Electronic Supplementary Material (ESI) for RSC Advances.

D-Glucosamine-derived copper catalyst for Ullmann-type C-N coupling reaction: theoretical and experimental study

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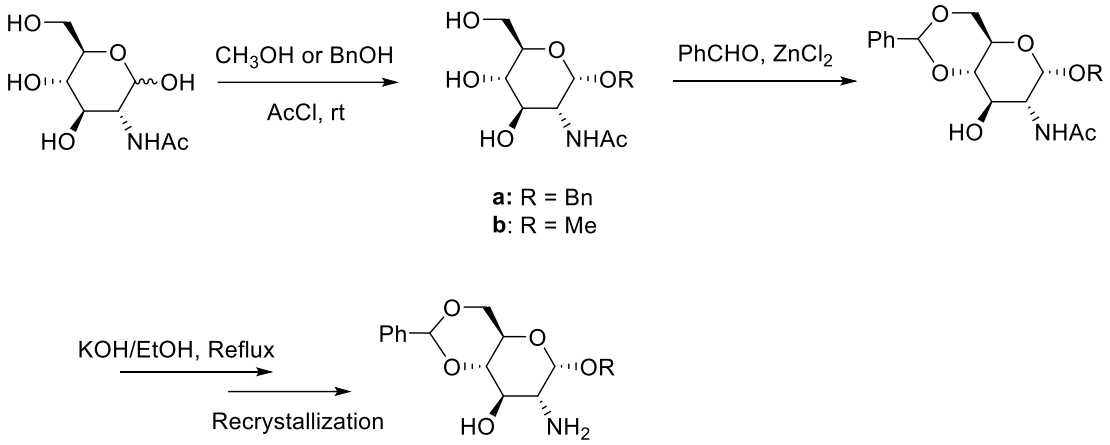
Experimental section

The synthesis of L4-L9



The carbohydrate derived ligands L4-L9 were prepared by previously described methods.[1-4]

L9 White solide. Mp 172.4-173.8 ºC. $[\alpha]_D^{20}$= +59.7 °(c=1.05, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80 – 6.91 (m, 10H), 5.53 (s, 1H), 4.90 (d, *J* = 3.6 Hz, 1H), 4.75 (d, *J* = 11.7 Hz, 1H), 4.52 (d, *J* = 11.8 Hz, 1H), 4.24 (dd, *J* = 10.1, 4.8 Hz, 1H), 3.88 (td, *J* = 9.9, 4.8 Hz, 1H), 3.83 – 3.66 (m, 2H), 3.49 (t, *J* = 9.3 Hz, 1H), 2.81 (dd, *J* = 9.7, 3.6 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 137.86, 137.67, 128.97, 128.42, 128.06, 127.89, 127.76, 126.62, 101.47, 99.58, 82.08, 71.70, 69.33, 68.74, 63.30, 57.06. MS (EI): *m/z* = 357 $[M]^+$.

L8 White solide. M.p. 166 - 167 ℃; $[\alpha]_D^{20}$= +103.1 °(c=0.905, $CHCl_3$). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47-7.41 (m, 2H), 7.41 – 7.35 (m, 3H), 5.61 (s, 1H), 4.62 (d, *J* = 3.6 Hz, 1H), 4.18 (dd, *J* = 9.9, 4.8 Hz, 1H), 3.76 3.56 (m, 3H), 3.48 (t, *J* = 9.2 Hz, 1H), 3.29 (s, 3H), 2.81 (dd, *J* = 9.7, 3.6 Hz, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ142.99, 134.09, 133.24, 131.63, 106.13, 103.97, 87.27, 73.27, 72.63, 67.68, 59.96, 59.35. MS (EI): *m/z* =281 $[M]^+$.

L7 White solide. M.p. 189-192 ℃; $[\alpha]_D^{20}$= +56 °(*c*=0.21, MeOH); ^{1}H NMR (400 MHz, DMSO) δ 8.00 (d, *J* = 8.2 Hz, 1H), 7.49 – 7.43 (m, 2H), 7.42 – 7.33 (m, 7H), 7.30 (ddd, *J* = 8.4, 3.6, 1.8 Hz, 1H), 5.62 (s, 1H), 5.19 (d, *J* = 5.8 Hz, 1H), 4.80 (d, *J* = 3.6 Hz, 1H), 4.70 (d, *J* = 12.6 Hz, 1H), 4.49 (d, *J* = 12.6 Hz, 1H), 4.18 – 4.11 (m, 1H), 3.86 (ddd, *J* = 10.6, 8.3, 3.7 Hz, 1H), 3.72 (ddd, *J* = 21.9, 12.6, 7.9 Hz, 3H), 3.51 (t, *J* = 9.0 Hz, 1H), 1.84 (d, *J* = 9.8 Hz, 3H). ^{13}C NMR (100 MHz, DMSO) δ 169.93, 138.19 (d, *J* = 3.3 Hz), 129.34, 128.7, 128.49, 128.07 (d, *J* = 7.3 Hz), 126.86, 101.34, 97.43, 69.06, 68.48, 67.73, 63.33 54.67, 23.00. MS (EI): *m/z* = 399 $[M]^+$.

L6 White solide. M.p. 250 - 252 ℃; $[\alpha]_D^{20}$ = +90 °(c=0.11, MeOH); ^{1}H NMR (400 MHz, DMSO) δ 7.90 (d, *J* = 8.4 Hz, 1H), 7.46 (dd, *J* = 6.6, 3.2 Hz, 2H), 7.41 – 7.35 (m, 3H), 5.61 (s, 1H), 4.62 (d, *J* = 3.6 Hz, 1H), 4.18 (dd, *J* = 9.9, 4.8 Hz, 1H), 3.89 – 3.80 (m, 1H), 3.74 (t, *J* = 10.1 Hz, 1H), 3.69 – 3.63 (m, 1H), 3.63 – 3.56 (m, 1H), 3.48 (t, *J* = 9.2 Hz, 1H), 3.29 (s, 3H), 1.85 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 169.43, 137.74, 128.84, 127.99, 126.37, 100.87, 98.71, 82.01, 68.02, 67.37, 62.43, 54.71, 54.10, 22.57. MS (EI): *m/z* = 323 $[M]^+$.

The spectral data of the products

1-(4-Methoxyphenyl)-1*H*-imidazole 3a.[5] Pale yellow solid, m.p.: 60-61 ℃. ^{1}H NMR (400 MHz, CDCl3) δ 7.79 (s, 1H), 7.30 (d, J = 8.9 Hz, 2H), 7.20 (d, J = 6.7 Hz, 2H), 6.99 (d, J = 8.9 Hz, 2H), 3.85 (s, 3H). 13C NMR (100 MHz, CDCl3) δ 159.00, 135.84, 130.67, 129.86, 123.25, 118.82, 114.93, 55.62. MS (EI): m/z = 174 $[M]^+$.

1-(4-Fluorophenyl)-1*H*-imidazole 3b.[6] Yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.77 (d, *J* = 15.0 Hz, 1H), 7.42 – 7.32 (m, 2H), 7.26 – 7.11 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 162.92, 160.46, 135.78, 133.61, 130.44, 123.51 (*J* = 8.5 Hz), 118.61, 116.76 (*J* = 23.0 Hz). MS (EI): m/z = 162 $[M]^+$.

1-(4-Chlorophenyl)-1*H*-imidazole 3c.[5] Colorless oil. ^{1}H NMR (400 MHz, CDCl3) δ 7.84 (s, 1H), 7.52 – 7.42 (m, 2H), 7.35 (d, J = 8.7 Hz, 2H), 7.27 (s, 1H), 7.21 (s, 1H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 135.89, 135.53, 133.22, 130.67, 130.04, 122.72, 118.19. MS (EI): *m/z* = 178 $[M]^+$.

1-(4-(Trifluoromethoxy)phenyl)-1*H*-imidazole 3d.[7] Colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (s, 1H), 7.44 (d, *J* = 8.9 Hz, 2H), 7.35 (d, *J* = 8.6 Hz, 2H), 7.27 (s, 1H), 7.22 (s, 1H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 148.10, 135.90, 135.63, 130.79, 122.92, 122.54, 121.67, 119.10, 118.30. MS (EI): *m/z* = 228 $[M]^+$.

1-(4-(Trifluoromethyl)phenyl)-1*H*-imidazole 3e.[8] Yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.97 (s, 1H), 7.43 (d, *J* = 7.4 Hz, 2H), 7.35 (d, *J* = 7.9 Hz, 2H), 7.25 (s, 1H), 7.20 (s, 1H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 137.48, 135.62, 134.99, 130.26 (d, *J* = 21.4 Hz), 121.45, 118.37. MS (EI): *m/z* = 212 $[M]^+$.

1-Phenyl-1*H*-imidazole 3f.[5] Yellow oil. ^{1}H NMR (400 MHz, CDCl3) δ 7.87 (s, 1H), 7.49 (t, J = 7.7 Hz, 2H), 7.42 – 7.35 (m, 3H), 7.29 (s, 1H), 7.21 (s, 1H). ^{13}C NMR (100 MHz, CDCl3) δ 137.40, 135.60, 130.41, 129.89, 127.50, 121.51, 118.25. MS (EI): *m/z* = 144 $[M]^+$.

1-(4-Methoxyphenyl)-1*H*-benz[d]imidazole 3g.[9] Yellow solid, m.p.: 96-97 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 (s, 1H), 7.87 – 7.73 (m, 1H), 7.43 – 7.36 (m, 1H), 7.33 (d, *J* = 8.8 Hz, 2H), 7.24 (p, *J* = 7.2 Hz, 2H), 7.00 (d, *J* = 8.8 Hz, 2H), 3.81 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.37, 142.55, 129.12, 125.74, 123.56, 122.63, 120.43, 115.13, 110.36, 55.64. MS (EI): *m/z* = 224 $[M]^+$.

4-(4-Methoxyphenyl)morpholine 3h.[10] White solid. m.p.: 72-73 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.97 – 6.77 (m, 4H), 3.90 – 3.82 (m, 4H), 3.77 (s, 3H), 3.11 – 3.00 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 154.00, 145.66, 117.84, 114.53, 67.06, 55.59, 50.84. MS (EI): *m/z* = 193 $[M]^+$.

1-(4-Methoxyphenyl)pyrrolidine 3i.[10] Yellow solid. m.p.: 45-46 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) δ 6.76 (d, *J* = 8.9 Hz, 2H), 6.45 (d, *J* = 8.9 Hz, 2H), 3.67 (s, 3H), 3.14 (t, *J* = 6.4 Hz, 4H), 1.99 – 1.79 (m, 4H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 149.75, 142.23, 114.00, 111.58, 54.98, 47.20, 24.35. MS (EI): *m/z* = 177 $[M]^+$.

***N*-Benzyl-4-methoxybenzenamine 3j**.[10] White solid, m.p.: 49-50 ºC. ^{1}H NMR (400 MHz, CDCl3) δ 7.27 (q, J = 7.1 Hz, 3H), 7.18 (m, 1H), 6.70 (d, J = 8.8 Hz, 2H), 6.53 (d, J = 8.7 Hz, 2H), 4.20 (s, 2H), 3.66 (d, J = 0.9 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 151.16, 141.43, 138.66, 127.56, 126.52, 126.14, 113.89, 113.08, 54.78, 48.22. MS (EI): *m/z* = 213 $[M]^+$.

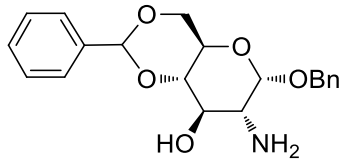
4-Methoxy-*N*-phenylbenzenamine 3k.[11] White solid, m.p.: 105-106 ºC. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.14 (m, 2H), 6.99 (d, *J* = 8.8 Hz, 2H), 6.87 – 6.68 (m, 5H), 5.40 (s, 1H), 3.71 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 154.24, 144.14, 134.71, 128.27, 121.17, 118.53, 114.62, 113.64, 54.55. MS (EI): *m/z* = 199 $[M]^+$.

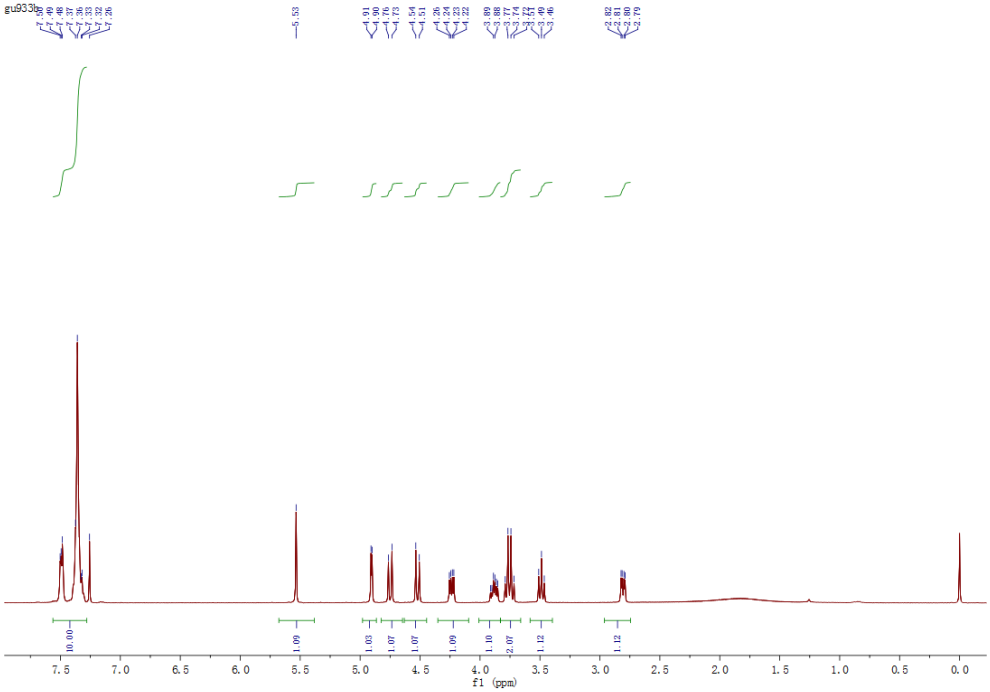
Indoline.[12] Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.03 (d, *J* = 7.2 Hz, 1H), 6.93 (t, *J* = 7.6 Hz,

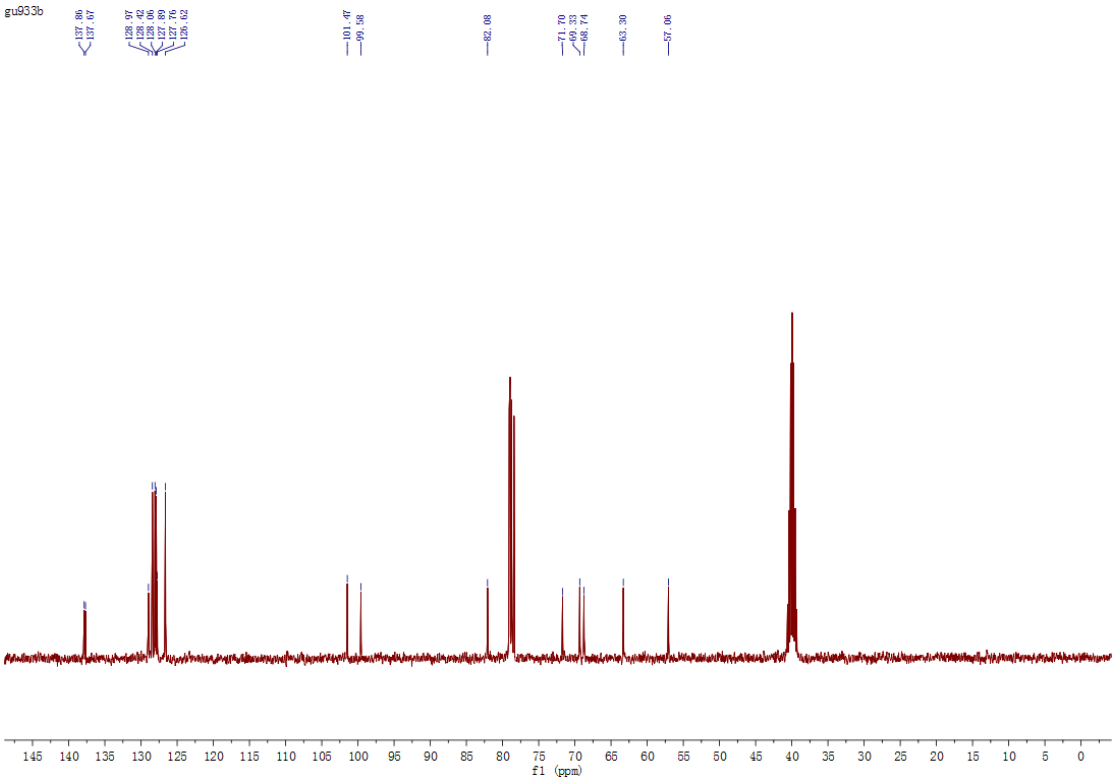
1H), 6.62 (t, *J* = 7.4 Hz, 1H), 6.55 (d, *J* = 7.7 Hz, 1H), 3.44 (t, *J* = 8.3 Hz, 3H), 2.93 (t, *J* = 8.3 Hz, 3H).[13]C NMR (100 MHz, $CDCl_3$) δ 151.64, 129.37, 127.25, 124.68, 118.71, 109.51, 47.37, 29.89. MS (EI): *m/z* = 119 $[M]^+$.

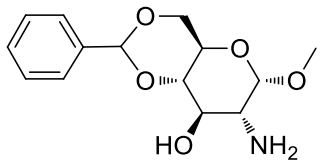
1-(4-methoxyphenyl)indoline.[13] Pale yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (d, *J* = 8.9 Hz, 1H), 7.11 (d, *J* = 9.0 Hz, 2H), 7.06 (d, *J* = 7.1 Hz, 1H), 6.95 (t, *J* = 7.6 Hz, 1H), 6.82 (t, *J* = 8.0 Hz, 3H), 3.79 (t, *J* = 8.4 Hz, 2H), 3.73 (s, 3H), 3.03 (t, *J* = 8.4 Hz, 2H). ^{13}C NMR (100MHz, $CDCl_3$) δ 138.22, 137.99, 130.67, 127.12, 124.88, 120.71, 118.17, 116.39, 114.57, 107.39, 55.60, 53.12, 28.33. MS (EI): *m/z* = 225 $[M]^+$.

NMR Spectra of Ligand and Products





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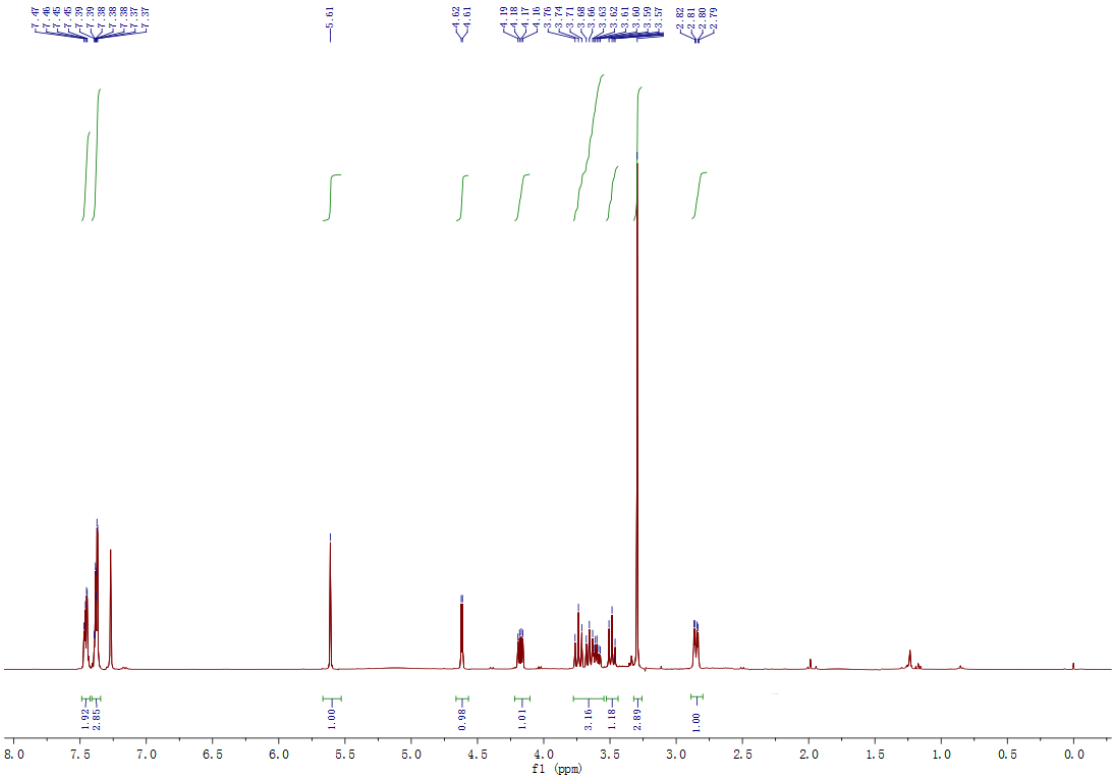
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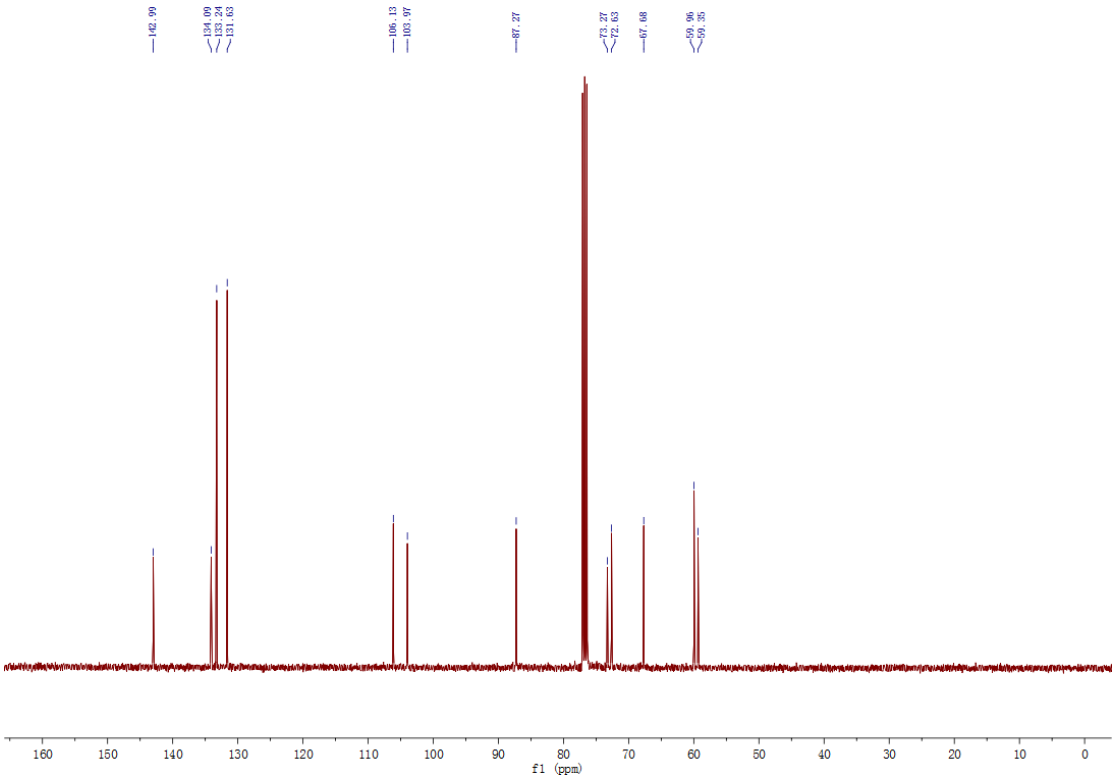
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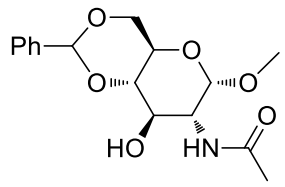
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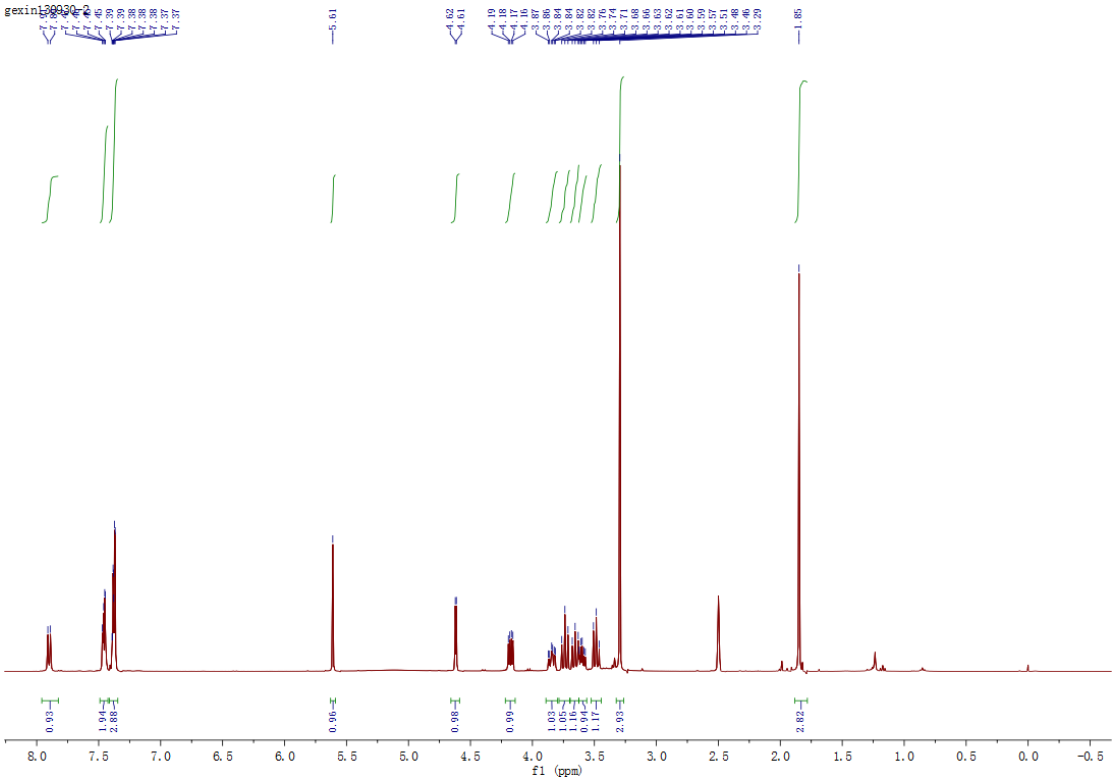
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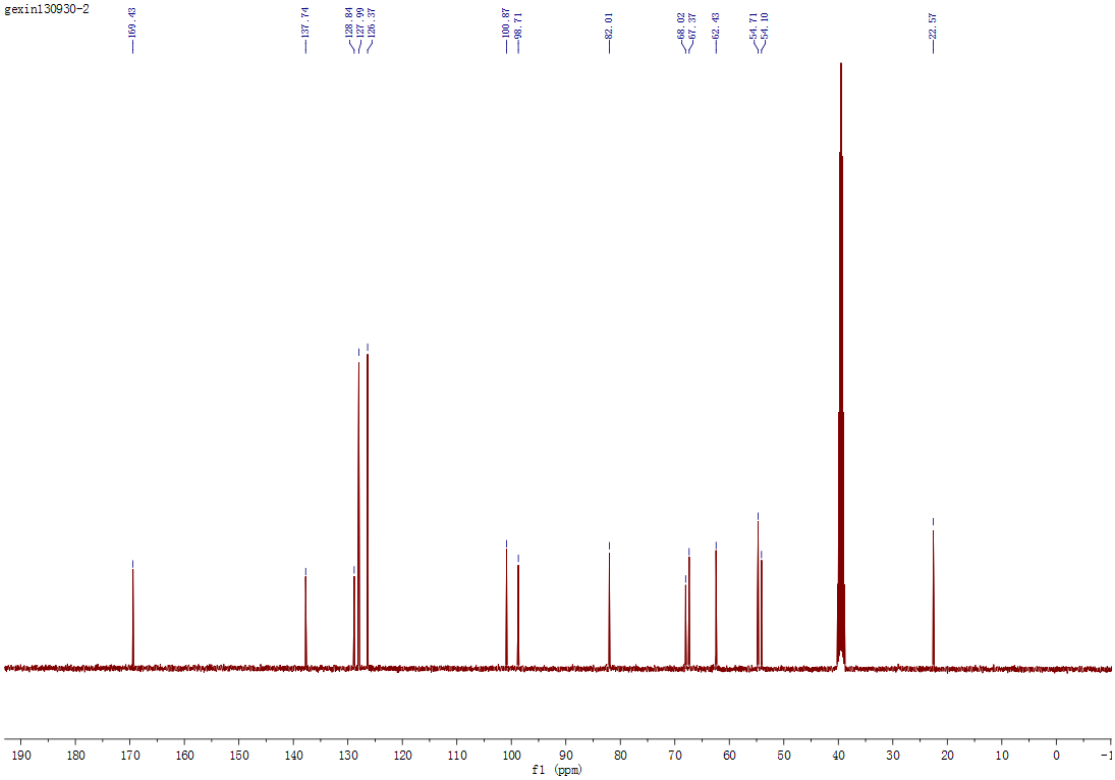
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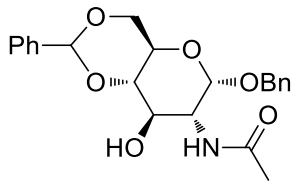

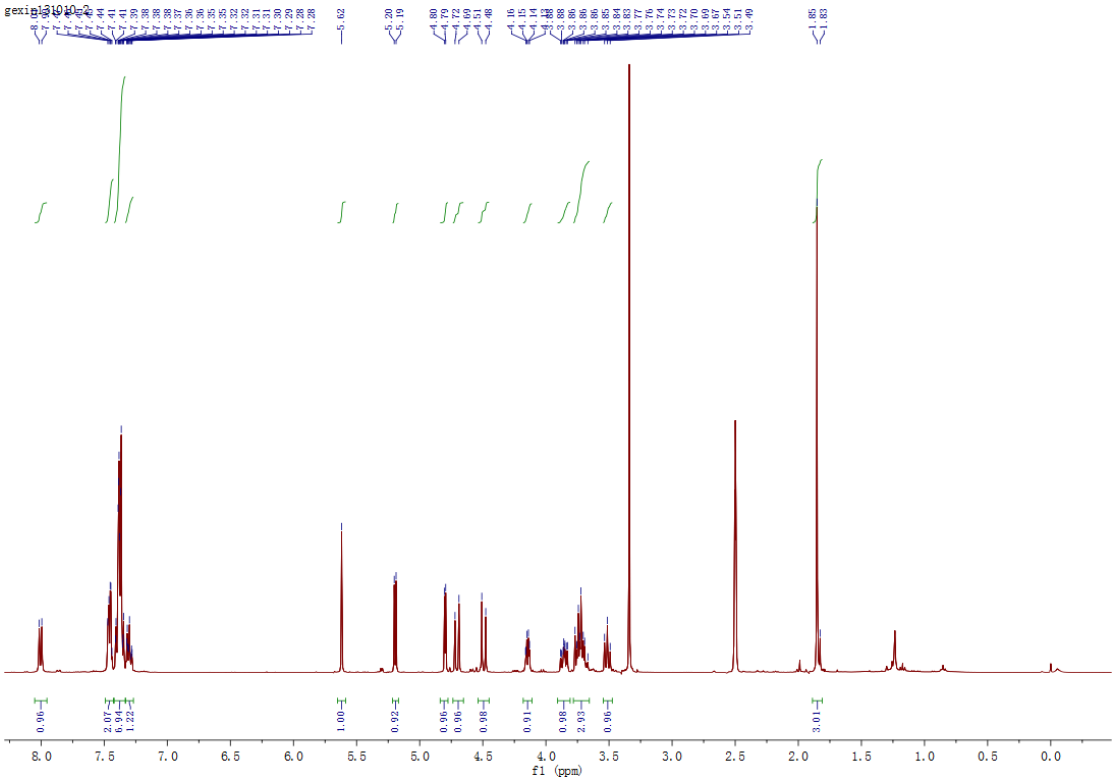

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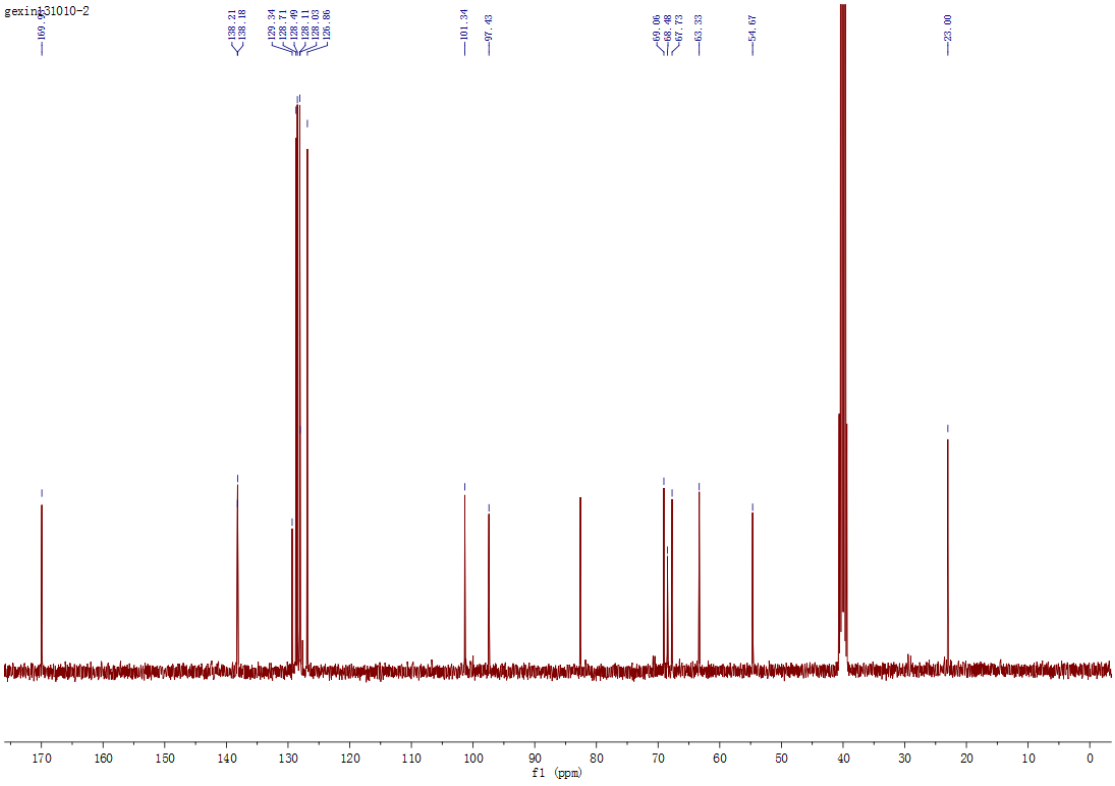

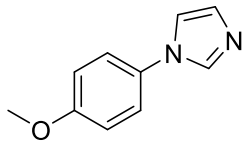
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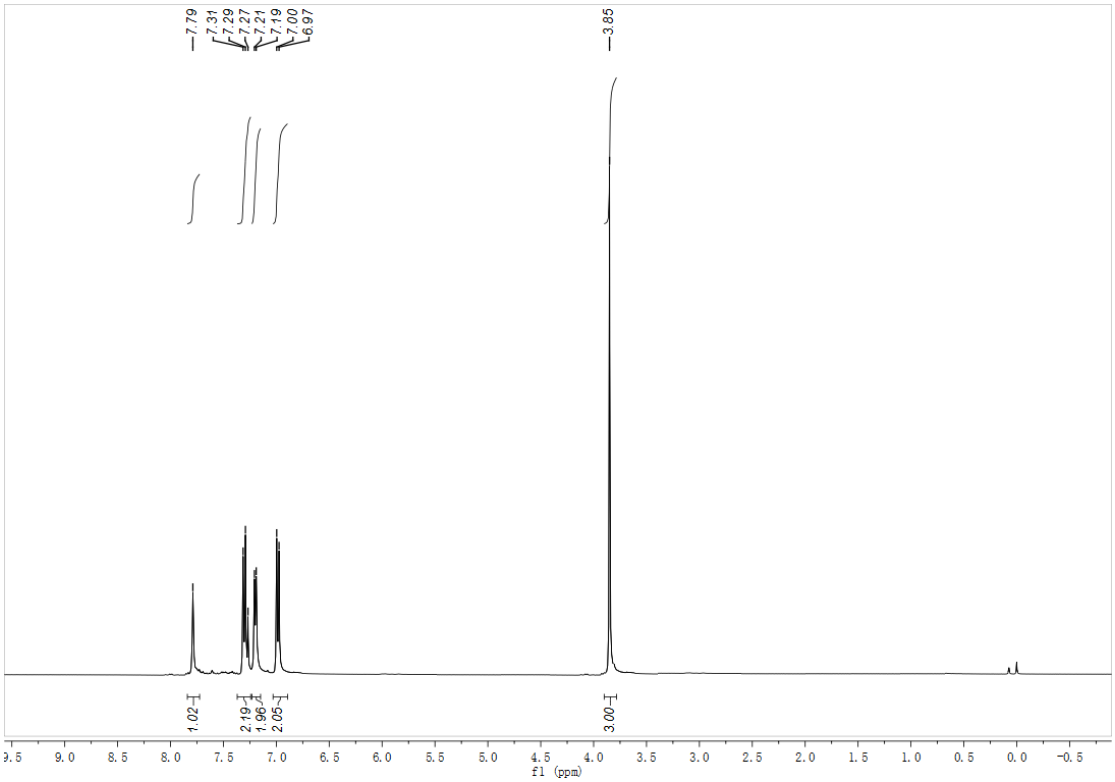
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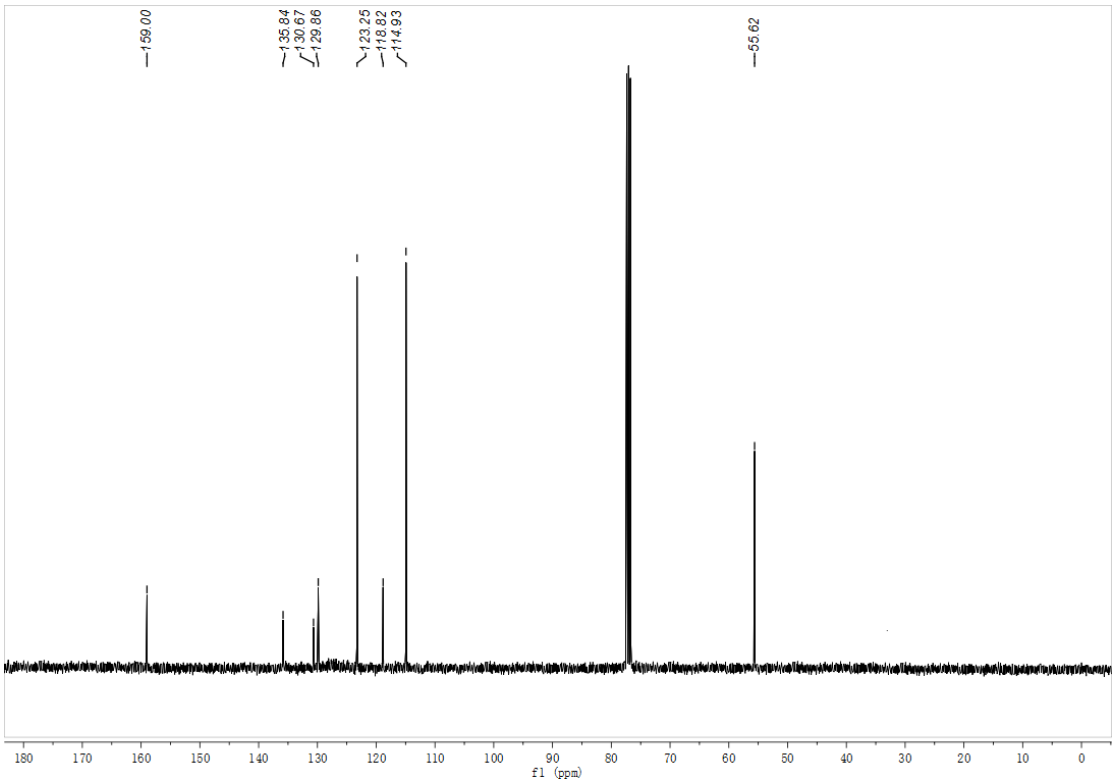
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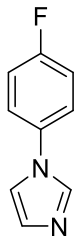
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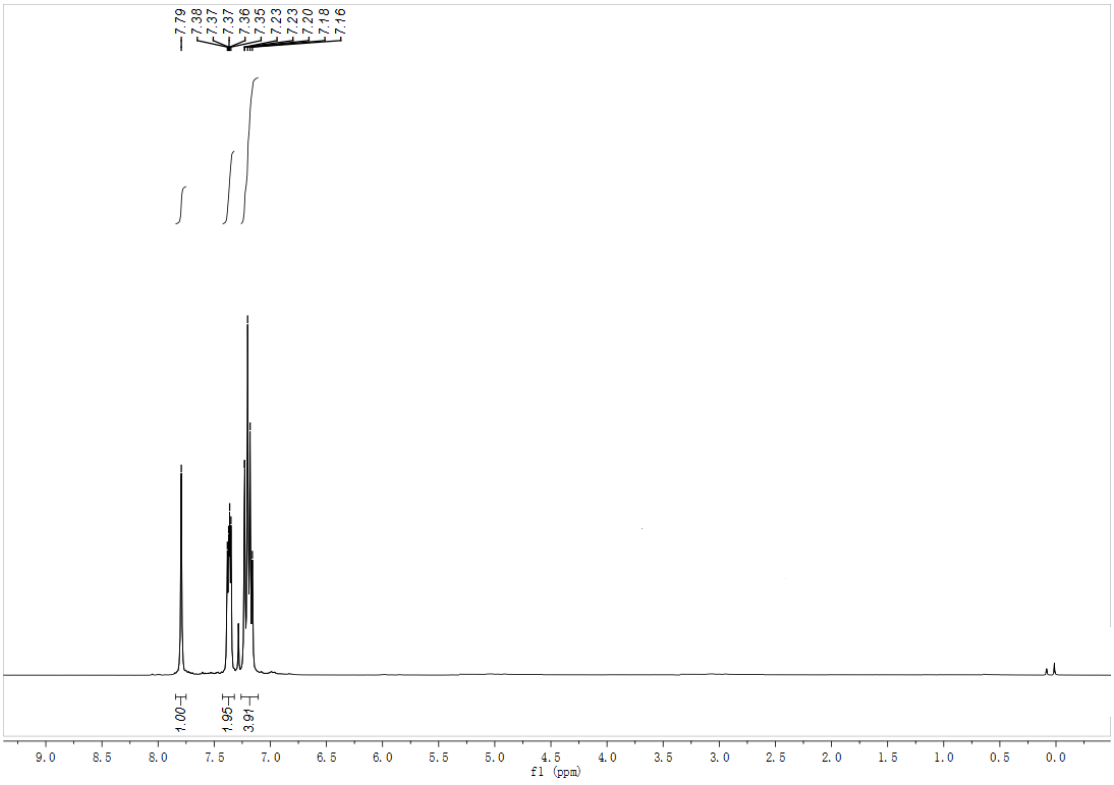
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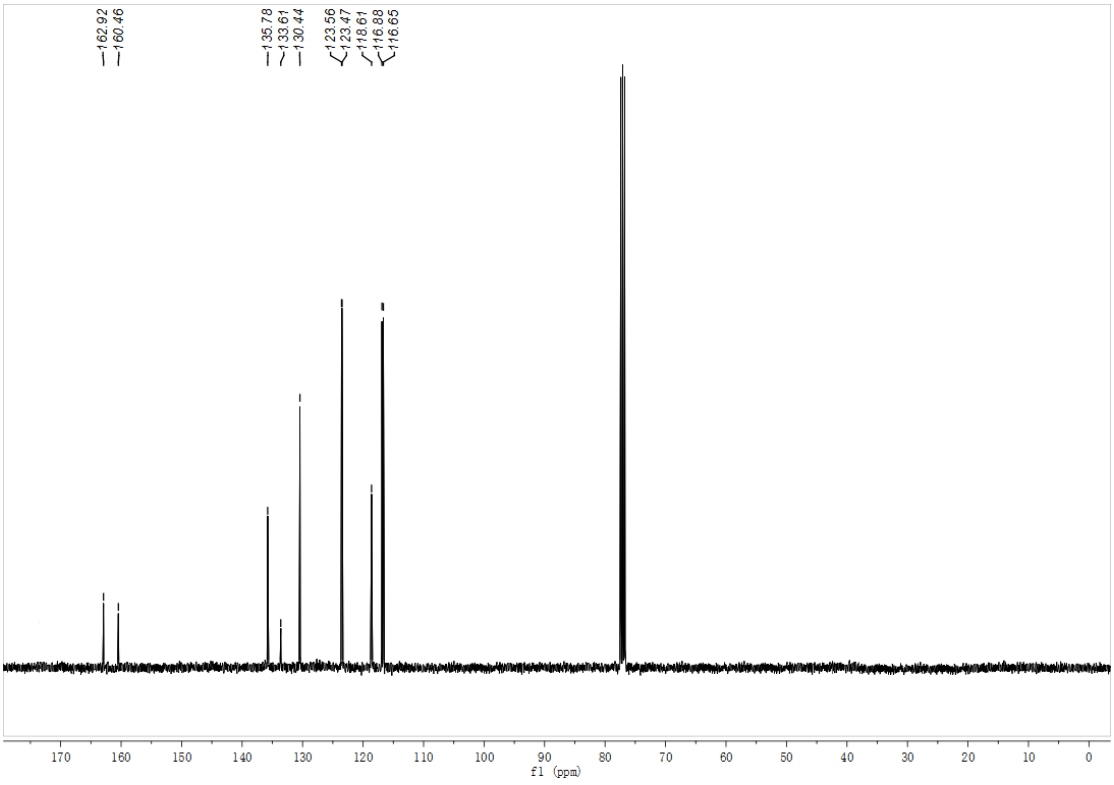
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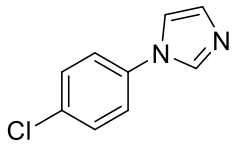
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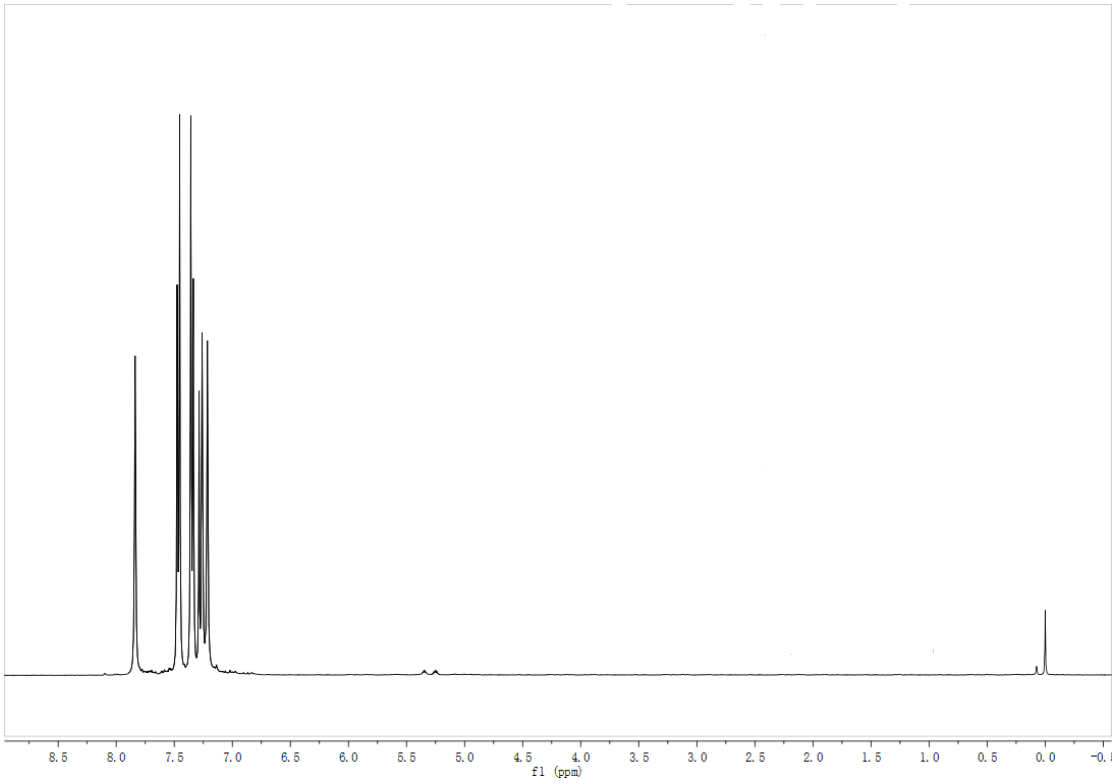
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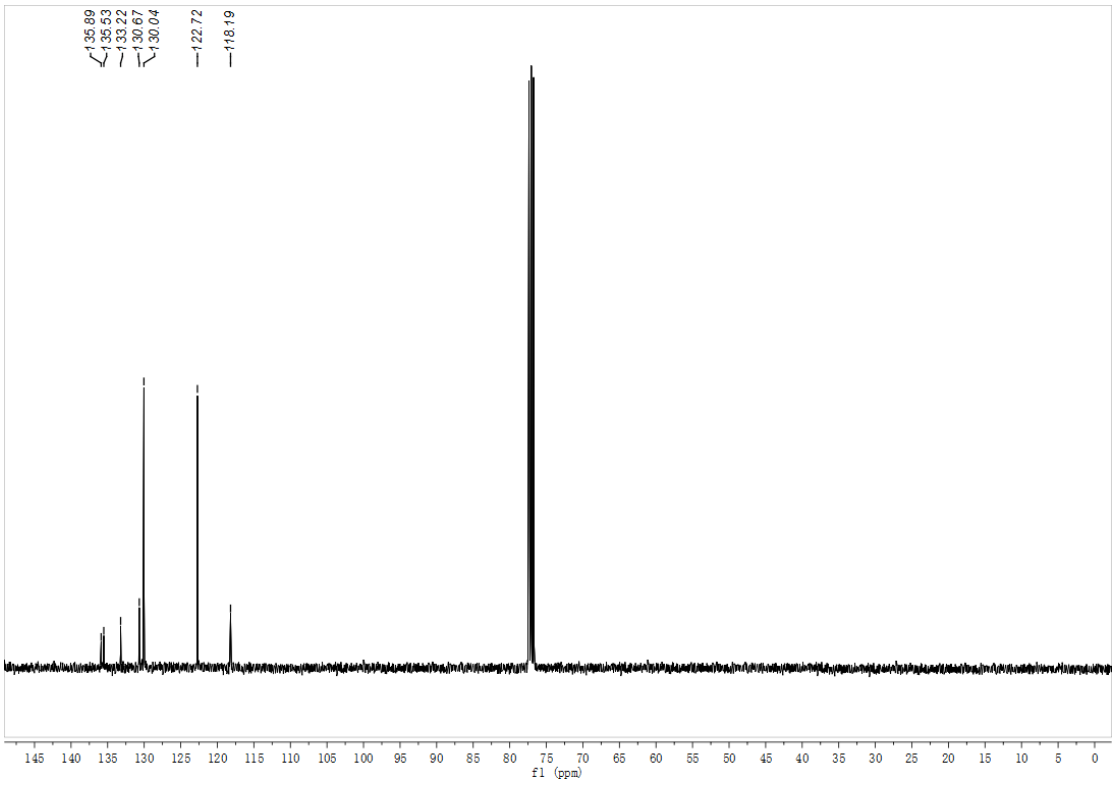
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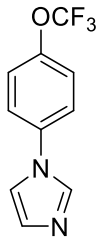
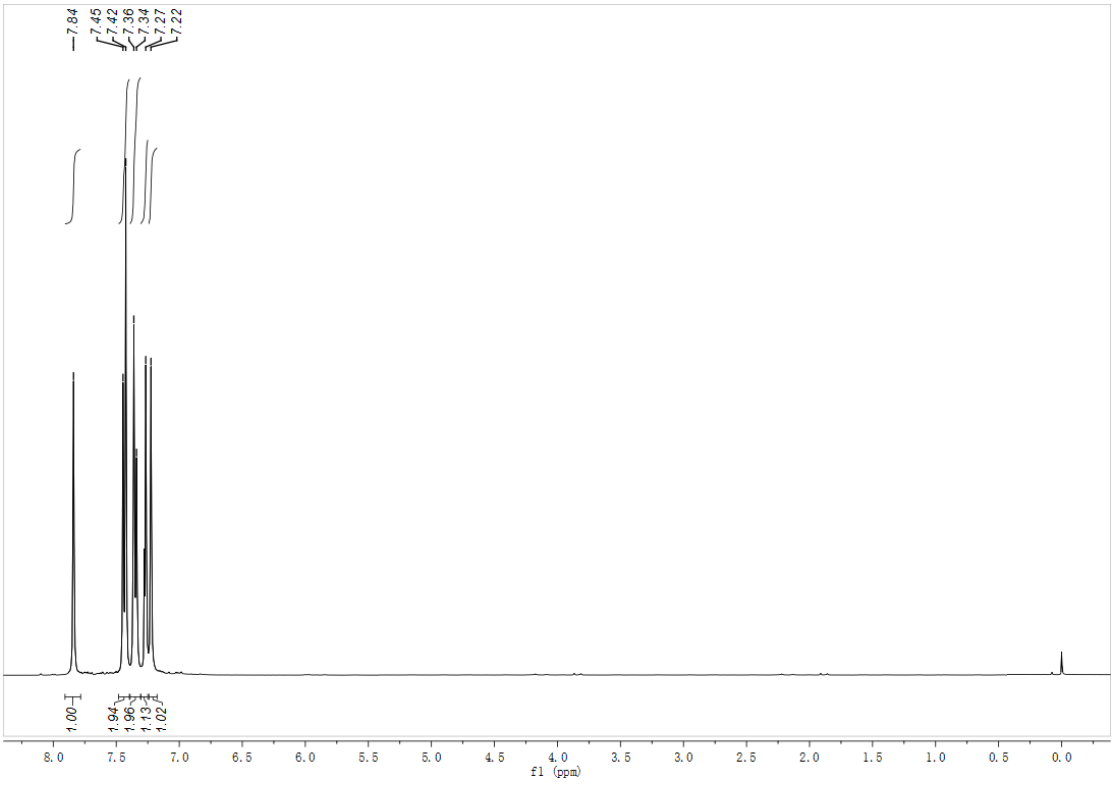
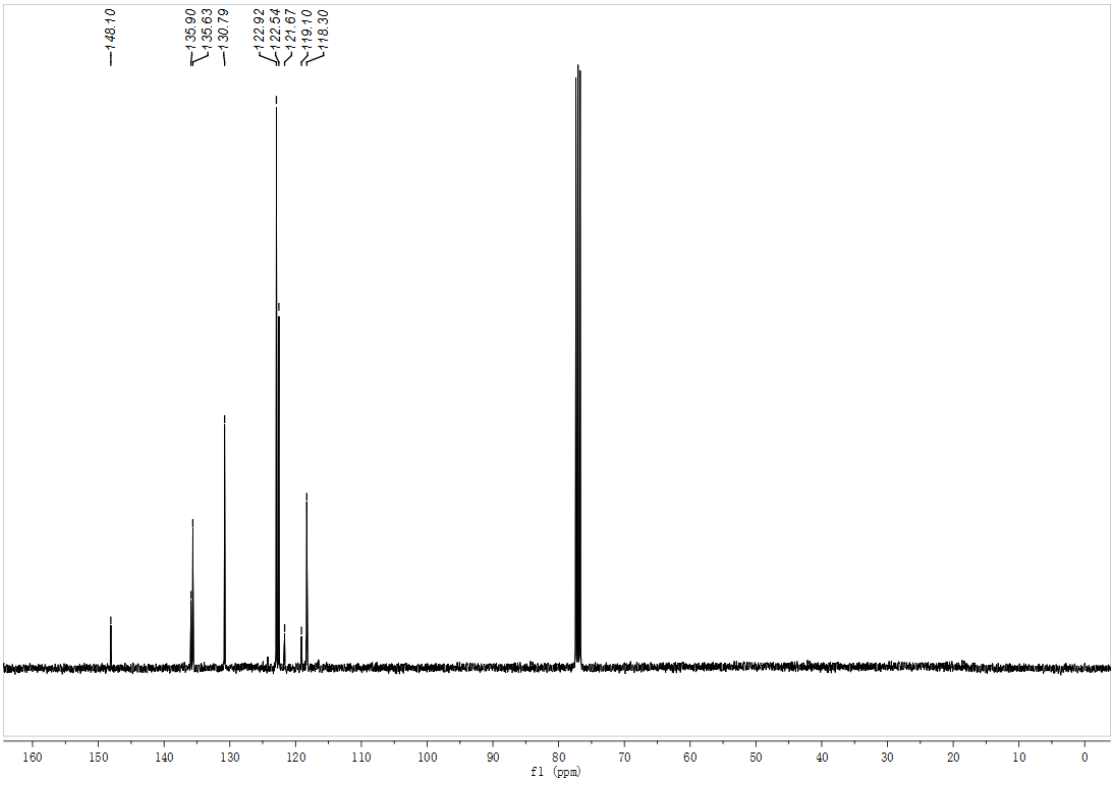
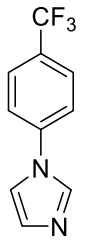
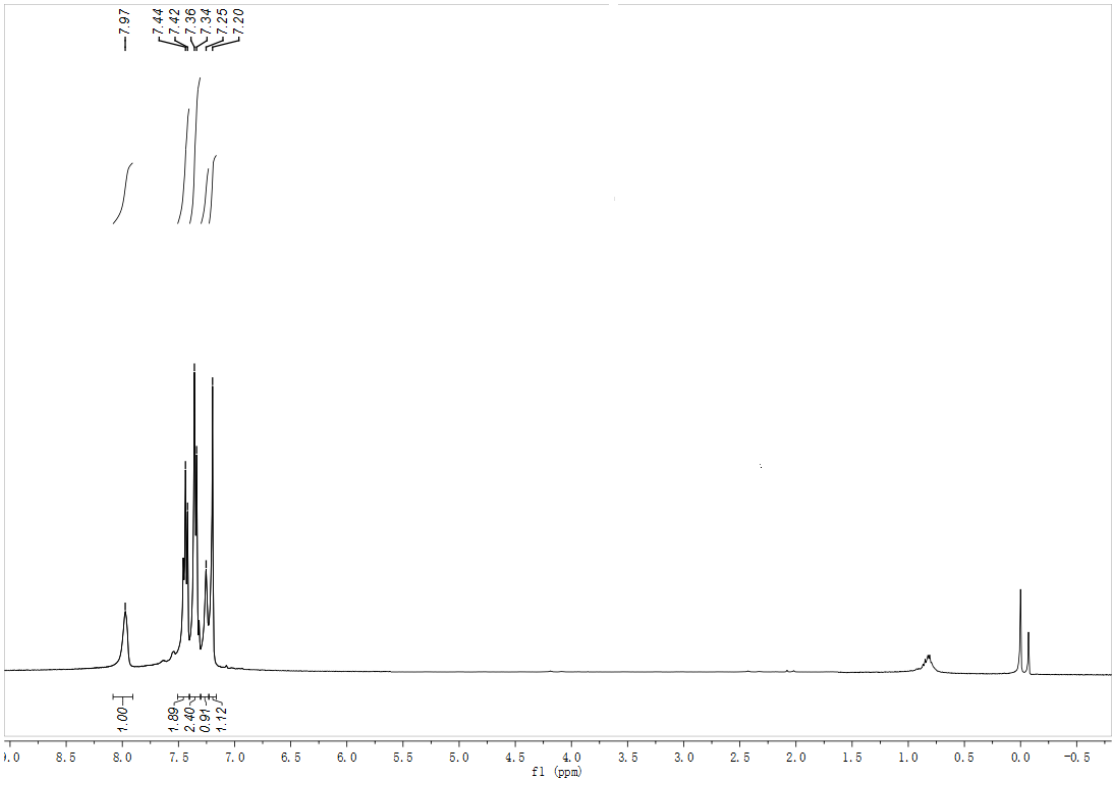
145
140
135
130
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
f1 (ppm)

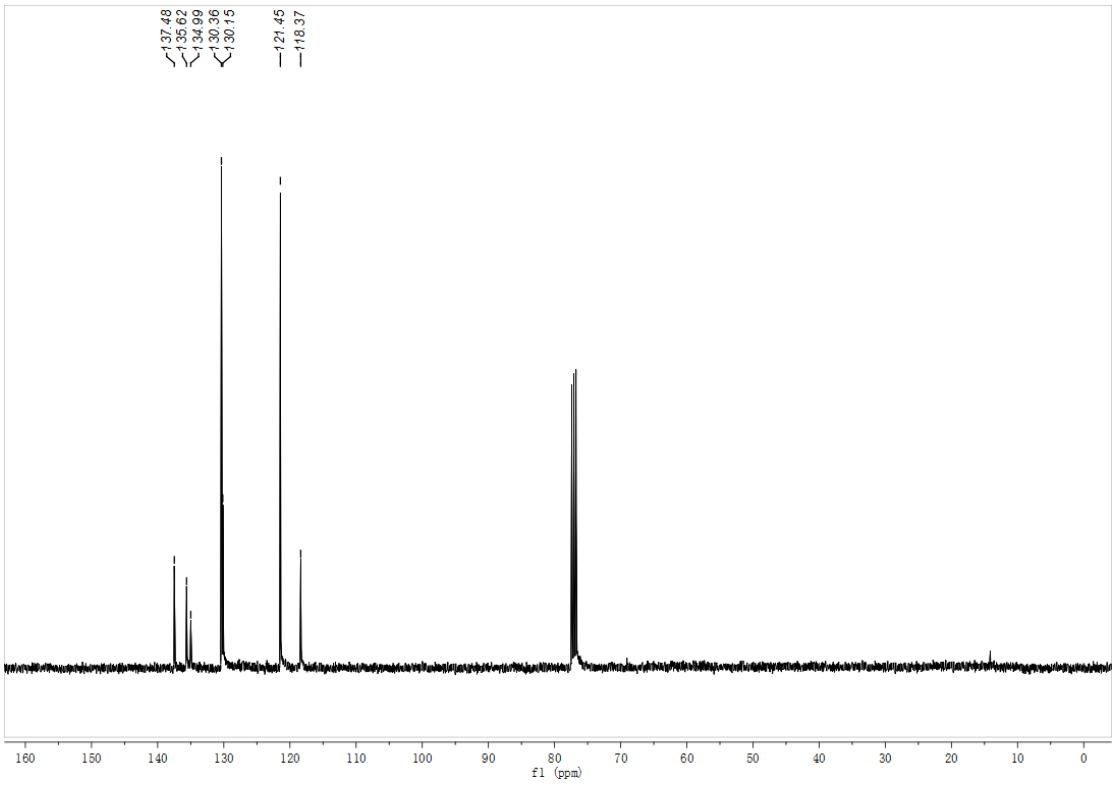

OCF3
N
N

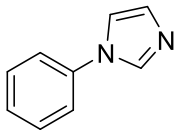

7.84
7.45
7.42
7.36
7.34
7.27
7.22
1.00
1.94
1.96
1.13
1.02
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

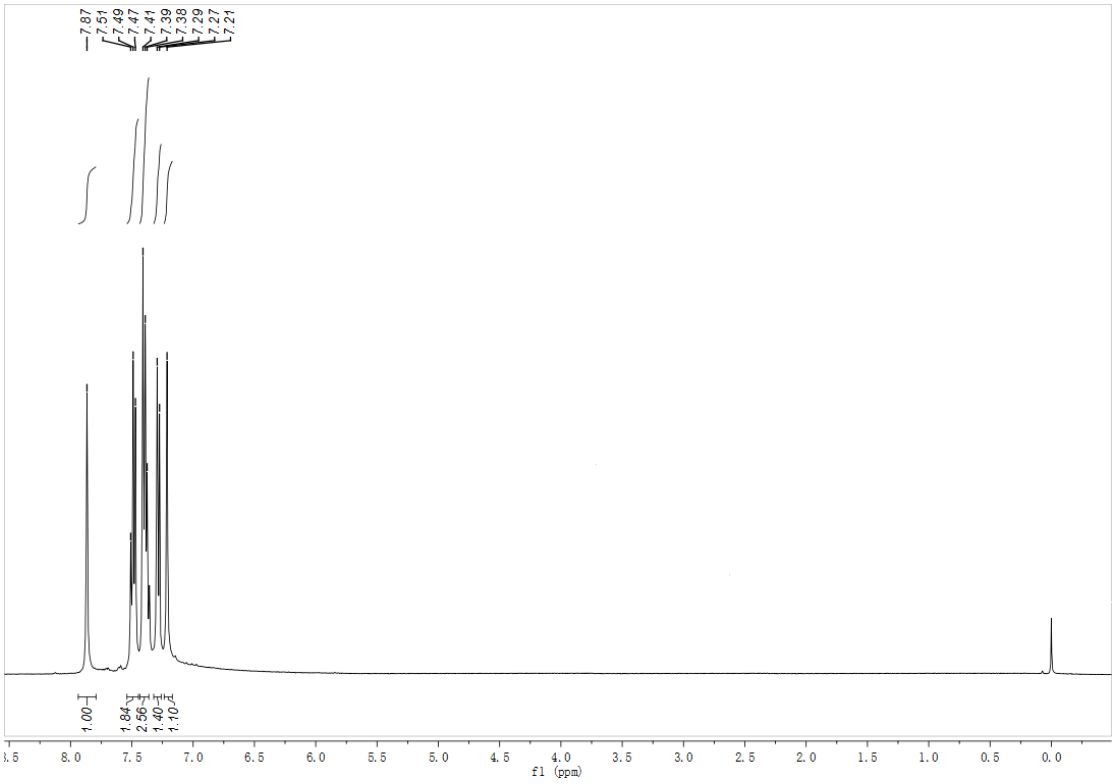

148.10
135.90
135.63
130.79
122.92
122.54
121.67
119.10
118.30
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

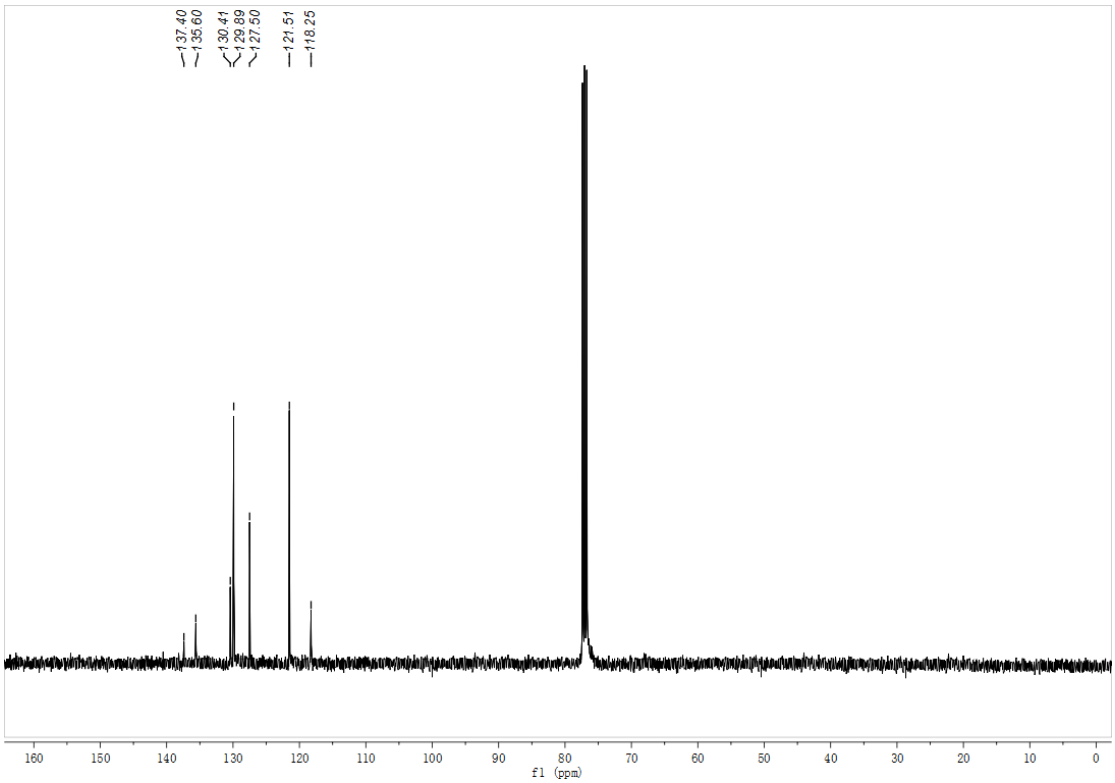

CF3
N
N

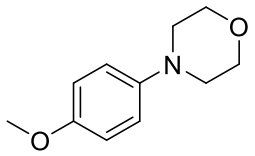

7.97
7.44
7.42
7.36
7.34
7.25
7.20
1.00
1.89
2.40
0.91
1.12
f1 (ppm)

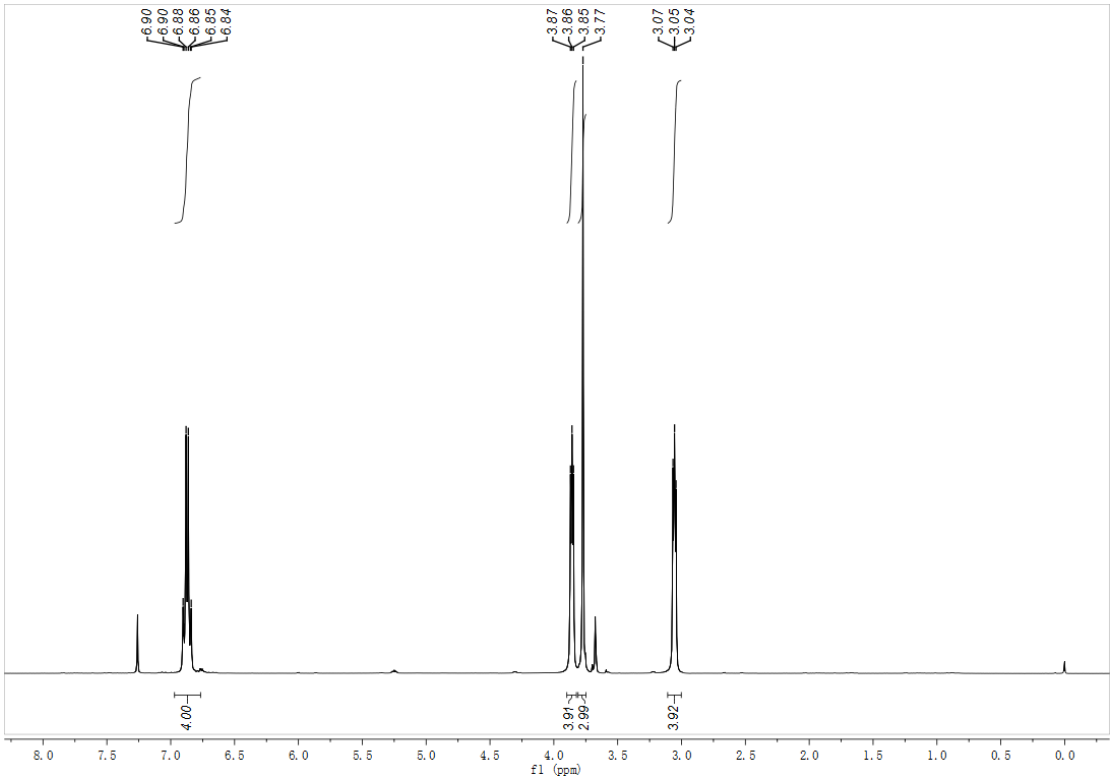

137.48
135.62
134.99
130.36
130.15
121.45
118.37
f1 (ppm)




7.87
7.51
7.49
7.47
7.41
7.39
7.38
7.29
7.27
7.21
1.00
1.84
2.56
1.40
1.10
f1 (ppm)


137.40
135.60
130.41
129.89
127.50
121.51
118.25
f1 (ppm)


O
N
O


6.90
6.90
6.88
6.86
6.85
6.84
3.87
3.86
3.85
3.77
3.07
3.05
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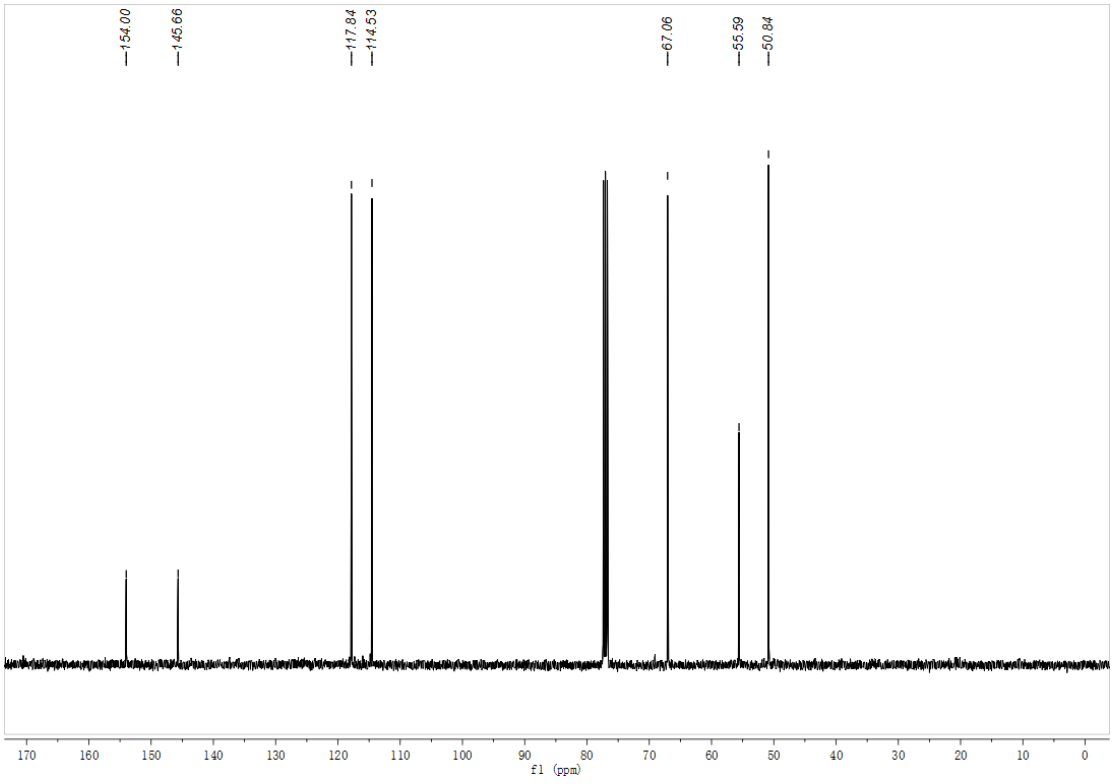
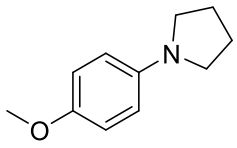
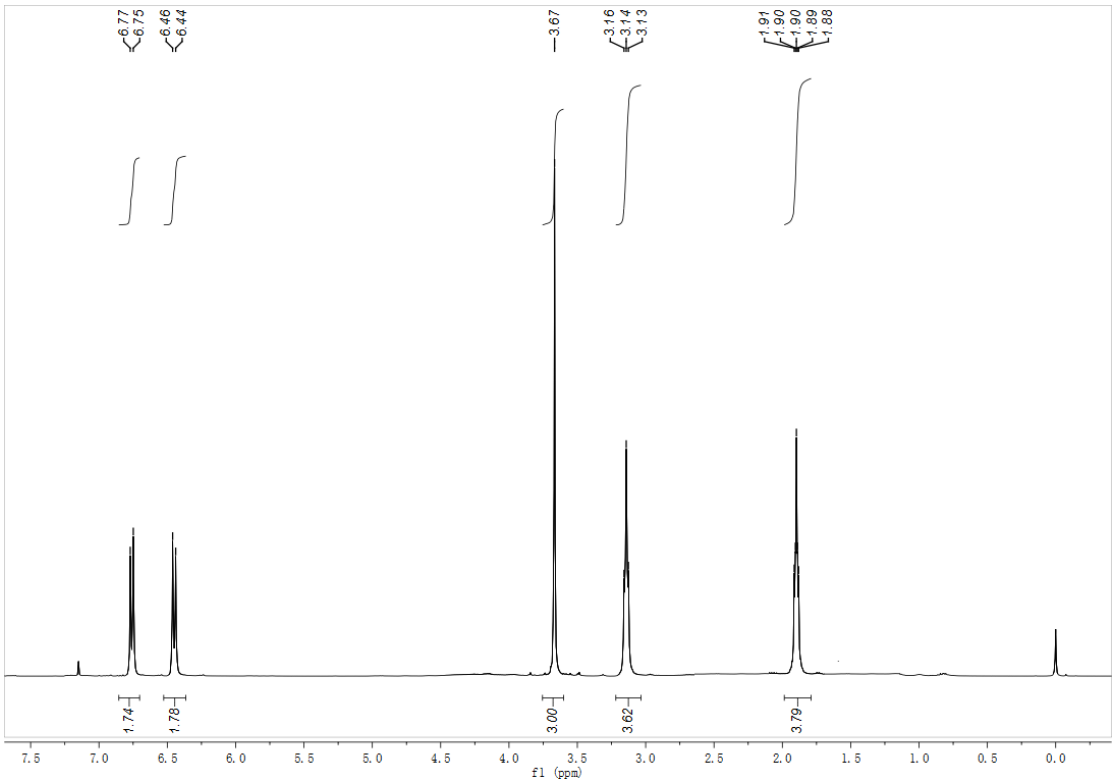
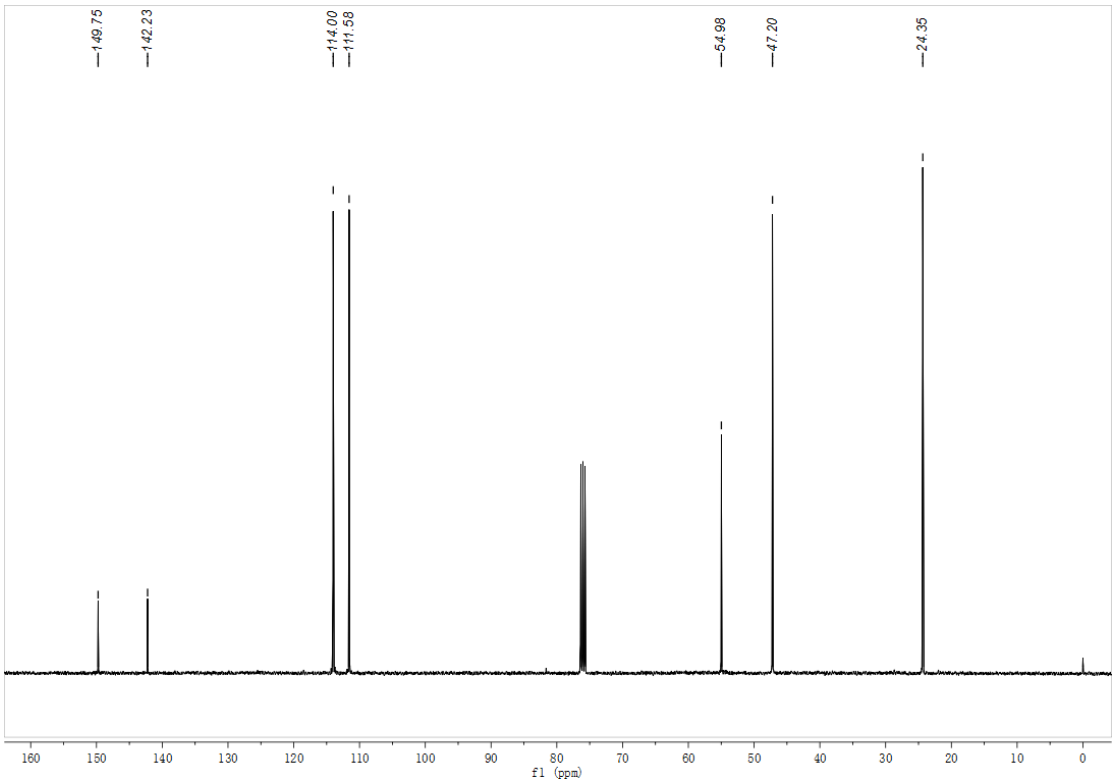
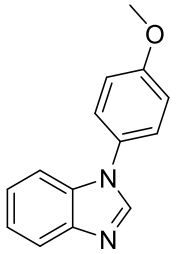
4.00
3.91
2.99
3.92
f1 (ppm)

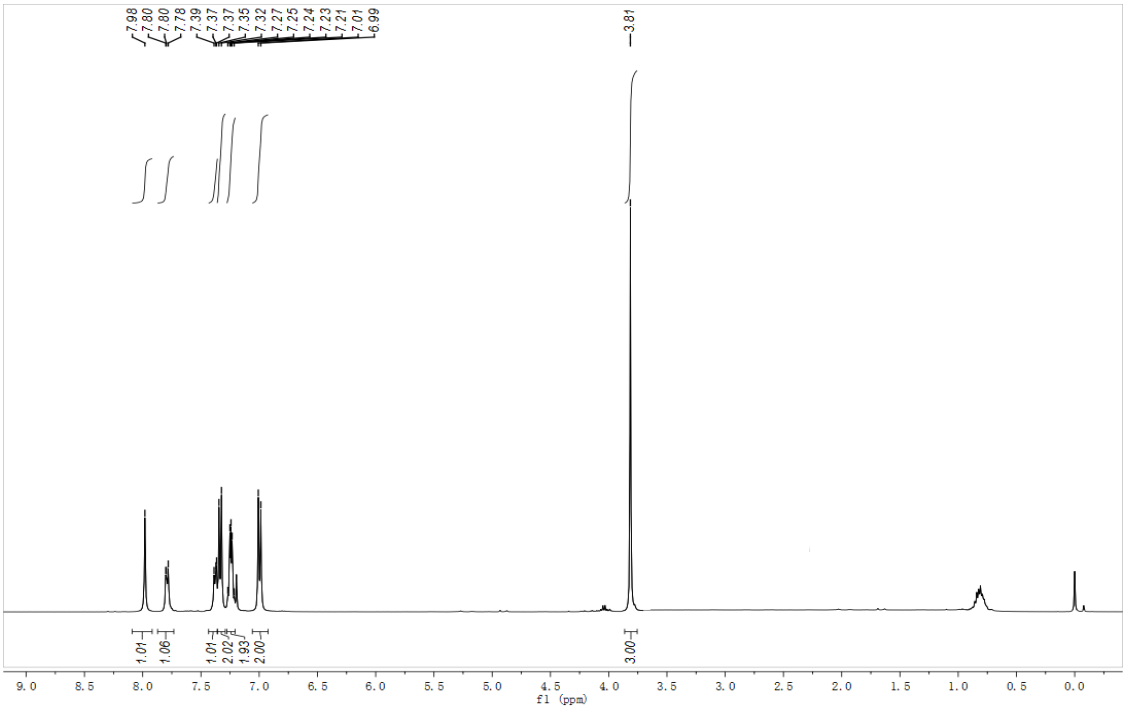

154.00
145.66
117.84
114.53
67.06
55.59
50.84
f1 (ppm)

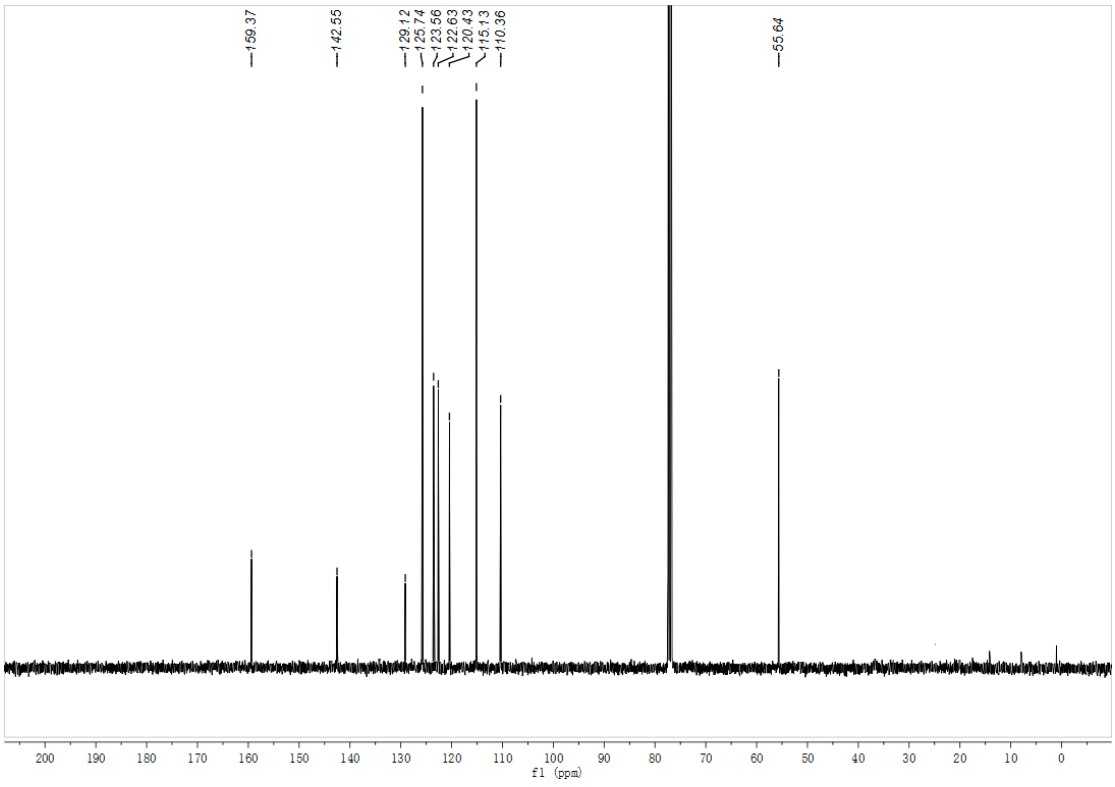

N
O

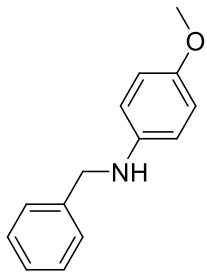

6.77
6.75
6.46
6.44
3.67
3.16
3.14
3.13
1.91
1.90
1.90
1.89
1.88
1.74
1.78
3.00
3.62
3.79
f1 (ppm)

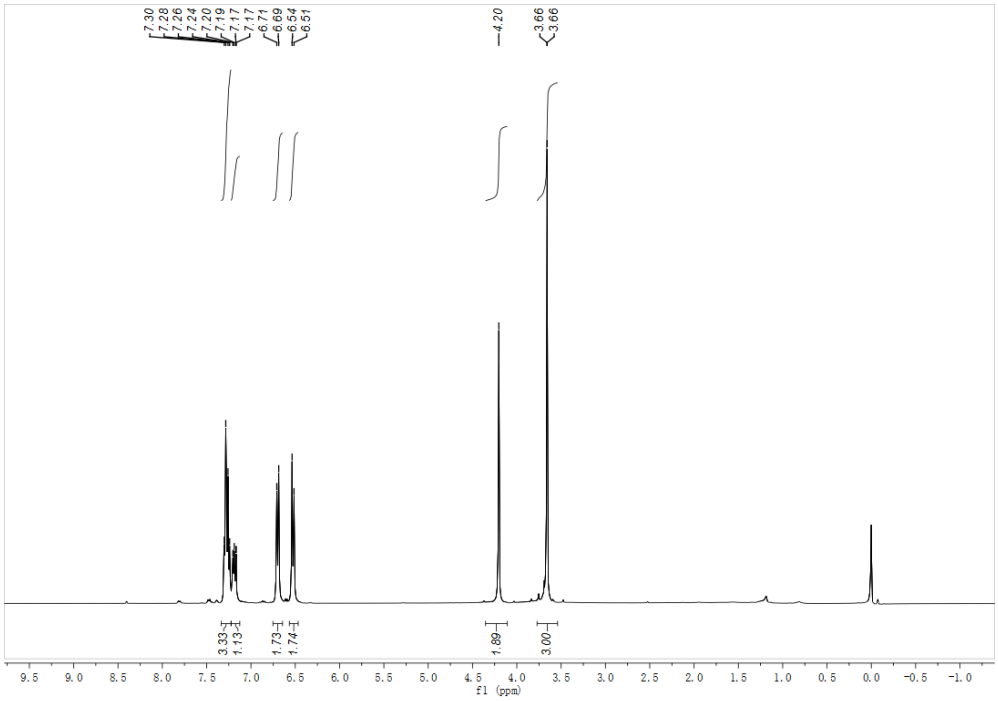

149.75
142.23
114.00
111.58
54.98
47.20
24.35
f1 (ppm)

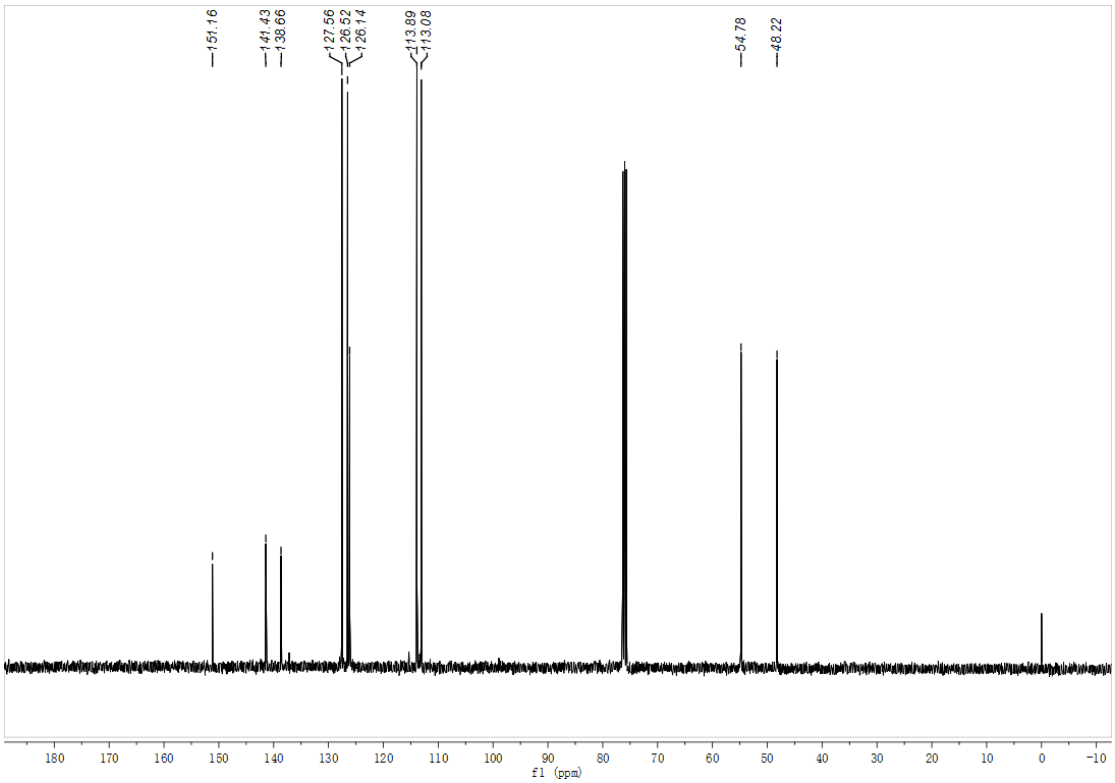

O
N
N

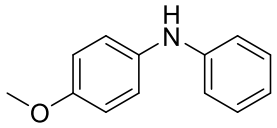

7.98
7.80
7.80
7.78
7.39
7.37
7.37
7.35
7.32
7.27
7.25
7.24
7.23
7.21
7.01
6.99
3.81
1.01
1.06
1.01
2.02
1.93
2.00
3.00
f1 (ppm)

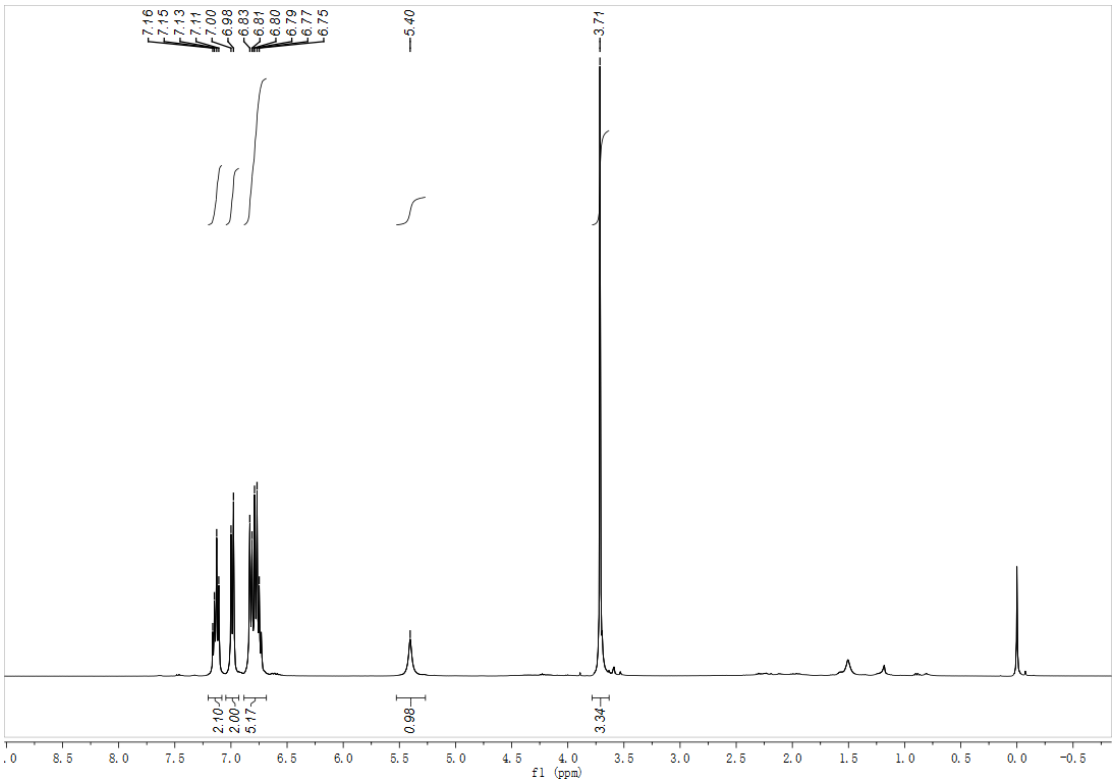

159.37
142.55
129.12
125.74
123.56
122.63
120.43
115.13
110.36
55.64
f1 (ppm)


O
NH


7.30
7.28
7.26
7.24
7.20
7.19
7.17
7.17
6.71
6.69
6.54
6.51
4.20
3.66
3.66
3.33
1.13
1.73
1.74
1.89
3.00
f1 (ppm)


151.16
141.43
138.66
127.56
126.52
126.14
113.89
113.08
54.78
48.22
f1 (ppm)


H
N
O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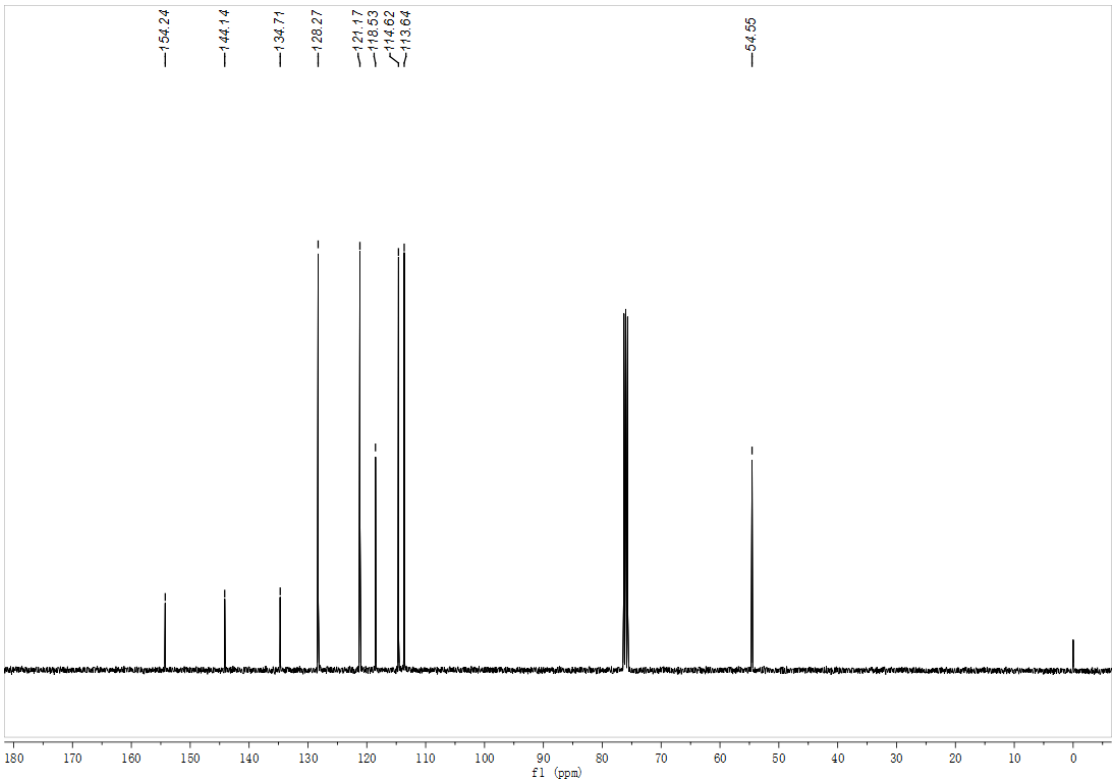
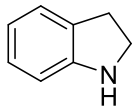
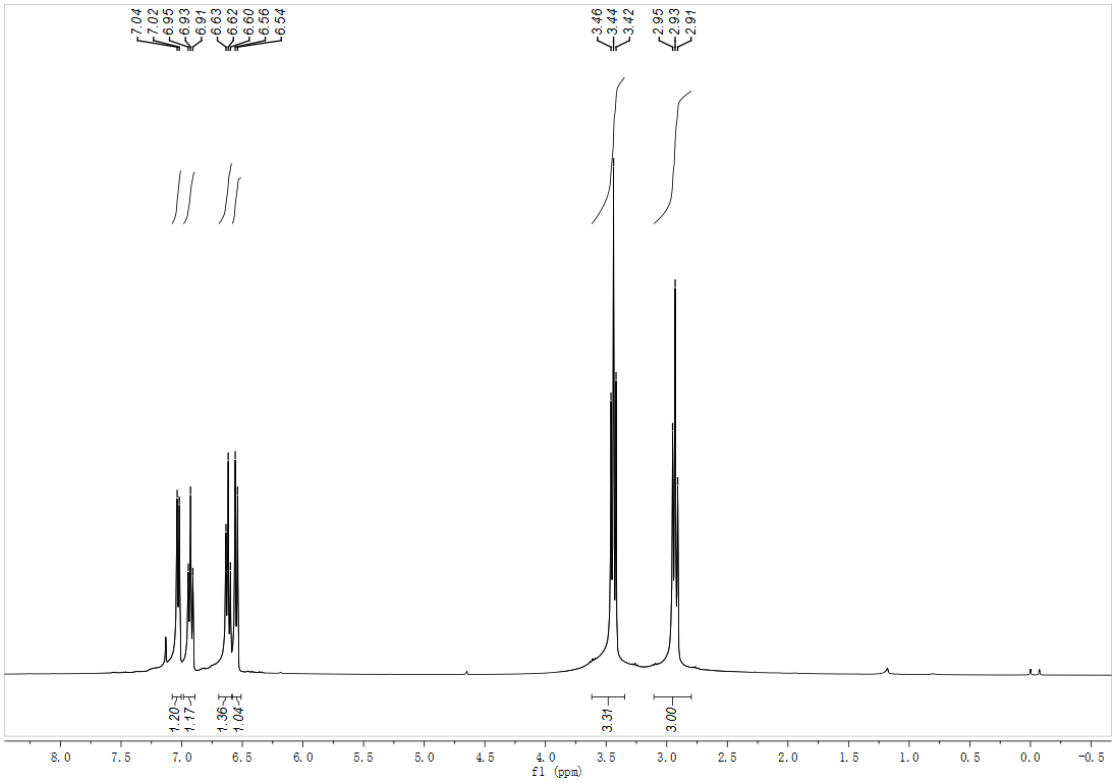
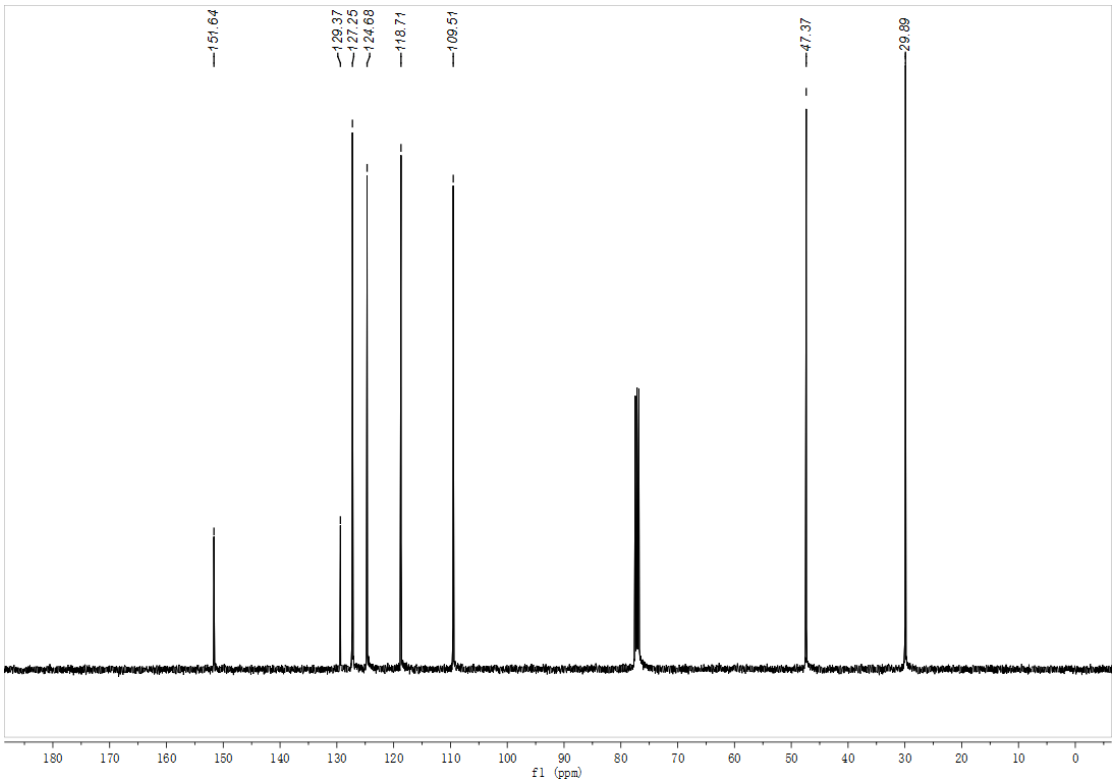
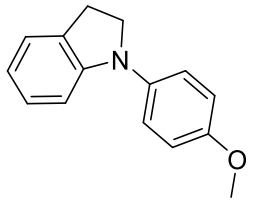
7.15
7.13
7.11
7.00
6.98
6.83
6.81
6.80
6.79
6.77
6.75
5.40
3.71
2.10
2.00
5.17
0.98
3.34
f1 (ppm)

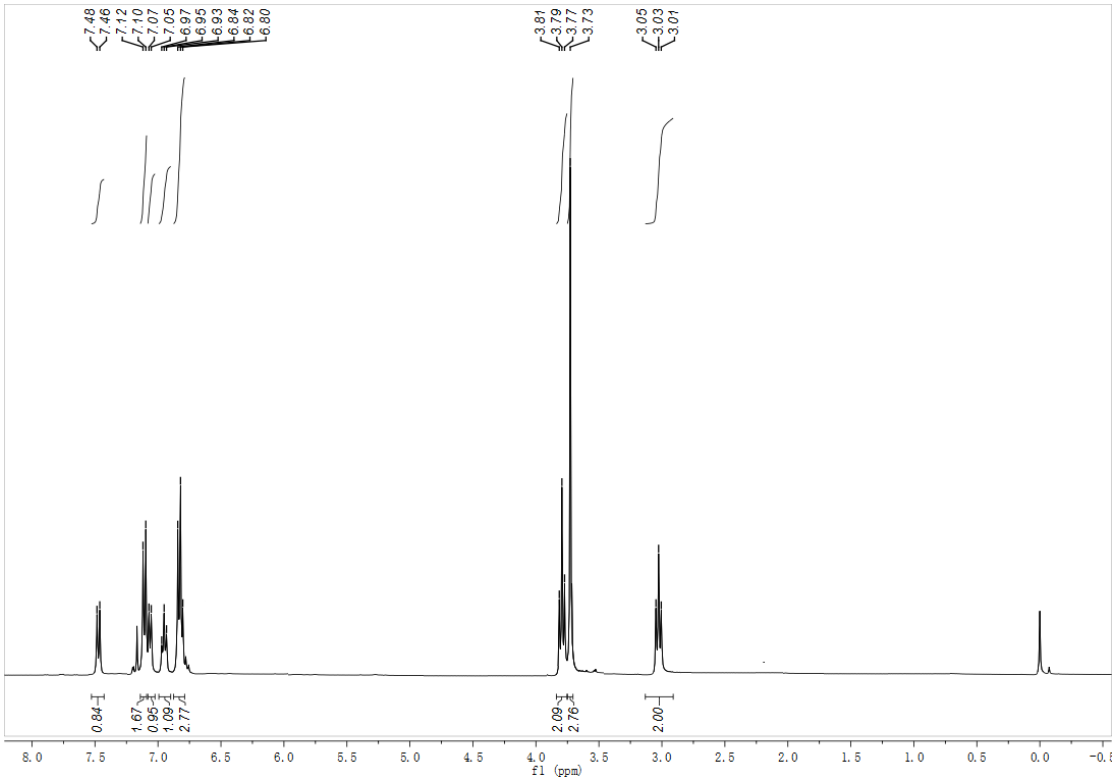

154.24
144.14
134.71
128.27
121.17
118.53
114.62
113.64
54.55
f1 (ppm)




7.04
7.02
6.95
6.93
6.91
6.63
6.62
6.60
6.56
6.54
3.46
3.44
3.42
2.95
2.93
2.91
1.20
1.17
1.36
1.04
3.31
3.00
f1 (ppm)


151.64
129.37
127.25
124.68
118.71
109.51
47.37
29.89
f1 (ppm)


N
O


7.48
7.46
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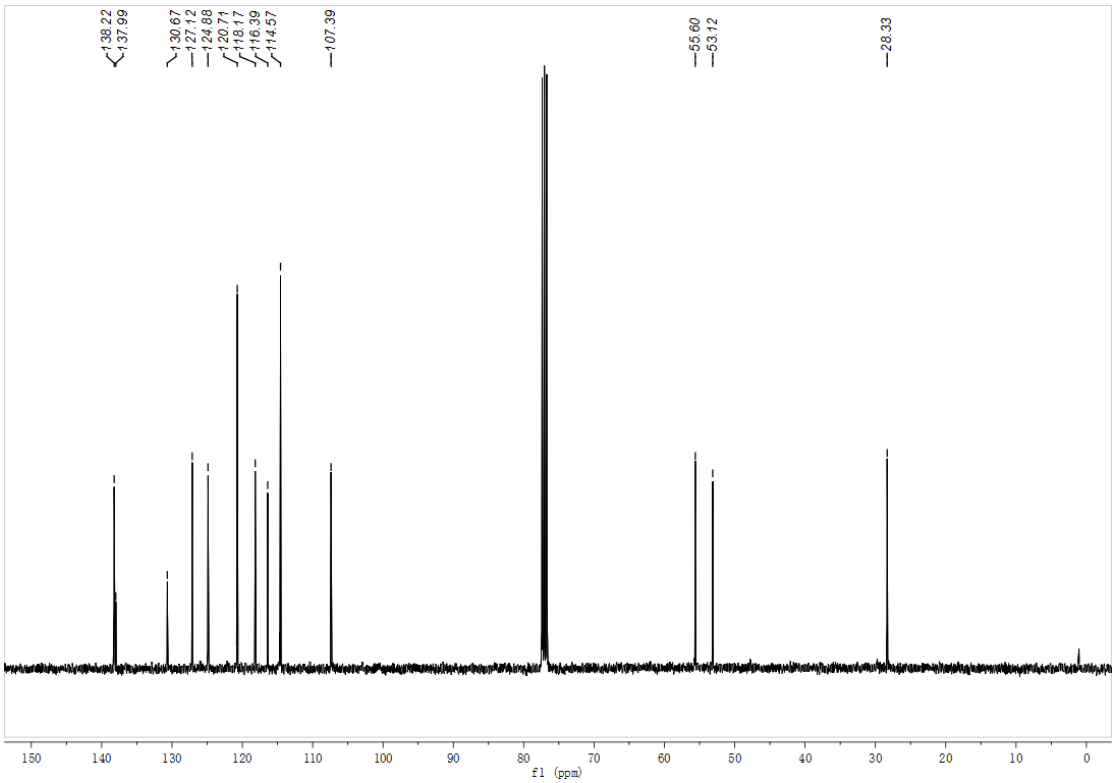
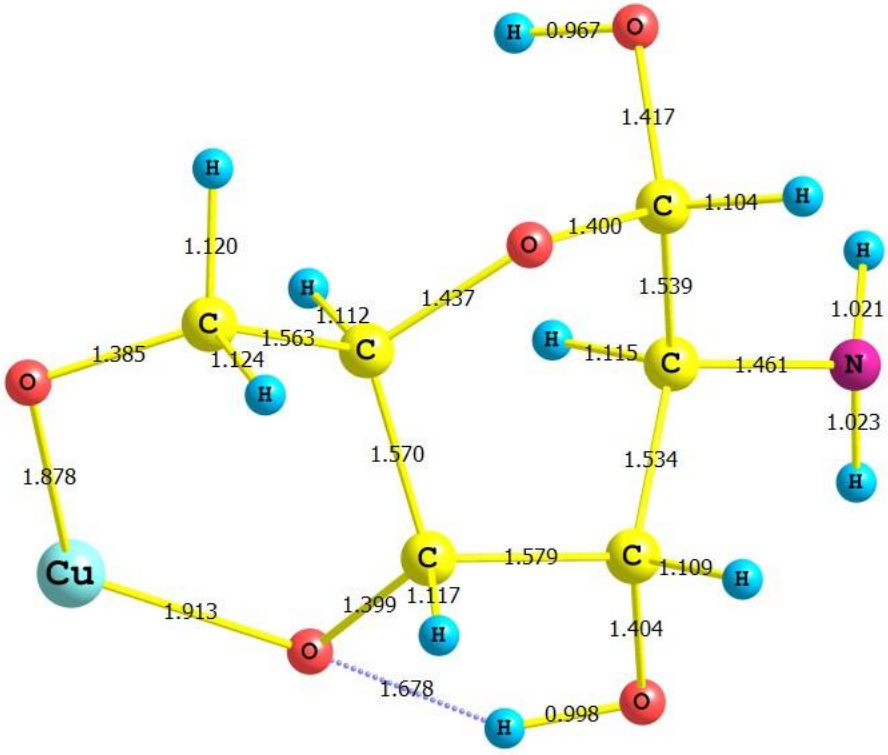
7.10
7.07
7.05
6.97
6.95
6.93
6.84
6.82
6.80
3.81
3.79
3.77
3.73
3.05
3.03
3.01
0.84
1.67
0.95
1.09
2.77
2.09
2.76
2.00
f1 (ppm)

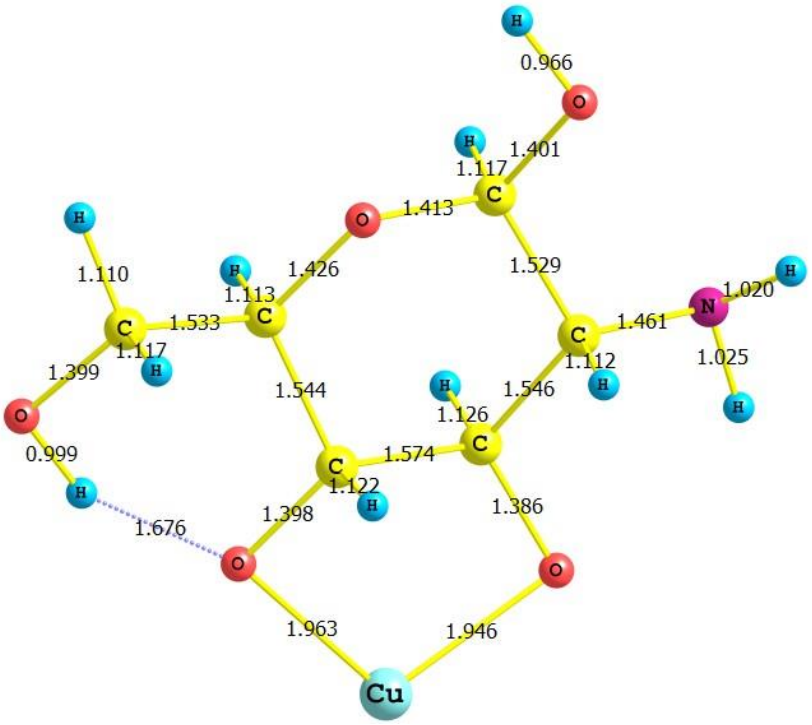

138.22
137.99
130.67
127.12
124.88
120.71
118.17
116.39
114.57
107.39
55.60
53.12
28.33
f1 (ppm)

Structural information of associated coordinates for the most favorable pathways

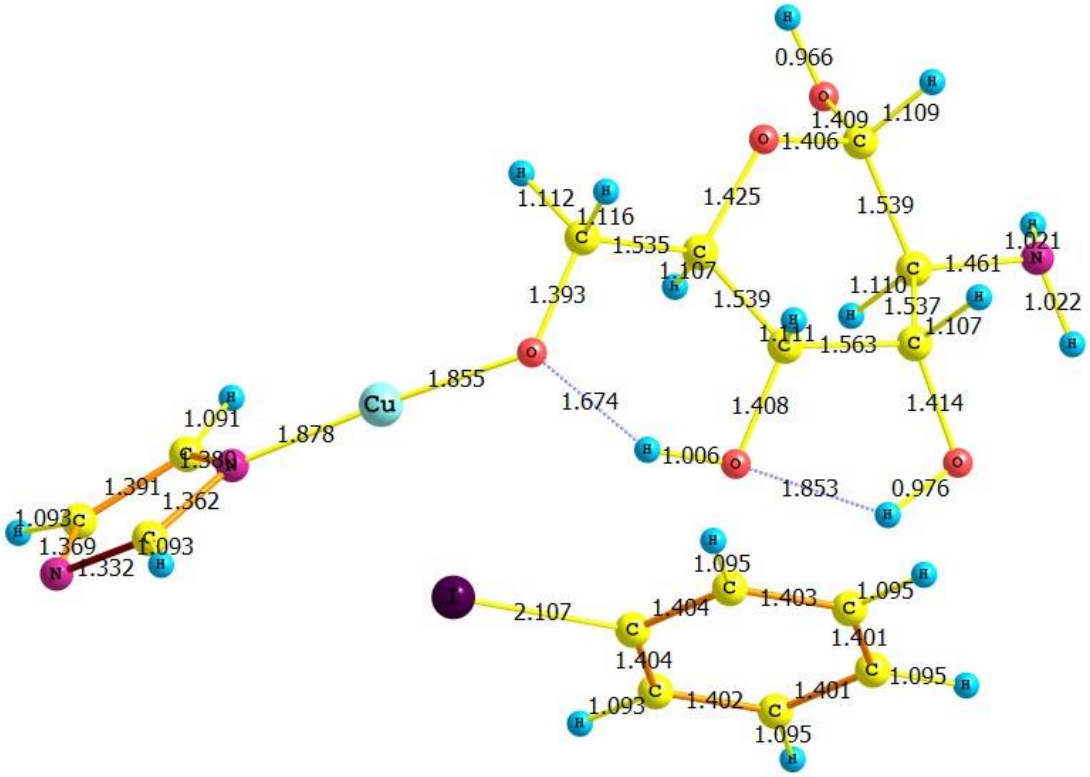
Selected bond lengths are in Å.



Cat. A


0.966
1.401
1.117
1.413
1.529
1.110
1.426
1.113
1.020
1.533
1.461
1.117
1.112
1.025
1.399
1.544
1.546
1.126
0.999
1.574
1.122
1.398
1.386
1.676
1.963
1.946
Cu

Cat. B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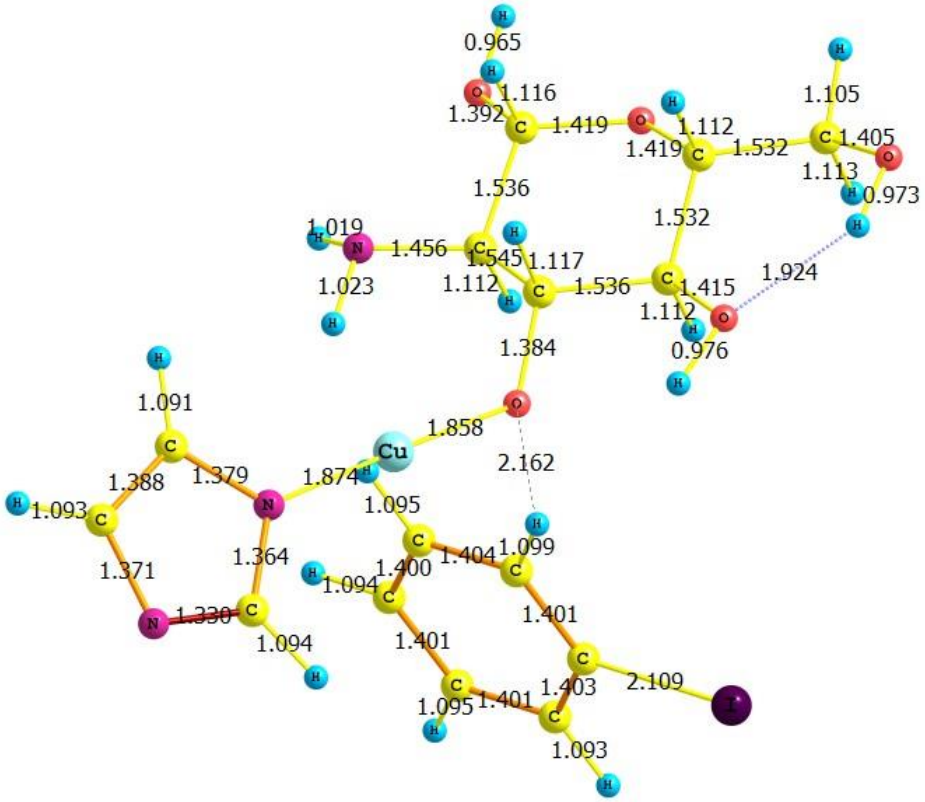
1.109
1.406
1.425
1.539
1.112
1.116
1.535
1.107
1.461
1.021
1.393
1.539
1.110
1.537
1.022
1.107
1.563
1.855
1.674
1.408
1.414
Cu
1.091
1.878
1.006
1.853
0.976
1.391
1.362
1.093
1.369
1.332
1.095
2.107
1.404
1.403
1.095
1.401
1.404
1.401
1.095
1.093
1.402
1.095

IM1a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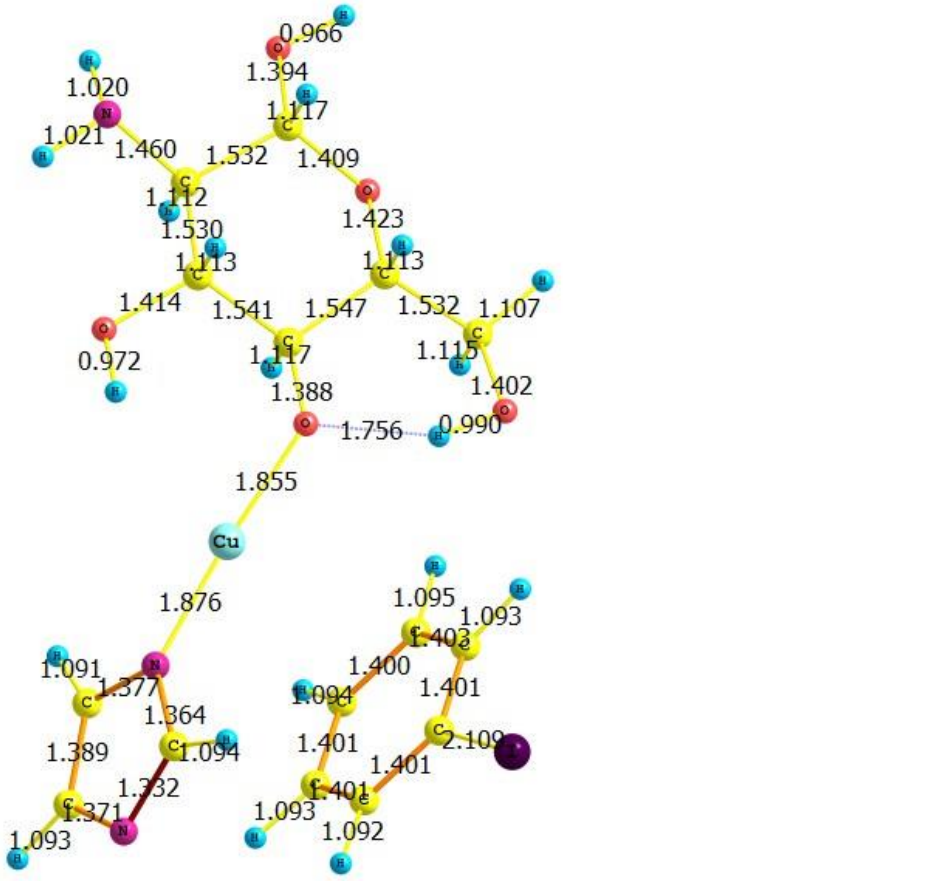
1.116
1.392
1.419
1.419
1.112
1.532
1.105
1.405
1.113
0.973
1.536
1.532
1.019
1.456
1.545
1.117
1.112
1.536
1.415
1.924
1.023
1.112
0.976
1.384
1.091
1.858
Cu
2.162
1.388
1.379
1.874
1.095
1.093
1.099
1.364
1.400
1.404
1.371
1.094
1.401
1.330
1.094
1.401
2.109
1.403
1.095
1.401
1.093

IM1b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1.394
1.020
1.117
1.021
1.460
1.532
1.409
1.112
1.423
1.530
1.113
1.113
1.414
1.541
1.547
1.532
1.107
0.972
1.117
1.115
1.402
1.388
0.990
1.756
1.855
Cu
1.876
1.095
1.093
1.403
1.091
1.400
1.377
1.094
1.401
1.364
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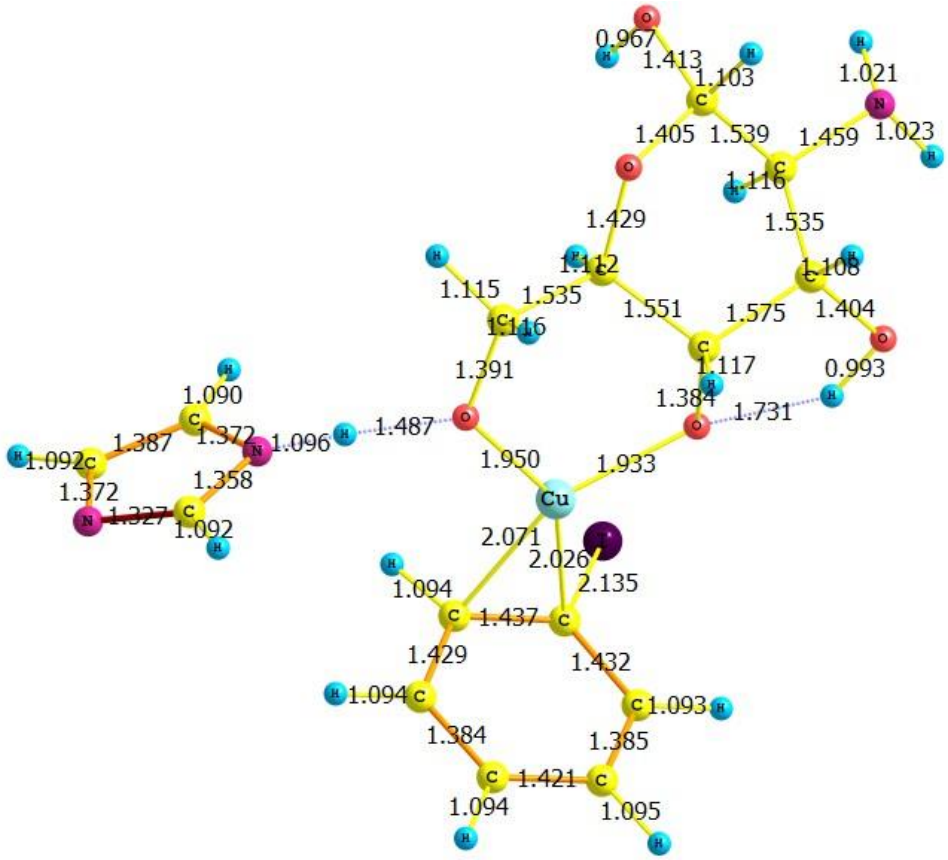
1.094
1.401
2.109
1.332
1.401
1.371
1.093
1.092
1.093

IM1c


0.967
1.413
1.103
1.021
1.405
1.539
1.459
1.023
1.116
1.429
1.535
1.112
1.108
1.115
1.535
1.551
1.575
1.404
1.116
1.117
0.993
1.391
1.384
1.731
1.090
1.487
1.387
1.372
1.096
1.092
1.950
1.933
1.358
1.372
1.327
1.092
Cu
2.071
2.026
2.135
1.094
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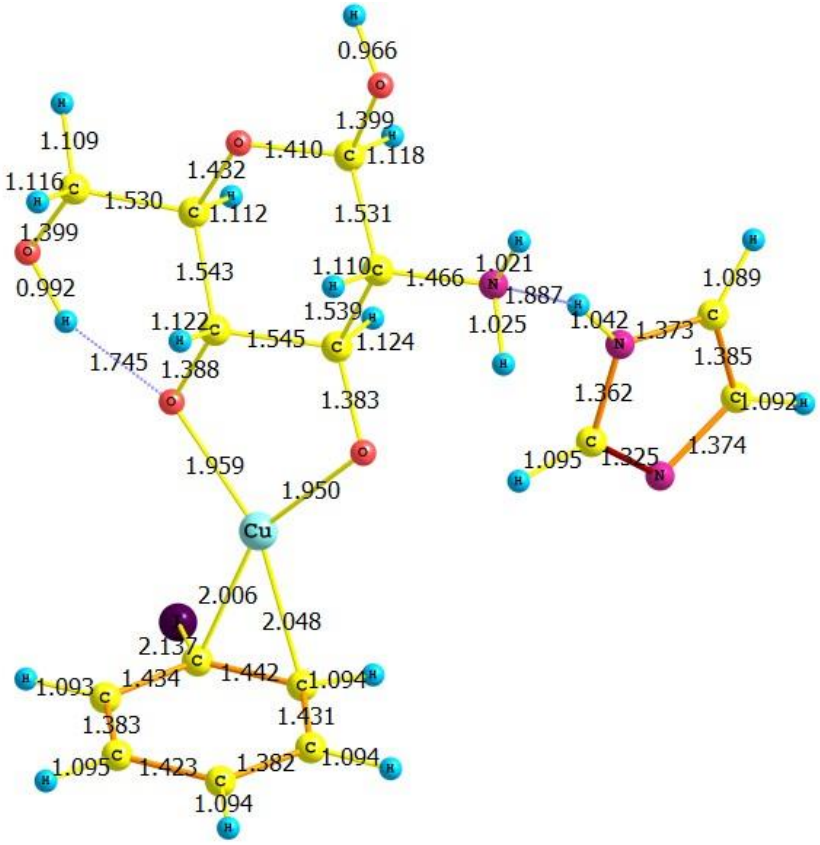
1.429
1.432
1.094
1.093
1.384
1.385
1.421
1.094
1.095

IM1d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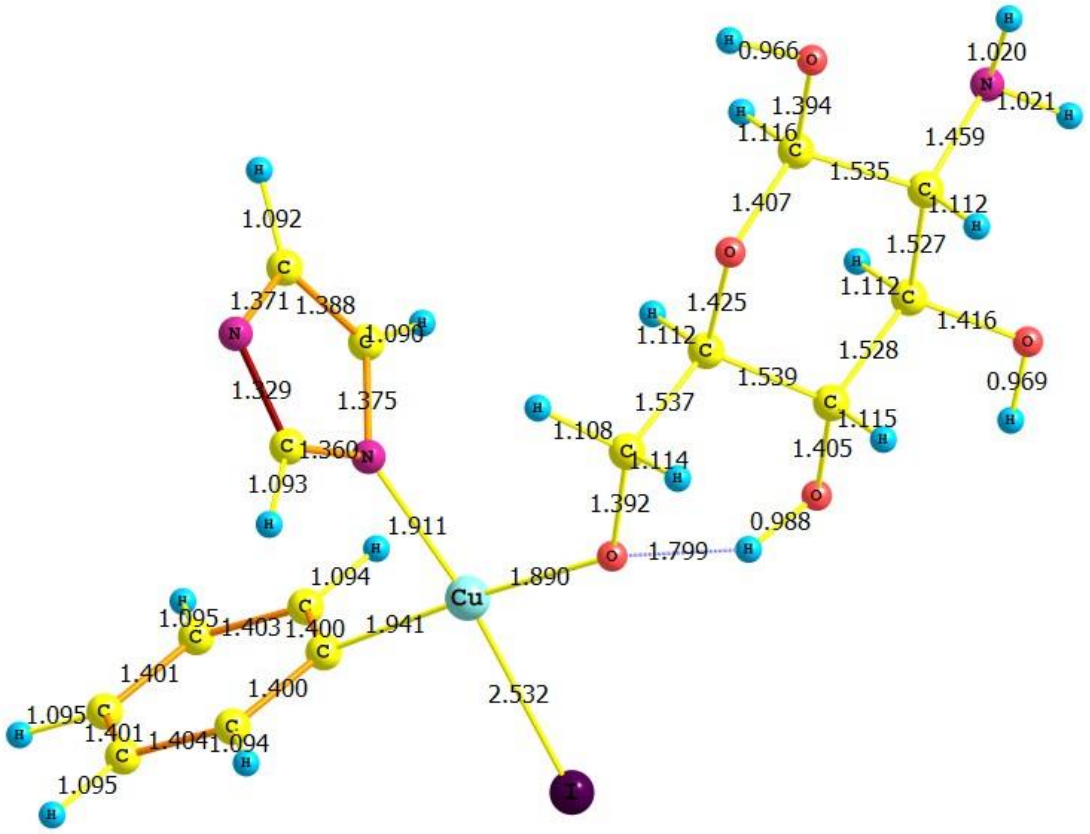
1.399
1.109
1.410
1.118
1.432
1.116
1.530
1.112
1.531
1.399
1.543
1.110
1.466
1.021
1.887
1.089
0.992
1.539
1.025
1.042
1.373
1.122
1.545
1.124
1.385
1.745
1.388
1.362
1.092
1.383
1.095
1.325
1.374
1.959
1.950
Cu
2.006
2.048
2.137
1.442
1.434
1.094
1.093
1.431
1.383
1.095
1.423
1.382
1.094
1.094

IM1e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1.890
Cu
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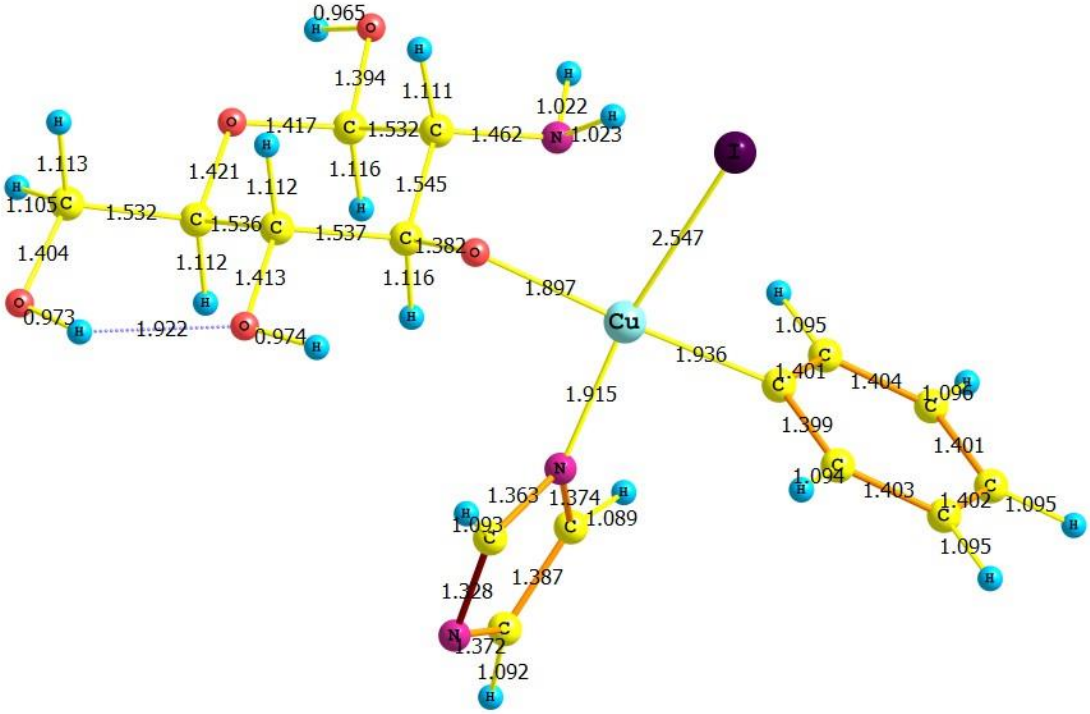
IM2a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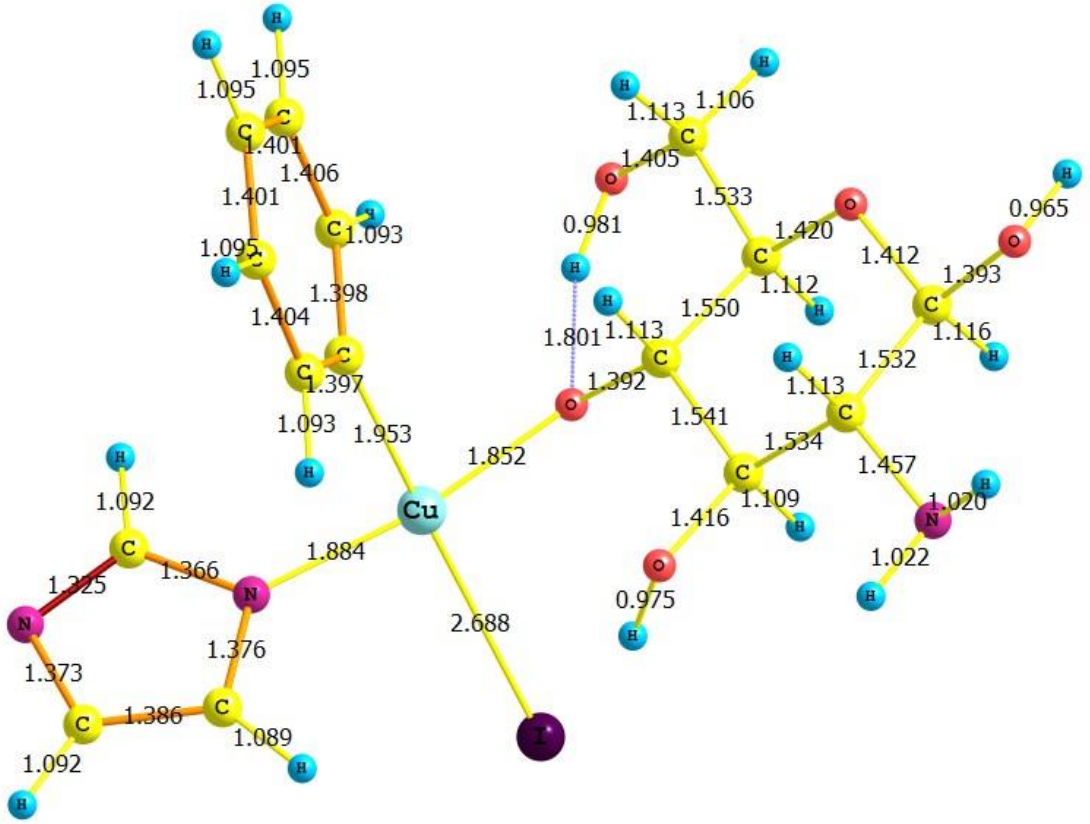
IM2b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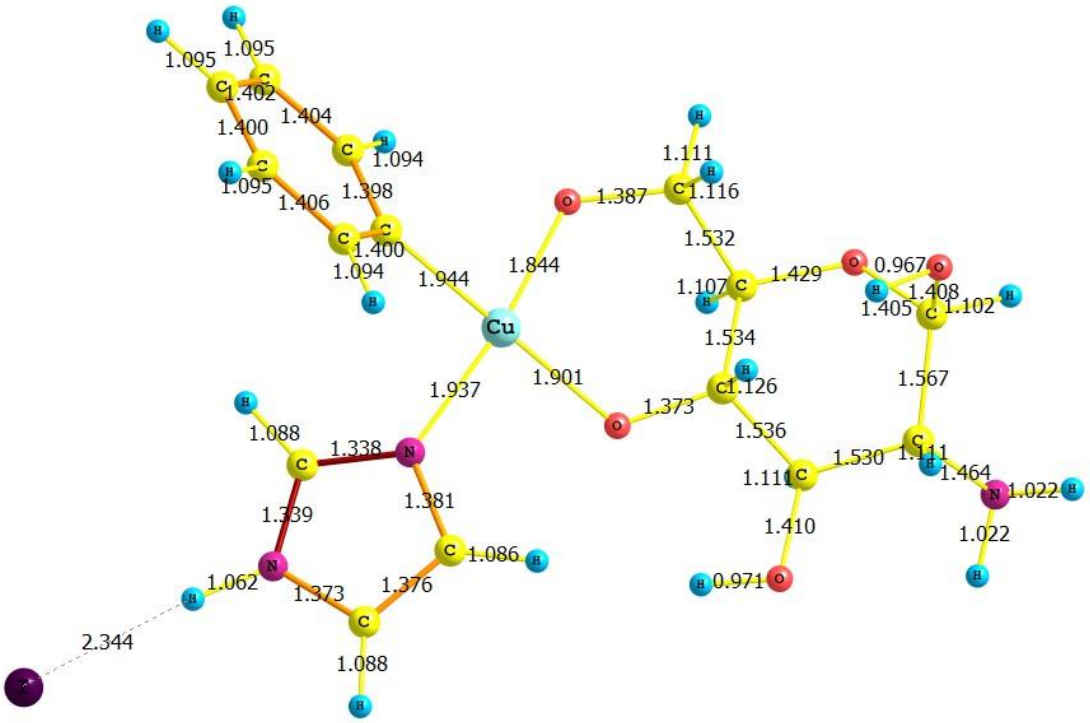
IM2c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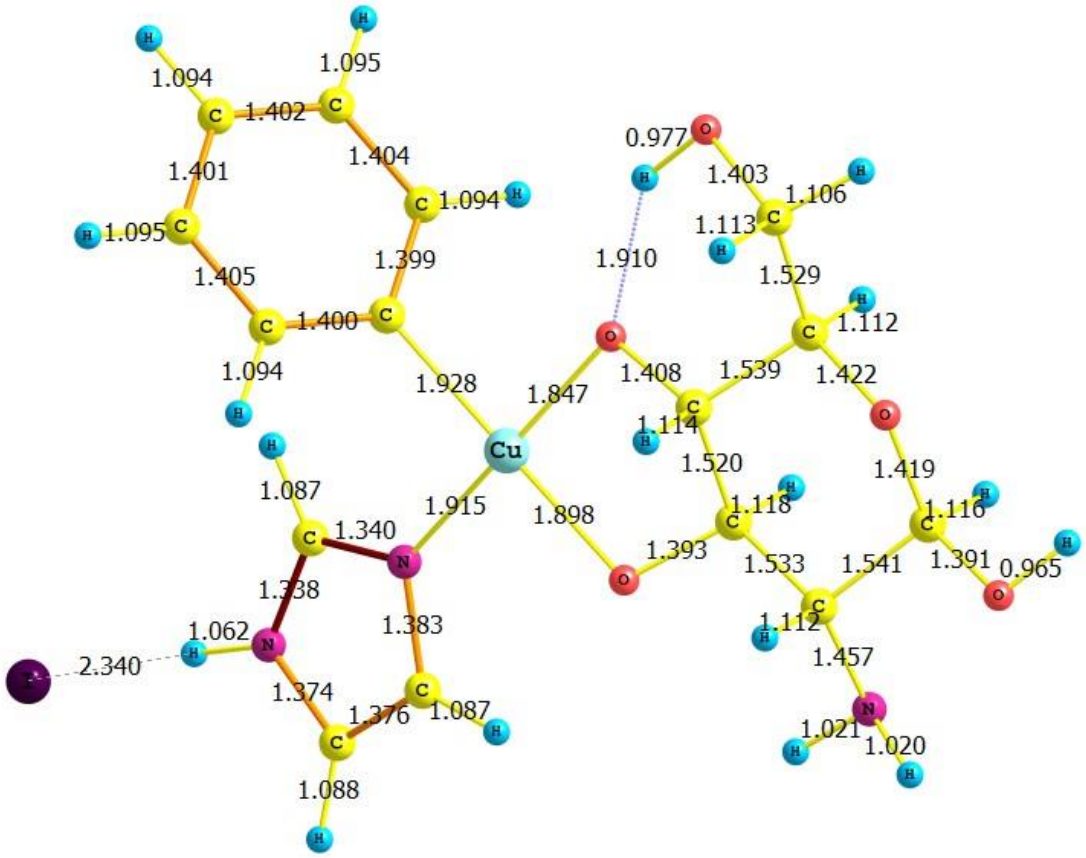
1.088

IM2d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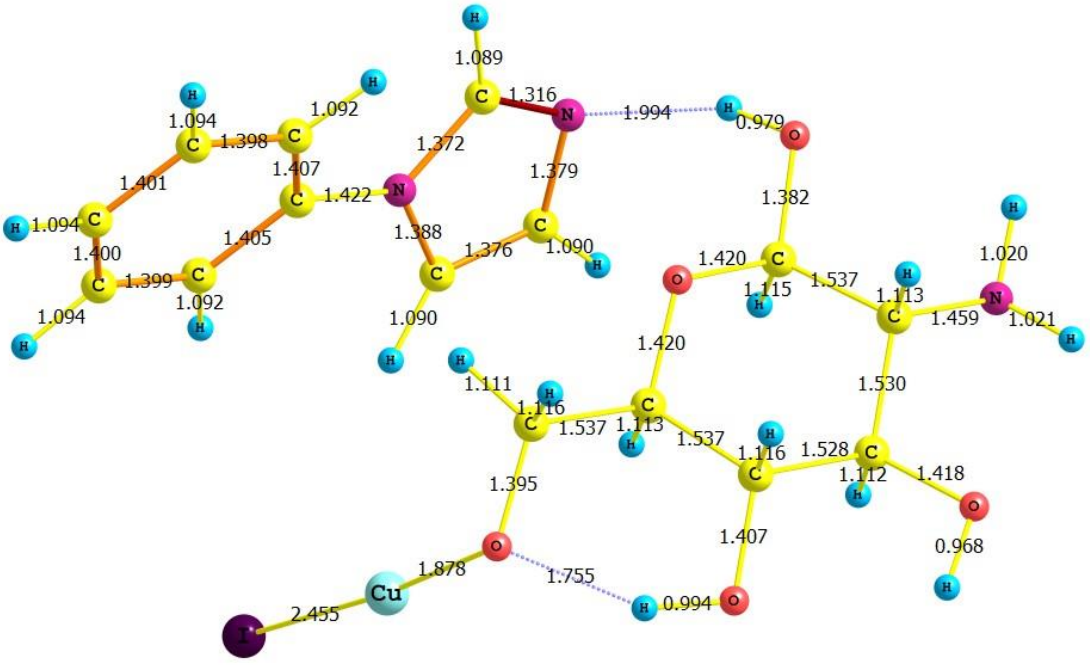
1.020

IM2e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1.094
1.388
1.376
1.090
1.400
1.405
1.420
1.020
1.399
1.092
1.537
1.113
1.459
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1.111
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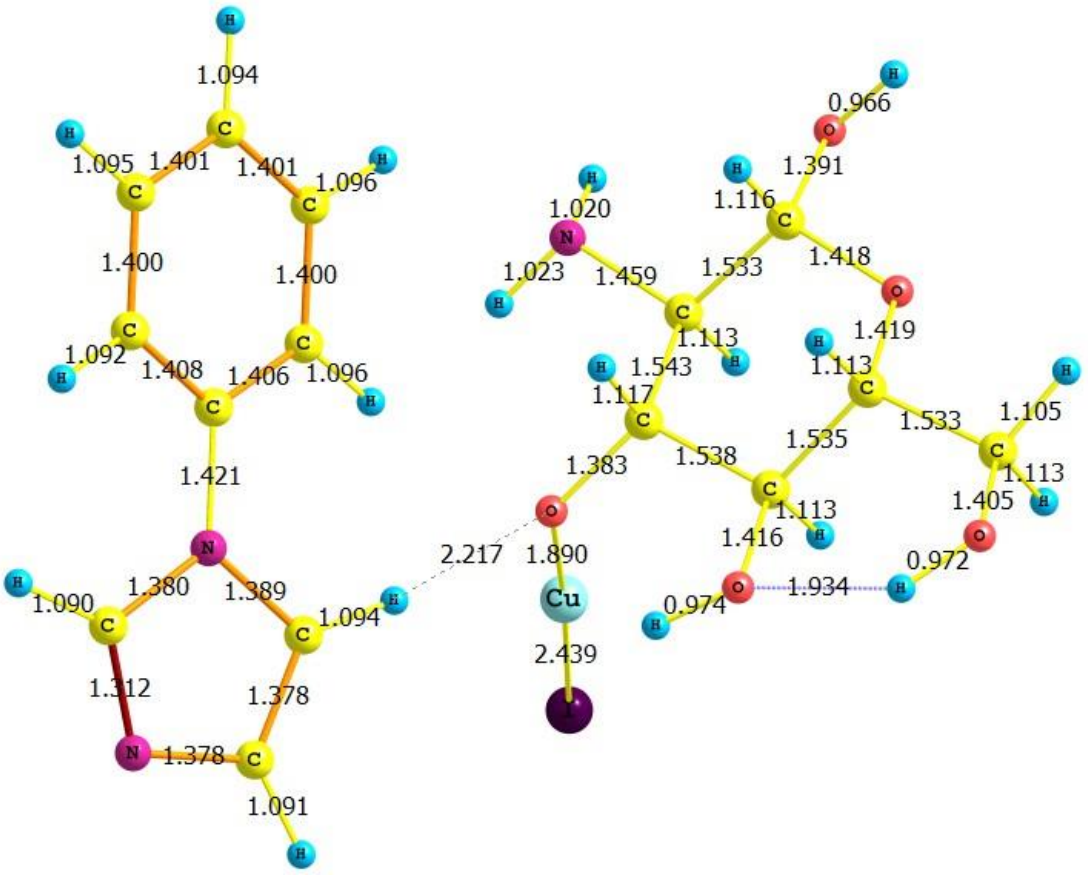
IM3a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1.094
1.312
1.378
1.378
1.091
2.217
1.890
Cu
2.439
0.966
1.391
1.116
1.020
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1.117
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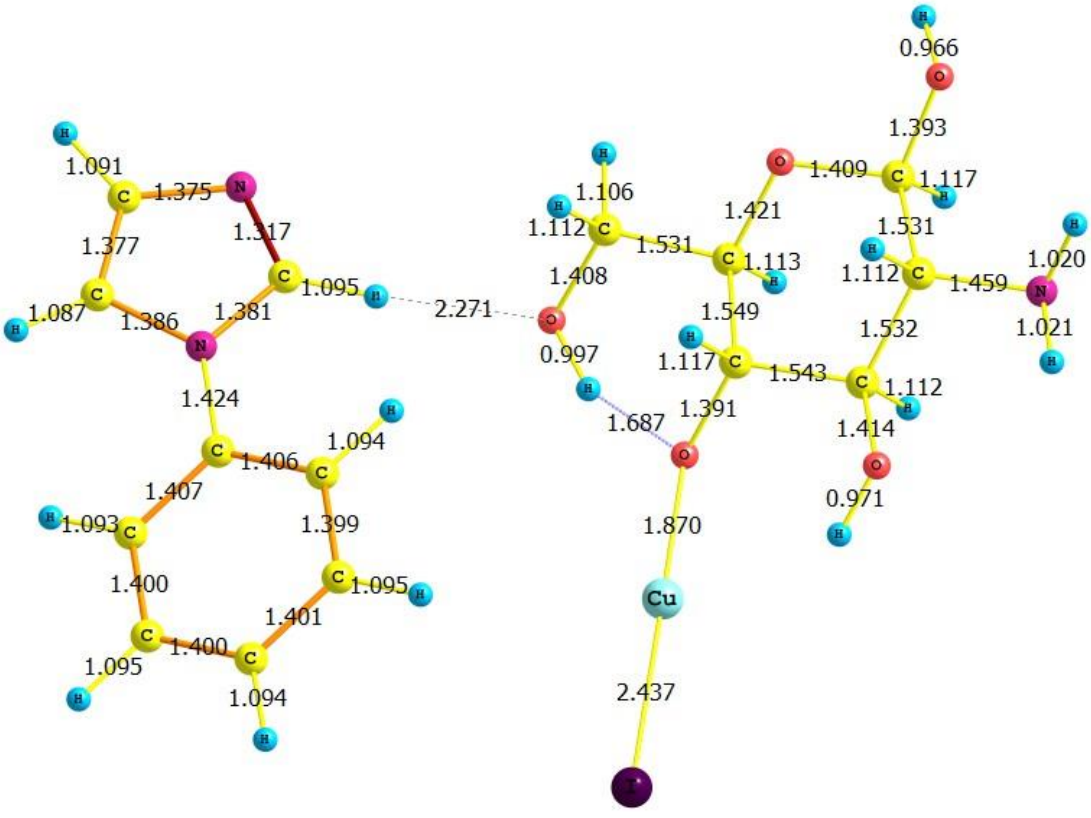
IM3b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Cu
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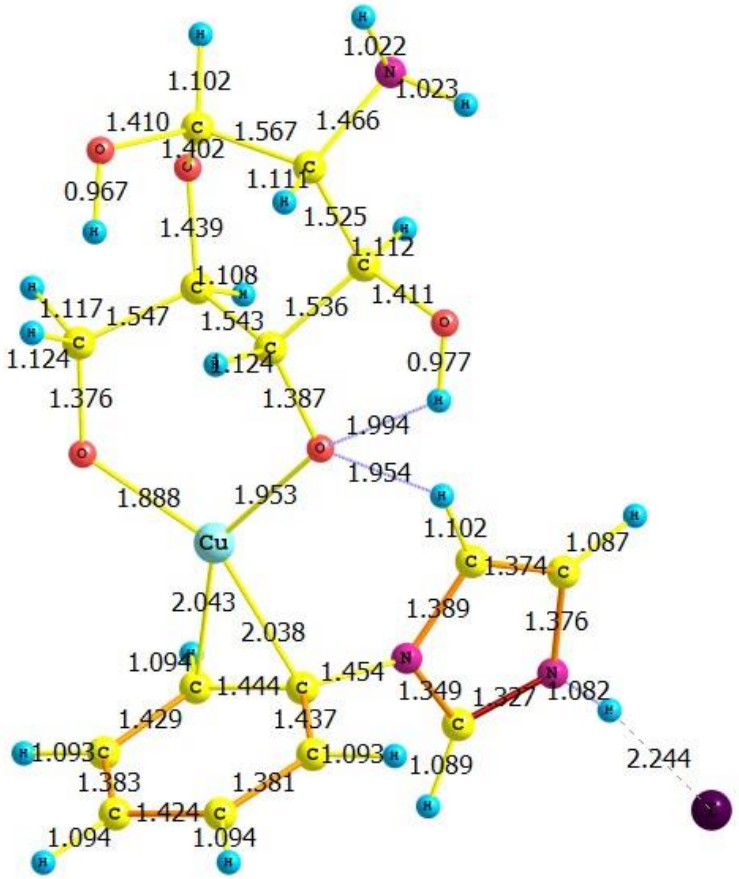
IM3c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Cu
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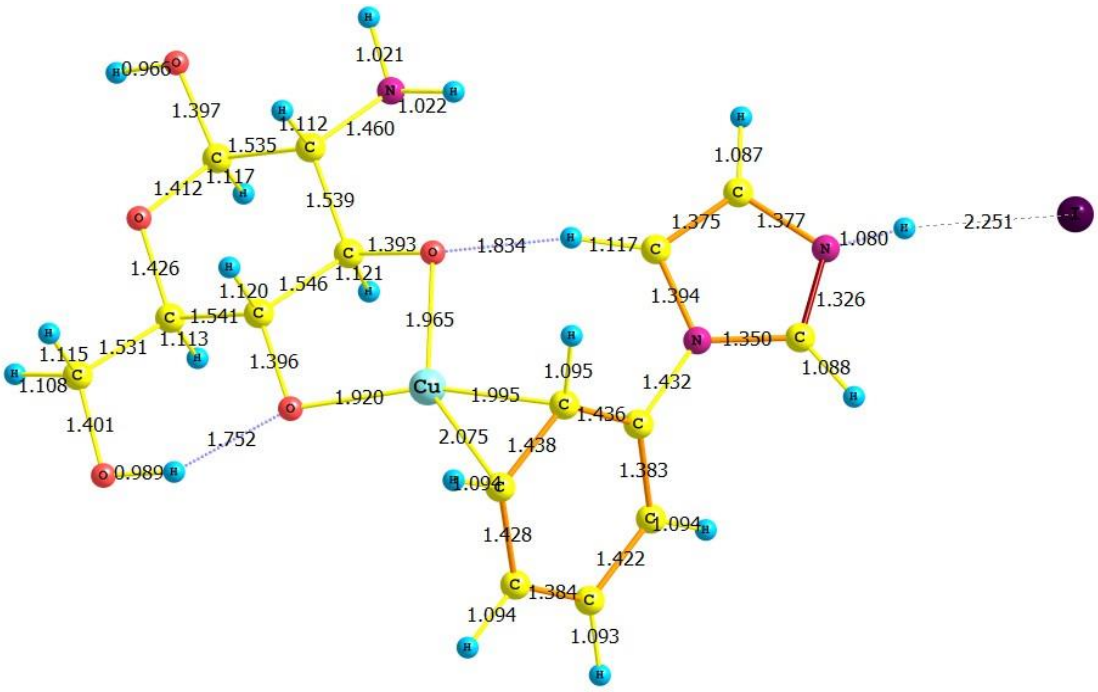
IM3d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1.120
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1.531
1.113
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1.095
1.088
1.108
Cu
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1.432
1.920
1.436
1.401
1.752
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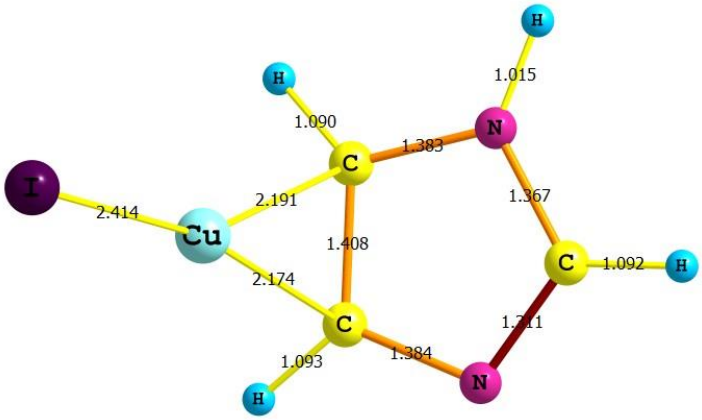
1.383
1.094
1.428
1.422
1.384
1.094
1.093

IM3e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I
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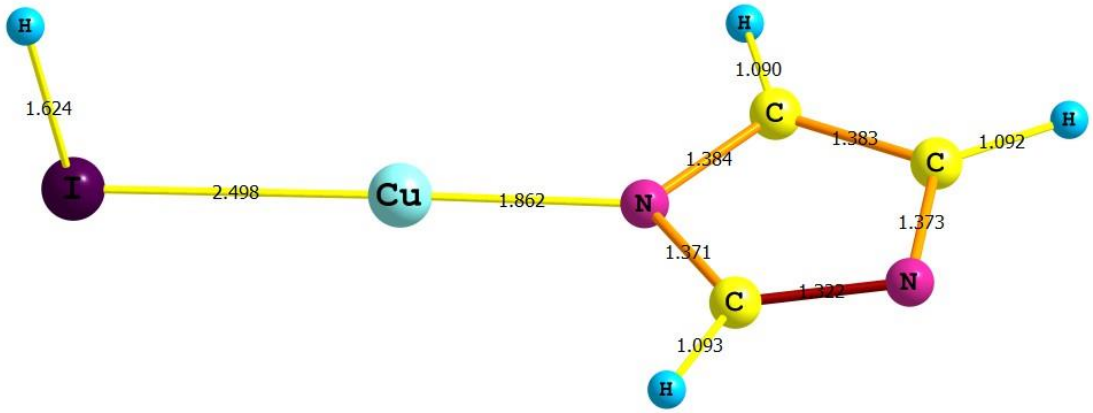
C
1.092
H
2.174
C
1.384
1.093
N
H

IM4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I
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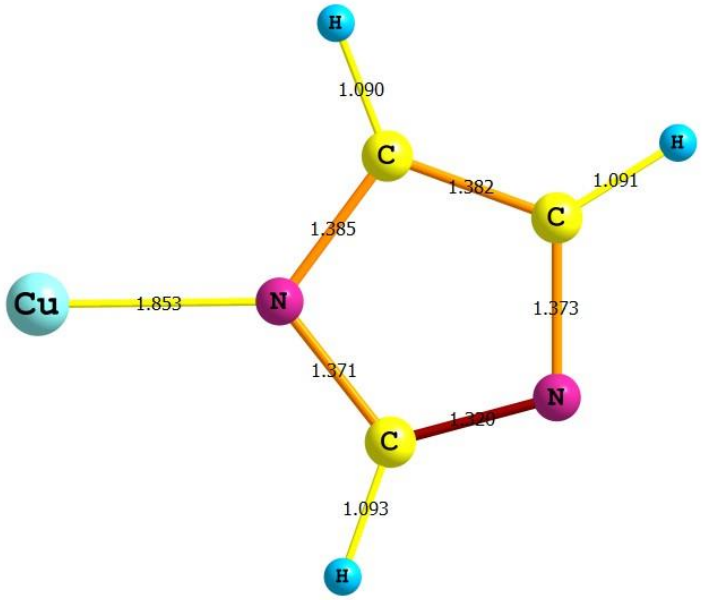
1.371
N
C
1.093
H

IM5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Cu
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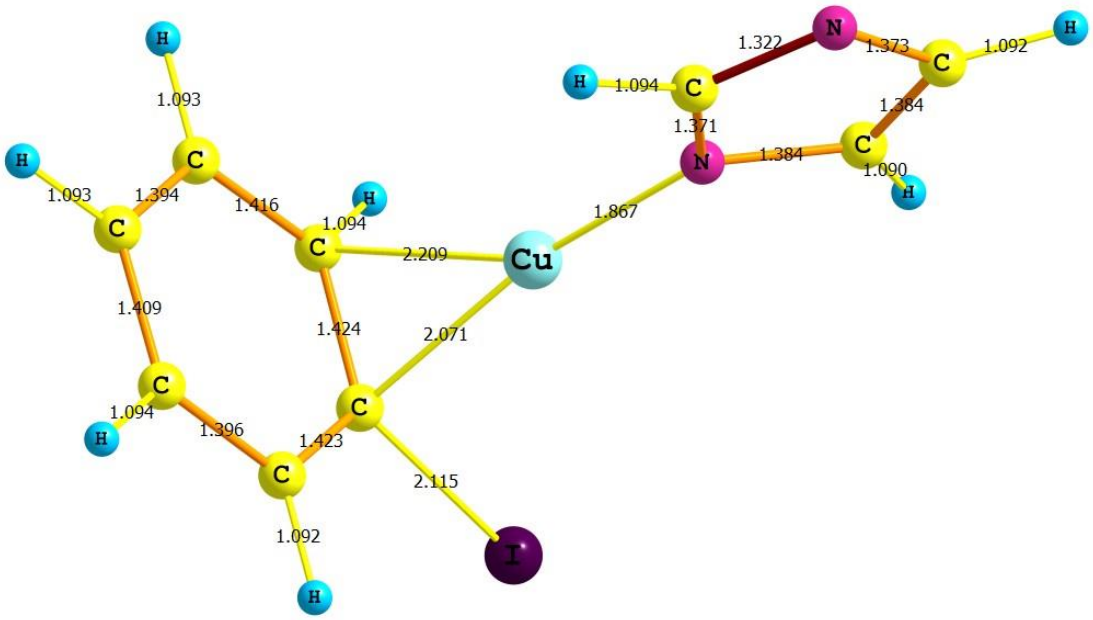
N
1.373
1.371
N
C
1.093
H

IM6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C
H
1.093
1.394
C
1.416
H
1.094
C
2.209
Cu
1.867
N
1.322
1.373
C
1.092
H
H
1.094
C
1.371
1.384
C
1.384
1.090
H
1.409
1.424
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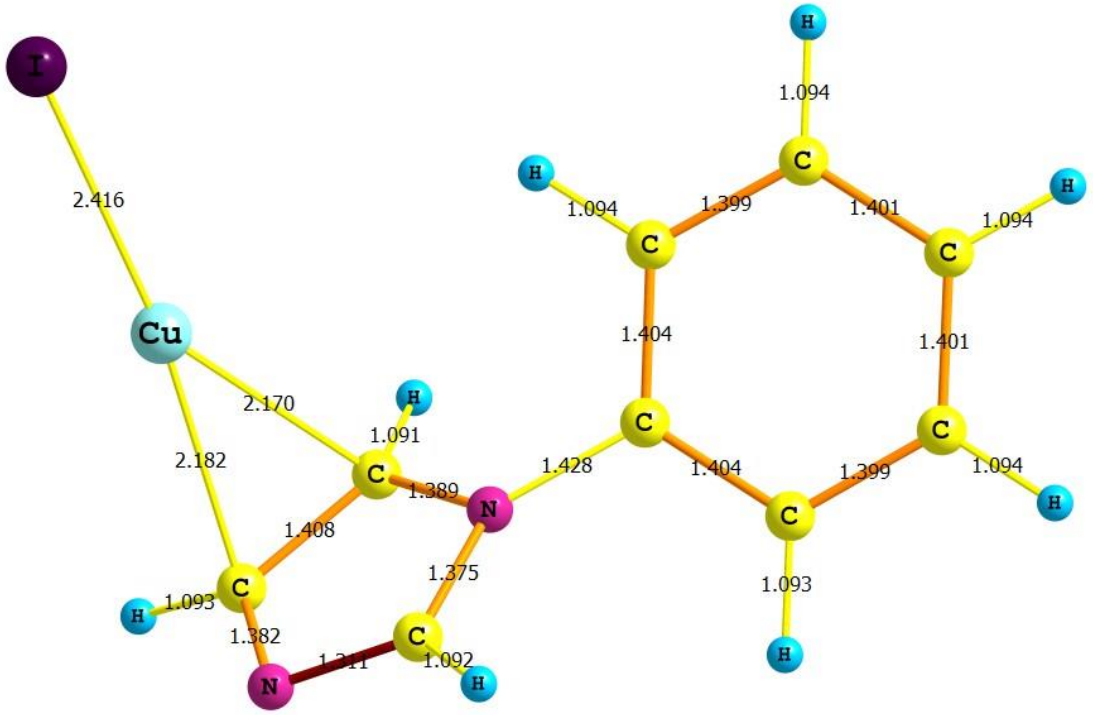
C
C
1.094
H
1.396
1.423
C
2.115
1.092
H
I

IM7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C
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N
1.408
C
1.093
H
1.382
C
1.311
1.092
N
H
1.428
H
1.094
C
1.399
1.401
C
H
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1.404
1.401
C
C
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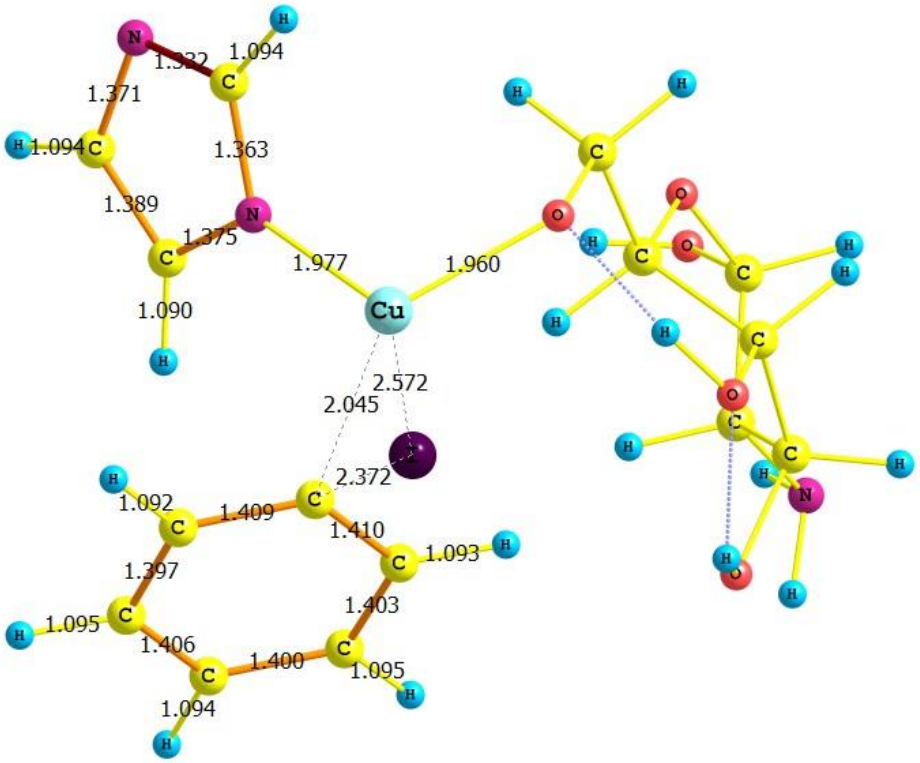
1.094
H
C
1.093
H

IM8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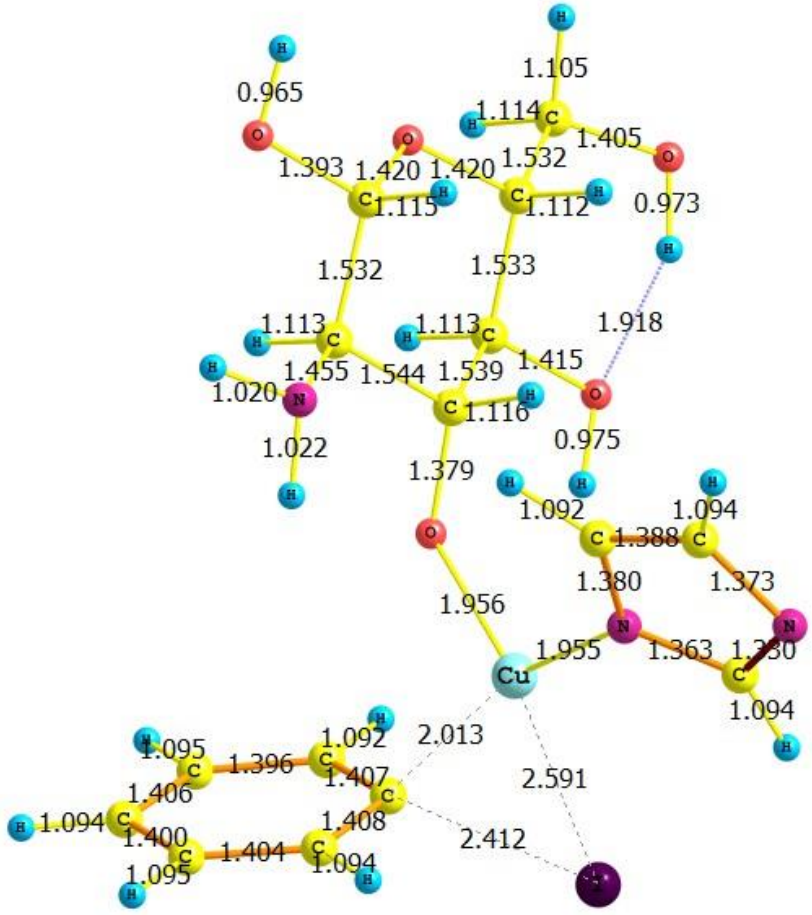
1.406
1.400
1.095
1.094

TS1/2a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1.544
1.539
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0.975
1.022
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1.363
1.094
Cu
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1.095
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2.412
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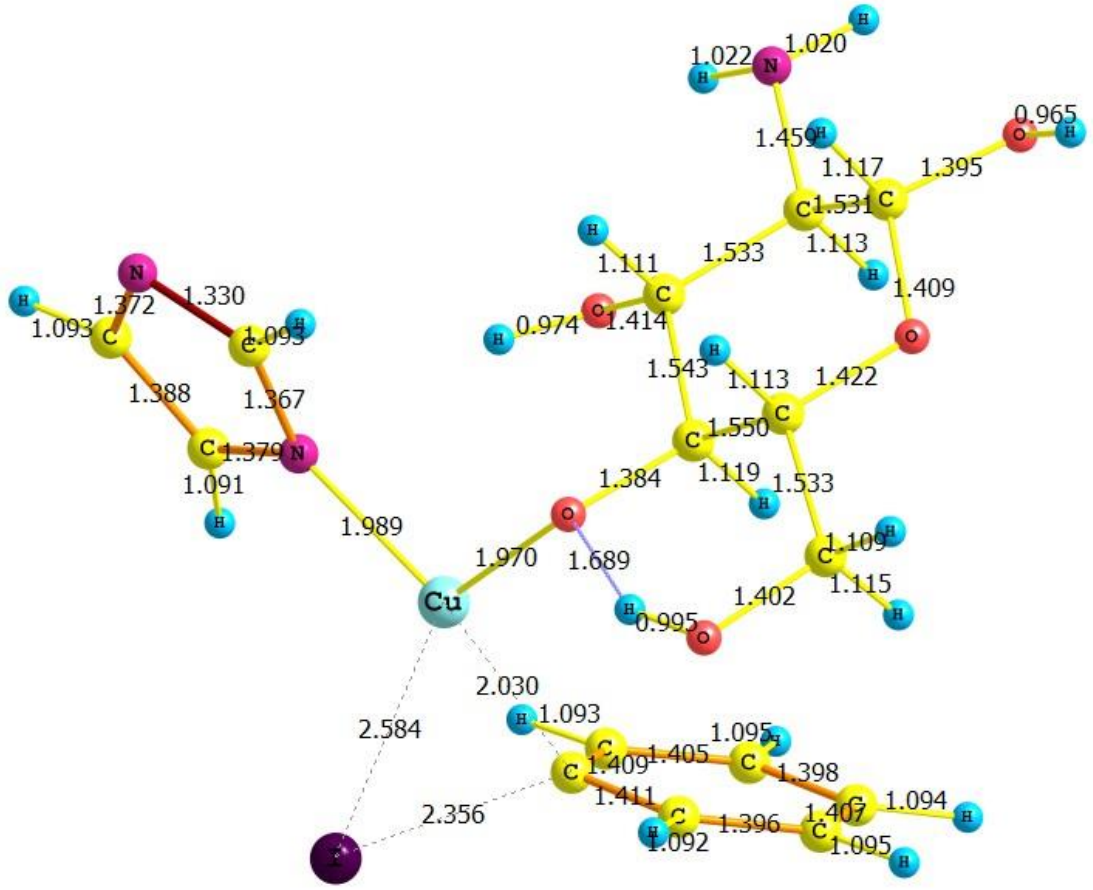
1.404
1.094
1.095

TS1/2b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1.111
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1.543
1.113
1.422
1.550
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1.533
1.109
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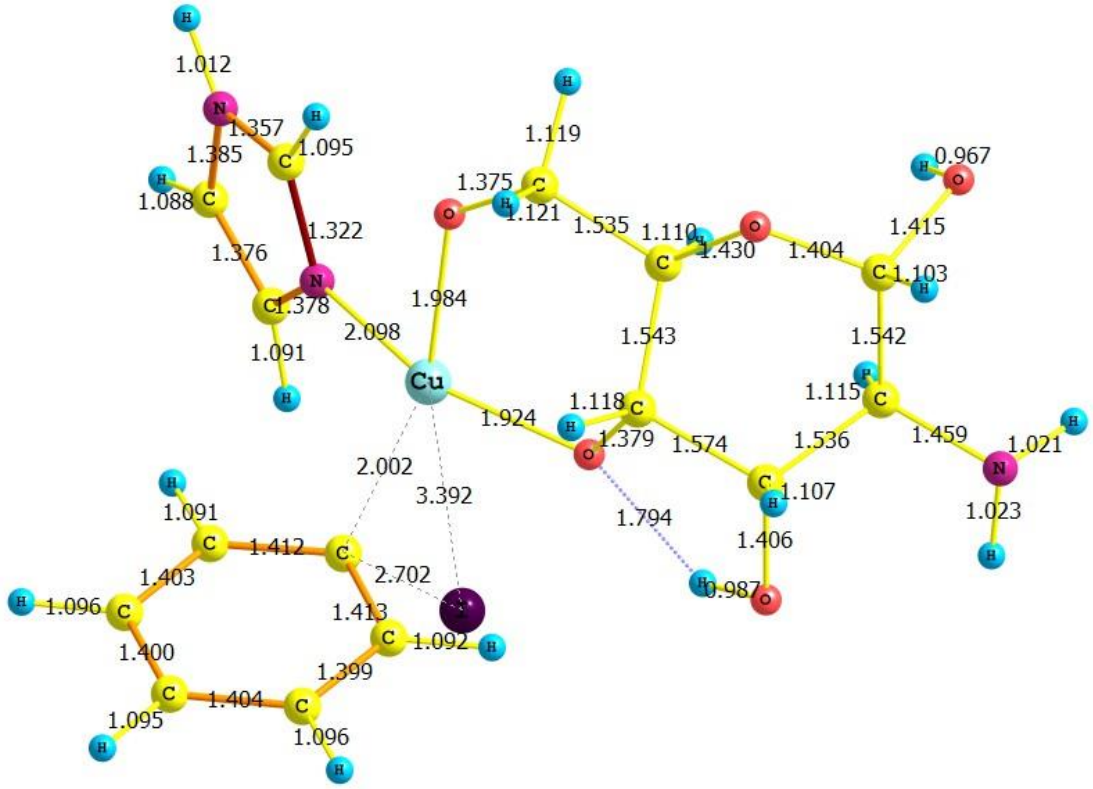
TS1/2c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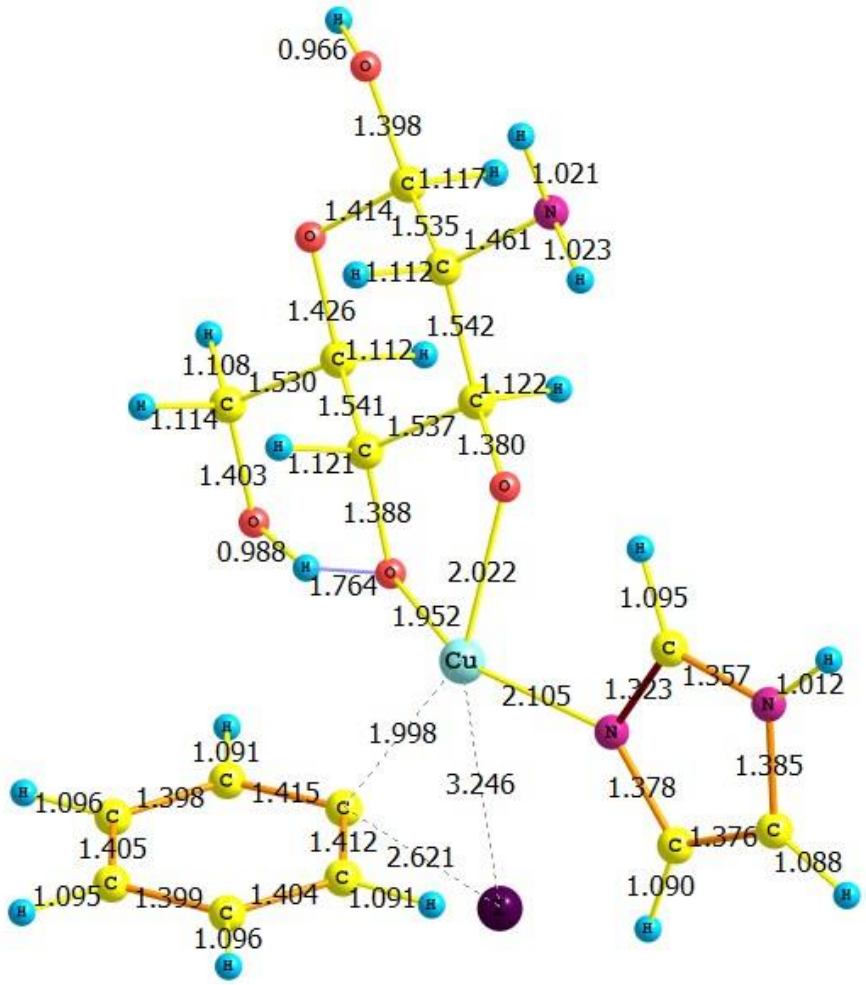
1.096

TS1/2d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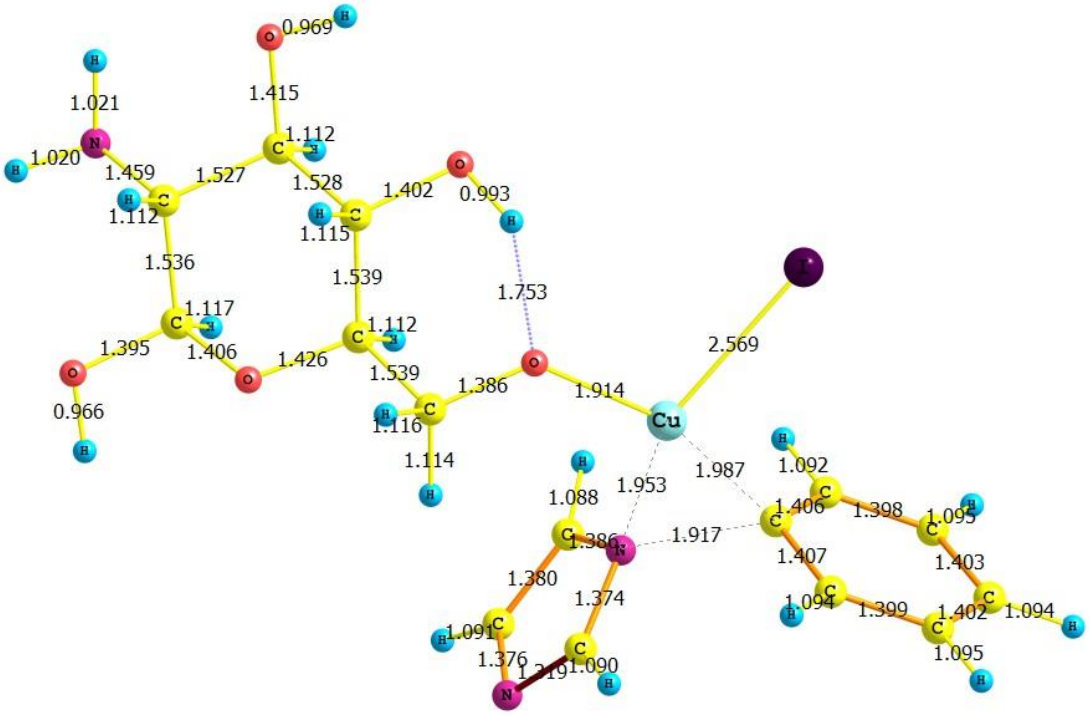
TS1/2e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1.395
1.406
1.426
1.539
2.569
1.386
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1.116
Cu
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1.088
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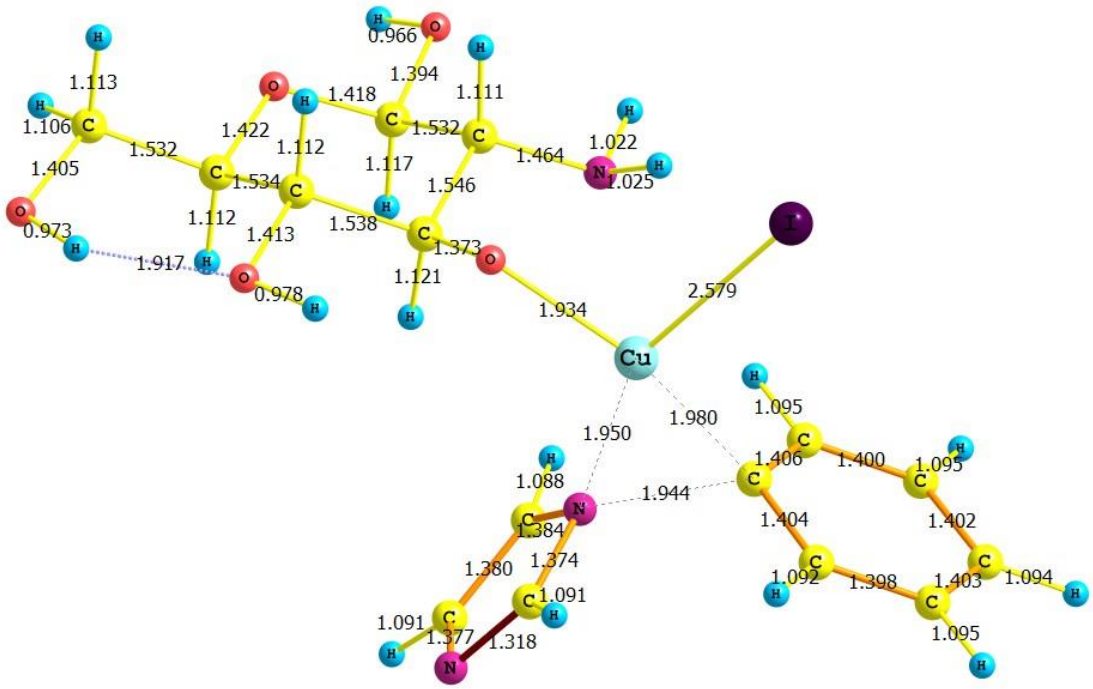
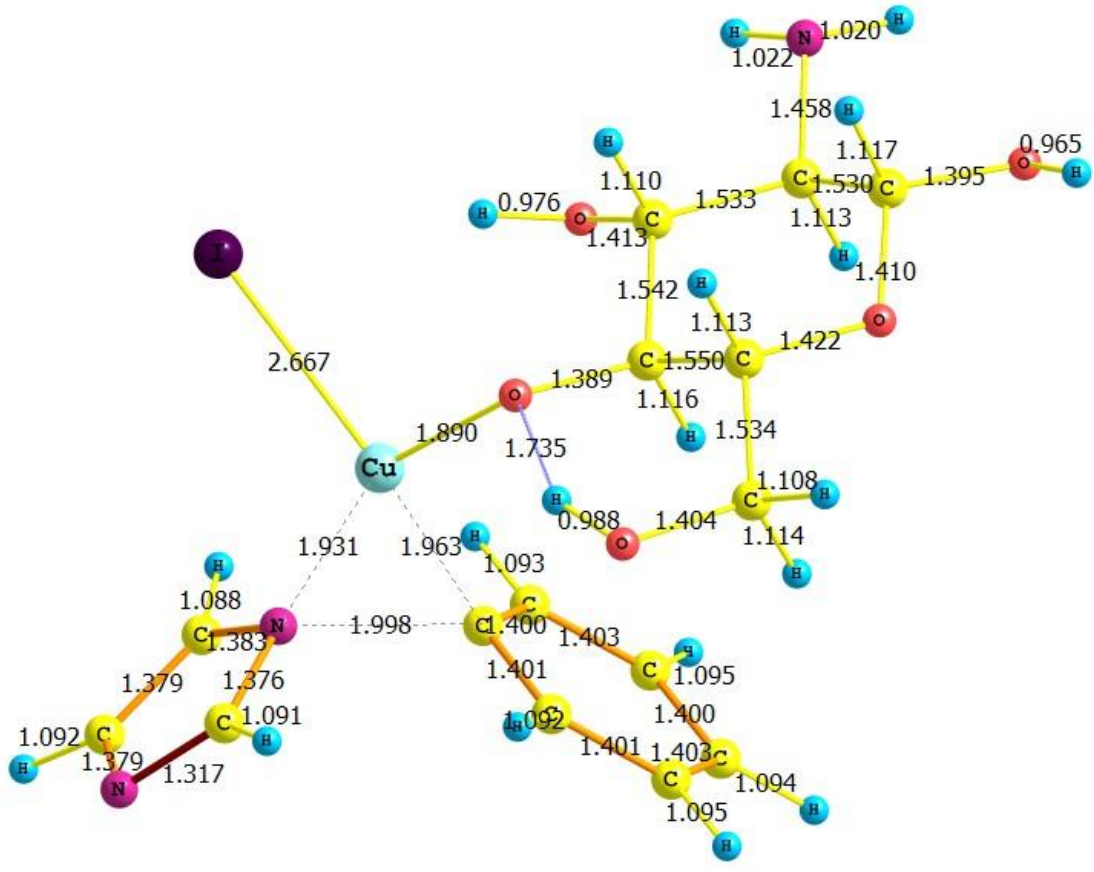
1.090

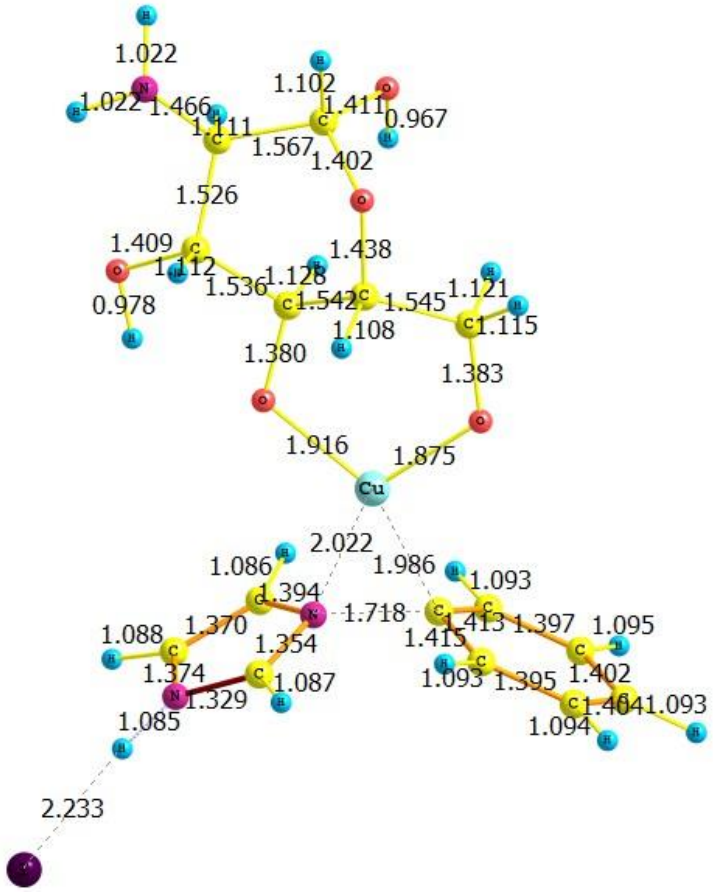
TS2/3a



TS2/3b



TS2/3c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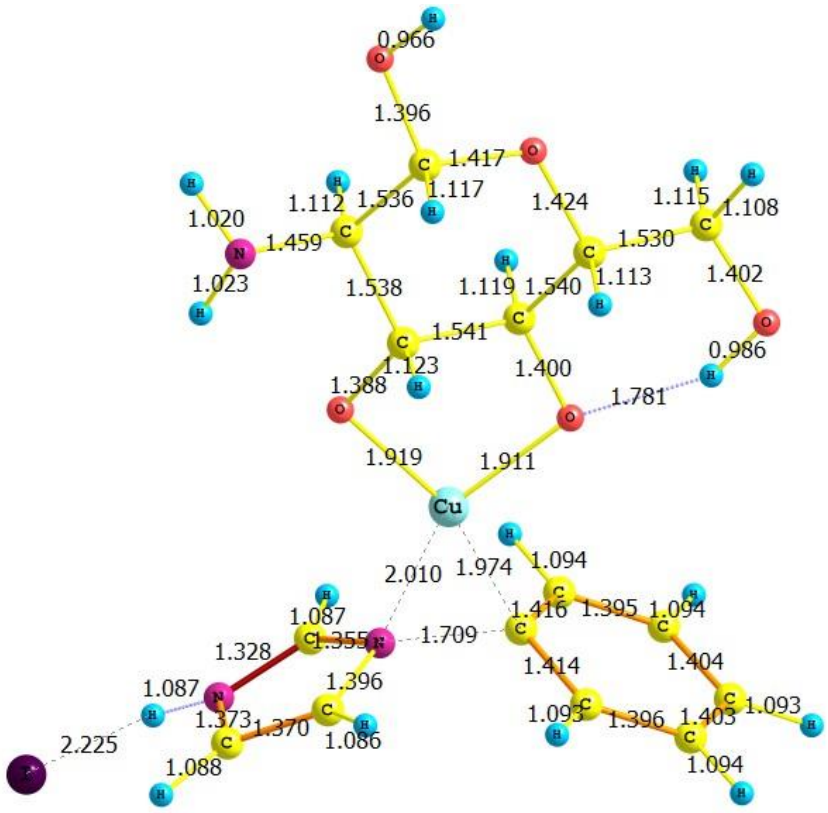
TS2/3d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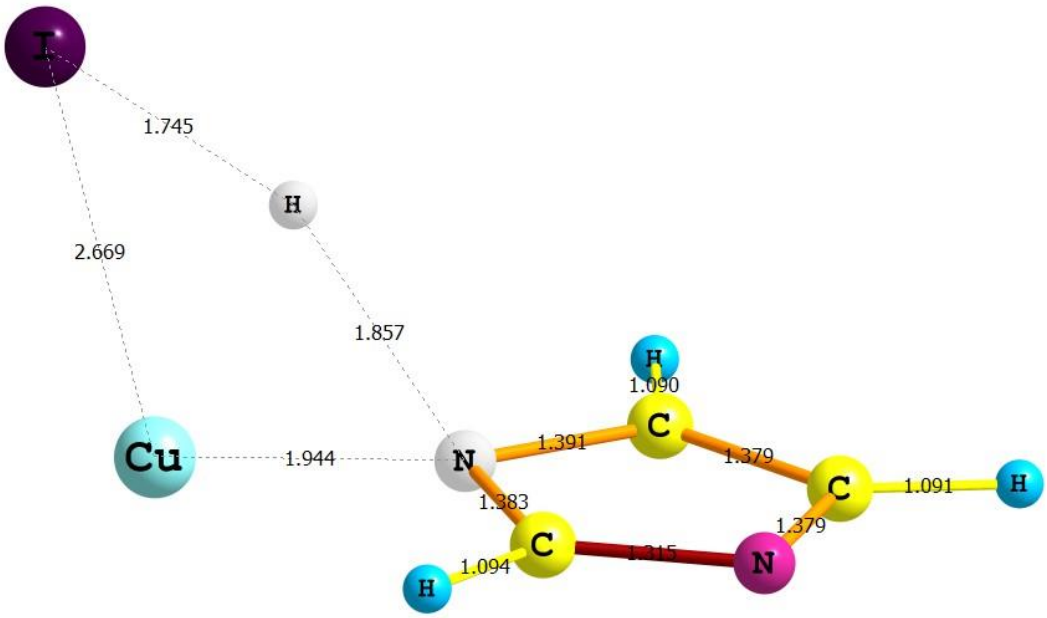
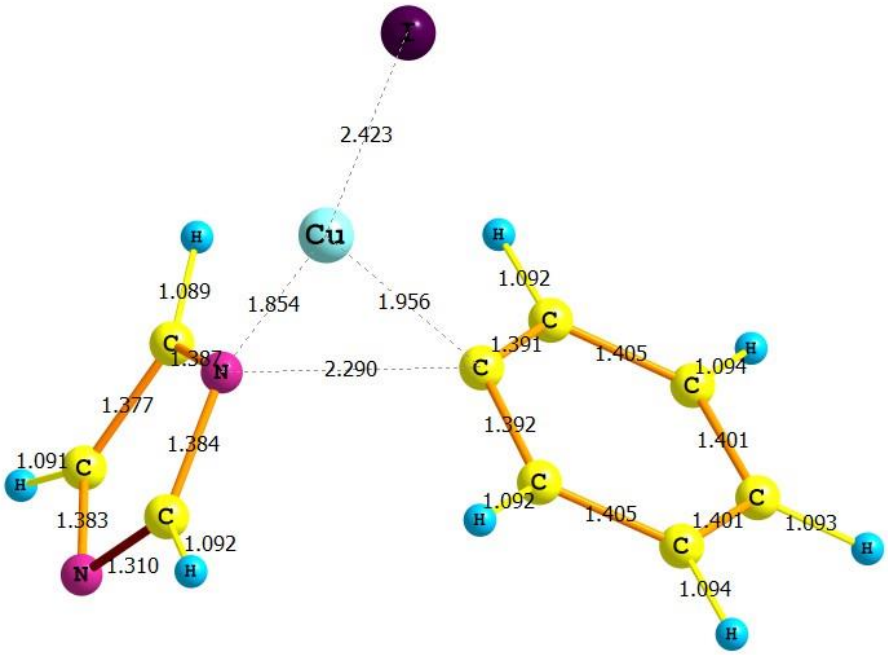
1.459
1.530
1.023
1.538
1.119
1.540
1.113
1.402
1.541
0.986
1.123
1.400
1.388
1.781
1.919
1.911
Cu
2.010
1.974
1.094
1.087
1.416
1.395
1.094
1.355
1.709
1.328
1.414
1.404
1.087
1.396
1.373
1.370
1.086
1.093
1.396
1.403
1.093
2.225
1.088
1.094

TS2/3e



TS4/5



TS7/8

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