

# Supporting Information

## TFOH-SIO<sub>2</sub> AS AN EFFICIENT AND RECYCLABLE CATALYST FOR SYNTHESIS OF 3-ARYLBENZOFURANS

Baolong Wang<sup>1</sup>, Jiaying Hu<sup>2</sup>, Fanglin Zhang<sup>1</sup> and Hua Zheng<sup>1\*</sup>

<sup>1</sup> School of Chemistry, Chemical Engineering and Life Sciences, Wuhan University of Technology, Wuhan 430070, Hubei, P. R.China. <sup>2</sup> Huahai Pharmaceutical, Linhai, Taizhou 317000, Zhejiang, P. R.China.

E-mail:zhenghuawhut@163.com

### Spectra of Products

<sup>1</sup> H NMR of 5-methoxy-3-phenylbenzofuran (Table 2, Entry 1) in CDCl <sub>3</sub> .....	S5
<sup>13</sup> C NMR of 5-methoxy-3-phenylbenzofuran (Table 2, Entry 1) in CDCl <sub>3</sub> .....	S6
<sup>1</sup> H NMR of 3-phenylbenzofuran (Table 2, Entry2) in CDCl <sub>3</sub> .....	S7
<sup>13</sup> C NMR of 3-phenylbenzofuran (Table 2, Entry2) in CDCl <sub>3</sub> .....	S8

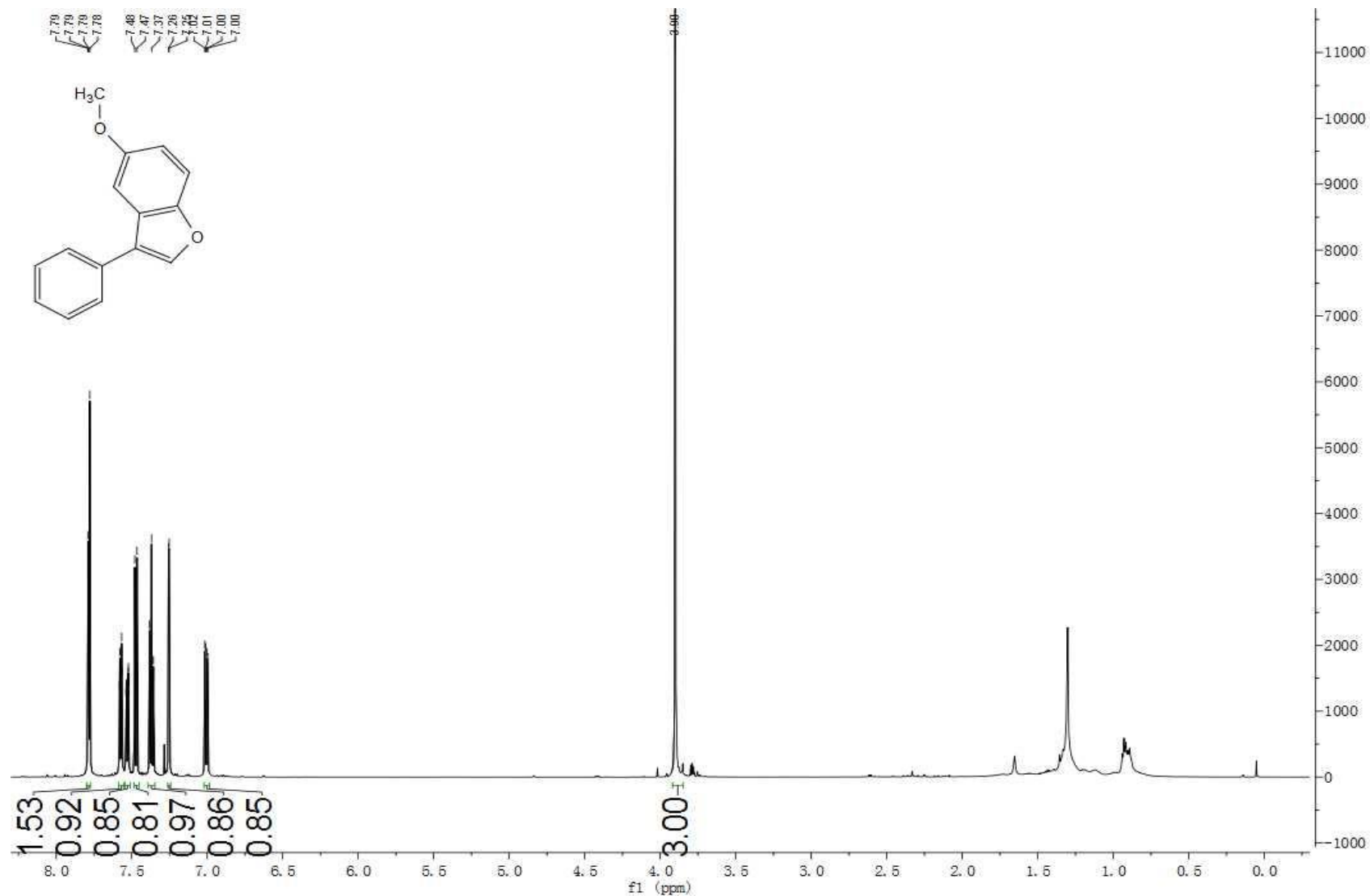
<b><sup>1</sup>H NMR of 5-fluoro-3-phenylbenzofuran</b>	<b>(Table 2, Entry3)</b>	<b>in CDCl<sub>3</sub></b>	<b>S9</b>
<b><sup>13</sup>C NMR of 5-fluoro-3-phenylbenzofuran</b>	<b>(Table 2, Entry3)</b>	<b>in CDCl<sub>3</sub></b>	<b>S10</b>
<b><sup>1</sup>H NMR of 5-chloro-3-phenylbenzofuran</b>	<b>(Table 2, Entry4)</b>	<b>in CDCl<sub>3</sub></b>	<b>S11</b>
<b><sup>13</sup>C NMR of 5-chloro-3-phenylbenzofuran</b>	<b>(Table 2, Entry4)</b>	<b>in CDCl<sub>3</sub></b>	<b>S12</b>
<b><sup>1</sup>H NMR of 5-bromo-3-phenylbenzofuran</b>	<b>(Table 2, Entry5)</b>	<b>in CDCl<sub>3</sub></b>	<b>S13</b>
<b><sup>13</sup>C NMR of 5-bromo-3-phenylbenzofuran</b>	<b>(Table 2, Entry5)</b>	<b>in CDCl<sub>3</sub></b>	<b>S14</b>
<b><sup>1</sup>H NMR of 5-methyl-3-phenylbenzofuran</b>	<b>(Table 2, Entry6)</b>	<b>in CDCl<sub>3</sub></b>	<b>S15</b>
<b><sup>13</sup>C NMR of 5-methyl-3-phenylbenzofuran</b>	<b>(Table 2, Entry6)</b>	<b>in CDCl<sub>3</sub></b>	<b>S16</b>
<b><sup>1</sup>H NMR of 5-(tert-butyl)-3-phenylbenzofuran</b>	<b>(Table 2, Entry7)</b>	<b>in CDCl<sub>3</sub></b>	<b>S17</b>
<b><sup>13</sup>C NMR of 5-(tert-butyl)-3-phenylbenzofuran</b>	<b>(Table 2, Entry7)</b>	<b>in CDCl<sub>3</sub></b>	<b>S18</b>
<b><sup>1</sup>H NMR of 5,6-dimethyl-3-phenylbenzofuran</b>	<b>(Table 2, Entry8)</b>	<b>in CDCl<sub>3</sub></b>	<b>S19</b>
<b><sup>13</sup>C NMR of 5,6-dimethyl-3-phenylbenzofuran</b>	<b>(Table 2, Entry8)</b>	<b>in CDCl<sub>3</sub></b>	<b>S20</b>
<b><sup>1</sup>H NMR of 3-(2-chlorophenyl)-5-methoxybenzofuran</b>	<b>(Table 2, Entry11)</b>	<b>in CDCl<sub>3</sub></b>	<b>S21</b>
<b><sup>13</sup>C NMR of 3-(2-chlorophenyl)-5-methoxybenzofuran</b>	<b>(Table 2, Entry11)</b>	<b>in CDCl<sub>3</sub></b>	<b>S22</b>
<b><sup>1</sup>H NMR of 3-(4-chlorophenyl)-5-methoxybenzofuran</b>	<b>(Table 2, Entry12)</b>	<b>in CDCl<sub>3</sub></b>	<b>S23</b>
<b><sup>13</sup>C NMR of 3-(4-chlorophenyl)-5-methoxybenzofuran</b>	<b>(Table 2, Entry12)</b>	<b>in CDCl<sub>3</sub></b>	<b>S24</b>

<b><sup>1</sup>H NMR of 3-(4-bromophenyl)-5-methoxybenzofuran</b>	<b>(Table 2, Entry13)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S25</b>
<b><sup>13</sup>C NMR of 3-(4-bromophenyl)-5-methoxybenzofuran</b>	<b>(Table 2, Entry13)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S26</b>
<b><sup>1</sup>H NMR of 5-methoxy-3-(o-tolyl)benzofuran</b>	<b>(Table 2, Entry14)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S27</b>
<b><sup>13</sup>C NMR of 5-methoxy-3-(o-tolyl)benzofuran</b>	<b>(Table 2, Entry14)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S28</b>
<b><sup>1</sup>H NMR of 5-methoxy-3-(m-tolyl)benzofuran</b>	<b>(Table 2, Entry15)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S29</b>
<b><sup>13</sup>C NMR of 5-methoxy-3-(m-tolyl)benzofuran</b>	<b>(Table 2, Entry15)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S30</b>
<b><sup>1</sup>H NMR of 5-methoxy-3-(p-tolyl)benzofuran</b>	<b>(Table 2, Entry16)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S31</b>
<b><sup>13</sup>C NMR of 5-methoxy-3-(p-tolyl)benzofuran</b>	<b>(Table 2, Entry16)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S32</b>
<b><sup>1</sup>H NMR of 3-(4-(tert-butyl)phenyl)-5-methoxybenzofuran</b>	<b>(Table 2, Entry17)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S33</b>
<b><sup>13</sup>C NMR of 3-(4-(tert-butyl)phenyl)-5-methoxybenzofuran</b>	<b>(Table 2, Entry17)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S34</b>
<b><sup>1</sup>H NMR of 5-methoxy-3-(4-methoxyphenyl)benzofuran</b>	<b>(Table 2, Entry18)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S35</b>
<b><sup>13</sup>C NMR of 5-methoxy-3-(4-methoxyphenyl)benzofuran</b>	<b>(Table 2, Entry18)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S36</b>
<b><sup>1</sup>H NMR of 3-phenylnaphtho[1,2-b]furan</b>	<b>(Table 3, 2q)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S37</b>
<b><sup>13</sup>C NMR of 3-phenylnaphtho[1,2-b]furan</b>	<b>(Table 3, 2q)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S38</b>
<b><sup>1</sup>H NMR of 3-(2-bromophenyl)naphtho[1,2-b]furan</b>	<b>(Table 3, 2r)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S39</b>
<b><sup>13</sup>C NMR of 3-(2-bromophenyl)naphtho[1,2-b]furan</b>	<b>(Table 3, 2r)</b>	<b>in CDCl<sub>3</sub>.....</b>	<b>S40</b>

<b><sup>1</sup>H NMR of 3-(m-tolyl)naphtho[1,2-b]furan (Table 3, 2s) in CDCl<sub>3</sub>.....</b>	<b>S41</b>
<b><sup>13</sup>C NMR of 3-(m-tolyl)naphtho[1,2-b]furan (Table 3, 2s) in CDCl<sub>3</sub>.....</b>	<b>S42</b>
<b><sup>1</sup>H NMR of 10-methyl-5,6-dihydronaphtho[2,1-b]benzofuran (Scheme 2, 2t) in CDCl<sub>3</sub>.....</b>	<b>S43</b>
<b><sup>13</sup>C NMR of 10-methyl-5,6-dihydronaphtho[2,1-b]benzofuran (Scheme 2, 2t) in CDCl<sub>3</sub>.....</b>	<b>S44</b>
<b><sup>1</sup>H NMR of 5,6-dihydrodinaphtho[1,2-b:1',2'-d]furan (Scheme 2, 2u) in CDCl<sub>3</sub>.....</b>	<b>S45</b>
<b><sup>13</sup>C NMR of 5,6-dihydrodinaphtho[1,2-b:1',2'-d]furan (Scheme 2, 2u) in CDCl<sub>3</sub>.....</b>	<b>S46</b>
<b><sup>1</sup>H NMR of 8,9-dihydrodinaphtho[2,1-b:1',2'-d]furan-2-ol (Scheme 2, 2v) in CDCl<sub>3</sub>.....</b>	<b>S47</b>
<b><sup>13</sup>C NMR of 8,9-dihydrodinaphtho[2,1-b:1',2'-d]furan-2-ol (Scheme 2, 2v) in CDCl<sub>3</sub>.....</b>	<b>S48</b>
<b>IR spectra of 3-(2-bromophenyl)naphtho[1,2-b]furan (Table 3, 2r).....</b>	<b>S49</b>
<b>IR spectra of 3-(m-tolyl)naphtho[1,2-b]furan (Table 3, 2s).....</b>	<b>S50</b>
<b>IR spectra of 10-methyl-5,6-dihydronaphtho[2,1-b]benzofuran (Scheme 2, 2t).....</b>	<b>S51</b>
<b>IR spectra of 5,6-dihydrodinaphtho[1,2-b:1',2'-d]furan (Scheme 2, 2u).....</b>	<b>S52</b>
<b>IR spectra of 8,9-dihydrodinaphtho[2,1-b:1',2'-d]furan-2-ol (Scheme 2, 2v).....</b>	<b>S53</b>

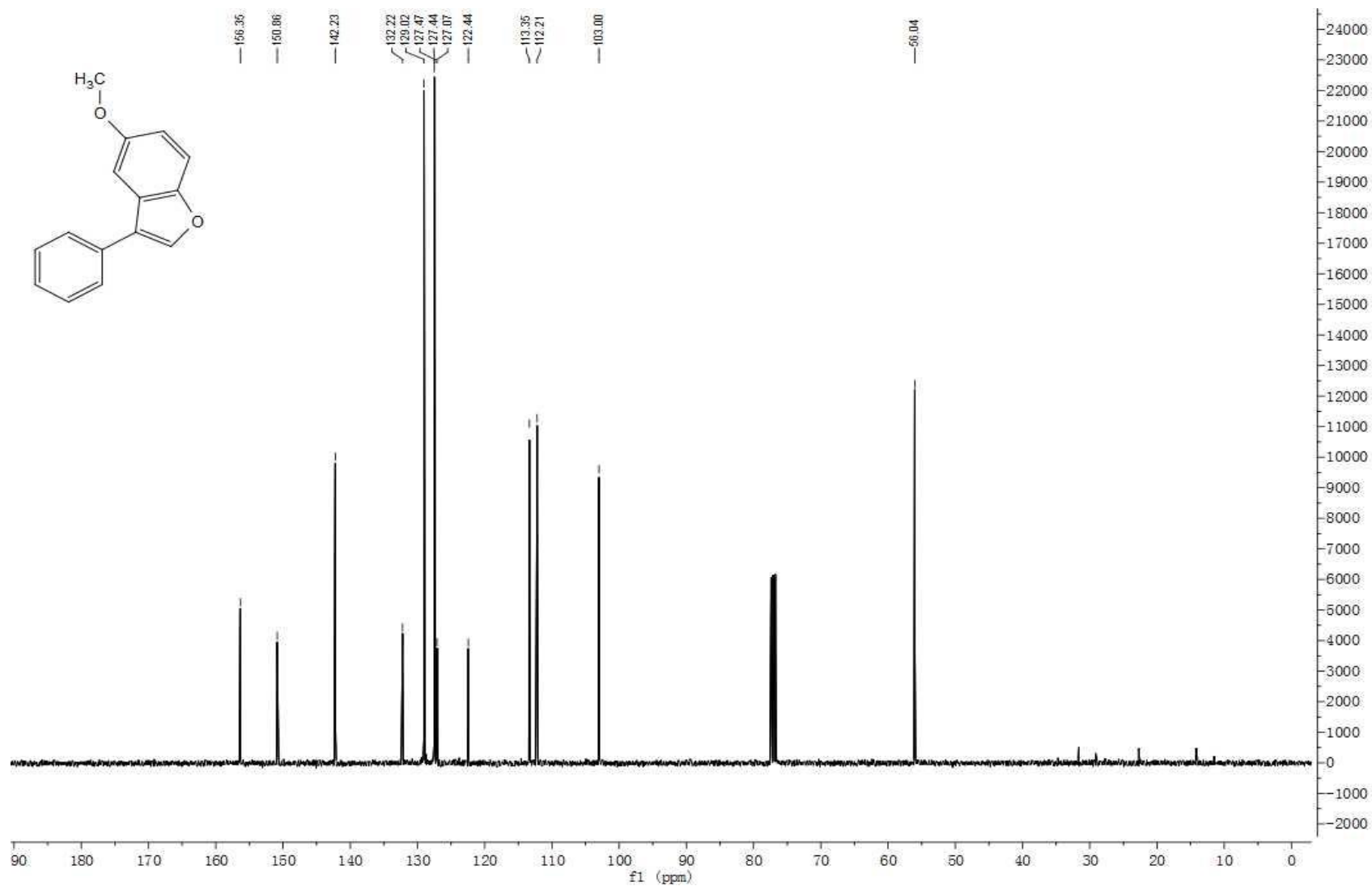
# 5-methoxy-3-phenylbenzofuran (Table 2 Entry 1)

## <sup>1</sup>H NMR



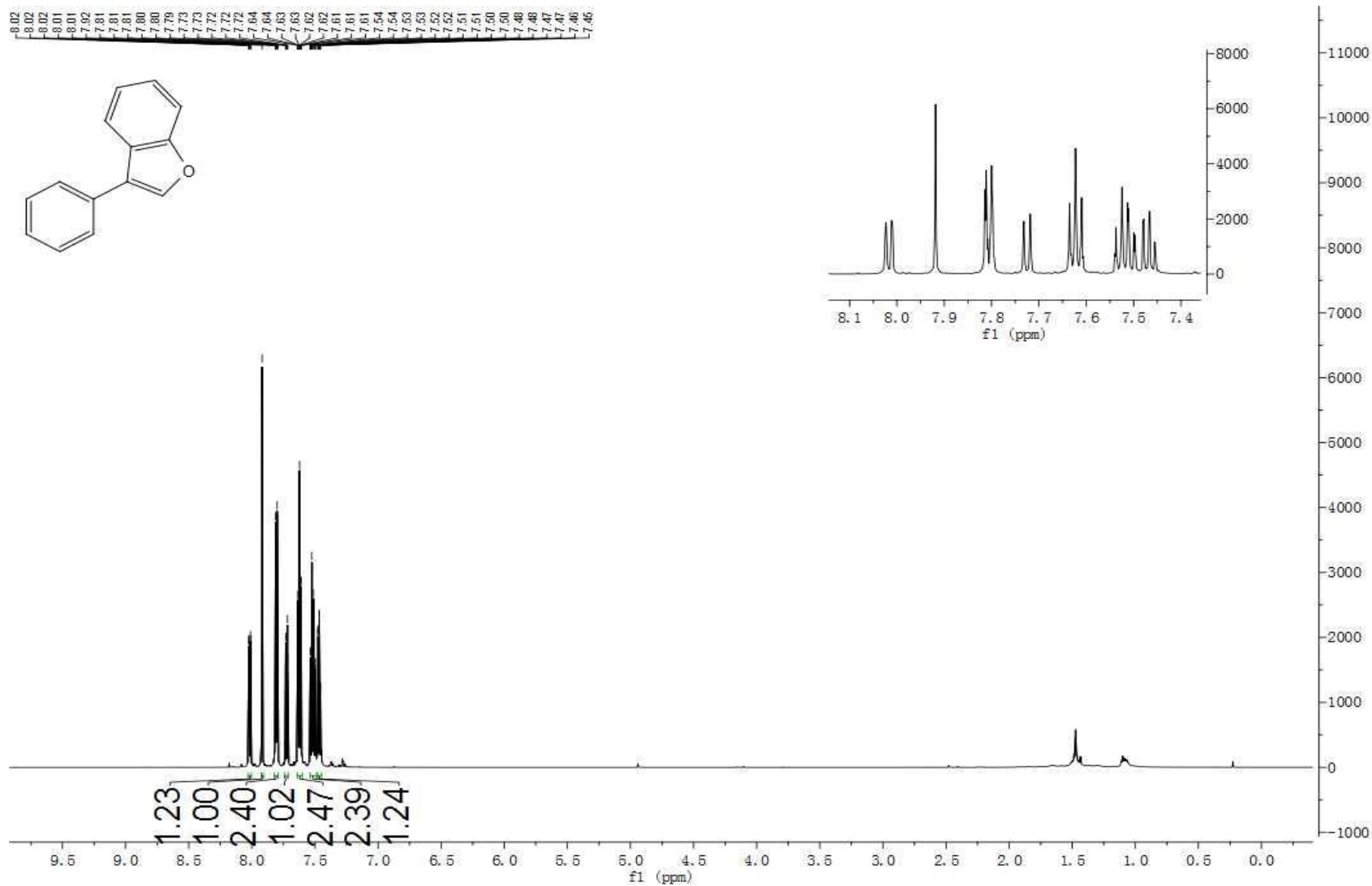
# 5-methoxy-3-phenylbenzofuran (Table 2 Entry 1)

## <sup>13</sup>C NMR



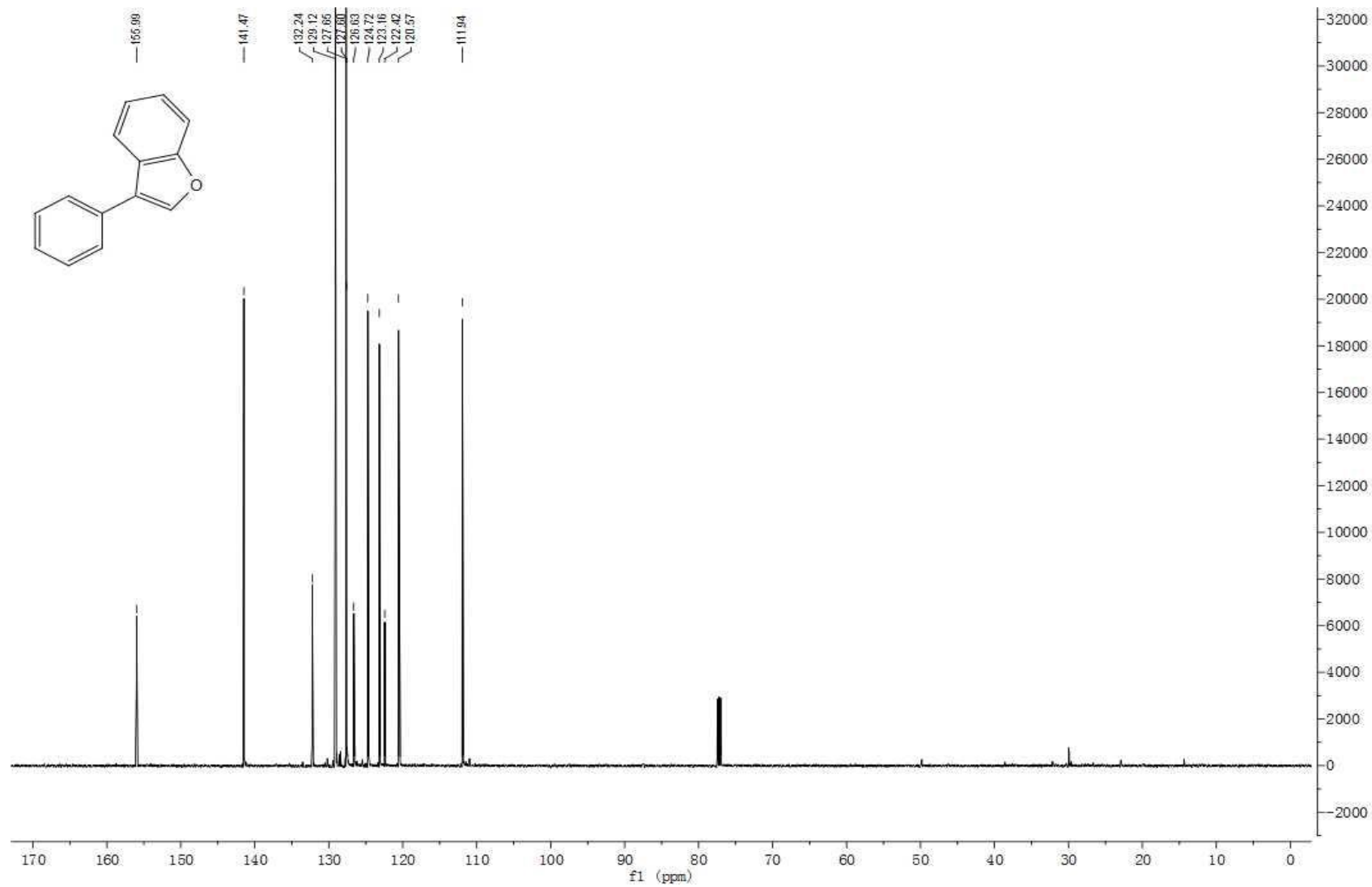
### 3-phenylbenzofuran (Table 2 Entry 2)

#### <sup>1</sup>H NMR



### 3-phenylbenzofuran (Table 2 Entry 2)

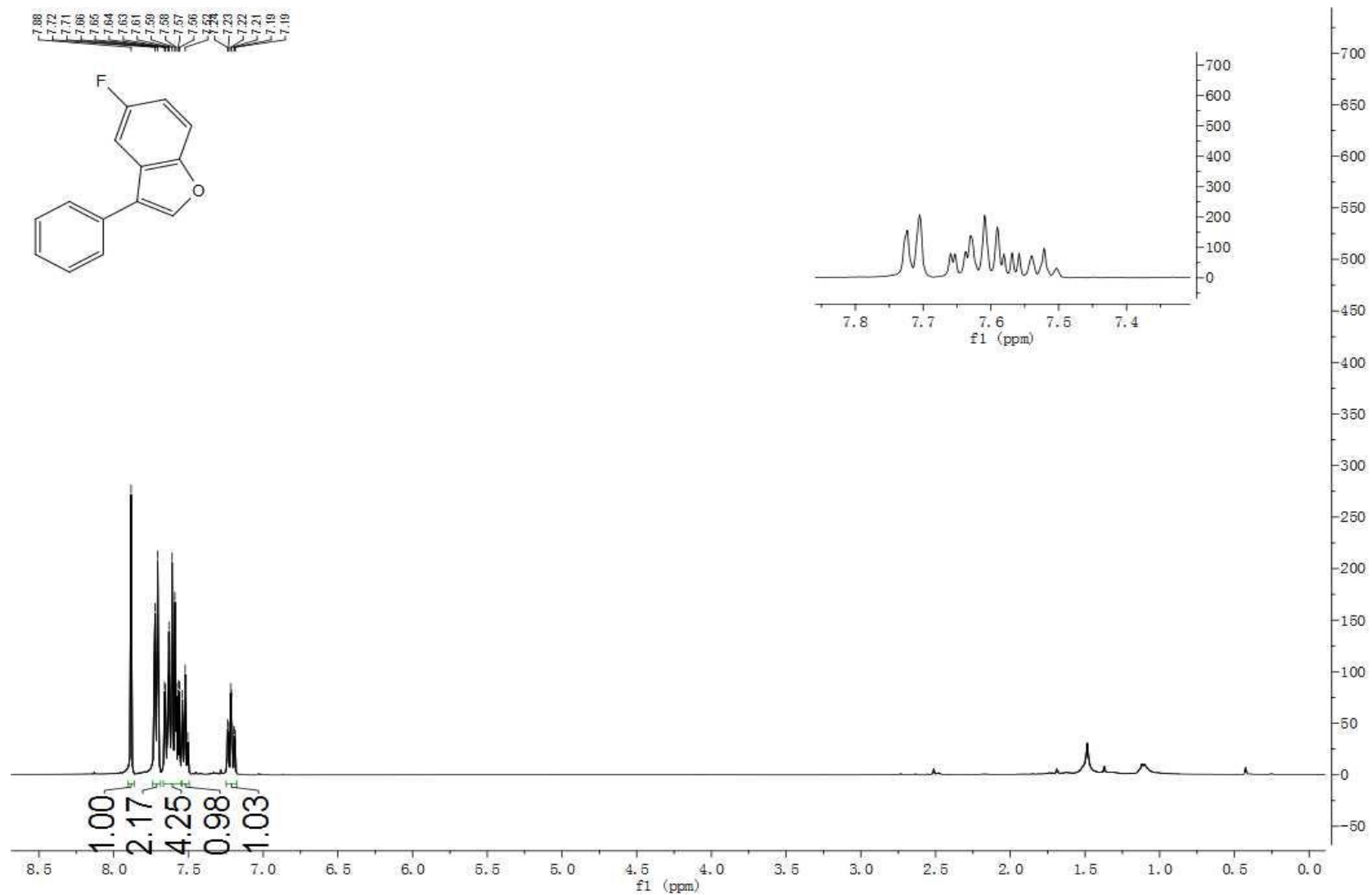
#### <sup>13</sup>C NMR





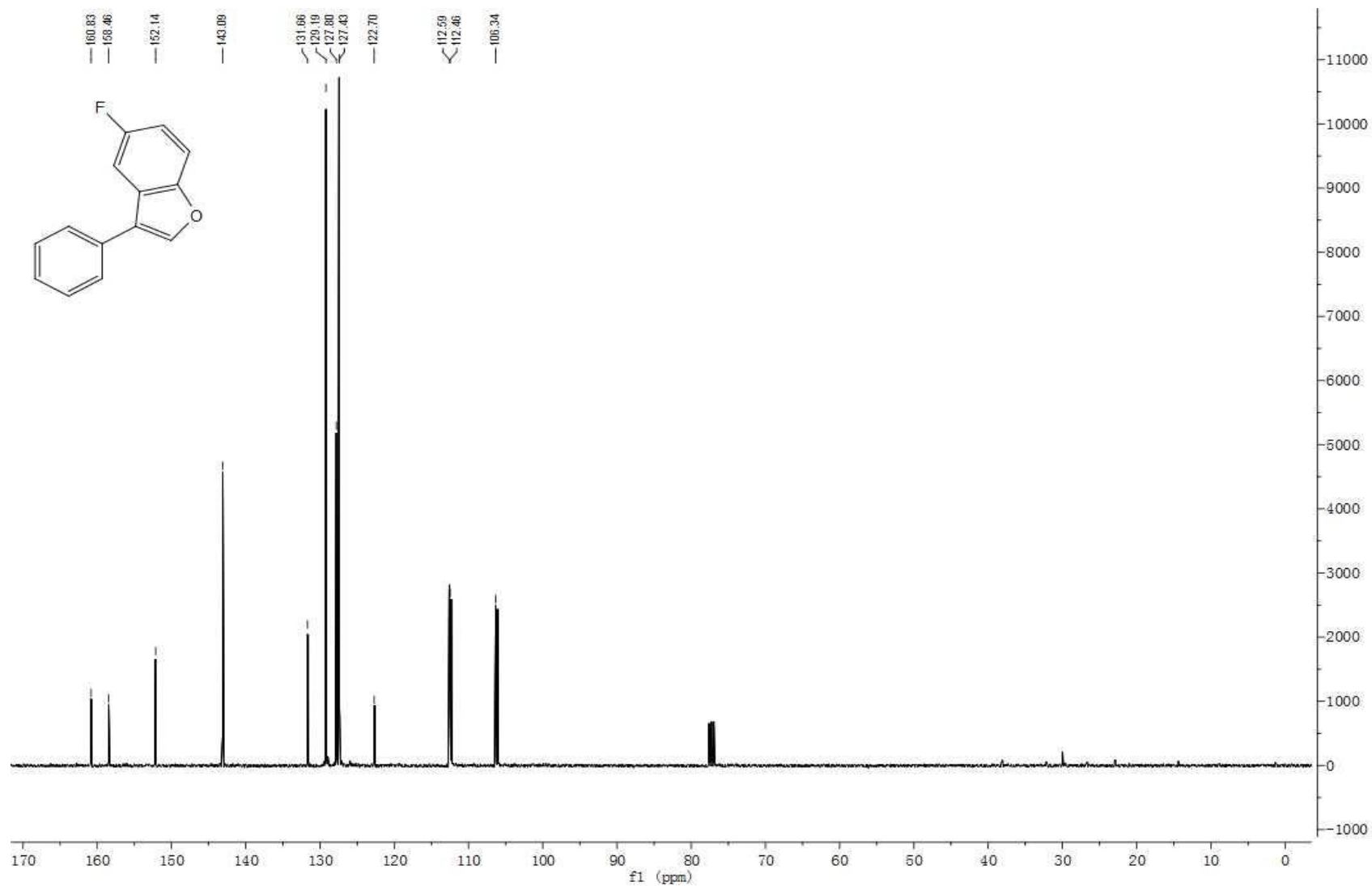
# 5-fluoro-3-phenylbenzofuran (Table 2 Entry 3)

## <sup>1</sup>H NMR



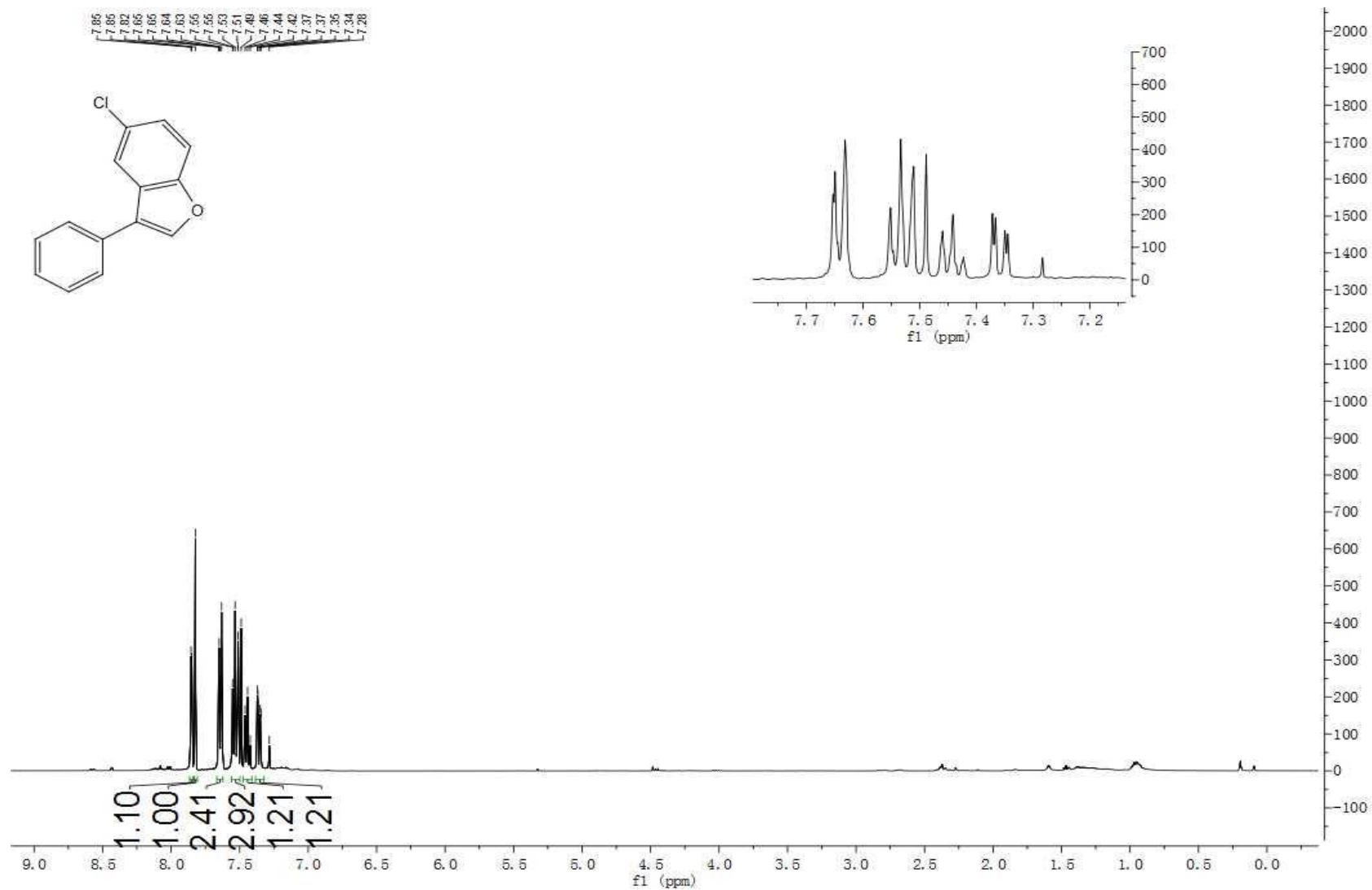
# 5-fluoro-3-phenylbenzofuran (Table 2 Entry 3)

## <sup>13</sup>C NMR



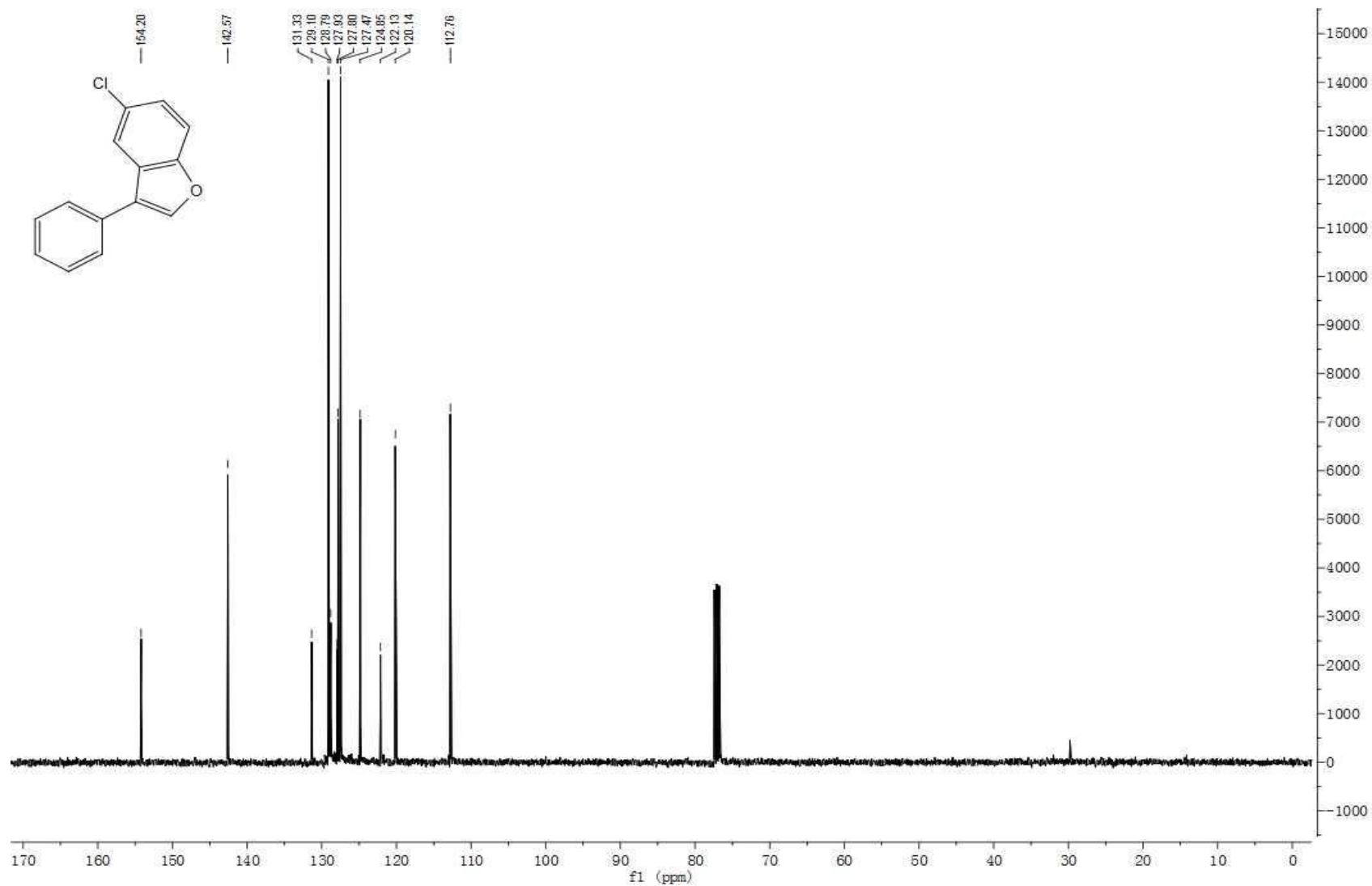
# 5-chloro-3-phenylbenzofuran (Table 2 Entry 4)

## <sup>1</sup>H NMR



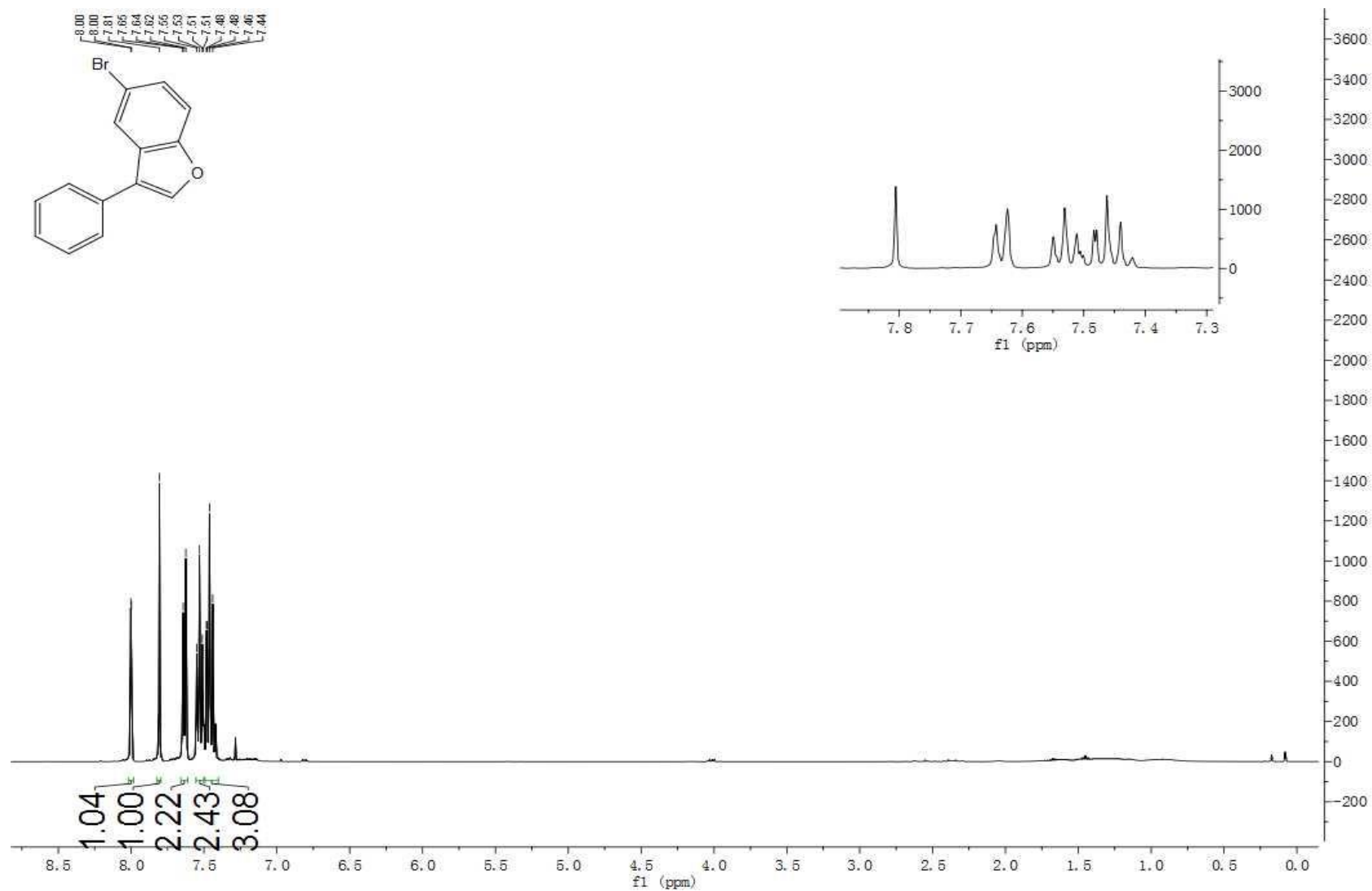
# 5-chloro-3-phenylbenzofuran (Table 2 Entry 4)

## <sup>13</sup>C NMR



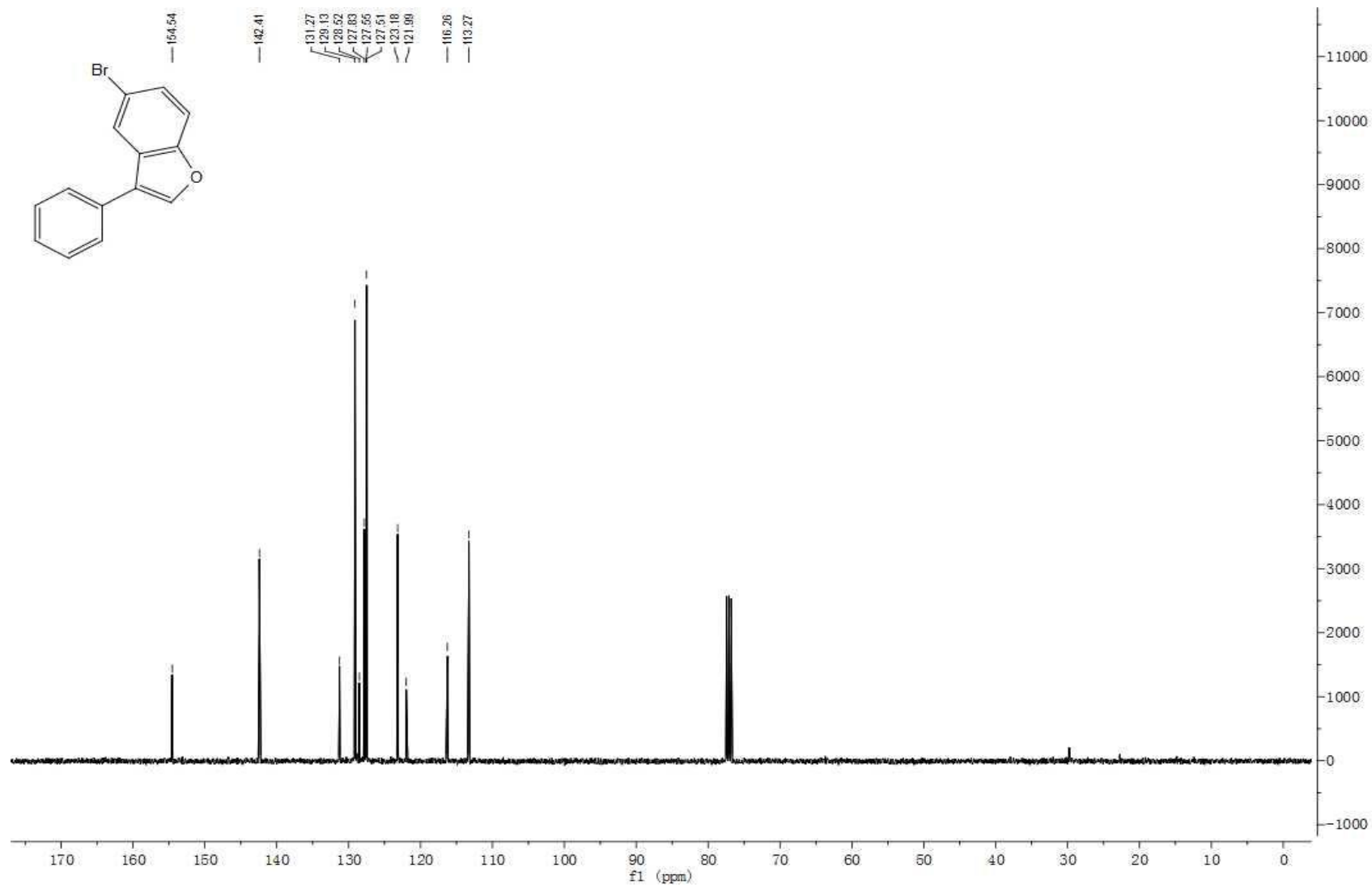
# 5-bromo-3-phenylbenzofuran (Table 2 Entry 5)

## <sup>1</sup>H NMR



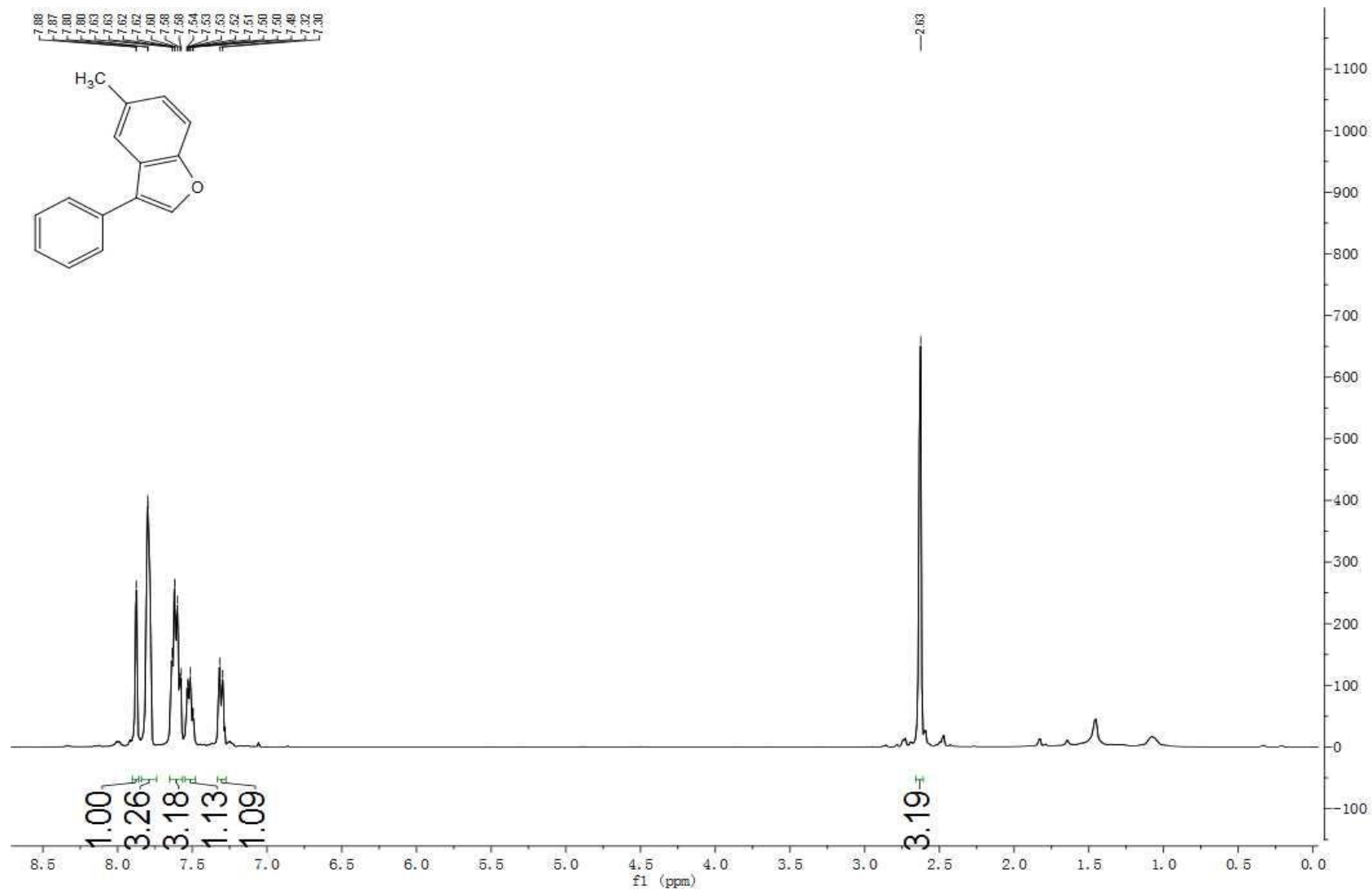
# 5-bromo-3-phenylbenzofuran (Table 2 Entry 5)

## <sup>13</sup>C NMR



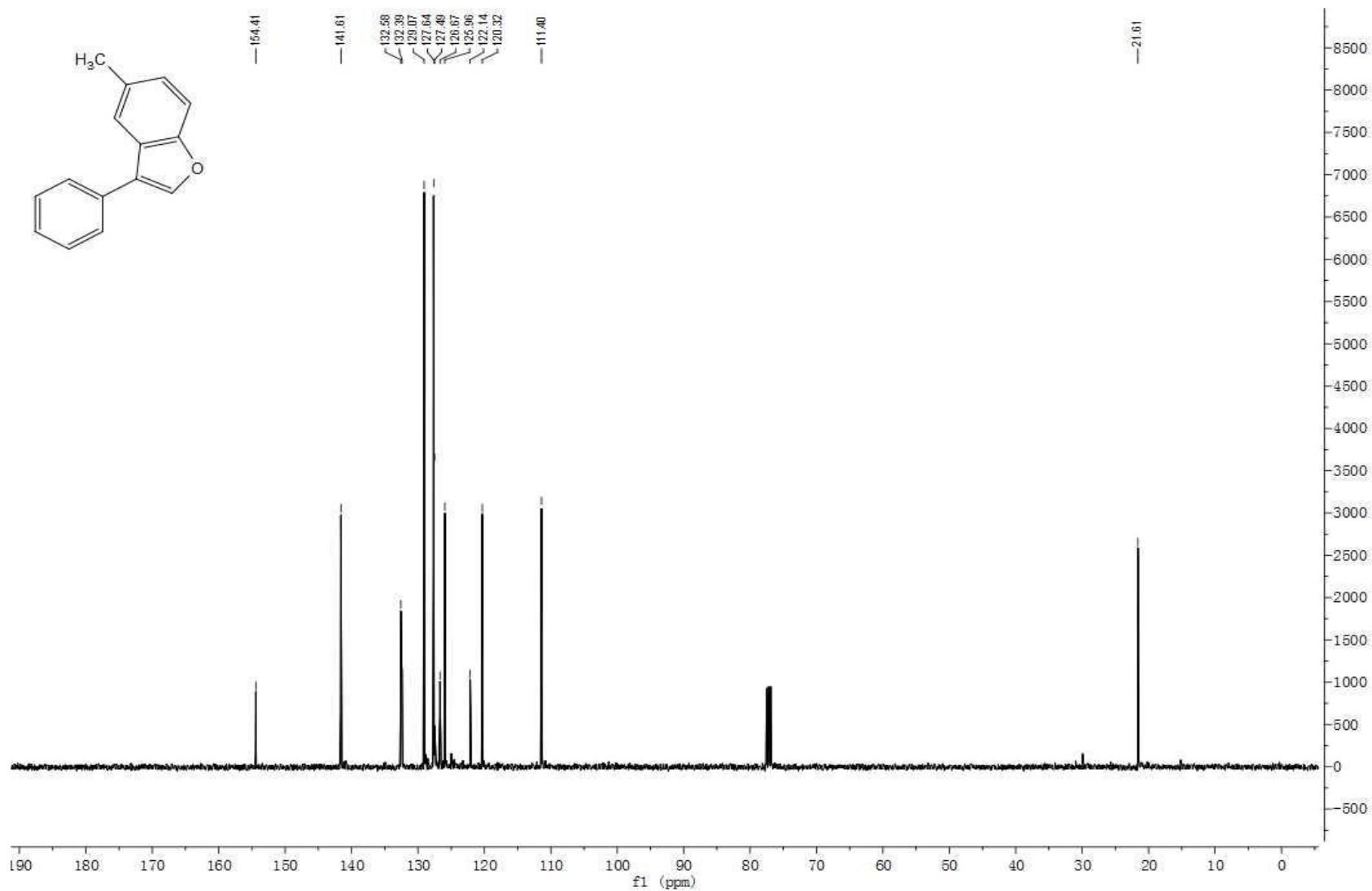
# 5-methyl-3-phenylbenzofuran (Table 2 Entry 6)

## <sup>1</sup>H NMR



# 5-methyl-3-phenylbenzofuran (Table 2 Entry 6)

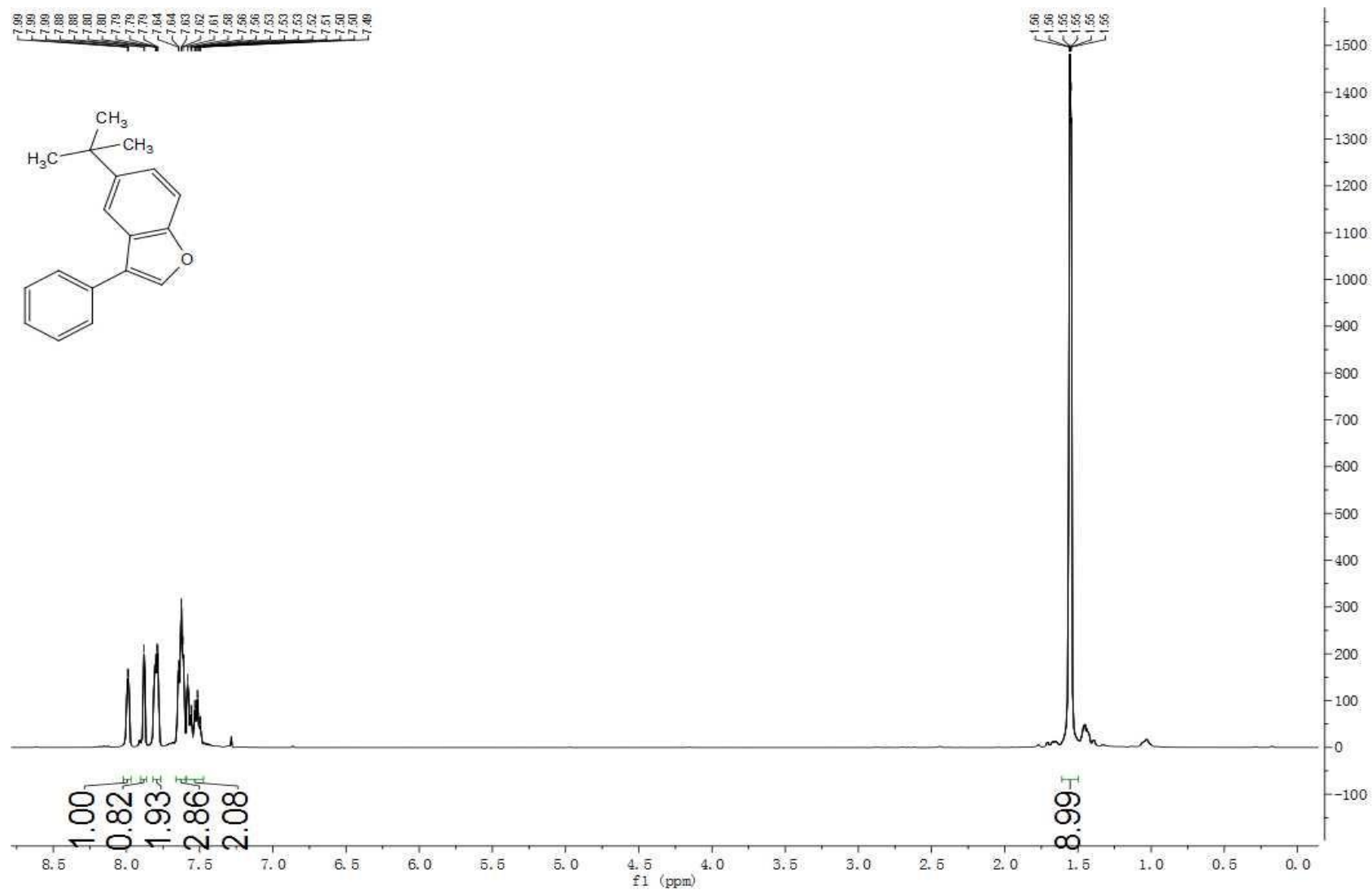
## <sup>13</sup>C NMR





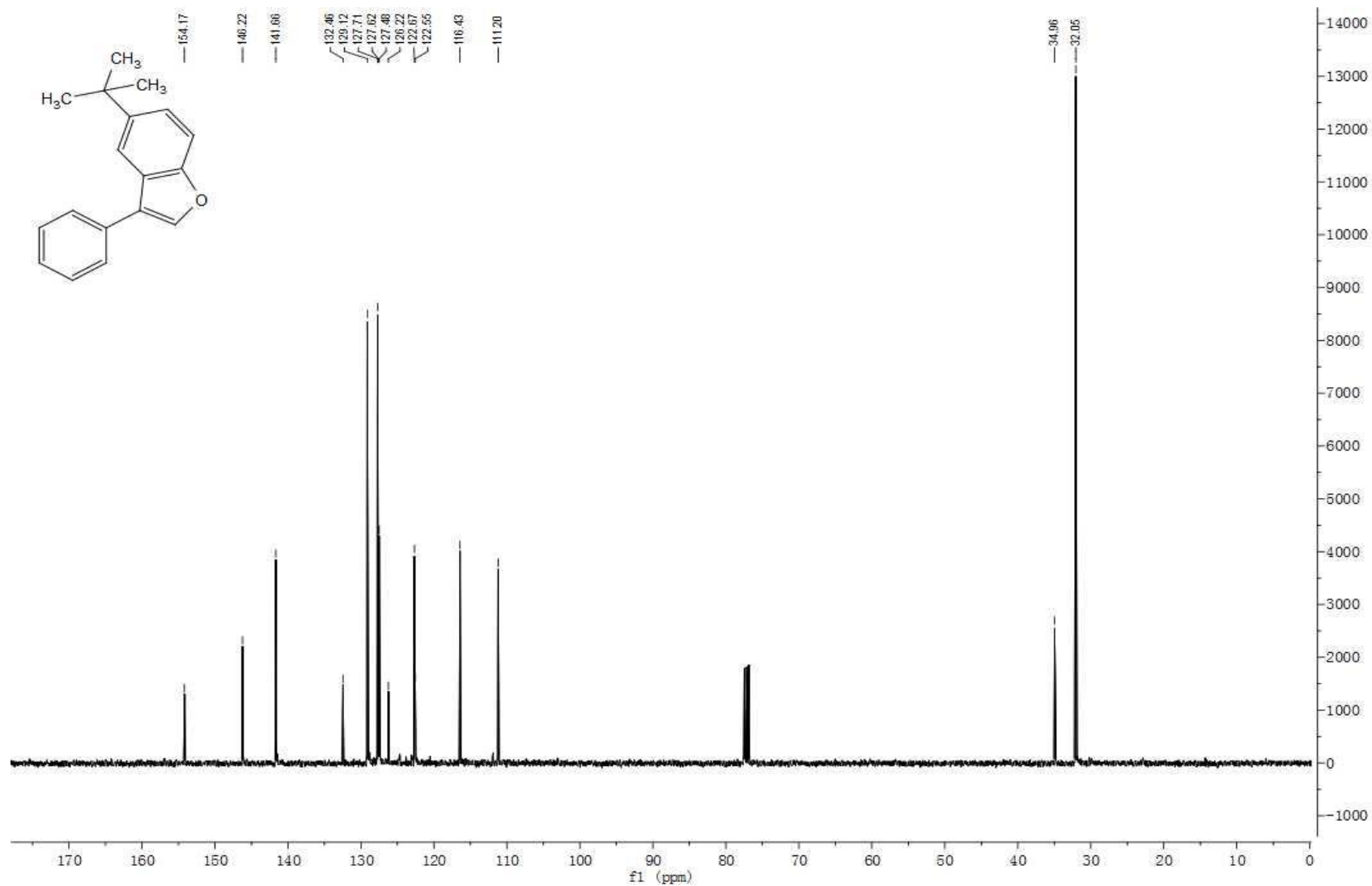
# 5-(tert-butyl)-3-phenylbenzofuran (Table 2 Entry 7)

## <sup>1</sup>H NMR



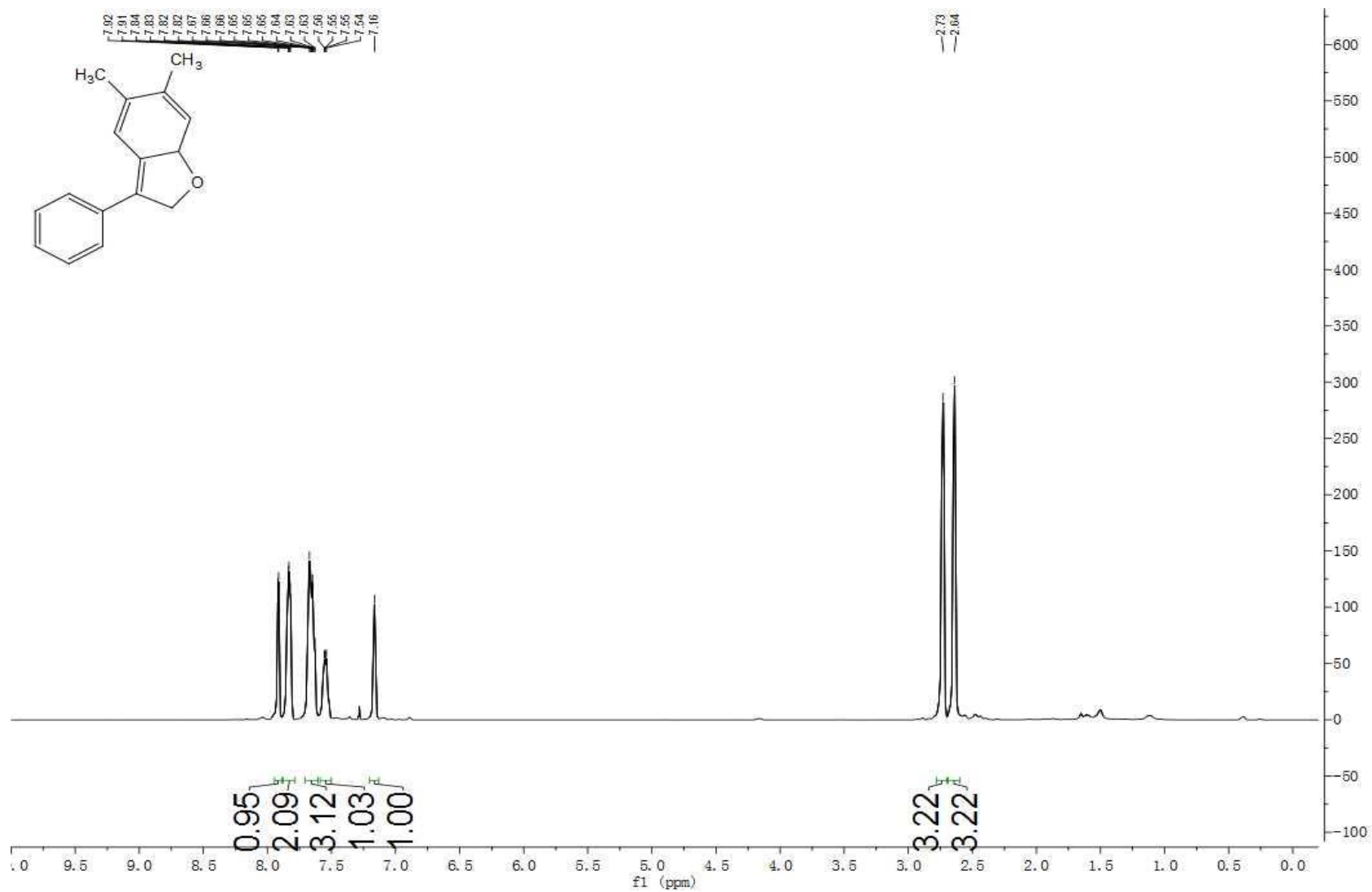
# 5-(tert-butyl)-3-phenylbenzofuran (Table 2 Entry 7)

## <sup>13</sup>C NMR



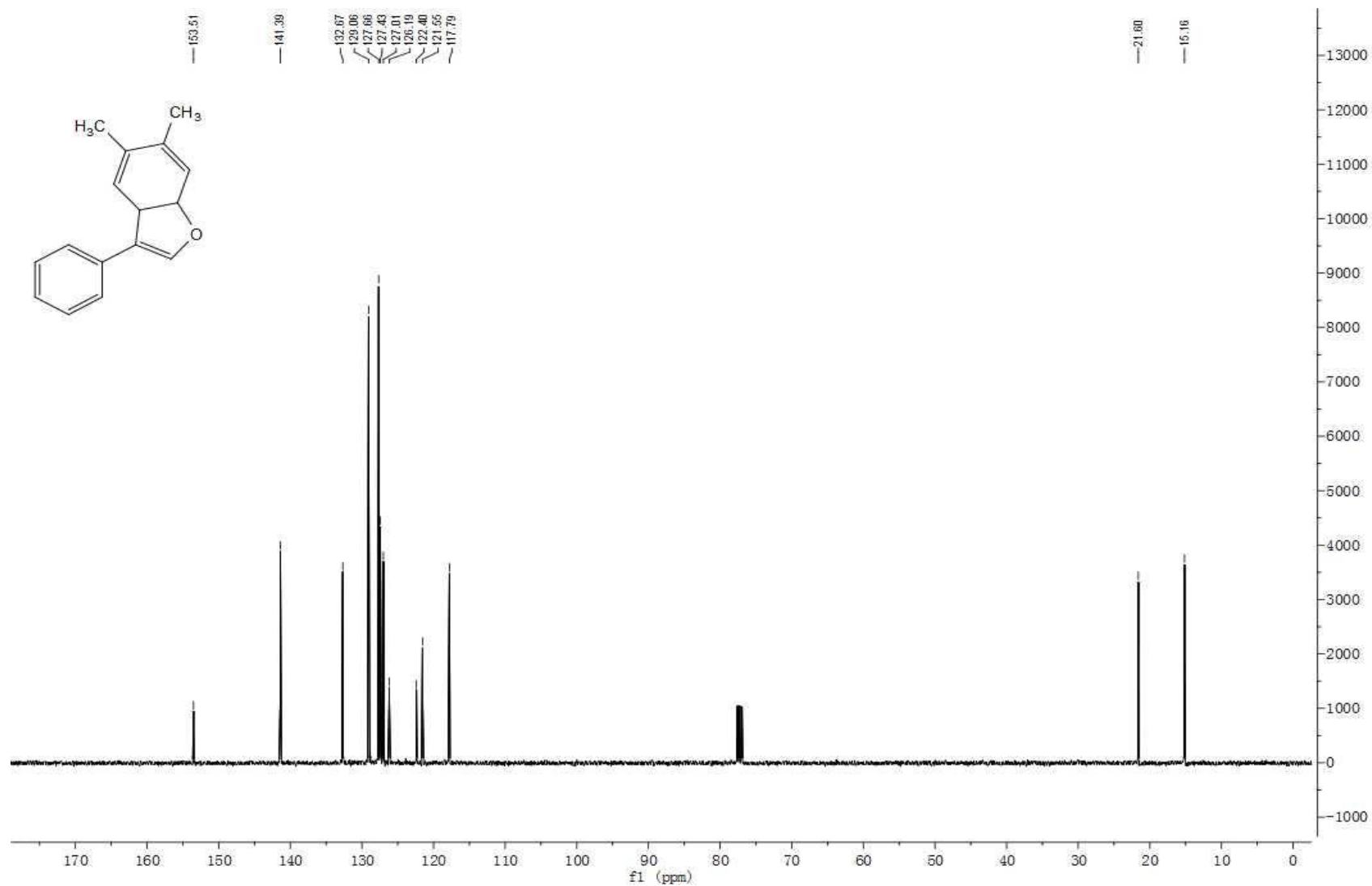
# 5,6-dimethyl-3-phenyl-2,7a-dihydrobenzofuran (Table 2 Entry 8)

## <sup>1</sup>H NMR



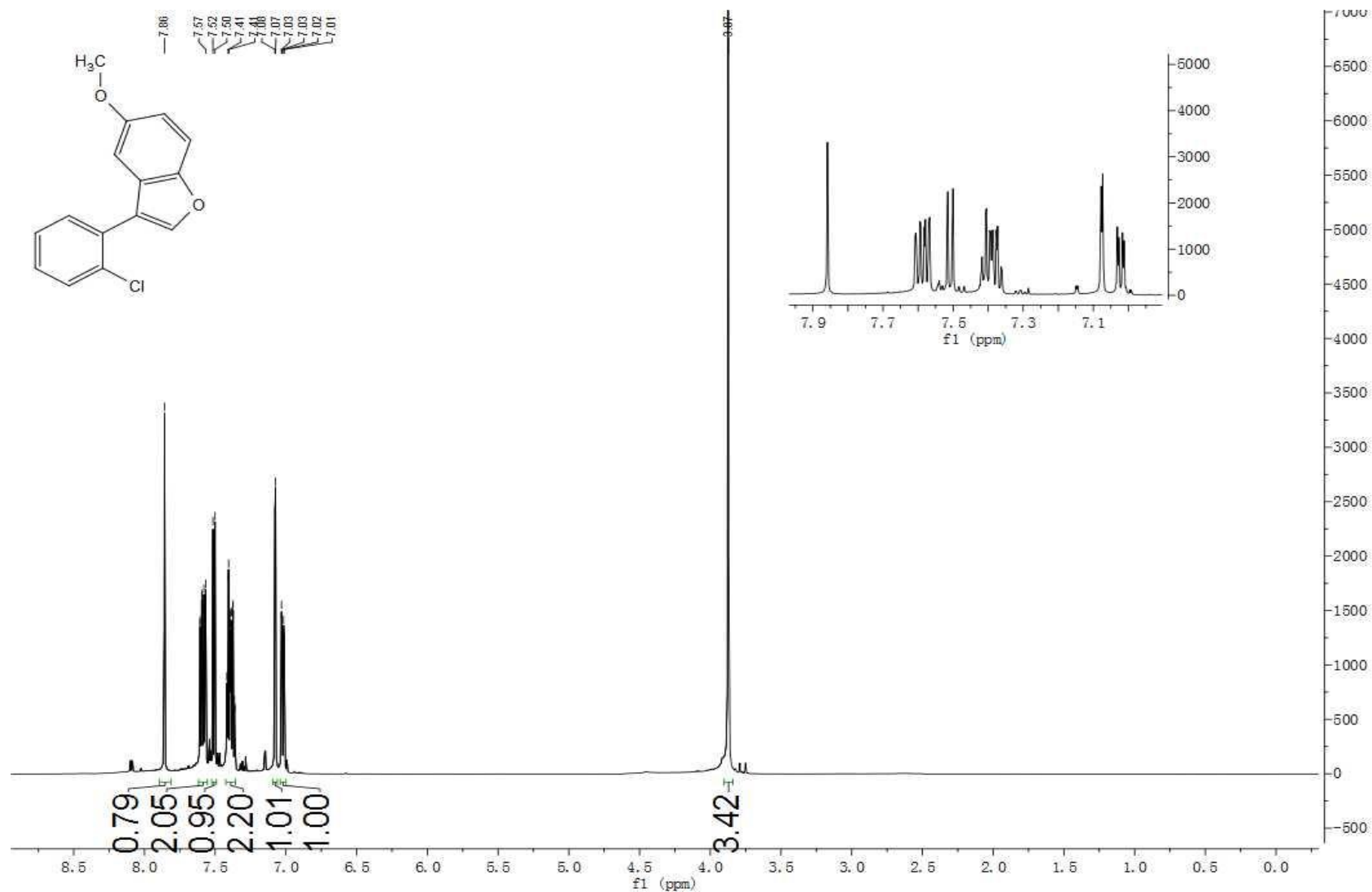
# 5,6-dimethyl-3-phenyl-2,7-dihydrobenzofuran (Table 2 Entry 8)

## <sup>13</sup>C NMR



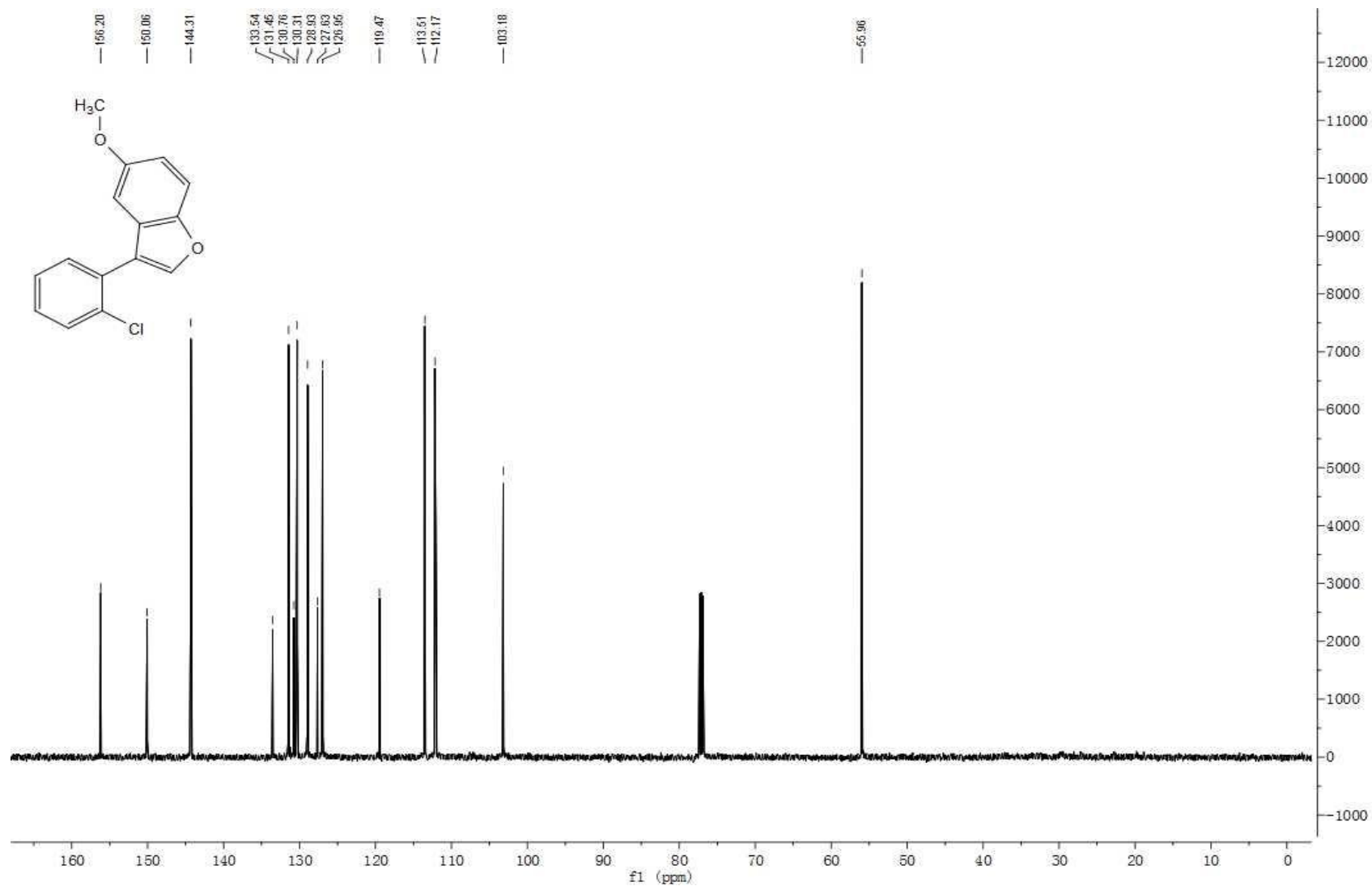
### 3-(2-chlorophenyl)-5-methoxybenzofuran (Table 2 Entry 11)

#### <sup>1</sup>H NMR



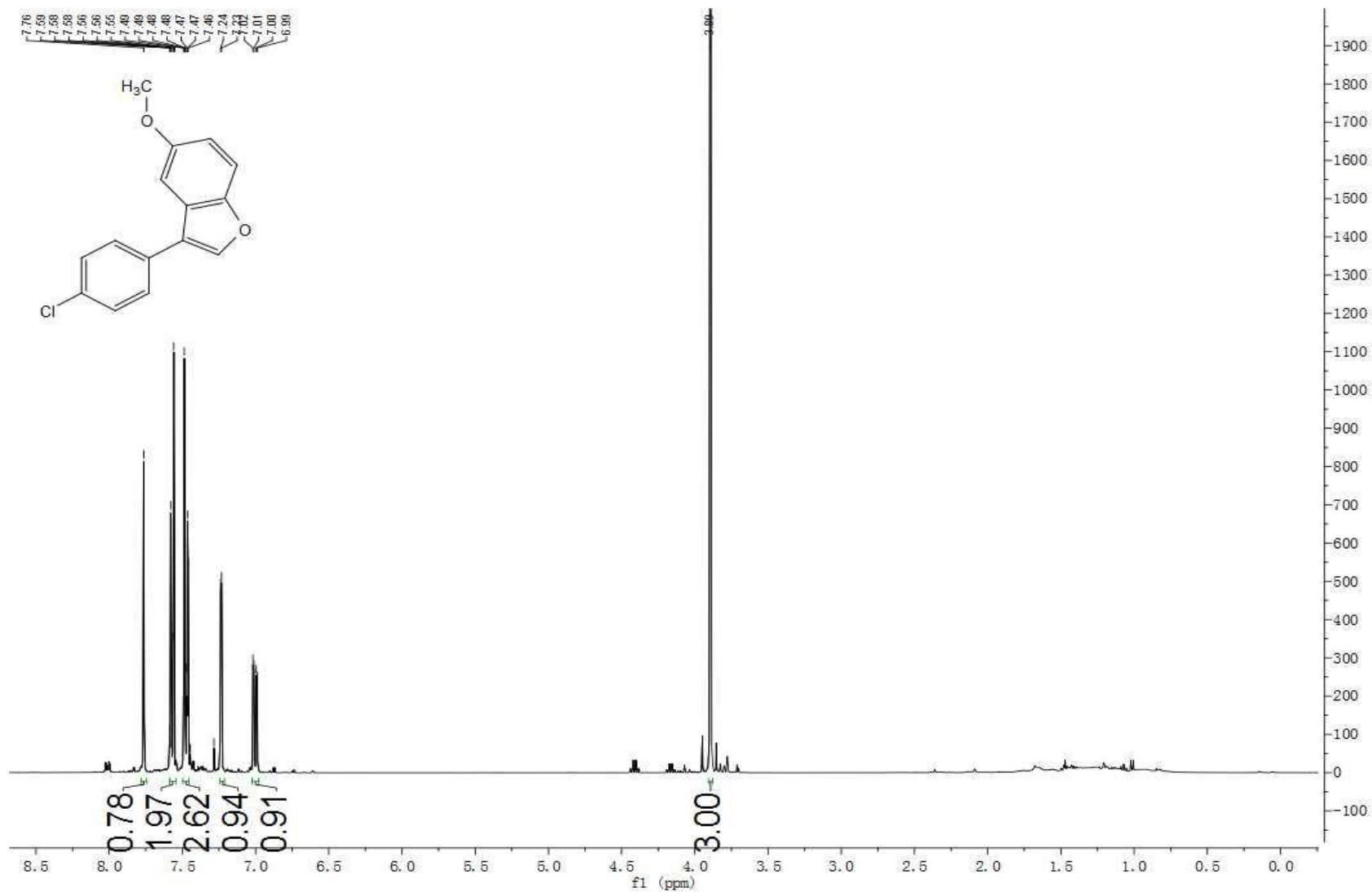
### 3-(2-chlorophenyl)-5-methoxybenzofuran (Table 2 Entry 11)

#### <sup>13</sup>C NMR



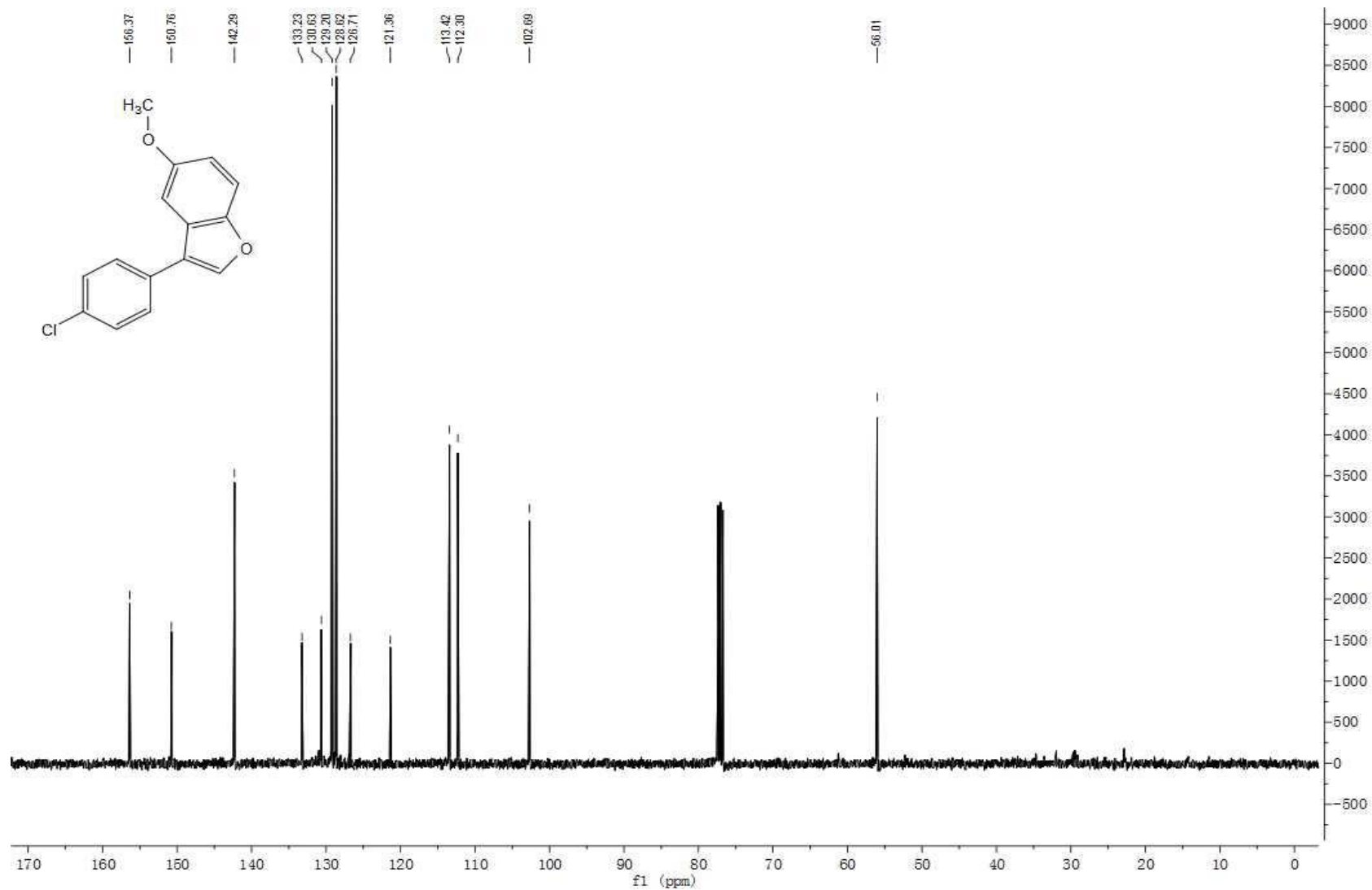
### 3-(4-chlorophenyl)-5-methoxybenzofuran (Table 2 Entry 12)

#### <sup>1</sup>H NMR



### 3-(4-chlorophenyl)-5-methoxybenzofuran (Table 2 Entry 12)

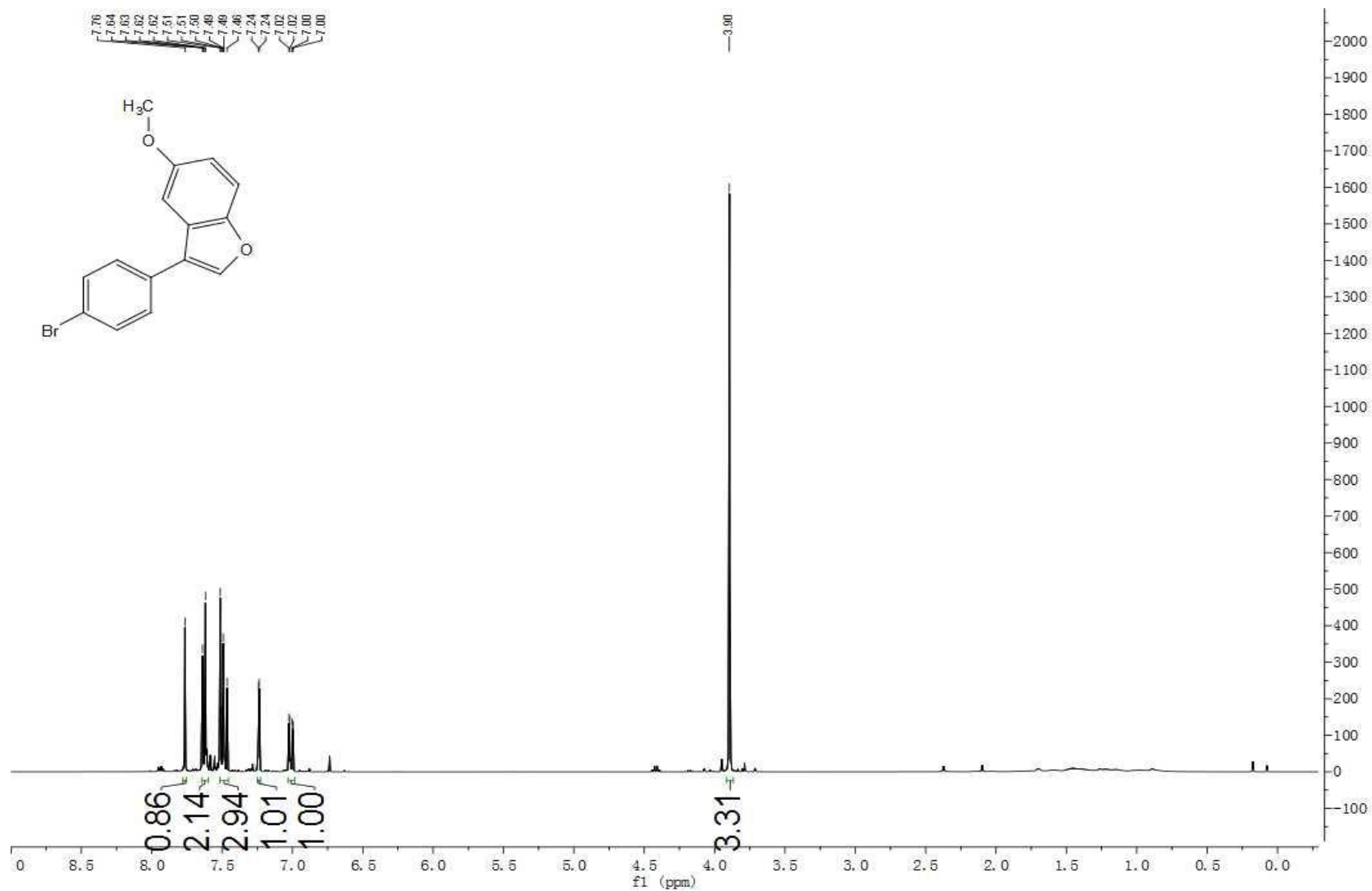
#### <sup>13</sup>C NMR





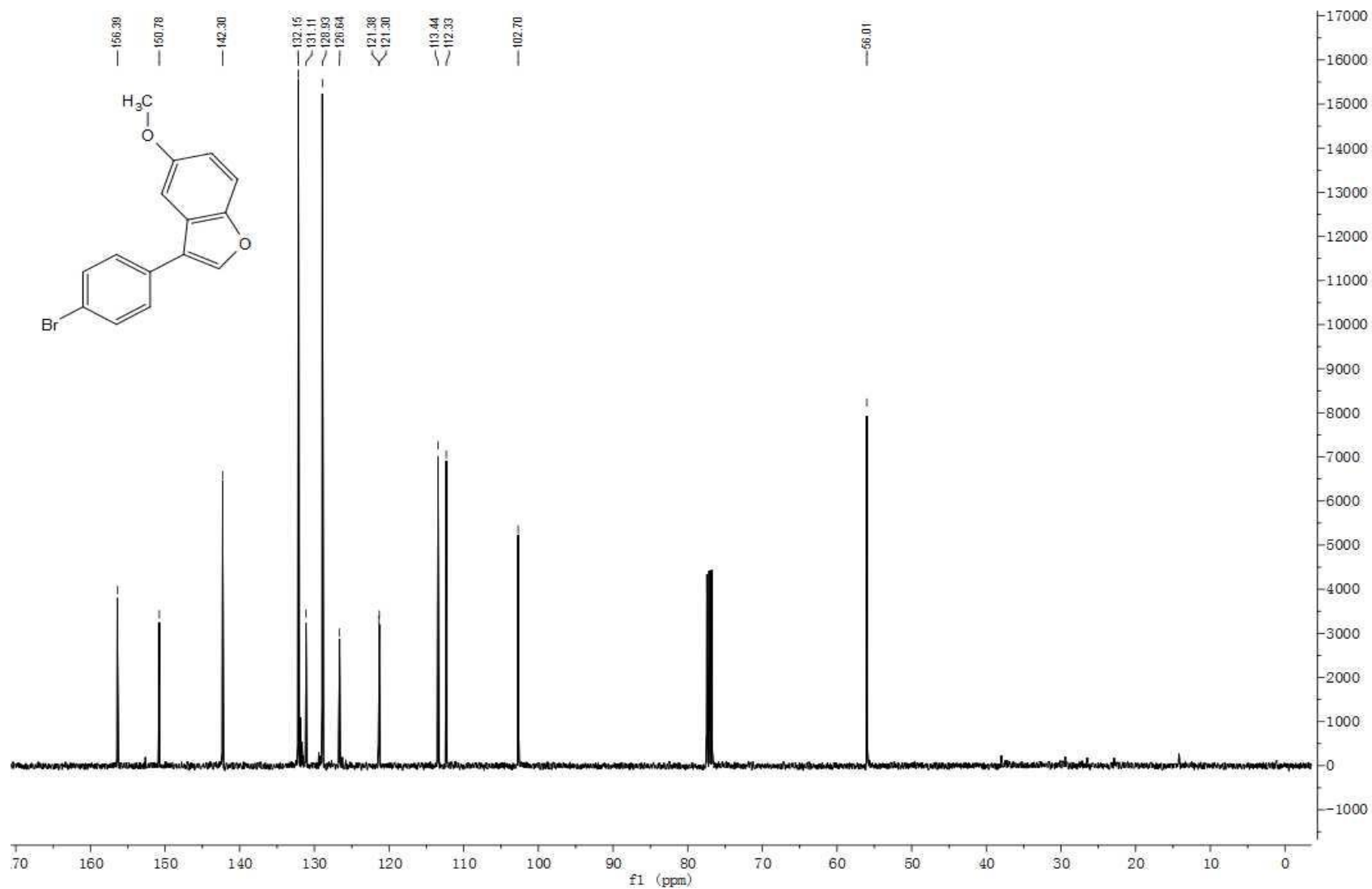
### 3-(4-bromophenyl)-5-methoxybenzofuran (Table 2 Entry 13)

#### $^1\text{H}$ NMR



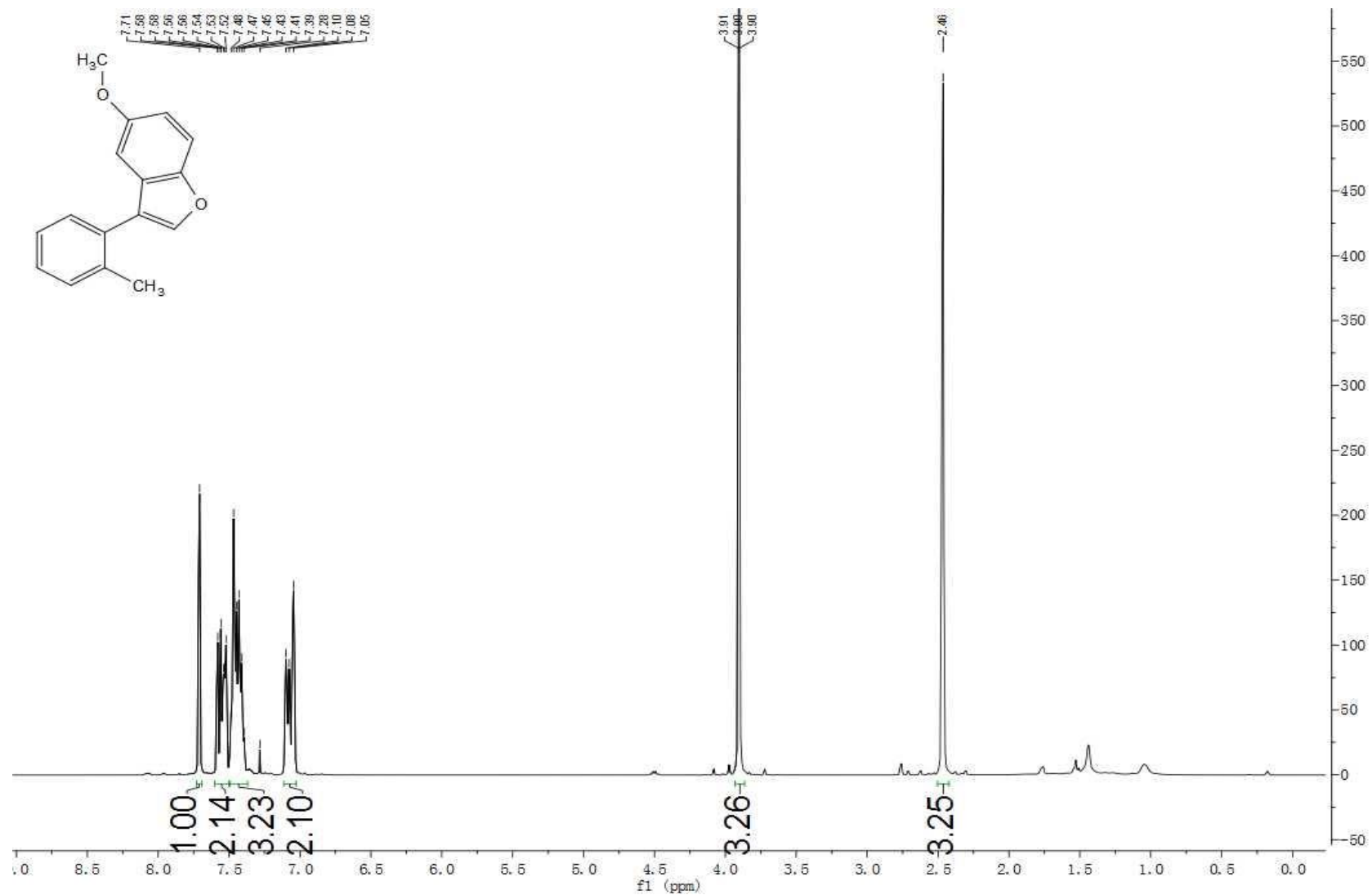
### 3-(4-bromophenyl)-5-methoxybenzofuran (Table 2 Entry 13)

#### <sup>13</sup>C NMR



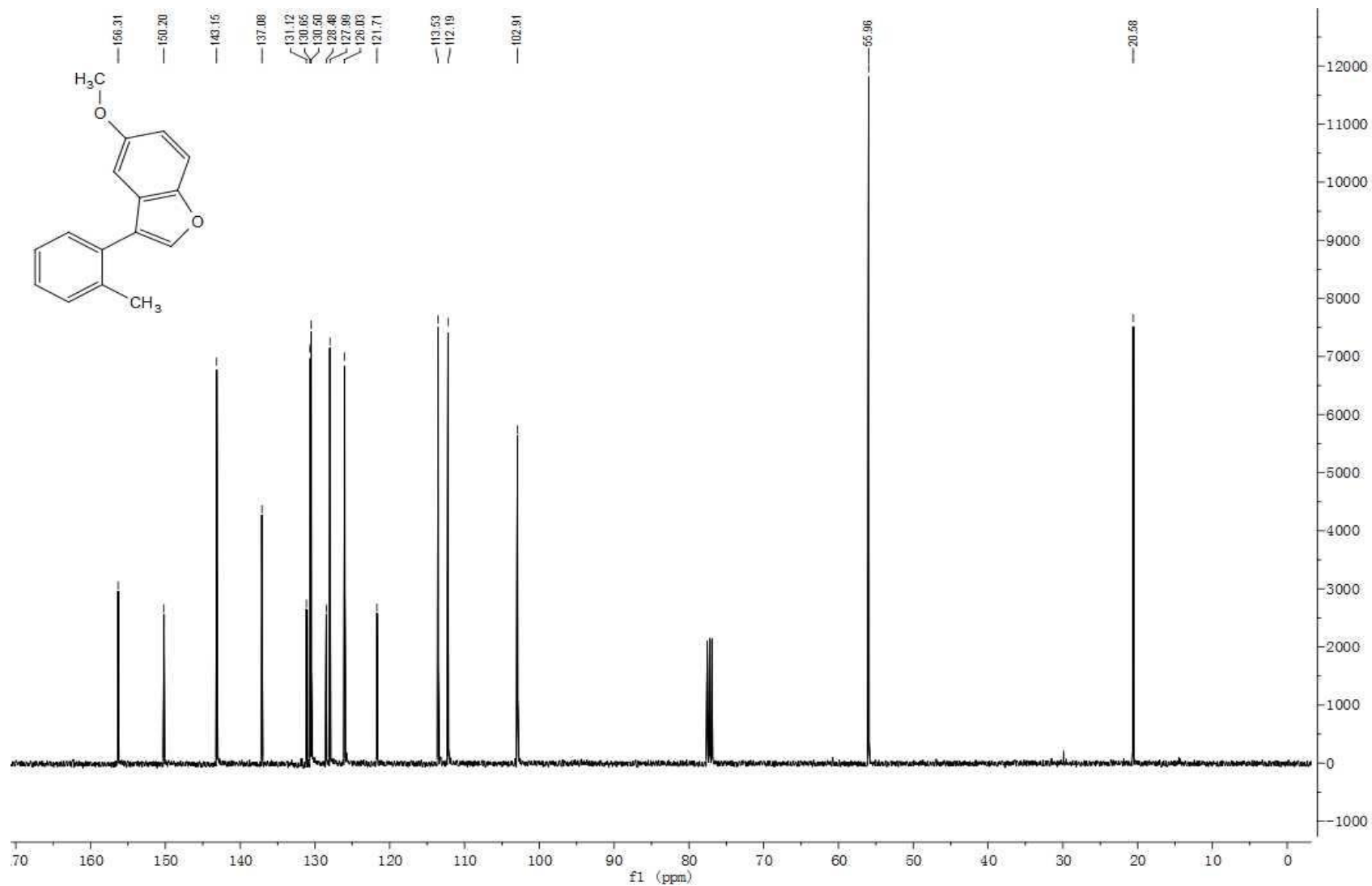
# 5-methoxy-3-(o-tolyl)benzofuran (Table 2 Entry 14)

## <sup>1</sup>H NMR



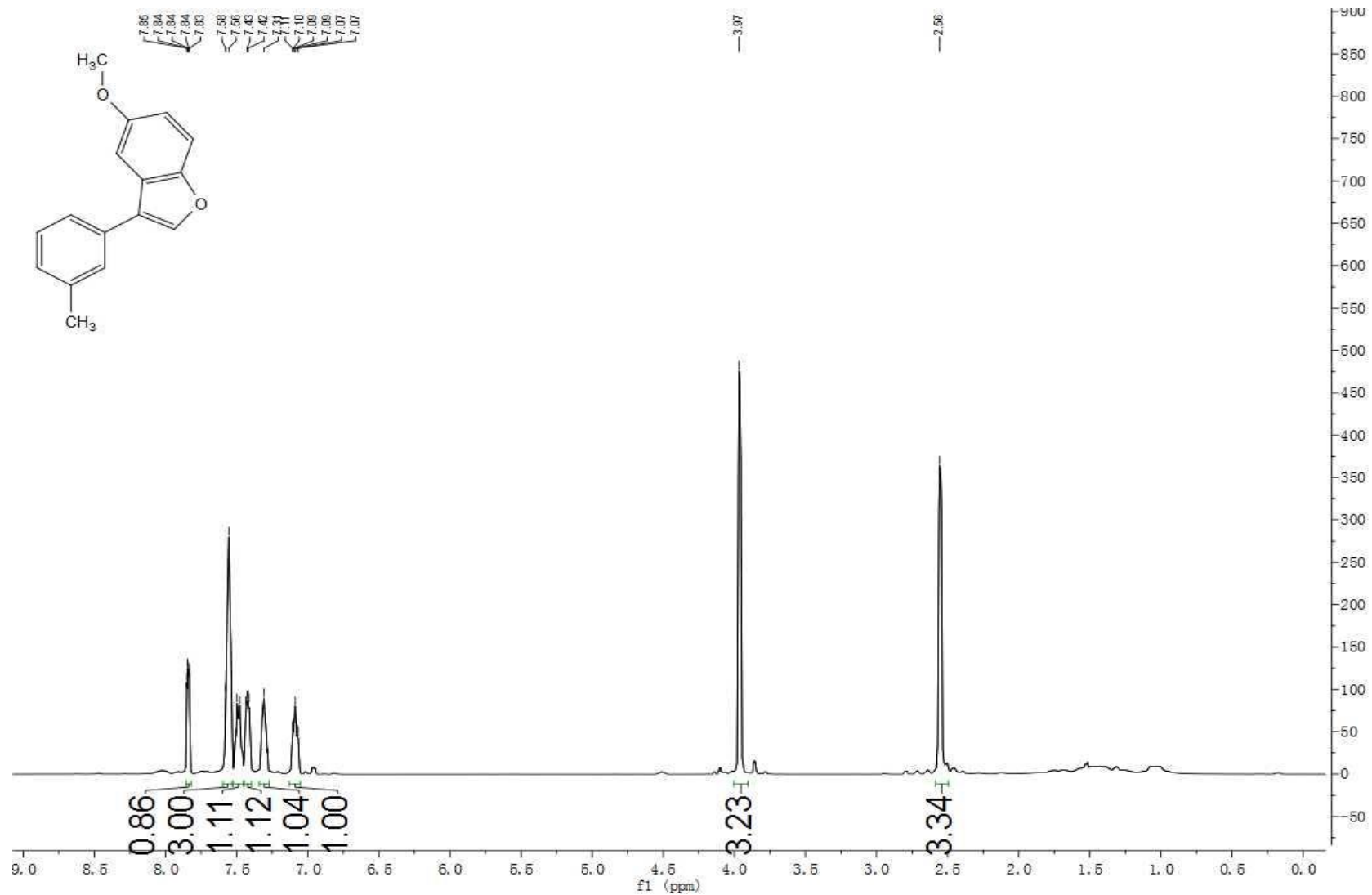
# 5-methoxy-3-(o-tolyl)benzofuran (Table 2 Entry 14)

## <sup>13</sup>C NMR



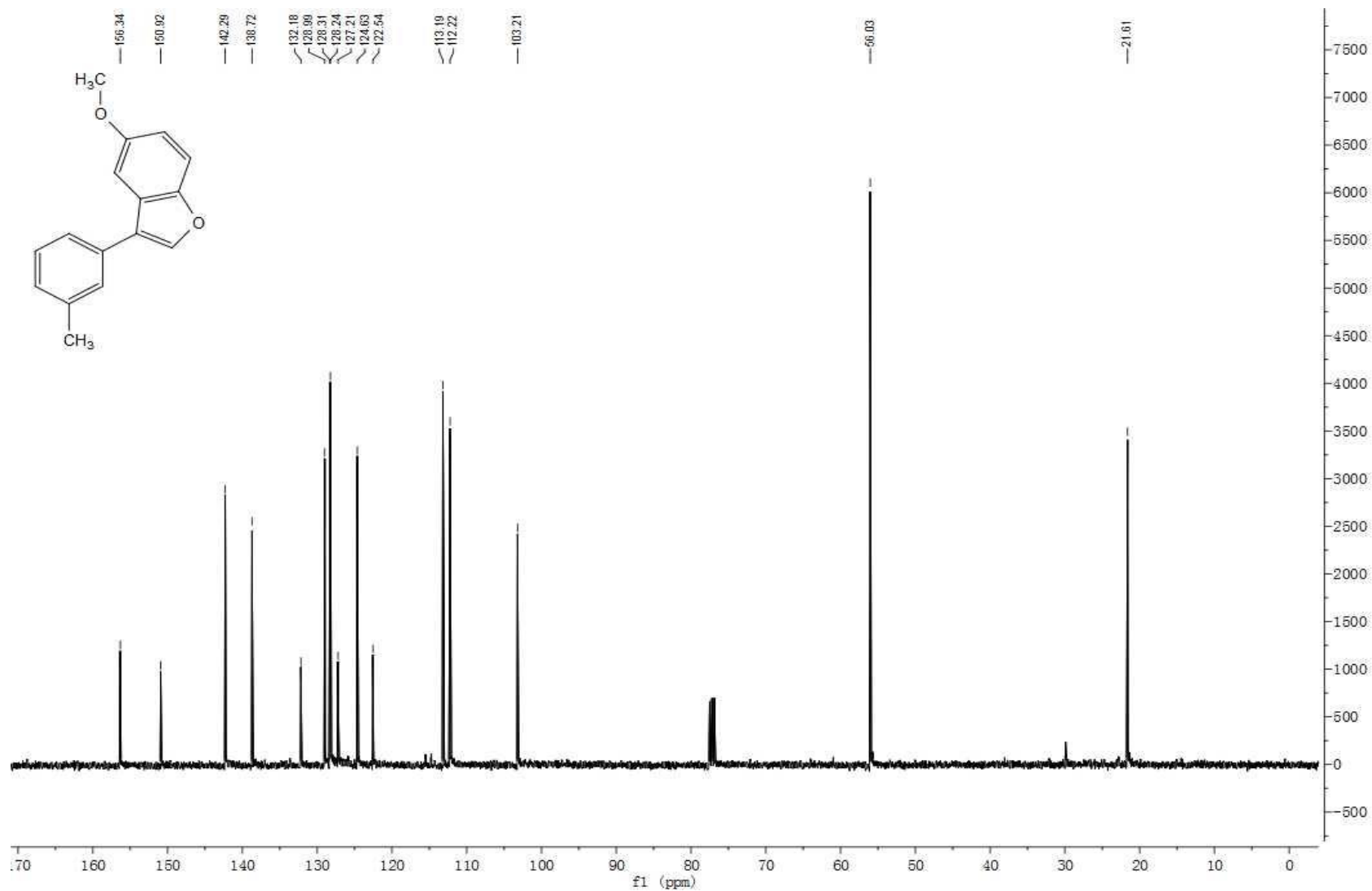
# 5-methoxy-3-(m-tolyl)benzofuran (Table 2 Entry 15)

## <sup>1</sup>H NMR



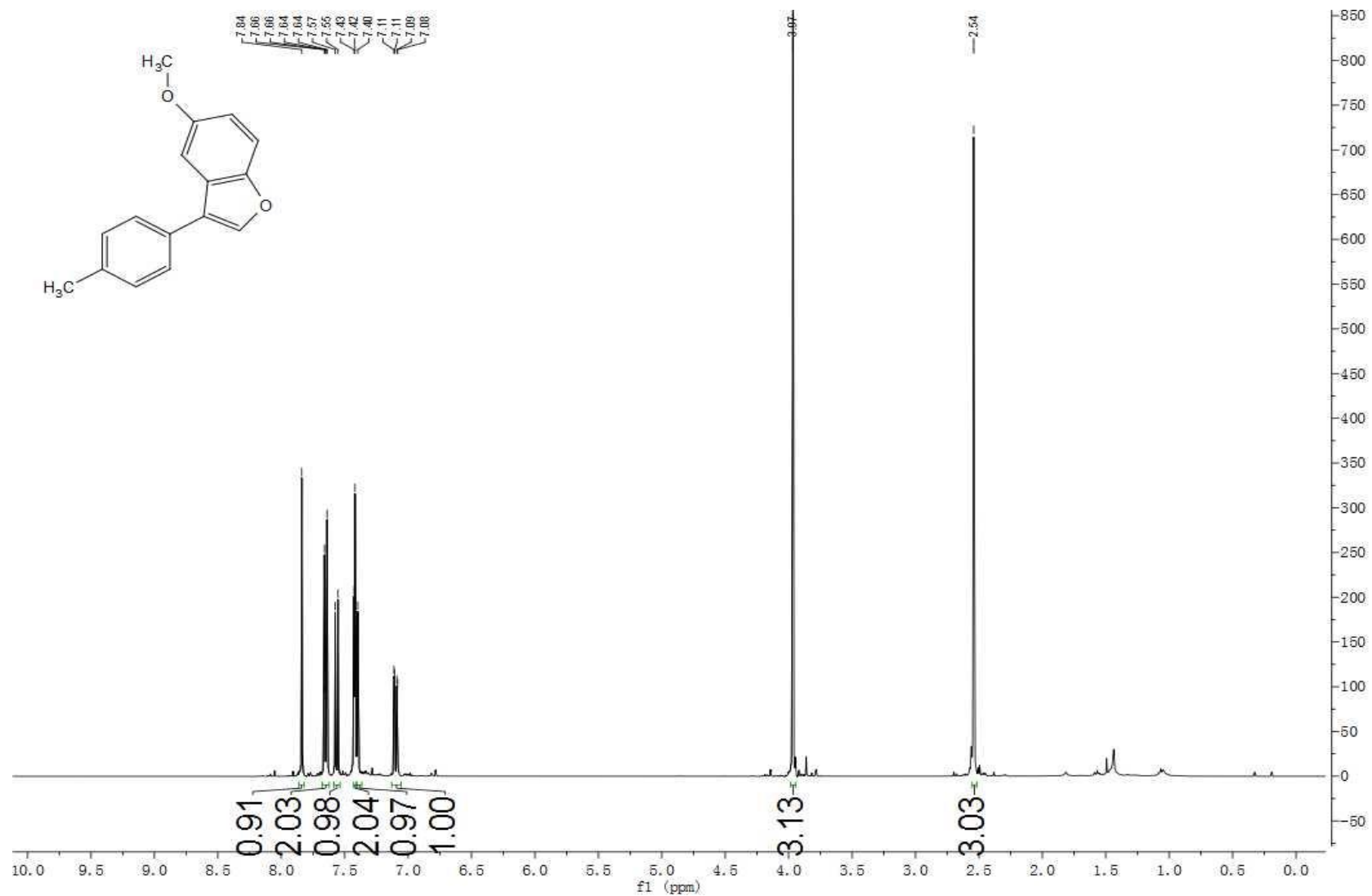
# 5-methoxy-3-(m-tolyl)benzofuran (Table 2 Entry 15)

## <sup>13</sup>C NMR



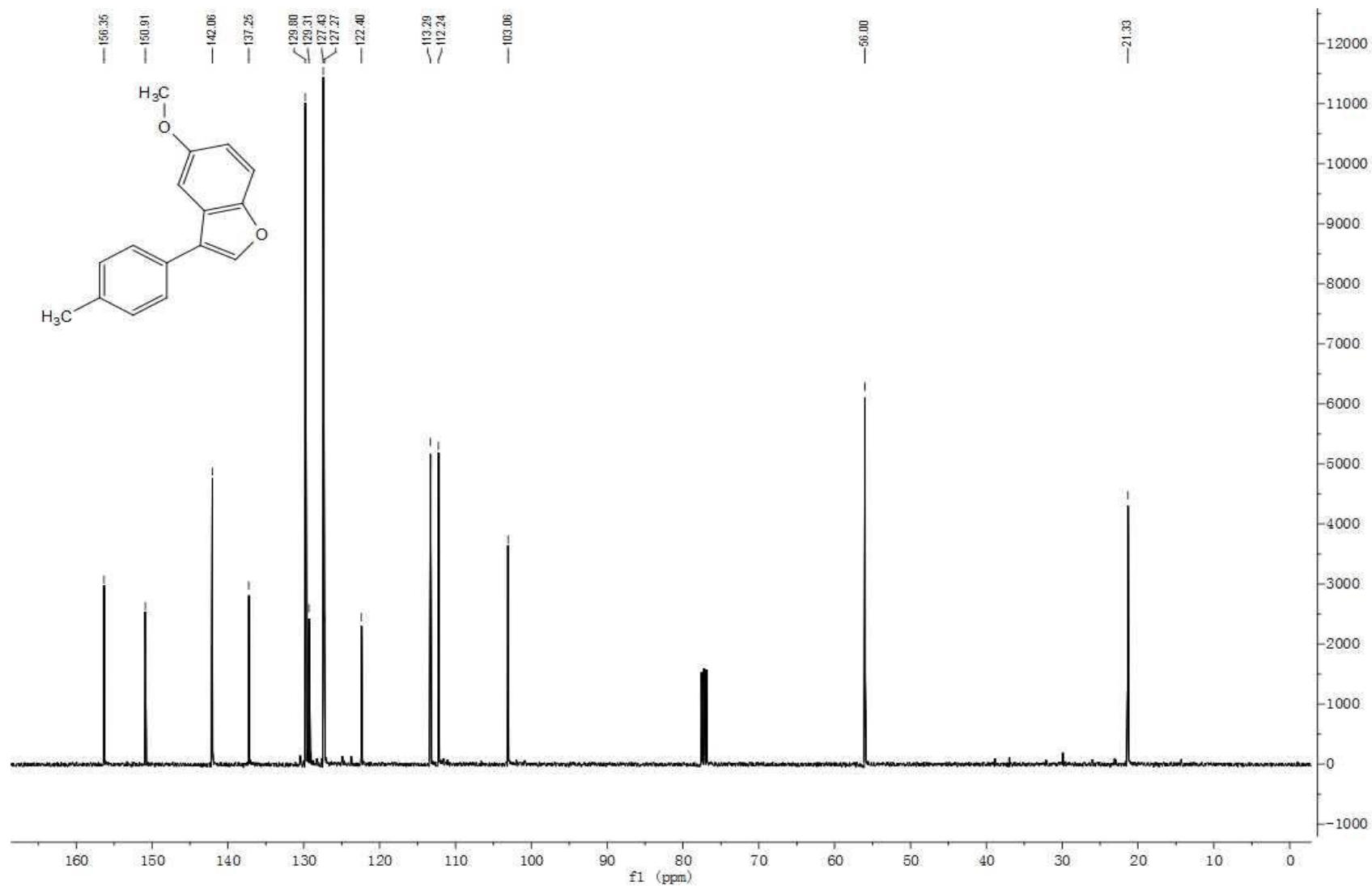
# 5-methoxy-3-(p-tolyl)benzofuran (Table 2 Entry 16)

## <sup>1</sup>H NMR



# 5-methoxy-3-(p-tolyl)benzofuran (Table 2 Entry 16)

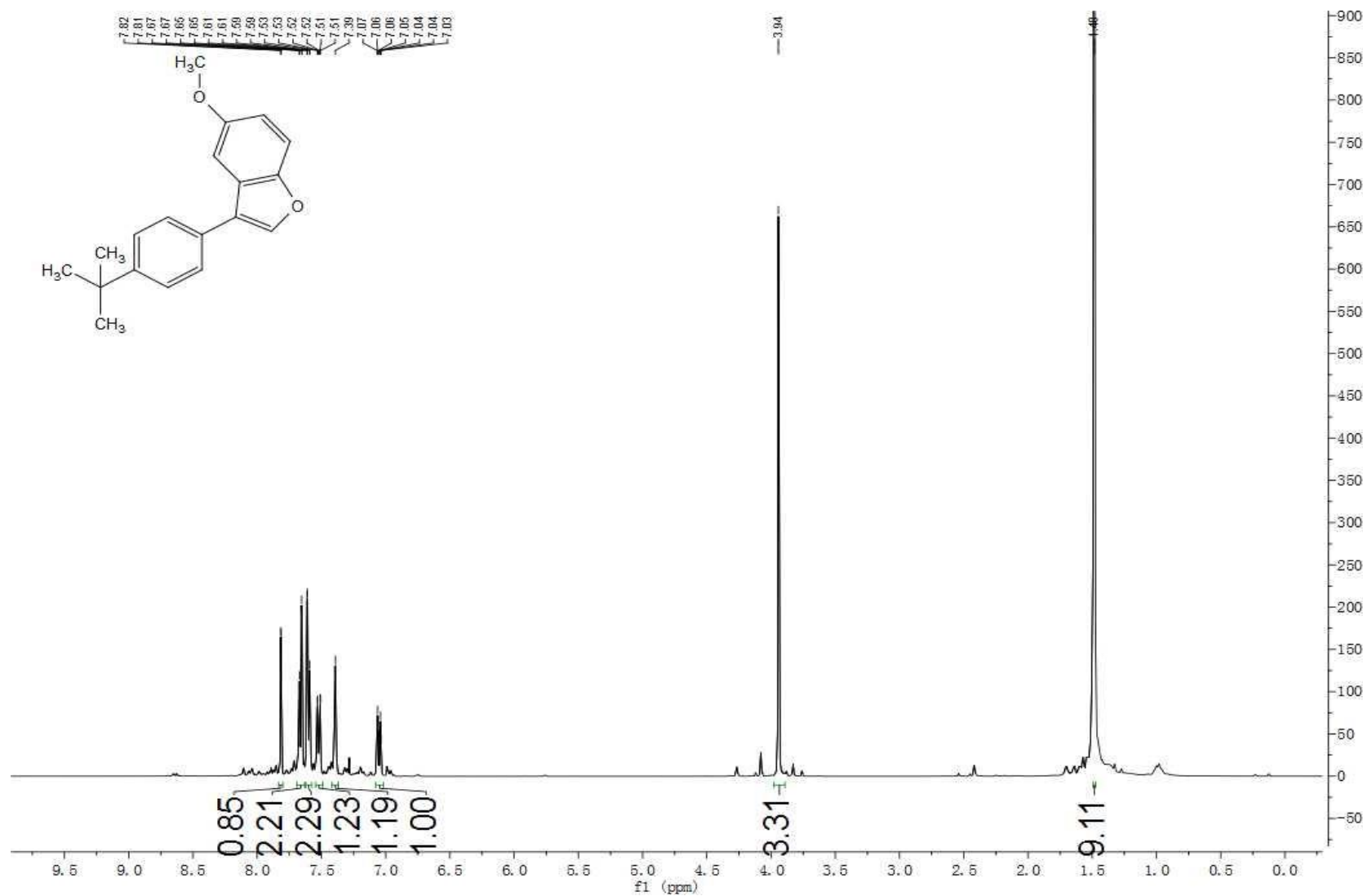
## <sup>13</sup>C NMR





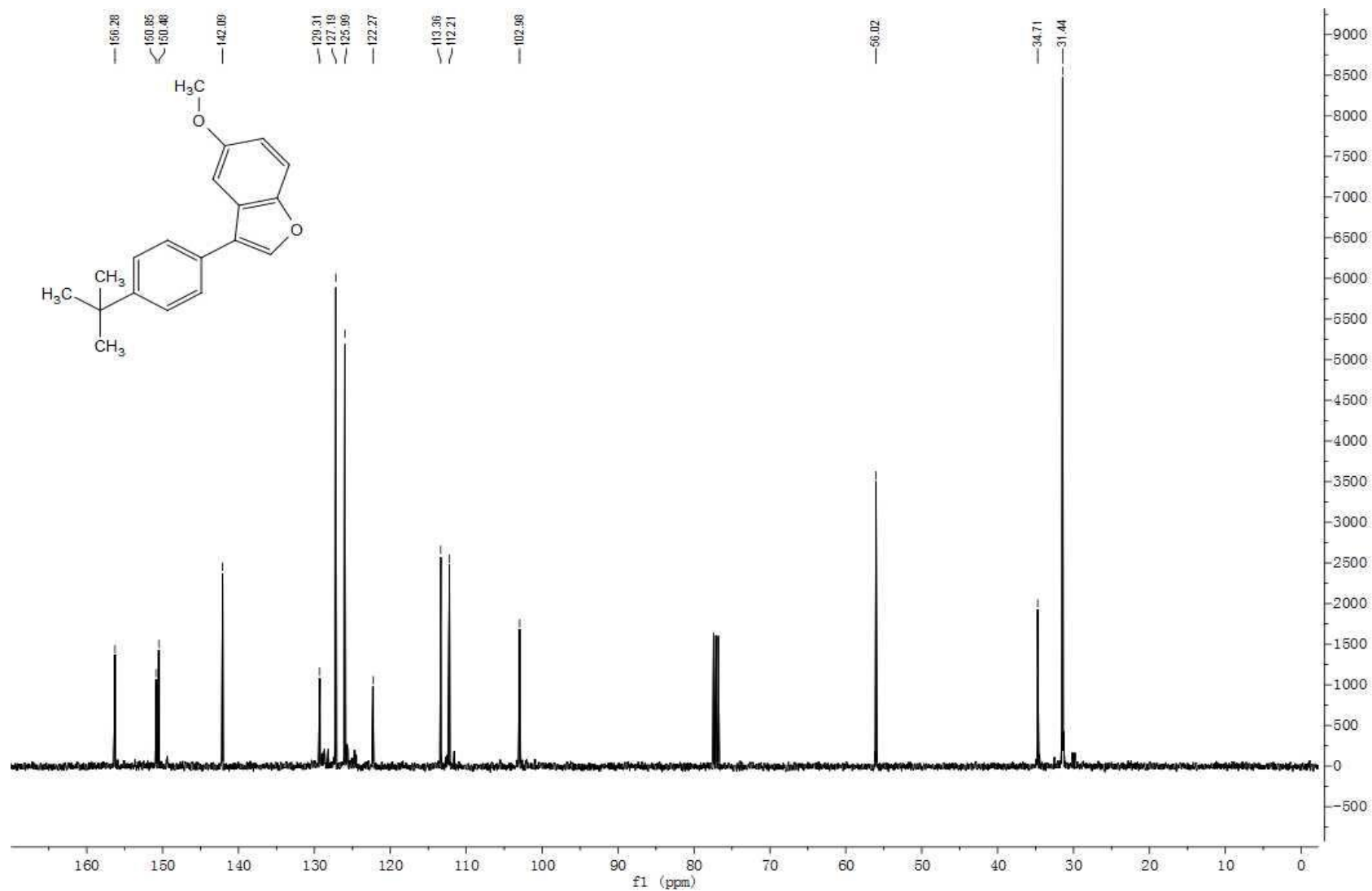
### 3-(4-(tert-butyl)phenyl)-5-methoxybenzofuran (Table 2 Entry 17)

#### <sup>1</sup>H NMR



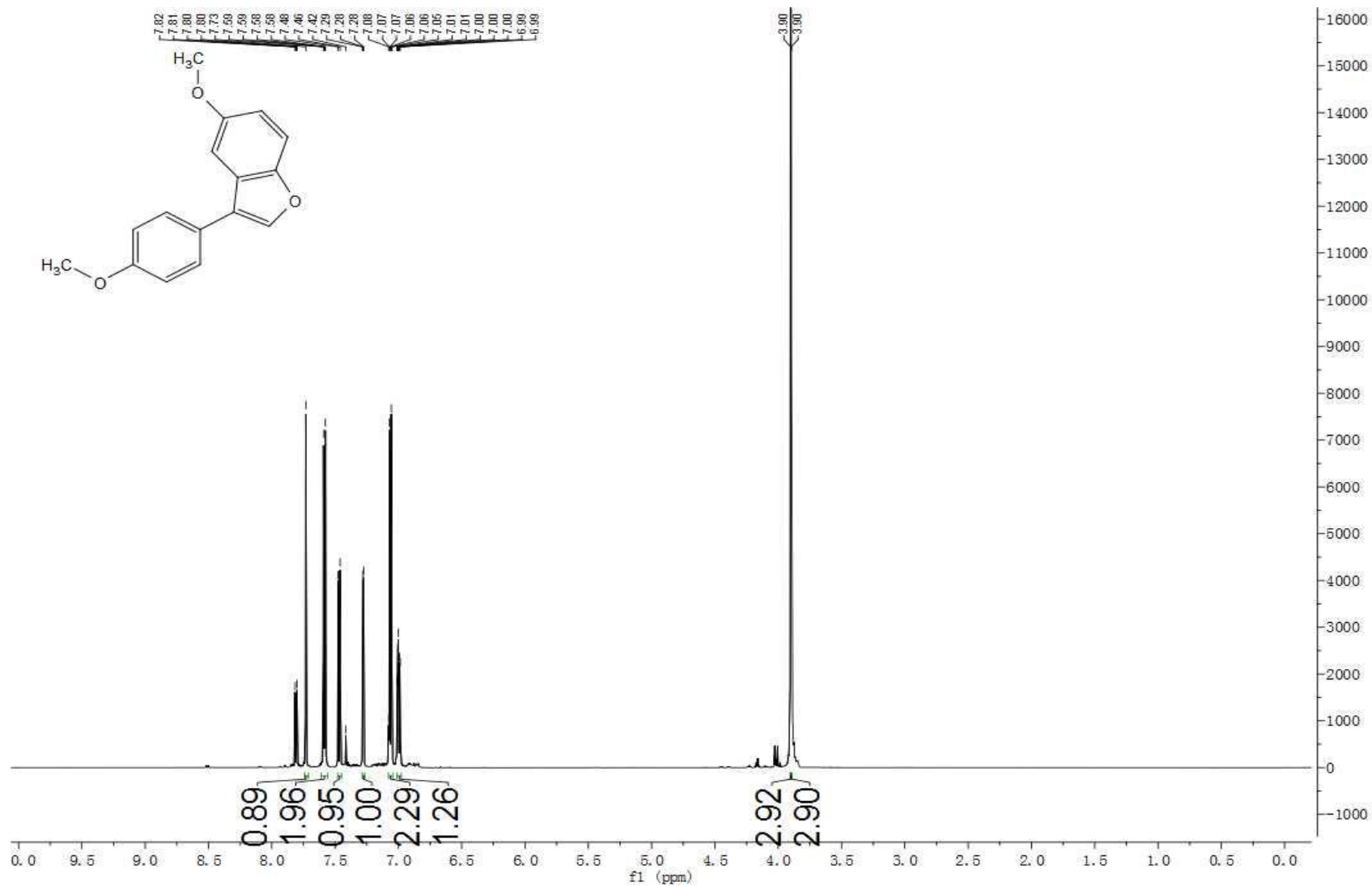
# 3-(4-(tert-butyl)phenyl)-5-methoxybenzofuran (Table 2 Entry 17)

## <sup>13</sup>C NMR



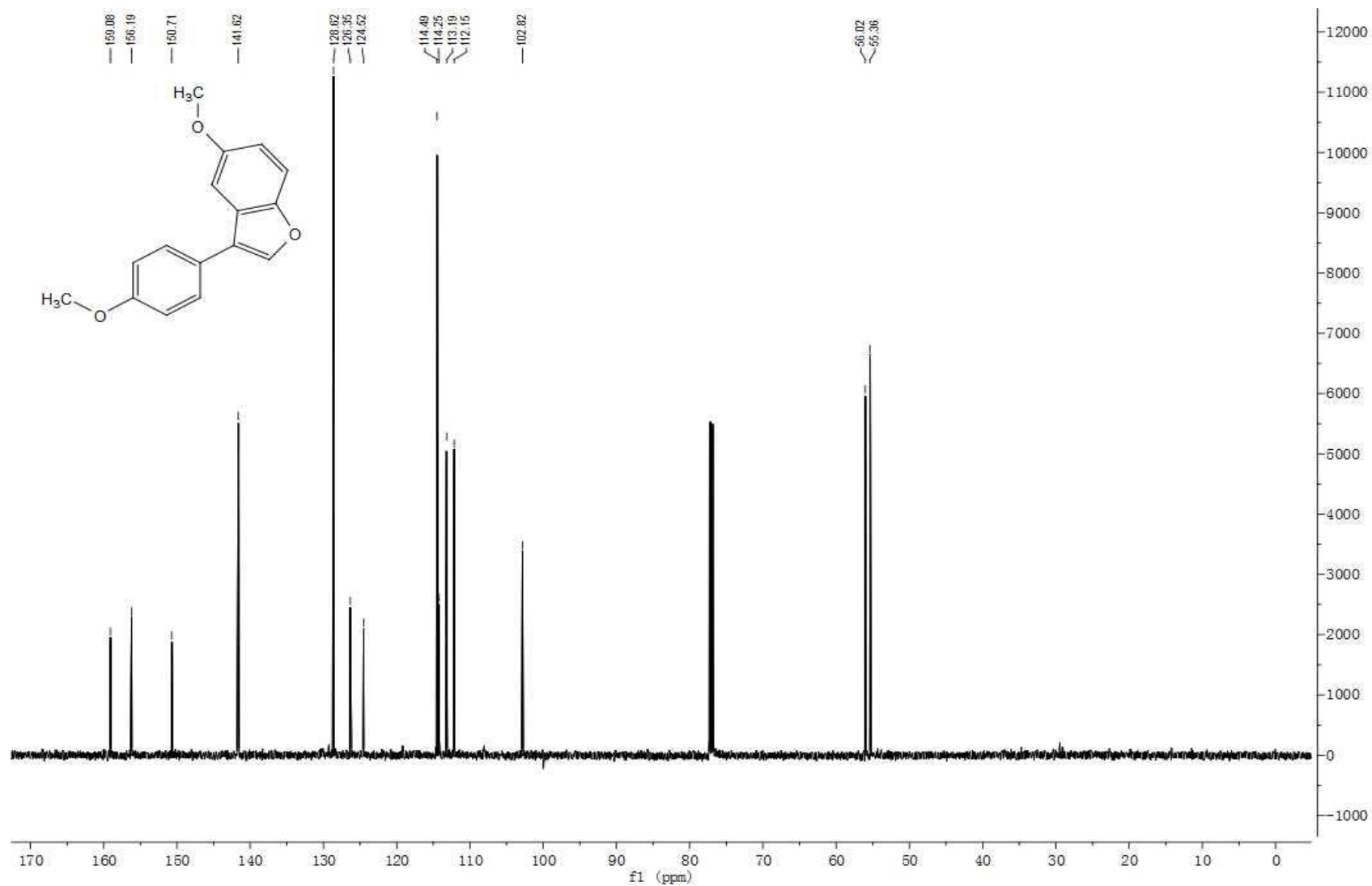
# 5-methoxy-3-(4-methoxyphenyl)benzofuran (Table 2 Entry 18)

## <sup>1</sup>H NMR



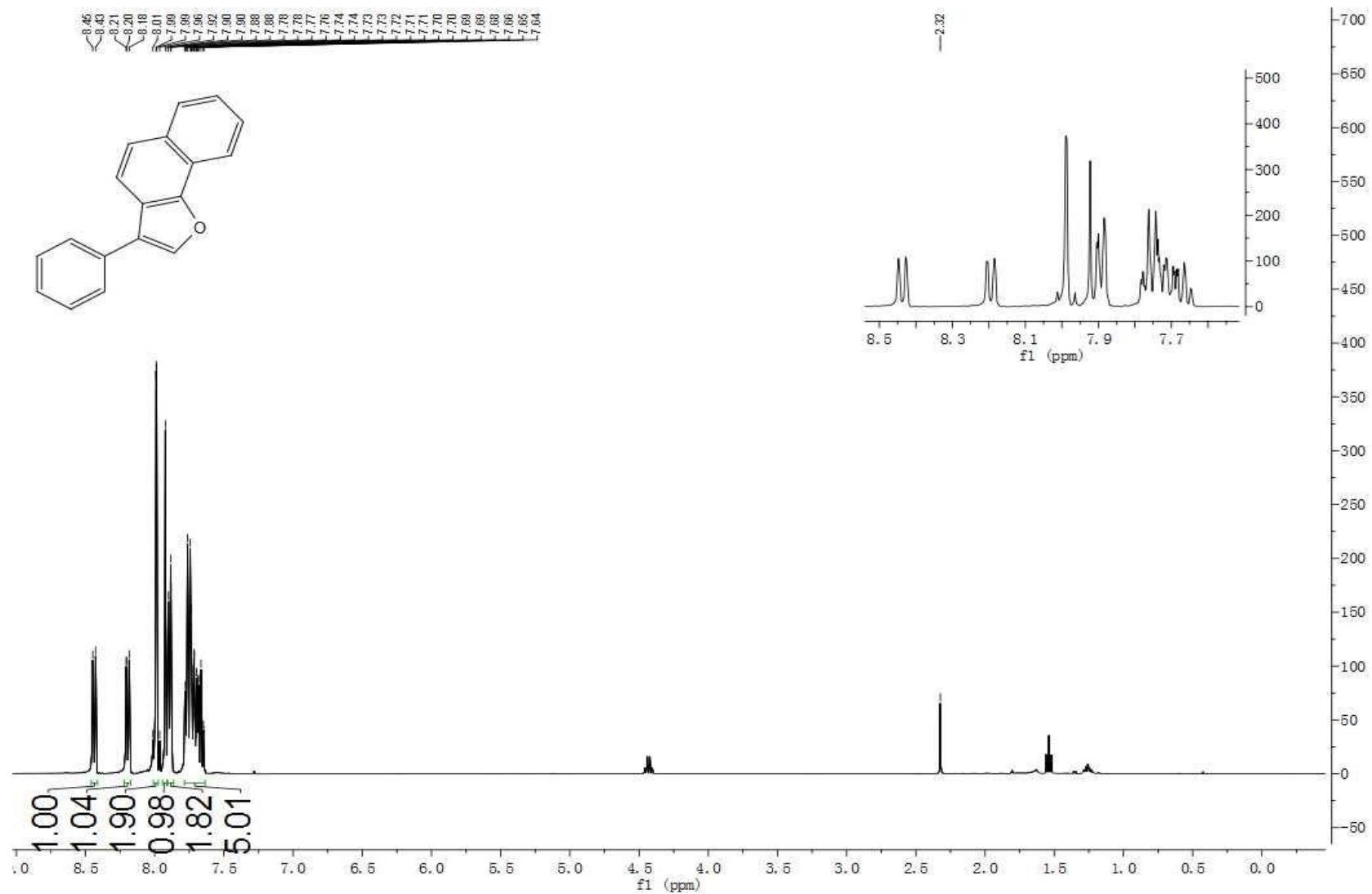
# 5-methoxy-3-(4-methoxyphenyl)benzofuran (Table 2 Entry 18)

## <sup>13</sup>C NMR



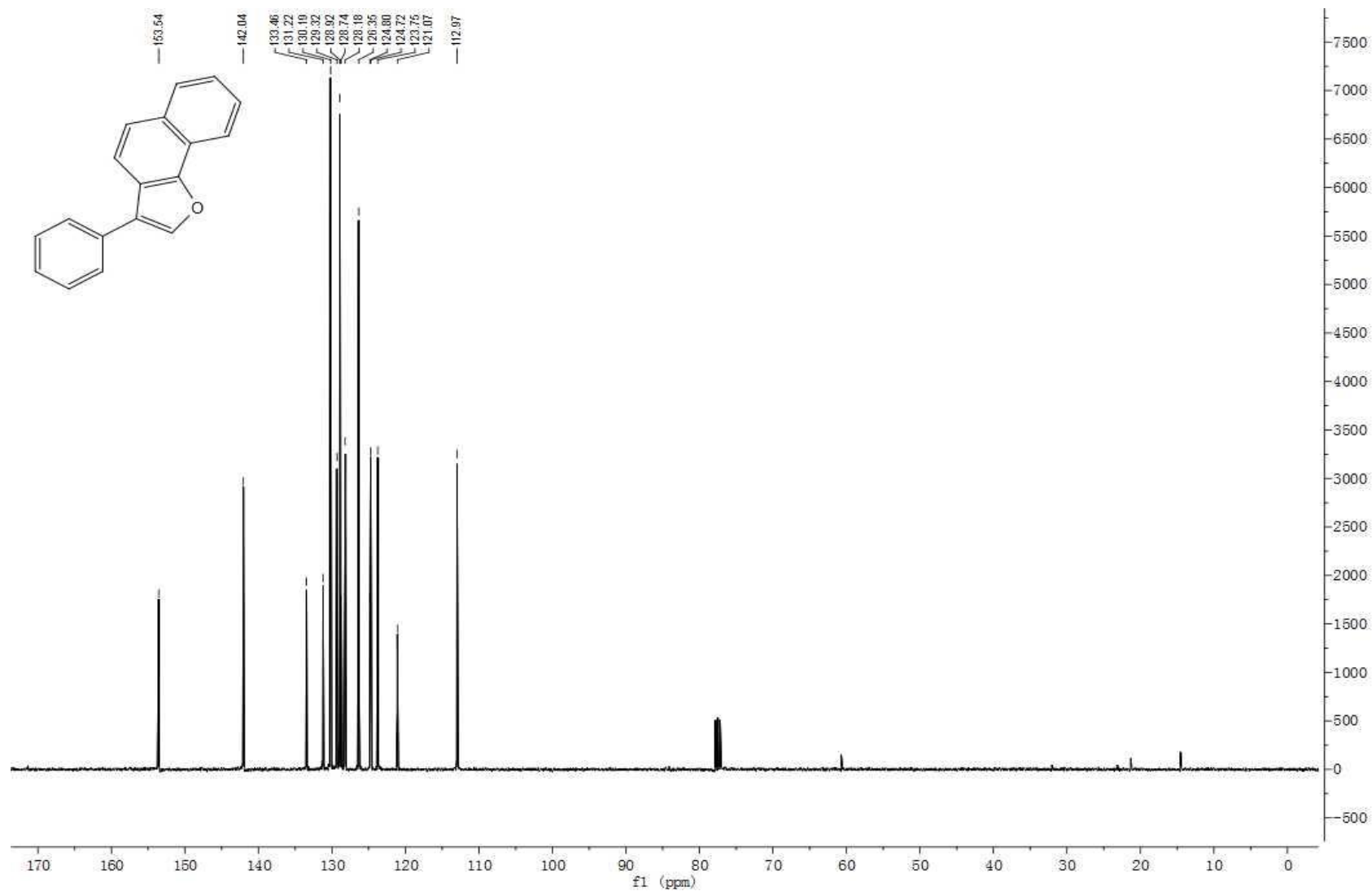
### 3-phenylnaphtho[1,2-b]furan (Table 3, 2q)

#### <sup>1</sup>H NMR



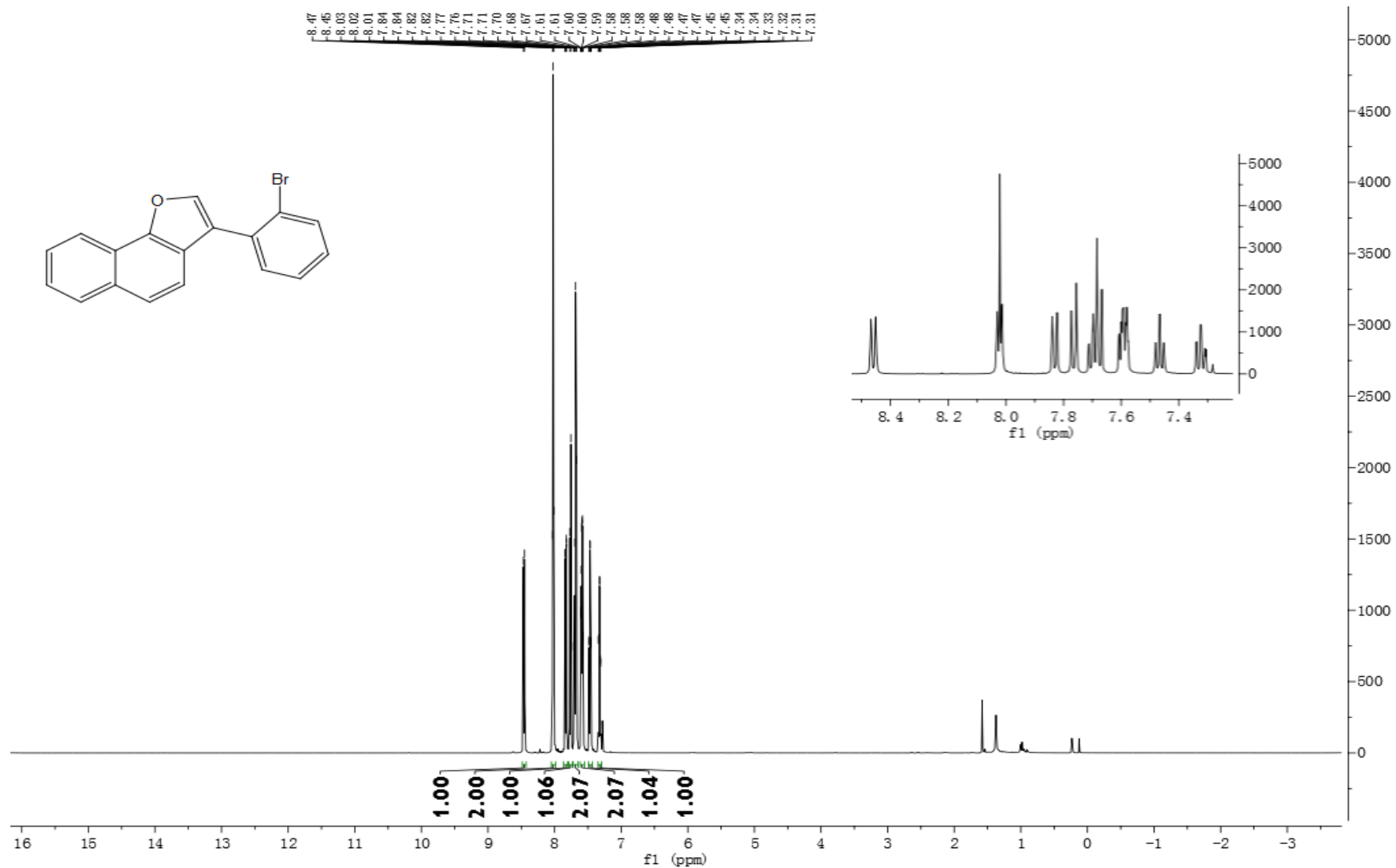
### 3-phenylnaphtho[1,2-b]furan (Table 3, 2q)

#### <sup>13</sup>C NMR



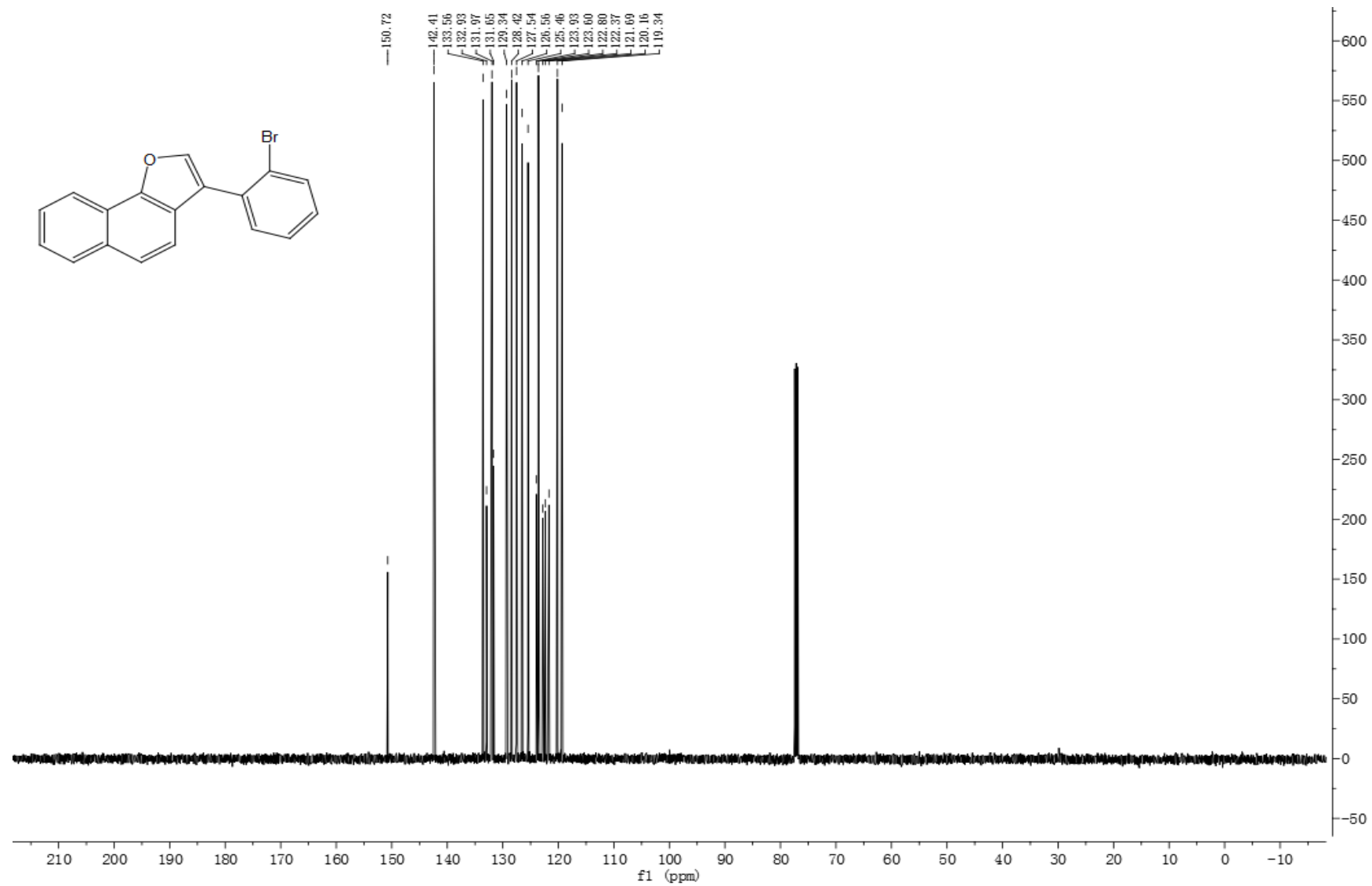
# 3-(2-bromophenyl)naphtho[1,2-b]furan (Table 3, 2r)

## <sup>1</sup>H NMR



### 3-(2-bromophenyl)naphtho[1,2-b]furan (Table 3, 2r)

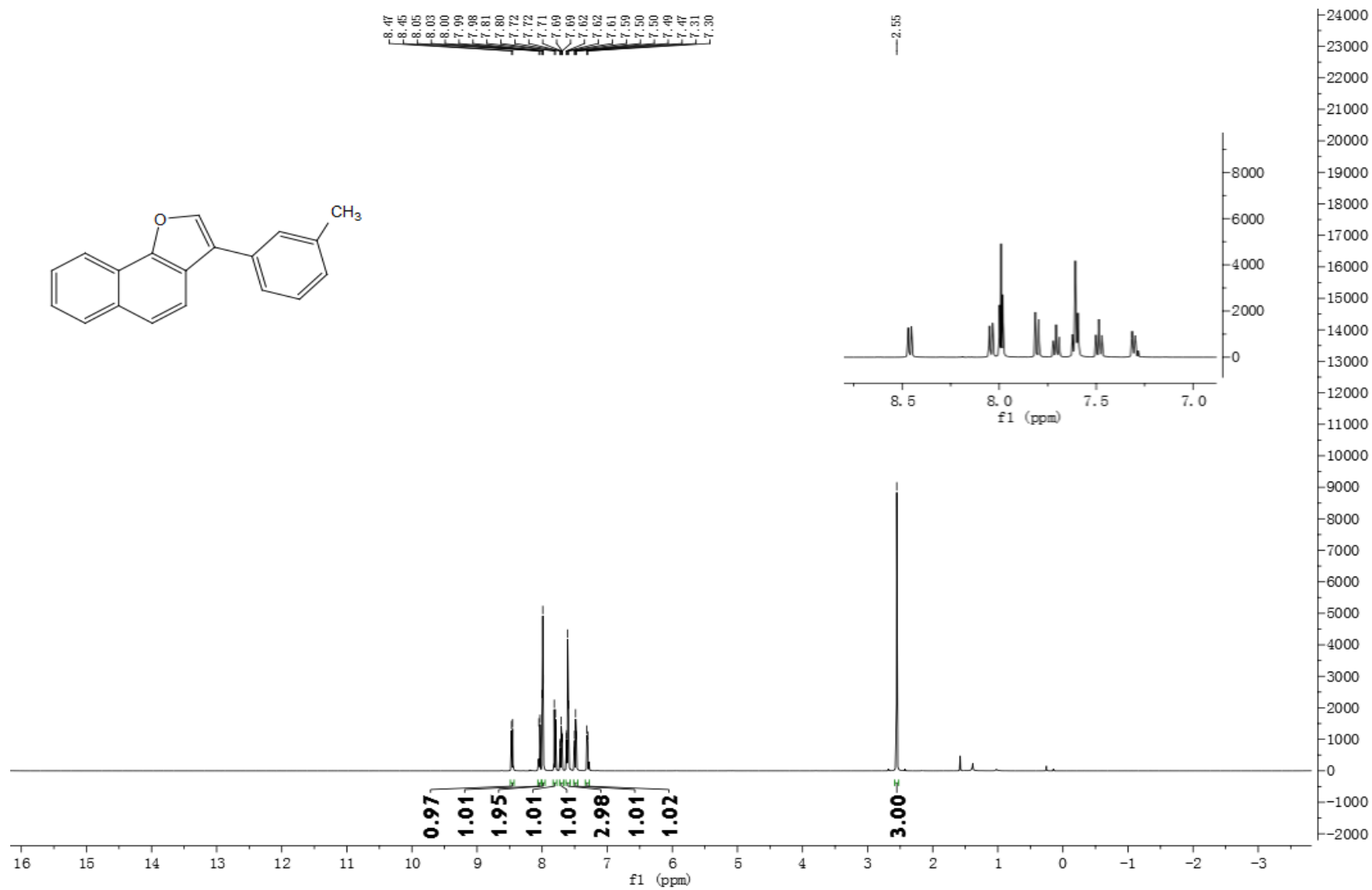
#### <sup>13</sup>C NMR





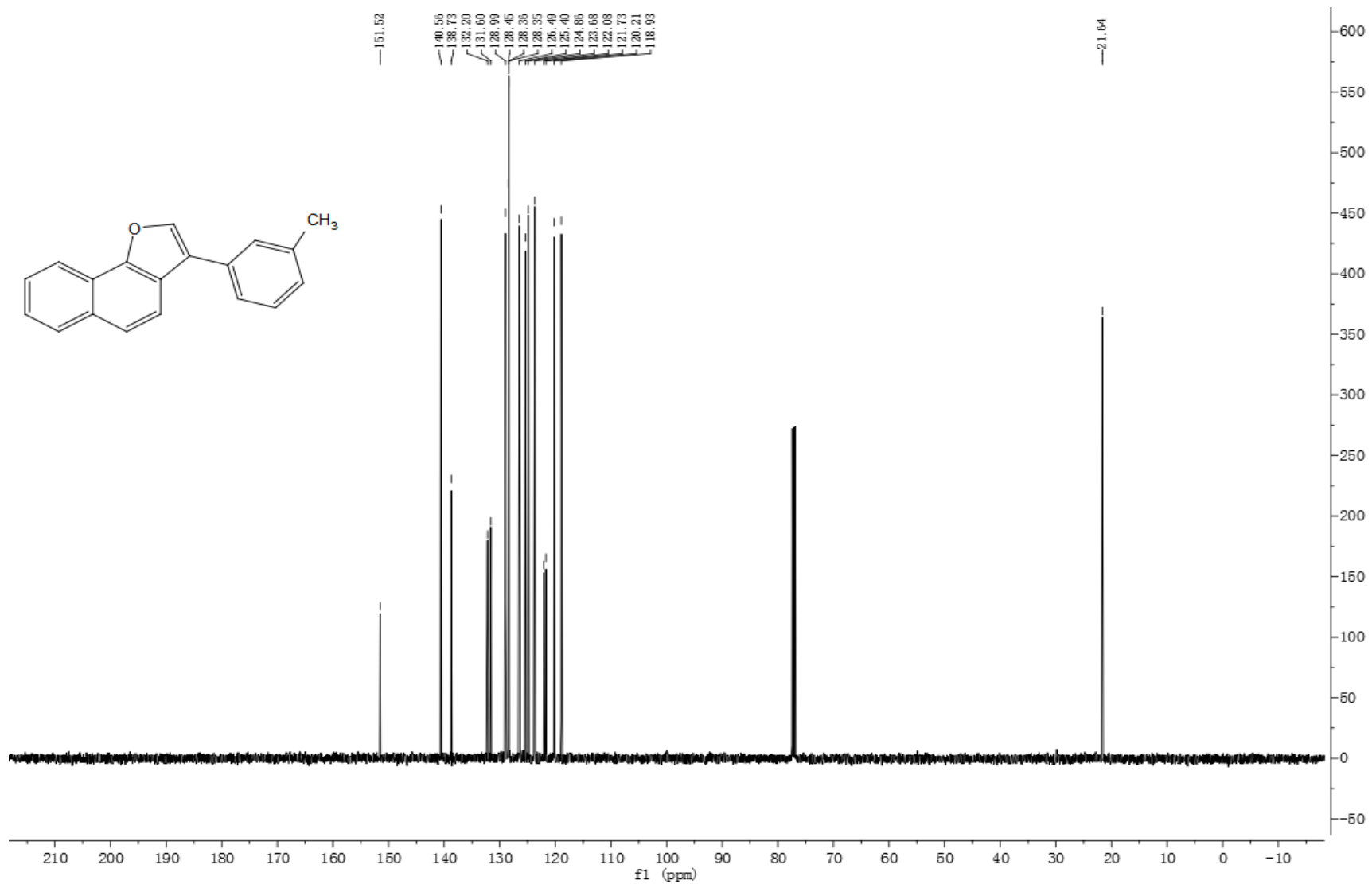
### 3-(m-tolyl)naphtho[1,2-b]furan (Table 3, 2s)

#### <sup>1</sup>H NMR



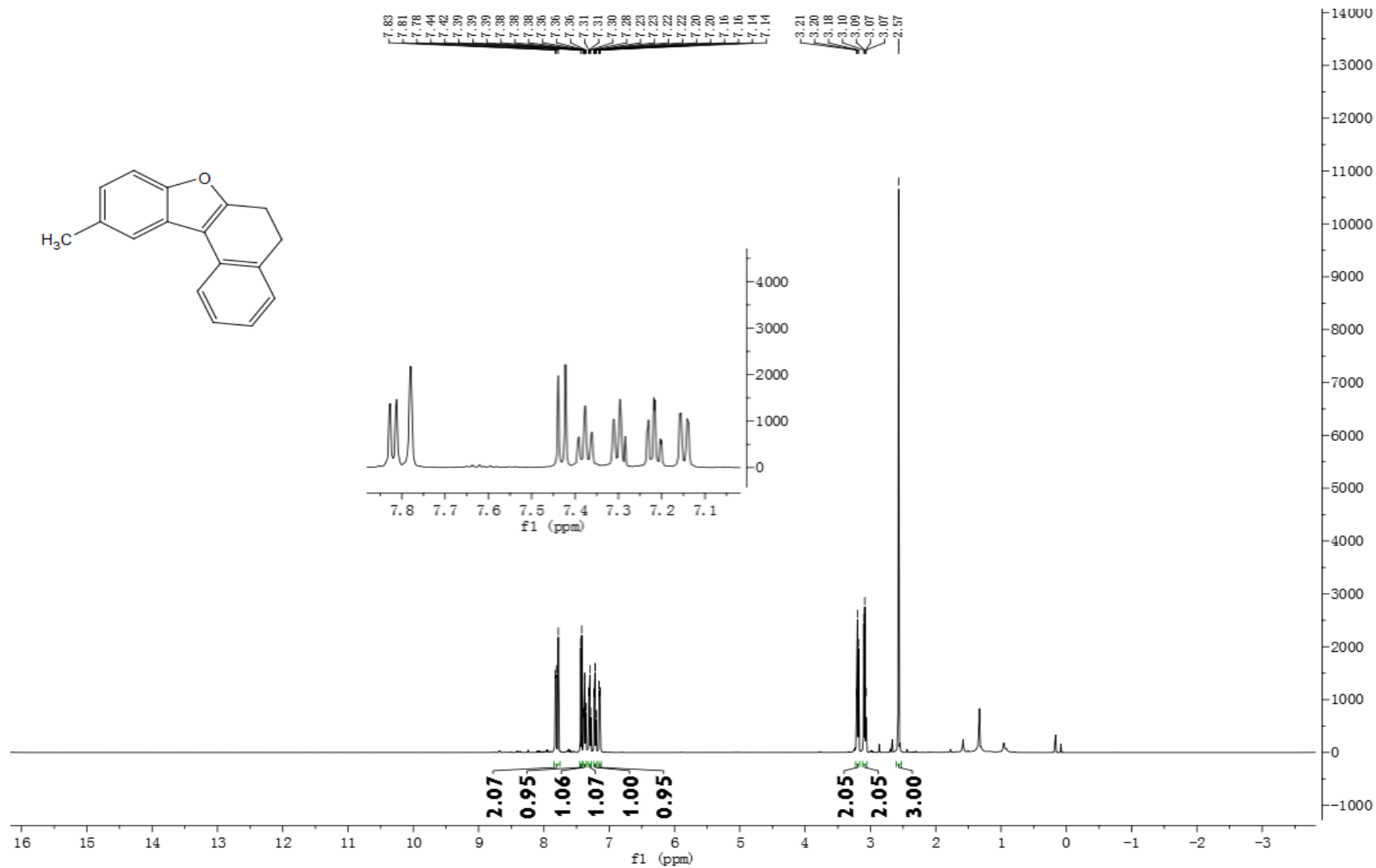
### 3-(m-tolyl)naphtho[1,2-b]furan (Table 3, 2s)

#### <sup>13</sup>C NMR



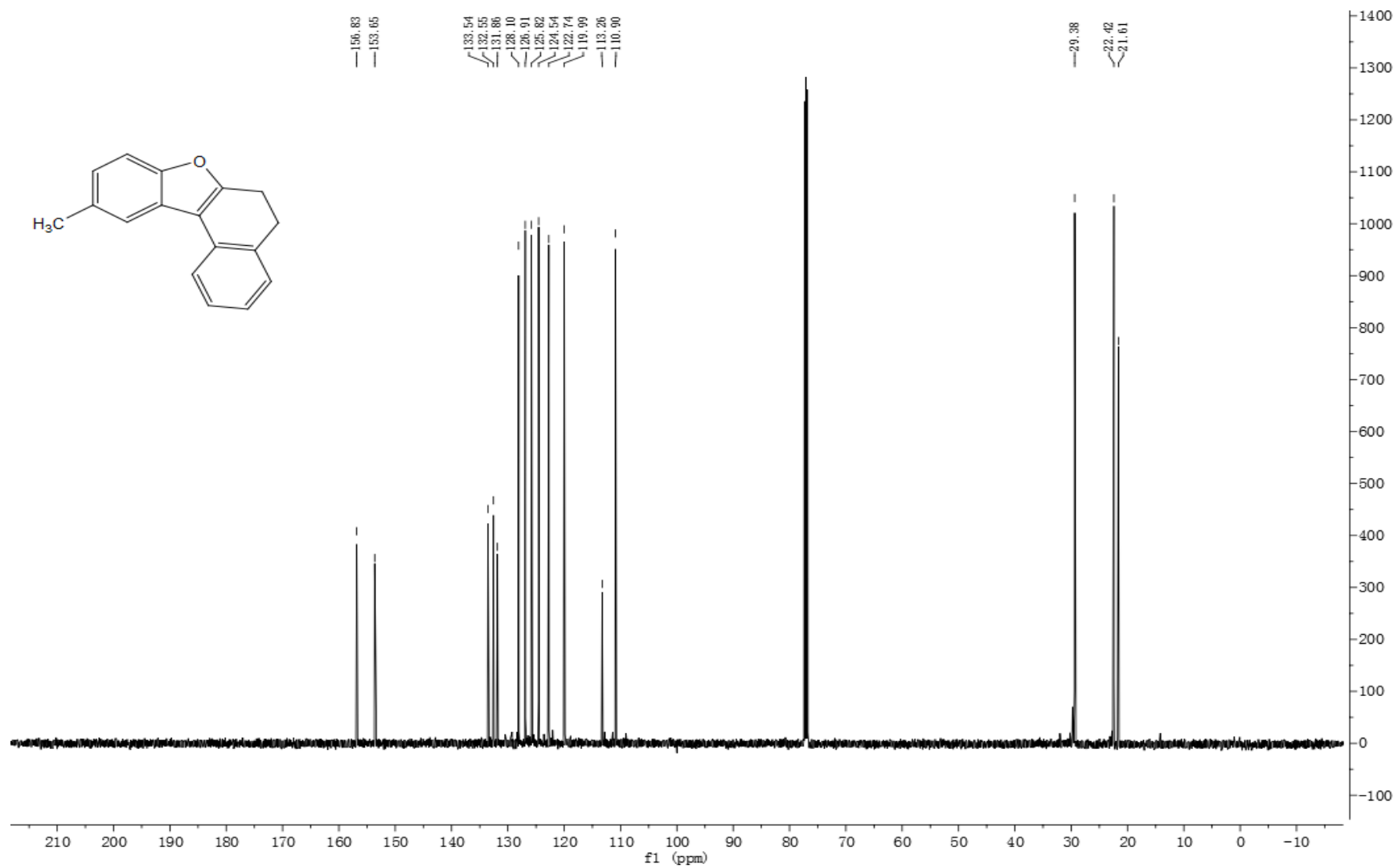
# 10-methyl-5,6-dihydronaphtho[2,1-b]benzofuran (Scheme 2, 2t)

## <sup>1</sup>H NMR



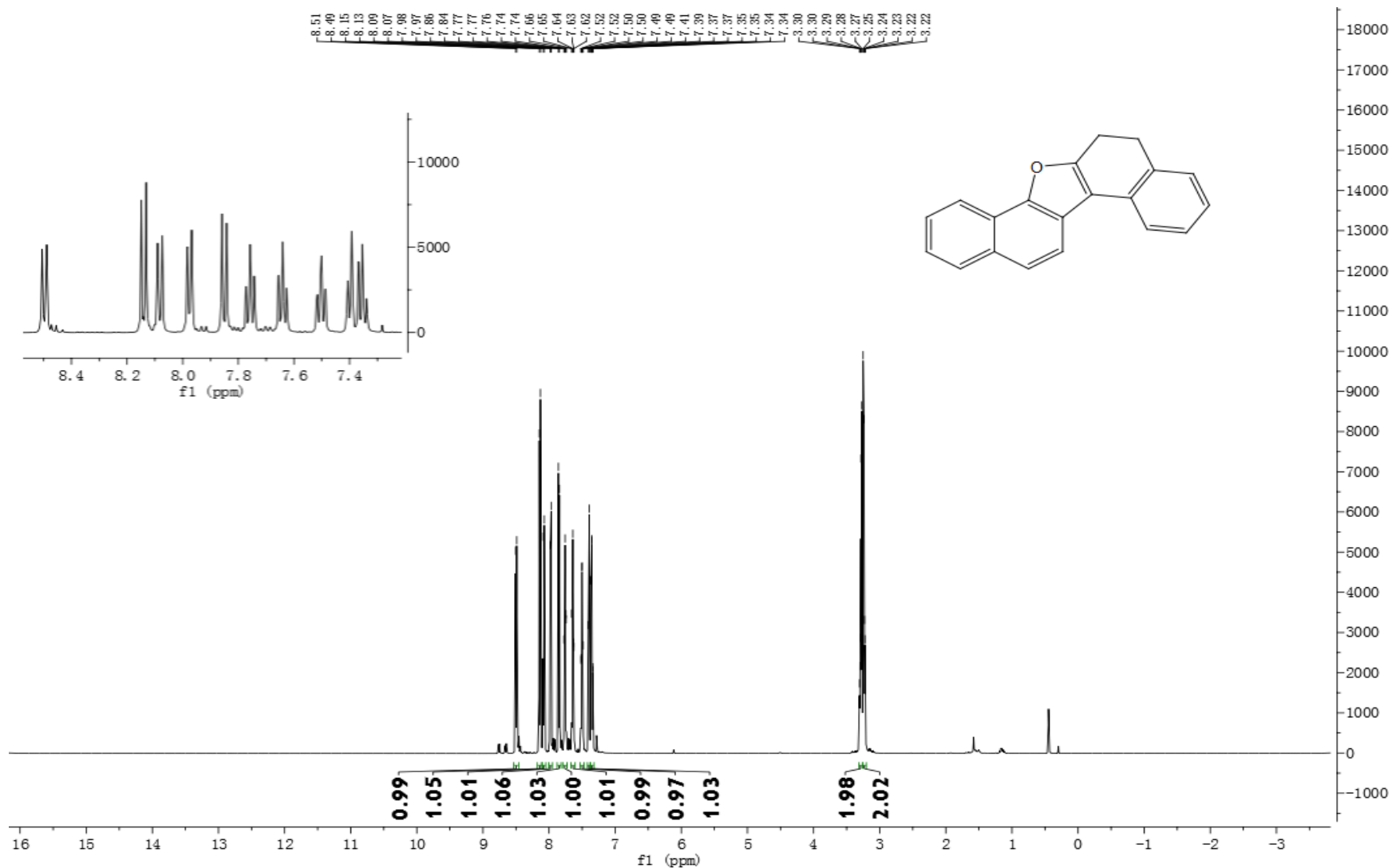
# 10-methyl-5,6-dihydronaphtho[2,1-b]benzofuran (Scheme 2, 2t)

## <sup>13</sup>C NMR



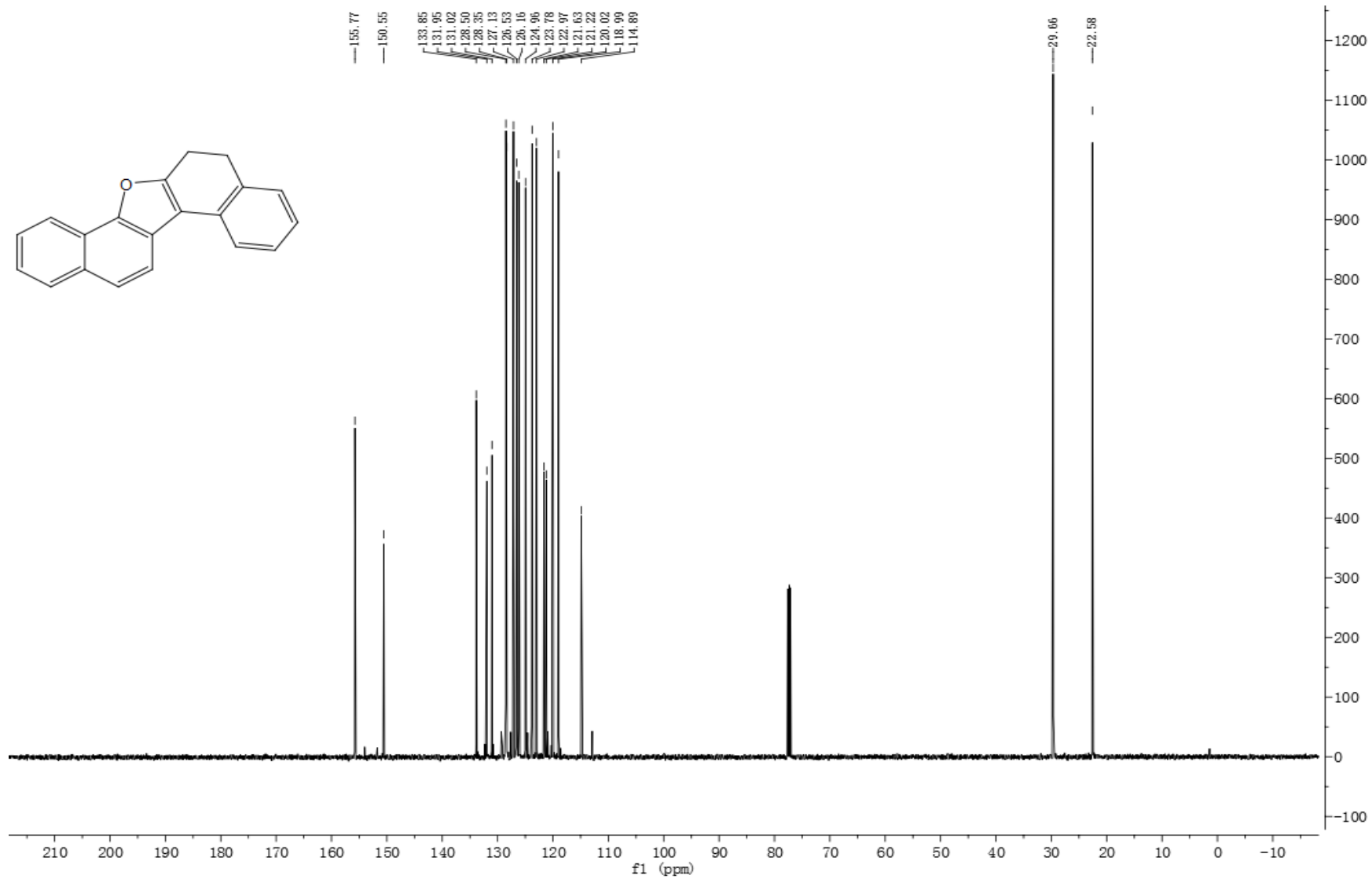
# 5,6-dihydrodinaphtho[1,2-b:1',2'-d]furan (Scheme 2, 2u)

## <sup>1</sup>H NMR



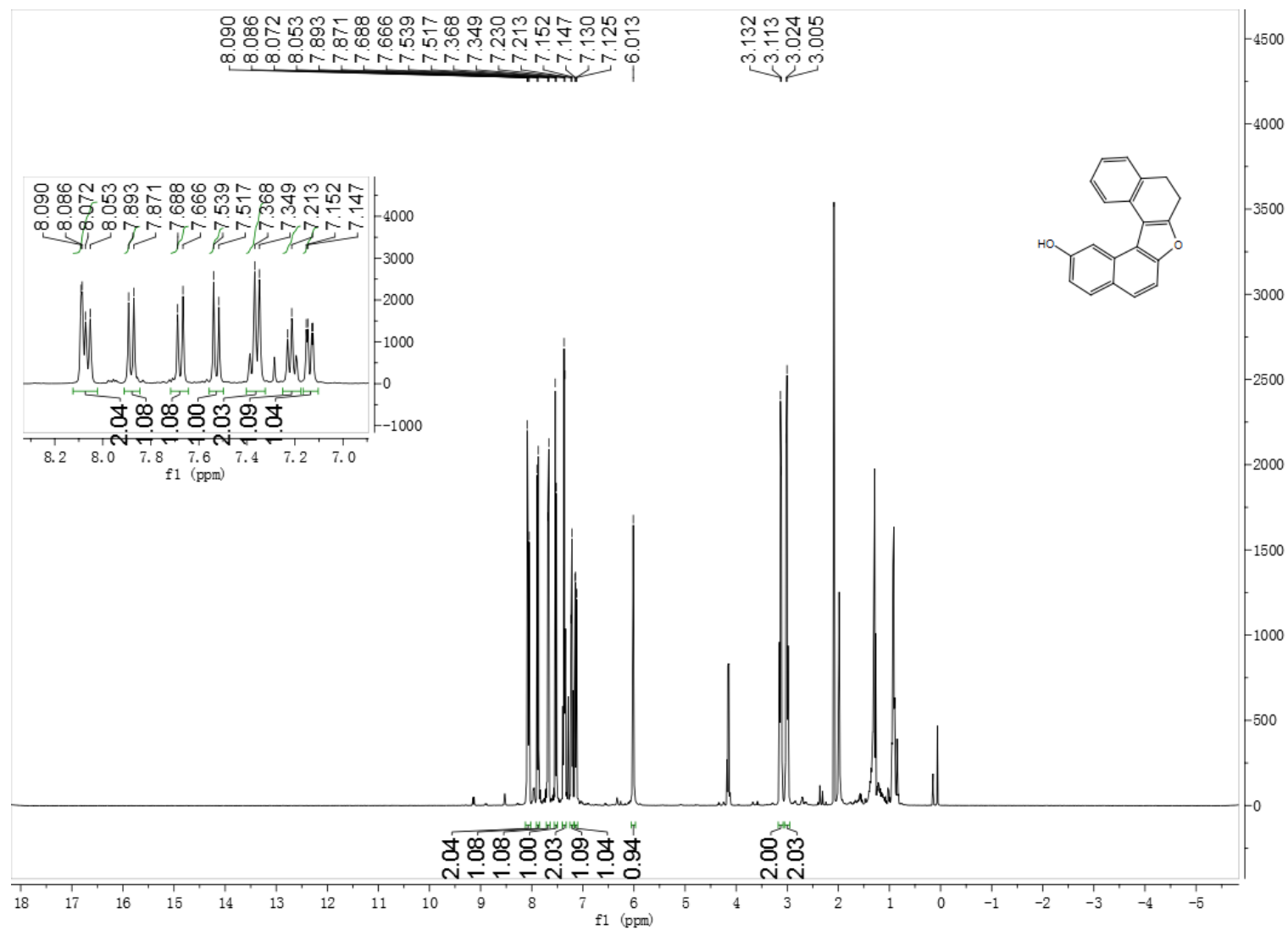
# 5,6-dihydrodinaphtho[1,2-b:1',2'-d]furan (Scheme 2, 2u)

## <sup>13</sup>C NMR



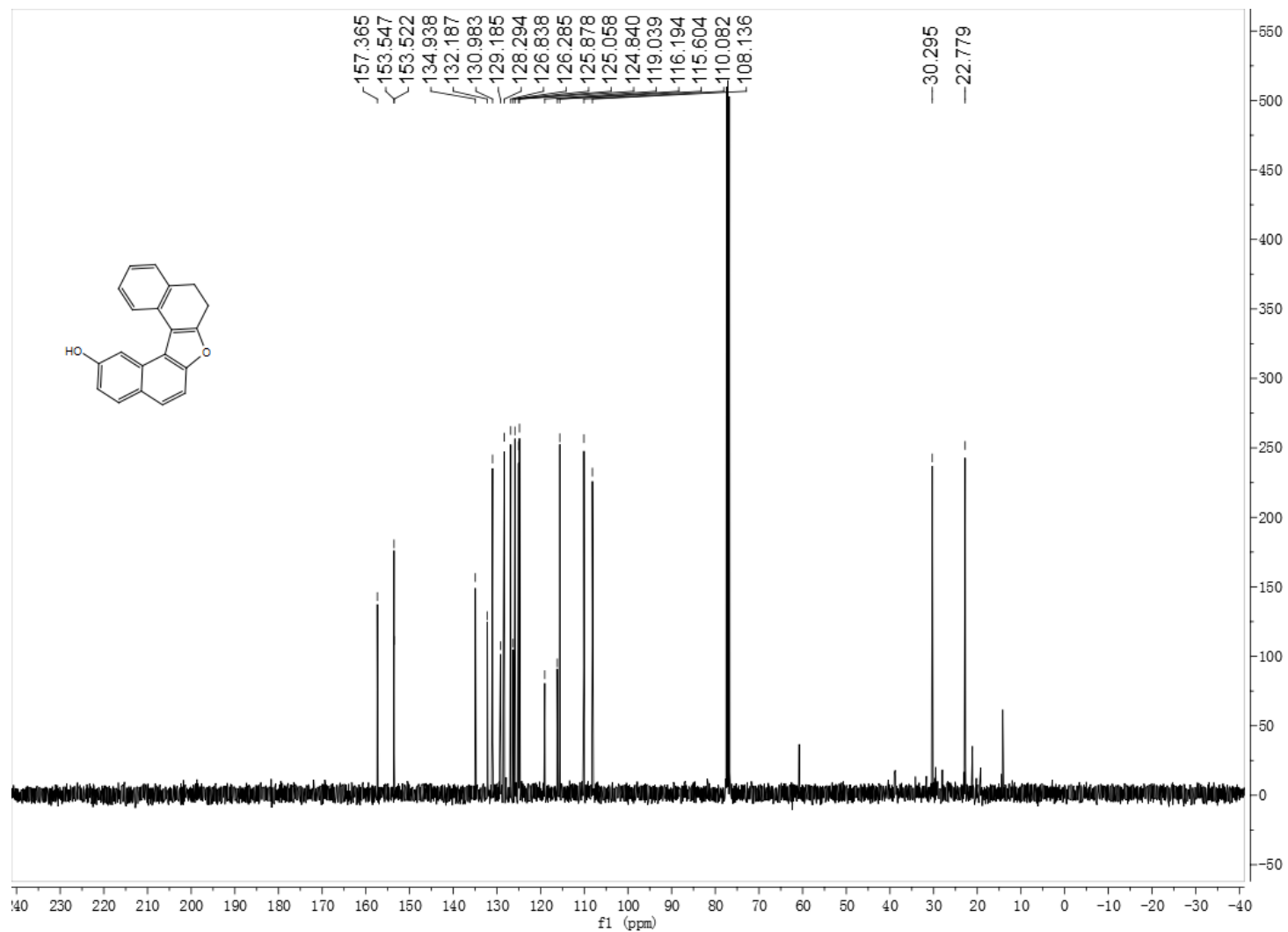
8,9-dihydrodinaphtho[2,1-b:1',2'-d]furan-2-ol (Scheme 2, 2v)

<sup>1</sup>H NMR



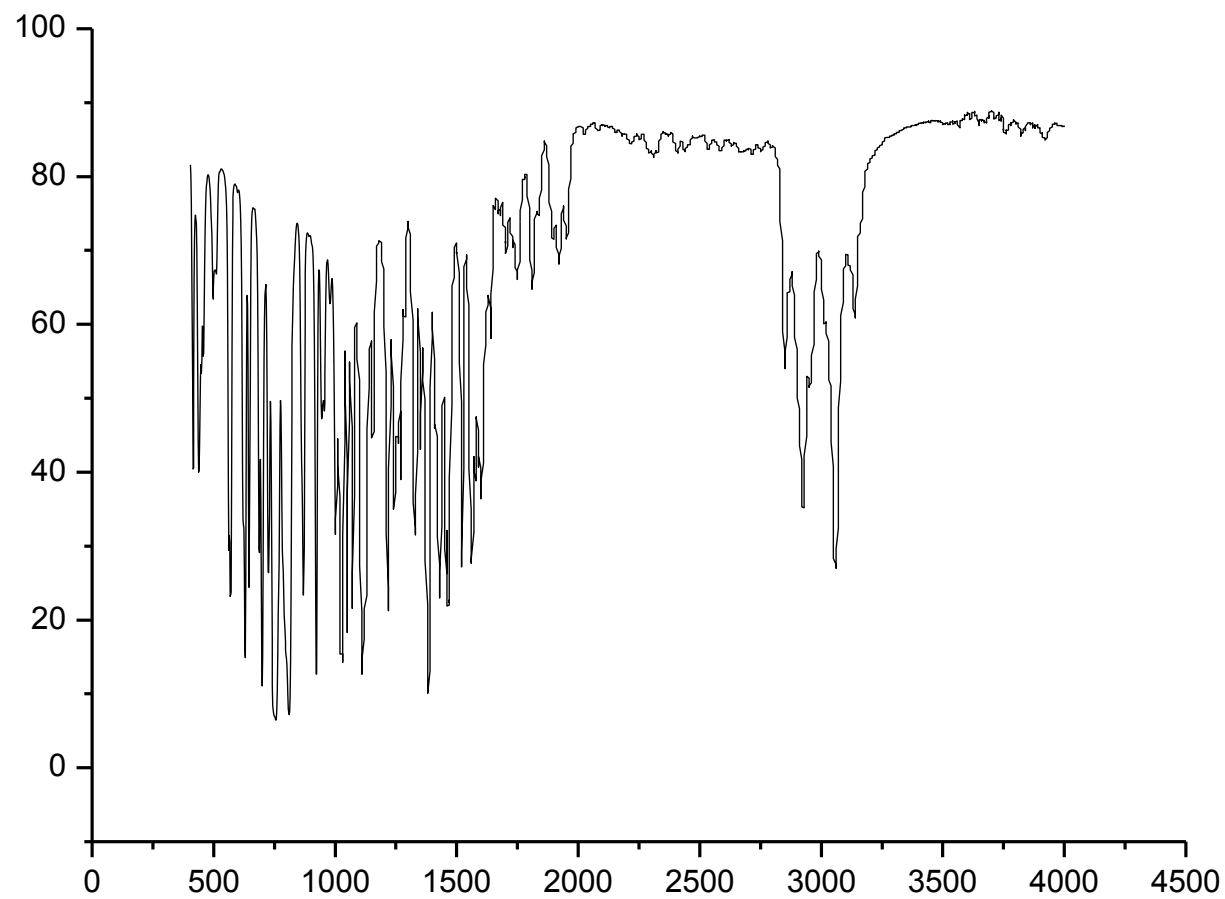
# 8,9-dihydrodinaphtho[2,1-b:1',2'-d]furan-2-ol (Scheme 2, 2v)

## <sup>13</sup>C NMR

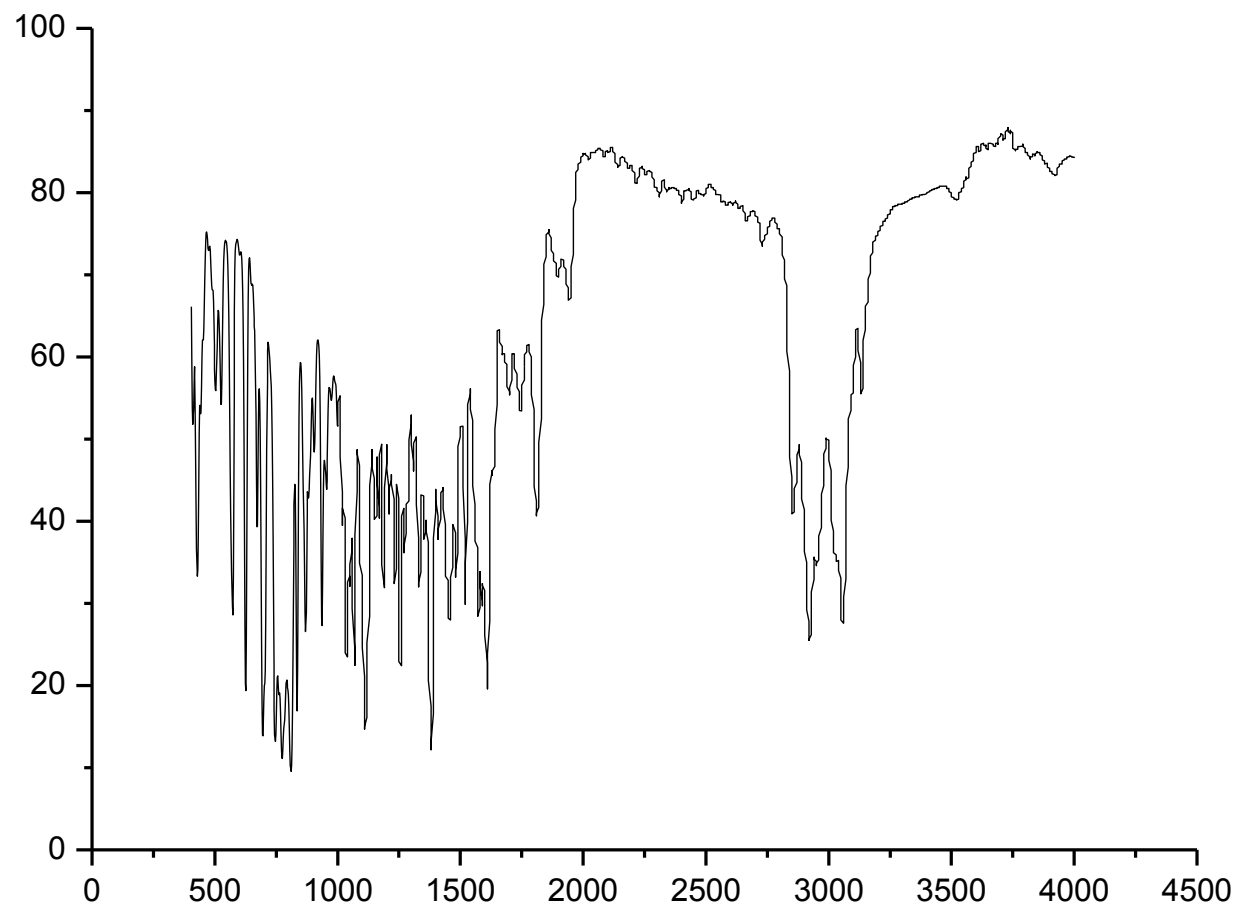




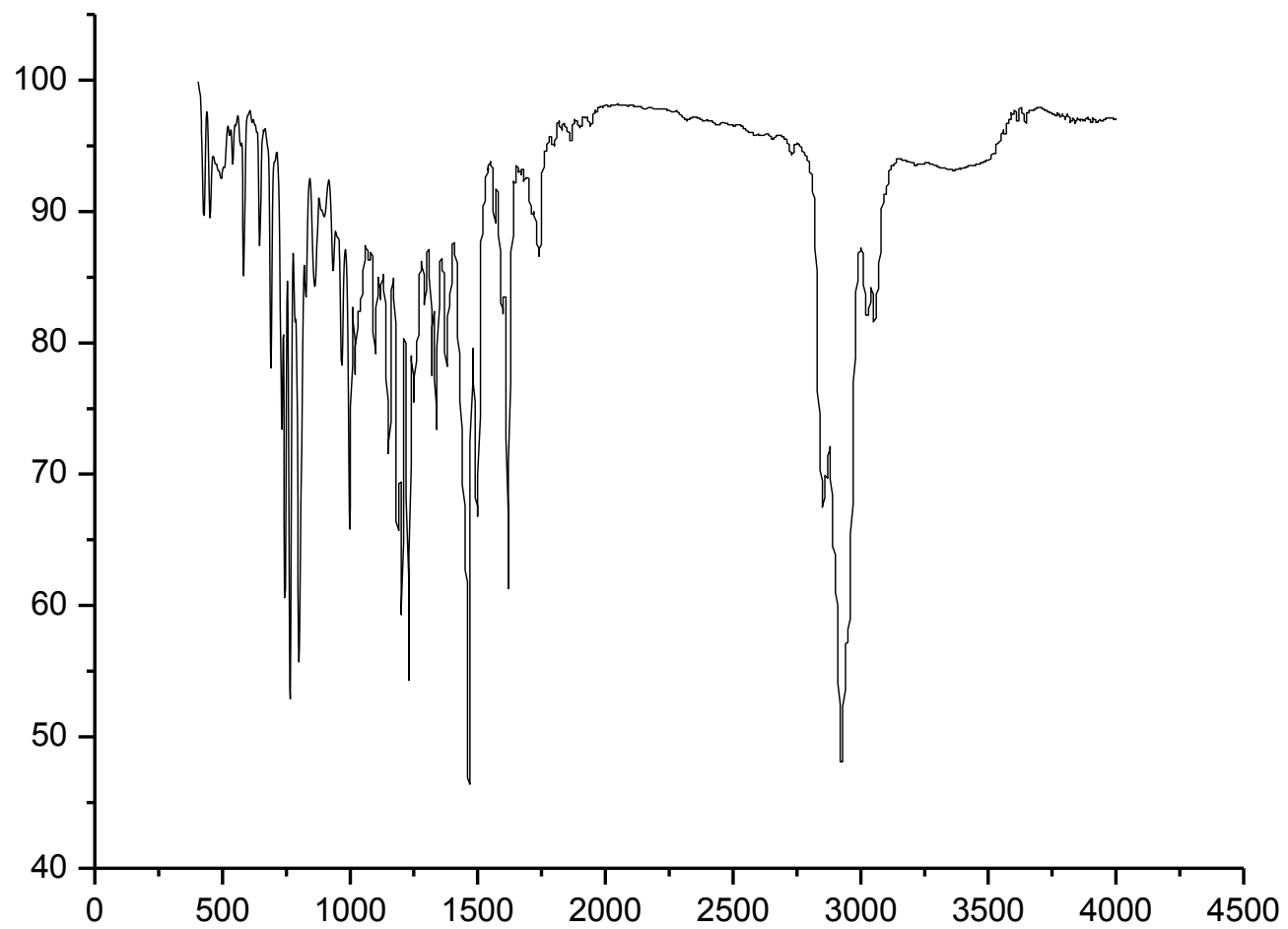
IR spectra of 3-(2-bromophenyl)naphtho[1,2-b]furan (Table 3, 2r)



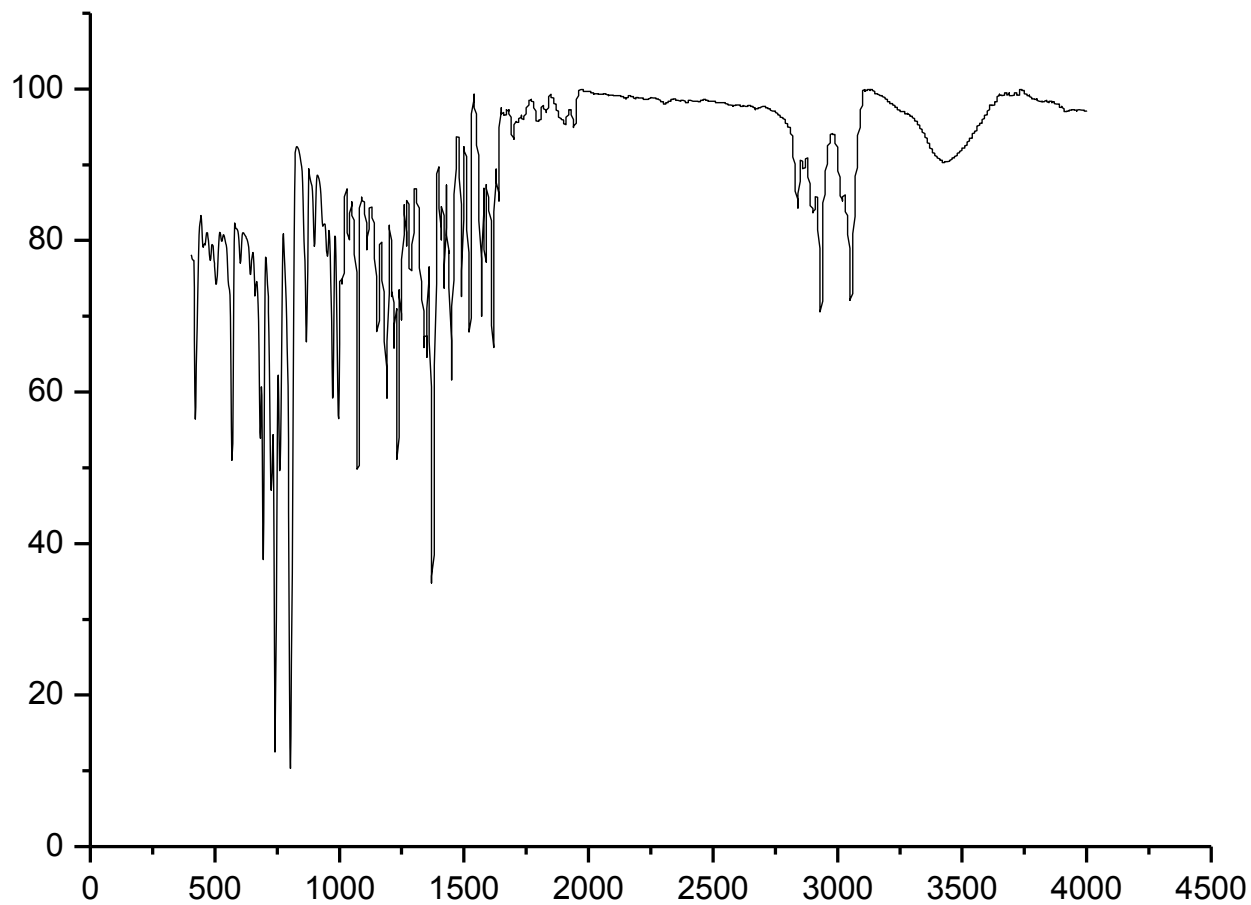
IR spectra of 3-(m-tolyl)naphtho[1,2-b]furan (Table 3, 2s)



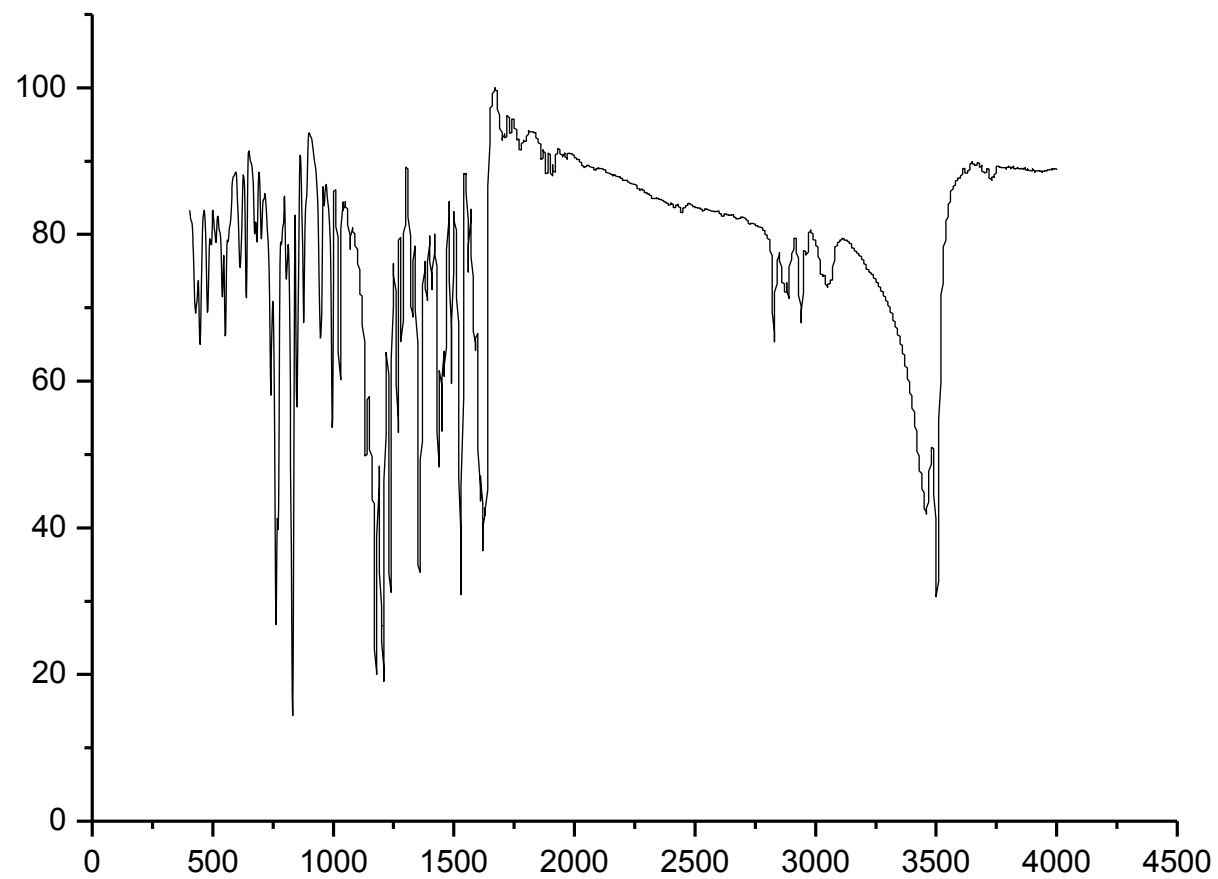
IR spectra of 10-methyl-5,6-dihydronaphtho[2,1-b]benzofuran (Scheme 2, 2t)



IR spectra of 5,6-dihydroindaphtho[1,2-b:1',2'-d]furan (Scheme 2, 2u).....S52



**IR spectra of 8,9-dihydroindaphtho[2,1-b:1',2'-d]furan-2-ol (Scheme 2, 2v).**



The products **2a**,<sup>1</sup> **2b**,<sup>2</sup> **2d**,<sup>3</sup> **2e**,<sup>3</sup> **2f**,<sup>4</sup> **2g**,<sup>3</sup> **2j**,<sup>2</sup> **2n**,<sup>5</sup> **2p**<sup>1</sup> and **2q**<sup>6</sup> are known compounds.

1. J.Habermann, S. V. Ley, and R. Smits, *J. Chem. Soc., Perkin Trans. 1*, 1999, 2421.
2. T. Pei, C. Chen, L. DiMichele, and I. W. Davies, *Org. Lett.*, 2010, **12** 4972.
3. M. Garcia, M. Jesus, S. M. Faces, Raul, D. Perez, and Esther, ES, 2387225, 2012.
4. A. R. Katritzky, Y. Fang, and I. Prakash, *J. Org. Chem.*, 2001, **66**, 5613.
5. Y. Shen, Y. Tian, X. Bu, and L. Gu, *Eur. J. Med. Chem.*, 2009, **44**, 3915.
6. Z. Wang, J. Gu, H. Jing, and Y. Liang, *Syn. Comm.*, 2009, **39**, 4079.