Electronic Supplementary Information

Iminonaphthofuranone Synthesis via Multiple-Component Cyclization of 2-Naphthols Using Only Molecular Oxygen

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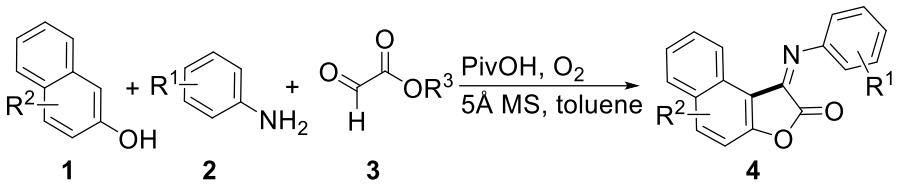
1. General Information

The reactions were carried out in Schlenk tubes of 25 mL under N_2 atmosphere. The heat source is IKA magnetic stirrer with RCT Basic. Reagents were used as received unless otherwise noted, and solvents were purified according to standard operation procedure. Column chromatography was performed using Silica Gel 60 (300–400 mesh). The reactions were monitored by GC and GC-MS, GC-MS results were recorded on GC-MS QP2010, and GC analysis was performed on GC 2010 plus. The ^{1}H and ^{13}C NMR spectra were recorded on a Brucker ADVANCE III spectrometer at 400 MHz and 101 MHz, respectively, and chemical shifts were reported in parts per million (ppm). The HRMS measurements were recorded on MAT95XP high resolution mass spectrometer by the electron ionization (EI) method, and the mass analyzer type is TOF for EI. EPR spectra were recorded on JES-FA 200 electron spin resonance spectrometer. The single-crystal X-ray diffraction was conducted on the D8 Quest X-ray single crystal diffractometer. All solvents and reagents were purchased from Energy Chemical, Bide Pharmatech Ltd., Alfa Aesar, and Aladdin.

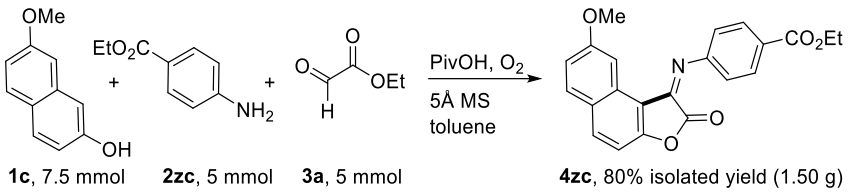
2. Experimental Procedure

2.1 General Experimental Procedure for the Synthesis of Iminonaphthofuranones



In an oven dried 25 mL Schlenk tube was charged with 2-naphthols **1** (0.3 mmol), anilines **2** (0.2 mmol), trimethylacetic acid (0.4 mmol), and 5Å molecular sieve (200 mg), after charging oxygen for three times, the ester glyoxylate solution **3** (0.2 mmol), and toluene (4 mL) were added. The reaction mixture was reacted at 100 °C for 14 h. After completion of the reaction, the reaction mixture was filtered and the filtrate was concentrated under vacuum. The desired product was isolated by column chromatography over silica gen (300-400 mesh) using petroleum ether-ethyl acetate as eluent.

2.2 Preparation of ethyl (*Z*)-4-((8-methoxy-2-oxonaphtho[2,1-*b*]furan-1(2*H*)-ylidene)amino)benzoate (4zc) at 5 mmol scale



1c, 7.5 mmol **2zc**, 5 mmol **3a**, 5 mmol **4zc**, 80% isolated yield (1.50 g)

In an oven dried 250 mL Schlenk tube was charged with 7-methoxy-2-naphthol (**1c**, 7.5 mmol), ethyl *p*-aminobenzoate (**2zc**, 5 mmol), trimethylacetic acid (10 mmol), and 5Å molecular sieve (2 g), after charging oxygen for three times, the ester glyoxylate solution **3a** (5 mmol), and toluene (100 mL) were added. The reaction mixture was reacted at 100 °C for 14 h. After completion of the reaction, the reaction solution was cooled to room temperature and left undisturbed for at least one hour, during which red solids precipitated and deposited on the walls of the container. The solids were then filtered and washed to obtain the product. The remaining solution was subjected to solvent removal, and the residue was further purified by column chromatography over silica gen (300-400 mesh) using petroleum ether-ethyl acetate as eluent.

3. X-ray Crystallographic Data of the Product (4m): Thermal Ellipsoid Plot Drawn with 50% Probability.

Crystal of product **4m** was obtained after slow evaporation of DCM, layered by methanol at room temperature. Crystals suited for single crystal X-Ray diffraction measurements were mounted on a glass fiber. Geometry and intensity data were collected with a Bruker D8 Quest X-ray single crystal diffractometer equipped with a PHOTON II detector using graphite monochromated Mo-Kα radiation (λ = 0.71073 Å). The crystal was kept at 150(2) K during data collection. The structure was solved by direct methods and refined on F^2 with SHELXL-97 using Olex-2 software.

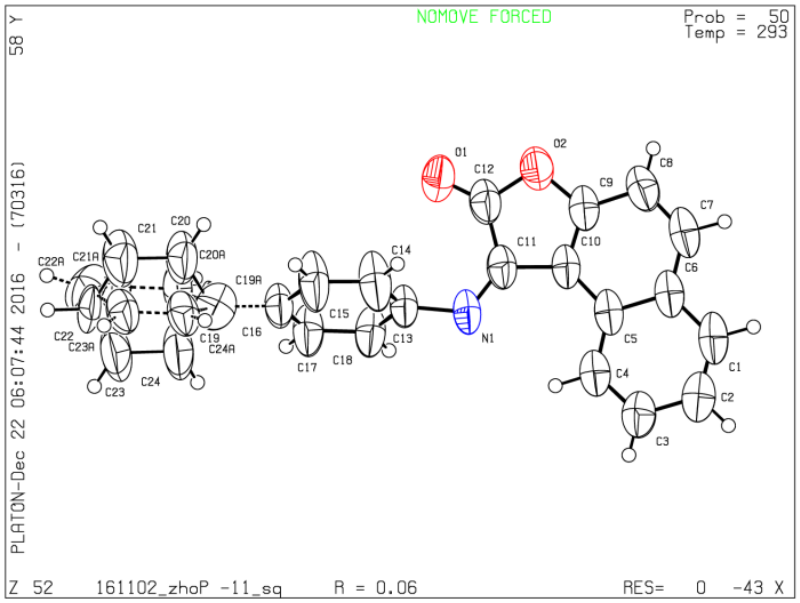


Figure S1. X-ray crystal structure of compound **4m** (CCDC number: 2182610).

Table S2. Summary of X-ray crystallographic data for compound 4m.

formula	$C_{24}H_{15}NO_2$
Fw.	349.37
crystal system	triclinic
space group	P-1
a/Å	4.5878(8)
b/Å	13.936(3)
c/Å	16.303(3)
α/deg	111.653(19)
β/deg	95.183(16)
γ/deg	99.427(16)
V/Å^3	942.7(3)
Z	2
D/g cm^{-3}	1.231
cryst size/mm	0.4 × 0.26 × 0.23
reflns collected	5885
ind reflns, *R*int	3464, 0.0259
goodness-of-fit on F^2	1.010
*R*1, *wR*2 [$I > 2\sigma(I)$]	0.0646, 0.1707
*R*1, *wR*2 (all data)	0.1323, 0.2150

4. The UV Absorption Detection and Solution Photographs of Products

4.1 The UV Absorption Detection of Products

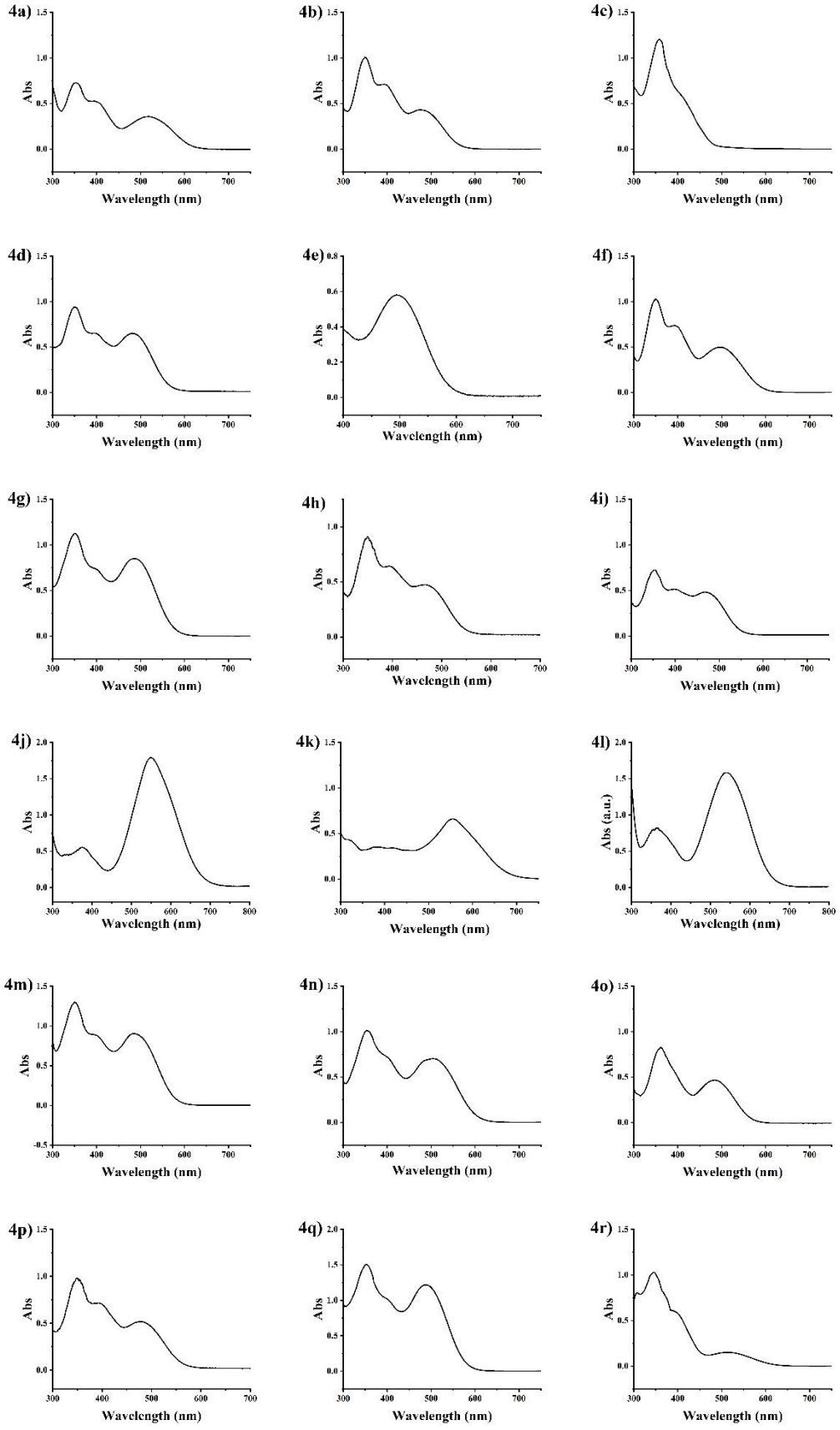
Table S3. The λ_{max} and ε values of compounds

Compound	**4a**	**4b**	**4c**	**4d**	**4e**	**4f**	**4g**	**4h**	**4i**	**4j**	**4k**	**4l**
λ_{max}/nm	353	349	359	348	494	349	349	349	353	549	555	540
ε (× 10^5)	0.727	1.009	1.203	0.939	0.582	1.027	1.128	0.909	0.726	1.792	0.661	1.586

Compound	**4m**	**4n**	**4o**	**4p**	**4q**	**4r**	**4s**	**4t**	**4u**	**4v**	**4w**	**4x**
λ_{max}/nm	350	353	361	349	353	345	349	394	354	349	349	395
ε (× 10^5)	1.298	1.013	0.826	0.987	1.504	1.032	0.982	1.212	1.014	1.144	0.689	1.054

Compound	**4y**	**4z**	**4za**	**4zb**	**4zc**	**4zd**
λ_{max}/nm	400	399	399	403	405	401

ε (× 10^5)	0.907	1.012	1.270	1.181	1.444	1.046



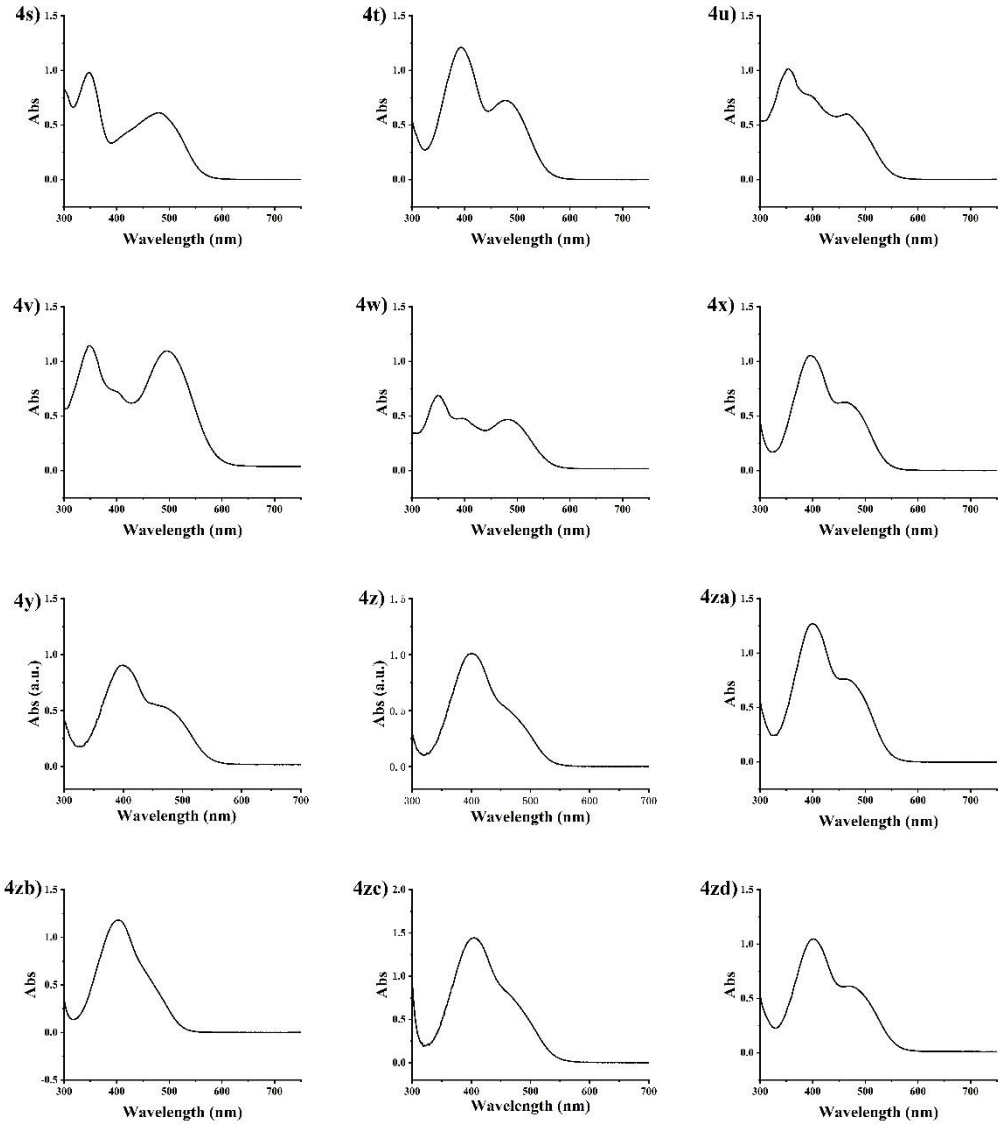


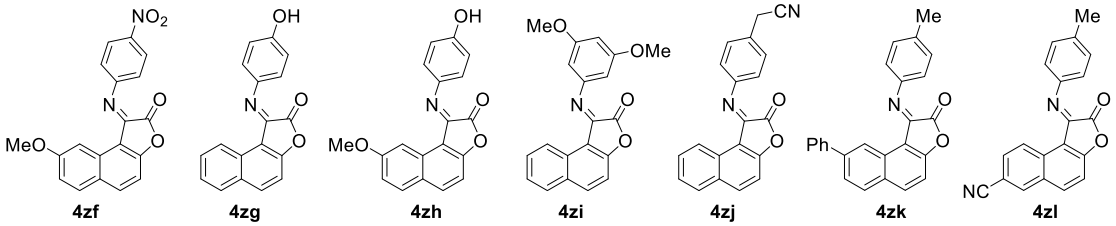
Figure S2. The UV absorption spectra of **4a–4zd** in DCM solution (1×10^{-5} mol/L) at 25 °C.

4.2 The Solution Photographs of Products

4a	4b	4c	4d	4e	4f	4g	4h	4i	4j	4k	4l
											
4m	**4n**	**4o**	**4p**	**4q**	**4r**	**4s**	**4t**	**4u**	**4v**	**4w**	**4x**
											
4y	**4z**	**4za**	**4zb**	**4zc**	**4zd**	**4j**^{b}	**4k**^{b}	**4l**^{b}			

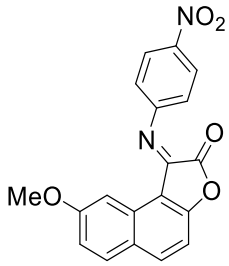
Figure S3. The Solution Photographs of **4a–4zd** in DCM solution (1×10^{-4} mol/L); [b]The corresponding DCM solution (1×10^{-5} mol/L).

4.3 The HRMS Spectra, UV Absorption Detection, and Solution Photographs of Other Products

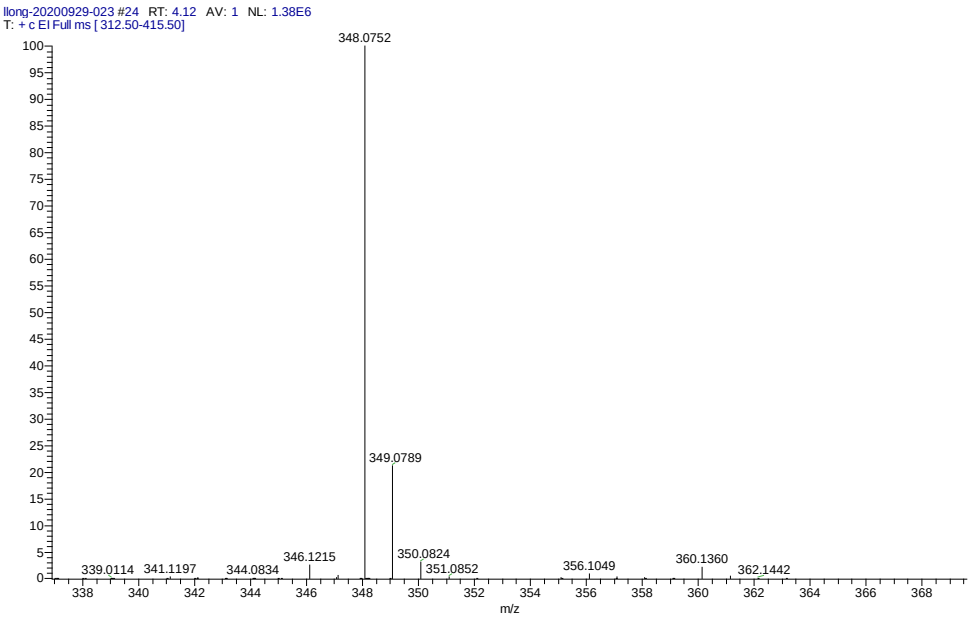


4.3.1 The HRMS Spectra of 4zf-4zl

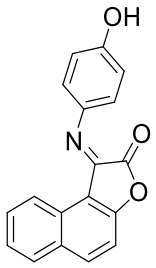
(*Z*)-8-methoxy-1-((4-nitrophenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4zf)



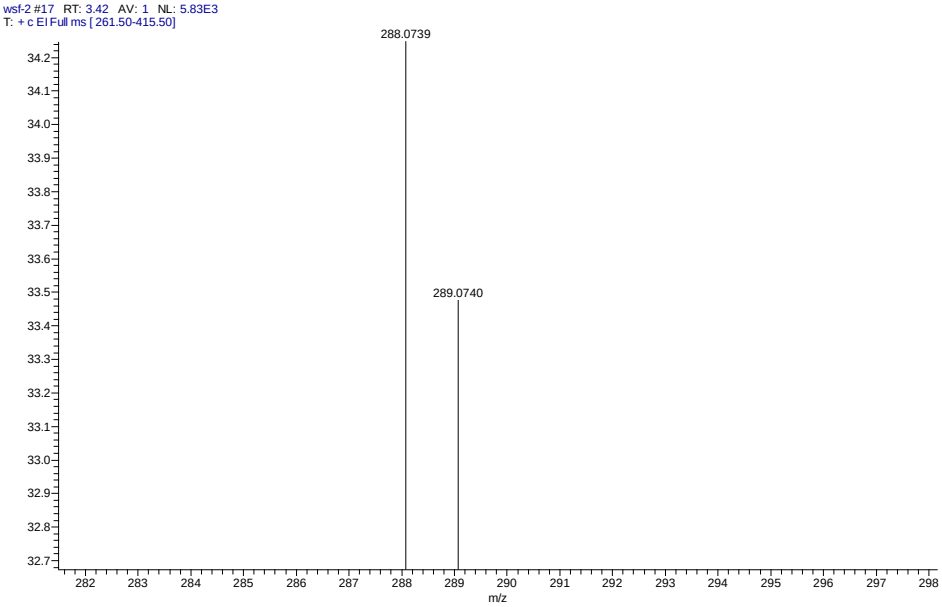
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (5/1) to afford a red solid; HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{12}N_2O_5$: 348.0746; found: 348.0752.



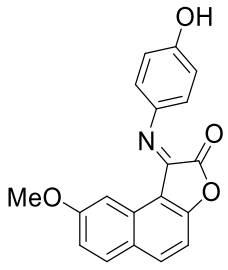
(*Z*)-1-((4-hydroxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4zg)



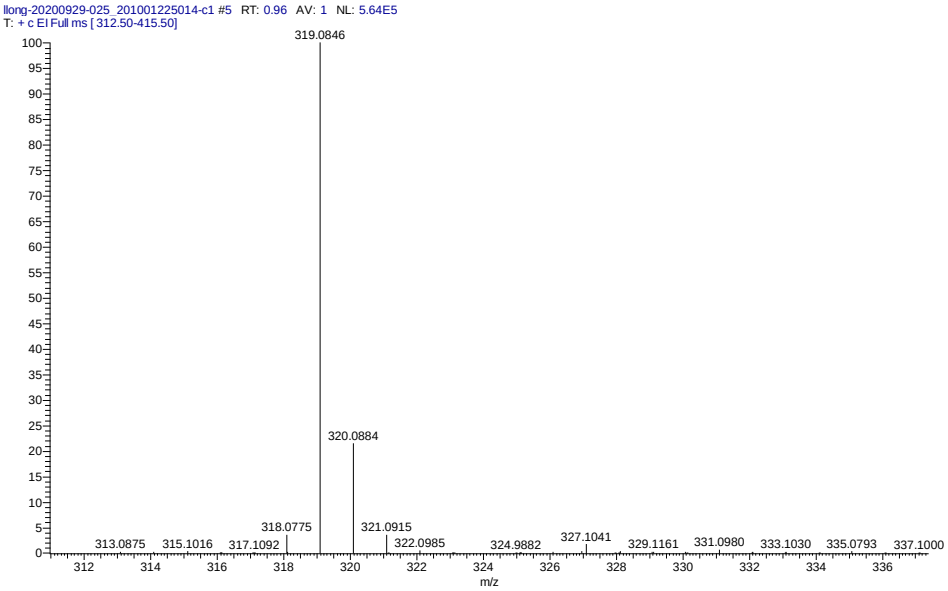
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (10/1) to afford a red solid; HRMS (EI) m/z: $[M]^+$ calcd. for $C_{18}H_{11}NO_3$: 289.0739; found: 289.0740.



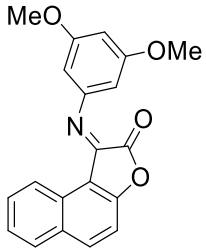
(*Z*)-1-((4-hydroxyphenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one (4zh)



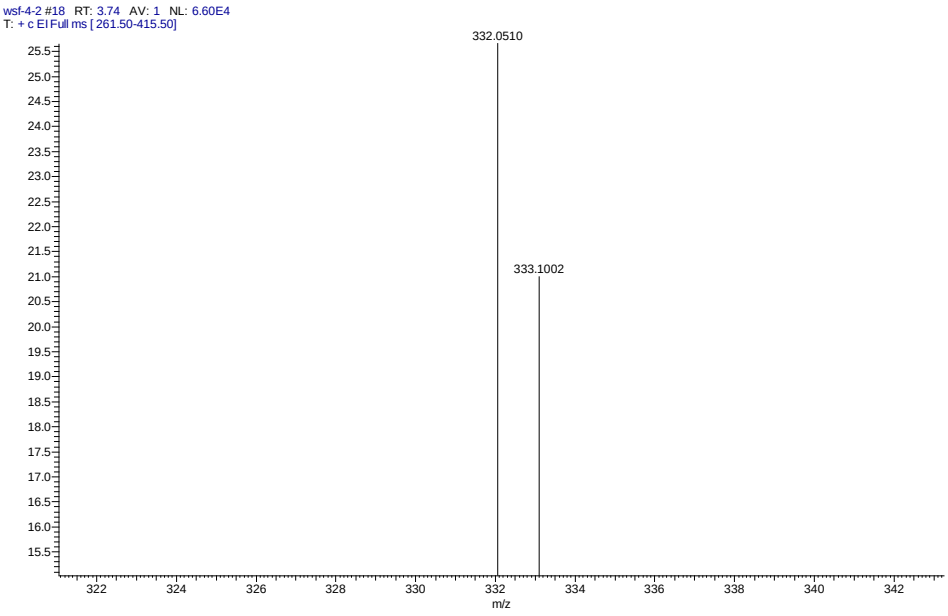
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (10/1) to afford a red solid; HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{13}NO_4$: 319.0845; found: 319.0846.



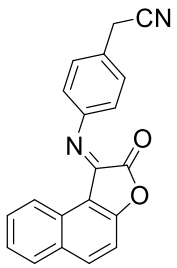
(*Z*)-1-((3,5-dimethoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4zi)



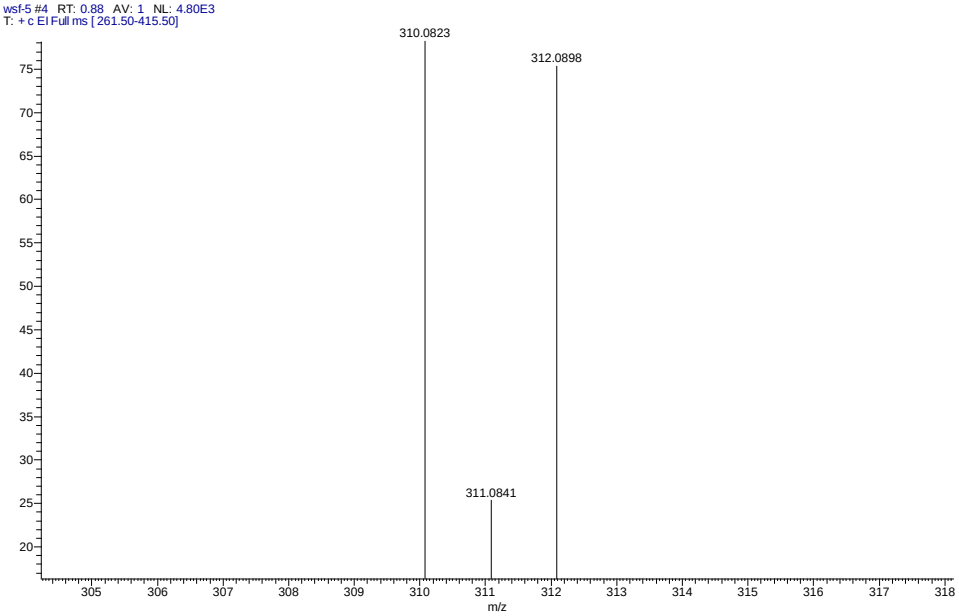
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (10/1) to afford a red solid; HRMS (EI) m/z: $[M]^+$ calcd. for $C_{20}H_{15}NO_4$: 333.1001; found: 333.1002.



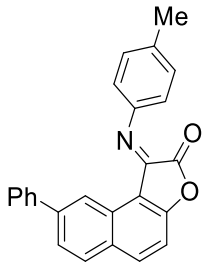
(*Z*)-2-(4-((2-oxonaphtho[2,1-*b*]furan-1(2*H*)-ylidene)amino)phenyl)acetonitrile (4zj)



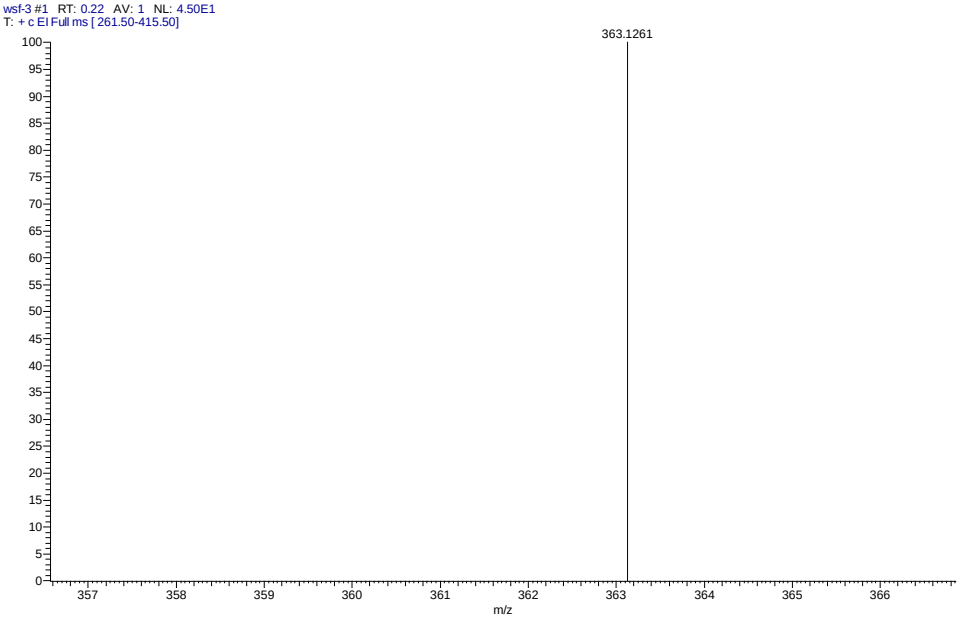
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (10/1) to afford a red solid; HRMS (EI) m/z: $[M]^+$ calcd. for $C_{20}H_{12}N_2O_2$: 312.0899; found: 312.0898.



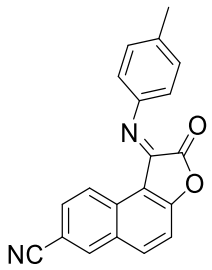
(*Z*)-8-phenyl-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one (4zk)



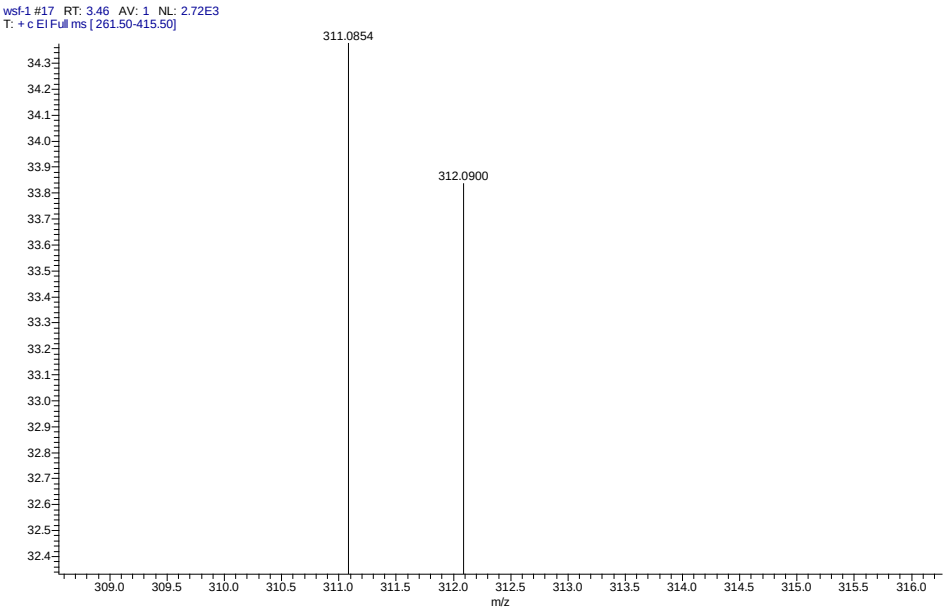
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a grey solid; HRMS (EI) m/z: $[M]^+$ calcd. for $C_{25}H_{17}NO_2$: 363.1259; found: 363.1261.



(*Z*)-2-oxo-1-(*p*-tolylimino)-1,2-dihydronaphtho[2,1-*b*]furan-7-carbonitrile (4zl)



The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (10/1) to afford a red solid; HRMS (EI) m/z: $[M]^+$ calcd. for $C_{20}H_{12}N_2O_2$: 312.0899; found: 312.0900.



4.3.2 The UV Absorption Detection of the Above Products

Table S4. The λ_{max} and ε values of compounds

Compound	4zf	4zg	4zh	4zi	4zj	4zk	4zl
λ_{max}/nm	413	385	361	409	349	346	357
ε (× 10^5)	1.485	0.892	0.721	2.234	0.935	1.158	1.212

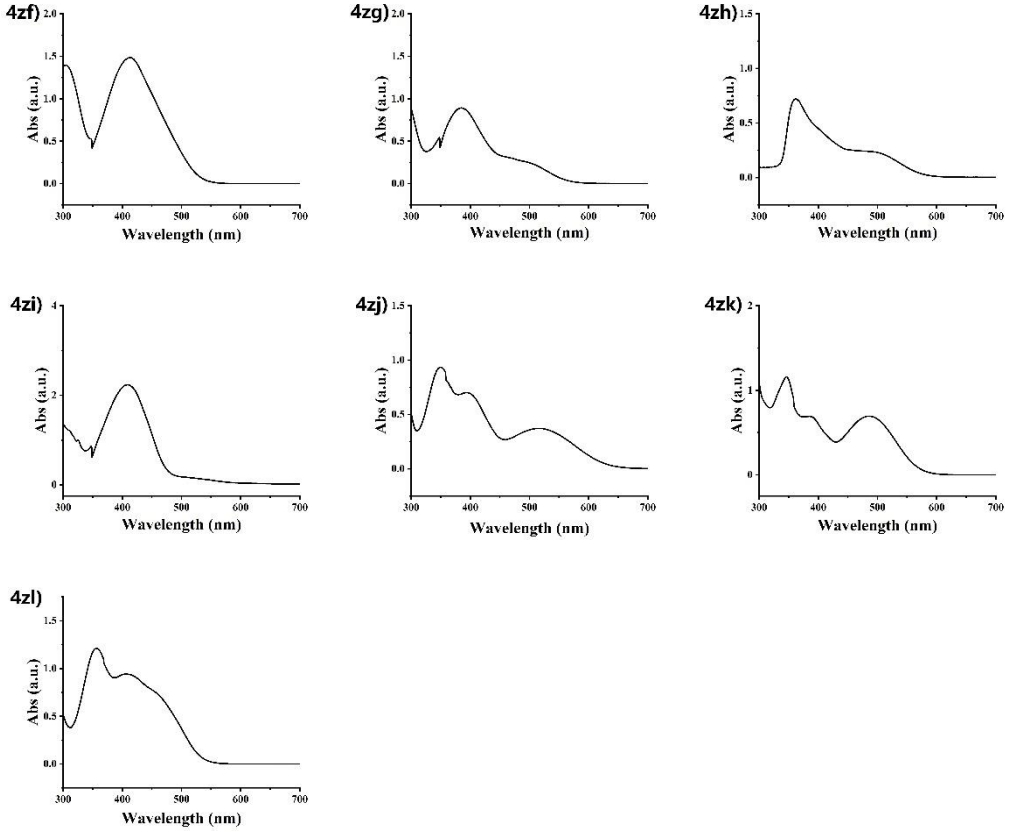


Figure S4. The UV absorption spectra of **4zf–4zl** in DCM solution (1 × 10^{-5} mol/L) at 25 °C.

4.3.3 The Solution Photographs of Products 4zf–4zl

4zf	4zg	4zh	4zi	4zj	4zk	4zl
						

Figure S5. The Solution Photographs of **4zf–4zl** in DCM solution (1 × 10^{-5} mol/L).

5. Investigations of the Reaction Mechanism

5.1 Detection of hydrogen peroxide

In an oven dried 25 mL Schlenk tube was charged with anilines 2-naphthol (**1a**, 0.3 mmol), **2a** (0.2 mmol), trimethylacetic acid (0.4 mmol), and 5Å molecular sieve (200 mg), after charging oxygen for three times, the ester glyoxalate solution (**3a**, 0.2 mmol), and toluene (4 mL) were added. The reaction mixture was reacted at 100 °C for 14 h. After completion, a small amount of activated MnO_2 powder was added to the reaction solution, bubbles are formed as shown in Figure S6, which supported the inference that oxygen is reduced to hydrogen peroxide.

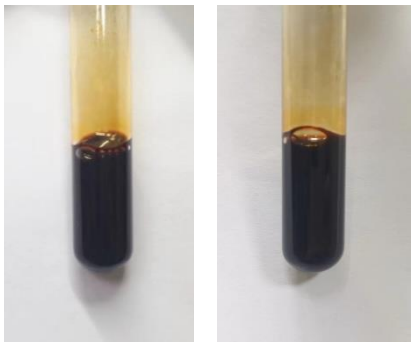


Figure S6. The formation of bubbles when the activated MnO_2 powder was added to the reaction solution.

5.2 Computational details

In our calculations, Gaussian 16 program[1] was used to carry out total density functional theory (DFT) calculations. Geometry optimizations were performed by B3LYP functional[2,3] with dispersion correction of D3(BJ)[4], 6-31+G(d) basis set for the all elements. The vibrational frequencies calculations were conducted at the same level of theory to be sure whether every optimized stationary point is an energy minimum or a transition state and evaluate the zero-point vibrational energy and thermal corrections at 298 K. The single point energies and solvent effects based on the gas-phase optimized structures were calculated by the UM06 functional[5,6] with dispersion correction of D3,[7] and def2-TZVP basis set[8] was used for all elements. The solvation energies were evaluated by self-consistent reaction field by SMD implicit solvent model.[9] In order to adjust the Gibbs free energies from 1 atm to 1 mol/L, a correction of $RT\ln(Csol/Cgas)$ (1.89 kcal/mol) is added to energies of all species. Csol represents the standard molar concentration in solution (1 mol/L), Cgas represents the standard molar concentration in gas phase (0.0446 mol/L), and R represents the gas constant.

Table S5. Zero-point correction (ZPE), thermal correction to enthalpy (TCH), thermal correction to Gibbs free energy (TCG), energies (E), Gibbs free energies(G), and enthalpies (H) (in Hartree) of the structures calculated at the M06-D3/def2-TZVP//B3LYP-D3(BJ)/6-31+G(d) level of theory

	ZPE	TCH	TCG	E	G	H	Imaginary Frequency
O2 (T)	0.003741	0.007048	-0.016239	-150.316860	-150.333099	-150.309812	-

O2 (S)	0.003713	0.007021	-0.015229	-150.257894	-150.273123	-150.250873	-
H2O2	0.026260	0.030427	0.004604	-151.544370	-151.539766	-151.513943	-
HOO·	0.014018	0.017819	-0.008174	-150.901670	-150.909844	-150.883851	-
1a	0.151350	0.159461	0.118628	-460.954329	-460.835701	-460.794868	-
A	0.220382	0.233880	0.180031	-632.006069	-631.826038	-631.772189	-
B	0.138783	0.147529	0.105495	-460.315846	-460.210351	-460.168317	-
C	0.362184	0.385482	0.308500	-1092.337475	-1092.028975	-1091.951993	-
D	0.352207	0.375009	0.298140	-1091.757596	-1091.459456	-1091.382587	-
F	0.207896	0.223232	0.162076	-631.346814	-631.184738	-631.123582	-
TS (T)	0.152610	0.164121	0.114072	-611.232996	-611.118924	-611.068875	-460.79
TS (S)	0.156253	0.167965	0.119289	-611.217161	-611.097872	-611.049196	-194.12
TS1	0.362184	0.385482	0.308500	-1092.317560	-1092.00906	-1091.932078	-513.61
TS2	0.375463	0.402334	0.315439	-1243.223422	-1242.907983	-1242.821088	-1741.41
TS3	0.222031	0.240164	0.172780	-782.226588	-782.053808	-781.986424	-993.59

5.3 Cartesian coordinates of the optimized structure

O2 (T)

O	-3.01716100	2.59493700	0.00000000
O	-1.80208000	2.59493700	0.00000000

O2 (S)

O	-3.01718400	2.59493700	0.00000000
O	-1.80205600	2.59493700	0.00000000

H2O2

O	0.00000000	0.72832800	-0.05465700
O	0.00000000	-0.72832800	-0.05465700
H	0.82272600	0.90151400	0.43725900
H	-0.82272600	-0.90151400	0.43725900

HOO•

O	0.05578100	-0.61182700	0.00000000
O	0.05578100	0.72105800	0.00000000
H	-0.89249700	-0.87385000	0.00000000

1a

O	3.37247800	-0.75422000	0.00000500
C	2.10250300	-0.23415400	-0.00000300
C	1.04033500	-1.11216600	-0.00000500
C	-0.29160000	-0.62665200	-0.00000800
C	-1.41309300	-1.50118200	-0.00000800
C	-2.69796000	-1.00352100	0.00000400
C	-2.92853700	0.39531600	0.00001400

C	-1.86309000	1.26912700	0.00000400
C	-0.52680500	0.78859800	-0.00000800
C	0.59417700	1.65965600	-0.00000800
C	1.87931300	1.16678100	-0.00000600
H	4.02225600	-0.03463800	0.00010100
H	1.23180400	-2.18128700	0.00000600
H	-1.23925100	-2.57456500	-0.00001600
H	-3.54283300	-1.68711500	0.00000400
H	-3.94642900	0.77509600	0.00002600
H	-2.03215100	2.34368400	0.00000400
H	0.42658700	2.73398800	-0.00000600
H	2.72873500	1.84777800	-0.00001400

A

C	-3.06777900	-1.33120700	-0.00005600
C	-4.05829900	-0.33641700	-0.00000300
C	-3.64619000	1.00409600	0.00003300
C	-2.29502900	1.33711100	0.00002200
C	-1.30717000	0.33835600	-0.00001800
C	-1.71384200	-1.00809700	-0.00006200
C	-5.52431600	-0.69268400	0.00002600
N	0.02178200	0.80152800	-0.00002500
C	1.02350400	0.01285100	0.00005600
C	2.40753000	0.58082200	0.00007000
O	2.71078100	1.75381700	-0.00007000
O	3.30285000	-0.43714400	0.00004000
C	5.52164800	-1.32873000	0.00003700
C	4.69862400	-0.05560400	-0.00005300
H	-3.36494900	-2.37732900	-0.00009800
H	-4.39343900	1.79446700	0.00006600
H	-1.97005800	2.37291500	0.00004500
H	-0.98237000	-1.81021600	-0.00011500
H	-5.67308400	-1.77704700	-0.00022100
H	-6.03133300	-0.28349200	0.88278900
H	-6.03147800	-0.28306200	-0.88245200
H	0.96821300	-1.08124200	0.00014400
H	6.58855600	-1.07767400	-0.00003300
H	5.30983100	-1.93271900	0.88874000
H	5.30975600	-1.93289500	-0.88852900
H	4.88834500	0.56053400	-0.88479900
H	4.88841400	0.56070800	0.88455600

B

O	3.37292100	-0.75356300	-0.00000500

C	2.20920100	-0.28295700	-0.00000500
C	1.05200500	-1.14844400	-0.00000300
C	-0.25808100	-0.63991800	-0.00000100
C	-1.39816800	-1.49370400	0.00000100
C	-2.67523600	-0.96766000	0.00000500
C	-2.86248200	0.43145400	0.00000800
C	-1.76760200	1.28899900	0.00000500
C	-0.45660400	0.78453700	0.00000100
C	0.69530800	1.65205100	-0.00000200
C	1.96145400	1.15984300	-0.00000500
H	1.23313700	-2.21985900	-0.00000300
H	-1.24309900	-2.56948900	-0.00000200
H	-3.53773200	-1.62765500	0.00000700
H	-3.86891800	0.84023400	0.00001300
H	-1.91912800	2.36561100	0.00000700
H	0.52156000	2.72602000	-0.00000200
H	2.83203200	1.80844000	-0.00000700

C

C	-1.13863800	-0.58437800	-0.27278100
C	-2.51063300	-1.26280900	-0.14180700
N	-0.18030100	-1.26441700	0.54361200
O	-2.74428300	-2.27063400	0.48028200
C	1.09667600	-1.37853900	0.14926100
C	-1.24016500	0.93408600	0.18614700
C	0.00745500	1.67484200	-0.21935700
C	1.02025300	1.92178200	0.73080500
C	0.78051300	1.60613900	2.13368500
C	-0.40729000	1.15900800	2.59594800
C	-1.53620200	0.93458500	1.68681100
C	0.20301400	2.06873300	-1.54426900
C	1.40044400	2.66640000	-1.94416900
C	2.42235800	2.87228400	-1.01237100
C	2.22660100	2.50922200	0.31818500
O	-2.67331500	0.71507400	2.08961900
C	1.65733000	-0.98951900	-1.10955200
C	3.01377000	-1.12454700	-1.35231400
C	3.89073500	-1.65246800	-0.38658500
C	3.34735400	-2.05959000	0.85204700
C	1.99843300	-1.93707200	1.11456700
C	5.36344100	-1.79996200	-0.66332000
O	-3.42290100	-0.59363900	-0.87950100
C	-5.65351800	-0.13198900	-1.60122500
C	-4.78725400	-1.07045100	-0.78474100

H	-0.91231700	-0.56501100	-1.34913500
H	-2.11349500	1.34157100	-0.32920700
H	1.60030600	1.78399000	2.82740400
H	-0.58699700	0.97888600	3.65124400
H	-0.58671200	1.89561800	-2.27259200
H	1.53647600	2.96733700	-2.97931800
H	3.36026300	3.32570600	-1.32029700
H	3.00878000	2.68440100	1.05302600
H	1.02702500	-0.56925200	-1.88269800
H	3.41413100	-0.80975900	-2.31332200
H	4.00754400	-2.47678600	1.60959500
H	1.57272800	-2.24252400	2.06520800
H	5.64100000	-1.34017300	-1.61701400
H	5.96564400	-1.33419700	0.12695300
H	5.65367100	-2.85844400	-0.70450400
H	-6.69806200	-0.46115200	-1.55584400
H	-5.59743300	0.88926300	-1.20976400
H	-5.34161600	-0.12092100	-2.65141400
H	-4.82335000	-2.09869500	-1.15849600
H	-5.06953500	-1.07987600	0.27191700

D

C	0.18964400	0.43118800	0.03616300
C	-0.68055900	1.65031100	0.31108700
N	-0.23887500	-0.76504700	0.01366000
O	-1.35817800	1.77851000	1.30514100
C	-1.61153900	-1.07706100	0.06323600
C	1.68831800	0.72886300	-0.12899300
C	2.45629600	-0.49667600	-0.55464500
C	3.25278500	-1.18978600	0.37719200
C	3.40791300	-0.66156000	1.72483700
C	2.90492800	0.53067500	2.11942000
C	2.14899000	1.37298800	1.19381600
C	2.34860500	-0.98191600	-1.85679700
C	3.01619900	-2.14654700	-2.24160600
C	3.79888800	-2.84419000	-1.31617200
C	3.91605100	-2.36483200	-0.01422500
O	1.83166300	2.52904700	1.45324400
C	-2.03619700	-2.08291500	0.93886200
C	-3.38263500	-2.43961300	0.99342200
C	-4.33074400	-1.84339600	0.15119100
C	-3.88374400	-0.86885300	-0.75277700
C	-2.54646900	-0.48352300	-0.79953100
C	-5.78623900	-2.24248000	0.19868800

O	-0.57097800	2.55231100	-0.67713000
C	-0.92990600	4.71108500	-1.64303400
C	-1.24093600	3.82278900	-0.45586300
H	1.76237100	1.51404400	-0.89066300
H	3.99522100	-1.25456000	2.42394900
H	3.08020500	0.93209500	3.11277900
H	1.72563800	-0.45194200	-2.57315100
H	2.92163000	-2.51175900	-3.26041700
H	4.31538600	-3.75313900	-1.61096500
H	4.52871800	-2.89482300	0.71126400
H	-1.30565300	-2.56185000	1.58375900
H	-3.70082700	-3.20534700	1.69708800
H	-4.59463800	-0.40324000	-1.43244200
H	-2.21742800	0.26159500	-1.51891200
H	-5.96177200	-3.01692800	0.95239600
H	-6.42626100	-1.38570700	0.44476400
H	-6.12630300	-2.63387300	-0.76847200
H	-1.41866400	5.68328300	-1.51201700
H	0.14862600	4.87716100	-1.73273400
H	-1.29389500	4.26579500	-2.57531000
H	-2.31288800	3.63171400	-0.34624000
H	-0.86526900	4.23655700	0.48403300
H	-4.89479200	0.76900800	0.57593200
H	-4.95621600	-0.12599400	-0.95203600

F

C	3.14273200	-0.83365900	-0.90240500
C	4.03256900	-0.27929600	0.03463700
C	3.51095700	0.56674400	1.01995700
C	2.14643100	0.85573200	1.07565300
C	1.27746700	0.29552700	0.13704200
C	1.78191500	-0.55552100	-0.85919800
C	5.50732700	-0.59284600	-0.03149500
N	-0.09248900	0.61780400	0.23387500
C	-1.05115300	0.25048400	-0.44566500
C	-2.47719800	0.58588100	-0.46743600
O	-2.92680000	1.55577800	-1.05055300
O	-3.21002900	-0.36492800	0.14287000
C	-5.27499000	-1.36331300	0.81515500
C	-4.65004000	-0.18404100	0.09715100
H	3.52675700	-1.49341500	-1.67752100
H	4.17927600	1.00796200	1.75509800
H	1.74420600	1.51356100	1.83983900
H	1.09933600	-0.98609700	-1.58585000

H	5.68824700	-1.67161700	0.05311000
H	5.93994200	-0.26603600	-0.98537800
H	6.05748800	-0.09601900	0.77372800
H	-6.36640900	-1.26325600	0.80377300
H	-5.00900000	-2.30598200	0.32566400
H	-4.94288500	-1.40769200	1.85760100
H	-4.89479200	0.76900800	0.57593200
H	-4.95621600	-0.12599400	-0.95203600

TS (T)

O	-2.67951200	0.78684600	-0.78371100
C	-1.42765900	0.79017900	-0.50411700
C	-0.61754800	-0.37225900	-0.69376600
C	0.75068100	-0.37828000	-0.35999600
C	1.56024600	-1.53167900	-0.53499700
C	2.90089600	-1.50863300	-0.20603800
C	3.48198500	-0.33255800	0.30865400
C	2.71430400	0.81000400	0.48784600
C	1.34773300	0.81622000	0.16273200
C	0.52855300	1.98524900	0.33133100
C	-0.79540900	1.98203600	0.01914100
H	-3.29620200	-0.26804400	-0.15148000
H	-1.07809900	-1.25324400	-1.12567600
H	1.10265400	-2.43508200	-0.92836400
H	3.51023700	-2.39694500	-0.34142700
H	4.53681100	-0.32072400	0.56626400
H	3.16661100	1.71552400	0.88357500
H	0.99742800	2.88361500	0.72545100
H	-1.42241000	2.85715000	0.15240300
O	-3.60096100	-1.07302900	0.51227100
O	-2.49199200	-1.50680800	1.04075400

TS (S)

O	2.77824300	0.16961200	1.12801200
C	1.50816600	0.40023500	0.70739100
C	0.58852000	-0.63503700	0.80748100
C	-0.76171300	-0.43535700	0.42041200
C	-1.73059700	-1.46399500	0.52297500
C	-3.03338000	-1.24447600	0.12808800
C	-3.42019300	0.01285100	-0.38625400
C	-2.49678000	1.03244000	-0.49877600
C	-1.15340700	0.83751200	-0.10274100
C	-0.17448700	1.87024800	-0.20709600
C	1.12101800	1.66505600	0.18355600

H	3.39829800	0.42509600	0.41492000
H	0.91562900	-1.58979200	1.20381800
H	-1.42790300	-2.43055400	0.91635200
H	-3.76741500	-2.04057900	0.21057600
H	-4.44884900	0.17464900	-0.69464500
H	-2.79121600	2.00049000	-0.89579400
H	-0.47841200	2.83543800	-0.60349300
H	1.86346400	2.45444400	0.11375900
O	3.22113500	-1.00408000	-1.05903300
O	2.00731400	-0.92378800	-1.33344200

TS1

C	-1.15060500	-0.89149500	-0.48288000
C	-2.59595100	-1.26984900	-0.28073400
N	-0.27151700	-1.47747800	0.34268700
O	-3.04055100	-1.86472400	0.66994700
C	1.06764600	-1.45620400	0.06598100
C	-1.27759400	1.10708600	-0.00187000
C	0.05812200	1.60232500	-0.27286100
C	1.01577600	1.60111200	0.77758000
C	0.59450100	1.22602800	2.11478400
C	-0.69405800	0.96130000	2.42512300
C	-1.74577300	1.02718200	1.40423900
C	0.44723600	2.03506800	-1.55357700
C	1.75318900	2.43787300	-1.79949600
C	2.70409300	2.40263200	-0.77020900
C	2.33403400	1.99248000	0.50548900
O	-2.94482100	0.98980700	1.68789700
C	1.67362700	-1.07259700	-1.15966200
C	3.05051900	-1.03273500	-1.28175900
C	3.89450500	-1.37244300	-0.20918600
C	3.30109700	-1.79437700	0.99250500
C	1.92474000	-1.85088400	1.12633600
C	5.38984300	-1.26258600	-0.34577300
O	-3.32003700	-0.82507200	-1.33722000
C	-5.36380800	0.30842600	-0.66838400
C	-4.75827500	-0.96596100	-1.23323400
H	-0.90786600	-0.66813800	-1.52586000
H	-2.05598600	1.34144400	-0.72340500
H	1.36094200	1.19659200	2.88617900
H	-1.01035500	0.73160500	3.43698000
H	-0.29093200	2.04766100	-2.35168500
H	2.03906400	2.77447400	-2.79173900
H	3.72848400	2.70493200	-0.96669000

H	3.06653400	1.97223100	1.30784300
H	1.06114200	-0.80041100	-2.01047000
H	3.49267500	-0.72440900	-2.22586200
H	3.93619400	-2.07993600	1.82738100
H	1.45446000	-2.16111200	2.05336600
H	5.73074400	-1.61500900	-1.32558300
H	5.71616100	-0.21782400	-0.24925100
H	5.90808700	-1.84109200	0.42502500
H	-6.44980800	0.19524500	-0.57212500
H	-4.93641100	0.52745200	0.31342400
H	-5.16456800	1.15833000	-1.33042000
H	-5.09490700	-1.16520600	-2.25389700
H	-4.97694100	-1.82887100	-0.60148300

TS2

C	0.99336400	-0.35452300	-0.27598100
C	2.31789200	-0.86376200	-0.81167500
N	-0.04315700	-0.48922100	-1.18592900
O	2.49242500	-1.37292800	-1.89097100
C	-1.28316500	-0.91575500	-0.95487400
C	1.09015600	1.11458300	0.27428600
C	-0.21215100	1.49526600	0.93396500
C	-1.14640500	2.28465300	0.23239900
C	-0.77785900	2.86526100	-1.05080000
C	0.45443900	2.75056100	-1.58945000
C	1.51050800	1.99077400	-0.91548500
C	-0.54273600	1.00467100	2.19684400
C	-1.79639400	1.26502500	2.75327200
C	-2.73532200	2.01952000	2.04776400
C	-2.40662700	2.53151800	0.79634700
O	2.67061000	1.98647500	-1.30754700
C	-1.73346100	-1.55148200	0.24835100
C	-3.06362500	-1.89103400	0.39043800
C	-4.00852800	-1.64413300	-0.62524000
C	-3.56315400	-1.04953300	-1.82448500
C	-2.24221400	-0.69767900	-1.99597700
C	-5.46053100	-1.98284700	-0.42675800
O	3.29875100	-0.68341000	0.11282300
C	5.59003200	-0.54051800	0.75748500
C	4.64699100	-0.85975400	-0.38439600
H	0.89672400	-1.05353200	0.84696500
H	1.91191500	1.10721900	0.99309000
H	-1.53958400	3.44970100	-1.56351100
H	0.72565300	3.23534600	-2.52167000

H	0.17455900	0.39169700	2.73407000
H	-2.04030400	0.87035100	3.73522800
H	-3.71459900	2.21403700	2.47501700
H	-3.12377000	3.13441800	0.24500300
H	-1.02296100	-1.76943800	1.03650600
H	-3.39284800	-2.36654800	1.31094100
H	-4.27821600	-0.86620800	-2.62243700
H	-1.88927100	-0.23051800	-2.90907100
H	-6.00740400	-1.12688200	-0.00709200
H	-5.94528800	-2.24369000	-1.37318600
H	-5.58601100	-2.81953700	0.26774700
H	6.62752500	-0.64397000	0.42267300
H	5.43886500	0.48555000	1.10616300
H	5.43640700	-1.22101700	1.60268000
H	4.75986800	-1.88579700	-0.74658500
H	4.78039400	-0.17953800	-1.22960300
O	1.03700900	-1.60989900	1.94305400
O	1.94034200	-2.65853200	1.66787100
H	2.79007700	-2.17561800	1.64054500

TS3

C	-3.26158600	0.93667500	0.17770500
C	-4.15314300	-0.14790000	0.20400300
C	-3.63422300	-1.44004900	0.05624900
C	-2.26987100	-1.64805200	-0.11339200
C	-1.39690800	-0.55349200	-0.14648300
C	-1.89722100	0.75641100	-0.00138300
C	-5.63394800	0.08260800	0.36549800
N	-0.03928500	-0.82061800	-0.30123800
C	0.97145600	-0.17023900	-0.54499500
C	2.42223400	-0.50657700	-0.59553800
O	3.08586500	-0.34490700	-1.59539200
O	2.85289600	-0.92758500	0.59738800
C	4.99112100	0.20423200	0.96918400
C	4.29183800	-1.12096600	0.72117300
H	-3.64683700	1.94617400	0.29623400
H	-4.30643300	-2.29319600	0.08074400
H	-1.86273200	-2.64855000	-0.21307200
H	-1.22016400	1.61025400	-0.01620800
H	-6.07582600	0.45964000	-0.56585600
H	-6.15722600	-0.84109600	0.62966700
H	-5.83819500	0.82657900	1.14314900
H	0.84493700	1.32050500	-1.01440600
H	6.06095300	0.03088600	1.13028000

H	4.87506800	0.86882800	0.10911200
H	4.58086500	0.69807800	1.85500500
H	4.38905300	-1.80178900	1.56859900
H	4.65625800	-1.60943400	-0.18510300
O	1.30720800	2.10112500	-0.44299100
O	0.42862800	2.77406000	0.28329400

6. Reference

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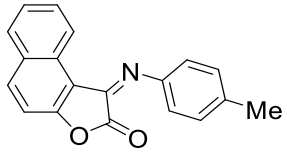
7. Characterization Data for the Products

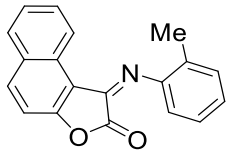
(*Z*)-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one (4a)



The title compound was prepared according to the general procedure and purified by column chromatography on

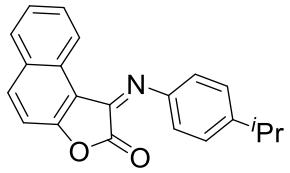
silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 92% yield (52.8 mg). mp 170–172 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.96 (d, *J* = 8.4 Hz, 1H), 8.06 (d, *J* = 8.8 Hz, 1H), 7.88 (d, *J* = 8.0 Hz, 1H), 7.68 (t, *J* = 7.6 Hz, 1H), 7.54–7.51 (m, 1H), 7.29 (d, *J* = 8.8 Hz, 1H), 7.26–7.22 (m, 2H). 7.09–7.07 (m, 2H), 2.40 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.4, 155.2, 147.2, 146.0, 136.8, 136.2, 130.9, 130.0, 129.4, 129.1, 128.6, 126.1, 124.2, 119.9, 115.1, 111.8, 21.2. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{13}NO_2$: 287.0946; found: 287.0943.

(*Z*)-1-(*o*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one (4b)



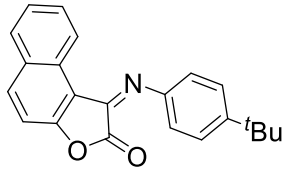
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 89% yield (51.1 mg). mp 171–173 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.00 (d, *J* = 8.0 Hz, 1H), 8.09 (d, *J* = 8.8 Hz, 1H), 7.90 (d, *J* = 8.4 Hz, 1H), 7.70 (t, *J* = 7.6 Hz, 1H), 7.54 (t, *J* = 7.6 Hz, 1H), 7.33–7.30 (m, 2H), 7.25–7.14 (m, 2H), 6.90 (d, *J* = 7.6 Hz, 1H), 2.29 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.8, 155.2, 147.8, 147.6, 137.1, 131.0, 130.6, 130.2, 129.2, 128.7, 128.2, 126.2, 126.1, 126.0, 124.1, 117.3, 114.8, 111.9, 18.2. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{13}NO_2$: 287.0946; found: 287.0949.

(*Z*)-1-((4-isopropylphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4c)



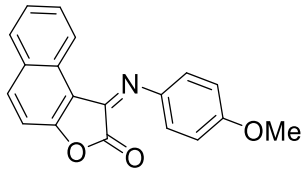
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 93% yield (58.6 mg). mp 175–177 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.96 (d, *J* = 8.4 Hz, 1H), 8.06 (d, *J* = 8.8 Hz, 1H), 7.88 (d, *J* = 8.2 Hz, 1H), 7.68 (t, *J* = 7.7 Hz, 1H), 7.52 (t, *J* = 7.6 Hz, 1H), 7.36 – 7.23 (m, 3H), 7.14 (d, *J* = 8.2 Hz, 2H), 3.01 – 2.93 (m, 1H), 1.30 (d, *J* = 6.9 Hz, 6H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.4, 155.2, 147.3, 146.9, 146.0, 136.8, 130.9, 130.0, 129.1, 128.6, 126.7, 126.0, 124.1, 120.2, 115.1, 111.7, 33.8, 24.0. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{21}H_{17}NO_2$: 315.1259; found: 315.1255.

(*Z*)-1-((4-(*tert*-butyl)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4d)



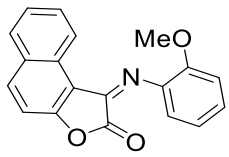
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 91% yield (59.9 mg). mp 181–183 °C ; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.94 (d, *J* = 8.4 Hz, 1H), 8.03 (d, *J* = 8.8 Hz, 1H), 7.86 (d, *J* = 8.0 Hz, 1H), 7.66 (t, *J* = 7.6 Hz, 1H), 7.50 (t, *J* = 7.6 Hz, 1H), 7.44 (d, *J* = 7.6 Hz, 2H), 7.28–7.24 (m, 1H), 7.14 (d, *J* = 7.6 Hz, 2H), 1.36 (s, 9H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.4, 155.3, 149.7, 146.9, 145.7, 136.8, 130.9, 130.1, 129.1, 128.6, 126.1, 125.7, 124.2, 120.0, 115.2, 111.8, 34.7, 31.4. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{22}H_{19}NO_2$: 329.1416; found: 329.1418.

(*Z*)-1-((4-methoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4e)



The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a dark red solid in 95% yield (57.6 mg). mp 195–197 °C ; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.99 (d, *J* = 8.4 Hz, 1H), 8.03 (d, *J* = 8.8 Hz, 1H), 7.88 (d, *J* = 8.4 Hz, 1H), 7.68 (t, *J* = 7.6 Hz, 1H), 7.52 (t, *J* = 7.6 Hz, 1H), 7.34–7.26 (m, 3H), 6.97 (d, *J* = 8.8 Hz, 2H), 3.09 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 159.1, 158.0, 155.7, 145.8, 141.2, 136.3, 131.0, 129.9, 129.1, 128.6, 126.0, 124.2, 123.5, 115.6, 113.9, 111.7, 55.5. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{13}NO_3$: 303.0895; found: 303.0896.

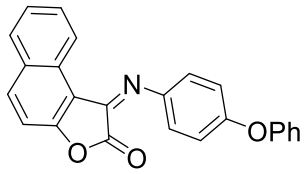
(*Z*)-1-((2-methoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4f)



The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 89% yield (54.0 mg). mp 201–

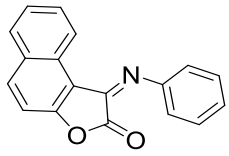
202 °C ; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.98 (d, *J* = 8.4 Hz, 1H), 8.06 (d, *J* = 8.8 Hz, 1H), 7.88 (d, *J* = 8.0 Hz, 1H), 7.70-7.66 (m, 1H), 7.52 (t, *J* = 7.6 Hz, 1H), 7.29 (d, *J* = 8.8 Hz, 1H), 7.21–7.17 (m, 1H), 7.08–6.97 (m, 3H), 3.79 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.7, 155.1, 149.7, 148.2, 138.4, 137.0, 130.9, 130.1, 129.1, 128.8, 126.6, 126.1, 124.4, 120.9, 120.8, 114.8, 111.8, 111.4, 55.6. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{13}NO_3$: 303.0895; found: 303.0899.

(*Z*)-1-((4-phenoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4g)



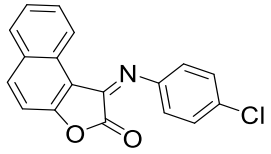
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a dark red solid in 89% yield (65.0 mg). mp 181–183 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.95 (d, *J* = 8.4 Hz, 1H), 8.04 (d, *J* = 8.8 Hz, 1H), 7.87 (d, *J* = 8.4 Hz, 1H), 7.69–7.66 (m, 1H), 7.52 (t, *J* = 7.6 Hz, 1H), 7.36 (t, *J* = 7.6 Hz, 2H), 7.28 (d, *J* = 8.8 Hz, 1H), 7.23 (d, *J* = 8.8 Hz, 2H), 7.15–7.04 (m, 5H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.4, 157.0, 156.2, 155.4, 146.9, 143.5, 136.9, 130.9, 130.1, 129.9, 129.2, 128.6, 126.1, 124.1, 123.5, 122.5, 119.2, 118.8, 115.2, 111.8. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{24}H_{15}NO_3$: 365.1052; found: 365.1056.

(*Z*)-1-(phenylimino)naphtho[2,1-*b*]furan-2(1*H*)-one (4h)



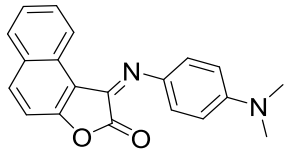
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford an orange solid in 88% yield (48.1 mg). mp 184–186 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.94 (d, *J* = 8.4 Hz, 1H), 8.09 (d, *J* = 8.8 Hz, 1H), 7.90 (d, *J* = 8.0 Hz, 1H), 7.70 (t, *J* = 7.2 Hz, 1H), 7.54 (t, *J* = 8.0 Hz, 1H), 7.43 (t, *J* = 7.2 Hz, 2H), 7.26 (d, *J* = 3.2 Hz, 1H), 7.25–7.23 (m, 1H), 7.10 (d, *J* = 7.6 Hz, 2H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.8, 155.1, 148.8, 147.7, 137.2, 130.9, 130.2, 129.2, 128.9, 128.6, 126.2, 125.9, 124.2, 119.2, 114.8, 111.8. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{18}H_{11}NO_2$: 273.0790; found: 273.0791.

(*Z*)-1-((4-chlorophenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4i)



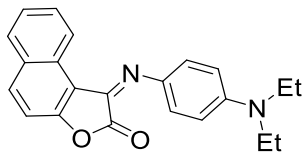
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 96% yield (59.0 mg). mp 213–214 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.89 (d, *J* = 8.4 Hz, 1H), 8.10 (d, *J* = 8.8 Hz, 1H), 7.90 (d, *J* = 8.2 Hz, 1H), 7.70 (t, *J* = 7.7 Hz, 1H), 7.54 (t, *J* = 7.6 Hz, 1H), 7.38 (d, *J* = 8.5 Hz, 2H), 7.31 (d, *J* = 8.9 Hz, 1H), 7.06 (d, *J* = 8.5 Hz, 2H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 159.0, 155.2, 148.1, 147.0, 137.6, 131.4, 130.9, 130.3, 129.2, 129.0, 128.6, 126.3, 124.1, 120.8, 114.7, 111.8. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{18}H_{10}ClNO_2$: 307.0400; found: 307.0404.

(*Z*)-1-((4-(dimethylamino)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4j)



The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a dark purple solid in 93% yield (58.8 mg). mp 169–171 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.12 (d, *J* = 8.4 Hz, 1H), 7.91 (d, *J* = 8.8 Hz, 1H), 7.84 (d, *J* = 8.0 Hz, 1H), 7.70 (d, *J* = 8.8 Hz, 2H), 7.66–7.62 (m, 1H), 7.49–7.45 (m, 1H), 7.25 (s, 1H), 6.73 (d, *J* = 8.8 Hz, 2H), 3.08 (s, 6H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 156.9, 156.1, 150.9, 140.6, 136.9, 134.0, 131.0, 129.2, 128.9, 128.6, 127.5, 125.5, 124.2, 116.9, 111.6, 111.3, 40.3. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{20}H_{16}N_2O_2$: 316.1212; found: 316.1212.

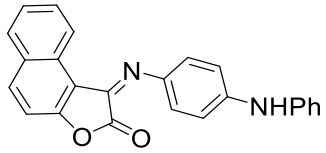
(*Z*)-1-((4-(diethylamino)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4k)



The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a dark purple solid in 89% yield (61.3 mg). mp 170–171 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.14 (d, *J* = 8.4 Hz, 1H), 7.87 (d, *J* = 8.8 Hz, 1H), 7.82 (d, *J* = 8.0 Hz, 1H), 7.77 (d, *J* = 8.8 Hz, 2H), 7.62 (t, *J* = 7.6 Hz, 1H), 7.47–7.43 (m, 1H), 7.23 (d, *J* = 8.4 Hz, 1H), 6.69 (d, *J* = 8.8 Hz, 2H), 3.44 (q, *J* = 6.8 Hz, 4H), 1.25–1.21 (m, 6H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 157.3, 155.6, 148.9, 139.3,

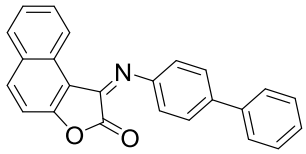
136.2, 133.5, 131.0, 129.0, 128.9, 128.8, 125.4, 124.3, 117.3, 111.6, 110.7, 44.8, 12.8. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{22}H_{20}N_2O_2$: 344.1525; found: 344.1523.

(*Z*)-1-((4-(phenylamino)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4l)



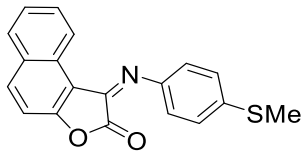
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a dark purple solid in 90% yield (65.5 mg). mp 148–150 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.03 (d, *J* = 8.4 Hz, 1H), 7.99 (d, *J* = 8.8 Hz, 1H), 7.86 (d, *J* = 8.0 Hz, 1H), 7.66 (t, *J* = 7.6 Hz, 1H), 7.52–7.48 (m, 1H), 7.44 (d, *J* = 8.4 Hz, 2H), 7.33 (d, *J* = 7.6 Hz, 1H), 7.29 (d, *J* = 5.6 Hz, 1H), 7.16 (d, *J* = 7.6 Hz, 2H), 7.09 (d, *J* = 8.0 Hz, 2H), 7.02–6.99 (m, 1H), 6.00 (s, 1H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 157.3, 156.2, 144.0, 143.6, 141.9, 140.6, 135.6, 131.0, 129.7, 129.5, 129.1, 128.6, 125.9, 125.1, 124.2, 122.1, 119.2, 116.3, 116.1, 111.7. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{24}H_{16}N_2O_2$: 364.1212; found: 364.1221.

(*Z*)-1-([1,1'-biphenyl]-4-ylimino)naphtho[2,1-*b*]furan-2(1*H*)-one (4m)



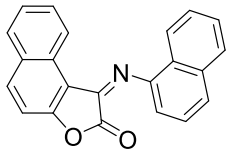
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 90% yield (62.8 mg). mp 173–175 °C ; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.96 (d, *J* = 8.4 Hz, 1H), 8.08 (d, *J* = 8.8 Hz, 1H), 7.89 (d, *J* = 8.2 Hz, 1H), 7.75 – 7.61 (m, 5H), 7.54 (t, *J* = 7.6 Hz, 1H), 7.45 (t, *J* = 7.5 Hz, 2H), 7.39 – 7.28 (m, 2H), 7.24 (d, *J* = 7.5 Hz, 2H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.8, 155.3, 147.7, 147.5, 140.6, 139.1, 137.2, 131.0, 130.2, 129.2, 128.8, 128.6, 127.5, 127.3, 127.0, 126.2, 124.2, 120.4, 115.0, 111.8. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{24}H_{15}NO_2$: 349.1103; found: 349.1092.

(*Z*)-1-((4-(methylthio)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4n)



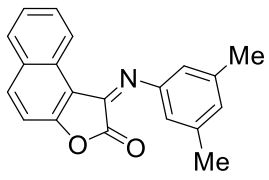
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a dark red solid in 96% yield (61.3 mg). mp 185–187 °C ; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.94 (d, *J* = 8.4 Hz, 1H), 8.07 (d, *J* = 8.8 Hz, 1H), 7.89 (d, *J* = 8.0 Hz, 1H), 7.69 (t, *J* = 7.6 Hz, 1H), 7.53 (t, *J* = 7.6 Hz, 1H), 7.32–7.29 (m, 3H), 7.17 (d, *J* = 8.2 Hz, 2H), 2.54 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ158.5, 155.4, 147.0, 145.5, 134.0, 130.9, 130.1, 129.2, 128.6, 126.8, 126.2, 124.2, 121.2, 115.2, 111.8, 16.1. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{13}NO_2S$: 319.0667; found: 319.0665.

(*Z*)-1-(naphthalen-1-ylimino)naphtho[2,1-*b*]furan-2(1*H*)-one (4o)



The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 88% yield (56.9 mg). mp 182–183 °C ; ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.10 (d, *J* = 8.4 Hz, 1H), 8.10 (d, *J* = 8.8 Hz, 1H), 8.05 (d, *J* = 8.4 Hz, 1H), 7.93–7.88 (m, 2H), 7.77–7.71 (m, 2H), 7.58–7.46 (m, 4H), 7.32 (d, *J* = 8.8 Hz, 1H), 7.12 (d, *J* = 7.2 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.8, 155.3, 148.3, 145.0, 137.4, 134.2, 131.0, 130.4, 129.3, 128.7, 128.2, 126.6, 126.5, 126.5, 126.3, 126.1, 125.5, 124.2, 123.4, 115.1, 113.0, 111.9. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{22}H_{13}NO_2$: 323.0946; found: 323.0939.

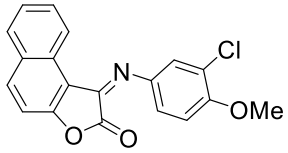
(*Z*)-1-((3,5-dimethylphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4p)



The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 96% yield (57.8 mg). mp 165–167 °C ; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.93 (d, *J* = 8.4 Hz, 1H), 8.08 (d, *J* = 8.8 Hz, 1H), 7.89 (d, *J* = 8.0 Hz, 1H), 7.68 (t, *J* = 7.6 Hz, 1H), 7.53 (t, *J* = 7.2 Hz, 1H), 7.30 (d, *J* = 8.8 Hz, 1H), 6.89 (s, 1H); 6.73 (s, 2H); 2.36 (s, 6H);

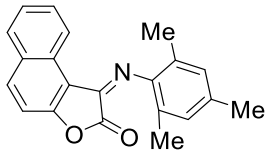
^{13}C NMR (101 MHz, $CDCl_3$): δ 158.6, 155.0, 148.9, 147.4, 138.5, 137.0, 130.9, 130.1, 129.1, 128.6, 127.7, 126.1, 124.2, 116.7, 114.9, 111.8, 21.4. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{20}H_{15}NO_2$: 301.1103; found: 301.1095.

(*Z*)-1-((3-chloro-4-methoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4q)



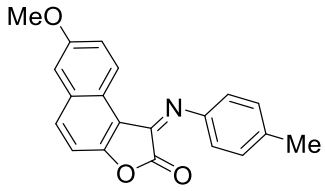
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 85% yield (57.3 mg). mp 177–178 °C ; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.93 (d, *J* = 6.0 Hz, 1H), 8.07 (d, *J* = 8.0 Hz, 1H), 7.89 (d, *J* = 6.4 Hz, 1H), 7.69 (s, 1H), 7.54 (s, 1H), 7.39 (s, 1H), 7.31 (d, *J* = 8.0 Hz, 1H), 7.19 (d, *J* = 6.8 Hz, 1H), 6.98 (d, *J* = 7.6 Hz, 1H), 3.96 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.5, 155.5, 153.9, 147.2, 141.5, 137.1, 130.9, 130.2, 129.2, 128.6, 126.2, 124.1, 123.8, 122.6, 120.3, 115.2, 111.8, 111.7, 56.41. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{12}ClNO_3$: 337.0506; found: 337.0505.

(*Z*)-1-(mesitylimino)naphtho[2,1-*b*]furan-2(1*H*)-one (4r)



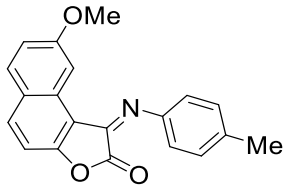
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a dark red solid in 43% yield (27.1 mg). mp 161–162 °C ; ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.02 (d, *J* = 8.0 Hz, 1H), 8.09 (d, *J* = 8.8 Hz, 1H), 7.91 (d, *J* = 8.4 Hz, 1H), 7.72–7.69 (m, 1H), 7.57–7.53 (m, 1H), 7.32 (d, *J* = 8.8 Hz, 1H), 6.94 (s, 2H), 2.32 (s, 3H), 2.08 (s, 6H). ^{13}C NMR (101 MHz, $CDCl_3$): δ 159.0, 154.8, 149.4, 145.4, 137.1, 133.8, 131.0, 130.2, 129.2, 128.8, 126.2, 124.3, 124.3, 114.3, 112.0, 20.9, 18.2. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{21}H_{17}NO_2$: 315.1259; found: 315.1259.

(*Z*)-7-methoxy-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one (4s)



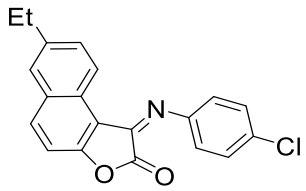
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 92% yield (58.3 mg). mp 176–178 °C ; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.84 (d, *J* = 9.2 Hz, 1H), 7.92 (d, *J* = 8.8 Hz, 1H), 7.34–7.32 (m, 1H), 7.25–7.21 (m, 3H), 7.17 (s, 1H), 7.07 (d, *J* = 8.0 Hz, 2H), 3.93 (s, 3H), 2.39 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 157.6, 156.9, 147.3, 146.0, 136.2, 135.3, 132.3, 129.4, 125.5, 123.8, 122.3, 112.0, 115.3, 112.1, 107.5, 99.4, 55.4, 21.2. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{20}H_{15}NO_3$: 317.1052; found: 317.1054.

(*Z*)-8-methoxy-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one (4t)



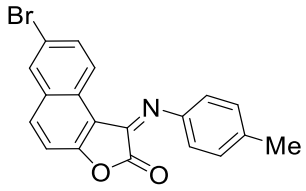
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 92% yield (58.3 mg). mp 183–185 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.34 (s, 1H), 7.96 (d, *J* = 8.8 Hz, 1H), 7.76 (d, *J* = 9.2 Hz, 1H), 7.23 (d, *J* = 7.6 Hz, 2H), 7.16–7.06 (m, 4H), 3.94 (s, 3H), 2.40 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.6, 158.8, 155.5, 147.3, 146.2, 136.4, 136.0, 130.7, 130.5, 129.4, 126.4, 112.0, 118.7, 114.2, 108.8, 102.8, 55.6, 21.2. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{20}H_{15}NO_3$: 317.1052; found: 317.1058.

(*Z*)-1-((4-chlorophenyl)imino)-7-ethylnaphtho[2,1-*b*]furan-2(1*H*)-one (4u)



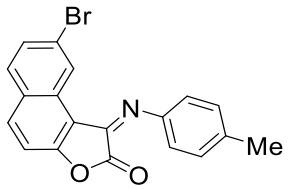
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 86% yield (57.6 mg). mp 177–179 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.79 (d, *J* = 8.5 Hz, 1H), 8.03 (d, *J* = 8.8 Hz, 1H), 7.68 (s, 1H), 7.56 (d, *J* = 8.6 Hz, 1H), 7.38 (d, *J* = 8.5 Hz, 2H), 7.28 (s, 1H), 7.05 (d, *J* = 8.5 Hz, 2H), 2.83 (q, *J* = 7.5 Hz, 2H), 1.34 (t, *J* = 7.6 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.5, 155.3, 148.2, 147.1, 142.3, 137.1, 131.5, 131.3, 128.9, 127.0, 126.8, 123.9, 120.8, 114.6, 111.6, 28.9, 15.4. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{20}H_{14}ClNO_2$: 335.0713; found: 335.0711.

(*Z*)-7-bromo-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one (4v)



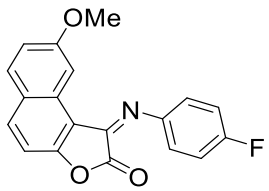
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 71% yield (51.8 mg). mp 216–218 °C ; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.84 (d, *J* = 8.8 Hz, 1H), 8.04 (s, 1H), 7.96 (d, *J* = 8.8 Hz, 1H), 7.73 (d, *J* = 8.8 Hz, 1H), 7.32 (d, *J* = 8.8 Hz, 1H), 7.24 (d, *J* = 8.0 Hz, 2H), 7.10 (d, *J* = 8.0 Hz, 2H), 2.40 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.3, 154.9, 146.7, 145.6, 136.8, 135.6, 133.2, 132.0, 131.0, 129.4, 127.0, 125.9, 120.2, 112.0, 115.4, 113.0, 21.2. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{12}BrNO_2$: 365.0051; found: 365.0044.

(*Z*)-8-bromo-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one (4w)



The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 70% yield (51.1 mg). mp 225–227 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 9.11 (s, 1H), 7.99 (d, *J* = 8.8 Hz, 1H), 7.71 (d, *J* = 8.8 Hz, 1H), 7.59 (d, *J* = 8.4 Hz, 1H), 7.29 (d, *J* = 8.8 Hz, 1H), 7.24 (d, *J* = 8.8 Hz, 2H), 7.11 (d, *J* = 8.8 Hz, 2H), 2.40 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 158.7, 154.9, 146.4, 145.7, 136.8, 136.5, 130.5, 129.7, 129.4, 129.3, 126.5, 125.3, 120.2, 114.4, 112.2, 21.2. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{12}BrNO_2$: 365.0051; found: 365.0059.

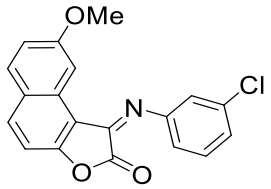
(*Z*)-1-((4-fluorophenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one (4x)



The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford an orange solid in 87% yield (55.9 mg). mp 230–232 °C; ^{1}H NMR (400 MHz, DMSO-d_6): δ 8.24–8.20 (m, 2H), 8.00 (d, *J* = 8.8 Hz, 1H), 7.35–7.23 (m, 6H),

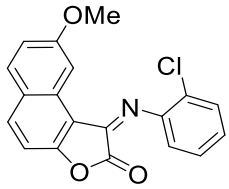
3.89 (s, 3H); ^{13}C NMR (101 MHz, DMSO-d_6): δ 161.5, 160.6 (d, J = 242.7 Hz), 159.3, 155.8, 149.4, 145.4 (d, J = 2.8 Hz), 137.5, 131.8, 130.3, 126.3, 122.6 (d, J = 8.4 Hz), 118.3, 115.7 (d, J = 22.6 Hz), 113.9, 109.6, 102.9, 55.9. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{12}FNO_3$: 321.0801; found: 321.0793.

(*Z*)-1-((3-chlorophenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one (4y)



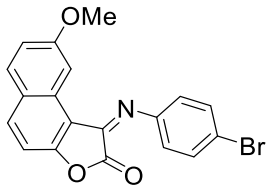
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 72% yield (48.5 mg). mp 182–184 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.22 (s, 1H), 7.99 (d, J = 8.6 Hz, 1H), 7.76 (d, J = 9.0 Hz, 1H), 7.33 (t, J = 7.9 Hz, 1H), 7.22 – 7.03 (m, 4H), 6.93 (d, J = 7.8 Hz, 1H), 3.94 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.8, 159.5, 155.3, 150.2, 148.6, 137.4, 134.5, 130.8, 130.5, 129.8, 126.3, 125.2, 119.3, 118.9, 117.1, 113.5, 108.8, 102.7, 55.6. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{12}ClNO_3$: 337.0506; found: 337.0506.

(*Z*)-1-((2-chlorophenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one (4z)



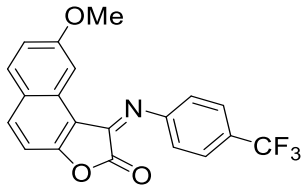
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 75% yield (50.6 mg). mp 181–182 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.37 (s, 1H), 8.00 (d, J = 8.7 Hz, 1H), 7.77 (d, J = 9.0 Hz, 1H), 7.49 (d, J = 7.9 Hz, 1H), 7.30 (t, J = 7.5 Hz, 1H), 7.15 (dd, J = 12.6, 8.7 Hz, 3H), 7.07 (d, J = 7.7 Hz, 1H), 3.96 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.9, 159.8, 155.5, 149.4, 146.2, 137.5, 130.8, 130.7, 129.9, 127.1, 126.4, 126.3, 124.4, 119.6, 119.0, 113.6, 108.8, 102.9, 55.7. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{12}ClNO_3$: 337.0506; found: 337.0505.

(*Z*)-1-((4-bromophenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one (4za)



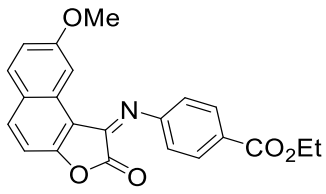
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a red solid in 73% yield (55.6 mg). mp 233–235 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.25 (s, 1H), 8.00 (d, *J* = 8.8 Hz, 1H), 7.78 (d, *J* = 8.8 Hz, 1H), 7.53 (d, *J* = 8.0 Hz, 2H), 7.14 (t, *J* = 8.8 Hz, 2H), 6.98 (d, *J* = 8.4 Hz, 2H), 3.95 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.8, 159.4, 155.5, 148.2, 147.8, 137.2, 131.9, 130.8, 130.5, 126.4, 121.2, 119.0, 118.8, 113.8, 108.8, 102.8, 55.6. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{19}H_{12}BrNO_3$: 381.0001; found: 381.0002.

(*Z*)-8-methoxy-1-((4-(trifluoromethyl)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one (4zb)



The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford an orange solid in 90% yield (66.8 mg). mp 173–175 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.21 (s, 1H), 8.01 (d, *J* = 8.4 Hz, 1H), 7.78 (d, *J* = 8.8 Hz, 1H), 7.67 (d, *J* = 8.0 Hz, 2H), 7.18–7.10 (m, 4H), 3.94 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 162.0, 159.8, 155.5, 152.2, 148.7, 137.7, 130.9, 130.5, 128.5 (q, *J* = 340.5 Hz), 127.1 (q, *J* = 32.7 Hz), 126.4, 126.2 (q, *J* = 3.9 Hz), 118.9, 118.8, 113.4, 108.8, 102.8, 55.7. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{20}H_{12}F_3NO_3$: 371.0769; found: 371.0768.

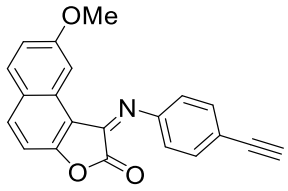
ethyl (*Z*)-4-((8-methoxy-2-oxonaphtho[2,1-*b*]furan-1(2*H*)-ylidene)amino)benzoate (4zc)



The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a dark red solid in 83% yield (62.3 mg). mp 221–223 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.22 (s, 1H), 8.11 (d, *J* = 8.4 Hz, 2H), 8.01 (d, *J* = 8.8 Hz, 1H), 7.78 (d, *J* = 8.8 Hz, 1H), 7.18–7.12 (m, 2H), 7.06 (d, *J* = 8.4 Hz, 2H), 4.39 (q, *J* = 7.2 Hz, 2H), 3.95 (s, 3H), 1.41 (t, *J* = 7.2

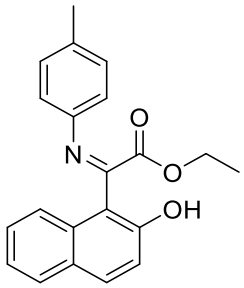
Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 166.3, 161.9, 159.7, 153.5, 148.4, 137.6 130.9, 130.6, 130.5, 127.1, 126.4, 118.9, 118.4, 113.4, 108.8, 102.8, 60.9, 55.7, 14.4. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{22}H_{17}NO_5$: 375.1107; found: 375.1106.

(*Z*)-1-((4-ethynylphenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one (4zd)



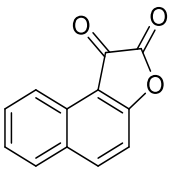
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a pale yellow solid in 82% yield (53.6 mg). mp 181–182 °C; ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.23 (s, 1H), 7.98 (d, *J* = 8.4 Hz, 1H), 7.76 (d, *J* = 8.8 Hz, 1H), 7.54 (d, *J* = 7.6 Hz, 2H), 7.16–7.10 (m, 2H), 7.04 (d, *J* = 8.0 Hz, 2H), 3.94 (s, 3H), 3.10 (s, 1H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 161.8, 159.4, 155.5, 149.3, 148.1, 137.3, 132.8, 130.8, 130.5, 126.3, 119.4, 119.2, 118.8, 113.7, 108.8, 102.8, 83.7, 77.27, 55.67. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{21}H_{13}NO_3$: 327.0895; found: 327.0891.

ethyl (*Z*)-2-(2-hydroxynaphthalen-1-yl)-2-(*p*-tolylimino)acetate (5a)



The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a pale yellow oil in 46% yield (30.6 mg). ^{1}H NMR (400 MHz, $CDCl_3$): 7.86 (d, *J* = 9.0 Hz, 1H), 7.78 – 7.75 (m, 2H), 7.44 – 7.39 (m, 1H), 7.36 – 7.31 (m, 1H), 7.21 (d, *J* = 9.0 Hz, 1H), 7.18 (d, *J* = 8.1 Hz, 2H), 6.97 (d, *J* = 8.2 Hz, 2H), 4.16 (d, *J* = 7.1 Hz, 2H), 2.37 (s, 3H), 1.06 (t, *J* = 7.1 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 164.2, 164.1, 162.4, 143.6, 135.6, 135.6, 131.8, 129.5, 129.4, 128.2, 127.6, 123.5, 122.1, 121.0, 120.3, 108.97, 62.0, 21.0, 13.5. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{21}H_{19}NO_3$: 333.1365; found: 333.1363.

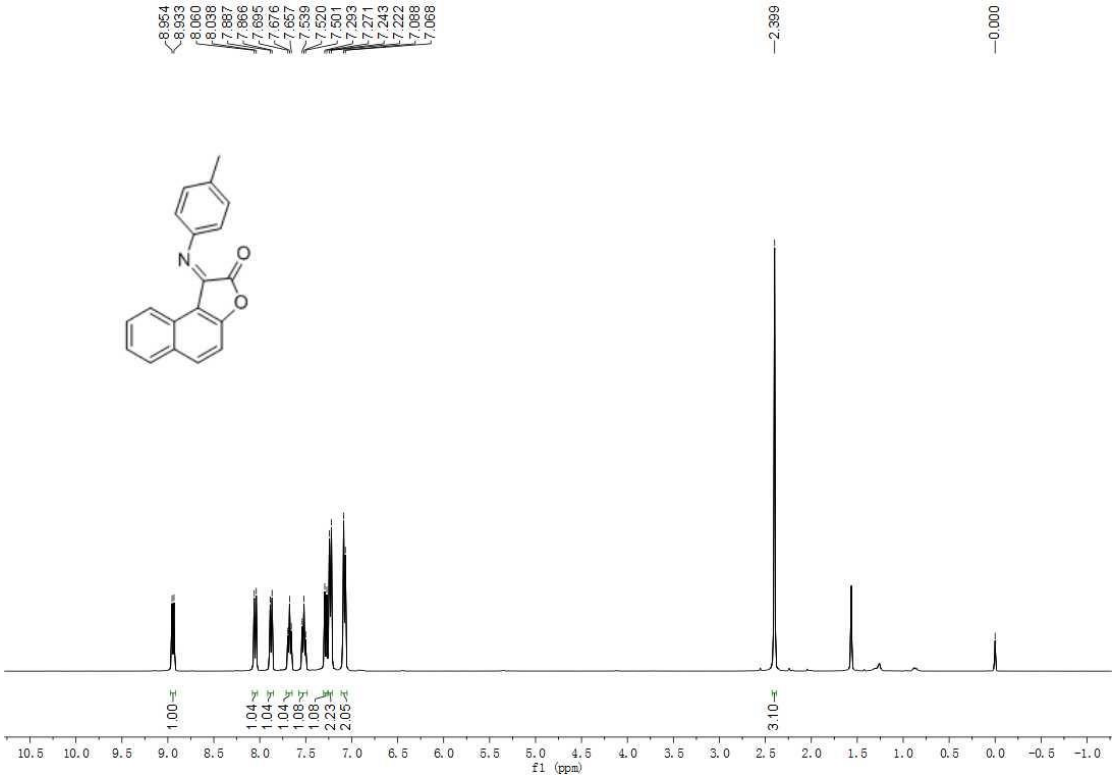
naphtho[2,1-*b*]furan-1,2-dione (6a)



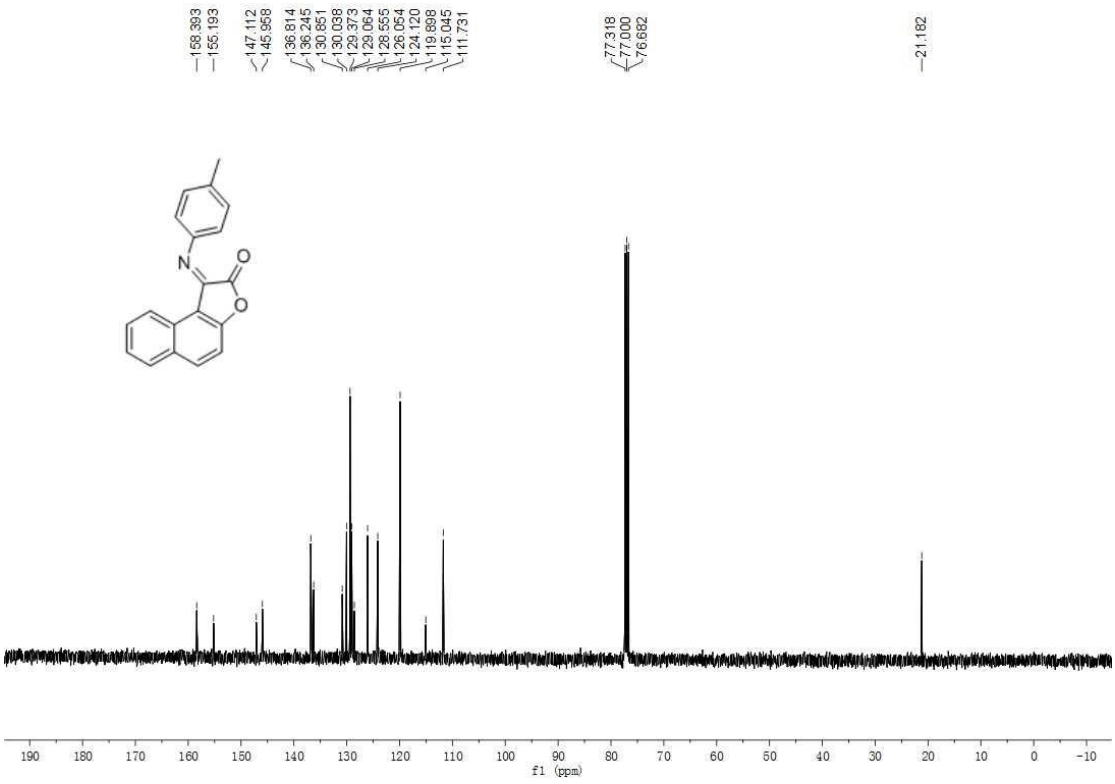
The title compound was prepared according to the general procedure and purified by column chromatography on silica gel and eluted with petroleum ether/ethyl acetate (20/1) to afford a pale yellow oil in 76% yield (30.1 mg). ^{1}H NMR (400 MHz, $CDCl_3$): δ 8.64 (d, *J* = 8.3 Hz, 1H), 8.30 (d, *J* = 8.9 Hz, 1H), 7.90 (d, *J* = 8.2 Hz, 1H), 7.77 (t, *J* = 7.7 Hz, 1H), 7.58 (t, *J* = 7.6 Hz, 1H), 7.36 (d, *J* = 8.9 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$): δ 176.1, 166.8, 156.1, 143.1, 131.8, 130.7, 129.3, 128.4, 127.1, 123.8, 112.7, 112.7. HRMS (EI) m/z: $[M]^+$ calcd. for $C_{12}H_6O_3$: 198.0317; found: 198.0316.

8. Copies of ^{1}H and ^{13}C NMR Spectra of the Products

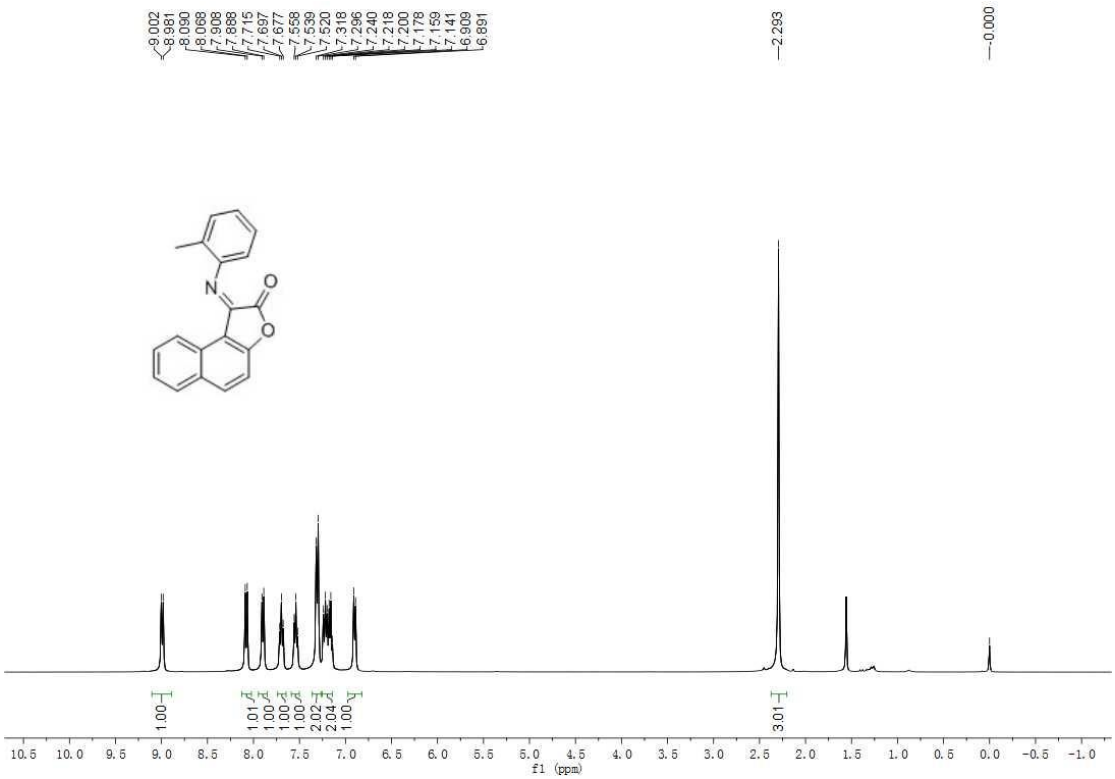
^{1}H NMR Spectrum of (*Z*)-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4a)**



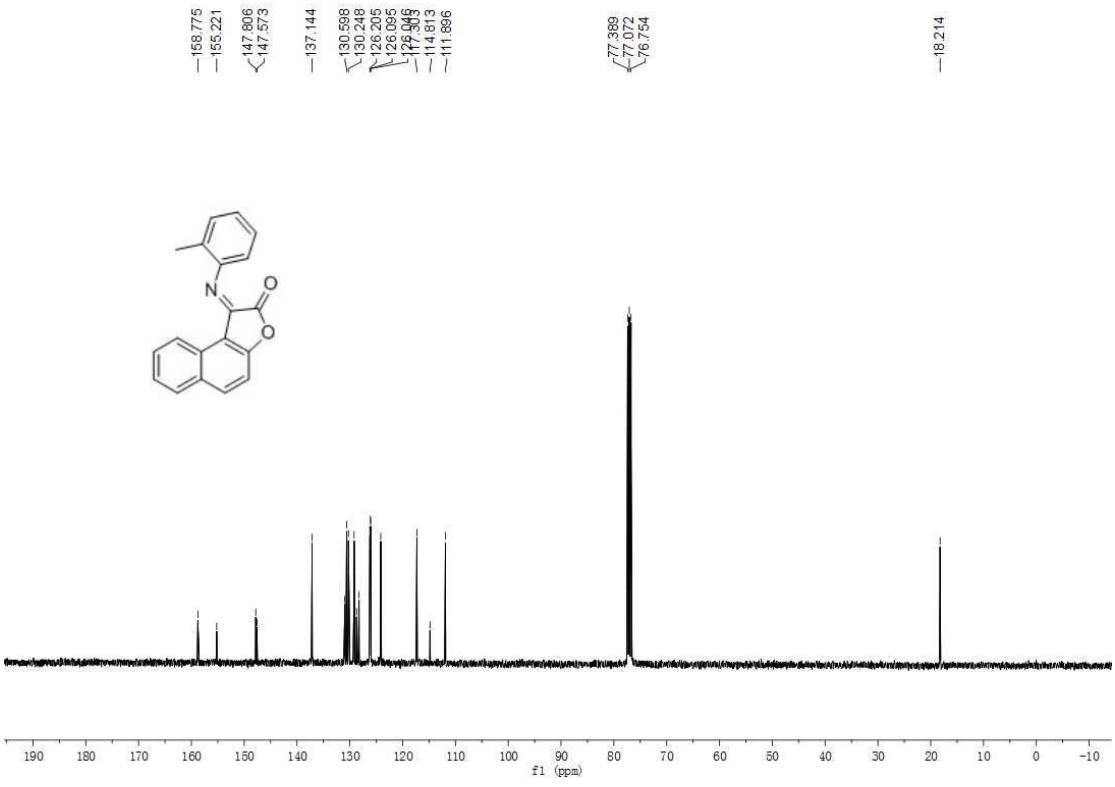
^{13}C NMR Spectrum of (*Z*)-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4a)**



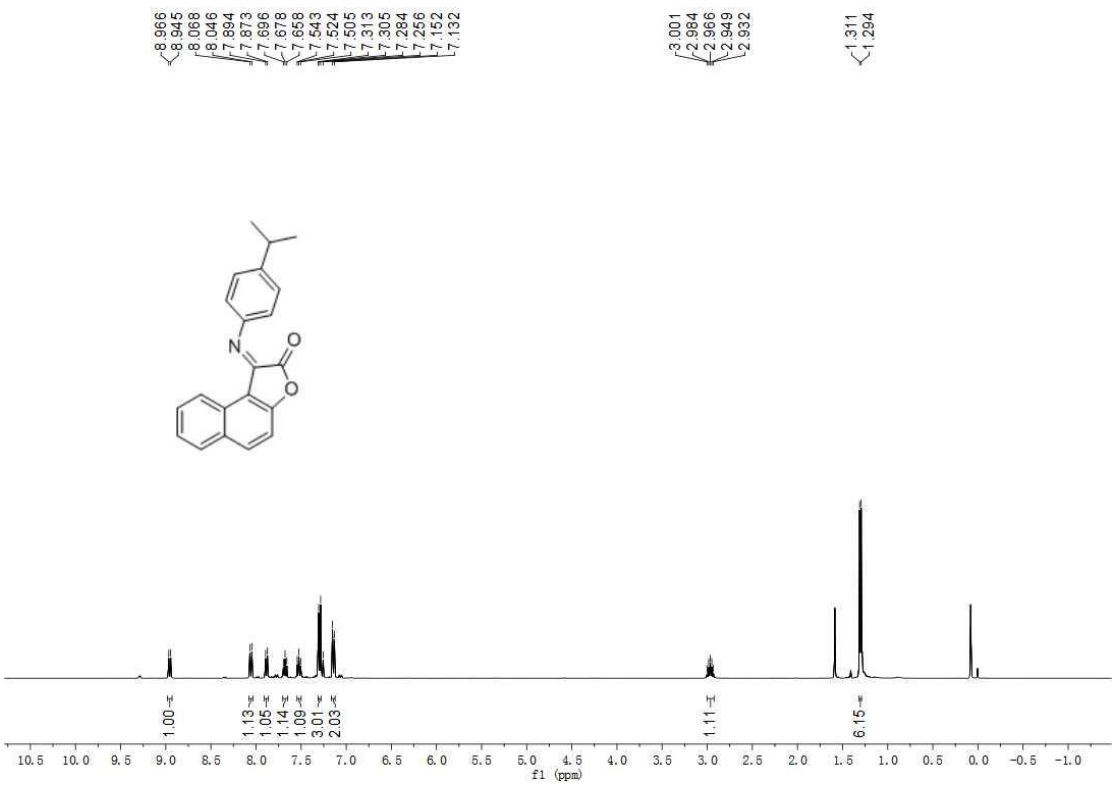
^{1}H NMR Spectrum of (*Z*)-1-(*o*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4b)**



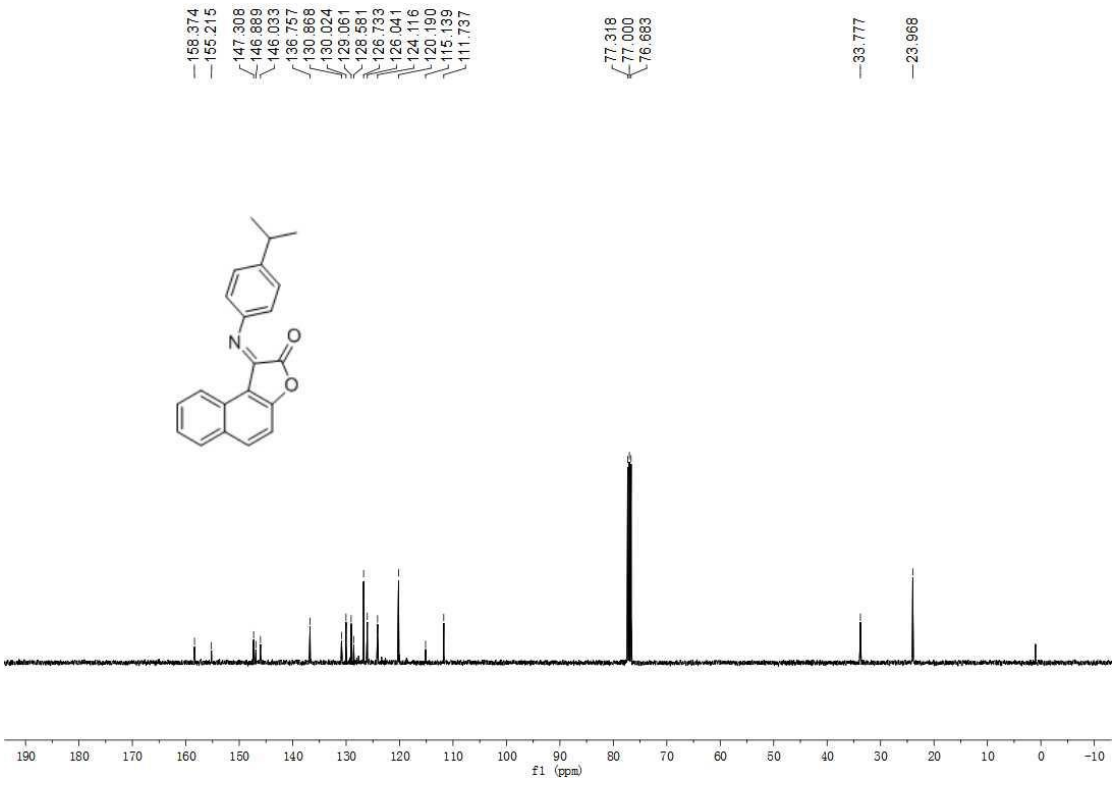
^{13}C NMR Spectrum of (*Z*)-1-(*o*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4b)**



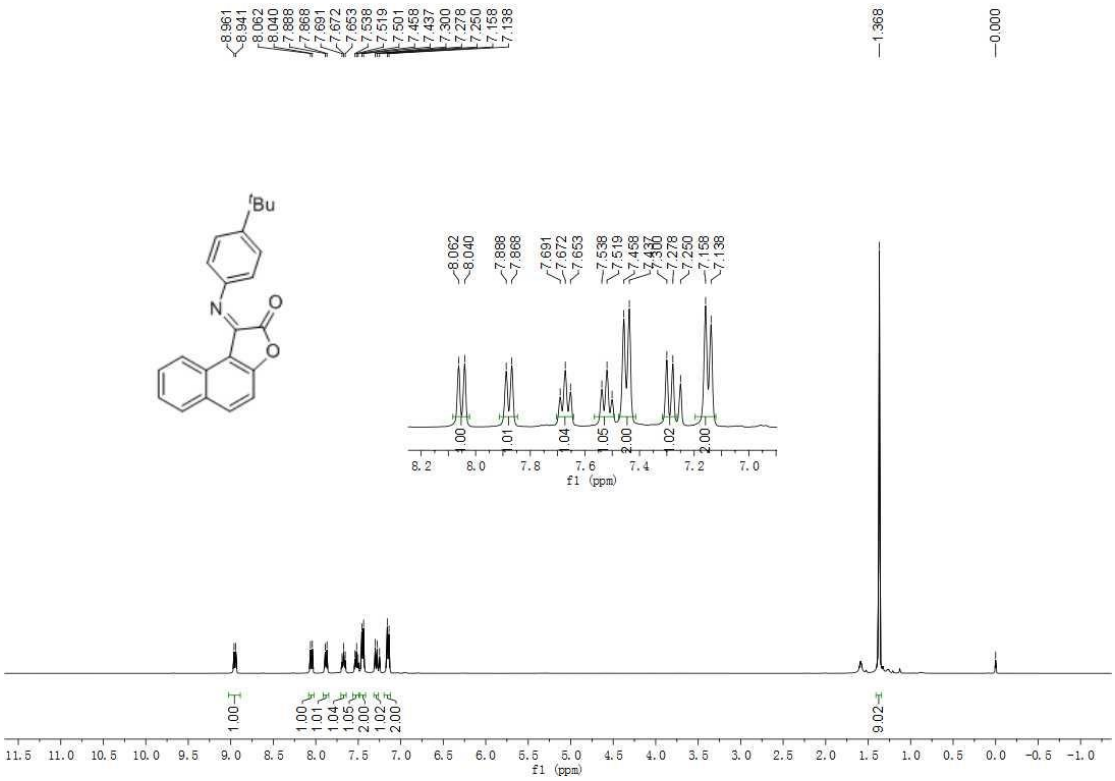
^{1}H NMR Spectrum of (*Z*)-1-((4-isopropylphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4c)**



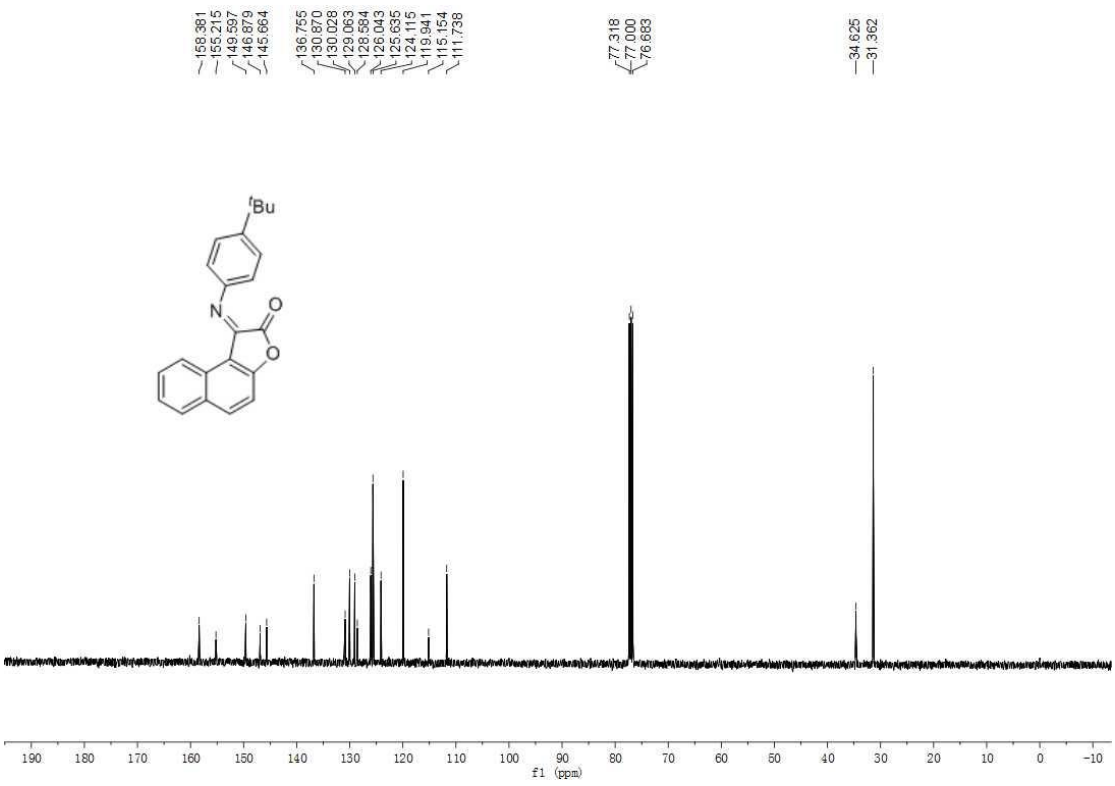
^{13}C NMR Spectrum of (*Z*)-1-((4-isopropylphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4c)**



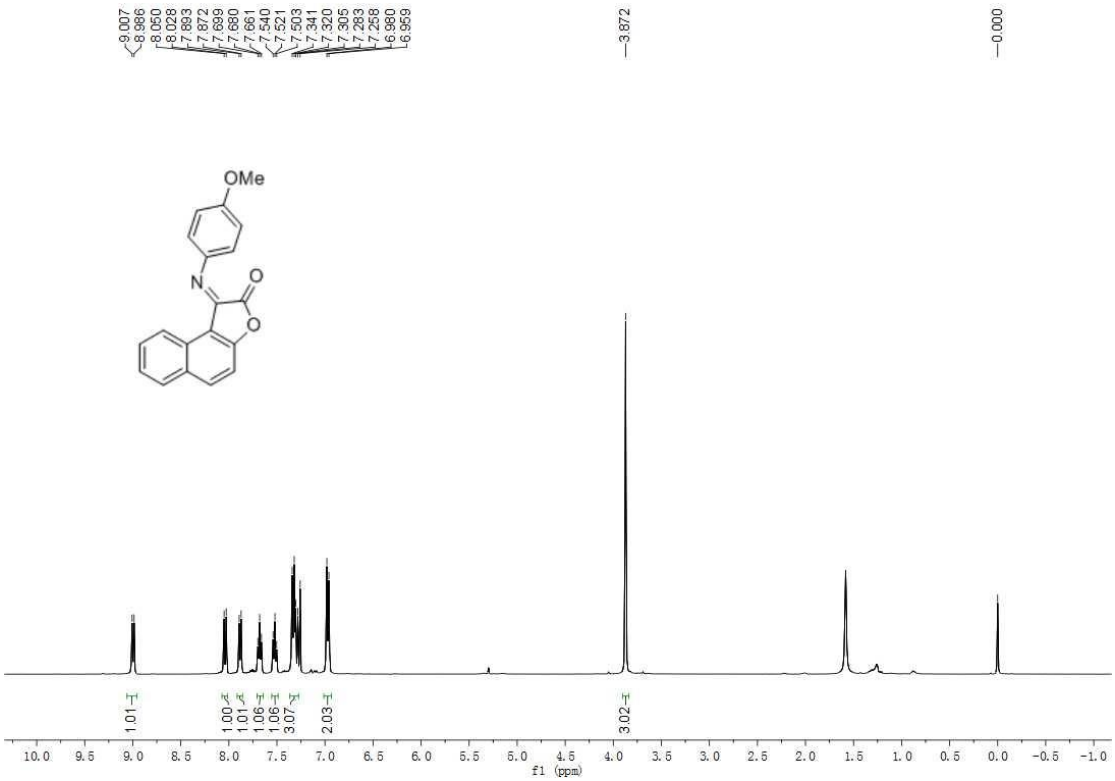
^{1}H NMR Spectrum of (*Z*)-1-((4-(*tert*-butyl)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4d)**



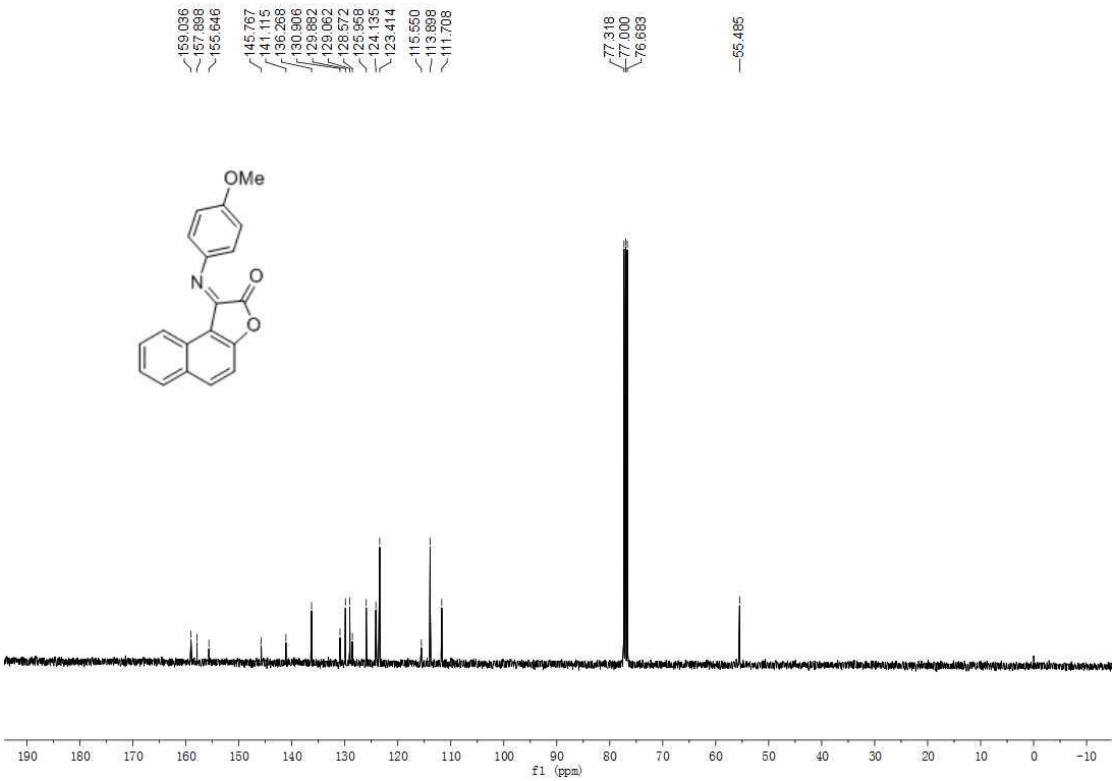
^{13}C NMR Spectrum of (*Z*)-1-((4-(*tert*-butyl)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4d)**



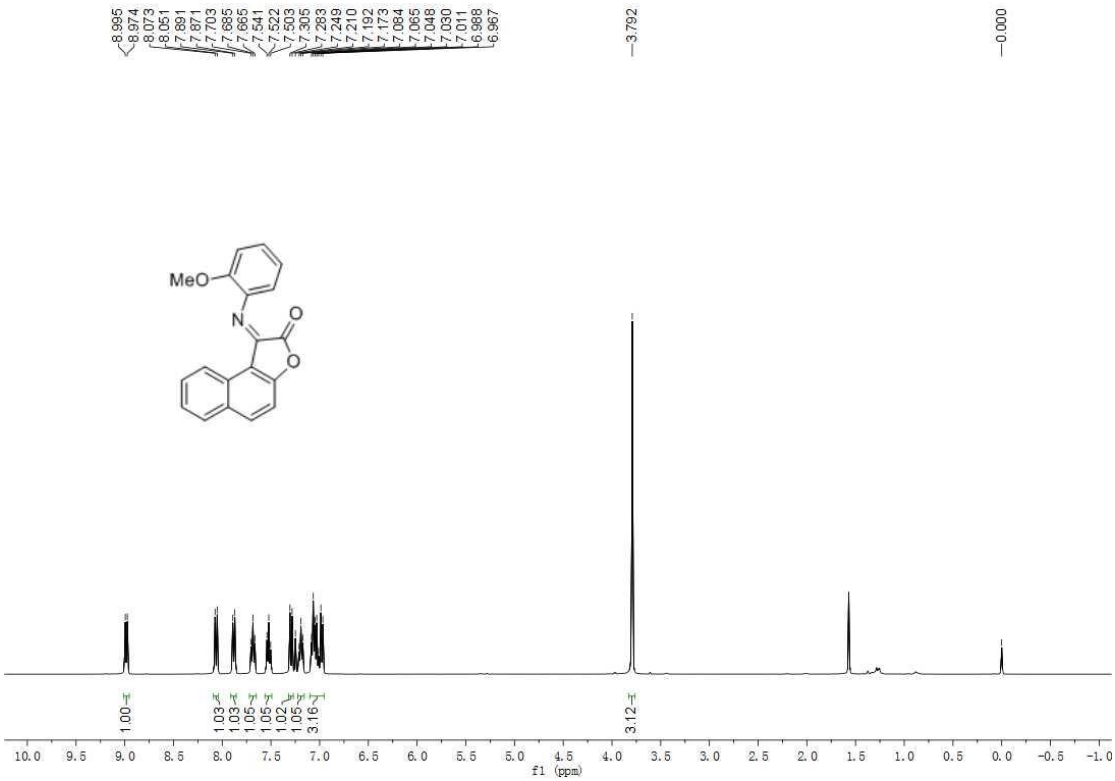
^{1}H NMR Spectrum of (*Z*)-1-((4-methoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4e)**



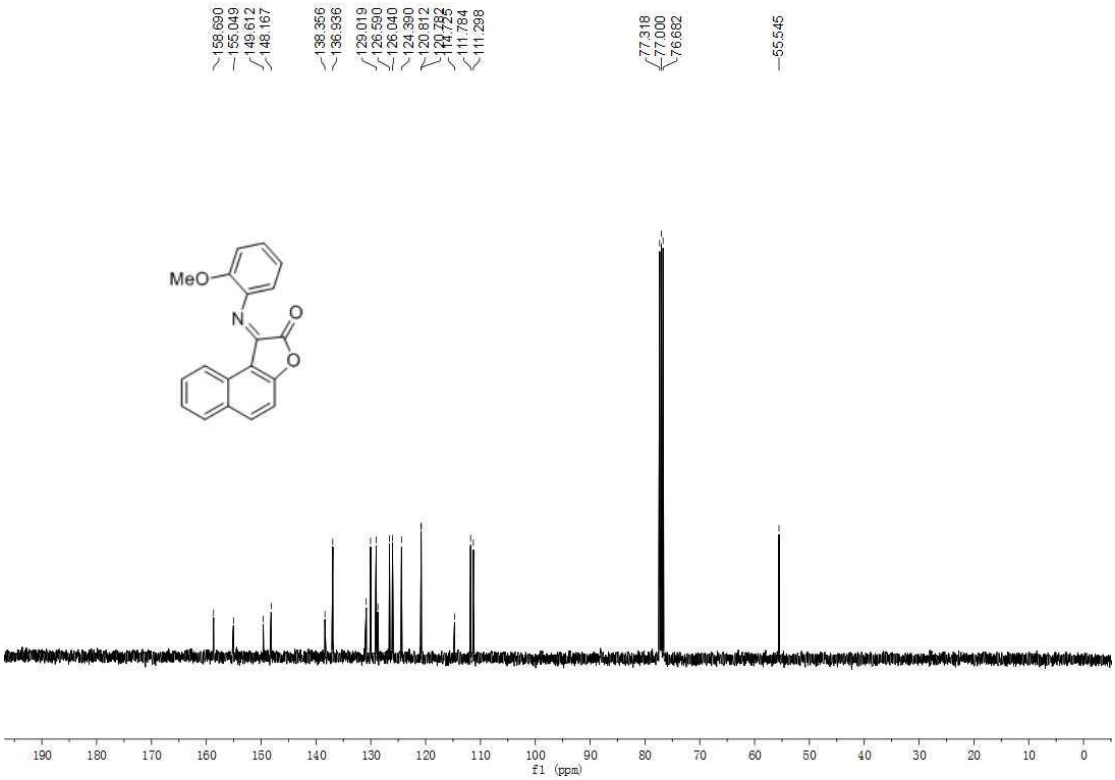
^{13}C NMR Spectrum of (*Z*)-1-((4-methoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4e)**



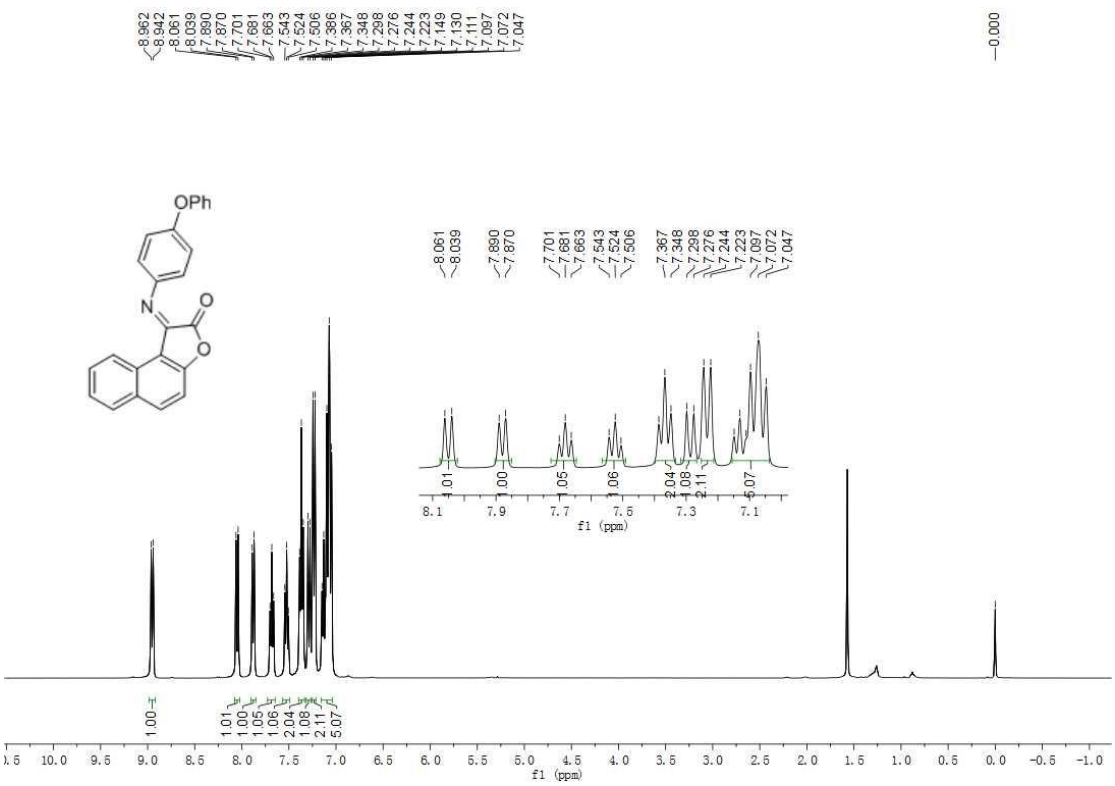
^{1}H NMR Spectrum of (*Z*)-1-((2-methoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4f)**



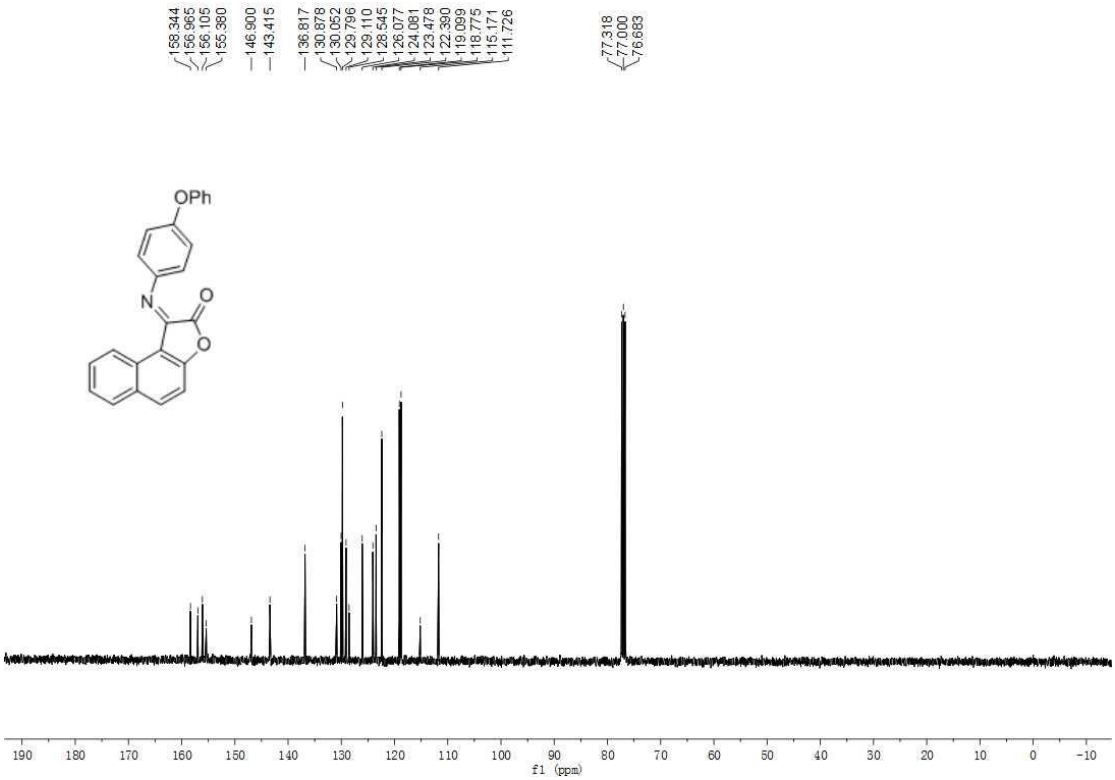
^{13}C NMR Spectrum of (*Z*)-1-((2-methoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4f)**



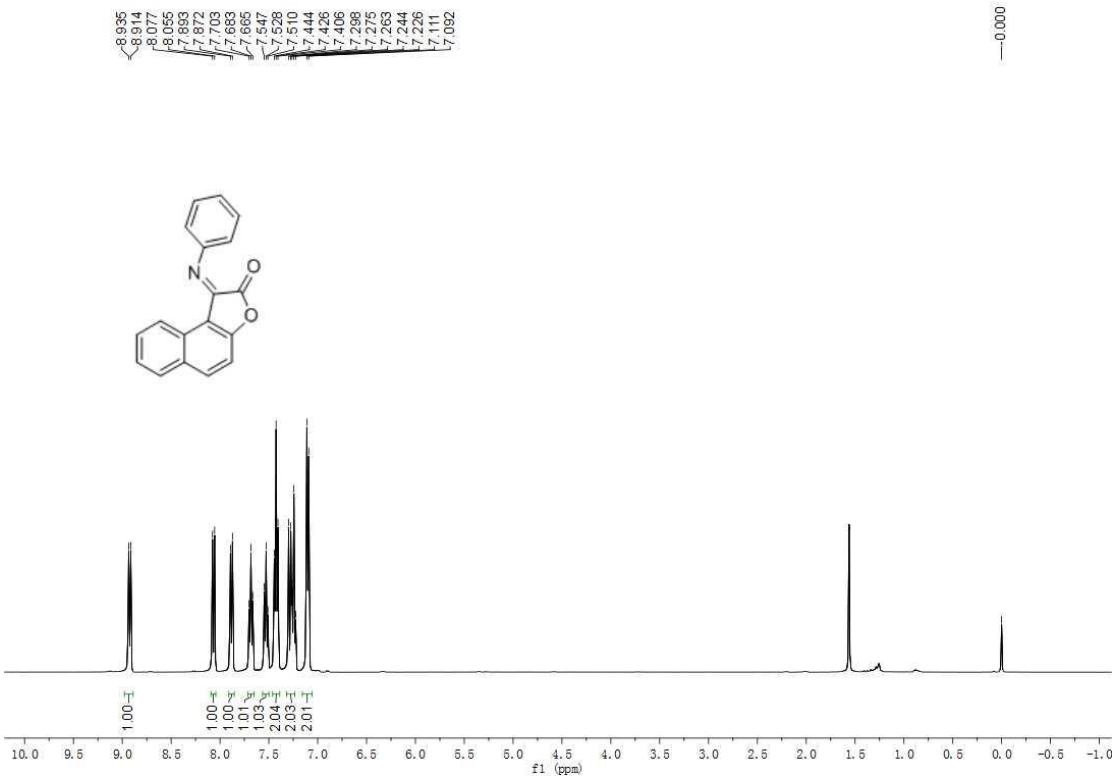
^{1}H NMR Spectrum of (*Z*)-1-((4-phenoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4g)**



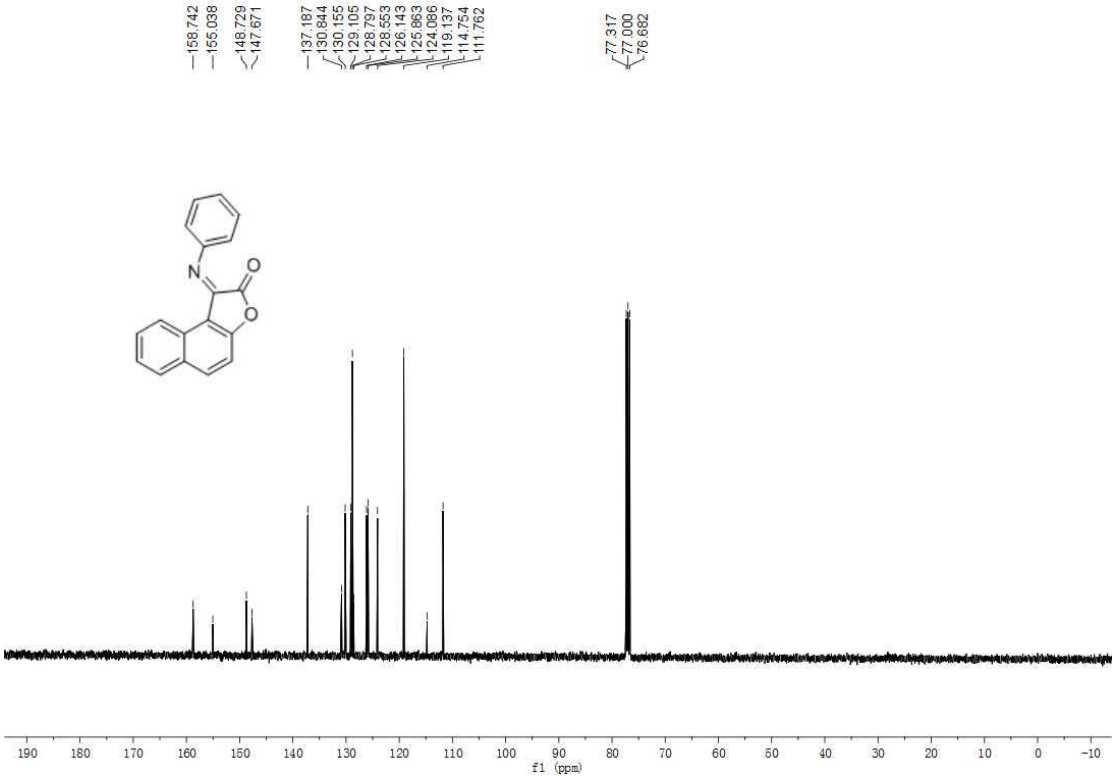
^{13}C NMR Spectrum of (*Z*)-1-((4-phenoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4g)**



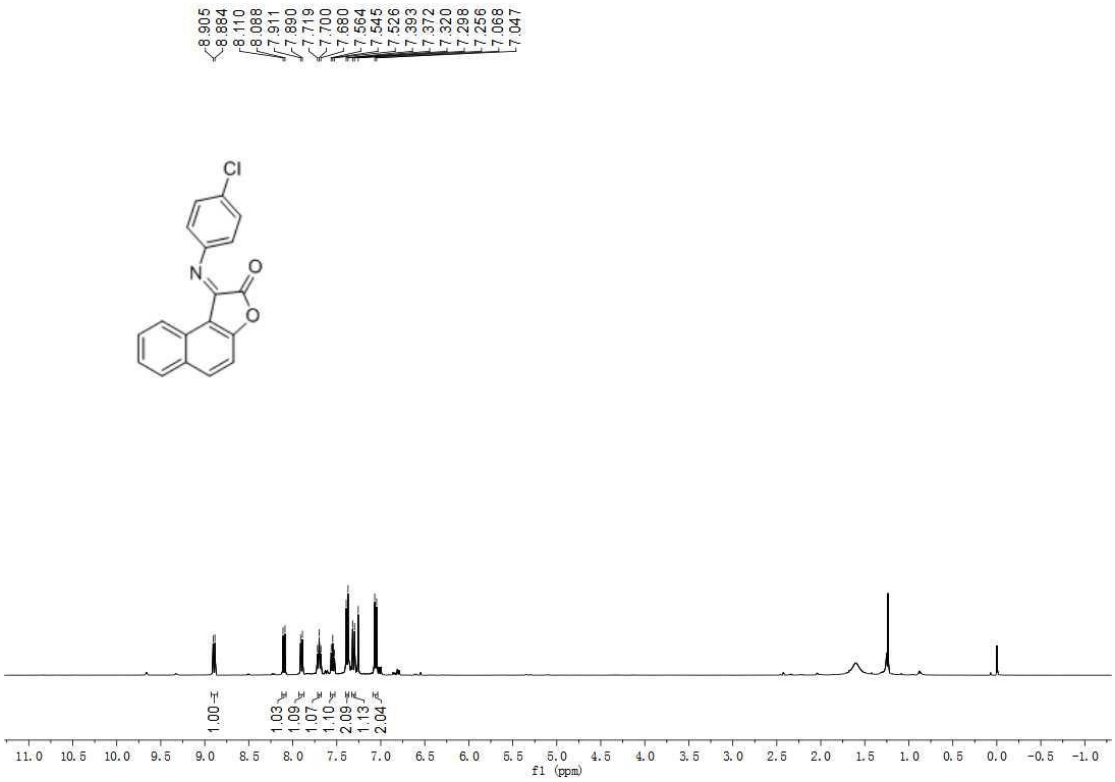
^{1}H NMR Spectrum of (*Z*)-1-(phenylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4h)**



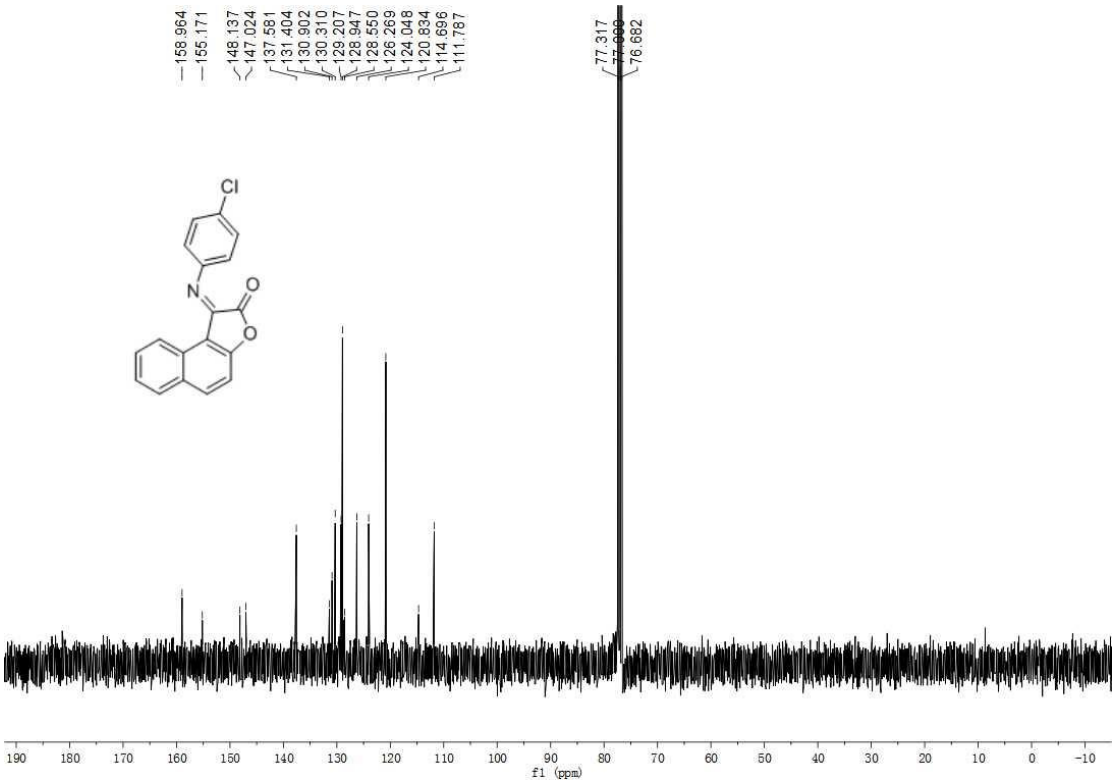
^{13}C NMR Spectrum of (*Z*)-1-(phenylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4h)**



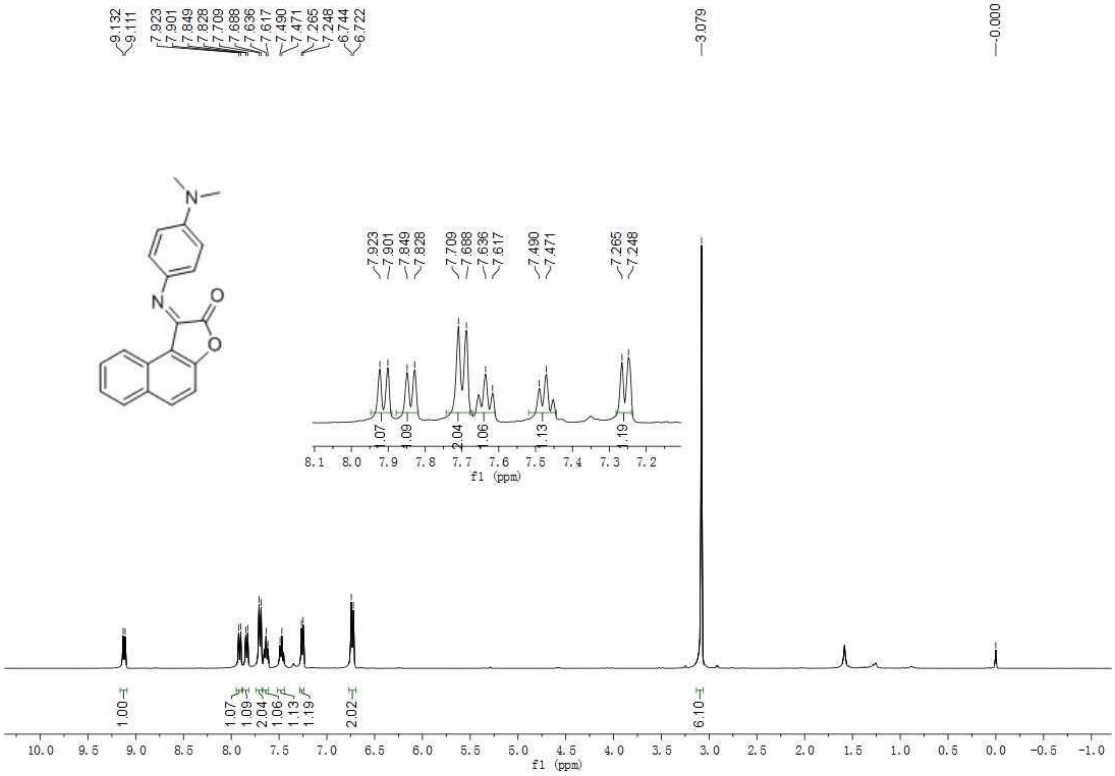
^{1}H NMR Spectrum of (*Z*)-1-((4-chlorophenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4i)**



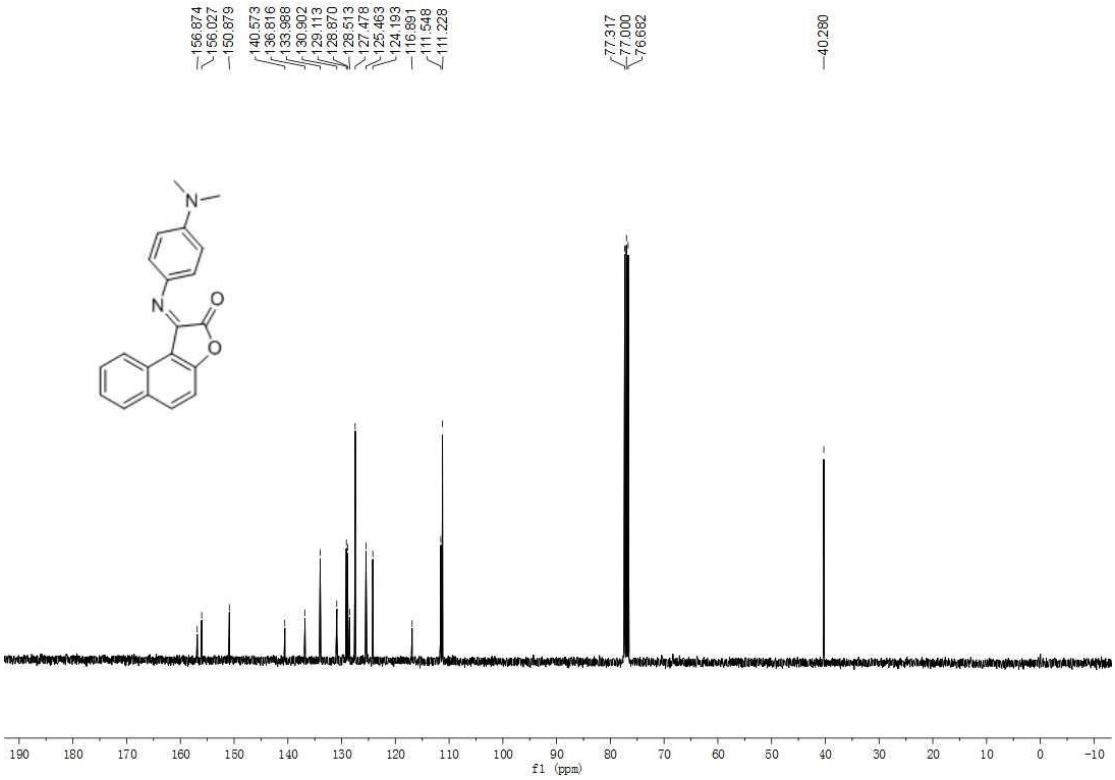
^{13}C NMR Spectrum of (*Z*)-1-((4-chlorophenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4i)**



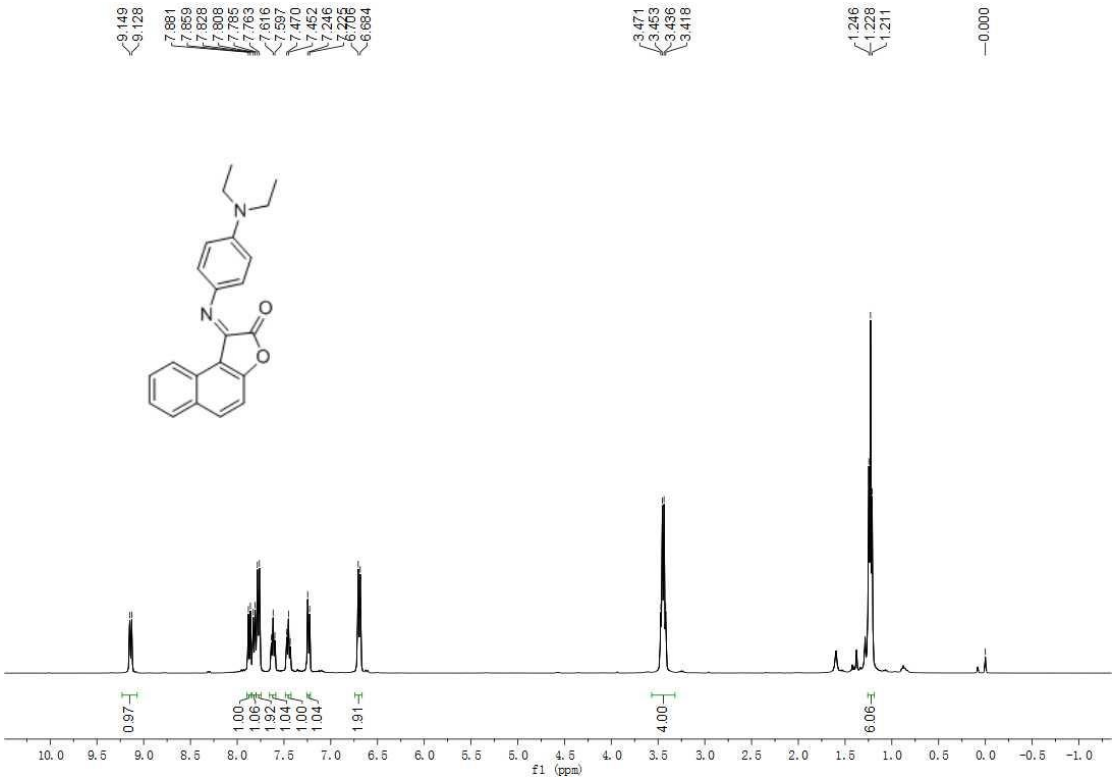
^{1}H NMR Spectrum of (*Z*)-1-((4-(dimethylamino)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4j)**



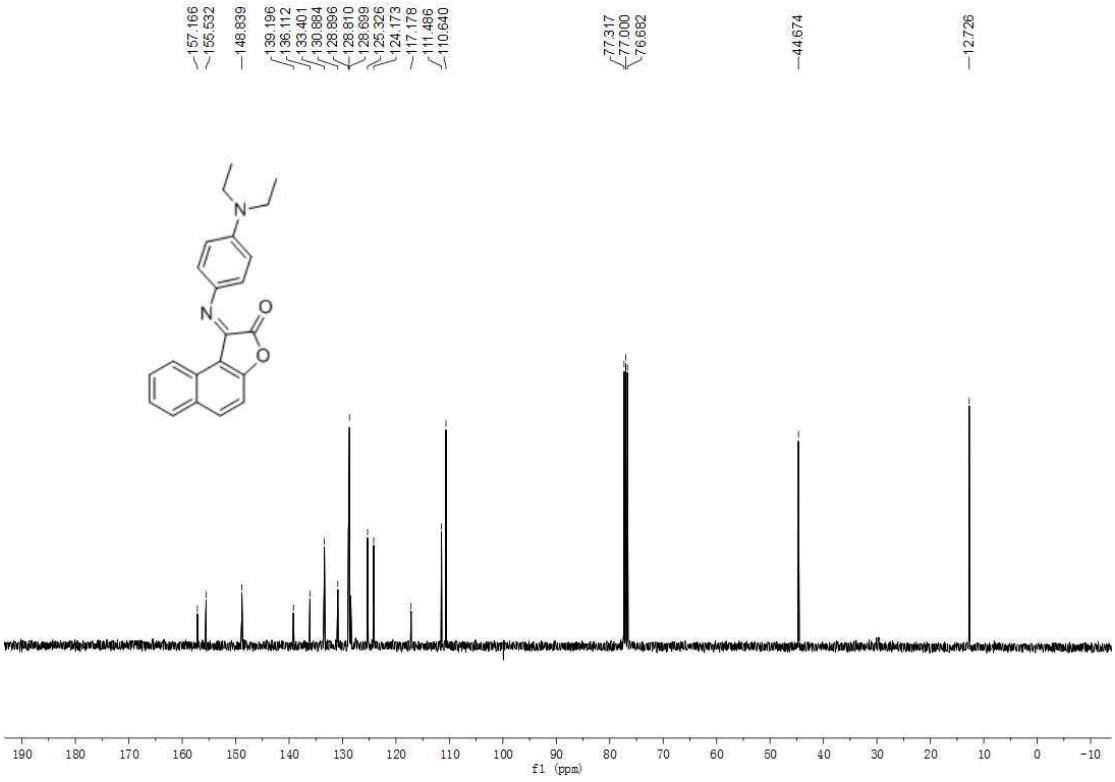
^{13}C NMR Spectrum of (*Z*)-1-((4-(dimethylamino)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4j)**



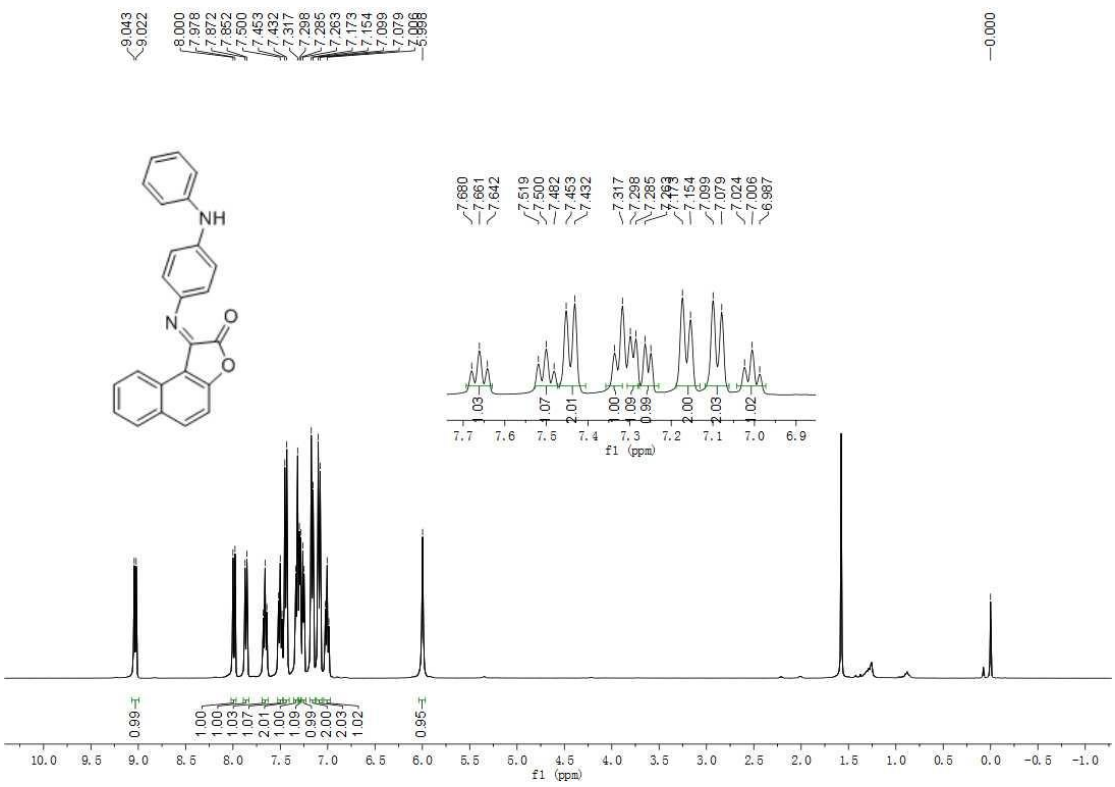
^{1}H NMR Spectrum of (*Z*)-1-((4-(diethylamino)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4k)**



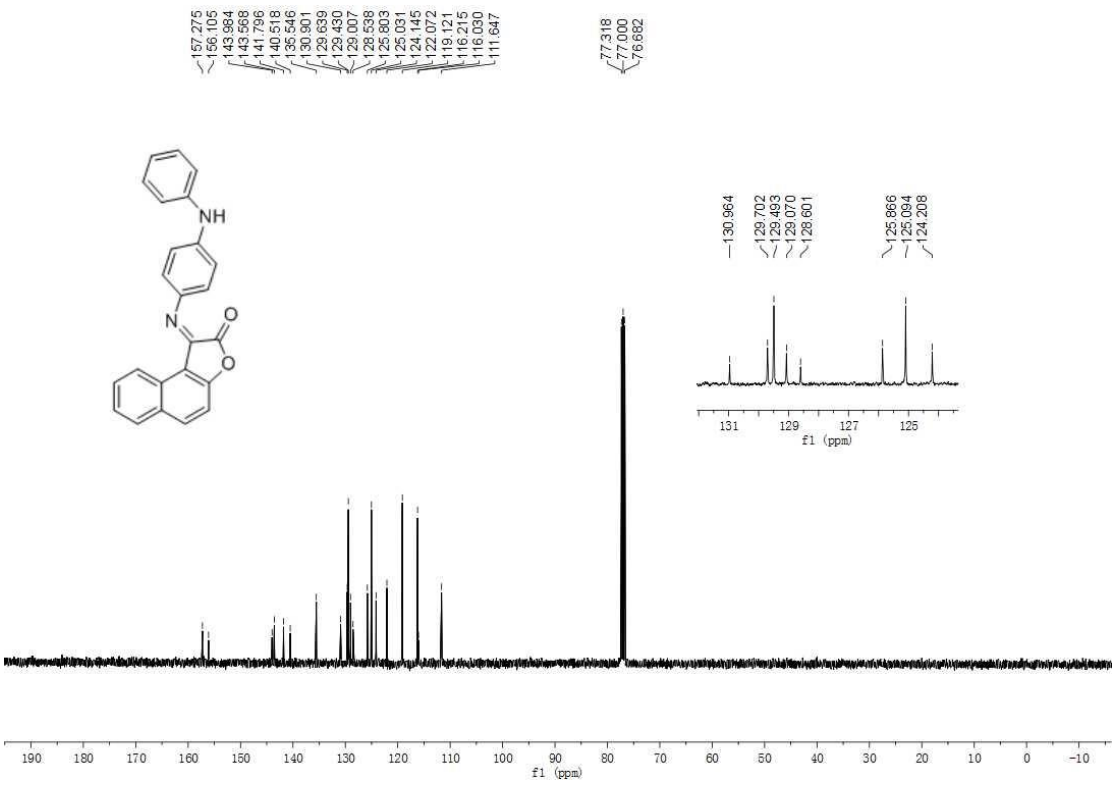
^{13}C NMR Spectrum of (*Z*)-1-((4-(diethylamino)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4k)**



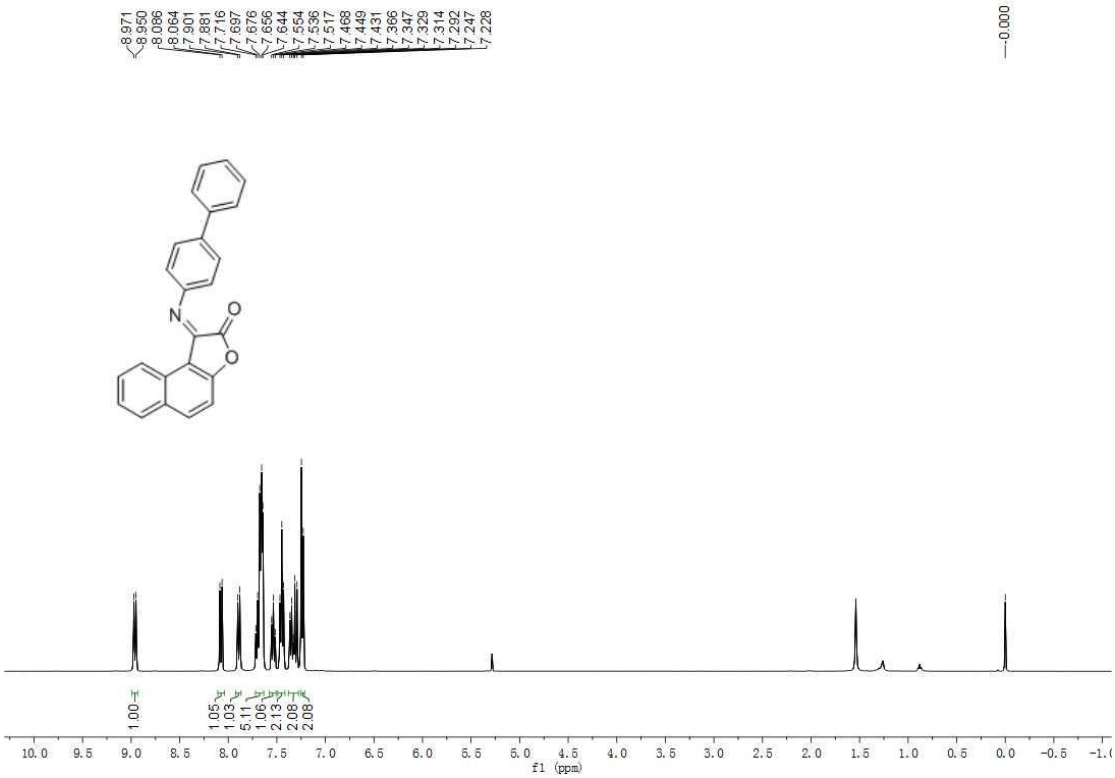
^{1}H NMR Spectrum of (*Z*)-1-((4-(phenylamino)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4l)**



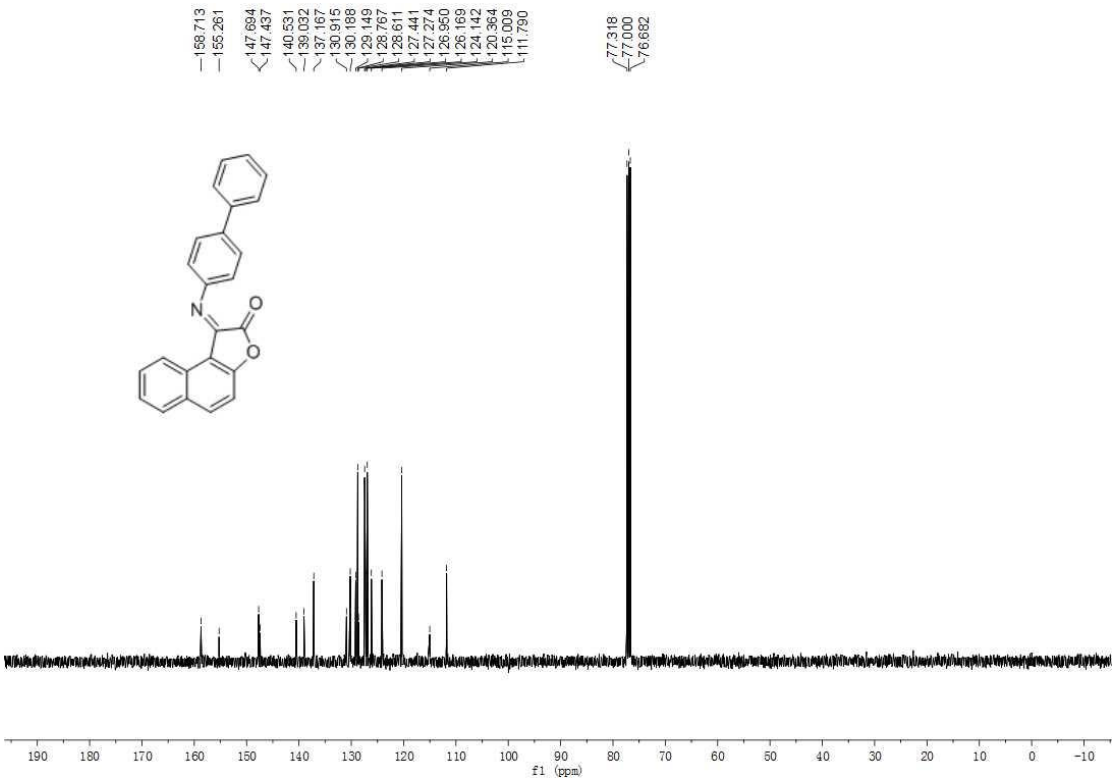
^{13}C NMR Spectrum of (*Z*)-1-((4-(phenylamino)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4l)**



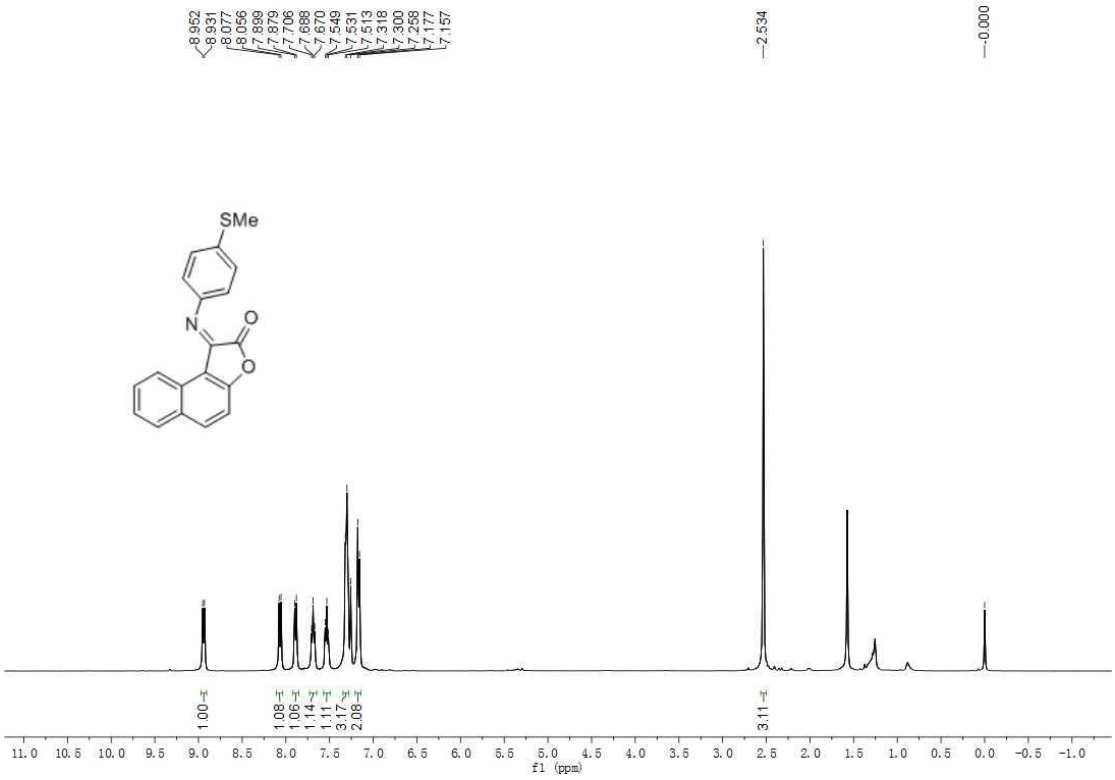
^{1}H NMR Spectrum of (*Z*)-1-([1,1'-biphenyl]-4-ylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4m)**



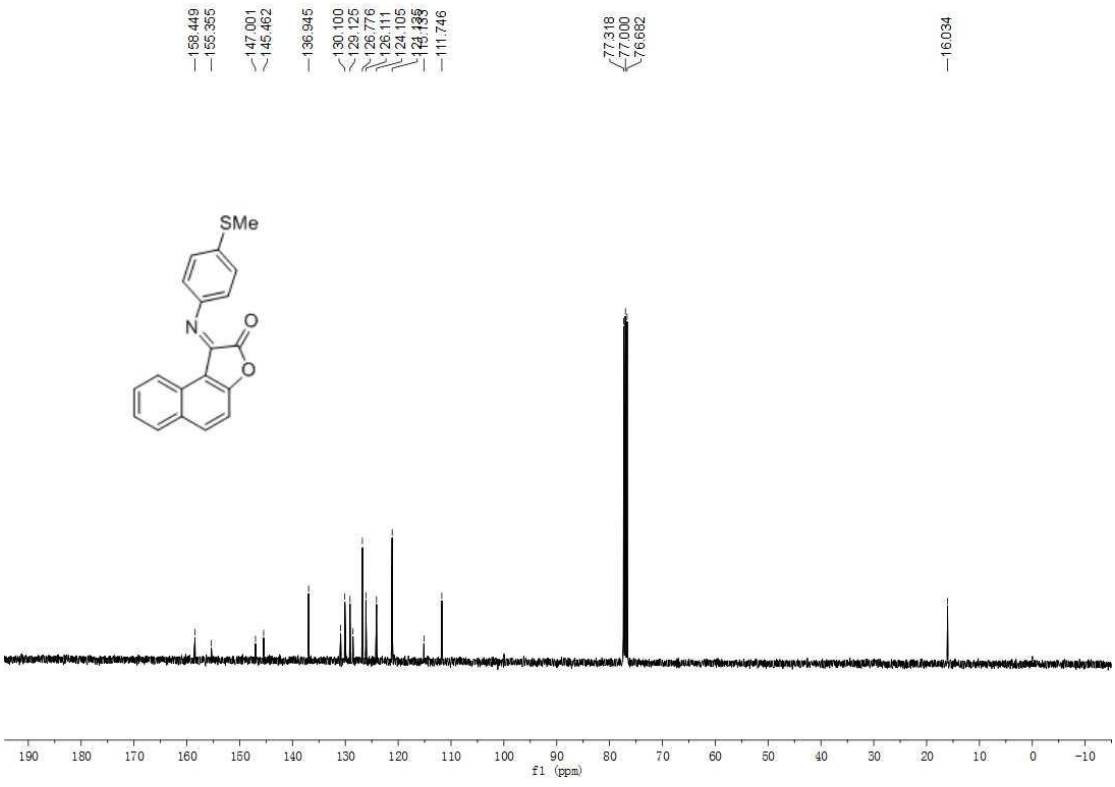
^{13}C NMR Spectrum of (*Z*)-1-([1,1'-biphenyl]-4-ylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4m)**



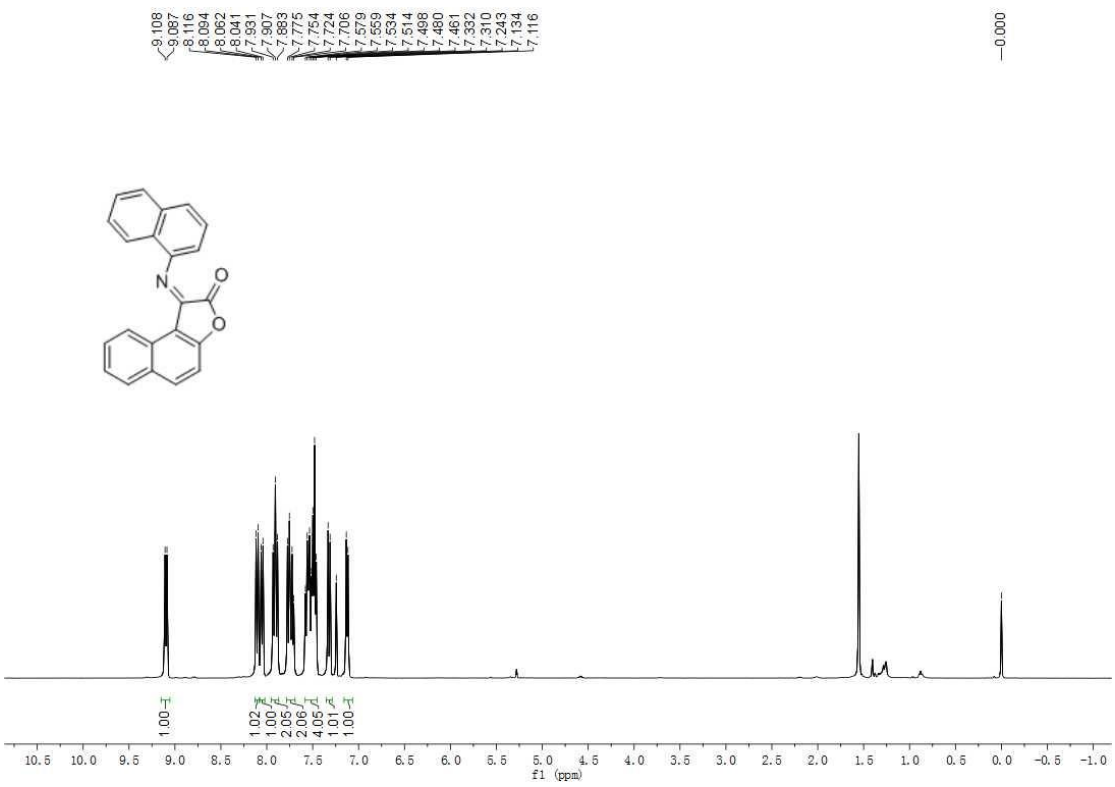
^{1}H NMR Spectrum of (*Z*)-1-((4-(methylthio)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4n)**



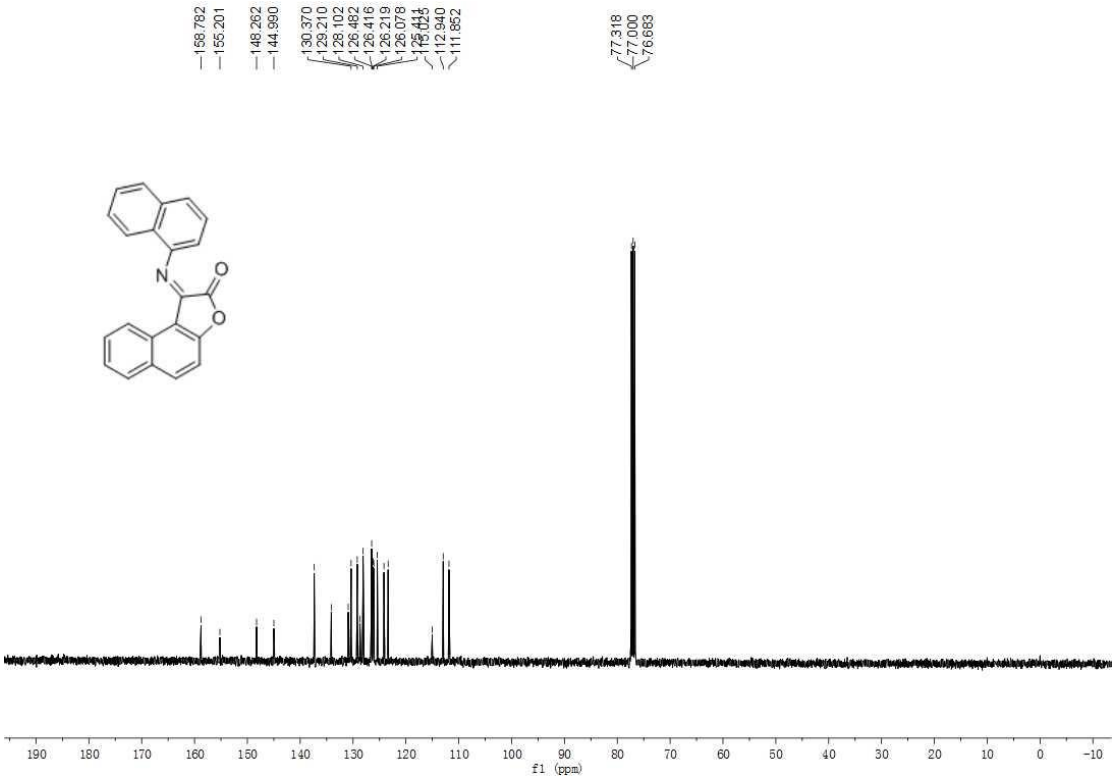
^{13}C NMR Spectrum of (*Z*)-1-((4-(methylthio)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4n)**



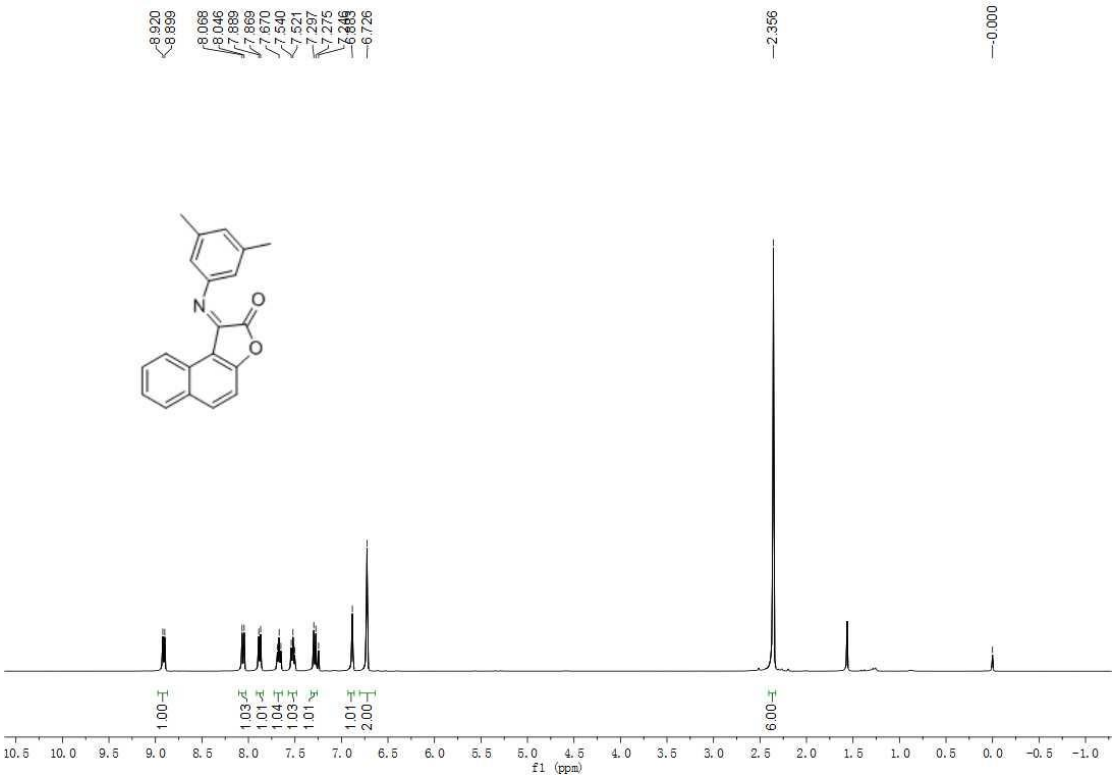
^{1}H NMR Spectrum of (*Z*)-1-(naphthalen-1-ylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4o)**



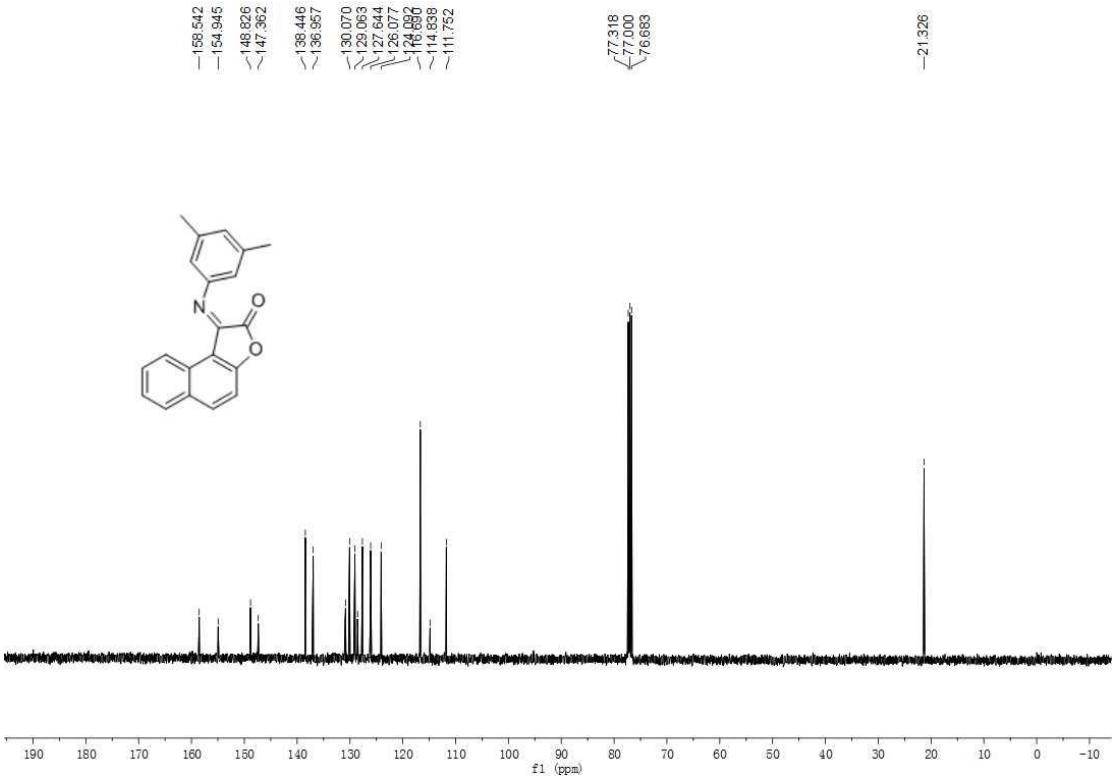
^{13}C NMR Spectrum of (*Z*)-1-(naphthalen-1-ylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4o)**



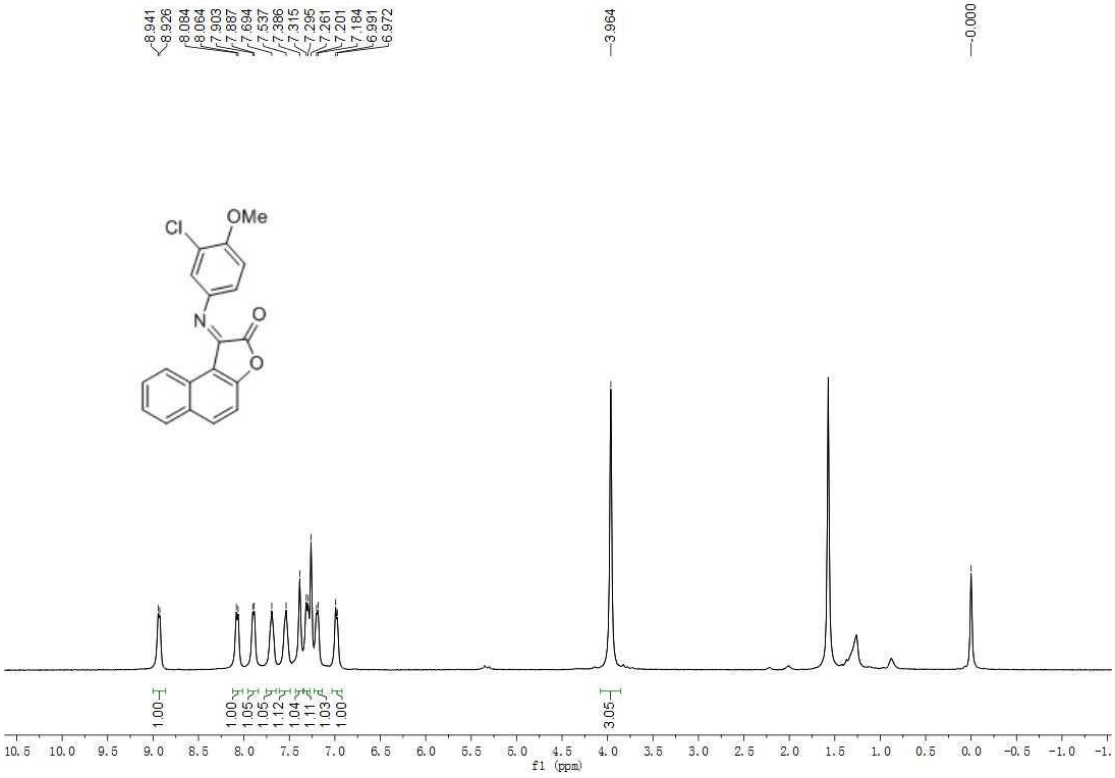
^{1}H NMR Spectrum of (*Z*)-1-((3,5-dimethylphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4p)**



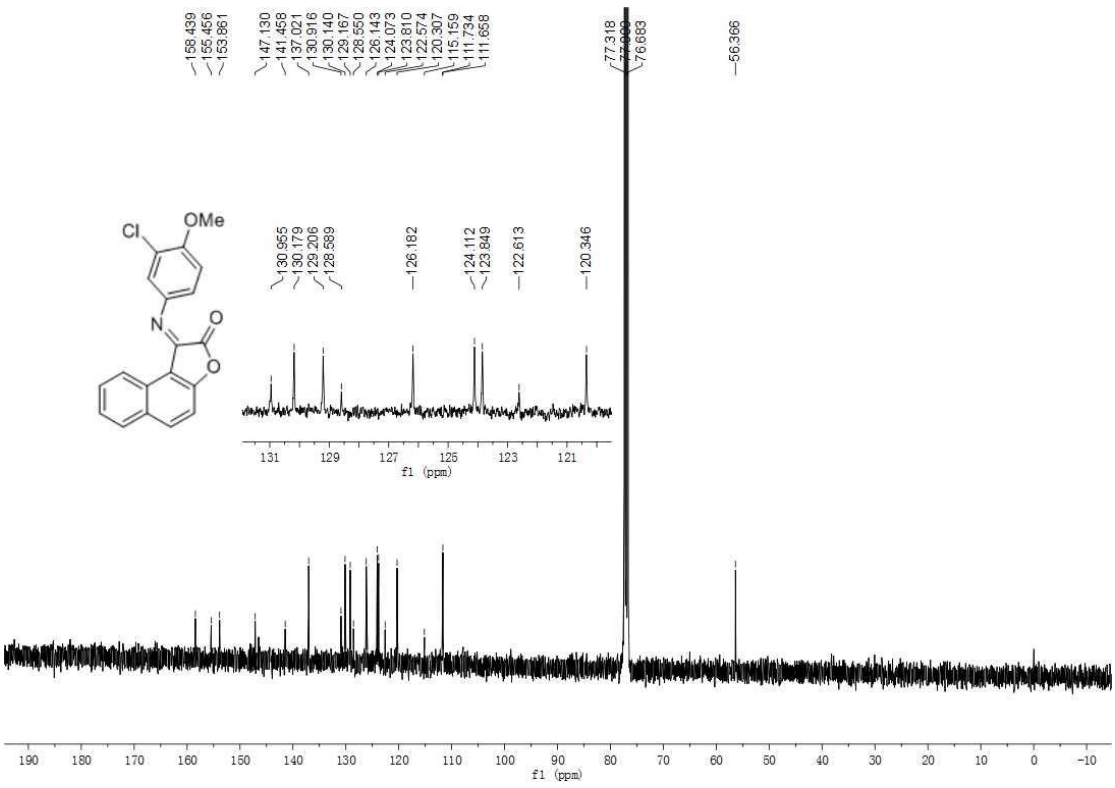
^{13}C NMR Spectrum of (*Z*)-1-((3,5-dimethylphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4p)**



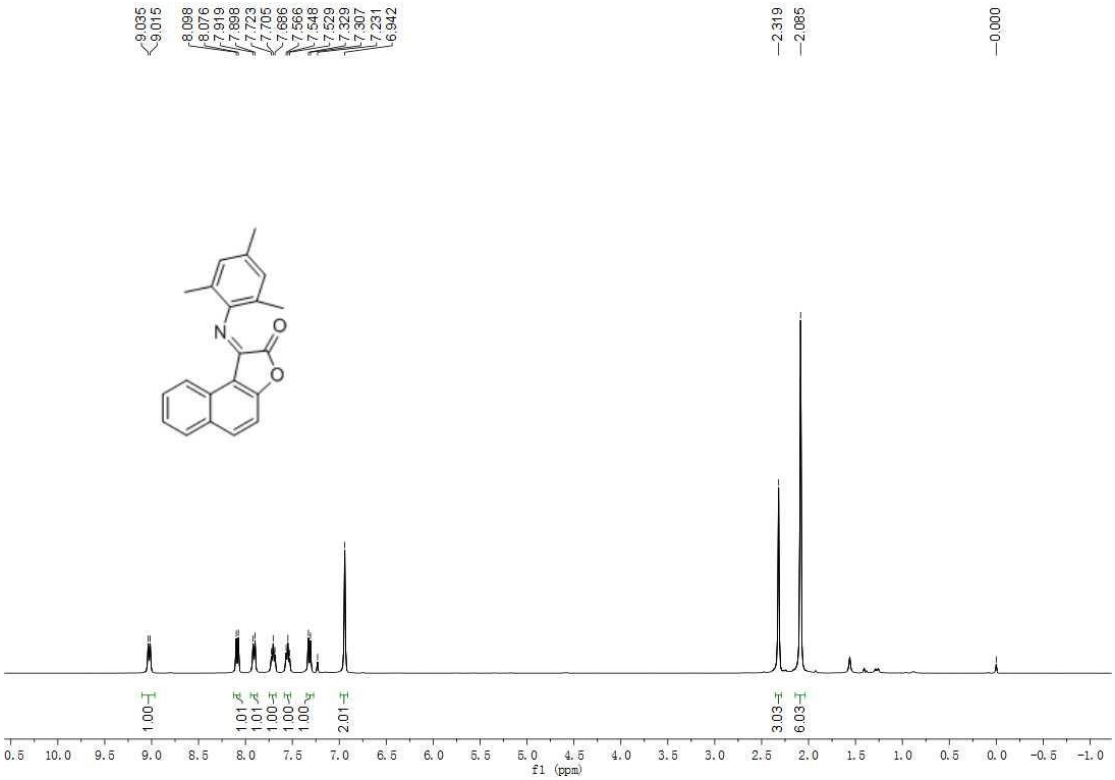
^{1}H NMR Spectrum of (*Z*)-1-((3-chloro-4-methoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4q)**



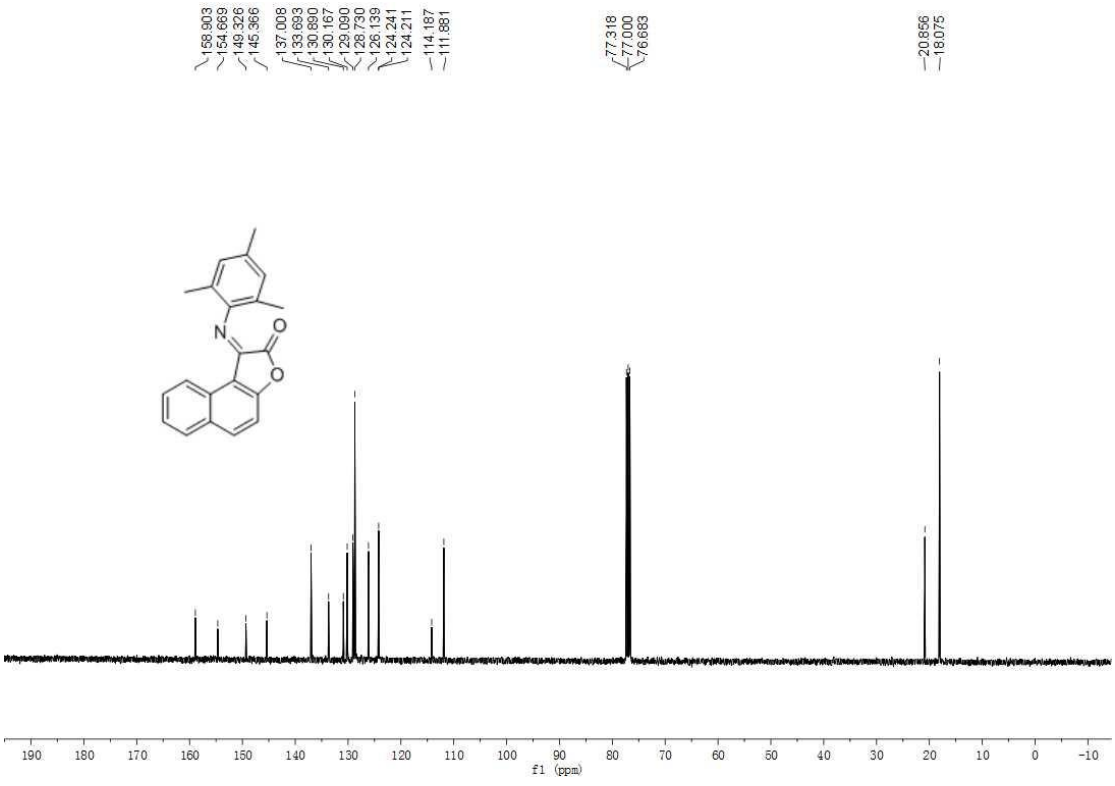
^{13}C NMR Spectrum of (*Z*)-1-((3-chloro-4-methoxyphenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4q)**



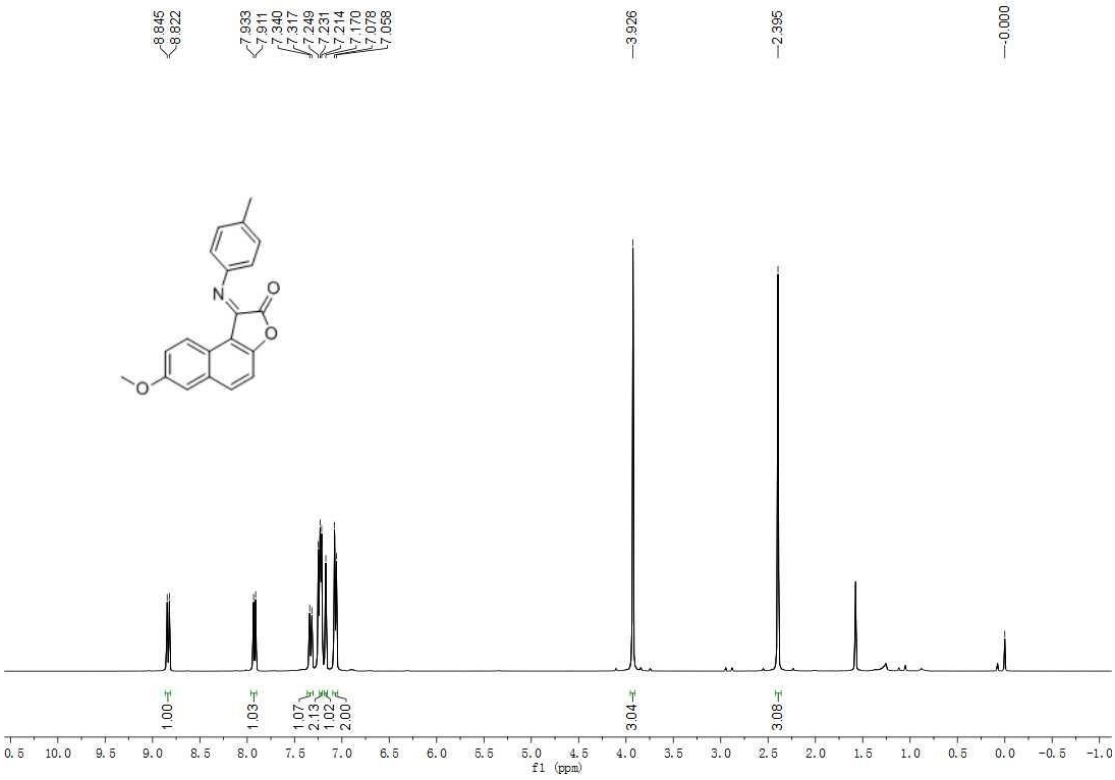
^{1}H NMR Spectrum of (*Z*)-1-(mesitylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4r)**



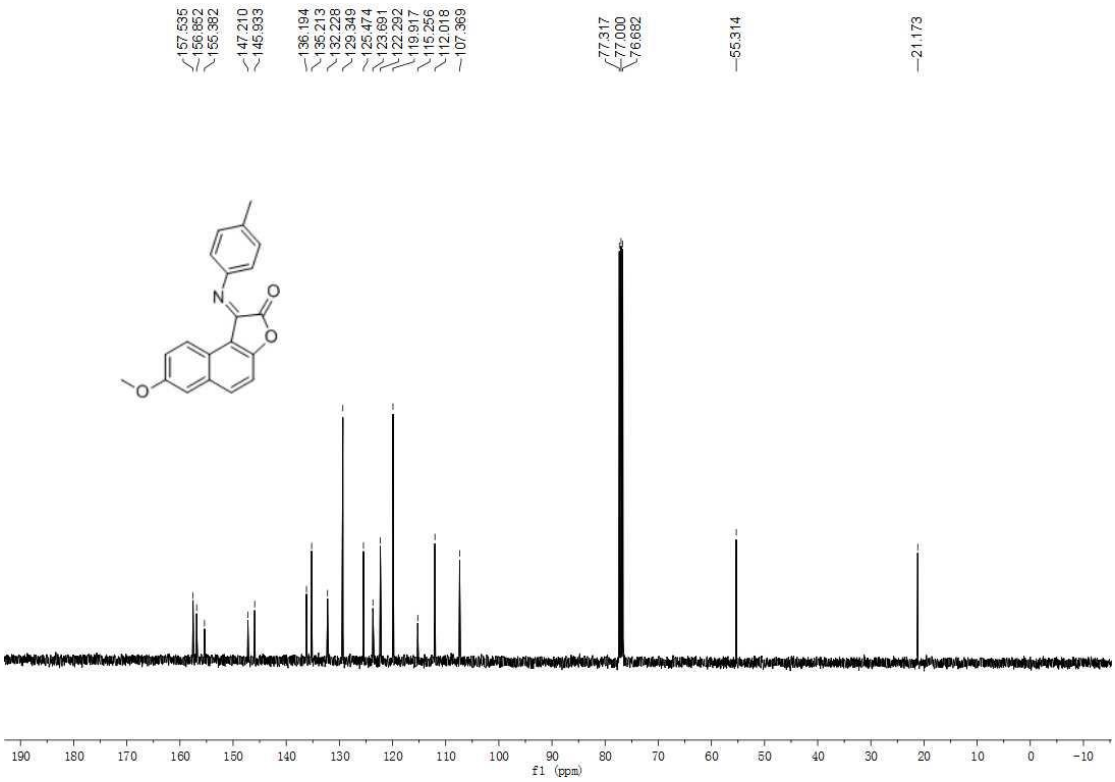
^{13}C NMR Spectrum of (*Z*)-1-(mesitylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4r)**



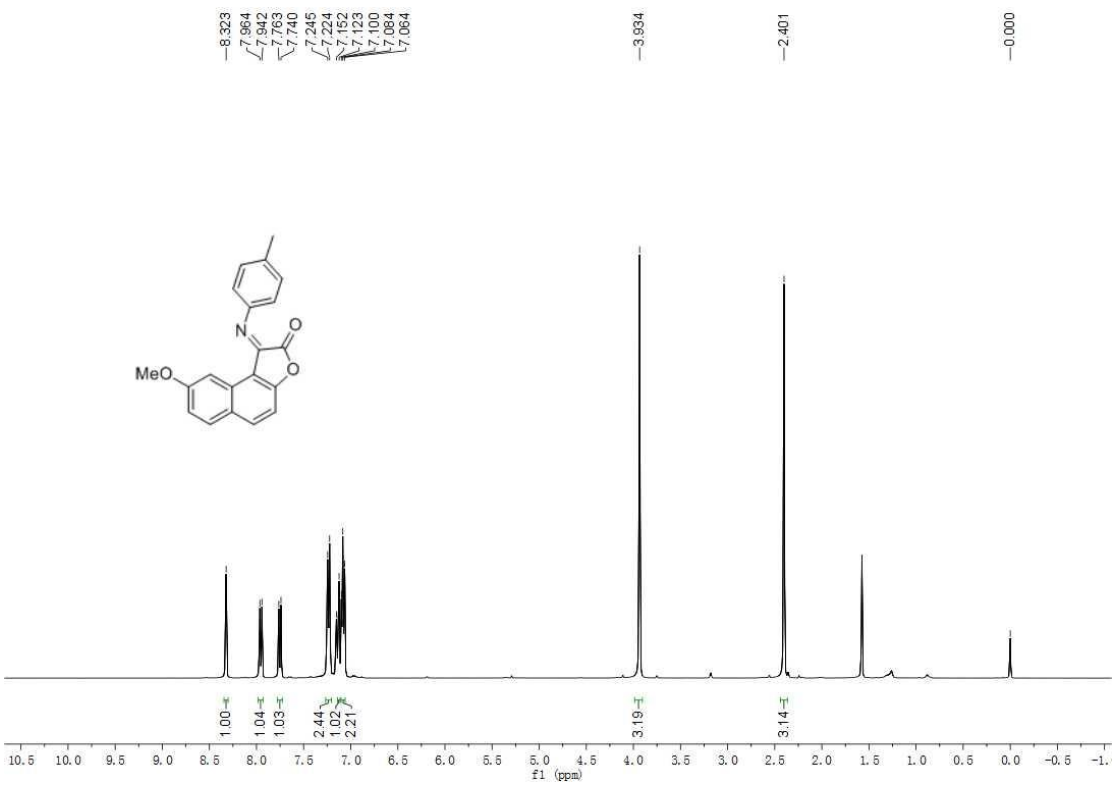
^{1}H NMR Spectrum of (*Z*)-7-methoxy-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4s)**



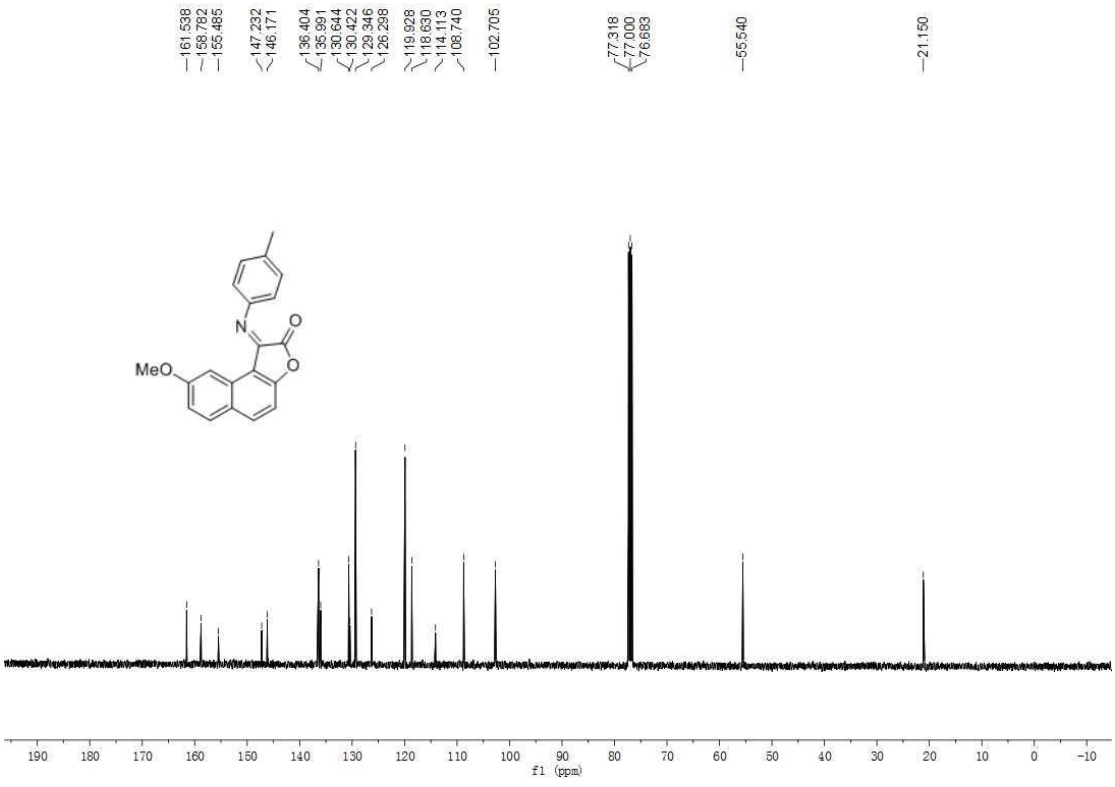
^{13}C NMR Spectrum of (*Z*)-7-methoxy-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4s)**



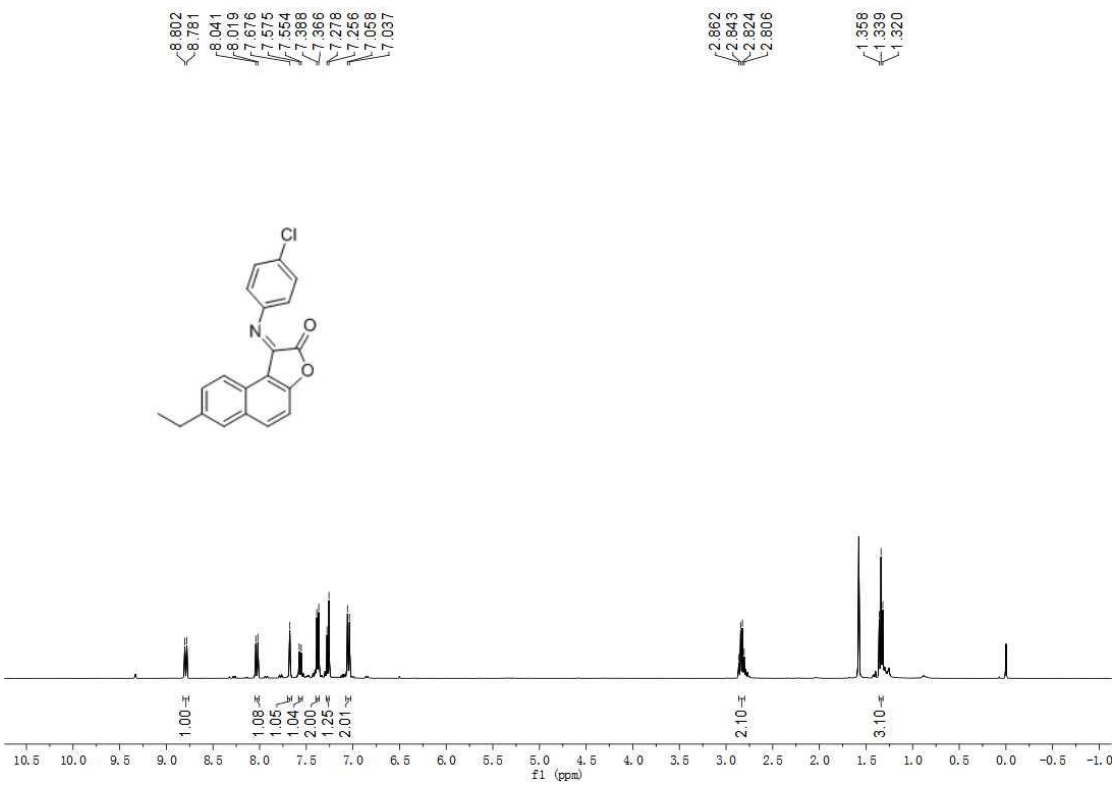
^{1}H NMR Spectrum of (*Z*)-8-methoxy-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4t)**



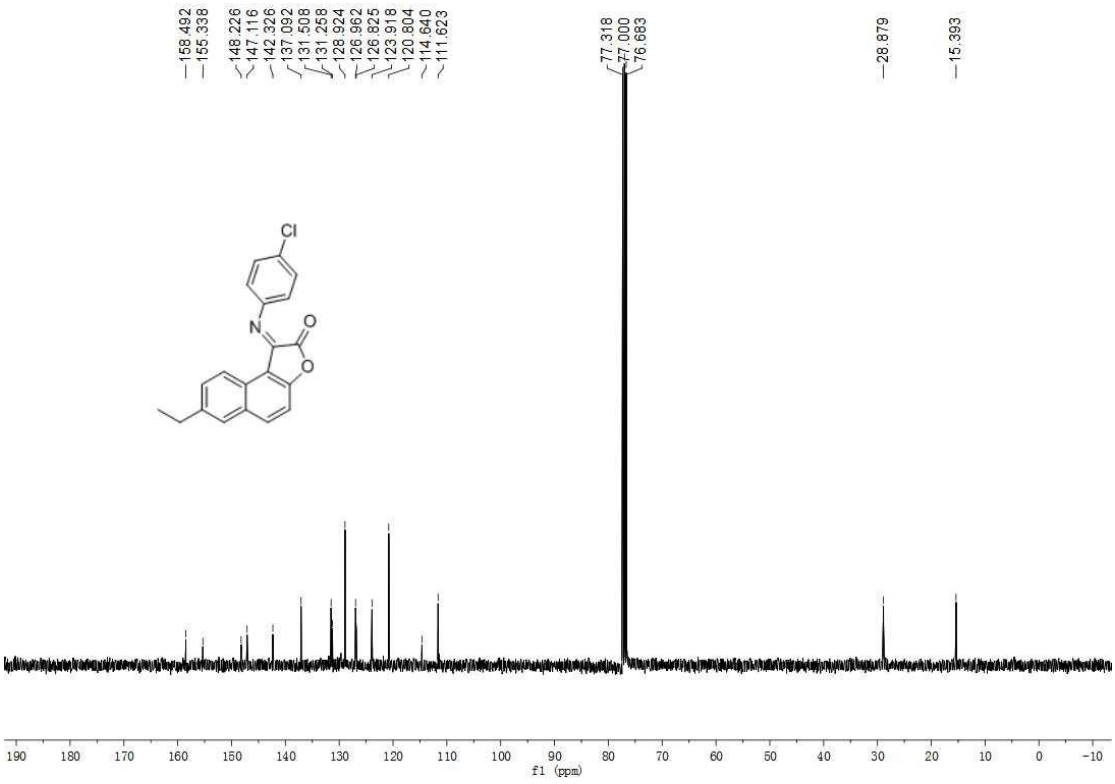
^{13}C NMR Spectrum of (*Z*)-8-methoxy-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4t)**



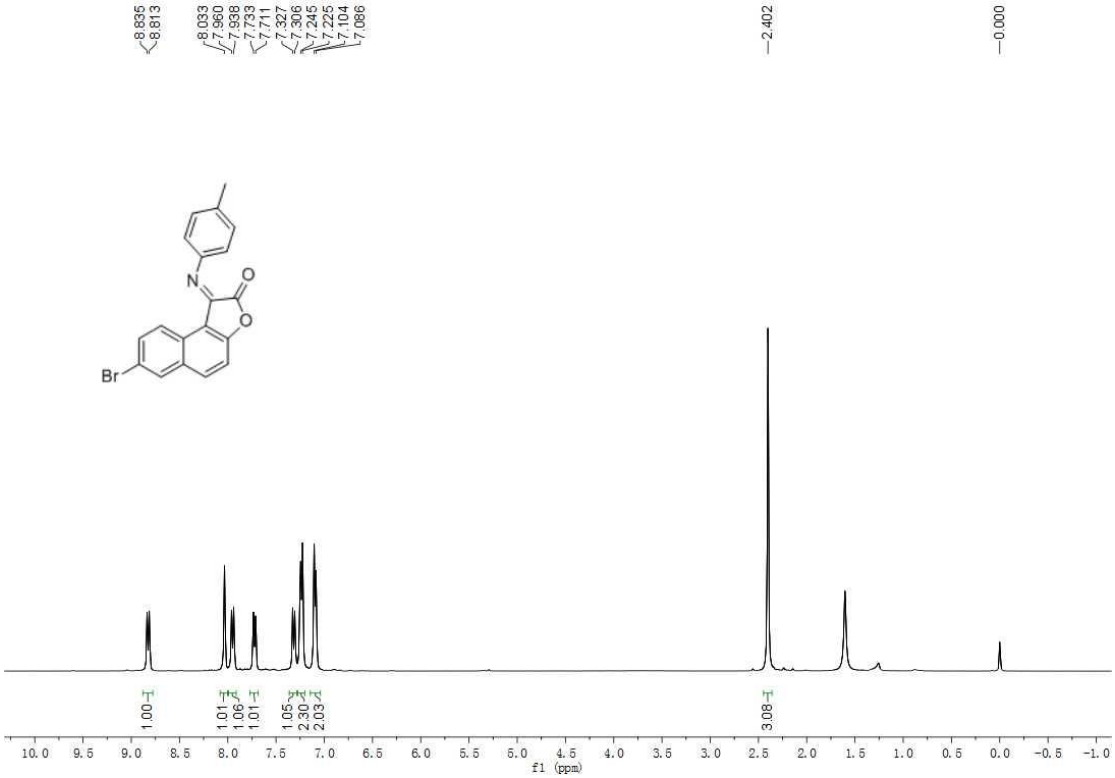
^{1}H NMR Spectrum of (*Z*)-1-((4-chlorophenyl)imino)-7-ethylnaphtho[2,1-*b*]furan-2(1*H*)-one **(4u)**



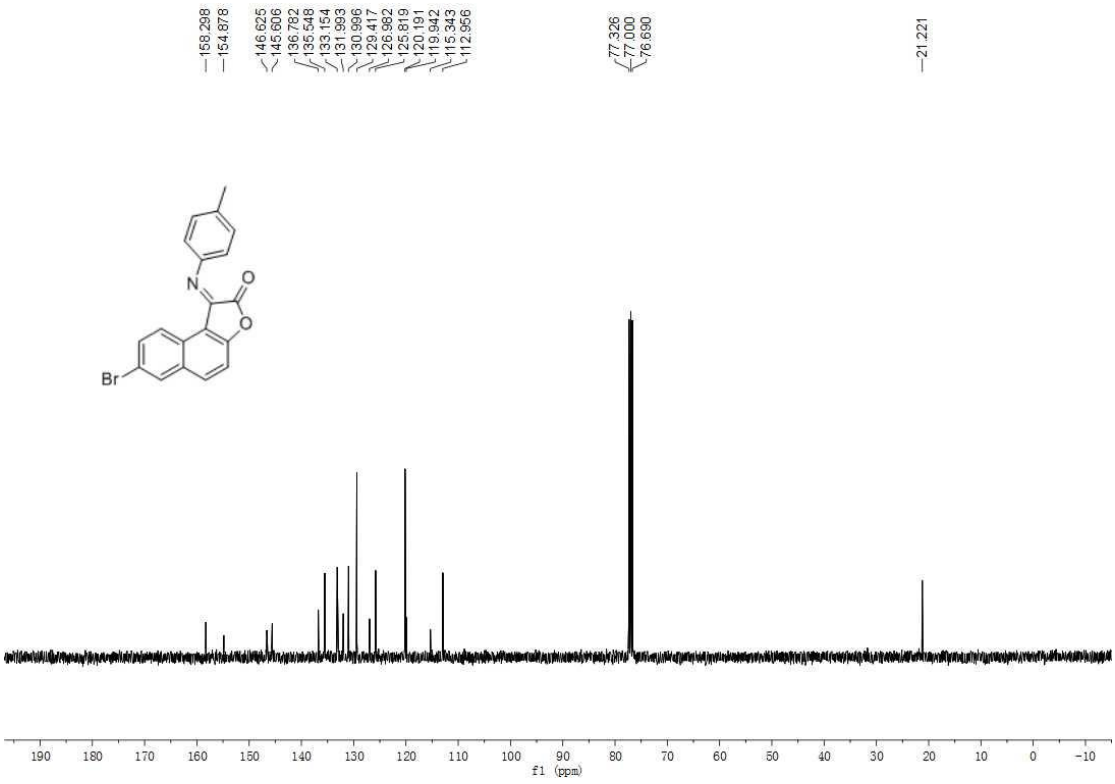
^{13}C NMR Spectrum of (*Z*)-1-((4-chlorophenyl)imino)-7-ethylnaphtho[2,1-*b*]furan-2(1*H*)-one **(4u)**



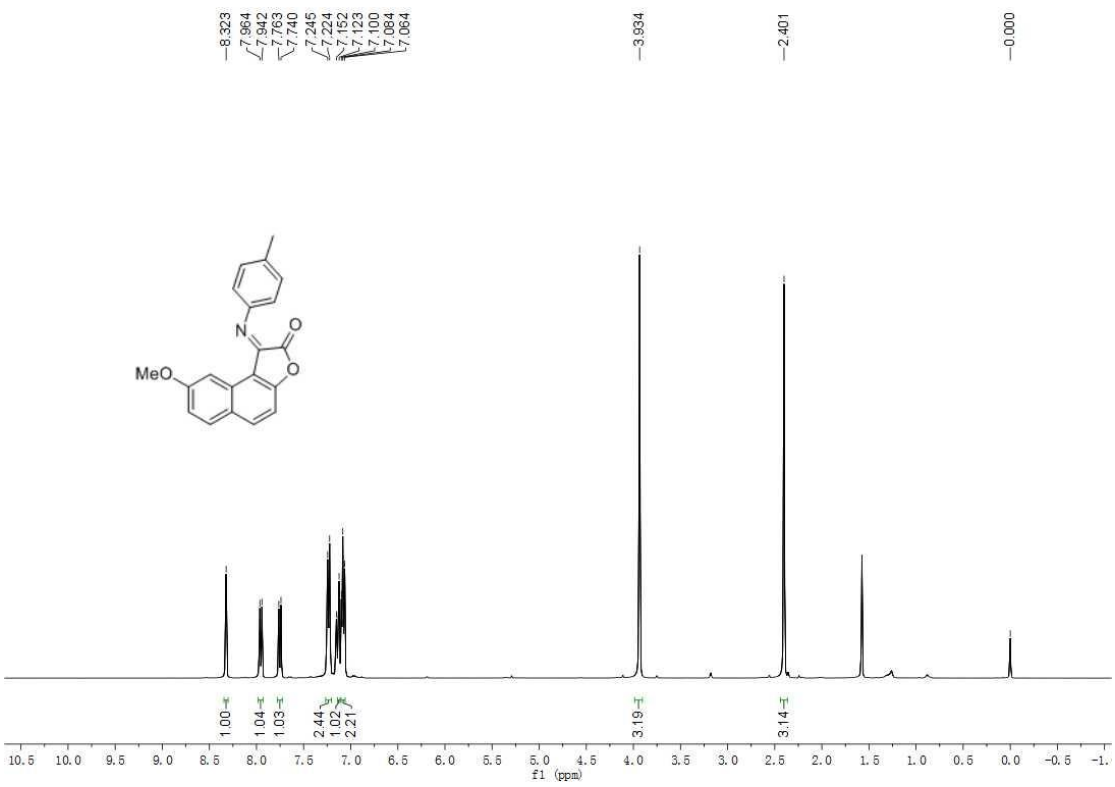
^{1}H NMR Spectrum of (*Z*)-7-bromo-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4v)**



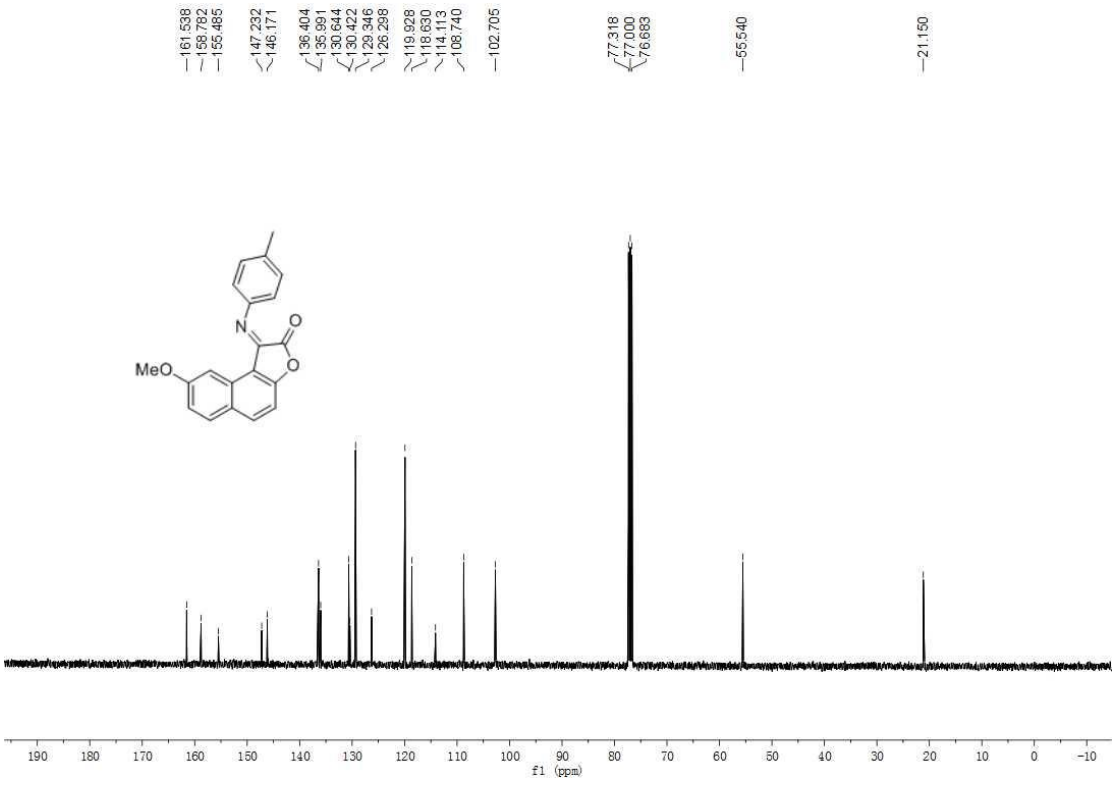
^{13}C NMR Spectrum of (*Z*)-7-bromo-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4v)**



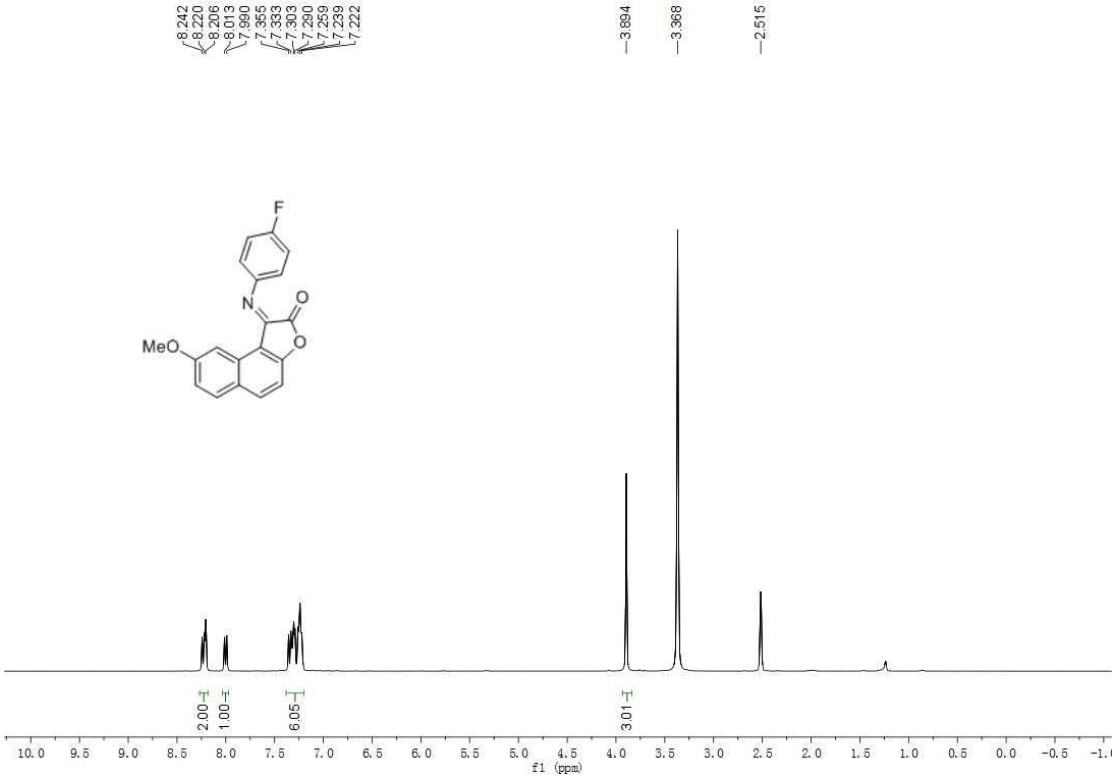
^{1}H NMR Spectrum of (*Z*)-8-bromo-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4w)**



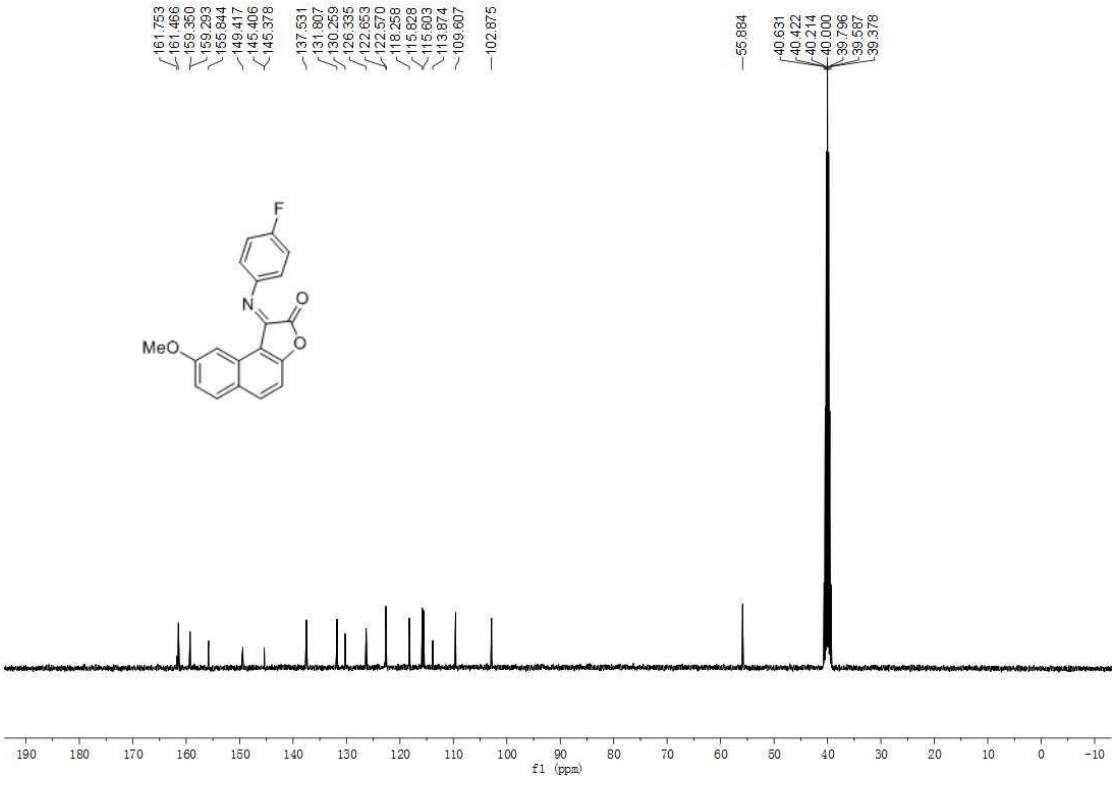
^{13}C NMR Spectrum of (*Z*)-8-bromo-1-(*p*-tolylimino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4w)**



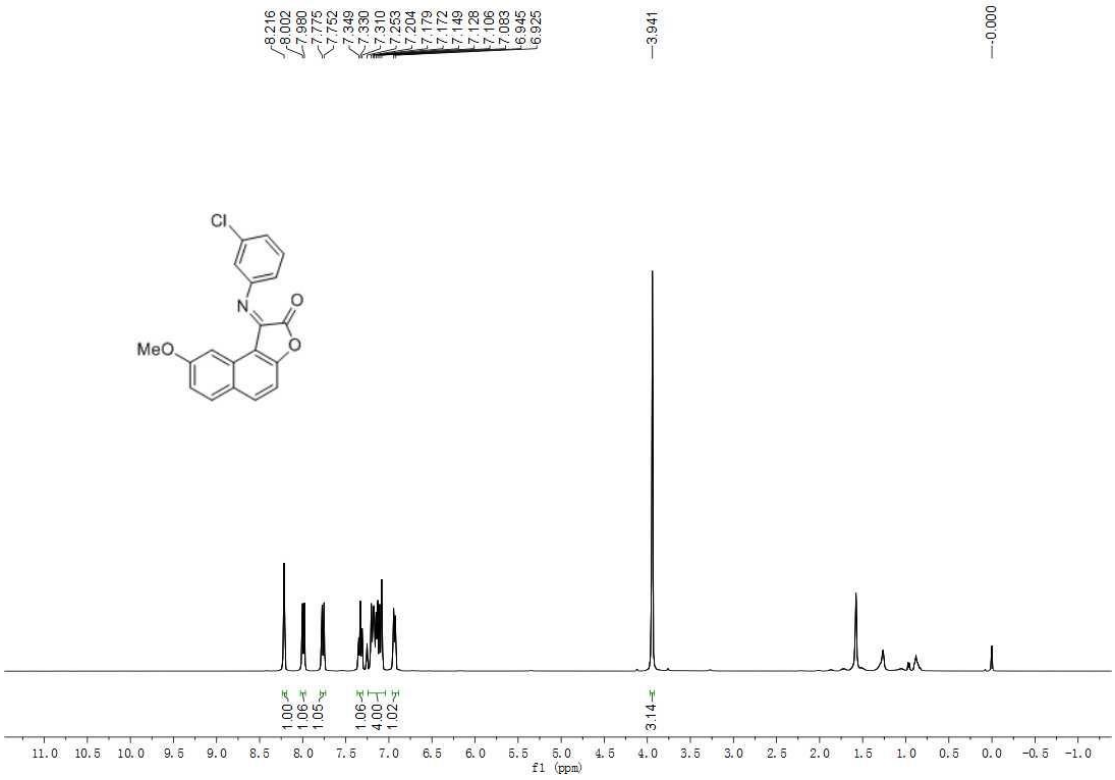
^{1}H NMR Spectrum of (*Z*)-1-((4-fluorophenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one **(4x)**



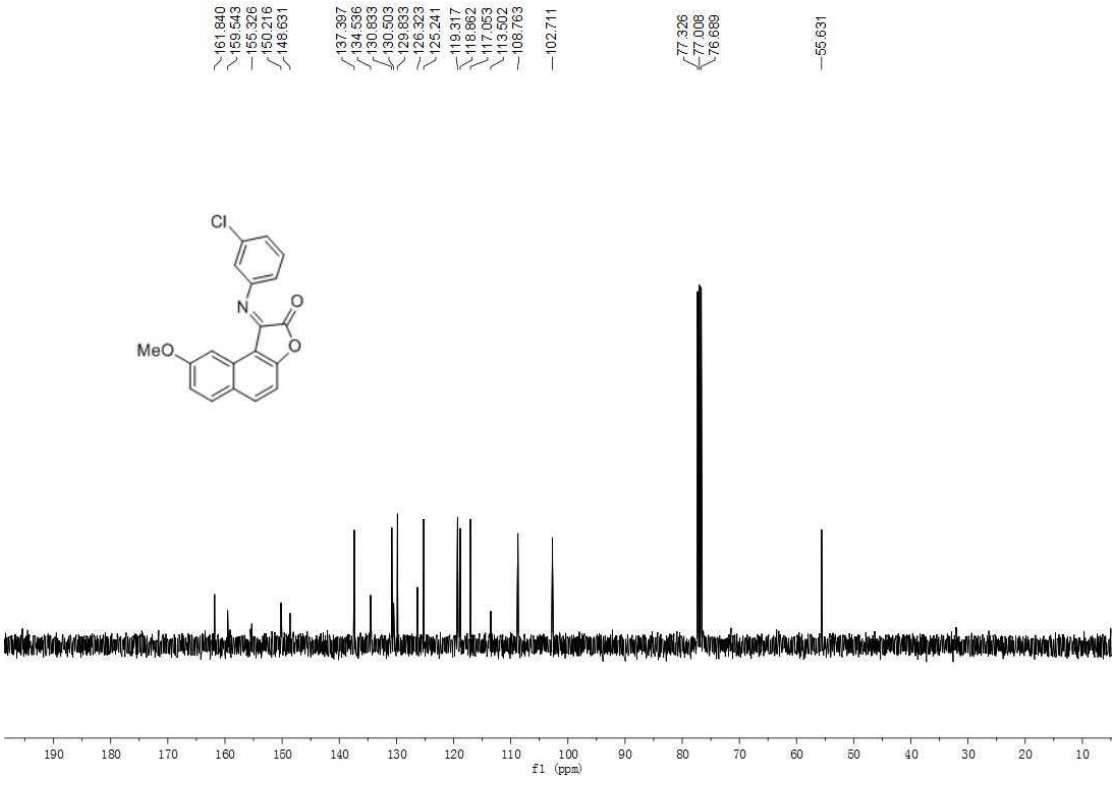
^{13}C NMR Spectrum of (*Z*)-1-((4-fluorophenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one **(4x)**



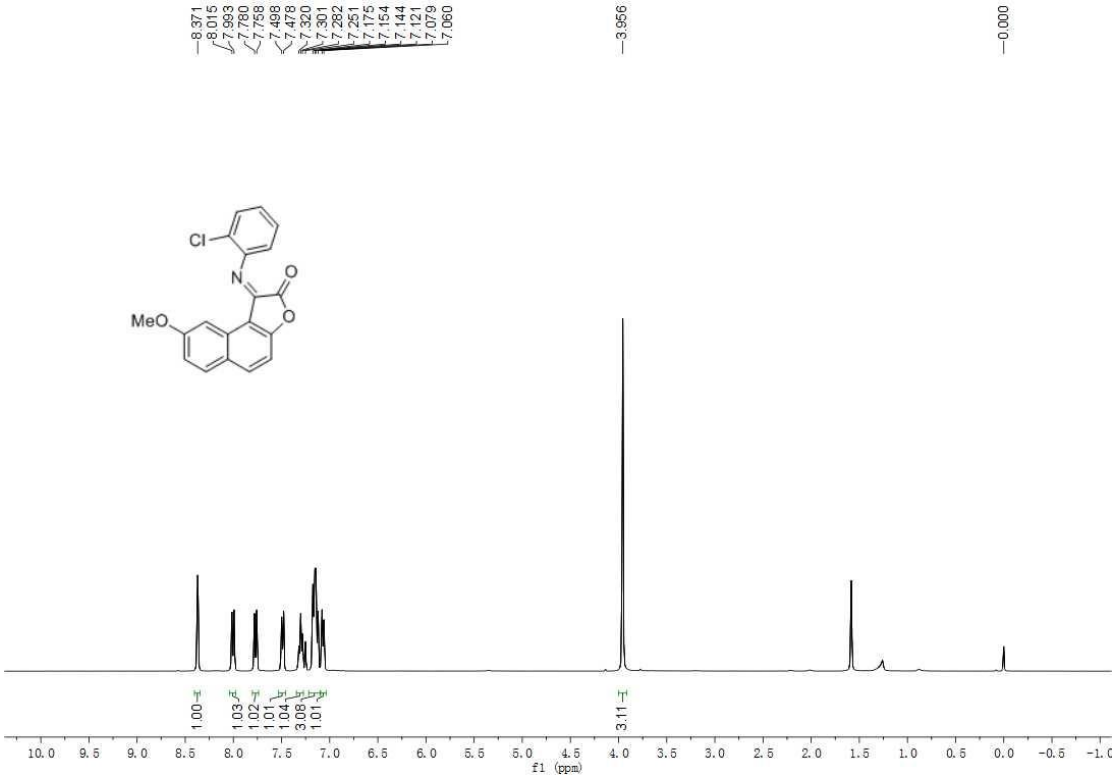
^{1}H NMR Spectrum of (*Z*)-1-((3-chlorophenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one **(4y)**



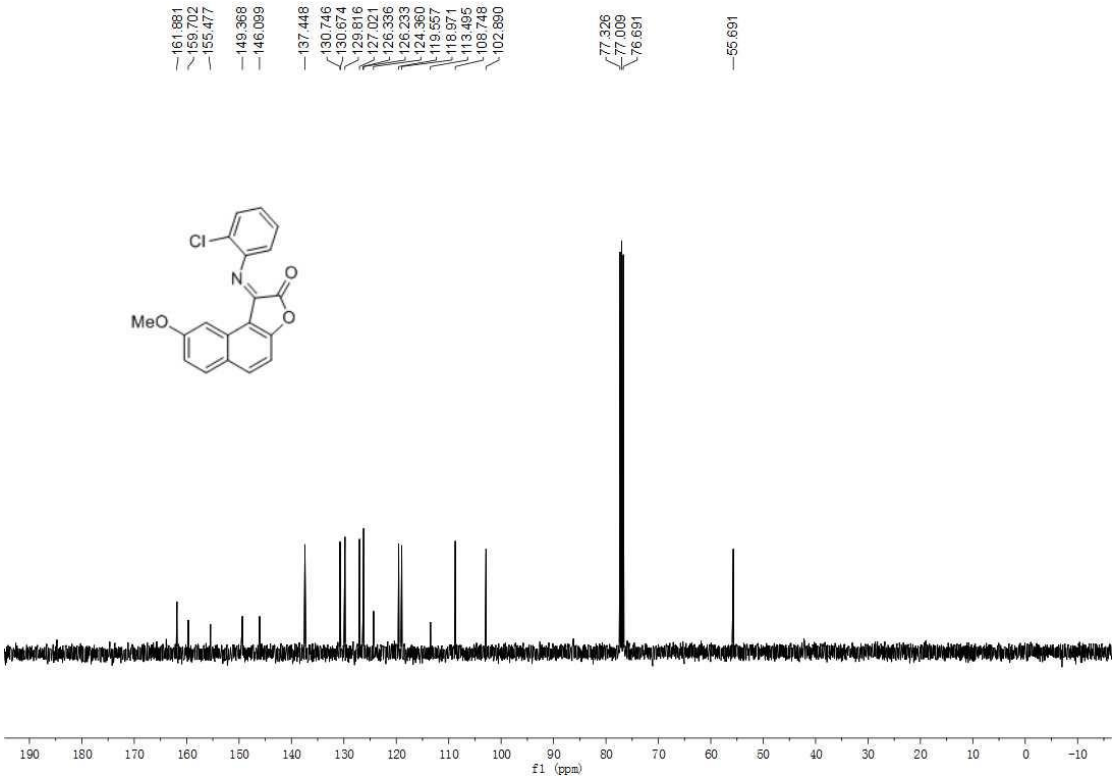
^{13}C NMR Spectrum of (*Z*)-1-((3-chlorophenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one **(4y)**



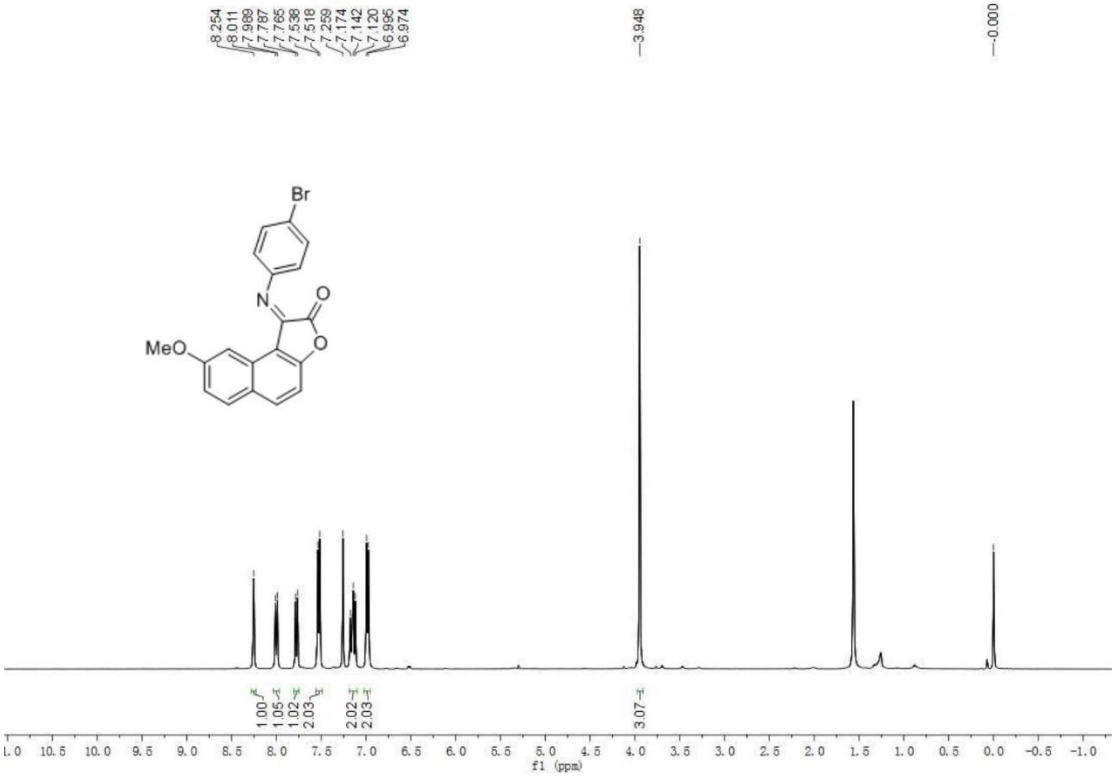
^{1}H NMR Spectrum of (*Z*)-1-((2-chlorophenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one **(4z)**



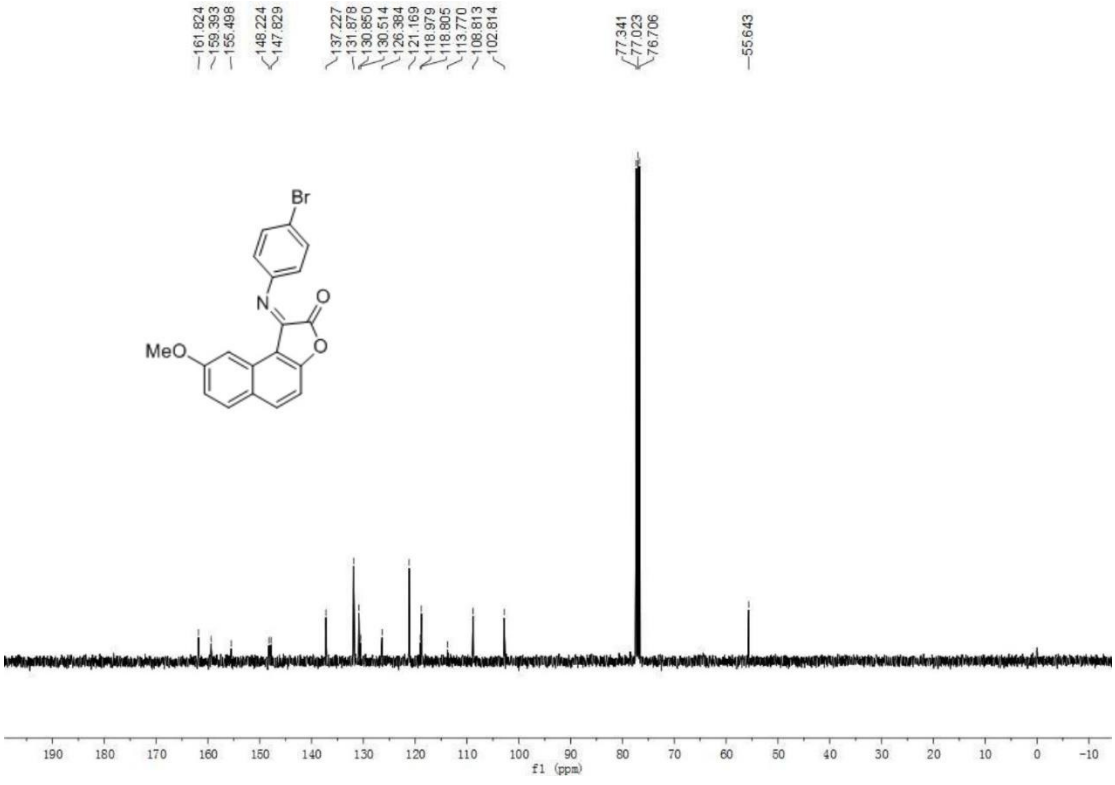
^{13}C NMR Spectrum of (*Z*)-1-((2-chlorophenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one **(4z)**



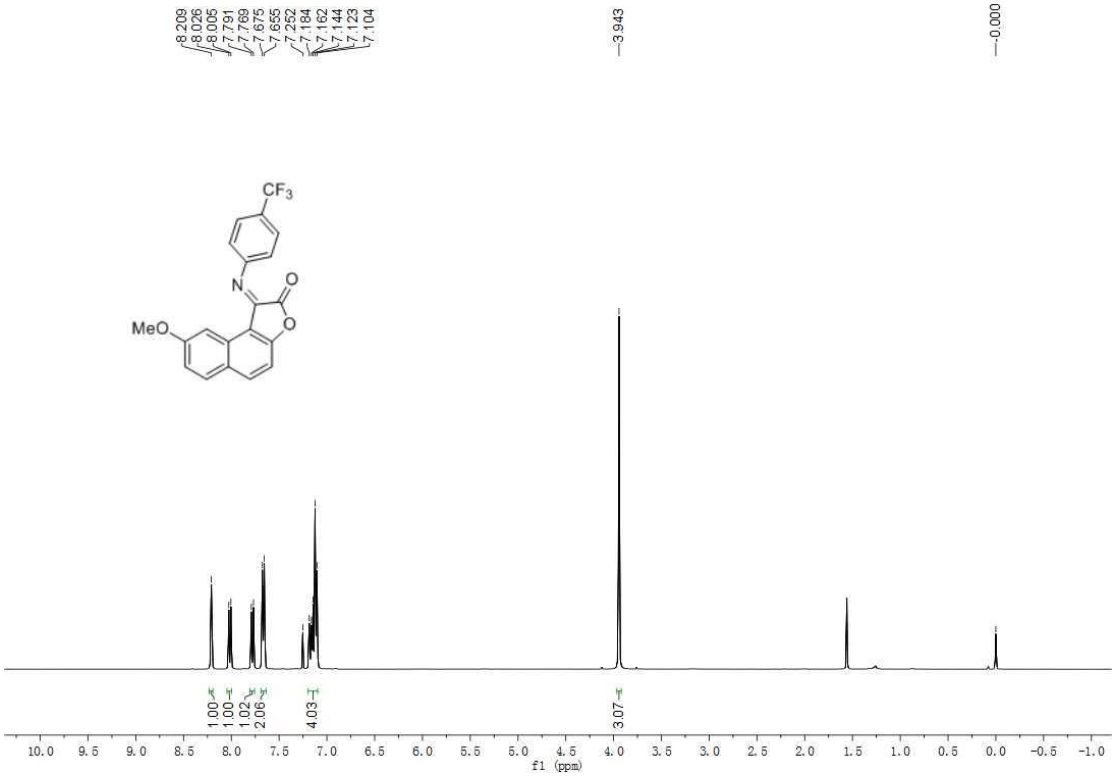
^{1}H NMR Spectrum of (*Z*)-1-((4-bromophenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one **(4za)**



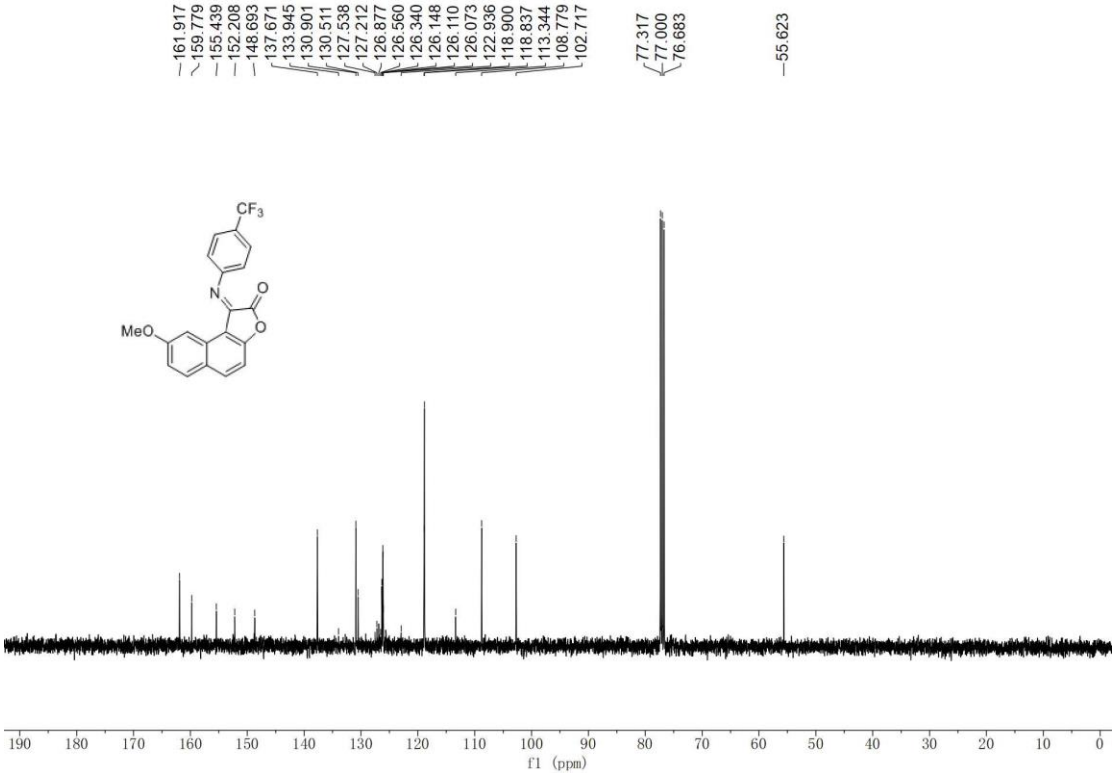
^{13}C NMR Spectrum of (*Z*)-1-((4-bromophenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one **(4za)**



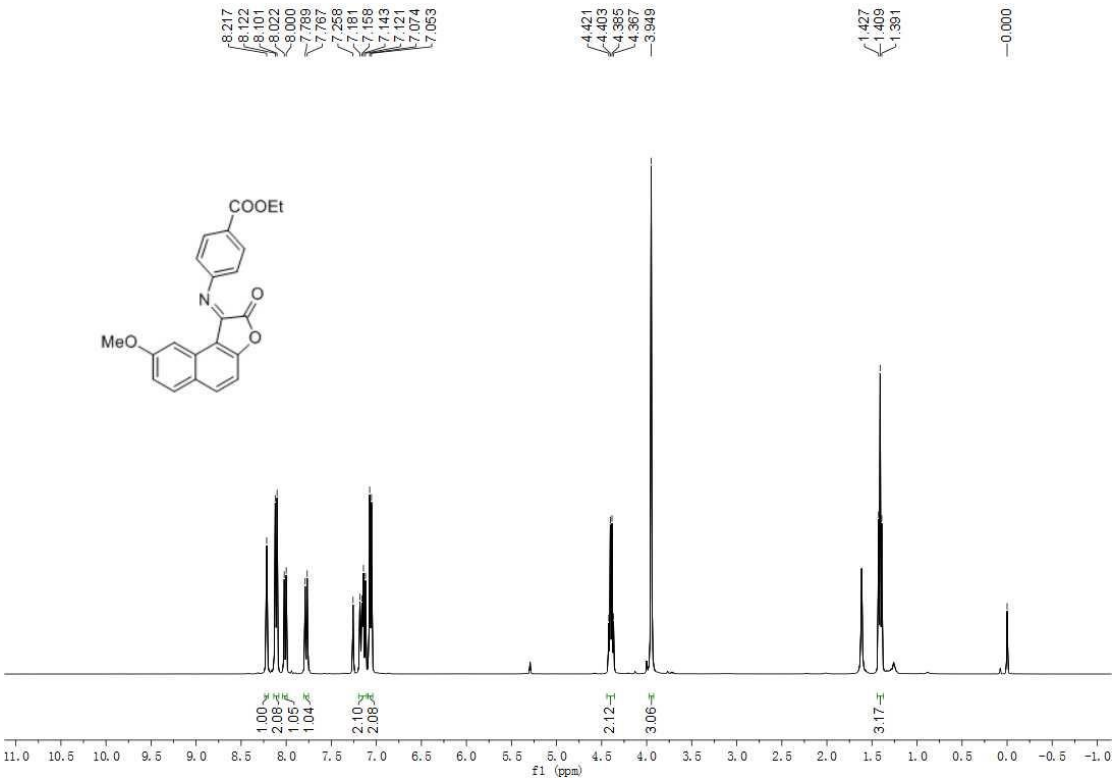
^{1}H NMR Spectrum of (*Z*)-8-methoxy-1-((4-(trifluoromethyl)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4zb)**



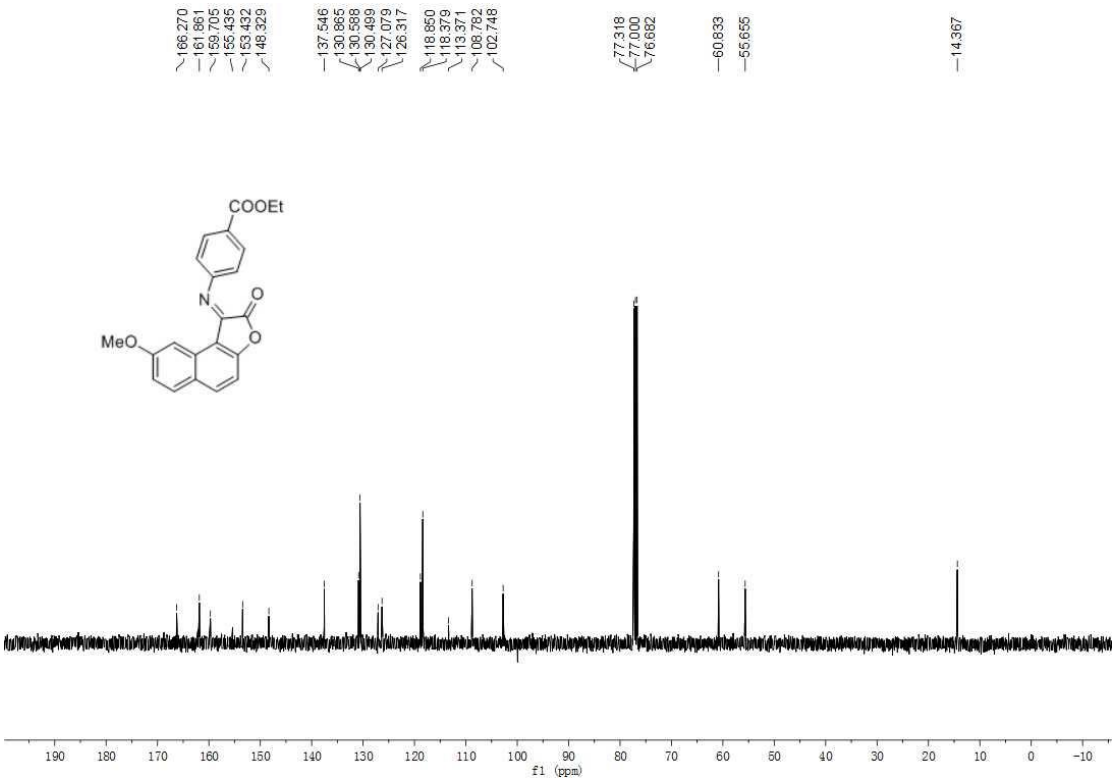
^{13}C NMR Spectrum of (*Z*)-8-methoxy-1-((4-(trifluoromethyl)phenyl)imino)naphtho[2,1-*b*]furan-2(1*H*)-one **(4zb)**



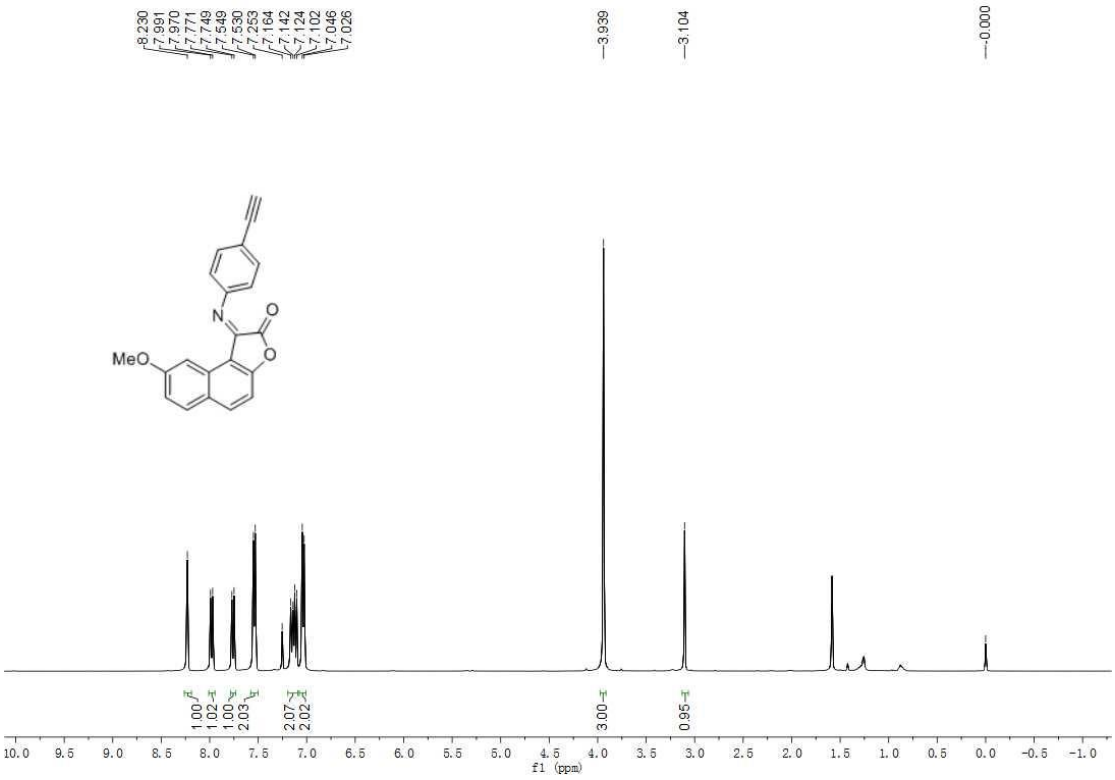
^{1}H NMR Spectrum of ethyl (*Z*)-4-((8-methoxy-2-oxonaphtho[2,1-*b*]furan-1(2*H*)-ylidene)amino)benzoate **(4zc)**



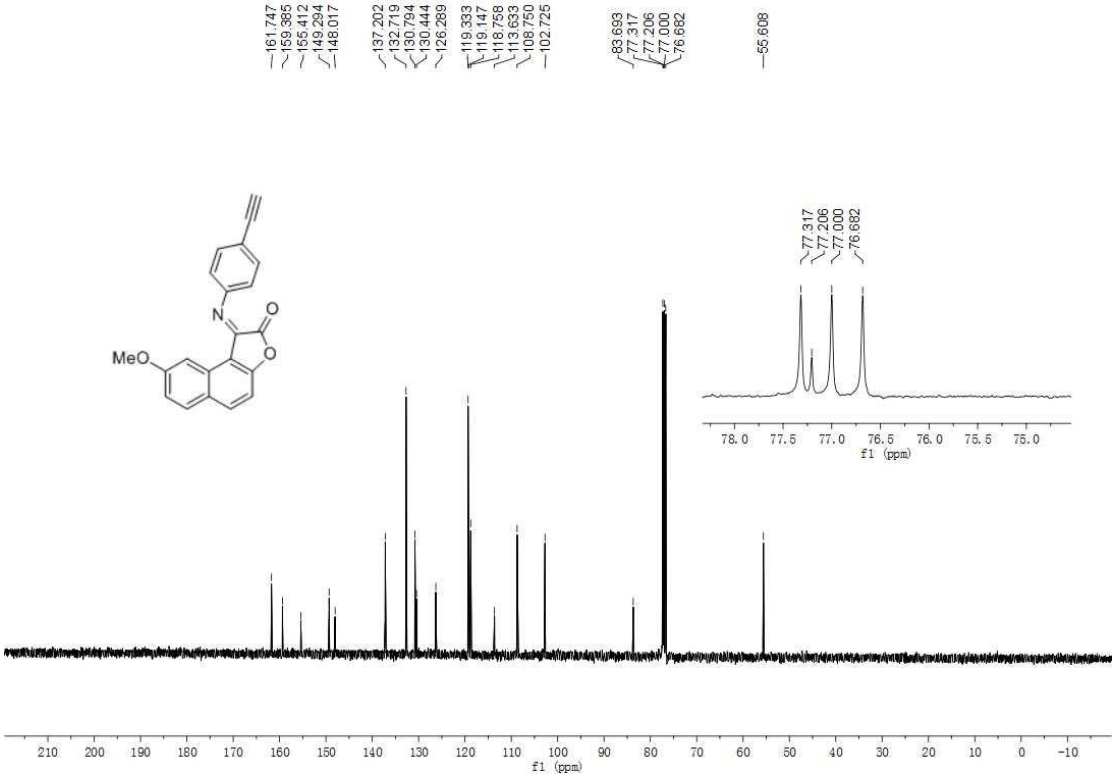
^{13}C NMR Spectrum of ethyl (*Z*)-4-((8-methoxy-2-oxonaphtho[2,1-*b*]furan-1(2*H*)-ylidene)amino)benzoate **(4zc)**



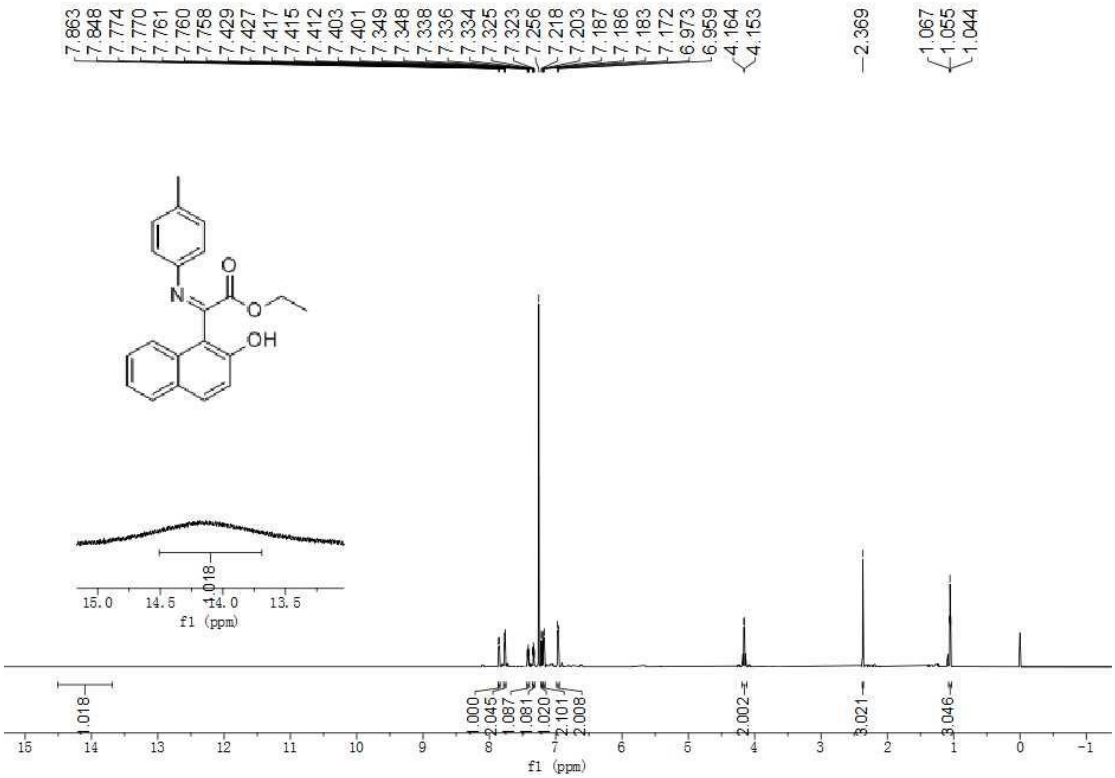
^{1}H NMR Spectrum of (*Z*)-1-((4-ethynylphenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-one **(4zd)**



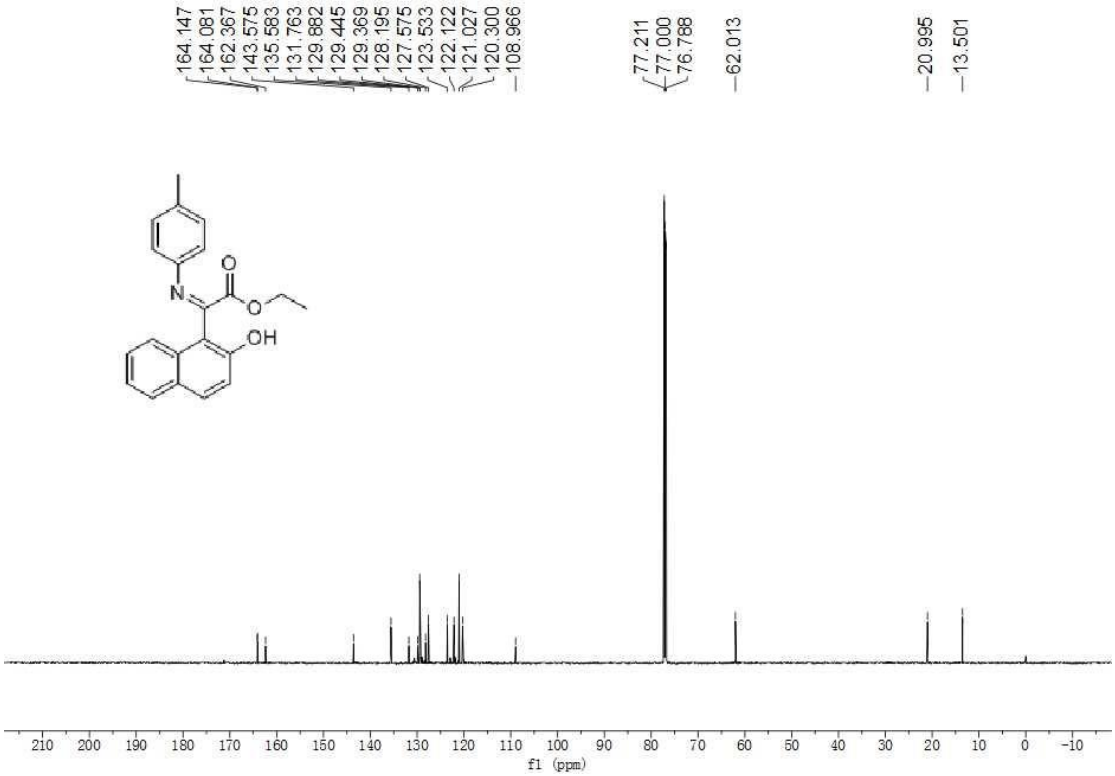
^{13}C NMR Spectrum of (*Z*)-1-((4-ethynylphenyl)imino)-8-methoxynaphtho[2,1-*b*]furan-2(1*H*)-**one (4zd)**



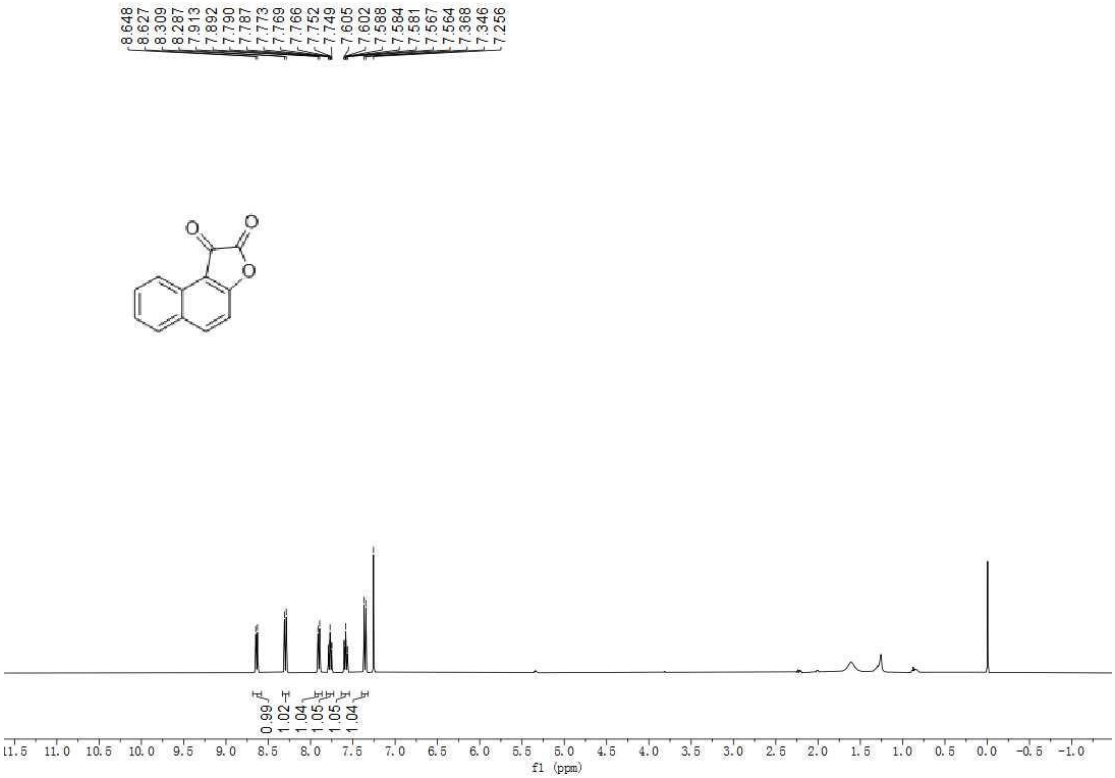
^{1}H NMR Spectrum of ethyl (*Z*)-2-(2-hydroxynaphthalen-1-yl)-2-(*p*-tolylimino)acetate **(5a)**



^{13}C NMR Spectrum of ethyl (*Z*)-2-(2-hydroxynaphthalen-1-yl)-2-(*p*-tolylimino)acetate **(5a)**



^{1}H NMR Spectrum of naphtho[2,1-*b*]furan-1,2-dione **(6a)**



^{13}C NMR Spectrum of naphtho[2,1-*b*]furan-1,2-dione **(6a)**