Supporting Information

Rhodium(III)-Catalyzed Azacycle-Directed Intermolecular Insertion of Arene C-H Bonds into α-Diazocarbonyl Compounds

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Table of Contents

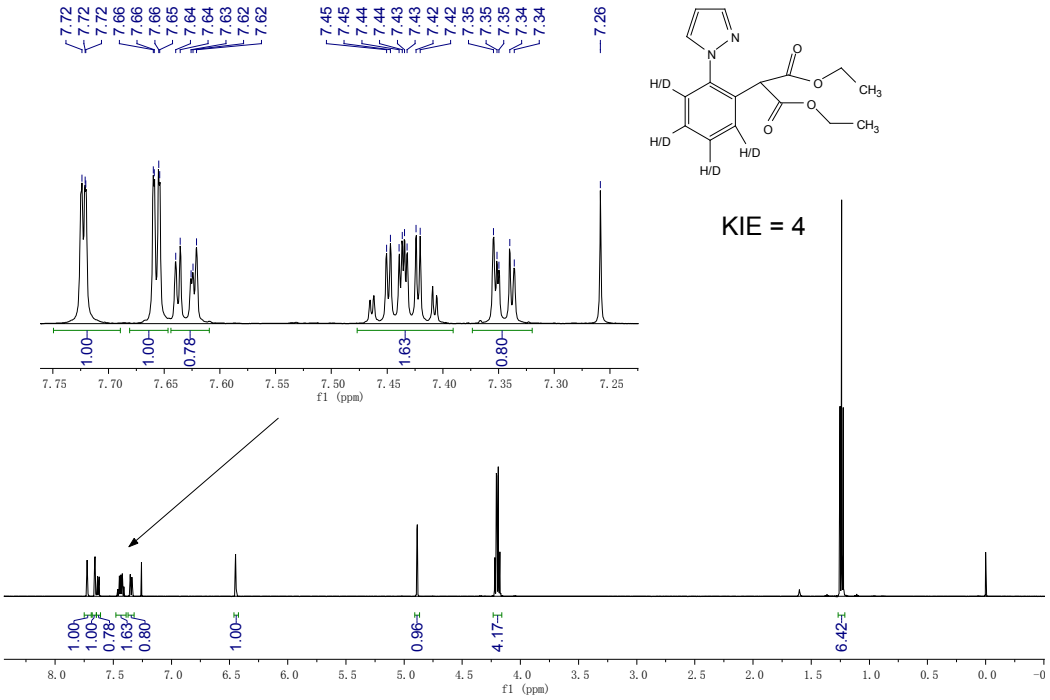
1. Data of Mechanistic Studies

Kinetic Isotope effect (KIE) experiments

The intermolecular competitive experiment was carried out to determine the primary KIE (k_H/k_D) of the Rh(III)-catalyzed arene C-H functionalizations with diazomalonates.

1a : 1a-d_5 = 1:1

A dried 10 mL Schlenk tube equipped with a magnetic stirrer was charged with $[Cp^*RhCl_2]_2$ (3 mg, 5 μmol), $AgSbF_6$ (9 mg, 25 μmol), **1a** (0.25 mmol), **1a**-d_5 (0.25 mmol) and EtOH (1.5 mL) under Ar. After the reaction mixture was stirred at room temperature for 1 h, **2a** (0.3 mmol) was then added, and the mixture was stirred at 75 °C for 60 min. The reaction mixture was cooled to room temperature, filtered through a pad of Celite, and concentrated under reduced pressure. The residue obtained was then purified by flash column chromatography**.** A KIE value of 4.0 was measured by using ^{1}H NMR spectroscopy.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7.72
7.72
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7.66
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7.64
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7.62
7.62
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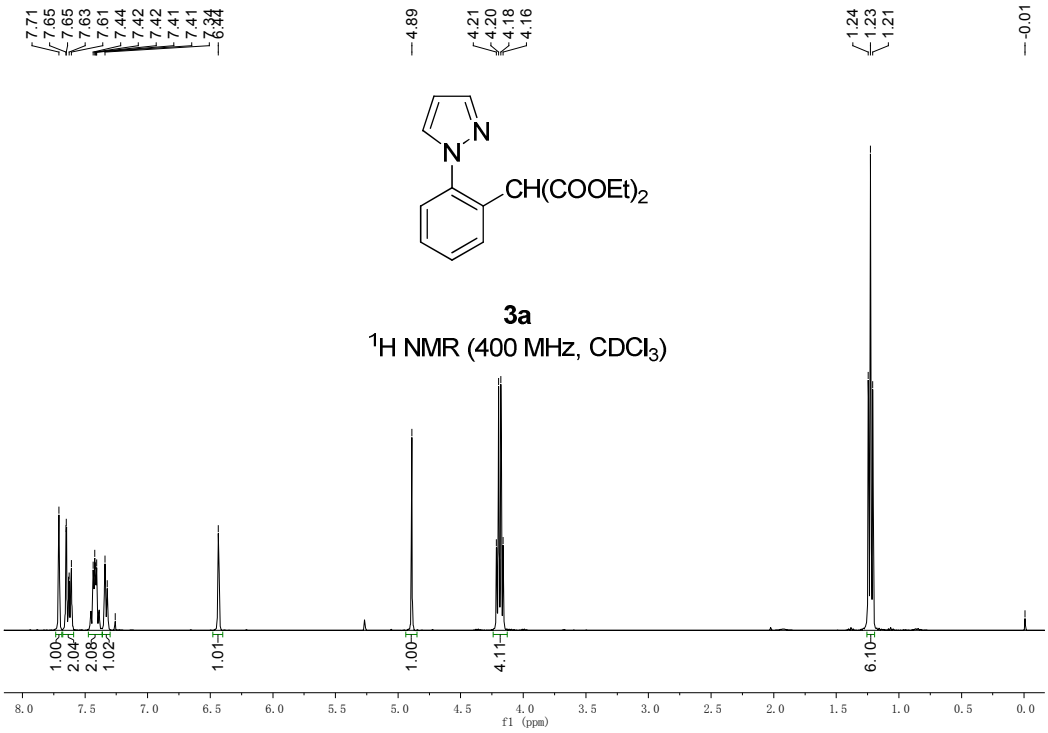
7.45
7.44
7.44
7.43
7.43
7.42
7.42
7.35
7.35
7.34
7.34
7.26
H/D
H/D
H/D
H/D
O
O
O
O
CH3
CH3
KIE = 4
1.00
1.00
0.78
1.63
0.80
1.00
0.96
4.17
6.42
f1 (ppm)

2. ^{1}H and ^{13}C spectra



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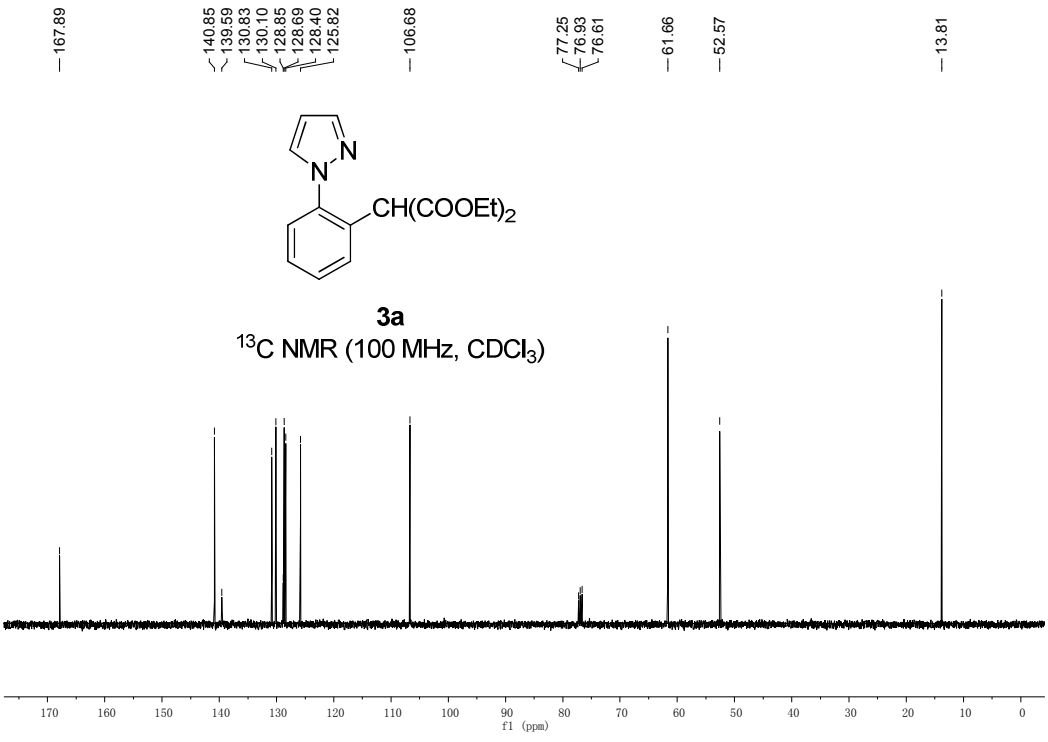
^{1}H NMR (400 MHz, $CDCl_3$)



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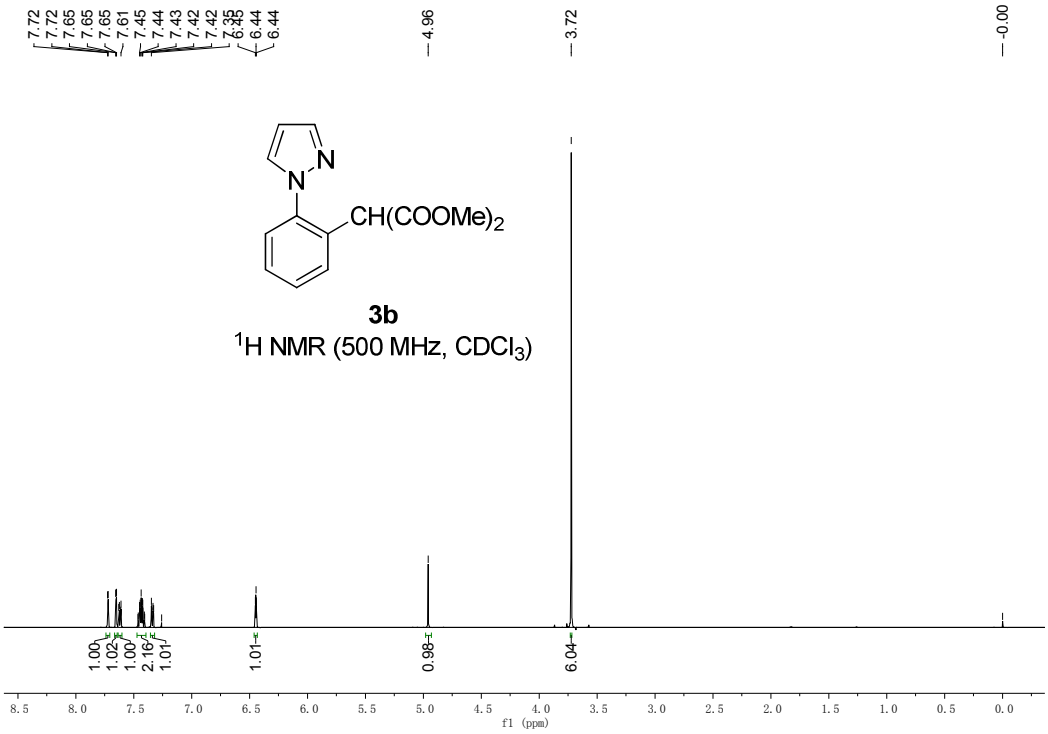
^{13}C NMR (100 MHz, $CDCl_3$)



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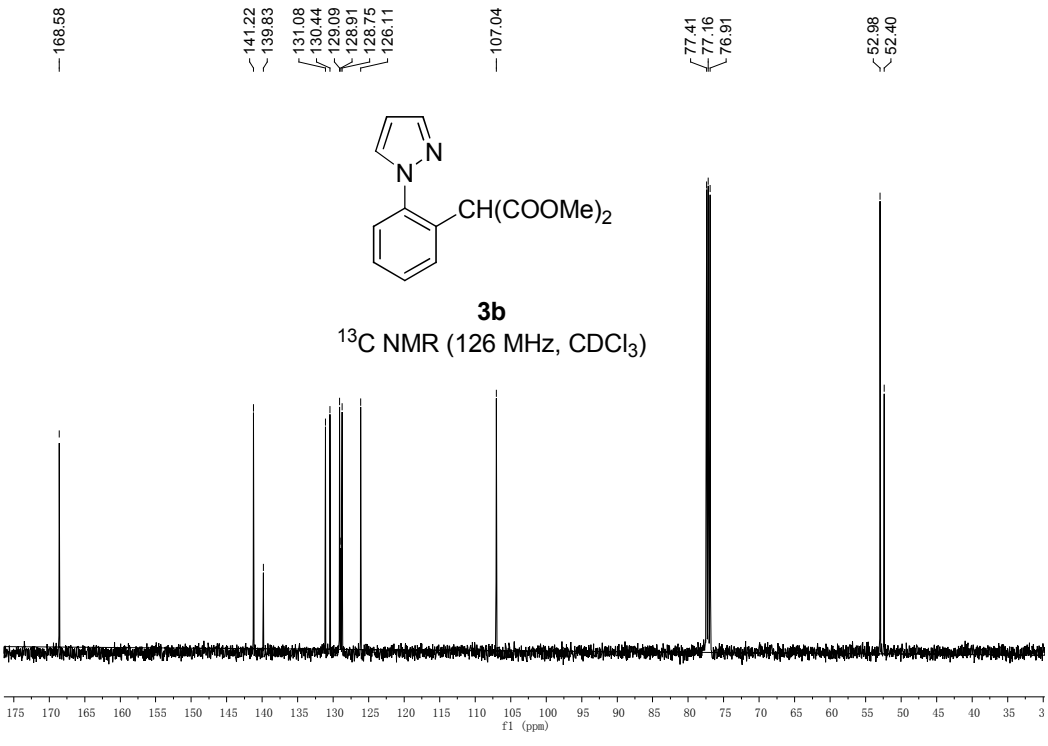
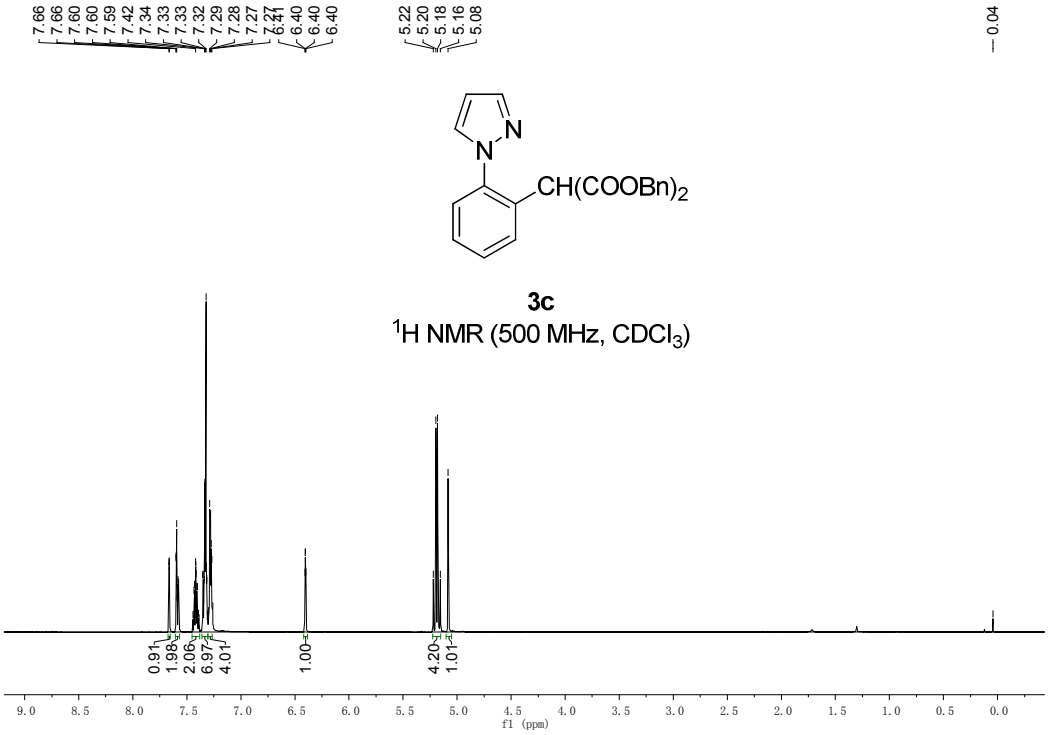


3b

^{13}C NMR (126 MHz, $CDCl_3$)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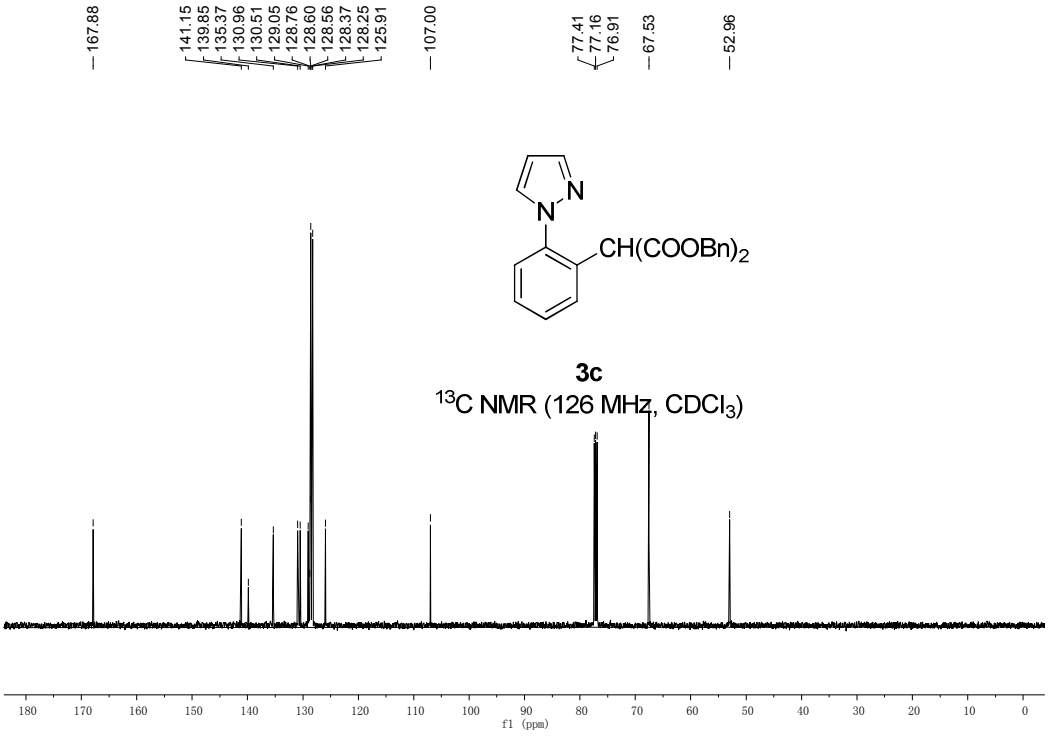
7.60
7.60
7.59
7.42
7.34
7.33
7.33
7.32
7.29
7.28
7.27
6.41
6.40
6.40
6.40
5.22
5.20
5.18
5.16
5.08
0.04
N
N
CH(COOBn)2
3c
1H NMR (500 MHz, CDCl3)
0.91
1.98
2.06
6.97
4.01
1.00
4.20
1.01
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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128.56
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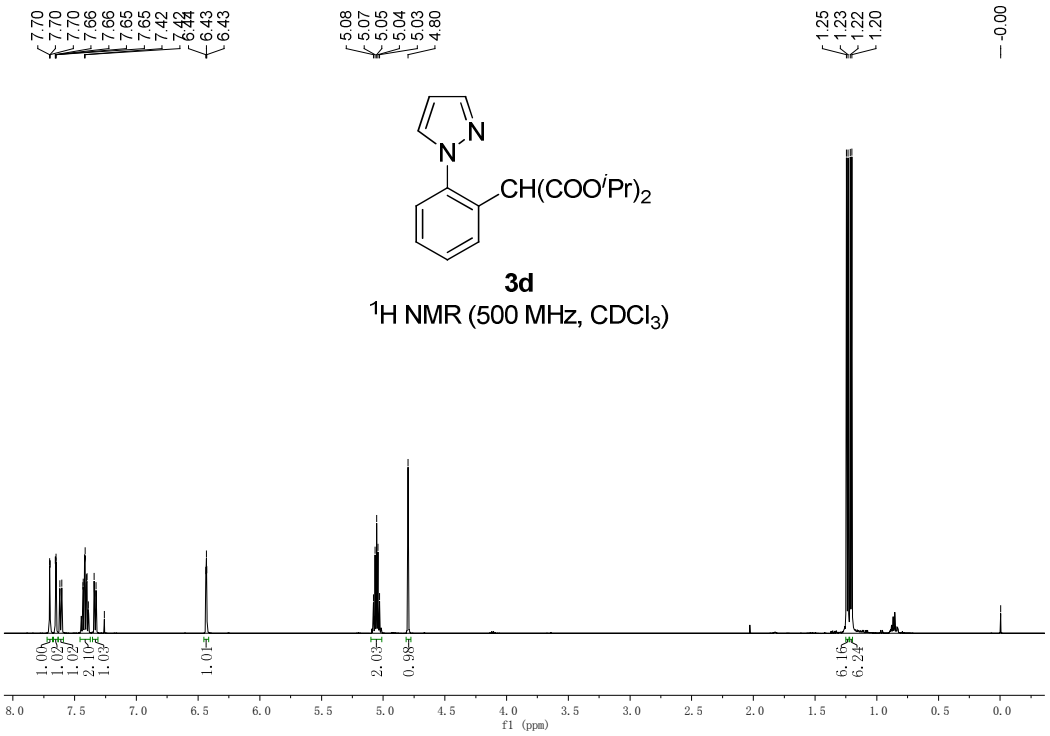
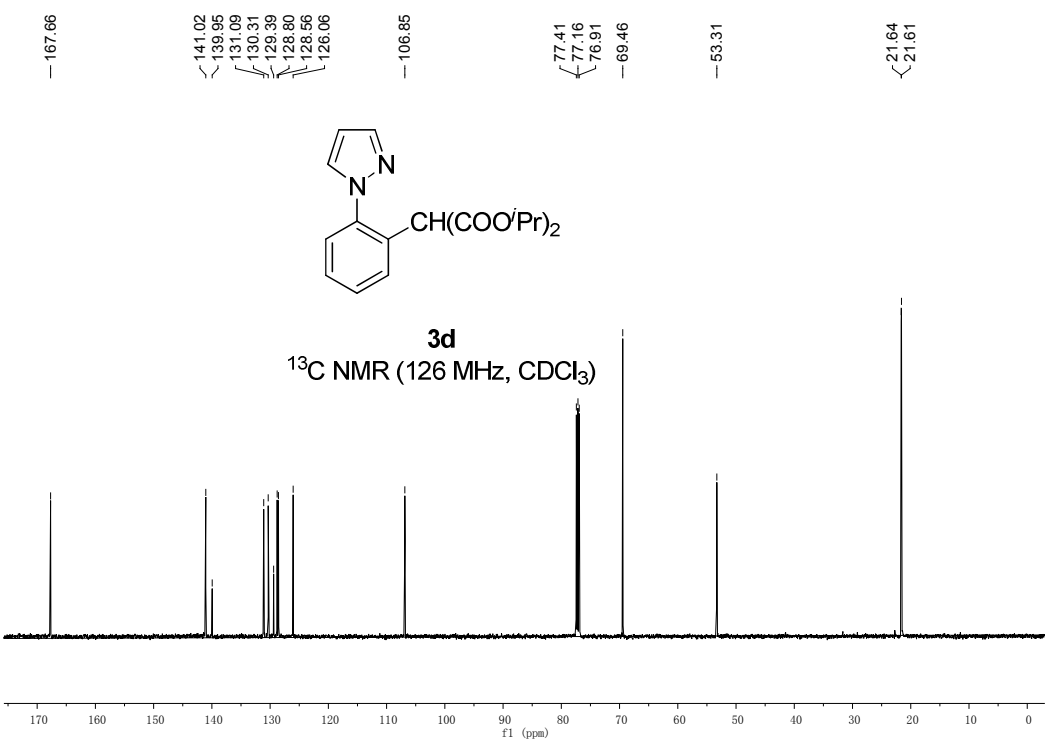
128.25
125.91
107.00
77.41
77.16
76.91
67.53
52.96
N
N
CH(COOBn)2
3c
13C NMR (126 MHz, CDCl3)
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)



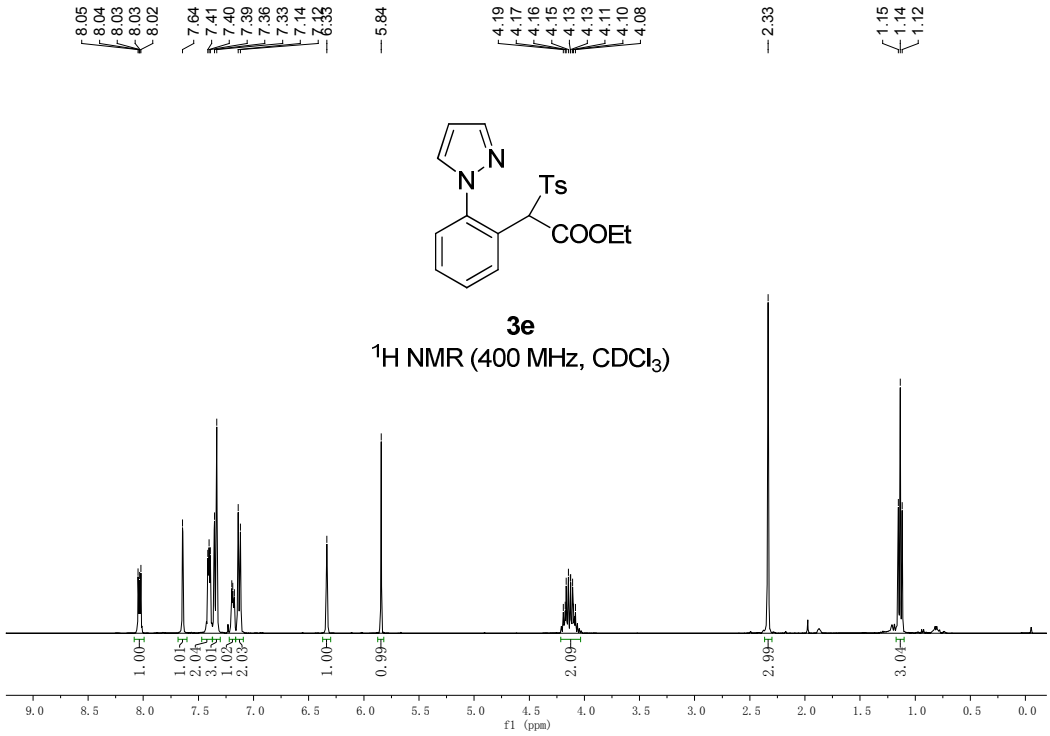
3d

^{1}H NMR (500 MHz, $CDCl_3$)



3d

^{13}C NMR (126 MHz, $CDCl_3$)



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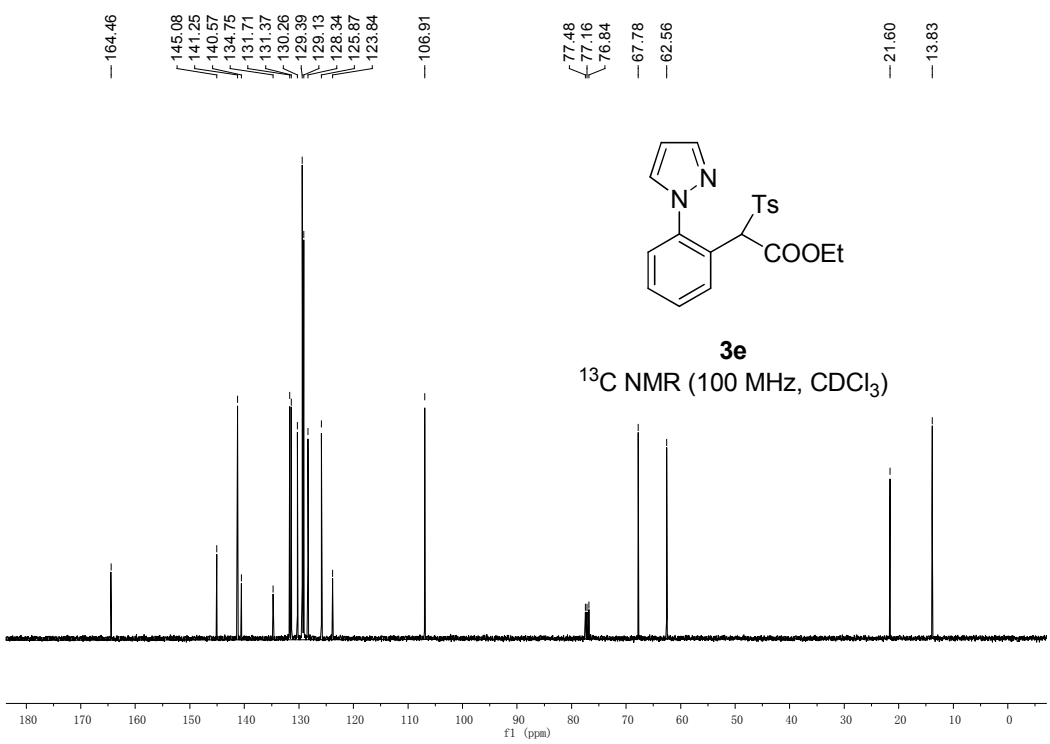
^{1}H NMR (400 MHz, $CDCl_3$)



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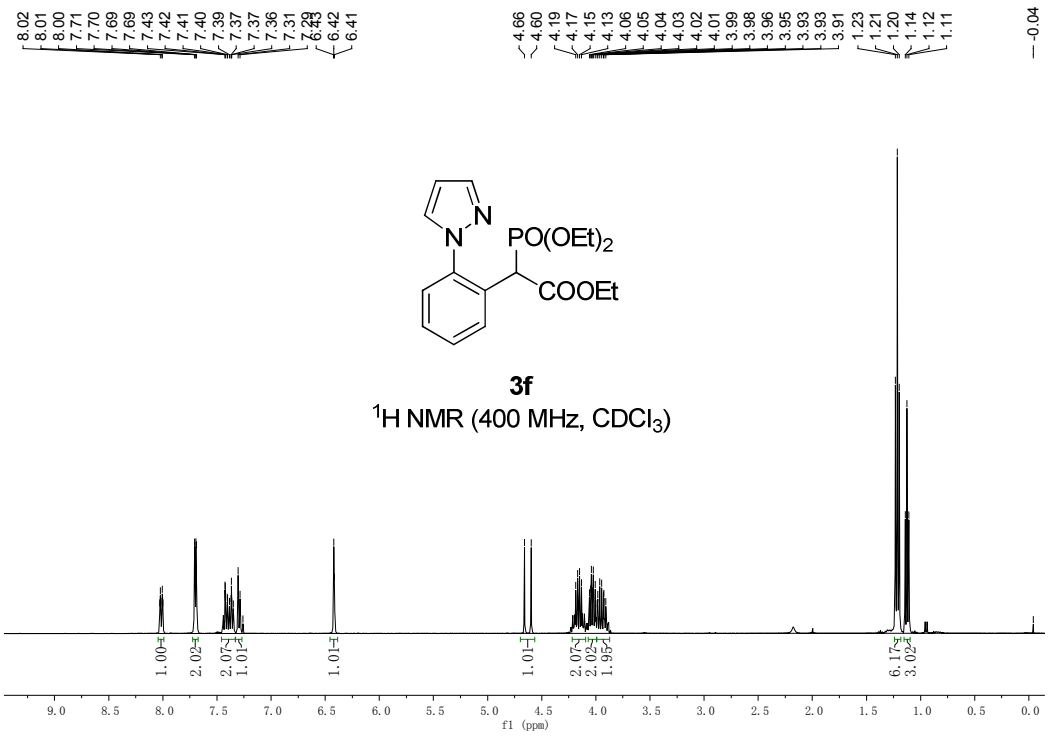
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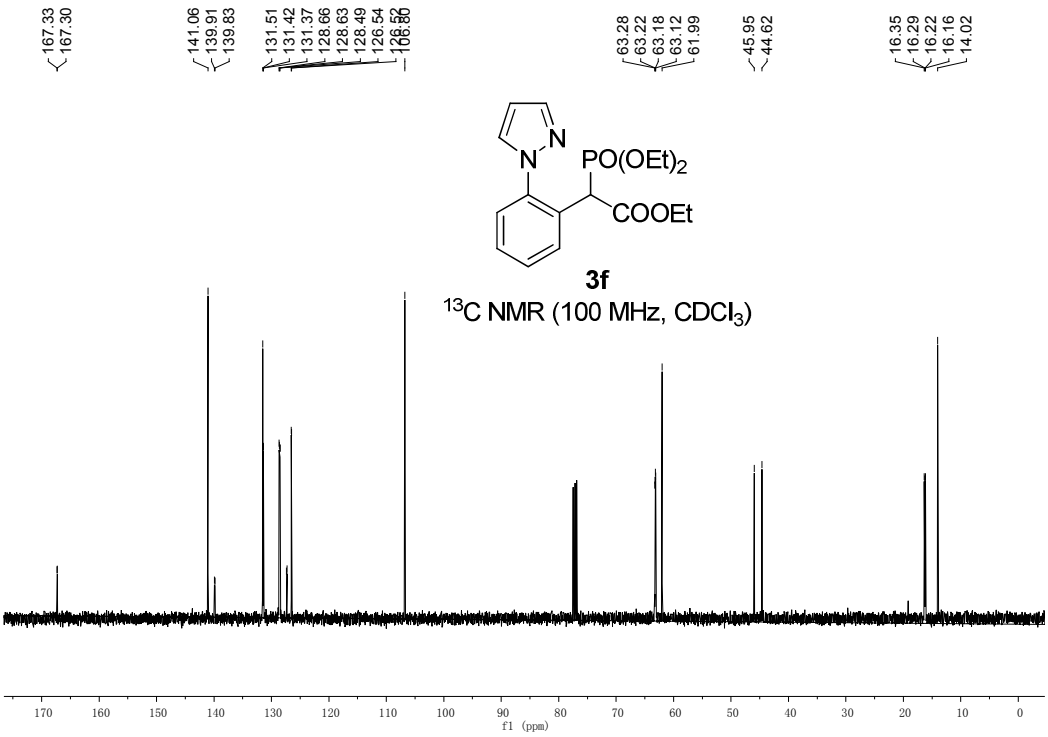
7.37
7.37
7.36
7.31
6.43
6.42
6.41
4.66
4.60
4.19
4.17
4.15
4.13
4.06
4.05
4.04
4.03
4.02
4.01
3.99
3.98
3.96
3.95
3.93
3.93
3.91
1.23
1.21
1.20
1.14
1.12
1.11
-0.04
PO(OEt)2
COOEt
3f
1H NMR (400 MHz, CDCl3)
1.00
2.02
2.07
1.01
1.01
1.01
2.07
2.02
1.95
6.17
3.02
f1 (ppm)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63.22
63.18
63.12
61.99
45.95
44.62
16.35
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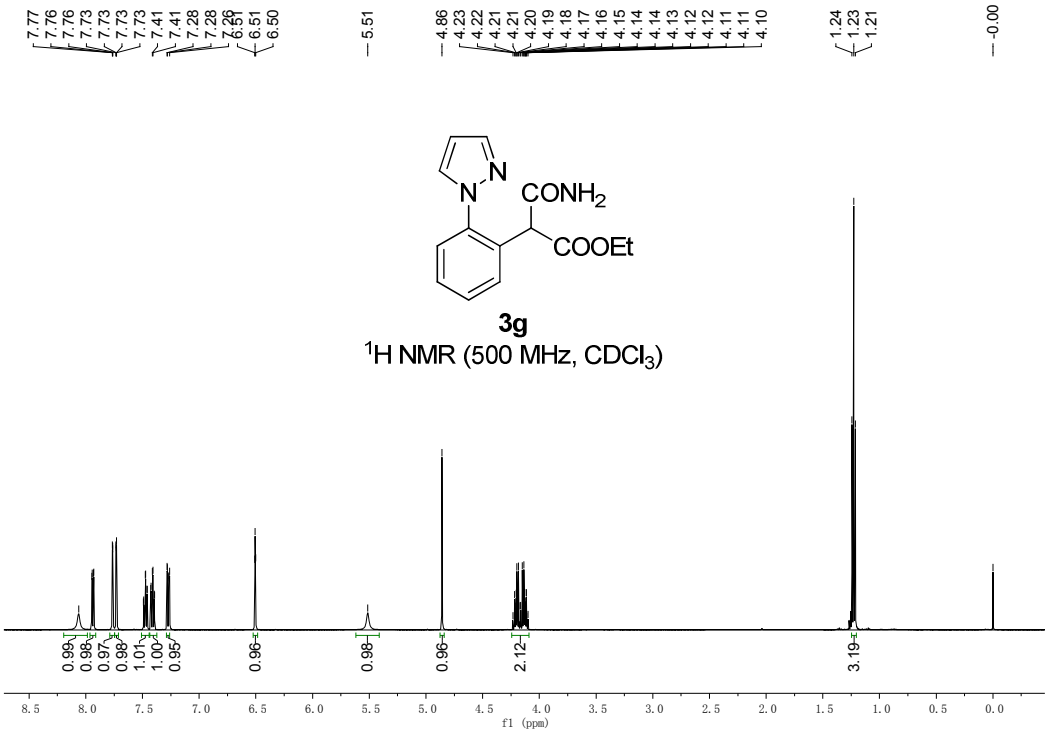
16.16
14.02
PO(OEt)2
COOEt
3f
13C NMR (100 MHz, CDCl3)
f1 (ppm)



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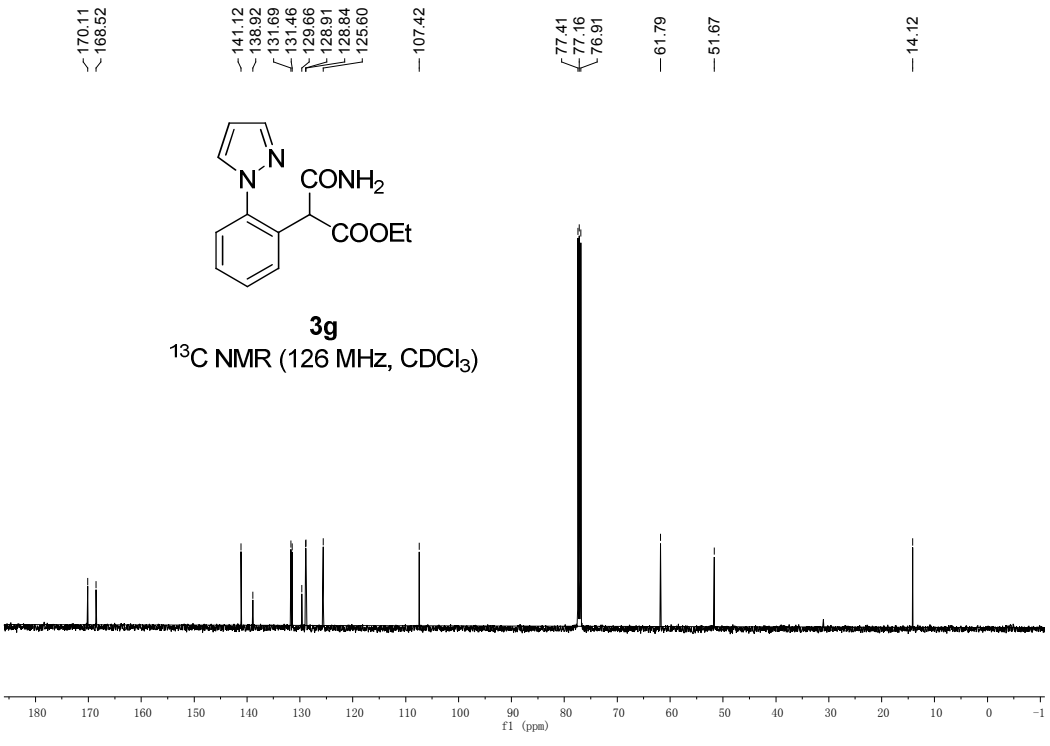
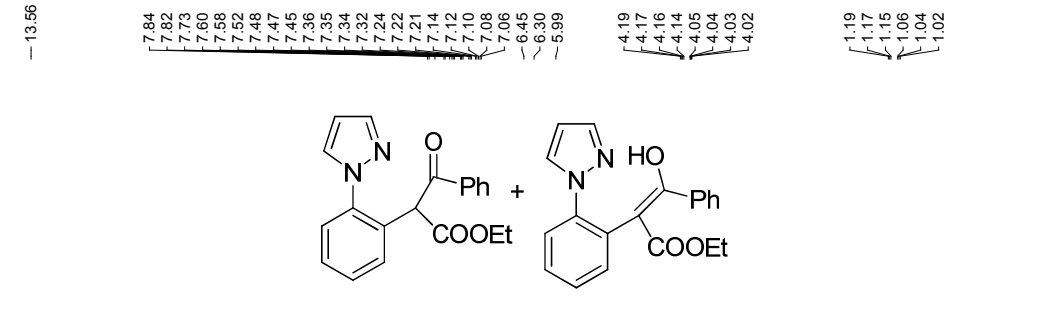
^{1}H NMR (500 MHz, $CDCl_3$)



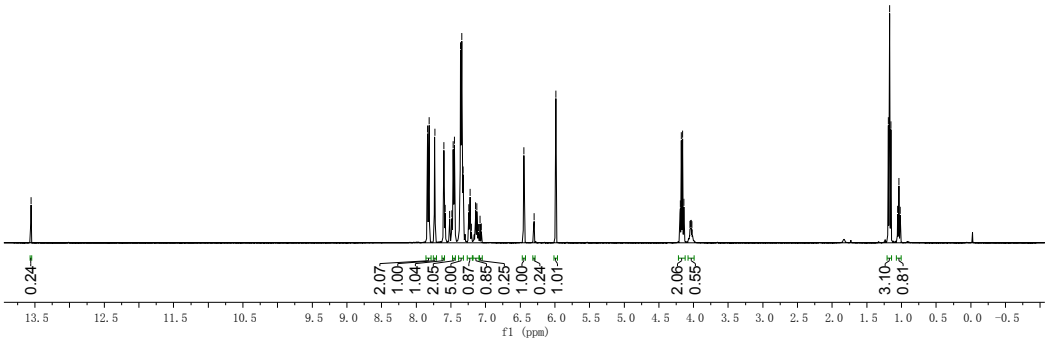
3g

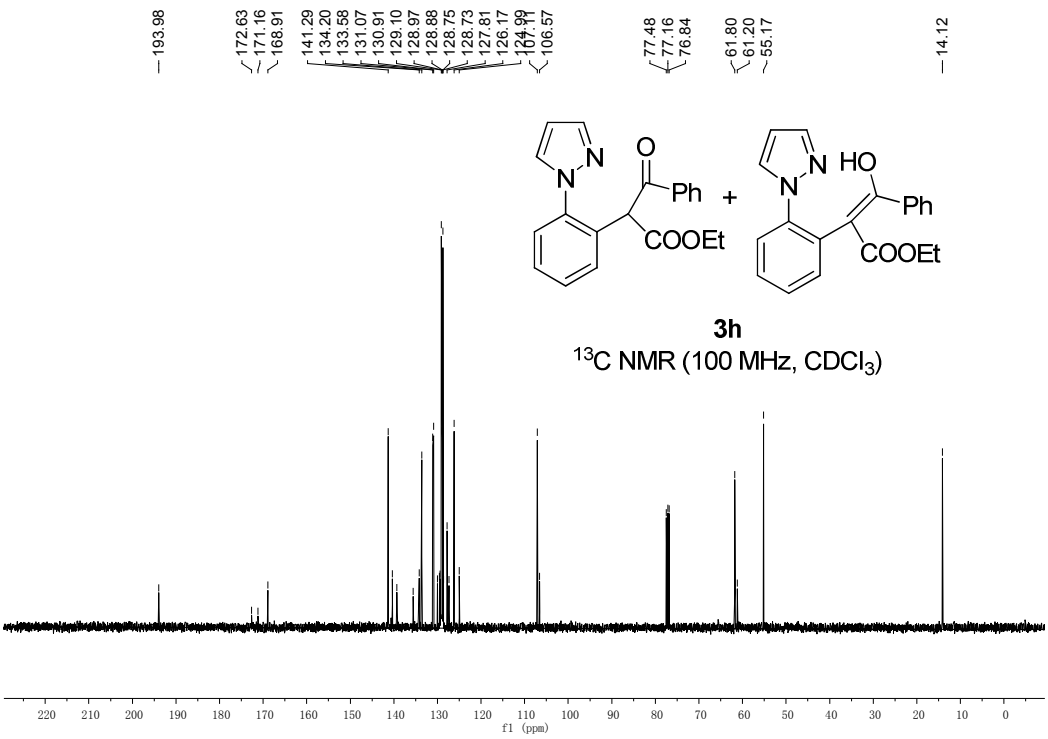
^{13}C NMR (126 MHz, $CDCl_3$)



3h (4:1)

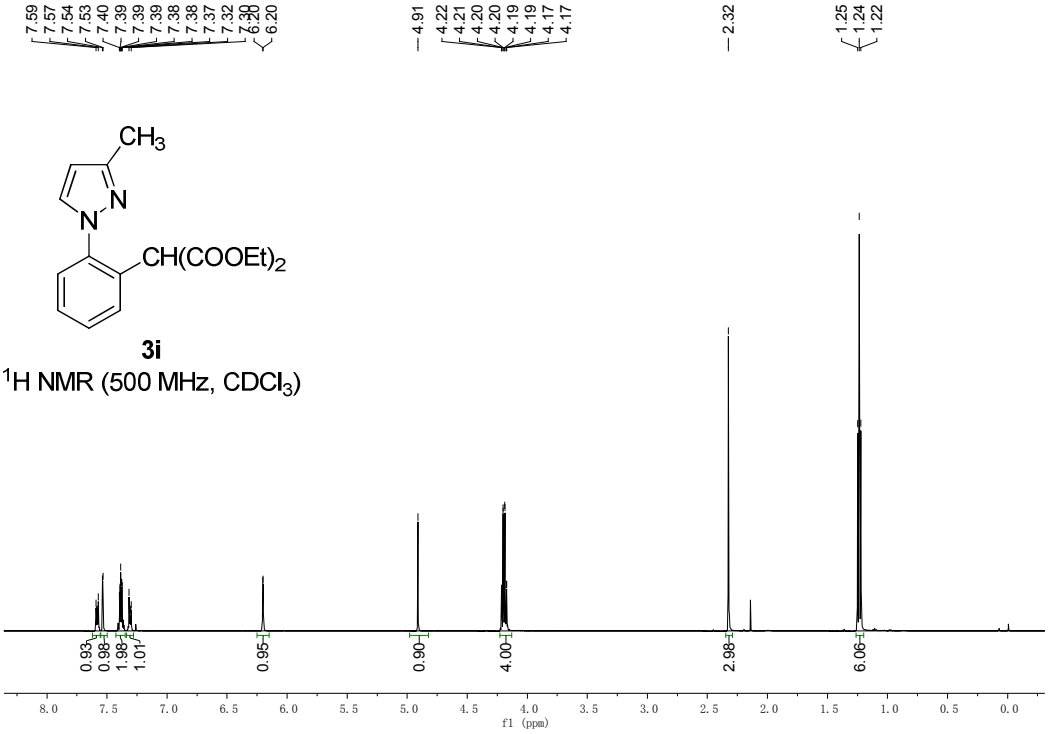
^{1}H NMR (400 MHz, $CDCl_3$)





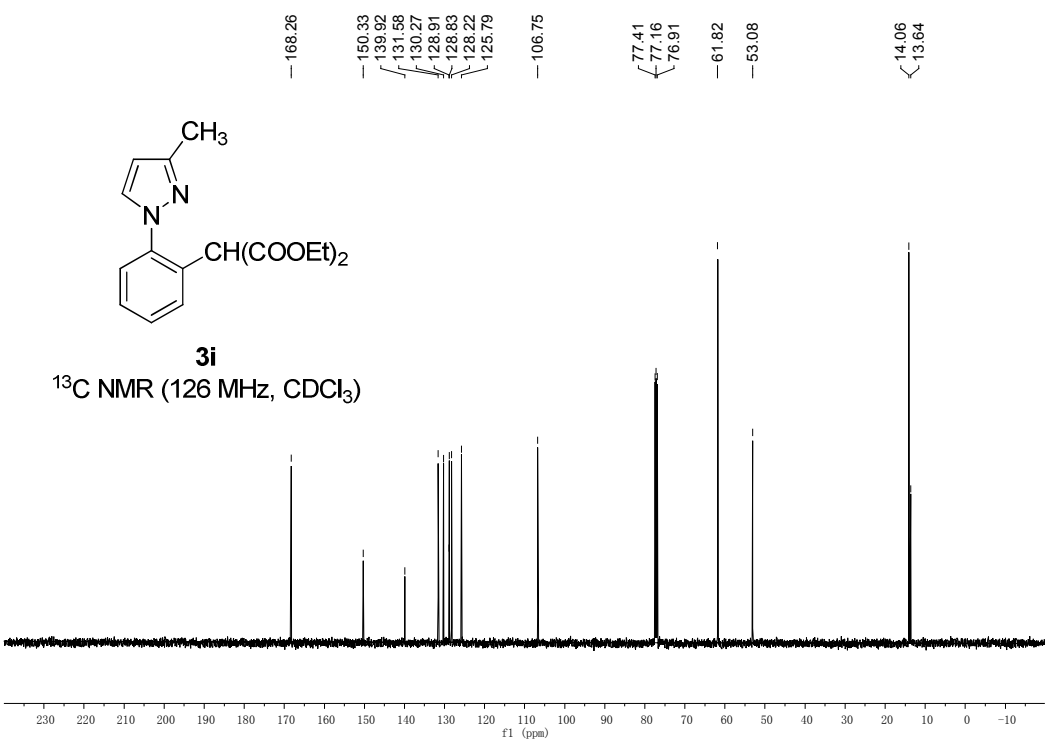
3h

^{13}C NMR (100 MHz, $CDCl_3$)



3i

^{1}H NMR (500 MHz, $CDCl_3$)



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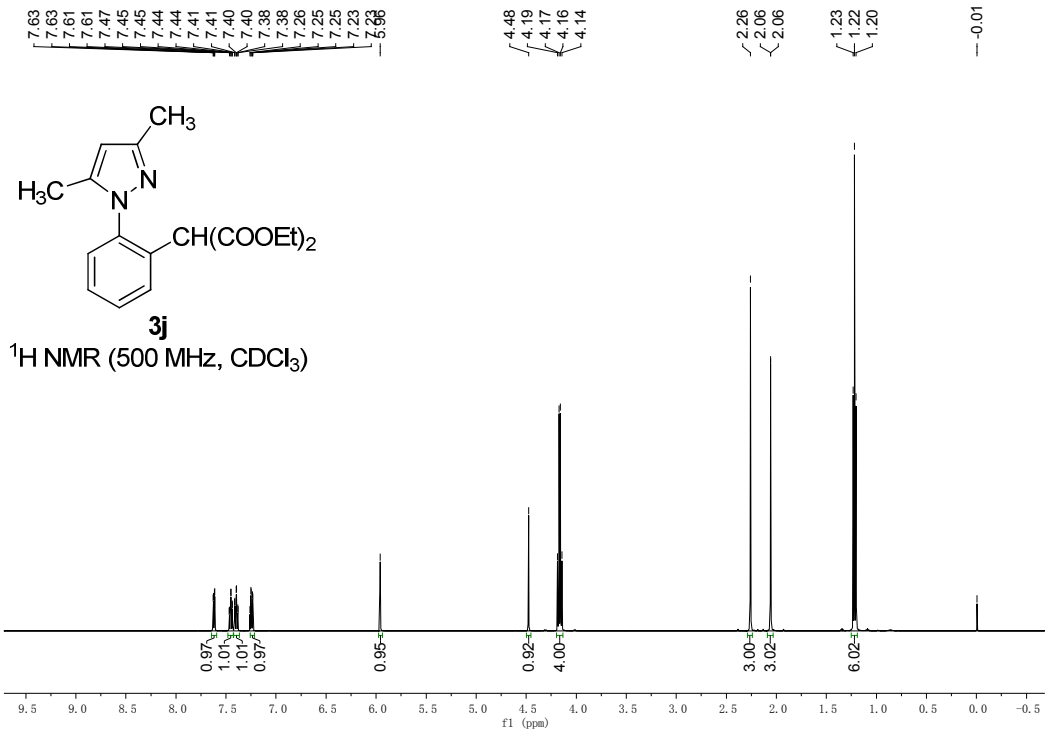

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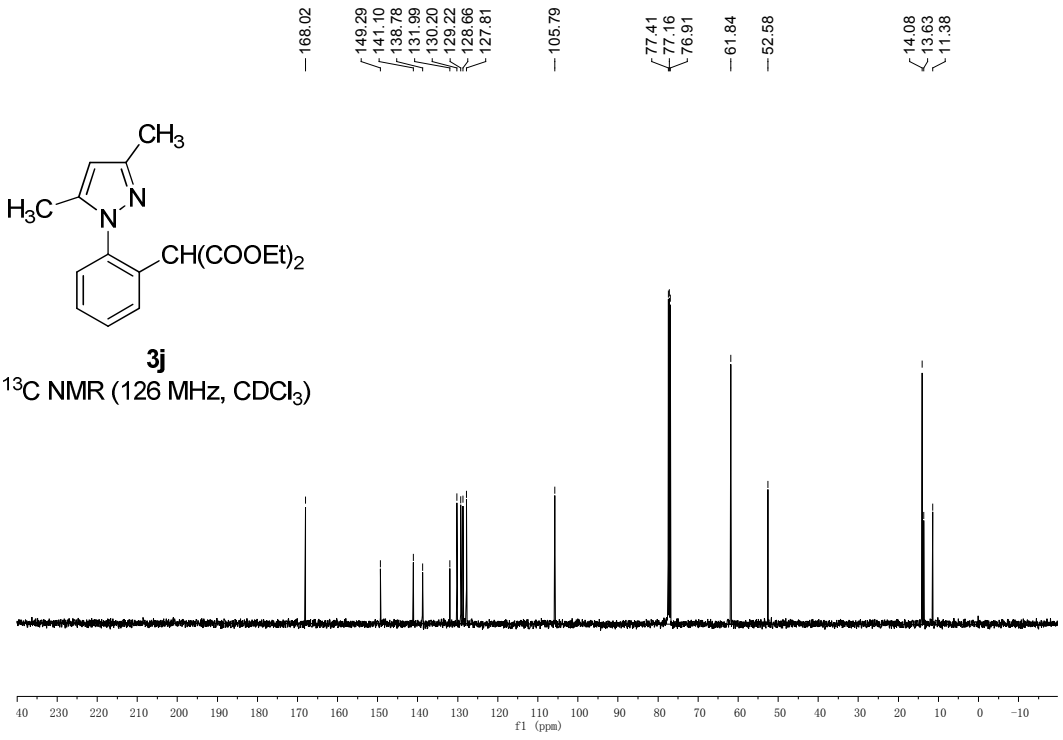

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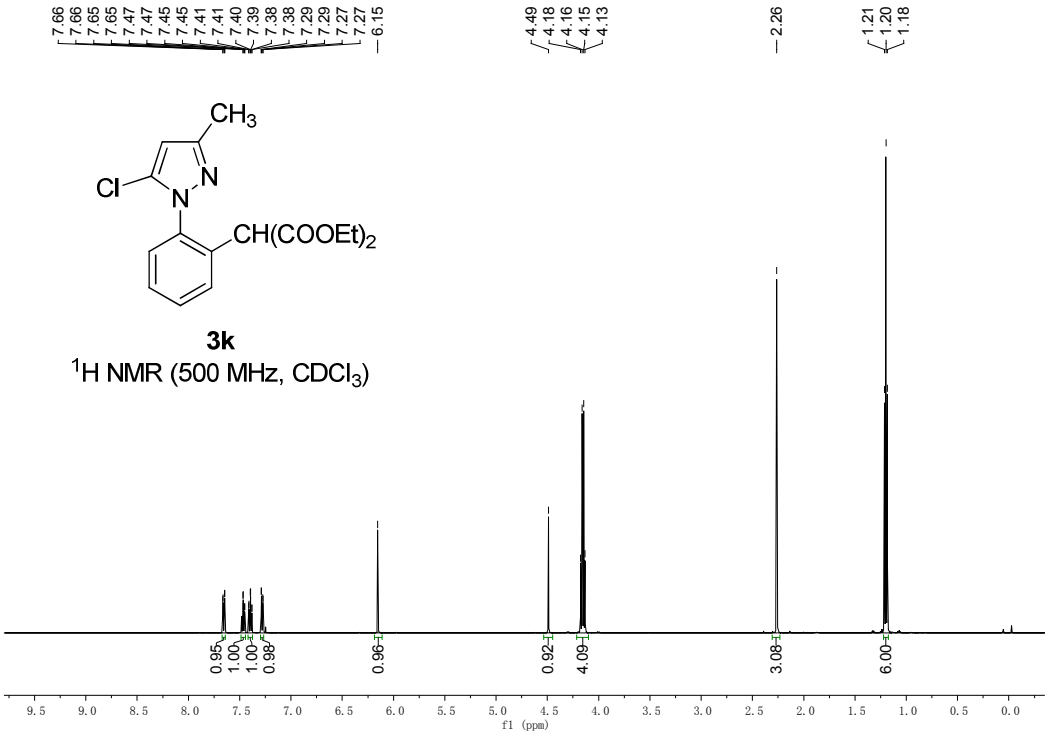
^{13}C NMR (126 MHz, $CDCl_3$)



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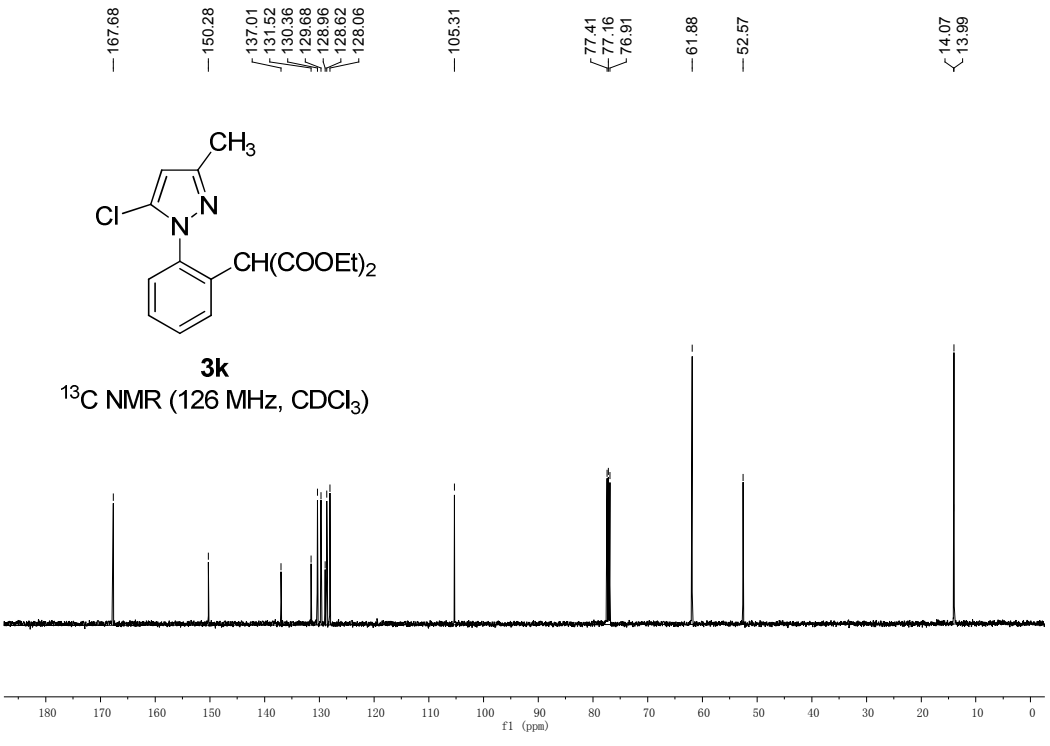

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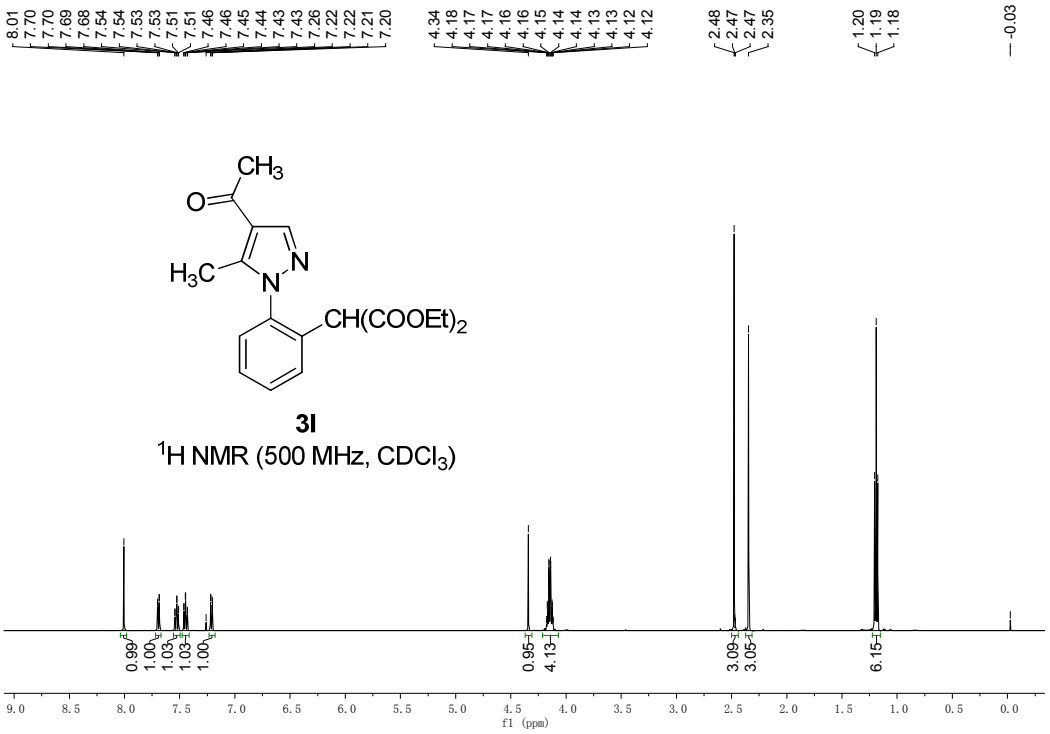

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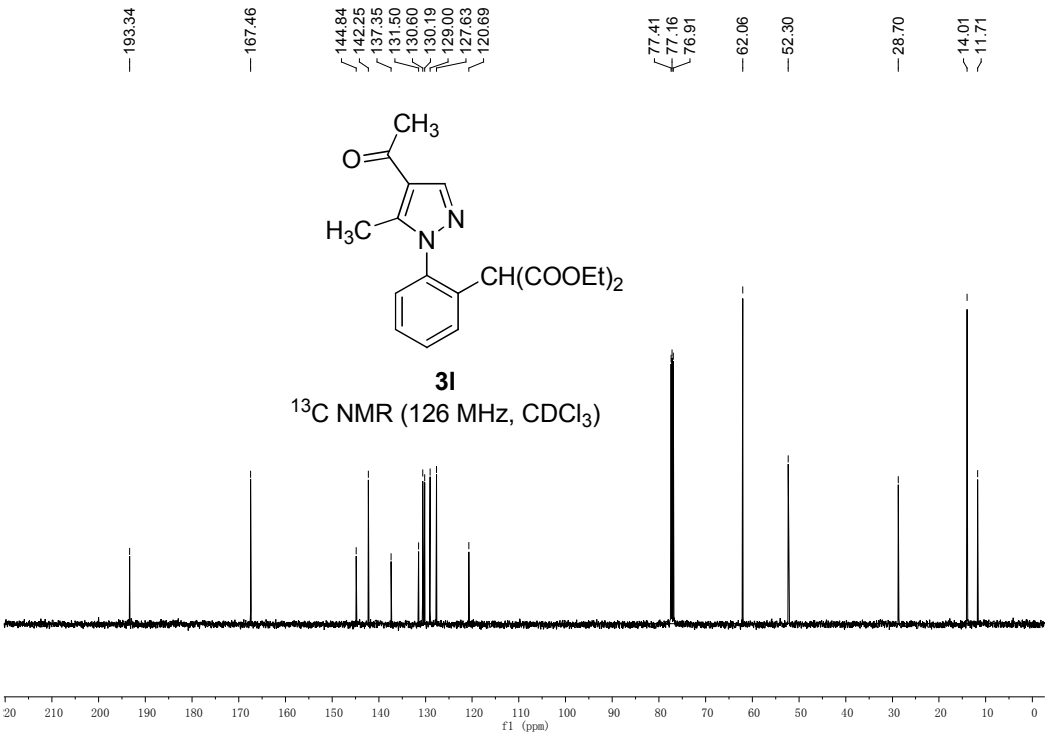

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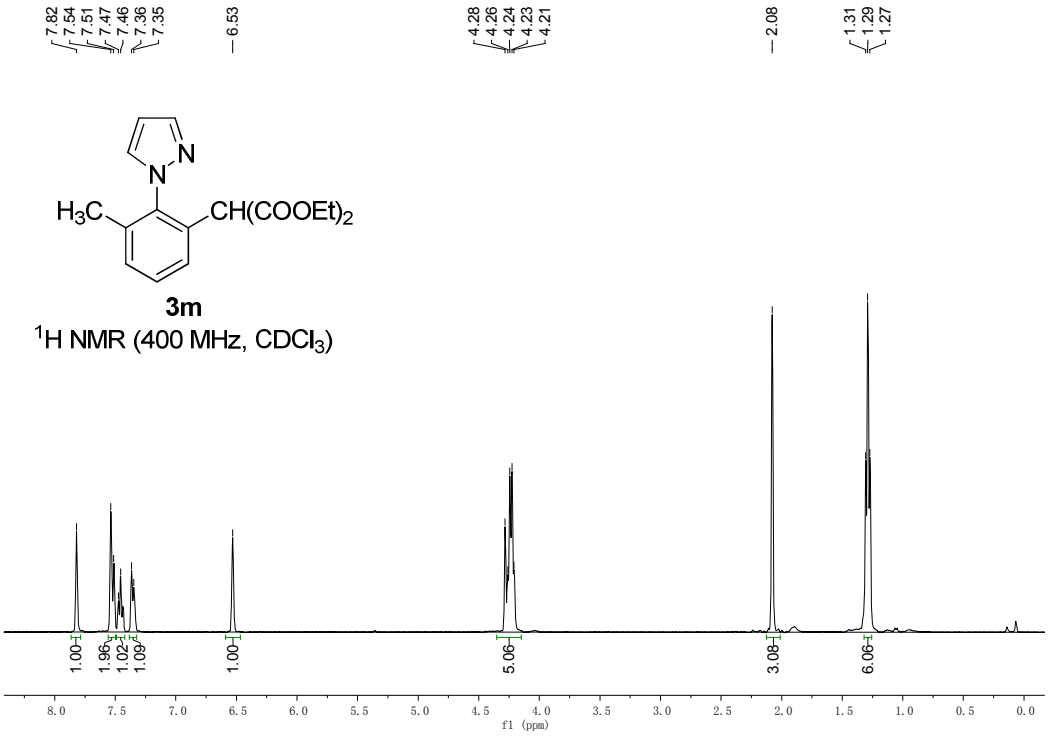

3m

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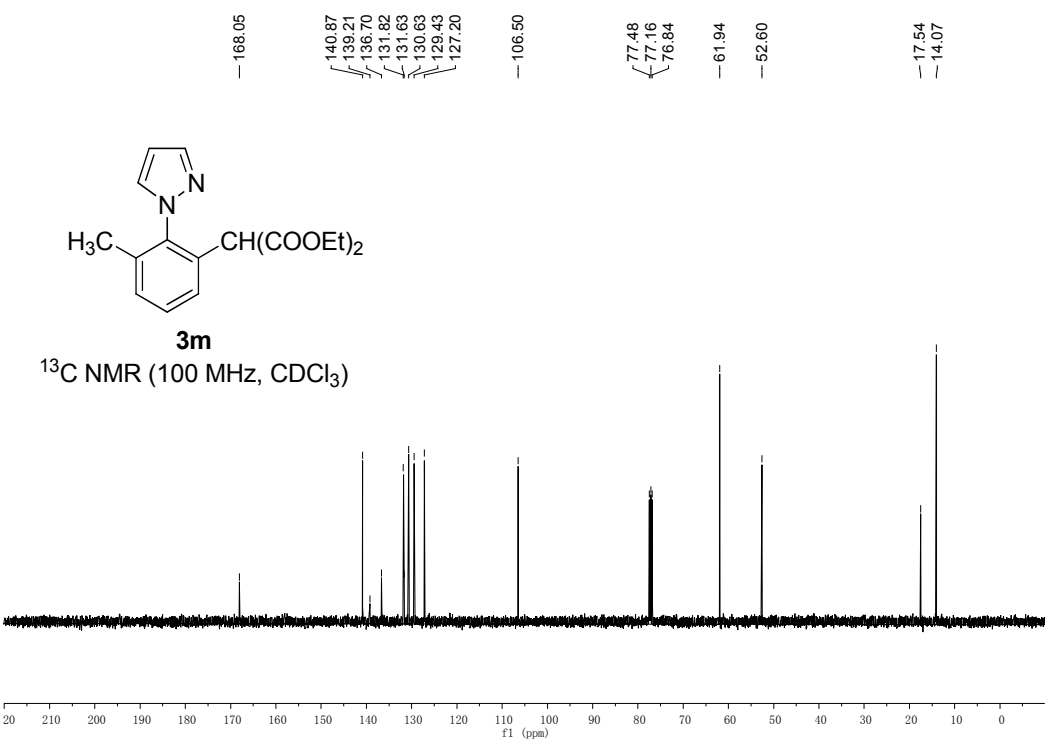

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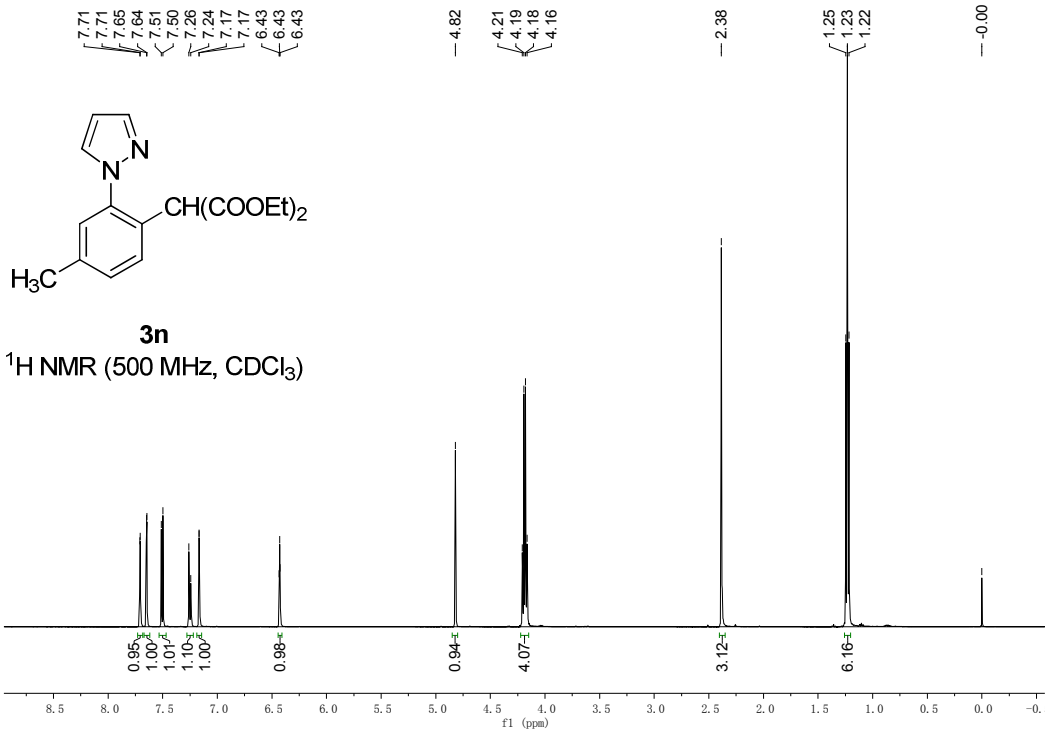

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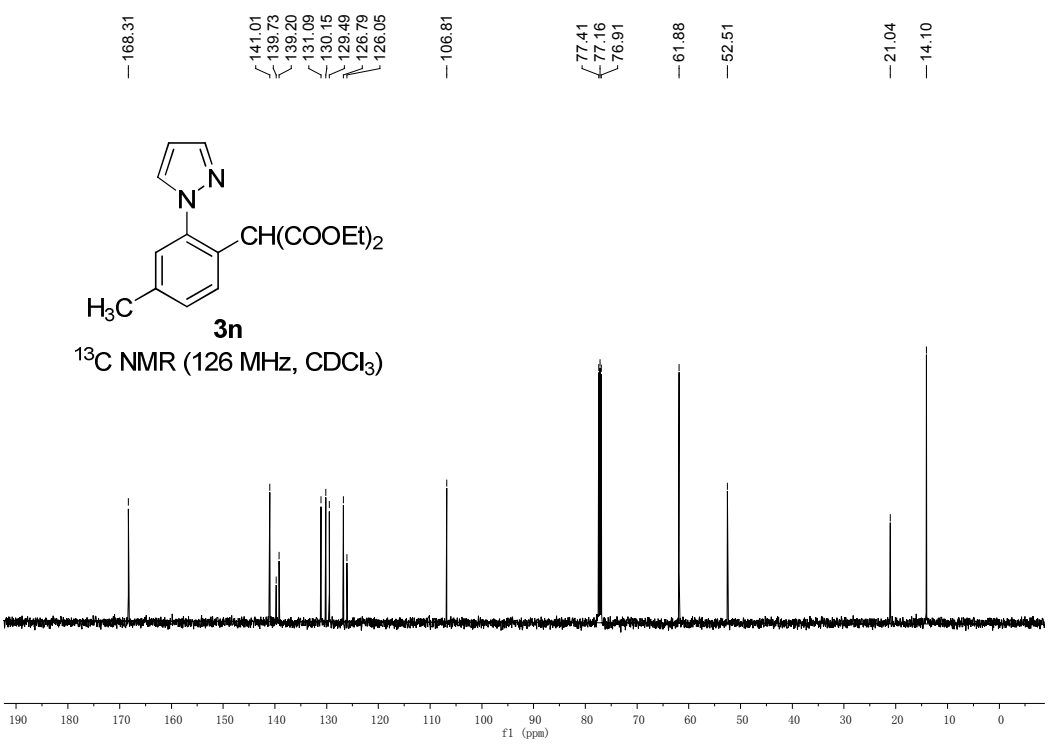

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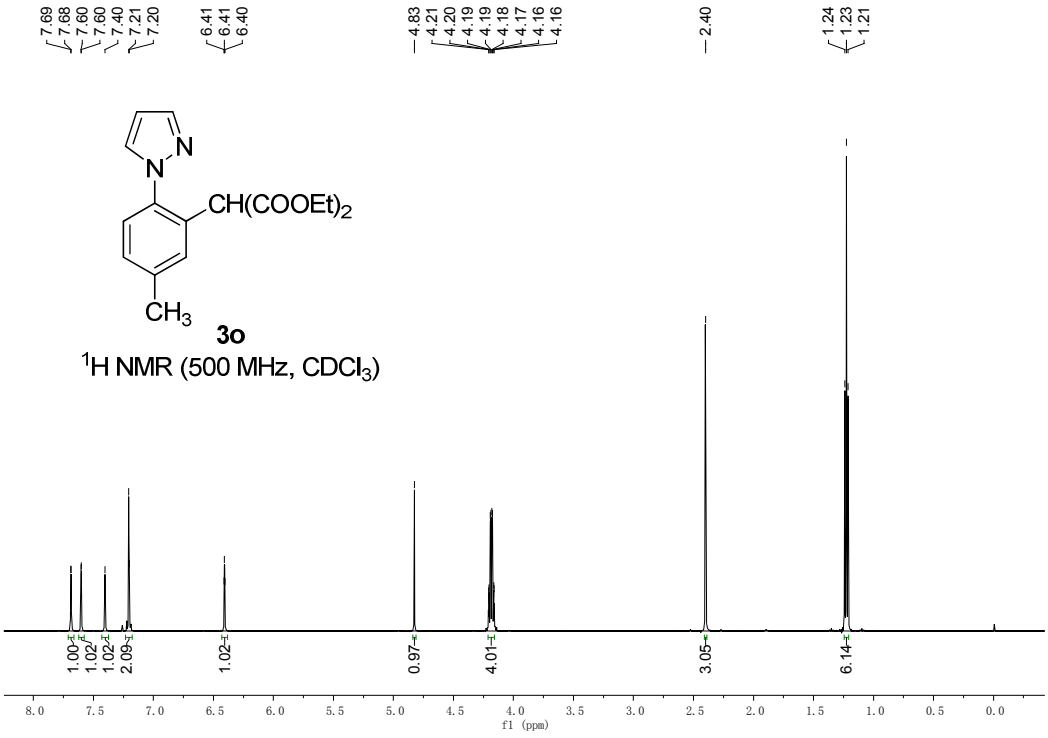
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7.60
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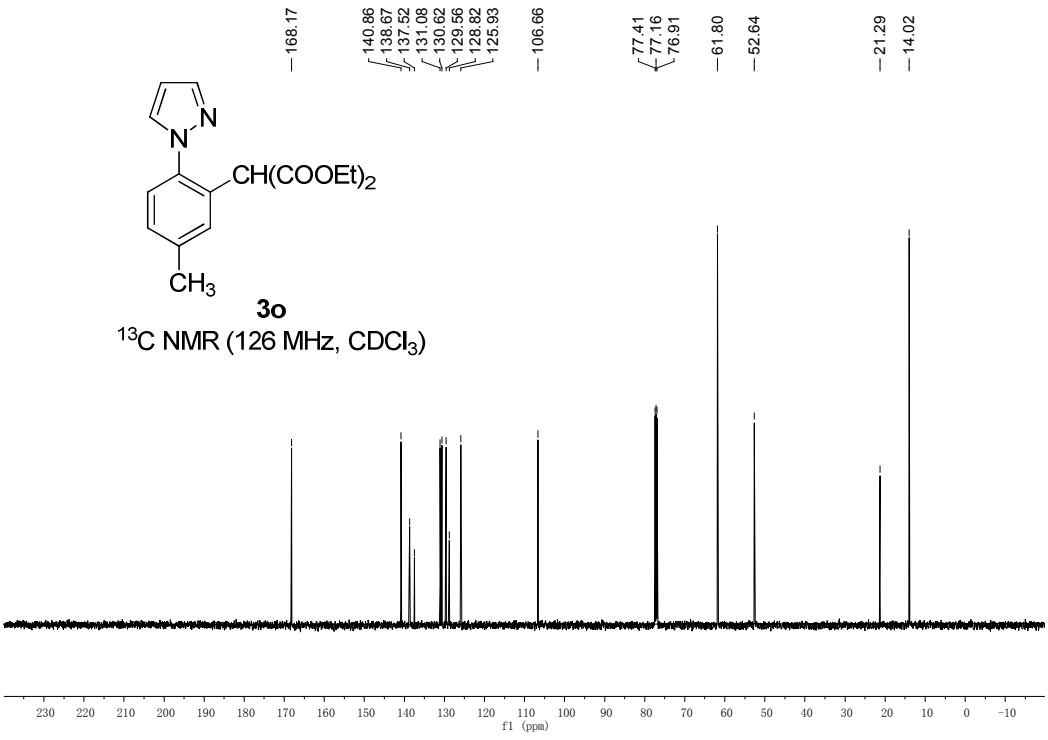
4.19
4.19
4.18
4.17
4.16
4.16
2.40
1.24
1.23
1.21
CH(COOEt)2
CH3
3o
1H NMR (500 MHz, CDCl3)
1.00
1.02
1.02
2.09
1.02
0.97
4.01
3.05
6.14
f1 (ppm)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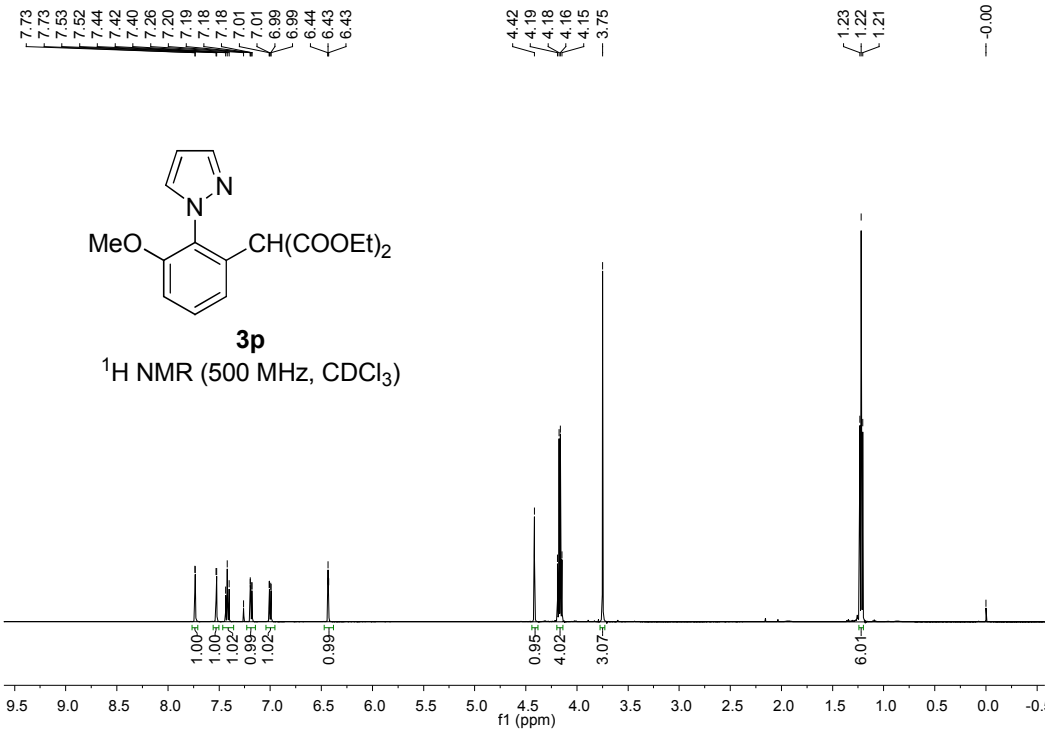
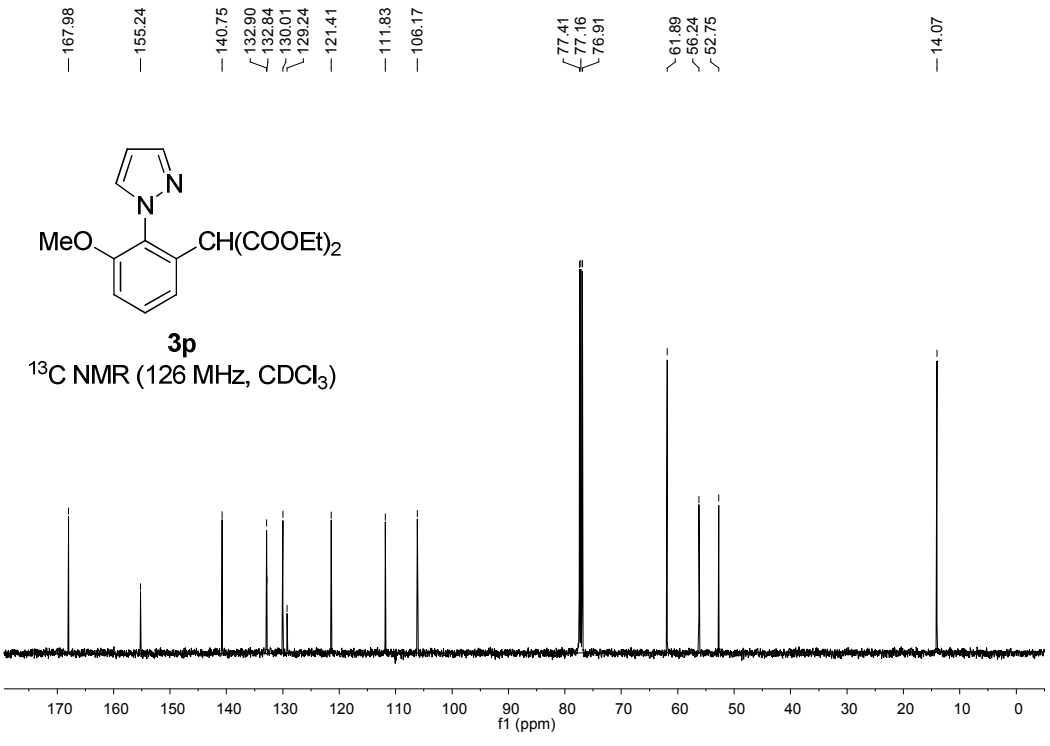
106.66
77.41
77.16
76.91
61.80
52.64
21.29
14.02
CH(COOEt)2
CH3
3o
13C NMR (126 MHz, CDCl3)
f1 (ppm)



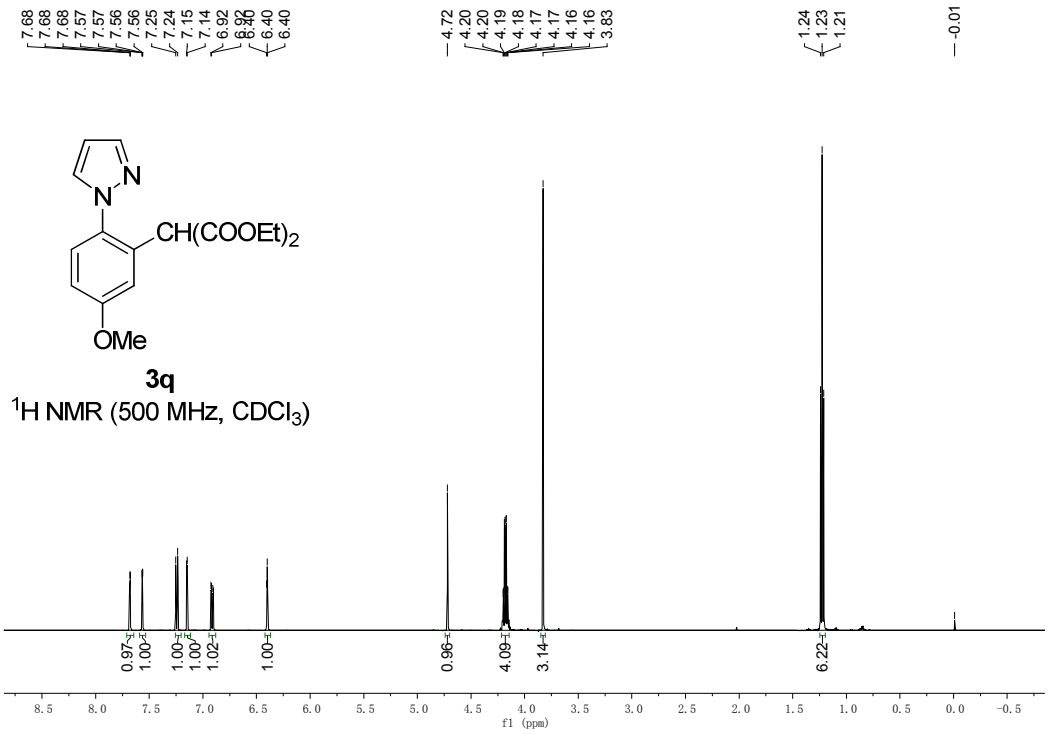
3p

^{1}H NMR (500 MHz, $CDCl_3$)



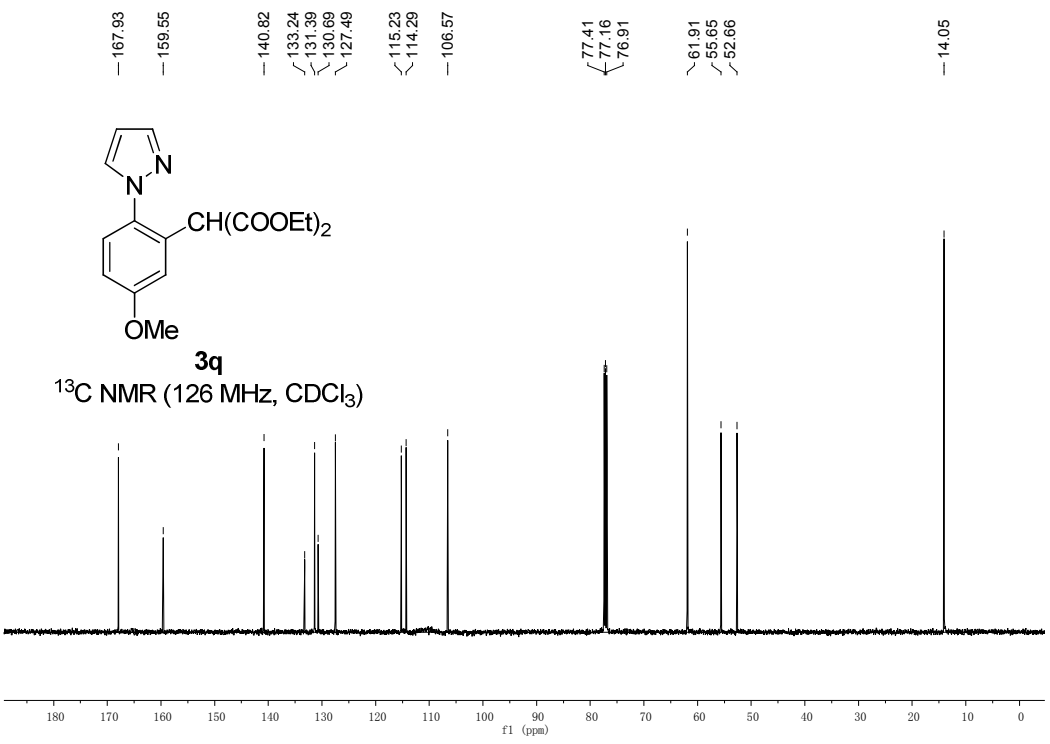
3p

^{13}C NMR (126 MHz, $CDCl_3$)



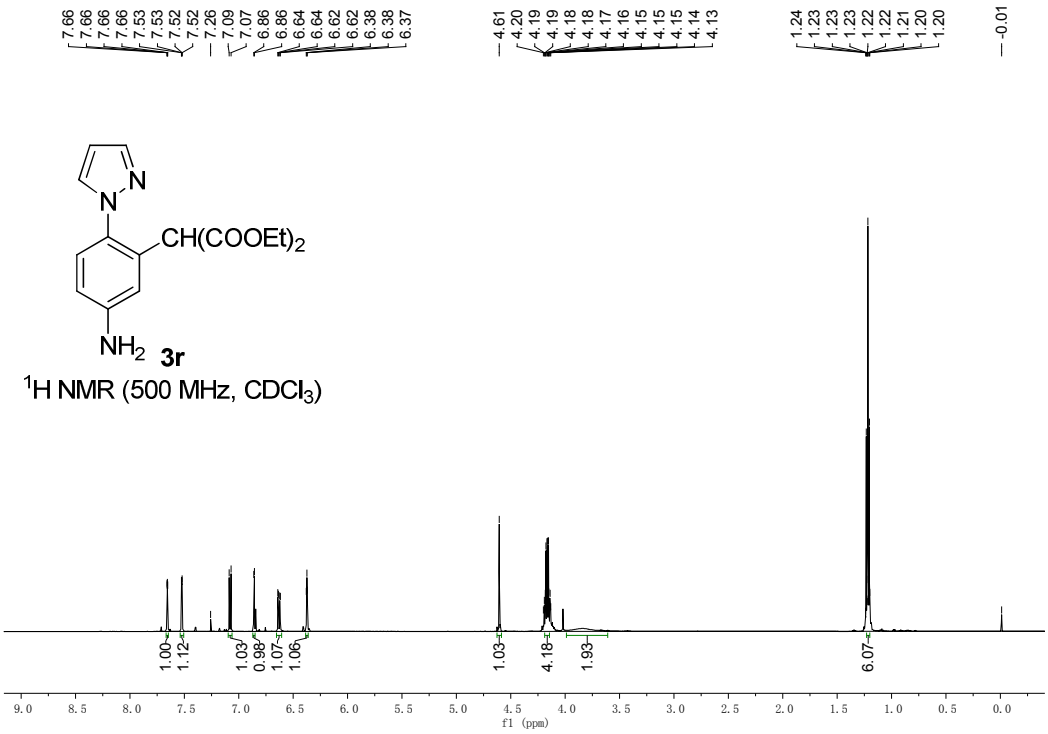
3q

^{1}H NMR (500 MHz, $CDCl_3$)



3q

^{13}C NMR (126 MHz, $CDCl_3$)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7.66
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7.66
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6.62
6.62
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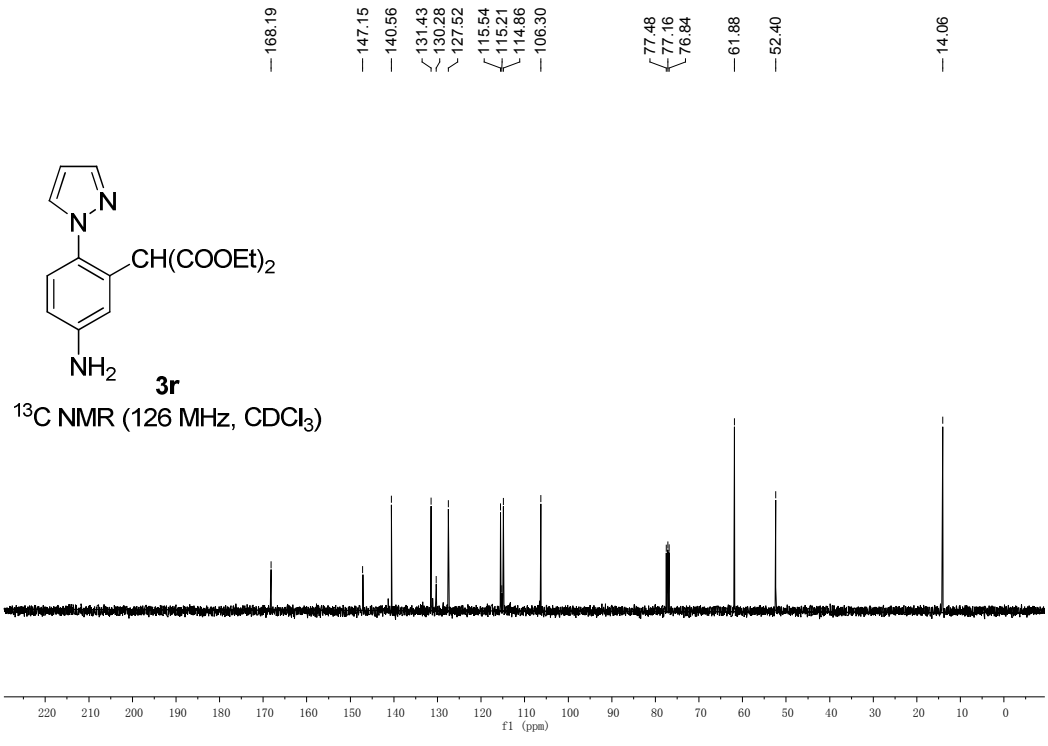
6.38
6.37
4.61
4.20
4.19
4.19
4.18
4.18
4.17
4.16
4.15
4.15
4.15
4.14
4.13
1.24
1.23
1.23
1.23
1.22
1.22
1.21
1.20
1.20
-0.01
CH(COOEt)2
NH2
3r
1H NMR (500 MHz, CDCl3)
1.00
1.12
1.03
0.98
1.07
1.06
1.03
4.18
1.93
6.07
f1 (ppm)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131.43
130.28
127.52
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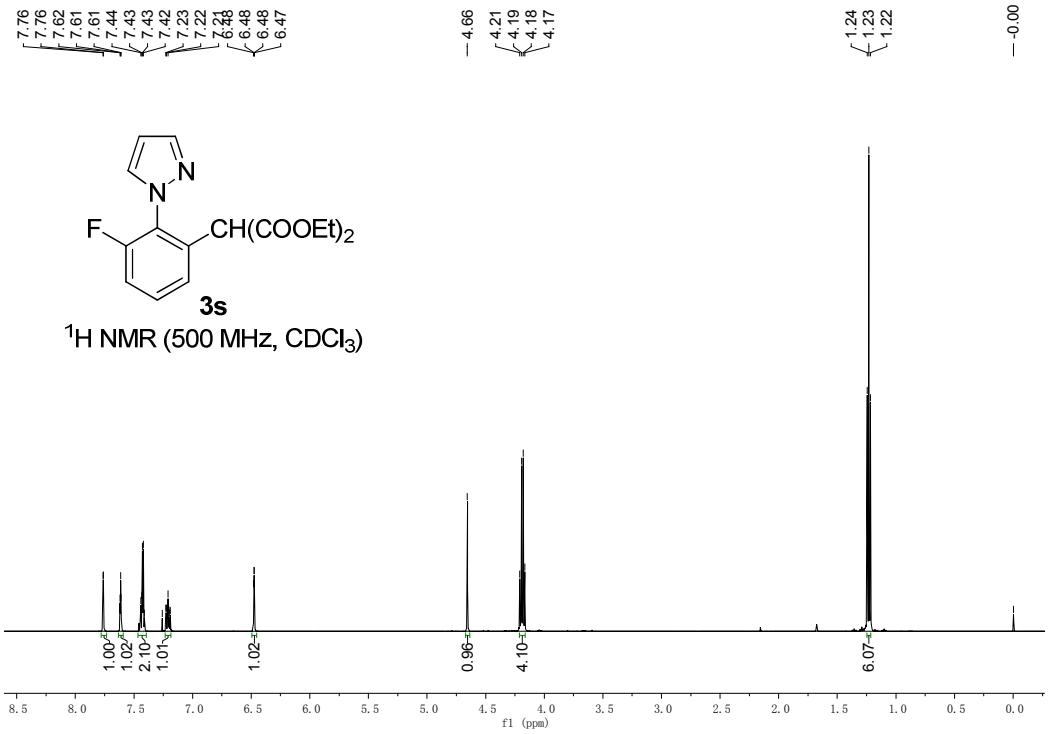
106.30
77.48
77.16
76.84
61.88
52.40
14.06
CH(COOEt)2
NH2
3r
13C NMR (126 MHz, CDCl3)
f1 (ppm)


7.76
7.76
7.62
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7.44
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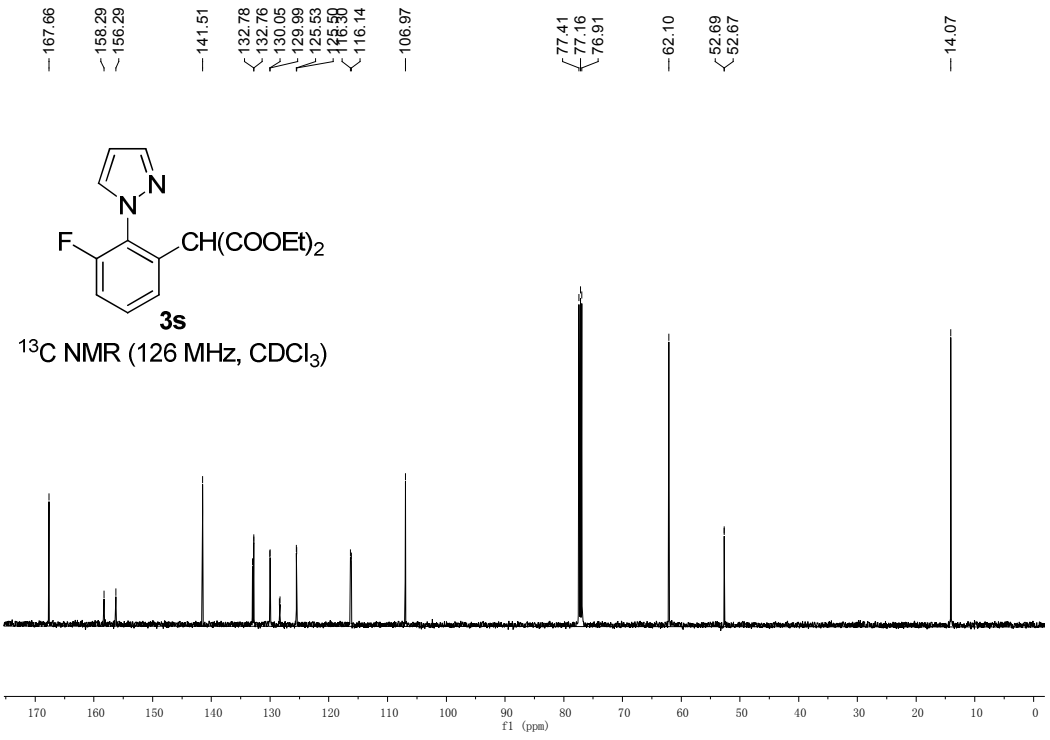
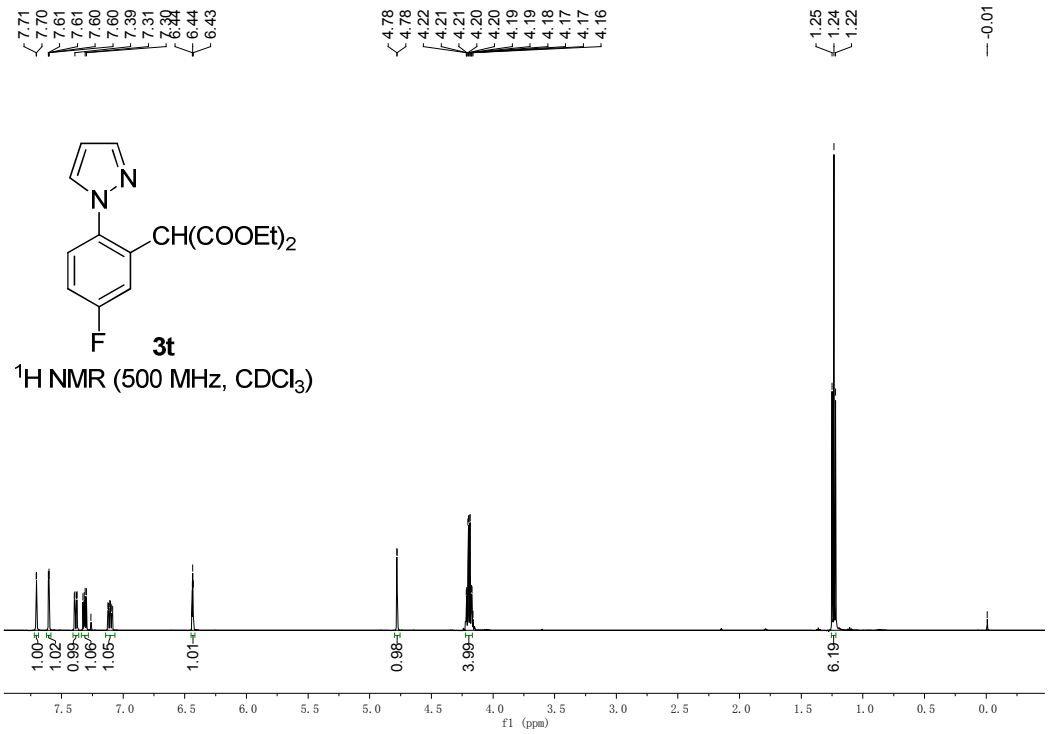
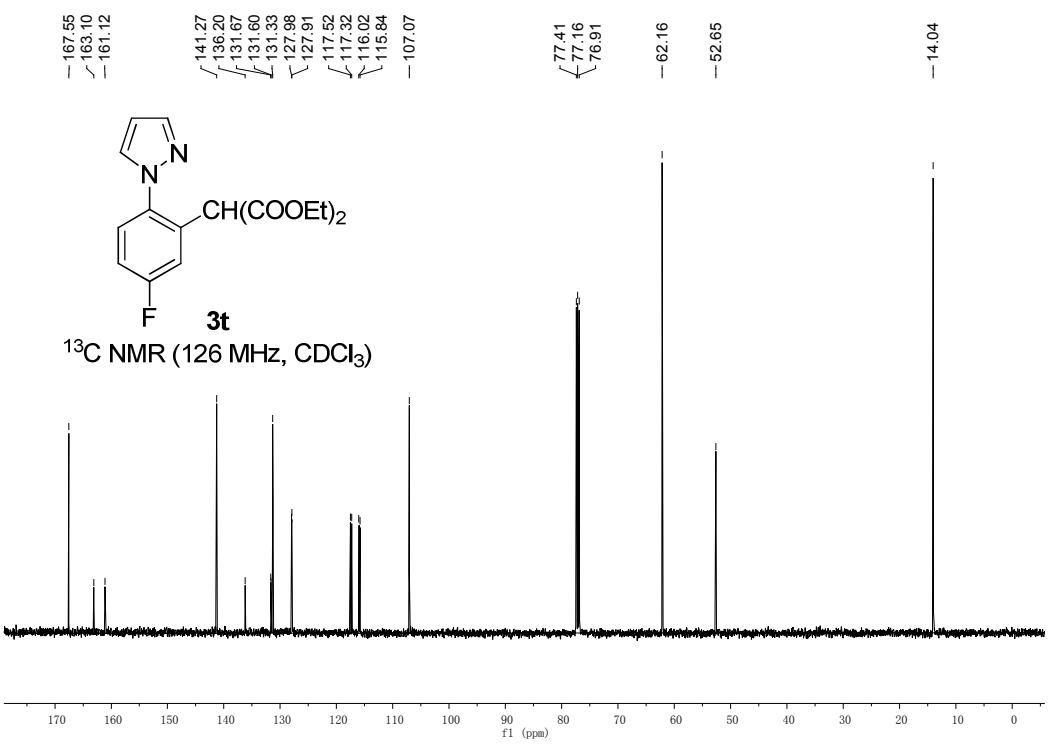
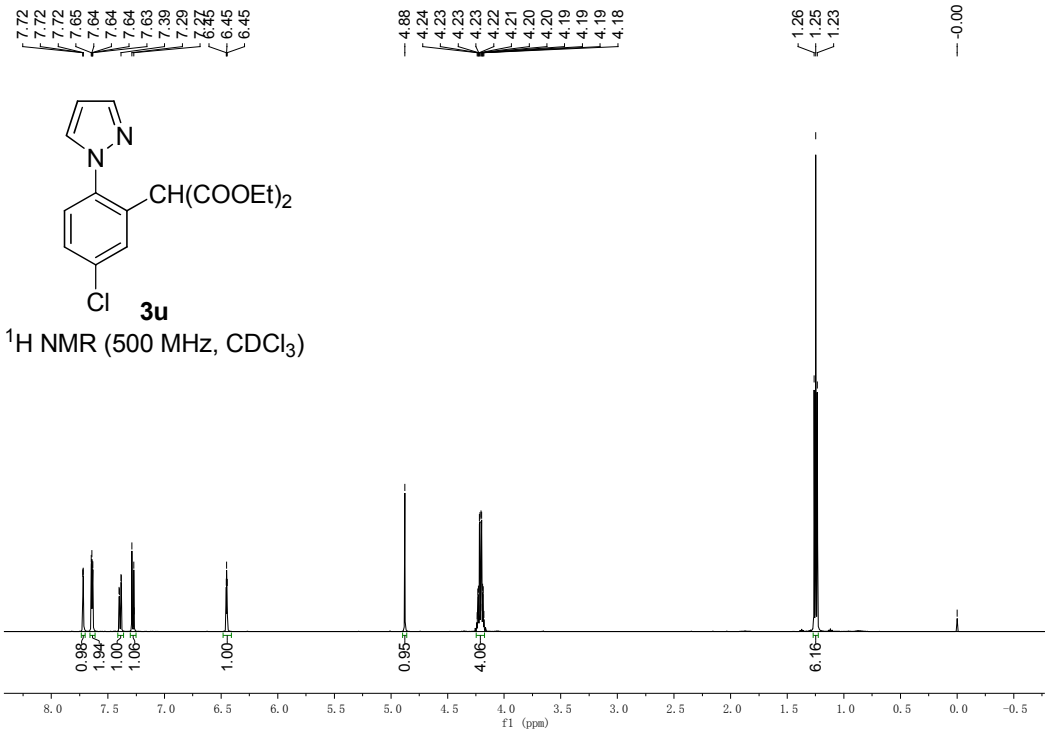
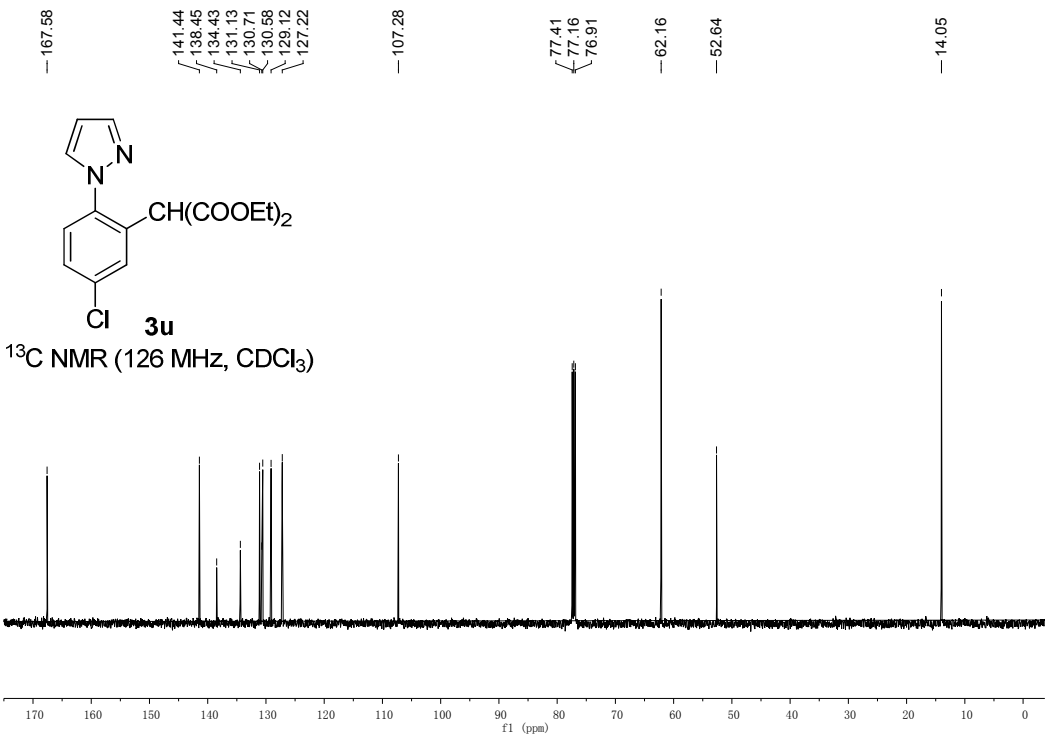
7.42
7.23
7.22
7.21
6.48
6.48
6.47
4.66
4.21
4.19
4.18
4.17
1.24
1.23
1.22
0.00
N
N
F
CH(COOEt)2
3s
1H NMR (500 MHz, CDCl3)
1.00
1.02
2.10
1.01
1.02
0.96
4.10
6.07
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

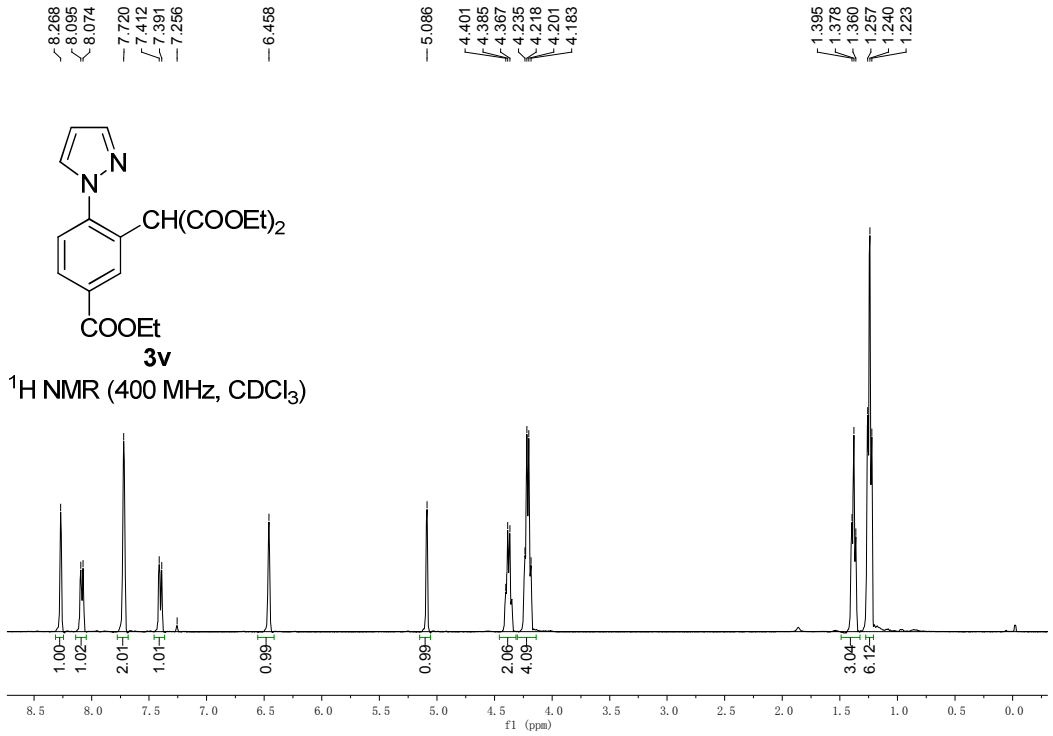

167.66
158.29
156.29
141.51
132.78
132.76
130.05
129.99
125.53
116.14
106.97
77.41
77.16
76.91
62.10
52.69
52.67
14.07
N
N
F
CH(COOEt)2
3s
13C NMR (126 MHz, CDCl3)
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


7.71
7.70
7.61
7.61
7.60
7.60
7.39
7.31
6.44
6.43
4.78
4.78
4.22
4.21
4.21
4.20
4.20
4.19
4.19
4.18
4.17
4.17
4.16
1.25
1.24
1.22
-0.01
CH(COOEt)2
F
3t
1H NMR (500 MHz, CDCl3)
1.00
1.02
0.99
1.06
1.05
1.01
0.98
3.99
6.19
f1 (ppm)


167.55
163.10
161.12
141.27
136.20
131.67
131.60
131.33
127.98
127.91
117.52
117.32
116.02
115.84
107.07
77.41
77.16
76.91
62.16
52.65
14.04
CH(COOEt)2
F
3t
13C NMR (126 MHz, CDCl3)
f1 (ppm)

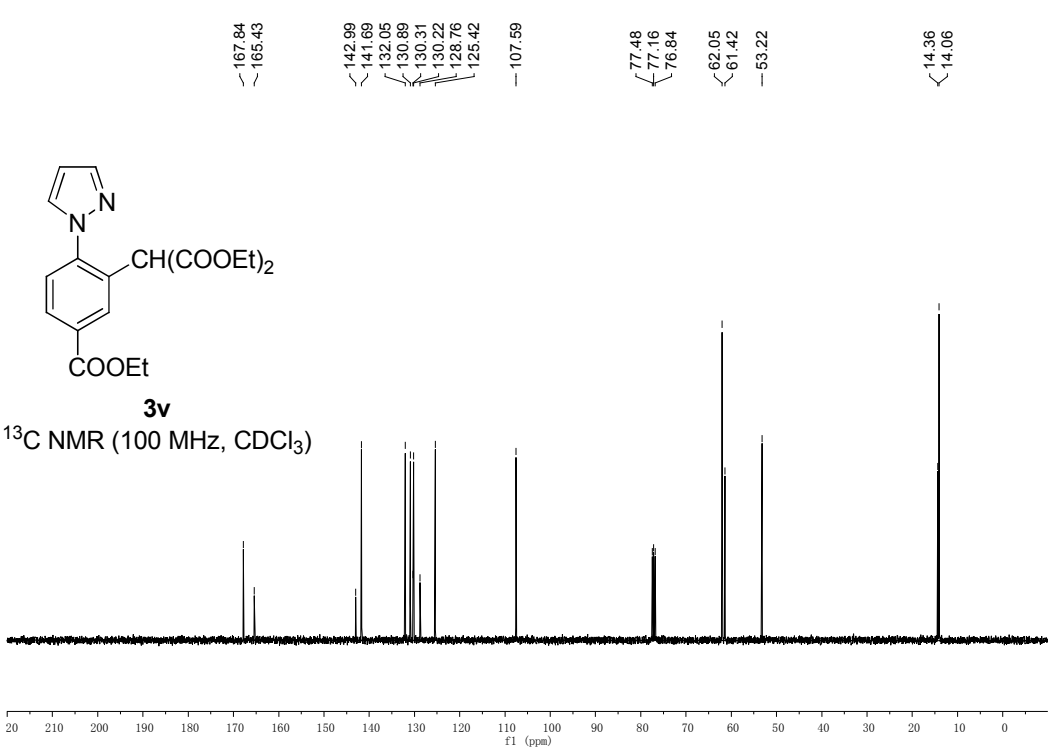

7.72
7.72
7.72
7.65
7.64
7.64
7.64
7.63
7.39
7.29
6.45
6.45
4.88
4.24
4.23
4.23
4.23
4.22
4.21
4.20
4.20
4.19
4.19
4.19
4.18
1.26
1.25
1.23
-0.00
N
N
CH(COOEt)2
Cl
3u
1H NMR (500 MHz, CDCl3)
0.98
1.94
1.00
1.06
1.00
0.95
4.06
6.16
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
f1 (ppm)


167.58
141.44
138.45
134.43
131.13
130.71
130.58
129.12
127.22
107.28
77.41
77.16
76.91
62.16
52.64
14.05
N
N
CH(COOEt)2
Cl
3u
13C NMR (126 MHz, CDCl3)
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)



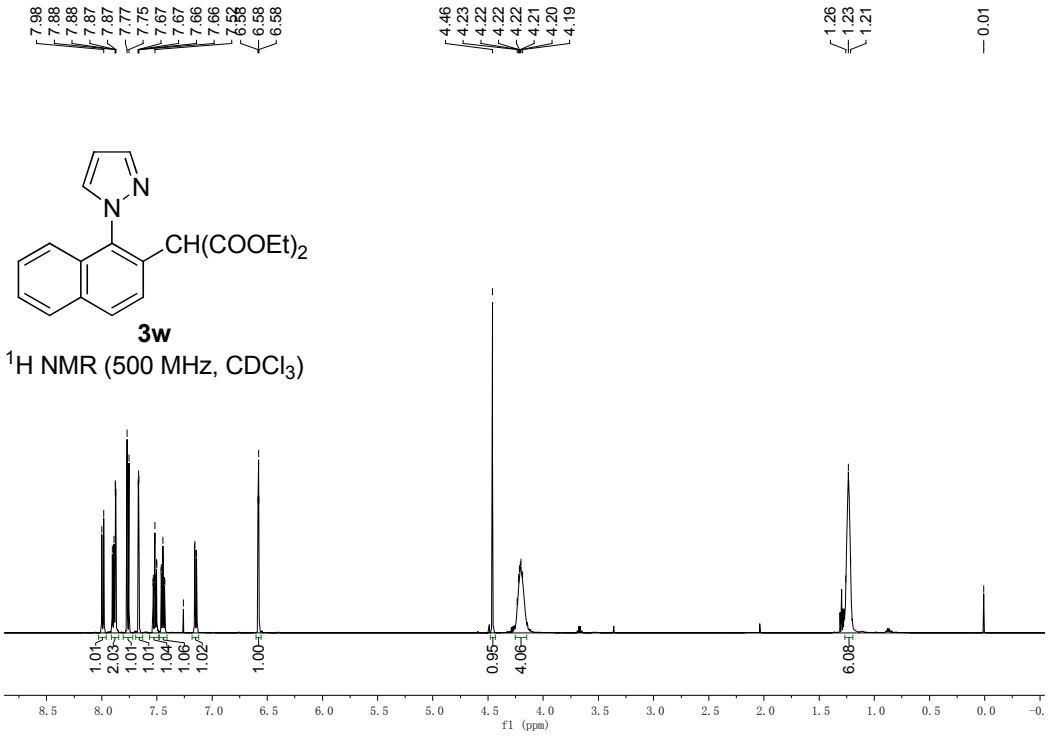
3v

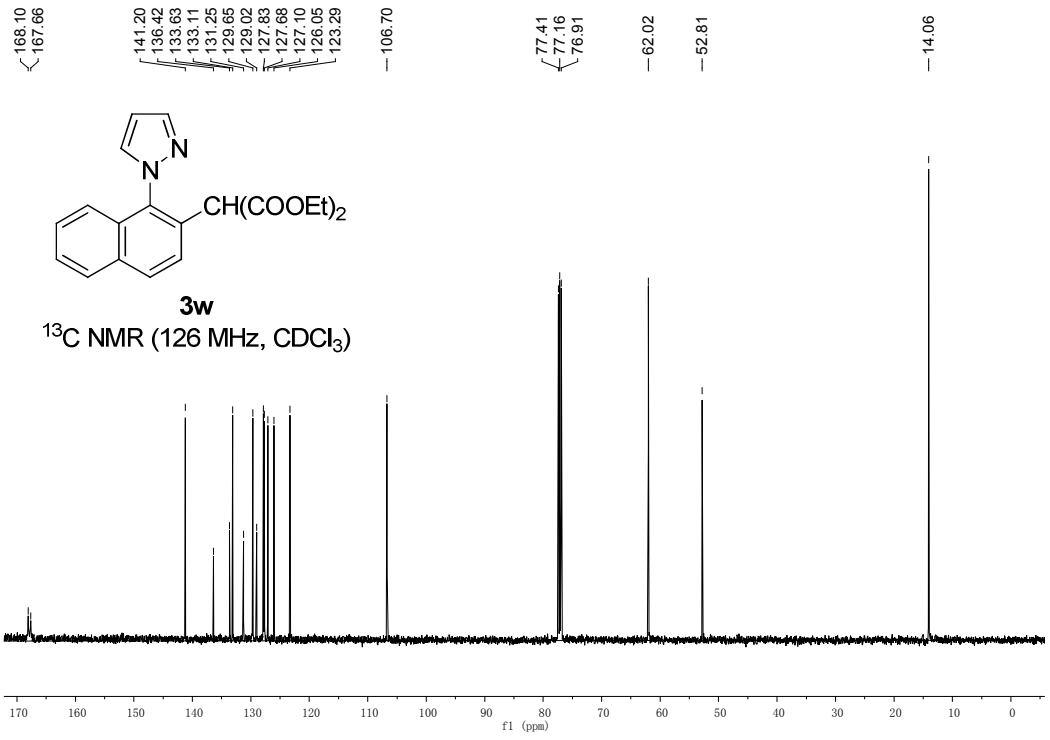
^{1}H NMR (400 MHz, $CDCl_3$)

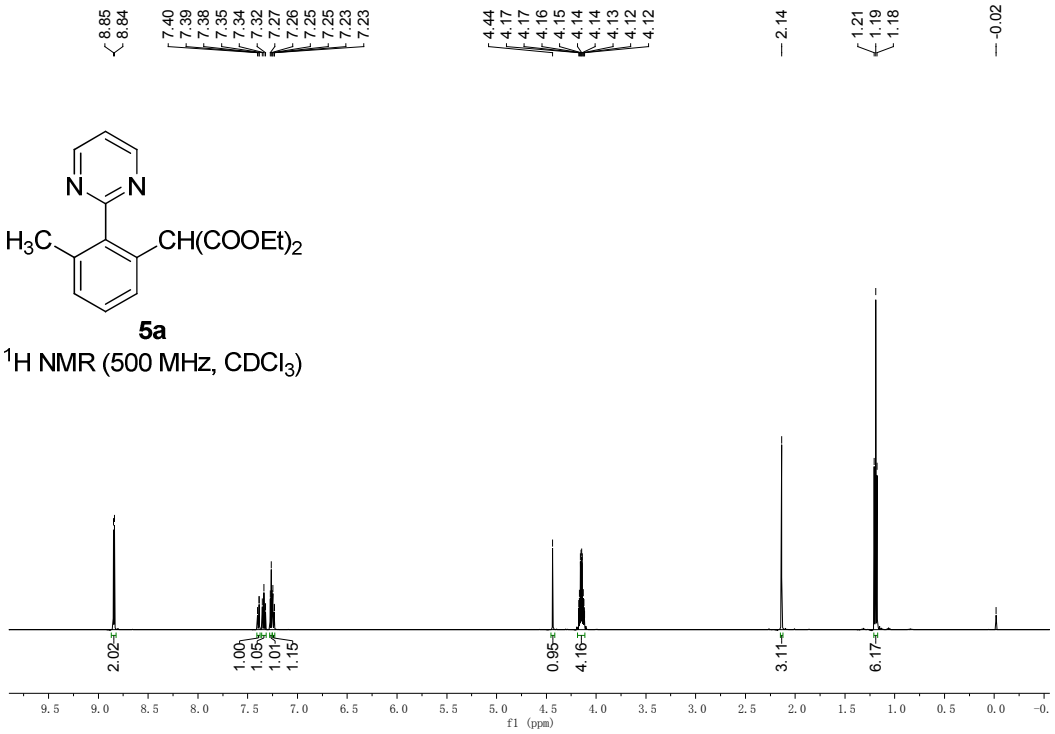


3v

^{13}C NMR (100 MHz, $CDCl_3$)

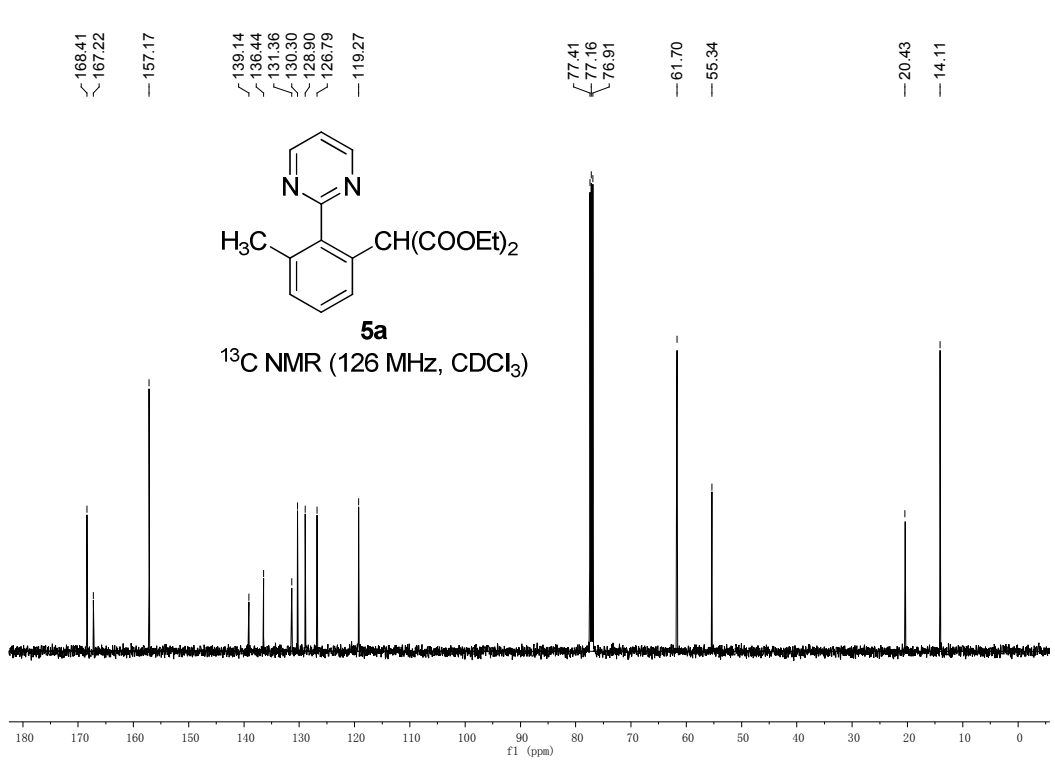

7.98
7.88
7.88
7.87
7.87
7.77
7.75
7.67
7.67
7.66
7.66
7.52
6.58
6.58
4.46
4.23
4.22
4.22
4.22
4.21
4.20
4.19
1.26
1.23
1.21
0.01
CH(COOEt)2
3w
1H NMR (500 MHz, CDCl3)
1.01
2.03
1.01
1.01
1.04
1.06
1.02
1.00
0.95
4.06
6.08
f1 (ppm)


168.10
167.66
141.20
136.42
133.63
133.11
131.25
129.65
129.02
127.83
127.68
127.10
126.05
123.29
106.70
77.41
77.16
76.91
62.02
52.81
14.06
CH(COOEt)2
3w
13C NMR (126 MHz, CDCl3)
f1 (ppm)



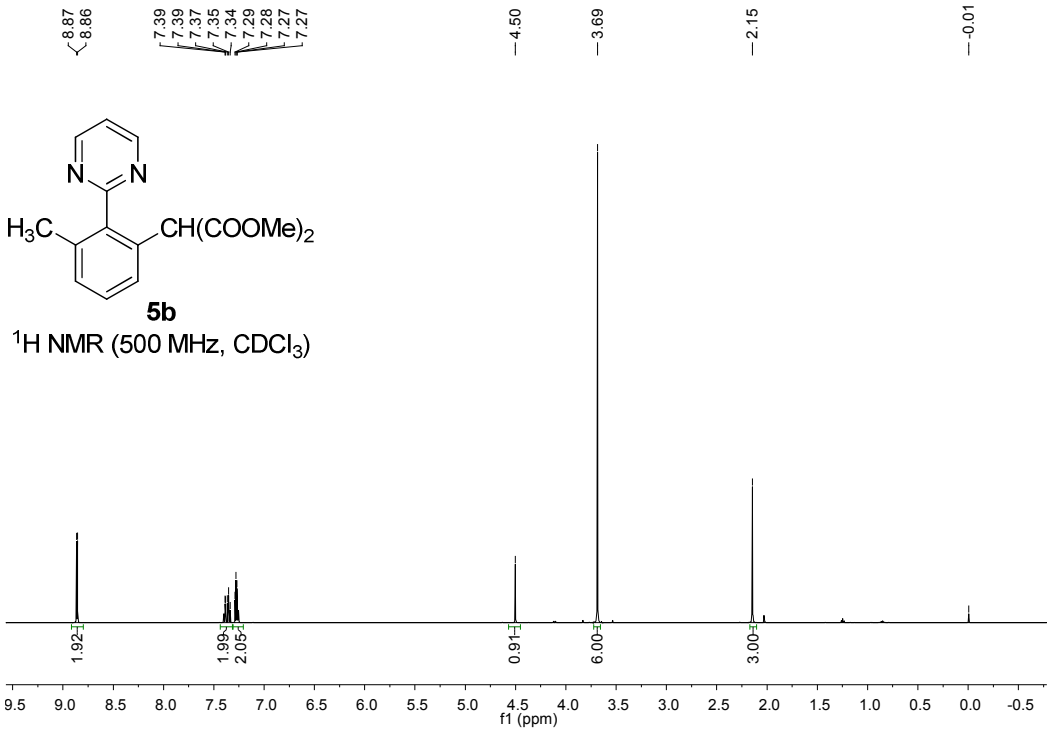
5a

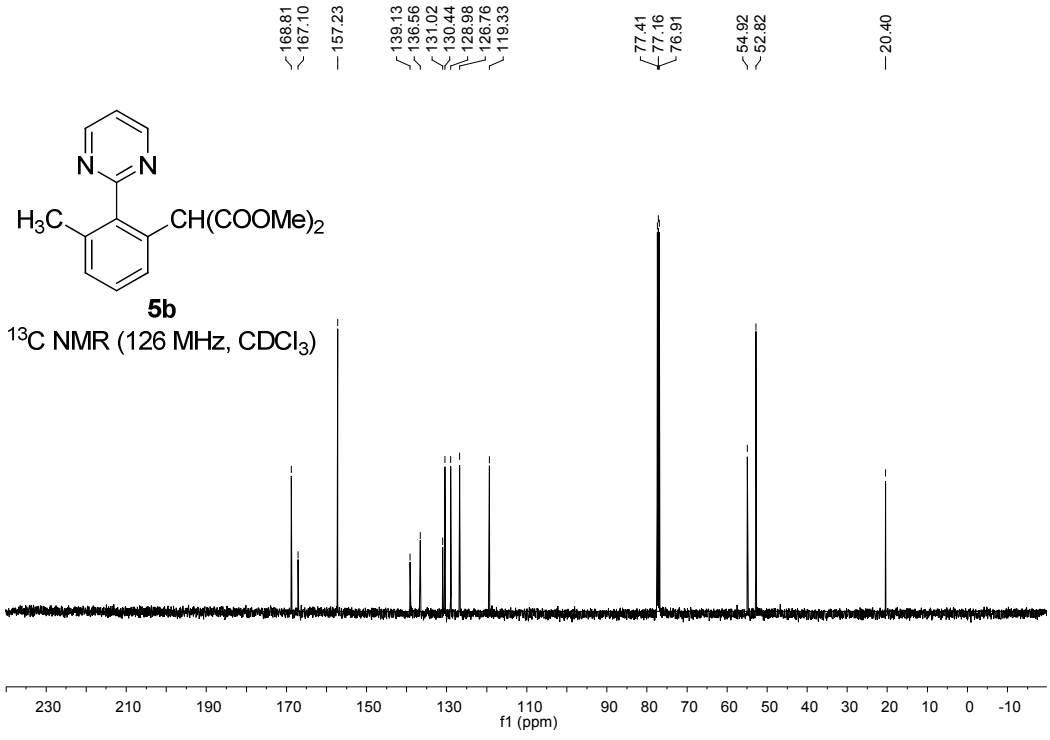
^{1}H NMR (500 MHz, $CDCl_3$)

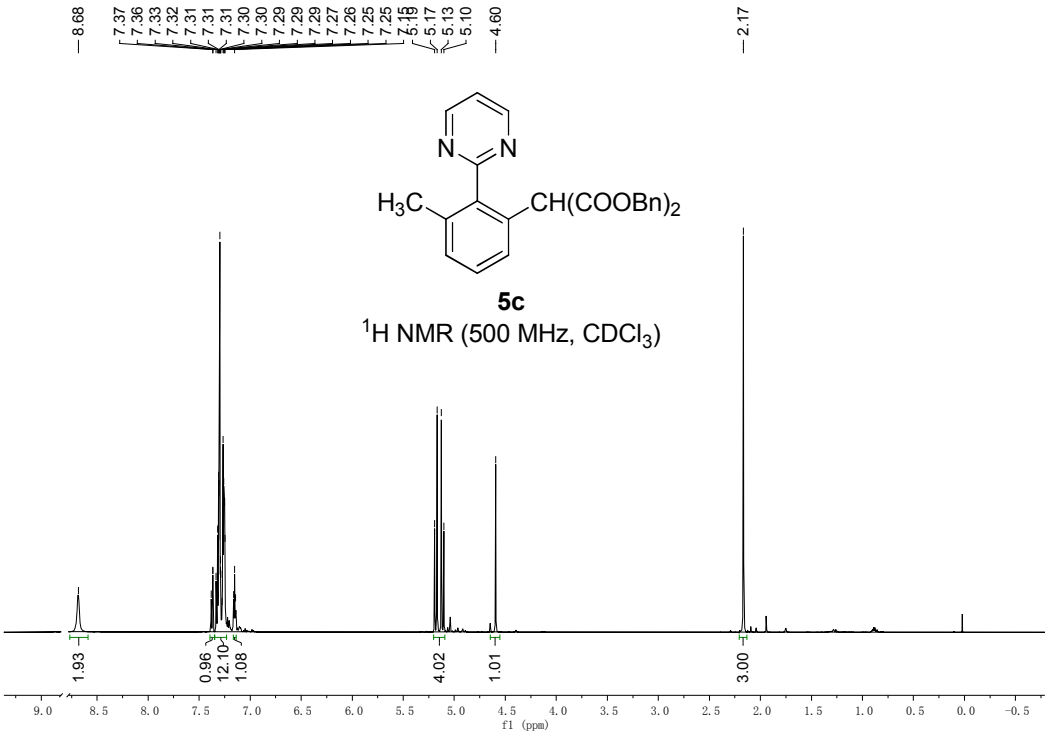


5a

^{13}C NMR (126 MHz, $CDCl_3$)

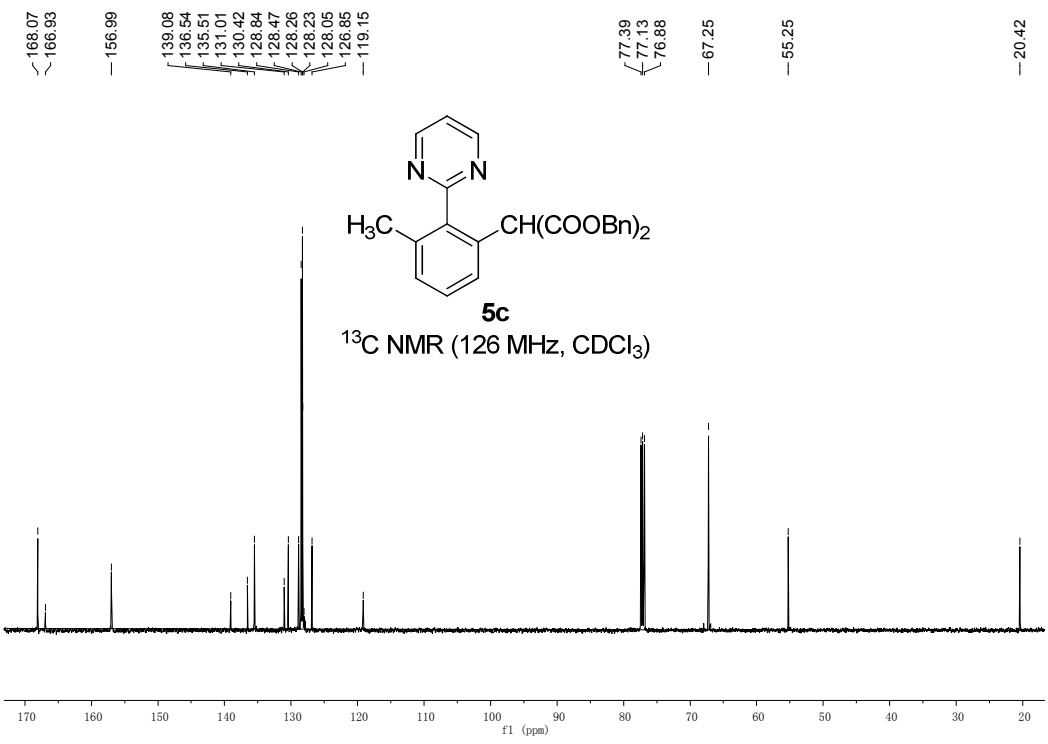

8.87
8.86
7.39
7.39
7.37
7.35
7.34
7.29
7.28
7.27
7.27
4.50
3.69
2.15
0.01
N
N
H3C
CH(COOMe)2
5b
1H NMR (500 MHz, CDCl3)
1.92
1.99
2.05
0.91
6.00
3.00
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)


168.81
167.10
157.23
139.13
136.56
131.02
130.44
128.98
126.76
119.33
77.41
77.16
76.91
54.92
52.82
20.40
N
N
H3C
CH(COOMe)2
5b
13C NMR (126 MHz, CDCl3)
230 210 190 170 150 130 110 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)



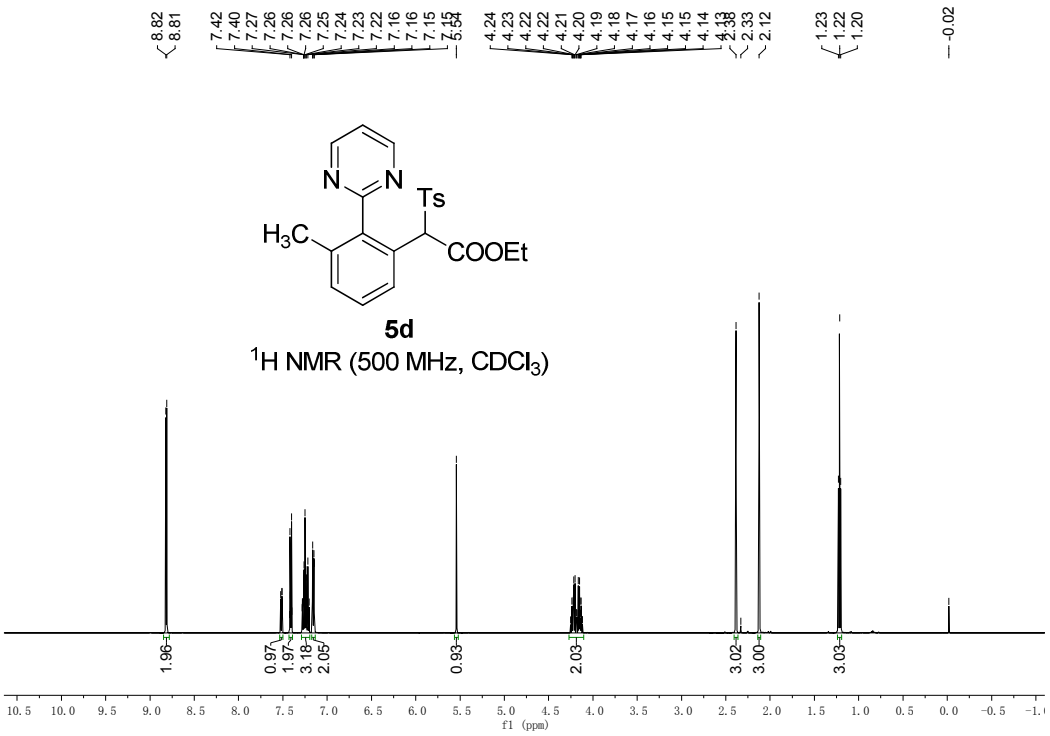
5c

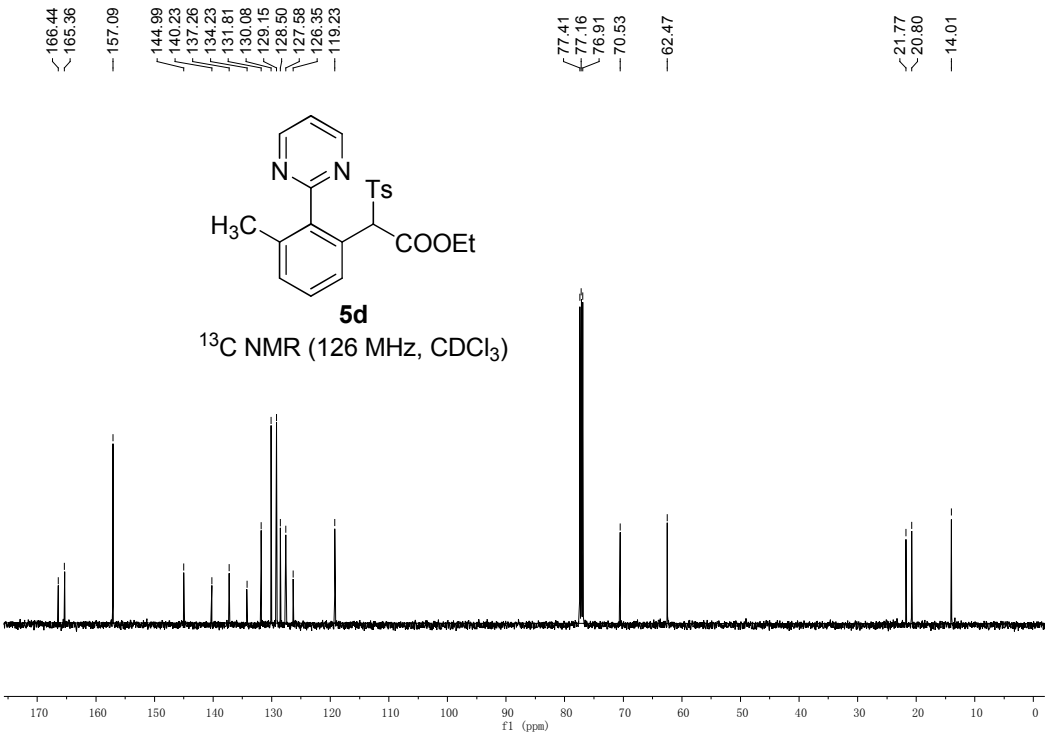
^{1}H NMR (500 MHz, $CDCl_3$)

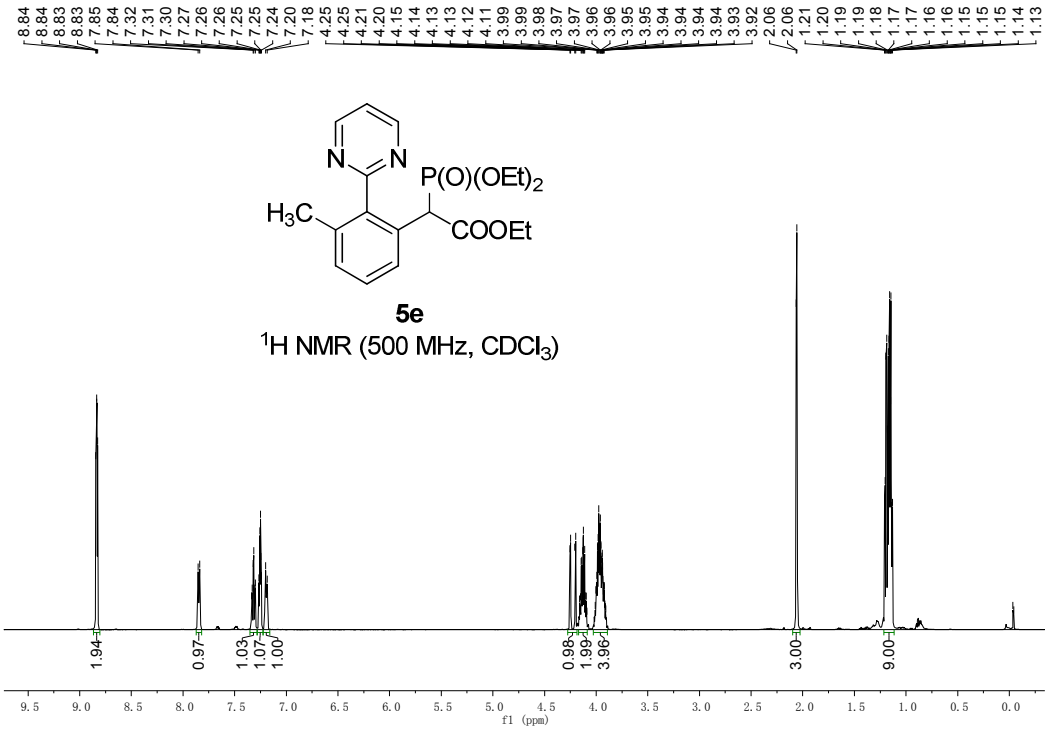


5c

^{13}C NMR (126 MHz, $CDCl_3$)

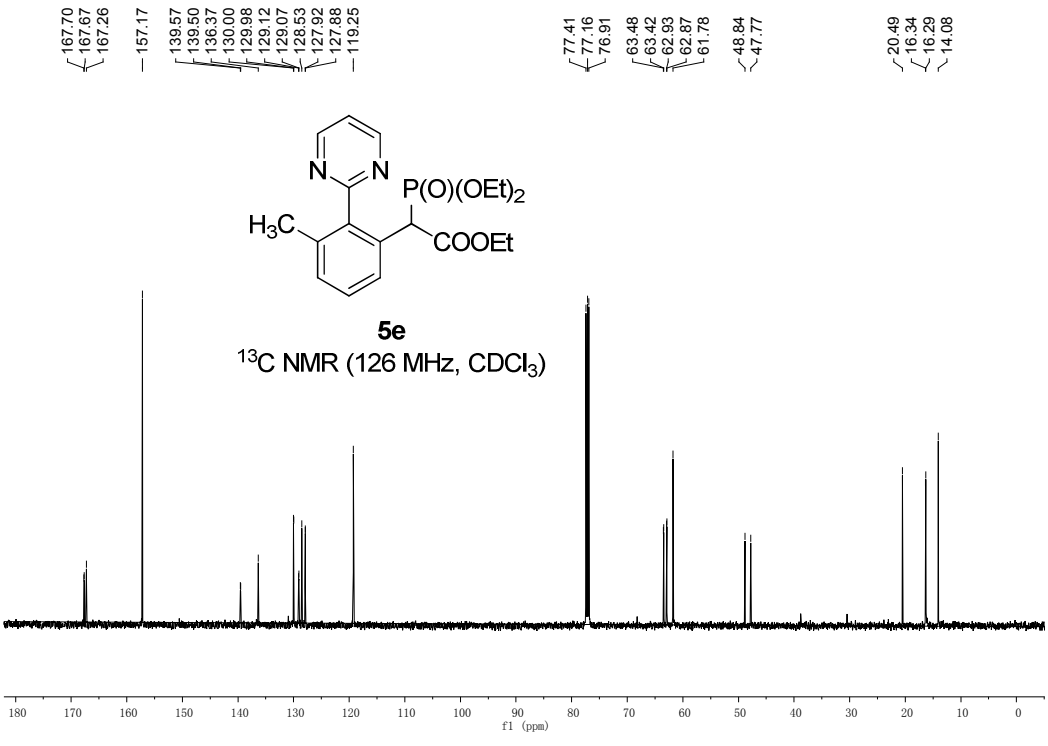

8.82
8.81
7.42
7.40
7.27
7.26
7.26
7.26
7.25
7.24
7.23
7.22
7.16
7.16
7.15
7.15
5.54
4.24
4.23
4.22
4.22
4.21
4.20
4.19
4.18
4.17
4.16
4.15
4.15
4.14
4.13
2.38
2.33
2.12
1.23
1.22
1.20
-0.02
N
N
Ts
H3C
COOEt
5d
1H NMR (500 MHz, CDCl3)
1.96
0.97
1.97
3.18
2.05
0.93
2.03
3.02
3.00
3.03
f1 (ppm)


166.44
165.36
157.09
144.99
140.23
137.26
134.23
131.81
130.08
129.15
128.50
127.58
126.35
119.23
77.41
77.16
76.91
70.53
62.47
21.77
20.80
14.01
N
N
Ts
H3C
COOEt
5d
13C NMR (126 MHz, CDCl3)
f1 (ppm)



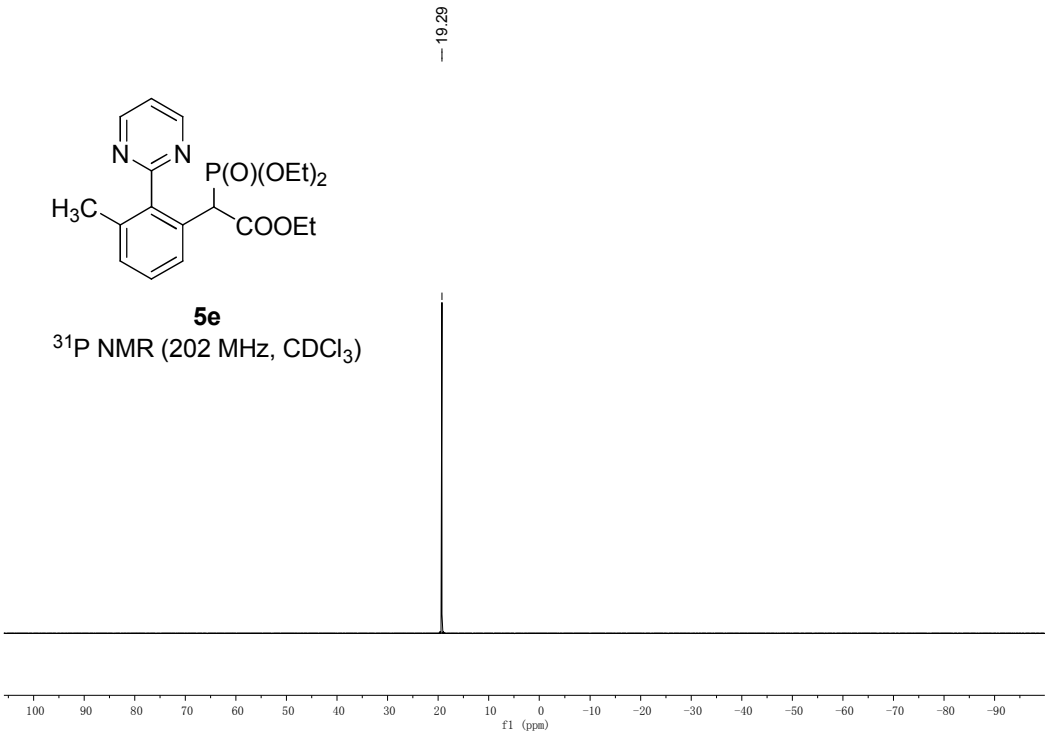
5e

^{1}H NMR (500 MHz, $CDCl_3$)



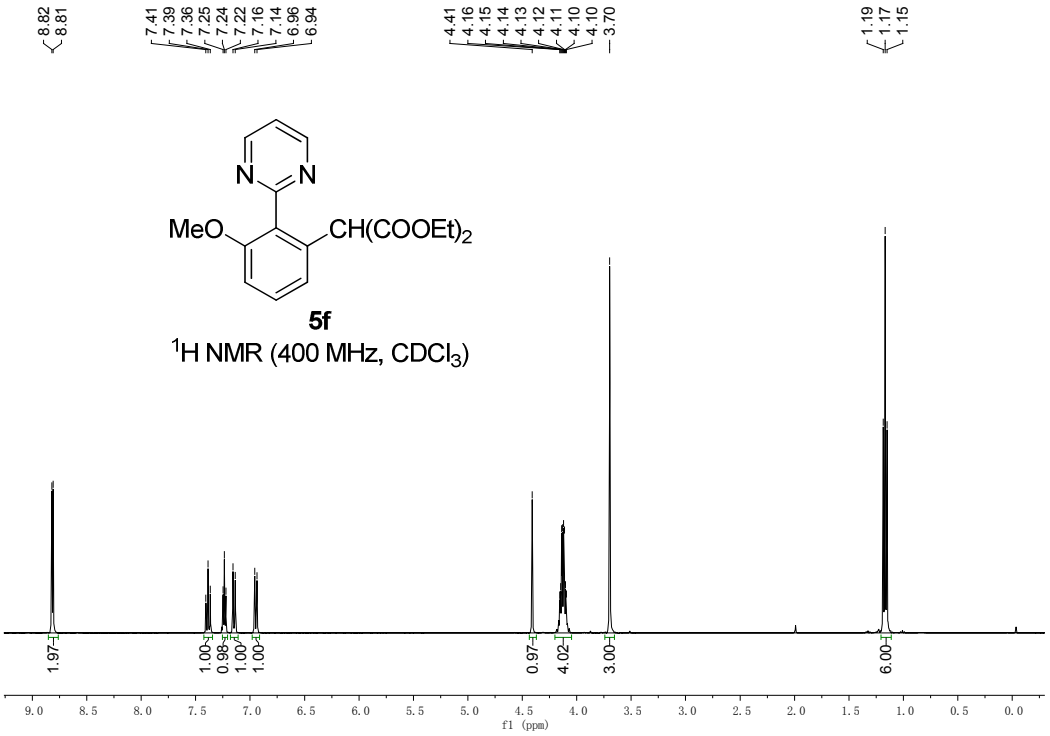
5e

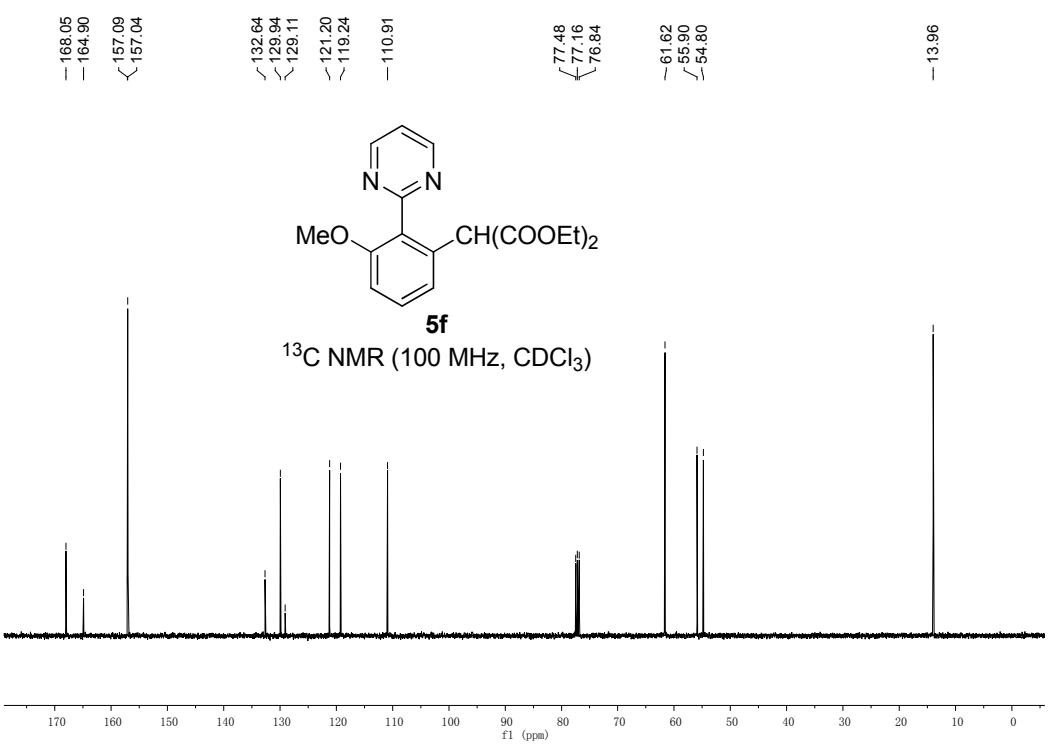
^{13}C NMR (126 MHz, $CDCl_3$)

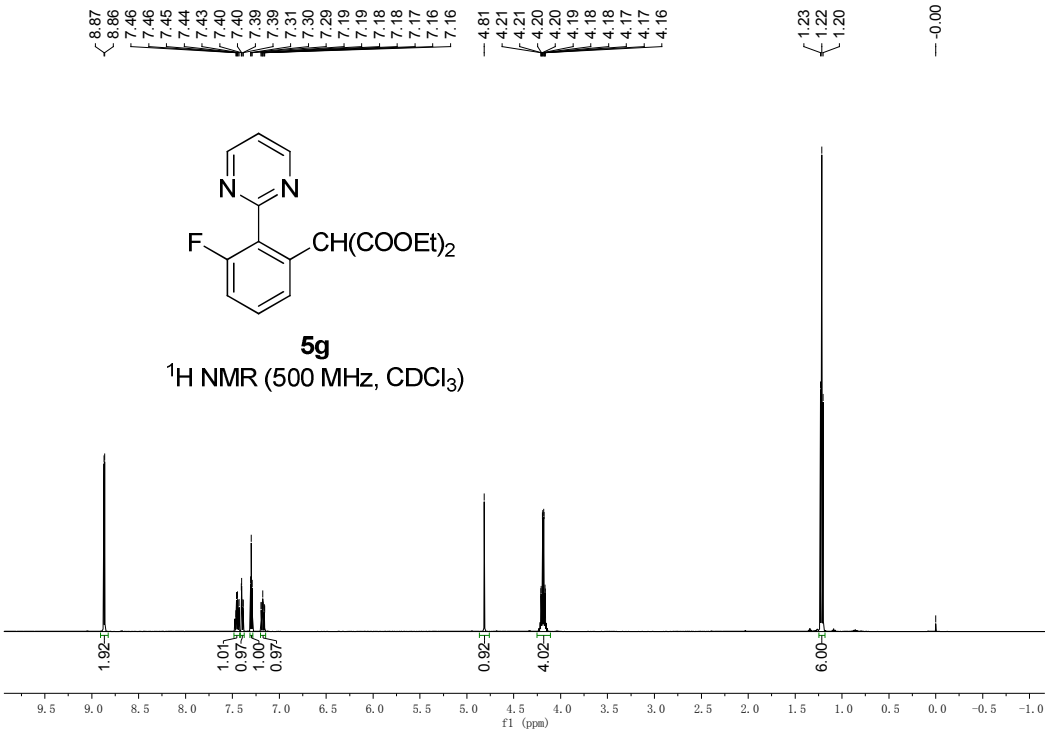


5e

^{31}P NMR (202 MHz, $CDCl_3$)

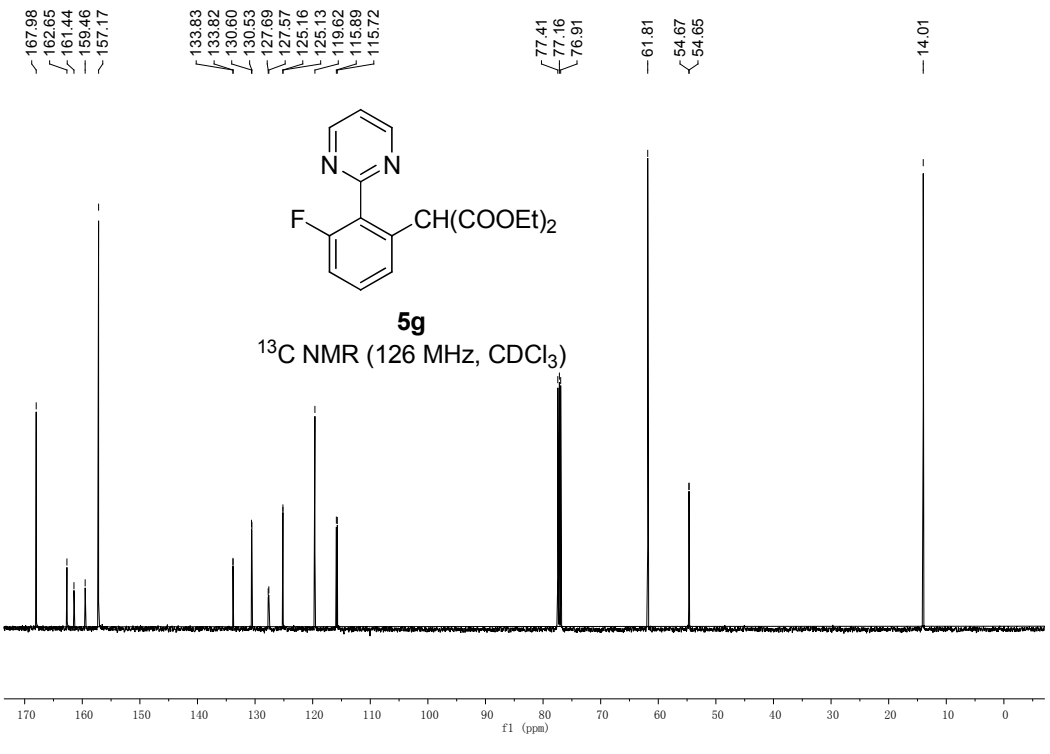

8.82
8.81
7.41
7.39
7.36
7.25
7.24
7.22
7.16
7.14
6.96
6.94
4.41
4.16
4.15
4.14
4.13
4.12
4.11
4.10
4.10
3.70
1.19
1.17
1.15
MeO
CH(COOEt)2
5f
1H NMR (400 MHz, CDCl3)
1.97
1.00
0.98
1.00
1.00
0.97
4.02
3.00
6.00
f1 (ppm)


168.05
164.90
157.09
157.04
132.64
129.94
129.11
121.20
119.24
110.91
77.48
77.16
76.84
61.62
55.90
54.80
13.96
MeO
CH(COOEt)2
5f
13C NMR (100 MHz, CDCl3)
f1 (ppm)



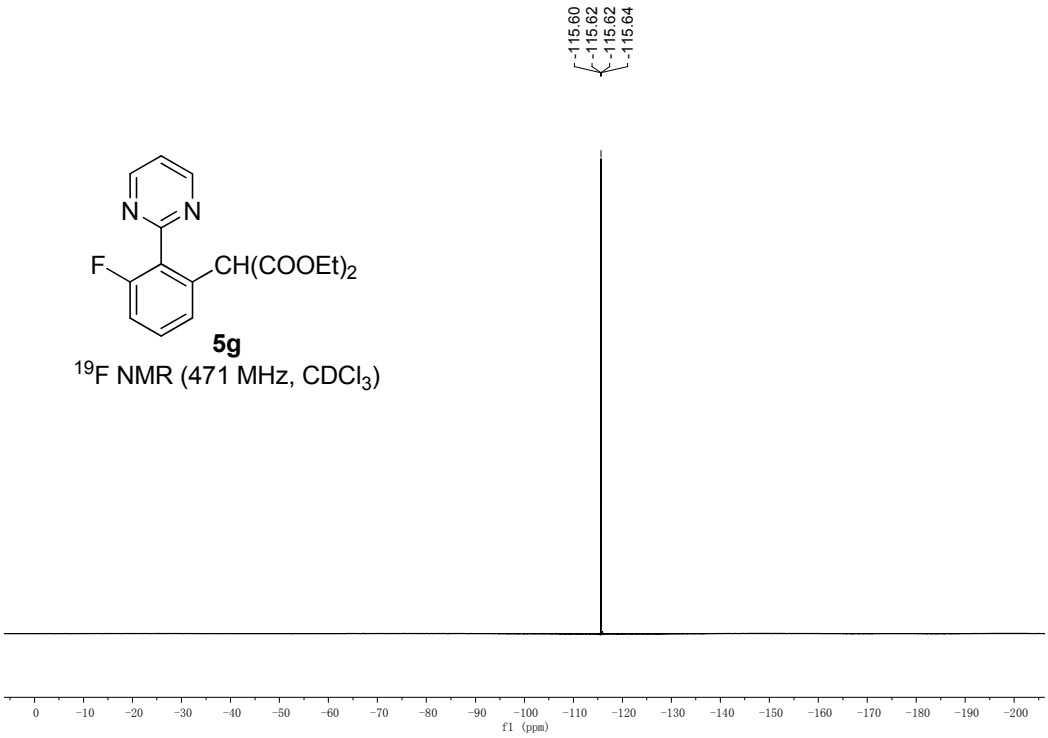
5g

^{1}H NMR (500 MHz, $CDCl_3$)



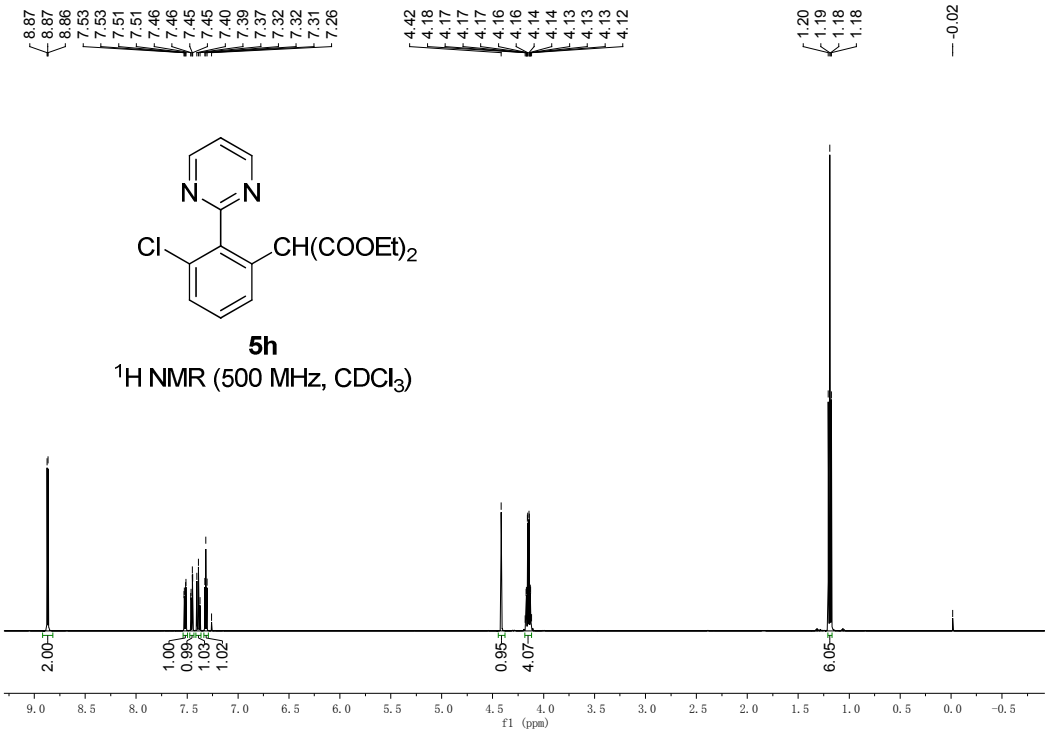
5g

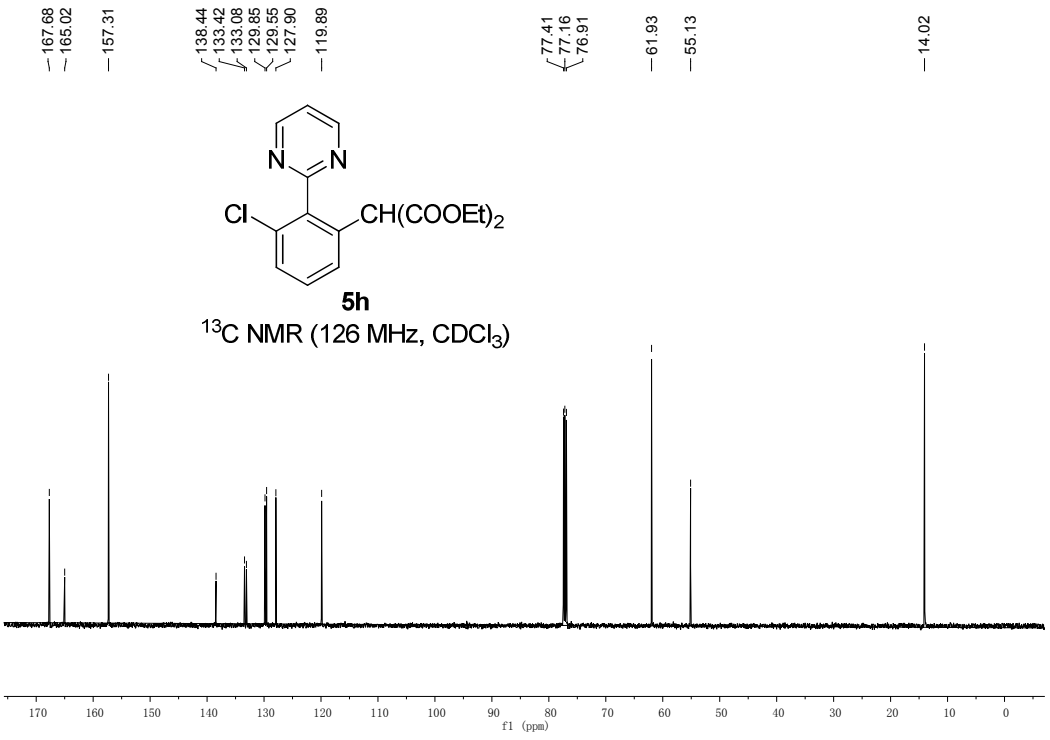
^{13}C NMR (126 MHz, $CDCl_3$)

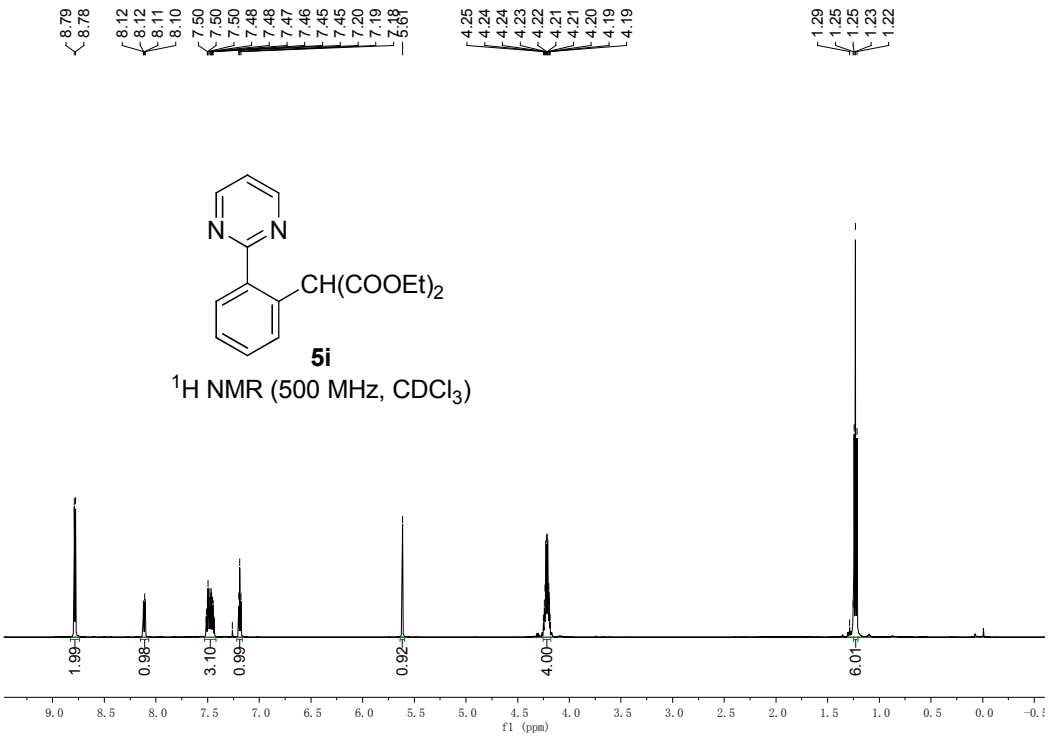


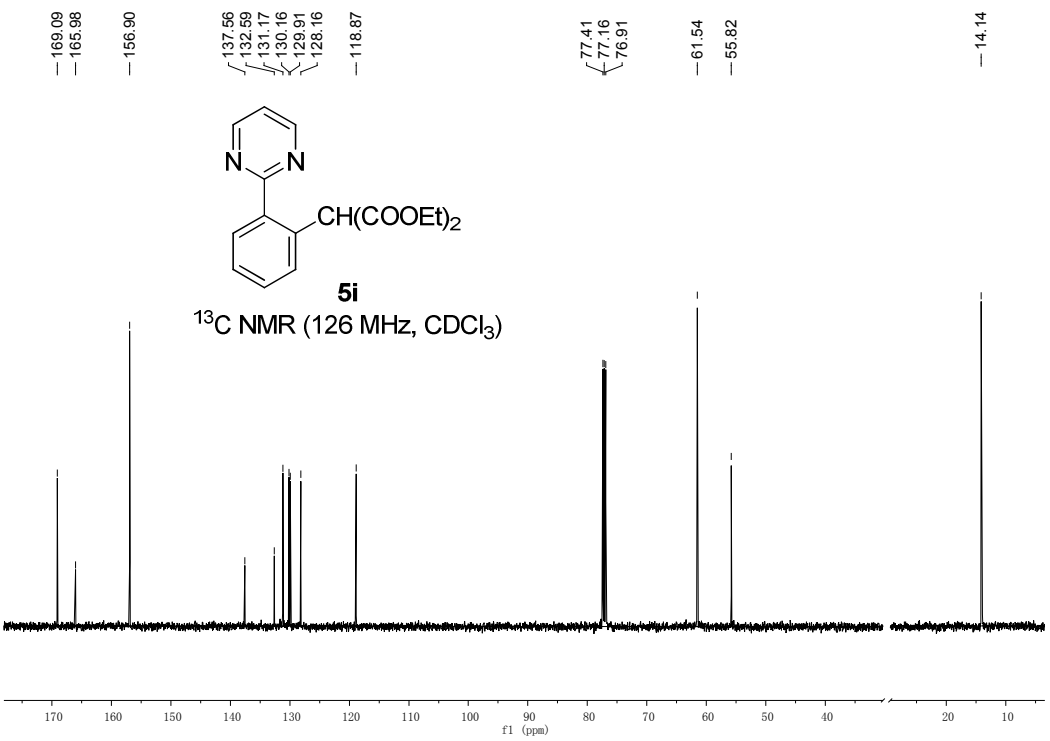
5g

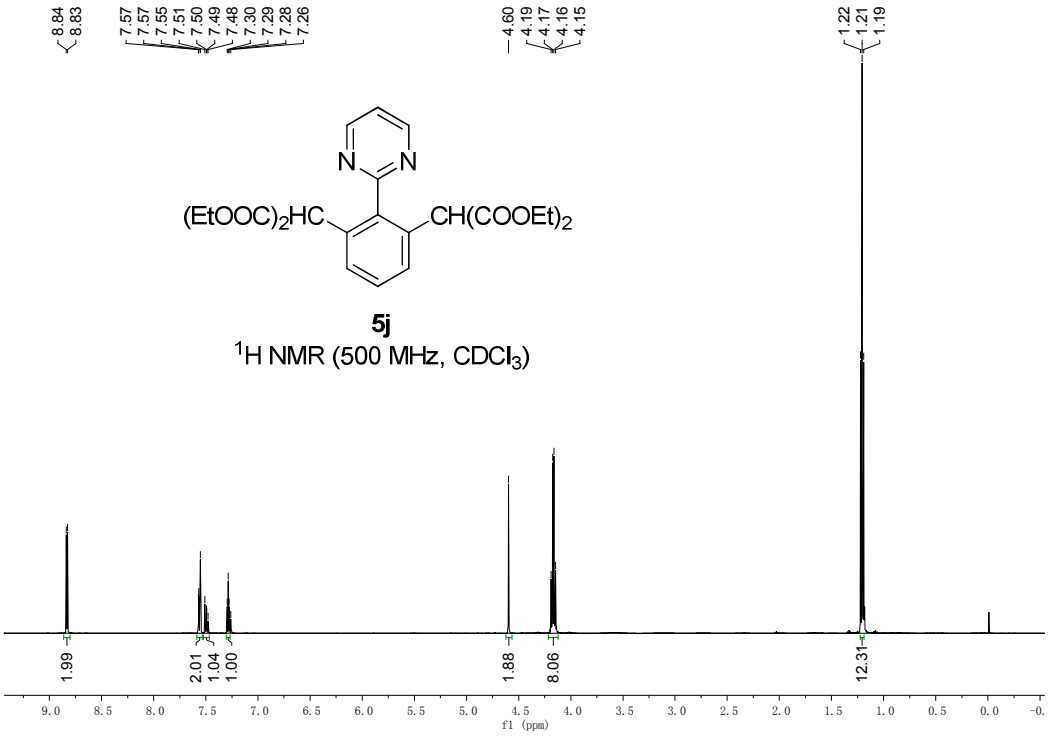
^{19}F NMR (471 MHz, $CDCl_3$)


8.87
8.87
8.86
7.53
7.53
7.51
7.51
7.46
7.46
7.45
7.45
7.40
7.39
7.37
7.32
7.32
7.31
7.26
4.42
4.18
4.17
4.17
4.17
4.16
4.16
4.14
4.14
4.13
4.13
4.13
4.12
1.20
1.19
1.18
1.18
-0.02
N
N
Cl
CH(COOEt)2
5h
1H NMR (500 MHz, CDCl3)
2.00
1.00
0.99
1.03
1.02
0.95
4.07
6.05
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)


167.68
165.02
157.31
138.44
133.42
133.08
129.85
129.55
127.90
119.89
77.41
77.16
76.91
61.93
55.13
14.02
N
N
Cl
CH(COOEt)2
5h
13C NMR (126 MHz, CDCl3)
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

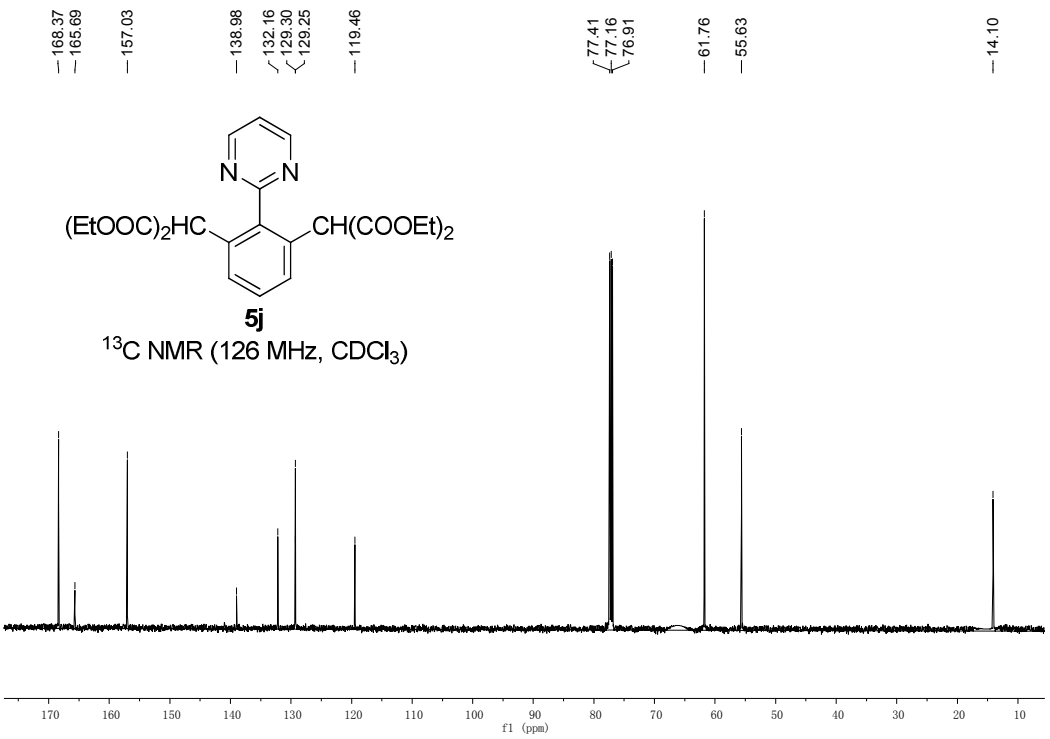

8.79
8.78
8.12
8.12
8.11
8.10
7.50
7.50
7.50
7.48
7.48
7.47
7.46
7.45
7.45
7.20
7.19
7.18
7.18
4.25
4.24
4.24
4.23
4.22
4.21
4.21
4.20
4.19
4.19
1.29
1.25
1.25
1.23
1.22
N
N
CH(COOEt)2
5i
1H NMR (500 MHz, CDCl3)
1.99
0.98
3.10
0.99
0.92
4.00
6.01
f1 (ppm)


169.09
165.98
156.90
137.56
132.59
131.17
130.16
129.91
128.16
118.87
77.41
77.16
76.91
61.54
55.82
14.14
N
N
CH(COOEt)2
5i
13C NMR (126 MHz, CDCl3)
f1 (ppm)



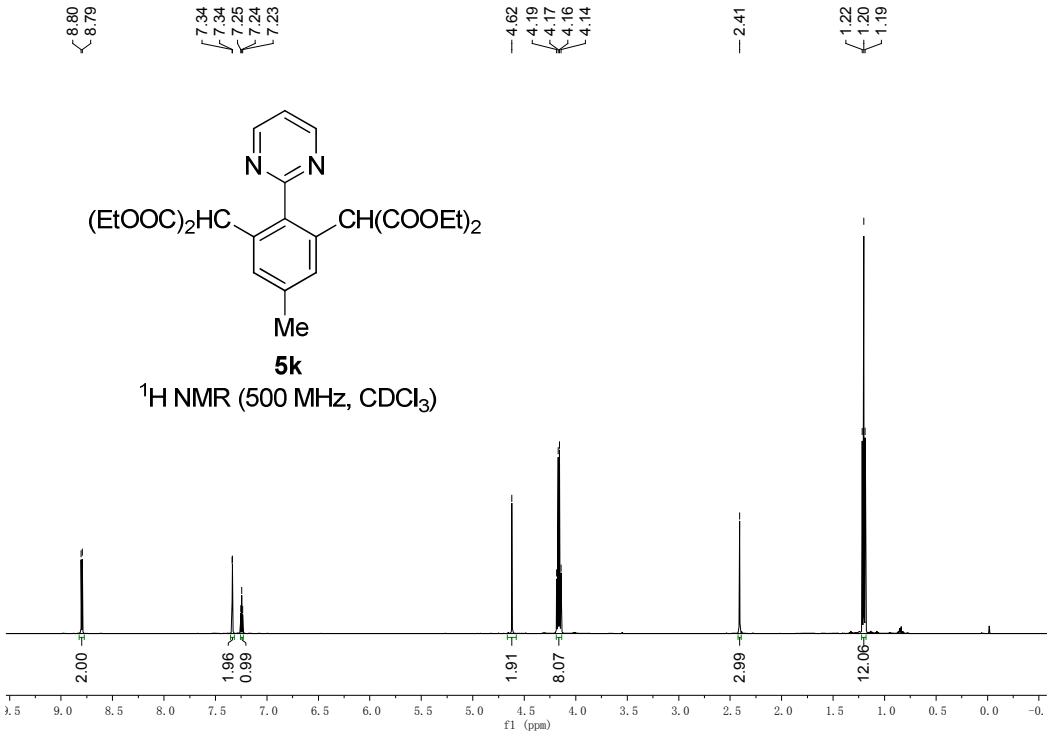
5j

^{1}H NMR (500 MHz, $CDCl_3$)



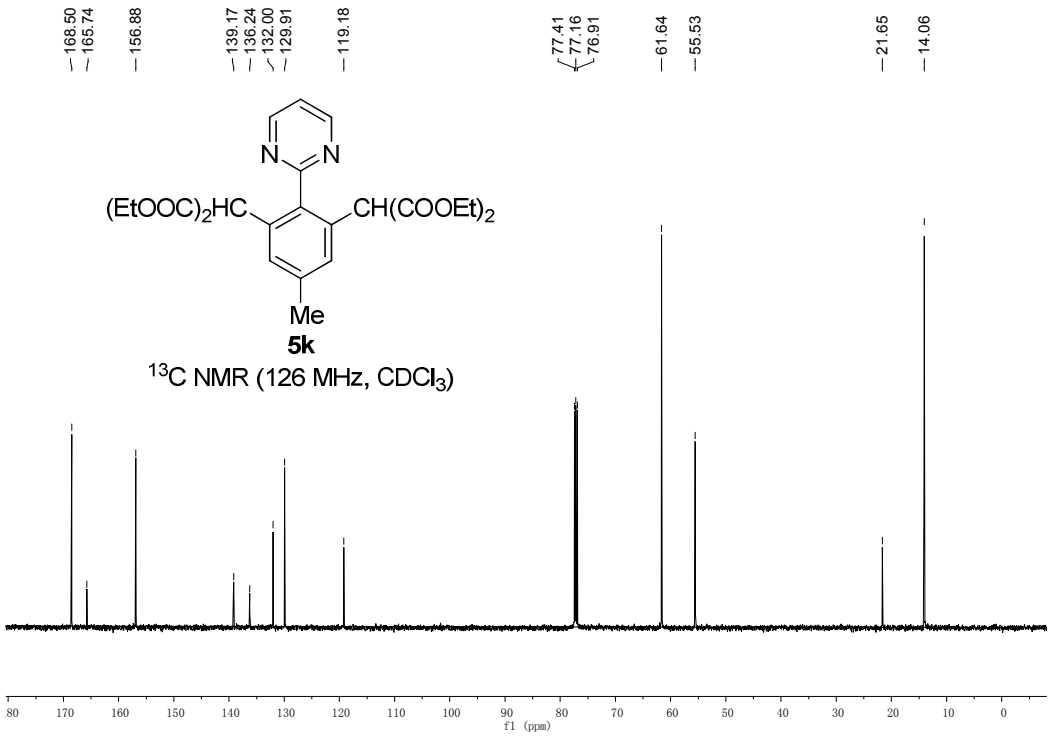
5j

^{13}C NMR (126 MHz, $CDCl_3$)



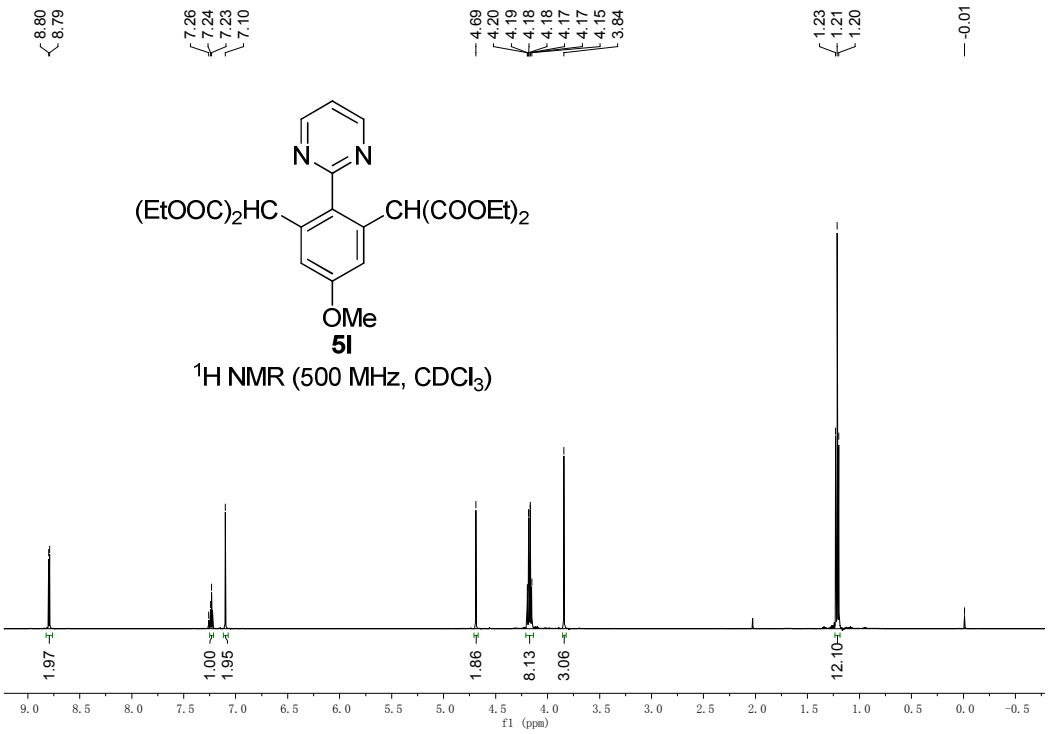
5k

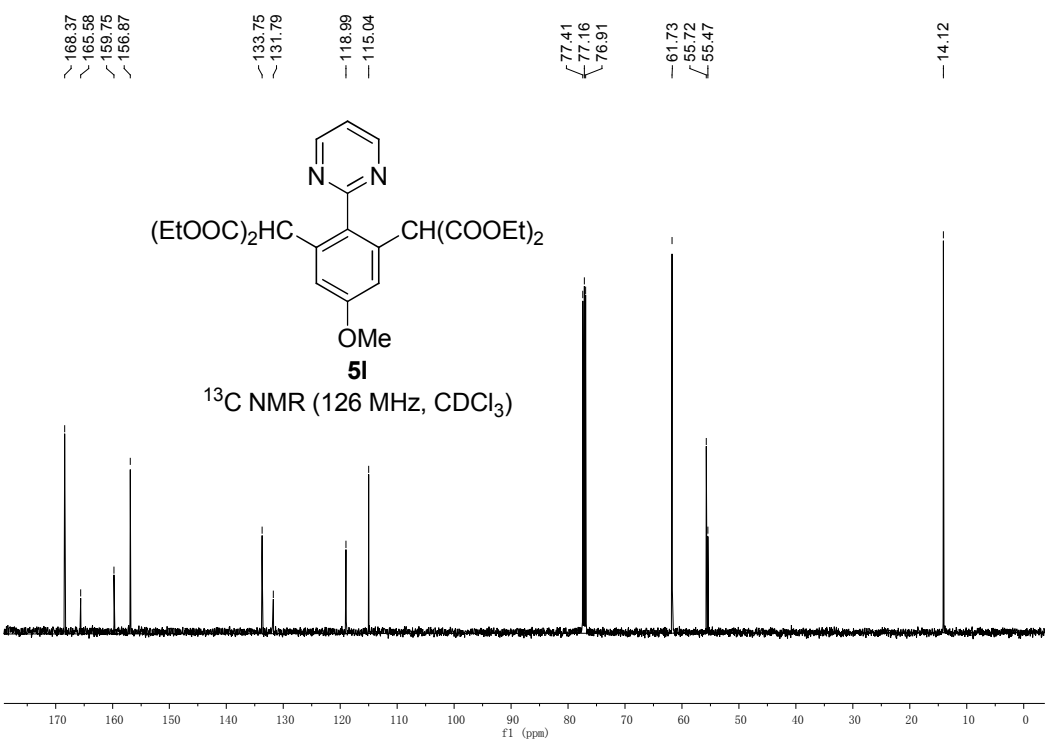
^{1}H NMR (500 MHz, $CDCl_3$)

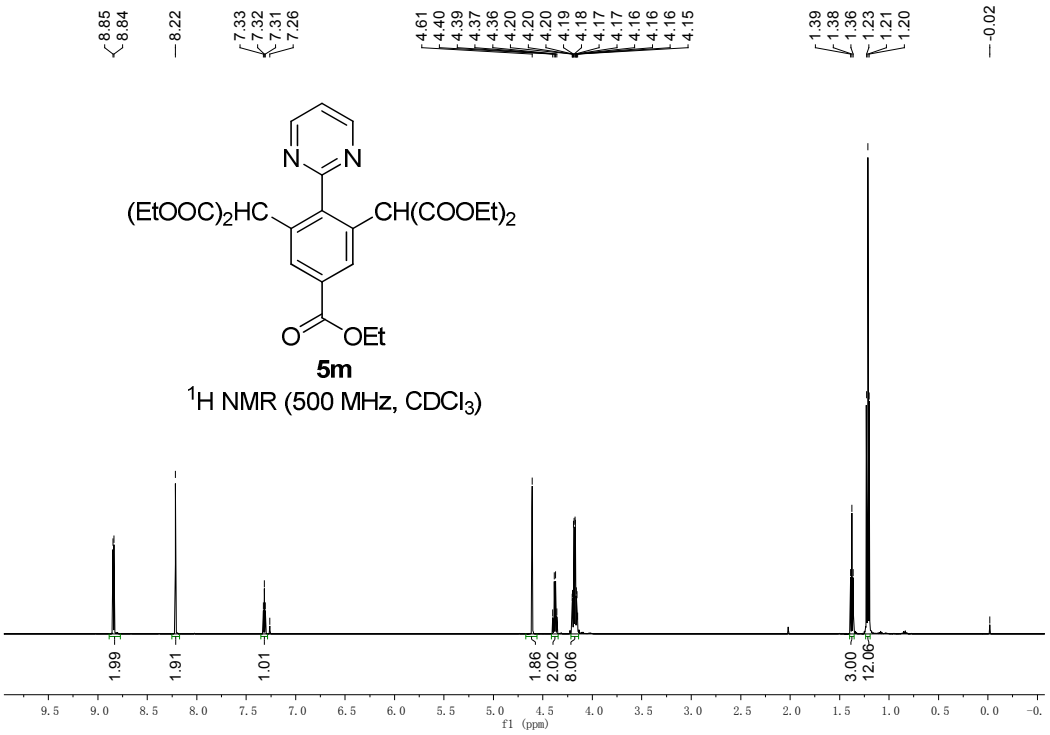


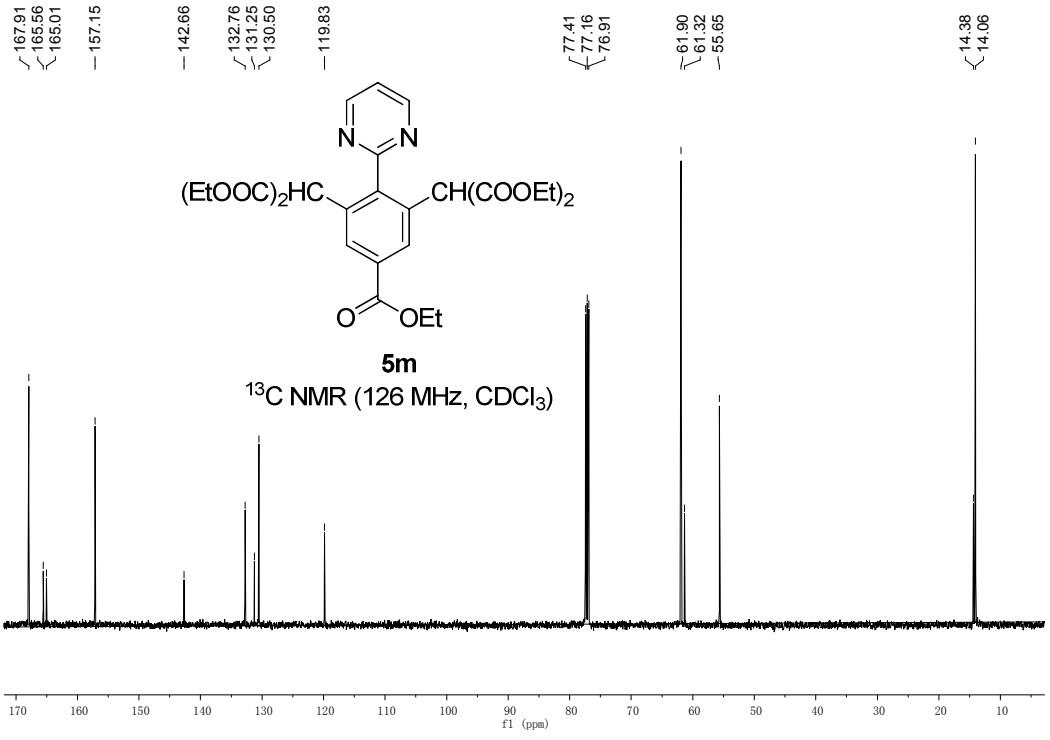
5k

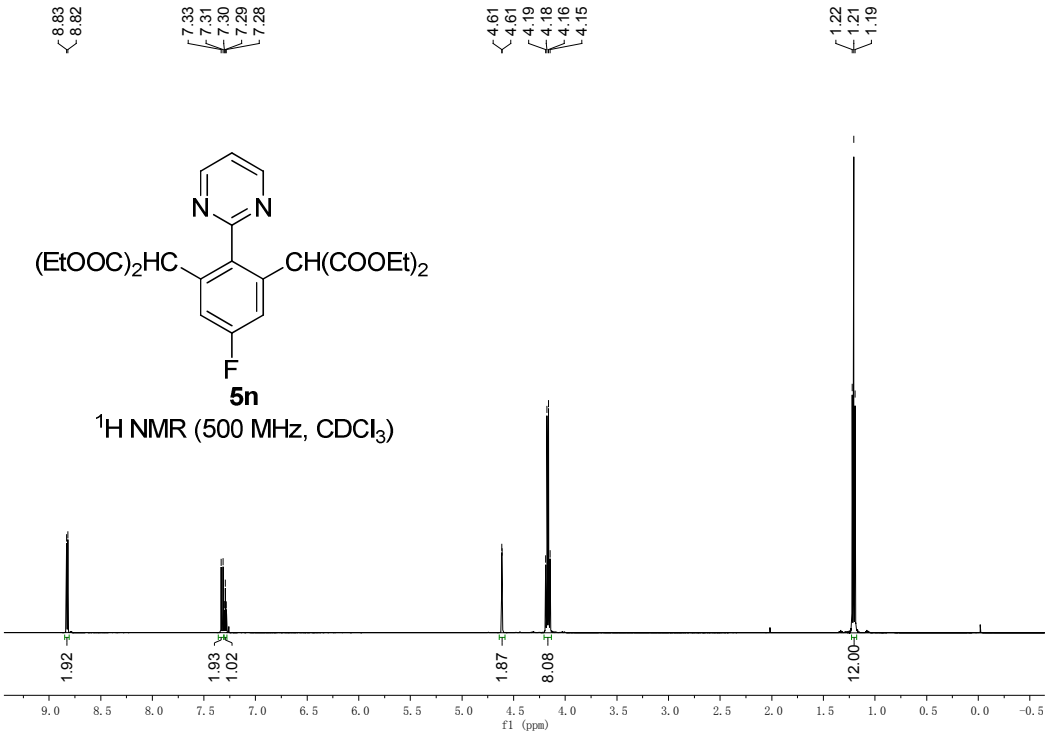
^{13}C NMR (126 MHz, $CDCl_3$)

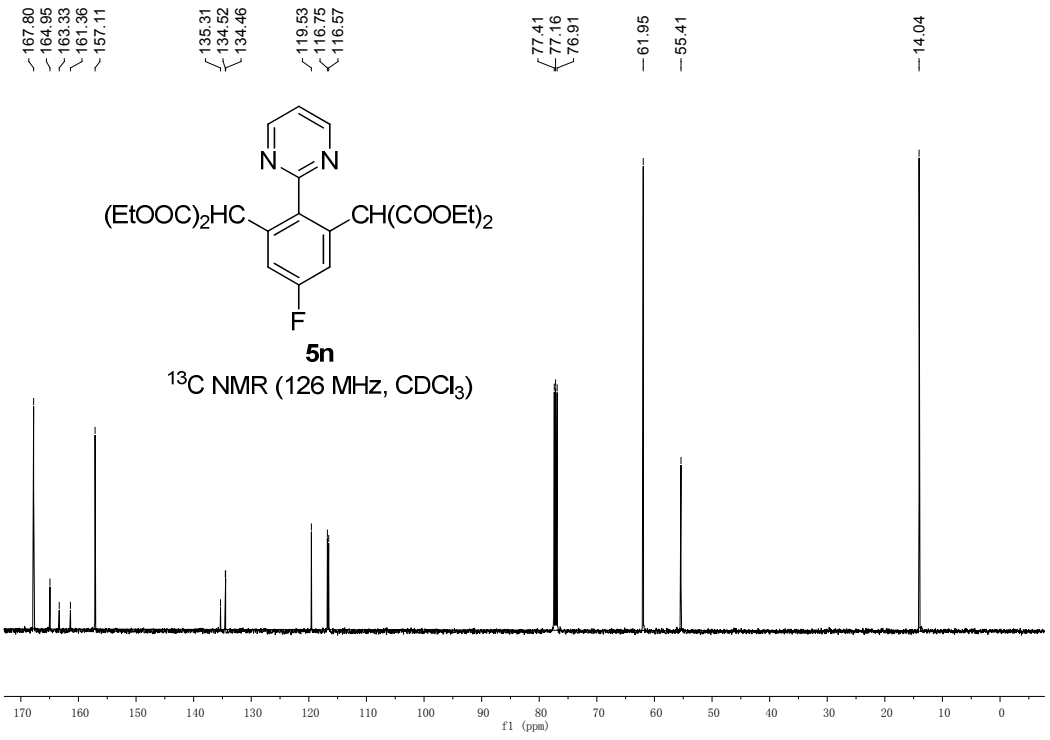

8.80
8.79
7.26
7.24
7.23
7.10
4.69
4.20
4.19
4.18
4.18
4.17
4.17
4.15
3.84
1.23
1.21
1.20
-0.01
N
N
(EtOOC)2HC
CH(COOEt)2
OMe
5l
1H NMR (500 MHz, CDCl3)
1.97
1.00
1.95
1.86
8.13
3.06
12.10
f1 (ppm)

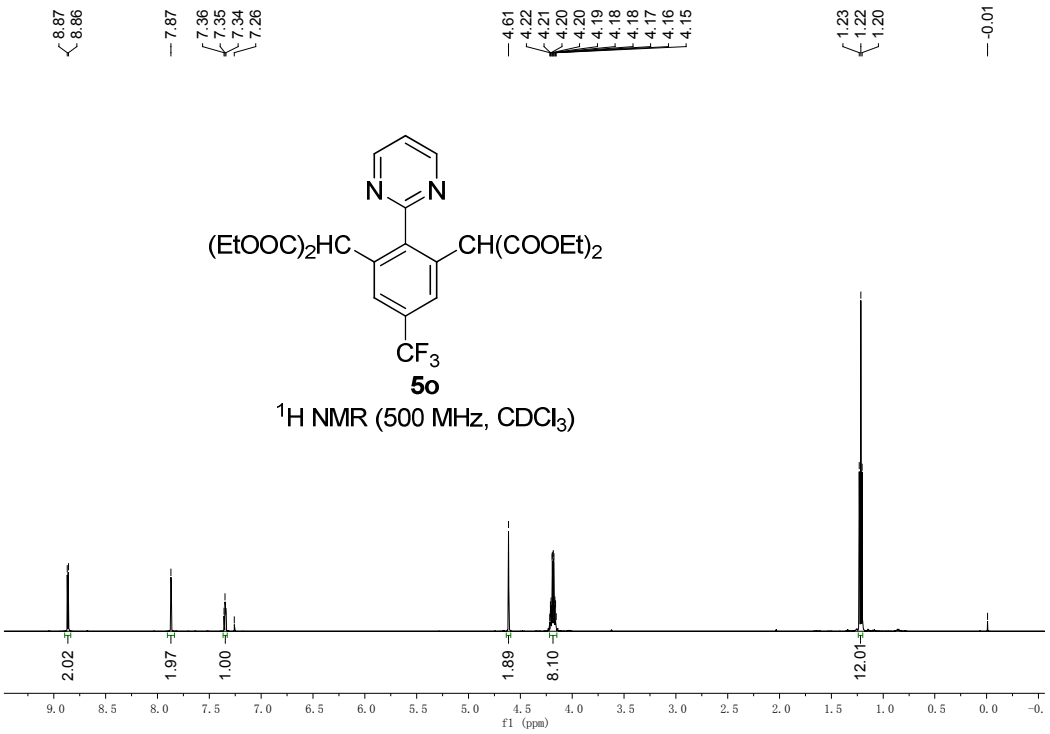

168.37
165.58
159.75
156.87
133.75
131.79
118.99
115.04
77.41
77.16
76.91
61.73
55.72
55.47
14.12
N
N
(EtOOC)2HC
CH(COOEt)2
OMe
5l
13C NMR (126 MHz, CDCl3)
f1 (ppm)

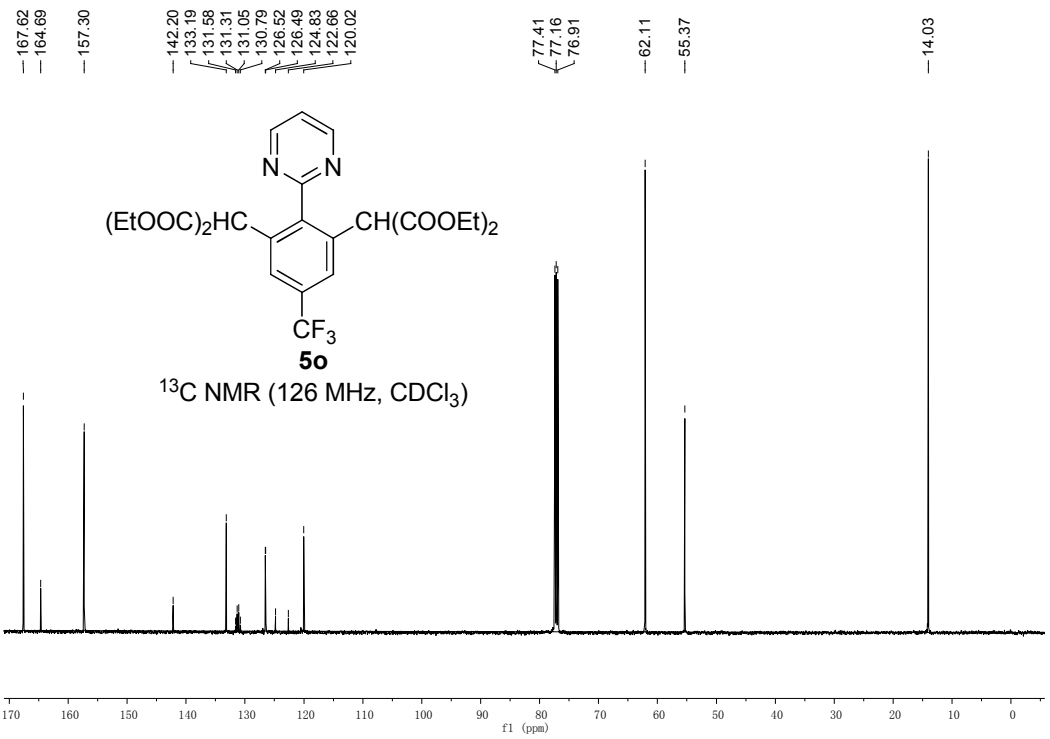

8.85
8.84
8.22
7.33
7.32
7.31
7.26
4.61
4.40
4.39
4.37
4.36
4.20
4.20
4.20
4.19
4.18
4.17
4.17
4.16
4.16
4.16
4.15
1.39
1.38
1.36
1.23
1.21
1.20
0.02
N
N
(EtOOC)2HC
CH(COOEt)2
O
OEt
5m
1H NMR (500 MHz, CDCl3)
1.99
1.91
1.01
1.86
2.02
8.06
3.00
12.06
f1 (ppm)

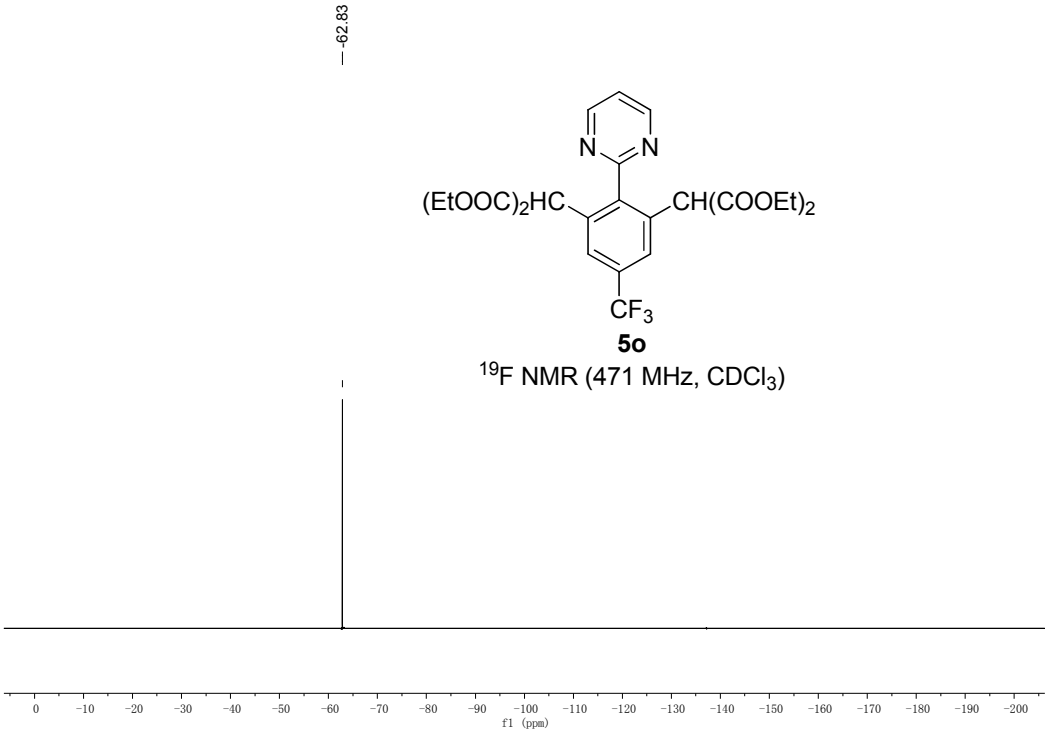

167.91
165.56
165.01
157.15
142.66
132.76
131.25
130.50
119.83
77.41
77.16
76.91
61.90
61.32
55.65
14.38
14.06
N
N
(EtOOC)2HC
CH(COOEt)2
O
OEt
5m
13C NMR (126 MHz, CDCl3)
f1 (ppm)


8.83
8.82
7.33
7.31
7.30
7.29
7.28
4.61
4.61
4.19
4.18
4.16
4.15
1.22
1.21
1.19
N
N
(EtOOC)2HC
CH(COOEt)2
F
5n
1H NMR (500 MHz, CDCl3)
1.92
1.93
1.02
1.87
8.08
12.00
f1 (ppm)


167.80
164.95
163.33
161.36
157.11
135.31
134.52
134.46
119.53
116.75
116.57
77.41
77.16
76.91
61.95
55.41
14.04
N
N
(EtOOC)2HC
CH(COOEt)2
F
5n
13C NMR (126 MHz, CDCl3)
f1 (ppm)

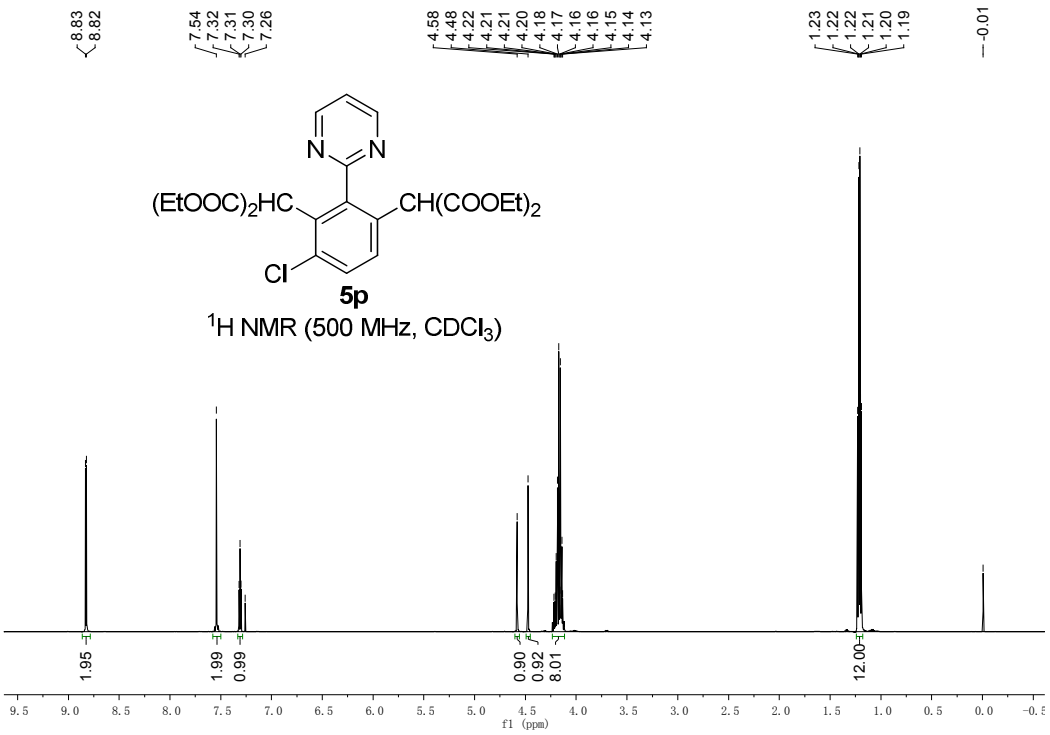

8.87
8.86
7.87
7.36
7.35
7.34
7.26
4.61
4.22
4.21
4.20
4.20
4.19
4.18
4.18
4.17
4.16
4.15
1.23
1.22
1.20
-0.01
N
N
(EtOOC)2HC
CH(COOEt)2
CF3
5o
1H NMR (500 MHz, CDCl3)
2.02
1.97
1.00
1.89
8.10
12.01
f1 (ppm)

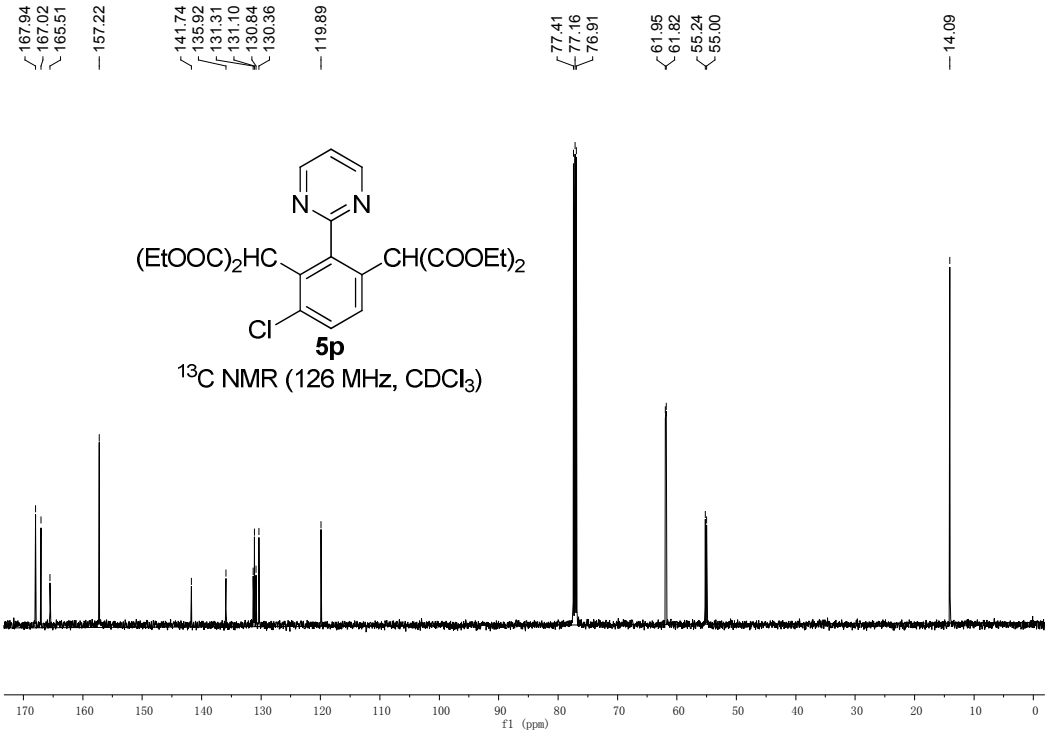

167.62
164.69
157.30
142.20
133.19
131.58
131.31
131.05
130.79
126.52
126.49
124.83
122.66
120.02
77.41
77.16
76.91
62.11
55.37
14.03
N
N
(EtOOC)2HC
CH(COOEt)2
CF3
5o
13C NMR (126 MHz, CDCl3)
f1 (ppm)

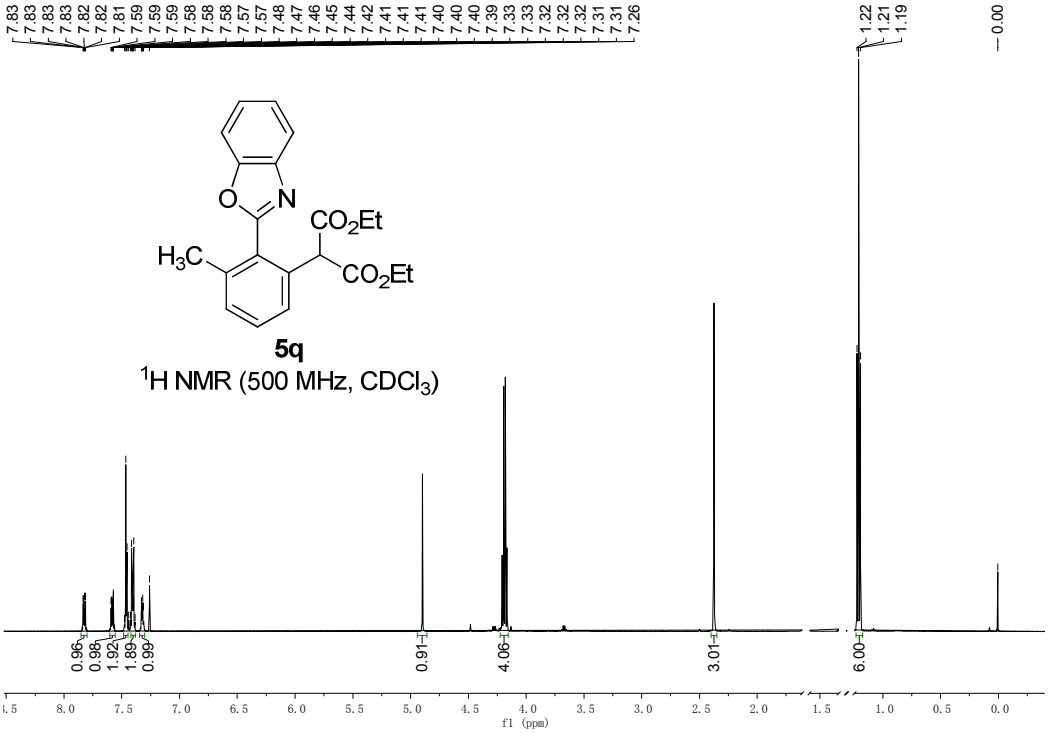


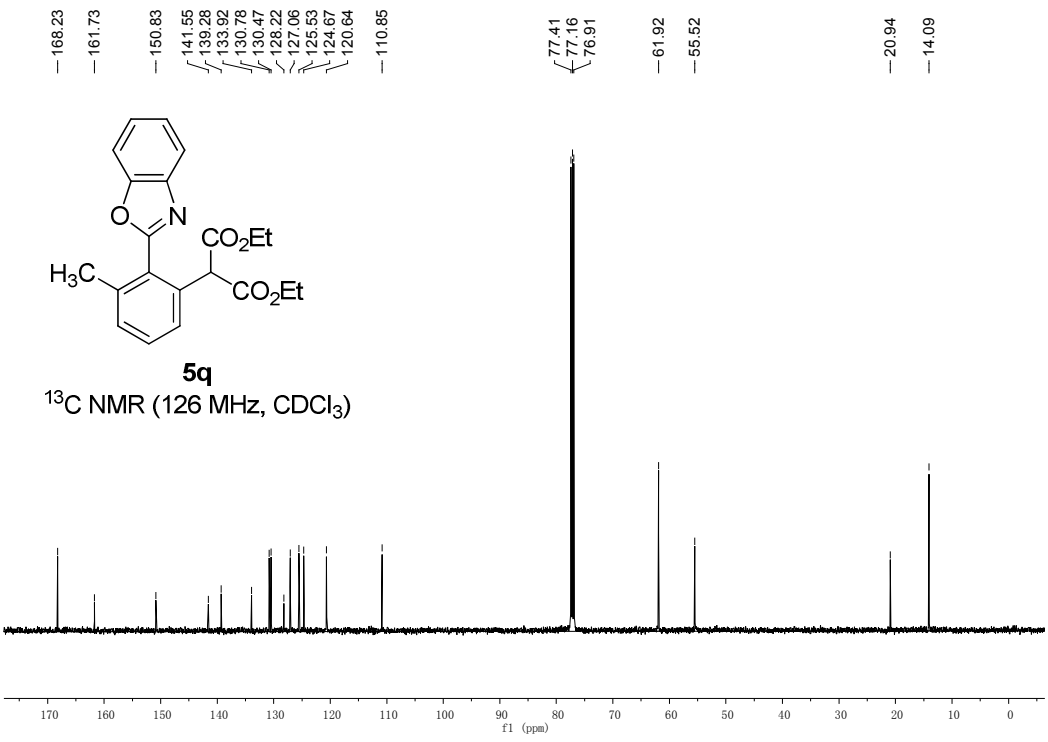
5o

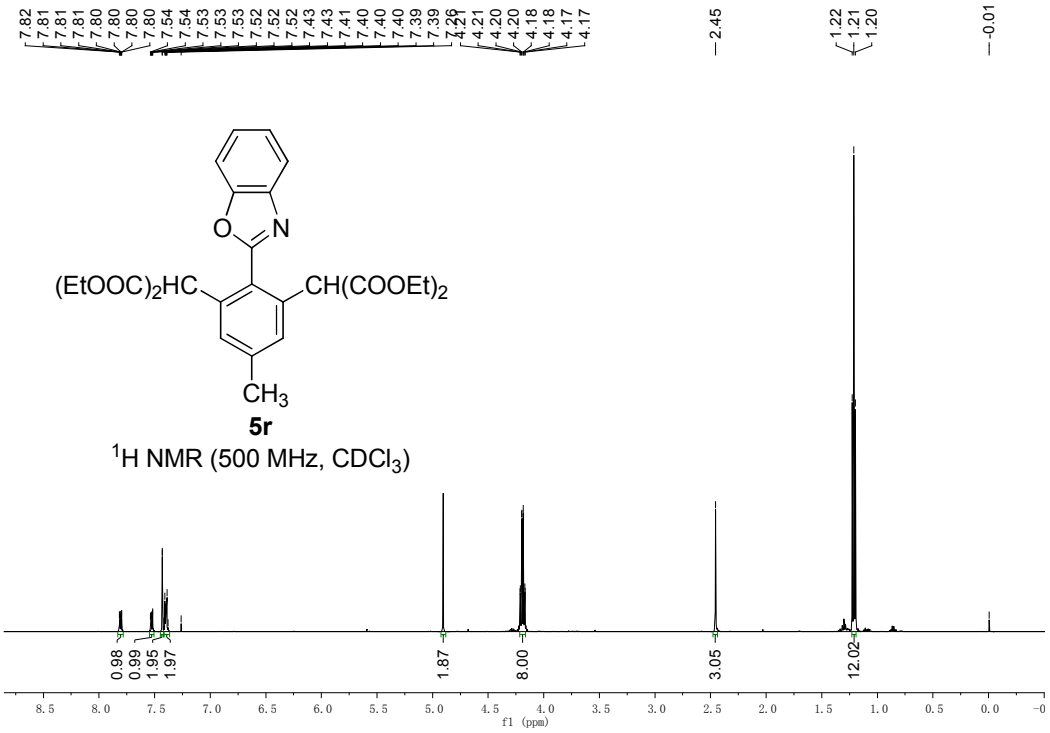
^{19}F NMR (471 MHz, $CDCl_3$)

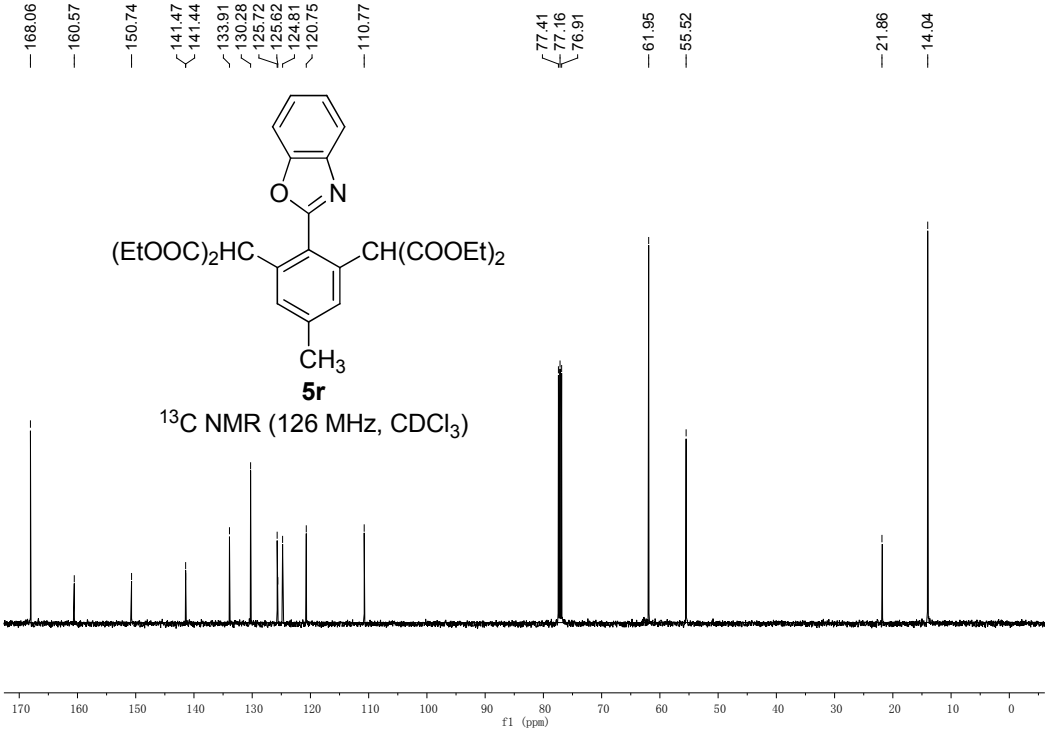

8.83
8.82
7.54
7.32
7.31
7.30
7.26
4.58
4.48
4.22
4.21
4.21
4.20
4.18
4.17
4.16
4.16
4.15
4.14
4.13
1.23
1.22
1.22
1.21
1.20
1.19
-0.01
(EtOOC)2HC
CH(COOEt)2
Cl
5p
1H NMR (500 MHz, CDCl3)
1.95
1.99
0.99
0.90
0.92
8.01
12.00
f1 (ppm)

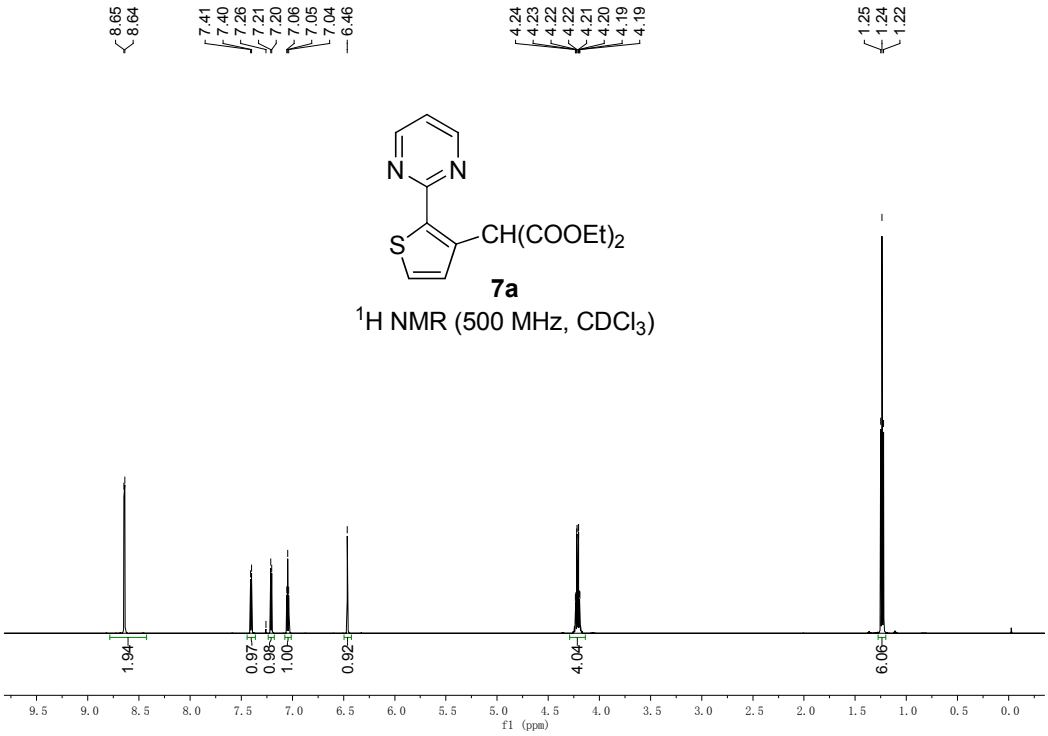

167.94
167.02
165.51
157.22
141.74
135.92
131.31
131.10
130.84
130.36
119.89
77.41
77.16
76.91
61.95
61.82
55.24
55.00
14.09
(EtOOC)2HC
CH(COOEt)2
Cl
5p
13C NMR (126 MHz, CDCl3)
f1 (ppm)


7.83 7.83 7.83 7.83 7.82 7.82 7.81 7.59 7.59 7.59 7.58 7.58 7.58 7.57 7.57 7.48 7.47 7.46 7.45 7.44 7.42 7.41 7.41 7.41 7.40 7.40 7.40 7.39 7.33 7.33 7.32 7.32 7.32 7.31 7.31 7.26
1.22 1.21 1.19
0.00
O
N
CO2Et
H3C
CO2Et
5q
1H NMR (500 MHz, CDCl3)
0.96 0.98 1.92 1.89 0.99 0.91 4.06 3.01 6.00
f1 (ppm)


168.23 161.73 150.83 141.55 139.28 133.92 130.78 130.47 128.22 127.06 125.53 124.67 120.64 110.85
77.41 77.16 76.91
61.92 55.52
20.94 14.09
O
N
CO2Et
H3C
CO2Et
5q
13C NMR (126 MHz, CDCl3)
f1 (ppm)

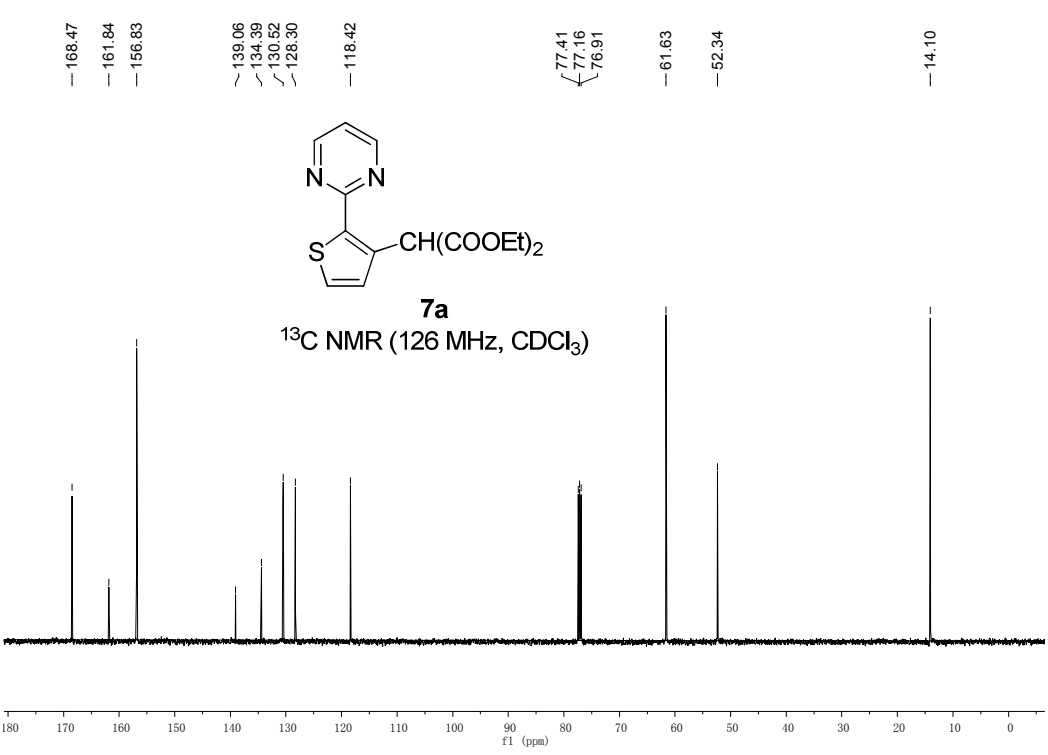

7.82
7.81
7.81
7.81
7.80
7.80
7.80
7.80
7.54
7.53
7.53
7.53
7.52
7.52
7.52
7.43
7.41
7.40
7.40
7.40
7.39
7.39
4.21
4.20
4.20
4.18
4.18
4.17
4.17
2.45
1.22
1.21
1.20
0.01
O
N
(EtOOC)2HC
CH(COOEt)2
CH3
5r
1H NMR (500 MHz, CDCl3)
0.98
0.99
1.95
1.97
1.87
8.00
3.05
12.02
f1 (ppm)


168.06
160.57
150.74
141.47
141.44
133.91
130.28
125.72
125.62
124.81
120.75
110.77
77.41
77.16
76.91
61.95
55.52
21.86
14.04
O
N
(EtOOC)2HC
CH(COOEt)2
CH3
5r
13C NMR (126 MHz, CDCl3)
f1 (ppm)



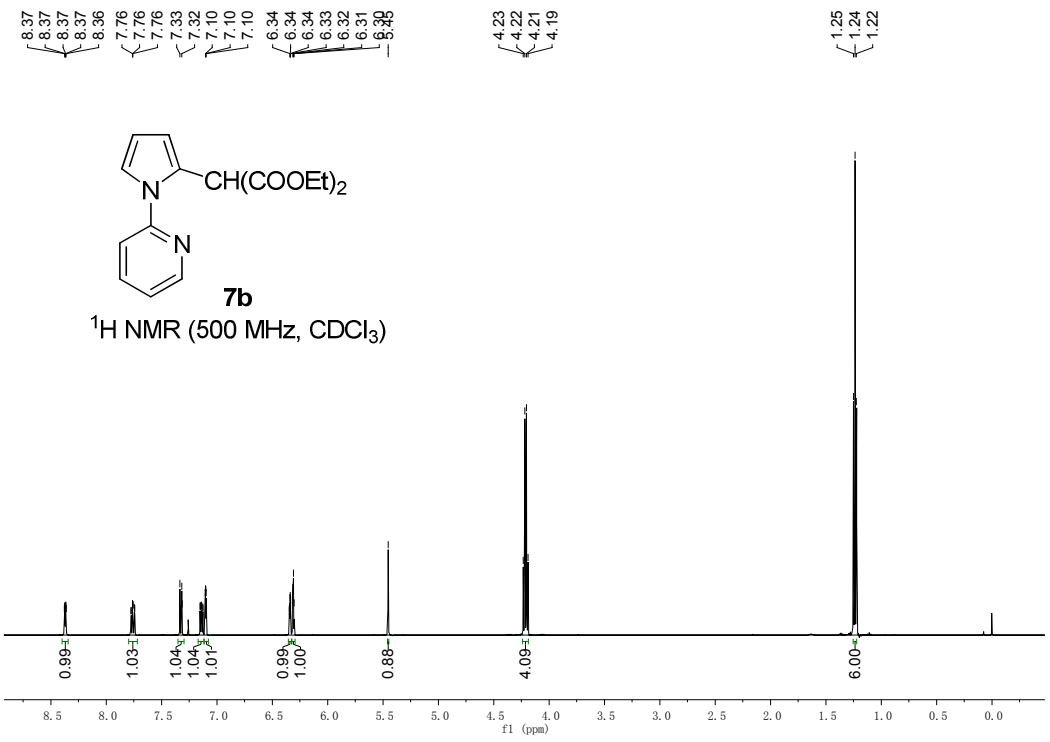
7a

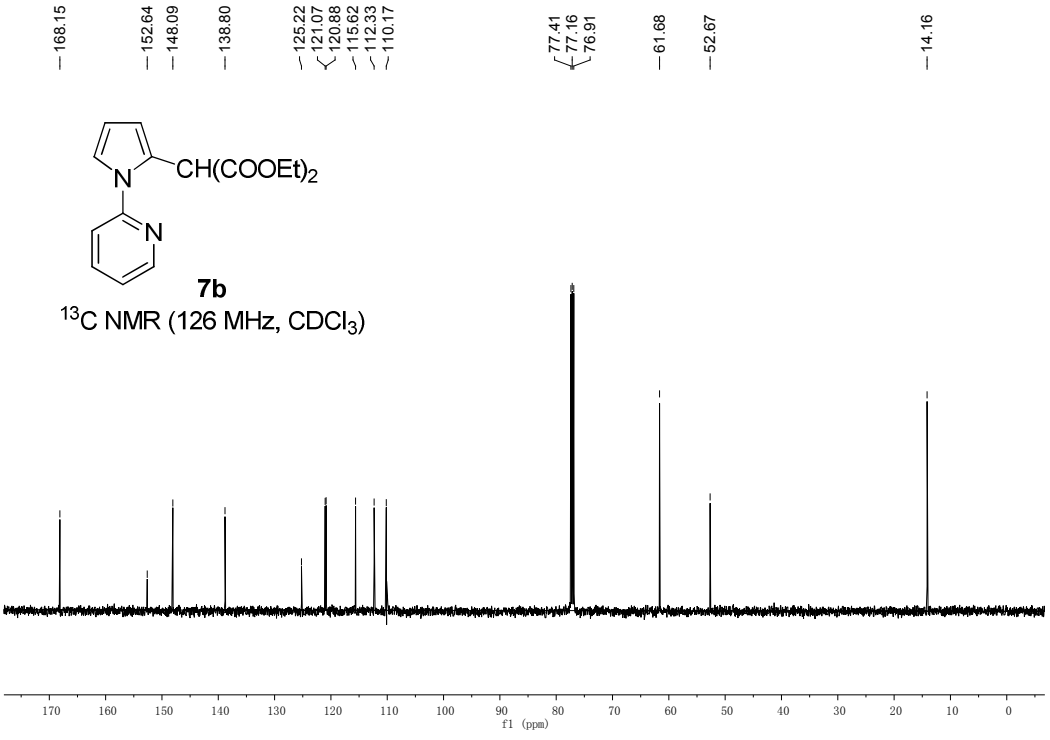
^{1}H NMR (500 MHz, $CDCl_3$)

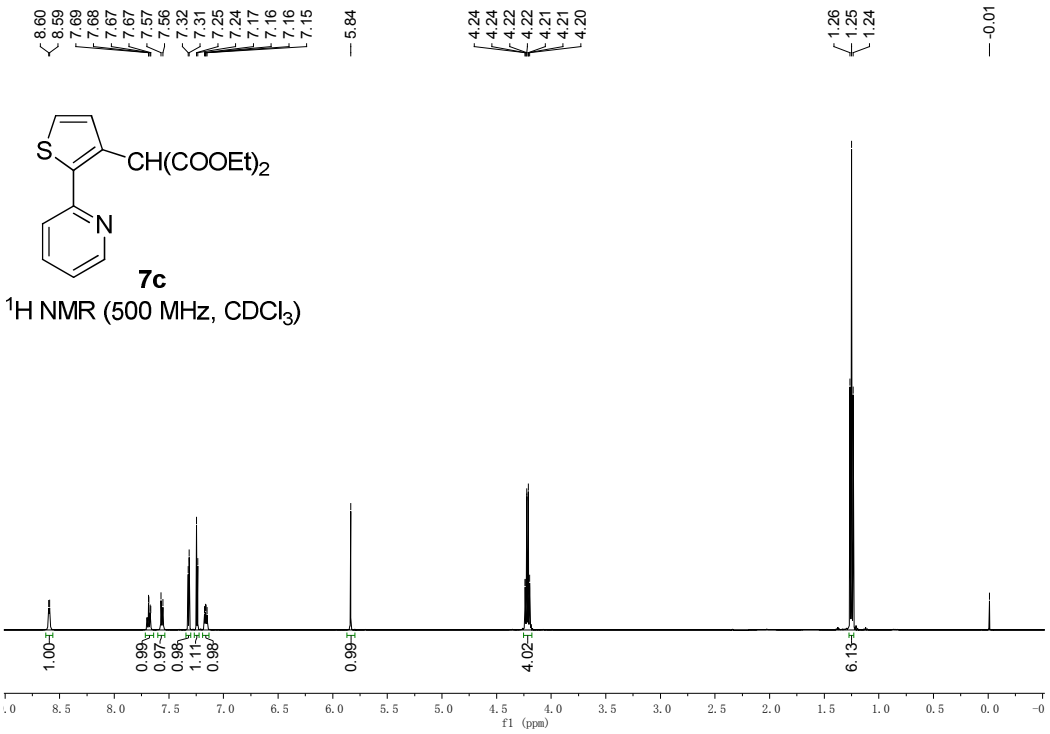


7a

^{13}C NMR (126 MHz, $CDCl_3$)

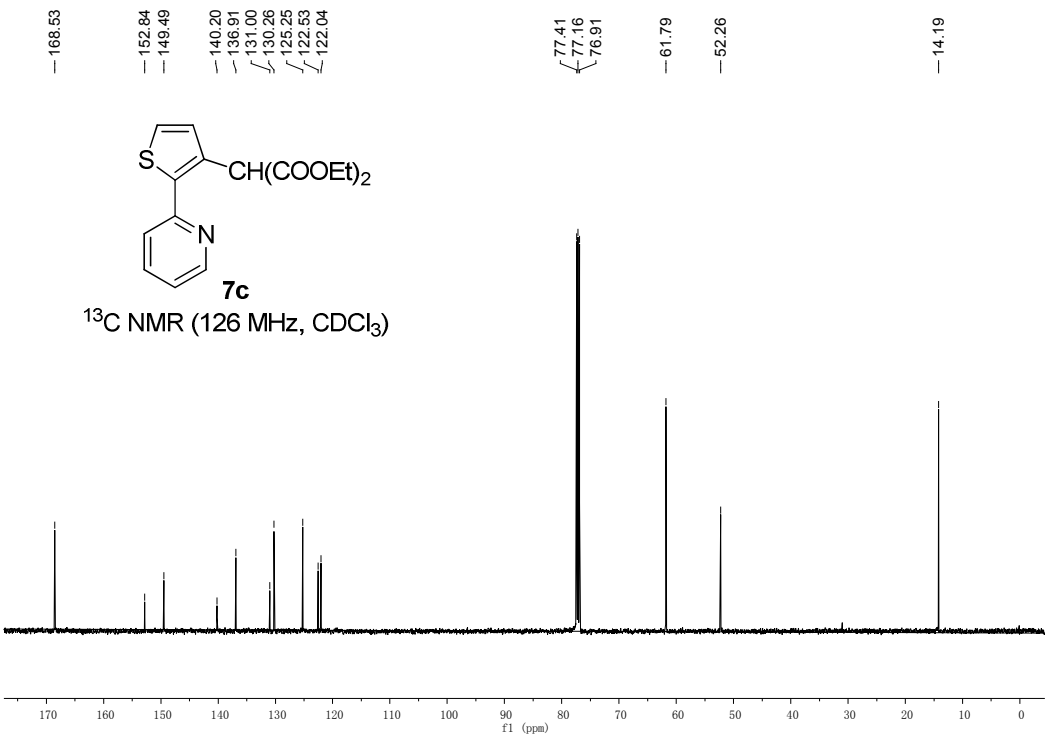

8.37
8.37
8.37
8.36
7.76
7.76
7.76
7.33
7.32
7.10
7.10
7.10
6.34
6.34
6.34
6.33
6.32
6.31
5.45
4.23
4.22
4.21
4.19
1.25
1.24
1.22
CH(COOEt)2
N
N
7b
1H NMR (500 MHz, CDCl3)
0.99
1.03
1.04
1.04
1.01
0.99
1.00
0.88
4.09
6.00
f1 (ppm)


168.15
152.64
148.09
138.80
125.22
121.07
120.88
115.62
112.33
110.17
77.41
77.16
76.91
61.68
52.67
14.16
CH(COOEt)2
N
N
7b
13C NMR (126 MHz, CDCl3)
f1 (ppm)



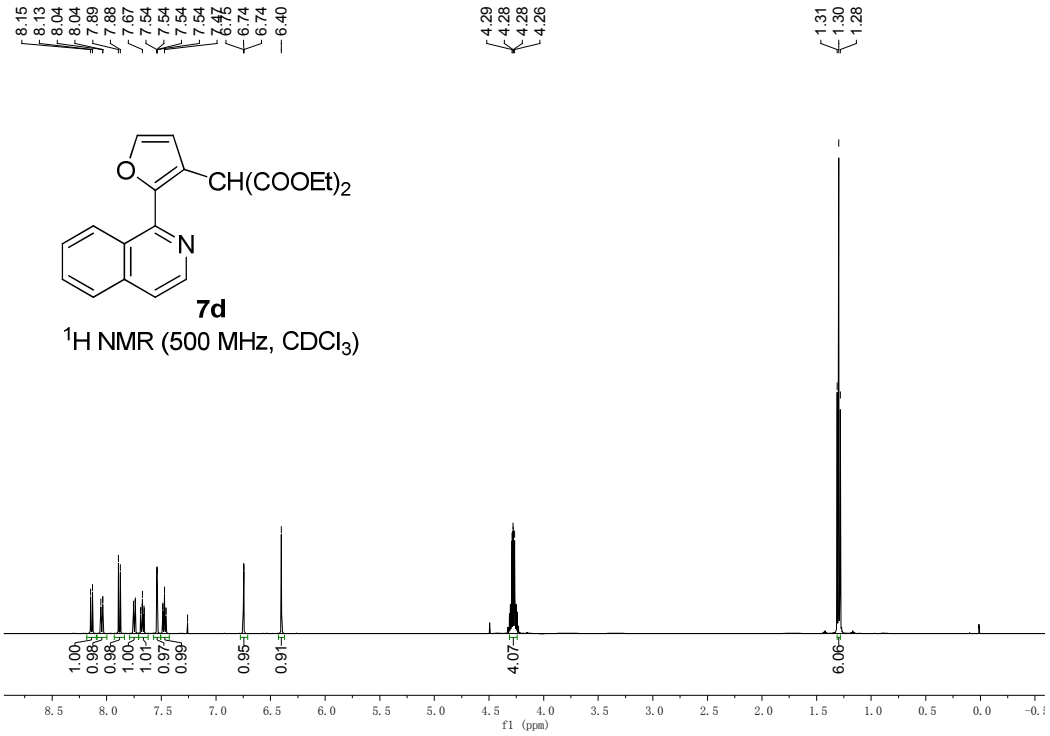
7c

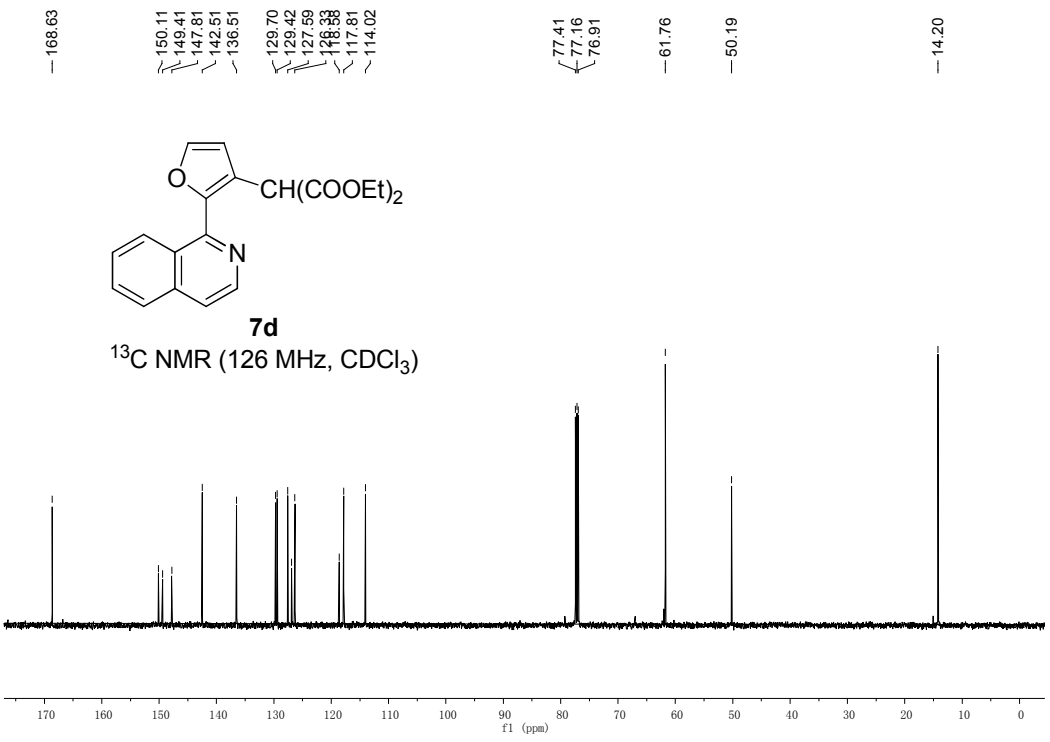
^{1}H NMR (500 MHz, $CDCl_3$)

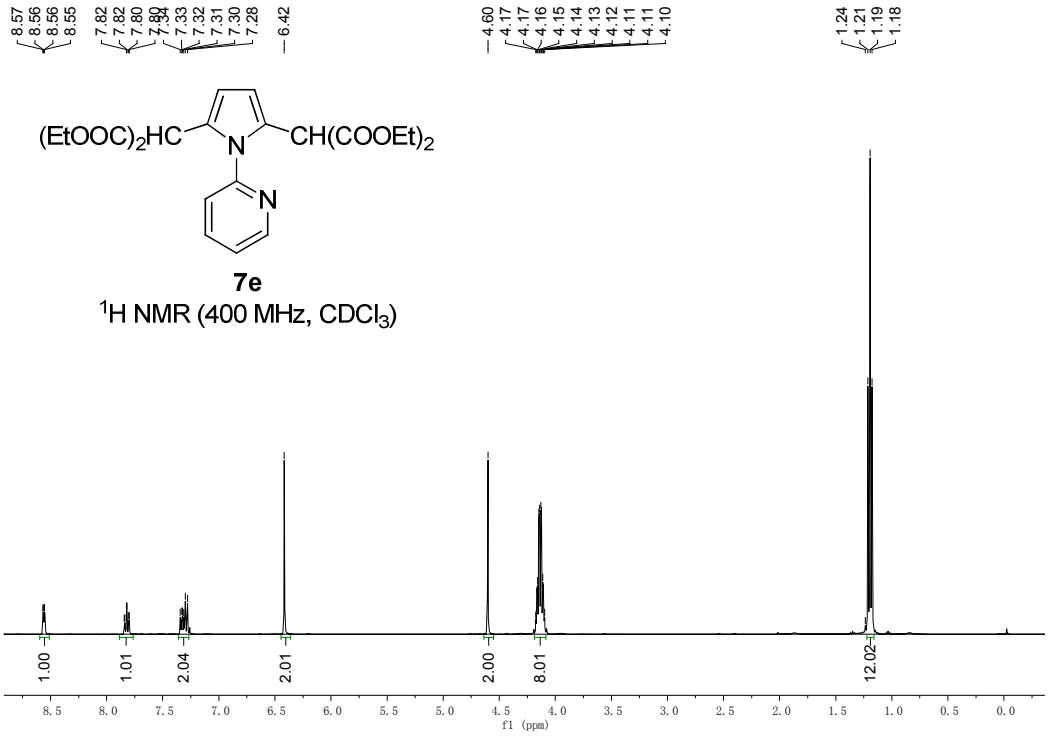


7c

^{13}C NMR (126 MHz, $CDCl_3$)

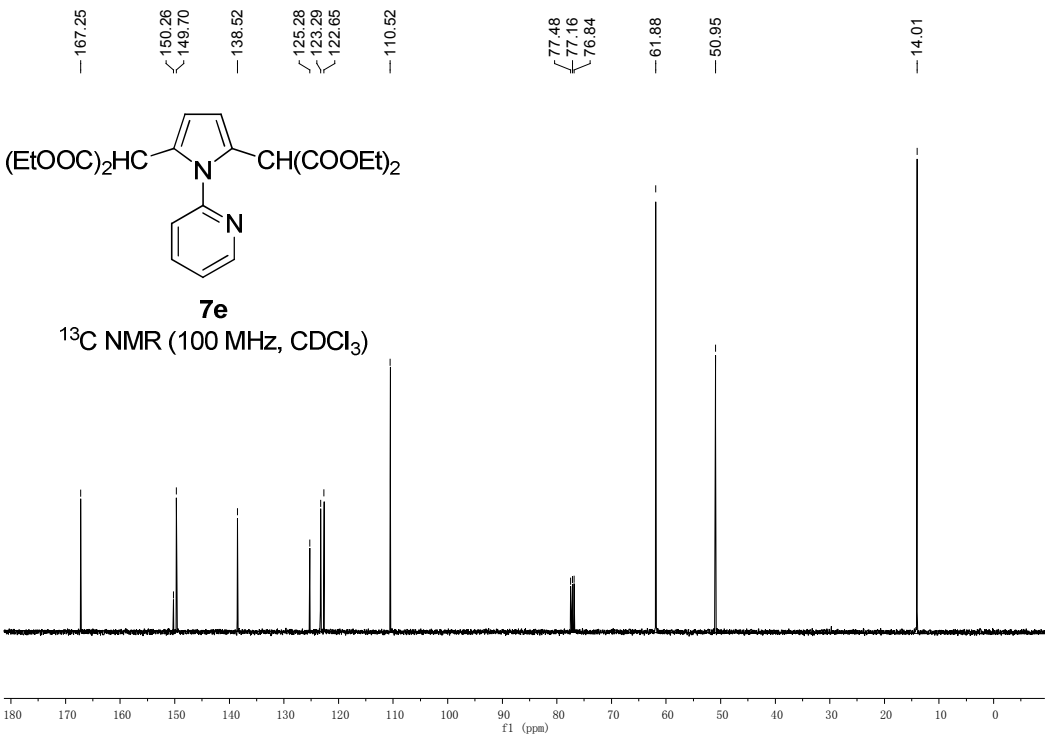

8.15
8.13
8.04
8.04
7.89
7.88
7.67
7.54
7.54
7.54
7.54
7.47
6.75
6.74
6.74
6.40
4.29
4.28
4.28
4.26
1.31
1.30
1.28
O
CH(COOEt)2
N
7d
1H NMR (500 MHz, CDCl3)
1.00
0.98
0.98
1.00
1.01
0.97
0.99
0.95
0.91
4.07
6.06
f1 (ppm)


168.63
150.11
149.41
147.81
142.51
136.51
129.70
129.42
127.59
118.38
117.81
114.02
77.41
77.16
76.91
61.76
50.19
14.20
O
CH(COOEt)2
N
7d
13C NMR (126 MHz, CDCl3)
f1 (ppm)



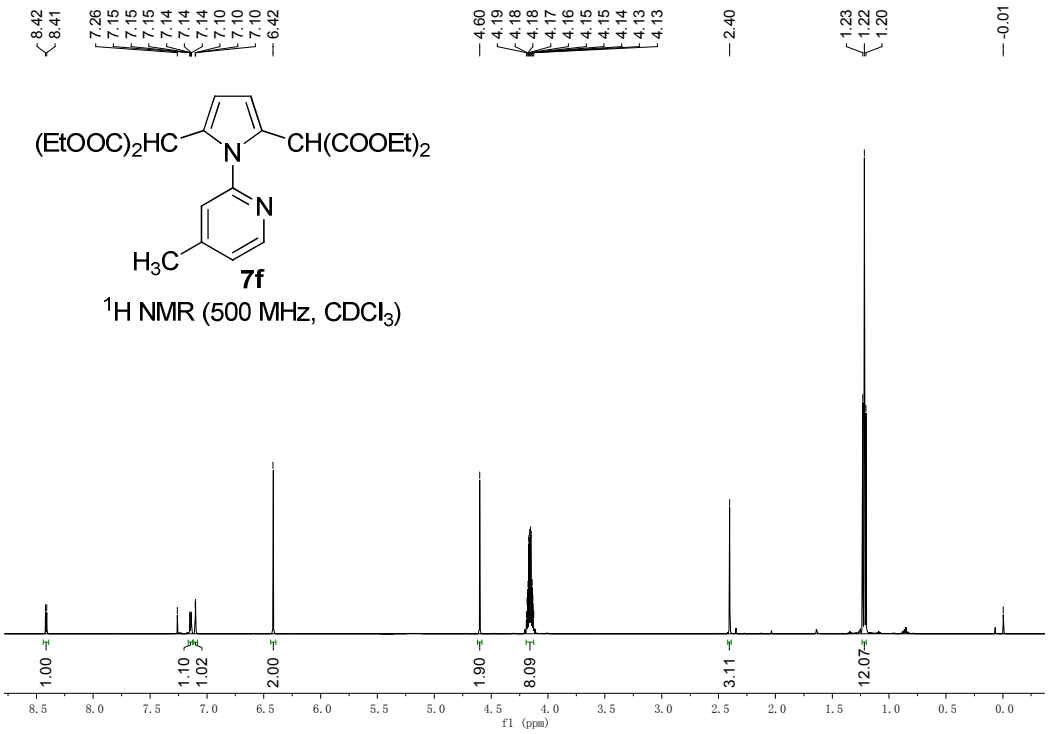
7e

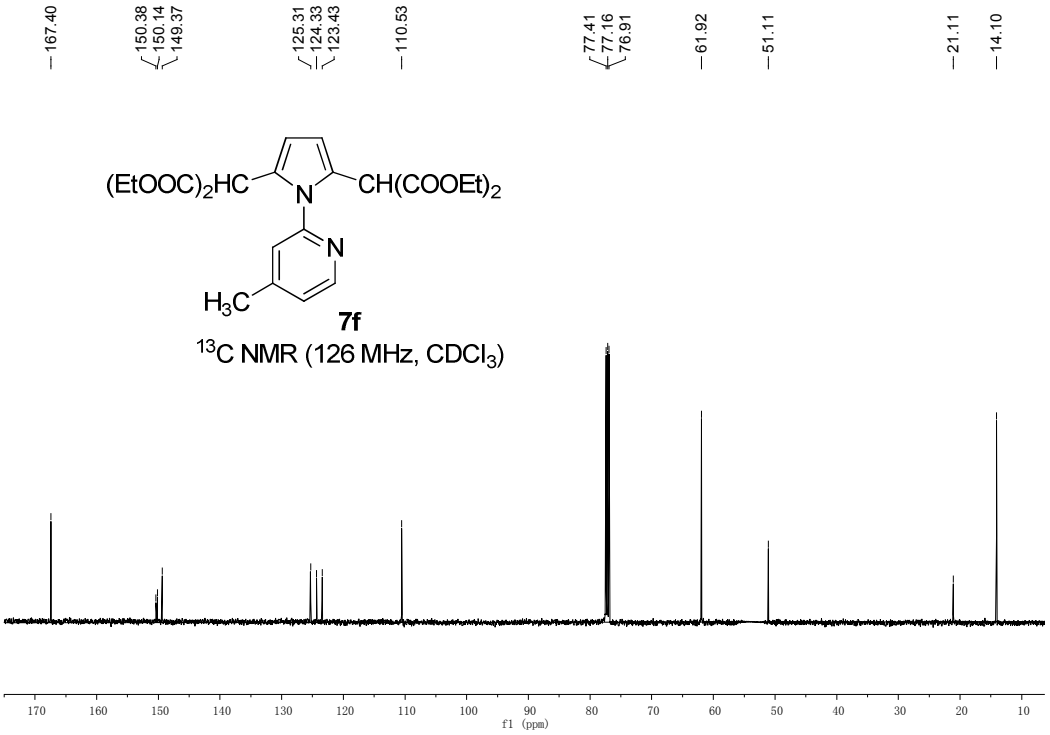
^{1}H NMR (400 MHz, $CDCl_3$)

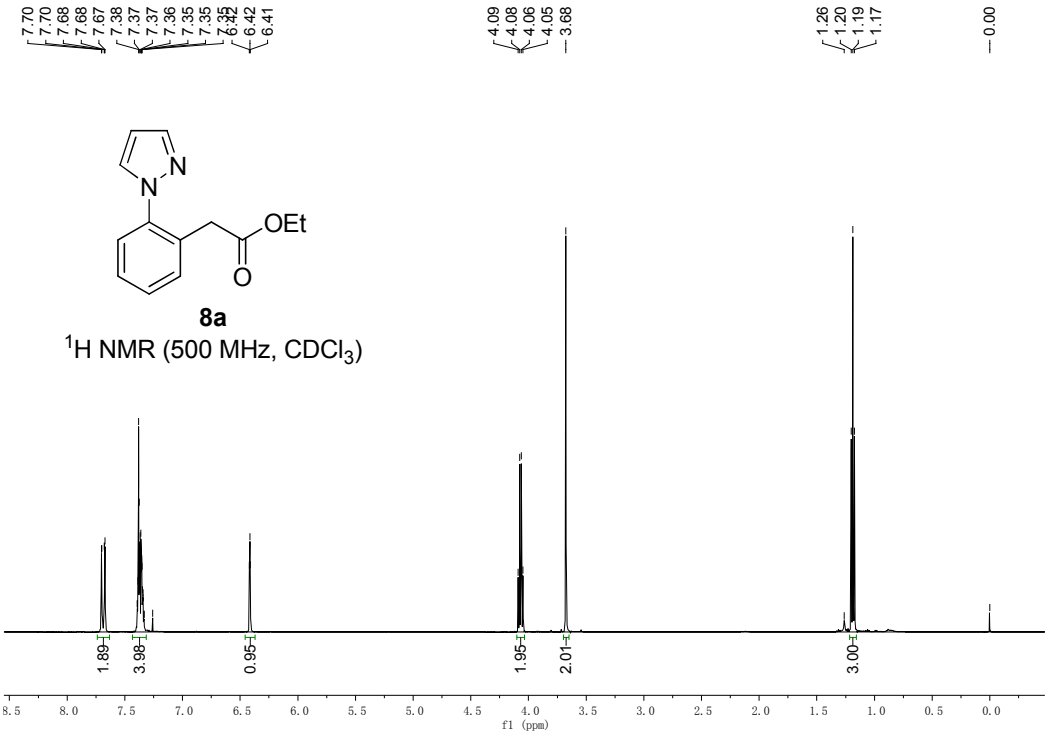


7e

^{13}C NMR (100 MHz, $CDCl_3$)

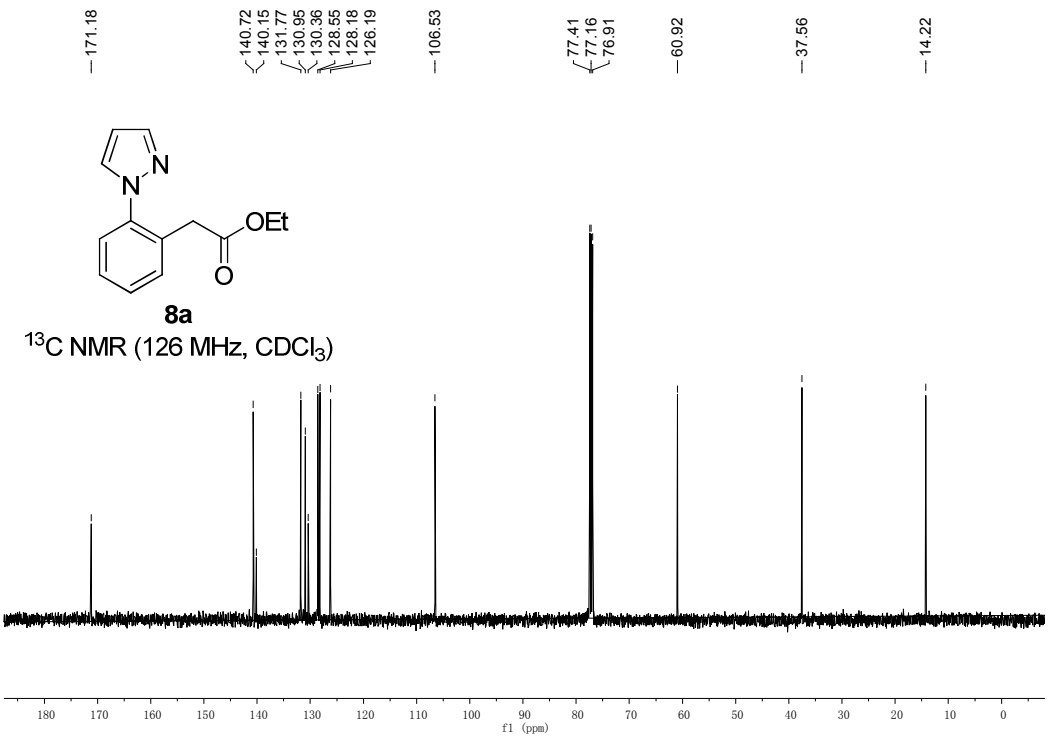

8.42
8.41
7.26
7.15
7.15
7.15
7.14
7.14
7.14
7.10
7.10
7.10
6.42
4.60
4.19
4.18
4.18
4.17
4.16
4.15
4.15
4.14
4.13
4.13
2.40
1.23
1.22
1.20
-0.01
(EtOOC)2HC
CH(COOEt)2
N
N
H3C
7f
1H NMR (500 MHz, CDCl3)
1.00
1.10
1.02
2.00
1.90
8.09
3.11
12.07
f1 (ppm)


167.40
150.38
150.14
149.37
125.31
124.33
123.43
110.53
77.41
77.16
76.91
61.92
51.11
21.11
14.10
(EtOOC)2HC
CH(COOEt)2
N
N
H3C
7f
13C NMR (126 MHz, CDCl3)
f1 (ppm)



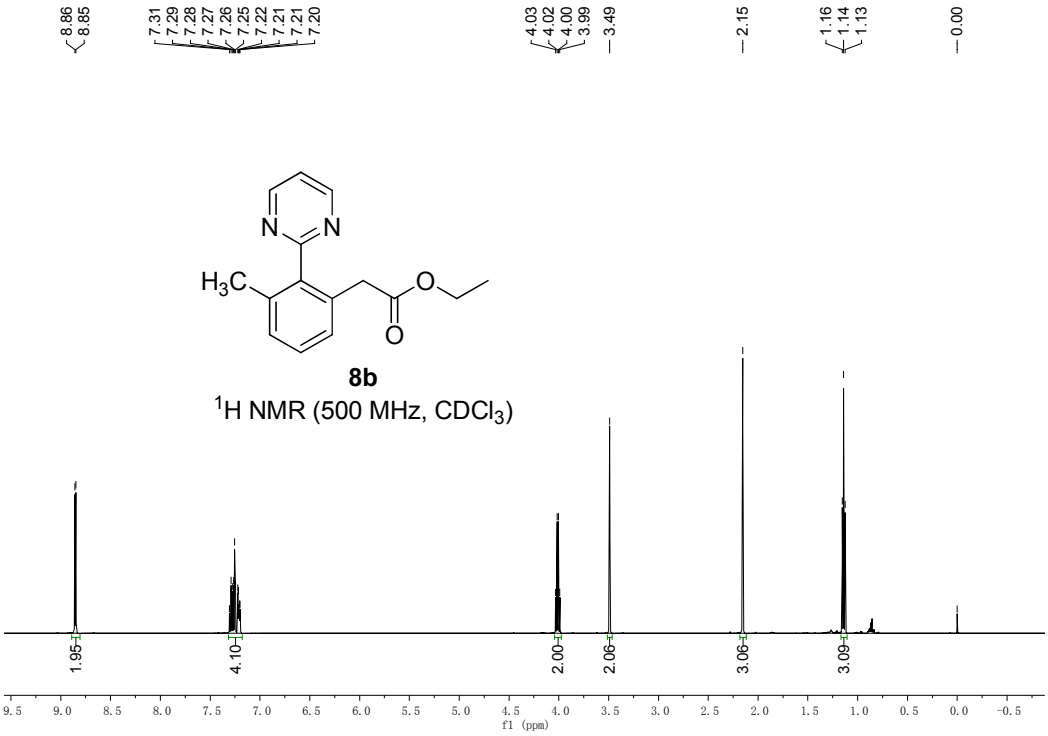
8a

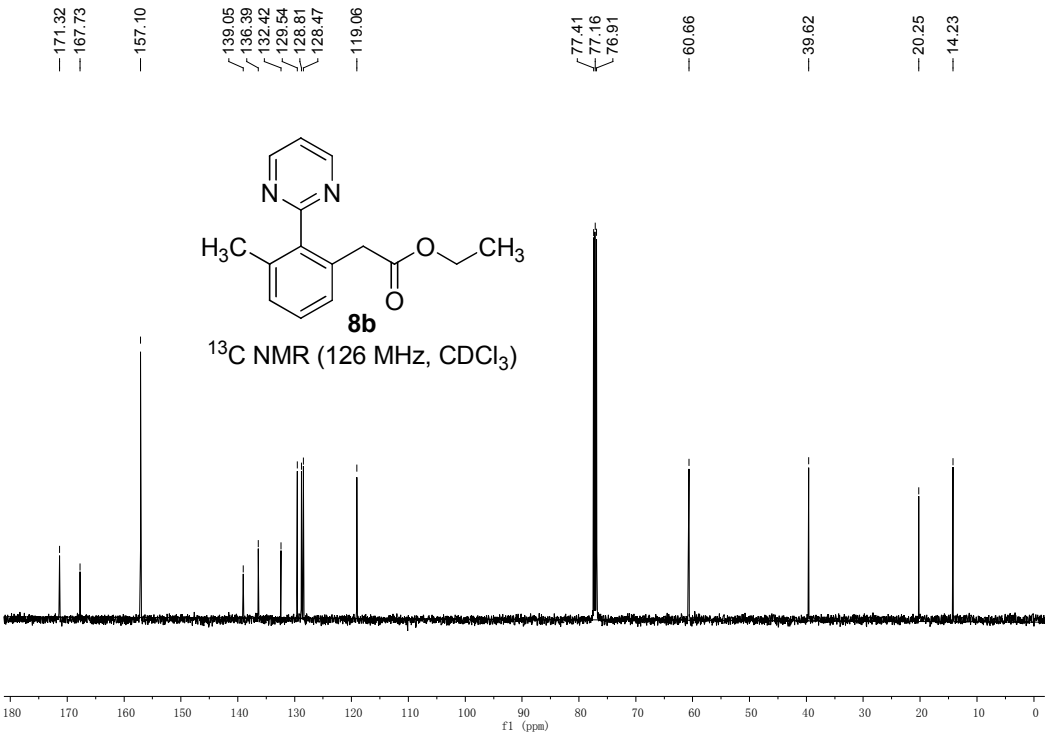
^{1}H NMR (500 MHz, $CDCl_3$)

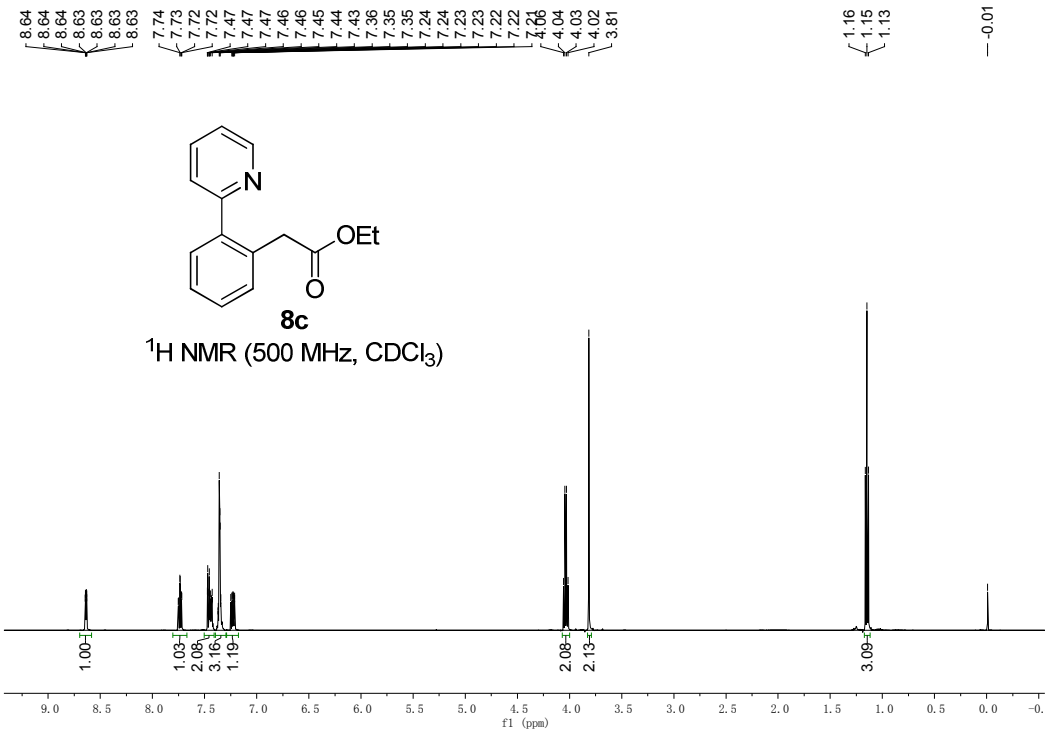


8a

^{13}C NMR (126 MHz, $CDCl_3$)

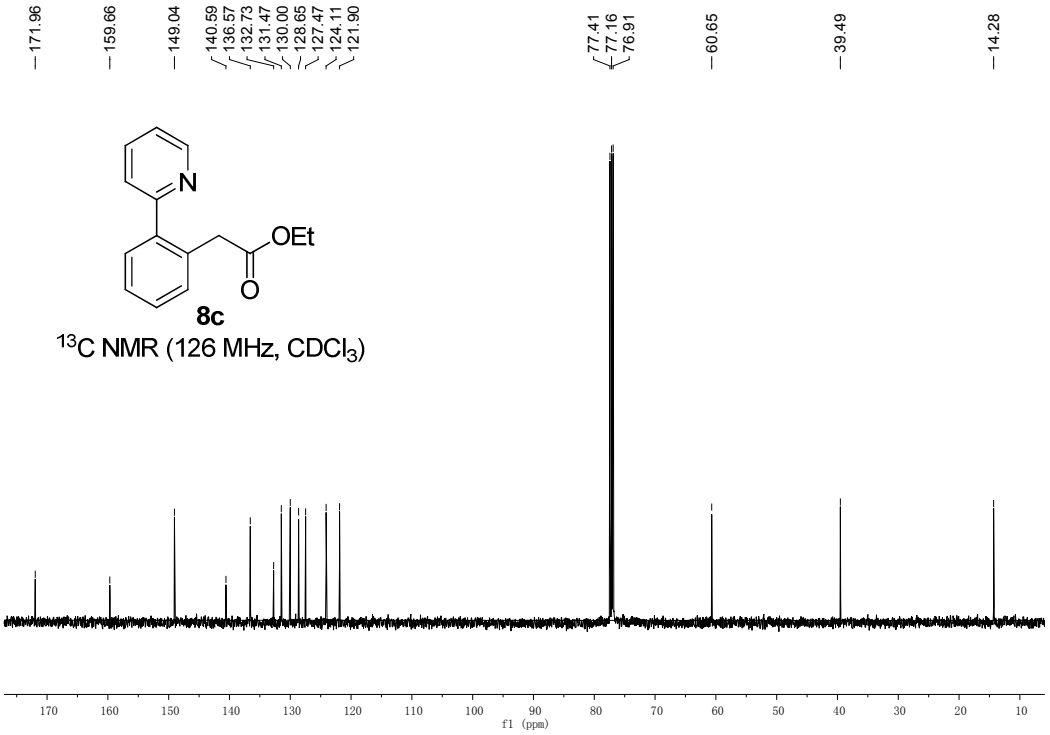

8.86
8.85
7.31
7.29
7.28
7.27
7.26
7.25
7.22
7.21
7.20
4.03
4.02
4.00
3.99
3.49
2.15
1.16
1.14
1.13
0.00
N
N
H3C
O
O
8b
1H NMR (500 MHz, CDCl3)
1.95
4.10
2.00
2.06
3.06
3.09
f1 (ppm)


171.32
167.73
157.10
139.05
136.39
132.42
129.54
128.81
128.47
119.06
77.41
77.16
76.91
60.66
39.62
20.25
14.23
N
N
H3C
O
O
CH3
8b
13C NMR (126 MHz, CDCl3)
f1 (ppm)



8c

^{1}H NMR (500 MHz, $CDCl_3$)



8c

^{13}C NMR (126 MHz, $CDCl_3$)