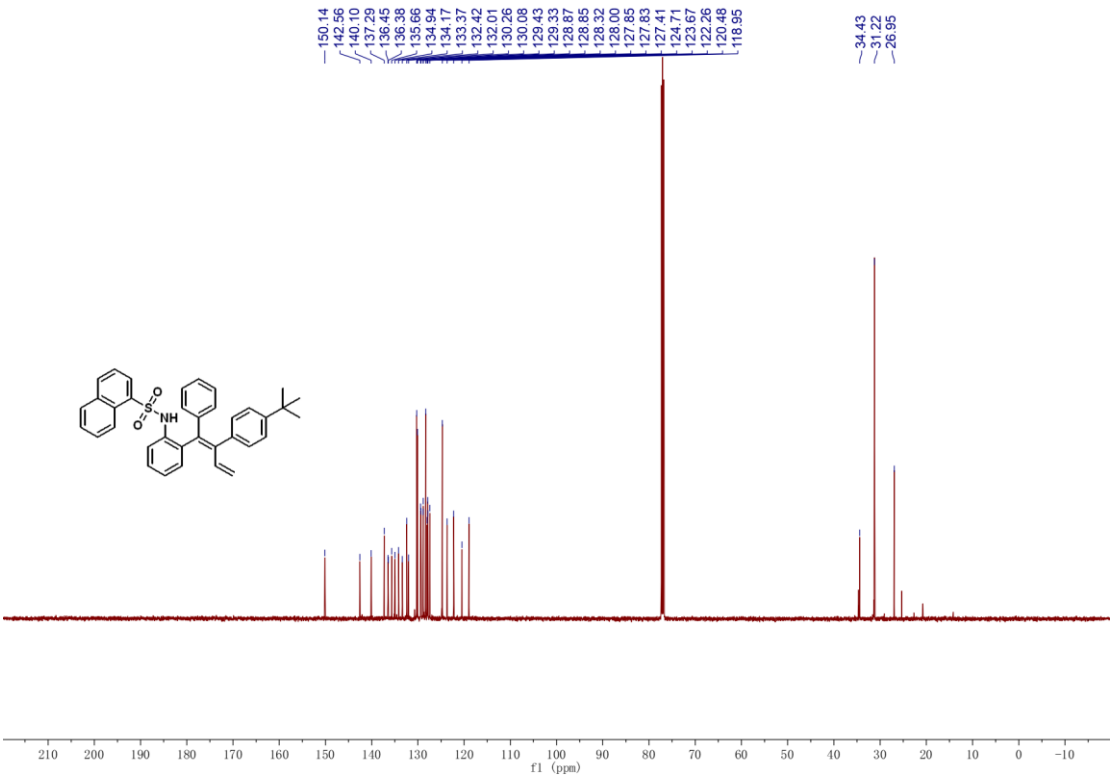


Figure S96. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 3ne

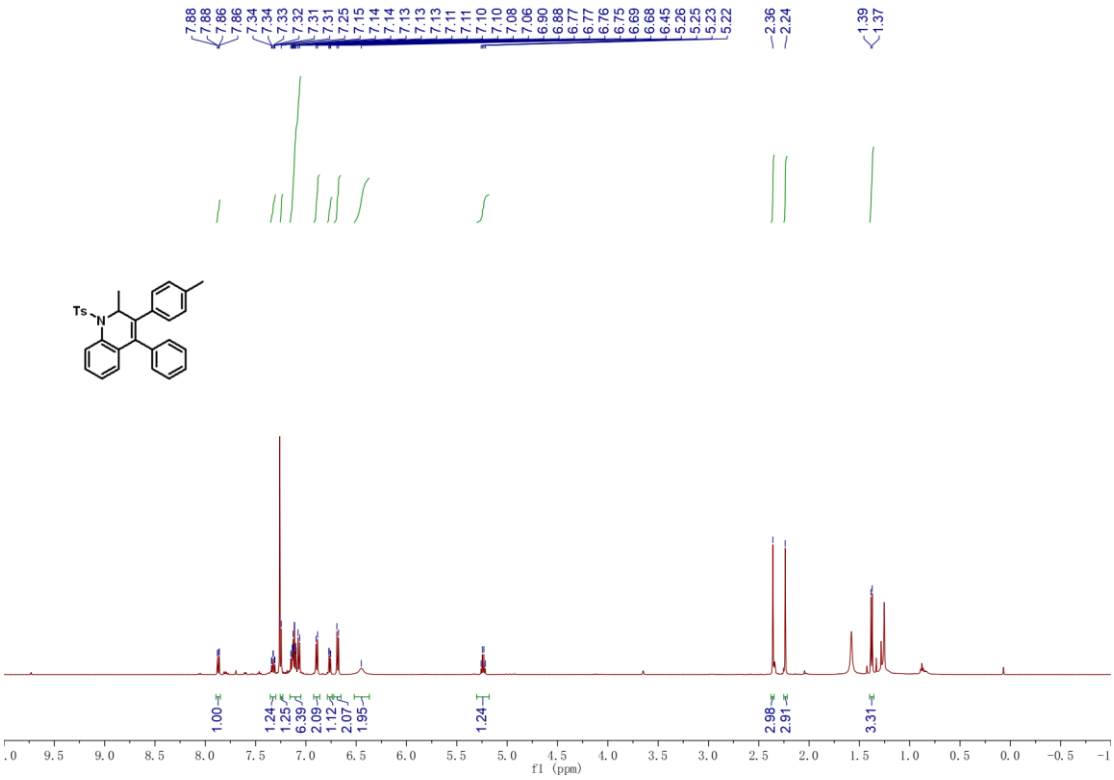


Figure S97. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4ab

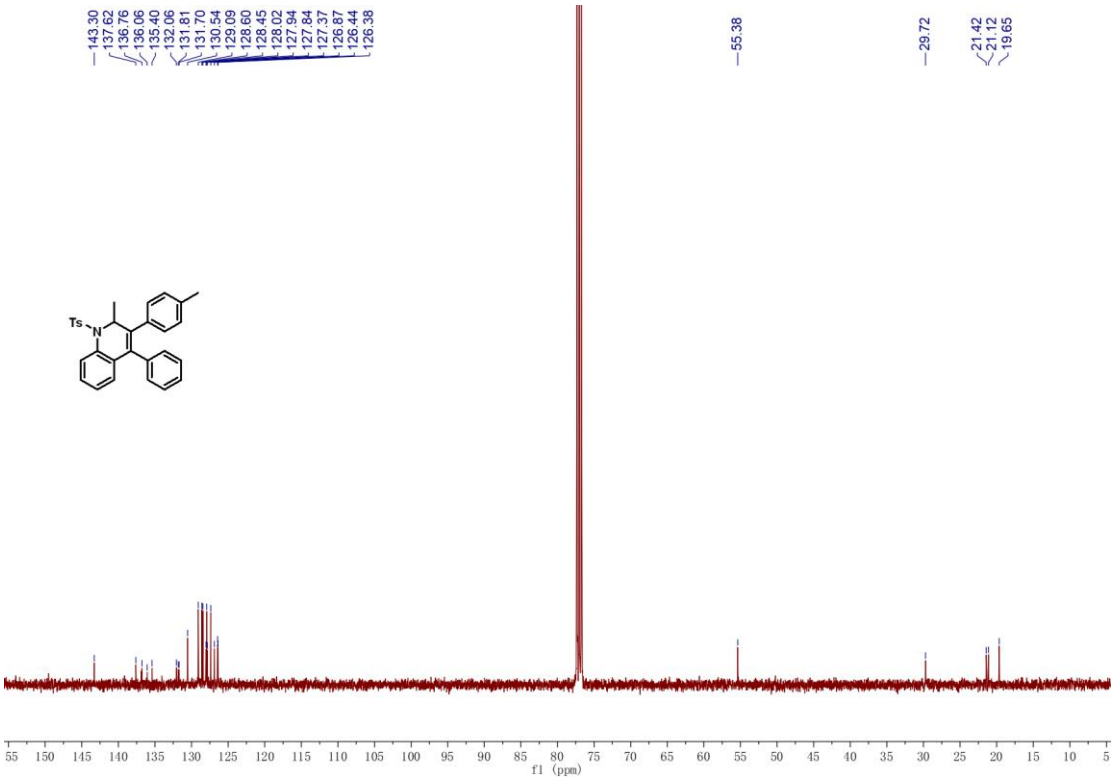


Figure S98. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4ab

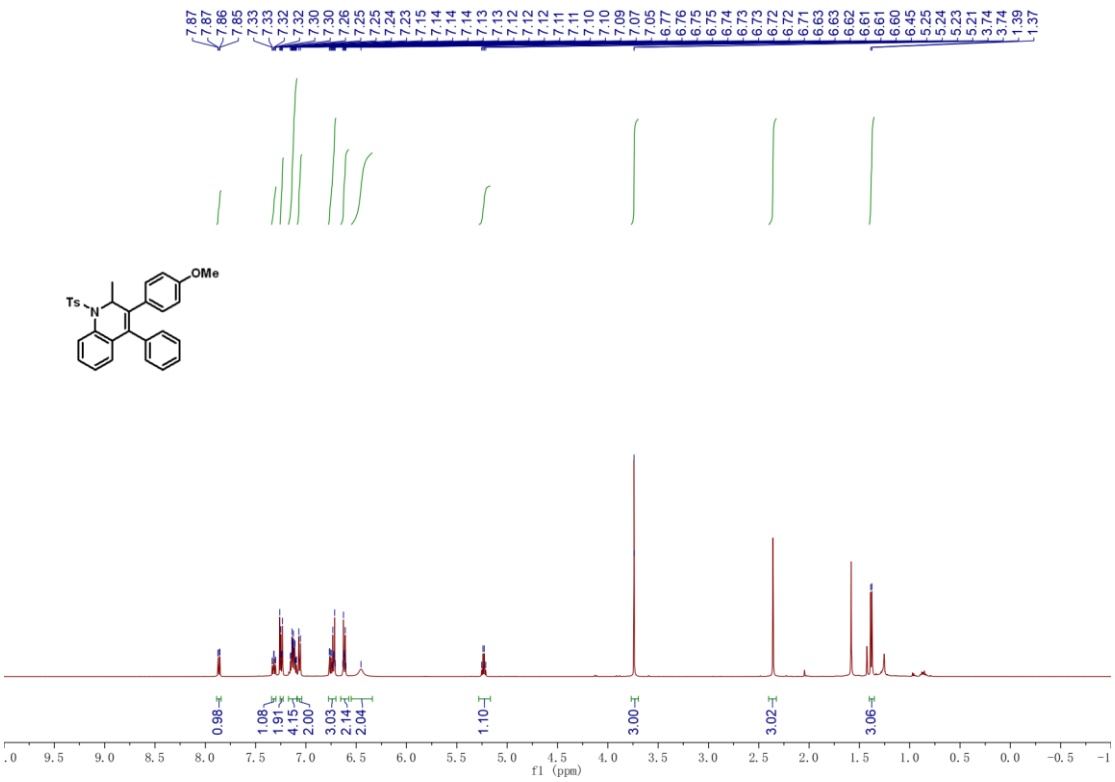


Figure S99. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4af

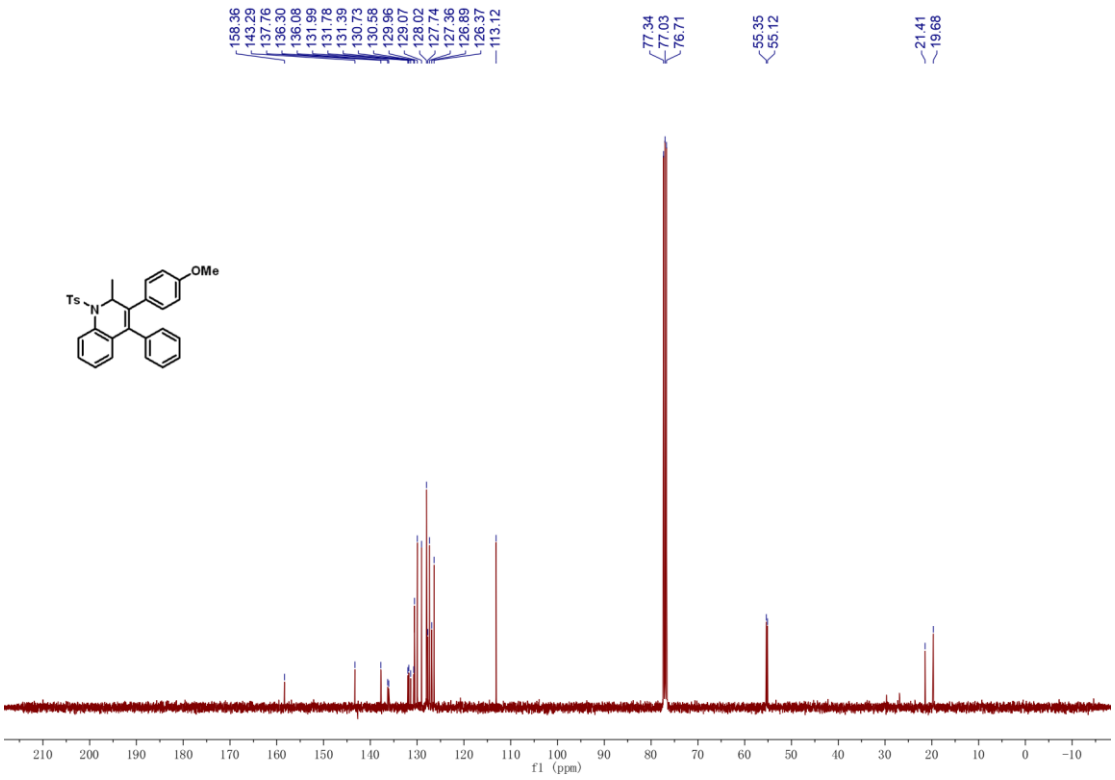


Figure S100. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4af

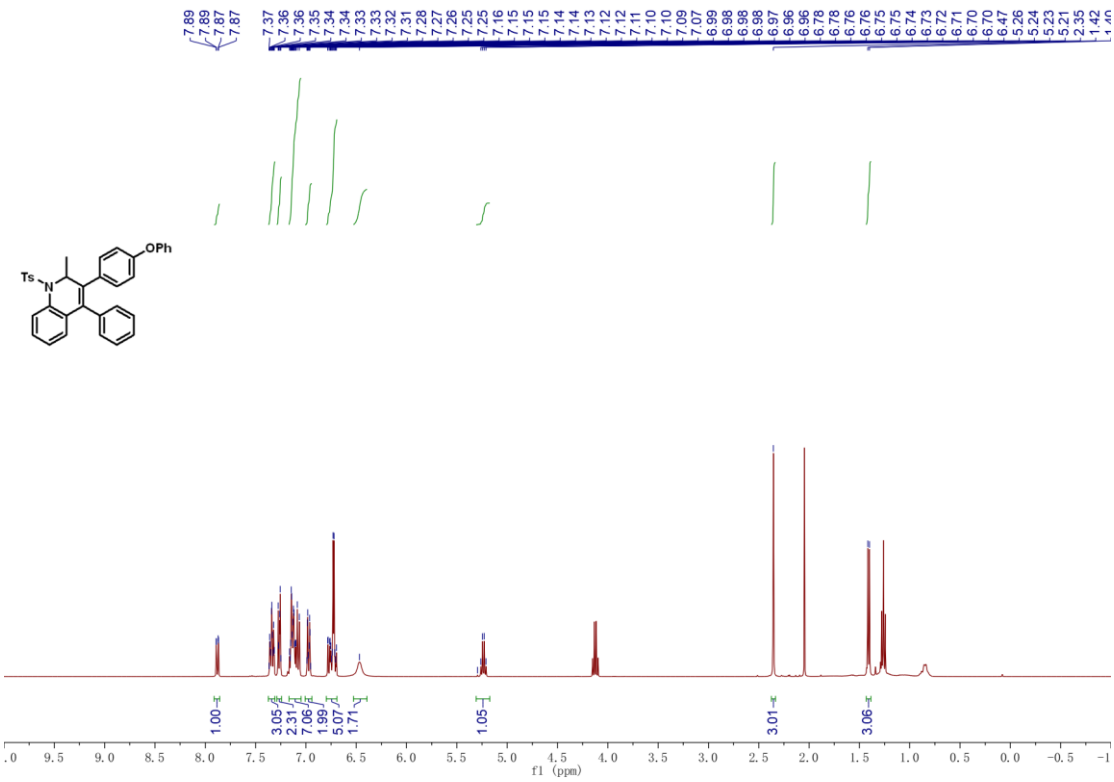


Figure S101. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4a

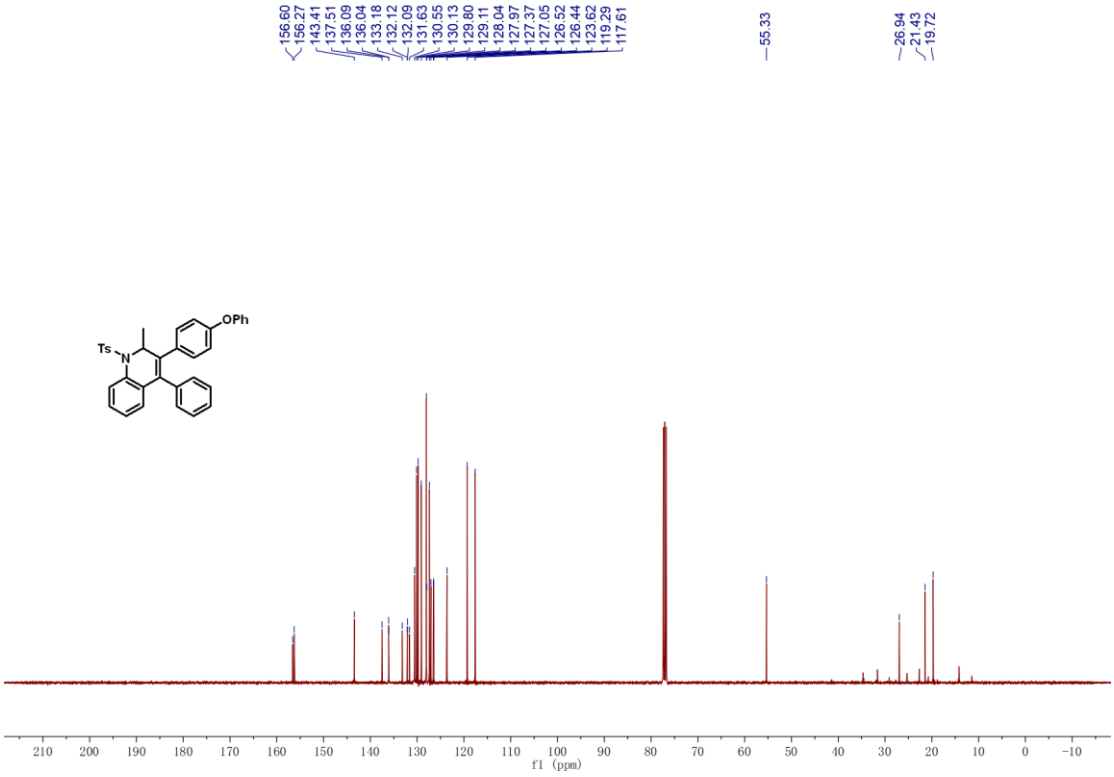


Figure S102. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4ah

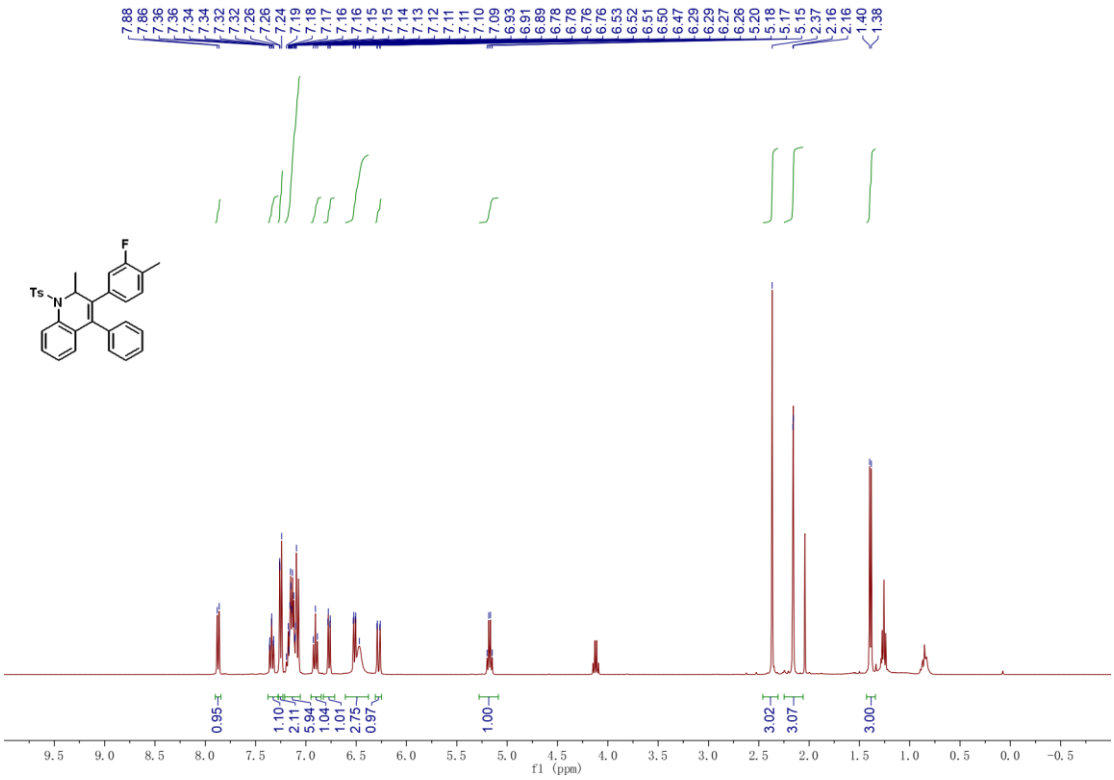


Figure S103. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4ak

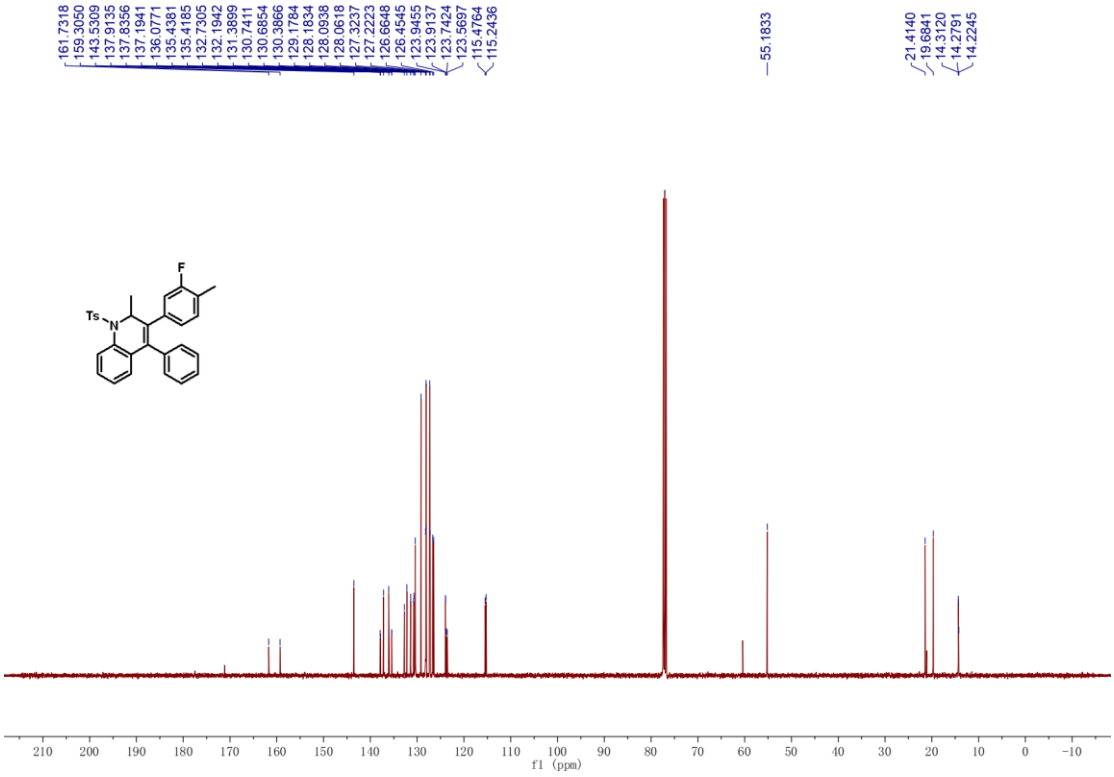


Figure S104. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4ak

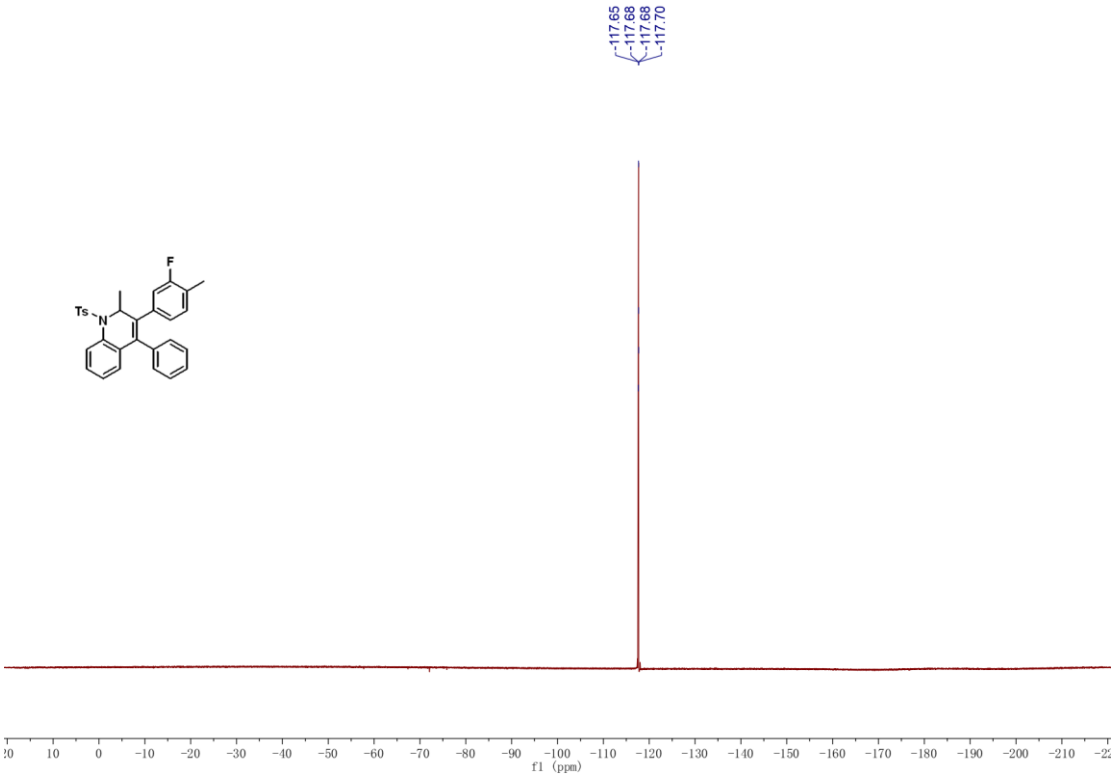


Figure S105. ^{19}F NMR (377 MHz, $CDCl_3$) spectrum of 4ak

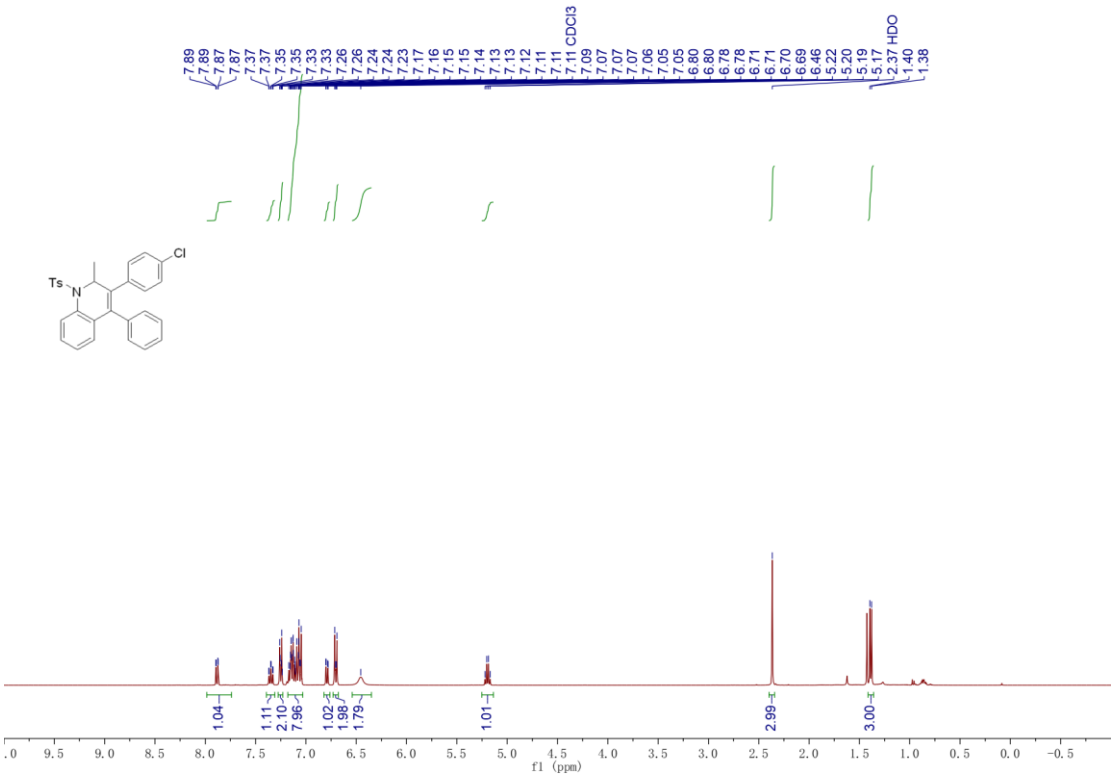


Figure S106. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4am

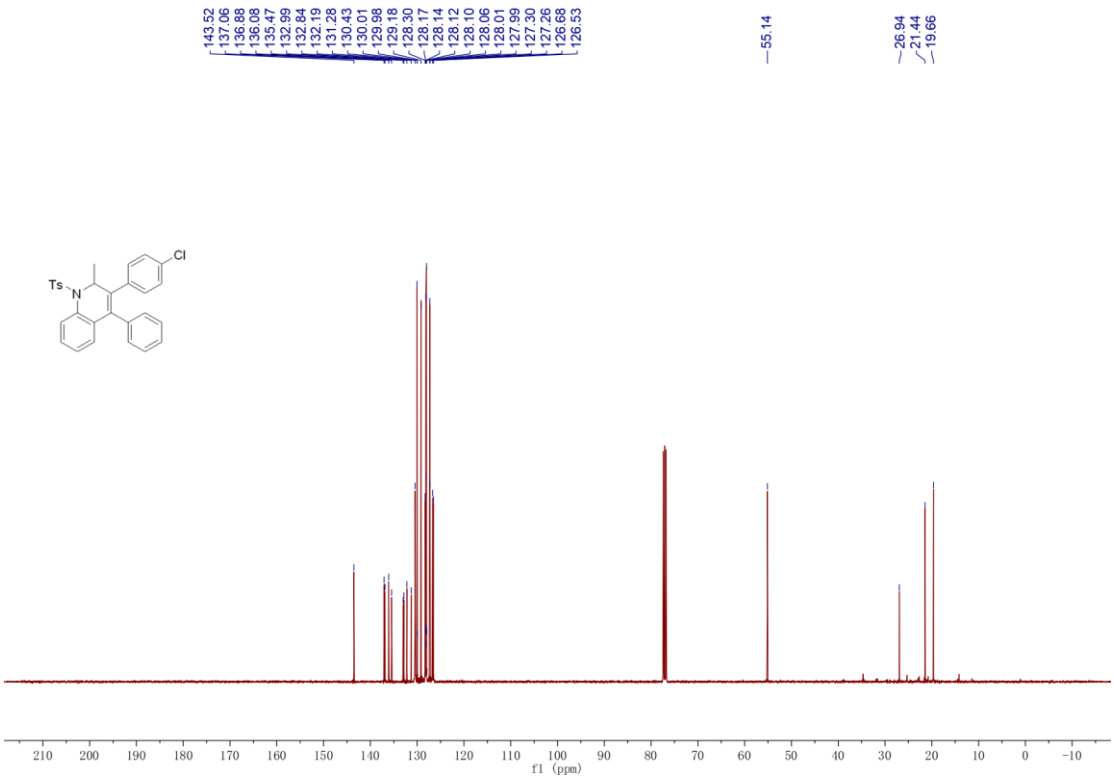


Figure S107. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4am

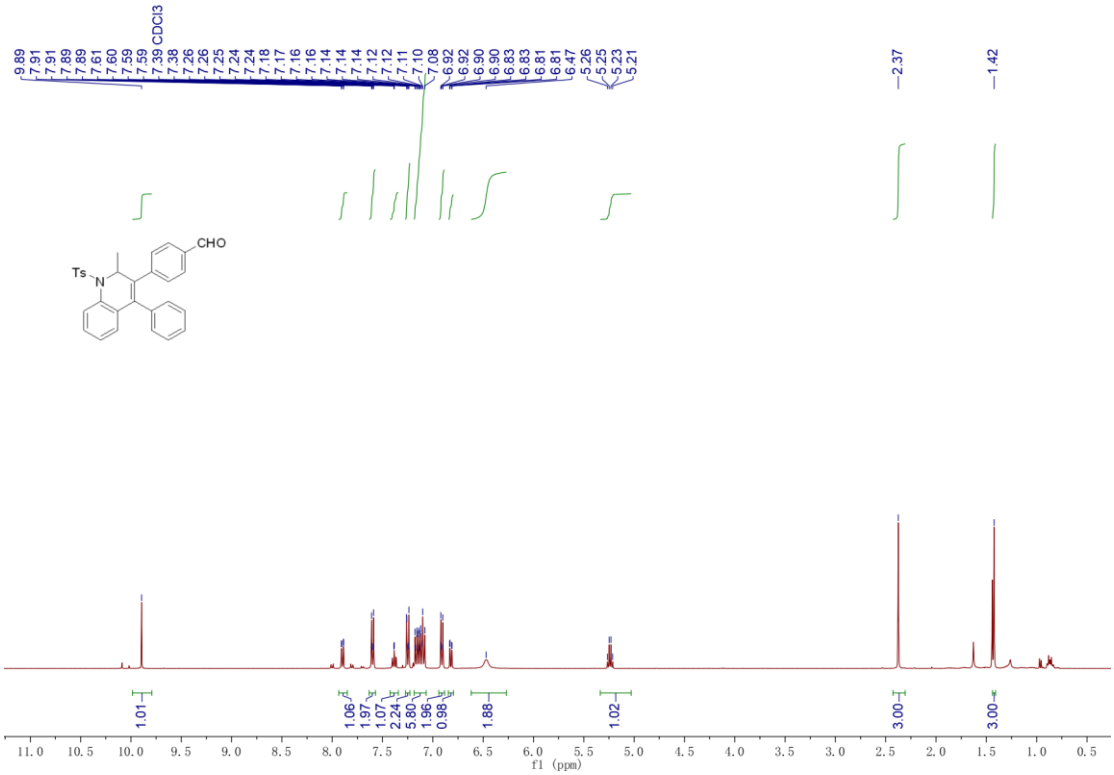


Figure S108. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4ao

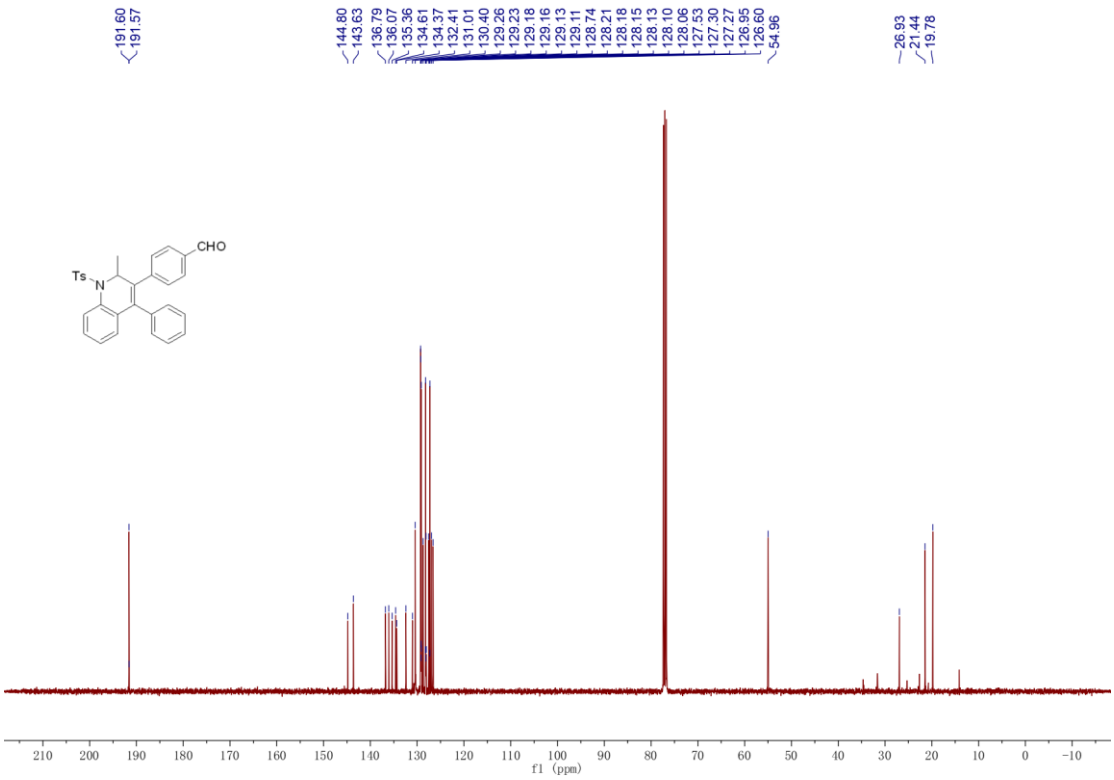


Figure S109. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4ao

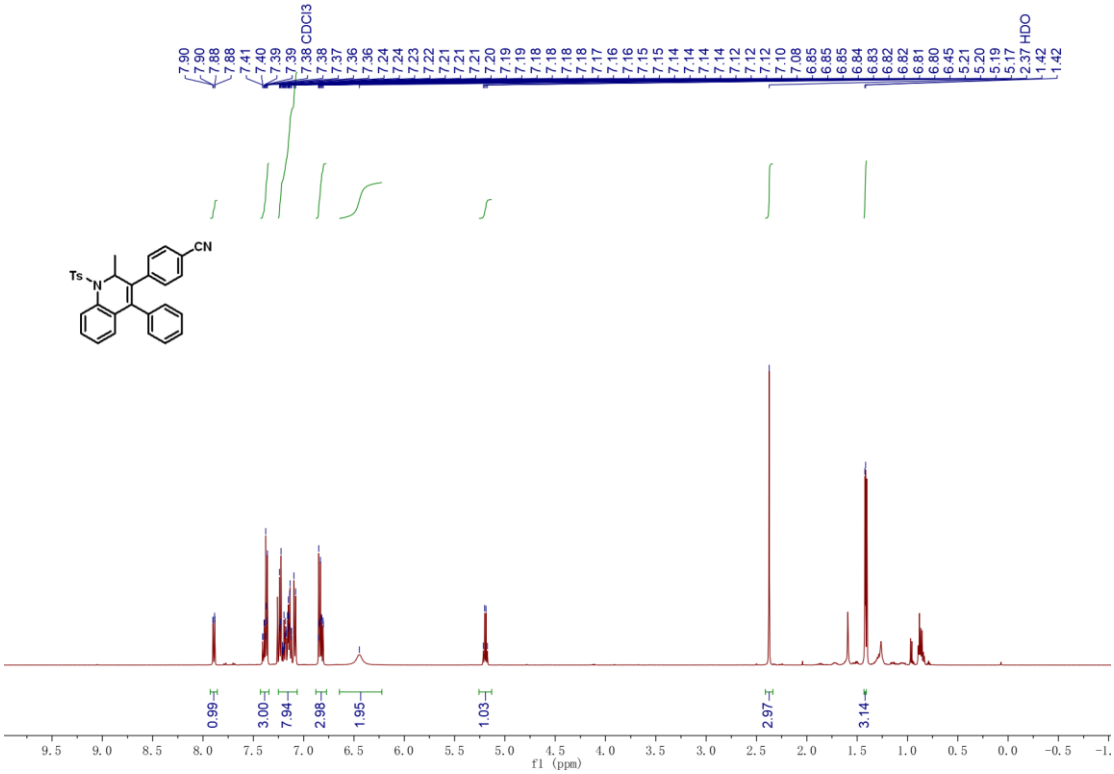


Figure S110. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4ap

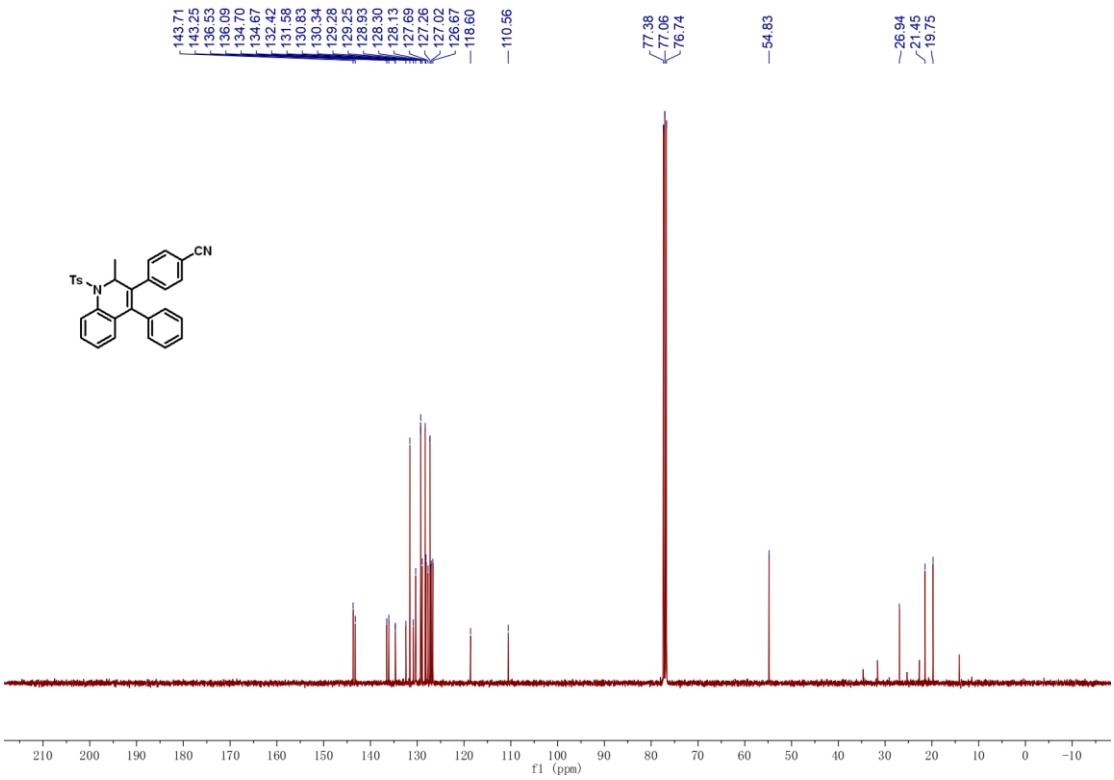


Figure S111. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4ap

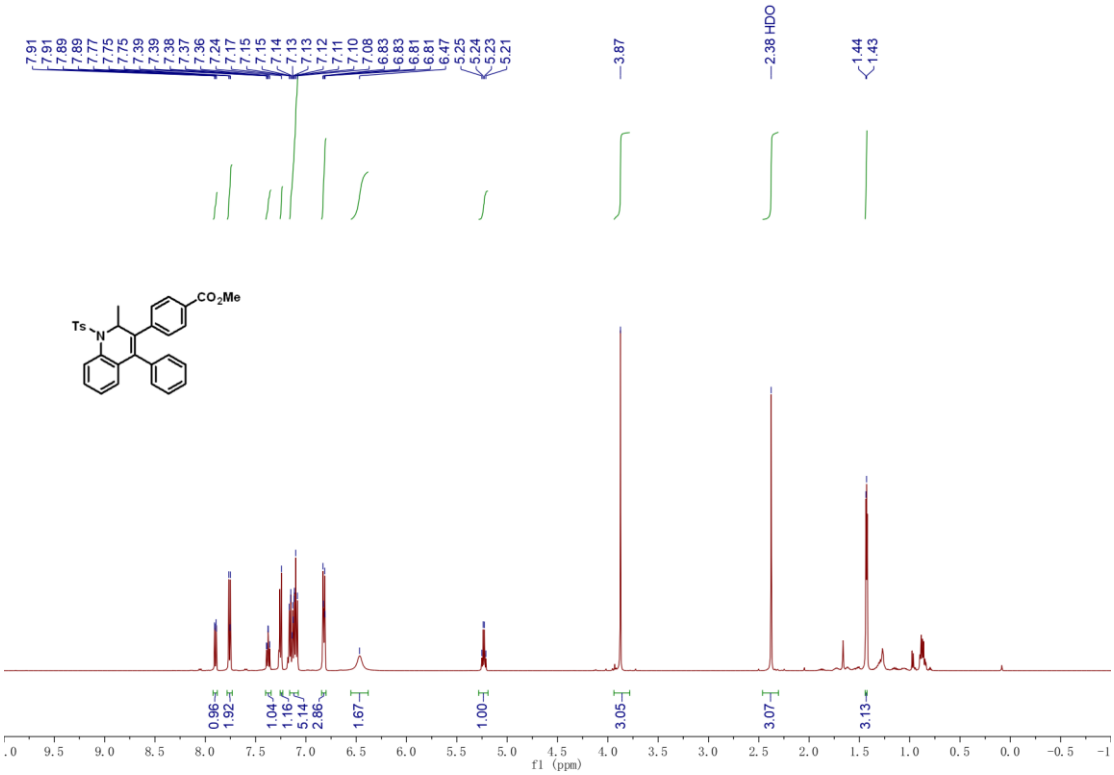


Figure S112. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4aq

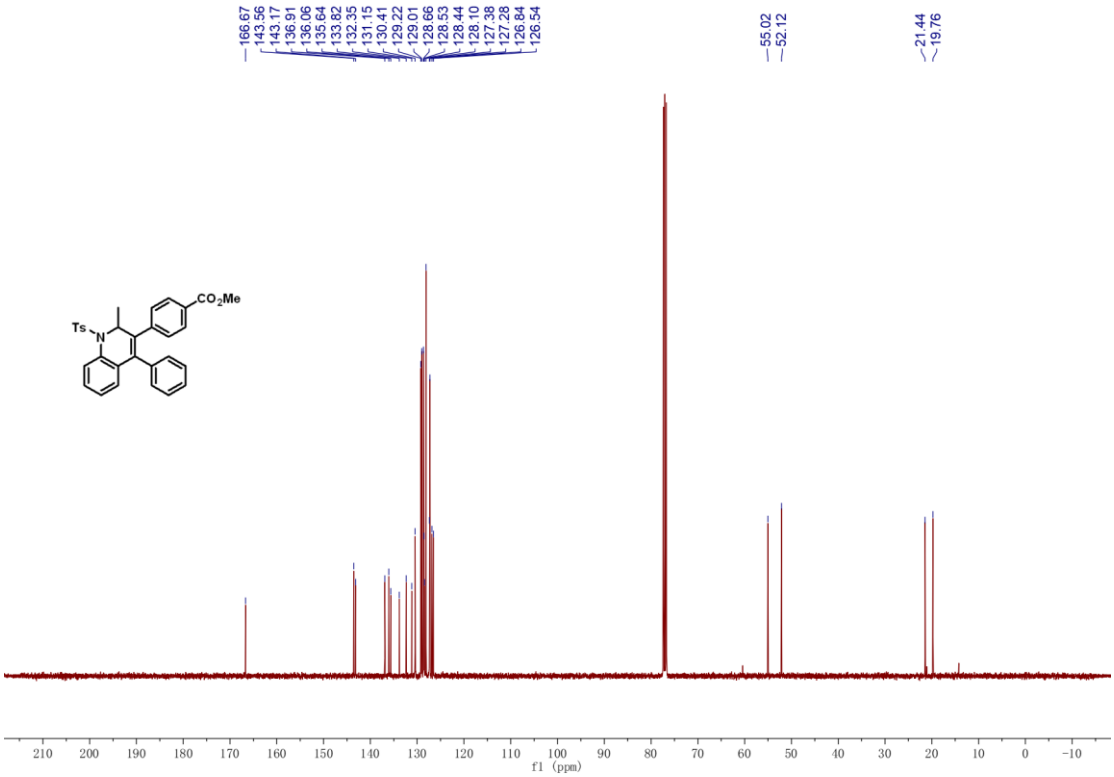


Figure S113. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4aq

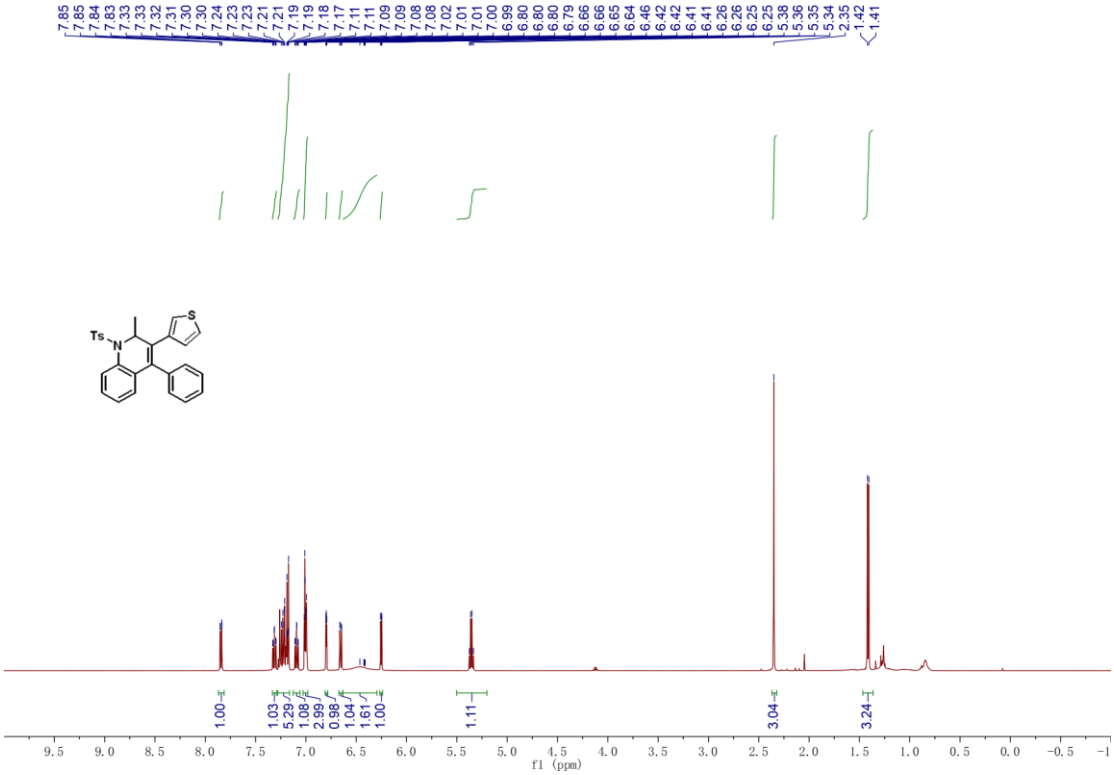


Figure S114. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4at

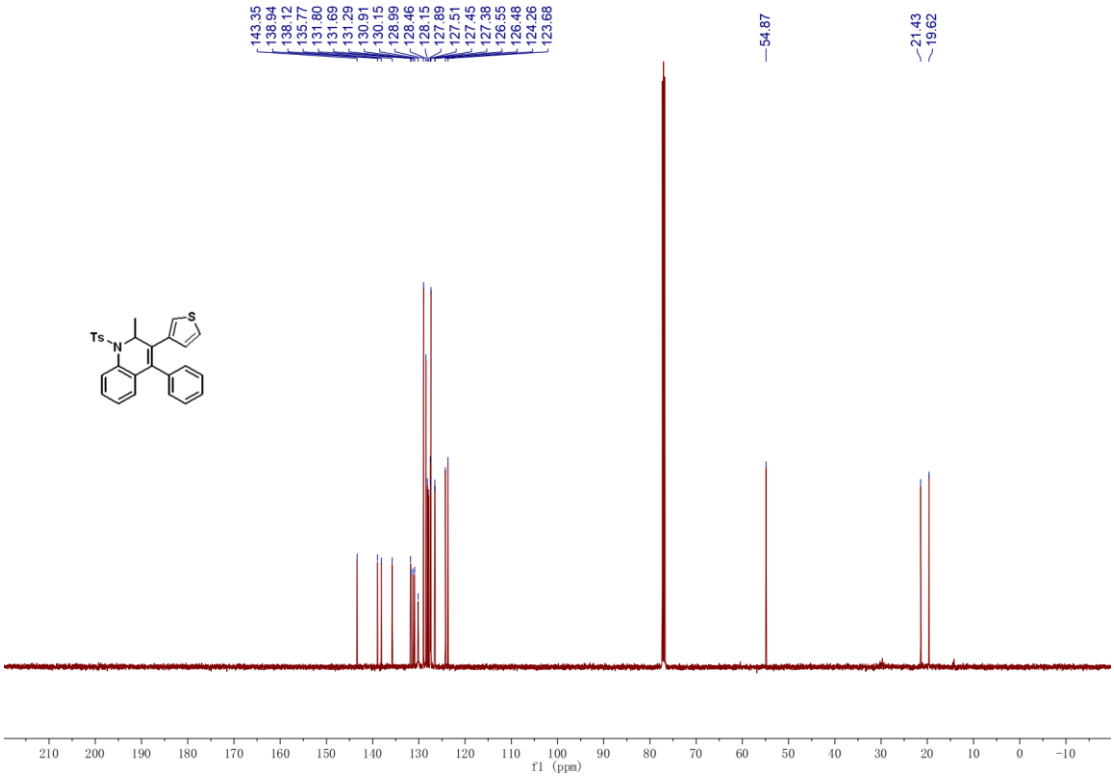


Figure S115. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4at

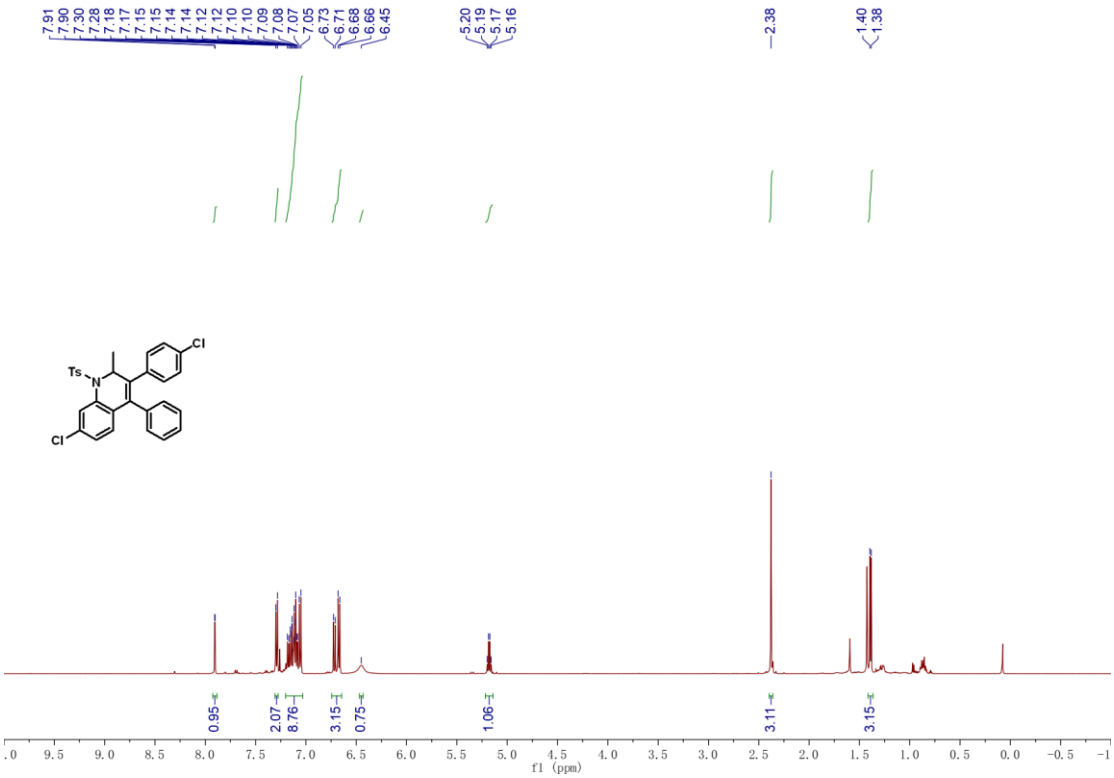


Figure S116. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4bm

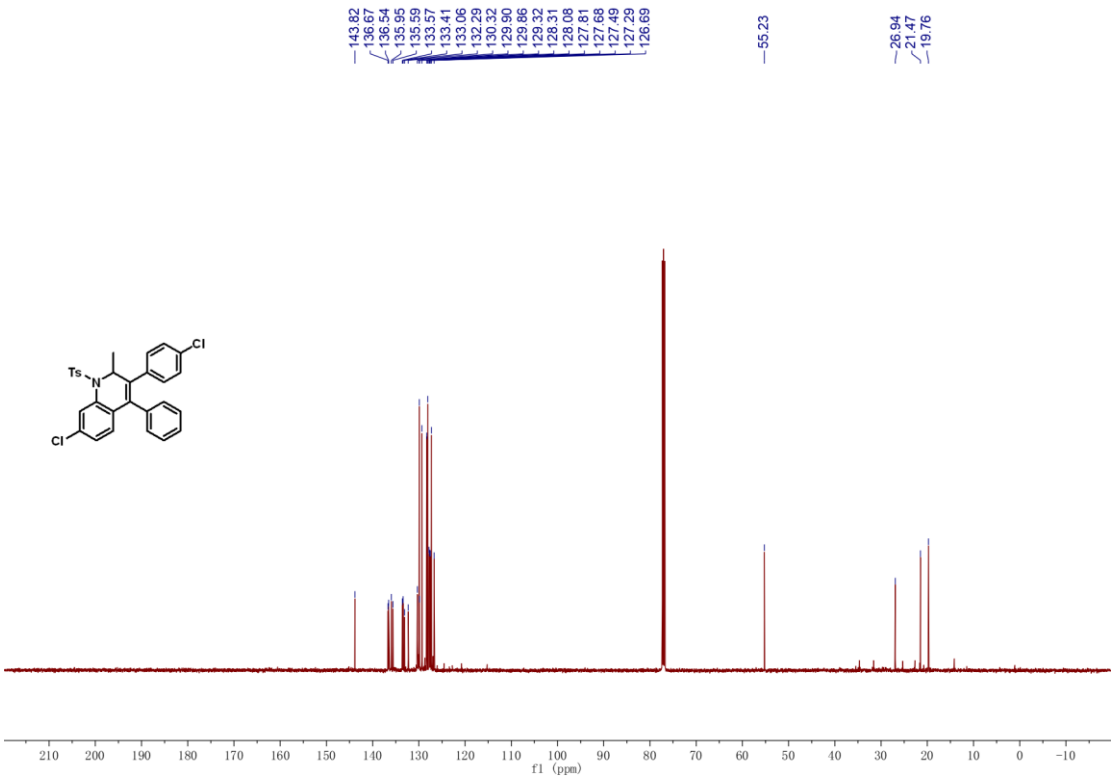


Figure S117. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4bm

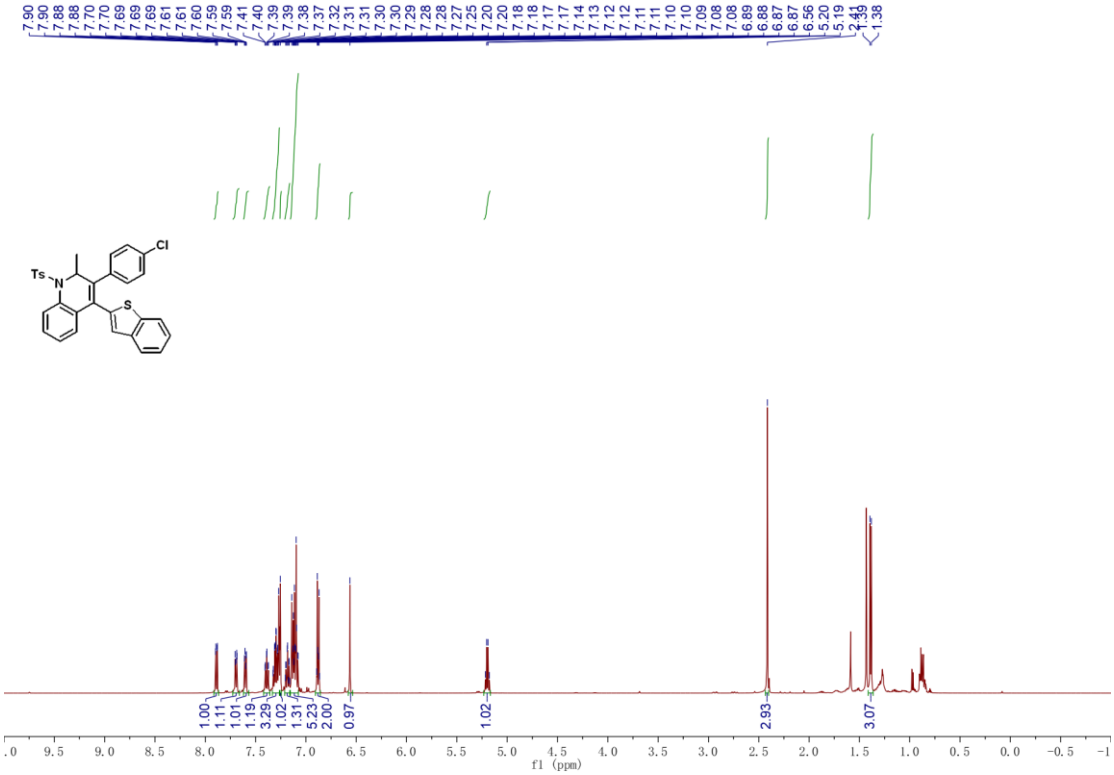


Figure S118. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4gm

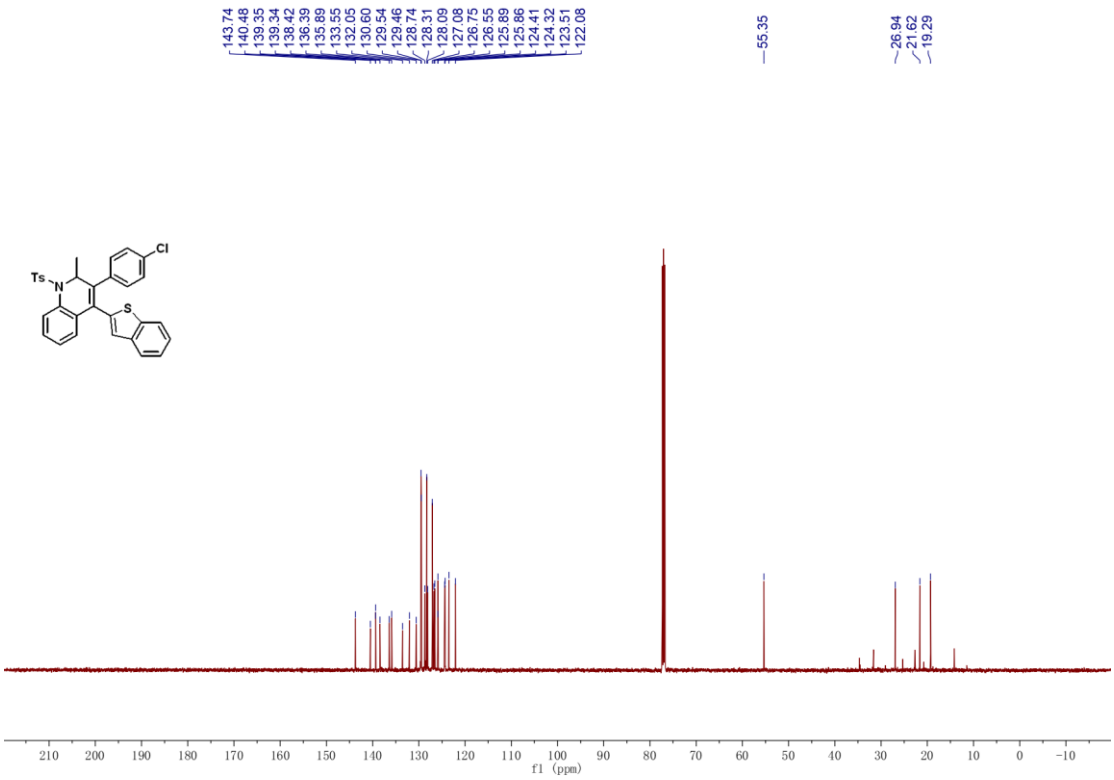


Figure S119. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4gm

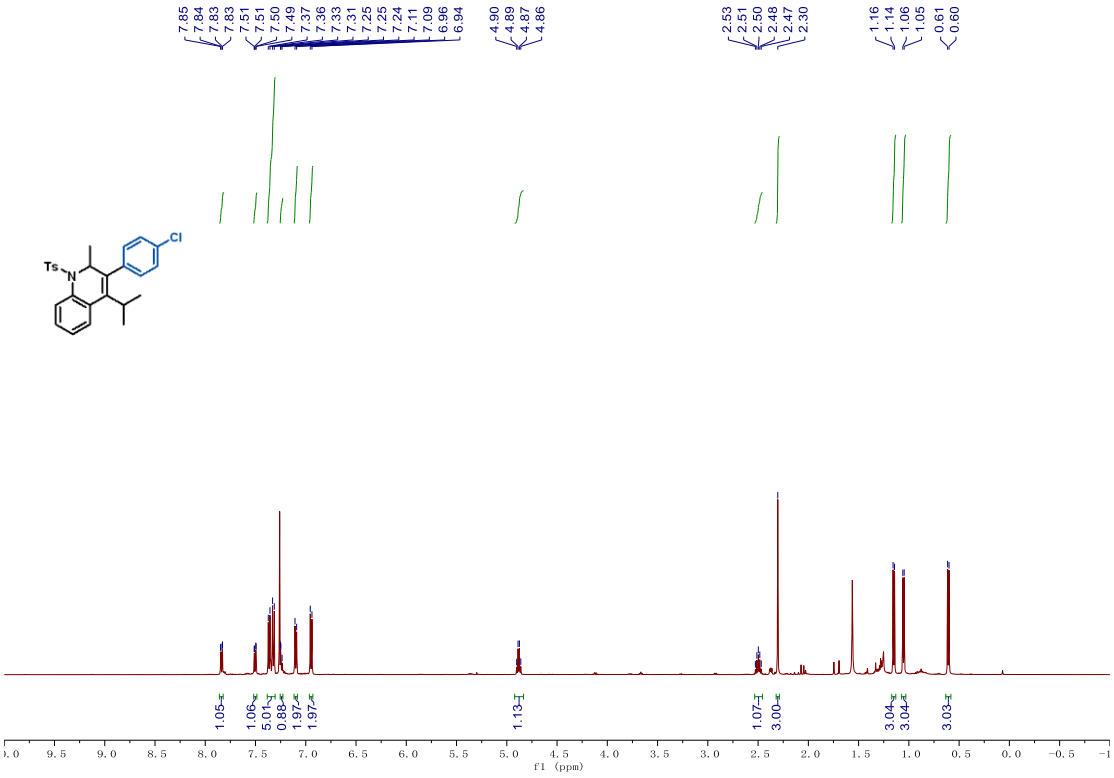


Figure S120. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4hm

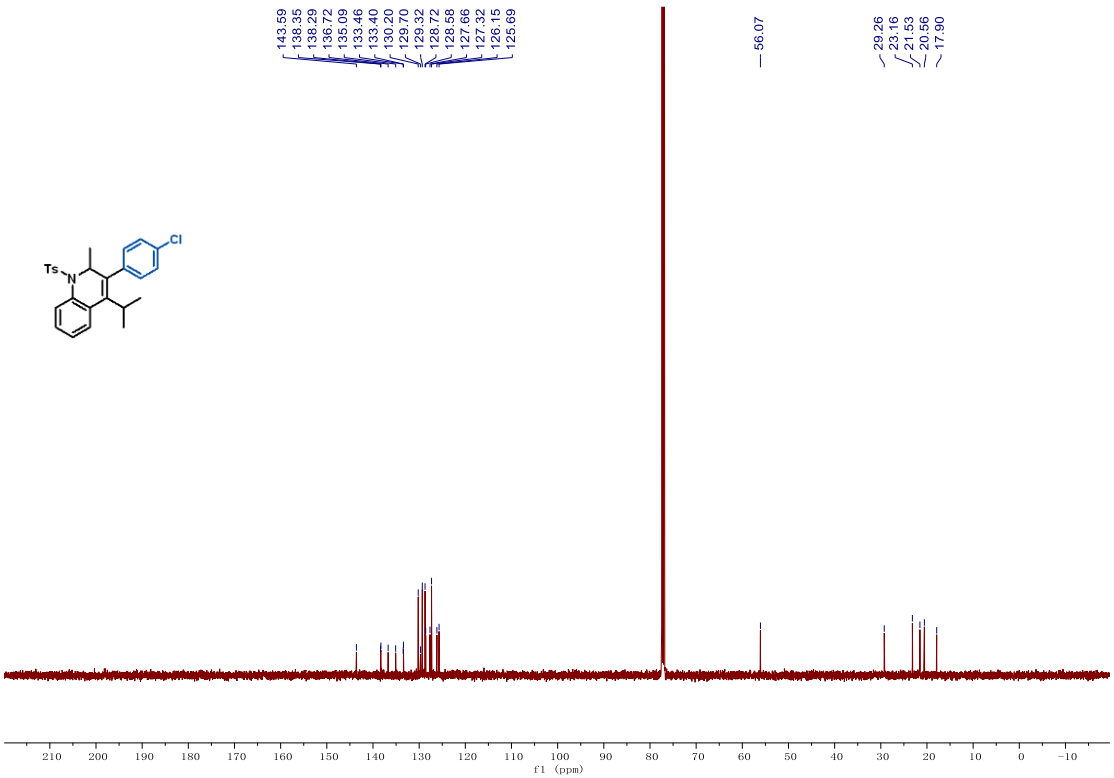


Figure S121. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4hm

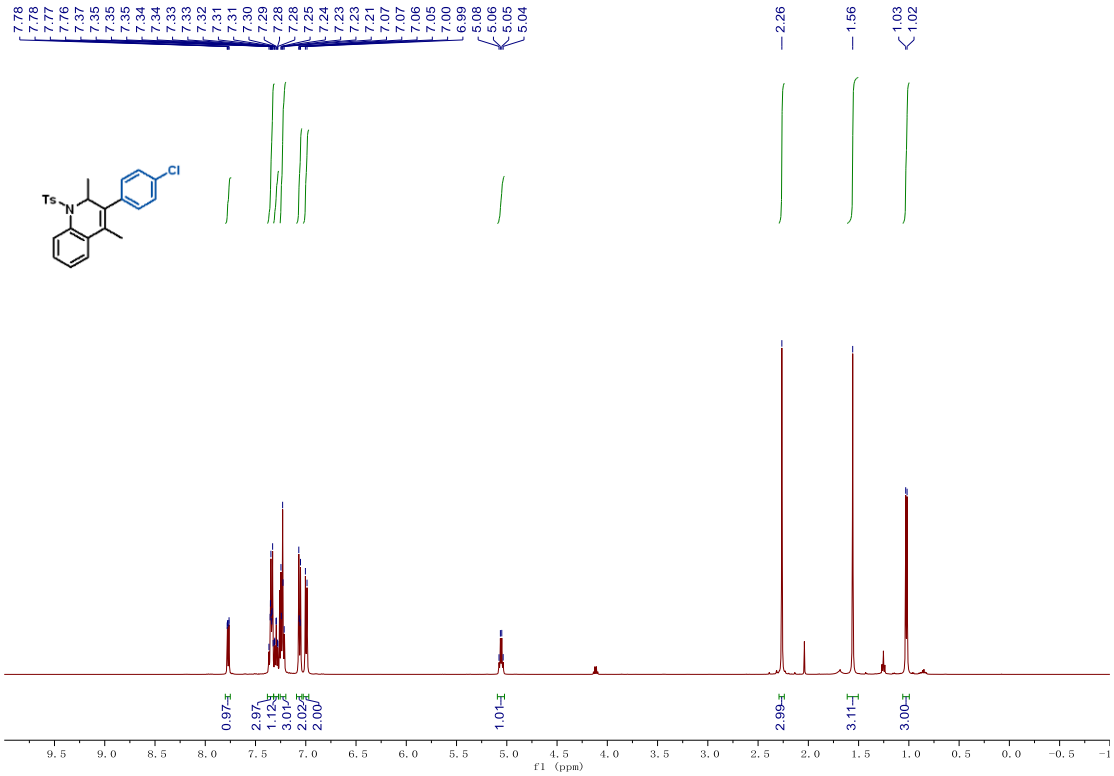


Figure S122. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4im

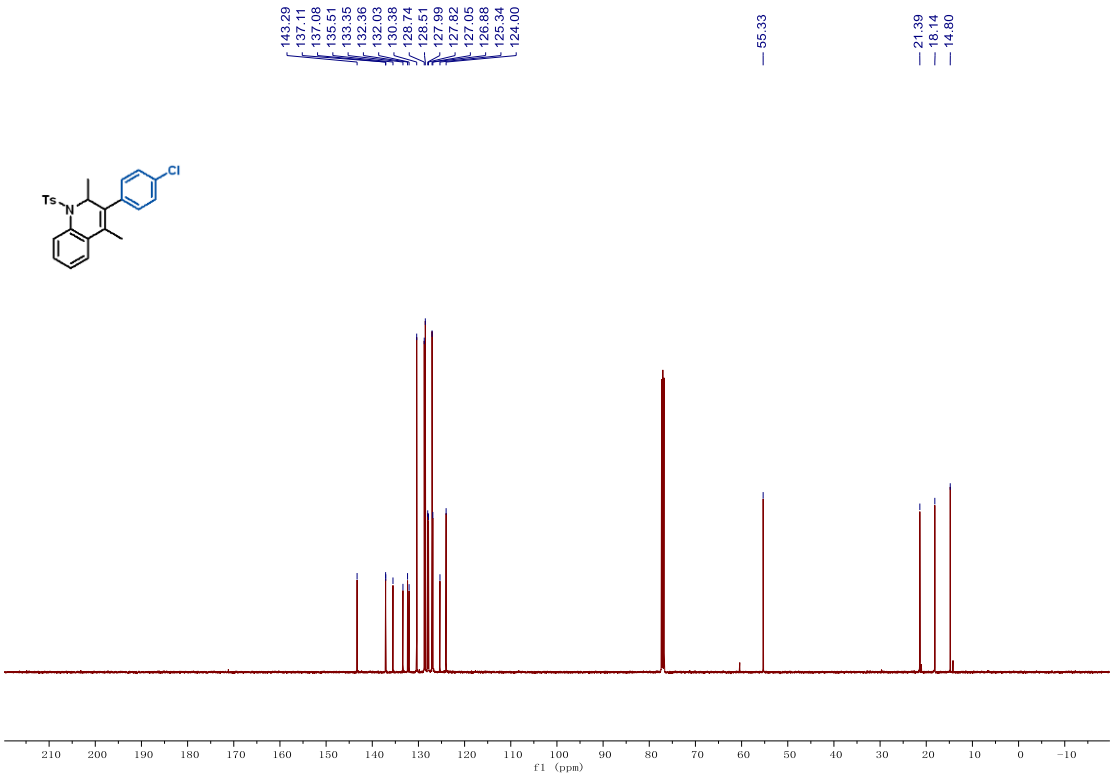


Figure S123. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4im

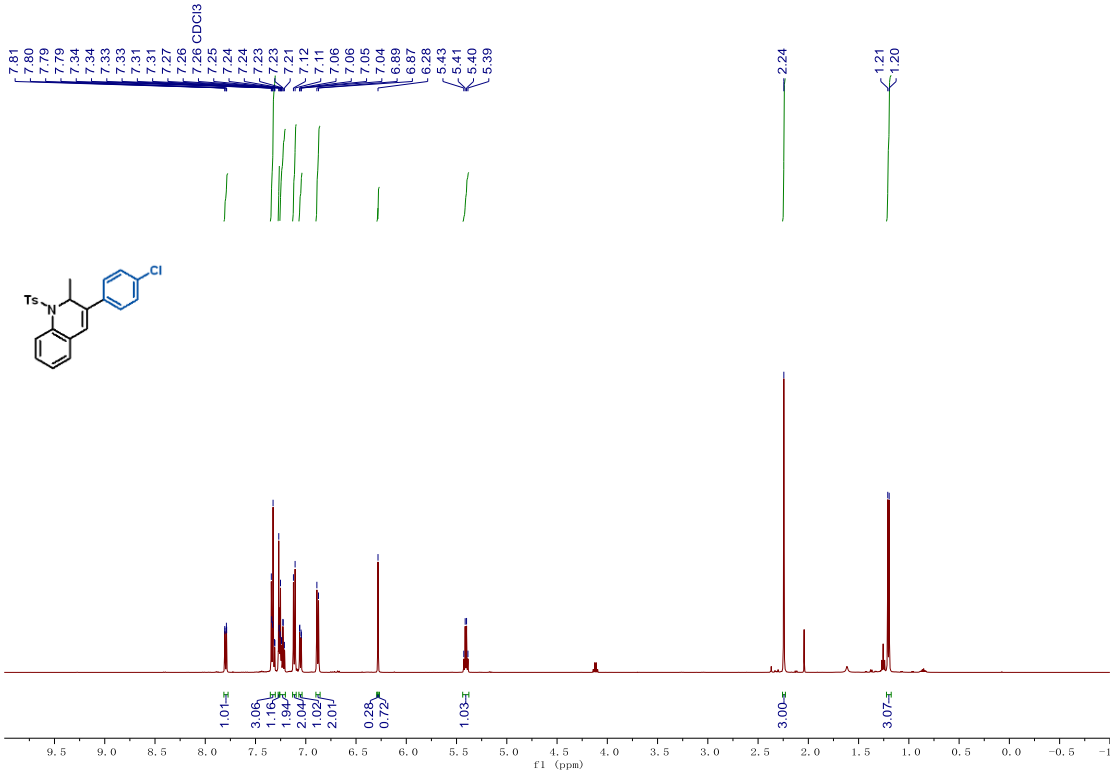


Figure S124. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4jm

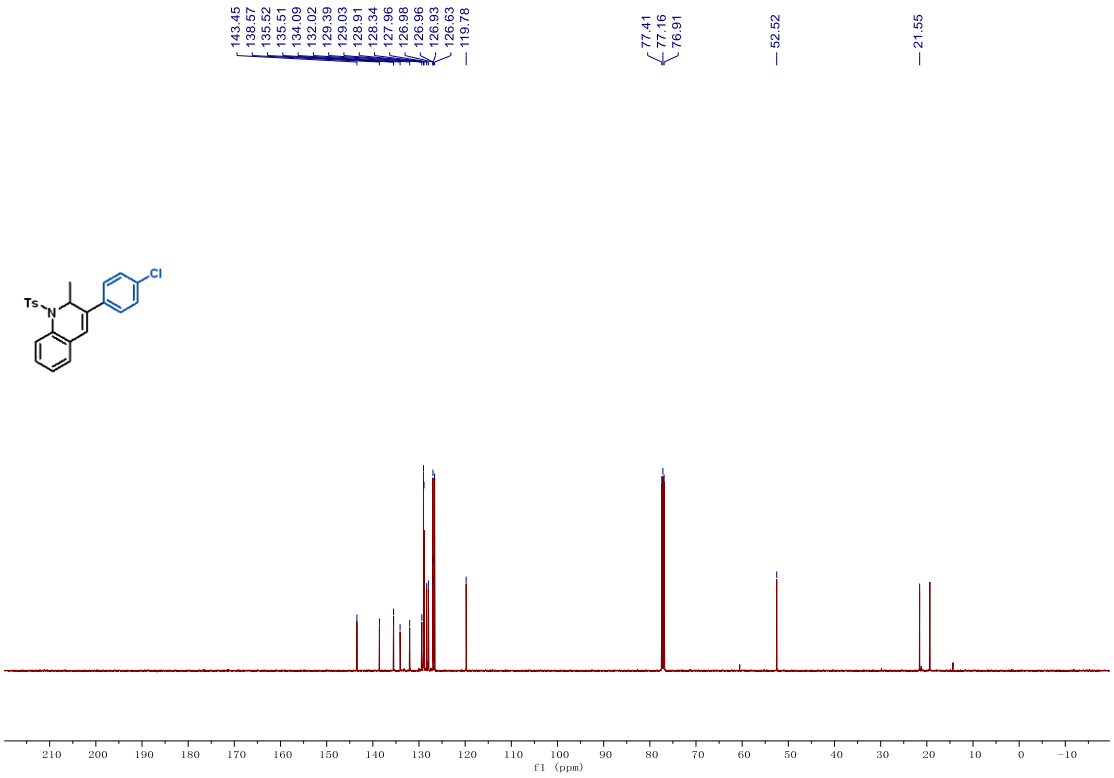


Figure S125. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4jm

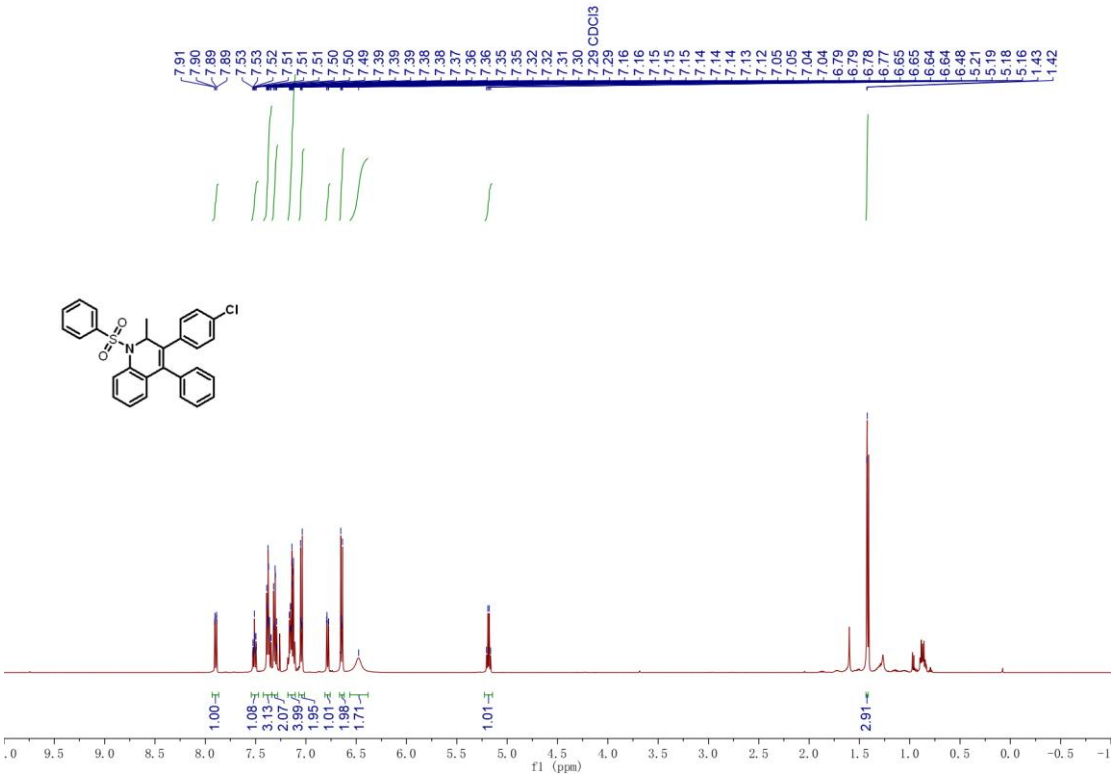


Figure S126. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4km

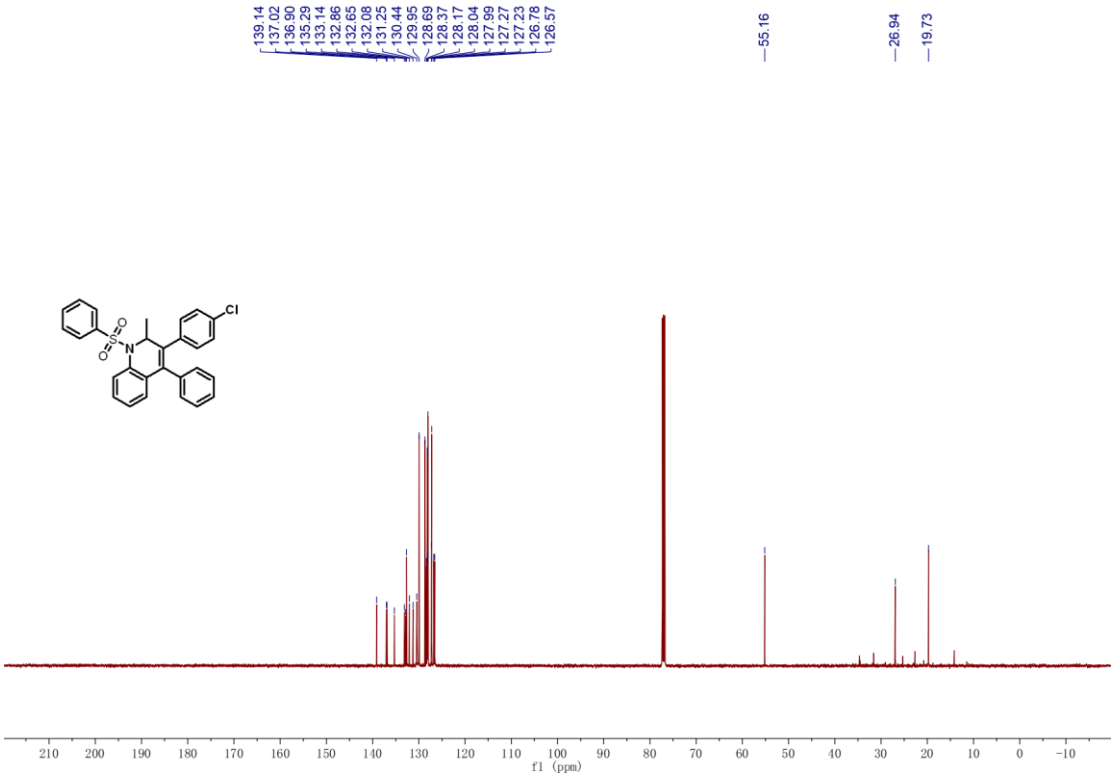


Figure S127. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4km

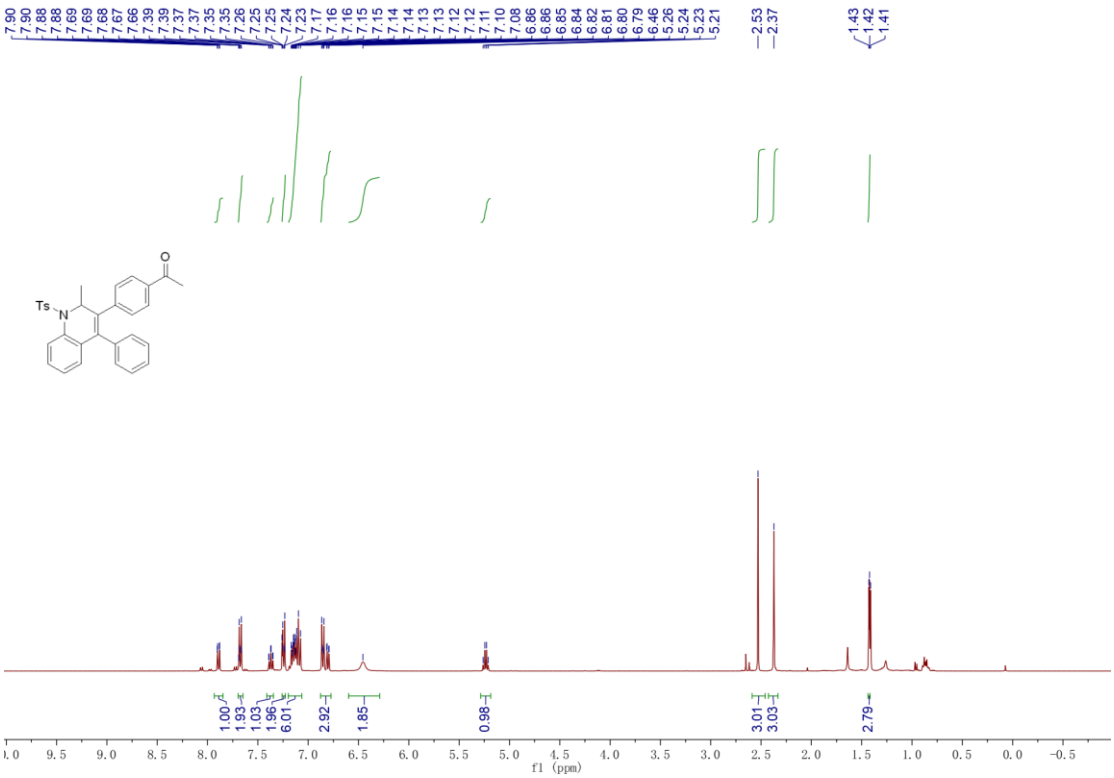


Figure S128. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4ar

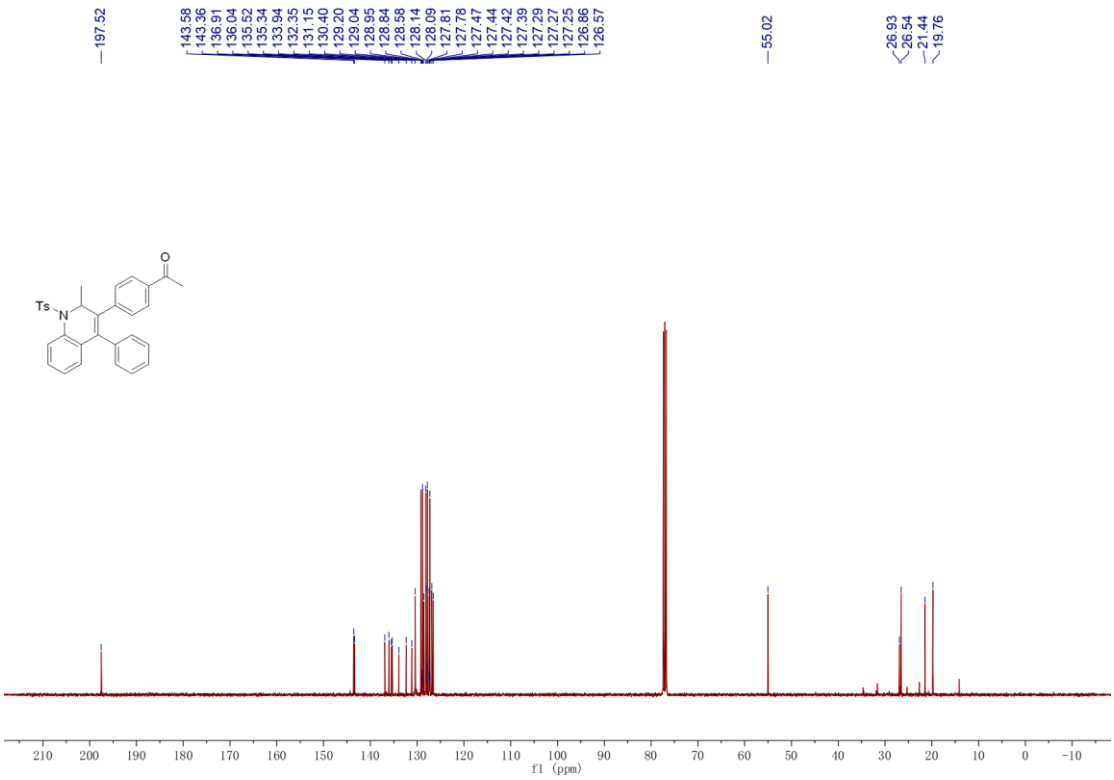


Figure S129. ^{13}C NMR (126 MHz, $CDCl_3$) spectrum of 4ar

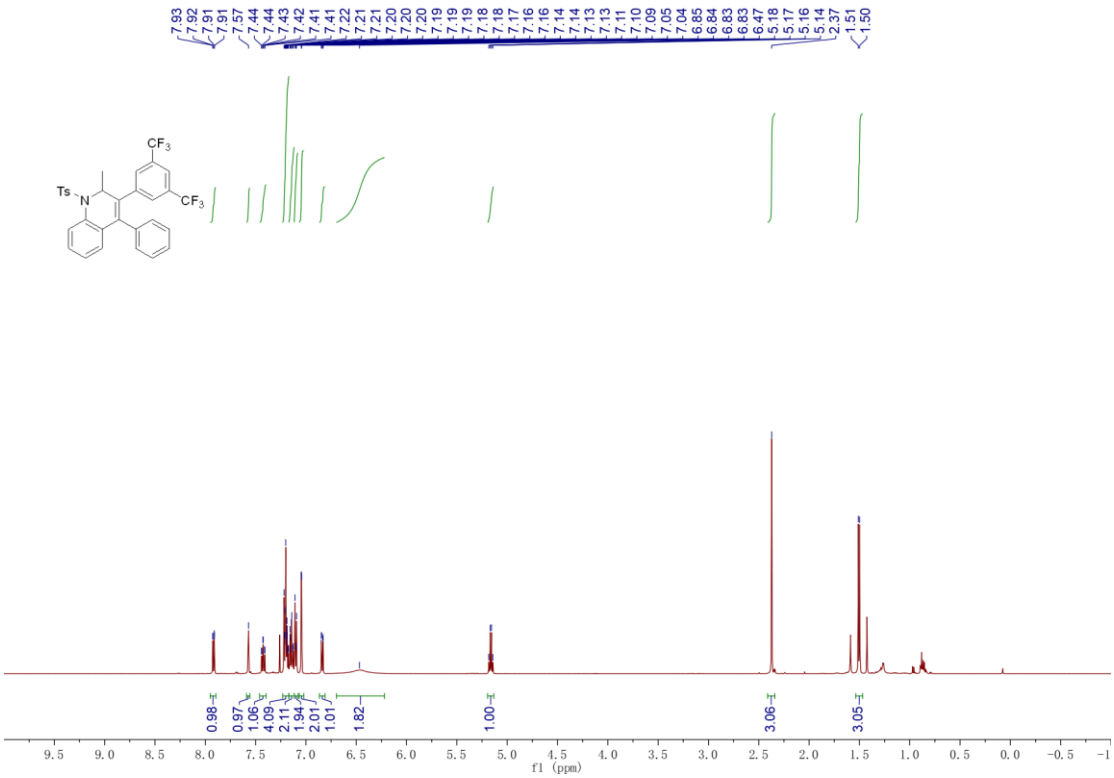


Figure S130. ^{1}H NMR (500 MHz, $CDCl_3$) spectrum of 4ay

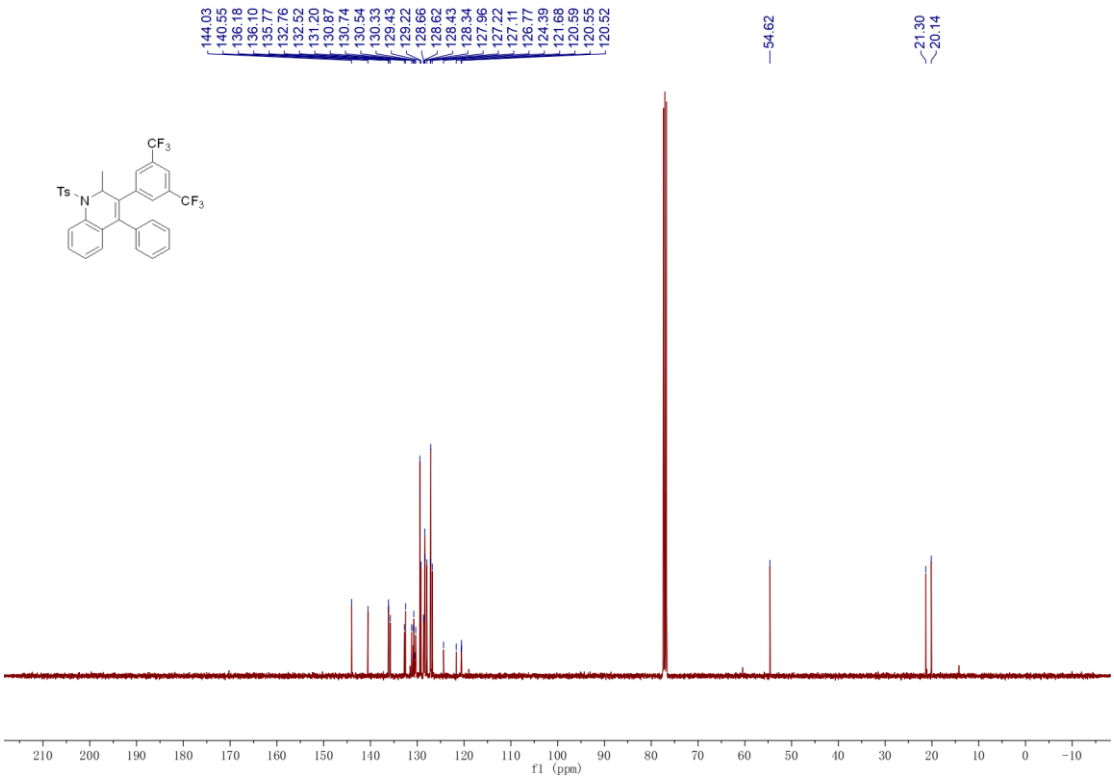


Figure S131. 13C NMR (126 MHz, $CDCl_3$) spectrum of 4ay

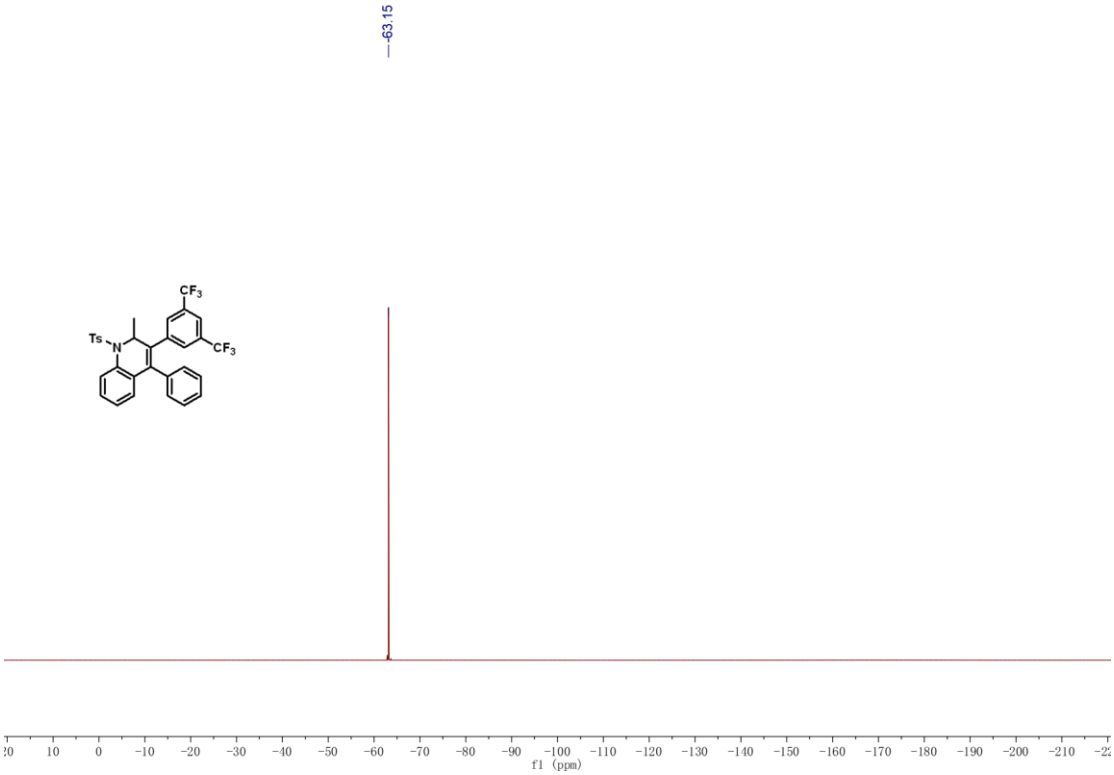


Figure S132. 19F NMR (377 MHz,$CDCl_3$) spectrum of 4ay