Supporting Information for

Pd(II)-catalyzed annulation of terminal alkynes with 2-pyridinyl-substituted *p*-quinone methides: Direct access to indolizines

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Experimental Section

1. *General methods*

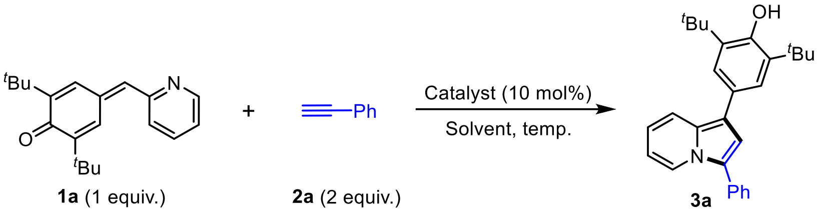
All reactions were carried out in an oven dried round bottom flask. All the solvents were distilled before use and stored under argon atmosphere. Most of the reagents, starting materials were purchased from commercial sources and used as such. Melting points were recorded on SMP20 melting point apparatus and are uncorrected. ^{1}H, ^{13}C and ^{19}F spectra were recorded in $CDCl_3$ (400, 100 and 376 MHz respectively) on Bruker FT–NMR spectrometer. Chemical shift (δ) values are reported in parts per million relative to TMS and the coupling constants (J) are reported in Hz. High resolution mass spectra were recorded on Waters Q–TOF Premier–HAB213 spectrometer. FT-IR spectra were recorded on a Perkin-Elmer FTIR spectrometer. Thin layer chromatography was performed on Merck silica gel 60 F_{254} TLC pellets and visualised by UV irradiation and $KMnO_4$ stain. Column chromatography was carried out through silica gel (100–200 mesh) using EtOAc/hexane as an eluent.

General procedure for the reaction between terminal alkynes to 2-pyridinyl-substituted p-quinone methides

Anhydrous MeCN (1.5 mL) was added to the mixture of *p*-quinone methide [*p*-QM] (30 mg, 1.0 equiv.), terminal alkyne (2.0 equiv.) and $Pd(OAc)_2$ (10 mol %) under argon atmosphere and the resulting suspension was stirred at 50 ^{o}C until the *p*-QM was completely consumed (based on TLC analysis). The reaction mixture was concentrated under reduced pressure and the residue was purified through a silica gel chromatography, using EtOAc/Hexane mixture as an eluent, to get the pure 1,3-disubstituted indolizine.

2. ***Table for optimization studies***:

Table 1. Optimization Study[a]

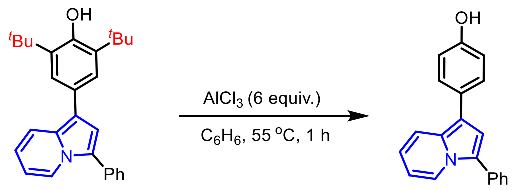


Entry	Catalyst	Solvent	Temp. [°C]	Time [h]	Yield [%][b]
1	$Cu(OTf)_2$	MeCN	RT	24	n.r.
2	$Cu(OTf)_2$	THF	RT	24	n.r.
3	$Cu(OTf)_2$	PhMe	RT	24	Trace
4	$Cu(OTf)_2$	PhMe	50	12	30
5[c]	$Cu(OTf)_2$	PhMe	50	12	32
6[d]	$Cu(OTf)_2$	PhMe	50	12	30
7	CuOTf.PhMe	PhMe	50	12	25
8	$Pd(OAc)_2$	PhMe	50	12	56
9	$Pd(OAc)_2$	1,2-DCE	50	12	73
10	$Pd(OAc)_2$	1,4-Dioxane	50	10	75
11	$Pd(OAc)_2$	THF	50	24	59
12	**$Pd(OAc)_2$**	**MeCN**	**50**	**7**	**90**
13	$PdCl_2$	MeCN	50	24	62
14	$Pd(PPh_3)_4$	MeCN	50	24	n.r.
15	$AgOCOCF_3$	MeCN	50	24	n.r.
16	$AgSbF_6$	MeCN	50	24	n.r.
17	AgOAc	MeCN	50	24	n.r.
18	$Pd(OAc)_2$	MeCN	RT	24	52
19	--	MeCN	50	48	n.r.
20	$Ni(C_5H_5)_2$	MeCN	50	24	n.r.
21	$[(C_6H_5)_3P]_3RhCl$	MeCN	50	24	n.r.
22	$[(C_6H_5)_2P(CH_2)_3P(C_6H_5)_2]NiCl_2$	MeCN	50	24	n.r.
23	$Cu(OAc)_2$	MeCN	50	24	Trace
24	$CuBr_2$	MeCN	50	24	n.r.
25	$FeCl_2$	MeCN	50	24	n.r.
26	$Fe(OAc)_2$	MeCN	50	24	n.r.

[a]Reaction conditions: Reactions were carried out with 0.10 mmol of **1a**, 2 equiv. of **2a** with respect to **1a** and 10 mol % catalyst. bYields reported are isolated yields. [c]2 equiv. Of NEt3 was used, [d]2 equiv. of $^{i}Pr_2NEt$ was used. 1,2-DCE = 1,2-Dichloroethane; n.r. = No reaction).

3. ***De-tert-butylation Reaction*:**

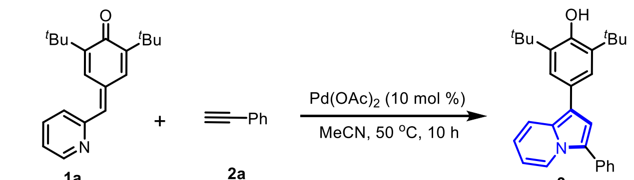
To further improve the substrate-scope of this transformation, **3a** was subjected to de-*tert*-butylation reaction with $AlCl_3$ (6 equiv.) in benzene at 55 °C and, the resultant product **4** was obtained in 95% yield in an hour (scheme 1).



Scheme 1. De-*tert*-butylation Reaction

4. ***Large scale reaction*:**

To show the practical applicability of this transformation, a relatively large-scale reaction between **1a** (0.5 g scale) and **2a** was performed, and the desired product **3a** was obtained in 82% yield (0.55 g) in 10 hours (scheme 2).

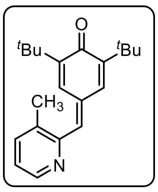


Scheme 2. Relatively large-scale reaction

5. ***Characterisation of 2-pyridinyl-substituted p-quinone methides (1b-f)*:**

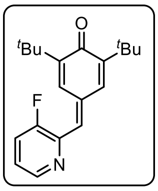
The 2-pyridinyl-substituted *p*-quinone methides **1b-f** were prepared by following a literature procedure.[1]

2,6-di-*tert*-butyl-4-[(3-methylpyridin-2-yl)-methylene]-cyclohexa-2,5-dien-1-one (1b)



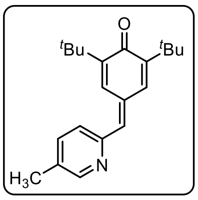
The reaction was performed at 4.127 mmol scale of 3-methylpicolinaldehyde; R_f = 0.5 (5% EtOAc in hexane); yellow solid (794 mg, 62% yield); m. p. = 154 – 156 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.57 – 8.56 (m, 1H), 8.34 (d, J = 1.9 Hz, 1H), 7.54 – 7.52 (m, 1H), 7.15 (dd, J = 7.7, 4.7 Hz, 1H), 7.12 (s, 1H), 7.00 (d, J = 2.0 Hz, 1H), 2.43 (s, 3H), 1.32 (s, 9H), 1.30 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.8, 153.7, 149.8, 148.6, 147.5, 138.3, 136.1, 135.5, 134.7, 134.4, 129.6, 123.1, 35.6, 35.2, 29.7, 29.67, 19.5; FT-IR (thin film, neat): 2952, 2857, 1739, 1604, 1540, 1372, 1237, 1045, 931, 740, 590 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{21}H_{28}NO$ [M+H]$^+$: 310.2171; found : 310.2176.

2,6-di-*tert*-butyl-4-[(3-fluoropyridin-2-yl)-methylene]-cyclohexa-2,5-dien-1-one (1c)



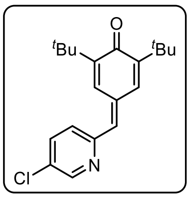
The reaction was performed at 3.997 mmol scale of 3-fluoropicolinaldehyde; R_f = 0.5 (5% EtOAc in hexane); orange solid (826 mg, 66% yield); m. p. = 130 – 132 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.75 (d, *J* = 2.2 Hz, 1H), 8.53 (d, *J* = 4.5 Hz, 1H), 7.44 – 7.39 (m, 1H), 7.27 – 7.23 (m, 1H), 7.13 (d, *J* = 2.2 Hz, 1H), 6.98 (d, *J* = 2.2 Hz, 1H), 1.33 (s, 9H), 1.32 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.8, 158.9 (d, $J_{C\text{-}F}$ = 263.4 Hz), 150.3, 149.0, 145.7 (d, $J_{C\text{-}F}$ = 5.4 Hz), 144.1 (d, $J_{C\text{-}F}$ = 9.0 Hz), 135.7 (d, $J_{C\text{-}F}$ = 1.6 Hz), 135.5, 129.4, 128.8, 124.5 (d, $J_{C\text{-}F}$ = 4.1 Hz), 123.3 (d, $J_{C\text{-}F}$ = 19.5 Hz), 35.8, 35.2, 29.7, 29.69; ^{19}F{^{1}H} NMR (376 MHz, $CDCl_3$) δ −120.4; FT-IR (thin film, neat): 2983, 1738, 1618, 1451, 1372, 1235, 1044, 936, 787, 536 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{20}H_{25}FNO$ [M+H]$^+$: 314.1920; found : 314.1913.

2,6-di-*tert*-butyl-4-[(5-methylpyridin-2-yl)-methylene]-cyclohexa-2,5-dien-1-one (1d)



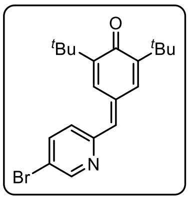
The reaction was performed at 0.102 mmol scale of 5-methylpicolinaldehyde; R_f = 0.5 (5% EtOAc in hexane); yellow solid (820 mg, 64% yield); m. p. = 152 – 154 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.69 (d, *J* = 1.6 Hz, 1H), 8.57 (brs, 1H), 7.52 – 7.49 (m, 1H), 7.29 (d, *J* = 8.0 Hz 1H), 6.95 (d, *J* = 1.8 Hz, 1H), 6.92 (s, 1H), 2.36 (s, 3H), 1.33 (s, 9H), 1.31 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.8, 152.7, 150.9, 149.6, 148.4, 138.7, 136.9, 135.6, 133.9, 133.0, 129.3, 126.9, 35.7, 35.1, 29.7, 29.69, 18.6; FT-IR (thin film, neat): 3090, 2954, 2864, 2734, 1951, 1762, 1606, 1541, 1382, 1251, 1023, 950, 705, 644, 535 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{21}H_{28}NO$ $[M+H]^+$: 310.2171; found: 310.2180.

2,6-di-*tert*-butyl-4-[(5-chloropyridin-2-yl)-methylene]-cyclohexa-2,5-dien-1-one (1e)



The reaction was performed at 3.532 mmol scale of 5-chloropicolinaldehyde; R_f = 0.5 (5% EtOAc in hexane); yellow solid (842 mg, 72% yield); m. p. = 154 – 156 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.68 (d, *J* = 2.2 Hz, 1H), 8.63 (d, *J* = 1.7 Hz, 1H), 7.68 (dd, *J* = 8.4, 2.4 Hz 1H), 7.33 (d, *J* = 8.4 Hz, 1H), 6.93 (d, *J* = 1.8 Hz, 1H), 6.86 (s, 1H), 1.32 (s, 9H), 1.31 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.7, 153.5, 150.2, 149.2, 149.0, 136.5, 136.3, 135.3, 135.1, 131.3, 128.8, 127.7, 35.8, 35.2, 29.7, 29.69; FT-IR (thin film, neat): 2984, 2925, 1737, 1618, 1448, 1372, 1234, 1044, 937, 736, 607, 512 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{20}H_{25}ClNO$ $[M+H]^+$: 330.1625; found : 330.1624.

4-[(5-bromopyridin-2-yl)methylene]-2,6-di-*tert*-butylcyclohexa-2,5-dien-1-one (1f)

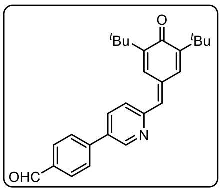


The reaction was performed at 2.855 mmol scale of 5-bromopicolinaldehyde; R_f = 0.5 (5% EtOAc in hexane); yellow solid (760 mg, 75% yield); m. p. = 168 – 17 0 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.78 (d, *J* = 2.3 Hz, 1H), 8.63 (d, *J* = 2.3 Hz, 1H), 7.83 (dd, *J* = 8.3, 2.4 Hz, 1H), 7.27 (d, *J* = 8.2 Hz, 1H), 6.93 (d, *J* = 2.2 Hz, 1H), 6.84 (s, 1H), 1.32 (s, 9H), 1.31 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.8, 153.7, 151.3, 150.2, 149.0, 139.2, 136.6, 135.3, 135.1, 128.8, 128.1, 120.2, 35.8, 35.2, 29.72, 29.68; FT-IR (thin film, neat): 3053, 2917, 2865, 1733, 1607, 1455, 1329, 1232, 1022, 742, 534 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{20}H_{25}BrNO$ $[M+H]^+$: 374.1120; found : 374.1109.

6. *Characterisation of 2-pyridinyl-substituted p-quinone methides (1g-h)*:

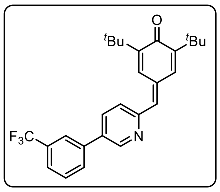
The 2-pyridinyl-substituted *p*-quinone methides **1g-h** were prepared by following a literature procedure [2] by the coupling of corresponding boronic acid and *p*-QM (**1f**)

4-{6-[(3,5-di-*tert*-butyl-4-oxocyclohexa-2,5-dien-1-ylidene)methyl]-pyridin-3-yl}-benzaldehyde (1g)



The reaction was performed at 0.801 mmol scale of **1f**; R_f = 0.3 (10% EtOAc in hexane); yellow solid (134mg, 41% yield); m. p. = 174 – 176 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 10.1 (s, 1H), 9.04 (d, *J* = 2.2 Hz, 1H), 8.79 (d, *J* = 2.0 Hz, 1H), 8.01 (d, *J* = 8.4 Hz, 2H), 7.97 (dd, *J* = 8.2, 2.4 Hz, 1H), 7.82 (d, *J* = 8.2, Hz, 2H), 7.51 (d, *J* = 8.1 Hz, 1H), 6.98 (d, *J* = 2.2 Hz 1H), 6.97 (s, 1H), 1.35 (s, 9H), 1.33 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 191.7, 186.8, 155.3, 150.2, 148.9, 148.8, 143.1, 137.3, 136.1, 135.5, 134.9, 135.3, 133.9, 130.7, 129.1, 127.7, 127.4, 35.8, 35.3, 29.8, 29.7; FT-IR (thin film, neat): 2998, 2955, 2866, 2731, 1699, 1604, 1535, 1359, 1251, 1089, 953, 818, 738 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{27}H_{30}NO_2$ $[M+H]^+$: 400.2277; found: 400.2257.

2,6-di-*tert*-butyl-4-{(5-[3-(trifluoromethyl)phenyl]pyridin-2-yl)methylene}-cyclohexa-2,5-dien-1-one (1h)

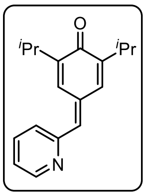


The reaction was performed at 0.801 mmol scale of **1f**; R_f = 0.5 (5% EtOAc in hexane); yellow solid (138 mg, 39% yield); m. p. = 122– 124 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.00 (d, *J* = 2.2 Hz, 1H), 8.81 (d, *J* = 2.2 Hz, 1H), 7.93 (dd, *J* = 8.1, 2.4 Hz, 1H), 7.88 (s, 1H), 7.85 (d, *J* = 7.6 Hz, 1H), 7.69 – 7.68 (m, 1H), 7.62 (t, *J* = 7.7 Hz 1H), 7.50 (d, *J* = 8.1 Hz, 1H), 6.98 (d, *J* = 2.2 Hz, 1H), 6.97 (s, 1H), 1.36 (s, 9H), 1.33 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 186.8, 155.0, 150.2, 148.9, 148.7, 138.1, 137.4, 135.5, 135.1, 134.7, 134.0, 13.8 (q, J_{C-F} = 32.2 Hz), 130.42, 130.41, 129.9, 127.4, 125.2 (q, J_{C-F} = 3.7 Hz), 124.1 (q, J_{C-F} = 270.8 Hz) 123.9 (q, J_{C-F} = 3.8 Hz), 35.8, 35.2, 29.8, 29.7; ^{19}F{^{1}H} NMR (376 MHz, $CDCl_3$) δ −62.7; FT-IR (thin film, neat): 2956, 2866, 1613, 1537, 1440, 1360, 1265, 1129, 1048, 933, 737 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{27}H_{29}F_3NO$ $[M+H]^+$: 440.2201; found: 440.2187.

7. *Characterisation of 2-pyridinyl-substituted p-quinone methide (1i)*:

The 2-pyridinyl-substituted *p*-quinone methide **1i** was prepared by following a literature procedure [3]

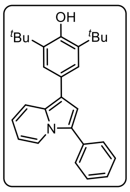
2,6-di-*iso*-propyl-4-(pyridin-2-ylmethylene)-cyclohexa-2,5-dien-1-one (1i)



R_f = 0.3 (10% EtOAc in hexane); greenish gummy solid; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.74 – 8.73 (m, 1H), 8.64 – 8.63 (m, 1H), 7.71 (td, J = 7.7, 1.8 Hz, 1H), 7.39 (d, J = 7.8 Hz, 1H), 7.22 – 7.19 (m, 1H), 6.96 (s, 1H), 6.92 (d, J = 2.3 Hz, 1H), 3.20 – 3.13 (m, 2H), 1.16 (d, J = 6.9 Hz, 6H), 1.14 (d, J = 6.9 Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 185.6, 155.2, 150.3, 147.8, 146.6, 138.7, 136.6, 135.3, 134.6, 128.9, 127.4, 123.0, 27.3, 26.6, 22.13, 22.12; FT-IR (thin film, neat): 3053, 2961, 2867, 1611, 1590, 1464, 1383, 1265, 1115, 993, 735, 703 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{18}H_{21}NNaO$ $[M+Na]^+$: 290.1521; found: 290.1518.

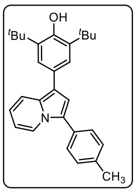
8. *Characterisation of 1,3-disubstituted indolizines (3a-3z and 3aa-3an)*

2,6-di-*tert*-butyl-4-(3-phenylindolizin-1-yl)-phenol (3a)



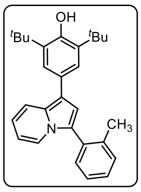
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); pale green solid (36.4 mg, 90% yield); m. p. = 108 – 110 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.29 (d, J = 7.2 Hz, 1H), 7.70 (d, J = 9.1 Hz, 1H), 7.64 – 7.62 (m, 2H), 7.52 – 7.48 (m, 3H), 7.44 (s, 2H), 7.38 – 7.34 (m, 1H), 7.00 (s, 1H), 6.74 – 6.70 (m, 1H), 6.52 – 6.47 (m, 1H), 5.18 (s, 1H), 1.52 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.3, 136.4, 132.5, 130.0, 129.1, 128.3, 127.4, 127.3, 125.4, 124.7, 122.6, 118.8, 117.5, 116.5, 113.9, 111.0, 34.6, 30.6; FT-IR (thin film, neat): 3635, 2956, 1600, 1407, 1302, 1233, 1155, 1013, 737, 699 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{28}H_{32}NO$ $[M+H]^+$: 398.2484; found : 398.2492.

2,6-di-*tert*-butyl-4-[3-(*p*-tolyl)-indolizin-1-yl]-phenol (3b)



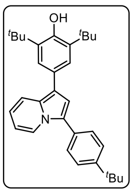
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); green solid (38.1 mg, 91% yield); m. p. = 180 – 182 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.25 (d, *J* = 7.2 Hz, 1H), 7.70 (d, *J* = 9.1 Hz, 1H), 7.52 (d, *J* = 8 Hz, 2H), 7.44(s, 2H), 7.31 (d, *J* = 7.9 Hz, 2H), 7.00 (s, 1H), 6.72 – 6.68 (m, 1H), 6.50 – 6.46 (m, 1H), 5.18 (s, 1H), 2.44 (s, 3H), 1.52 (s, 18H) ; ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.2, 137.2, 136.3, 129.8, 129.78, 129.6, 128.3, 127.5, 125.5, 124.7, 122.7, 118.8, 117.3, 116.3, 113.6, 110.9, 34.6, 30.6, 21.5; FT-IR (thin film, neat): 3451, 2956, 2870, 1641, 1451, 1360, 1233, 1154, 1119, 886, 738 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{29}H_{34}NO$ $[M+H]^+$: 412.2640; found : 412.2631.

2,6-di-*tert*-butyl-4-[3-(*o*-tolyl)-indolizin-1-yl]-phenol (3c)



The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); green solid (28.1 mg, 67% yield); m. p. = 128 – 130 ºC;^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73 (d, *J* = 9.1 Hz, 1H), 7.56 (d, *J* = 7.1 Hz, 1H), 7.47 (s, 2H), 7.43 (d, *J* = 7.2 Hz, 1H), 7.37 – 7.36 (m, 2H), 7.34 – 7.29 (m, 1H), 6.93 (s, 1H); 6.73 – 6.70 (m, 1H), 6.45 (t, *J* = 6.6 Hz, 1H), 5.17 (s, 1H), 2.20 (s, 3H) 1.53 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.1, 138.4, 136.4, 131.7, 131.4, 130.6, 128.8, 128.5, 127.7, 126.2, 124.5, 123.1, 118.6, 117.0, 115.49, 115.48, 114.0, 110.6, 34.6, 30.6, 20.0; FT-IR (thin film, neat): 3635, 2957, 2869, 1601, 1550, 1455, 1330, 1233, 1147, 884, 699, 599 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{29}H_{34}NO$ $[M+H]^+$: 412.2640; found : 412.2620.

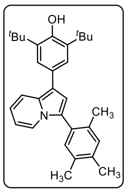
2,6-di-*tert*-butyl-4-{3-[4-(*tert*-butyl) phenyl] indolizin-1-yl}-phenol (3d)



The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); brown solid (38.1 mg, 82% yield); m. p. = 112 – 114 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.31 (d, *J* = 7.2 Hz, 1H), 7.73 (d, *J* = 9.1 Hz, 1H), 7.59 (d, *J* = 8.4

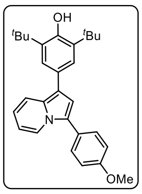
Hz 2H) 7.55 (d, J = 8.5 Hz 2H) 7.48 (s, 2H), 7.02 (s, 1H), 6.74 – 6.71 (m, 1H), 6.52 – 6.48 (m, 1H) 5.20 (s, 1H), 1.55 (s, 18H), 1.42 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.2, 150.3, 136.3, 129.8, 129.6, 128.0, 127.6, 126.0, 125.4, 124.7, 122.8, 118.8, 117.3, 116.3, 113.7, 110.8, 34.8, 34.6, 31.5, 30.6; FT-IR (thin film, neat): 3640, 2961, 1737, 1604, 1515, 1407, 1362, 1262, 1146, 1097, 1022, 826, 708 cm^{-1}; HRMS (ESI): m/z calcd for $C_{32}H_{40}NO$ $[M+H]^+$: 454.3110; found : 454.3109.

2,6-di-*tert*-butyl-4-[3-(2,4,5-trimethylphenyl)-indolizin-1-yl]-phenol (3e)



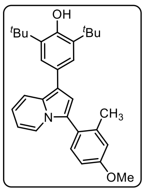
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); green solid (36.1 mg, 80% yield); m. p. = 118–120 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74 (d, J = 9.1 Hz, 1H), 7.59 (d, J = 7.1 Hz, 1H), 7.50 (s, 2H), 7.22 (s, 1H), 7.17 (s, 1H), 6.92 (s, 1H), 6.73 – 6.70 (m, 1H), 6.47 – 6.44 (m, 1H), 5.18 (s, 1H), 2.35 (s, 3H), 2.31 (s, 3H), 2.15 (s, 3H), 1.55 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.0, 136.9, 136.3, 135.6, 134.2, 132.5, 131.9, 129.0, 128.7, 127.8, 124.7, 124.5, 123.2, 118.5, 116.8, 115.4, 113.9, 110.4, 34.6, 30.6, 19.7, 19.4 (2C); FT-IR (thin film, neat): 3639, 2956, 2869, 1602, 1515, 1451, 1410, 1360, 1304, 1264, 1199, 1150, 1114, 1009, 885, 831, 740, 726 cm^{-1}; HRMS (ESI): m/z calcd for $C_{31}H_{38}NO$ $[M+H]^+$: 440.2953; found : 440.2955.

2,6-di-*tert*-butyl-4-[3-(4-methoxyphenyl)-indolizin-1-yl]-phenol (3f)



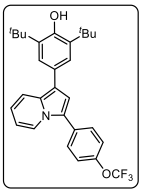
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); pale green solid (37.5 mg, 86% yield); m. p. = 148–150 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.18 (d, J = 7.2 Hz, 1H), 7.69 (d, J = 9.1 Hz, 1H), 7.56 – 7.52 (m, 2H), 7.45 (s, 2H), 7.10 – 7.03 (m, 2H), 6.94 (s, 1H), 6.71 – 6.67 (m, 1H), 6.49 – 6.45 (m, 1H), 5.18 (s, 1H), 3.89 (s, 3H), 1.52 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.0, 152.2, 136.3, 129.8, 129.5, 127.6, 125.2, 124.9, 124.7, 122.6, 118.7, 117.2, 116.1, 114.5, 113.4, 110.8, 55.5, 34.6, 30.6; FT-IR (thin film, neat): 3632, 2962, 1732, 1601, 1504, 1462, 1291, 1258, 1169, 1096, 830, 799 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{29}H_{34}NO_2$ $[M+H]^+$: 428.2590; found : 428.2597.

2,6-di-*tert*-butyl-4-[3-(4-methoxy-2-methylphenyl)-indolizin-1-yl]-phenol (3g)



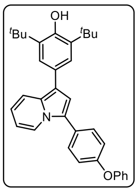
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); green solid (35.0 mg, 78% yield); m. p. = 157–159 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74 (d, *J* = 9.1 Hz, 1H), 7.55 (d, *J* = 7.1 Hz, 1H), 7.49 (s, 1H), 7.34 (d, *J* = 8.4 Hz, 1H), 6.93 (d, *J* = 2.3 Hz, 1H), 6.91 (s, 2H), 6.88 (dd, *J* = 8.4, 2.5 Hz 1H), 6.71 (dd, *J* = 8.9, 6.4 Hz 1H), 6.45 (t, *J* = 6.8 Hz, 1H), 5.18 (s, 1H), 3.89 (s, 3H), 2.17 (s, 3H) 1.54 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.8, 152.1, 140.1, 136.3, 132.6, 128.6, 127.7, 124.5, 124.3, 124.1, 123.0, 118.5, 116.9, 115.9, 115.3, 114.0, 111.5, 110.4, 55.4, 34.6, 30.6, 20.2; FT-IR (thin film, neat): 3635, 2956, 2870, 1607, 1567, 1515, 1463, 1413, 1304, 1238, 1160, 1119, 1045, 885, 819, 741 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{30}H_{36}NO_2$ $[M+H]^+$: 442.2746; found : 442.2746.

2,6-di-*tert*-butyl-4-{3-[4-(trifluoromethoxy)phenyl]indolizin-1-yl}-phenol (3h)



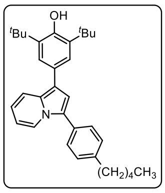
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); green solid (30.3 mg, 62% yield); m. p. = 178–180 ºC;^{1}H NMR (400 MHz, $CDCl_3$) *δ* 8.22 (d, *J* = 7.2 Hz, 1H), 7.70 (d, *J* = 9.1 Hz, 1H), 7.64 (d, *J* = 8.6 Hz, 2H), 7.43 (s, 2H), 7.34 (d, *J* = 8.2 Hz, 2H), 7.00 (s, 1H), 6.76 – 6.72 (m, 1H), 6.52 (t, *J* = 6.9 Hz, 1H), 5.19 (s, 1H), 1.52 (s, 18H); ^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) *δ* 152.4, 148.2 (q, $J_{C\text{-}F}$ = 1.8 Hz), 136.4, 131.3, 130.3, 129.5, 127.2, 124.7, 123.9, 122.3, 121.7, 120.7 (q, $J_{C\text{-}F}$ = 255.7 Hz), 118.9, 117.8, 116.7, 114.2, 111.4, 34.6, 30.6; ^{19}F{^{1}H} NMR (376 MHz, $CDCl_3$) δ −57.78; FT-IR (thin film, neat): 3641, 2957, 2871, 1603, 1548, 1481, 1407, 1340, 1258, 1164, 1119, 1013, 921, 854, 780, 738 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{29}H_{31}F_3NO_2$ $[M+H]^+$: 482.2307; found : 482.2284.

2,6-di-*tert*-butyl-4-[3-(4-phenoxyphenyl)indolizin-1-yl]-phenol (3i)



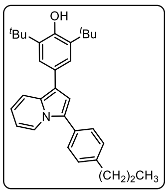
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); brown solid (43.2 mg, 86% yield); m. p. = 110–112 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.24 (d, J = 7.1 Hz, 1H), 7.71 (d, J = 9.1 Hz, 1H), 7.6 (d, J = 8.6 Hz, 2H), 7.46 (s, 2H), 7.42 – 7.38 (m, 2H) , 7.18 – 7.16 (m, 2H), 7.13 – 7.11 (m, 3H), 7.00 (s, 1H), 6.74 – 6.70 (m, 1H), 6.53 – 6.48 (m, 1H), 5.19 (s, 1H), 1.54 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.1, 156.7, 152.3, 136.4, 130.0, 129.84, 129.79, 129.4, 127.5, 127.4, 124.8, 124.7, 123.7, 122.5, 119.3, 118.8, 117.4, 116.3, 113.7, 111.0, 34.6, 30.6; FT-IR (thin film, neat): 3449, 2958, 1640, 1484, 1338, 1145, 828, 762, 739, 696 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{34}H_{36}NO_2$ $[M-H]^+$: 490.2746; found : 490.2758.

2,6-di-*tert*-butyl-4-[3-(4-pentylphenyl)indolizin-1-yl]-phenol (3j)



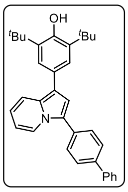
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); green solid (34.4 mg, 85% yield); m. p. = 116 – 118 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.28 (d, J = 7.2 Hz, 1H), 7.71 (d, J = 9.1 Hz, 1H), 7.55 (d, J = 8.0 Hz, 2H), 7.46 (s, 1H), 7.32 (d, J = 8.1 Hz, 2H), 7.0 (s, 1H), 6.73 – 6.69 (m, 1H), 6.51 – 6.47 (m, 1H), 5.19 (s, 1H)), 2.69 (t, J = 7.6 Hz, 2H), 1.74 – 1.67 (m, 2H), 1.54 (s, 18H), 1.43 – 1.38 (m, 4H), 0.95 (t, J = 7.1 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.2, 142.2, 136.3, 129.8, 129.1, 128.2, 127.5, 125.5, 124.7, 122.7, 118.8, 117.3, 116.3, 113.7, 110.8, 35.9, 34.6, 31.7, 31.3, 30.6, 22.7, 14.2; FT-IR (thin film, neat): 3451, 2956, 1641, 1451, 1407, 1304, 1233, 1143, 1012, 827, 739 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{33}H_{42}NO$ $[M+H]^+$: 468.3266; found : 468.3270.

2,6-di-*tert*-butyl-4-[3-(4-propylphenyl)indolizin-1-yl]-phenol (3k)



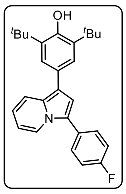
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); brown solid (39.4 mg, 88% yield); m. p. = 124–126 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.28 (d, J = 7.2 Hz, 1H), 7.71 (d, J = 9.1 Hz, 1H), 7.55 (d, J = 7.9 Hz, 2H), 7.46 (s, 2H), 7.32 (d, J = 8.0 Hz, 2H), 7.01 (s, 1H), 6.73 – 6.69 (m, 1H), 6.49 (t, J = 6.6 Hz, 1H), 5.19 (s, 1H), 2.68 (t, J = 7.5 Hz, 2H), 1.78 – 1.68 (m, 2H), 1.54 (s, 18H), 1.02 (t, J = 7.3 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.2, 142.0, 136.3, 129.81, 129.78, 129.2, 128.2, 127.6, 125.5, 124.7, 122.7, 118.8, 117.3, 116.3, 113.7, 110.8, 38.0, 34.6, 30.6, 24.7, 14.1 ; FT-IR (thin film, neat): 3633, 2955, 2859, 1654, 1547, 1453, 1408, 1304, 1233, 1152, 1017, 965, 887, 737, 591, 535, 512 cm^{-1}; HRMS (ESI): m/z calcd for $C_{31}H_{38}NO$ $[M+H]^+$: 440.2953; found : 440.2953.

4-{3-[(1,1'-biphenyl)-4-yl]-indolizin-1-yl}-2,6-di-*tert*-butylphenol (3l)



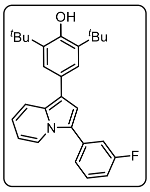
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); green solid (39.7 mg, 82% yield); m. p. = 248–250 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.37 (d, J = 7.2 Hz, 1H), 7.77 – 7.71 (m, 5H), 7.70 – 7.68 (m, 2H), 7.52 – 7.48 (m, 4H), 7.42 – 7.38 (m, 1H), 7.10 (s, 1H), 6.77 – 6.73 (m, 1H), 6.56 – 6.52 (m, 1H), 5.21 (s, 1H), 1.55 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.3, 140.8, 140.0, 136.4, 131.4, 130.2, 129.0, 128.5, 127.8, 127.5, 127.4, 127.1, 125.1, 124.7, 122.7, 118.9, 117.6, 116.7, 114.0, 111.1, 34.6, 30.6; FT-IR (thin film, neat): 3449, 2957, 1640, 1484, 1446, 1360, 1306, 1233, 1145, 1007, 885, 696 cm^{-1}; HRMS (ESI): m/z calcd for $C_{34}H_{36}NO$ $[M+H]^+$: 474.2797; found : 474.2780.

2,6-di-*tert*-butyl- 4-[3-(4-fluorophenyl)-indolizin-1-yl]-phenol (3m)



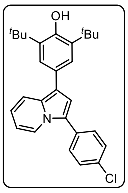
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); off white solid (24.2 mg, 57% yield); m. p. = 176–178 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.18 (d, J = 7.2 Hz, 1H), 7.72 (d, J = 9.1 Hz, 1H), 7.61 – 7.57 (m, 2H), 7.45 (s, 2H), 7.23 – 7.18 (m, 2H), 7.00 (s, 1H), 6.75 – 6.71 (m, 1H), 6.52 – 6.49 (m, 1H), 5.20 (s, 1H), 1.54 (s, 18H); ^{13}C NMR (100 MHz, CDCl3) δ 162.1 (d, $J_{C\text{-}F}$ = 245.5 Hz), 152.3, 136.4, 130.5 (d, $J_{C\text{-}F}$ = 7.9 Hz), 129.9, 128.6 (d, $J_{C\text{-}F}$ = 3.2 Hz), 127.3, 124.7, 124.3, 122.4, 118.8, 117.5, 116.4, 116.1 (d, $J_{C\text{-}F}$ = 21.4 Hz), 113.9, 111.1, 34.6, 30.6; ^{19}F{^{1}H} NMR (376 MHz, $CDCl_3$) δ −114.32; FT-IR (thin film, neat): 3636, 3440, 2957, 1603, 1521, 1451, 1360, 1304, 1233, 1157, 1119, 1013, 887, 739 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{28}H_{31}FNO$ $[M+H]^+$: 416.2390; found : 416.2378.

2,6-di-*tert*-butyl-4-[3-(3-fluorophenyl)indolizin-1-yl]-phenol (3n)



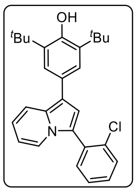
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); brown solid (22.0 mg, 52% yield); m. p. = 152–154 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.29 (d, J = 7.2 Hz, 1H), 7.70 (d, J = 9.1 Hz, 1H), 7.46 – 7.40 (m, 4H), 7.34 – 7.31 (m, 1H), 7.06 – 7.01 (m, 2H), 6.76 – 6.72 (m, 1H), 6.53 (t, J = 7.0 Hz, 1H), 5.19 (s, 1H), 1.52 (s, 18H); ^{13}C NMR (100 MHz, CDCl3) δ 163.3 (d, $J_{C\text{-}F}$ = 244.8 Hz), 152.4, 136.4, 134.6 (d, $J_{C\text{-}F}$ = 8.3 Hz), 130.6, (d, $J_{C\text{-}F}$ = 8.7 Hz), 130.5, 127.2, 124.7, 124.1 (d, $J_{C\text{-}F}$ = 2.4 Hz), 123.6 (d, $J_{C\text{-}F}$ = 2.7 Hz), 122.5, 118.9, 117.9, 116.8, 114.8 (d, $J_{C\text{-}F}$ = 21.9 Hz), 114.3 (d, $J_{C\text{-}F}$ = 1.1 Hz), 114.0, (d, $J_{C\text{-}F}$ = 21.0 Hz), 111.4, 34.6, 30.6; ^{19}F{^{1}H} NMR (376 MHz, $CDCl_3$) δ −112.35; FT-IR (thin film, neat): 3636, 2924, 1603, 1521, 1482, 1408, 1304, 1233, 1119, 887, 739 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{28}H_{31}FNO$ $[M+H]^+$: 416.2390; found : 416.2387.

2,6-di-*tert*-butyl-4-[3-(4-chlorophenyl)indolizin-1-yl]-phenol (3o)



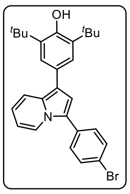
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); green solid (32.1 mg, 73% yield); m. p. = 216 – 218 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.22 (d, J = 7.2 Hz, 1H), 7.72 – 7.69 (m, 1H), 7.59 – 7.56 (m, 1H), 7.55 – 7.54 (m, 1H), 7.48 – 7.45 (m, 2H) 7.43 (s, 2H), 7.00 (s, 1H); 6.75 – 6.71 (m, 1H), 6.53 – 7.50 (m, 1H), 5.19 (s, 1H)), 1.52 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.4, 136.4, 132.9, 130.9, 130.3, 129.4, 129.3, 127.2, 124.7, 124.1, 122.4, 118.9, 117.8, 116.7, 114.1, 111.3, 34.6, 30.5; FT-IR (thin film, neat): 3627, 2954, 1511, 1450, 1304, 1231, 1141, 1009, 829, 726 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{28}H_{31}ClNO$ $[M+H]^+$: 432.2094; found : 432.2097.

2,6-di-*tert*-butyl-4-[3-(2-chlorophenyl)indolizin-1-yl]-phenol (3p)



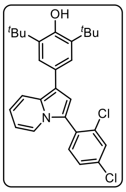
The reaction was performed at 0.102mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); brown solid (24.4 mg, 55% yield); m. p. = 165–167 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.77 – 7.74 (m, 1H), 7.67 – 7.66 (m, 1H), 7.58 – 7.53 (m, 2H), 7.48 (s, 2H), 7.40 – 7.37 (m, 2H), 7.04 (s, 1H); 6.80 – 6.76 (m, 1H), 6.55 – 6.51 (m, 1H), 5.19 (s, 1H)), 1.54 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.2, 136.3, 134.8, 133.1, 131.3, 130.2, 129.6, 129.5, 127.4, 127.1, 124.7, 123.7, 122.3, 118.5, 117.6, 115.9, 114.9, 110.6, 34.6, 30.6; FT-IR (thin film, neat): 3634, 2957, 1598, 1443, 1306, 1262, 1150, 1034, 833, 654 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{28}H_{31}ClNO$ $[M+H]^+$: 432.2094; found : 432.2094.

4-[3-(4-bromophenyl)-indolizin-1-yl]-2,6-di-*tert*-butylphenol (3q)



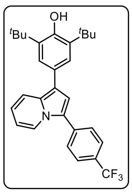
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); green solid (28.3 mg, 58% yield); m. p. = 230–232 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.22 (d, J = 7.2 Hz, 1H), 7.70 (d, J = 9.1 Hz, 1H), 7.63 – 7.60 (m, 2H), 7.51 – 7.48 (m, 2H), 7.42 (s, 2H), 6.98 (s, 1H), 6.75 – 6.71 (m, 1H), 6.53 – 6.50 (m, 1H), 5.19 (s, 1H), 1.52 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.4, 136.4, 132.3, 131.4, 130.3, 129.7, 127.2, 124.7, 124.1, 122.4, 121.0, 118.9, 117.8, 116.8, 114.1, 111.4, 34.6, 30.5; FT-IR (thin film, neat): 3437, 2956, 2850, 1633, 1510, 1485, 1450, 1361, 1304, 1233, 1144, 1071, 1009, 822, 723 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{28}H_{31}BrNO$ $[M+H]^+$: 476.1589; found : 476.1570.

2,6-di-*tert*-butyl-4-[3-(2,4-dichlorophenyl)-indolizin-1-yl]-phenol (3r)



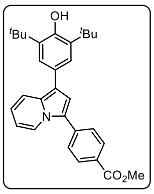
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); brown solid (24.0 mg, 50% yield); m. p. = 152–154 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74 (d, J = 9.1 Hz, 1H), 7.62 (d, J = 7.1 Hz, 1H), 7.58 (d, J = 2.1 Hz, 1H), 7.48 – 7.45 (m, 3H), 7.37 (dd, J = 8.2, 1.9 Hz, 1H), 7.00 (s, 1H), 6.80 – 6.76 (m, 1H), 6.55 – 6.51 (m, 1H), 5.19 (s, 1H), 1.52 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.3, 136.4, 135.4, 134.6, 133.7, 130.1, 130.0, 129.9, 127.5, 127.2, 124.7, 123.5, 121.0, 118.6, 117.9, 116.1, 115.1, 110.9, 34.6, 30.6; FT-IR (thin film, neat): 3635, 3452, 2956, 2870, 1631, 1548, 1443, 1408, 1360, 1233, 1154, 1101, 1056, 822, 724 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{28}H_{30}Cl_2NO$ $[M+H]^+$: 466.1704; found : 466.1687.

2,6-di-*tert*-butyl-4-{3-[4-(trifluoromethyl)phenyl]indolizin-1-yl}-phenol (3s)



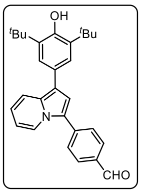
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); off white solid (23.0 mg, 48% yield); m. p. = 220–222 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.30 (d, J = 7.2 Hz, 1H), 7.74 – 7.71 (m, 5H), 7.43 (s, 2H), 7.05 (s, 1H) , 6.79 – 6.75 (m, 1H), 6.57 – 6.53 (m, 1H), 5.21 (s, 1H), 1.52 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.5, 136.4, 136.0 (apparent q, $J_{C\text{-}F}$ = 0.9 Hz), 130.9, 128.8 (q, $J_{C\text{-}F}$ = 32.4 Hz), 127.9, 127.0, 126.1 (q, $J_{C\text{-}F}$ = 3.7 Hz), 124.7, 124.3 (q, $J_{C\text{-}F}$ = 270.2 Hz), 123.9, 122.4, 119.0, 118.3, 117.2, 114.8, 111.7, 34.6, 30.5; ^{19}F{^{1}H} NMR (376 MHz, $CDCl_3$) δ −62.41; FT-IR (thin film, neat): 3453, 2957, 2855, 1615, 1456, 1408, 1324, 1235, 1167, 1127, 1067, 1017, 841, 722, 684 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{29}H_{31}F_3NO$ $[M+H]^+$: 466.2358; found : 466.2349.

methyl 4-[1-(3,5-di-*tert*-butyl-4-hydroxyphenyl)indolizin-3-yl]-benzoate (3t)



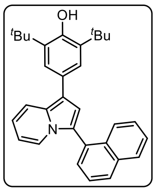
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.4 (5% EtOAc in hexane); brown solid (17.3 mg, 37% yield); m. p. = 204–206 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.36 (d, J = 7.2 Hz, 1H), 8.15 (d, J = 8.3 Hz, 2H), 7.71 (d, J = 8.3 Hz, 3H), 7.42 (s, 2H), 7.07 (s, 1H), 6.79 – 6.75 (m, 1H), 6.57 – 6.54 (m, 1H), 5.20 (s, 1H), 3.96 (s, 3H) 1.52 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.0, 152.5, 136.9, 136.4, 131.2, 130.5, 128.2, 127.2, 127.0, 124.7, 124.3, 122.7, 119.0, 118.4, 117.3, 114.9, 111.7, 52.3, 34.6, 30.5; FT-IR (thin film, neat): 3633, 3078, 2955, 1719, 1605, 1517, 1407, 1235, 1146, 1014, 832, 704 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{30}H_{34}NO_3$ $[M+H]^+$: 456.2539; found : 456.2541.

4-[1-(3,5-di-*tert*-butyl-4-hydroxyphenyl)indolizin-3-yl]-benzaldehyde (3u)



The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.4 (5% EtOAc in hexane); brown solid (14.8 mg, 34% yield); m. p. = 234–236 ºC;^{1}H NMR (400 MHz, $CDCl_3$) δ 10.04 (s, 1H), 8.41 (d, J = 7.2 Hz, 1H), 8.00 (d, J = 8.3 Hz, 2H), 7.81 (d, J = 8.2 Hz, 2H), 7.73 (d, J = 9.1 Hz, 1H), 7.43 (s, 2H), 7.12 (s, 1H), 6.82 – 6.78 (m, 1H), 6.61 – 6.58 (m, 1H), 5.22 (s, 1H), 1.52 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 191.6, 152.6, 138.5, 136.5, 134.5, 131.7, 130.7, 127.5, 126.8, 124.8, 124.1, 122.7, 119.1, 118.8, 117.7, 115.4, 112.0, 34.6, 30.5; FT-IR (thin film, neat): 3522, 2924, 2864, 2730, 1685, 1591, 1458, 1401, 1291, 1222, 1103, 1023, 943, 822, 730, 666 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{29}H_{32}NO_2$ $[M+H]^+$: 426.2433; found : 426.2443.

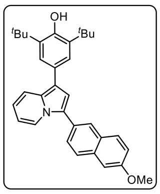
2,6-di-*tert*-butyl-4-[3-(naphthalen-1-yl)-indolizin-1-yl]-phenol (3v)



The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); green solid (33.7 mg, 74% yield); m. p. = 139–141 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.0 (d, J = 8.1 Hz, 2H), 7.80 (d, J = 9.1 Hz, 1H), 7.70 – 7.66 (m, 2H), 7.63 – 7.59 (m, 2H), 7.56 – 7.52 (m, 3H), 7.47 – 7.43 (m, 1H), 7.14 (s, 1H), 6.78 – 6.74

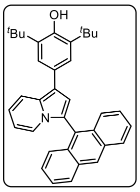
(m, 1H), 6.42 – 6.39 (m, 1H), 5.21 (s, 1H), 1.56 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.2, 136.4, 134.1, 132.4, 129.9, 129.4, 129.0, 128.8, 128.7, 127.6, 126.7, 126.3, 126.1, 125.8, 124.6, 123.5, 123.3, 118.6, 117.4, 115.9, 115.4, 110.6, 34.6, 30.6; FT-IR (thin film, neat): 3633, 3056, 2957, 2870, 1599, 1545, 1451, 1410, 1361, 1303, 1264, 1234, 1154, 1112, 1017, 886, 777, 740 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{32}H_{34}NO$ $[M+H]^+$: 448.2640; found : 448.2644.

2,6-di-*tert*-butyl-4-[3-(6-methoxynaphthalen-2-yl)indolizin-1-yl]-phenol (3w)



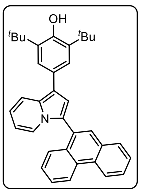
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); brown solid (40.4 mg, 83% yield); m. p. = 190–192 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) *δ* 8.38 (d, *J* = 7.2 Hz, 1H), 8.03 (s, 1H), 7.87 (d, *J* = 8.5 Hz 1H), 7.81 (d, *J* = 8.6 Hz, 1H), 7.78 – 7.72 (m, 2H), 7.52 (s, 2H), 7.25 – 7.22 (m, 2H), 7.12 (s, 1H), 6.78 – 6.74 (m, 1H), 6.55 – 6.51 (m, 1H), 5.22 (s, 1H), 3.98 (s, 3H), 1.39 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) *δ* 158.0, 152.2, 136.4, 133.8, 130.0, 129.6, 129.3, 127.6, 127.54, 127.51, 127.1, 126.6, 125.5, 124.7, 122.6, 119.4, 118.8, 117.5, 116.5, 114.0, 111.1, 105.9, 55.5, 34.6, 30.6; FT-IR (thin film, neat): 3630, 2956, 1732, 1606, 1494, 1302, 1220, 1135, 890, 739 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{33}H_{36}NO_2$ $[M+H]^+$: 478.2746; found : 478.2742.

4-[3-(anthracen-9-yl)-indolizin-1-yl]-2,6-di-*tert*-butylphenol (3x)



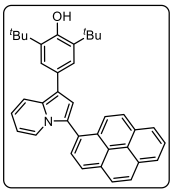
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); green solid (34.4 mg, 68% yield); m. p. = 154–156 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.62 (s, 1H), 8.12 (d, *J* = 8.4 Hz, 2H), 7.91 (d, *J* = 9.1 Hz, 1H), 7.69 (d, *J* = 8.7 Hz, 2H), 7.64 (s, 2H), 7.53 – 7.49 (m, 2H), 7.43 – 7.38 (m, 2H), 7.28 (s, 1H), 7.18 (d, *J* = 7.1 Hz, 1H), 6.81 – 6.77 (m, 1H), 6.35 – 6.31 (m, 1H), 5.23 (s, 1H), 1.58 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.2, 136.5, 132.0, 131.8, 129.3, 128.8, 128.4, 127.7, 126.6, 126.5, 126.1, 125.6, 124.5, 123.5, 120.3, 118.6, 117.4, 116.8, 115.9, 110.6, 34.7, 30.6; FT-IR (thin film, neat): 3633, 3401, 2957, 2870, 1622, 1511, 1454, 1361, 1324, 1233, 1152, 1115, 1013, 887, 791, 737 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{36}H_{35}NNaO$ [M+Na]$^+$: 520.2616; found : 520.2596.

2,6-di-*tert*-butyl-4-[3-(phenanthren-9-yl) indolizin-1-yl]-phenol (3y)



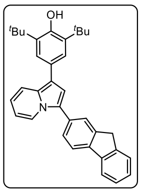
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); green solid (39.6 mg, 78% yield); m. p. = 136–138 ºC; 8.83 (d, *J* = 8.2 Hz, 1H), 8.78 (d, *J* = 8.2 Hz, 1H), 8.00 (s, 1H), 7.95 (dd, *J* = 7.8, 0.9 Hz, 1H), 7.83 (d, *J* = 9.2 Hz, 1H), 7.76 – 7.73 (m, 1H), 7.72 – 7.71 (m, 1H), 7.70 – 7.68 (m, 1H), 7.67 – 7.65 (m, 1H), 7.60 – 7.53 (m, 4H), 7.21 (s, 1H), 6.80 – 6.75 (m, 1H), 6.42 – 6.39 (m, 1H), 5.22 (s, 1H), 1.57 (s, 18H); ^{13}C NMR (100 MHz, CDCl3) δ 152.2, 136.4, 131.8, 131.2, 130.9, 130.6, 130.3, 129.4, 129.0, 128.6, 127.6, 127.3, 127.2, 127.1, 127.0, 126.9, 124.6, 123.7, 123.3, 123.2, 122.8, 118.6, 117.4, 115.9, 115.3, 110.6, 34.7, 30.6; FT-IR (thin film, neat): 3635, 3450, 2957, 1642, 1450, 1442, 1336, 1233, 1153, 886, 727 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{36}H_{36}NO$ [M+H]$^+$: 498.2797; found : 498.2788.

2,6-di-*tert*-butyl-4-[3-(pyren-1-yl)indolizin-1-yl]-phenol (3z)



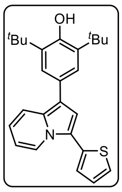
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); green solid (33.1 mg, 62% yield); m. p. = 128–130 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.30 (d, *J* = 7.9 Hz, 1H), 8.24 (d, *J* = 7.6 Hz, 1H), 8.21 – 8.16 (m, 2H), 8.15 (s, 2H), 8.06 – 8.02 (m, 2H), 7.92 (d, *J* = 9.2 Hz, 1H), 7.83 (d, *J* = 9.1 Hz, 1H), 7.69 (d, *J* = 7.1 Hz, 1H), 7.56 (s, 2H), 7.25 (s, 1H), 6.80 – 6.76 (m, 1H), 6.43 – 6.40 (m, 1H), 5.21 (s,1H), 1.55 (s, 18H) ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.3, 136.5, 131.5, 131.3, 131.1, 129.9, 129.7, 128.8, 128.2, 127.9, 127.6, 127.5, 127.0, 126.3, 125.52, 125.49, 125.4, 125.3, 125.1, 124.9, 124.7, 123.7, 123.2, 118.7, 117.6, 116.3, 115.9, 110.8, 34.7, 30.6; FT-IR (thin film, neat): 3465, 2924, 1640, 1462, 1432, 1303, 1234, 1116, 844, 716 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{38}H_{36}NO$ [M+H]$^+$: 522.2797; found : 522.2772.

4-[3-(9H-fluoren-2-yl)indolizin-1-yl]-2,6-di-*tert*-butylphenol (3aa)



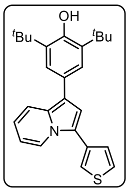
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); light green solid (37.6 mg, 76% yield); m. p. = 196–198 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.36 (d, *J* = 7.1 Hz, 1H), 7.91 (d, *J* = 7.8 Hz, 1H), 7.85 (d, *J* = 7.5 Hz, 1H), 7.81 (s, 1H), 7.74 (d, *J* = 9.1 Hz, 1H), 7.67 (d, *J* = 7.9, Hz,1H), 7.60 (d, *J* = 7.4 Hz, 1H), 7.50 (s, 2H), 7.43 (t, *J* = 7.4 Hz, 1H), 7.35 (t, *J* = 7.4, Hz, 1H), 7.10 (s, 1H), 6.76 – 6.73 (m, 1H), 6.53 (t, *J* = 6.8 Hz, 1H), 5.21 (s, 1H), 4.01 (s, 2H), 1.55 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.3, 144.1, 143.5, 141.5, 140.9, 136.4, 130.8, 130.0, 127.5, 127.0, 126.9 (2C), 125.8, 125.2, 124.8, 124.7, 122.8, 120.4, 120.0, 118.8, 117.5, 116.5, 113.9, 111.0, 37.1, 34.6, 30.6; FT-IR (thin film, neat): 3633, 2957, 2870, 1612, 1547, 1422, 1337, 1152, 1014, 827, 703, 653 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{35}H_{36}NO$ $[M+H]^+$: 486.2797; found : 486.2785.

2,6-di-*tert*-butyl-4-[3-(thiophen-2-yl)-indolizin-1-yl]-phenol (3ab)



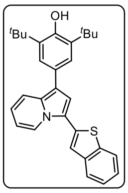
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); brown solid (32.0 mg, 78% yield); m. p. = 138 – 140 ºC;^{1}H NMR (400 MHz, $CDCl_3$) δ 8.38 (d, *J* = 7.2 Hz, 1H), 7.72 (d, *J* = 9.1 Hz, 1H), 7.45 (s, 2H), 7.37 (dd, *J* = 5.2, 1.0 Hz, 1H), 7.31 – 7.30 (m, 1H), 7.20 – 7.18 (m, 1H), 7.10 (s, 1H), 6.79 – 6.75 (m, 1H), 6.61 – 6.57 (m, 1H), 5.21 (s, 1H) 1.54 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.4, 136.4, 134.0, 130.5, 127.7, 127.1, 124.8, 124.74, 124.70, 123.2, 118.7, 118.3, 117.8, 116.6, 115.0, 111.4, 34.6, 30.6, FT-IR (thin film, neat): 3633, 3452, 2870, 1758, 1566, 1416, 1399, 1248, 1139, 853, 724, 664 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{26}H_{30}NOS$ $[M+H]^+$: 404.2048; found : 404.2034.

2,6-di-*tert*-butyl-4-[3-(thiophen-3-yl)indolizin-1-yl]-phenol (3ac)



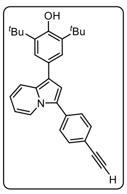
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); brown solid (33.6 mg, 82% yield); m. p. = 140–142 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.25 (d, J = 7.2 Hz, 1H), 7.71 (d, J = 9.1 Hz, 1H), 7.49 – 7.47 (m, 2H), 7.44 (s, 2H), 7.40 (dd, J = 4.7, 1.4 Hz, 1H), 7.03 (s, 1H), 6.74 – 6.70 (m, 1H), 6.56 – 6.52 (m, 1H), 5.19 (s, 1H), 1.53 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.3, 136.4, 132.8, 129.8, 127.7, 127.4, 126.2, 124.7, 123.0, 121.2, 120.8, 118.7, 117.3, 116.2, 113.8, 111.2, 34.6, 30.6; FT-IR (thin film, neat): 3632,3452, 2956, 2870, 1642, 1566, 1452, 1416, 1399, 1360, 1331, 1264, 1248, 1139, 887, 783, 663 cm^{-1}; HRMS (ESI): m/z calcd for $C_{26}H_{30}NOS$ $[M+H]^+$: 404.2048; found : 404.2037.

4-{3-(benzo[*b*]thiophen-2-yl)indolizin-1-yl}-2,6-di-*tert*-butylphenol (3ad)



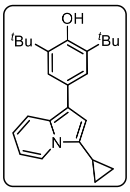
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); brown solid (29.1 mg, 63% yield); m. p. = 126–128 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.55 (d, J = 7.2 Hz, 1H), 7.85 (d, J = 8.0 Hz, 1H), 7.80 (d, J = 7.5 Hz, 1H), 7.73 (d, J = 9.0 Hz, 1H), 7.50 (s, 1H), 7.43 (s, 1H), 7.41 – 7.31(m, 3H), 7.19 (s, 1H), 6.82 – 6.78 (m, 1H), 6.67 – 6.63 (m, 1H), 5.22 (s, 1H) 1.53 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.5, 140.6, 138.9, 136.4, 134.4, 131.3, 126.9, 124.8, 124.7, 124.3, 123.5, 123.3, 122.1, 119.7, 118.8, 118.5, 118.3, 117.2, 115.8, 111.9, 34.6, 30.6; FT-IR (thin film, neat): 3632, 2957, 2922, 2871, 1597, 1578, 1434, 1360, 1238, 1157, 1025, 889, 748, 665 cm^{-1}; HRMS (ESI): m/z calcd for C30$H_{32}NOS$ $[M+H]^+$: 454.2205; found : 454.2226.

2,6-di-*tert*-butyl-4-[3-(4-ethynylphenyl)indolizin-1-yl]-phenol (3ae)



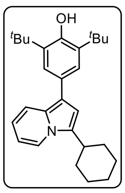
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); brown solid (24.0 mg, 56% yield); m. p. = 118–120 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.29 (d, J = 7.2 Hz, 1H), 7.70 (d, J = 9.1 Hz, 1H), 7.63 – 7.58 (m, 4H), 7.43 (s, 2H)), 7.02 (s, 1H), 6.76 – 6.72 (m, 1H), 6.55 – 6.51 (m, 1H), 5.19 (s, 1H), 3.16 (s, 1H), 1.52 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.4, 136.4, 132.91, 132.88, 130.6, 127.6, 127.2, 124.7, 124.6, 122.6, 120.5, 118.9, 118.0, 117.0, 114.4, 111.4, 83.7, 77.9, 34.6, 30.6; FT-IR (thin film, neat): 3643, 3306, 3267, 3066, 2923, 2870, 1657, 1484, 1365, 1243, 1154, 1025, 918, 684 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{30}H_{32}NO$ $[M+H]^+$: 422.2484; found : 422.2472.

2,6-di-*tert*-butyl-4-(3-cyclopropylindolizin-1-yl)-phenol (3af)



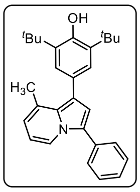
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); brown gummy solid (7.6 mg, 20% yield); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.07 (d, *J* = 7.1 Hz, 1H), 7.64 (d, *J* = 9.1 Hz, 1H), 7.37 (s, 2H), 6.71 – 6.66 (m, 2H), 6.57 – 6.53 (m, 1H), 5.12 (s, 1H), 1.91 – 1.85 (m, 1H), 1.50 (s, 18H), 1.03 – 0.98 (m, 2H), 0.76 – 0.72 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.0, 136.3, 128.7, 127.9, 126.1, 124.5, 122.7, 118.4, 116.7, 114.3, 111.4, 110.2, 34.6, 30.6, 6.3, 5.5; FT-IR (thin film, neat): 3630, 3500, 3055, 2871, 1605, 1499, 1407, 1338, 1301, 1157, 1030, 928, 808, 676, 556 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{25}H_{32}NO$ $[M+H]^+$: 362.2484; found : 362.2498.

2,6-di-*tert*-butyl-4-(3-cyclohexylindolizin-1-yl)-phenol (3ag)



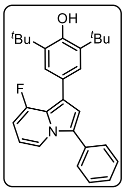
The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.6 (5% EtOAc in hexane); brown gummy solid (10.1 mg, 24% yield); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.78 (d, *J* = 7.2 Hz, 1H), 7.64 (d, *J* = 9.1 Hz, 1H), 7.38 (s, 2H), 6.69 (s, 1H), 6.65 – 6.61 (m, 1H), 6.52 – 6.47 (m, 1H), 5.12 (s, 1H), 2.86 – 2.80 (m, 1H), 2.18 – 2.13 (m, 4H), 1.92 – 1.80 (m, 3H), 1.61 – 1.54 (m, 3H), 1.50 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 151.9, 136.2, 130.1, 128.4, 128.0, 124.6, 122.1, 118.8, 115.9, 114.8, 110.2, 109.4, 35.4, 34.6, 31.9, 30.6, 29.9, 26.8; FT-IR (thin film, neat): 3451, 2927, 2853, 1644, 1453, 1407, 1360, 1336, 1234, 1155, 1118, 888, 735, 721 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{28}H_{38}NO$ $[M+H]^+$: 404.2953; found : 404.2960.

2,6-di-*tert*-butyl-4-(8-methyl-3-phenylindolizin-1-yl)-phenol (3ah)



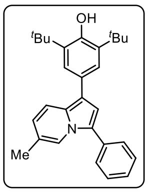
The reaction was performed at 0.0969 mmol scale of **1b**; R_f = 0.6 (5% EtOAc in hexane); green solid (32.8 mg, 82% yield); m. p. = 158–160 ºC; ^1H NMR (400 MHz, $CDCl_3$) δ 8.23 (d, J = 6.3 Hz, 1H), 7.66 – 7.64 (m, 2H); 7.53 – 7.49 (m, 2H); 7.40 – 7.35 (m, 1H), 7.30 (s, 2H), 6.89 (s, 1H), 6.47 – 6.42 (m, 2H), 5.22 (s, 1H), 2.18 (s, 3H), 1.53 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.6, 134.8, 132.7, 130.0, 129.8, 129.1, 128.8, 128.5, 127.8, 127.2, 124.7, 120.7, 118.0, 117.8, 116.5, 110.6, 34.5, 30.6, 20.9; FT-IR (thin film, neat): 3635, 2955, 2870, 1601, 1544, 1395, 1333, 1231, 1154, 1026, 833, 736, 627, 590 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{29}H_{34}NO$ $[M+H]^+$: 412.2640; found : 412.2638.

2,6-di-*tert*-butyl-4-(8-fluoro-3-phenylindolizin-1-yl)-phenol (3ai)



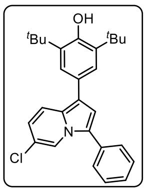
The reaction was performed at 0.0957 mmol scale of **1c**; R_f = 0.6 (5% EtOAc in hexane); brown solid (30.3 mg, 76% yield); m. p. = 160–160 ºC;^1H NMR (400 MHz, $CDCl_3$) δ 8.07 – 8.05 (m, 1H), 7.63 – 7.61 (m, 2H), 7.54 – 7.50 (m, 2H), 7.46 (d, J = 3.3 Hz, 2H), 7.43 – 7.39 (m, 1H), 7.00 (s, 1H), 6.42 – 6.38 (m, 2H), 5.21 (s, 1H), 1.53 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 155.9 (d, $J_{C\text{-}F}$ = 247.9 Hz) 152.6, 135.5, 132.1, 129.2, 128.6, 127.8, 127.4, 126.7, 126.3 (d, $J_{C\text{-}F}$ = 4.1 Hz), 121.0 (d, $J_{C\text{-}F}$ = 32.1 Hz), 119.1 (d, $J_{C\text{-}F}$ = 4.0 Hz), 117.1 (d, $J_{C\text{-}F}$ = 4.7 Hz), 115.5, 109.5 (d, $J_{C\text{-}F}$ = 8.1 Hz), 100.1 (d, $J_{C\text{-}F}$ = 19.4 Hz), 34.6, 30.6; $^{19}F\{^1H\}$ NMR (376 MHz, $CDCl_3$) δ −120.04; FT-IR (thin film, neat): 3638, 2941, 2856, 2742, 1601, 1527, 1437, 1396, 1264, 1152, 1078, 924, 831, 731, 623, 516 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{28}H_{30}NaFNO$ $[M+H]^+$: 438.2209; found : 438.2204.

2,6-di-*tert*-butyl-4-(6-methyl-3-phenylindolizin-1-yl)-phenol (3aj)



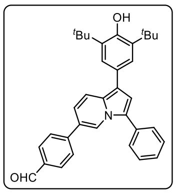
The reaction was performed at 0.0969 mmol scale of **1d**; R_f = 0.6 (5% EtOAc in hexane); brown solid (33.6 mg, 84% yield); m. p. = 146–148 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) *δ* 8.09 (s, 1H), 7.66 – 7.63 (m, 3H), 7.53 – 7.49 (m, 2H), 7.46 (s, 2H), 7.39 – 7.35 (m, 1H), 7.00 (s, 1H), 6.61 (d, *J* = 9.1 Hz, 1H), 5.18 (s, 1H), 2.23 (s, 3H), 1.53 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.2, 136.3, 132.7, 129.1, 129.0, 128.3, 127.6, 127.2, 125.1, 124.6, 120.9, 120.3, 120.0, 118.3, 116.2, 113.4, 34.6, 30.6, 18.7; FT-IR (thin film, neat): 3633, 3056, 2954, 2869, 1884, 1729, 1514, 1413, 1301, 1199, 1072, 884, 785, 698, 627, 574, 536 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{29}H_{34}NO$ $[M+H]^+$: 412.2640; found : 412.2644.

2,6-di-*tert*-butyl-4-(6-chloro-3-phenylindolizin-1-yl)-phenol (3ak)



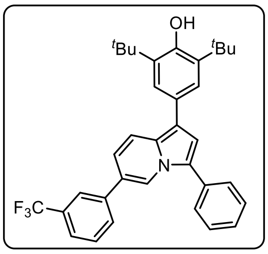
The reaction was performed at 0.0909 mmol scale of **1e**; R_f = 0.6 (5% EtOAc in hexane); brown gummy solid (29.2 mg, 74% yield); ^{1}H NMR (400 MHz, $CDCl_3$) *δ* 8.293 – 8.287 (m, 1H), 7.66 – 7.60 (m, 3H), 7.55 – 7.51 (m, 2H), 7.42 – 7.38 (m, 3H), 7.00 (s, 1H), 6.68 (dd, *J* = 9.5, 1.7 Hz, 1H), 5.23 (s, 1H), 1.53 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.6, 136.5, 131.8, 129.3, 128.6, 128.3, 127.8, 126.8, 126.1, 124.7, 120.2, 119.5, 119.4, 118.7, 117.9, 114.4, 34.6, 30.5; FT-IR (thin film, neat): 3633, 2955, 2869, 1601, 1455, 1313, 1233, 1152, 1112, 887, 757, 671 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{28}H_{31}ClNO$ $[M+H]^+$: 432.2094; found : 432.2084.

4-[1-(3,5-di-*tert*-butyl-4-hydroxyphenyl)-3-phenyl-indolizin-6-yl]-benzaldehyde (3al)



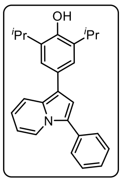
The reaction was performed at 0.075 mmol scale of **1g**; R_f = 0.3 (10% EtOAc in hexane); brown solid (18.0 mg, 47% yield); m. p. = 102–104 ºC; ^{1}H NMR (400 MHz, $CDCl_3$) *δ* 10.04 (s, 1H), 8.56 (s, 1H), 7.94 (d, *J* = 8.3 Hz, 1H), 7.81 (dd, *J* = 9.3, 0.5 Hz, 1H), 7.71 (d, *J* = 8.2 Hz, 2H), 7.68 – 7.65 (m, 2H), 7.54 (t, *J* = 7.6 Hz, 2H), 7.47 (s, 2H), 7.43 – 7.39 (m, 1H), 7.06 (s, 1H), 7.04 (dd, *J* = 7.8, 1.6 Hz, 1H), 5.23 (s, 1H), 1.54 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) *δ* 191.8, 152.5, 144.8, 136.5, 135.2, 132.1, 130.6, 129.3, 129.0, 128.4, 127.7, 127.0, 126.5, 124.7, 123.8, 121.1, 119.3, 117.4, 117.2, 115.07, 115.05, 34.6, 30.5; FT-IR (thin film, neat): 3627, 2955, 2826, 1701, 1603, 1565, 1462, 1396, 1265, 839, 702, cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{35}H_{34}NO_2$ [M–H]⁻: 500.2590; found: 500.2586.

2,6-di-tert-butyl-4-{3-phenyl-6-[3-(trifluoromethyl)phenyl]-indolizin-1-yl}-phenol (3am)



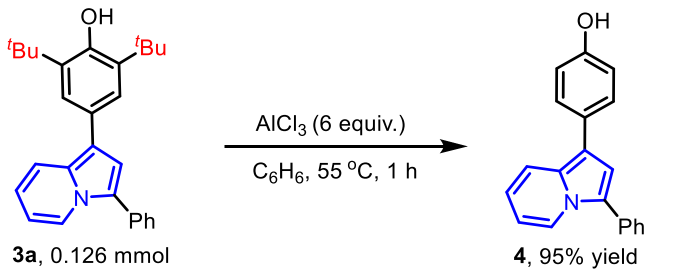
The reaction was performed at 0.068 mmol scale of **1h**; R_f = 0.5 (5% EtOAc in hexane); brown gummy solid (17 mg, 46% yield); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.48 (s, 1H), 7.81 (dd, J = 8.6, 0.7 Hz, 1H), 7.78 (s, 1H), 7.71 (d, J = 7.6 Hz, 1H) 7.68 – 7.66 (m, 2H), 7.59 (d, J = 7.8 Hz, 1H), 7.76– 7.52 (m, 3H), 7.48 (s, 2H), 7.43 – 7.38 (m, 1H), 7.06 (s, 1H), 7.00 (dd, J = 9.4, 1.5 Hz, 1H), 5.22 (s, 1H), 1.54 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.5, 139.7, 136.5, 132.2, 131.6, 131.3, 130.0, 129.5, 129.3, 129.1, 128.4, 127.7, 127.1, 126.3, 124.7, 124.0 (q, J_{C-F} = 5.1 Hz), 124.2 (q, J_{C-F} = 270.8 Hz), 123.5 (q, J_{C-F} = 3.8 Hz), 120.5, 119.3, 117.7, 117.0, 114.9, 34.7, 30.6; ^{19}F{^{1}H} NMR (376 MHz, $CDCl_3$) δ −62.6; FT-IR (thin film, neat): 3641, 2956, 2859, 1736, 1602, 1517, 1458, 1364, 1235, 1038, 889, 788, 701 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{35}H_{33}F_3NO$ $[M-H]^-$: 540.2514; found : 540.2518.

2,6-di-*iso*-propyl-4-(3-phenylindolizin-1-yl)-phenol (3an)



The reaction was performed at 0.112 mmol scale of **1i**; R_f = 0.3 (5% EtOAc in hexane); brown gummy solid (32.3 mg, 78% yield); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.32 (d, J = 7.0 Hz, 1H), 7.74 (d, J = 9.1 Hz, 1H), 7.67 (d, J = 7.3 Hz, 2H), 7.53 (t, J = 7.5 Hz, 1H), 7.40 (d, J = 7.4 Hz, 1H), 7.37 (s, 2H), 7.07 (s, 1H), 6.76 (t, J = 7.1 Hz, 1H), 6.54 – 6.51 (m, 1H), 4.83 (s, 1H), 3.28 (septet, J = 5.8 Hz, 2H), 1.39 (d, J = 6.8 Hz, 12H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 148.4, 134.1, 132.5, 130.0, 129.1, 128.6, 128.3, 127.3, 125.5, 123.2, 122.6, 118.8, 117.6, 116.2, 113.9, 111.0, 27.4, 23.0; FT-IR (thin film, neat): 3053, 2960, 2869, 1654, 1601, 1547, 1341, 1263, 1014, 938, 833, 700 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{26}H_{26}NO$ [M-H]$^-$: 368.2014; found: 368.2014.

9. Experimental procedure for the de-tert-butylation of 3a:



$AlCl_3$ (100.6 mg, 0.755 mmol) was added to a solution of **3a** (50 mg, 0.126 mmol) in benzene (2.0 mL) and the mixture was stirred at 55 °C for 1 h . The reaction mixture was then quenched with cold ice water and extracted with Ethyl acetate, and the organic part was concentrated under reduced pressure. The residue was purified through a neutral alumina column using EtOAc/Hexane mixture as an eluent to get the pure product **4** (34.2 mg, 95%) as brown gummy solid; R_f = 0.5 (50% EtOAc in hexane); ^{1}H NMR (400 MHz, DMSO-d$_6$) δ 9.32 (s, 1H), 8.29 (d, *J* = 7.2 Hz, 1H), 7.64 (d, *J* = 9.1 Hz, 1H), 7.57 (d, *J* = 7.3 Hz, 2H), 7.45 (t, *J* = 7.5 Hz, 2H), 7.37 (d, *J* = 8.4 Hz, 2H), 7.31 (t, *J* = 7.4 Hz, 1H), 7.00 (s, 1H), 6.80 (d, *J* = 8.5 Hz, 2H), 6.73 – 7.70 (m, 1H), 6.54 (t, *J* = 6.9 Hz, 1H); ^{13}C NMR (100 MHz, DMSO-d$_6$) δ 155.5, 131.6, 129.2, 129.1, 128.3, 127.7, 127.2, 126.4, 124.7, 122.6, 118.3, 118.0, 115.7, 114.8, 113.5, 111.4; FT-IR (thin film, neat): 3386, 3255, 2956, 2257, 1653, 1552, 1515, 1267, 1023, 572 cm^{-1}; HRMS (ESI): *m/z* calcd for $C_{20}H_{16}NO$ [M+H]$^+$: 286.1232; found : 286.1227.

10. (a) Experimental Procedure for the reaction between phenylacetylene to 1a in a mixture of MeCN and D_2O:

Anhydrous MeCN (1.25 mL) and D_2O (0.25 mL) was added to the mixture of *p*-quinone methide **1a** (30 mg, 1.0 equiv.), phenylacetylene (2.0 equiv.) and $Pd(OAc)_2$ (10 mol %) under argon atmosphere and the resulting suspension was stirred at 50 °C until the *p*-QM **1a** was completely consumed (based on TLC analysis). The reaction mixture was concentrated under reduced pressure and the residue was purified through a silica gel chromatography, using EtOAc/Hexane mixture as an eluent, to get the pure **3a'**.

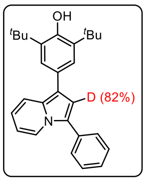
(b) Experimental Procedure for the reaction between phenylacetylene-d to 1a:

The phenylacetylene-d was prepared by following a literature procedure [4]

Anhydrous MeCN (1.5 mL) was added to the mixture of *p*-quinone methide **1a** (30 mg, 1.0 equiv.), phenylacetylene-d (2.0 equiv.) and $Pd(OAc)_2$ (10 mol %) under argon atmosphere and the resulting suspension was stirred at 50 °C until the *p*-QM **1a** was completely consumed (based on TLC analysis). The reaction mixture was concentrated under reduced pressure and the residue was purified through a silica gel chromatography, using EtOAc/Hexane mixture as an eluent, to get the pure **3a'**.

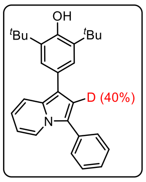
11. *Characterisation of product 3a':*

2,6-di-*tert*-butyl-4-(3-phenylindolizin-1-yl-2-d)-phenol (3a')



The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); brown solid (23.0 mg, 57% yield); m. p. = 104–106 °C; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.30 (d, J = 7.2 Hz, 1H), 7.72 (d, J = 9.1 Hz, 1H), 7.65 – 7.63 (m, 2H), 7.51 (t, J = 7.5 Hz, 2H), 7.46 (s, 2H), 7.39 – 7.35 (m, 1H), 7.02 (s, 0.18H), 6.75 – 6.71 (m, 1H) 6.50 (td, J = 7.4, 1.2 Hz, 1H), 5.20 (s,1H), 1.54 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.3, 136.4, 132.5, 130.0, 129.1, 128.3, 127.4, 127.3, 125.3, 124.7, 122.6, 118.8, 117.5, 116.4, 113.9, 111.0, 34.6, 30.6.

2,6-di-*tert*-butyl-4-(3-phenylindolizin-1-yl-2-d)-phenol (3a')



The reaction was performed at 0.102 mmol scale of **1a**; R_f = 0.5 (5% EtOAc in hexane); brown gummy solid (34.2 mg, 84% yield); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.30 (d, J = 7.2 Hz, 1H), 7.72 (d, J = 9.1 Hz, 1H), 7.65 – 7.63 (m, 2H), 7.51 (t, J = 7.5 Hz, 2H), 7.46 (s, 2H), 7.39 – 7.35 (m, 1H), 7.02 (s, 0.60H), 6.75 – 6.71 (m, 1H), 6.50 (td, J = 7.4, 1.2 Hz, 1H), 5.20 (s,1H), 1.54 (s, 18H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.3, 136.4, 132.5, 130.0, 129.1, 128.3, 127.4, 127.3, 125.4, 124.7, 122.6, 118.8, 117.5, 116.4, 113.9, 111.0, 34.6, 30.6.

12. References:

(1) (a) V. Reddy and R. V. Anand, *Org. Lett.*, 2015, **17**, 3390; (b) W. –D. Chu, L. –F. Zhang, X. Bao, X. –H. Zhao, C. Zeng, J. –Y. Du, G. –B. Zhang, F. –X. Wang, X. –Y. Ma and C. –A. Fan, *Angew. Chem., Int. Ed.*, 2013, **52**, 9229

(2) Y. A. Pankhade, R. Pandey; S. Fatma,; F. Ahmad; R. V. Anand, J. Org. Chem. 2022, **87**, 3363

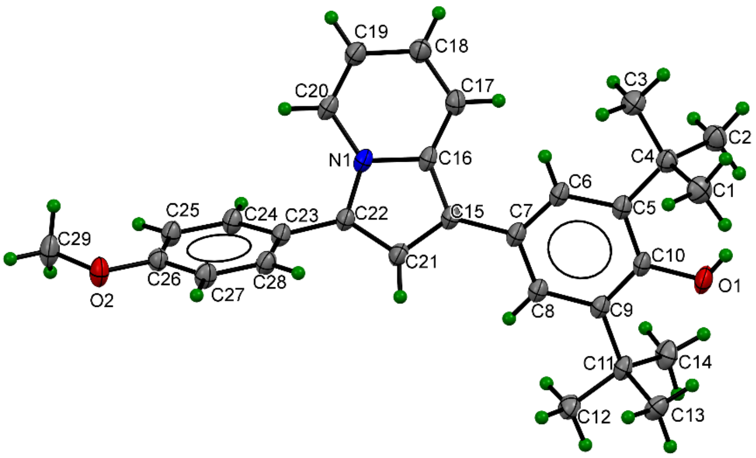
(3) A. Lopez, A. Parra, C. Jarava-Barrera and M. Tortosa, *Chem. Commun.*, 2015, **51**, 17684

(4) H. Chen, M. Yang, G. Wang, L. Gao, Z. Ni, J. Zou, S. Li, *Org. Lett.* 2021, **23**, 5533

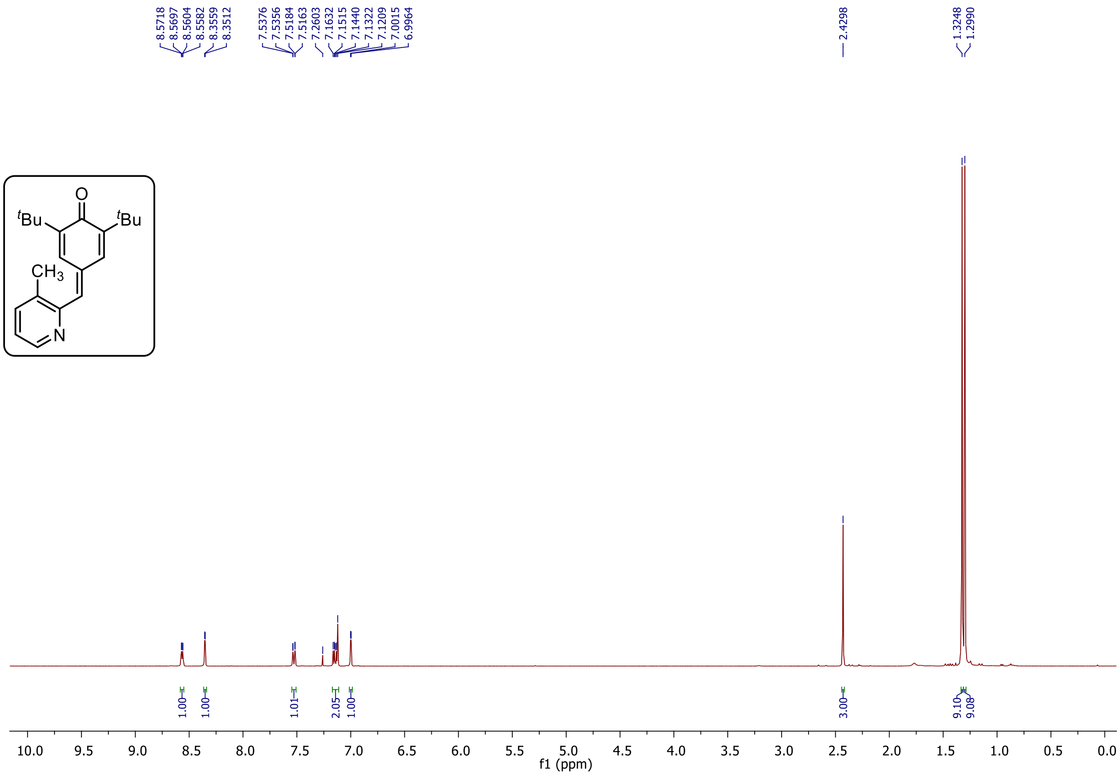
13. X-ray crystallographic analysis for compound 3f:

Table S1. Crystal data and structure refinement for compound 3f (CCDC 2132083)

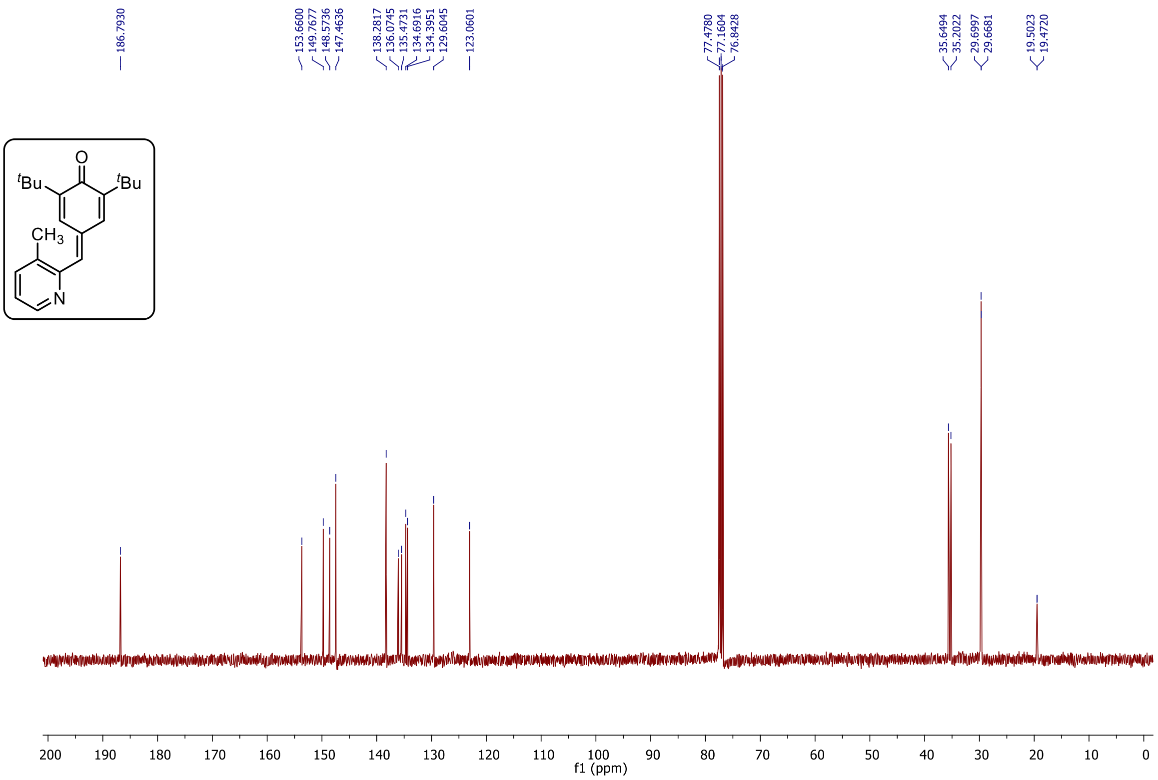
Complex	**XII-FZ-23**
Chemical formula	$C_{29}H_{33}NO_2$
molar mass	427.56
Crystal system	Monoclinic
Space group	$P2_1/c$
T[K]	150.02(10)
a[Å]	12.5189(4)
b[Å]	10.2586(4)
c[Å]	18.1361(7)
α [°]	90.00
β [°]	97.843(4)
γ [°]	90.00
V [Å^3]	2307.37(15)
Z	4
D(calcd.) [g·cm^{-3}]	1.231
μ(Mo-K$_\alpha$) [mm^{-1}]	0.076
Reflections collected	16666
Independent reflections	7963
Data/restraints/parameters	7963/0/300
$R1$, $wR_2[I>2\sigma(I)]$[a]	0.0708, 0.1848
$R1$, wR_2 (all data)[a]	0.0955, 0.2251
GOF	1.062
CCDC	2132083



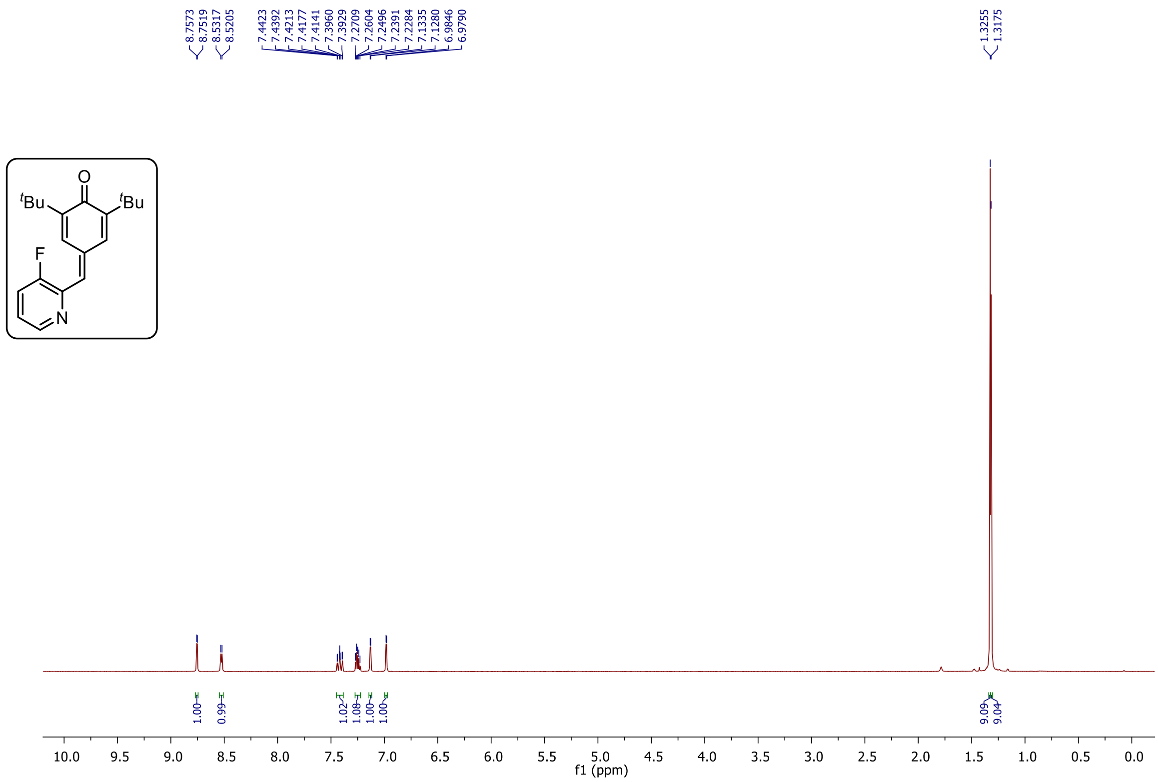
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**1b**)



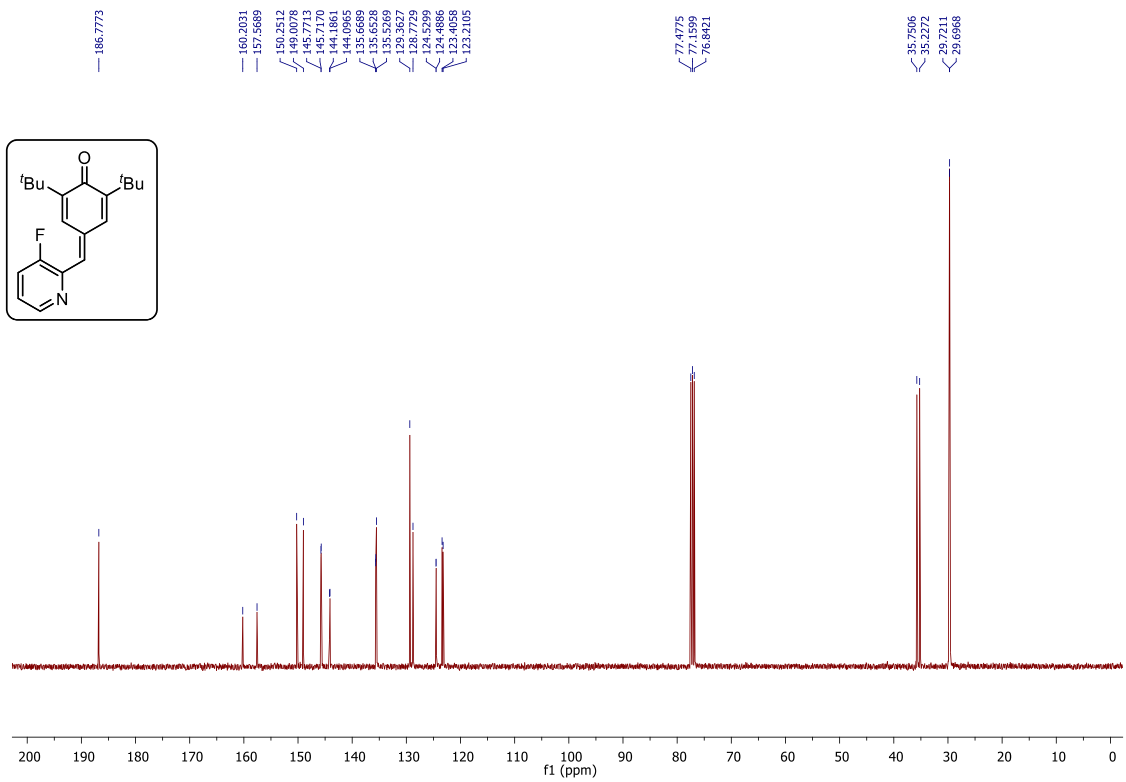
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**1b**)



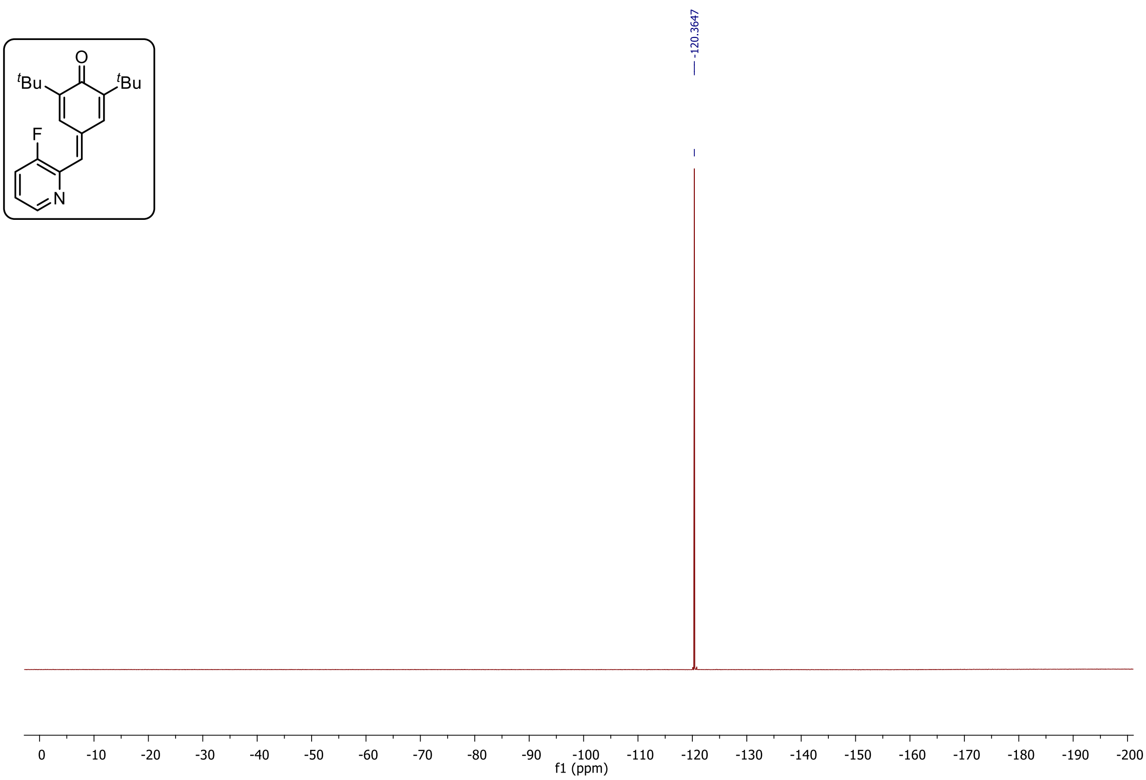
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**1c**)



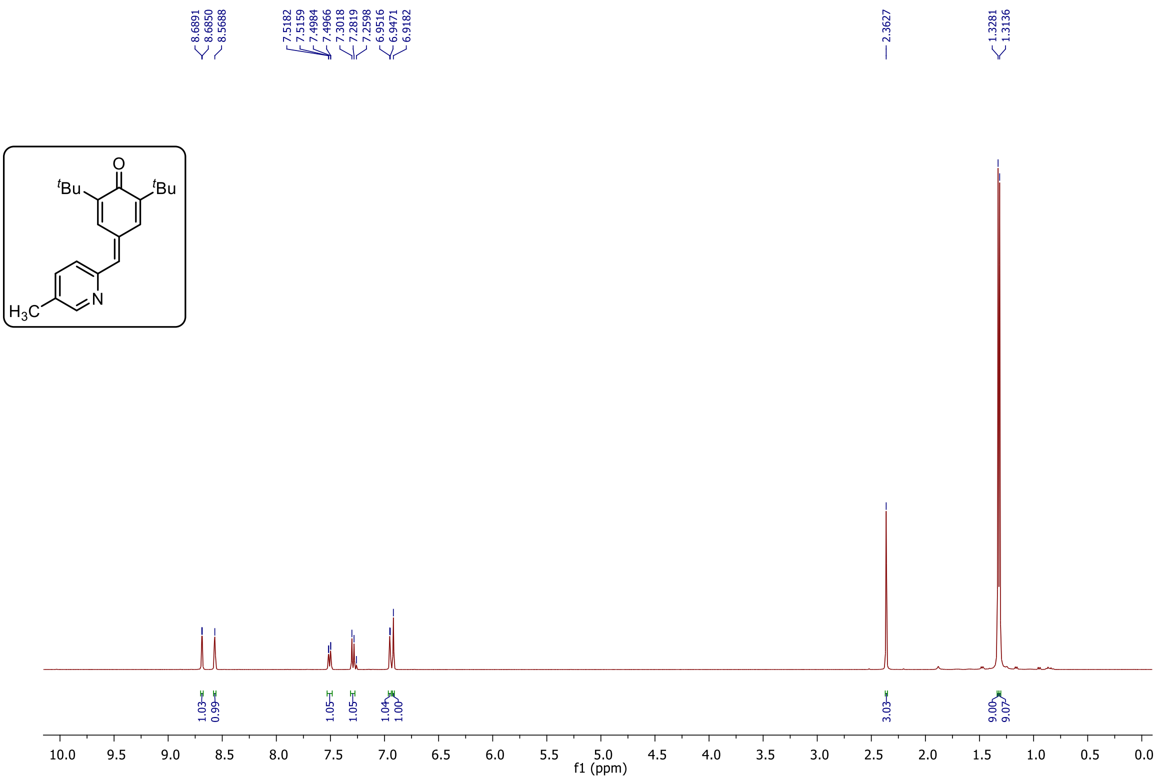
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**1c**)



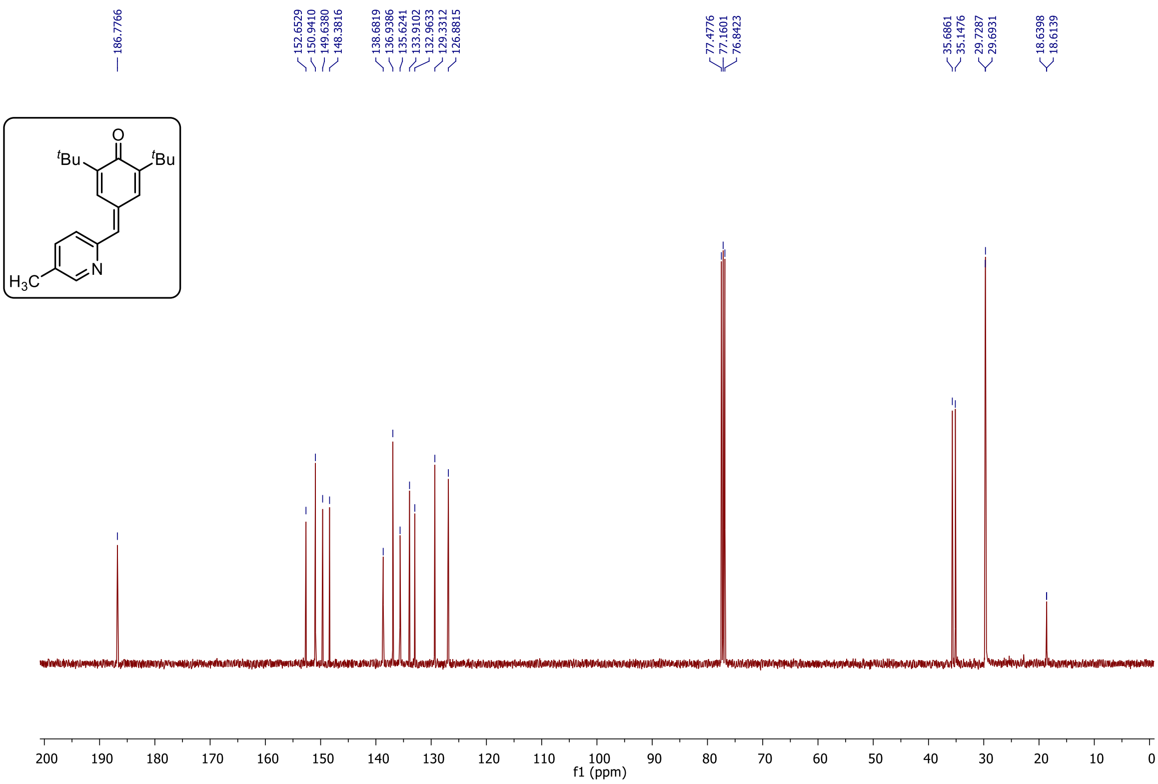
$^{19}F\{^{1}H\}$ NMR (376 MHz, $CDCl_3$) spectrum of (**1c**)



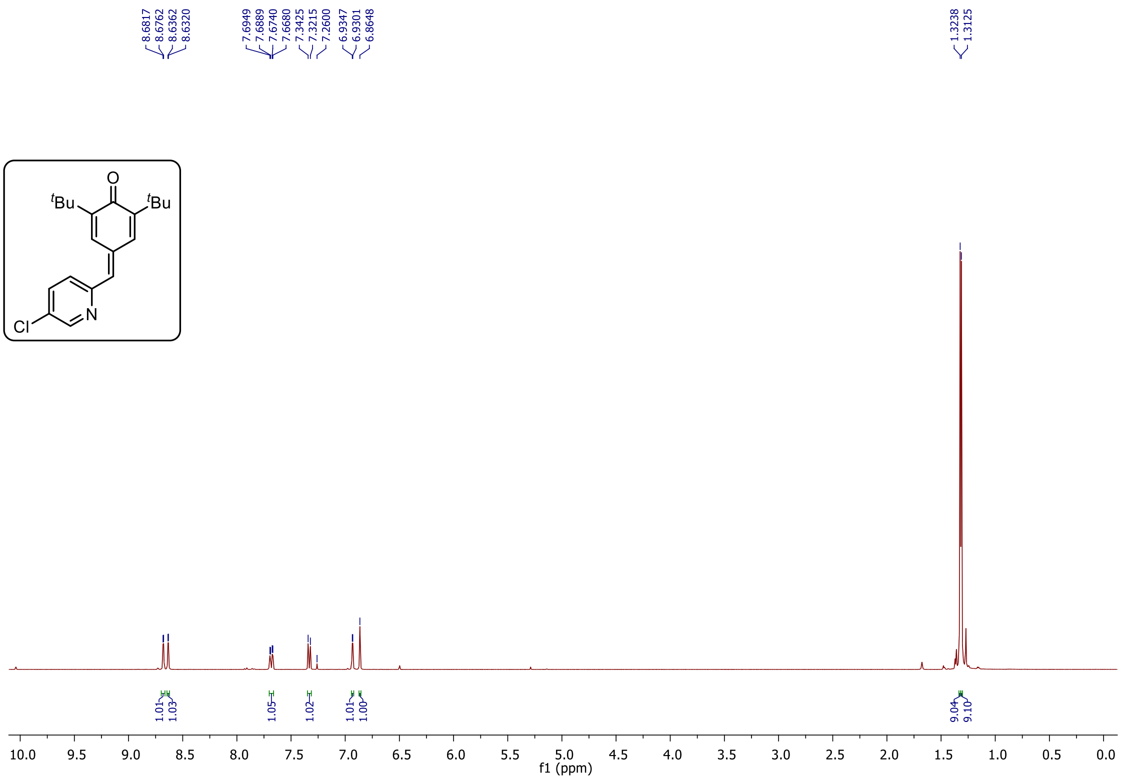
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**1d**)



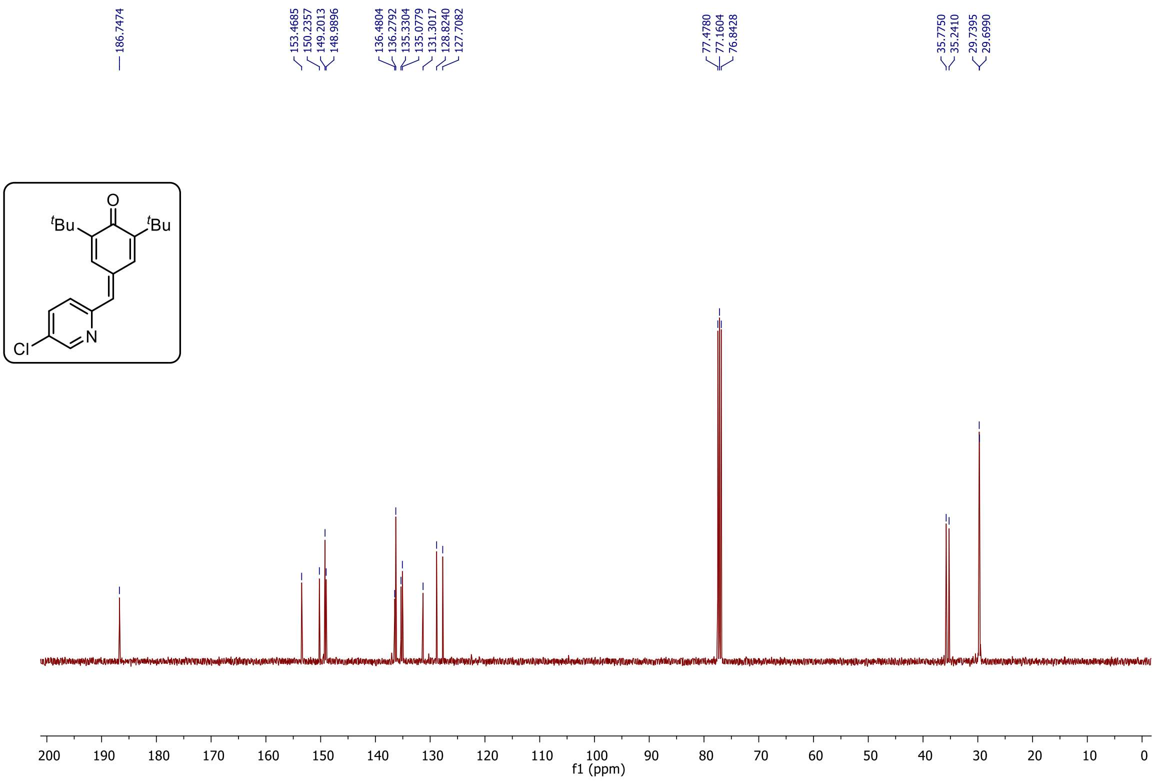
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**1d**)



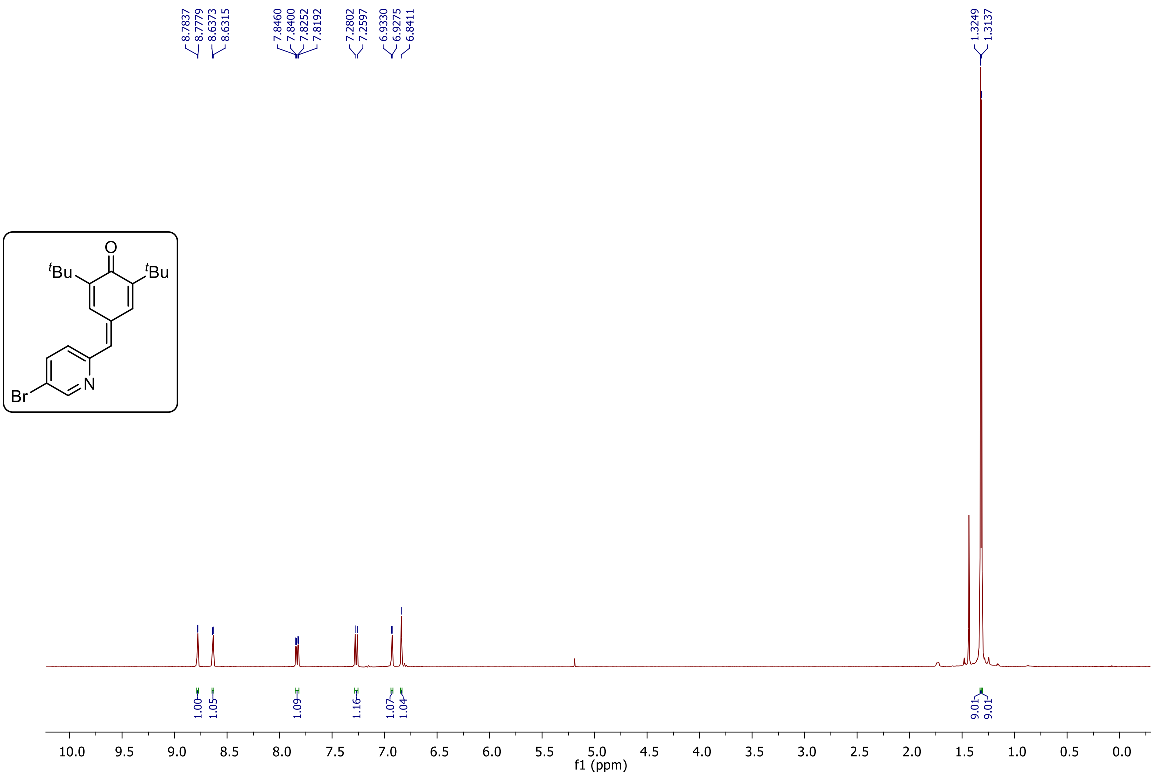
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**1e**)



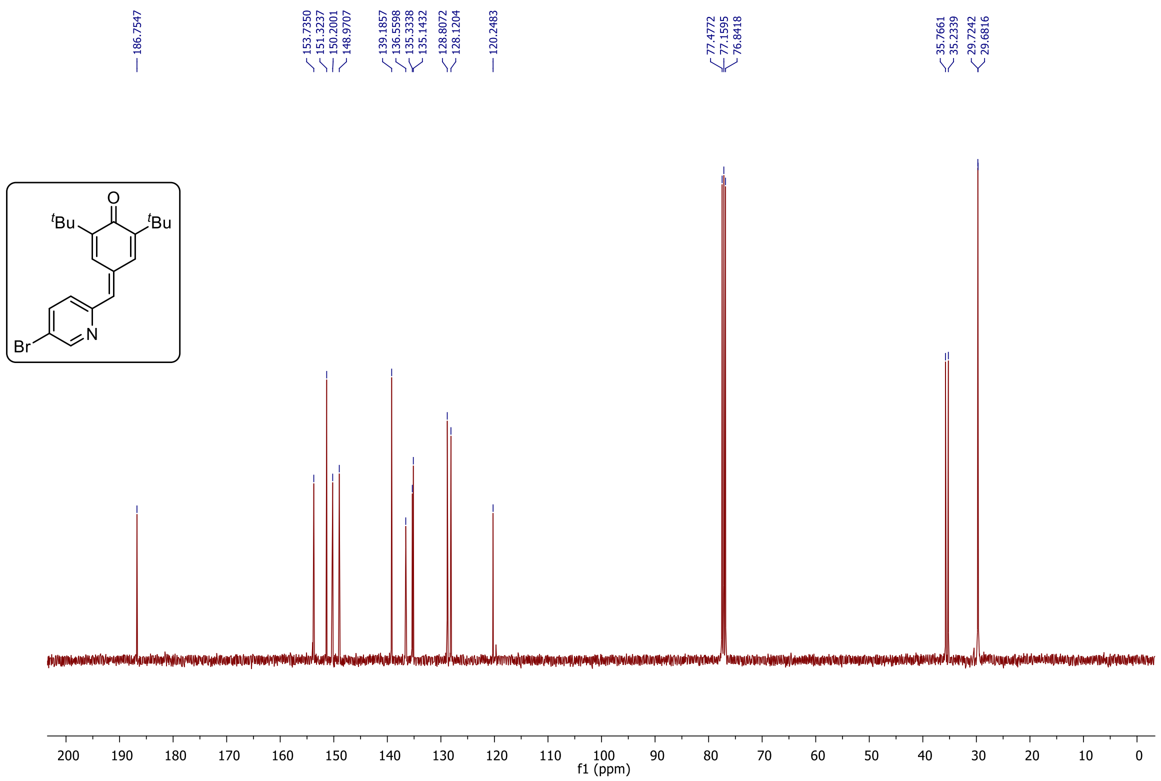
$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**1e**)



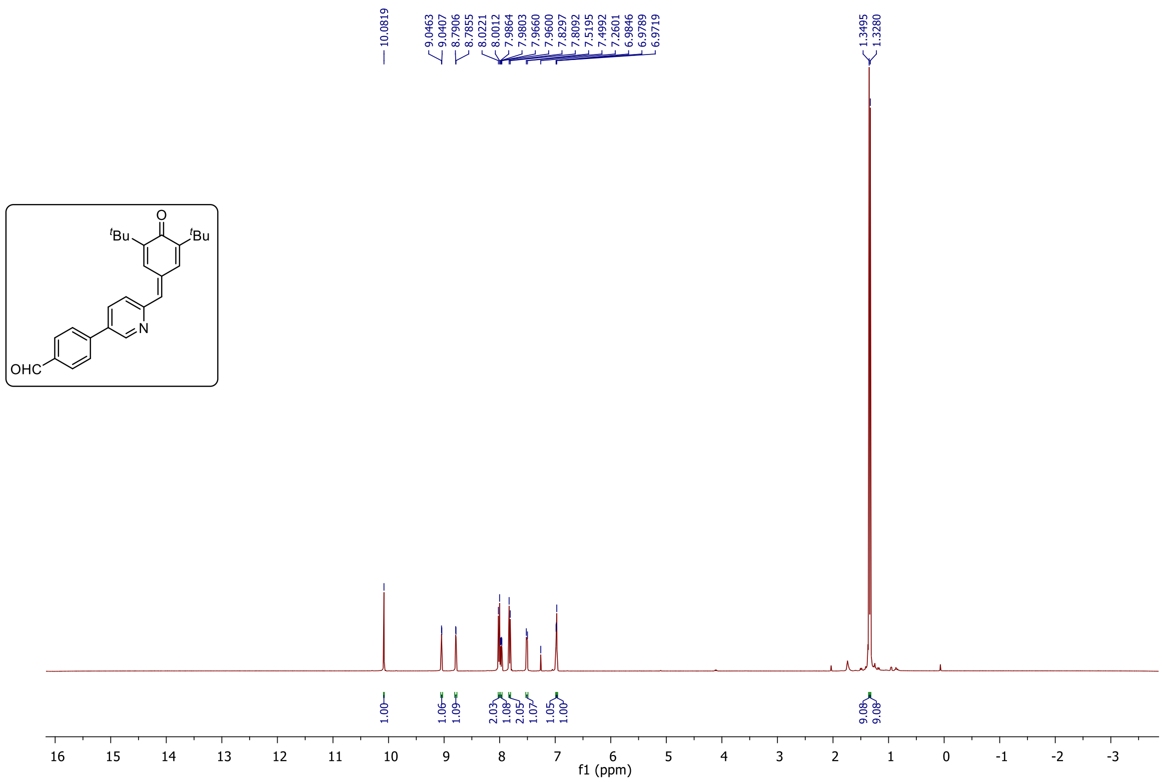
^1H NMR (400 MHz, $CDCl_3$) spectrum of **(1f)**



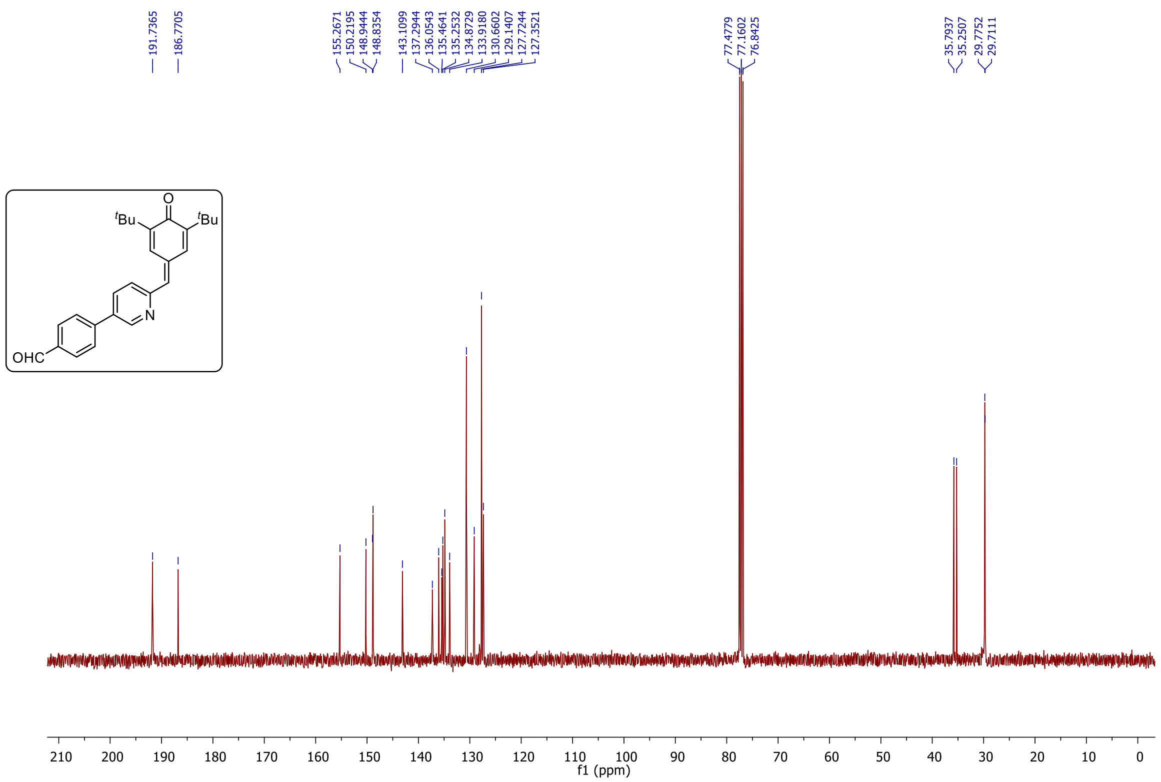
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(1f)**



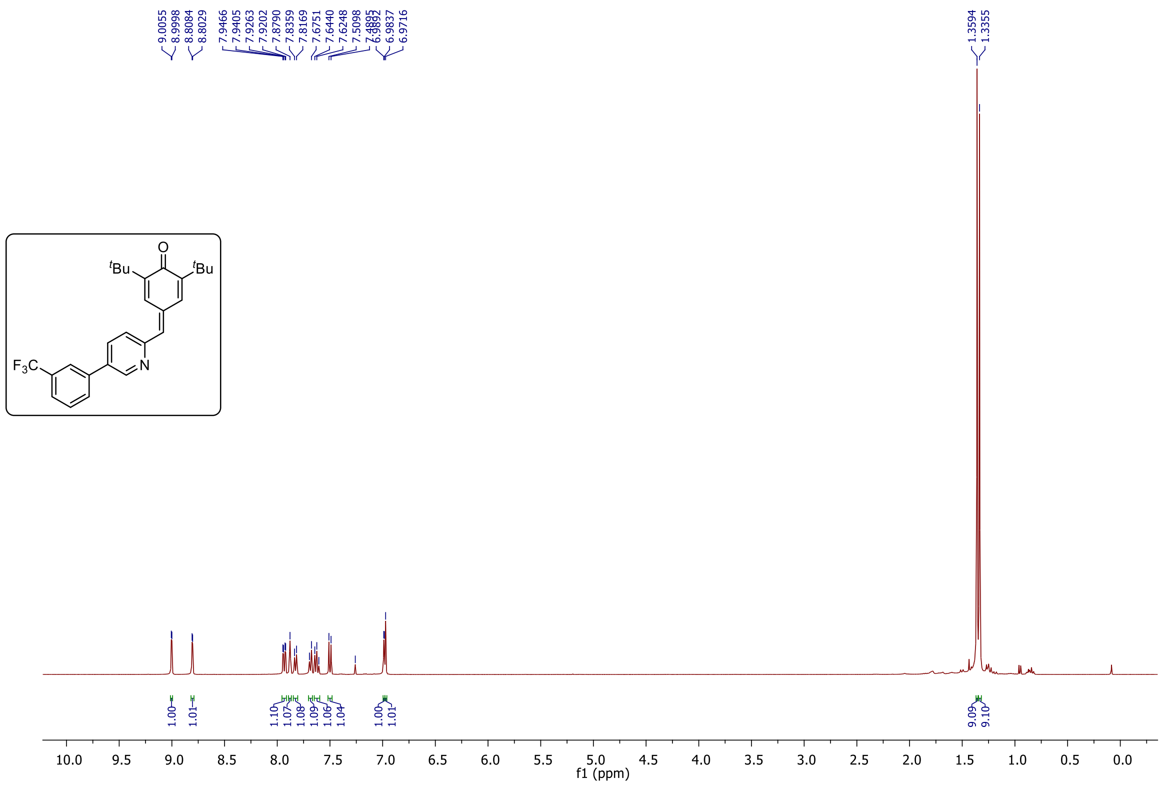
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **(1g)**



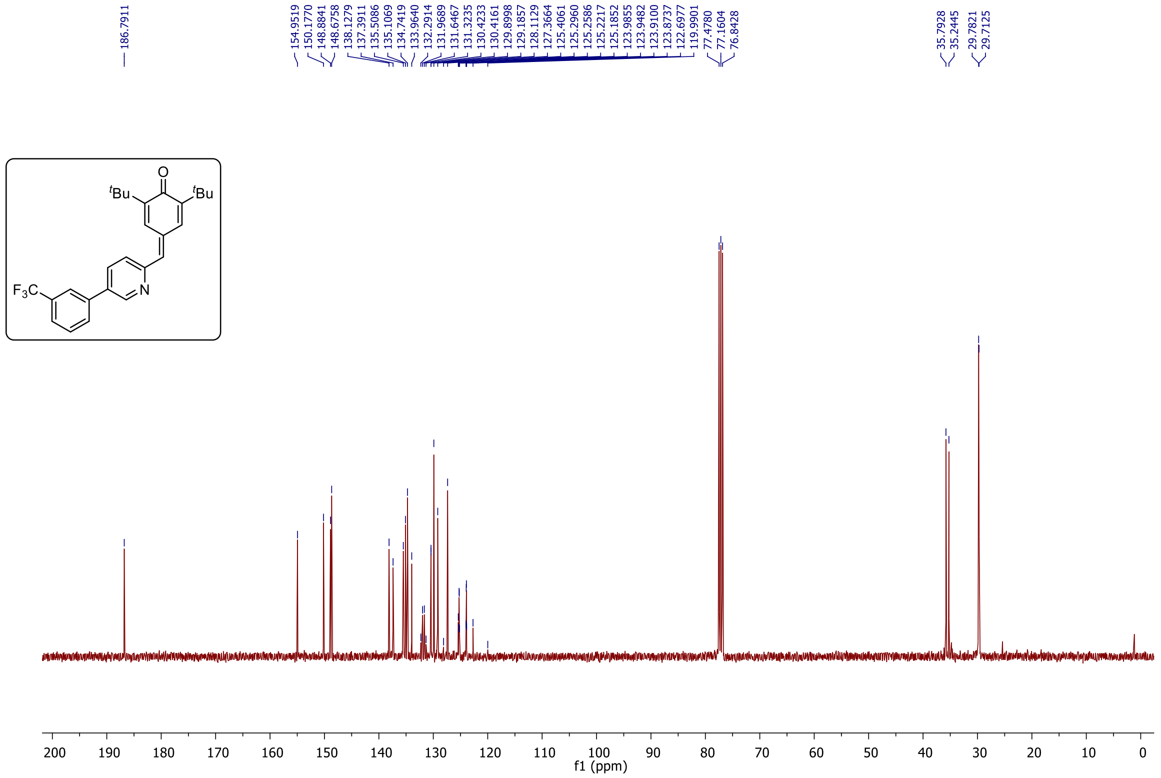
$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(1g)**



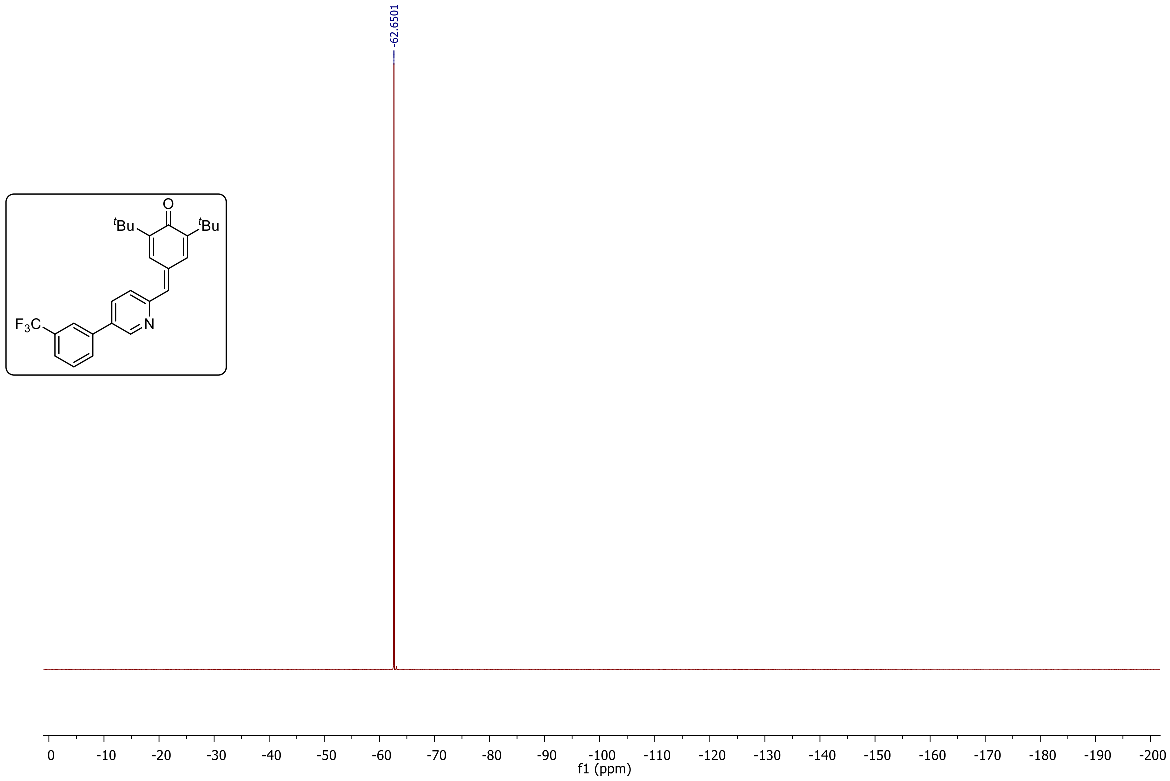
^1H NMR (400 MHz, $CDCl_3$) spectrum of **(1h)**



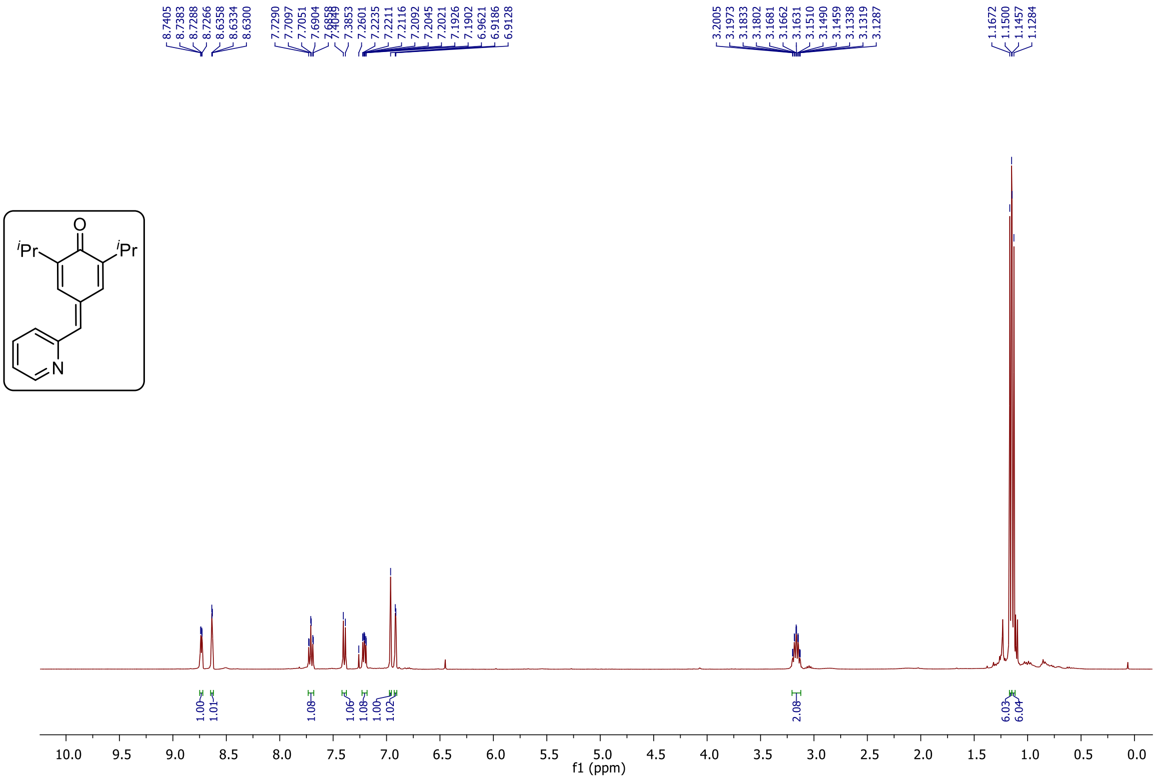
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(1h)**



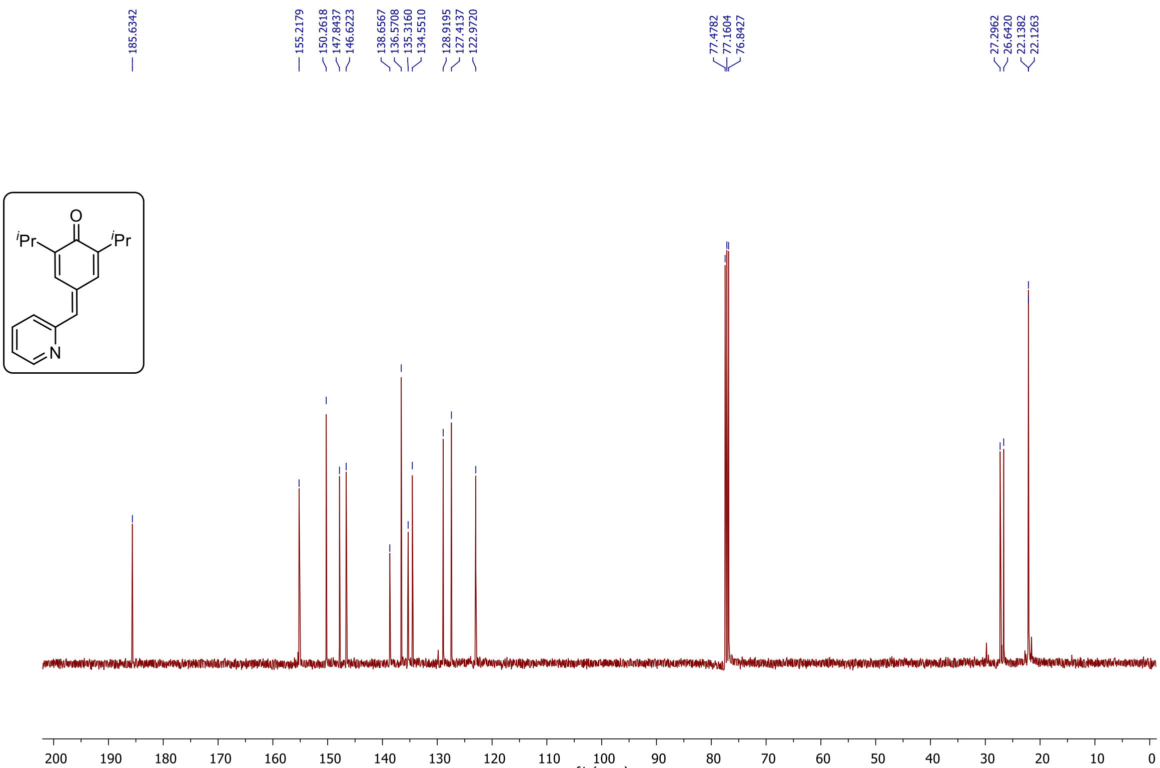
$^{19}F\{^{1}H\}$ NMR (376 MHz, $CDCl_3$) spectrum of **(1h)**



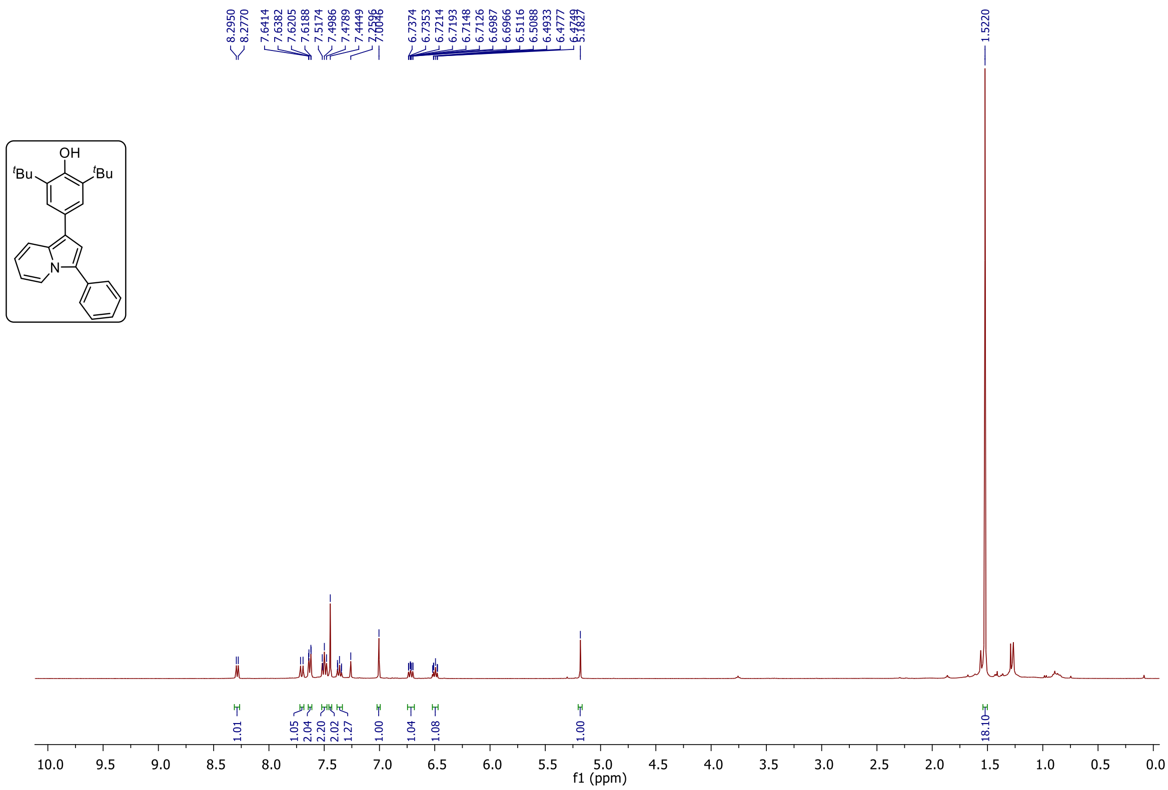
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **(1i)**



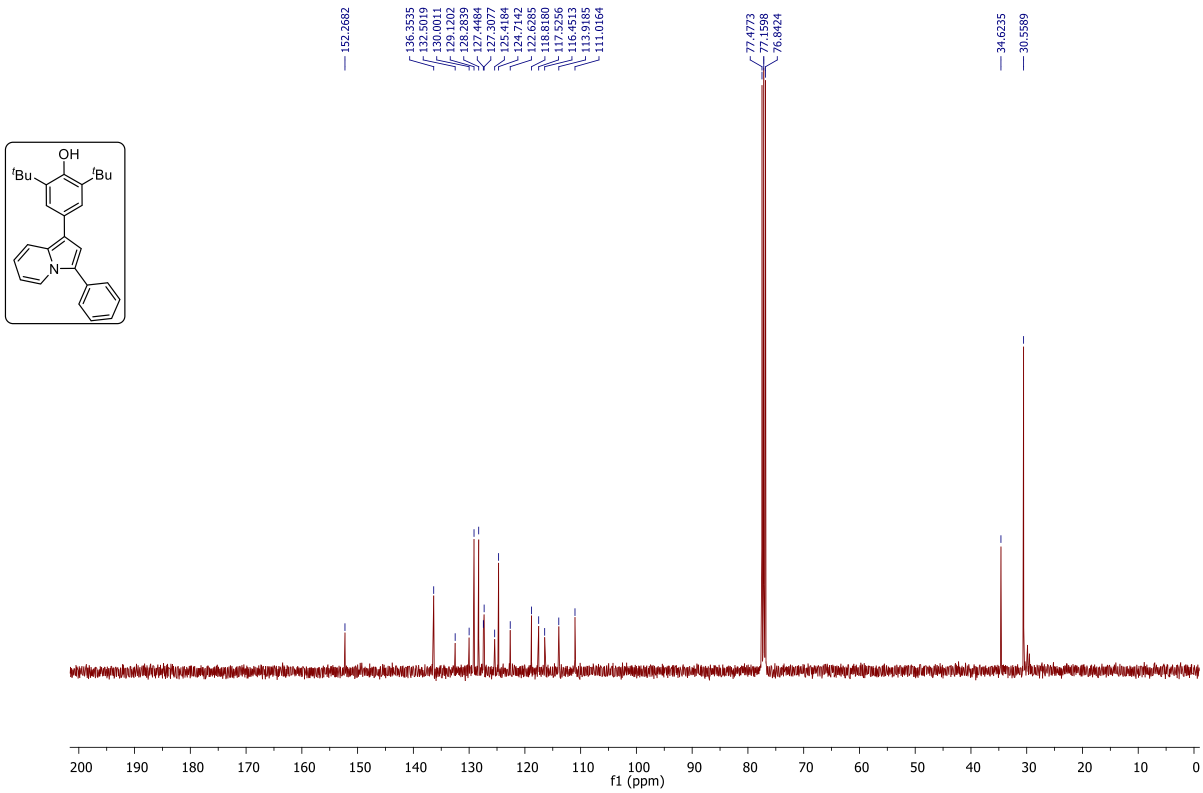
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(1i)**



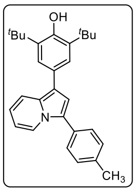
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3a**)

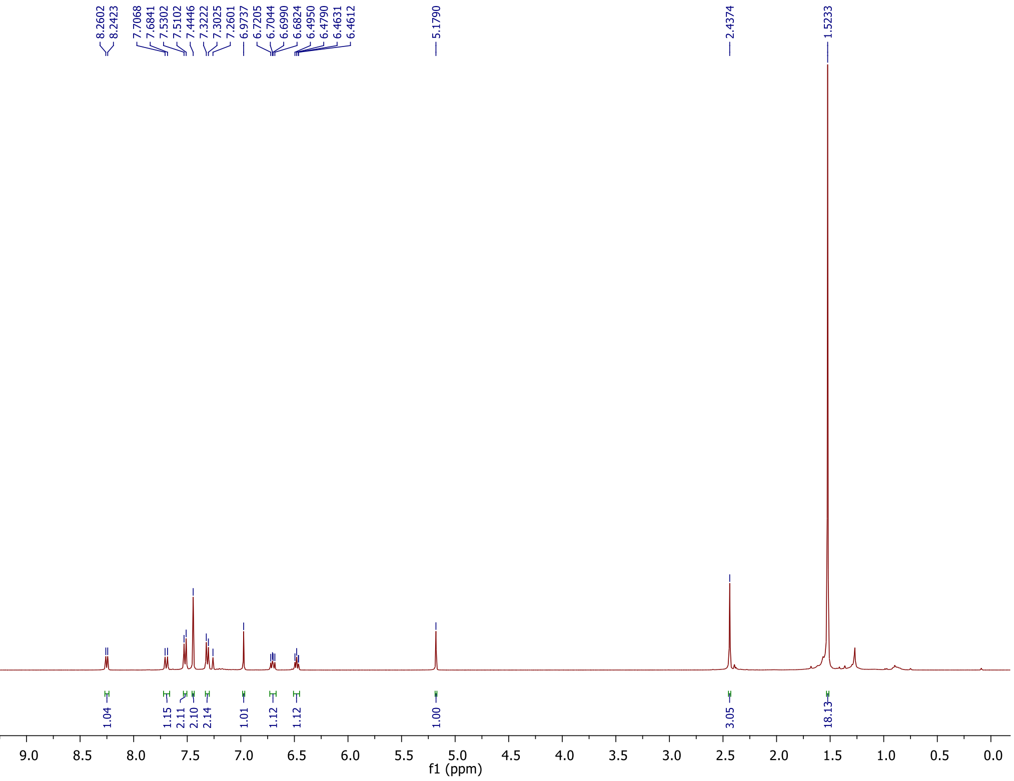


$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**3a**)

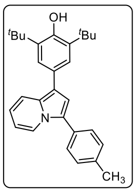


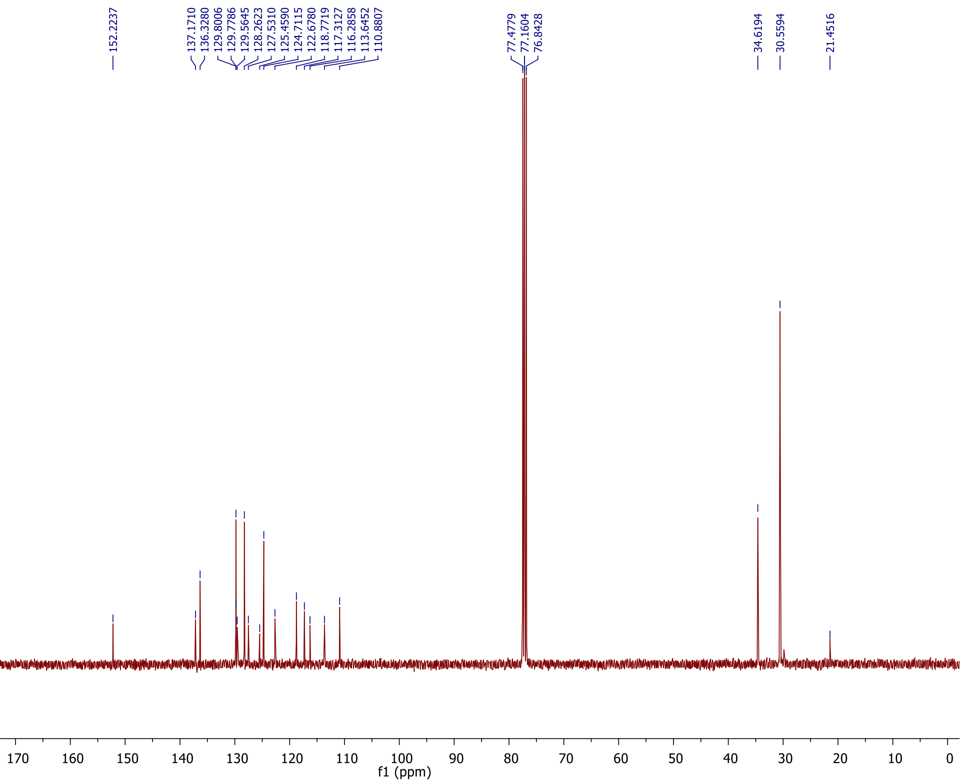
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3b)**



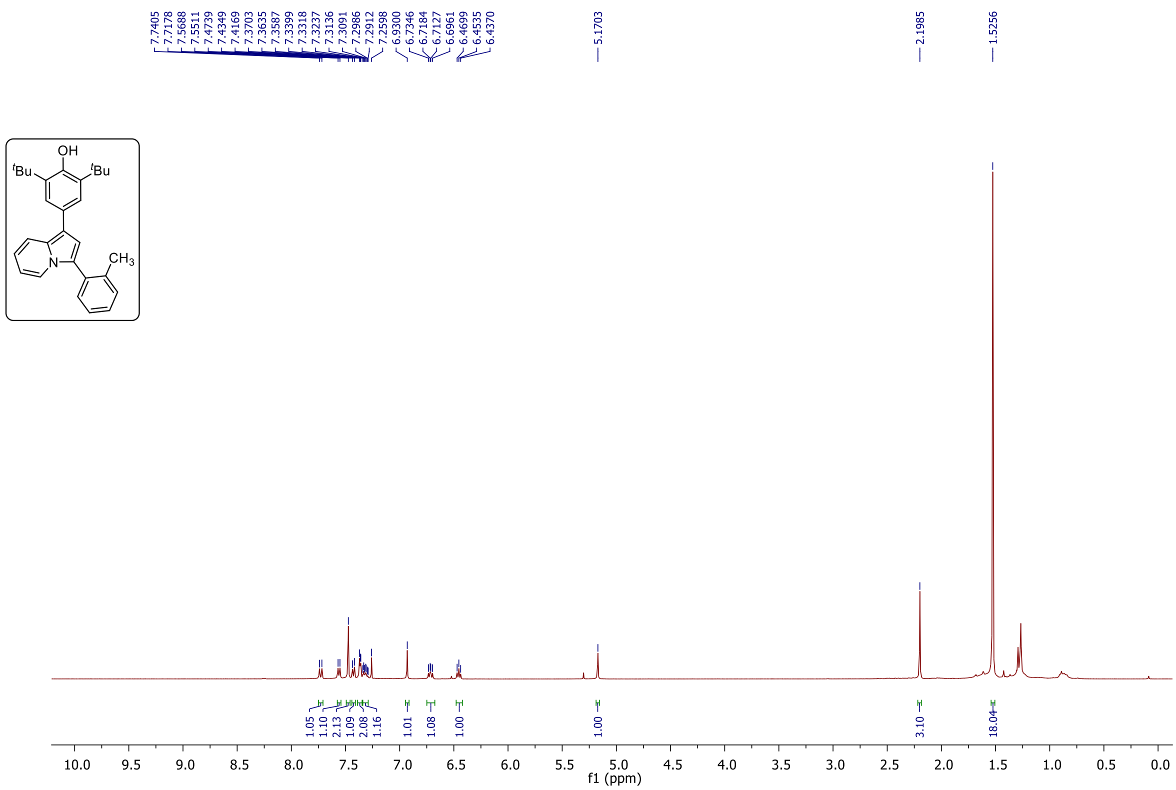


$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**3b)**

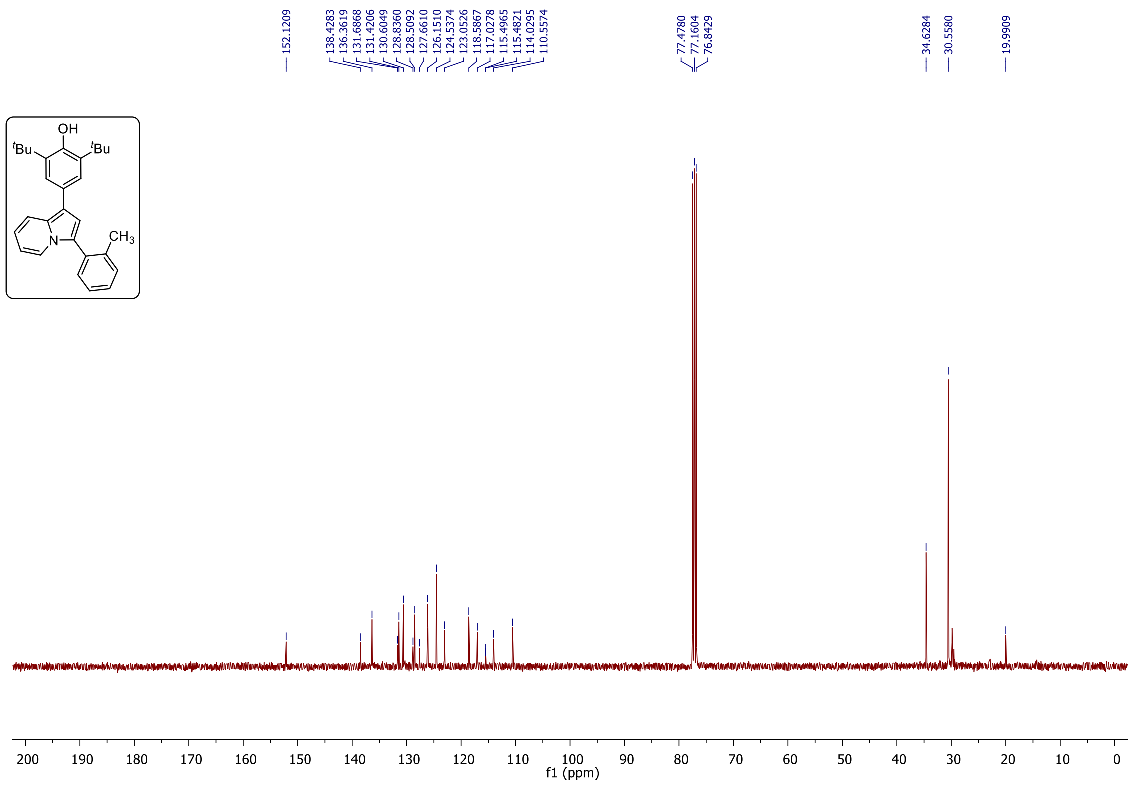




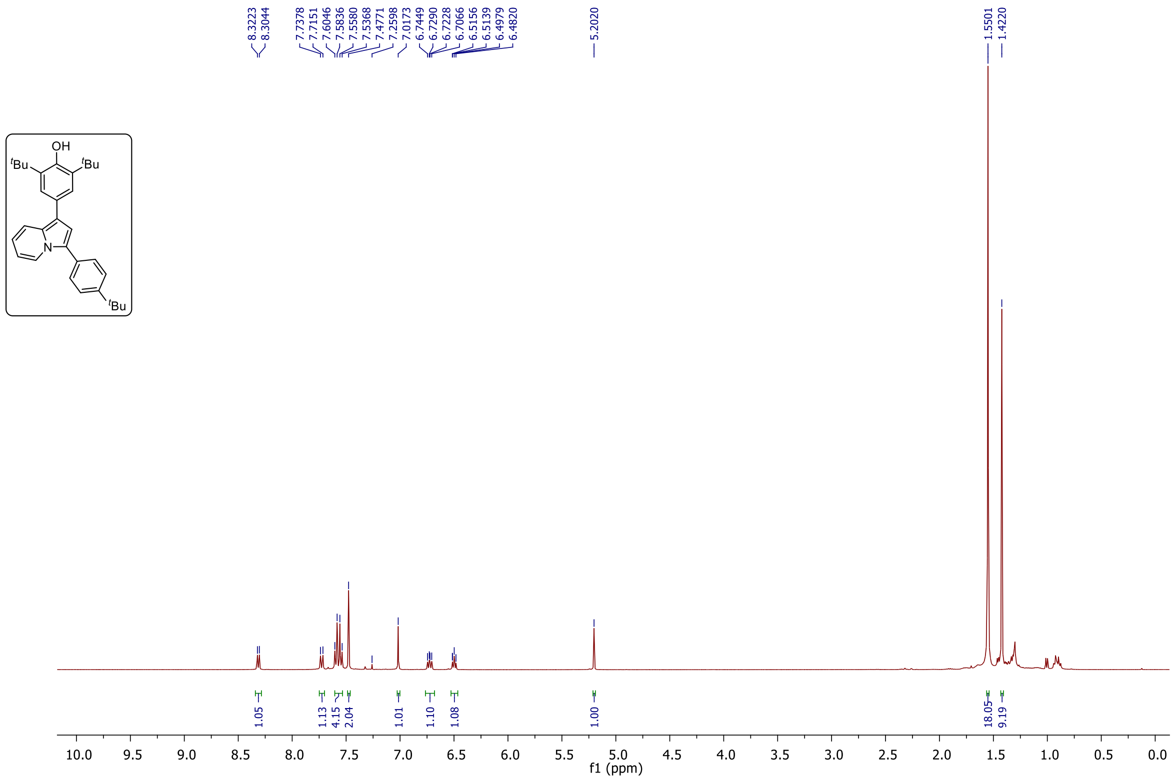
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3c**)



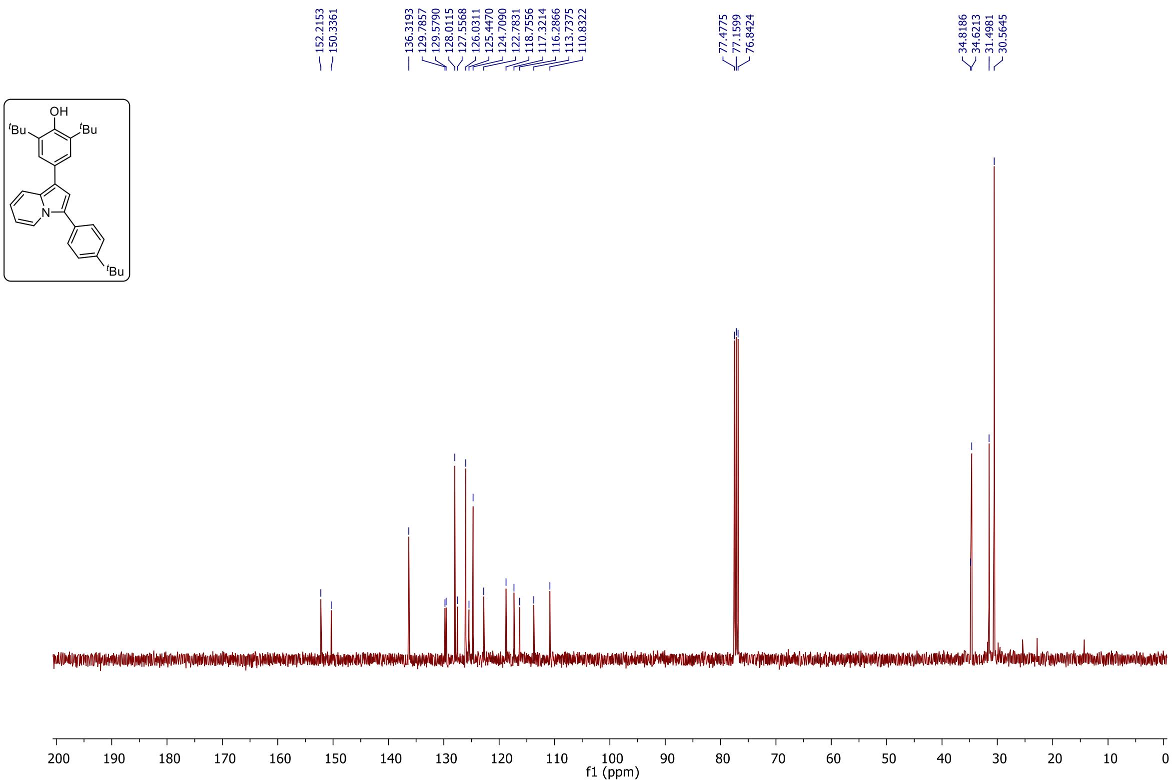
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**3c**)



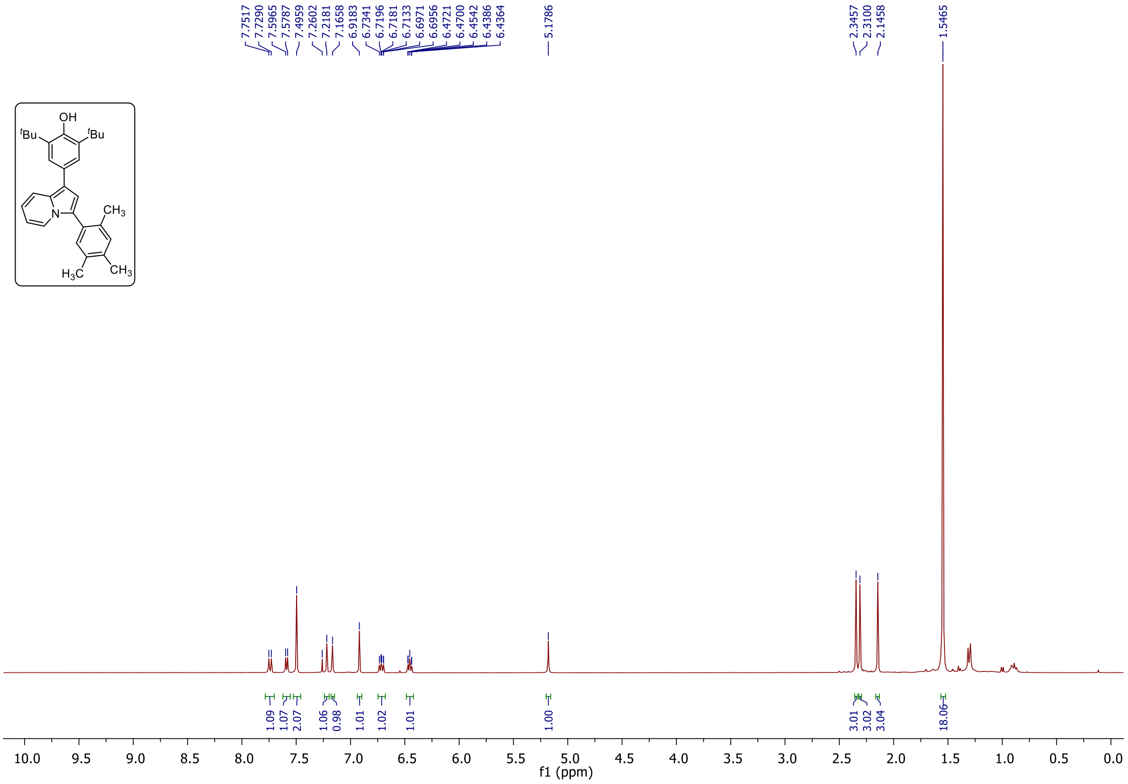
[1]H NMR (400 MHz, $CDCl_3$) spectrum of (**3d)**



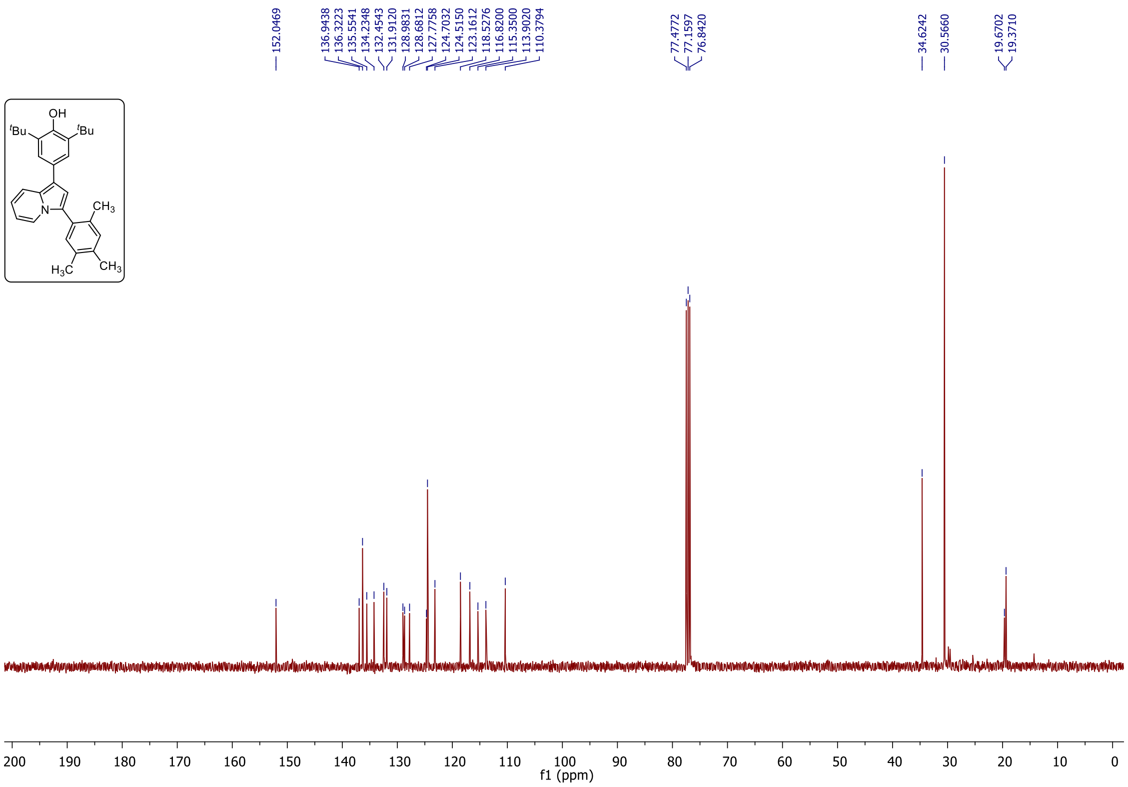
[13]C{[1]H} NMR (100 MHz, $CDCl_3$) spectrum of **(3d)**



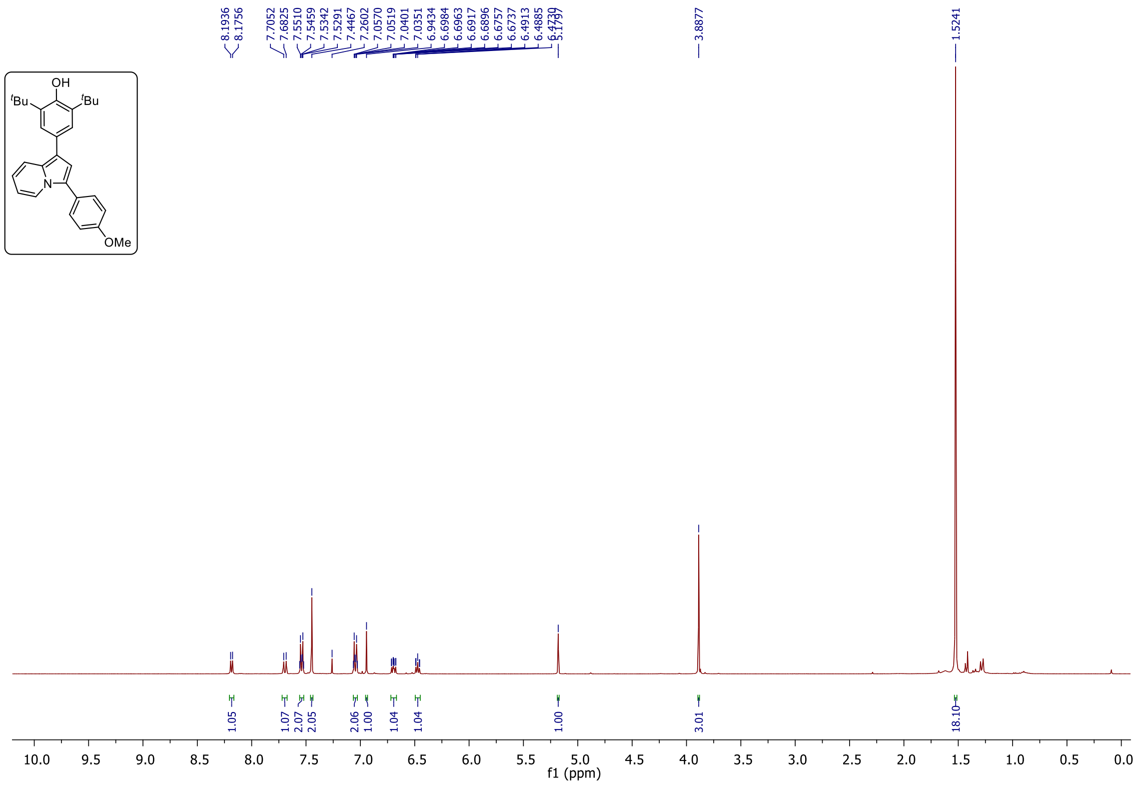
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3e**)



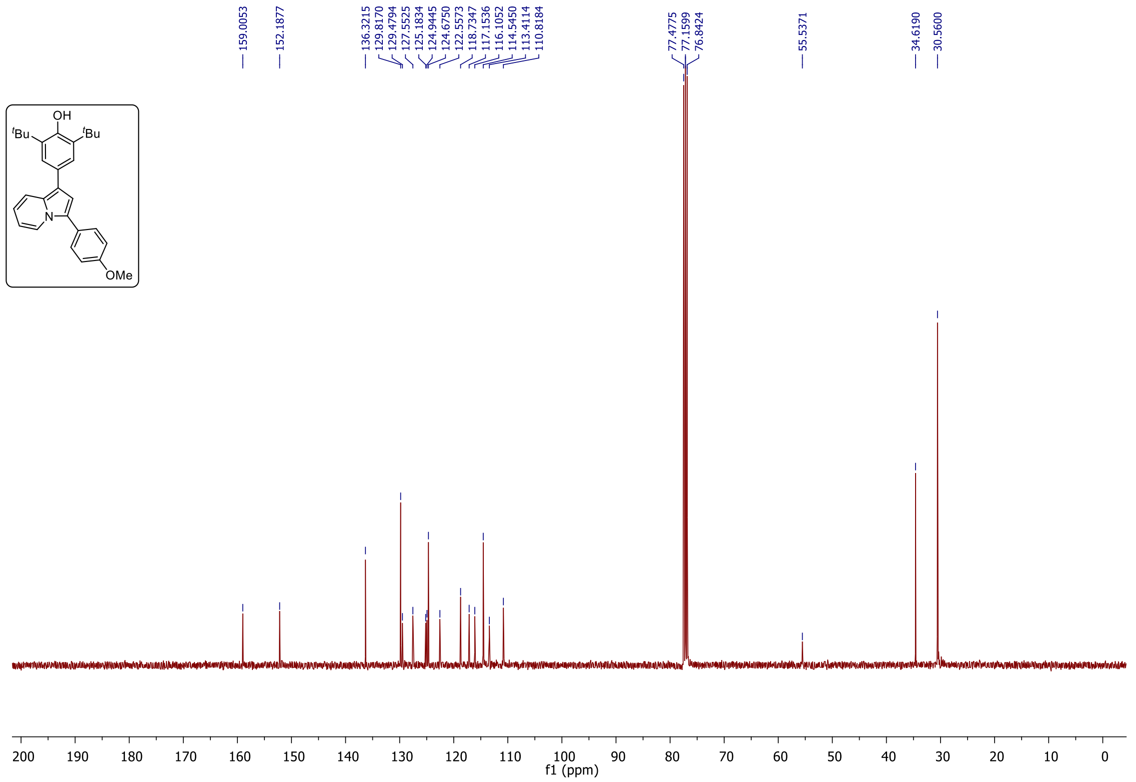
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3e)**



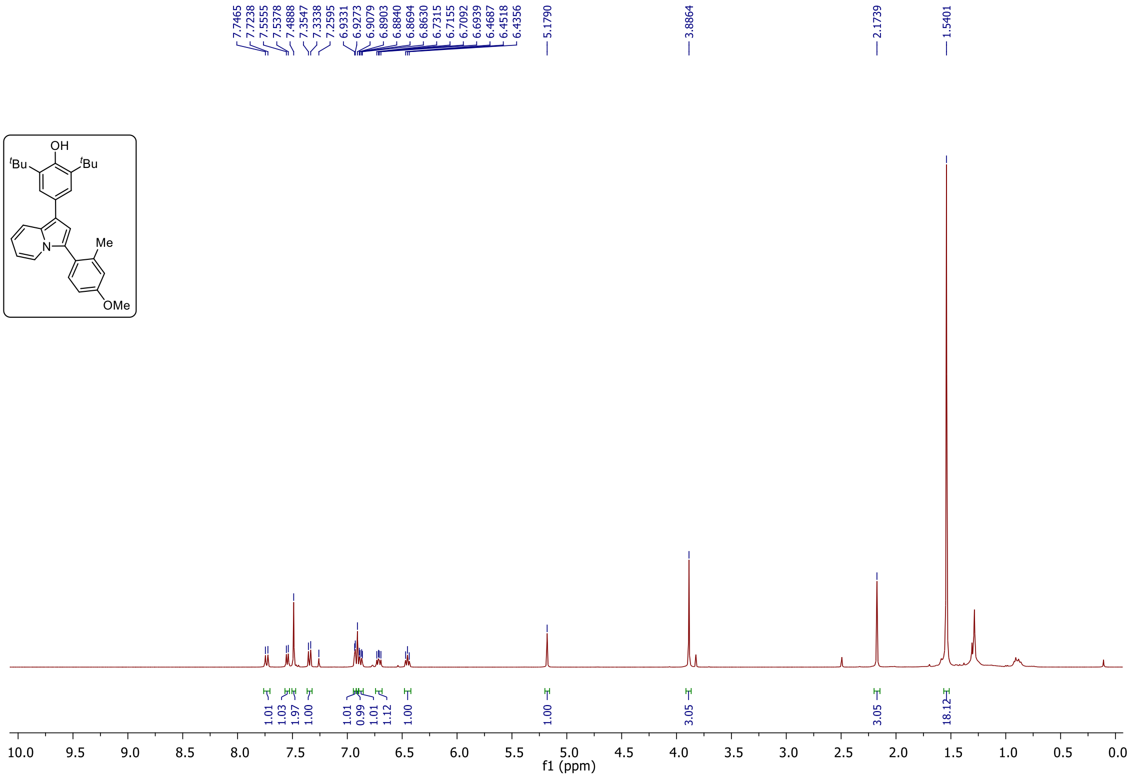
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3f**)



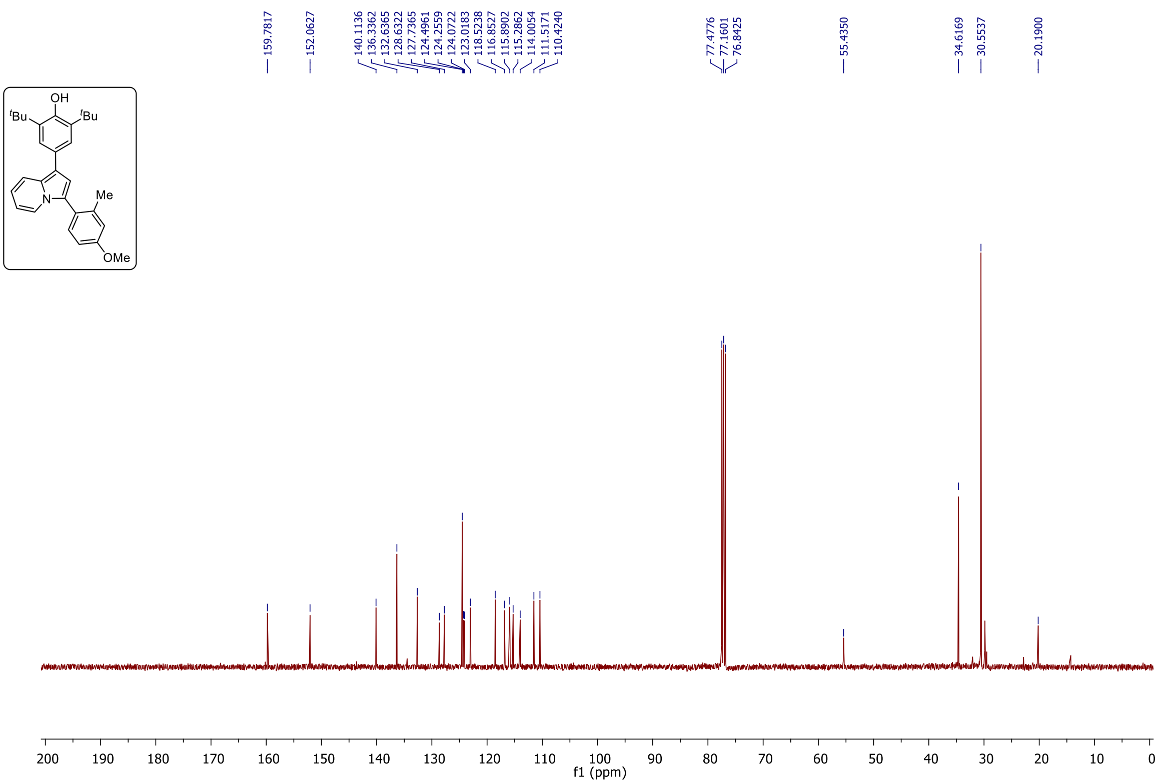
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3f)**



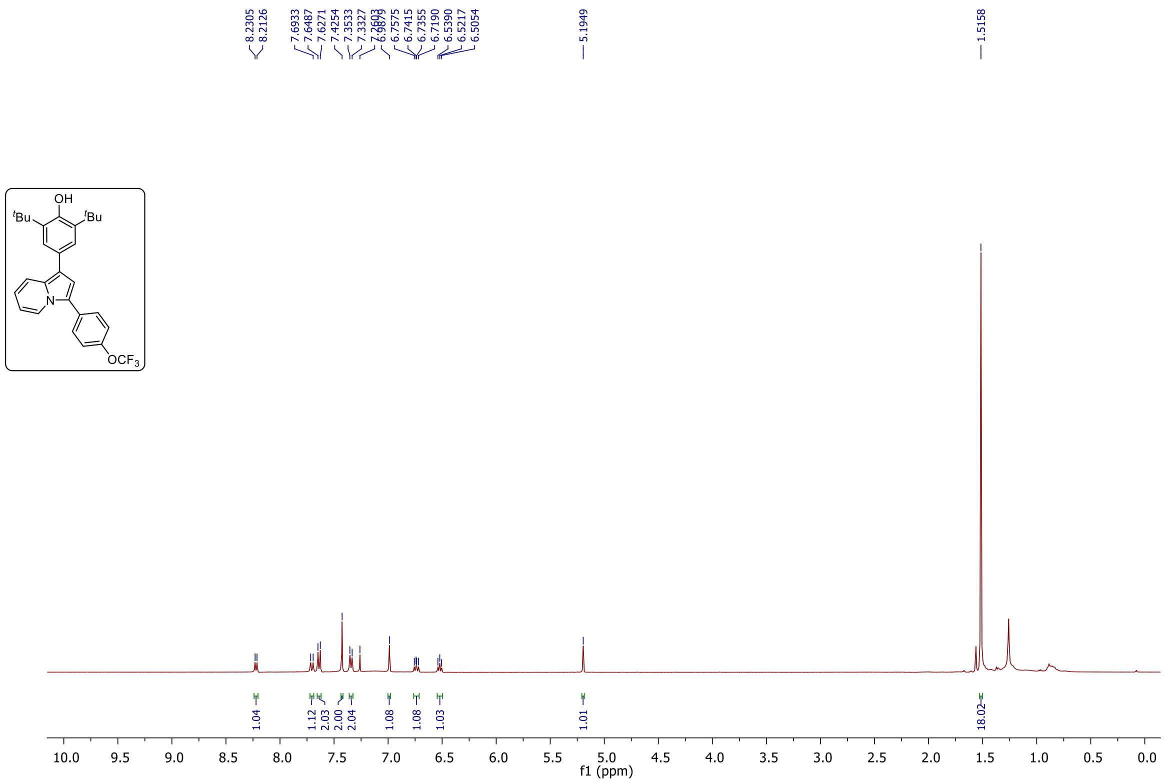
^{1}H NMR (400 MHz, CDCl$_3$) spectrum of (**3g**)



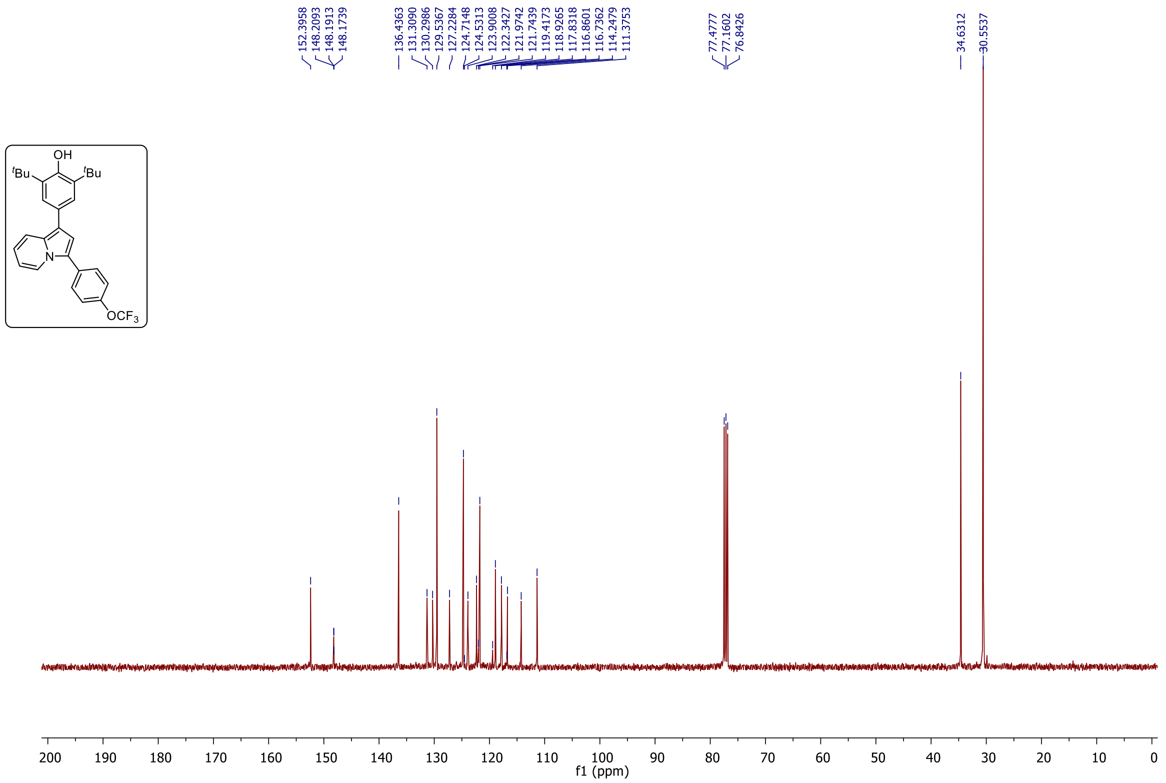
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$) spectrum of **(3g)**



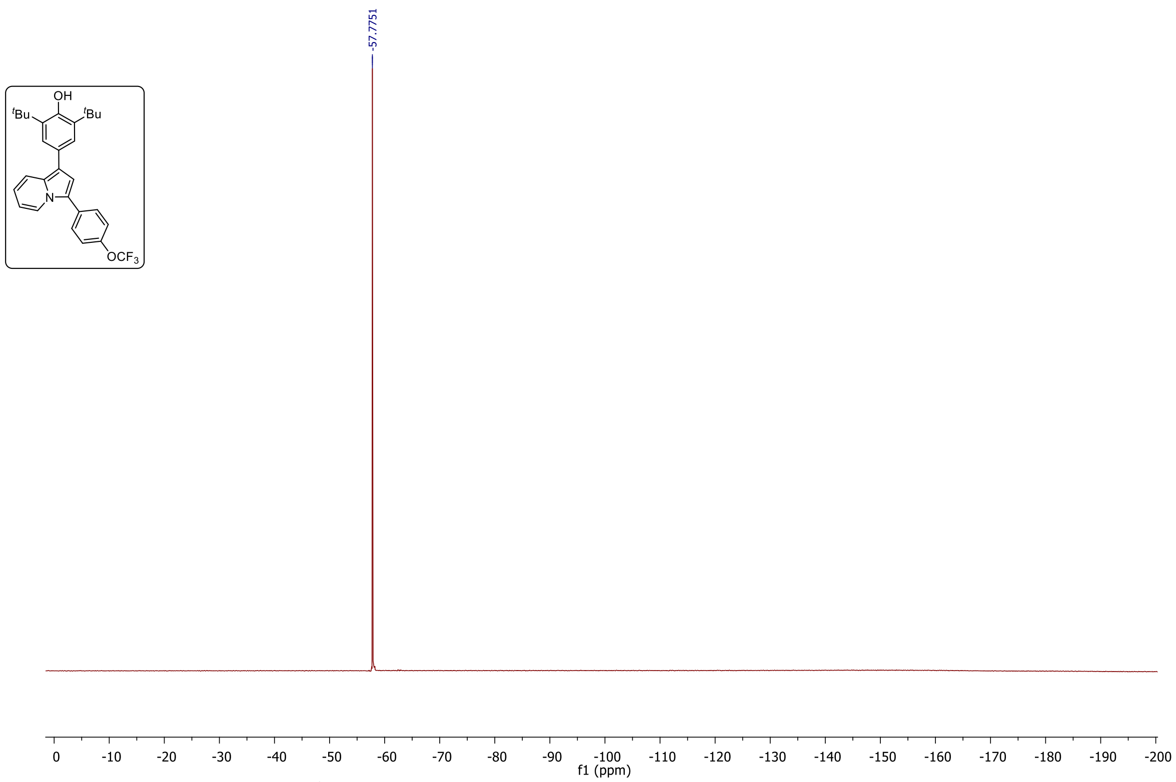
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3h**)



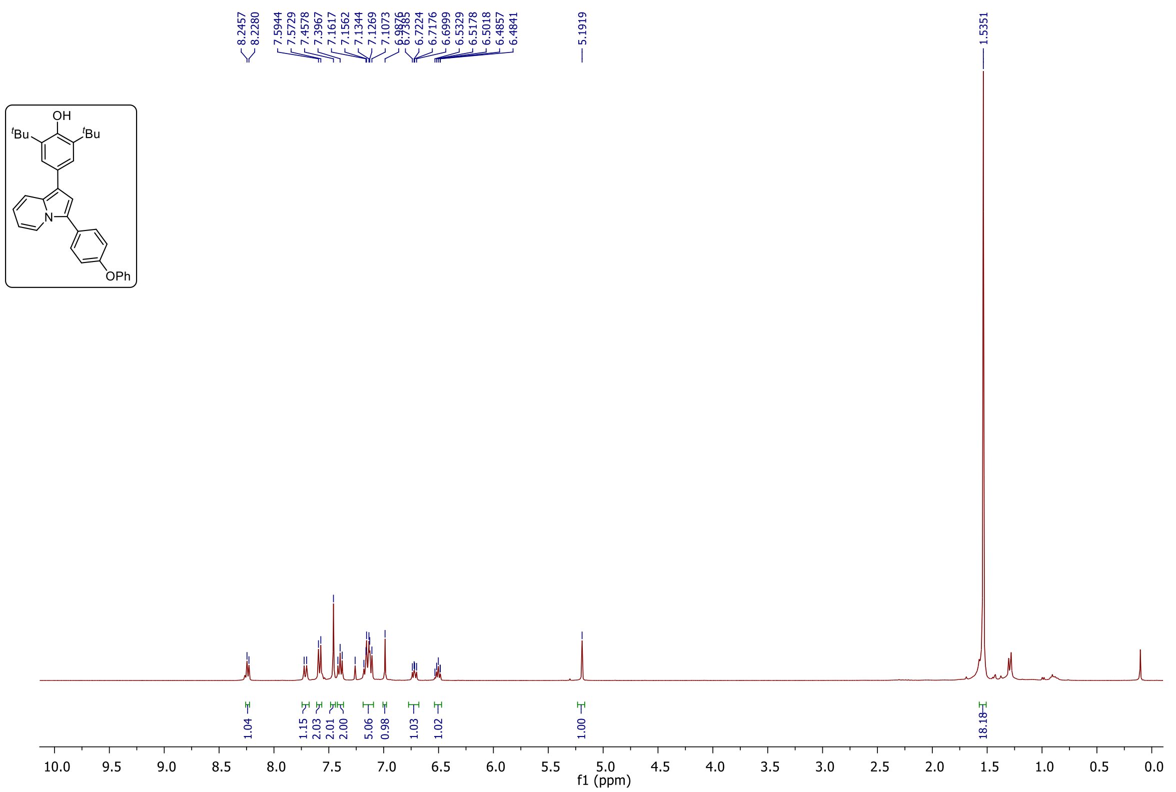
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**3h**)



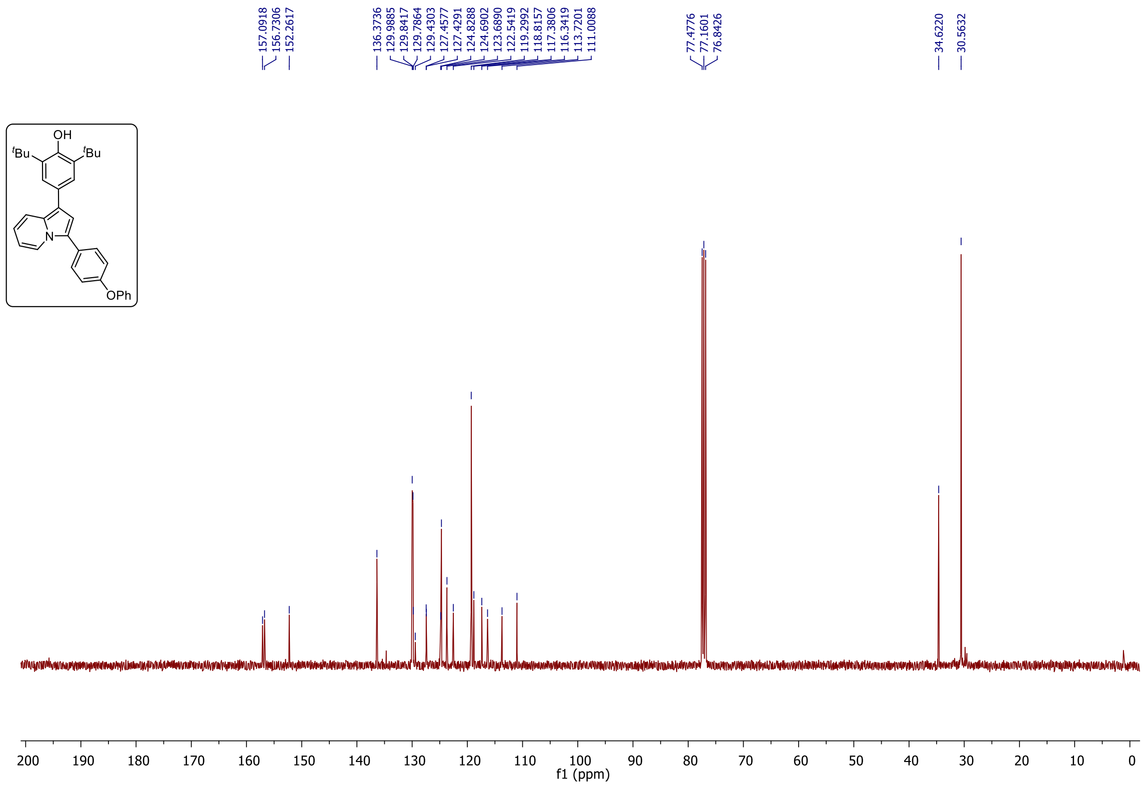
$^{19}F\{^{1}H\}$ NMR (376 MHz, $CDCl_3$) spectrum of (**3h**)



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



$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**3i**)



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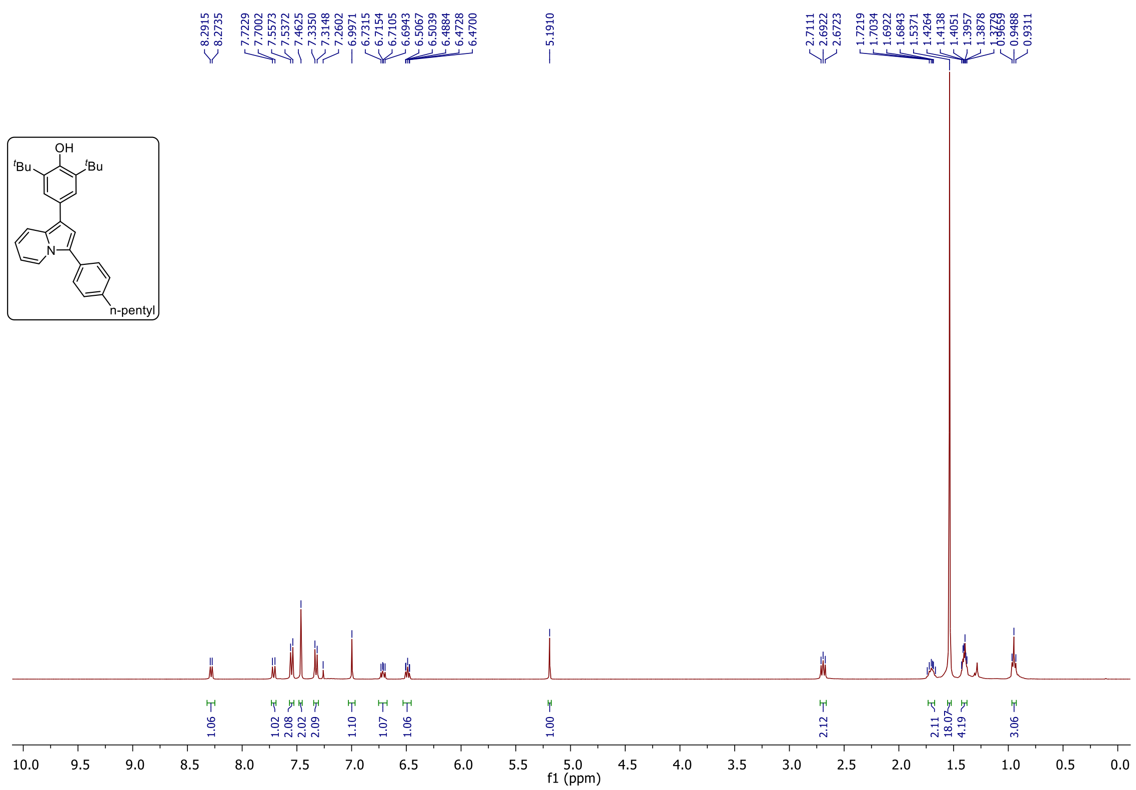
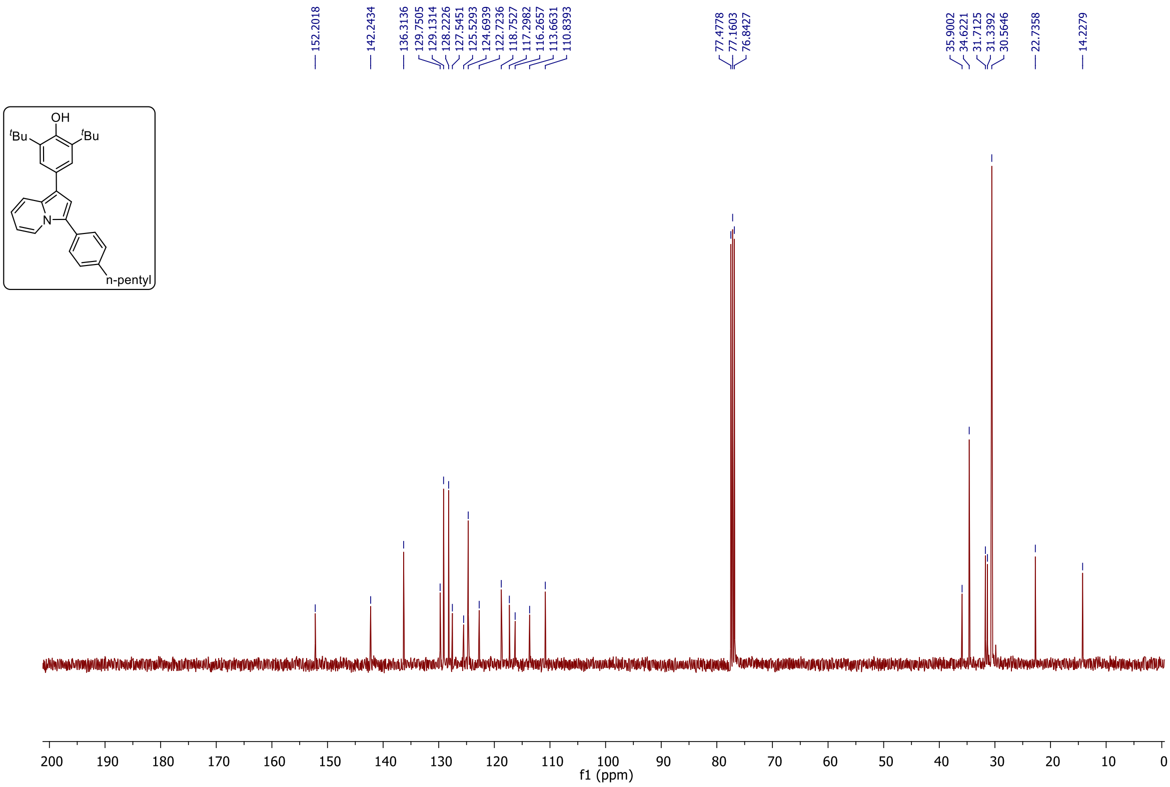
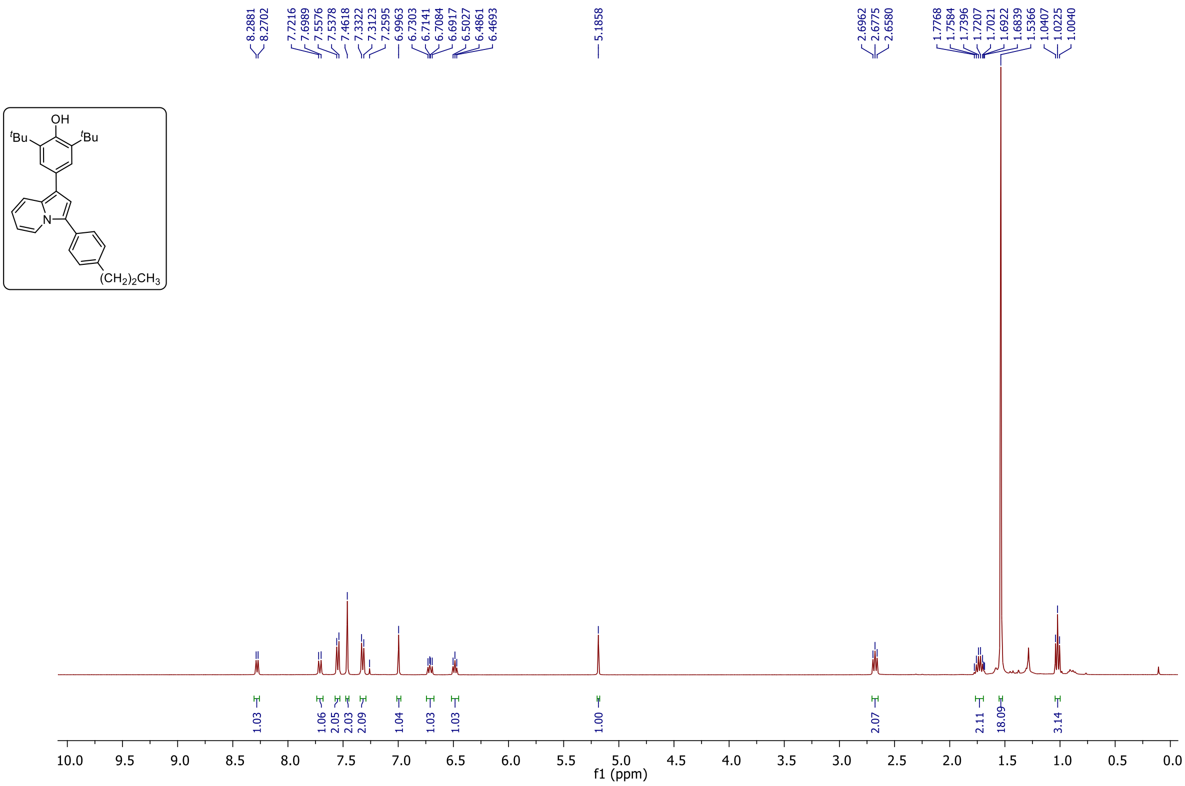


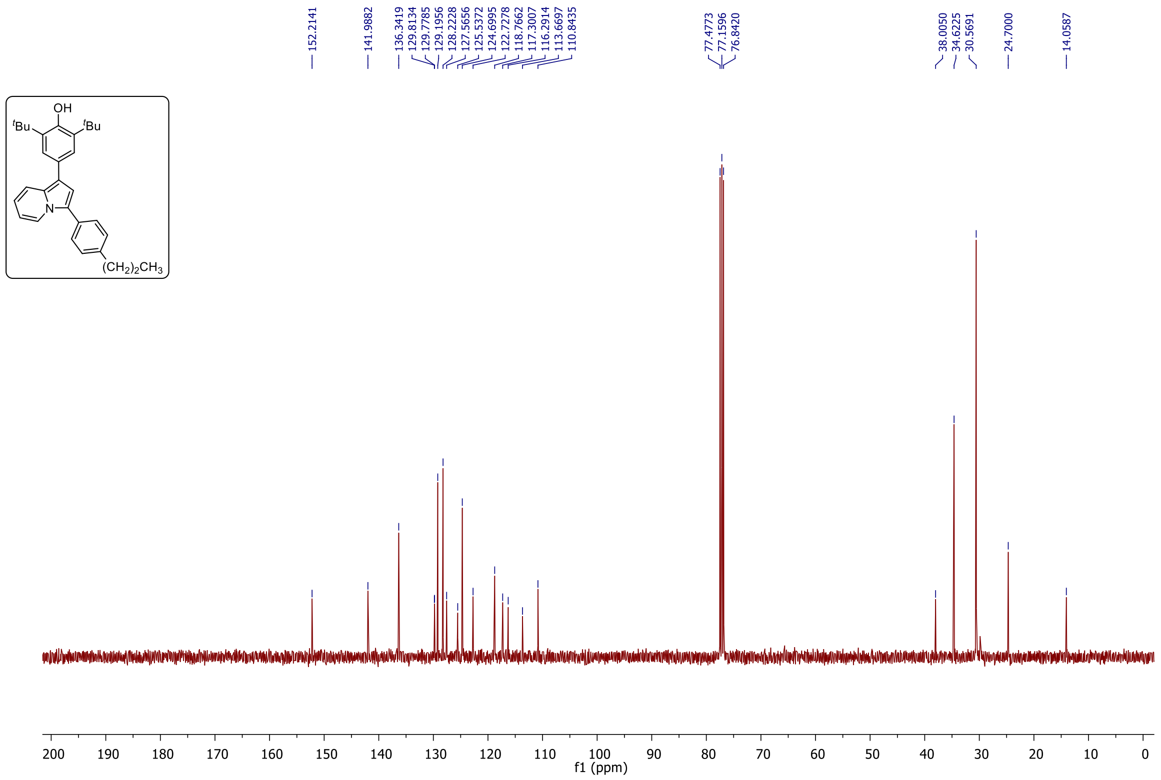
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**3j)**



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



$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**3k**)



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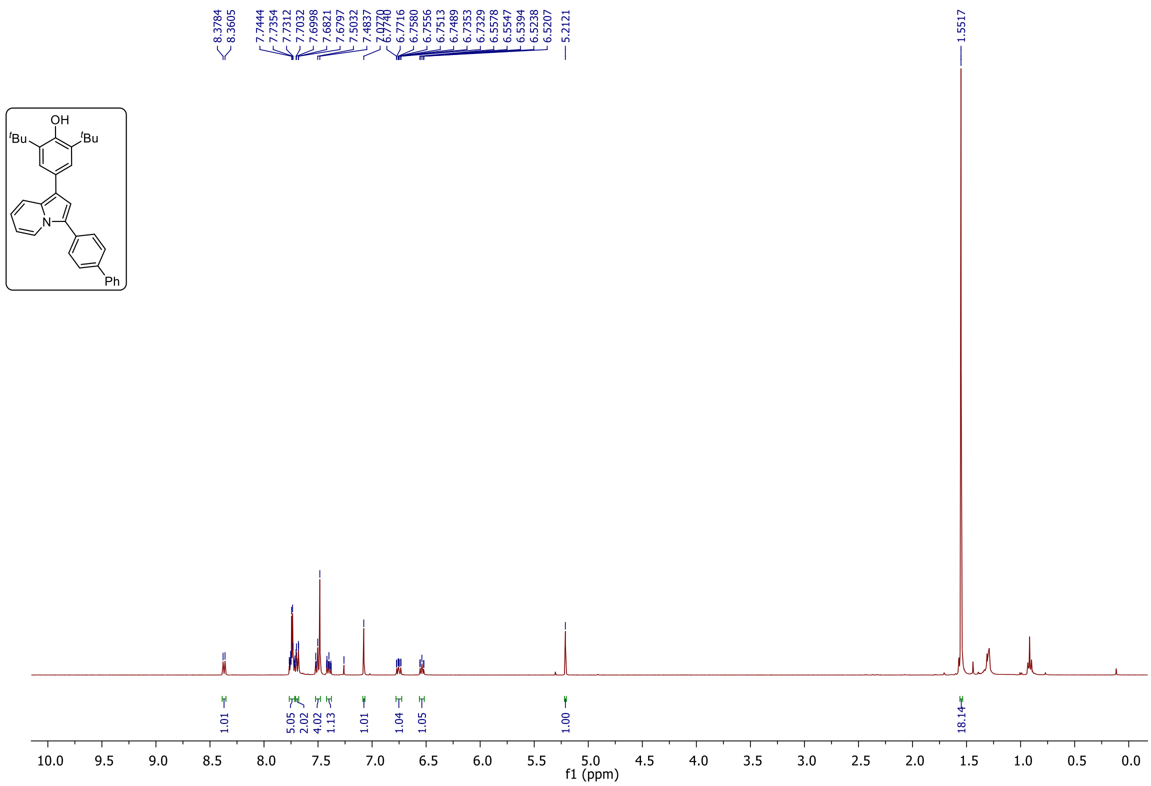
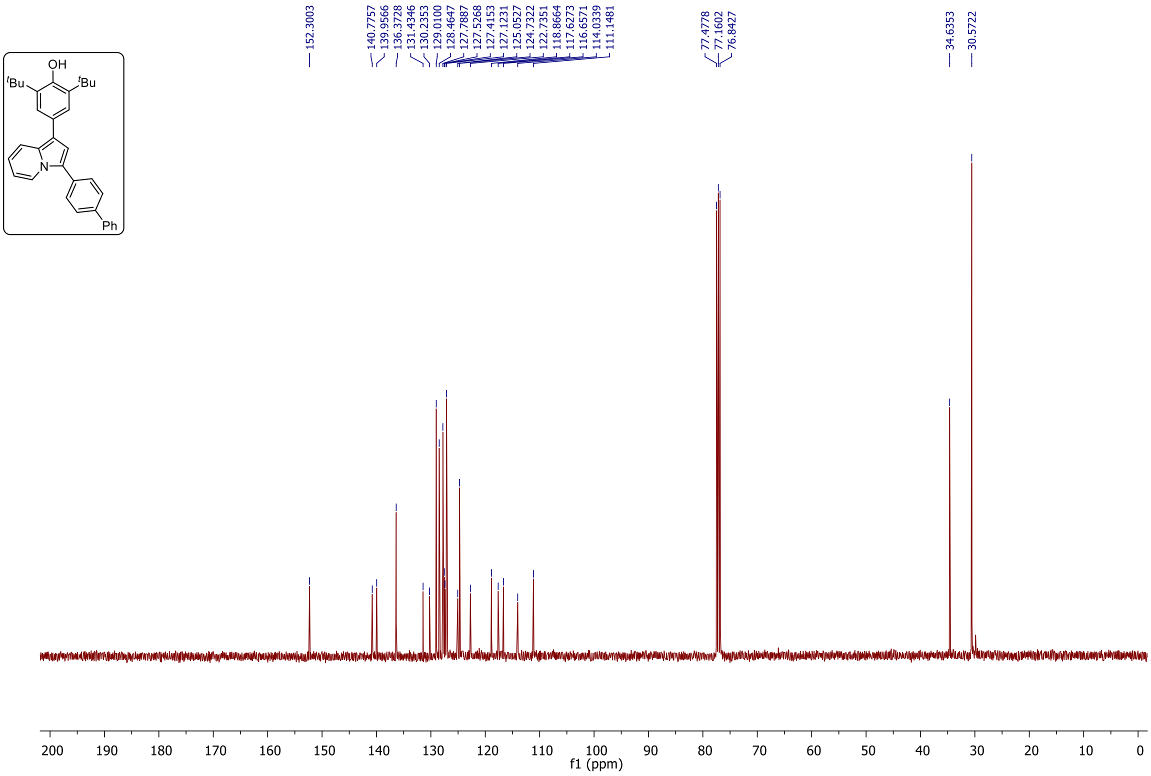
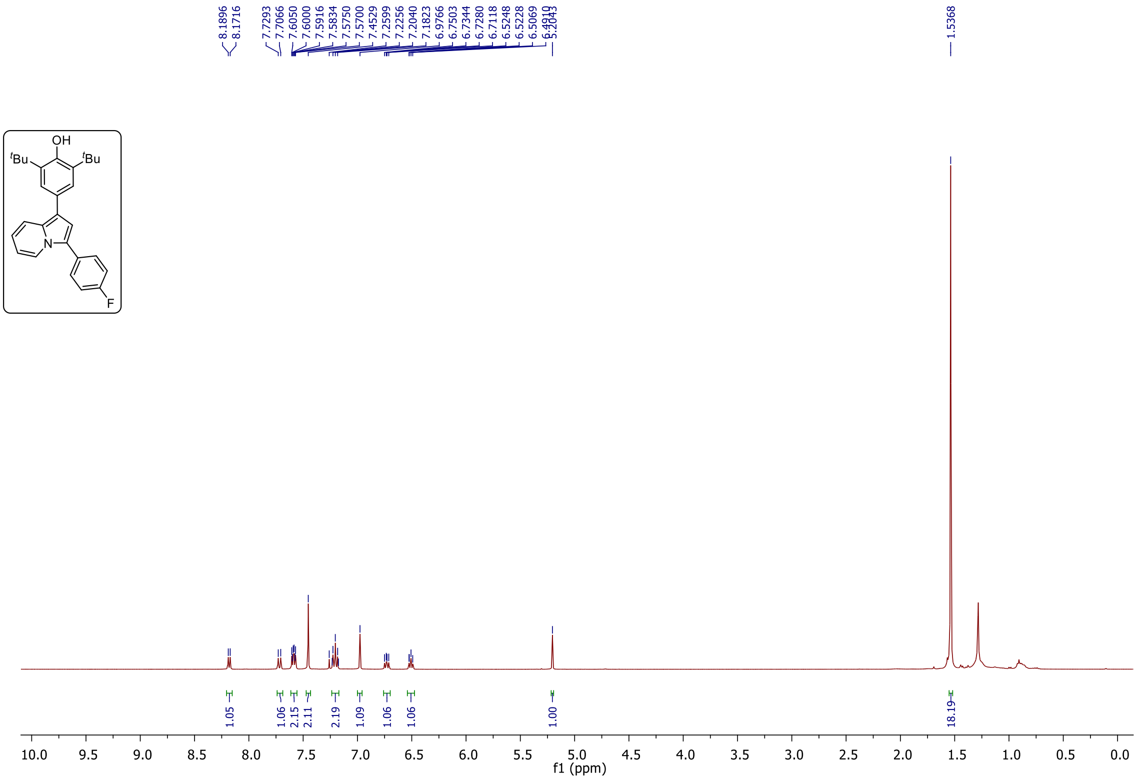


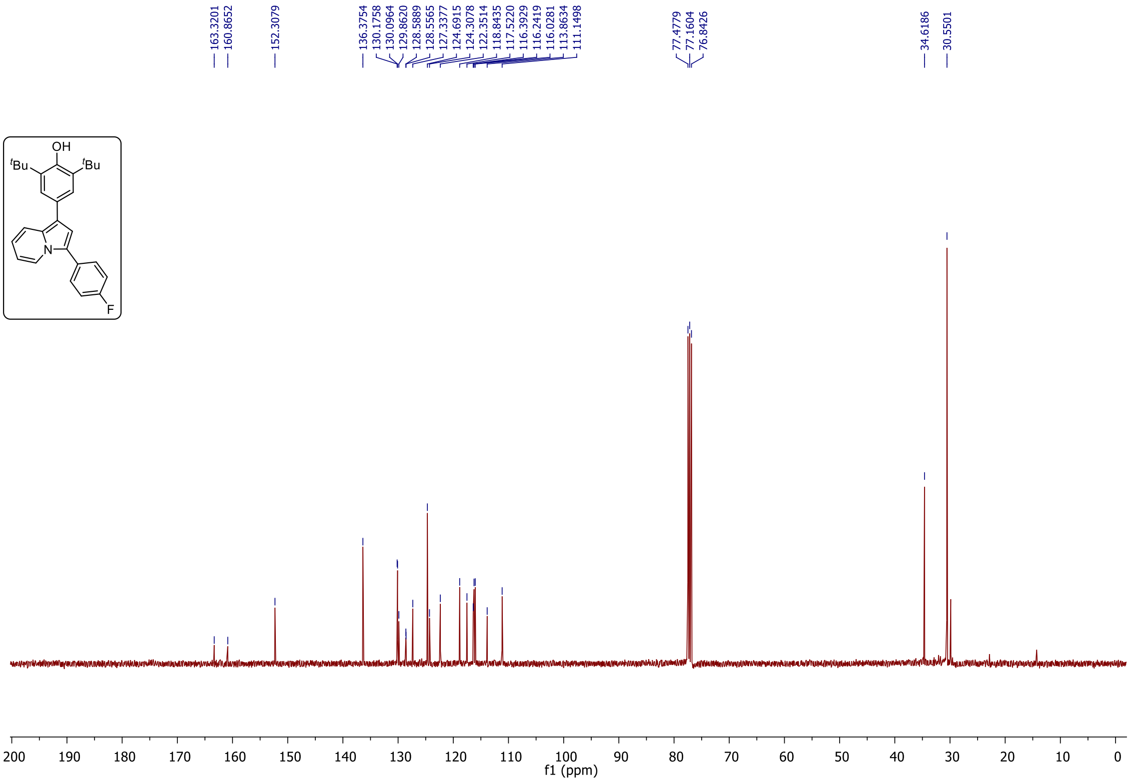
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3l)**



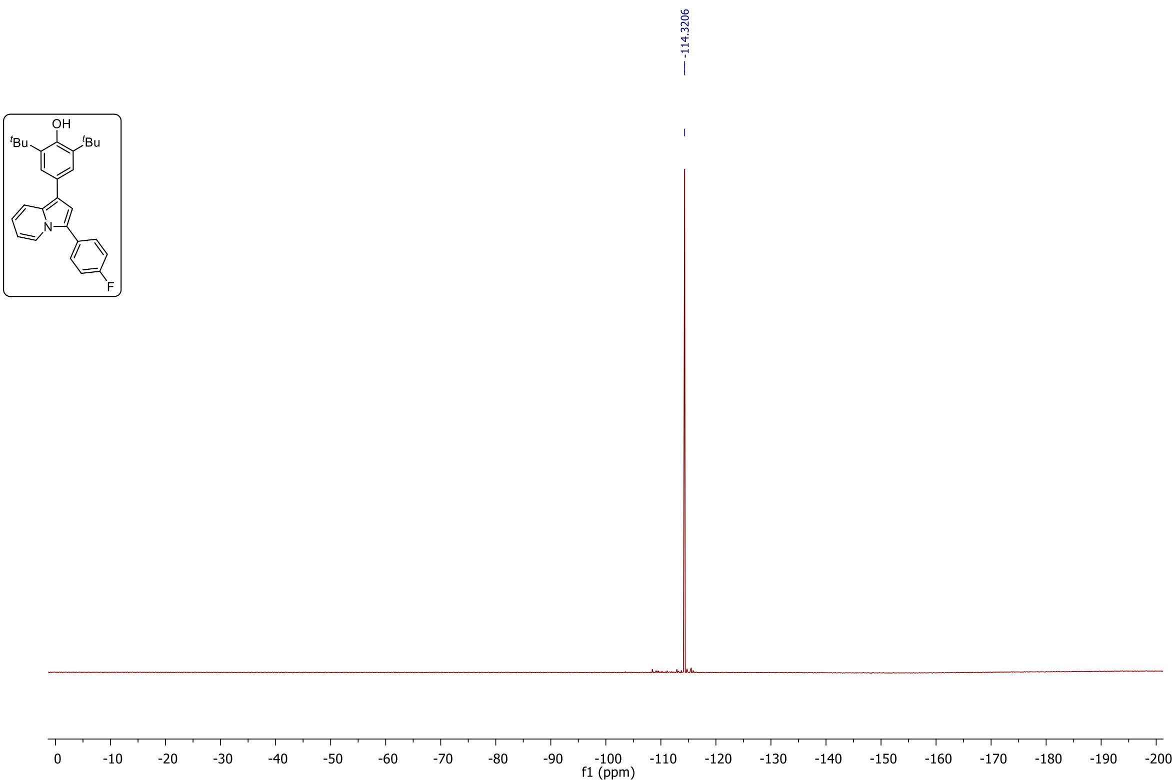
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3m)**



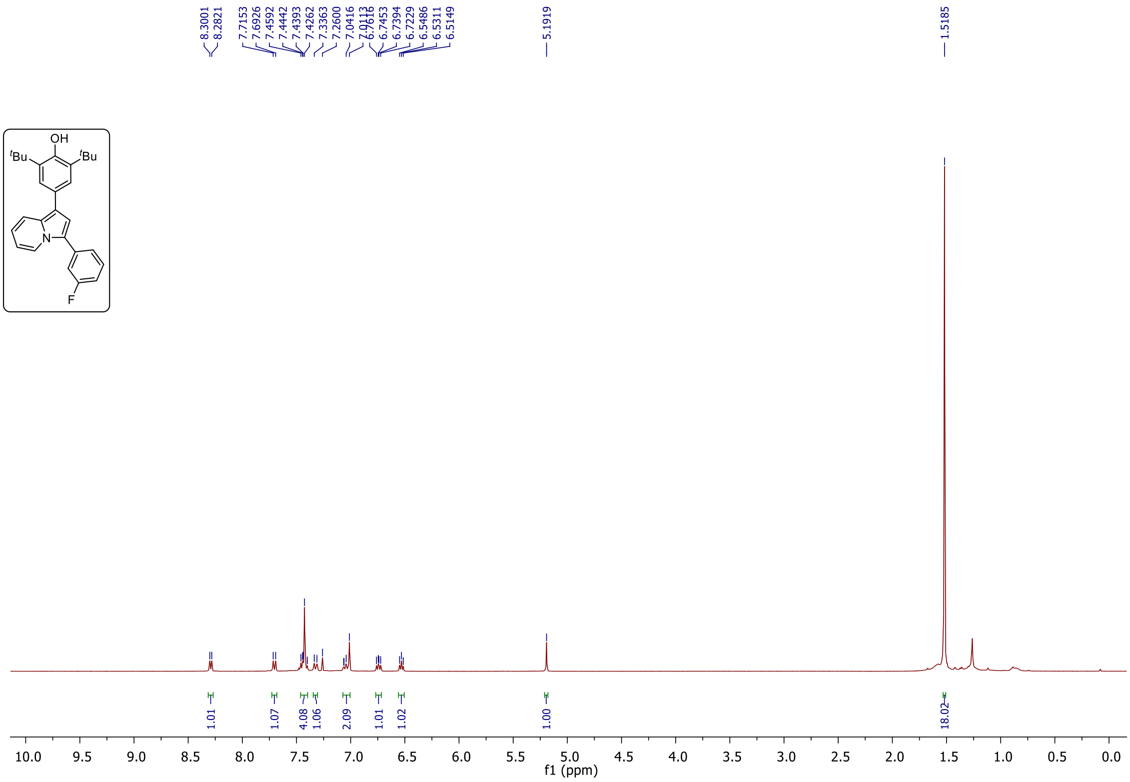
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3m)**



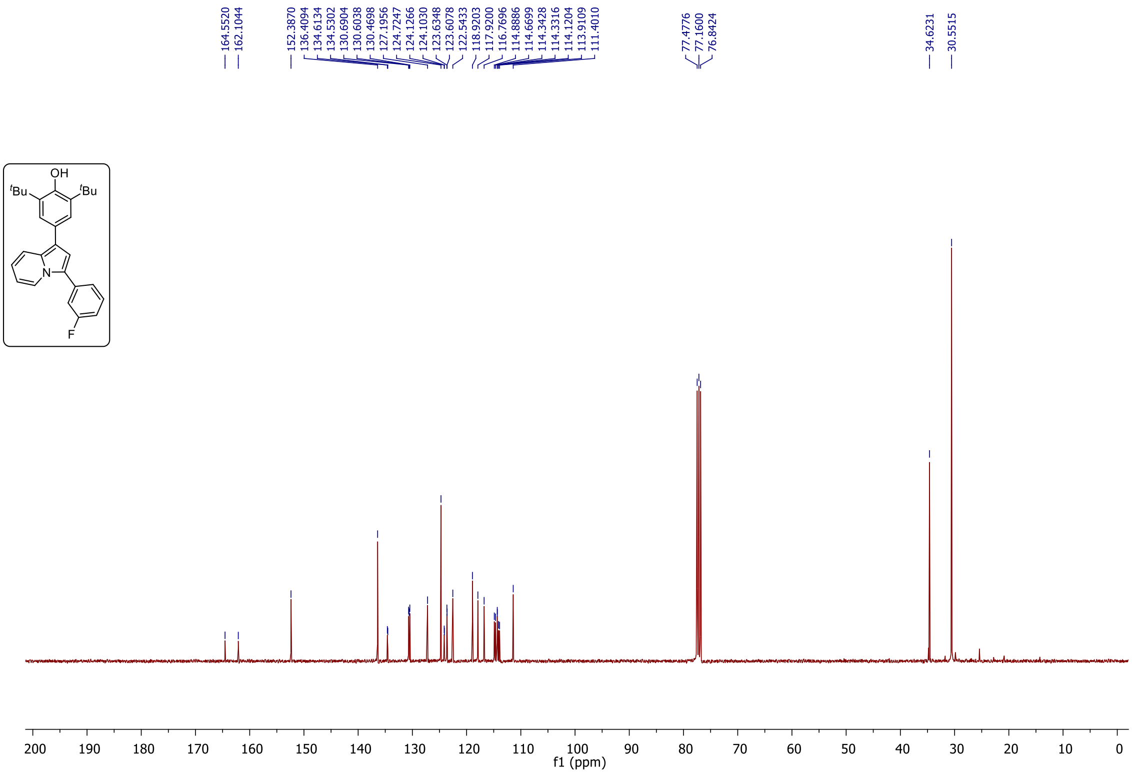
$^{19}F\{^{1}H\}$ NMR (376 MHz, $CDCl_3$) spectrum of (**3m)**



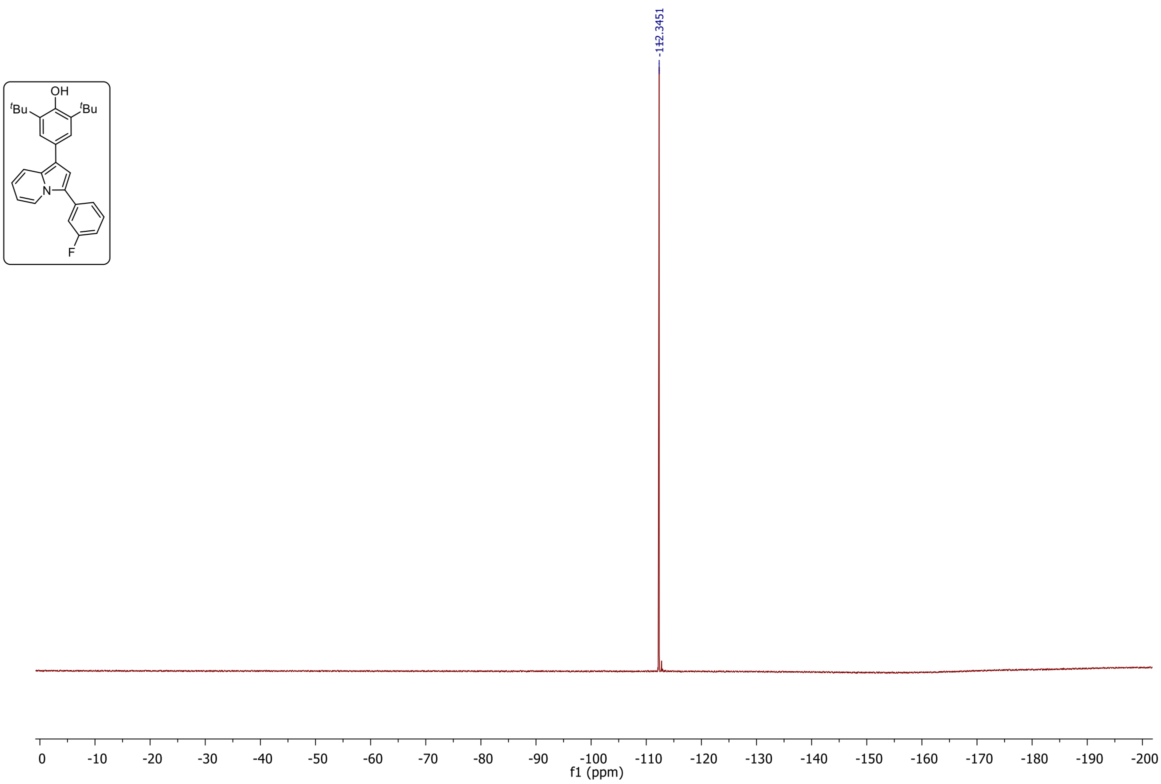
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **(3n)**



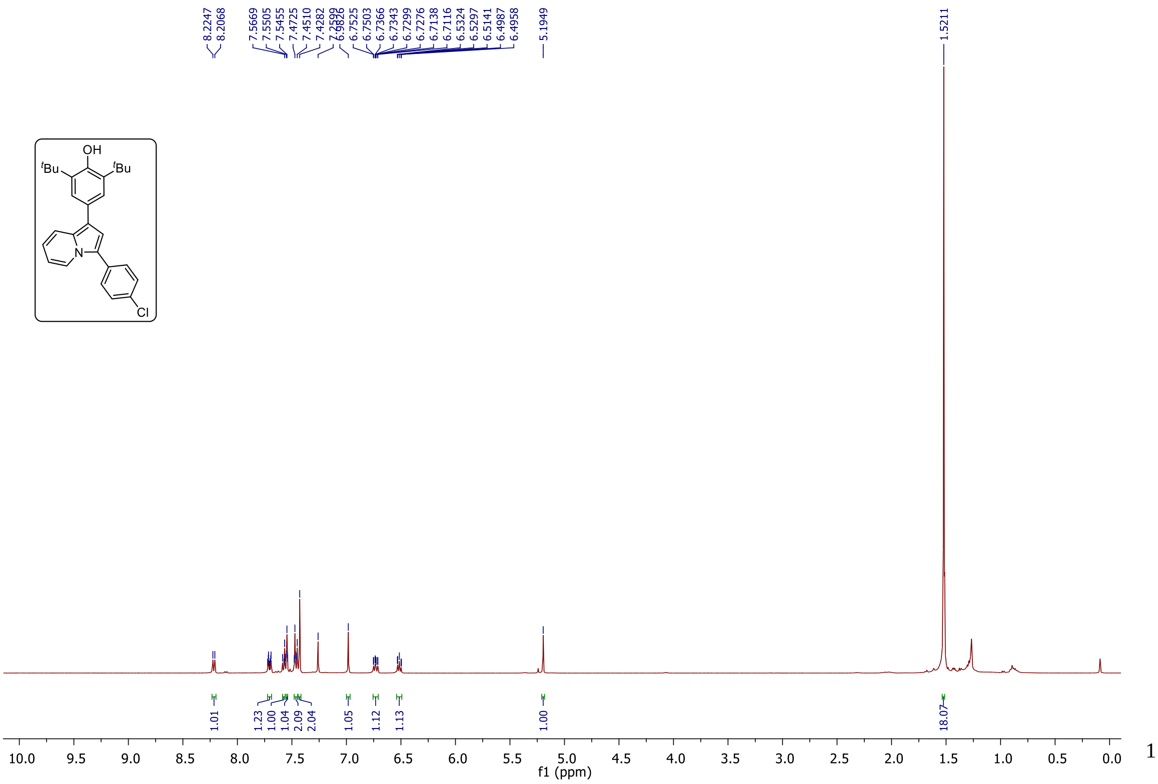
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3n)**



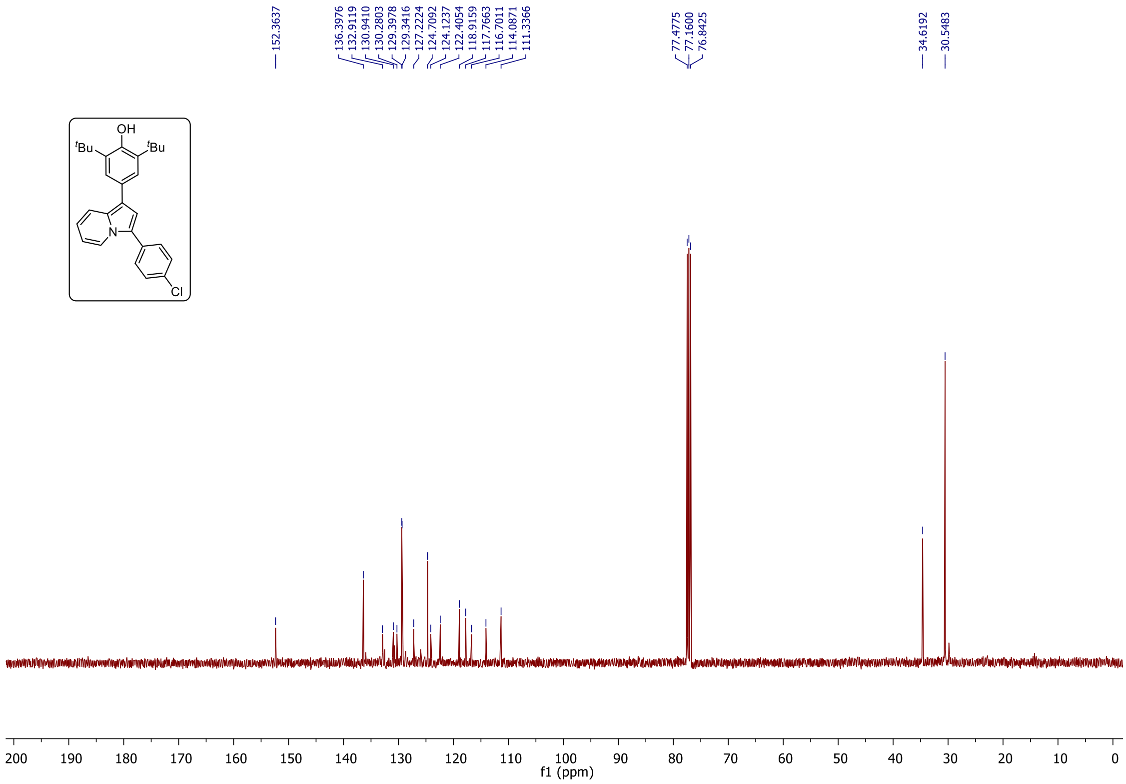
$^{19}F\{^{1}H\}$ NMR (376 MHz, $CDCl_3$) spectrum of (**3n**)



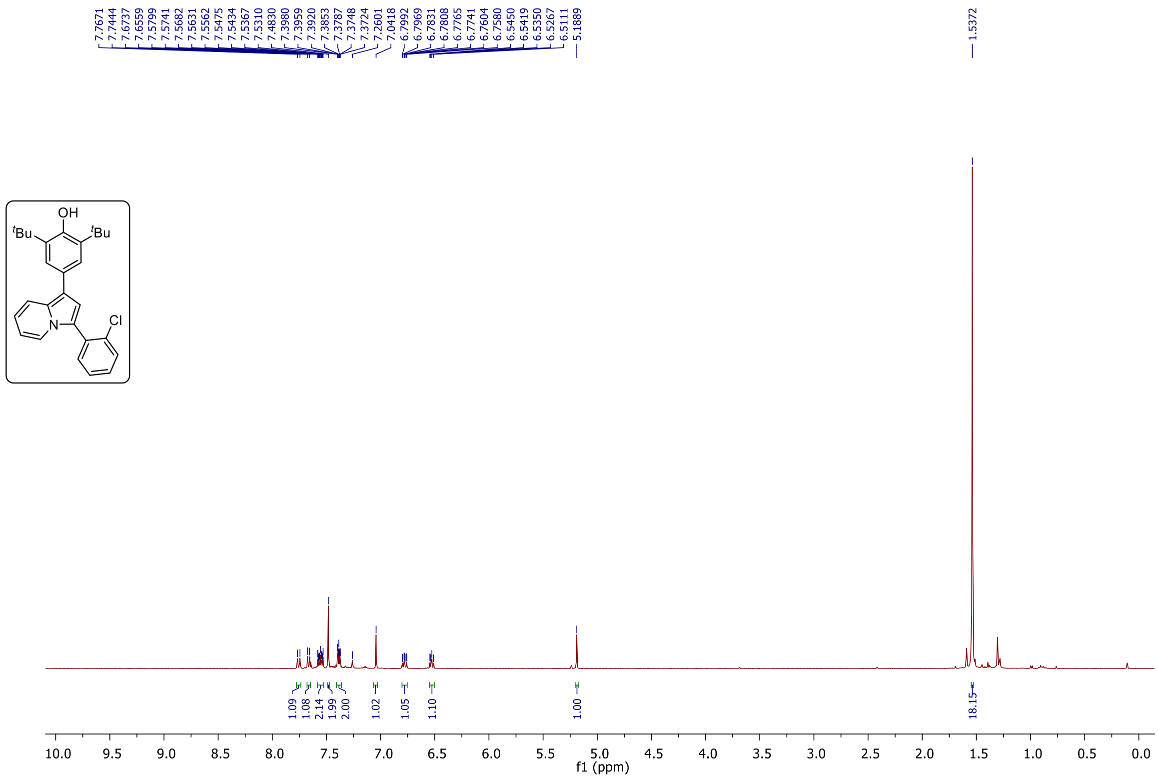
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3o**)



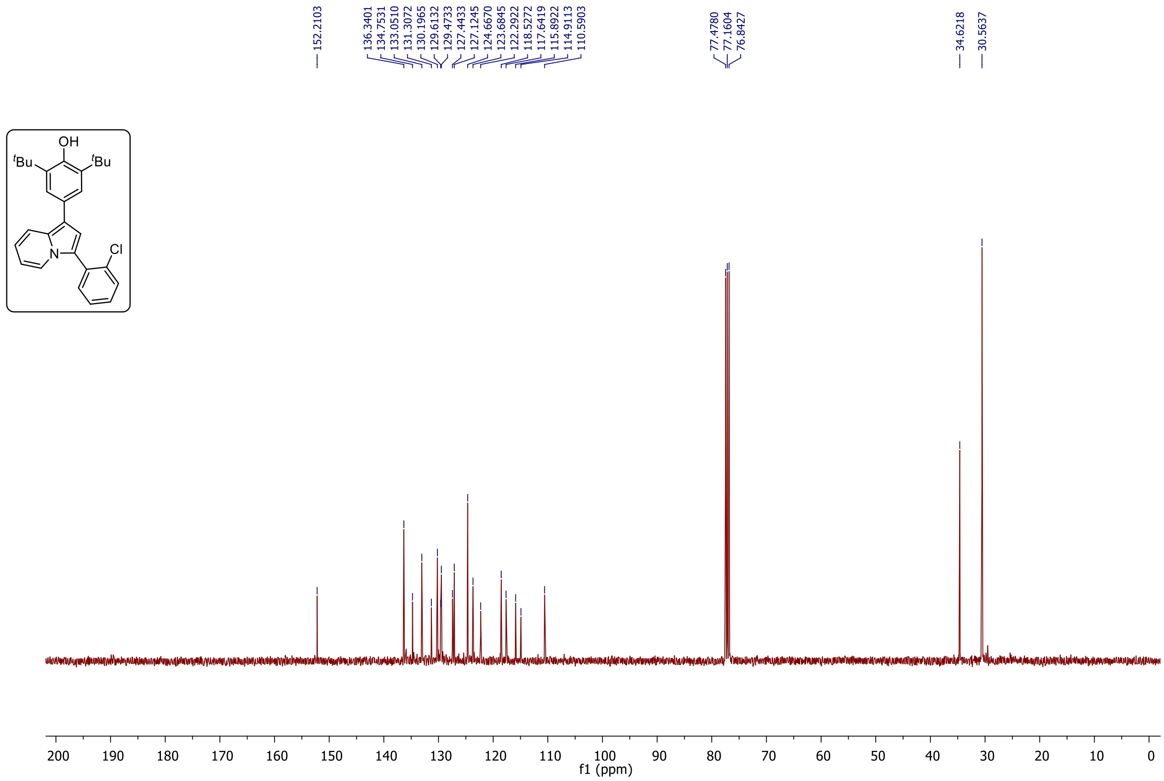
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3o)**



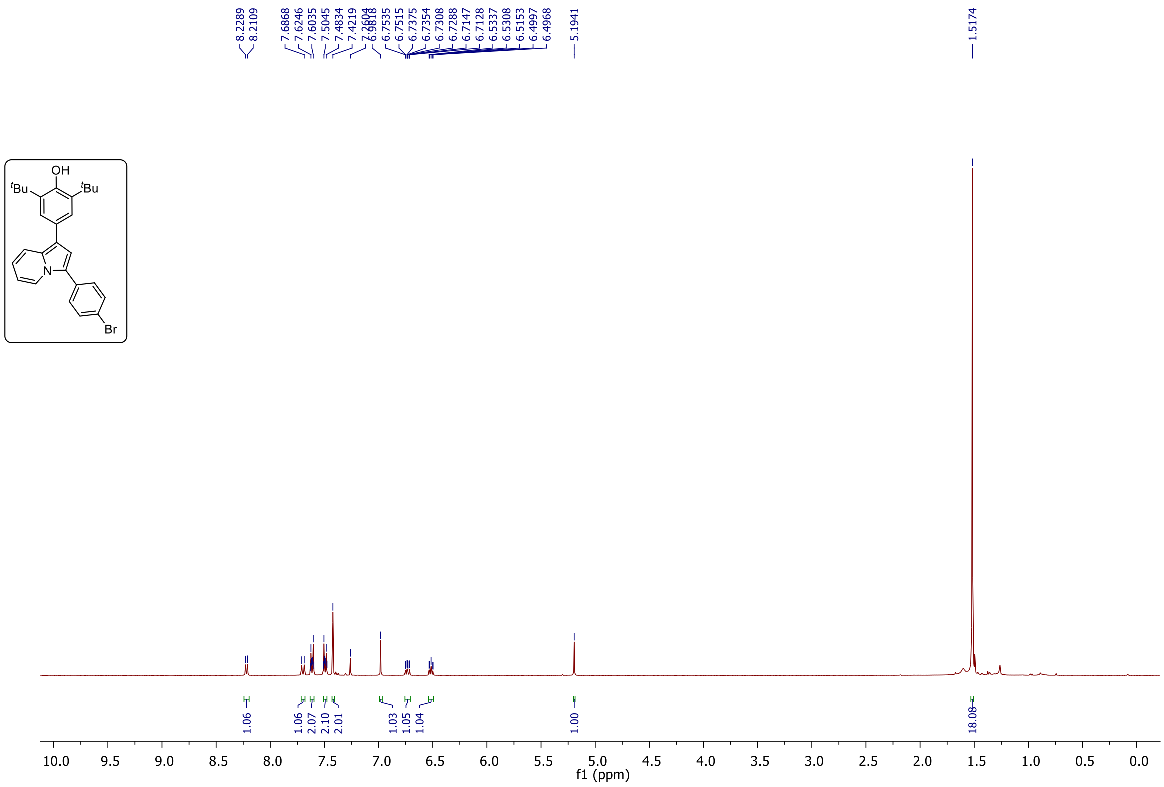
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3p)**



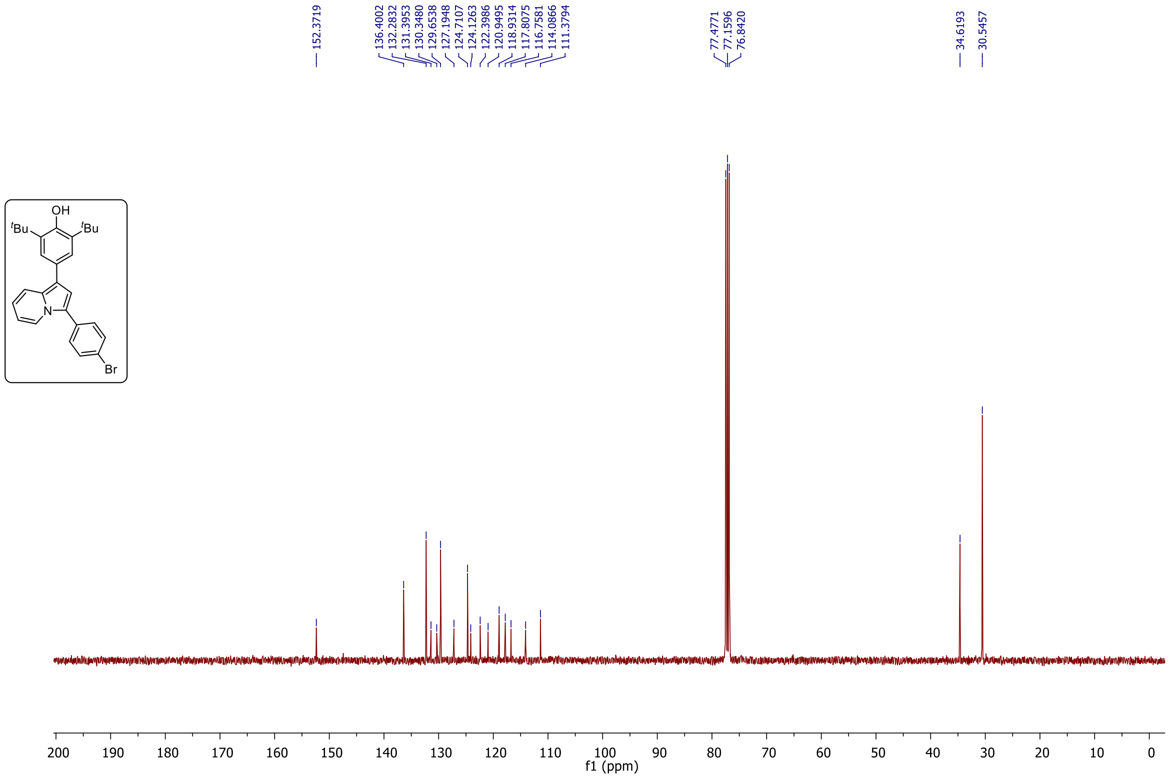
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3p)**



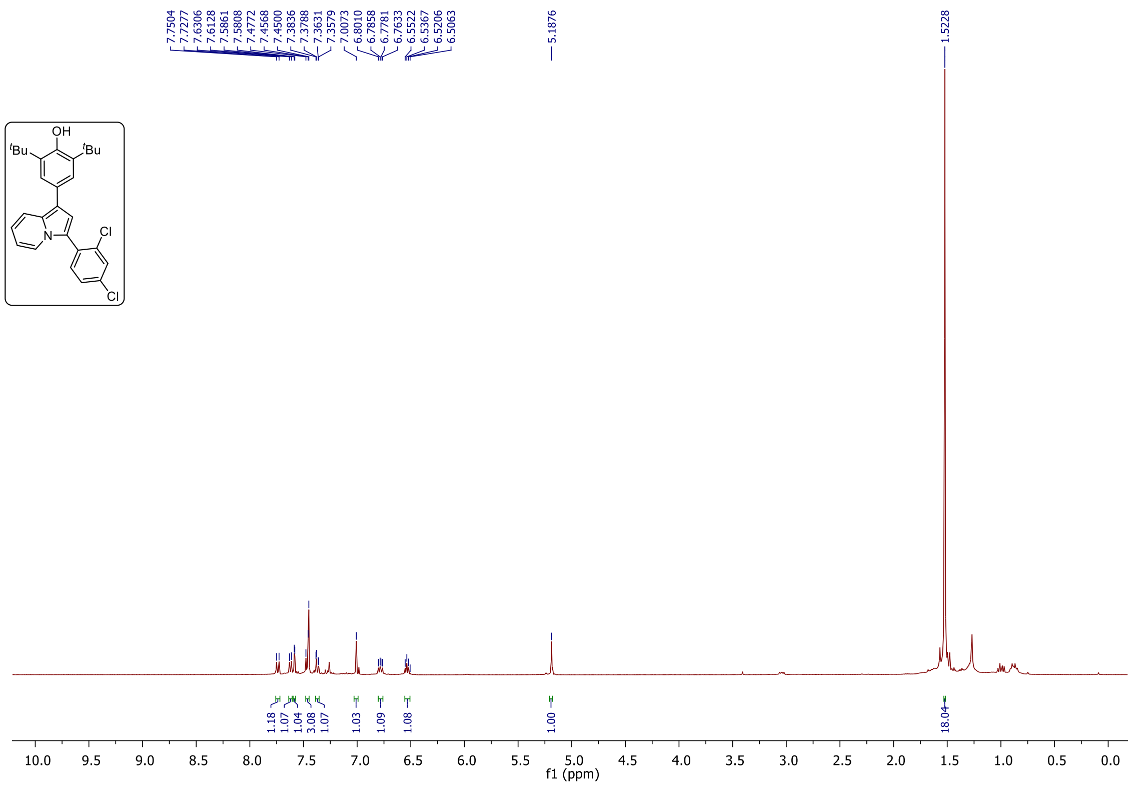
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3q)**



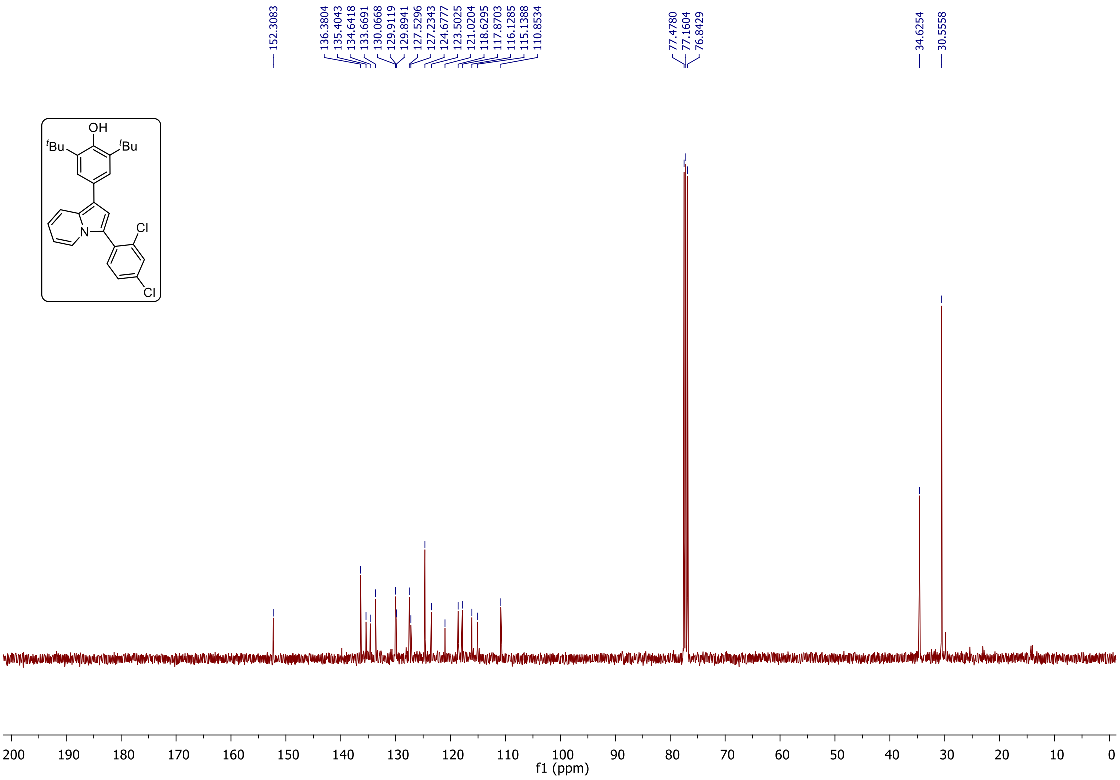
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3q)**



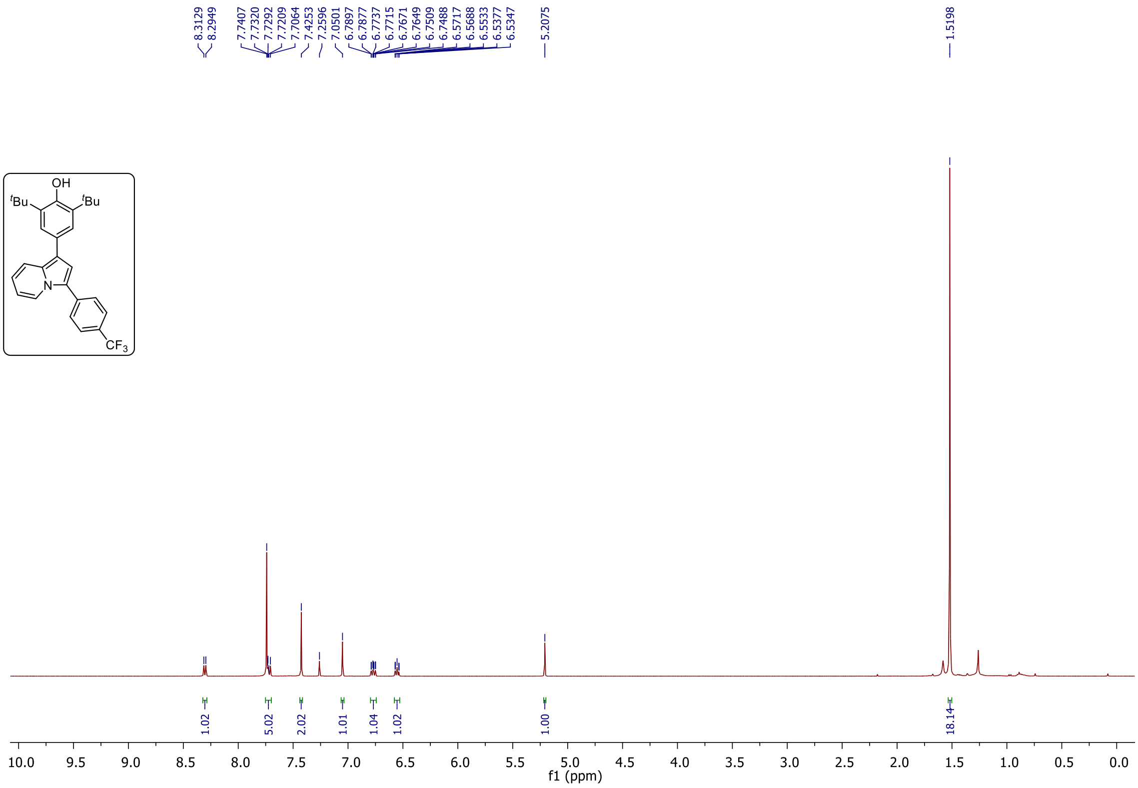
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **(3r)**



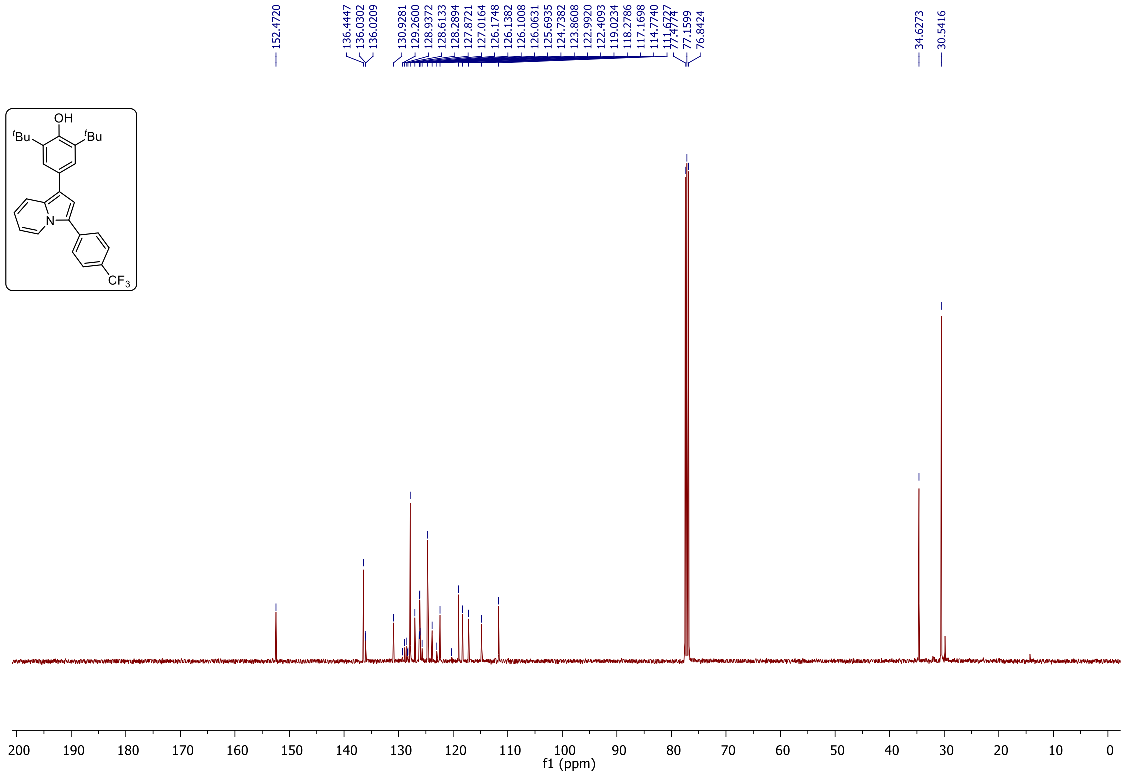
$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3r)**



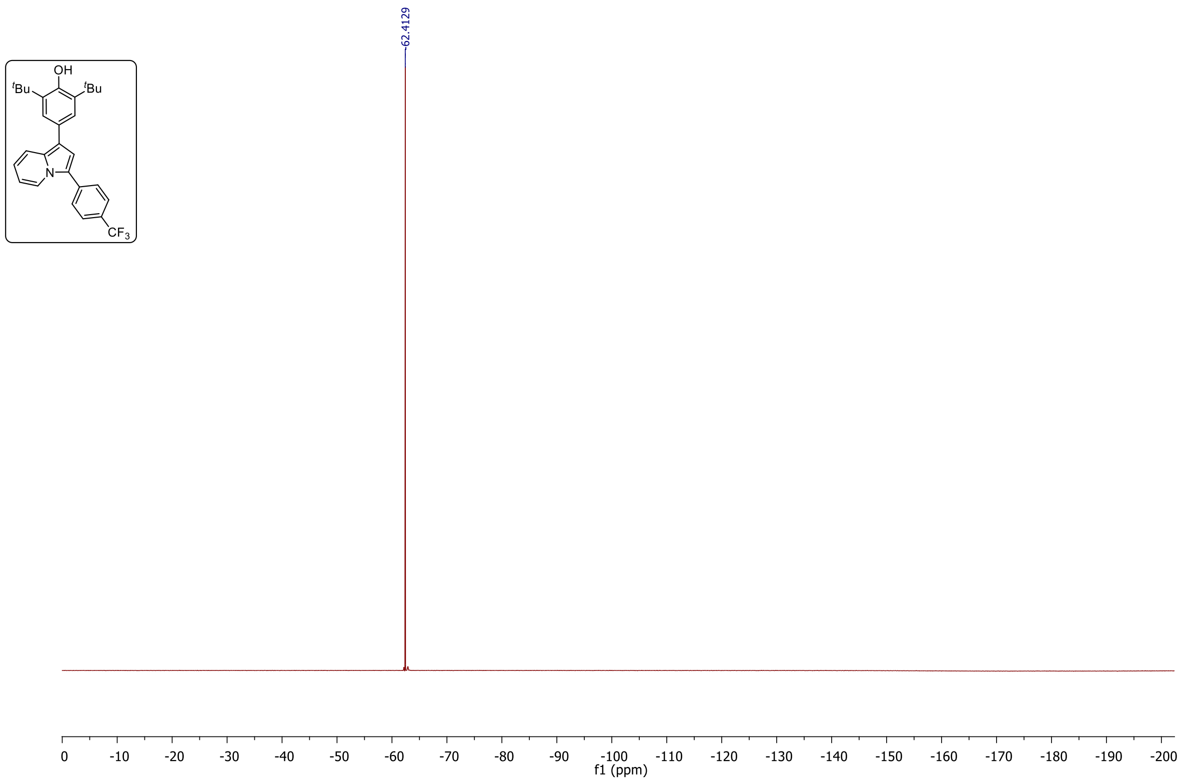
^1H NMR (400 MHz, $CDCl_3$) spectrum of **(3s)**



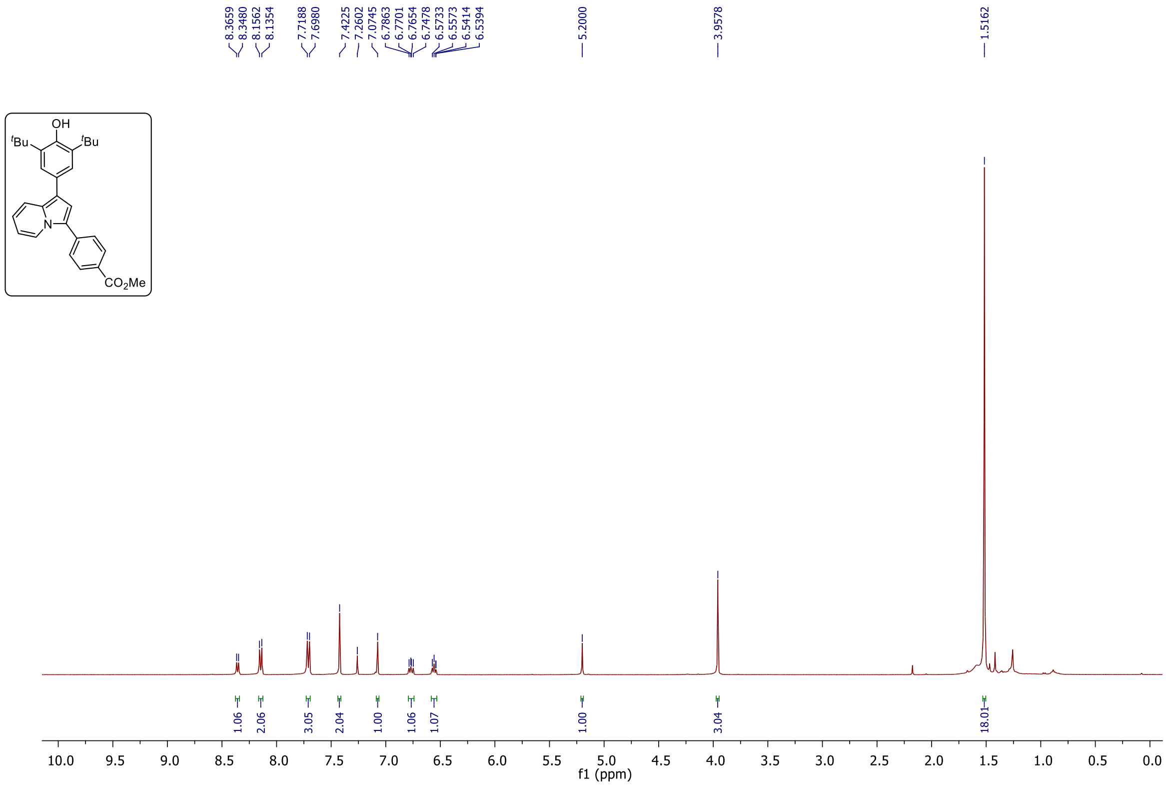
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3s)**



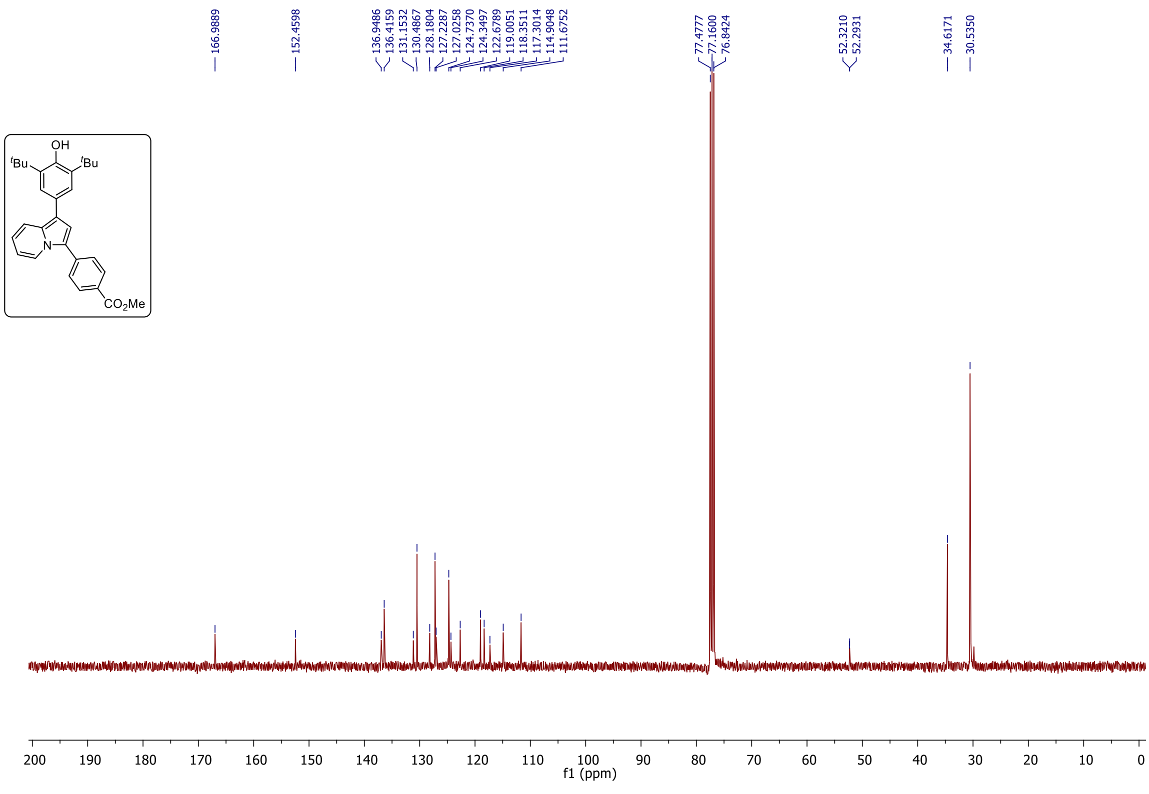
$^{19}F\{^{1}H\}$ NMR (376 MHz, $CDCl_3$) spectrum of (**3s)**



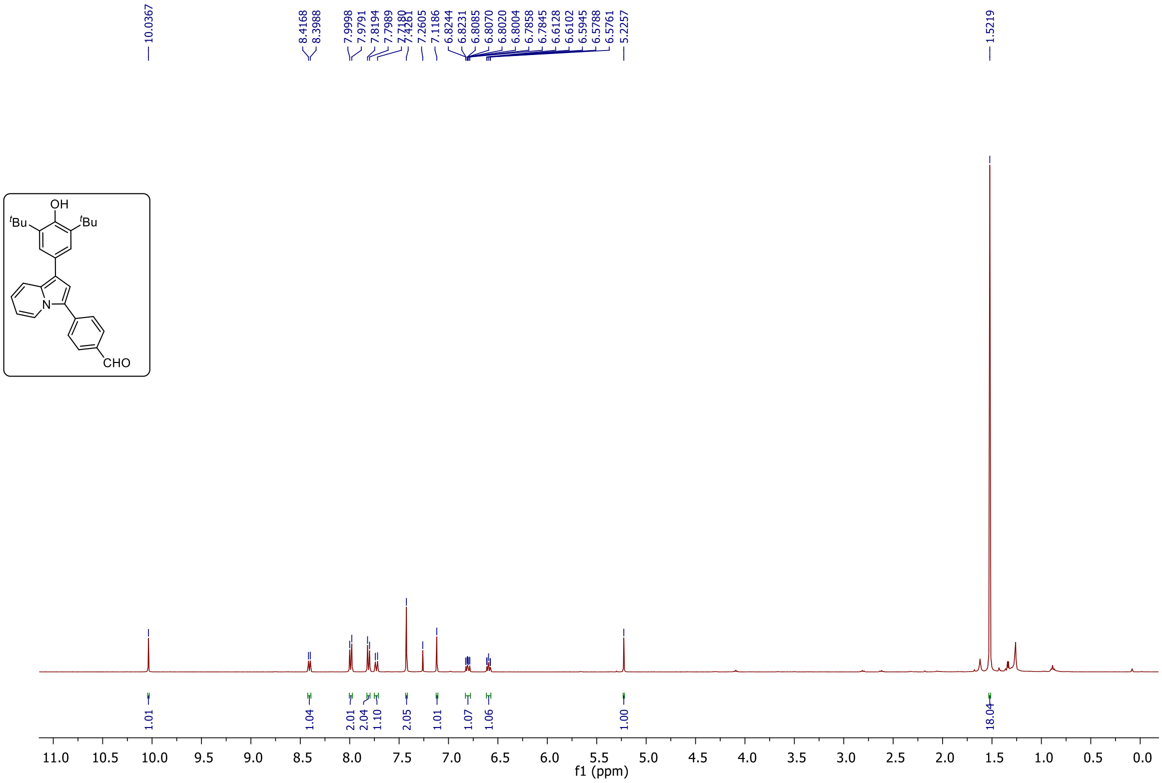
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **(3t)**



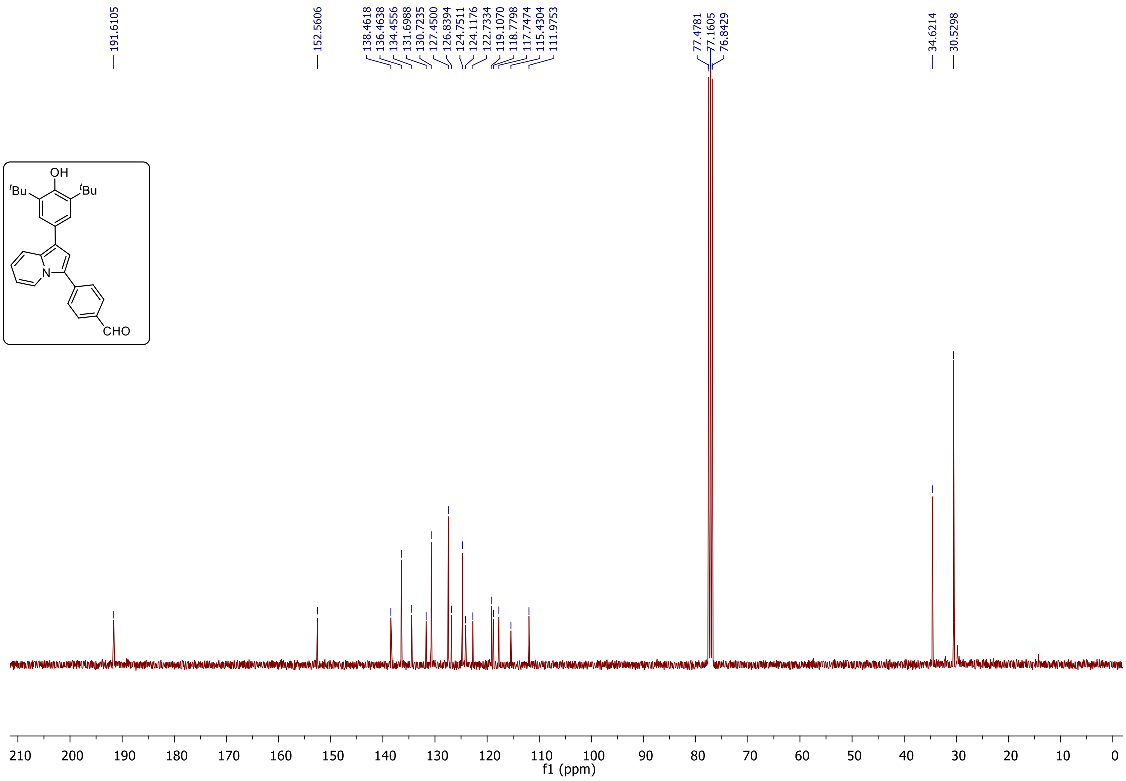
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3t)**



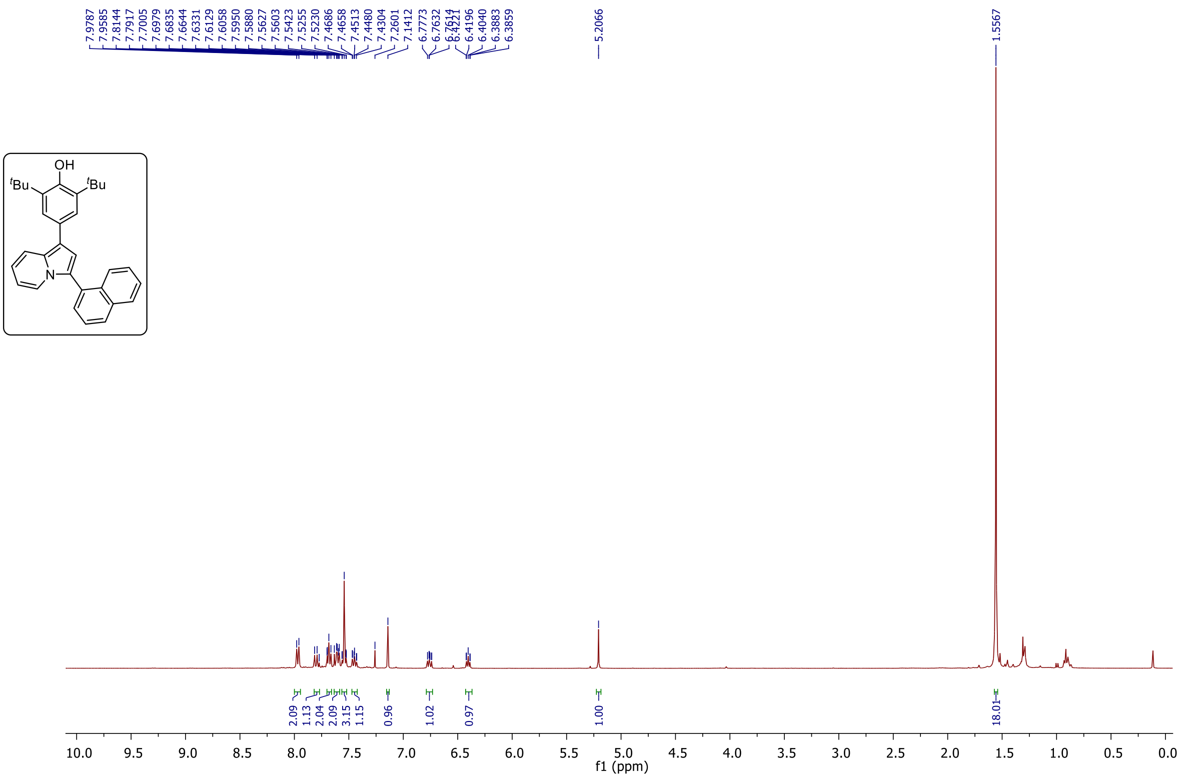
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **(3u)**



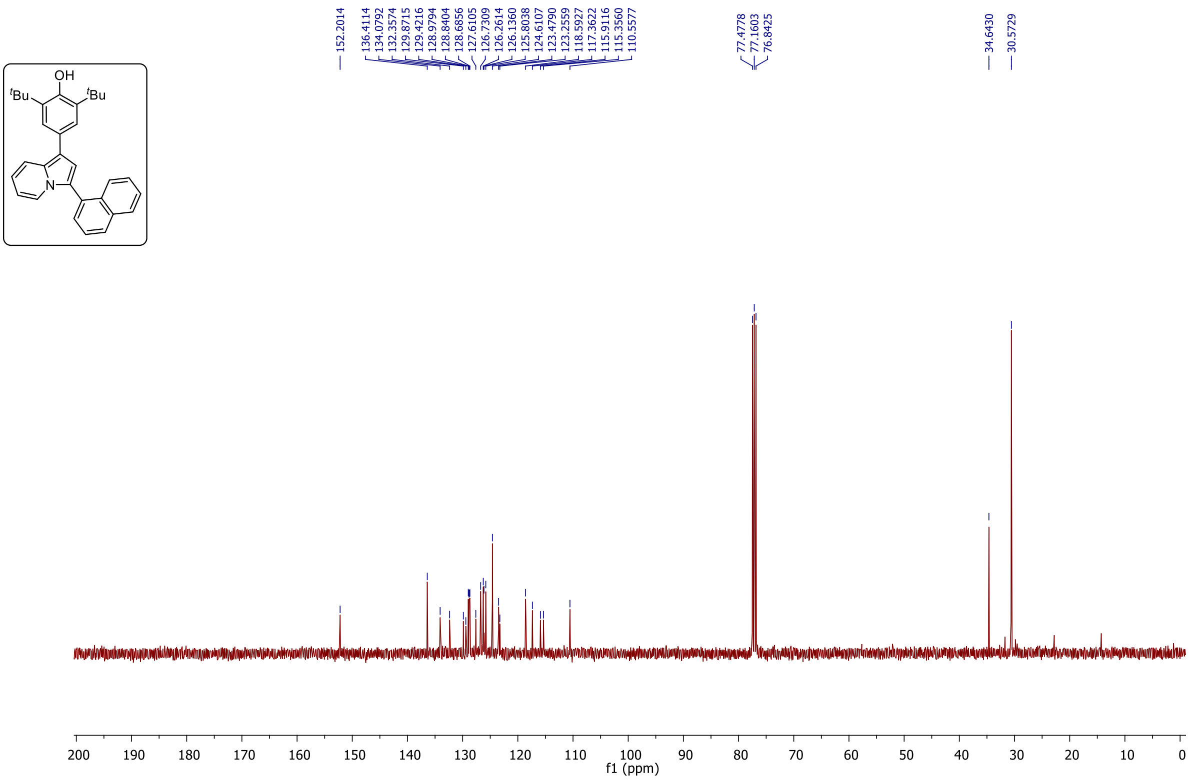
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**3u)**



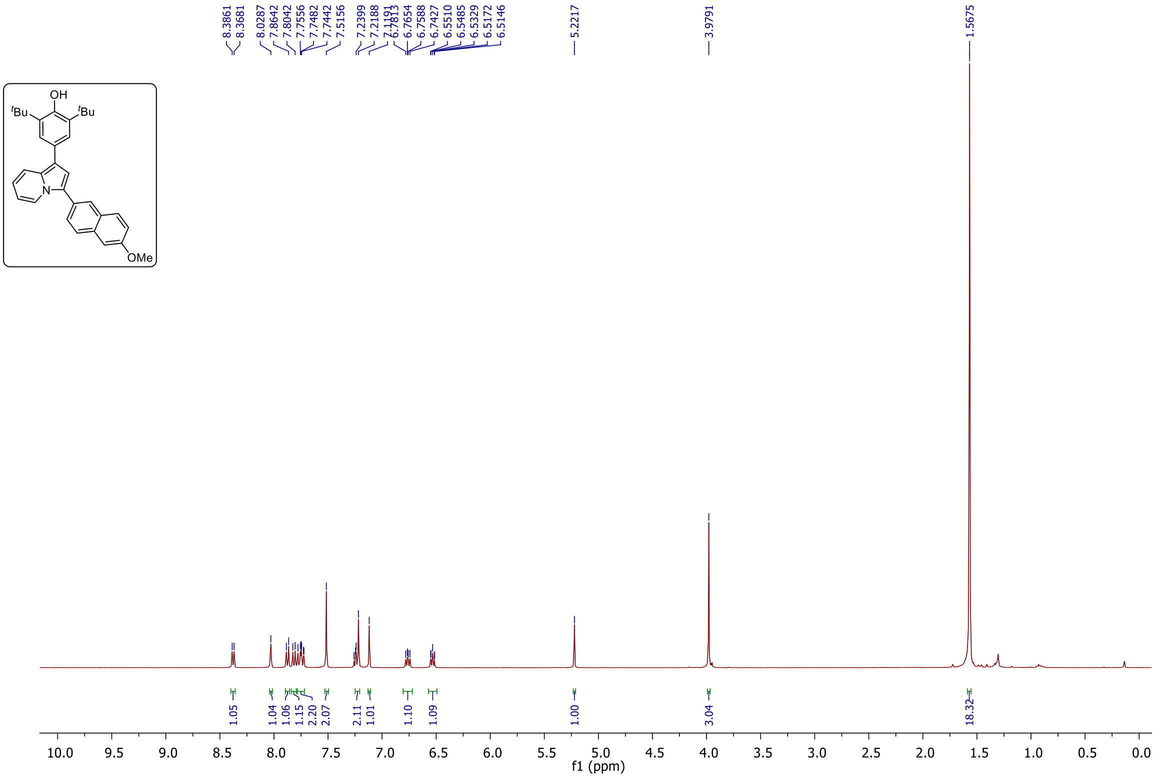
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **(3v)**



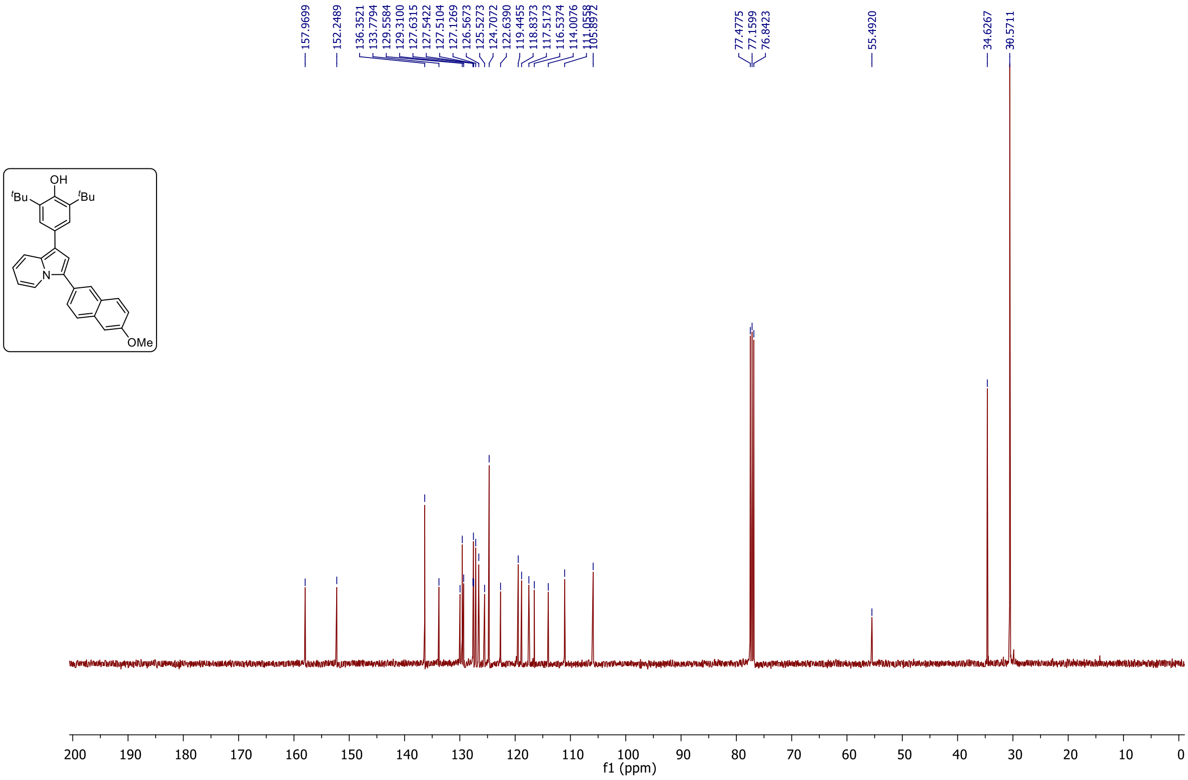
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3v)**



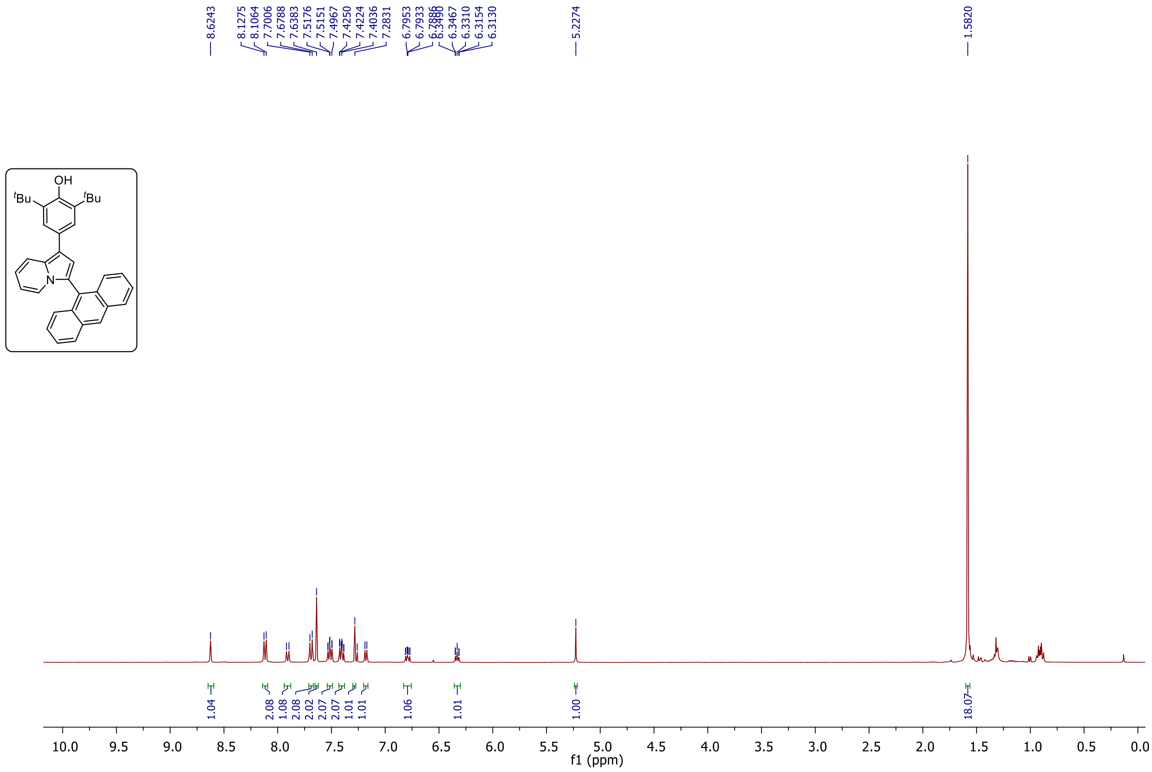
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **(3w)**



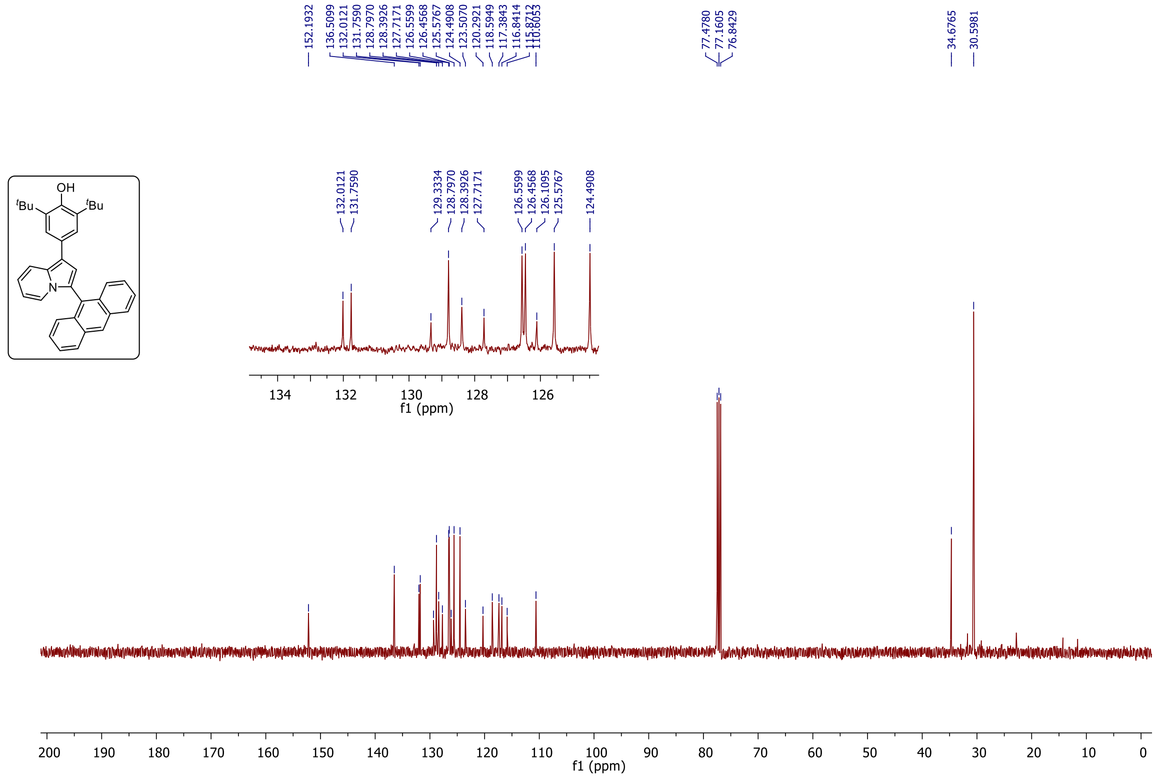
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3w)**



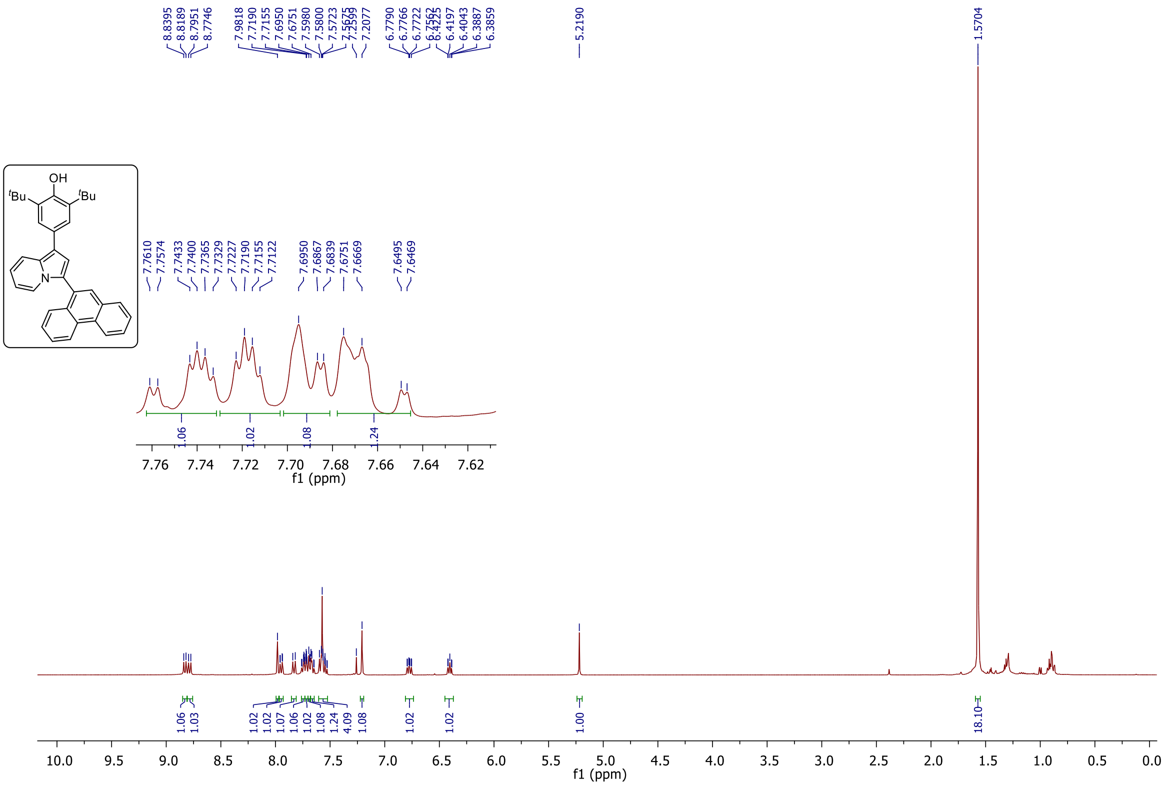
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of **(3x)**



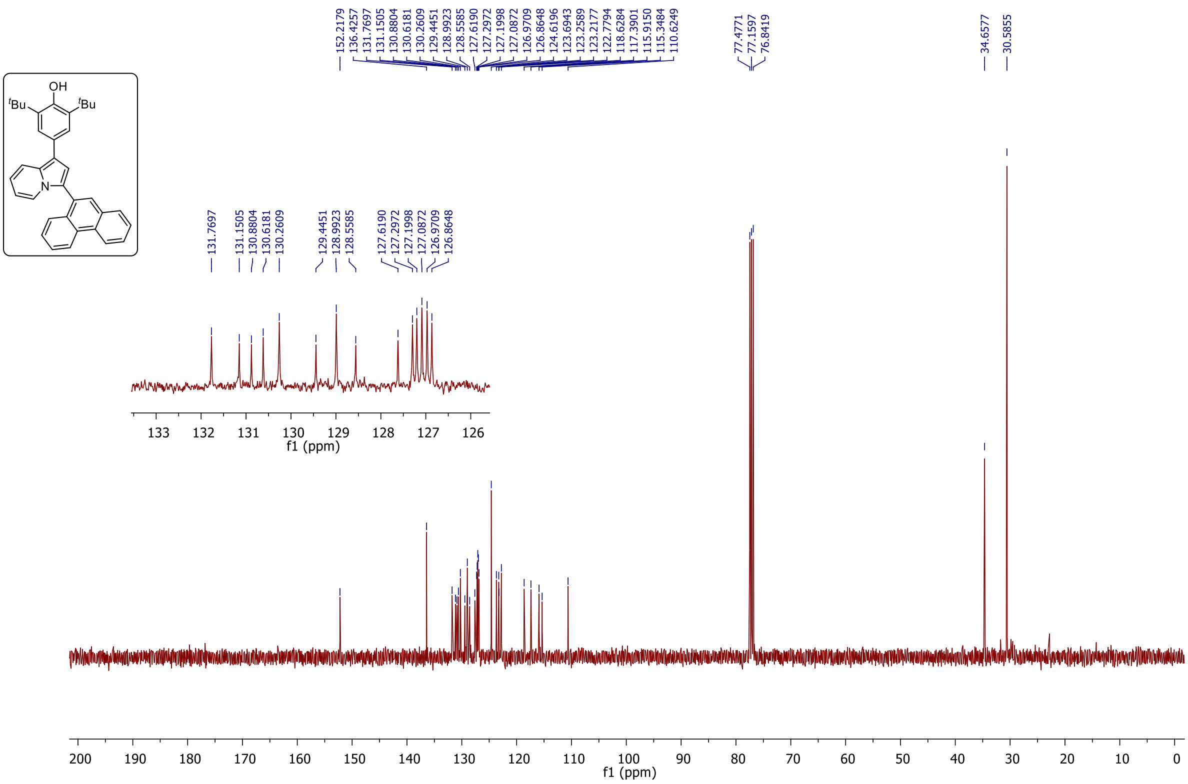
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectrum of **(3x)**



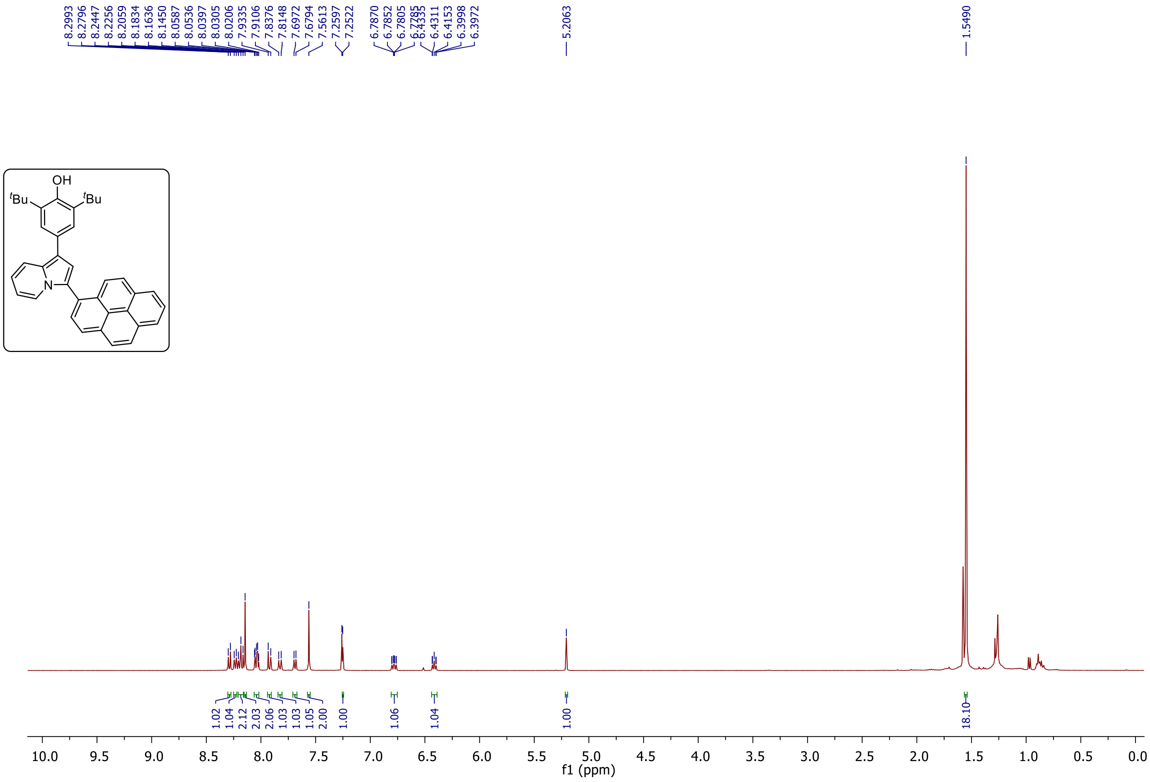
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3y**)



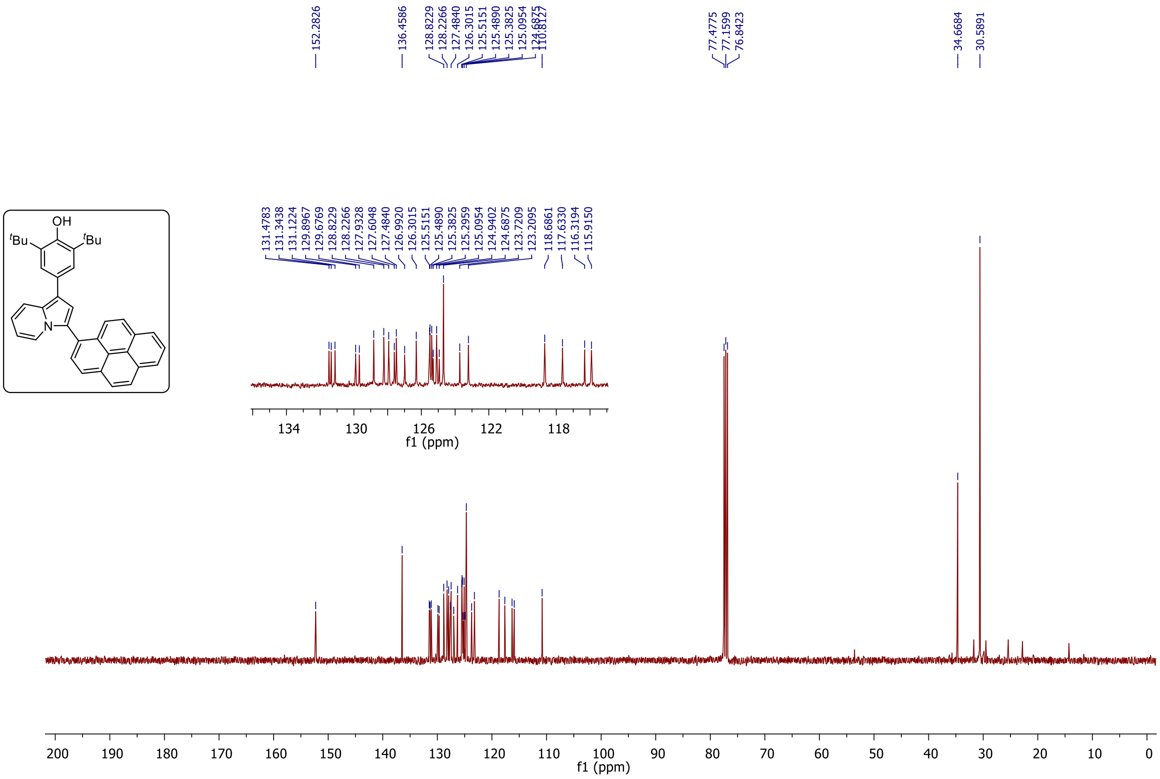
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3y)**



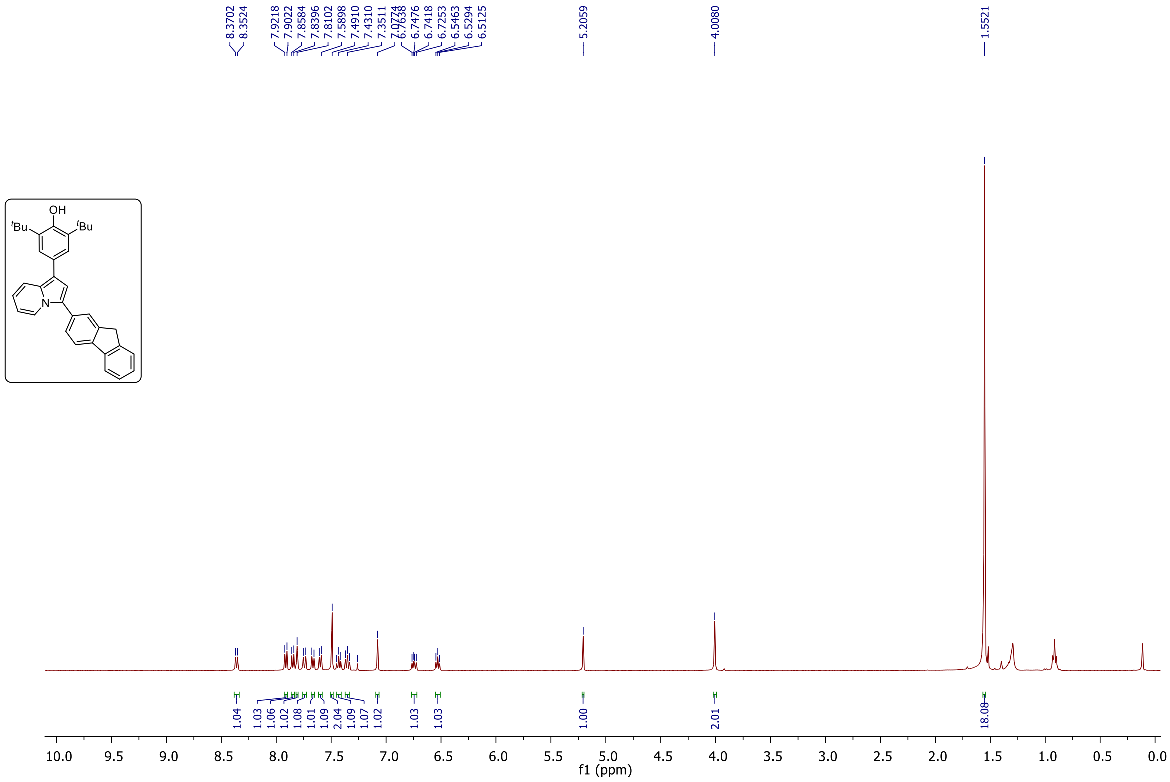
^{1}H NMR (400 MHz, CDCl$_3$) spectrum of (**3z**)



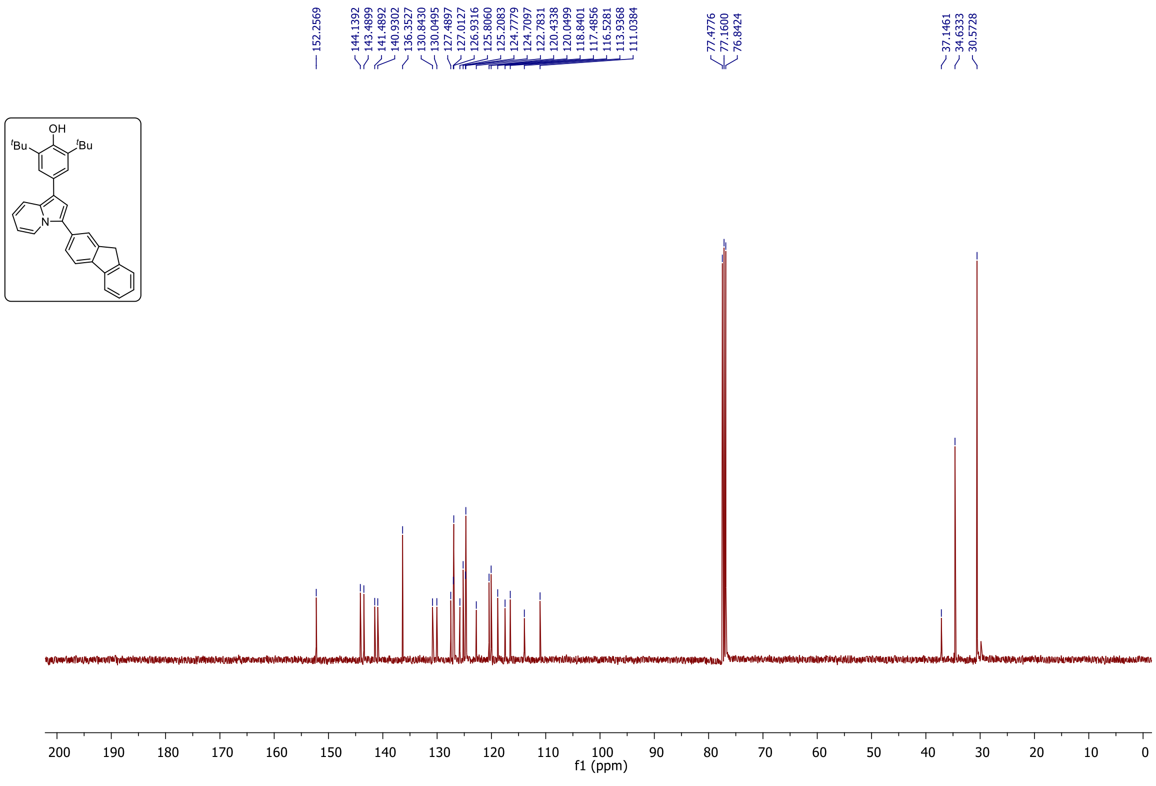
^{13}C{^{1}H} NMR (100 MHz, CDCl$_3$) spectrum of **(3z)**



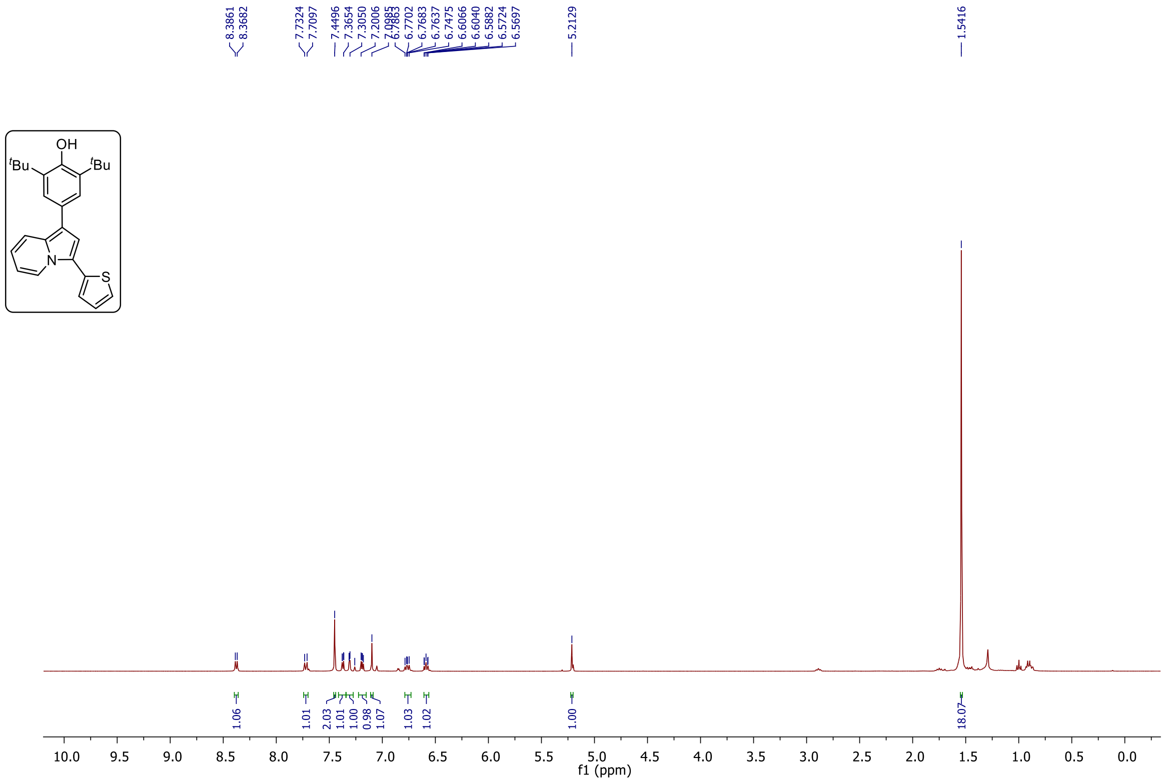
[1]H NMR (400 MHz, $CDCl_3$) spectrum of (**3aa)**



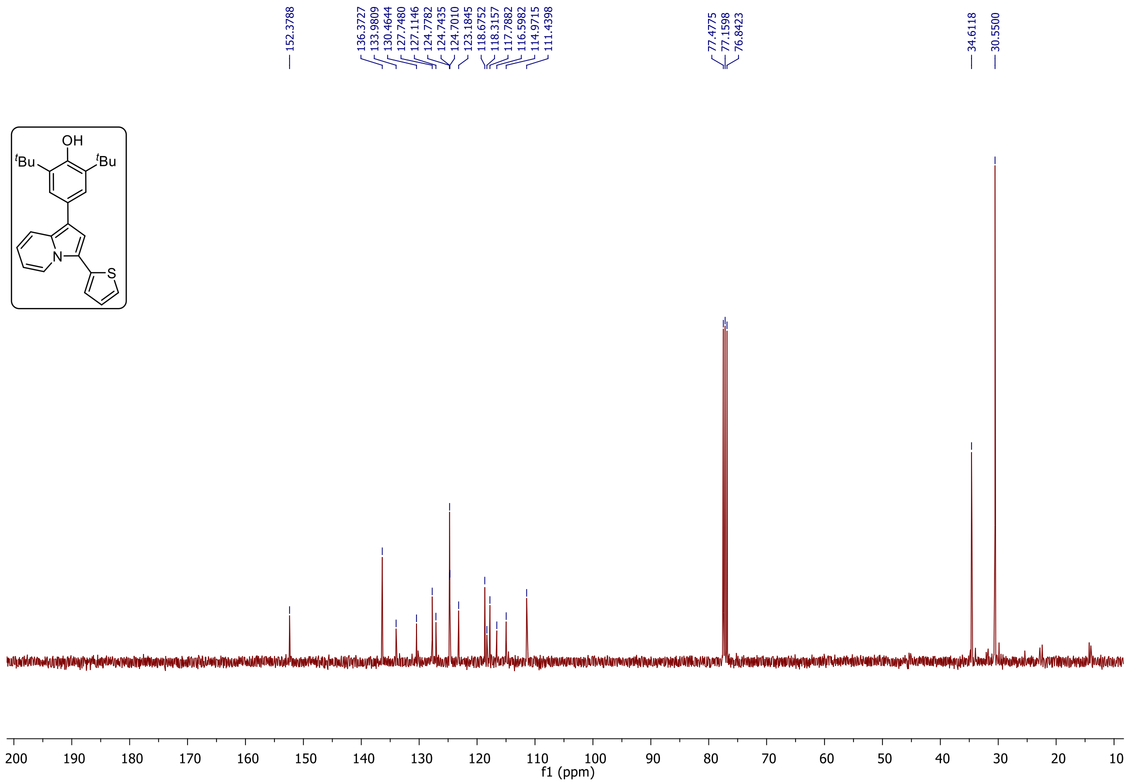
[13]C{[1]H} NMR (100 MHz, $CDCl_3$) spectrum of **(3aa)**



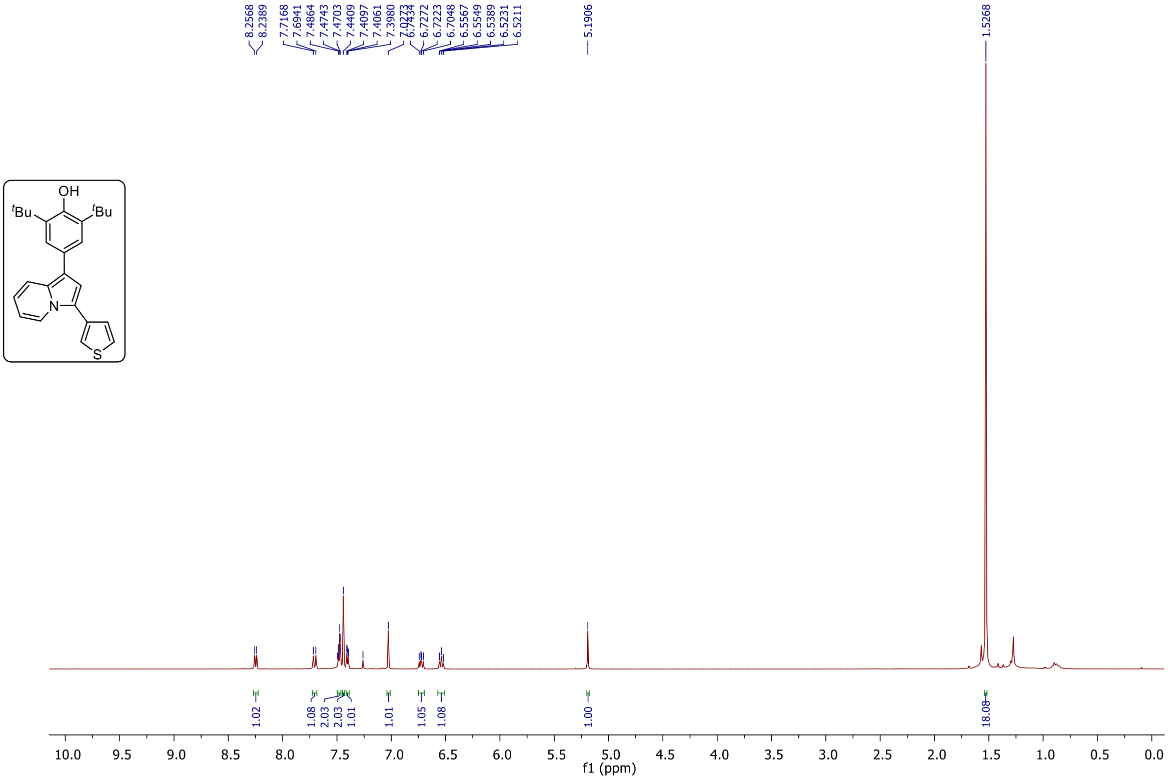
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3ab)**



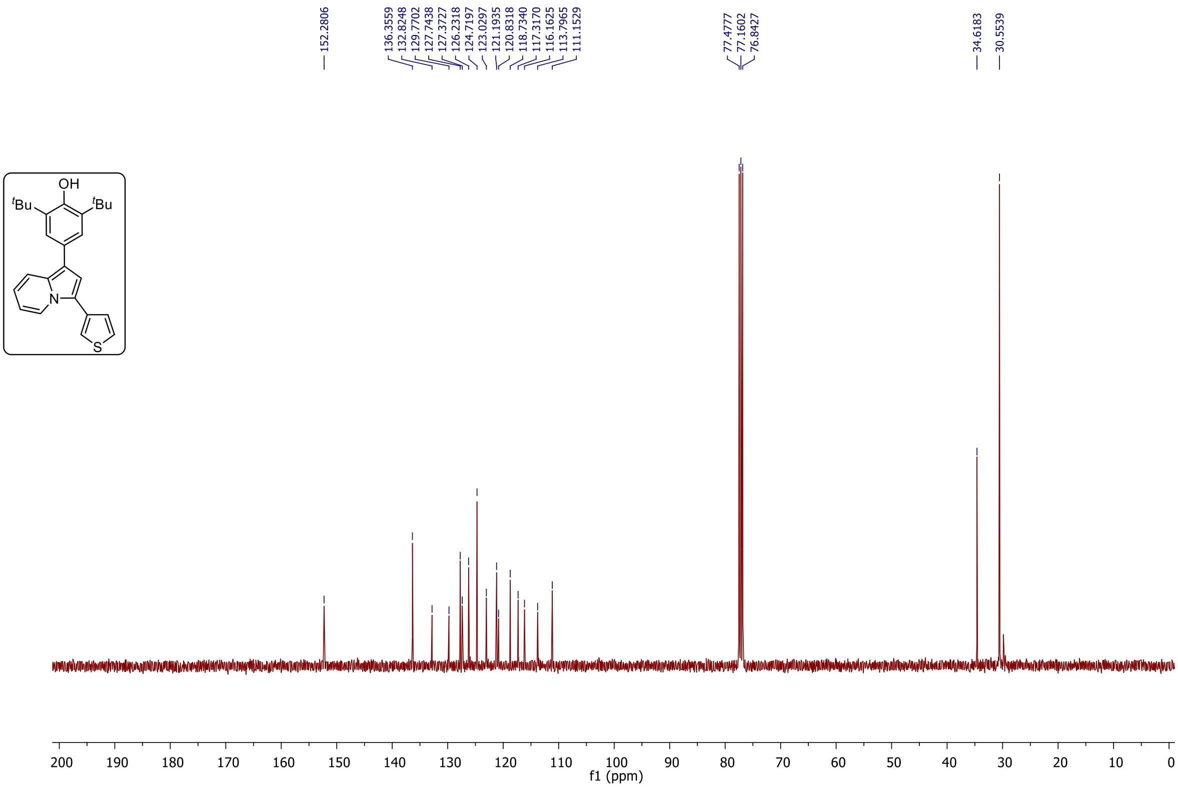
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3ab)**



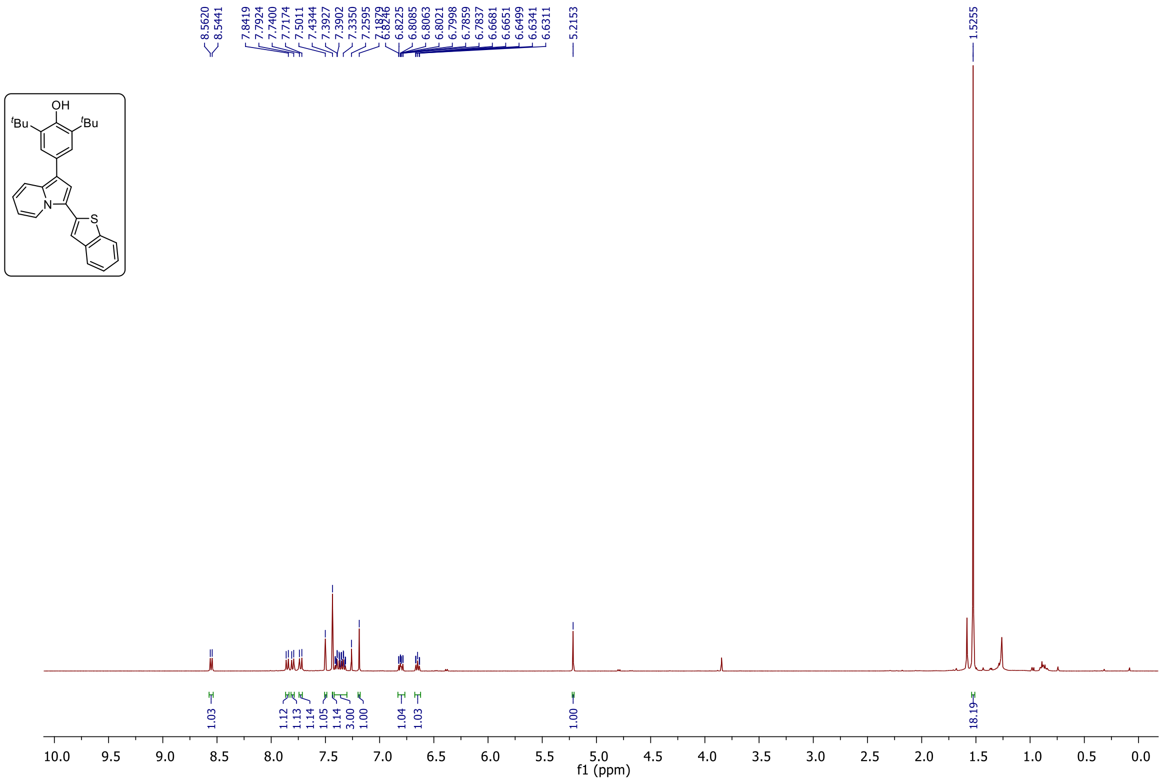
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3ac**)



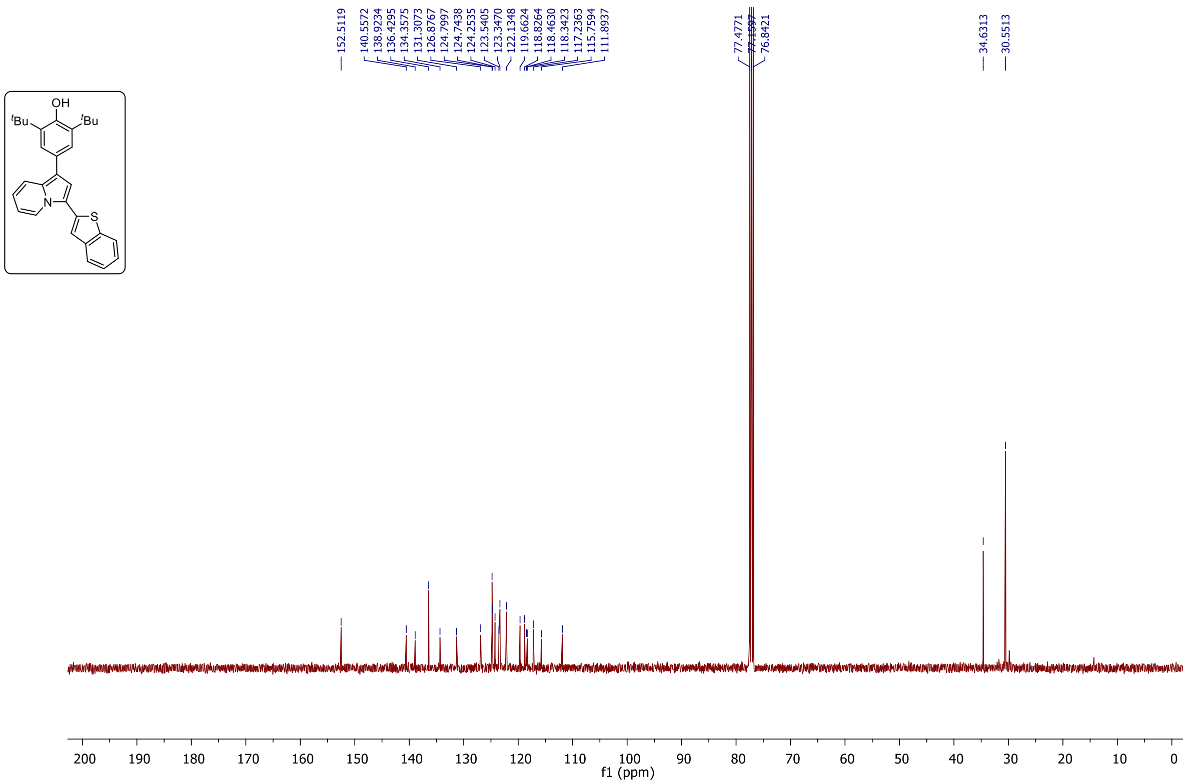
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectrum of **(3ac)**



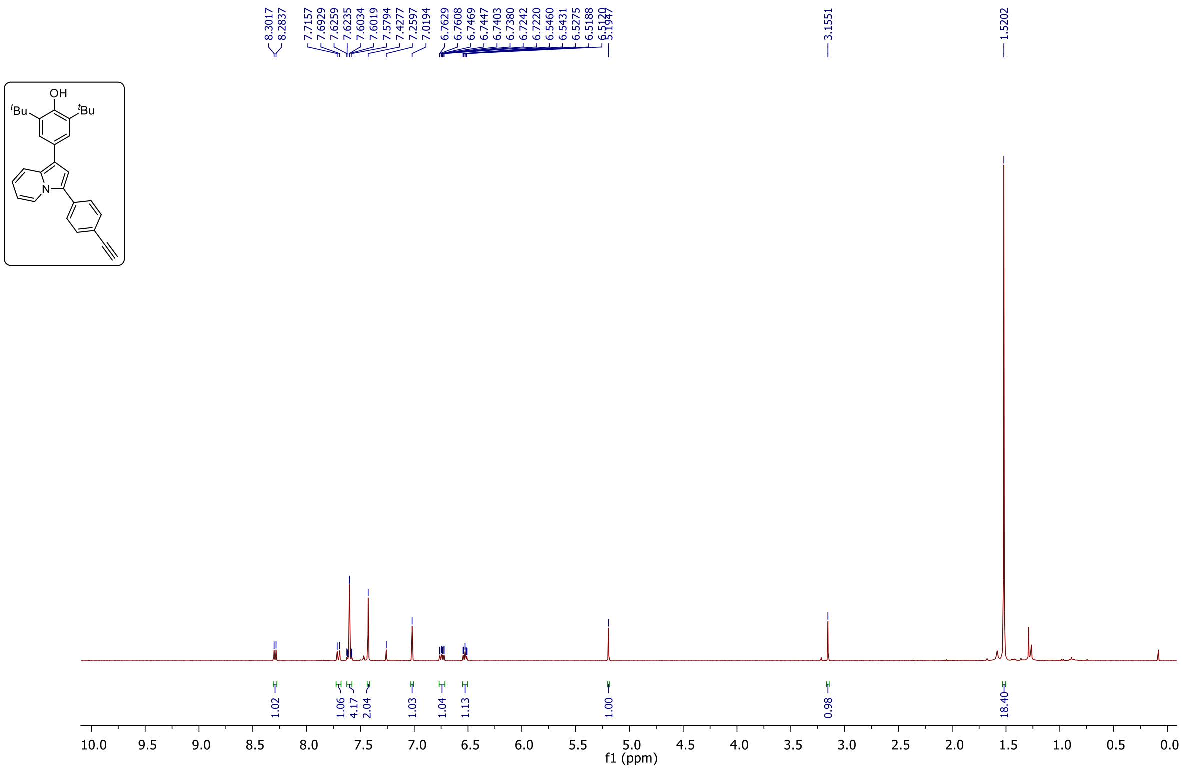
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3ad)**



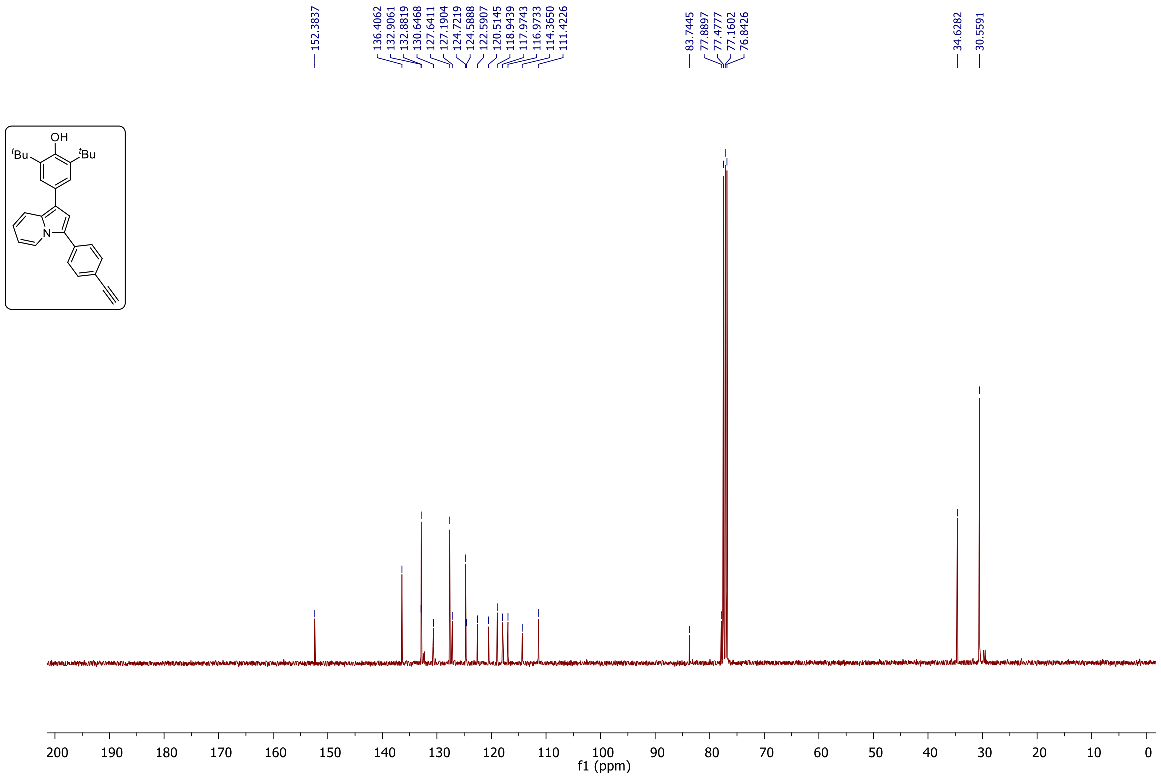
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3ad)**



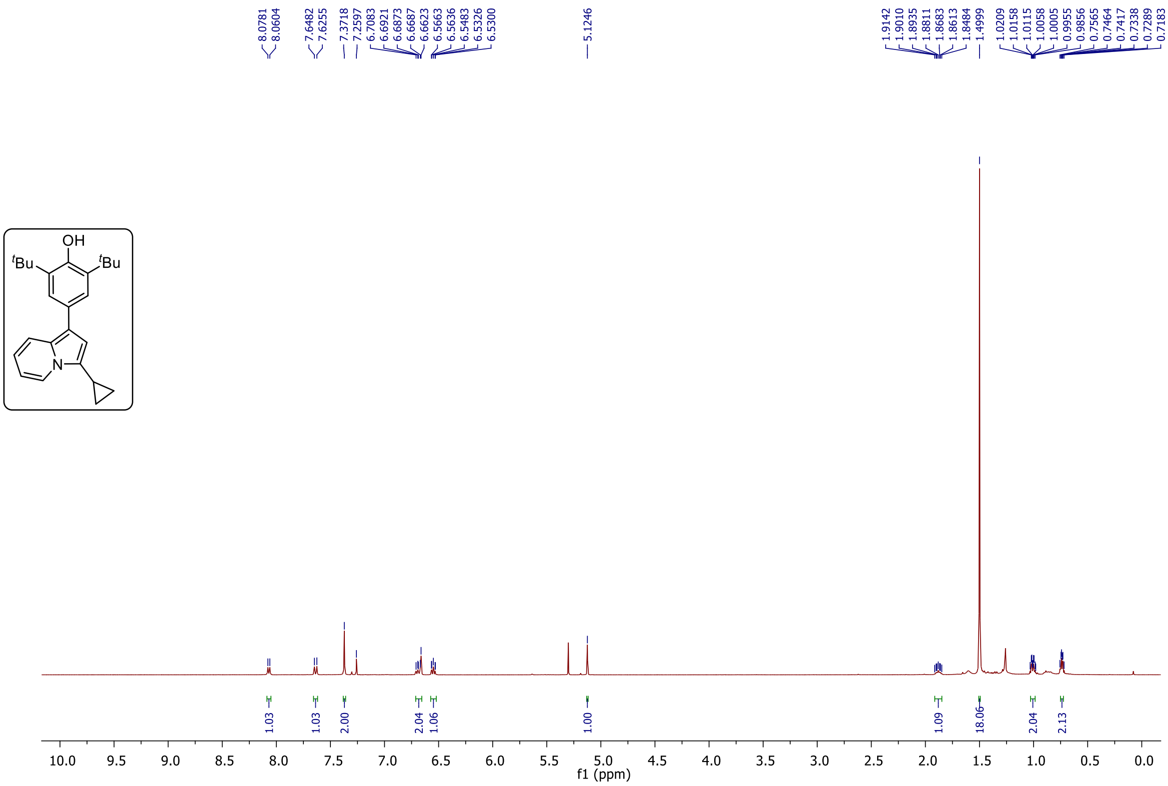
[1]H NMR (400 MHz, CDCl$_3$) spectrum of (**3ae**)



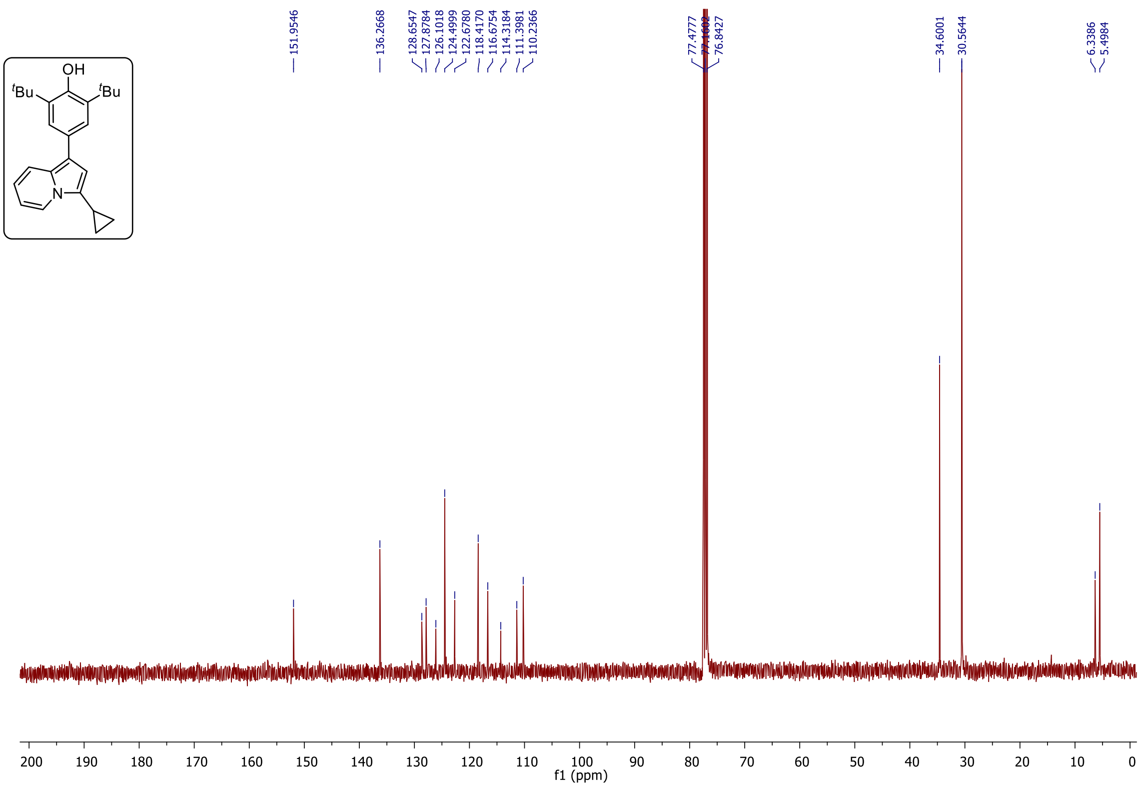
[13]C{[1]H} NMR (100 MHz, CDCl$_3$) spectrum of **(3ae)**



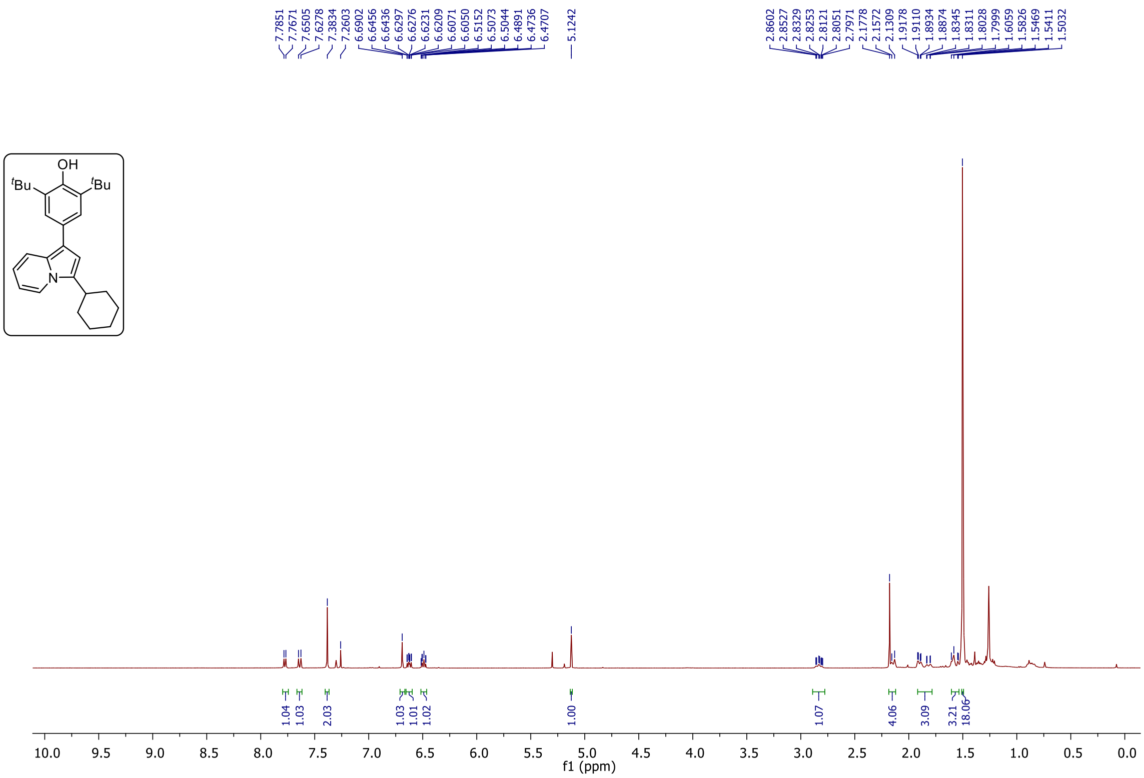
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3af**)



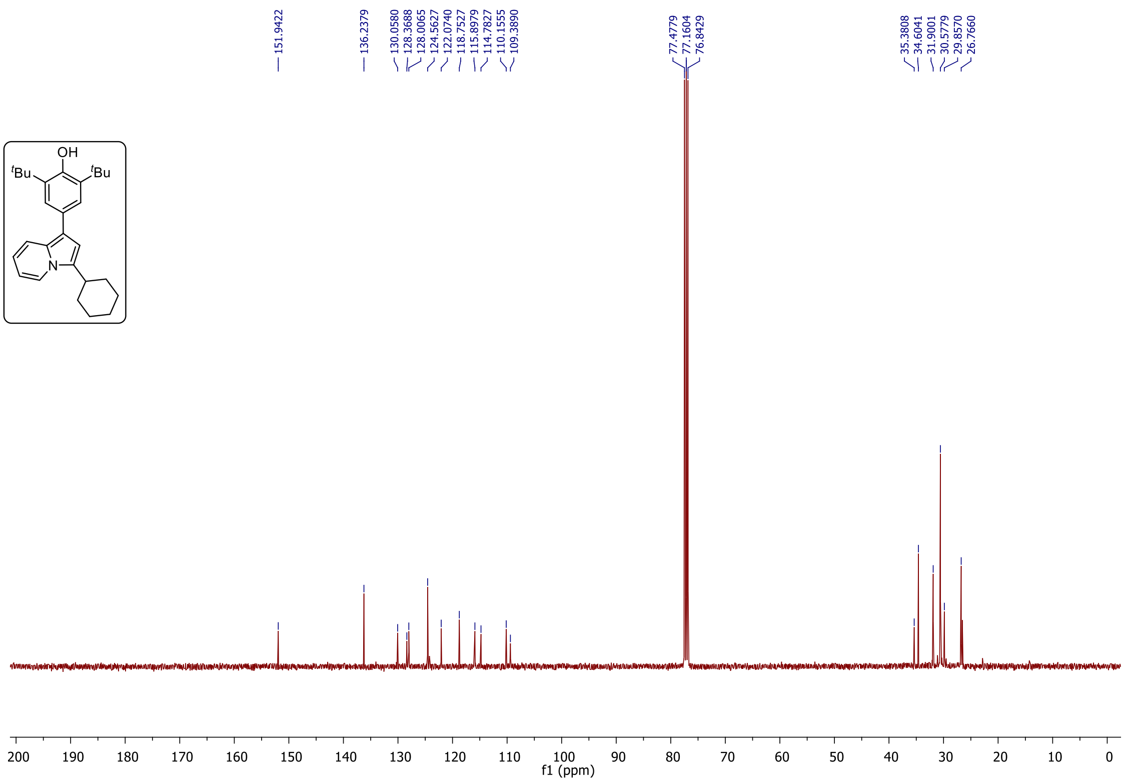
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3af)**



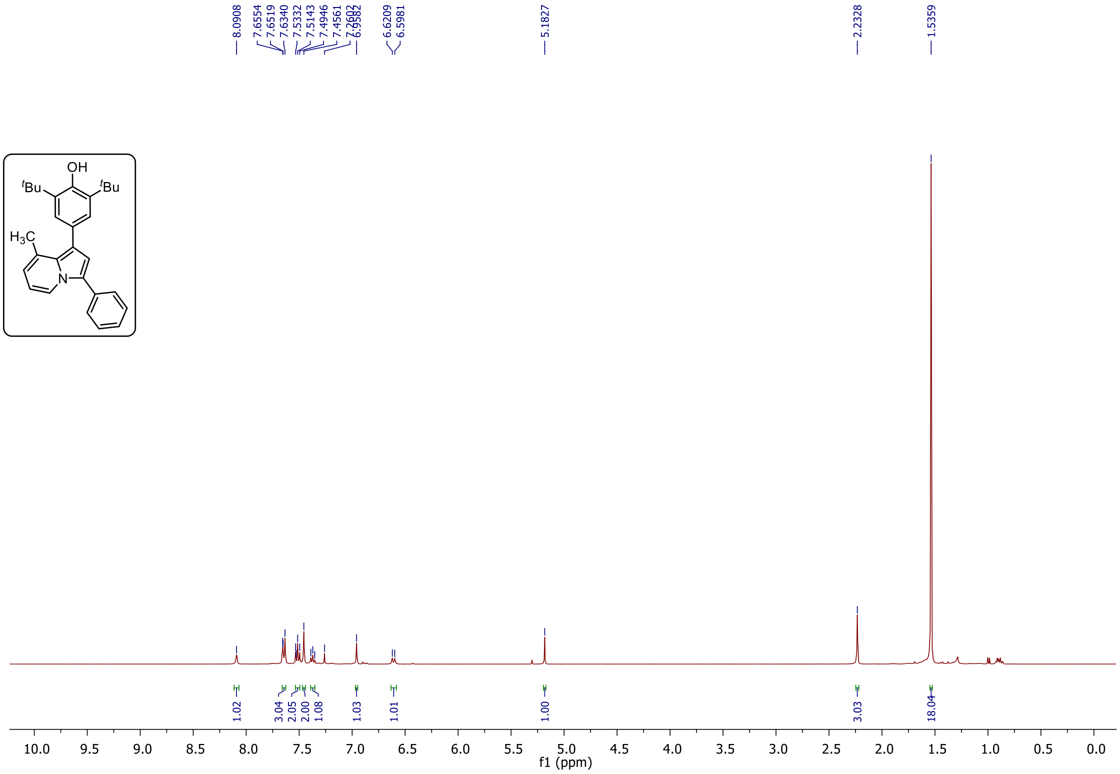
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3ag**)



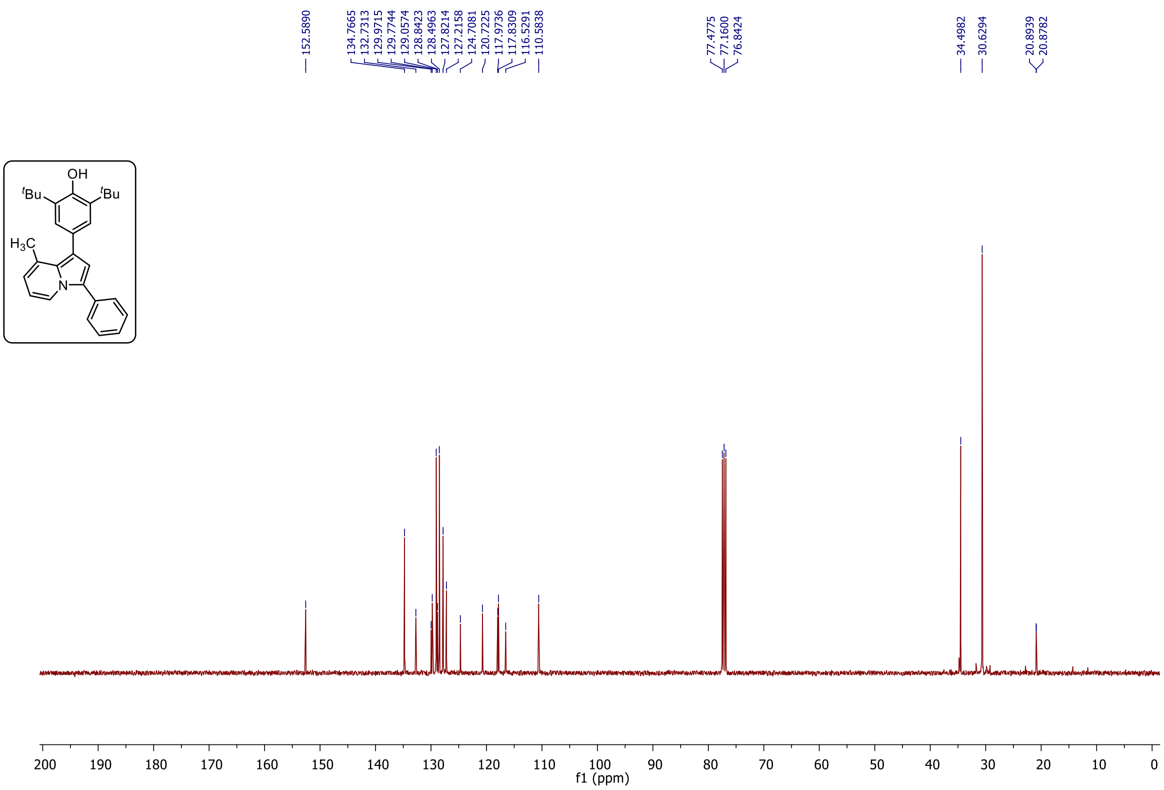
$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) spectrum of (**3ag**)



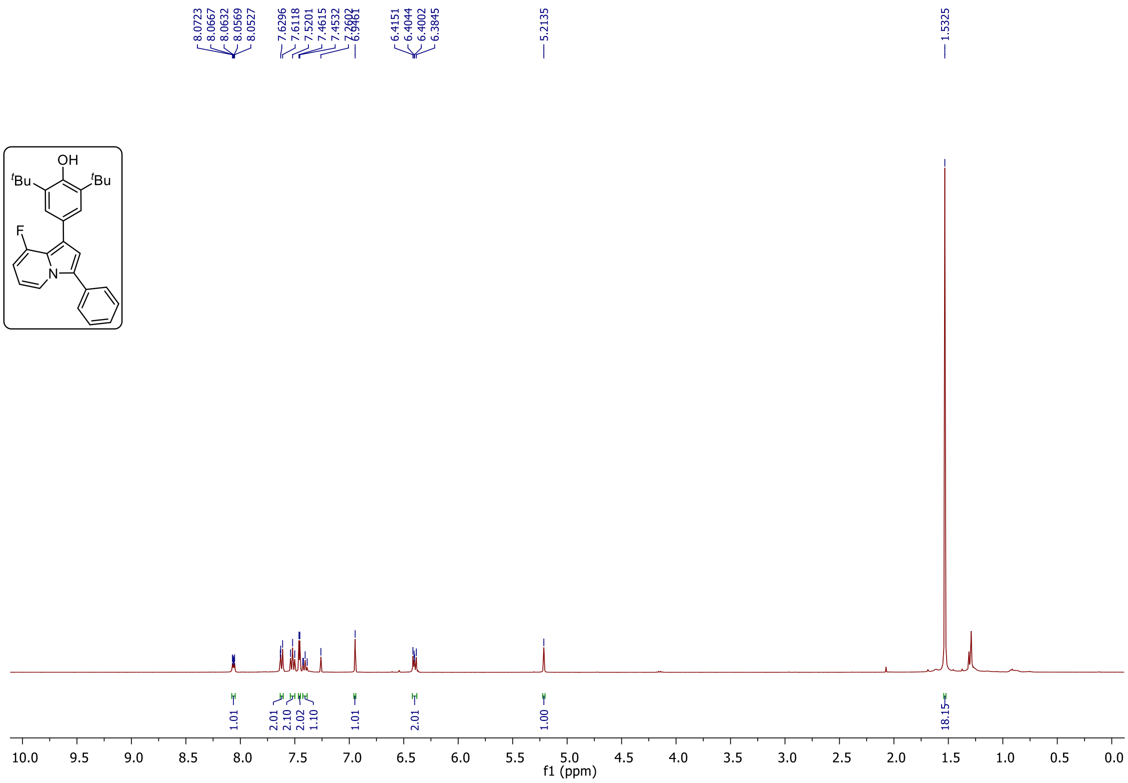
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3ah)**



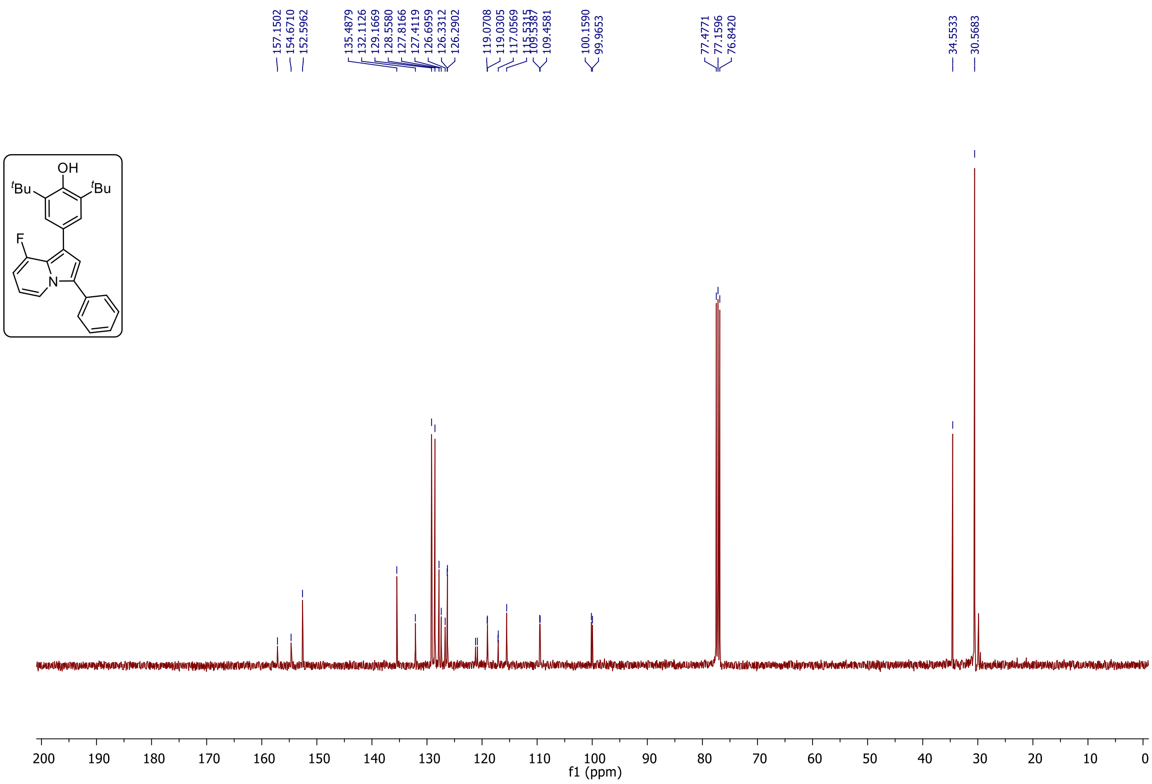
^{13}C{^{1}H} NMR (100 MHz, $CDCl_3$) spectrum of **(3ah)**



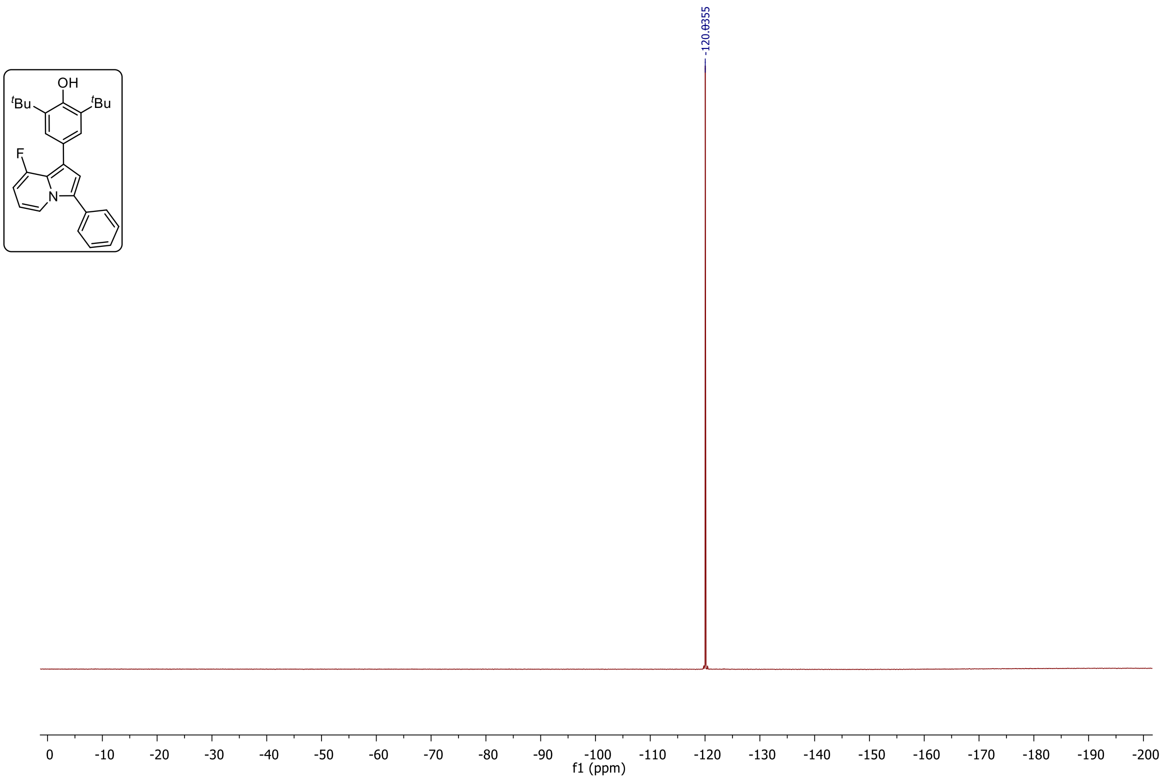
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3ai)**



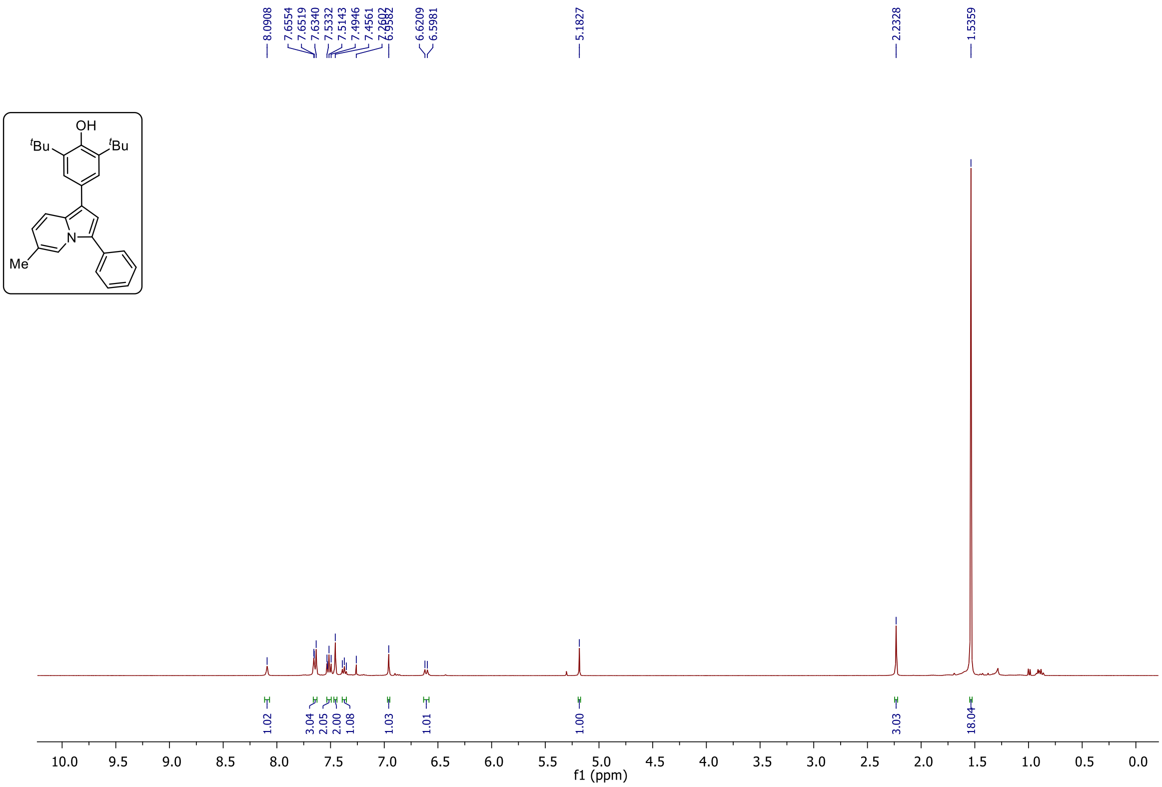
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3ai)**



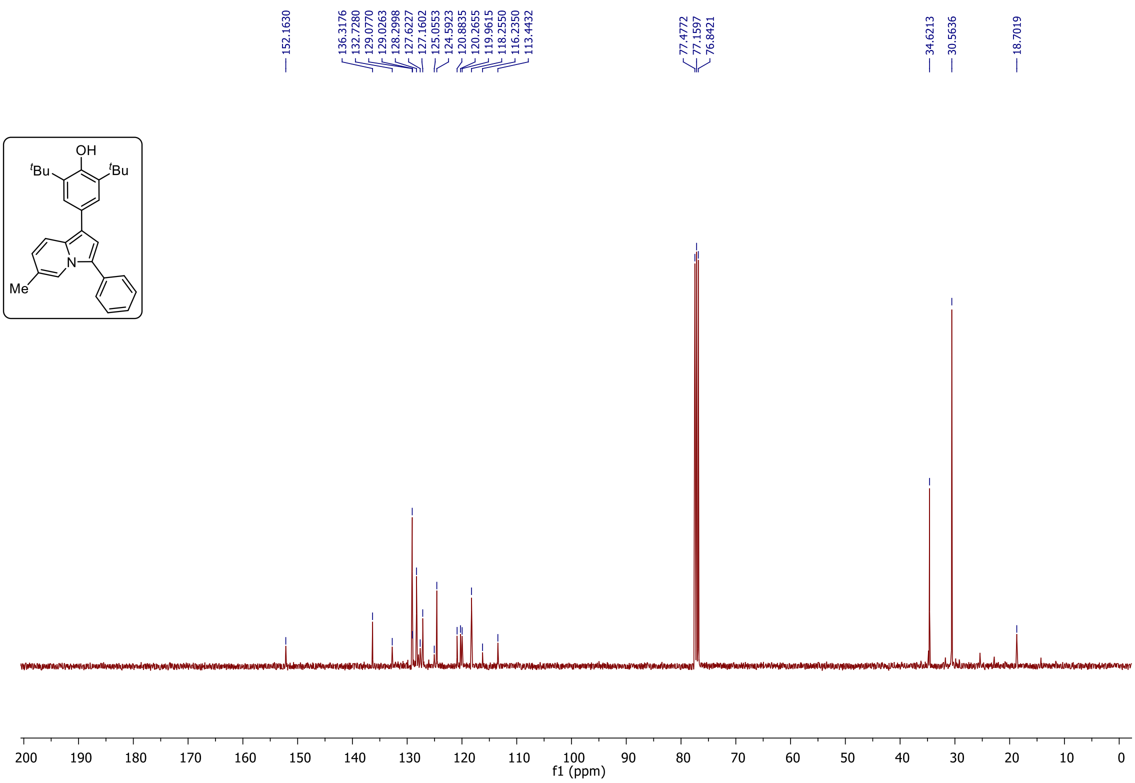
$^{19}F\{^{1}H\}$ NMR (376 MHz, $CDCl_3$) spectrum of (**3ai**)



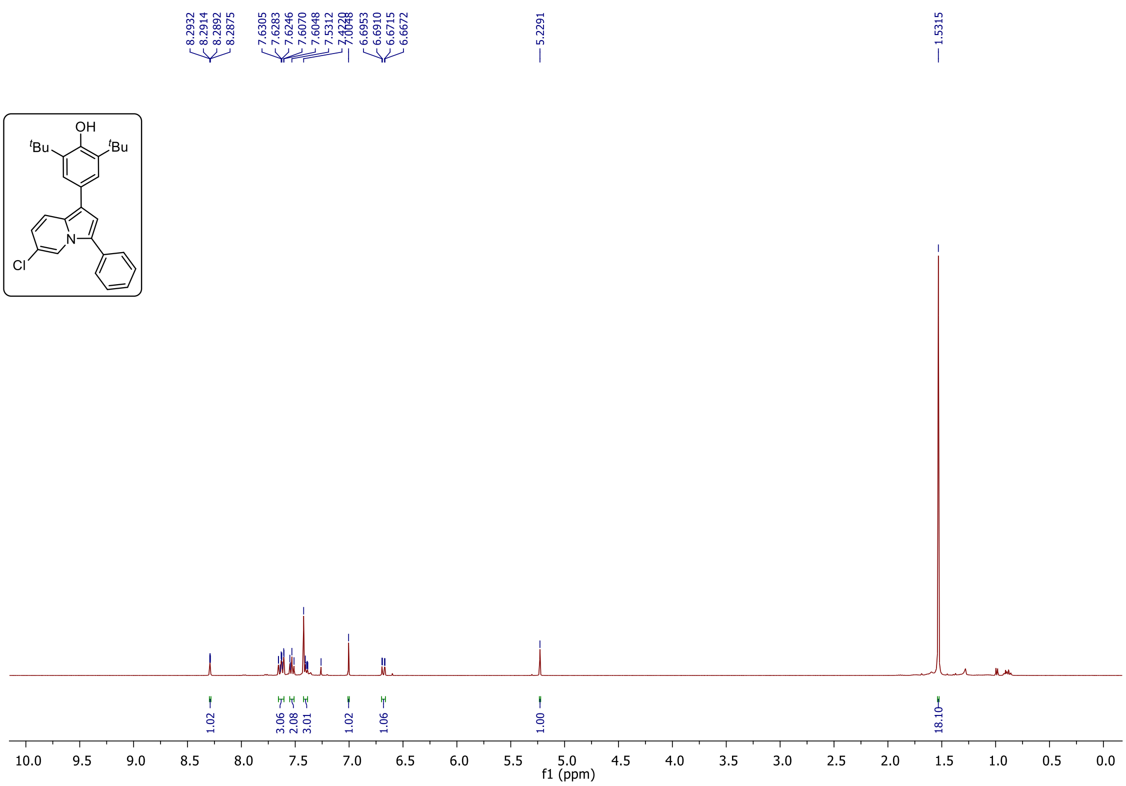
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3aj**)



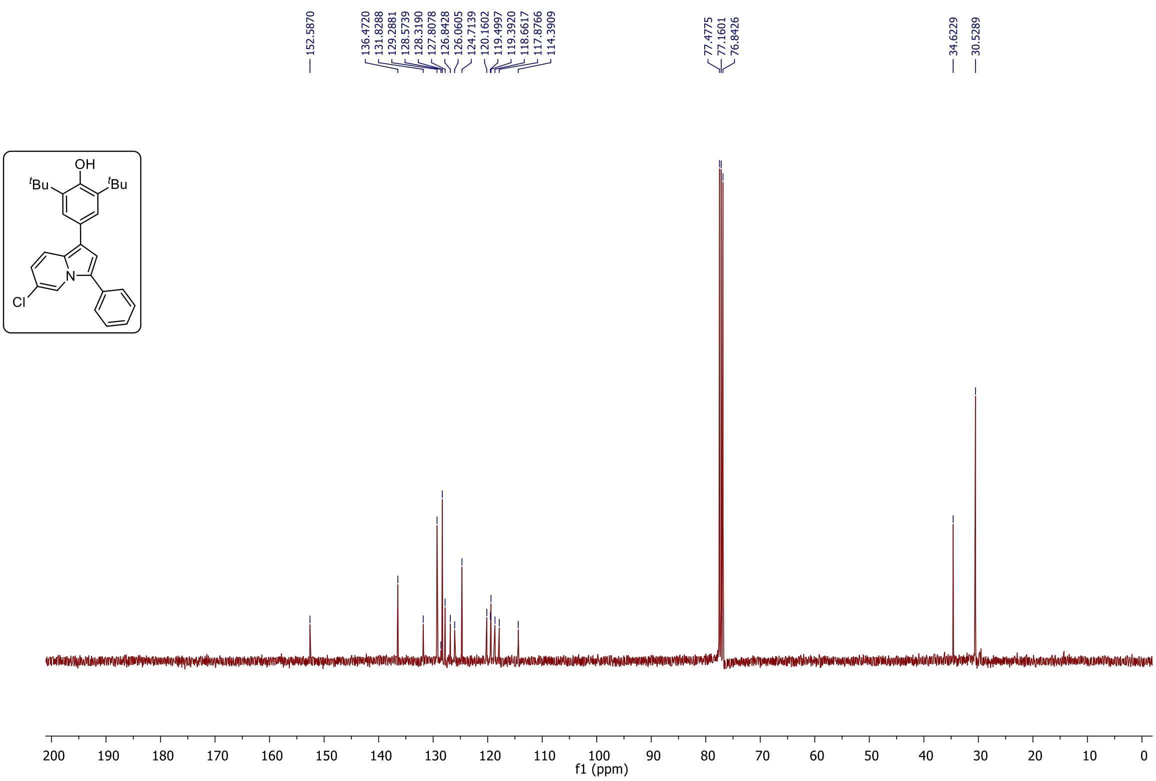
$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3aj)**



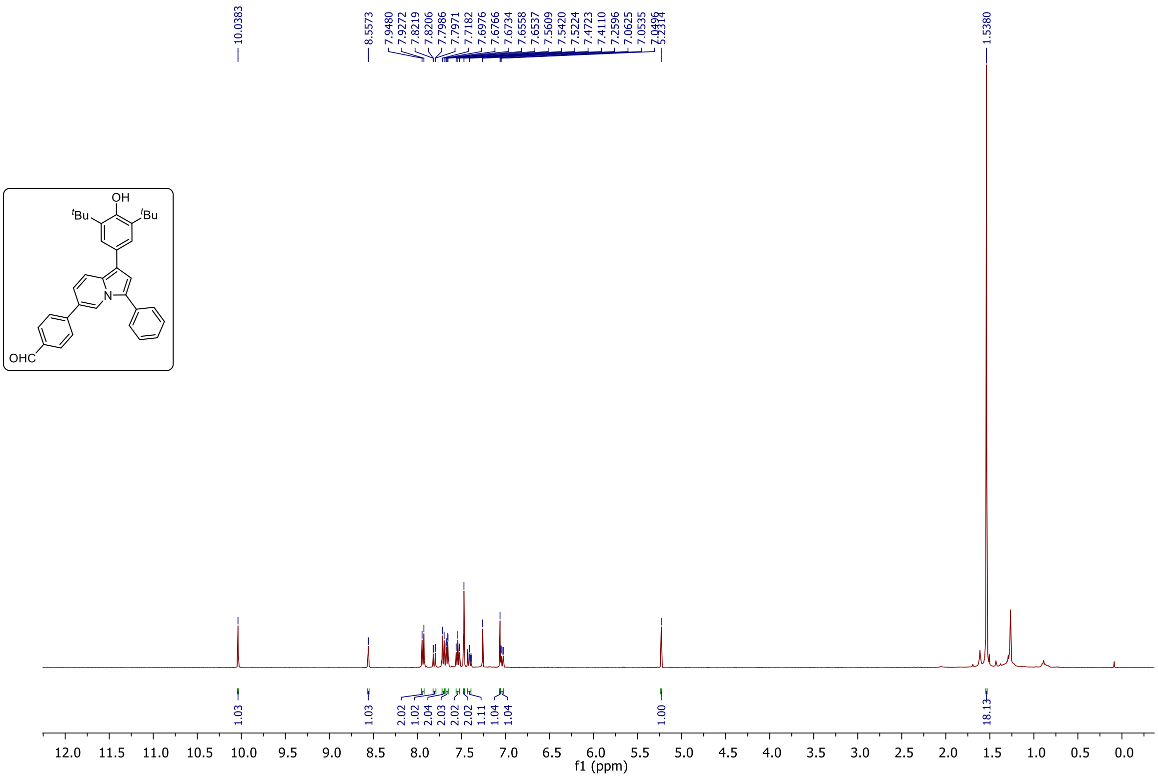
^1H NMR (400 MHz, $CDCl_3$) spectrum of (**3ak)**



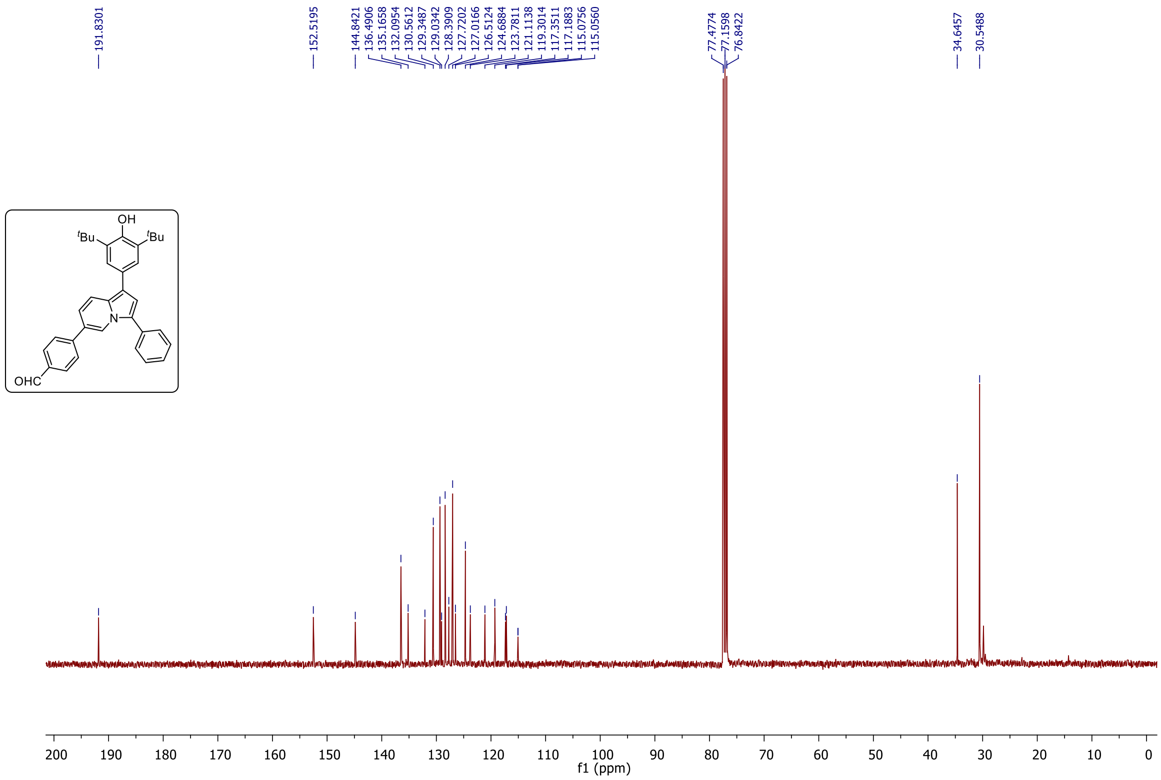
$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3ak)**



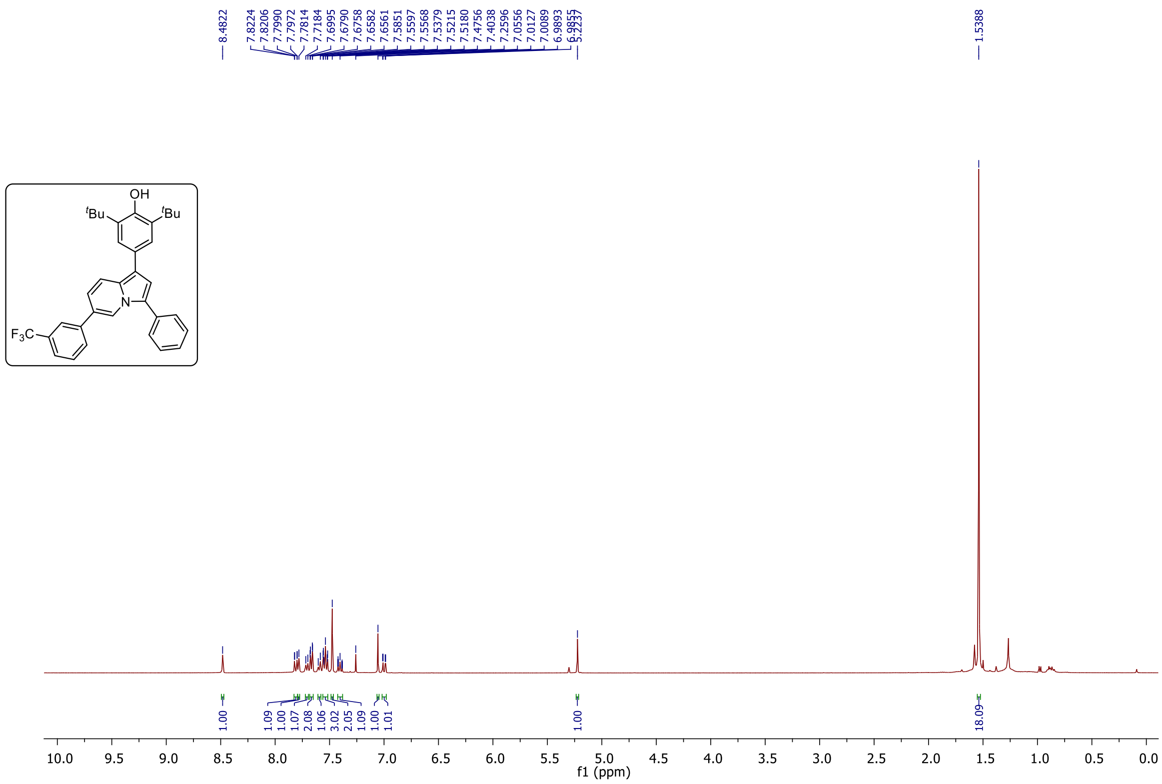
^1H NMR (400 MHz, $CDCl_3$) spectrum of **(3al)**



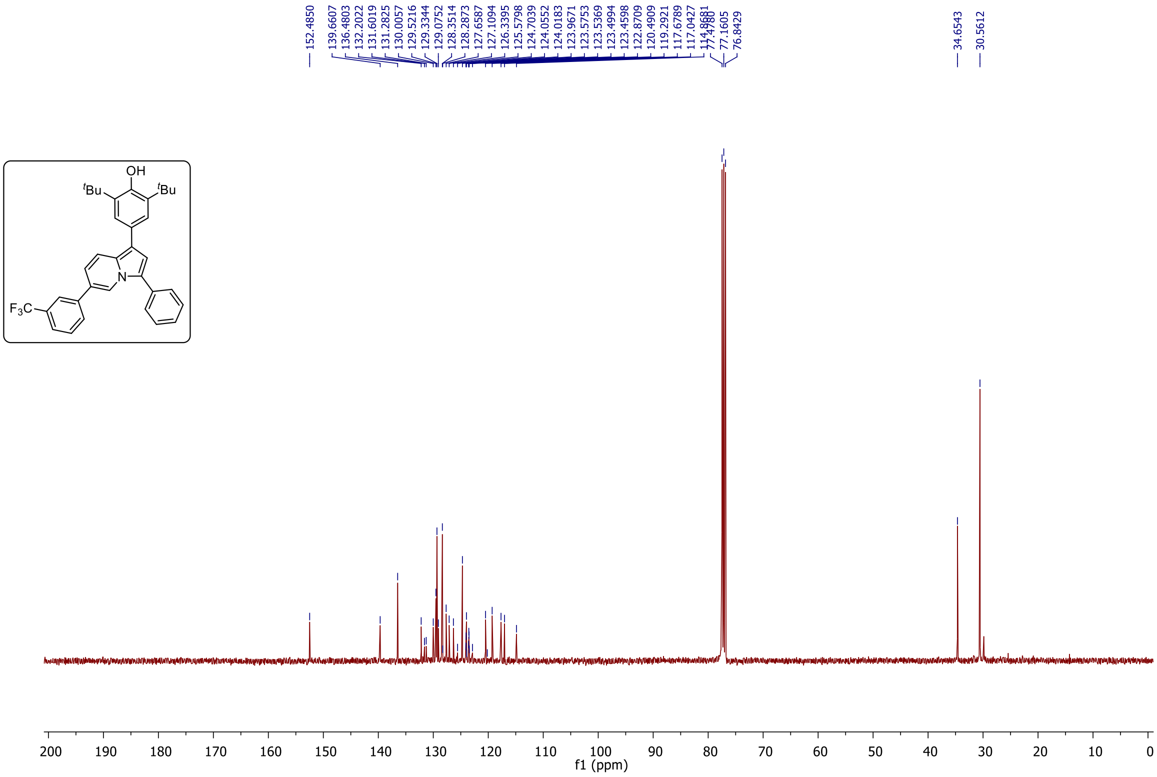
$^{13}C\{^1H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3al)**



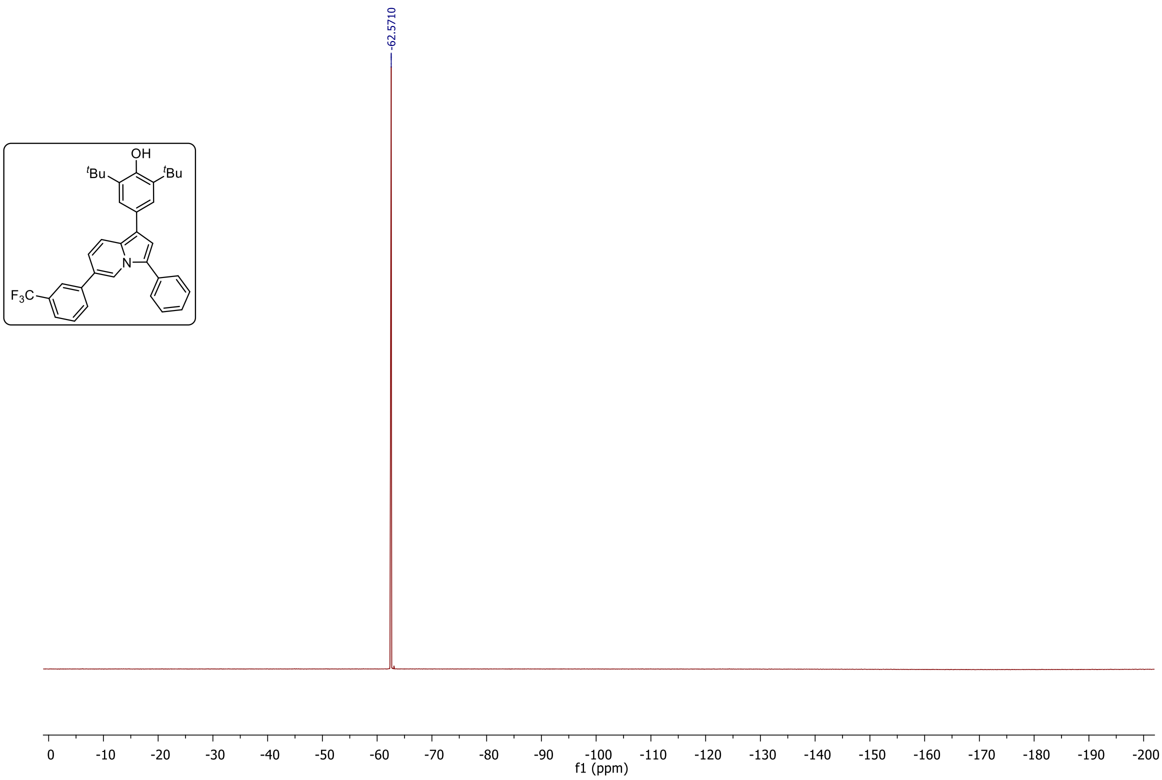
^1H NMR (400 MHz, $CDCl_3$) spectrum of **(3am)**



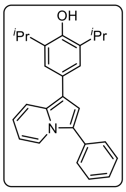
$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3am)**

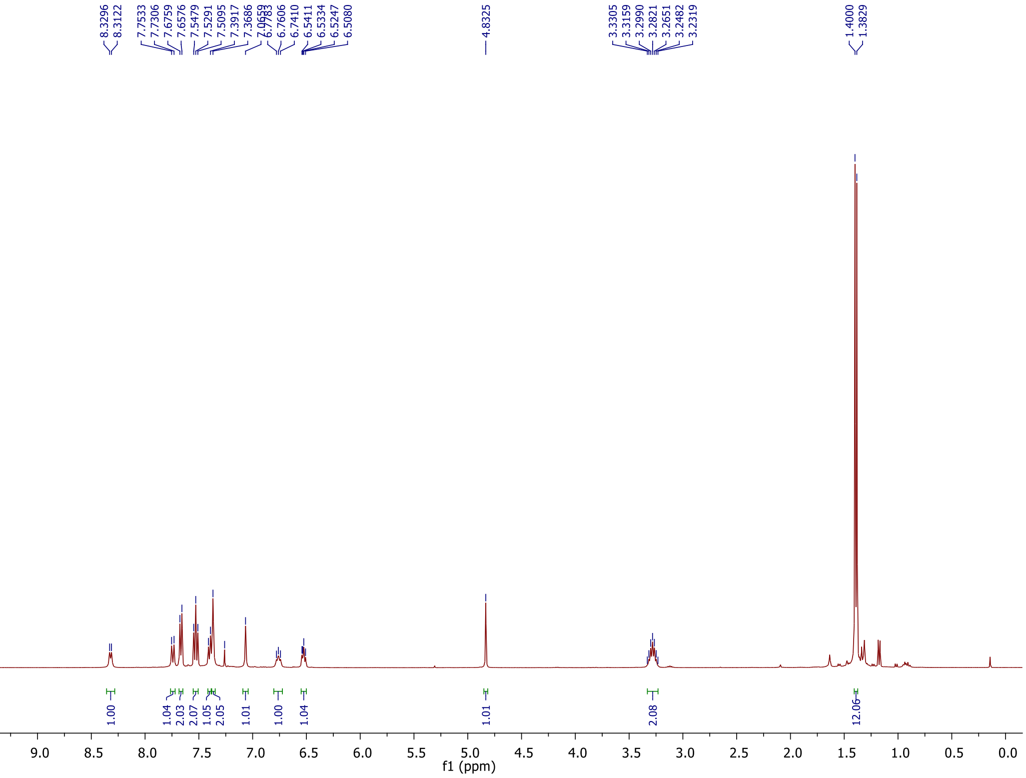


$^{19}F\{^{1}H\}$ NMR (376 MHz, $CDCl_3$) spectrum of (**3am)**

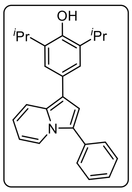


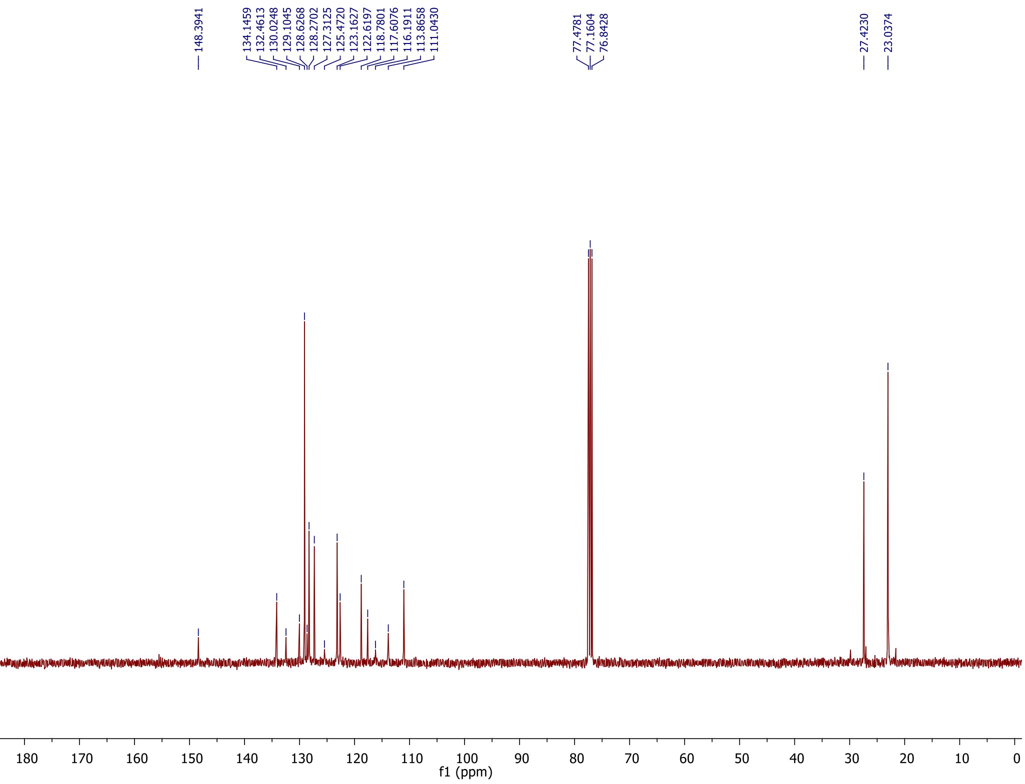
[1]H NMR (400 MHz, $CDCl_3$) spectrum of **(3an)**



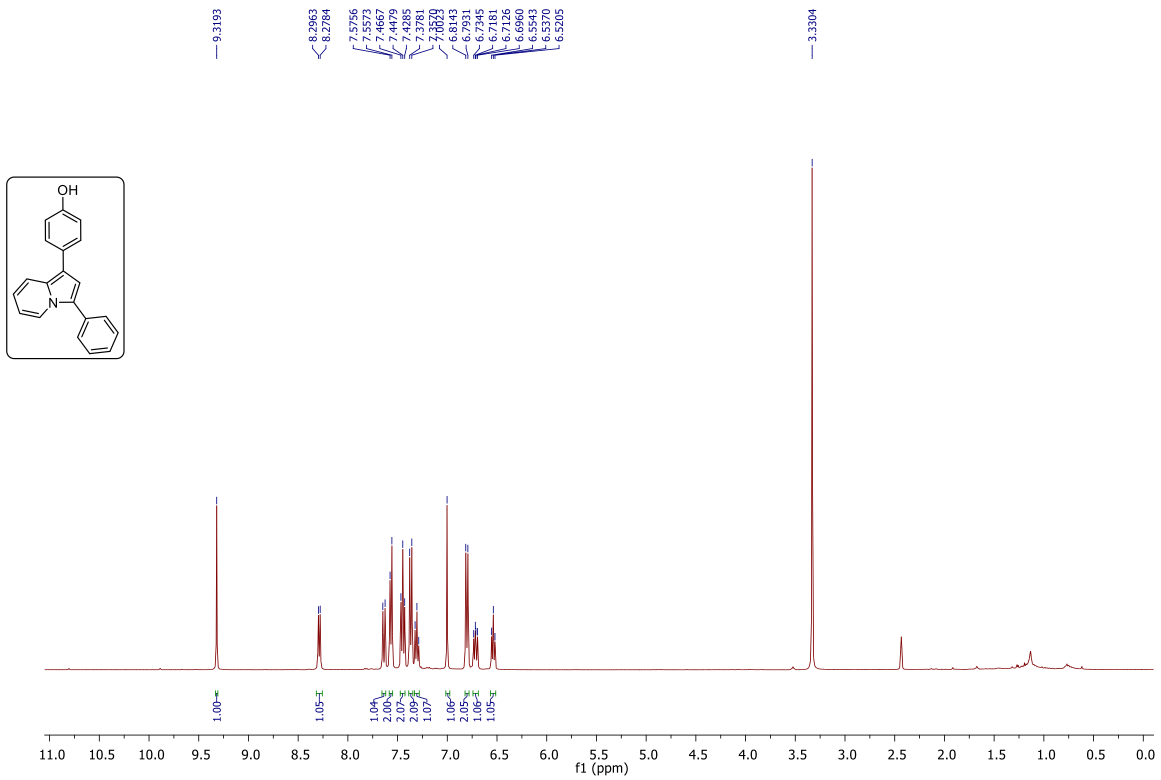


[13]C{[1]H} NMR (100 MHz, $CDCl_3$) spectrum of **(3an)**

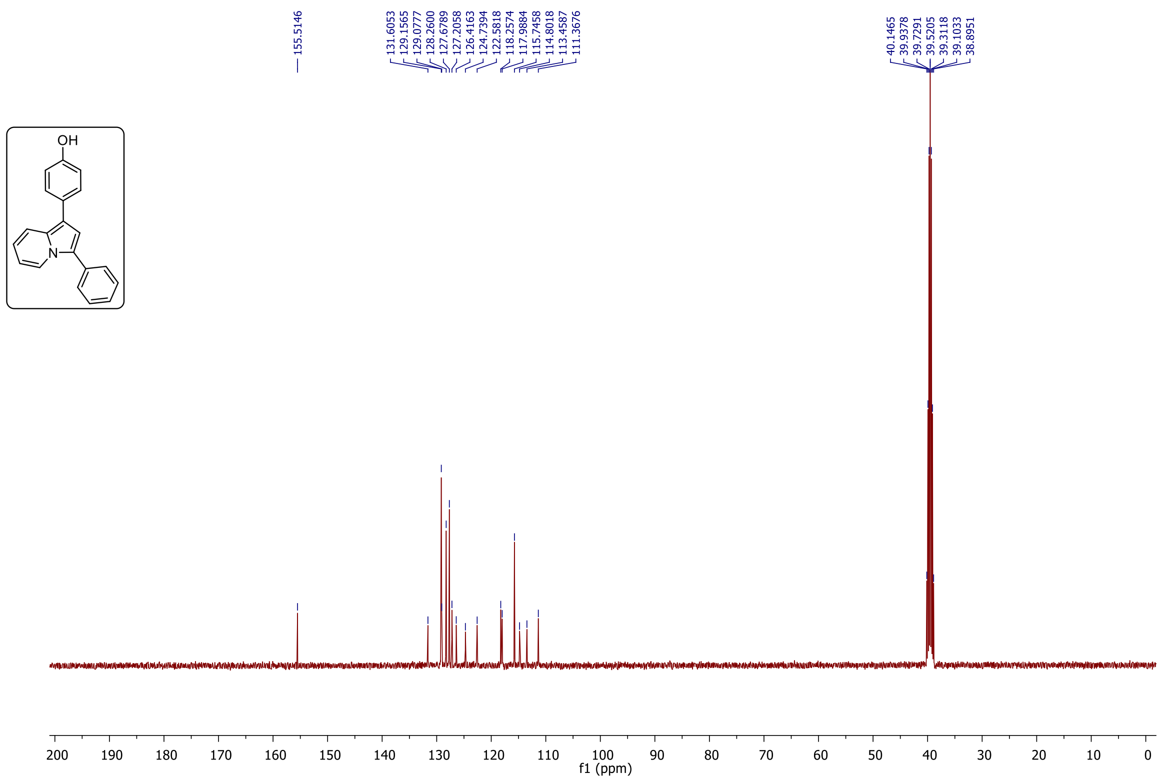




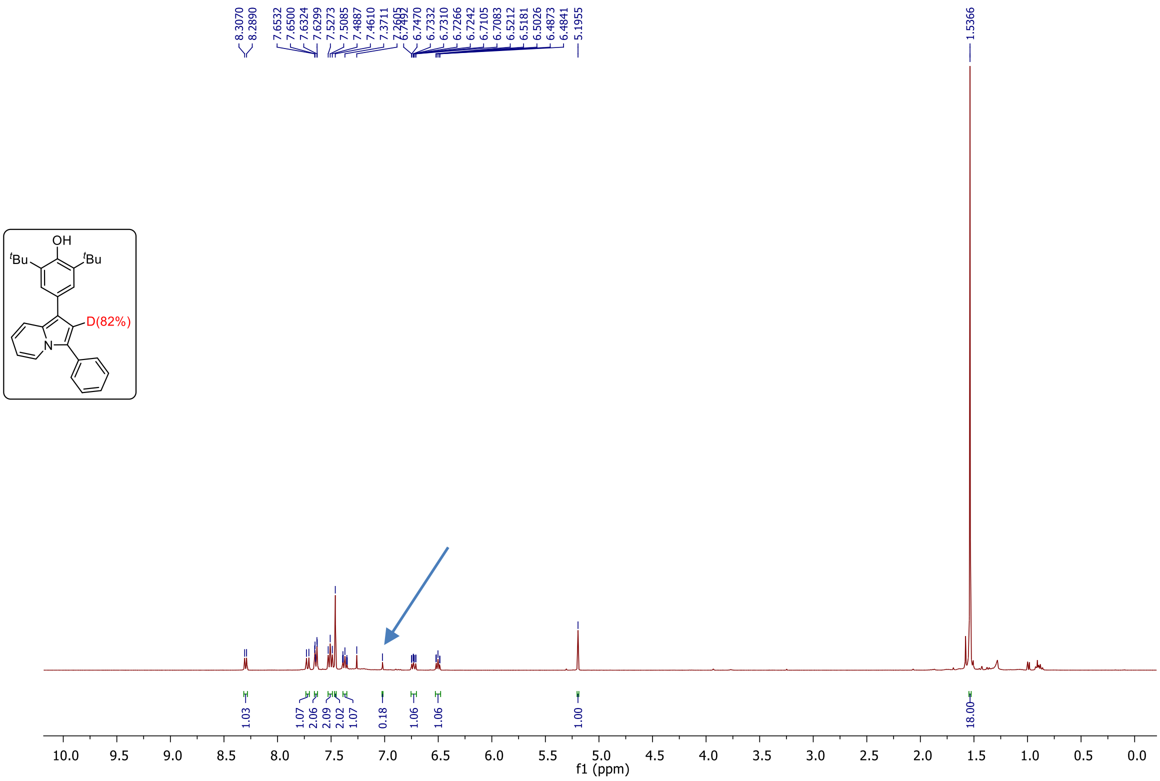
^{1}H NMR (400 MHz, DMSO-d$_6$) spectrum of (**4**)



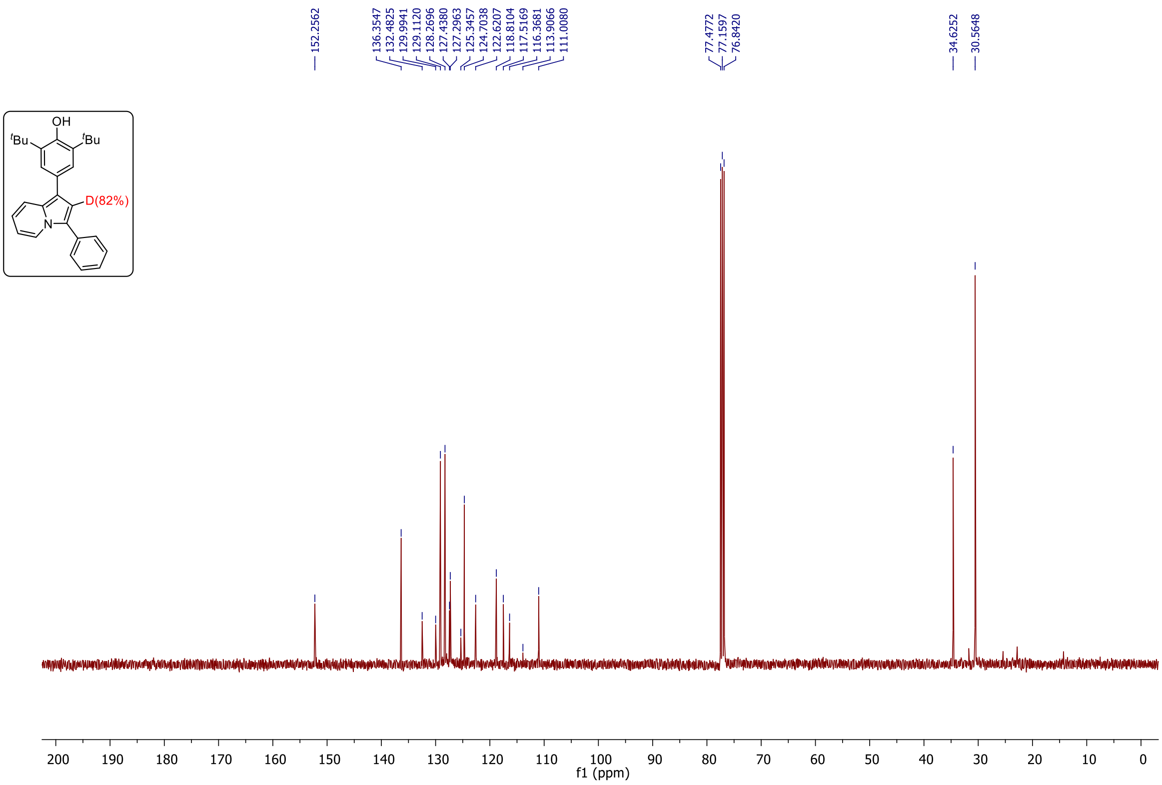
^{13}C{^{1}H} NMR (100 MHz, DMSO-d$_6$) spectrum of **(4)**



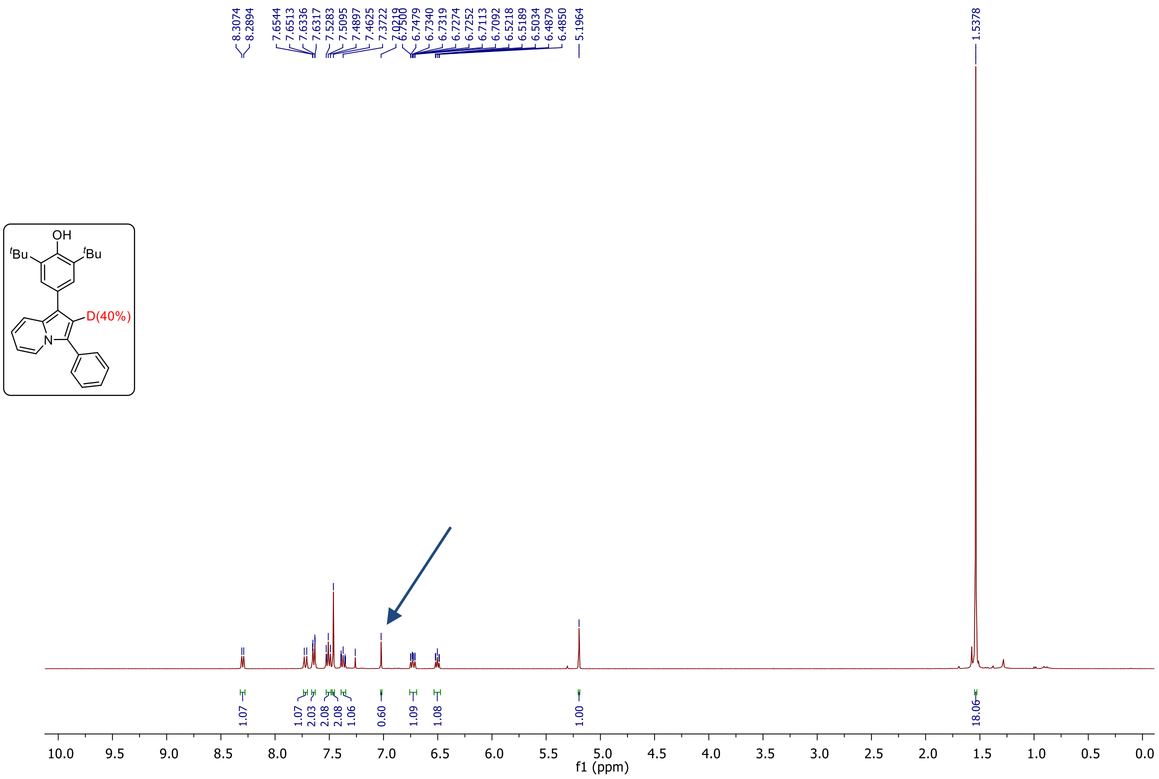
^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3a'**)



$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3a')**



^{1}H NMR (400 MHz, $CDCl_3$) spectrum of (**3a'**)



$^{13}C\{^{1}H\}$ NMR (100 MHz, $CDCl_3$) spectrum of **(3a')**