Supporting Information

Synthesis of Fluorescent Heterocycles via a Knoevenagel/ [4+1]-cycloaddition cascade using Acetyl Cyanide

Guillermo Martinez-Ariza[a] Bereketab T. Mehari,[b] Ludmila A. G. Pinho,[c] Christopher Foley,[b] Kendall Day,[a] John C. Jewett,[b] and Christopher Hulme*[a,b]

[a.] *Department of Pharmacology and Toxicology, College of Pharmacy, The University of Arizona, BSW 351,1041 E. Lowell St., Tucson, AZ, 85721, USA.*
[b.] *Department of Chemistry and Biochemistry, The University of Arizona, Tucson, AZ, 85721, USA.*
[c.] *Faculdade de Ciências da Saúde, University of Brasilia, Brasilia, DF, Brazil.*

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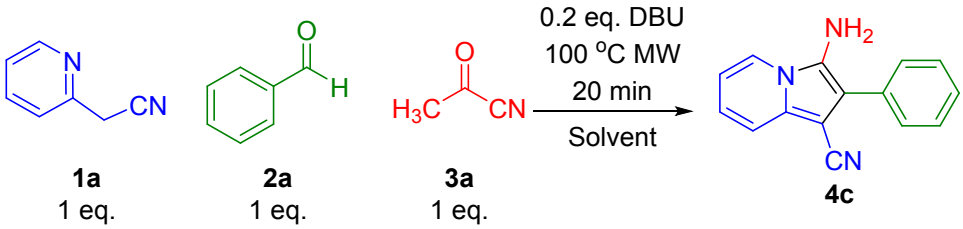
Table of contents:

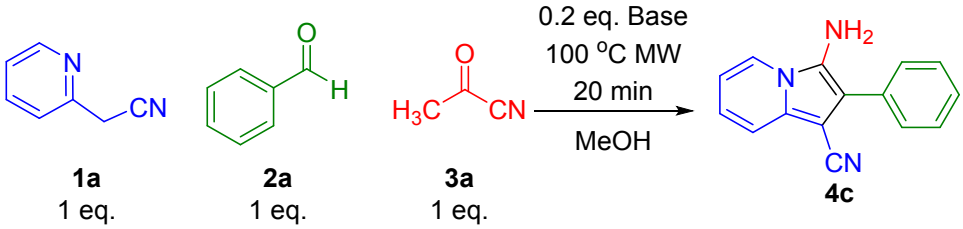
Table S1. Solvent optimization



Entry[a]	Solvent	Yield **4c**[b] [%]
1	*n*-BuOH	82
2	TFE	13
3	MeOH	95
4	EtOH	87
5	*t*-BuOH	nr
6	2-EtO-EtOH	12
7	*i*-PrOH	46
8	THF	71
9	DCE	nr
10	DMF	91
11	Dioxane	60
12	DMSO	84
13	1,2-DME	57

[a] Scale: 0.25 mmol [b] Reported % yields are 'Area under the Curve' of desired product (A%) as judged by LC/MS at UV 254 nm. nr = no reaction

Table S2. Base optimization

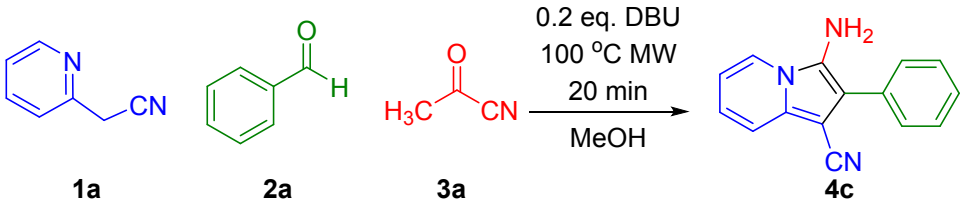


1a 1 eq. **2a** 1 eq. **3a** 1 eq. **4c**

Entry[a]	Base	Yield **4c**[b] [%]
1	DBU	95
2	TEA	nr
3	DIPEA	nr
4	DIPA	1
5	Cs_2CO_3	64
6	K_2CO_3	67
7	KOAc	nr
8	NaH	nr
9	CsOH	90

[a] Scale: 0.25 mmol [b] Reported % yields are 'Area under the Curve' of desired product (A%) as judged by LC/MS at UV 254 nm. nr = no reaction.

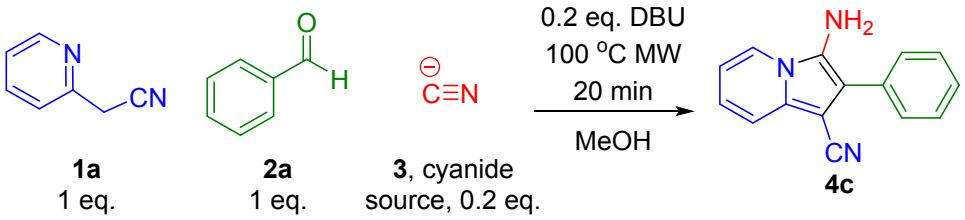
Table S3. Stoichiometry optimization.

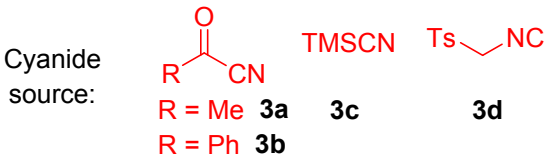


Entry[a]	**1a** eq.	**2a** eq.	**3a** eq.	DBU eq.	Yield **4c**[b] [%]
1	1	1	1	0.2	95
2	1	1	1	0.5	94
3	1	1	1	1	93
4	1	1	1.3	0.2	92
5	1	1	2	0.2	90
6	1	1.3	1	0.2	78
7	1.3	1	1	0.2	87

[a] Scale: 0.25 mmol, [b] Reported % yields are 'Area under the Curve' of desired product (A%) as judged by LC/MS at UV 254 nm

Table S4. Cyanide source optimization.

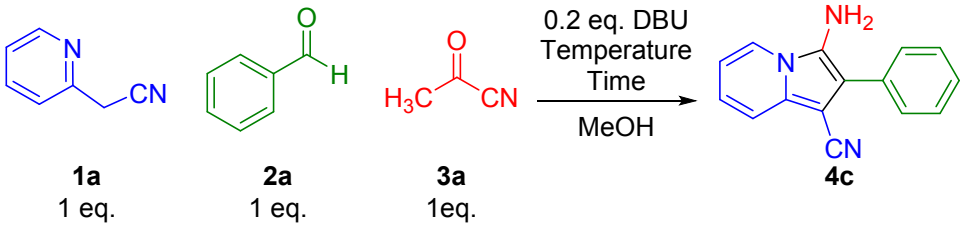




Entry[a]	Cyanide source	Yield **4c**[b] [%]
1	**3a**	95
2	**3b**	90
3	**3c**	84
4	**3d**	13

[a] Scale: 0.25 mmol, [b] Reported % yields are 'Area under the Curve' of desired product (A%) as judged by LC/MS at UV 254 nm

Table S5. Temperature optimization.



1a 1 eq. **2a** 1 eq. **3a** 1eq. **4c**

Entry[a]	Temperature	Time	Yield **4c**[b] [%]
1	80 °C MW	20 min.	12
2	100 °C MW	20 min.	95
3	120 °C MW	20 min.	97
4	RT	overnight	82

[a] Scale: 0.25 mmol, [b] Reported % yields are 'Area under the Curve' of desired product (A%) as judged by LC/MS at UV 254 nm

General procedure

All reagents and solvents were acquired from commercially available suppliers and used without further purification. The products were purified using an automated flash chromatography apparatus. Low resolution mass spectra were obtained using positive ESI methods in a mass spectrometer. High resolution mass spectra were obtained using positive ESI method for all the compounds, obtained in an Ion Cyclotron Resonance (ICR) spectrometer. ^{1}H and ^{13}C NMR spectra were obtained on a Bruker NMR spectrometer at 400 and 100 MHz respectively. The data is reported as follows: chemical shift in ppm (δ), multiplicity (*s* = singlet, *d* = doublet, *t* = triplet, *m* = multiplet). Coupling constant are reported in Hertz (Hz) and were automatically generated using known NMR analyzer software (Mestrenova). All microwave irradiation experiments were carried out in a Biotage Initiator, operating at a frequency of 2.45GHz with continuous irradiation power from 0 to 300W with utilization of the standard absorbance level of 220W maximum power using an external sensor of temperature. The reactions were carried out in 5 mL microwave vials, sealed with Teflon septum and placed in the microwave cavity at the specified temperature without the use of inert conditions. Absorbance spectra were measured with an Agilent 8453 UV-vis spectrophotomer. Fluorescence spectra were measured with a QuantaMaster 400 Steady State Spectrofluormeter and PTRI fluorescence spectrophotometer. Quantum yield was calculated using coumarine 151[1] and rhodamine[2] in absolute ethanol.

References:

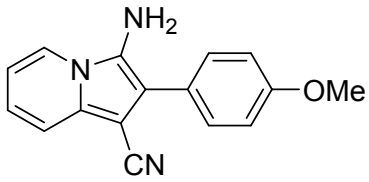
1. *The Journal of Physical Chemistry,* **2001,** *105*, 1097-1106
2. *Chemical Physics letters*, **1996,** *260,* 115-118

General procedure for the preparation of compound 4a-4q

The corresponding 2-cyanomethyl pyridine (**1**, 1 eq., 0.5 mmol) was placed in a 5 mL microwave vial equipped with a magnetic stir bar. Subsequently, anhydrous MeOH (1 mL) was added followed by the addition of the corresponding aldehyde (**2**, 1 eq., 0.5 mmol) and DBU (0.2 eq., 0.1 mmol). Then, acetyl cyanide (**3**, 1 eq. 0.5 mmol) was added slowly through the wall of the vial (note: if acetyl cyanide is not added slowly the solvent mixture will splash outside of the vial). The reaction was heated via microwave irradiation for 20 minutes at 120 ^{o}C. After reaction completion (monitored by TLC and LC/MS), the solvent was removed *in vacuo* and the crude product was purified using a silica column by flash chromatography (0-30% AcOEt/Hexane) to afford title compounds, **4a-4q**.

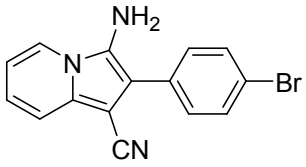
Analytical data of compound 4a-4q

3-amino-2-(4-methoxyphenyl) indolizine-1-carbonitrile (4a)



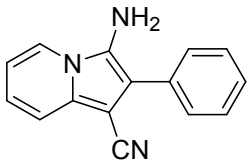
Brown solid, 76 mg, 58% yield, m.p. 144-146 ^{o}C, ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.23 – 8.21 (m, 1H), 7.58 – 7.57 (m, 2H), 7.56 – 7.55 (m, 1H), 7.08 – 7.06 (m, 2H), 7.00 – 6.97 (m,1H), 6.88 – 6.86 (m, 1H), 5.14 (s, 2H), 3.81 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 148.6, 123.0, 120.0, 117.9, 115.1, 112.8, 110.5, 107.9, 106.7, 104.6, 102.5, 102.4, 67.6, 45.5; $[M+H]^+$ = 264; HRMS (ESI) m/z calculated for $C_{16}H_{14}N_3O$ $[M+H]^+$= 264.11314; found 264.11327; λ_{ex} = 292, 393 nm; λ_{em} = 497 nm.

3-amino-2-(4-bromophenyl) indolizine-1-carbonitrile (4b)



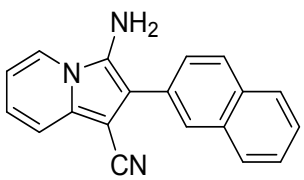
Light brown solid, 98 mg, 63%, m.p. 164-166 ^{o}C, ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.25 – 8.23 (m, 1H), 7.69– 7.67 (m, 2H), 7.59 – 7.57 (m, 2H), 7.01 (d, J = 8.9 Hz, 1H), 7.03 – 6.99 (m, 1H), 6.90 – 6.86 (m, 1H), 5.35 (br s, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 133.0, 131.9, 131.7, 130.4, 128.4, 122.6, 120.7, 119.9, 117.3, 116.6, 112.4, 110.1, 77.0; $[M]^+$ = 312, 314; HRMS (ESI) m/z calculated for $C_{15}H_{11}BrN_3$ $[M+H]^+$= 312.01309; found 312.01321, 314.01116; λ_{ex} = 282, 398 nm; λ_{em} = 493 nm.

3-amino-2-phenylindolizine-1-carbonitrile (4c)



Dark brown solid, 86 mg, 74% yield, m.p.128-130 ^{o}C, ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.27 – 8.25 (m, 1H), 7.68 – 7.51 (m, 6H), 7.02 – 6.85 (m, 2H), 5.29 (s, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 132.9, 132.7, 128.8, 128.5, 126.7, 122.5, 120.4, 117.5, 116.6, 112.2, 111.6, 77.3; $[M+H]^+$ = 234; HRMS (ESI) m/z calculated for $C_{15}H_{12}N_3$ $[M+H]^+$= 234.10257; found 234.10277; λ_{ex} = 287, 398 nm; λ_{em} = 496 nm.

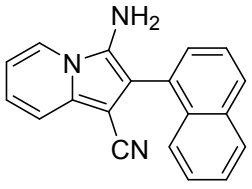
3-amino-2-(naphthalen-2-yl) indolizine-1-carbonitrile (4d)



Brown solid, 79 mg, 56% yield, m.p. 146-148 ^{o}C, ^{1}H NMR (400 MHz, DMSO-d^6) δ 8.30 – 8.27 (m,1H), 8.14 – 8.13 (m, 1H), 8.04 – 8.02 (m, 1H), 7.96 – 7.95 (m, 2H), 7.83 – 7.80 (m, 1H), 7.58 – 7.50 (m, 3H), 7.04 – 7.00 (m, 1H), 6.92 – 6.88 (m, 1H), 5.43 (s, 1H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 149.5, 137.4,

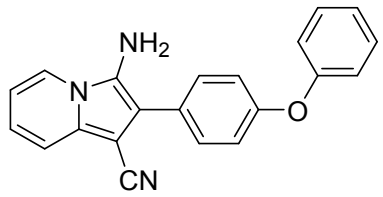
128.1, 127.9, 127.5, 127.0, 126.7, 126.3, 126.0, 122.6, 120.5, 116.6, 112.3, 112.2, 77.5; $[M+H]^+$ = 284; HRMS (ESI) m/z calculated for $C_{19}H_{13}N_3Na$ $[M+Na]^+$= 306.10017; found 306.10019; λ_{ex} = 292, 398 nm; λ_{em} = 505 nm.

3-amino-2-(naphthalen-1-yl) indolizine-1-carbonitrile (4e)



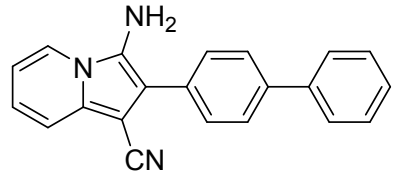
Brown solid, 96 mg, 67%, 142-144 ^oC, ^1H NMR (400 MHz, DMSO-d_6) δ 8.25 – 8.23 (m, 1H), 8.04 – 7.99 (m, 2H), 7.74 – 7.72 (m, 1H), 7.66 – 7.62 (m,1H), 7.59 – 7.49 (m, 4H), 7.06 – 7.02 (m,1H), 6.94 – 6.90 (m,1H), 5.08 (s, 1H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 133.5, 132.4, 131.5, 129.8, 129.2, 128.9, 128.3, 128.0, 126.0, 125.8, 125.6, 122.5, 120.2, 117.2, 116.6, 112.2, 109.7, 79.8; $[M+H]^+$ = 284; HRMS (ESI) m/z calculated for $C_{19}H_{13}N_3Na$ $[M+Na]^+$= 306.10017; found 306.10013; λ_{ex} = 297, 397 nm; λ_{em} = 512 nm.

3-amino-2-(4-phenoxyphenyl) indolizine-1-carbonitrile (4f)



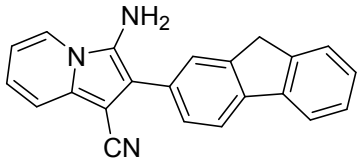
Brown oil, 71 mg, 43%, ^1H NMR (400 MHz, DMSO-d6) δ 8.24 – 8.22 (m, 1H), 7.66 – 7.62 (m, 2H), 7.52 – 7.50 (m, 1H), 7.44 – 7.40 (m, 3H), 7.18 – 7.07 (m, 5H), 7.02 – 6.97 (m, 1H), 6.89– 6.85 (m, 1H), 5.24 (s, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 156.5, 155.6, 151.3, 149.5, 137.4, 132.8, 130.2, 130.1, 128.0, 127.7, 122.5, 120.4, 118.9, 118.8, 117.5, 116.5, 112.3, 111.2, 77.2; $[M+H]^+$ = 326; HRMS (ESI) m/z calculated for $C_{21}H_{15}N_3O$ $[M+H]^+$ = 326.12879, found 326.12877; λ_{ex} = 300, 400 nm; λ_{em} = 494 nm.

2-([1,1'-biphenyl]-4-yl)-3-aminoindolizine-1-carbonitrile (4g)



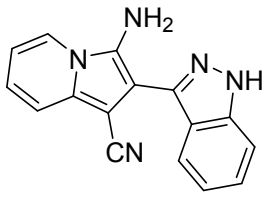
Beige solid, 85 mg, 55% yield, 160-62 ^oC, 1H NMR (400 MHz, DMSO-d_6) δ 8.27 – 8.25 (m, 1H), 7.82 – 7.72(m, 6H), 7.55 – 7.47 (m, 3H), 7.40 – 7.36 (m, 1H), 7.03 – 6.99 (m, 1H), 6.90 – 6.87 (m, 1H), 5.36 (s, 2H);); ^{13}C NMR (100 MHz, DMSO-d_6) δ 139.7, 138.4, 133.0, 131.8, 129.0, 128.9, 128.4, 127.5, 127.0, 126.5, 122.5, 120.5, 117.6, 116.6, 112.3, 111.0, 77.1; $[M+H]^+$ = 310; HRMS (ESI) m/z calculated for $C_{21}H_{15}N_3$ $[M+H]^+$ = 310.13387, found 310.131387; λ_{ex} = 292, 398 nm; λ_{em} = 496 nm.

3-amino-2-(9H-fluoren-2-yl)indolizine-1-carbonitrile (4h)



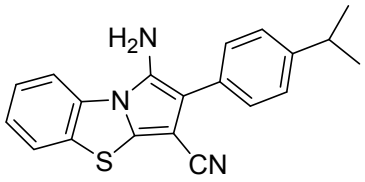
Brown solid, 113 mg, 70% yield, m.p. 156-158 °C, ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.26 – 8.24 (m, 1H), 8.02 – 8.00 (m, 1H), 7.94– 7.92 (m, 1H), 7.85– 7.81(m, 1H), 7.66 – 7.52 (m, 3H), 7.42 – 7.30 (m, 2H), 7.01– 6.98 (m, 1H), 6.90 – 6.86 (m, 1H), 5.35 (s, 2H), 3.99 (s, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 143.5, 143.1, 140.8, 139.7, 137.4, 132.9, 131.1, 128.3, 127.2, 126.83, 126.79, 125.2, 122.5, 120.35, 120.30 120.0, 117.6, 116.6, 112.3, 111.8, 77.3, 36.5; $[M+H]^+$ = 322; HRMS (ESI) m/z calculated for $C_{22}H_{14}N_3$ $[M-H]^+$ = 320.11822, found 320.11847; λ_{ex} = 300, 398 nm; λ_{em} = 490 nm.

3-amino-2-(1*H*-indazol-3-yl)indolizine-1-carbonitrile (4i)



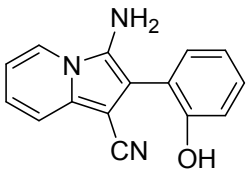
Brown solid, 61 mg, 44% yield, m.p. 140-142 °C, ^{1}H NMR (400 MHz, DMSO-d_6) δ 13.32 (s, 1H), 8.22 – 8.20 (m, 1 H), 8.07 –8.05 (m, 1H), 7.62 –7.57 (m, 2H), 7.44 –7.40 (m, 1H), 7.20 –7.17 (m, 1H), 7.04 –7.00 (m, 1H), 6.93 –6.89 (m, 1H), 5.67 (s, 2H);); ^{13}C NMR (100 MHz, DMSO-d_6) δ 144.6, 141.0, 137.8, 133.0, 130.1, 126.4, 122.5, 121.3, 121.0, 120.29, 120.27, 117.9, 116.7, 112.4, 110.4, 102.9, 90.9, 76.8; $[M+H]^+$ = 274; HRMS (ESI) m/z calculated for $C_{16}H_{12}N_5$ $[M+H]^+$ = 274.10872, found 274.10890; λ_{ex} = 299, 399 nm; λ_{em} = 493 nm.

1-amino-2-(4-isopropylphenyl)benzo[d]pyrrolo[2,1-b]thiazole-3-carbonitrile (4j)



Light brown solid, 102 mg, 62% yield, m.p. 186-188 °C, ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.39 – 8.37 (m, 1H), 7.98 – 7.96 (m, 1H), 7.53 – 7.47 (m, 3H), 7.42 – 7.34 (m, 3H), 4.97 (s, 2H), 2.97 – (m, 1H), 1.26 (s, 3H), 1.24 (s, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 146.8, 134.2, 131.0, 130.5, 129.9, 129.6, 128.2, 126.7, 126.2, 124.9, 124.3, 116.5, 115.2, 114.6, 80.3, 33.2, 23.9; $[M+H]^+$ = 332; HRMS (ESI) m/z calculated for $C_{20}H_{17}N_3SNa$ $[M+Na]^+$= 354.10354; found 354.10373; λ_{ex} = 313, 392 nm; λ_{em} = 498 nm.

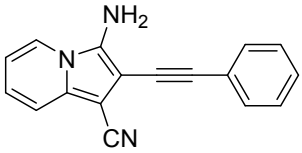
3-amino-2-(2-hydroxyphenyl)indolizine-1-carbonitrile (4k)



Brown solid, 36 mg, 29% yield, m.p. 180-182 °C, ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.96 (s, 1H), 8.19 –8.17 (m, 1H), 7.52 –7.50 (m, 1H), 7.34 –7.32 (m, 1H), 7.24 –7.20 (m, 1H), 7.02 –6.84 (m, 4H), 4.98 (s, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 134.8, 113.2, 111.9, 109.1, 108.7, 102.7, 100.4, 99.85, 99.81, 98.0,

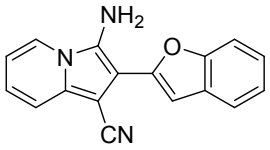
97.0, 96.6, 92.5, 90.5, 59.1; $[M+H]^+$ = 250; HRMS (ESI) m/z calculated for $C_{15}H_{11}N_3ONa$ $[M+Na]^+$ = 272.07943, found 272.07946; λ_{ex} = 291, 392 nm; λ_{em} = 494 nm.

3-amino-2-(phenylethynyl)indolizine-1-carbonitrile (4l)



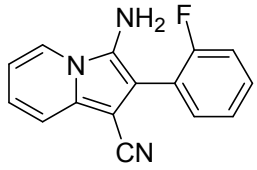
Dark brown solid, 44 mg, 35% yield, m.p. 158-160 °C, ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.41 –8.39 (m, 1H), 7.77 –7.74 (m, 1H), 7.56 –7.49 (m, 1H), 7.38 –7.30 (m, 3H), 7.26 –7.23 (m, 2H), 7.10 –7.07 (m, 1H), 4.51 (s, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 153.6, 137.2, 135.4, 132.6, 128.9, 128.2, 127.2, 125.9, 125.4, 123.8, 117.7, 115.3, 113.8, 113.4, 98.3, 81.9, 29.9; $[M+H]^+$ = 258; HRMS (ESI) m/z calculated for $C_{17}H_{12}N_3$ $[M+H]^+$ = 258.10257, found 258.10268; λ_{ex} = 304, 348 nm; λ_{em} = 404 nm.

3-amino-2-(benzofuran-2-yl)indolizine-1-carbonitrile (4m)



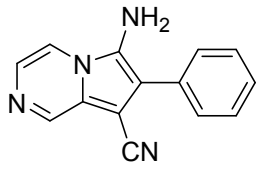
Brown oil, 40 mg, 29% yield, ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.26 – 8.24 (m, 1H), 7.67 – 7.61 (m, 2H), 7.53 – 7.50 (m, 1H), 7.31 – 7.23 (m, 2H), 7.20 – 7.19 (m, 1H), 7.04 – 6.99 (m, 1H), 6.90 – 6.86 (m, 1H), 6.09 (s, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 153.3, 150.4, 133.4, 130.5, 128.6, 123.8, 123.2, 122.5, 121.2, 120.5, 117.1, 116.7, 112.6, 111.0, 100.7, 98.3, 74.8; $[M+H]^+$ = 274; HRMS (ESI) m/z calculated for $C_{17}H_{12}N_3O$ $[M+H]^+$ = 274.09749; found 274.09763; λ_{ex} = 294, 332, 373 nm; λ_{em} = 476 nm.

3-amino-2-(2-fluorophenyl)indolizine-1-carbonitrile (4n)



Beige solid, 91 mg, 73% yield, m.p. 128-130 °C, ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.21 – 8.18 (m, 1H), 7.56 – 7.50 (m, 2H), 7.48 – 7.42 (m, 1H), 7.38 – 7.31 (m, 2H), 7.03 – 6.98 (m, 1H), 6.90 – 6.86 (m, 1H), 5.25 (s, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 161.1, 158.7, 133.0, 132.4, 130.0, 129.7, 125.1, 120.9, 120.4, 117.4, 117.1, 112.7, 105.5, 79.0; $[M+H]^+$ = 252; HRMS (ESI) m/z calculated for $C_{15}H_{11}FN_3$ $[M+H]^+$ = 252.09315; found 252.09333; λ_{ex} = 280, 323, 383 nm; λ_{em} = 493 nm.

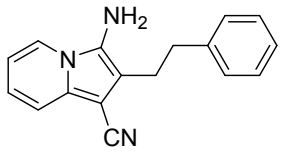
6-amino-7-phenylpyrrolo[1,2-*a*]pyrazine-8-carbonitrile (4o)



Light brown solid, 86 mg, 74% yield, m.p. 172-174 °C, ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.82 (s, 1H), 8.17– 8.15 (m, 1H), 7.72 – 7.70 (m, 1H), 7.64 – 7.61 (m, 2H), 7.55 – 7.51 (m, 2H), 7.42 – 7.38 (m, 1H), 5.92 (s, 2H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 142.2, 131.5, 130.9, 129.0, 128.9, 128.6, 127.5, 125.9, 115.7,

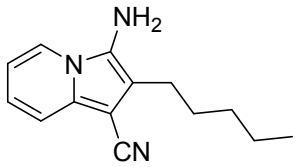
114.4, 112.8, 82.0; $[M+H]^+$ = 235; HRMS (ESI) m/z calculated for $C_{14}H_{11}N_4$ $[M+H]^+$= 235.09784; found 235.09782; λ_{ex} = 295, 399 nm; λ_{em} = 494 nm.

3-amino-2-phenethylindolizine-1-carbonitril (4p)



Brown oil, 99 mg, 76% yield, ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.09– 8.06 (m, 1H),7.45– 7.43 (m, 1H), 7.30– 7.26 (m, 4H), 7.20– 7.17 (m, 1H), 6.92– 7.88 (m, 1H), 6.80– 6.77 (m, 1H), 4.97 (s, 2H), 3.11 – 2.82 (m, 5H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 141.4, 131.8, 128.3, 128.2, 128.0, 125.9, 122.1, 119.3, 117.3, 116.2, 112.34, 112.31, 111.6, 78.2, 35.8, 26.1; $[M+H]^+$ = 262; HRMS (ESI) m/z calculated for $C_{17}H_{16}N_3$ $[M+H]^+$= 262.13387; found 262.13402.

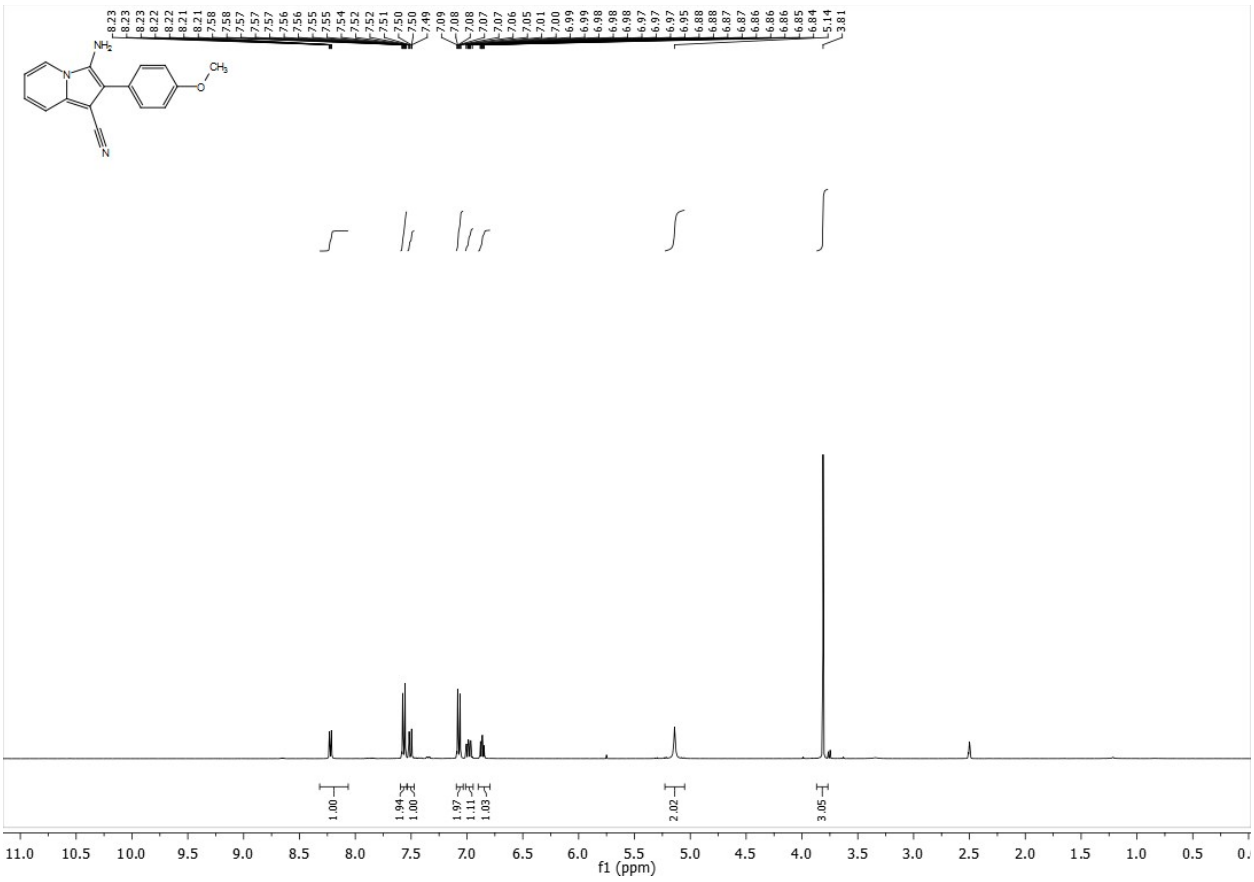
3-amino-2-pentylindolizine-1-carbonitrile (4q)



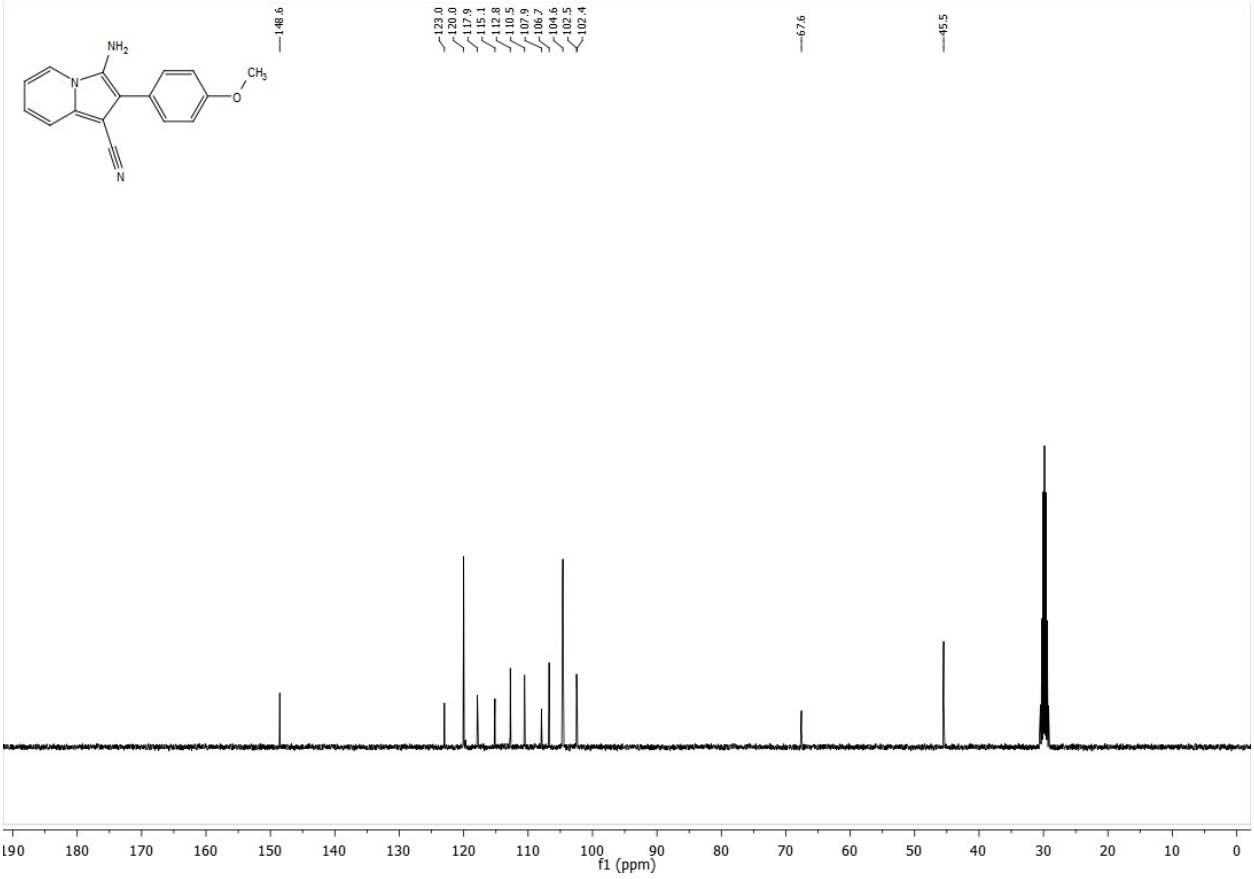
Brown oil, 91 mg, 80% yield, ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.06 – 8.04 (m, 1H), 7.43 – 7.40 (m, 1H), 6.91 – 6.87 (m, 1H), 6.79 – 6.76 (m, 1H), 4.91 (s, 2H), 2.65 (t, J = 7.5 Hz, 2H), 1.61 – 1.57 (m, 2H), 1.42 – 1.14 (m, 4H), 0.92 – 0.74 (m, 3H); ^{13}C NMR (100 MHz, DMSO-d_6) δ 131.7, 127.9, 122.0, 119.2, 117.4, 116.1, 113.3, 111.5, 30.9, 29.5, 23.8, 22.0, 13.9; $[M+H]^+$ = 228; HRMS (ESI) m/z calculated for $C_{14}H_{18}N_3$ $[M+H]^+$= 228.14952; found 228.14971.

NMR spectra for compounds 4a-4q

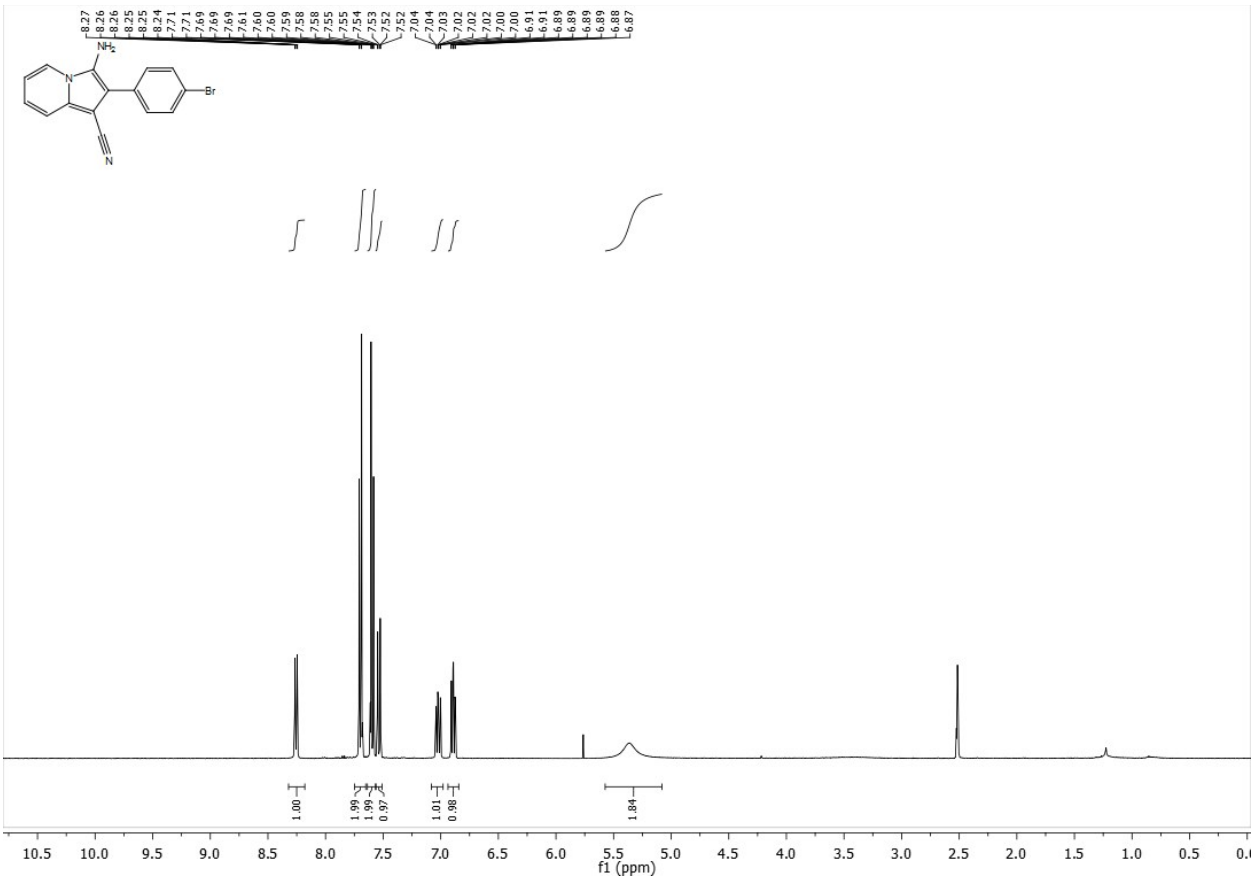
^{1}H NMR for compound **4a** (400 MHz, DMSO-d_6)



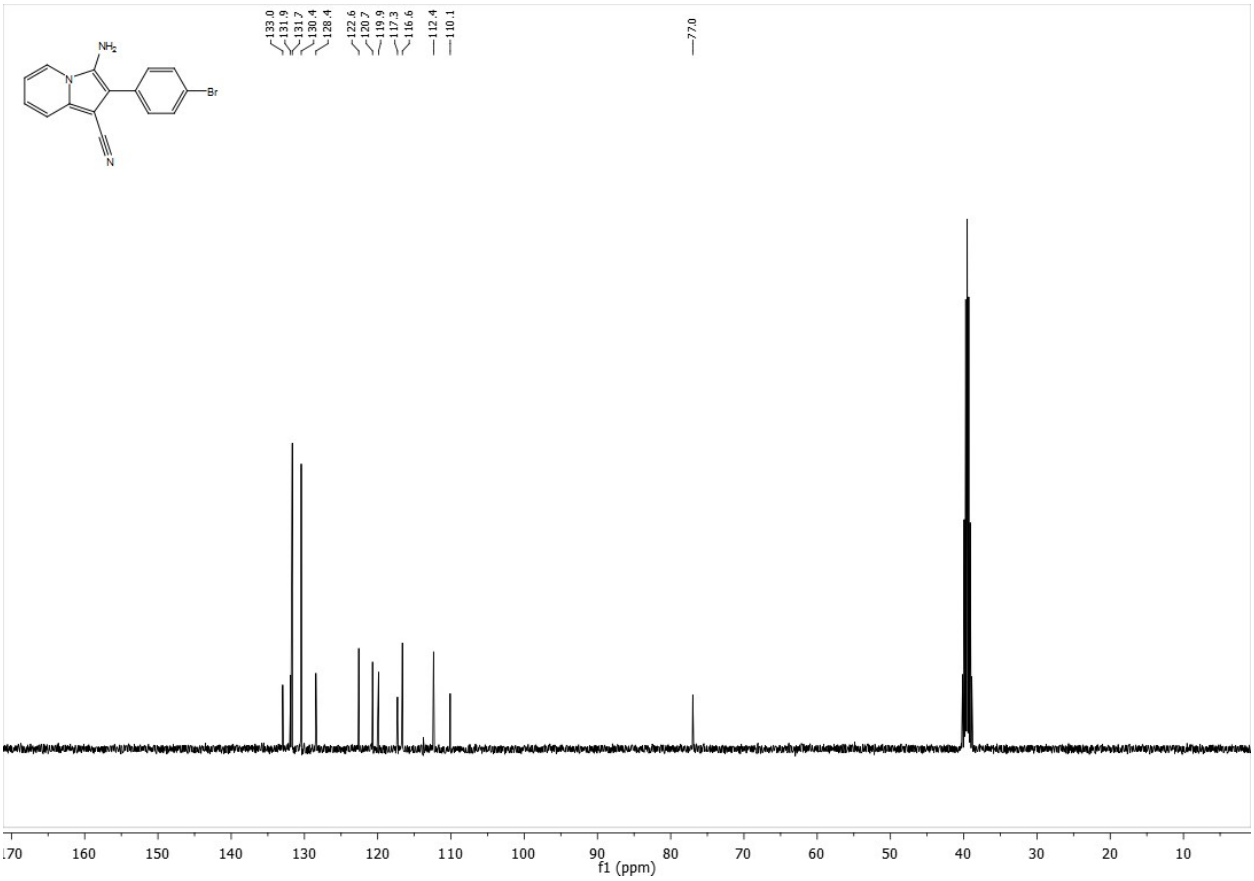
^{13}C NMR for compound **4a** (100 MHz, DMSO-d_6)



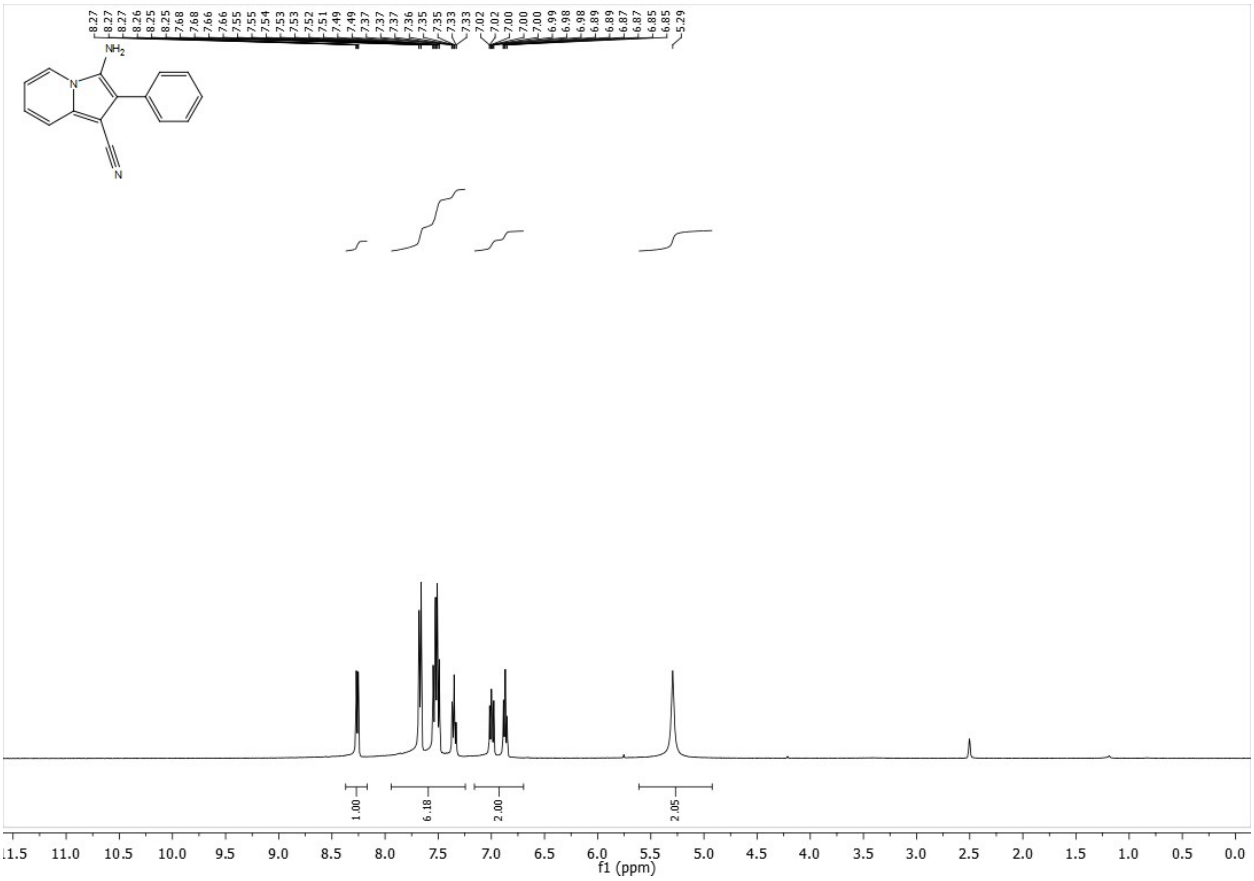
^{1}H NMR for compound **4b** (400 MHz, DMSO-d_6)



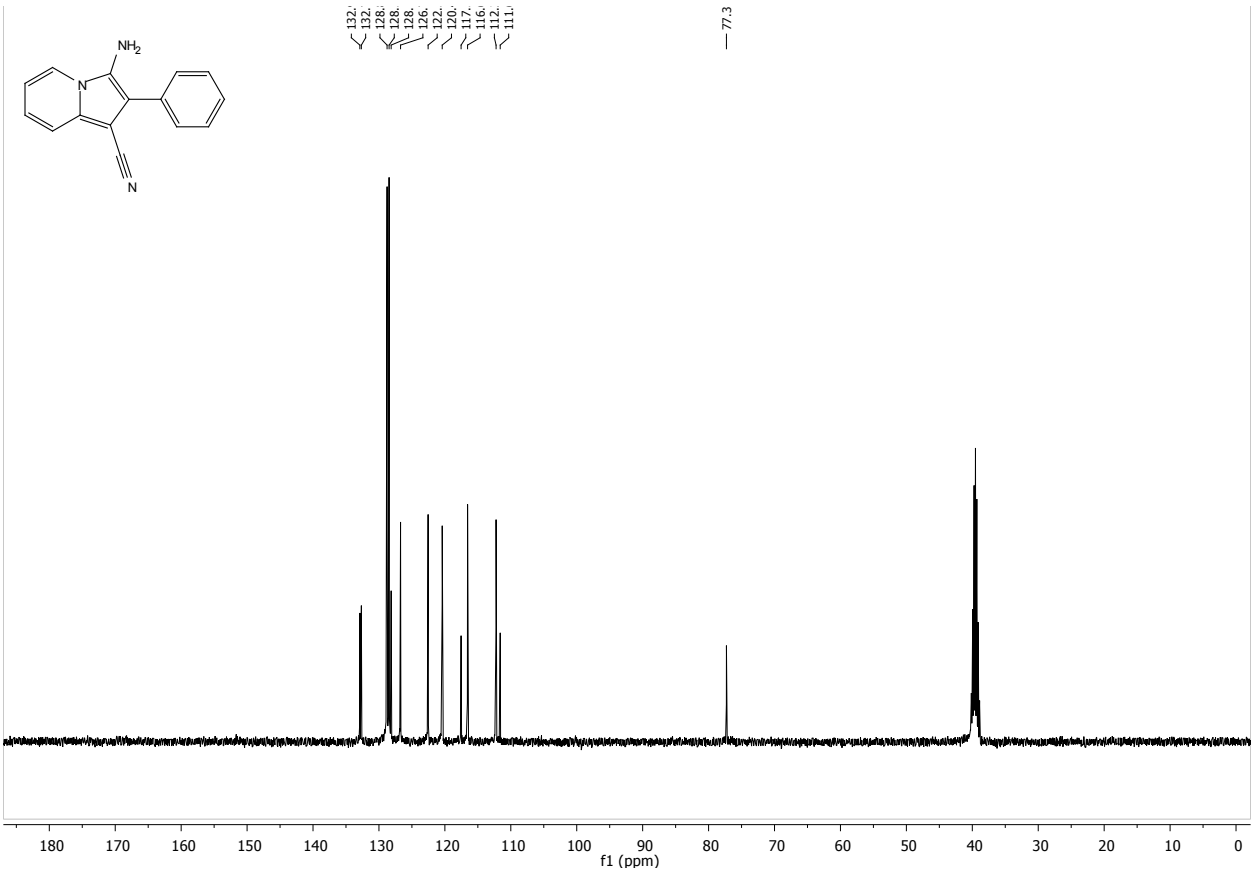
^{13}C NMR for compound **4b** (100 MHz, DMSO-d_6)



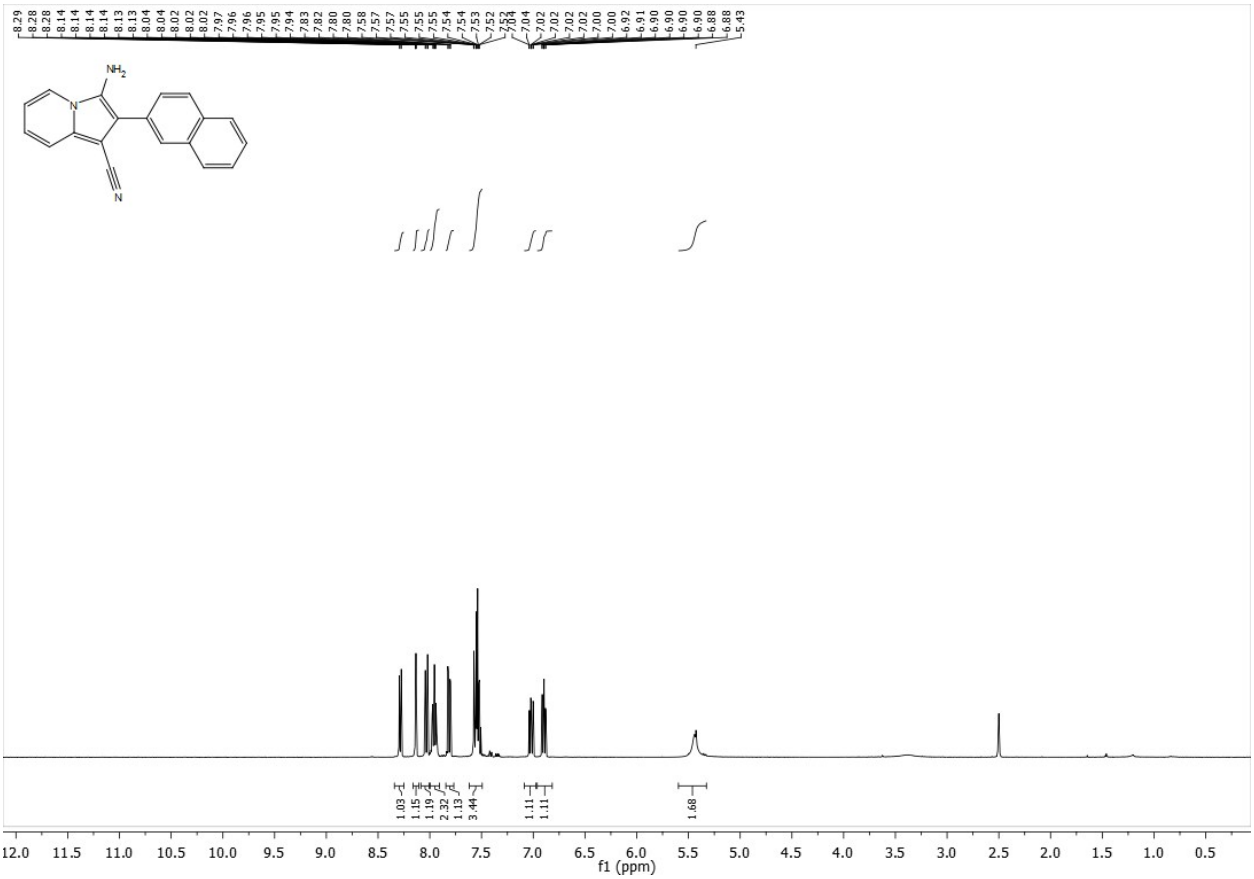
^{1}H NMR for compound **4c** (400 MHz, DMSO-d_6)



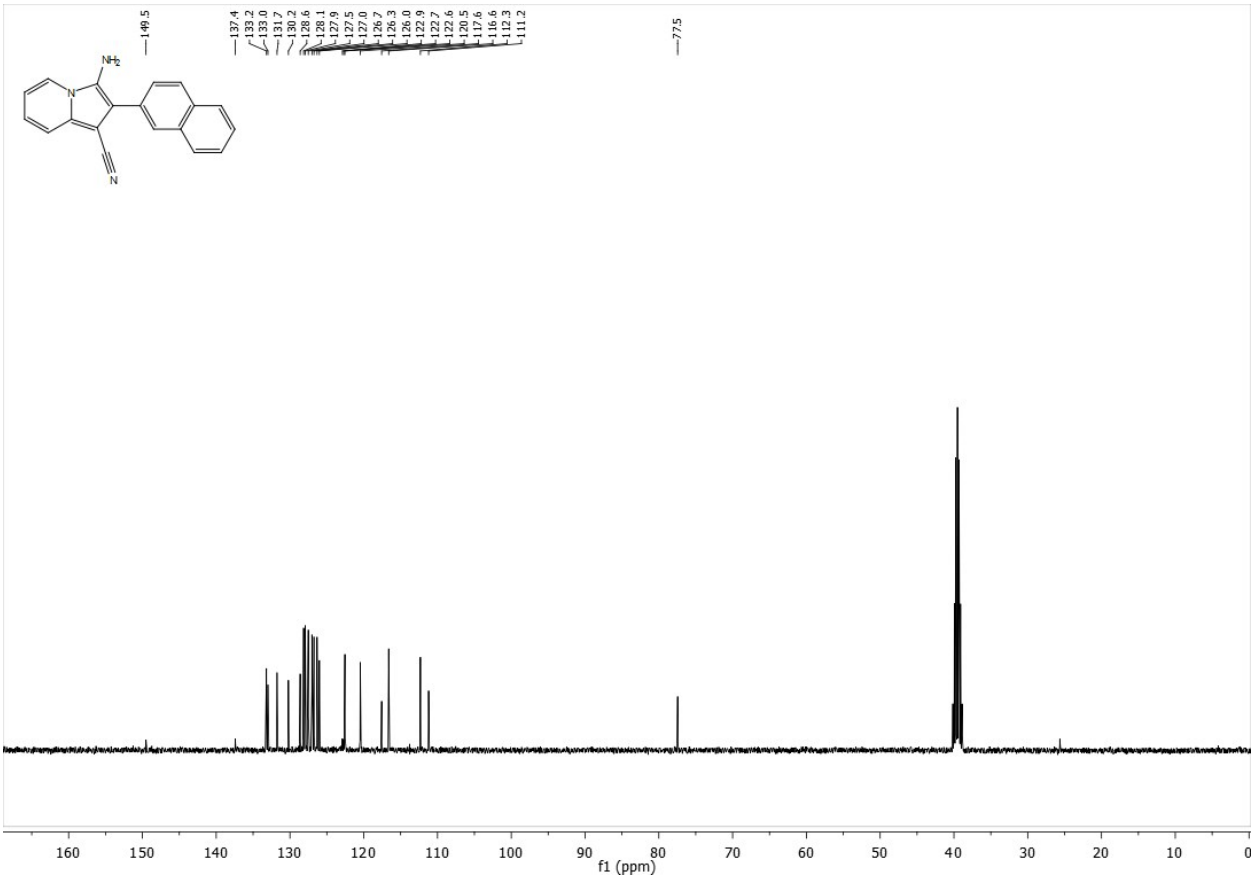
^{13}C NMR for compound **4c** (100 MHz, DMSO-d_6)



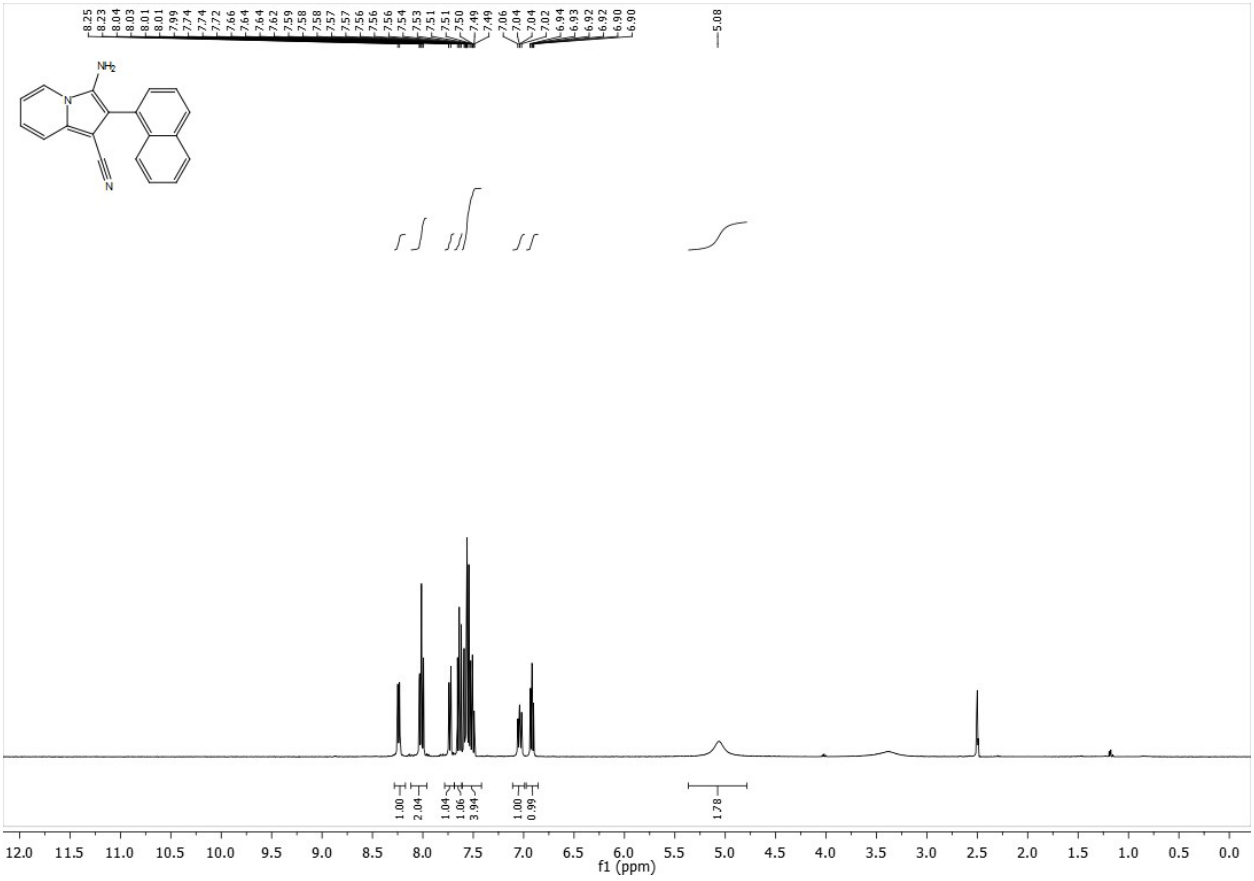
^{1}H NMR for compound **4d** (400 MHz, DMSO-d_6)



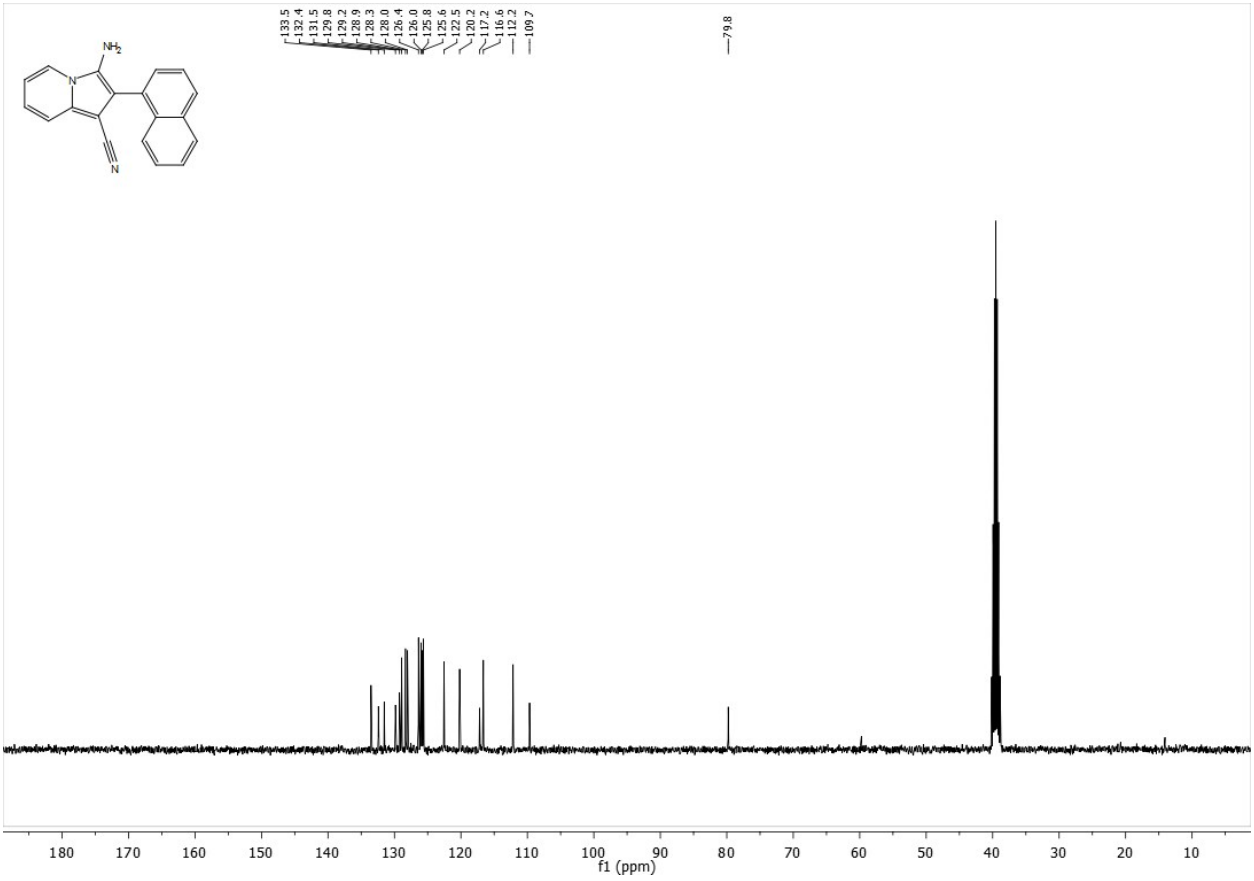
^{13}C NMR for compound **4d** (100 MHz, DMSO-d_6)


149.5
137.4
133.2
133.0
131.7
130.2
128.6
128.1
127.9
127.5
127.0
126.7
126.3
126.0
122.9
122.7
122.6
120.5
117.6
116.6
112.3
111.2
77.5
NH2
N
N
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

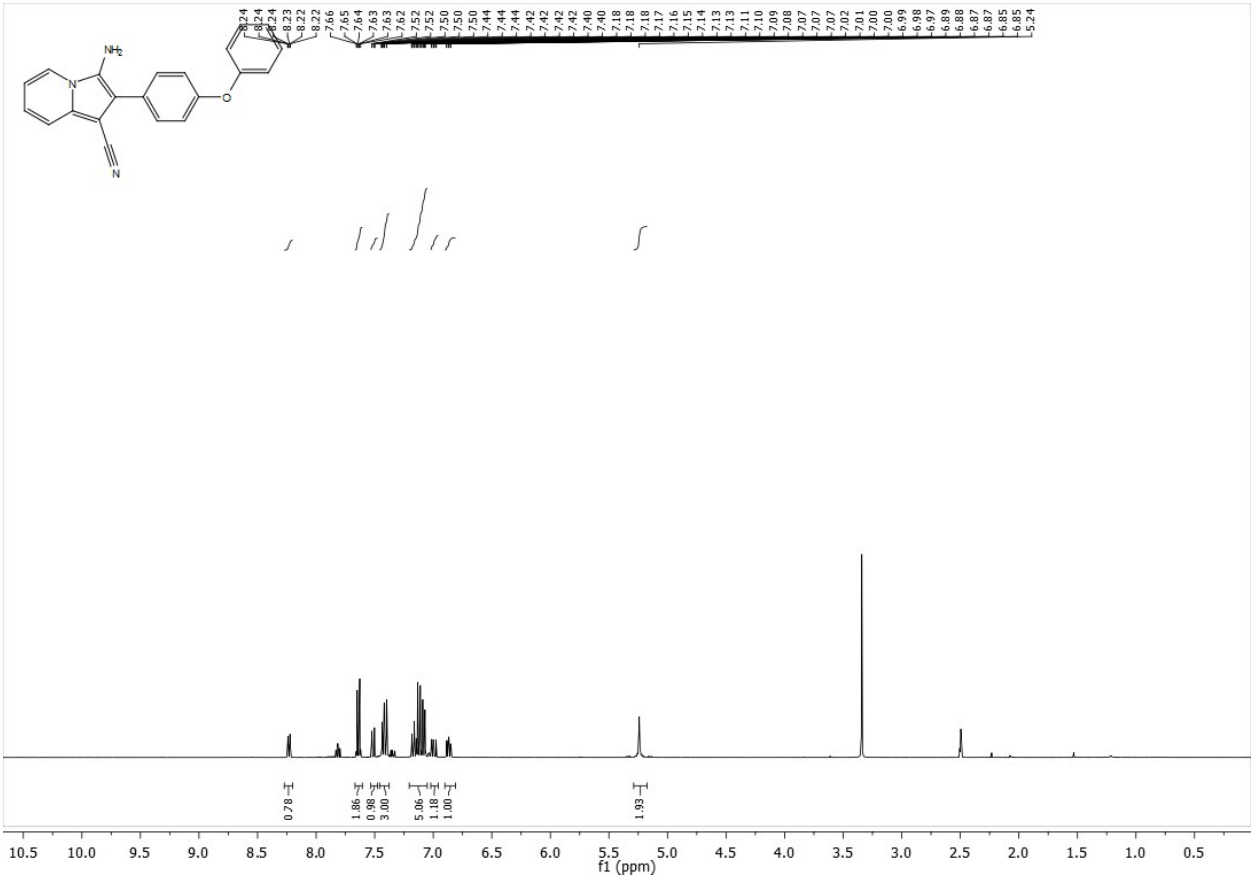
^{1}H NMR for compound **4e** (400 MHz, DMSO-d_6)



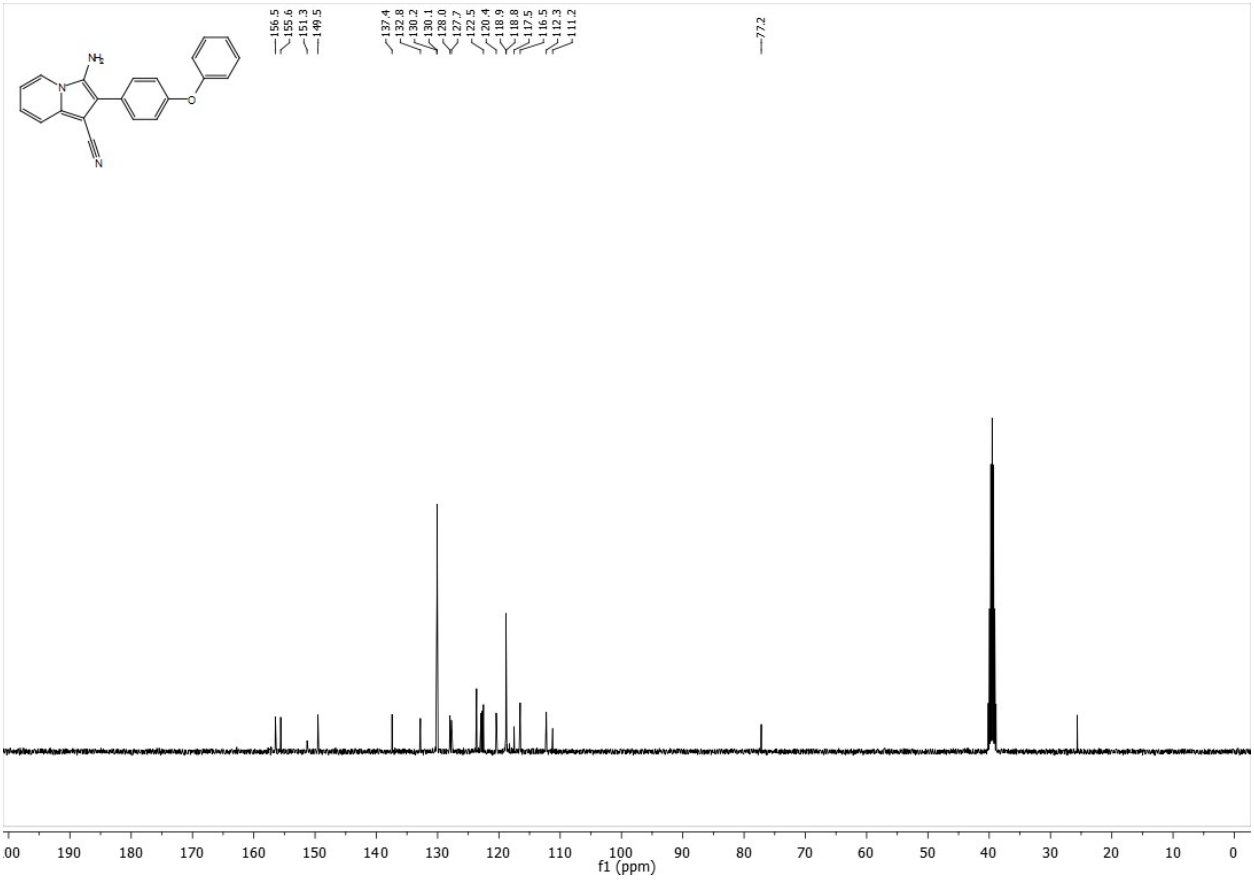
^{13}C NMR for compound **4e** (100 MHz, DMSO-d_6)



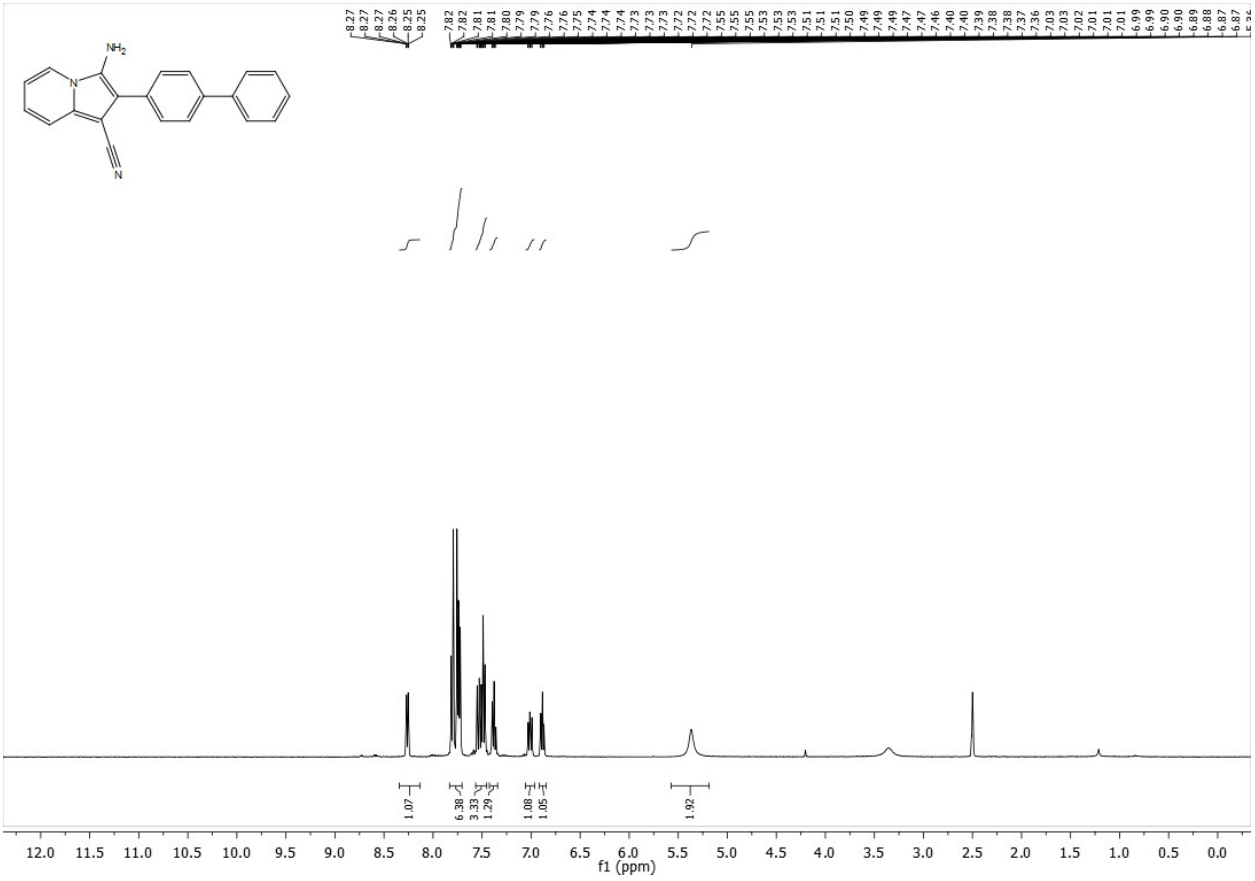
^{1}H NMR for compound **4f** (400 MHz, DMSO-d_6)



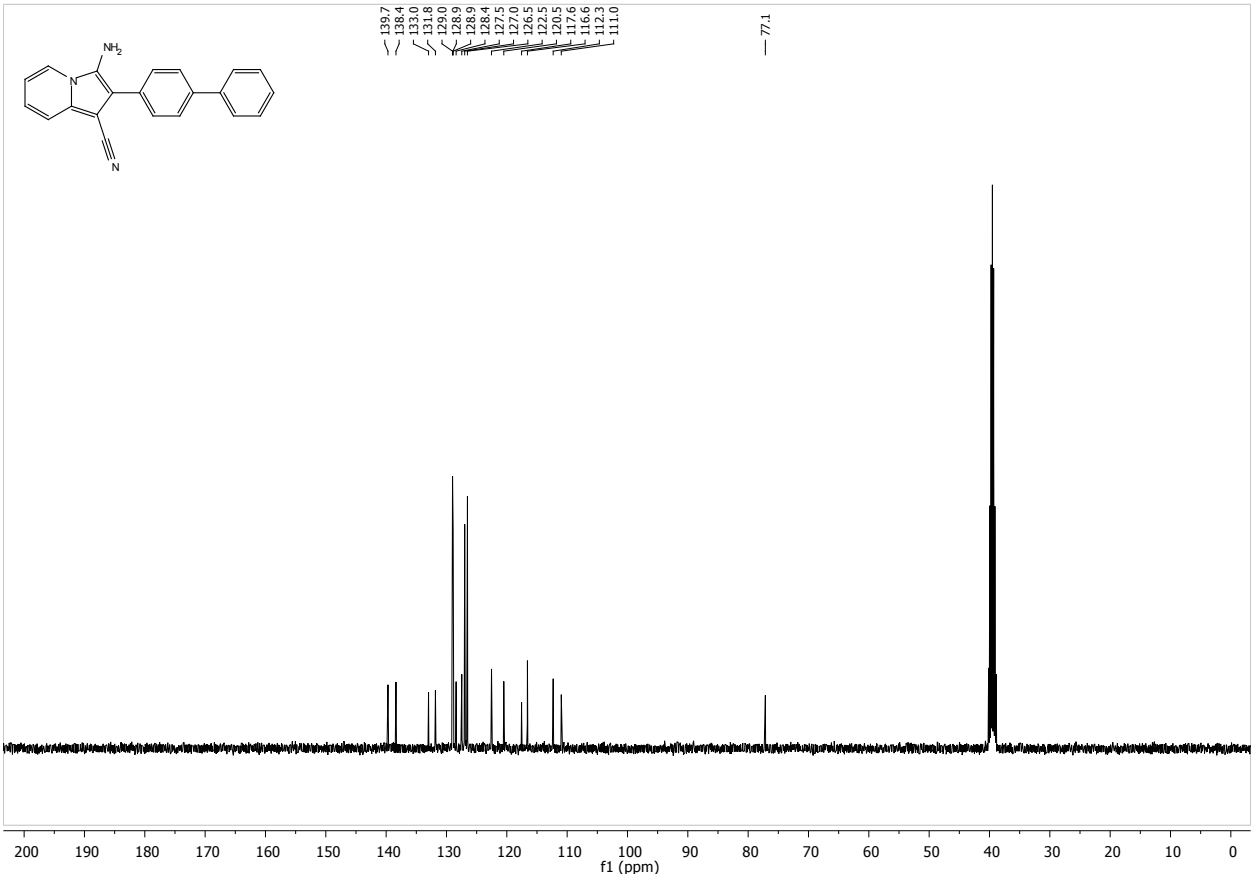
^{13}C NMR for compound **4f** (100 MHz, DMSO-d_6)



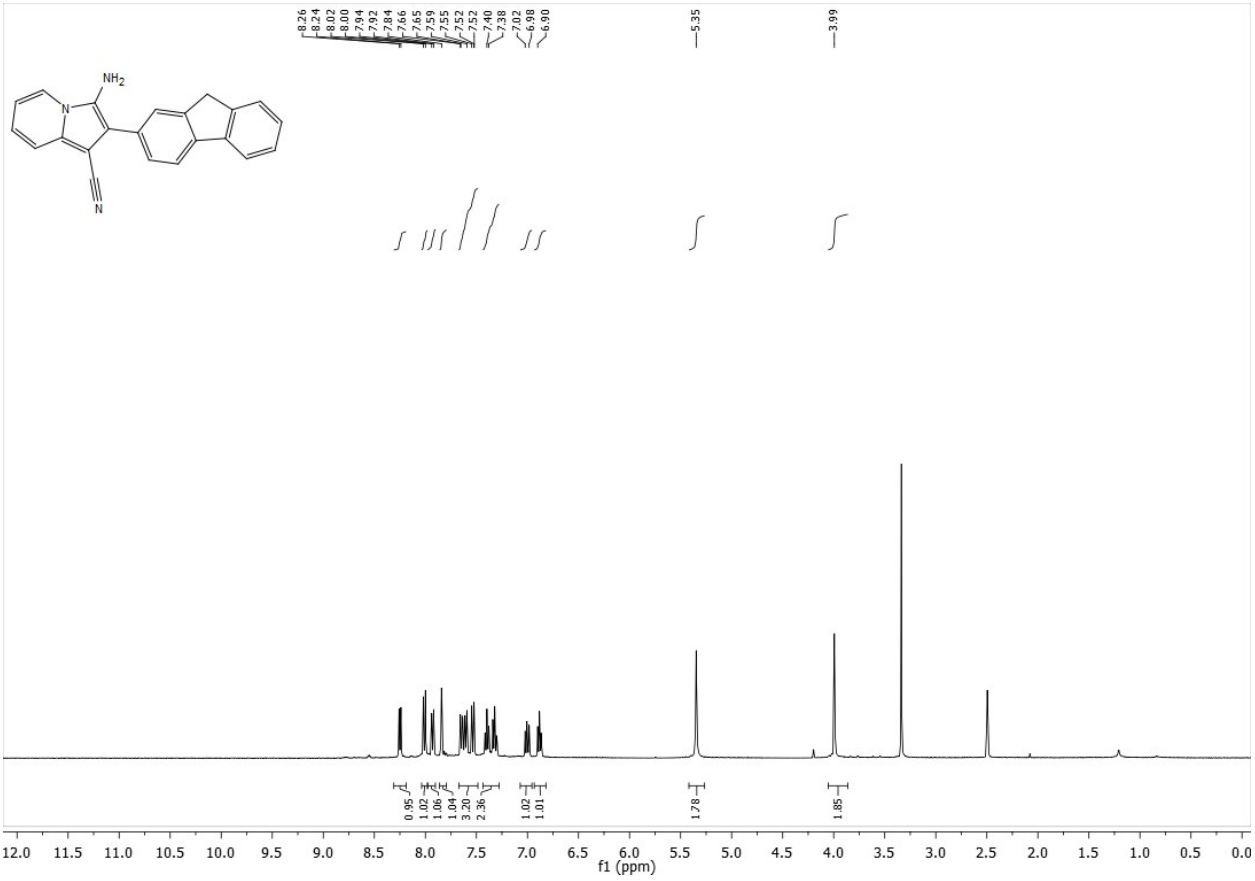
^{1}H NMR for compound **4g** (400 MHz, DMSO-d_6)



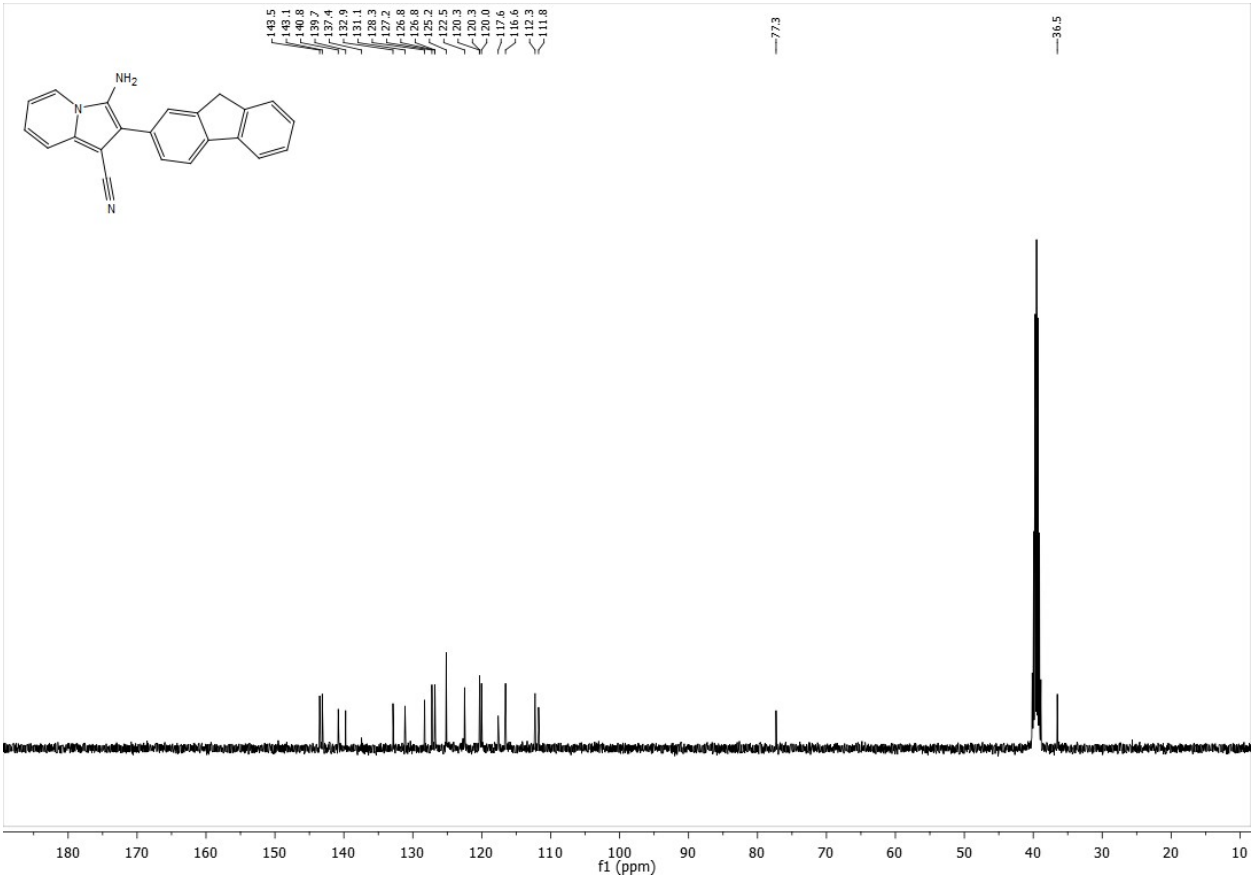
^{13}C NMR for compound **4g** (100 MHz, DMSO-d_6)



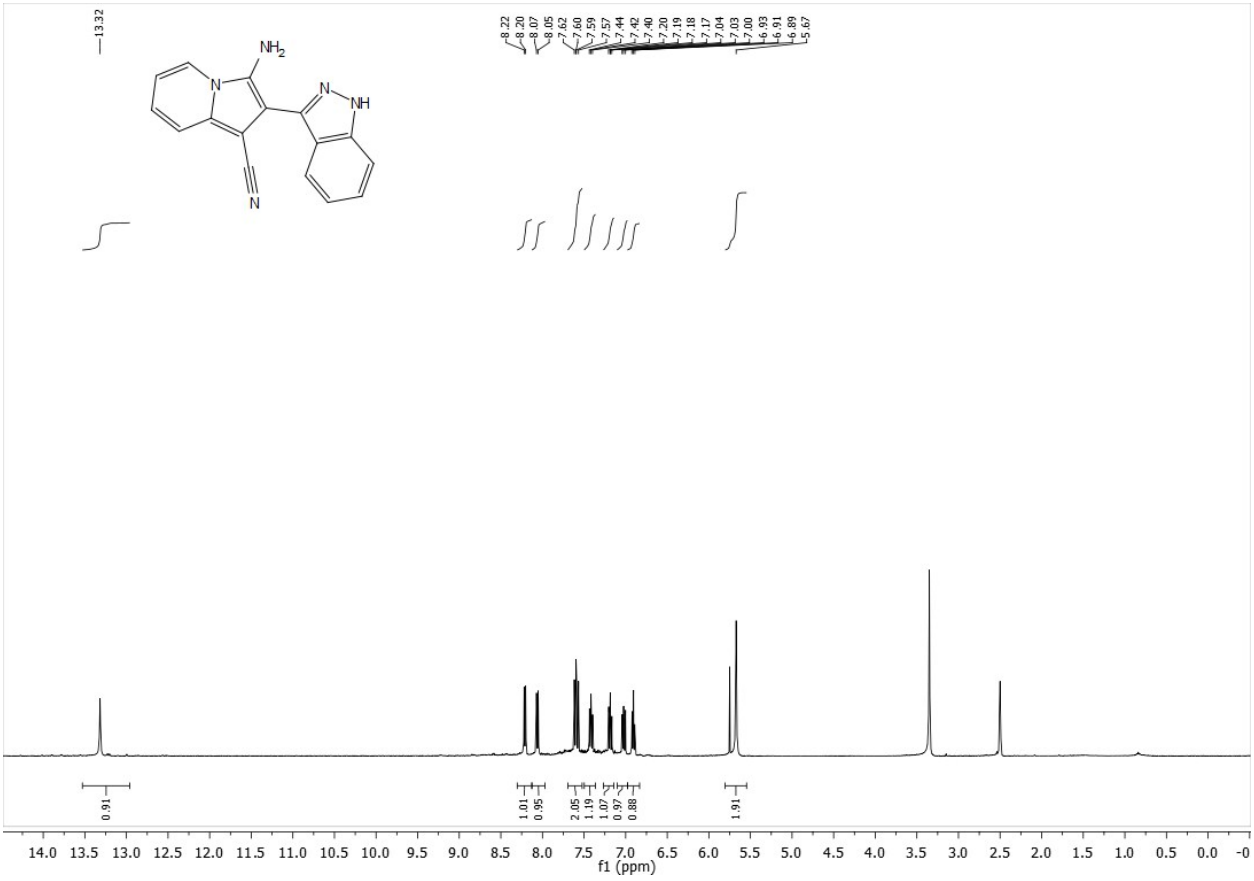
^{1}H NMR for compound **4h** (400 MHz, DMSO-d_6)



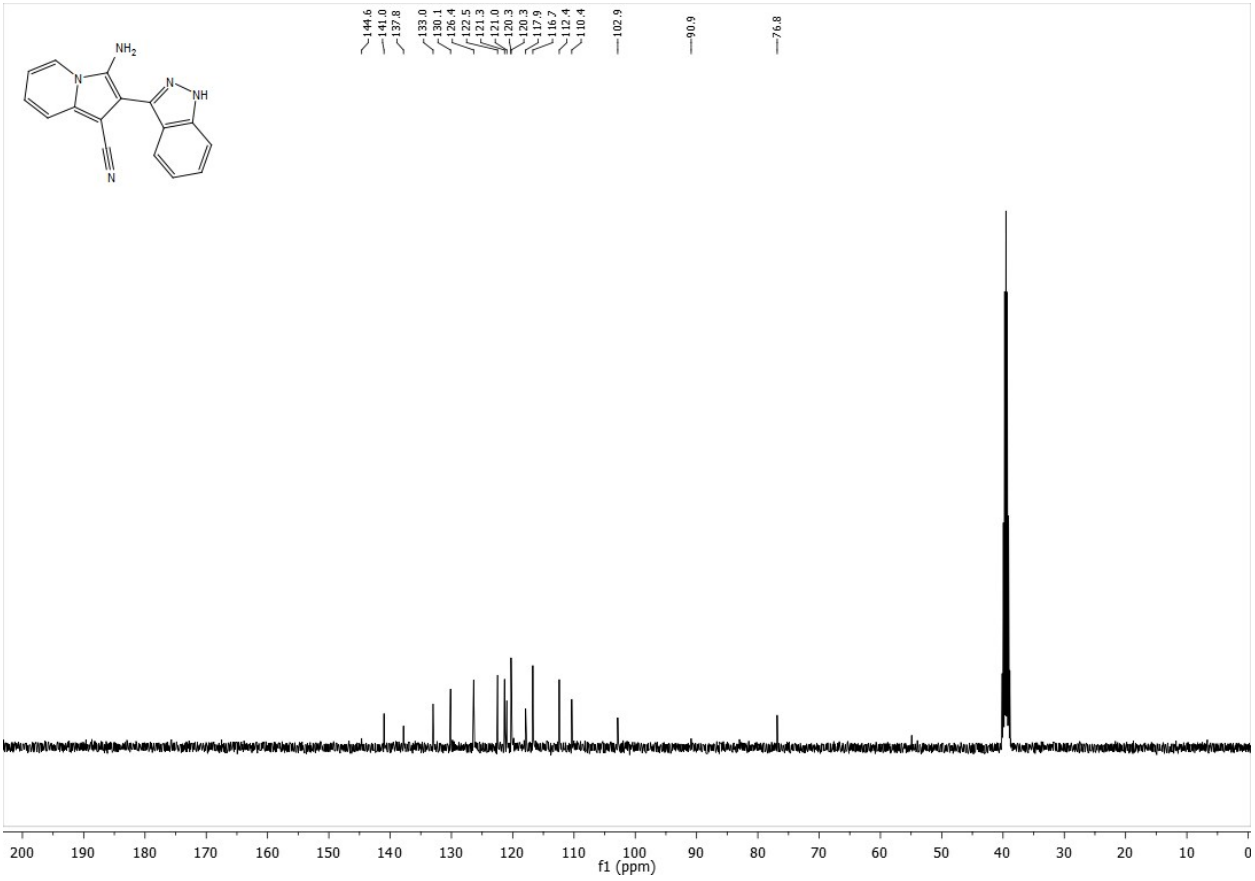
^{13}C NMR for compound **4h** (100 MHz, DMSO-d_6)



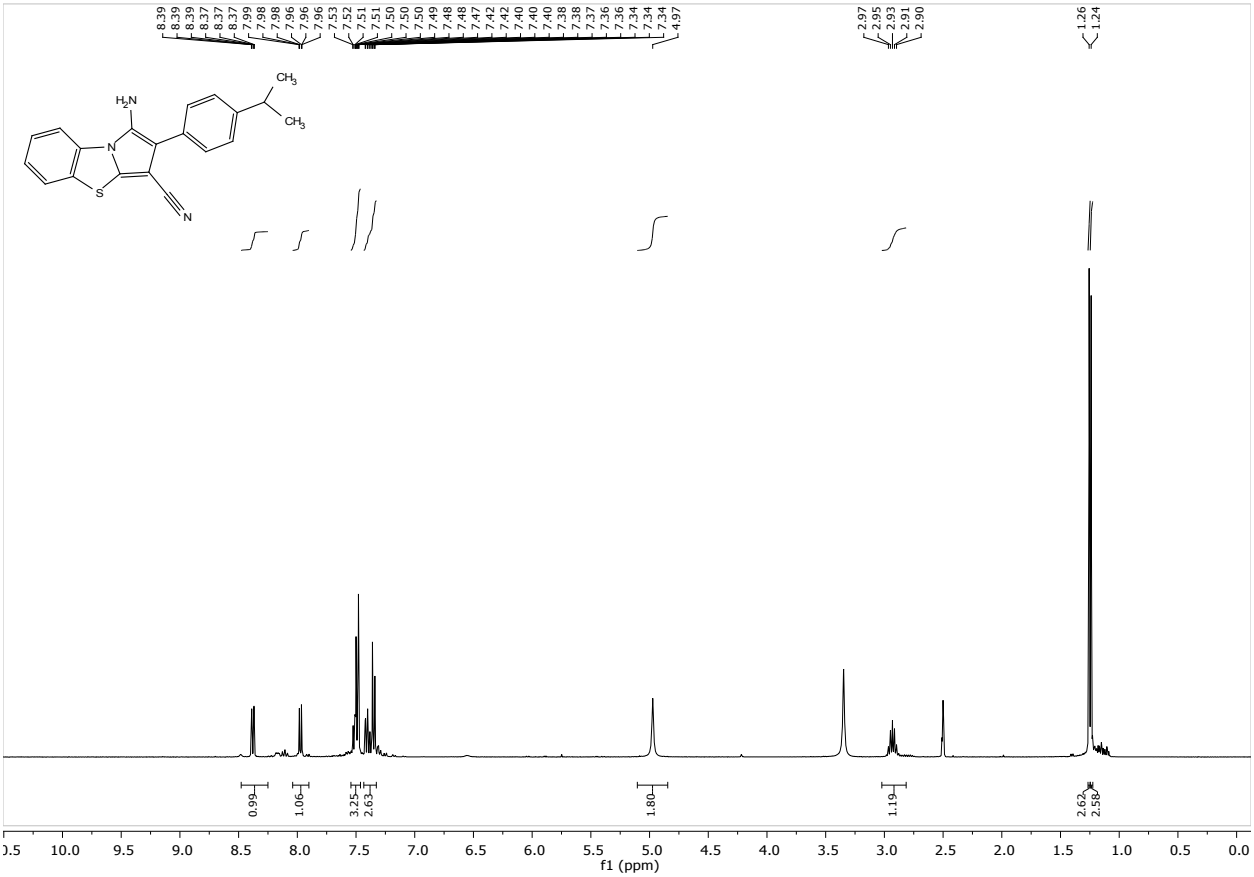
^{1}H NMR for compound **4i** (400 MHz, DMSO-d_6)



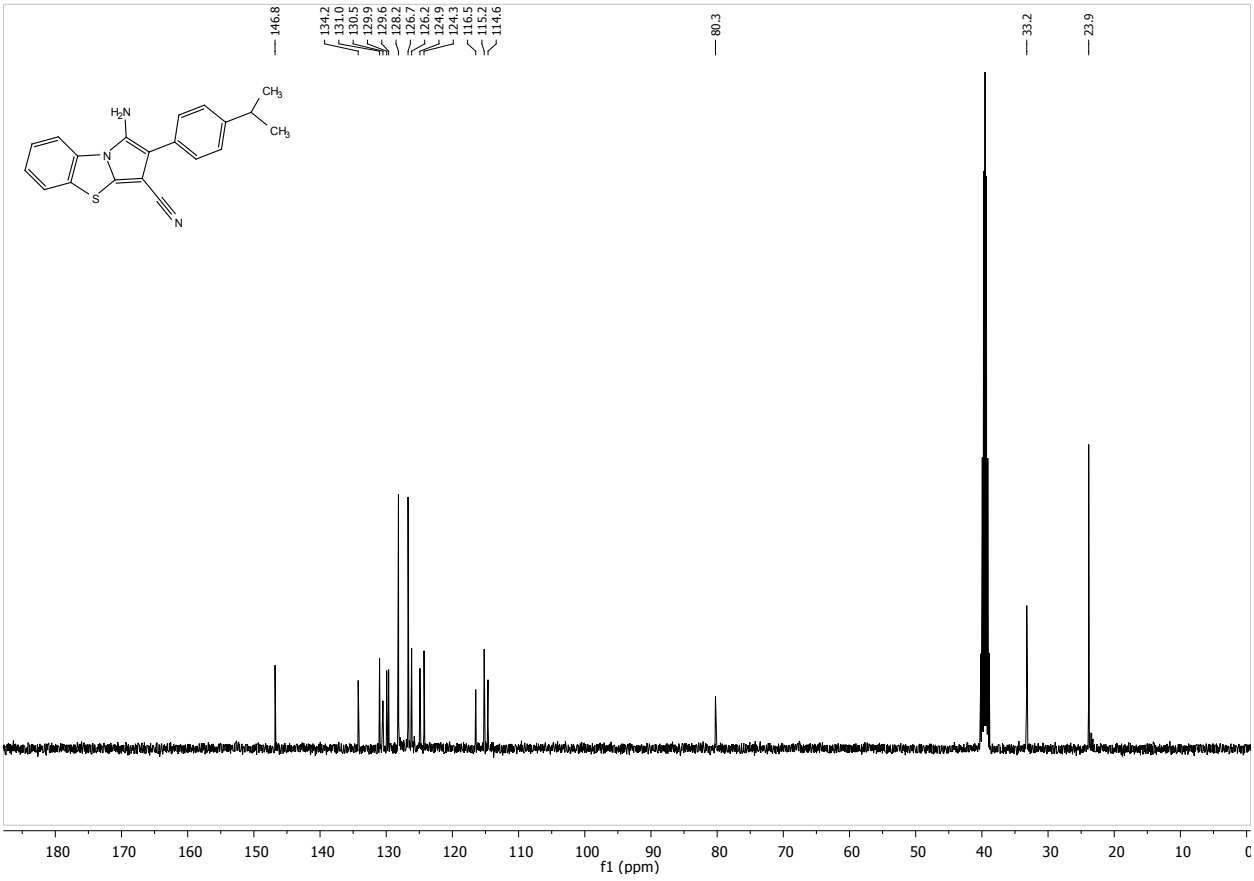
^{1}H NMR for compound **4i** (100 MHz, DMSO-d_6)



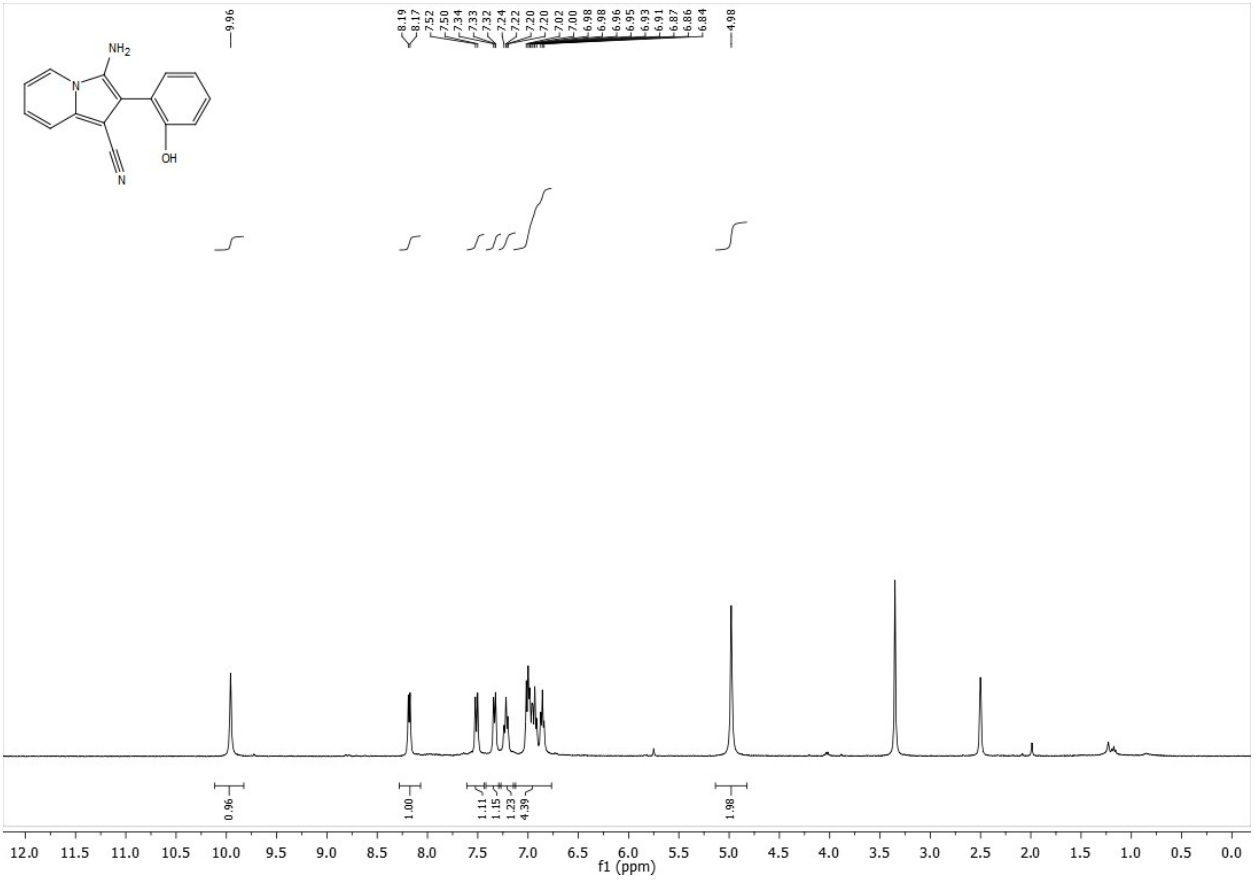
^{1}H NMR for compound **4j** (400 MHz, DMSO-d_6)



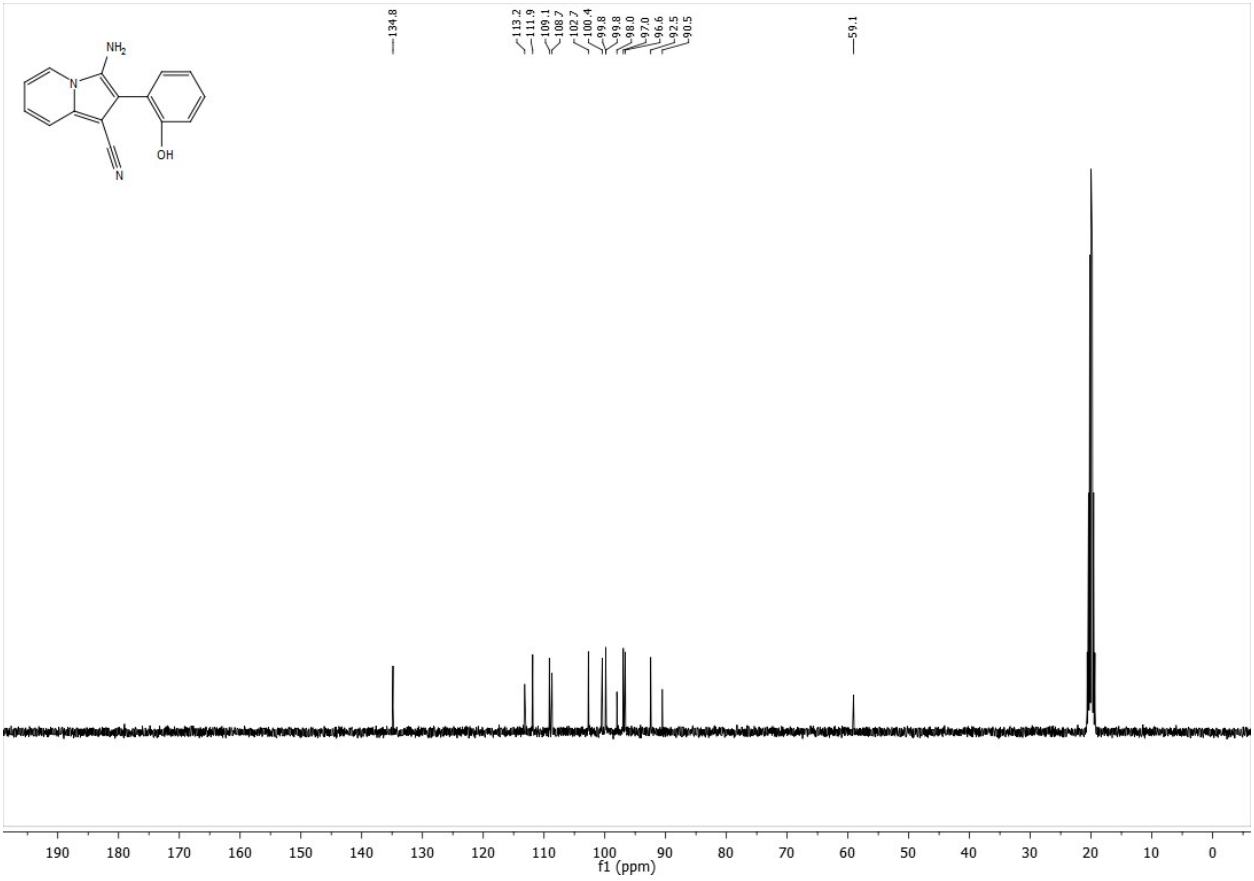
^{13}C NMR for compound **4j** (100 MHz, DMSO-d_6)



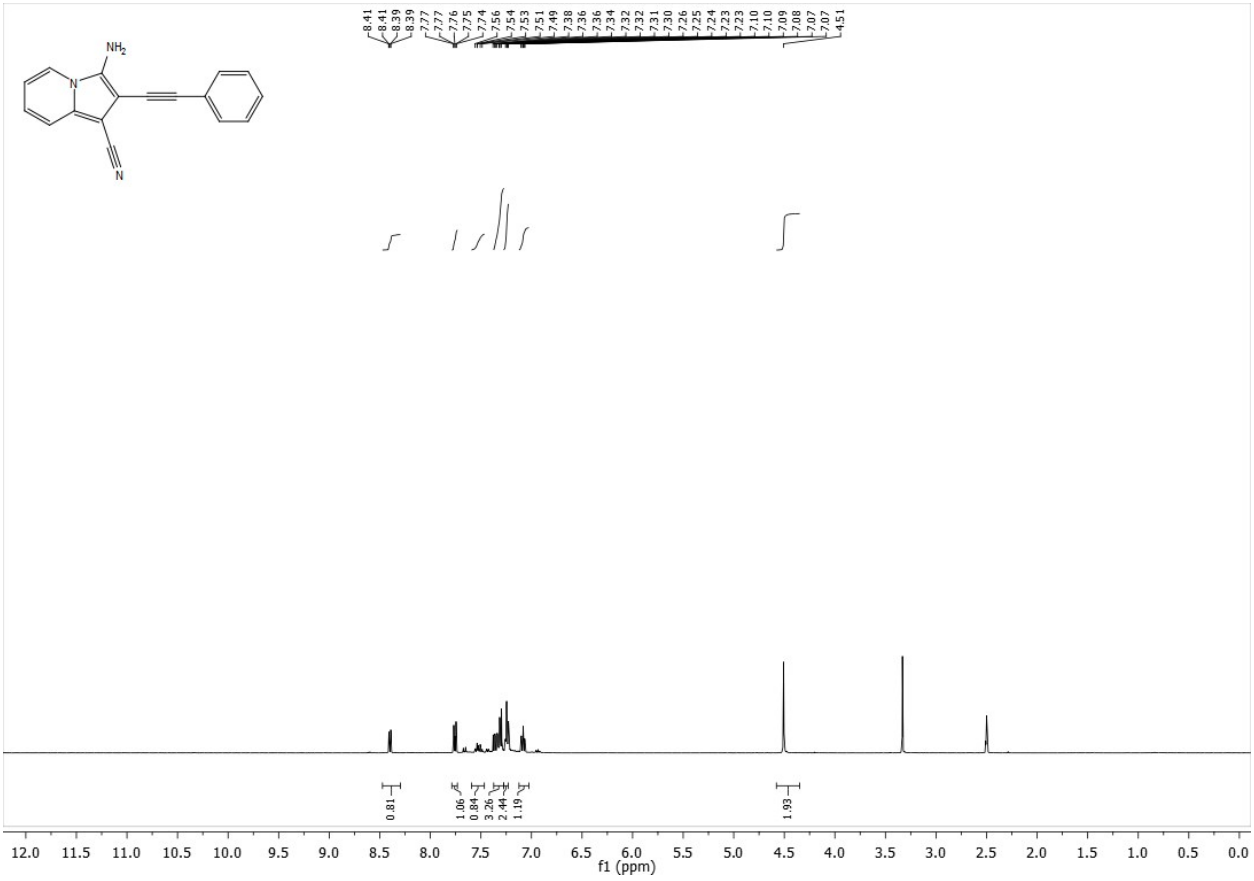
^{1}H NMR for compound **4k** (400 MHz, DMSO-d_6)



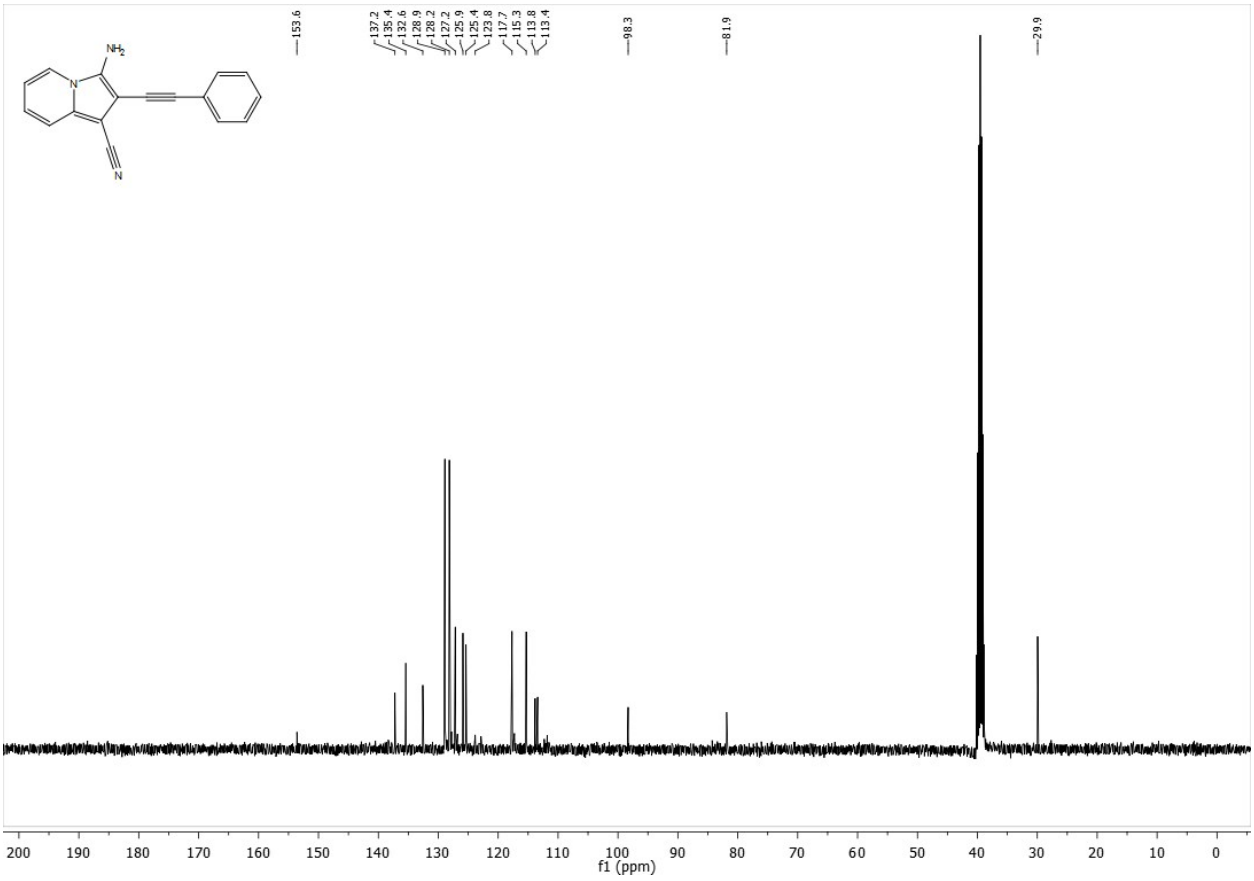
^{13}C NMR for compound **4k** (100 MHz, DMSO-d_6)



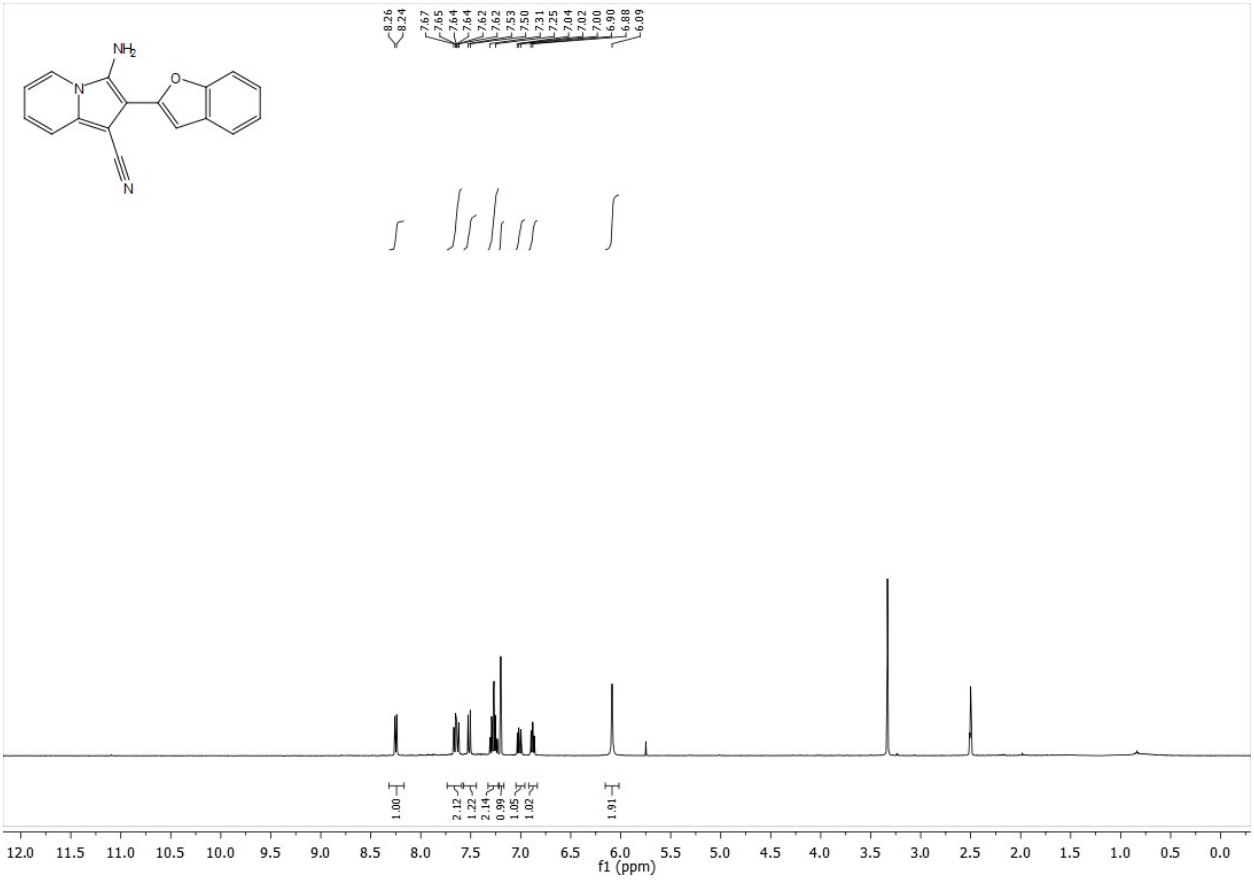
^{1}H NMR for compound **4l** (400 MHz, DMSO-d_6)



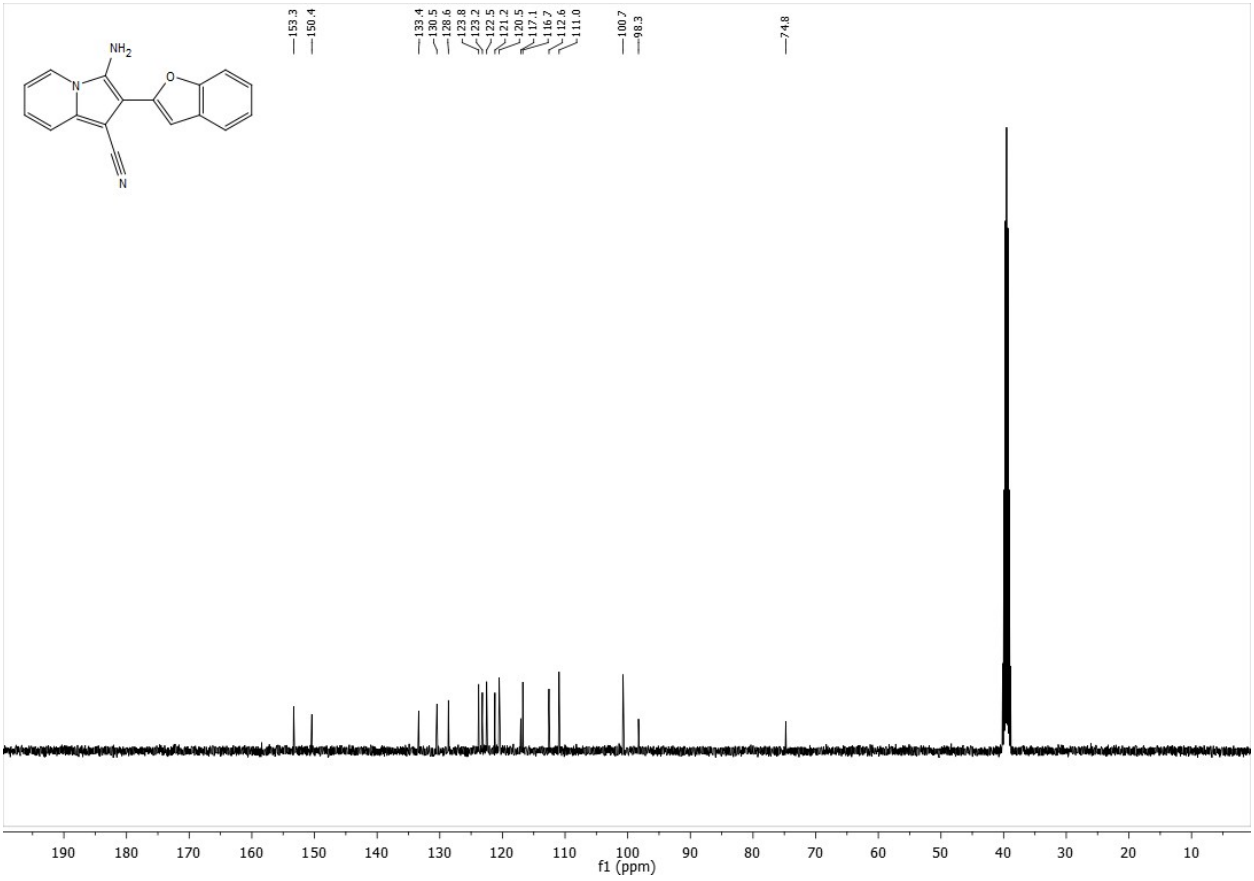
^{13}C NMR for compound **4l** (100 MHz, DMSO-d_6)



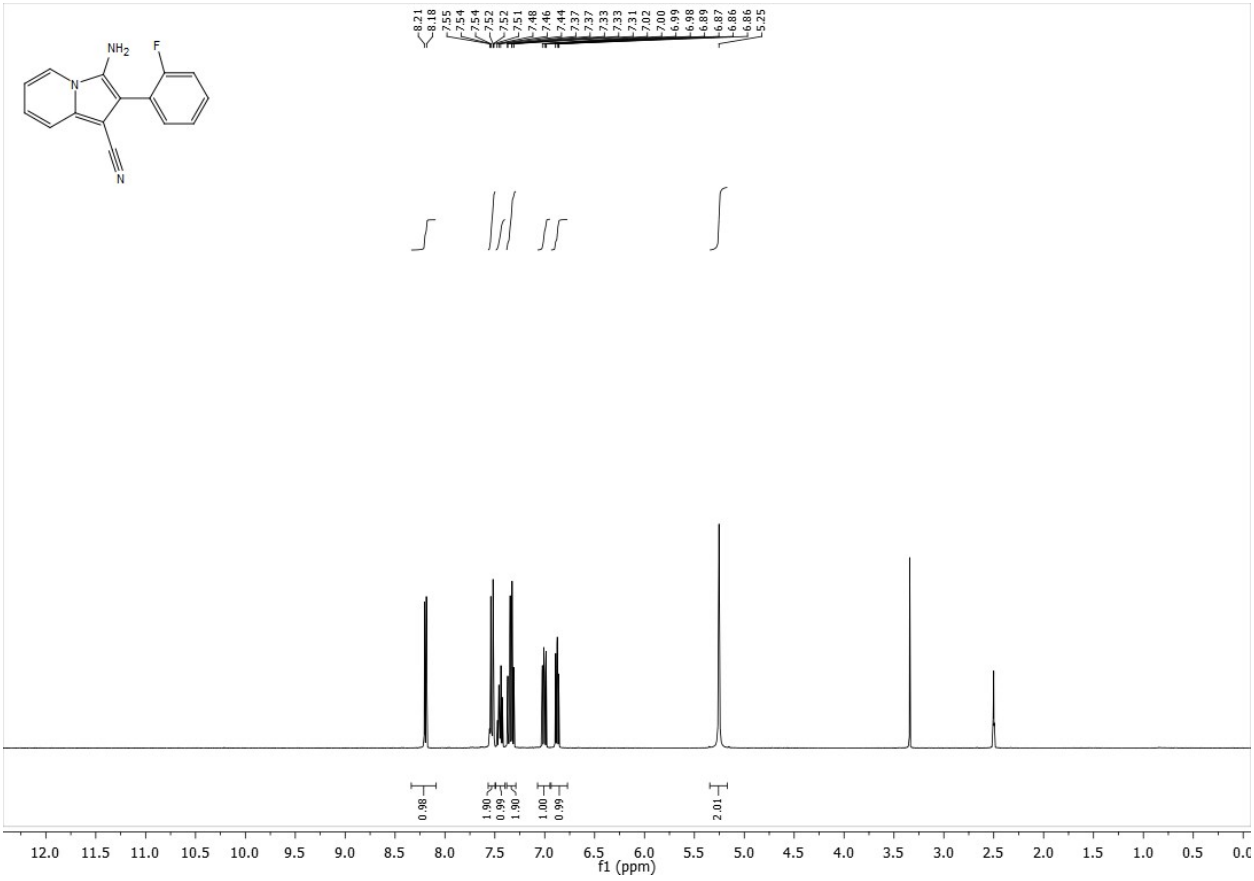
^{1}H NMR for compound **4m** (400 MHz, DMSO-d_6)



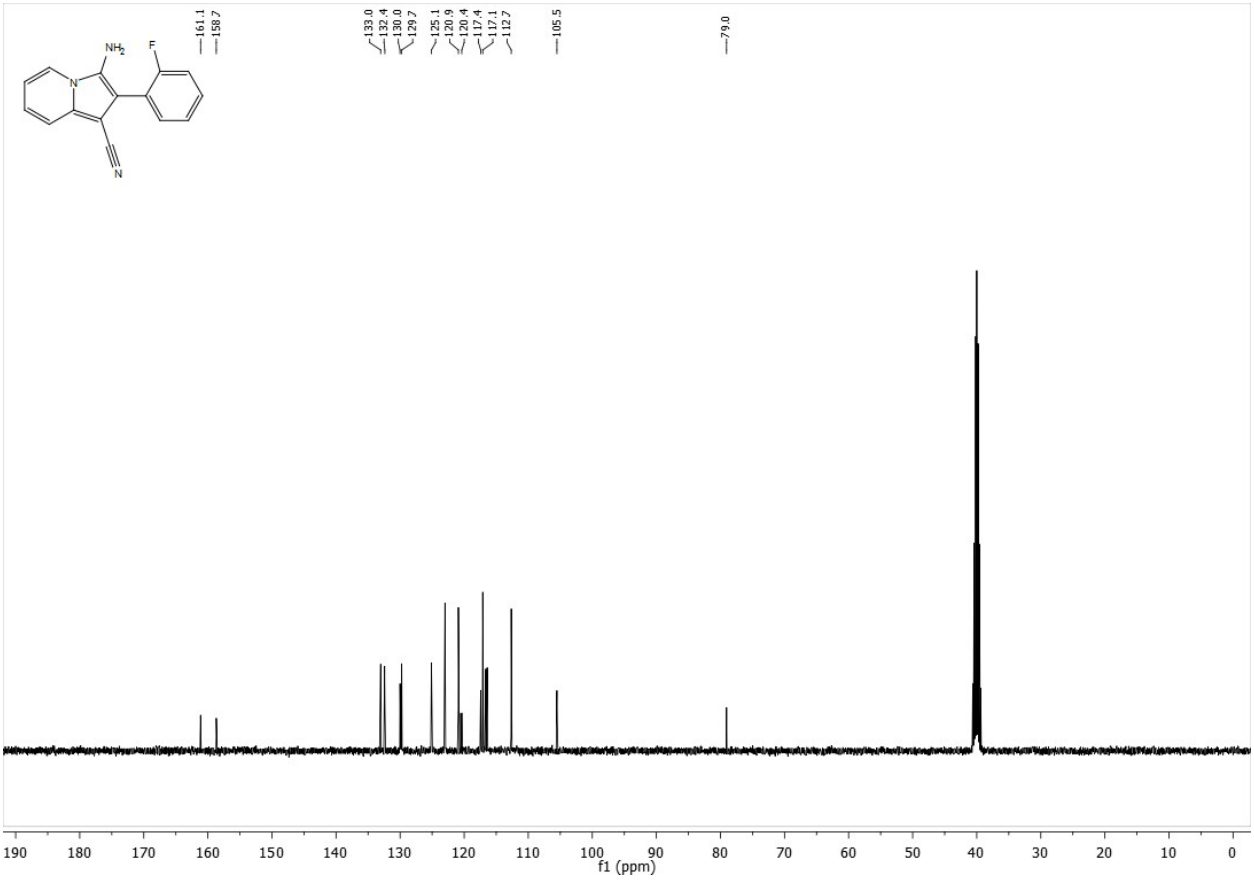
^{13}C NMR for compound **4m** (100 MHz, DMSO-d_6)



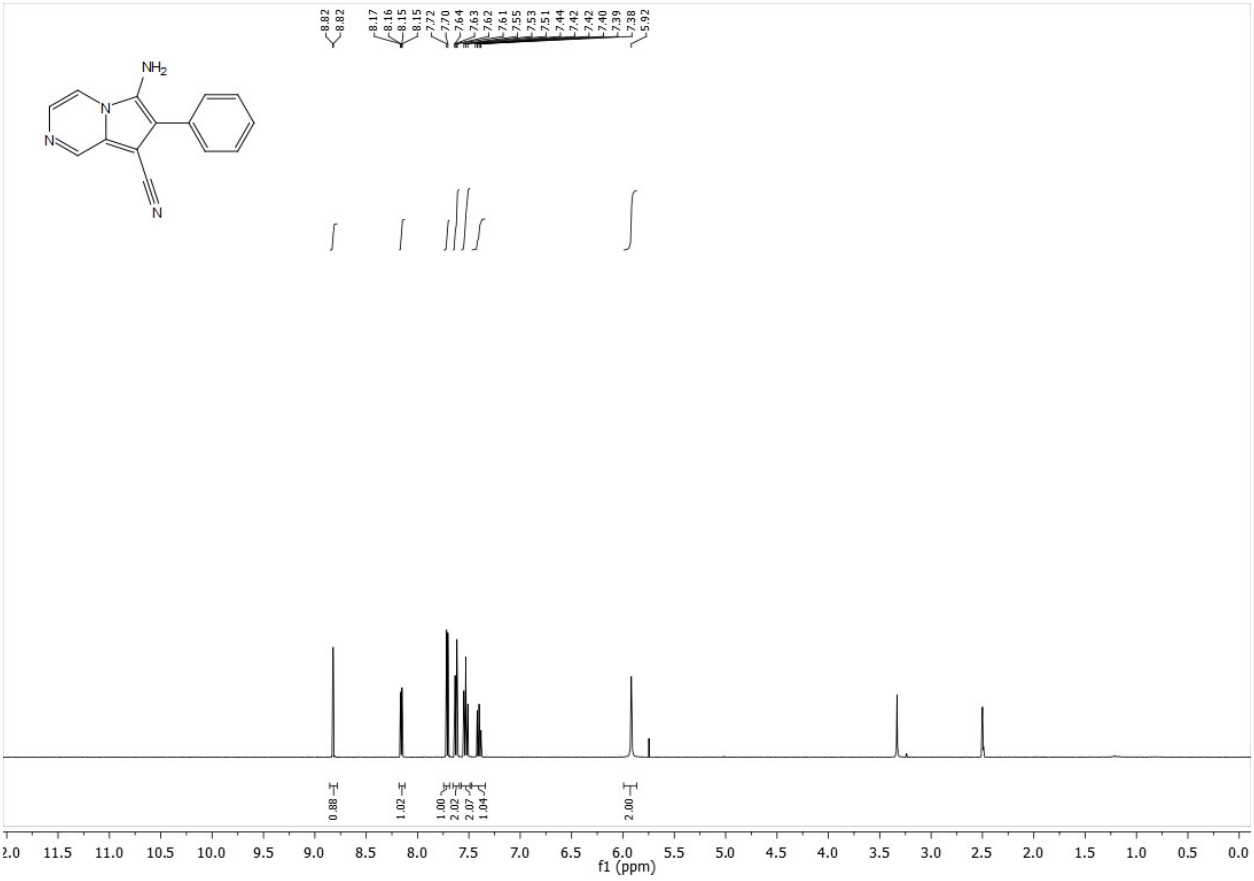
^{1}H NMR for compound **4n** (400 MHz, DMSO-d_6)



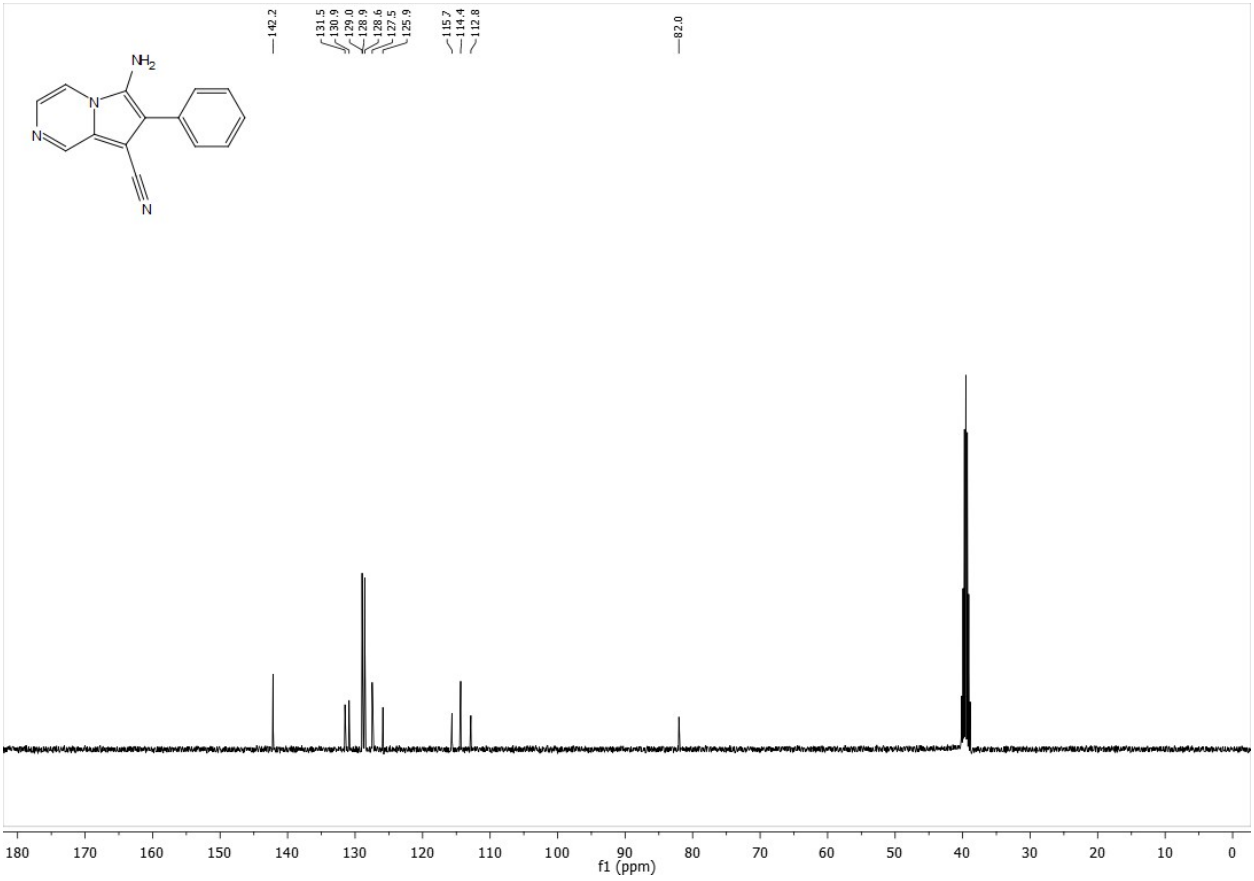
^{13}C NMR for compound **4n** (100 MHz, DMSO-d_6)



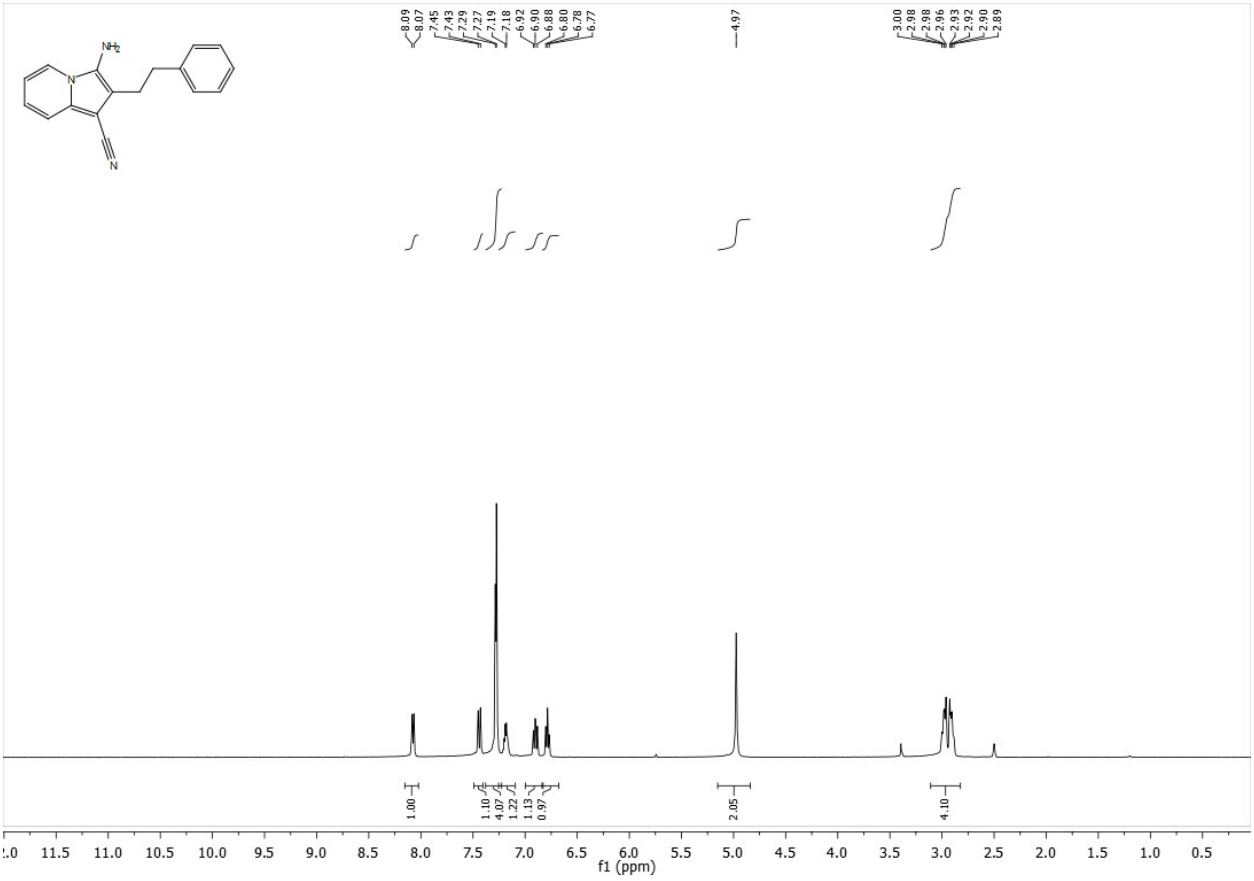
^{1}H NMR for compound **4o** (400 MHz, DMSO-d_6)



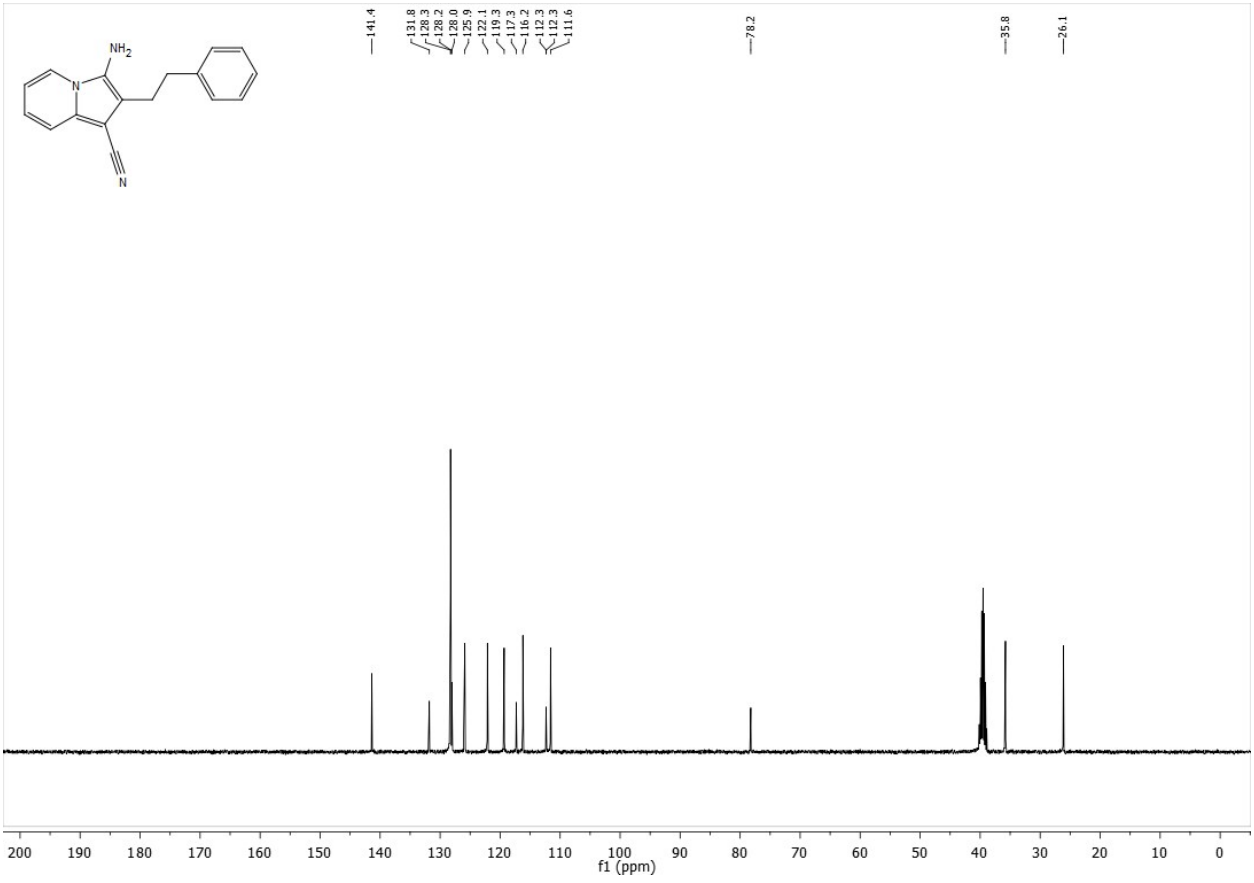
^{13}C NMR for compound **4o** (100 MHz, DMSO-d_6)



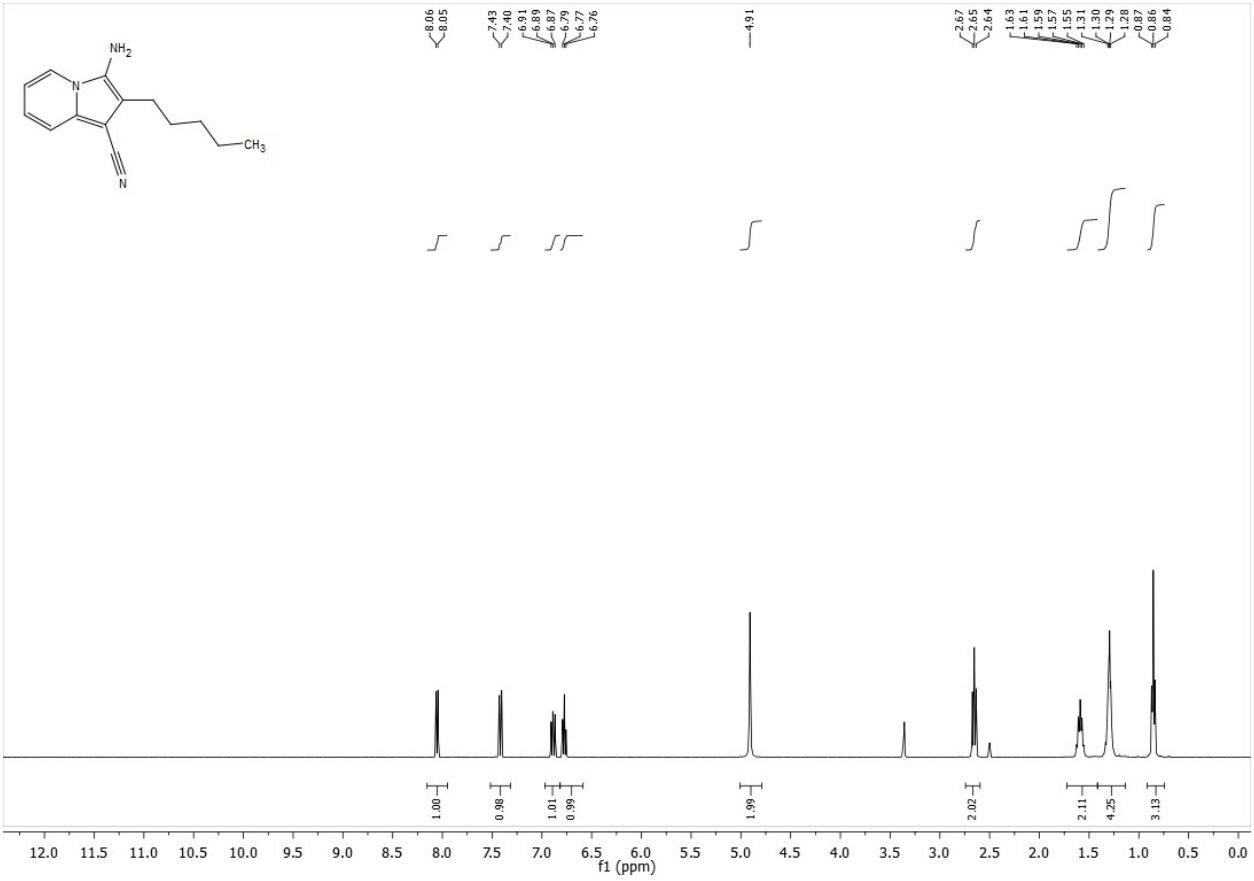
^{1}H NMR for compound **4p** (400 MHz, DMSO-d_6)



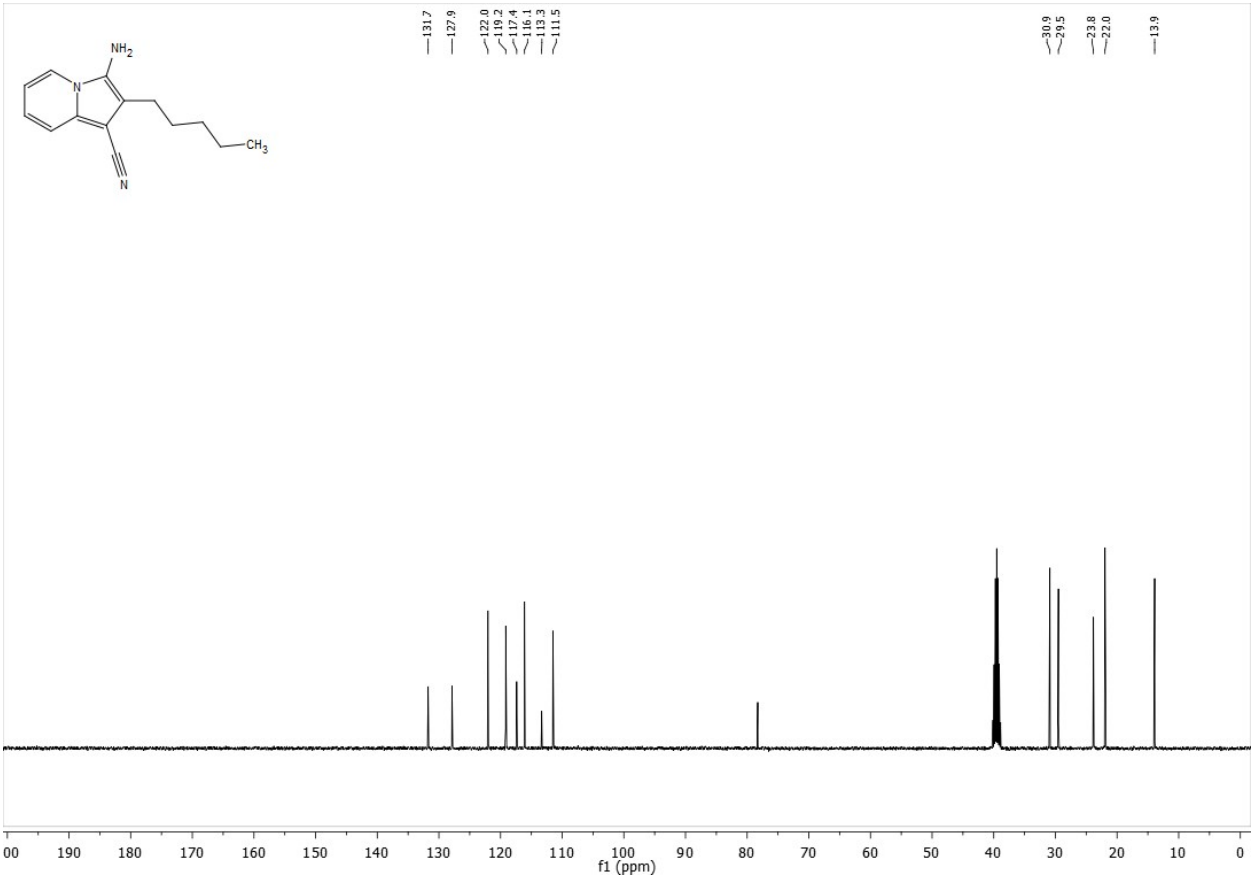
^{13}C NMR for compound **4p** (100 MHz, DMSO-d_6)



^{1}H NMR for compound **4q** (400 MHz, DMSO-d_6)

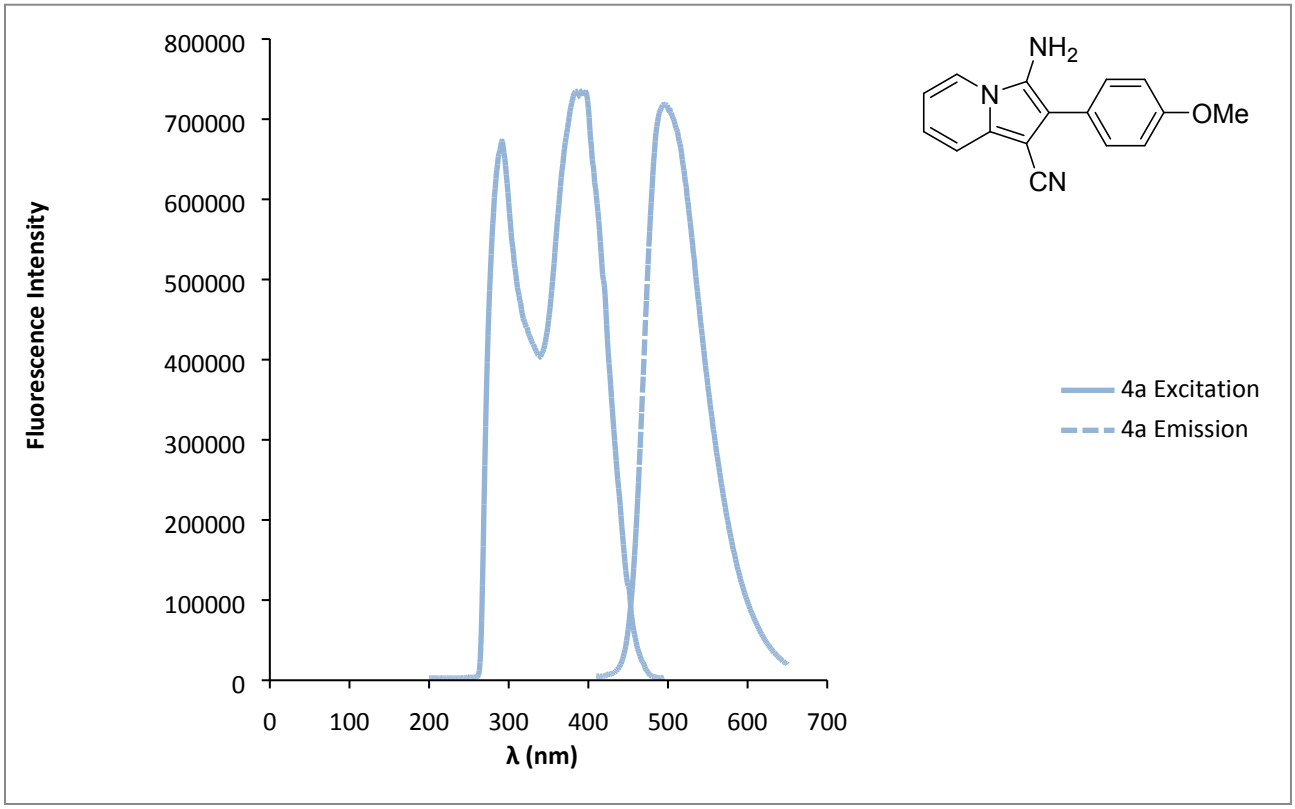


^{13}C NMR for compound **4q** (100 MHz, DMSO-d_6)

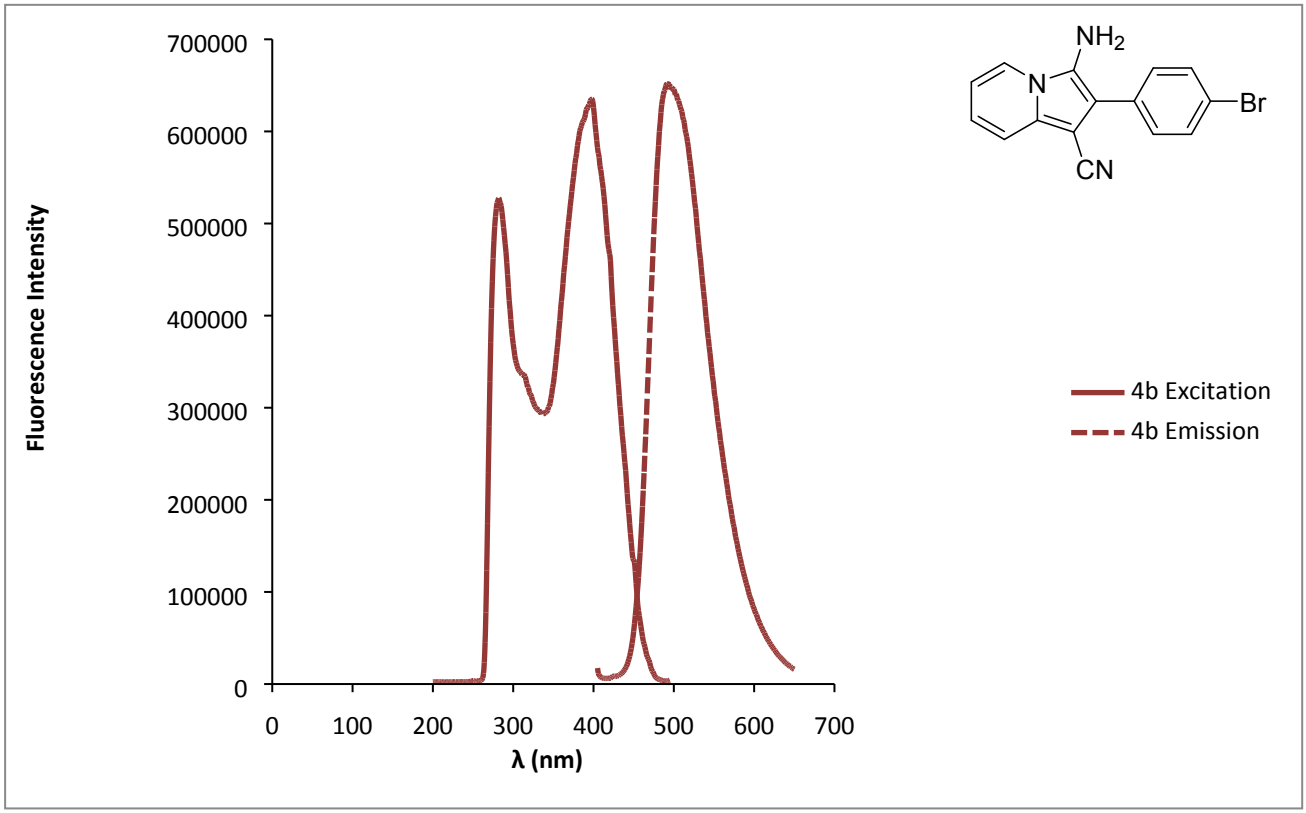


Fluorescent spectra for compounds 4a-4o

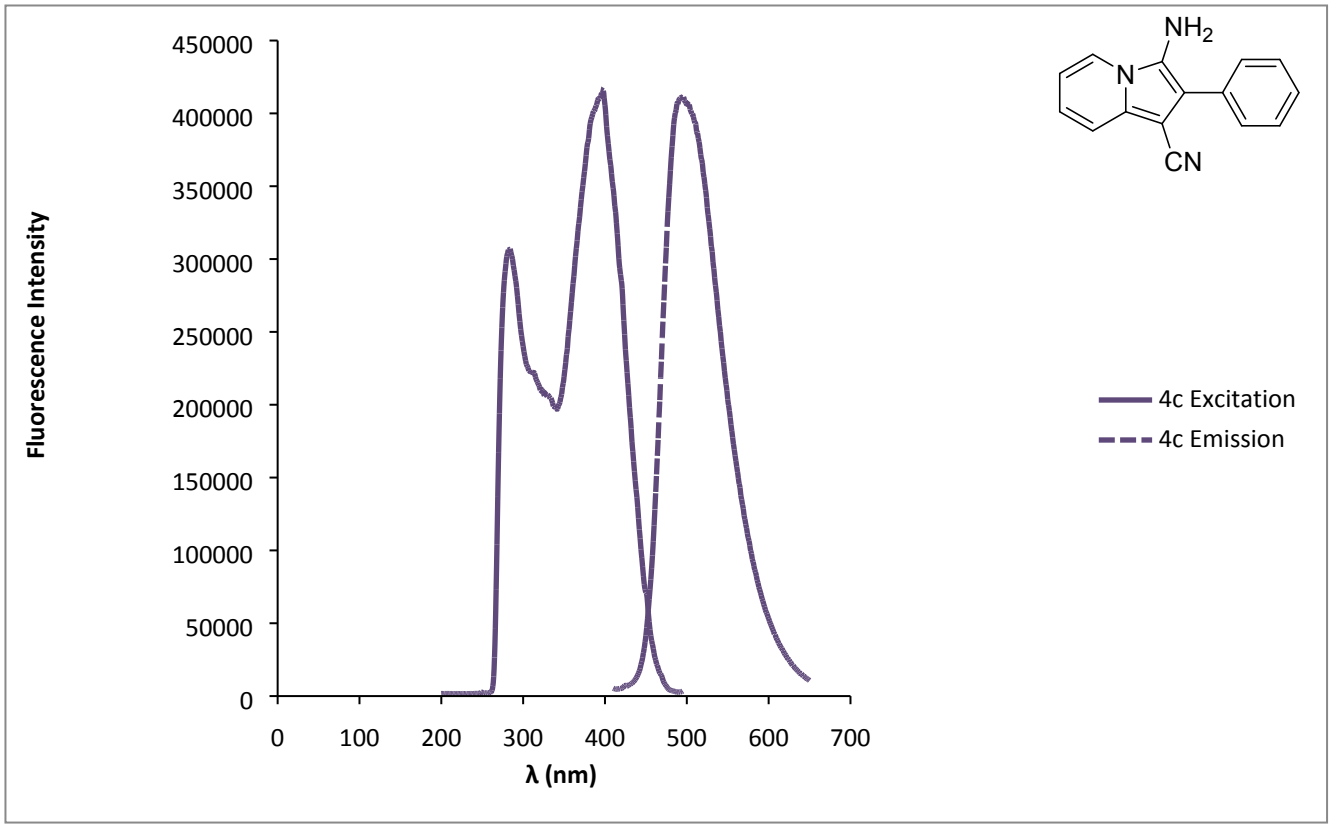
Fluorescent spectra for compound **4a** (10 μM, DMF, λex = 292, 393 nm; λem = 497 nm)



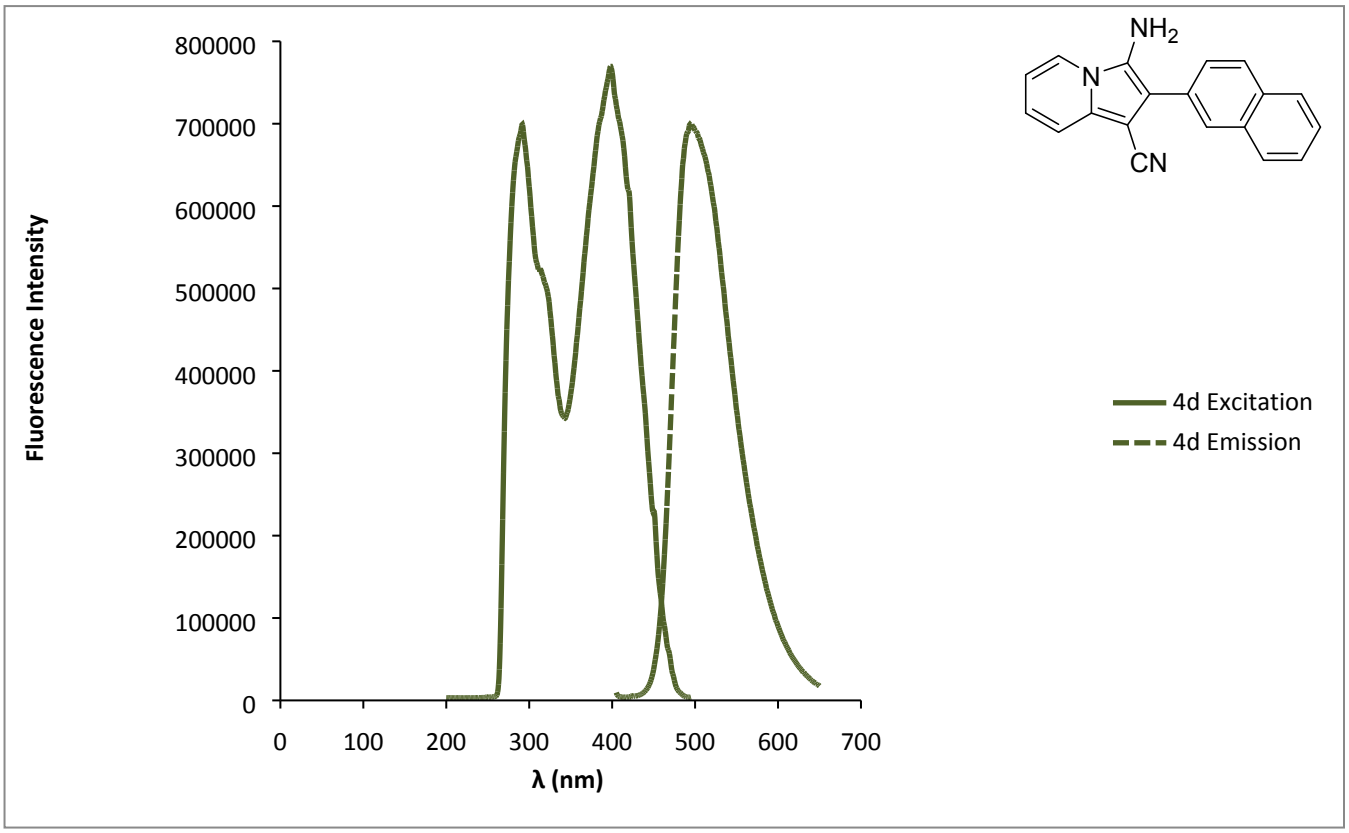
Fluorescent spectra for compound **4b** (10 μM, DMF, λex = 282, 398 nm; λem = 493 nm)



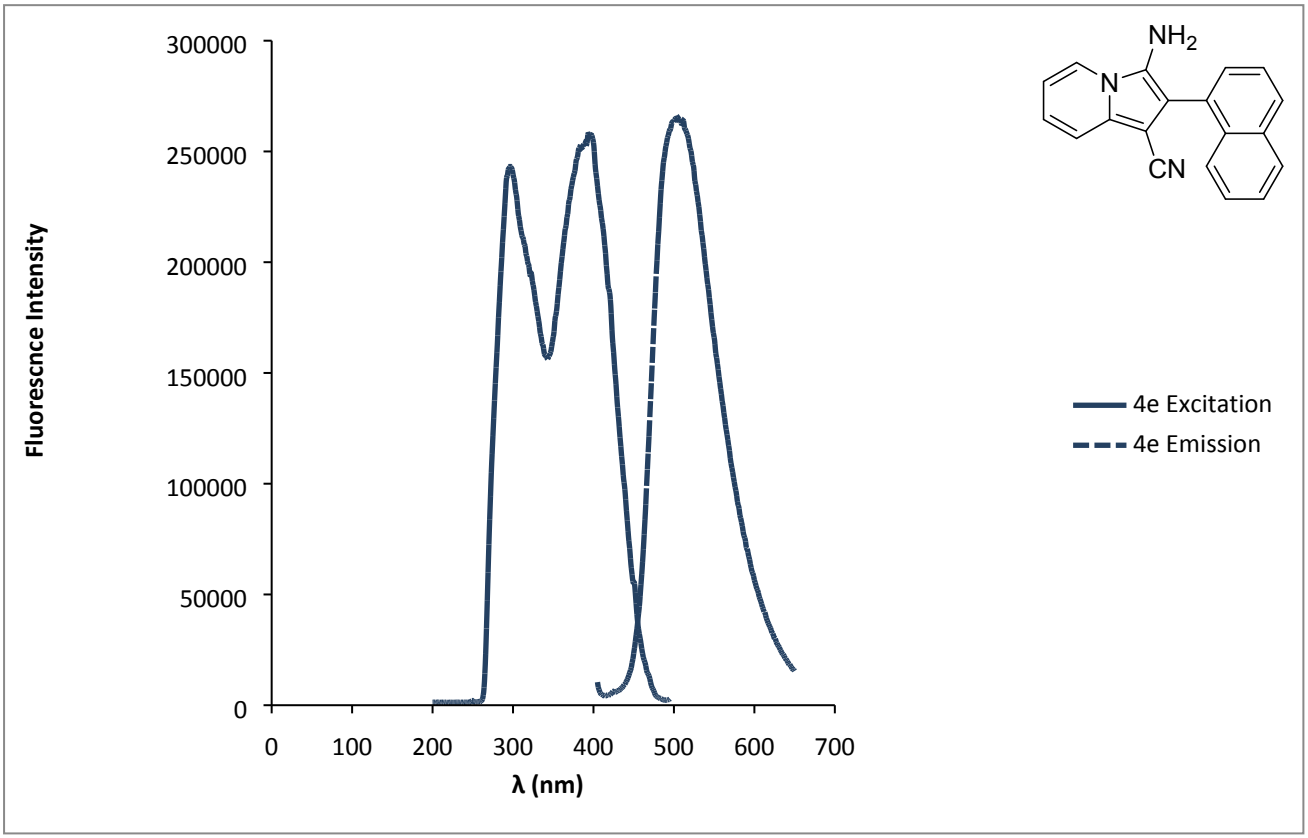
Fluorescent spectra for compound **4c** (10 μM, DMF, λex = 287, 398 nm; λem = 496 nm)



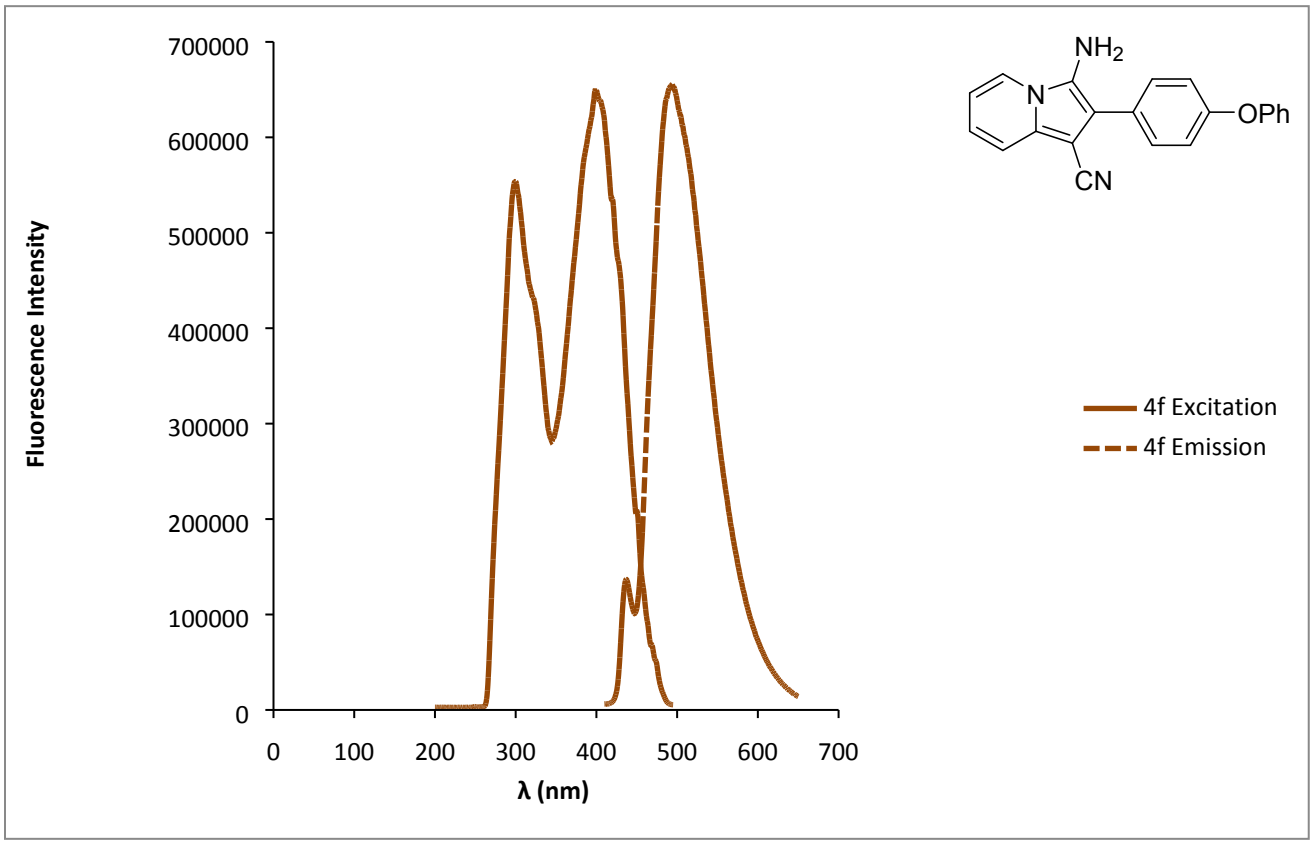
Fluorescent spectra for compound **4d** (10 μM, DMF, λex =292, 398 nm; λem = 505 nm)



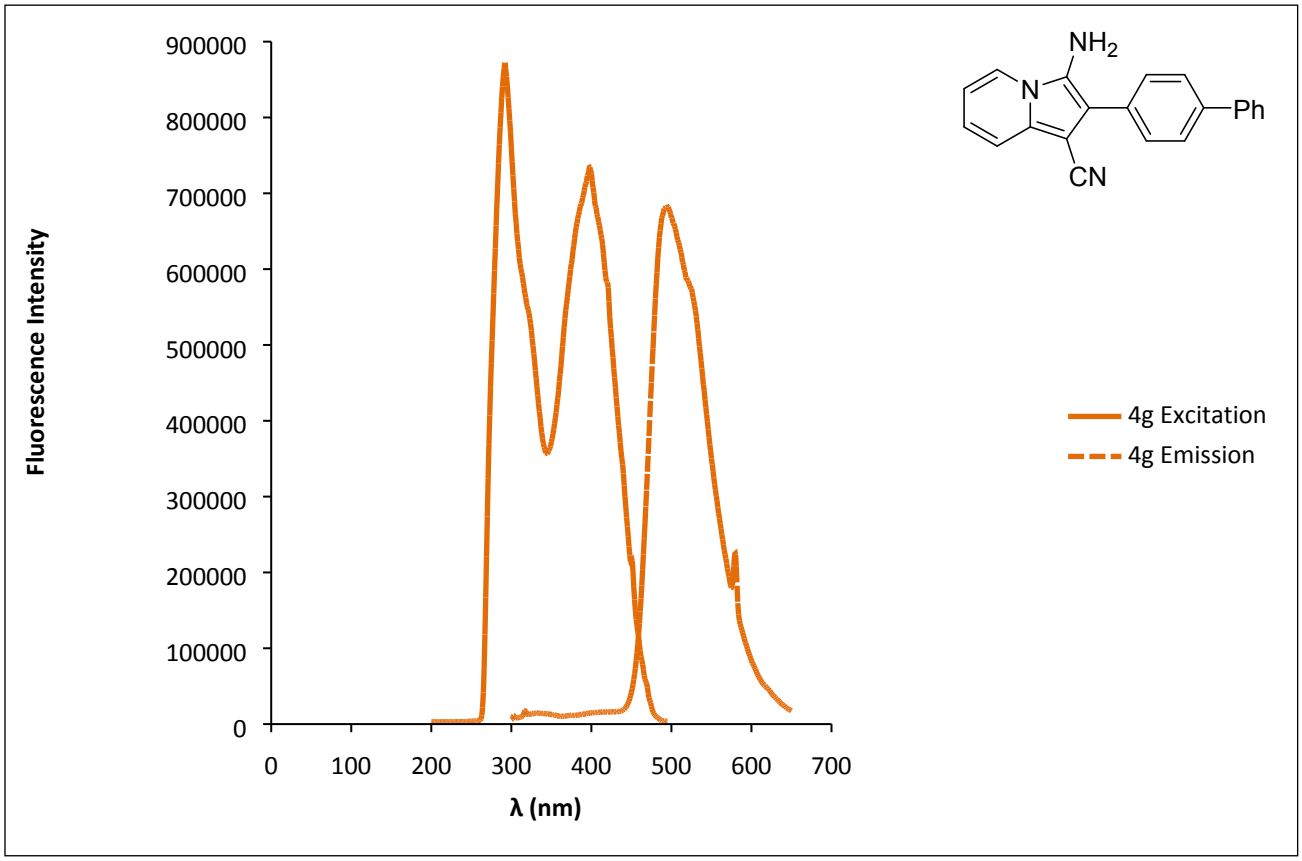
Fluorescent spectra for compound **4e** (10 μM, DMF, λex = 297, 397 nm; λem = 512 nm)



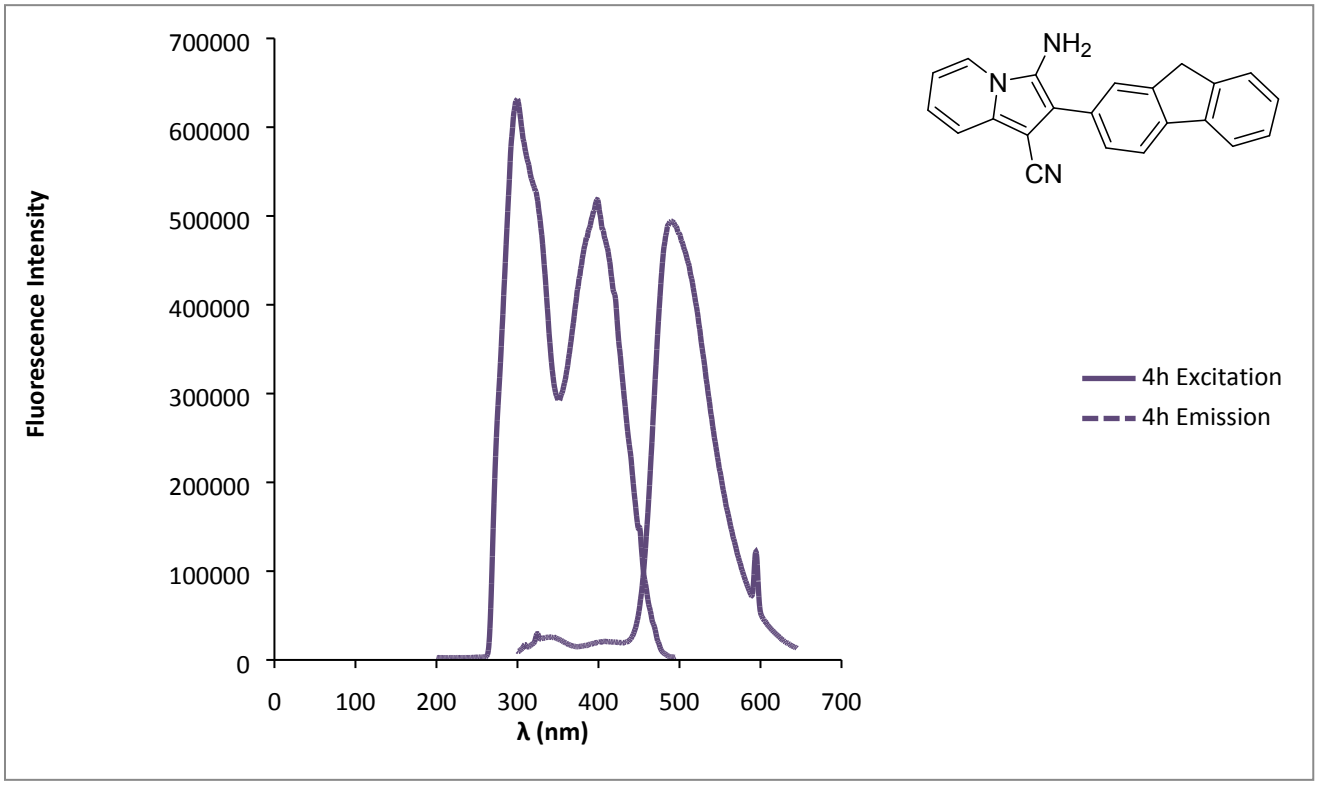
Fluorescent spectra for compound **4f** (10 μM, DMF, λex = 300, 400 nm; λem = 494 nm)



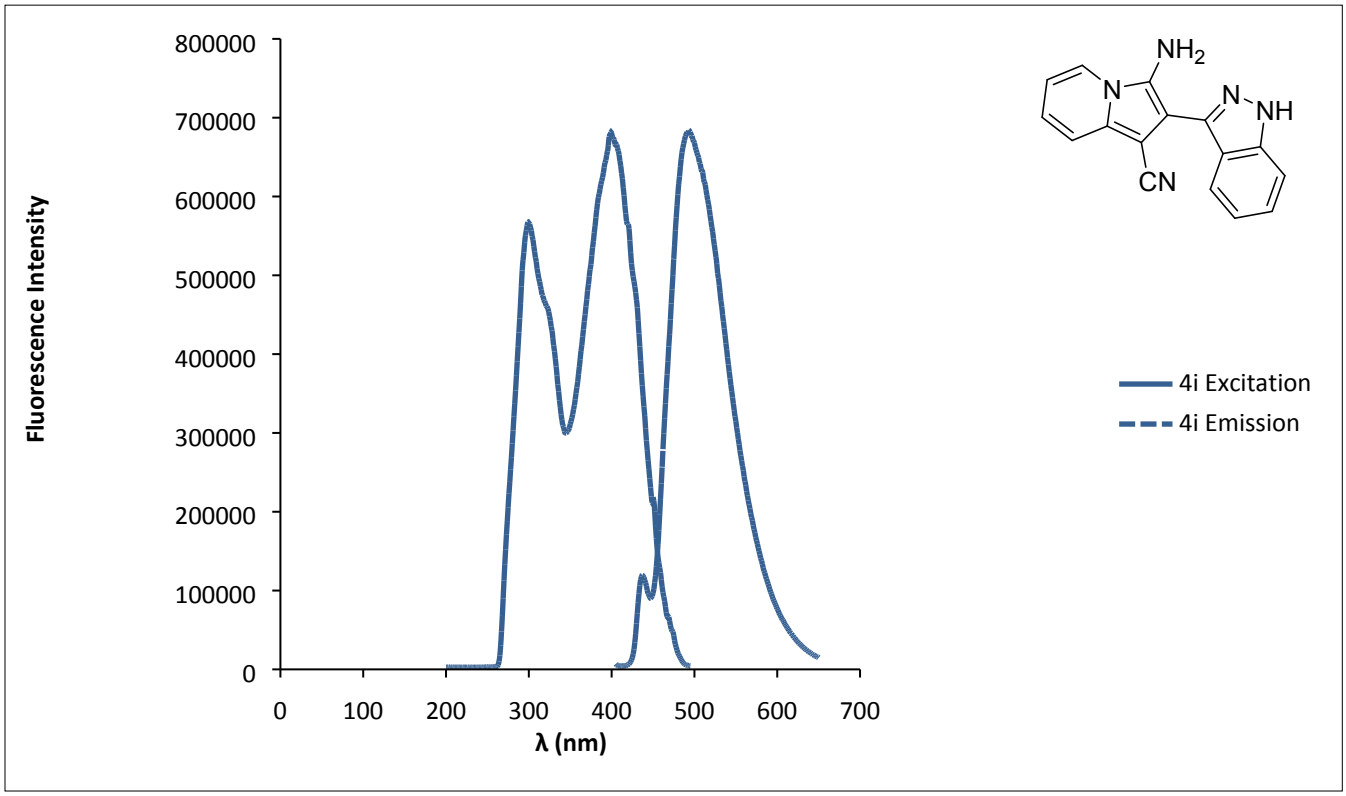
Fluorescent spectra for compound **4g** (10 μM, DMF, λex = 292, 398 nm; λem = 496 nm)



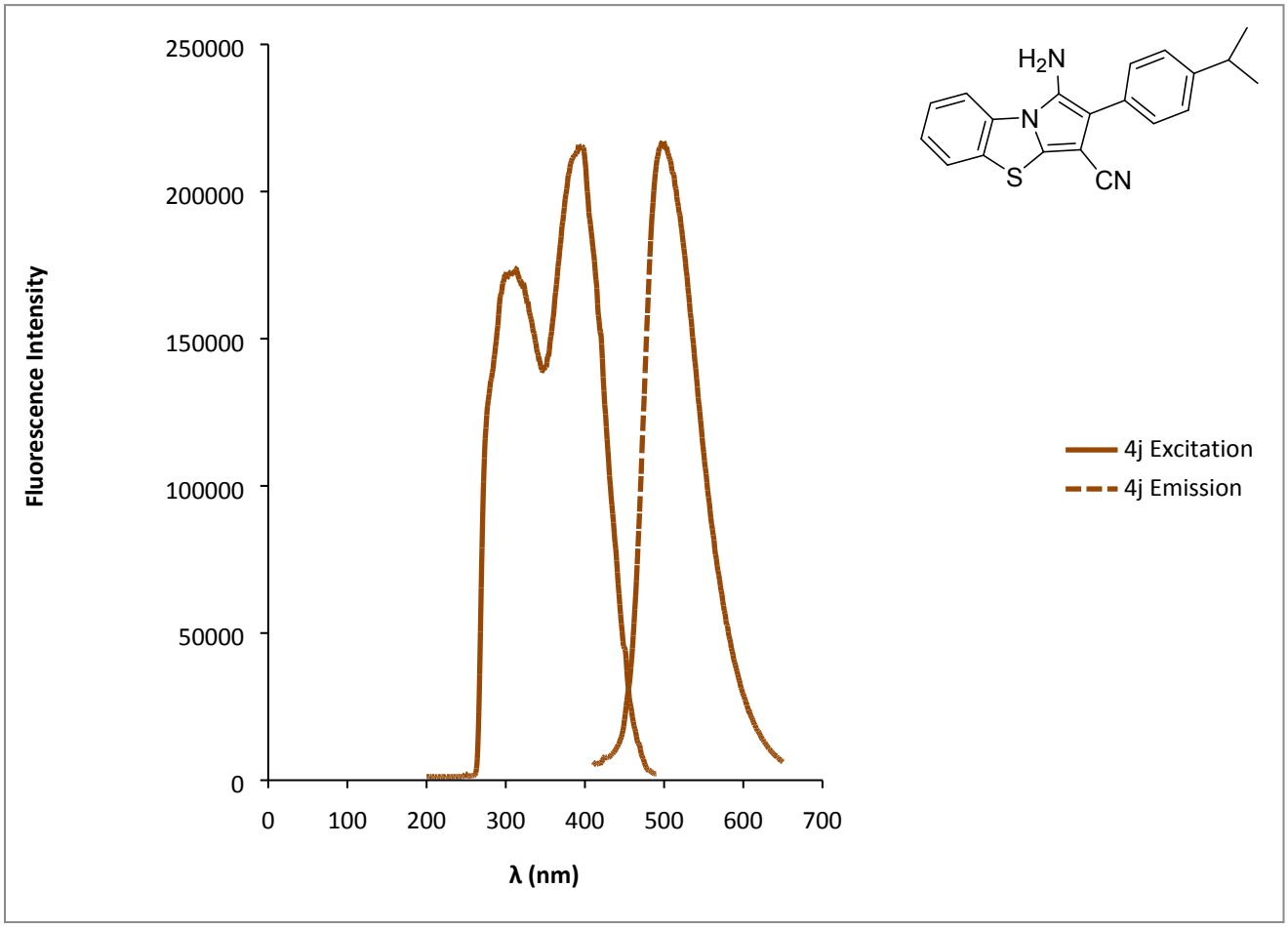
Fluorescent spectra for compound **4h** (10 μM, DMF, λex = 300, 398 nm; λem = 490 nm)



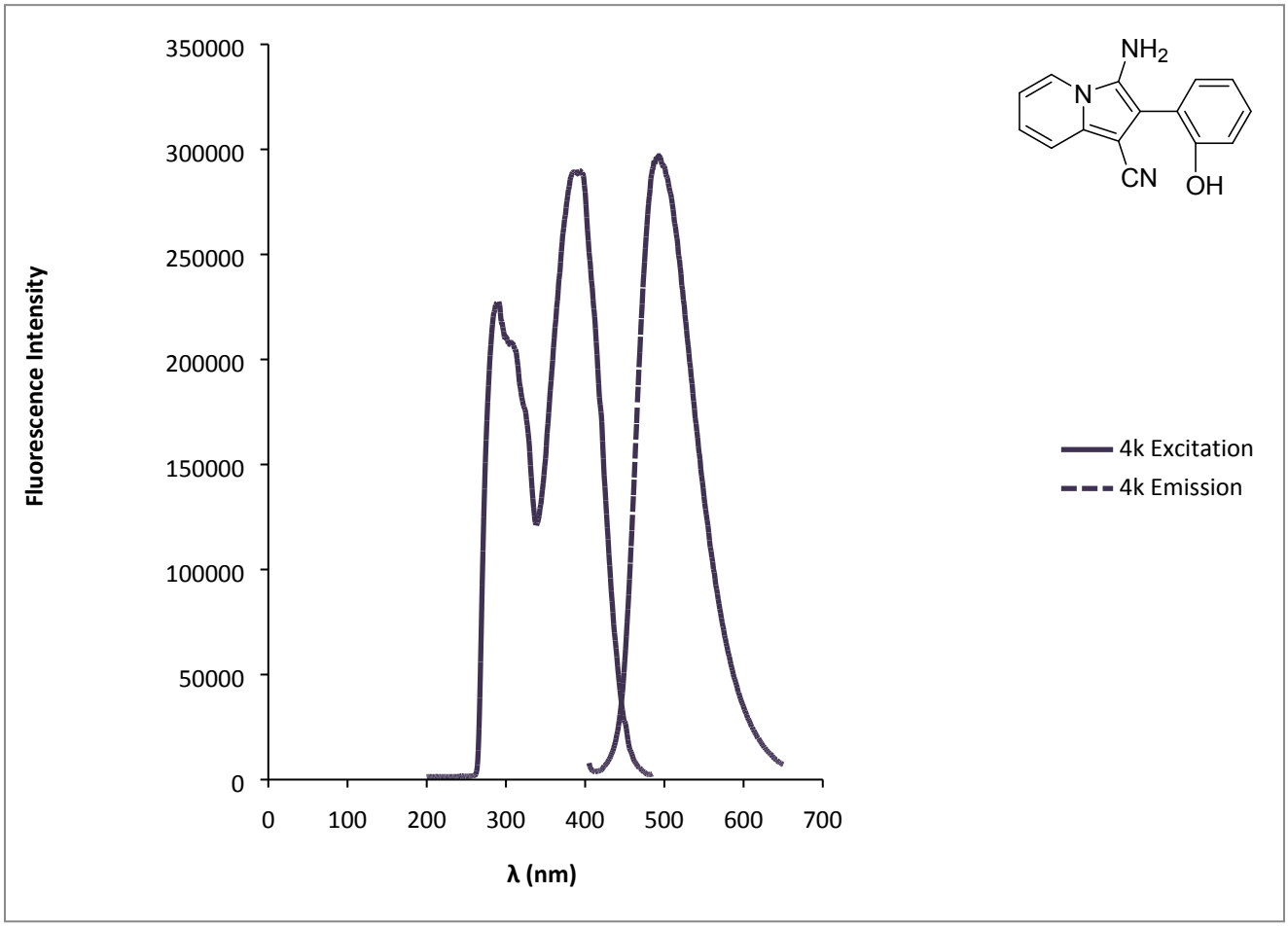
Fluorescent spectra for compound **4i** (10 μM, DMF, λex = 299, 399 nm; λem = 493 nm)



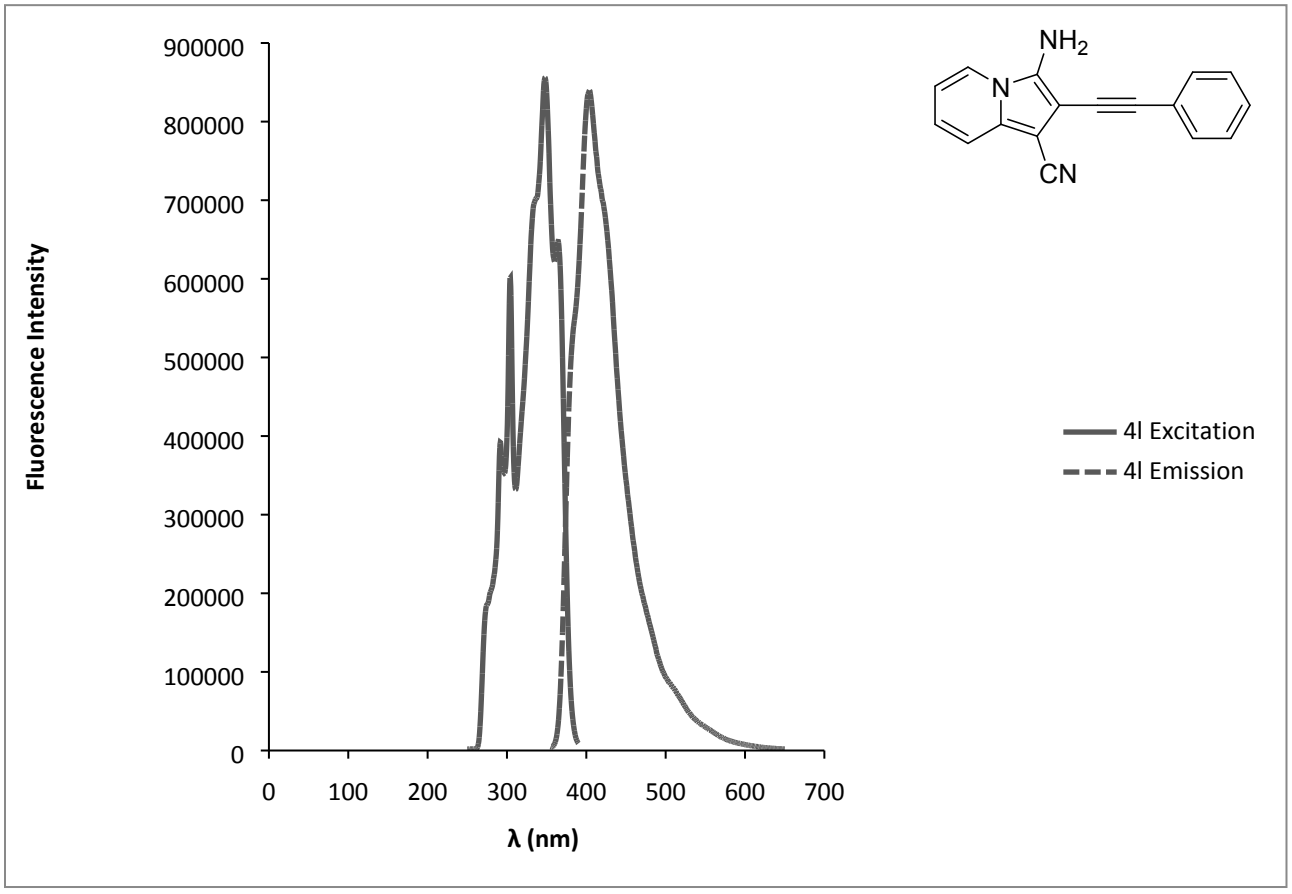
Fluorescent spectra for compound **4j** (10 μM, DMF, λex = 313, 392 nm; λem = 498 nm)



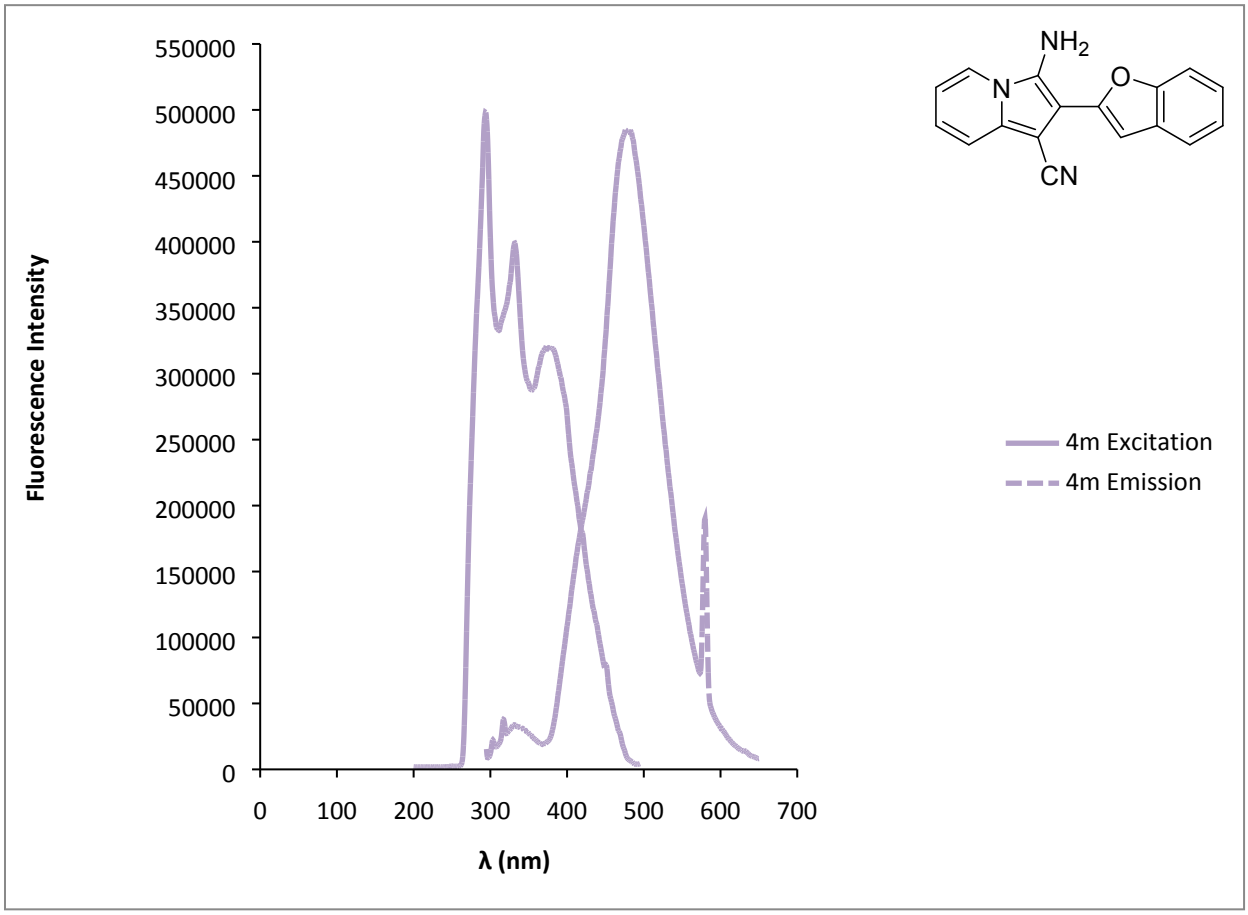
Fluorescent spectra for compound **4k** (10 μM, DMF, λex = 291, 392 nm; λem = 494 nm)



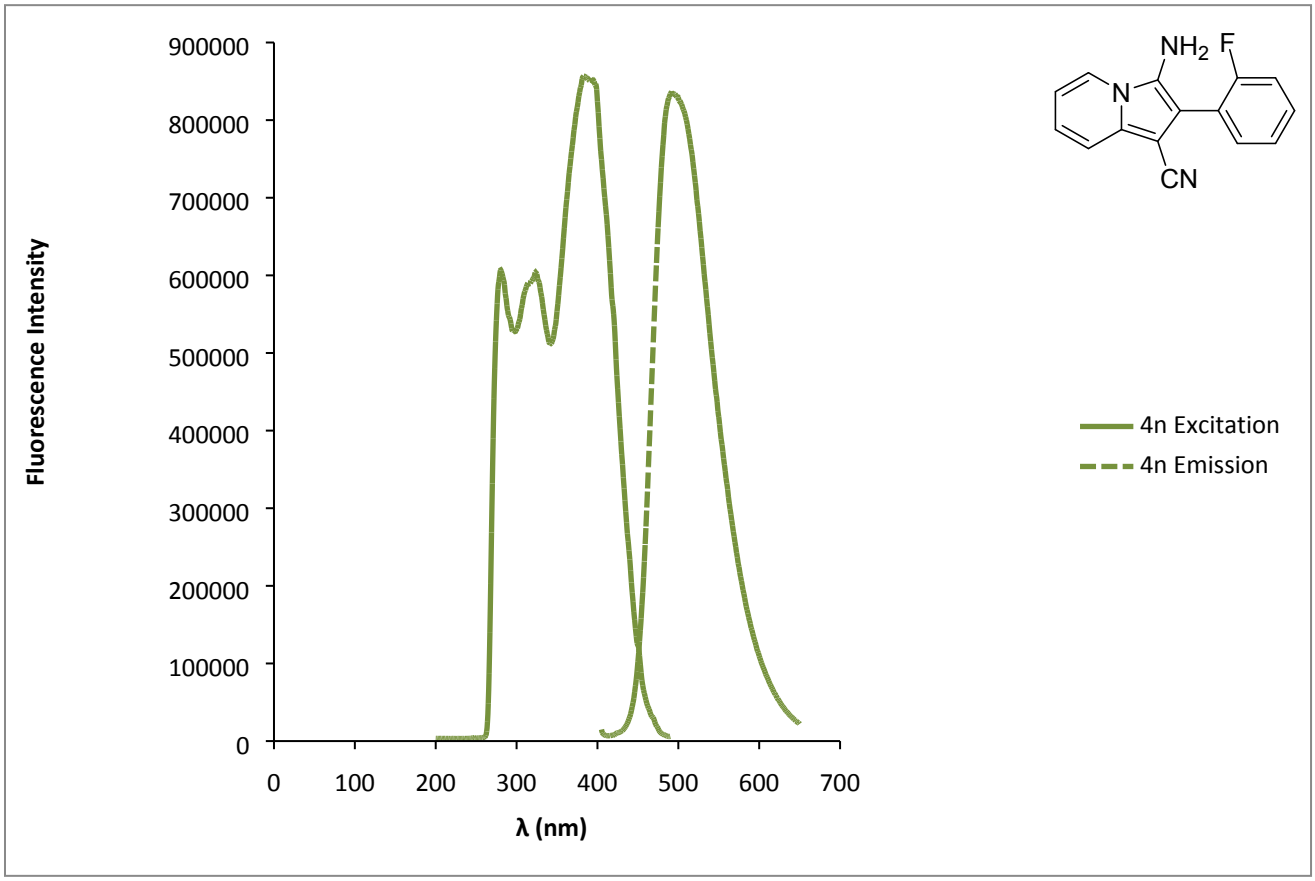
Fluorescent spectra for compound **4l** (10 μM, DMF, λex = 304, 348 nm; λem = 404 nm)



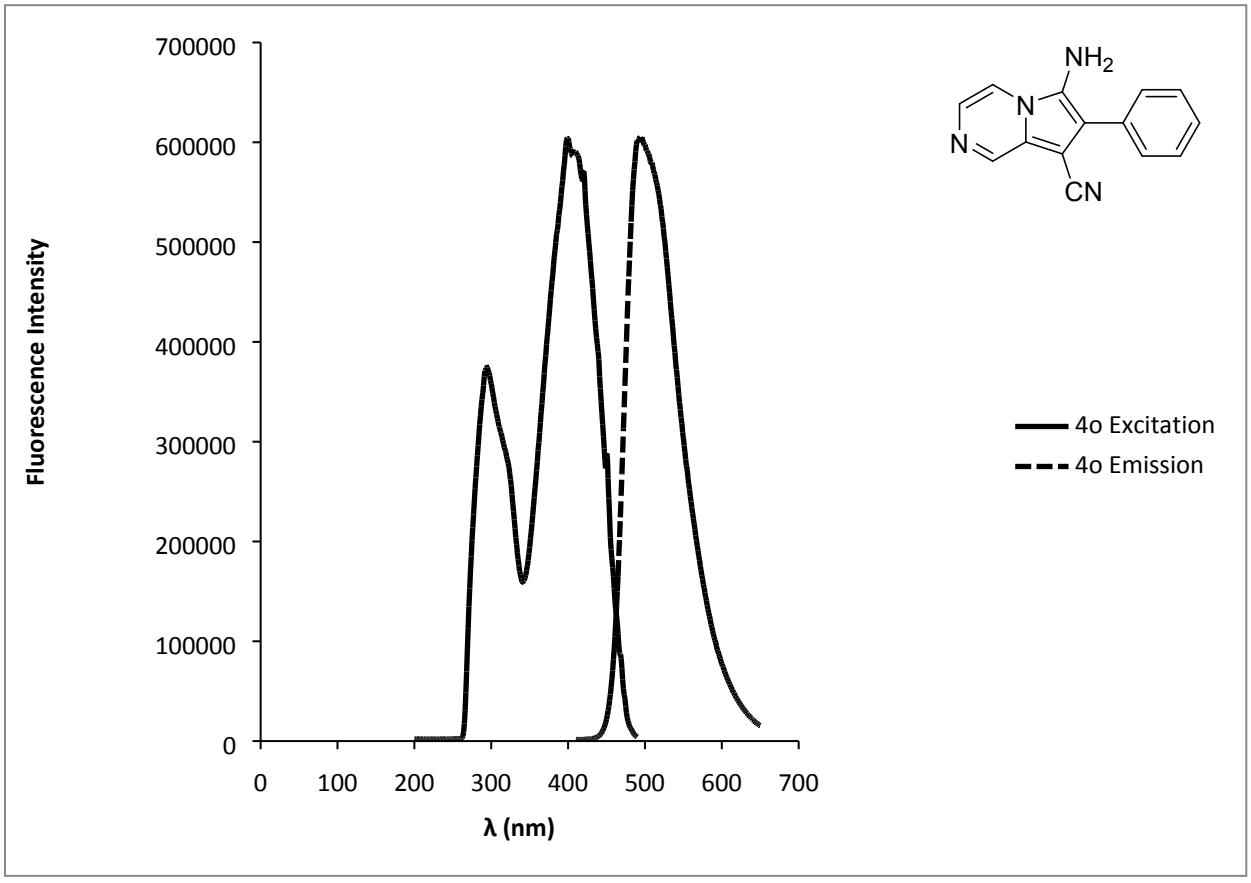
Fluorescent spectra for compound **4m** (10 μM, DMF, λex = 294, 332, 373 nm; λem = 476 nm)



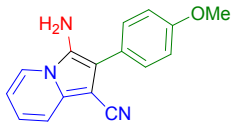
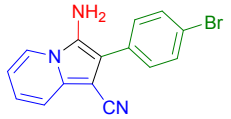
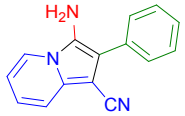
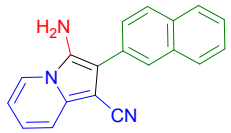
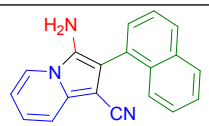
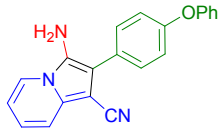
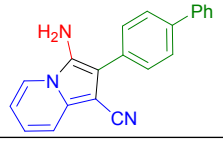
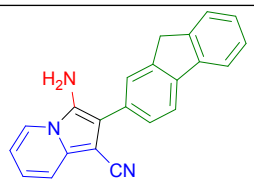
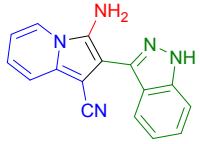
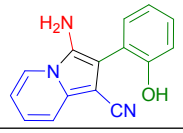
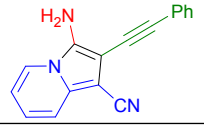
Fluorescent spectra for compound **4n** (10 μM, DMF, λex = 280, 323, 383 nm; λem = 493 nm)

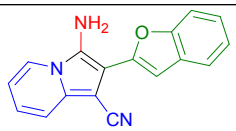
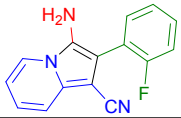
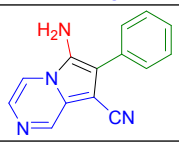


Fluorescent spectra for compound **4o** (10 μM, DMF, λex = 295, 399 nm; λem = 494 nm)



Data for Compounds 4a-4o

Compound Number	Structure	Quantum yield (ϕ_f) in DMF	Molar Absorbitivity($M^{-1}cm^{-1}$)	λex (nm)	λem (nm)
4a		0.03	5525	292, 393	497
4b		0.01	6395	282, 398	493
4c		0.02	4128	287, 398	496
4d		0.02	8147	292, 398	505
4e		0.05	4920	297, 397	512
4f		0.05	3613	300, 400	494
4g		0.02	7634	292, 398	496
4h		0.10	4358	300, 398	490
4i		0.07	6096	299, 399	493
4k		0.03	4267	291, 392	494
4l		0.24	4938	304, 348	404

4m		0.06	7465	294, 332, 373	476
4n		0.09	6449	280, 323, 383	493
4o		0.22	8100	295, 399	494

(Reference coumarine 151 in ethanol)