Electronic Supporting Information (ESI)

CuBr catalyzed aerobic oxidative coupling of 2-aminopyridines with cinnamaldehydes: Direct access to 3-formyl-2-phenyl-imidazo[1,2-a]pyridines

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[c]*Departments of Pharmacoinformatics and Medicinal Chemistry, National Institute of Pharmaceutical Education and Research (NIPER), SAS Nagar, Punjab-160062, India.*

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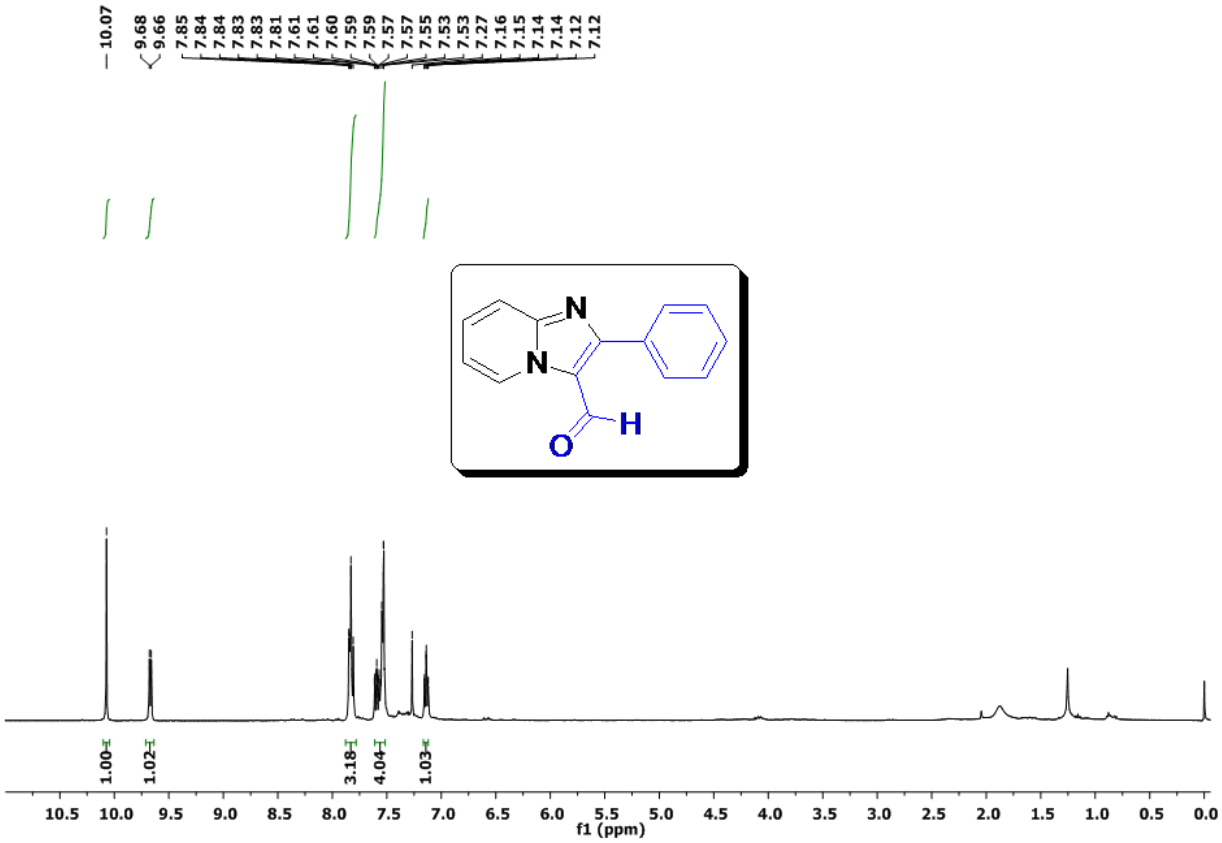
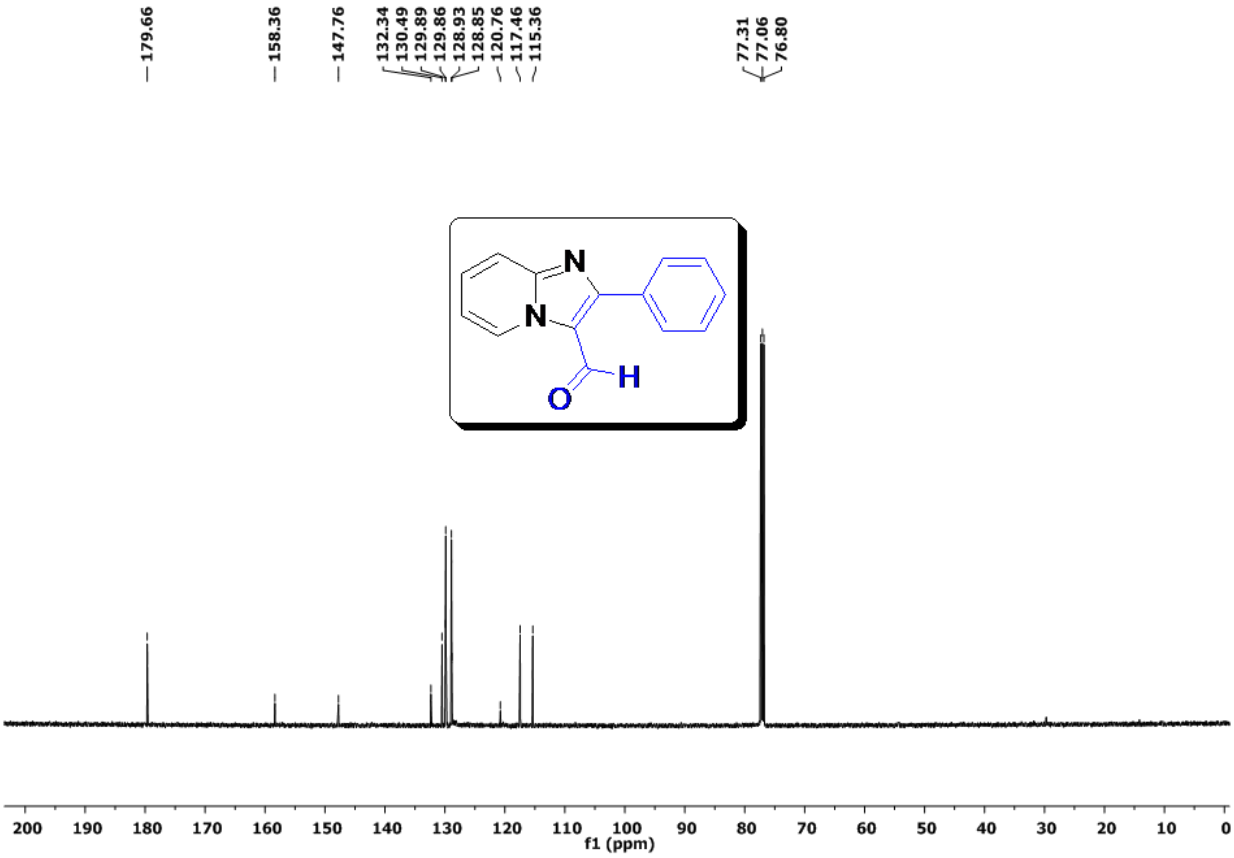
S1. NMR data scans

^{1}H, ^{13}C and DEPT-135 NMR of 2-phenyl-imidazo[1,2-a]pyridine-3-carbaldehyde (3a):

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158.36
147.76
132.34
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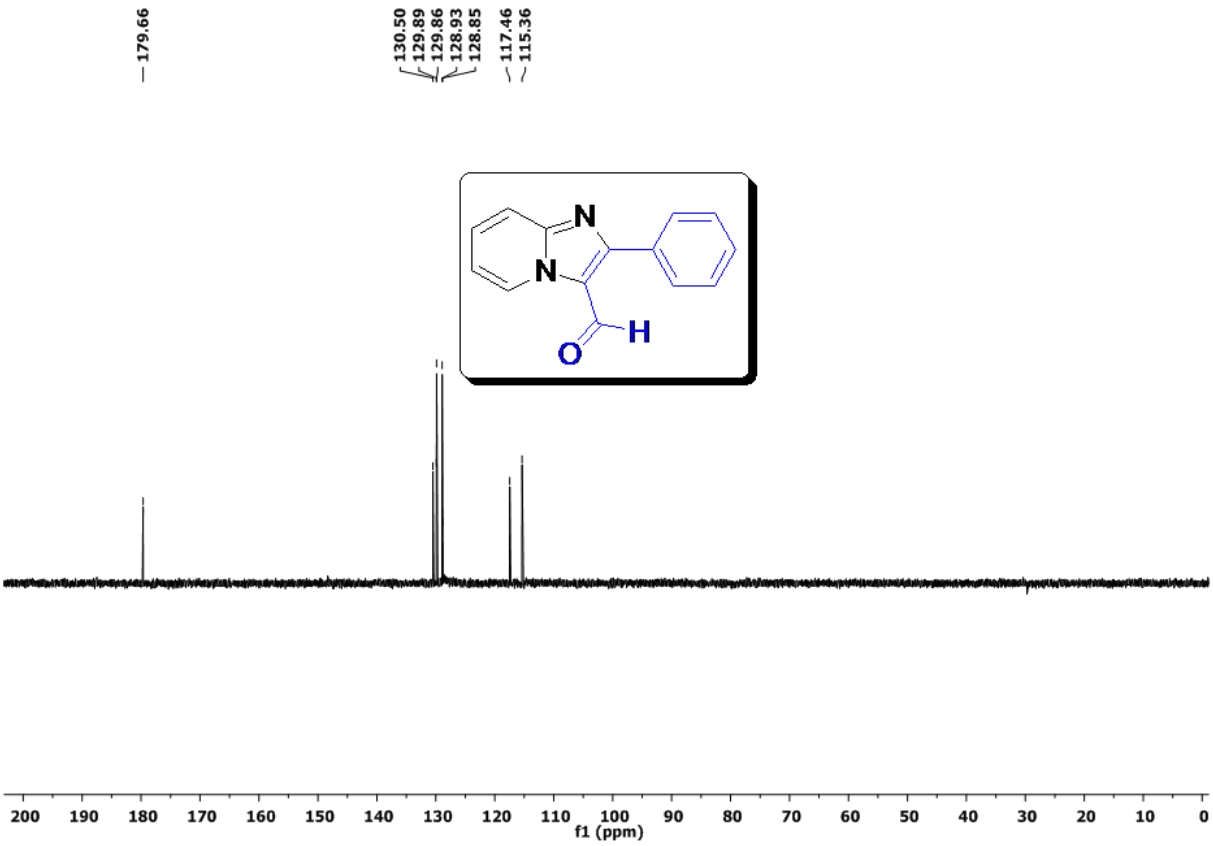
129.89
129.86
128.93
128.85
120.76
117.46
115.36
77.31
77.06
76.80
N
N
O
H
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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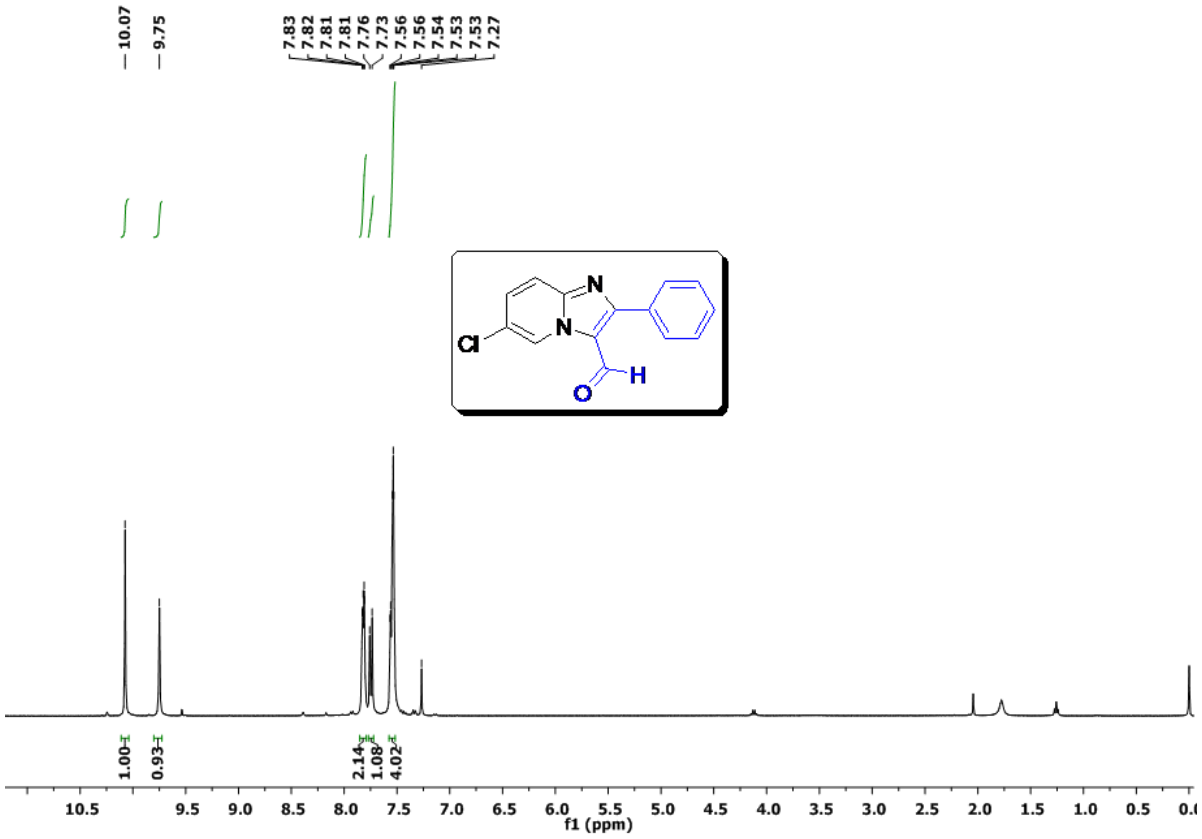
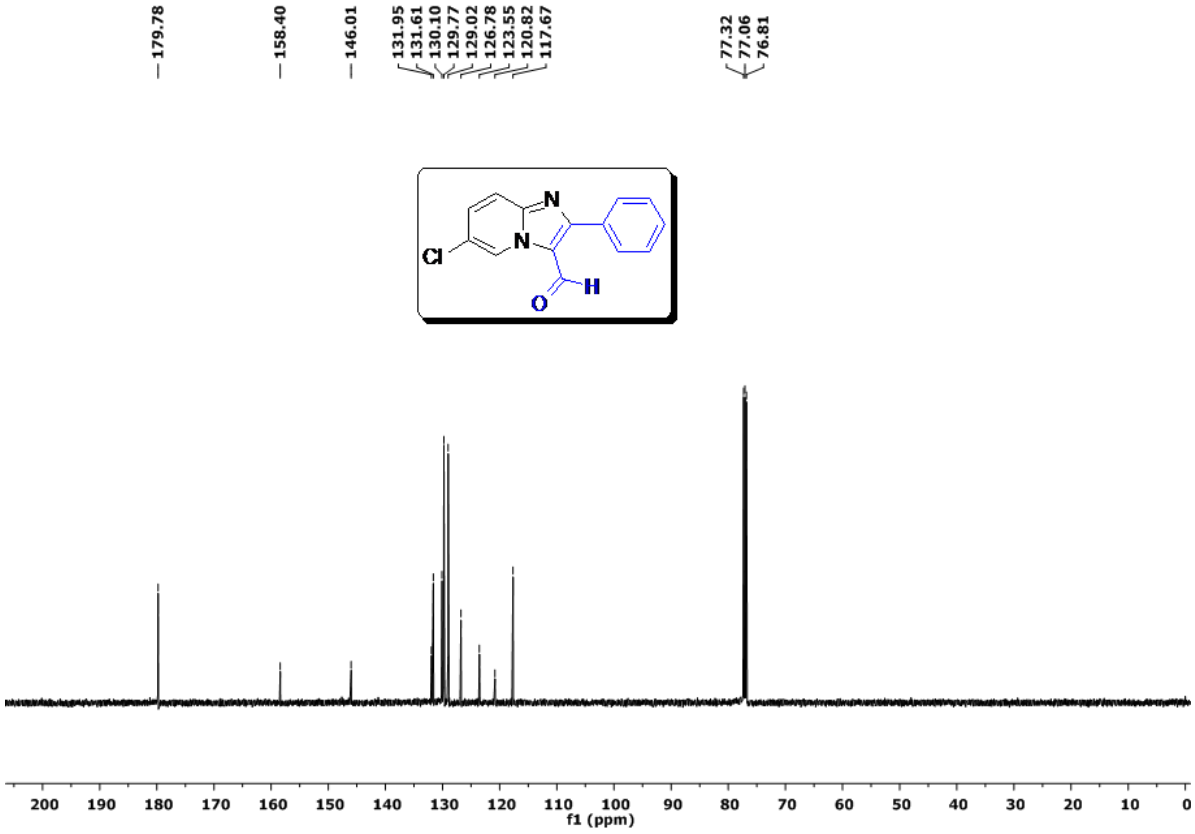
128.93
128.85
117.46
115.36
N
N
O
H
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

^{1}H, ^{13}C and DEPT-135 NMR of 7-chloro-2-phenyl-imidazo[1,2-a]pyridine-3-carbaldehyde (3b):

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131.61
130.10
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129.02
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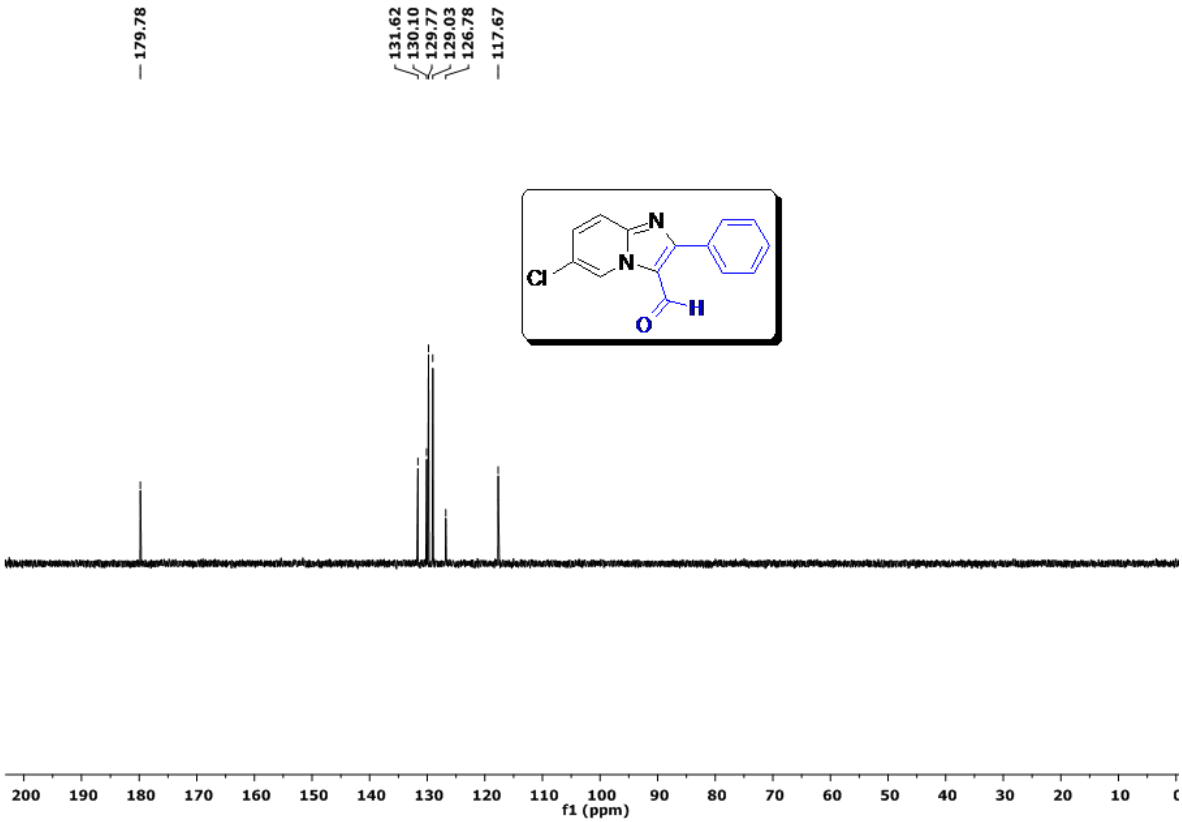
123.55
120.82
117.67
77.32
77.06
76.81
N
N
Cl
O
H
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)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129.77
129.03
126.78
117.67
N
N
Cl
O
H
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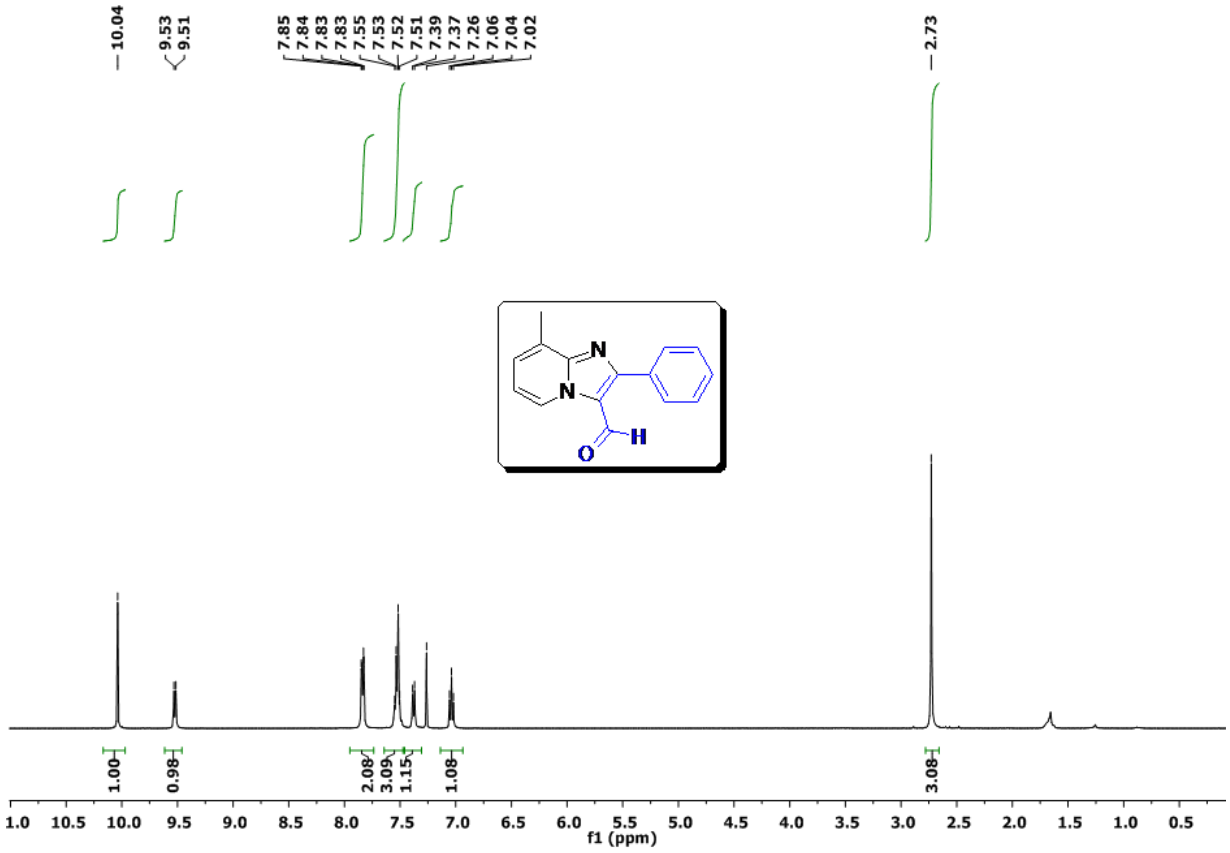
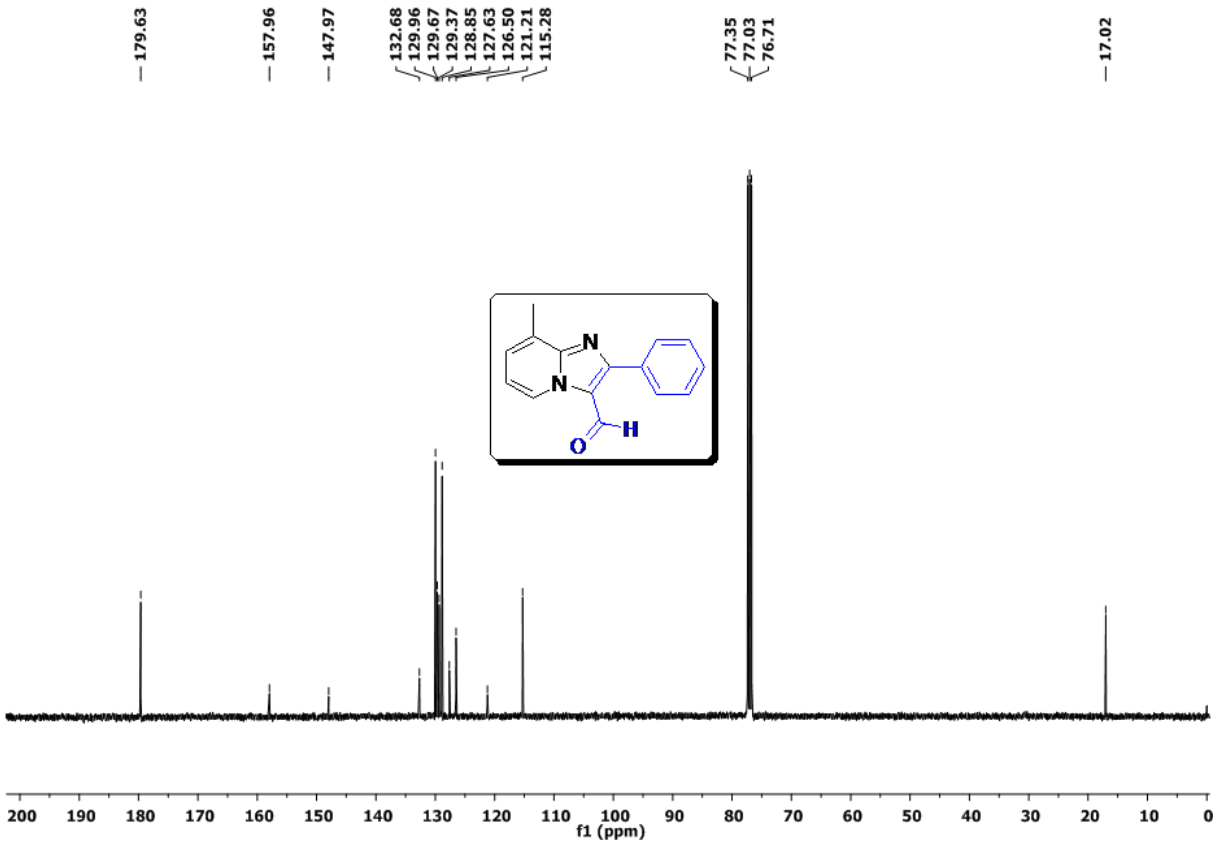
f1 (ppm)

^{1}H, ^{13}C and DEPT-135 NMR of 8-methyl-2-phenyl-imidazo[1,2-a]pyridine-3-carbaldehyde (3c):

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132.68
129.96
129.67
129.37
128.85
127.63
126.50
121.21
115.28
77.35
77.03
76.71
17.02
N
N
O
H
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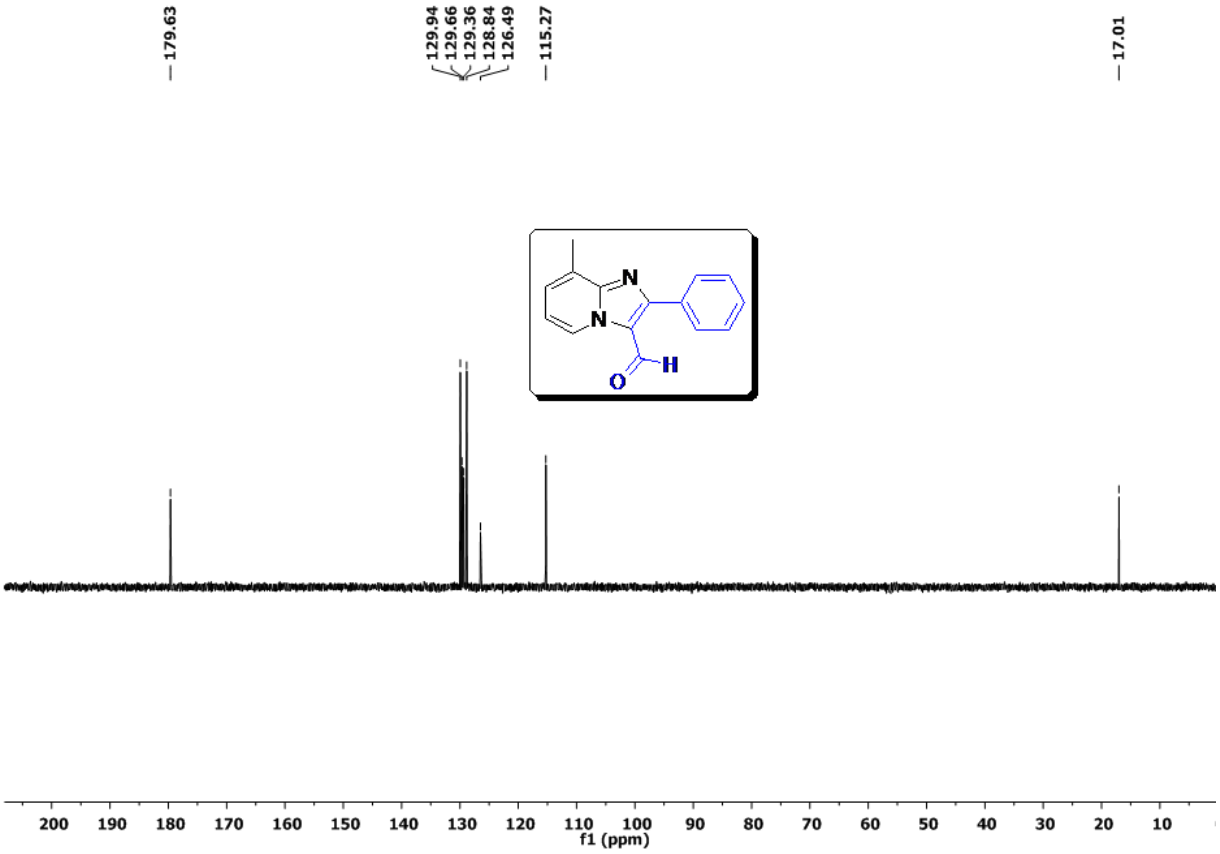
f1 (ppm)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126.49
115.27
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N
O
H
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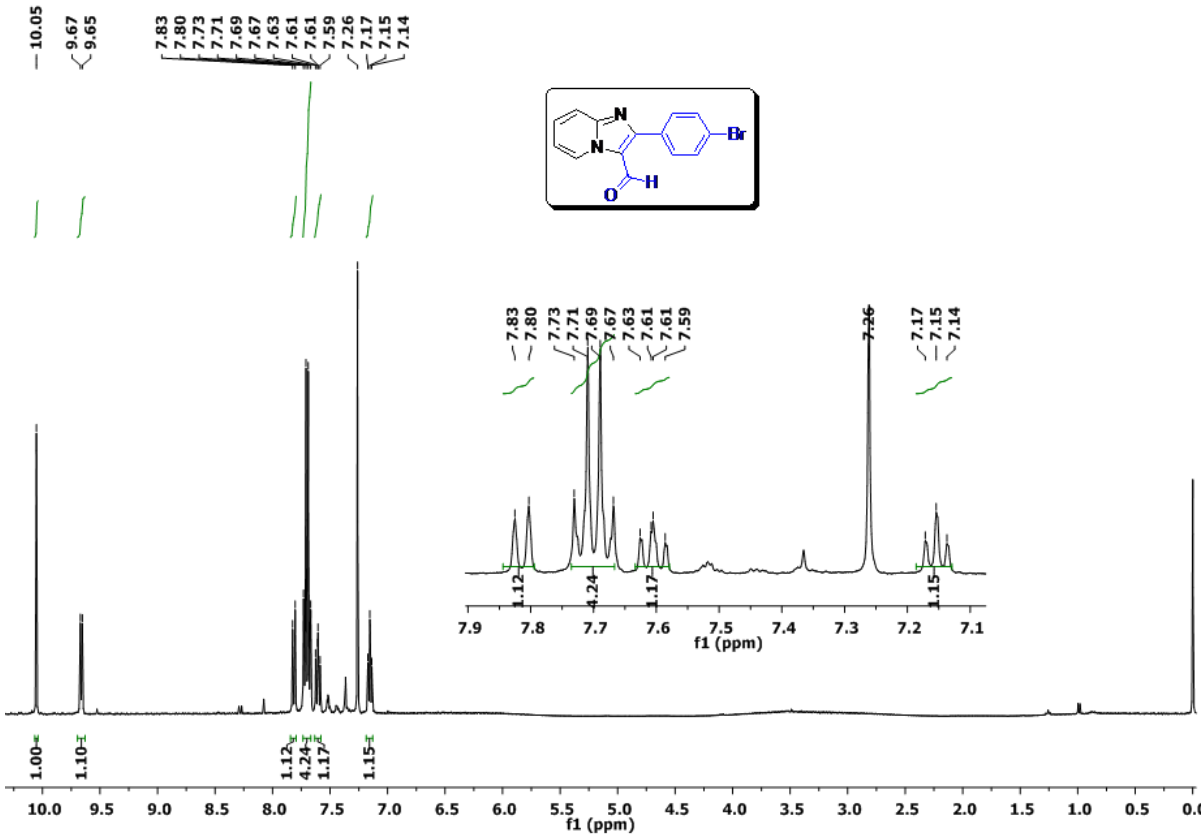
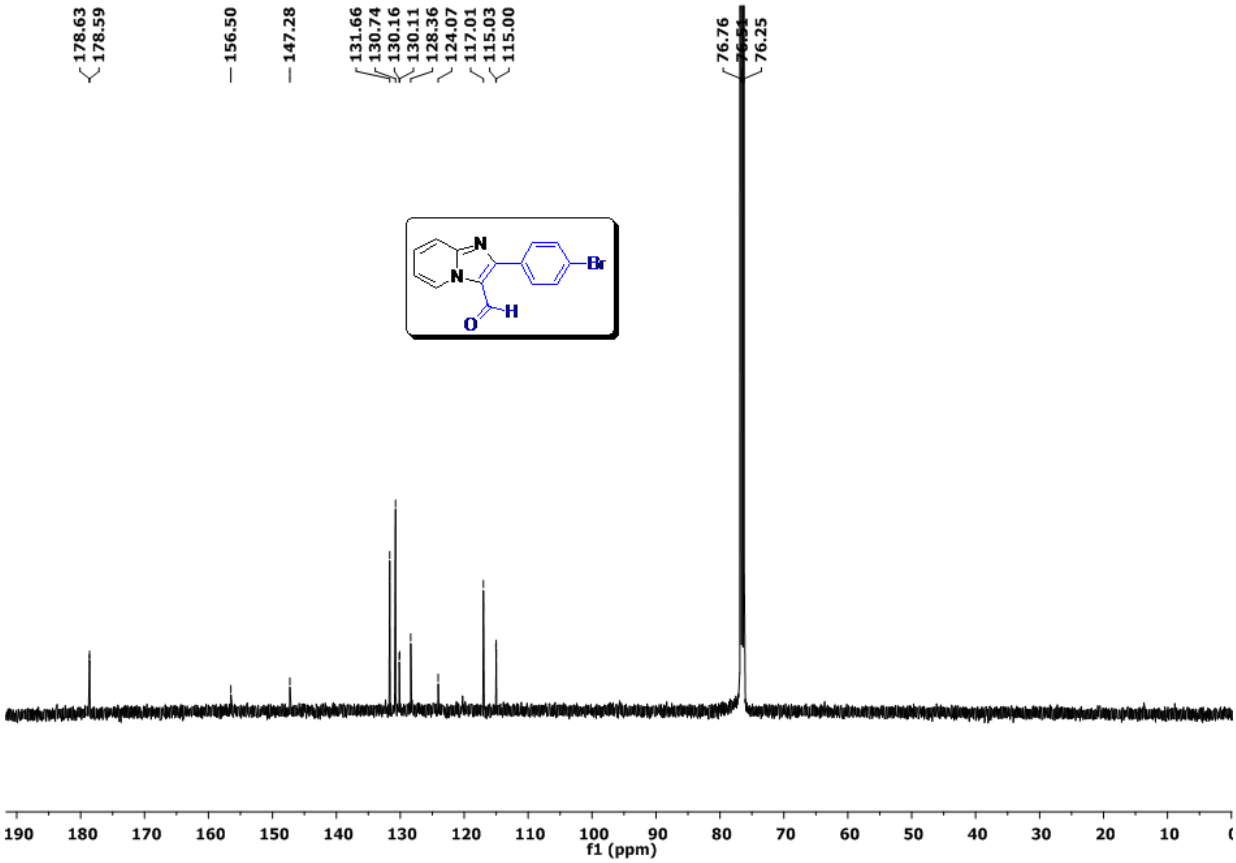
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

^{1}H, ^{13}C and DEPT-135 NMR of 2-(4-bromophenyl)imidazo[1,2-a]pyridine-3-carbaldehyde (3d):

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147.28
131.66
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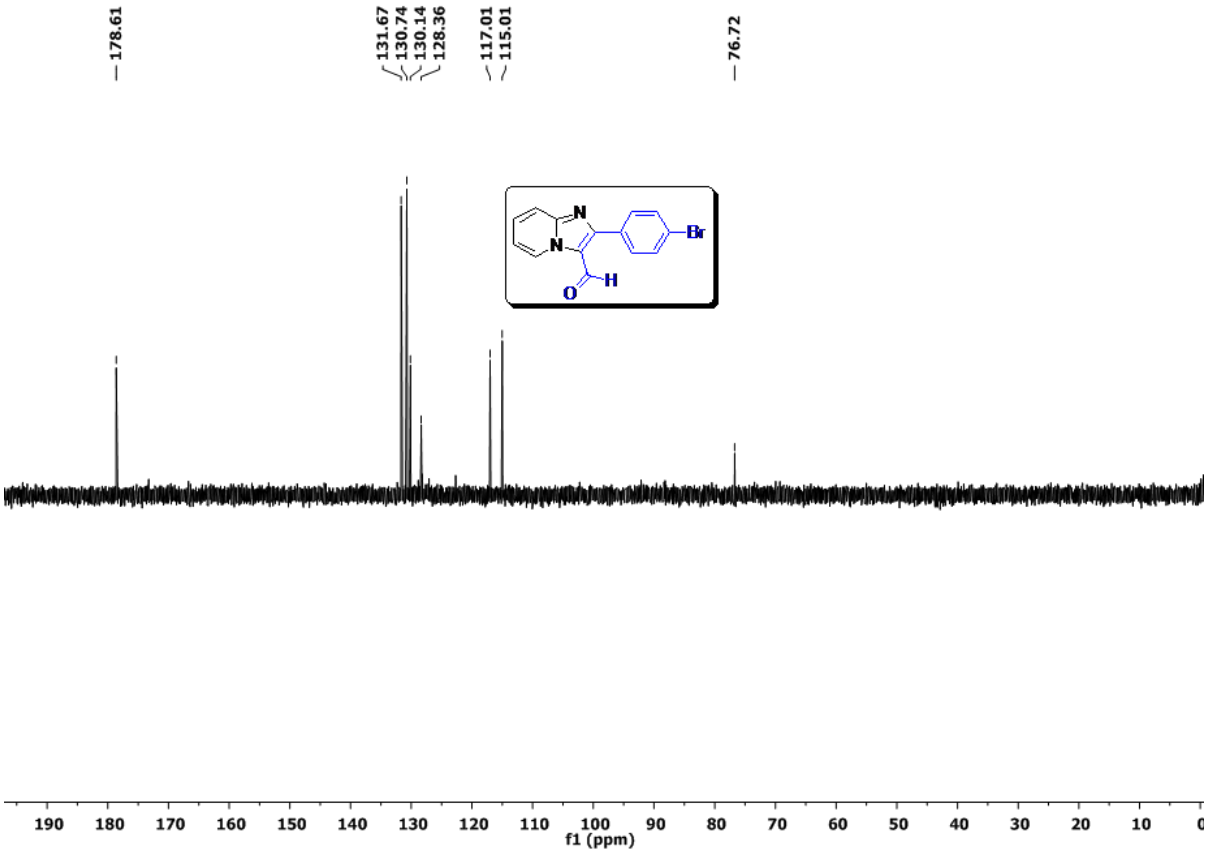
130.16
130.11
128.36
124.07
117.01
115.03
115.00
76.76
76.25
N
N
Br
O
H
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)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115.01
76.72
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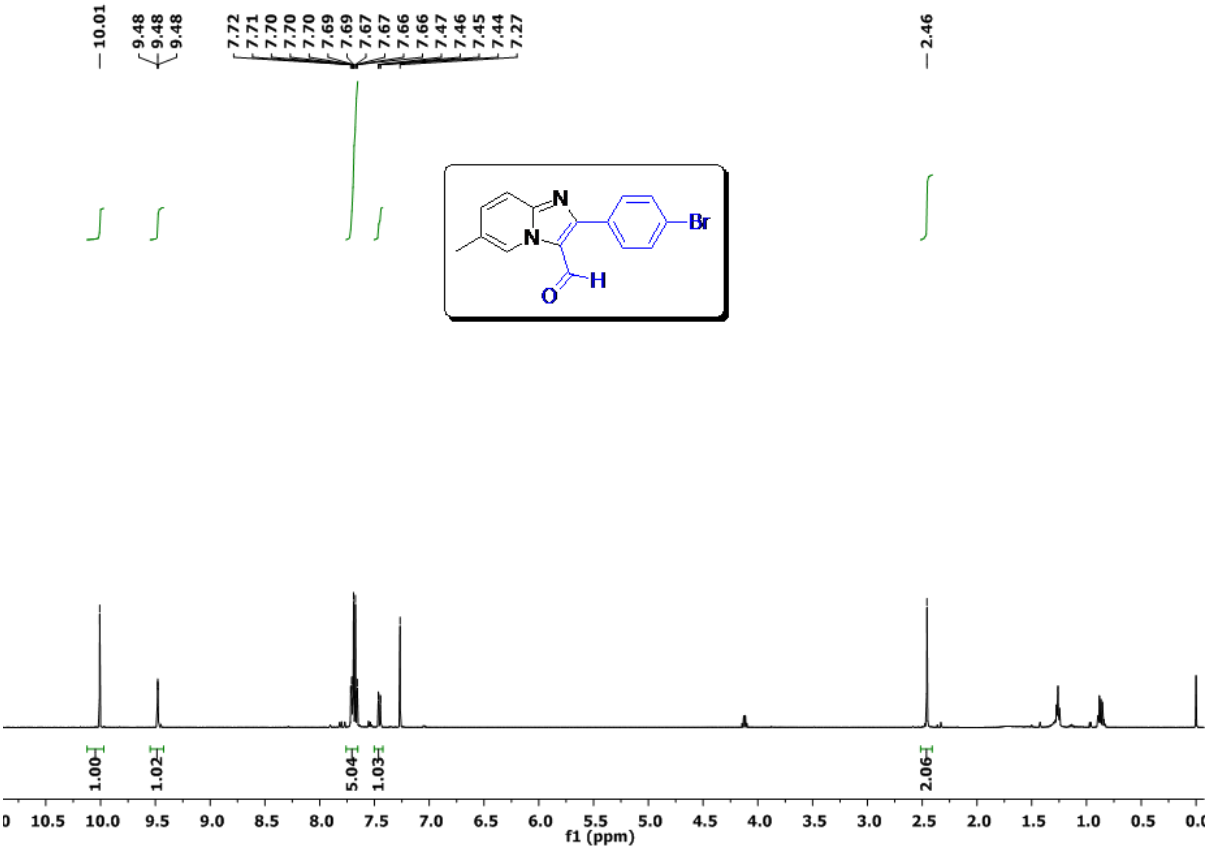
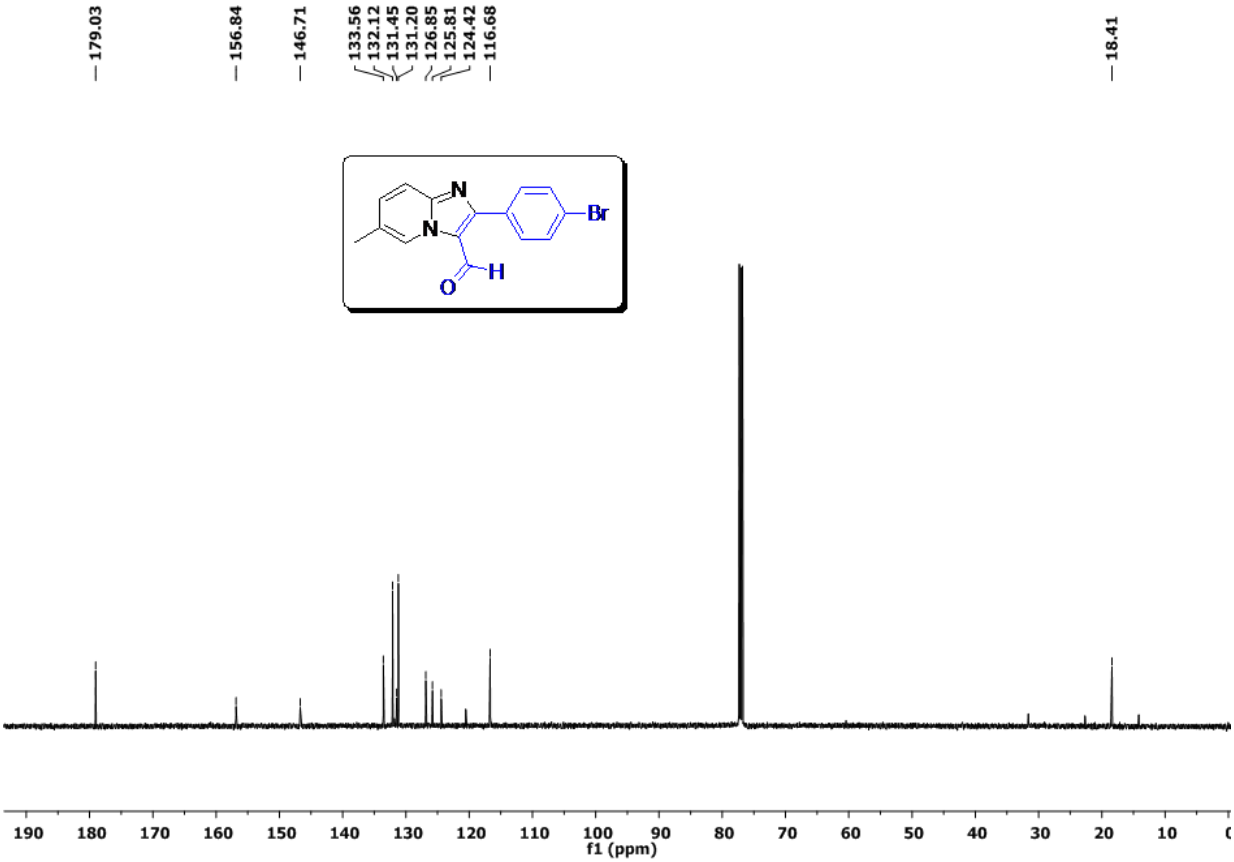
N
Br
O
H
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

^{1}H, ^{13}C and DEPT-135 NMR of 2-(4-bromophenyl)-6-methylimidazo[1,2-a]pyridine-3-carbaldehyde (3e):

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146.71
133.56
132.12
131.45
131.20
126.85
125.81
124.42
116.68
18.41
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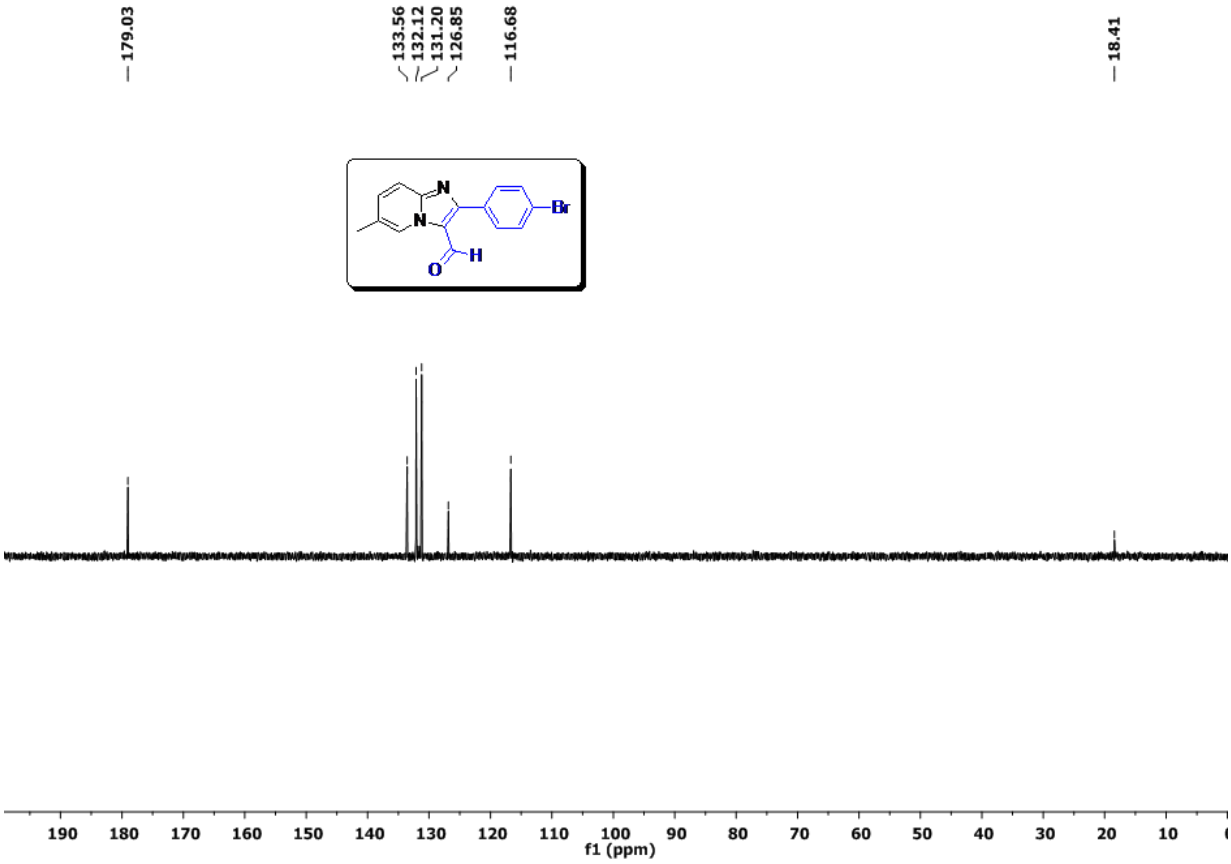
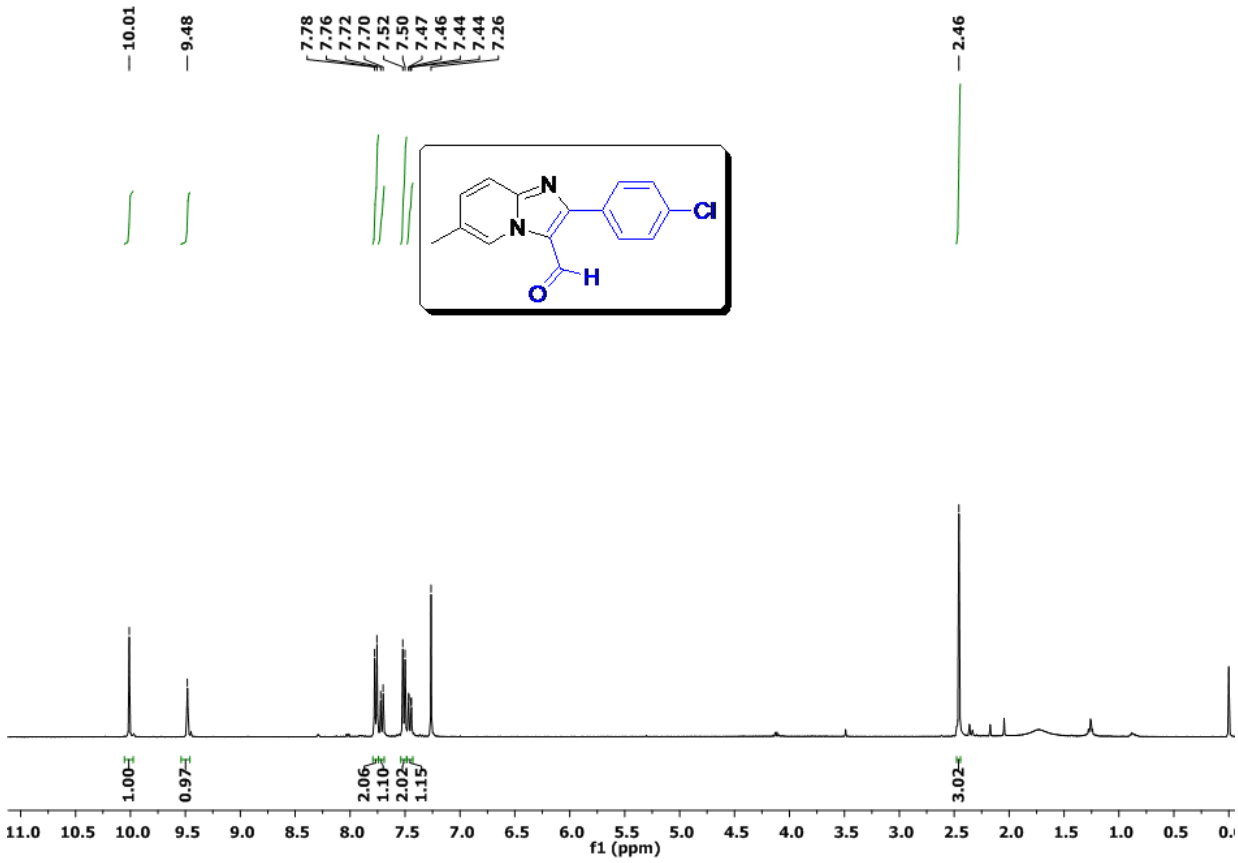
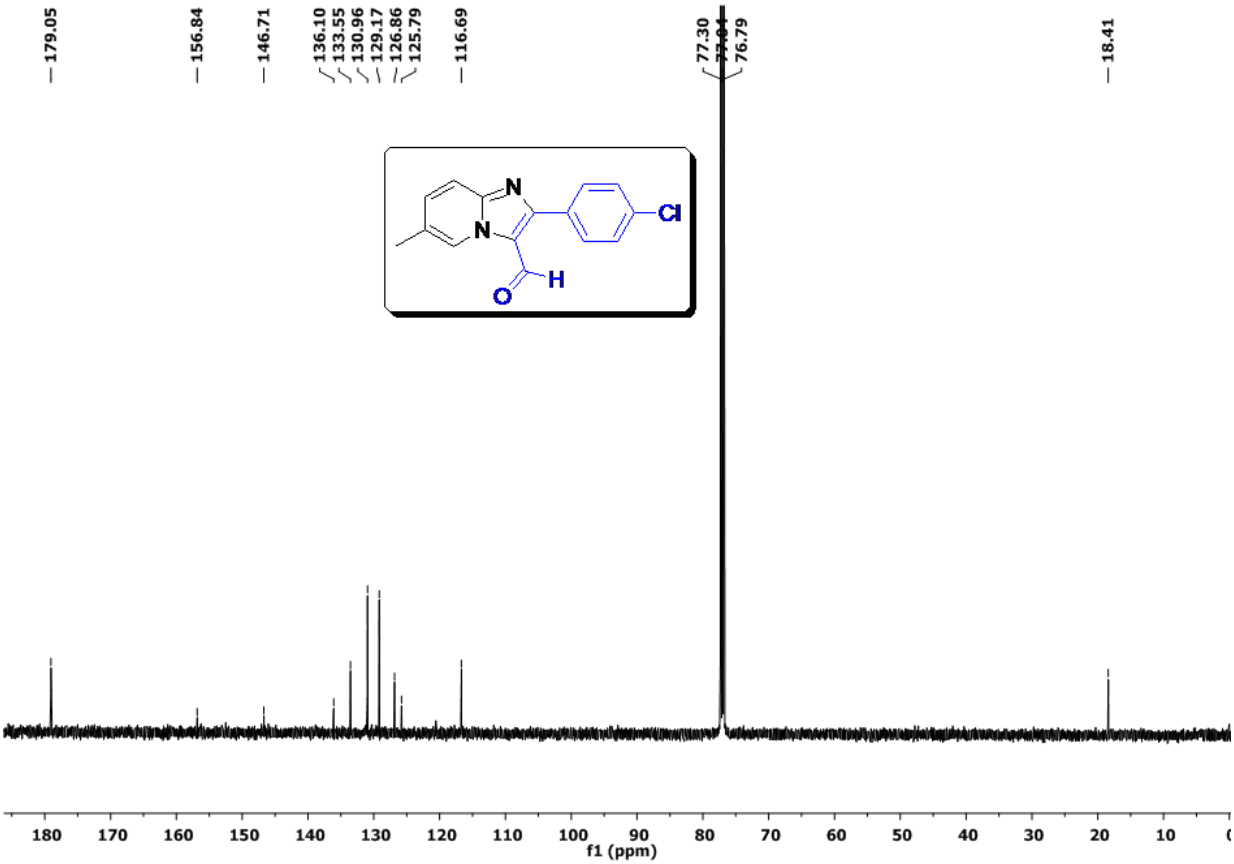
N
Br
O
H
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


179.03
133.56
132.12
131.20
126.85
116.68
18.41
N
N
Br
O
H
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

^{1}H, ^{13}C and DEPT-135 NMR of 2-(4-chlorophenyl)-6-methylimidazo[1,2-a]pyridine-3-carbaldehyde (3f):

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136.10
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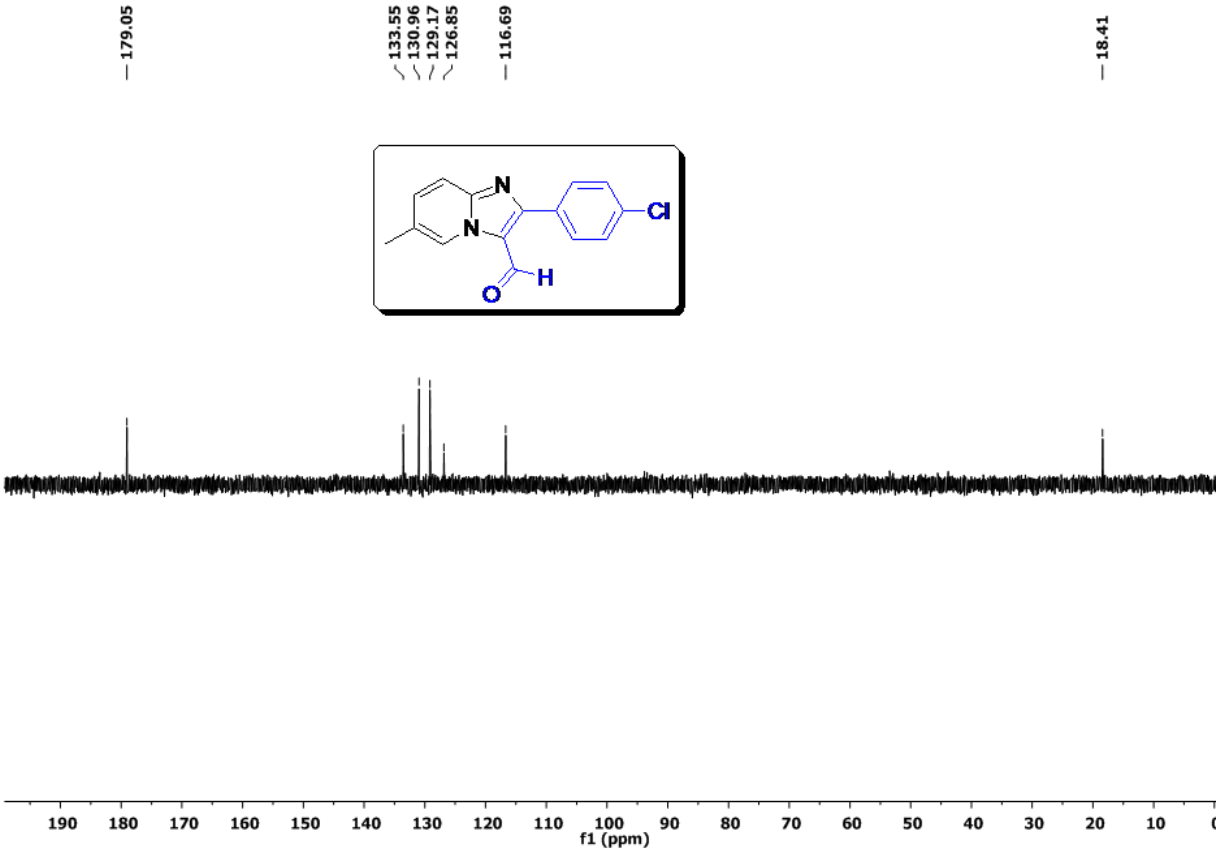
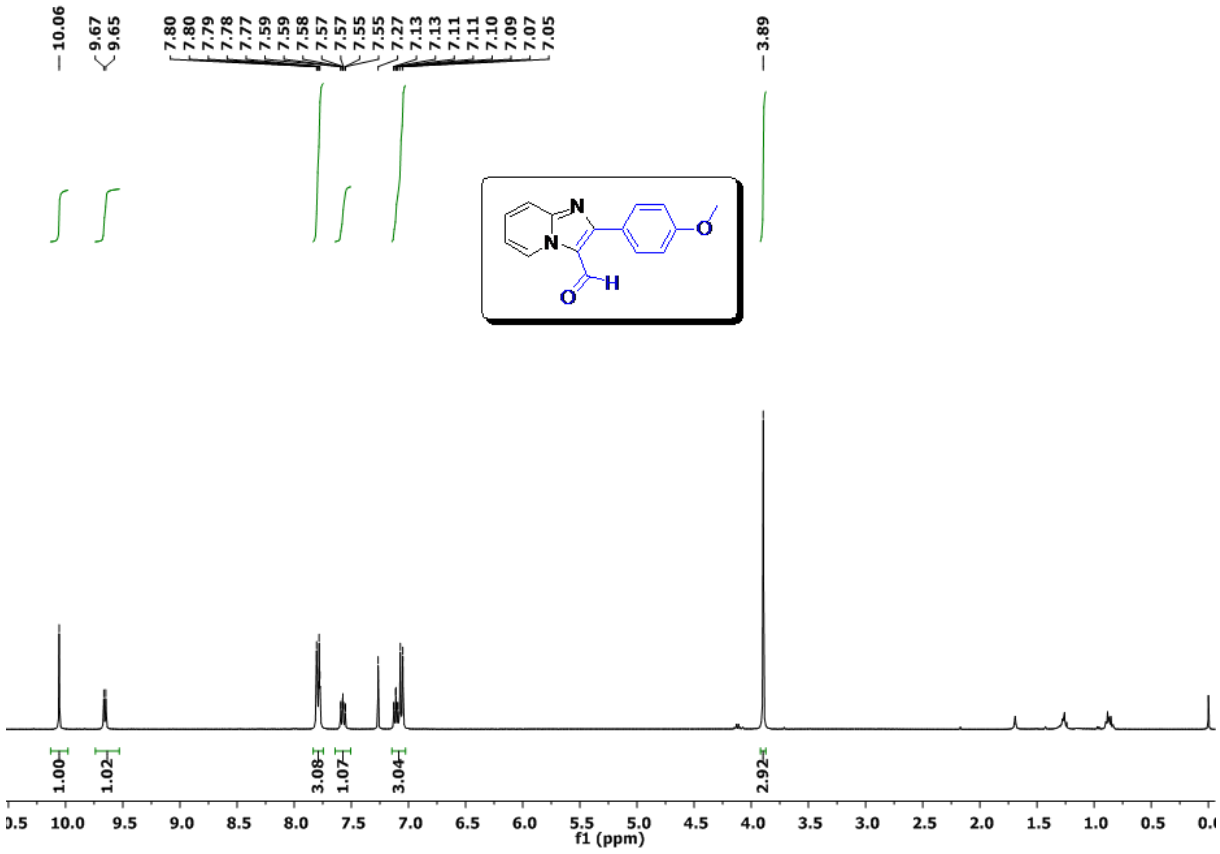
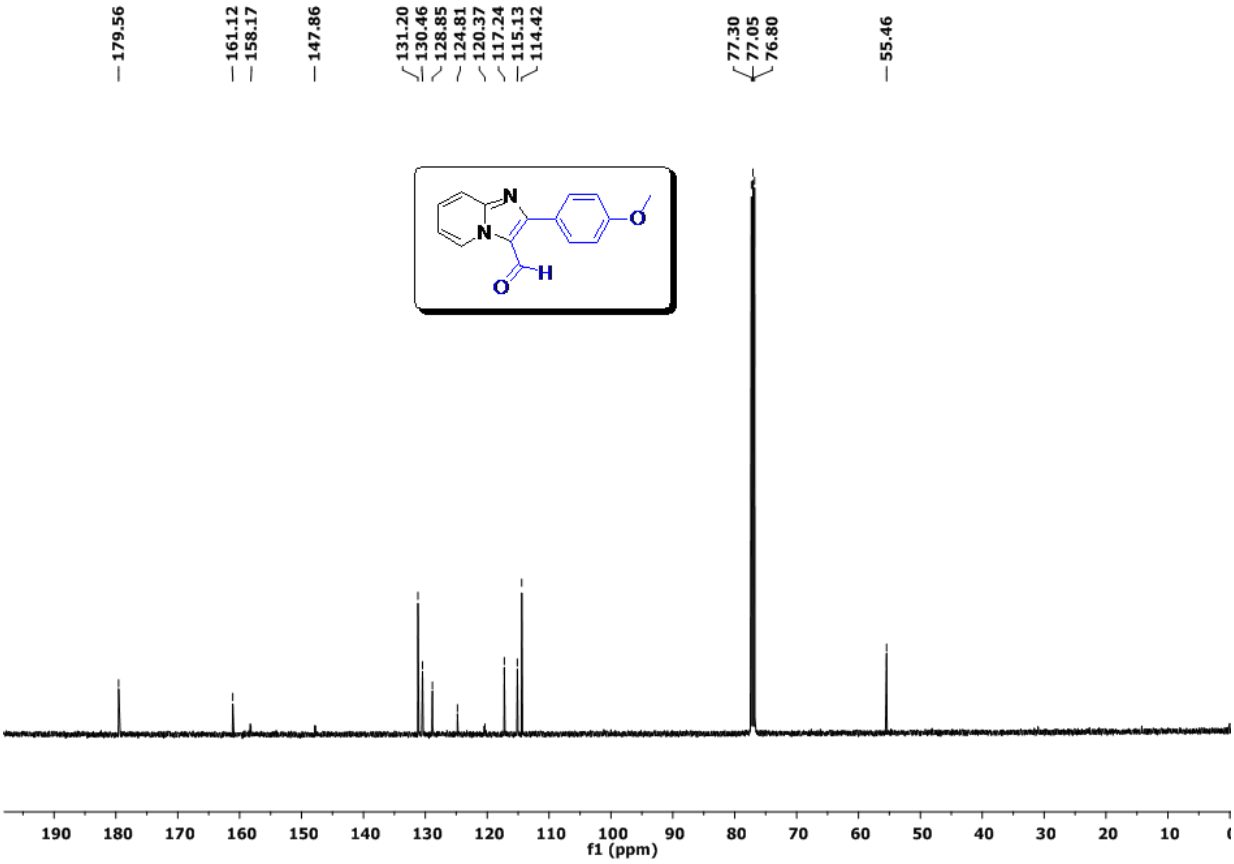
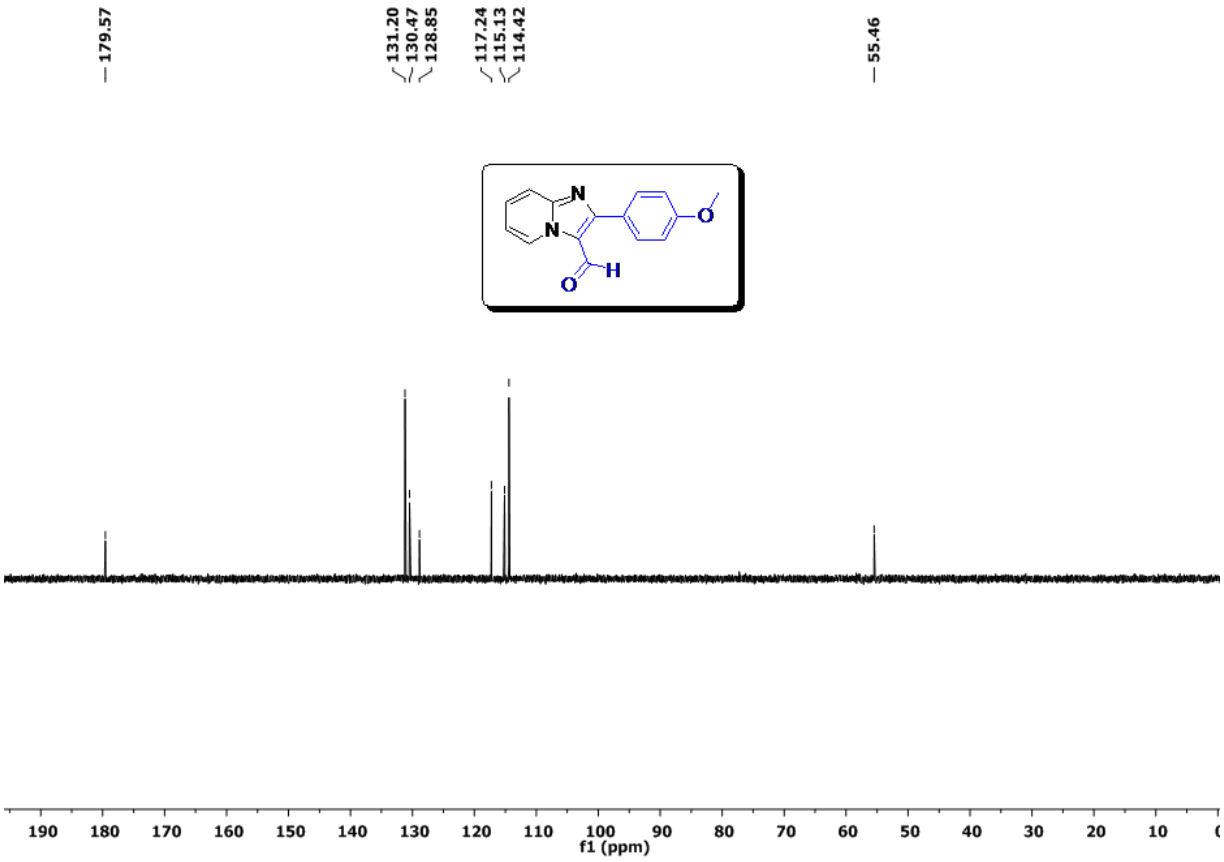
116.69
77.30
77.04
76.79
18.41
N
N
Cl
O
H
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


179.05
133.55
130.96
129.17
126.85
116.69
18.41
N
N
Cl
O
H
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

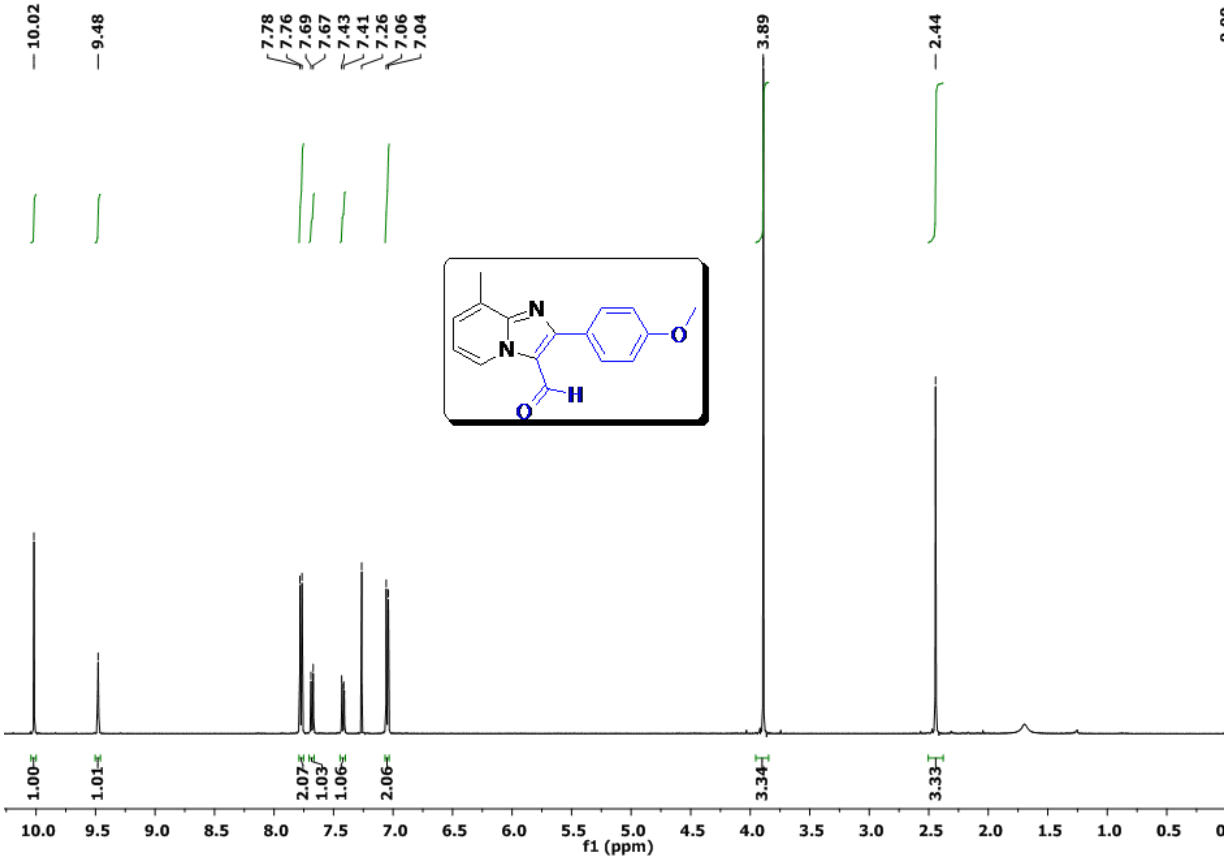
^{1}H, ^{13}C and DEPT-135 NMR of 2-(4-methoxyphenyl)imidazo[1,2-a]pyridine-3-carbaldehyde (3g):

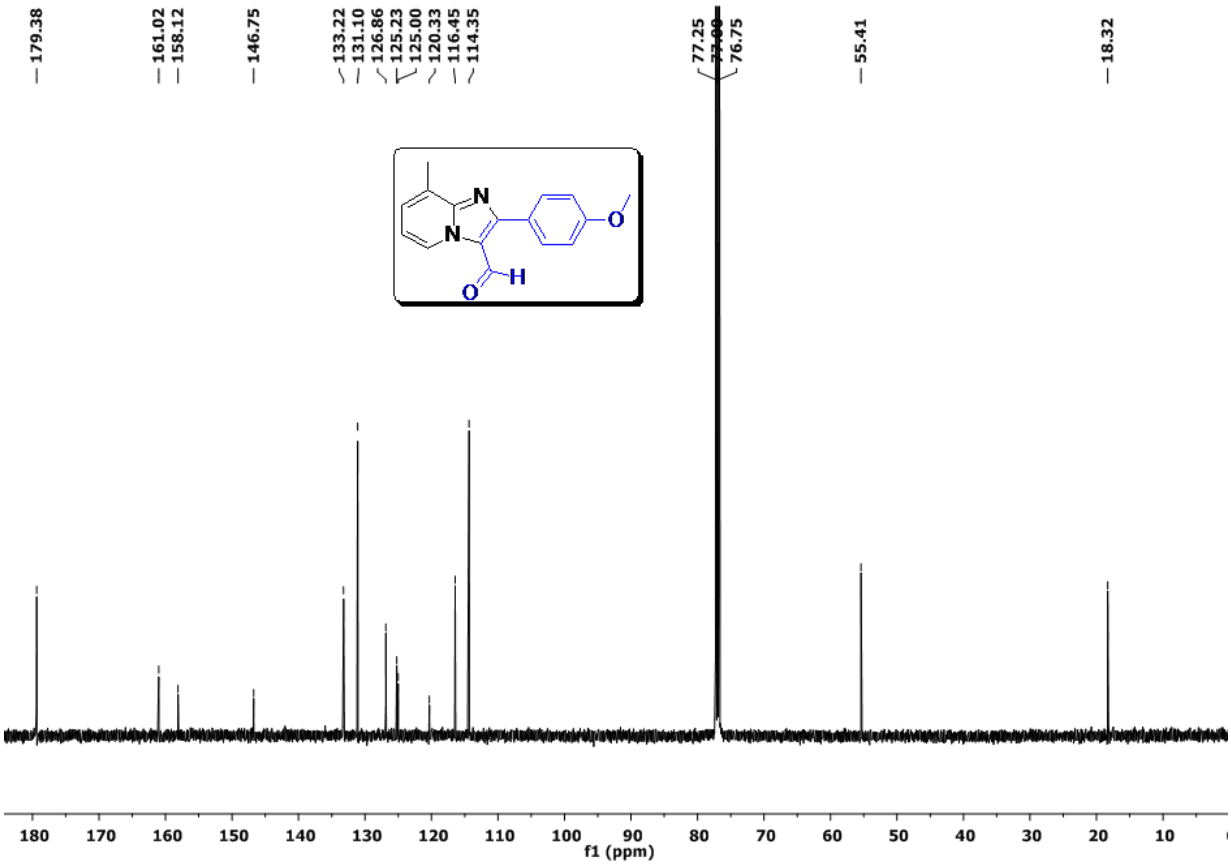



179.56
161.12
158.17
147.86
131.20
130.46
128.85
124.81
120.37
117.24
115.13
114.42
77.30
77.05
76.80
55.46
N
N
O
O
H
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


179.57
131.20
130.47
128.85
117.24
115.13
114.42
55.46
N
N
O
O
H
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

^{1}H, ^{13}C and DEPT-135 NMR of 2-(4-methoxyphenyl)-8-methylimidazo[1,2-a]pyridine-3-carbaldehyde (3h):

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120.33
116.45
114.35
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77.00
76.75
55.41
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N
N
O
O
H
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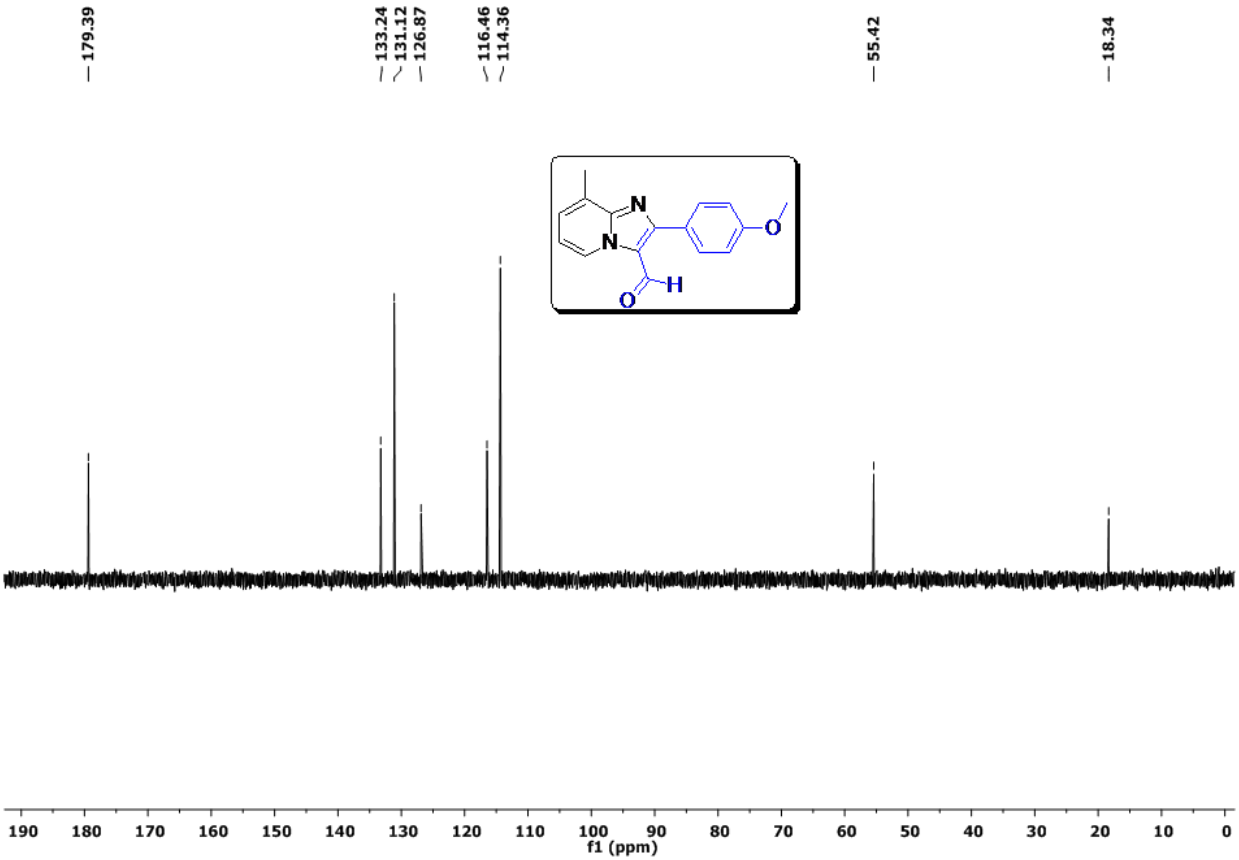
60
50
40
30
20
10
f1 (ppm)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131.12
126.87
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114.36
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O
O
H
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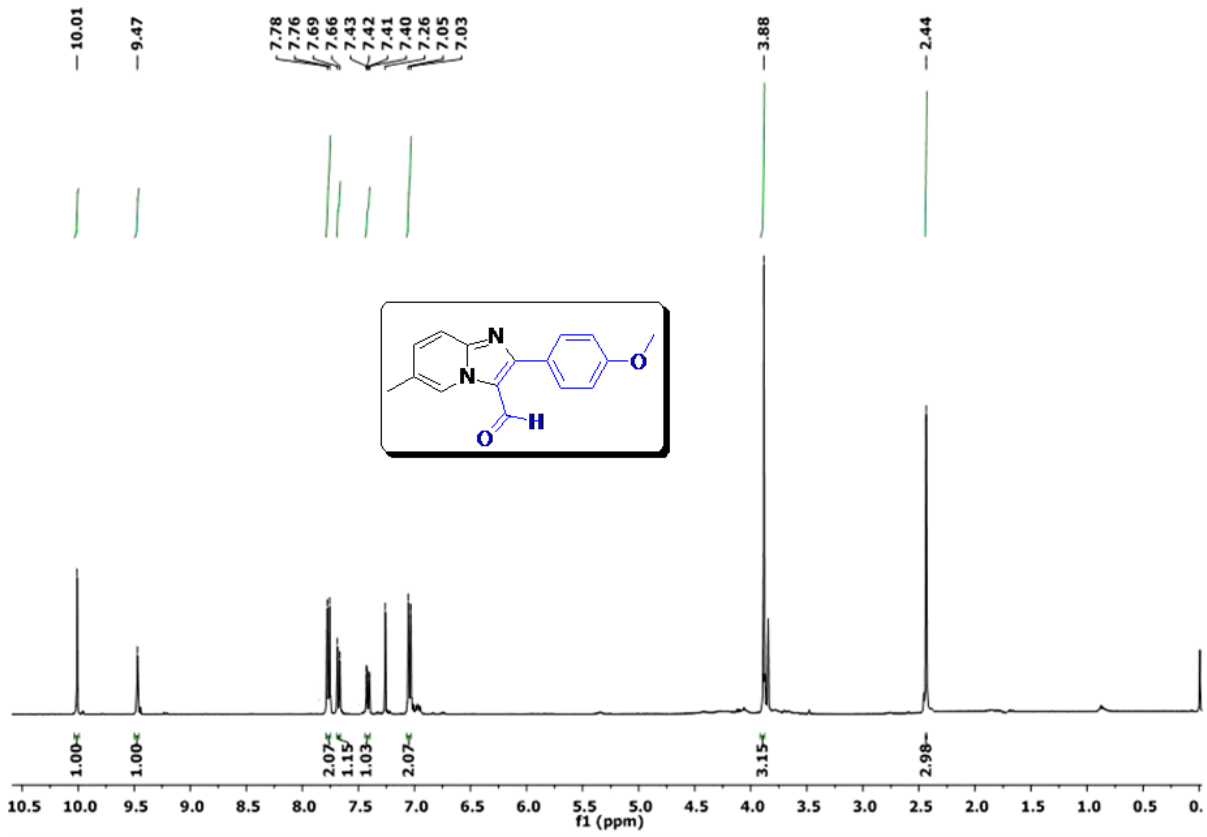
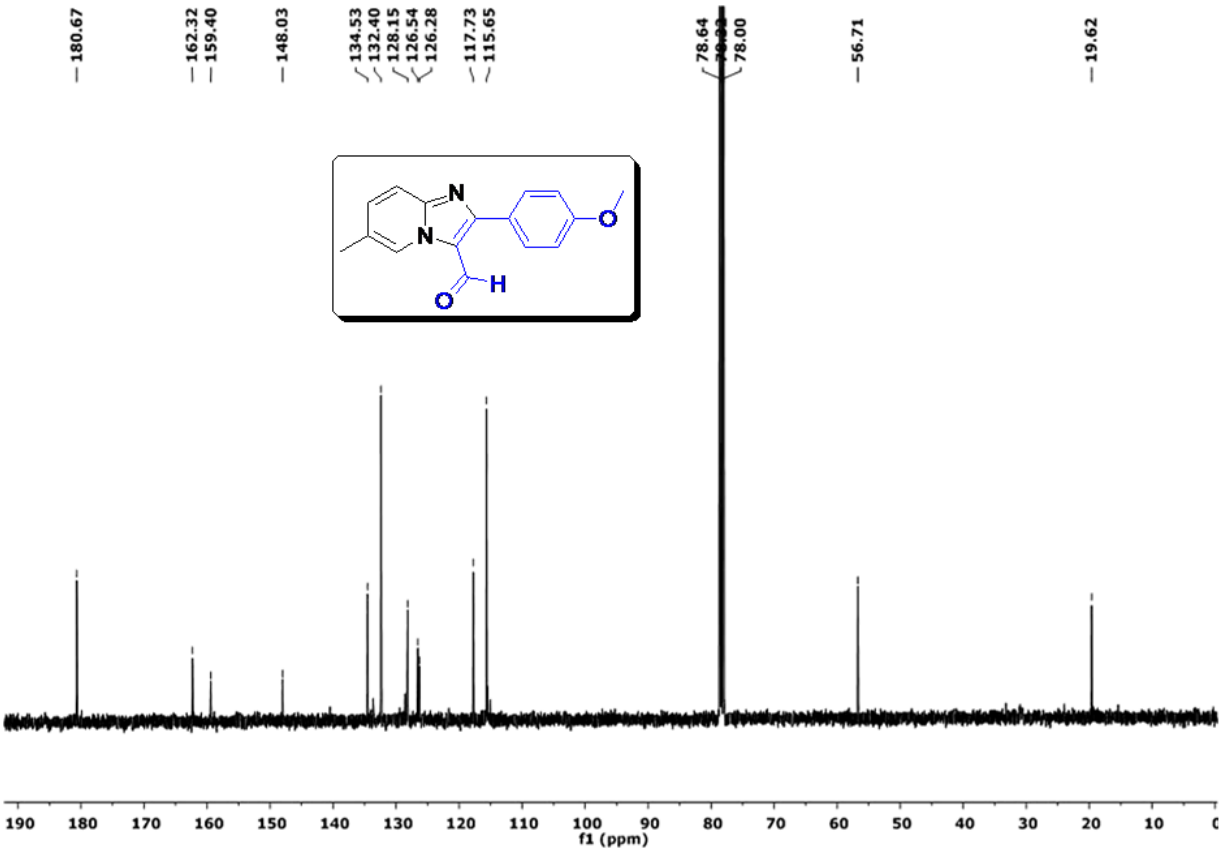
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

^{1}H, ^{13}C and DEPT-135 NMR of 2-(4-methoxyphenyl)-6-methylimidazo[1,2-a]pyridine-3-carbaldehyde (3i):




180.67
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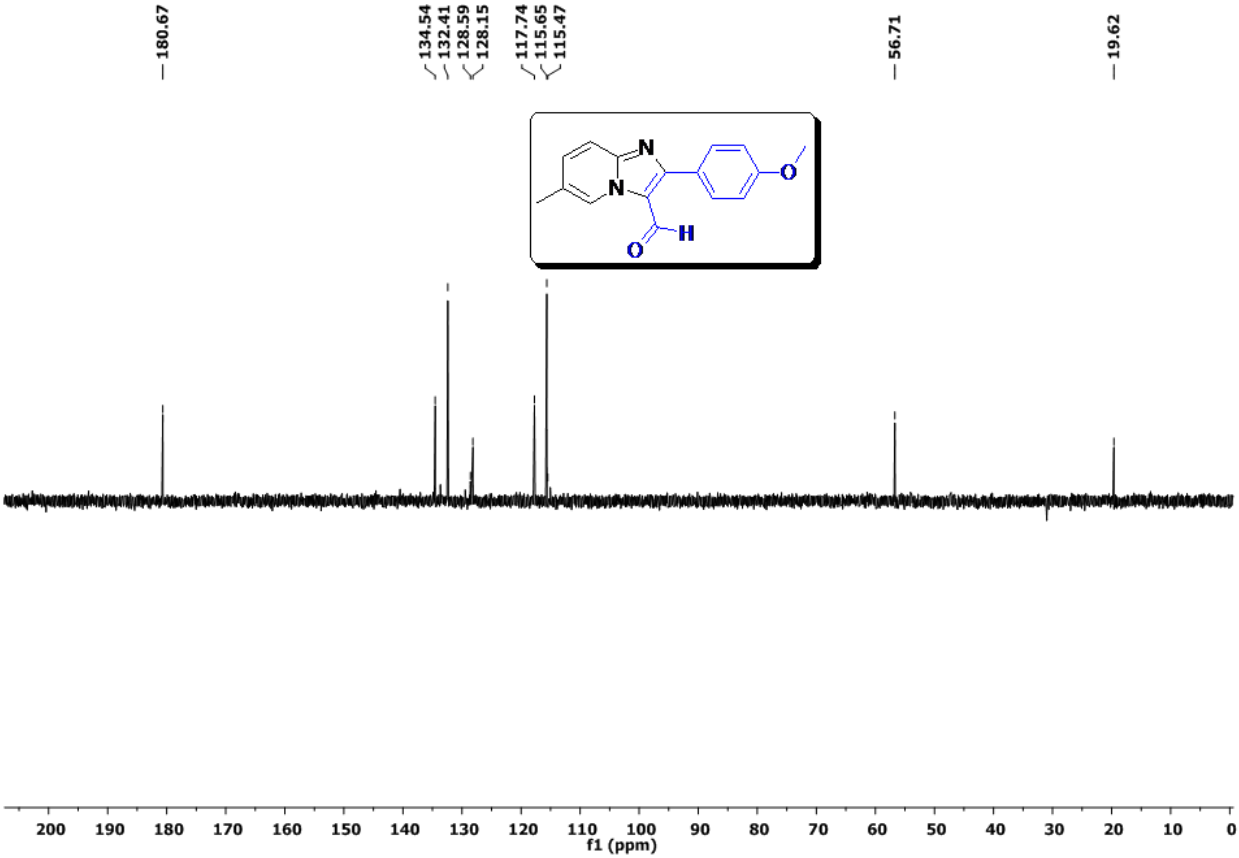
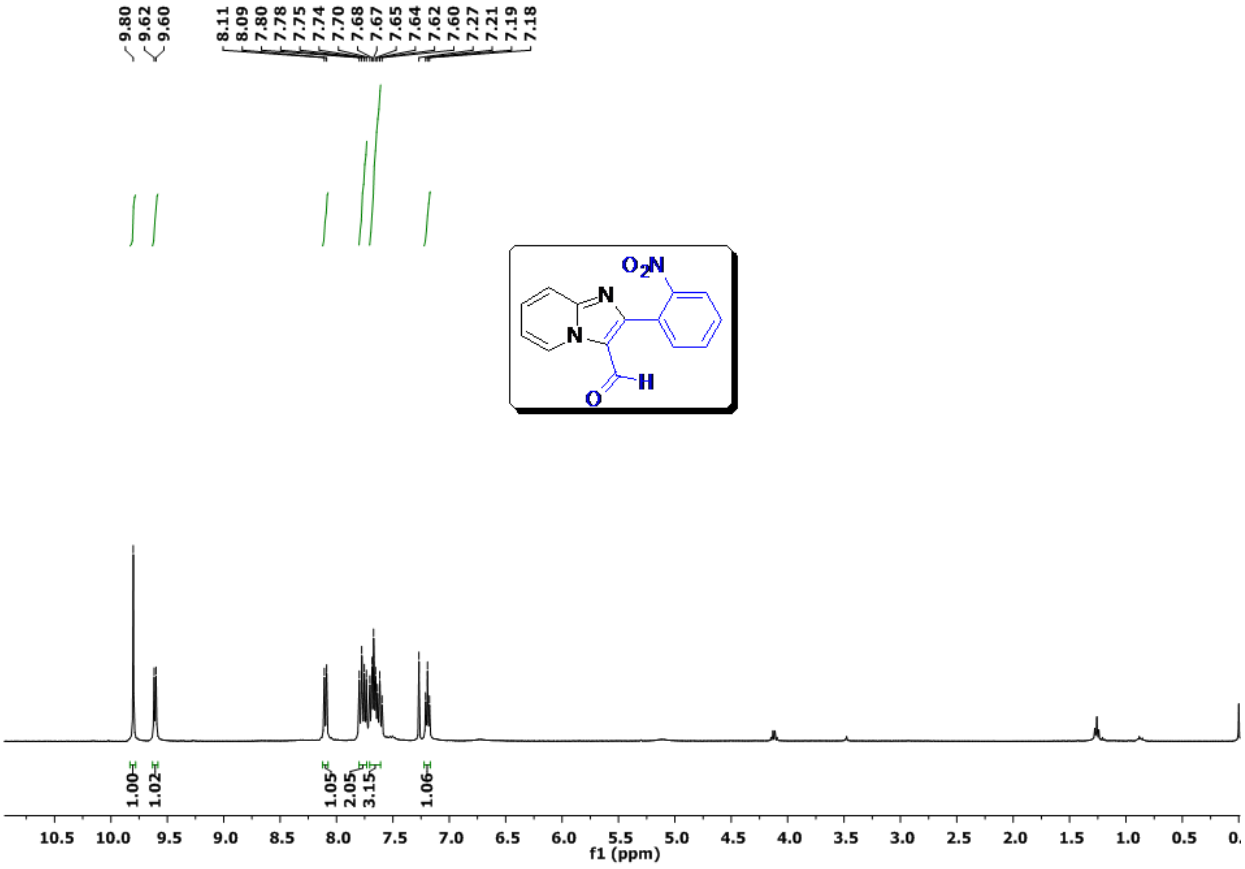
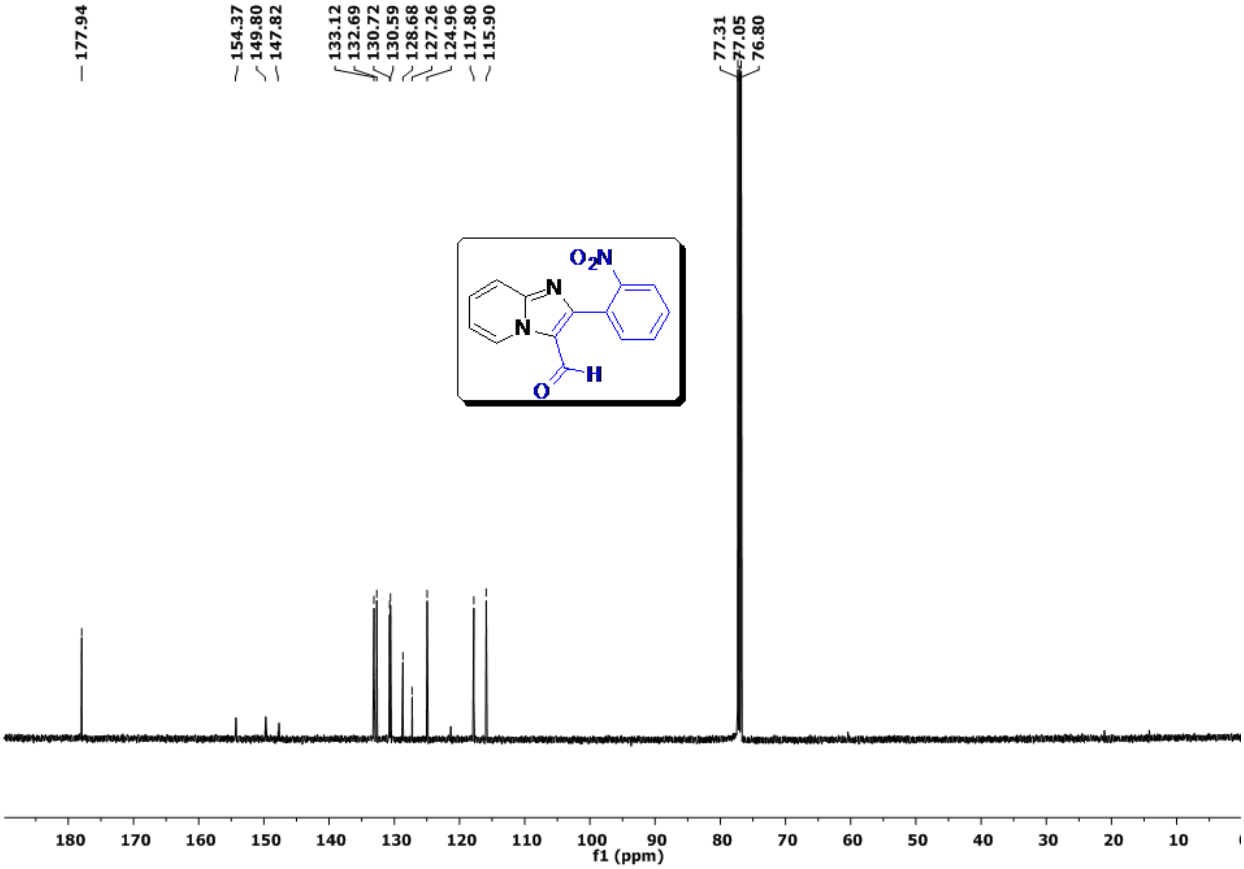
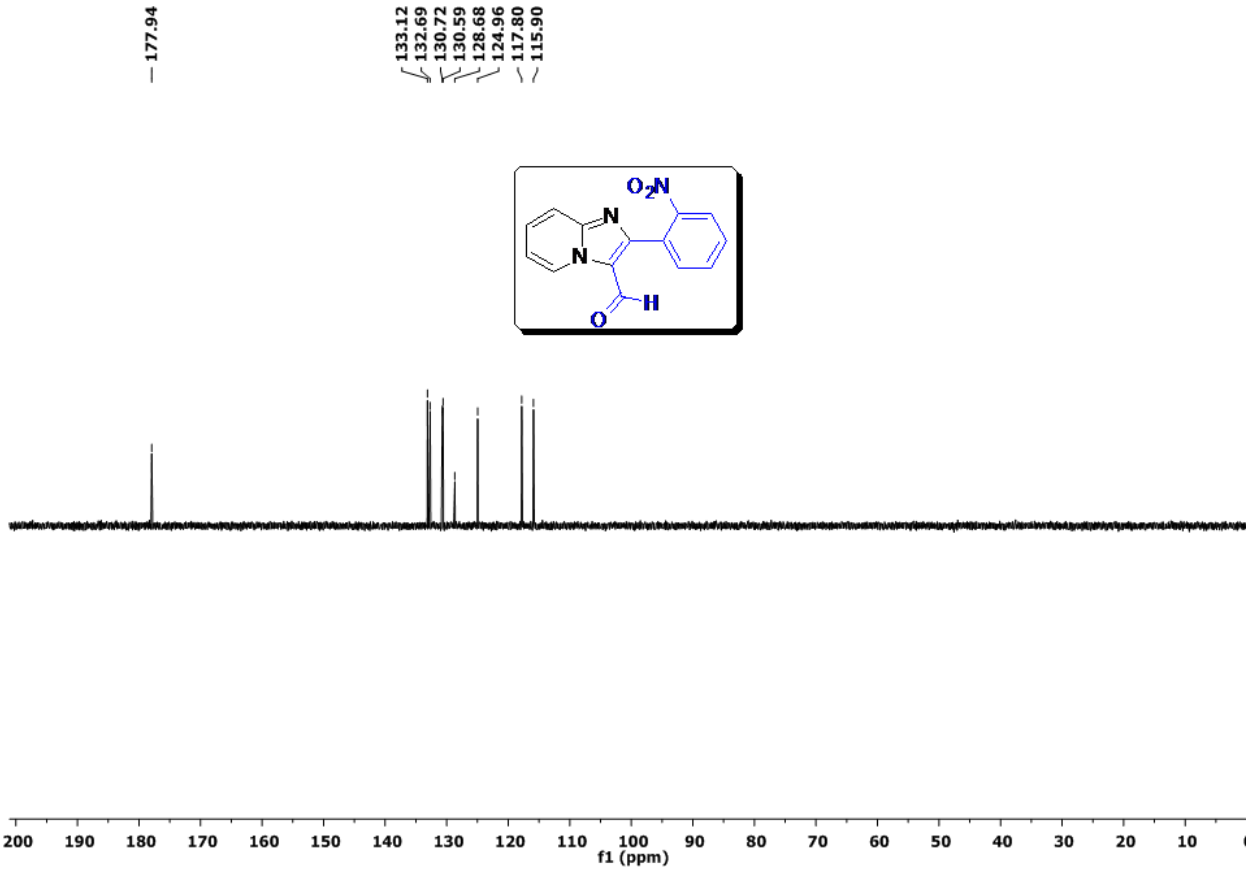
148.03
134.53
132.40
128.15
126.54
126.28
117.73
115.65
78.64
78.00
56.71
19.62
N
N
O
O
H
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


180.67
134.54
132.41
128.59
128.15
117.74
115.65
115.47
56.71
19.62
N
N
O
O
H
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

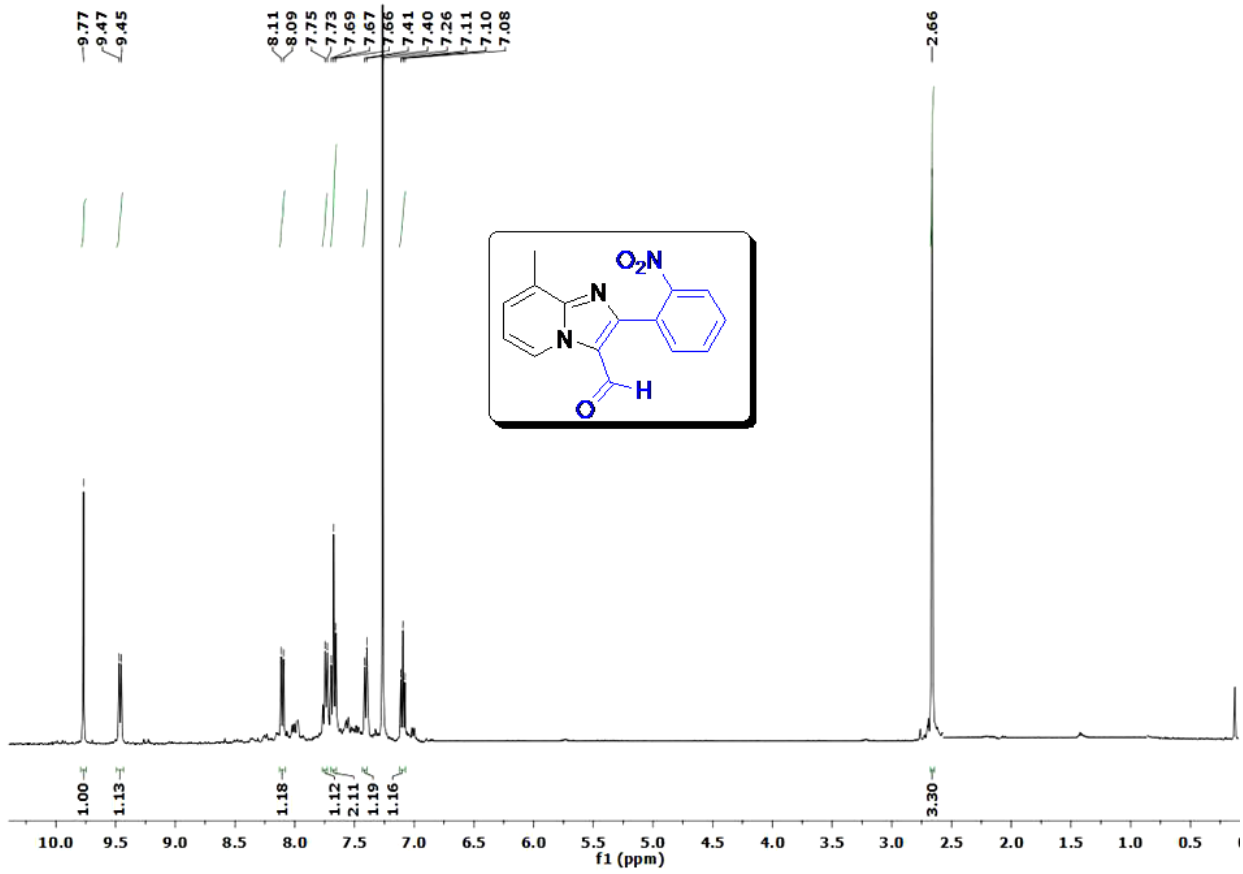
^{1}H, ^{13}C and DEPT-135 NMR of 2-(2-nitrophenyl)imidazo[1,2-a]pyridine-3-carbaldehyde (3j):

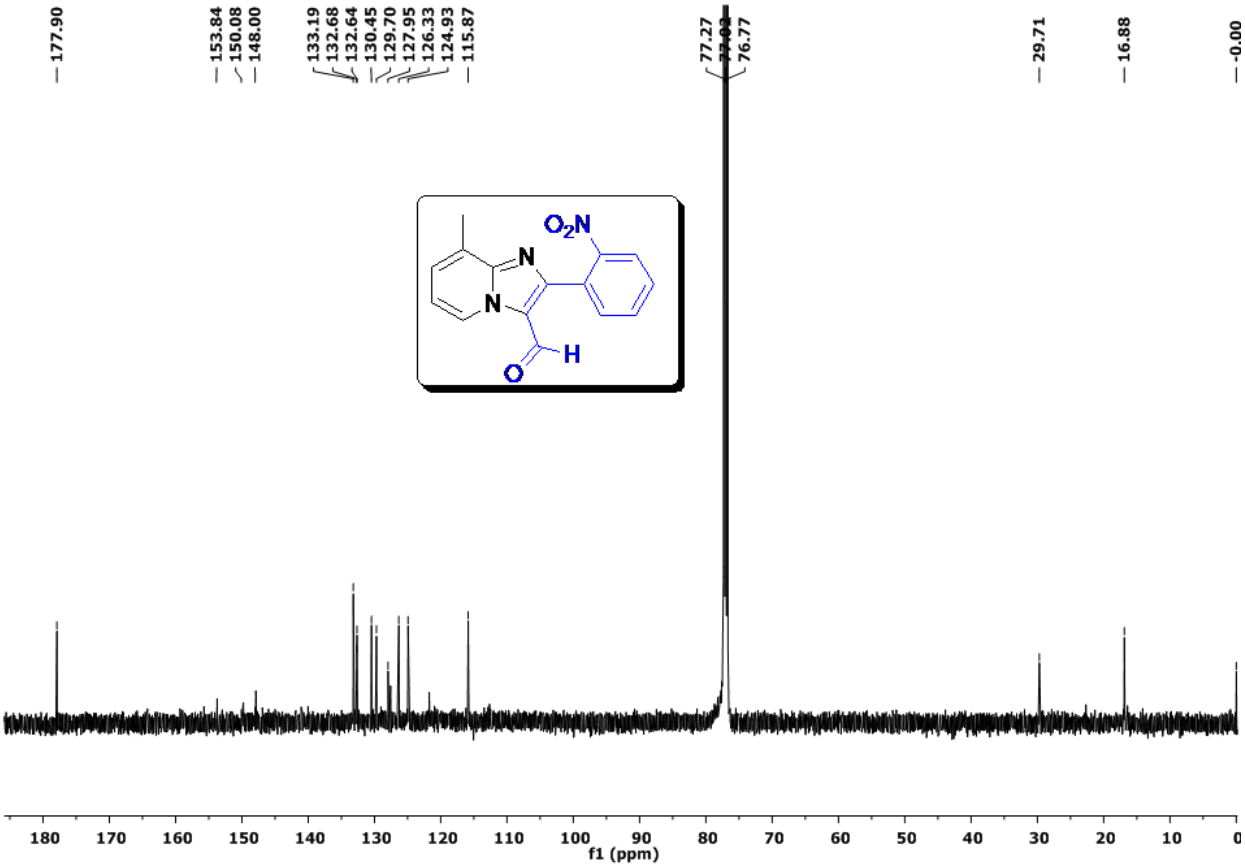


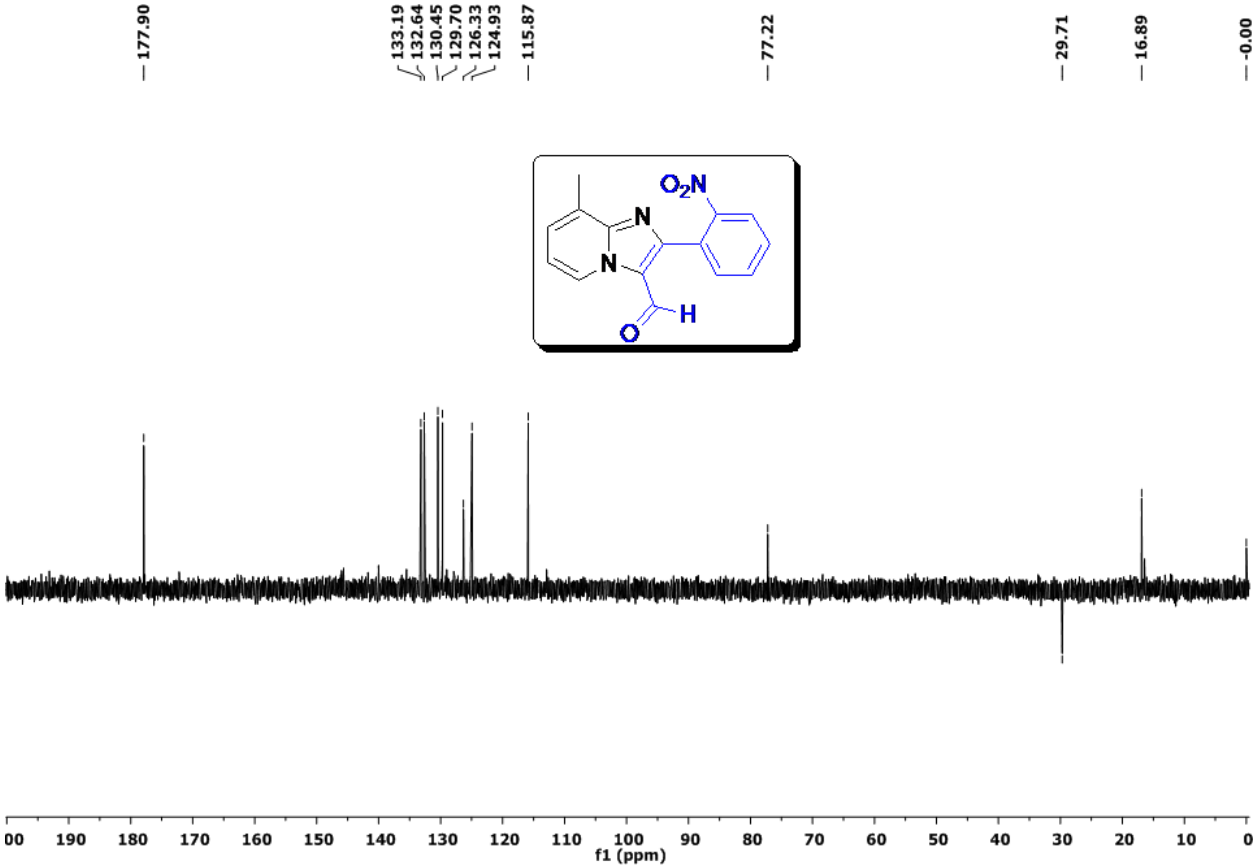

177.94
154.37
149.80
147.82
133.12
132.69
130.72
130.59
128.68
127.26
124.96
117.80
115.90
77.31
77.05
76.80
O2N
N
N
O
H
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


177.94
133.12
132.69
130.72
130.59
128.68
124.96
117.80
115.90
O2N
N
N
O
H
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

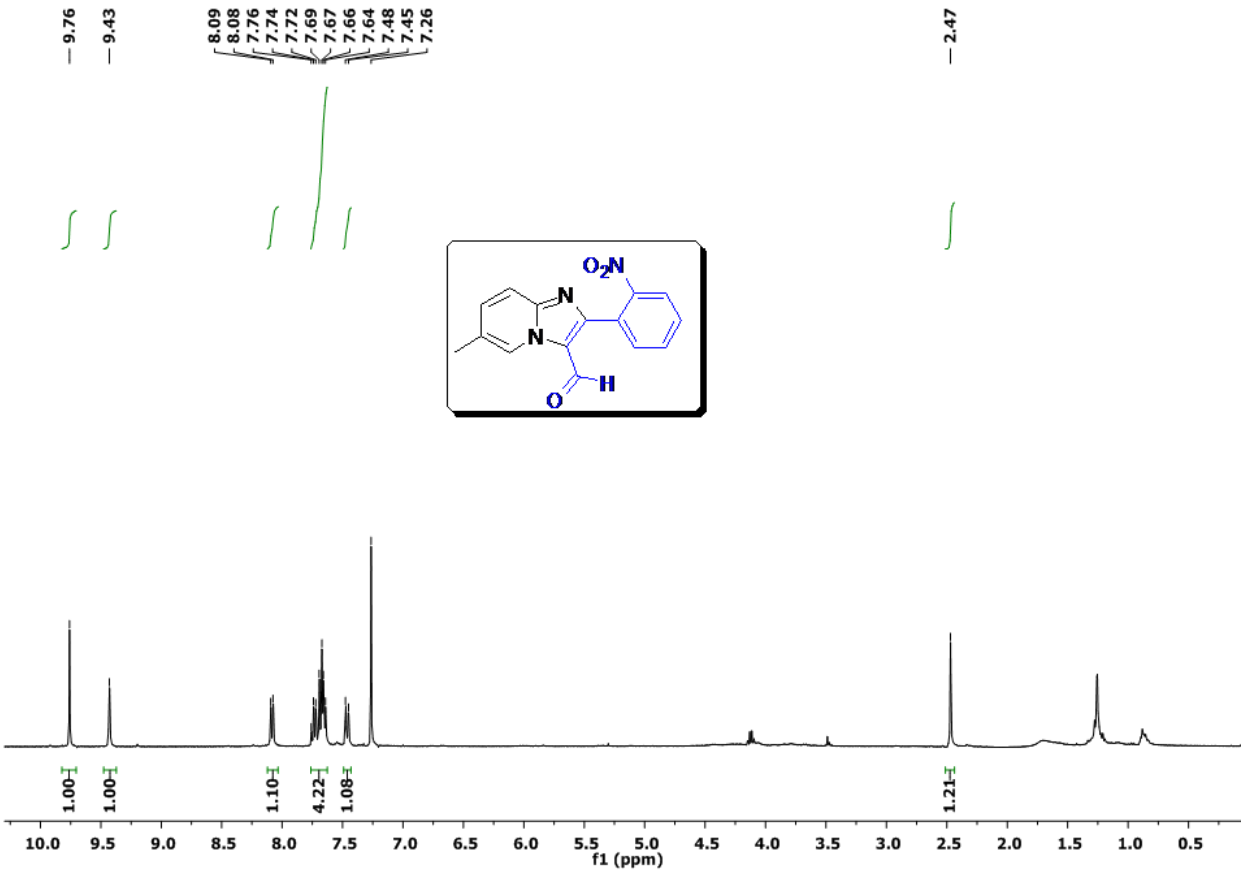
^{1}H, ^{13}C and DEPT-135 NMR of 2-(2-nitrophenyl)imidazo[1,2-a]pyridine-carbaldehyde (3k):

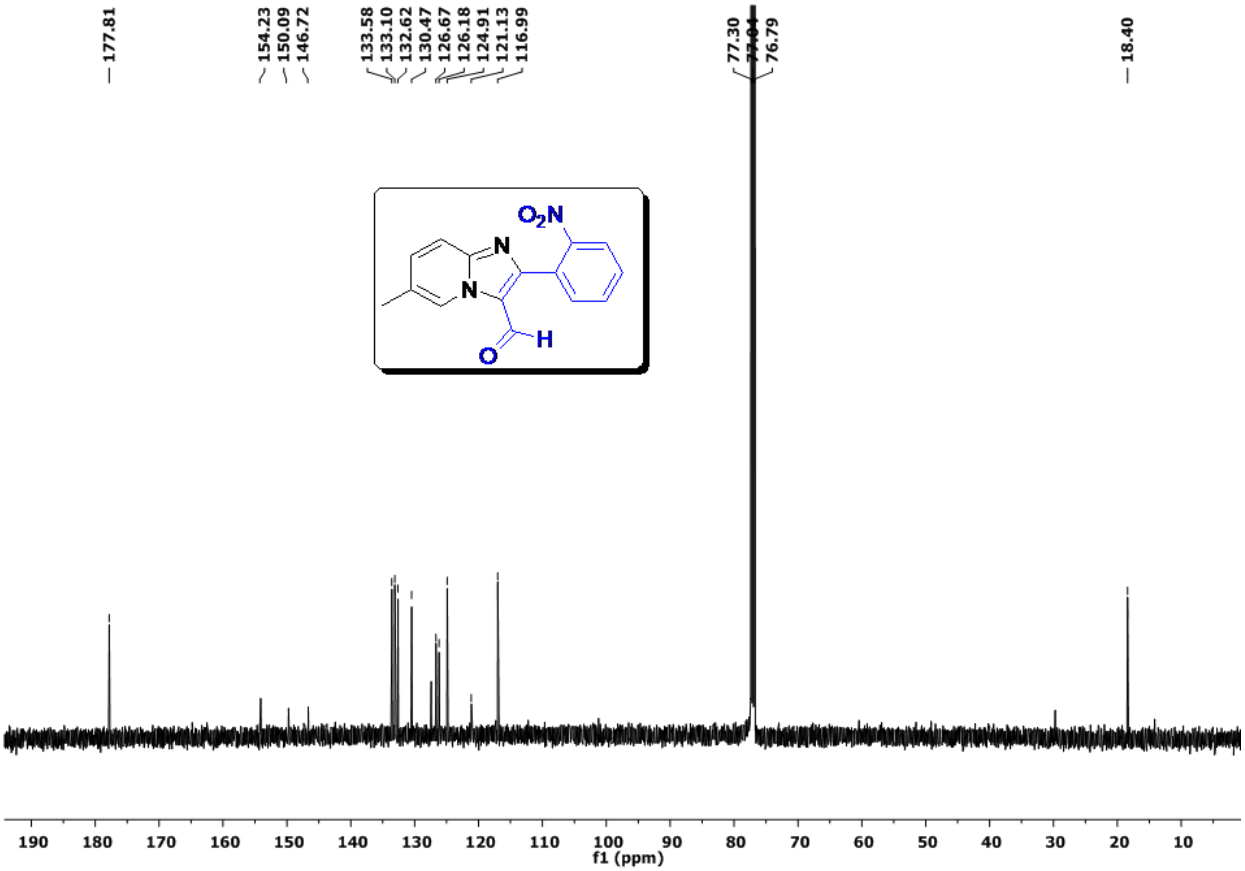


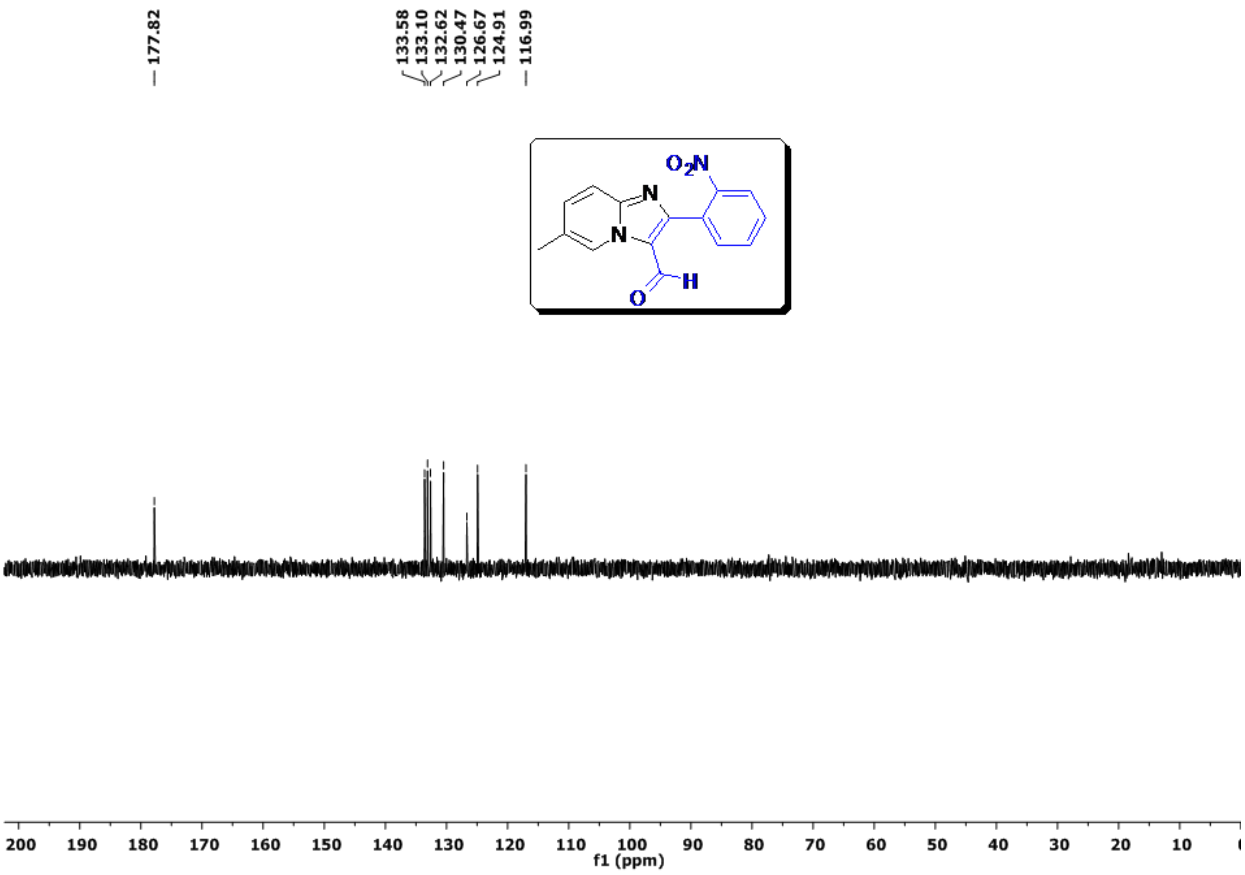

177.90
153.84
150.08
148.00
133.19
132.68
132.64
130.45
129.70
127.95
126.33
124.93
115.87
77.27
77.02
76.77
29.71
16.88
-0.00
O2N
N
N
H
O
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


177.90
133.19
132.64
130.45
129.70
126.33
124.93
115.87
77.22
29.71
16.89
0.00
O2N
N
N
O
H
f1 (ppm)

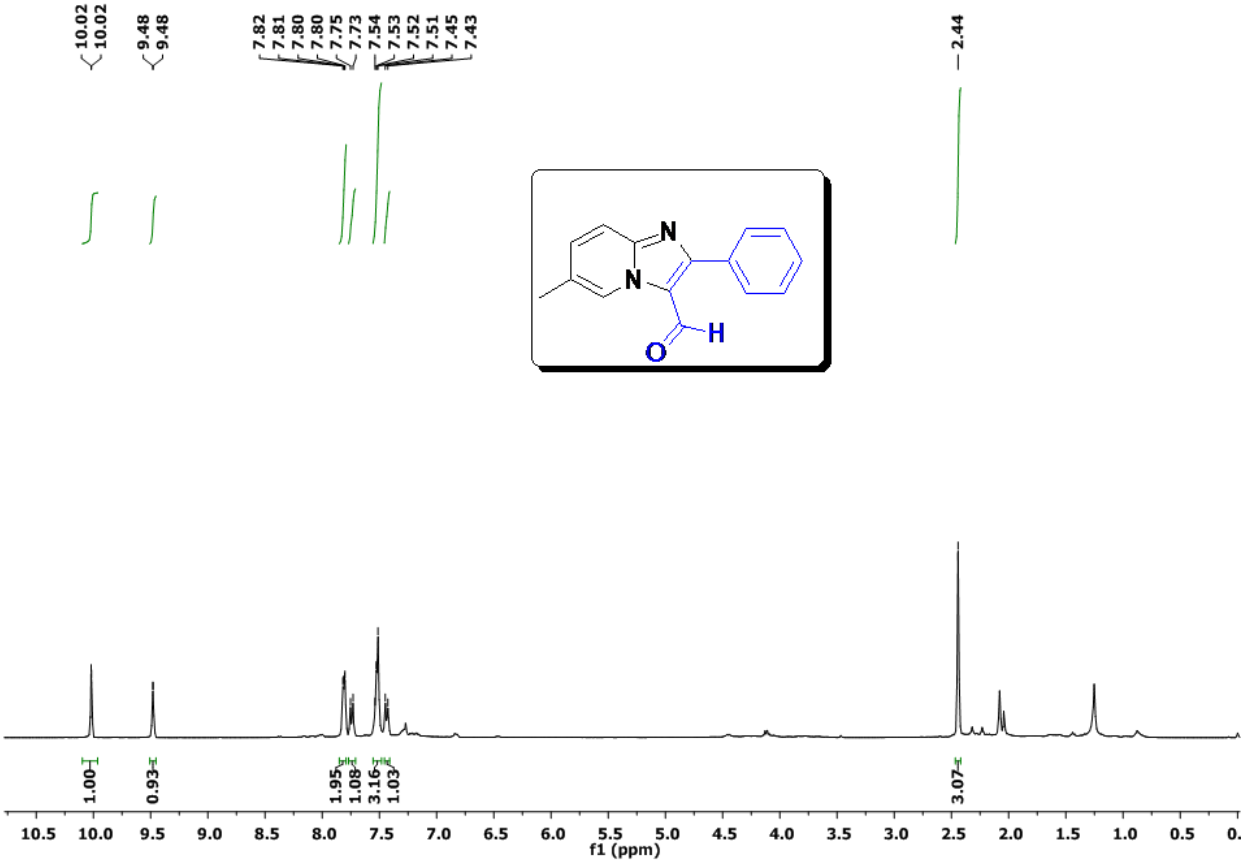
^{1}H, ^{13}C and DEPT-135 NMR of 6-methyl-2-(2-nitrophenyl)imidazo[1,2-a]pyridine-3-carbaldehyde (3l):

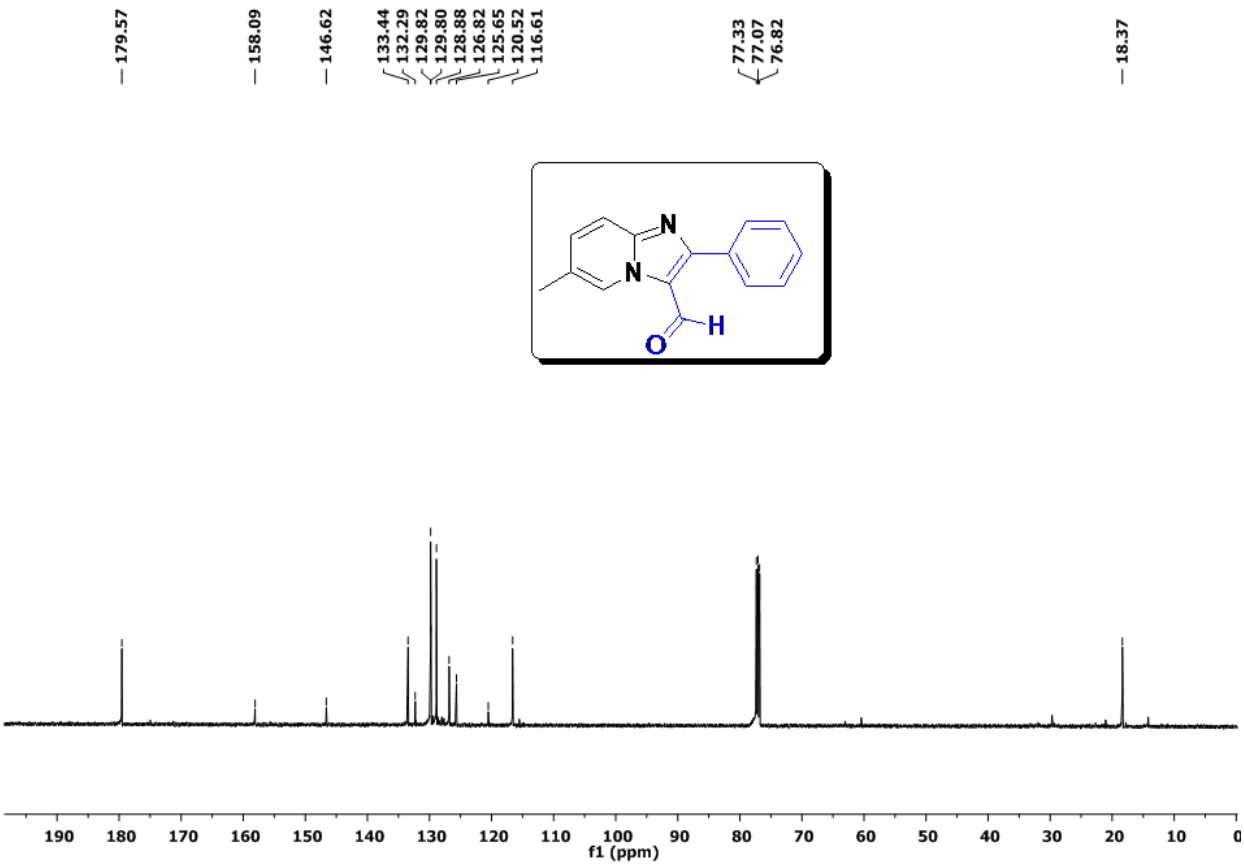


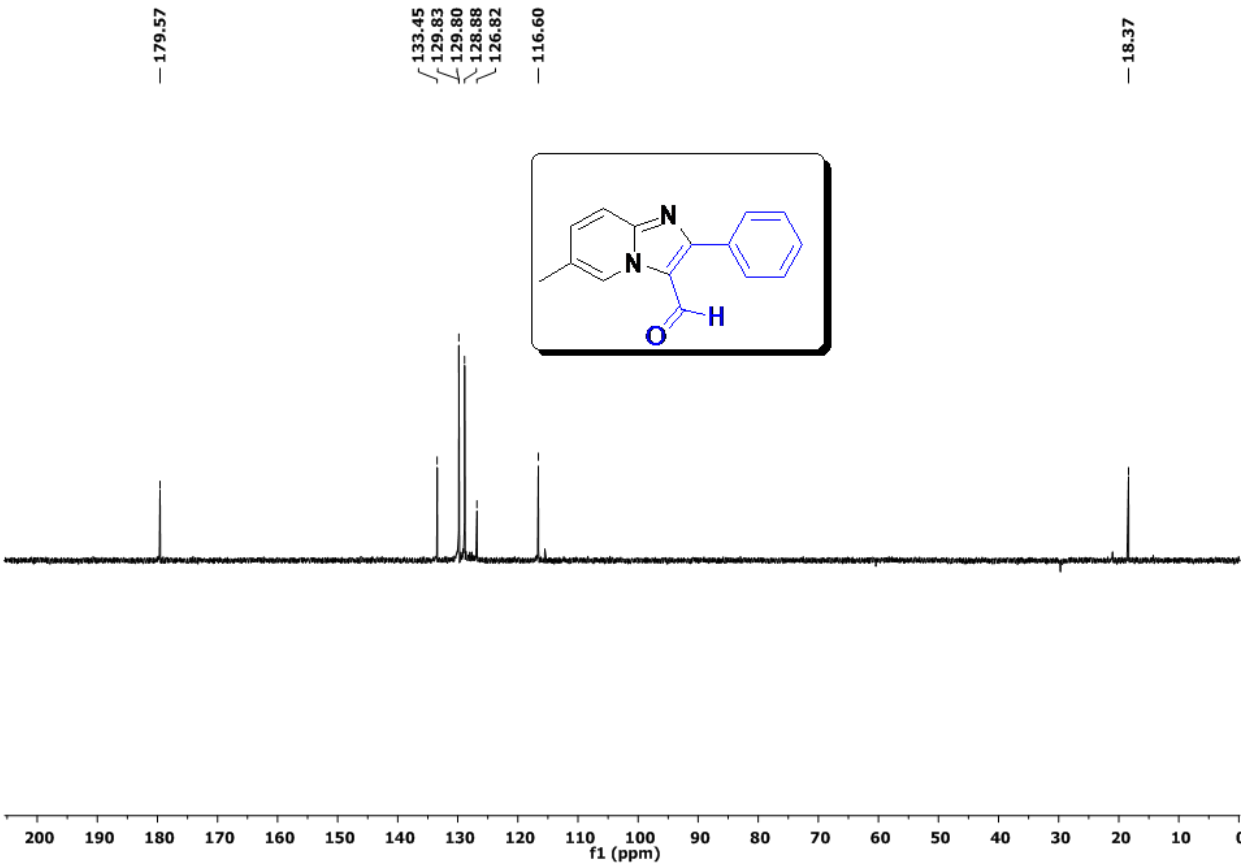

177.81
154.23
150.09
146.72
133.58
133.10
132.62
130.47
126.67
126.18
124.91
121.13
116.99
77.30
77.04
76.79
18.40
O2N
N
N
O
H
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)


177.82
133.58
133.10
132.62
130.47
126.67
124.91
116.99
O2N
N
N
O
H
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
f1 (ppm)

^{1}H, ^{13}C and DEPT-135 NMR of 6-methyl-2-phenylimidazo[1,2-a]pyridine-3-carbaldehyde (3m):

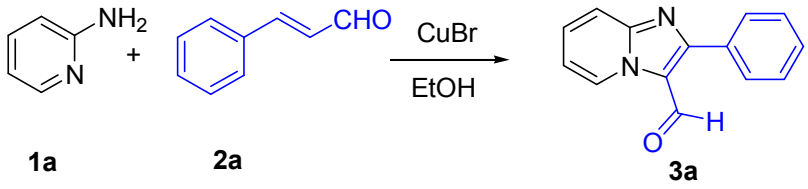



179.57
158.09
146.62
133.44
132.29
129.82
129.80
128.88
126.82
125.65
120.52
116.61
77.33
77.07
76.82
18.37
N
N
O
H
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


179.57
133.45
129.83
129.80
128.88
126.82
116.60
18.37
N
N
O
H
200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10
f1 (ppm)

S2. Monitoring of reaction color change

To the mixture of 2-aminopyridine (**1a**, 1.0 equiv.) and cinnamaldehyde (**2a**, 1.2 equiv.) in ethanol was added 10 mol% CuBr and reaction mixture was stirred at 60 °C for 8 h. The initial green color of the reaction was changed to red at the completion (after 8 h), indicating the conversion of CuBr (green) to Cu_2O (red).

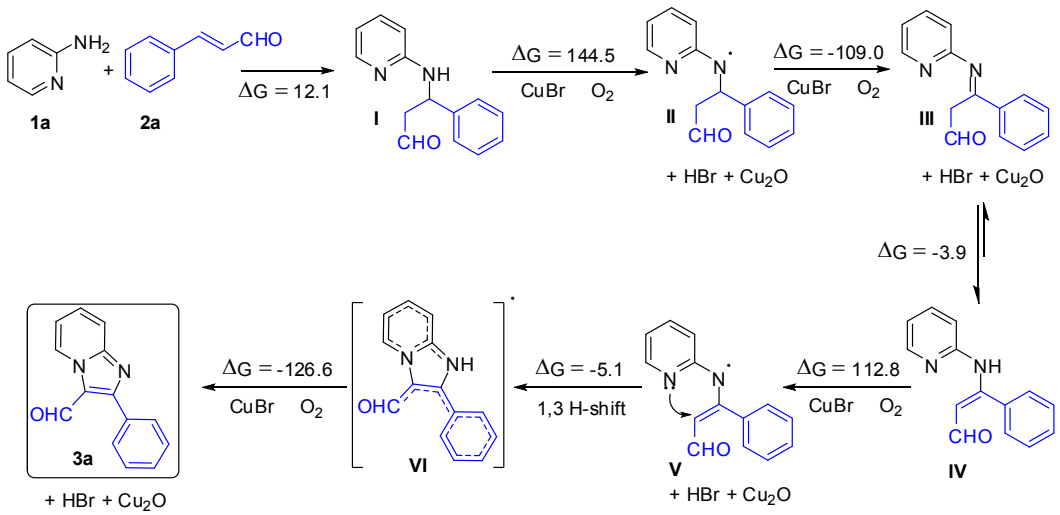


1a **2a** **3a**

Reaction mixture at start of the reaction	Reaction mixture after 8 h
	

S3. Table of Gibbs free energy values calculated using B3LYP/6-311+G(d,p) method, for all the reactants, intermediates and products involved in the reaction mechanism

No.	Compound	Gibbs free energy values (*Hartrees*)
1	**1a**	-303.662219
2	**2a**	-422.984557
3	**3a**	-724.261612
4	**I**	-726.627541
5	**II**	-725.977056
6	**III**	-725.427576
7	**IV**	-725.433823
8	**V**	-724.795972
9	**VI**	-724.8041
10	**CuBr**	-4214.719201
11	**O_2**	-150.324188
12	**HBr**	-2574.76639
13	**Cu_2O**	-3356.253546



Plausible mechanism for the preparation of 3-formyl-2-phenyl-imidazo[1,2-a]pyridine **3a**. The Gibbs free energy values at each step are given in kcal/mol.