

## Supporting Information

### High Atomic Utilization Conversion of Ethers to Furancarbaldehydes via Oxidation Iminium-ion Activation Cascade Strategy

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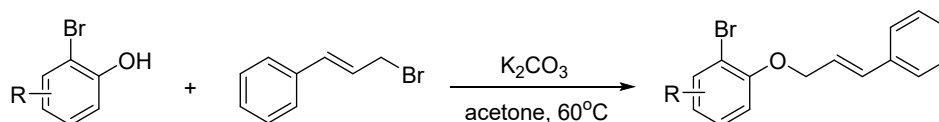
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## 1. General Information

Commercial reagents were purchased from TCI, Acros, Accela and Adamas and used without further purification unless otherwise stated. Solvents, unless otherwise specified, were reagent grade and distilled once prior to use.  $^1\text{H}$  and  $^{13}\text{C}$ NMR spectra were recorded on Bruke Avance-400 (400 MHz), and tetramethylsilane (TMS) was used as a reference. Chromatography was carried out with silica gel (300-400 mesh) using mixtures of petroleum ether (b.p. 60-90 °C) and ethyl acetate as eluents. HRMS were carried out on Micromass GCTTM gas chromatograph-mass spectrometer. Melting points were determined in open capillary tubes using SGW X-4 micro melting point apparatus which were uncorrected.

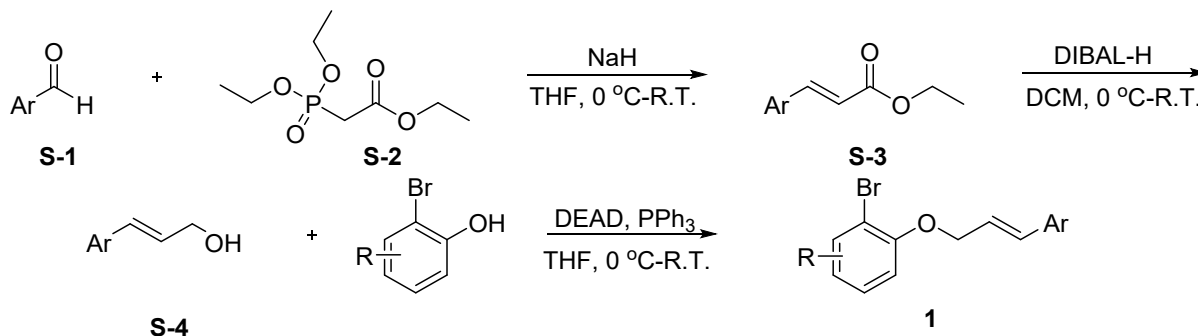
## 2. Experimental Section

### 2.1 General Procedure for Synthesis of 1a, 1t-1w



The starting phenols (3.0 mmol),  $\text{K}_2\text{CO}_3$  (7.5 mmol) were dissolved in acetone (20.0 ml), and cinnamyl bromide (3.9 mmol) was added into the mixture, then the reaction was warmed to  $60^\circ\text{C}$  for about 20 hours. After the reaction completed, water was added to the reaction mixture, extracted with ethyl acetate, then the organic phase was washed with saturated brine and concentrated under vacuum. The crude product was purified by silica gel chromatography to obtain **1a**, **1t-1w**.

### 2.2 General Procedure for Synthesis of 1b-1s, 1x-1z



A mixture of NaH (4.5 mmol) in THF (20 mL), **S-2** (3.6 mmol) was dropwise added by syringe with ice-bath, then added **S-1** (3.0 mmol) and then the reaction was warmed to room temperature for about 1 hour. The resulting mixture was quenched with water and extracted by ethyl acetate. The organic layer was dried with anhydrous  $\text{Na}_2\text{SO}_4$ , and evaporated under reduced to obtain compound **S-3**.

DIBAL-H (7.2 mmol) was slowly added to a stirred solution of ester **S-3** (3.0 mmol) in DCM (20.0 mL) at  $0^\circ\text{C}$ . And the reaction mixture was stirred for about 2 hours at room temperature. After completion, the reaction mixture was poured into cold diluted HCl (0.5 N), and extracted with dichloromethane. The organic layer was dried with anhydrous  $\text{Na}_2\text{SO}_4$ , and evaporated under reduced to obtain compound **S-4**.

To a stirred solution of **S-4** (3.0 mmol), 1-bromo-2-naphthol (3.6 mmol), and

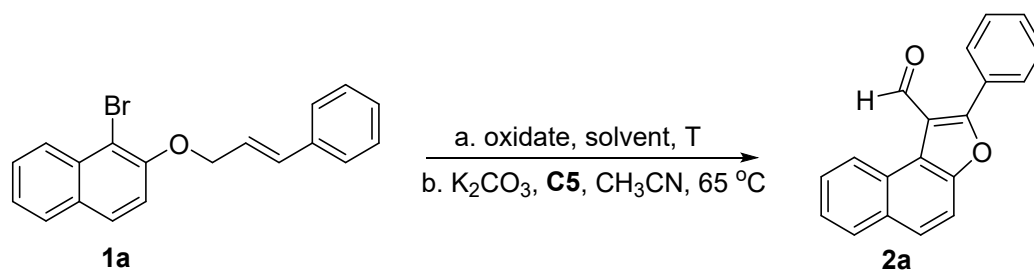
triphenylphosphane (3.9 mmol) in THF (20 mL) under argon atmosphere was added diethylazodicarboxylate (DEAD, 3.6 mmol) drop-wise at 0°C. The mixture was further stirred at room temperature for about 20 hours. The solvent was evaporated under reduced pressure to give a viscous residue. The residue was purified by silica gel column chromatography to obtain **1b-1s, 1x-1z**.

### 2.3 General Procedure for Synthesis of **2**

A mixture of **1** (0.50 mmol), DDQ (0.60 mmol), H<sub>2</sub>O (0.60 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (5 mL) was stirred at 50°C for about 1 hour, followed by addition of **C5** (0.10 mmol), K<sub>2</sub>CO<sub>3</sub> (2.50 mmol) and MeCN (5ml), and heated to 65°C for 24 hours. After the reaction completed, the mixture was filtered, and the filtrate was concentrated under vacuum. The crude product was purified by silica gel chromatography to obtain **2**.

### 2.4 Optimization of Reaction Conditions

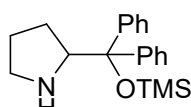
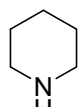
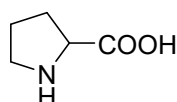
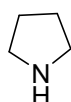
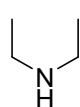
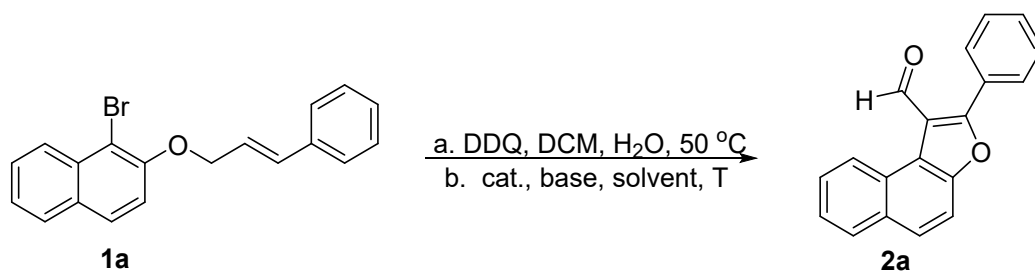
**Table S1. Optimization of ether oxidation.**



Entry	Oxidate	Solvent	H <sub>2</sub> O(equiv.)	Temperature(°C)	Time (h) <sup>c</sup>	Yields(%) <sup>d</sup>
1	IBX	CH <sub>2</sub> Cl <sub>2</sub>	1.2	50	>20	ND <sup>e</sup>
2	DMP	CH <sub>2</sub> Cl <sub>2</sub>	1.2	50	>20	10
3	TEMPO	CH <sub>2</sub> Cl <sub>2</sub>	1.2	50	>20	ND
4	PCC	CH <sub>2</sub> Cl <sub>2</sub>	1.2	50	>20	18
5	BF <sub>4</sub> NO	CH <sub>2</sub> Cl <sub>2</sub>	1.2	50	>20	ND
6	DDQ	CH <sub>2</sub> Cl <sub>2</sub>	1.2	50	1	71
7	DDQ <sup>a</sup>	CH <sub>2</sub> Cl <sub>2</sub>	1.2	50	1	66
8	DDQ	CH <sub>2</sub> Cl <sub>2</sub> <sup>b</sup>	-	50	>20	46
9	DDQ	CH <sub>2</sub> Cl <sub>2</sub>	0.8	50	14	65
10	DDQ	CH <sub>2</sub> Cl <sub>2</sub>	1.6	50	1.5	68
11	DDQ	THF	1.2	50	3	58
12	DDQ	CHCl <sub>3</sub>	1.2	50	1.5	65
13	DDQ	DMF	1.2	50	>20	10
14	DDQ	CH <sub>3</sub> CH <sub>2</sub> OH	1.2	50	>20	30
15	DDQ	CH <sub>3</sub> CN	1.2	50	3	45
16	DDQ	toluene	1.2	50	4	25
17	DDQ	DMSO	1.2	50	>20	ND
18	DDQ	dioxane	1.2	50	2	30
19	DDQ	CH <sub>2</sub> Cl <sub>2</sub>	1.2	0	8	57
20	DDQ	CH <sub>2</sub> Cl <sub>2</sub>	1.2	25	2	63
21	DDQ	CH <sub>2</sub> Cl <sub>2</sub>	1.2	40	1.5	65
22	DDQ	CH <sub>2</sub> Cl <sub>2</sub>	1.2	65	0.70	70

Reaction conditions: a mixture of **1a** (0.50 mmol), oxidation (0.60 mmol) and H<sub>2</sub>O in CH<sub>2</sub>Cl<sub>2</sub> (5 mL), was stirred at setting temperature for about 1 hour, followed by addition of **C5** (0.10 mmol), K<sub>2</sub>CO<sub>3</sub> (2.50 mmol) and MeCN (5 mL) continued to stir 24 hours at 65°C. <sup>a</sup> 0.75 mmol DDQ used. <sup>b</sup> redistilled CH<sub>2</sub>Cl<sub>2</sub> used. <sup>c</sup> the time when **1a** completely transformed and determined by TLC. <sup>d</sup> by NMR. <sup>e</sup> ND means not determined.

**Table S2. Optimization of aromatization reaction.**

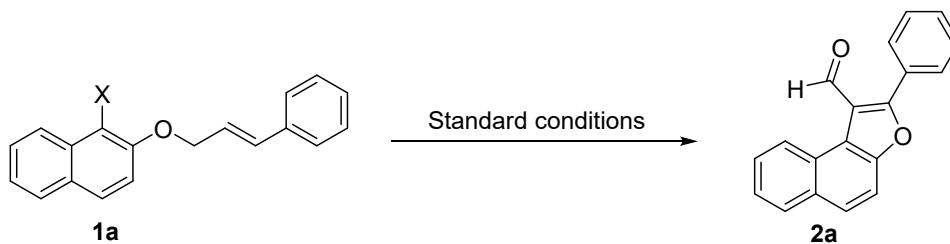


Entry	Catalyst	Base	Solvent	Temperature(°C)	Additive <sup>e</sup>	Yield(%) <sup>f</sup>
1	<b>C1</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	—	38
2	<b>C2</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	—	24
3	<b>C3</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	—	33
4	<b>C4</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	—	18
5	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	—	71
6 <sup>a</sup>	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	—	52
7 <sup>b</sup>	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	—	58
8 <sup>c</sup>	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	—	65
9 <sup>d</sup>	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	—	61
10	<b>C5</b>	Cs <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	—	34
11	<b>C5</b>	DBU	CH <sub>3</sub> CN	65	—	30
12	<b>C5</b>	DABCO	CH <sub>3</sub> CN	65	—	25
13	<b>C5</b>	CH <sub>3</sub> COONa	CH <sub>3</sub> CN	65	—	ND <sup>g</sup>
14	<b>C5</b>	TEA	CH <sub>3</sub> CN	65	—	45
15	<b>C5</b>	NaCO <sub>3</sub>	CH <sub>3</sub> CN	65	—	42
16	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	DCM	65	—	15
17	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	THF	65	—	ND
18	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CH <sub>2</sub> OH	65	—	20
19	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	DMF	65	—	13
20	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	DMSO	65	—	ND
21	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	Toluene	65	—	ND
22	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	1,4-dioxane	65	—	ND
23	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	25	—	50
24	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	50	—	64
25	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	75	—	64
26	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	TBAB	53
27	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	18-Crown-6	44
28	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	<i>n</i> -Pentanoic acid	51
29	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	TBAHS	62
30	<b>C5</b>	K <sub>2</sub> CO <sub>3</sub>	CH <sub>3</sub> CN	65	TMAC	56

Reaction conditions: a mixture of **1a** (0.50 mmol), DDQ (0.60 mmol) and H<sub>2</sub>O (0.60 mmol) in the CH<sub>2</sub>Cl<sub>2</sub> (5 mL), was stirred at 50 °C for about 1 hour, followed by addition of **Cat.** (0.10 mmol), **Base** (2.50 mmol) and solvent (5 mL) continued to stir 24 hours at setting temperature. <sup>a</sup> **C5** (0.05 mmol, 0.1 equiv.). <sup>b</sup> **C5** (0.20 mmol, 0.4 equiv.). <sup>c</sup> **Base** (2.00 mmol, 4.0 equiv.). <sup>d</sup> **Base** (3.00 mmol, 6.0 equiv.) <sup>e</sup> 0.10 mmol addition used. <sup>f</sup> by NMR. <sup>g</sup> ND means not determined.

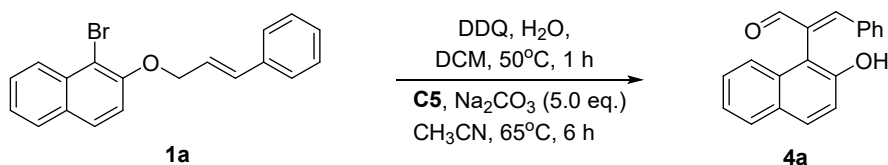
**Table S3. The effect of halogen substitution on the reaction.**





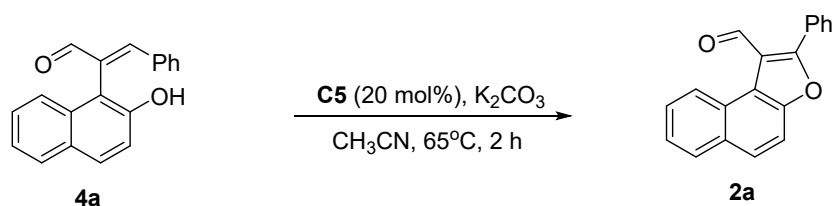
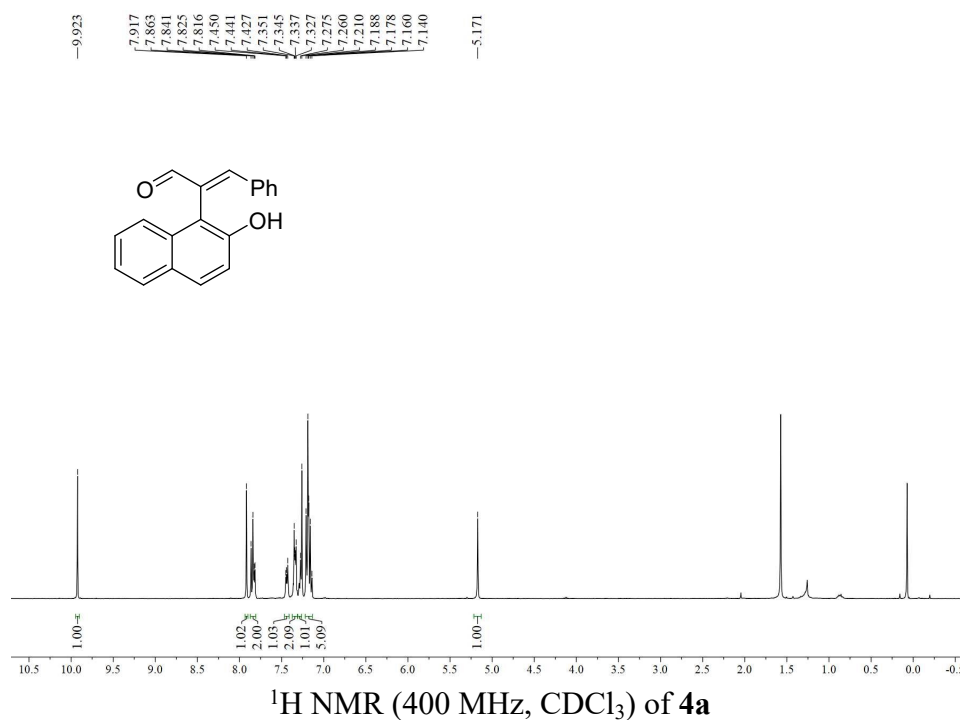
Entry	X	Yield(%)
1	H	-
2	F	-
3	Cl	36
4	Br	71
5	I	73

## 2.5 Control experiments.



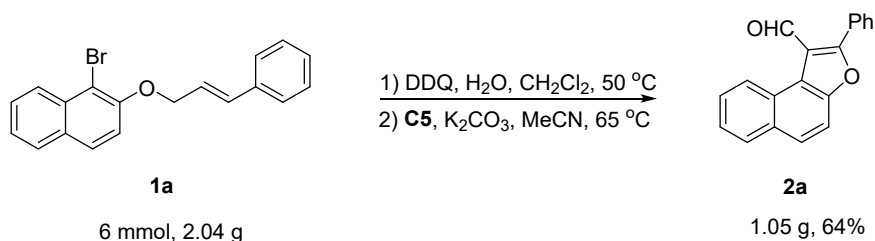
**1a** (0.17 g, 0.5 mmol) in DCM (5.0 mL) was added DDQ (0.14 g, 0.6 mmol) and H<sub>2</sub>O (11 mg, 0.6 mmol), after stirred at 50 °C for 1 h, diphenylprolinol TMS ether **C5** (33 mg, 0.1 mmol), Na<sub>2</sub>CO<sub>3</sub> (0.26 g, 2.5 mmol) and CH<sub>3</sub>CN (5.0 mL) were added, then the reaction mixture was stirred at 65 °C for 6 h. After cooling to ambient temperature, the mixture was filtered through the Celite pad. The solvent was removed under reduced pressure and the crude product was purified by flash chromatography (petroleum ether/ethyl acetate = 10:1 to 2:1) to afford the intermediate **4a** as a yellow solid (70 mg, 51 %, mp 181-182 °C).

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 9.92 (s, 1H), 7.92 (s, 1H), 7.86-7.82 (m 2H), 7.47-7.41 (m, 1H), 7.37-7.31 (m, 2H), 7.28 (t, *J* = 6.8 Hz, 1H), 7.22-7.13 (m, 5H), 5.17 (s, 1H).



To a solution of **4a** (30 mg, 0.1 mmol) in MeCN (3 mL) was added diphenylprolinol TMS ether **C5** (7 mg, 0.02 mmol) and K<sub>2</sub>CO<sub>3</sub> (76 mg, 0.5 mmol), then the reaction mixture was stirred at 65 °C for 2 h. After cooling to ambient temperature, the mixture was filtered through the Celite pad. The solvent was removed under reduced pressure and the crude product was purified by flash chromatography to afford the desired product **2a** (28 mg, 94%).

### 2.6 Gram-scale Reaction.

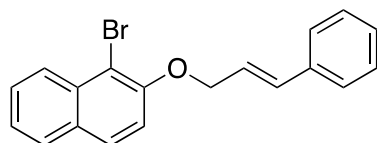


A mixture of **1a** (2.04 g, 6.0 mmol), DDQ (1.63 g, 7.2 mmol), H<sub>2</sub>O (0.13 g, 7.2 mmol) in CH<sub>2</sub>Cl<sub>2</sub> (15 mL) was stirred at 50°C for about 1 hour, followed by addition of **C5** (0.39 g, 1.2 mmol), K<sub>2</sub>CO<sub>3</sub> (4.15 g, 30.0 mmol) and MeCN (15 mL), and heated to 65°C for 24 hours. After the reaction completed, the mixture was filtered, and the filtrate was concentrated under vacuum. The crude product was purified by silica gel chromatography (petroleum ether/ethyl acetate = 200:1) to obtain **2a**.

### 3. Characterization Data

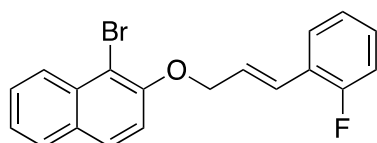
#### 3.1 Characterization Data for substrates (1)

##### 1-bromo-2-(cinnamyloxy)naphthalene (1a)



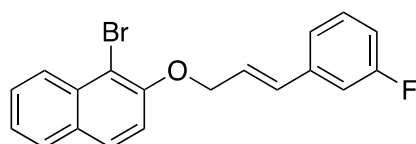
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a white solid (0.94 g, 92%); mp. 95-96°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.24 (dd, *J* = 8.6, 1.0 Hz, 1H), 7.78 (d, *J* = 3.3 Hz, 1H), 7.76 (d, *J* = 2.5 Hz, 1H), 7.61 – 7.52 (m, 1H), 7.44 – 7.41 (m, 1H), 7.41 – 7.37 (m, 2H), 7.35 – 7.27 (m, 3H), 7.24 (d, *J* = 5.0 Hz, 1H), 6.80 (d, *J* = 16.0 Hz, 1H), 6.46 (dt, *J* = 16.0, 5.6 Hz, 1H), 4.91 (dd, *J* = 5.5, 1.6 Hz, 2H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 153.0, 136.4, 133.3, 133.2, 130.1, 128.9, 128.6(2C), 128.1, 128.0, 127.7, 126.7(2C), 126.3, 124.5, 124.2, 115.7, 110.0, 70.8. The data is consistent with *Adv. Synth. Catal.*, 2015, **357**, 2442-2446.

##### 1-bromo-2-((3-(2-fluorophenyl)allyl)oxy)naphthalene (1b)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a brown solid (0.93g 87%); mp. 110-112°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.24 (d, *J* = 8.6 Hz, 1H), 7.78 (dd, *J* = 8.4, 5.6 Hz, 2H), 7.55 (d, *J* = 7.6 Hz, 1H), 7.47 (d, *J* = 1.2 Hz, 1H), 7.41 (d, *J* = 7.9 Hz, 1H), 7.29 (d, *J* = 9.0 Hz, 1H), 7.24 – 7.15 (m, 1H), 7.14 – 6.91 (m, 3H), 6.56 (dt, *J* = 16.1, 5.5 Hz, 1H), 4.92 (d, *J* = 5.5 Hz, 2H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 159.3, 151.8, 132.1, 128.9, 128.1, 127.8, 127.0, 126.7, 126.6(2C), 125.7, 125.2, 124.5, 123.4, 123.0, 114.7, 114.4, 108.8, 69.6. The data is consistent with *Adv. Synth. Catal.*, 2015, **357**, 2442-2446.

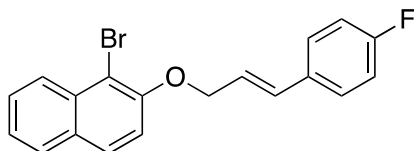
##### 1-bromo-2-((3-(3-fluorophenyl)allyl)oxy)naphthalene (1c)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a brown solid (0.95g, 89%); mp. 93-95°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.24 (d, *J* = 8.5 Hz, 1H), 7.77 (dd, *J* = 8.9, 2.9 Hz, 2H), 7.56 (m, 1H), 7.40 (m, 1H), 7.30 – 7.26 (m, 1H), 7.26 – 7.23 (m, 1H), 7.16 (dt, *J* = 7.7, 1.2 Hz, 1H), 7.10 (dt, *J* =

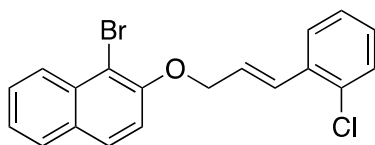
10.1, 2.1 Hz, 1H), 6.94 (td,  $J = 8.6, 2.5$  Hz, 1H), 6.78 (d,  $J = 15.8$  Hz, 1H), 6.45 (m, 1H), 4.88 (dd,  $J = 5.4, 1.7$  Hz, 2H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  164.3, 152.9, 138.8, 133.2, 131.8, 130.1, 130.0, 128.9, 128.1, 127.8, 126.3, 125.6, 124.6, 122.6, 115.5, 114.8, 113.1, 110.0, 70.4. The data is consistent with *Adv. Synth. Catal.*, 2015, **357**, 2442-2446.

#### 1-bromo-2-((3-(4-fluorophenyl)allyl)oxy)naphthalene (1d)



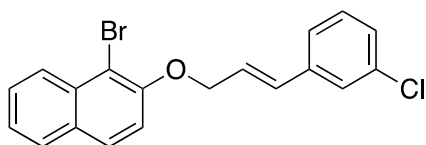
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a white solid (0.96 g, 90%); mp. 149-150°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  8.16 (dd,  $J = 8.6, 1.0$  Hz, 1H), 7.74 – 7.66 (m, 2H), 7.48 (m, 1H), 7.35 – 7.31 (m, 1H), 7.31 – 7.29 (m, 1H), 7.29 – 7.25 (m, 1H), 7.19 (d,  $J = 9.0$  Hz, 1H), 6.96 – 6.88 (m, 2H), 6.68 (m, 1H), 6.29 (m, 1H), 4.80 (dd,  $J = 5.6, 1.6$  Hz, 2H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  163.75, 161.3, 152.9, 133.1, 132.5, 132.0, 130.0, 128.9, 128.2, 128.1, 128.0, 127.7, 126.3, 124.5, 123.8, 115.6(2C), 115.4, 109.9, 70.6. The data is consistent with *Adv. Synth. Catal.*, 2015, **357**, 2442-2446.

#### 1-bromo-2-((3-(2-chlorophenyl)allyl)oxy)naphthalene (1e)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a yellow solid (0.92 g, 82%); mp. 114-116°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  8.16 (d,  $J = 8.6$  Hz, 1H), 7.70 (t,  $J = 7.4$  Hz, 2H), 7.48 (t,  $J = 7.8$  Hz, 2H), 7.32 (t,  $J = 7.7$  Hz, 1H), 7.27 (d,  $J = 7.6$  Hz, 1H), 7.21 (d,  $J = 9.1$  Hz, 1H), 7.17 (d,  $J = 5.6$  Hz, 1H), 7.15 – 7.07 (m, 2H), 6.36 (m, 1H), 4.85 (d,  $J = 5.4$  Hz, 2H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  152.9, 134.6, 133.3, 133.2, 130.1, 129.7, 129.4, 129.0, 128.9, 128.1, 127.7, 127.1(2C), 126.9, 126.3, 124.6, 115.6, 110.0, 70.7. The data is consistent with *Adv. Synth. Catal.*, 2015, **357**, 2442-2446.

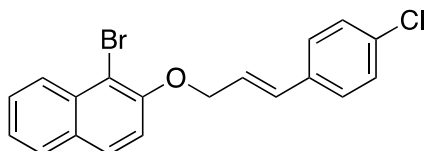
#### 1-bromo-2-((3-(3-chlorophenyl)allyl)oxy)naphthalene (1f)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale brown solid (0.94 g, 84%); mp. 86-88°C.  $^1\text{H}$

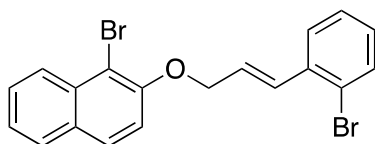
NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  8.25 (d,  $J$  = 8.5 Hz, 1H), 7.79 (dd,  $J$  = 8.5, 5.8 Hz, 2H), 7.58 (ddd,  $J$  = 8.4, 6.9, 1.2 Hz, 1H), 7.41 (ddd,  $J$  = 7.9, 5.9, 1.1 Hz, 2H), 7.26 (ddd,  $J$  = 11.1, 4.7, 2.3 Hz, 4H), 6.78 (d,  $J$  = 16.0 Hz, 1H), 6.48 (dt,  $J$  = 16.0, 5.4 Hz, 1H), 4.92 (dd,  $J$  = 5.4, 1.6 Hz, 2H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  153.0, 138.4, 134.7, 133.3, 131.7, 130.2, 130.0, 129.1, 128.2, 128.0, 127.9, 126.7, 126.5, 125.9, 125.0, 124.8, 115.7, 110.1, 70.5. HRMS (EI):  $m/z$  calcd for C<sub>19</sub>H<sub>14</sub>BrClO [M<sup>+</sup>]: 371.9917, found: 371.9919.

### 1-bromo-2-((3-(4-chlorophenyl)allyl)oxy)naphthalene (1g)



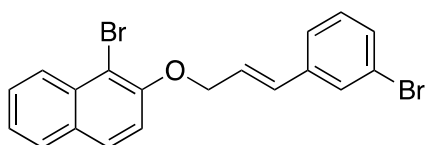
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a white solid (0.98 g, 88%); mp. 154-155°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  8.25 (d,  $J$  = 9.0 Hz, 1H), 7.79 (dd,  $J$  = 8.5, 5.5 Hz, 2H), 7.64 – 7.51 (m, 1H), 7.42 (ddd,  $J$  = 8.0, 6.9, 1.1 Hz, 1H), 7.38 – 7.32 (m, 2H), 7.30 (dd,  $J$  = 8.6, 2.1 Hz, 3H), 6.78 (d,  $J$  = 16.0 Hz, 1H), 6.45 (dt,  $J$  = 16.0, 5.5 Hz, 1H), 4.91 (dd,  $J$  = 5.5, 1.6 Hz, 2H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  153.0, 135.0, 133.7, 133.3, 131.9, 130.2, 129.0, 128.9, 128.2, 128.0, 127.9, 126.4, 124.9, 124.7, 115.7, 110.1, 70.7. The data is consistent with *Adv. Synth. Catal.*, 2015, **357**, 2442-2446.

### 1-bromo-2-((3-(2-bromophenyl)allyl)oxy)naphthalene (1h)



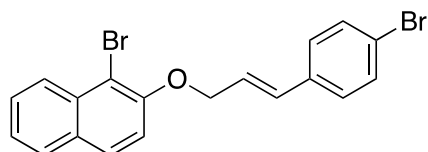
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a white solid (1.08 g, 86%); mp. 113-115°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  8.24 (d,  $J$  = 8.6 Hz, 1H), 7.79 (t,  $J$  = 8.3 Hz, 2H), 7.56 (ddd,  $J$  = 5.3, 4.8, 3.6 Hz, 3H), 7.41 (ddd,  $J$  = 8.0, 6.9, 1.1 Hz, 1H), 7.32 (d,  $J$  = 9.0 Hz, 1H), 7.28 (dd,  $J$  = 7.4, 0.6 Hz, 1H), 7.20 (d,  $J$  = 15.9 Hz, 1H), 7.11 (td,  $J$  = 7.9, 1.6 Hz, 1H), 6.41 (dt,  $J$  = 15.9, 5.5 Hz, 1H), 4.95 (dd,  $J$  = 5.5, 1.6 Hz, 2H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  153.0, 136.5, 133.3, 133.1, 132.0, 130.2, 129.3, 129.0, 128.2, 127.8, 127.6, 127.4, 127.3, 126.4, 124.7, 123.9, 115.7, 110.1, 70.6. HRMS (EI):  $m/z$  calcd for C<sub>19</sub>H<sub>14</sub>Br<sub>2</sub>O [M<sup>+</sup>]: 417.9391, found: 417.9395.

### 1-bromo-2-((3-(3-bromophenyl)allyl)oxy)naphthalene (1i)



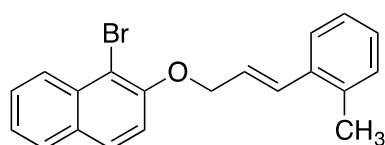
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale brown solid (1.13 g, 90%); mp. 91-92°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.24 (dd, *J* = 8.6, 1.0 Hz, 1H), 7.81 – 7.77 (m, 1H), 7.77 – 7.75 (m, 1H), 7.59 – 7.53 (m, 2H), 7.43 – 7.34 (m, 2H), 7.31 (m, 1H), 7.24 (d, *J* = 0.8 Hz, 1H), 7.17 (t, *J* = 7.8 Hz, 1H), 6.74 (m, 1H), 6.44 (m, 1H), 4.88 (dd, *J* = 5.3, 1.7 Hz, 2H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 153.0, 138.7, 133.3, 131.6, 130.9, 130.2, 129.6, 129.1, 128.2, 127.9, 126.5, 125.9, 125.4, 124.8, 122.9, 115.7, 110.1, 70.5. HRMS (EI): *m/z* calcd for C<sub>19</sub>H<sub>14</sub>Br<sub>2</sub>O [M<sup>+</sup>]: 417.9391, found: 417.9393.

### 1-bromo-2-((3-(4-bromophenyl)allyl)oxy)naphthalene (1j)



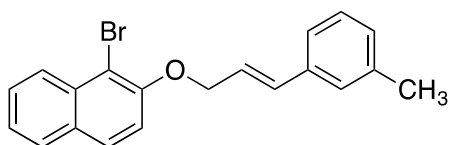
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a white solid (1.15 g, 92%); mp. 156-157°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.25 (d, *J* = 8.5 Hz, 1H), 7.79 (dd, *J* = 8.5, 5.1 Hz, 2H), 7.65 – 7.53 (m, 1H), 7.50 – 7.38 (m, 3H), 7.29 (dd, *J* = 8.7, 2.0 Hz, 3H), 6.77 (d, *J* = 16.0 Hz, 1H), 6.47 (dt, *J* = 16.0, 5.4 Hz, 1H), 4.91 (dd, *J* = 5.4, 1.5 Hz, 2H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 153.0, 135.5, 133.3, 131.9, 131.9, 130.2, 129.0, 128.3, 128.2, 127.9, 126.5, 125.1, 124.7, 121.9, 115.7, 110.1, 70.7. HRMS (EI): *m/z* calcd for C<sub>19</sub>H<sub>14</sub>Br<sub>2</sub>O [M<sup>+</sup>]: 417.9391, found: 417.9392.

### 1-bromo-2-((3-(*o*-tolyl)allyl)oxy)naphthalene (1k)



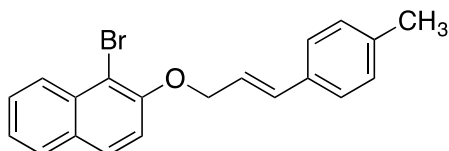
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a yellow solid (0.81 g, 76%); mp. 114-116°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.15 (dd, *J* = 8.6, 1.0 Hz, 1H), 7.71 – 7.66 (m, 2H), 7.47 (m, 1H), 7.38 (dd, *J* = 5.3, 3.7 Hz, 1H), 7.30 (m, 1H), 7.20 (d, *J* = 8.9 Hz, 1H), 7.10 – 7.03 (m, 3H), 6.97 (m, 1H), 6.24 (m, 1H), 4.83 (dd, *J* = 5.5, 1.7 Hz, 2H), 2.24 (s, 3H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 153.0, 135.7, 135.6, 133.2, 131.1, 130.3, 130.1, 128.9, 128.1, 127.8, 127.7, 126.3, 126.2, 125.8, 125.3, 124.5, 115.7, 110.0, 70.8, 19.8. The data is consistent with *Adv. Synth. Catal.*, 2015, **357**, 2442-2446.

### 1-bromo-2-((3-(*m*-tolyl)allyl)oxy)naphthalene (1l)



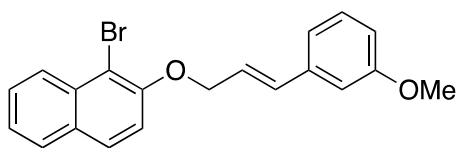
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale brown solid (0.90 g, 85%); mp. 91-92°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.16 (dd, *J* = 8.6, 1.1 Hz, 1H), 7.70 (d, *J* = 2.5 Hz, 1H), 7.69 – 7.66 (m, 1H), 7.48 (m, 1H), 7.31 (m, 1H), 7.20 (d, *J* = 8.9 Hz, 1H), 7.15 – 7.11 (m, 3H), 6.99 (m, 1H), 6.69 (m, 1H), 6.36 (m, 1H), 4.82 (dd, *J* = 5.6, 1.6 Hz, 2H), 2.26 (s, 3H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 152.0, 137.1, 135.2, 132.2, 132.1, 129.0, 127.8, 127.7, 127.4, 127.0, 126.6, 126.3, 125.2, 123.4, 122.8, 122.7, 114.6, 108.8, 69.7, 20.3. The data is consistent with *Adv. Synth. Catal.*, 2015, **357**, 2442-2446.

### 1-bromo-2-((3-(*p*-tolyl)allyl)oxy)naphthalene (1m)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale brown solid (0.96 g, 91%); mp. 149-151°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.14 (d, *J* = 8.6 Hz, 1H), 7.65 (d, *J* = 8.7 Hz, 2H), 7.45 (m, 1H), 7.29 (m, 1H), 7.18 (dd, *J* = 15.8, 8.4 Hz, 3H), 7.02 (d, *J* = 7.8 Hz, 2H), 6.66 (d, *J* = 15.9 Hz, 1H), 6.30 (m, 1H), 4.77 (dd, *J* = 5.7, 1.6 Hz, 2H), 2.23 (s, 3H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 153.1, 137.9, 133.6, 133.2(2C), 130.1, 129.4(2C), 128.9, 128.1, 127.7, 126.6(2C), 126.3, 124.5, 123.1, 115.7, 109.9, 70.9, 21.3. The data is consistent with *Adv. Synth. Catal.*, 2015, **357**, 2442-2446.

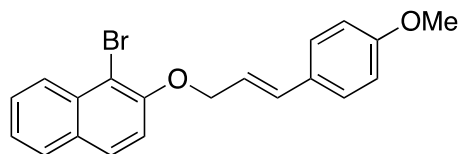
### 1-bromo-2-((3-(3-methoxyphenyl)allyl)oxy)naphthalene (1n)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a white solid (0.89 g, 80%); mp. 97-99°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.24 (m, 1H), 7.79 – 7.77 (m, 1H), 7.77 – 7.74 (m, 1H), 7.56 (m, 1H), 7.39 (m, 1H), 7.27 (d, *J* = 9.0 Hz, 1H), 7.26 – 7.21 (m, 1H), 7.00 (m, 1H), 6.95 (dd, *J* = 2.6, 1.6 Hz, 1H), 6.83 – 6.80 (m, 1H), 6.77 (m, 1H), 6.45 (m, 1H), 4.89 (dd, *J* = 5.6, 1.6 Hz, 2H), 3.80 (s, 3H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 160.0, 153.1, 138.0, 133.3, 133.2, 130.2, 129.7, 129.0,

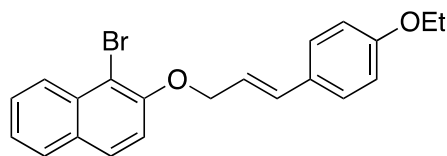
128.2, 127.8, 126.5, 124.7, 124.6, 119.4, 115.8, 113.8, 112.1, 110.1, 70.9, 55.4. HRMS (EI):  $m/z$  calcd for  $C_{20}H_{17}BrO_2$  [ $M^+$ ]: 368.0412, found: 368.0414.

**1-bromo-2-((3-(4-methoxyphenyl)allyl)oxy)naphthalene (1o)**



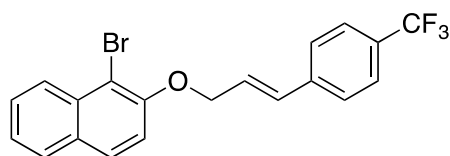
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a yellow solid (0.93 g, 84%); mp. 151-153°C.  $^1H$  NMR (600 MHz,  $CDCl_3$ )  $\delta$  8.24 (d,  $J$  = 8.5 Hz, 1H), 7.79 (t,  $J$  = 7.4 Hz, 2H), 7.57 (t,  $J$  = 7.6 Hz, 1H), 7.41 (t,  $J$  = 7.4 Hz, 1H), 7.36 (d,  $J$  = 8.0 Hz, 2H), 7.31 (d,  $J$  = 8.9 Hz, 1H), 6.86 (d,  $J$  = 8.0 Hz, 2H), 6.75 (d,  $J$  = 15.9 Hz, 1H), 6.37 – 6.32 (m, 1H), 4.90 (d,  $J$  = 5.6 Hz, 2H), 3.81 (s, 3H).  $^{13}C$  NMR (150 MHz,  $CDCl_3$ )  $\delta$  159.7, 153.2, 133.3, 133.1, 130.2, 129.3, 129.0, 128.2, 128.0, 127.8, 126.4, 124.6, 122.0, 115.9, 114.1, 110.1, 71.2, 55.4. HRMS (EI):  $m/z$  calcd for  $C_{20}H_{17}BrO_2$  [ $M^+$ ]: 368.0412, found: 368.0416.

**1-bromo-2-((3-(4-ethoxyphenyl)allyl)oxy)naphthalene (1p)**



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a brown solid (0.92 g, 80%); mp. 147-149°C.  $^1H$  NMR (400 MHz,  $CDCl_3$ )  $\delta$  8.23 (dd,  $J$  = 8.6, 1.0 Hz, 1H), 7.77 – 7.72 (m, 2H), 7.54 (m, 1H), 7.37 (m, 1H), 7.33 – 7.29 (m, 2H), 7.23 (d,  $J$  = 10.8 Hz, 1H), 6.84 – 6.80 (m, 2H), 6.71 (m, 1H), 6.30 (m, 1H), 4.84 (dd,  $J$  = 5.8, 1.5 Hz, 2H), 3.99 (q,  $J$  = 7.0 Hz, 2H), 1.38 (t,  $J$  = 7.0 Hz, 3H).  $^{13}C$  NMR (150 MHz,  $CDCl_3$ )  $\delta$  159.0, 153.2, 133.3, 133.2, 130.2, 129.1, 129.0, 128.2, 128.0, 127.8, 126.5, 124.6, 121.8, 115.9, 114.7, 110.1, 71.3, 63.6, 15.0. HRMS (EI):  $m/z$  calcd for  $C_{21}H_{19}BrO_2$  [ $M^+$ ]: 382.0568, found: 382.0572.

**1-bromo-2-((3-(4-(trifluoromethyl)phenyl)allyl)oxy)naphthalene (1q)**

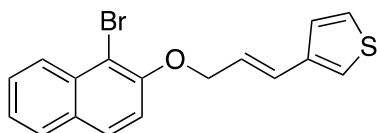


Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale brown solid (0.88 g, 72%); mp. 161-162°C.  $^1H$  NMR (400 MHz,  $CDCl_3$ )  $\delta$  8.25 (d,  $J$  = 8.5 Hz, 1H), 7.79 (dd,  $J$  = 8.6, 4.9 Hz, 2H), 7.57 (d,  $J$  = 7.9 Hz, 3H), 7.49 (d,  $J$  = 8.1 Hz, 2H), 7.41 (t,  $J$  = 7.5 Hz, 1H), 7.27 (d,  $J$  = 9.1 Hz, 1H), 6.86



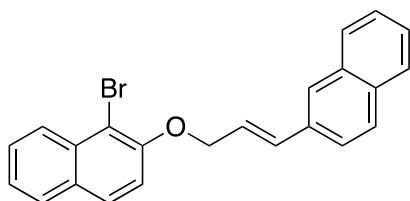
(d,  $J = 16.0$  Hz, 1H), 6.55 (m, 1H), 4.92 (d,  $J = 5.1$  Hz, 2H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  152.8, 139.9, 133.2, 131.4, 130.1, 129.7, 129.0, 128.1, 127.8, 126.9, 126.8(3C), 126.3, 125.6 (2C), 124.7, 115.5, 110.0, 70.3. The data is consistent with *Adv. Synth. Catal.*, 2015, **357**, 2442-2446.

### 3-(3-((1-bromonaphthalen-2-yl)oxy)prop-1-en-1-yl)thiophene (1r)



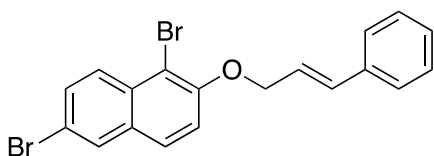
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale brown solid (0.74 g, 71%); mp. 134-135°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  8.24 (d,  $J = 8.6$  Hz, 1H), 7.79 (dd,  $J = 8.5, 4.3$  Hz, 2H), 7.57 (ddd,  $J = 8.4, 6.9, 1.2$  Hz, 1H), 7.41 (ddd,  $J = 8.0, 7.0, 1.0$  Hz, 1H), 7.32 – 7.27 (m, 2H), 7.24 (d,  $J = 1.2$  Hz, 1H), 7.20 (d,  $J = 2.6$  Hz, 1H), 6.81 (d,  $J = 15.9$  Hz, 1H), 6.32 (dt,  $J = 15.9, 5.7$  Hz, 1H), 4.89 (dd,  $J = 5.7, 1.4$  Hz, 2H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  153.1, 139.2, 133.3, 130.2, 129.0, 128.2, 127.8, 127.6, 126.4, 126.3, 125.2, 124.7, 124.1, 123.06, 115.8, 110.0, 70.8. HRMS (EI):  $m/z$  calcd for  $\text{C}_{17}\text{H}_{13}\text{BrOS}$  [ $\text{M}^+$ ]: 343.9870, found: 343.9872.

### 1-bromo-2-((3-(naphthalen-2-yl)allyl)oxy)naphthalene (1s)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale brown solid (0.79 g, 68%); mp. 137-138°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  8.26 (d,  $J = 8.6$  Hz, 1H), 7.80 (dd,  $J = 11.4, 6.0$  Hz, 6H), 7.64 (d,  $J = 8.6$  Hz, 1H), 7.58 (t,  $J = 7.7$  Hz, 1H), 7.44 (tt,  $J = 14.9, 7.4$  Hz, 3H), 7.34 (d,  $J = 9.0$  Hz, 1H), 6.99 (d,  $J = 15.9$  Hz, 1H), 6.61 (dt,  $J = 15.9, 5.5$  Hz, 1H), 4.99 (d,  $J = 5.4$  Hz, 2H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  153.1, 133.9, 133.7, 133.4, 133.3, 133.2, 130.2, 129.0, 128.4, 128.2, 127.8, 127.8, 127.0, 126.4, 126.2, 124.7, 124.6, 123.7, 115.8, 110.1, 70.9. HRMS (EI):  $m/z$  calcd for  $\text{C}_{23}\text{H}_{17}\text{BrO}$  [ $\text{M}^+$ ]: 388.0463, found: 388.0465.

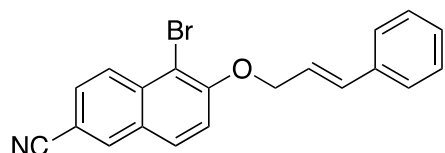
### 1,6-dibromo-2-(cinnamyloxy)naphthalene (1t)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid (0.77 g, 61%); mp. 166-167°C.

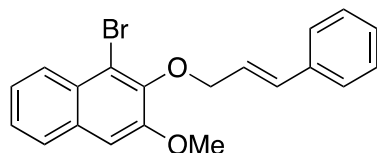
$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  8.10 (d,  $J = 9.0$  Hz, 1H), 7.92 (d,  $J = 2.0$  Hz, 1H), 7.68 (d,  $J = 9.0$  Hz, 1H), 7.60 (dd,  $J = 9.1, 2.0$  Hz, 1H), 7.43 – 7.39 (m, 2H), 7.35 – 7.30 (m, 3H), 7.28 (d,  $J = 1.2$  Hz, 1H), 6.80 (m, 1H), 6.45 (m, 1H), 4.90 (dd,  $J = 5.6, 1.6$  Hz, 2H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  153.2, 136.2, 133.3, 131.8, 130.9, 130.8, 129.8, 128.6 (2C), 128.2, 128.0, 127.9, 126.6 (2C), 123.8, 118.4, 116.4, 109.9, 70.7. The data is consistent with *Adv. Synth. Catal.*, 2015, **357**, 2442-2446.

### 5-bromo-6-(cinnamyloxy)-2-naphthonitrile (1u)



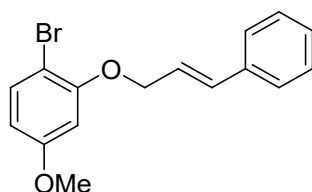
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid (0.67 g, 61%); mp. 149-151°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  8.32 (d,  $J = 8.9$  Hz, 1H), 8.16 (s, 1H), 7.86 (d,  $J = 9.0$  Hz, 1H), 7.67 (d,  $J = 8.9$  Hz, 1H), 7.48 – 7.38 (m, 3H), 7.34 (t,  $J = 7.4$  Hz, 2H), 7.28 (d,  $J = 7.2$  Hz, 1H), 6.83 (d,  $J = 16.0$  Hz, 1H), 6.45 (dt,  $J = 16.0, 5.6$  Hz, 1H), 4.98 (d,  $J = 5.5$  Hz, 2H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  155.4, 136.1, 134.7, 134.2, 133.7, 129.5, 128.7(2C), 128.5, 128.2, 128.0, 127.6, 126.7(2C), 123.3, 119.0, 116.4, 109.5, 107.8, 70.5. HRMS (EI):  $m/z$  calcd for  $\text{C}_{20}\text{H}_{14}\text{BrNO}$  [ $\text{M}^+$ ]: 363.0259, found: 363.0265.

### 1-bromo-2-(cinnamyloxy)-3-methoxynaphthalene (1v)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid (0.72 g, 65%); mp. 182-184°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  8.16 – 8.13 (m, 1H), 7.70 – 7.66 (m, 1H), 7.44 – 7.38 (m, 4H), 7.33 – 7.28 (m, 2H), 7.26 – 7.22 (m, 1H), 7.13 (s, 1H), 6.72 (m, 1H), 6.57 (m, 1H), 4.79 (dd,  $J = 6.3, 1.3$  Hz, 2H), 3.97 (s, 3H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  152.5, 146.0, 136.6, 133.5, 131.5, 128.5(2C), 127.9, 127.8, 126.8, 126.7, 126.6(2C), 126.0, 125.1, 125.0, 116.9, 106.8, 74.1, 55.9. HRMS (EI):  $m/z$  calcd for  $\text{C}_{20}\text{H}_{17}\text{BrO}_2$  [ $\text{M}^+$ ]: 368.0412, found: 368.0418.

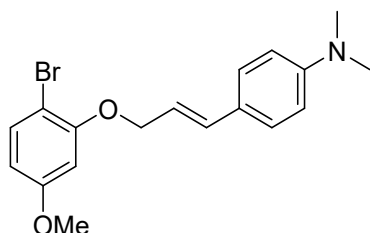
### 1-bromo-2-(cinnamyloxy)-4-methoxybenzene (1w)



Following the general procedure, the compound was purified by flash chromatography

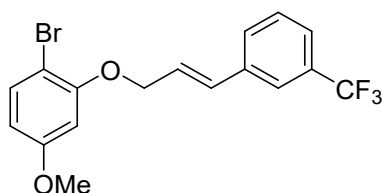
(petroleum ether/ethyl acetate = 200:1) as a colorless oil in 87% yield.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.47 (d,  $J = 7.0$  Hz, 3H), 7.38 (t,  $J = 7.2$  Hz, 2H), 7.32 (d,  $J = 7.7$  Hz, 1H), 6.83 (d,  $J = 16.0$  Hz, 1H), 6.59 (s, 1H), 6.46 (d,  $J = 9.3$  Hz, 2H), 4.79 (d,  $J = 4.5$  Hz, 2H), 3.83 (s, 3H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  160.2, 155.8, 136.5, 133.3(2C), 128.7(2C), 128.1, 126.8(2C), 126.8, 123.9, 106.5, 103.2, 101.7, 69.8, 55.7. HRMS (EI):  $m/z$  calcd for  $\text{C}_{16}\text{H}_{15}\text{BrO}_2$  [ $\text{M}^+$ ]: 318.0255, found: 318.0263.

**4-(3-(2-bromo-5-methoxyphenoxy)prop-1-en-1-yl)-*N,N*-dimethylaniline (1x)**



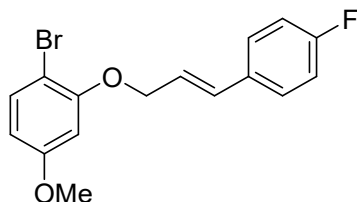
Following the general procedure, the compound was obtained as a pale-yellow oil in 71% crude yield. Due to the instability of **1x**, we failed to get the pure NMR spectra of **1x**. Crude **1x** was directly used for the next reaction.

**1-bromo-4-methoxy-2-((3-(3-(trifluoromethyl)phenyl)allyl)oxy)benzene (1y)**



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a colorless oil in 74% yield.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.51 (s, 1H), 7.40 (dd,  $J = 23.0, 7.7$  Hz, 2H), 7.35 – 7.22 (m, 2H), 6.68 (d,  $J = 16.0$  Hz, 1H), 6.39 (d,  $J = 2.7$  Hz, 1H), 6.37 – 6.26 (m, 2H), 4.66 – 4.51 (m, 2H), 3.64 (s, 3H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  160.2, 155.5, 137.3, 133.4, 131.3, 131.0, 129.8, 129.1, 125.9, 124.5, 124.2, 123.3, 106.5, 103.1, 101.5, 69.2, 55.6. HRMS (EI):  $m/z$  calcd for  $\text{C}_{17}\text{H}_{14}\text{BrF}_3\text{O}_2$  [ $\text{M}^+$ ]: 386.0129, found: 386.0135.

**1-bromo-2-((3-(4-fluorophenyl)allyl)oxy)-4-methoxybenzene (1z)**

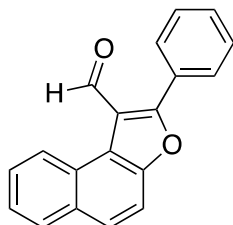


Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a colorless oil in 84% yield.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  7.43 (d,  $J = 8.7$  Hz, 1H), 7.38 (dd,  $J = 8.6, 5.5$  Hz, 2H), 7.02 (t,  $J = 8.7$  Hz, 2H), 6.75 (d,  $J = 16.0$  Hz, 1H), 6.53 (d,  $J = 2.7$  Hz, 1H), 6.42 (dd,  $J = 8.7, 2.7$  Hz, 1H), 6.33 (dt,  $J = 15.9,$

5.6 Hz, 1H), 4.80 – 4.65 (m, 2H), 3.79 (s, 3H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 162.7, 160.2, 155.7, 133.4, 132.5, 132.1, 128.4, 128.3, 123.6, 115.8, 115.5, 106.5, 103.3, 101.7, 69.7, 55.7. HRMS (EI): *m/z* calcd for C<sub>16</sub>H<sub>14</sub>BrFO<sub>2</sub> [M<sup>+</sup>]: 336.0161, found: 336.0169.

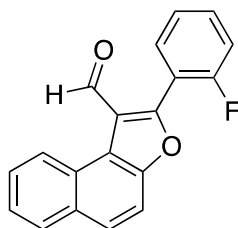
### 3.1 Characterization Data for products (2)

#### 2-(phenylnaphtho[2,1-*b*]furan-1-carbaldehyde (2a)



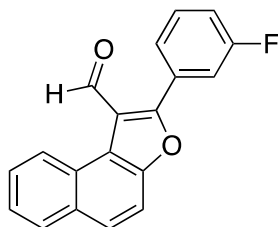
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 71% yield, 97 mg; mp. 125-126°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.30 (s, 1H), 9.54 (dd, *J* = 8.5, 1.2 Hz, 1H), 7.93 (d, *J* = 8.1, 0.9 Hz, 1H), 7.83 (d, *J* = 8.9 Hz, 1H), 7.79 (m, 2H), 7.70 – 7.65 (m, 2H), 7.59 – 7.54 (m, 4H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 186.8, 167.1, 152.6, 131.4, 130.9, 129.9, 129.0, 128.7, 128.6, 128.5, 128.2, 127.8, 126.9, 125.5, 120.4, 120.2, 111.7. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

#### 2-(2-fluorophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2b)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 47% yield, 68 mg; mp. 141-142°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.05 (d, *J* = 3.6 Hz, 1H), 9.44 (d, *J* = 8.4 Hz, 1H), 7.85 (d, *J* = 8.1 Hz, 1H), 7.76 (d, *J* = 8.8 Hz, 1H), 7.60 (dd, *J* = 8.3, 5.9 Hz, 3H), 7.47 (t, *J* = 7.5 Hz, 2H), 7.26 (t, *J* = 7.3 Hz, 1H), 7.21 – 7.13 (m, 1H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 185.2 (d, *J* = 4.8 Hz), 160.2, 157.8, 152.3, 131.9 (d, *J* = 8.4 Hz), 131.1 (d, *J* = 1.6 Hz), 130.4, 127.6, 127.4, 127.3, 126.8, 126.0, 124.5, 123.6 (d, *J* = 3.8 Hz), 120.7, 118.7, 116.0 (d, *J* = 13.6 Hz), 115.6 (d, *J* = 21.8 Hz), 110.7. HRMS (EI): *m/z* calcd for C<sub>19</sub>H<sub>11</sub>FO<sub>2</sub> [M<sup>+</sup>]: 290.0743, found: 290.0745.

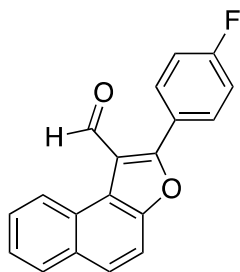
#### 2-(3-fluorophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2c)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a white solid in 51% yield, 74 mg; mp. 151-152°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.36 (s, 1H), 9.51 (d, *J* = 8.4 Hz, 1H), 8.00 – 7.94 (m, 1H), 7.89 (d, *J* = 8.9 Hz, 1H), 7.74 – 7.67 (m, 2H), 7.63 – 7.53 (m, 4H), 7.33 – 7.26 (m, 1H). <sup>13</sup>C NMR

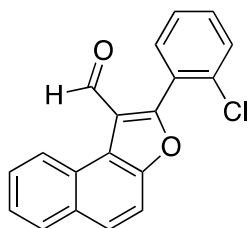
(100 MHz, CDCl<sub>3</sub>)  $\delta$  186.3, 164.9 (d,  $J$  = 253.8 Hz), 152.7, 131.5, 130.7 (d,  $J$  = 8.0 Hz), 128.7 (d,  $J$  = 3.3 Hz), 128.6, 128.4, 127.7, 127.1, 125.8, 125.6, 120.9, 120.1, 118.0, 117.8 (d,  $J$  = 21.4 Hz), 116.7 (d,  $J$  = 23.4 Hz), 116.5, 111.6. HRMS (EI):  $m/z$  calcd for C<sub>19</sub>H<sub>11</sub>FO<sub>2</sub>[M<sup>+</sup>]: 290.0743, found: 290.0741.

### 2-(3-fluorophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2d)



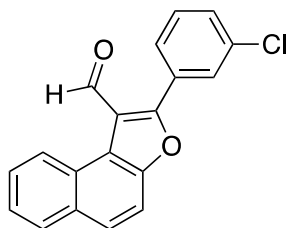
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a white solid in 72% yield, 104 mg; mp. 157-158°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  10.26 (s, 1H), 9.49 (d,  $J$  = 8.4 Hz, 1H), 7.94 (d,  $J$  = 8.1 Hz, 1H), 7.84 (d,  $J$  = 9.0 Hz, 1H), 7.82 – 7.76 (m, 2H), 7.67 (dd,  $J$  = 8.7, 6.7 Hz, 2H), 7.55 (m, 1H), 7.28 (d,  $J$  = 8.5 Hz, 2H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  186.3, 165.8, 164.3 (d,  $J$  = 252.9 Hz), 152.5, 131.9 (d,  $J$  = 8.7 Hz) (2C), 131.5, 128.6, 128.4 (d,  $J$  = 3.3 Hz), 128.3, 127.7, 127.0, 125.5, 124.9 (d,  $J$  = 3.3 Hz), 120.2, 120.1, 116.3 (d,  $J$  = 22.0 Hz) (2C), 111.6. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

### 2-(2-chlorophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2e)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a yellow solid in 34% yield, 52 mg; mp. 144-145°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  9.95 (s, 1H), 9.47 (dd,  $J$  = 8.5, 1.1 Hz, 1H), 7.93 – 7.88 (m, 1H), 7.82 (d,  $J$  = 8.9 Hz, 1H), 7.64 (m, 2H), 7.58 – 7.52 (m, 2H), 7.51 – 7.48 (m, 1H), 7.46 (dd,  $J$  = 8.0, 1.8 Hz, 1H), 7.40 (m, 1H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>)  $\delta$  185.1, 163.5, 152.2, 133.8, 132.1, 131.1, 130.4, 129.5, 127.6, 127.4, 127.3, 126.9, 126.8, 126.0, 125.9, 124.6, 121.1, 118.4, 110.8. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

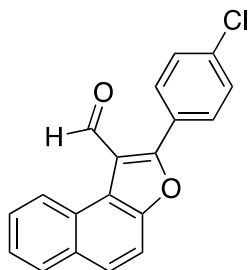
### 2-(3-chlorophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2f)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a white solid in 54% yield, 83 mg; mp. 160-161°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>)  $\delta$  10.31 (s, 1H), 9.48 (d,  $J$  = 8.4 Hz, 1H), 7.95 (d,  $J$  = 8.1 Hz, 1H),

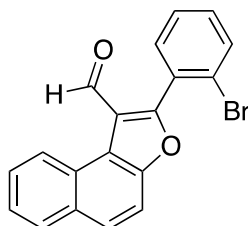
7.86 (d,  $J = 8.9$  Hz, 1H), 7.82 (t,  $J = 1.9$  Hz, 1H), 7.69 (q,  $J = 2.9, 1.6$  Hz, 2H), 7.68 – 7.66 (m, 1H), 7.60 – 7.47 (m, 3H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  186.2, 164.8, 152.7, 135.2, 131.5, 130.8, 130.3, 130.2, 129.6, 128.8, 128.7, 128.4, 128.0, 127.7, 127.1, 125.6, 120.9, 120.0, 111.6. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

### 2-(4-chlorophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2g)



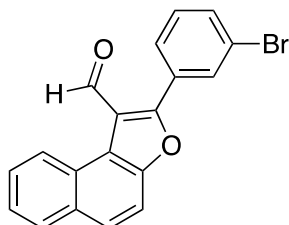
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a white solid in 73% yield, 112 mg; mp. 165-166°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  10.24 (s, 1H), 9.45 – 9.40 (m, 1H), 7.91 – 7.87 (m, 1H), 7.80 (d,  $J = 8.9$  Hz, 1H), 7.72 – 7.67 (m, 2H), 7.62 (dd,  $J = 8.5, 6.4$  Hz, 2H), 7.53 – 7.47 (m, 3H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  186.2, 165.4, 152.7, 137.3, 131.5, 131.0 (2C), 129.4 (2C), 128.7, 128.5, 128.4, 127.7, 127.1, 127.0, 125.6, 120.7, 120.1, 111.6. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

### 2-(2-bromophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2h)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a yellow solid in 28% yield, 49 mg; mp. 149-151°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  9.99 (s, 1H), 9.55 (d,  $J = 8.4$  Hz, 1H), 7.93 (d,  $J = 8.1$  Hz, 1H), 7.84 (d,  $J = 8.9$  Hz, 1H), 7.74 (d,  $J = 8.0$  Hz, 1H), 7.67 (d,  $J = 8.6$  Hz, 2H), 7.56 (d,  $J = 7.5$  Hz, 2H), 7.45 (t,  $J = 7.4$  Hz, 1H), 7.42 – 7.35 (m, 1H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  186.1, 166.0, 153.1, 133.6, 133.3, 132.3, 131.5, 130.0, 128.7, 128.5, 128.4, 127.9, 127.5, 127.1, 125.6, 124.4, 121.9, 119.4, 111.8. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

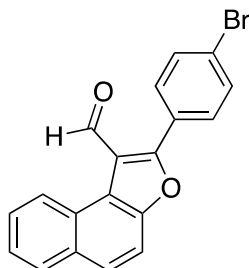
### 2-(3-bromophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2i)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 53% yield, 93 mg; mp. 162-164°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  10.33 (s, 1H), 9.50 (dd,  $J = 8.6, 1.1$  Hz, 1H), 7.99 (t,  $J = 1.8$  Hz, 1H), 7.98 – 7.94 (m, 1H), 7.88 (d,  $J = 8.9$  Hz, 1H), 7.76 – 7.67 (m, 4H), 7.57 (ddd,  $J =$

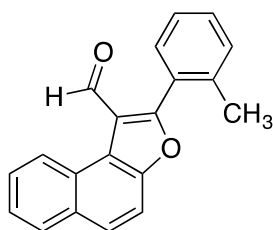
8.1, 6.9, 1.2 Hz, 1H), 7.45 (t,  $J = 7.9$  Hz, 1H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  186.2, 164.7, 152.8, 133.8, 132.4, 131.5, 130.6, 130.4, 128.7(2C), 128.5, 128.4, 127.7, 127.1, 125.7, 123.1, 121.0, 120.1, 111.6. HRMS (EI):  $m/z$  calcd for  $\text{C}_{19}\text{H}_{11}\text{BrO}_2$  [ $\text{M}^+$ ]: 349.9942, found: 349.9939.

### 2-(4-bromophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2j)



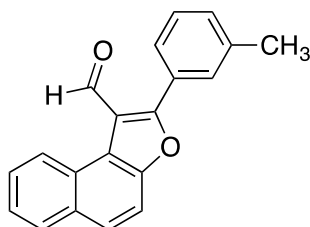
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 66% yield, 116 mg; mp. 170-171°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  10.32 (s, 1H), 9.50 (d,  $J = 8.4$  Hz, 1H), 8.01 – 7.94 (m, 1H), 7.89 (d,  $J = 9.0$  Hz, 1H), 7.75 – 7.72 (m, 3H), 7.72 – 7.68 (m, 3H), 7.58 (m, 1H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  186.3, 165.5, 152.7, 132.3(2C), 131.5, 131.2(2C), 128.7, 128.6, 128.4, 127.7, 127.6, 127.1, 125.7, 125.6, 120.7, 120.2, 111.7. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

### 2-(*o*-tolyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2k)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a yellow solid in 36% yield, 54 mg; mp. 139-141°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  9.91 (s, 1H), 9.50 (d,  $J = 8.5$  Hz, 1H), 7.88 (d,  $J = 8.1$  Hz, 1H), 7.79 (d,  $J = 8.9$  Hz, 1H), 7.62 (dt,  $J = 8.4, 3.2$  Hz, 2H), 7.50 – 7.47 (m, 1H), 7.43 – 7.39 (m, 2H), 7.34 – 7.27 (m, 2H), 2.33 (s, 3H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  186.7, 168.7, 152.8, 138.7, 132.2, 131.5, 131.0, 130.9, 128.6, 128.4, 128.1, 128.0, 127.9, 126.9, 125.8, 125.5, 121.6, 119.6, 111.7, 20.3. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

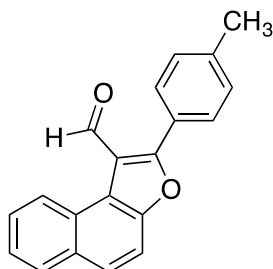
### 2-(*m*-tolyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2l)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 52% yield, 74 mg; mp. 122-123°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  10.32 (s, 1H), 9.57 (dd,  $J = 8.5, 1.1$  Hz, 1H), 7.99 – 7.91 (m, 1H), 7.86 (d,  $J = 8.9$  Hz, 1H), 7.73 – 7.66 (m, 2H), 7.64 – 7.59 (m, 2H), 7.57 (m, 1H), 7.50 – 7.44 (m, 1H), 7.40 (m, 1H), 2.49 (s, 3H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  186.9, 167.5, 152.5,

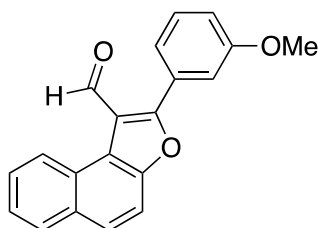
138.9, 131.7, 131.4, 130.4, 128.8, 128.6, 128.5, 128.4, 128.1, 127.8, 127.2, 126.8, 125.4, 120.3, 120.2, 111.6, 21.4. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

### 2-(p-tolyl)naphtho[2,1-b]furan-1-carbaldehyde (2m)



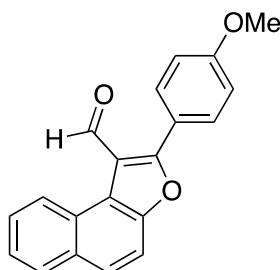
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 73% yield, 105 mg; mp. 153-155°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.29 (s, 1H), 9.55 (d, *J* = 8.5 Hz, 1H), 7.93 (d, *J* = 8.2 Hz, 1H), 7.83 (d, *J* = 8.9 Hz, 1H), 7.71 – 7.66 (m, 4H), 7.57 – 7.52 (m, 1H), 7.36 (d, *J* = 7.8 Hz, 2H), 2.46 (s, 3H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 186.8, 167.6, 152.5, 141.4, 131.4, 129.8 (2C), 129.7 (2C), 128.6, 128.5, 128.1, 127.9, 126.8, 125.9, 125.4, 120.3, 120.1, 111.7, 21.6. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

### 2-(3-methoxyphenyl)naphtho[2,1-b]furan-1-carbaldehyde (2n)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 48% yield, 73 mg; mp. 120-121°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.26 (s, 1H), 9.47 (d, *J* = 8.5 Hz, 1H), 7.87 (d, *J* = 8.1 Hz, 1H), 7.78 (d, *J* = 8.9 Hz, 1H), 7.64 – 7.58 (m, 2H), 7.51 – 7.46 (m, 1H), 7.40 (t, *J* = 7.9 Hz, 1H), 7.31 – 7.26 (m, 2H), 7.04 (dd, *J* = 8.3, 2.6 Hz, 1H), 3.83 (s, 3H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 186.8, 166.9, 159.9, 152.6, 131.5, 130.1, 129.8, 128.6, 128.5, 128.3, 127.8, 126.9, 125.5, 122.6, 120.5, 120.2, 116.8, 114.9, 111.7, 55.6. HRMS (EI): *m/z* calcd for C<sub>20</sub>H<sub>14</sub>O<sub>3</sub> [M<sup>+</sup>]: 302.0943, found: 302.0939.

### 2-(4-methoxyphenyl)naphtho[2,1-b]furan-1-carbaldehyde (2o)

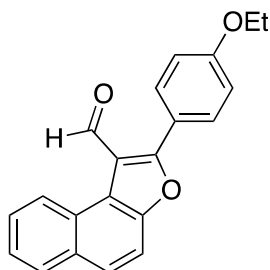


Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 66% yield, 99 mg; mp. 131-133°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.29 (s, 1H), 9.56 (d, *J* = 8.5 Hz, 1H), 7.95 (d, *J* = 8.0 Hz, 1H), 7.85 (d, *J* = 8.9 Hz, 1H), 7.77 (d, *J* = 8.8 Hz, 2H), 7.68 (t, *J* = 8.9 Hz, 2H), 7.56 (t, *J* =



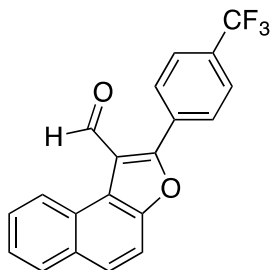
7.9 Hz, 1H), 7.09 (d,  $J = 8.8$  Hz, 2H), 3.92 (s, 3H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  186.8, 167.5, 161.8, 152.3, 131.5(2C), 131.4, 128.6, 128.4, 127.9, 127.8, 126.8, 125.4, 121.1, 120.3, 119.6, 114.5(2C), 111.6, 55.5. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

### 2-(4-ethoxyphenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2p)



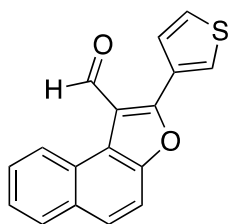
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a yellow solid in 75% yield, 119 mg; mp. 129-131°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  10.27 (d,  $J = 1.2$  Hz, 1H), 9.55 (dd,  $J = 8.5, 1.2$  Hz, 1H), 7.94 (dd,  $J = 8.1, 1.3$  Hz, 1H), 7.85 – 7.79 (m, 1H), 7.76 – 7.71 (m, 2H), 7.70 – 7.65 (m, 2H), 7.54 (m, 1H), 7.08 – 7.03 (m, 2H), 4.11 (qd,  $J = 7.0, 6.5, 2.8$  Hz, 2H), 1.47 (t,  $J = 7.0$  Hz, 3H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  186.8, 167.6, 161.2, 152.3, 131.5 (2C), 131.4, 128.6, 128.4, 127.9, 127.8, 126.7, 125.4, 120.9, 120.3, 119.5, 115.0 (2C), 111.6, 63.8, 14.7. HRMS (EI):  $m/z$  calcd for  $\text{C}_{21}\text{H}_{16}\text{O}_3$  [ $\text{M}^+$ ]: 316.1099, found: 316.1096.

### 1-bromo-2-(trifluoromethoxy)naphtho[2,1-*b*]furan-1-carbaldehyde (2q)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a yellow solid in 44% yield, 75 mg; mp. 153-154°C.  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  10.30 (s, 1H), 9.44 (dd,  $J = 8.5, 1.2$  Hz, 1H), 7.93 (dd,  $J = 8.3, 1.3$  Hz, 1H), 7.90 (d,  $J = 8.2$  Hz, 2H), 7.83 (d,  $J = 3.4$  Hz, 2H), 7.81 (s, 1H), 7.70 – 7.64 (m, 2H), 7.56 (ddd,  $J = 8.1, 6.8, 1.2$  Hz, 1H).  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  185.8, 164.0, 152.7, 132.0 (q,  $J = 33.0$  Hz), 131.8, 131.2, 129.8(2C), 128.6, 128.5, 128.1, 127.3, 126.9, 125.7 (q,  $J = 3.7$  Hz), 125.5, 124.9 (q,  $J = 272.5$  Hz), 122.1, 121.1, 119.8, 111.4. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

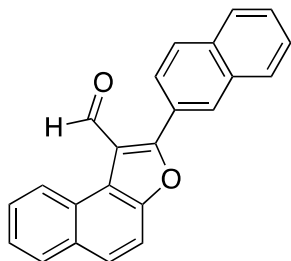
### 2-(thiophen-3-yl)naphtho[2,1-*b*]furan-1-carbaldehyde (2r)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 58% yield, 81 mg; mp. 174-

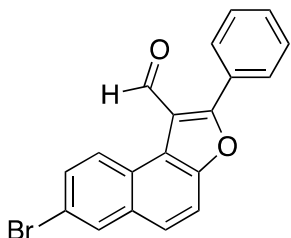
176°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.57 (s, 1H), 9.40 (d, *J* = 8.5 Hz, 1H), 7.91 – 7.9 (m, 1H), 7.80 (d, *J* = 8.9 Hz, 1H), 7.75 (m, 1H), 7.71 – 7.63 (m, 3H), 7.54 (dd, *J* = 8.1, 5.1, 1.3 Hz, 1H), 7.25 (d, *J* = 3.8 Hz, 1H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 185.5, 160.1, 152.3, 131.5, 130.8, 130.4, 130.2, 128.7, 128.4, 128.3, 128.2, 127.5, 127.0, 125.5, 120.3, 119.7, 111.5. HRMS (EI): *m/z* calcd for C<sub>17</sub>H<sub>10</sub>O<sub>2</sub>S [M<sup>+</sup>]: 278.0402, found: 278.0399.

### 2-(naphthalen-2-yl)naphtho[2,1-*b*]furan-1-carbaldehyde (2s)



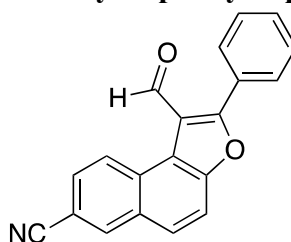
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 62% yield, 100 mg; mp. 181–182°C. <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>) δ 10.44 (s, 1H), 9.59 (d, *J* = 8.4 Hz, 1H), 8.30 (s, 1H), 8.05 (d, *J* = 8.5 Hz, 1H), 8.02 – 7.98 (m, 2H), 7.95 (t, *J* = 7.8 Hz, 2H), 7.90 (d, *J* = 8.8 Hz, 1H), 7.76 (d, *J* = 8.9 Hz, 1H), 7.72 (t, *J* = 7.5 Hz, 1H), 7.64 – 7.62 (m, 2H), 7.60–7.58 (m, 1H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 187.0, 167.1, 152.8, 134.1, 132.9, 131.5, 130.7, 128.9, 128.8, 128.6, 128.5, 128.3, 128.0, 127.9, 127.8, 127.3, 126.9, 126.0, 125.8, 125.5, 120.6, 120.3, 111.7. HRMS (EI): *m/z* calcd for C<sub>23</sub>H<sub>14</sub>O<sub>2</sub> [M<sup>+</sup>]: 322.0994, found: 322.0997.

### 7-bromo-2-phenylnaphtho[2,1-*b*]furan-1-carbaldehyde (2t)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a white solid in 49% yield, 86 mg; mp. 179–180°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.29 (s, 1H), 9.46 (d, *J* = 9.0 Hz, 1H), 8.09 (d, *J* = 3.7 Hz, 1H), 8.07 (d, *J* = 3.2 Hz, 1H), 7.95 (d, *J* = 2.0 Hz, 1H), 7.81 (m, 1H), 7.74 (d, *J* = 7.7 Hz, 1H), 7.72 (d, *J* = 4.8 Hz, 1H), 7.62 (d, *J* = 2.7 Hz, 1H), 7.60 (d, *J* = 2.5 Hz, 2H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 186.7, 167.6, 152.5, 151.6, 132.7, 131.7, 131.1, 130.5, 129.9(2C), 129.1, 128.4, 128.1, 127.2, 120.1, 119.4, 118.2, 112.8, 111.0. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935–4938.

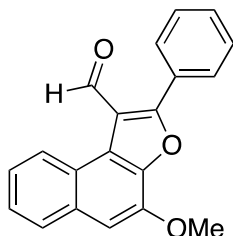
### 1-formyl-2-phenylnaphtho[2,1-*b*]furan-7-carbonitrile (2u)



Following the general procedure, the compound was purified by flash chromatography

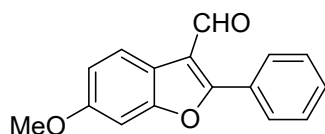
(petroleum ether/ethyl acetate = 100:1) as a yellow solid in 35% yield, 52 mg; mp. 218-220°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.30 (s, 1H), 9.86 – 9.49 (m, 1H), 8.31 (d, *J* = 3.9 Hz, 1H), 7.94 – 7.88 (m, 1H), 7.83 (d, *J* = 7.7 Hz, 4H), 7.63 (d, *J* = 4.8 Hz, 3H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 186.5, 168.1, 153.8, 134.3, 131.4, 130.4, 130.3, 130.0(2C), 129.3, 129.2(2C), 128.3, 128.1, 127.5, 120.5, 120.0, 119.2, 113.7, 109.0. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

#### 4-methoxy-2-phenylnaphtho[2,1-*b*]furan-1-carbaldehyde (2v)



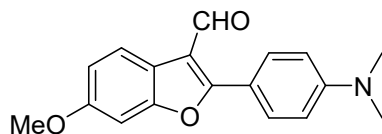
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 61% yield, 92 mg; mp. 206-207°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.31 (s, 1H), 9.45 (d, *J* = 7.6 Hz, 1H), 7.84 (d, *J* = 6.1 Hz, 3H), 7.60 – 7.52 (m, 5H), 7.20 (s, 1H), 4.13 (s, 3H). <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ 186.8, 167.4, 144.9, 144.3, 132.5, 130.9, 130.1 (2C), 128.9 (2C), 128.5, 127.5, 127.3, 125.9, 124.6, 123.9, 122.0, 120.5, 105.5, 56.0. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

#### 6-methoxy-2-phenylbenzofuran-3-carbaldehyde (2w)



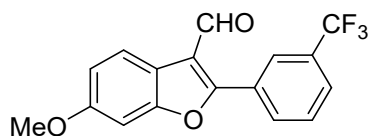
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a yellow solid in 64% yield, 81 mg; mp. 117-119°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.30 (s, 1H), 8.13 (d, *J* = 8.6 Hz, 1H), 7.87 – 7.77 (m, 2H), 7.55 (q, *J* = 3.7 Hz, 3H), 7.07 (d, *J* = 2.1 Hz, 1H), 7.00 (dd, *J* = 8.6, 2.2 Hz, 1H), 3.88 (s, 3H). <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) δ 186.8, 164.7, 159.2, 155.3, 130.9, 129.2(2C), 129.0(2C), 128.9, 123.0, 118.7, 117.7, 113.6, 95.9, 55.9. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938.

#### 2-(4-(dimethylamino)phenyl)-6-methoxybenzofuran-3-carbaldehyde (2x)



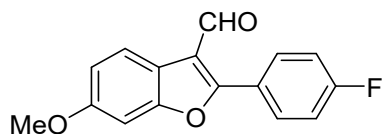
Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 50:1) as a yellow solid in 61% yield, 90 mg; mp. 107-109°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.28 (s, 1H), 8.08 (d, *J* = 8.6 Hz, 1H), 7.73 (d, *J* = 8.9 Hz, 2H), 7.04 (d, *J* = 2.1 Hz, 1H), 6.95 (dd, *J* = 8.6, 2.2 Hz, 1H), 6.80 (d, *J* = 9.0 Hz, 2H), 3.87 (s, 3H), 3.08 (s, 6H). <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) δ 186.8, 166.5, 158.6, 154.8, 152.1, 130.2(2C), 122.5, 119.4, 116.1, 115.6, 112.8, 112.0(2C), 96.0, 55.9, 40.3(2C). HRMS (ESI): *m/z* calcd for C<sub>18</sub>H<sub>18</sub>NO<sub>3</sub> [M + H]<sup>+</sup>: 296.1282, found: 296.1286.

### 6-methoxy-2-(3-(trifluoromethyl)phenyl)benzofuran-3-carbaldehyde (2y)



Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 51% yield, 82 mg; mp. 106-107°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.33 (s, 1H), 8.13 (d, *J* = 8.5 Hz, 2H), 8.03 (d, *J* = 7.8 Hz, 1H), 7.80 (d, *J* = 7.8 Hz, 1H), 7.70 (t, *J* = 7.8 Hz, 1H), 7.10 (d, *J* = 2.1 Hz, 1H), 7.02 (dd, *J* = 8.6, 2.2 Hz, 1H), 3.90 (s, 3H). <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) δ 186.0, 162.0, 159.7, 155.5, 132.0, 131.9, 129.9, 129.8, 127.3, 125.6, 123.8, 123.2, 118.5(2C), 114.1, 95.9, 55.9. HRMS (EI): *m/z* calcd for C<sub>17</sub>H<sub>11</sub>F<sub>3</sub>O<sub>3</sub> [M<sup>+</sup>]: 320.0660, found: 320.0663.

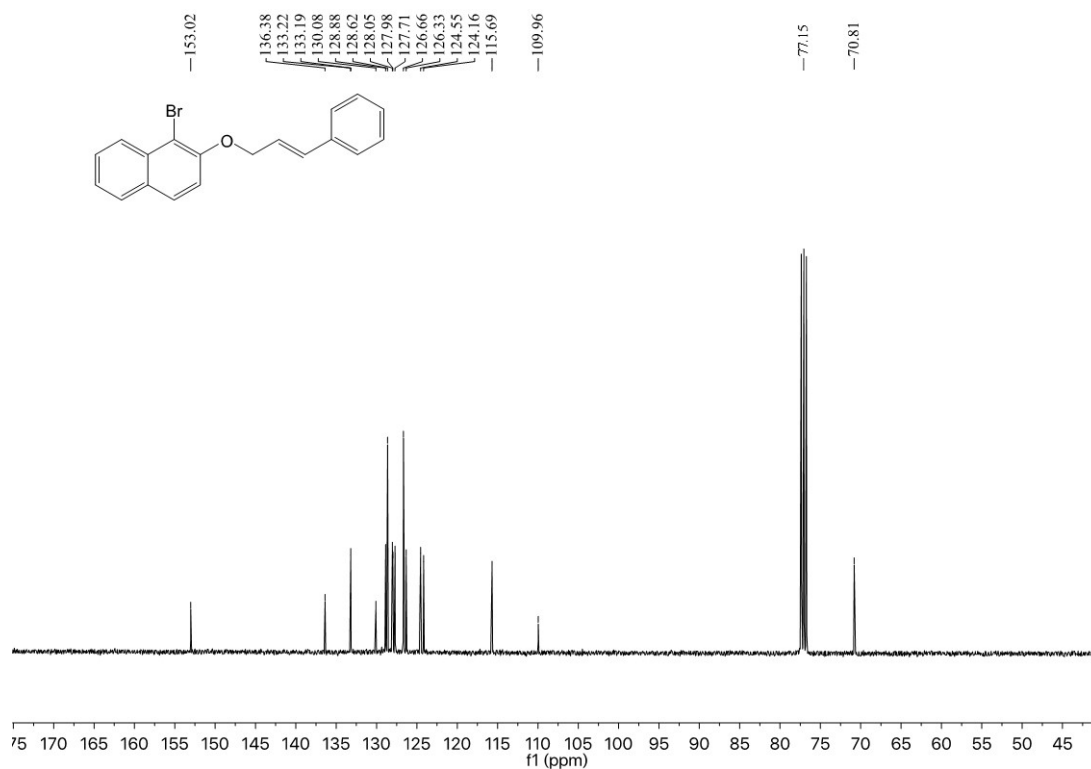
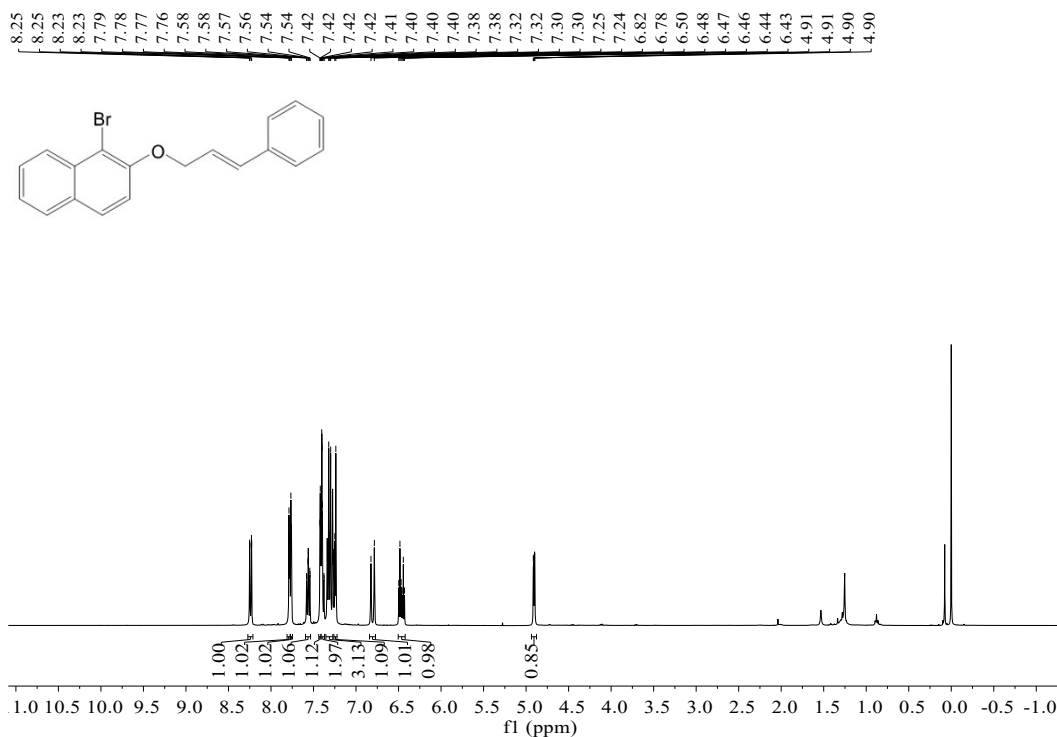
### 2-(4-fluorophenyl)-6-methoxybenzofuran-3-carbaldehyde (2z)

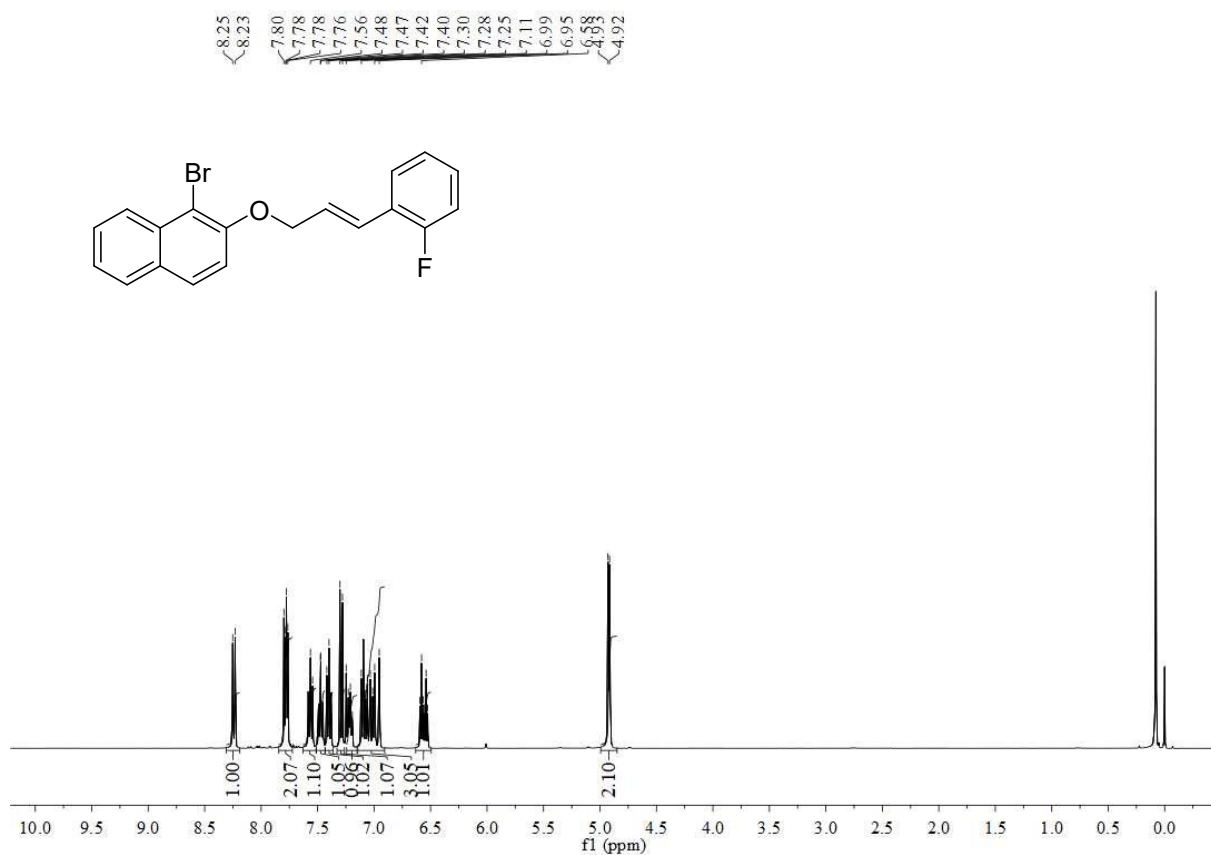


Following the general procedure, the compound was purified by flash chromatography (petroleum ether/ethyl acetate = 200:1) as a pale-yellow solid in 63% yield, 85 mg; mp. 126-127°C. <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 10.17 (s, 1H), 8.01 (d, *J* = 8.6 Hz, 1H), 7.73 (dd, *J* = 8.7, 5.3 Hz, 2H), 7.16 (t, *J* = 8.5 Hz, 2H), 6.96 (d, *J* = 2.1 Hz, 1H), 6.90 (dd, *J* = 8.6, 2.1 Hz, 1H), 3.79 (s, 3H). <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) δ 186.4, 164.4, 163.4, 159.3, 155.2, 131.0, 130.9, 125.1, 122.9, 118.6, 117.5, 116.6, 114.4, 113.6, 95.9, 55.9. The data is consistent with *Chem. Commun.*, 2018, **54**, 4935-4938

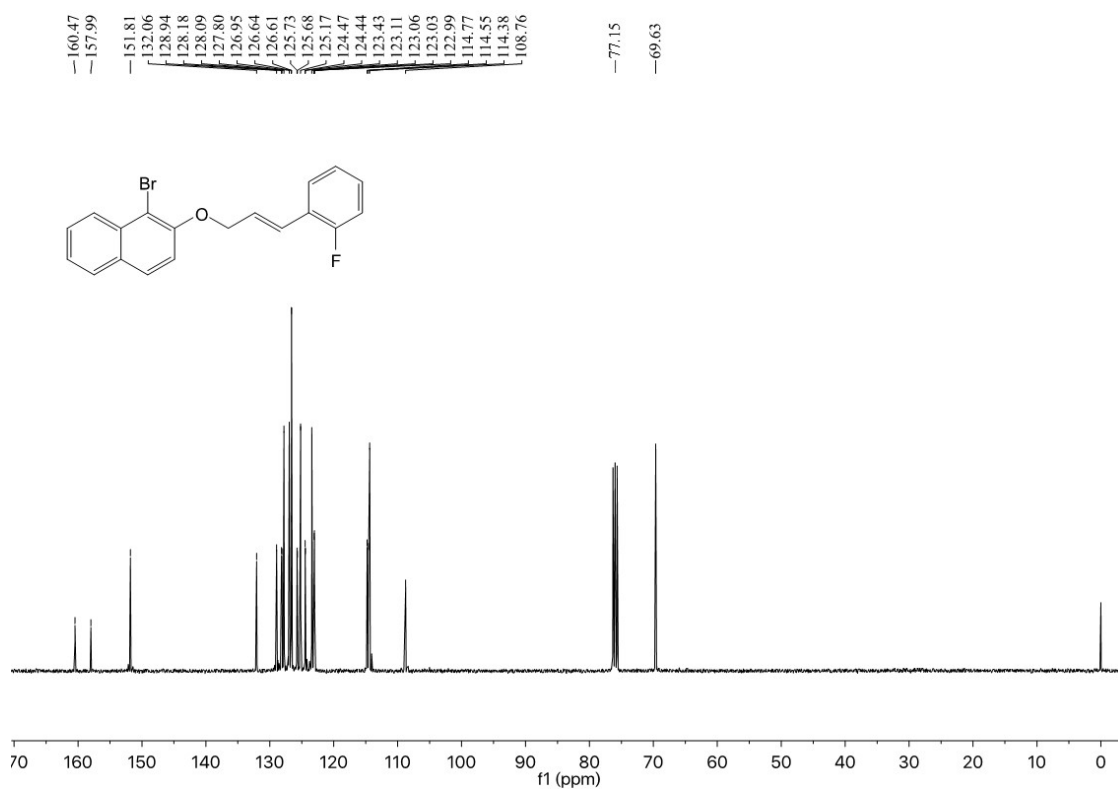
## 4. Copies of NMR Spectra

### 4.1 Copies of Substrates NMR Spectra

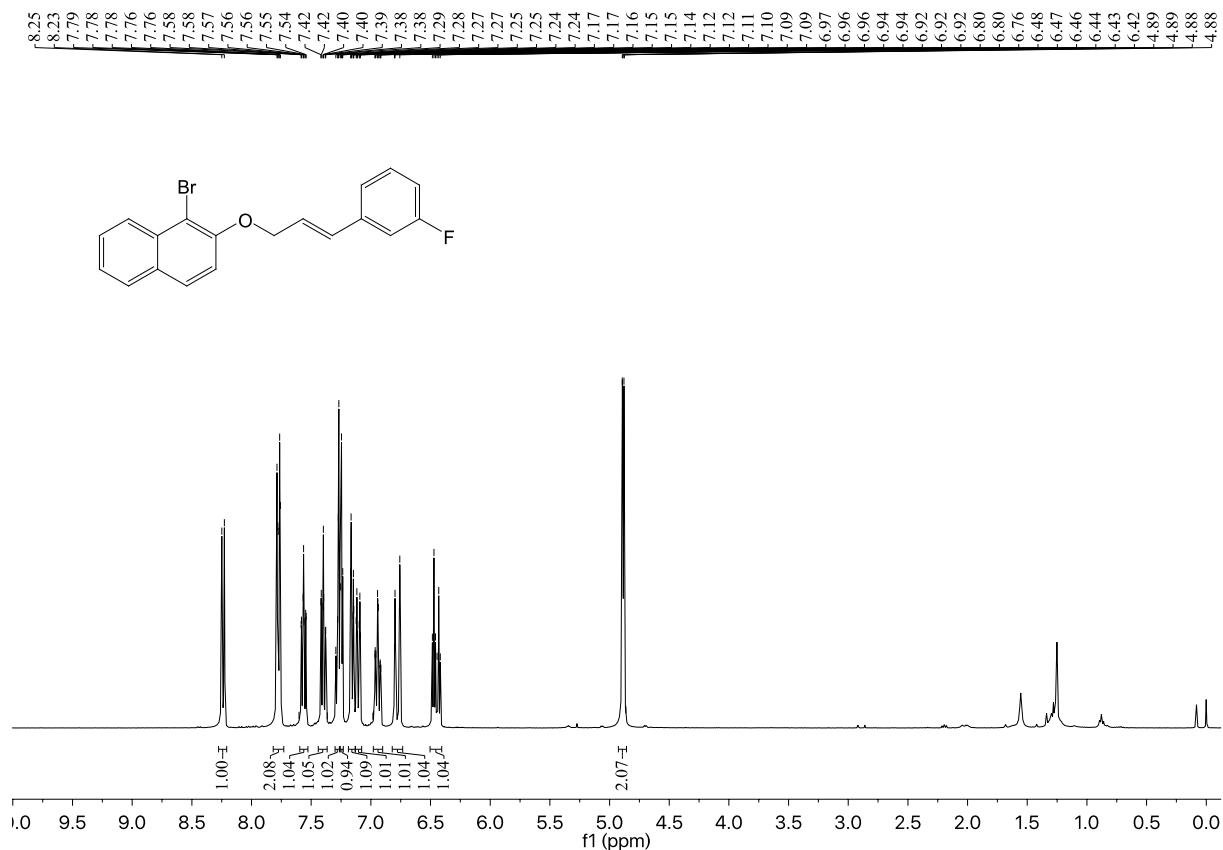




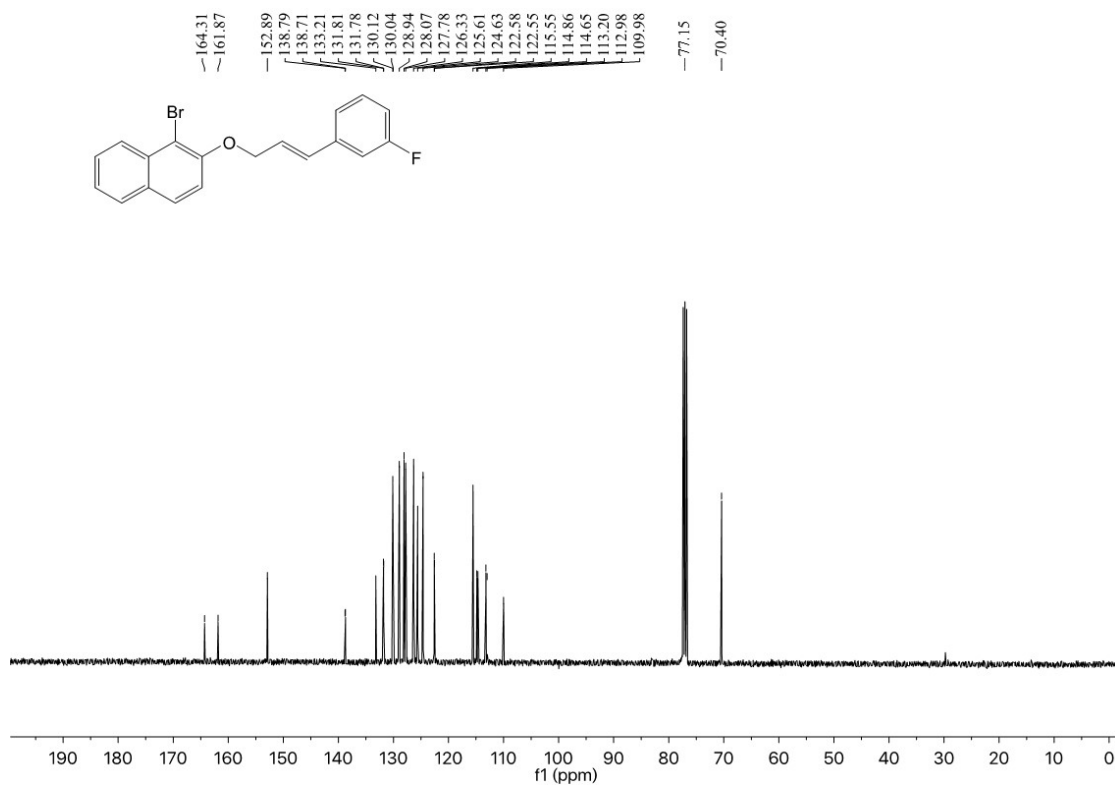
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(2-fluorophenyl)allyl)oxy)naphthalene (1b)



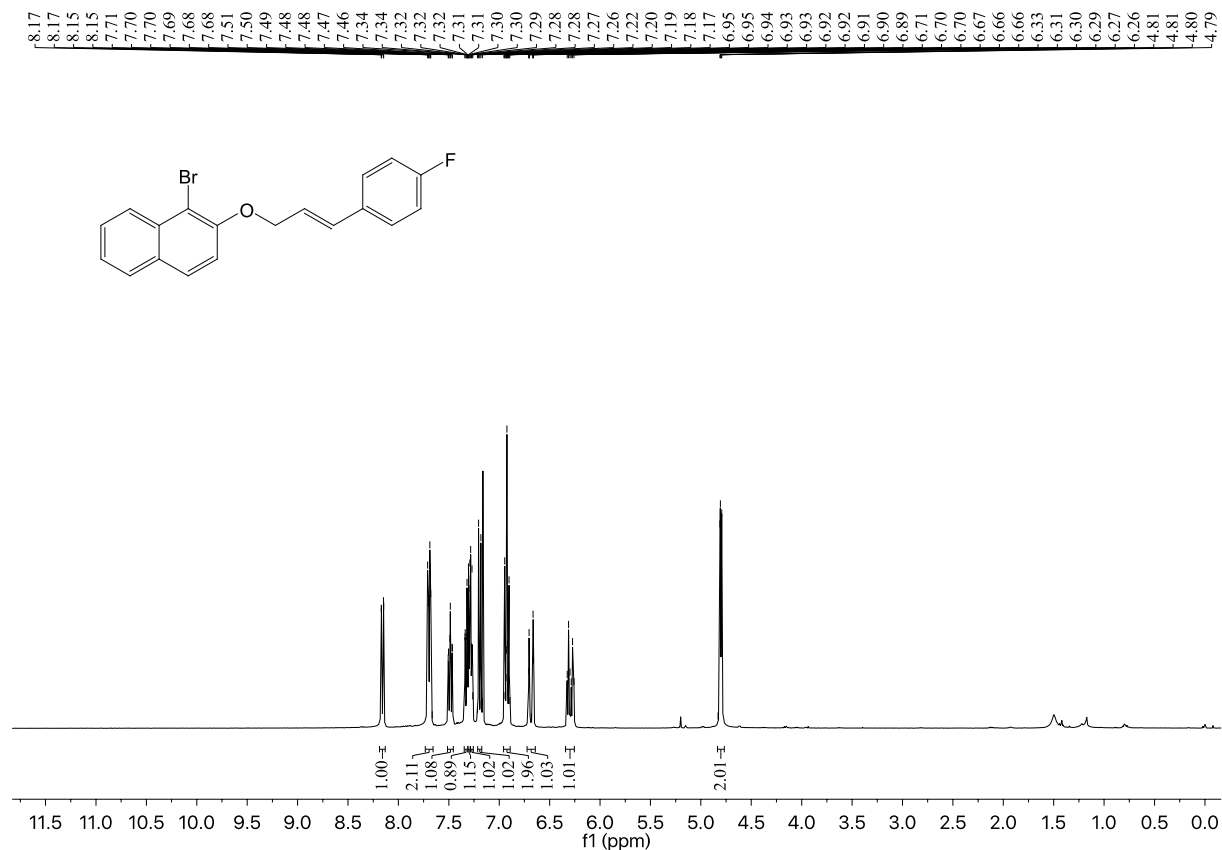
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(2-fluorophenyl)allyl)oxy)naphthalene (1b)



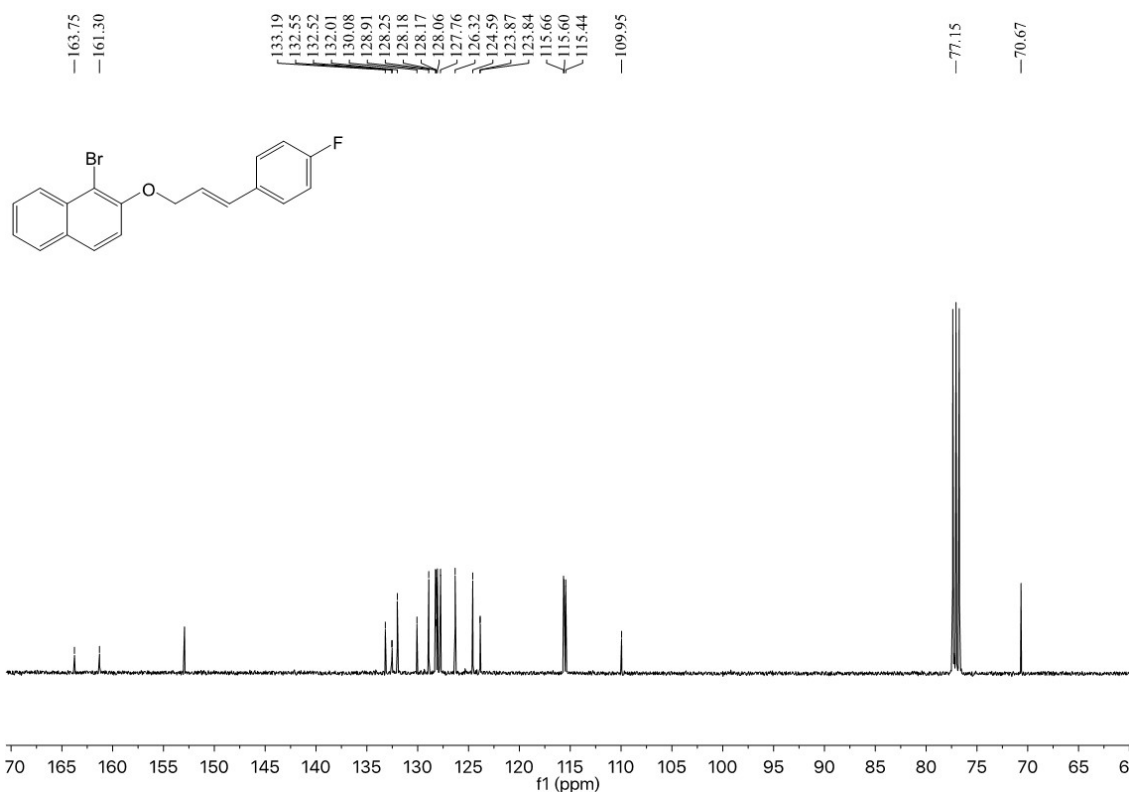
$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of **1-bromo-2-((3-(3-fluorophenyl)allyl)oxy)naphthalene (1c)**



$^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ) of **1-bromo-2-((3-(3-fluorophenyl)allyl)oxy)naphthalene (1c)**

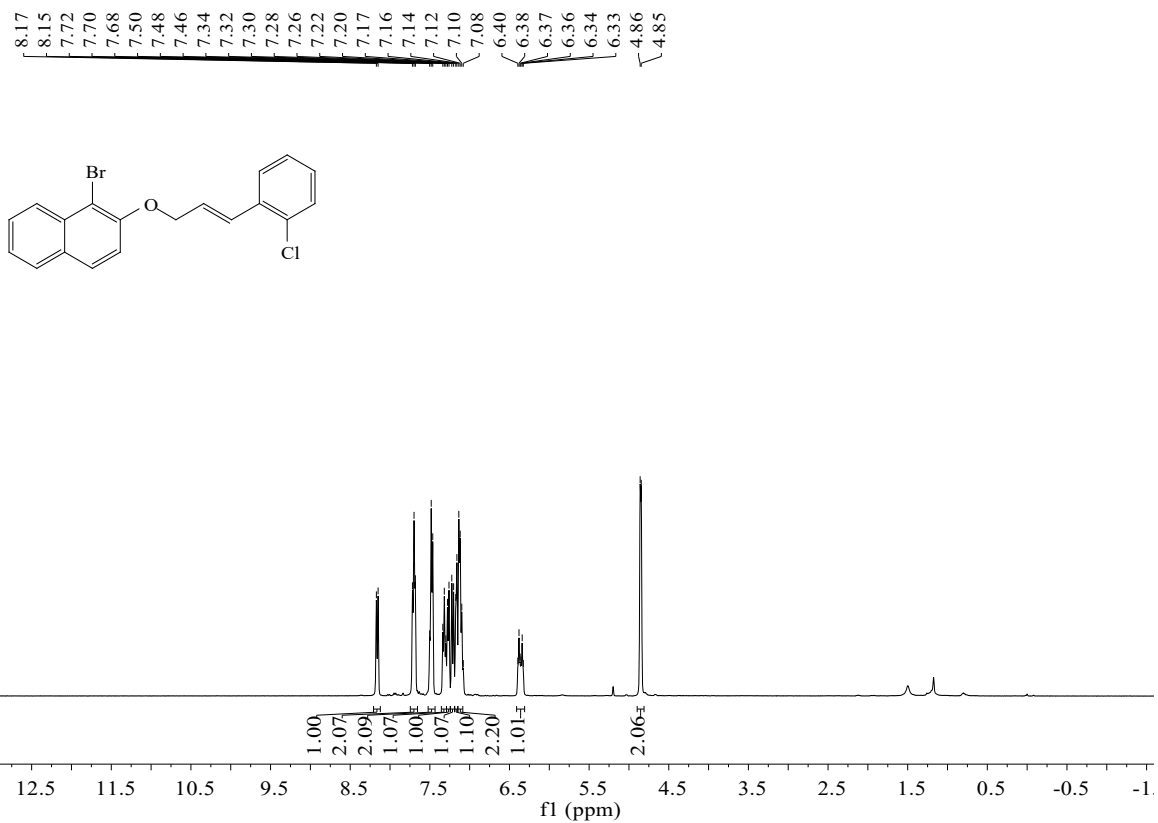


$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of **1-bromo-2-((3-(4-fluorophenyl)allyl)oxy)naphthalene (1d)**

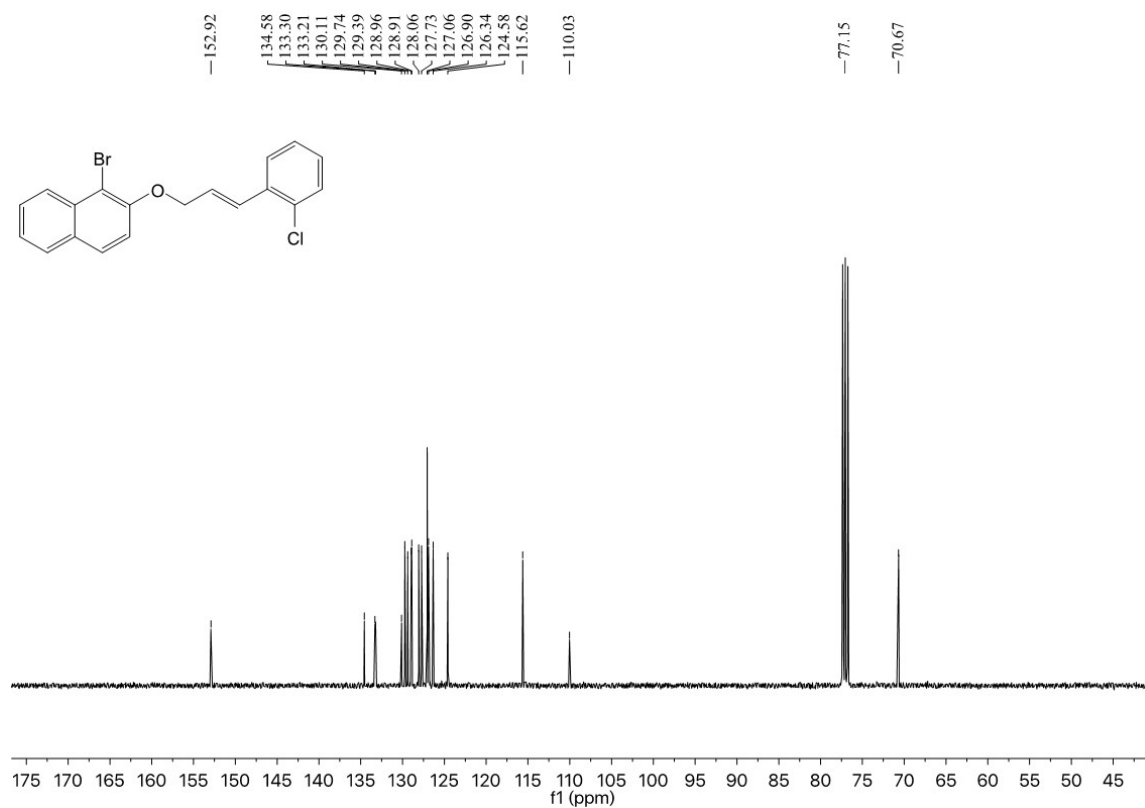


$^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ) of **1-bromo-2-((3-(4-fluorophenyl)allyl)oxy)naphthalene (1d)**



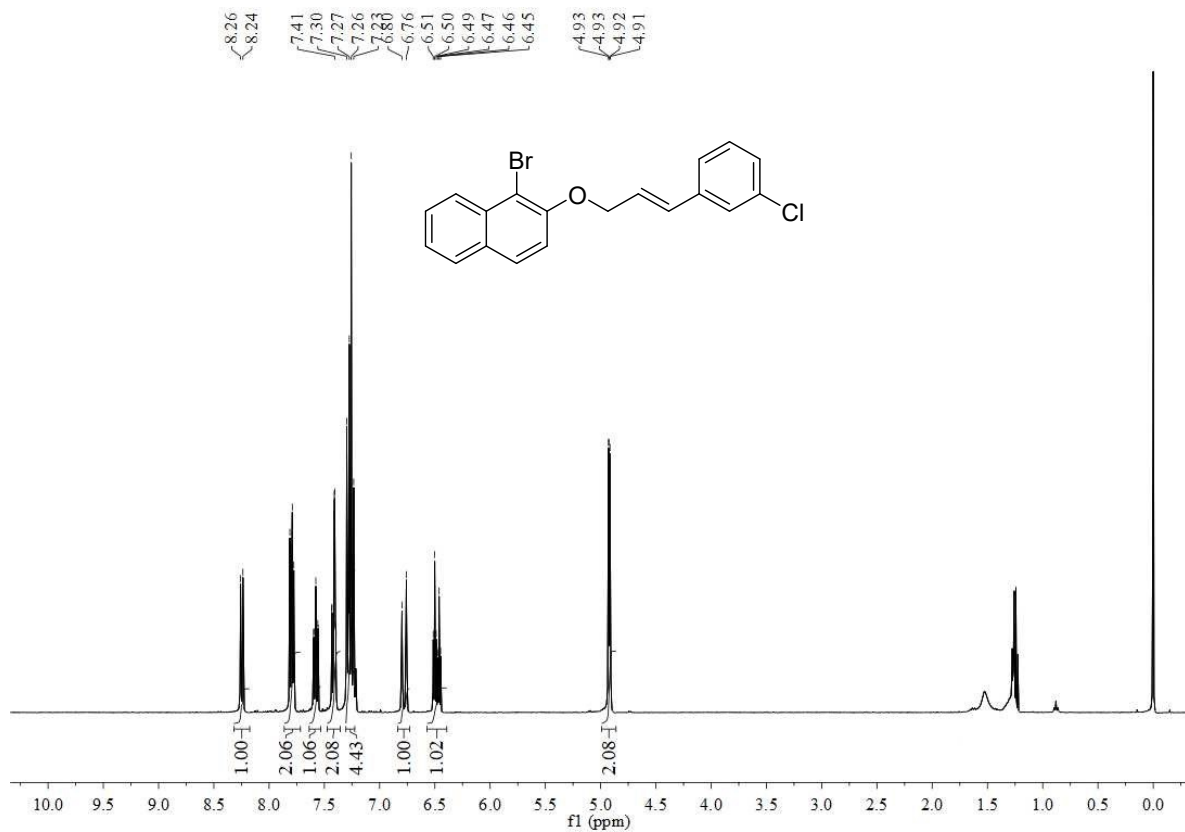


<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(2-chlorophenyl)allyl)oxy)naphthalene (1e)

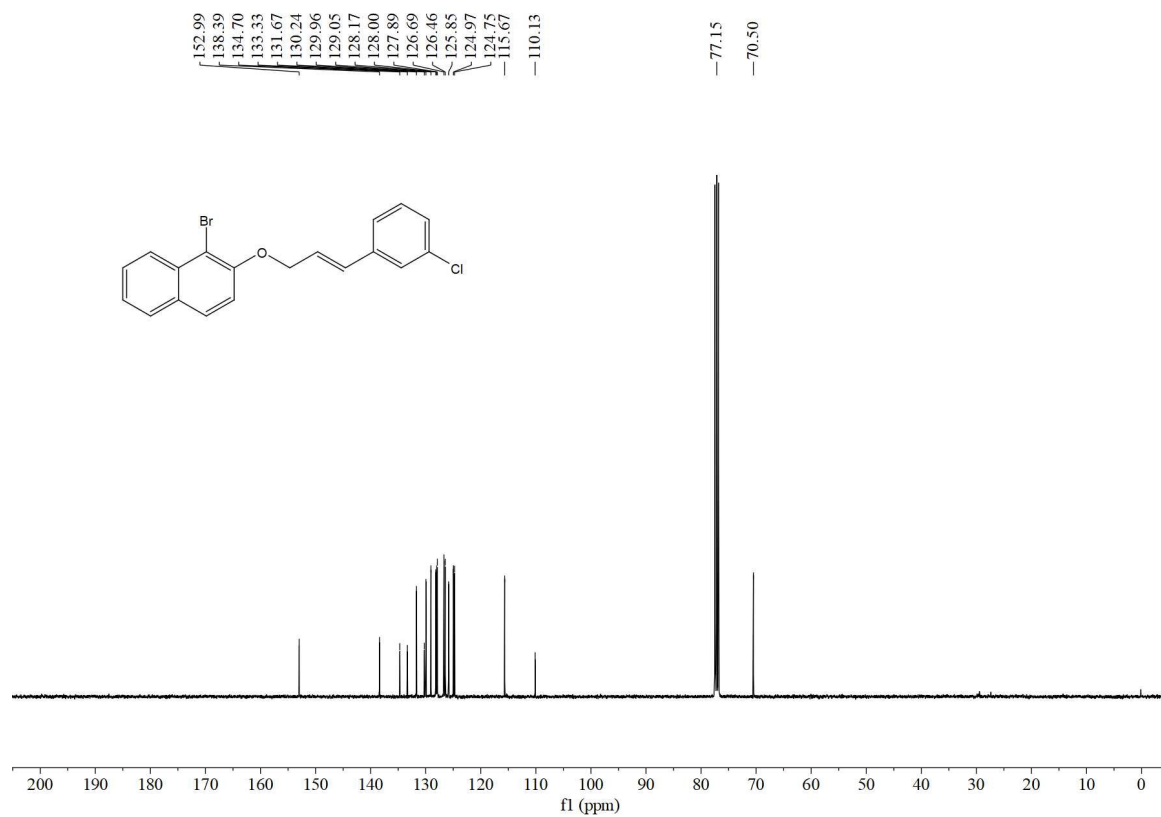


<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(2-chlorophenyl)allyl)oxy)naphthalene

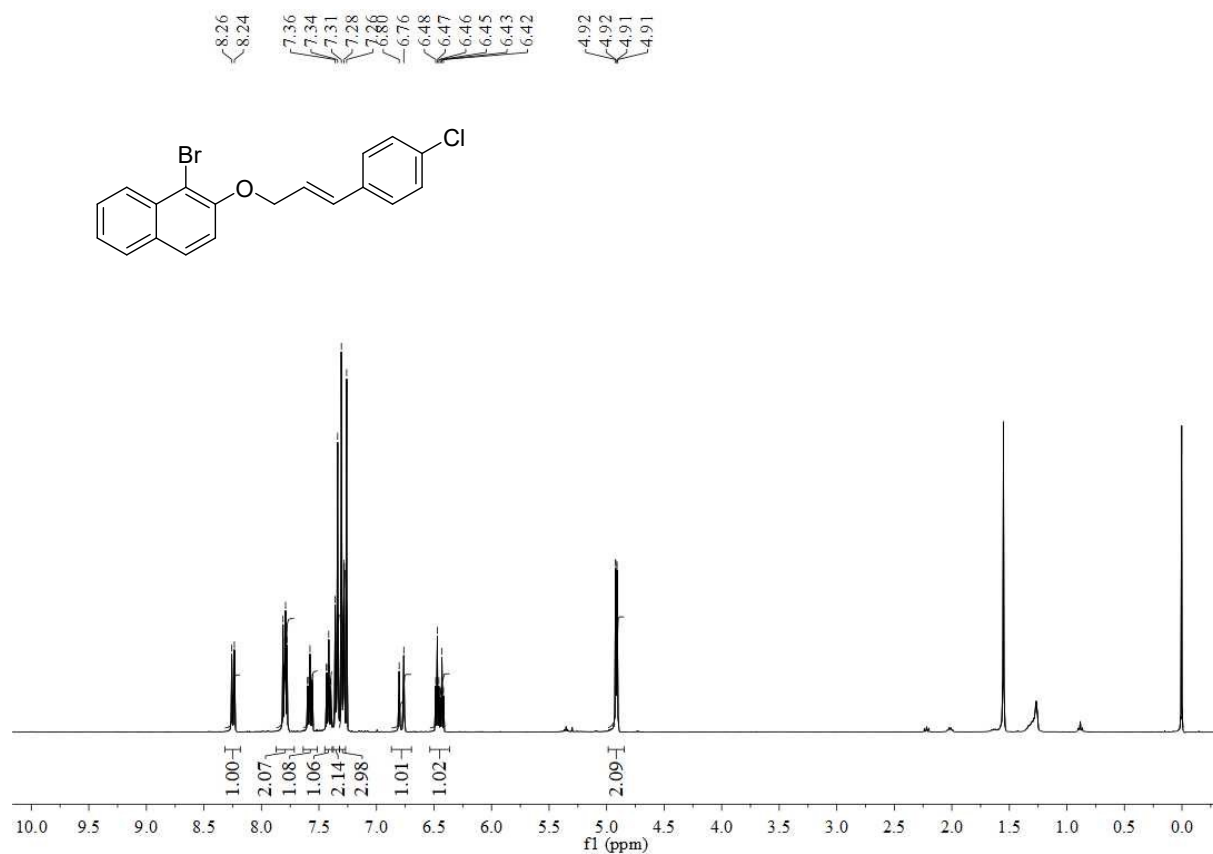
(1e)



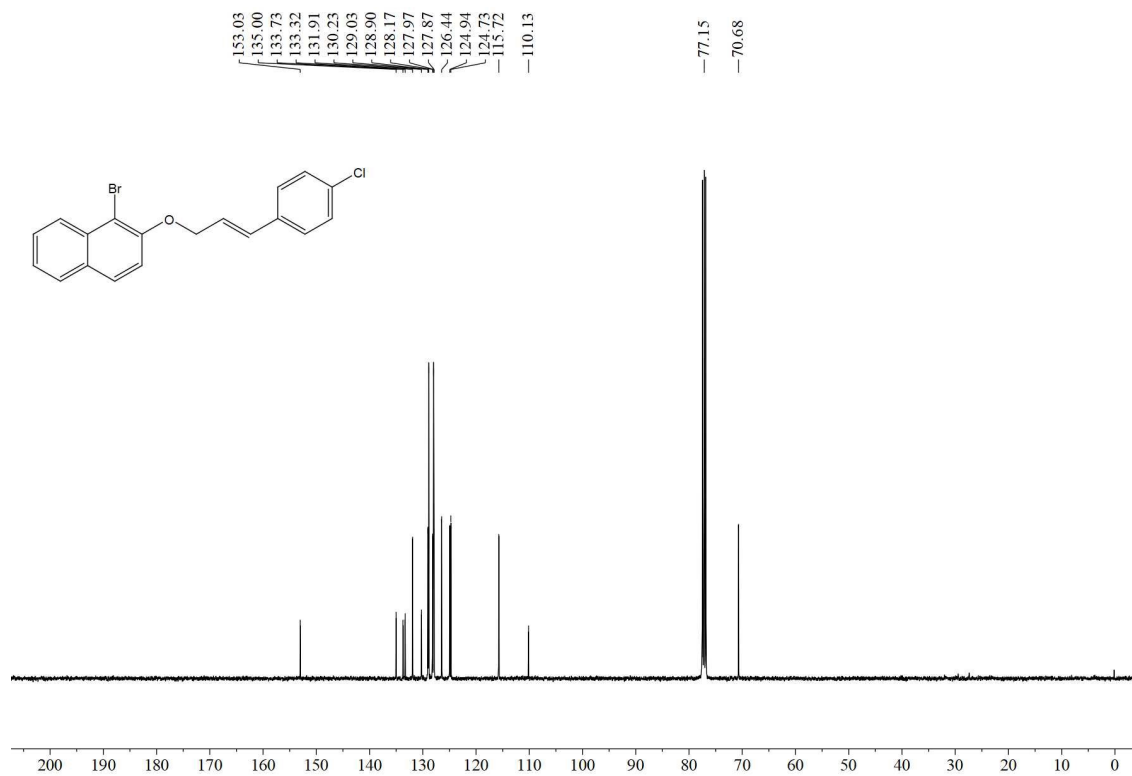
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(3-chlorophenyl)allyl)oxy)naphthalene (1f)



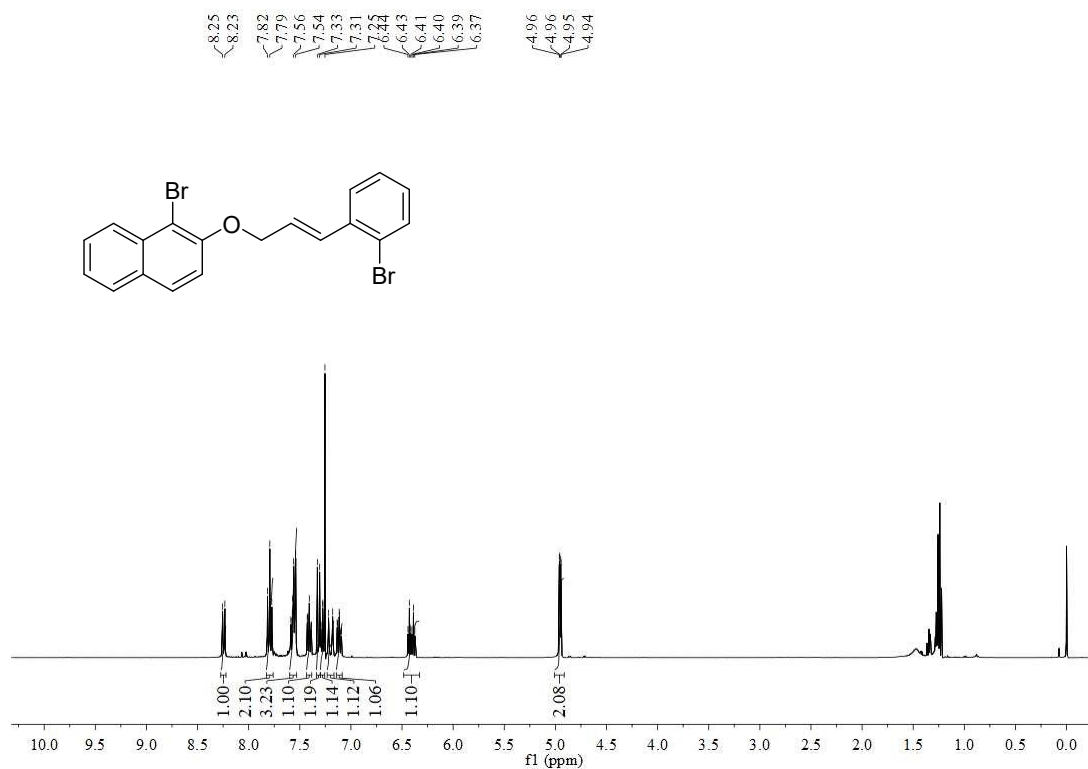
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(3-chlorophenyl)allyl)oxy)naphthalene (1f)



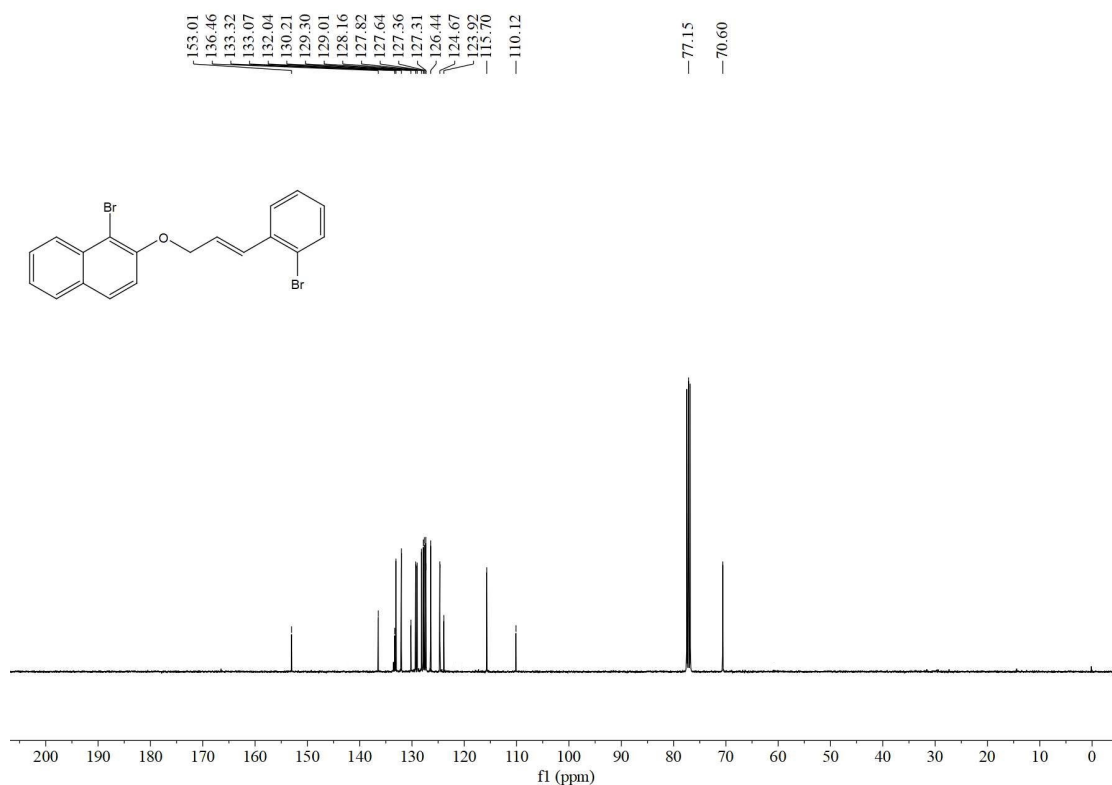
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(4-chlorophenyl)allyl)oxy)naphthalene (1g)



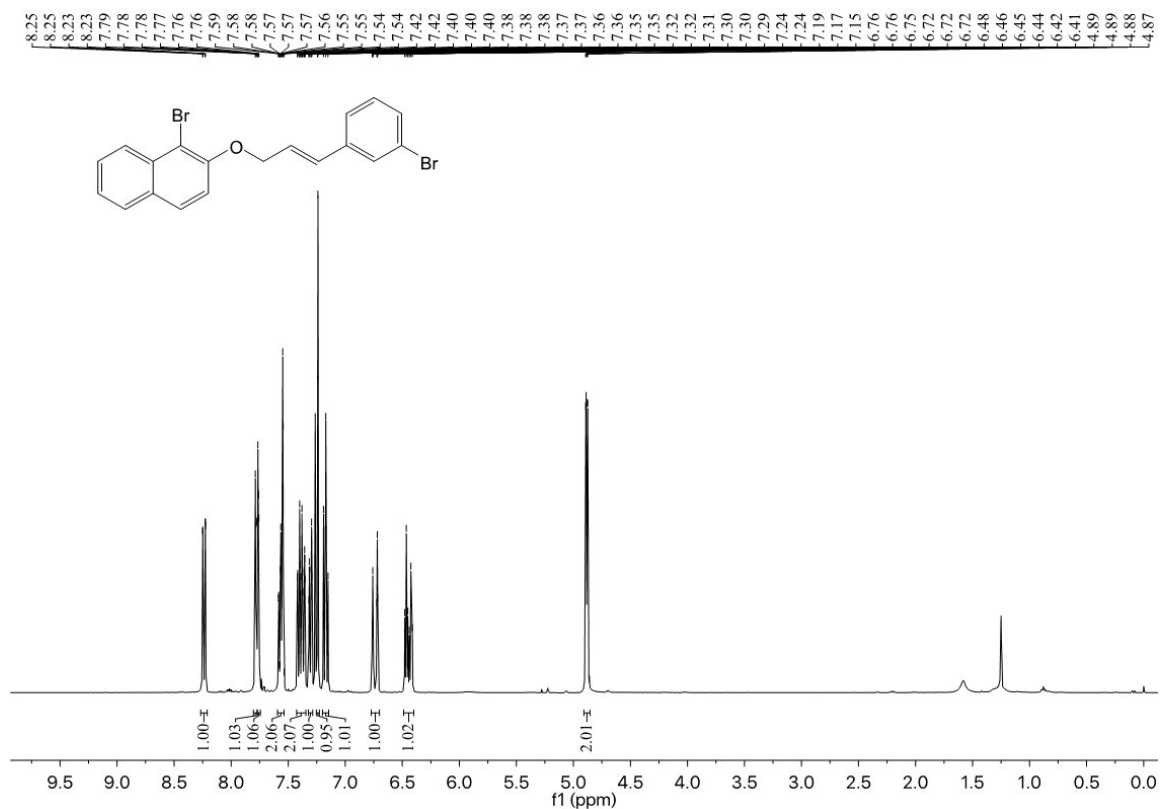
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(4-chlorophenyl)allyl)oxy)naphthalene (1g)



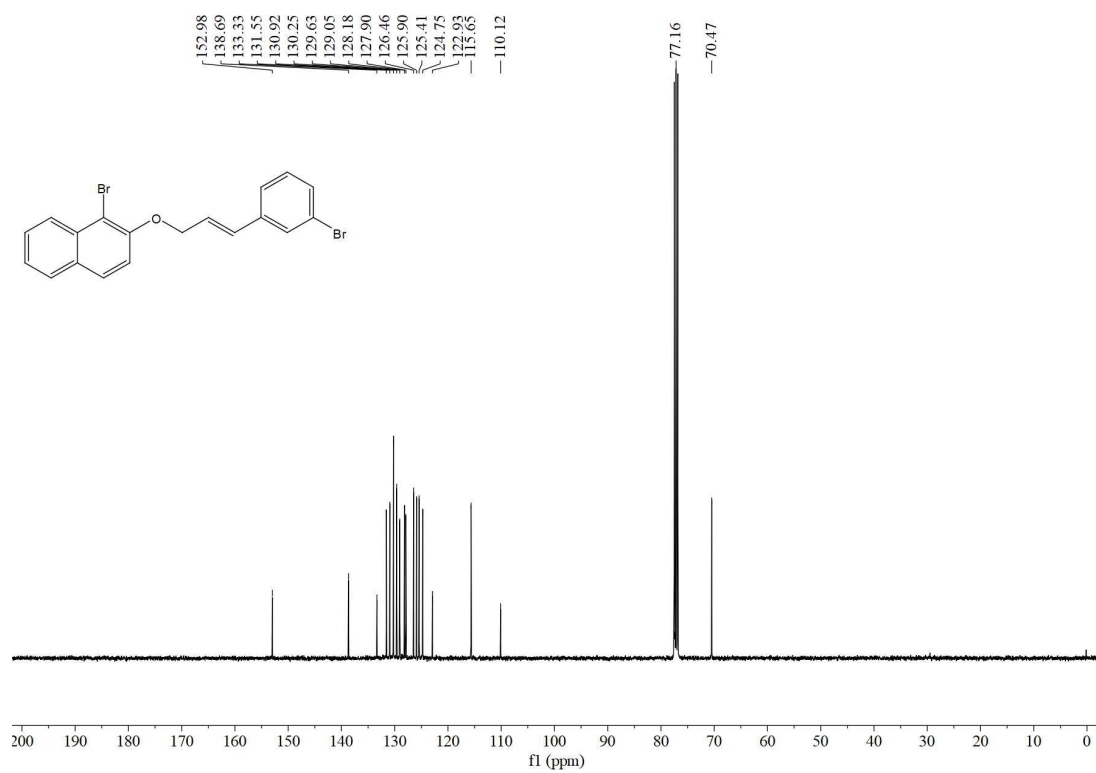
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(2-bromophenyl)allyl)oxy)naphthalene (1h)



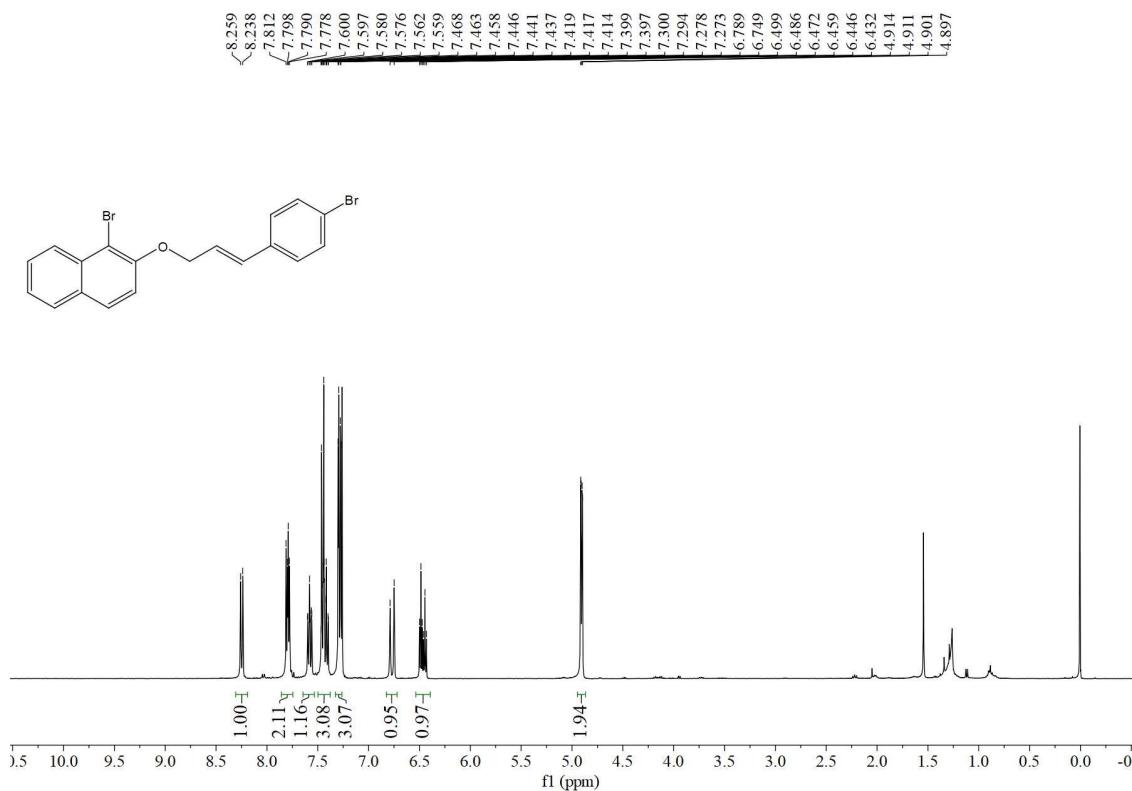
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(2-bromophenyl)allyl)oxy)naphthalene (1h)



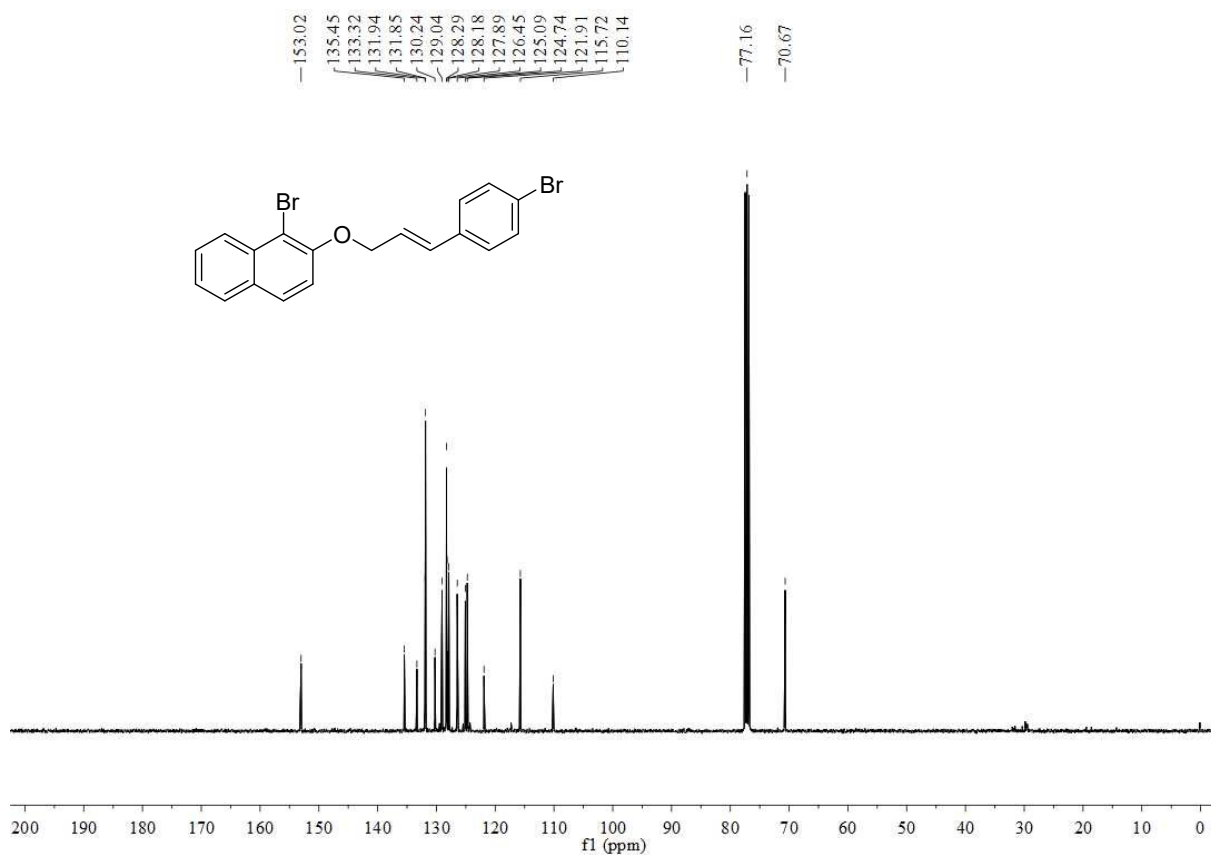
$^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ ) of 1-bromo-2-((3-(3-bromophenyl)allyl)oxy)naphthalene (1i)



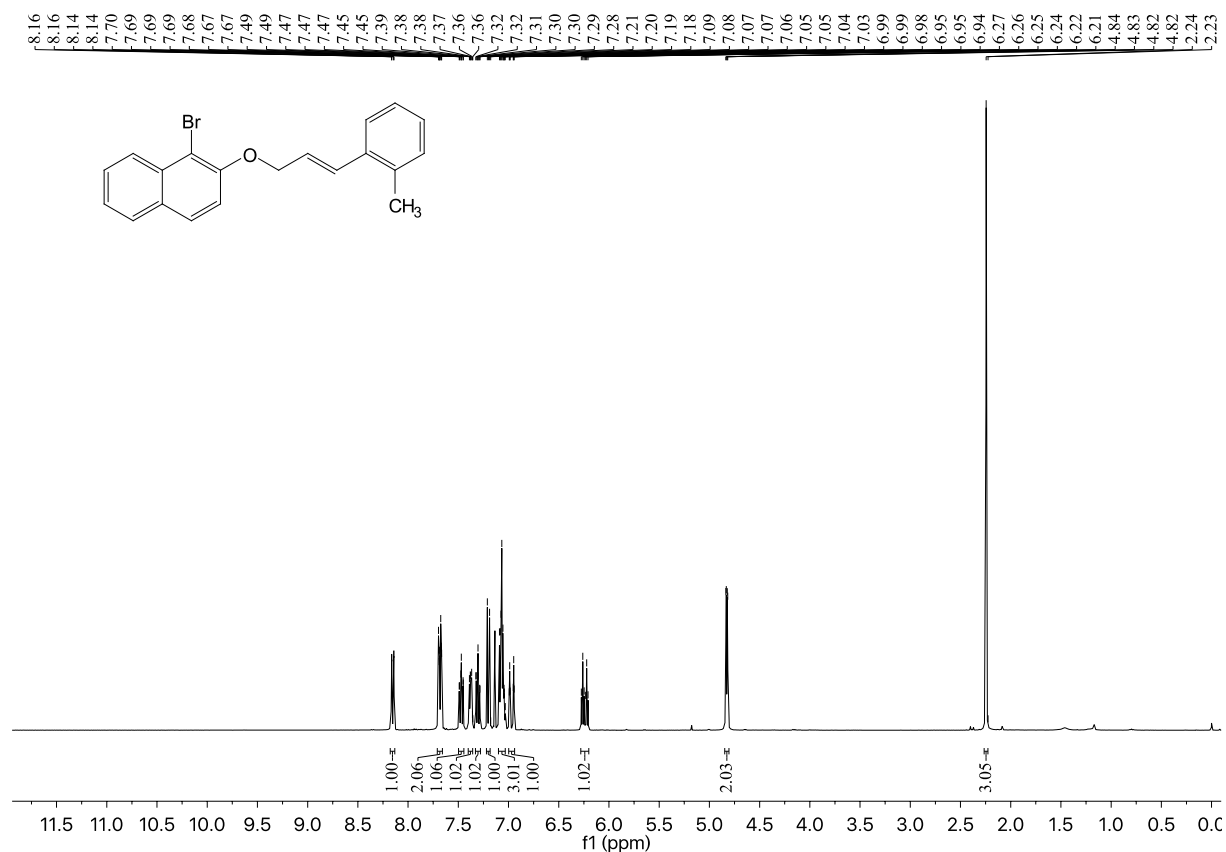
$^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ ) of 1-bromo-2-((3-(3-bromophenyl)allyl)oxy)naphthalene (1i)



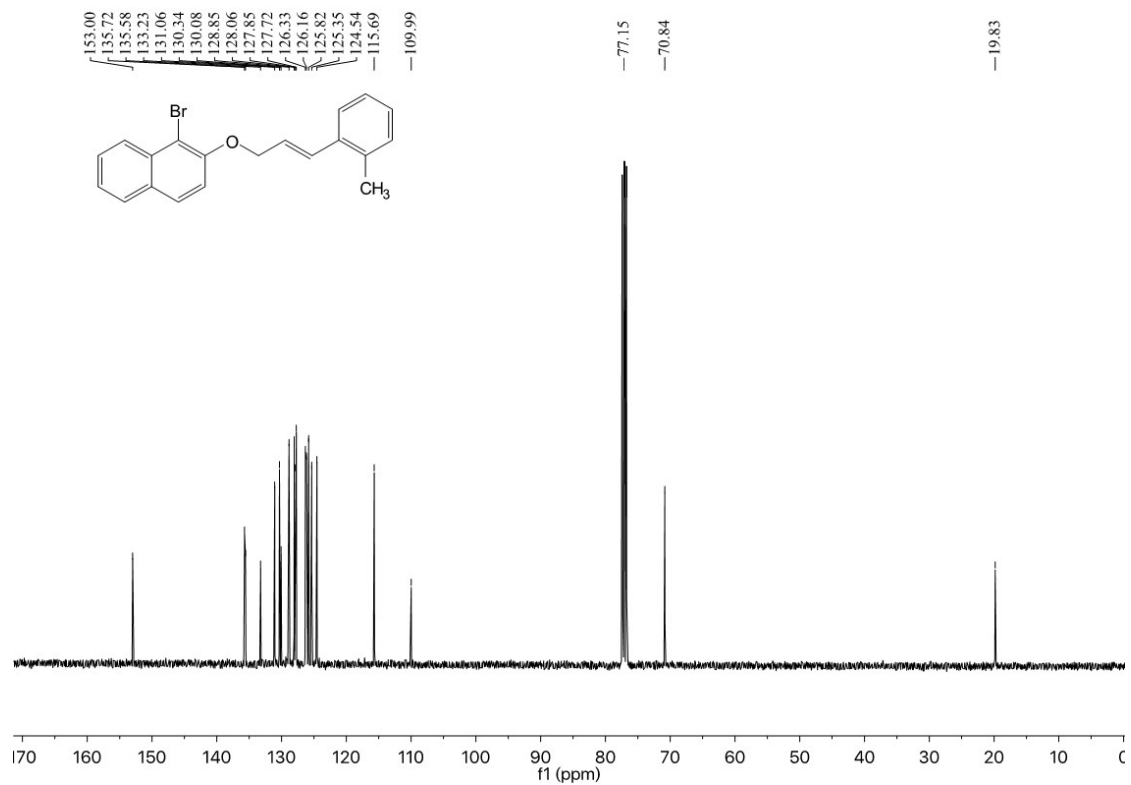
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(4-bromophenyl)allyl)oxy)naphthalene (1j)



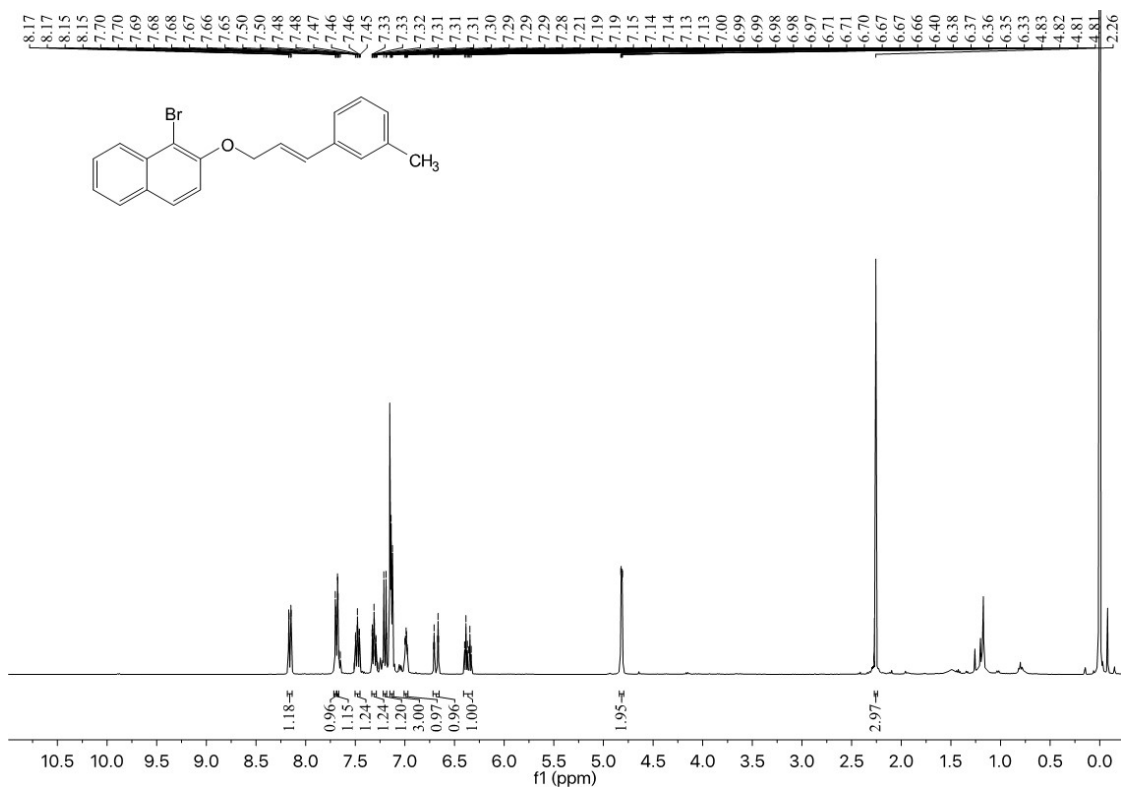
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(4-bromophenyl)allyl)oxy)naphthalene (1j)



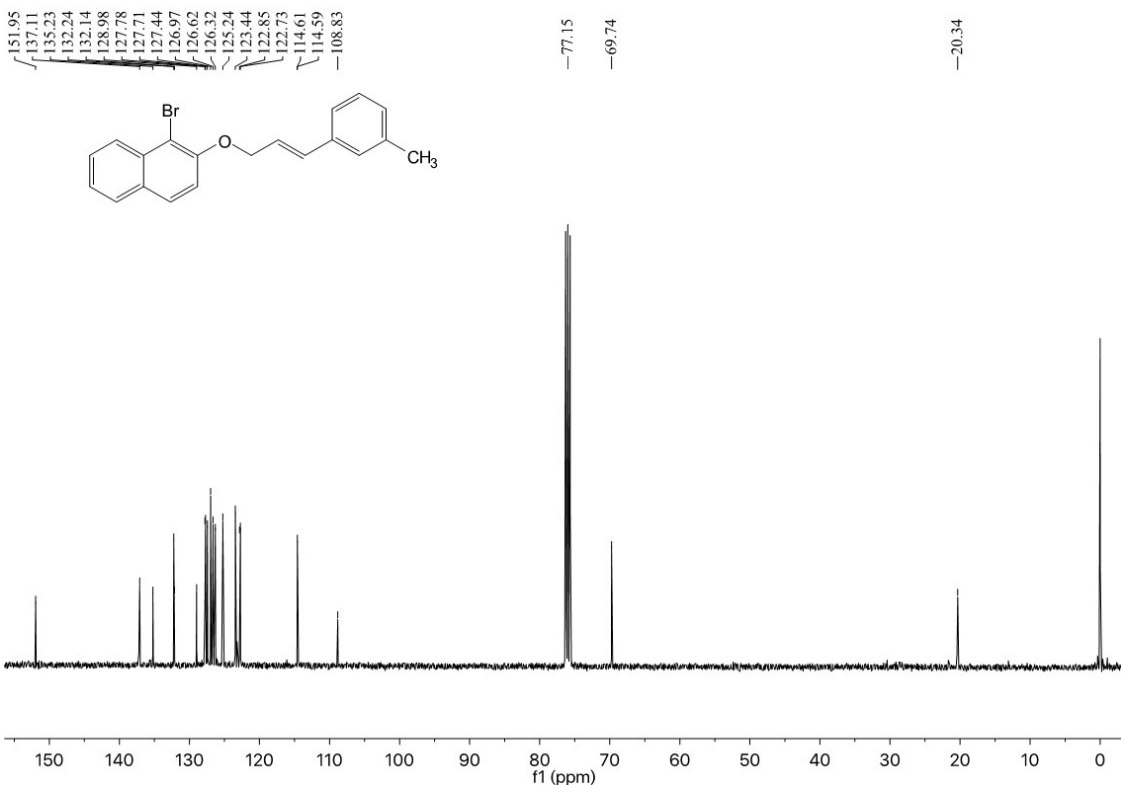
$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of 1-bromo-2-((3-(*o*-tolyl)allyl)oxy)naphthalene (1k)



$^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ) of 1-bromo-2-((3-(*o*-tolyl)allyl)oxy)naphthalene (1k)

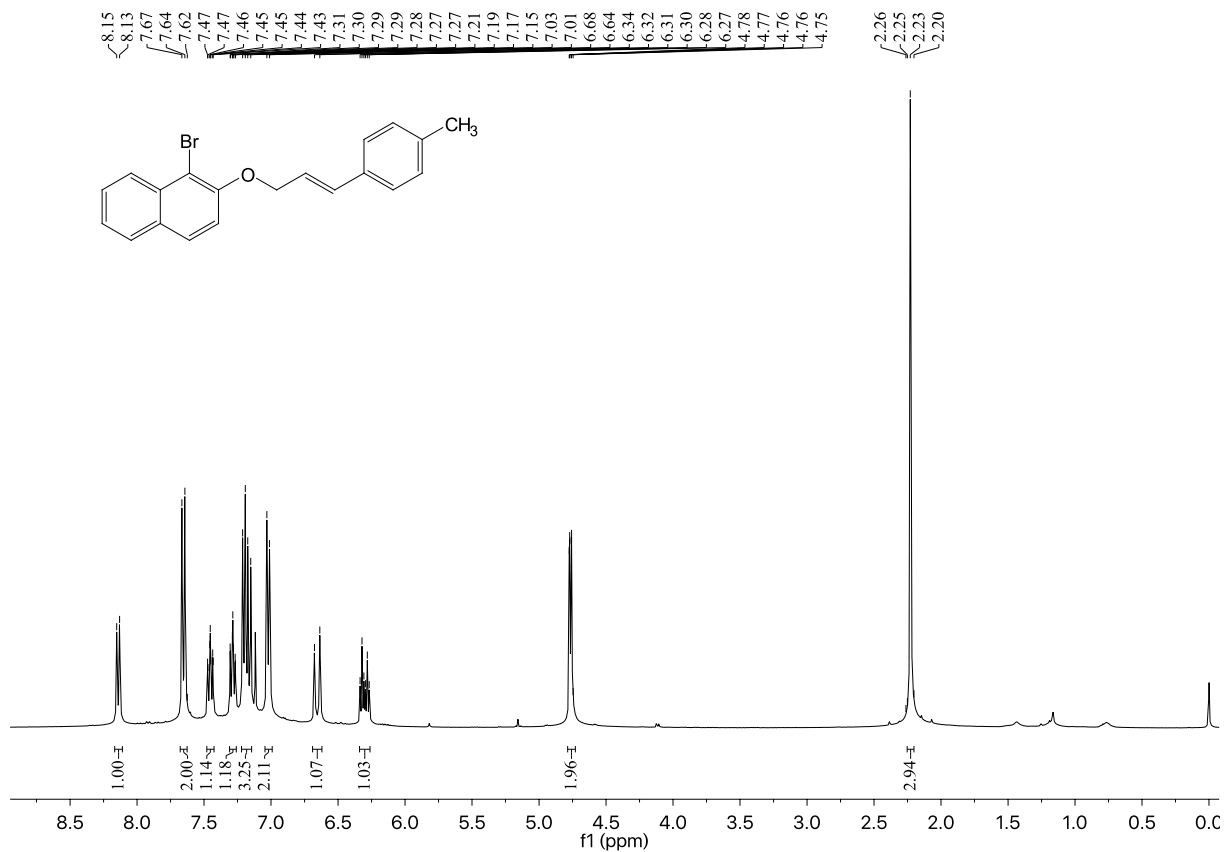


<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(*m*-tolyl)allyl)oxy)naphthalene (11)

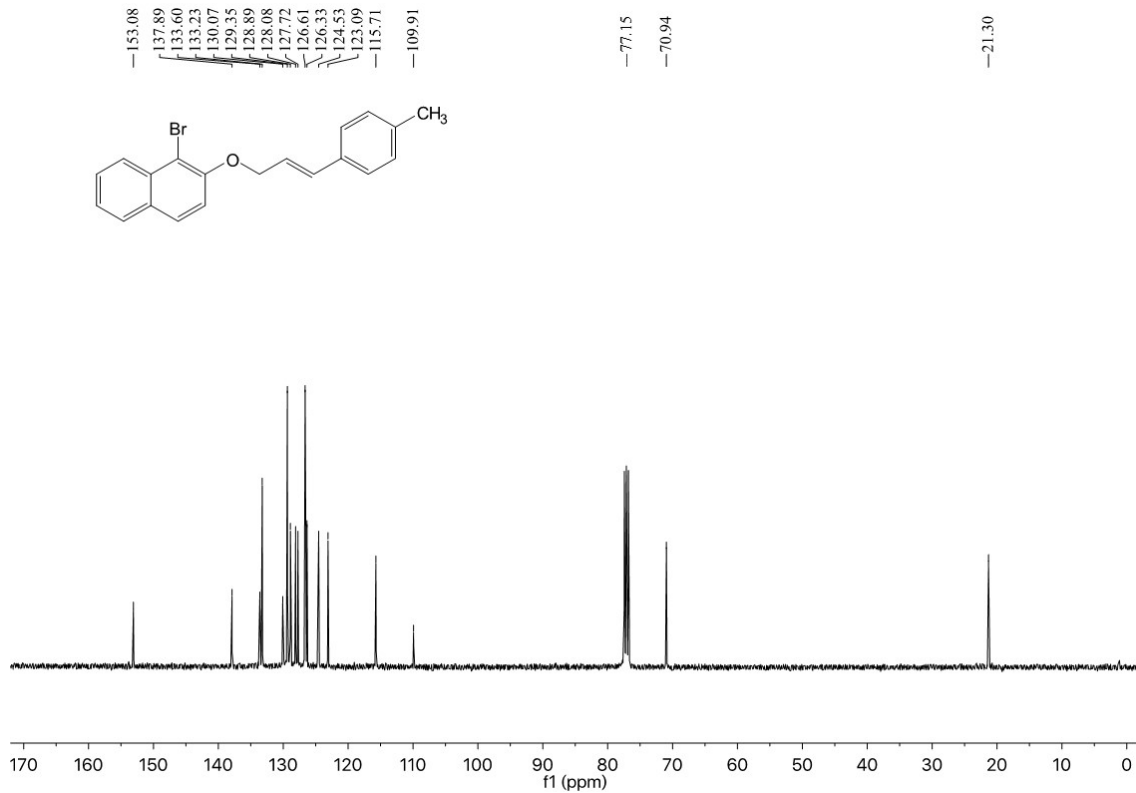


<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(*m*-tolyl)allyl)oxy)naphthalene (11)

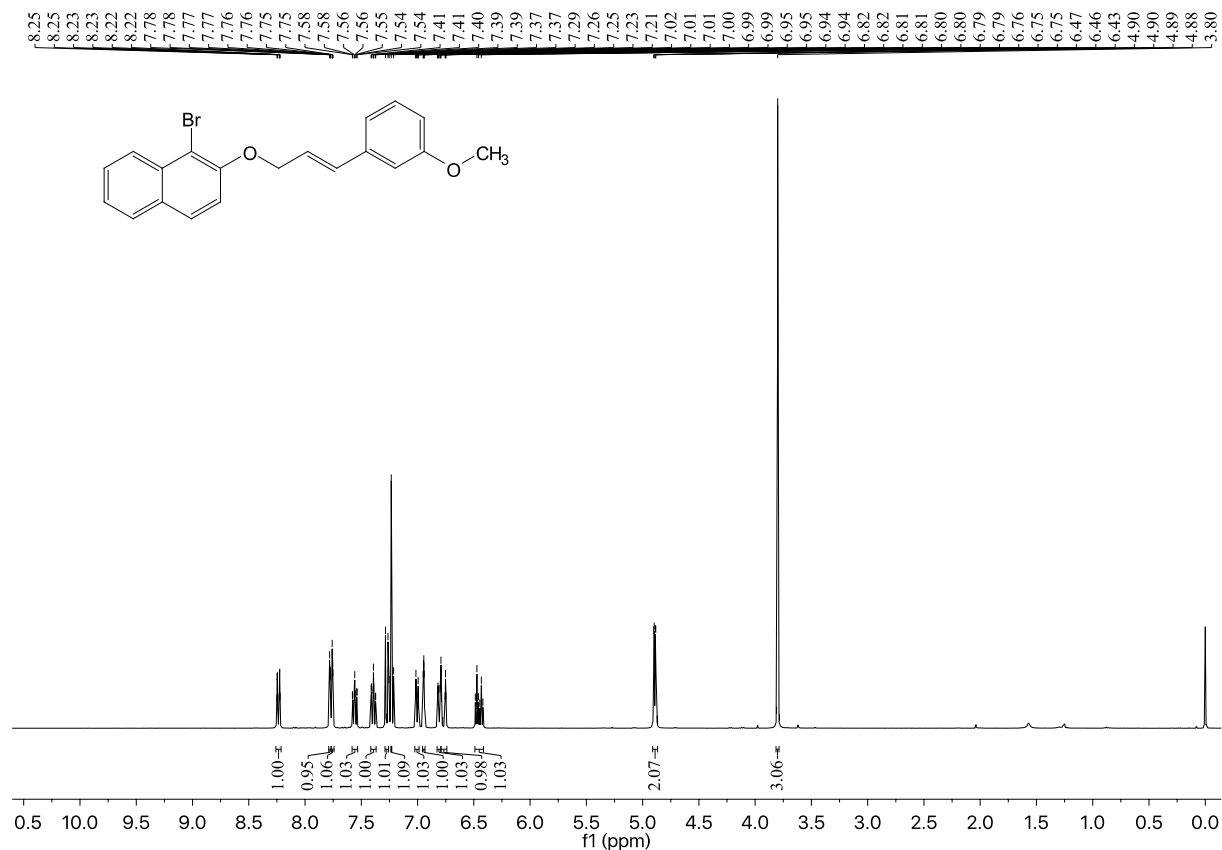




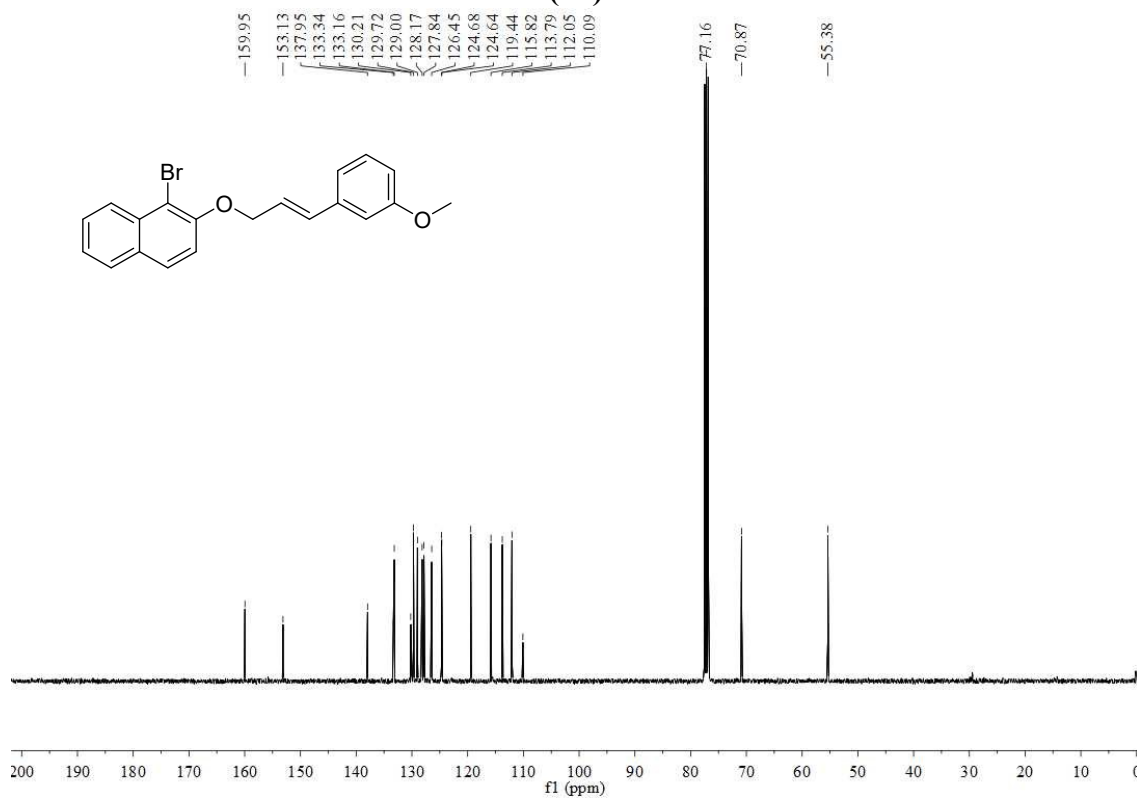
**<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(*p*-tolyl)allyl)oxy)naphthalene (1m)**



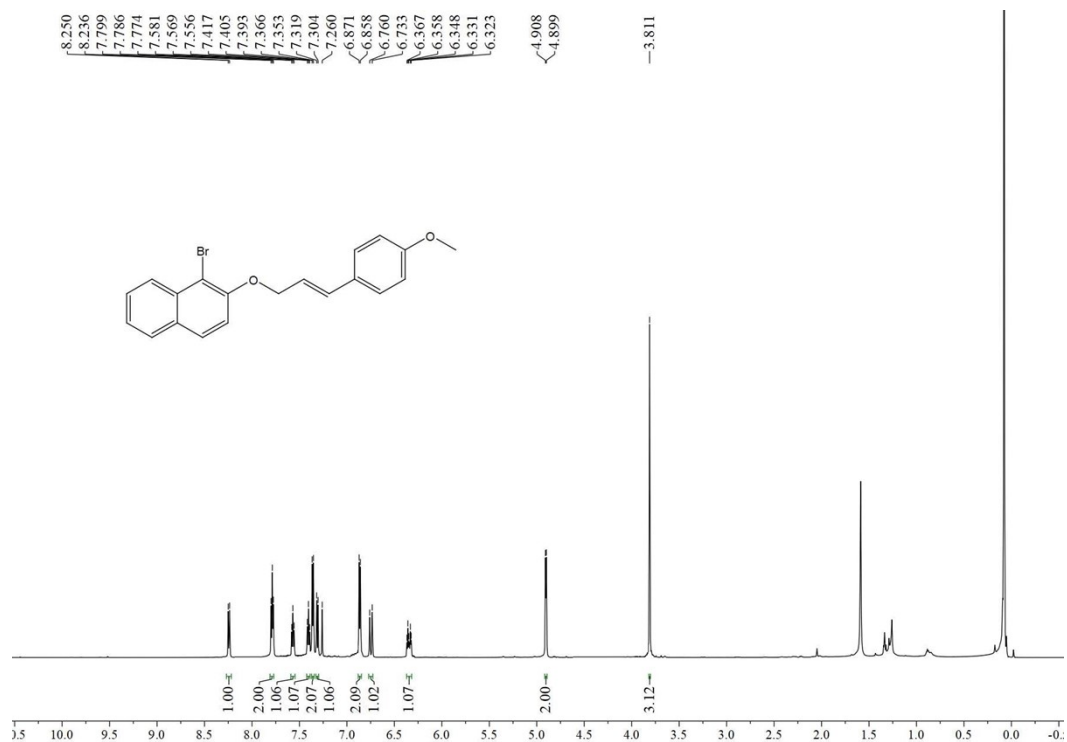
**<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(*p*-tolyl)allyl)oxy)naphthalene (1m)**



<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(3-methoxyphenyl)allyl)oxy)naphthalene (1n)

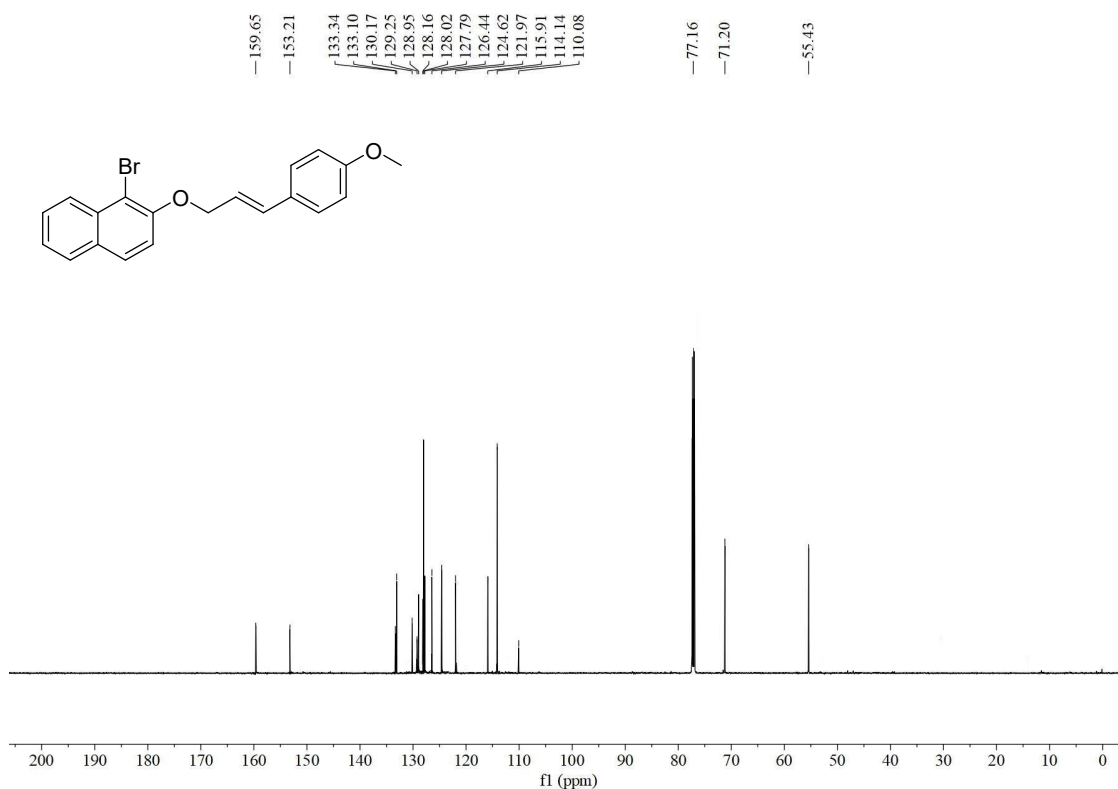


<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(3-methoxyphenyl)allyl)oxy)naphthalene (1n)



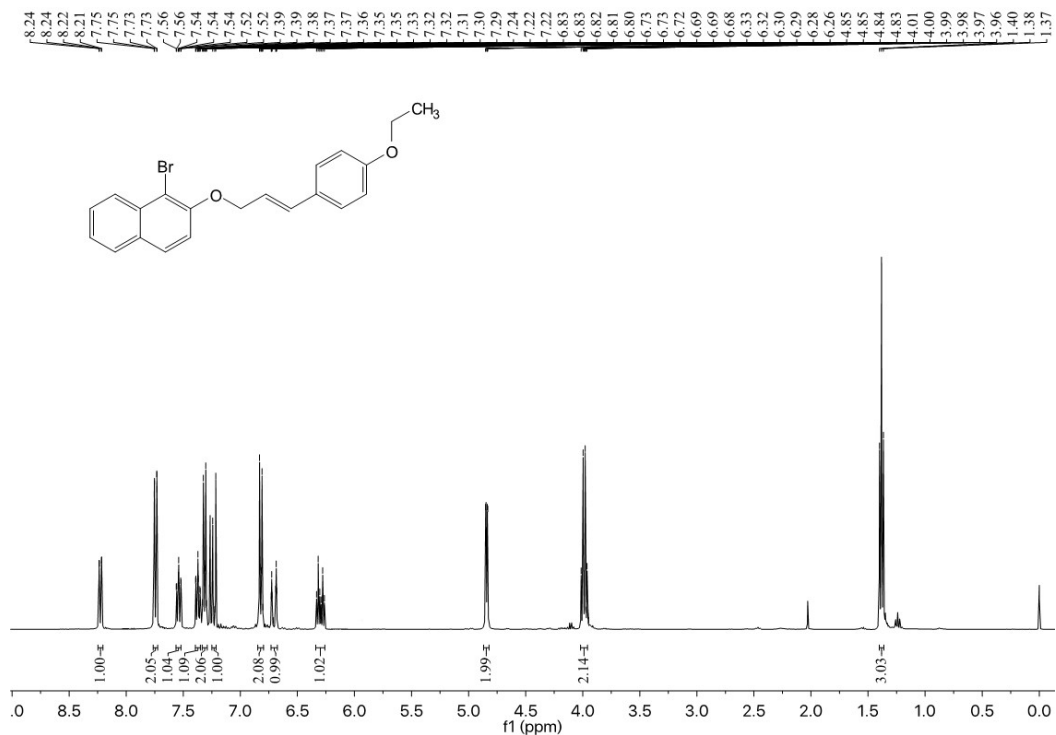
<sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(4-methoxyphenyl)allyl)oxy)naphthalene

(1o)

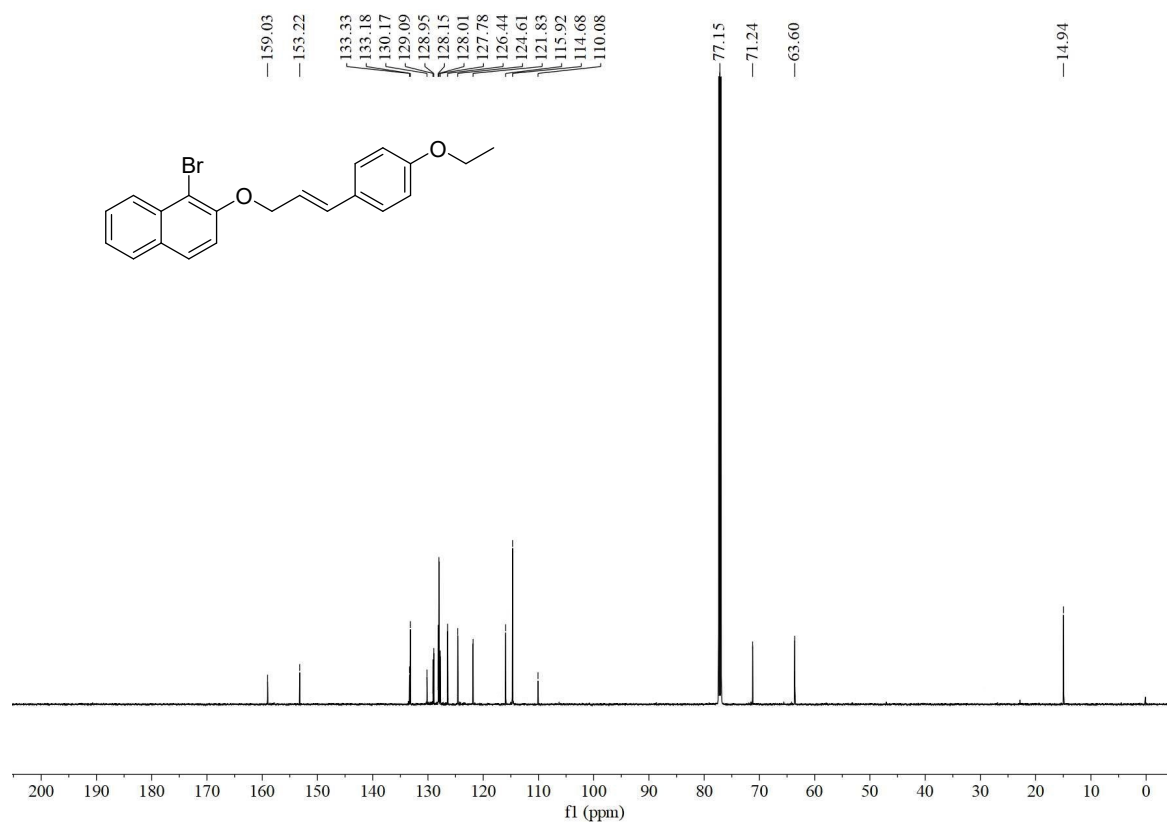


<sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(4-methoxyphenyl)allyl)oxy)naphthalene

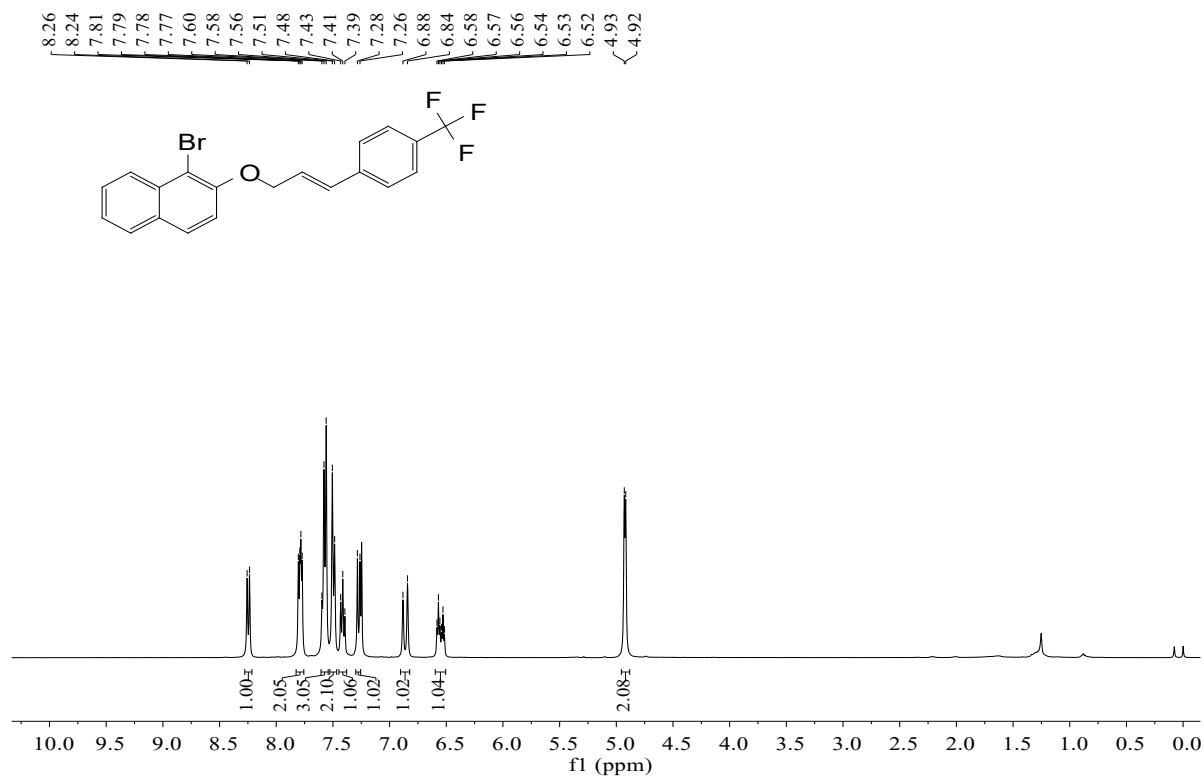
(1o)



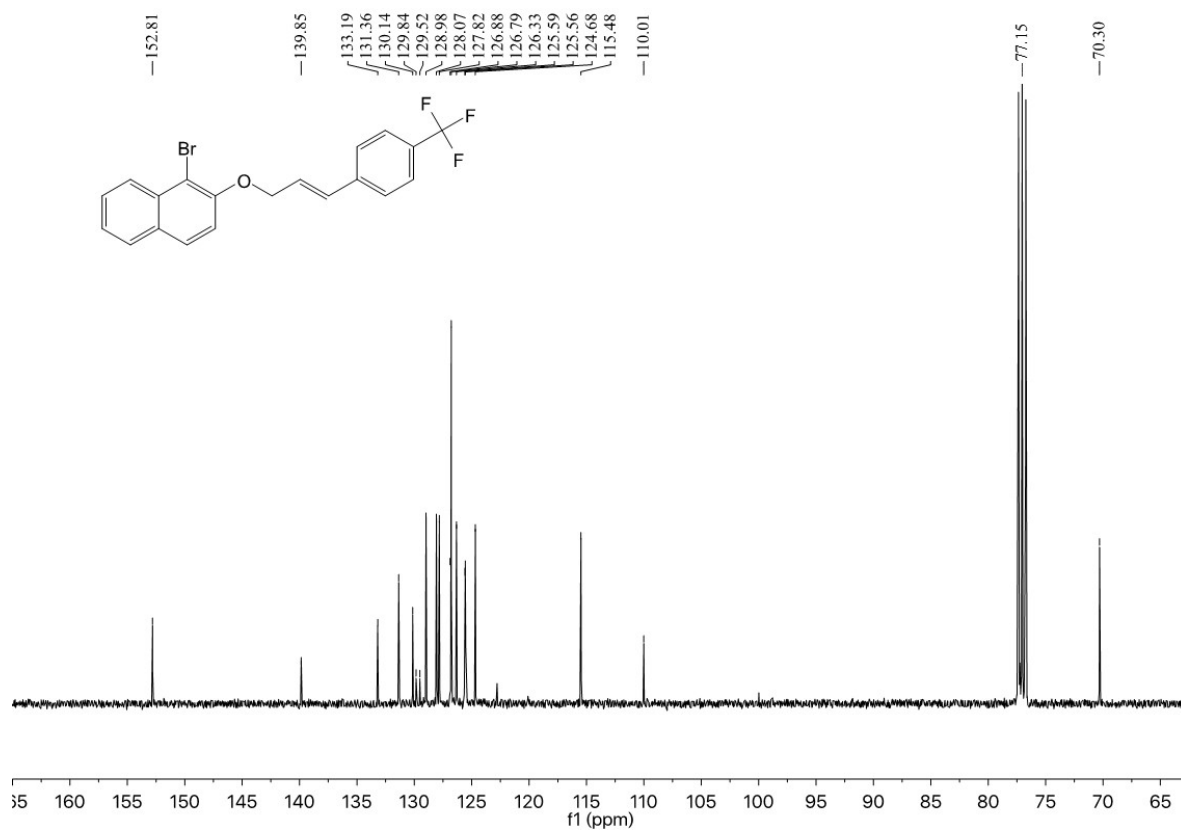
**<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(4-ethoxyphenyl)allyl)oxy)naphthalene (1p)**



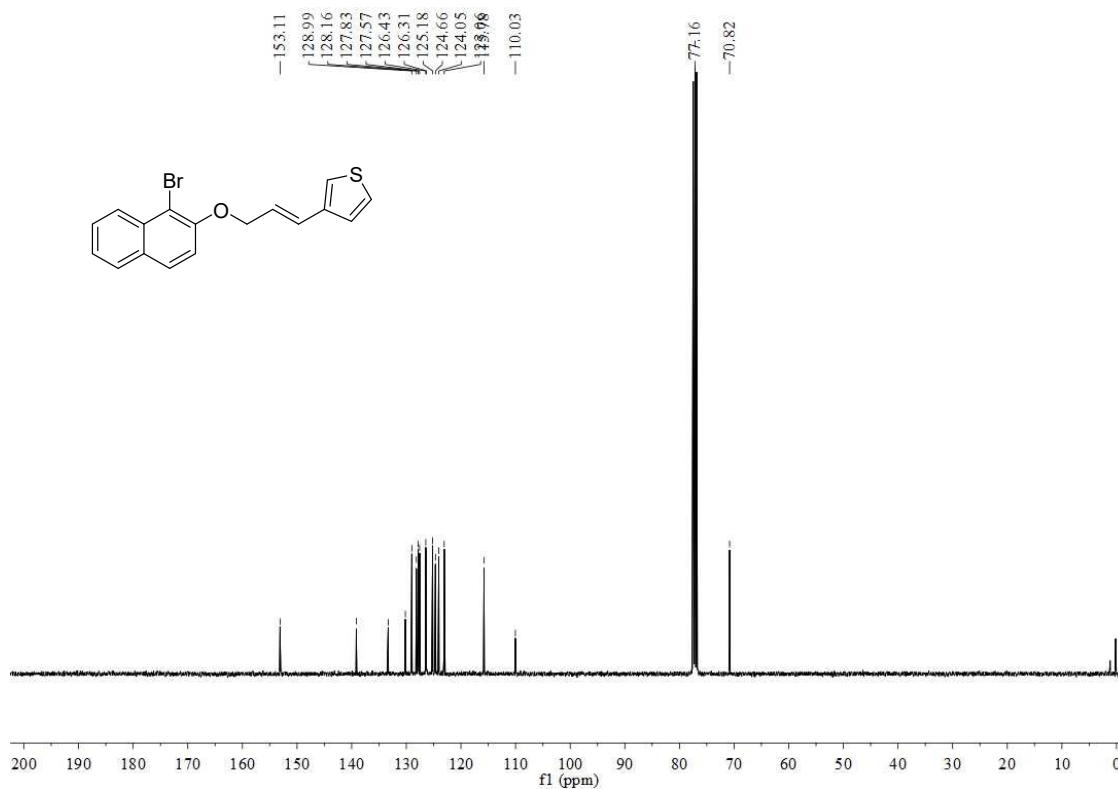
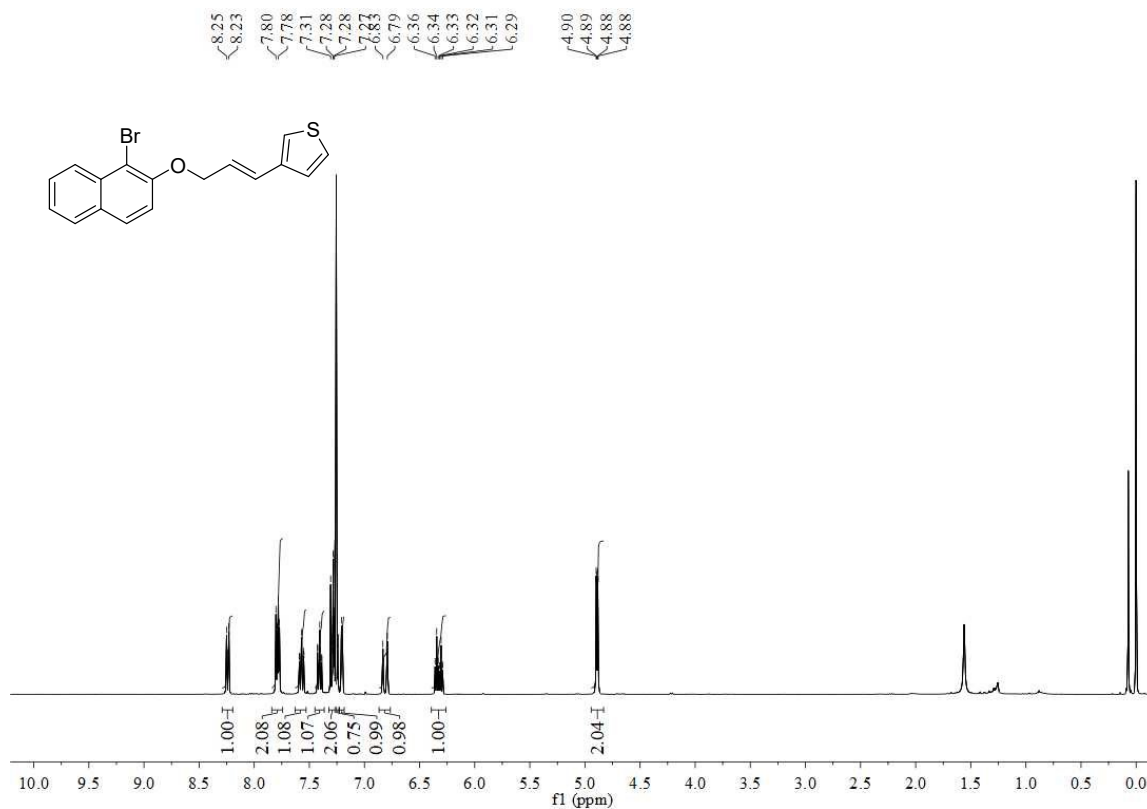
**<sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(4-ethoxyphenyl)allyl)oxy)naphthalene (1p)**

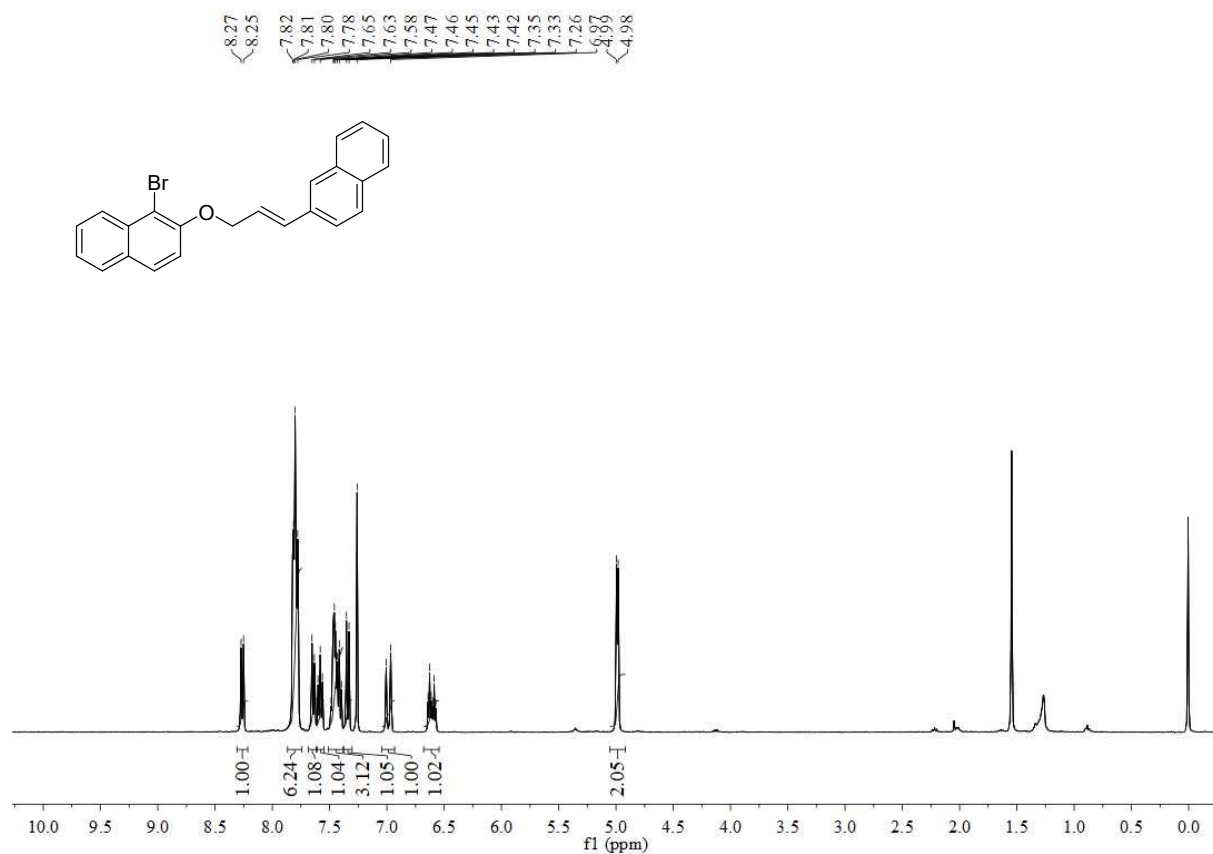


<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(4-(trifluoromethyl)phenyl)allyl)oxy)naphthalene (1q)

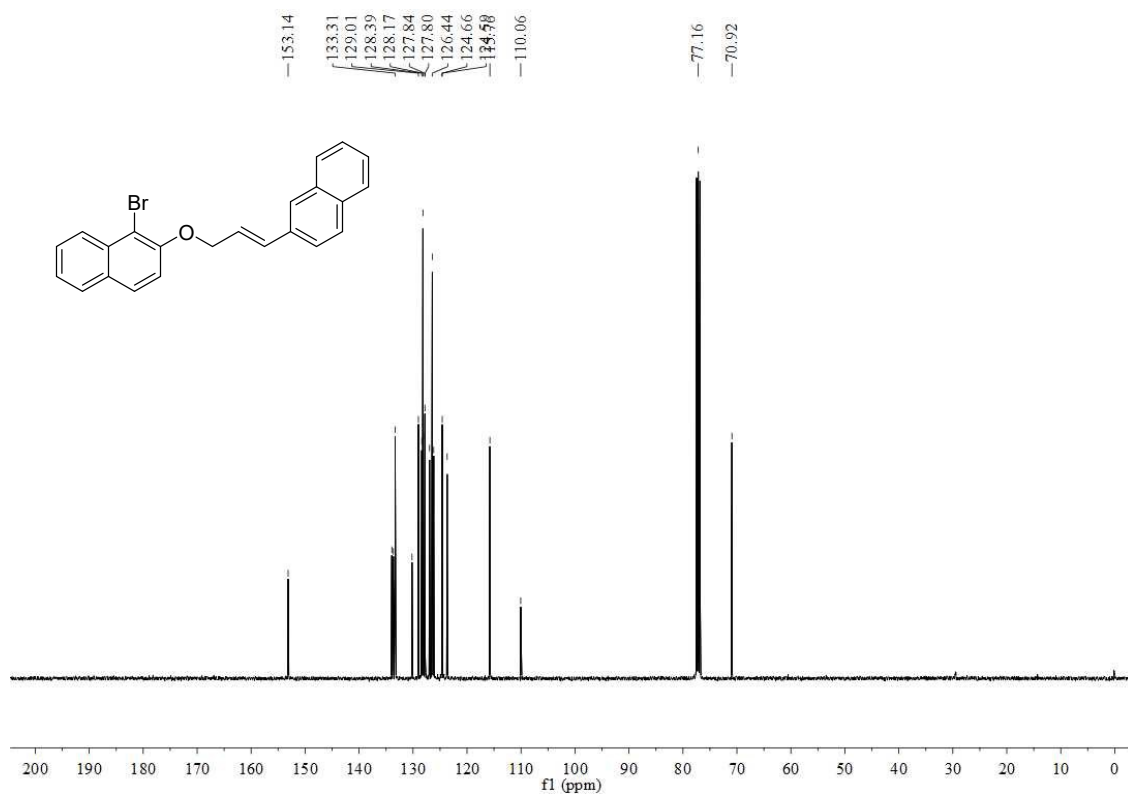


<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-((3-(4-(trifluoromethyl)phenyl)allyl)oxy)naphthalene (1q)

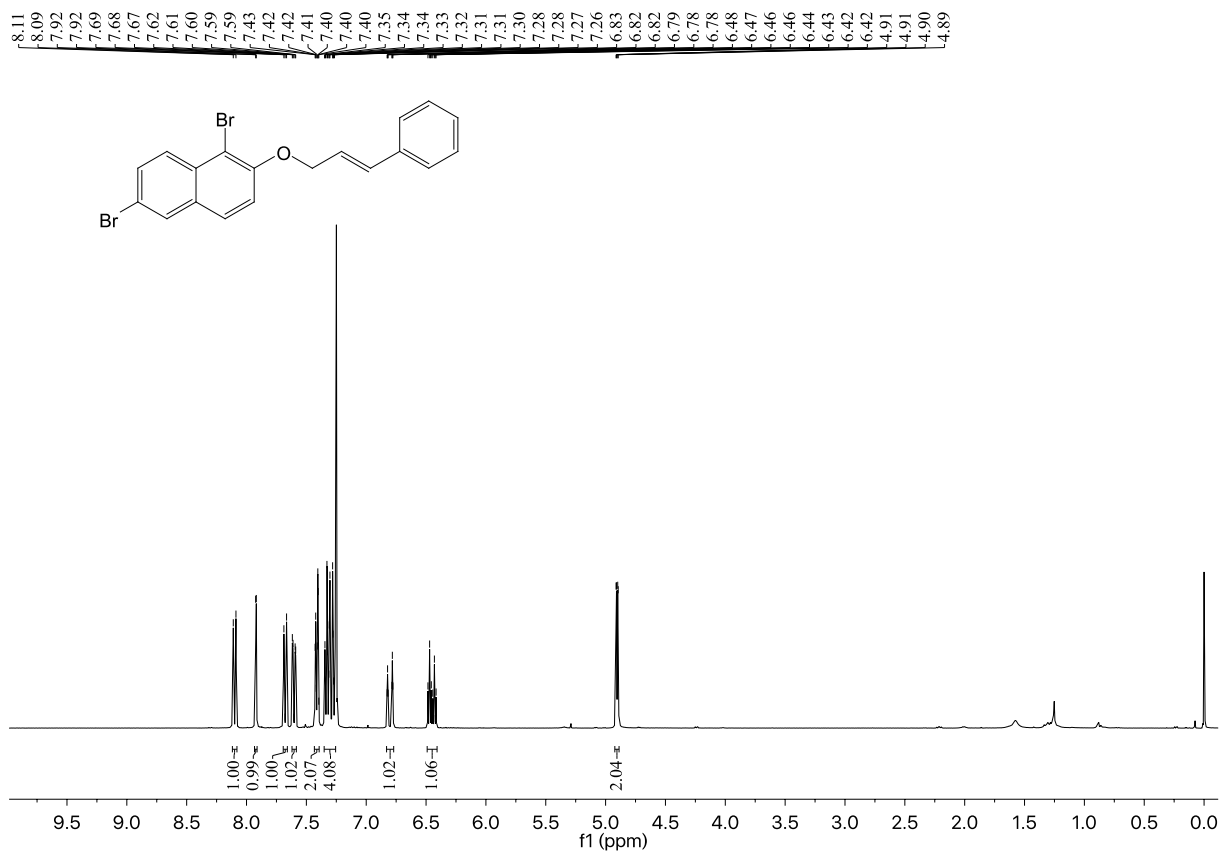




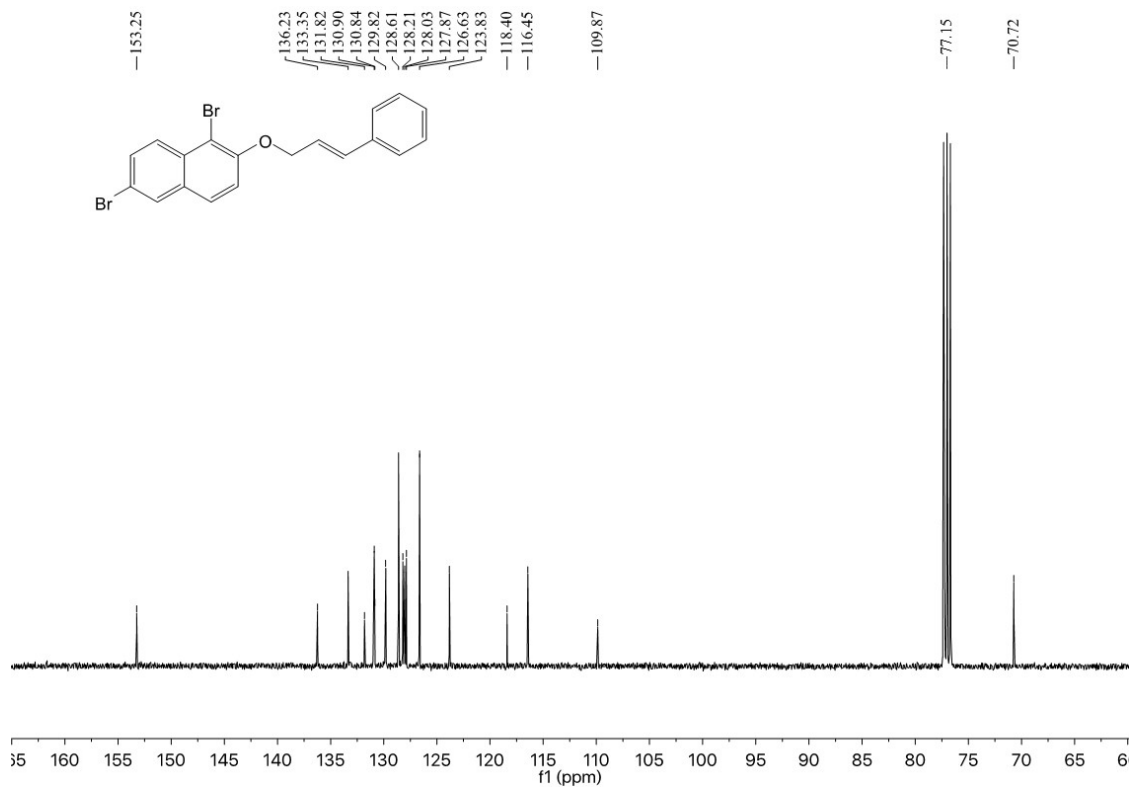
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of **1-bromo-2-((3-(naphthalen-2-yl)allyl)oxy)naphthalene (1s)**



<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of **1-bromo-2-((3-(naphthalen-2-yl)allyl)oxy)naphthalene (1s)**

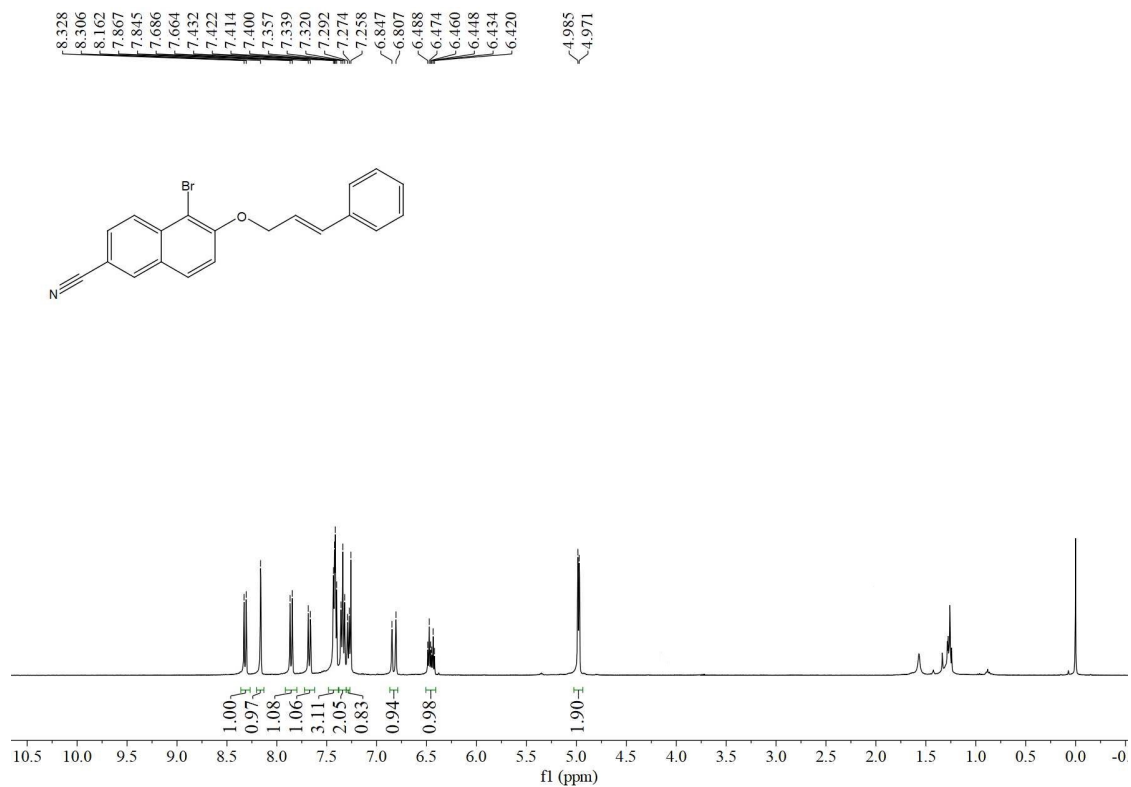


$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of **1, 6-dibromo-2-(cinnamyloxy)naphthalene (1t)**

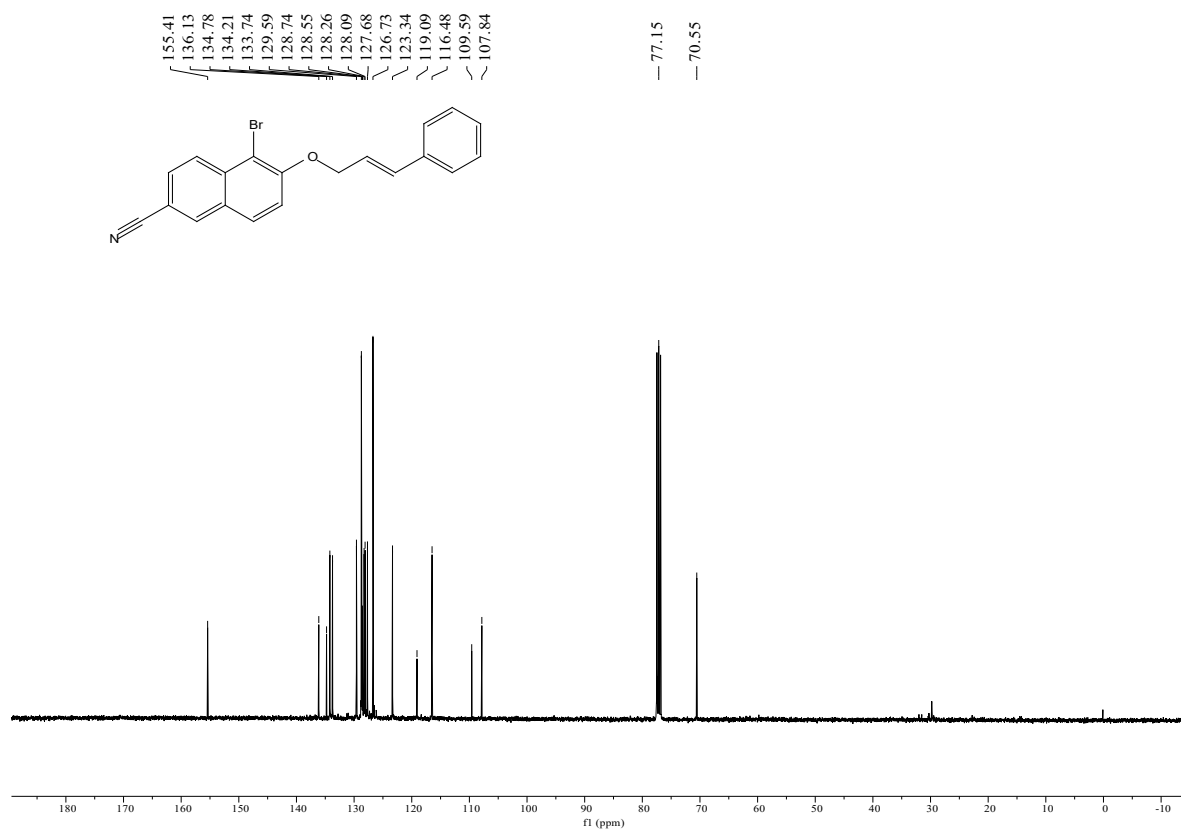


$^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ) of **1, 6-dibromo-2-(cinnamyloxy)naphthalene (1t)**

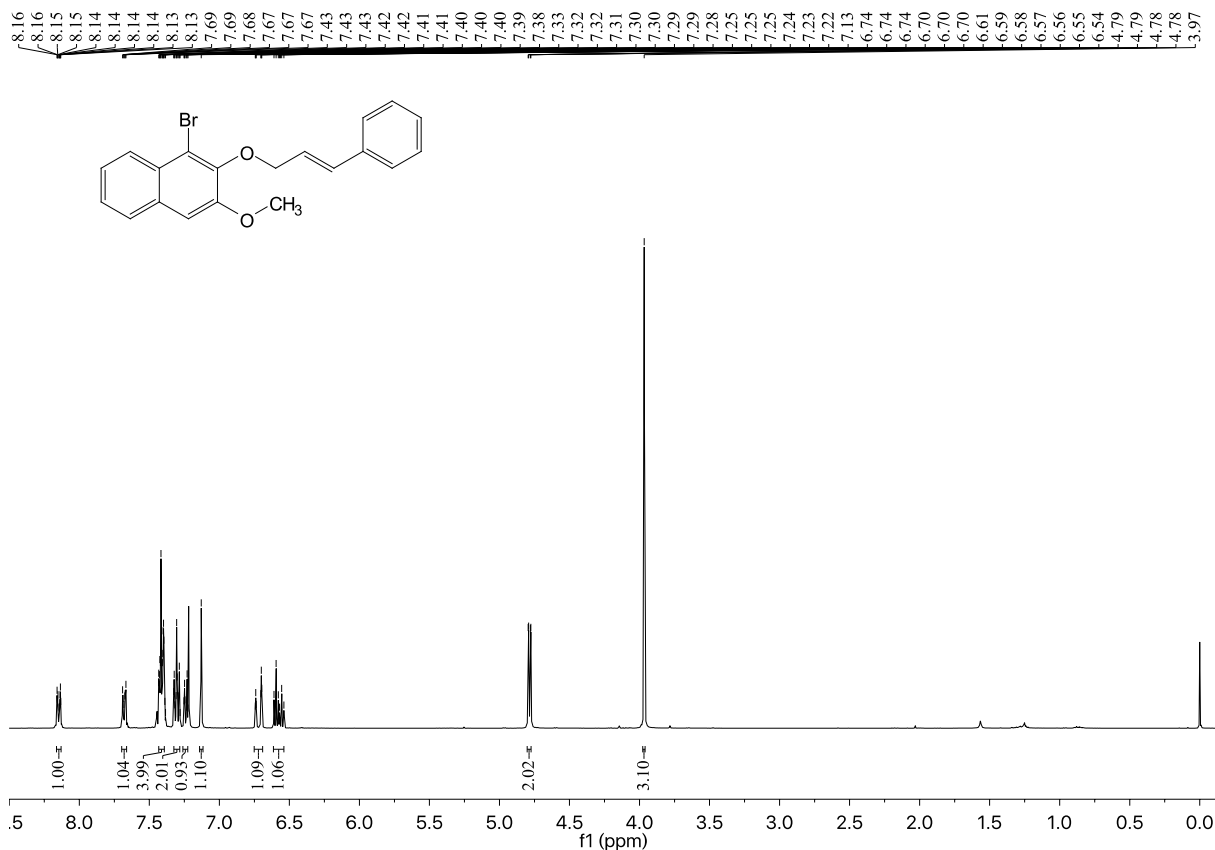




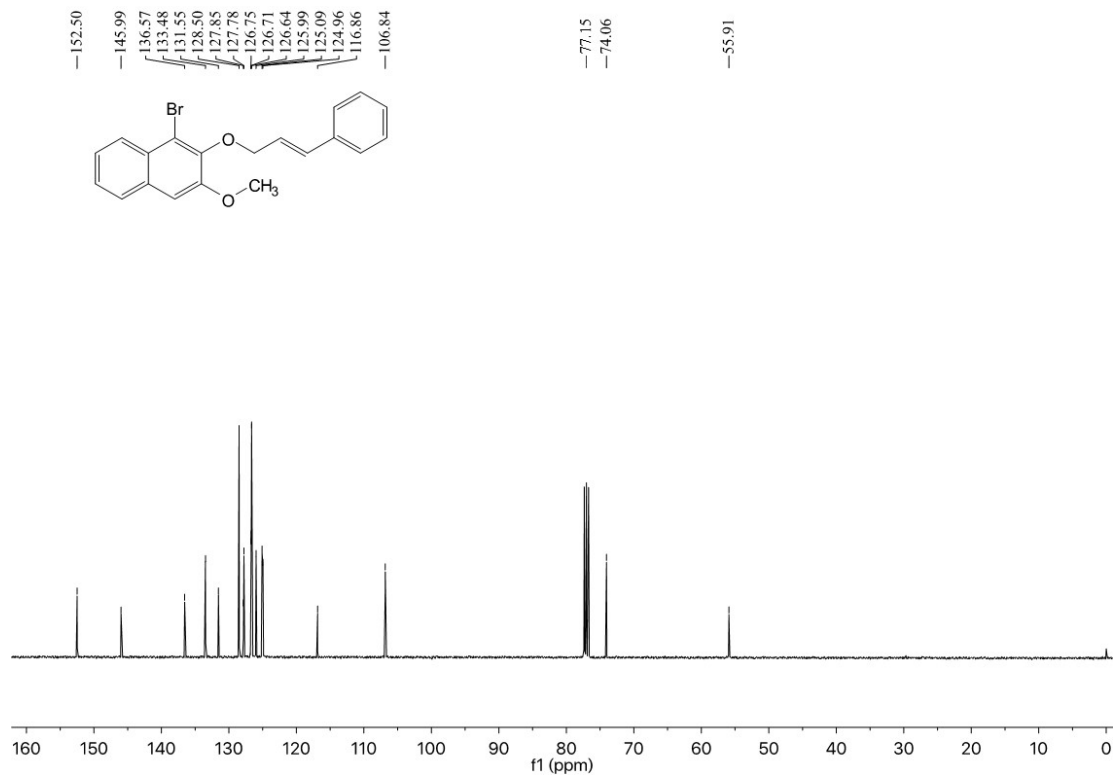
$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of **5-bromo-6-(cinnamyloxy)-2-naphthonitrile (1u)**



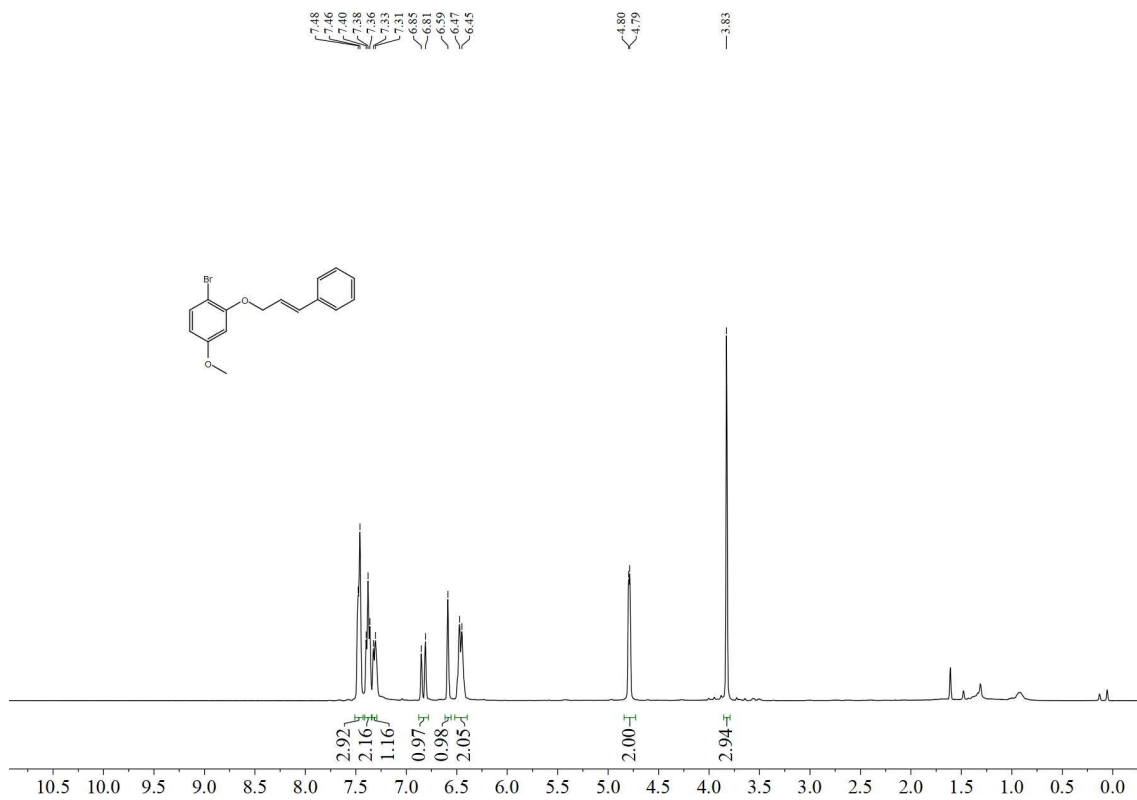
$^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ) of **5-bromo-6-(cinnamyloxy)-2-naphthonitrile (1u)**



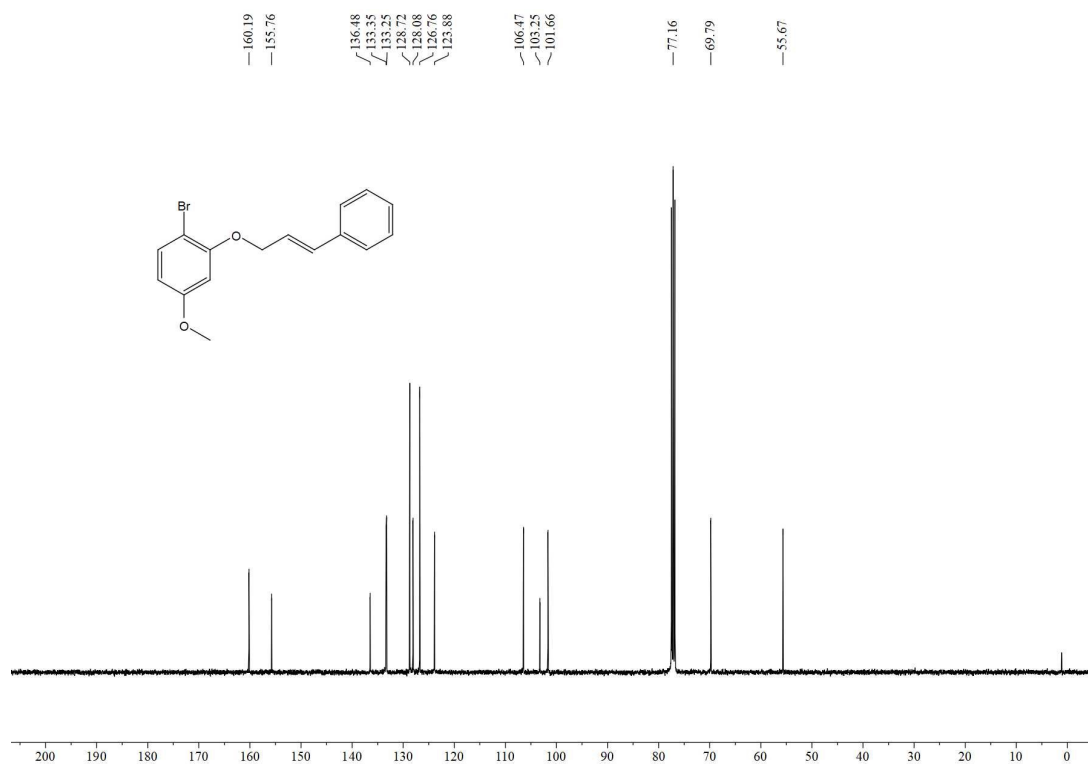
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-(cinnamyloxy)-3-methoxynaphthalene (1v)



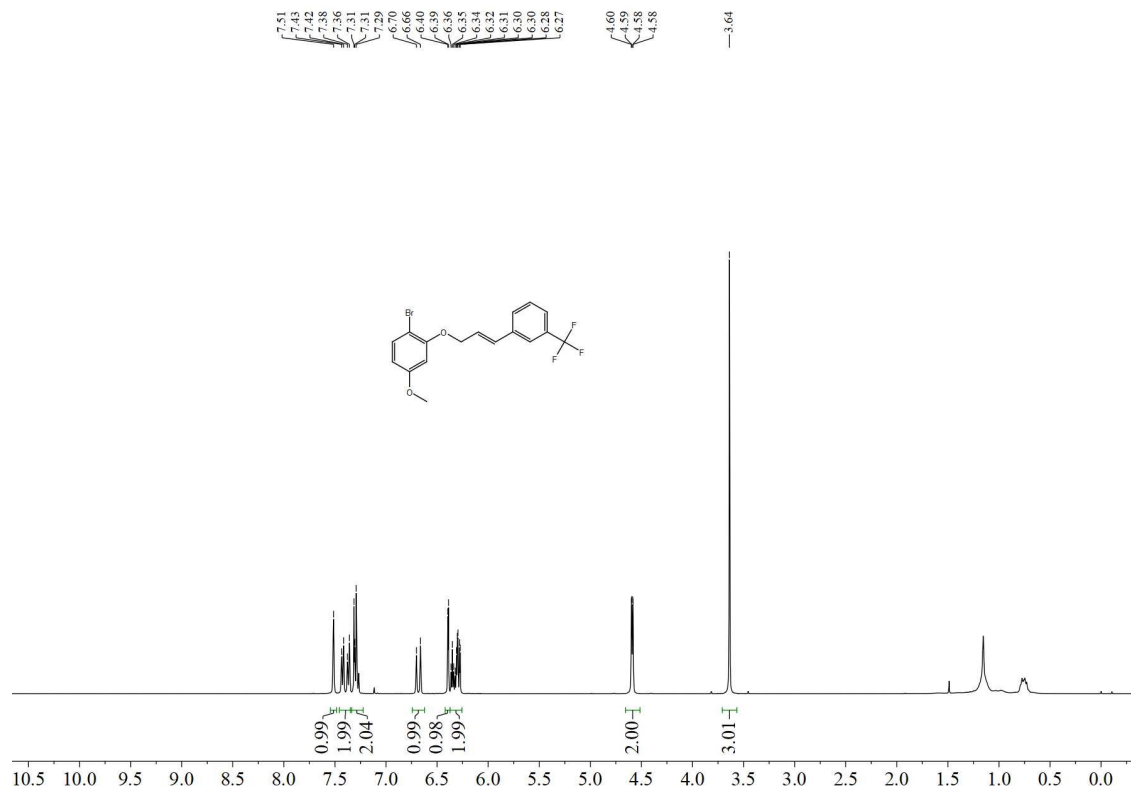
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-(cinnamyloxy)-3-methoxynaphthalene (1v)



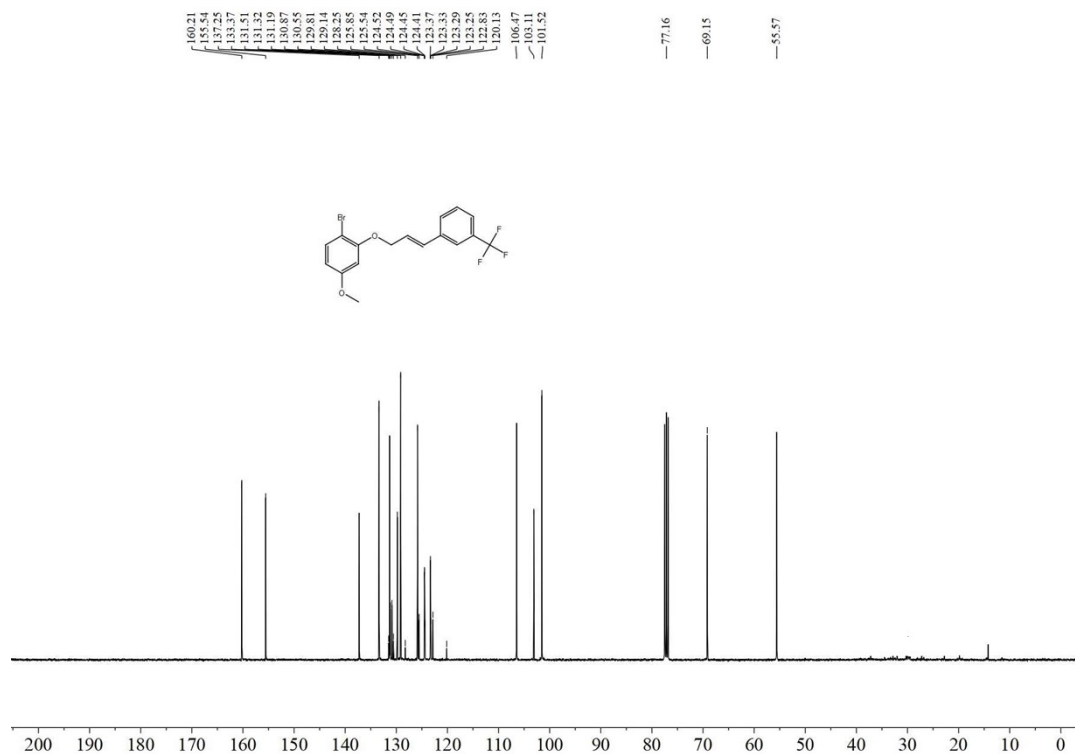
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-2-(cinnamyloxy)-4-methoxybenzene (1w)



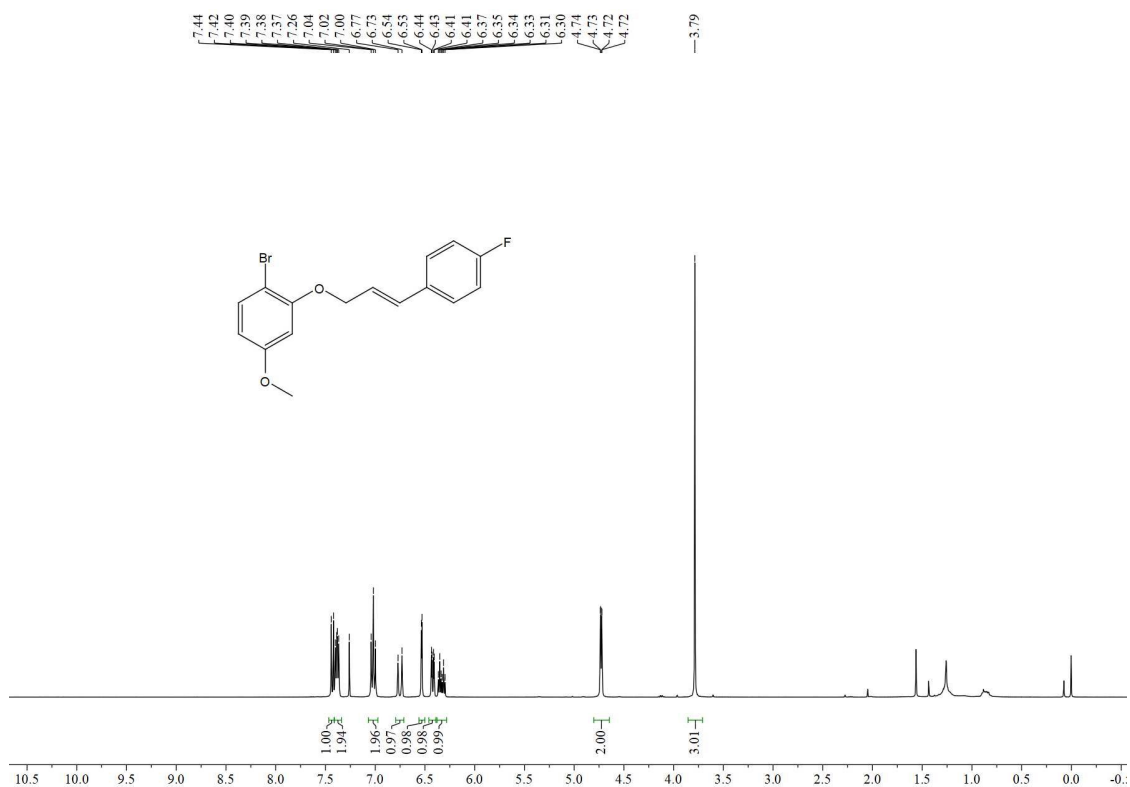
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-(cinnamyloxy)-4-methoxybenzene (1w)



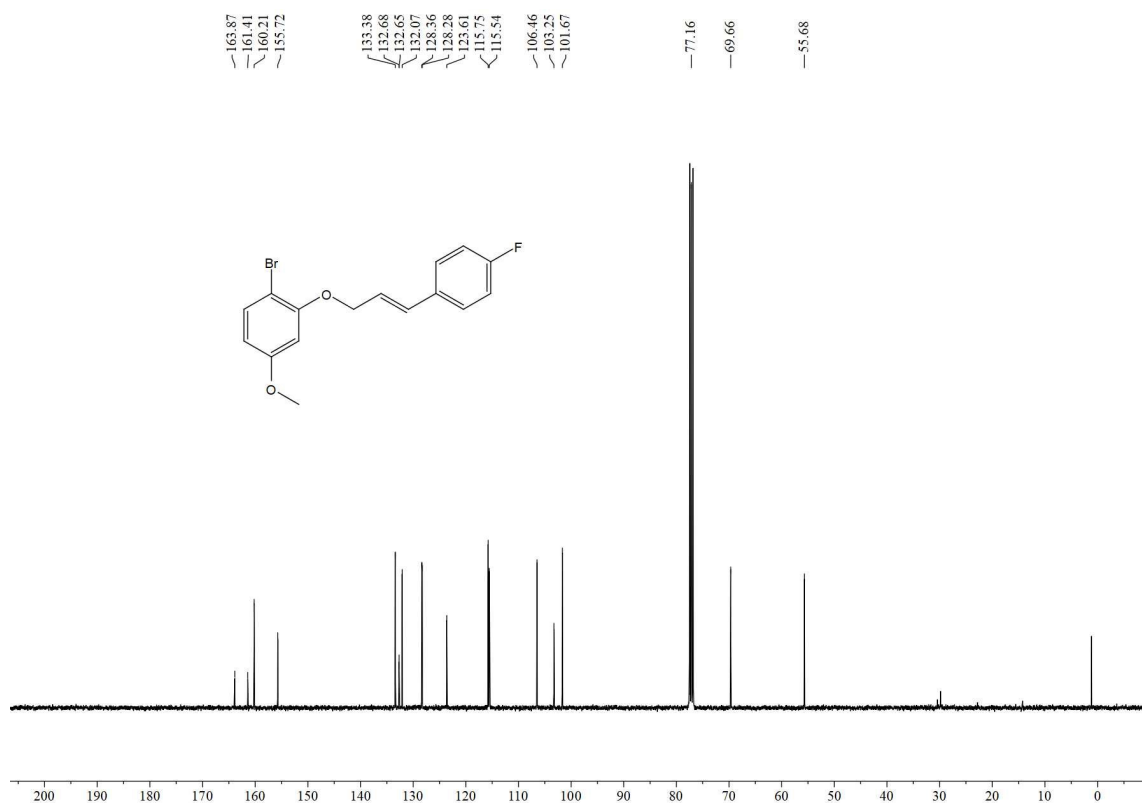
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 1-bromo-4-methoxy-2-((3-(3-(trifluoromethyl)phenyl)allyl)oxy)benzene (1y)



<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-4-methoxy-2-((3-(3-(trifluoromethyl)phenyl)allyl)oxy)benzene (1y)

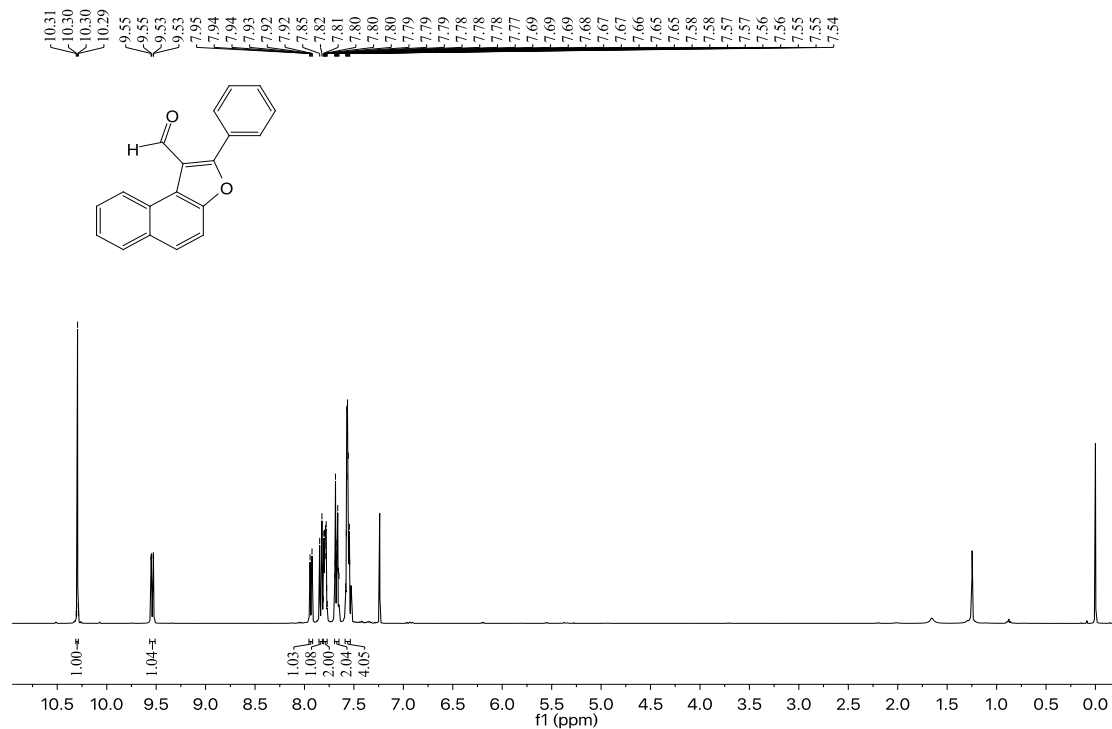


$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of 1-bromo-4-methoxy-2-((3-(3-(trifluoromethyl)phenyl)allyl)oxy)benzene (**1z**)

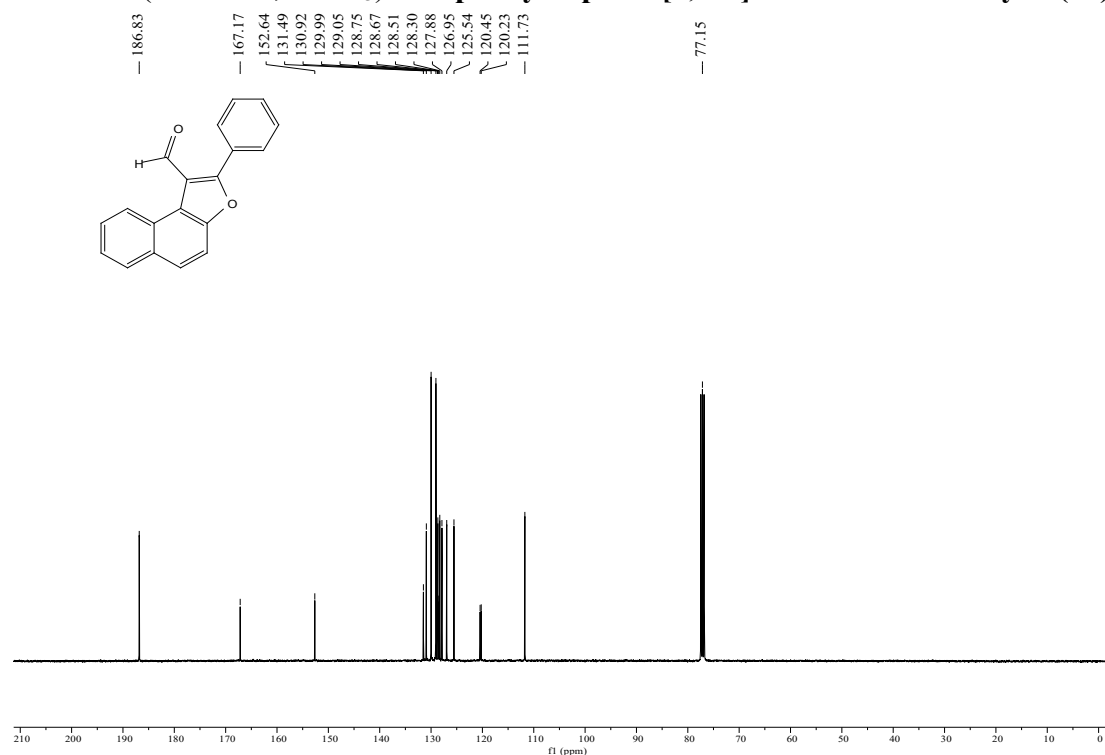


$^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ) of 1-bromo-4-methoxy-2-((3-(3-(trifluoromethyl)phenyl)allyl)oxy)benzene (**1z**)

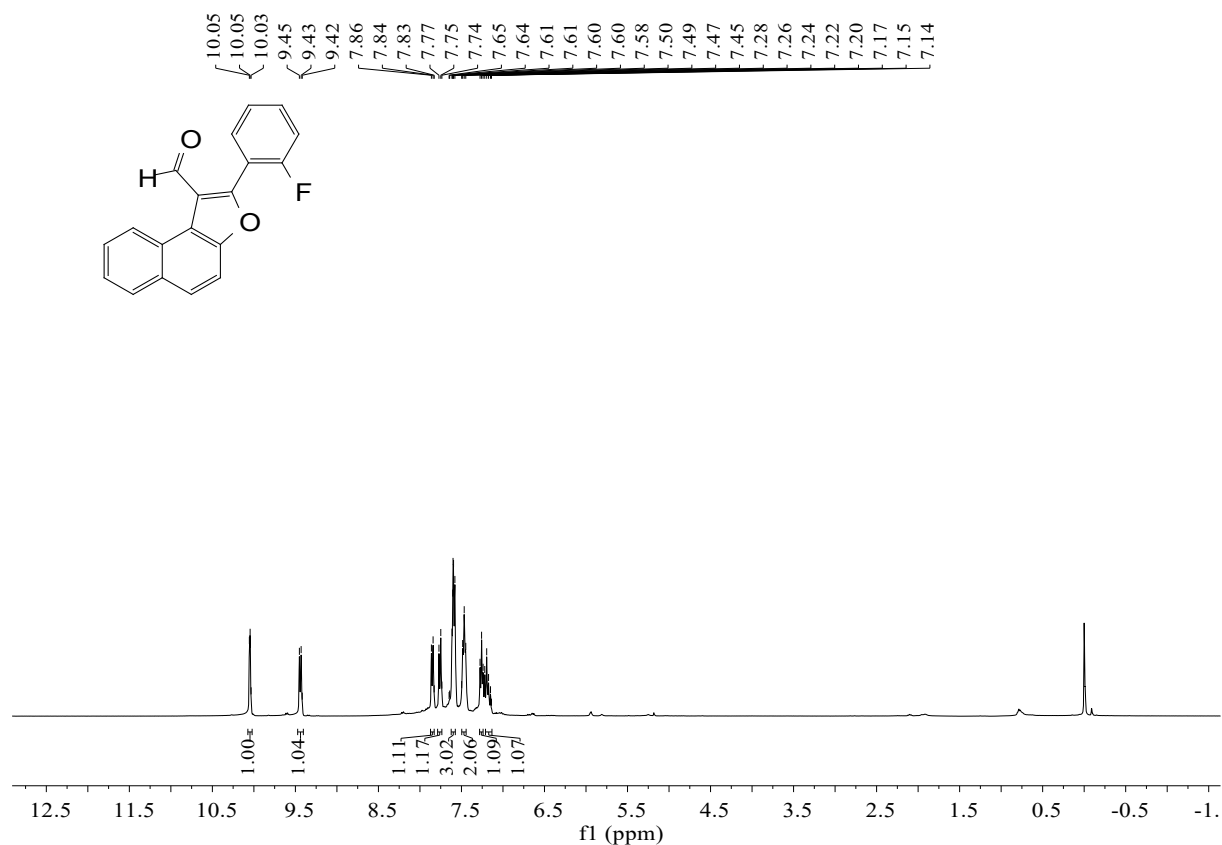
## 4.2 Copies of Product NMR Spectra



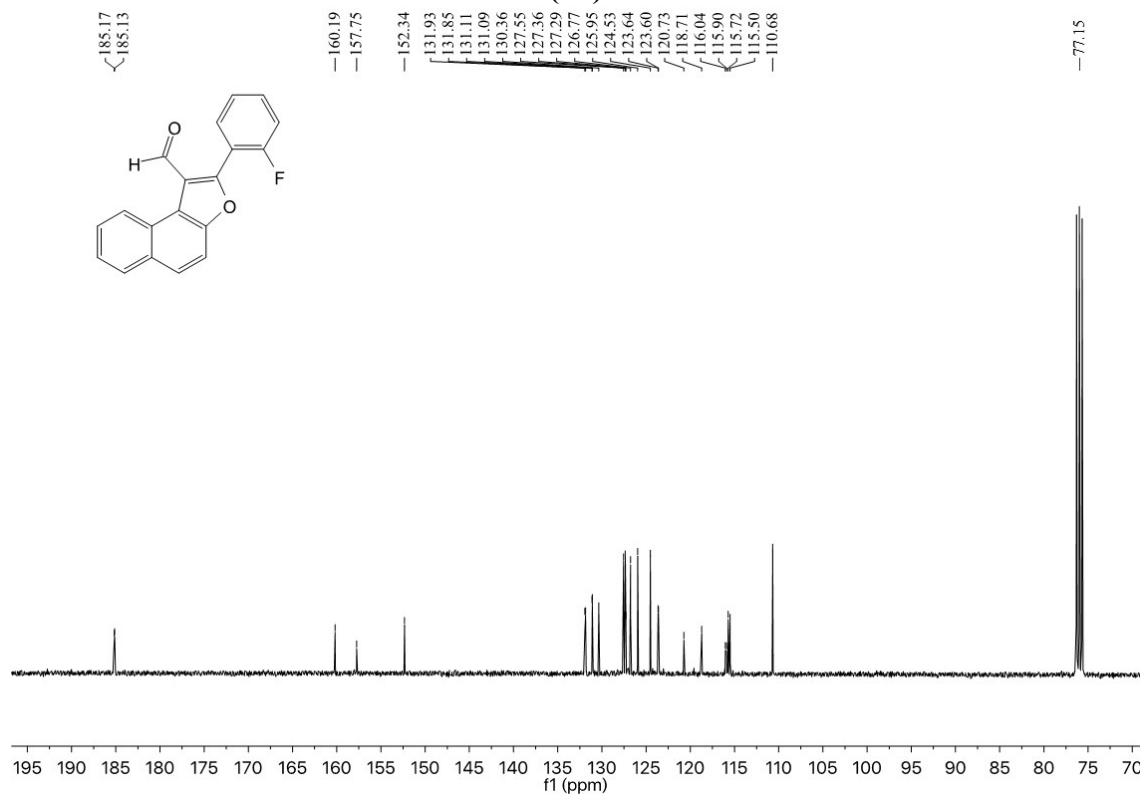
**<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-phenylnaphtho[2,1-b]furan-1-carbaldehyde (2a)**



**<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-phenylnaphtho[2,1-b]furan-1-carbaldehyde (2a)**



<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(2-fluorophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2b)

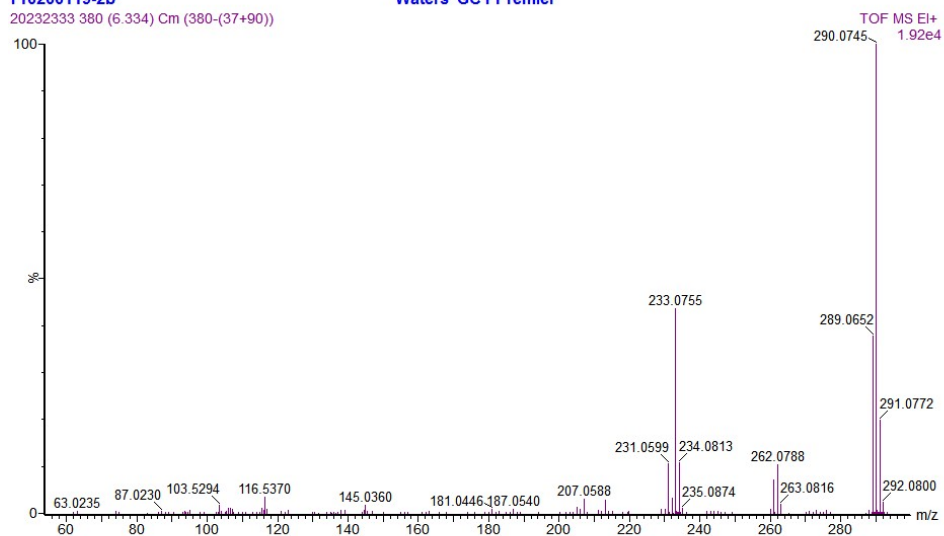


<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-(2-fluorophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2b)

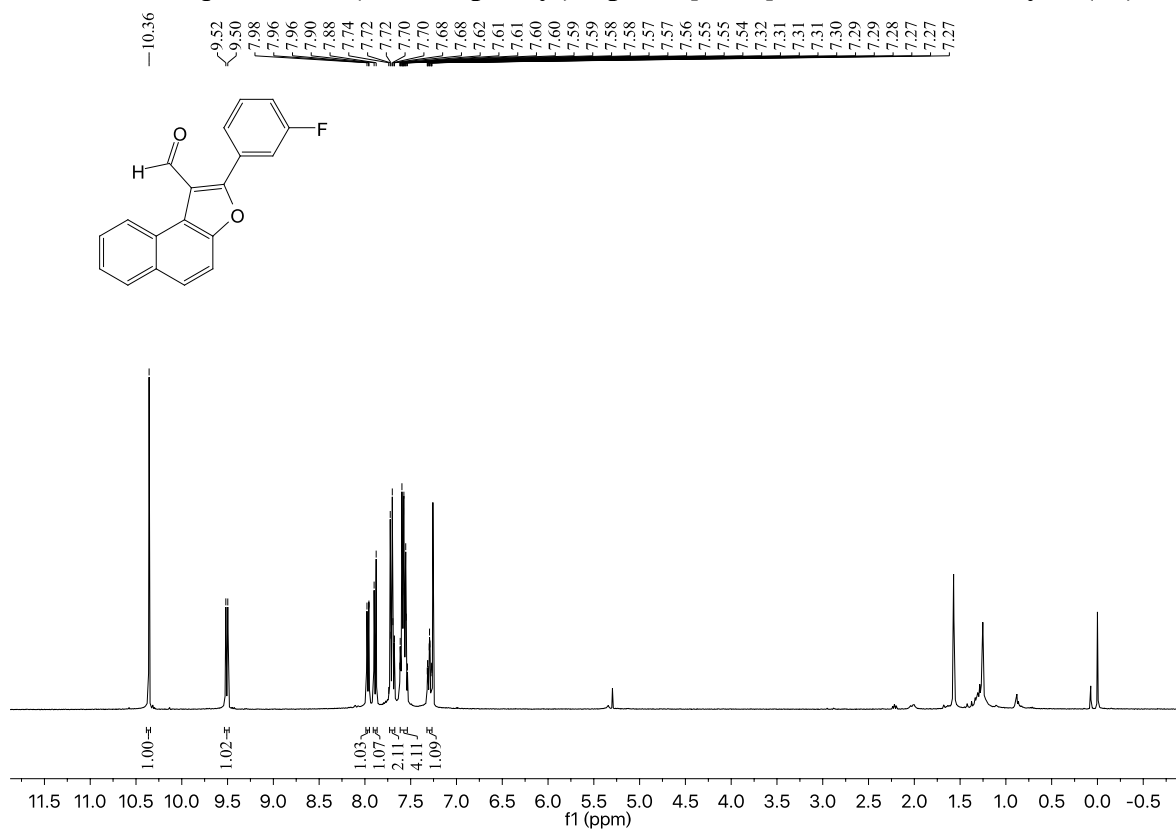
Y10200119-2b

20232333 380 (6.334) Cm (380-(37+90))

Waters GCTPremier



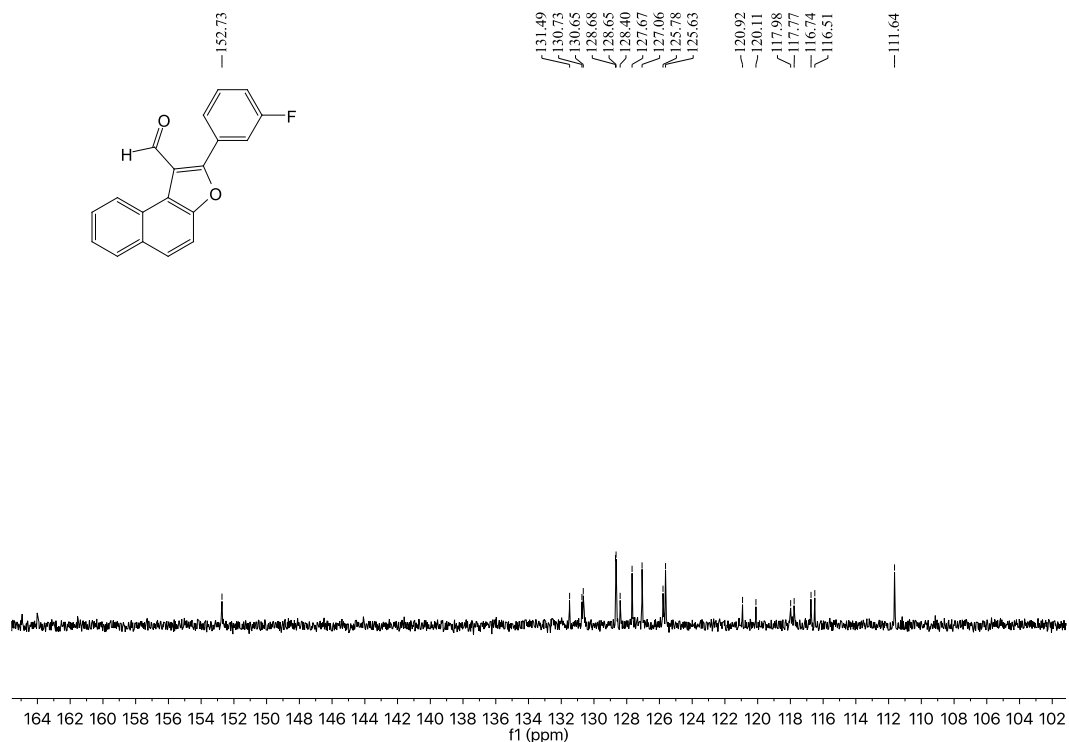
HRMS spectra of 2-(2-fluorophenyl)naphtho[2,1-b]furan-1-carbaldehyde (2b)



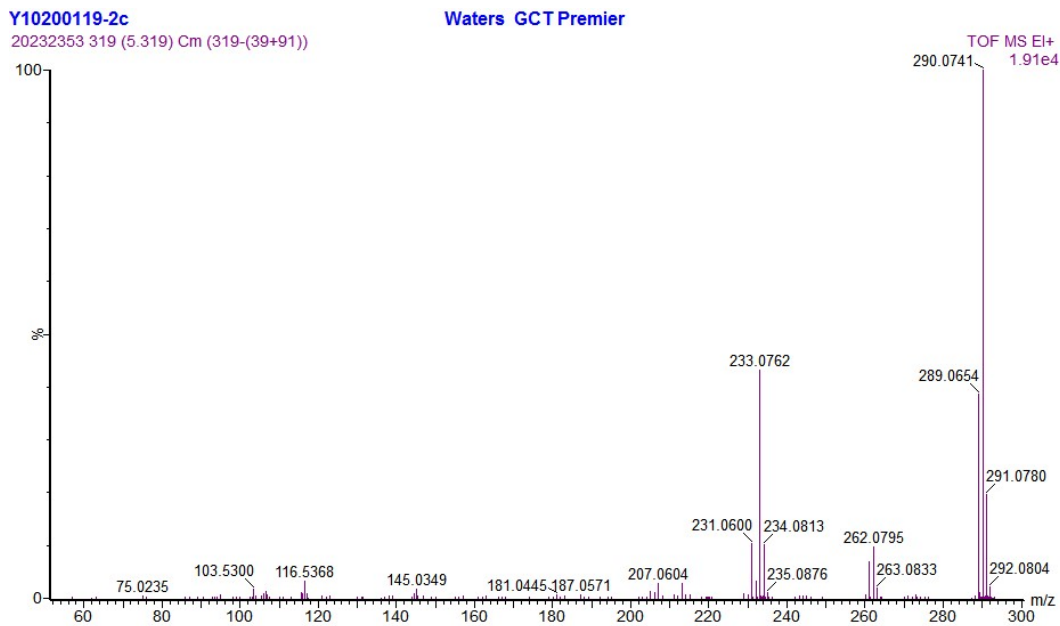
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(3-fluorophenyl)naphtho[2,1-b]furan-1-carbaldehyde (2c)



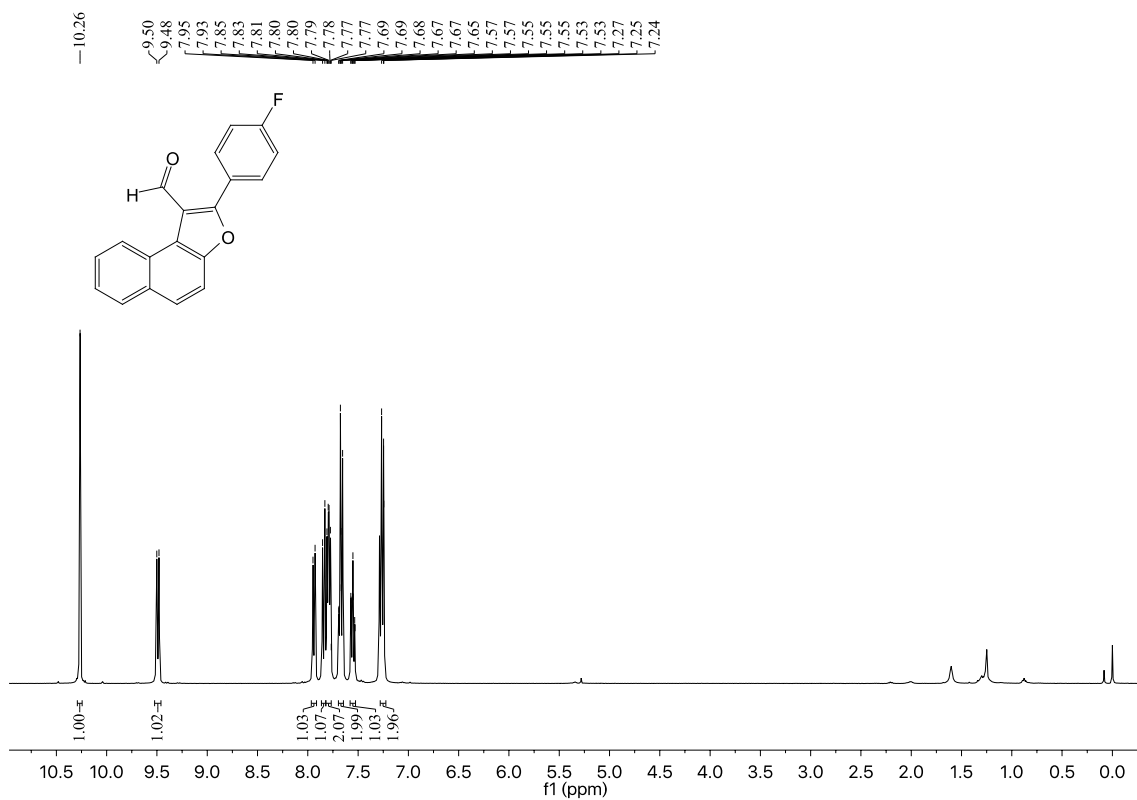
HRMS spectra of 2-(3-fluorophenyl)naphtho[2,1-b]furan-1-carbaldehyde (2c)



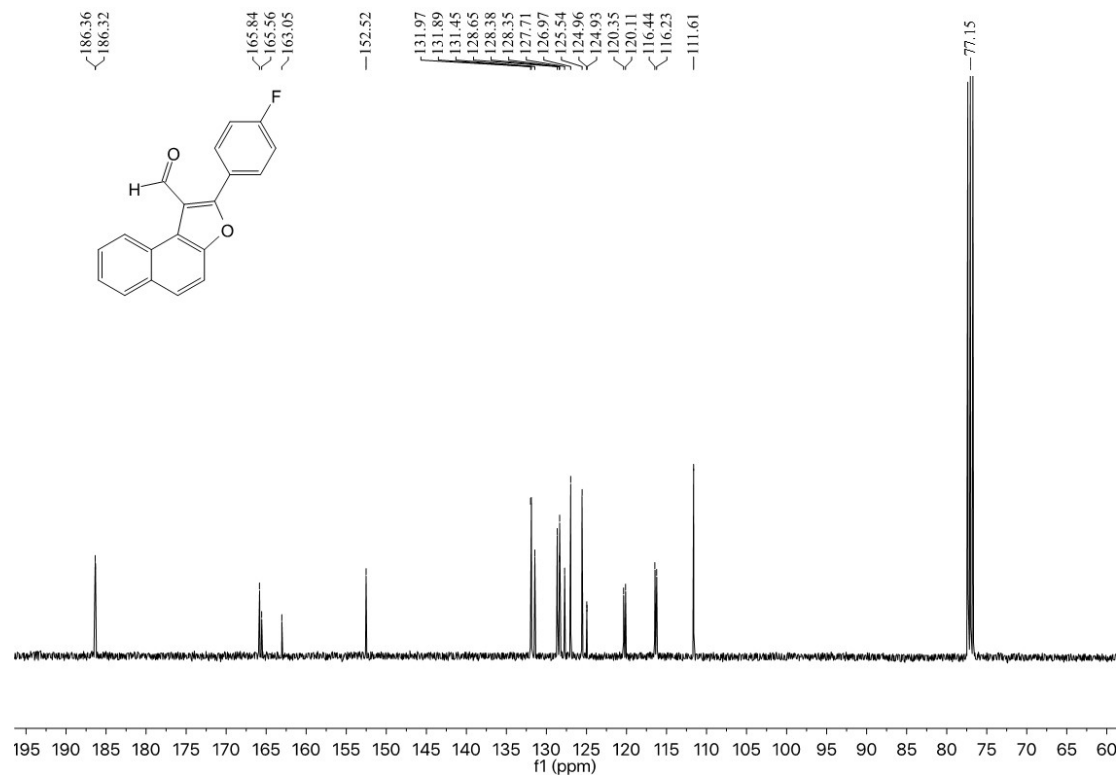
$^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ) of 2-(3-fluorophenyl)naphtho[2,1-b]furan-1-carbaldehyde (2c)



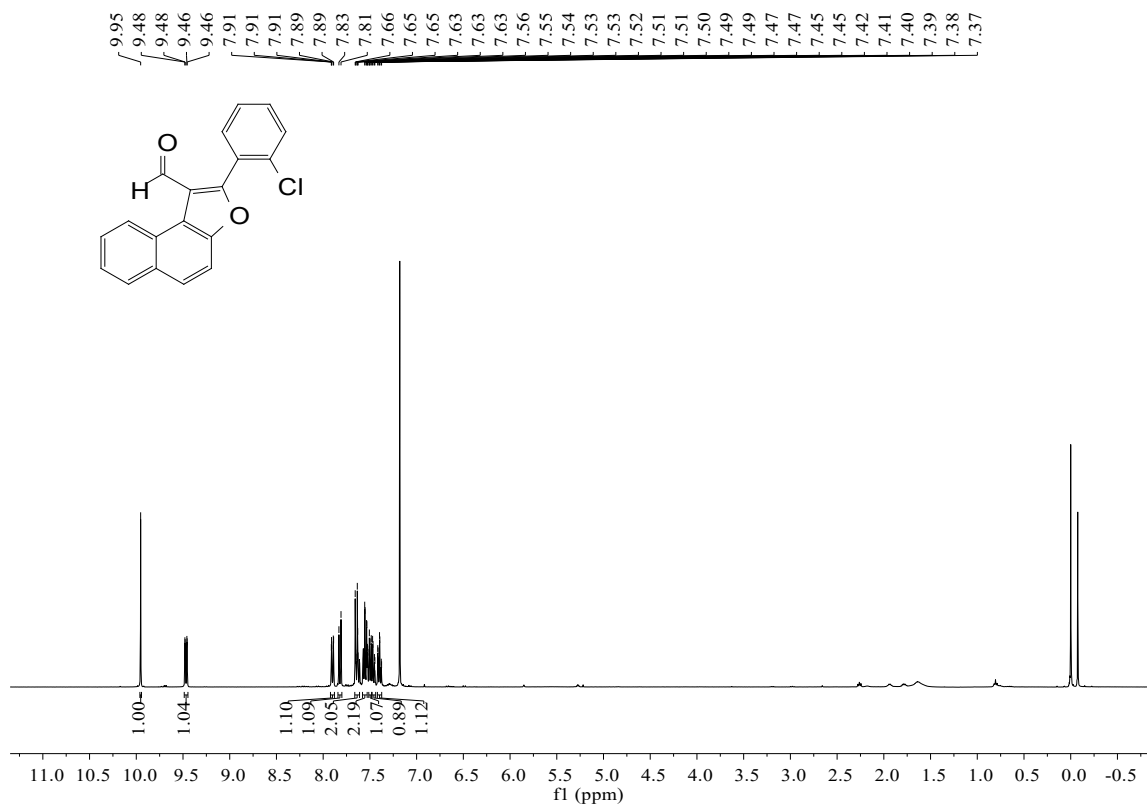
HRMS spectra of 2-(3-fluorophenyl)naphtho[2,1-b]furan-1-carbaldehyde (2c)



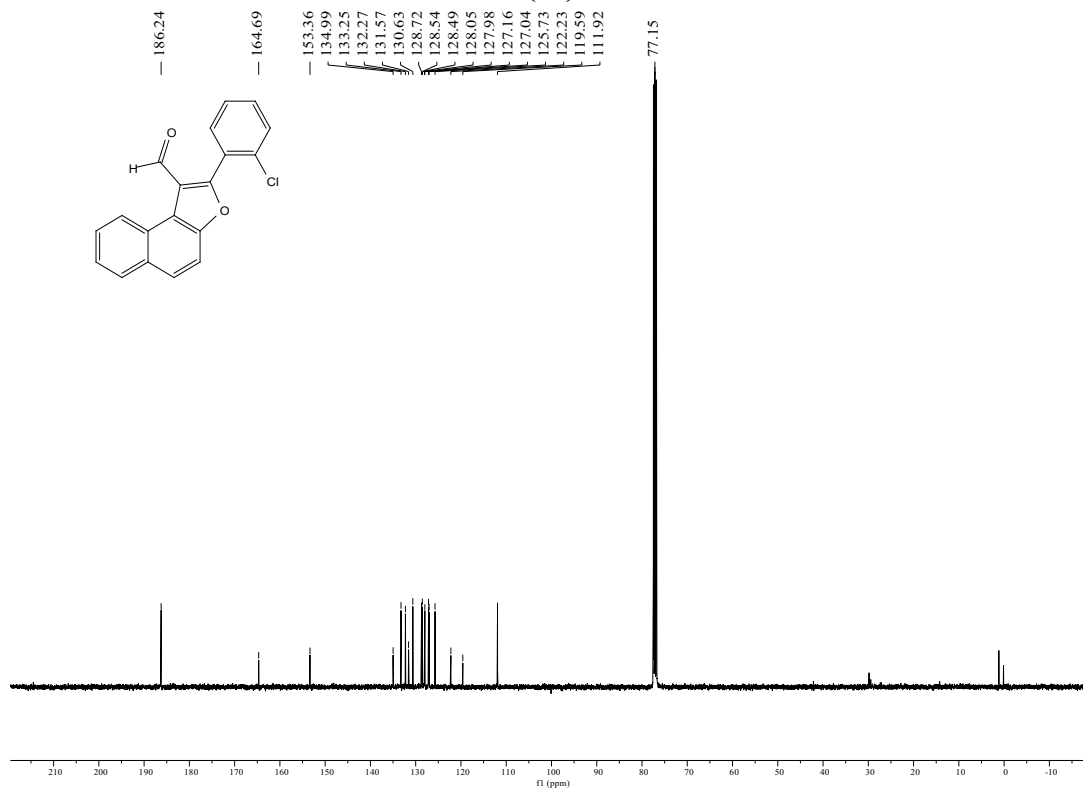
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(4-fluorophenyl)naphtho[2,1-b]furan-1-carbaldehyde (2d)



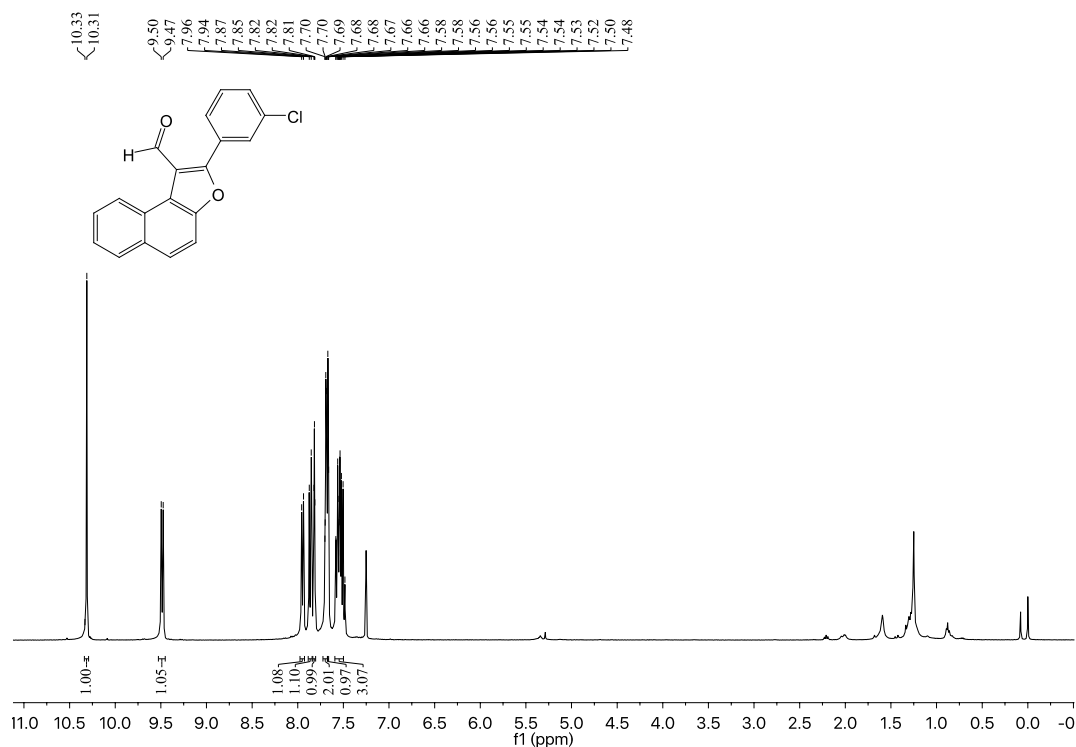
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-(4-fluorophenyl)naphtho[2,1-b]furan-1-carbaldehyde (2d)



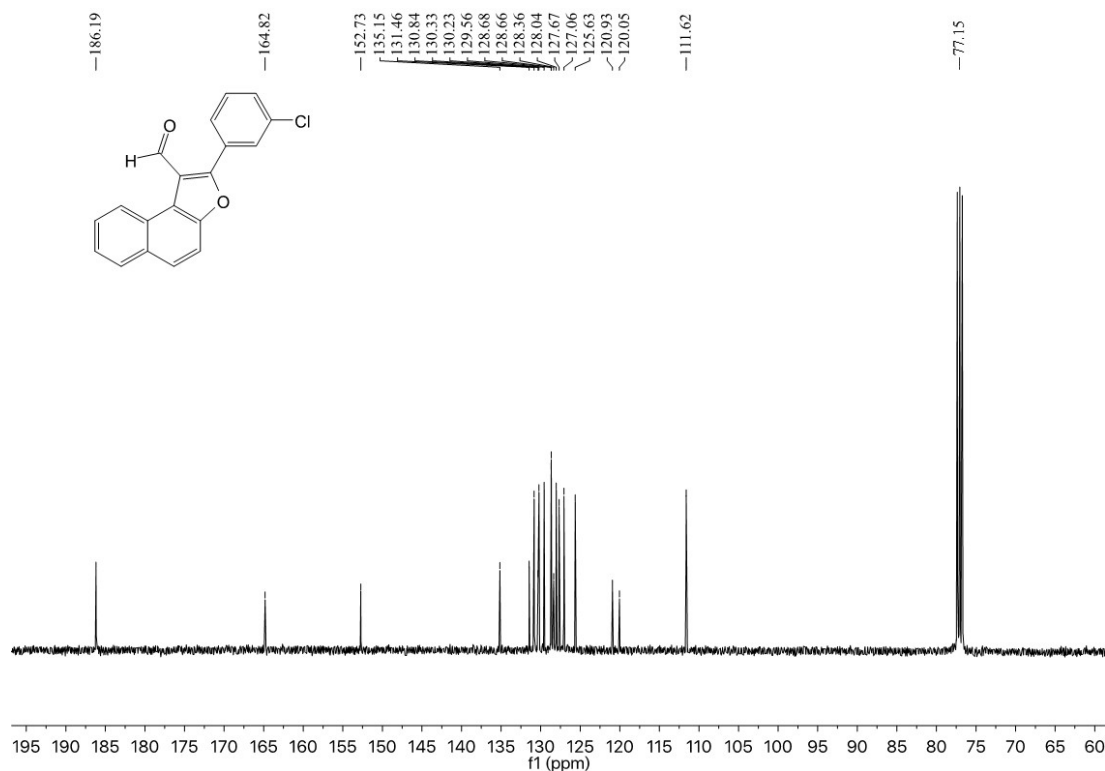
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(2-chlorophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2e)



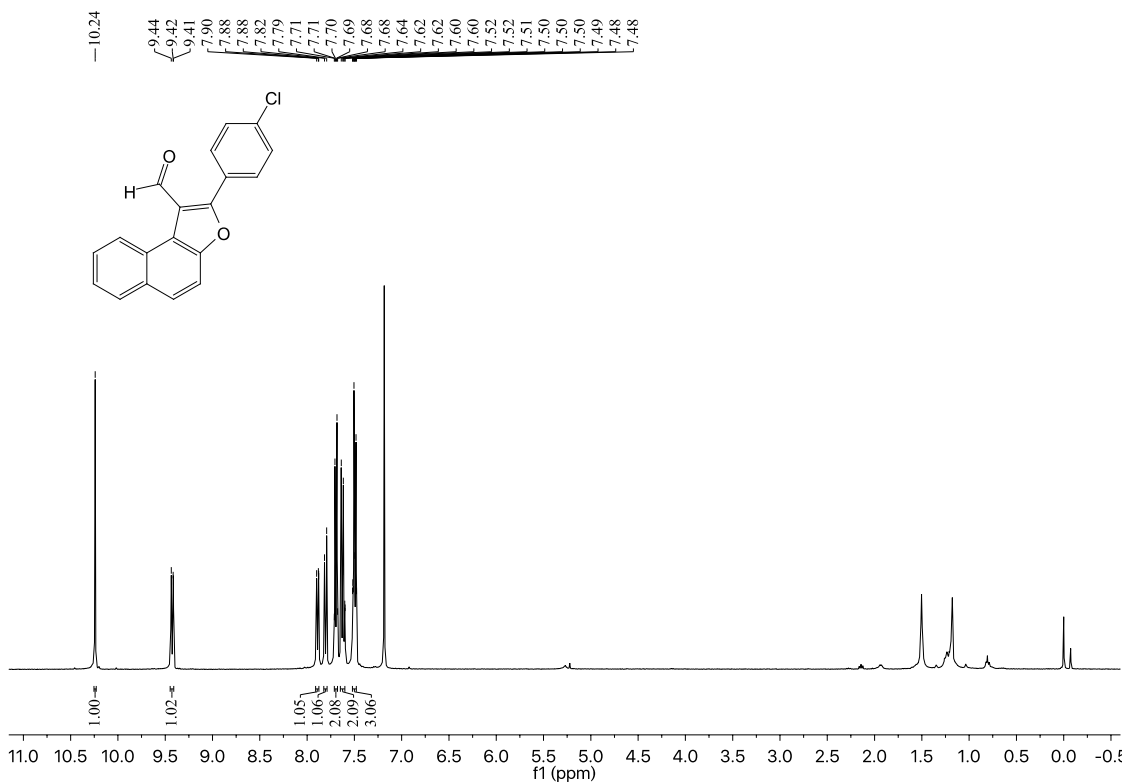
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-(2-chlorophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2e)



**<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(3-chlorophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2f)**

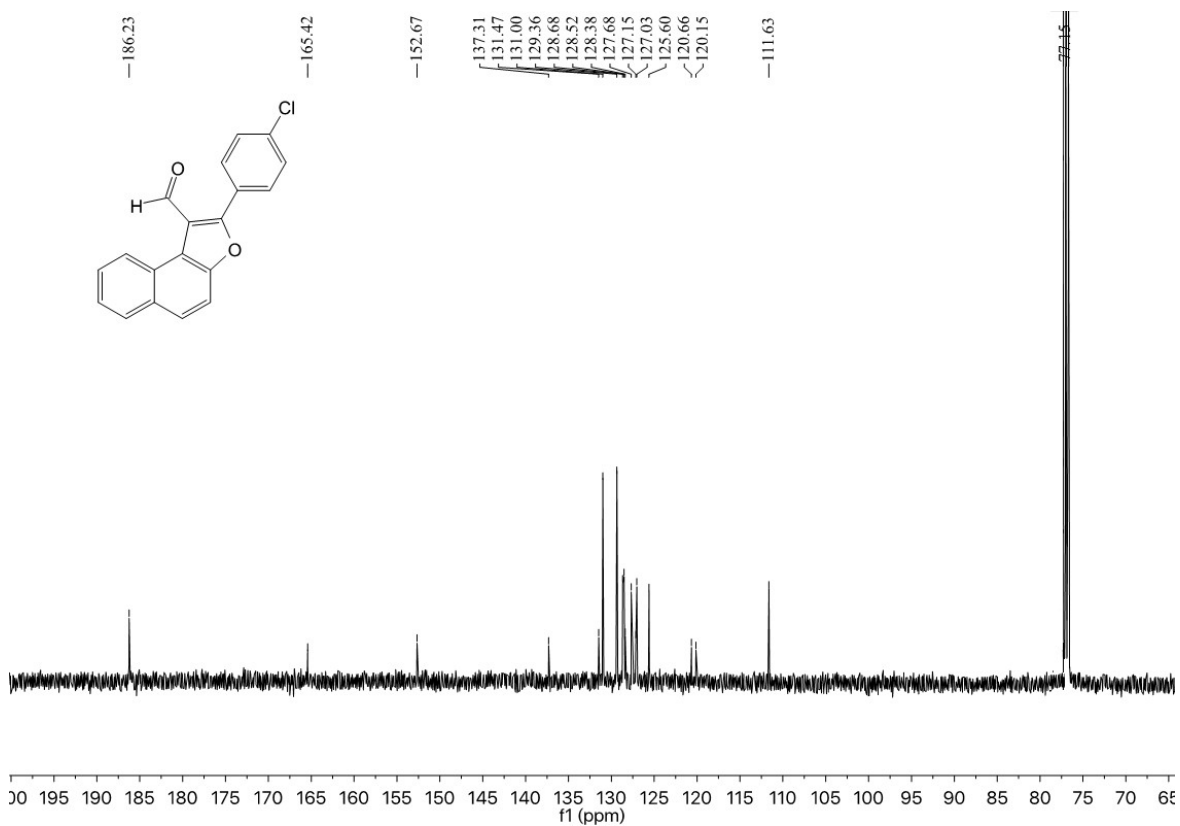


**<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-(3-chlorophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2f)**



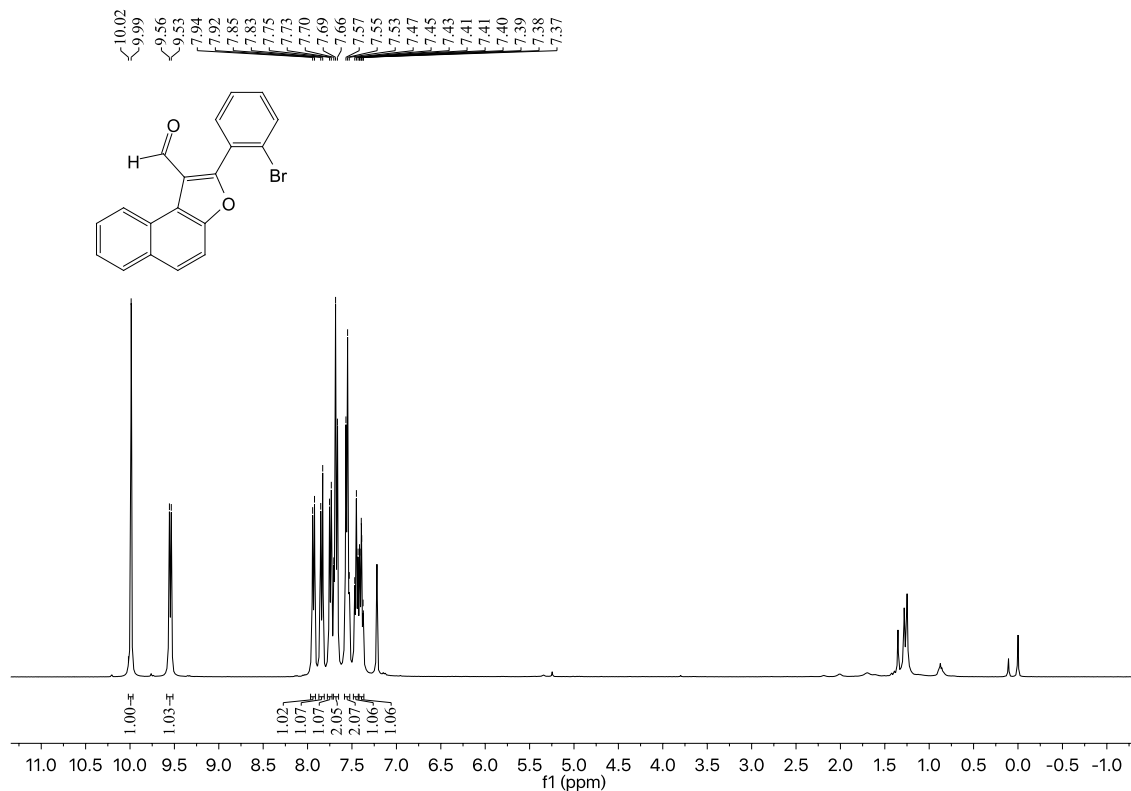
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(4-chlorophenyl)naphtho[2,1-b]furan-1-carbaldehyde

(2g)

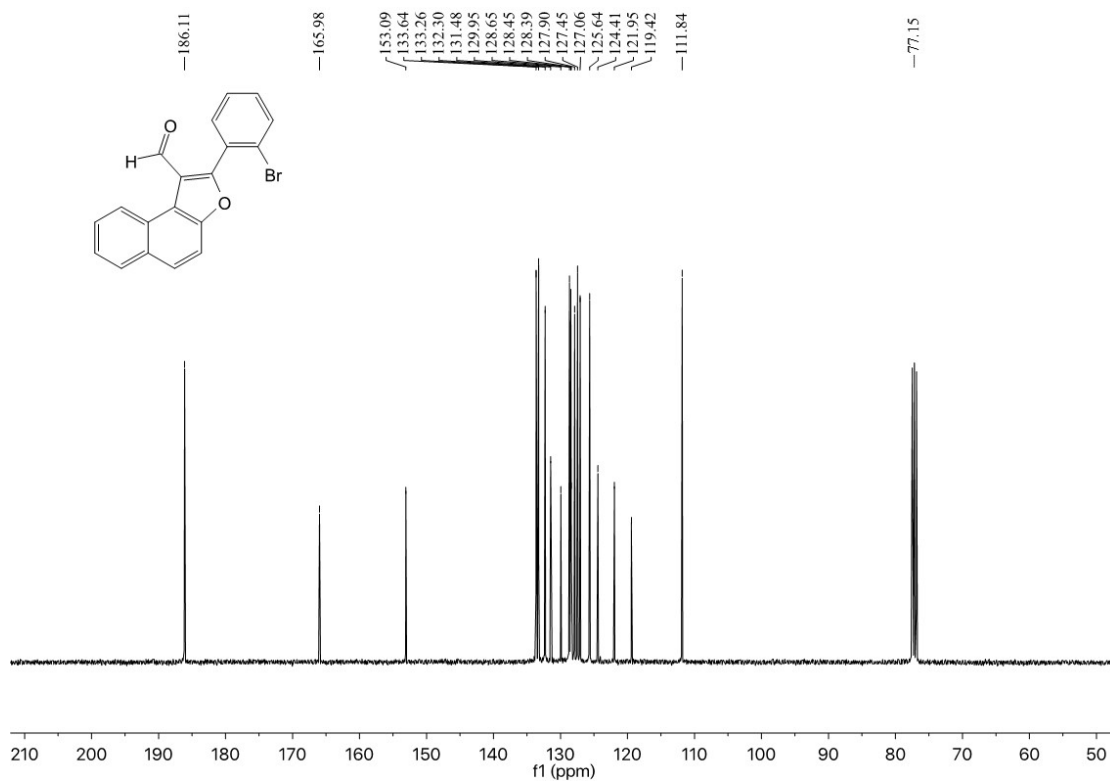


<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-(4-chlorophenyl)naphtho[2,1-b]furan-1-carbaldehyde

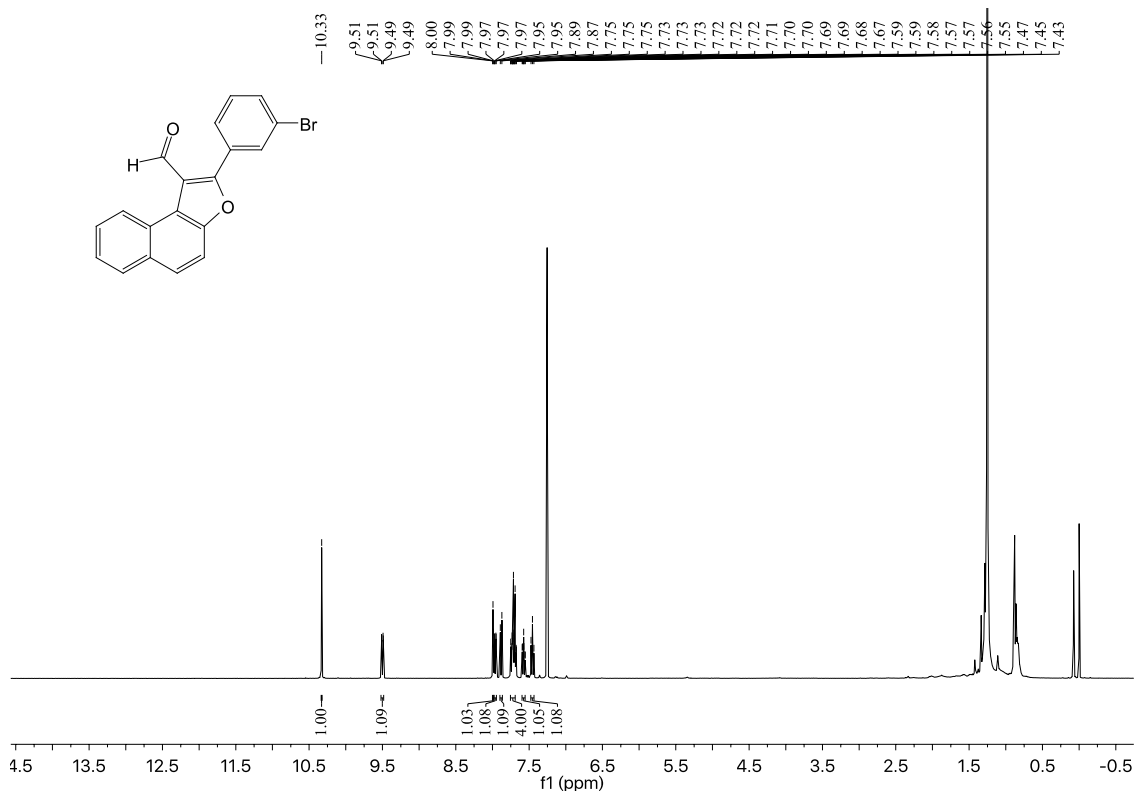
(2g)



<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(2-bromophenyl)naphtho[2,1-b]furan-1-carbaldehyde (2h)

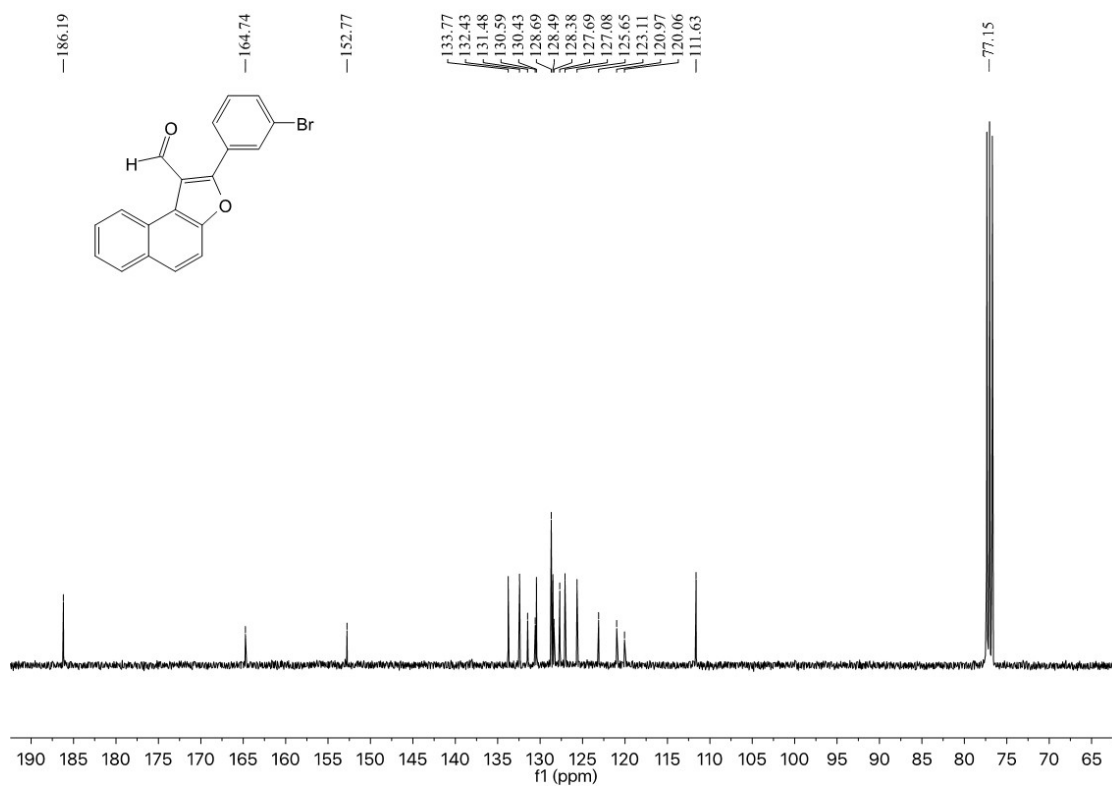


<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-(2-bromophenyl)naphtho[2,1-b]furan-1-carbaldehyde (2h)



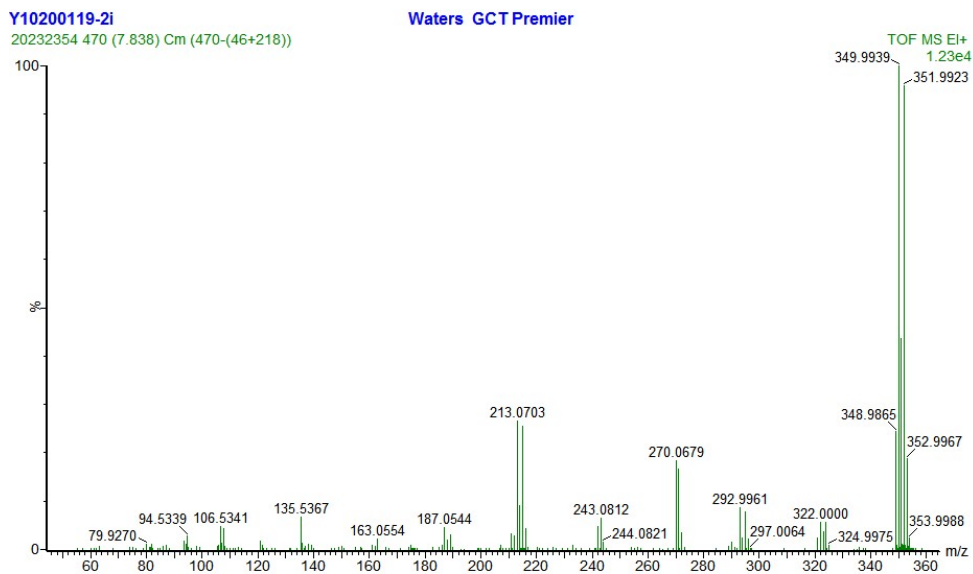
**<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(3-bromophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde**

(2i)

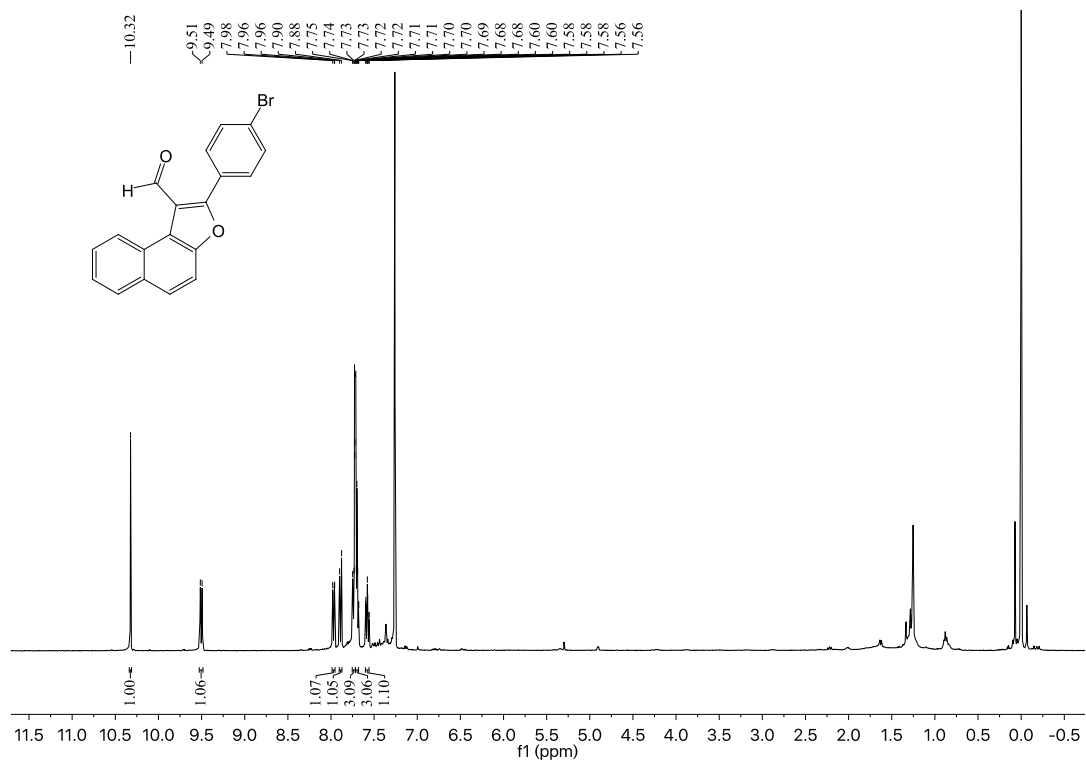


**<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-(3-bromophenyl)naphtho[2,1-*b*]furan-1-carbaldehyde**

(2i)

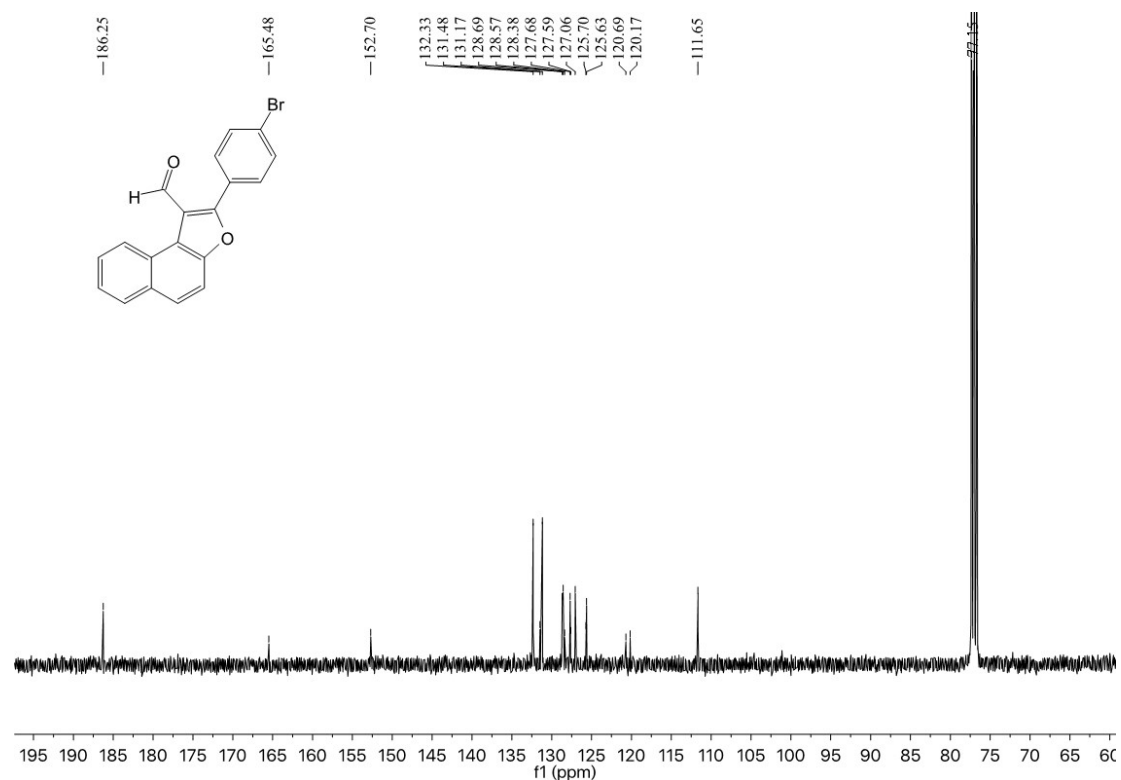


HRMS spectra of 2-(3-bromophenyl)naphtho[2,1-b]furan-1-carbaldehyde (2i)



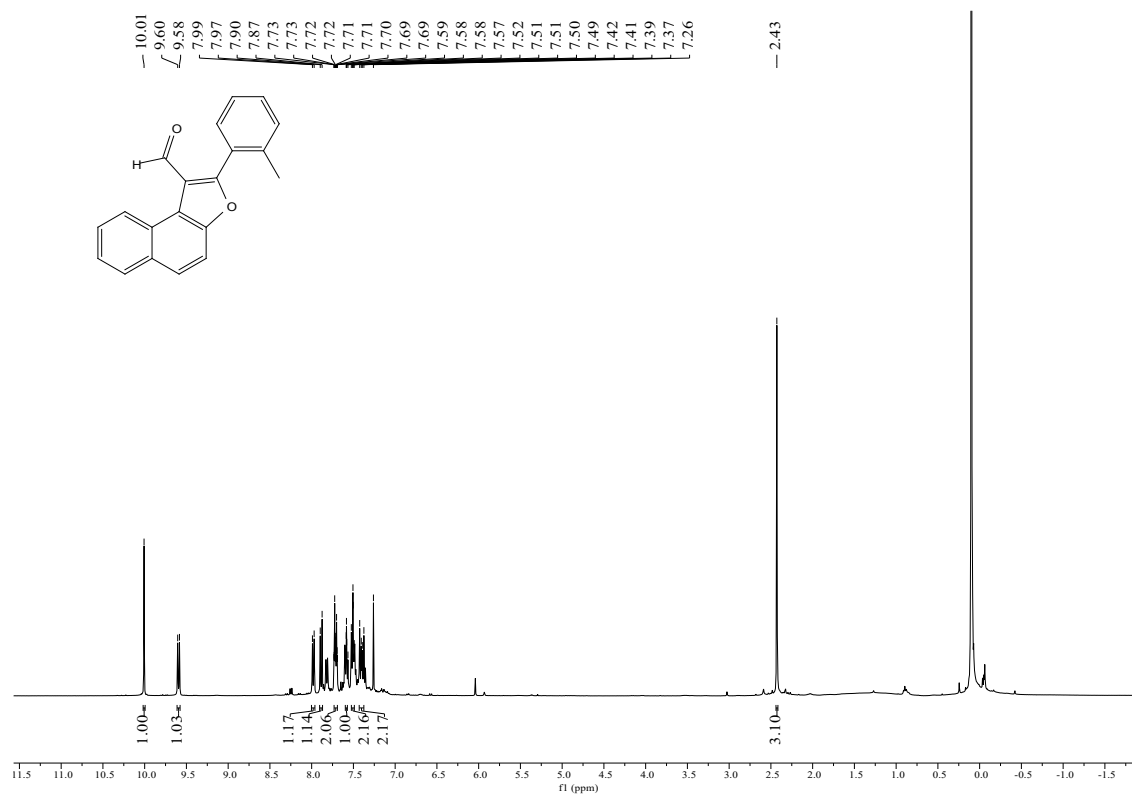
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(4-bromophenyl)naphtho[2,1-b]furan-1-carbaldehyde (2j)



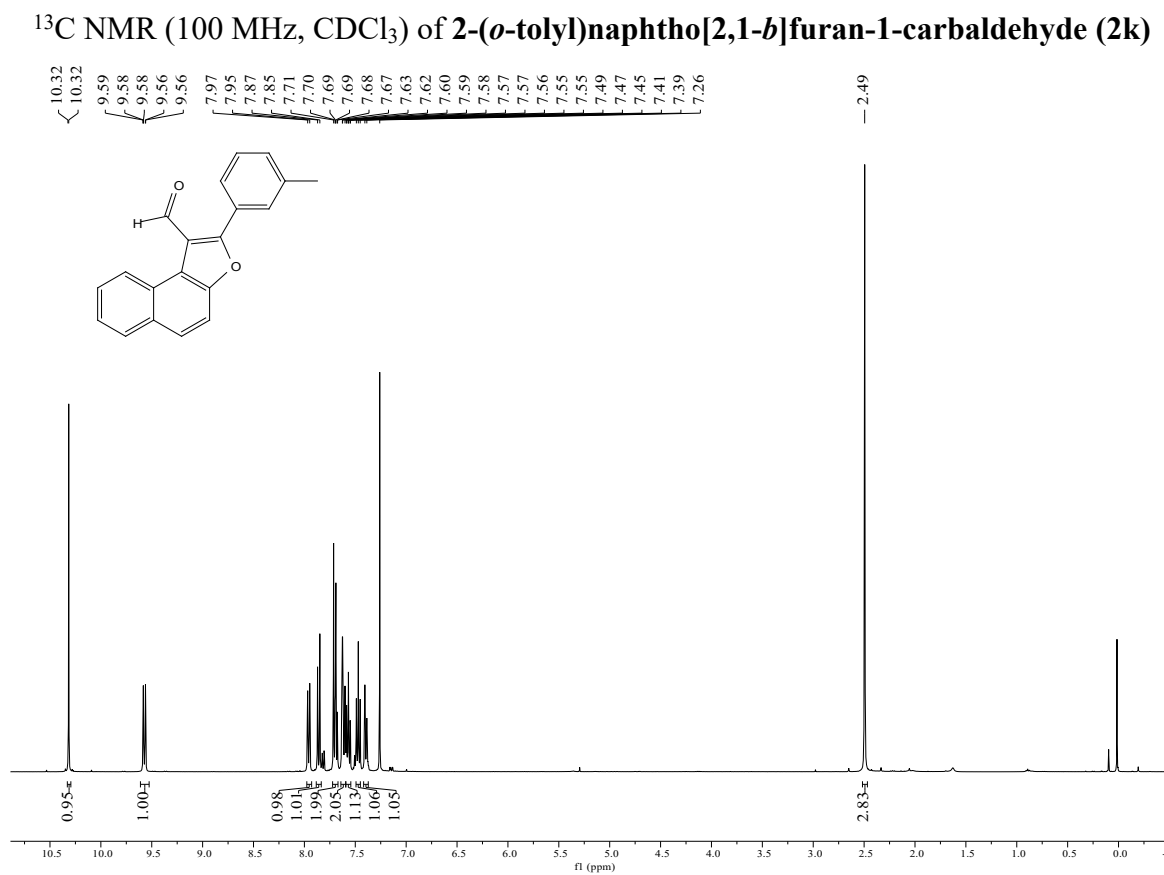
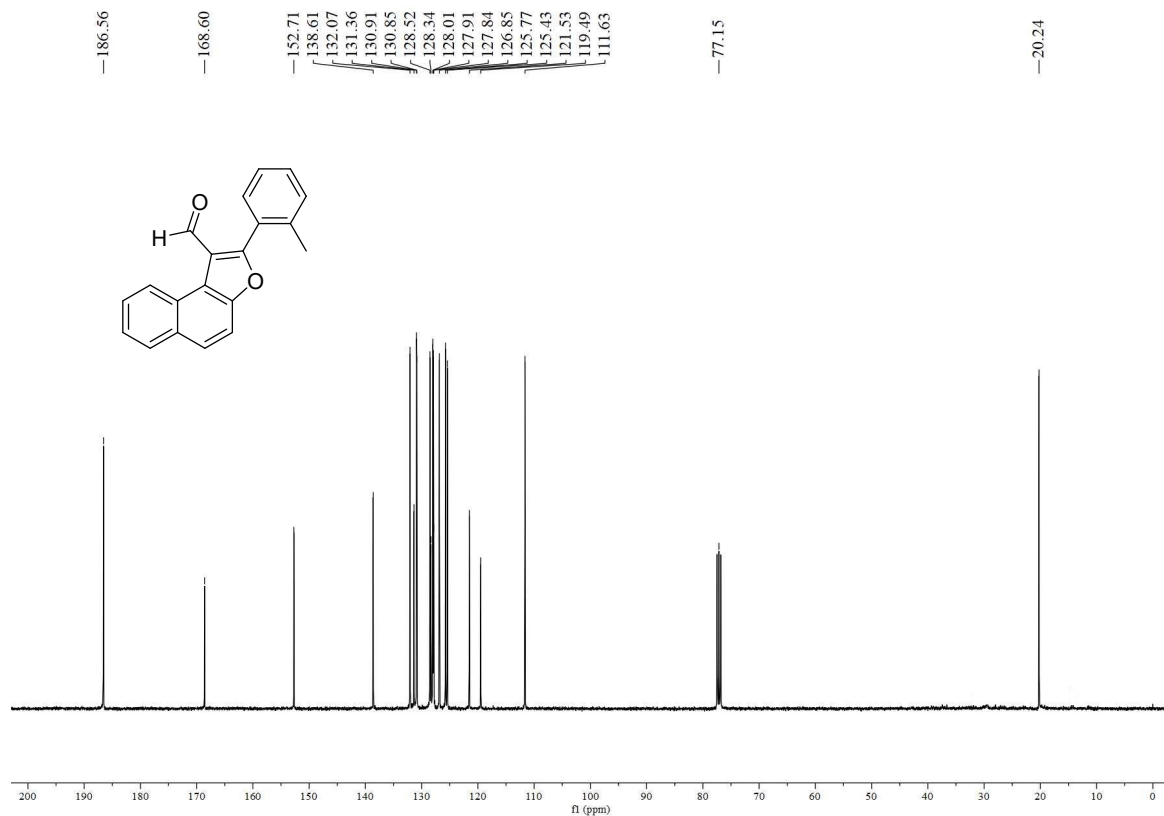


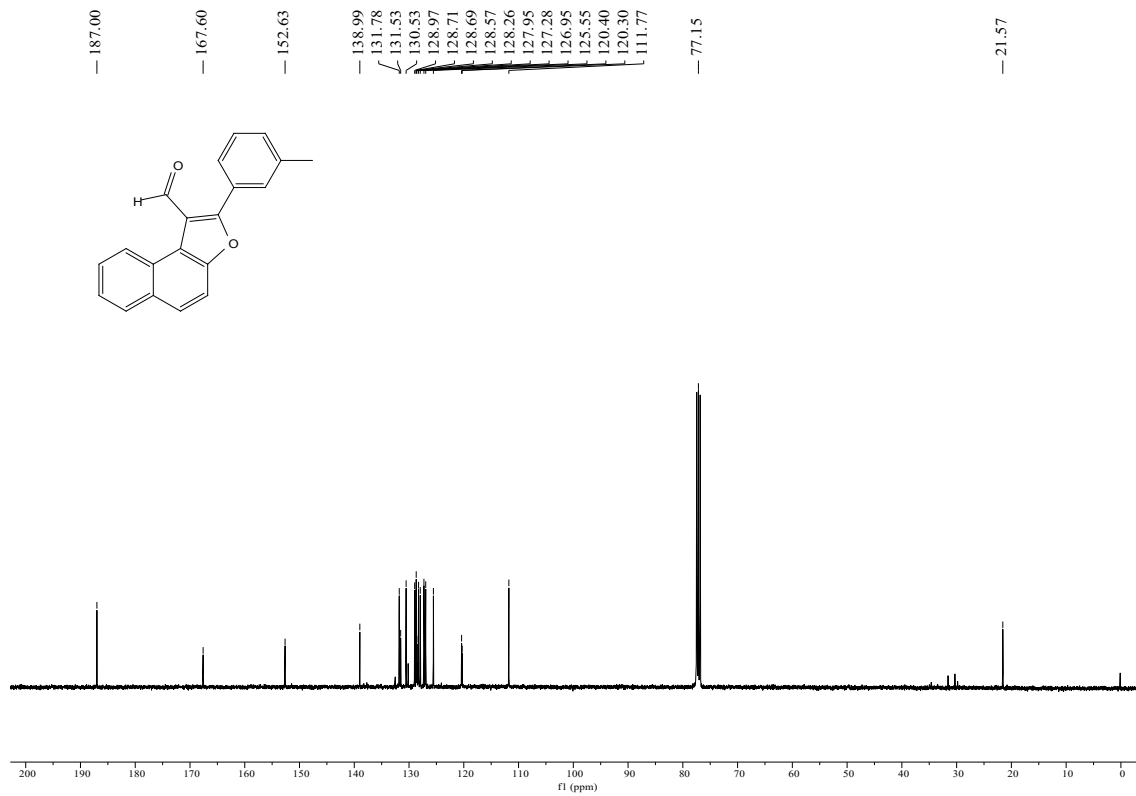
$^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ) of 2-(4-bromophenyl)naphtho[2,1-b]furan-1-carbaldehyde

(2j)

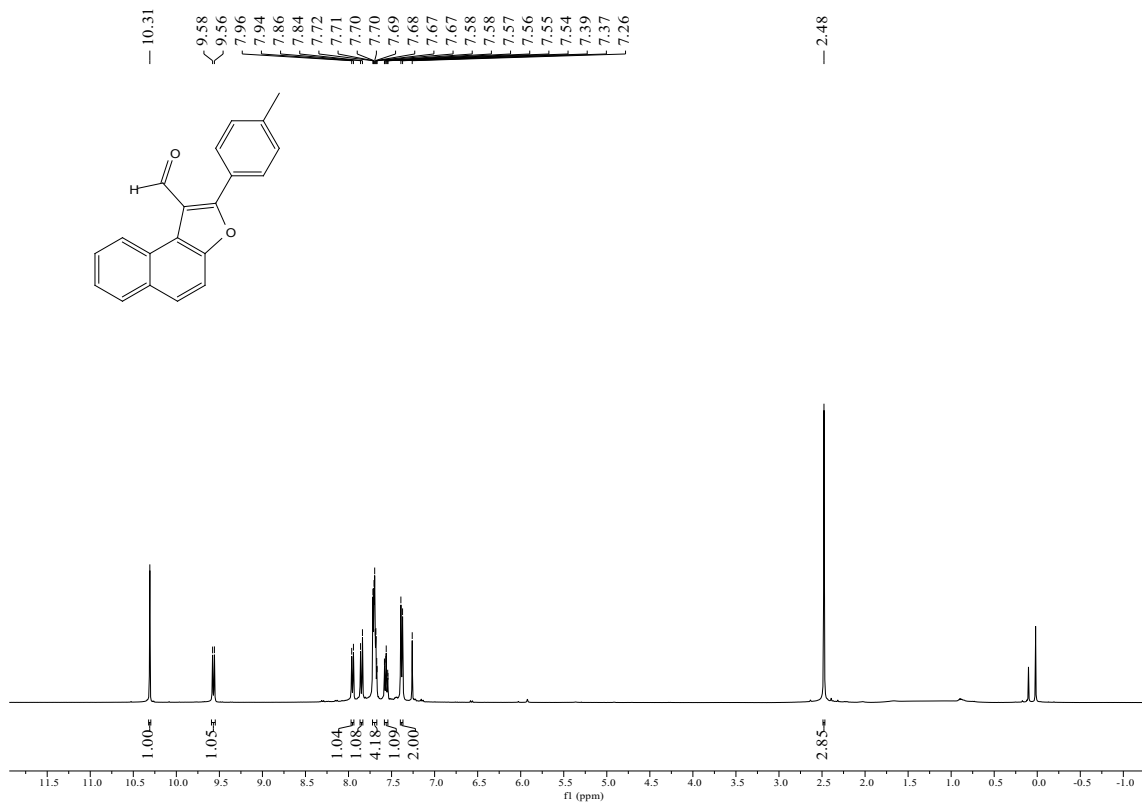


$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of 2-(*o*-tolyl)naphtho[2,1-b]furan-1-carbaldehyde (2k)

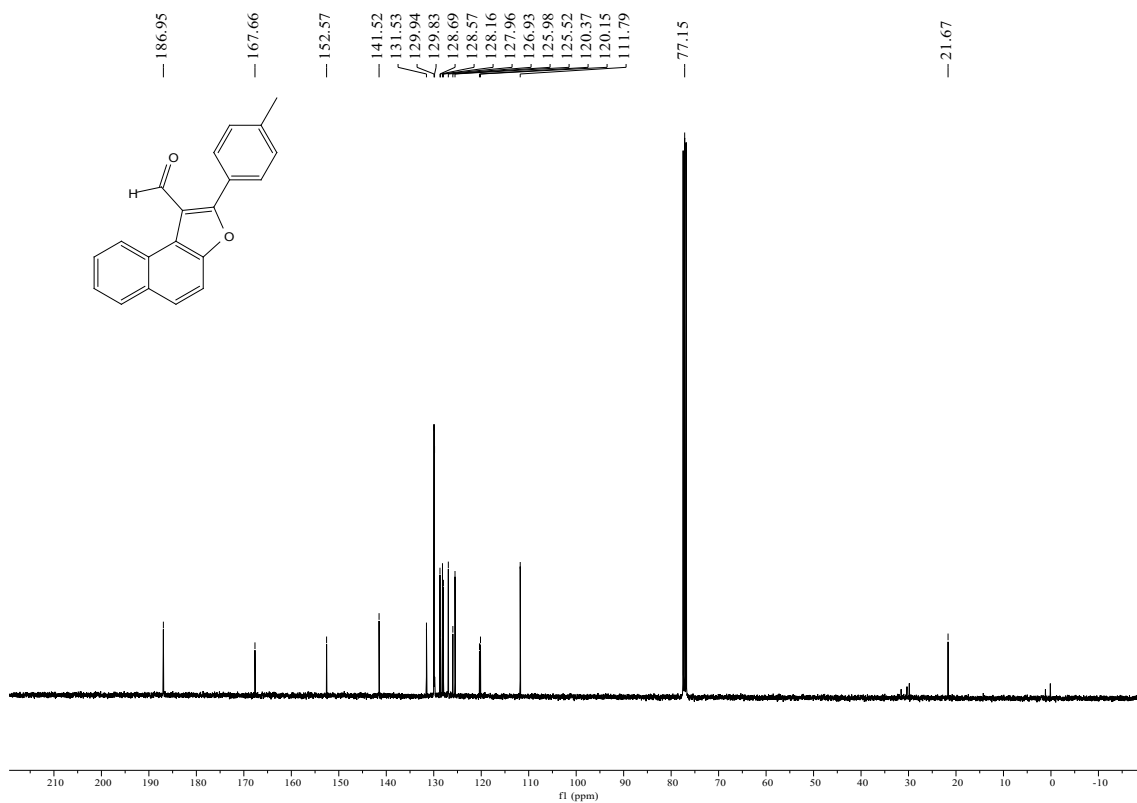




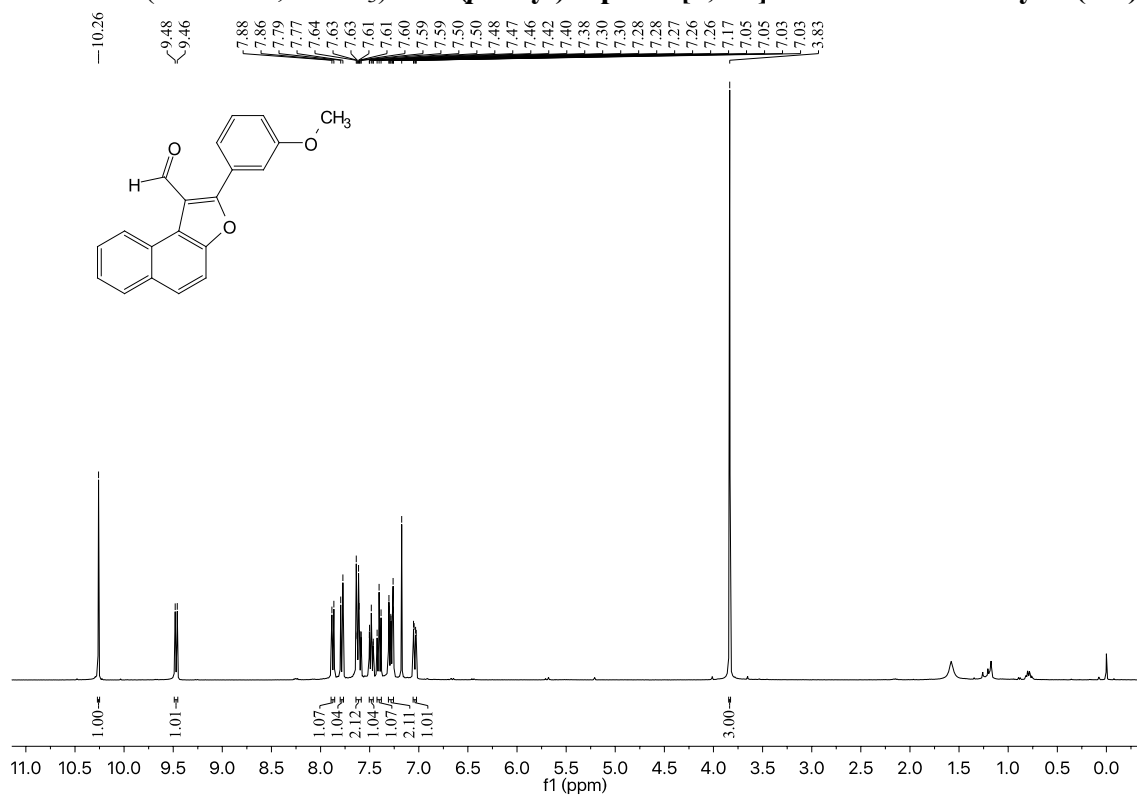
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-(*m*-tolyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2l)



<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(*p*-tolyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2m)

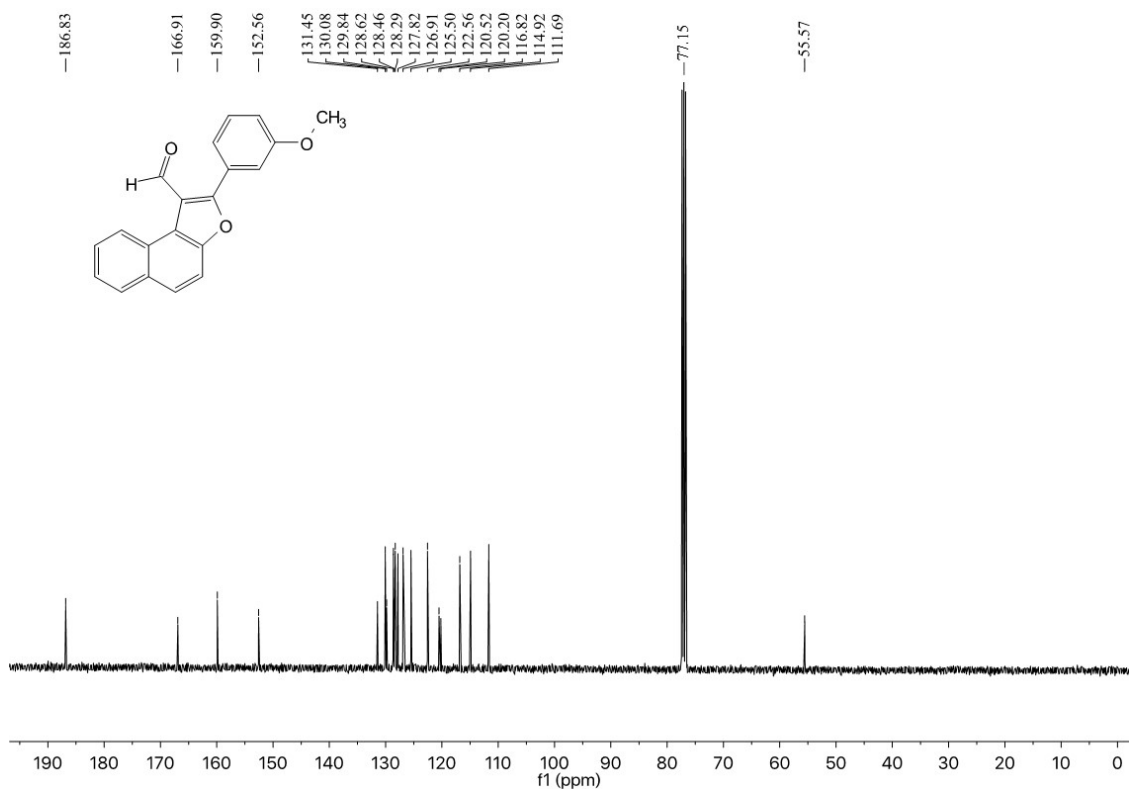


<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-(*p*-tolyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2m)



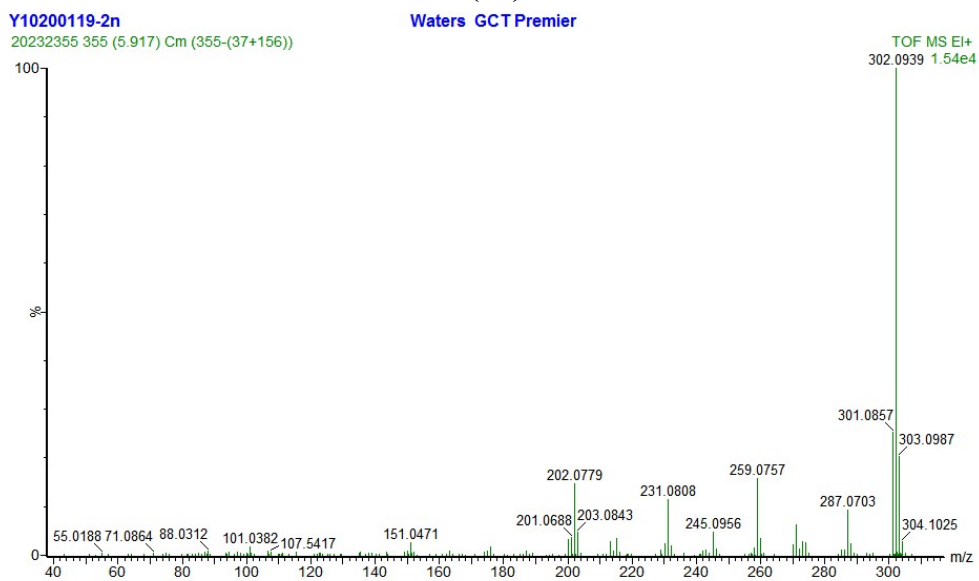
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(3-methoxyphenyl)naphtho[2,1-*b*]furan-1-carbaldehyde

(2n)

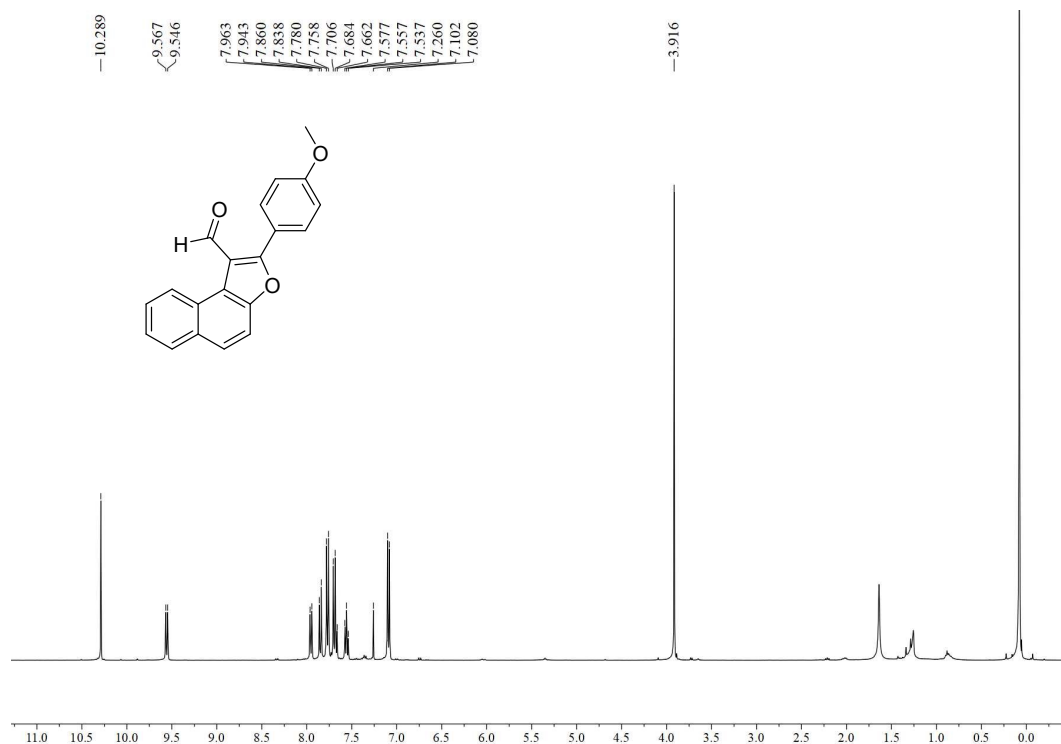


<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-(3-methoxyphenyl)naphtho[2,1-*b*]furan-1-carbaldehyde

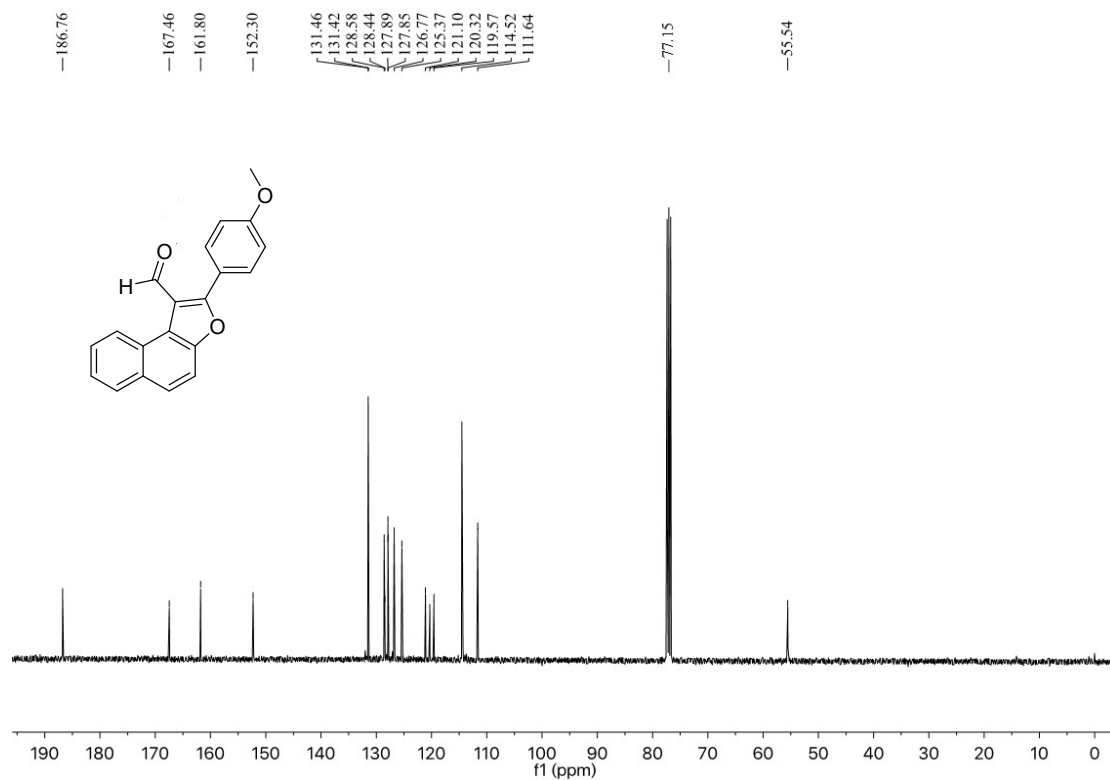
(2n)



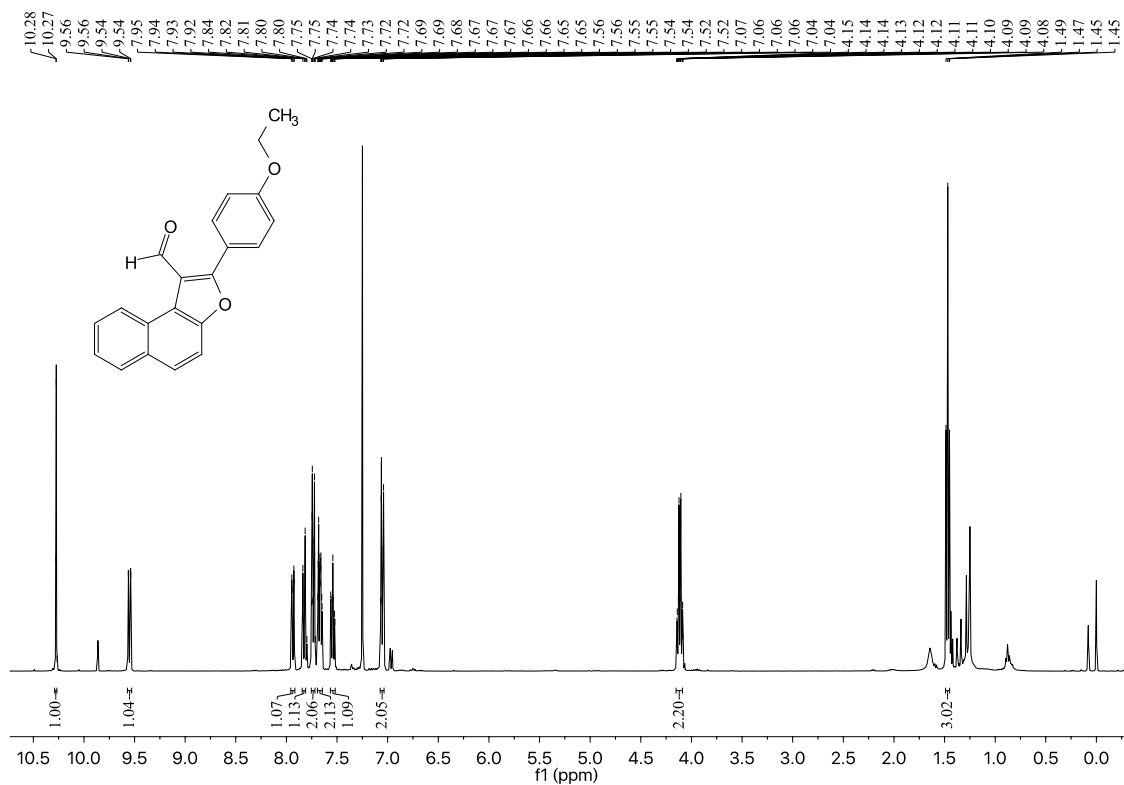
HRMS spectra of 2-(3-methoxyphenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2n)



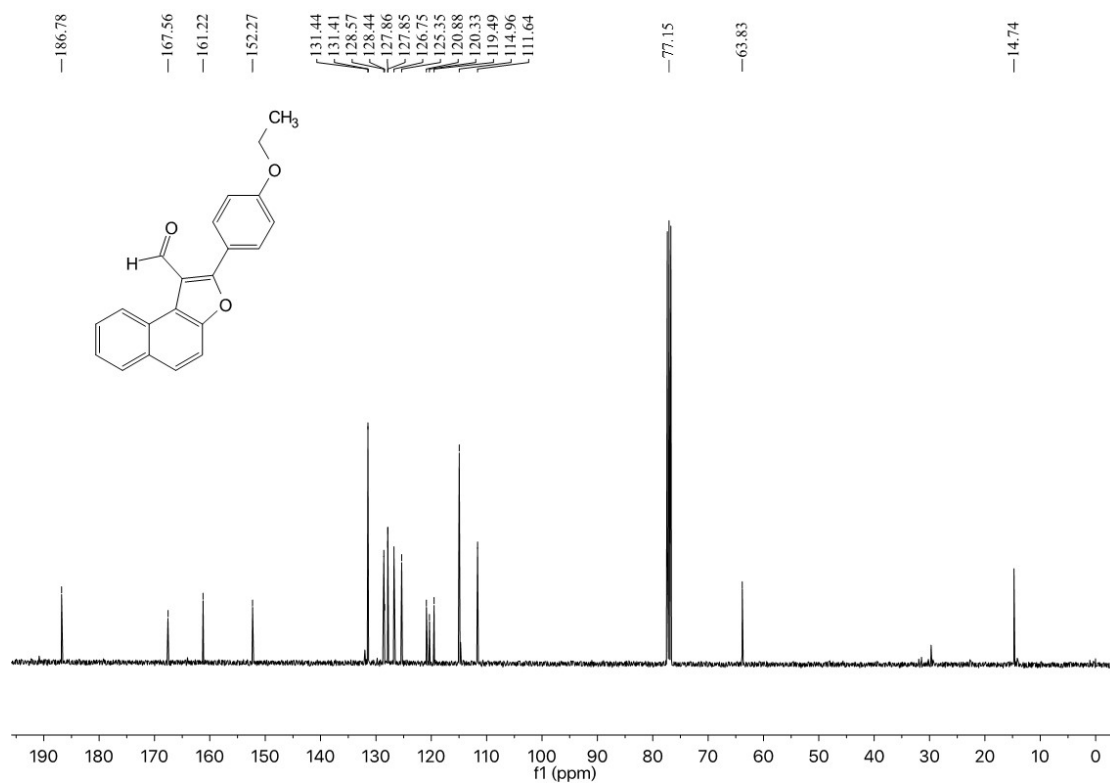
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of **2-(4-methoxyphenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2o)**



<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of **2-(4-methoxyphenyl)naphtho[2,1-*b*]furan-1-carbaldehyde (2o)**



<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(4-ethoxyphenyl)naphtho[2,1-b]furan-1-carbaldehyde (2p)

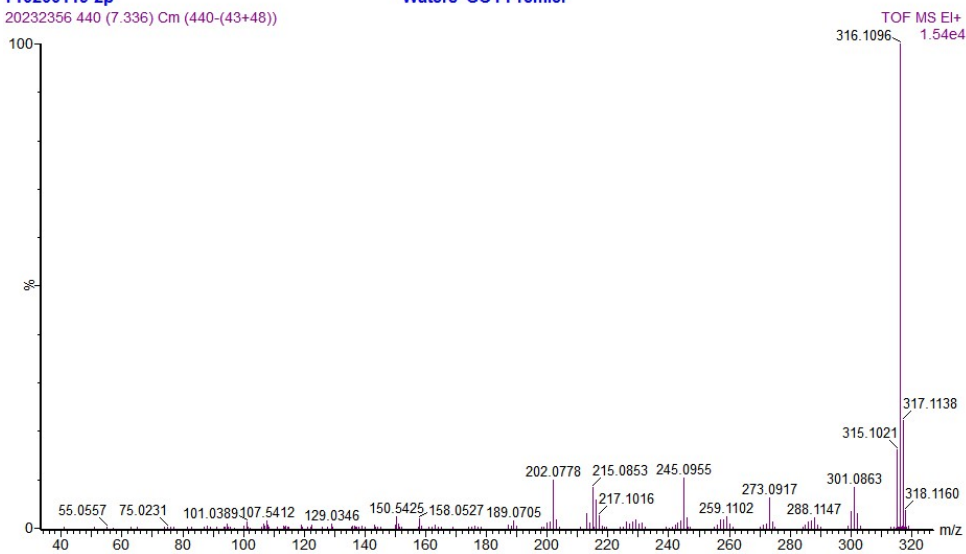


<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-(4-ethoxyphenyl)naphtho[2,1-b]furan-1-carbaldehyde (2p)

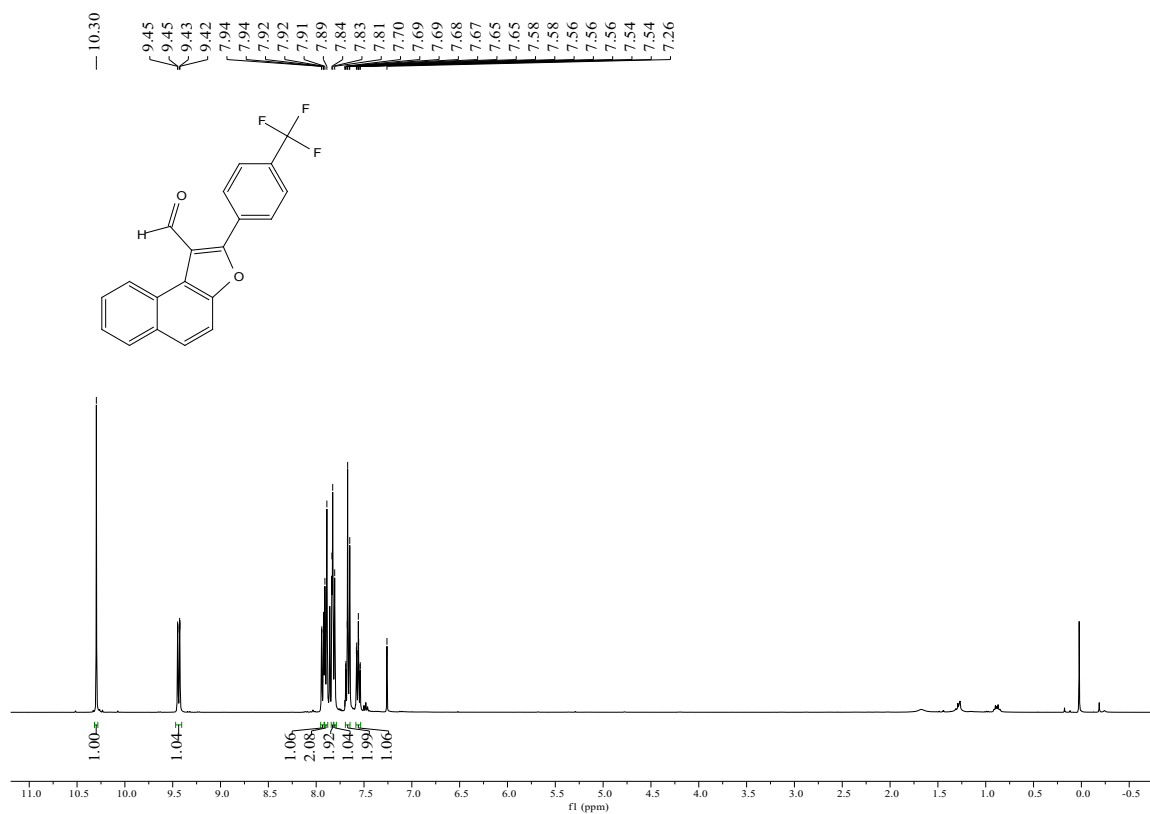
Y10200119-2p

20232356 440 (7.336) Cm (440-(43+48))

Waters GCT Premier

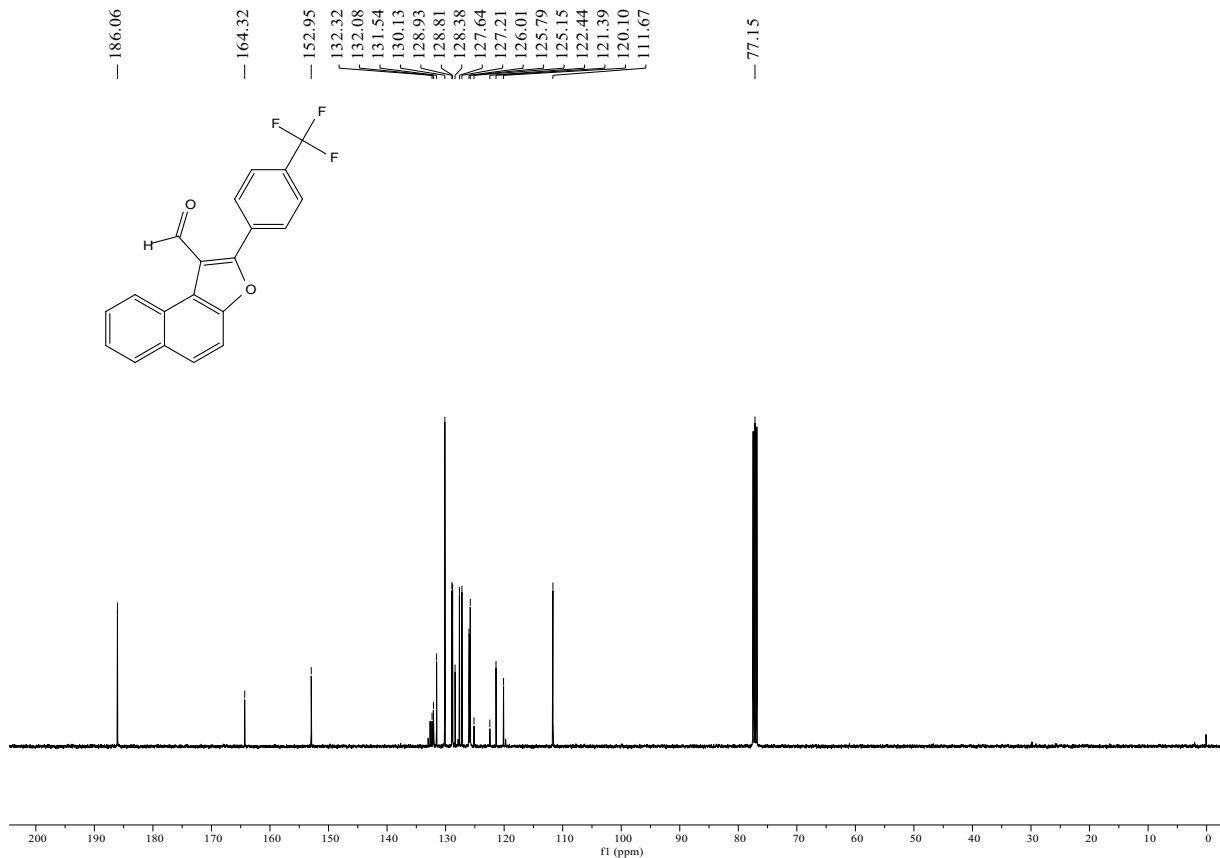


HRMS spectra of 2-(4-ethoxyphenyl)naphtho[2,1-b]furan-1-carbaldehyde (2p)

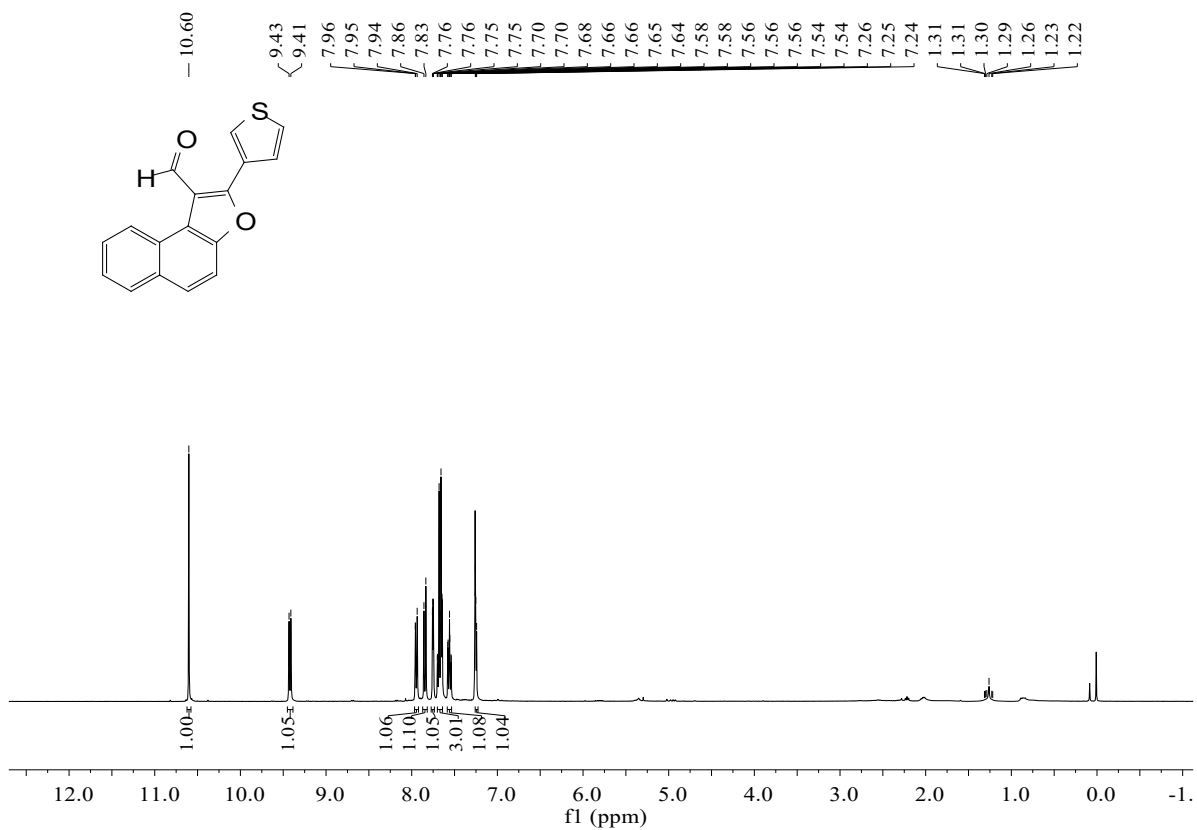


$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of 1-bromo-2-(cinnamyloxy)-3-ethoxynaphthalene (2q)

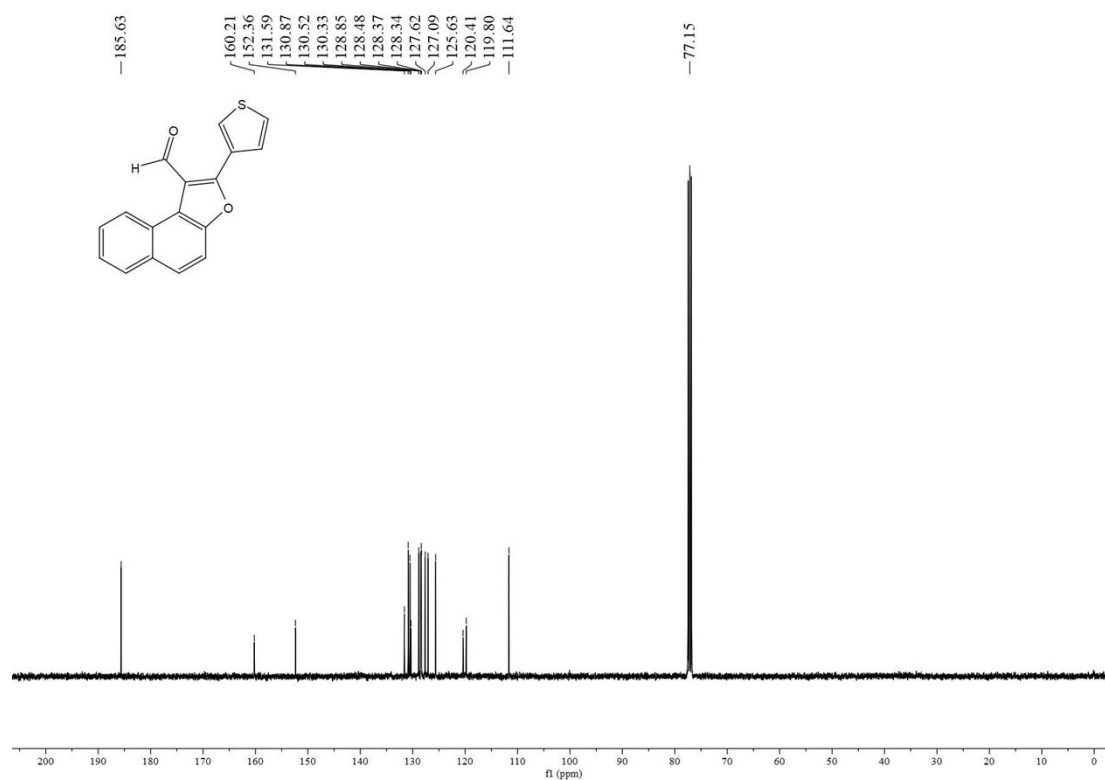




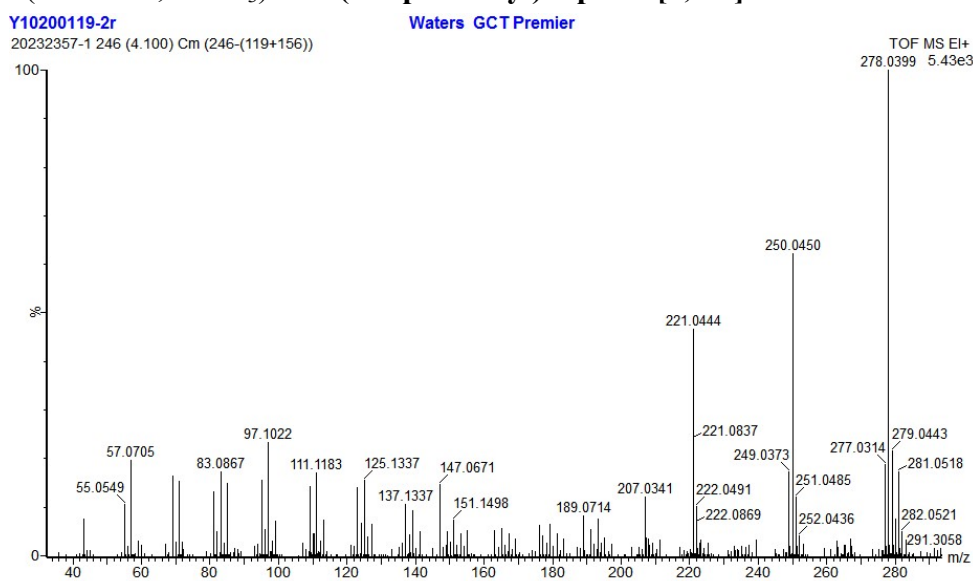
**<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 1-bromo-2-(cinnamyloxy)-3-ethoxynaphthalene (2q)**



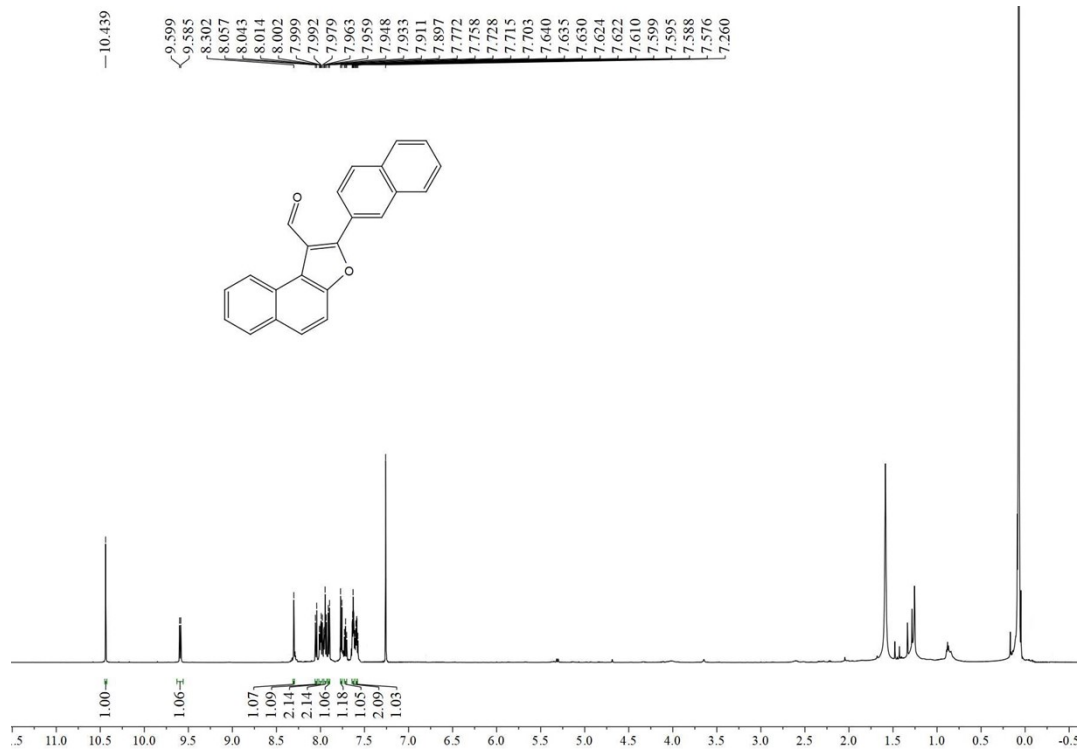
$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of 2-(thiophen-3-yl)naphtho[2,1-*b*]furan-1-carbaldehyde (2r)



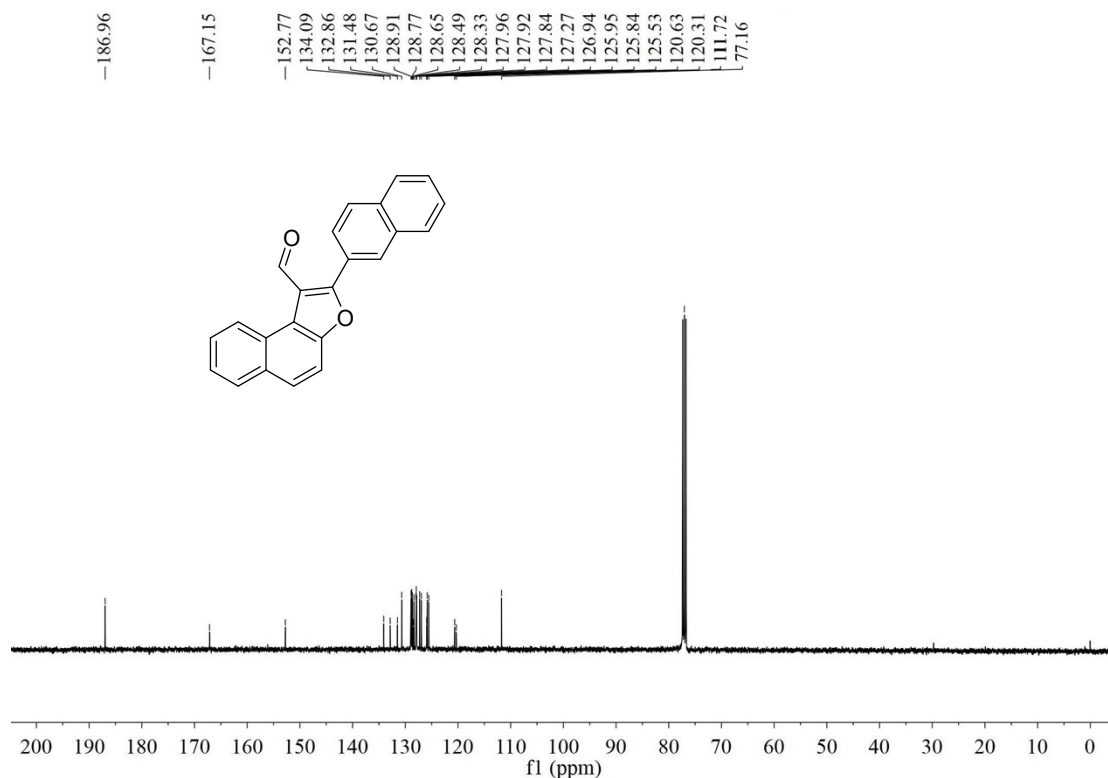
$^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ) of 2-(thiophen-3-yl)naphtho[2,1-*b*]furan-1-carbaldehyde (2r)



HRMS spectra of 2-(thiophen-3-yl)naphtho[2,1-*b*]furan-1-carbaldehyde (2r)



<sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>) of 2-(naphthalen-2-yl)naphtho[2,1-b]furan-1-carbaldehyde (2s)

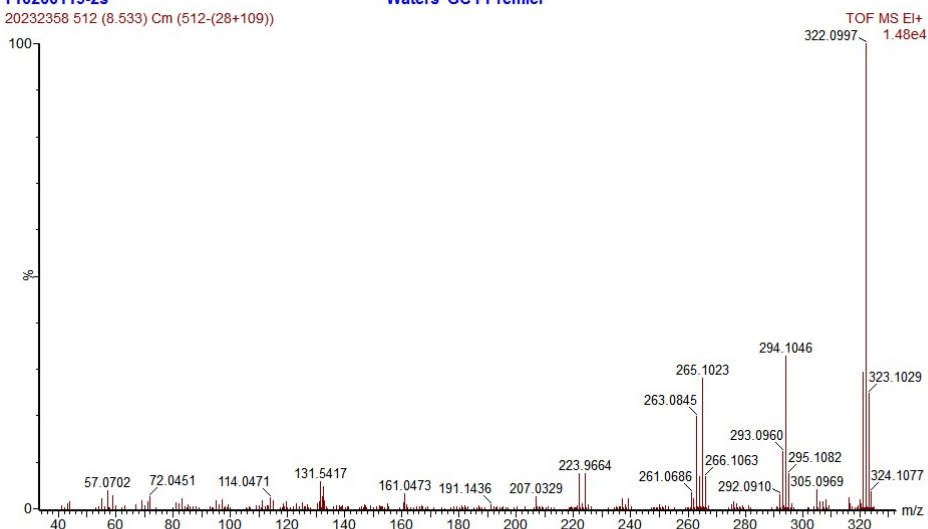


<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 2-(naphthalen-2-yl)naphtho[2,1-b]furan-1-carbaldehyde (2s)

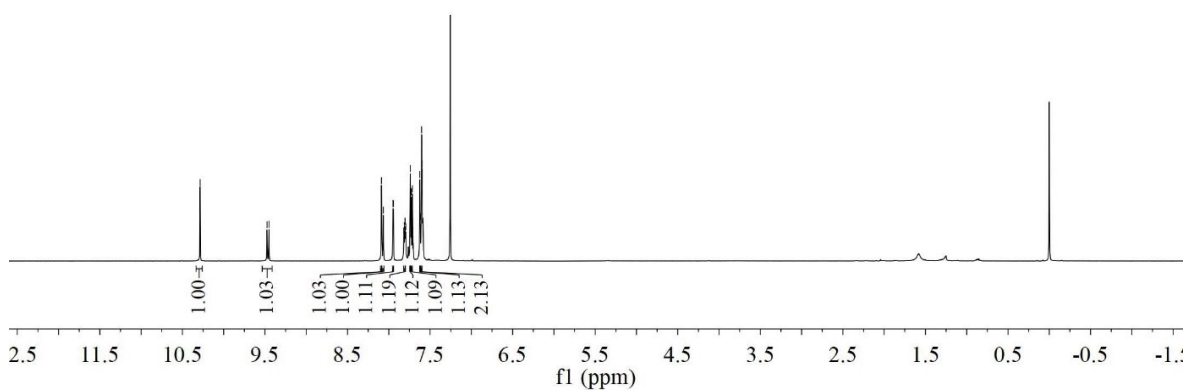
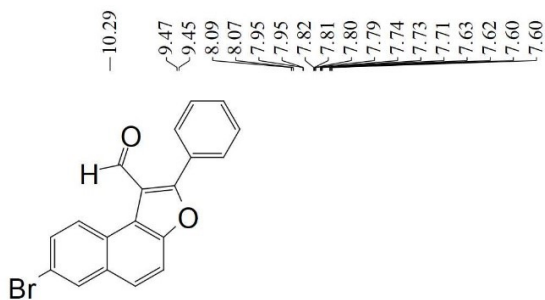
Y10200119-2s

20232358 512 (8.533) Cm (512-(28+109))

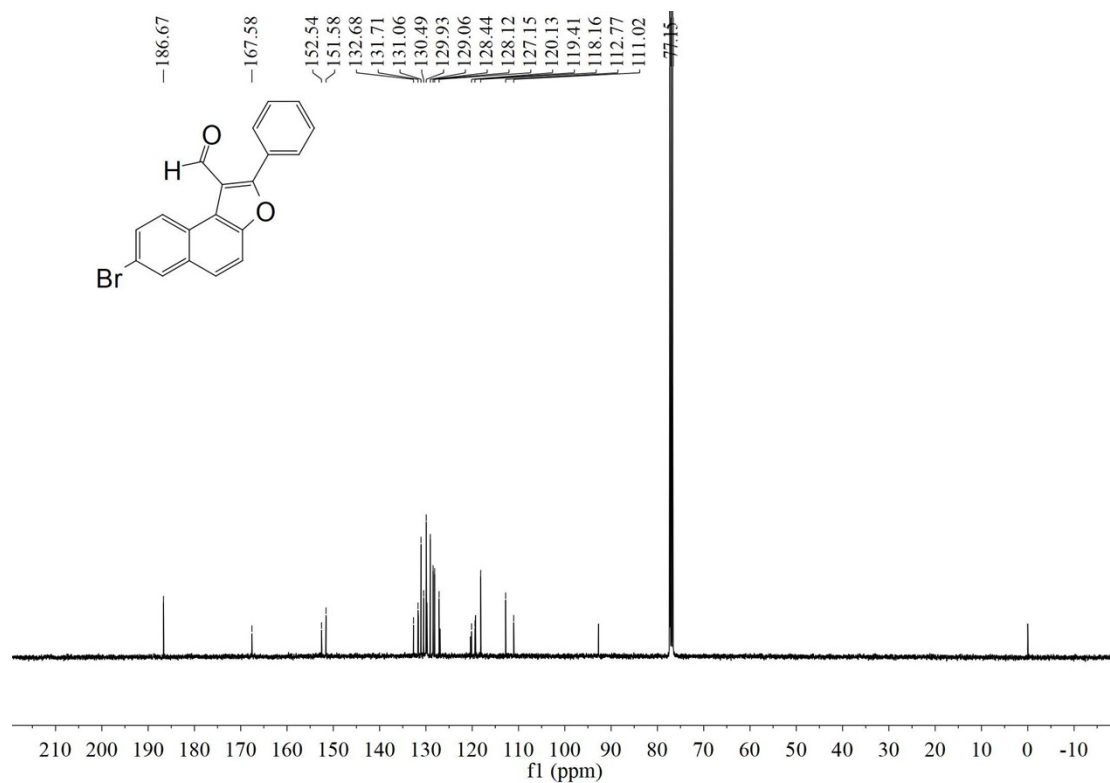
Waters GCT Premier



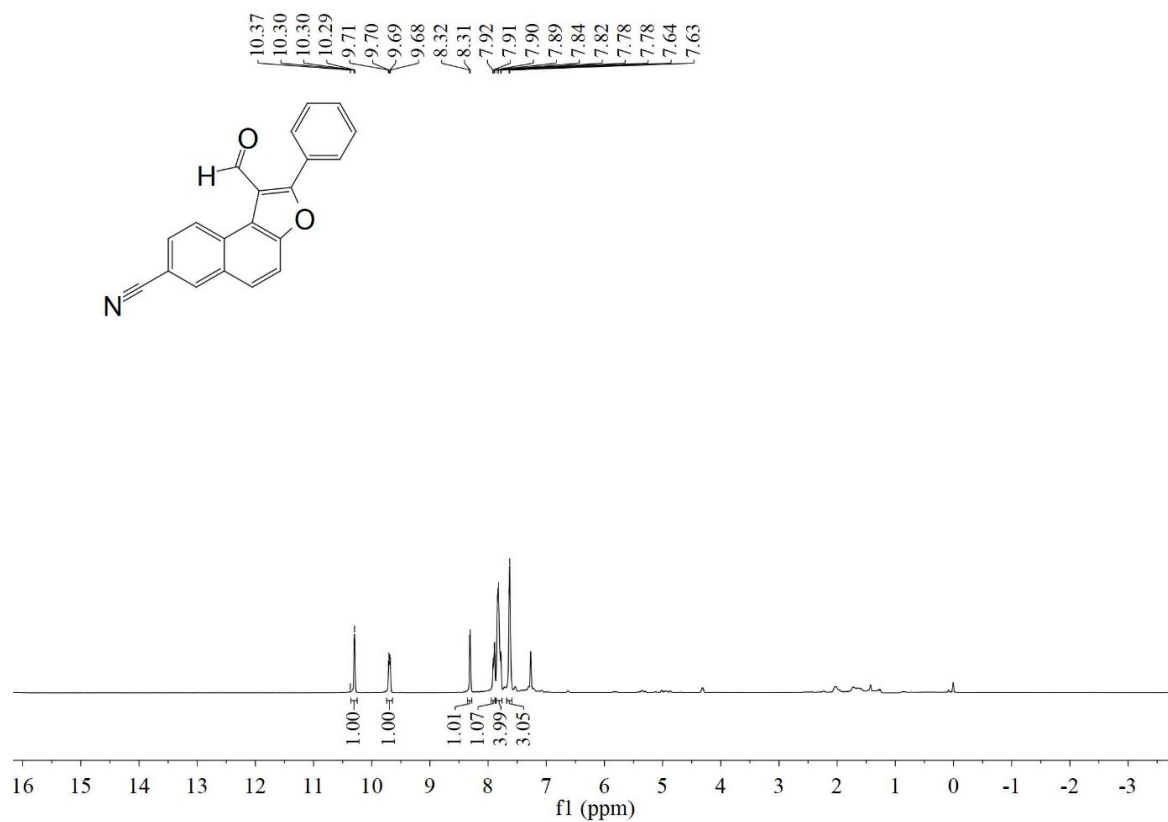
HRMS spectra of 2-(naphthalen-2-yl)naphtho[2,1-*b*]furan-1-carbaldehyde (2s)



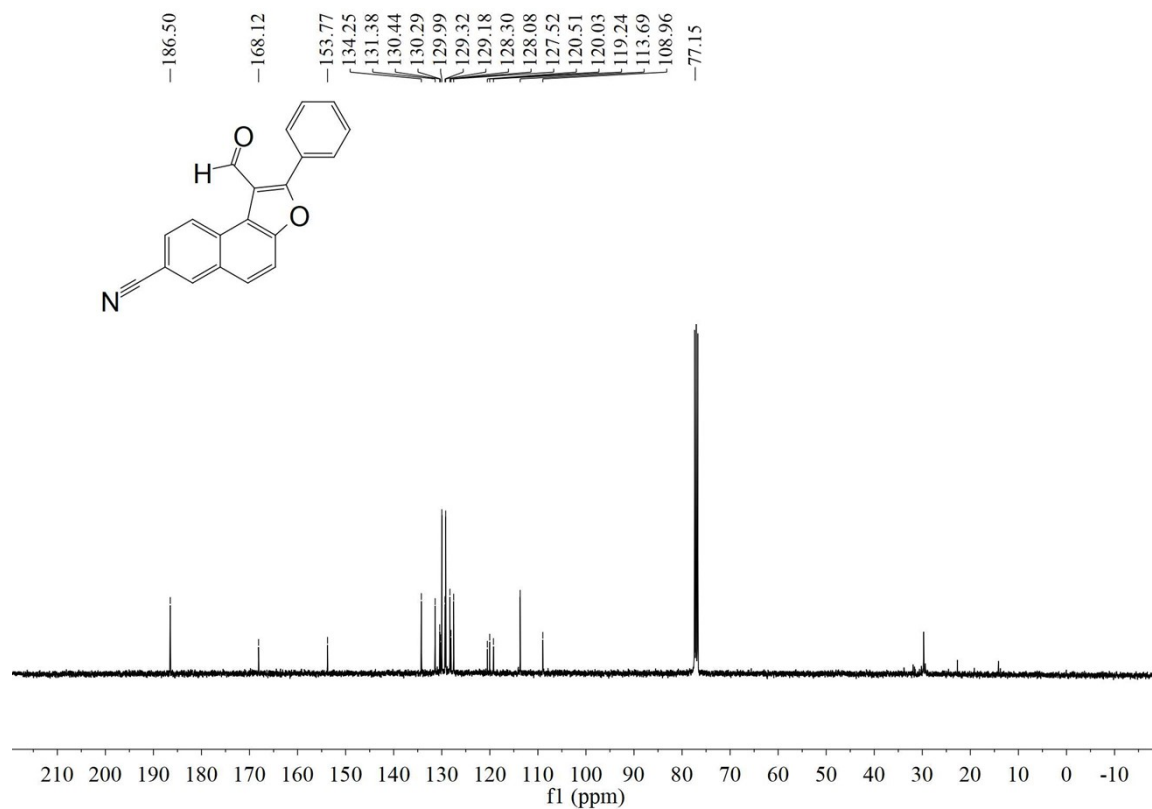
$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of 7-bromo-2-phenylnaphtho[2,1-*b*]furan-1-carbaldehyde (2t)



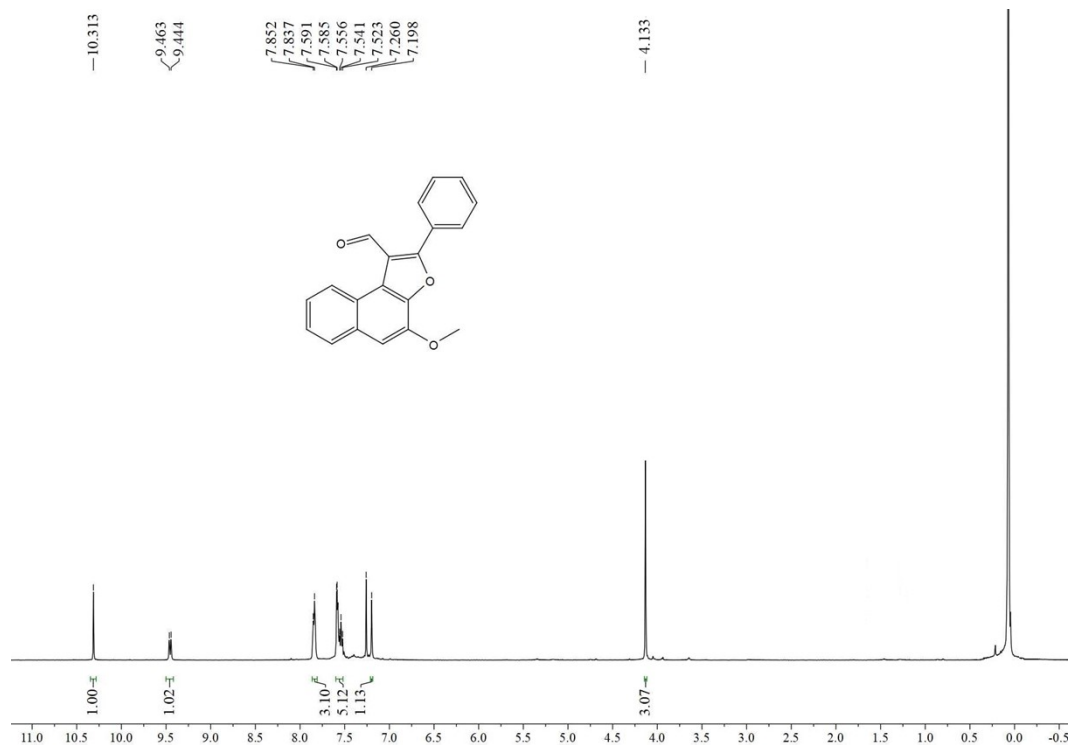
$^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ ) of 7-bromo-2-phenylnaphtho[2,1-*b*]furan-1-carbaldehyde (2t)



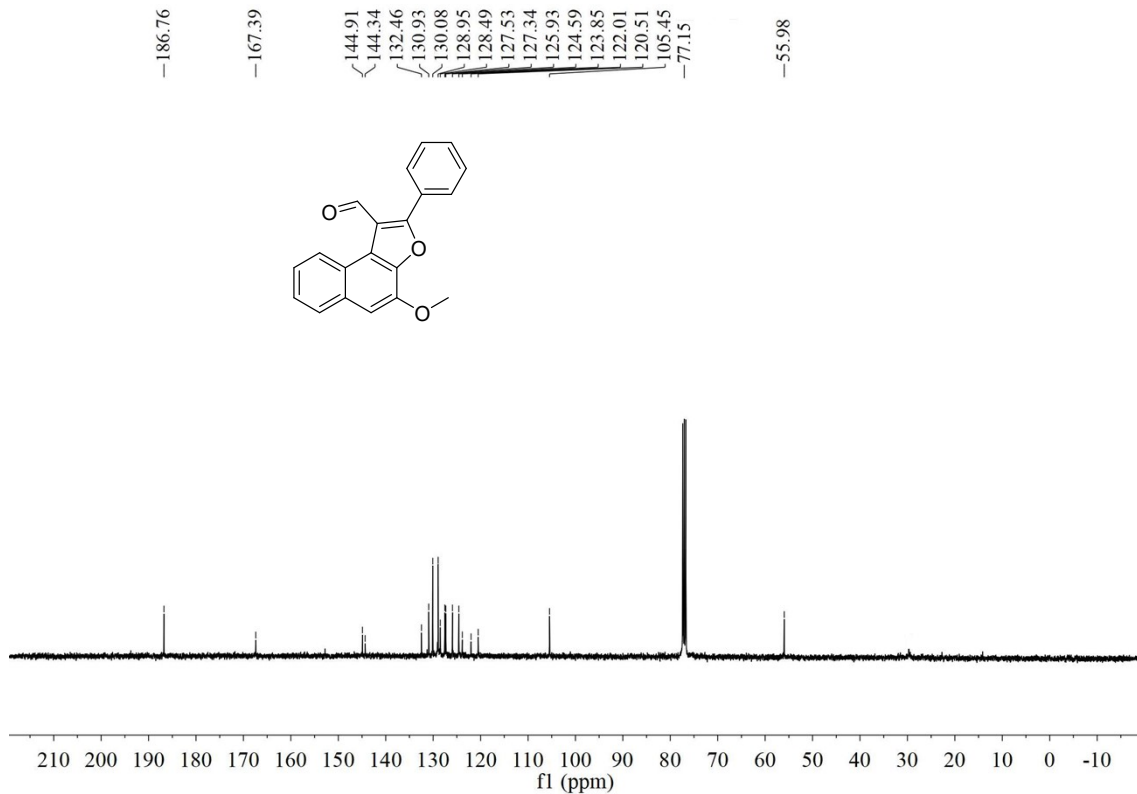
$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of 1-formyl-2-phenylnaphtho[2,1-*b*]furan-7-carbonitrile (2u)



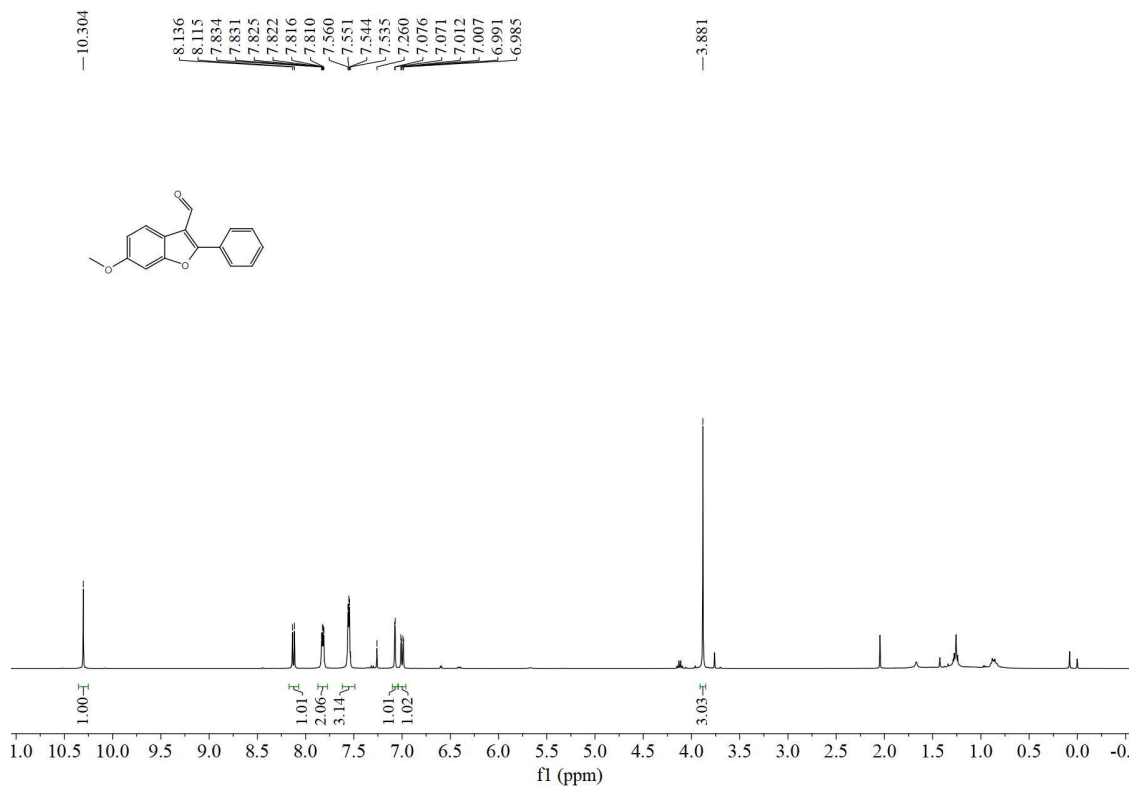
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of **1-formyl-2-phenylnaphtho[2,1-*b*]furan-7-carbonitrile (2u)**



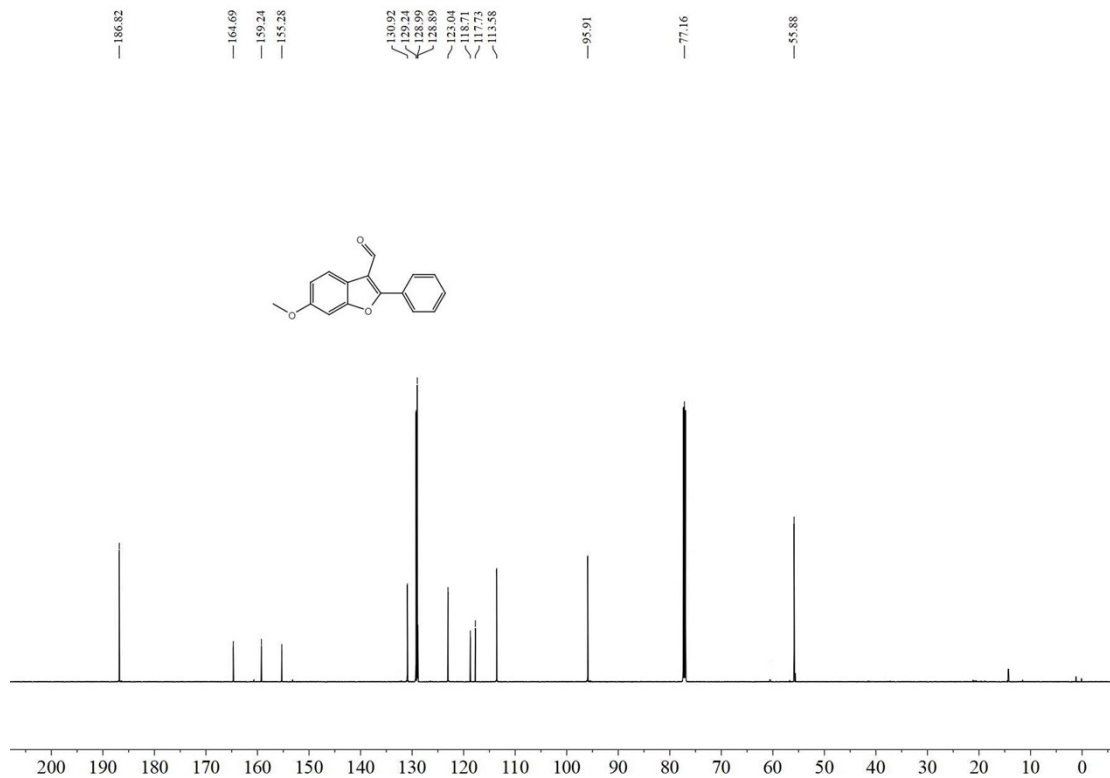
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of **4-methoxy-2-phenylnaphtho[2,1-*b*]furan-1-carbaldehyde (2v)**



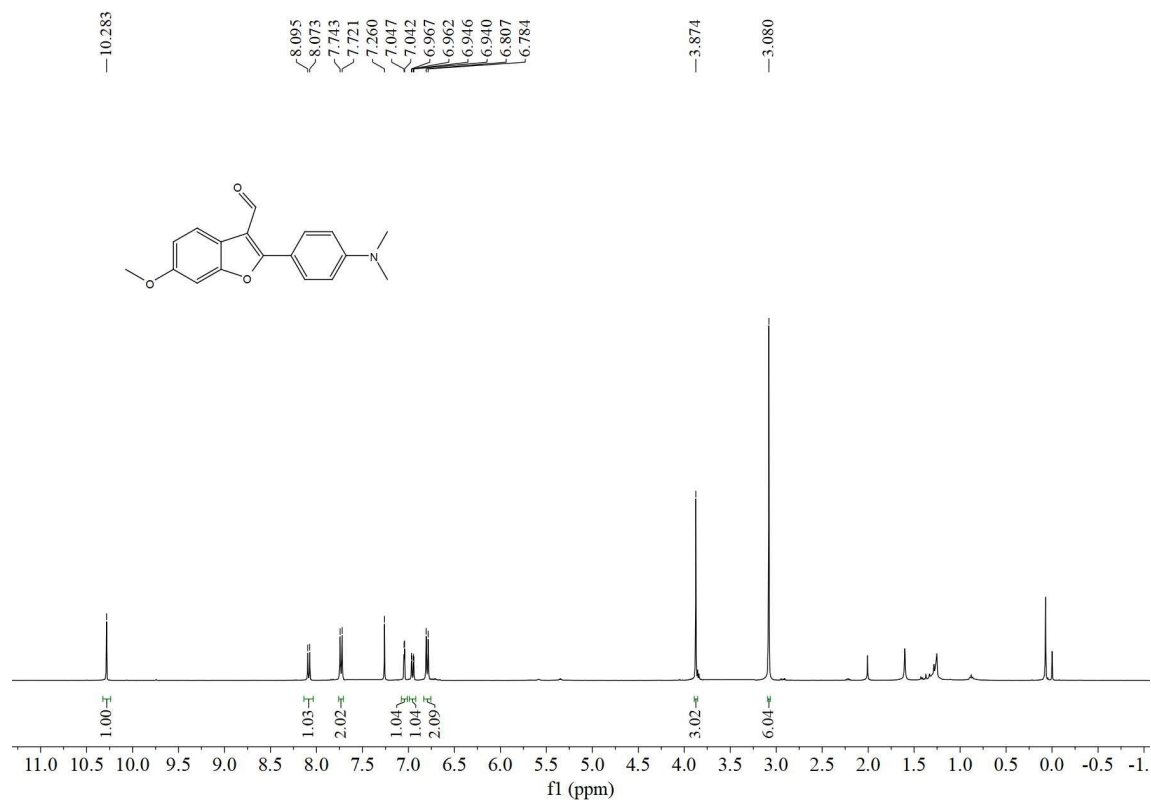
<sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) of 4-methoxy-2-phenylnaphtho[2,1-b]furan-1-carbaldehyde (2v)



<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 6-methoxy-2-phenylbenzofuran-3-carbaldehyde (2w)

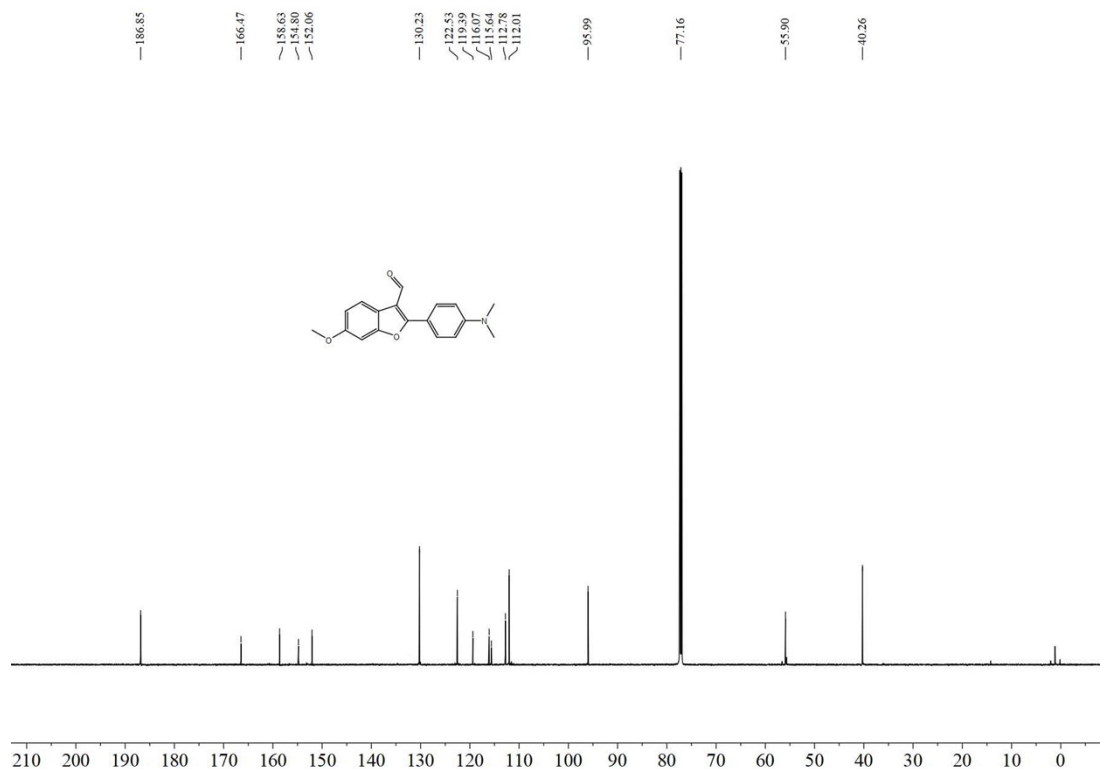


<sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) of 6-methoxy-2-phenylbenzofuran-3-carbaldehyde (2w)

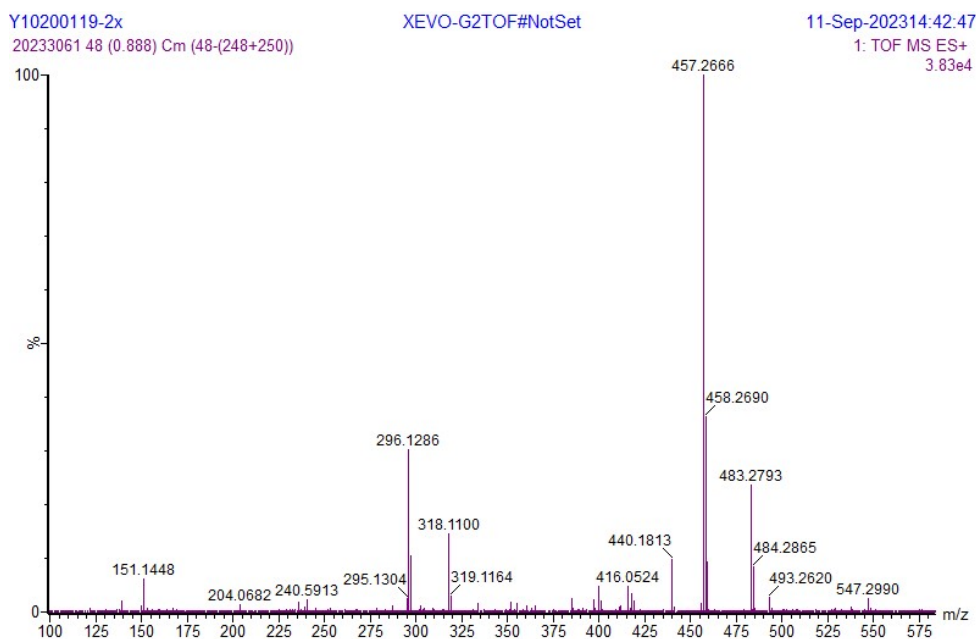


<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 2-(4-(dimethylamino)phenyl)-6-methoxybenzofuran-3-carbaldehyde (2x)

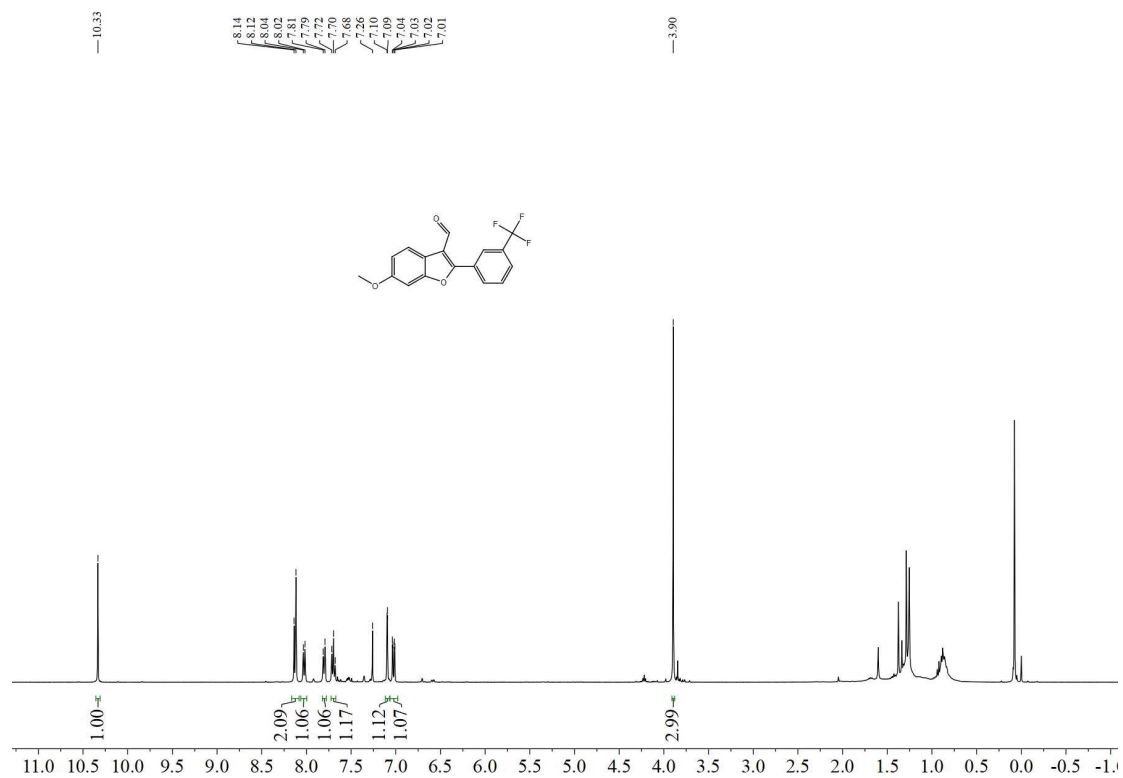




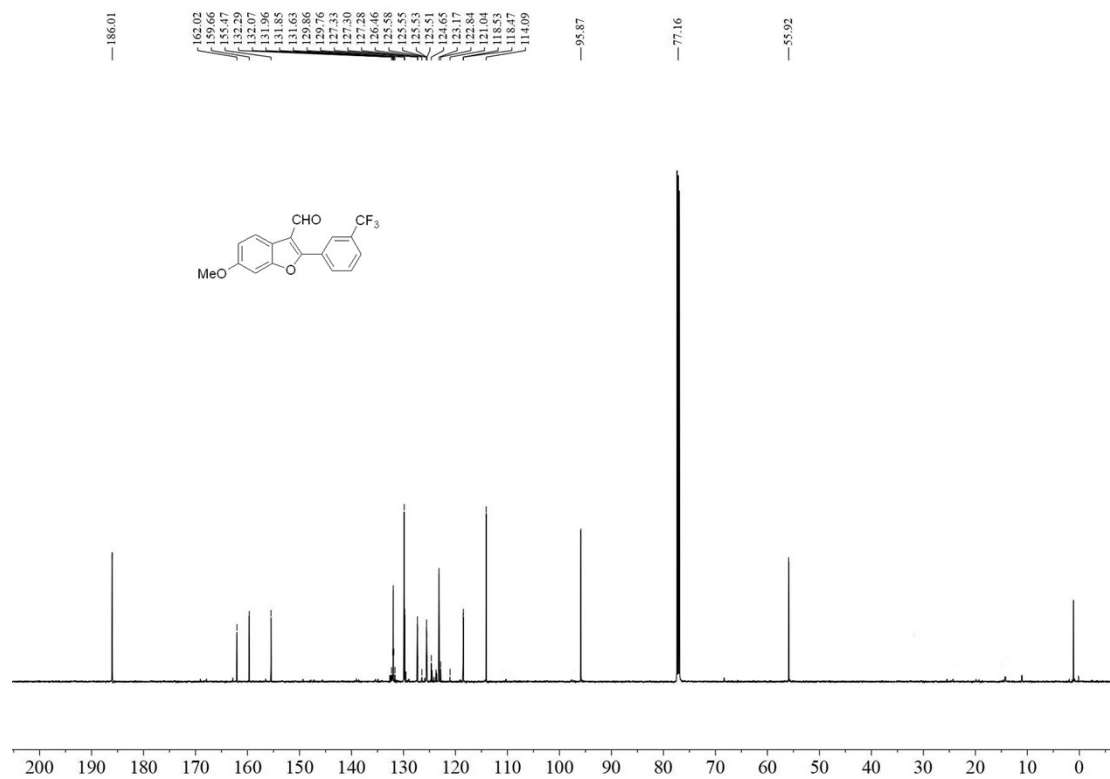
<sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) of 2-(4-(dimethylamino)phenyl)-6-methoxybenzofuran-3-carbaldehyde (2x)



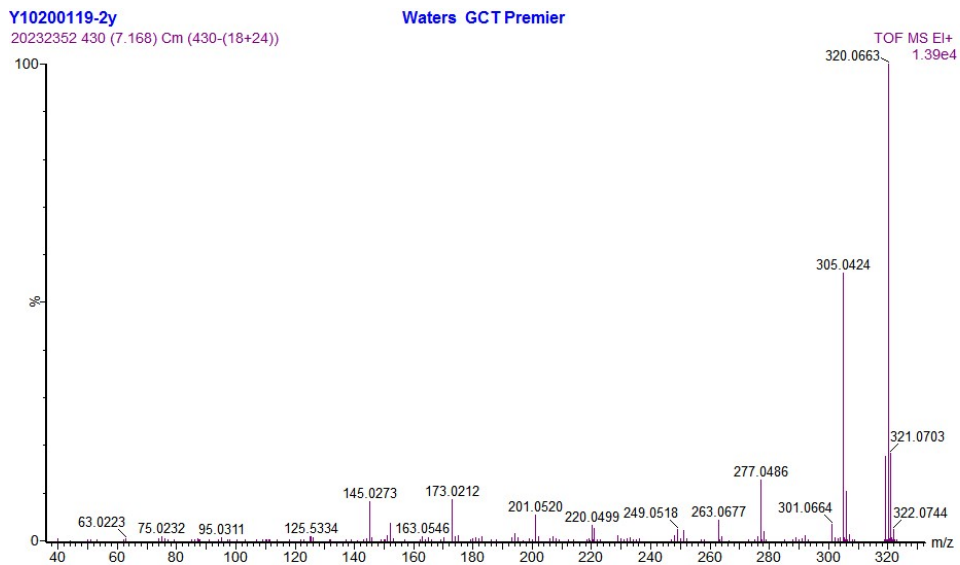
HRMS spectra of 2-(4-(dimethylamino)phenyl)-6-methoxybenzofuran-3-carbaldehyde (2x)



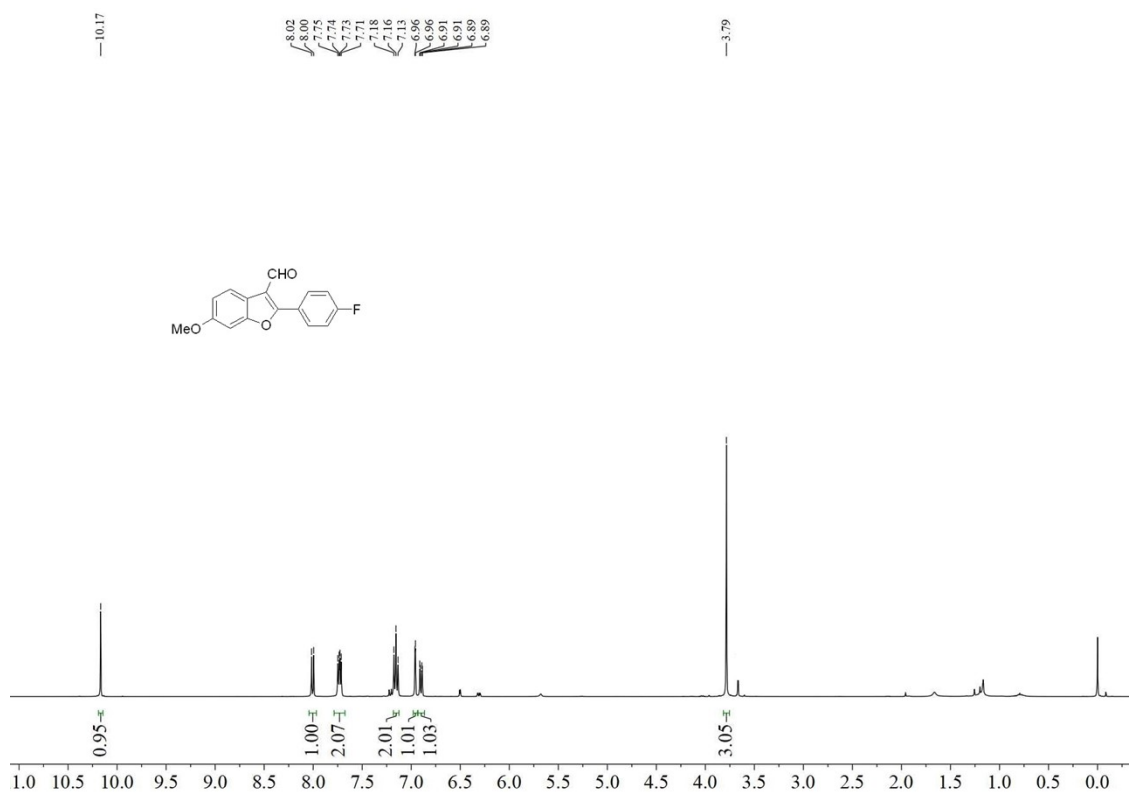
<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) of 6-methoxy-2-(3-(trifluoromethyl)phenyl)benzofuran-3-carbaldehyde (2y)



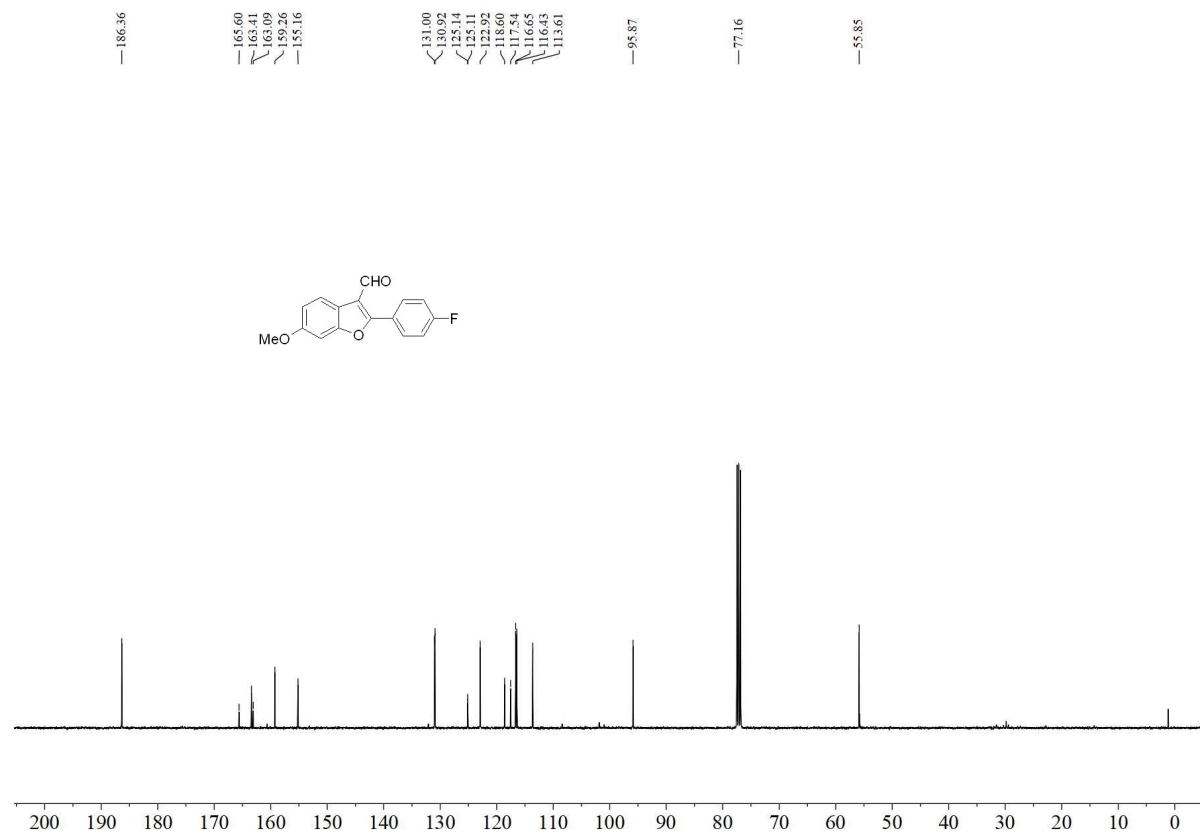
<sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) of 6-methoxy-2-(3-(trifluoromethyl)phenyl)benzofuran-3-carbaldehyde (2y)



HRMS spectra of 6-methoxy-2-(3-(trifluoromethyl)phenyl)benzofuran-3-carbaldehyde  
(2y)



$^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ ) of 2-(4-fluorophenyl)-6-methoxybenzofuran-3-carbaldehyde  
(2z)



<sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) of **2-(4-fluorophenyl)-6-methoxybenzofuran-3-carbaldehyde (2z)**