Supporting Information

Palladium-catalyzed Synthesis of Benzoxazoles by the Cleavage Reaction of Carbon-carbon Triple Bond with *o*-Aminophenol

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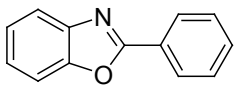
Experimental

1 General methods and materials Melting points were uncorrected. NMR spectra were in $CDCl_3$ (^1H at 500 MHz or 400 MHz and ^{13}C at 125 MHz or 100 MHz). Column chromatography was performed on silica gel (300-400 mesh). Unless otherwise noted, all reagents were obtained commercially and used without further purification.

2 General procedure for the formation of benzoxazoles

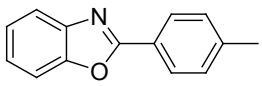
The reaction mixture of *o*-aminophenol (**1a**, 109.1 mg 1.0 mmol), diphenylacetylene (**2a**, 89 mg, 0.5 mmol), $PdCl_2$ (4.4 mg, 0.0025 mmol), PhCl (1 mL) in a 10 mL flask was stirred at reflux and monitored periodically by TLC. Upon completion, chlorobenzene was removed under reduced pressure using an aspirator, and then the residue was purified by flash chromatography (hexane/ethyl acetate = 40:1) on silica gel to yield the desired product **3aa** as white solid (167.8 mg, 86% yield), mp 101.7-103.5 ^oC.

2-Phenylbenzo[d]oxazole (3aa, CAS: 833-50-1)[1]



^1H NMR (400 MHz, $CDCl_3$) δ 8.29-8.24 (m, 2H), 7.81-7.76 (m, 1H), 7.62-7.57 (m, 1H), 7.56-7.51 (m, 3H), 7.38-7.33 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.05, 150.78, 142.13, 131.50, 128.90, 127.63, 127.20, 125.09, 124.56, 120.02, 110.57. *m/z* (MS): 196 $[M+H]^+$.

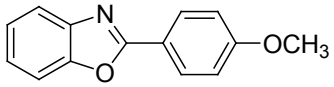
2-(4-Methylphenyl)benzo[*d*]oxazole (3ab, CAS: 835-71-2)[1]



The reaction was conducted with *o*-aminophenol (**1a**, 109.1 mg, 1.0 mmol), 1,2-bis(4-methylphenyl)acetylene (**2b**, 103.1 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 40:1) on silica gel to yield the desired product **3ab** as colorless solid (163.1 mg, 78% yield), mp 110.2-111.7 ^{o}C.

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.14 (d, *J* = 8.1 Hz, 2H), 7.77-7.76 (m, 1H), 7.55-7.74 (m, 1H), 7.35-7.31 (m, 4H), 2.41 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 163.18, 150.59, 142.12, 141.89, 129.51, 127.49, 124.74, 124.35, 119.74, 110.37, 21.50. *m/z* (MS): 210 $[M+H]^+$.

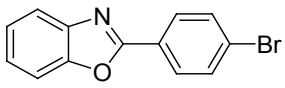
2-(4-Methoxyphenyl)benzo[*d*]oxazole (3ac, CAS: 838-34-6)[1]



The reaction was conducted with *o*-aminophenol (**1a**, 109.1 mg, 1.0 mmol), 1,2-bis(4-methoxyphenyl)acetylene (**2c**, 119.1 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 40:1) on silica gel to yield the desired product **3ac** as colorless solid (164.3 mg, 73% yield), mp 101.2-102.5 ^{o}C.

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.24-8.18 (m, 2H), 7.74 (dd, *J* = 5.5, 2.1 Hz, 1H), 7.56 (d, *J* = 6.8 Hz, 1H), 7.36-7.29 (m, 2H), 7.06-7.01 (m, 2H), 3.90 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 163.15, 162.35, 150.70, 142.33, 129.36, 124.53, 124.36, 119.76, 119.61, 114.34, 110.31, 55.37. *m/z* (MS): 226 $[M+H]^+$.

2-(4-Bromophenyl)benzo[*d*]oxazole (3ad, CAS: 3164-13-4)[2]

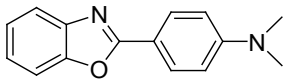


The reaction was conducted with *o*-aminophenol (**1a**, 109.1 mg, 1.0 mmol), 1,2-bis(4-bromophenyl)acetylene (**2d**, 167 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 40:1) on silica gel to yield the desired product **3ad** as white solid (240.2 mg, 88% yield), mp 157.3-158.1 ºC.

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.12 (d, *J* = 8.8 Hz, 2H), 7.70 (d, *J* = 7.3 Hz, 1H), 7.53 (d, *J* = 7.7 Hz, 1H), 7.37-7.27(m, 2H), 6.78 (d, *J* = 8.7 Hz, 2H), 3.08 (s, 6H). ^{13}C

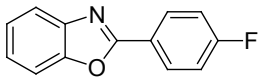
NMR (125 MHz, $CDCl_3$) δ 162.16, 150.81, 142.07, 132.24, 129.02, 126.22, 125.38, 124.75, 120.14, 110.62. *m/z* (MS): 274, 276 $[M+H]^+$.

4-(Benzo[*d*]oxazol-2-yl)-N,N-dimethylaniline (3ag, CAS: 840-57-3)[3]



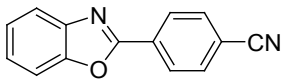
The reaction was conducted with *o*-aminophenol (**1a**, 109.1 mg, 1.0 mmol), 4-(phenylethynyl)-N,N-dimethylaminobenzene (**2g**, 110.6 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 20:1) on silica gel to yield the desired product **3ag** as white solid (43 mg, 36% yield), mp 182.3-183.7 °C.
^1H NMR (500 MHz, $CDCl_3$) δ 8.14 (d, *J* = 8.7 Hz, 2H), 7.72 (d, *J* = 7.5 Hz, 1H), 7.54 (d, *J* = 7.8 Hz, 1H), 7.28-7.34 (m, 2H), 6.79 (d, *J* = 8.5 Hz, 2H), 3.09 (s, 6H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 164.21, 152.42, 150.60, 142.64, 129.09, 124.14, 123.88, 119.12, 111.59, 110.09, 40.11. *m/z* (MS): 239 $[M+H]^+$.

2-(4-Fluorophenyl)benzo[*d*]oxazole (3ai, CAS: 397-54-6)[4]



The reaction was conducted with *o*-aminophenol (**1a**, 109.1 mg, 1.0 mmol), 1-(4-fluorophenyl)-2-phenylethyne (**2i**, 98 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 40:1) on silica gel to yield the desired product **3ai** as pale yellow solid (48 mg, 45% yield), mp 93-94 °C.
^1H NMR (400 MHz, $CDCl_3$) δ 8.27-8.23 (m, 2H), 7.78-7.74 (m, 1H), 7.58-7.54 (m, 1H), 7.37-7.33 (m, 2H), 7.20 (t, *J* = 8.6 Hz, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.00, 163.49, 162.10, 150.69, 141.98, 129.82, 129.73, 125.10, 124.62, 123.43, 119.93, 116.26, 116.04, 110.53. *m/z* (MS): 214 $[M+H]^+$.

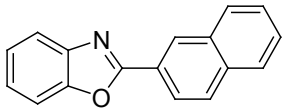
4-(Benzo[*d*]oxazol-2-yl)benzonitril (3aj, CAS: 838-33-5)[2]



The reaction was conducted with *o*-aminophenol (**1a**, 109.1 mg, 1.0 mmol), 1-(4-cyanophenyl)-2-phenylethyne (**2j**, 101.5 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 30:1) on silica gel to yield the desired product **3aj** as white solid (51 mg, 46.5% yield), mp 202-204 °C.

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.41-8.35 (m, 2H), 7.81 (d, *J* = 6.1 Hz, 3H), 7.61 (s, 1H), 7.41 (s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 160.95, 150.98, 141.96, 132.66, 131.20, 127.99, 126.14, 125.11, 120.61, 118.09, 114.83, 110.85. *m/z* (MS): 221 $[M+H]^+$.

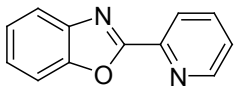
2-(Naphthalen-2-yl)benzo[*d*]oxazole (3ak, CAS: 14625-56-0)[5]



The reaction was conducted with *o*-aminophenol (**1a**, 109.1 mg, 1.0 mmol), 2-(2-phenylethynyl)naphthalene (**2k**, 114 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 40:1) on silica gel to yield the desired product **3ak** as white solid (49 mg, 40% yield), mp 115.3-116.7 °C.

^{1}H NMR (500 MHz, $CDCl_3$) δ 9.51 (d, *J* = 8.7 Hz, 1H), 8.44 (d, *J* = 7.3 Hz, 1H), 8.03 (d, *J* = 8.2 Hz, 1H), 7.95-7.90 (m, 2H), 7.73 (t, *J* = 7.7 Hz, 1H), 7.66-7.64 (m, 1H), 7.62-7.59 (m, 2H), 7.42-7.40 (m, 2H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 162.79, 150.17, 142.33, 133.96, 132.24, 130.70, 129.27, 128.62, 127.85, 126.40, 126.30, 125.22, 124.88, 124.45, 123.61, 120.26, 110.45. *m/z* (MS): 246 $[M+H]^+$.

2-(Pyridin-2-yl)benzo[*d*]oxazole (3al, CAS: 32959-62-9)[5]

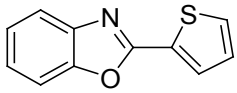


The reaction was conducted with *o*-aminophenol (**1a**, 109.1 mg, 1.0 mmol), 1-(2-pyridyl)-2-phenylethyne (**2l**, 89.5 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 20:1) on silica gel to yield the desired product **3al** as white solid (40 mg, 40.5% yield), mp 108-109 °C.

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.82 (d, *J* = 4.6 Hz, 1H), 8.37 (d, *J* = 7.9 Hz, 1H), 7.89

(t, J = 7.7 Hz, 1H), 7.83 (d, J = 7.3 Hz, 1H), 7.67 (d, J = 7.7 Hz, 1H), 7.47-7.38 (m, 3H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 161.47, 151.09, 150.29, 146.14, 141.81, 137.05, 126.02, 125.52, 124.91, 123.45, 120.65, 111.22. *m/z* (MS): 197 $[M+H]^+$.

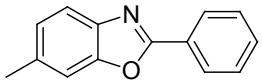
2-(Thiophenyl)benzoxazole (3am, CAS: 23999-63-5)[5]



The reaction was conducted with *o*-aminophenol (**1a**, 109.1 mg, 1.0 mmol), 2-(2-phenylethynyl)thiophene (**2m**, 92 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 40:1) on silica gel to yield the desired product **3am** as white solid (41 mg, 41% yield), mp 81-83 °C.

^{1}H NMR (500 MHz; $CDCl_3$) δ 7.92 (d, J = 3.3 Hz, 1H), 7.74-7.73 (m, 1H), 7.57-7.54 (m, 2H), 7.35-7.33 (m, 2H), 7.20-7.18 (m, 1H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 159.07, 150.48, 142.06, 130.21, 129.94, 129.71, 128.23, 125.07, 124.72, 119.83, 110.42. *m/z* (MS): 202 $[M+H]^+$.

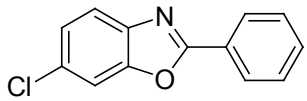
6-Methyl-2-phenylbenzo[*d*]oxazole (3bn, CAS: 14016-00-3)[6]



The reaction was conducted with 2-amino-5-methylphenol (**1b**, 123.1 mg, 1.0 mmol), diphenylacetylene (**2n**, 89 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 40:1) on silica gel to yield the desired product **3bn** as pale yellow solid (177.7 mg, 85% yield), mp 91-92 °C.

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.25-8.21 (m, 2H), 7.64 (d, J = 8.1 Hz, 1H), 7.52-7.49 (m, 3H), 7.37-7.36 (m, 1H), 7.17-7.14 (m, 1H), 2.49 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 162.50, 151.01, 139.88, 135.49, 131.19, 128.79, 127.40, 127.32, 125.74, 119.28, 110.69, 21.71. *m/z* (MS): 210 $[M+H]^+$.

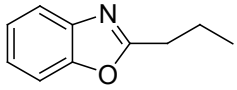
6-Chloro-2-phenylbenzo[*d*]oxazole (3co, CAS: 15952-20-2)[7]



The reaction was conducted with 3-chloro-6-aminophenol (**1c**, 143 mg, 1.0 mmol), diphenylacetylene (**2o**, 89 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 40:1) on silica gel to yield the desired product **3co** as yellow solid (190.1 mg, 83% yield), mp 107-108 ^{o}C.

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.21-8.19 (m, 2H), 7.65 (d, J = 8.4 Hz, 1H), 7.56 (d, J = 1.8 Hz, 1H), 7.54-7.49 (t, J = 7.5 Hz, 3H), 7.33-7.31 (m, 1H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 163.59, 150.80, 140.78, 131.74, 131.45, 128.90, 128.84, 127.56, 125.21, 120.38, 111.17. *m/z* (MS): 230 $[M+H]^+$.

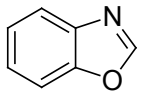
2-Propylbenzo[*d*]oxazole (3ap, CAS: 2008-05-1)[8]



The reaction was conducted with *o*-aminophenol (**1a**, 109.1 mg, 1.0 mmol), pent-1-ynyl-benzene (**2p**, 72 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 40:1) on silica gel to yield the desired product **3ap** as pale yellow oil (29 mg, 36.5% yield).

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.65-7.68 (m, 1H), 7.45-7.48 (m, 1H), 7.27-7.30 (m, 2H), 2.92 (t, J = 5.1 Hz, 2H), 1.85-1.91 (m, 2H), 0.89 (t, J = 5.1 Hz, 3H). ^{13}C NMR (125 MHz, $CDCl_3$) δ 167.32, 150.59, 141.42, 124.34, 123.99, 119.49, 110.17, 31.37, 22.43, 13.97. *m/z* (MS): 162 $[M+H]^+$.

Benzo[*d*]oxazole (3aq, CAS: 273-53-0)[9]



The reaction was conducted with *o*-aminophenol (**1a**, 109.1 mg, 1.0 mmol), phenylacetylene (**2r**, 80.5 mg, 0.5 mmol). The residue was purified by flash chromatography (hexane/ethyl acetate = 40:1) on silica gel to yield the desired product **3aq** as colorless oil (25 mg, 41.5% yield).

^{1}H NMR (400 MHz, $CDCl_3$) δ 8.09 (s, 1H), 7.80-7.77 (m, 1H), 7.59-7.56 (m, 1H), 7.39-7.35 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 152.44, 149.88, 139.94, 125.53, 124.52, 120.53, 112.22. *m/z* (MS): 120 $[M+H]^+$.

References

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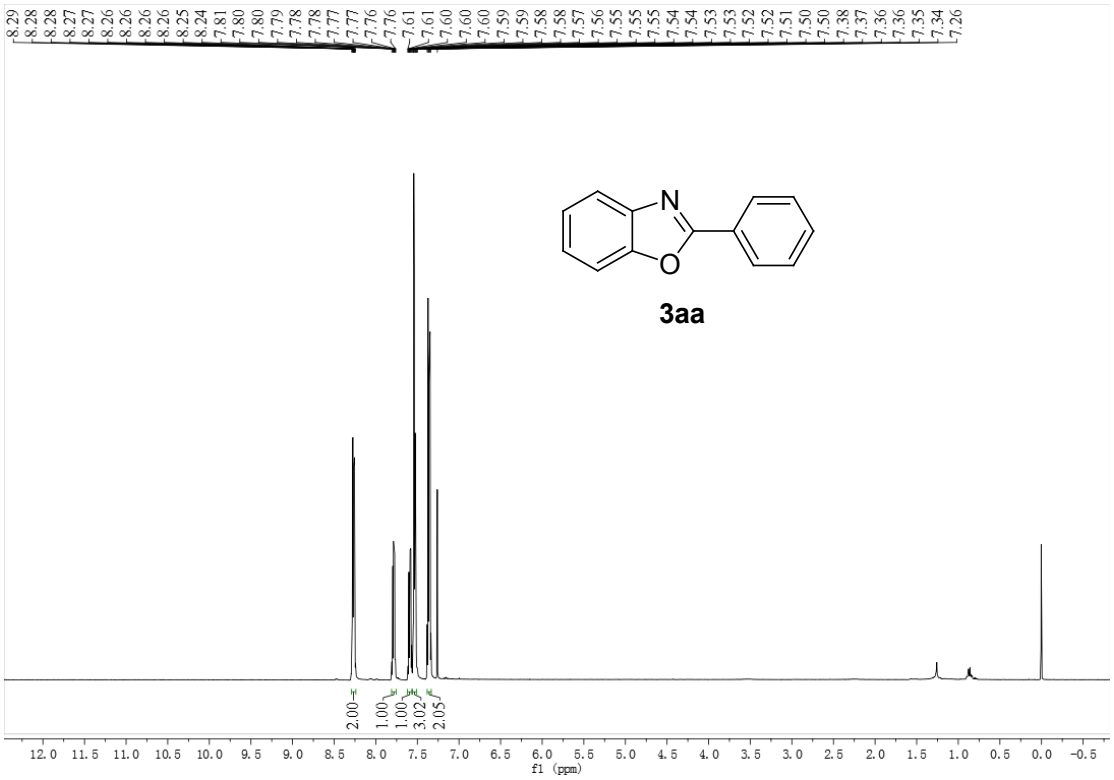
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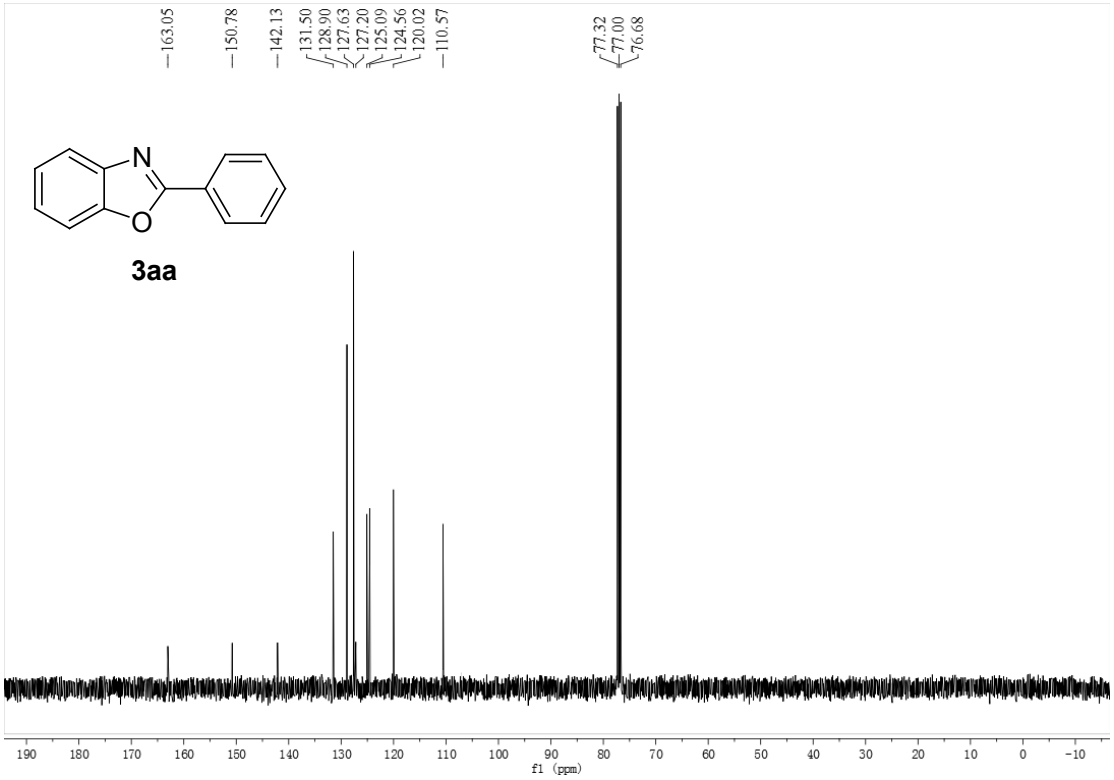
N
O
3aa
2.00 1.00 1.00 3.02 2.05
12.0 11.5 11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)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77.32 77.00 76.68
N
O
3aa
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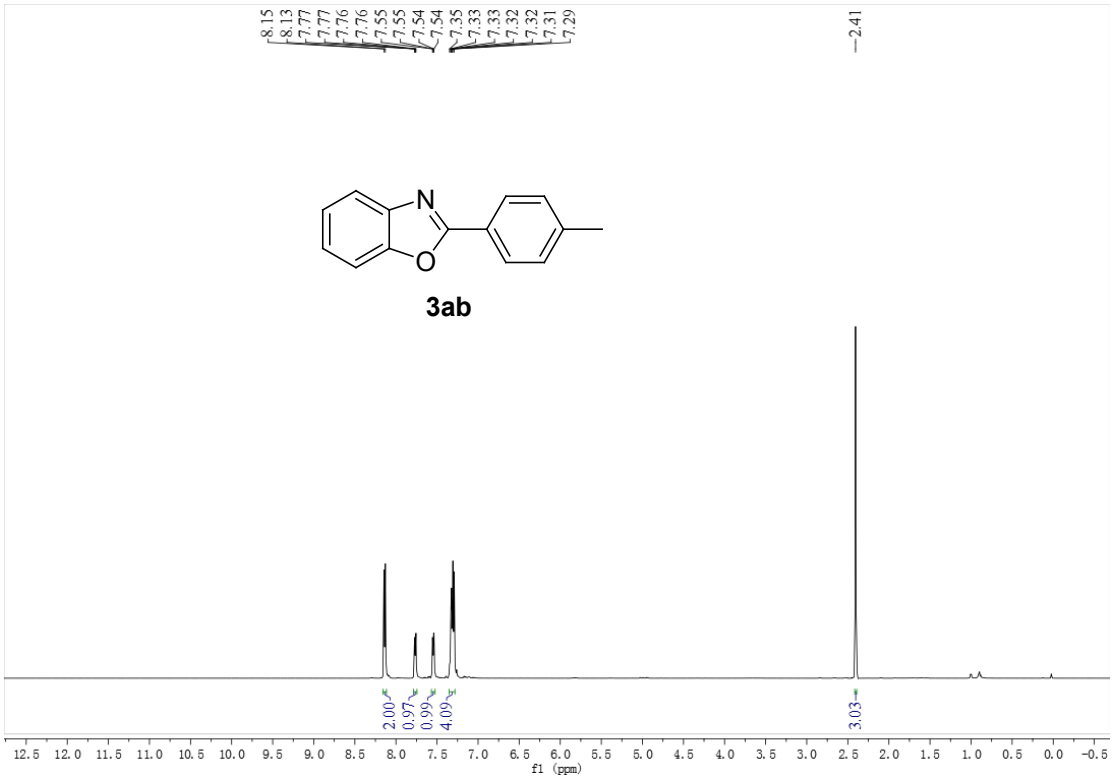
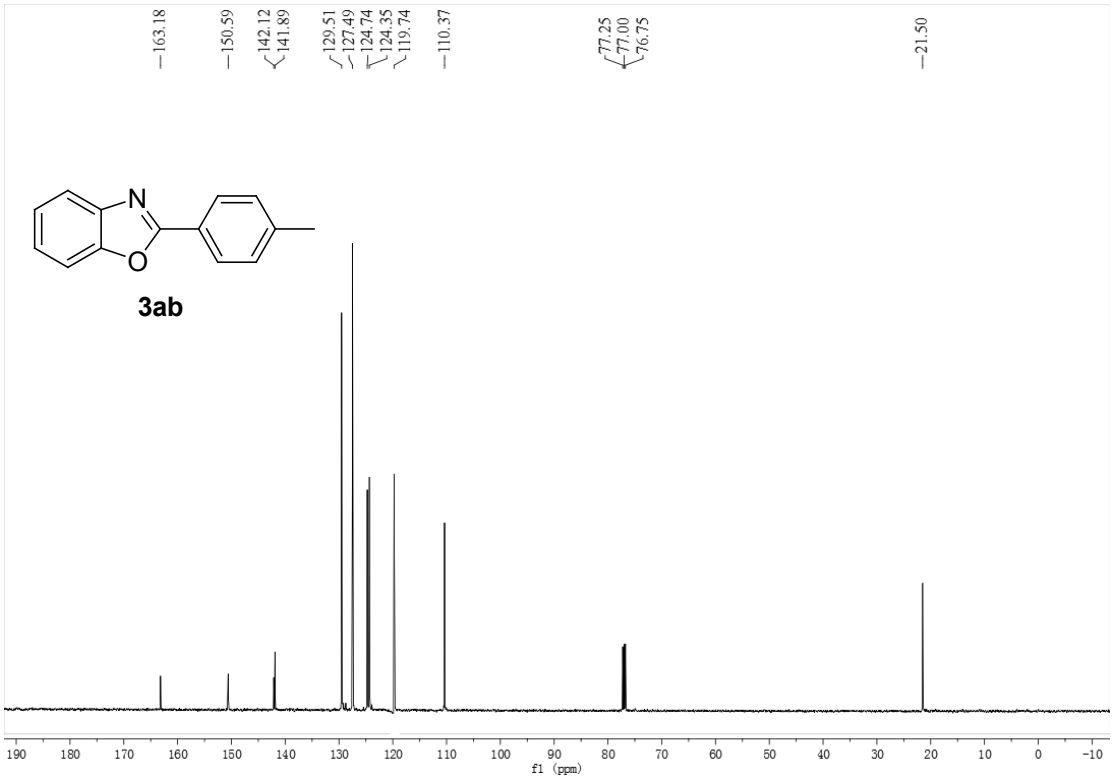
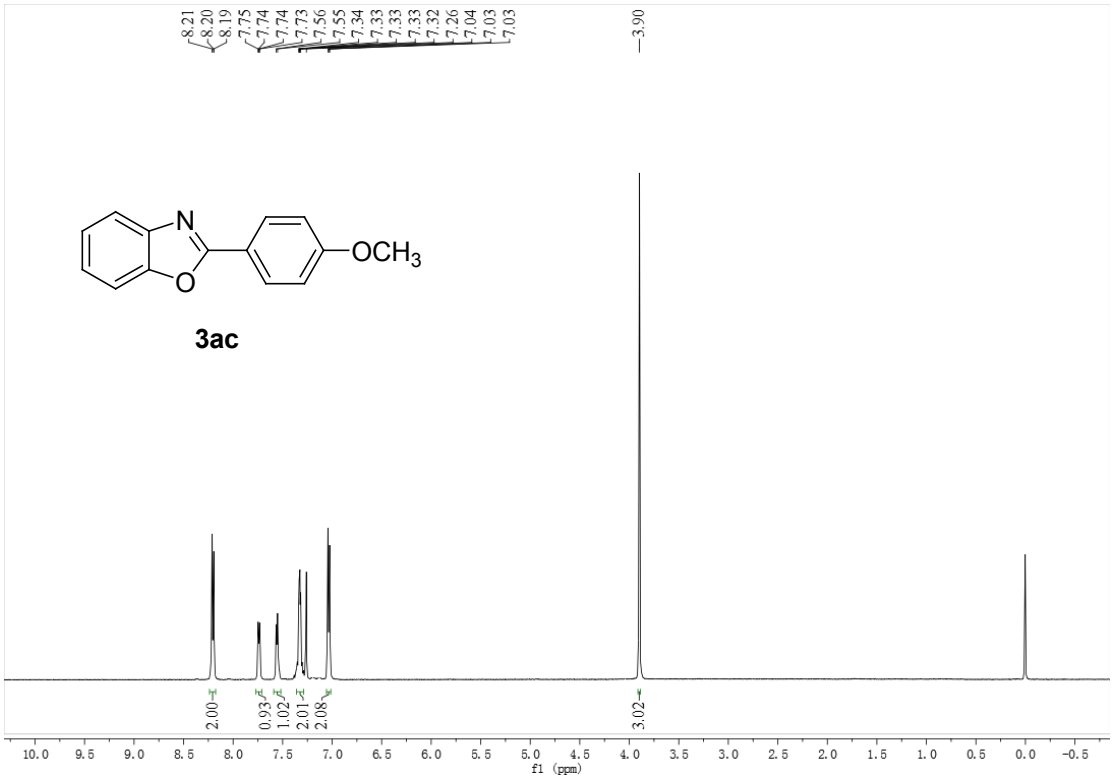
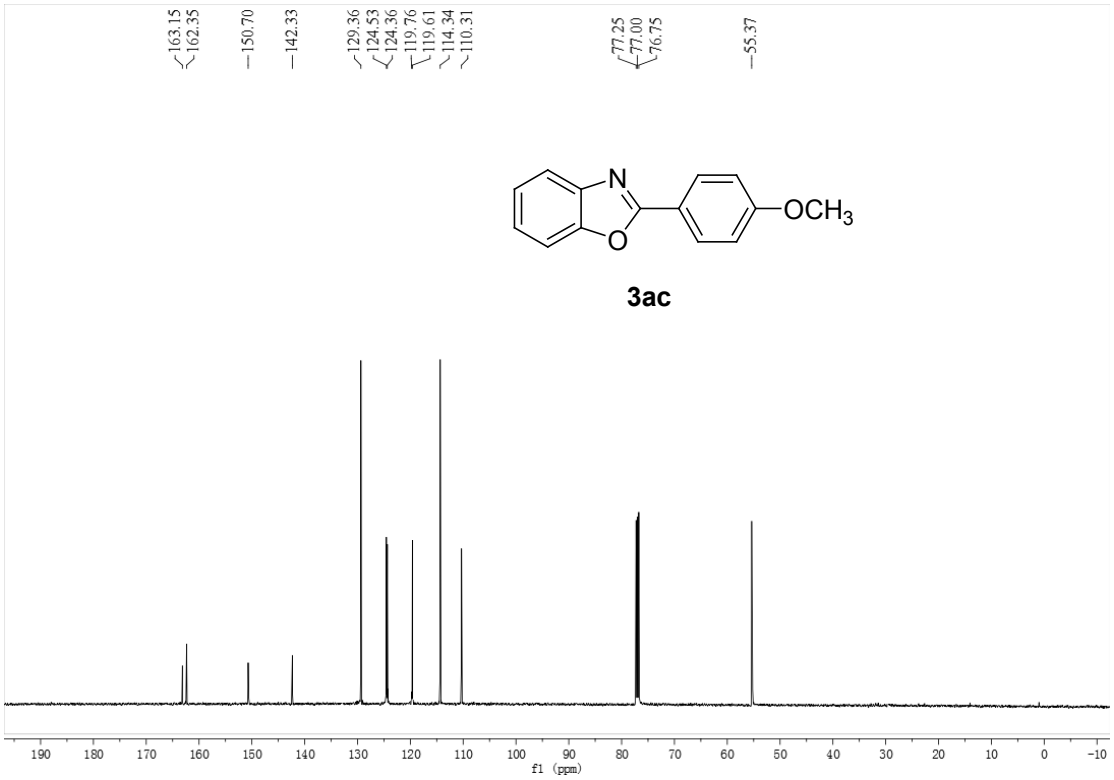
f1 (ppm)



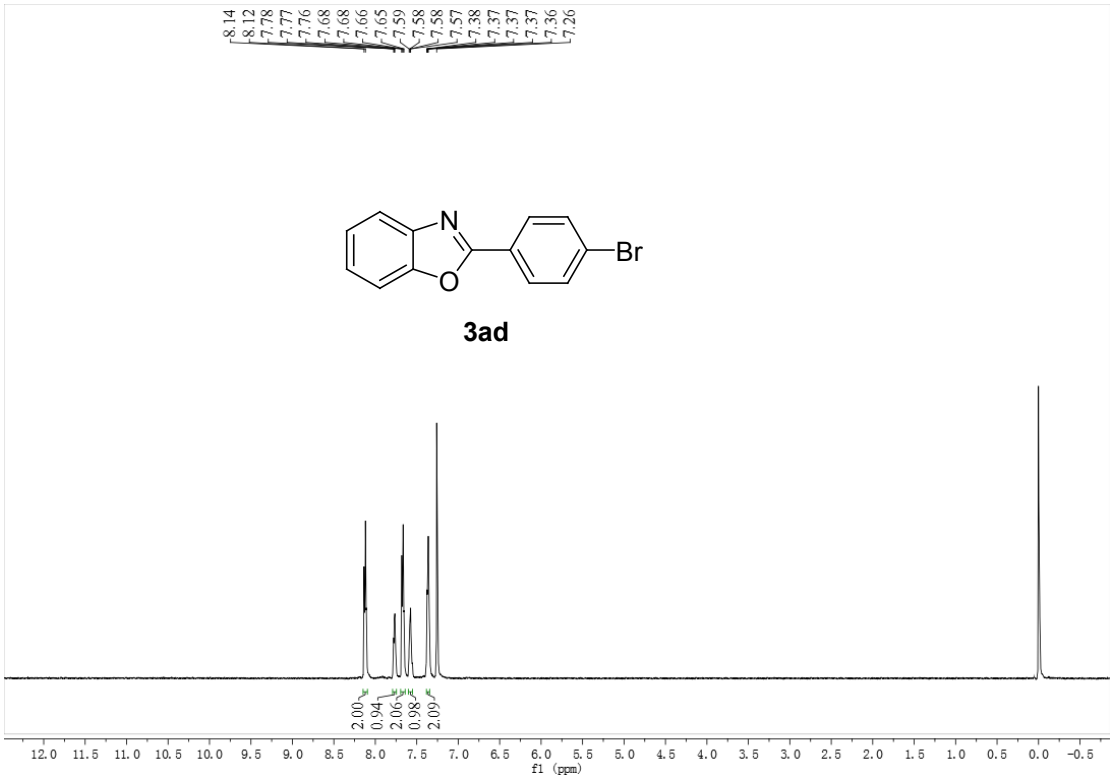


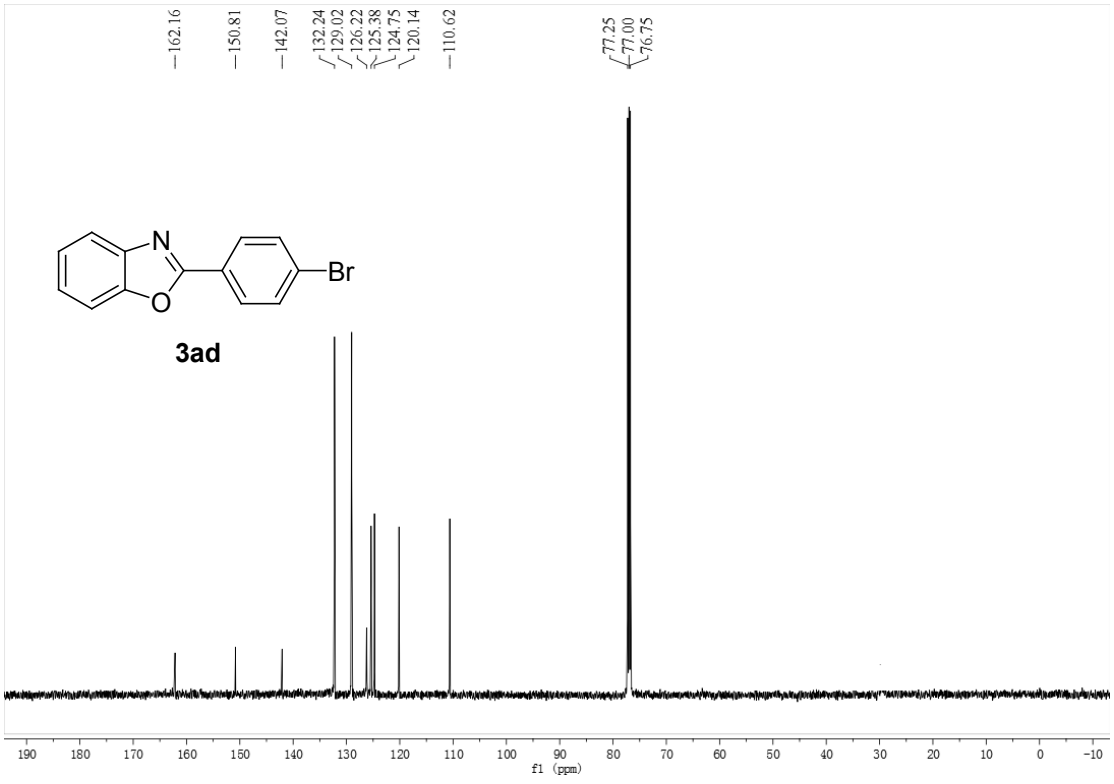


3ac



3ac


8.14
8.12
7.78
7.77
7.76
7.68
7.68
7.66
7.65
7.59
7.58
7.58
7.57
7.38
7.37
7.37
7.37
7.36
7.26
N
O
Br
3ad
2.00
0.94
2.06
0.98
2.09
f1 (ppm)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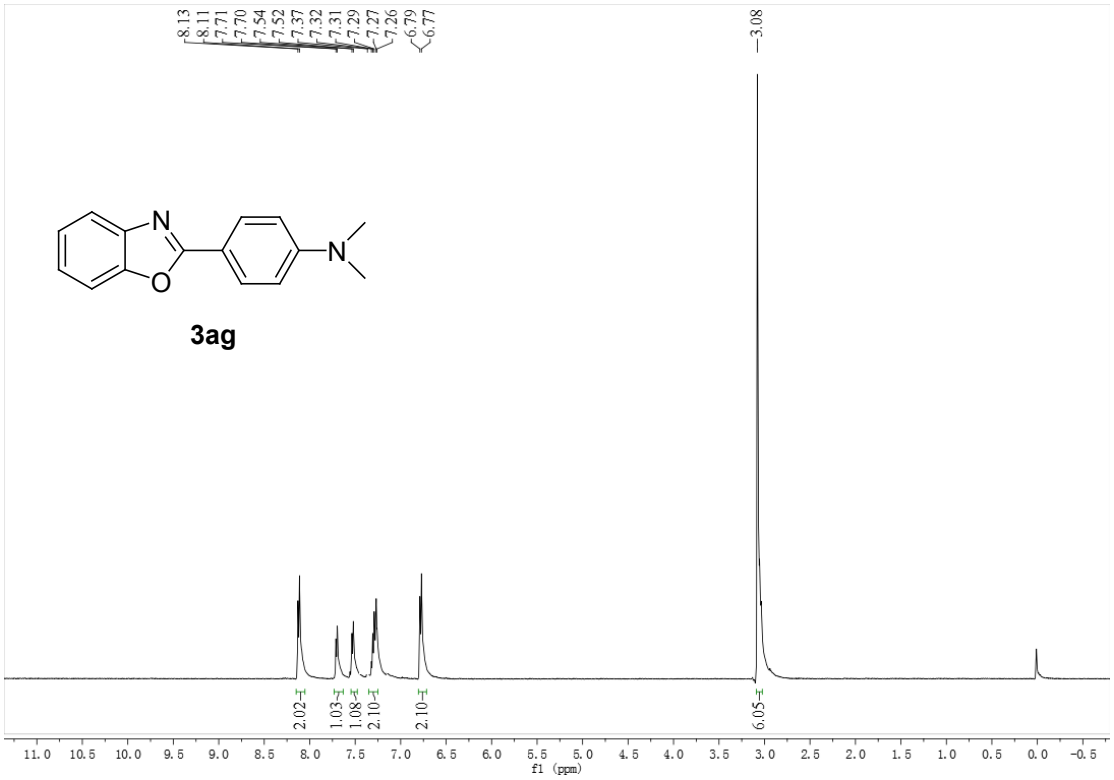
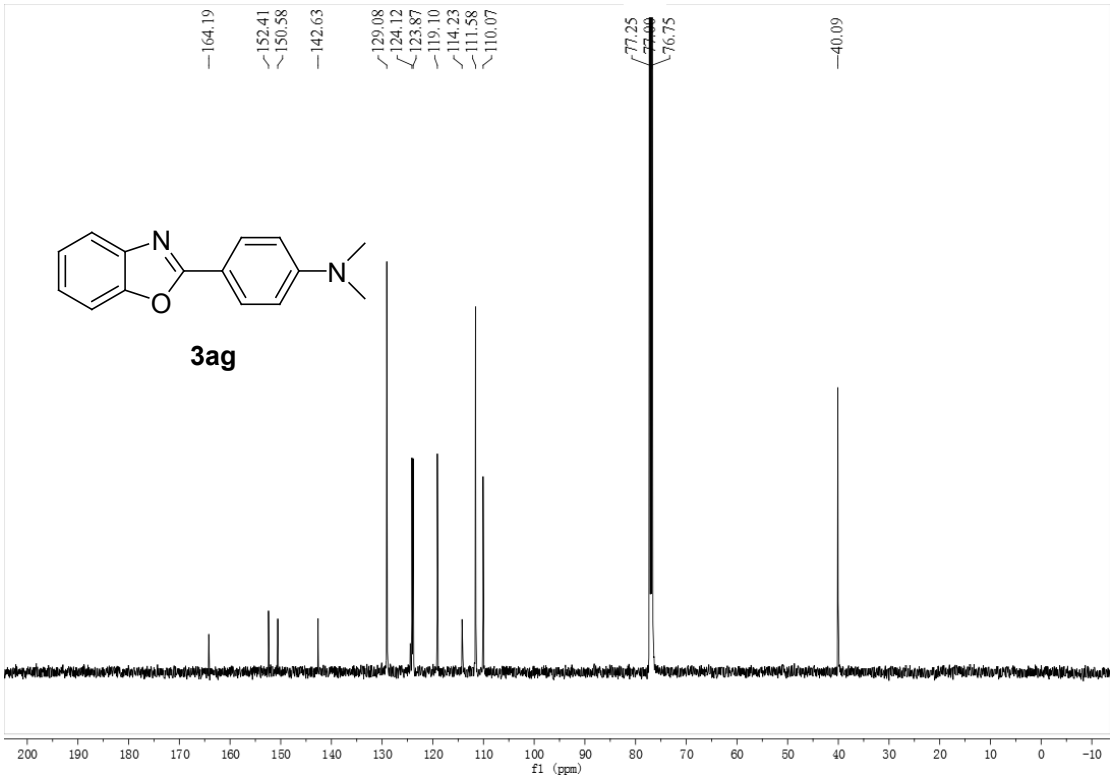
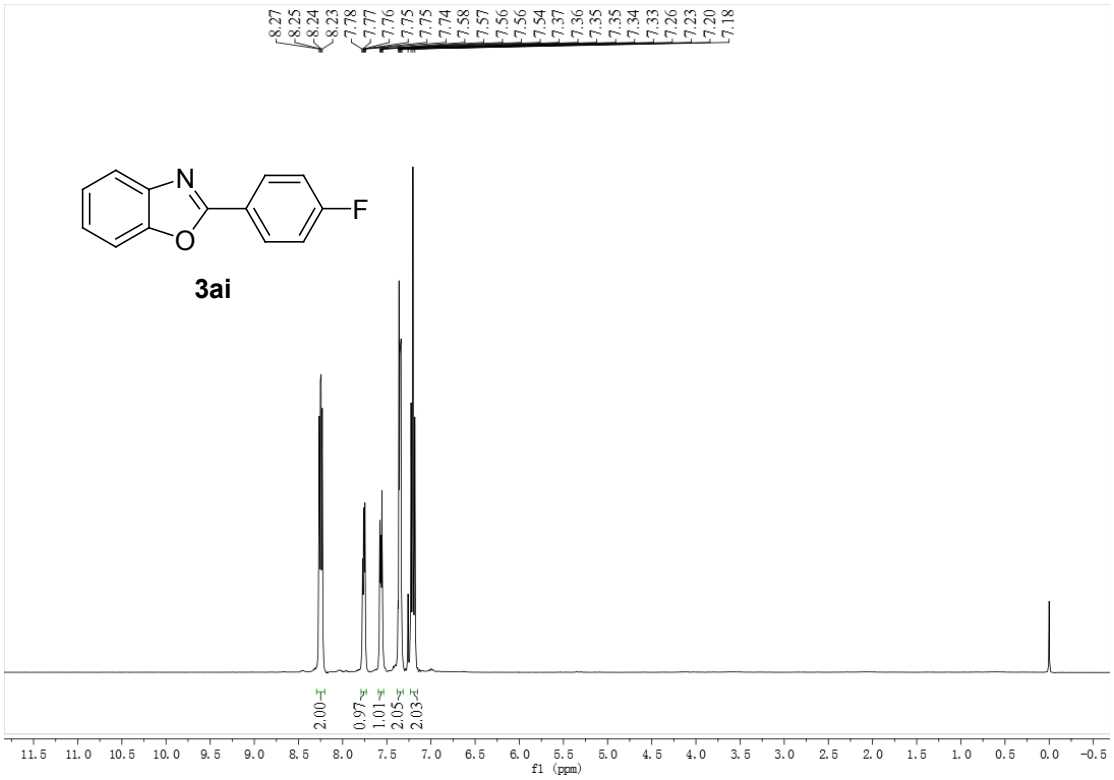
150.81
142.07
132.24
129.02
126.22
125.38
124.75
120.14
110.62
77.25
77.00
76.75
N
O
Br
3ad
f1 (ppm)


8.13
8.11
7.71
7.70
7.54
7.52
7.37
7.32
7.31
7.29
7.27
7.26
6.79
6.77
3.08
N
O
N
3ag
2.02
1.03
1.08
2.10
2.10
6.05
f1 (ppm)


164.19
152.41
150.58
142.63
129.08
124.12
123.87
119.10
114.23
111.58
110.07
77.25
76.75
40.09
N
O
N
3ag
f1 (ppm)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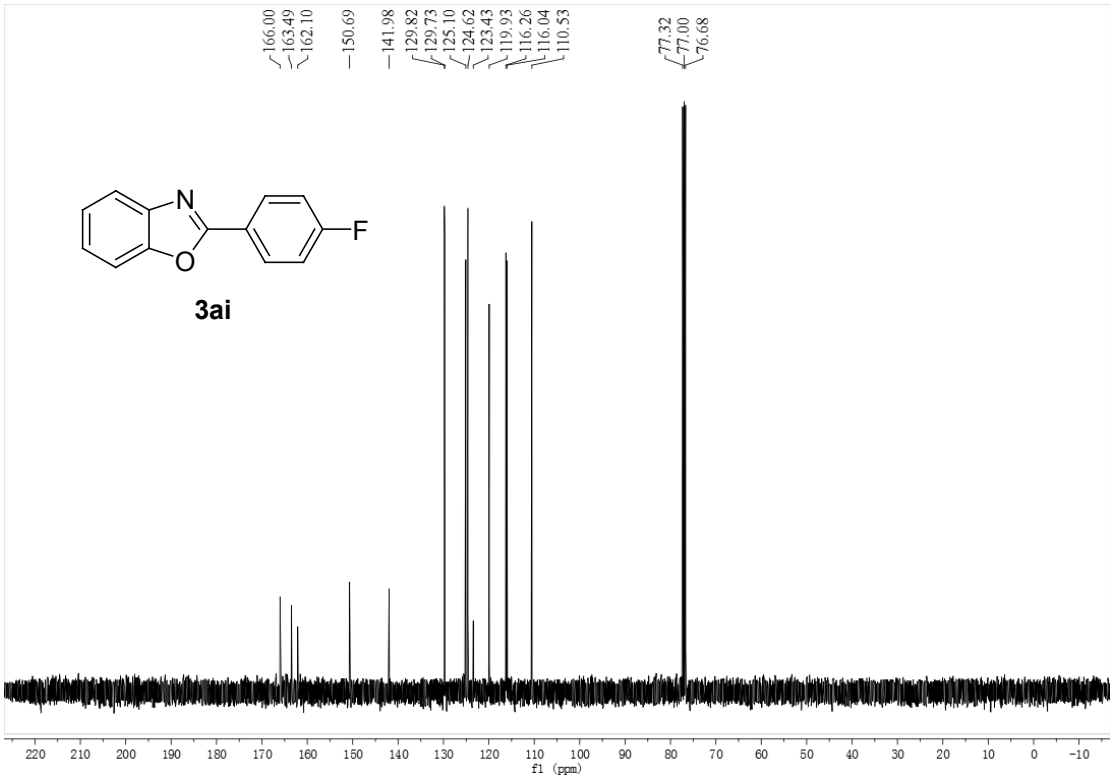
8.24
8.23
7.78
7.77
7.76
7.75
7.75
7.74
7.58
7.57
7.56
7.56
7.54
7.37
7.36
7.35
7.35
7.34
7.33
7.26
7.23
7.20
7.18
N
O
F
3ai
2.00
0.97
1.01
2.05
2.03
f1 (ppm)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116.26
116.04
110.53
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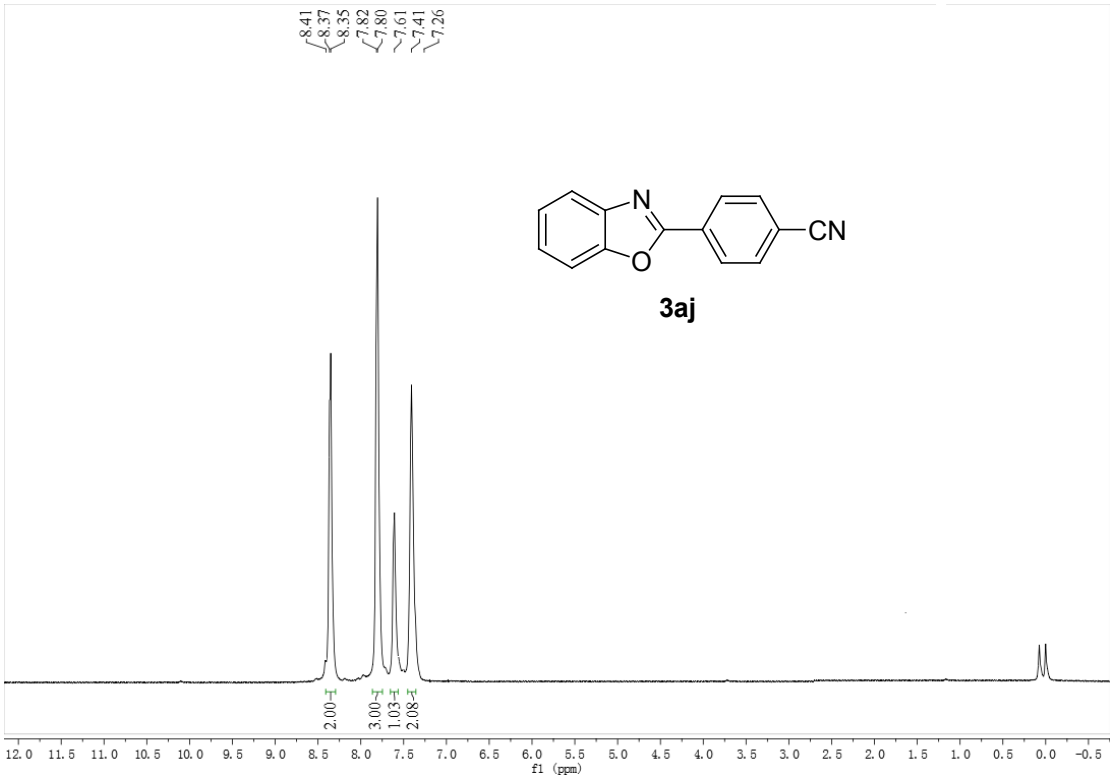
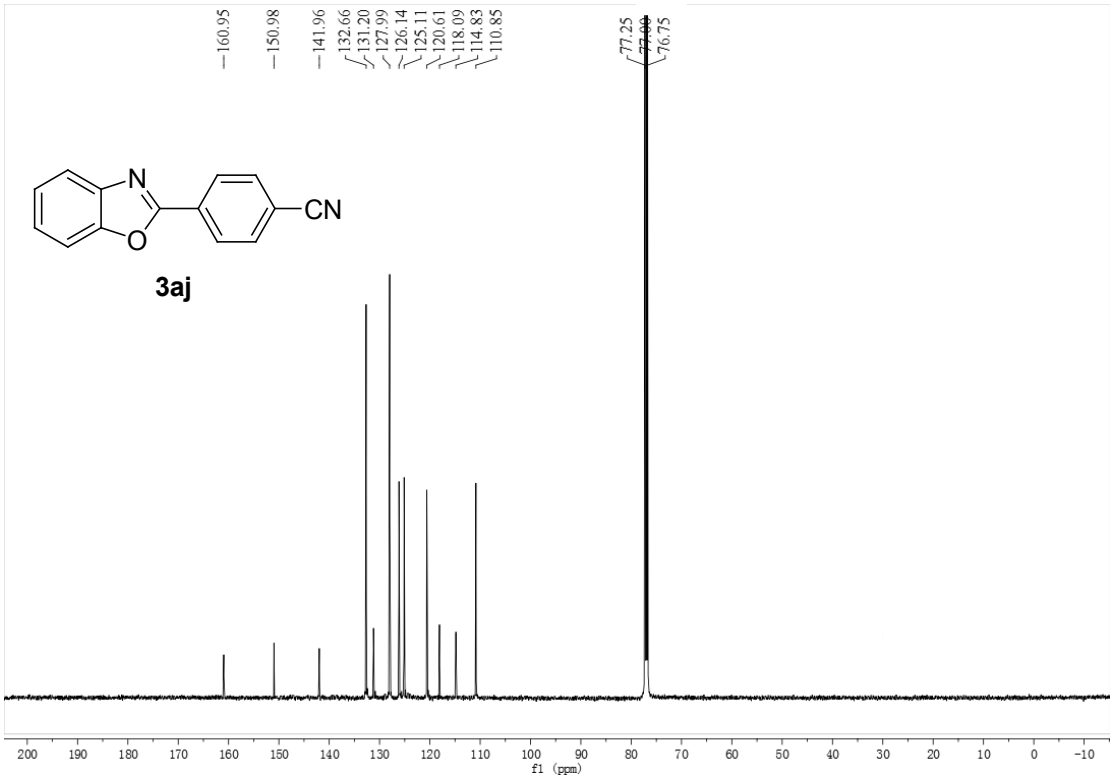
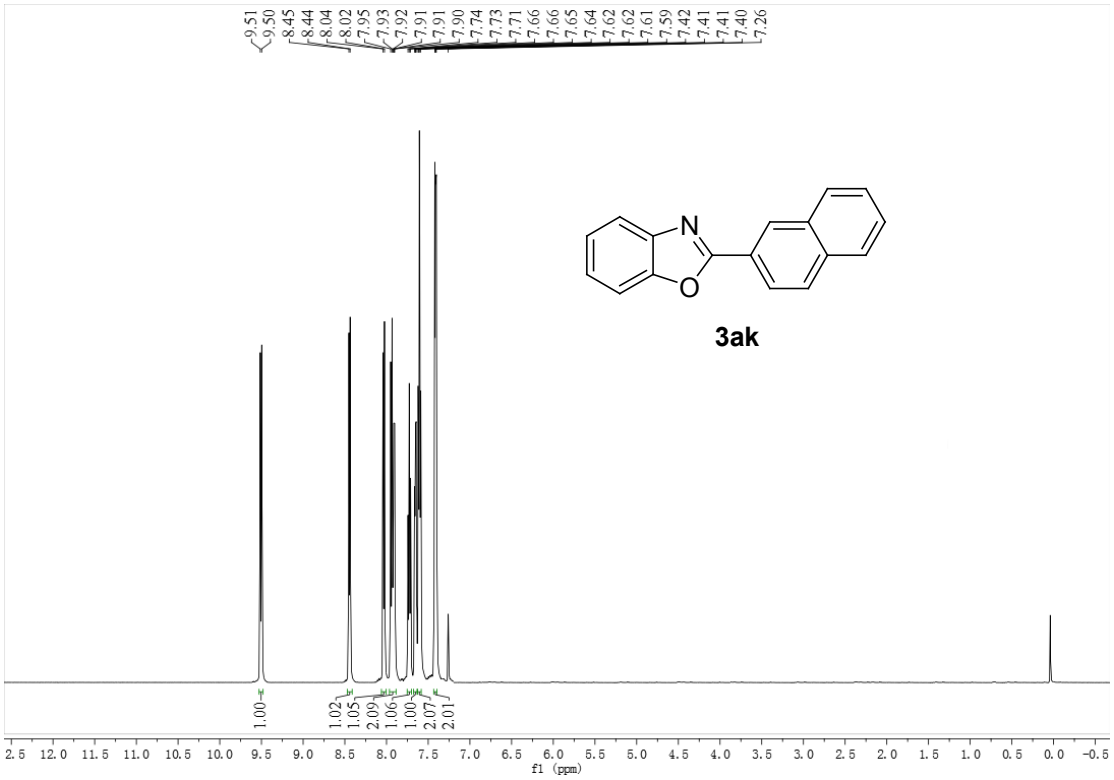
77.00
76.68
N
O
F
3ai
f1 (ppm)



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8.02
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7.93
7.92
7.91
7.91
7.90
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7.73
7.71
7.66
7.65
7.64
7.62
7.62
7.61
7.59
7.42
7.41
7.41
7.40
7.26
N
O
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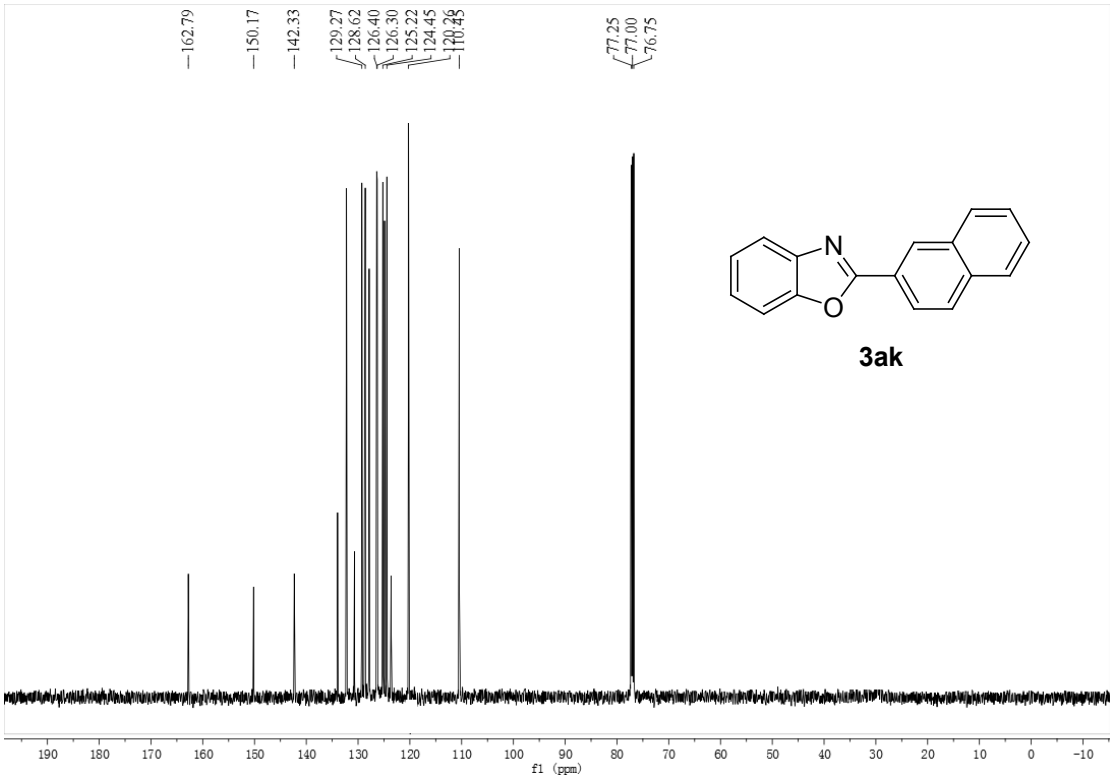
1.02
1.05
2.09
1.06
1.00
2.07
2.01
f1 (ppm)

3ak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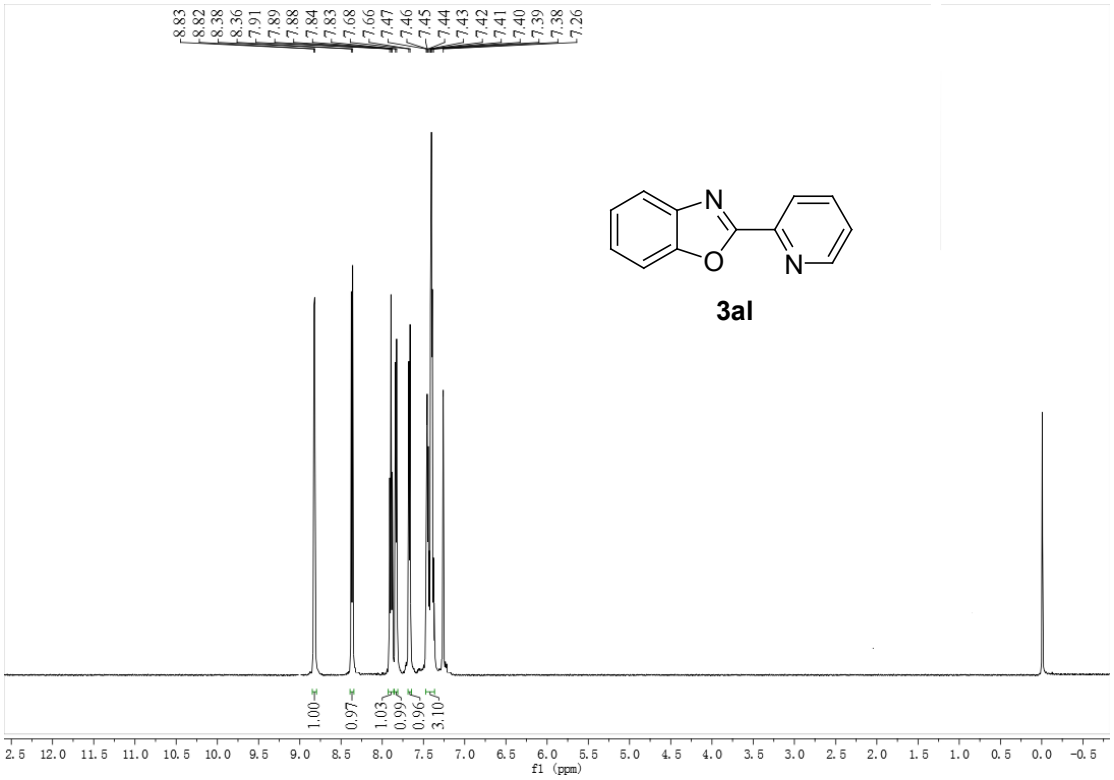
128.62
126.40
126.30
125.22
124.45
120.26
110.43
77.25
77.00
76.75
N
O
f1 (ppm)

3ak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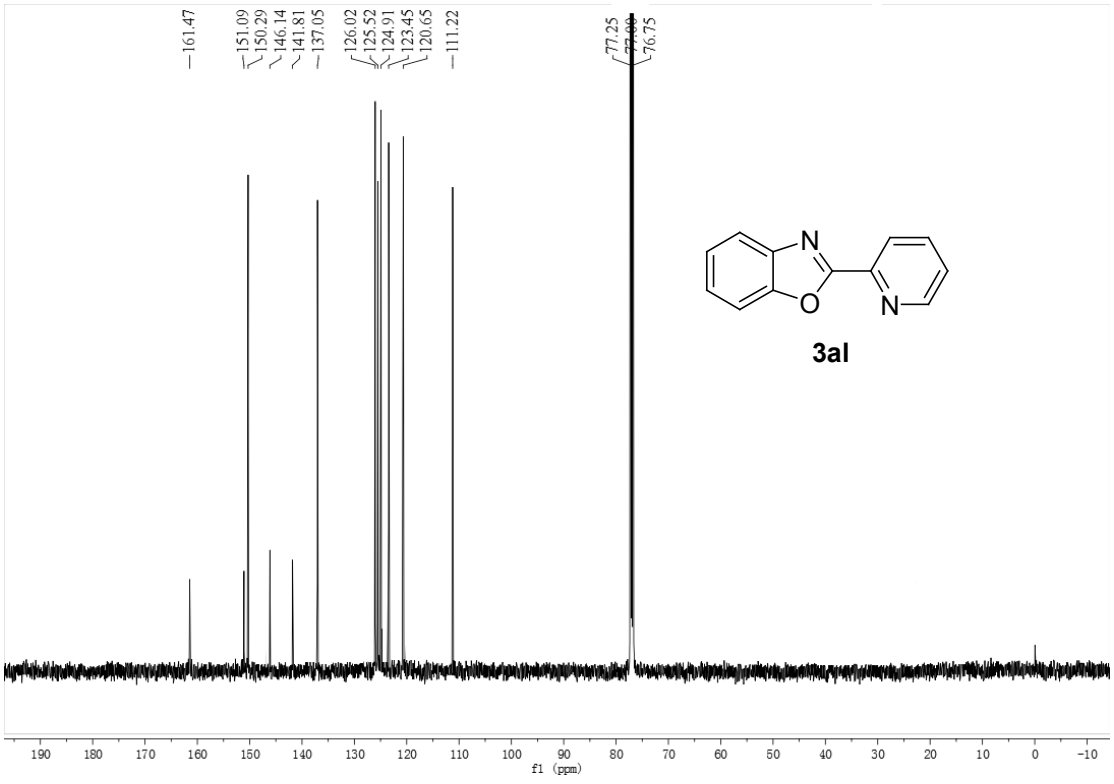
8.82
8.38
8.36
7.91
7.89
7.88
7.84
7.83
7.68
7.66
7.47
7.46
7.45
7.44
7.43
7.42
7.41
7.40
7.39
7.38
7.26
1.00
0.97
1.03
0.99
0.96
3.10
f1 (ppm)

3al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151.09
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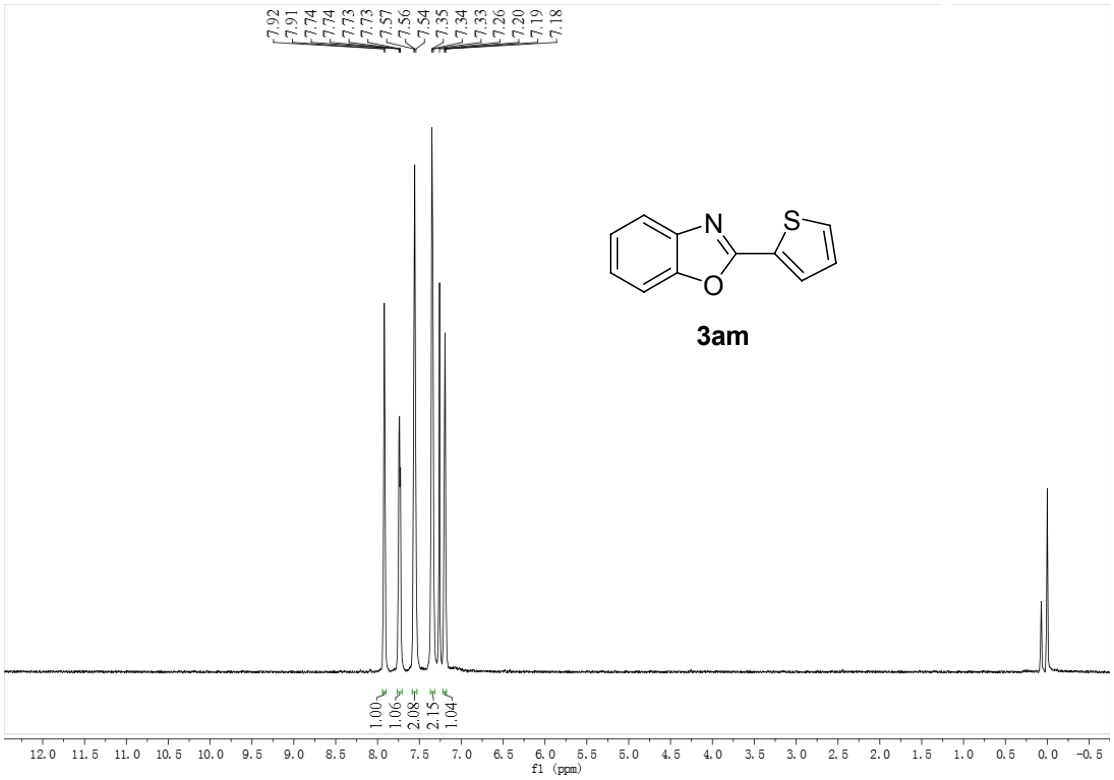
146.14
141.81
137.05
126.02
125.52
124.91
123.45
120.65
111.22
77.25
77.00
76.75
f1 (ppm)

3al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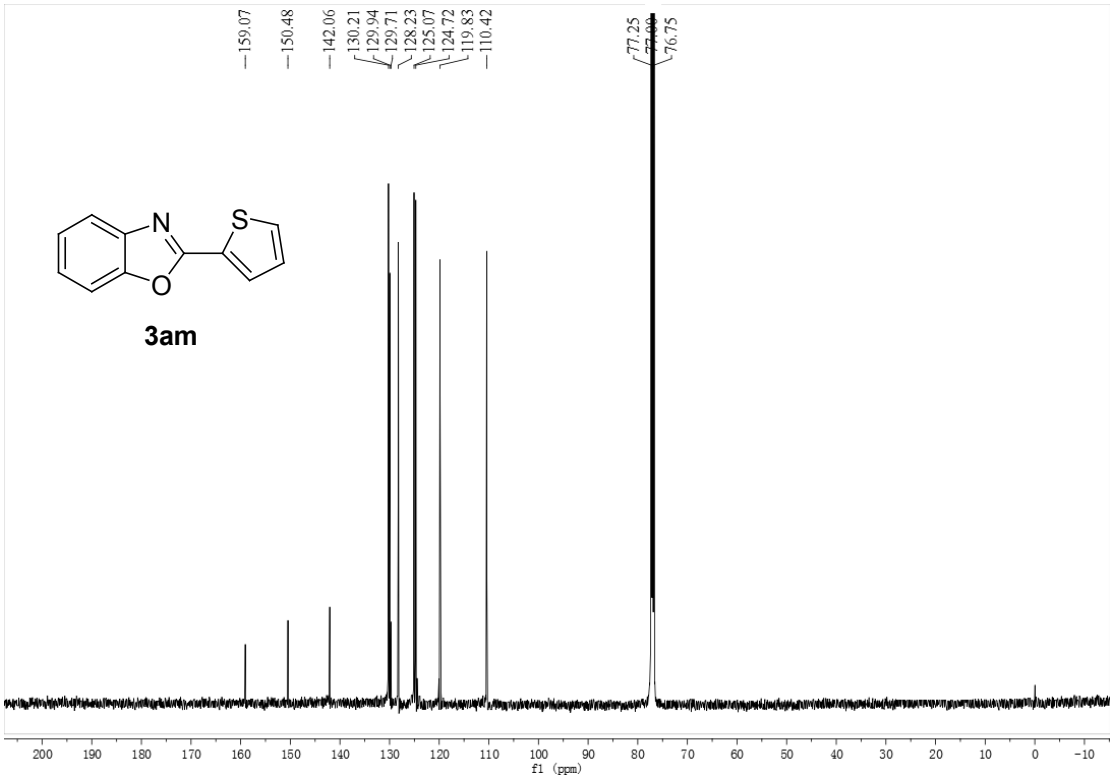
7.91
7.74
7.74
7.73
7.73
7.57
7.56
7.54
7.35
7.34
7.33
7.26
7.20
7.19
7.18
N
S
O
3am
1.00
1.06
2.08
2.15
1.04
f1 (ppm)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142.06
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129.94
129.71
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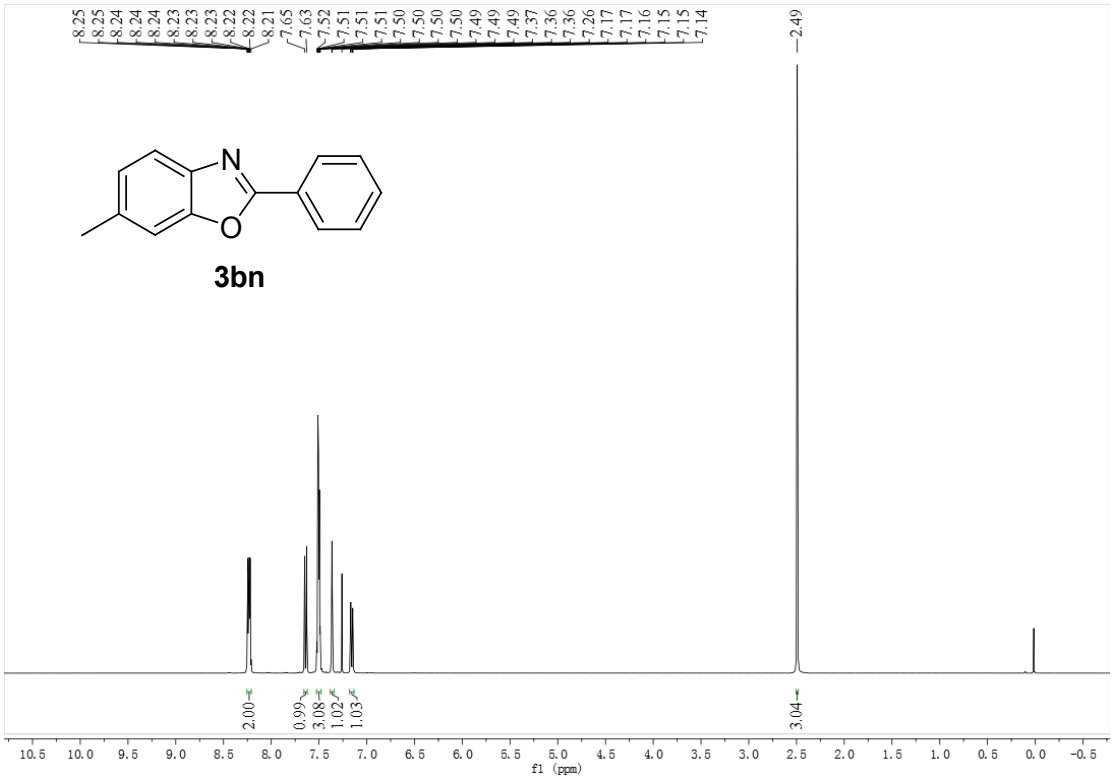
125.07
124.72
119.83
110.42
77.25
77.00
76.75
N
S
O
3am
f1 (ppm)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8.24
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8.23
8.23
8.22
8.22
8.21
7.65
7.63
7.52
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7.51
7.51
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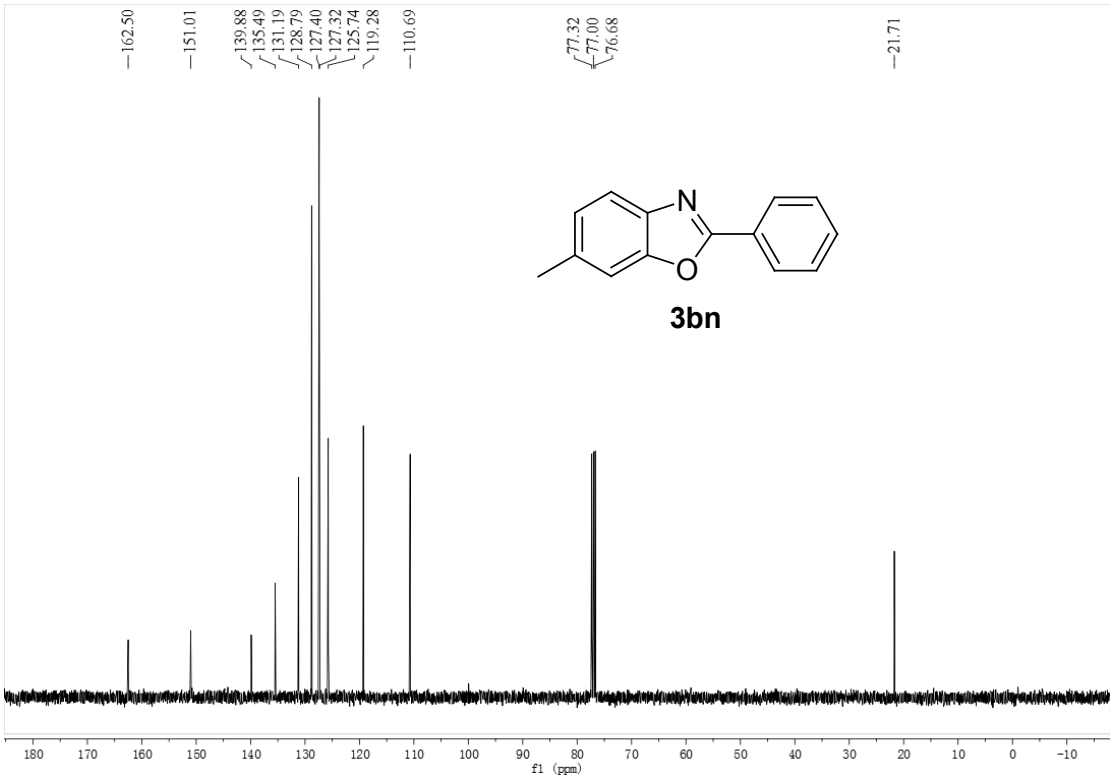
7.50
7.50
7.50
7.49
7.49
7.49
7.37
7.36
7.36
7.26
7.17
7.17
7.16
7.15
7.15
7.14
2.49
N
O
3bn
2.00
0.99
3.08
1.02
1.03
3.04
f1 (ppm)


162.50
151.01
139.88
135.49
131.19
128.79
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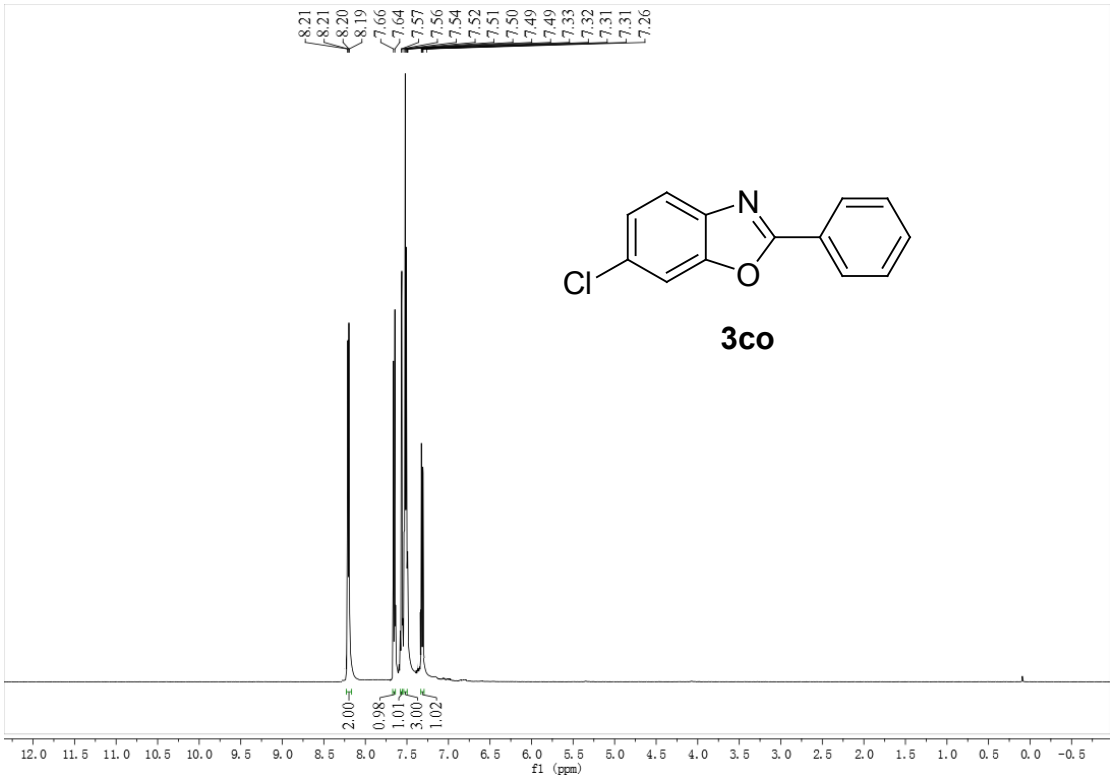
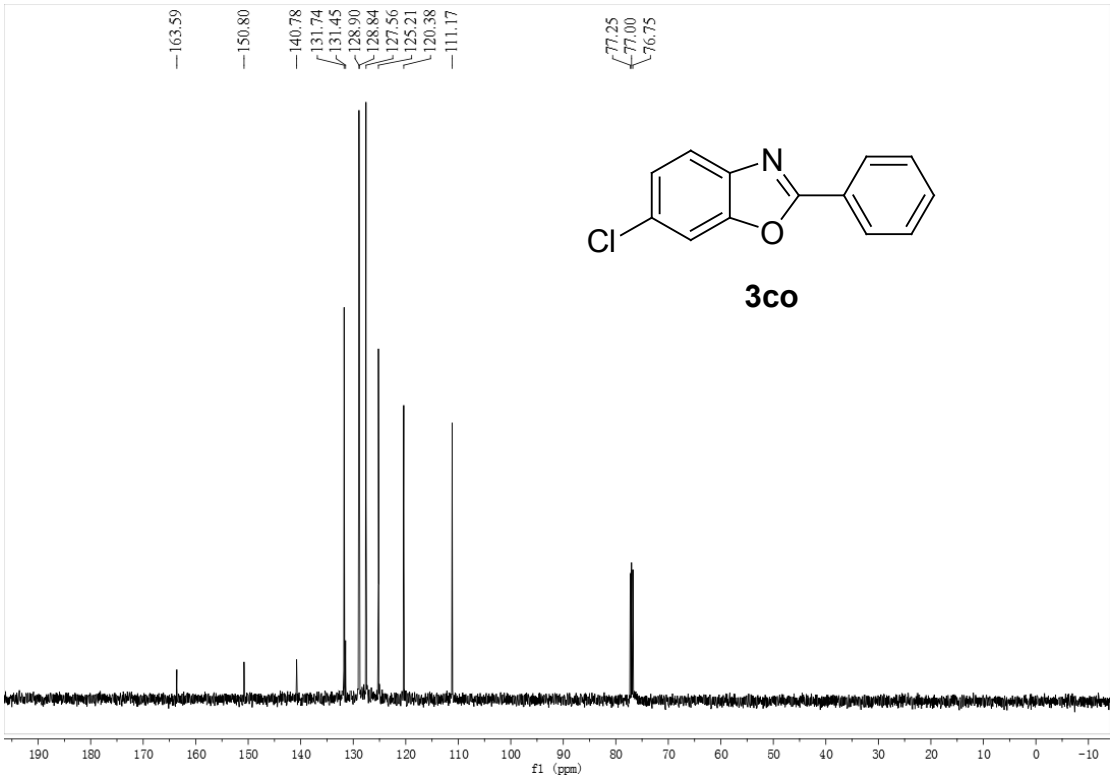
127.32
125.74
119.28
110.69
77.32
77.00
76.68
21.71
N
O
3bn
f1 (ppm)



3co



3co