Electronic Supplementary Information (ESI)

One-pot synthesis of 2-azolylimidazole derivatives through a domino addition/A^3 coupling/cyclization process under copper catalysis

Yifan Lin,[a] Erfei Li,[a‡] Xin Wu,[a‡] Luyu Wang,[a‡] Haofeng Wang,[a] Xiaoyu Li,[a] Honglan Kang,[a] Liejin Zhou,[a] Guodong Shen,[b] Xin Lv*[a]

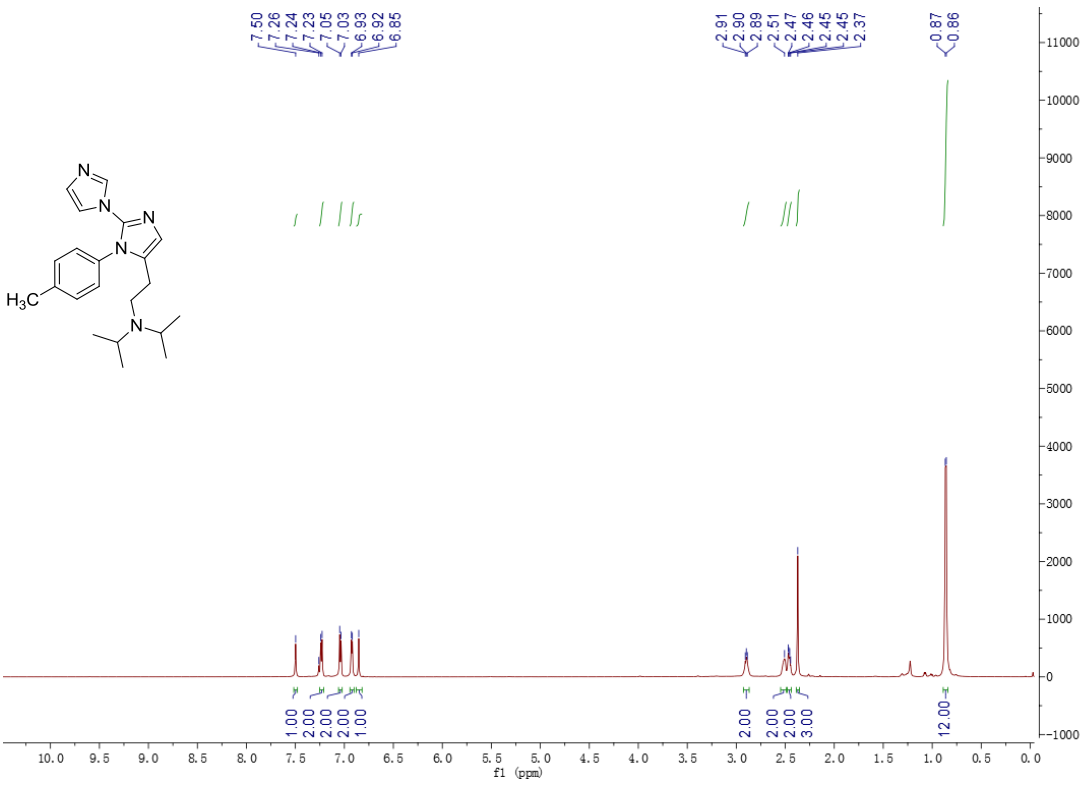
[a] *Key Laboratory of the Ministry of Education for Advanced Catalysis Materials, College of Chemistry and Life Sciences, Zhejiang Normal University, Jinhua 321004, People's Republic of China.* Email: lvxin@zjnu.cn (X. Lv)

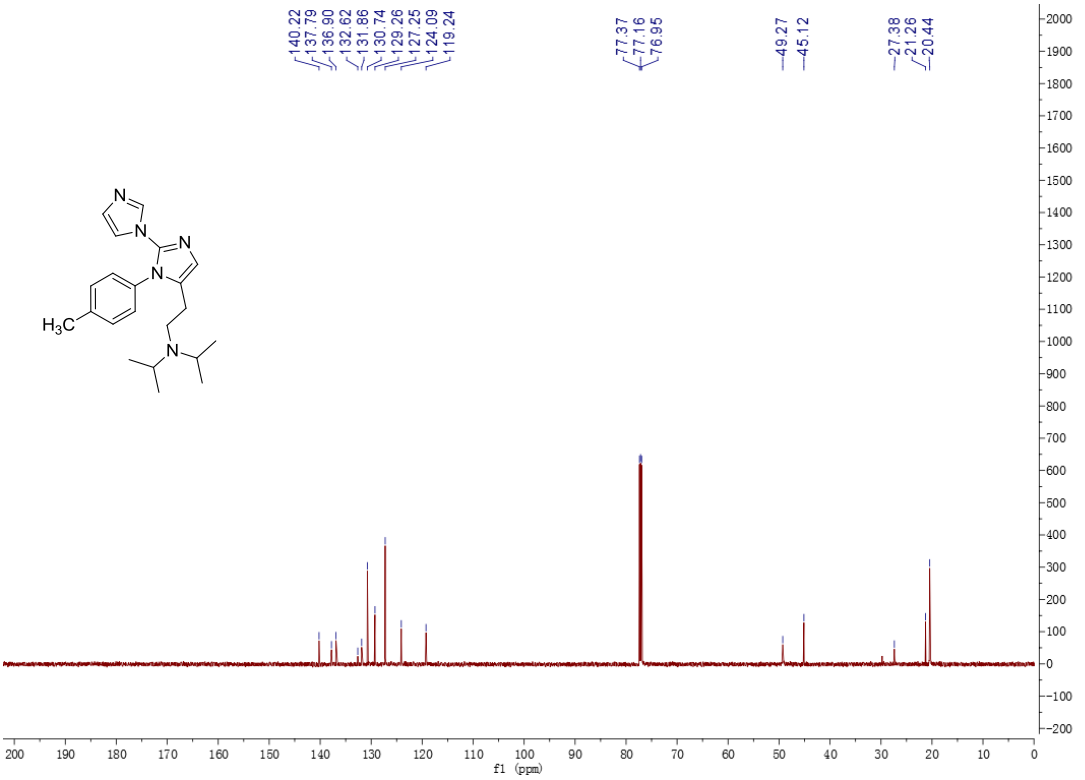
[b] *School of Chemistry and Chemical Engineering, Shandong Provincial Key Laboratory of Chemical Energy Storage and Novel Cell Technology, Liaocheng University, Liaocheng 252059, Shandong, People's Republic of China.*

Table of Contents

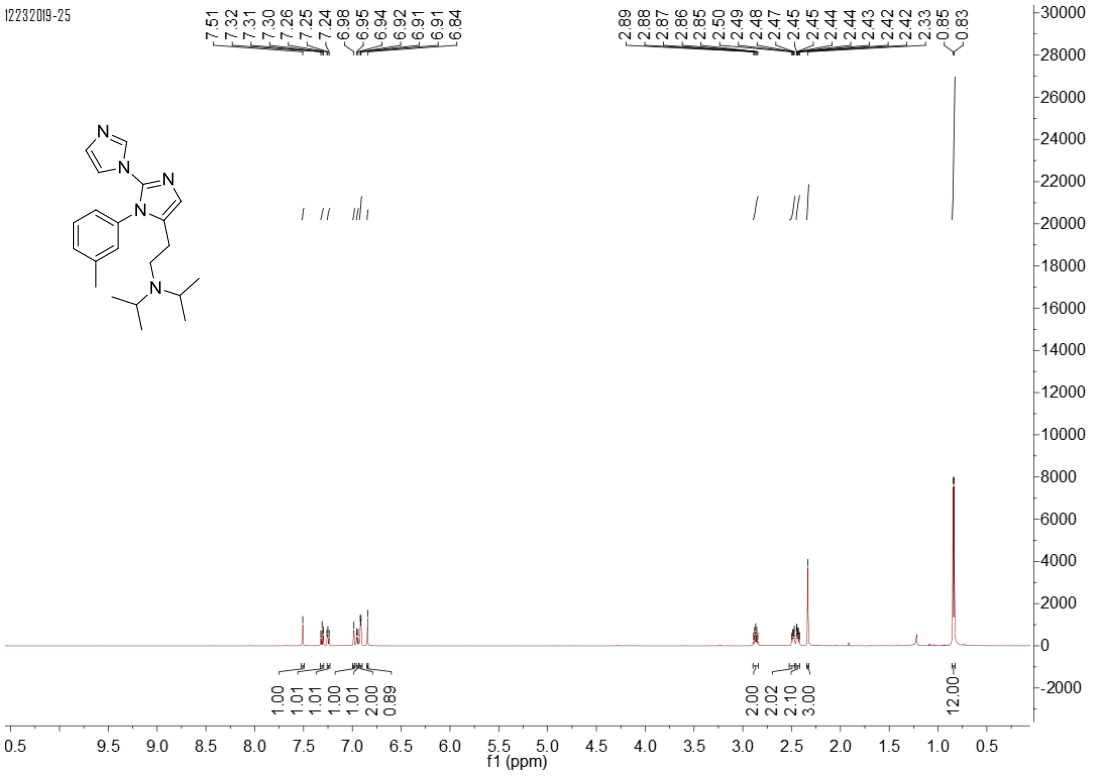
1.Copies of ^{1}H and ^{13}C NMR Spectra for Products 4

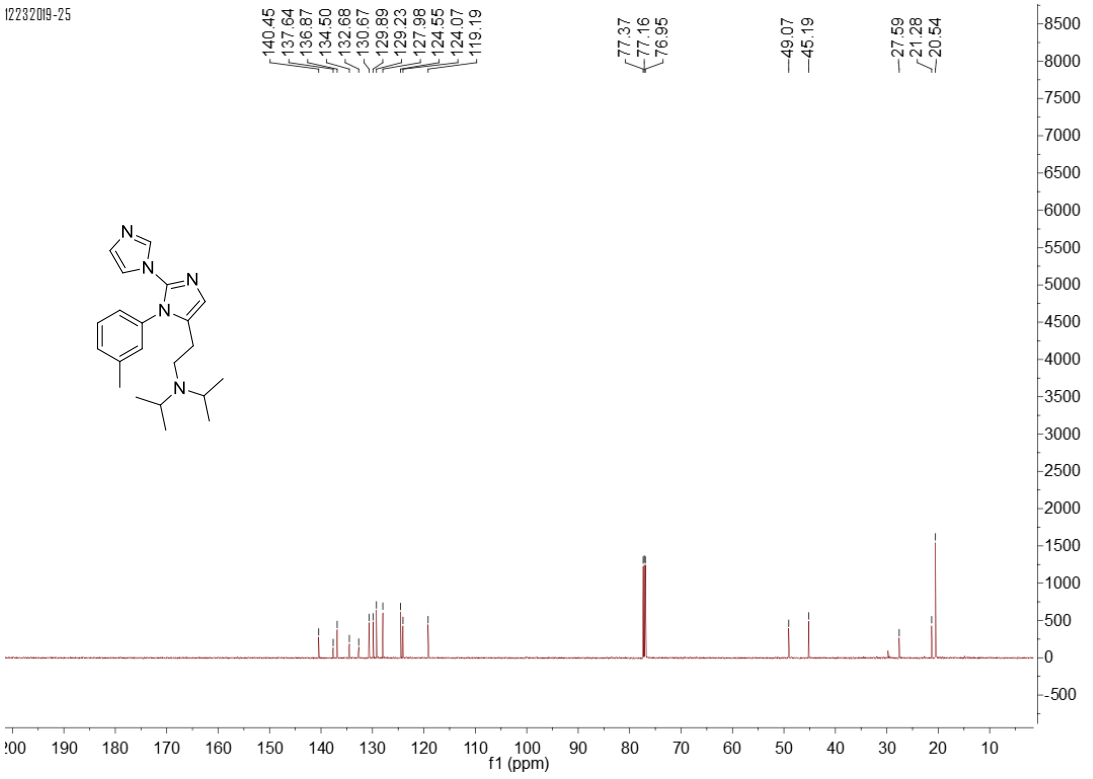
4a



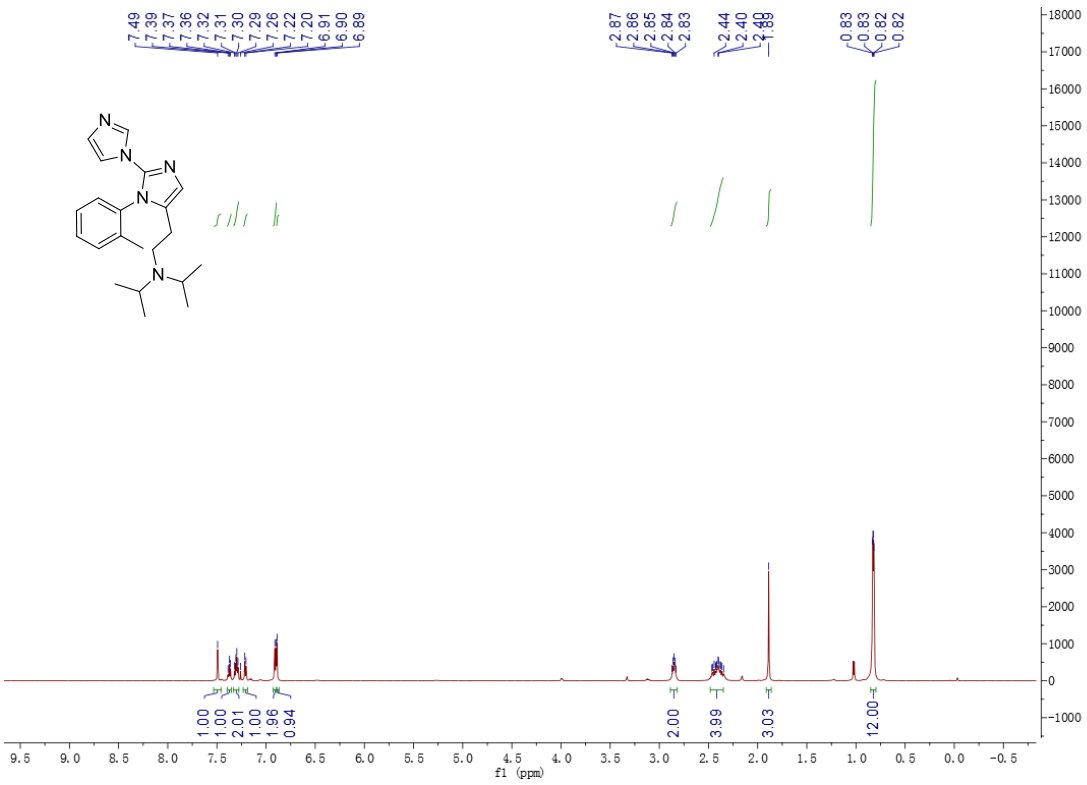


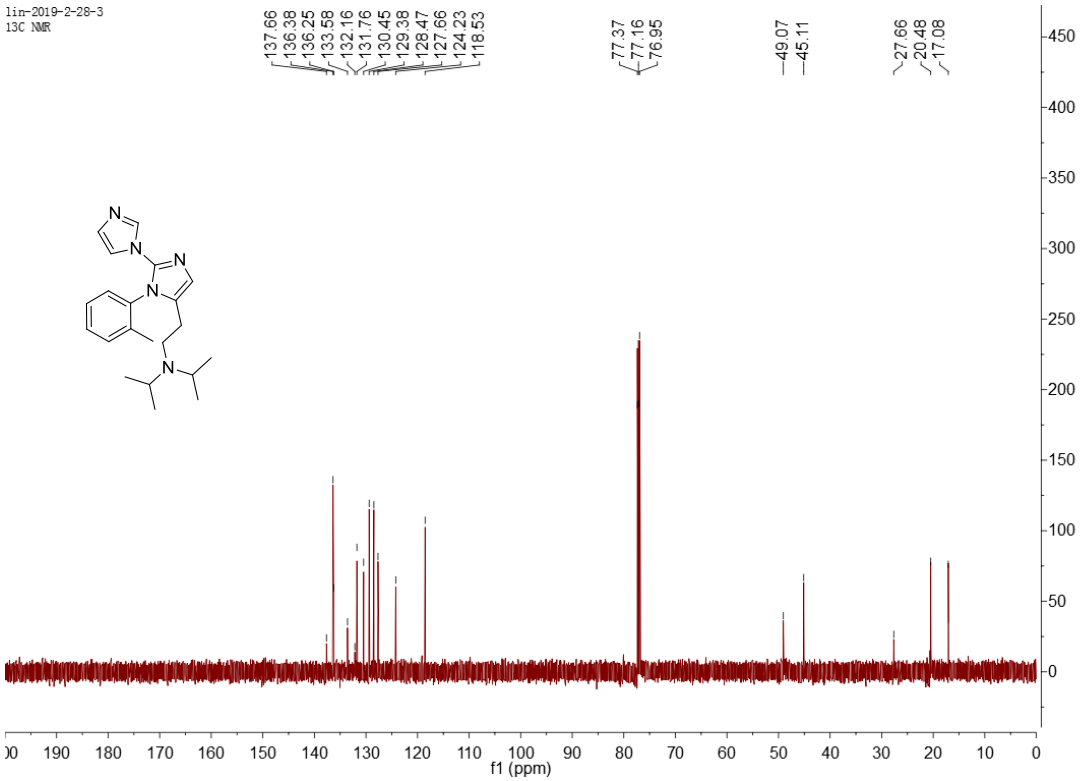
4b


12232019-25
7.51
7.32
7.31
7.30
7.26
7.25
7.24
6.98
6.95
6.94
6.92
6.91
6.91
6.84
2.89
2.88
2.87
2.86
2.85
2.50
2.49
2.48
2.47
2.45
2.45
2.44
2.44
2.43
2.42
2.42
2.33
0.85
0.83
1.00
1.01
1.01
1.00
1.01
2.00
0.89
2.00
2.02
2.10
3.00
12.00
f1 (ppm)

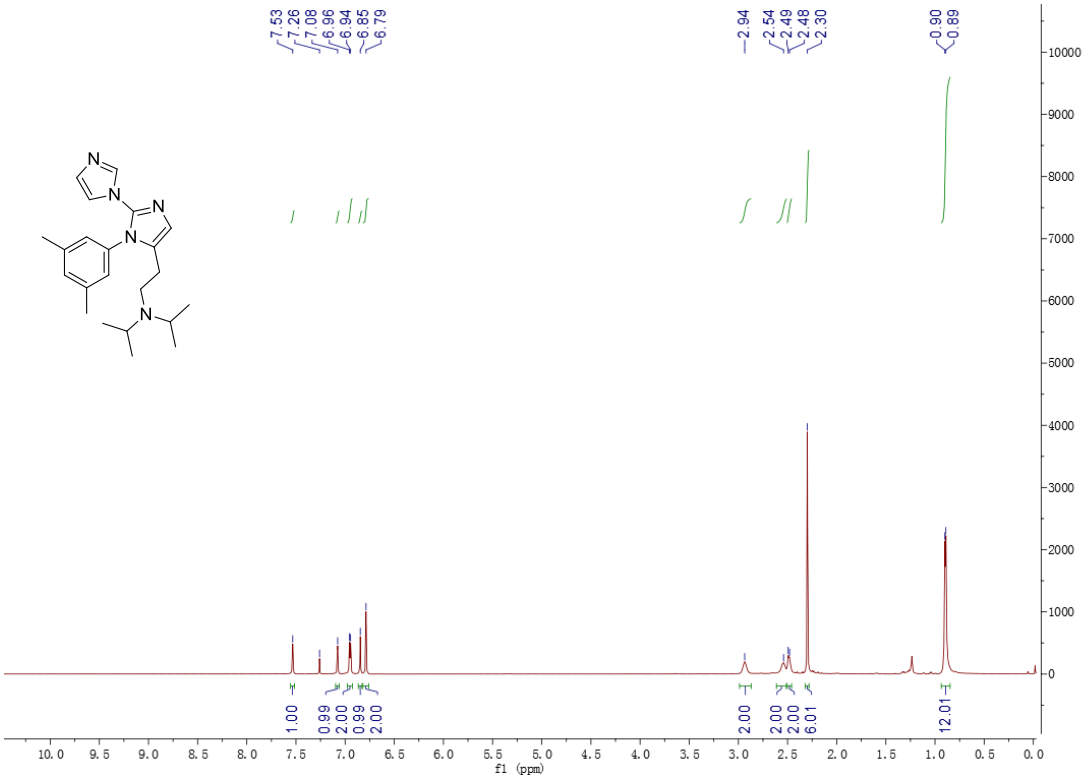

12232019-25
140.45
137.64
136.87
134.50
132.68
130.67
129.89
129.23
127.98
124.55
124.07
119.19
77.37
77.16
76.95
49.07
45.19
27.59
21.28
20.54
f1 (ppm)

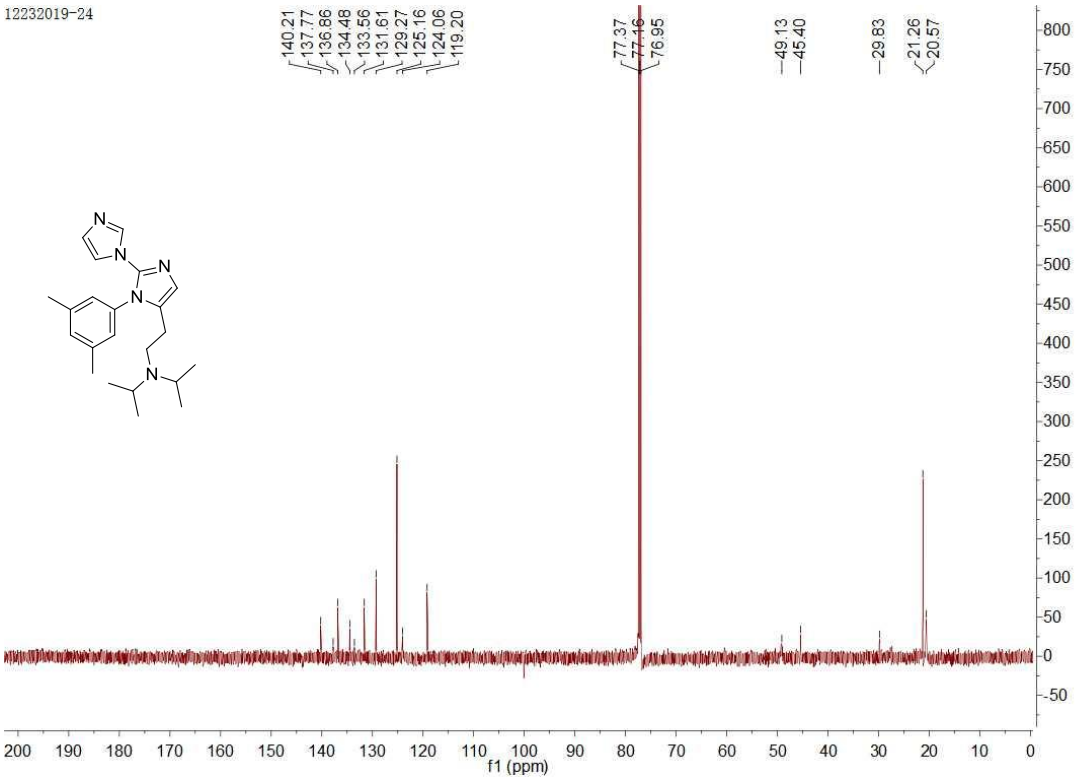
4c


7.49
7.39
7.37
7.36
7.32
7.31
7.30
7.29
7.26
7.22
7.20
6.91
6.90
6.89
2.87
2.86
2.85
2.84
2.83
2.44
2.40
2.39
1.89
0.83
0.83
0.82
0.82
1.00
1.00
2.01
1.00
1.96
0.94
2.00
3.99
3.03
12.00
f1 (ppm)

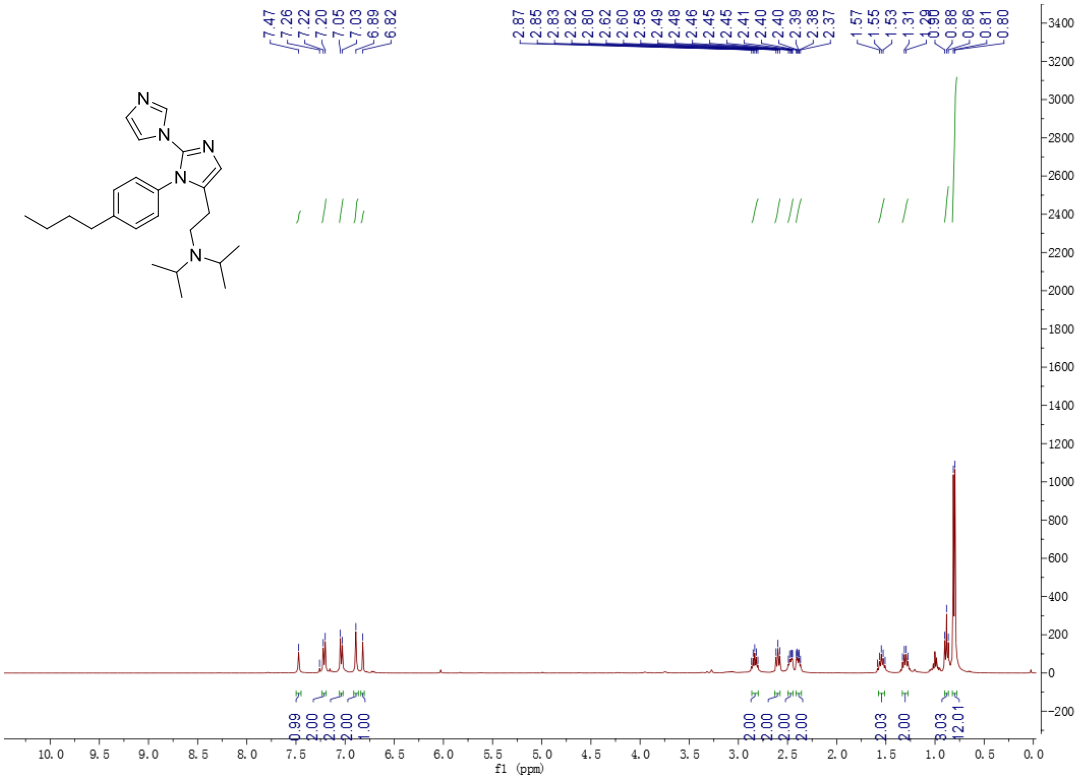

lin-2019-2-28-3
13C NMR
137.66
136.38
136.25
133.58
132.16
131.76
130.45
129.38
128.47
127.66
124.23
118.53
77.37
77.16
76.95
49.07
45.11
27.66
20.48
17.08
f1 (ppm)

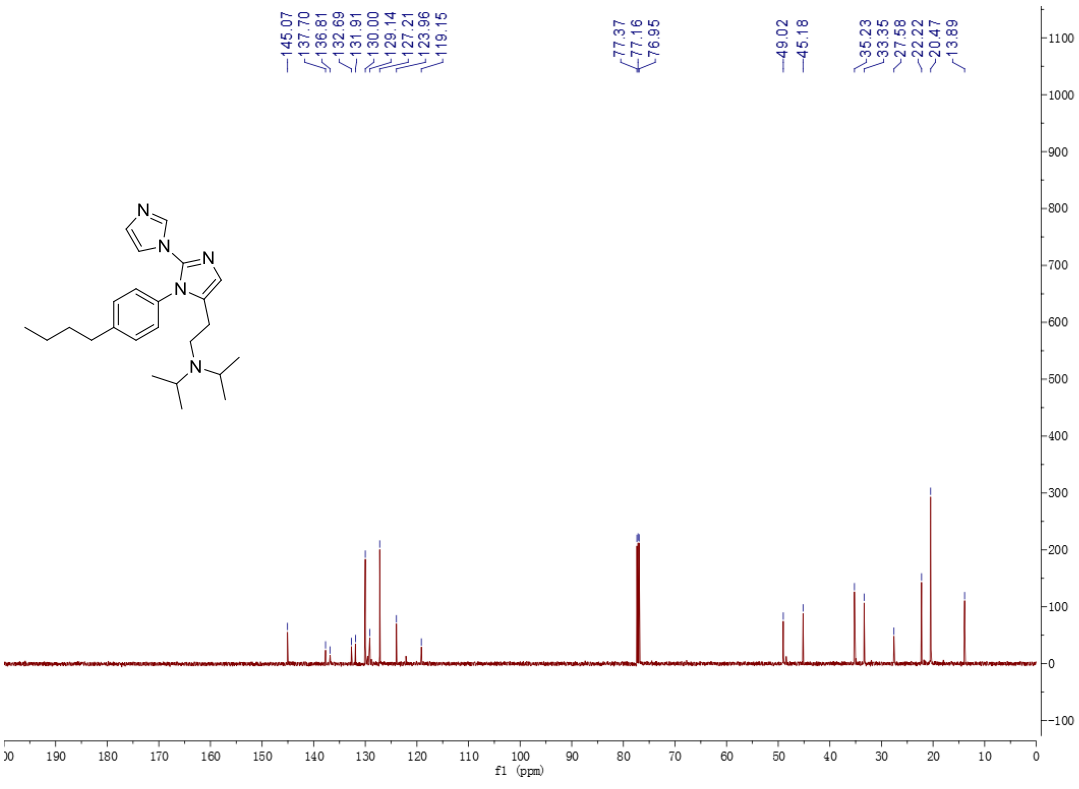
4d


7.53
7.26
7.08
6.96
6.94
6.85
6.79
2.94
2.54
2.49
2.48
2.30
0.90
0.89
1.00
0.99
2.00
0.99
2.00
2.00
2.00
2.00
6.01
12.01
f1 (ppm)

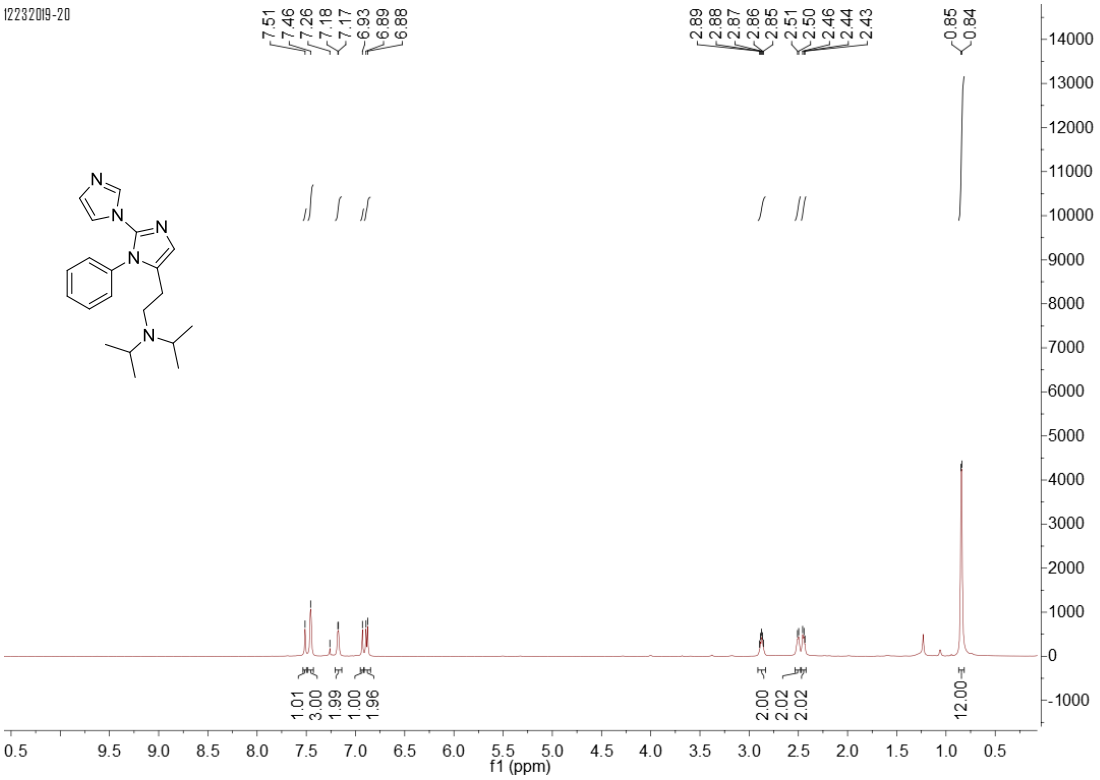

12232019-24
140.21
137.77
136.86
134.48
133.56
131.61
129.27
125.16
124.06
119.20
77.37
77.16
76.95
49.13
45.40
29.83
21.26
20.57
f1 (ppm)

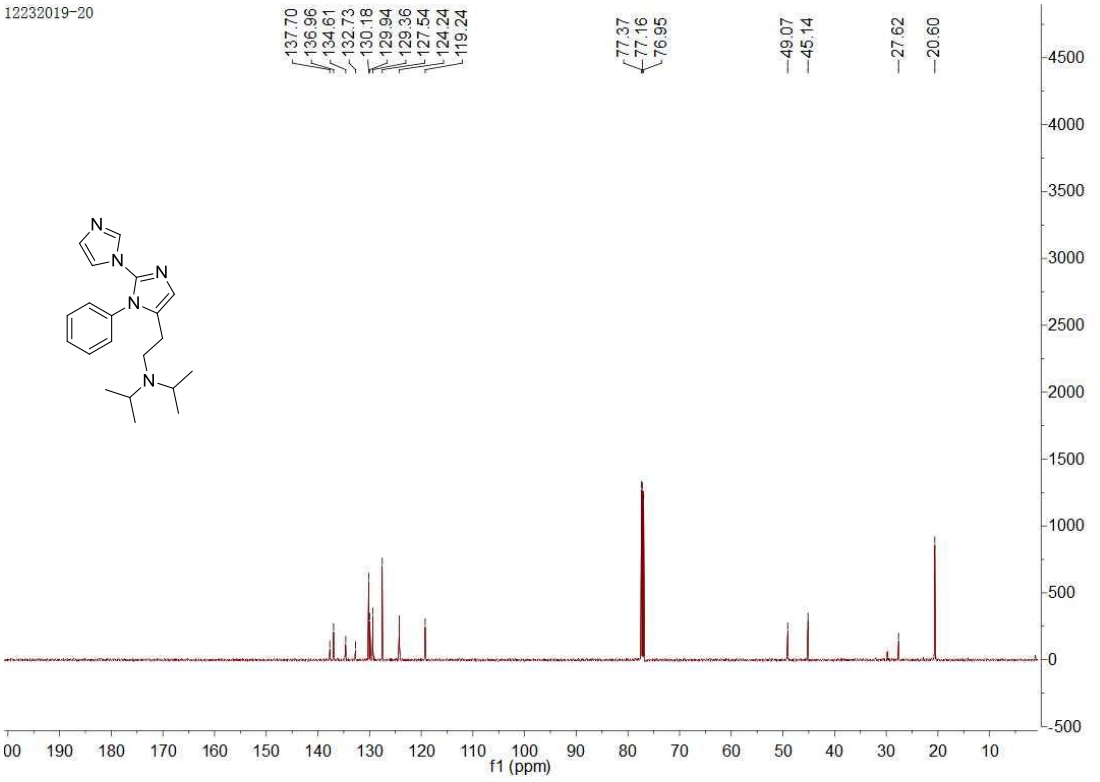
4e


7.47
7.26
7.22
7.20
7.05
7.03
6.89
6.82
2.87
2.85
2.83
2.82
2.80
2.62
2.60
2.58
2.49
2.48
2.46
2.45
2.45
2.41
2.40
2.40
2.39
2.38
2.37
1.57
1.55
1.53
1.31
1.29
0.90
0.88
0.86
0.81
0.80
0.99
2.00
2.00
2.00
1.00
2.00
2.00
2.00
2.00
2.03
2.00
3.03
12.01
f1 (ppm)

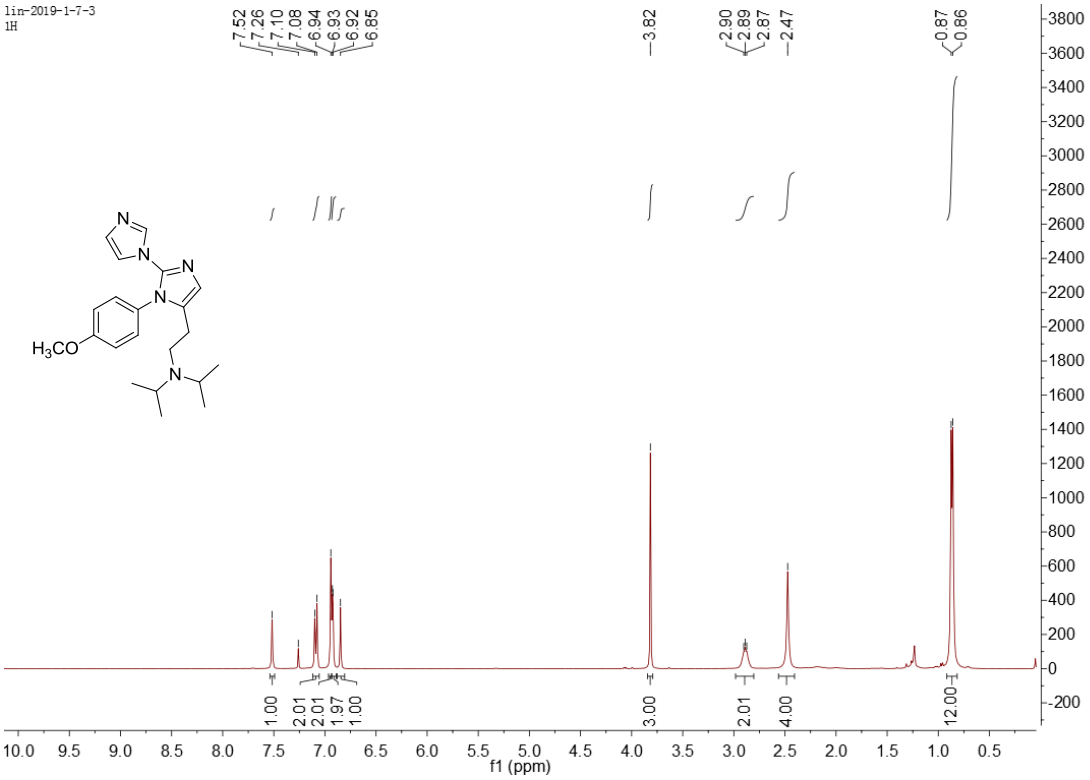

145.07
137.70
136.81
132.69
131.91
130.00
129.14
127.21
123.96
119.15
77.37
77.16
76.95
49.02
45.18
35.23
33.35
27.58
22.22
20.47
13.89
f1 (ppm)

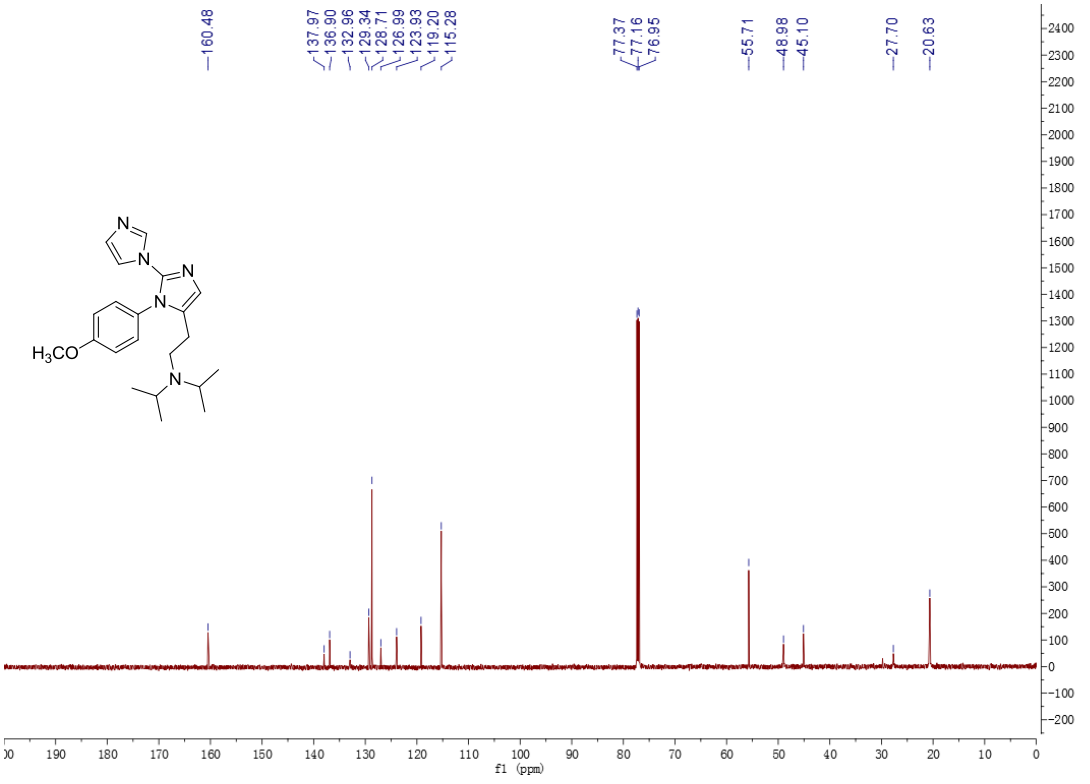
4f


12232019-20
7.51
7.46
7.26
7.18
7.17
6.93
6.89
6.88
2.89
2.88
2.87
2.86
2.85
2.51
2.50
2.46
2.44
2.43
0.85
0.84
1.01
3.00
1.99
1.00
1.96
2.00
2.02
2.02
12.00
f1 (ppm)

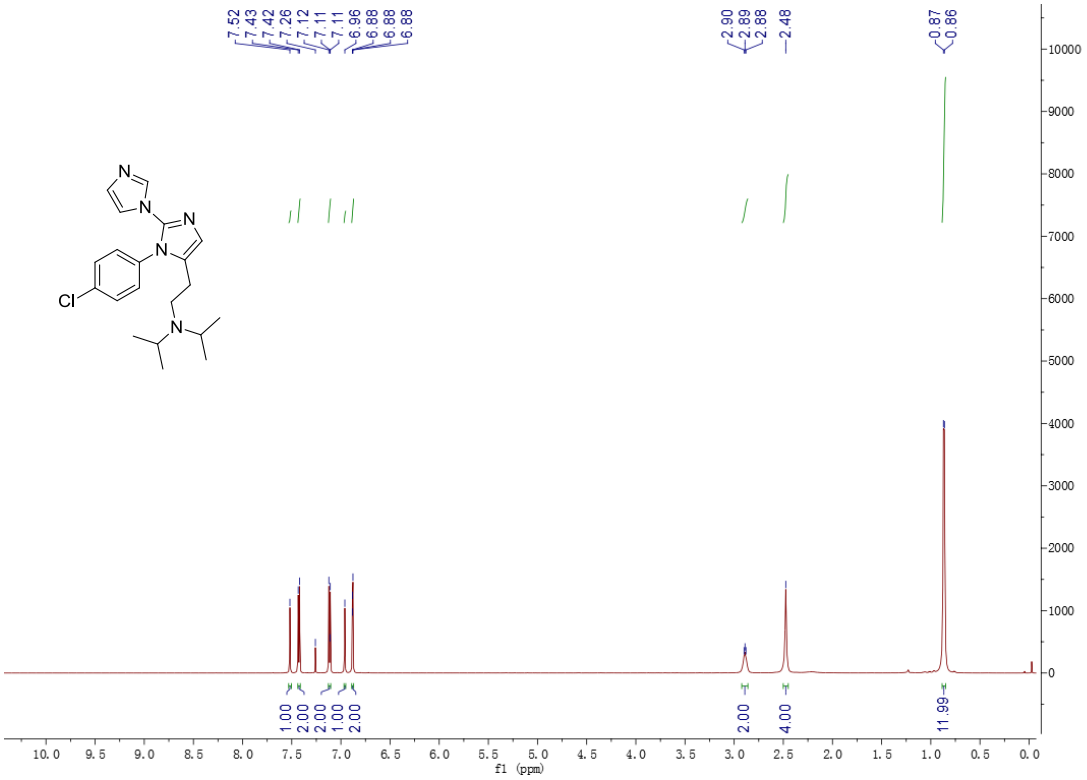

12232019-20
137.70
136.96
134.61
132.73
130.18
129.94
129.36
127.54
124.24
119.24
77.37
77.16
76.95
49.07
45.14
27.62
20.60
f1 (ppm)

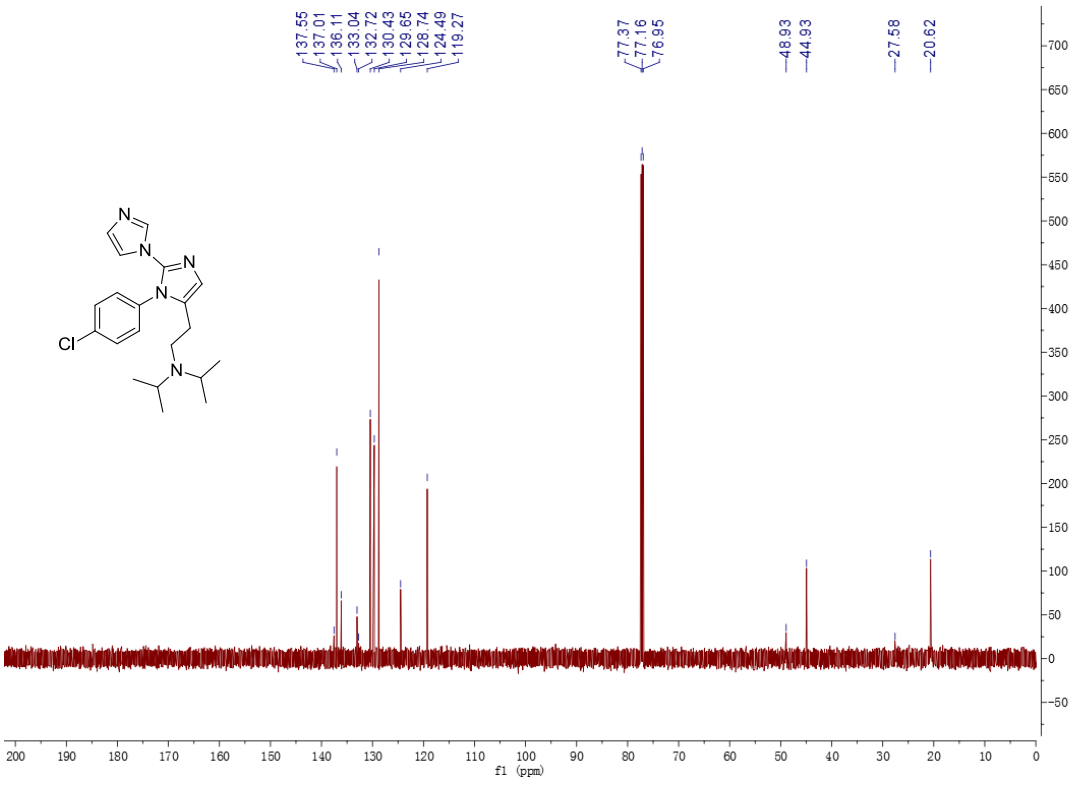
4g


lin-2019-1-7-3
1H
7.52
7.26
7.10
7.08
6.94
6.93
6.92
6.85
3.82
2.90
2.89
2.87
2.47
0.87
0.86
1.00
2.01
2.01
1.97
1.00
3.00
2.01
4.00
12.00
f1 (ppm)

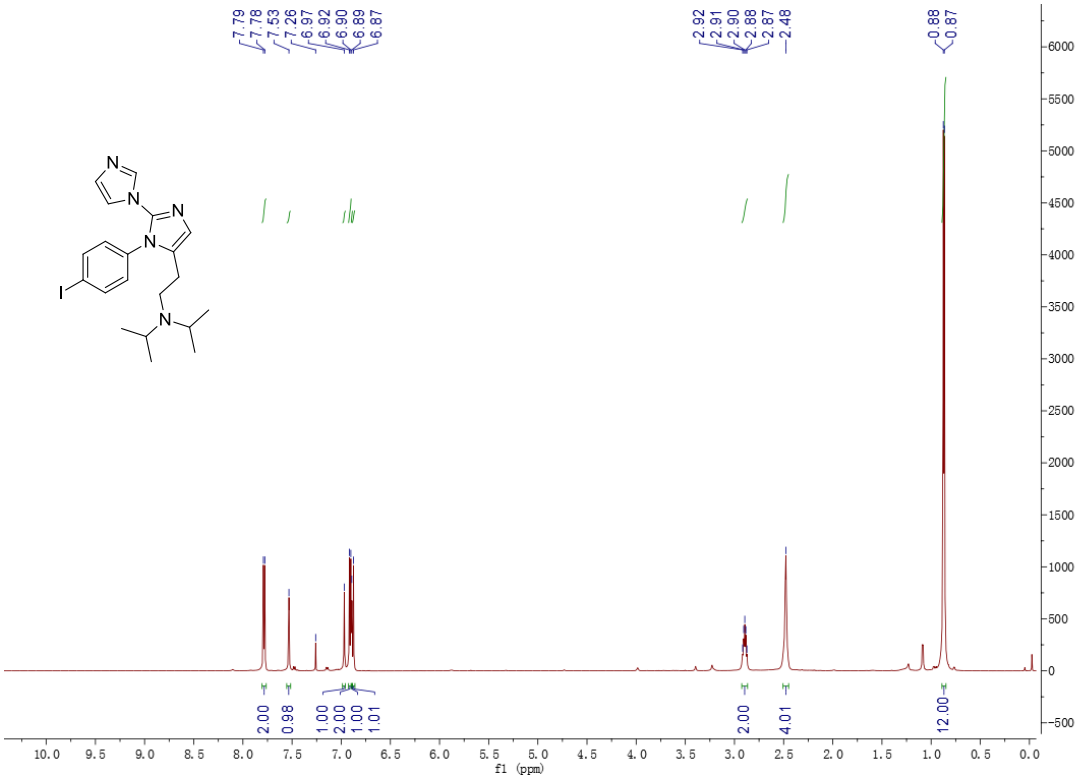

160.48
137.97
136.90
132.96
129.34
128.71
126.99
123.93
119.20
115.28
77.37
77.16
76.95
55.71
48.98
45.10
27.70
20.63
f1 (ppm)

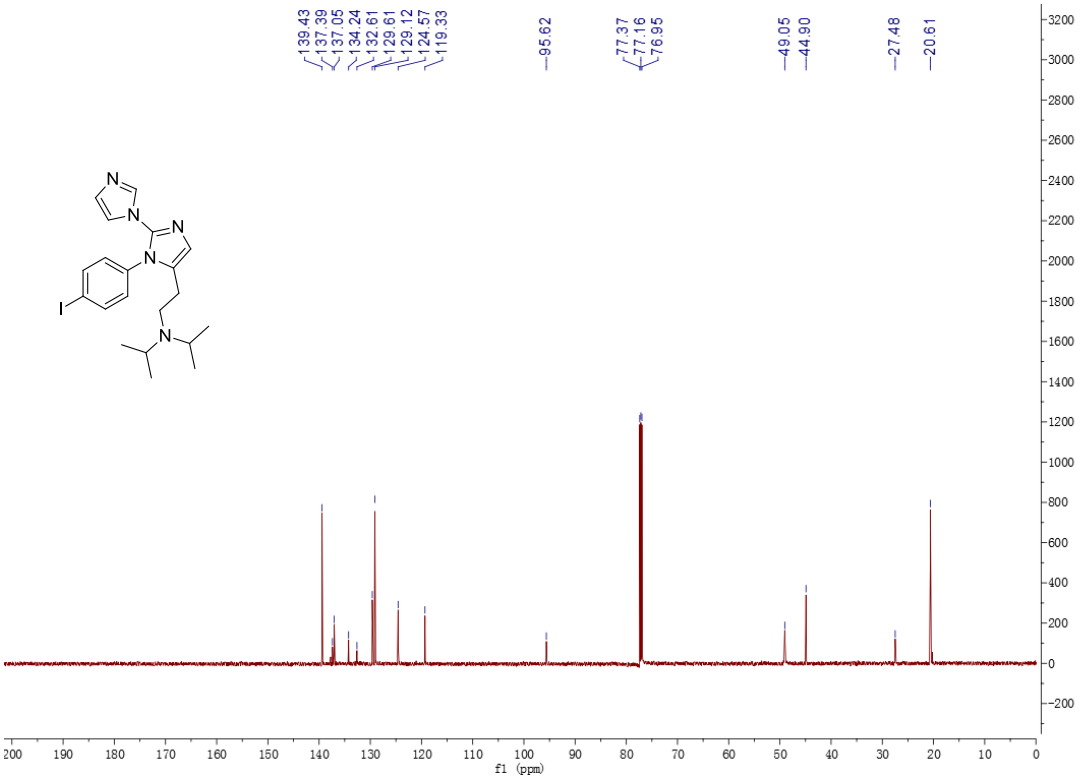
4h


7.52
7.43
7.42
7.26
7.12
7.11
7.11
6.96
6.88
6.88
6.88
2.90
2.89
2.88
2.48
0.87
0.86
Cl
1.00
2.00
2.00
1.00
2.00
2.00
4.00
11.99
f1 (ppm)

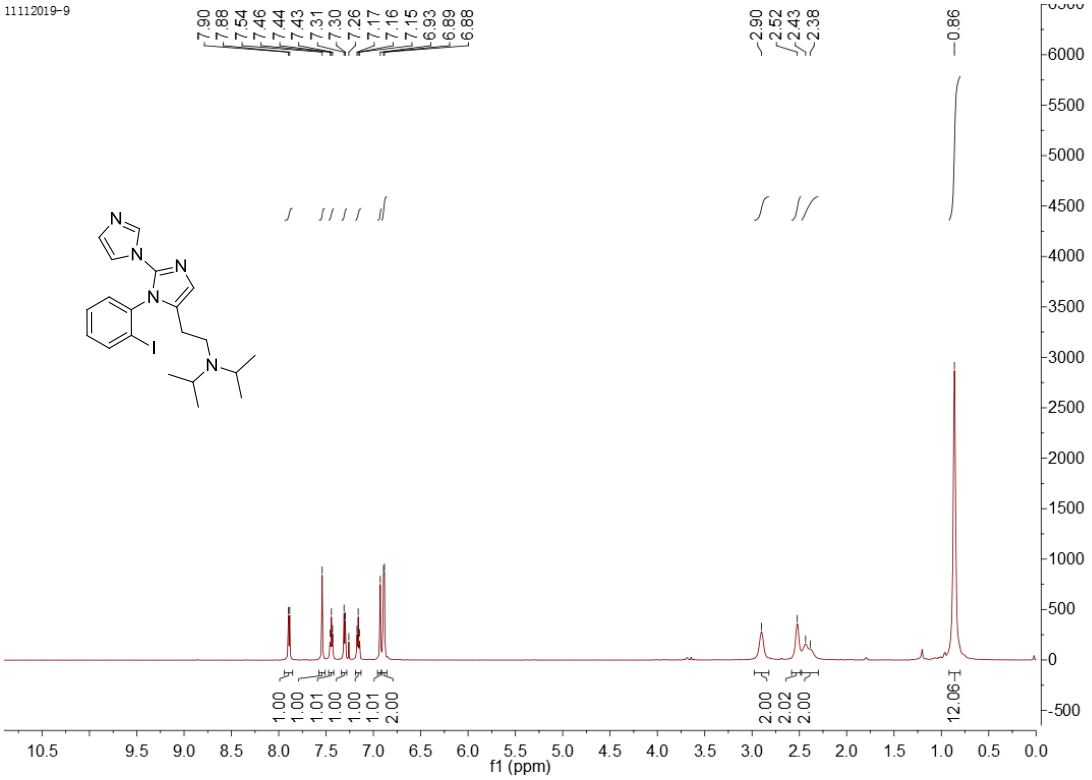

137.55
137.01
136.11
133.04
132.72
130.43
129.65
128.74
124.49
119.27
77.37
77.16
76.95
48.93
44.93
27.58
20.62
Cl
f1 (ppm)

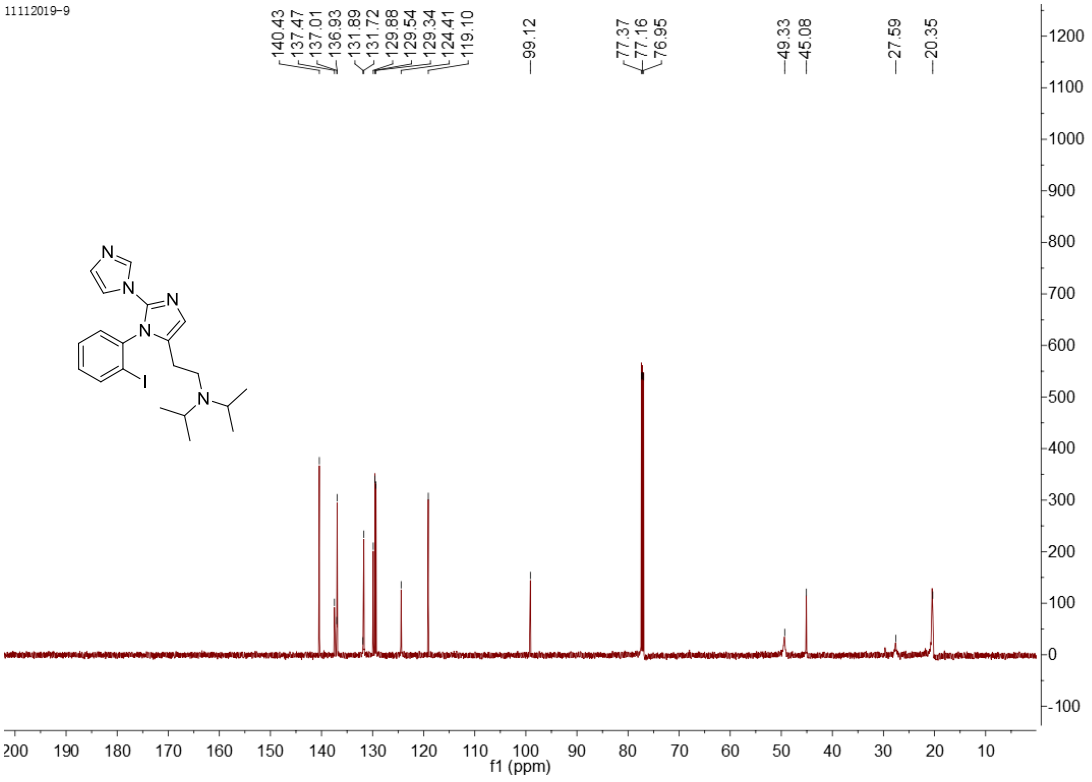
4i


7.79
7.78
7.53
7.26
6.97
6.92
6.90
6.89
6.87
2.92
2.91
2.90
2.88
2.87
2.48
0.88
0.87
2.00
0.98
1.00
2.00
1.00
1.01
2.00
4.01
12.00
f1 (ppm)

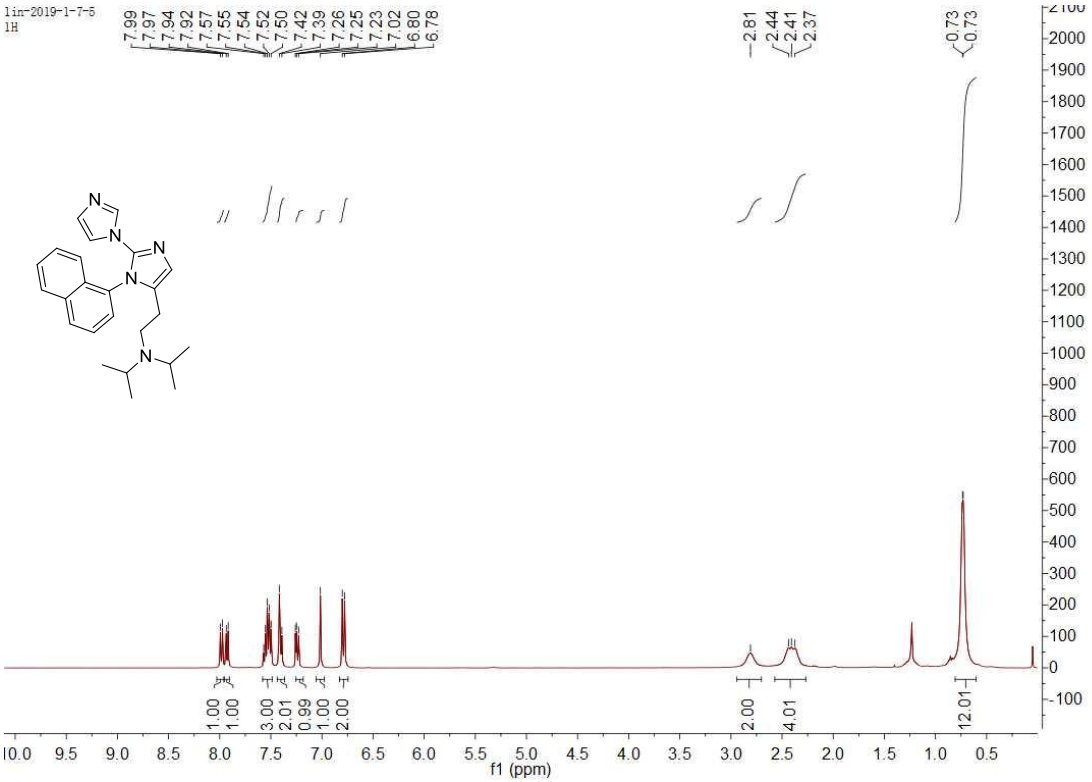

139.43
137.39
137.05
134.24
132.61
129.61
129.12
124.57
119.33
95.62
77.37
77.16
76.95
49.05
44.90
27.48
20.61
f1 (ppm)

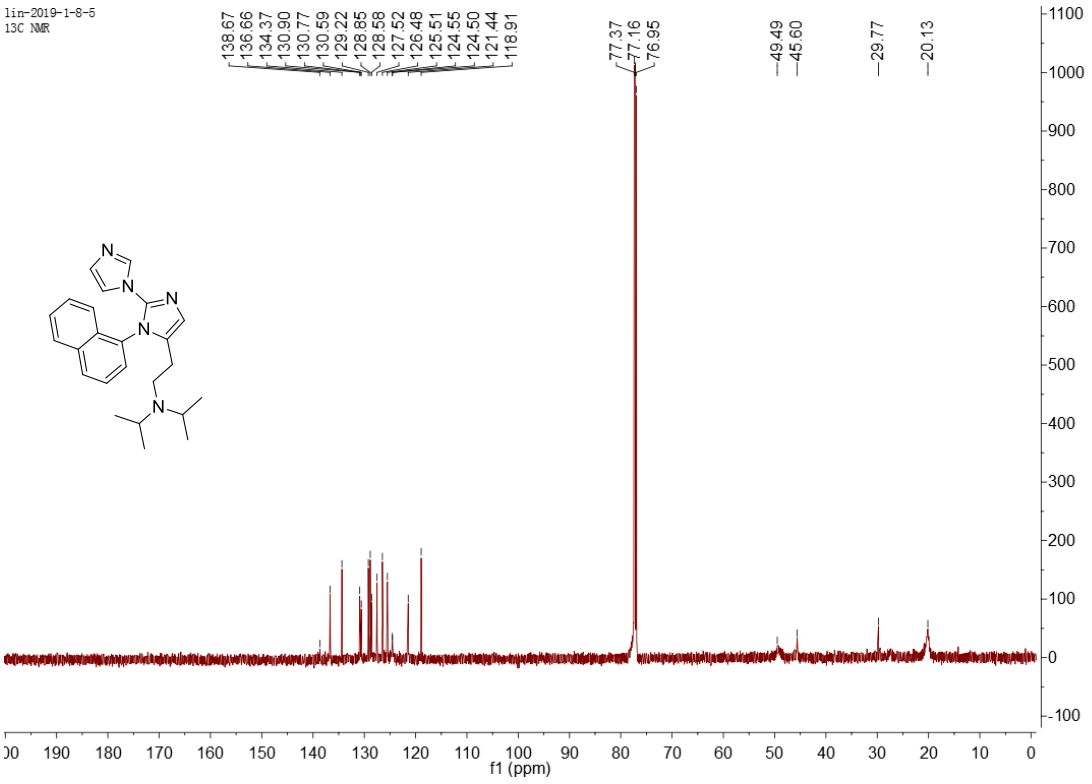
4j


11112019-9
7.90
7.88
7.54
7.46
7.44
7.43
7.31
7.30
7.26
7.17
7.16
7.15
6.93
6.89
6.88
2.90
2.52
2.43
2.38
0.86
1.00
1.00
1.01
1.00
1.00
1.01
2.00
2.00
2.02
2.00
12.06
f1 (ppm)

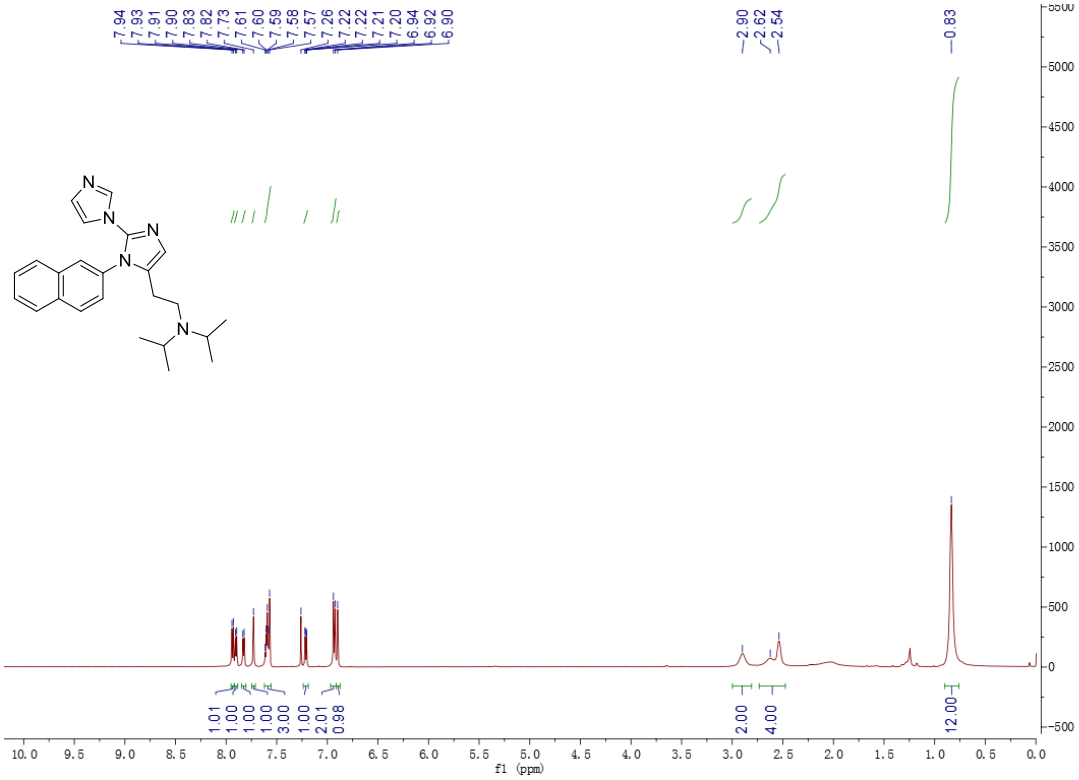

11112019-9
140.43
137.47
137.01
136.93
131.89
131.72
129.88
129.54
129.34
124.41
119.10
99.12
77.37
77.16
76.95
49.33
45.08
27.59
20.35
f1 (ppm)

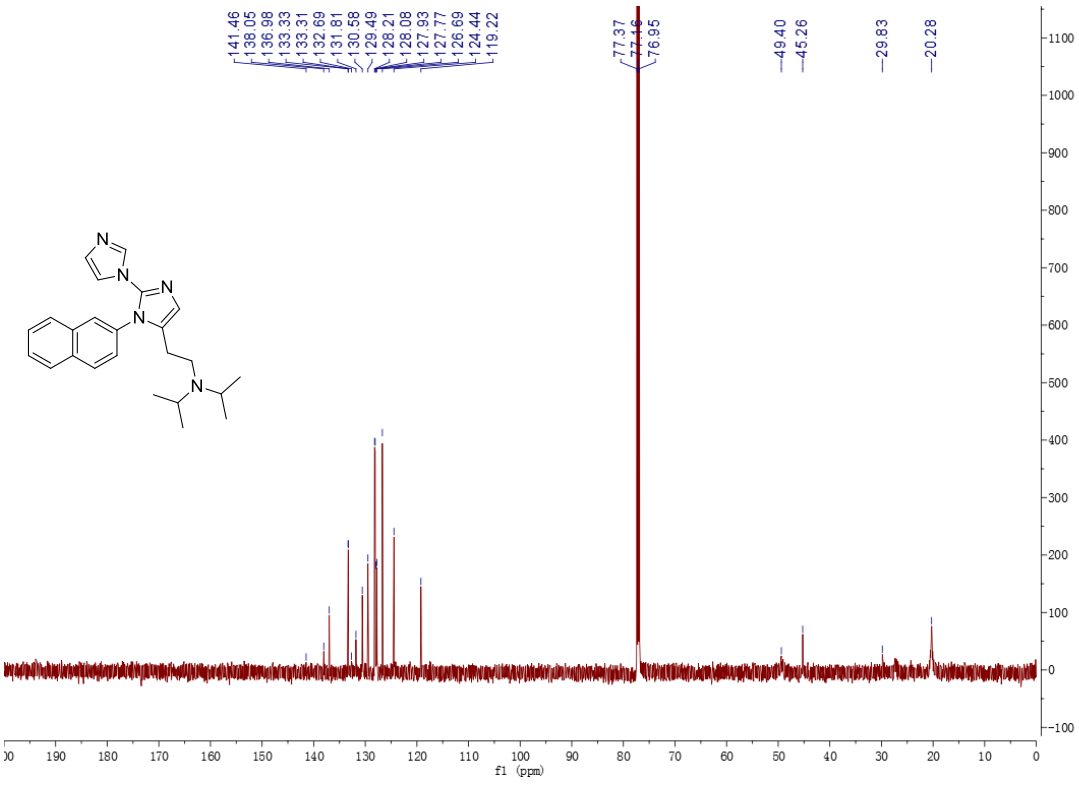
4k


lin-2019-1-7-5
1H
7.99
7.97
7.94
7.92
7.57
7.55
7.54
7.52
7.50
7.42
7.39
7.26
7.25
7.23
7.02
6.80
6.78
2.81
2.44
2.41
2.37
0.73
0.73
1.00
1.00
3.00
2.01
0.99
1.00
2.00
2.00
4.01
12.01
f1 (ppm)

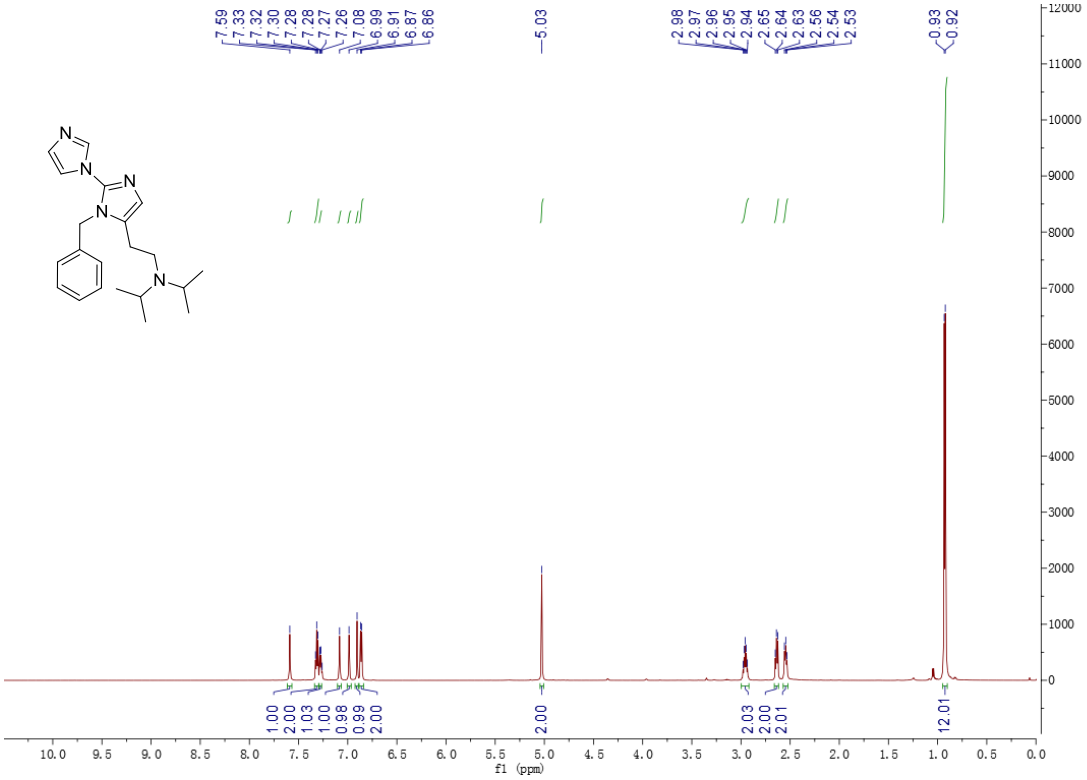

lin-2019-1-8-5
13C NMR
138.67
136.66
134.37
130.90
130.77
130.59
129.22
128.85
128.58
127.52
126.48
125.51
124.55
124.50
121.44
118.91
77.37
77.16
76.95
49.49
45.60
29.77
20.13
f1 (ppm)

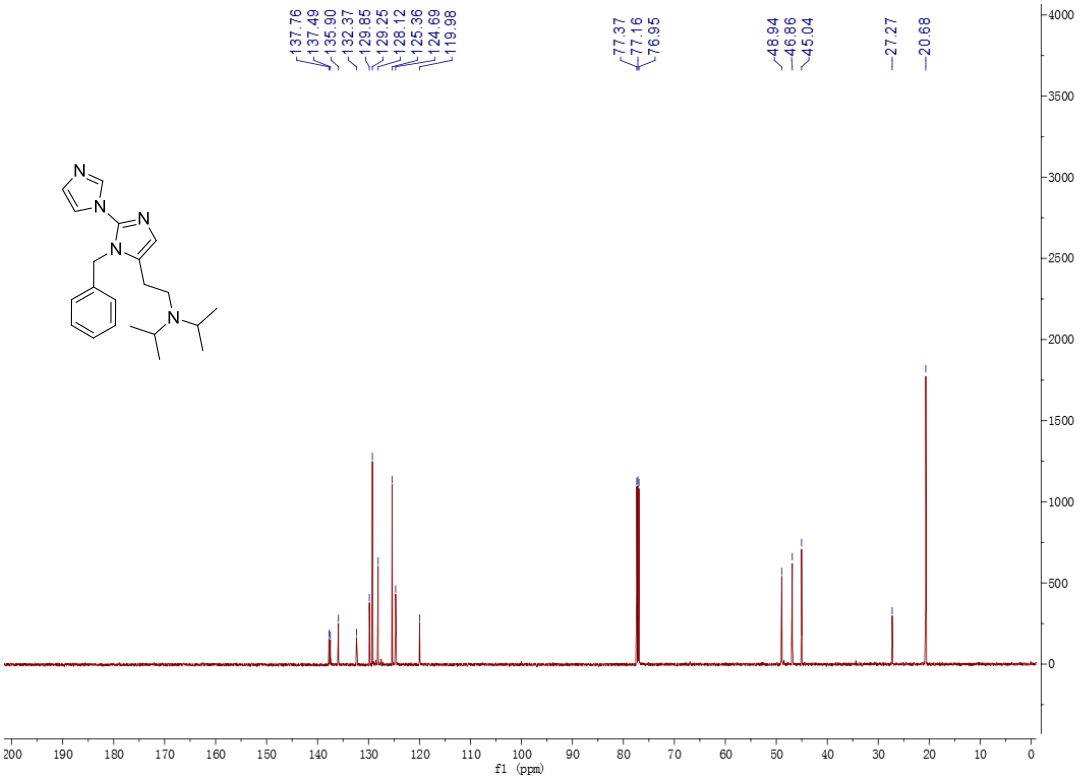
4l


7.94
7.93
7.91
7.90
7.83
7.82
7.73
7.61
7.60
7.59
7.58
7.57
7.26
7.22
7.22
7.21
7.20
6.94
6.92
6.90
2.90
2.62
2.54
0.83
1.01
1.00
1.00
1.00
3.00
1.00
2.01
0.98
2.00
4.00
12.00
f1 (ppm)

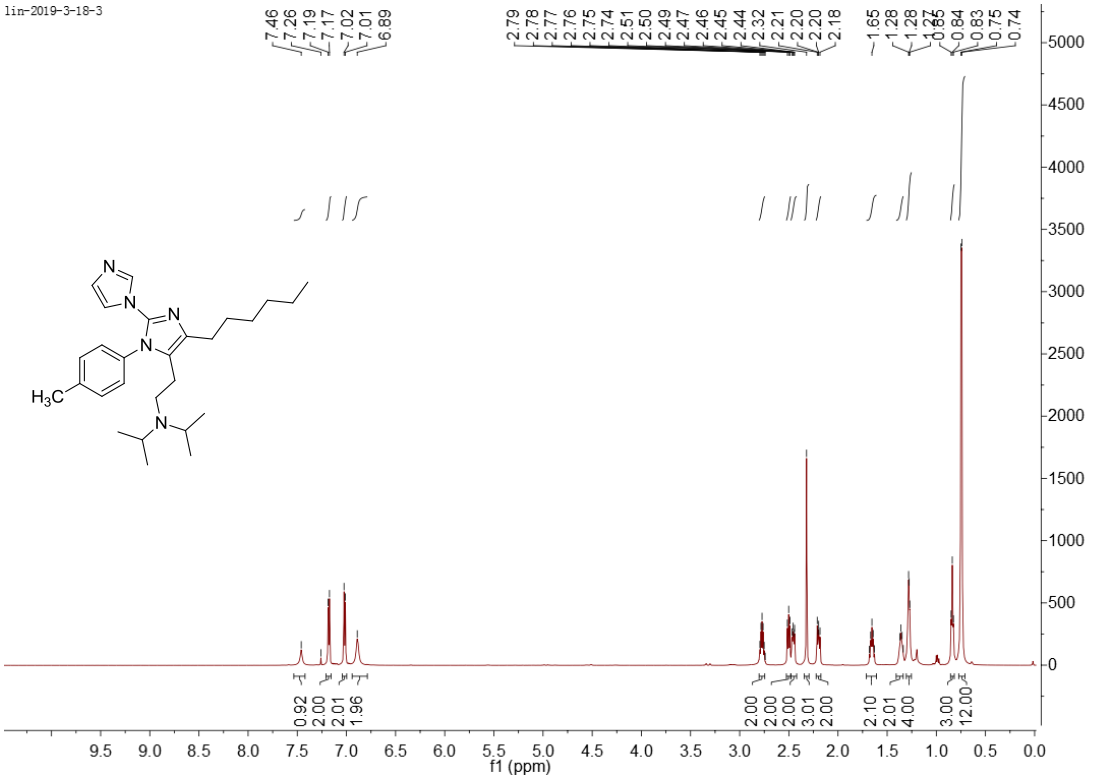

141.46
138.05
136.98
133.33
133.31
132.69
131.81
130.58
129.49
128.21
128.08
127.93
127.77
126.69
124.44
119.22
77.37
77.16
76.95
49.40
45.26
29.83
20.28
f1 (ppm)

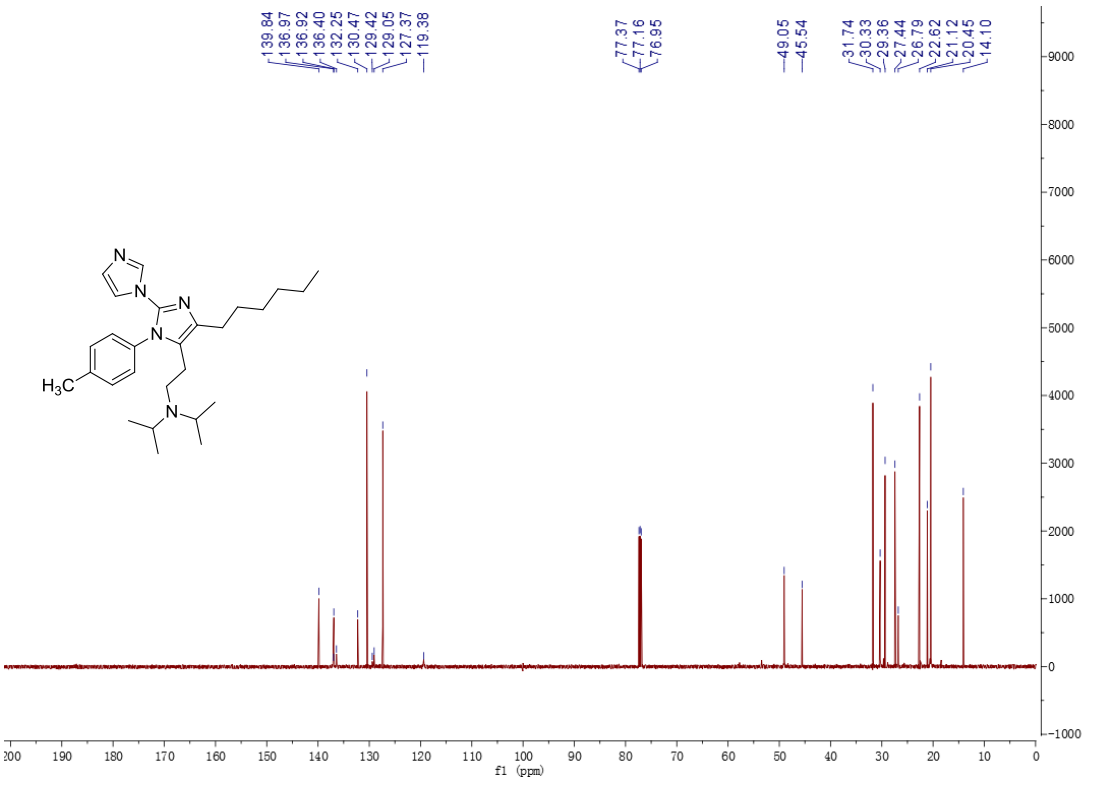
4m


7.59
7.33
7.32
7.30
7.28
7.28
7.27
7.26
7.08
6.99
6.91
6.87
6.86
5.03
2.98
2.97
2.96
2.95
2.94
2.65
2.64
2.63
2.56
2.54
2.53
0.93
0.92
1.00
2.00
1.03
1.00
0.98
0.99
2.00
2.00
2.03
2.00
2.01
12.01
f1 (ppm)

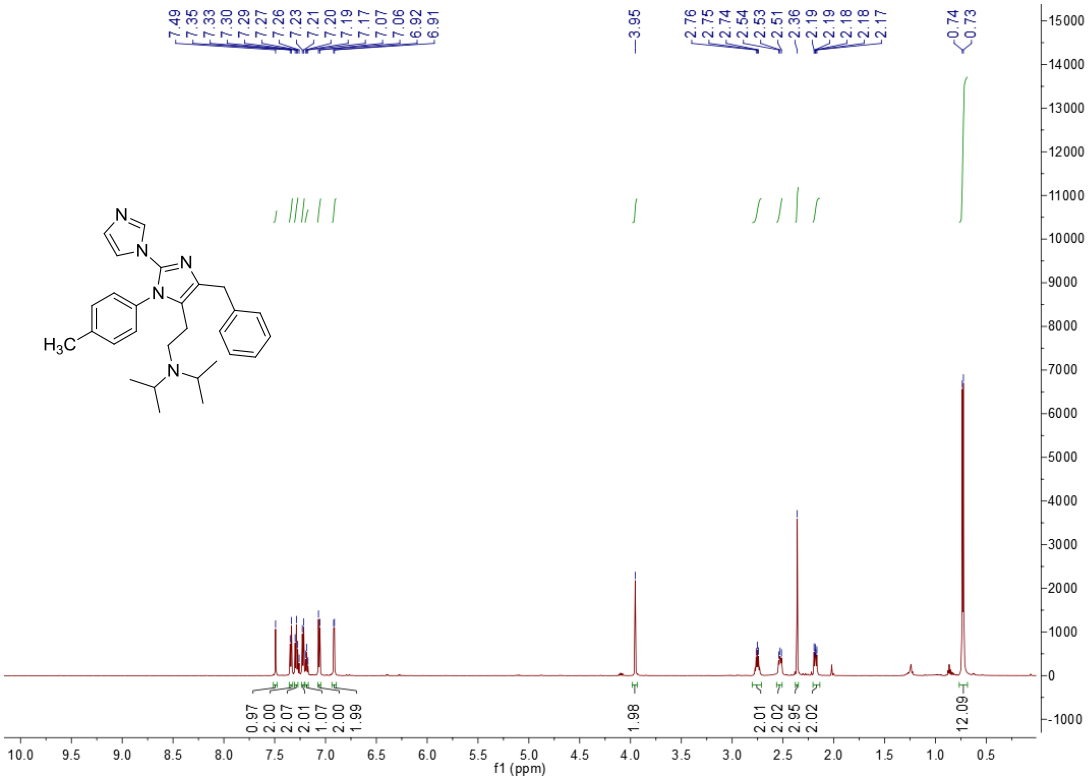

137.76
137.49
135.90
132.37
129.85
129.25
128.12
125.36
124.69
119.98
77.37
77.16
76.95
48.94
46.86
45.04
27.27
20.68
f1 (ppm)

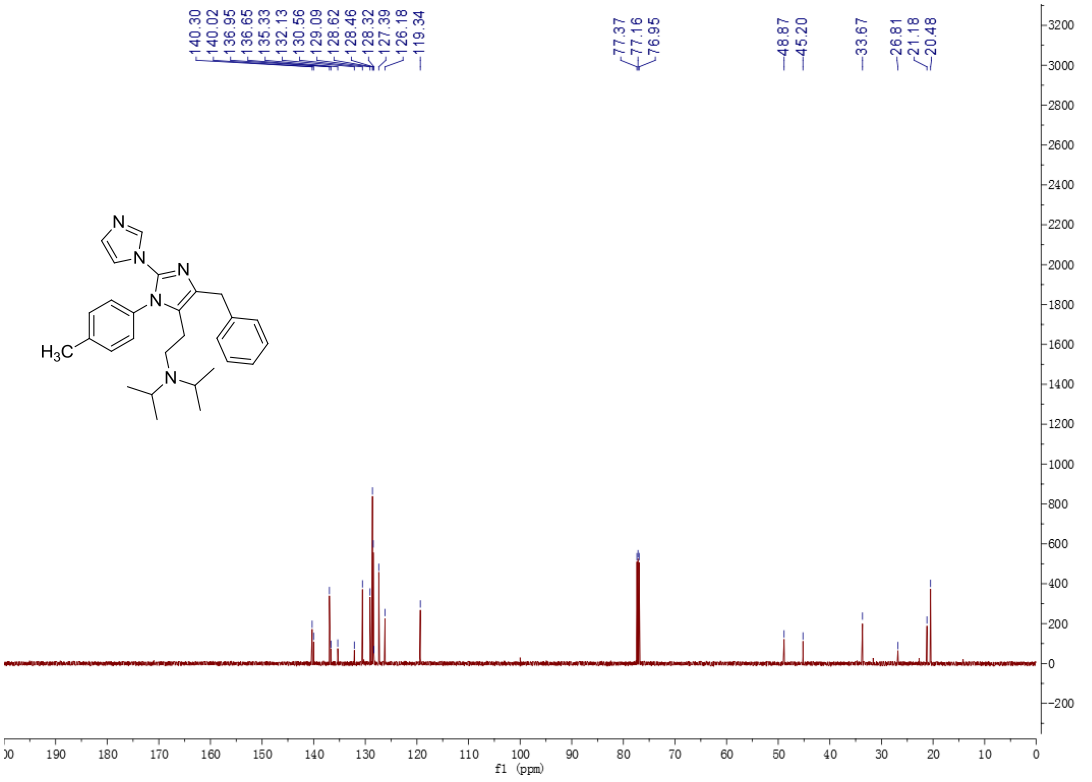
4n



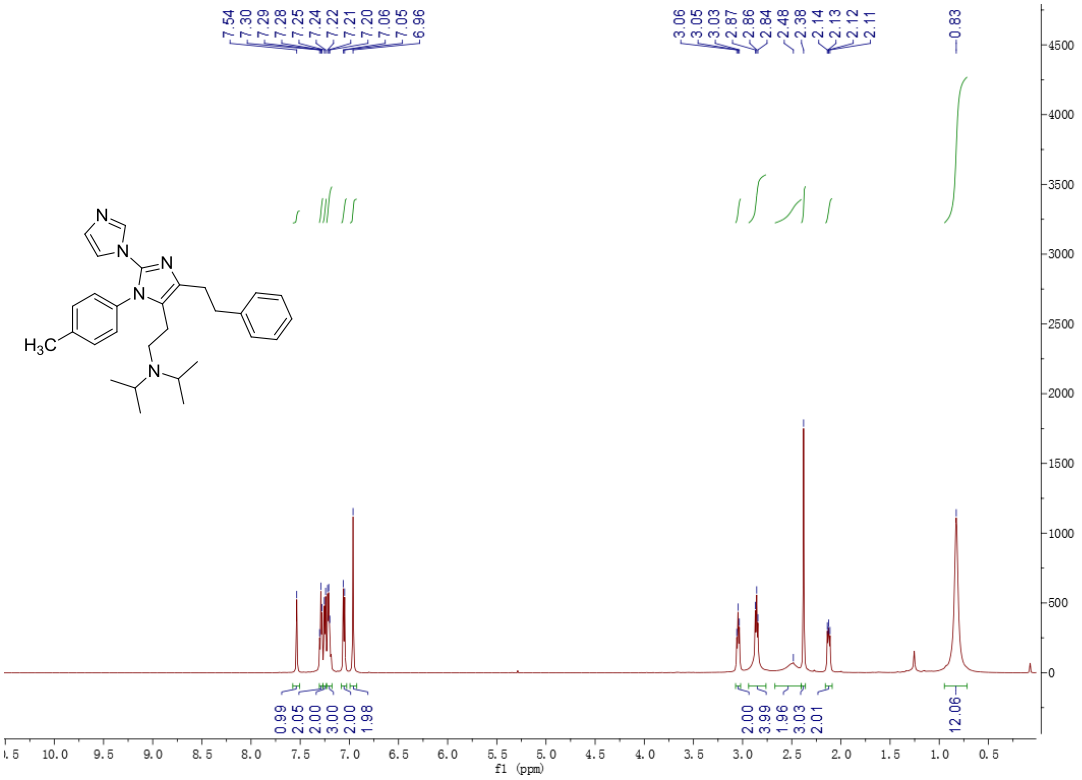


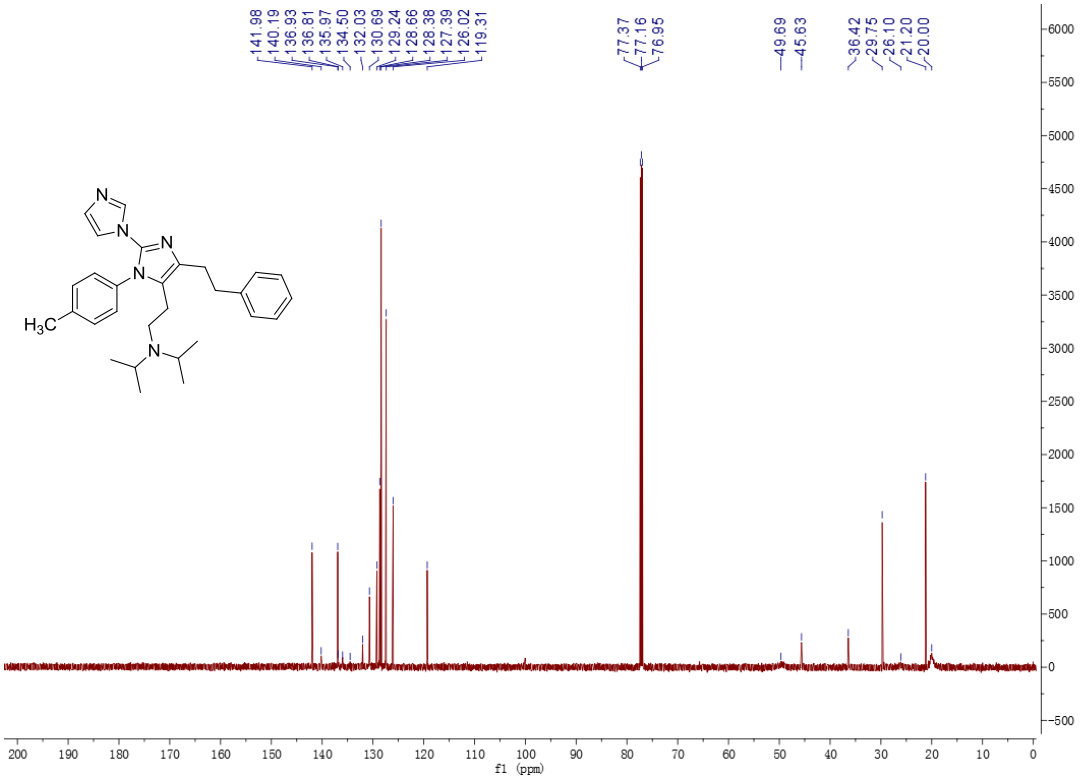
4o


7.49
7.35
7.33
7.30
7.29
7.27
7.26
7.23
7.21
7.20
7.19
7.17
7.07
7.06
6.92
6.91
3.95
2.76
2.75
2.74
2.54
2.53
2.51
2.36
2.19
2.19
2.18
2.18
2.17
0.74
0.73
0.97
2.00
2.07
2.01
1.07
2.00
1.99
1.98
2.01
2.02
2.95
2.02
12.09
f1 (ppm)

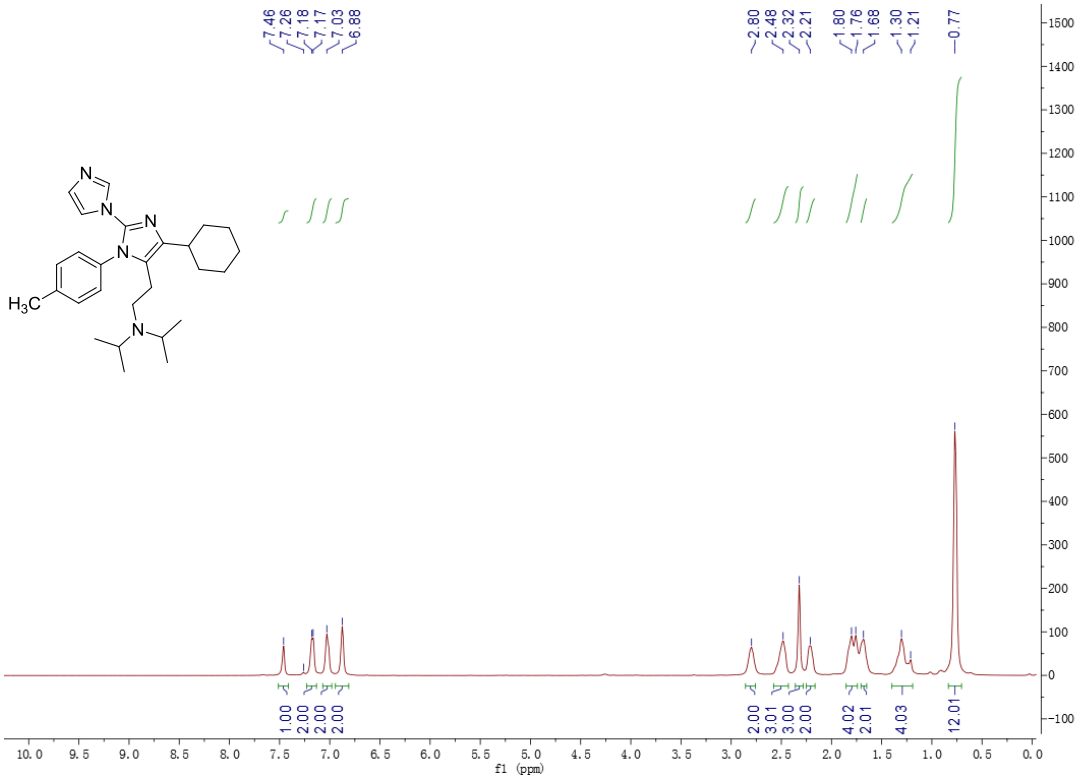

140.30
140.02
136.95
136.65
135.33
132.13
130.56
129.09
128.62
128.46
128.32
127.39
126.18
119.34
77.37
77.16
76.95
48.87
45.20
33.67
26.81
21.18
20.48
f1 (ppm)

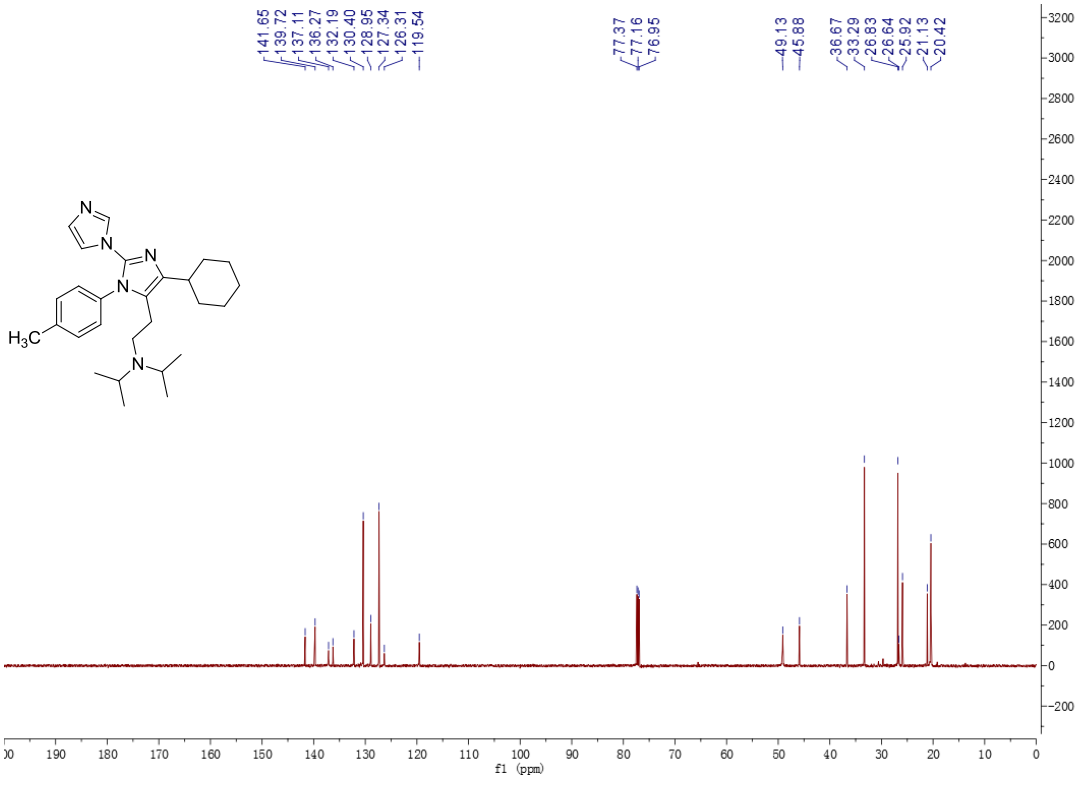
4p


7.54
7.30
7.29
7.28
7.25
7.24
7.22
7.21
7.20
7.06
7.05
6.96
3.06
3.05
3.03
2.87
2.86
2.84
2.48
2.38
2.14
2.13
2.12
2.11
0.83
0.99
2.05
2.00
3.00
2.00
1.98
2.00
3.99
1.96
3.03
2.01
12.06
f1 (ppm)

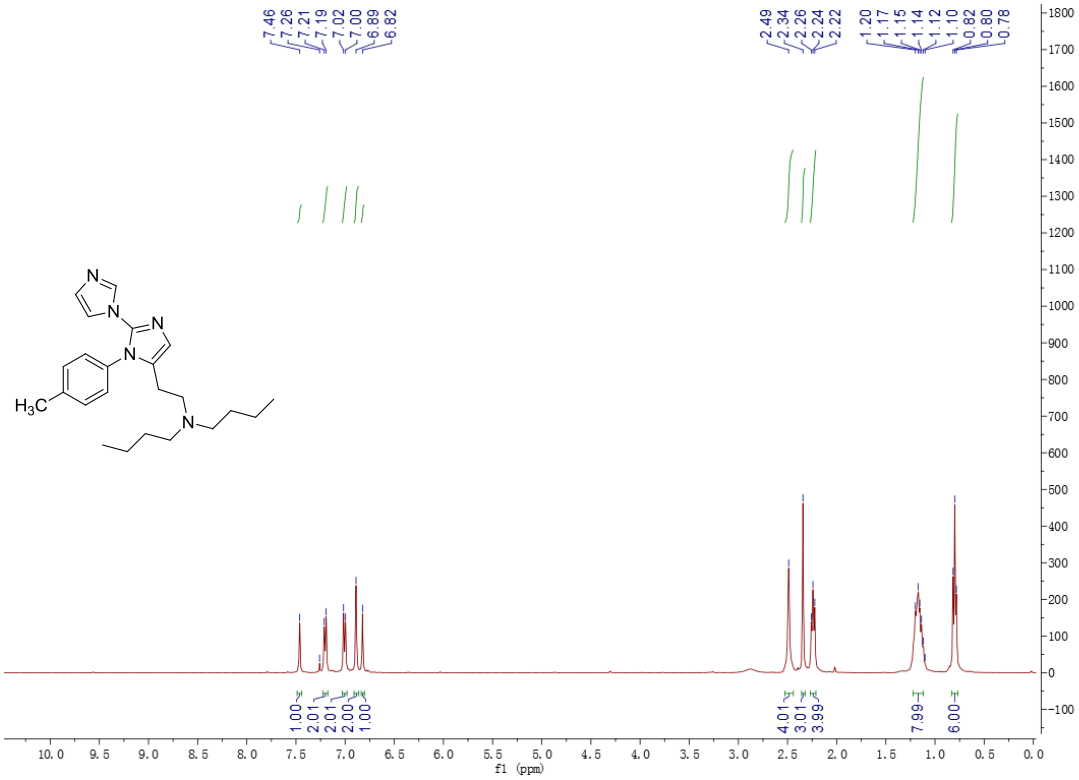

141.98
140.19
136.93
136.81
135.97
134.50
132.03
130.69
129.24
128.66
128.38
127.39
126.02
119.31
77.37
77.16
76.95
49.69
45.63
36.42
29.75
26.10
21.20
20.00
f1 (ppm)

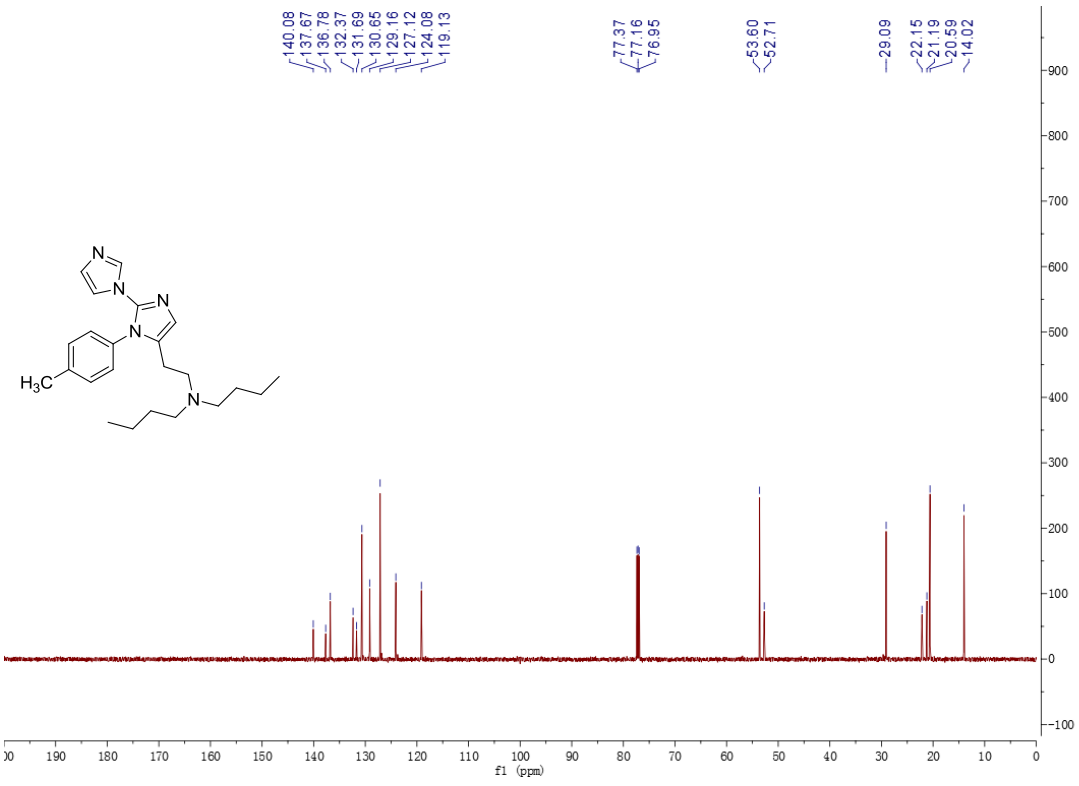
4q


7.46
7.26
7.18
7.17
7.03
6.88
2.80
2.48
2.32
2.21
1.80
1.76
1.68
1.30
1.21
0.77
1.00
2.00
2.00
2.00
2.00
3.01
3.00
2.00
4.02
2.01
4.03
12.01
f1 (ppm)

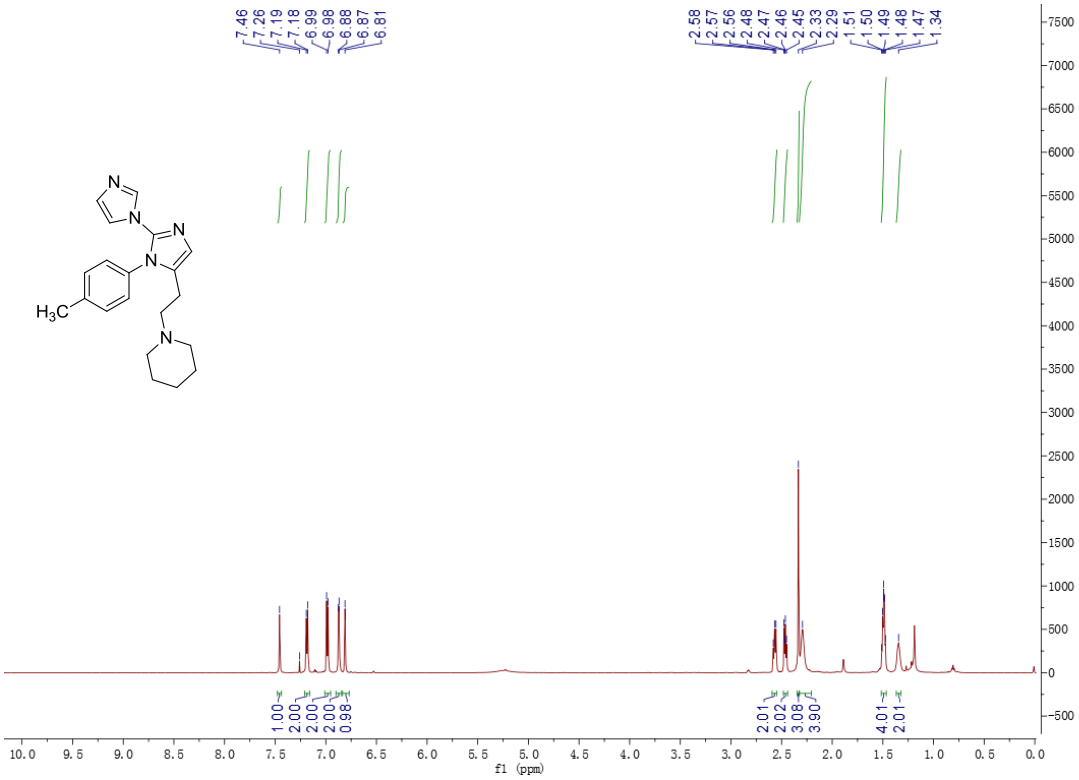

141.65
139.72
137.11
136.27
132.19
130.40
128.95
127.34
126.31
119.54
77.37
77.16
76.95
49.13
45.88
36.67
33.29
26.83
26.64
25.92
21.13
20.42
f1 (ppm)

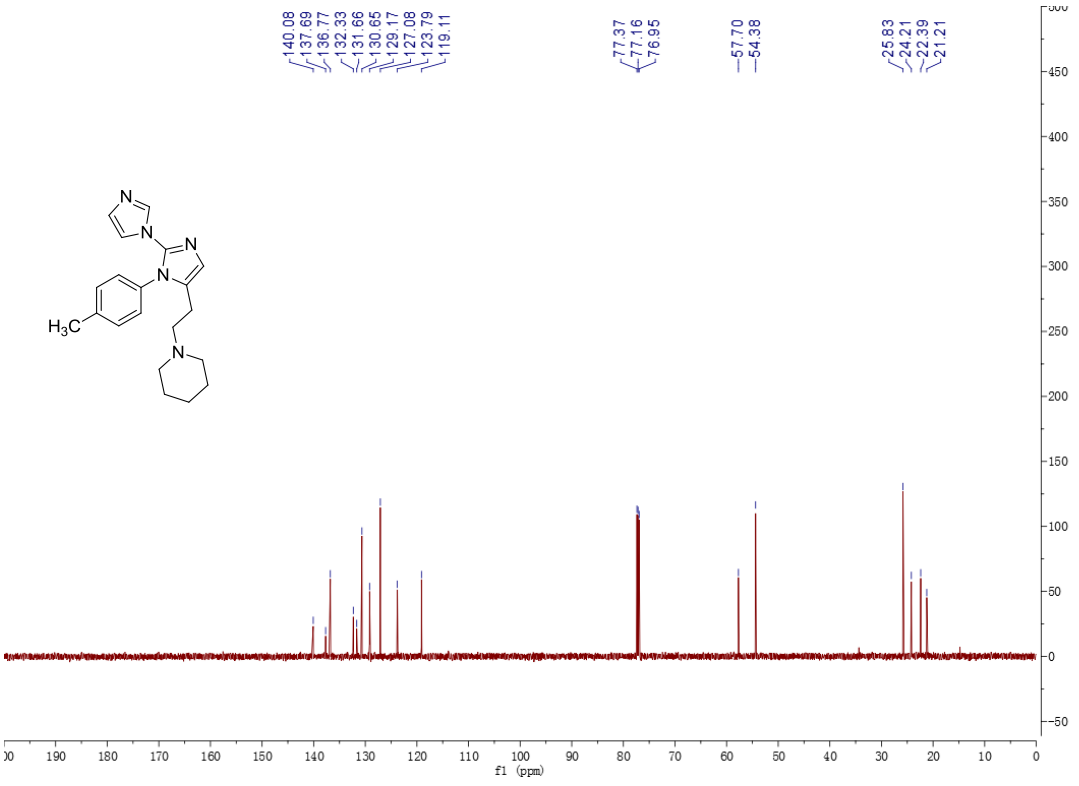
4r


7.46
7.26
7.21
7.19
7.02
7.00
6.89
6.82
2.49
2.34
2.26
2.24
2.22
1.20
1.17
1.15
1.14
1.12
1.10
0.82
0.80
0.78
1.00
2.01
2.01
2.00
1.00
4.01
3.01
3.99
7.99
6.00
f1 (ppm)

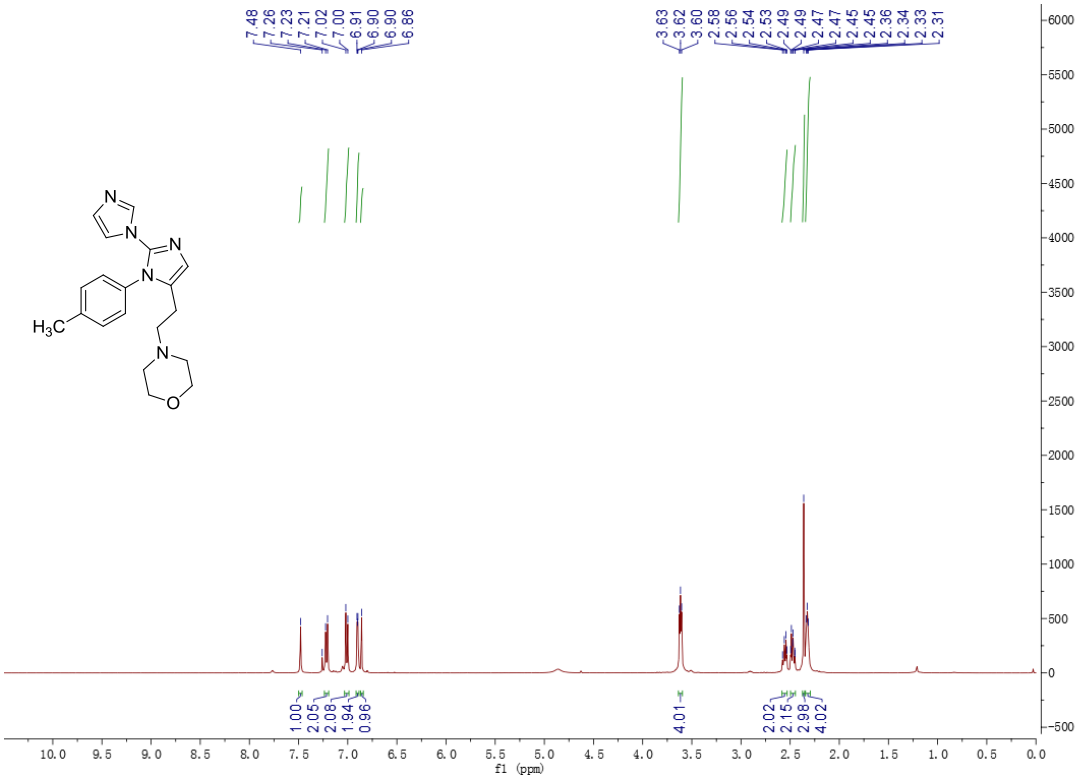

140.08
137.67
136.78
132.37
131.69
130.65
129.16
127.12
124.08
119.13
77.37
77.16
76.95
53.60
52.71
29.09
22.15
21.19
20.59
14.02
f1 (ppm)

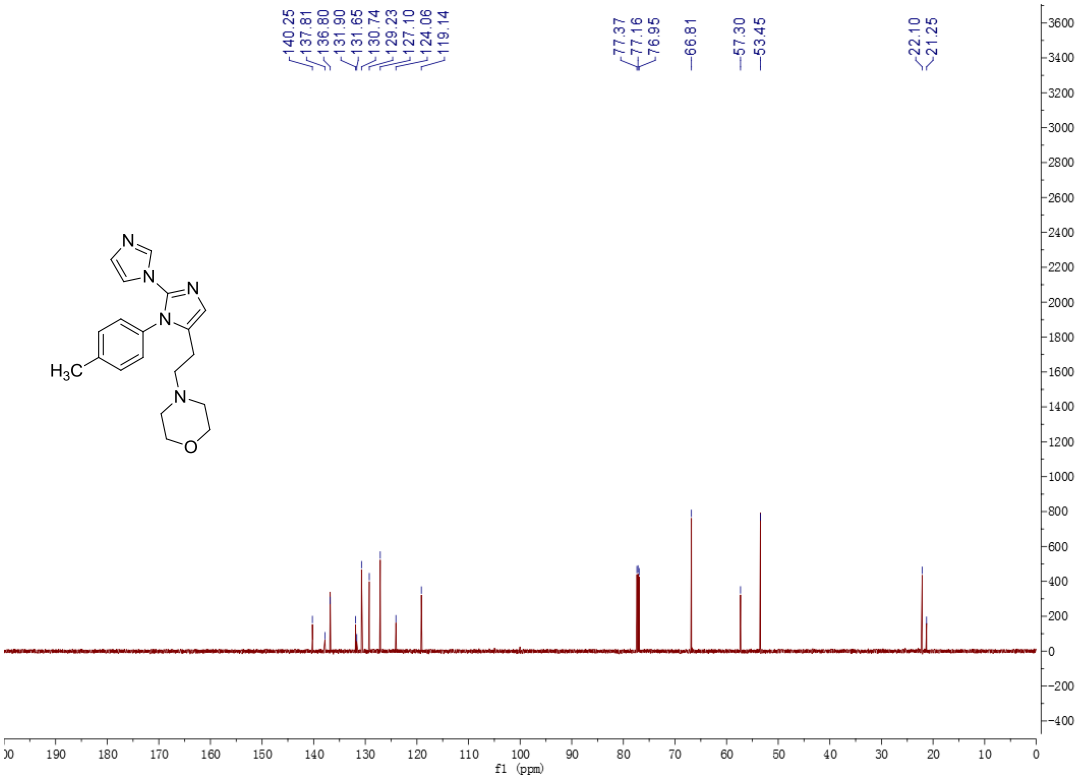
4s


7.46
7.26
7.19
7.18
6.99
6.98
6.88
6.87
6.81
2.58
2.57
2.56
2.48
2.47
2.46
2.45
2.33
2.29
1.51
1.50
1.49
1.48
1.47
1.34
1.00
2.00
2.00
2.00
0.98
2.01
2.02
3.08
3.90
4.01
2.01
f1 (ppm)

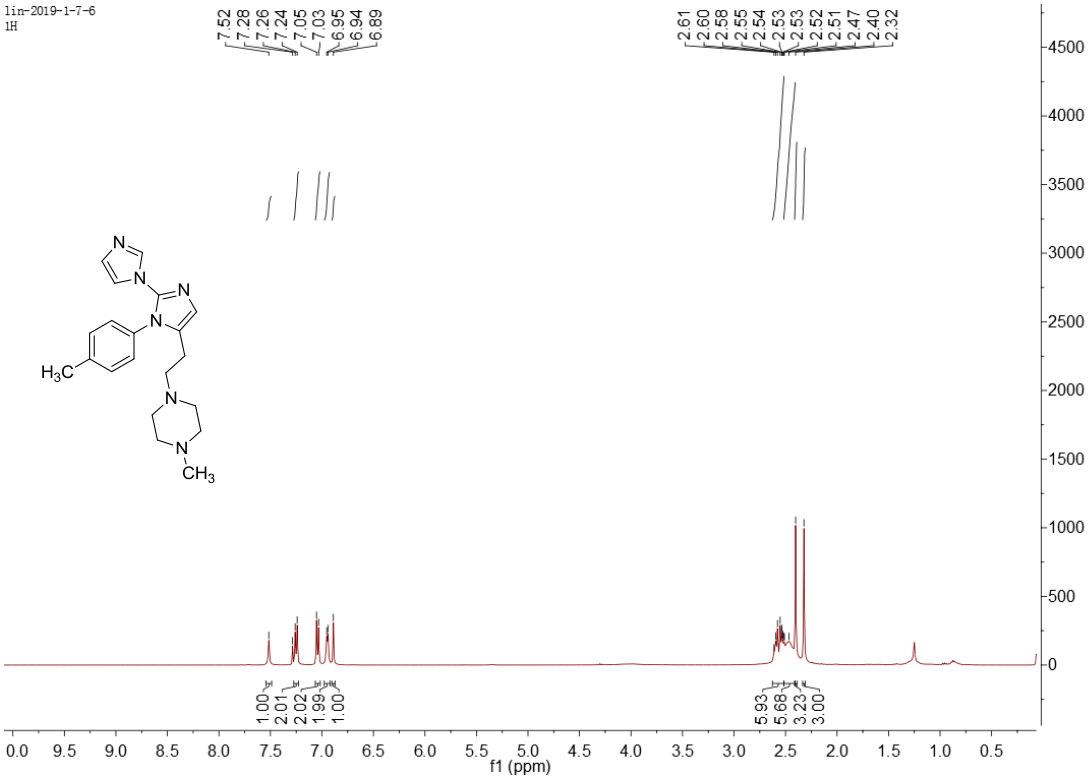

140.08
137.69
136.77
132.33
131.66
130.65
129.17
127.08
123.79
119.11
77.37
77.16
76.95
57.70
54.38
25.83
24.21
22.39
21.21
f1 (ppm)

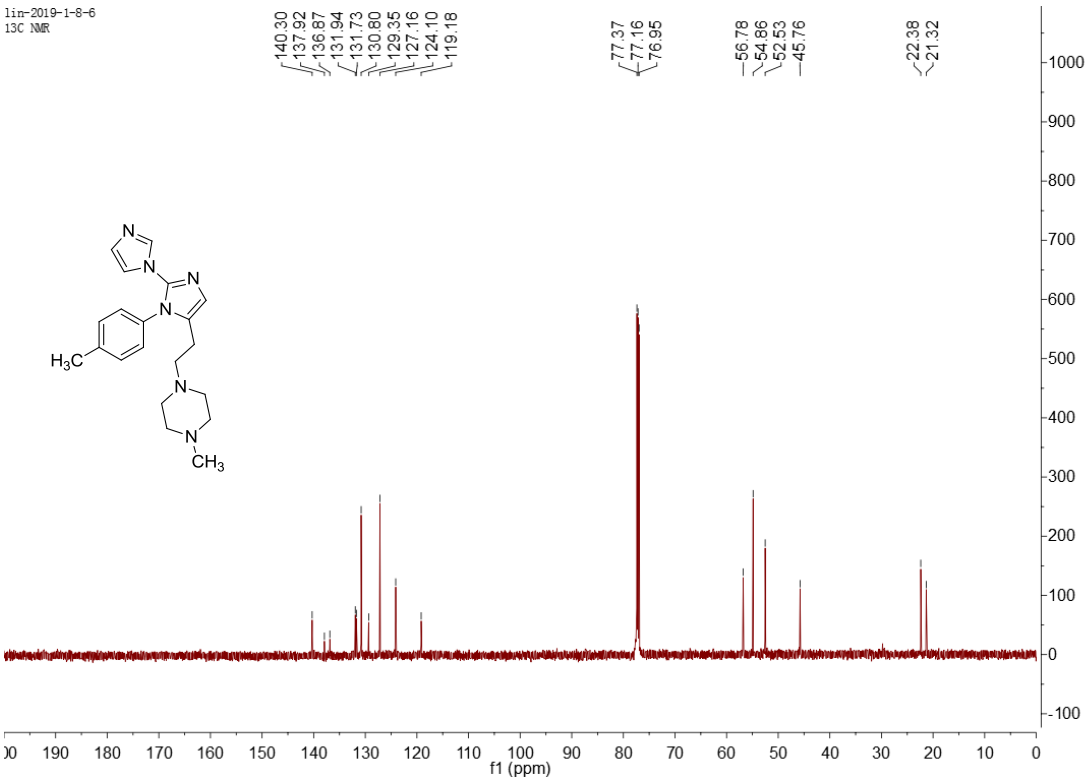
4t


7.48
7.26
7.23
7.21
7.02
7.00
6.91
6.90
6.90
6.86
3.63
3.62
3.60
2.58
2.56
2.54
2.53
2.49
2.49
2.47
2.47
2.45
2.45
2.36
2.34
2.33
2.31
1.00
2.05
2.08
1.94
0.96
4.01
2.02
2.15
2.98
4.02
f1 (ppm)

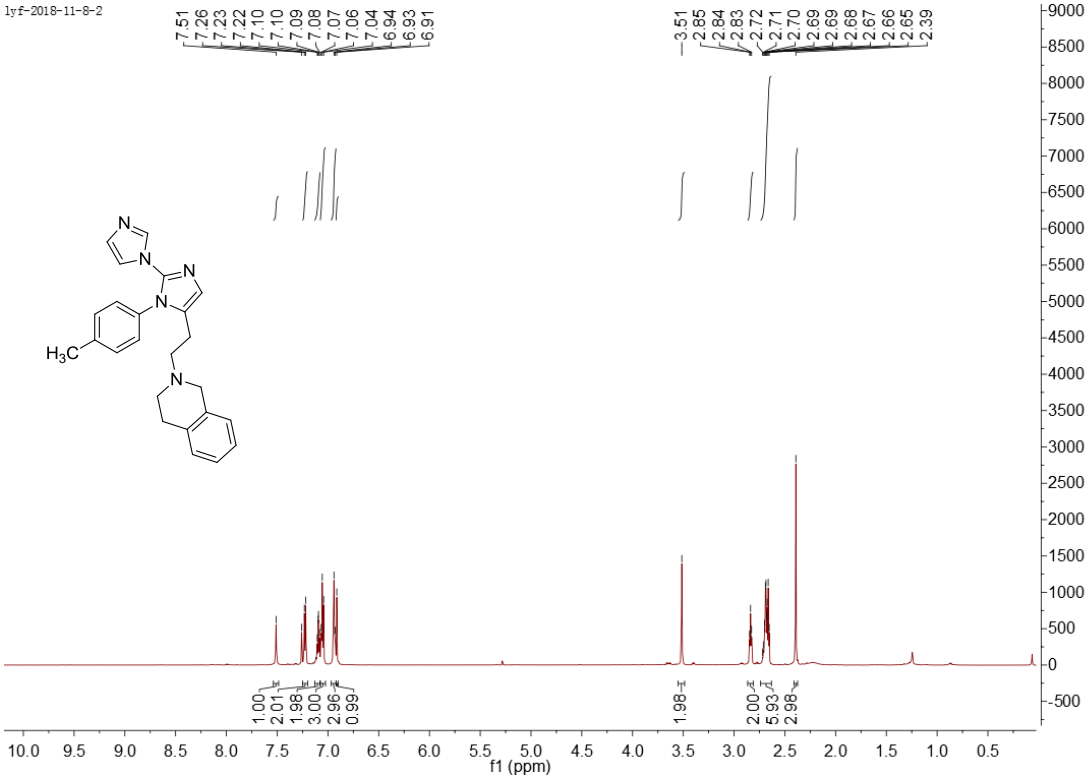

140.25
137.81
136.80
131.90
131.65
130.74
129.23
127.10
124.06
119.14
77.37
77.16
76.95
66.81
57.30
53.45
22.10
21.25
f1 (ppm)

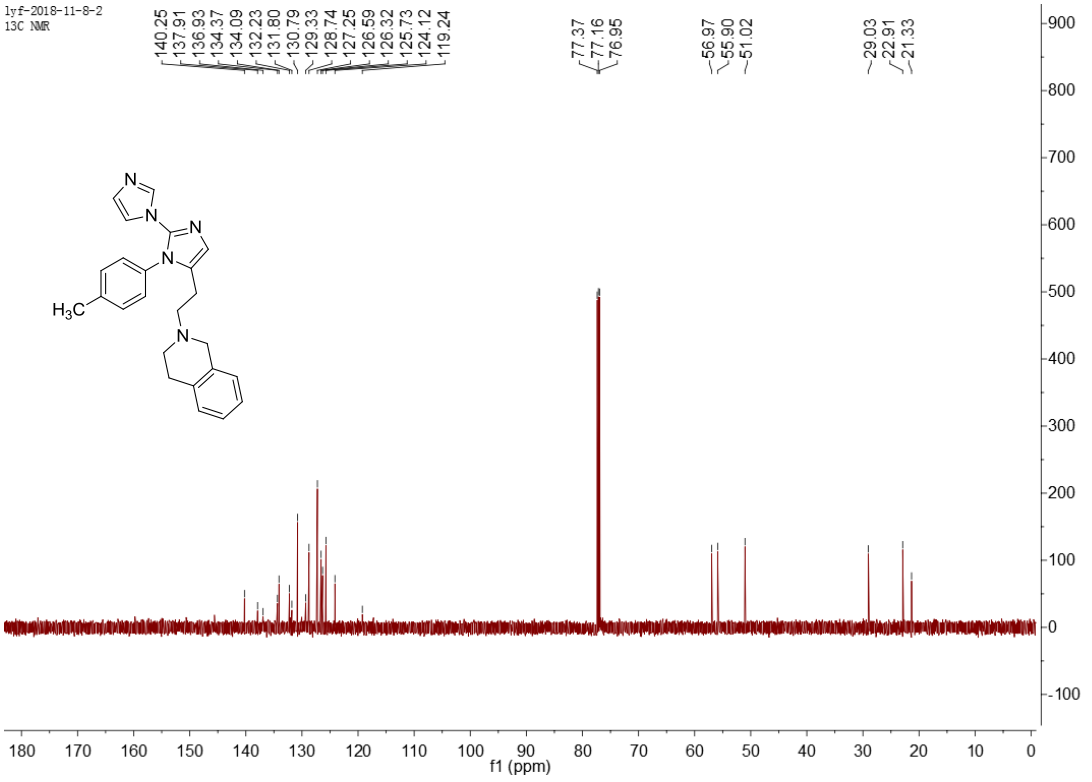
4u


lin-2019-1-7-6
1H
7.52
7.28
7.26
7.24
7.05
7.03
6.95
6.94
6.89
2.61
2.60
2.58
2.55
2.54
2.53
2.53
2.52
2.51
2.47
2.40
2.32
1.00
2.01
2.02
1.99
1.00
5.93
5.68
3.23
3.00
f1 (ppm)

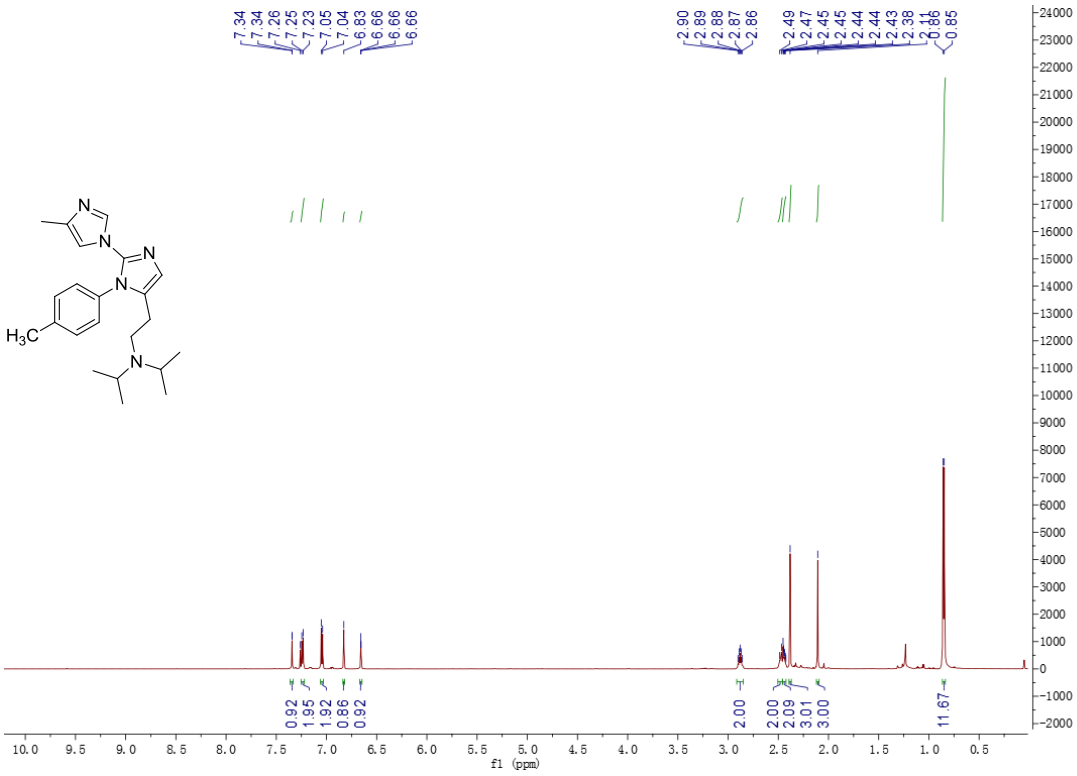

lin-2019-1-8-6
13C NMR
140.30
137.92
136.87
131.94
131.73
130.80
129.35
127.16
124.10
119.18
77.37
77.16
76.95
56.78
54.86
52.53
45.76
22.38
21.32
f1 (ppm)

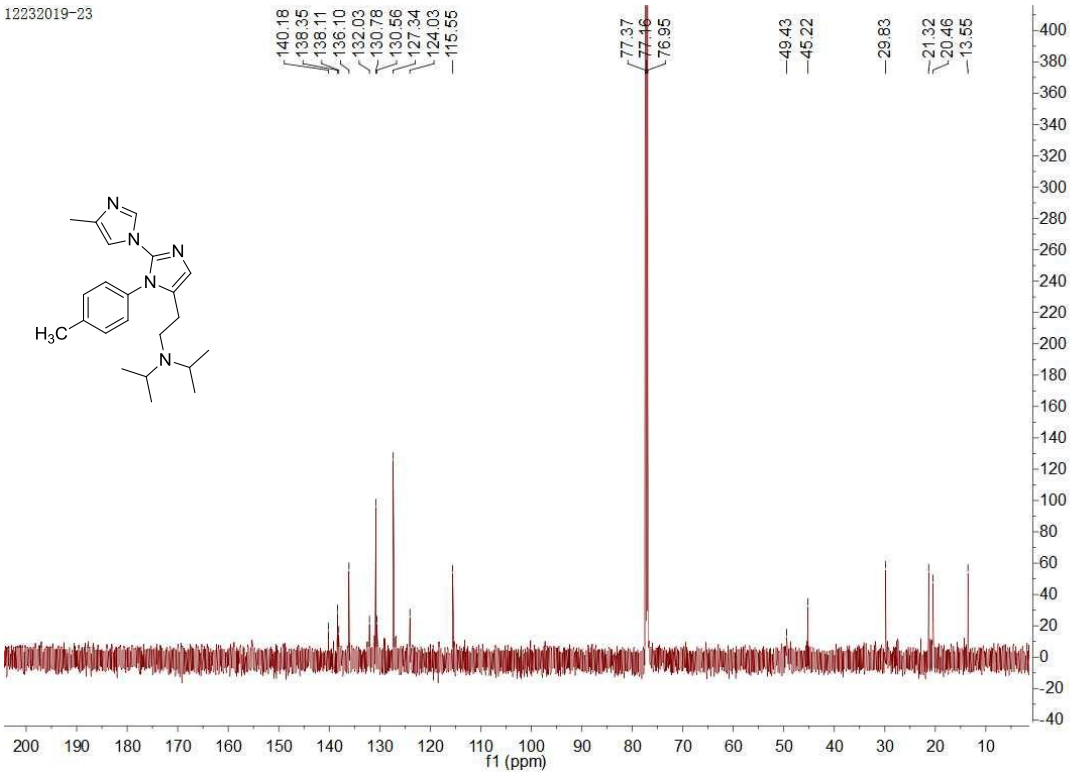
4v


lyf-2018-11-8-2
7.51
7.26
7.23
7.22
7.10
7.10
7.09
7.08
7.07
7.06
7.04
6.94
6.93
6.91
3.51
2.85
2.84
2.83
2.72
2.71
2.70
2.69
2.69
2.68
2.67
2.66
2.65
2.39
1.00
2.01
1.98
3.00
2.96
0.99
1.98
2.00
5.93
2.98
f1 (ppm)

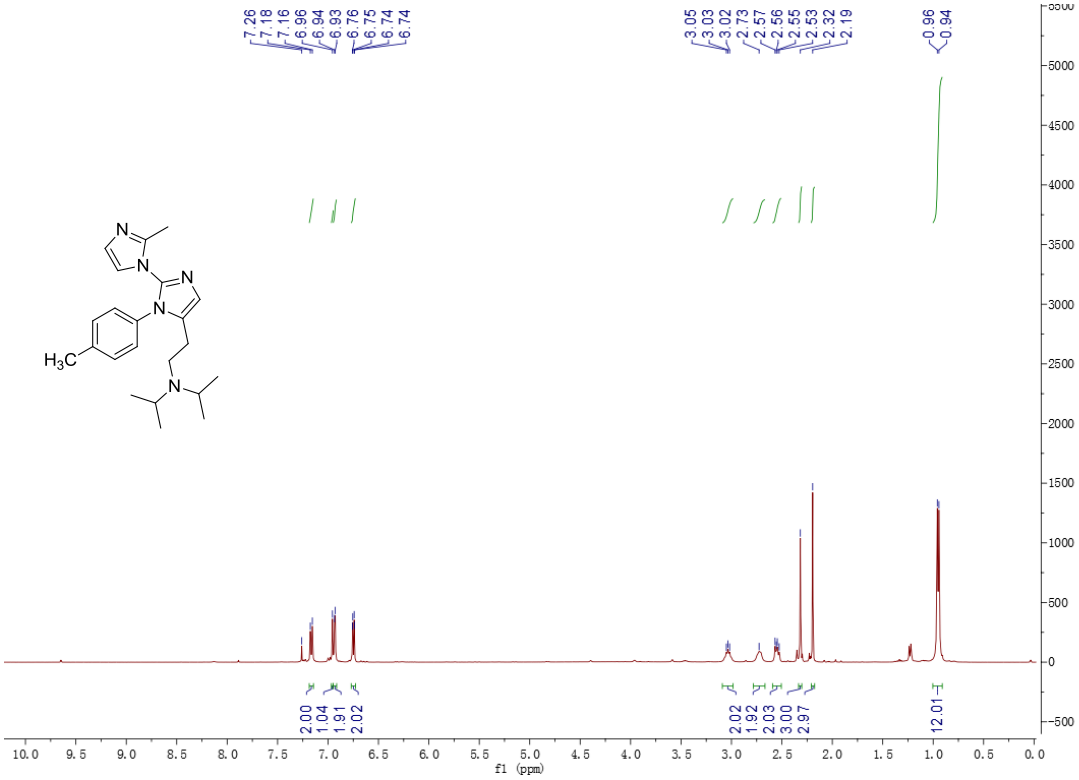

lyf-2018-11-8-2
13C NMR
140.25
137.91
136.93
134.37
134.09
132.23
131.80
130.79
129.33
128.74
127.25
126.59
126.32
125.73
124.12
119.24
77.37
77.16
76.95
56.97
55.90
51.02
29.03
22.91
21.33
f1 (ppm)

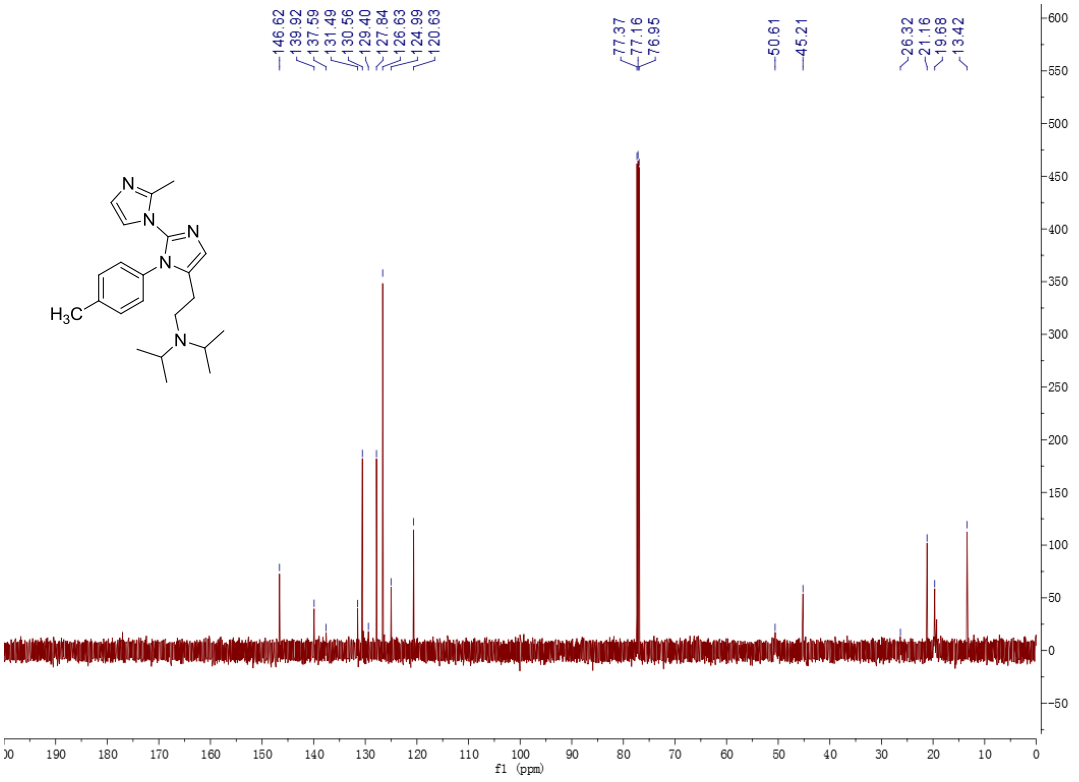
4w


7.34
7.34
7.26
7.25
7.23
7.05
7.04
6.83
6.66
6.66
6.66
2.90
2.89
2.88
2.87
2.86
2.49
2.47
2.45
2.45
2.44
2.44
2.43
2.38
2.11
0.86
0.85
0.92
1.95
1.92
0.86
0.92
2.00
2.00
2.09
3.01
3.00
11.67
f1 (ppm)

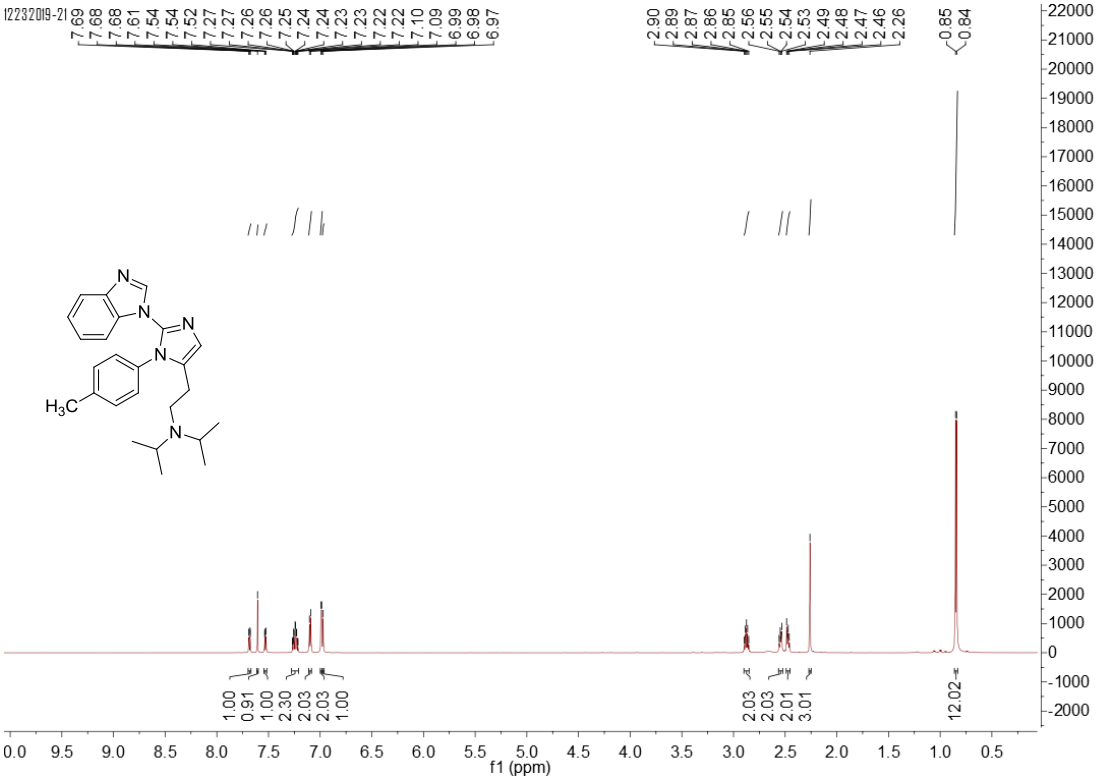

12232019-23
140.18
138.35
138.11
136.10
132.03
130.78
130.56
127.34
124.03
115.55
77.37
77.16
76.95
49.43
45.22
29.83
21.32
20.46
13.55
f1 (ppm)

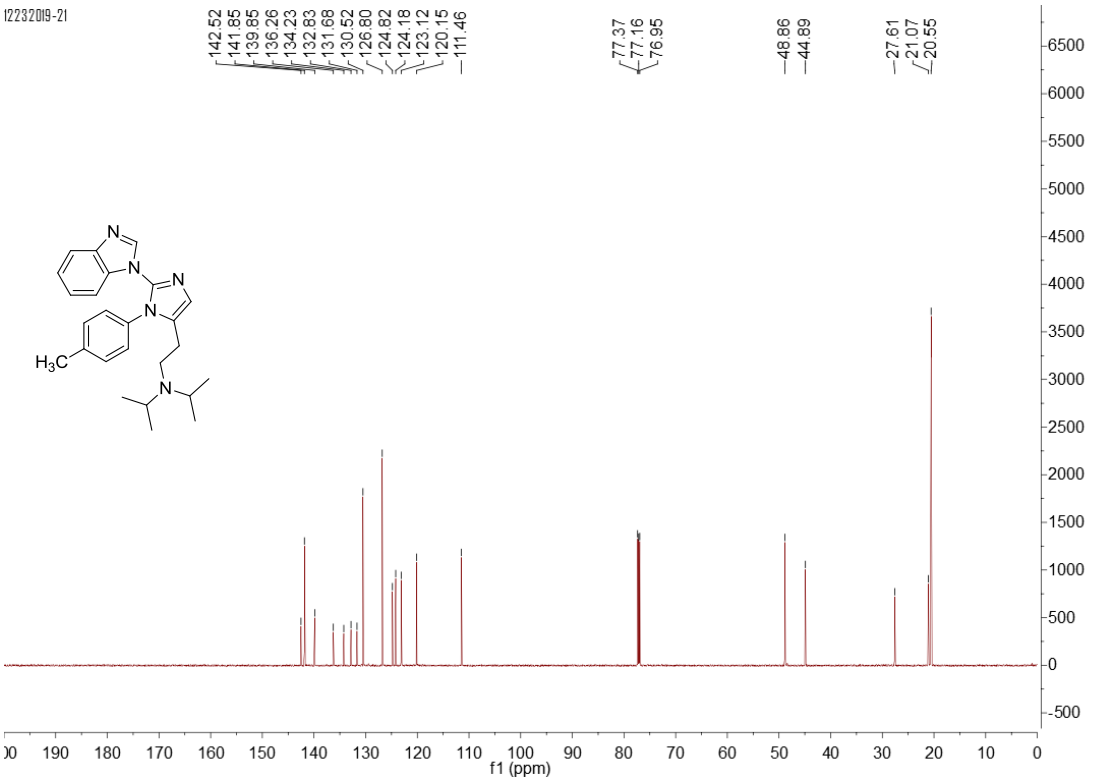
4x


7.26
7.18
7.16
6.96
6.94
6.93
6.76
6.75
6.74
6.74
3.05
3.03
3.02
2.73
2.57
2.56
2.55
2.53
2.32
2.19
0.96
0.94
2.00
1.04
1.91
2.02
2.02
1.92
2.03
3.00
2.97
12.01
f1 (ppm)

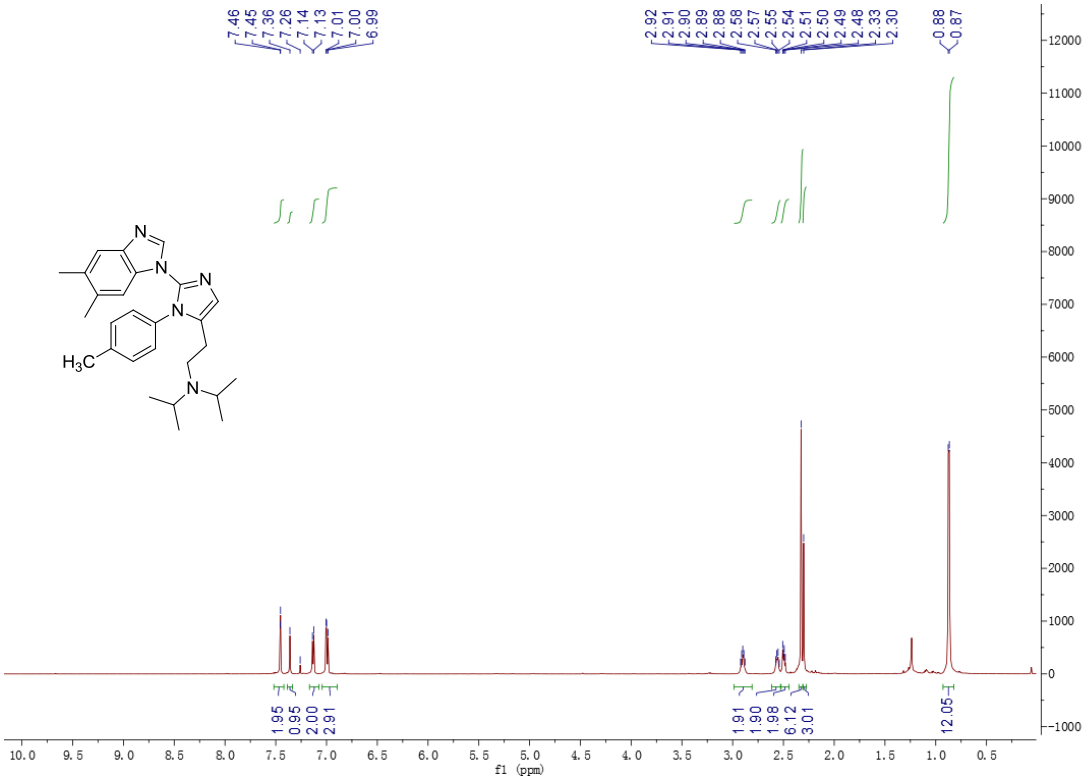

146.62
139.92
137.59
131.49
130.56
129.40
127.84
126.63
124.99
120.63
77.37
77.16
76.95
50.61
45.21
26.32
21.16
19.68
13.42
f1 (ppm)

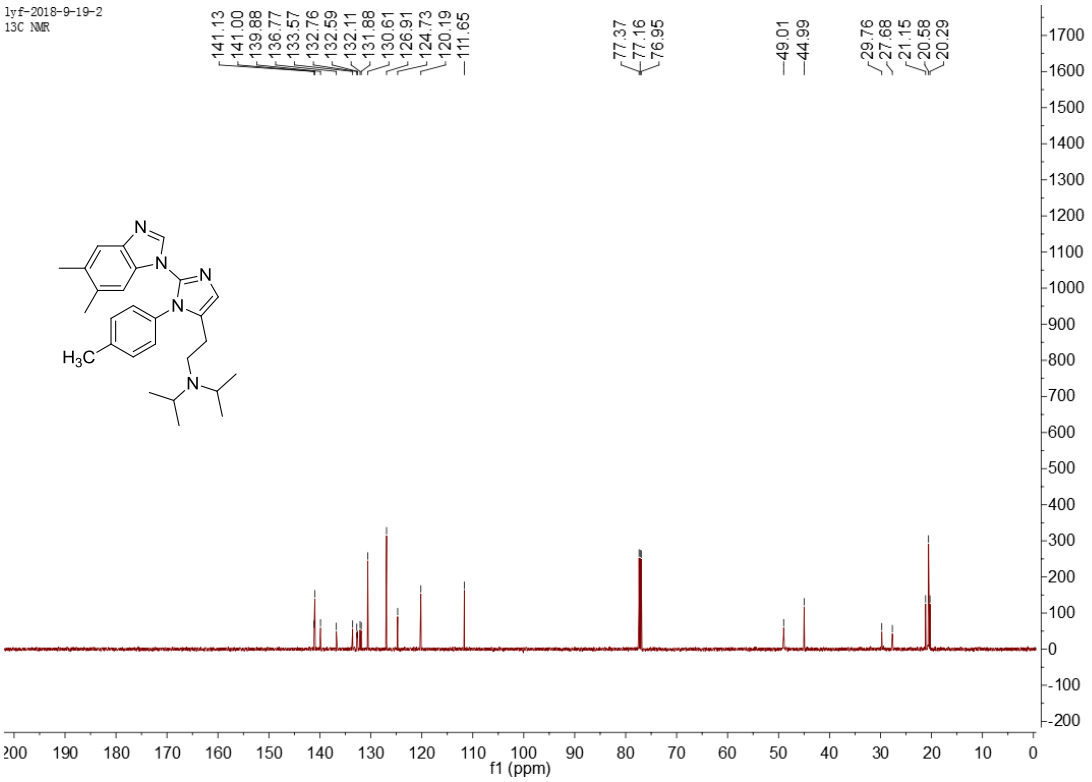
4y


12232019-21
7.69
7.68
7.68
7.61
7.54
7.54
7.52
7.27
7.27
7.26
7.26
7.25
7.24
7.24
7.23
7.23
7.22
7.22
7.10
7.09
6.99
6.98
6.97
2.90
2.89
2.87
2.86
2.85
2.56
2.55
2.54
2.53
2.49
2.48
2.47
2.46
2.26
0.85
0.84
1.00
0.91
1.00
2.30
2.03
2.03
1.00
2.03
2.03
2.01
3.01
12.02
f1 (ppm)

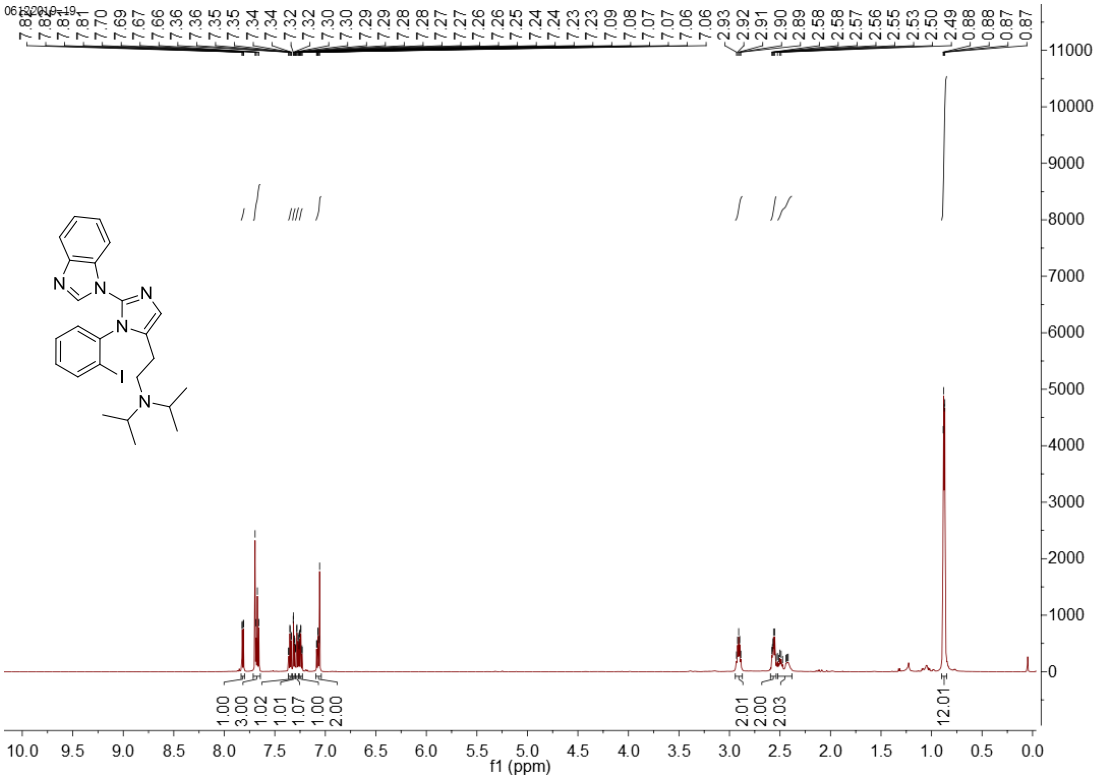

12232019-21
142.52
141.85
139.85
136.26
134.23
132.83
131.68
130.52
126.80
124.82
124.18
123.12
120.15
111.46
77.37
77.16
76.95
48.86
44.89
27.61
21.07
20.55
f1 (ppm)

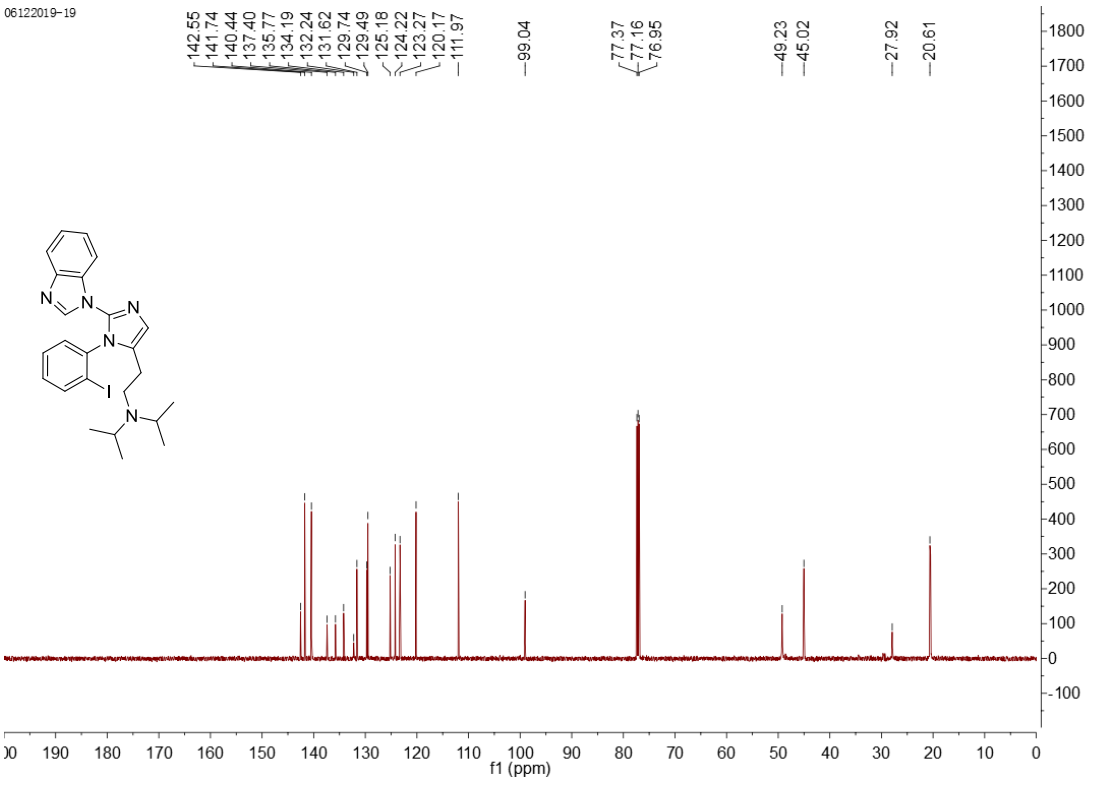
4z


7.46
7.45
7.36
7.26
7.14
7.13
7.01
7.00
6.99
2.92
2.91
2.90
2.89
2.88
2.58
2.57
2.55
2.54
2.51
2.50
2.49
2.48
2.33
2.30
0.88
0.87
1.95
0.95
2.00
2.91
1.91
1.90
1.98
6.12
3.01
12.05
f1 (ppm)

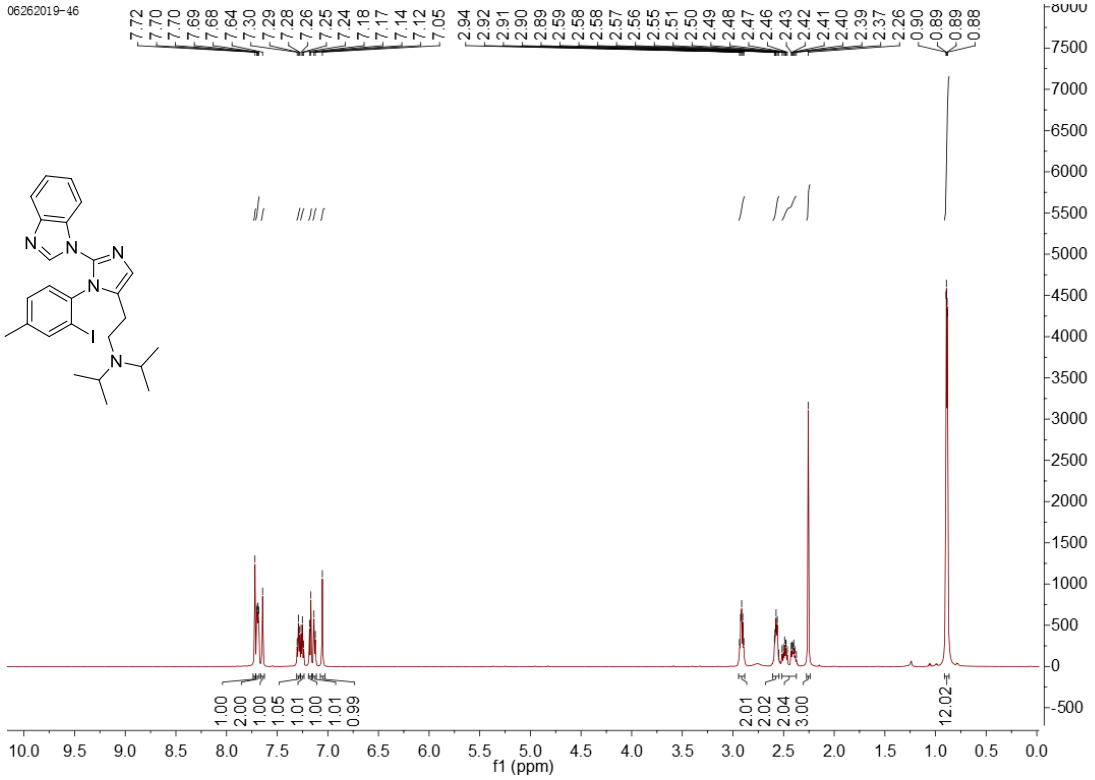

lyf-2018-9-19-2
13C NMR
141.13
141.00
139.88
136.77
133.57
132.76
132.59
132.11
131.88
130.61
126.91
124.73
120.19
111.65
77.37
77.16
76.95
49.01
44.99
29.76
27.68
21.15
20.58
20.29
f1 (ppm)

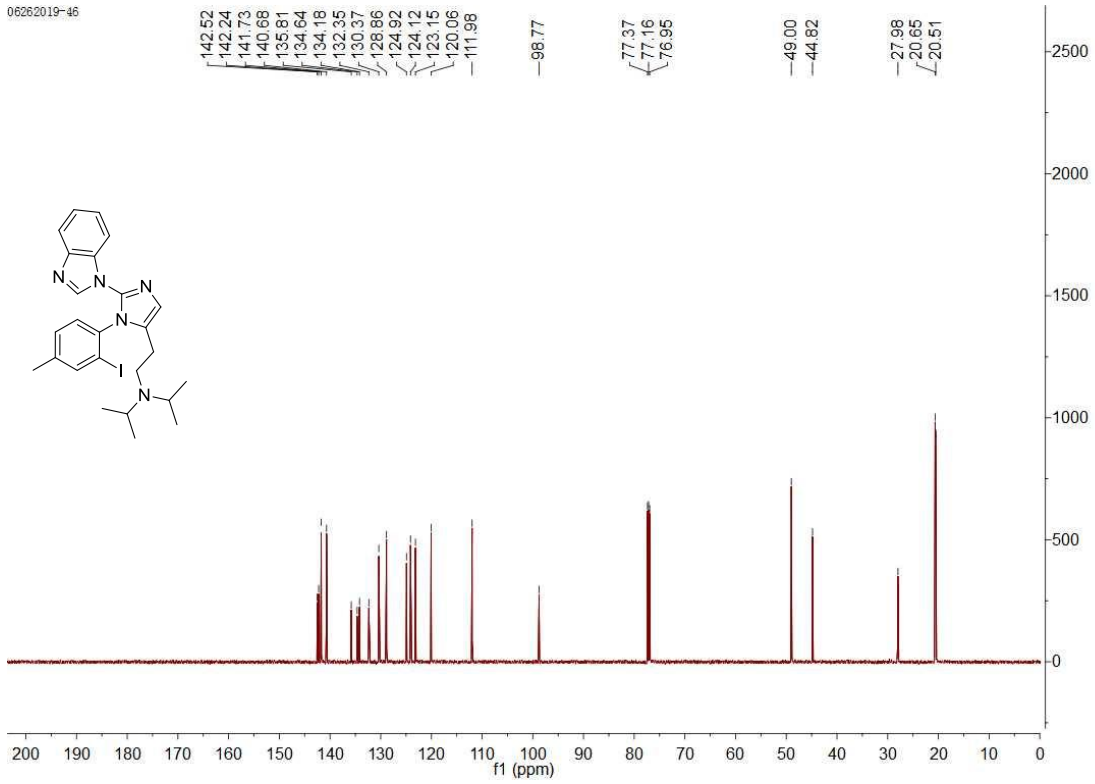
4A


06122019-19
f1 (ppm)

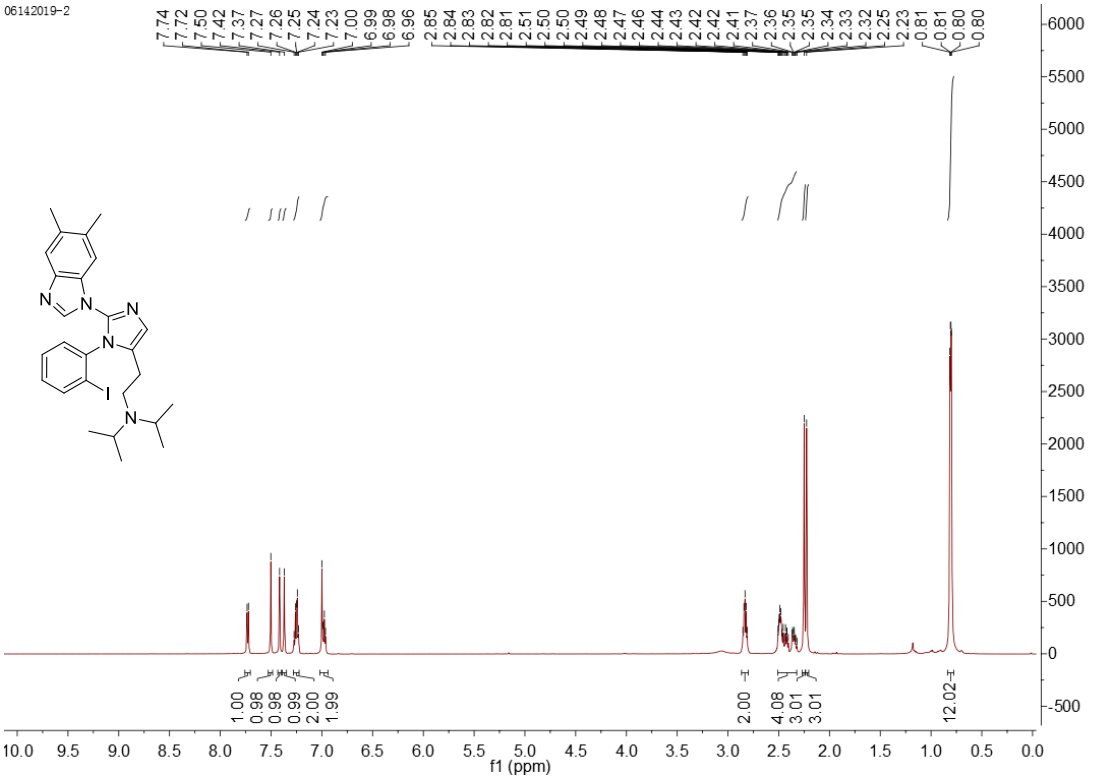

06122019-19
142.55
141.74
140.44
137.40
135.77
134.19
132.24
131.62
129.74
129.49
125.18
124.22
123.27
120.17
111.97
99.04
77.37
77.16
76.95
49.23
45.02
27.92
20.61
f1 (ppm)

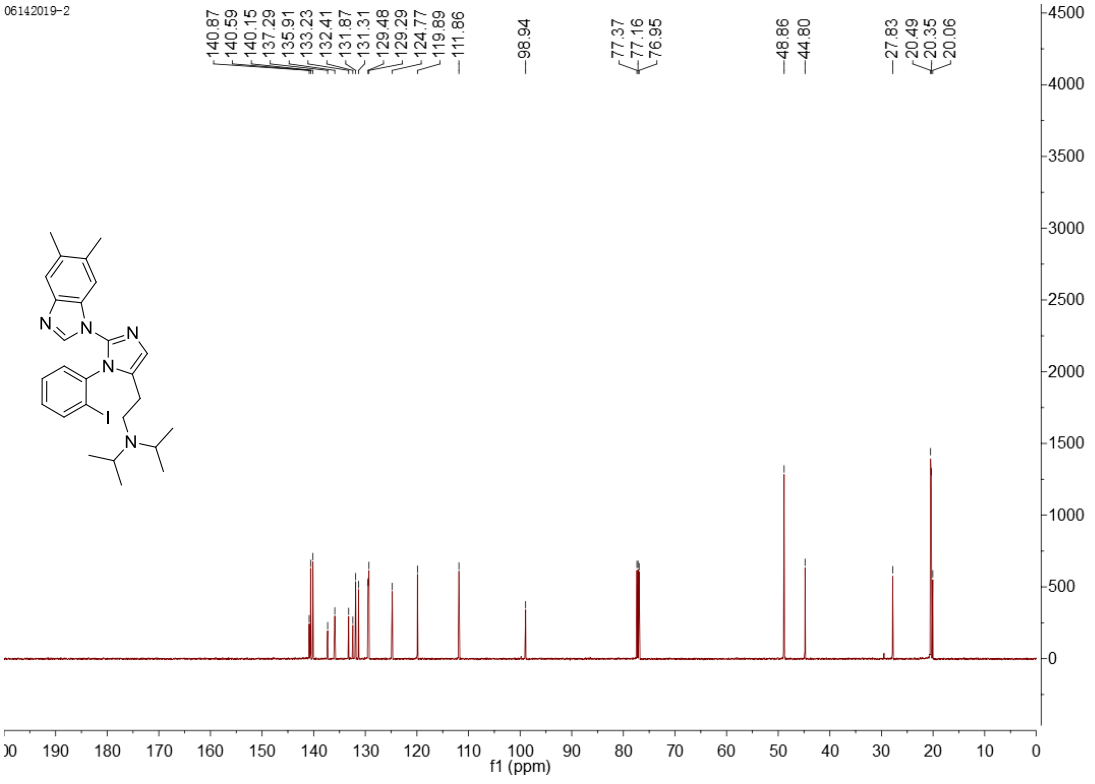
4B


06262019-46
7.72 7.70 7.70 7.69 7.68 7.64 7.30 7.29 7.28 7.26 7.25 7.24 7.18 7.17 7.14 7.12 7.05
2.94 2.92 2.91 2.90 2.89 2.59 2.58 2.58 2.57 2.56 2.55 2.51 2.50 2.49 2.48 2.47 2.46 2.43 2.42 2.41 2.40 2.39 2.37 2.26
0.90 0.89 0.89 0.88
1.00 2.00 1.00 1.05 1.01 1.00 1.01 0.99
2.01 2.02 2.04 3.00
12.02
f1 (ppm)

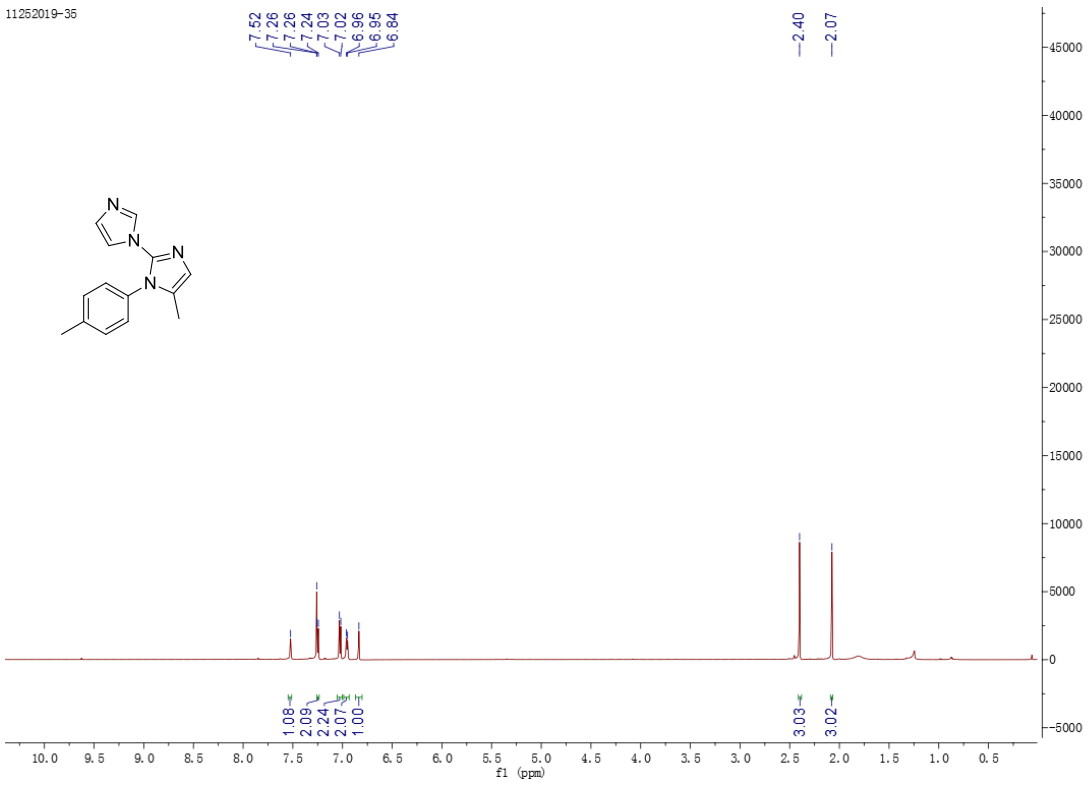

06262019-46
142.52 142.24 141.73 140.68 135.81 134.64 134.18 132.35 130.37 128.86 124.92 124.12 123.15 120.06 111.98
98.77
77.37 77.16 76.95
49.00 44.82
27.98 20.65 20.51
f1 (ppm)

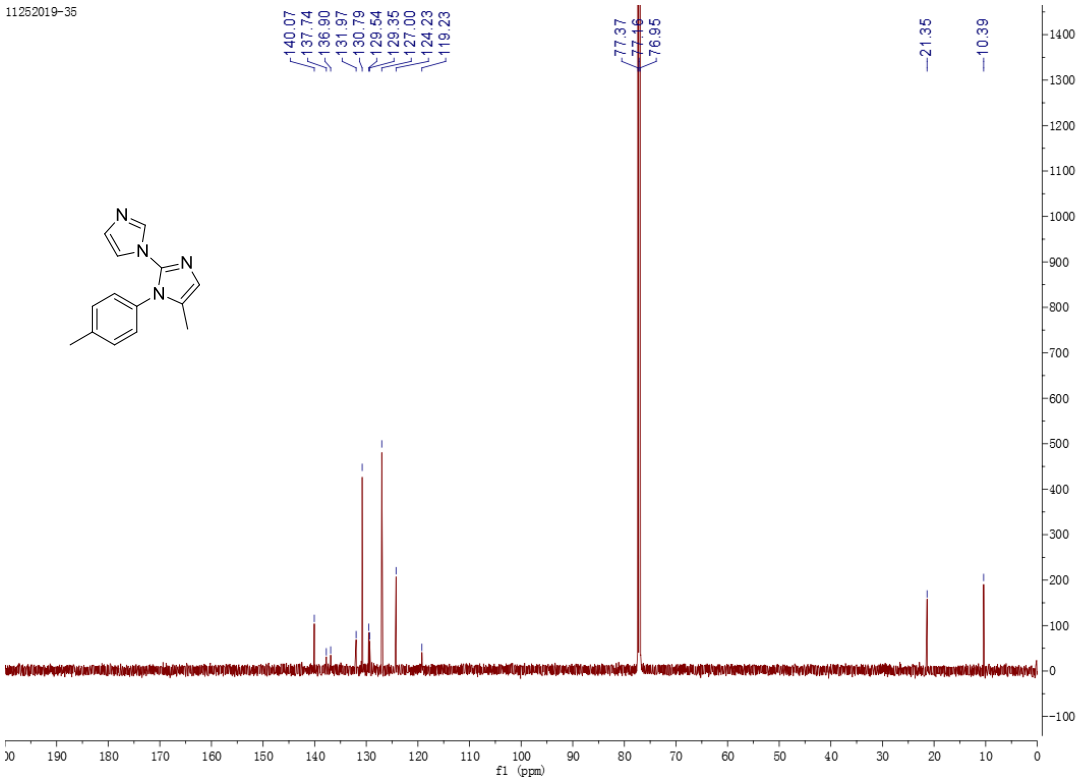
4C


06142019-2
7.74
7.72
7.50
7.42
7.37
7.27
7.26
7.25
7.24
7.23
7.00
6.99
6.98
6.96
2.85
2.84
2.83
2.82
2.81
2.51
2.50
2.50
2.49
2.48
2.47
2.46
2.44
2.43
2.42
2.42
2.41
2.37
2.36
2.35
2.35
2.34
2.33
2.32
2.25
2.23
0.81
0.81
0.80
0.80
1.00
0.98
0.98
0.99
2.00
1.99
2.00
4.08
3.01
3.01
12.02
f1 (ppm)

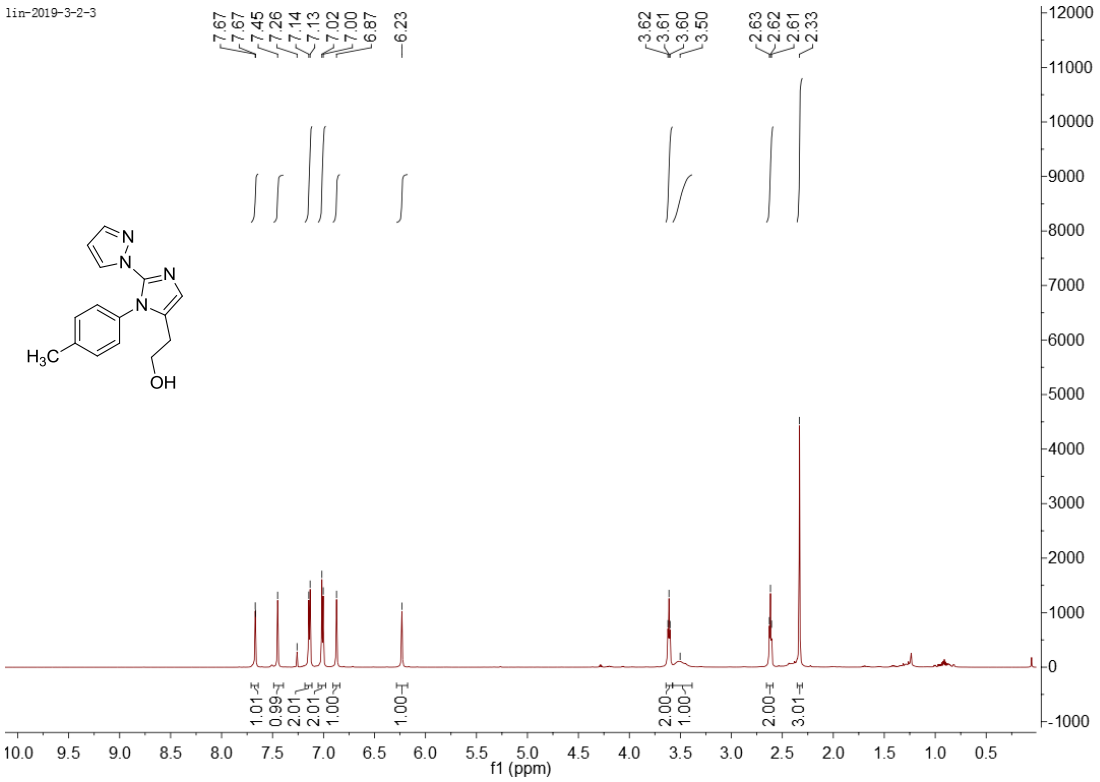

06142019-2
140.87
140.59
140.15
137.29
135.91
133.23
132.41
131.87
131.31
129.48
129.29
124.77
119.89
111.86
98.94
77.37
77.16
76.95
48.86
44.80
27.83
20.49
20.35
20.06
f1 (ppm)

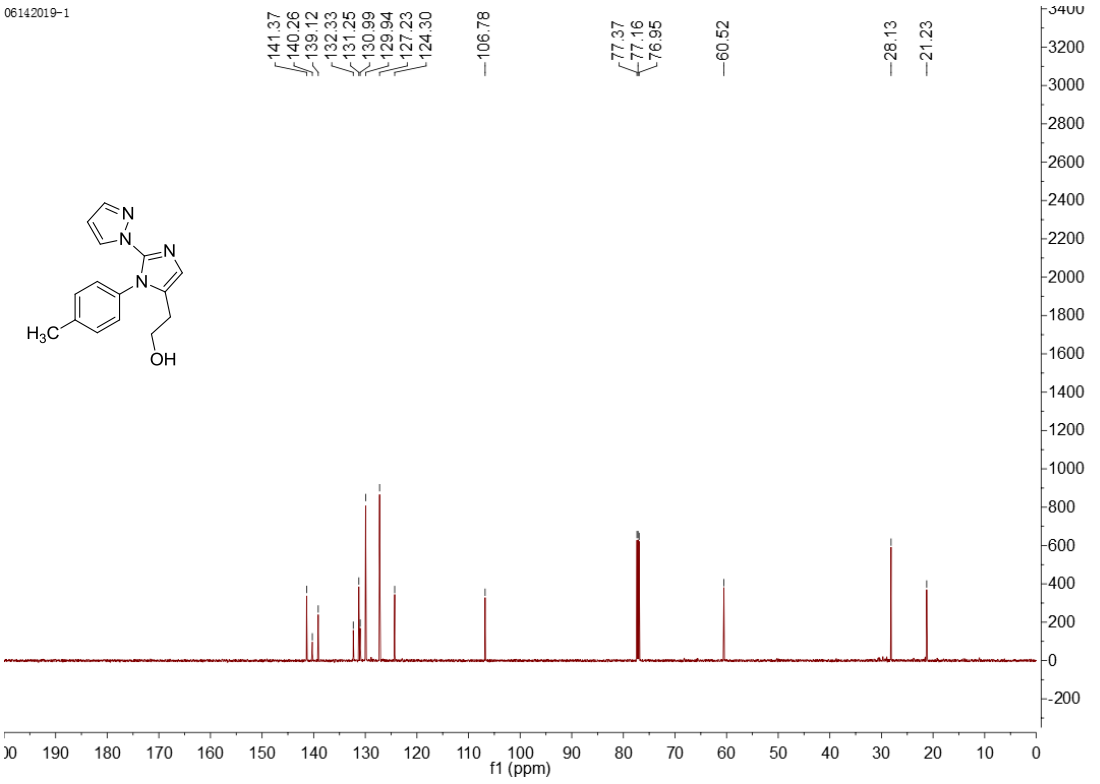
4a’


11252019-35
7.52
7.26
7.26
7.24
7.03
7.02
6.96
6.95
6.84
2.40
2.07
1.08
2.09
2.24
2.07
1.00
3.03
3.02
f1 (ppm)

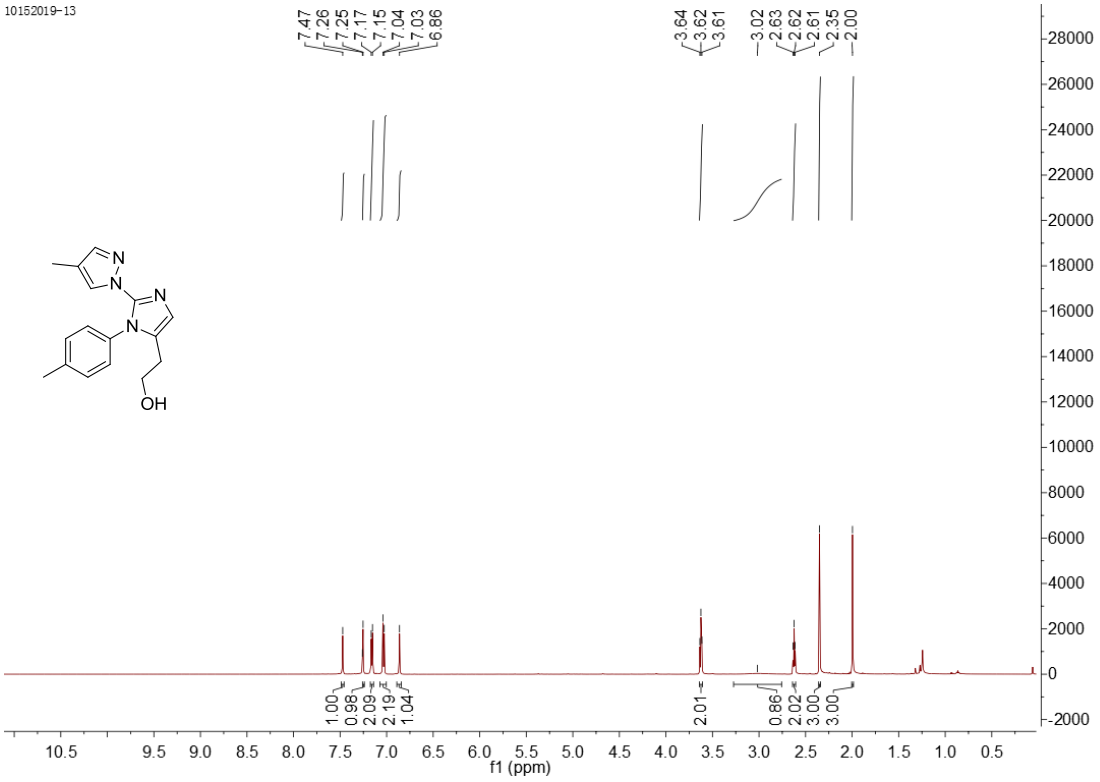

11252019-35
140.07
137.74
136.90
131.97
130.79
129.54
129.35
127.00
124.23
119.23
77.37
77.16
76.95
21.35
10.39
f1 (ppm)

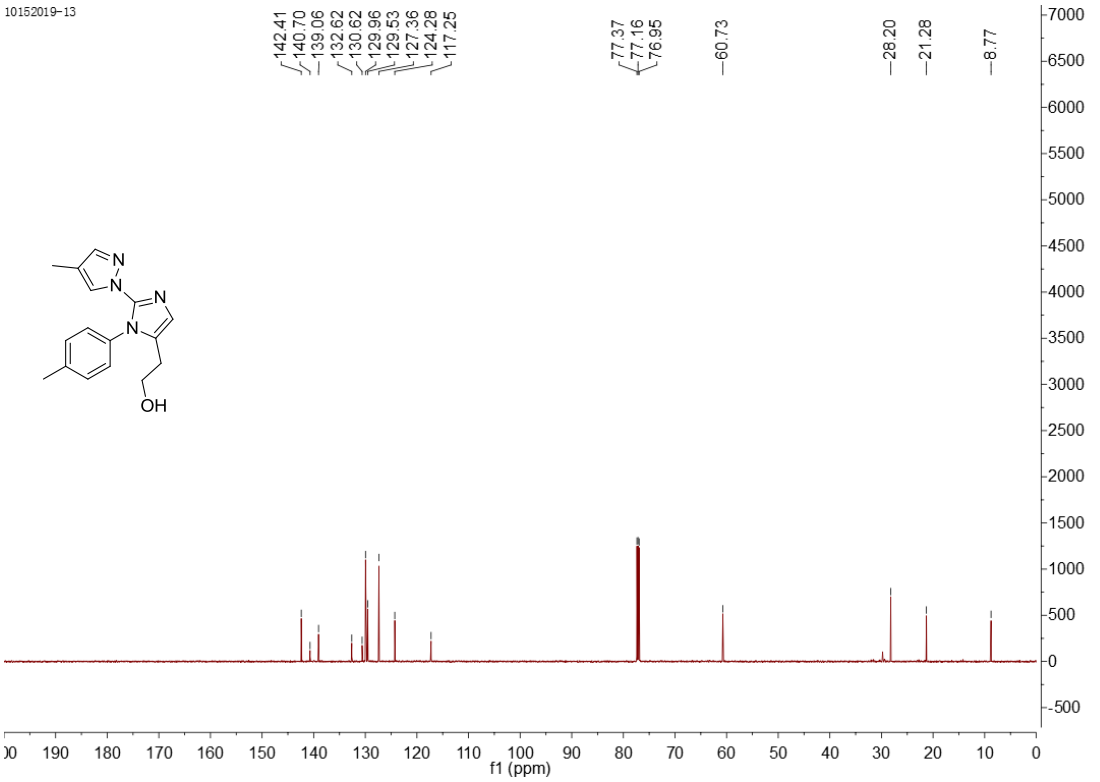
5a


lin-2019-3-2-3
7.67
7.67
7.45
7.26
7.14
7.13
7.02
7.00
6.87
6.23
3.62
3.61
3.60
3.50
2.63
2.62
2.61
2.33
1.01
0.99
2.01
2.01
1.00
1.00
2.00
1.00
2.00
3.01
f1 (ppm)

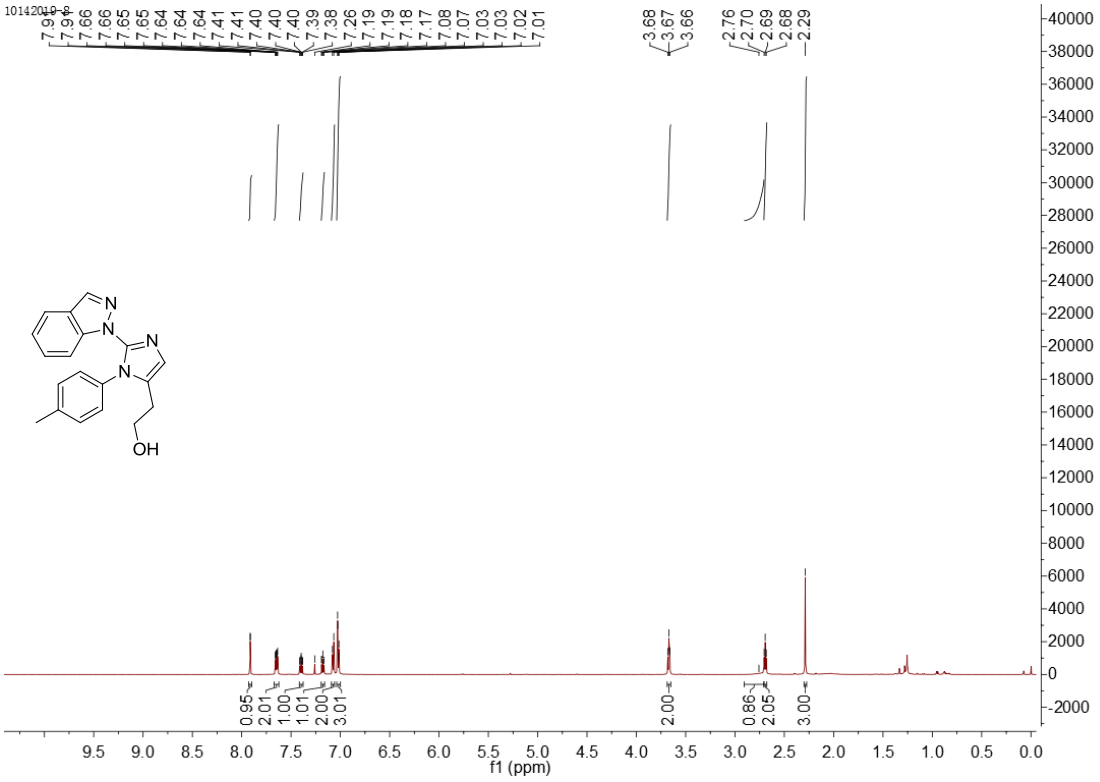

06142019-1
141.37
140.26
139.12
132.33
131.25
130.99
129.94
127.23
124.30
106.78
77.37
77.16
76.95
60.52
28.13
21.23
f1 (ppm)

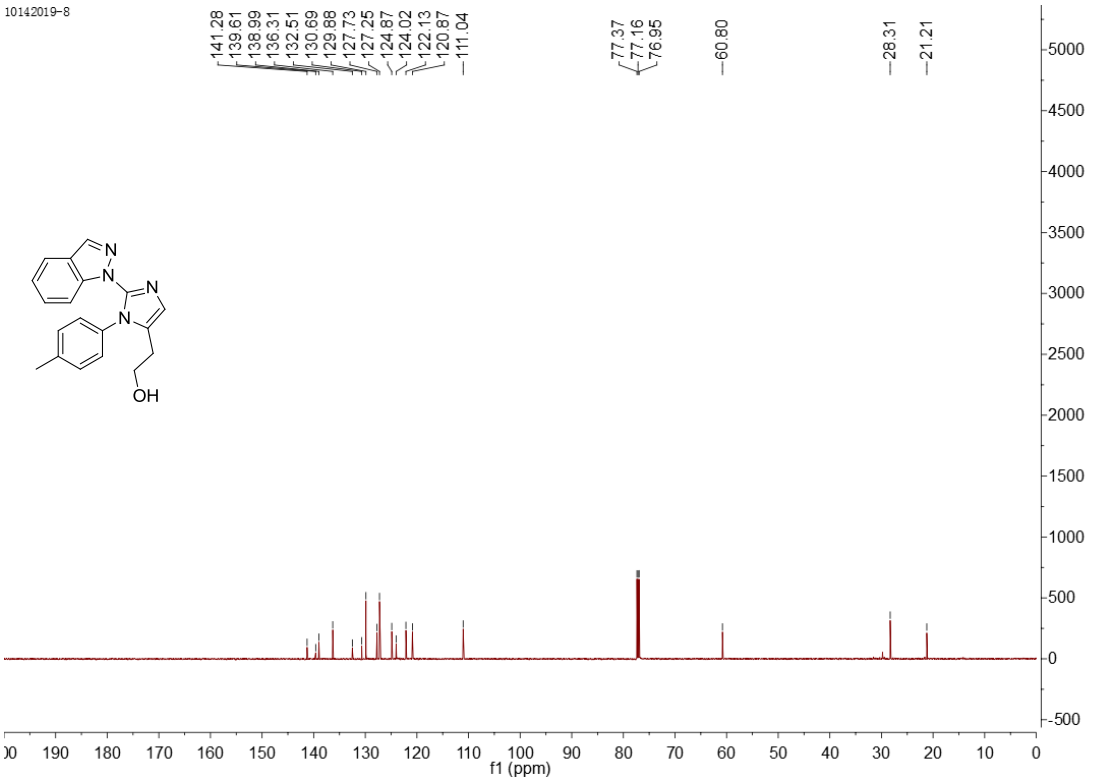
5b


10152019-13
7.47
7.26
7.25
7.17
7.15
7.04
7.03
6.86
3.64
3.62
3.61
3.02
2.63
2.62
2.61
2.35
2.00
OH
1.00
0.98
2.09
2.19
1.04
2.01
0.86
2.02
3.00
3.00
f1 (ppm)

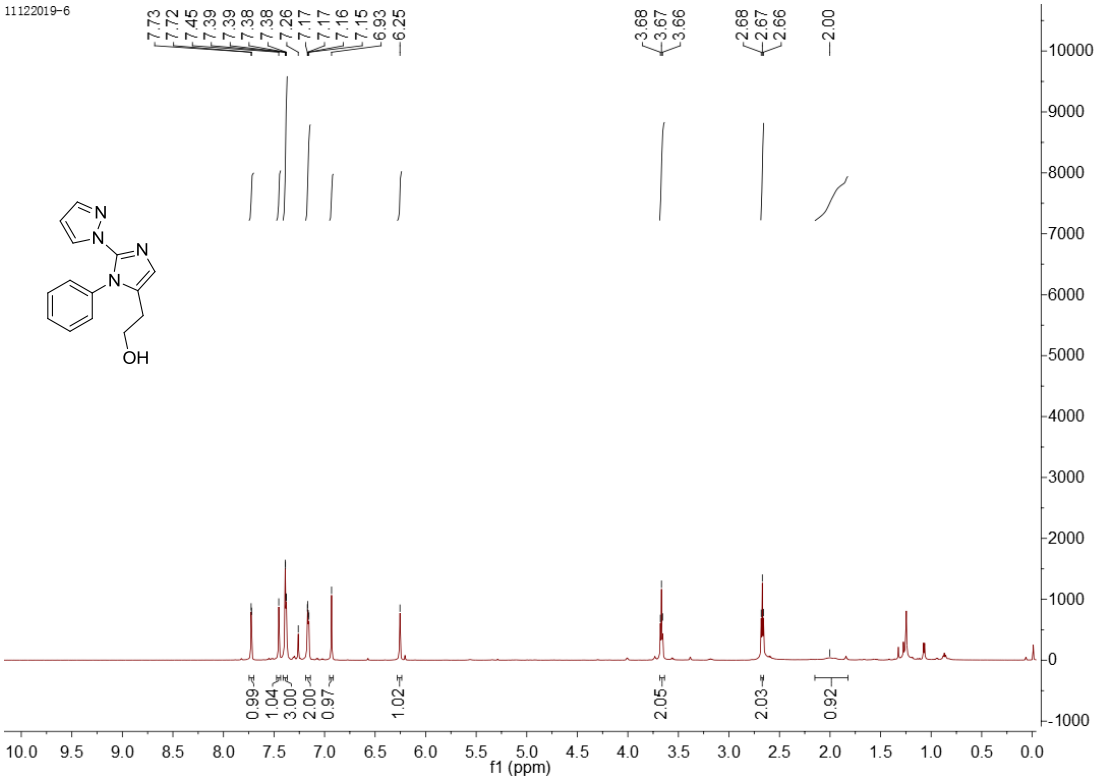

10152019-13
142.41
140.70
139.06
132.62
130.62
129.96
129.53
127.36
124.28
117.25
77.37
77.16
76.95
60.73
28.20
21.28
8.77
OH
f1 (ppm)

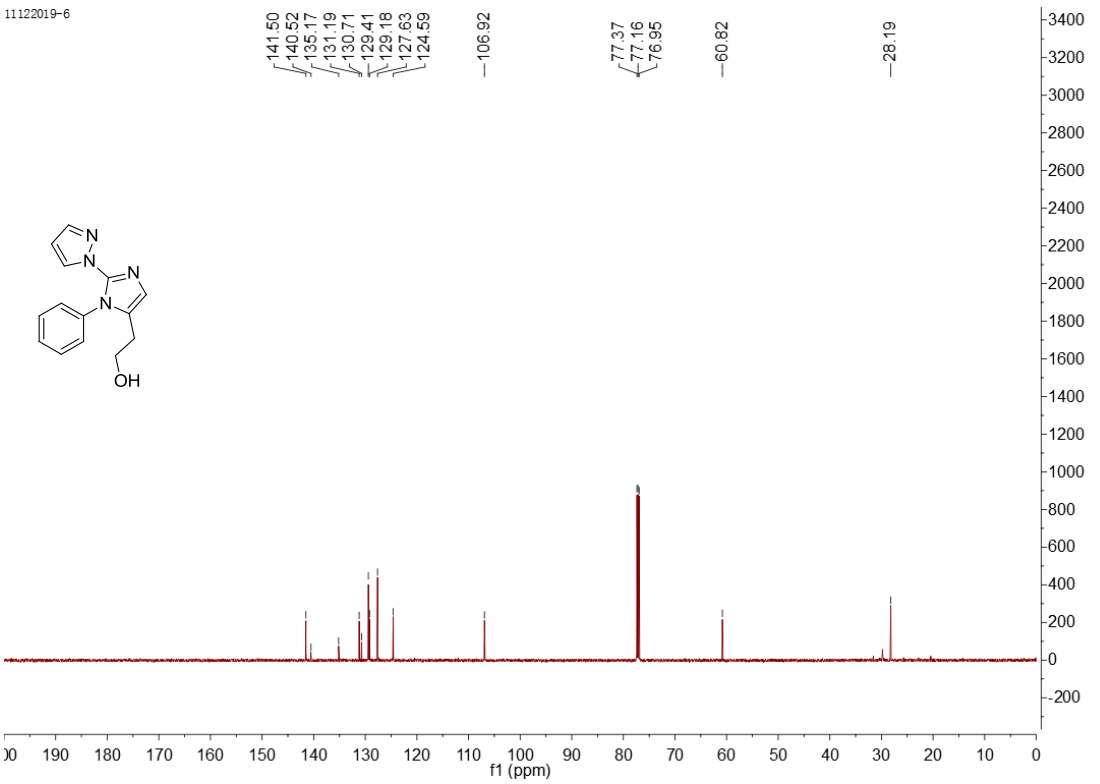
5c


10142019-8
7.91
7.91
7.66
7.66
7.65
7.65
7.64
7.64
7.64
7.41
7.41
7.40
7.40
7.40
7.39
7.38
7.26
7.19
7.19
7.18
7.17
7.08
7.07
7.03
7.03
7.02
7.01
3.68
3.67
3.66
2.76
2.70
2.69
2.68
2.29
N
N
N
N
OH
0.95
2.01
1.00
1.01
2.00
3.01
2.00
0.86
2.05
3.00
f1 (ppm)

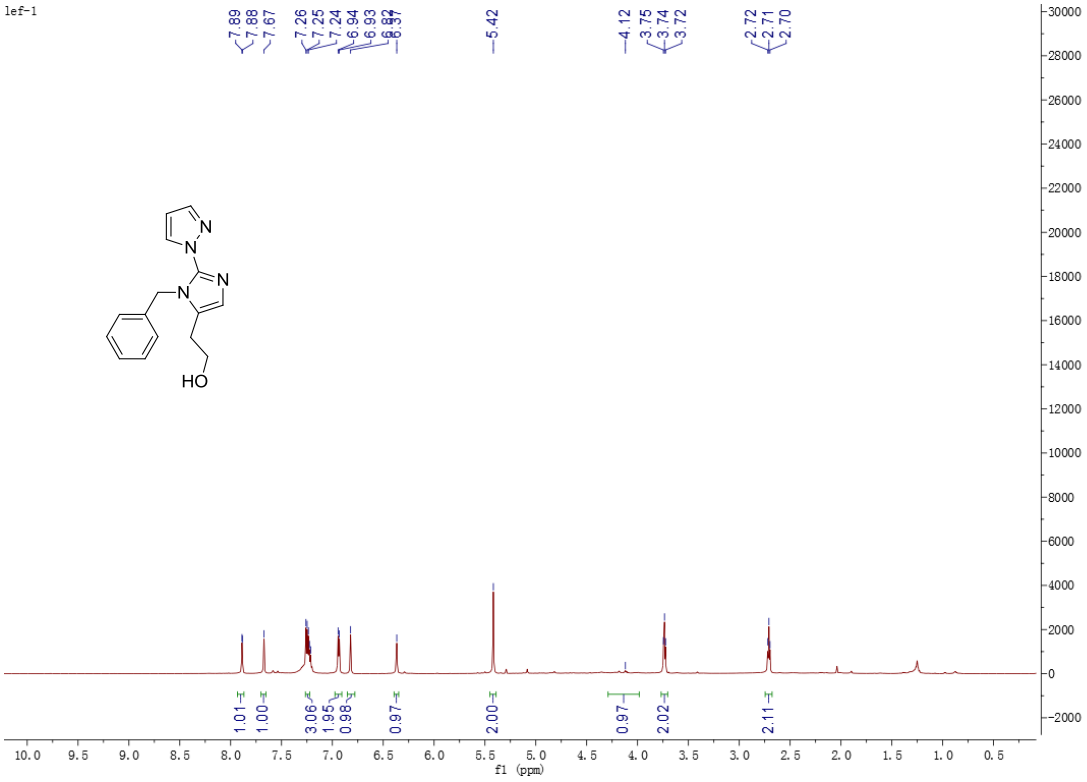

10142019-8
141.28
139.61
138.99
136.31
132.51
130.69
129.88
127.73
127.25
124.87
124.02
122.13
120.87
111.04
77.37
77.16
76.95
60.80
28.31
21.21
N
N
N
N
OH
f1 (ppm)

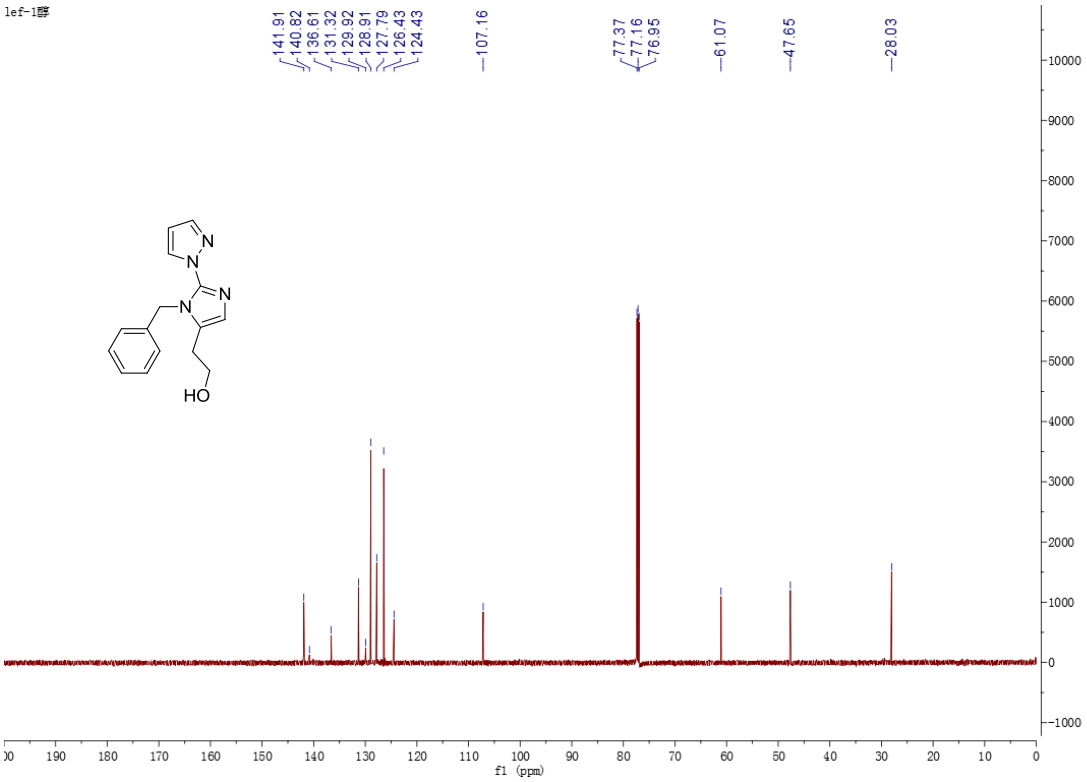
5d


11122019-6
7.73
7.72
7.45
7.39
7.39
7.38
7.38
7.26
7.17
7.17
7.16
7.15
6.93
6.25
3.68
3.67
3.66
2.68
2.67
2.66
2.00
OH
0.99
1.04
3.00
2.00
0.97
1.02
2.05
2.03
0.92
f1 (ppm)

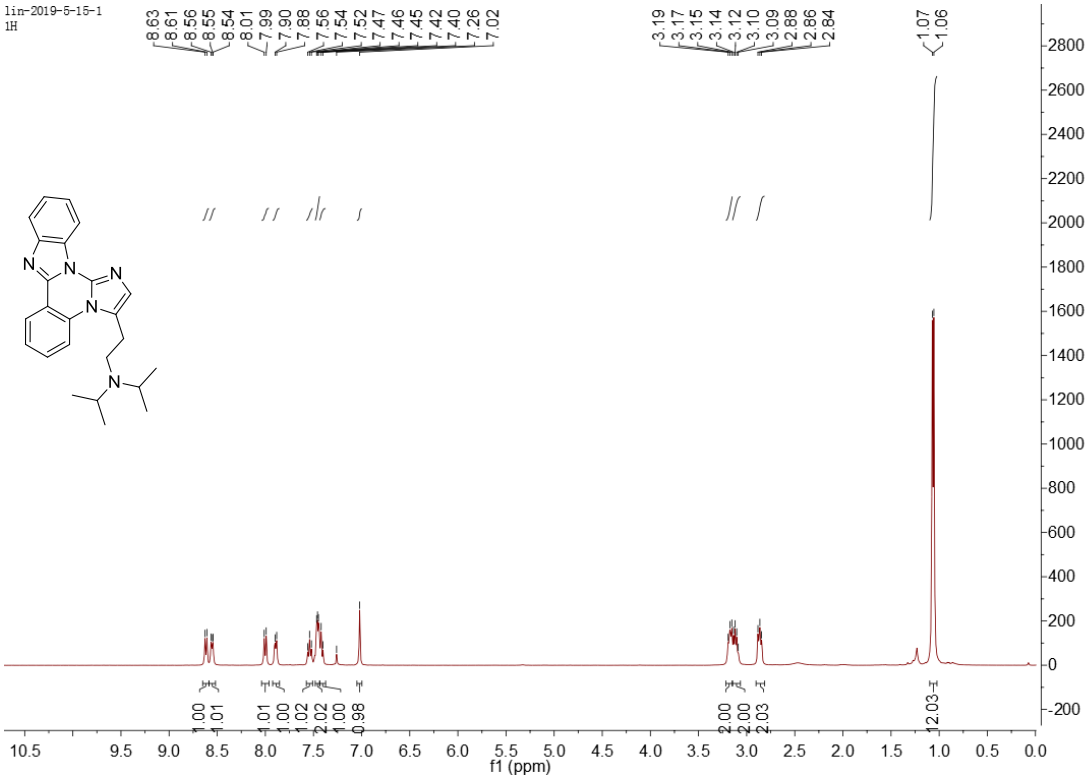

11122019-6
141.50
140.52
135.17
131.19
130.71
129.41
129.18
127.63
124.59
106.92
77.37
77.16
76.95
60.82
28.19
OH
f1 (ppm)

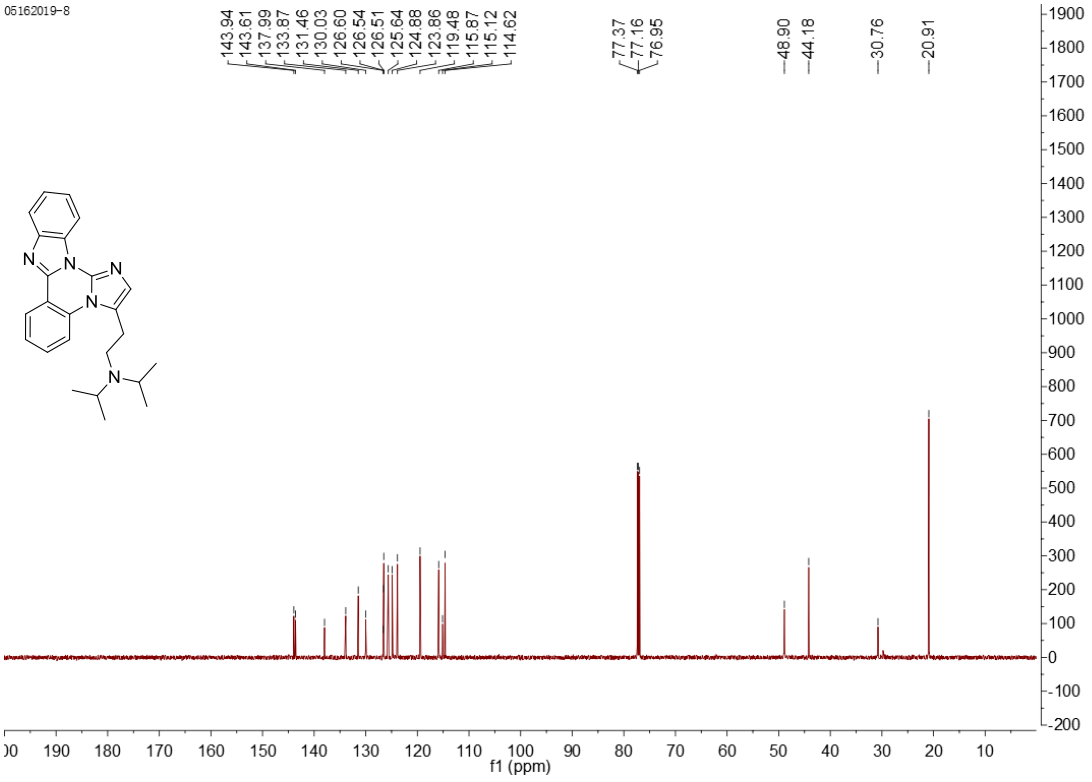
5e


lef-1
7.89
7.88
7.67
7.26
7.25
7.24
6.94
6.93
5.42
4.12
3.75
3.74
3.72
2.72
2.71
2.70
HO
1.01
1.00
3.06
1.95
0.98
0.97
2.00
0.97
2.02
2.11
f1 (ppm)

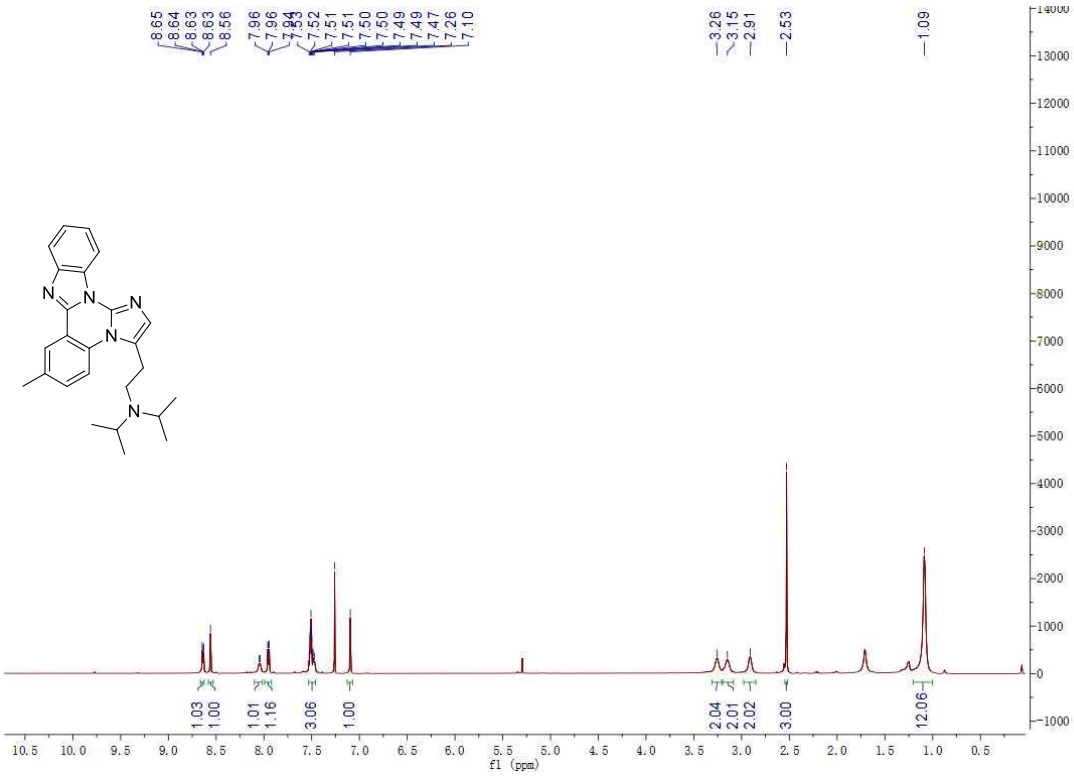

lef-1醇
141.91
140.82
136.61
131.32
129.92
128.91
127.79
126.43
124.43
107.16
77.37
77.16
76.95
61.07
47.65
28.03
HO
f1 (ppm)

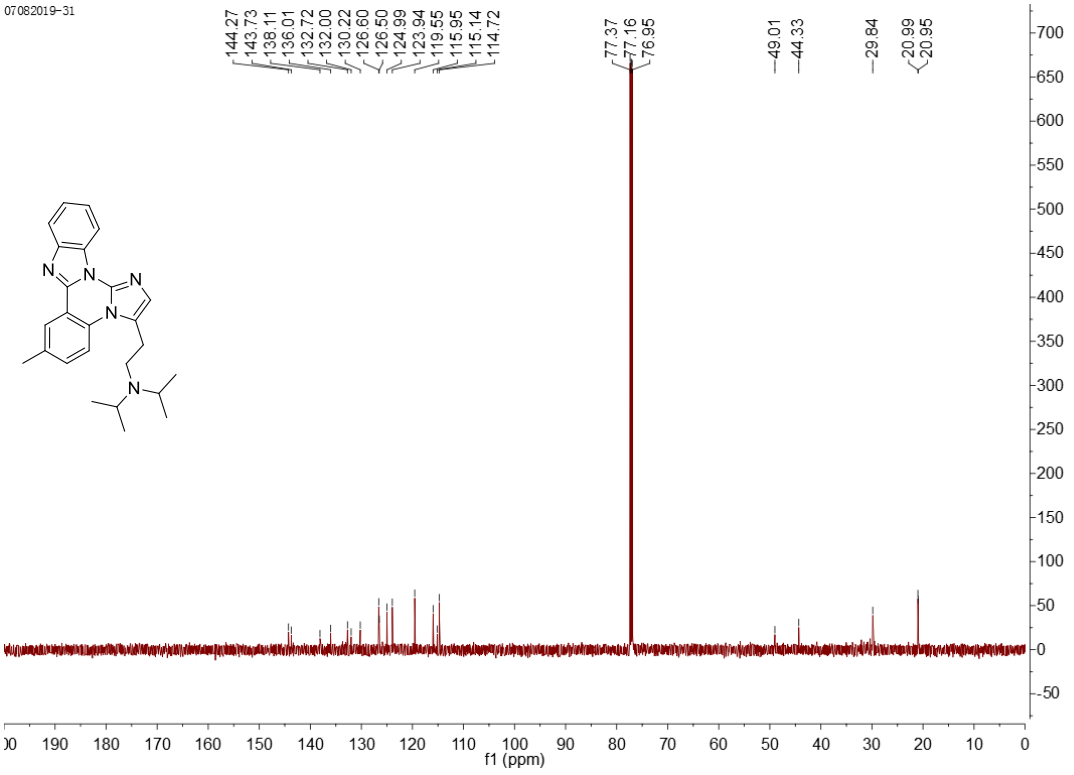
6a


lin-2019-5-15-1
1H
8.63
8.61
8.56
8.55
8.54
8.01
7.99
7.90
7.88
7.56
7.54
7.52
7.47
7.46
7.45
7.42
7.40
7.26
7.02
3.19
3.17
3.15
3.14
3.12
3.10
3.09
2.88
2.86
2.84
1.07
1.06
1.00
1.01
1.01
1.00
1.02
2.02
1.00
0.98
2.00
2.00
2.03
12.03
f1 (ppm)

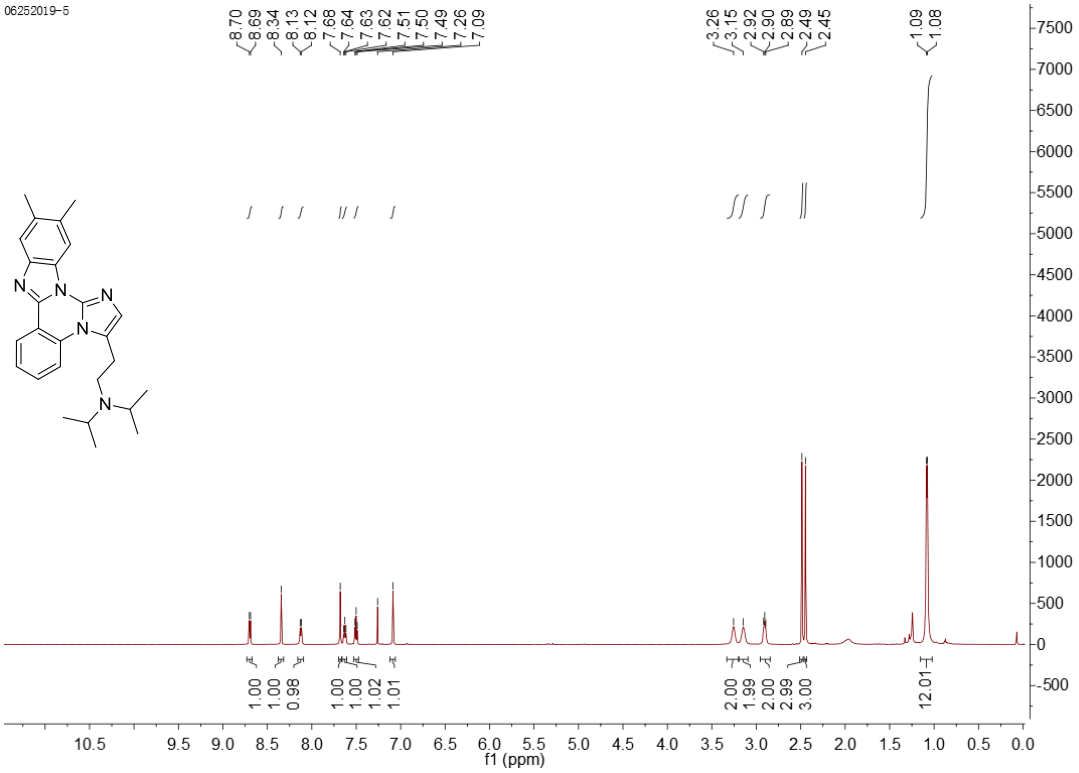

05162019-8
143.94
143.61
137.99
133.87
131.46
130.03
126.60
126.54
126.51
125.64
124.88
123.86
119.48
115.87
115.12
114.62
77.37
77.16
76.95
48.90
44.18
30.76
20.91
f1 (ppm)

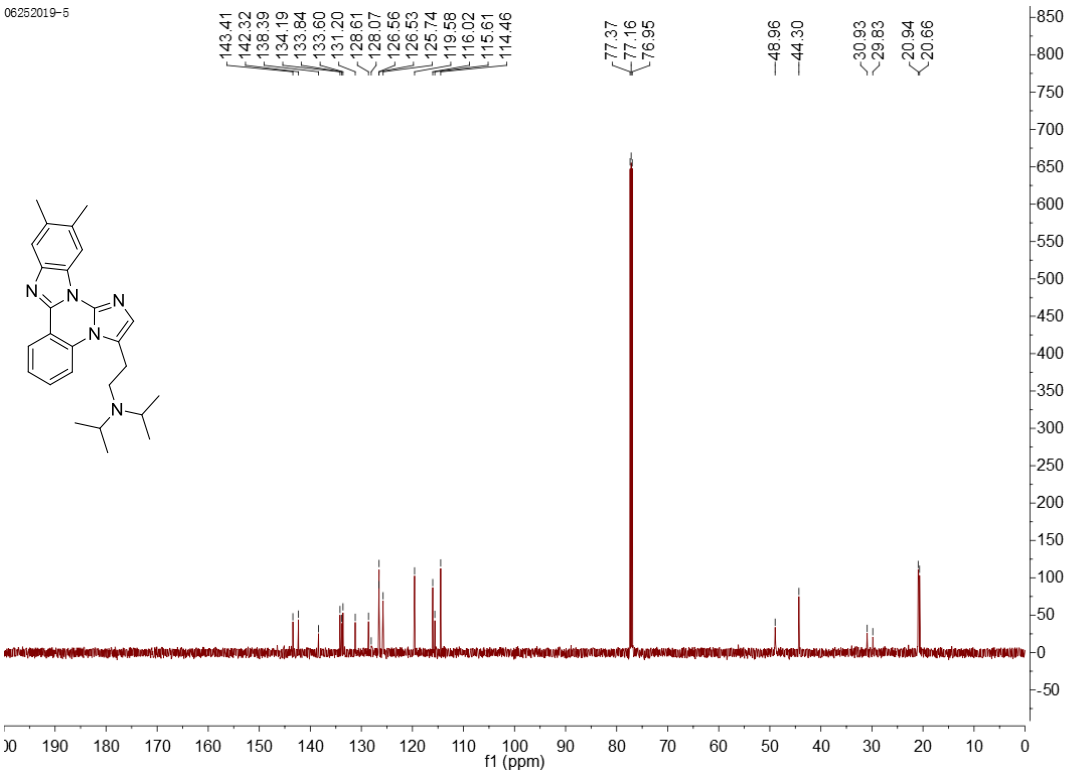
6b


8.65
8.64
8.63
8.63
8.56
7.96
7.96
7.94
7.93
7.52
7.51
7.51
7.50
7.50
7.49
7.49
7.47
7.26
7.10
3.26
3.15
2.91
2.53
1.09
1.03
1.00
1.01
1.16
3.06
1.00
2.04
2.01
2.02
3.00
12.06
f1 (ppm)


07082019-31
144.27
143.73
138.11
136.01
132.72
132.00
130.22
126.60
126.50
124.99
123.94
119.55
115.95
115.14
114.72
77.37
77.16
76.95
49.01
44.33
29.84
20.99
20.95
f1 (ppm)

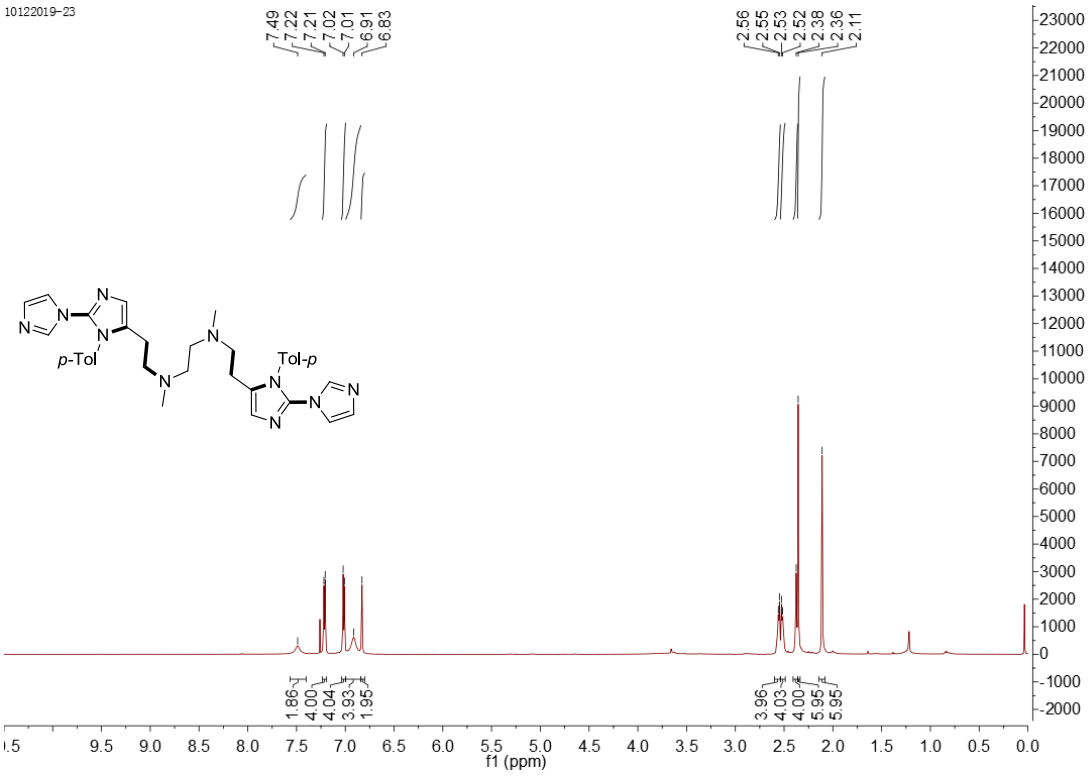
6c

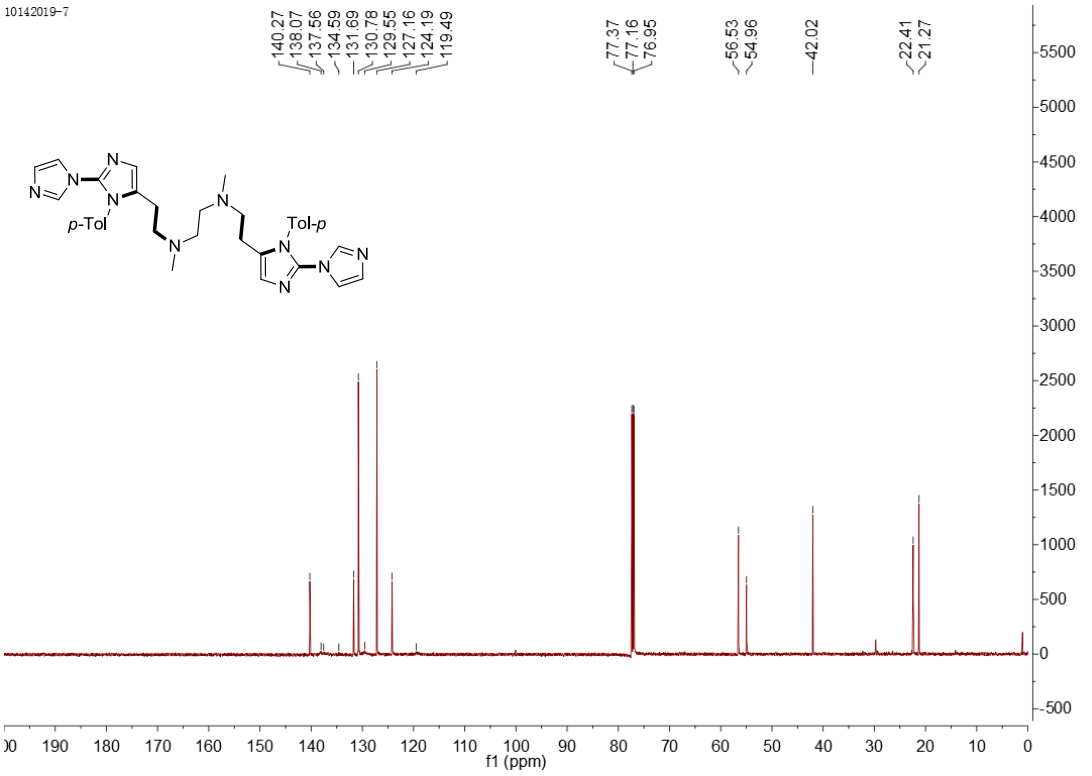

06252019-5
8.70
8.69
8.34
8.13
8.12
7.68
7.64
7.63
7.62
7.51
7.50
7.49
7.26
7.09
3.26
3.15
2.92
2.90
2.89
2.49
2.45
1.09
1.08
1.00
1.00
0.98
1.00
1.00
1.02
1.01
2.00
1.99
2.00
2.99
3.00
12.01
f1 (ppm)


06252019-5
143.41
142.32
138.39
134.19
133.84
133.60
131.20
128.61
128.07
126.56
126.53
125.74
119.58
116.02
115.61
114.46
77.37
77.16
76.95
48.96
44.30
30.93
29.83
20.94
20.66
f1 (ppm)

Copies of ^{1}H and ^{13}C NMR Spectra for Product **7**

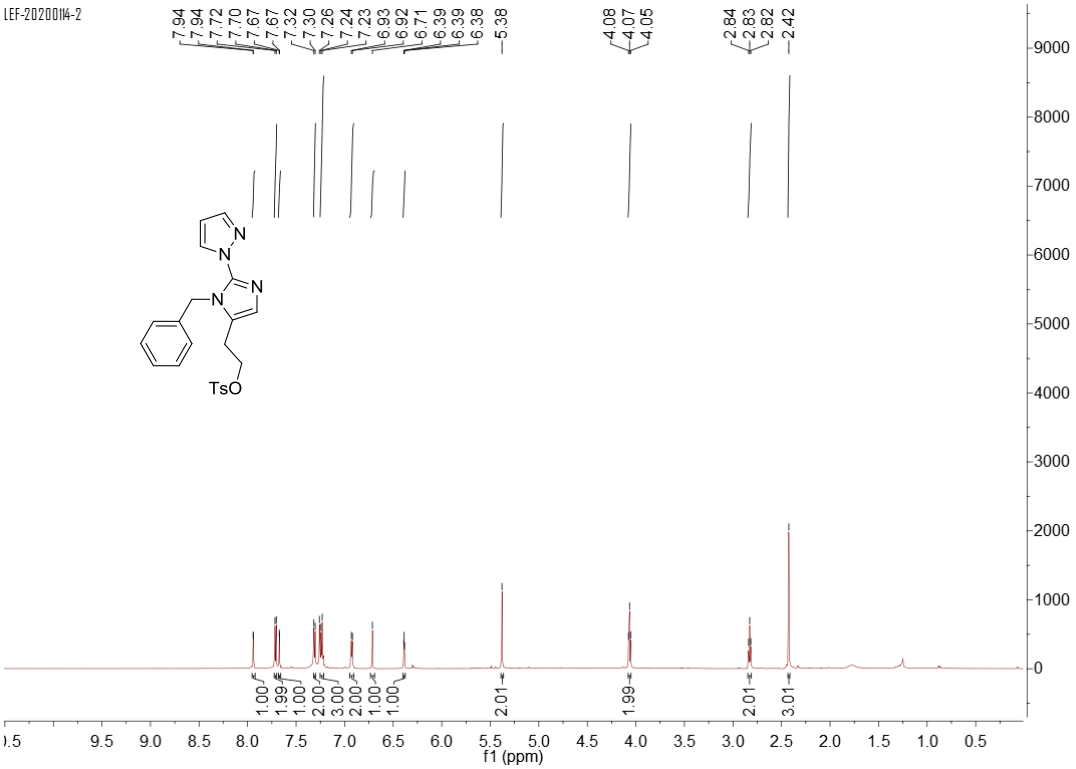
7a

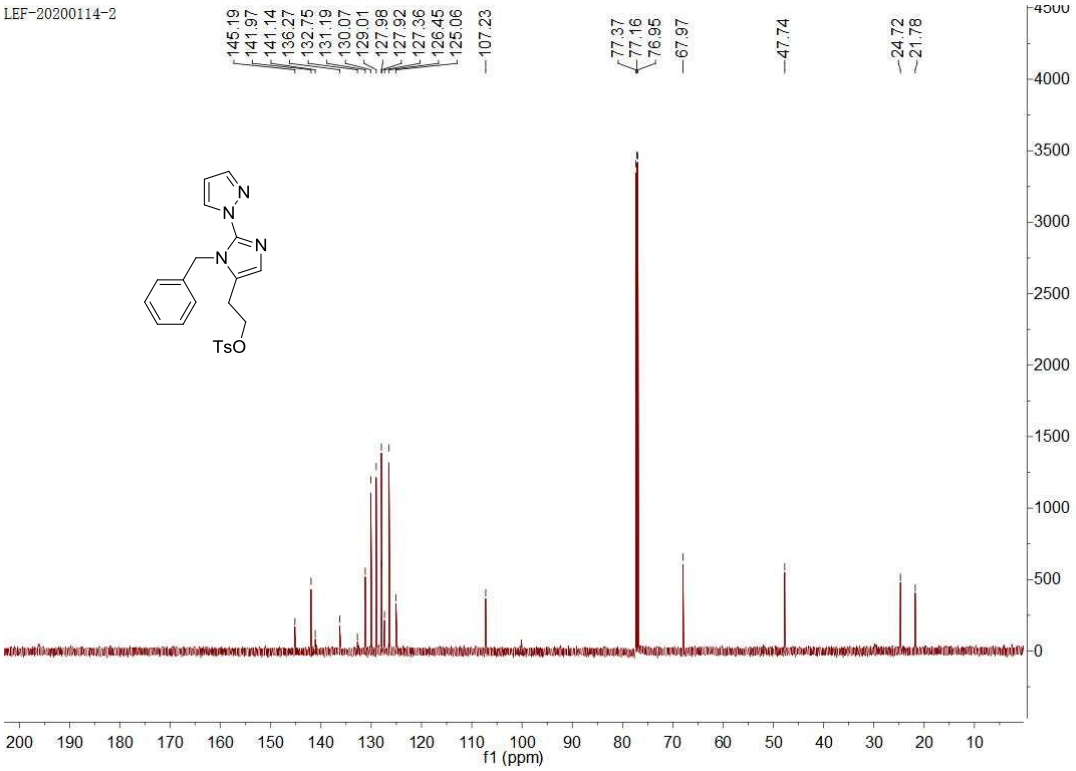




Copies of ^{1}H and ^{13}C NMR Spectra for Product **8**

8





Copies of ^{1}H and ^{13}C NMR Spectra for Product **9**

9