Supporting Information

I_2/H_2O_2 mediated synthesis and photophysical properties of imidazole-fused heterocycles via [4+1] cyclization approach

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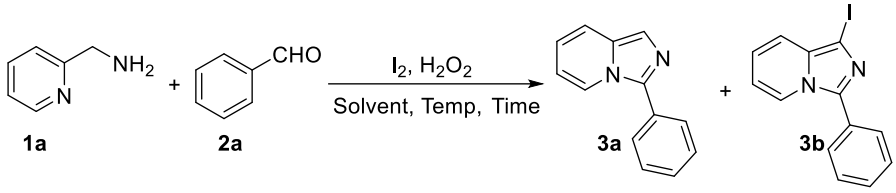
1. General Information

Reagents, solvents, and analytical methods:

Unless otherwise noted, all reactions were carried out under an atmospheric atmosphere. All reagents were from commercial sources and used as received without further purification. All solvents were dried by standard techniques and distilled before use. Column chromatography was performed on silica gel (200-300 meshes) using petroleum ether (bp. 60~90 °C) and ethyl acetate as eluent. ^{1}NMR spectra were recorded on a Bruker Avance operating for ^{1}H NMR at 400 MHz, ^{13}C NMR at 101 MHz, and ^{19}F NMR at 376 MHz. NMR spectral data were reported in ppm relative to tetramethylsilane (TMS) as internal standard and $CDCl_3$ (^{1}H NMR δ 7.27, ^{13}C NMR δ 77.0), DMSO (^{1}H NMR δ 5.20, ^{13}C NMR δ 39.52) as solvent. All coupling constants (J) are reported in Hz. 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, br = broad. High-resolution mass spectra (HRMS) are produced on Q-Exactive Orbitrap HR-MS (Thermo Fisher Scientific, Waltham, Massachusetts). All the amines and aldehydes used here were commercially available. The raw material used in the reaction were purchased from Aladdin, Macklin, and so on.

2. Optimization of Reaction Conditions and Control experiment

Table S1. Optimization for generating **3b**[a]

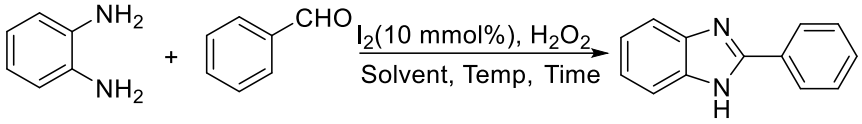


1a **2a** **3a** **3b**

Entry	I_2(x mmol)	H_2O_2 (mmol)	Solvent (5 mL)	Time (h)	Temp. (°C)	Yield (%)[b] 3a	Yield (%)[b] 3b
1	0	3	CH_3CN	1.2	70	0	0
2	0.2	3	CH_3CN	1.2	70	25	48
3	0.3	3	CH_3CN	1.2	70	19	58
4	0.4	3	CH_3CN	1.2	70	12	69
5	0.5	3	CH_3CN	1.2	70	0	76
6	0.6	3	CH_3CN	1.2	70	0	72
7	0.5	2	CH_3CN	1.2	70	7	69
8	0.5	4	CH_3CN	1.2	70	3	67
9	0.5	5	CH_3CN	1.2	70	5	64
10	0.5	6	CH_3CN	1.2	70	5	62
11	0.5	3	DMF	1.2	70	0	75
12	0.5	3	DMSO	1.2	70	0	74
13	0.5	3	THF	1.2	70	32	47
14	0.5	3	Dioxane	1.2	70	29	32
15	0.5	3	DCE	1.2	70	48	39
16	0.5	3	H_2O	1.2	70	0	35
17	0.5	3	CH_3CH_2OH	1.2	70	10	73
18	0.5	3	CH_3CN	0.5	70	11	69
19	0.5	3	CH_3CN	1	70	7	77
20	0.5	3	CH_3CN	2	70	0	84
21	0.5	3	CH_3CN	3	70	0	61
22	0.5	3	CH_3CN	4	70	0	54
23	0.5	3	CH_3CN	5	70	0	39
24	0.5	3	CH_3CN	2	20	0	67
25	0.5	3	CH_3CN	2	40	0	87
26	0.5	3	CH_3CN	2	60	0	86
27	0.5	3	CH_3CN	2	80	0	81
28	0.5	3	CH_3CN	2	90	5	79

[a] Reaction conditions: **1a** (0.8 mmol), **2a** (1.6 mmol), I_2 (0.5 mmol), H_2O_2 (3 mmol), CH_3CN (5 mL), 2 h, 40 °C, in an oil bath, opened tube, [b] isolated yield.

Table S2. Optimization for generating **3c**[a]

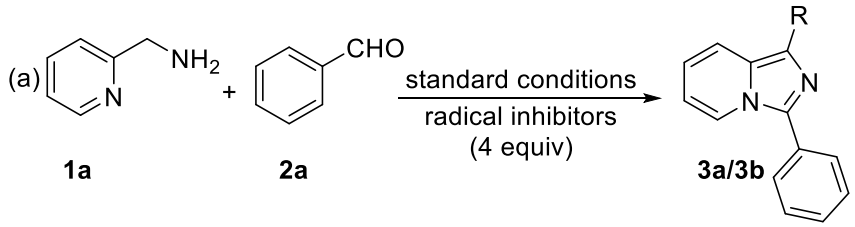


1b **2a** **3c**

Entry	H_2O_2 (mmol)	2a (mmol)	Solvent (5 mL)	Time (h)	Temp. (°C)	Yield (%)[b] 3c
1	2	1	CH_3CN	2	50	59
2	3	1	CH_3CN	2	50	67
3	4	1	CH_3CN	2	50	69
4	5	1	CH_3CN	2	50	71
5	6	1	CH_3CN	2	50	73
6	7	1	CH_3CN	2	50	76
7	8	1	CH_3CN	2	50	70
8	7	0.4	CH_3CN	2	50	66
9	7	0.6	CH_3CN	2	50	74
10	7	0.75	CH_3CN	2	50	77
11	7	1.25	CH_3CN	2	50	80
12	7	1.75	CH_3CN	2	50	81
13	7	2	CH_3CN	2	50	78
14	7	1.75	DMF	2	50	66
15	7	1.75	DMSO	2	50	68
16	7	1.75	THF	2	50	53
17	7	1.75	Dioxane	2	50	39
18	7	1.75	DCE	2	50	63
19	7	1.75	H_2O	2	50	41
20	7	1.75	CH_3CH_2OH	2	50	79
21	7	1.75	CH_3CN	1	50	83
22	7	1.75	CH_3CN	2.5	50	76
23	7	1.75	CH_3CN	3	50	74
24	7	1.75	CH_3CN	4	50	70
25	7	1.75	CH_3CN	5	50	68
26	7	1.75	CH_3CN	1	rt	69
27	7	1.75	CH_3CN	1	45	78
28	7	1.75	CH_3CN	1	60	85
29	7	1.75	CH_3CN	1	80	90
30	7	1.75	CH_3CN	1	90	86

[a] Reaction conditions: **1b** (1 mmol), **2a** (1.75 mmol), I_2 (10 mmol%), H_2O_2 (7 mmol), CH_3CN (5 mL), 1 h, 80 °C, in an oil bath, opened tube, [b] isolated yield.

Scheme S1. Control Experiment



For generating 3a: R = H, **1a:2a** = 2:1,I_2 (10 mmol%), 3 h, 60 ^oC

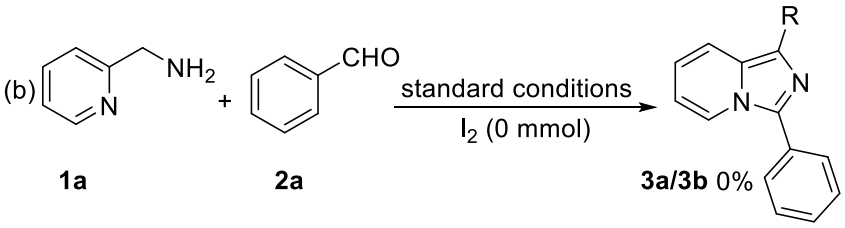
TEMPO (60 ^oC) 79% **3a** (without TEMPO, 84% **3a**)

BHT (60 ^oC) 71% **3a** (without BHT, 84% **3a**)

For generating 3b: R = I, **1a:2a** = 1:2, I_2 (0.5 mmol), 2 h, 40 ^oC

TEMPO (40 ^oC) 84% **3b** (without TEMPO, 87% **3b**)

BHT (40 ^oC) 72% **3b** (without BHT, 87% **3b**



1a + **2a** $\xrightarrow[CH_3CN,\ 60\ ^oC,\ 3\ h]{KI\ (20\ mmol\%),\ H_2O_2\ (3\ mmol)}$ **3a** (0%);

1a + **2a** $\xrightarrow[CH_3CN,\ 60\ ^oC,\ 3\ h]{KI\ (20\ mmol\%),\ O_2}$ **3a** (0%);

1a + **2a** $\xrightarrow[CH_3CN,\ 40\ ^oC,\ 2\ h]{KI\ (1\ mmol),\ H_2O_2\ (3\ mmol)}$ **3b** (0%);

1a + **2a** $\xrightarrow[CH_3CN,\ 40\ ^oC,\ 2\ h]{KI\ (1\ mmol),\ O_2\ (3\ mmol)}$ **3b** (0%);

(c) **3a** (1 mmol) $\xrightarrow[CH_3CN,\ 60\ ^oC,\ 3\ h]{I_2\ (10\ mmol\%),\ H_2O_2\ (3\ mmol)}$ **3b** (69%)

1a + **2a** (**1a** = **2a** =0.8 mmol) $\xrightarrow[CH_3CN,\ 40\ ^oC,\ 2\ h]{I_2\ (0.5\ mmol),\ H_2O_2\ (3\ mmol)}$ **3b** (81%);

1a + **2a** (**1a** = **2a** =0.8 mmol) $\xrightarrow[CH_3COOH\ (1a:2a:H^+=1:1:1)\ CH_3CN,\ 40\ ^oC,\ 2\ h]{I_2\ (0.5\ mmol),\ H_2O_2\ (3\ mmol)}$ **3b** (92%);

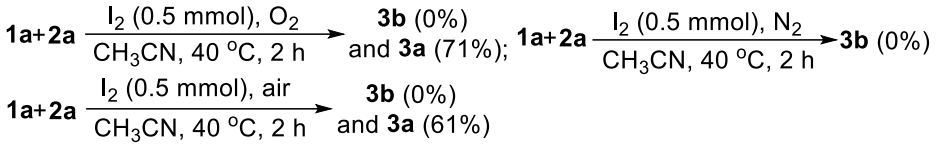
1a + **2a** (**1a** = **2a** =0.8 mmol) $\xrightarrow[PhCOOH(1a:2a:H^+=1:1:1)\ CH_3CN,\ 40\ ^oC,\ 2\ h]{I_2\ (0.5\ mmol),\ H_2O_2\ (3\ mmol)}$ **3b** (96%)

(d) **1a** = 0.8 mmol, **2a** = 0.4 mmol

1a + **2a** $\xrightarrow[CH_3CN,\ 60\ ^oC,\ 3\ h]{I_2\ (10\ mmol\%),\ O_2}$ **3a** (64%); **1a** + **2a** $\xrightarrow[CH_3CN,\ 60\ ^oC,\ 3\ h]{I_2\ (10\ mmol\%),\ N_2}$ **3a** (trace)

1a + **2a** $\xrightarrow[CH_3CN,\ 60\ ^oC,\ 3\ h]{I_2\ (10\ mmol\%),\ air}$ **3a** (57%)

(e) **1a** = 0.8 mmol, **2a** = 1.6 mmol



3. General Procedure

1.1. General Procedure A

General Procedures for the Synthesis of 3-phenyl-imidazo[1,5-a]pyridine by benzaldehyde and 2-pyridinemethanamine.1a (0.8 mmol, 2 eq.), **2a** (0.4 mmol, 1 eq.), I_2 (25.4 mg, 10 mmol%), 30% hydrogen peroxide (3 mmol), CH_3CN (5 mL) were transferred into a 25 mL round-bottom flask equipped with a spherical condensing tube. Then the reaction flask was placed in a heating block that was preheated to 60 °C. The reaction was monitored by checking the TLC. After some time of 3 h, the reaction flask was allowed to cool to room temperature. 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 = 20:1 to 5:1) to afford the products **3a.**

1.2. General Procedure B

General Procedures for the Synthesis of 1-iodo-3-phenyl-imidazo[1,5-a]pyridine, by benzaldehyde and 2-pyridinemethanamine.1a (0.8 mmol, 1 eq.), **2a** (1.6 mmol, 2 eq.), I_2 (127 mg, 0.5 mmol), 30% hydrogen peroxide (3 mmol), CH_3CN (5 mL) were transferred into a 25 mL round-bottom flask equipped with a spherical condensing tube. Then the reaction flask was placed in a heating block that was preheated to 40 °C. The reaction was monitored by checking the TLC. After some time of 2 h, the reaction flask was allowed to cool to room temperature. 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 = 15:1 to 3:1) to afford the products **3b**.

1.3. General Procedure C

General Procedures for the Synthesis of 2-phenyl-1H-benzimidazole by benzaldehyde and 1, 2-benzenediamine. 1b (1 mmol, 1 eq.), **2a** (1.75 mmol, 1.75 eq.), I_2 (25.4 mg, 10 mmol%), 30% hydrogen peroxide (7 mmol), CH_3CN (5 mL) were transferred into a 25 mL round-bottom flask equipped with a spherical condensing tube. Then the reaction flask was placed in a heating block that was preheated to 80 °C. The reaction was monitored by checking the TLC. After some time of 1 h, the reaction flask was allowed to cool to room temperature. 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 = 20:1 to 5:1) to afford the products **3c**.

4. Photophysical Properties of Selected Products

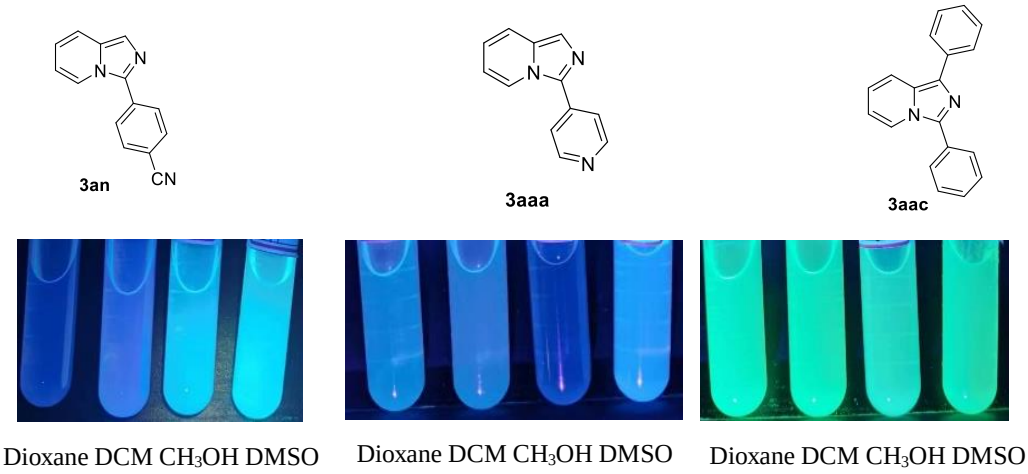


Figure S1. Partially selected emission of obtained **3an**, **3aaa**, and **3aac** in four solvents under 365nm irradiation.

Table S3. Wavelengths of maximum absorbance and maximum emission and Stokes shift and the fluorescence quantum yields of selected products in DCM, Dioxane, MeOH, and DMSO.

S.NO	λabs(nm) (logε)				λem(nm) (Stokes shift cm^{-1})			
	DCM	Dioxane	MeOH	DMSO	DCM	Dioxane	MeOH	DMSO
3a	320 (3.84)	321 (4.15)	313 (4.00)	324 (4.16)	455 (9272)	457 (9271)	451 (9776)	460 (9125)
3b	329 (4.03)	328 (4.14)	320 (4.04)	331 (4.08)	468 (9028)	466 (9029)	459 (9464)	468 (8844)
3ab	315 (3.86)	310 (4.14)	309 (3.91)	316 (4.00)	451 (9573)	453 (10183)	443 (9789)	451 (9473)
3ac	326 (3.95)	322 (4.13)	320 (4.04)	329 (4.09)	457 (8793)	457 (9174)	451 (9077)	456 (8465)
3ad	315 (3.92)	307 (4.19)	309 (3.90)	318 (4.07)	461 (10054)	462 (10928)	454 (10336)	459 (9660)
3an	362 (4.14)	360 (4.30)	352 (4.18)	368 (4.26)	447(5253)	439 (4999)	463 (6811)	470 (5897)
3ao	338 (3.82)	340 (3.94)	333 (3.75)	346 (3.85)	453 (7511)	453 (7337)	448 (7709)	447 (6530)
3ar	315 (4.00)	313 (4.06)	309 (4.06)	320 (4.10)	462 (10101)	461 (10257)	456 (10433)	466 (9791)
3at	308 (4.07)	306 (4.18)	304 (4.04)	314 (4.19)	474 (11370)	468 (11312)	466 (11436)	473 (10705)
3au	329 (4.20)	332 (4.20)	324 (4.16)	336 (4.16)	468 (9028)	463 (8522)	462 (9219)	462 (8117)
3av	337 (4.04)	338 (4.15)	334 (4.07)	340 (4.16)	472 (8487)	472 (8399)	465 (8435)	476 (8403)
3aw	351 (3.90)	350 (4.16)	343 (4.09)	352 (4.11)	437 (5607)	438 (5740)	428 (5790)	434 (5368)
3ax	329 (4.23)	328 (4.21)	320 (4.06)	327 (4.16)	459 (8609)	458 (8654)	455 (9272)	461 (8889)
3ay	350 (4.14)	350 (4.31)	343 (4.23)	353 (4.27)	436 (5636)	438 (5740)	429 (5844)	435 (5340)
3az	330 (3.93)	328 (4.13)	327 (4.10)	334 (4.12)	455 (8325)	458 (8654)	449 (8309)	457 (8058)
3aaa	340 (3.89)	339 (4.09)	348 (4.07)	348 (4.09)	448 (7090)	450 (7276)	430 (5480)	434 (5694)
3aab	324 (3.96)	317 (4.17)	320 (3.84)	328 (4.10)	470 (9588)	467 (10132)	466 (9791)	470 (9211)
3aac	310 (4.02)	306 (4.17)	299 (4.21)	311 (4.23)	489 (11808)	491 (12313)	484 (12784)	489 (11704)
3c	303 (4.37)	305 (4.46)	302 (4.54)	306 (4.54)	357 (4992)	356 (4697)	355 (4944)	361 (4979)
3cu	292 (4.32)	293 (4.42)	288 (4.13)	292 (4.34)	365 (6849)	362 (6505)	357 (6711)	368 (7073)

Table S4 Fluorescence quantum yields of 20 selected compounds in DCM, Dioxane, MeOH and DMSO

S.NO	Quantum Yield			
	DCM	Dioxane	MeOH	DMSO
3a	0.0720	0.0688	0.0757	0.0880
3b	< 0.05	< 0.05	< 0.05	< 0.05
3ab	0.0728	0.0588	0.0864	0.1064
3ac	0.0656	0.0656	0.0713	0.0920
3ad	0.0609	0.0435	0.0720	0.0856
3an	0.5125	0.3488	0.3411	0.4670
3ao	0.0782	0.0922	0.0909	0.1437
3ar	0.0520	0.0547	0.0598	0.0773
3at	< 0.05	< 0.05	0.0529	0.0642
3au	0.0539	0.0753	0.0729	0.1273
3av	< 0.05	< 0.05	< 0.05	0.0538
3aw	0.1658	0.2222	0.1822	0.2021
3ax	0.0540	0.0565	0.0635	0.0631
3ay	0.1490	0.1708	0.1691	0.1883
3az	0.0737	0.0846	< 0.05	0.0878
3aaa	0.0891	0.1090	< 0.05	0.1602
3aab	0.2694	0.2186	0.2817	0.2518
3aac	0.1587	0.1707	0.1218	0.1516
3c	0.6374	0.5777	0.5007	0.5601
3cu	0.4999	0.3822	0.5673	0.4688

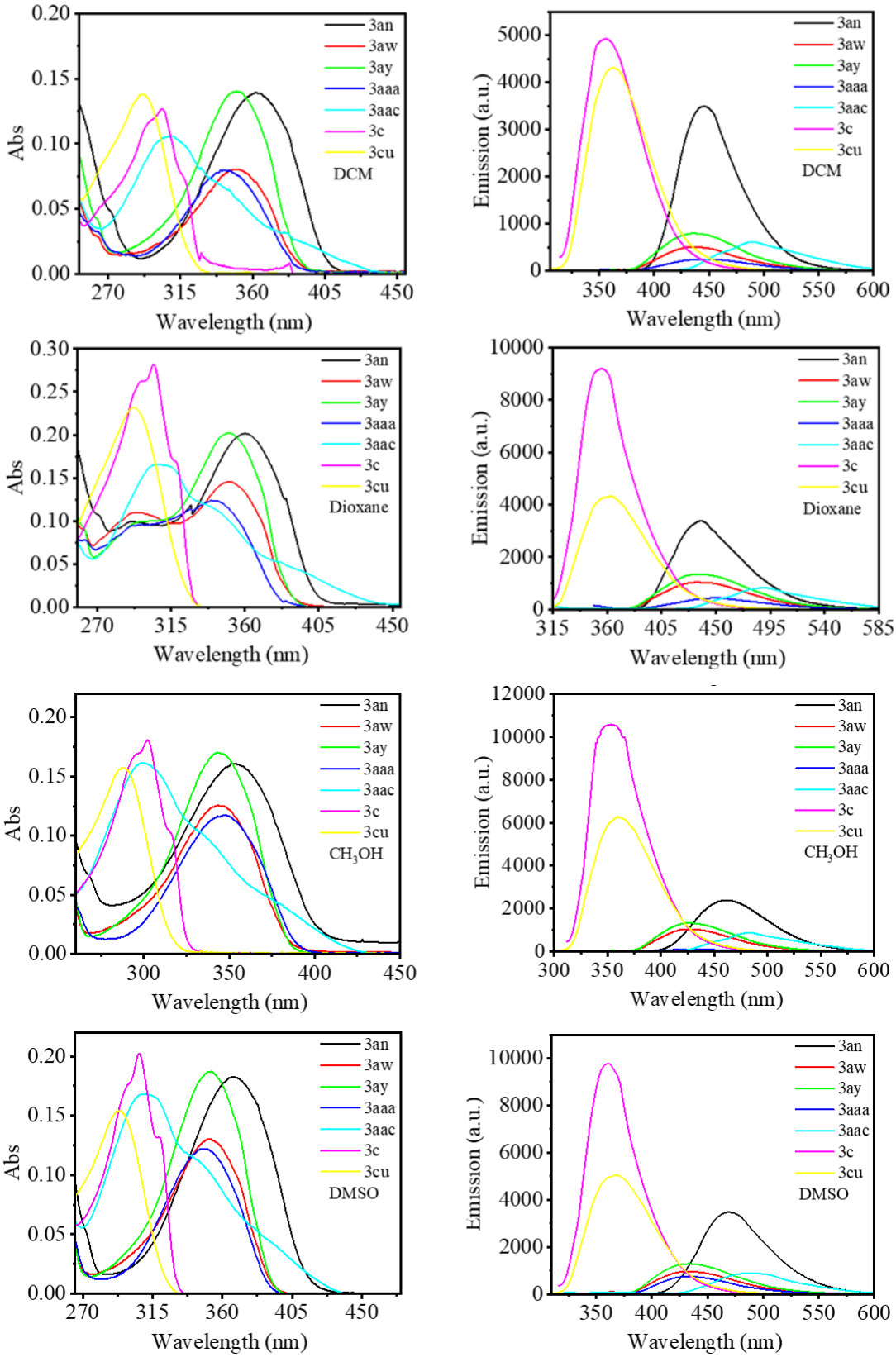
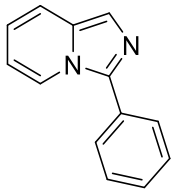


Figure S2. Partially electronic absorption and emission spectra of selected compounds recorded in DCM, Dioxane, MeOH, and DMSO(1×10^{-5} M).

Table S5. Comparison of experimental absorption wavelengths for selected compounds with theoretical calculations: electron transition, HOMO and LUMO energies, oscillator intensity, and absorption wavelength.

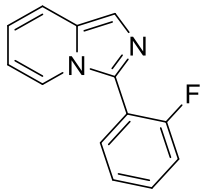
S.No.	Solvents	λ_{exp} (nm)	E_{HOMO} (eV)	E_{LUMO} (eV)	λ_{calc} (nm)	E (eV)	f_{osc}	Transitions
3a	DCM	320	-6.35	0.10	283	4.39	0.5419	H→L+1 0.65
	Dioxane	321	-6.32	0.07	283	4.38	0.5473	H→L+1 0.66
	MeOH	313	-6.38	0.11	280	4.43	0.5000	H→L+1 0.65
	DMSO	324	-6.37	0.11	283	4.38	0.5390	H→L+1 0.63
3an	DCM	362	-6.48	-0.73	325	3.81	0.6746	H→L 0.69
	Dioxane	360	-6.56	-0.75	322	3.85	0.6616	H→L 0.69
	MeOH	352	-6.48	-0.72	323	3.84	0.6233	H→L 0.69
	DMSO	368	-6.47	-0.73	326	3.80	0.6746	H→L 0.69
3at	DCM	308	-6.23	0.14	276	4.48	0.6238	H→L+1 0.68
	Dioxane	306	-6.18	0.13	277	4.48	0.6127	H→L+1 0.68
	MeOH	304	-6.27	0.14	275	4.51	0.5909	H→L+1 0.68
	DMSO	314	-6.25	0.14	276	4.48	0.6229	H→L+1 0.68
3ay	DCM	350	-6.36	-0.21	310	3.99	0.5956	H→L 0.66
	Dioxane	350	-6.30	-0.16	311	4.00	0.5623	H→L 0.63
	MeOH	343	-6.39	-0.24	309	4.01	0.5713	H→L 0.66
	DMSO	353	-6.39	-0.24	310	3.99	0.6009	H→L 0.66
3aaa	DCM	340	-6.52	-0.30	303	4.09	0.4361	H→L 0.66
	Dioxane	339	-6.56	-0.28	299	4.15	0.5299	H→L 0.65
	MeOH	348	-6.52	-0.30	302	4.11	0.4471	H→L 0.68
	DMSO	348	-6.52	-0.31	304	4.08	0.5160	H→L 0.69
3aac	DCM	310	-6.13	-0.11	292	4.25	0.4750	H→L+1 0.68
					267	4.64	0.4904	H→L+2 0.67
	Dioxane	306	-6.09	-0.11	293	4.24	0.4701	H→L+1 0.68
					266	4.66	0.5393	H→L+2 0.68
	MeOH	299	-6.17	-0.10	289	4.29	0.4496	H→L+1 0.68
					266	4.66	0.4561	H→L+2 0.67
	DMSO	311	-6.16	-0.11	291	4.25	0.4738	H→L+1 0.68
					267	4.64	0.4661	H→L+2 0.67
3c	DCM	303	-7.08	-0.30	269	4.60	0.9077	H→L 0.68
	Dioxane	305	-7.03	-0.25	268	4.62	0.9025	H→L 0.67
	MeOH	302	-7.13	-0.30	266	4.66	0.8551	H→L 0.67
	DMSO	306	-7.12	-0.31	268	4.63	0.8928	H→L 0.68
3cu	DCM	292	-7.15	-0.13	259	4.80	0.7549	H→L 0.65
	Dioxane	293	-7.06	-0.09	260	4.77	0.7732	H→L 0.65
	MeOH	288	-7.20	-0.13	256	4.84	0.6942	H→L 0.64
	DMSO	292	-7.19	-0.16	258	4.80	0.7479	H→L 0.65

5. Experimental Characterization Data for the Products



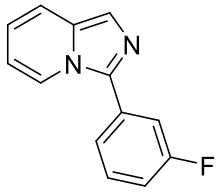
3-Phenyl-imidazo[1, 5-a] pyridine (3a)[1]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and benzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (65.2 mg, 84%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.10 (d, *J* = 6.8 Hz, 1H), 7.66 (d, *J* = 6.76 Hz, 2H), 7.49-7.16 (m, 5H), 6.55 (dd, *J* = 8.8, 6.0 Hz, 1H), 6.38 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 138.22, 131.61, 130.44, 128.96, 128.56, 127.89, 121.36, 120.63, 118.74, 113.03.



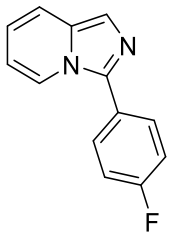
3-(2-fluorophenyl)-imidazo[1,5-a]pyridine (3ab)[2]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 2-fluoro-benzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (72.9 mg, 86%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.80-7.60 (m, 2H), 7.52 (s, 1H), 7.36 (s, 2H), 7.45-7.31 (m, 1H), 7.14 (t, *J* = 9.2 Hz, 1H), 6.66 (dd, *J* = 8.4, 5.88 Hz, 1H) , 6.48 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) *δ*: 159.92 (d, *J* = 247.7 Hz), 133.54, 132.22, 132.19, 131.78, 130.84 (d, *J* = 8.2 Hz), 124.85 (d, *J* = 3.6 Hz), 122.35, 122.29, 120.93, 119.03, 118.39, 116.18 (d, *J* = 21.5 Hz), 112.80; ^{19}F NMR (376 MHz, $CDCl_3$) δ: -111.14.



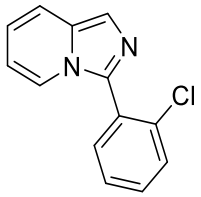
3-(3-fluorophenyl)-imidazo[1,5-a]pyridine (3ac)[2]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 3-fluoro-benzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (73.8 mg, 87%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.06 (d, *J* = 7.4 Hz, 1H), 7.45-7.34 (m, 3H), 7.32-7.27 (m, 2H), 6.94 (td, *J* = 8.6, 2.2 Hz, 1H), 6.54 (dd, *J* = 8.9, 5.6 Hz, 1H), 6.39 (t, *J* = 6.9 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 162.90 (d, *J* = 247.5 Hz), 136.78, 132.44, 131.90, 130.50 (d, *J* = 9.3 Hz), 123.13 (d, *J* = 2.9 Hz), 121.16, 120.90, 119.03, 118.74, 115.31 (d, *J* = 21.1 Hz), 114.83, 114.60, 113.42; ^{19}F NMR (376 MHz, $CDCl_3$) δ: -111.82.



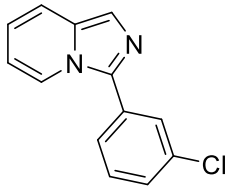
3-(4-fluorophenyl)-imidazo[1,5-a]pyridine (3ad)[2]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 4-fluoro-benzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (75.5 mg, 89%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.09 (d, *J* = 7.2 Hz, 1H), 7.78-7.61 (m, 2H), 7.46 (s, 1H), 7.40 (d, *J* = 8.6 Hz, 1H), 7.13 (t, *J* = 8.6 Hz, 2H), 6.64 (dd, *J* = 8.8, 6.4 Hz, 1H), 6.48 (t, *J* = 6.9 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 162.91 (d, *J* = 249.8 Hz), 137.33, 131.59, 129.85 (d, *J* = 8.3 Hz), 126.66, 121.12, 120.59, 118.85, 118.76, 116.01 (d, *J* = 21.6 Hz), 113.22; ^{19}F NMR (376 MHz, $CDCl_3$) δ: -112.10.



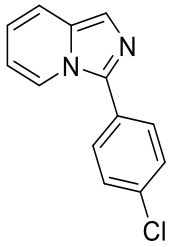
3-(2-chlorophenyl)-imidazo[1,5-a]pyridine (3ae)[3]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 2-chlorobenzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (76.6 mg, 84%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.05 (d, *J* = 7.2 Hz, 1H), 7.60 (d, *J* = 8.5 Hz, 2H), 7.43 (s, 1H), 7.35 (d, *J* = 8.5 Hz, 3H), 6.59 (dd, *J* = 9.0, 6.4 Hz, 1H), 6.43 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 137.01, 134.31, 131.82, 129.18, 129.00, 128.91, 121.14, 120.88, 118.92, 118.82, 113.37.



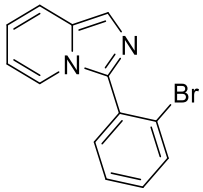
3-(3-chlorophenyl)-imidazo[1,5-a]pyridine (3af)[3]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 3-chlorobenzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (77.5 mg, 85%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.04 (d, *J* = 7.0 Hz, 1H), 7.64 (s, 1H), 7.50 (d, *J* = 7.2 Hz, 1H), 7.39 (s, 1H), 7.34-7.16 (m, 3H), 6.55 (t, *J* = 6.6 Hz, 1H), 6.39 (t, *J* = 6.5 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 135.45, 133.77, 131.02, 130.82, 129.06, 127.30, 126.65, 124.45, 120.02, 119.89, 117.99, 117.64, 112.38.



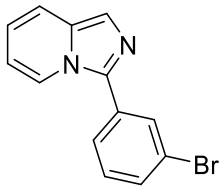
3-(4-chlorophenyl)-imidazo[1,5-a]pyridine (3ag)[1]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 4-chlorobenzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (76.6 mg, 84%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.10 (d, *J* = 7.4 Hz, 1H), 7.85-7.65 (m, 2H), 7.46 (s, 1H), 7.41 (d, *J* = 9.1 Hz, 1H), 7.14 (t, *J* = 8.6 Hz, 2H), 6.66 (dd, *J* = 9.8, 6.3 Hz, 1H), 6.49 (t, *J* = 6.6 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 134.56, 133.06, 131.87, 129.98, 129.49, 128.82, 128.32, 125.98, 120.99, 119.05, 117.83, 117.23, 111.45.



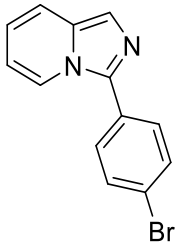
3-(2-bromophenyl)-imidazo[1,5-a]pyridine (3ah)[3]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 2-bromobenzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (91.4 mg, 84%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.61 (d, *J* = 7.4 Hz, 1H), 7.51-7.42 (m, 3H), 7.39 (d, *J* = 8.6 Hz, 1H), 7.34 (t, *J* = 8.0 Hz, 1H), 7.29-7.20 (m, 1H), 6.64 (dd, *J* = 9.1, 6.8 Hz, 1H), 6.44 (t, *J* = 5.6 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 136.89, 133.26, 133.18, 131.58, 130.93, 127.69, 124.20, 122.12, 119.97, 119.02, 118.41, 112.62.



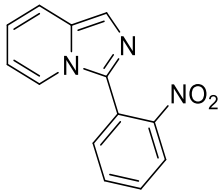
3-(3-bromophenyl)-imidazo[1,5-a]pyridine (3ai)[3]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 3-bromobenzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (92.4 mg, 85%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.08 (d, *J* = 7.1 Hz, 1H), 7.83 (s, 1H), 7.58 (d, *J* = 7.8 Hz, 1H), 7.45-7.37 (m, 2H), 7.34 (d, *J* = 8.4 Hz, 1H), 7.22 (t, *J* = 7.6 Hz, 1H), 6.60 (dd, *J* = 8.9, 6.4 Hz, 1H), 6.44 (t, *J* = 7.6 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 136.49, 132.37, 131.94, 131.39, 130.69, 130.42, 126.09, 123.04, 121.15, 121.02, 119.13, 118.81, 113.54.



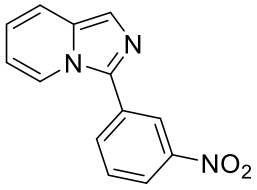
3-(4-bromophenyl)-imidazo[1,5-a]pyridine (3aj)[1]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 4-bromobenzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (92.4 mg, 85%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.03 (d, *J* = 6.6 Hz, 1H), 7.58-7.40 (m, 4H), 7.41 (s, 1H), 7.32 (d, *J* = 9.5 Hz, 1H), 6.57 (dd, *J* = 8.8, 6.3 Hz, 1H), 6.41 (t, *J* = 6.7 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 136.99, 136.43, 132.11, 131.85, 129.33, 129.20, 122.48, 121.13, 120.93, 118.97, 118.82, 113.43.



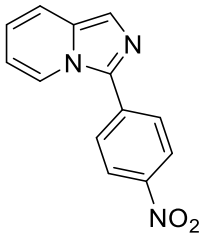
3-(2-nitrophenyl)-imidazo[1,5-a]pyridine (3ak)[3]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 2-nitro-benzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (85.1 mg, 89%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.14 (d, *J* = 7.7 Hz, 1H), 7.80-7.70 (m, 2H), 7.67-7.57 (m, 3H), 7.52 (d, *J* = 7.7 Hz, 1H), 6.77 (dd, *J* = 9.2, 6.6 Hz, 1H), 6.56 (t, *J* = 6.6 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 148.67, 133.43, 133.29, 132.84, 131.65, 130.18, 125.07, 125.04, 120.96, 120.89, 119.40, 118.74, 113.53.



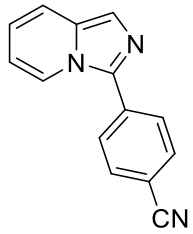
3-(3-nitrophenyl)-imidazo[1,5-a]pyridine (3al)[3]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 3-nitro-benzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (88.0 mg, 92%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.70 (s, 1H), 8.36-8.25 (m, 2H), 8.21 (d, *J* = 8.0 Hz, 1H), 7.72 (t, *J* = 8.0 Hz, 1H), 7.63 (s, 1H), 7.57 (d, *J* = 8.0 Hz, 1H), 6.84 (dd, *J* = 8.6, 6.1 Hz, 1H), 6.72 (t, *J* = 7.0 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 148.65, 135.63, 133.64, 132.44, 132.15, 130.14, 122.95, 121.97, 121.63, 120.92, 119.60, 119.08, 114.22.



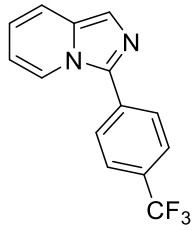
3-(4-nitrophenyl)-imidazo[1,5-a]pyridine (3am)[3]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 4-nitro-benzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (89.9 mg, 94%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.25 (d, *J* = 8.2 Hz, 3H), 7.91 (d, *J* = 8.3 Hz, 2H), 7.54 (s, 1H), 7.46 (d, *J* = 8.9 Hz, 1H), 6.75 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.62 (t, *J* = 6.6 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 146.91, 136.50, 135.80, 132.93, 127.68, 124.36, 122.35, 121.29, 120.05, 119.13, 114.47.



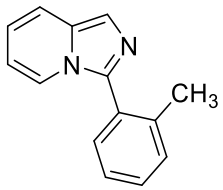
4-imidazo[1,5-a]pyridin-3-yl-benzonitrile (3an)[3]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 4-formylbenzonitrile (0.4 mmol, 1 eq.), following the general procedure A, the title compound (82.3 mg, 94%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.22 (d, *J* = 7.2 Hz, 1H), 7.88 (d, *J* = 8.1 Hz, 2H), 7.71 (d, *J* = 8.5 Hz, 2H), 7.54 (s, 1H), 7.47 (d, *J* = 8.4 Hz, 1H), 6.75 (dd, *J* = 9.0, 6.4 Hz, 1H), 6.60 (t, *J* = 6.8, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 136.11, 134.71, 132.77, 132.66, 127.75, 122.00, 121.19, 119.78, 119.10, 118.66, 114.21, 111.49.



3-(4-(trifluoromethyl)phenyl)imidazo[1,5-a]pyridine (3ao)[1]:

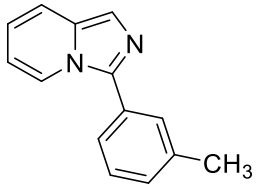
From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 4-(trifluoromethyl)benzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (102.7 mg, 98%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.18 (d, *J* = 6.8 Hz, 1H), 7.84 (d, *J* = 8.2 Hz, 2H), 7.67 (d, *J* = 8.2 Hz, 2H), 7.50 (s, 1H), 7.43 (d, *J* = 9.1 Hz, 1H), 6.69 (dd, *J* = 8.8, 6.4 Hz, 1H), 6.54 (t, *J* = 7.0, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 136.69, 133.90, 132.25, 130.22 (d, *J* = 32.8 Hz), 127.87, 126.00 (q, *J* = 3.7 Hz), 124.01 (d, *J* = 272.7 Hz), 121.41, 121.17, 119.35, 119.00, 113.78; ^{19}F NMR (376 MHz, $CDCl_3$) δ: -62.65.



3-(2-methylphenyl)-imidazo[1,5-a]pyridine (3ap)[3]:

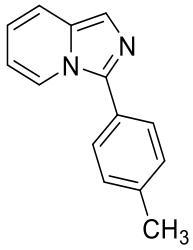
From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 2-methylbenzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (54.1 mg, 65%) was obtained as a faint

white solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.64 (d, *J* = 7.1 Hz, 1H), 7.58 (s, 1H), 7.48 (dd, *J* = 12.5, 9.4 Hz, 2H), 7.40-7.28 (m, 3H), 6.72 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.50 (t, *J* = 6.7 Hz, 1H), 2.24 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 138.41, 137.87, 130.83, 130.54, 130.38, 129.48, 129.36, 126.00, 121.49, 119.76, 118.56, 118.52, 112.59, 19.76.



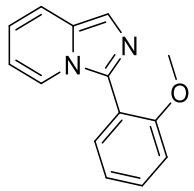
3-(3-methylphenyl)-imidazo[1,5-a]pyridine (3aq)[3]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 3-methylbenzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (54.9 mg, 66%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.11 (d, *J* = 7.2 Hz, 1H), 7.51 (s, 1H), 7.48-7.38 (m, 2H), 7.34-7.20 (m, 2H), 7.11 (d, *J* = 7.6 Hz, 1H), 6.55 (dd, *J* = 9.0, 6.4 Hz, 1H), 6.39 (t, *J* = 6.8 Hz, 1H), 2.31 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 138.78, 138.36, 131.54, 130.28, 129.38, 128.76, 124.68, 121.47, 120.48, 118.70, 118.68, 112.96, 21.47.



3-(4-methylphenyl)-imidazo[1,5-a]pyridine (3ar)[1]:

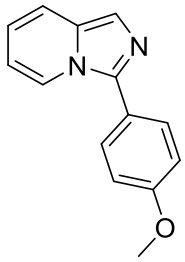
From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 4-methylbenzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (56.6 mg, 68%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.13 (d, *J* = 7.2 Hz, 1H), 7.59 (d, *J* = 7.6 Hz, 2H), 7.44 (s, 1H), 7.37 (d, *J* = 9.1 Hz, 1H), 7.23 (d, *J* = 7.6 Hz, 2H), 6.60 (dd, *J* = 9.2, 6.3 Hz, 1H), 6.43 (t, *J* = 6.8 Hz, 1H), 2.33 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 138.56, 138.40, 131.46, 129.65, 129.61, 129.16, 127.83, 127.56, 127.50, 121.45, 120.41, 118.75, 118.57, 112.89, 21.40.



3-(2-methoxyphenyl)-imidazo[1,5-a]pyridine (3as)[3]:

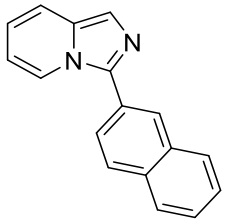
From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 2-methoxy-benzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (53.8 mg, 60%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.59 (d, *J* = 13.2 Hz, 3H), 7.46 (d, *J* = 9.4 Hz, 2H), 7.17-6.95 (m, 2H), 6.77-6.64 (m, 1H), 6.49

(t, *J* = 6.7 Hz, 1H), 3.78 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 157.30, 136.22, 132.46, 131.27, 130.63, 123.13, 121.10, 120.13, 119.42, 118.50, 118.17, 111.77, 111.22, 55.51.



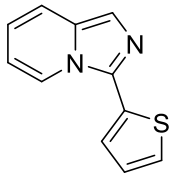
3-(2-methoxyphenyl)-imidazo[1, 5-a]pyridine (3at)[2]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 4-methoxy-benzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (63.6 mg, 71%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.06 (d, *J* = 7.3 Hz, 1H), 7.61 (d, *J* = 7.5 Hz, 2H), 7.42 (s, 1H), 7.34 (d, *J* = 9.2 Hz, 1H), 6.94 (d, *J* = 6.7 Hz, 2H), 6.57 (dd, *J* = 9.2, 6.3 Hz, 1H), 6.40 (t, *J* = 6.8 Hz, 1H), 3.76 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 159.84, 138.22, 131.28, 129.37, 122.92, 121.33, 120.20, 118.73, 118.43, 114.39, 112.82, 55.37.



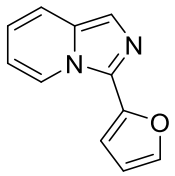
3-(naphthalen-2-yl)imidazo[1,5-a]pyridine (3au)[3]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and 2-naphthaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (71.2 mg, 73%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.41 (d, *J* = 7.3 Hz, 1H), 8.29 (s, 1H), 8.04-7.91 (m, 4H), 7.64 (s, 1H), 7.58-7.52 (m, 3H), 6.82-6.73 (m, 1H), 6.62 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 138.28, 133.37, 133.15, 131.83, 128.81, 128.24, 127.85, 126.69, 126.66, 126.63, 125.72, 121.51, 120.96, 118.91, 113.25.



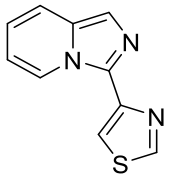
3-(thiophen-2-yl)imidazo[1,5-a]pyridine (3av)[1]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and thiophene-2-carbaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (56.8 mg, 71%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.21 (d, *J* = 7.2 Hz, 1H), 7.47-7.36 (m, 3H), 7.31 (d, *J* = 5.2 Hz, 1H), 7.08 (dd, *J* = 4.8, 3.6 Hz, 1H), 6.64 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.54 (t, *J* = 7.2, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 133.03, 132.73, 131.72, 127.62, 125.84, 124.30, 121.68, 120.93, 118.80, 118.79, 113.67.



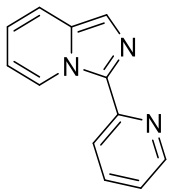
3-(furan-2-yl)imidazo[1,5-a]pyridine (3aw)[1]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and furan-2-carbaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (47.8 mg, 65%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.71 (s, 1H), 7.38 (s, 1H), 7.09 (s, 1H), 6.52 (s, 1H), 6.42-6.21 (m, 1H), 5.94 (s, 1H), 5.61 (s, 1H), 5.48 (s, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 151.11, 148.14, 136.53, 132.93, 126.04, 121.73, 121.58, 120.94, 120.16, 117.99, 113.55.



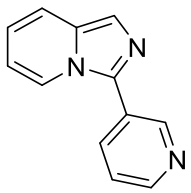
4-(imidazo[1,5-a]pyridin-3-yl)thiazole (3ax):

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and furan- thiazole-4-carbaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (55.5 mg, 69%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). m.p.: 95-97 °C; IR (KBr) 3116, 1629, 1541, 1502, 1458, 1344, 1308, 1253, 1134, 1097, 1002, 881, 810, 746, 694, 655 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 9.37 (d, *J* = 7.3 Hz, 1H), 8.85 (s, 1H), 7.99 (s, 1H), 7.50-7.34 (m, 2H), 6.71 (dd, *J* = 9.1, 6.3 Hz, 1H), 6.59 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 152.62, 148.39, 132.93, 131.56, 124.72, 120.58, 119.36, 118.11, 115.39, 113.20; HRMS(ESI): calculated for $C_{10}H_8N_3S^+$ $[M+H]^+$: 202.0433, found: 202.0434.



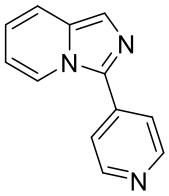
3-(pyridin-2-yl)imidazo[1,5-a]pyridine (3ay)[1]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and picolinaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (60.8 mg, 78%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 9.84 (d, *J* = 7.2 Hz, 1H), 8.51 (d, *J* = 5.0 Hz, 1H), 8.23 (d, *J* = 8.1 Hz, 1H), 7.65 (t, *J* = 7.8 Hz, 1H), 7.48 (s, 1H), 7.40 (d, *J* = 9.0 Hz, 1H), 7.09-7.00 (m, 1H), 6.72 (dd, *J* = 9.1, 6.4 Hz, 1H), 6.59 (t, *J* = 7.2 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 151.15, 148.09, 136.45, 135.41, 132.91, 126.01, 121.64, 121.49, 121.02, 120.07, 117.92, 113.45.



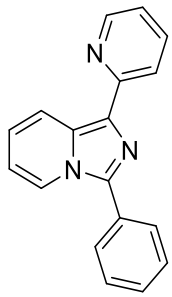
3-(pyridin-3-yl)imidazo[1,5-a]pyridine (3az)[3]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and nicotinaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (59.3 mg, 76%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.99 (s, 1H), 8.56 (s, 1H), 8.14 (d, *J* = 7.2 Hz, 1H), 8.02 (d, *J* = 7.9 Hz, 1H), 7.50 (s, 1H), 7.41 (d, *J* = 9.1 Hz, 1H), 7.35 (dd, *J* = 8.0, 4.8 Hz, 1H), 6.67 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.52 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 149.34, 148.47, 135.16, 132.12, 126.78, 123.77, 121.40, 120.95, 119.29, 118.91, 113.76.



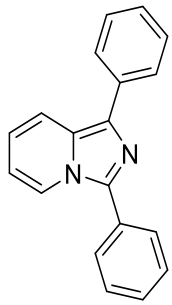
3-(pyridin-4-yl)imidazo[1,5-a]pyridine (3aaa)[3]:

From 2-pyridinemethanamine (0.8 mmol, 2 eq.) and isonicotinaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (64.0 mg, 82%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.64 (d, *J* = 4.3 Hz, 2H), 8.28 (d, *J* = 7.2 Hz, 1H), 7.66 (d, *J* = 4.4 Hz, 2H), 7.53 (s, 1H), 7.45 (d, *J* = 9.1 Hz, 1H), 6.74 (dd, *J* = 9.1, 6.4 Hz, 1H), 6.61 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 150.41, 137.67, 135.18, 134.50, 132.84, 121.99, 121.41, 121.19, 119.87, 119.06, 114.26.



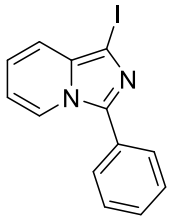
3-phenyl-1-(pyridin-2-yl)imidazo[1,5-a]pyridine (3aab)[1]:

From di(pyridin-2-yl)methanamine (0.8 mmol, 2 eq.) and benzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (74.8 mg, 69%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.61 (d, *J* = 9.2 Hz, 1H), 8.54 (d, *J* = 4.9 Hz, 1H), 8.15 (t, *J* = 7.9 Hz, 2H), 7.74 (d, *J* = 8.0 Hz, 2H), 7.62 (t, *J* = 7.8 Hz, 1H), 7.45 (t, *J* = 7.5 Hz, 2H), 7.36 (t, *J* = 7.4 Hz, 1H), 7.04-6.95 (m, 1H), 6.81 (dd, *J* = 9.3, 6.3 Hz, 1H), 6.53 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 155.06, 148.99, 138.07, 136.26, 130.58, 130.23, 130.14, 129.07, 128.94, 128.40, 121.85, 121.61, 121.06, 120.47, 119.96, 113.93.



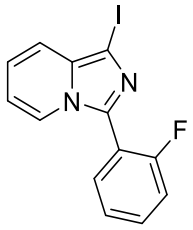
1,3-diphenylimidazo[1,5-a]pyridine (3aac)[1]:

From phenyl(pyridin-2-yl)methanamine (0.8 mmol, 2 eq.) and benzaldehyde (0.4 mmol, 1 eq.), following the general procedure A, the title compound (82.1 mg, 76%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.16 (d, *J* = 7.2 Hz, 1H), 7.87 (d, *J* = 8.0 Hz, 2H), 7.77 (d, *J* = 8.0 Hz, 3H), 7.50-7.43 (m, 2H), 7.42-7.34 (m, 3H), 7.26-7.19 (m, 1H), 6.71 (dd, *J* = 9.3, 6.3 Hz, 1H), 6.50 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 138.14, 134.99, 132.04, 130.21, 129.04, 128.83, 128.73, 128.35, 127.69, 126.83, 126.55, 121.79, 119.70, 119.19, 113.24.



1-iodo-3-phenylimidazo[1,5-a]pyridine (3b)[4]:

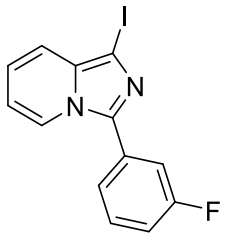
From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and benzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (222.7 mg, 87%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.95 (d, *J* = 7.2 Hz, 1H), 7.54 (d, *J* = 7.6 Hz, 2H), 7.36-7.18 (m, 3H), 7.10 (d, *J* = 9.2 Hz, 1H), 6.54 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.34 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 140.30, 133.32, 129.28, 129.01, 127.84, 121.73, 120.31, 118.76, 114.01, 74.27.



3-(2-fluorophenyl)-1-iodoimidazo[1,5-a]pyridine (3bb):

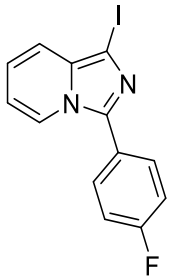
From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 2-fluorobenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (235.2 mg, 87%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 122-124 °C; IR (KBr) 3053, 1627, 1568, 1510, 1454, 1355, 1307, 1259, 1209, 1091, 1002, 943, 815, 765, 732, 684 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.77-7.67 (m, 2H), 7.45 (tdd, *J* = 7.5, 5.2, 1.8 Hz, 1H), 7.34 (d, *J* = 9.6 Hz, 1H), 7.29 (t, *J* = 7.6 Hz, 1H), 7.25-7.15 (m, 1H), 6.81 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.61 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 159.75 (d, *J* = 249.7 Hz), 135.68, 133.69, 132.40, 132.36, 131.34 (d, *J* = 8.3 Hz), 124.96 (d, *J* = 3.4 Hz), 122.86, 122.79, 120.54, 118.53,

117.36, 117.22, 116.12 (d, J = 21.4 Hz), 113.74, 74.09; ^{19}F NMR (376 MHz, $CDCl_3$) δ: -110.71; HRMS(ESI): calculated for $C_{13}H_9FIN_2^+$ $[M+H]^+$: 338.9789, found: 338.9797.



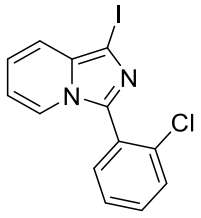
3-(3-fluorophenyl)-1-iodoimidazo[1,5-a]pyridine (3bc):

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 3-fluorobenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (238.0 mg, 88%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 66-68 °C; IR (KBr) 3076, 1612, 1583, 1504, 1463, 1368, 1419, 1442, 1116, 1018, 862, 788, 738, 692 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.24 (d, J = 7.2 Hz, 1H), 7.57 (d, J = 7.8 Hz, 1H), 7.54-7.45 (m, 2H), 7.38 (d, J = 9.2 Hz, 1H), 7.19-7.09 (m, 1H), 6.84 (dd, J = 9.2, 6.4 Hz, 1H), 6.67 (t, J = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 163.00 (d, J = 247.3 Hz), 139.10, 133.73, 131.39, 131.30, 130.70 (d, J = 8.5 Hz), 123.32 (d, J = 3.0 Hz), 121.70, 120.53, 119.13, 116.09, 115.88, 114.90 (d, J = 23.1 Hz), 114.40, 74.55; ^{19}F NMR (376 MHz, $CDCl_3$) δ: -111.49; HRMS(ESI): calculated for $C_{13}H_9FIN_2^+$ $[M+H]^+$: 338.9789, found: 338.9791.



3-(4-fluorophenyl)-1-iodoimidazo[1,5-a]pyridine (3bd)[4]:

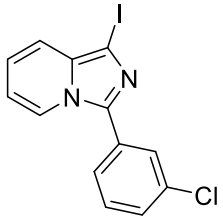
From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 4-fluorobenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (240.7 mg, 89%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.01 (d, J = 7.2 Hz, 1H), 7.67-7.56 (m, 2H), 7.22 (d, J = 9.2 Hz, 1H), 7.08 (t, J = 8.7 Hz, 2H), 6.67 (dd, J = 9.2, 6.4 Hz, 1H), 6.49 (t, J = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 162.96 (d, J = 249.7 Hz), 139.44, 133.36, 129.90 (d, J = 8.4 Hz), 125.53 (d, J = 3.4 Hz), 121.54, 120.28, 118.97, 116.20 (d, J = 21.9 Hz), 114.16, 74.06; ^{19}F NMR (376 MHz, $CDCl_3$) δ: -111.06.



3-(2-chlorophenyl)-1-iodoimidazo[1,5-a]pyridine (3be):

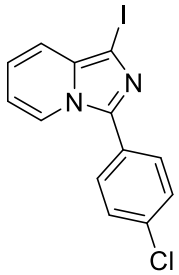
From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 2-chlorobenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (252.0 mg, 89%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 145-146 °C; IR (KBr)

3070, 1629, 1560, 1500, 1425, 1355, 1303, 1255, 1124, 1058, 1001, 945, 742, 684 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ: 7.65-7.56 (m, 2H), 7.57-7.51 (m, 1H), 7.50-7.35 (m, 3H), 6.87 (dd, *J* = 9.2, 6.5 Hz, 1H), 6.64 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 137.95, 134.05, 133.37, 133.19, 131.10, 129.98, 128.52, 127.26, 122.78, 120.48, 118.63, 113.54, 73.27; HRMS(ESI): calculated for $C_{13}H_9ClIN_2^+$ $[M+H]^+$: 354.9493, found: 354.9495.



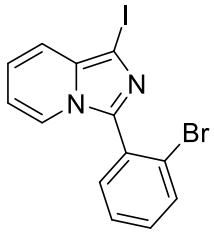
3-(3-chlorophenyl)-1-iodoimidazo[1,5-a]pyridine (3bf):

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 3-chlorobenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (254.9 mg, 90%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 103-105 °C; IR (KBr) 3055, 1593, 1558, 1496, 1452, 1353, 1301, 1257, 1093, 1006, 947, 887, 786, 752, 690, 563 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ: 8.21 (d, *J* = 7.2 Hz, 1H), 7.78 (s, 1H), 7.66 (dt, *J* = 7.4, 1.6 Hz, 1H), 7.48-7.34 (m, 3H), 6.84 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.67 (t, *J* = 6.8, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 138.88, 135.05, 133.73, 131.02, 130.27, 129.03, 127.89, 125.68, 121.65, 120.59, 119.09, 114.47, 74.64; HRMS(ESI): calculated for $C_{13}H_9ClIN_2^+$ $[M+H]^+$: 354.9493, found: 354.9493.



3-(4-chlorophenyl)-1-iodoimidazo[1,5-a]pyridine (3bg)[4]:

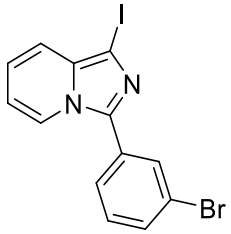
From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 4- chlorobenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (257.7 mg, 91%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). ^1H NMR (400 MHz, $CDCl_3$) δ: 8.14 (d, *J* = 7.1 Hz, 1H), 7.68 (d, *J* = 7.9 Hz, 2H), 7.45 (d, *J* = 8.3 Hz, 2H), 7.34 (d, *J* = 9.1 Hz, 1H), 6.88-6.73 (m, 1H), 6.68-6.53 (m, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 139.23, 134.87, 133.60, 129.28, 129.05, 127.80, 121.60, 120.43, 119.06, 114.34, 74.49.



3-(2-bromophenyl)-1-iodoimidazo[1,5-a]pyridine (3bh):

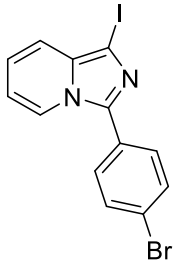
From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 2-bromobenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (289.7 mg, 91%) was obtained as a faint

yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 122-125 °C; IR (KBr) 3070, 1627, 1554, 1496, 1419, 1357, 1303, 1259, 1114, 1002, 945, 740, 686 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ: 7.73 (d, *J* = 8.0 Hz, 1H), 7.64-7.54 (m, 2H), 7.47 (t, *J* = 7.5 Hz, 1H), 7.44-7.35 (m, 2H), 6.88 (dd, *J* = 9.2, 6.5 Hz, 1H), 6.65 (t, *J* = 6.8, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 139.09, 133.62, 133.16, 132.98, 131.33, 130.61, 127.77, 123.94, 122.76, 120.48, 118.64, 113.51, 73.01; HRMS(ESI): calculated for $C_{13}H_9BrIN_2^+$ $[M+H]^+$: 398.8988, found: 398.8993.



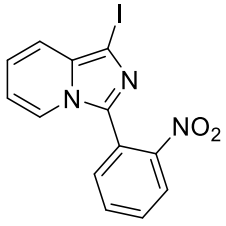
3-(3-bromophenyl)-1-iodoimidazo[1,5-a]pyridine (3bi):

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 3-bromobenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (302.5 mg, 95%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 107-109 °C; IR (KBr) 3078, 1631, 1593, 1556, 1500, 1421, 1352, 1299, 1257, 1068, 1010, 950, 879, 740, 686 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ: 8.21 (d, *J* = 7.2 Hz, 1H), 7.95 (s, 1H), 7.70 (d, *J* = 7.7 Hz, 1H), 7.56 (d, *J* = 8.0 Hz, 1H), 7.45-7.32 (m, 2H), 6.84 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.67 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 138.76, 133.75, 131.96, 131.27, 130.79, 130.49, 126.15, 123.14, 121.64, 120.60, 119.13, 114.48, 74.65; HRMS(ESI): calculated for $C_{13}H_9BrIN_2^+$ $[M+H]^+$: 398.8988, found: 398.8987.



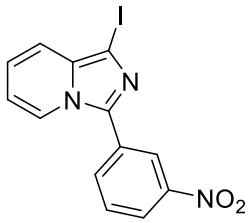
3-(4-bromophenyl)-1-iodoimidazo[1,5-a]pyridine (3bj)[4]:

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 4-bromobenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (305.7 mg, 96%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). ^1H NMR (400 MHz, $CDCl_3$) δ: 8.08 (d, *J* = 7.2 Hz, 1H), 7.55 (s, 4H), 7.28 (d, *J* = 9.2 Hz, 1H), 6.74 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.56 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 139.32, 133.67, 132.25, 129.32, 128.28, 123.13, 121.62, 120.43, 119.16, 114.36, 74.52.



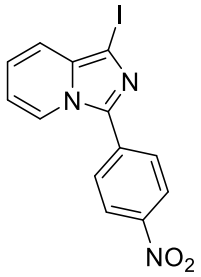
1-iodo-3-(2-nitrophenyl)imidazo[1,5-a]pyridine (3bk):

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 2-nitrobenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (262.8 mg, 90%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 158-161 °C; IR (KBr) 3095, 1612, 1516, 1340, 1257, 1137, 1002, 945, 854, 786, 744, 698 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ: 8.10 (t, *J* = 8.8 Hz, 1H), 7.72-7.55 (m, 3H), 7.44 (d, *J* = 7.2 Hz, 1H), 7.30 (t, *J* = 9.1 Hz, 1H), 6.78 (t, *J* = 7.2 Hz, 1H), 6.54 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 148.25, 135.61, 133.80, 133.57, 133.52, 130.80, 125.18, 124.10, 121.51, 120.87, 118.90, 114.41, 73.66; HRMS(ESI): calculated for $C_{13}H_9IN_3O_2^+$ $[M+H]^+$: 365.9734, found: 365.9730.



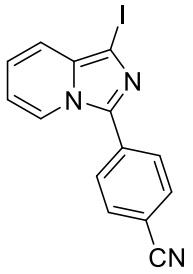
1-iodo-3-(3-nitrophenyl)imidazo[1,5-a]pyridine (3bl):

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 3-nitrobenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (277.4 mg, 95%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 200-202 °C; IR (KBr) 3086, 1637, 1539, 1350, 1263, 1076, 1020, 896, 742, 682 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ: 8.58 (s, 1H), 8.20 (d, *J* = 8.6 Hz, 2H), 8.10 (d, *J* = 7.8 Hz, 1H), 7.64 (t, *J* = 8.0 Hz, 1H), 7.37 (d, *J* = 9.2 Hz, 1H), 6.84 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.69 (t, *J* = 6.9 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 148.60, 137.80, 134.23, 133.72, 131.06, 130.25, 123.42, 121.95, 121.36, 121.03, 119.38, 115.14, 75.30; HRMS(ESI): calculated for $C_{13}H_9IN_3O_2^+$ $[M+H]^+$: 365.9734, found: 365.9733.



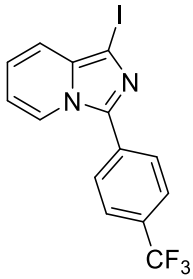
1-iodo-3-(4-nitrophenyl)imidazo[1,5-a]pyridine (3bm):

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 4-nitrobenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (286.2 mg, 98%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 129-130 °C; IR (KBr) 3084, 1705, 1595, 1344, 1244, 1103, 1108, 1006, 854, 812, 738, 692 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ: 8.23 (s, 3H), 7.88 (d, *J* = 8.6 Hz, 2H), 7.33 (d, *J* = 8.8 Hz, 1H), 6.84 (t, *J* = 7.6 Hz, 1H), 6.69 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 147.19, 137.97, 135.30, 134.67, 127.78, 124.38, 121.73, 121.47, 119.39, 115.38, 76.30; HRMS(ESI): calculated for $C_{13}H_9IN_3O_2^+$ $[M+H]^+$: 365.9734, found: 365.9737.



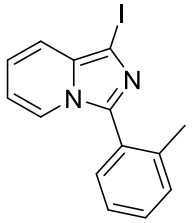
4-(1-iodoimidazo[1,5-a]pyridin-3-yl)benzonitrile (3bn):

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 4-formylbenzonitrile (1.6 mmol, 2 eq.), following the general procedure B, the title compound (262.2 mg, 95%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 167-169 °C; IR (KBr) 2221, 1606, 1494, 1359, 1263, 1120, 1010, 844, 740, 682 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.27 (d, *J* = 7.2 Hz, 1H), 7.91 (d, *J* = 8.0 Hz, 2H), 7.77 (d, *J* = 8.0 Hz, 2H), 7.41 (d, *J* = 9.1 Hz, 1H), 6.90 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.74 (t, *J* = 6.8, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 138.25, 134.40, 133.51, 132.79, 127.76, 121.66, 121.24, 119.33, 118.49, 115.14, 111.93, 75.86; HRMS(ESI): calculated for $C_{14}H_9IN_3^+$ $[M+H]^+$: 345.9836, found: 345.9837.



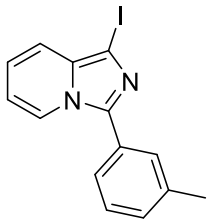
1-iodo-3-(4-(trifluoromethyl)phenyl)imidazo[1,5-a]pyridine (3bo)[4]:

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 4-(trifluoromethyl)benzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (304.2 mg, 98%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.09 (d, *J* = 7.3 Hz, 1H), 7.75 (d, *J* = 8.2 Hz, 2H), 7.61 (d, *J* = 8.2 Hz, 2H), 7.23 (d, *J* = 9.2 Hz, 1H), 6.71 (dd, *J* = 9.3, 6.4 Hz, 1H), 6.54 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 138.74, 133.98, 132.72, 130.48 (d, *J* = 32.6 Hz), 127.80, 125.94 (q, *J* = 3.8 Hz), 123.90 (d, *J* = 272.3 Hz), 121.56, 120.83, 119.10, 114.71, 75.11; ^{19}F NMR (376 MHz, $CDCl_3$) δ: -62.61.



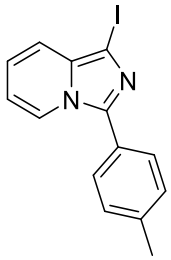
1-iodo-3-(2-methylphenyl)imidazo[1,5-a]pyridine (3bp)[4]:

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 2-methylbenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (197.7 mg, 74%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.59 (d, *J* = 7.2 Hz, 1H), 7.48-7.21 (m, 5H), 6.78 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.54 (t, *J* = 6.7 Hz, 1H), 2.20 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 140.05, 138.34, 132.53, 130.86, 130.48, 129.80, 128.46, 126.09, 121.94, 120.10, 118.67, 113.58, 72.89, 19.78.



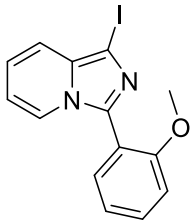
1-iodo-3-(3-methylphenyl)imidazo[1,5-a]pyridine (3bq):

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 3-methylbenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (211.1 mg, 79%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 91-94 °C; IR (KBr) 2922, 1604, 1506, 1469, 1352, 1307, 1257, 1018, 948, 802, 751, 704 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.17 (d, *J* = 7.2 Hz, 1H), 7.57 (s, 1H), 7.51 (d, *J* = 7.7 Hz, 1H), 7.36 (t, *J* = 7.7 Hz, 1H), 7.30 (d, *J* = 9.2 Hz, 1H), 7.22 (d, *J* = 7.6 Hz, 1H), 6.74 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.54 (t, *J* = 6.8 Hz, 1H), 2.41 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 140.59, 138.91, 133.30, 129.86, 129.21, 128.82, 128.79, 124.63, 121.90, 120.18, 118.86, 113.88, 74.08, 21.52; HRMS(ESI): calculated for $C_{14}H_{12}IN_2^+$ $[M+H]^+$: 335.0040, found: 335.0037.



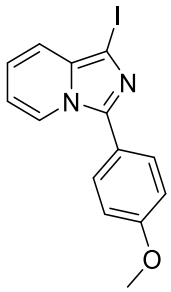
1-iodo-3-(4-methylphenyl)imidazo[1,5-a]pyridine (3br)[4]:

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 4-methylbenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (219.1 mg, 82%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.20 (d, *J* = 7.2 Hz, 1H), 7.66 (d, *J* = 6.4 Hz, 2H), 7.46-7.30 (m, 3H), 6.79 (dd, *J* = 9.1, 6.3 Hz,1H), 6.59 (t, *J* = 6.8 Hz, 1H), 2.44 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 140.66, 139.14, 133.24, 129.69, 127.91, 126.50, 121.90, 120.03, 118.98, 113.77, 73.89, 21.45.



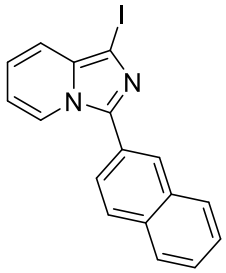
1-iodo-3-(2-methoxyphenyl)imidazo[1,5-a]pyridine (3bs)[4]:

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 2-methoxybenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (196.0 mg, 70%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.58-7.45 (m, 2H), 7.39 (t, *J* = 7.9 Hz, 1H), 7.28 (d, *J* = 9.1 Hz, 1H), 7.02 (t, *J* = 7.5 Hz, 1H), 6.95 (d, *J* = 8.3 Hz, 1H), 6.73 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.48 (t, *J* = 6.8 Hz, 1H), 3.72 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 157.15, 138.47, 133.23, 132.74, 131.09, 123.71, 121.20, 119.97, 118.39, 112.66, 111.14, 73.09, 55.57.



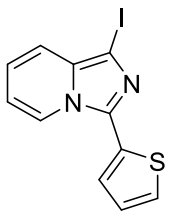
1-iodo-3-(4-methoxyphenyl)imidazo[1,5-a]pyridine (3bt)[4]:

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 4-methoxybenzaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (210.0 mg, 75%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.03 (d, *J* = 7.2 Hz, 1H), 7.62-7.51 (m, 2H), 7.21 (d, *J* = 9.2 Hz, 1H), 6.95-6.90 (m, 2H), 6.66 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.47 (t, *J* = 6.8 Hz, 1H), 3.76 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 160.21, 140.49, 133.08, 130.05, 129.49, 121.81, 121.74, 119.98, 118.94, 114.47, 114.23, 113.78, 73.52, 55.44.



1-iodo-3-(naphthalen-2-yl)imidazo[1,5-a]pyridine (3bu):

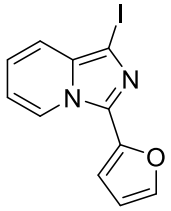
From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and 2-naphthaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (233.8 mg, 79%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 120-121 °C; IR (KBr) 3055, 1628, 1598, 1498, 1438, 1363, 1265, 1199, 1112, 1008, 954, 860, 825, 744, 684 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.21 (d, *J* = 7.2 Hz, 1H), 8.10 (s, 1H), 7.85 (d, *J* = 8.5 Hz, 1H), 7.81-7.73 (m, 3H), 7.46-7.36 (m, 2H), 7.27 (d, *J* = 9.2 Hz, 1H), 6.70 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.51 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 140.48, 133.58, 133.29, 133.24, 128.87, 128.30, 127.86, 126.95, 126.88, 126.78, 126.70, 125.43, 121.90, 120.38, 119.08, 114.15, 74.50; HRMS(ESI): calculated for $C_{17}H_{12}IN_2^+$ $[M+H]^+$: 371.0040, found: 371.0035.



1-iodo-3-(thiophen-2-yl)imidazo[1,5-a]pyridine (3bv)[5]:

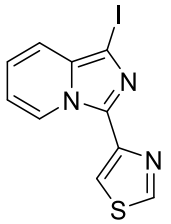
From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and thiophene-2-carbaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (200.8 mg, 77%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.21 (d, *J* = 7.2 Hz, 1H), 7.44 (d, *J* = 3.7 Hz, 1H), 7.35 (d, *J* = 5.1 Hz, 1H), 7.29 (d, *J*

= 9.2 Hz, 1H), 7.10 (dd, *J* = 5.1, 3.6 Hz, 1H), 6.75 (dd, *J* = 9.1, 6.4 Hz, 1H), 6.62 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 135.20, 133.55, 131.18, 127.63, 126.45, 125.39, 122.14, 120.24, 119.08, 114.52, 74.41.



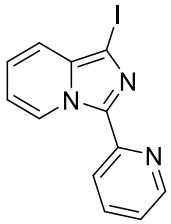
3-(furan-2-yl)-1-iodoimidazo[1,5-a]pyridine (3bw)[4]:

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and furan-2-carbaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (186.0 mg, 75%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.33 (d, *J* = 7.2 Hz, 1H), 7.55 (d, *J* = 3.7 Hz, 1H), 7.46 (d, *J* = 5.1 Hz, 1H), 7.40 (d, *J* = 9.2 Hz, 1H), 7.20 (dd, *J* = 5.1, 3.7 Hz, 1H), 6.86 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.73 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 147.19, 137.97, 135.30, 134.67, 127.78, 124.38, 121.73, 121.47, 119.39, 115.38, 76.30.



4-(1-iodoimidazo[1,5-a]pyridin-3-yl)thiazole (3bx):

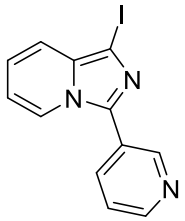
From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and thiazole-4-carbaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (211.9 mg, 81%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 117-119 °C; IR (KBr) 3074, 1625, 1500, 1452, 1342, 1303, 1257, 1103, 995, 956, 883, 813, 740, 686 cm^{-1}; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 9.44 (d, J = 7.3 Hz, 1H), 8.93 (d, J = 2.2 Hz, 1H), 8.12 (d, J = 2.2 Hz, 1H), 7.37 (d, J = 9.2 Hz, 1H), 6.87 (dd, J = 9.2, 6.5 Hz, 1H), 6.71 (t, J = 6.9 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 152.73, 147.41, 135.28, 133.30, 125.27, 120.74, 118.33, 116.23, 113.99, 74.18; HRMS(ESI): calculated for $C_{10}H_7IN_3S^+$ $[M+H]^+$: 327.9400, found: 327.9398.



1-iodo-3-(pyridin-2-yl)imidazo[1,5-a]pyridine (3by)[4]:

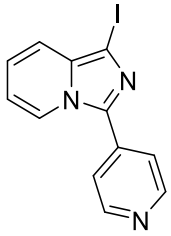
From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and picolinaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (215.7 mg, 84%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 9.77 (d, *J* = 7.3 Hz, 1H), 8.46 (s, 1H), 8.19 (d, *J* = 8.1 Hz, 1H), 7.62 (t, *J* = 7.6 Hz, 1H), 7.25 (d, *J* = 9.1 Hz, 1H), 7.05 (t, *J* = 6.2 Hz, 1H), 6.77 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.60 (t, *J* = 6.9 Hz, 1H); ^{13}C

NMR (101 MHz, $CDCl_3$) δ: 150.16, 148.08, 137.69, 136.50, 134.52, 126.49, 121.92, 121.85, 121.46, 118.15, 114.28, 75.02.



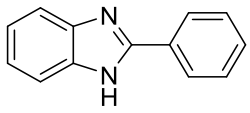
1-iodo-3-(pyridin-3-yl)imidazo[1,5-a]pyridine (3bz):

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and nicotinaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (202.9 mg, 79%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 102-104 °C; IR (KBr) 3037, 1629, 1585, 1494, 1406, 1363, 1263, 1172, 1099, 999, 941, 812, 744, 707, 678 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ: 8.94 (s, 1H), 8.56 (d, *J* = 4.9 Hz, 1H), 8.10 (d, *J* = 7.2 Hz, 1H), 7.99 (dt, *J* = 7.9, 2.0 Hz, 1H), 7.35 (dd, *J* = 8.0, 4.9 Hz, 1H), 7.27 (d, *J* = 9.2 Hz, 1H), 6.75 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.58 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 149.78, 148.30, 137.29, 135.30, 133.91, 125.77, 123.84, 121.41, 120.78, 119.12, 114.71, 74.99; HRMS(ESI): calculated for $C_{12}H_9IN_3^+$ $[M+H]^+$: 321.9836, found: 321.9837.



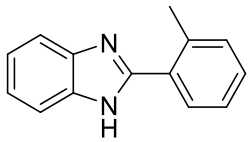
1-iodo-3-(pyridin-4-yl)imidazo[1,5-a]pyridine (3bba):

From 2-pyridinemethanamine (0.8 mmol, 1 eq.) and isonicotinaldehyde (1.6 mmol, 2 eq.), following the general procedure B, the title compound (210.6 mg, 82%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 15:1 – 3:1). m.p.: 161-163 °C; IR (KBr) 3032, 1591, 1493, 1446, 1409, 1357, 1245, 1141, 985, 947, 833, 742, 676 cm^{-1}; ^1H NMR (400 MHz, $CDCl_3$) δ: 8.66 (s, 2H), 8.26 (d, *J* = 7.2 Hz, 1H), 7.64 (d, *J* = 4.4 Hz, 2H), 7.35 (d, *J* = 9.2 Hz, 1H), 6.83 (dd, *J* = 9.2, 6.4 Hz, 1H), 6.68 (t, *J* = 6.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 150.57, 137.49, 136.62, 134.60, 121.83, 121.23, 121.18, 119.39, 115.14, 75.95; HRMS(ESI): calculated for $C_{12}H_9IN_3^+$ $[M+H]^+$: 321.9836, found: 321.9834.



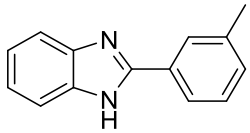
2-phenyl-1H-benzo[d]imidazole (3c)[5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and benzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (174.6 mg, 90%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^1H NMR (400 MHz, DMSO-d_6) δ: 8.28 (d, *J* = 7.6 Hz, 2H), 7.7-7.62 (m, 2H), 7.61-7.45 (m, 3H), 7.29-7.18 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 151.81, 139.96, 130.70, 130.30, 129.41, 129.22, 126.99, 122.63, 115.60.



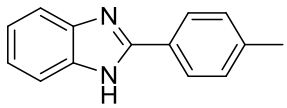
2-(o-tolyl)-1H-benzo[d]imidazole (3cb)[5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 2-methylbenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (174.7 mg, 84%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 7.82-7.73 (m, 1H), 7.63 (s, 2H), 7.39 (s, 3H), 7.22 (s, 2H), 2.62 (s, 3H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 152.41, 137.49, 131.72, 130.53, 129.92, 129.78, 126.42, 122.35, 21.50.



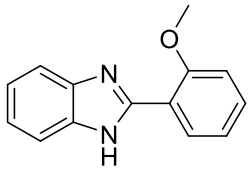
2-(m-tolyl)-1H-benzo[d]imidazole (3cc) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 3-methylbenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (178.9 mg, 86%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.04 (s, 1H), 7.99 (d, *J* = 7.7 Hz, 1H), 7.71-7.54 (m, 2H), 7.45 (t, *J* = 7.6 Hz, 1H), 7.33 (d, *J* = 7.6 Hz, 1H), 7.28-7.16 (m, 2H), 2.42 (s, 3H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 151.63, 138.69, 131.18, 130.09, 129.36, 127.57, 124.17, 122.76, 115.46, 21.51.



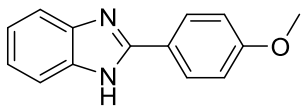
2-(p-tolyl)-1H-benzo[d]imidazole (3cd) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 4-methylbenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (185.1 mg, 89%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.10 (d, *J* = 7.8 Hz, 2H), 7.61 (dd, *J* = 6.1, 3.1 Hz, 2H), 7.36 (d, *J* = 7.9 Hz, 2H), 7.27-7.15 (m, 2H), 2.37 (s, 3H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 151.81, 140.14, 139.64, 129.98, 129.81, 127.72, 126.92, 122.53, 115.39, 21.43.



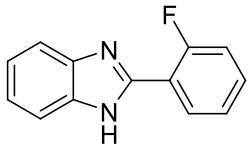
2-(2-methoxyphenyl)-1H-benzo[d]imidazole (3ce) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 2-methoxybenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (185.9 mg, 83%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.34 (dd, *J* = 7.7, 1.8 Hz, 1H), 7.64 (dd, *J* = 6.0, 3.2 Hz, 2H), 7.54-7.44 (m, 1H), 7.29-7.17 (m, 3H), 7.13 (t, *J* = 7.5 Hz, 1H), 4.03 (s, 3H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 157.25, 149.36, 131.81, 130.21, 122.35, 121.35, 118.41, 112.57, 56.23.



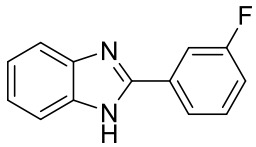
2-(4-methoxyphenyl)-1H-benzo[d]imidazole (3cf) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 4-methoxybenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (194.9 mg, 87%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.17 (d, *J* = 8.9 Hz, 2H), 7.59 (dd, *J* = 6.0, 3.2 Hz, 2H), 7.19 (dd, *J* = 6.0, 3.2 Hz, 2H), 7.12 (d, *J* = 8.9 Hz, 2H), 3.83 (s, 3H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 161.13, 151.82, 139.82, 128.54, 123.06, 122.30, 115.18, 114.83, 55.76.



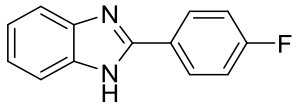
2-(2-fluorophenyl)-1H-benzo[d]imidazole (3cg) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 2-fluorobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (186.6 mg, 88%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.31 (t, *J* = 7.8 Hz, 1H), 7.78-7.63 (m, 2H), 7.58-7.49 (m, 1H), 7.47-7.35 (m, 2H), 7.26 (dd, *J* = 6.1, 3.2 Hz, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 159.98 (d, *J* = 249.9 Hz), 146.95, 132.24 (d, *J* = 8.6 Hz), 130.74, 130.71, 125.50 (d, *J* = 3.3 Hz), 122.80, 118.68, 118.57, 116.94 (d, *J* = 21.7 Hz); ^{19}F NMR (376 MHz, DMSO-d_6) δ: -114.57.



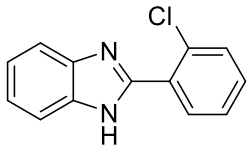
2-(3-fluorophenyl)-1H-benzo[d]imidazole (3ch) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 3-fluorobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (192.9 mg, 91%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.05 (d, *J* = 7.8 Hz, 1H), 8.02-7.93 (m, 1H), 7.77-7.55 (m, 3H), 7.38-7.30 (m, 1H), 7.24 (dd, *J* = 6.1, 3.1 Hz, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 162.93 (d, *J* = 243.6 Hz), 150.45, 150.42, 133.01, 132.93, 131.60 (d, *J* = 8.4 Hz), 122.99 (d, *J* = 2.9 Hz), 117.06 (d, *J* = 21.2 Hz), 113.61, 113.37; ^{19}F NMR (376 MHz, DMSO-d_6) δ: -112.39.



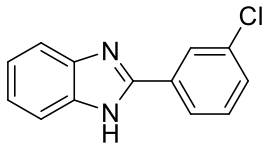
2-(4-fluorophenyl)-1H-benzo[d]imidazole (3ci) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 4-fluorobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (197.2 mg, 93%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.34-8.16 (m, 2H), 7.68-7.56 (m, 2H), 7.46-7.34 (m, 2H), 7.27-7.15 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 163.52 (d, *J* = 247.5 Hz), 150.90, 129.21 (d, *J* = 8.6 Hz), 127.29 (d, *J* = 3.0 Hz), 122.61, 116.40 (d, *J* = 21.9 Hz); ^{19}F NMR (376 MHz, DMSO-d_6) δ: -111.17.



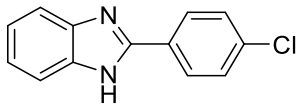
2-(2-chlorophenyl)-1H-benzo[d]imidazole (3cj) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 2-chlorobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (205.2 mg, 90%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 7.98-7.89 (m, 1H), 7.73-7.61 (m, 3H), 7.56-7.49 (m, 2H), 7.29-7.20 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 149.60, 132.56, 132.14, 131.64, 130.82, 130.46, 127.88, 122.70.



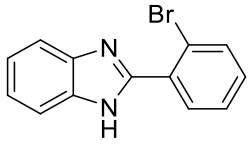
2-(3-chlorophenyl)-1H-benzo[d]imidazole (3ck) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 3-chlorobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (212.0 mg, 93%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.25 (s, 1H), 8.16 (d, *J* = 7.3 Hz, 1H), 7.69 (s, 1H), 7.63-7.52 (m, 3H), 7.23 (s, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 150.20, 134.25, 132.67, 131.40, 130.00, 126.50, 125.48, 119.54, 111.94.



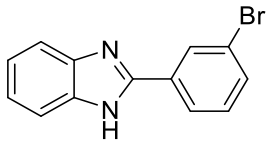
2-(4-chlorophenyl)-1H-benzo[d]imidazole (3cl) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 4-chlorobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (216.6 mg, 95%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.20 (d, *J* = 6.6 Hz, 2H), 7.69-7.56 (m, 4H), 7.27-7.16 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 150.63, 134.97, 133.01, 132.59, 132.48, 129.53, 129.51, 128.61, 122.78.



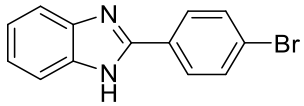
2-(2-bromophenyl)-1H-benzo[d]imidazole (3cm) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 2-bromobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (247.5 mg, 91%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 7.81 (t, *J* = 8.6 Hz, 2H), 7.73-7.59 (m, 2H), 7.55 (t, *J* = 7.5 Hz, 1H), 7.45 (t, *J* = 7.7 Hz, 1H), 7.36-7.11 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 150.93, 139.10, 133.88, 132.88, 132.75, 131.83, 128.25, 122.66, 122.07, 120.03, 115.83.



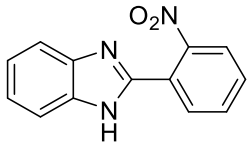
2-(3-bromophenyl)-1H-benzo[d]imidazole (3cn) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 3-bromobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (250.2 mg, 92%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.39 (t, *J* = 1.9 Hz, 1H), 8.20 (d, *J* = 7.8 Hz, 1H), 7.69 (d, *J* = 8.4 Hz, 2H), 7.60-7.45 (m, 2H), 7.28-7.18 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 150.09, 144.11, 135.48, 132.88, 131.63, 129.36, 125.84, 123.42, 122.74, 122.41, 119.55, 111.99.



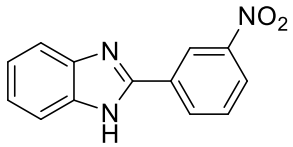
2-(4-bromophenyl)-1H-benzo[d]imidazole (3co) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 4-bromobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (261.1 mg, 96%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.13 (d, *J* = 7.5 Hz, 2H), 7.77 (d, *J* = 7.5 Hz, 2H), 7.61 (s, 2H), 7.27-7.16 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 150.68, 138.25, 132.98, 132.45, 129.86, 128.83, 123.72, 122.85, 122.76.



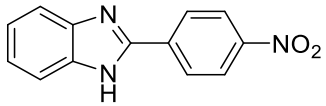
2-(2-nitrophenyl)-1H-benzo[d]imidazole (3cp) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 2-nitrobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (207.9 mg, 87%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.04 (d, *J* = 8.1 Hz, 1H), 7.99 (d, *J* = 7.7 Hz, 1H), 7.87 (t, *J* = 7.6 Hz, 1H), 7.76 (t, *J* = 7.8 Hz, 1H), 7.63 (d, *J* = 24.1 Hz, 2H), 7.26 (s, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 149.44, 147.78, 144.09, 137.37, 135.07, 133.10, 131.38, 124.76, 124.71, 123.54, 122.36, 119.65, 112.14.



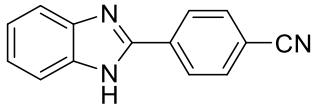
2-(3-nitrophenyl)-1H-benzo[d]imidazole (3cq) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 3-nitrobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (212.7 mg, 89%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.51-8.34 (m, 4H), 7.67 (s, 2H), 7.33-7.15 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 155.15, 149.46, 148.80, 148.28, 136.49, 131.29, 130.82, 129.73, 129.09, 127.86, 124.76, 123.46, 121.70.



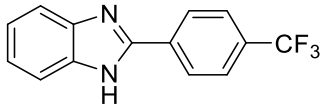
2-(4-nitrophenyl)-1H-benzo[d]imidazole (3cr) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 4-nitrobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (217.5 mg, 91%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.98 (s, 1H), 8.57 (d, *J* = 7.8 Hz, 1H), 8.25 (d, *J* = 8.3 Hz, 1H), 7.78 (t, *J* = 8.0 Hz, 1H), 7.63 (s, 2H), 7.25-7.20 (m, 2H).; ^{13}C NMR (101 MHz, DMSO-d_6) δ: 149.49, 148.71, 132.85, 132.15, 130.96, 124.51, 123.33, 121.24, 112.05.



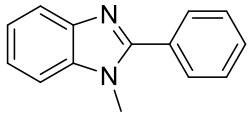
4-(1H-benzo[d]imidazol-2-yl)benzonitrile (3cs) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 4-formylbenzonitrile (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (210.2 mg, 96%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.34 (d, *J* = 7.6 Hz, 2H), 8.01 (d, *J* = 7.3 Hz, 2H), 7.65 (s, 2H), 7.32-7.20 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 149.83, 136.47, 134.71, 133.40, 133.24, 133.19, 130.27, 127.56, 127.43, 123.27, 119.08, 112.35.



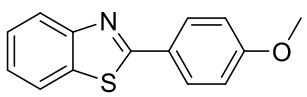
2-(4-(trifluoromethyl)phenyl)-1H-benzo[d]imidazole (3ct) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 4-(trifluoromethyl)benzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (256.7 mg, 98%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, DMSO-d_6) δ: 8.41 (d, *J* = 8.1 Hz, 2H), 7.93 (d, *J* = 8.2 Hz, 2H), 7.65 (s, 2H), 7.29-7.20 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ: 150.12, 141.52, 134.45, 134.44, 130.24, 130.14, 129.92, 129.61, 127.54, 126.40 (q, *J* = 3.8 Hz), 125.95, 123.25; ^{19}F NMR (376 MHz, DMSO-d_6) δ: -61.20.



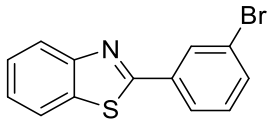
1-methyl-2-phenyl-1H-benzo[d]imidazole (3cu) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 4-(trifluoromethyl)benzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (187.2 mg, 90%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.98-7.79 (m, 1H), 7.79-7.64 (m, 2H), 7.54-7.41 (m, 3H), 7.37-7.24 (m, 3H), 3.75 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 153.71, 142.94, 136.58, 130.18, 129.71, 129.41, 128.67, 122.76, 122.41, 119.75, 109.71, 31.63.



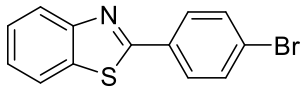
2-(4-methoxyphenyl)-benzothiazole (3cv) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 4-methoxybenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (163.9 mg, 68%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.06-7.82 (m, 3H), 7.75 (d, *J* = 8.0 Hz, 1H), 7.36 (t, *J* = 7.7 Hz, 1H), 7.23 (t, *J* = 7.6 Hz, 1H), 6.88 (d, *J* = 8.5 Hz, 2H), 3.74 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 167.92, 161.93, 154.22, 134.86, 129.13, 126.41, 126.24, 124.82, 122.83, 121.54, 114.38, 55.46.



2-(3-bromophenyl)-benzothiazole (3cw) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 3-bromobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (257.2 mg, 89%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.19 (s, 1H), 8.11 (d, *J* = 8.0 Hz, 1H), 8.05 (d, *J* = 8.1 Hz, 1H), 8.00 (d, *J* = 7.8 Hz, 1H), 7.73 (d, *J* = 8.1 Hz, 1H), 7.54 (t, *J* = 7.7 Hz, 1H), 7.47 (q, *J* = 7.9 Hz, 2H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 165.85, 153.79, 135.34, 135.08, 134.35, 131.92, 129.61, 127.23, 126.79, 126.29, 123.56, 123.00, 122.84.



2-(4-bromophenyl)-benzothiazole (3cx) [5]:

From benzene-1,2-diamine (1 mmol, 1 eq.) and 4-bromobenzaldehyde (1.75 mmol, 1.75 eq.), following the general procedure C, the title compound (262.9 mg, 91%) was obtained as a faint yellow solid. Rf = 0.3 (petroleum ether / ethyl acetate = 20:1 - 5:1). ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.09 (d, *J* = 8.1 Hz, 1H), 7.96 (d, *J* = 8.1 Hz, 2H), 7.91 (d, *J* = 8.1 Hz, 1H), 7.63 (d, *J* = 7.5 Hz, 2H), 7.56-7.47 (m, 1H), 7.42 (t, *J* = 7.6 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ: 166.70, 154.07, 135.04, 132.53, 132.24, 128.91, 126.53, 125.47, 125.44, 123.33, 121.69.

6. References

(1) (a) Li, M.; Xie, Y.; Ye, Y.; Zou, Y.; Jiang, H.; Zeng, W. Cu(I)-catalyzed transannulation of N-heteroaryl aldehydes or ketones with alkylamines via C(sp^3)-H amination. *Org. Lett.* **2014**, *16* (23), 6232-6235. (b) Li, Z.; Wu, S. S.; Luo, Z. G.; Liu, W. K.; Feng, C. T.; Ma, S. T. Copper-promoted double oxidative C-H amination cascade for the synthesis of imidazo[1,5-*a*]quinolines. *J. Org. Chem.* **2016**, *81* (10), 4386-4392. (c) Wang, H.; Xu, W.; Wang, Z.; Yu, L.; Xu, K. Copper-catalyzed oxidative amination of C(sp^3)-H bonds under air: synthesis of 1,3-diarylated imidazo[1,5-*a*]pyridines. *J. Org. Chem.* **2015**, *80* (4), 2431-2435. (d) Wang, H.; Xu, W.; Xin, L.; Liu, W.; Wang, Z.; Xu, K. Synthesis of 1,3-disubstituted imidazo[1,5-*a*]pyridines from amino acids via catalytic decarboxylative intramolecular cyclization. *J. Org. Chem.* **2016**, *81* (9), 3681-3687.

(2) (a) Yan, Y.; Zhang, Y.; Zha, Z.; Wang, Z. Mild metal-free sequential dual oxidative amination of C(sp^3)–H bonds: efficient synthesis of imidazo[1,5-*a*]pyridines. *Org. Lett.* **2013**, *15* (9), 2274–2277. (b) Kamal, A.; Ramakrishna, G.; Raju, P.; Rao, A. V. S.; Viswanath, A.; Nayak, V. L.; Ramakrishna, S. Synthesis and anticancer activity of oxindole derived imidazo[1,5-*a*]pyrazines. *Eur. J. Med. Chem.* **2011**, *46* (6), 2427-2435. (c) Shibahara, F.; Kitaga-wa, A.; Yamaguchi, E.; Murai, T. Synthesis of 2-azaindolizines by using an iodine-mediated oxidative desulfurization promoted cyclization of N-2-pyridylmethyl thioamides and an investigation of their photophysical properties. *Org. Lett.* **2006**, *8* (24), 5621-5624.

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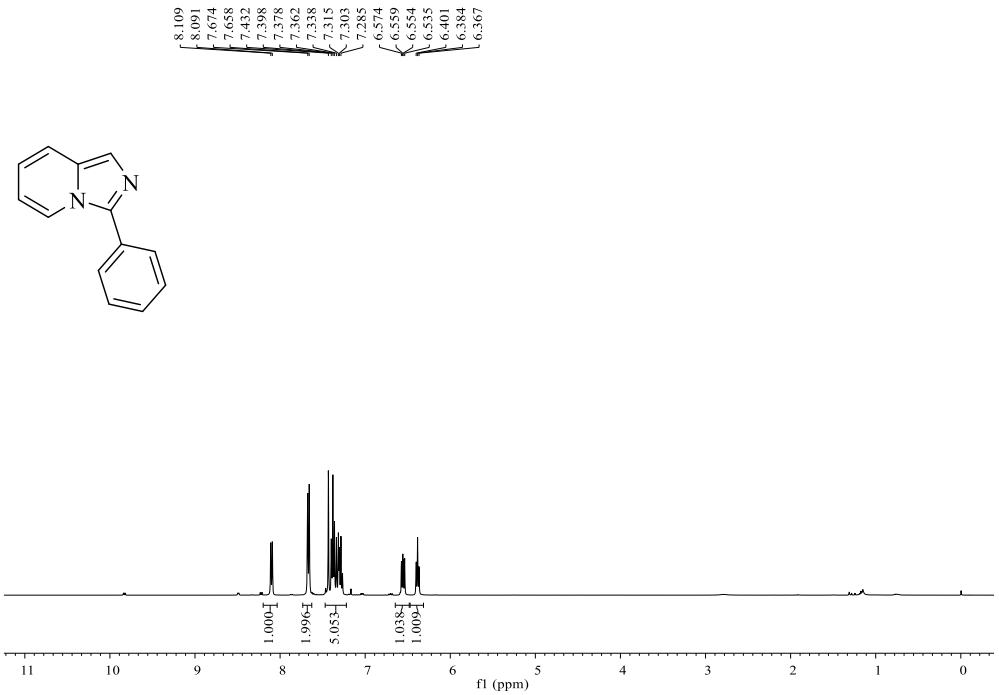
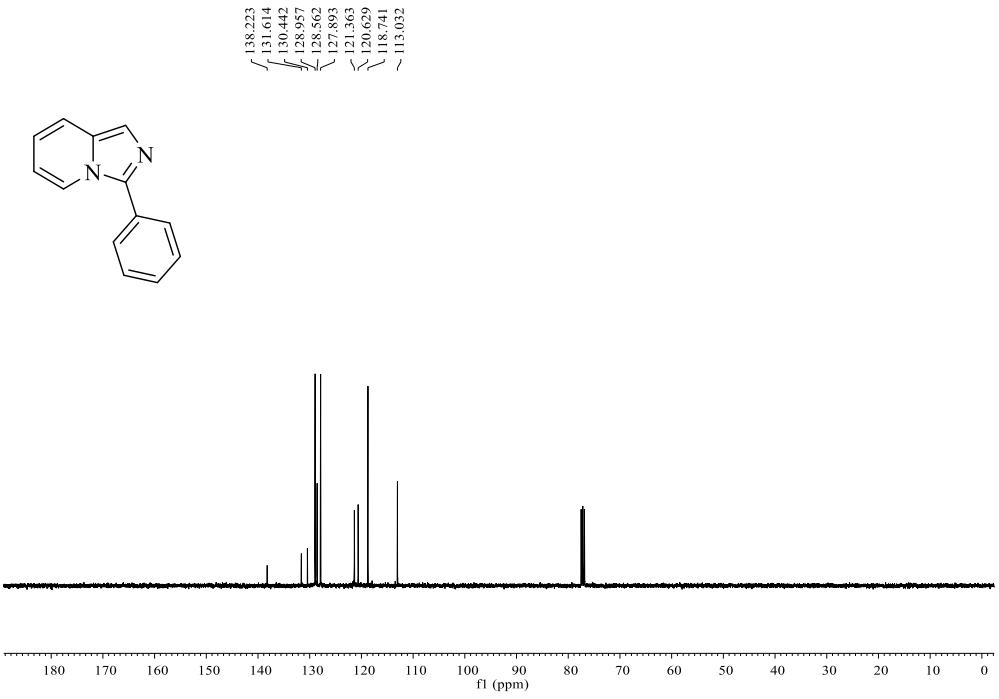
7. Copies of NMR Spectra for Compounds



^{1}H NMR Spectrum of **3a**



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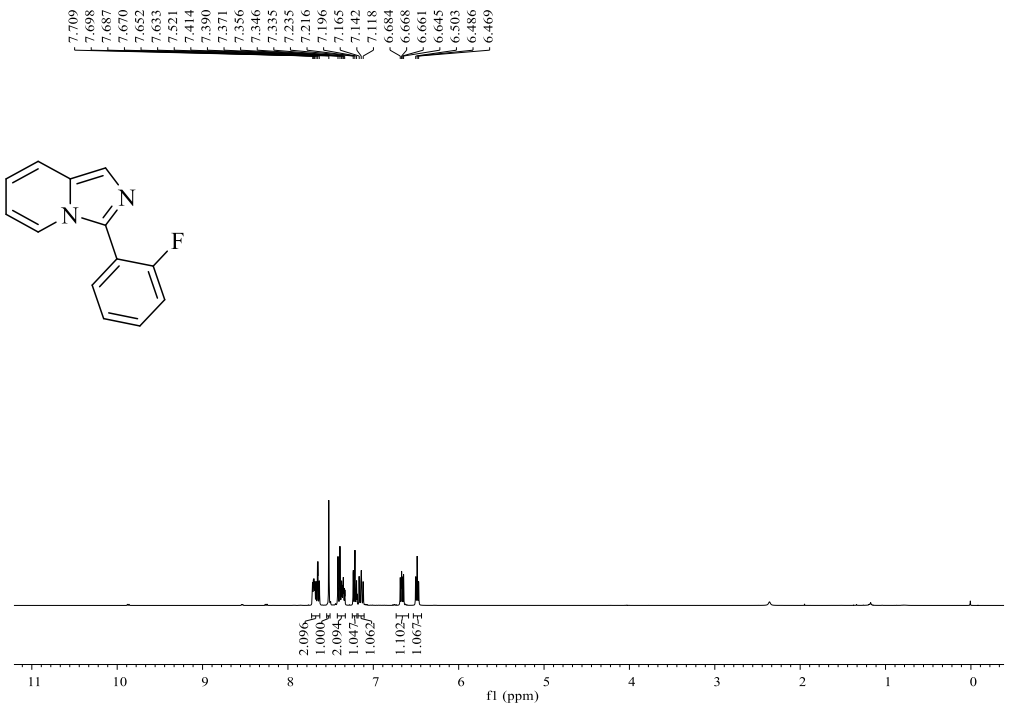
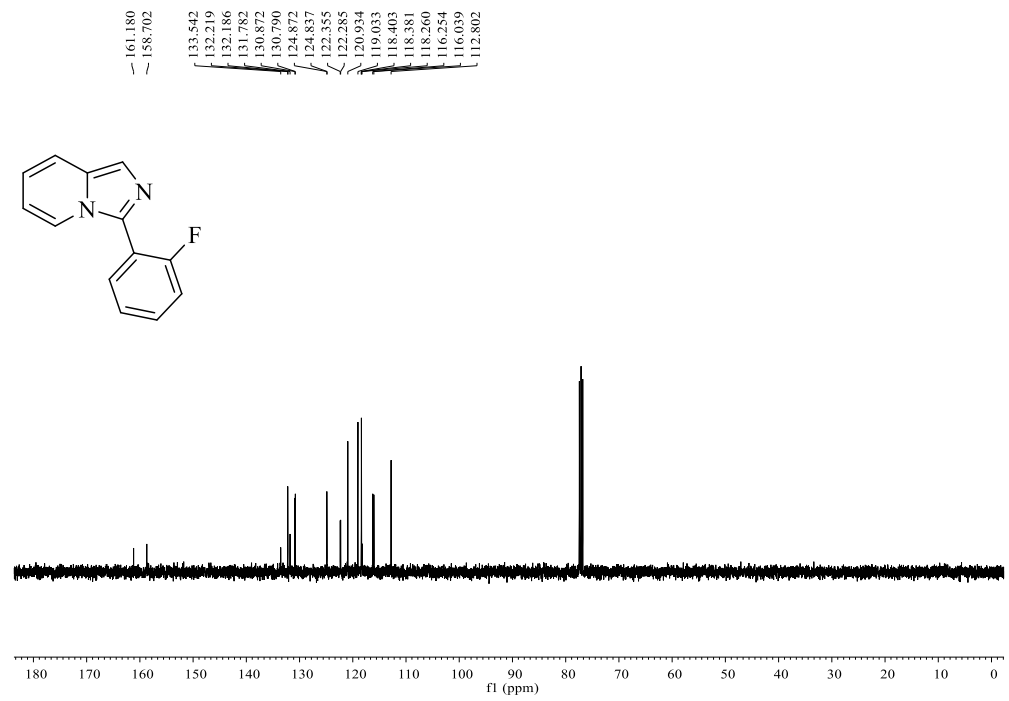


^{1}H NMR Spectrum of **3ab**



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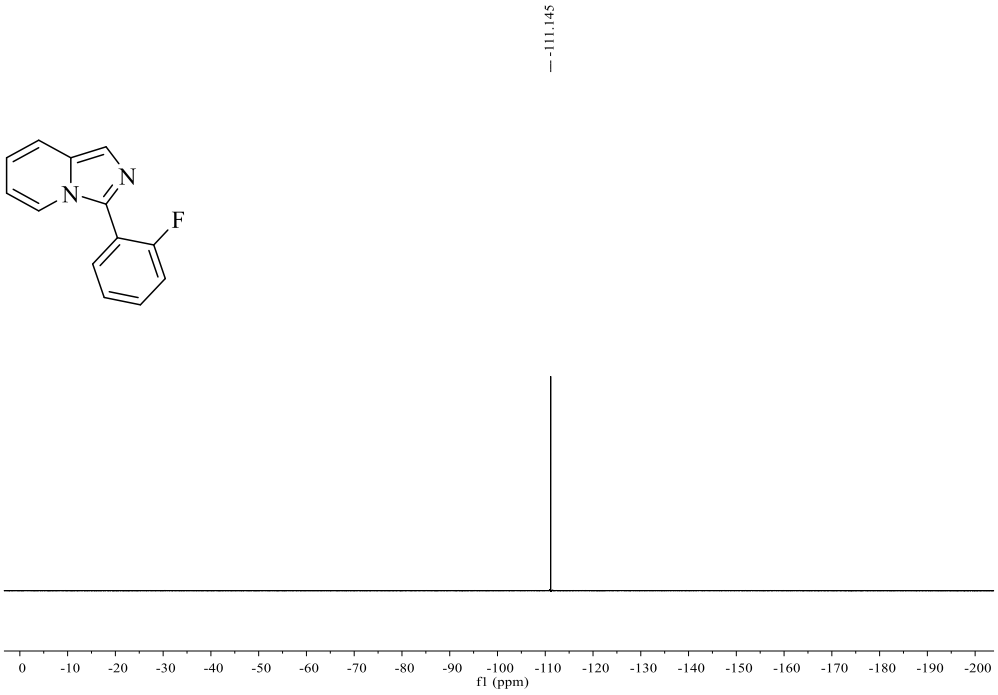
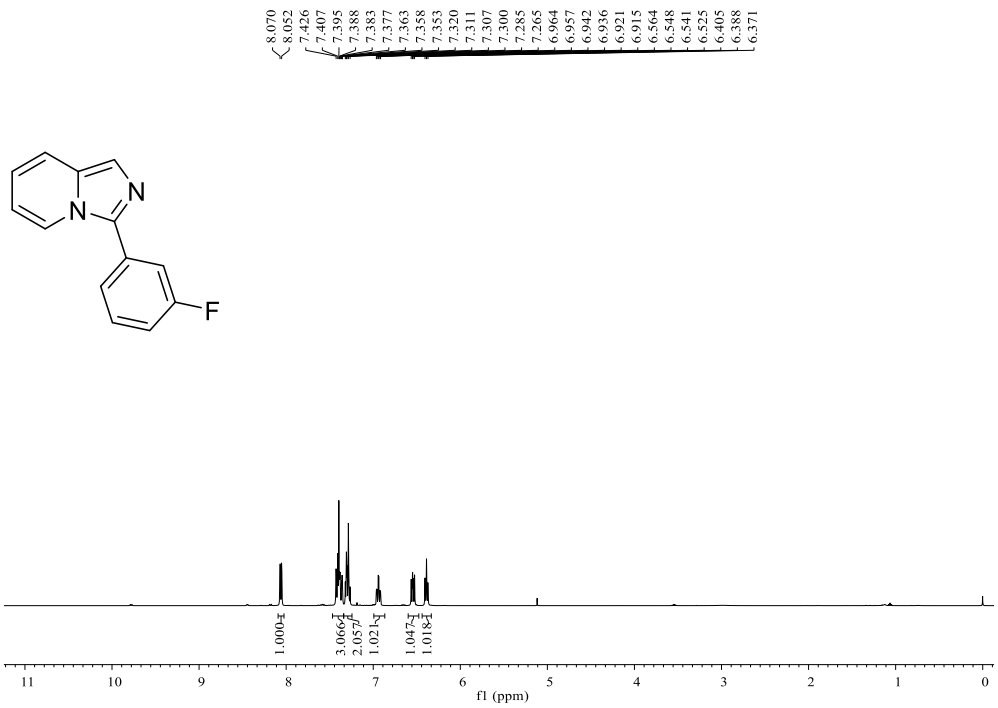
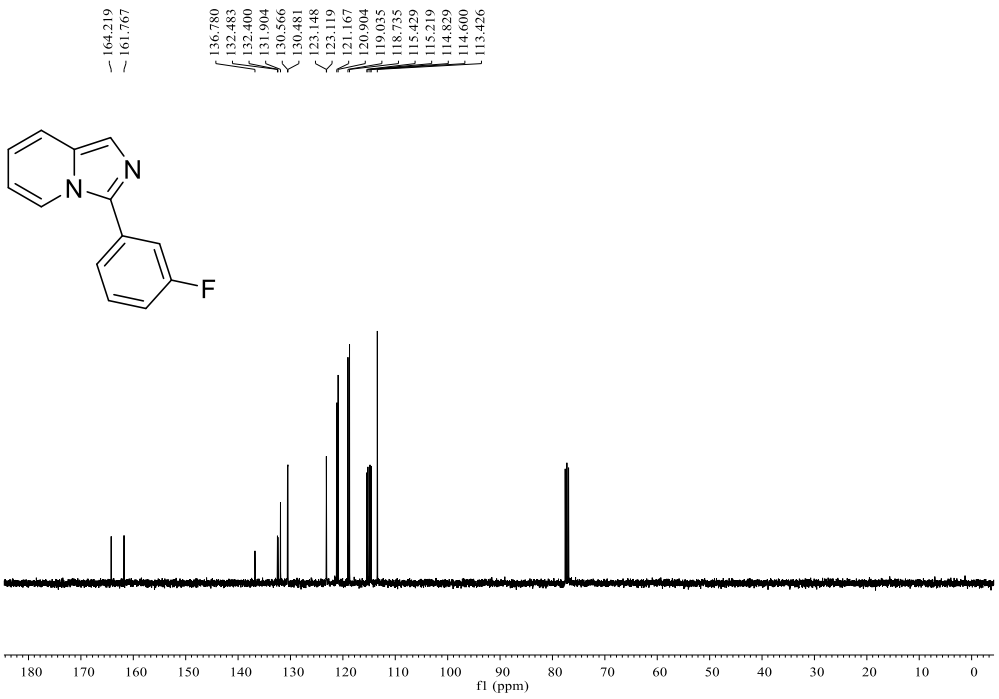


^{19}F NMR Spectrum of **3ab**



^{1}H NMR Spectrum of **3ac**



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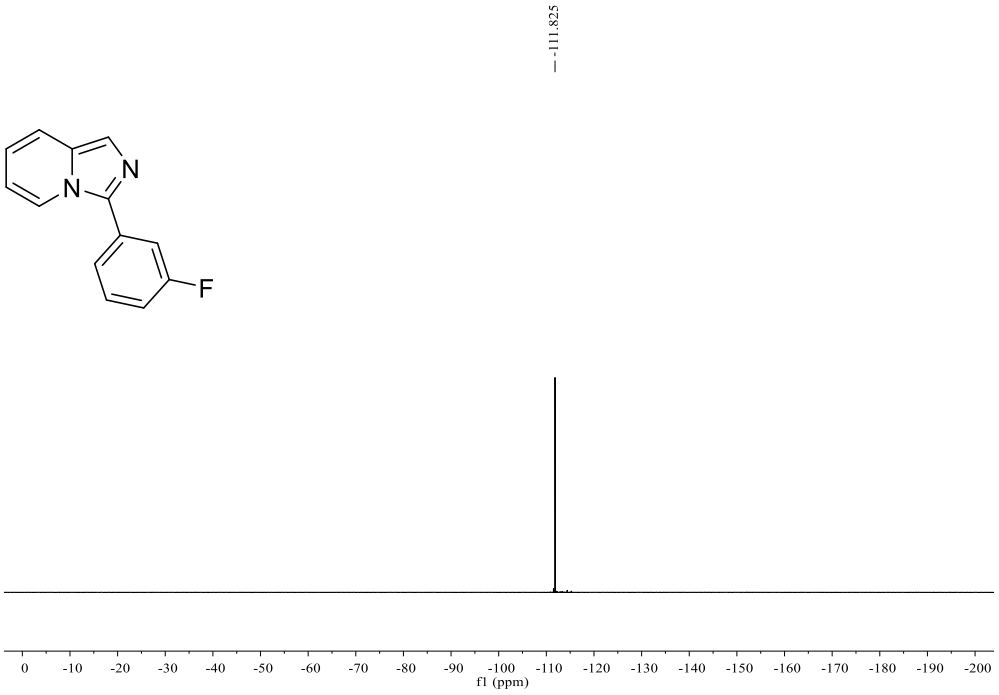

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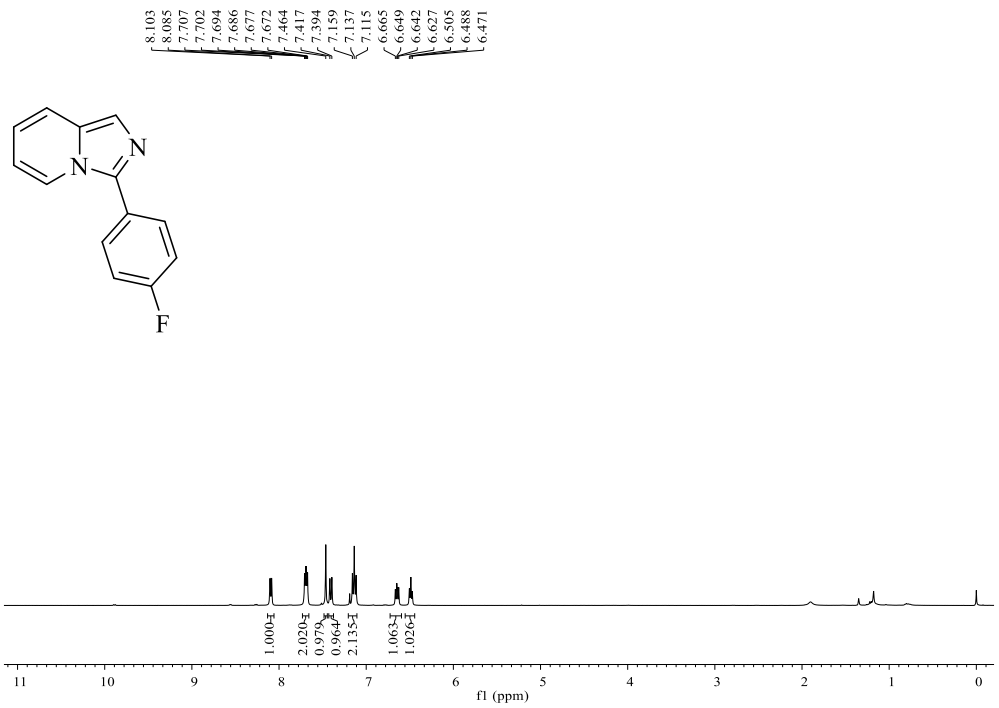
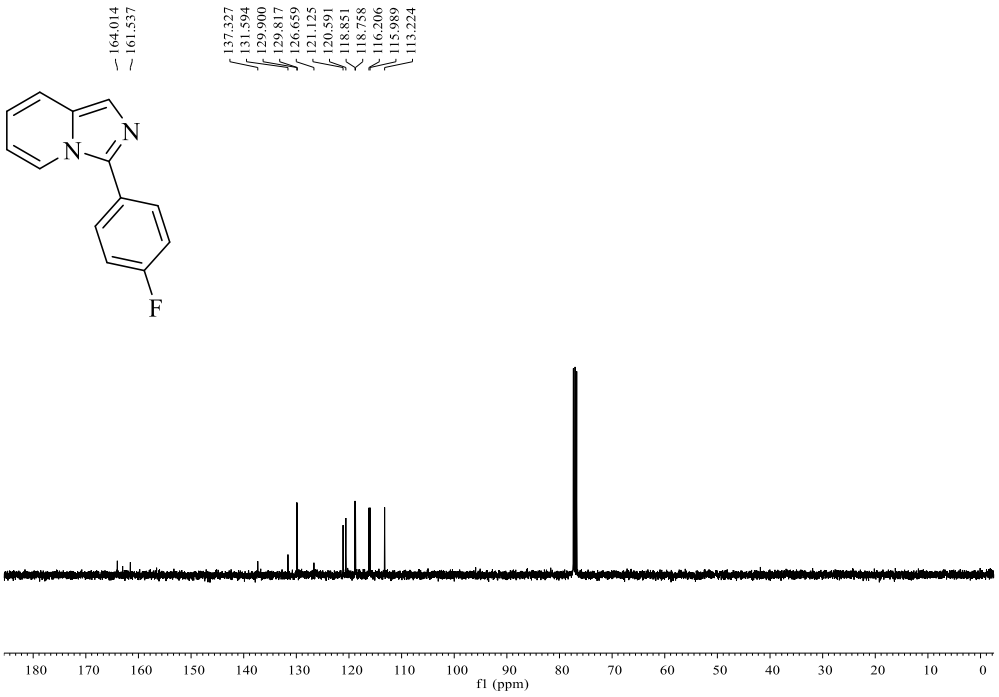


^{1}H NMR Spectrum of **3ad**



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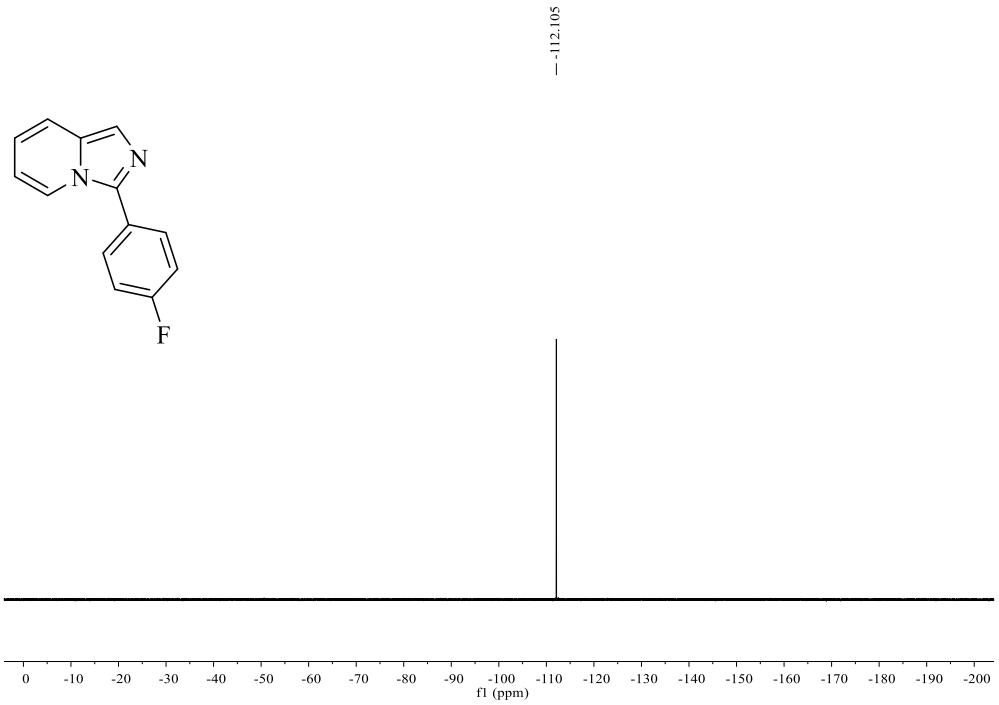

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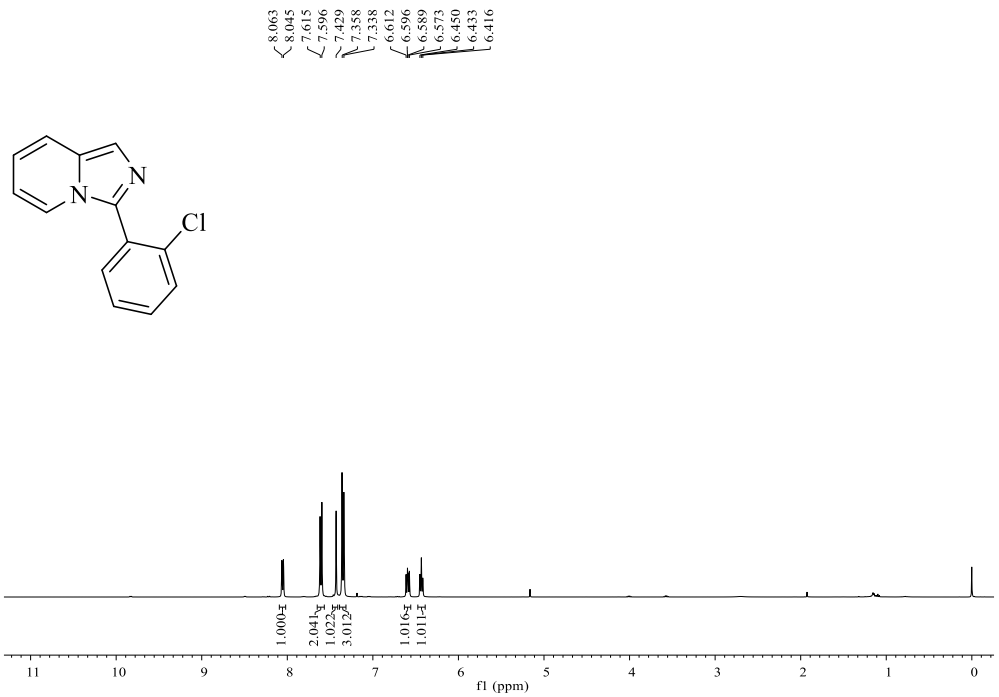
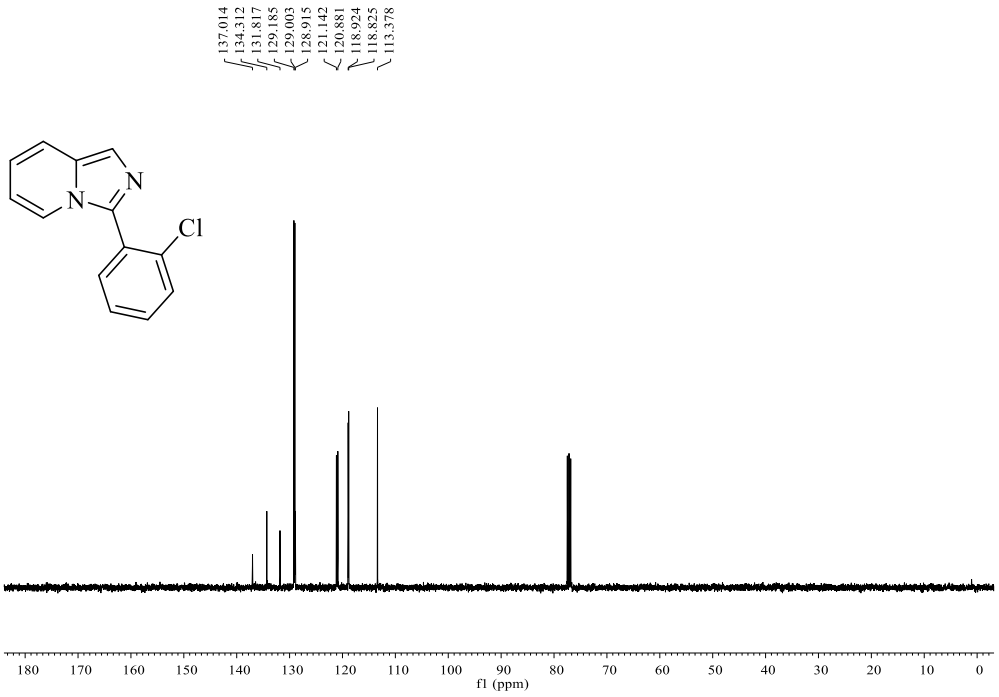


^{1}H NMR Spectrum of **3ae**



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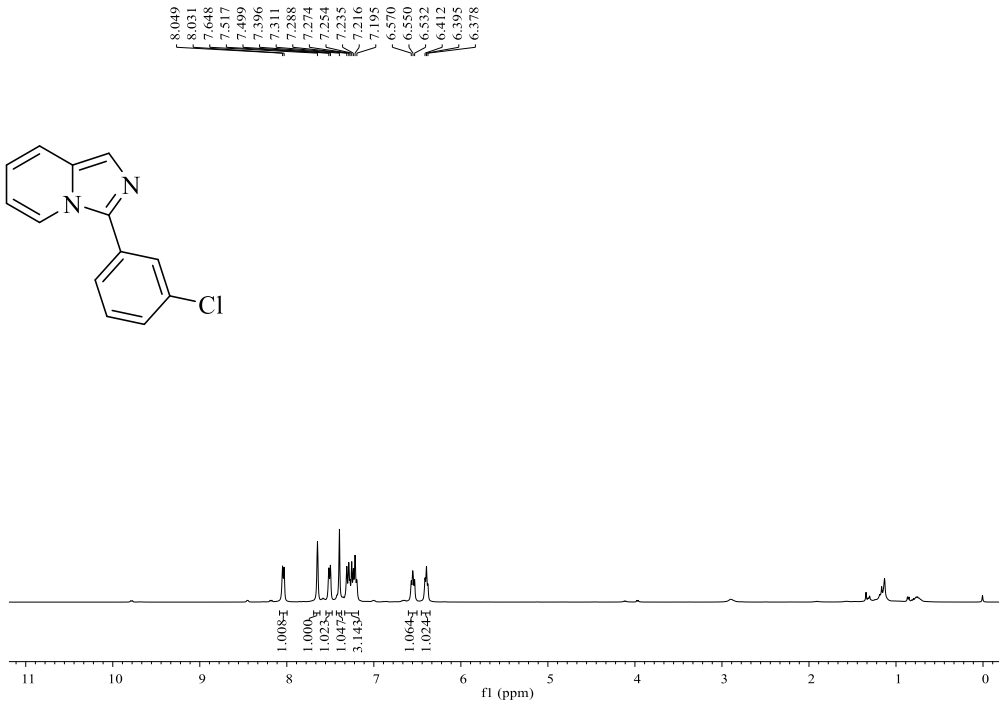
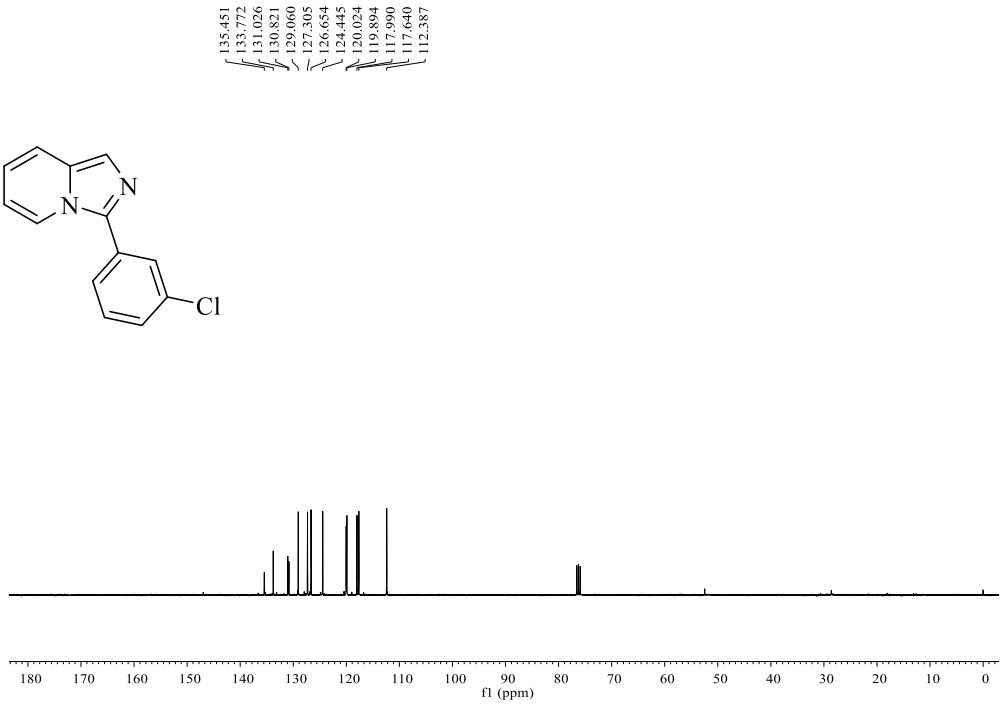
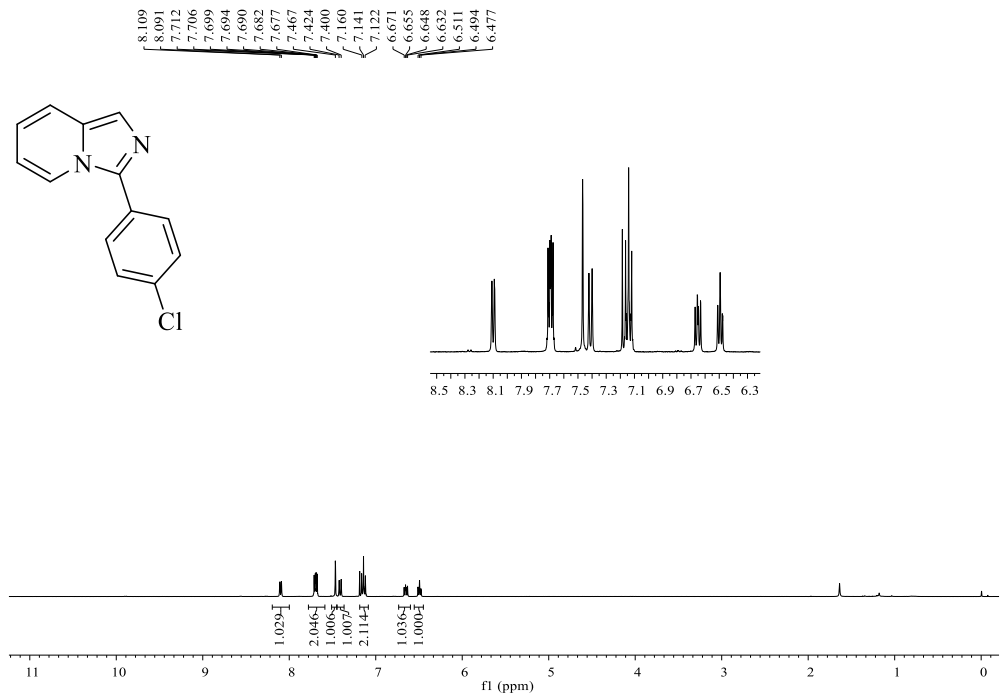


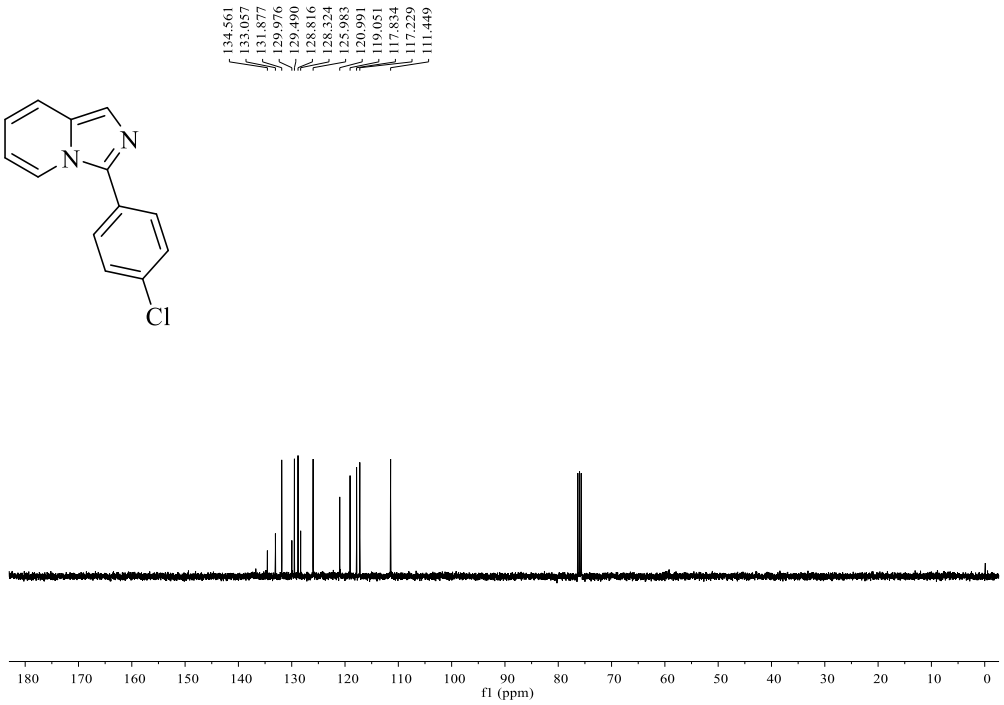
^{1}H NMR Spectrum of **3af**



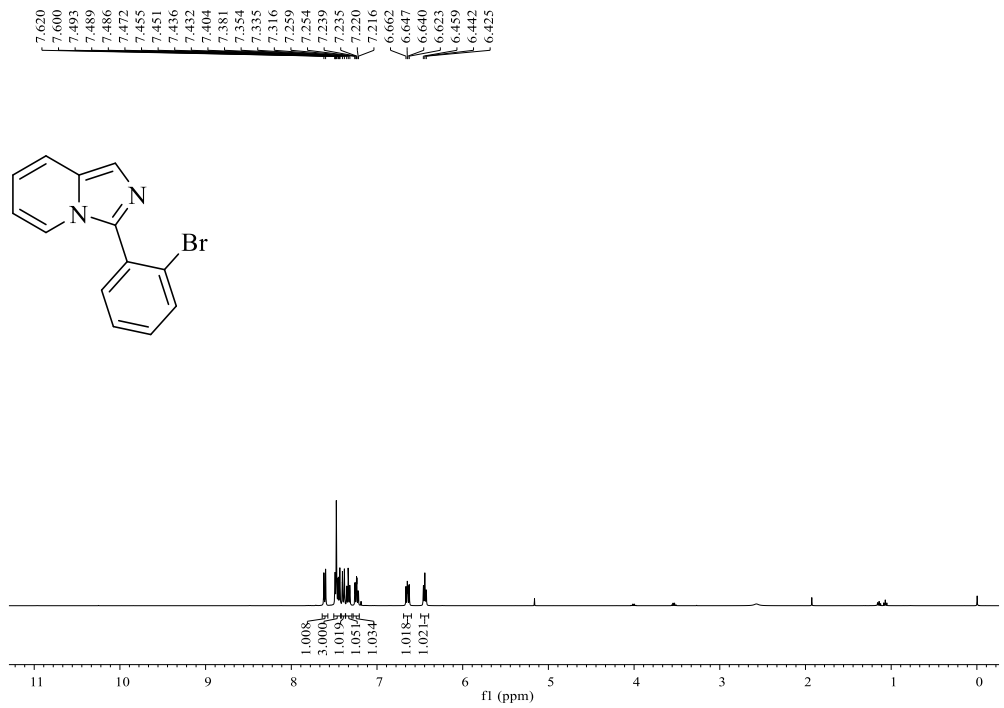
^{13}C NMR Spectrum of **3af**



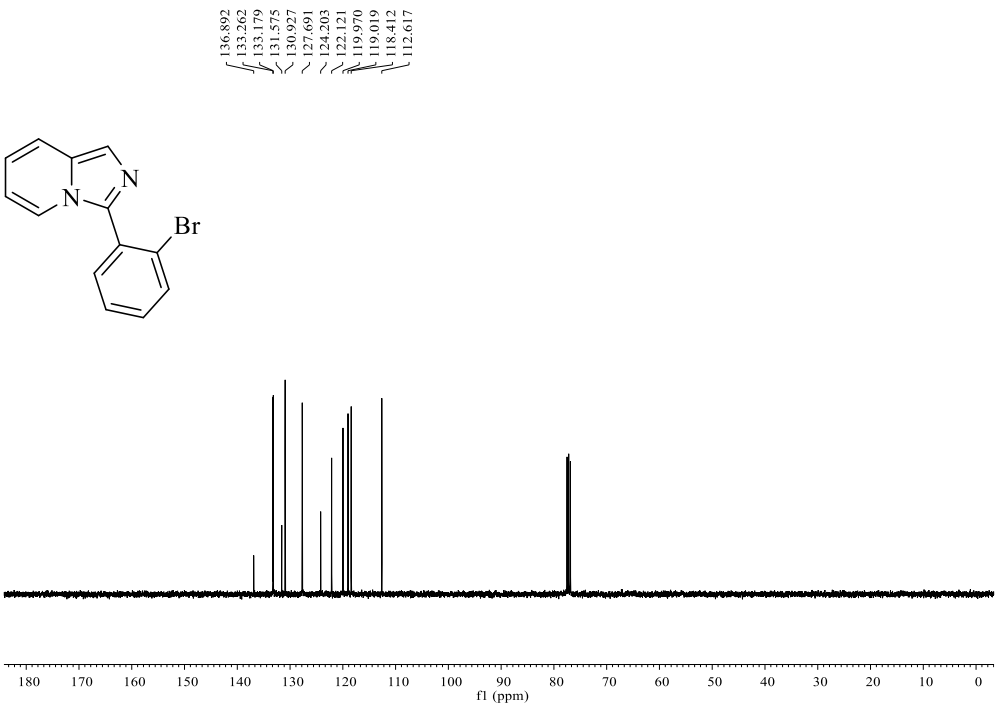
^{1}H NMR Spectrum of **3ag**



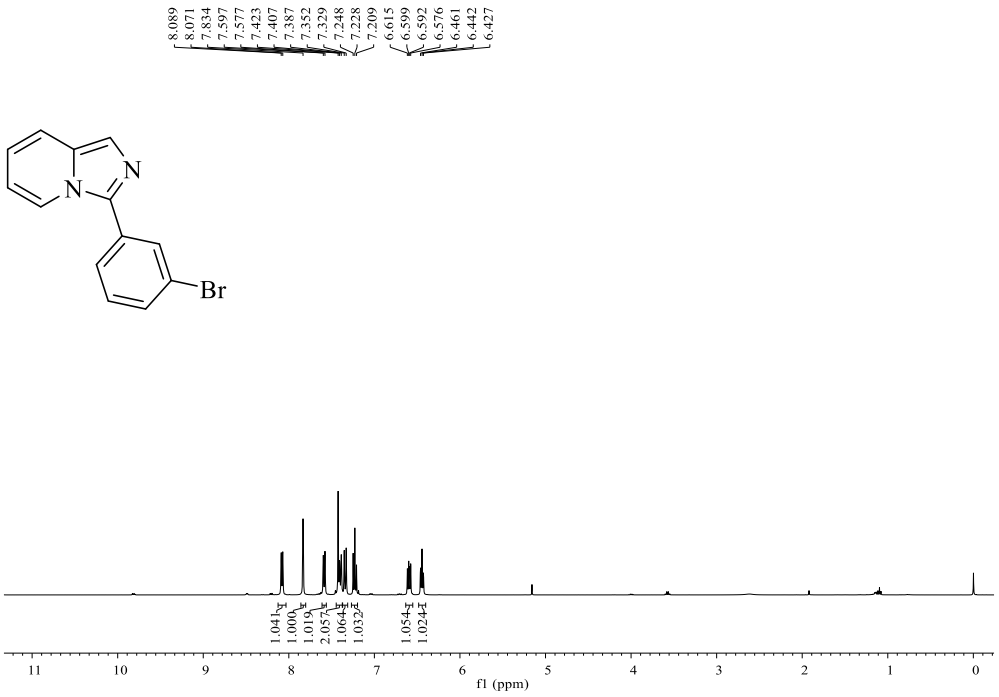
^{13}C NMR Spectrum of **3ag**



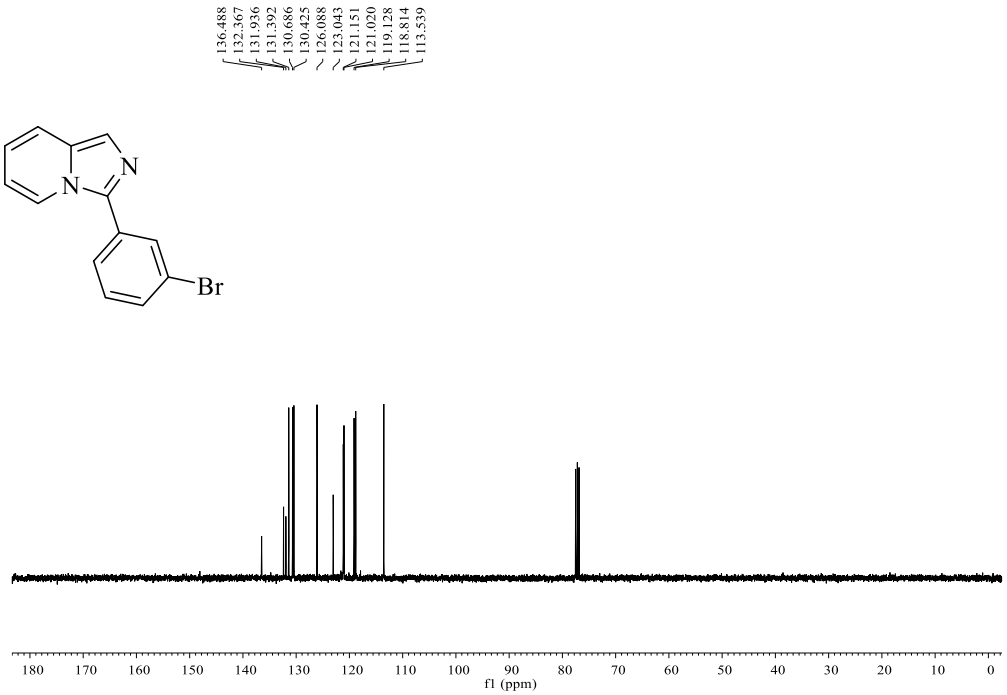
^{1}H NMR Spectrum of **3ah**



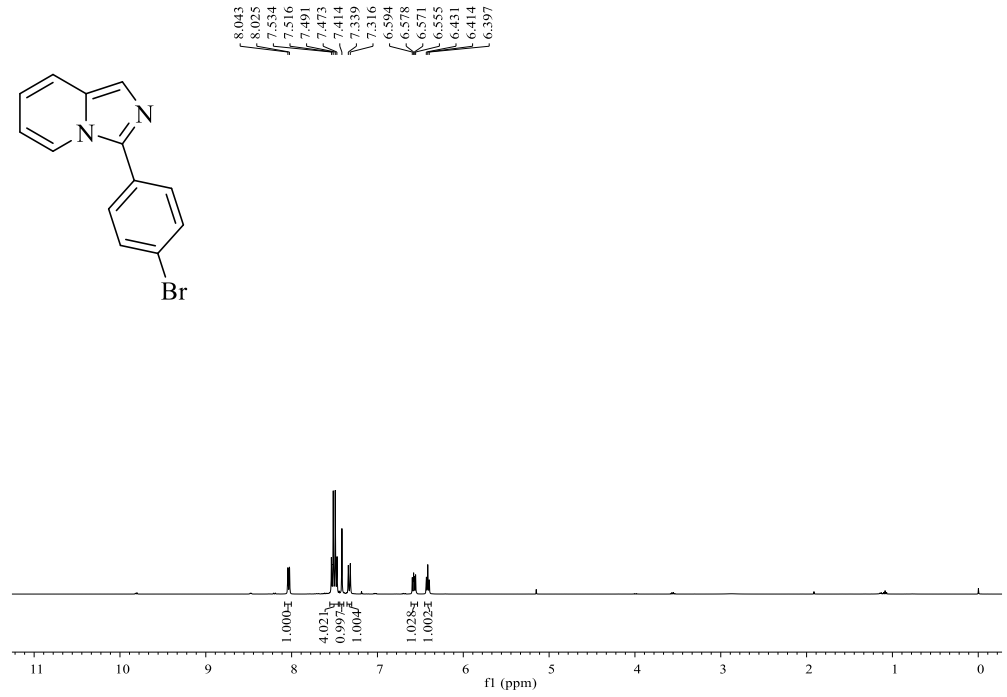
^{13}C NMR Spectrum of **3ah**



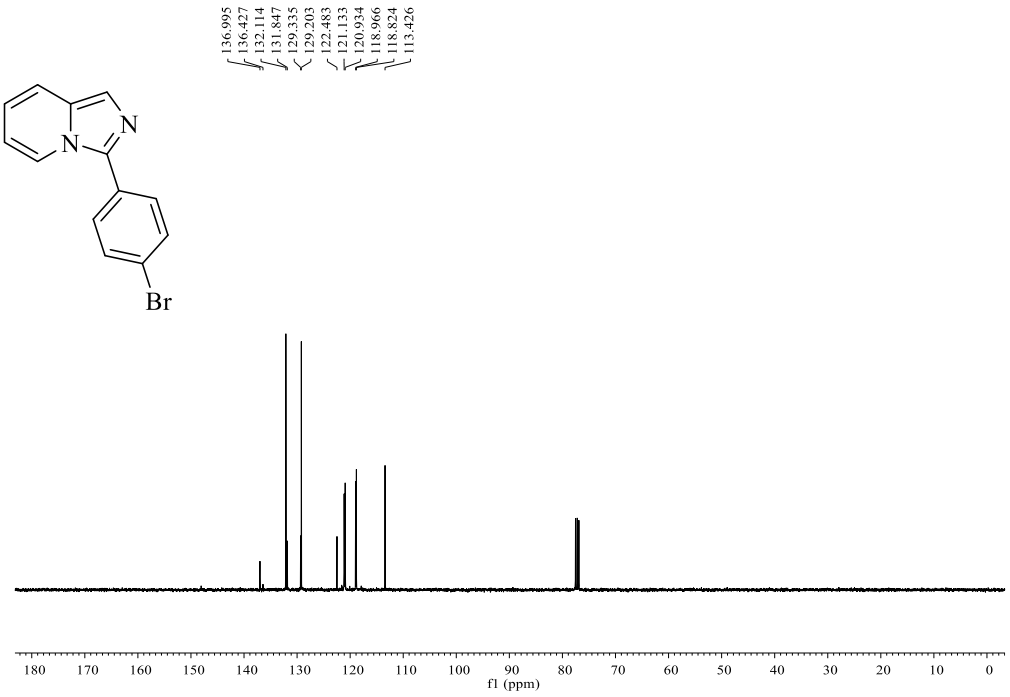
^{1}H NMR Spectrum of **3ai**



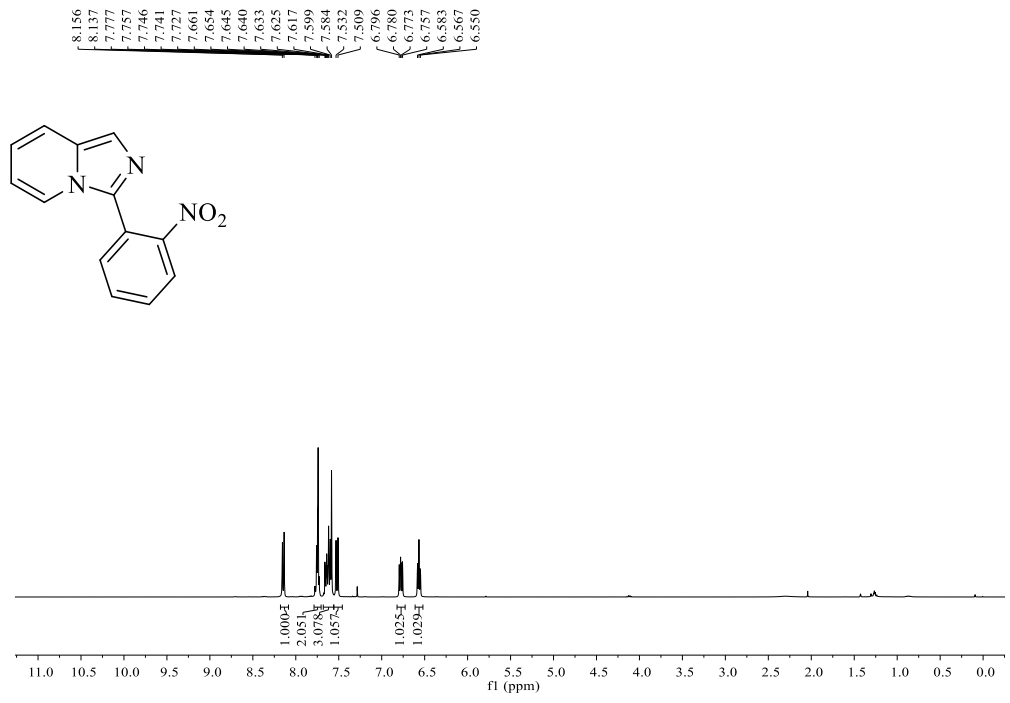
^{13}C NMR Spectrum of **3ai**



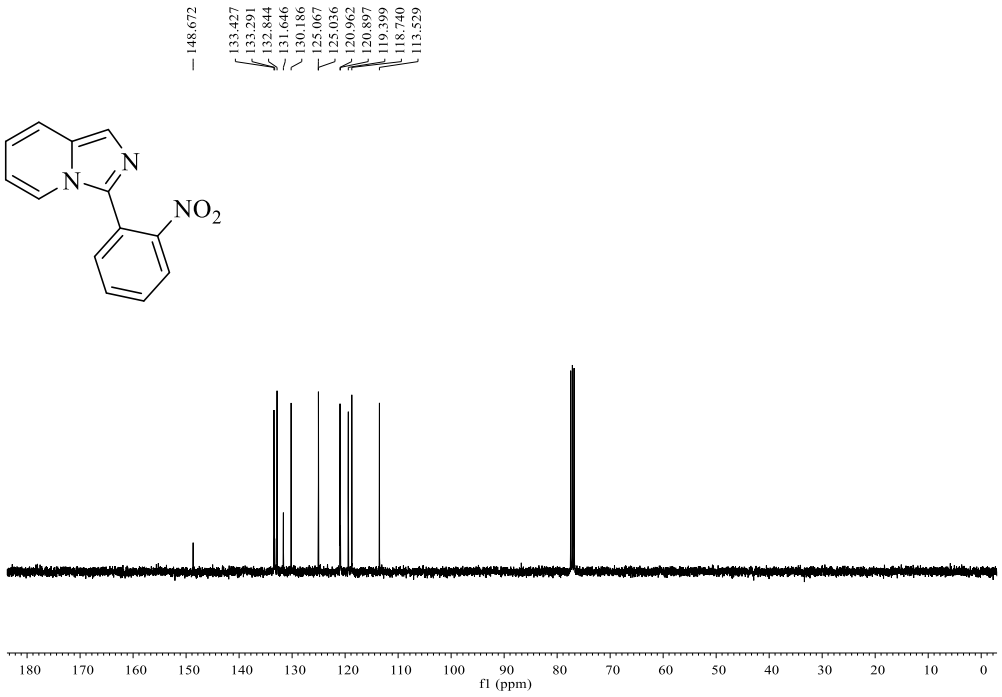
^{1}H NMR Spectrum of **3aj**



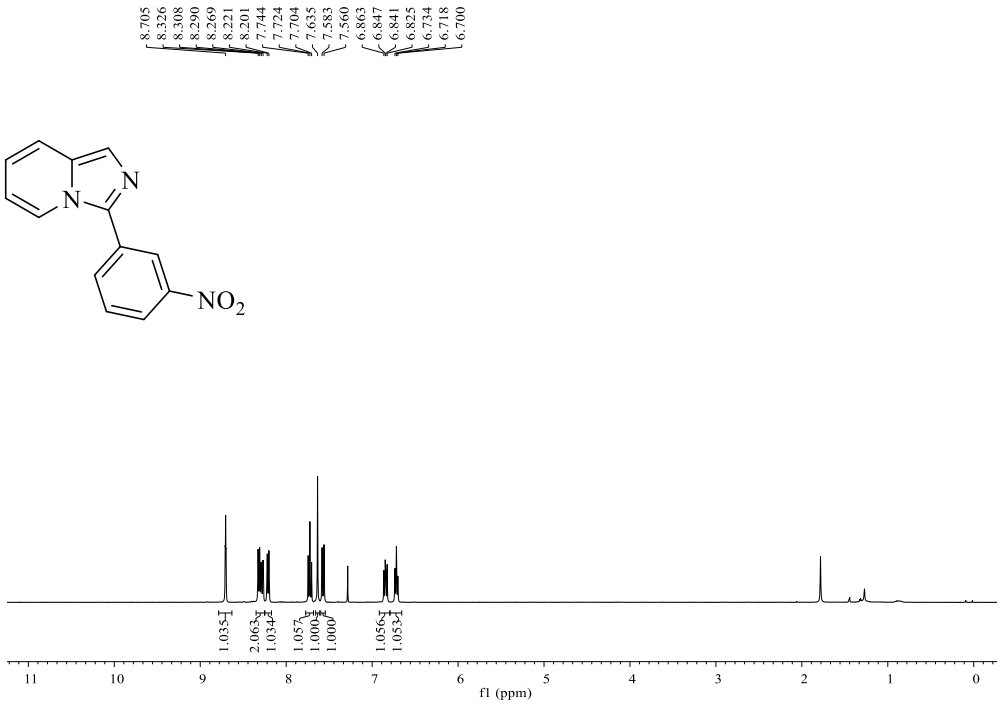
^{13}C NMR Spectrum of **3aj**



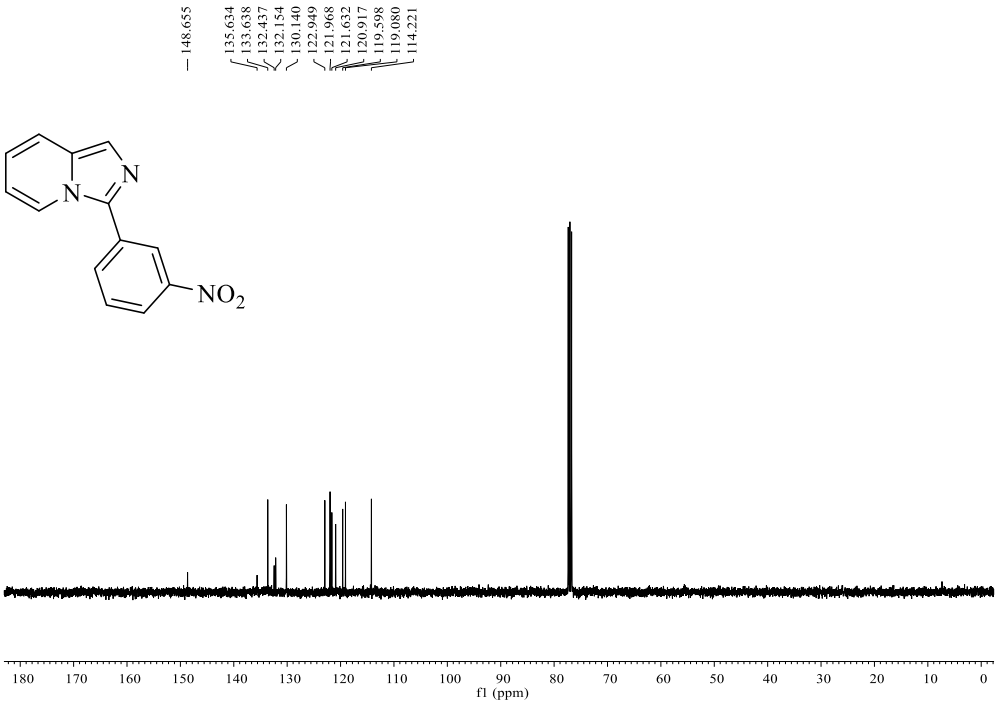
^{1}H NMR Spectrum of **3ak**



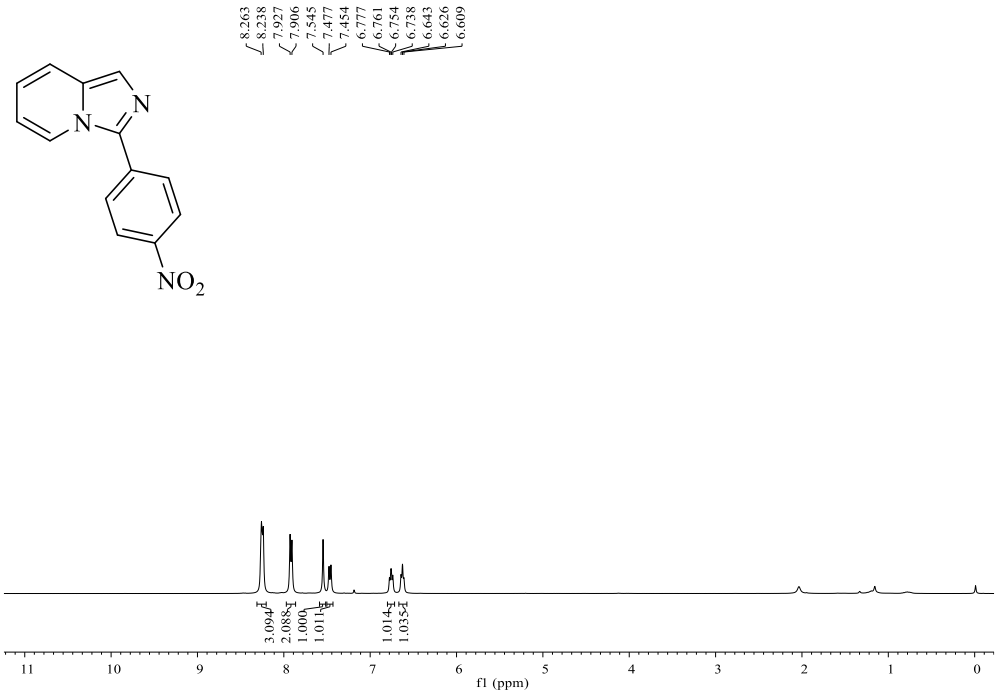
^{13}C NMR Spectrum of **3ak**



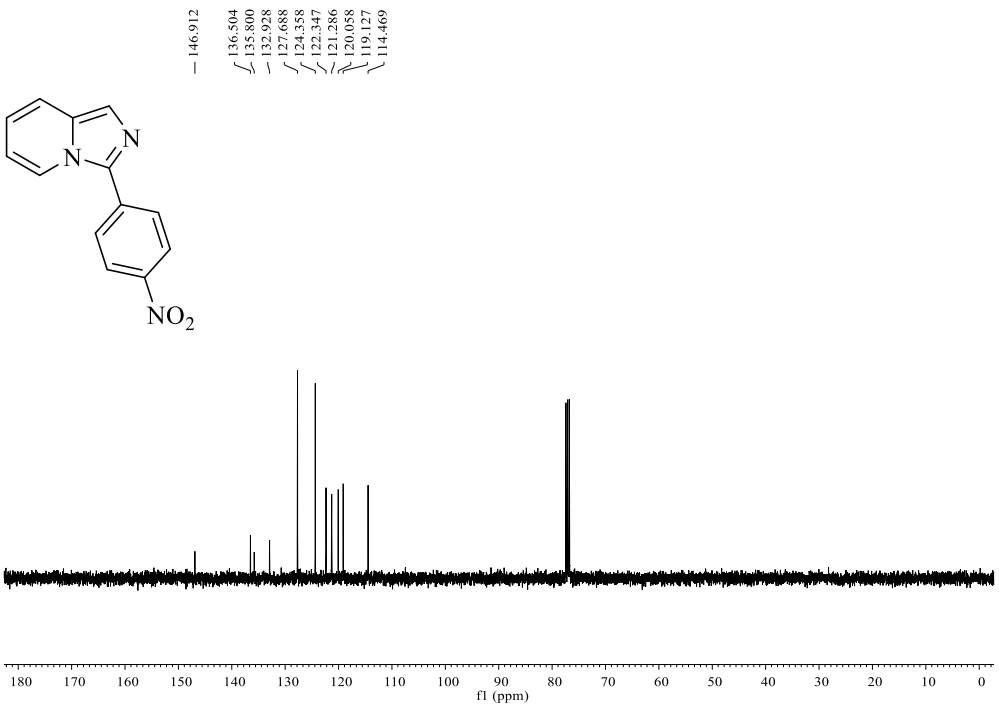
^{1}H NMR Spectrum of **3al**



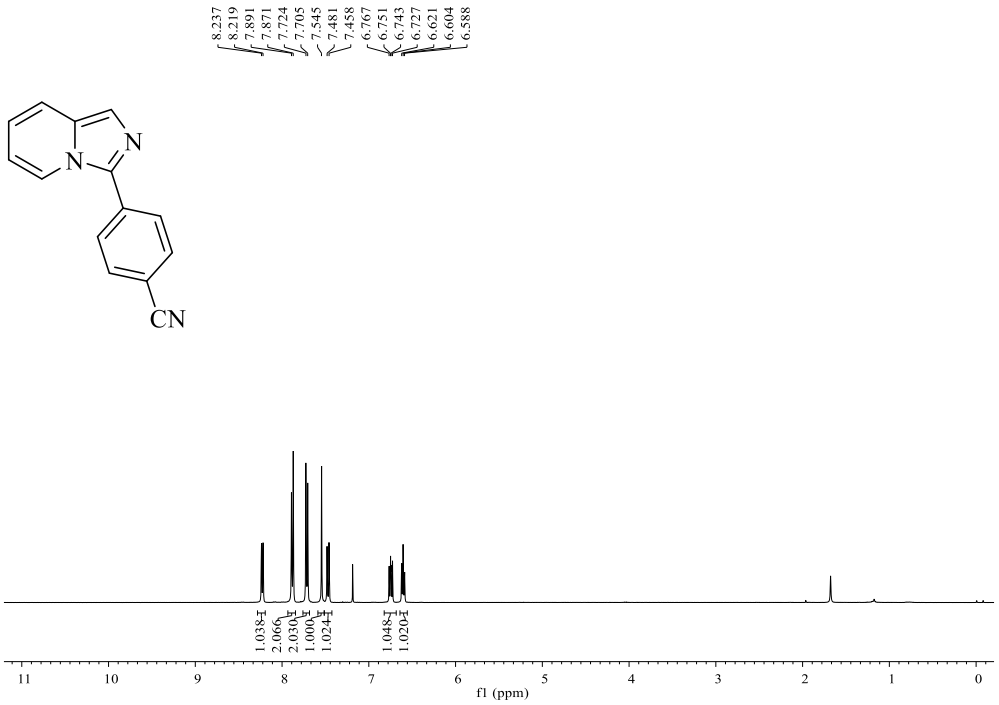
^{13}C NMR Spectrum of **3al**



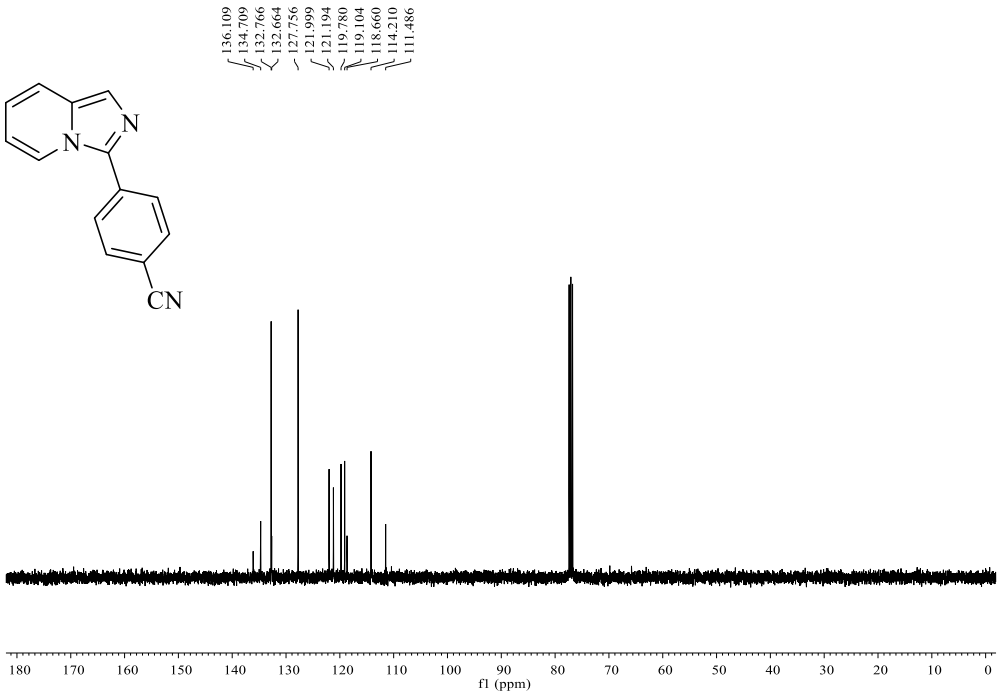
^{1}H NMR Spectrum of **3am**



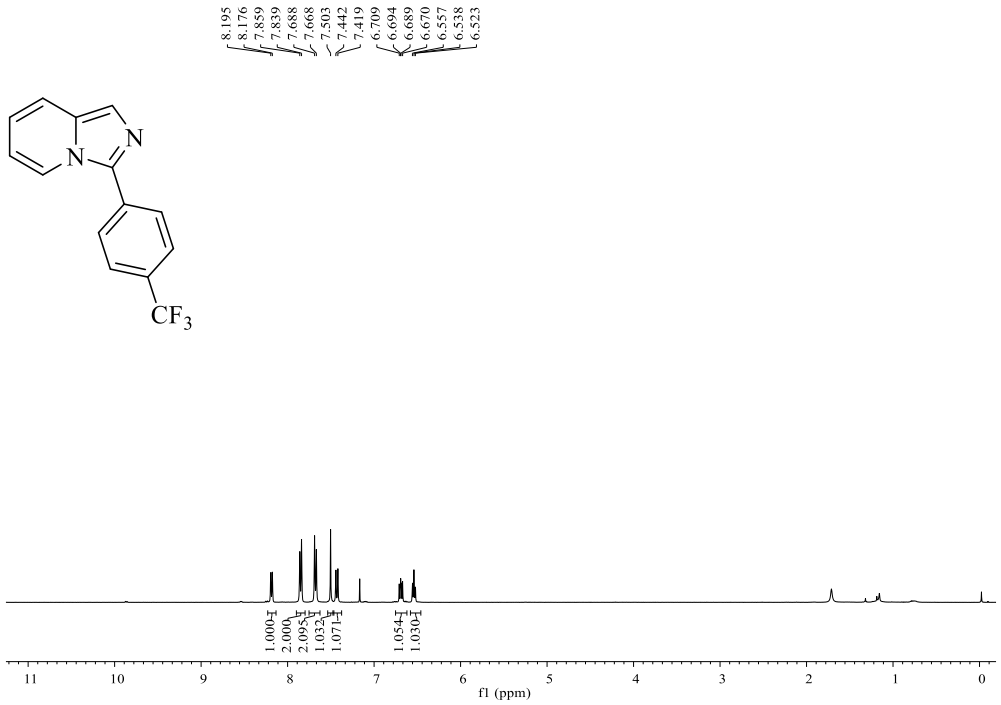
^{13}C NMR Spectrum of **3am**



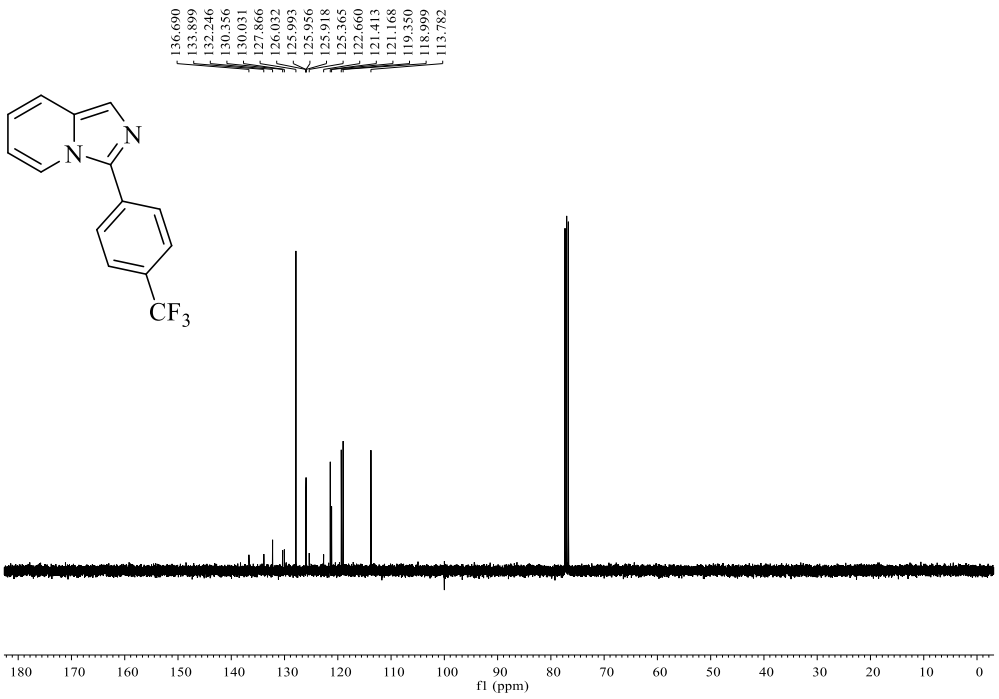
^{1}H NMR Spectrum of **3an**



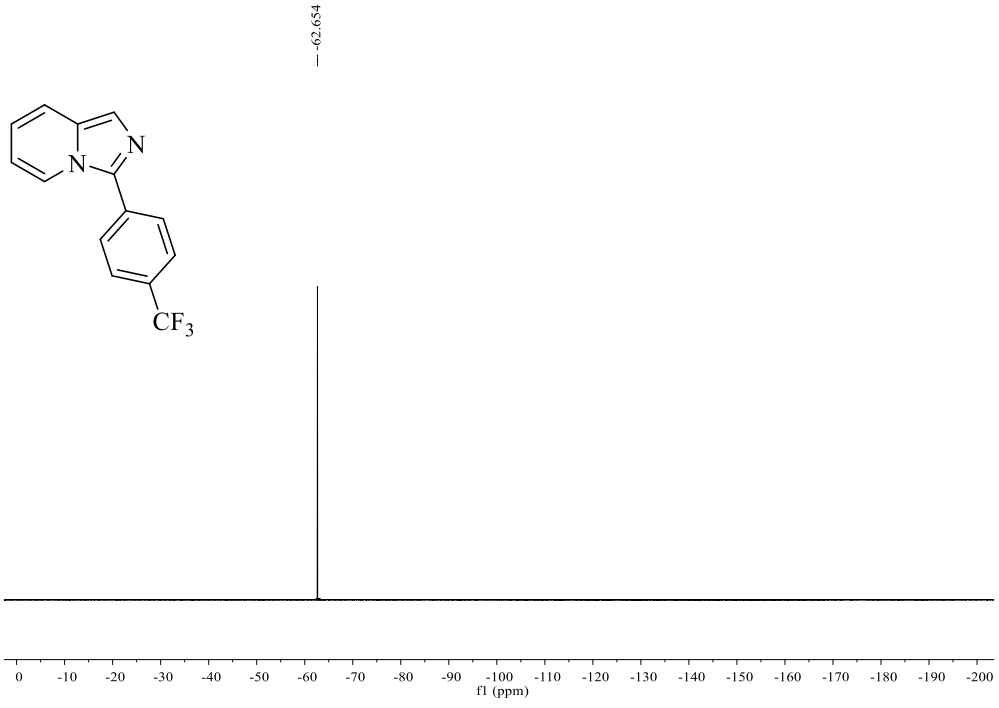
^{13}C NMR Spectrum of **3an**



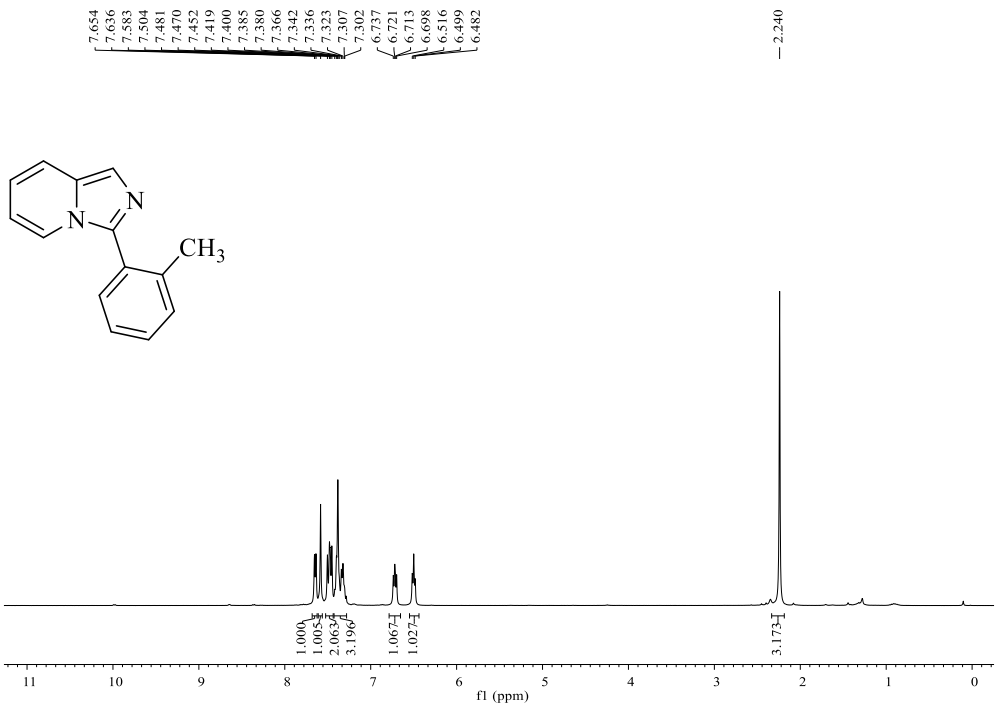
^{1}H NMR Spectrum of **3ao**



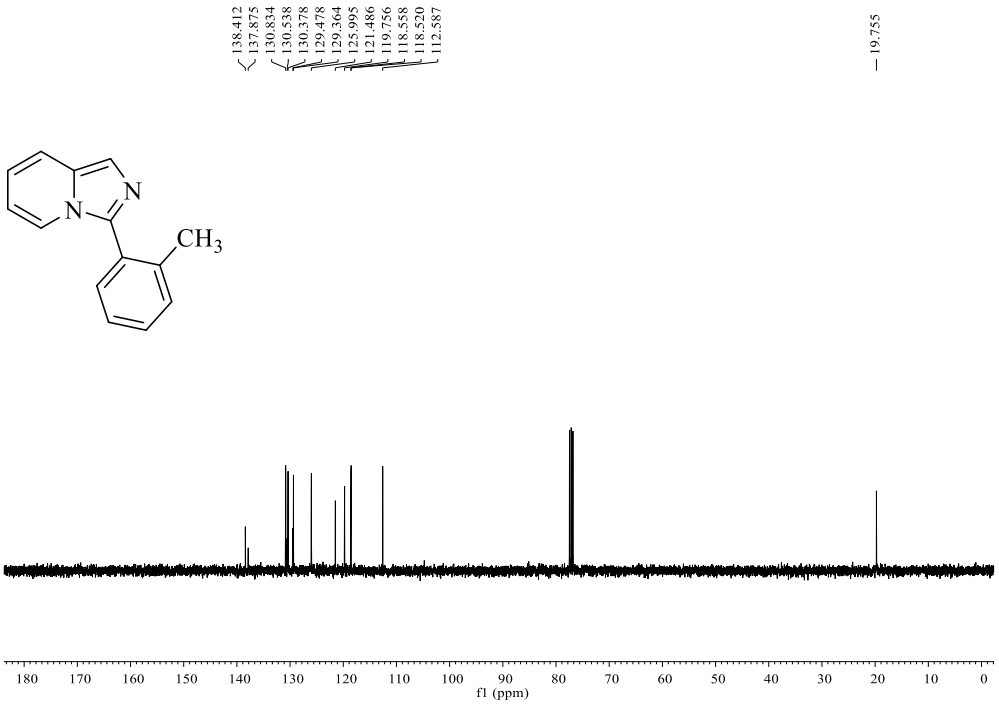
^{13}C NMR Spectrum of **3ao**



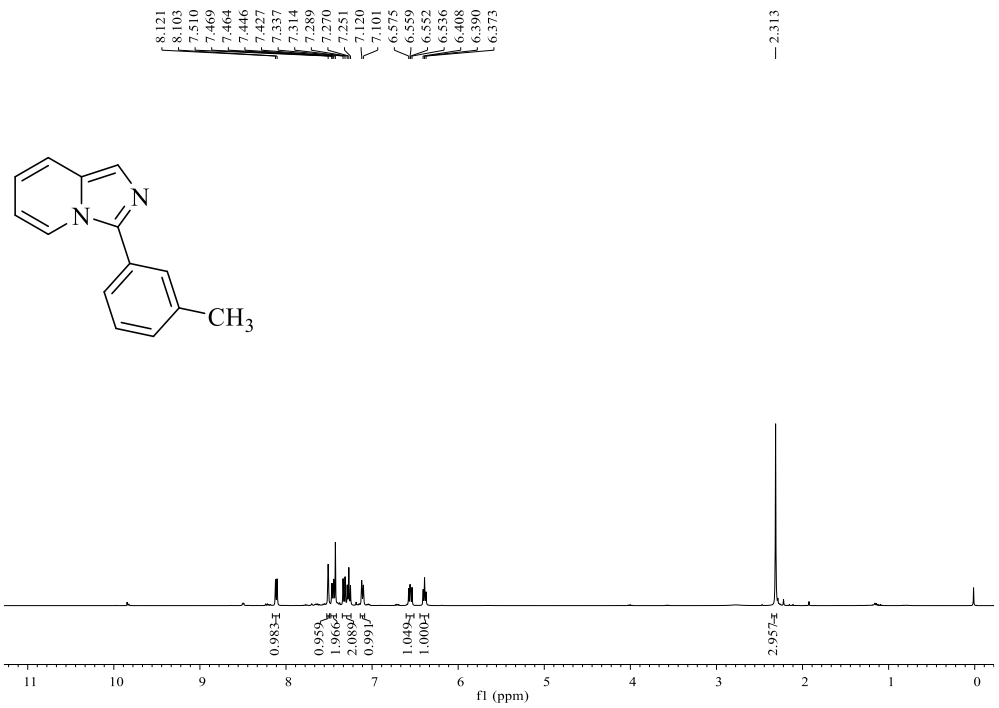
^{19}F NMR Spectrum of **3ao**



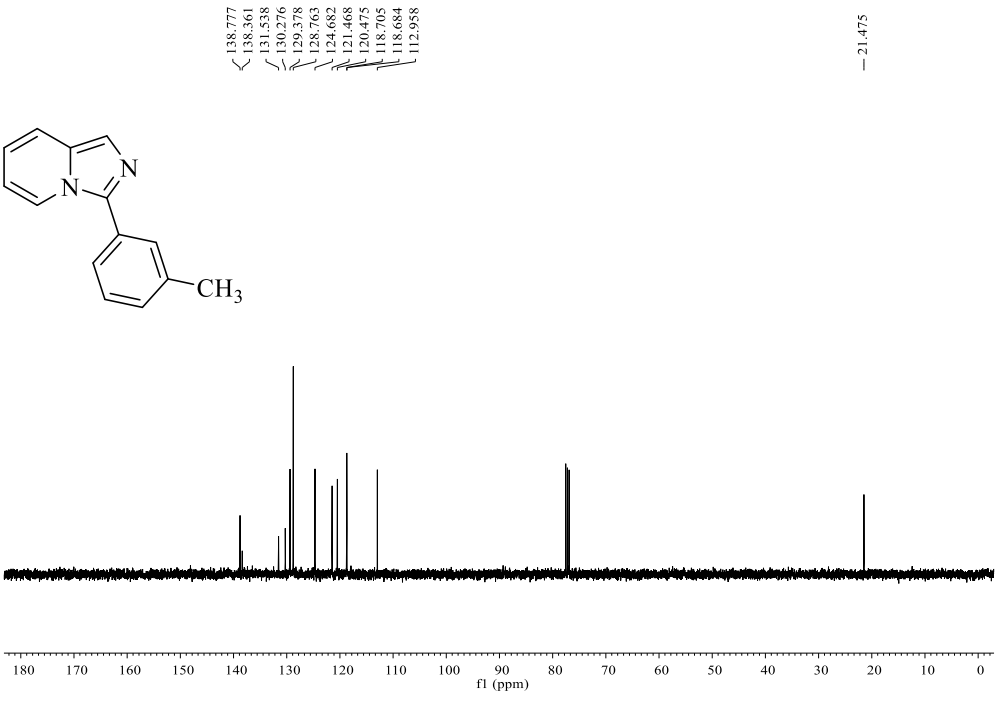
^{1}H NMR Spectrum of **3ap**



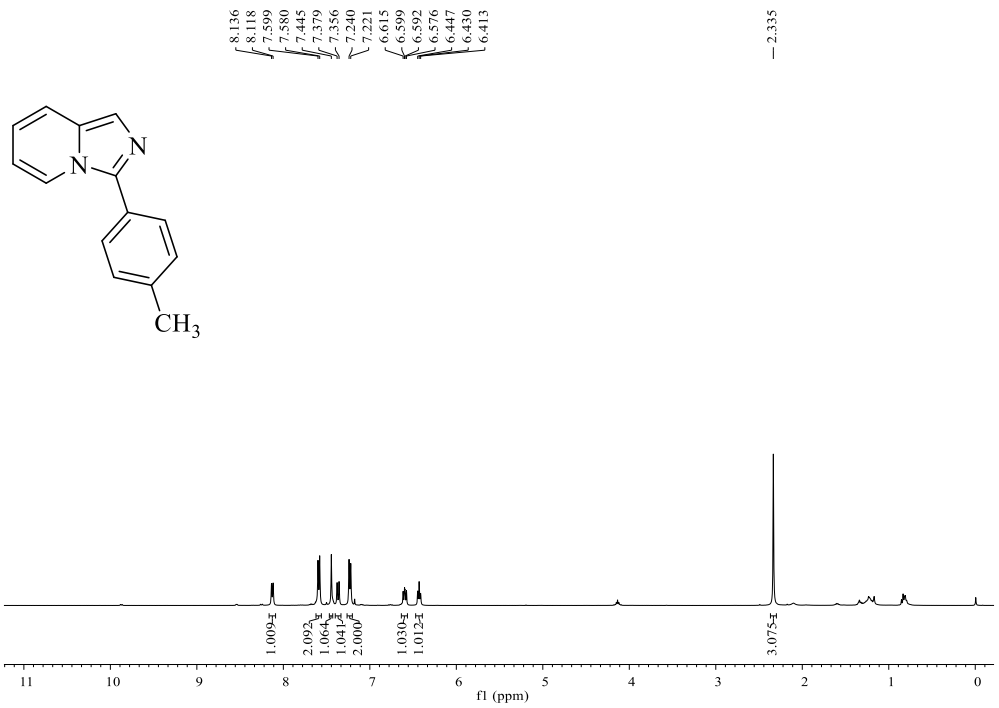
^{13}C NMR Spectrum of **3ap**



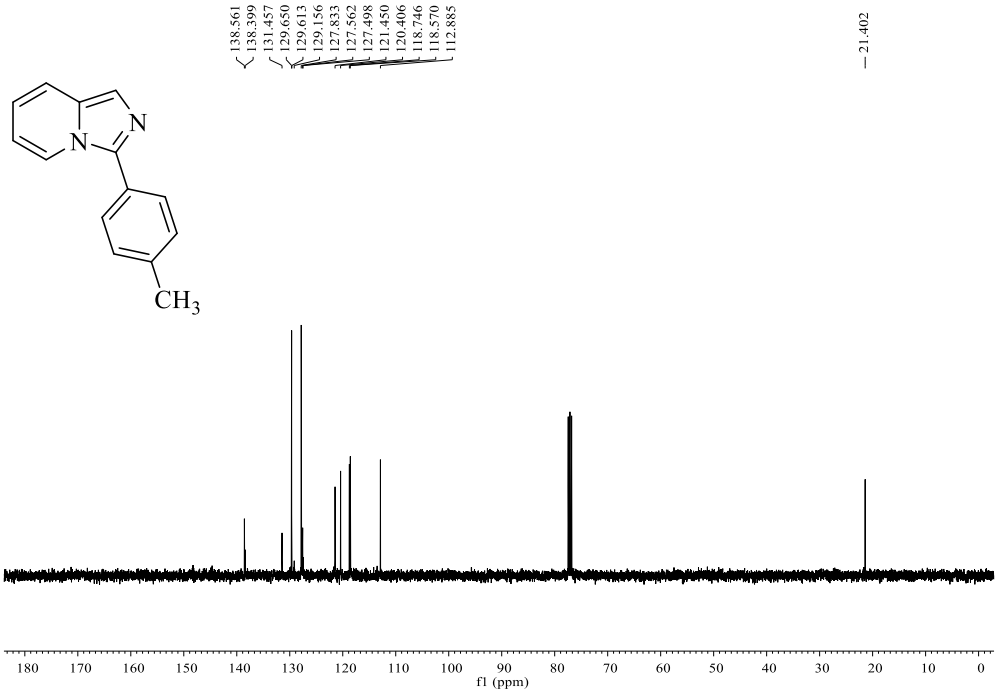
^{1}H NMR Spectrum of **3aq**



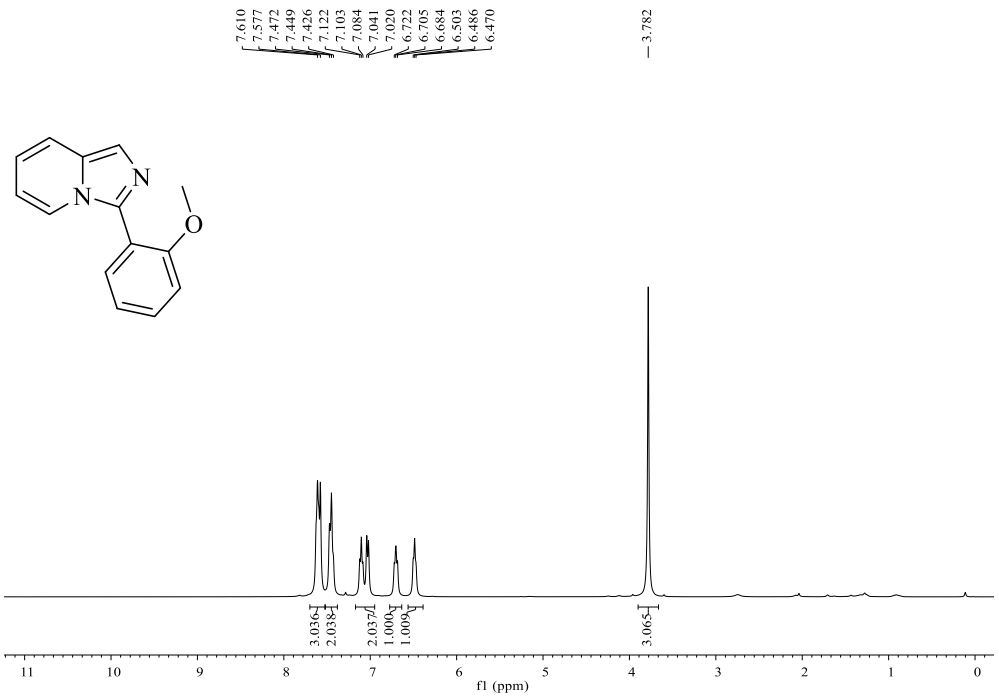
^{13}C NMR Spectrum of **3aq**



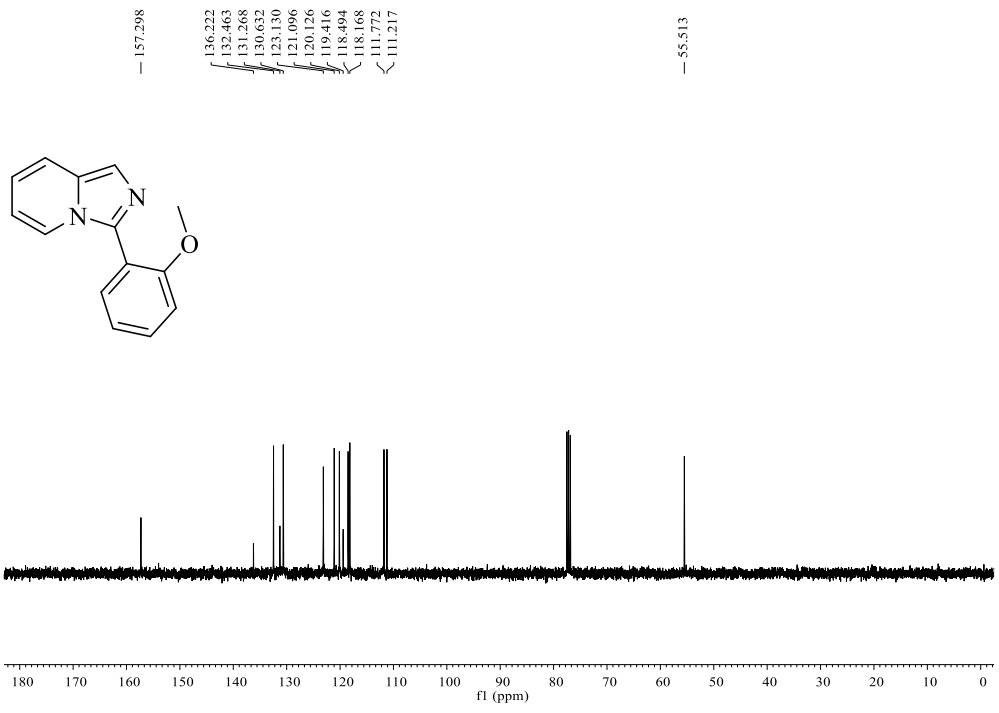
^{1}H NMR Spectrum of **3ar**



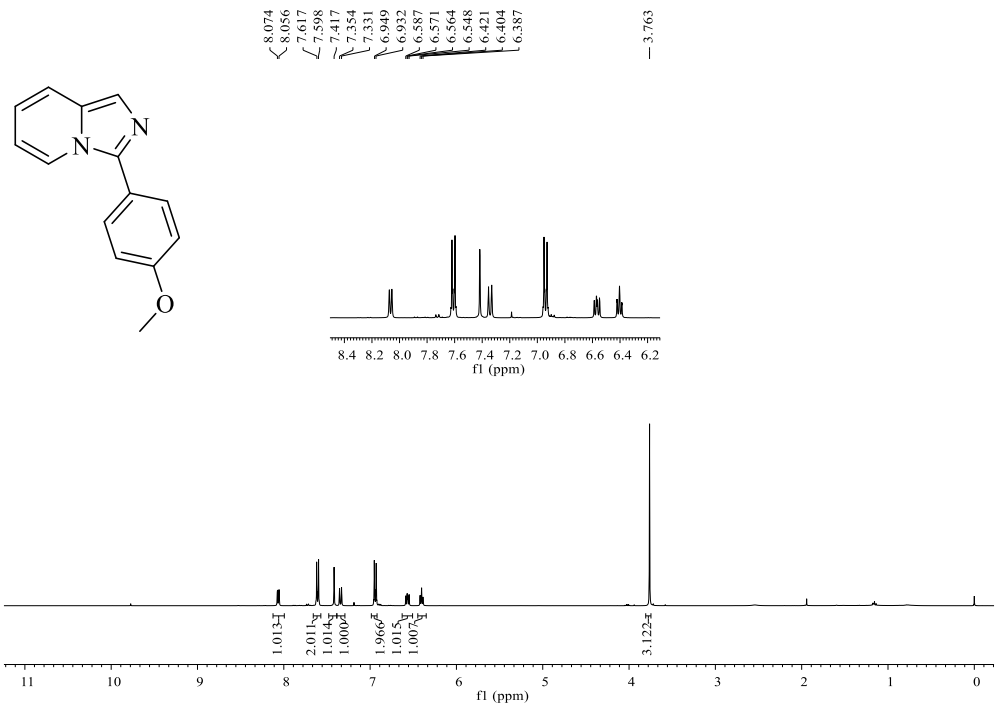
^{13}C NMR Spectrum of **3ar**



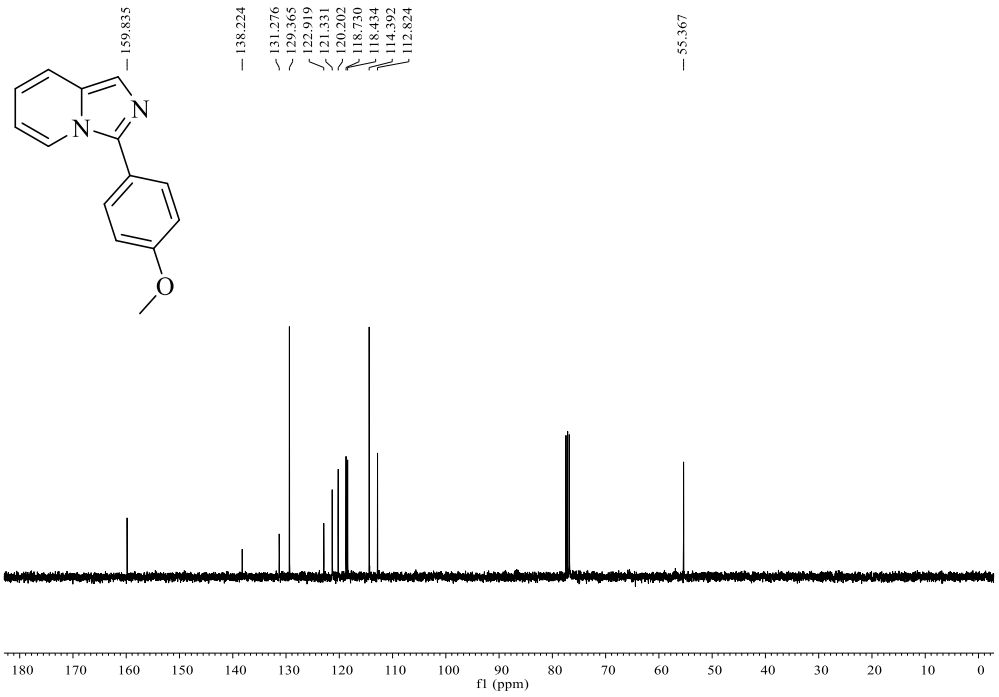
^{1}H NMR Spectrum of **3as**



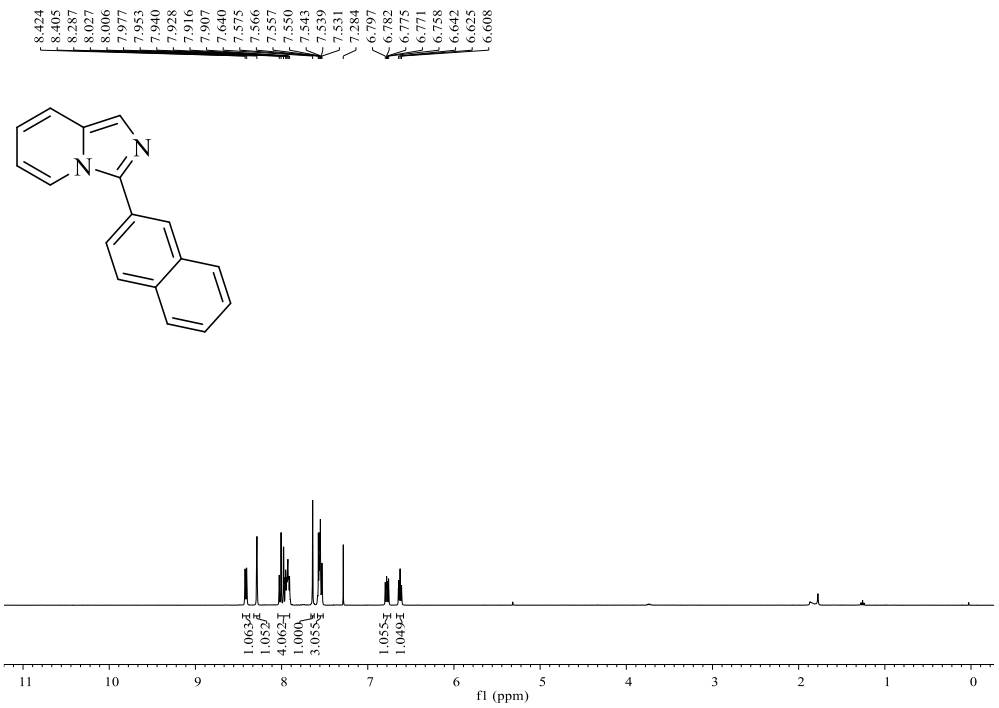
^{13}C NMR Spectrum of **3as**



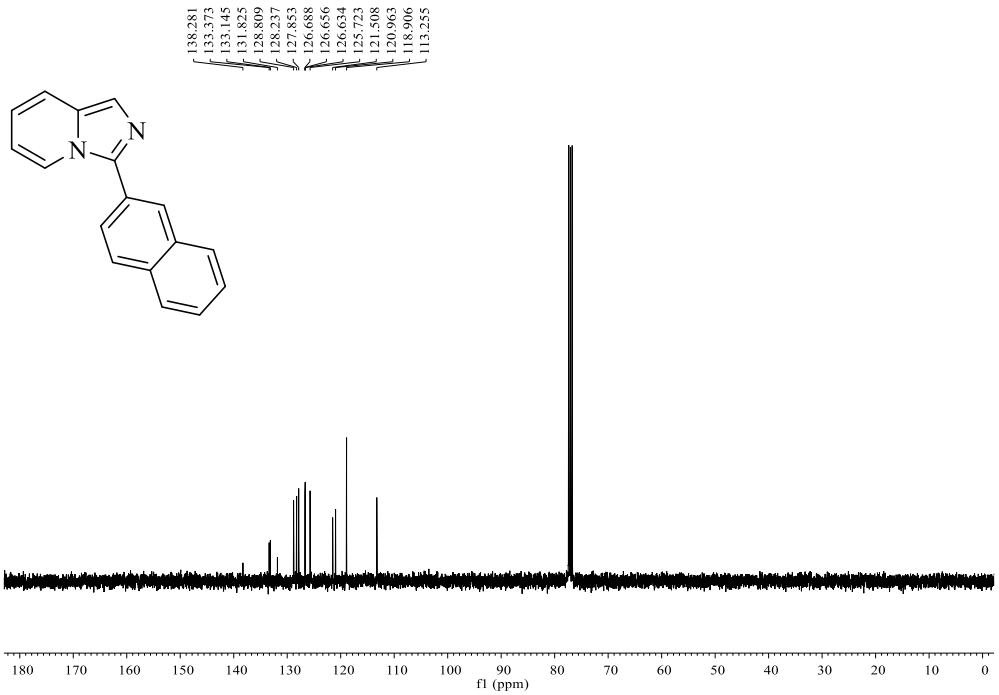
^{1}H NMR Spectrum of **3at**



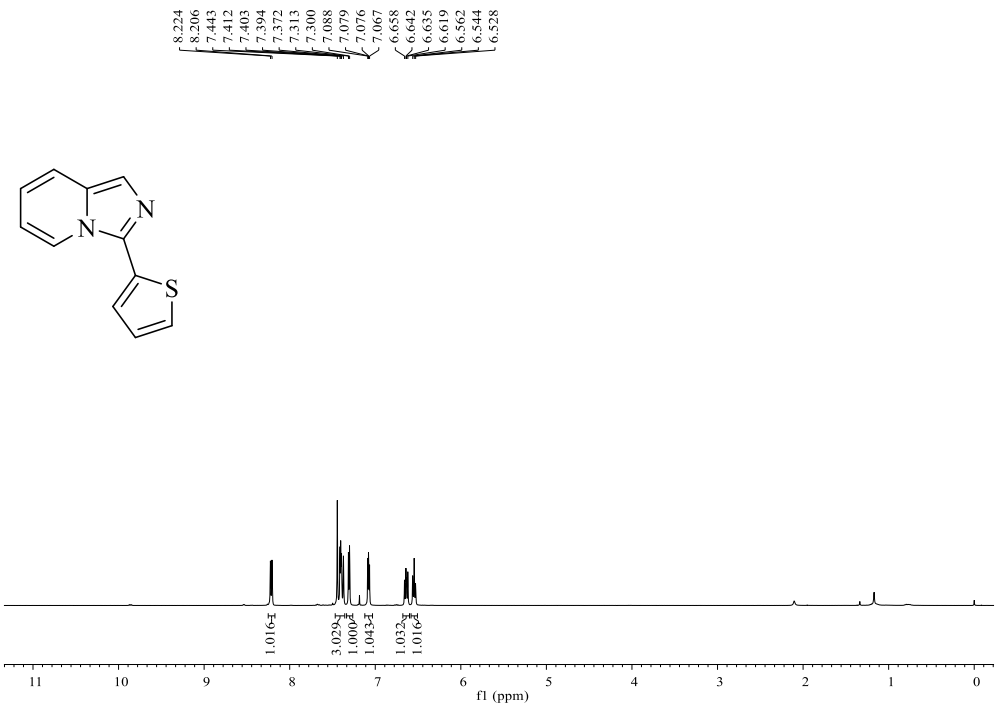
^{13}C NMR Spectrum of **3at**



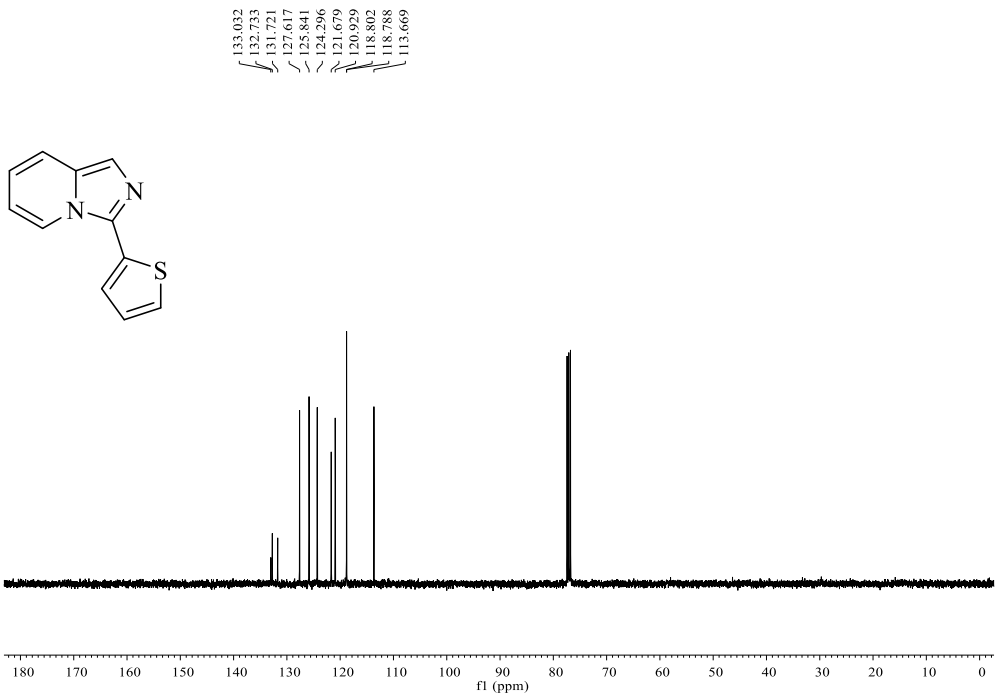
^{1}H NMR Spectrum of **3au**



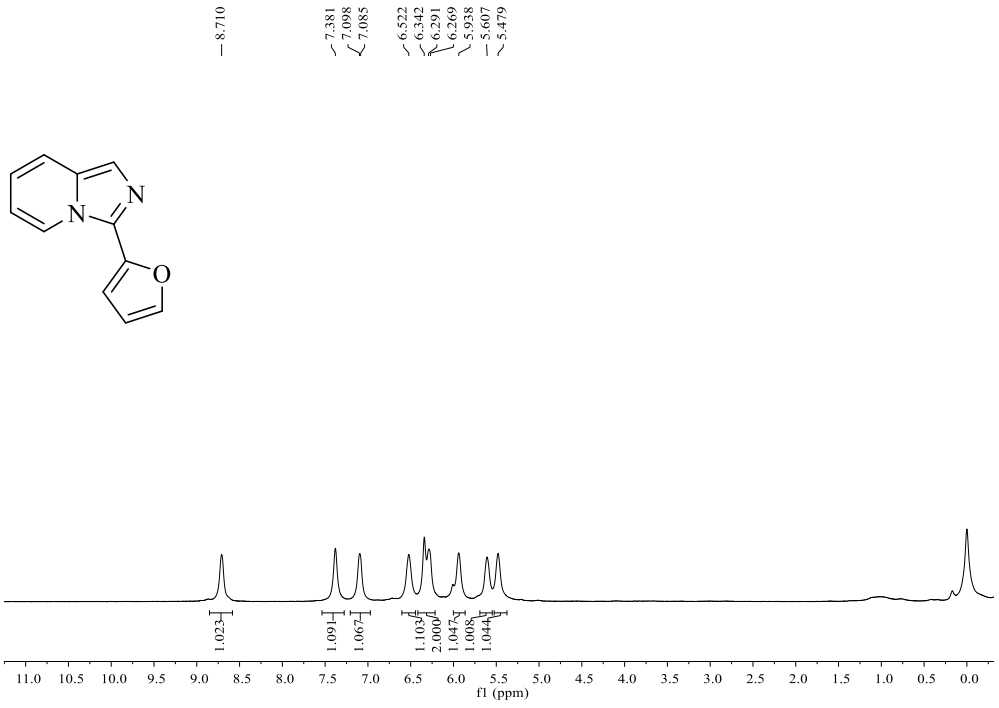
^{13}C NMR Spectrum of **3au**



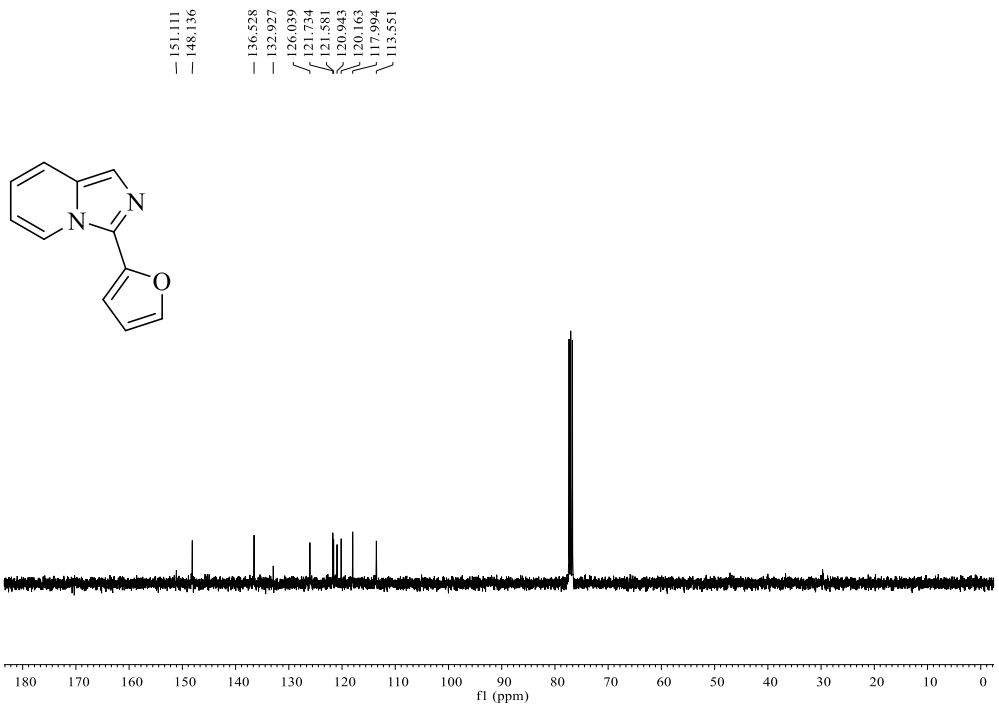
^{1}H NMR Spectrum of **3av**



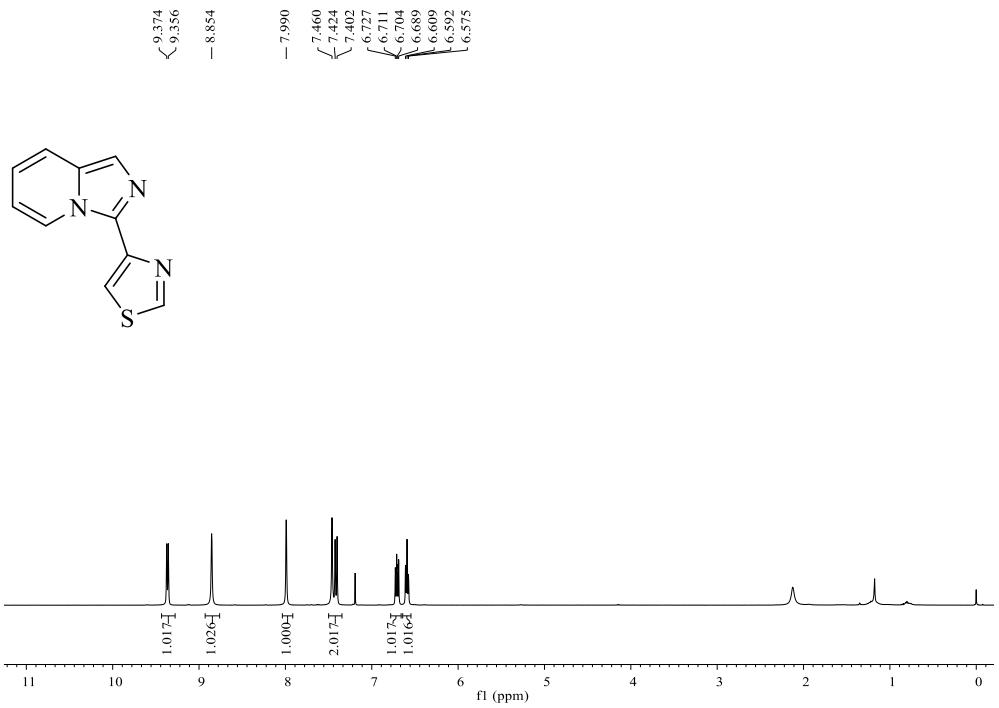
^{13}C NMR Spectrum of **3av**



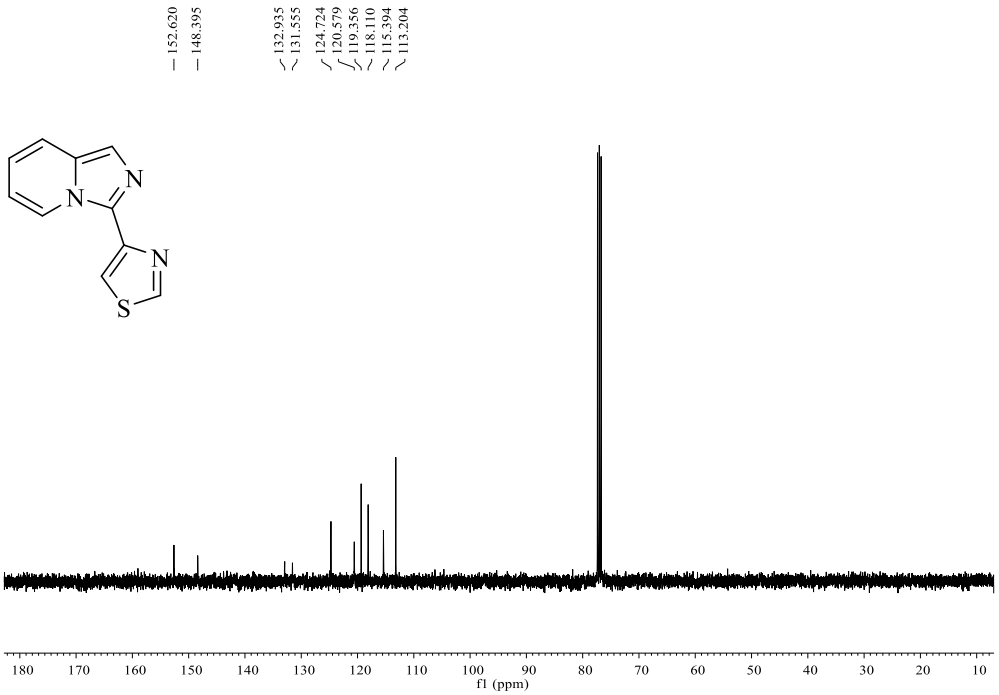
^{1}H NMR Spectrum of **3aw**



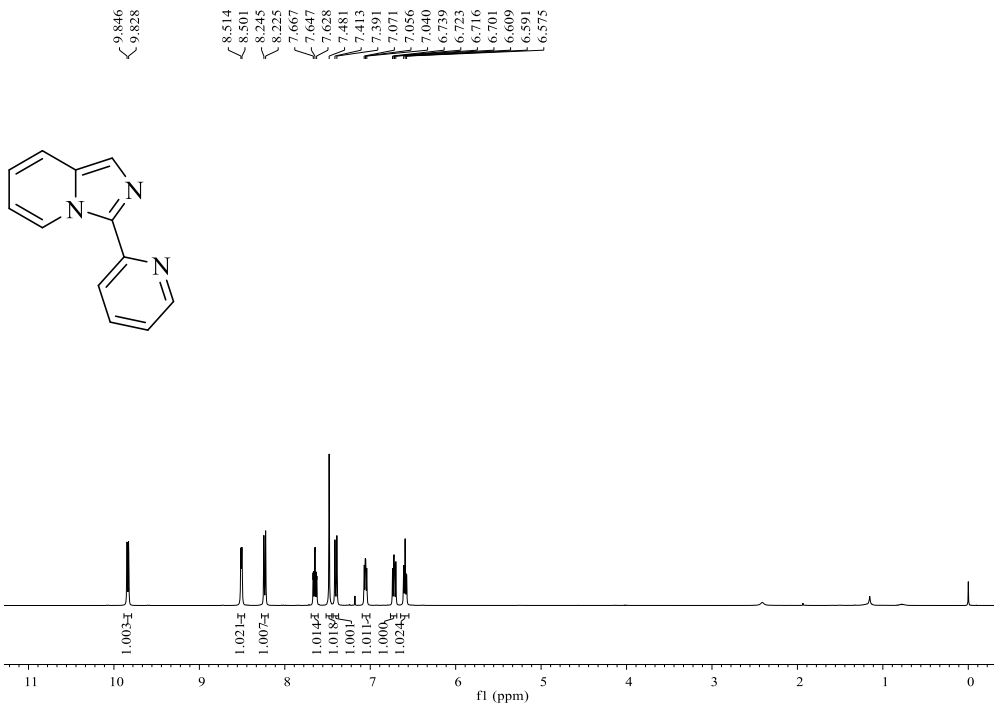
^{13}C NMR Spectrum of **3aw**



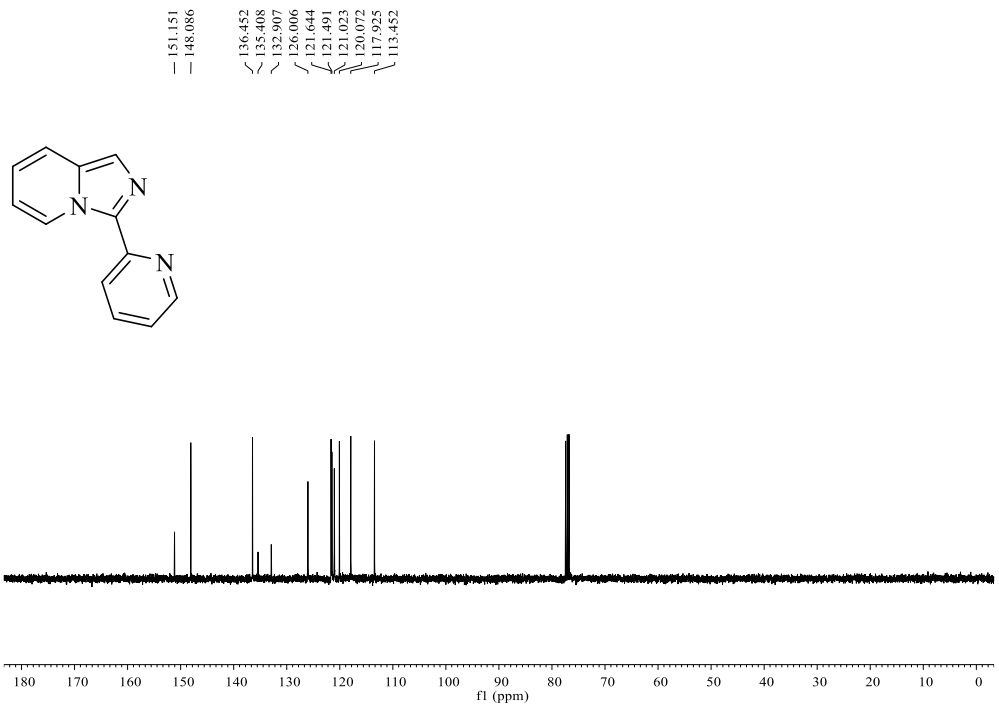
^{1}H NMR Spectrum of **3ax**



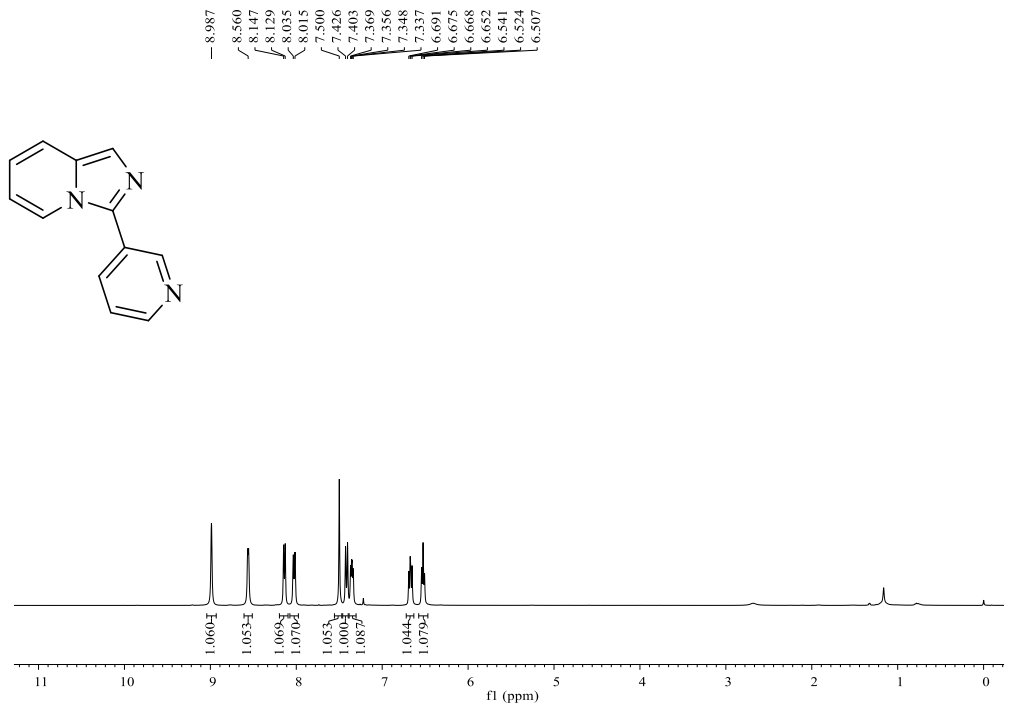
^{13}C NMR Spectrum of **3ax**



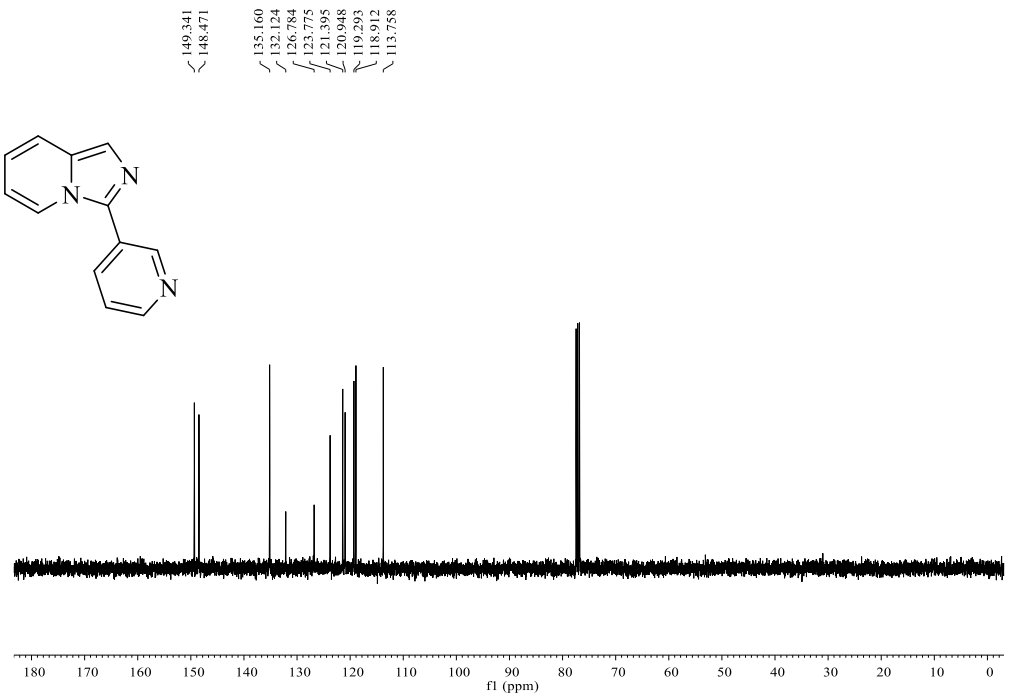
^{1}H NMR Spectrum of **3ay**



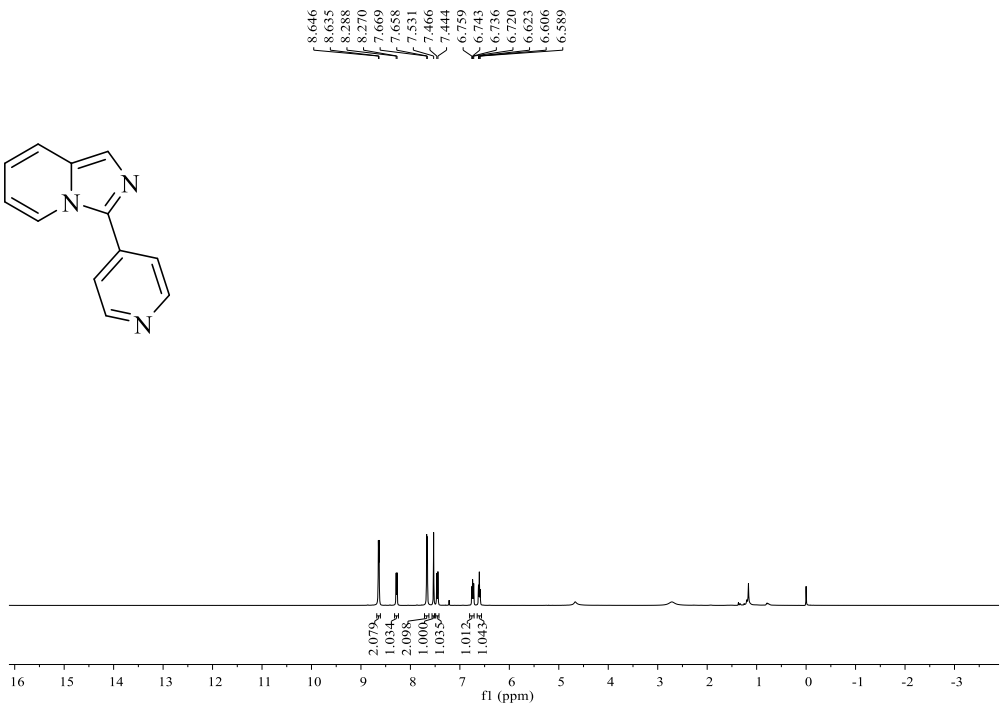
^{13}C NMR Spectrum of **3ay**



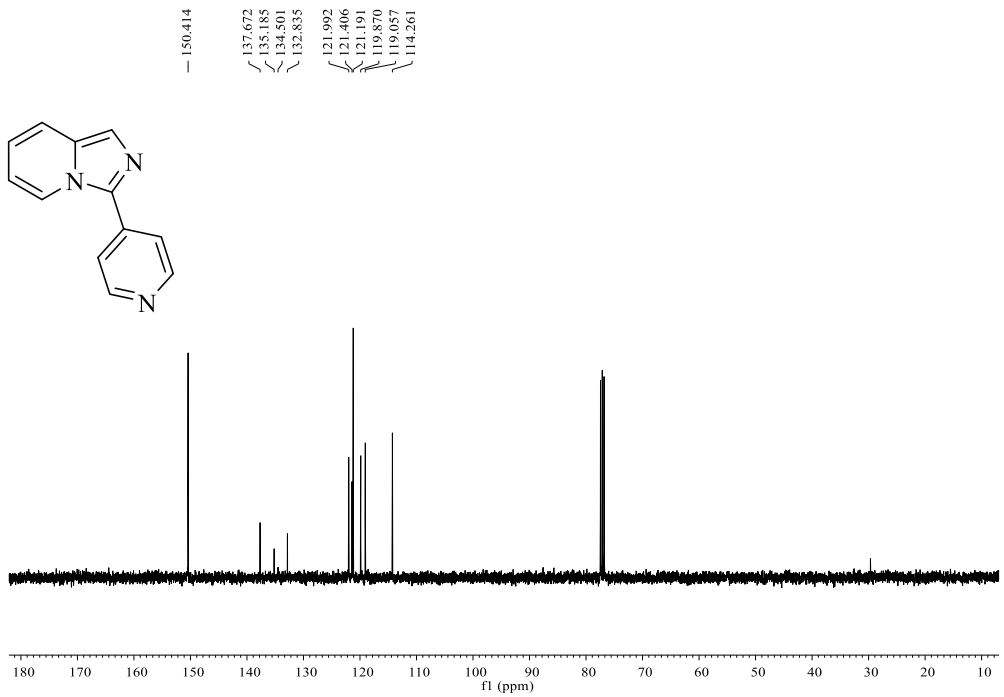
^{1}H NMR Spectrum of **3az**



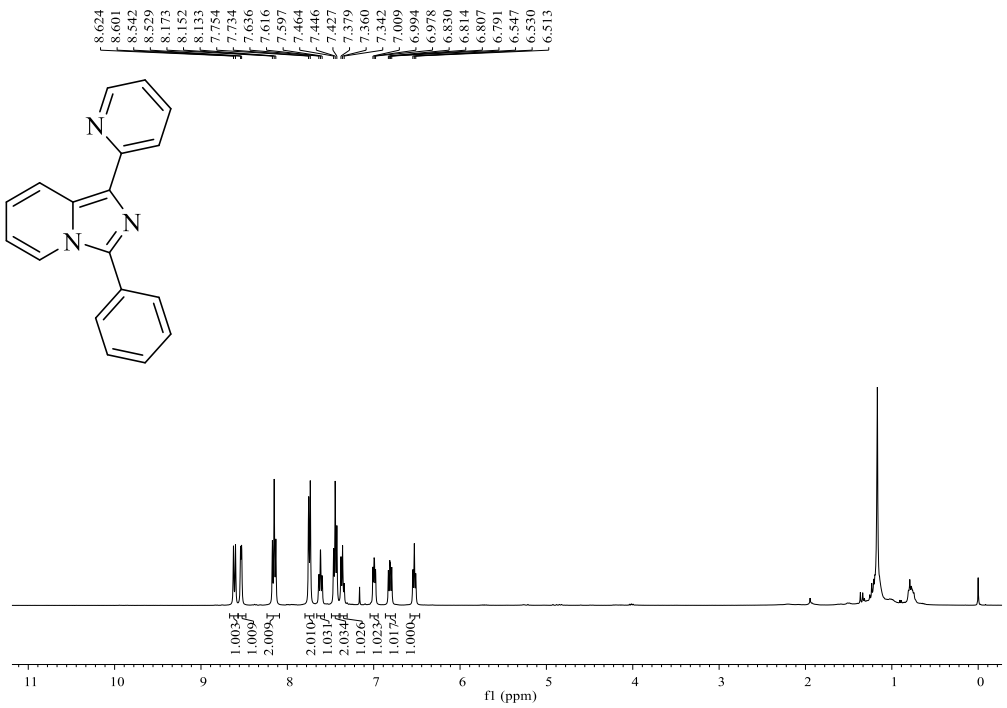
^{13}C NMR Spectrum of **3az**



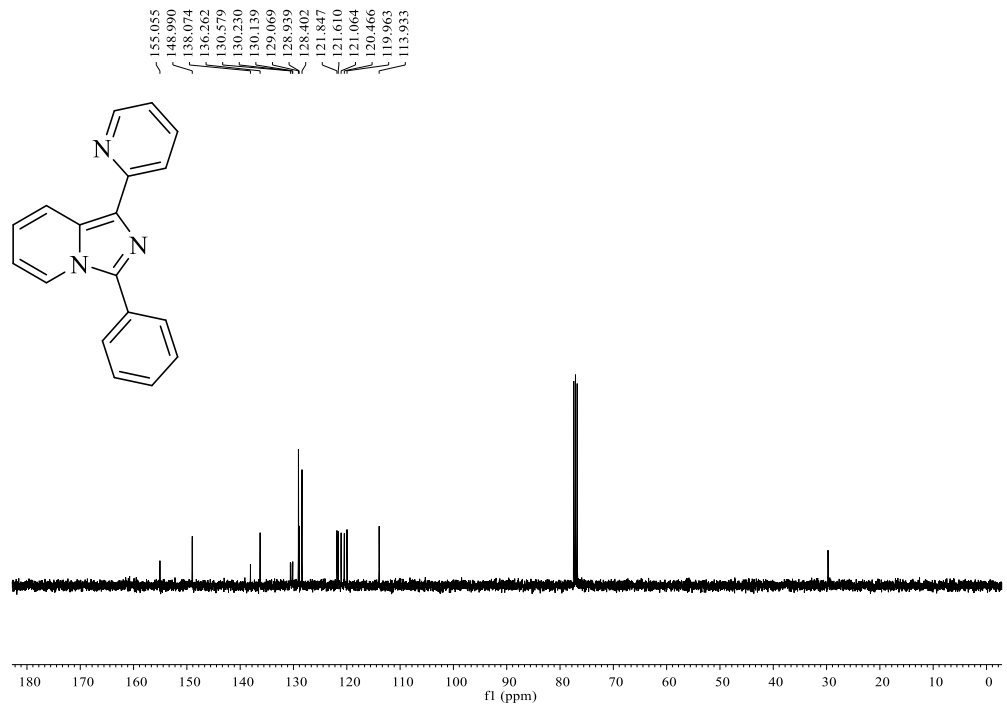
^{1}H NMR Spectrum of **3aaa**



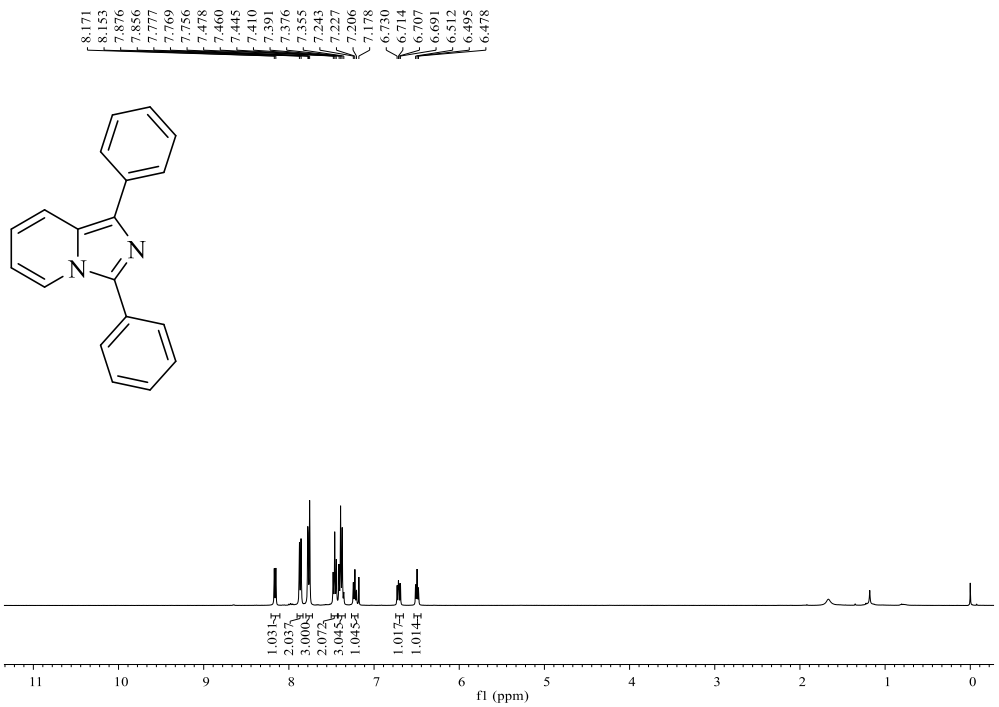
^{13}C NMR Spectrum of **3aaa**



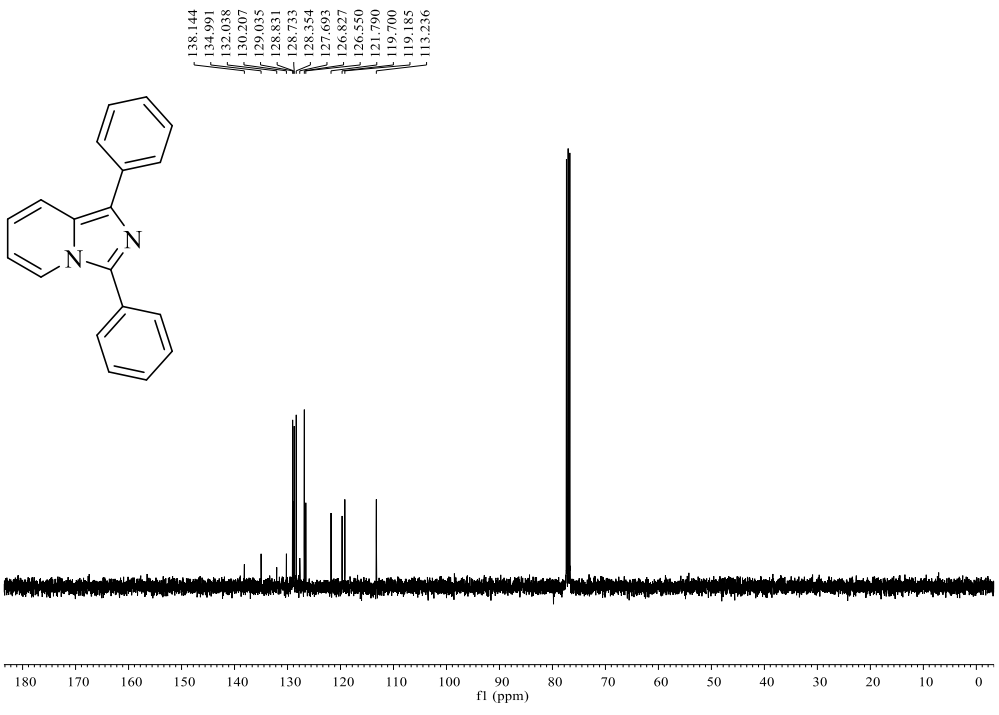
^{1}H NMR Spectrum of **3aab**



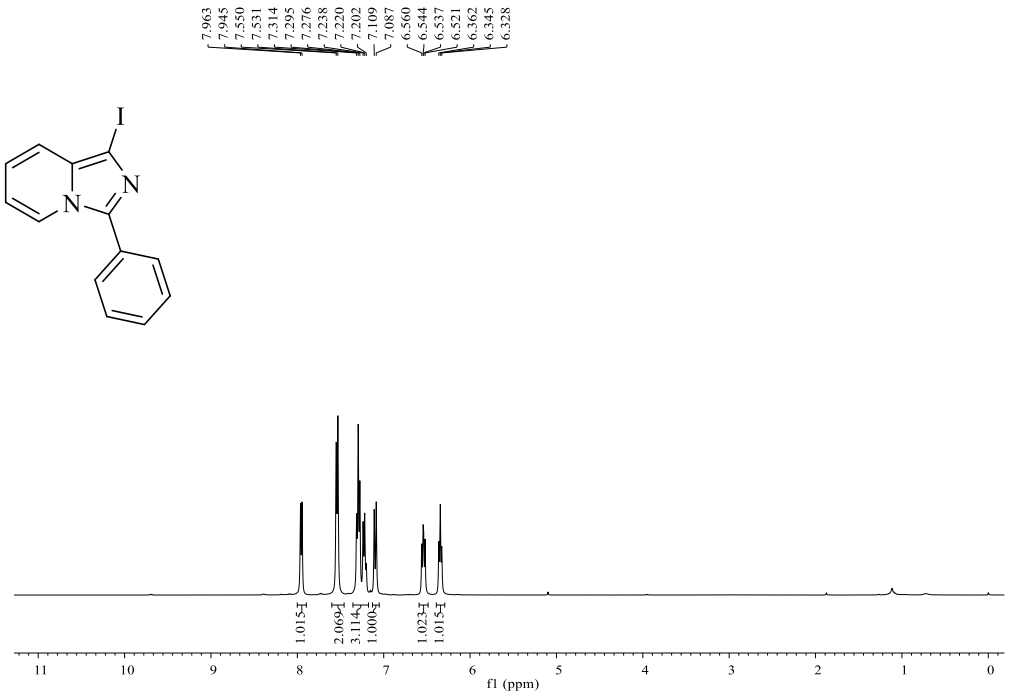
^{13}C NMR Spectrum of **3aab**



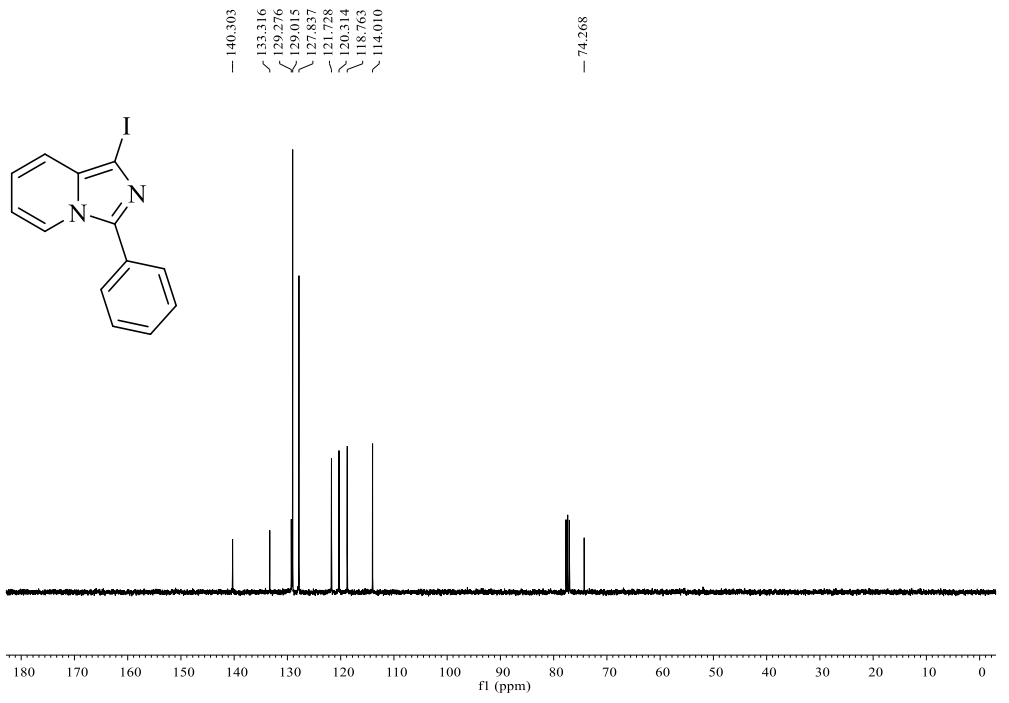
^{1}H NMR Spectrum of **3aac**



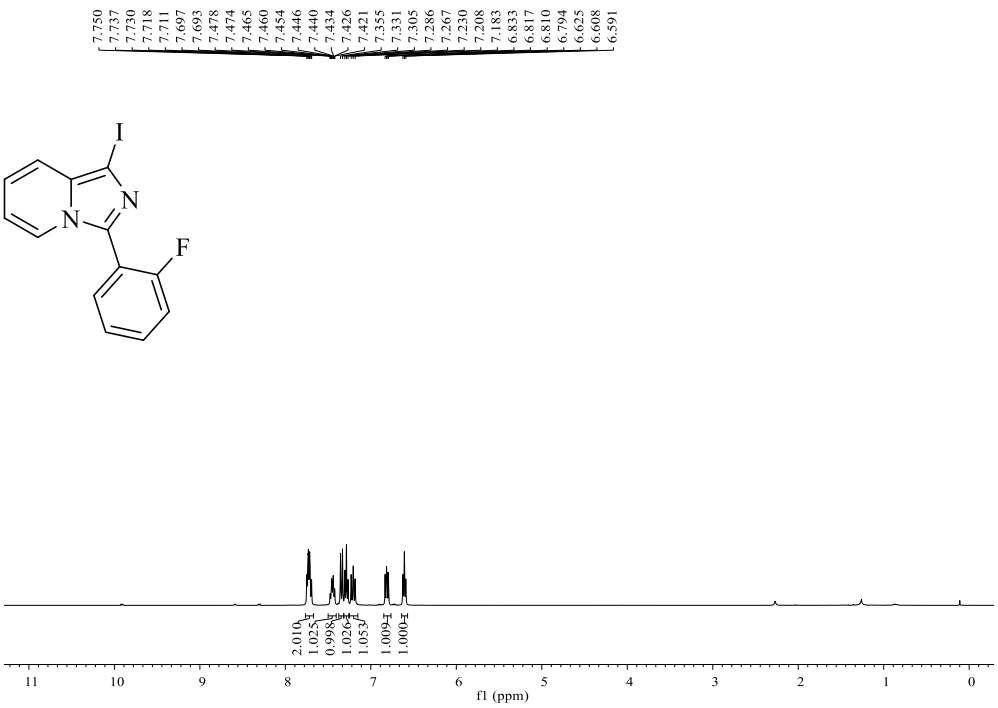
^{13}C NMR Spectrum of **3aac**



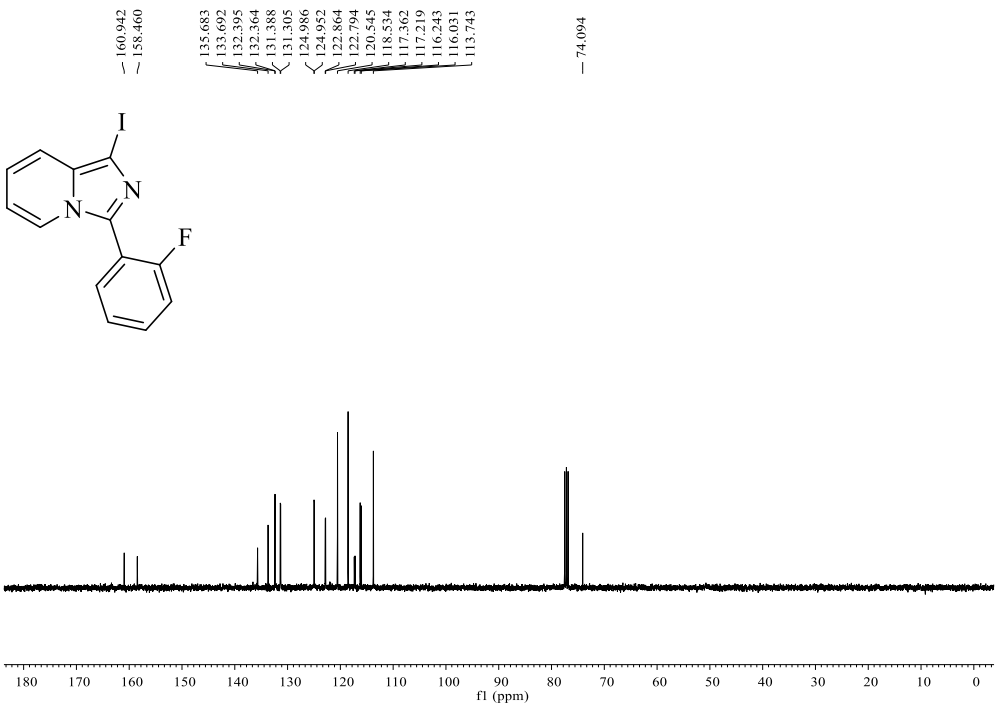
^{1}H NMR Spectrum of **3b**



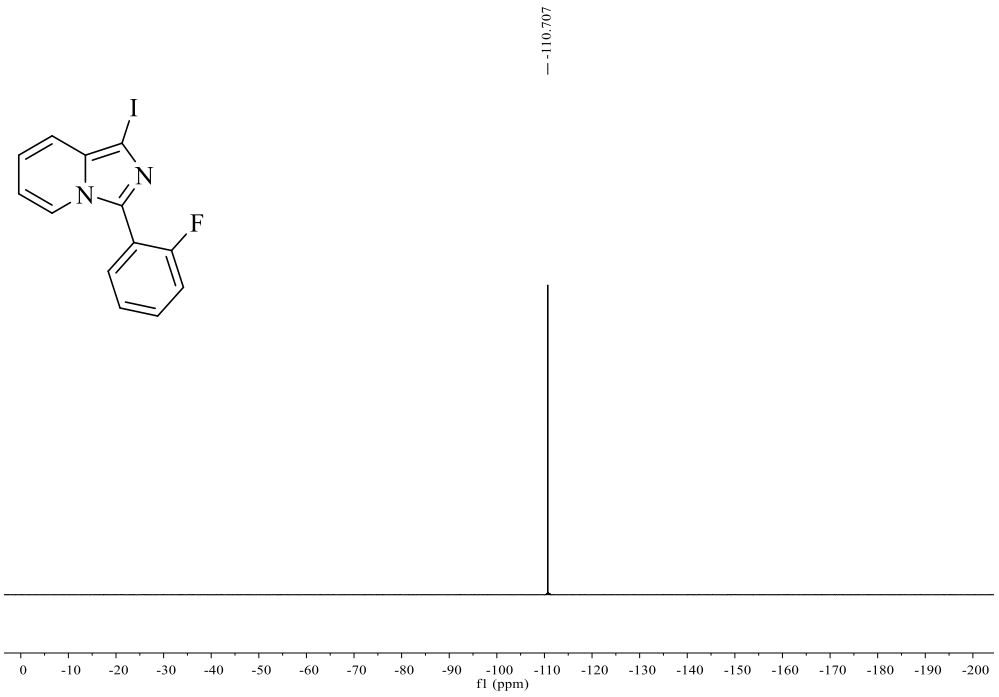
^{13}C NMR Spectrum of **3b**



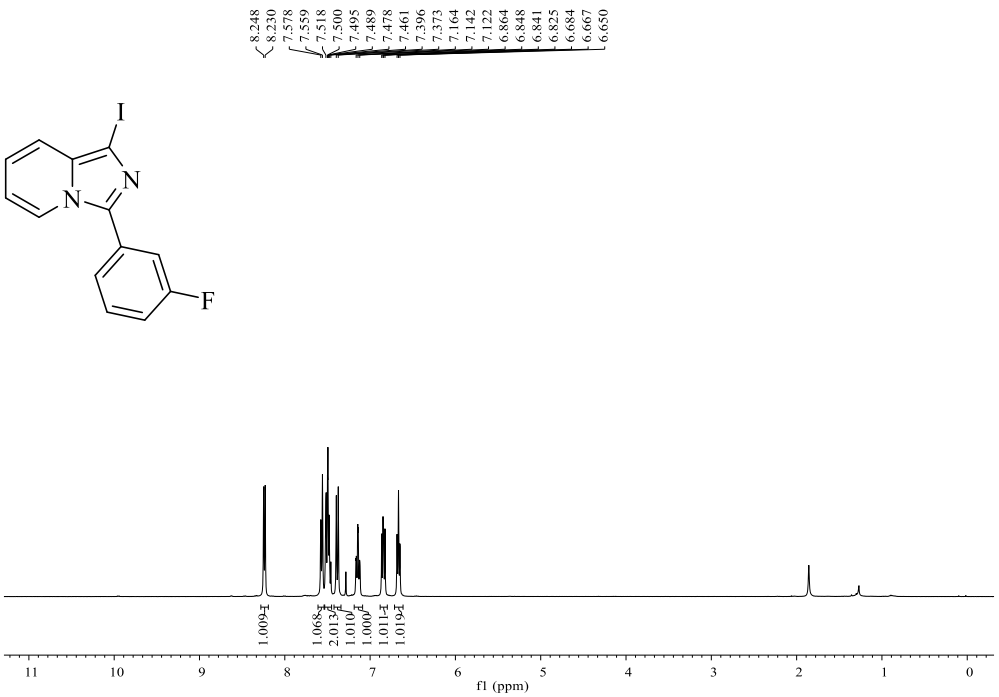
^{1}H NMR Spectrum of **3bb**



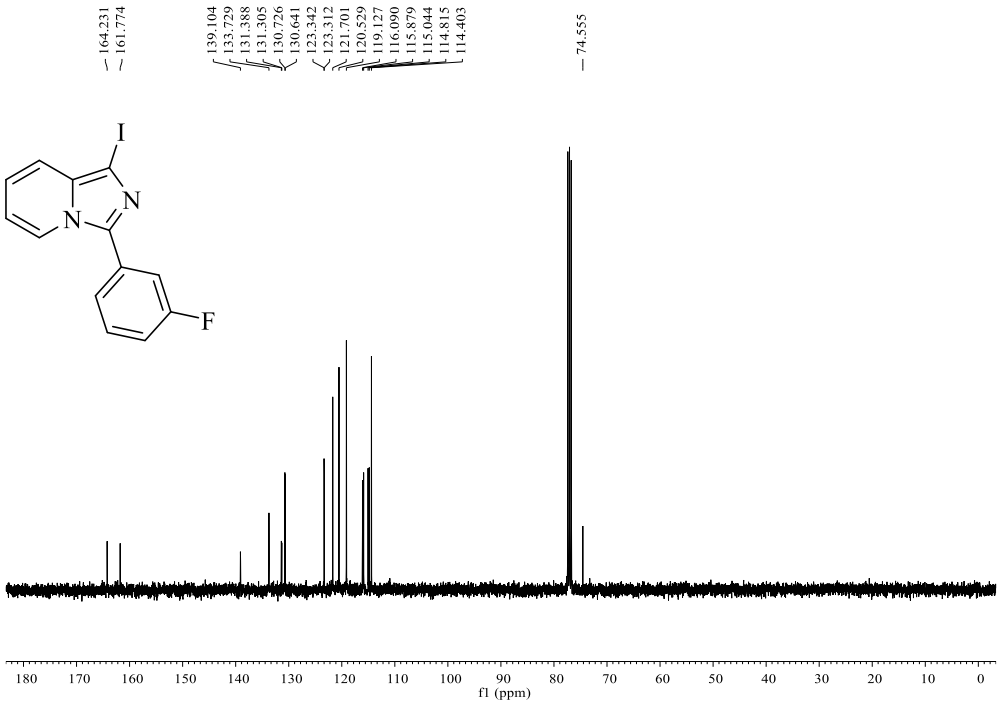
^{13}C NMR Spectrum of **3bb**



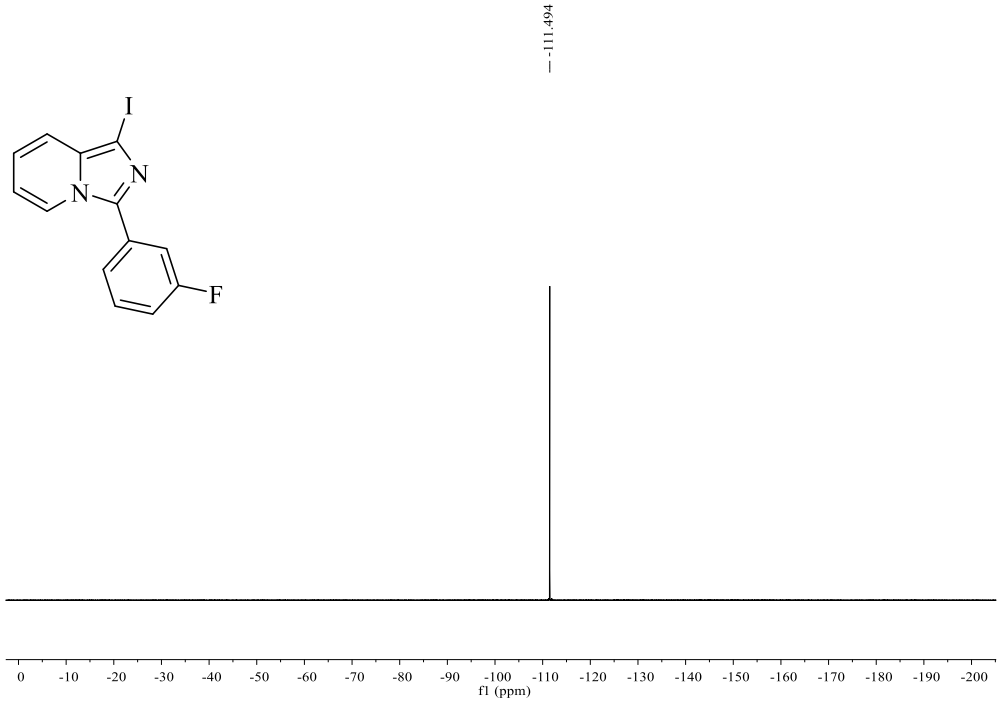
^{19}F NMR Spectrum of **3bb**



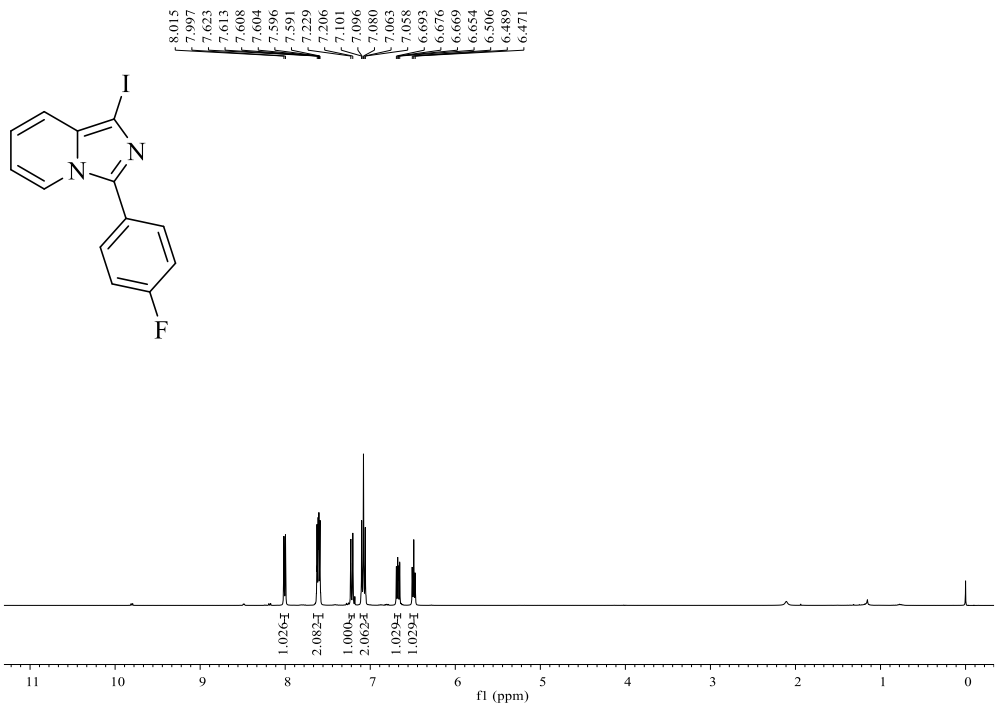
^{1}H NMR Spectrum of **3bc**



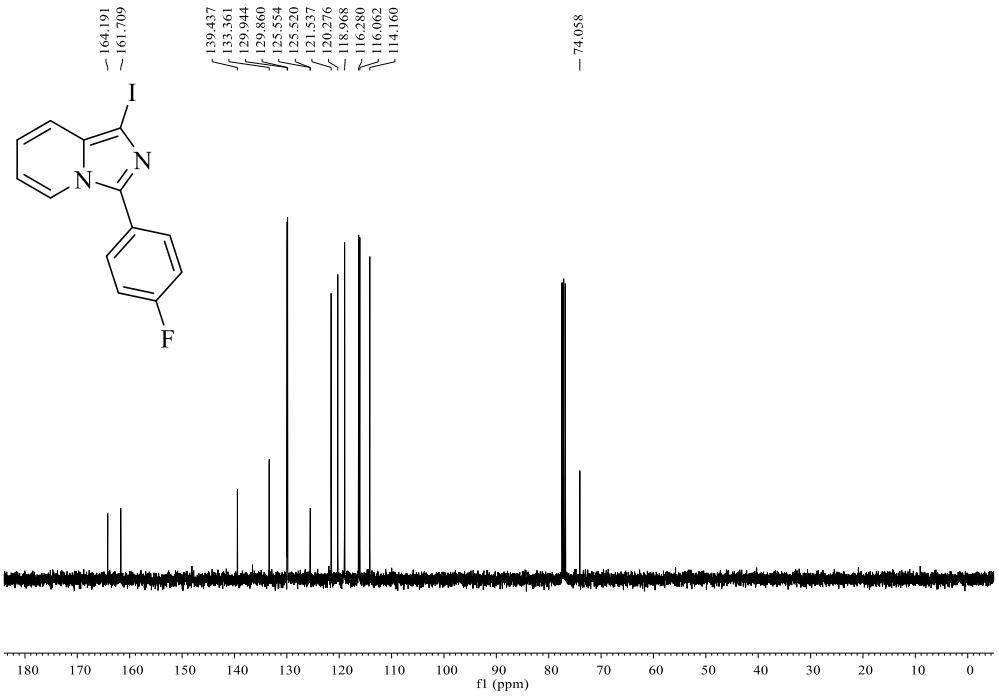
^{13}C NMR Spectrum of **3bc**



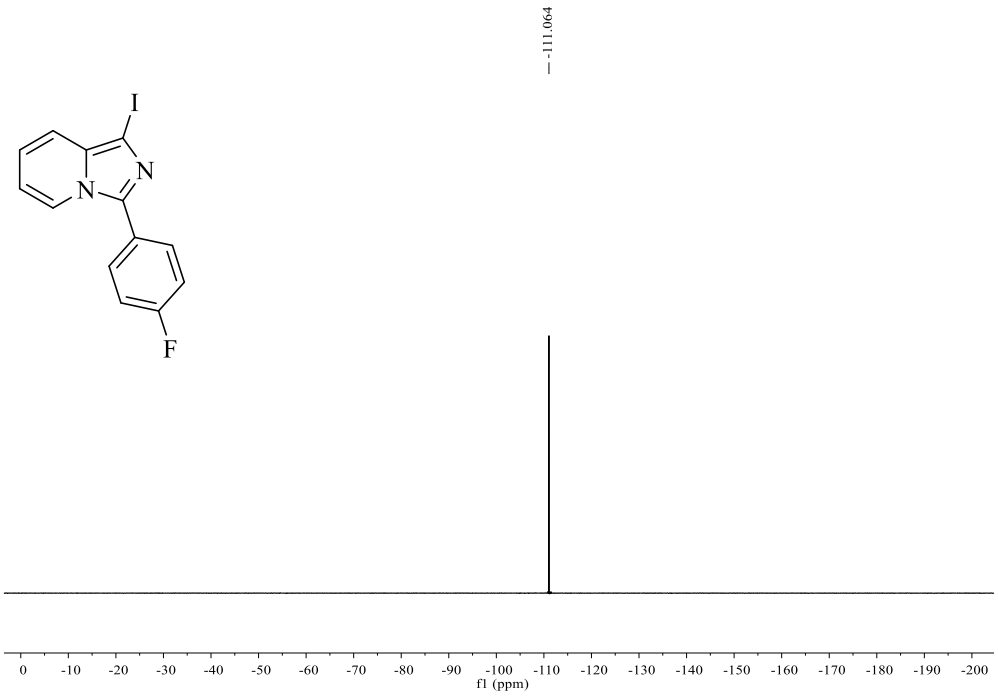
^{19}F NMR Spectrum of **3bc**



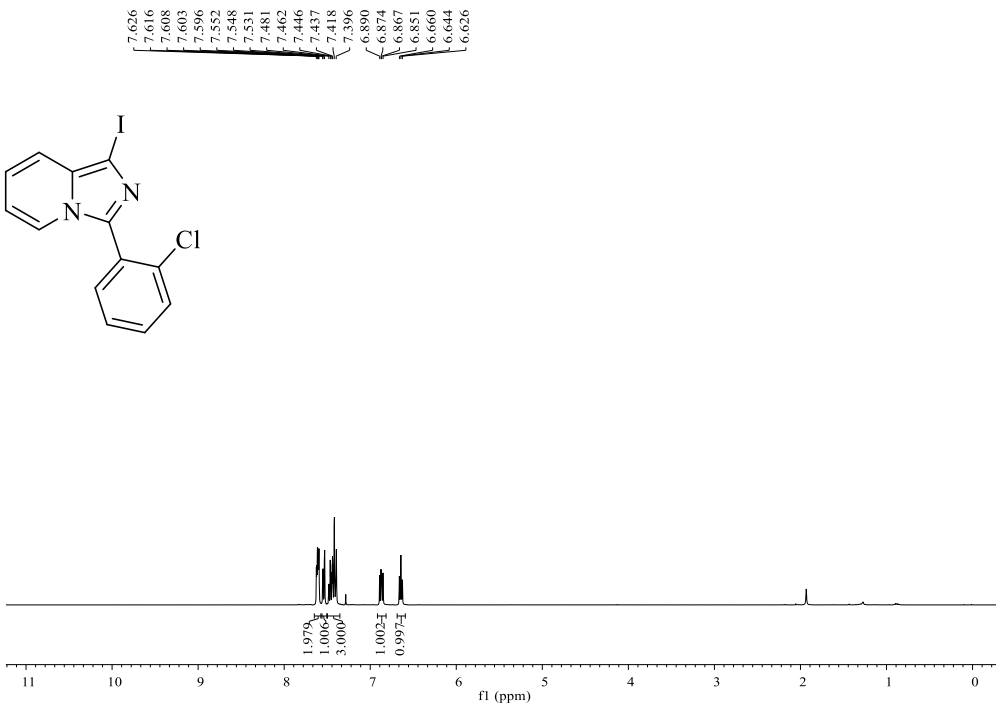
^{1}H NMR Spectrum of **3bd**



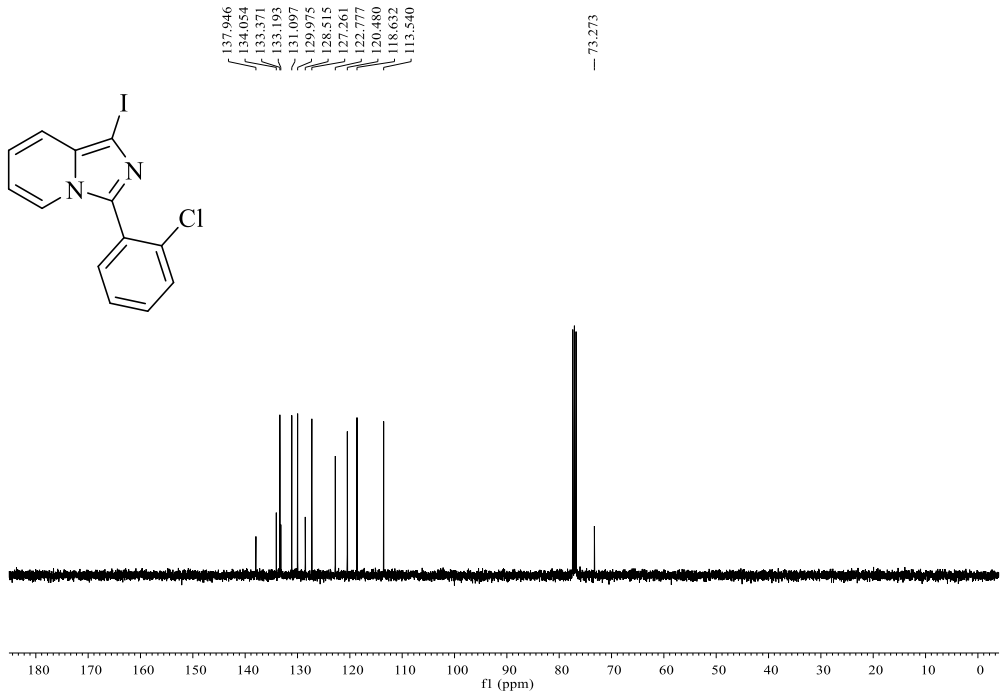
^{13}C NMR Spectrum of **3bd**



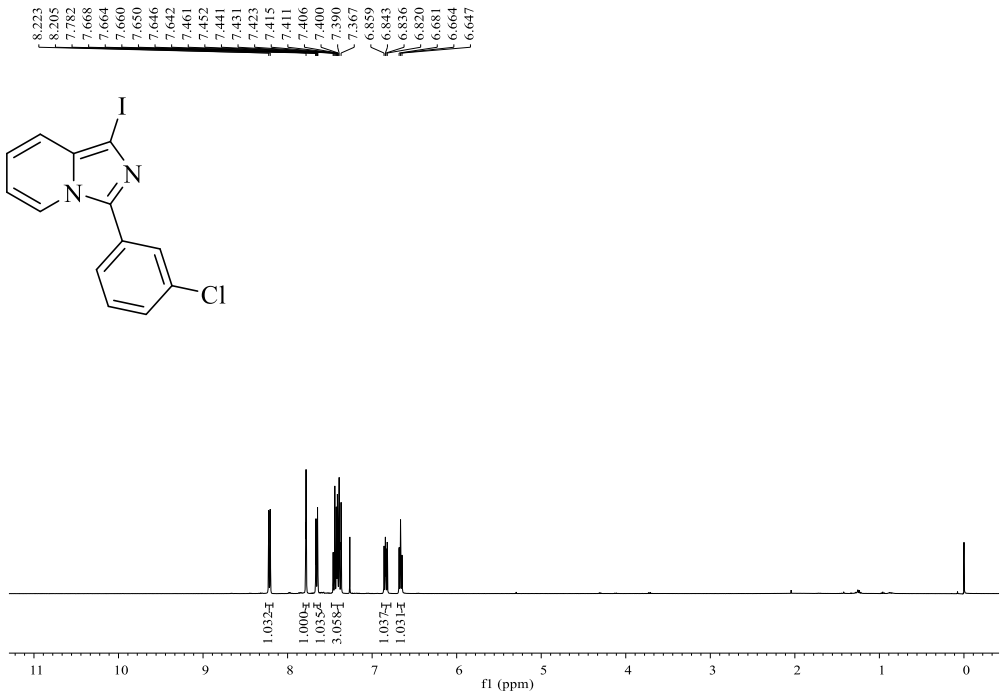
^{19}F NMR Spectrum of **3bd**



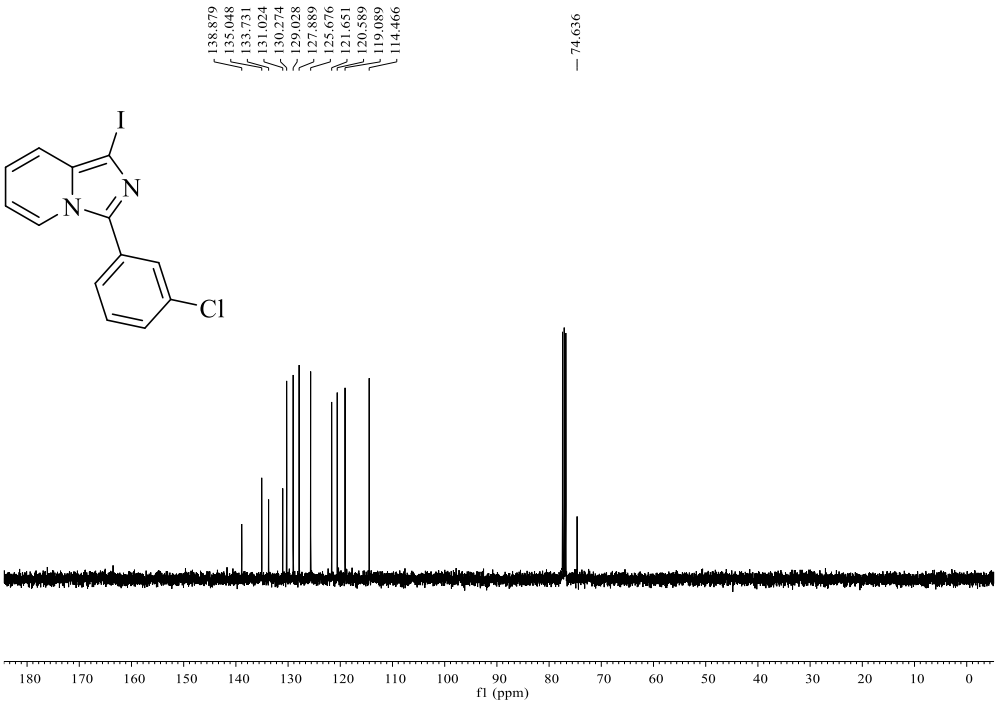
^{1}H NMR Spectrum of **3be**



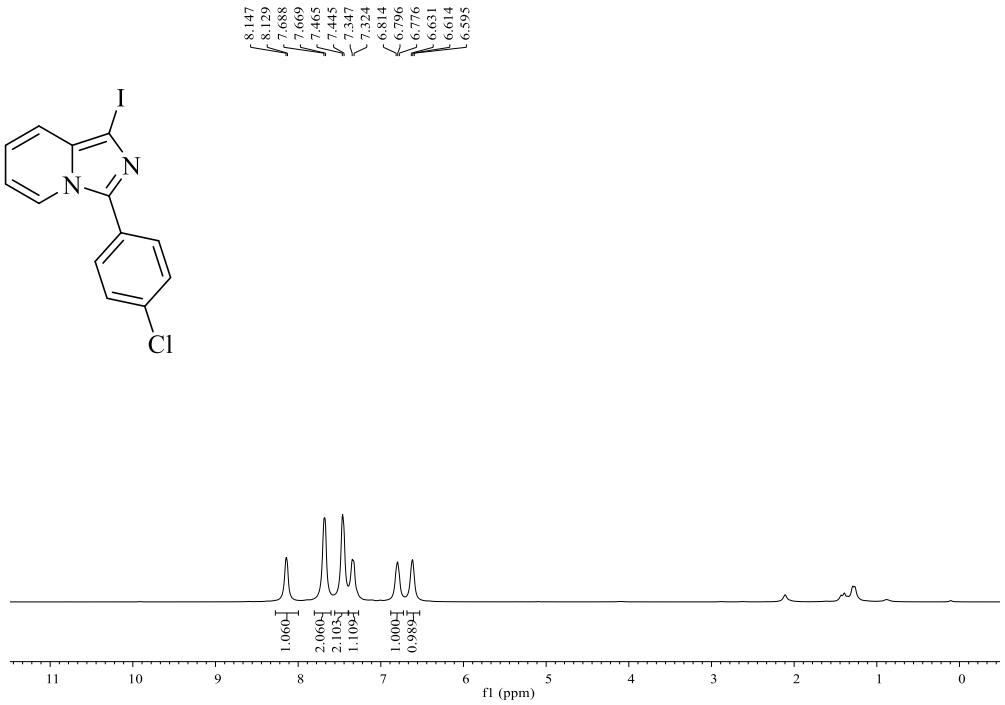
^{13}C NMR Spectrum of **3be**



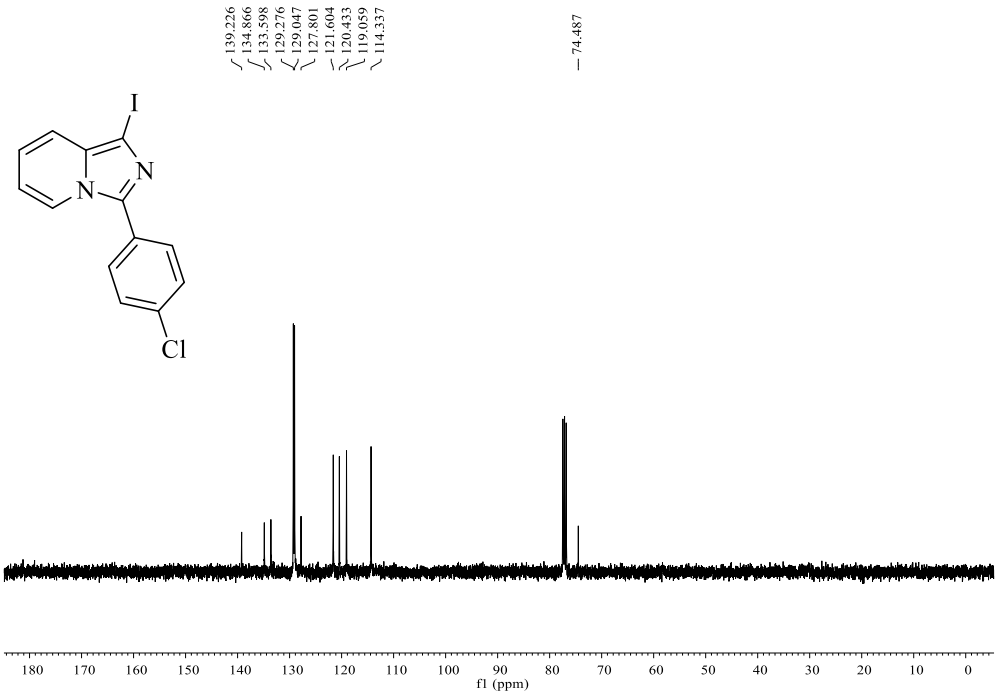
^{1}H NMR Spectrum of **3bf**



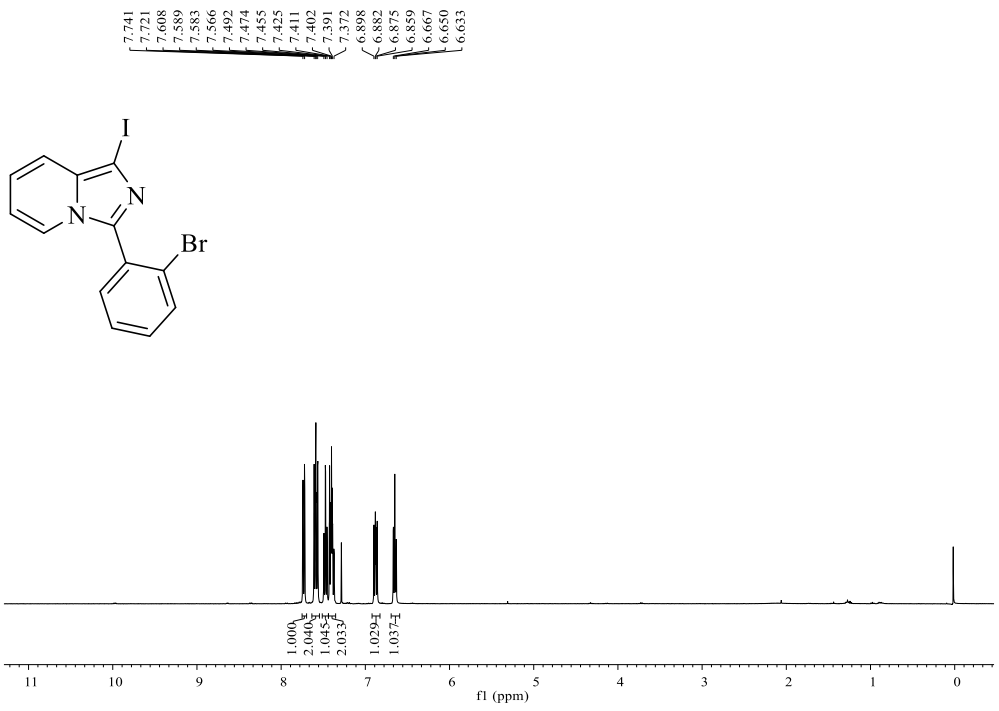
^{13}C NMR Spectrum of **3bf**



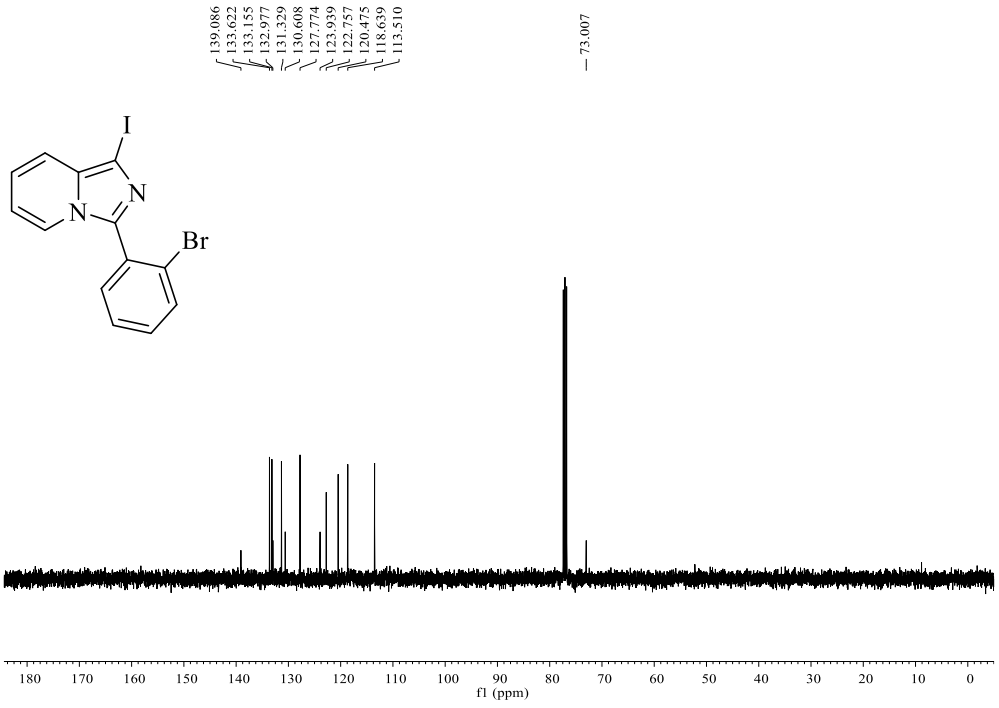
^{1}H NMR Spectrum of **3bg**



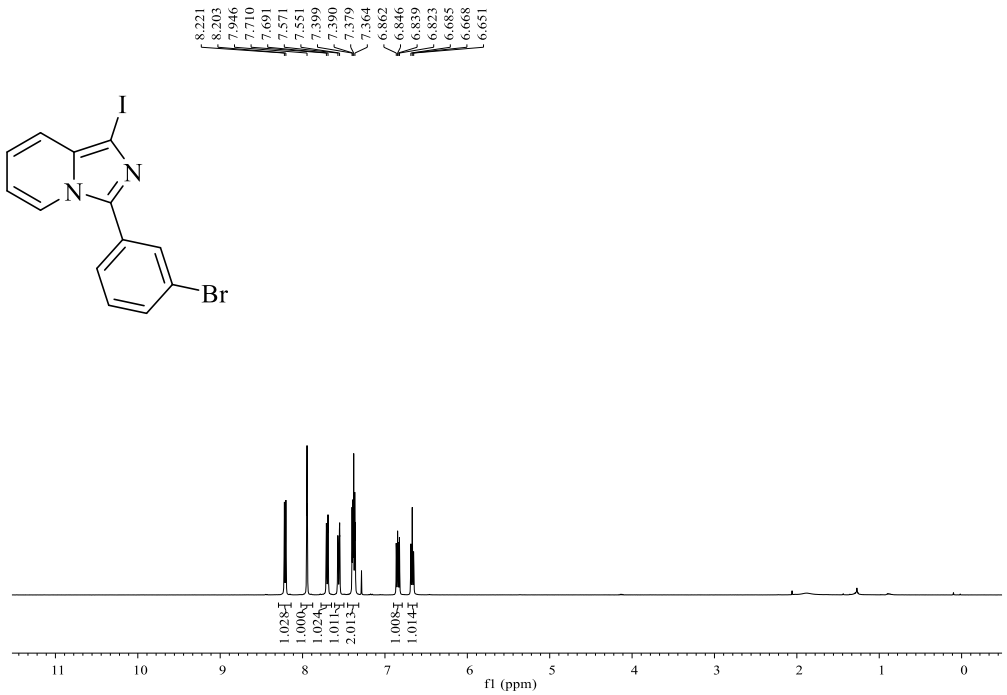
^{13}C NMR Spectrum of **3bg**



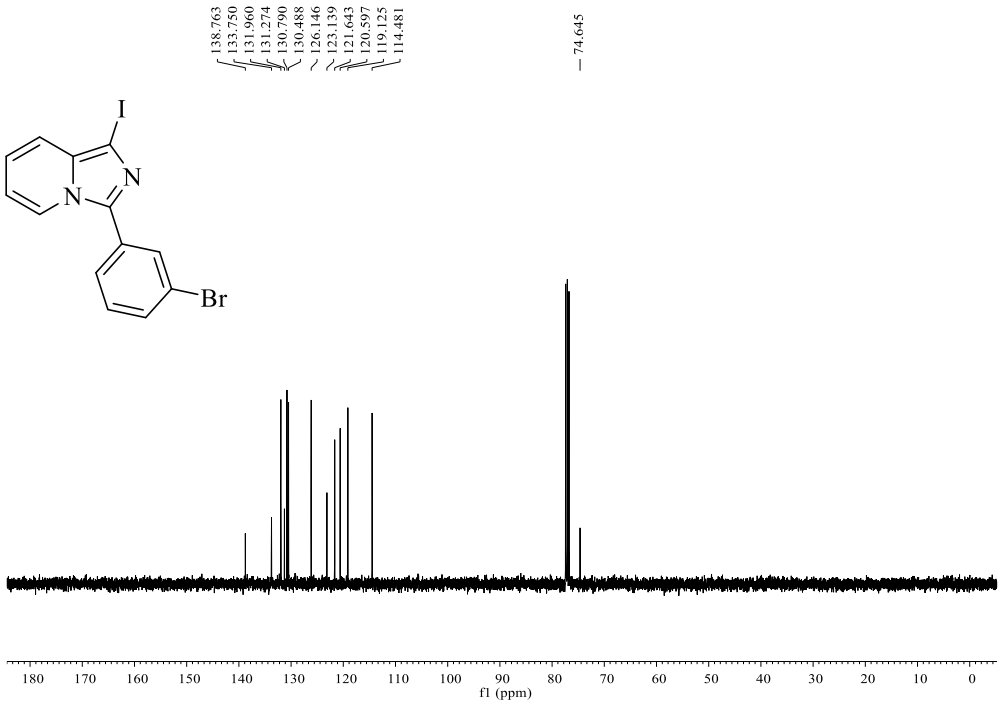
^{1}H NMR Spectrum of **3bh**



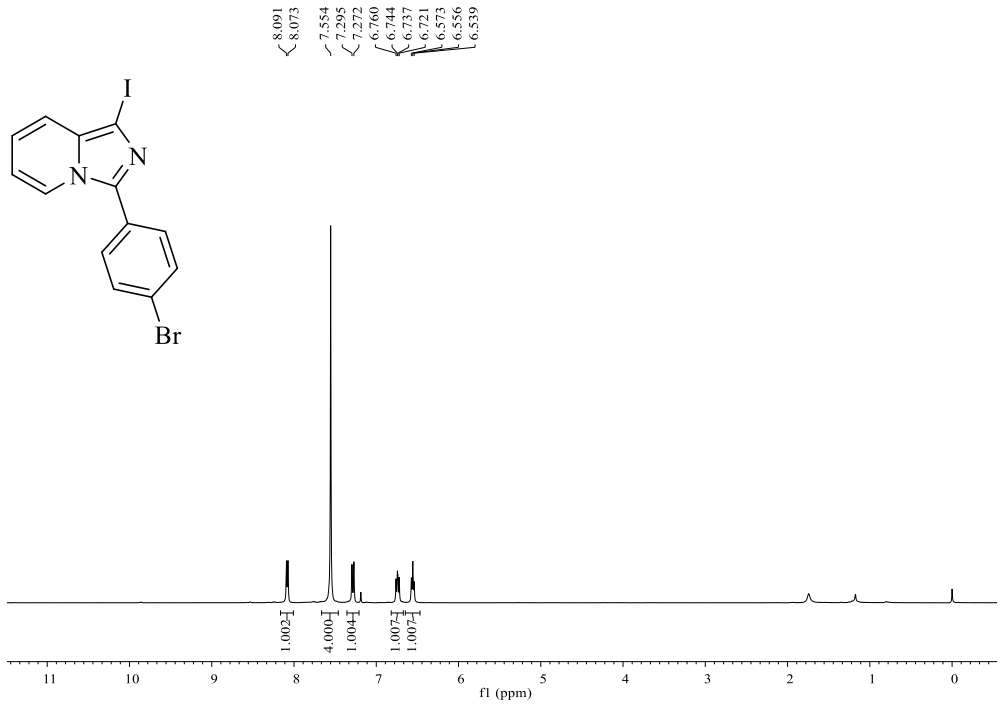
^{13}C NMR Spectrum of **3bh**



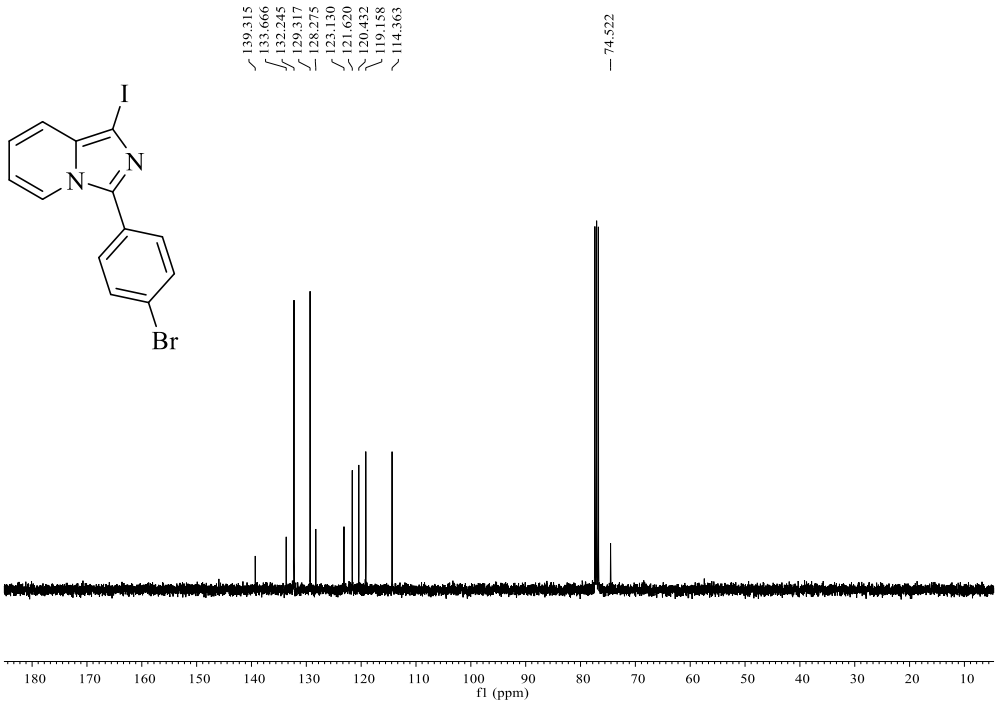
^{1}H NMR Spectrum of **3bi**



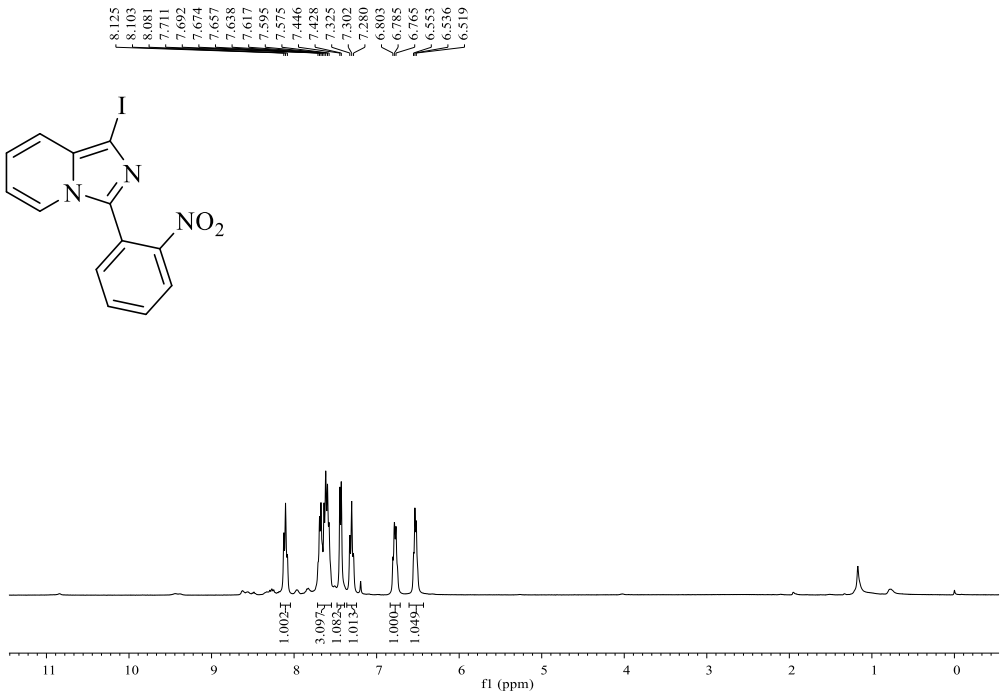
^{13}C NMR Spectrum of **3bi**



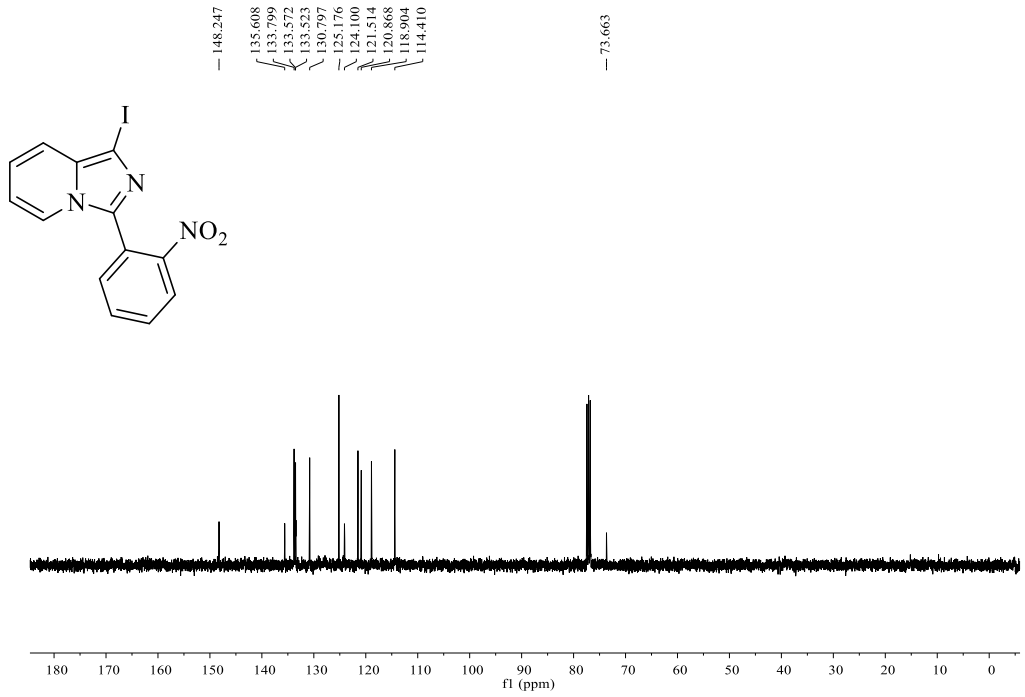
^{1}H NMR Spectrum of **3bj**



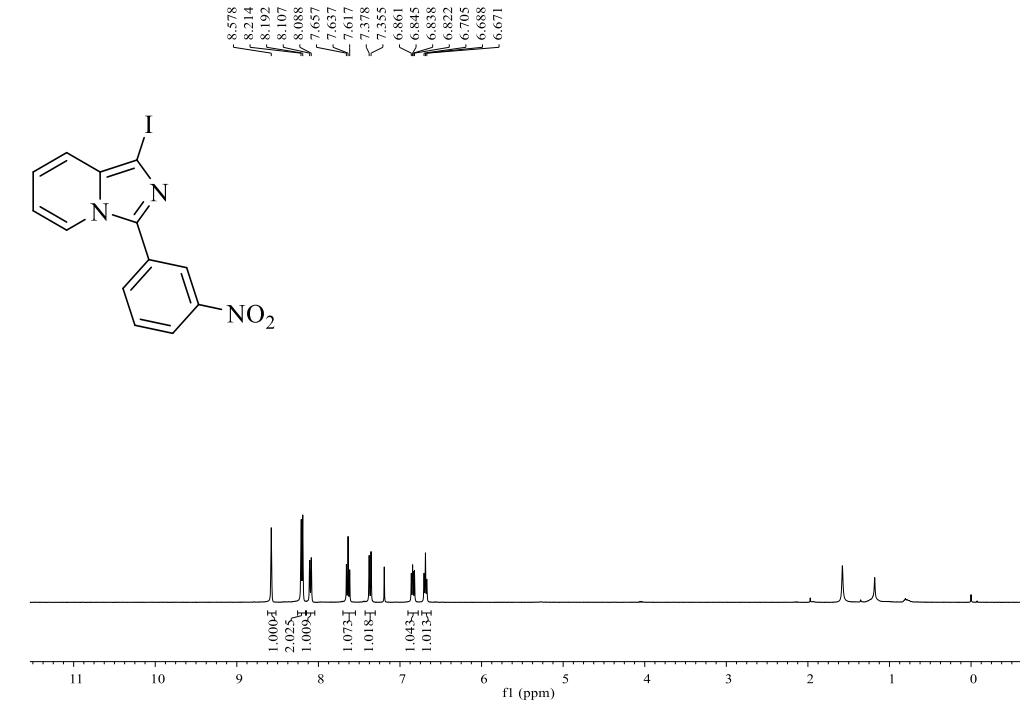
^{13}C NMR Spectrum of **3bj**



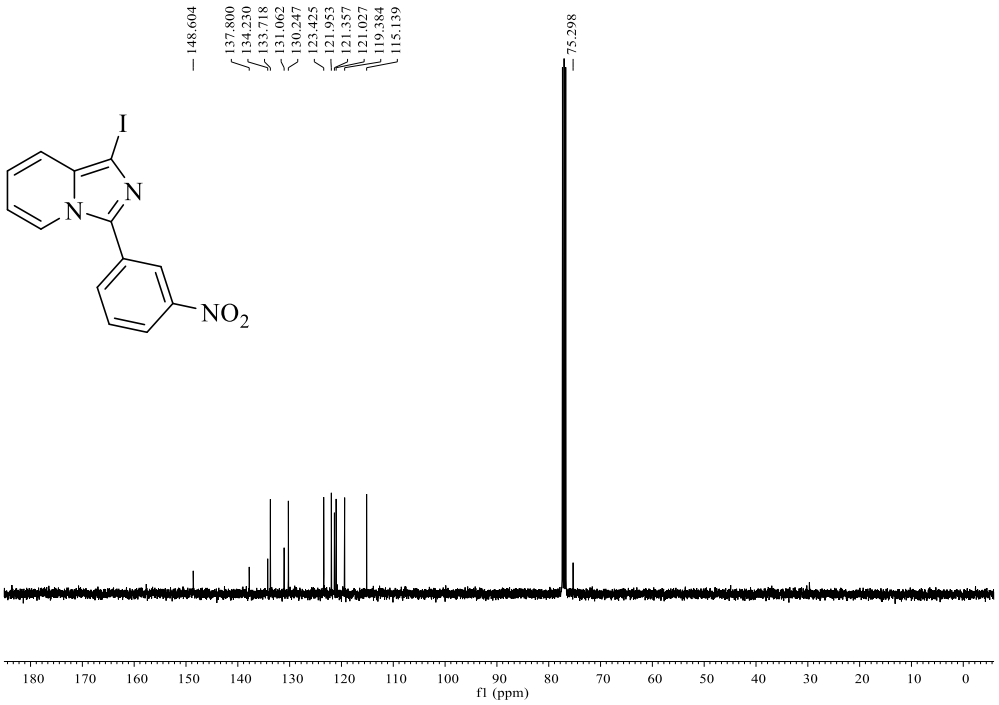
^{1}H NMR Spectrum of **3bk**



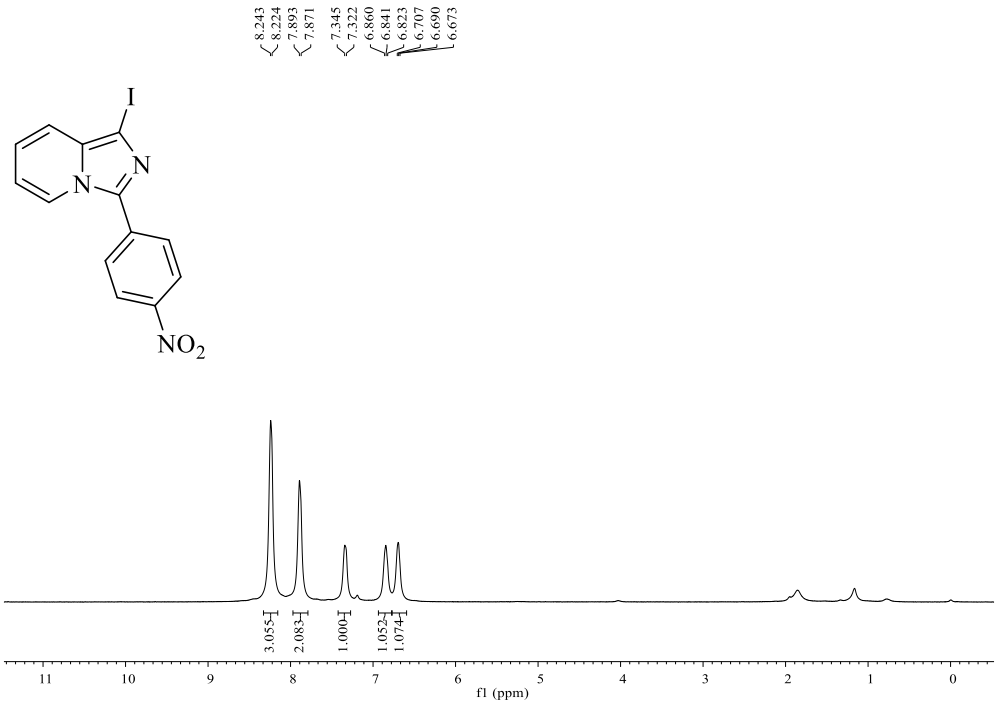
^{13}C NMR Spectrum of **3bk**



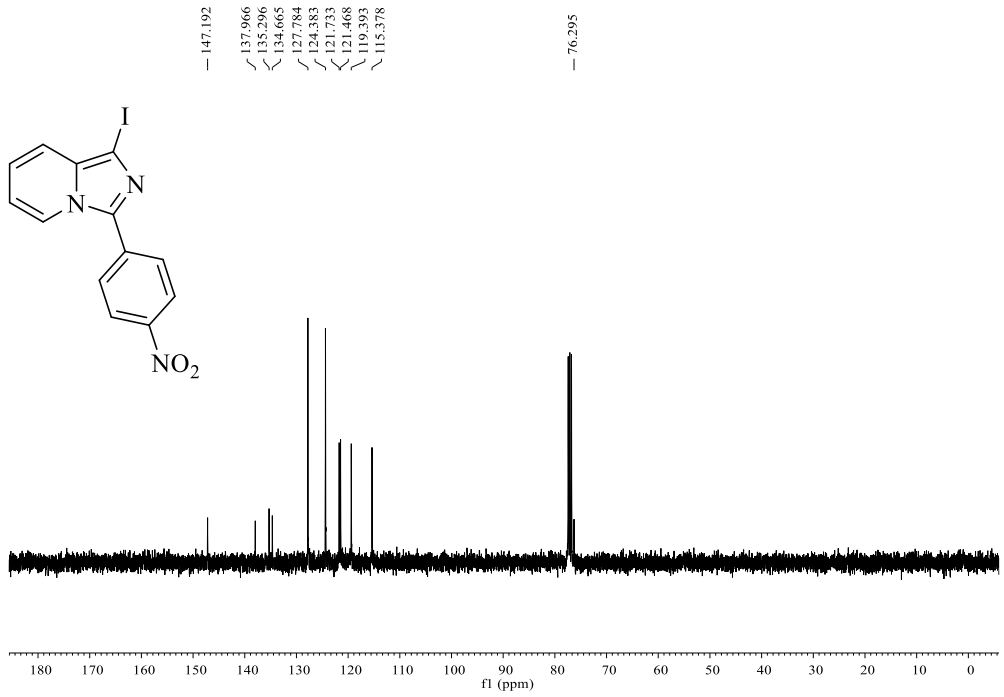
^{1}H NMR Spectrum of **3bl**



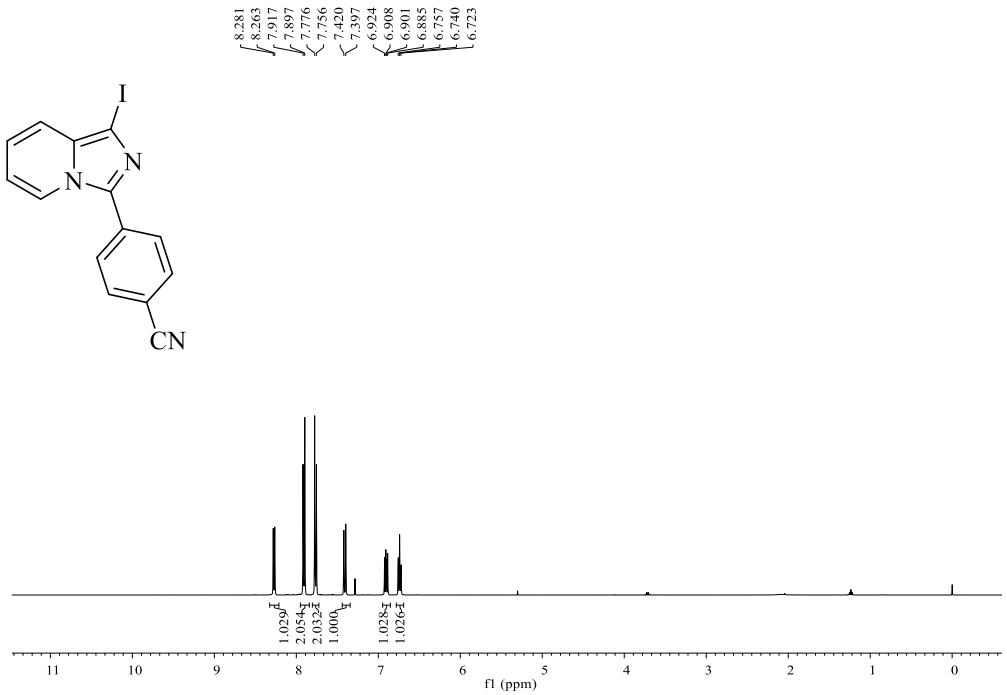
^{13}C NMR Spectrum of **3bl**



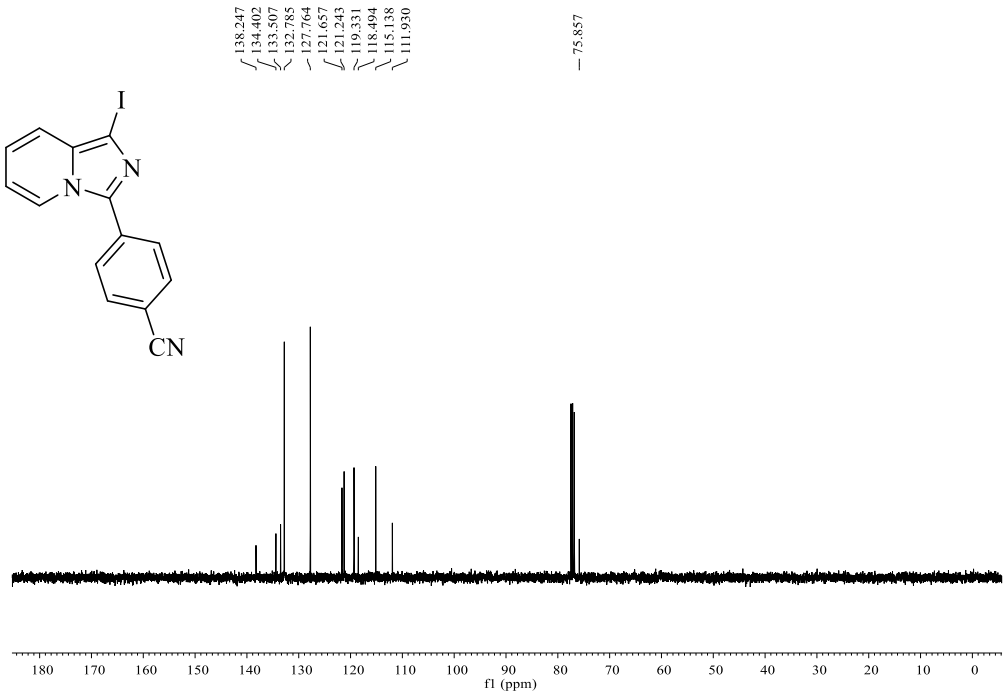
^{1}H NMR Spectrum of **3bm**



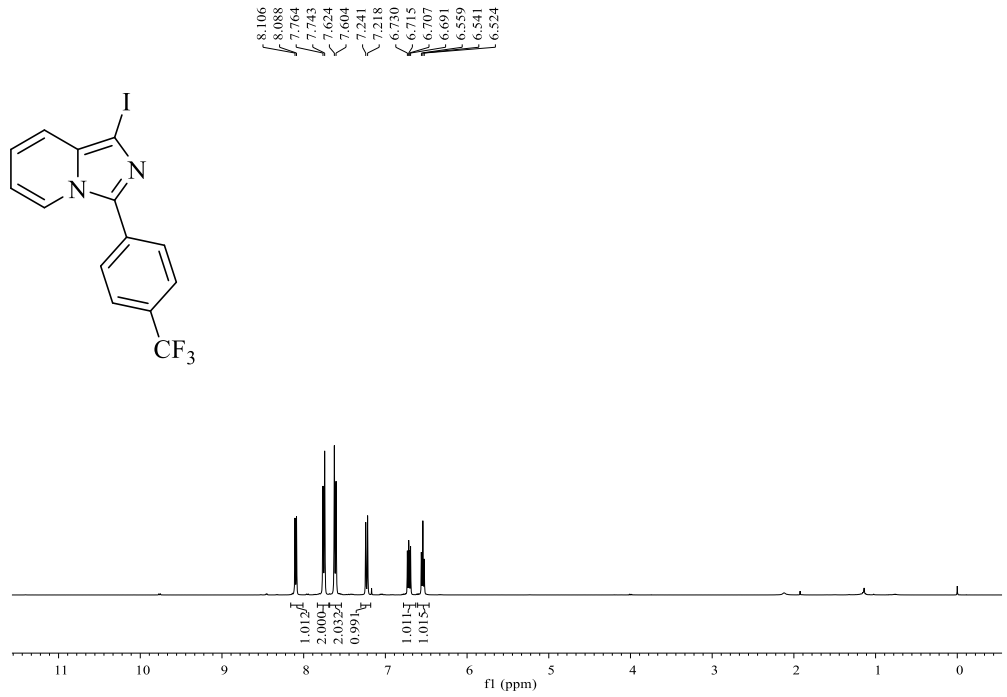
^{13}C NMR Spectrum of **3bm**



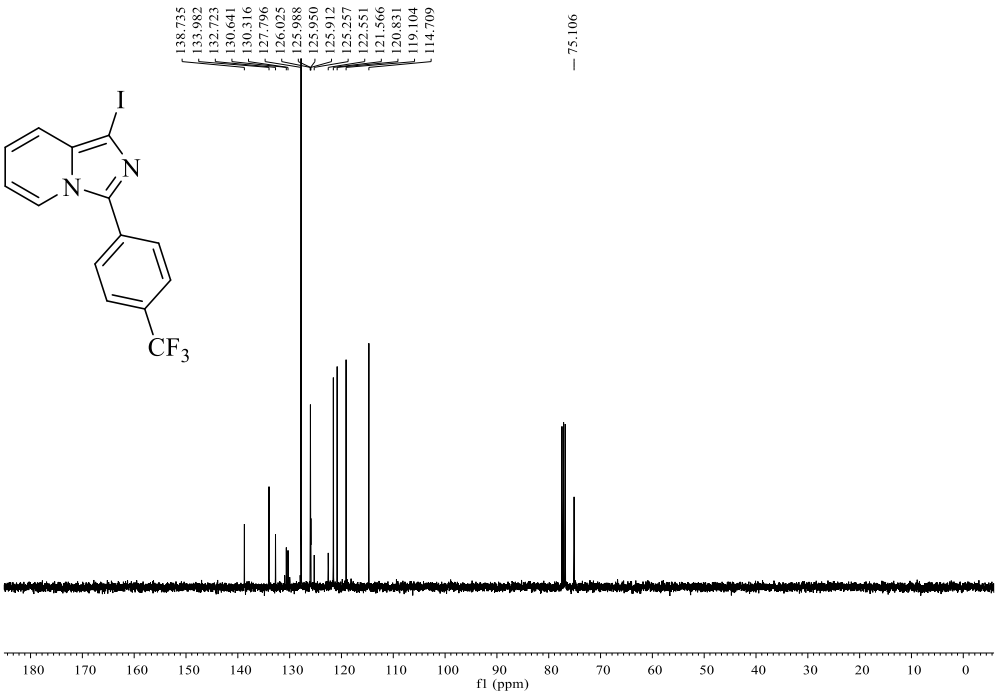
^{1}H NMR Spectrum of **3bn**



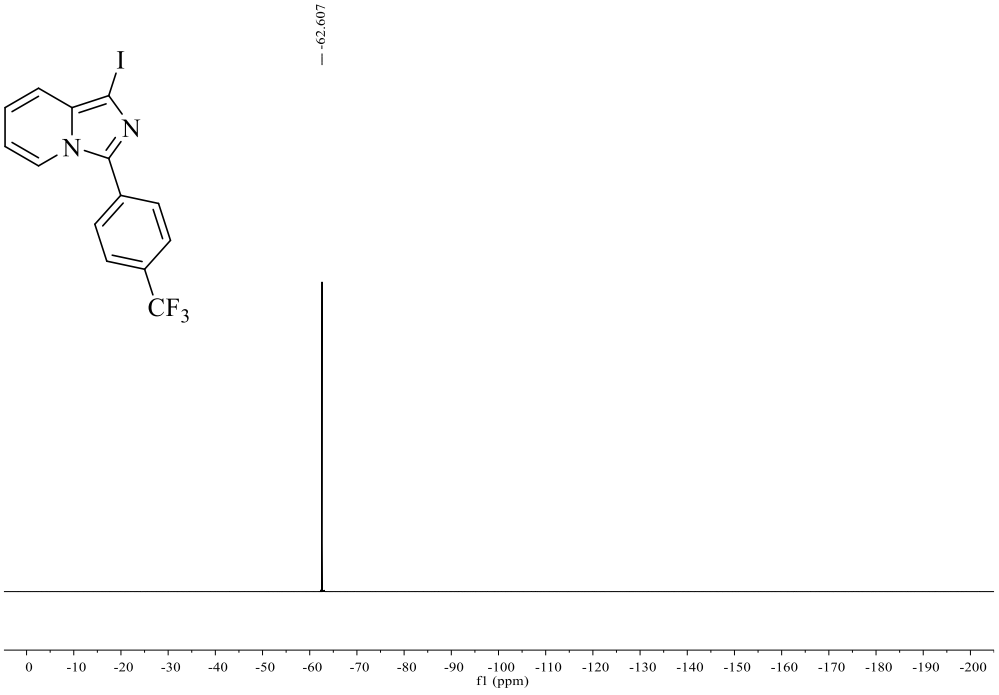
^{13}C NMR Spectrum of **3bn**



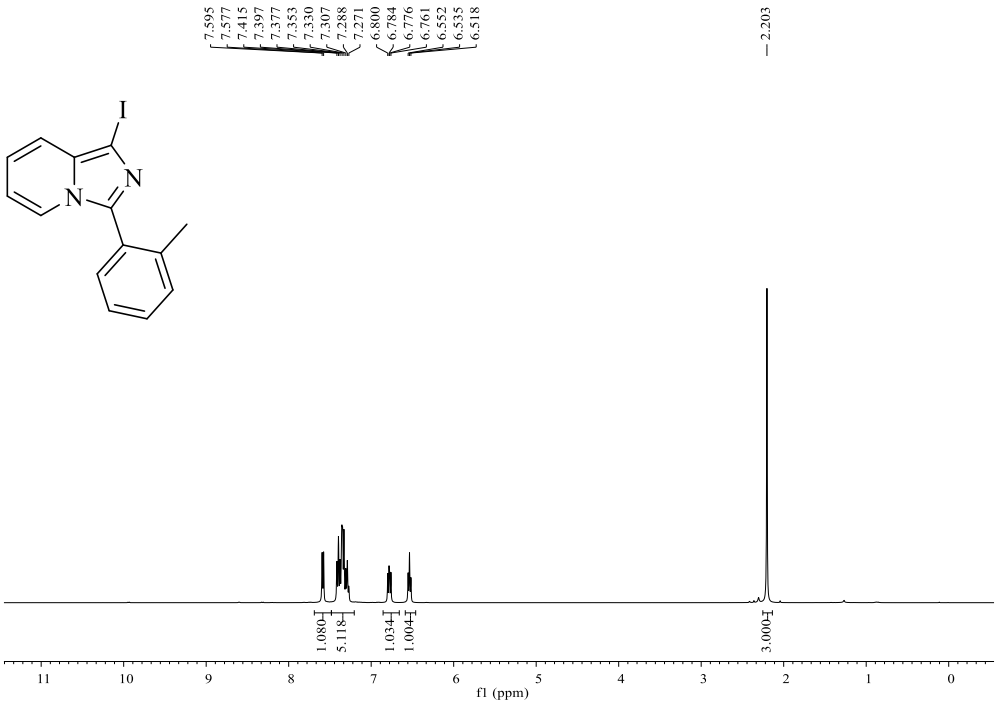
^{1}H NMR Spectrum of **3bo**



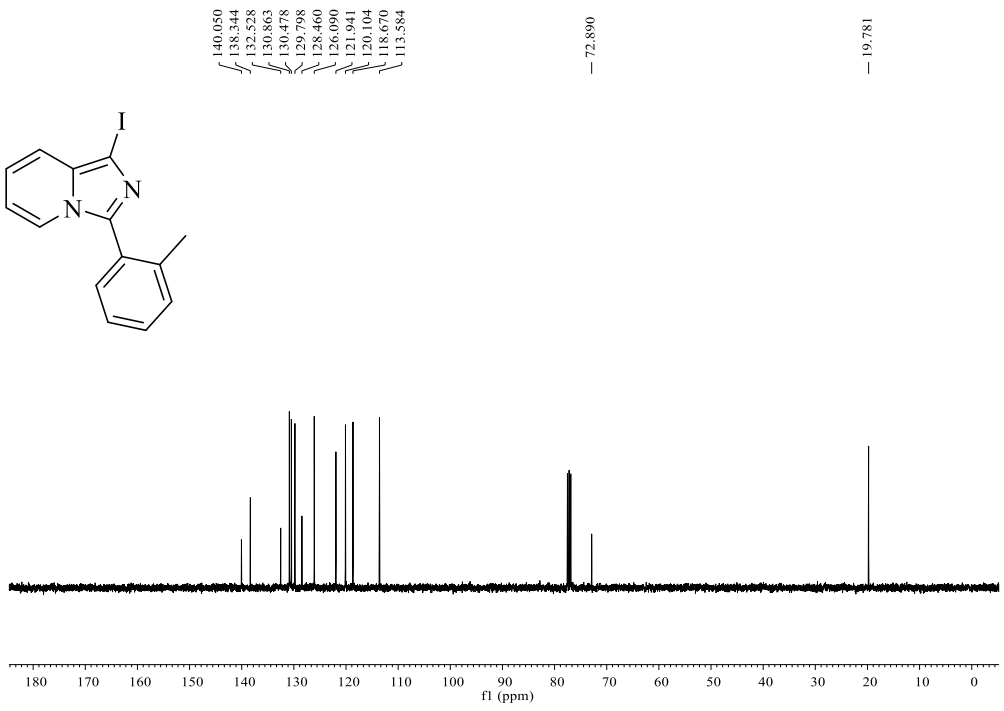
^{13}C NMR Spectrum of **3bo**



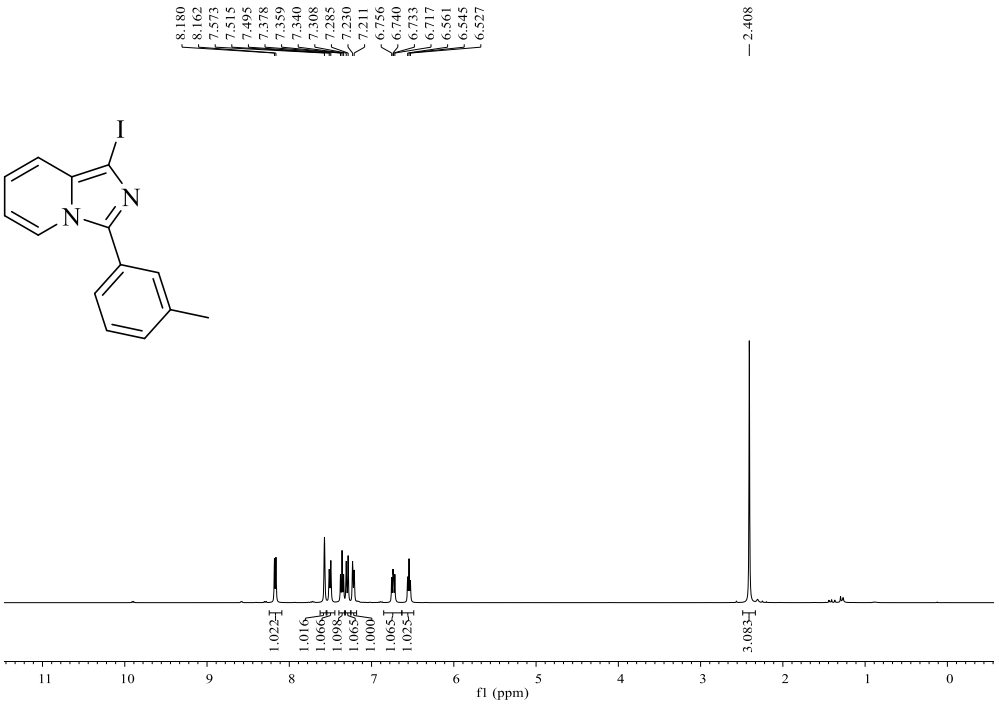
^{19}F NMR Spectrum of **3bo**



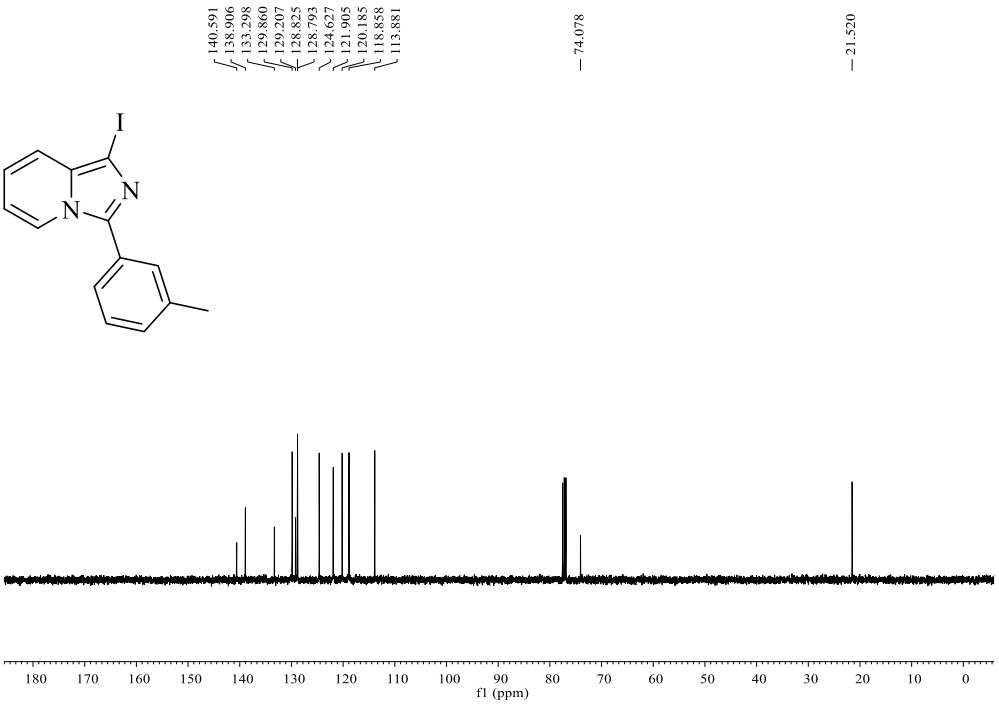
^{1}H NMR Spectrum of **3bp**



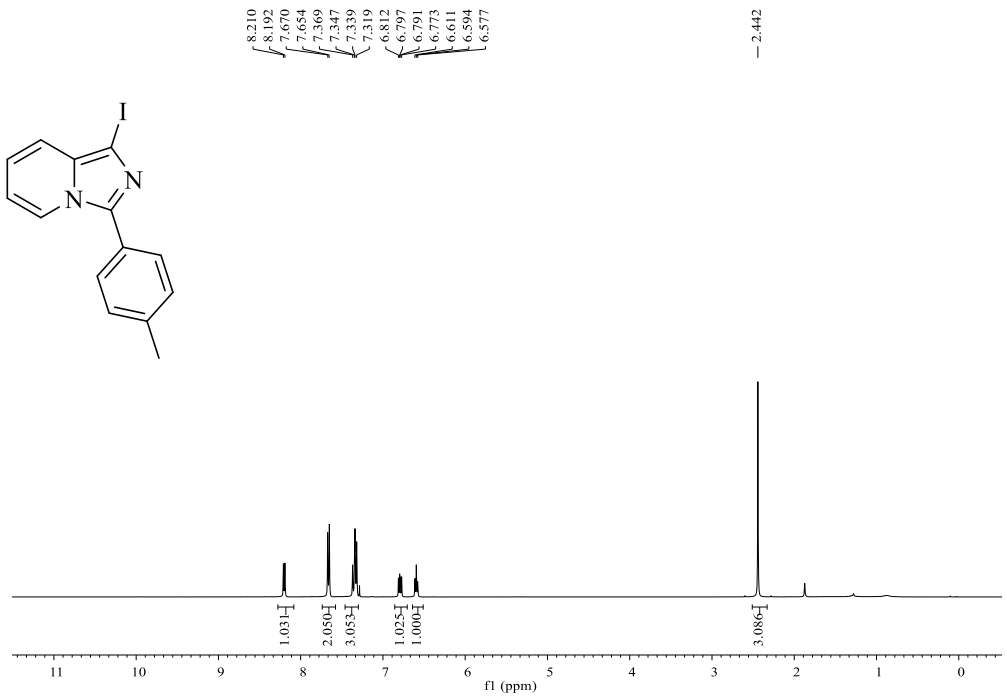
^{13}C NMR Spectrum of **3bp**



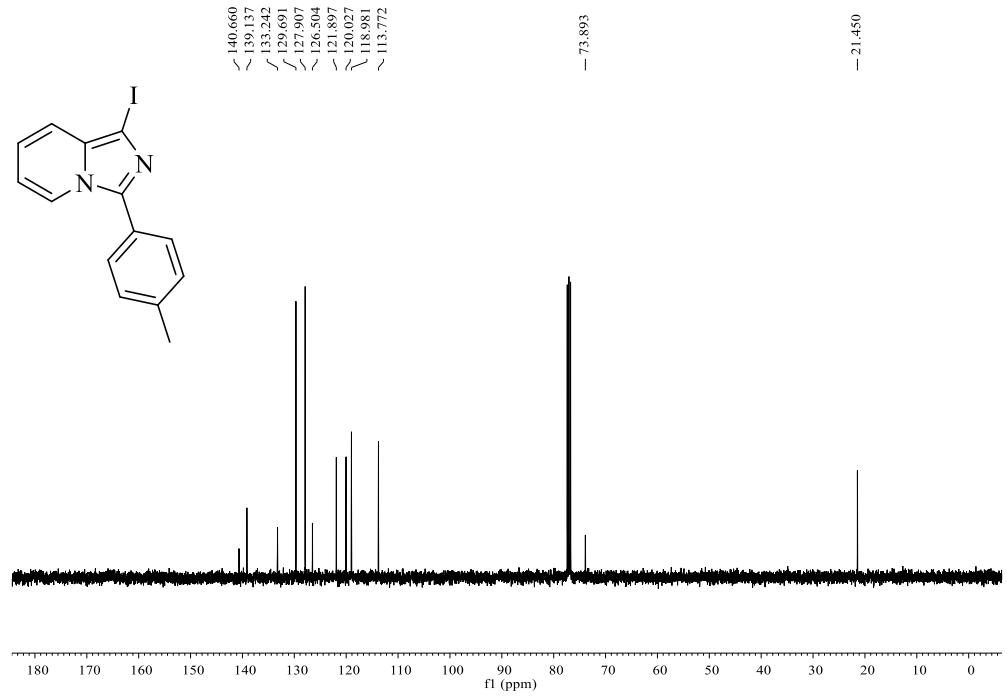
^{1}H NMR Spectrum of **3bq**



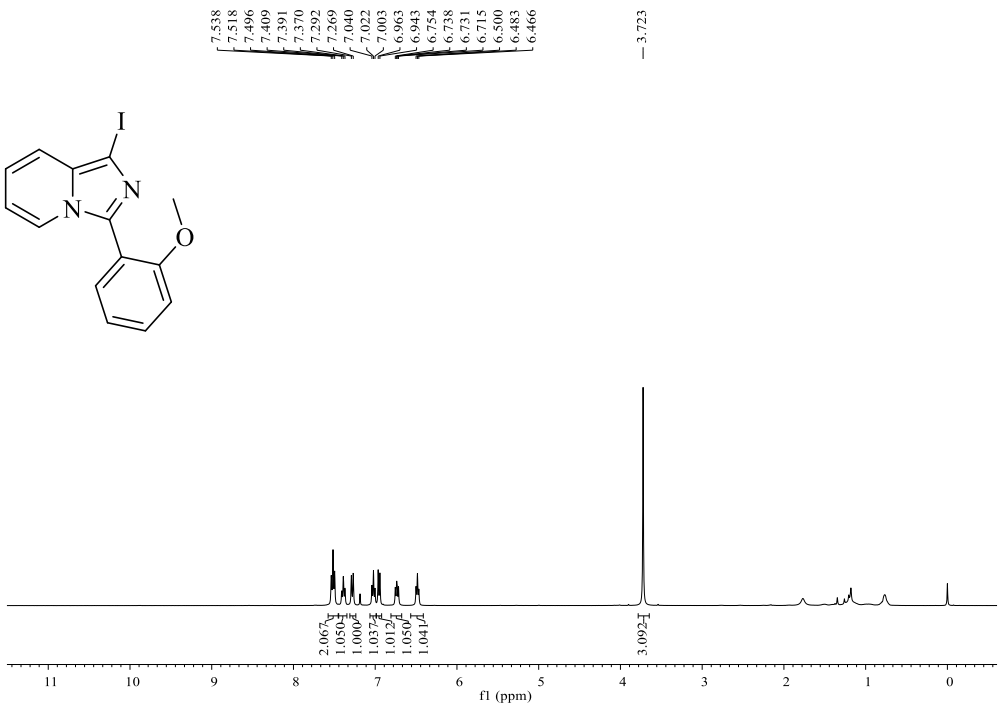
^{13}C NMR Spectrum of **3bq**



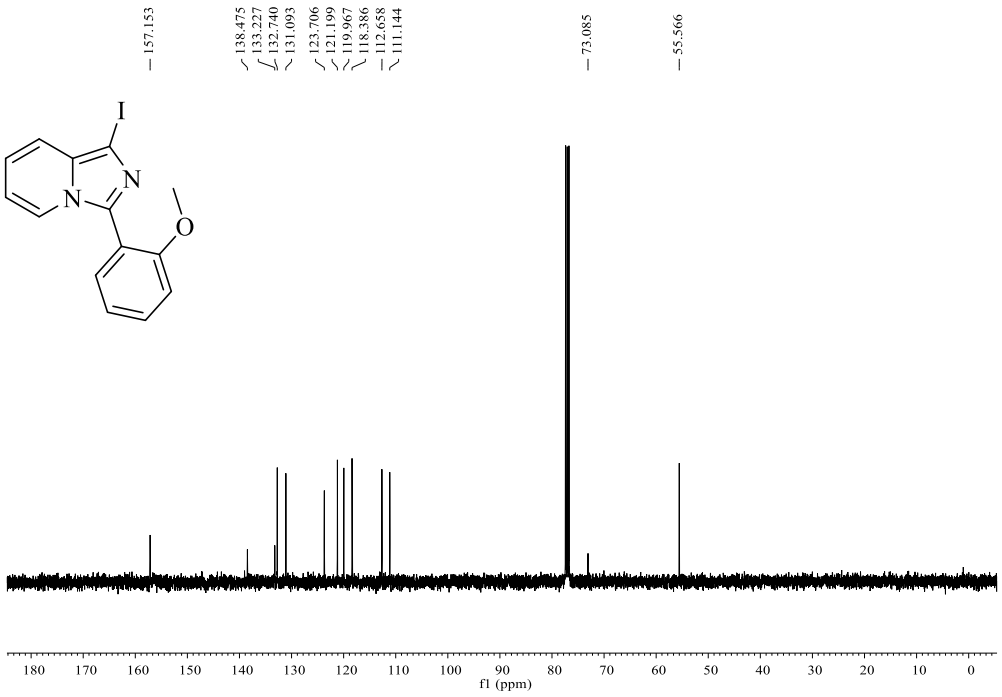
^{1}H NMR Spectrum of **3br**



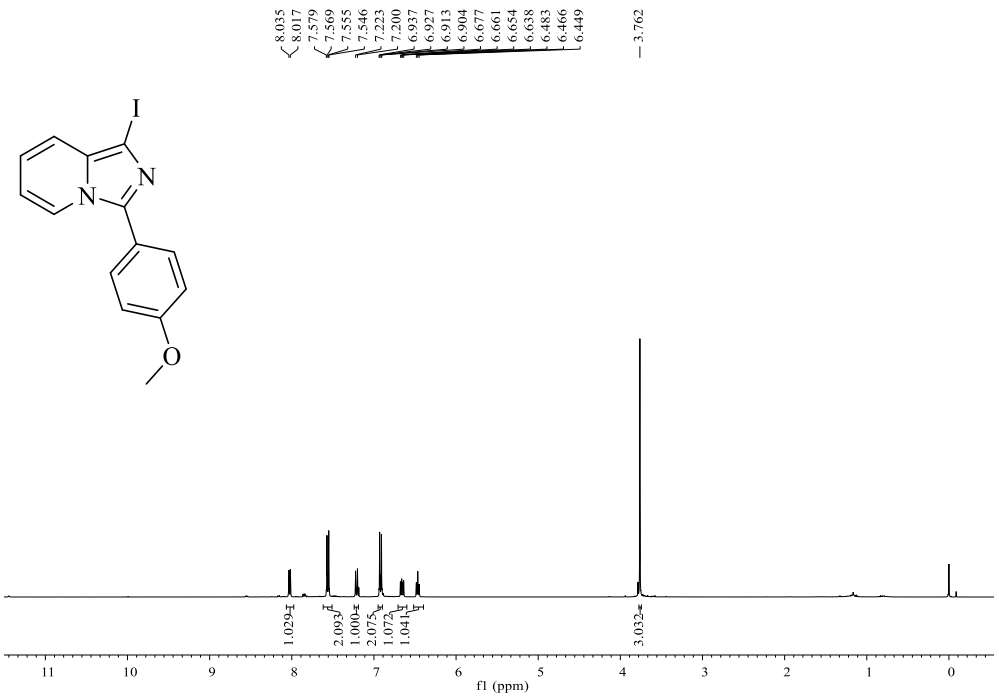
^{13}C NMR Spectrum of **3br**



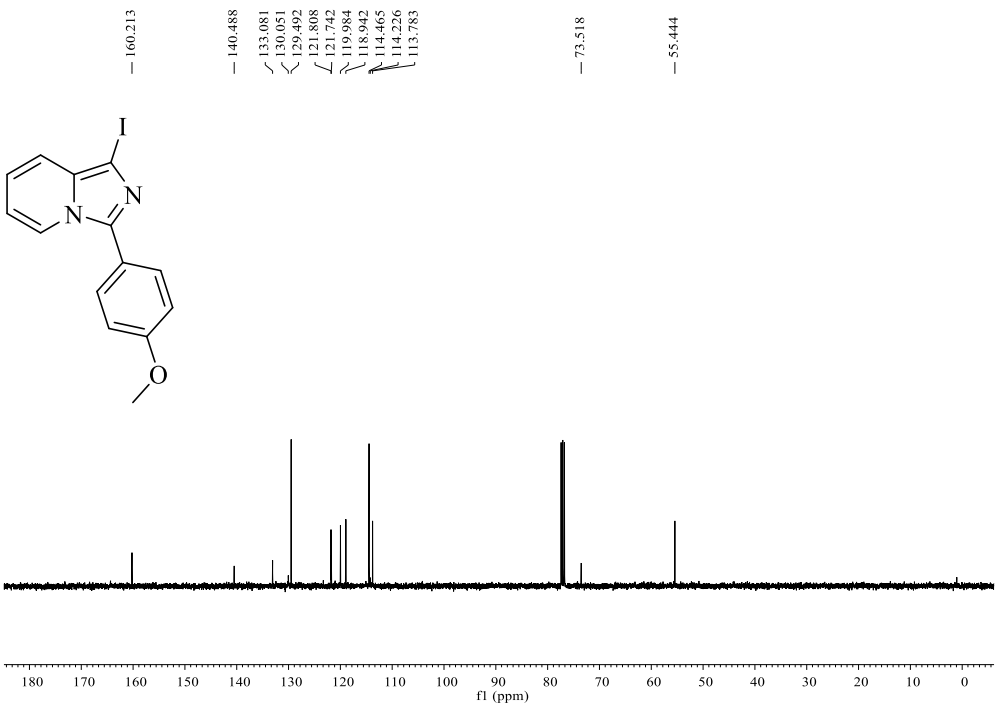
^{1}H NMR Spectrum of **3bs**



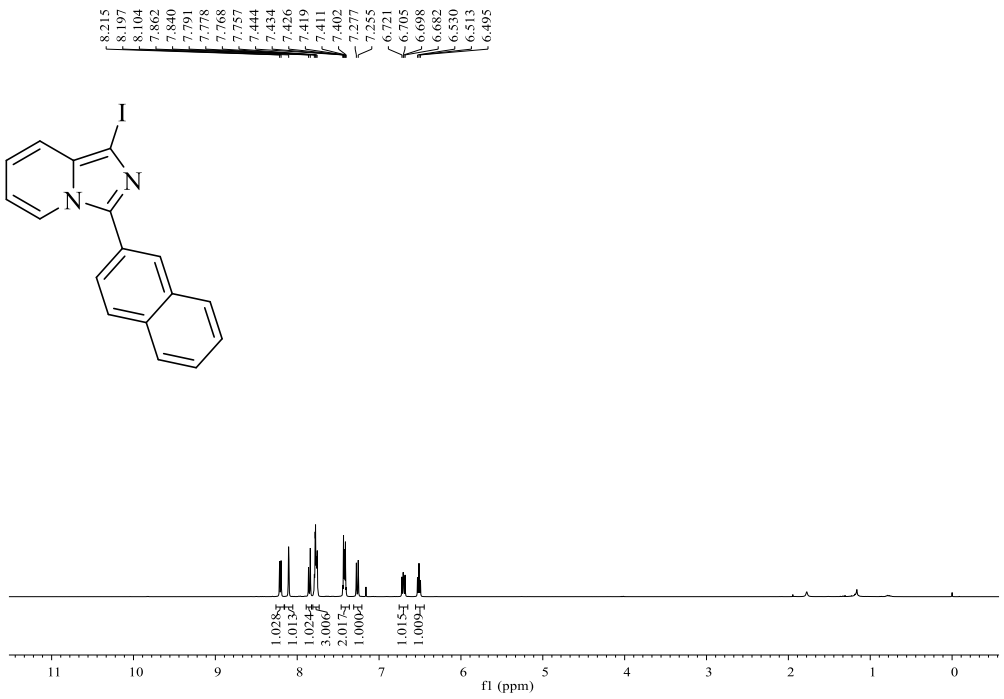
^{13}C NMR Spectrum of **3bs**



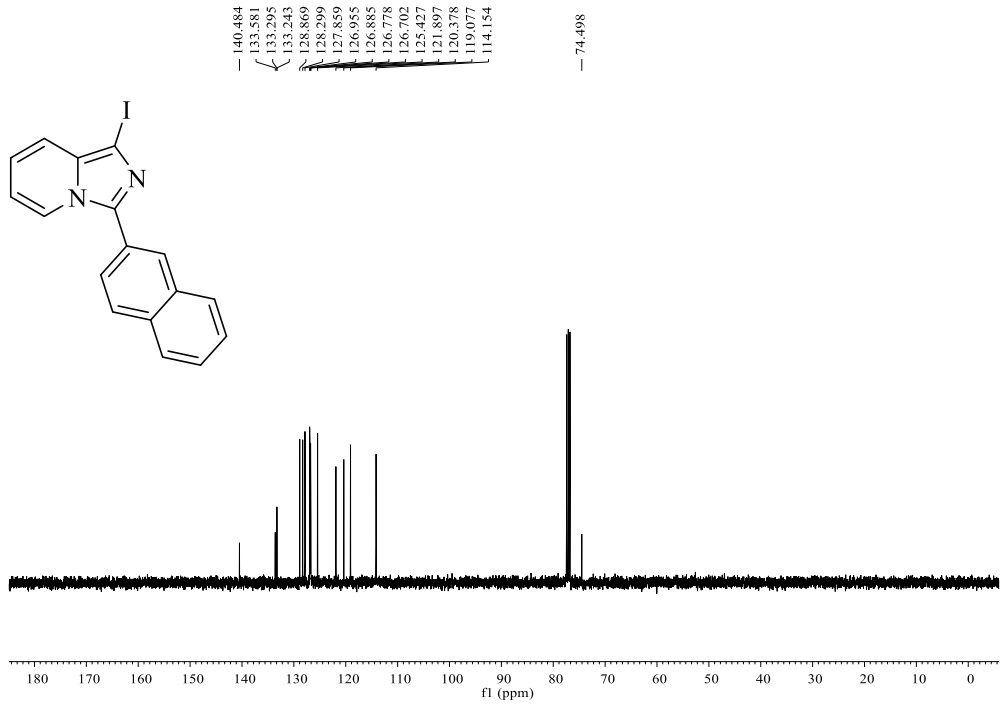
^{1}H NMR Spectrum of **3bt**



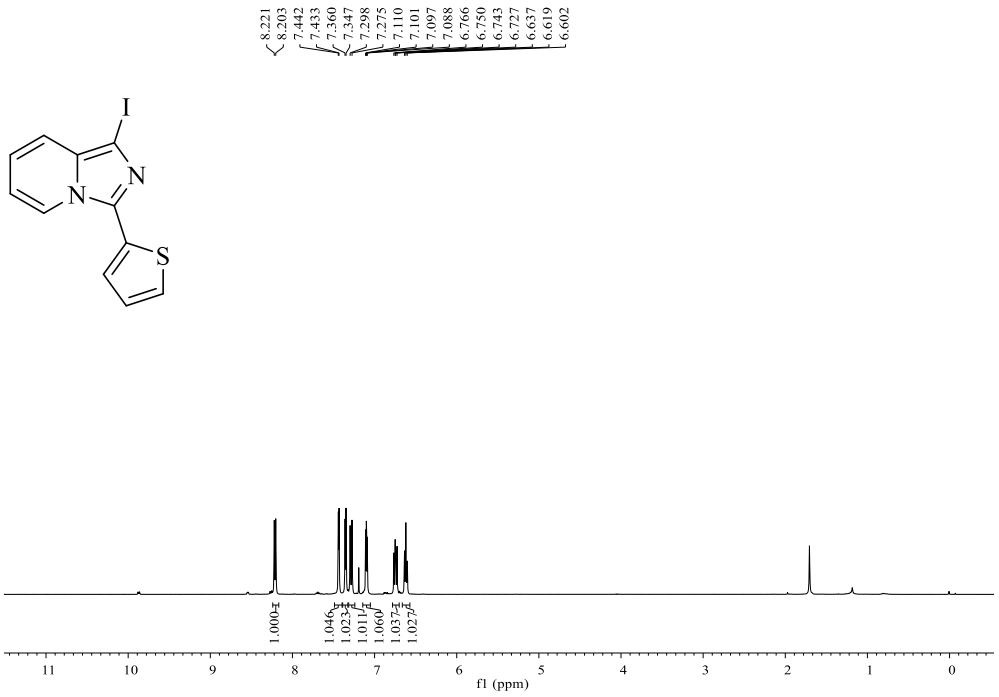
^{13}C NMR Spectrum of **3bt**



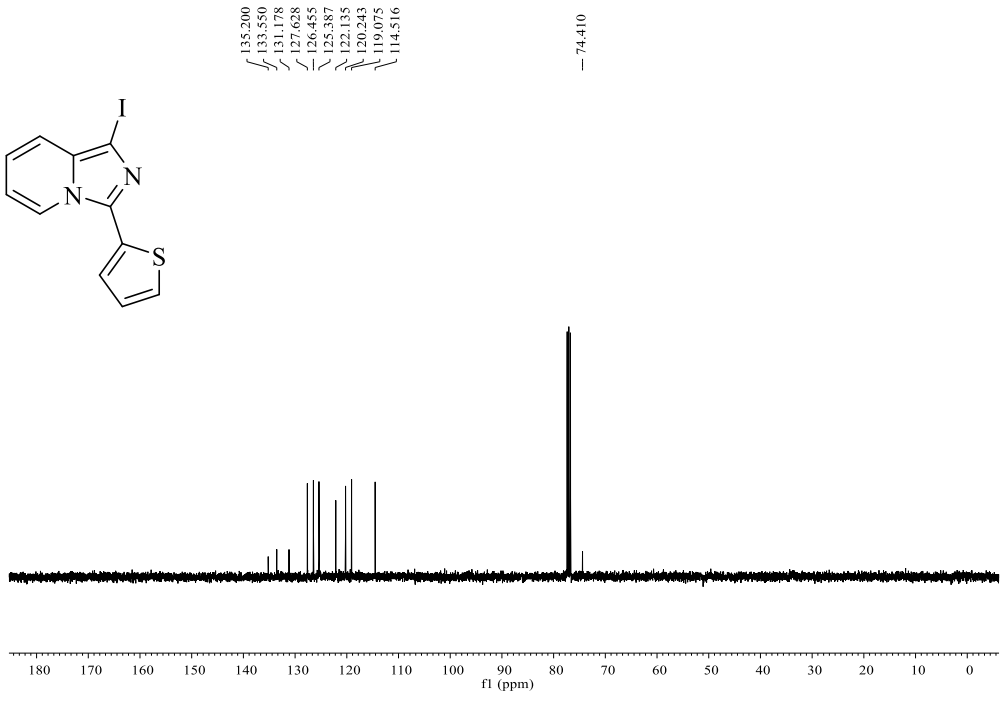
^{1}H NMR Spectrum of **3bu**



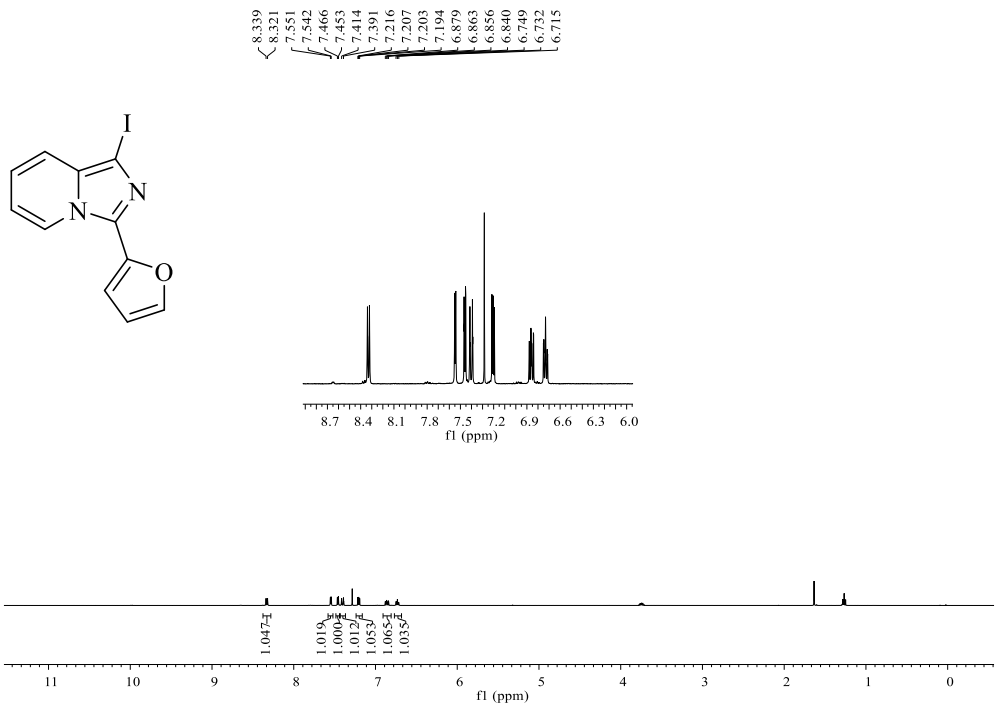
^{13}C NMR Spectrum of **3bu**



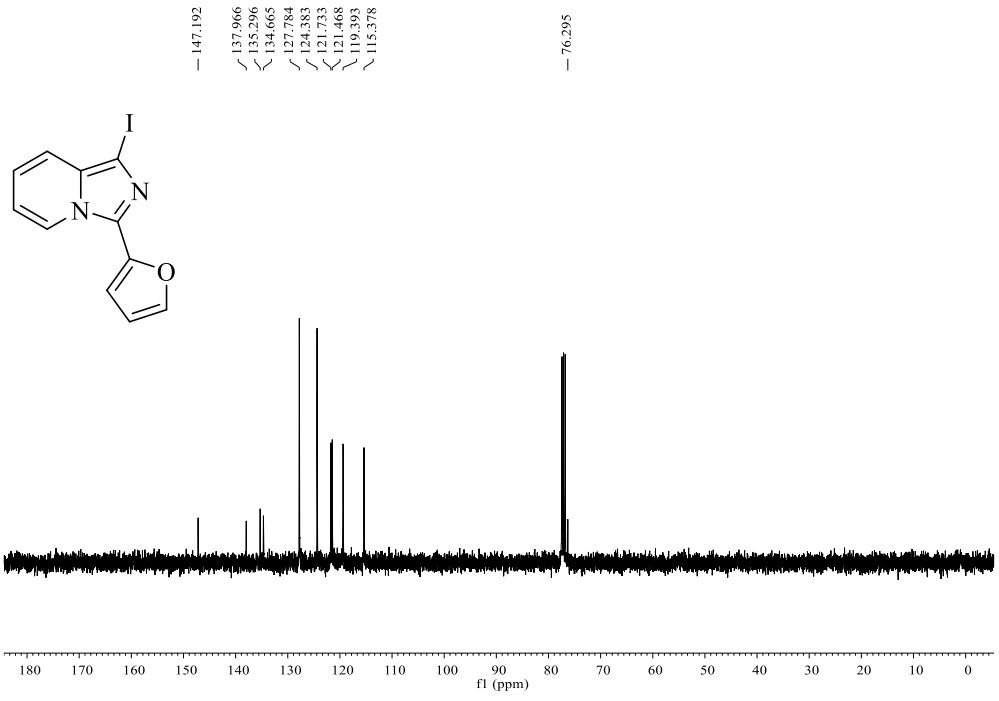
^{1}H NMR Spectrum of **3bv**



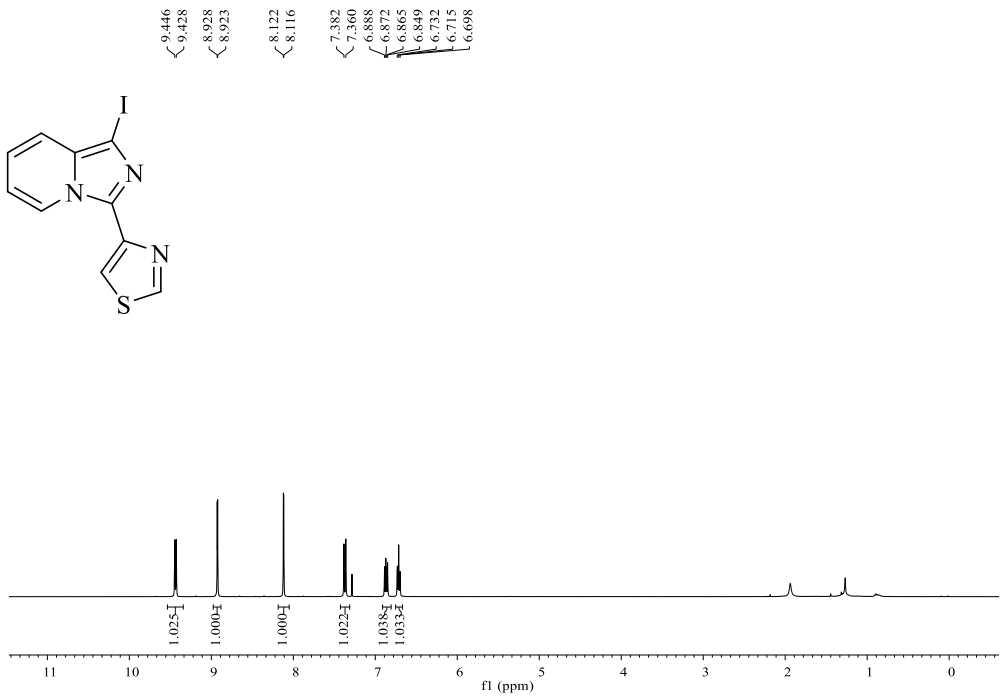
^{13}C NMR Spectrum of **3bv**



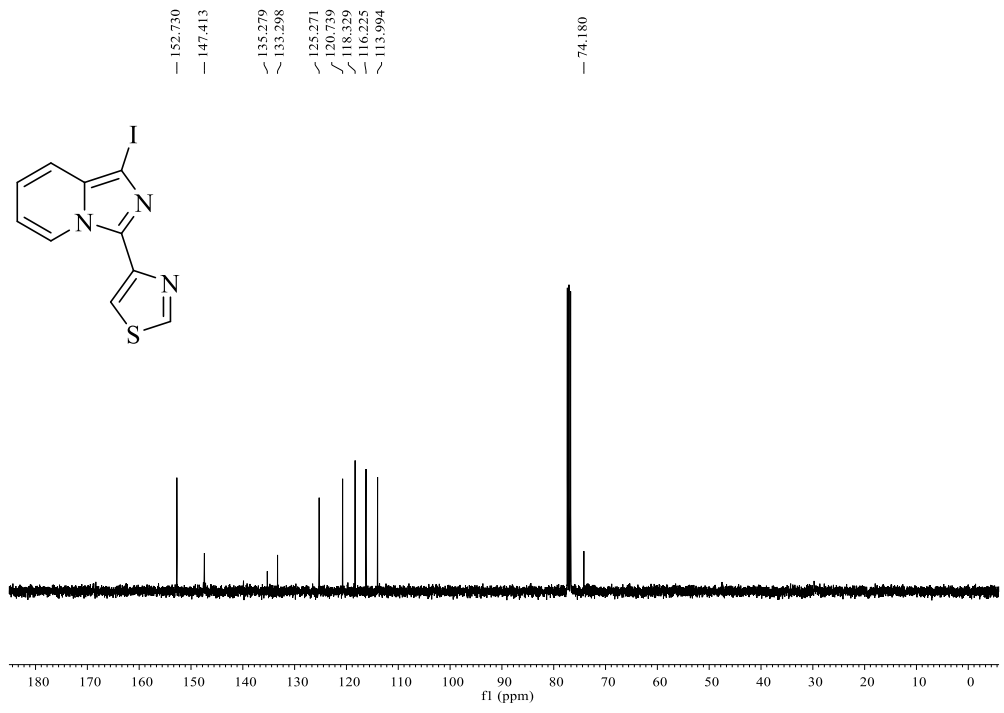
^{1}H NMR Spectrum of **3bw**



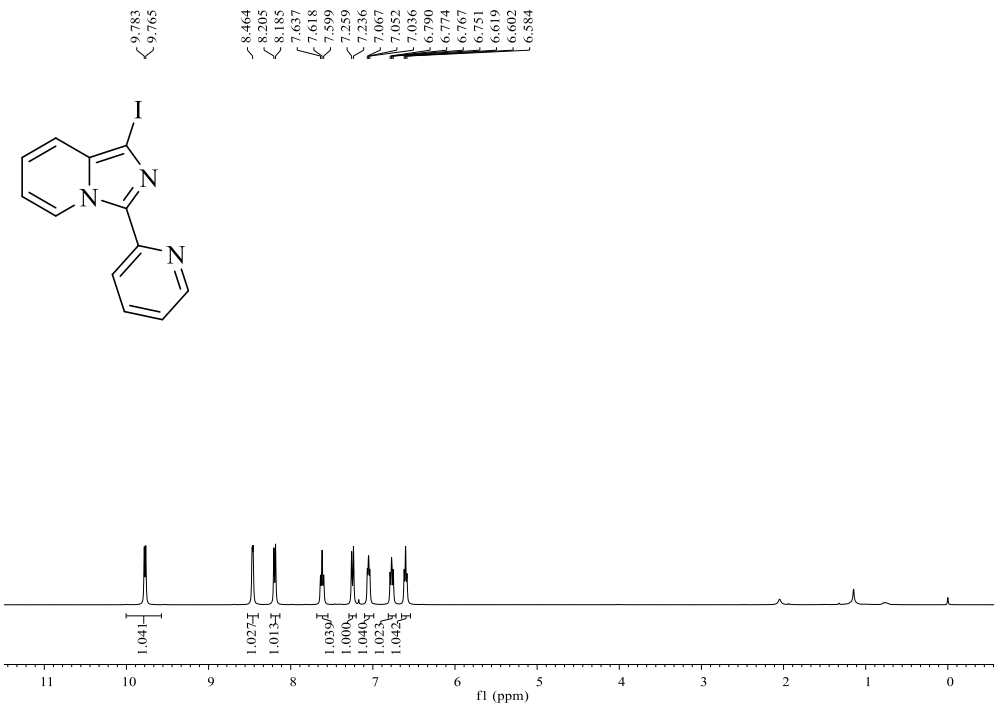
^{13}C NMR Spectrum of **3bw**



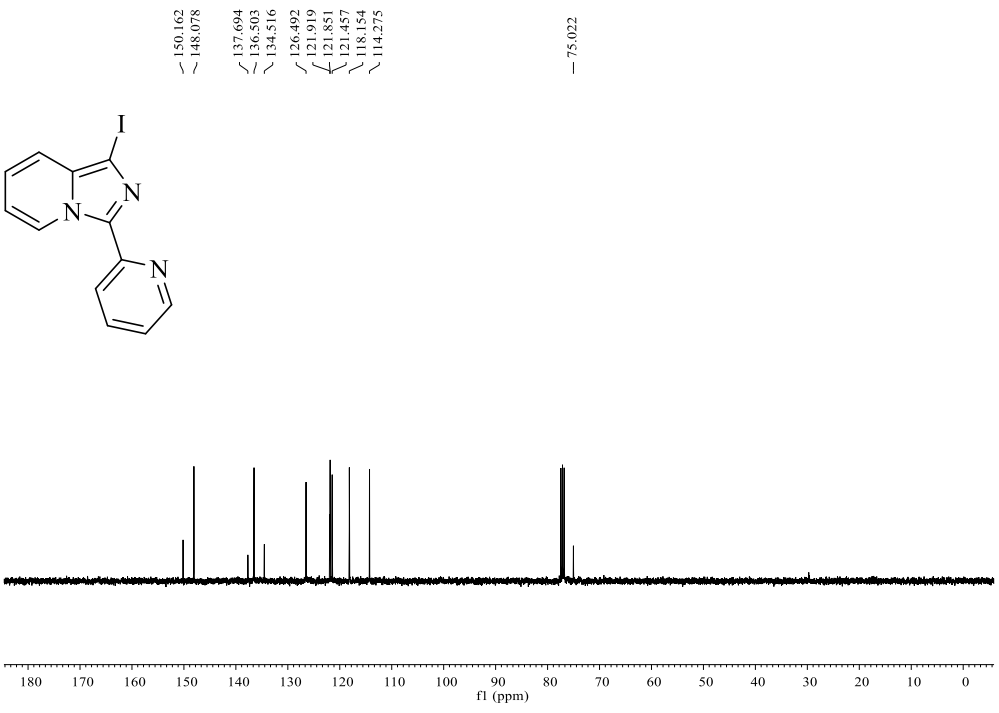
^{1}H NMR Spectrum of **3bx**



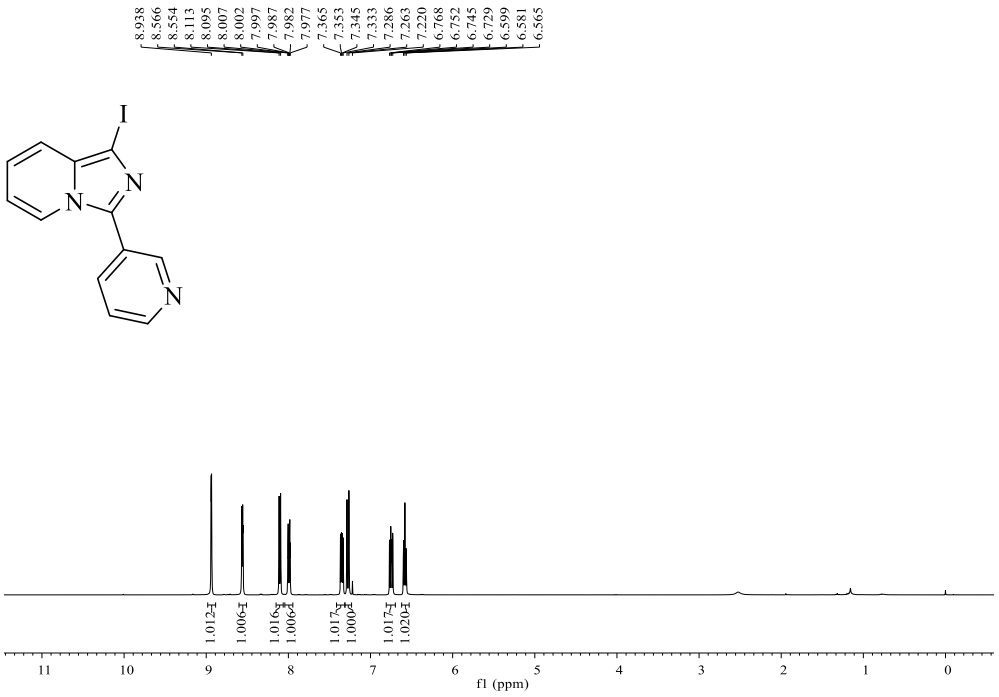
^{13}C NMR Spectrum of **3bx**



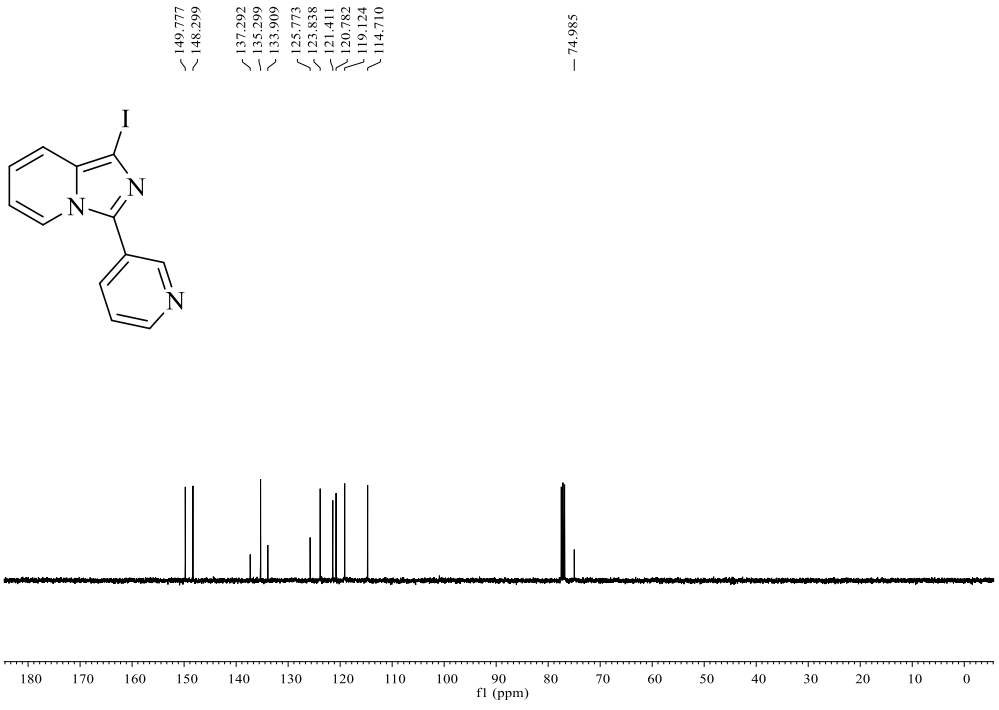
^{1}H NMR Spectrum of **3by**



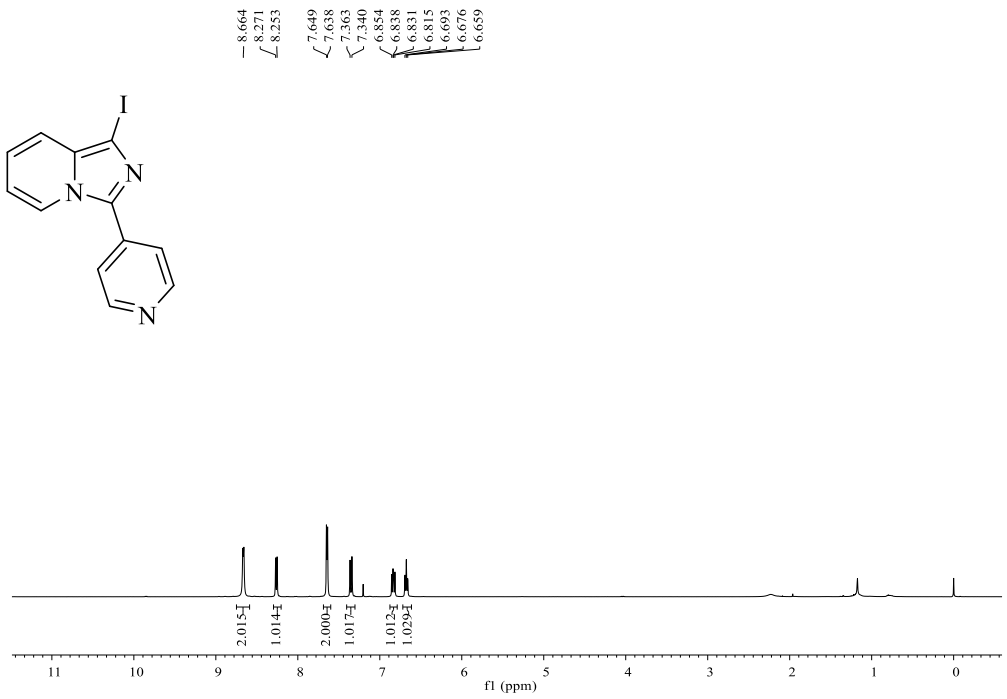
^{13}C NMR Spectrum of **3by**



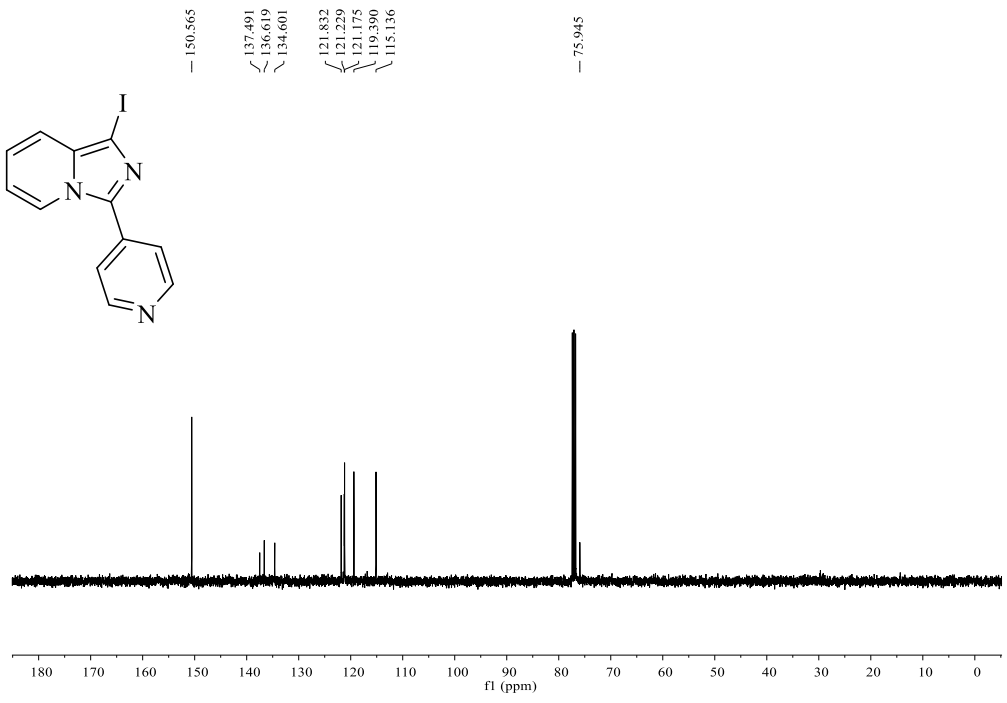
^{1}H NMR Spectrum of **3bz**



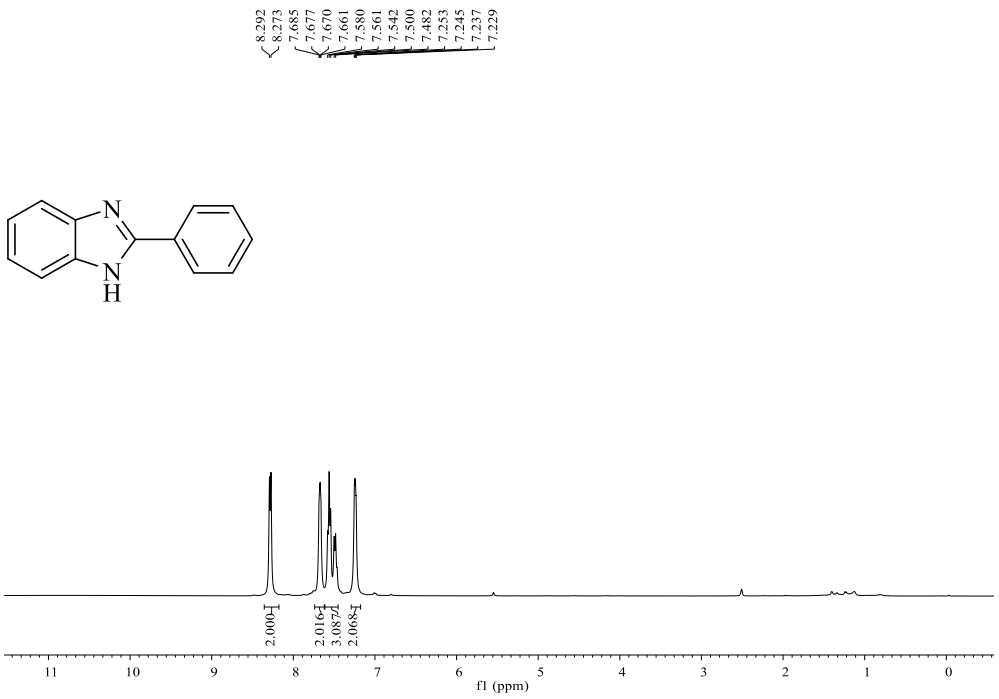
^{13}C NMR Spectrum of **3bz**



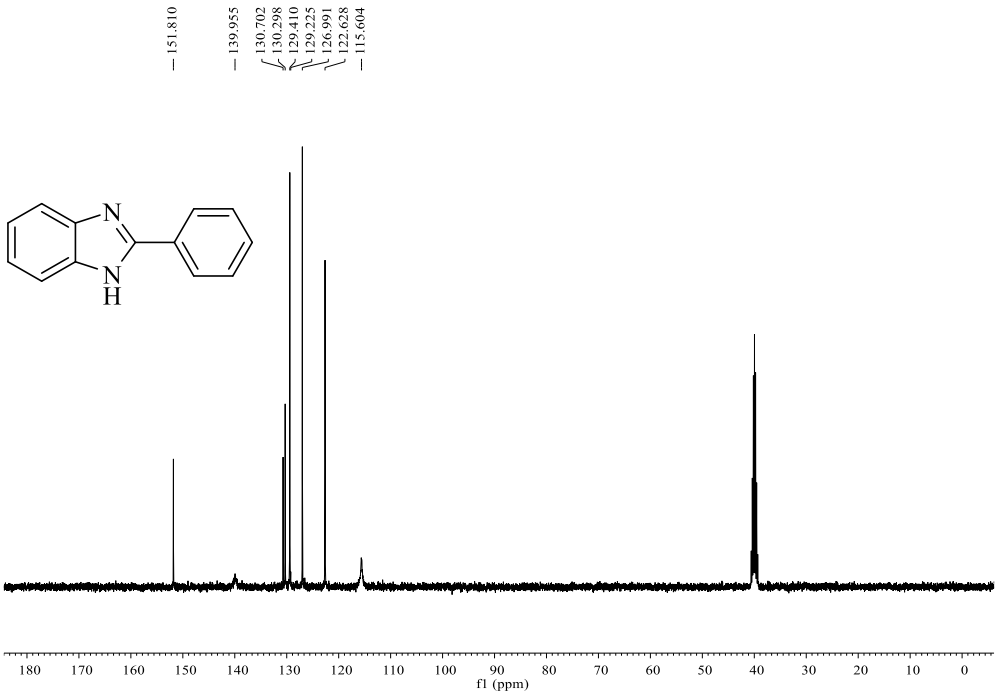
^{1}H NMR Spectrum of **3bba**



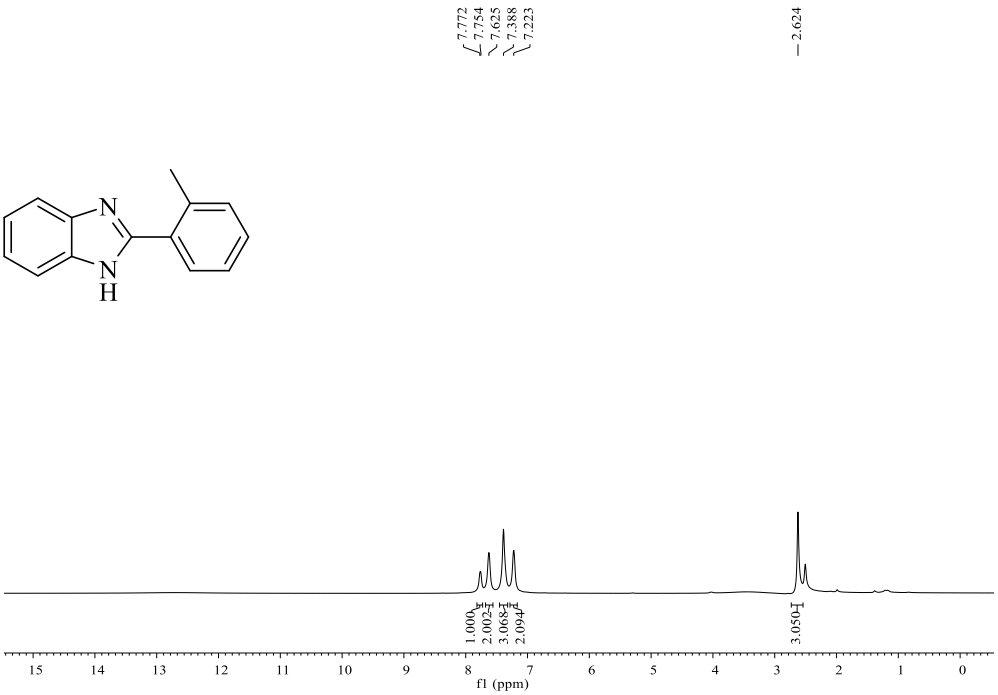
^{13}C NMR Spectrum of **3bba**



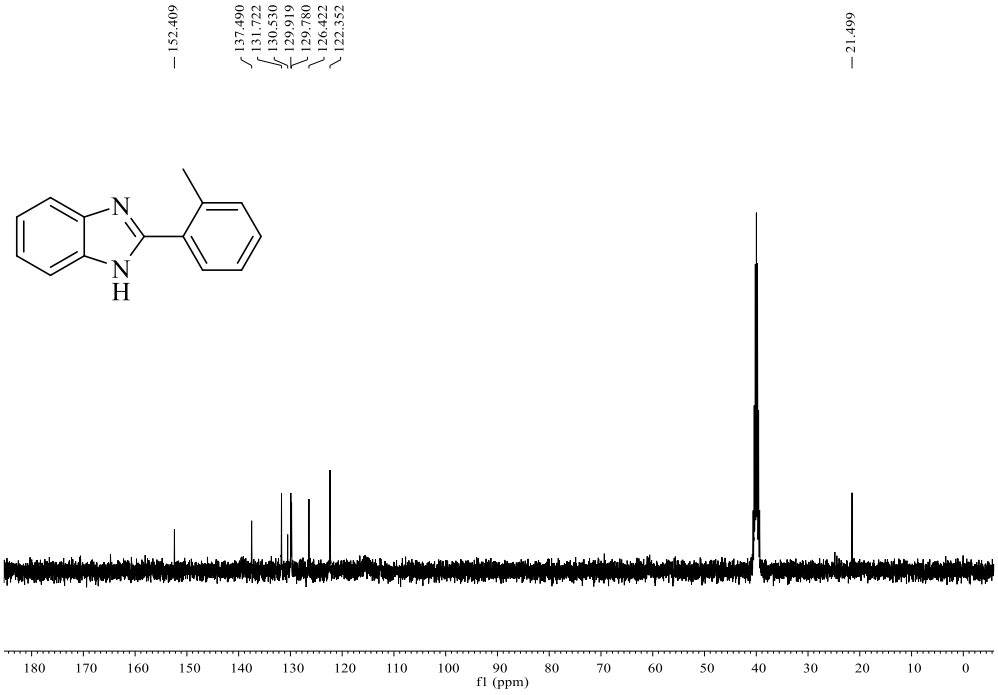
^{1}H NMR Spectrum of **3c**



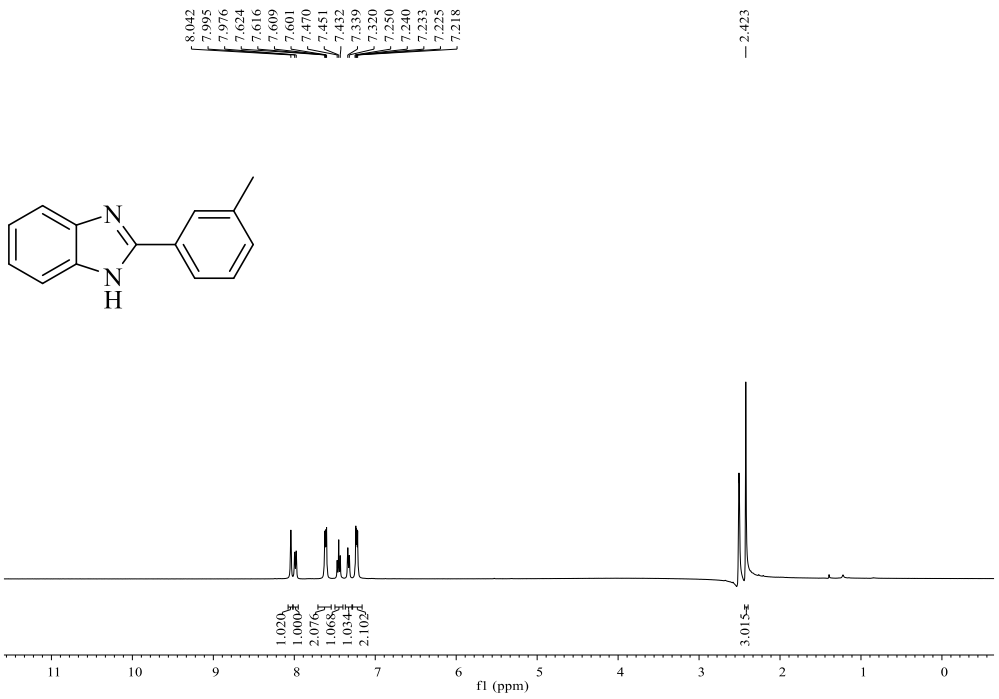
^{13}C NMR Spectrum of **3c**



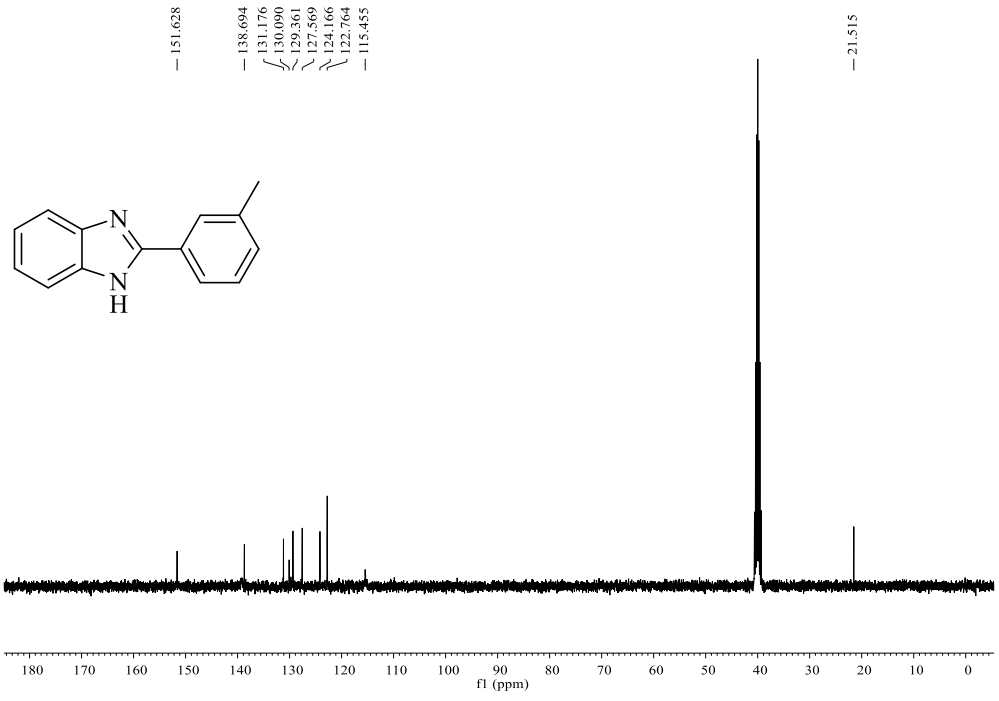
^{1}H NMR Spectrum of **3cb**



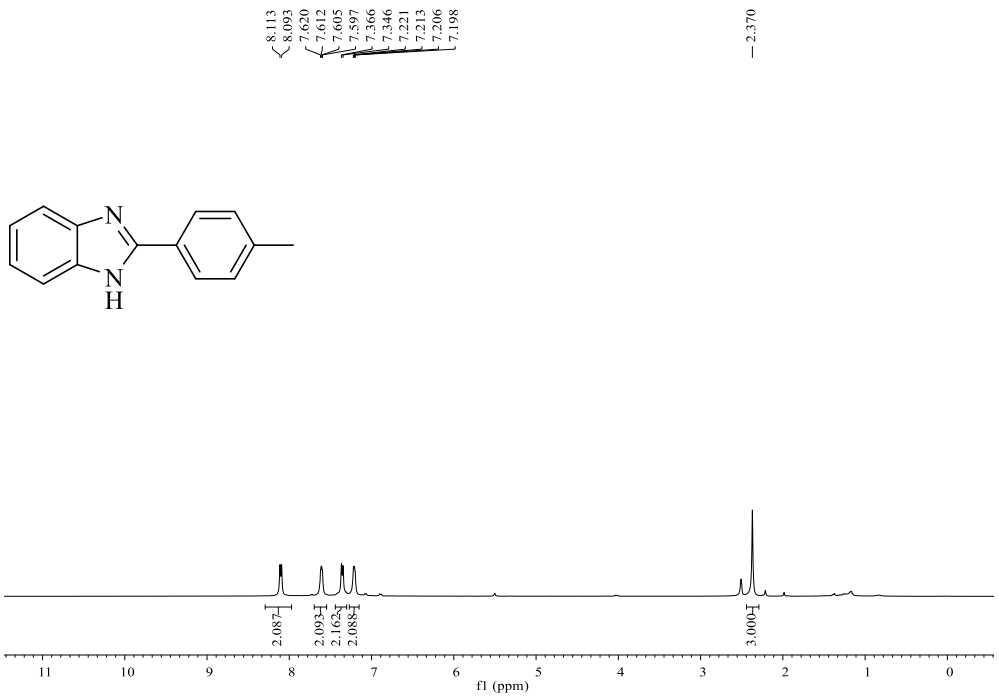
^{13}C NMR Spectrum of **3cb**



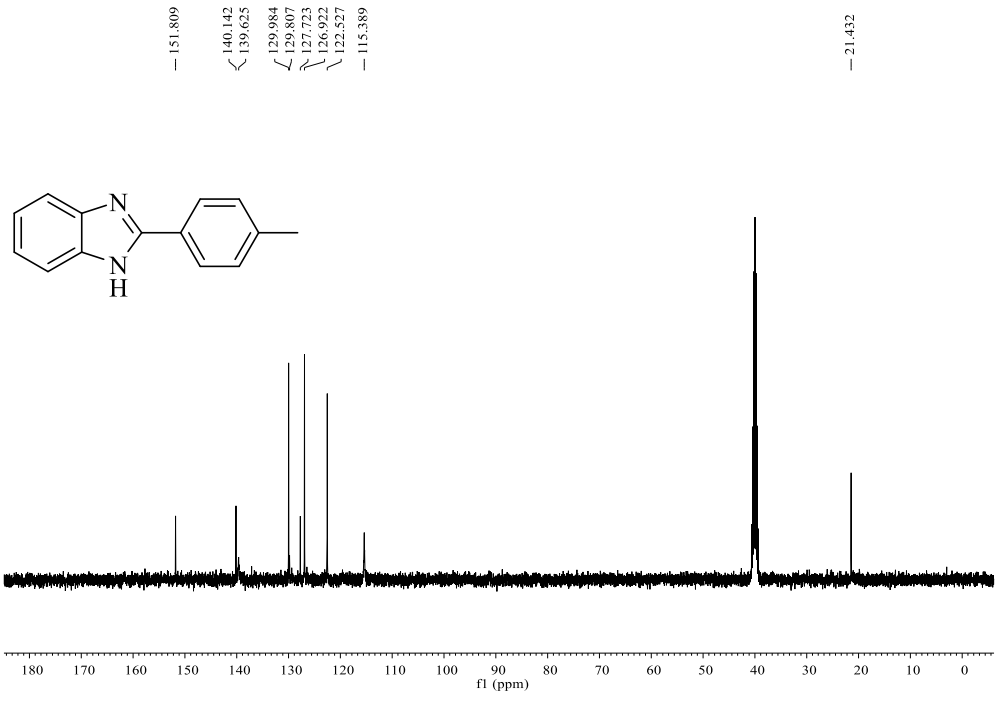
^{1}H NMR Spectrum of **3cc**



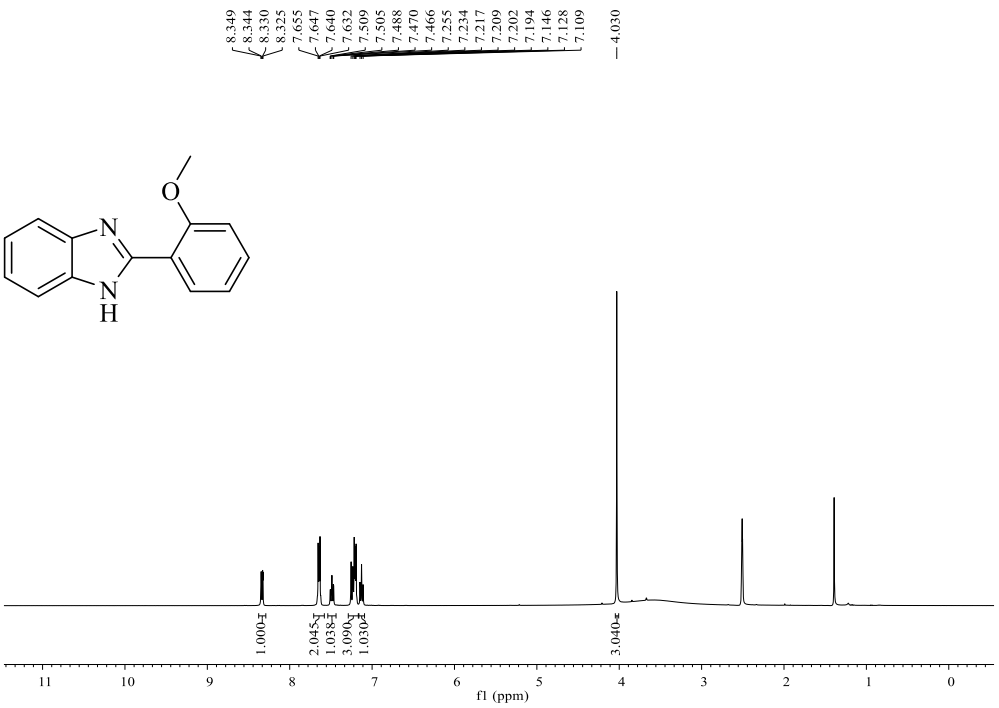
^{13}C NMR Spectrum of **3cc**



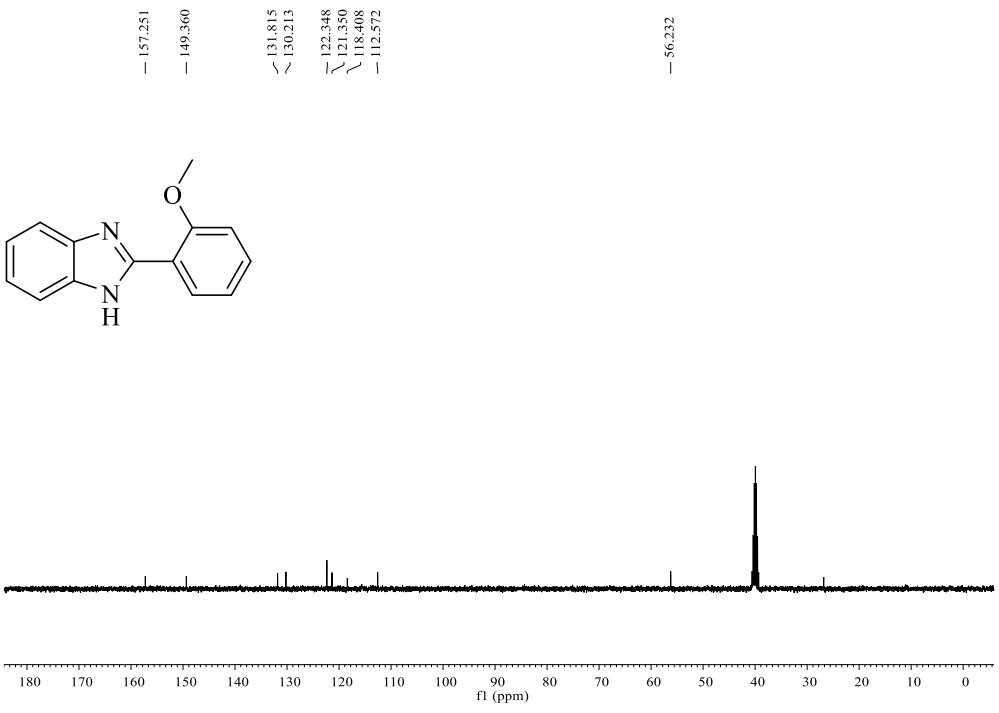
^{1}H NMR Spectrum of **3cd**



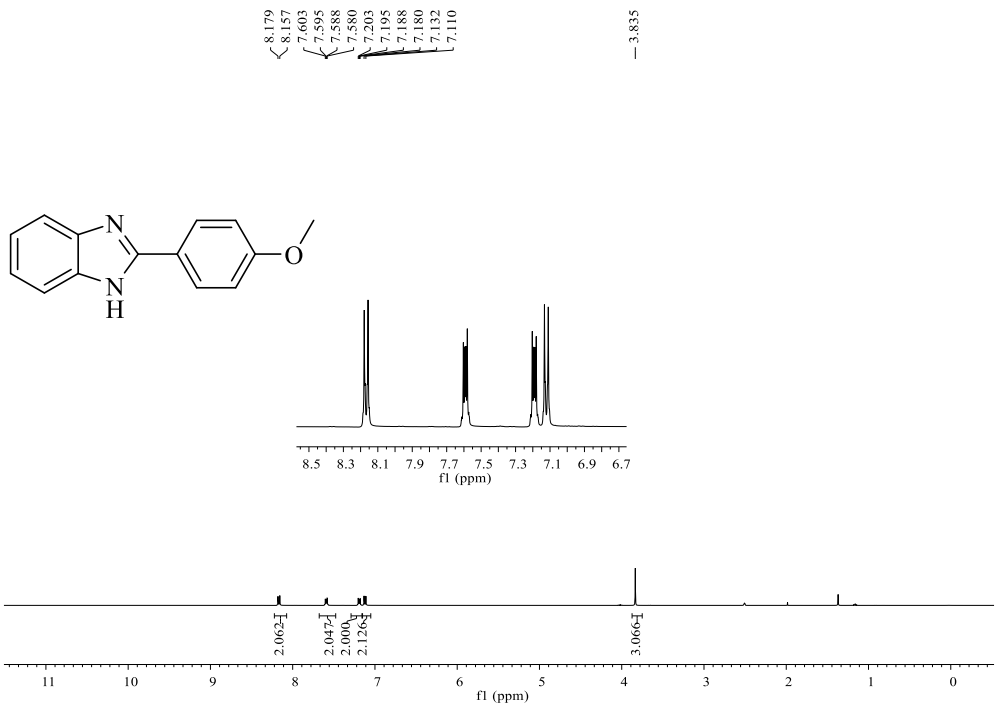
^{13}C NMR Spectrum of **3cd**



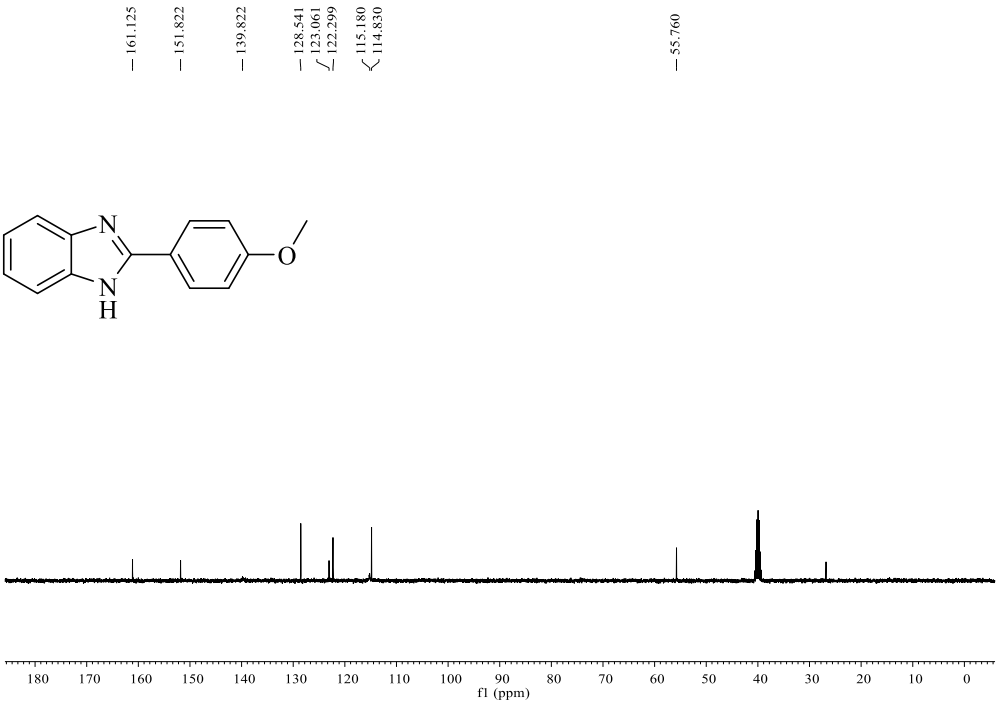
^{1}H NMR Spectrum of **3ce**



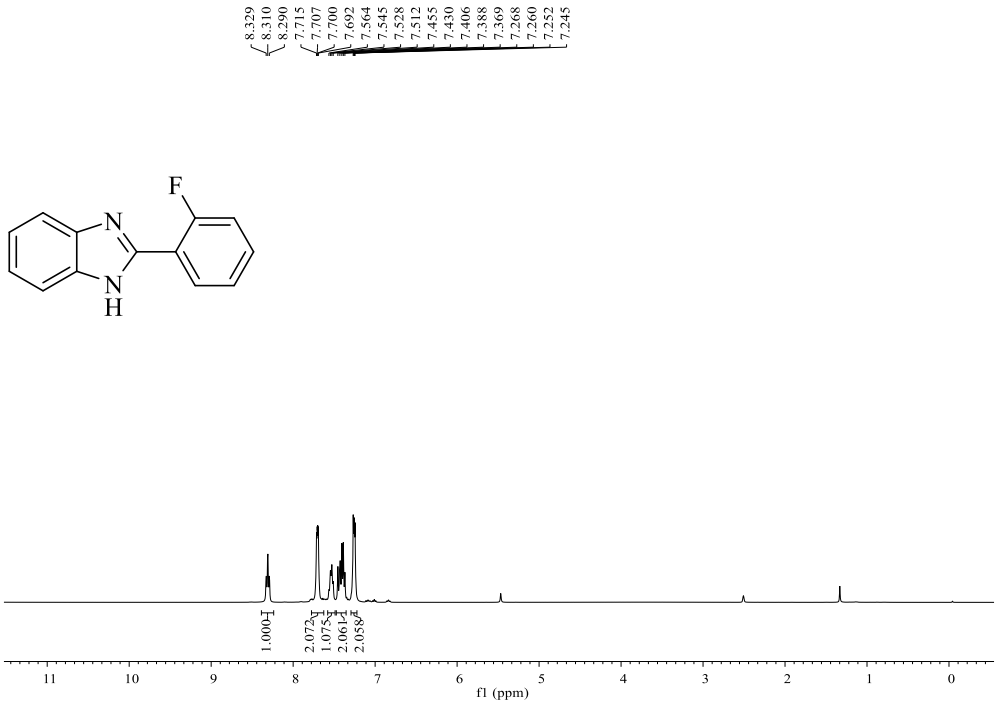
^{13}C NMR Spectrum of **3ce**



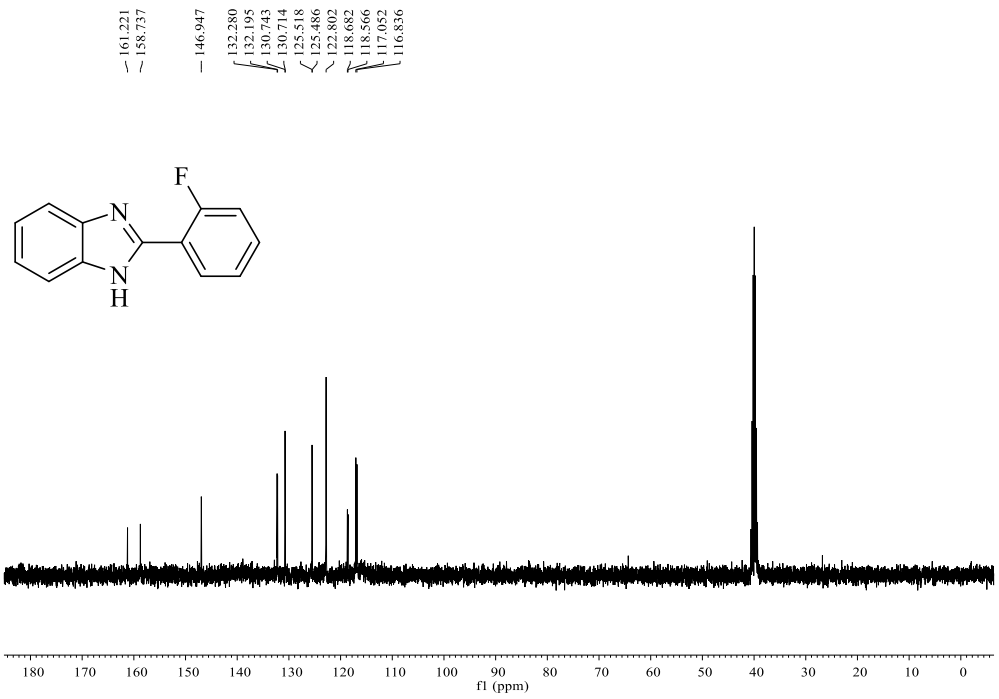
^{1}H NMR Spectrum of **3cf**



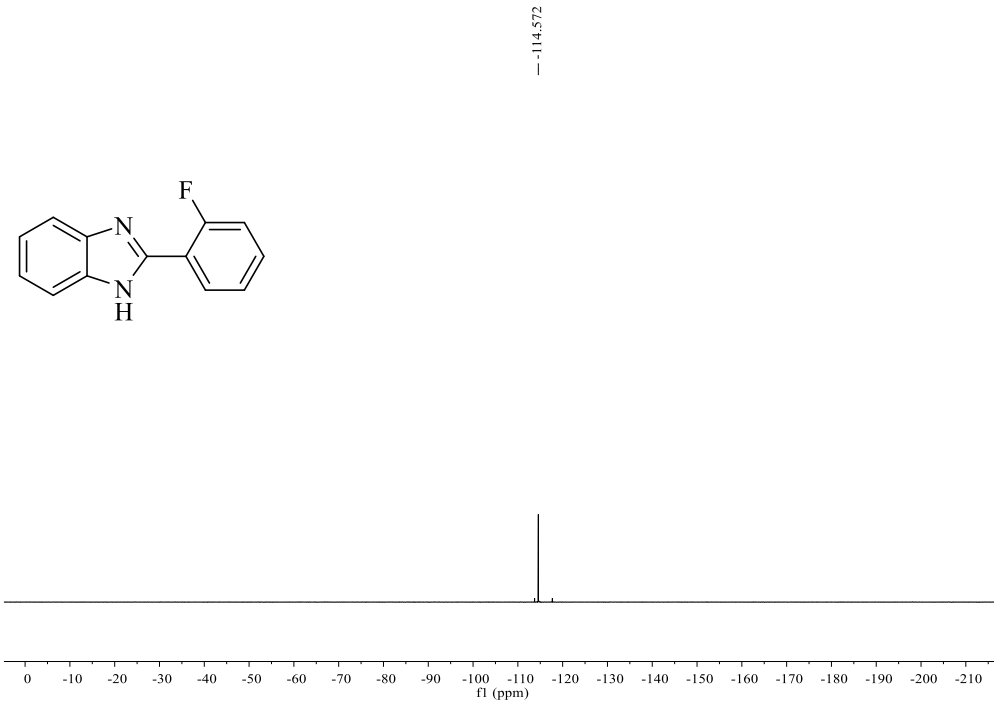
^{13}C NMR Spectrum of **3cf**



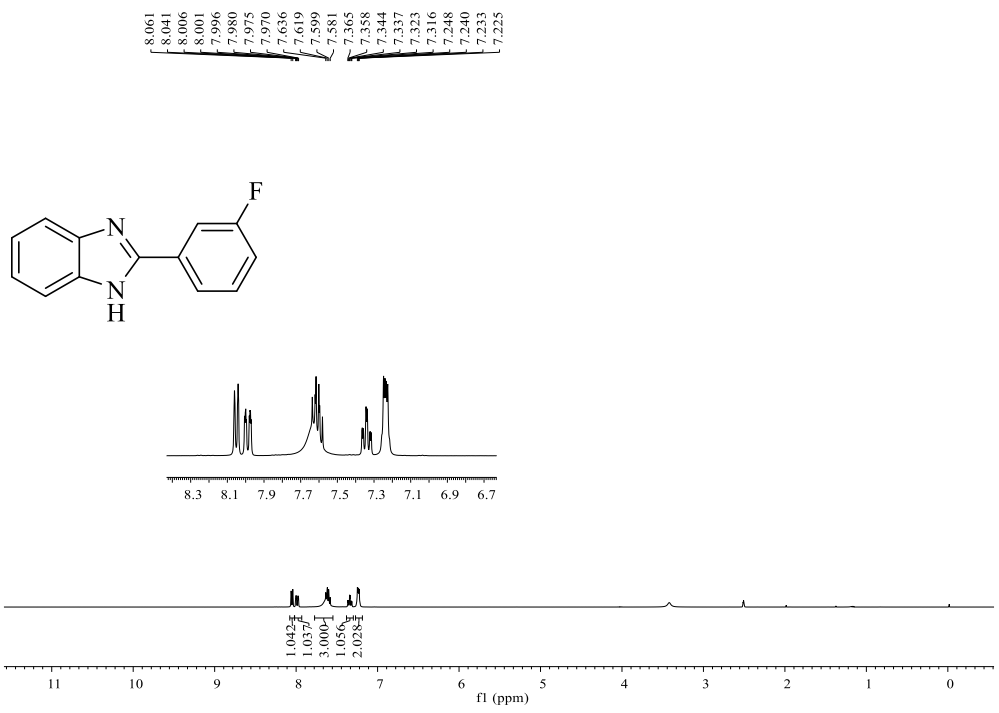
^{1}H NMR Spectrum of **3cg**



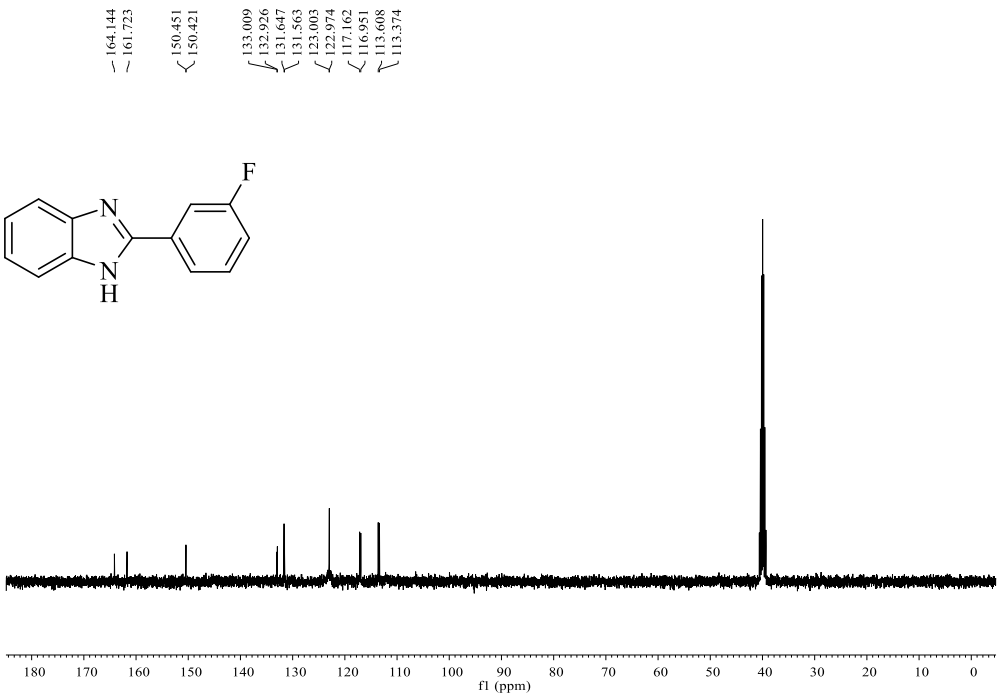
^{13}C NMR Spectrum of **3cg**



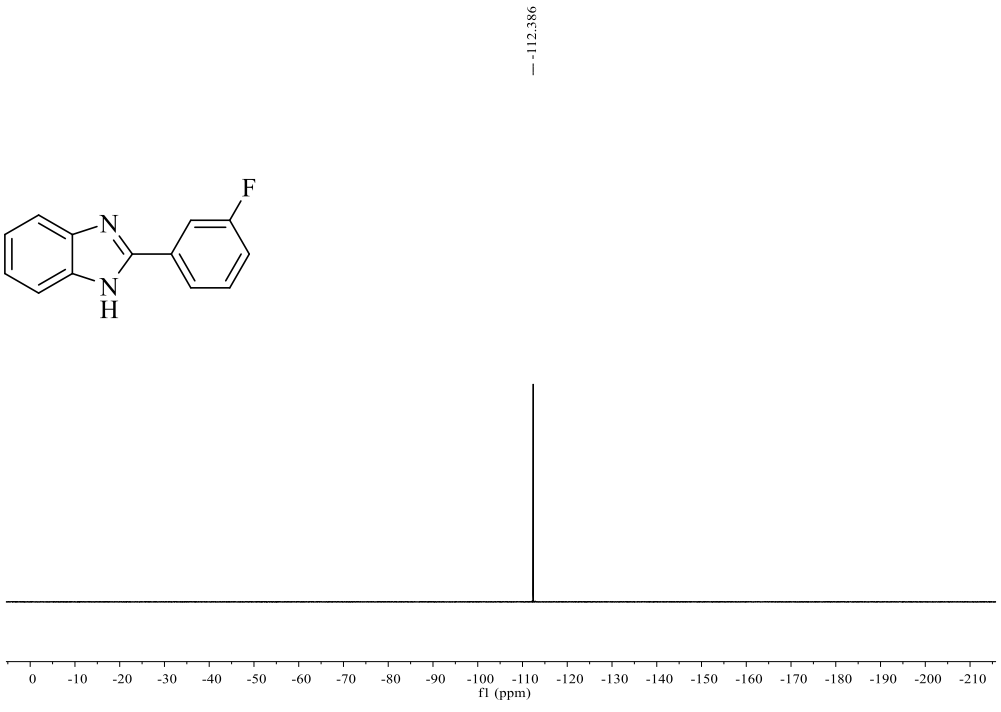
^{19}F NMR Spectrum of **3cg**



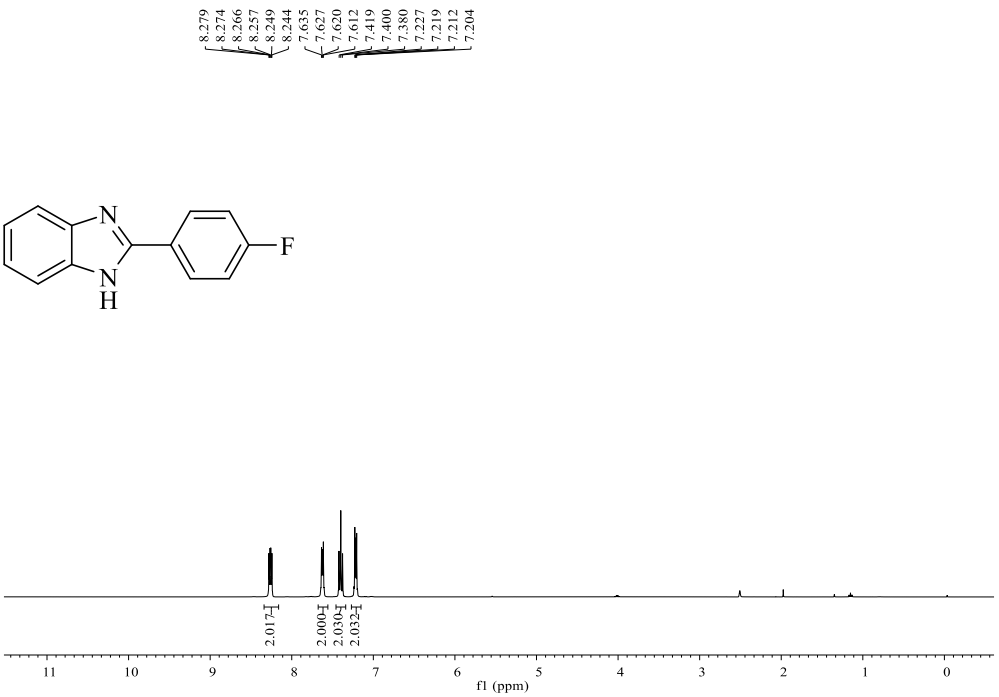
^{1}H NMR Spectrum of **3ch**



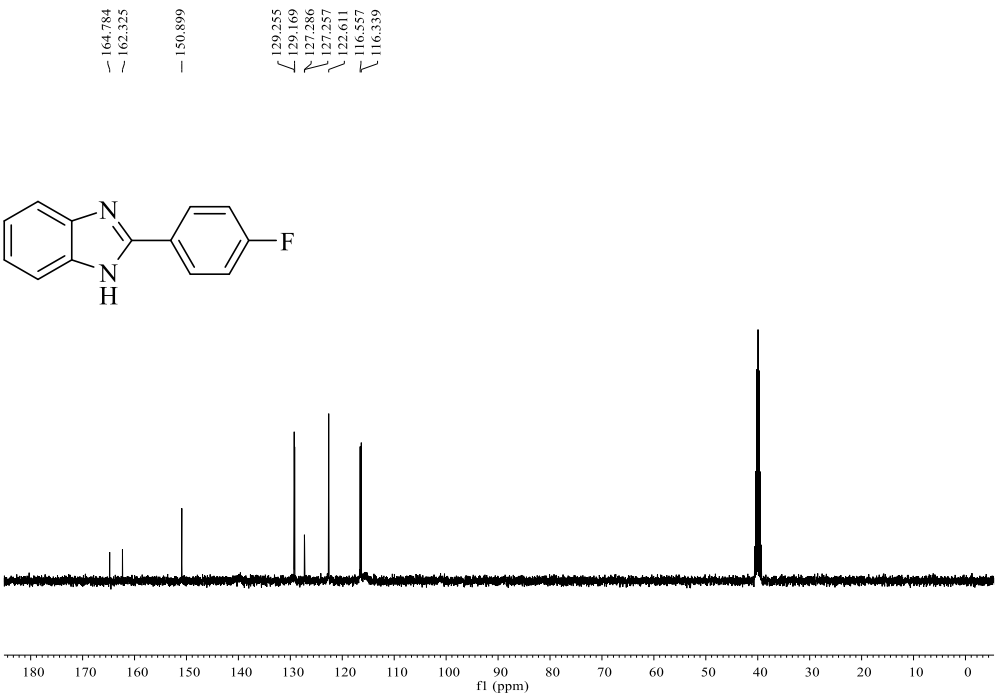
^{13}C NMR Spectrum of **3ch**



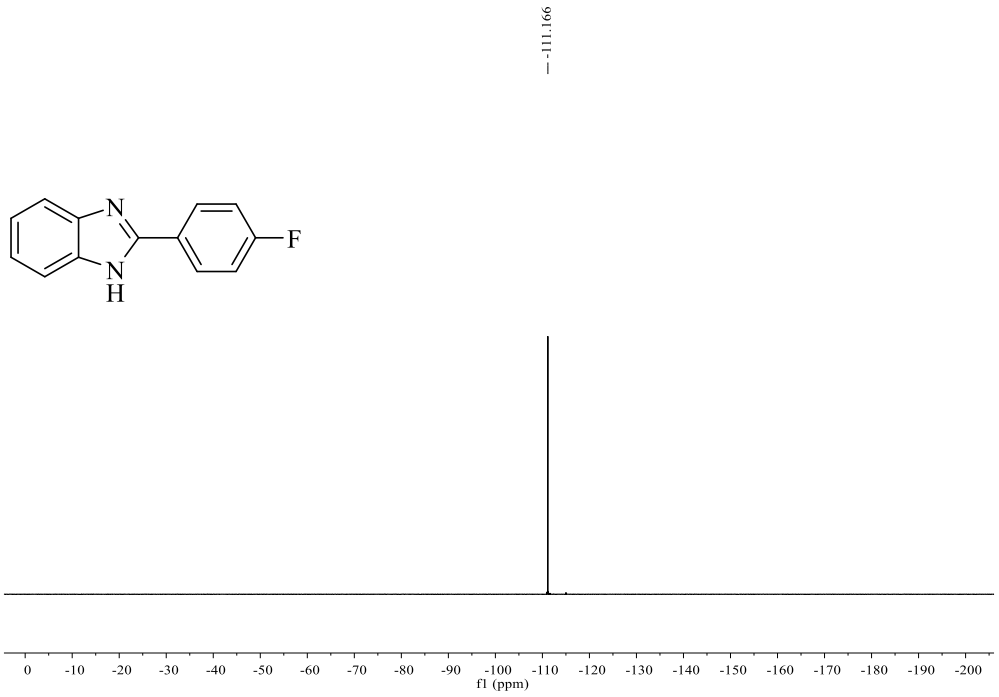
^{19}F NMR Spectrum of **3ch**



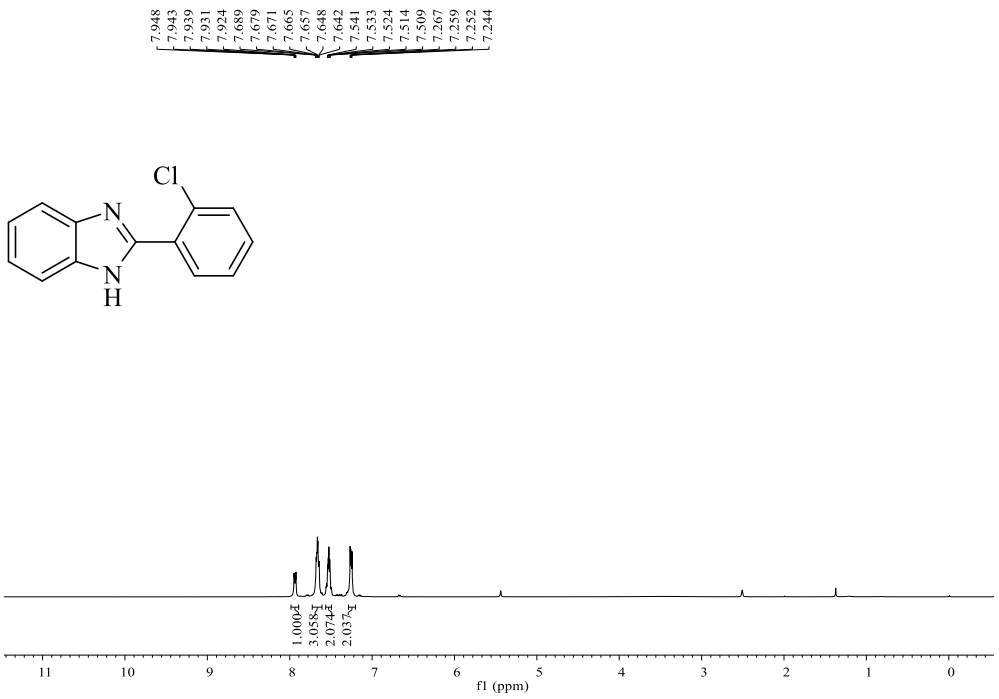
^{1}H NMR Spectrum of **3ci**



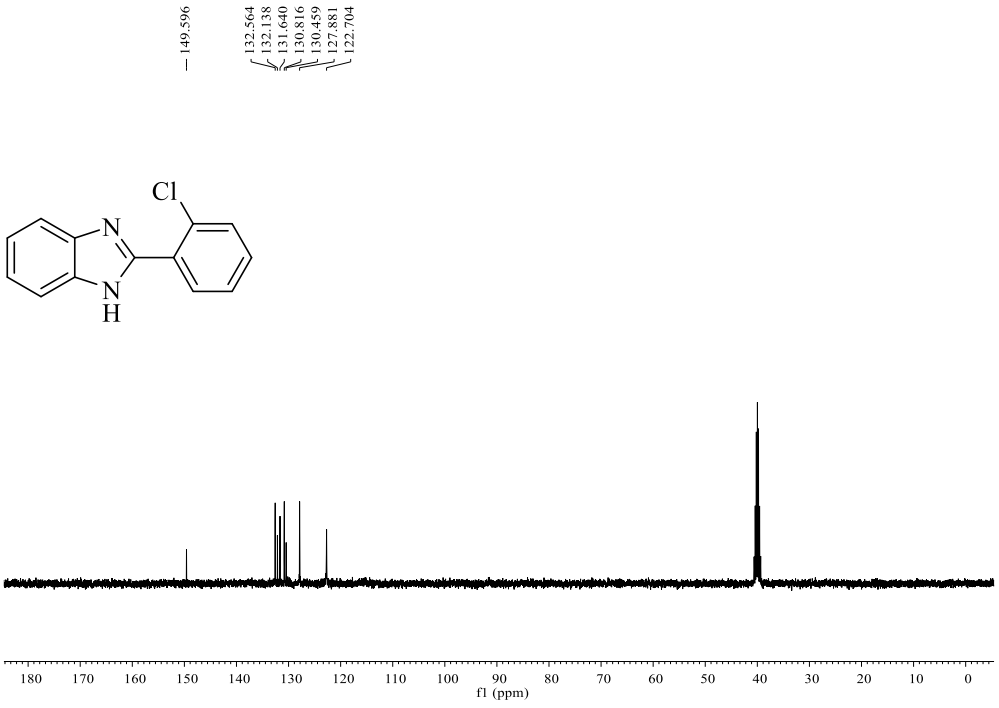
^{13}C NMR Spectrum of **3ci**



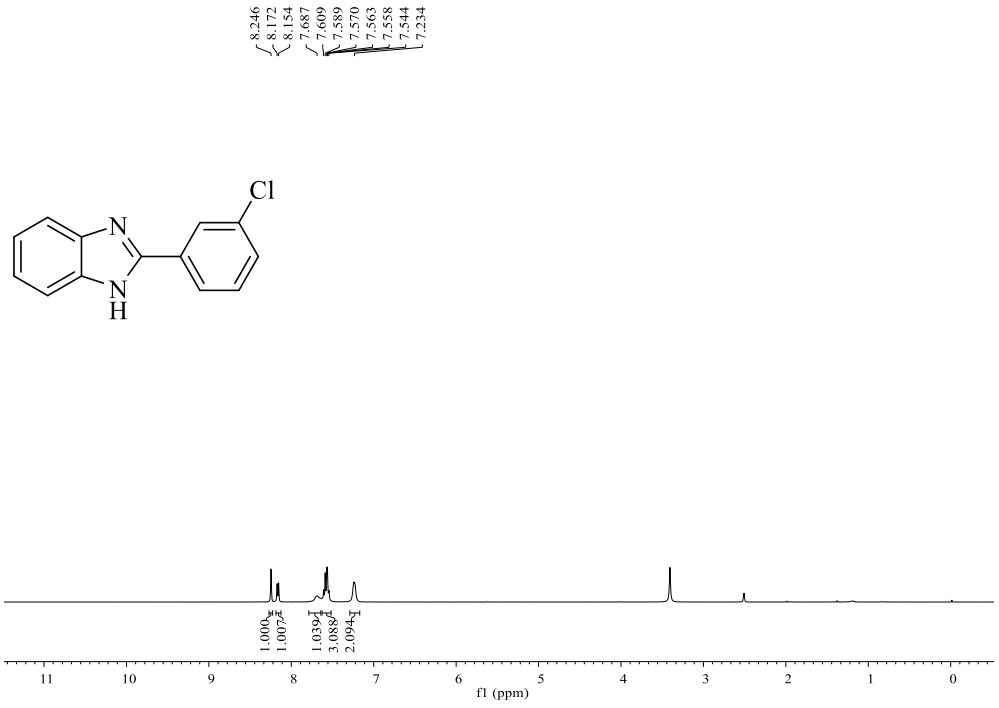
^{19}F NMR Spectrum of **3ci**



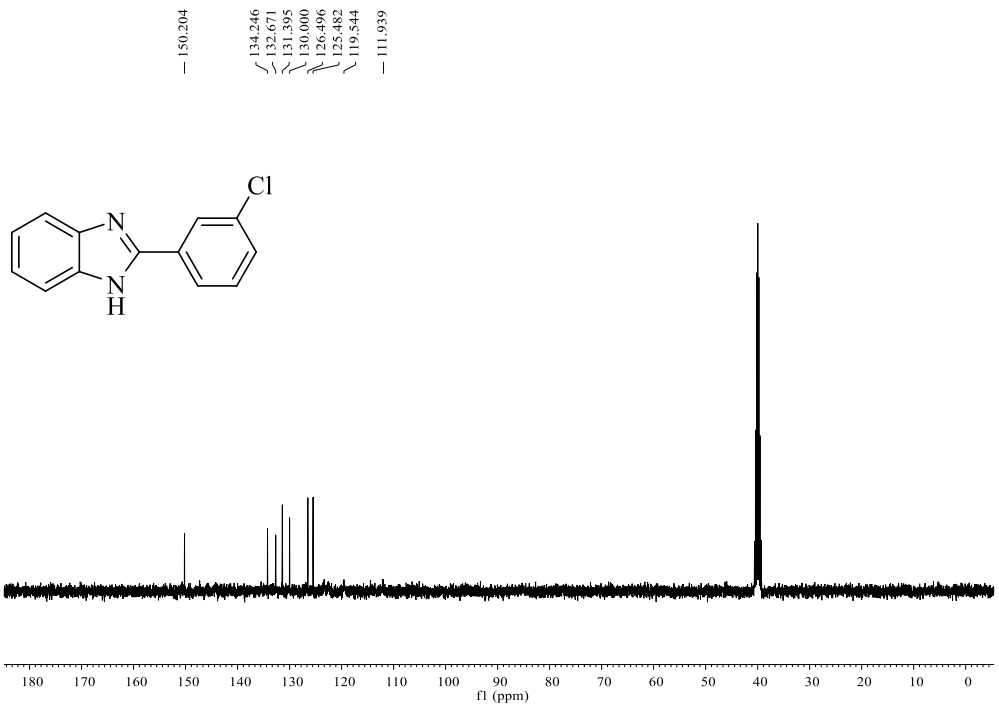
^{1}H NMR Spectrum of **3cj**



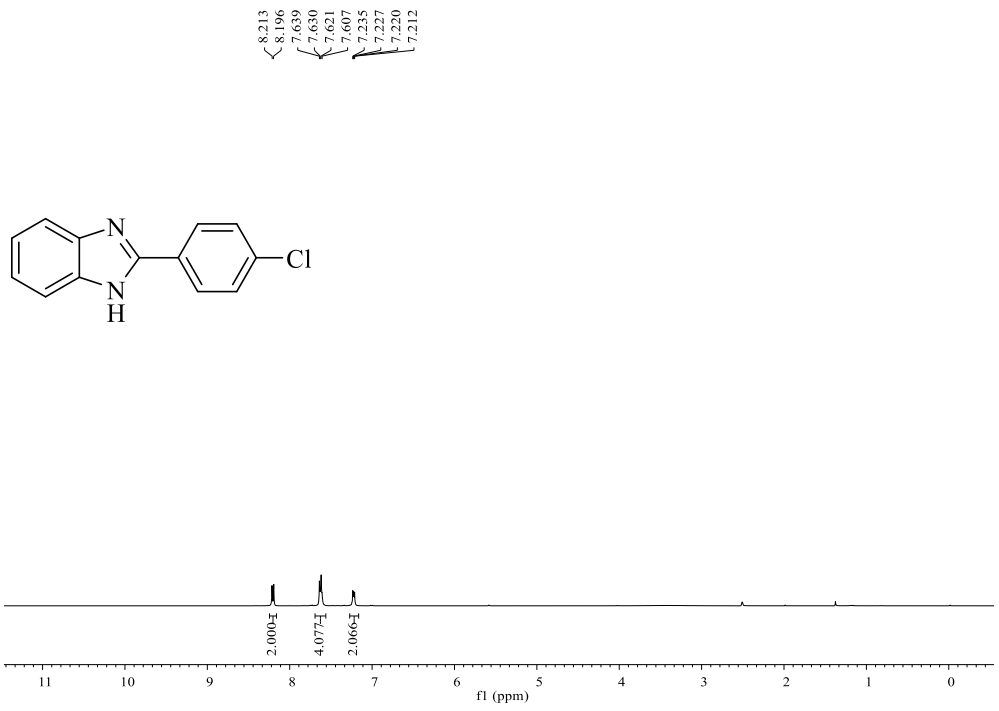
^{13}C NMR Spectrum of **3cj**



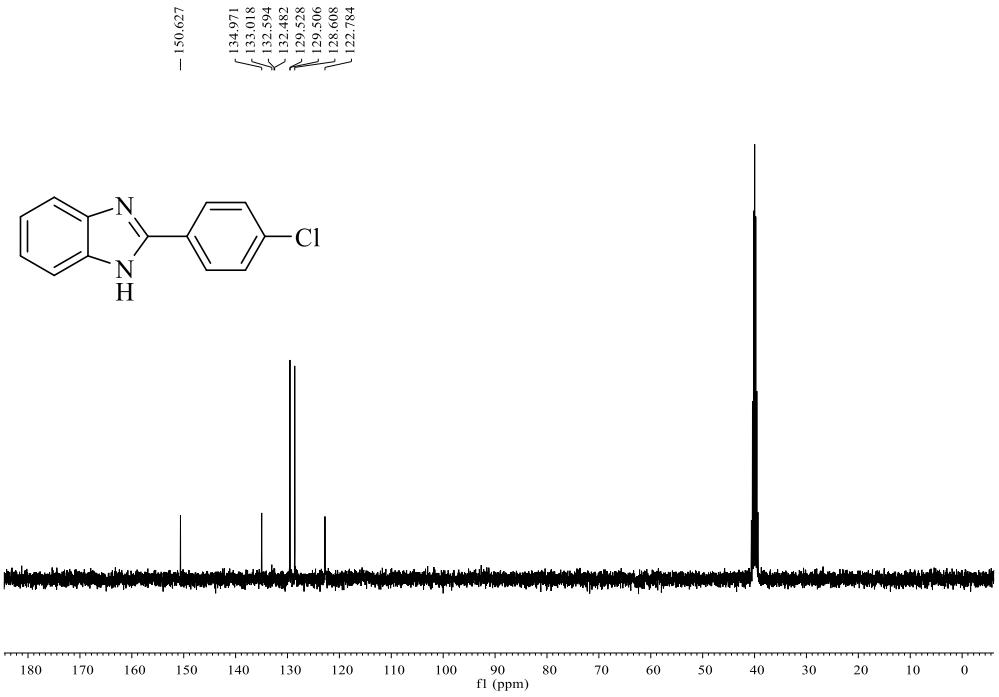
^{1}H NMR Spectrum of **3ck**



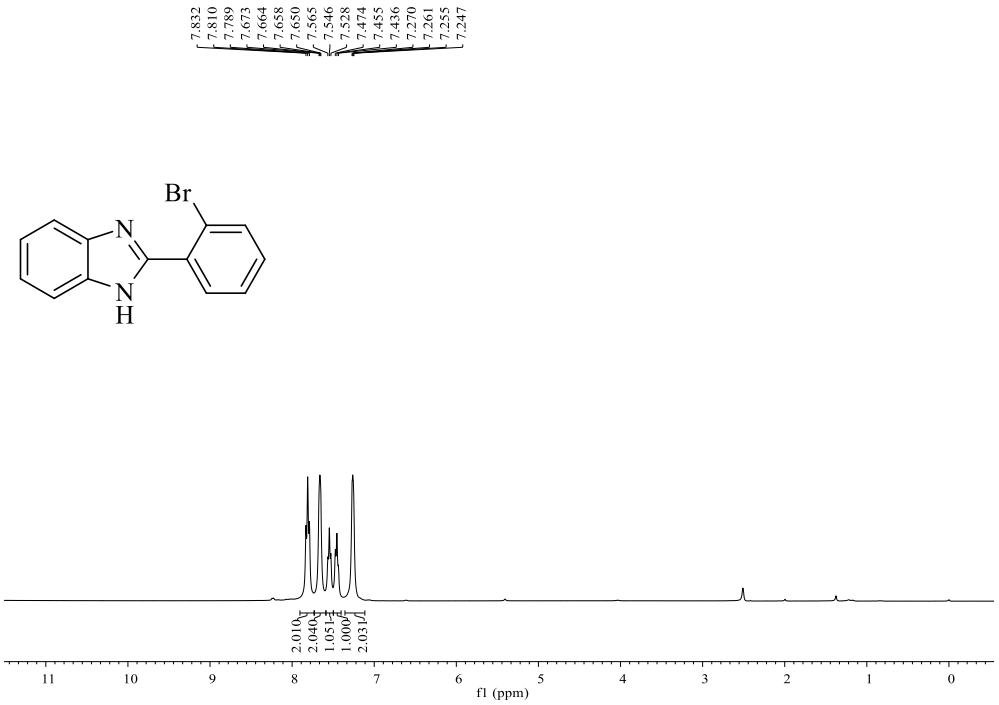
^{13}C NMR Spectrum of **3ck**



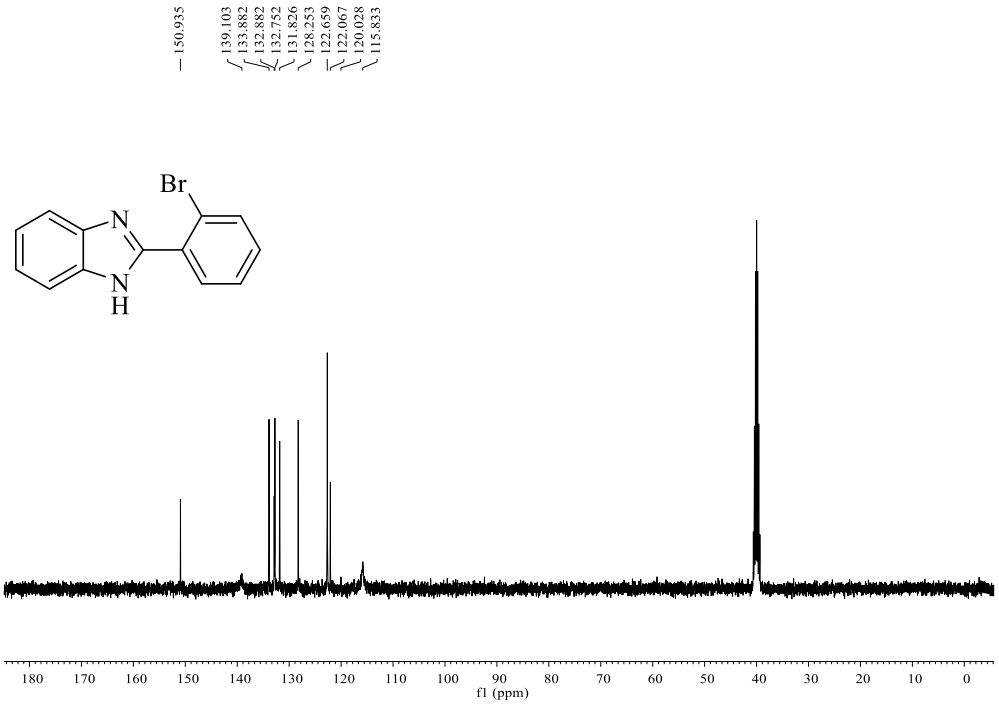
^{1}H NMR Spectrum of **3cl**



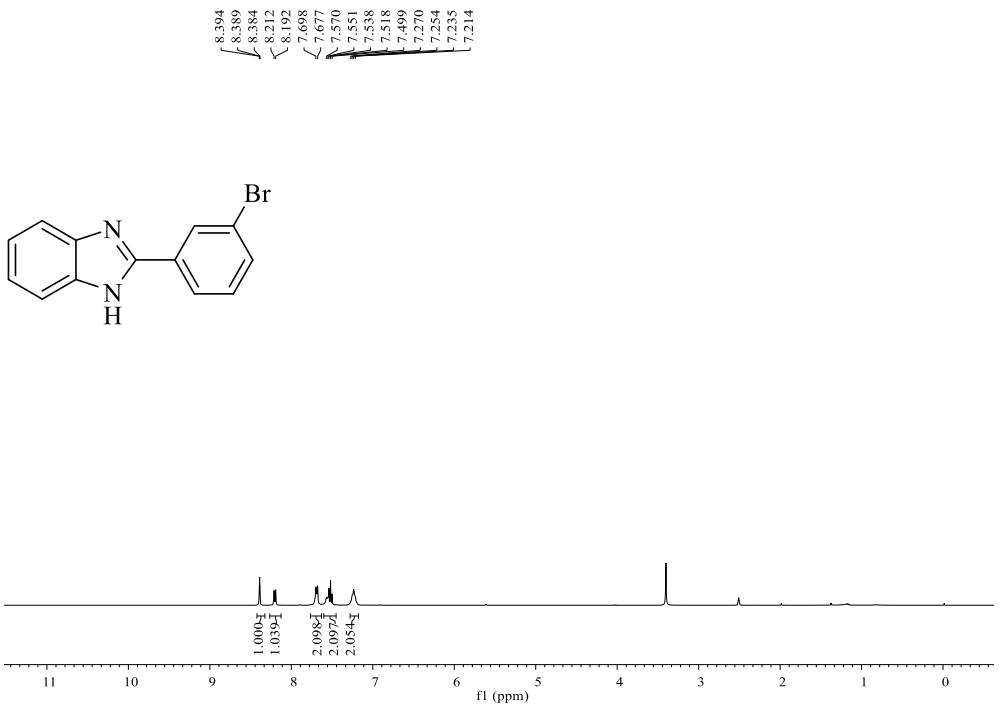
^{13}C NMR Spectrum of **3cl**



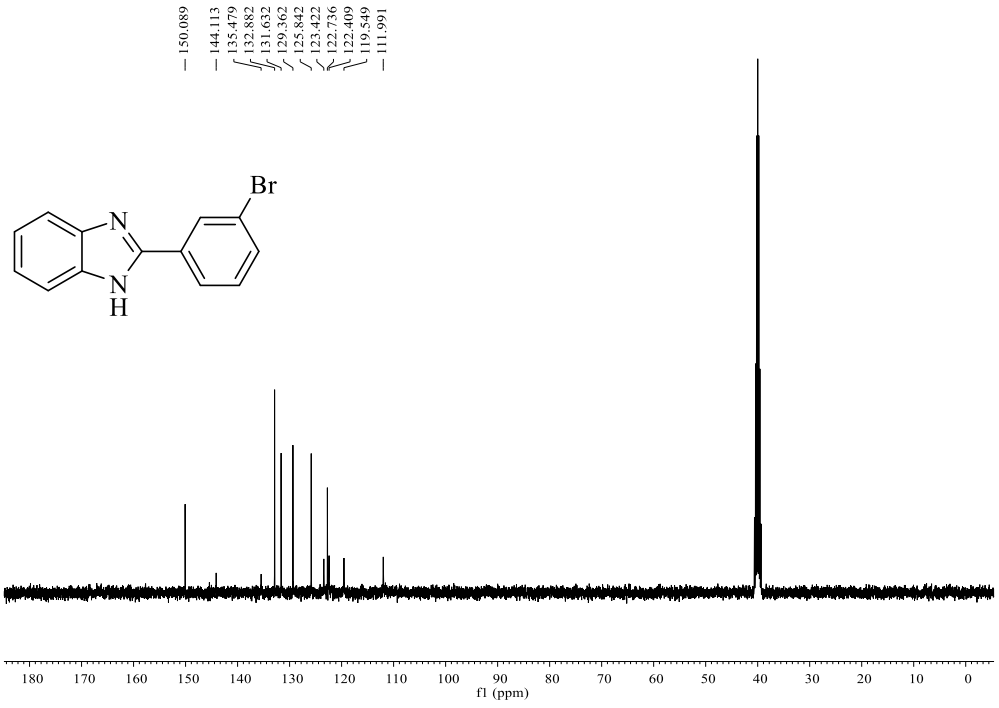
^{1}H NMR Spectrum of **3cm**



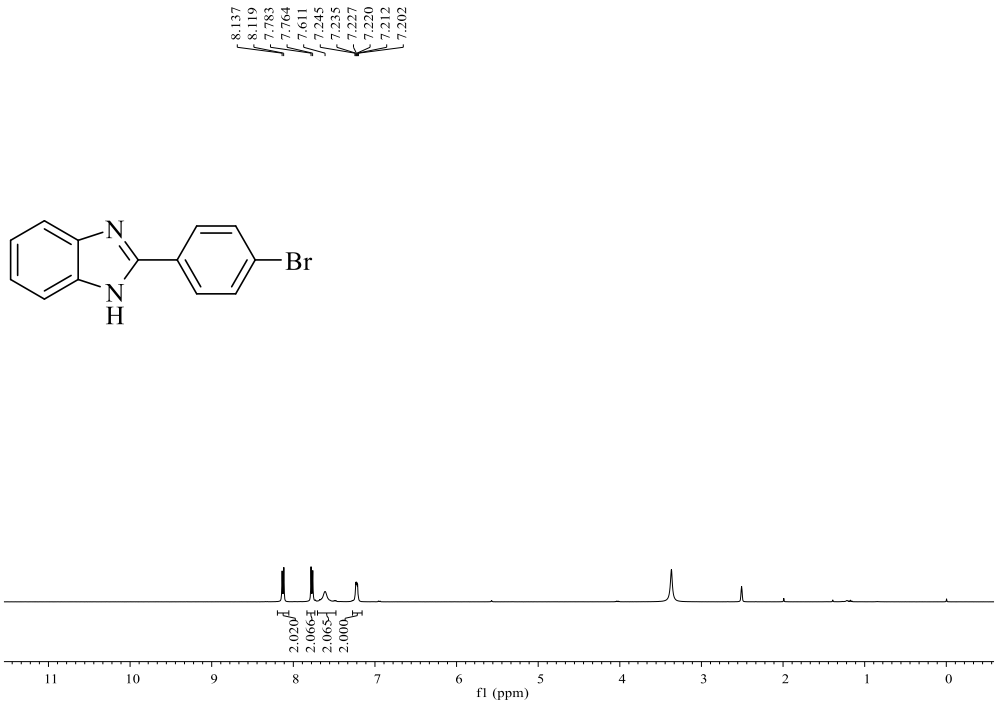
^{13}C NMR Spectrum of **3cm**



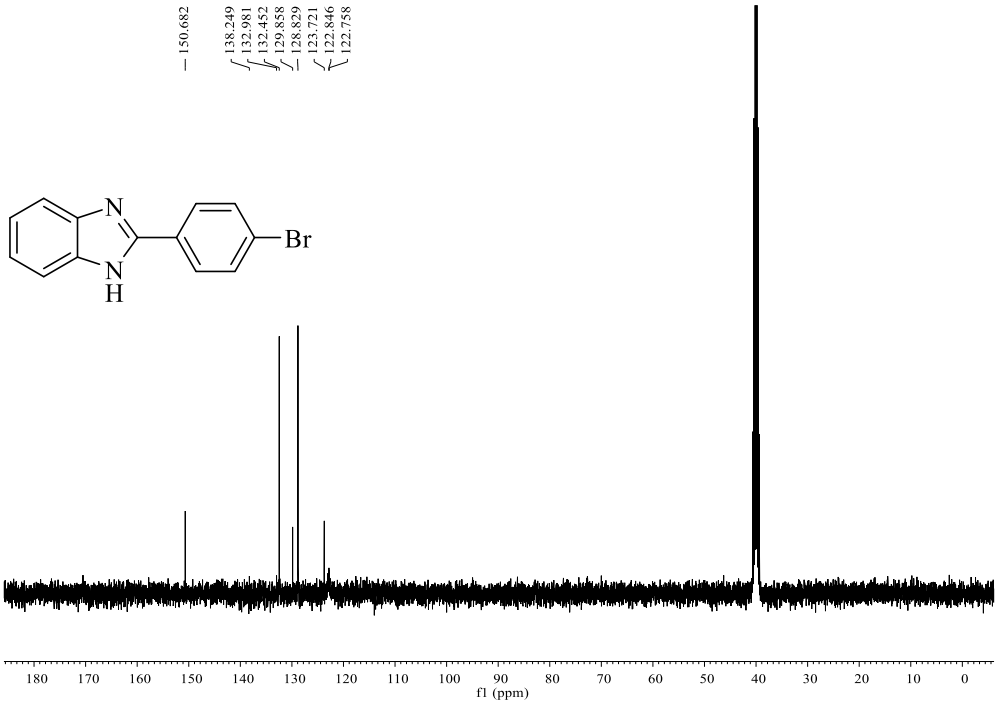
^{1}H NMR Spectrum of **3cn**



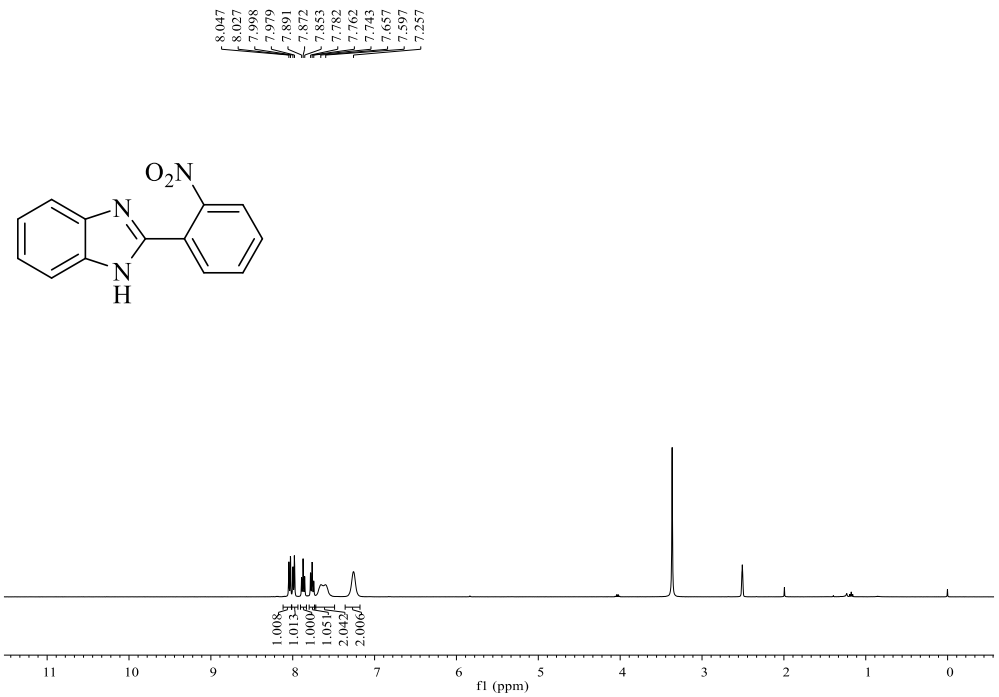
^{13}C NMR Spectrum of **3cn**



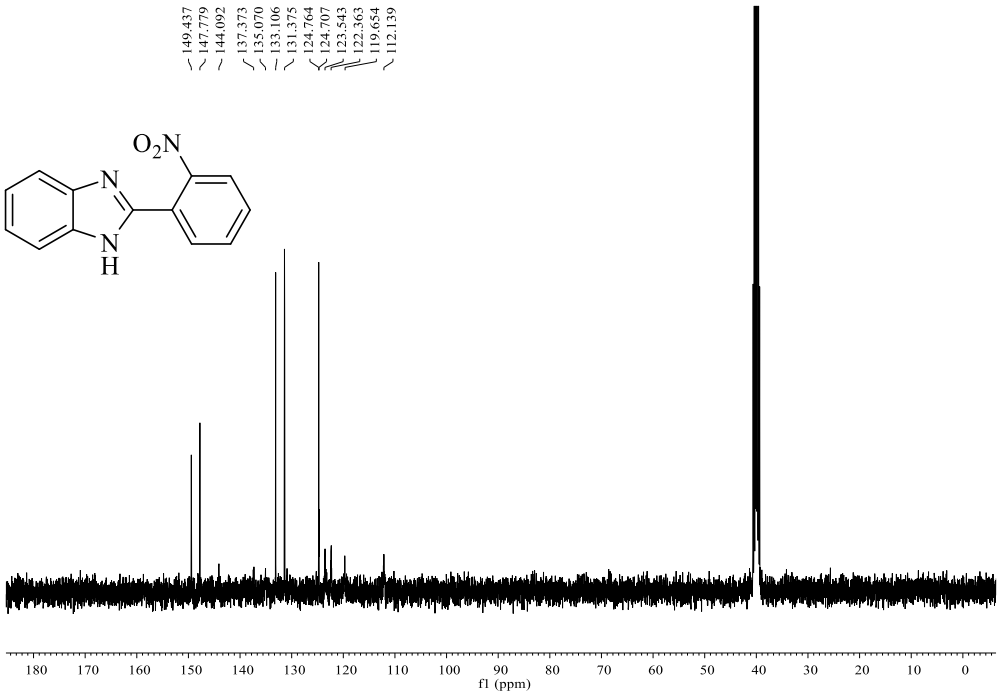
^{1}H NMR Spectrum of **3co**



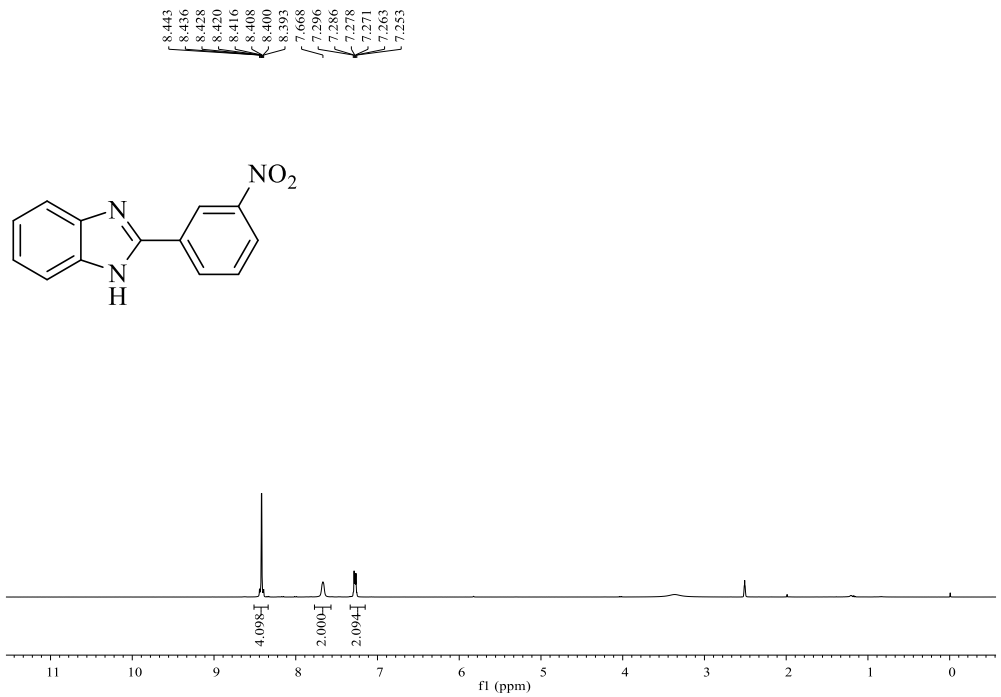
^{13}C NMR Spectrum of **3co**



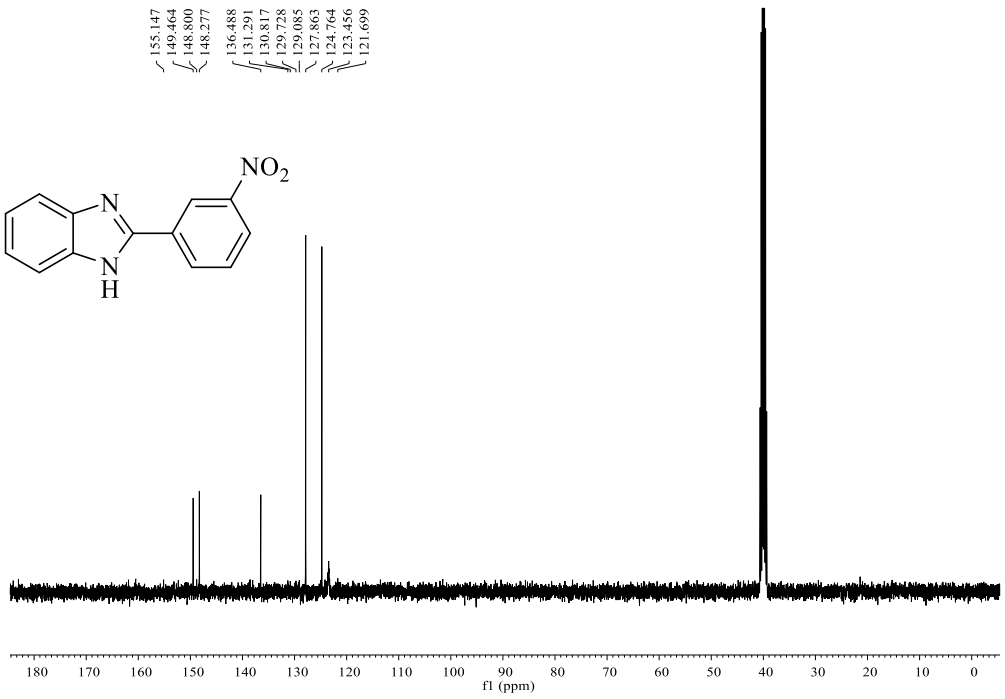
^{1}H NMR Spectrum of **3cp**



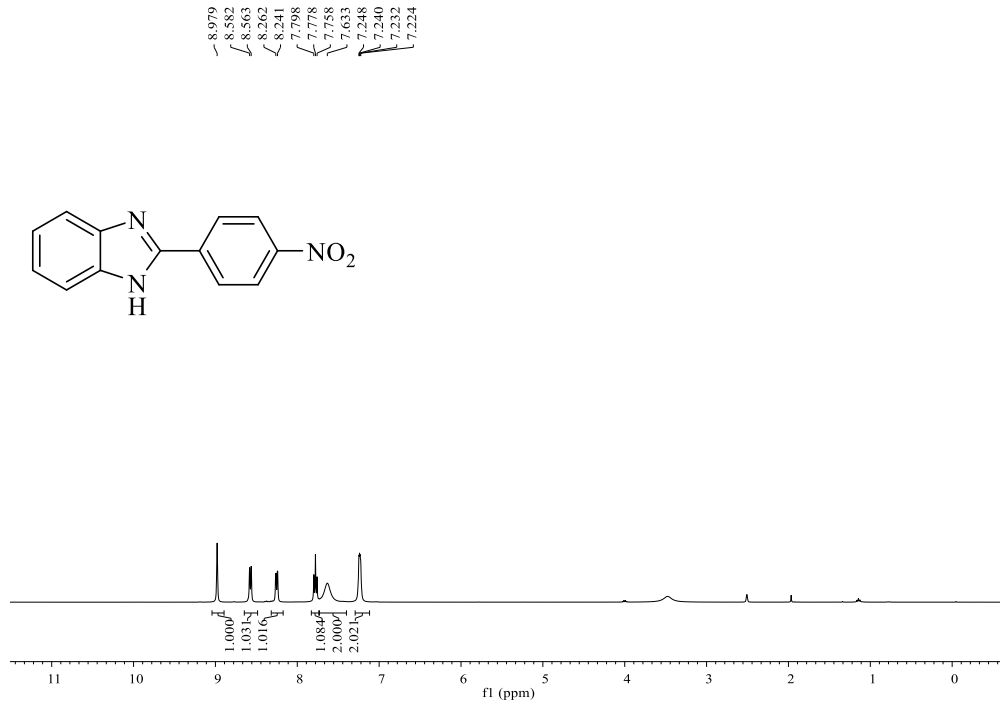
^{13}C NMR Spectrum of **3cp**



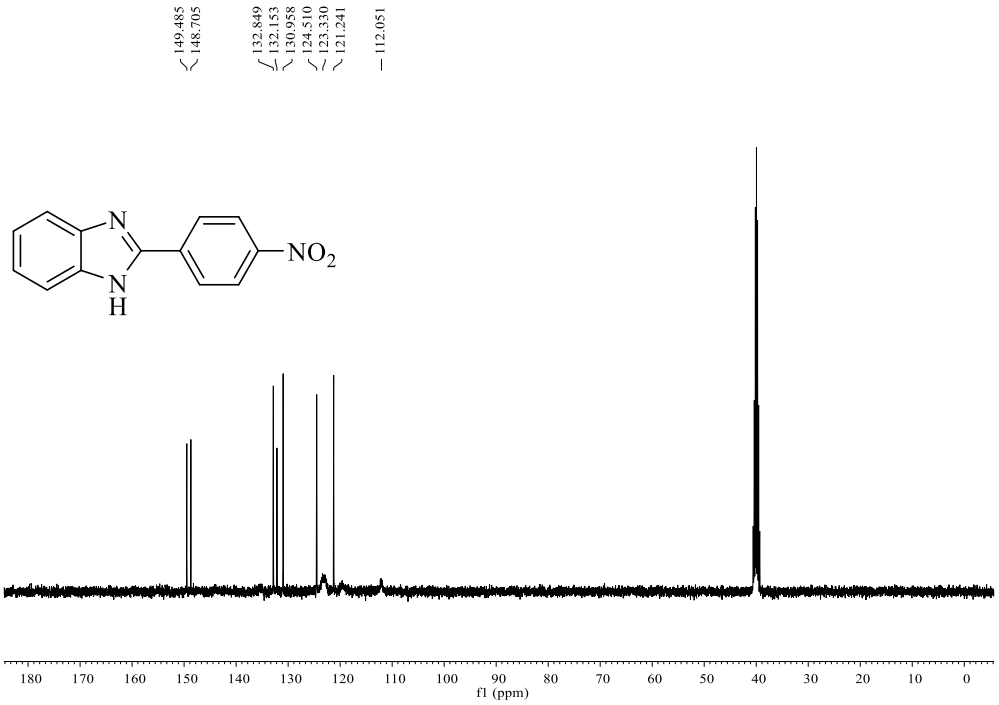
^{1}H NMR Spectrum of **3cq**



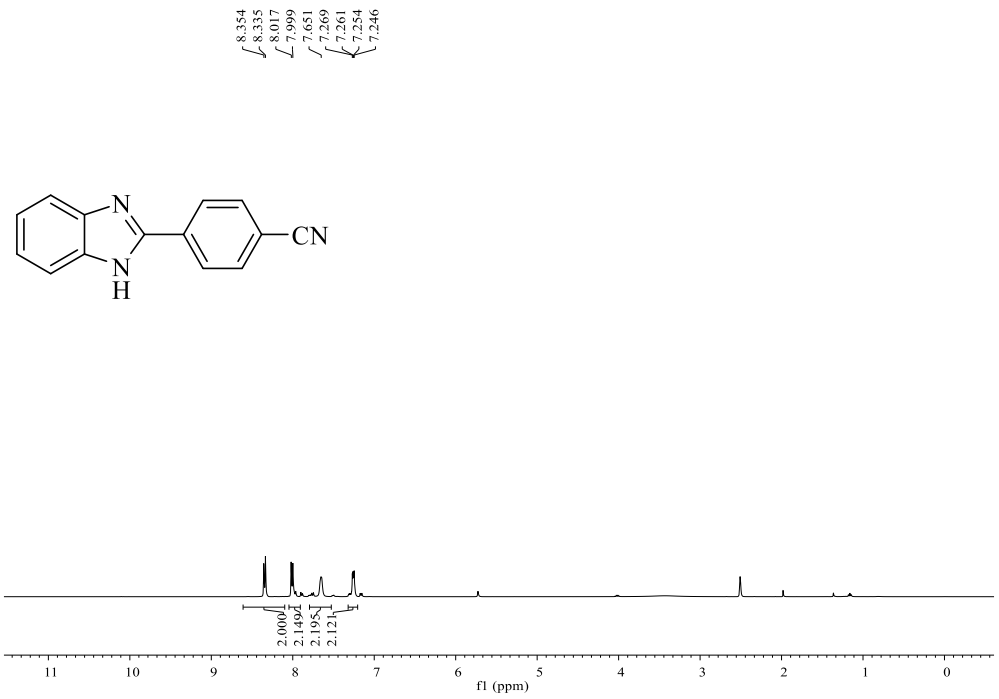
^{13}C NMR Spectrum of **3cq**



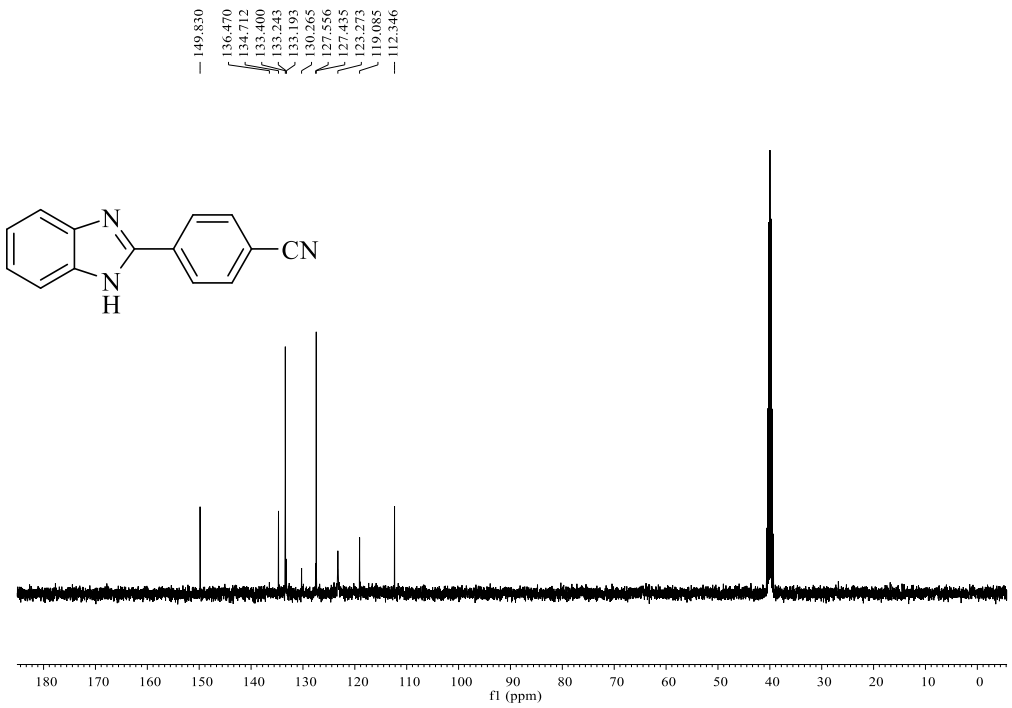
^{1}H NMR Spectrum of **3cr**



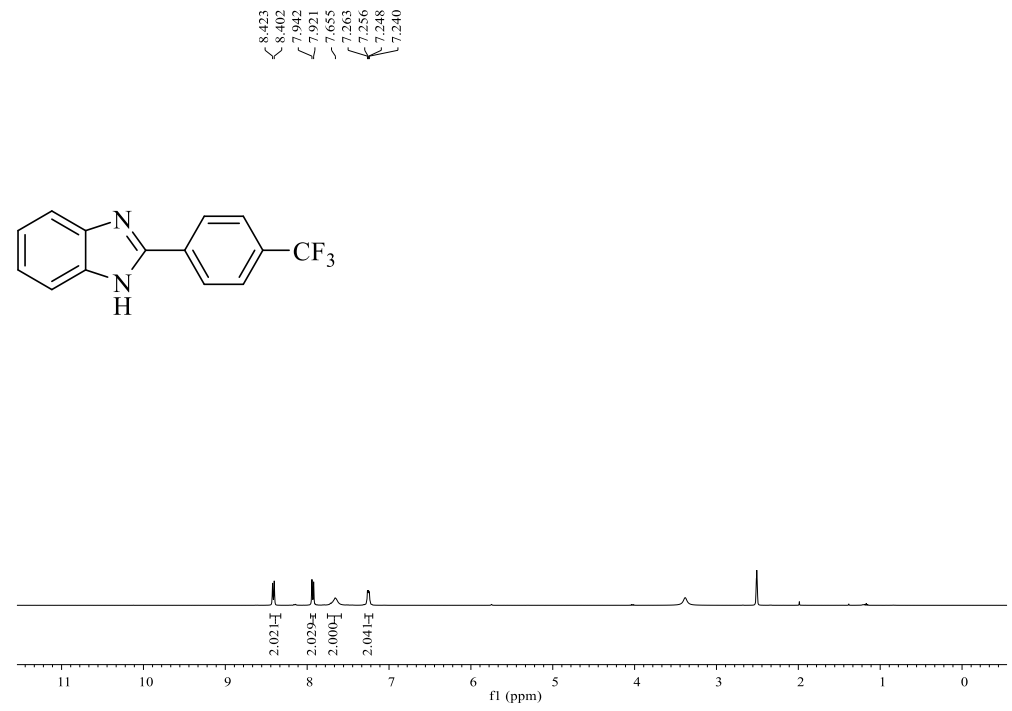
^{13}C NMR Spectrum of **3cr**



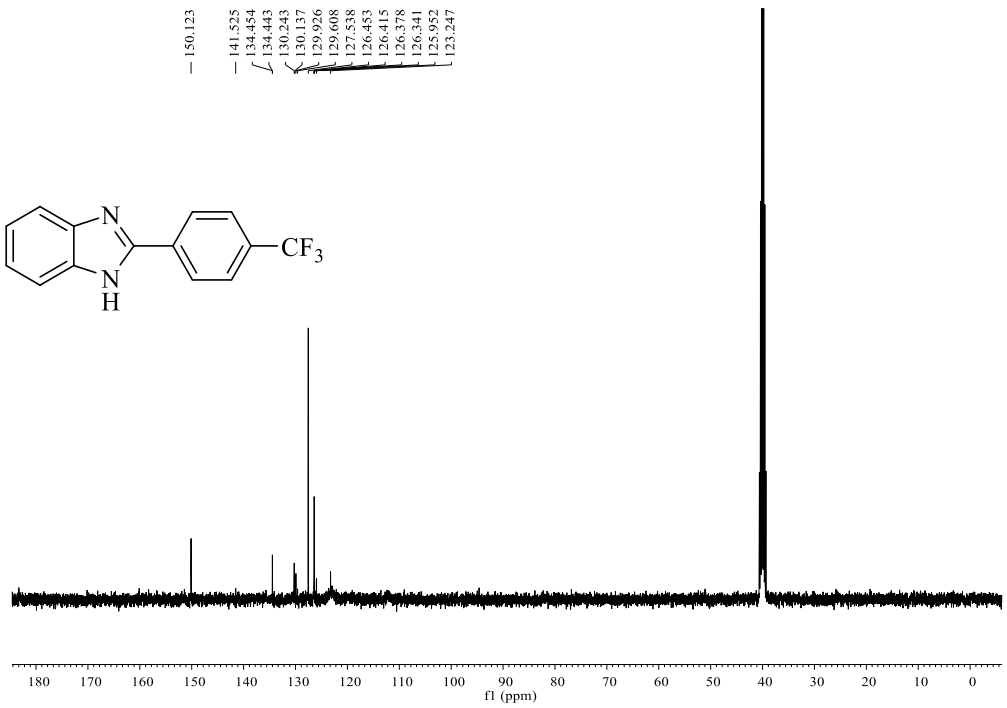
^{1}H NMR Spectrum of **3cs**



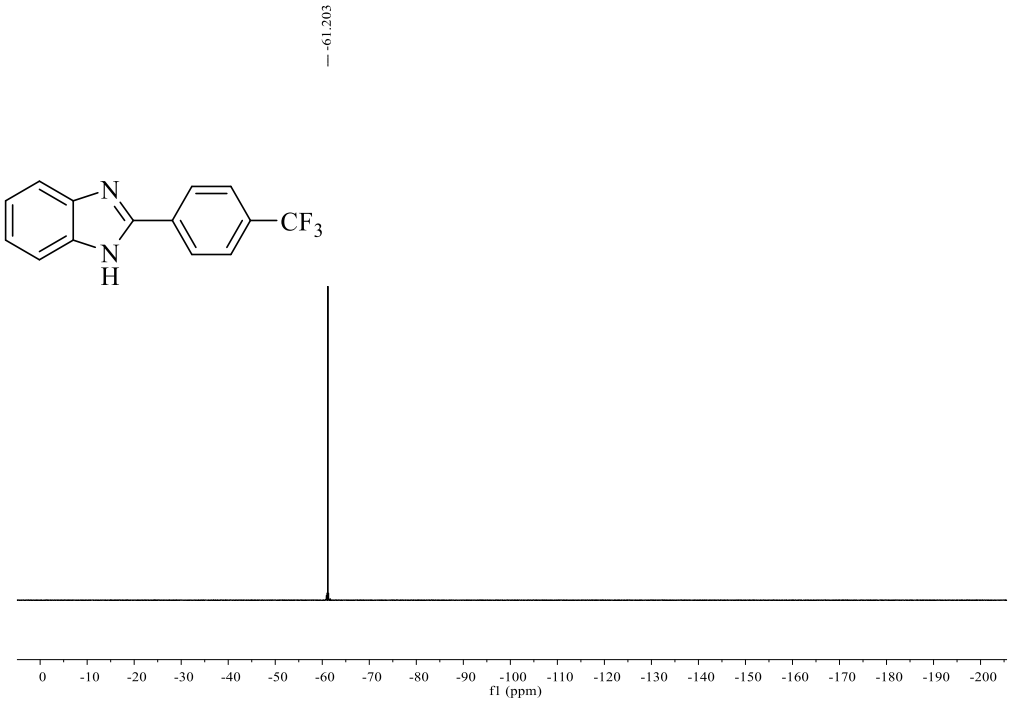
^{13}C NMR Spectrum of **3cs**



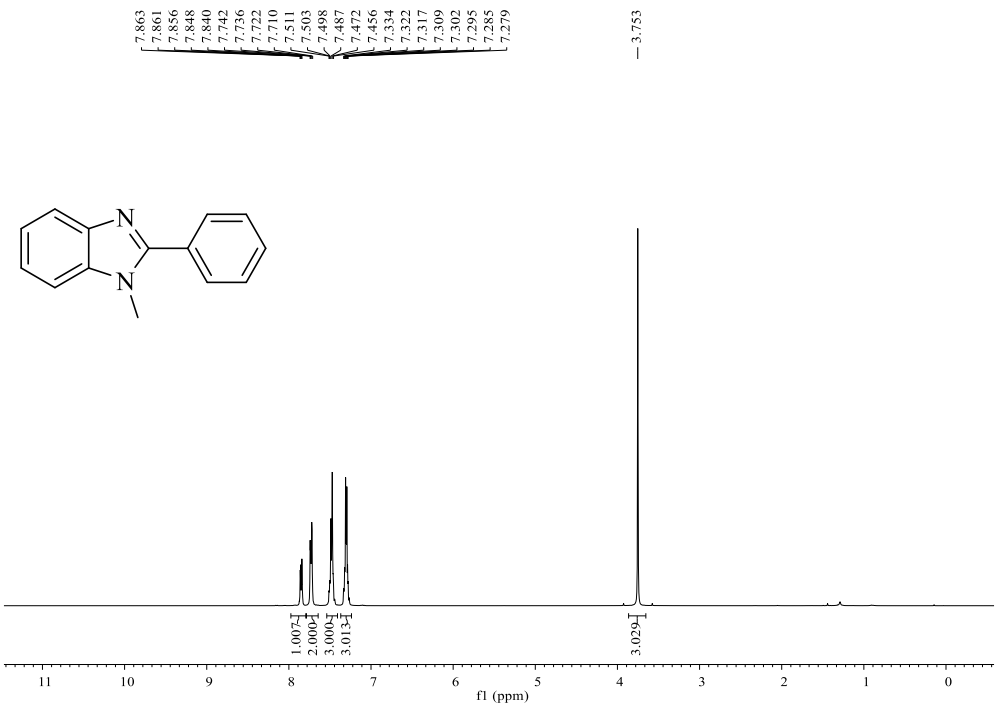
^{1}H NMR Spectrum of **3ct**



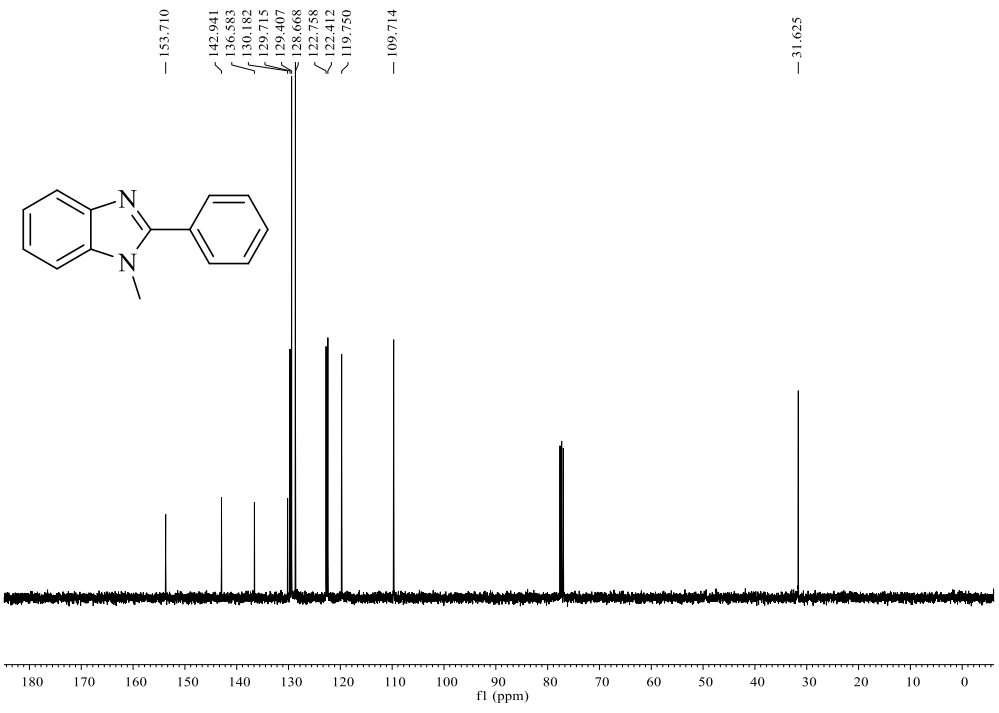
^{13}C NMR Spectrum of **3ct**



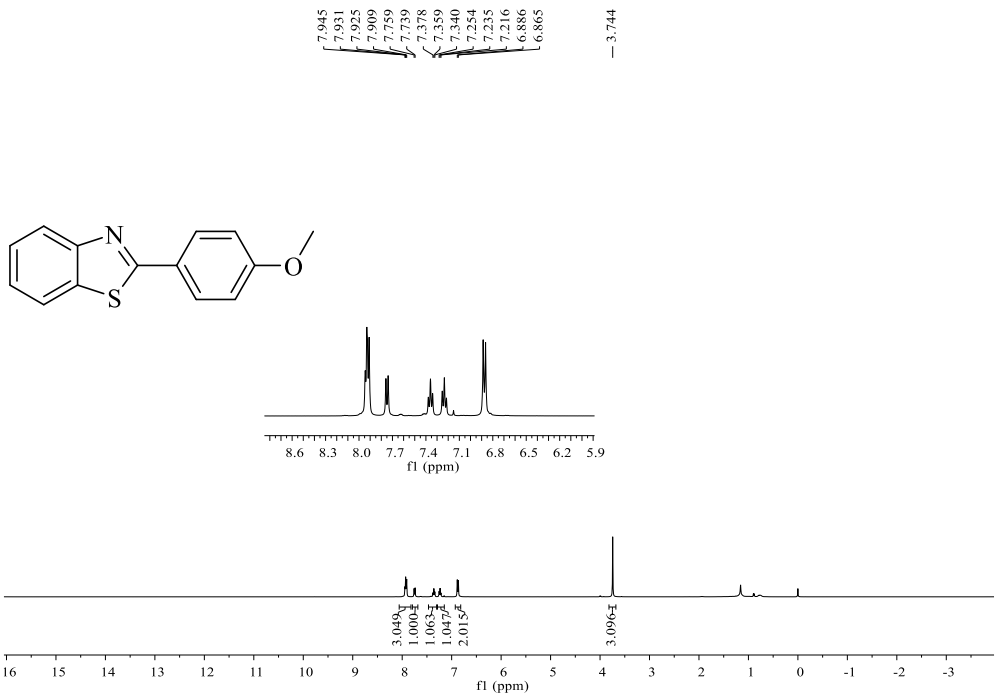
^{19}F NMR Spectrum of **3ct**



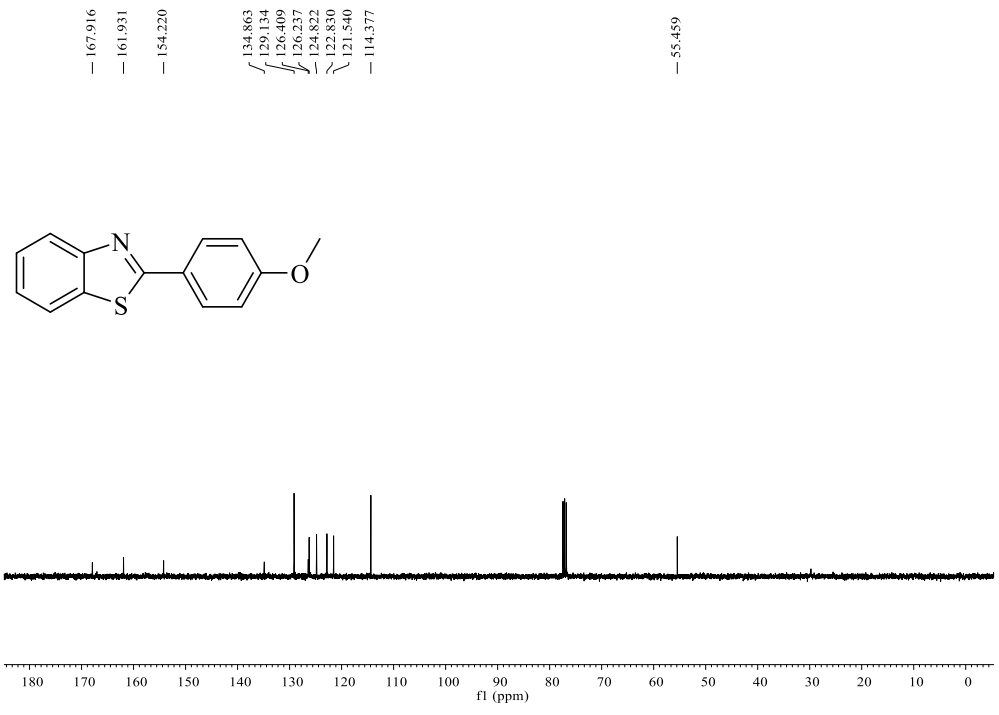
^{1}H NMR Spectrum of **3cu**



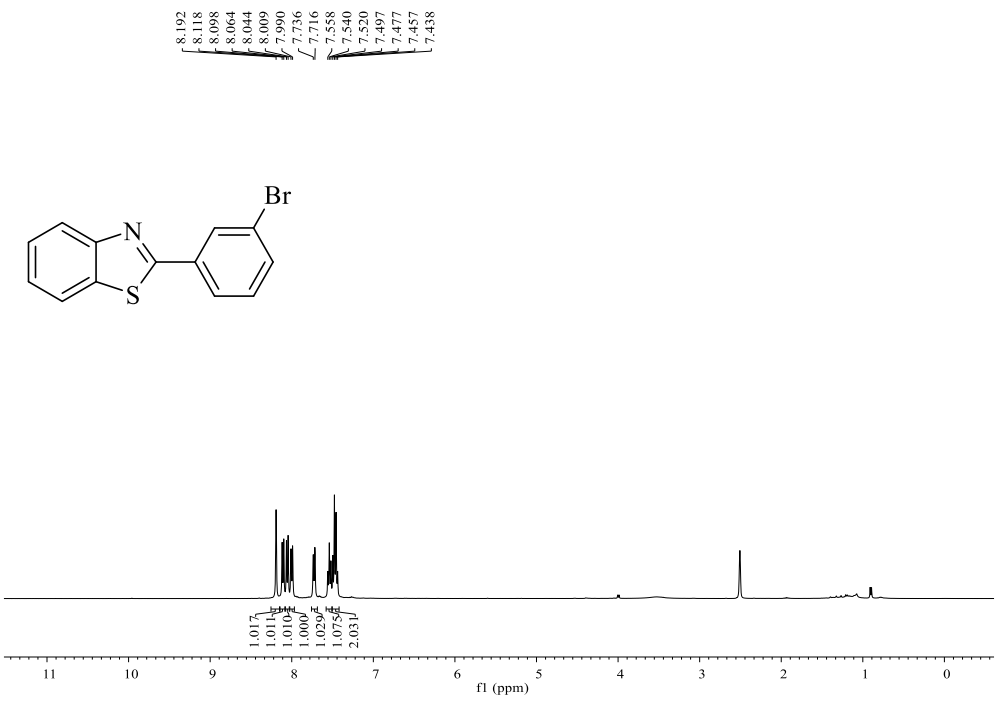
^{13}C NMR Spectrum of **3cu**



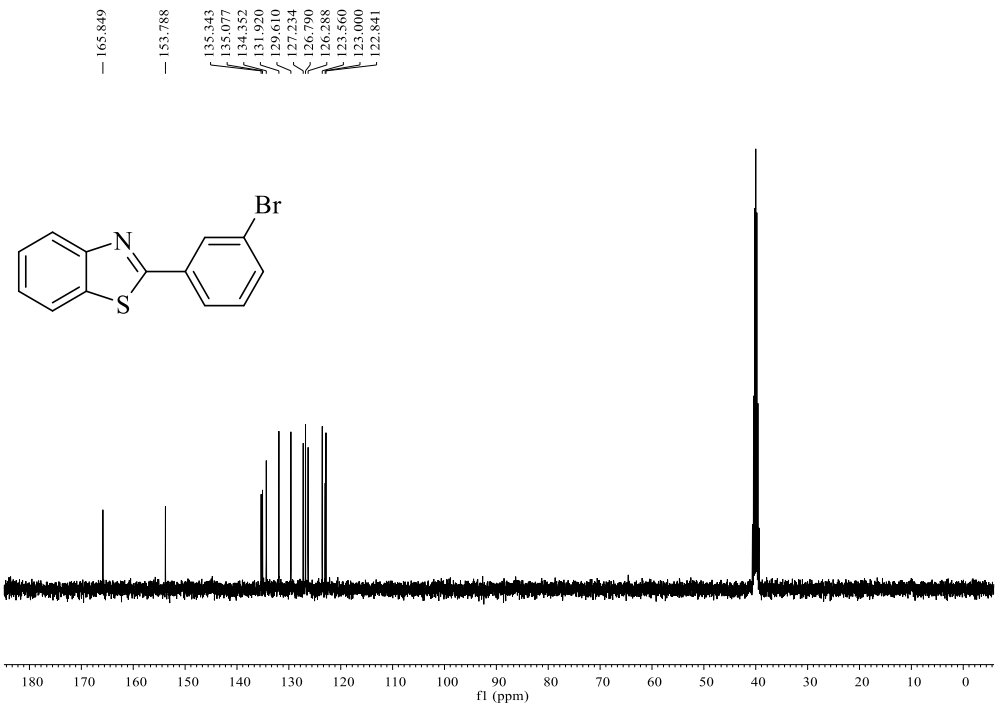
^{1}H NMR Spectrum of **3cv**



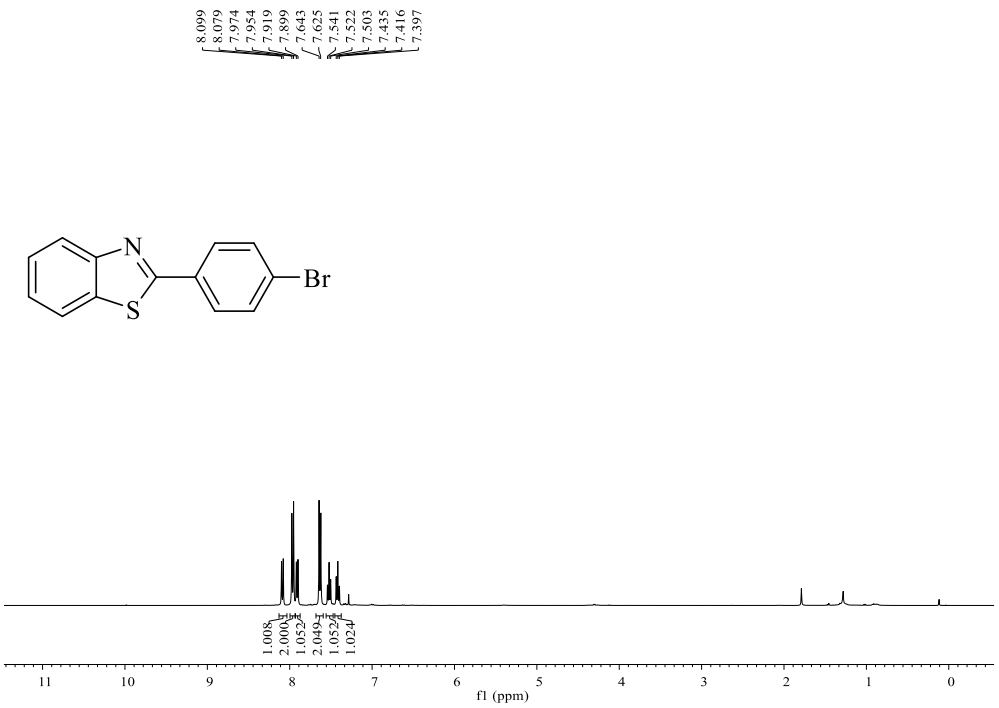
^{13}C NMR Spectrum of **3cv**



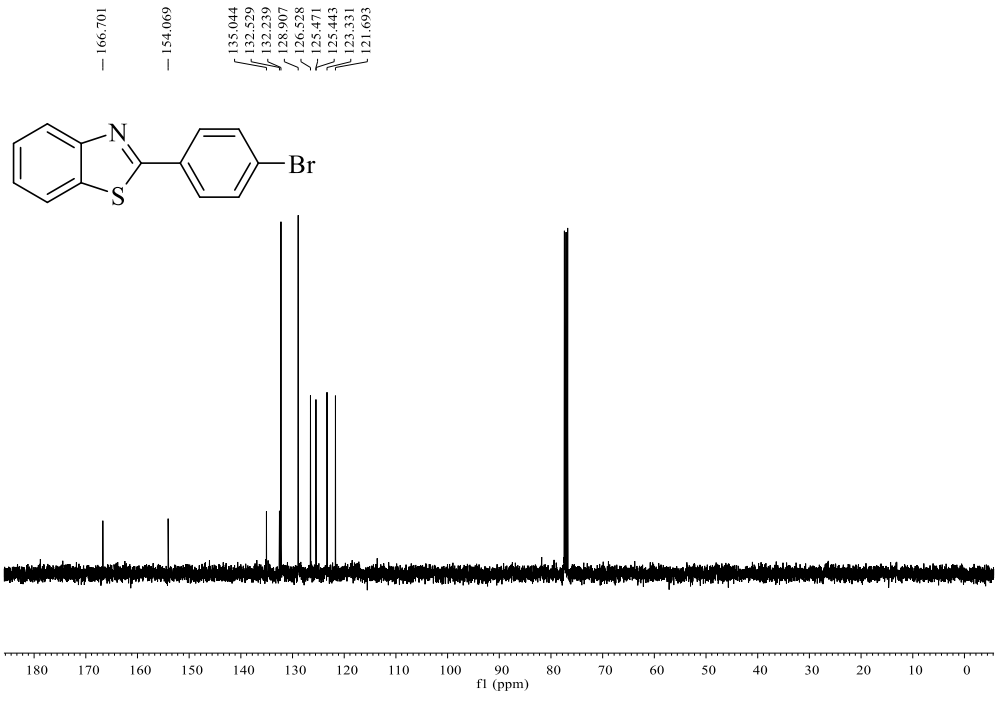
^{1}H NMR Spectrum of **3cw**



^{13}C NMR Spectrum of **3cw**



^{1}H NMR Spectrum of **3cx**



^{13}C NMR Spectrum of **3cx**