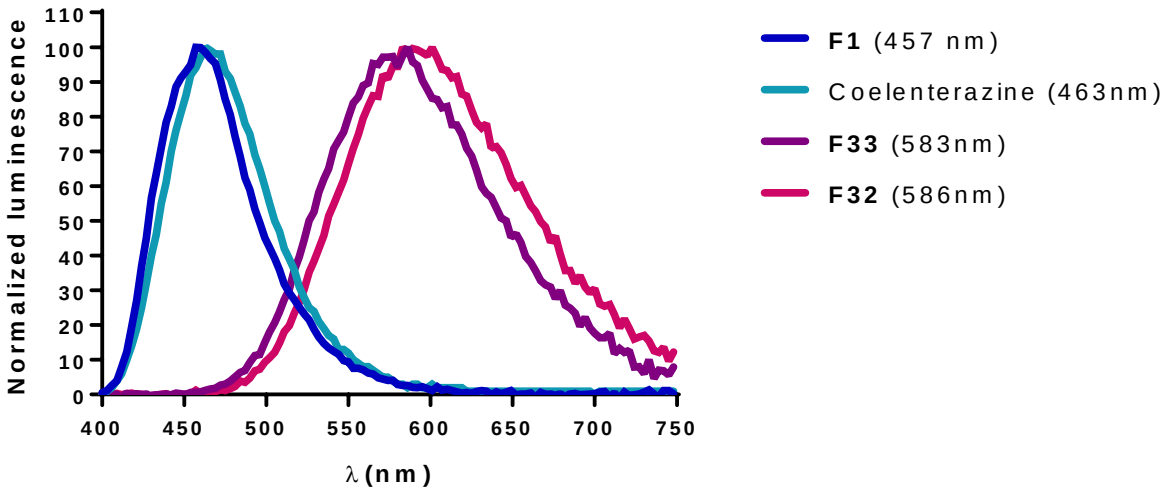
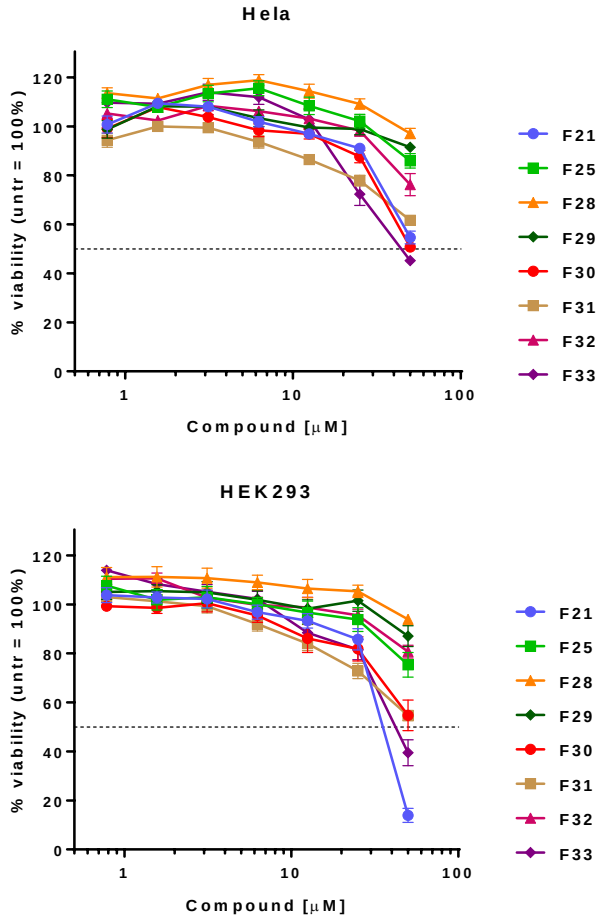
Supplemental Figure 1: NanoLuc emission spectra in TBS buffer



2722000	9158000	12660000	11330000	11590000
2699000	9679000	12860000	11610000	10740000
2871000	9440000	12420000	11730000	11260000

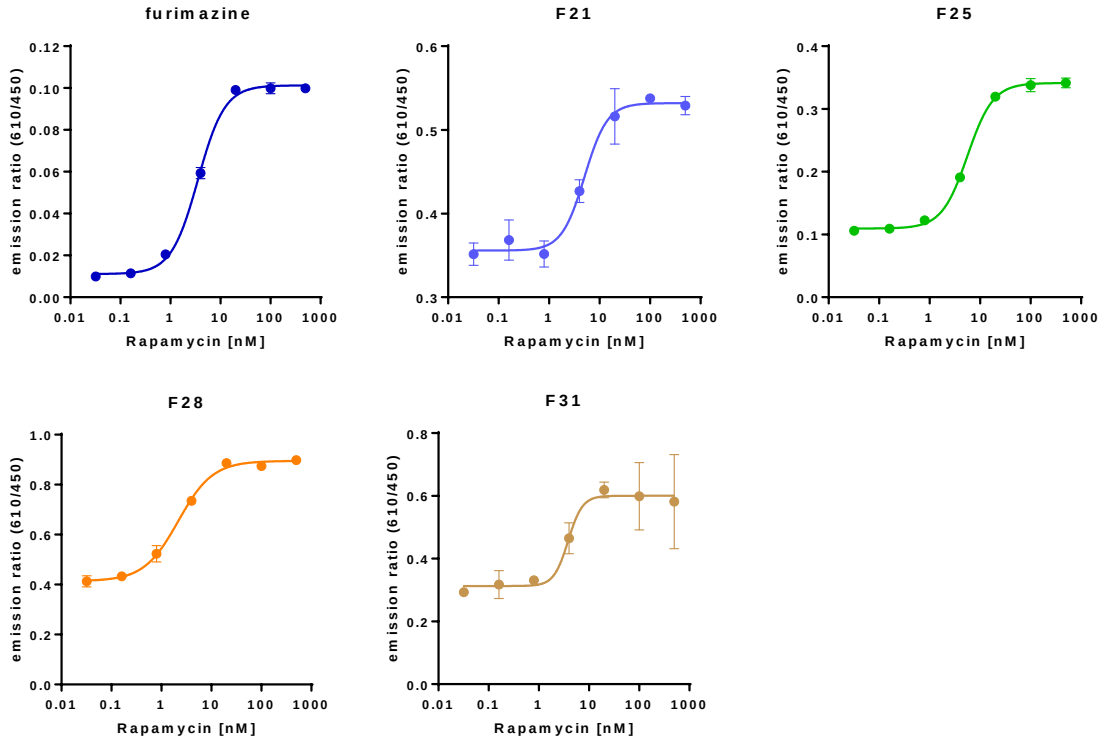
Comparison of NanoLuc spectral profiles assayed with **F1**, native coelenterazine, **F33** and **F32**. The values from three spectral scans were averaged and normalized to peak height for each substrate in TBS+0.01% BSA buffer. The values from three spectral scans were averaged and then normalized to peak height for each substrate.

Supplemental Figure 2: Effect of NanoLuc substrates on cell viability



HEK293 or HeLa cells were plated in white 96-well tissue culture plate in 100 ml DMEM + 10% FBS and incubated for 24h at 37°C. The medium was then replaced with 100 ml DMEM + 10% FBS supplemented with a serial titration of the indicated NanoLuc substrate followed by 6h incubation at 37°C. Cell viability was assessed using CellTiter Glo (Promega) following manufacturer's instructions. Shown are the means ± SEM of 3 independent experiments performed in triplicate.

Supplemental Figure 3: Comparative analysis of NanoLuc substrates using the Frb/FKBP model system



HeLa cells transfected with expression constructs for Frb-NanoLuc and FKBP were left untreated or treated for 15 minutes with a serial titration of Rapamycin (1 µM, 15 minutes). Rapamycin induced interaction of Frb and FKB was measured by BRET immediately after addition of 20 mM of the indicated NanoLuc substrates. The following filter settings were used for measuring donor and acceptor emission: Acceptor filter (all substrates): 660/100 nm. Donor emission filters: furimazine (**F1**) – 460/40; **F21** – 590/60; **F25** – 540/60; **F28, F31** – 574/60.

Methods

Spectral measurements: bioluminescence:

Purified NanoLuc® Luciferase and *Renilla* luciferase were diluted to a concentration of 20µM in CO_2 independent media (Thermo Fisher 18045) +10%FBS or TBS+0.01% BSA. Ten-fold serial dilutions were prepared for each enzyme in each diluent. Substrates were diluted to a concentration of 100µM in either Nano-Glo® buffer, *Renilla*-Glo® buffer or to 20µM in TBS+0.01% BSA. Enzyme concentrations were selected that provided approximately 10,000-3,000,000 relative light units. 50µL of enzyme dilution was combined with 50µL substrate dilution in triplicate. Samples were read in an Infinite® M1000 luminometer (Tecan) set to spectral scan mode from 400-700nm with 3nm increments. Spectral measurements were normalized to the peak height value.

Spectral measurements: chemiluminescence:

Substrates were diluted to a concentration of 100µM in either Nano-Glo® buffer, *Renilla*-Glo® buffer or to 20µM in TBS+0.01% BSA. 50µL of each substrate dilution was combined with 50µL of CO_2 independent media+10% FBS or TBS+10% FBS. Samples were read in an Infinite® M1000 luminometer (Tecan) set to spectral scan mode from 400-700nm with 3nm increments. Spectral measurements were normalized to the peak height value.

Luminescence measurements: Table1, Table 2, Table 3:

Substrates were diluted to a concentration of 100µM Nano-Glo buffer. 50µL of each substrate dilution was combined with 50µL purified NanoLuc diluted to a concentration 20pM in CO_2 independent media+10% FBS. Samples were incubated for three minutes at room temperature and then read on a GloMax®-Multi+ luminometer (Promega)

Luminescence measurements: Figure 2A

Substrates were diluted to a concentration of 100µM in Nano-Glo® buffer and *Renilla*-Glo® buffer. 50µL of each substrate dilution was combined with either 50µL of purified NanoLuc or Renilla diluted to a concentration 200pM in TBS+0.01% BSA. Samples were incubated for three minutes at room temperature and then read on a GloMax®-Multi+ luminometer (Promega).

Spectral measurements: BRET:

Recombinant NanoLuc-HaloTag protein was diluted to 1 µM in PBS + 0.05% BSA and left untreated of labeled with either 20 µM NB618 or 12 µM Alexa660 HaloTag ligand for 60 minutes at room temperature. The NanoLuc-HaloTag samples were then diluted to a concentration of 40 nM in PBS + 0.05% BSA and plated into a white 96-well plate. Each sample was combined with 100 µL PBS containing the indicated substrate (final concentration 100 µM). BRET spectra were measured using BMG Clariostar Flash plate reader set to spectral scan mode (Emission wavelength 400 – 700 nm, step width 2 nm, bandwith 20 nm).

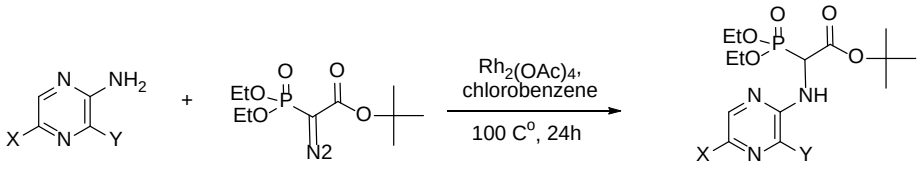
Frb/FKBP Interaction Assays

HEK293 cells were transientlytransfected with expression constructs for the indicated Frb and FKBP fusions and plated into a white 96-well tissue culture plate (CorningCostar #3917) at 2×10^4 cells/well in 100 µL volume. After 24 h of incubation at 37°C, the growth medium was replaced with 50 µL Opti-MEM (Life Technologies) or 50 µL Optimem supplemented with 500 nM NCT-HaloTag ligand. After incubation for 90 min at 37 °C the interaction of Frb and FKBP was induced by the addition of the indicate concentration(s) of rapamycin followed by 15 min of incubation at 37 °C. The indicated NanoLuc substrates were then added in 50 µL Optimem at a final concentration of 20 µM. All measurements were taken at RT using a BMG Clariostar Flash plate reader set to spectral scan mode (Emission wavelength 400 – 700 nm, step width 2 nm, bandwith 20 nm) or to BRET mode (properties of donor / acceptor emission filters used for each substrate are supplied in legend for figure).

Synthetic Procedures:

3-Benzyl-5-phenylpyrazin-2-amine was provided by *Promega Biosciences, Inc.* Diazophosphonates were synthesized according to Wang *at. al*.[1] All reagents and solvents for chemical syntheses were purchased from Aldrich, Sigma, and Fisher and were used without further purification. Nuclear Magnetic Resonance (NMR) and mass spectra were recorded on a Vivan-300 and a Waters LC-MS instrument with Waters 2695 Separation Module/3100 Mass Detector. Waters Preparative HPLC (Waters 2487 Series) was used to purify the products by using 0.1 % TFA in water and acetonitrile as eluents. The purity of the substrates were assessed on an analytical HPLC (Agilent 1100 Series) by monitoring absorbance at 254 nm**.**

General procedure for the preparation of *tert*-Butyl-2-aminopyrazine-2-(diethoxyphosphoryl) acetates 2a-c



2a X= Br, Y= Bn
2b X= Ph, Y= Br
2c X=I, Y=Br

In a 5mL round bottom flask were placed aminopyrazine **1a-c** (2 mmol, 1 eq.), diazo compound (1.1 g, 4 mmol, 2 eq.), $Rh_2(OAc)_4$ (88.36 mg, 10 mol%) and 3 mL of chlorobenzene. The reaction mixture was heated at 100 °C for 24 hours. The progress of the reaction was monitored by LCMS. After 24 hours, the reaction reached 100% conversion. The mixture was adsorbed on Celite and purified on silica column using 40% EtOAc in Heptane as eluent. Target compound was isolated pure as a brown solid.

Preparation of coelenterazine analogues

General procedure for the preparation of tert-butyl 2-aminopyrazine-3-(furan-2-yl)acrylate derivatives 3a-c

In a 20 mL vial was placed tert-Butyl-2-aminopyrazine-2-(diethoxyphosphoryl) acetate (**2a-c**) (2 mmol, 1 eq.), furancarbaldehyde (211 mg, 2.2 mmol, 1.1 eq.) and 40 mL of methanol. To that solution 1,1,3,3-tetramethylguanidine (460 mg, 4 mmol, 2 eq.) was added and the reaction mixture was stirred at room temperature for 1 hour. The progress of the reaction was monitored by LCMS. After the reaction was complete, the mixture was poured into water, extracted with ethyl acetate, and dried over $MgSO_4$.

The drying agent was filtered off and the solvent was concentrated under reduced pressure. The residue was purified using flash chromatography on silica gel with heptane/ethyl acetate (70/30) as eluent.

General procedure for the preparation of tert-butyl 2-aminopyrazine-3-(furan-2-yl)propanoate derivatives 4a-c

In a Parr-shaker reactor flask was placed tert-butyl 2-aminopyrazine-3-(furan-2-yl)-acrylate **3a-c** (2.26 mmol, 1 eq.), $Rh(PPh_3)_3Cl$ (209 mg, 0.226 mmol, 0.1 eq.) and 50 mL of ethanol. The reactor was charged with H_2 (50 psi), and shook for 20 hours at room temperature. The reaction was monitored by LCMS. Then all volatiles were removed under reduced pressure and the residue was subjected to flash chromatography on silica gel using heptane/ethyl acetate as eluent (70/30). The reduced aminopyrazine derivative **4a-c** was isolated pure as colorless oil.

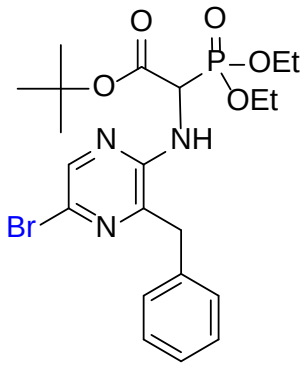
General procedure for preparation of furimazine analogues F2-33

Compounds with general structure **4a-c** (0.225mmol, 1 eq.) were dissolved in Dioxane (8 mL). To this solution were added appropriate boronic acid, boronic acid pinacol ester or potassium trifluoroborate (0.248 mmol, 1.1 eq), $Pd(PPh_3)_2Cl_2$ (0.022 mmol, 0.1 eq.) and Cs_2CO_3 (0.675 mmol, of 1M solution, 3 eq.). Reaction mixture was heated at 80°C for 1-4 hours. The progress of the reaction was monitored by LCMS. After reaction was complete, reaction mixture was adsorbed on Celite and purified by silica gel column chromatography using Heptane/EtOAc as eluent. For analogs **F29-33**, this procedure was repeated with a second aryl-aryl coupling with a different boronic acid. Fractions containing the product were concentrated under reduced pressure and redissolved in 2 mL of dichloromethane. To this solution 2 mL of TFA was added and reaction mixture was stirred at room temperature for several hours (6-12 h.). The progress of the reaction was monitored by LCMS. After reaction reached maximum conversion all volatiles were removed under reduced pressure and the residue was coevaporated with toluene (2 times ×30 mL) to remove the traces of TFA. The crude product was redissolved in dichloromethane (15 mL). Carbonyldiimidazole (122 mg, 0.757 mmol, 3 eq.) was added to the DCM solution and reaction mixture was stirred at room temperature for 30 minutes. Reaction mixture was poured into hydrochloric acid (0.1M, 100 mL). Organic fractions were extracted with dichloromethane, dried over MgSO4, filtered and concentrated under reduced pressure. The residue was loaded onto silica gel column and purified using dichloromethane/methanol as eluent providing the desired furimazine analogues **F2-33**.

In the case of furimazine analogs containing free aniline and or phenols (**F6, F29-33**), the respective Boc protected boronic acids were coupled to the appropriate haloaminopyrazine **4** following

deprotection of tert-butyl ester to the free carboxylic acid as described above. These protected compounds were then cyclized as described and finally deprotected following the TFA procedure outlined above to provide the desired furimazine.

tert-butyl 2-((3-benzyl-5-bromopyrazin-2-yl)amino)-2-(diethoxyphosphoryl)acetate (**2a**)



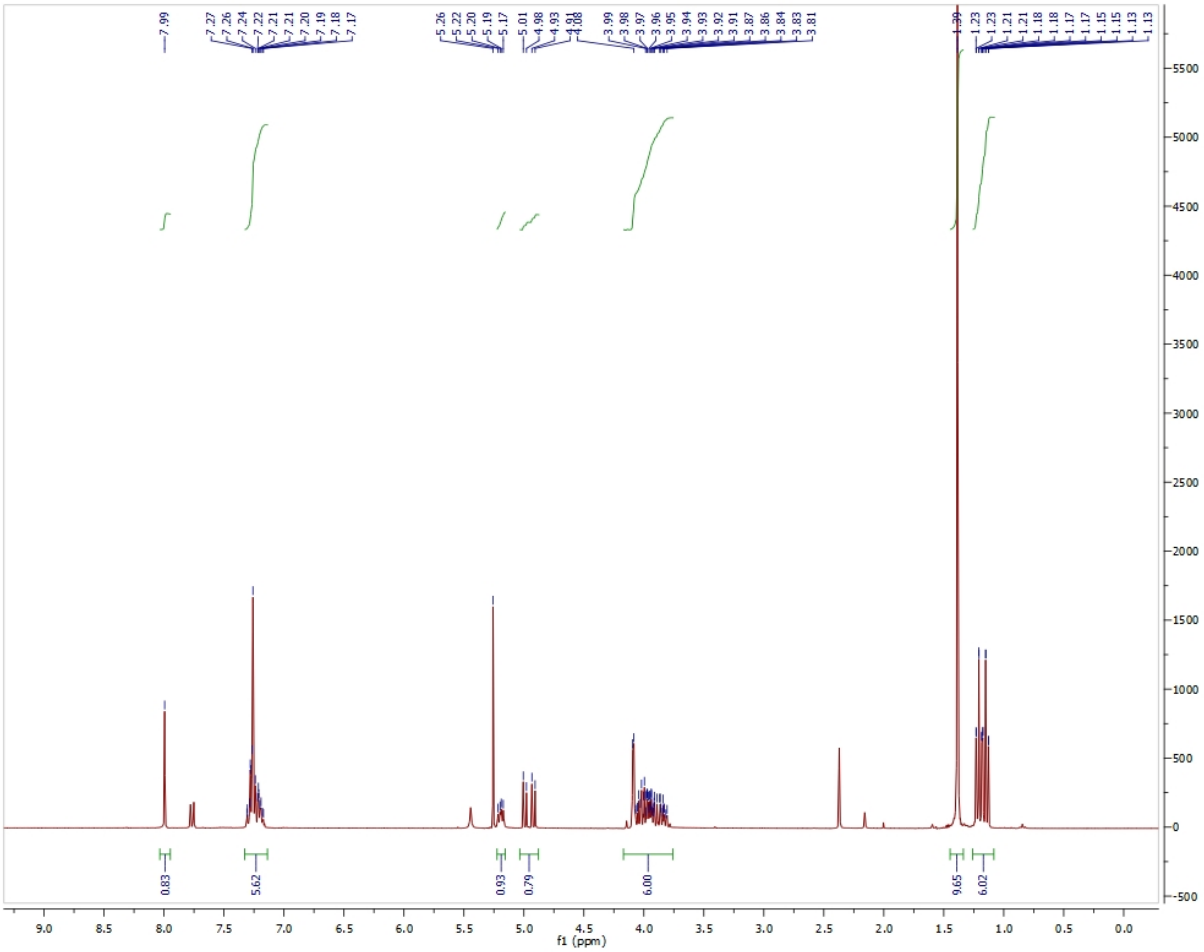
Yield: 76 %

^{1}H NMR (300 MHz, cd2cl2) δ = 7.99 (s, 1H), 7.27 – 7.17 (m, 5H), 5.26 – 5.17 (m, 1H), 5.00 (d, J=7.9Hz, 1H), 4.92 (d, J=7.9Hz, 1H), 4.08 – 3.81 (m, 6H), 1.39 (s, 9H), 1.23 (td, *J*=6.5Hz, 0.4Hz, 3H), 1.15 (td, *J*=7.3Hz, 0.4Hz, 3H).

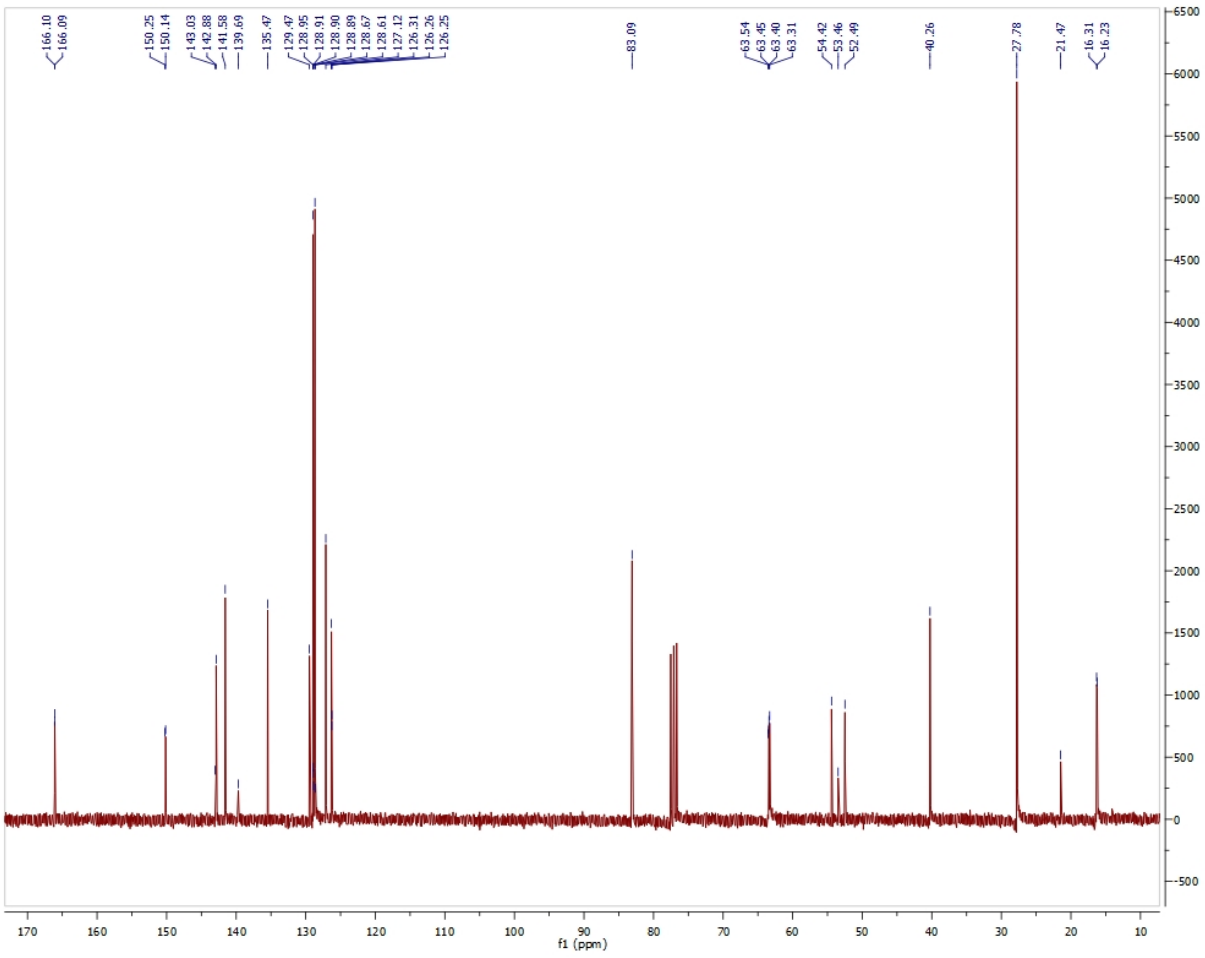
^{13}C NMR (75 MHz, cdcl3) δ = 166.10, 150.25, 142.88, 141.58, 139.69, 135.47, 129.47, 128.90, 128.67, 127.12, 126.31, 83.09, 63.54, 63.45, 63.40, 63.31, 54.42, 53.46, 52.49, 40.26, 27.78, 21.47, 16.31, 16.23.

HRMS (m/z) [M+H] (C21H29N3O5PBr) calculated 514.1101, observed 514.1089

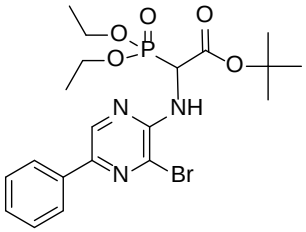
^{1}H NMR (**2a**)



^{13}C NMR (**2a)**


166.10
166.09
150.25
150.14
143.03
142.88
141.58
139.69
135.47
129.47
128.95
128.91
128.90
128.89
128.67
128.61
127.12
126.31
126.26
126.25
83.09
63.54
63.45
63.40
63.31
54.42
53.46
52.49
40.26
27.78
21.47
16.31
16.23
f1 (ppm)

tert-butyl 2-((3-bromo-5-phenylpyrazin-2-yl)amino)-2-(diethoxyphosphoryl)acetate (**2b**)



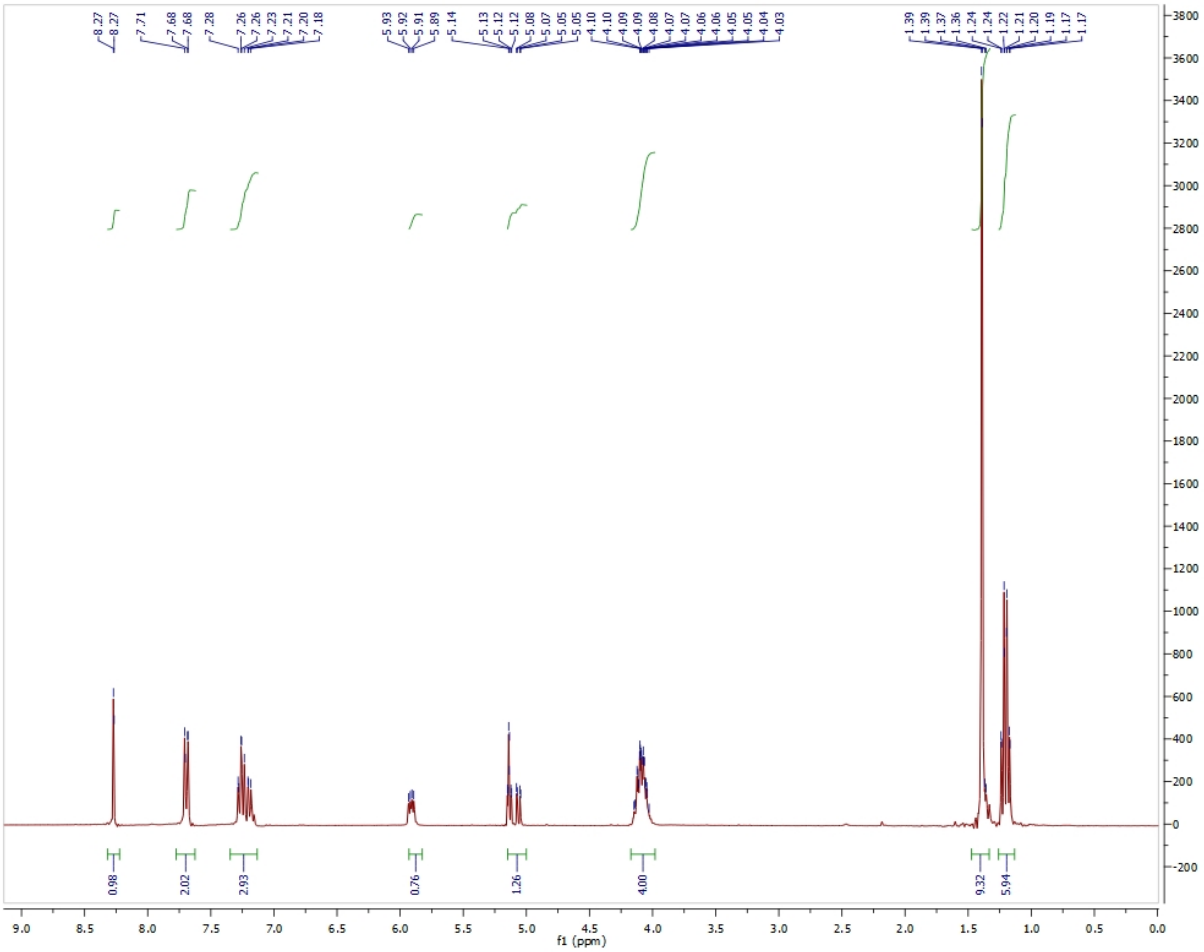
Yield: 73 %

^{1}H NMR (300 MHz, cd2cl2) δ = 8.27 (s, 1H), 7.71-7.68 (m, 2H), 7.28 – 7.18 (m, 3H), 5.93 – 5.89 (m, 1H), 5.15-5.05 (m, 2H), 4.13-4.04 (m, 3H), 1.39 (s, 9H), 1.23 (td, *J*=6.5Hz, 0.4Hz, 3H), 1.17 (td, *J*=7.3Hz, 0.4Hz, 3H).

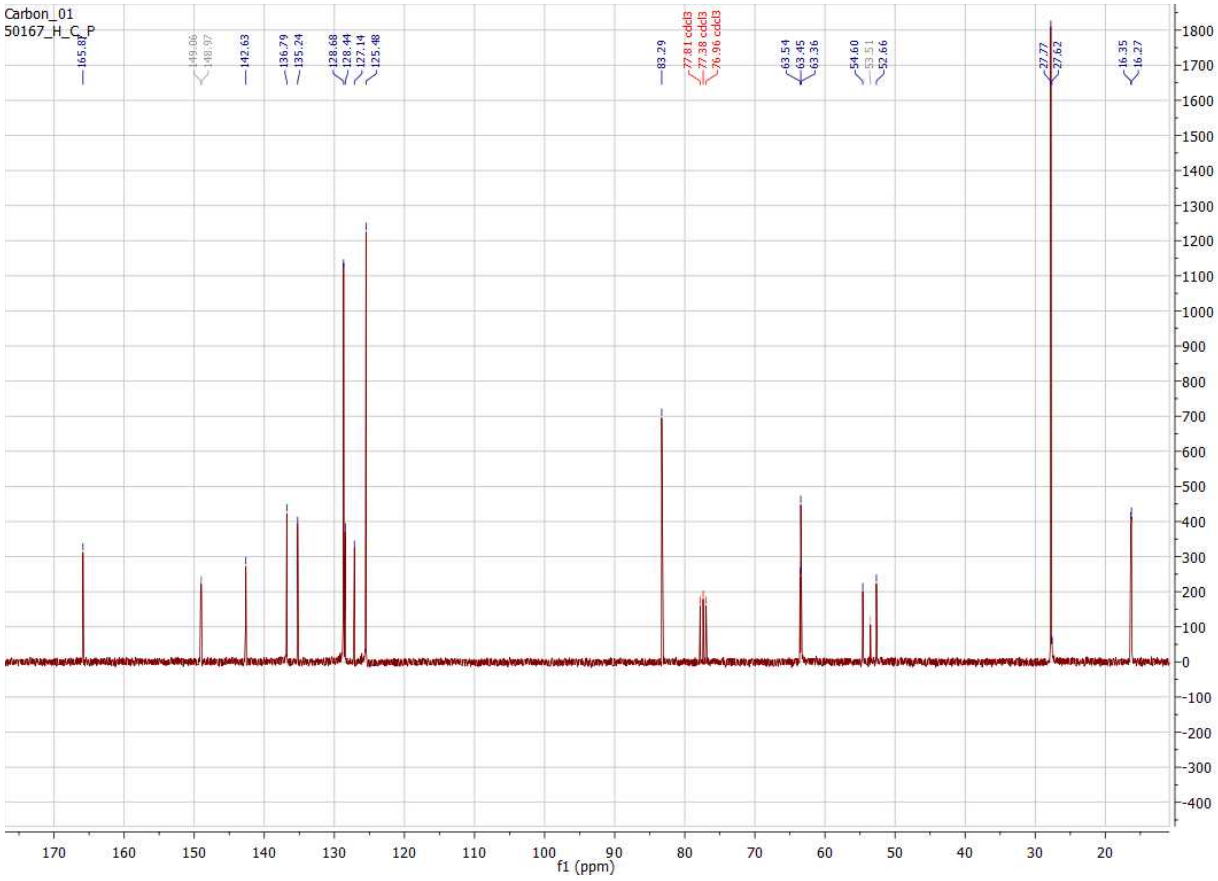
^{13}C NMR (75 MHz, cdcl3) δ = 165.87, 149.06, 142.63, 136.79, 135.24, 128.68, 128.44, 127.14, 125.48, 83.29, 63.54, 63.45, 63.36, 54.60, 53.51, 52.26, 27.77, 16.35, 16.27.

HRMS (m/z) [M+H] (C20H27N3O5PBr) calculated 500.0944, observed 500.0936

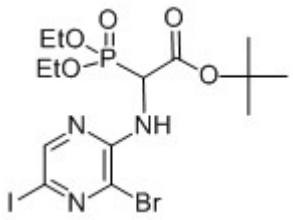
^{1}H NMR (**2b**)



^{13}C NMR (**2b)**


Carbon_01
50167_H_C_P
165.87
149.06
148.97
142.63
136.79
135.24
128.68
128.44
127.14
125.48
83.29
77.81 cdcl3
77.38 cdcl3
76.96 cdcl3
63.54
63.45
63.36
54.60
53.51
52.66
27.77
27.62
16.35
16.27
f1 (ppm)

tert-butyl 2-((3-bromo-5-iodopyrazin-2-yl)amino)-2-(diethoxyphosphoryl)acetate (**2c**)



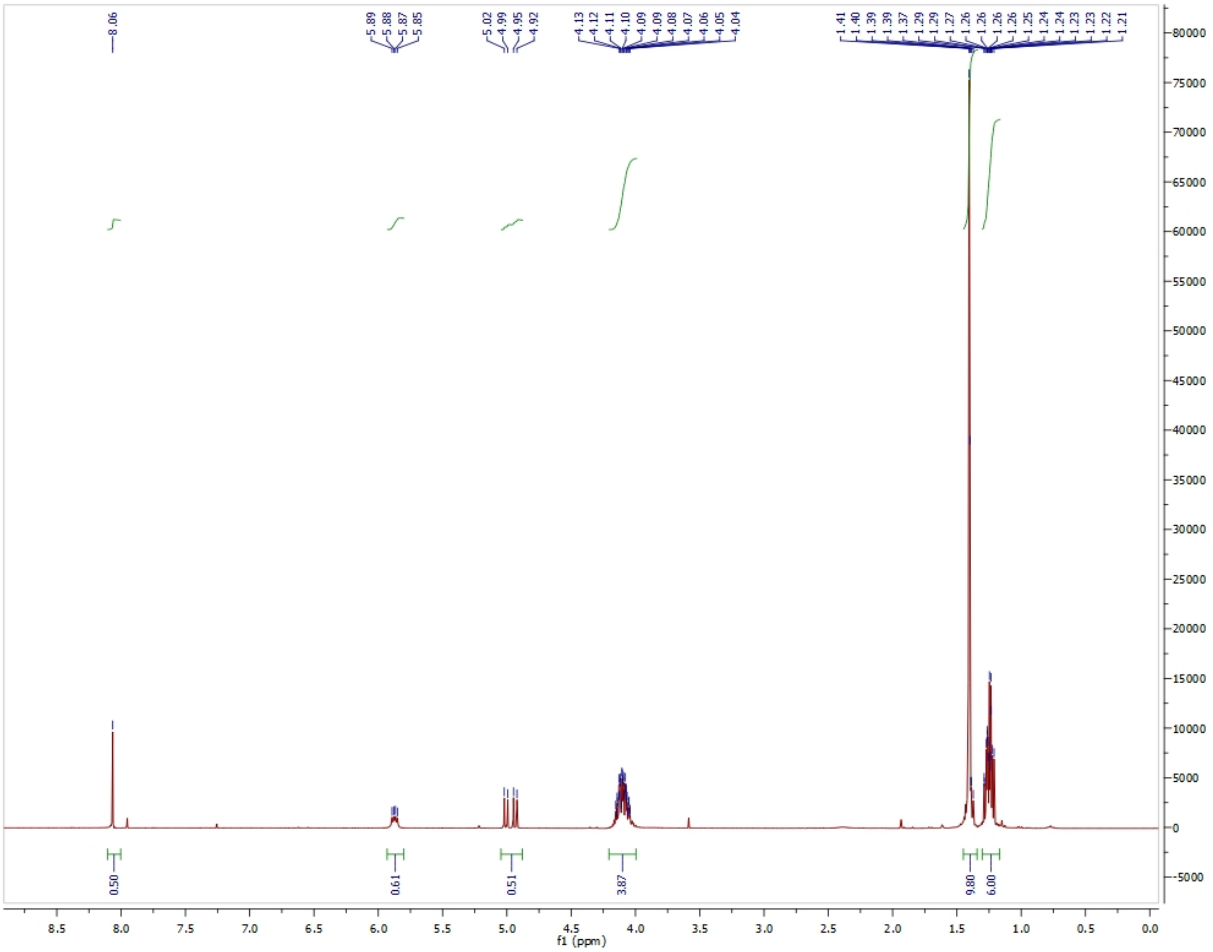
Yield: 35 %

^{1}H NMR (300 MHz, cd2cl2) δ = 8.07 (s, 1H), 5.89 – 5.85 (m, 1H), 4.96 (dd, *J*=21.4Hz, 8.0Hz, 1H), 4.18-4.02 (m, 5H), 1.40 (s, 9H), 1.31-1.13 (m, 6H).

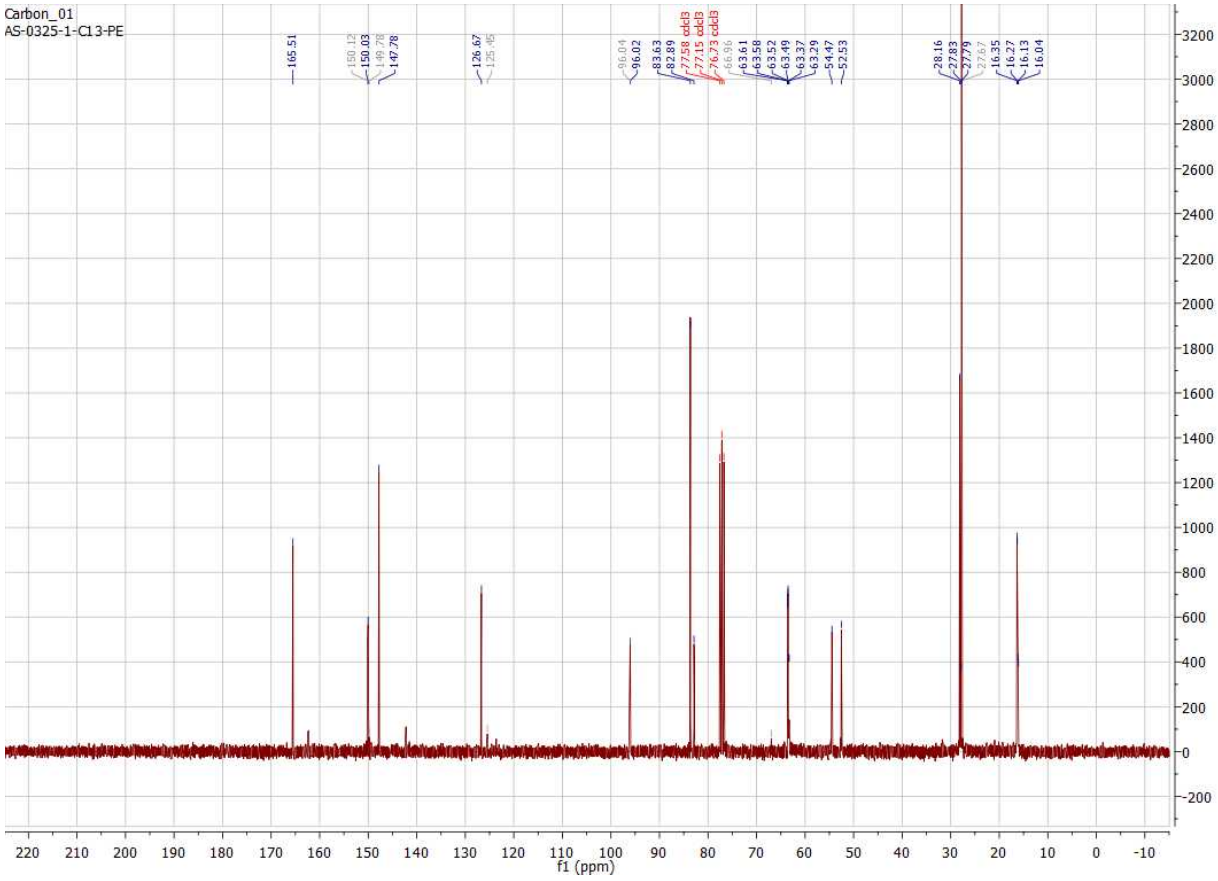
^{13}C NMR (75 MHz, cdcl3) δ = 165.51, 150.03, 147.78, 96.02, 83.63, 82.89, 63.61, 63.58, 63.25, 54.47, 52.53, 27.79, 16.27.

HRMS (m/z) [M+H] (C14H22N3O5PBrI) calculated 549.9598, observed 549.9592

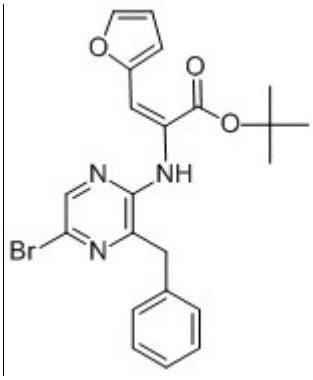
^{1}H NMR (**2c**)



^{13}C NMR (**2c)**


Carbon_01
AS-0325-1-C13-PE
165.51
150.12
150.03
149.78
147.78
126.67
125.45
96.04
96.02
83.63
82.89
77.58 cdcl3
77.15 cdcl3
76.73 cdcl3
66.96
63.61
63.58
63.52
63.49
63.37
63.29
54.47
52.53
28.16
27.83
27.79
27.67
16.35
16.27
16.13
16.04
f1 (ppm)

tert-butyl (E)-2-((3-benzyl-5-bromopyrazin-2-yl)amino)-3-(furan-2-yl)acrylate (**3a**)



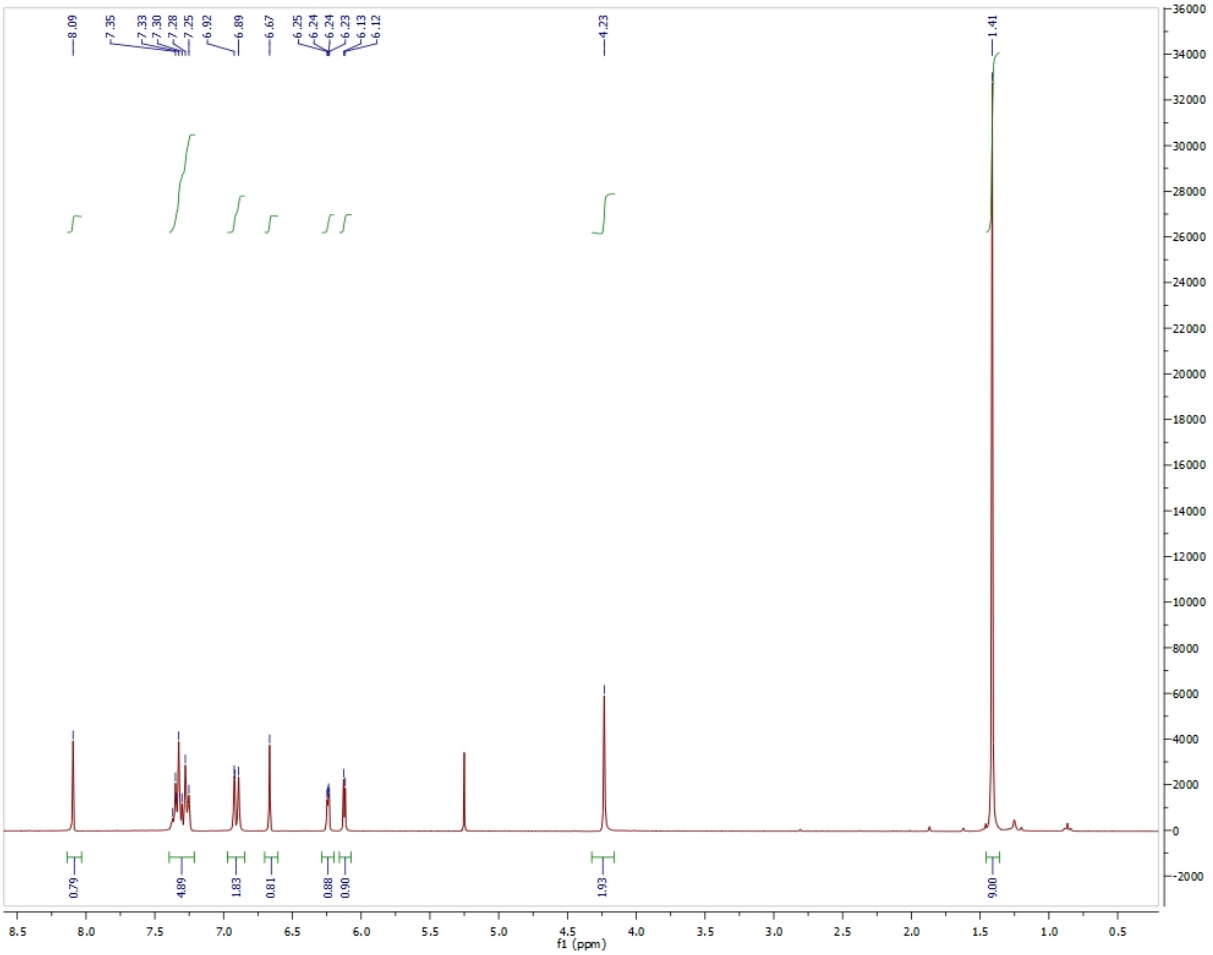
Yield: 75 %

^{1}H NMR (300 MHz, cd2cl2) δ = 8.10 (s, 1H), 7.39 – 7.26 (m, 5H), 6.94 (s, 1H), 6.88 (s, 1H), 6.67 (s, 1H), 6.25 (dd, *J*=3.6, 2.0Hz, 1H), 6.13 (d, *J*=3.3Hz, 1H), 4.24 (s, 2H), 1.42 (s, 9H).

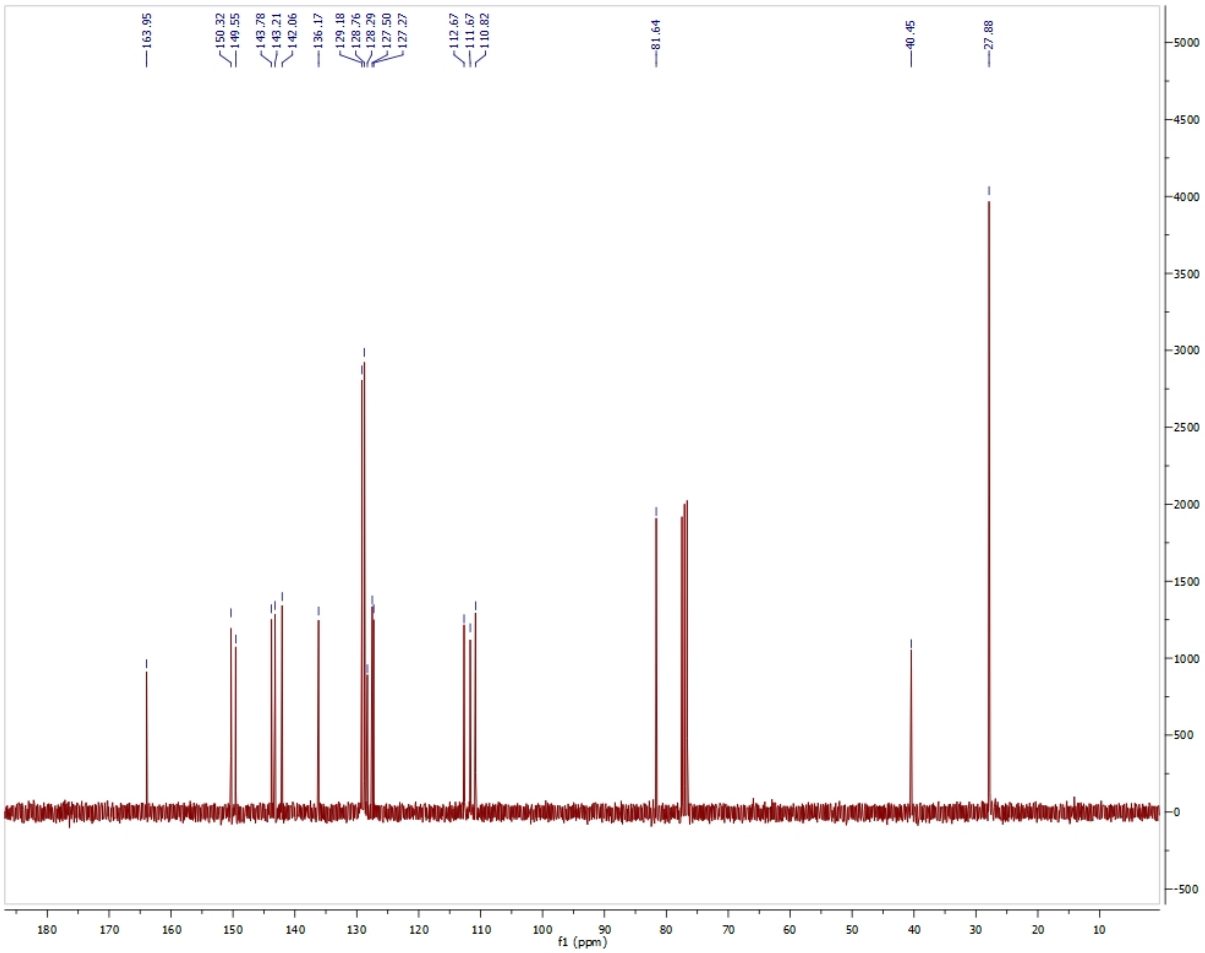
^{13}C NMR (75 MHz, cdcl3) δ = 163.95, 150.32, 149.55, 143.78, 143.21, 142.06, 136.17, 129.18, 128.76, 128.29, 127.50, 127.27, 112.67, 111.67, 110.82, 81.64, 40.45, 27.88.

HRMS (m/z) [M+H] (C22H22N3O3Br) calculated 456.0917, observed 456.0922.

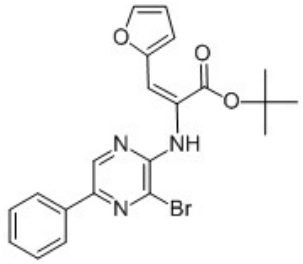
^{1}H NMR (**3a**)



^{13}C NMR (**3a)**


163.95
150.32
149.55
143.78
143.21
142.06
136.17
129.18
128.76
128.29
127.50
127.27
112.67
111.67
110.82
81.64
40.45
27.88
f1 (ppm)

tert-butyl (E)-2-((3-bromo-5-phenylpyrazin-2-yl)amino)-3-(furan-2-yl)acrylate (**3b**)



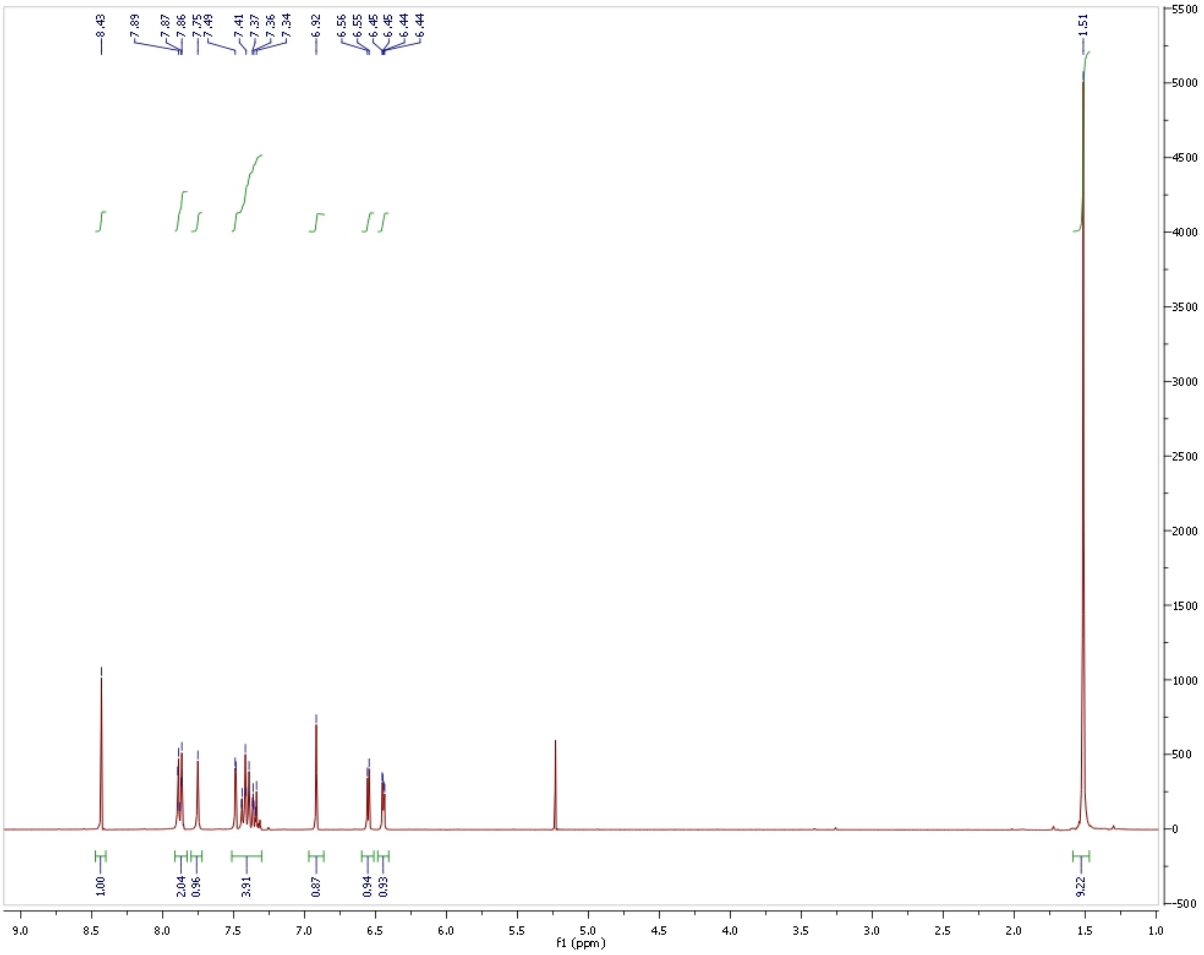
Yield: 91 %

^{1}H NMR (300 MHz, cd2cl2) δ = 8.43 (s, 1H), 7.89-7.85 (m, 2H), 7.75 (s, 1H), 7.48 (d, *J*=1.9Hz, 1H), 7.45-7.31 (m, 3H), 6.92 (s, 1H), 6.55 (d, *J*=3.4Hz, 1H), 6.44, (dd, *J*=3.4, 1.7Hz, 1H), 5.23 (s, 1H), 1.52 (s, 9H).

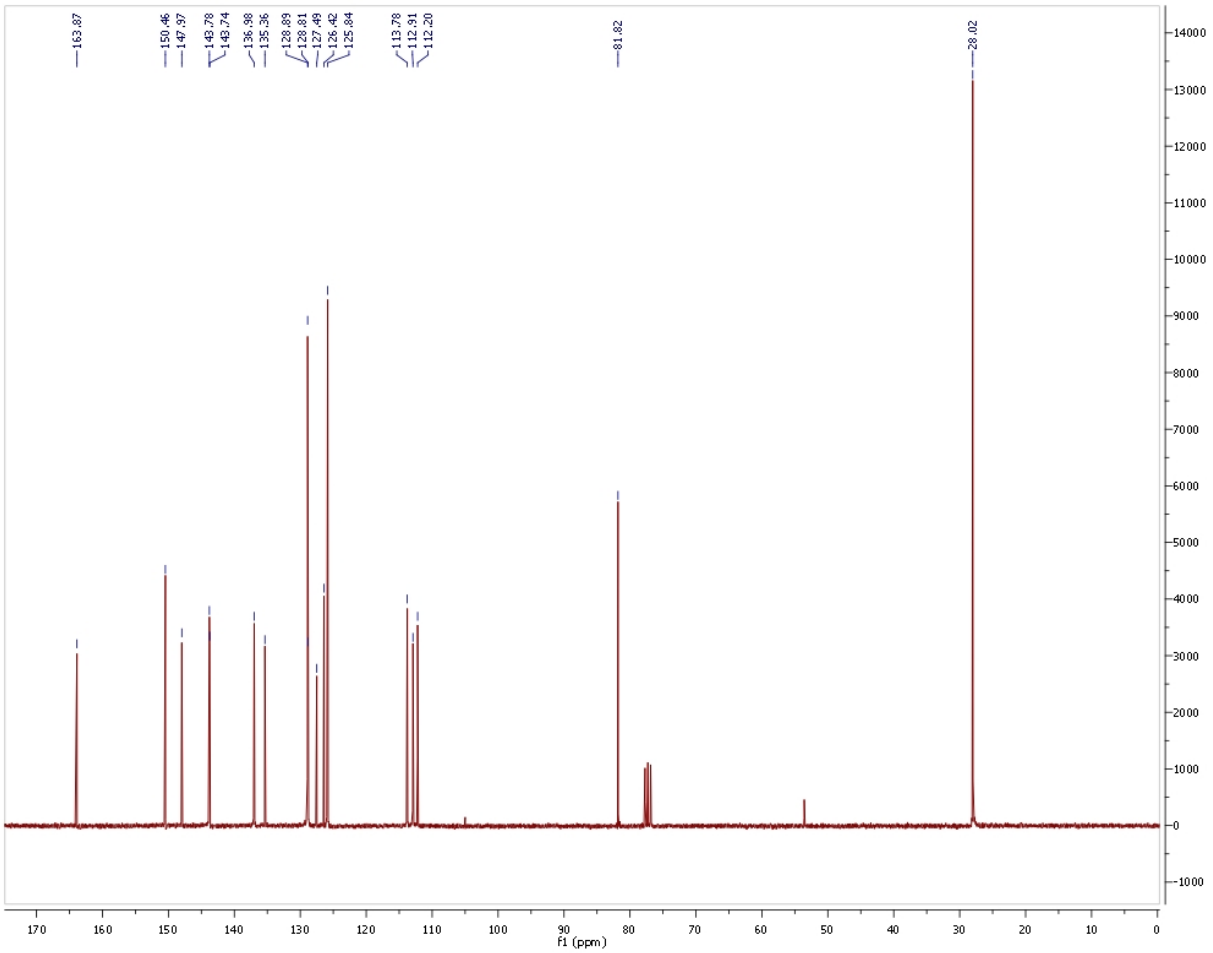
^{13}C NMR (75 MHz, cdcl3) δ = 163.87, 150.46, 147.97, 143.78, 136.98, 135.36, 128.89, 127.49, 126.42, 125.84, 113.78, 112.91, 112.70, 81.82, 28.02.

HRMS (m/z) [M+H] (C21H20N3O3Br) calculated 442.0761, observed 442.0768.

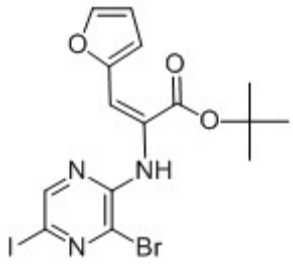
^{1}H NMR (**3b**)



^{13}C NMR (**3b)**


163.87
150.46
147.57
143.78
143.74
136.98
135.36
128.89
128.81
127.49
126.42
125.84
113.78
112.91
112.20
81.82
28.02
F1 (ppm)

tert-butyl (*E*)-2-((3-bromo-5-iodopyrazin-2-yl)amino)-3-(furan-2-yl)acrylate (**3c**)



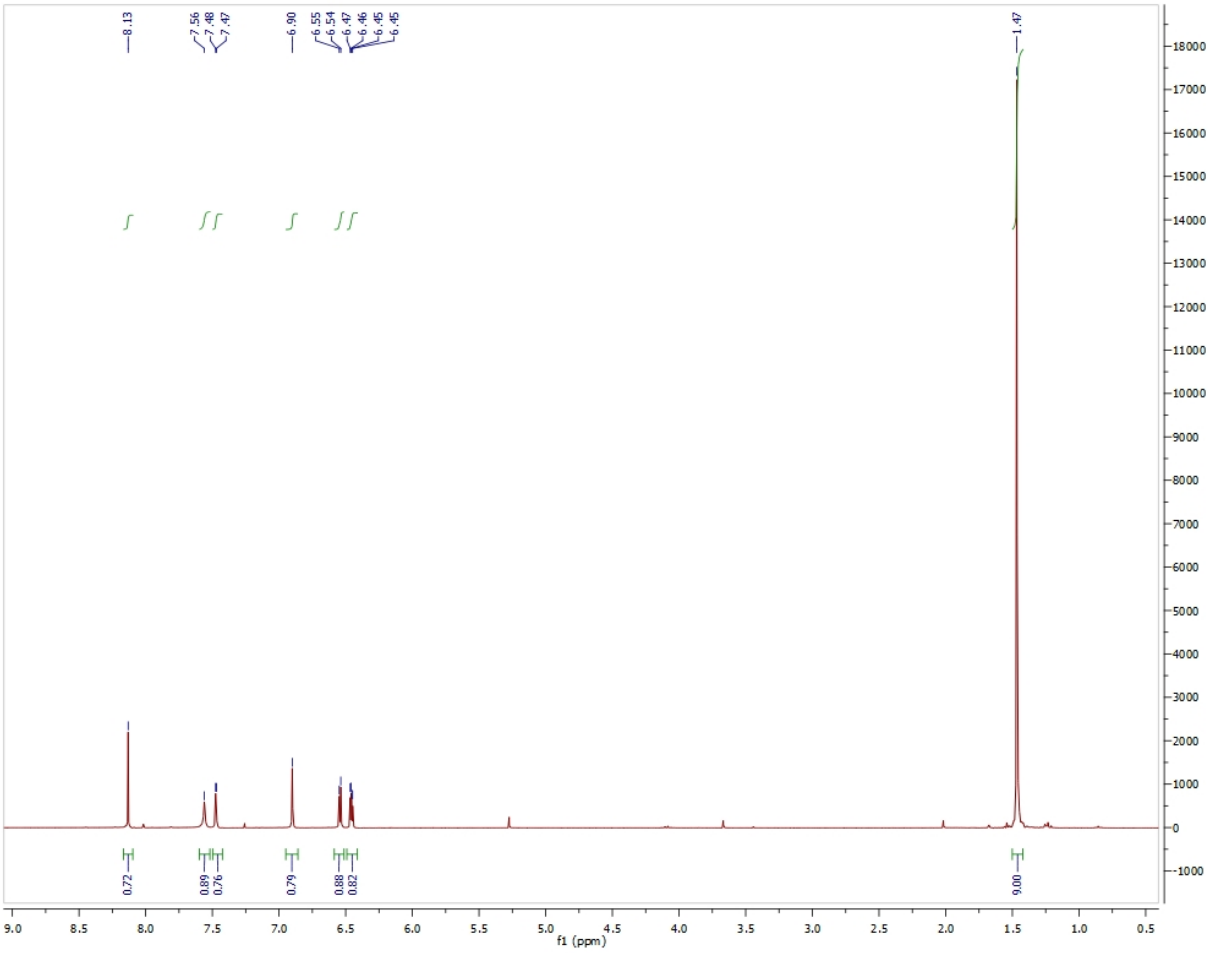
Yield: 79 %

^{1}H NMR (300 MHz, cd2cl2) δ = 8.13 (s, 1H), 7.56 (s, 1H), 7.47 (d, *J*=1.7Hz, 1H), 6.9 (s, 1H), 6.54 (d, *J*=3.6Hz, 1H), 6.46 (dd, *J*=3.1,1.3Hz, 1H), 1.47 (s, 9H).

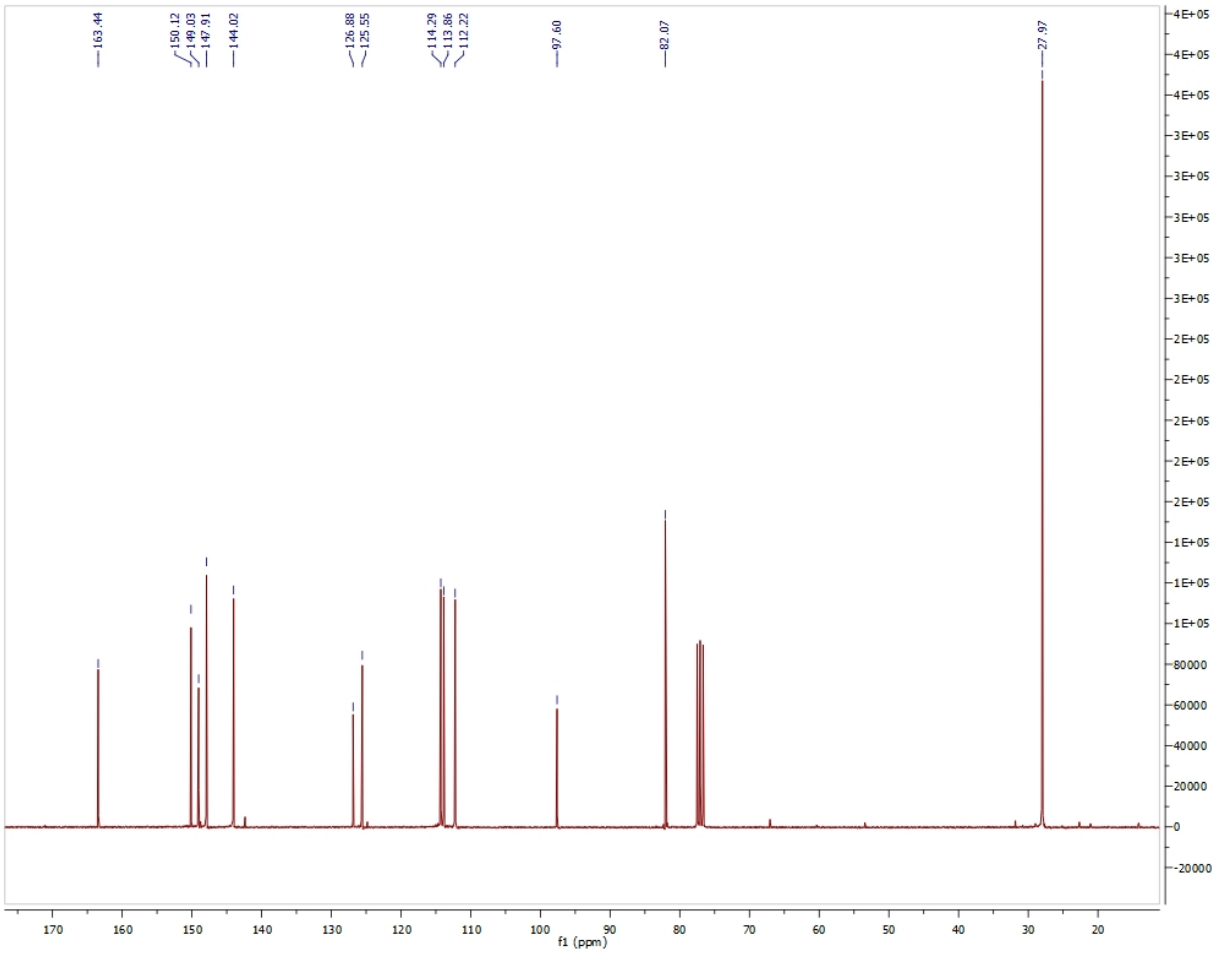
^{13}C NMR (75 MHz, cdcl3) δ = 163.44, 150.12, 149.03, 147.91, 144.02, 126.88, 125.55, 114.29, 113.86, 112.22, 97.60, 82.07, 27.97.

HRMS (m/z) [M+H] (C15H15N3O3BrI) calculated 491.9414, observed 491.9411.

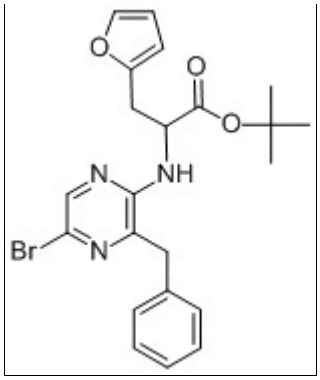
^{1}H NMR (**3c**)



^{13}C NMR (**3c)**


163.44
150.12
149.03
147.91
144.02
126.88
125.55
114.29
113.86
112.22
97.60
82.07
27.97
f1 (ppm)

tert-butyl 2-((3-benzyl-5-bromopyrazin-2-yl)amino)-3-(furan-2-yl)propanoate (**4a**)



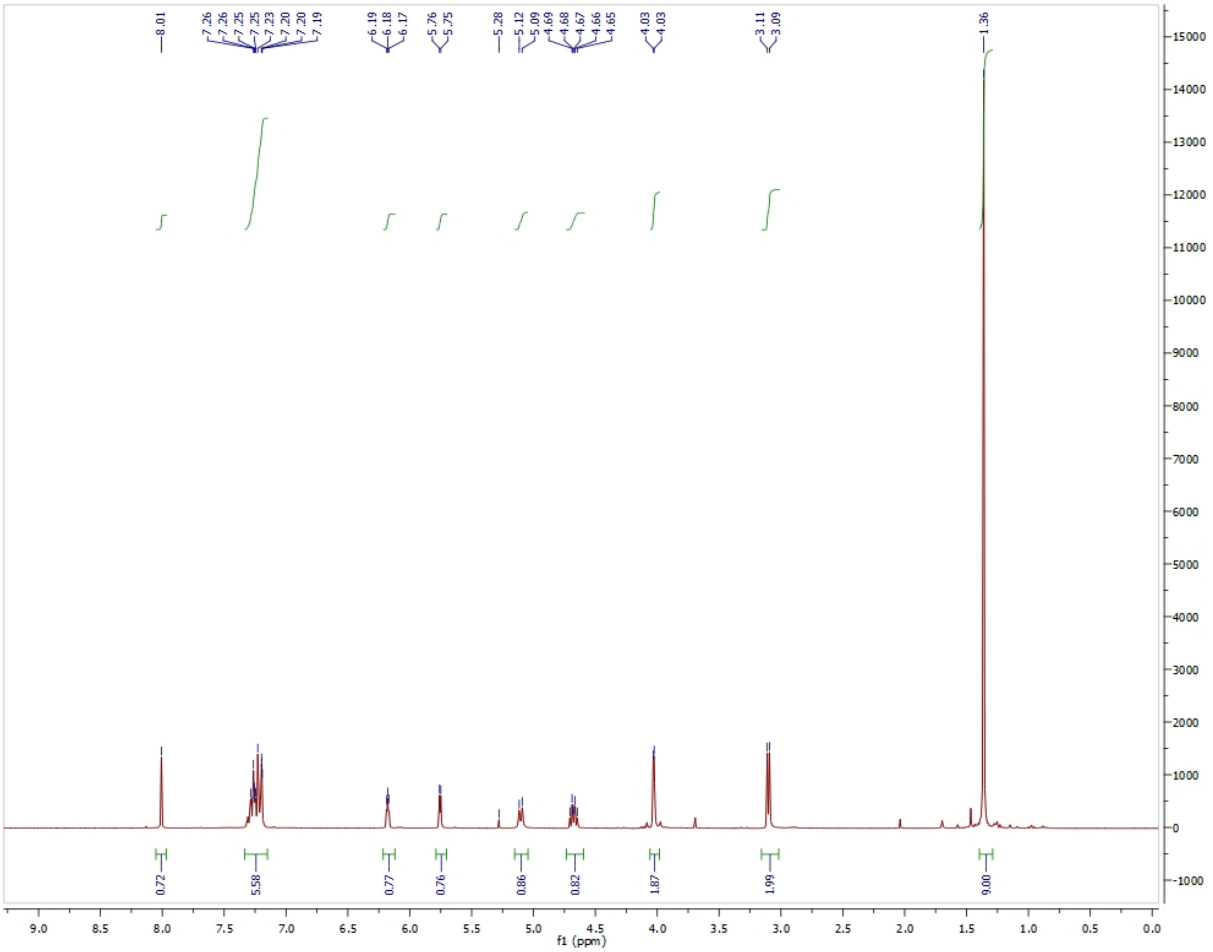
Yield: 89 %

^{1}H NMR (300 MHz, cd2cl2) δ = 8.01 (s, 1H), 7.32-7.19 (m, 5H), 6.19-6.17 (m, 1H), 5.75 (d, *J*=3.3Hz, 1H), 5.11 (d, *J*=6.0Hz, 1H), 4.71-4.65 (m, 1H), 4.06 (d, *J*=3.6Hz, 2H), 3.10 (d, *J*=5.6Hz, 2H), 1.36 (s, 9H).

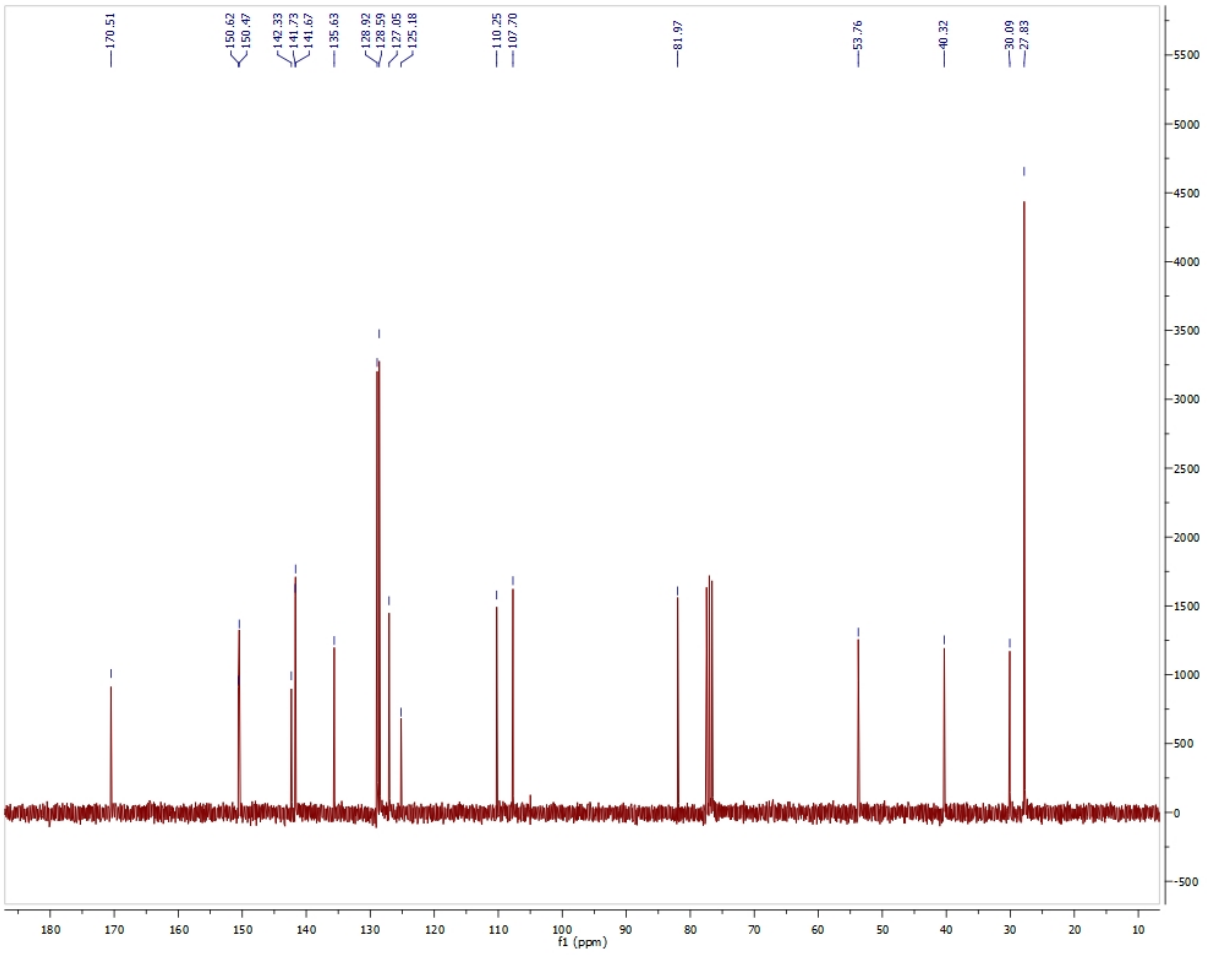
^{13}C NMR (75 MHz, cdcl3) δ = 170.51, 150.62, 142.33, 141.73, 135.63, 128.92, 128.59, 127.05, 125.18, 110.25, 110.70, 81.97, 53.76, 40.32, 30.09, 27.83.

HRMS (m/z) [M+H] (C22H24N3O3Br) calculated 458.1074, observed 458.1072.

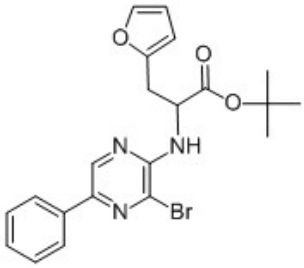
^{1}H NMR (**4a**)



^{13}C NMR (**4a)**


170.51
150.62
150.47
142.33
141.73
141.67
135.63
128.92
128.59
127.05
125.18
110.25
107.70
81.97
53.76
40.32
30.09
27.83
f1 (ppm)

tert-butyl 2-((3-bromo-5-phenylpyrazin-2-yl)amino)-3-(furan-2-yl)propanoate (**4b**)



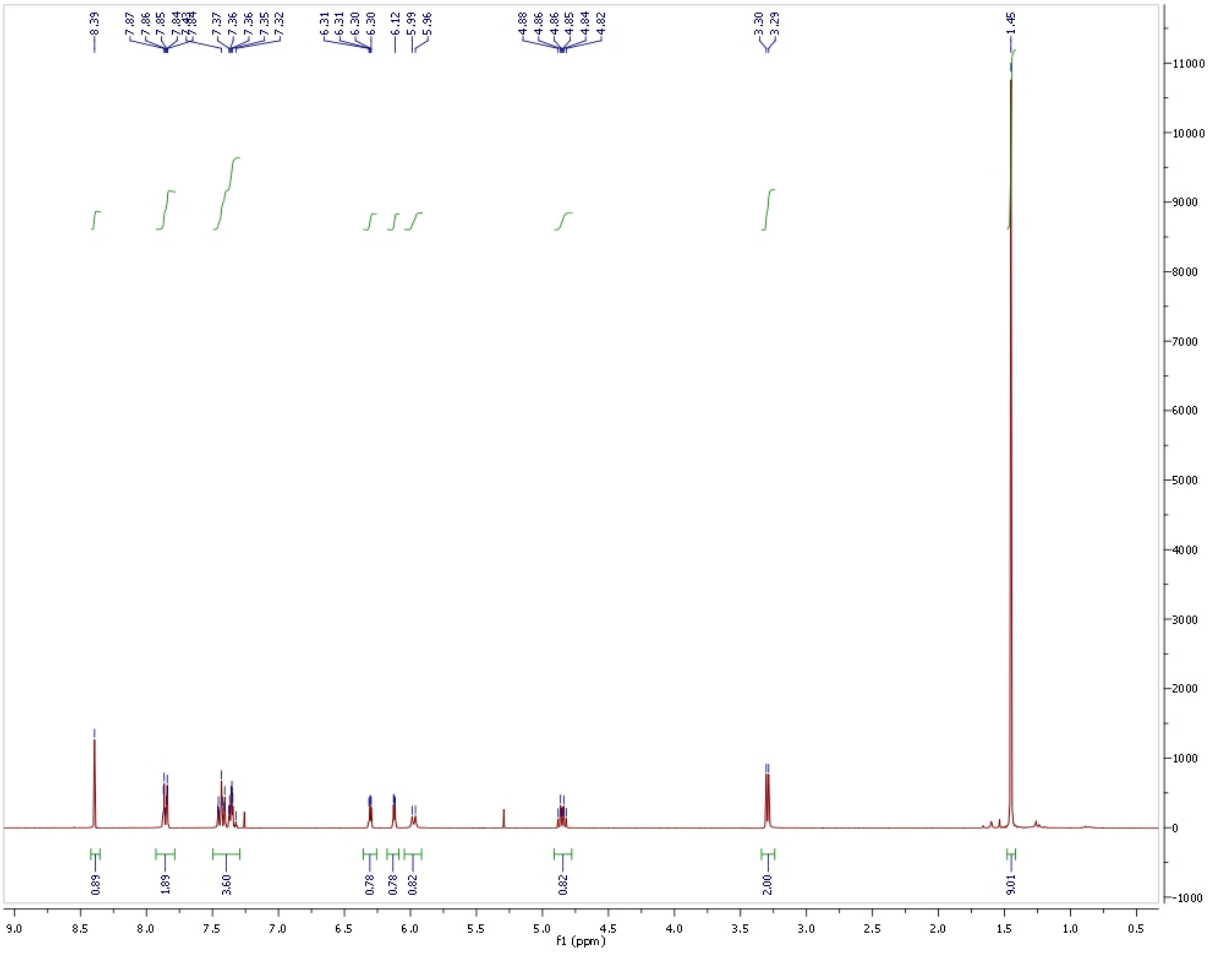
Yield: 81 %

^{1}H NMR (300 MHz, cdcl3) δ = 8.39 (s, 1H), 7.93 – 7.79 (m, 2H), 7.50 – 7.29 (m, 3H), 6.31 (dd, *J*=1.9, 3.2, 1H), 6.12 (dd, *J*=0.6, 3.2, 1H), 5.97 (d, *J*=7.5, 1H), 4.85 (dt, *J*=5.4, 7.5, 1H), 3.30 (d, *J*=5.4, 2H), 1.45 (s, 9H).

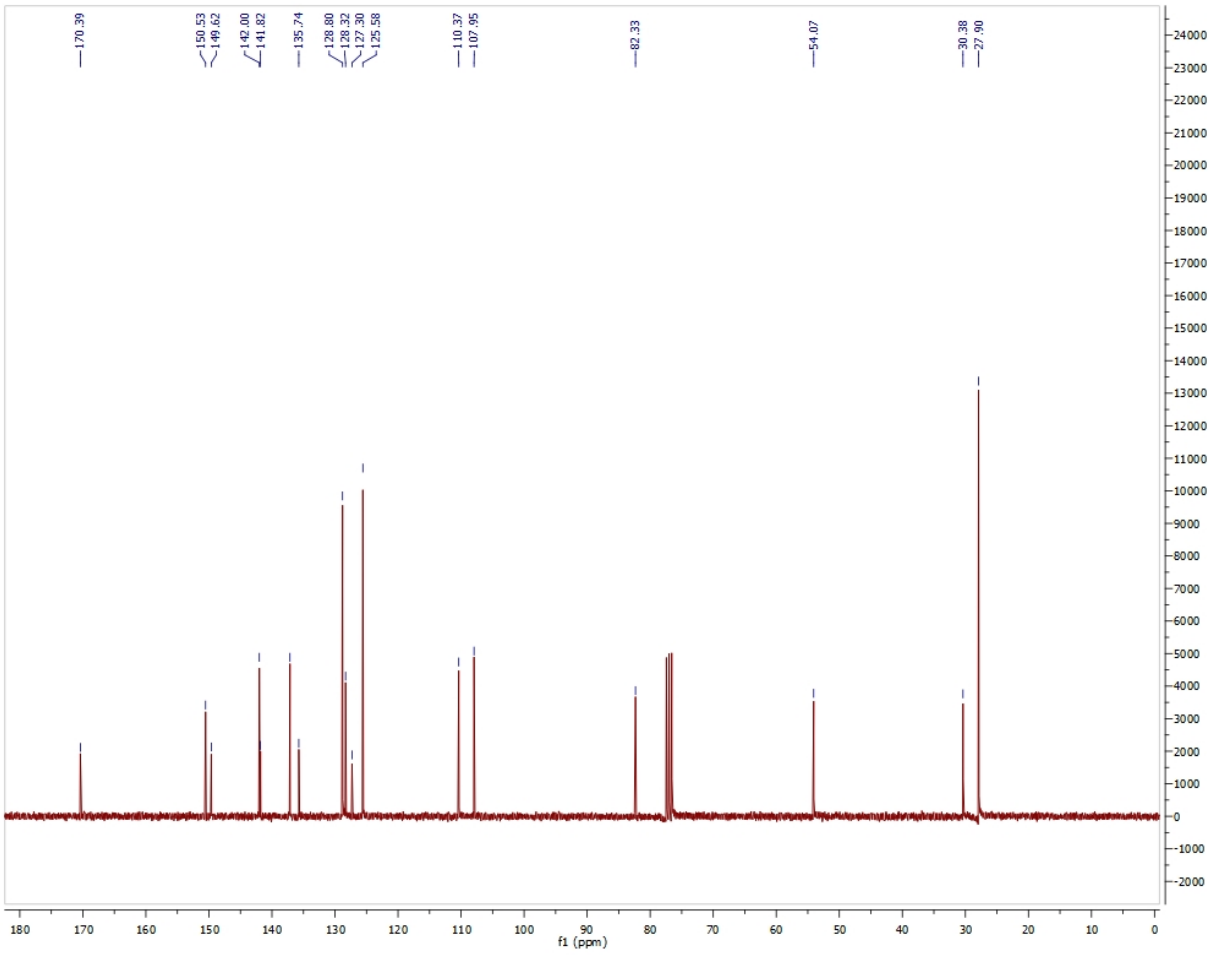
^{13}C NMR (75 MHz, cdcl3) δ = 170.4, 150.5, 149.6, 142.0, 141.8, 135.7, 128.8, 128.3, 127.3, 125.6, 110.4, 107.9, 82.3, 54.0, 30.4, 27.9.

HRMS, C21H22N3O3Br, (m/z) [M+H] calculated: 444.0917, observed: 444.0918.

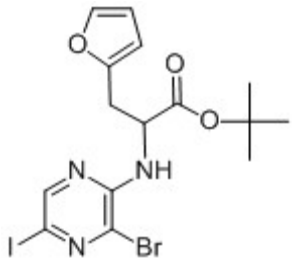
^{1}H NMR (**4b**)



^{13}C NMR (**4b)**


170.39
150.53
149.62
142.00
141.82
135.74
128.80
128.32
127.30
125.58
110.37
107.95
82.33
54.07
30.38
27.90
f1 (ppm)

tert-butyl 2-((3-bromo-5-iodopyrazin-2-yl)amino)-3-(furan-2-yl)propanoate (**4c**)



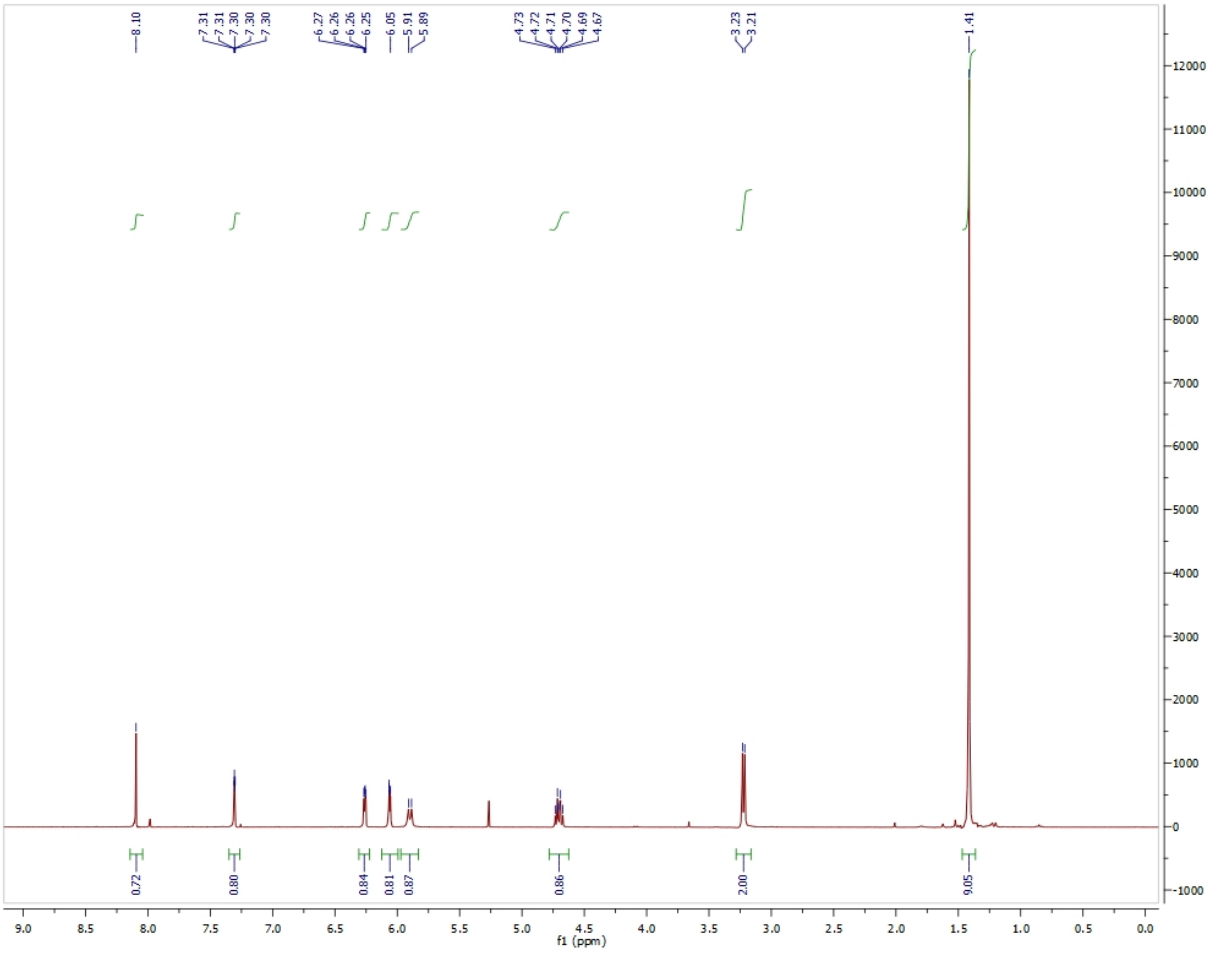
Yield: 67 %

^{1}H NMR (300 MHz, cdcl3) δ = 8.10 (s, 1H), 7.35 – 7.26 (m, 1H), 6.26 (dd, *J*=1.9, 3.1, 1H), 6.06 (dd, *J*=0.5, 3.2, 1H), 5.90 (d, *J*=7.4, 1H), 4.70 (dt, *J*=5.4, 7.4, 1H), 3.22 (d, *J*=5.4, 2H), 1.41 (s, 9H).

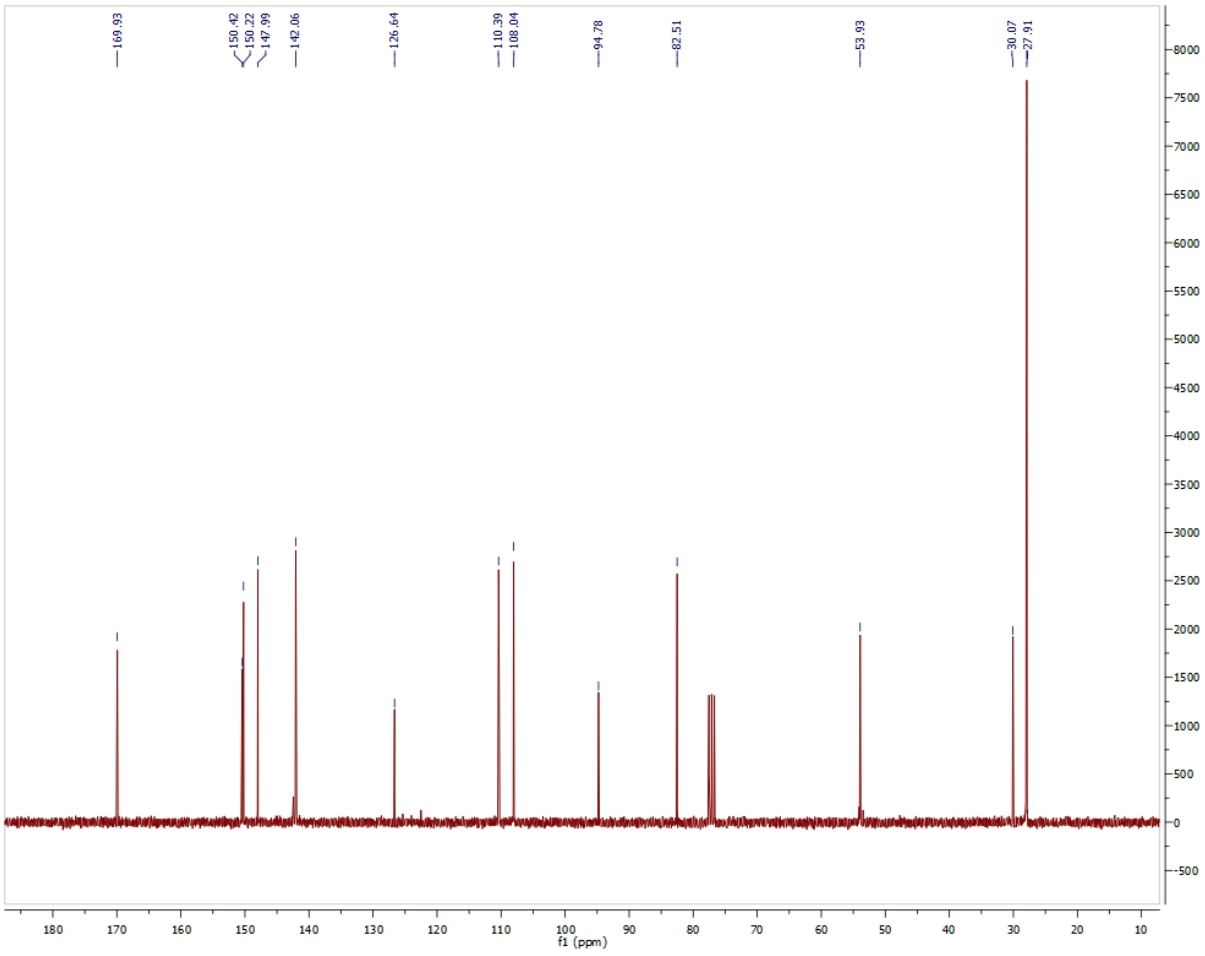
^{13}C NMR (75 MHz, cdcl3) δ = 169.9, 150.4, 150.2, 147.9, 142.1, 126.6, 110.4, 110.4, 94.8 82.5 53.9 30.0, 27.9.

HRMS, C15H17N3O3BrI, (m/z) [M+H] calculated: 493.9571, observed: 493.9568.

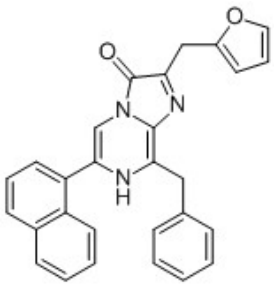
^{1}H NMR (**4c**)



^{13}C NMR (**4c)**


169.93
150.42
150.22
147.99
142.06
126.64
110.39
108.04
94.78
82.51
53.93
30.07
27.91
f1 (ppm)

8-benzyl-2-(furan-2-ylmethyl)-6-(naphthalen-1-yl)imidazo[1,2-a]pyrazin-3(7H)-one (**F2**)



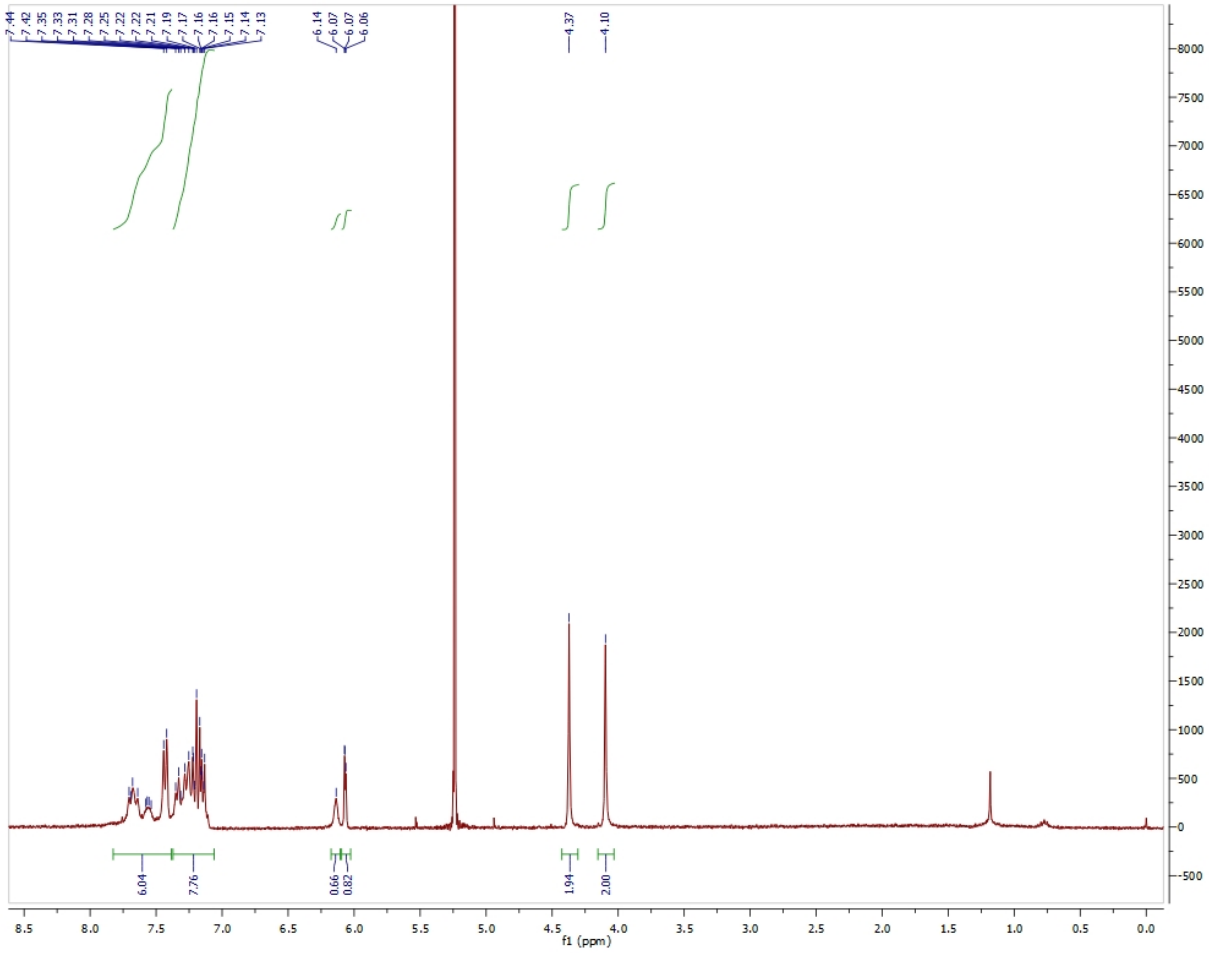
Yield: 8 %

^{1}H NMR (300 MHz, cd2cl2) δ = 7.72 – 7.38 (m, 6H), 7.35 – 7.14 (m, 8H), 6.12 (m, 1H), 6.06 (m, 1H), 4.38 (s, 2H), 4.09 (s, 2H).

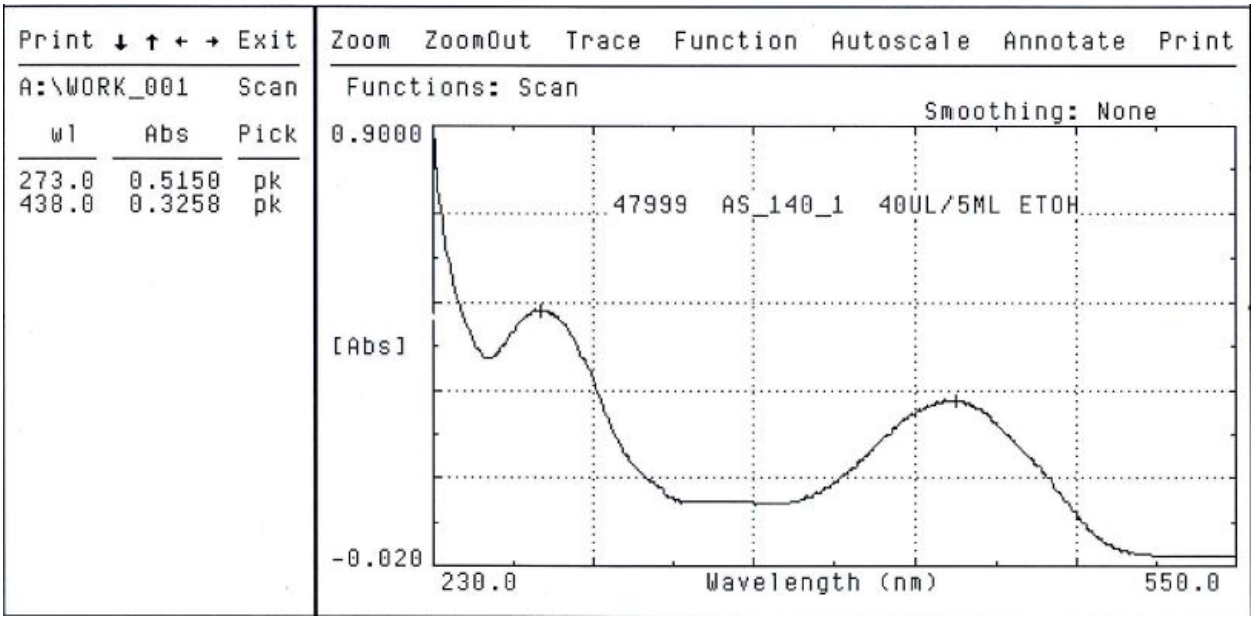
HRMS (C28H21N3O2), (m/z) $[M+H]^+$ calculated 432.1707 observed 432.1711

UV/Vis (methanol): λ^{max} (ε)=273 (15151 $mol^{-1}dm^3cm^{-1}$);

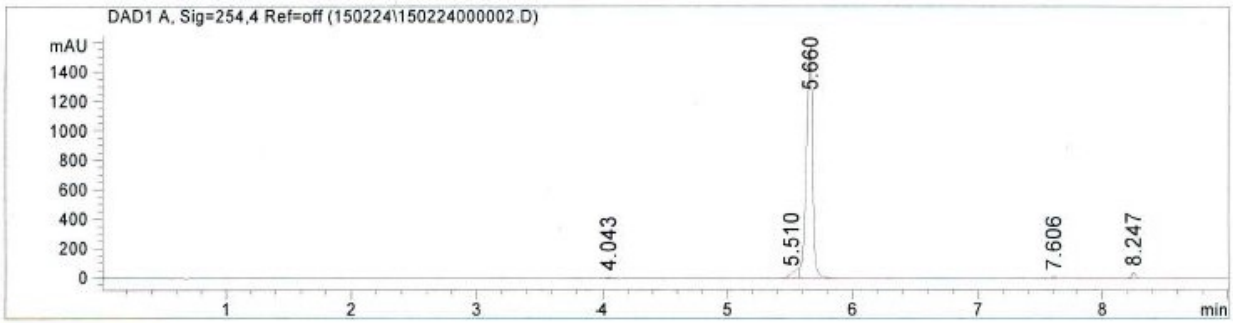
^{1}H NMR (**F2**)


7.44
7.42
7.35
7.33
7.31
7.28
7.25
7.22
7.22
7.21
7.19
7.17
7.16
7.16
7.15
7.14
7.13
6.14
6.07
6.07
6.06
4.37
4.10
6.04
7.76
0.66
0.82
1.94
2.00
f1 (ppm)

UV/Vis spectra (**F2**)

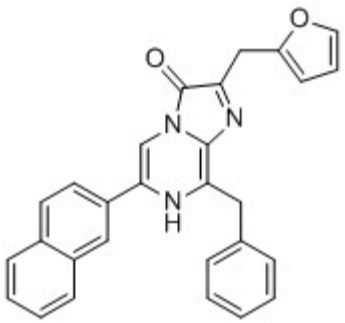


HPLC trace (**F2**)



HPLC purity 94% @ 254nm

8-benzyl-2-(furan-2-ylmethyl)-6-(naphthalen-2-yl)imidazo[1,2-a]pyrazin-3(7H)-one (**F3**)



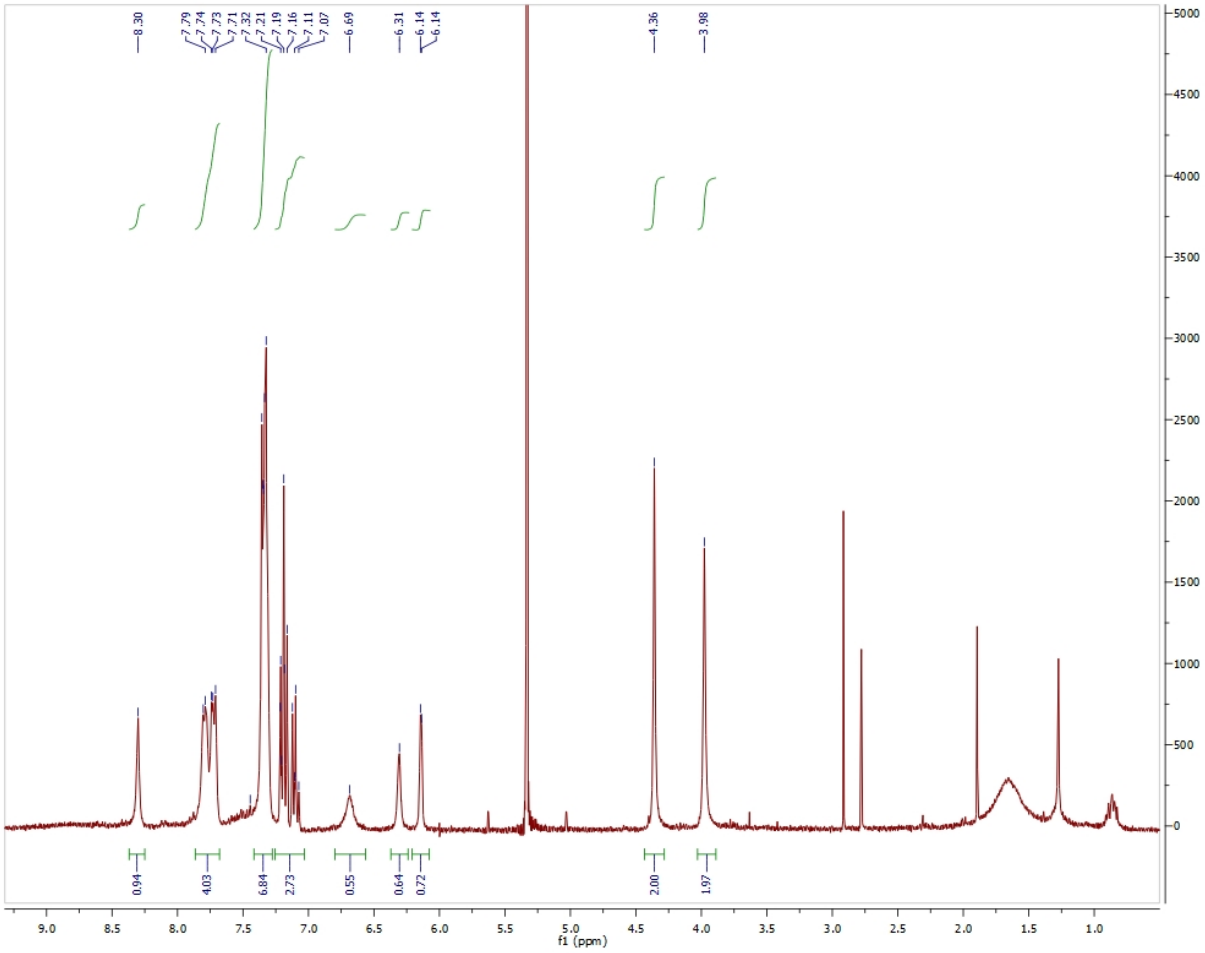
Yield: 7 %

^{1}H NMR (300 MHz, cd2cl2) δ = 8.30 (s, 1H), 7.86 – 7.68 (m, 4H), 7.42 – 7.28 (m, 6H), 7.26 – 7.03 (m, 6H), 6.69 (s, 1H), 6.31 (s, 1H), 6.14 (d, *J*=2.5, 1H), 4.36 (s, 2H), 3.98 (s, 2H).

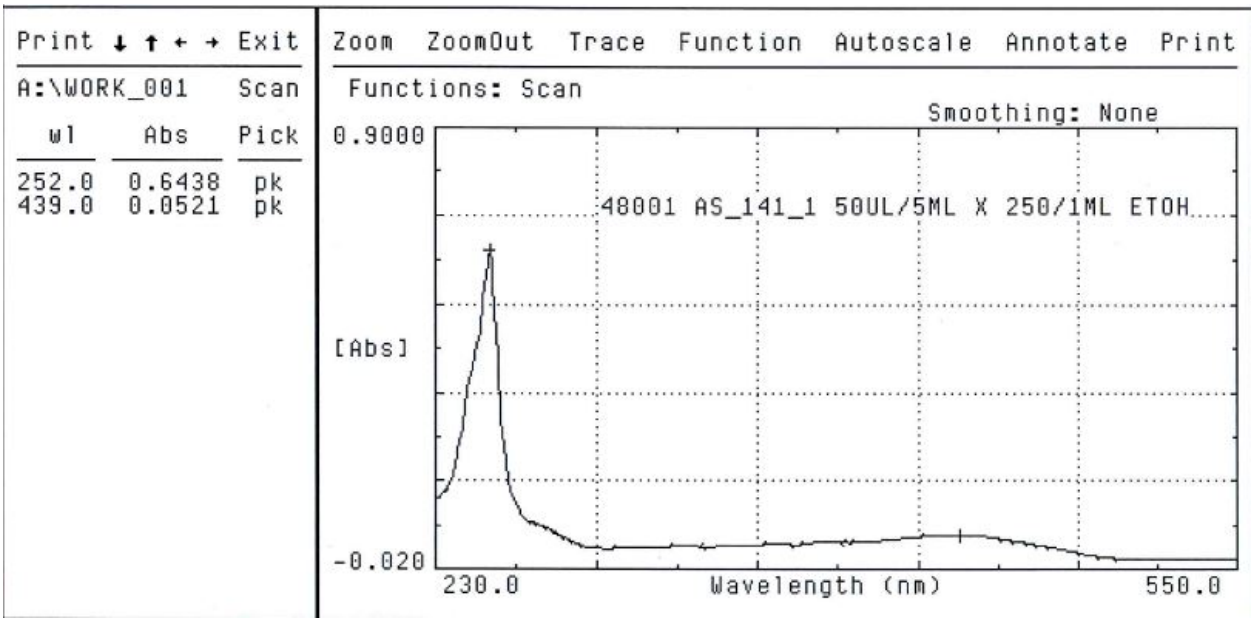
LC/MS (C28H21N3O2), (m/z) $[M+H]^{+}$ calculated 432.16 observed 432.48

UV/Vis (ethanol): λ^{max} (ε)=252 (83339 $mol^{-1}dm^{3}cm^{-1}$);

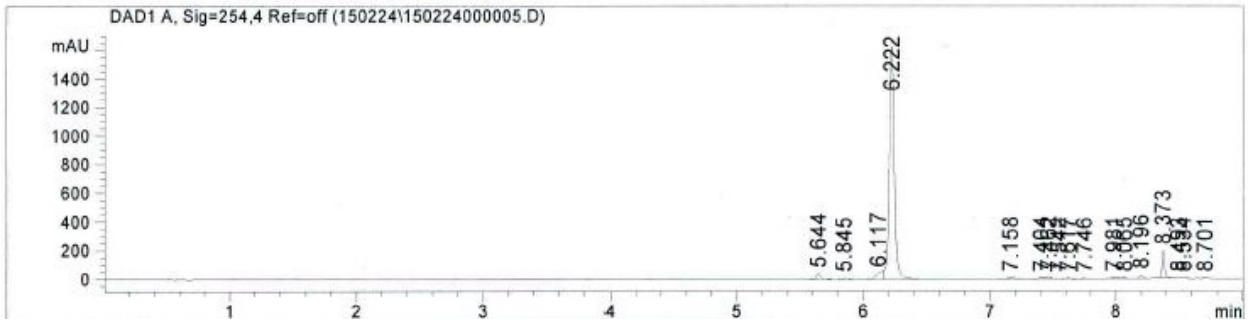
^{1}H NMR (**F3**)


8.30
7.79
7.74
7.73
7.71
7.32
7.21
7.19
7.16
7.11
7.07
6.69
6.31
6.14
6.14
4.36
3.98
0.94
4.03
6.84
2.73
0.55
0.64
0.72
2.00
1.97
f1 (ppm)

UV/Vis spectra (**F3**)

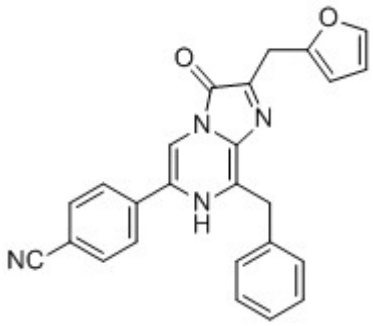


HPLC trace (**F3**)



HPLC purity 86% @ 254nm

4-(8-benzyl-2-(furan-2-ylmethyl)-3-oxo-3,7-dihydroimidazo[1,2-a]pyrazin-6-yl)benzonitrile (**F4**)



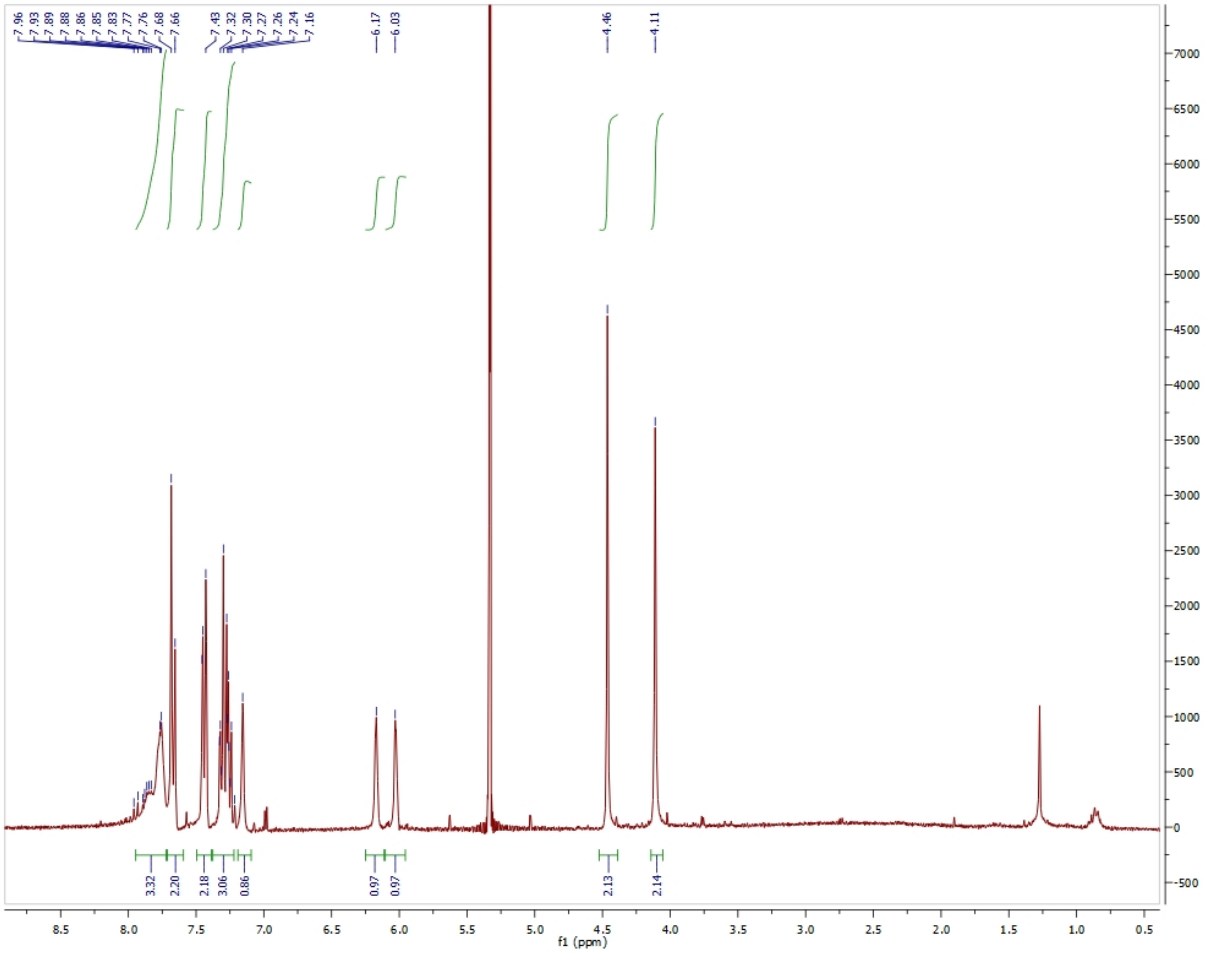
Yield: 20 %

^{1}H NMR (300 MHz, cd2cl2) δ = 7.95 – 7.72 (m, 3H), 7.67 (d, *J*=8.3, 2H), 7.49 – 7.39 (m, 2H), 7.28 m, 3H), 7.16 (s, 1H), 6.17 (s, 1H), 6.03 (s, 1H), 4.46 (s, 2H), 4.11 (s, 2H).

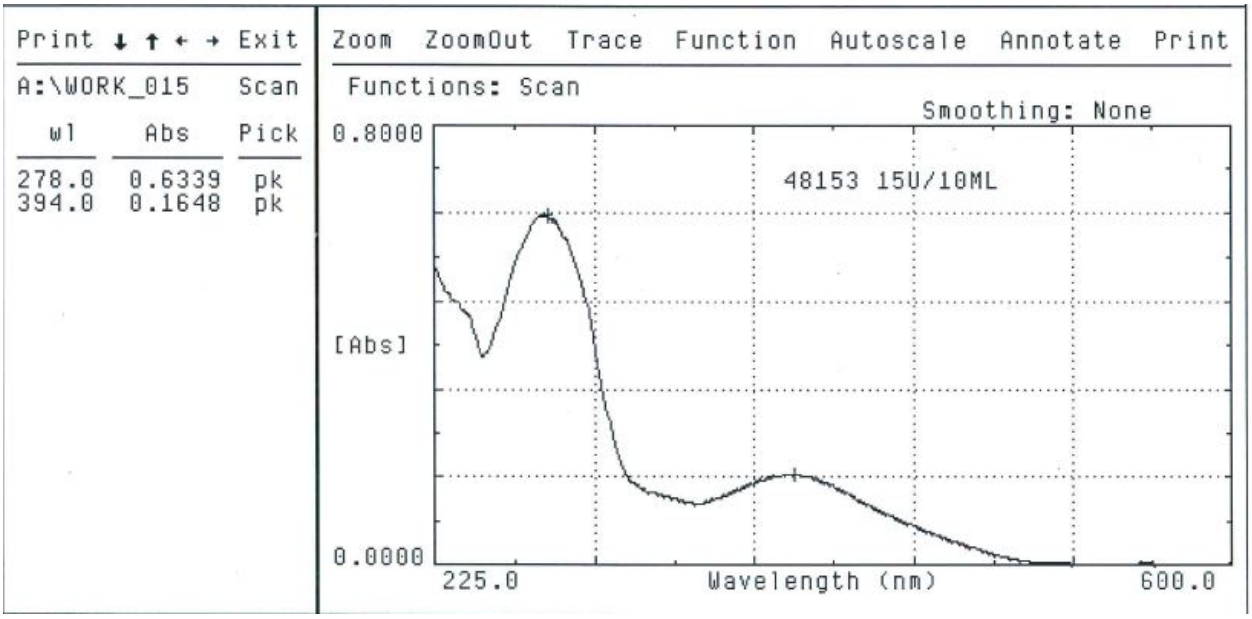
HRMS (C25H18N4O2), (m/z) $[M+H]^{+}$ calculated 407.1503 observed 407.1507

UV/Vis (methanol): λ^{max} (ε)=278 (18569 $mol^{-1}dm^{3}cm^{-1}$);

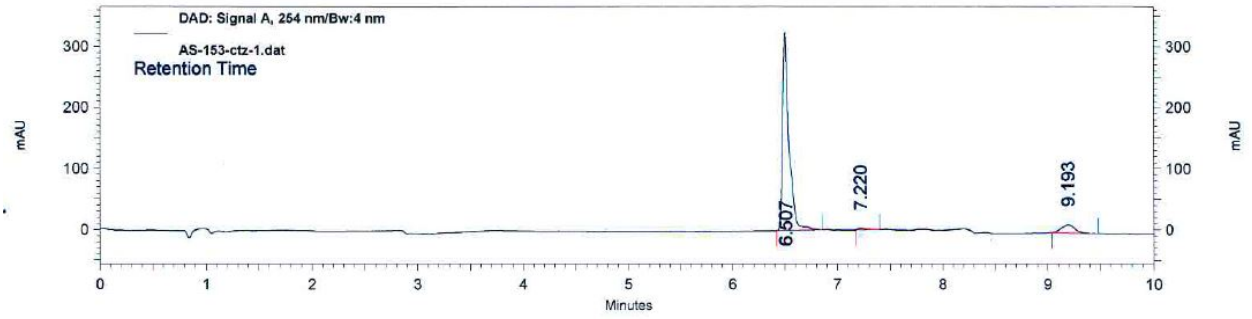
^{1}H NMR (**F4**)


7.96
7.93
7.89
7.88
7.86
7.85
7.83
7.77
7.76
7.68
7.66
7.43
7.32
7.30
7.27
7.26
7.24
7.16
6.17
6.03
4.46
4.11
3.32
2.20
2.18
3.06
0.86
0.97
0.97
2.13
2.14
f1 (ppm)

UV/Vis spectra (**F4**)



HPLC trace (**F4**)



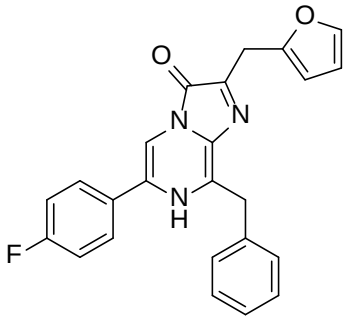
HPLC purity 80% at 280nm

8-benzyl-6-(4-fluorophenyl)-2-(furan-2-ylmethyl)imidazo[1,2-a]pyrazin-3(7H)-one (**F5**)

^{1}H NMR (300 MHz, cd2cl2) δ = 7.45-7.41 (m, 5H), 7.32-7.22 (m, 4H), 7.00 (t, *J* = 8.5Hz, 2H), 6.22 (s, 1H), 6.07 (s, 1H), 4.43 (s, 2H), 4.12 (s, 1H).

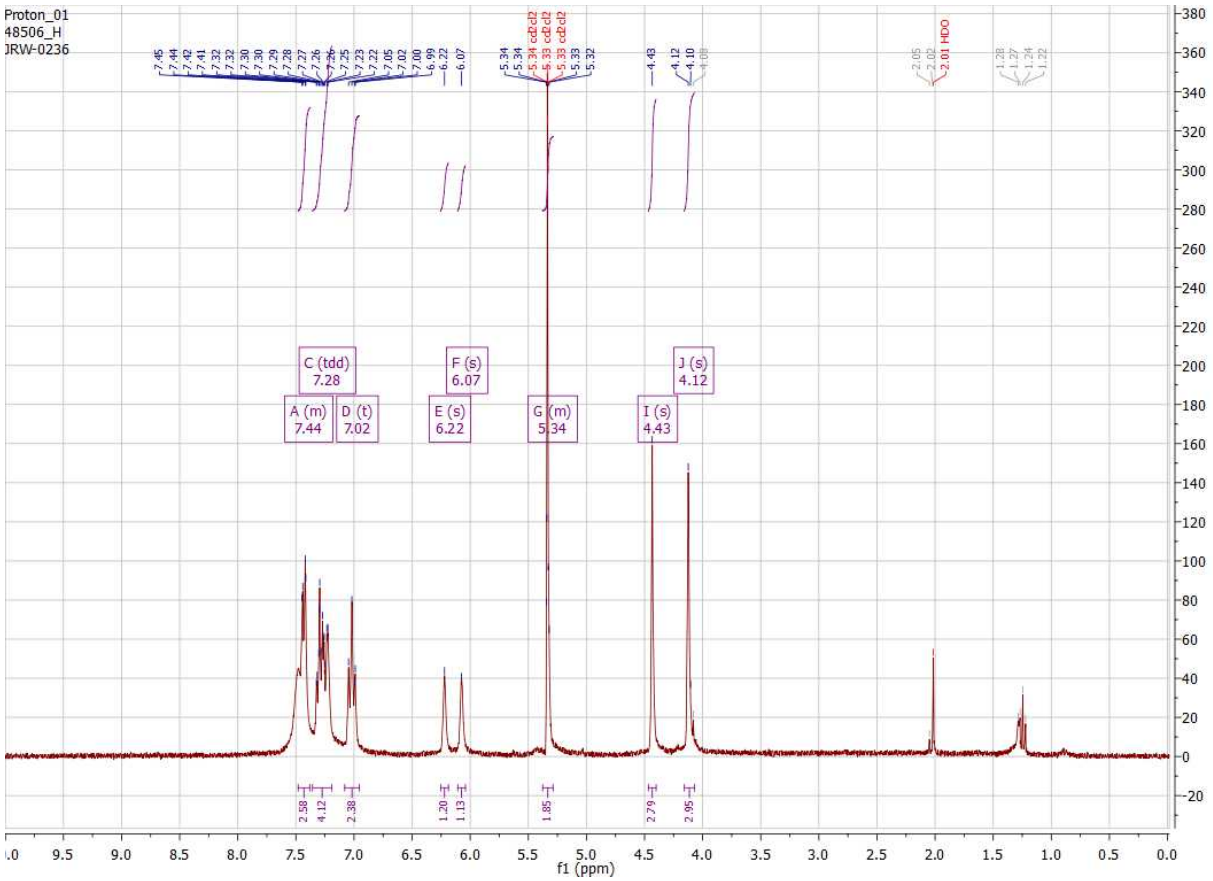
HRMS (C24H18N3O2F), (m/z) $[M+H]^+$ calculated 400.1456 observed 400.1456

UV/Vis (ethanol): λ^{max} (ε)=252 (15447 $mol^{-1}dm^3cm^{-1}$);

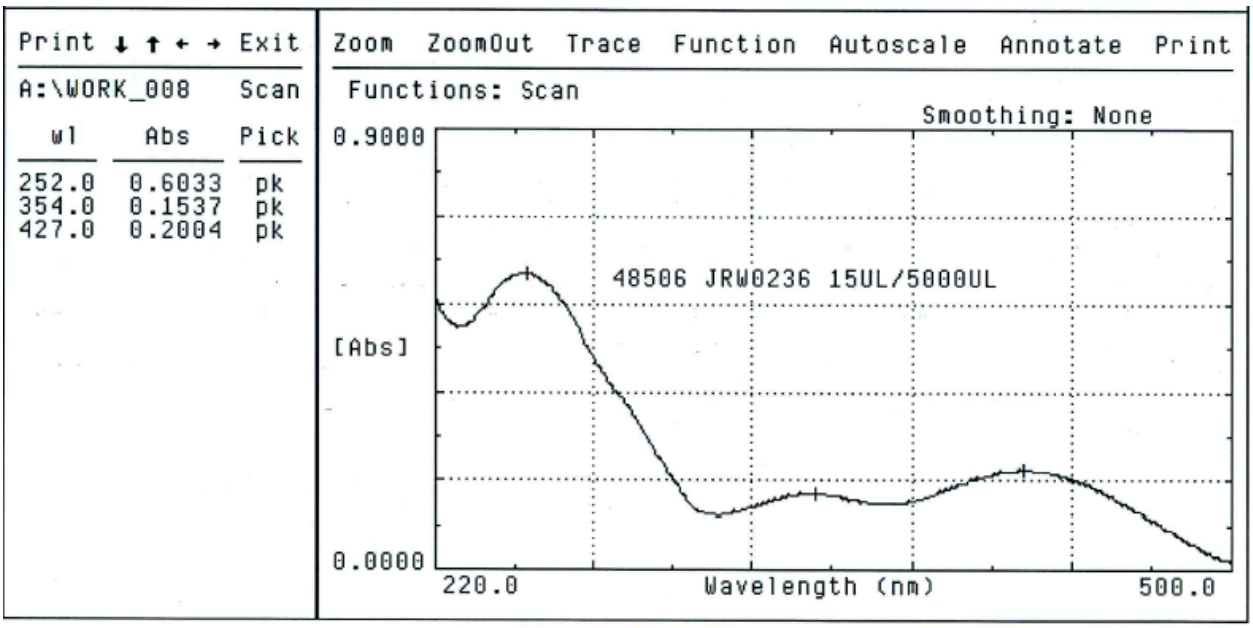


Yield: 31 %

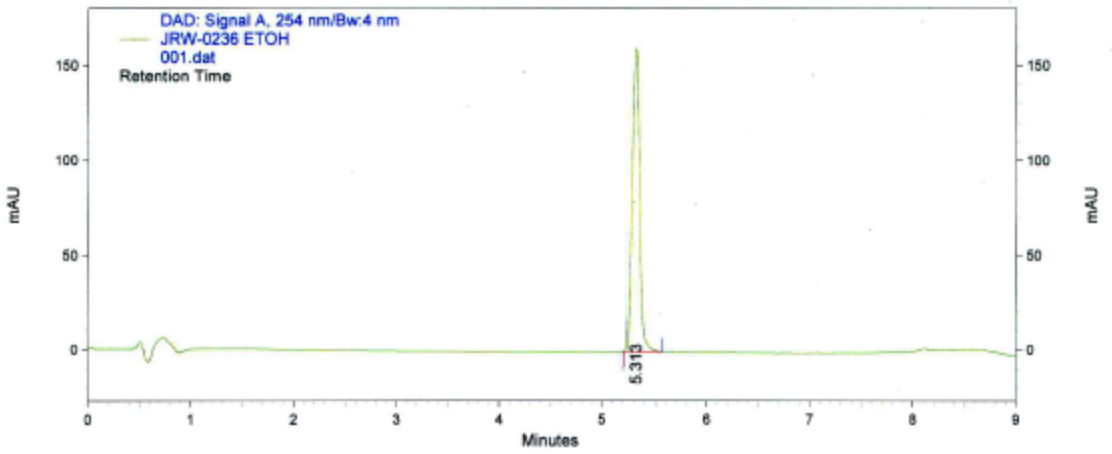
^{1}H NMR (**F5**)


Proton_01
48506_H
JRW-0236
C (tdd)
7.28
A (m)
7.44
D (t)
7.02
F (s)
6.07
E (s)
6.22
G (m)
5.34
I (s)
4.43
J (s)
4.12
f1 (ppm)

UV/Vis spectra (**F5**)



HPLC trace (**F5**)



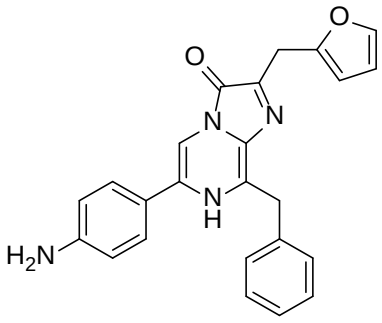
^{1}H NMR (300 MHz, cd2cl2) δ = 7.49 (s, 1H), 7.40 (d, *J*=8.4Hz, 2H), 7.34-7.22 (m, 8H), 6.72 (d, J=8.4Hz, 2H), 6.32-6.30 (m, 1H), 6.17-6.15 (m, 1H), 4.39 (s, 2H), 4.19 (s, 1H).

HRMS (C24H20N4O2), (m/z) $[M+H]^{+}$ calculated 397.1659 observed 397.1658

UV/Vis (ethanol): λ^{max} (ε)=274 (11596 $mol^{-1}dm^{3}cm^{-1}$);

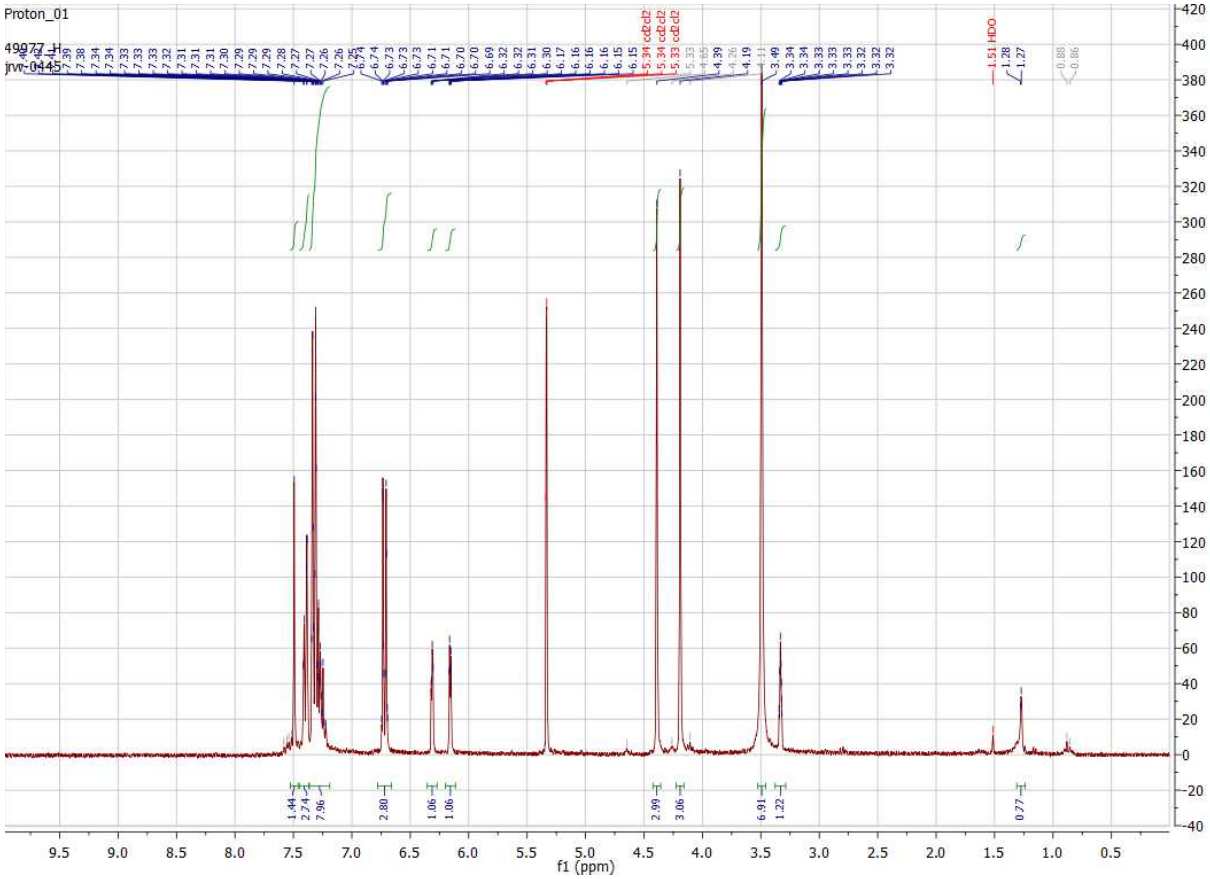
HPLC purity >99.9% @ 254 nm

6-(4-aminophenyl)-8-benzyl-2-(furan-2-ylmethyl)imidazo[1,2-a]pyrazin-3(7H)-one (**F6**)

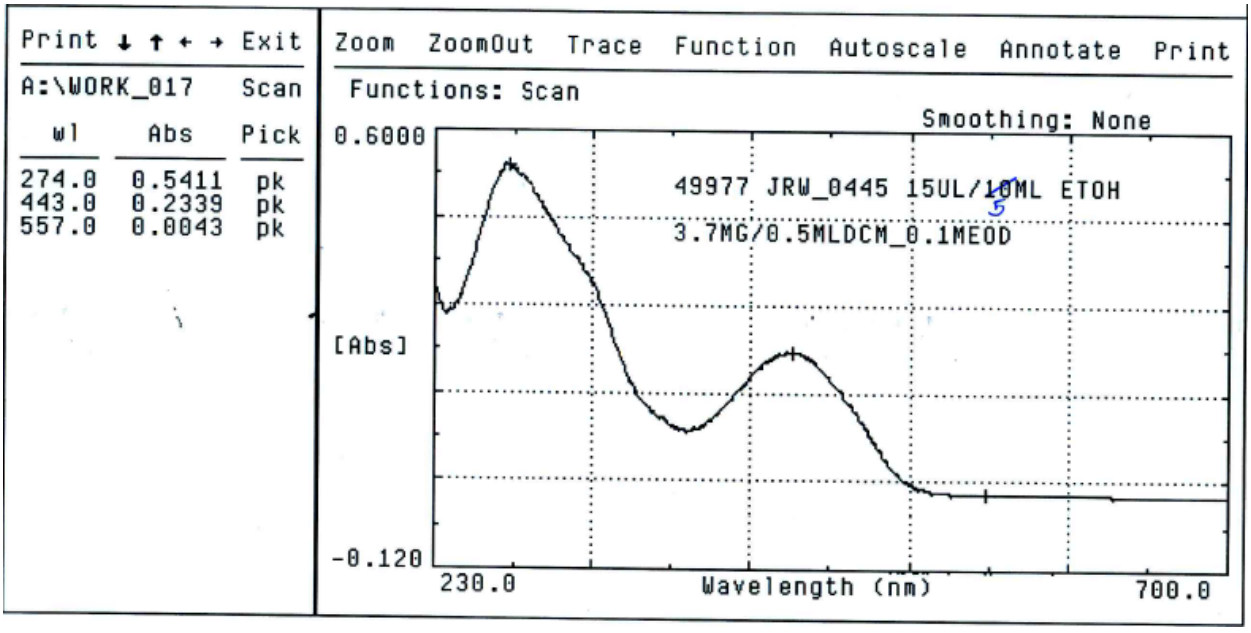


Yield: 88 %

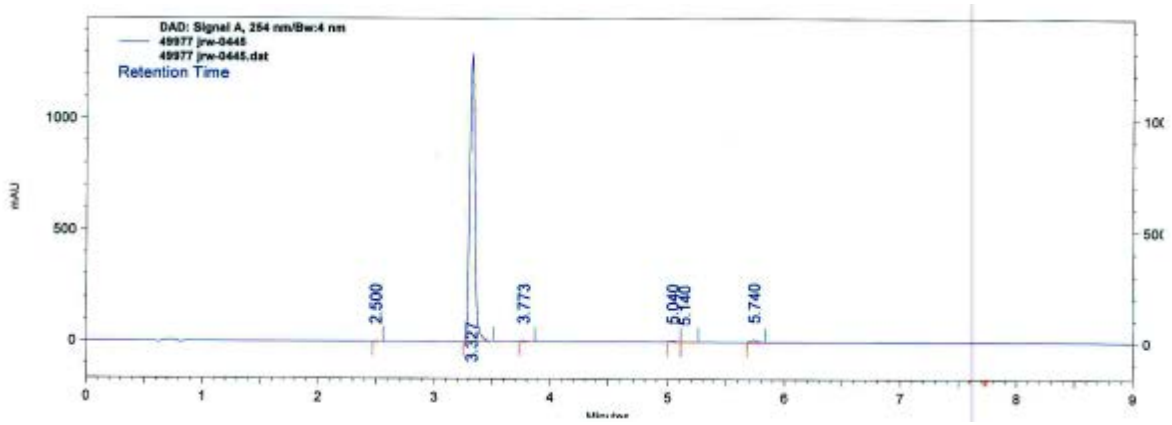
^{1}H NMR (**F6**)


Proton_01
49977_H
jrw-0445
1.51 HDO
1.28
1.27
0.88
0.86
1.44
2.74
7.96
2.80
1.06
1.06
2.99
3.06
6.91
1.22
0.77
f1 (ppm)

UV/Vis spectra (**F6**)

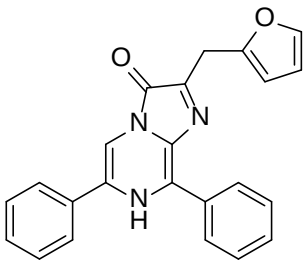


HPLC trace (**F6**)



HPLC purity 98.1% @ 254 nm

2-(furan-2-ylmethyl)-6,8-diphenylimidazo[1,2-a]pyrazin-3(7H)-one (**F7**)



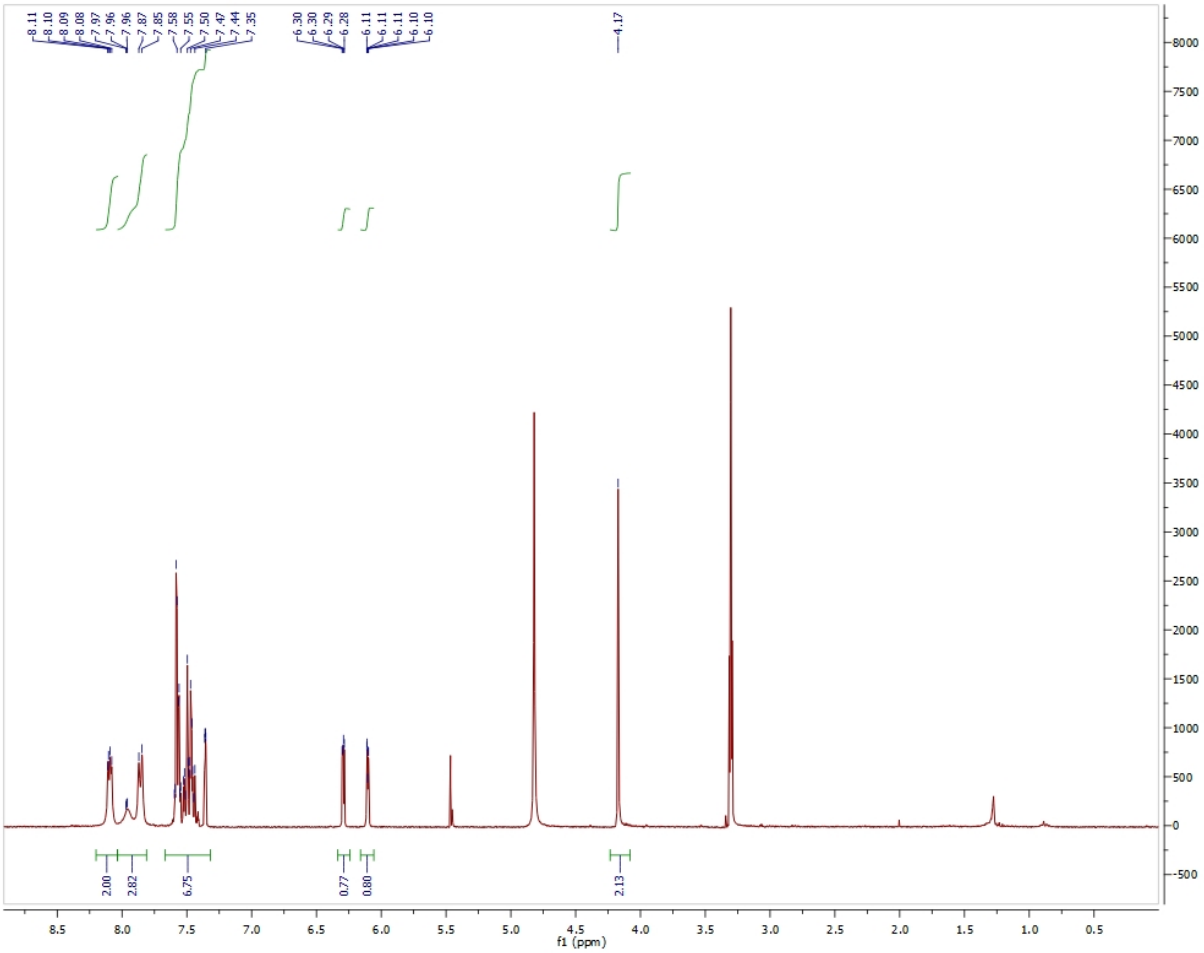
Yield: 25 %

^{1}H NMR (300 MHz, cd2cl2/cd3cod) δ = 8.13 – 8.03 (m, 2H), 7.98 – 7.83 (m, 3H), 7.61-7.33 (m, 7H), 6.29 (m, 1H), 6.11 (m, 1H), 4.17 (s, 2H).

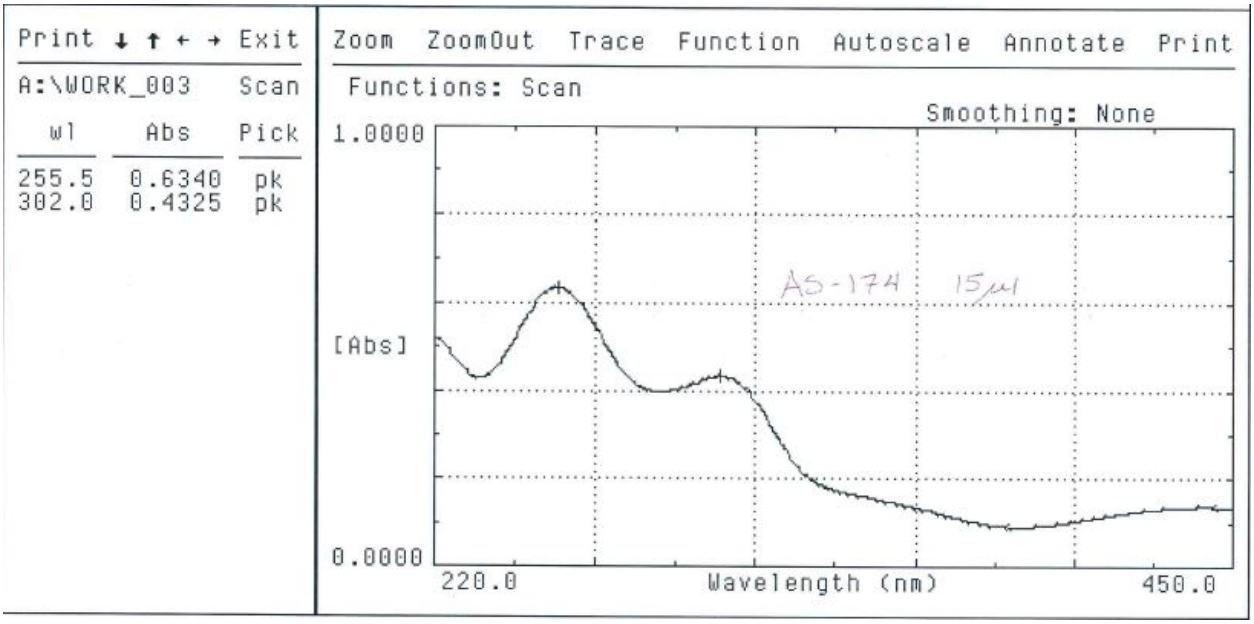
HRMS (C23H17N3O2), (m/z) $[M+H]^{+}$ calculated 368.1394 observed 368.1386

UV/Vis (methanol): λ^{max} (ε)=255 (23571 $mol^{-1}dm^{3}cm^{-1}$);

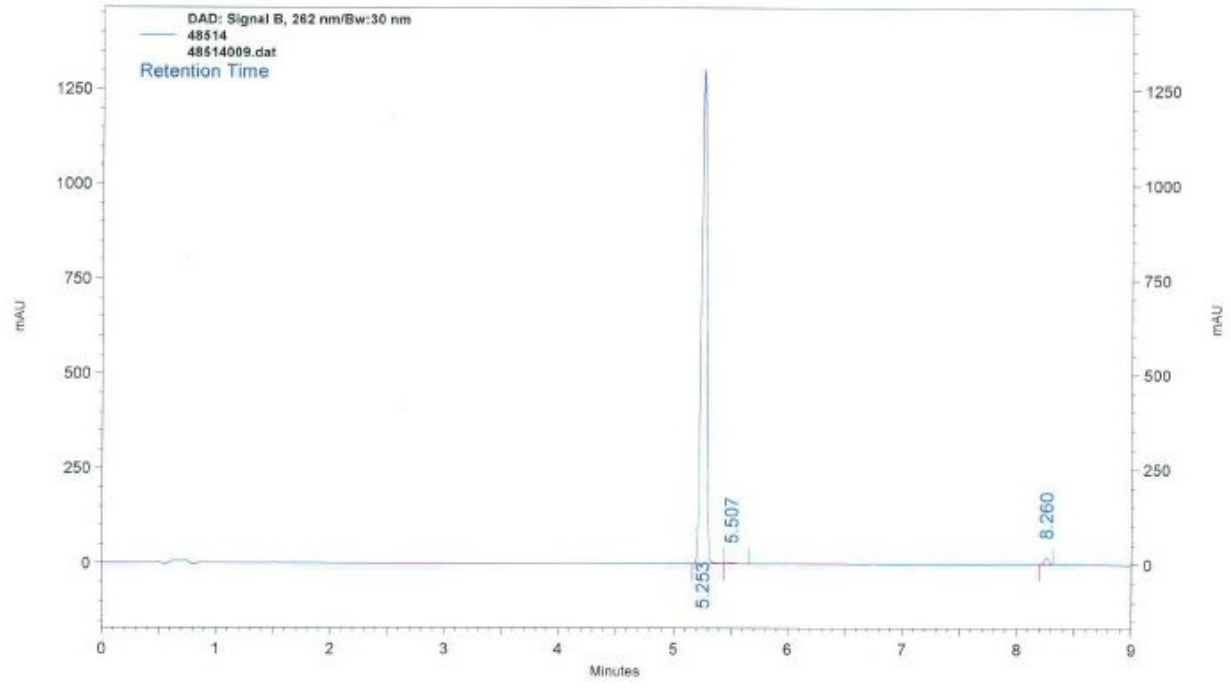
^{1}H NMR (**F7**)


8.11
8.10
8.09
8.08
7.97
7.96
7.96
7.87
7.85
7.58
7.55
7.50
7.47
7.44
7.35
6.30
6.30
6.29
6.28
6.11
6.11
6.11
6.10
6.10
4.17
2.00
2.82
6.75
0.77
0.80
2.13
f1 (ppm)

UV/Vis spectra (**F7**)

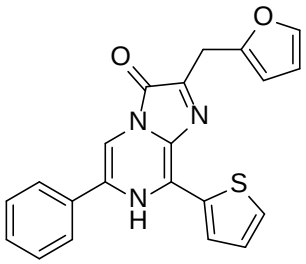


HPLC trace (**F7**)



HPLC purity 99% @ 262nm

2-(furan-2-ylmethyl)-6-phenyl-8-(thiophen-2-yl)imidazo[1,2-a]pyrazin-3(7H)-one (**F8**)



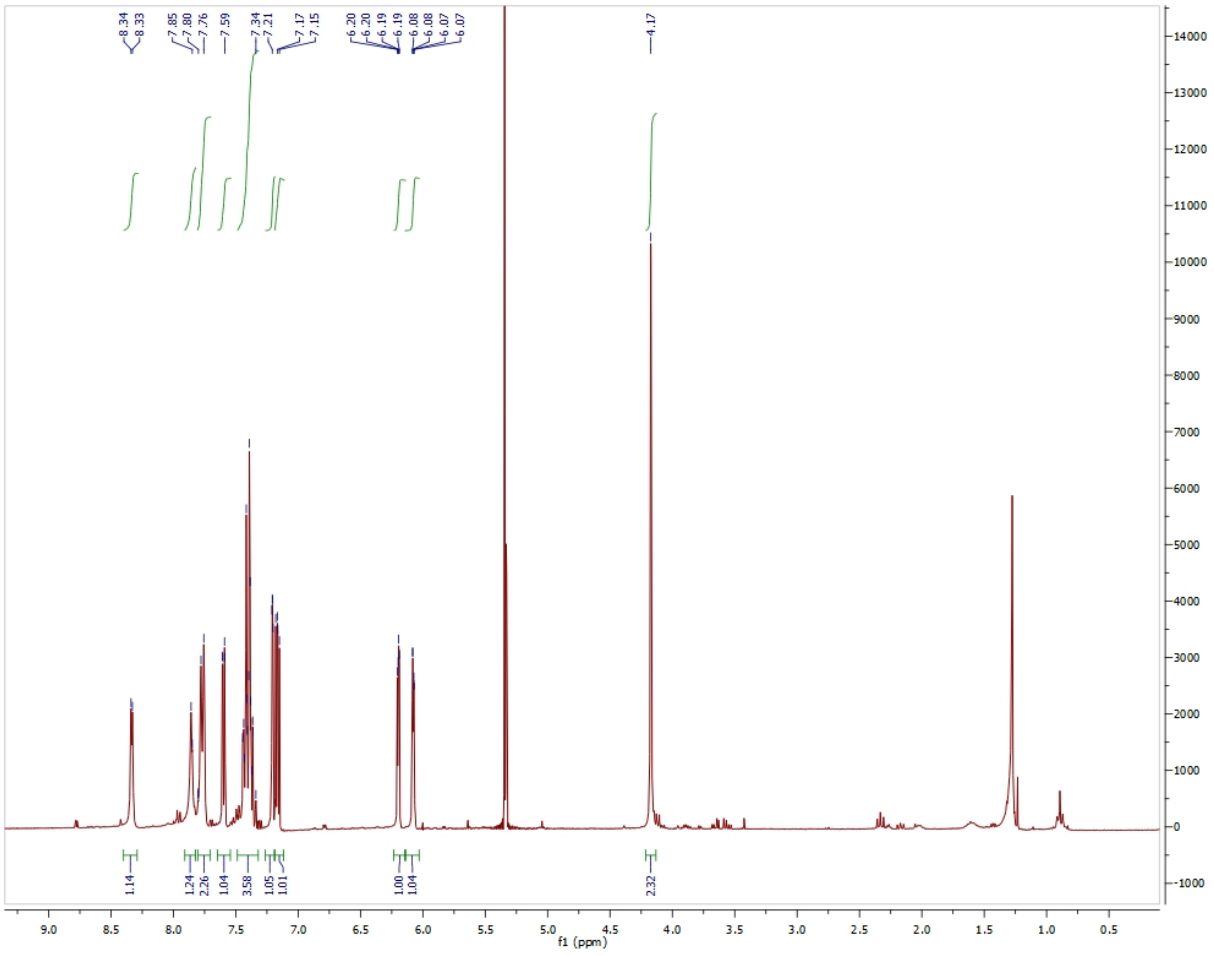
Yield: 25 %

^{1}H NMR (300 MHz, cd2cl2) δ = 8.33 (d, *J*=3.3, 1H), 7.85 (d, *J*=2.8, 1H), 7.78 (dd, *J*=3.6, 9.9, 2H), 7.60 (dd, *J*=1.1, 5.1, 1H), 7.49 – 7.32 (m, 3H), 7.21 (dd, *J*=0.7, 1.8, 1H), 7.16 (dd, *J*=3.8, 5.1, 1H), 6.20 (dd, *J*=1.9, 3.2, 1H), 6.08 (dd, *J*=0.7, 3.1, 1H), 4.17 (s, 2H).

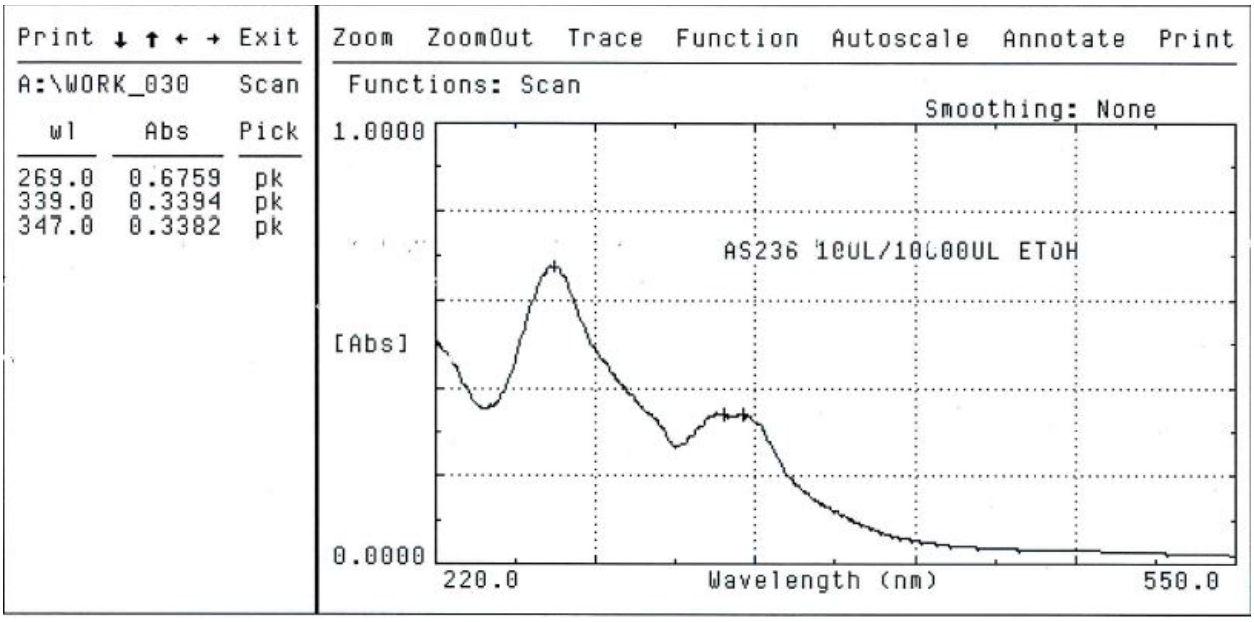
HRMS (C21H15N3O2S), (m/z) $[M+H]^{+}$ calculated 374.0958 observed 374.0964

UV/Vis (methanol): λ^{max} (ε)=269 (22271 $mol^{-1}dm^{3}cm^{-1}$);

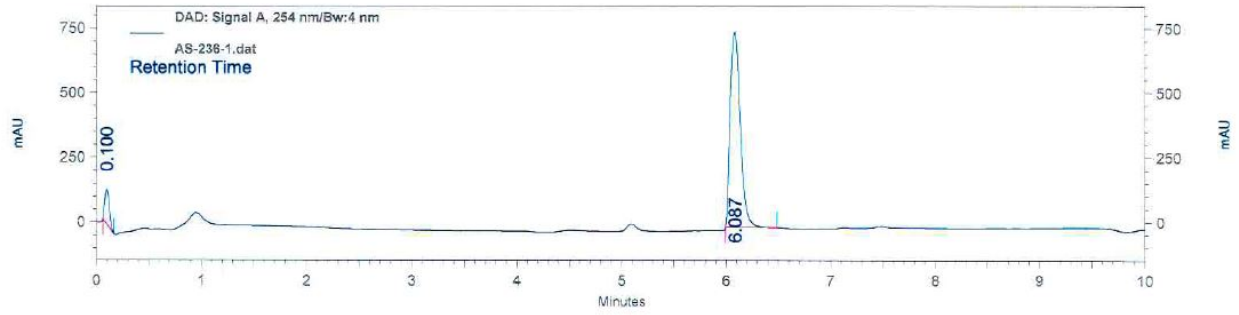
^{1}H NMR (**F8**)


8.34
8.33
7.85
7.80
7.76
7.59
7.34
7.21
7.17
7.15
6.20
6.20
6.19
6.19
6.08
6.08
6.07
6.07
4.17
1.14
1.24
2.26
1.04
3.58
1.05
1.01
1.00
1.04
2.32
f1 (ppm)

UV/Vis spectra (**F8**)



HPLC trace **(F8)**



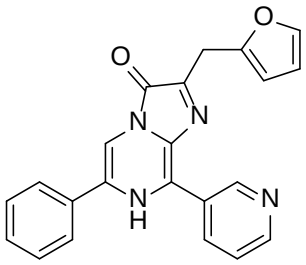
HPLC purity 93% @ 254nm

2-(furan-2-ylmethyl)-6-phenyl-8-(pyridin-3-yl)imidazo[1,2-a]pyrazin-3(7H)-one (**F9**)

^{1}H NMR (300 MHz, cd2cl2) δ = 9.52 (s, 1H), 8.83 (s, 1H), 8.73 – 8.60 (m, 1H), 7.94 (s, 2H), 7.63 – 7.38 (m, 5H), 7.32 (dd, *J*=0.7, 1.8, 1H), 6.29 (dd, *J*=1.9, 3.2, 1H), 6.11 (dd, *J*=0.7, 3.2, 1H), 4.19 (s, 2H).

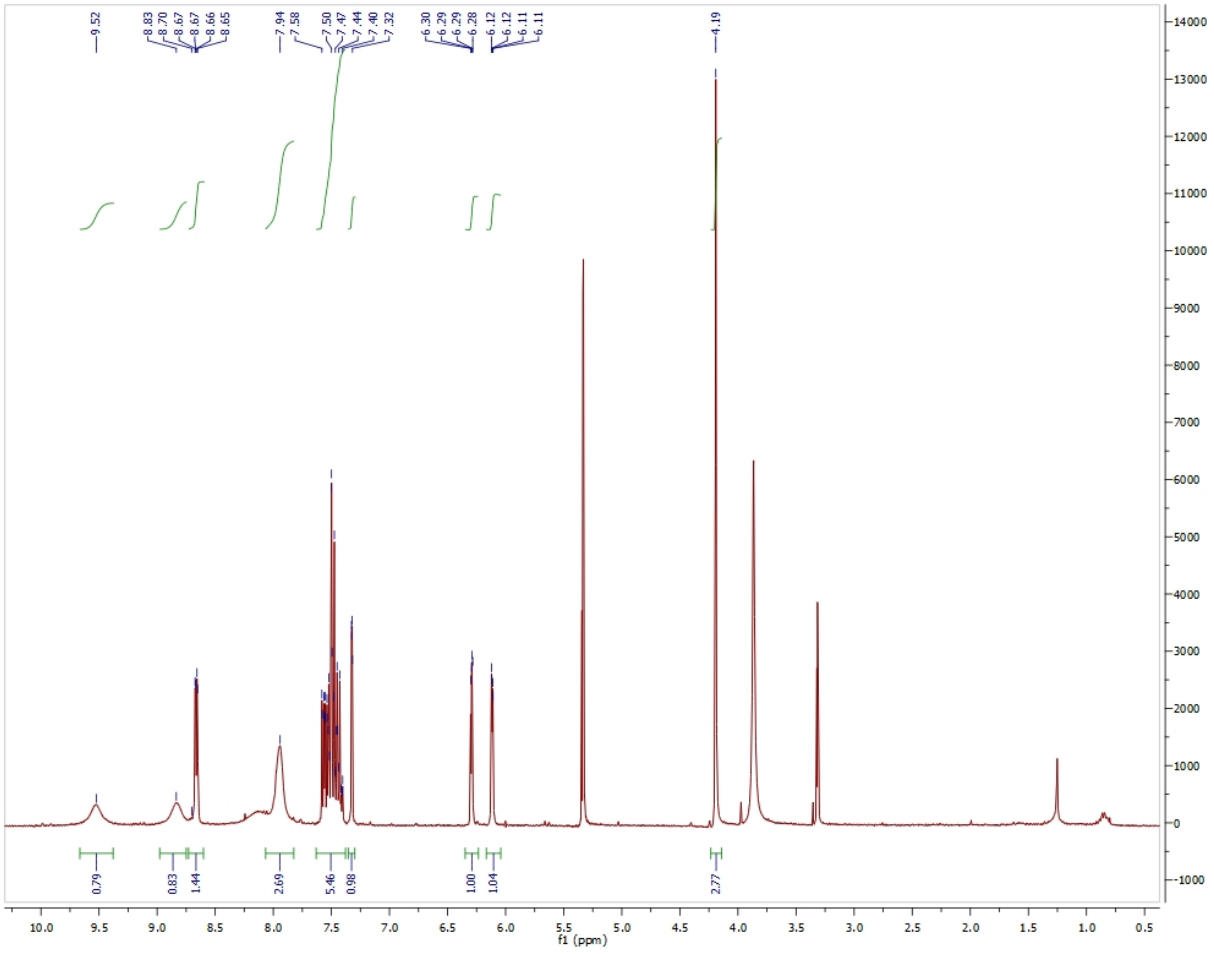
HRMS (C22H16N4O2), (m/z) $[M+H]^{+}$ calculated 369.1346 observed 369.1344

UV/Vis (methanol): λ^{max} (ε)= 257 (7858 $mol^{-1}dm^{3}cm^{-1}$);

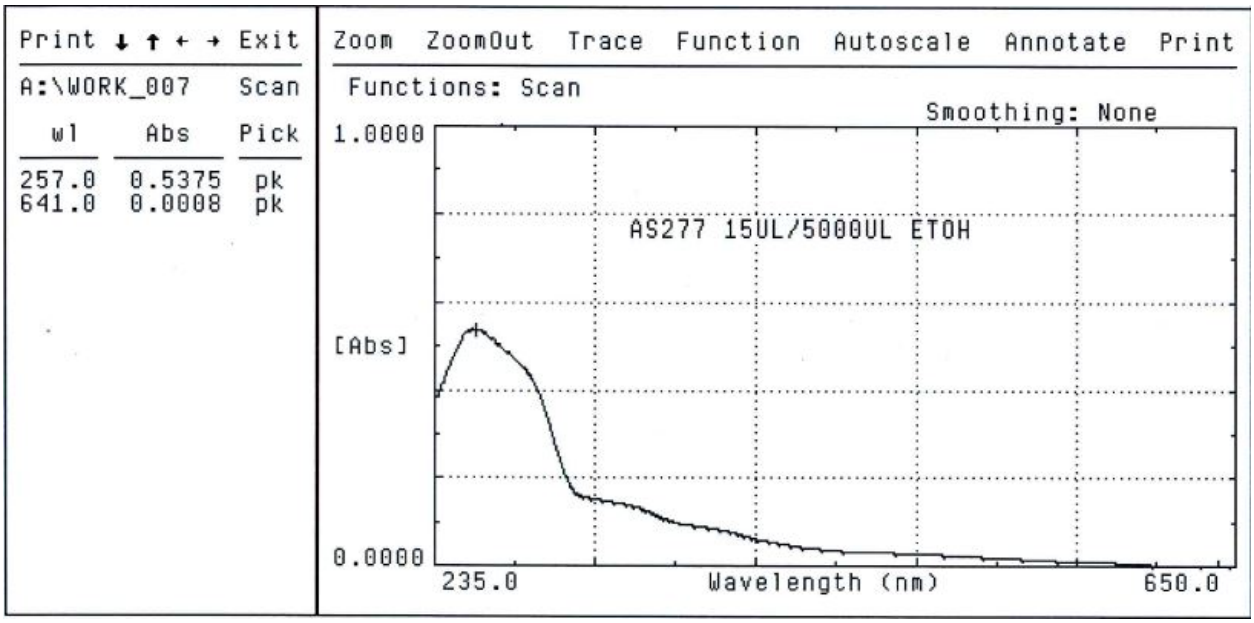


Yield: 34 %

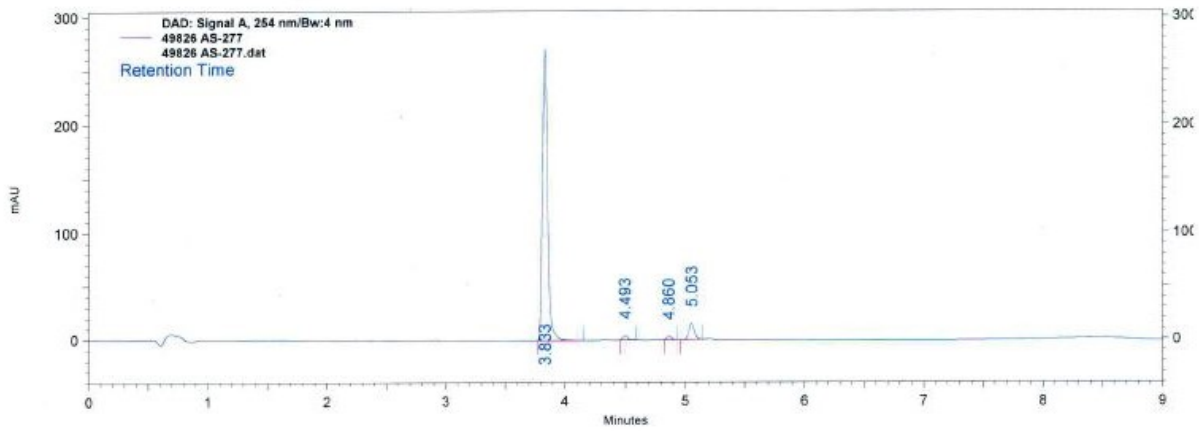
^{1}H NMR (**F9**)


9.52
8.83
8.70
8.67
8.67
8.66
8.65
7.94
7.58
7.50
7.47
7.44
7.40
7.32
6.30
6.29
6.29
6.28
6.12
6.12
6.11
6.11
4.19
0.79
0.83
1.44
2.69
5.46
0.98
1.00
1.04
2.77
f1 (ppm)

UV/Vis spectra (**F9**)



HPLC trace (**F9**)



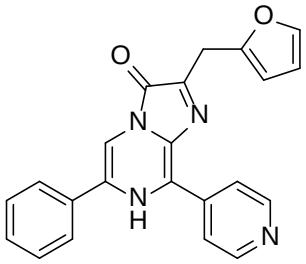
HPLC purity 93% @ 254nm

^{1}H NMR (300 MHz, cd2cl2) δ = 9.14 – 8.95 (m, 4H), 8.87 – 8.73 (m, 1H), 8.18 – 8.00 (m, 2H), 7.64 – 7.42 (m, 3H), 7.33 (d, *J*=0.6, 1H), 6.29 (dd, *J*=1.3, 3.3, 1H), 6.26 – 6.19 (m, 1H), 4.36 (s, 2H).

HRMS (C22H16N4O2), (m/z) $[M+H]^+$ calculated 369.1346 observed 369.1341

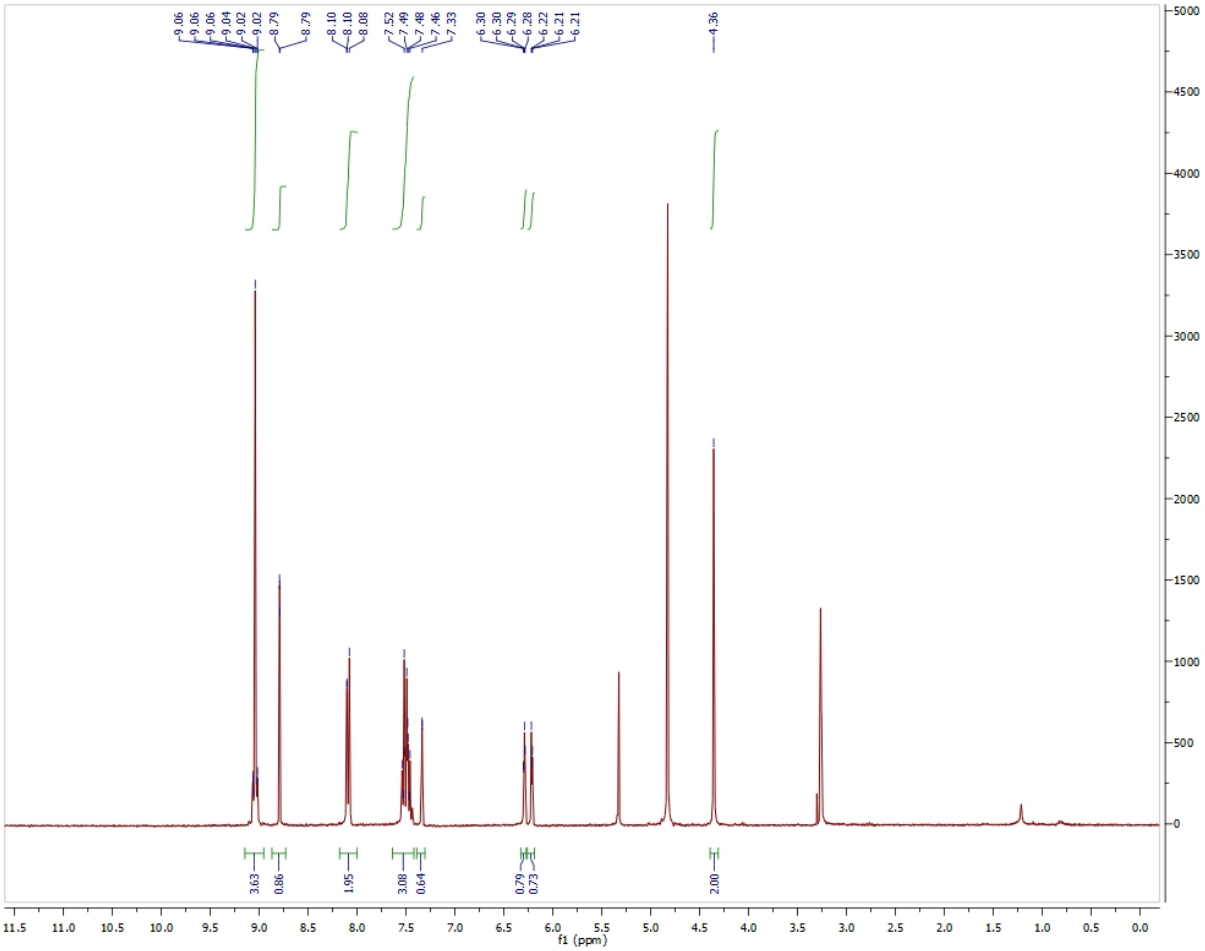
UV/Vis (methanol): λ^{max} (ε)= 256 (25793 $mol^{-1}dm^3cm^{-1}$);

2-(furan-2-ylmethyl)-6-phenyl-8-(pyridin-4-yl)imidazo[1,2-a]pyrazin-3(7H)-one (**F10**)

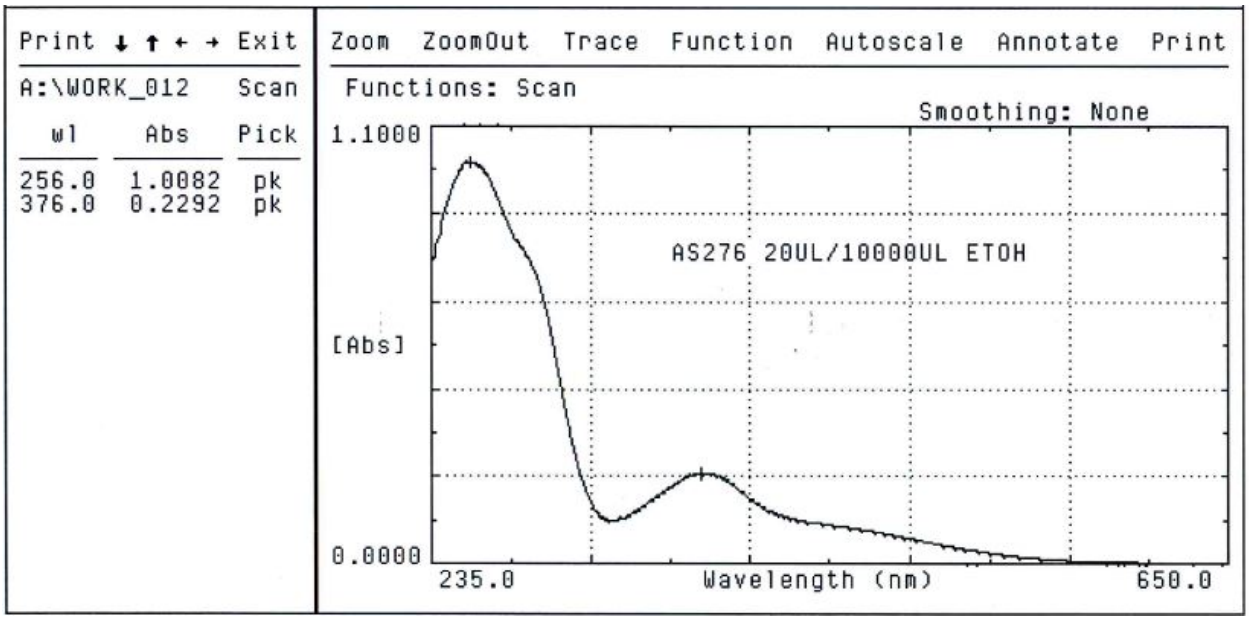


Yield: 16 %

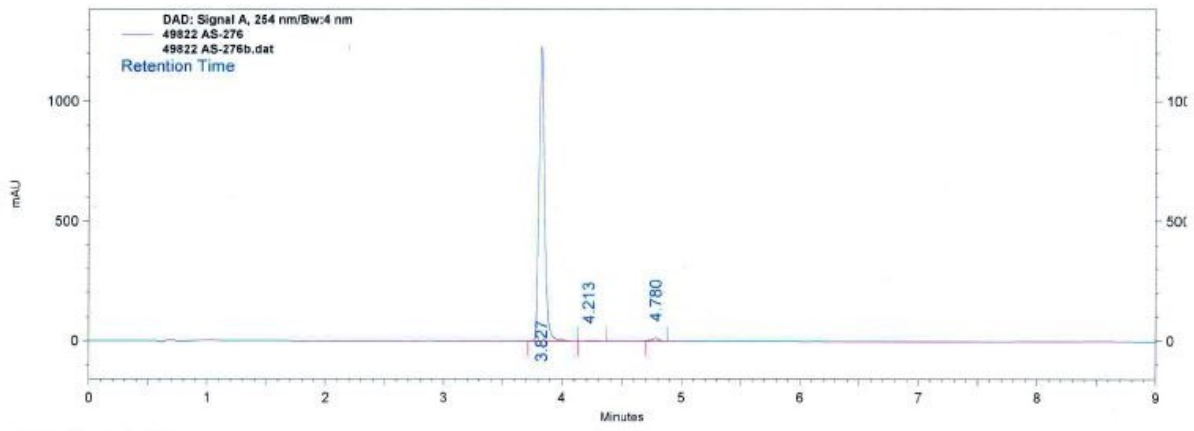
^{1}H NMR (**F10**)


9.06
9.06
9.06
9.04
9.02
9.02
8.79
8.79
8.10
8.10
8.08
7.52
7.49
7.48
7.46
7.33
6.30
6.30
6.29
6.28
6.22
6.21
6.21
4.36
3.63
0.86
1.95
3.08
0.64
0.79
0.73
2.00
f1 (ppm)

UV/Vis spectra (**F10**)

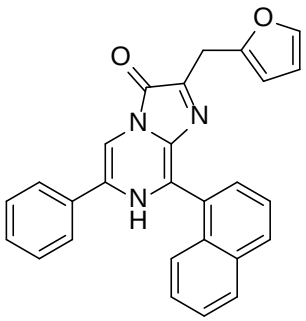


HPLC trace (**F10**)



HPLC purity 96% @ 366nm

2-(furan-2-ylmethyl)-8-(naphthalen-1-yl)-6-phenylimidazo[1,2-a]pyrazin-3(7H)-one (**F11**)



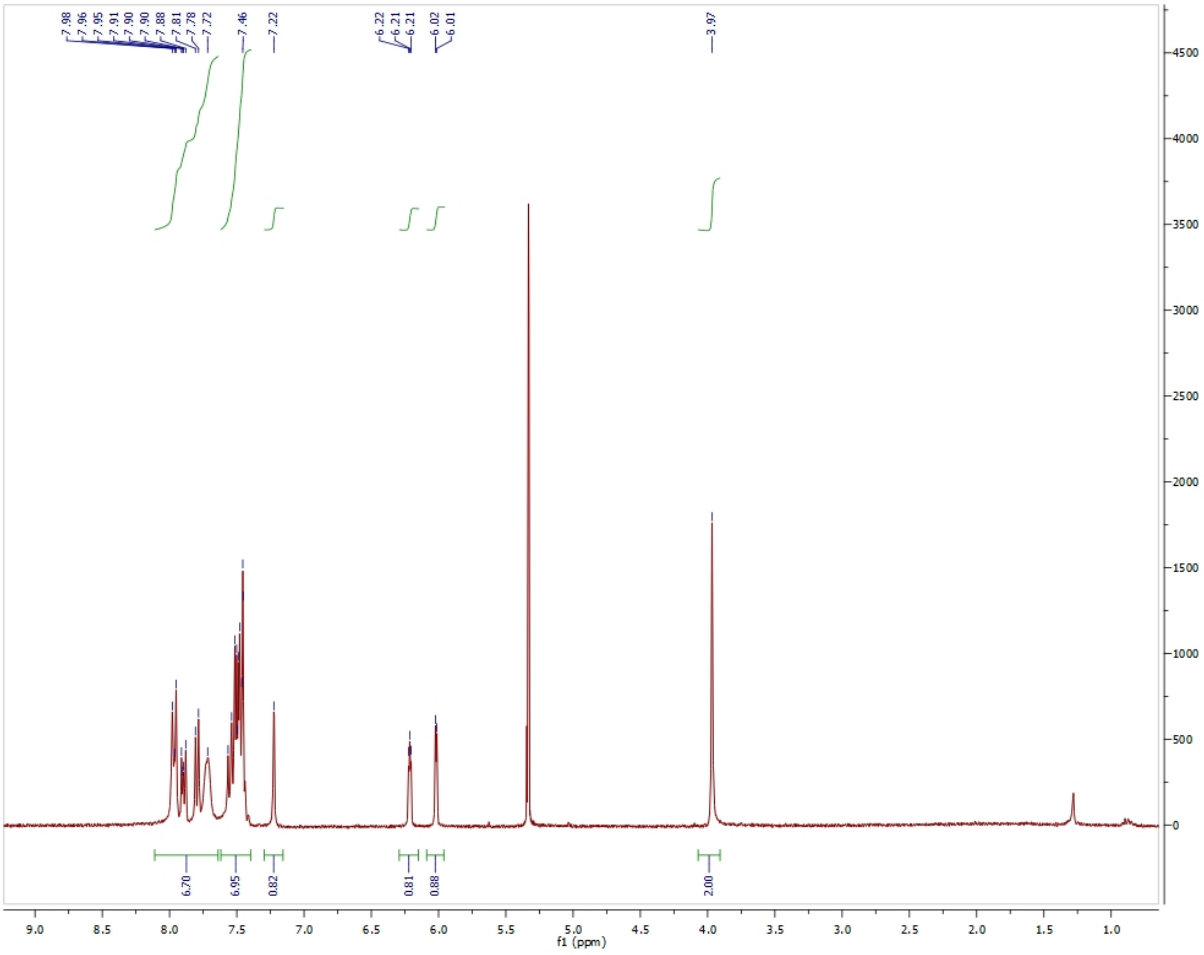
Yield: 16 %

^{1}H NMR (300 MHz, cd2cl2) δ = 8.11 – 7.64 (m, 6H), 7.62 – 7.40 (m, 7H), 7.22 (s, 1H), 6.29 – 6.15 (m, 1H), 6.02 (d, *J*=3.0, 1H), 3.97 (s, 2H).

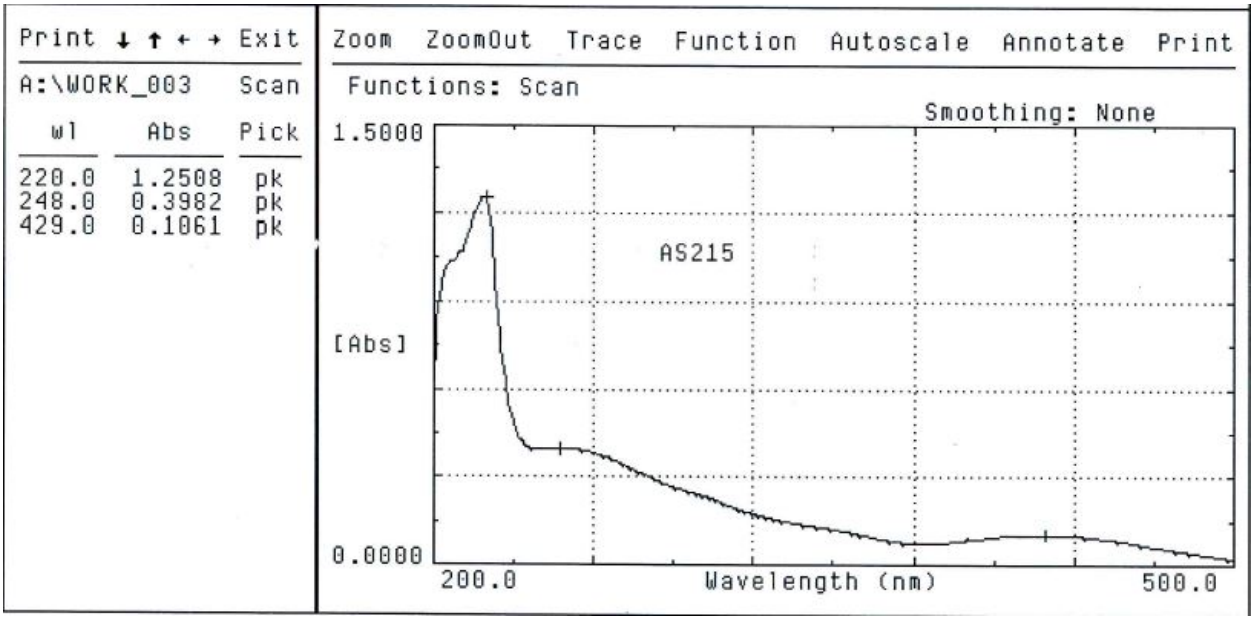
HRMS (C27H19N3O2), (m/z) $[M+H]^{+}$ calculated 418.1550 observed 418.1548

UV/Vis (methanol): λ^{max} (ε)=248 (14332 $mol^{-1}dm^{3}cm^{-1}$);

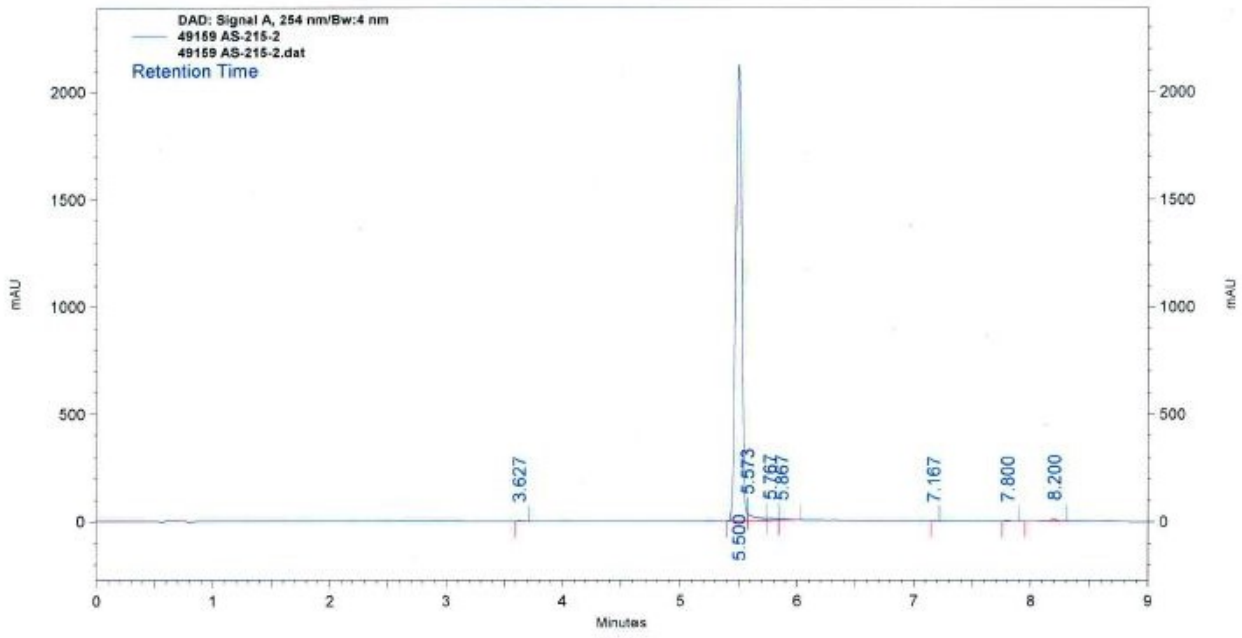
^{1}H NMR (**F11**)


7.98
7.96
7.95
7.91
7.90
7.90
7.88
7.81
7.78
7.72
7.46
7.22
6.22
6.21
6.21
6.02
6.01
3.97
6.70
6.95
0.82
0.81
0.88
2.00
f1 (ppm)

UV/Vis spectra (**F11**)

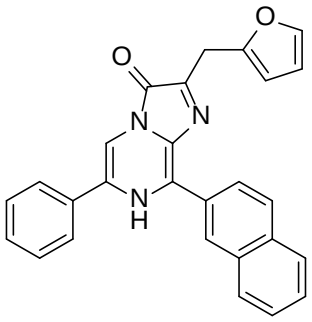


HPLC trace (**F11**)



HPLC purity 96% @ 254nm

2-(furan-2-ylmethyl)-8-(naphthalen-2-yl)-6-phenylimidazo[1,2-a]pyrazin-3(7H)-one (**F12**)



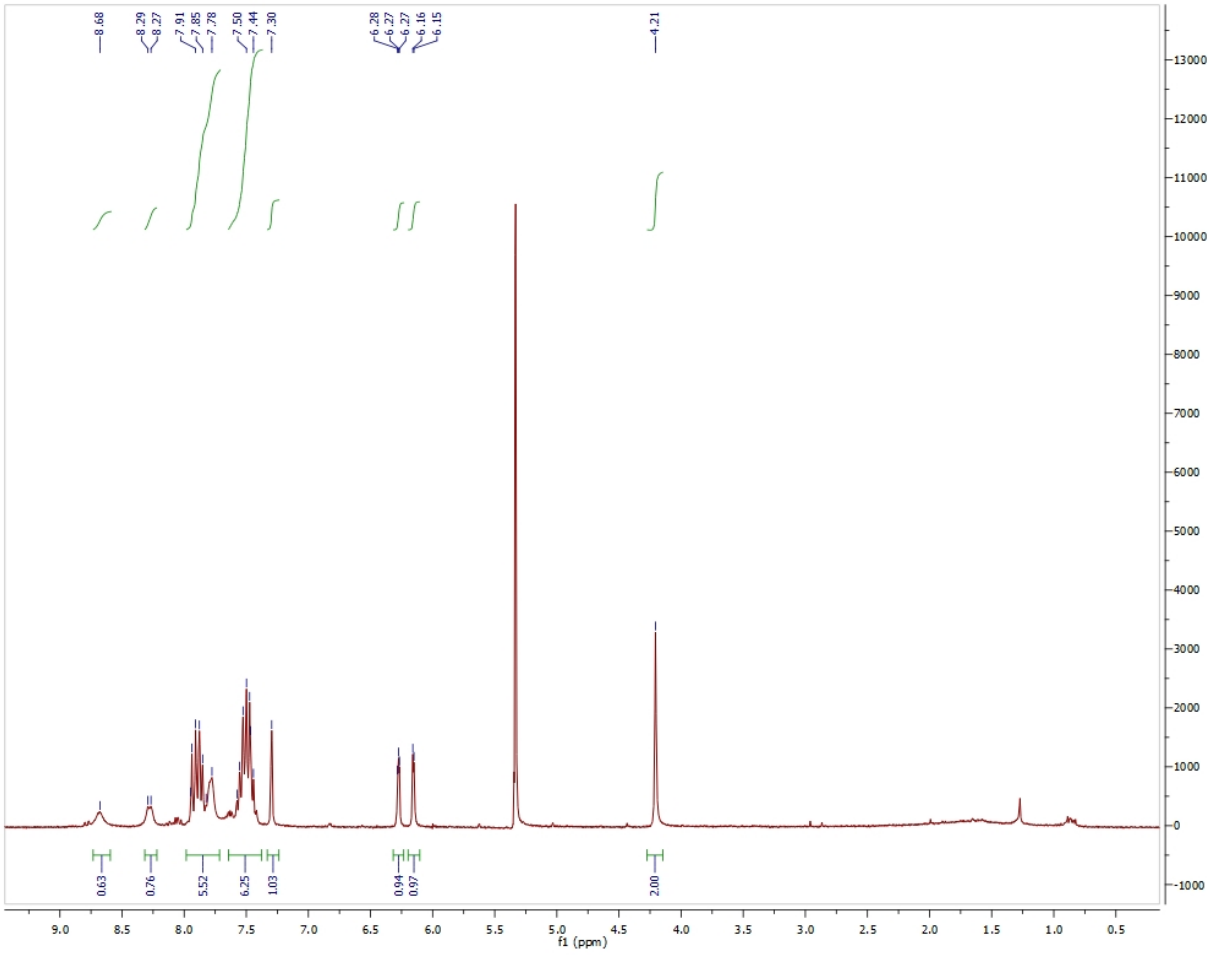
^{1}H NMR (300 MHz, cd2cl2) δ = 8.73 – 8.59 (m, 1H), 8.27 (s, 1H), 7.98 – 7.72 (m, 5H), 7.64 – 7.38 (m, 6H), 7.30 (s, 1H), 6.27 (s, 1H), 6.16 (s, 1H), 4.21 (s, 2H).

HRMS (C27H19N3O2), (m/z) $[M+H]^{+}$ calculated 418.1550 observed 418.1558

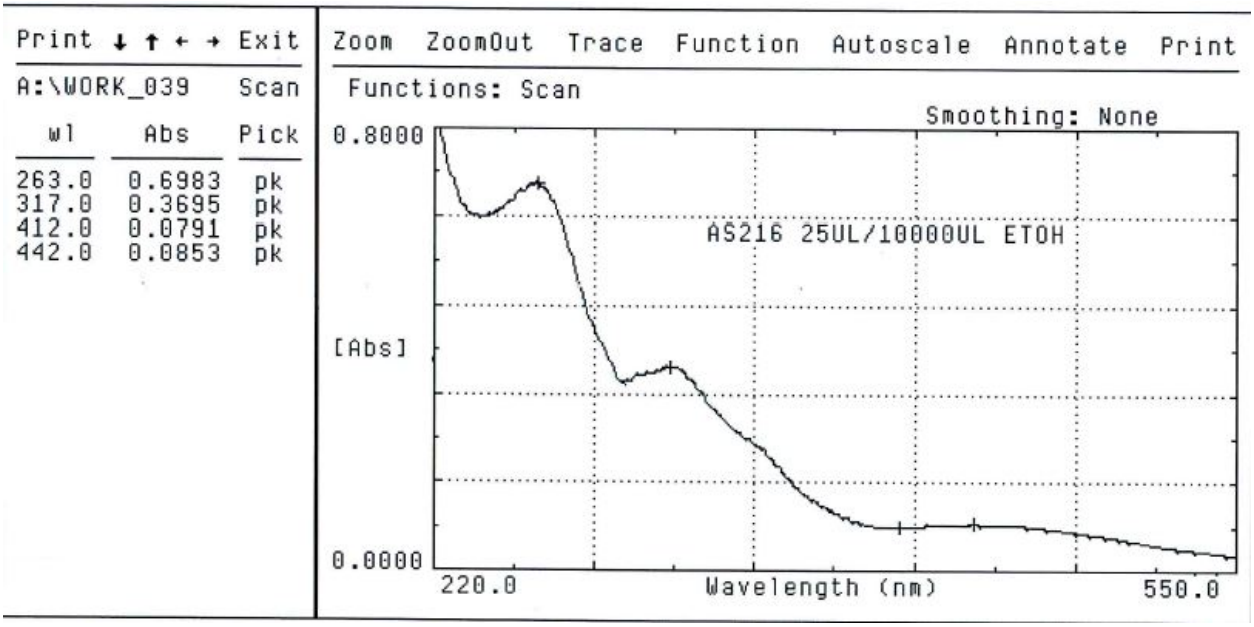
UV/Vis (methanol): λ^{max} (ε)= 263 (25915 $mol^{-1}dm^{3}cm^{-1}$);

Yield: 14 %

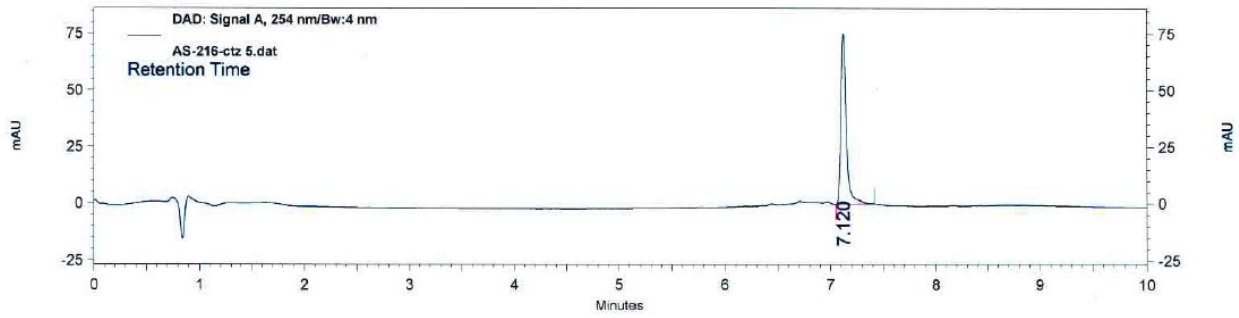
^{1}H NMR (**F12**)


8.68
8.29
8.27
7.91
7.85
7.78
7.50
7.44
7.30
6.28
6.27
6.27
6.16
6.15
4.21
0.63
0.76
5.52
6.25
1.03
0.94
0.97
2.00
f1 (ppm)

UV/Vis spectra (**F12**)



HPLC trace (**F12**)



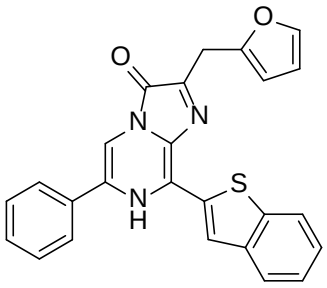
HPLC purity >99% @ 254nm

8-(benzo[b]thiophen-2-yl)-2-(furan-2-ylmethyl)-6-phenylimidazo[1,2-a]pyrazin-3(7H)-one (**F13**)

^{1}H NMR (300 MHz, cd2cl2) δ = 8.67 (s, 1H), 8.09 – 7.77 (m, 5H), 7.55 – 7.36 (m, 5H), 7.36 – 7.26 (m, 1H), 6.28 (dd, *J*=1.9, 3.1, 1H), 6.18 (d, *J*=3.0, 1H), 4.27 (s, 2H).

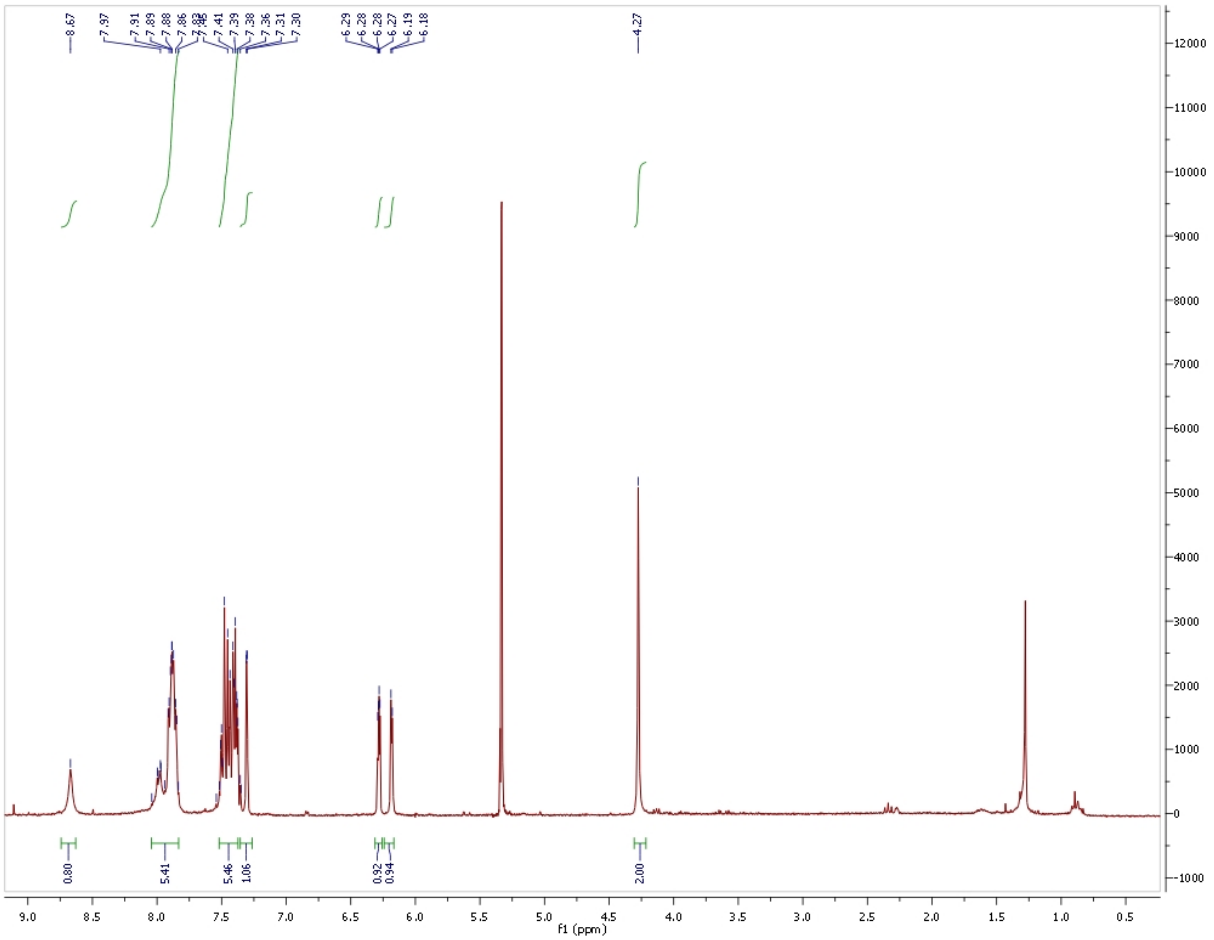
HRMS (C25H17N3O2S), (m/z) $[M+H]^{+}$ calculated 424.1114 observed 424.1122

UV/Vis (methanol): λ^{max} (ε)=269 (18465 $mol^{-1}dm^{3}cm^{-1}$);

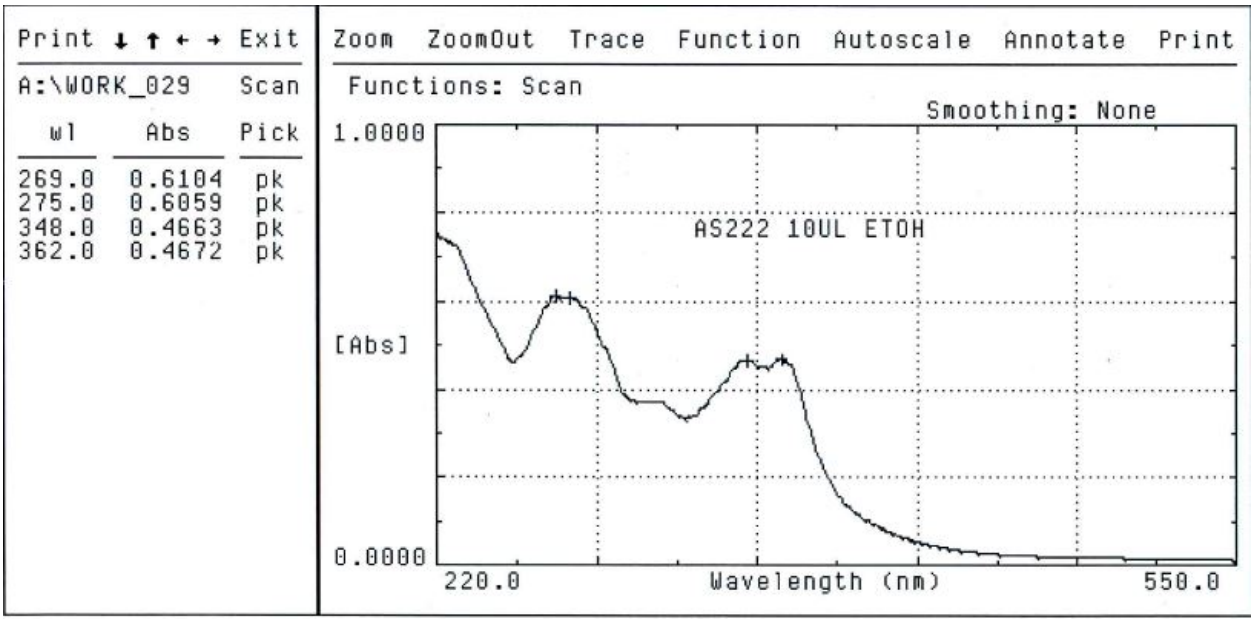


Yield: 28 %

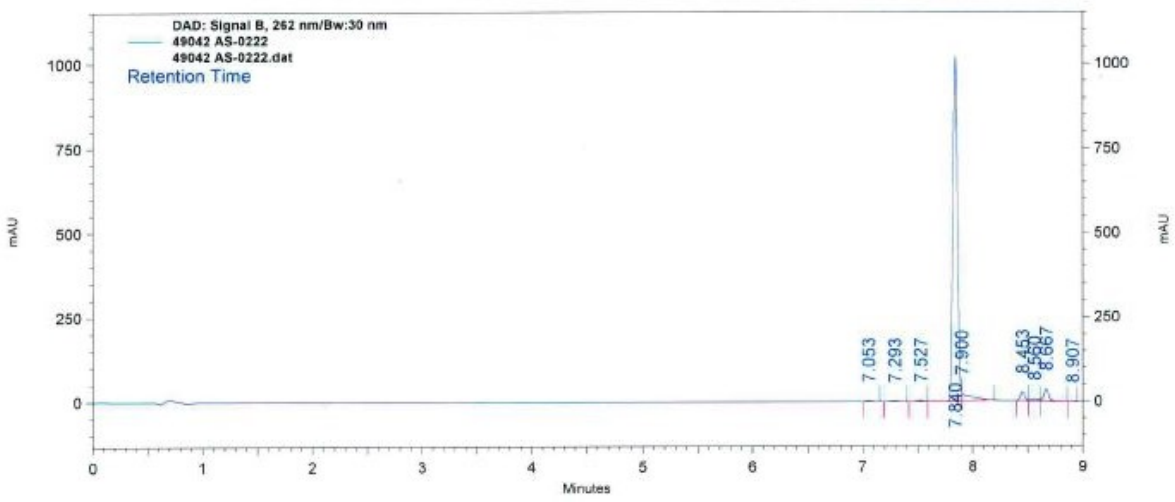
^{i}H NMR (**F13**)


8.67
7.97
7.91
7.89
7.88
7.86
7.41
7.39
7.38
7.36
7.31
7.30
6.29
6.28
6.28
6.27
6.19
6.18
4.27
0.80
5.41
5.46
1.06
0.92
0.94
2.00
f1 (ppm)

UV/Vis spectra (**F13**)

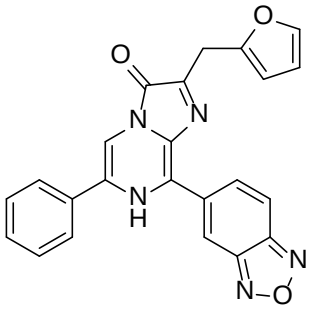


HPLC trace (**F13**)



HPLC purity 89% @ 262nm

8-(benzo[c][1,2,5]oxadiazol-5-yl)-2-(furan-2-ylmethyl)-6-phenylimidazo[1,2-a]pyrazin-3(7H)-one (**F14**)



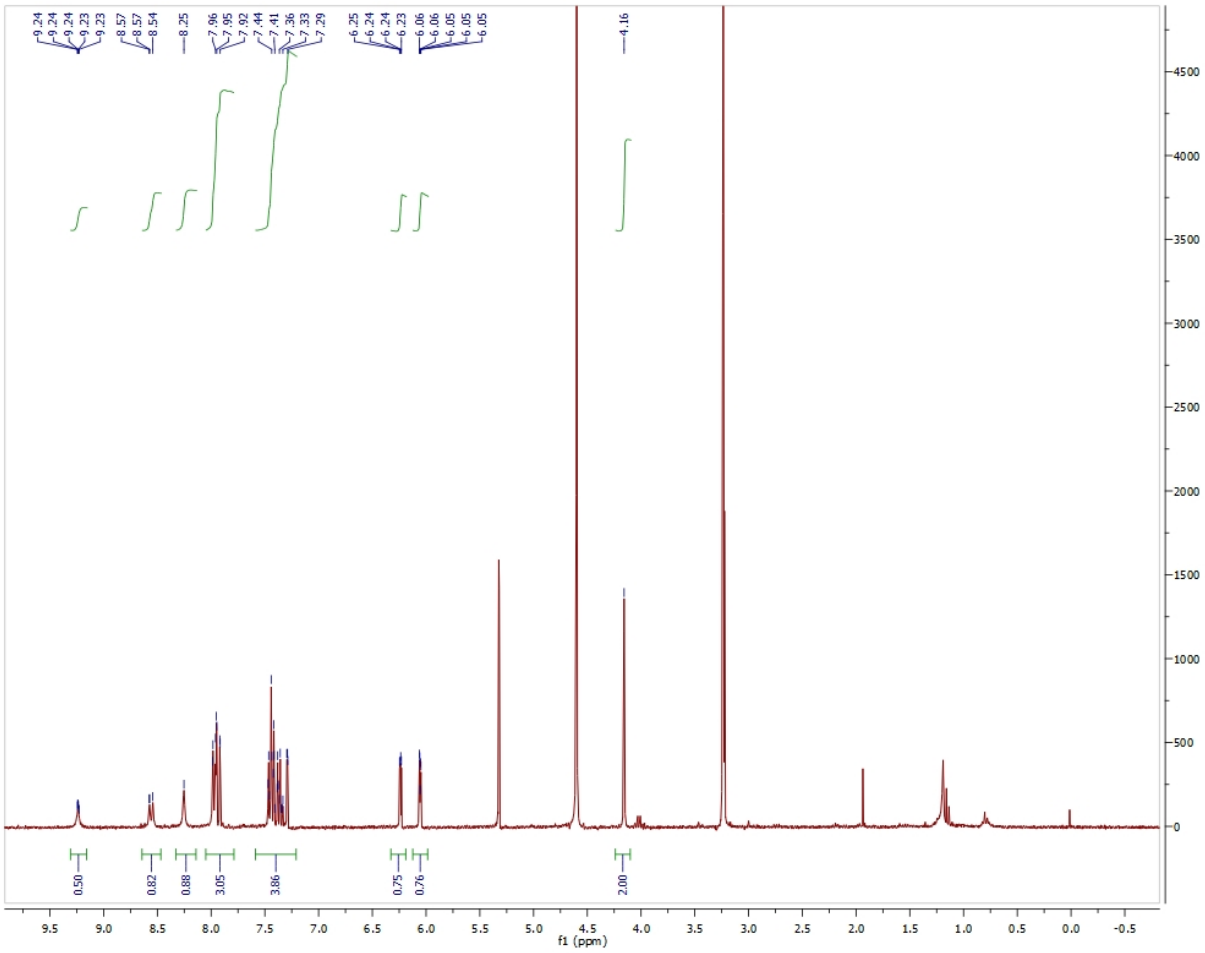
Yield: 14 %

^{1}H NMR (300 MHz, cd2cl2) δ = 9.31 – 9.16 (m, 1H), 8.64 – 8.47 (m, 1H), 8.25 (s, 1H), 7.95 (m, 3H), 7.59 – 7.21 (m, 4H), 6.24 (dd, *J*=1.9, 3.2, 1H), 6.12 – 5.99 (m, 1H), 4.16 (s, 2H).

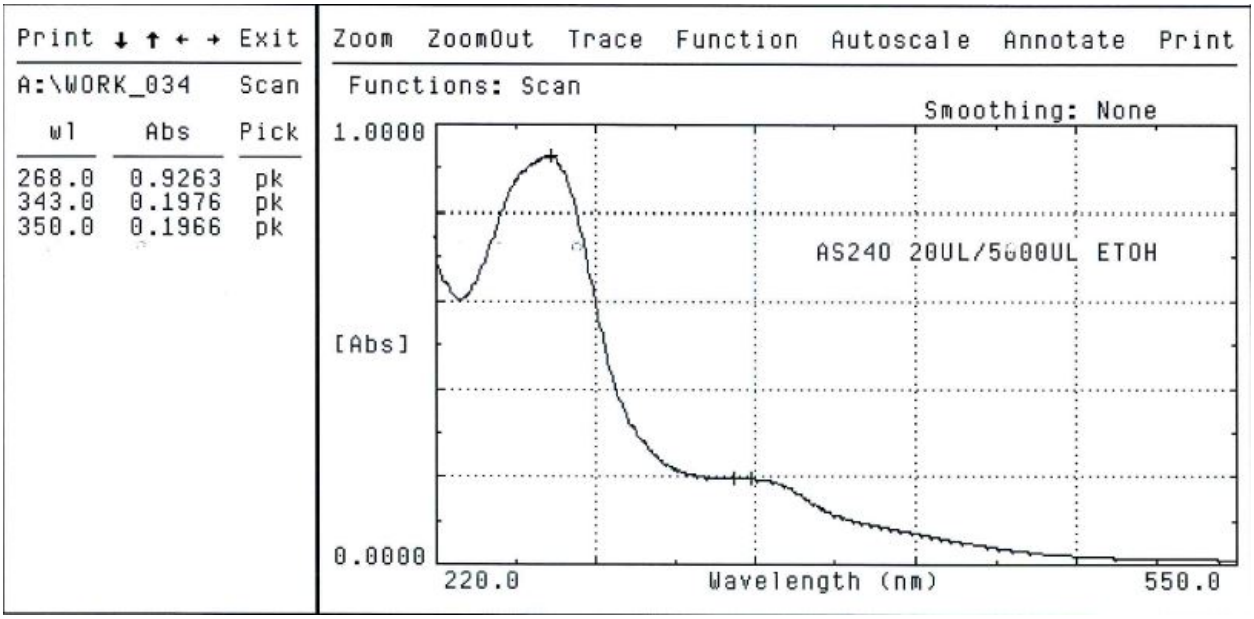
HRMS (C23H15N5O3), (m/z) $[M+H]^{+}$ calculated 410.1248 observed 410.1252

UV/Vis (methanol): λ^{max} (ε)= 268 (32818 $mol^{-1}dm^{3}cm^{-1}$);

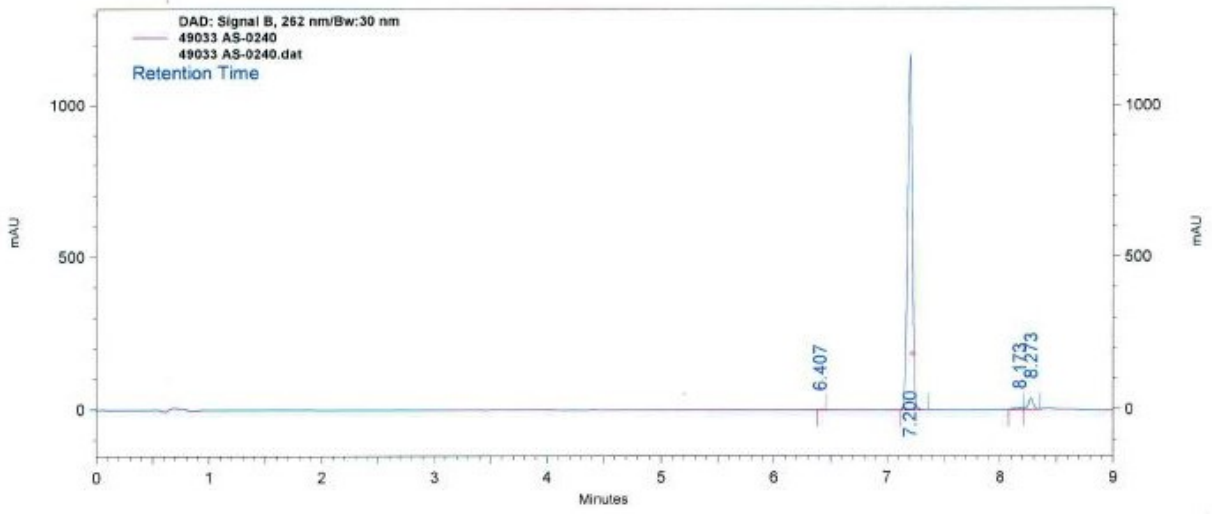
^{1}H NMR (**F14**)


9.24
9.24
9.24
9.23
9.23
8.57
8.57
8.54
8.25
7.96
7.95
7.92
7.44
7.41
7.36
7.33
7.29
6.25
6.24
6.24
6.23
6.06
6.06
6.05
6.05
6.05
4.16
0.50
0.82
0.88
3.05
3.86
0.75
0.76
2.00
f1 (ppm)

UV/Vis spectra (**F14**)

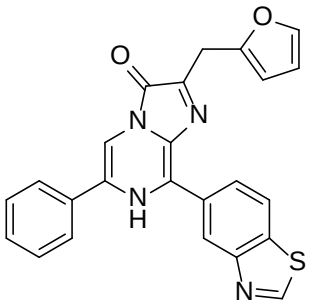


HPLC trace (**F14**)



HPLC purity 97% @ 262nm

8-(benzo[d]thiazol-5-yl)-2-(furan-2-ylmethyl)-6-phenylimidazo[1,2-a]pyrazin-3(7H)-one (**F15**)



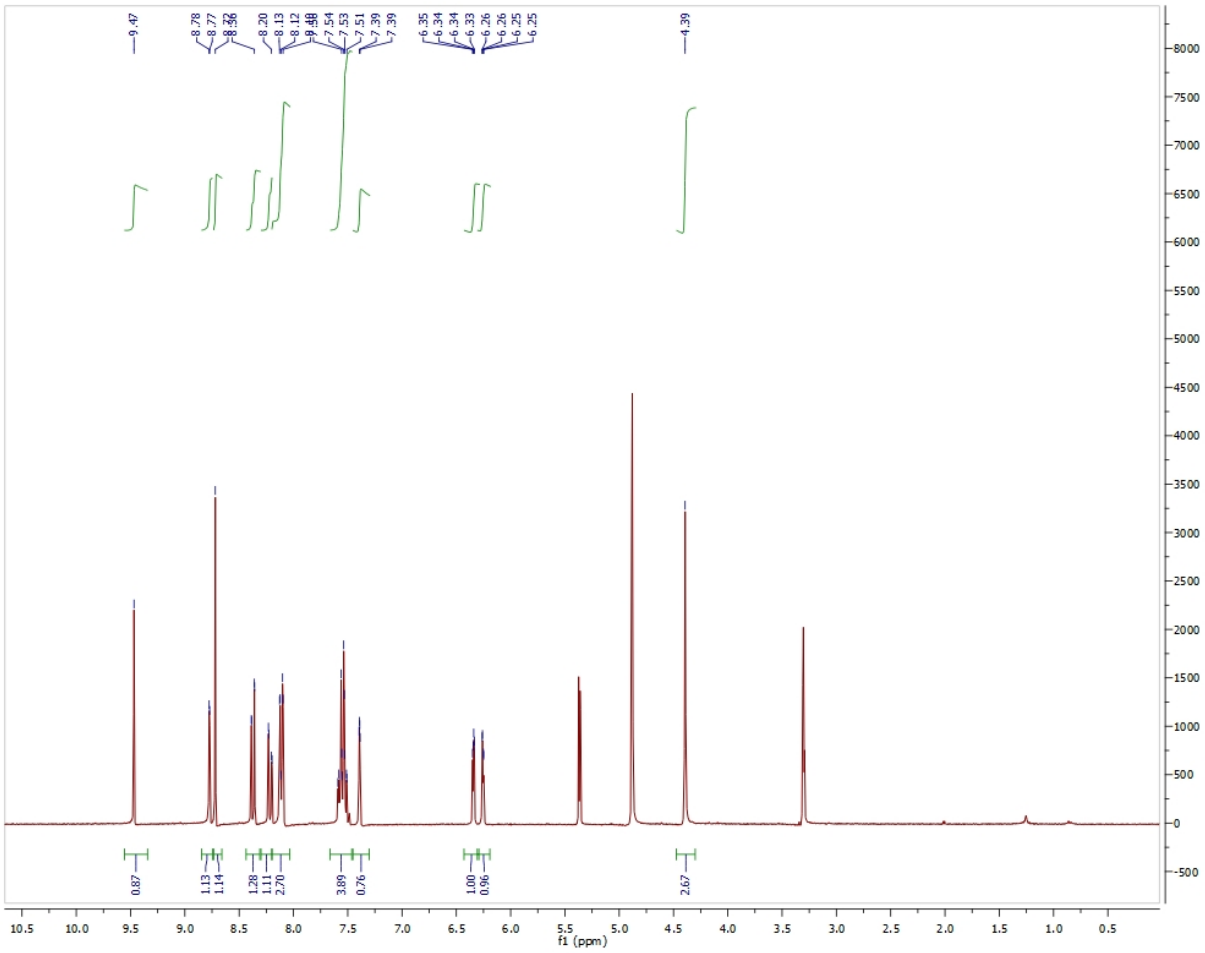
Yield: 31 %

^{1}H NMR (300 MHz, cd3od) δ = 9.47 (s, 1H), 8.77 (d, *J*=1.2, 1H), 8.72 (s, 1H), 8.37 (dd, *J*=0.5, 8.4, 1H), 8.30 – 8.20 (m, 1H), 8.20 – 8.04 (m, 2H), 7.66 – 7.46 (m, 3H), 7.39 (dd, *J*=0.8, 1.8, 1H), 6.34 (dd, *J*=1.9, 3.2, 1H), 6.26 (dd, *J*=0.8, 3.2, 1H), 4.39 (s, 2H).

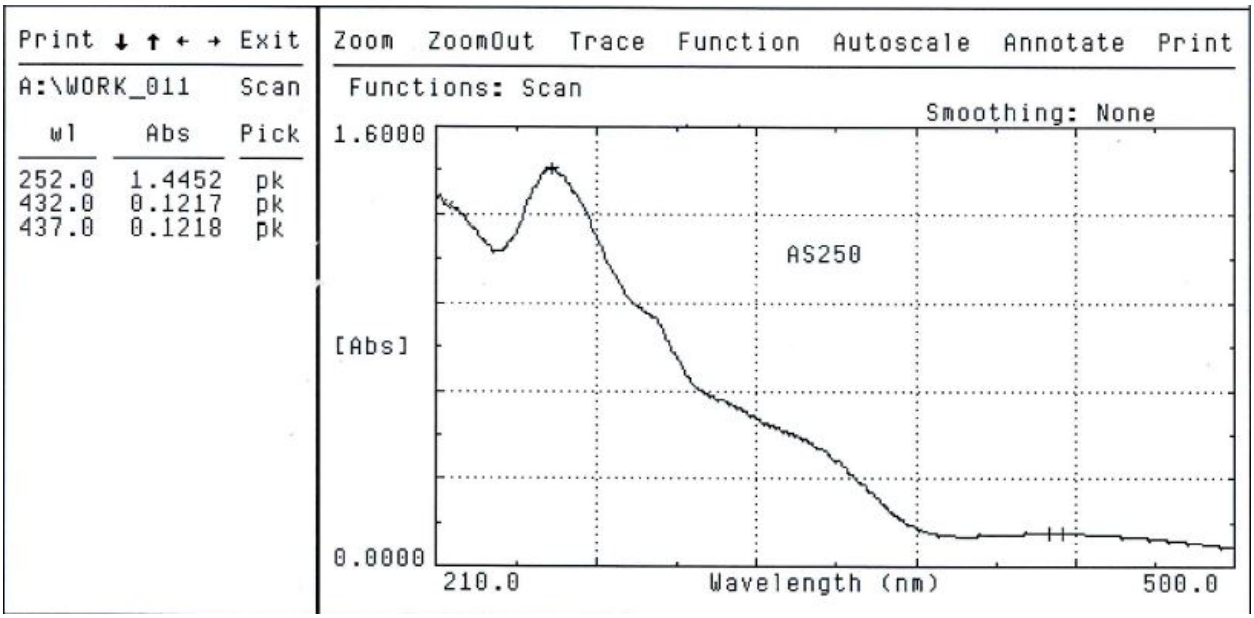
HRMS (C24H16N4O2S), (m/z) $[M+H]^+$ calculated 425.1067 observed 425.1062

UV/Vis (methanol): λ^{max} (ε)= 251 (25335 $mol^{-1}dm^3cm^{-1}$);

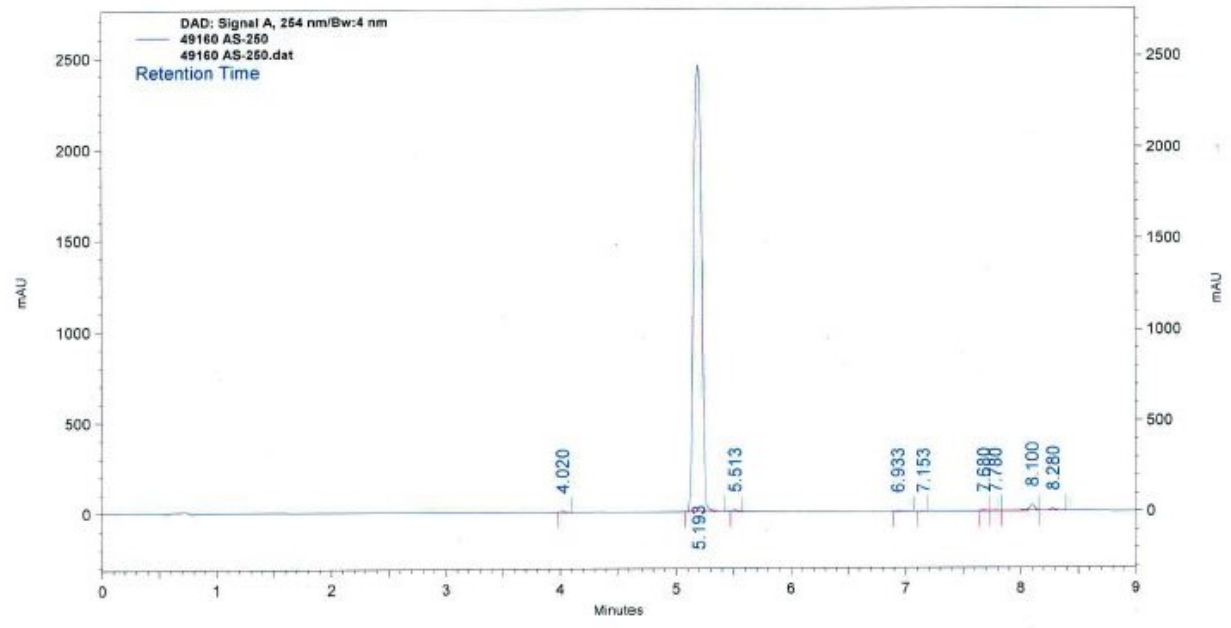
^{1}H NMR (**F15**)


9.47
8.78
8.77
8.20
8.13
8.12
7.54
7.53
7.51
7.39
7.39
6.35
6.34
6.34
6.33
6.26
6.26
6.25
6.25
4.39
0.87
1.13
1.14
1.28
1.11
2.70
3.89
0.76
1.00
0.96
2.67
f1 (ppm)

UV/Vis spectra (**F15**)

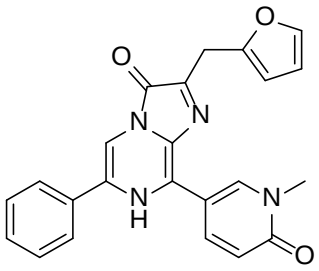


HPLC trace (**F15**)



HPLC purity 98% @ 254nm

2-(furan-2-ylmethyl)-8-(1-methyl-6-oxo-1,6-dihydropyridin-3-yl)-6-phenylimidazo[1,2-a]pyrazin-3(7H)-one (**F16**)



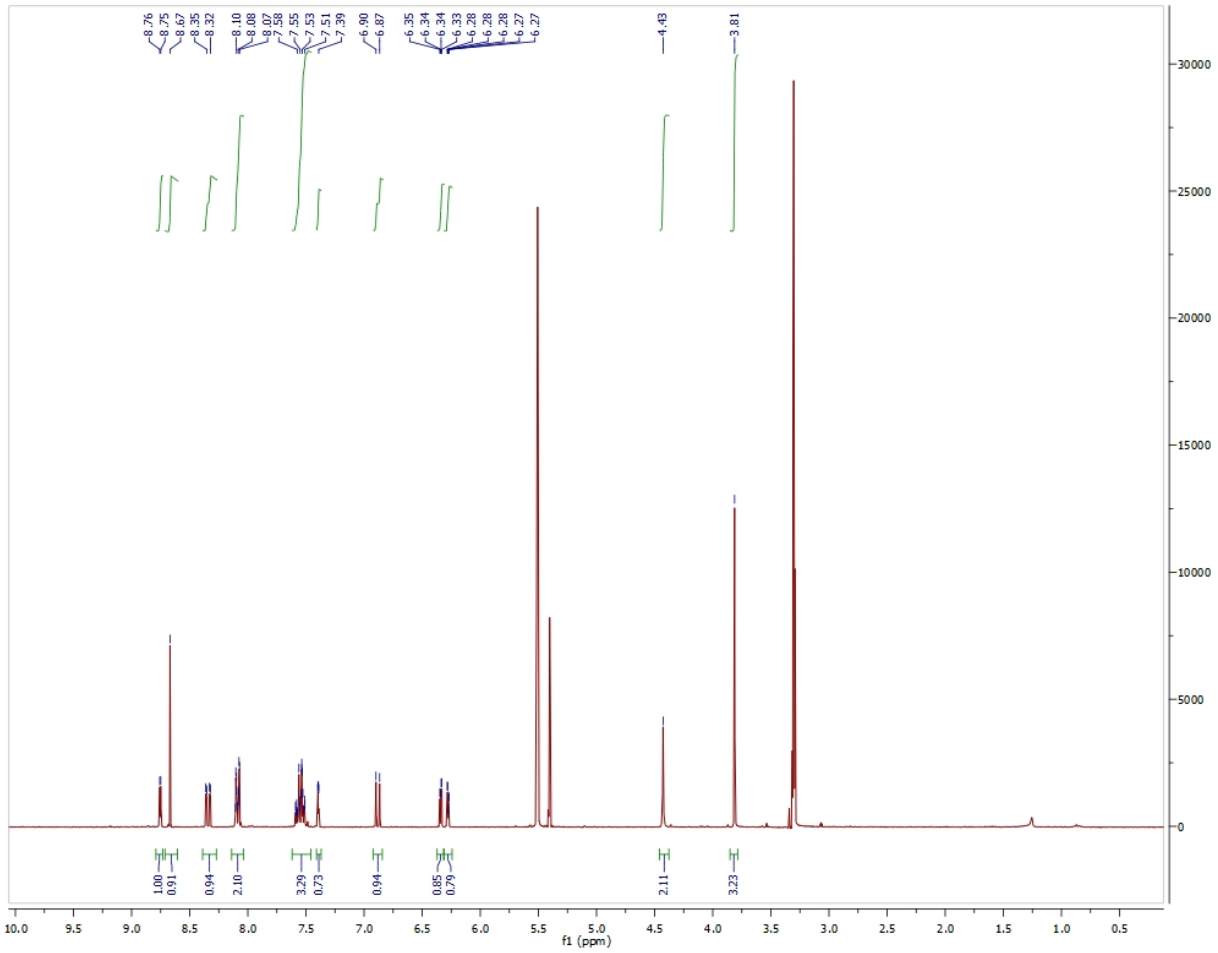
Yield: 7 %

^{1}H NMR (300 MHz, cd3od) δ = 8.75 (d, *J*=2.6, 1H), 8.67 (s, 1H), 8.34 (dd, *J*=2.6, 9.4, 1H), 8.14 – 8.04 (m, 2H), 7.62 – 7.46 (m, 3H), 7.39 (dd, *J*=0.8, 1.9, 1H), 6.88 (d, *J*=9.4, 1H), 6.34 (dd, *J*=1.9, 3.2, 1H), 6.31 – 6.24 (m, 1H), 4.43 (s, 2H), 3.81 (s, 3H).

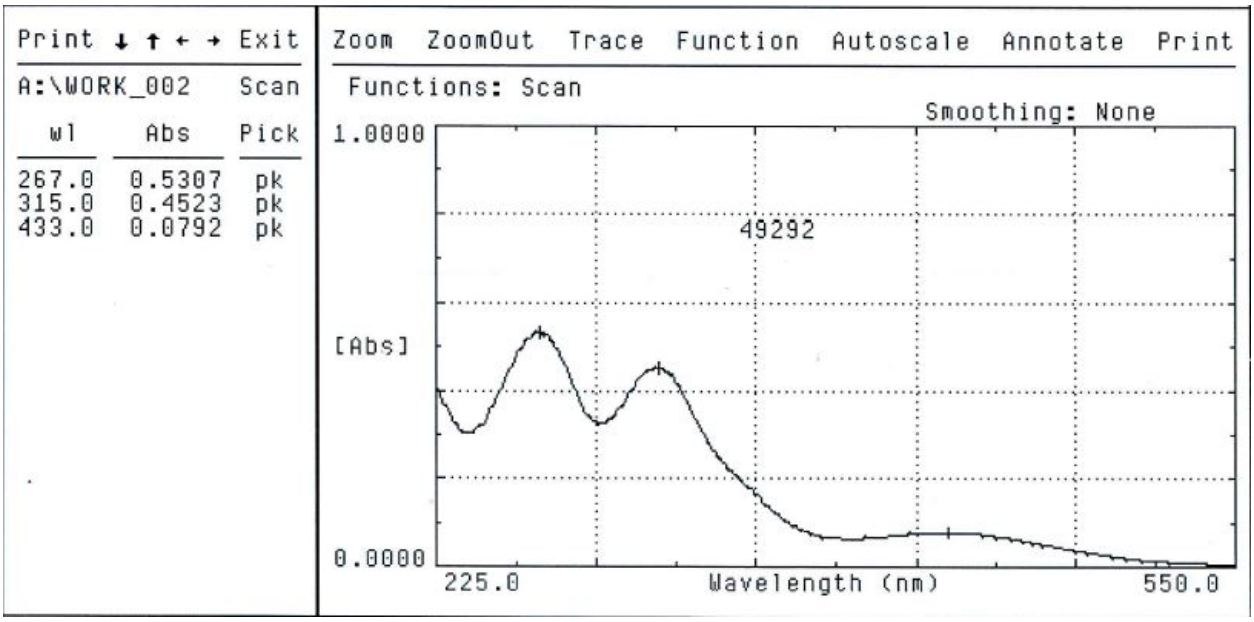
HRMS (C23H18N4O2), (m/z) $[M+H]^+$ calculated 399.1452 observed 399.1451

UV/Vis (methanol): λ^{max} (ε)= 267 (19228 $mol^{-1}dm^3cm^{-1}$);

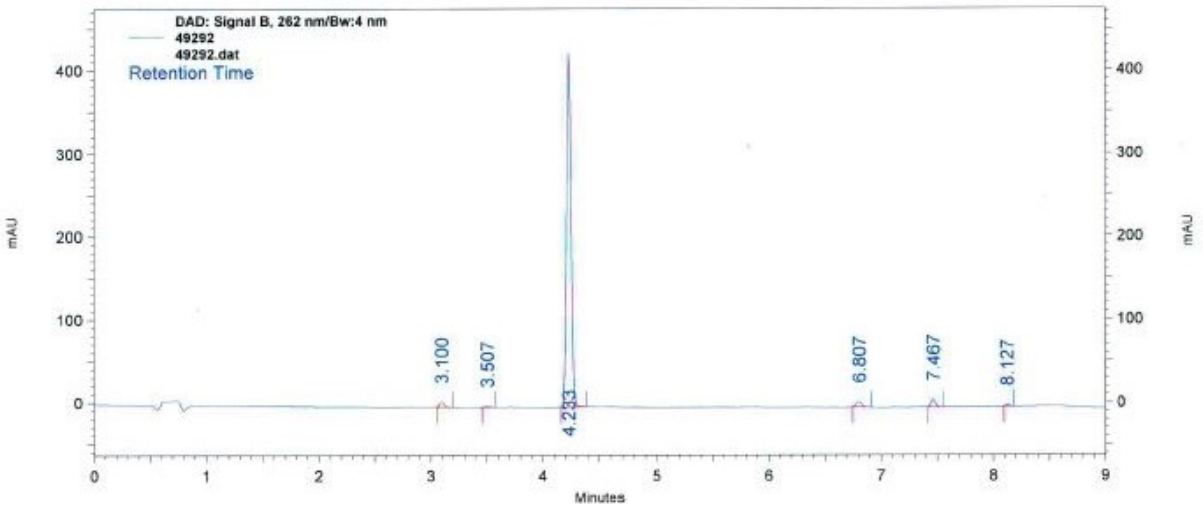
^{1}H NMR (**F16**)


8.76
8.75
8.67
8.35
8.32
8.10
8.08
8.07
7.58
7.55
7.53
7.51
7.39
6.90
6.87
6.35
6.34
6.34
6.33
6.28
6.28
6.28
6.27
6.27
4.43
3.81
30000
25000
20000
15000
10000
5000
0
1.00
0.91
0.94
2.10
3.29
0.73
0.94
0.85
0.79
2.11
3.23
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)

UV/Vis spectra (**F16**)

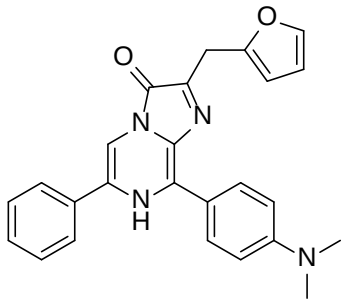


HPLC trace (**F16**)



HPLC purity 94% @ 262nm

8-(4-(dimethylamino)phenyl)-2-(furan-2-ylmethyl)-6-phenylimidazo[1,2-a]pyrazin-3(7H)-one (**F17**)



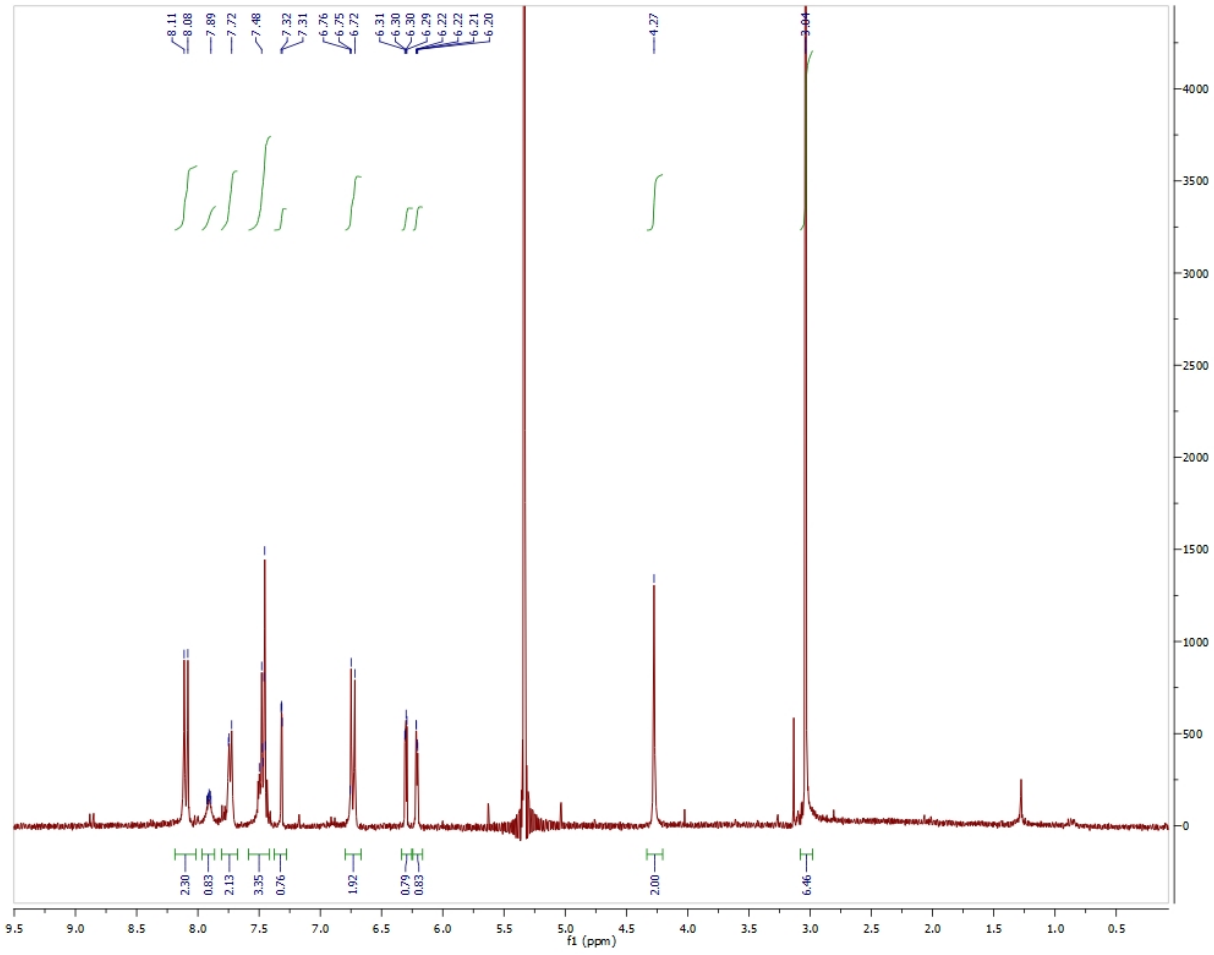
^{1}H NMR (300 MHz, cd2cl2) δ = 8.10 (d, *J*=9.0, 2H), 7.91-7.85 (m, 1H), 7.81 – 7.68 (m, 2H), 7.59 – 7.42 (m, 3H), 7.32 (dd, *J*=0.8, 1.9, 1H), 6.74 (d, *J*=9, 2H), 6.30 (dd, *J*=1.9, 3.2, 1H), 6.21 (dd, *J*=0.8, 3.2, 1H), 4.27 (s, 2H), 3.04 (s, 6H).

HRMS (C25H22N4O2), (m/z) $[M+H]^+$ calculated 411.1816 observed 411.1824

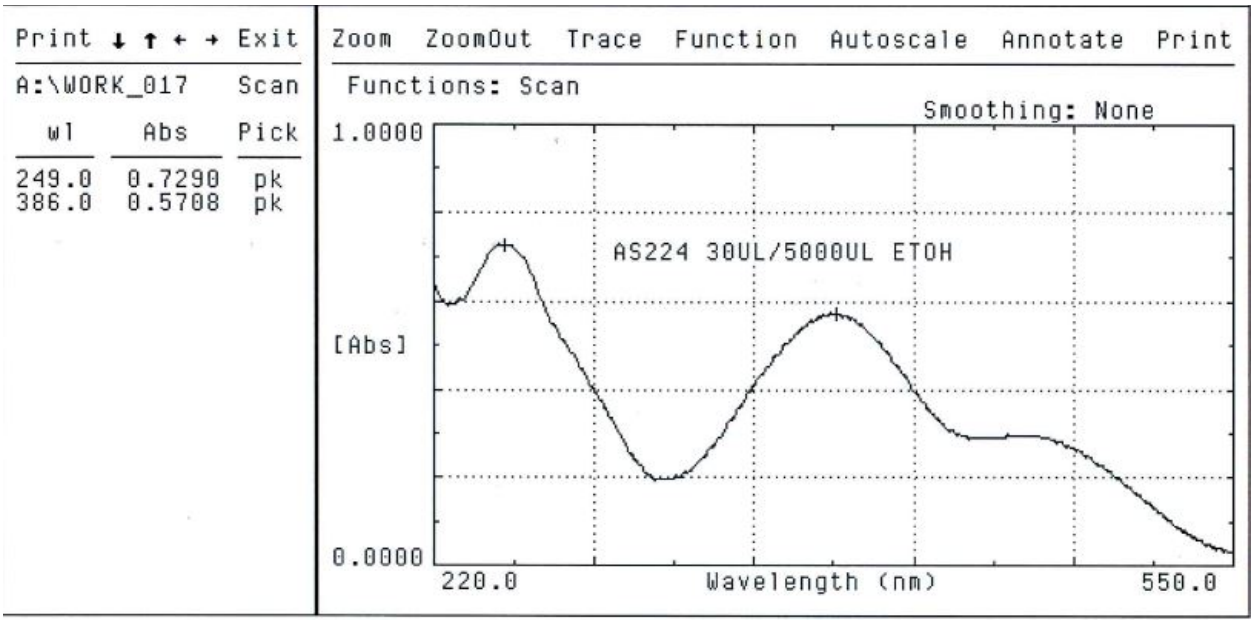
UV/Vis (methanol): λ^{max} (ε)=249 (27707 $mol^{-1}dm^3cm^{-1}$);

Yield: 5 %

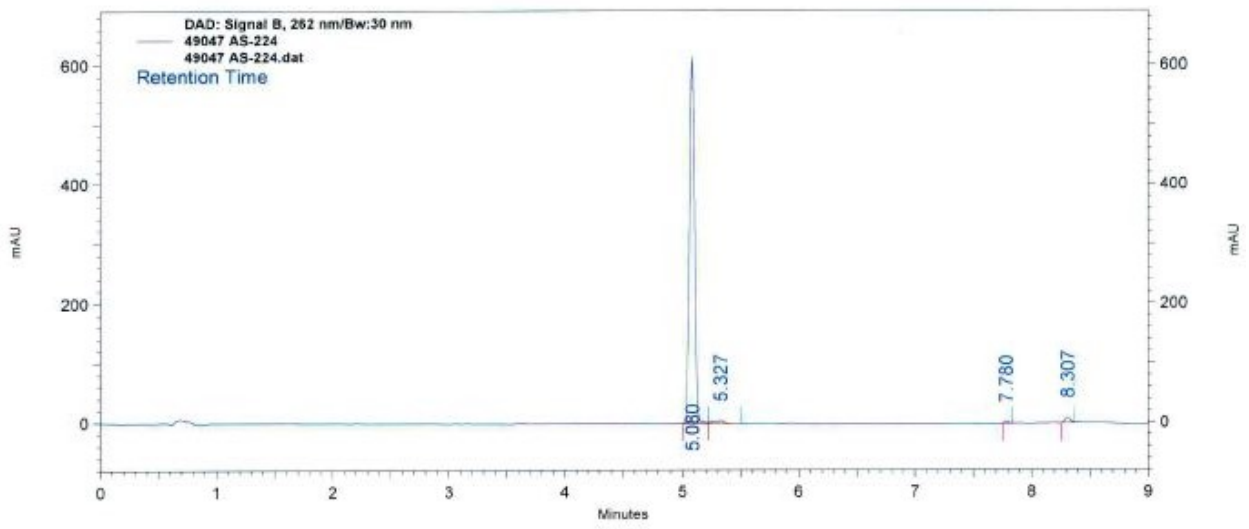
^{1}H NMR (**F17**)


8.11
8.08
7.89
7.72
7.48
7.32
7.31
6.76
6.75
6.72
6.31
6.30
6.30
6.29
6.22
6.22
6.21
6.20
4.27
3.01
2.30
0.83
2.13
3.35
0.76
1.92
0.79
0.83
2.00
6.46
f1 (ppm)

UV/Vis spectra (**F17**)



HPLC trace (**F17**)



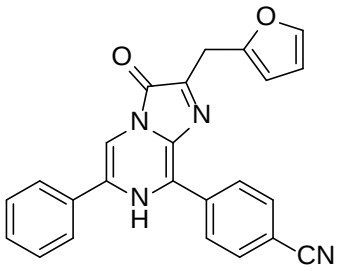
HPLC purity 97% @ 254nm

4-(2-(furan-2-ylmethyl)-3-oxo-6-phenyl-3,7-dihydroimidazo[1,2-a]pyrazin-8-yl)benzonitrile (**F18**)

^{1}H NMR (300 MHz, cd2cl2) δ = 8.47 (d, *J*=8.1, 2H), 8.03 – 7.80 (m, 3H), 7.75 – 7.65 (m, 2H), 7.45 (m, 3H), 7.22 (dd, *J*=0.7, 1.8, 1H), 6.22 (dd, *J*=1.9, 3.2, 1H), 6.08 (dd, *J*=0.7, 3.2, 1H), 4.19 (s, 2H).

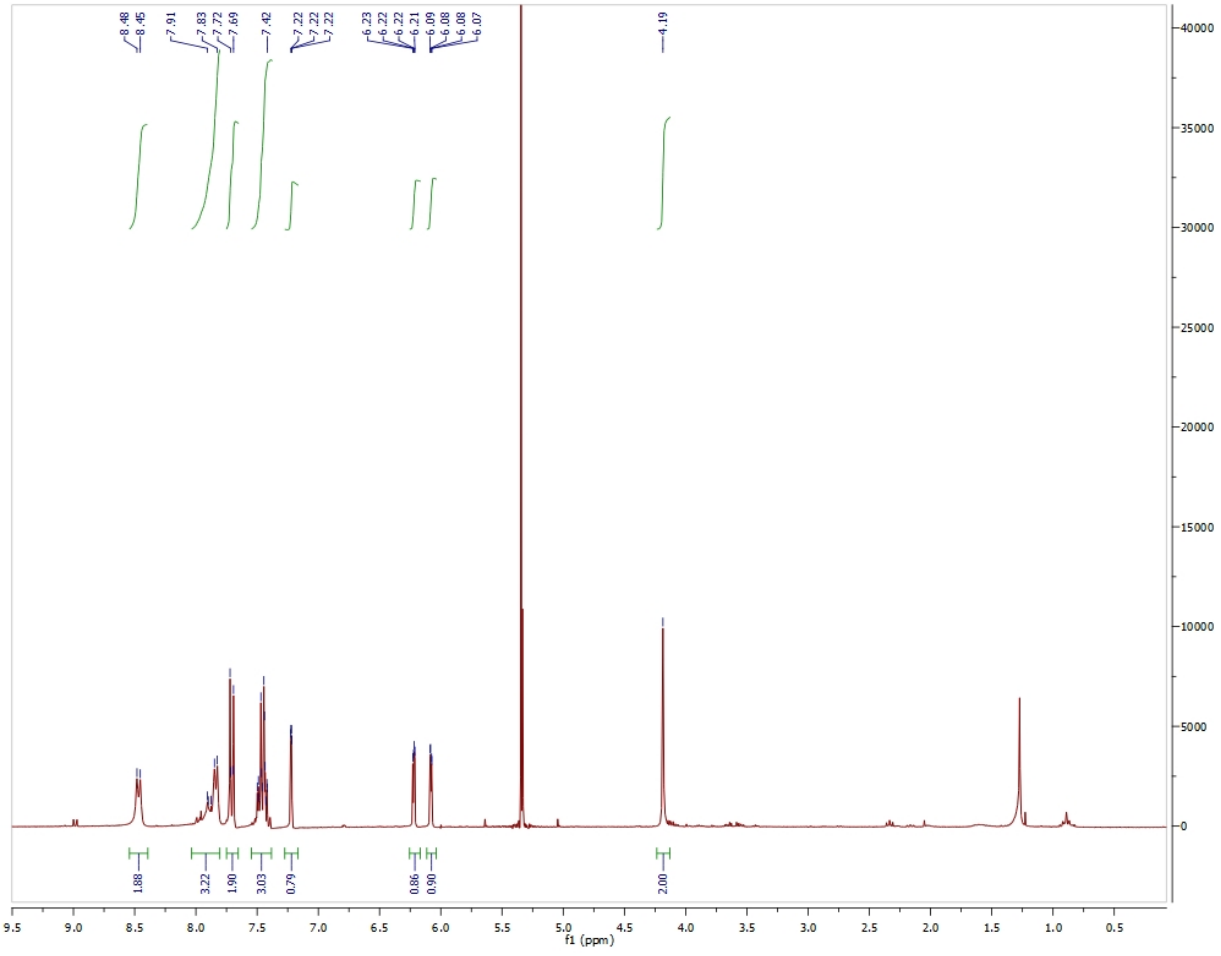
HRMS (C24H16N4O2), (m/z) $[M+H]^{+}$ calculated 393.1346 observed 393.1350

UV/Vis (methanol): λ^{max} (ε)= 264 (26176 $mol^{-1}dm^{3}cm^{-1}$);

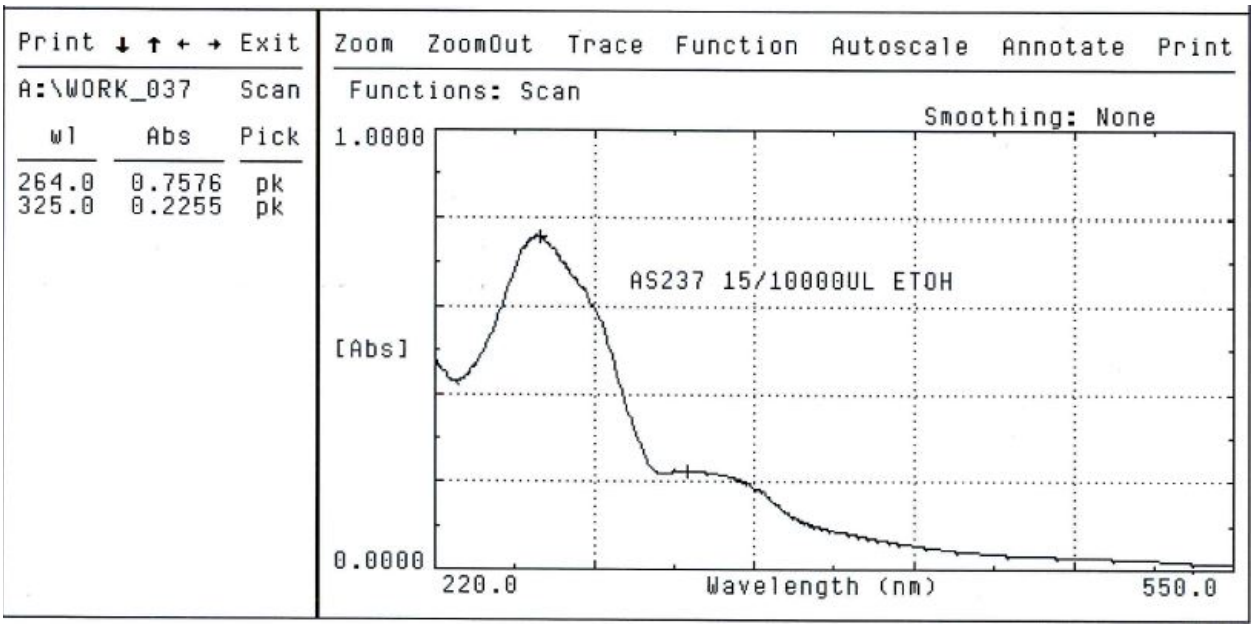


Yield: 13 %

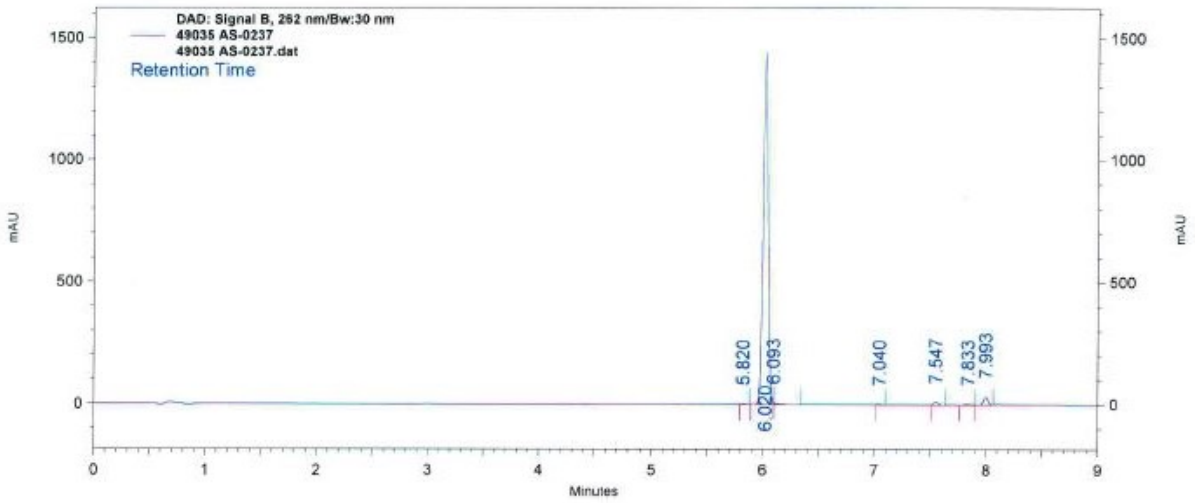
^{1}H NMR (**F18**)


8.48
8.45
7.91
7.83
7.72
7.69
7.42
7.22
7.22
7.22
6.23
6.22
6.22
6.21
6.09
6.08
6.08
6.07
4.19
1.88
3.22
1.90
3.03
0.79
0.86
0.90
2.00
f1 (ppm)

UV/Vis spectra (**F18**)

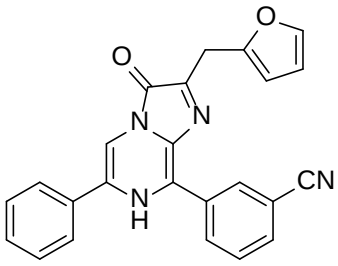


HPLC trace (**F18**)



HPLC purity 97% @ 262nm

3-(2-(furan-2-ylmethyl)-3-oxo-6-phenyl-3,7-dihydroimidazo[1,2-a]pyrazin-8-yl)benzonitrile (**F19**)



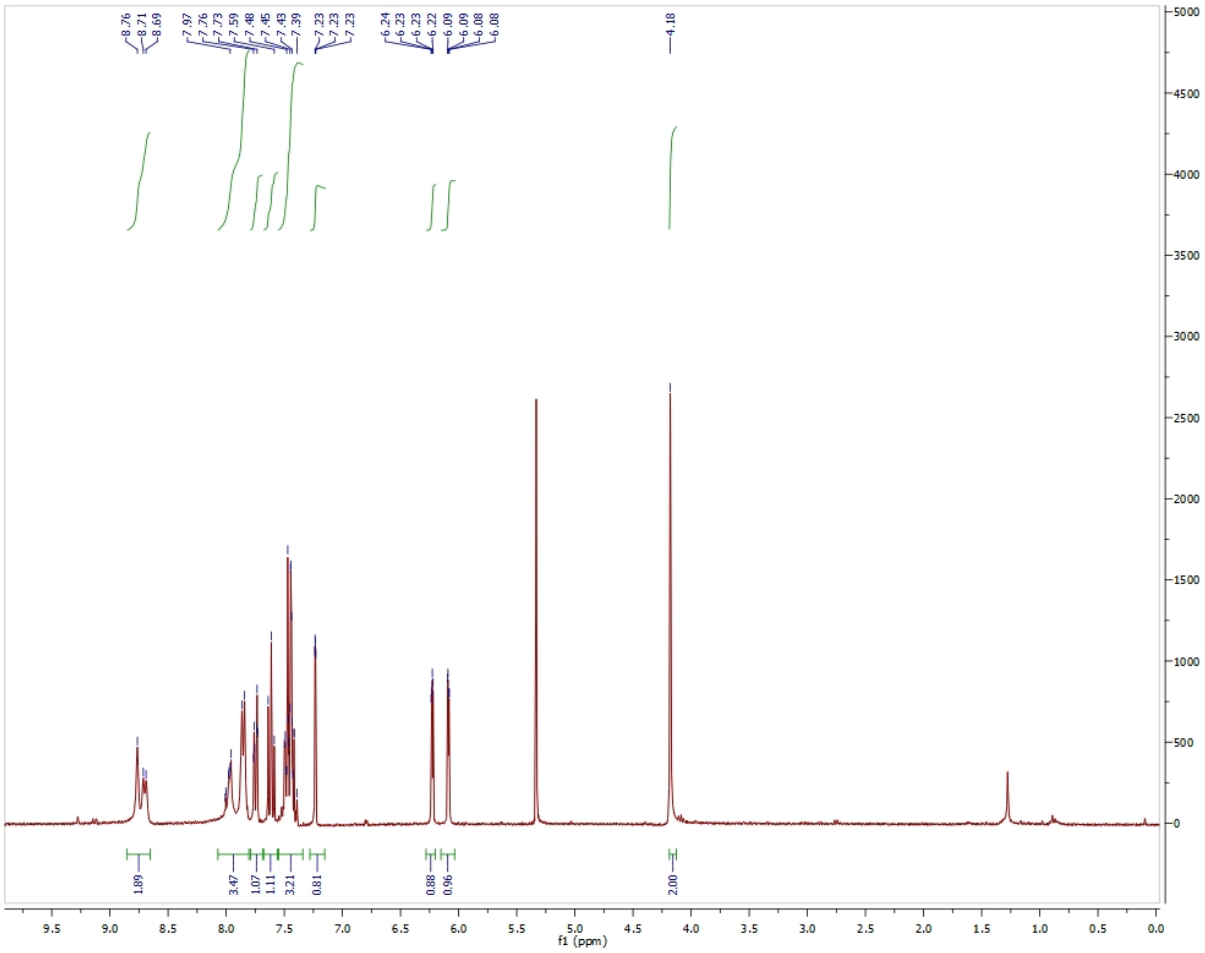
Yield: 21 %

^{1}H NMR (300 MHz, cd2cl2) δ = 8.85 – 8.65 (m, 2H), 7.95 (m, 3H), 7.75 (m, 1H), 7.61 (m, 1H), 7.55 – 7.34 (m, 3H), 7.23 (dd, *J*=0.8, 1.8, 1H), 6.23 (dd, *J*=1.9, 3.2, 1H), 6.09 (dd, *J*=0.7, 3.2, 1H), 4.18 (s, 2H).

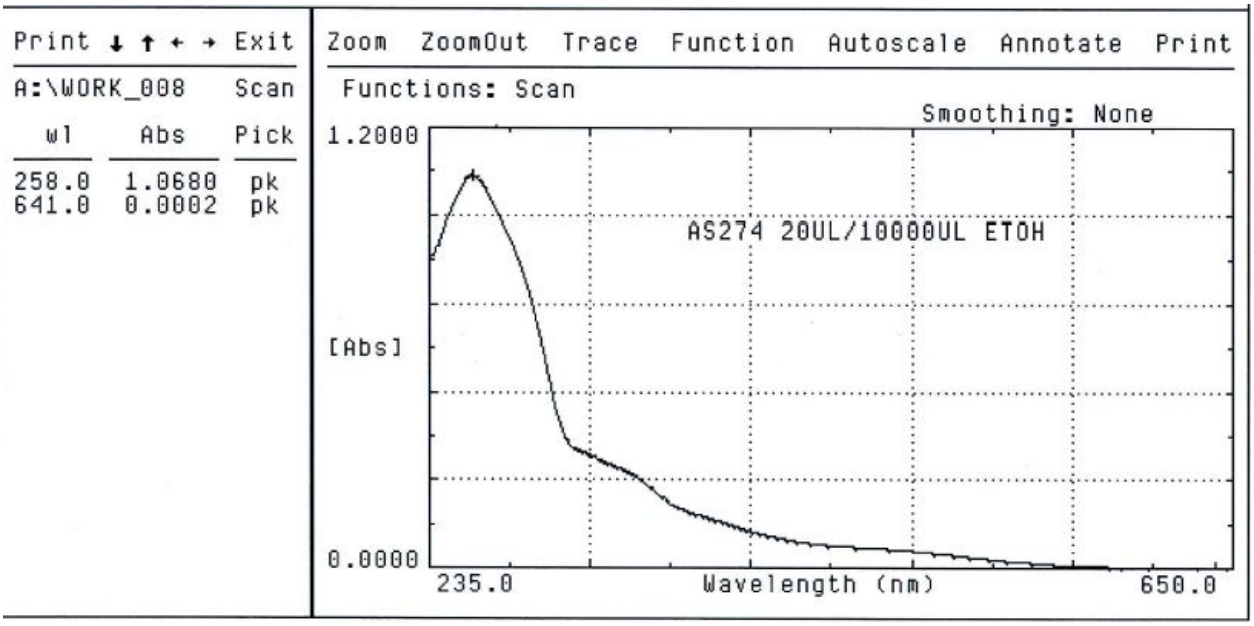
HRMS (C24H16N4O2), (m/z) $[M+H]^{+}$ calculated 393.1346 observed 131.1339

UV/Vis (methanol): λ^{max} (ε)= 258 (14698 $mol^{-1}dm^{3}cm^{-1}$);

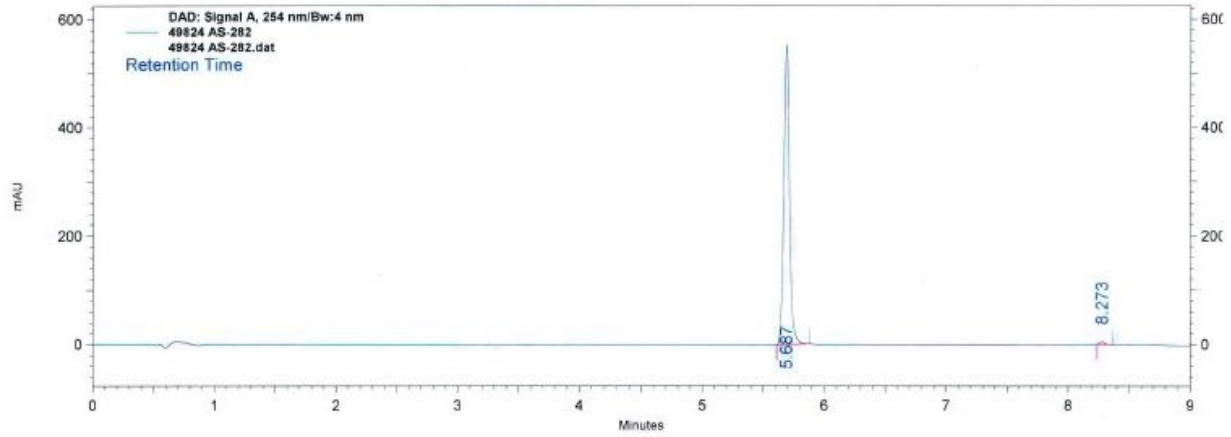
^{1}H NMR (**F19**)


8.76
8.71
8.69
7.97
7.76
7.73
7.59
7.48
7.45
7.43
7.39
7.23
7.23
7.23
6.24
6.23
6.23
6.22
6.09
6.09
6.08
6.08
4.18
1.89
3.47
1.07
1.11
3.21
0.81
0.88
0.96
2.00
f1 (ppm)

UV/Vis spectra (**F19**)

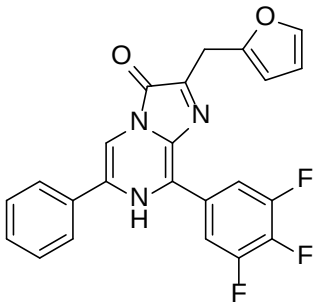


HPLC trace (**F19**)



HPLC purity 99% @ 254nm

2-(furan-2-ylmethyl)-6-phenyl-8-(3,4,5-trifluorophenyl)imidazo[1,2-a]pyrazin-3(7H)-one (**F20**)



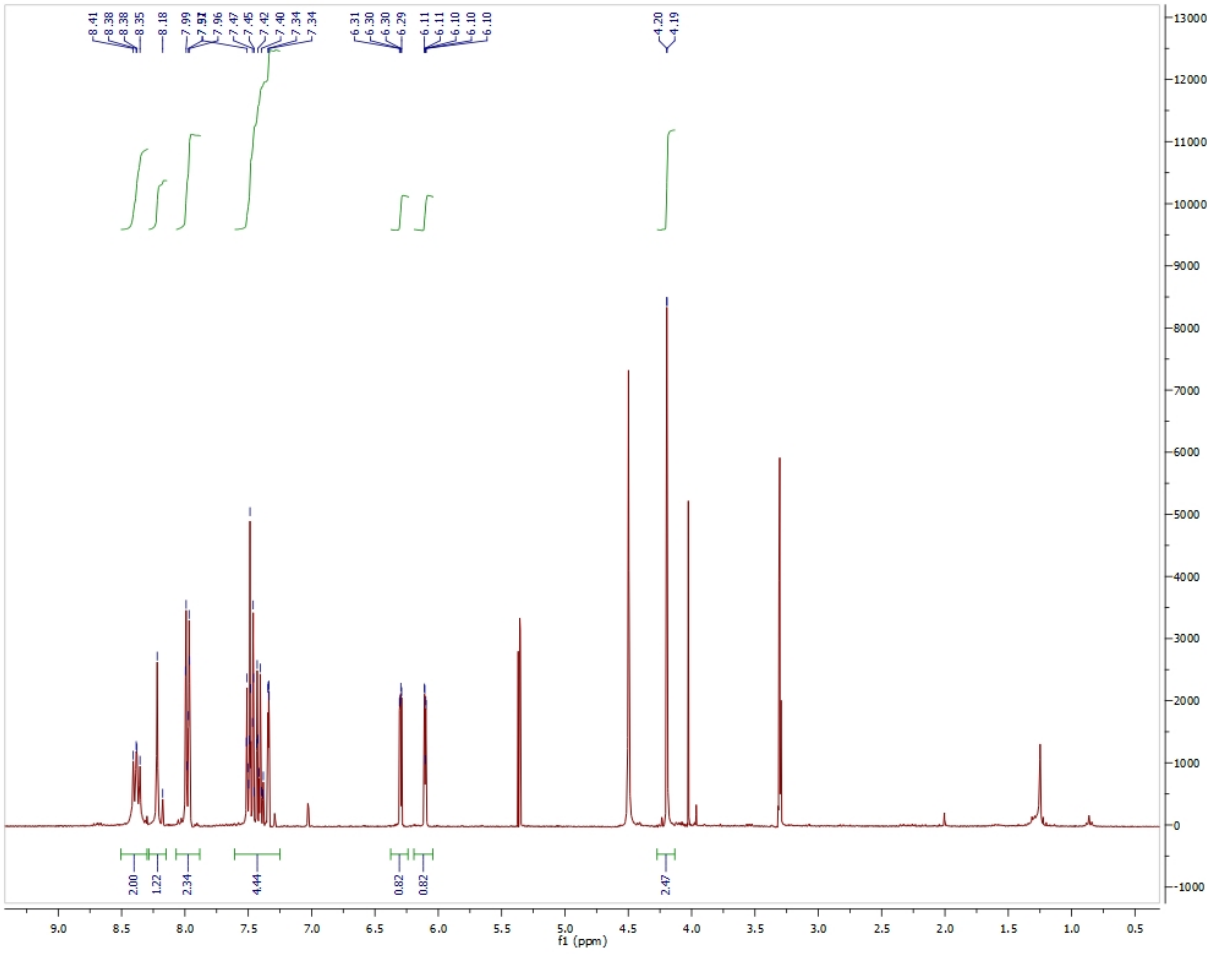
Yield: 20 %

^{1}H NMR (300 MHz, cd3od) δ = 8.38 (dd, *J*=7.2, 8.9, 2H), 8.20 (d, *J*=13.0, 1H), 8.07 – 7.88 (m, 2H), 7.61 – 7.25 (m, 4H), 6.30 (dd, *J*=1.9, 3.2, 1H), 6.19 – 6.04 (m, 1H), 4.19 (s, 2H).

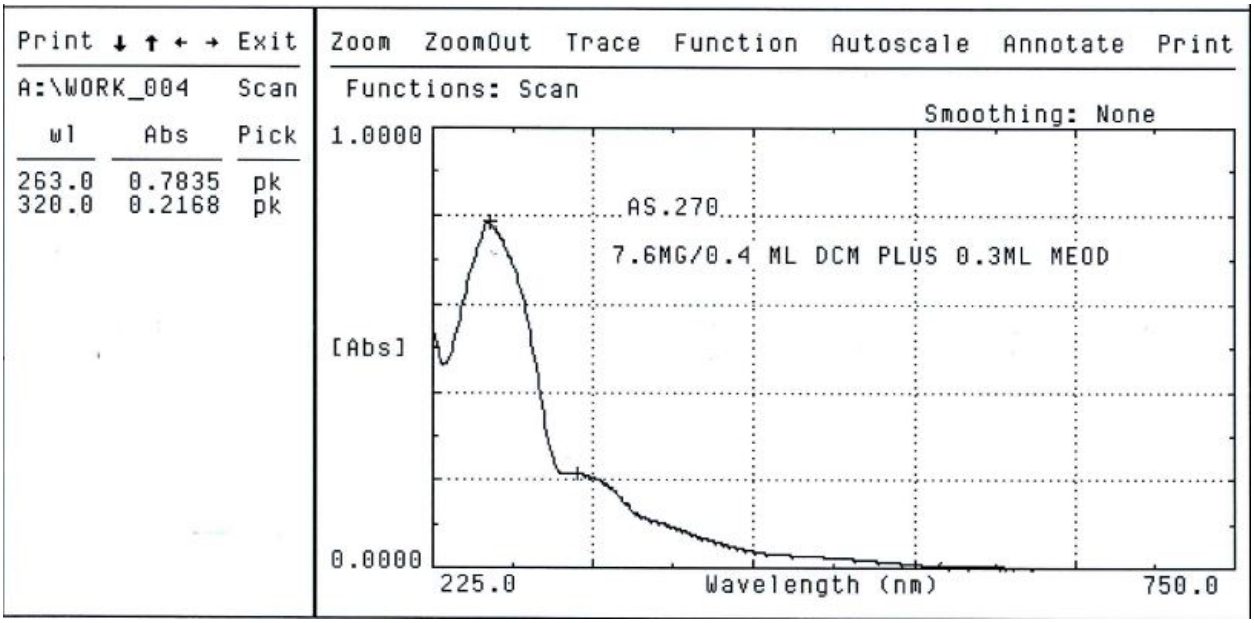
HRMS (C23H14N3O2F3), (m/z) $[M+H]^+$ calculated 422.1111 observed 422.1118

UV/Vis (methanol): λ^{max} (ε)= 263 (30.409 $mol^{-1}dm^3cm^{-1}$);

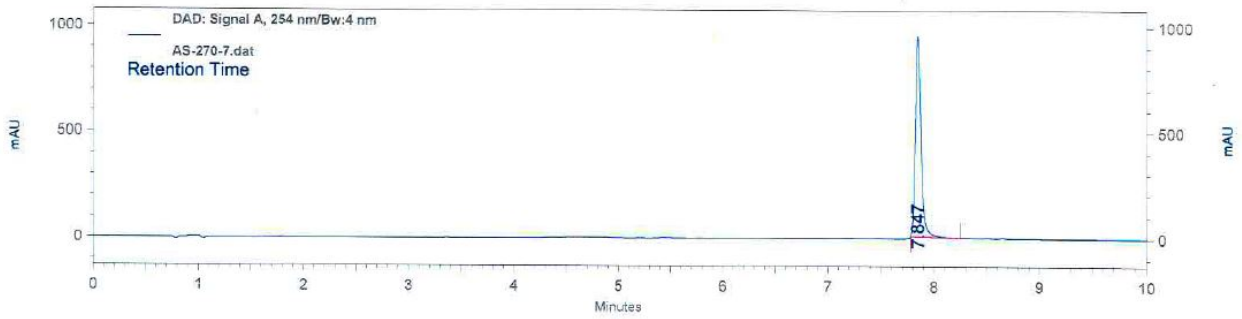
^{1}H NMR (**F20**)


8.41
8.38
8.38
8.35
8.18
7.99
7.97
7.96
7.47
7.45
7.42
7.40
7.34
7.34
6.31
6.30
6.30
6.29
6.11
6.11
6.10
6.10
6.10
4.20
4.19
2.00
1.22
2.34
4.44
0.82
0.82
2.47
f1 (ppm)

UV/Vis spectra (**F20**)



HPLC trace (**F20**)



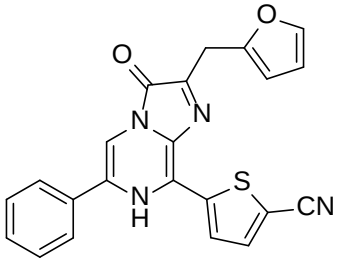
HPLC purity >99% @ 254nm

5-(2-(furan-2-ylmethyl)-3-oxo-6-phenyl-3,7-dihydroimidazo[1,2-a]pyrazin-8-yl)thiophene-2-carbonitrile (**F21**)

^{1}H NMR (300 MHz, cd2cl2) δ = 8.55 (s, 1H), 8.24 (s, 1H), 7.95 (d, *J*=7.3, 2H), 7.75 – 7.60 (m, 1H), 7.48 – 7.38 (m, 2H), 7.38 – 7.31 (m, 1H), 7.29 – 7.25 (m, 1H), 6.24 (dd, *J*=1.9, 3.2, 1H), 6.05 (dd, *J*=0.8, 3.2, 1H), 4.14 (s, 2H).

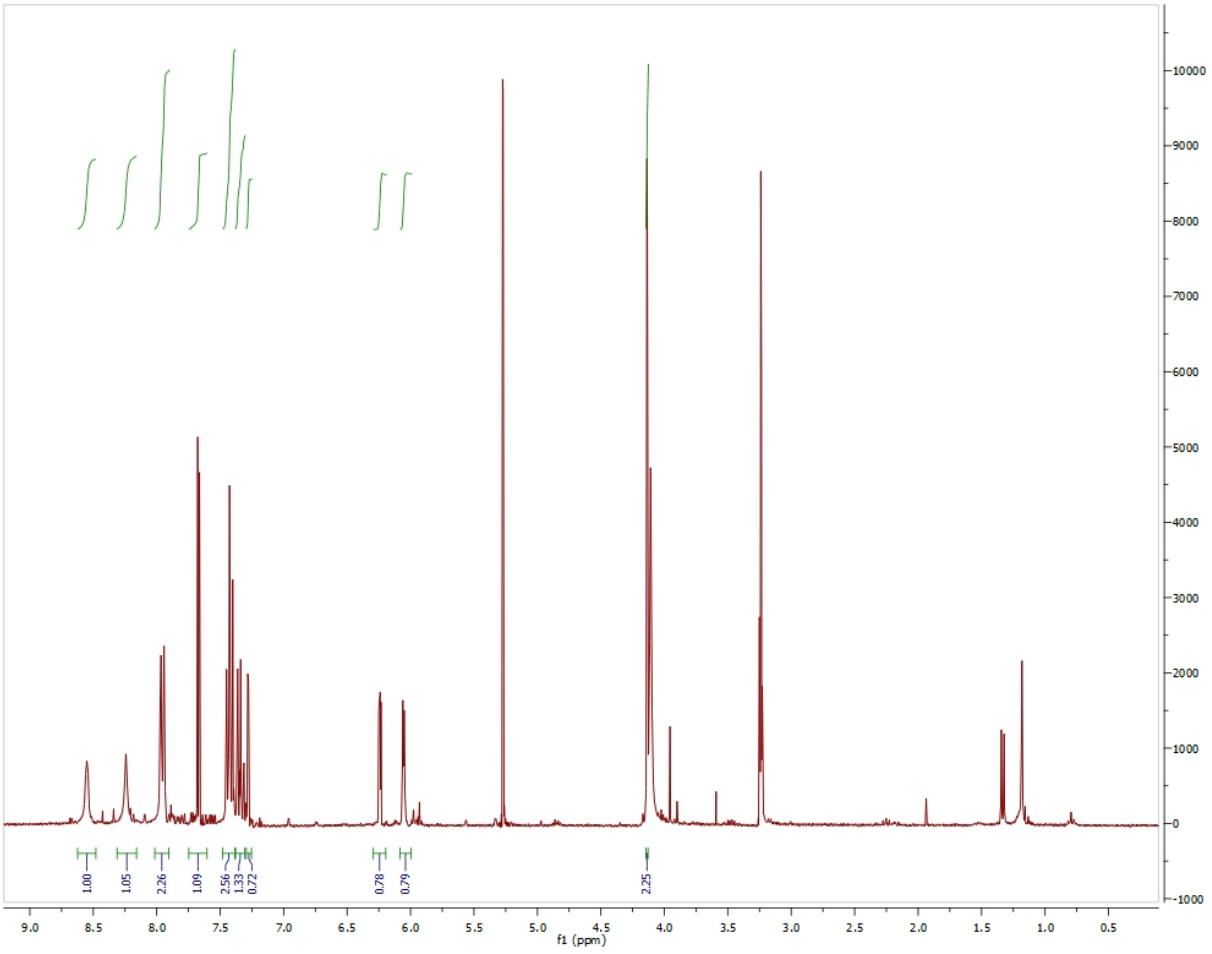
HRMS (C22H14N4O2S), (m/z) $[M+H]^{+}$ calculated 399.0910 observed 399.0915

UV/Vis (methanol): λ^{max} (ε)= 272 (21309 $mol^{-1}dm^{3}cm^{-1}$);

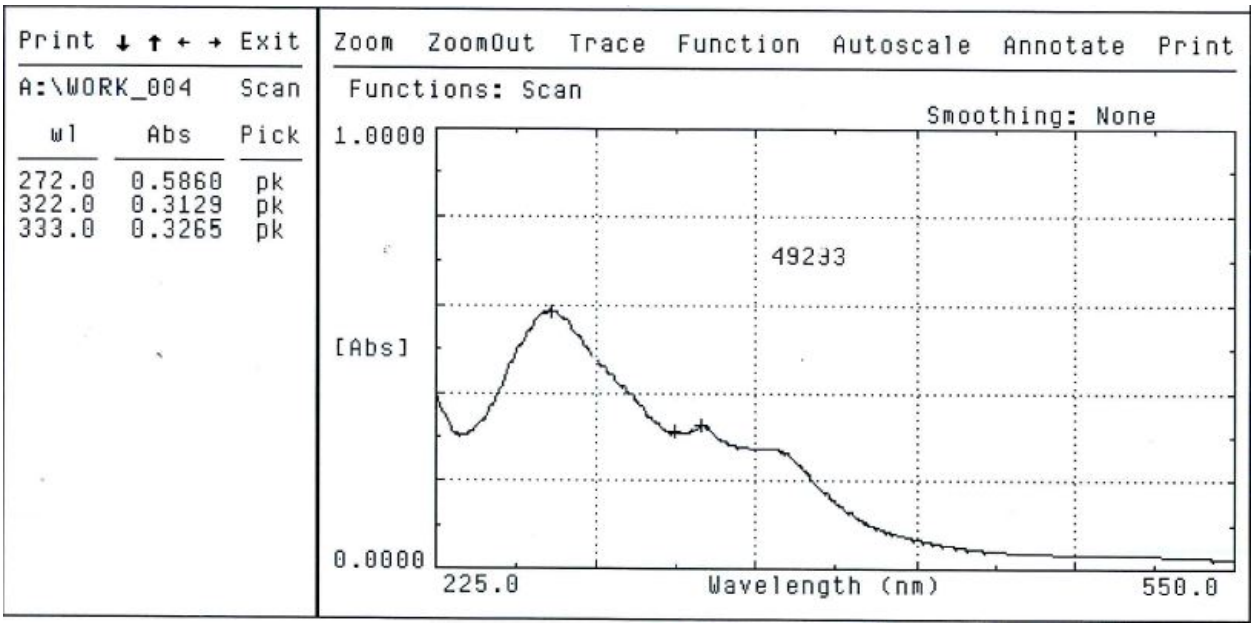


Yield: 15 %

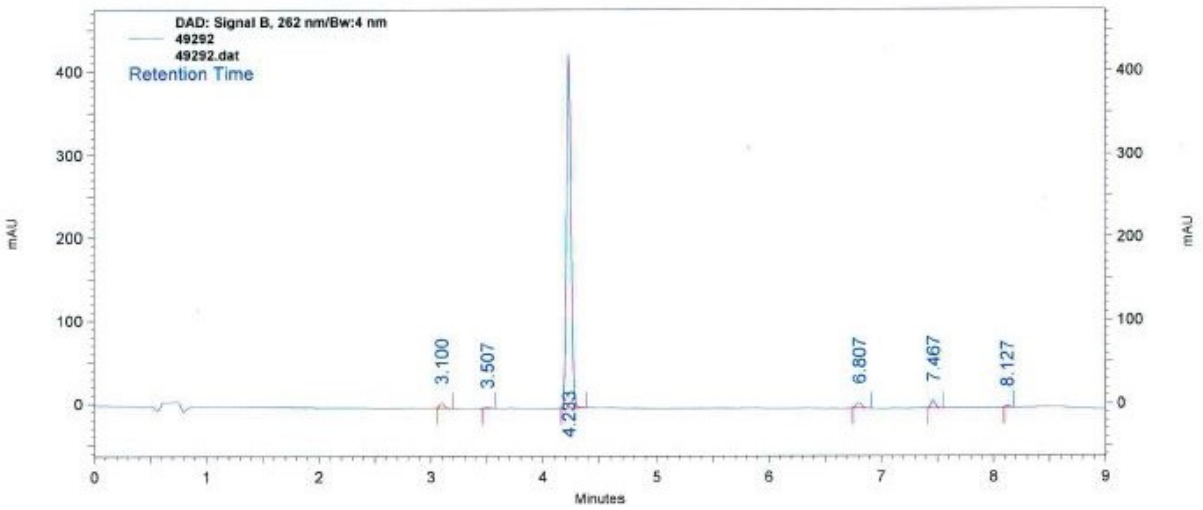
^{1}H NMR (**F21**)


10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-1000
1.00
1.05
2.26
1.09
2.56
1.33
0.72
0.78
0.79
2.25
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)

UV/Vis spectra (**F21**)

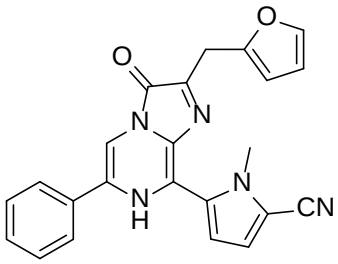


HPLC trace (**F21**)



HPLC purity 94% @ 262nm

5-(2-(furan-2-ylmethyl)-3-oxo-6-phenyl-3,7-dihydroimidazo[1,2-a]pyrazin-8-yl)-1-methyl-1H-pyrrole-2-carbonitrile (**F22**)



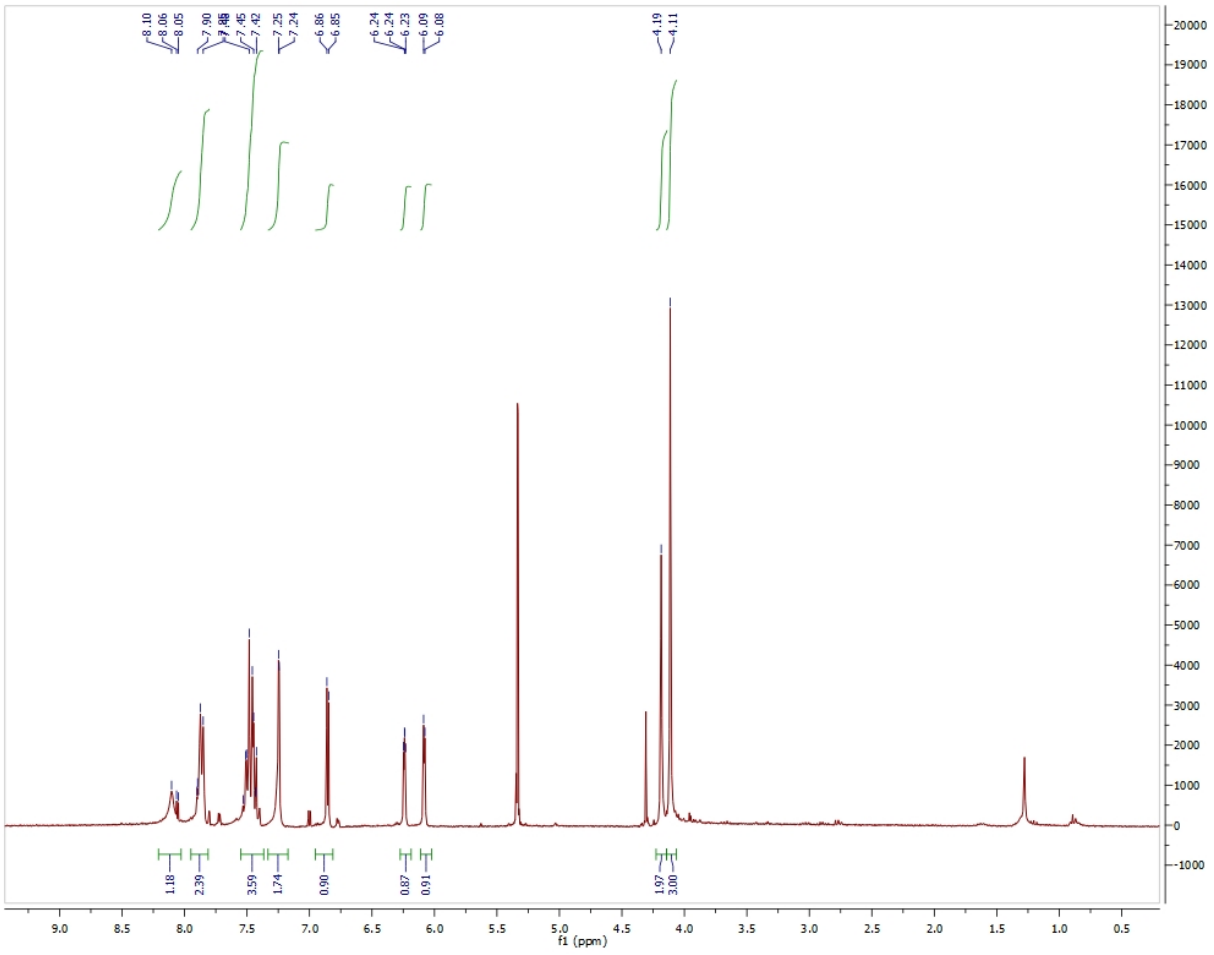
Yield: 13 %

^{1}H NMR (300 MHz, cd2cl2) δ = 8.21 – 8.03 (m, 1H), 7.88 (m, 2H), 7.55 – 7.37 (m, 3H), 7.25 (d, *J*=1.6, 2H), 6.85 (d, *J*=4.2, 1H), 6.24 (dd, *J*=2.0, 3.0, 1H), 6.08 (d, *J*=3.1, 1H), 4.19 (s, 2H), 4.11 (s, 3H).

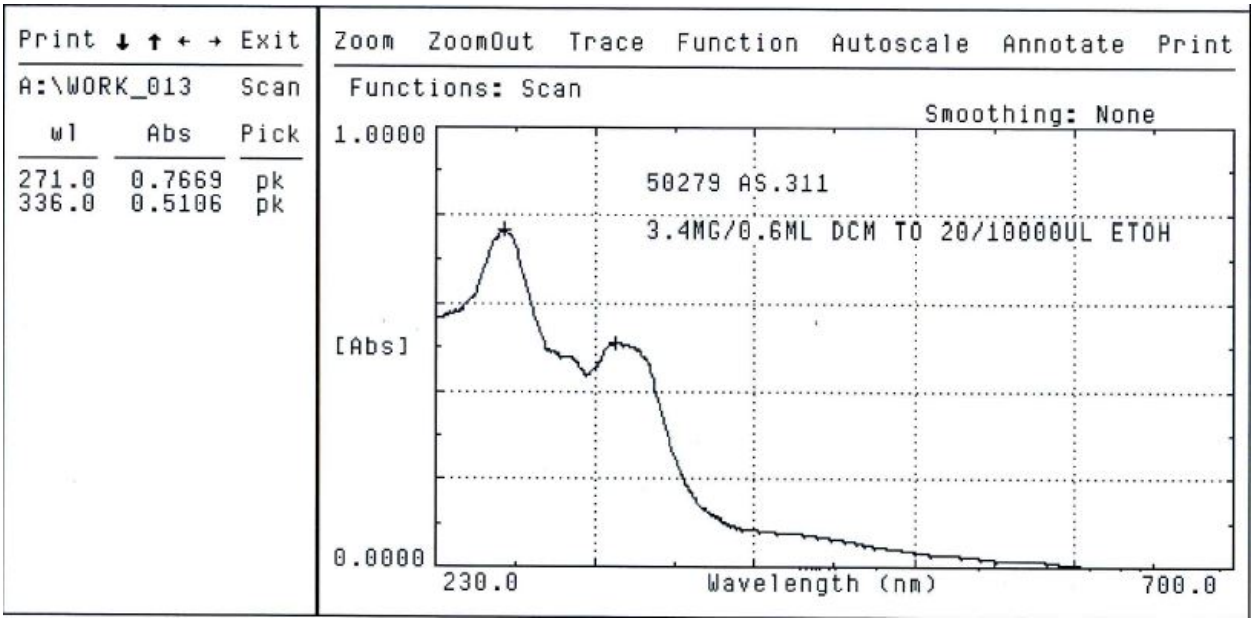
HRMS (C23H17N5O2), (m/z) $[M+H]^+$ calculated 396.1455 observed 396.1454

UV/Vis (methanol): λ^{max} (ε)= 271 (26721 $mol^{-1}dm^3cm^{-1}$);

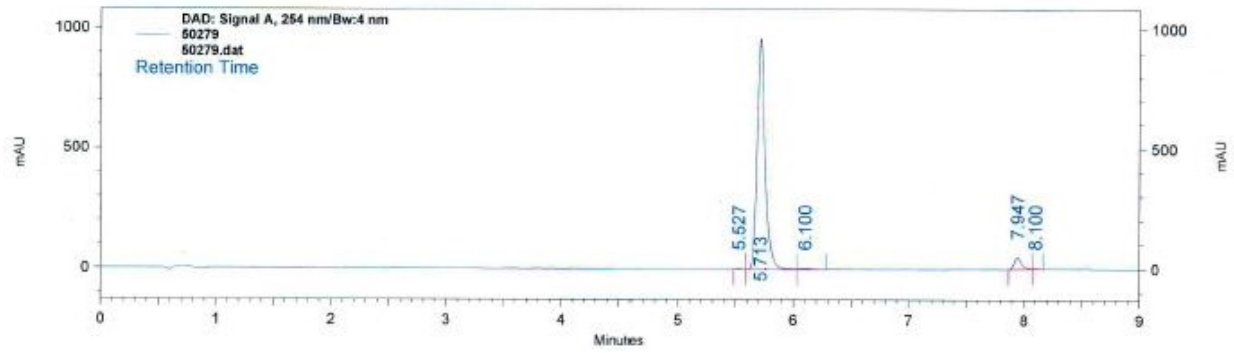
^{1}H NMR (**F22**)


8.10
8.06
8.05
7.90
7.45
7.42
7.25
7.24
6.86
6.85
6.24
6.24
6.23
6.09
6.08
4.19
4.11
1.18
2.39
3.59
1.74
0.90
0.87
0.91
1.97
3.00
f1 (ppm)

UV/Vis spectra (**F22**)

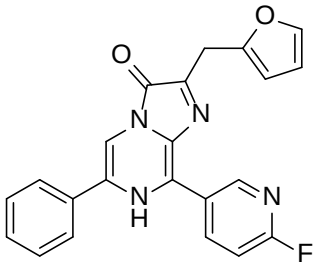


HPLC trace (**F22**)



HPLC purity 95% @ 254nm

8-(6-fluoropyridin-3-yl)-2-(furan-2-ylmethyl)-6-phenylimidazo[1,2-a]pyrazin-3(7H)-one (**F23**)



^{1}H NMR (300 MHz, cd2cl2) δ = 9.35 (s, 1H), 9.02 (s, 1H), 8.18 (s, 1H), 7.97 (d, *J*=7.6, 2H), 7.56 – 7.40 (m, 3H), 7.33 (dd, *J*=0.8, 1.8, 1H), 7.15 (ddd, *J*=0.6, 2.7, 8.6, 2H), 6.30 (dd, *J*=1.9, 3.2, 1H), 6.22 – 6.06 (m, 1H), 4.19 (s, 2H).

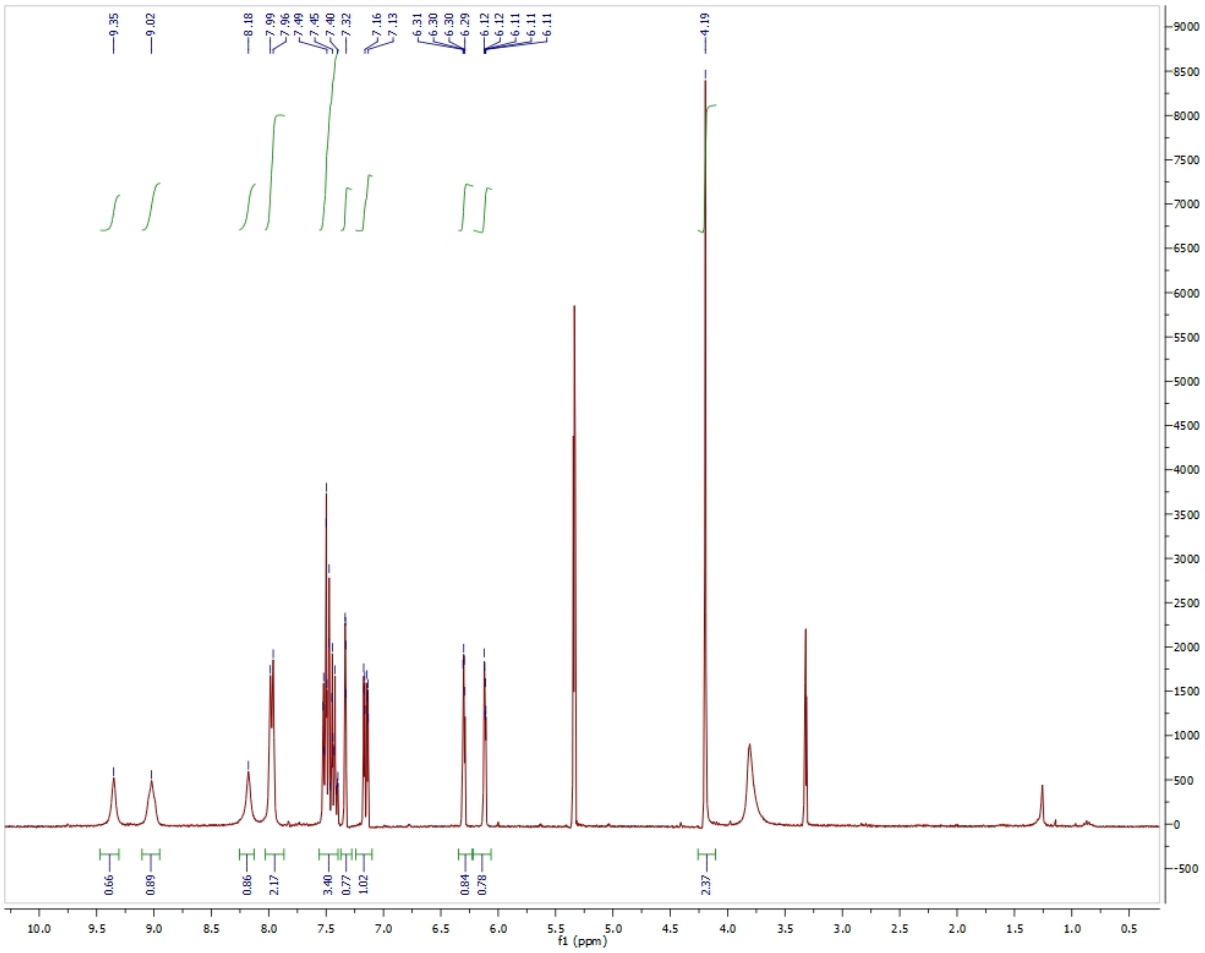
HRMS (C22H15N4O2F), (m/z) $[M+H]^+$ calculated 387.1252

observed 387.1252

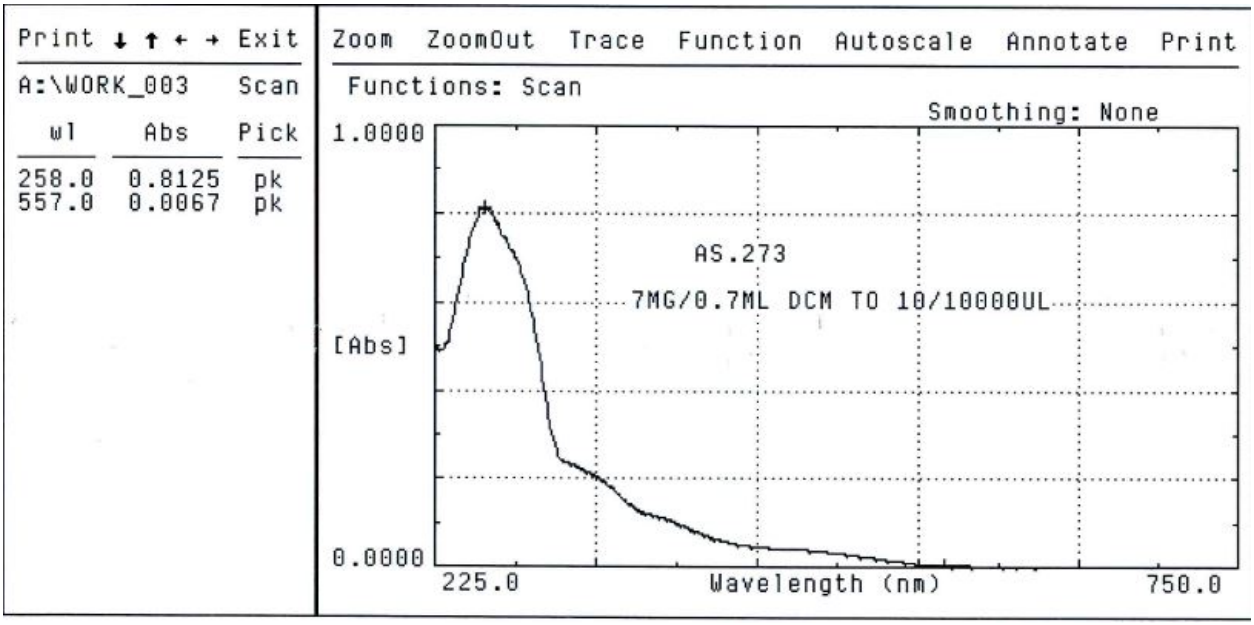
UV/Vis (methanol): λ^{max} (ε)= 258 (31394 $mol^{-1}dm^3cm^{-1}$);

Yield: 23 %

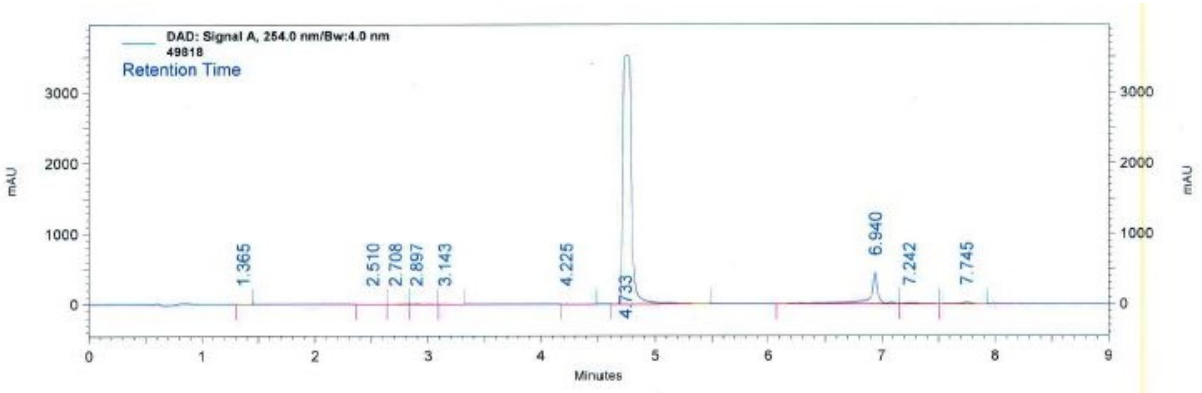
^{1}H NMR (**F23**)


9.35
9.02
8.18
7.99
7.96
7.49
7.45
7.40
7.32
7.16
7.13
6.31
6.30
6.30
6.29
6.12
6.12
6.11
6.11
6.11
4.19
0.66
0.89
0.86
2.17
3.40
0.77
1.02
0.84
0.78
2.37
f1 (ppm)

UV/Vis spectra (**F23**)



HPLC trace (**F23**)



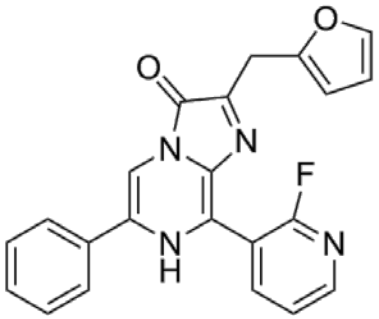
HPLC purity 90% @ 254nm

8-(2-fluoropyridin-3-yl)-2-(furan-2-ylmethyl)-6-phenylimidazo[1,2-a]pyrazin-3(7H)-one (**F24**)

^{1}H NMR (300 MHz, cd2cl2) δ = 8.44 (m, 1H), 8.29 – 8.18 (m, 1H), 7.91 (s, 1H), 7.87 – 7.73 (m, 2H), 7.52 – 7.35 (m, 3H), 7.33 – 7.24 (m, 1H), 7.13 (d, *J*=1.1, 1H), 6.13 (dd, *J*=1.9, 3.1, 1H), 5.96 (d, *J*=3.1, 1H), 4.03 (s, 2H).

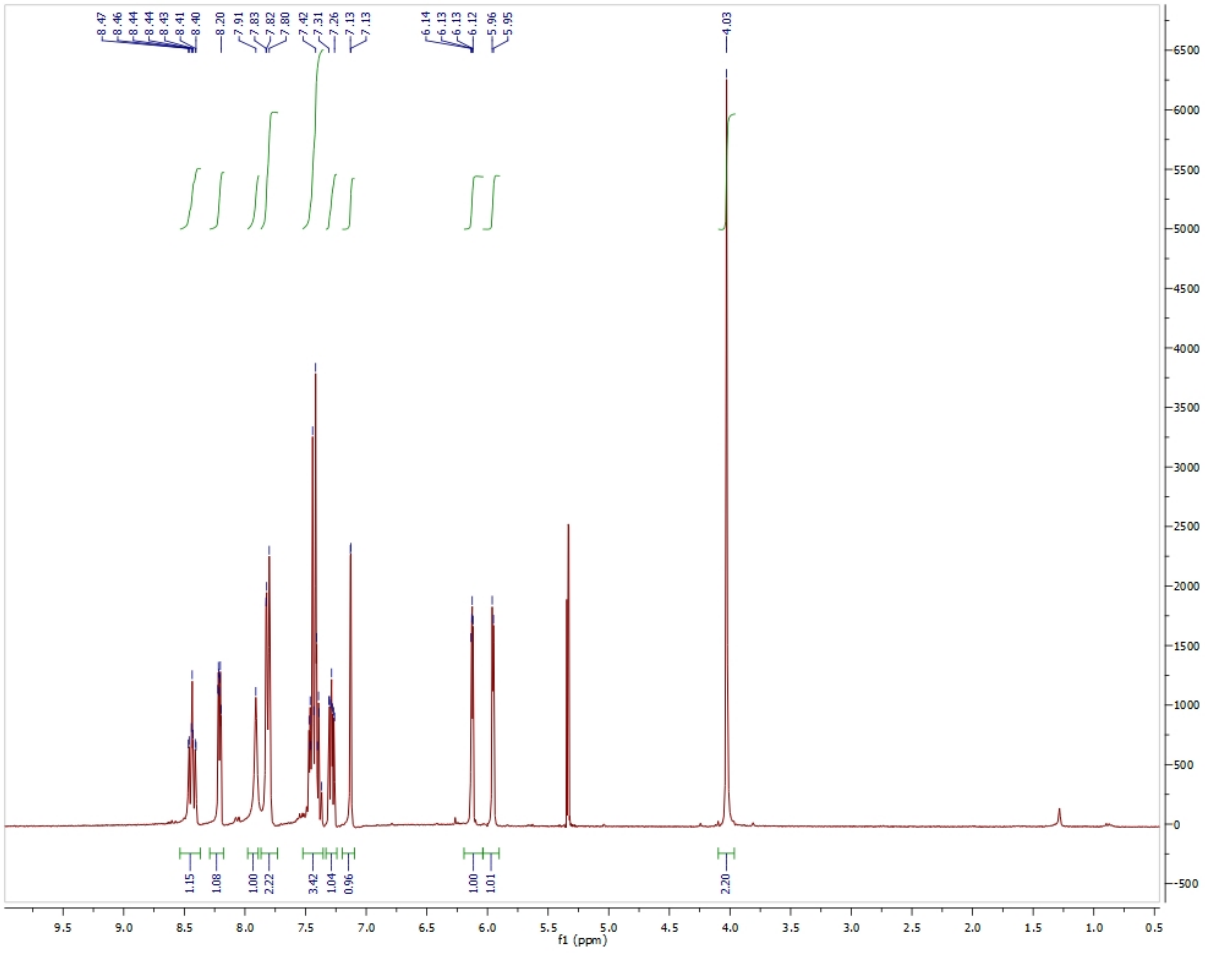
HRMS (C22H15N4O2F), (m/z) $[M+H]^{+}$ calculated 387.1252 observed 387.1253

UV/Vis (methanol): λ^{max} (ε)= 258 (23094 $mol^{-1}dm^{3}cm^{-1}$);

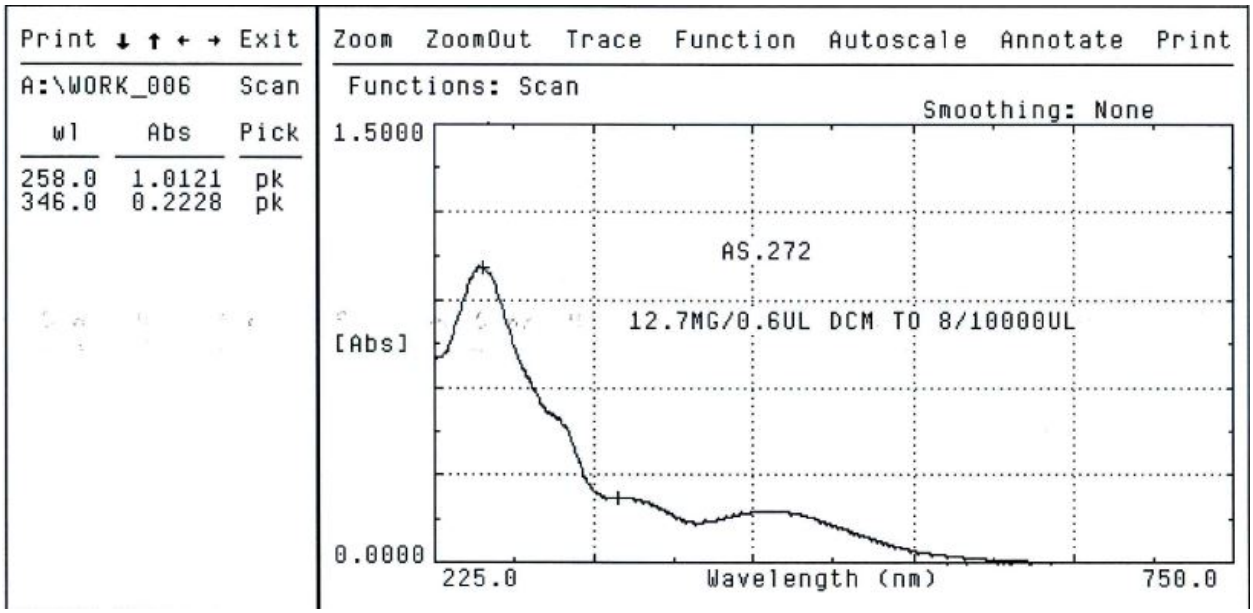


Yield: 38 %

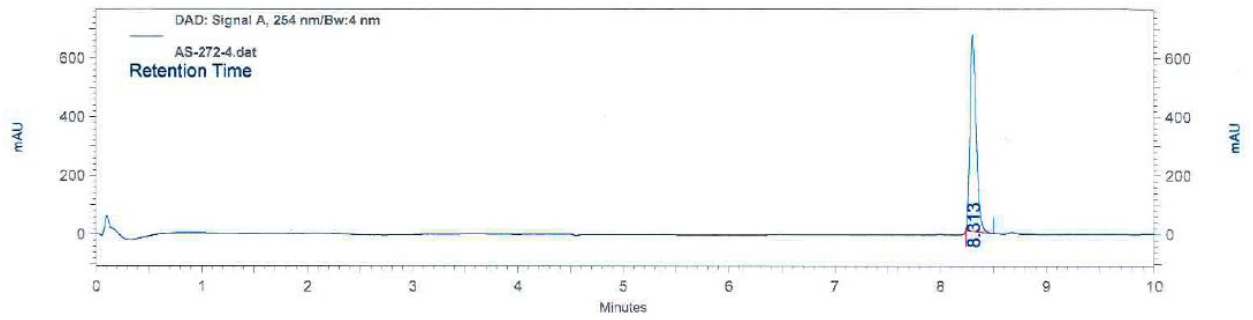
^{1}H NMR (**F24**)


8.47
8.46
8.44
8.44
8.43
8.41
8.40
8.20
7.91
7.83
7.82
7.80
7.42
7.31
7.26
7.13
7.13
6.14
6.13
6.13
6.12
5.96
5.95
4.03
1.15
1.08
1.00
2.22
3.42
1.04
0.96
1.00
1.01
2.20
f1 (ppm)

UV/Vis spectra (**F24**)



HPLC trace (**F24**)



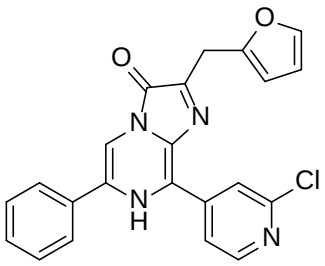
HPLC purity >99% @ 254nm

^{1}H NMR (300 MHz, cd2cl2) δ = 8.60 (s, 1H), 8.56 – 8.45 (m, 2H), 8.32 (s, 1H), 8.11 – 7.94 (m, 2H), 7.56 – 7.39 (m, 3H), 7.33 (dd, *J*=0.8, 1.9, 1H), 6.29 (dd, *J*=1.9, 3.2, 1H), 6.17 – 6.03 (m, 1H), 4.22 – 4.19 (m, 2H).

HRMS (C22H15N4O2Cl), (m/z) $[M+H]^+$ calculated 403.0956 observed 403.0965

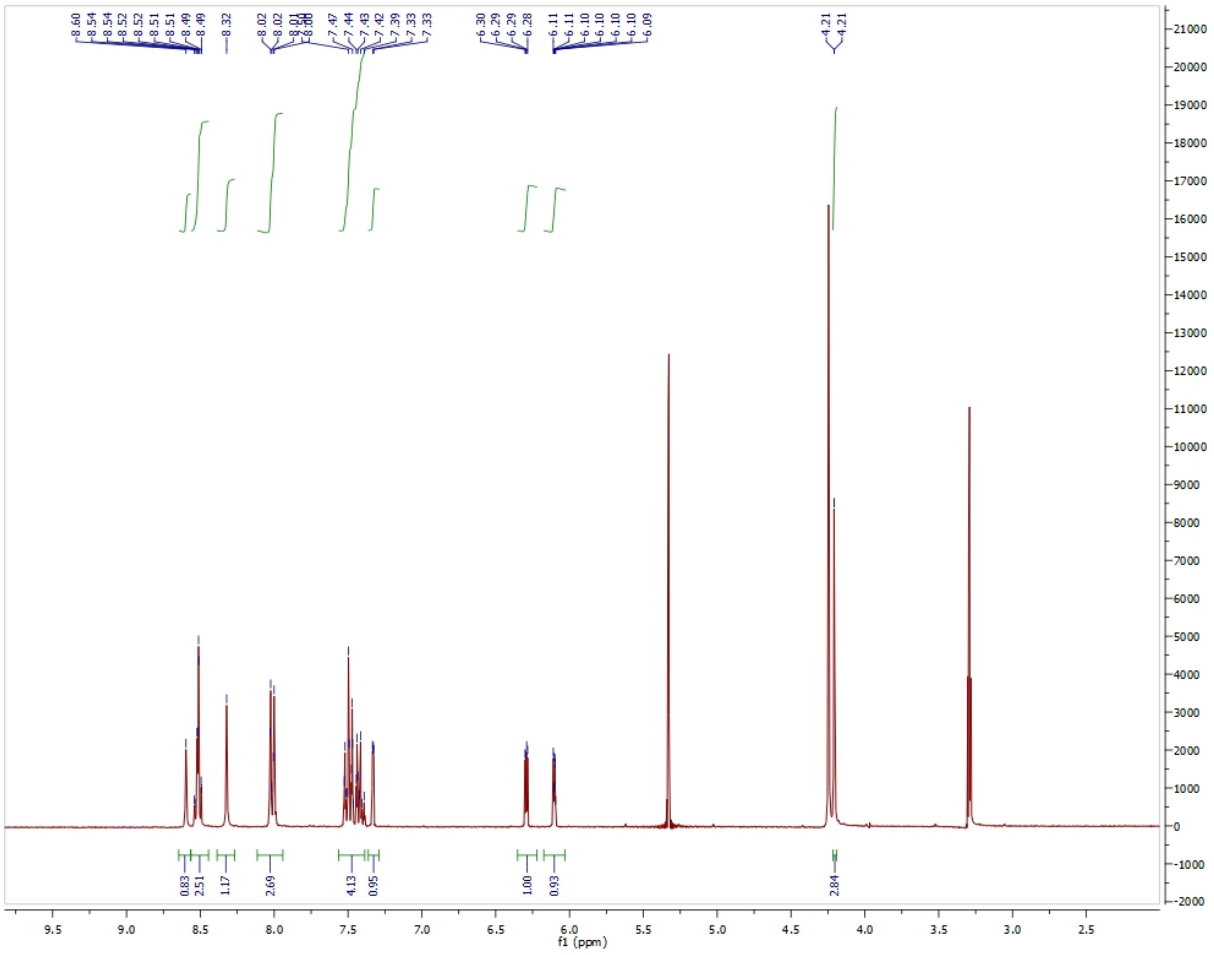
UV/Vis (methanol): λ^{max} (ε)= 256 (17814 $mol^{-1}dm^3cm^{-1}$);

8-(2-chloropyridin-4-yl)-2-(furan-2-ylmethyl)-6-phenylimidazo[1,2-a]pyrazin-3(7H)-one (**F25**)

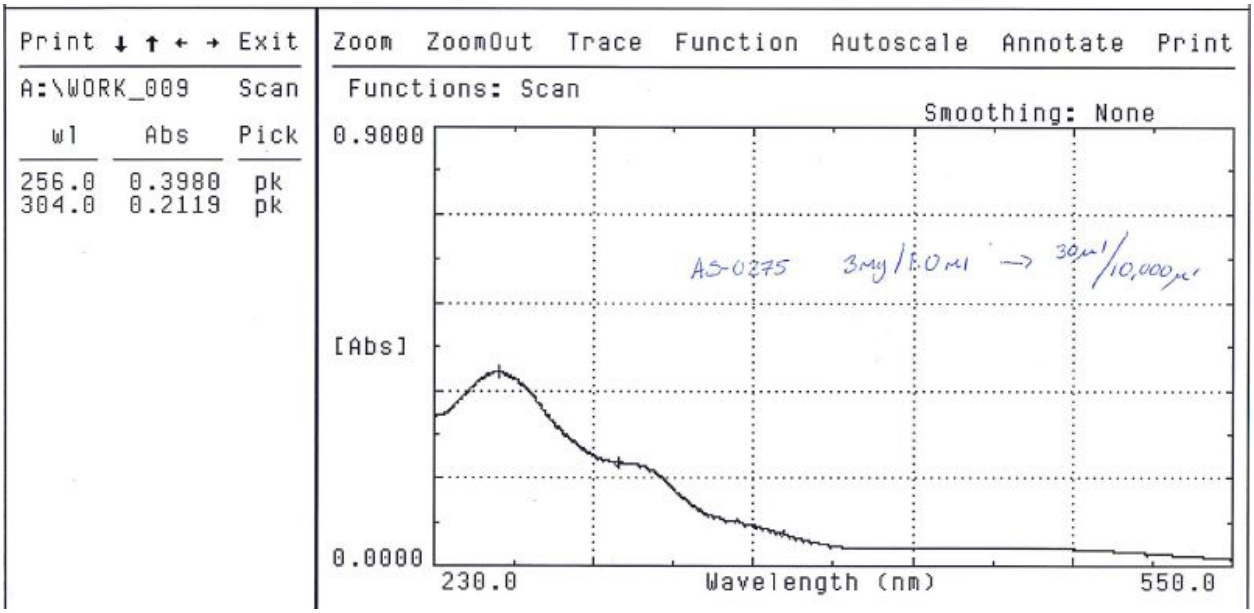


Yield: 22 %

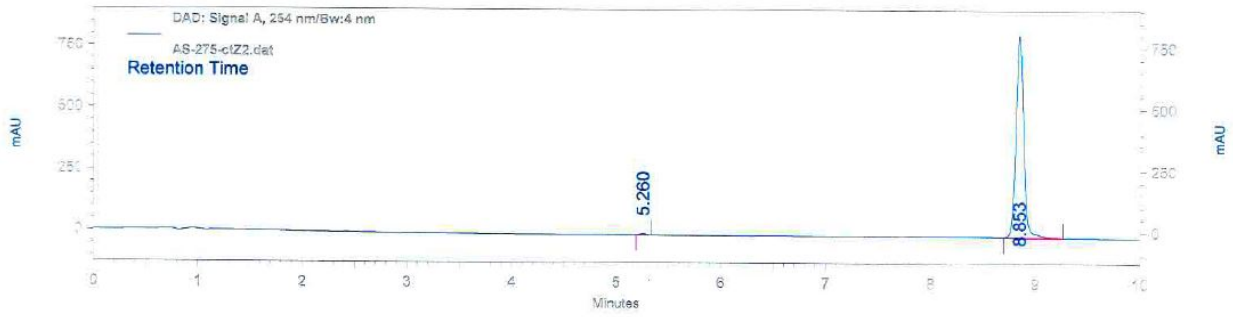
^{1}H NMR (**F25**)


8.60
8.54
8.54
8.52
8.52
8.51
8.51
8.49
8.49
8.32
8.02
8.02
8.01
8.00
7.47
7.44
7.43
7.42
7.39
7.33
7.33
6.30
6.29
6.29
6.28
6.11
6.11
6.10
6.10
6.10
6.10
6.09
4.21
4.21
0.83
2.51
1.17
2.69
4.13
0.95
1.00
0.93
2.84
f1 (ppm)

UV/Vis spectra (**F25**)



HPLC trace (**F25**)



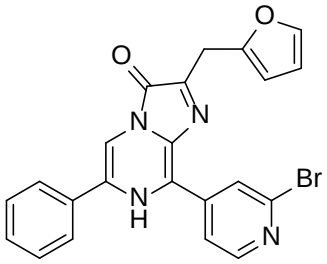
^{1}H NMR (300 MHz, cd2cl2) δ = 8.81 – 8.74 (m, 1H), 8.65 – 8.54 (m, 1H), 8.56 – 8.50 (m, 1H), 8.41 (d, *J*=5.9, 1H), 8.12 – 8.01 (m, 2H), 7.60 – 7.43 (m, 3H), 7.39 – 7.32 (m, 1H), 6.33 (dd, *J*=1.9, 3.2, 1H), 6.20 – 6.10 (m, 1H), 4.26 (s, 2H).

HRMS (C22H15N4O2Br), (m/z) $[M+H]^+$ calculated 447.0451 observed 447.0448

UV/Vis (methanol): λ^{max} (ε)= 256 (19809 $mol^{-1}dm^3cm^{-1}$);

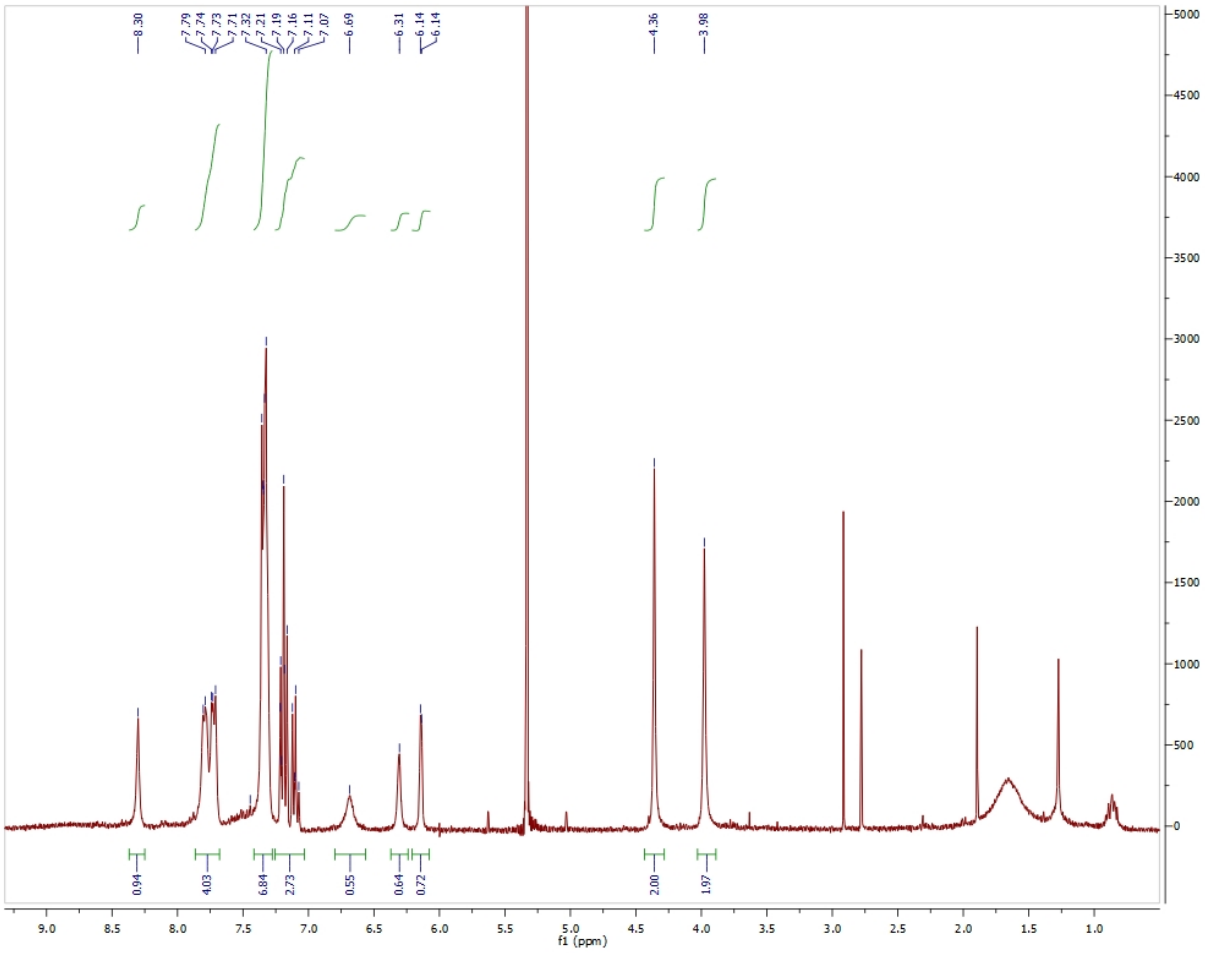
HPLC purity 99% @ 254nm

8-(2-bromopyridin-4-yl)-2-(furan-2-ylmethyl)-6-phenylimidazo[1,2-a]pyrazin-3(7H)-one (**F26**)

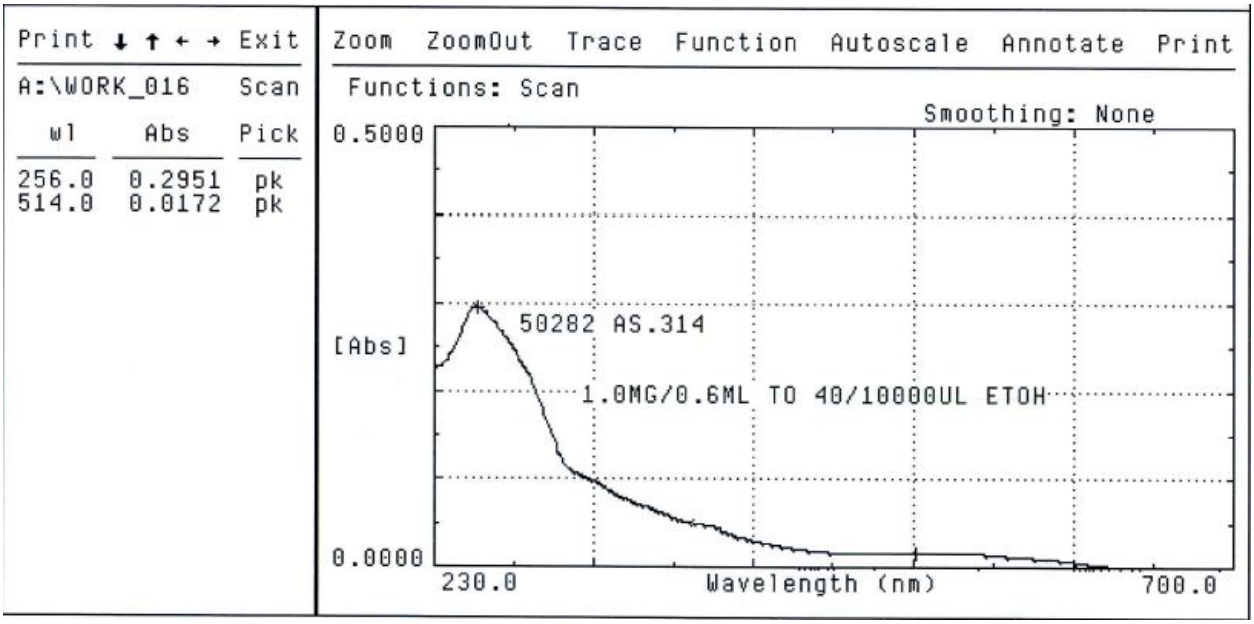


Yield: 4 %

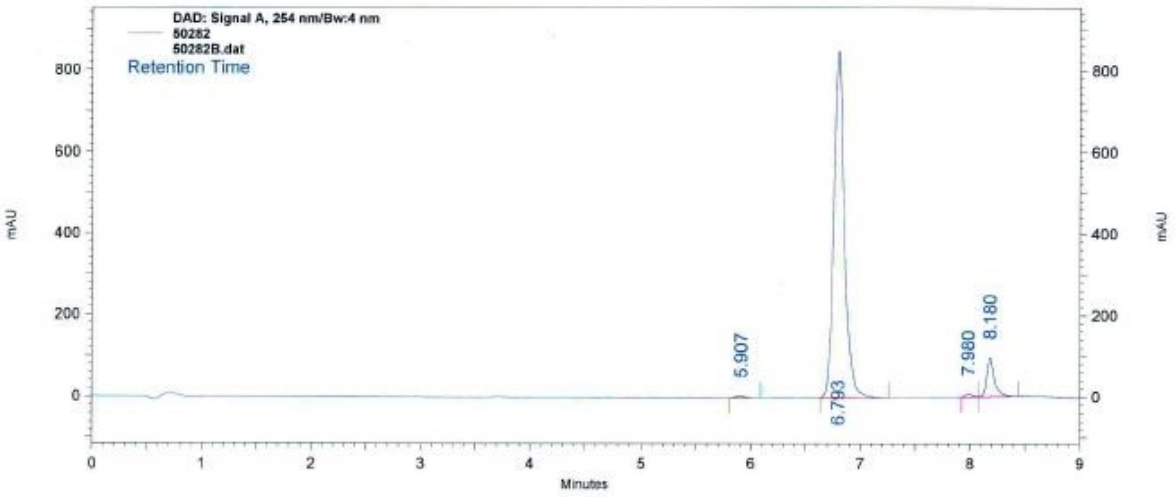
^{1}H NMR (**F26**)


8.30
7.79
7.74
7.73
7.71
7.32
7.21
7.19
7.16
7.11
7.07
6.69
6.31
6.14
6.14
4.36
3.98
0.94
4.03
6.84
2.73
0.55
0.64
0.72
2.00
1.97
f1 (ppm)

UV/Vis spectra (**F26**)

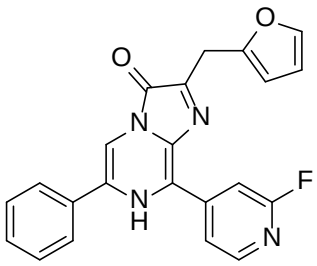


HPLC trace (**F26**)



HPLC purity 92% @ 254nm

8-(2-fluoropyridin-4-yl)-2-(furan-2-ylmethyl)-6-phenylimidazo[1,2-a]pyrazin-3(7H)-one (**F27**)



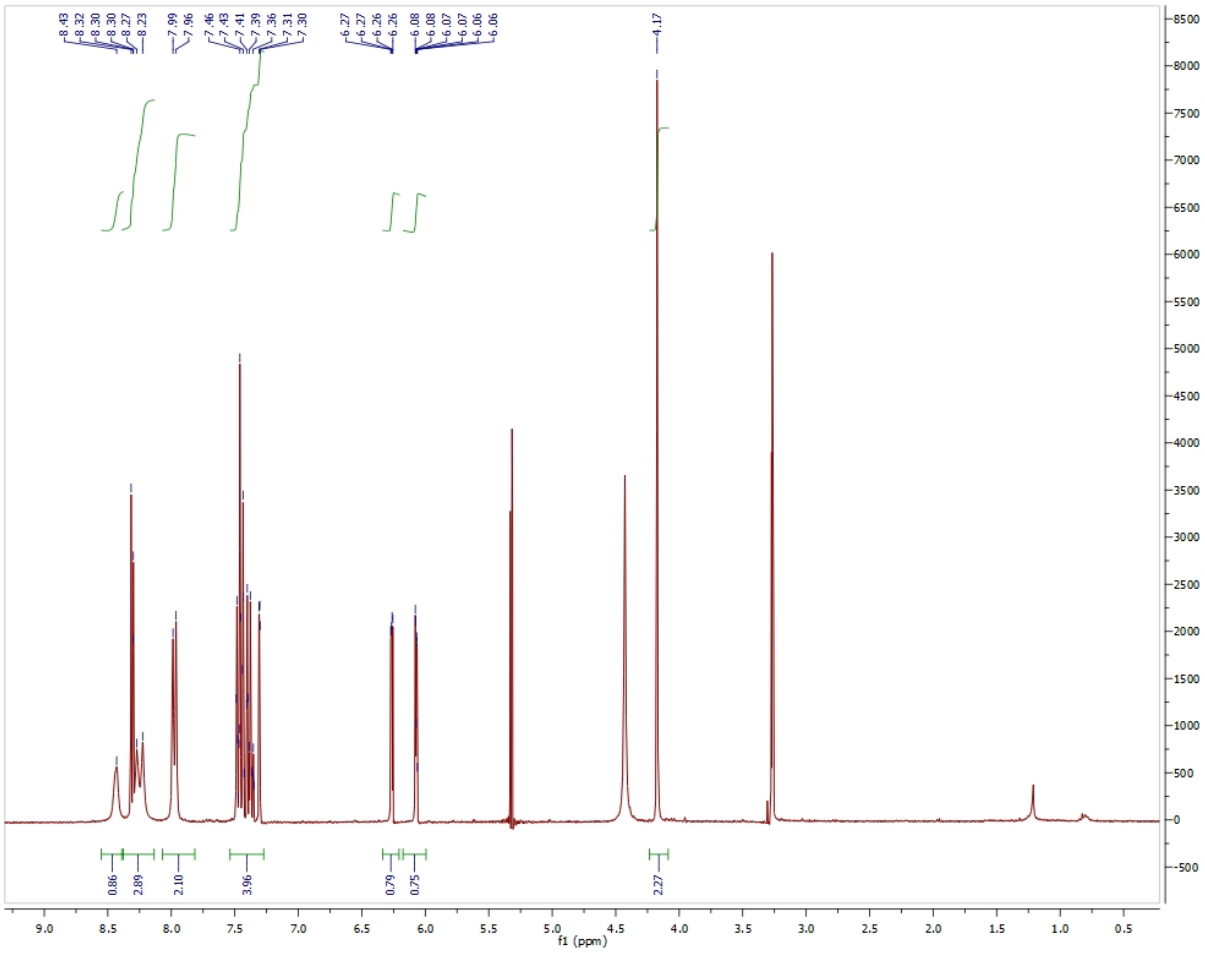
Yield: 20 %

^{1}H NMR (300 MHz, cd2cl2) δ = 8.43 (s, 1H), 8.39 – 8.14 (m, 3H), 7.97 (d, *J*=7.3, 2H), 7.54 – 7.27 (m, 4H), 6.26 (dd, *J*=1.9, 3.2, 1H), 6.18 – 5.99 (m, 1H), 4.17 (s, 2H).

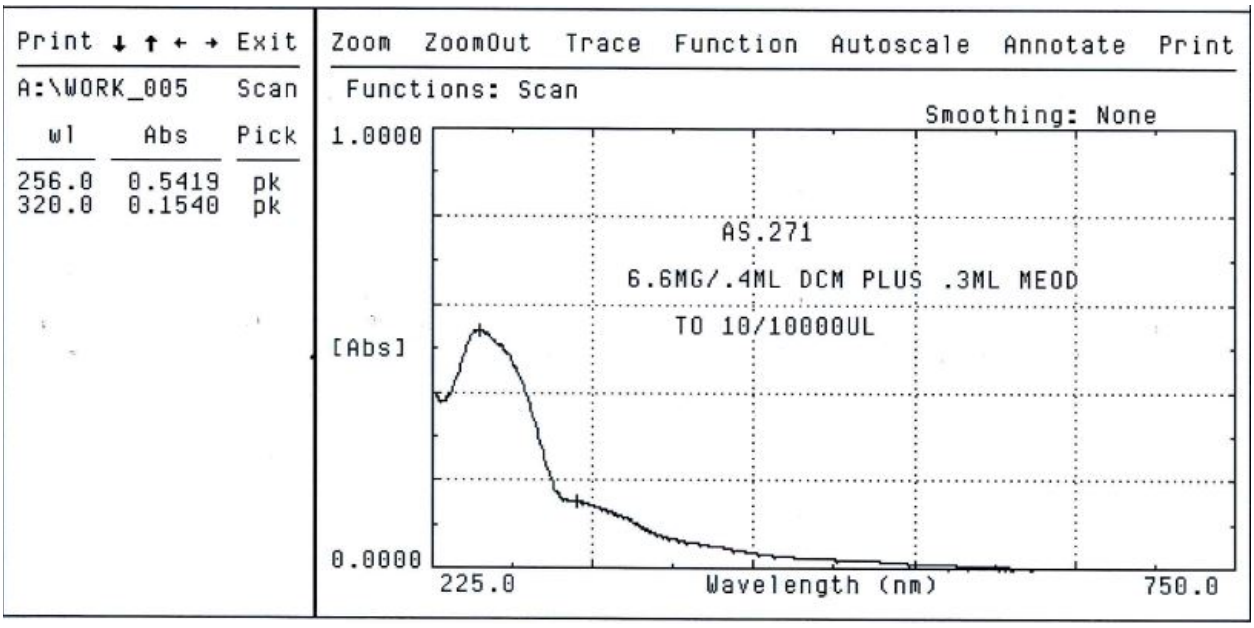
HRMS ($C_{22}H_{15}N_4O_2F$), (m/z) $[M+H]^+$ calculated 387.1252 observed 387.1255

UV/Vis (methanol): λ^{max} (ε)= 256 (22207 $mol^{-1}dm^3cm^{-1}$);

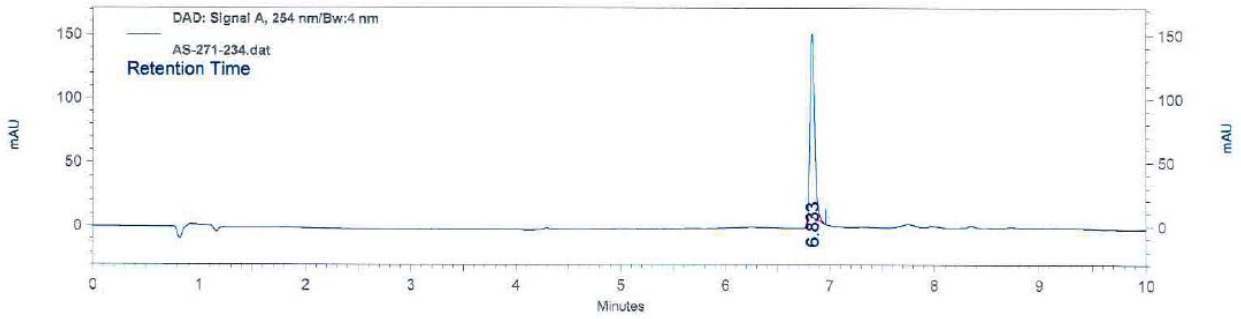
^{1}H NMR (**F27**)


8.43
8.32
8.30
8.30
8.27
8.23
7.99
7.96
7.46
7.43
7.41
7.39
7.36
7.31
7.30
6.27
6.27
6.26
6.26
6.08
6.08
6.07
6.07
6.06
6.06
4.17
0.86
2.89
2.10
3.96
0.79
0.75
2.27
f1 (ppm)

UV/Vis spectra (**F27**)

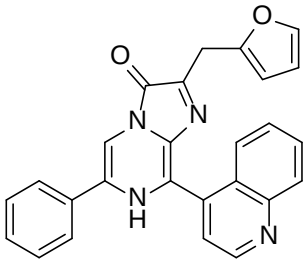


HPLC trace (**F27**)



HPLC purity >99% @ 254nm

2-(furan-2-ylmethyl)-6-phenyl-8-(quinolin-4-yl)imidazo[1,2-a]pyrazin-3(7H)-one (**F28**)



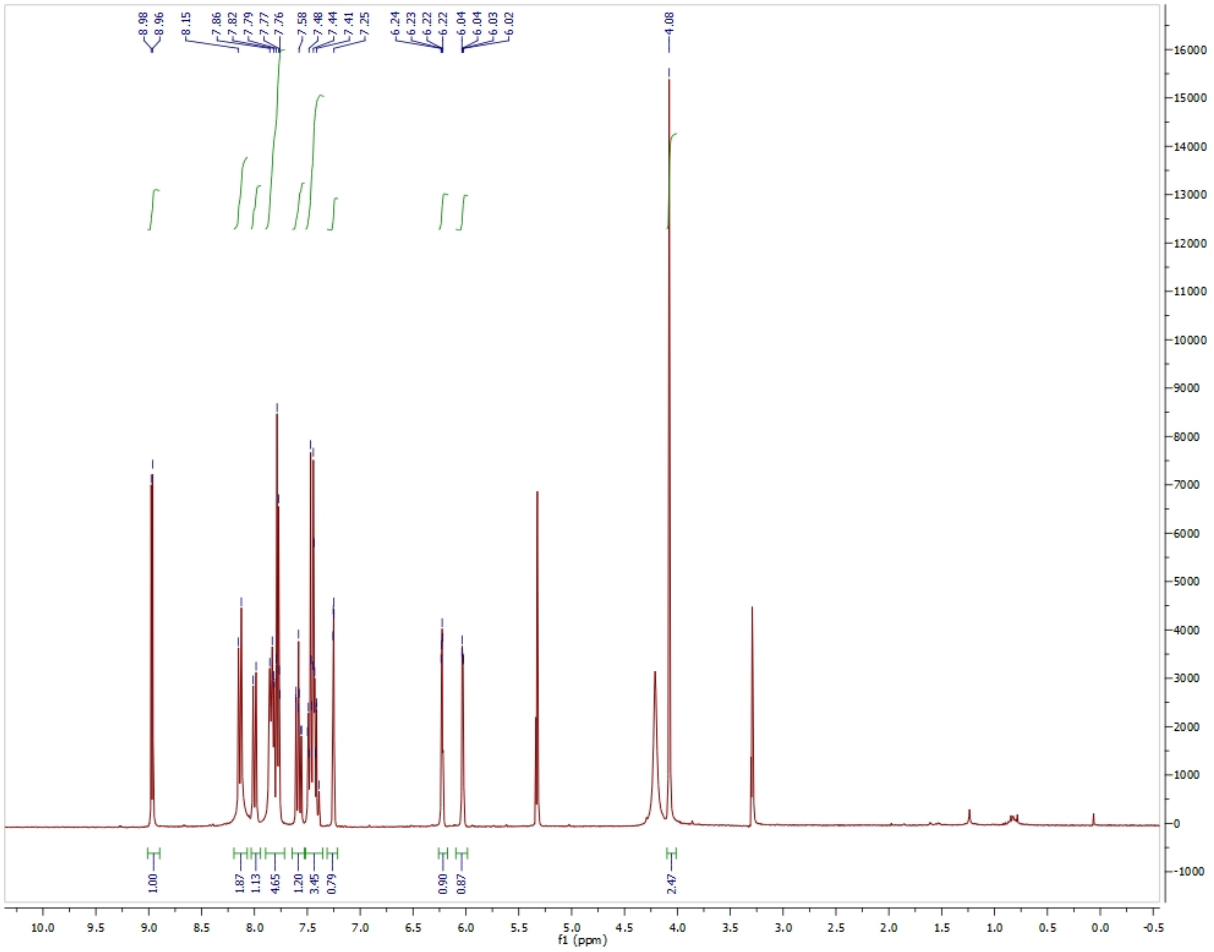
^{1}H NMR (300 MHz, cd2cl2) δ = 8.97 (d, *J*=4.5, 1H), 8.14 (d, *J*=8.2, 2H), 8.00 (d, *J*=8.5, 1H), 7.89 – 7.72 (m, 4H), 7.58 (m, 1H), 7.52 – 7.35 (m, 3H), 7.25 (dd, *J*=0.8, 1.8, 1H), 6.23 (dd, *J*=1.9, 3.2, 1H), 6.03 (dd, *J*=0.8, 3.2, 1H), 4.08 (s, 2H).

HRMS (C26H18N4O2), (m/z) $[M+H]^+$ calculated 419.1503 observed 419.1499

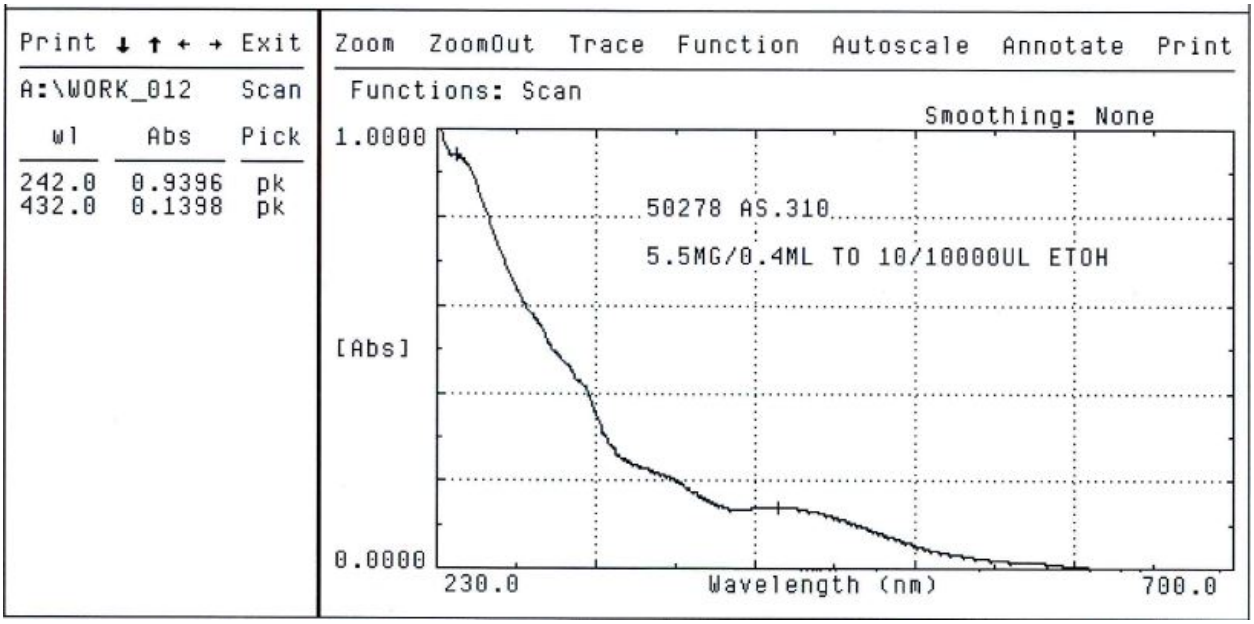
UV/Vis (methanol): λ^{max} (ε)= 242 (28559 $mol^{-1}dm^3cm^{-1}$);

Yield: 17 %

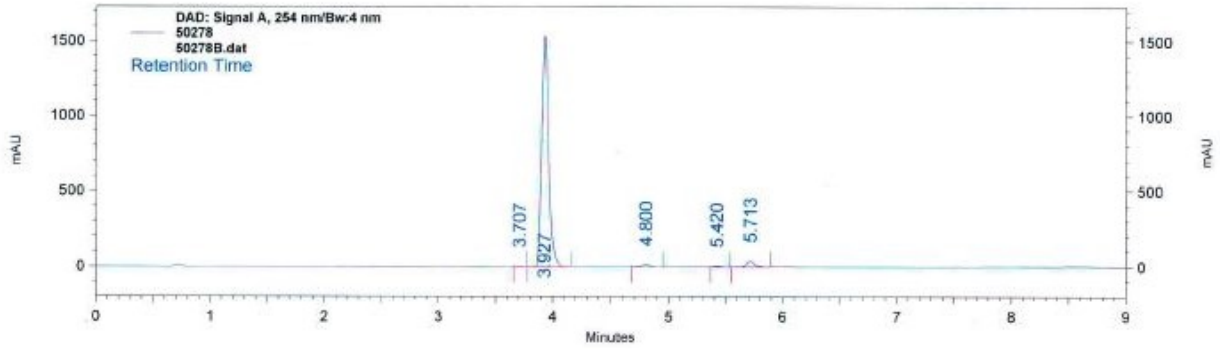
^{1}H NMR (**F28**)


8.98
8.96
8.15
7.86
7.82
7.79
7.77
7.76
7.58
7.48
7.44
7.41
7.25
6.24
6.23
6.22
6.22
6.04
6.04
6.03
6.02
4.08
1.00
1.87
1.13
4.65
1.20
3.45
0.79
0.90
0.87
2.47
f1 (ppm)

UV/Vis spectra (**F28**)



HPLC trace (**F28**)



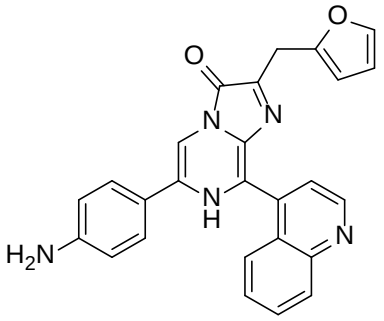
HPLC purity 96% @ 254nm

6-(4-aminophenyl)-2-(furan-2-ylmethyl)-8-(quinolin-4-yl)imidazo[1,2-a]pyrazin-3(7H)-one (**F29**)

^{1}H NMR (300 MHz, cd2cl2) δ = 8.97 (d, *J*=4.5, 1H), 8.13 (d, *J*=8.1, 1H), 7.93 (d, *J*=8.4, 1H), 7.84 – 7.70 (m, 3H), 7.64 – 7.45 (m, 3H), 7.23 (dd, *J*=0.8, 1.9, 1H), 6.83 – 6.67 (m, 2H), 6.20 (dd, *J*=1.9, 3.2, 1H), 6.00 (dd, *J*=0.8, 3.2, 1H), 4.05 (s, 2H).

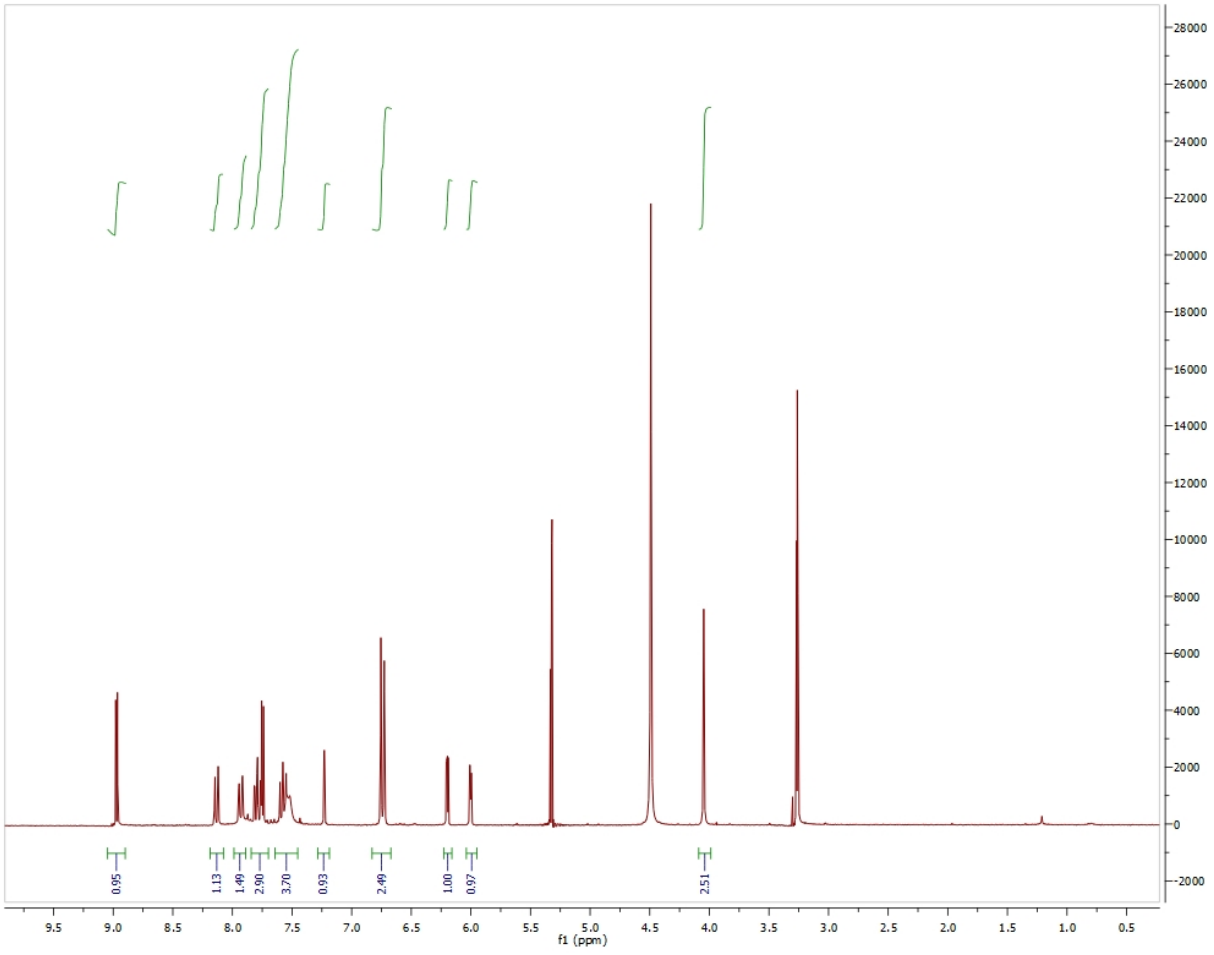
HRMS (C26H19N5O2), (m/z) $[M+H]^+$ calculated 434.1612 observed 434.1609

UV/Vis (methanol): λ^{max} (ε)= 283 (23169 $mol^{-1}dm^3cm^{-1}$);

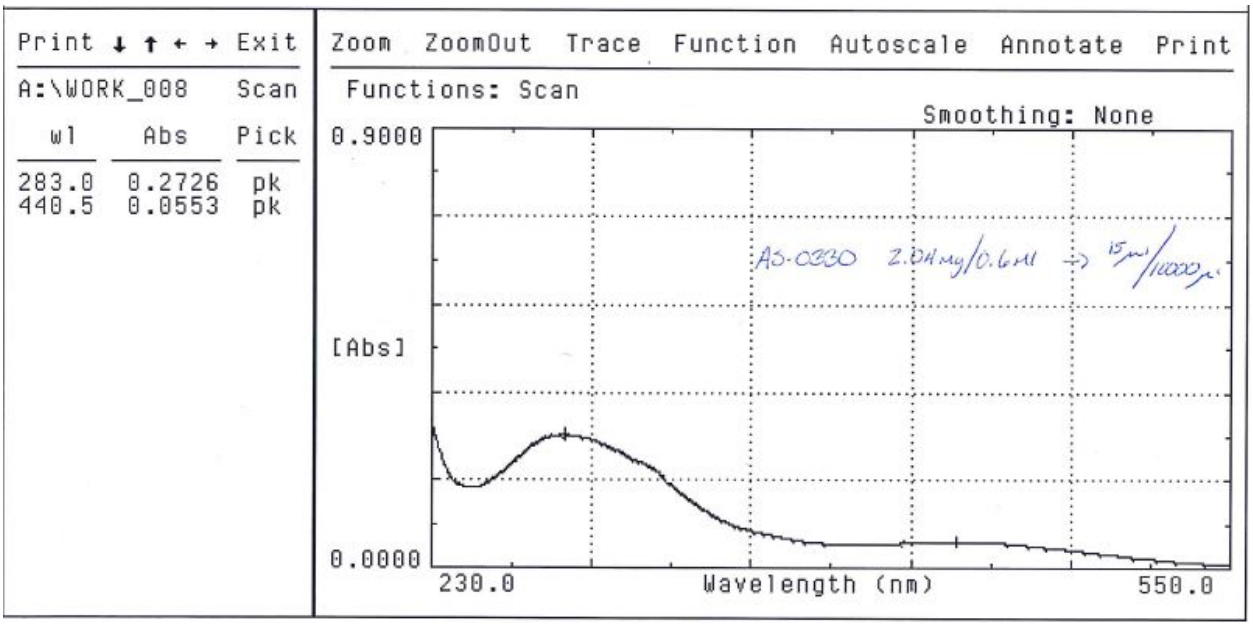


Yield: 3 %

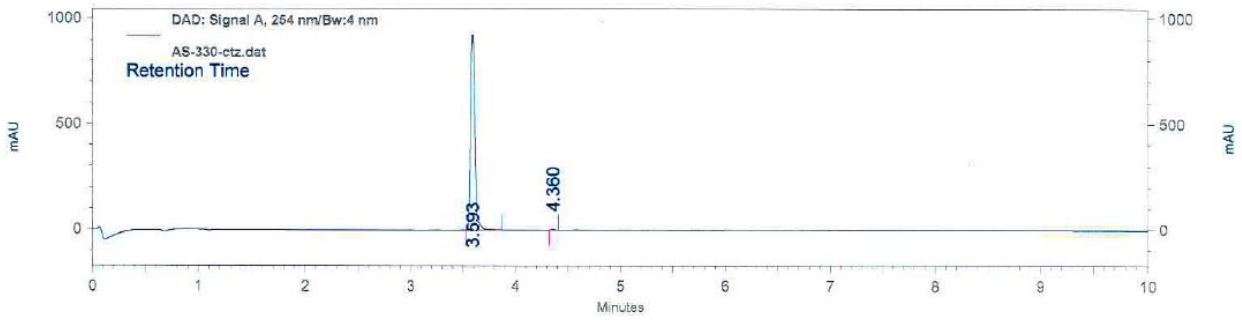
^{1}H NMR (**F29**)



UV/Vis spectra (**F29**)



HPLC trace (**F29**)



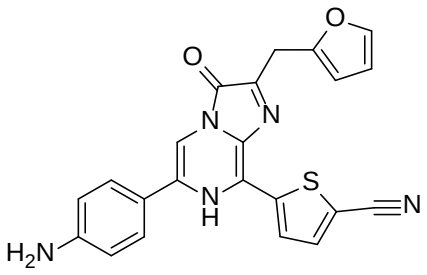
HPLC purity 99% @ 254nm

^{1}H NMR (300 MHz, cd2cl2) δ = 8.54 (d, *J*=7.2, 1H), 8.11 (s, 1H), 7.79 (t, *J*=8.1, 2H), 7.72 (t, *J*=4.8, 1H), 7.42 – 7.28 (m, 1H), 6.90 – 6.69 (m, 2H), 6.30 (dd, *J*=1.9, 3.2, 1H), 6.16 – 6.04 (m, 1H), 4.18 (s, 2H).

HRMS (C22H15N5O2S), (m/z) $[M+H]^{+}$ calculated 414.1019 observed 414.1015

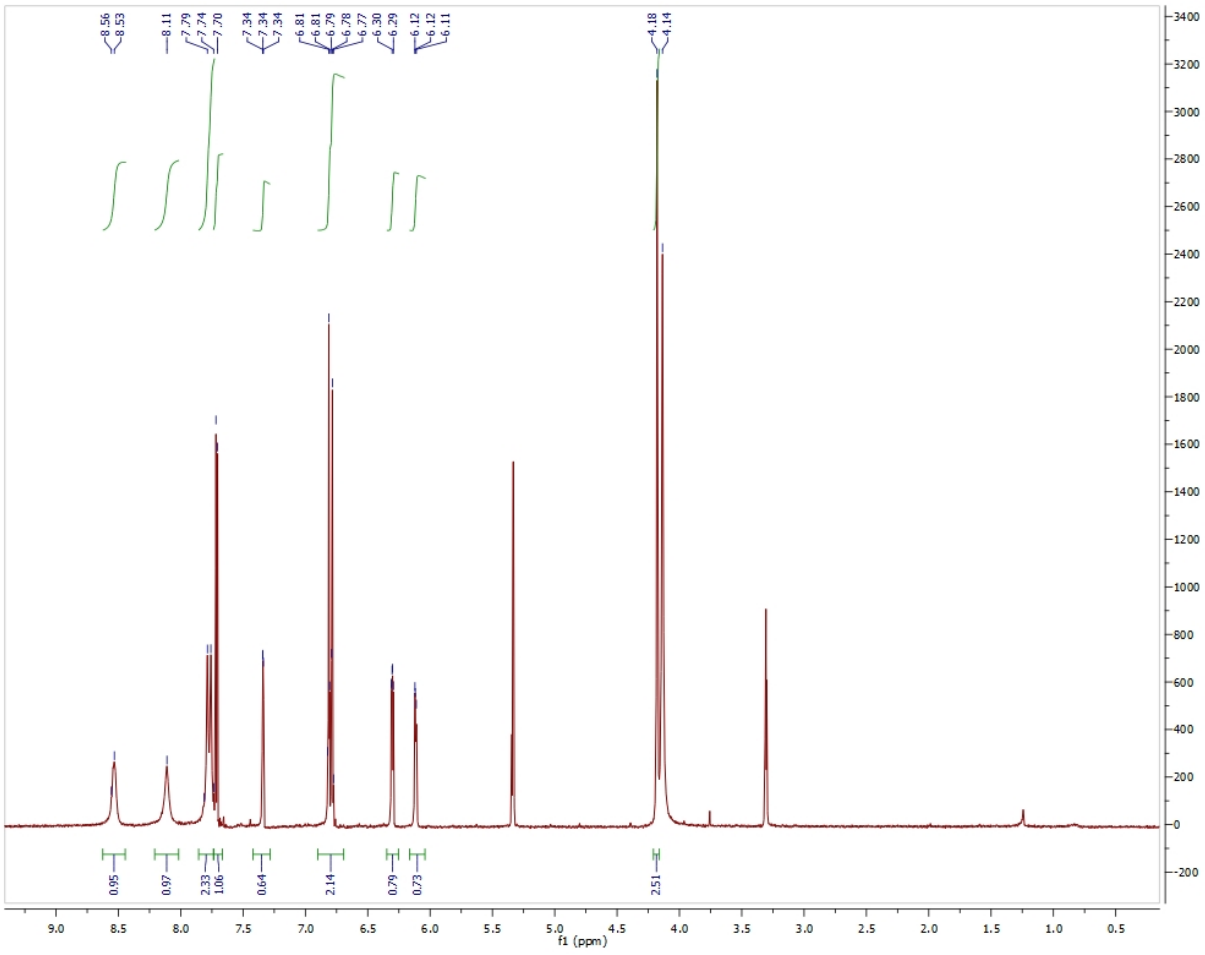
UV/Vis (methanol): λ^{max} (ε)= 304 (34753 $mol^{-1}dm^{3}cm^{-1}$);

5-(6-(4-aminophenyl)-2-(furan-2-ylmethyl)-3-oxo-3,7-dihydroimidazo[1,2-a]pyrazin-8-yl)thiophene-2-carbonitrile (**F30**)

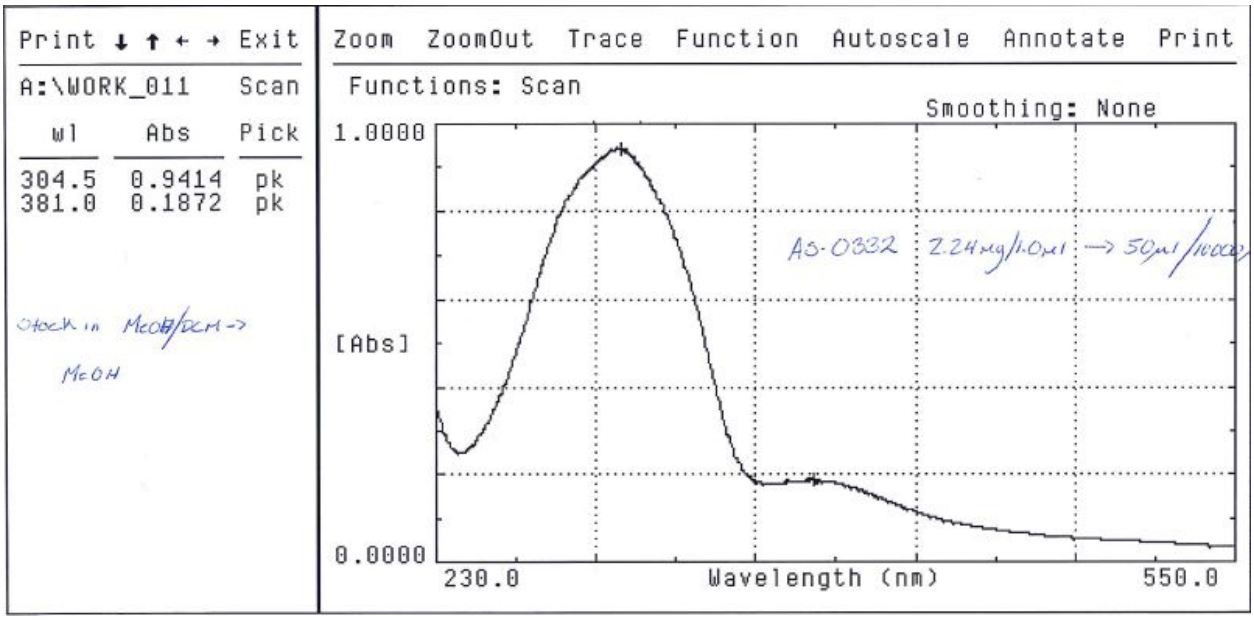


Yield: 7 %

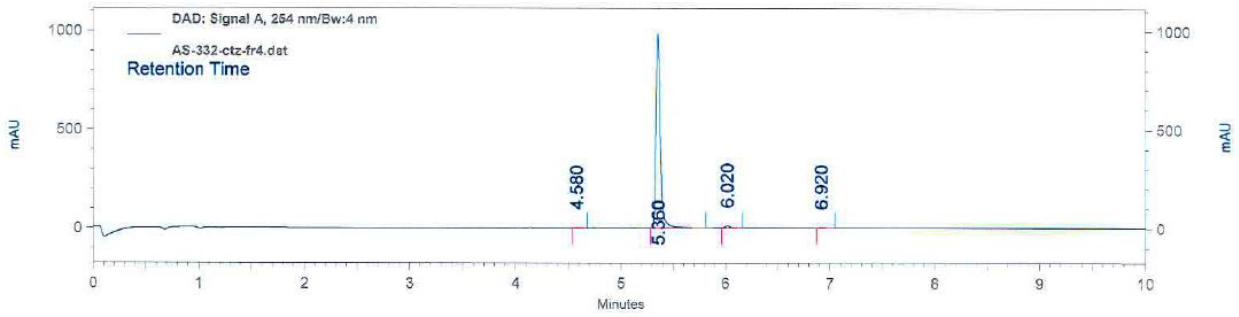
^{1}H NMR (**F30**)


8.56
8.53
8.11
7.79
7.74
7.70
7.34
7.34
7.34
6.81
6.81
6.79
6.78
6.77
6.30
6.29
6.12
6.12
6.11
4.18
4.14
0.95
0.97
2.33
1.06
0.64
2.14
0.79
0.73
2.51
f1 (ppm)

UV/Vis spectra (**F30**)



HPLC trace (**F30**)



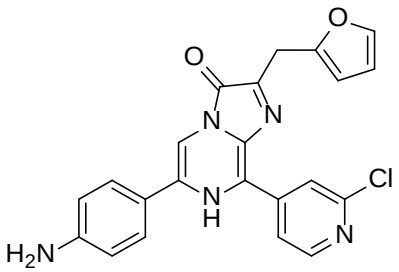
^{1}H NMR (300 MHz, cd2cl2) δ = 8.54 (d, *J*=7.2, 1H), 8.11 (s, 1H), 7.79 (t, *J*=8.1, 2H), 7.72 (t, *J*=4.8, 1H), 7.42 – 7.28 (m, 1H), 6.90 – 6.69 (m, 2H), 6.30 (dd, *J*=1.9, 3.2, 1H), 6.16 – 6.04 (m, 1H), 4.18 (s, 2H).

HRMS (C22H15N5O2S), (m/z) $[M+H]^+$ calculated 414.1019 observed 414.1015

UV/Vis (methanol): λ^{max} (ε)= 304 (34753 $mol^{-1}dm^3cm^{-1}$);

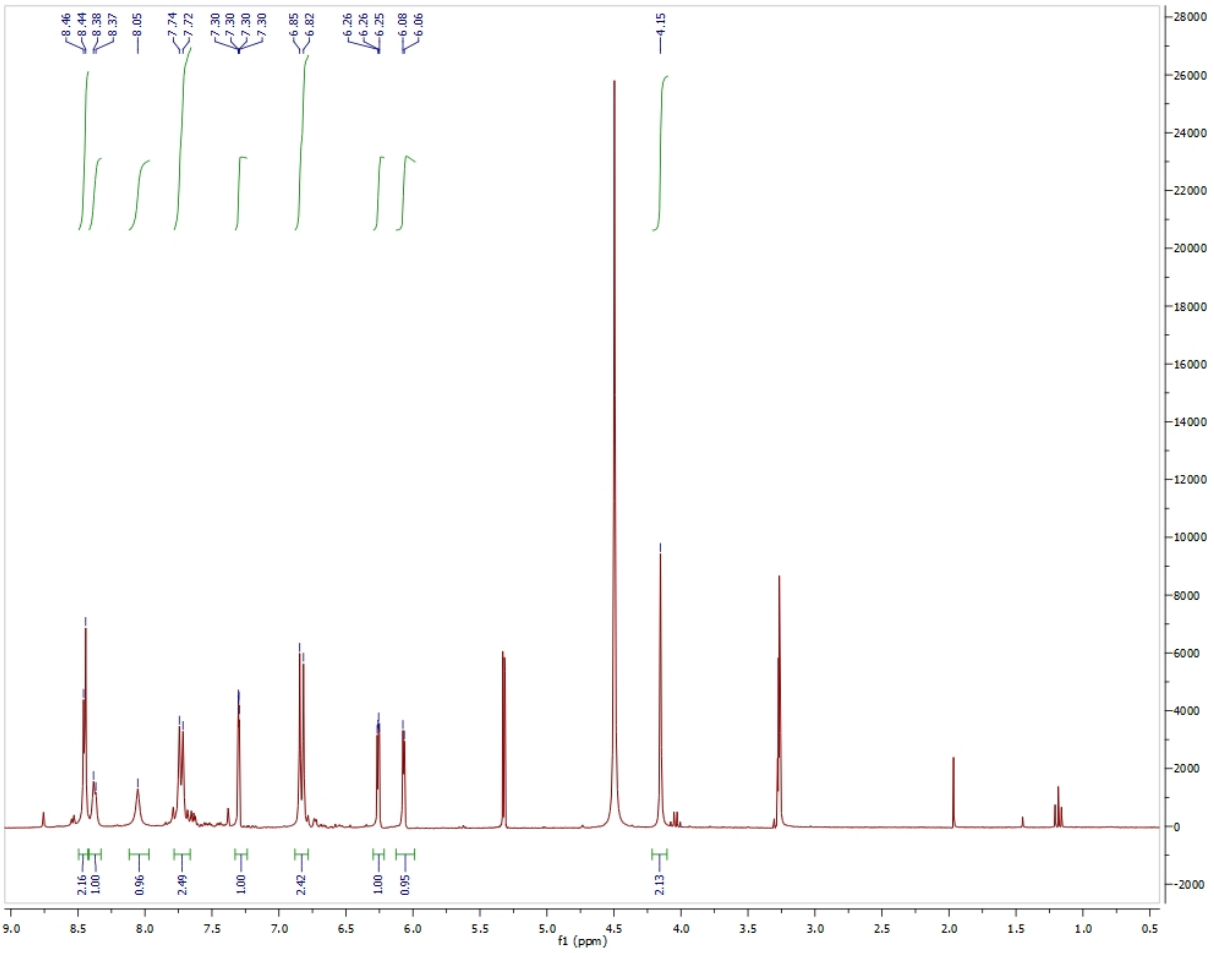
HPLC purity 98% @ 254nm

6-(4-aminophenyl)-8-(2-chloropyridin-4-yl)-2-(furan-2-ylmethyl)imidazo[1,2-a]pyrazin-3(7H)-one (**F31**)

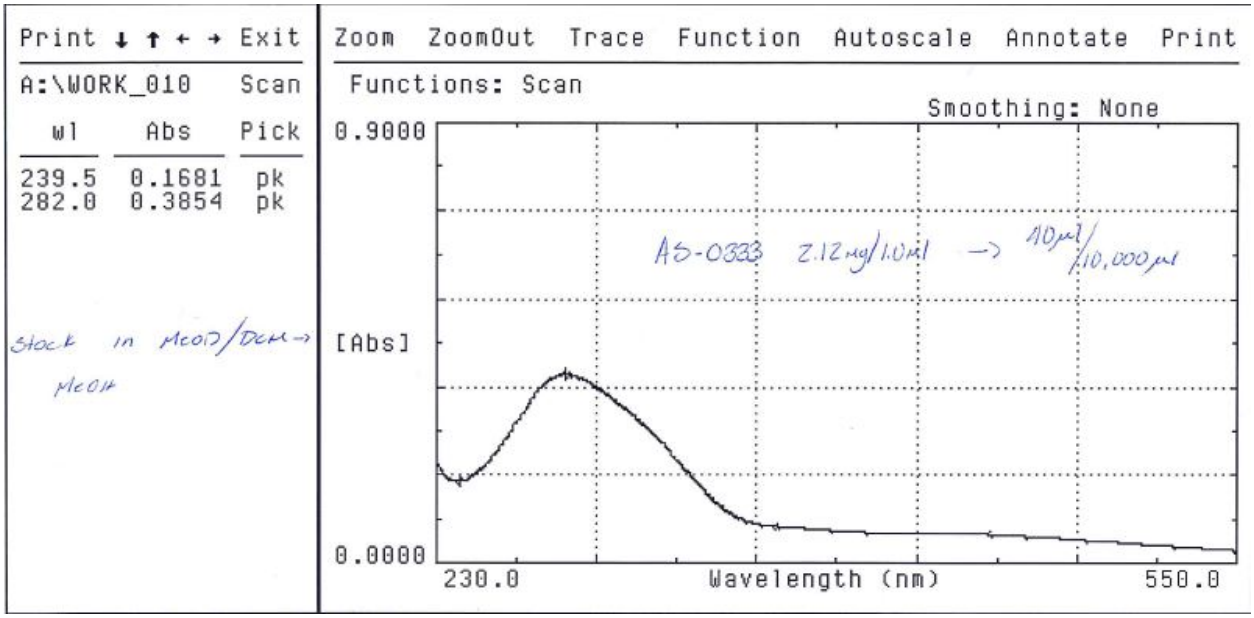


Yield: 8 %

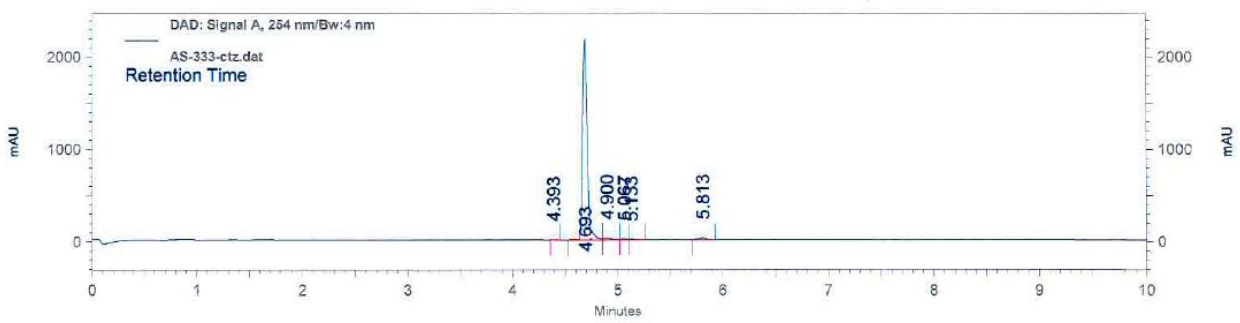
^{1}H NMR (**F31**)


8.46
8.44
8.38
8.37
8.05
7.74
7.72
7.30
7.30
7.30
7.30
6.85
6.82
6.26
6.26
6.25
6.08
6.06
4.15
2.16
1.00
0.96
2.49
1.00
2.42
1.00
0.95
2.13
f1 (ppm)

UV/Vis spectra (**F31**)

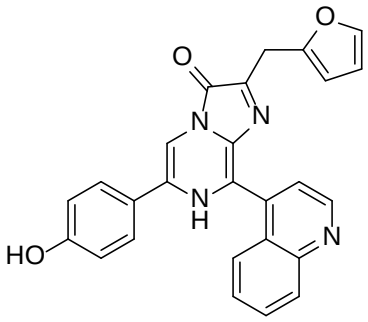


HPLC trace (**F31**)



HPLC purity 96% @ 254nm

2-(furan-2-ylmethyl)-6-(4-hydroxyphenyl)-8-(quinolin-4-yl)imidazo[1,2-a]pyrazin-3(7H)-one (**F32**)



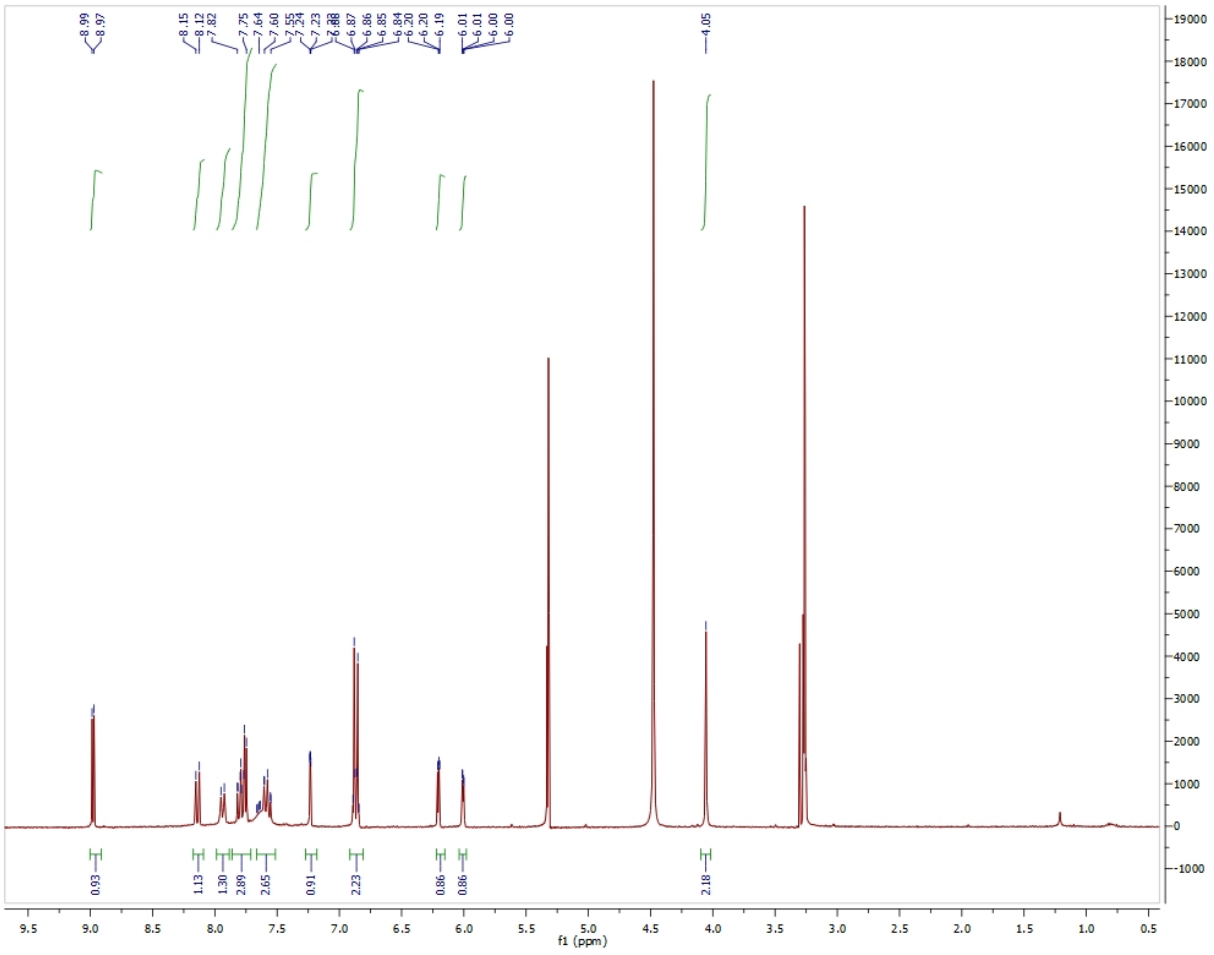
^{1}H NMR (300 MHz, cd2cl2) δ = 8.54 (d, *J*=7.2, 1H), 8.11 (s, 1H), 7.79 (t, *J*=8.1, 2H), 7.72 (t, *J*=4.8, 1H), 7.42 – 7.28 (m, 1H), 6.90 – 6.69 (m, 2H), 6.30 (dd, *J*=1.9, 3.2, 1H), 6.16 – 6.04 (m, 1H), 4.18 (s, 2H).

HRMS (C22H15N5O2S), (m/z) $[M+H]^{+}$ calculated 414.1019 observed 414.1015

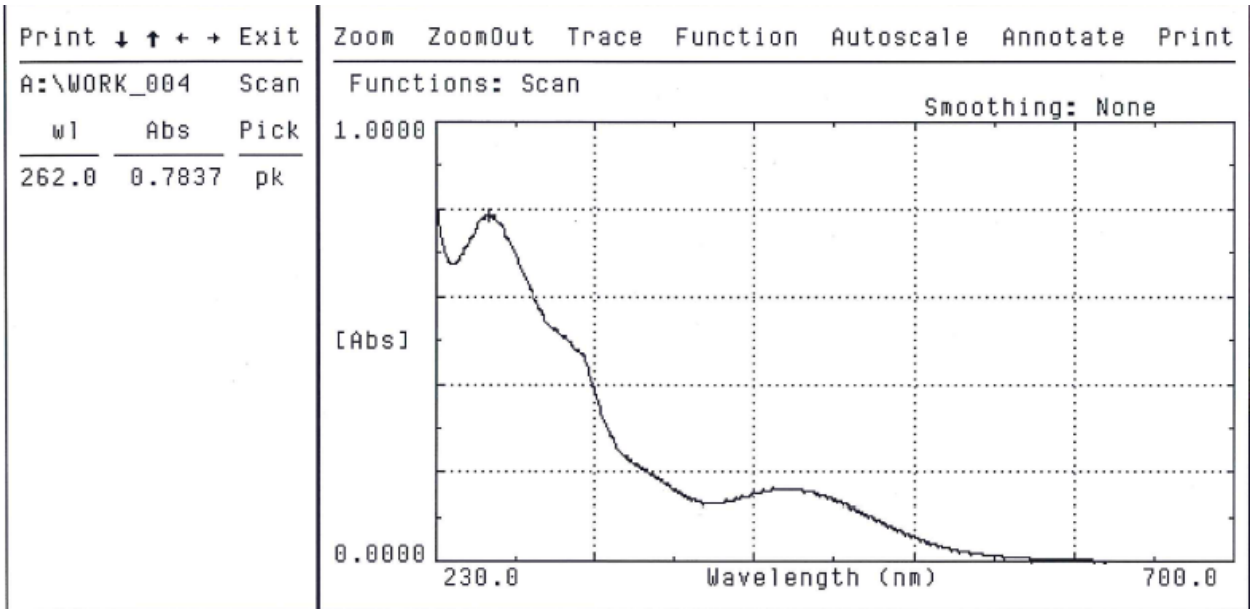
UV/Vis (methanol): λ^{max} (ε)= 304 (34753 $mol^{-1}dm^{3}cm^{-1}$);

Yield: 9 %

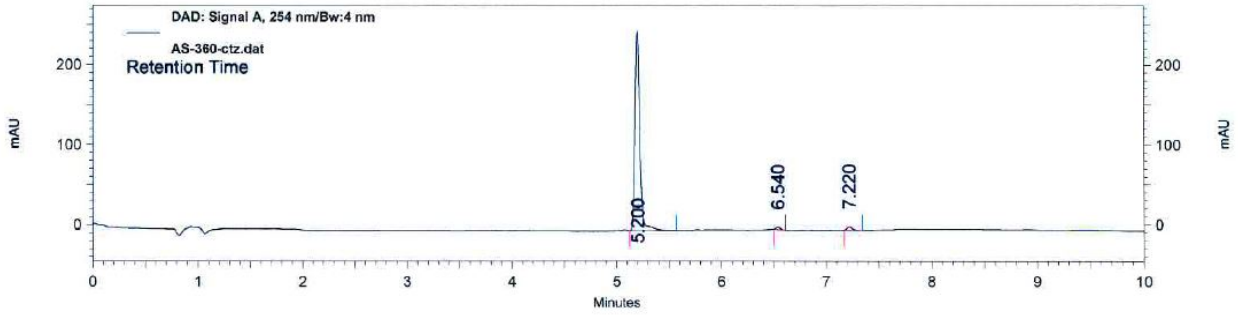
^{1}H NMR (**F32**)


8.99
8.97
8.15
8.12
7.82
7.75
7.64
7.60
7.55
7.24
7.23
6.87
6.86
6.85
6.84
6.20
6.20
6.19
6.01
6.01
6.00
6.00
4.05
0.93
1.13
1.30
2.89
2.65
0.91
2.23
0.86
0.86
2.18
f1 (ppm)

UV/Vis spectra (**F32**)



HPLC trace (**F32**)



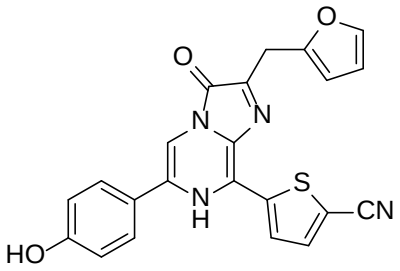
HPLC purity 97% @ 254nm

5-(2-(furan-2-ylmethyl)-6-(4-hydroxyphenyl)-3-oxo-3,7-dihydroimidazo[1,2-a]pyrazin-8-yl)thiophene-2-carbonitrile (**F33**)

^{1}H NMR (300 MHz, cd2cl2) δ = 8.54 (d, *J*=7.2, 1H), 8.11 (s, 1H), 7.79 (t, *J*=8.1, 2H), 7.72 (t, *J*=4.8, 1H), 7.42 – 7.28 (m, 1H), 6.90 – 6.69 (m, 2H), 6.30 (dd, *J*=1.9, 3.2, 1H), 6.16 – 6.04 (m, 1H), 4.18 (s, 2H).

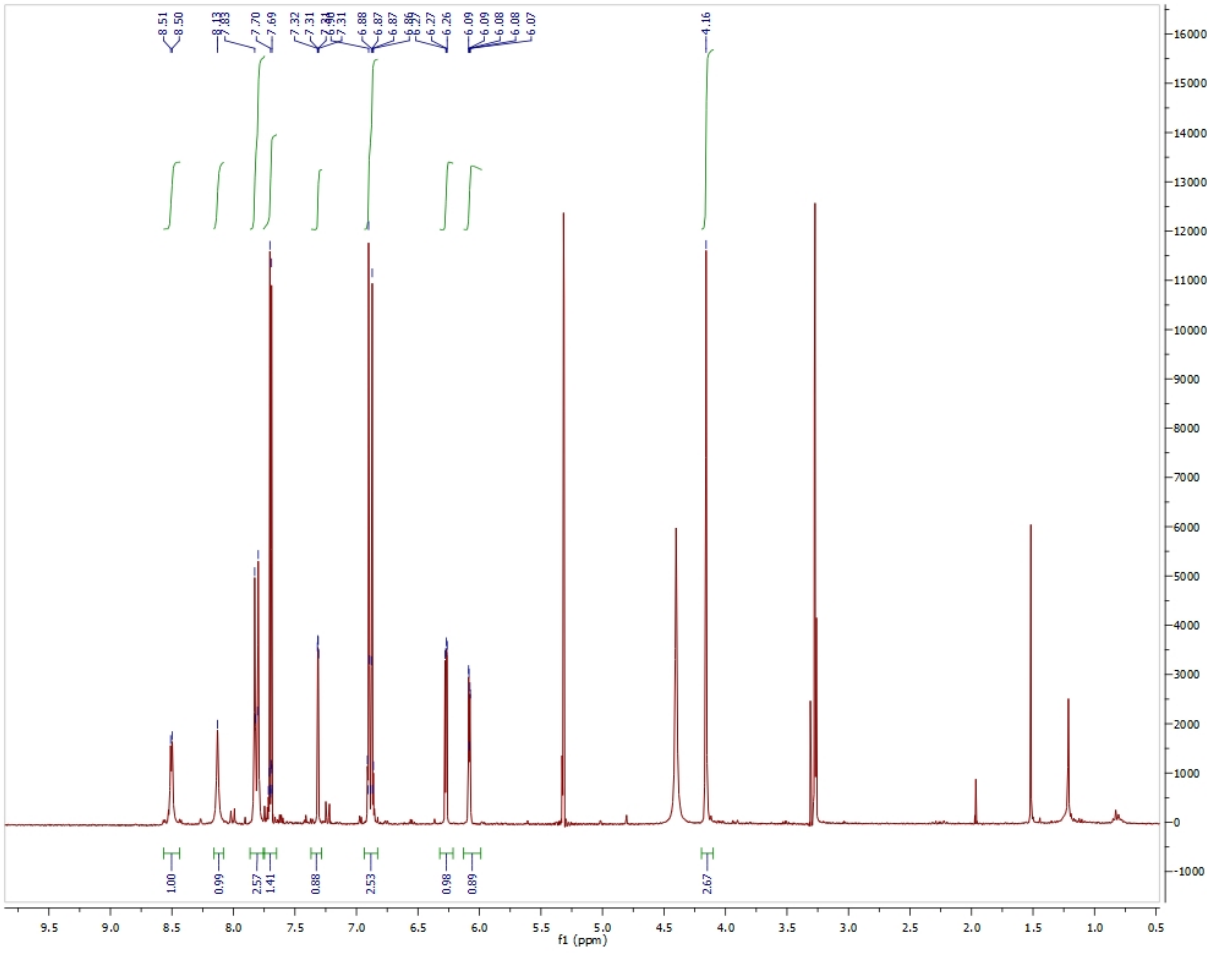
HRMS (C22H15N5O2S), (m/z) $[M+H]^{+}$ calculated 414.1019 observed 414.1015

UV/Vis (methanol): λ^{max} (ε)= 304 (34753 $mol^{-1}dm^{3}cm^{-1}$);

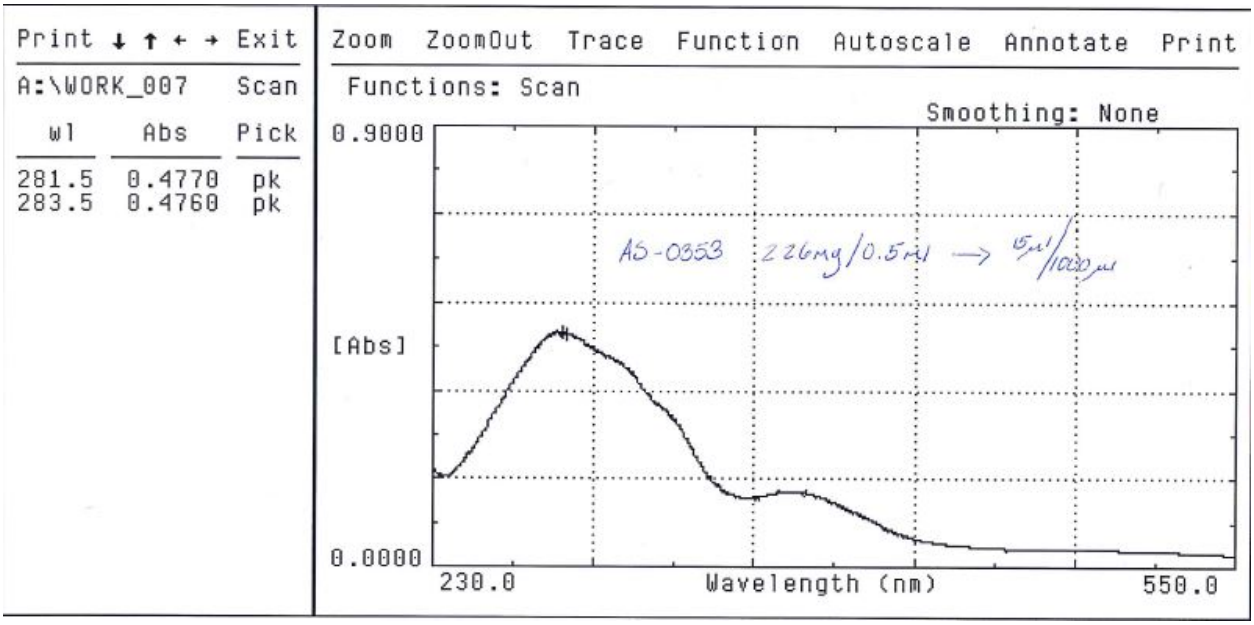


Yield: 7 %

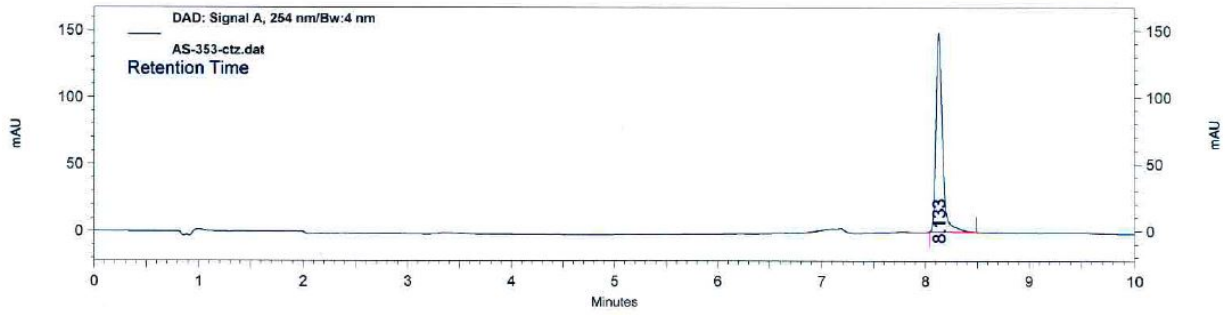
^{1}H NMR (**F33**)


8.51
8.50
8.13
8.12
7.83
7.82
7.70
7.69
7.32
7.31
7.31
7.31
6.88
6.87
6.87
6.86
6.86
6.27
6.26
6.09
6.09
6.08
6.08
6.07
4.16
1.00
0.99
2.57
1.41
0.88
2.53
0.98
0.89
2.67
f1 (ppm)

UV/Vis spectra (**F33**)



HPLC trace (**F33**)



HPLC purity >99% @ 254nm

1. Q. Wang, A. Millet and M. Hiersemann, *Synlett*, 2007, **2007**, 1683-1686.