Electronic Supplementary Material (ESI) for RSC Advances.

A polysalen based on polyacylamide stabilized palladium nanoparticle catalyst for efficient carbonylative Sonogashira reaction in aqueous media

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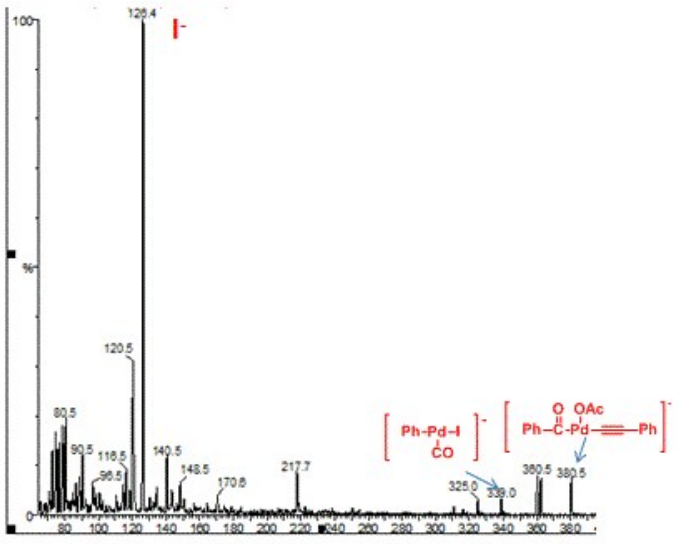
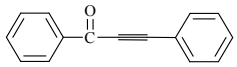


Fig S1 Reaction liquid correspond to species detected by ESI-MS

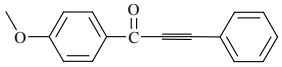
NMR date and spectra of product

1, 3-diphenylprop-2-yn-1-one (Table 2, entry 1):



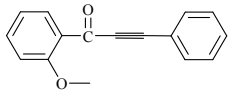
^{1}H NMR ($CDCl_3$, δppm): 7.29-7.33 (m, 3H), 7.35-7.43 (m, 2H), 7.50-7.54 (m, 1H), 7.54-7.60 (m, 2H), 8.11 (d, *J* = 8.4 Hz, 2H); ^{13}C NMR ($CDCl_3$, δppm): 86.9, 93.2, 120.1, 128.8, 128.7, 129.6, 130.9, 133.1, 134.2, 136.9, 178.0;

1-(4-methoxyphenyl)-3-phenylprop-2-yn-1-one (Table 2, entry 2):



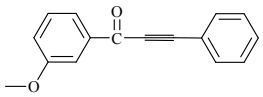
^{1}H NMR ($CDCl_3$, δppm): 3.84 (s, 3H), 6.90 (d, *J* = 9.2 Hz, 2H), 7.33-7.43 (m, 3H), 7.60-7.62 (m, 2H), 8.11 (d, *J* = 8.8 Hz, 2H); ^{13}C NMR ($CDCl_3$, δppm): 55.6, 86.9, 92.3, 113.9, 120.4, 128.7, 130.3, 130.6, 132.0, 133.0, 164.5;

1-(2-methoxyphenyl)-3-phenylprop-2-yn-1-one (Table 2, entry 3):



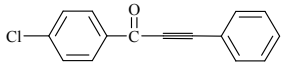
^{1}H NMR (400 MHz, $CDCl_3$)δ 3.90 (s, 3H), 6.95-7.01 (m, 2H), 7.31-7.41 (m, 3H), 7.46-7.50 (m, 1H), 7.56 (d, *J* = 6.8 Hz ,2H), 8.01 (dd, *J* = 1.6 Hz, *J* = 7.6 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 56.0, 89.2, 91.6, 112.2, 120.3, 120.7, 126.7;

1-(3-methoxyphenyl)-3-phenylprop-2-yn-1-one (Table 2, entry 4):



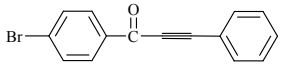
^{1}H NMR ($CDCl_3$, δppm): 3.19 (s, 3H), 7.09 (d, *J* = 8.0 Hz, 3H), 7.33-7.44 (m, 4H), 7.60-7.64 (m, 3H), 7.79 (dd, *J* = 1.2 Hz, *J* = 6.4 Hz, 2H); ^{13}C NMR ($CDCl_3$, δppm): 55.5, 87.0, 93.0, 112.9, 120.2, 121.0, 122.9, 128.7, 129.6, 130.8;

1-(4-chlorophenyl)-3-phenylprop-2-yn-1-one (Table 2, entry 5):



^{1}H NMR ($CDCl_3$, δppm): 7.24-7.39 (m, 2H), 7.41-7.76 (m, 3H), 7.59-7.64 (m, 2H), 8.08 (d, *J* = 8.8 Hz, 2H); ^{13}C NMR ($CDCl_3$, δppm): 86.6, 93.7, 119.9, 128.8, 129.0, 130.9, 131.0, 133.1, 135.3, 140.8, 176.7;

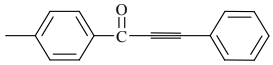
1-(4-bromophenyl)-3-phenylprop-2-yn-1-one (Table 2, entry 6):



^{1}H NMR ($CDCl_3$, δppm): 7.42-7.46 (m, 2H), 7.49-7.53 (m, 1H), 7.66-7.70 (m, 4H), 8.07 (d, *J* =

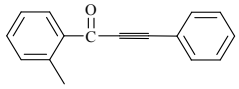
8.8 Hz, 2H); ^{13}C NMR ($CDCl_3$, δppm): 86.5, 93.7, 119.8, 128.8, 129.6, 130.9, 131.0, 132.0, 133.1, 135.7, 176.9;

1-(4-toyl)-3-phenyl-2-yn-1-one (Table 2, entry 7):



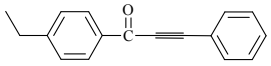
^{1}H NMR ($CDCl_3$, δppm): 2.37 (s, 3H), 7.23 (d, *J* = 8.0 Hz, 2H), 7.32-7.43 (m, 3H), 7.60-7.63 (m, 2H), 8.03 (d, *J* = 8.0 Hz, 2H); ^{13}C NMR ($CDCl_3$, δppm): 21.9, 87.0, 92.7, 120.3, 128.7, 129.4, 129.8, 130.7, 133.1, 134.6, 145.3, 177.8;

1-(2-toyl)-3-phenyl-2-yn-1-one (Table 2, entry 8):



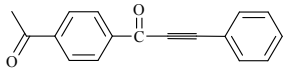
^{1}H NMR ($CDCl_3$, δppm): 2.60 (s, 3H), 7.14 (t, *J* = 7.2 Hz, 1H), 7.28-7.41 (m, 5H), 7.56 (d, *J* = 8.0 Hz, 2H), 8.21 (dd, *J* = 1.2 Hz, *J* = 8.0 Hz, 1H); ^{13}C NMR ($CDCl_3$, δppm): 22.0, 88.4, 91.8, 120.35, 125.9, 128.7, 130.6, 133.0, 133.2, 135.7, 140.5, 179.8;

1-(4-ethylphenyl)-3-phenylprop-2-yn-1-one (Table 2, entry 9):



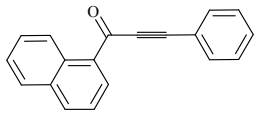
^{1}H NMR ($CDCl_3$, δppm): 1.18 (t, *J* = 7.6 Hz, 3H), 2.64-2.70 (m, 2H), 7.26 (d, *J* = 8.0 Hz, 2H), 7.32-7.43 (m, 3H), 7.60 (d, *J* = 6.8 Hz, 2H), 8.12 (d, *J* = 8.0 Hz, 2H); ^{13}C NMR ($CDCl_3$, δppm): 15.2, 29.1, 87.0, 92.6, 120.3, 128.2, 128.7, 129.9, 130.7, 133.1, 134.8, 151.4, 177.8;

1-(4-acetylphenyl)-3-phenylprop-2-yn-1-one (Table 2, entry 10):



^{1}H NMR ($CDCl_3$, δppm): 2.61 (s, 3H), 7.36-7.47 (m, 3H), 7.63 (d, *J* = 7.2 Hz, 2H), 8.01 (dd, *J* = 2.0 Hz, *J* = 6.8 Hz, 2H), 8.23 (dd, *J* = 1.6 Hz, *J* = 10.4 Hz, 2H); ^{13}C NMR ($CDCl_3$, δppm): 27.0, 86.8, 92.3, 119.8, 128.5, 128.8, 129.7, 131.2, 133.2, 139.8, 140.8, 177.2, 197.5;

1-(naphthalen-1-yl)-3-phenylprop-2-yn-1-one (Table 2, entry 11):

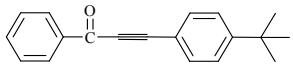


^{1}H NMR ($CDCl_3$, δppm): 7.28-7.46 (m, 3H), 7.48-7.54 (m, 2H), 7.56-7.64 (m, 3H), 7.85 (d, *J* = 8.0 Hz, 1H), 8.00 (d, *J* = 8.0 Hz, 1H), 8.56 (dd, *J* = 1.2 Hz, *J* = 7.2 Hz, 1H), 9.15 (d, *J* = 8.4 Hz, 1H); ^{13}C NMR ($CDCl_3$, δppm): 88.5, 91.7, 120.4, 124.5, 126.0, 126.8, 128.6, 128.7, 128.8, 129.0, 130.6, 130.8, 133.0, 133.1, 133.9, 134.6, 135.2, 179.8;

3-(4-methoxyphenyl)-1-phenylprop-2-yn-1-one (Table 2, entry 12):

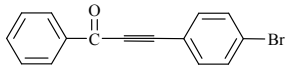
^{1}H NMR ($CDCl_3$, δppm): 3.79 (s, 3H), 6.85-6.89 (m, 2H), 7.43-7.47 (m, 2H), 7.54-7.60 (m, 3H), 8.14 (d, *J* = 8.4 Hz, 2H); ^{13}C NMR ($CDCl_3$, δppm): 54.4, 85.9, 93.3, 110.9, 113.4, 127.5, 128.5, 132.9, 134.2, 136.0, 160.7, 177.0;

3-(4-tert-butylphenyl)-1-phenylprop-2-yn-1-one (Table 2, entry 13):

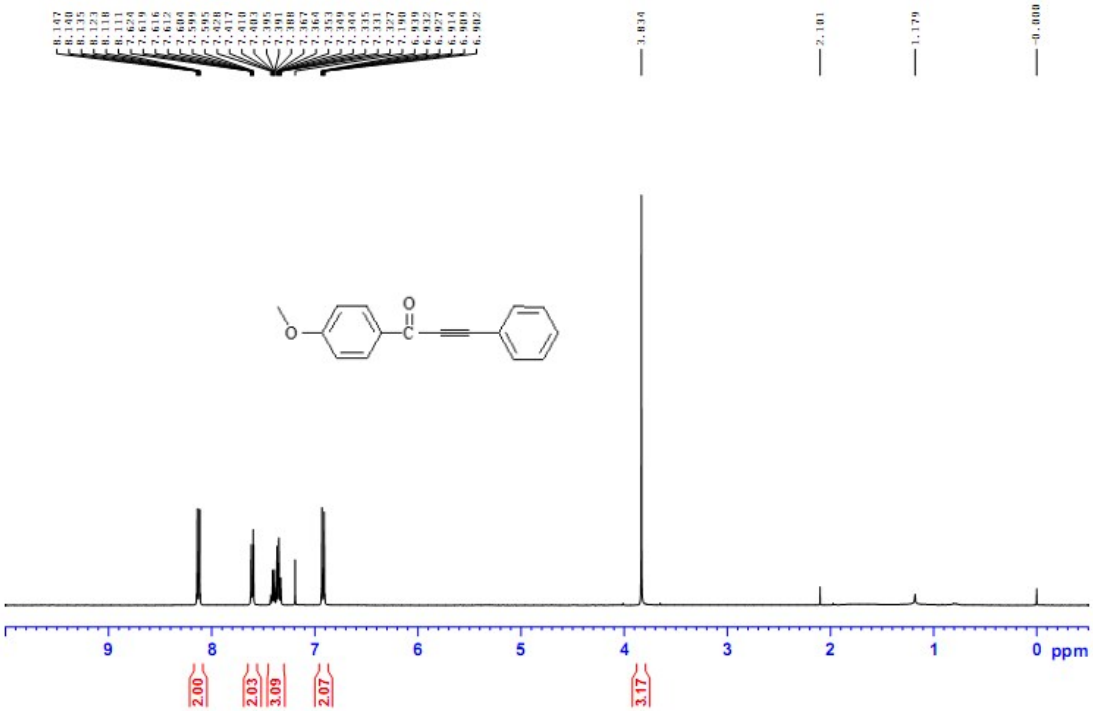


^{1}H NMR ($CDCl_3$, δppm): 1.26 (s, 9H), 7.36 (dd, *J* = 2.0 Hz, *J* = 6.8 Hz, 2H), 7.48-7.52 (m, 2H), 7.54-7.58 (m, 3H), 8.14 (d, *J* = 7.6 Hz, 2H); ^{13}C NMR ($CDCl_3$, δppm): 30.0, 34.1, 85.7, 92.8, 116.0, 124.7, 127.6, 128.5, 132.0, 133.0, 135.9, 153.6, 177.1.

3-(4-bromophenyl)-1-phenylprop-2-yn-1-one (Table 2, entry 14):



^{1}H NMR ($CDCl_3$, δppm): 7.44-7.53 (m, 6H), 7.56-7.60 (m, 1H), 8.13 (d, *J* = 8.0 Hz, 2H); ^{13}C NMR ($CDCl_3$, δppm): 87.7, 91.7, 119.1, 125.6, 128.7, 129.6, 132.1, 134.3, 134.4, 136.7, 177.9;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7.428
7.417
7.411
7.403
7.395
7.391
7.388
7.367
7.364
7.353
7.348
7.344
7.335
7.331
7.327
7.190
6.939
6.932
6.927
6.910
6.909
6.902
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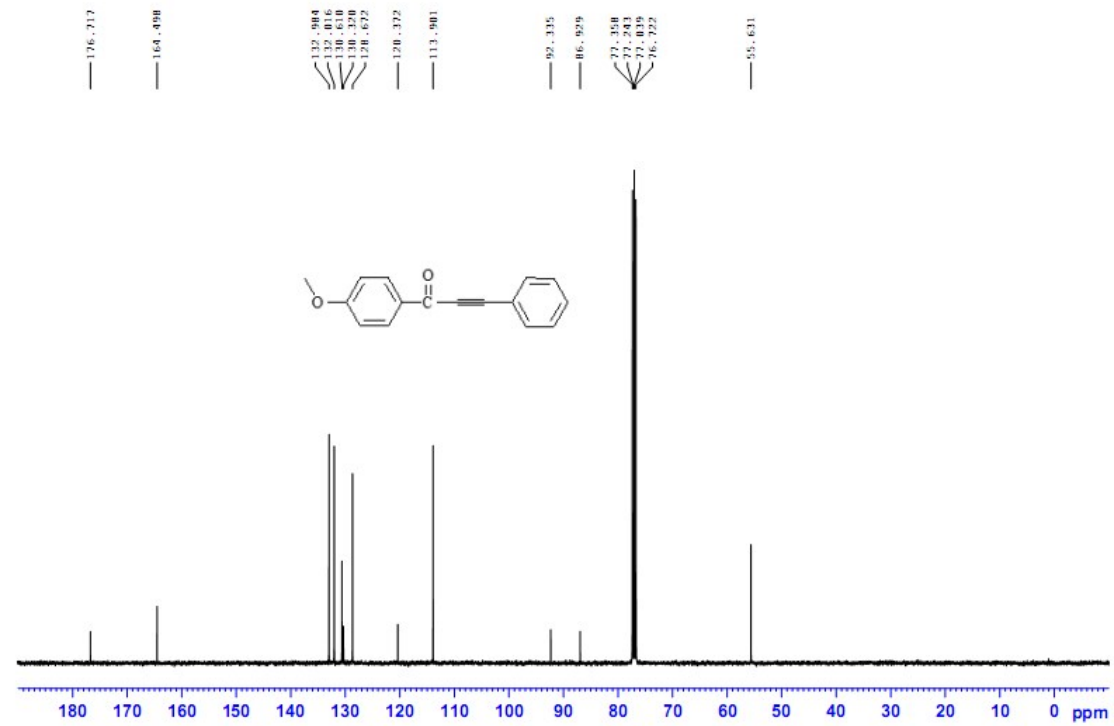
2.07
3.17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77.243
77.039
76.722
55.631
O
O
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150
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130
120
110
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70
60
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30
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10
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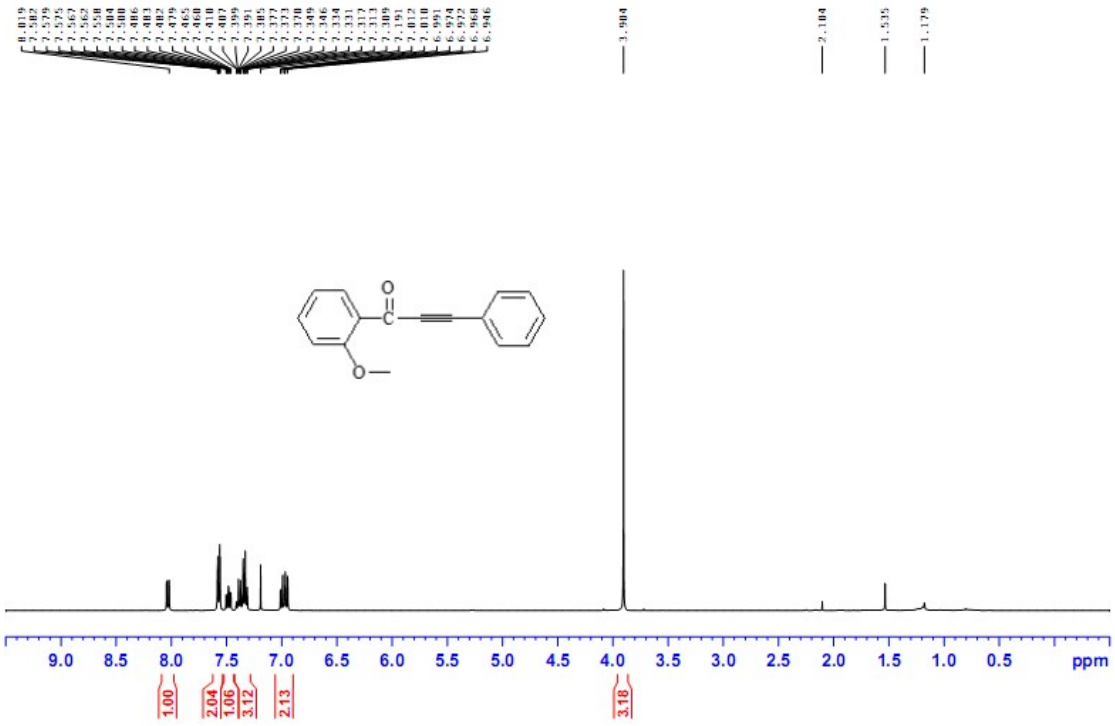
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7.391
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7.317
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7.309
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7.010
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6.972
6.968
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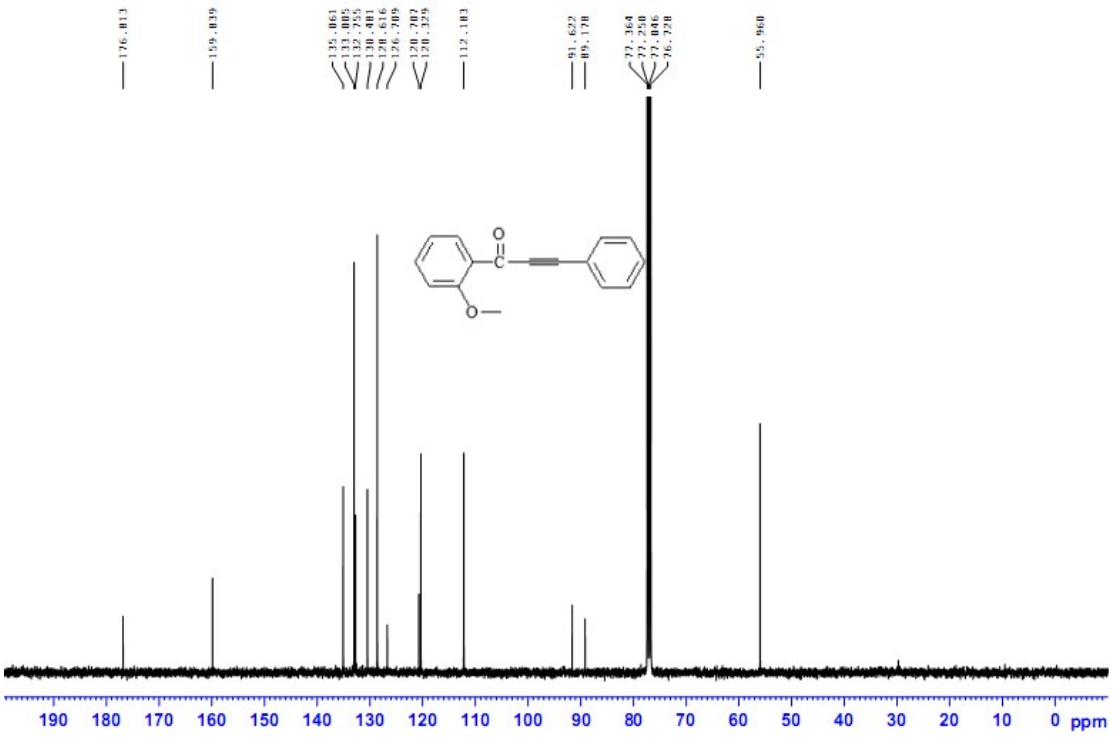
2.13
3.18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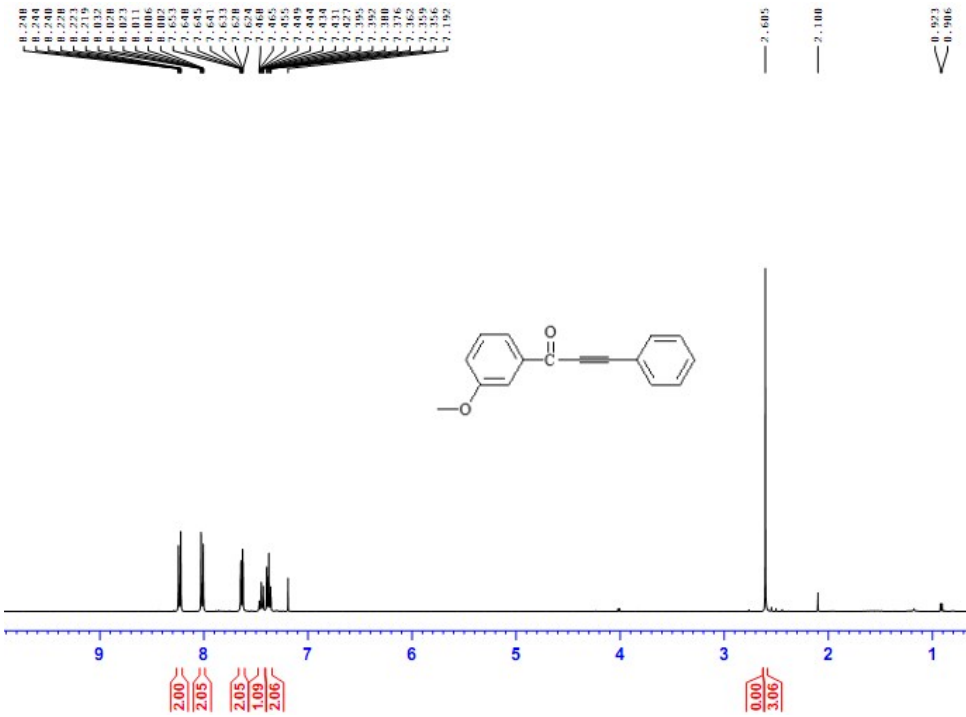
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7.641
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7.434
7.431
7.427
7.395
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7.380
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7.359
7.356
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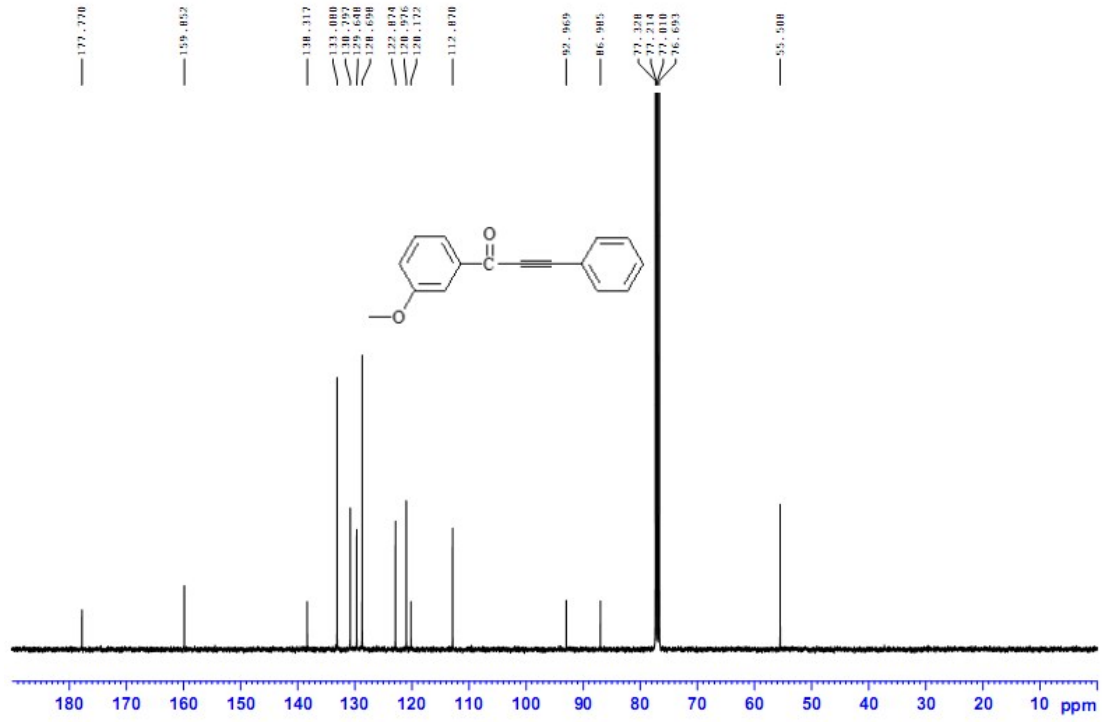
3.06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55.500
O
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O
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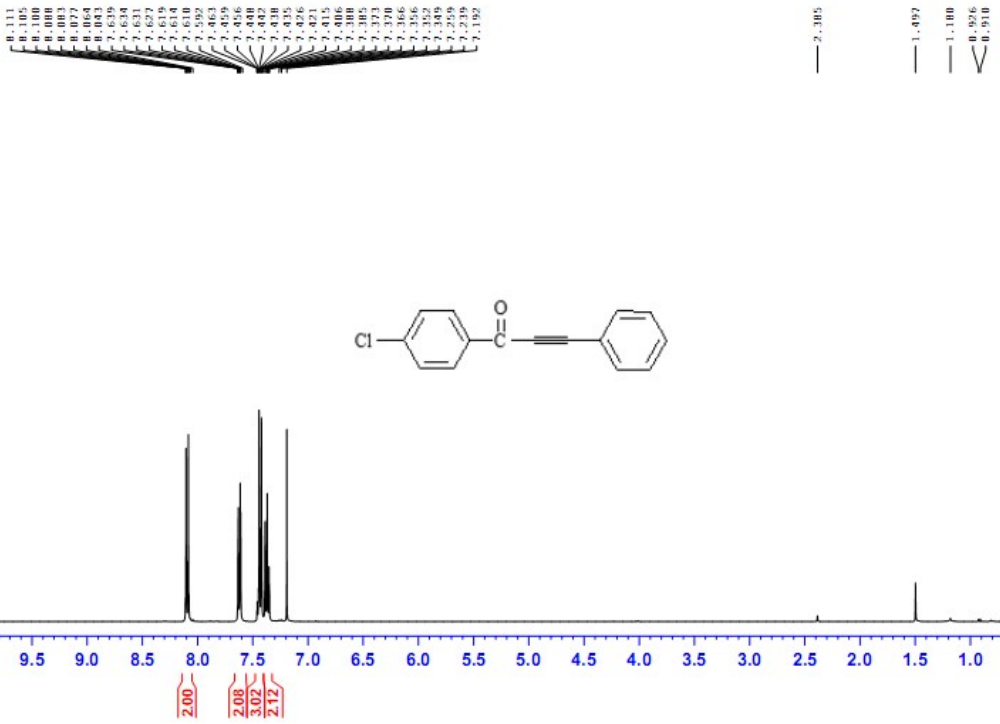
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7.614
7.610
7.592
7.463
7.459
7.456
7.448
7.442
7.438
7.435
7.426
7.421
7.415
7.406
7.388
7.385
7.373
7.370
7.366
7.356
7.352
7.349
7.259
7.239
7.192
2.385
1.497
1.100
0.926
0.910
Cl
O
C
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 ppm
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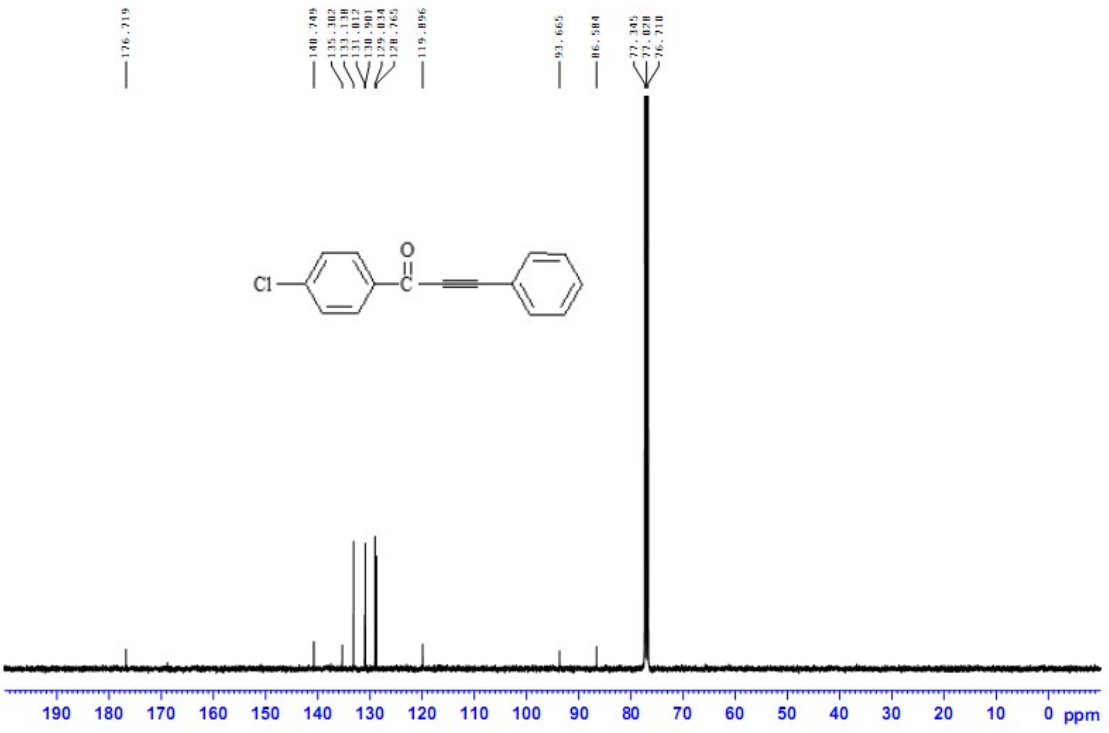
2.08
3.02
2.12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133.138
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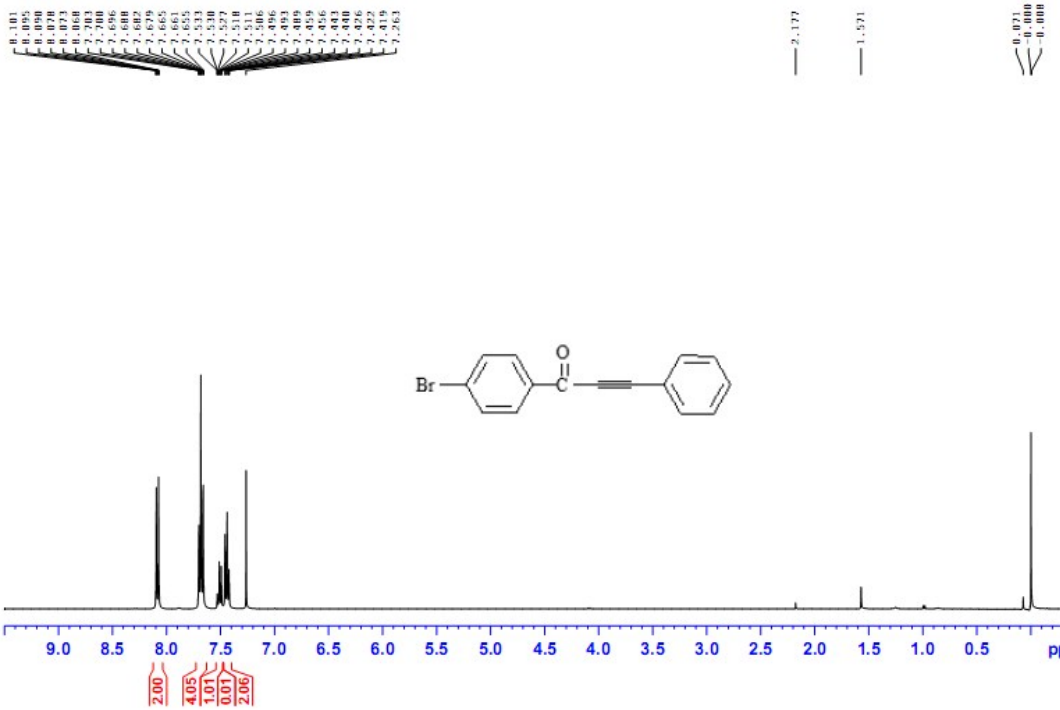
76.710
Cl
O
C
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm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7.518
7.511
7.506
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7.493
7.485
7.459
7.456
7.443
7.440
7.426
7.422
7.419
7.263
2.177
1.571
0.071
0.000
-0.008
Br
O
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 ppm
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0.01
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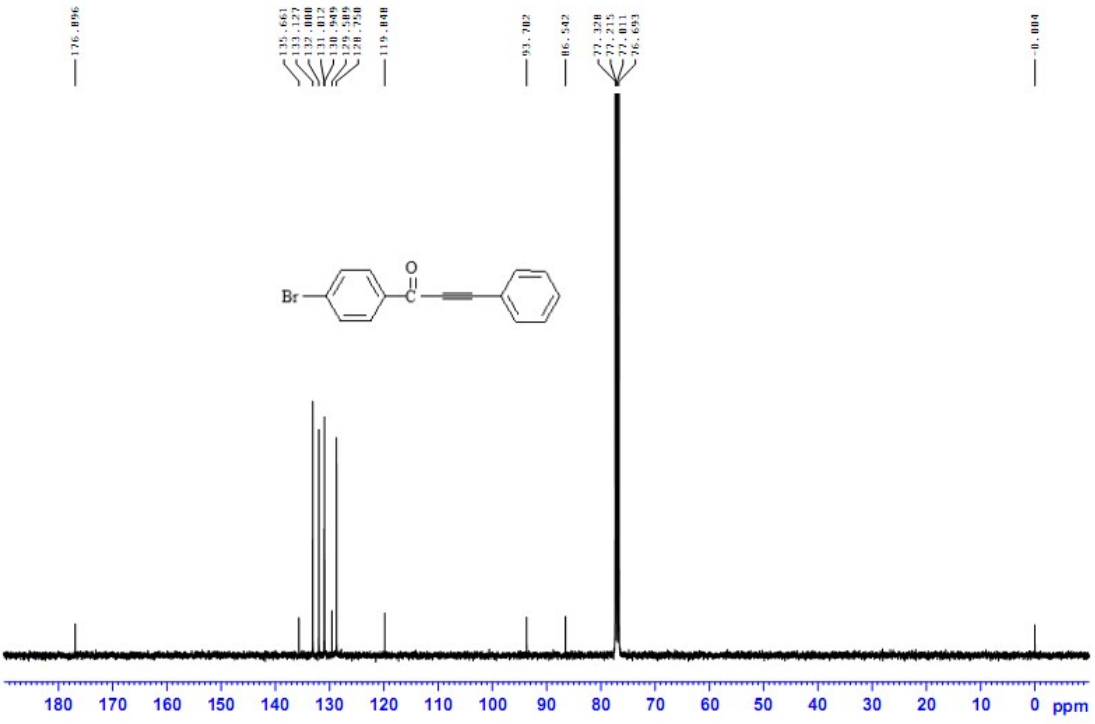
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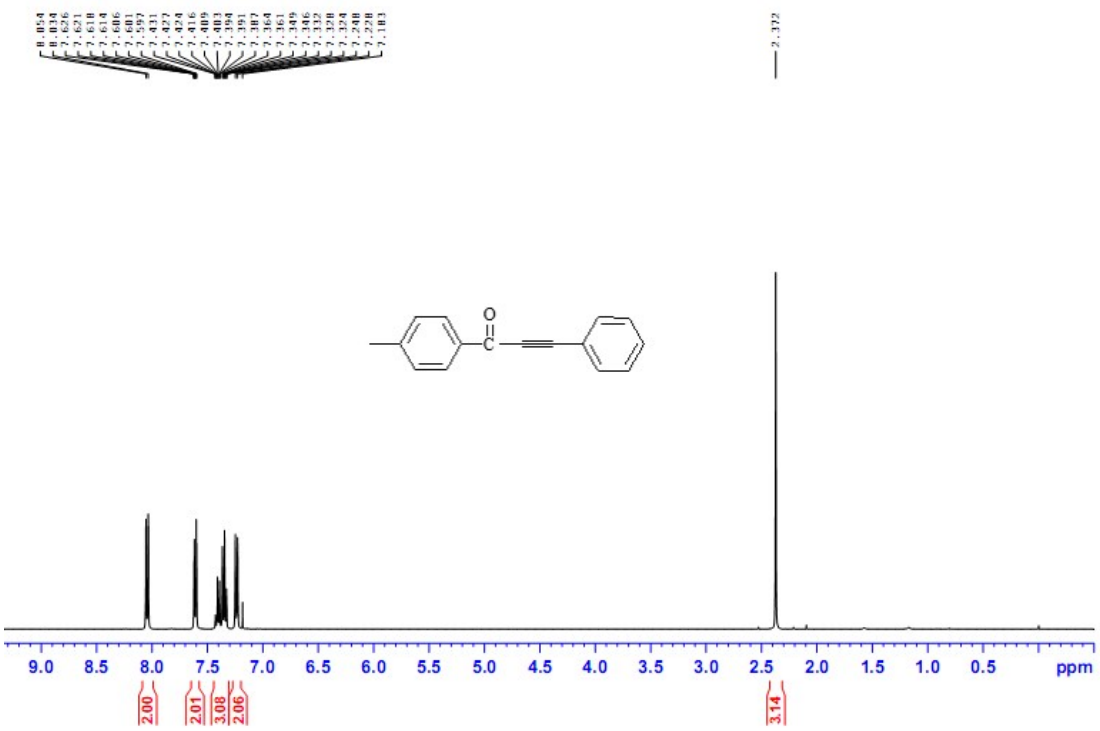
77.215
77.011
76.693
0.004
Br
O
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm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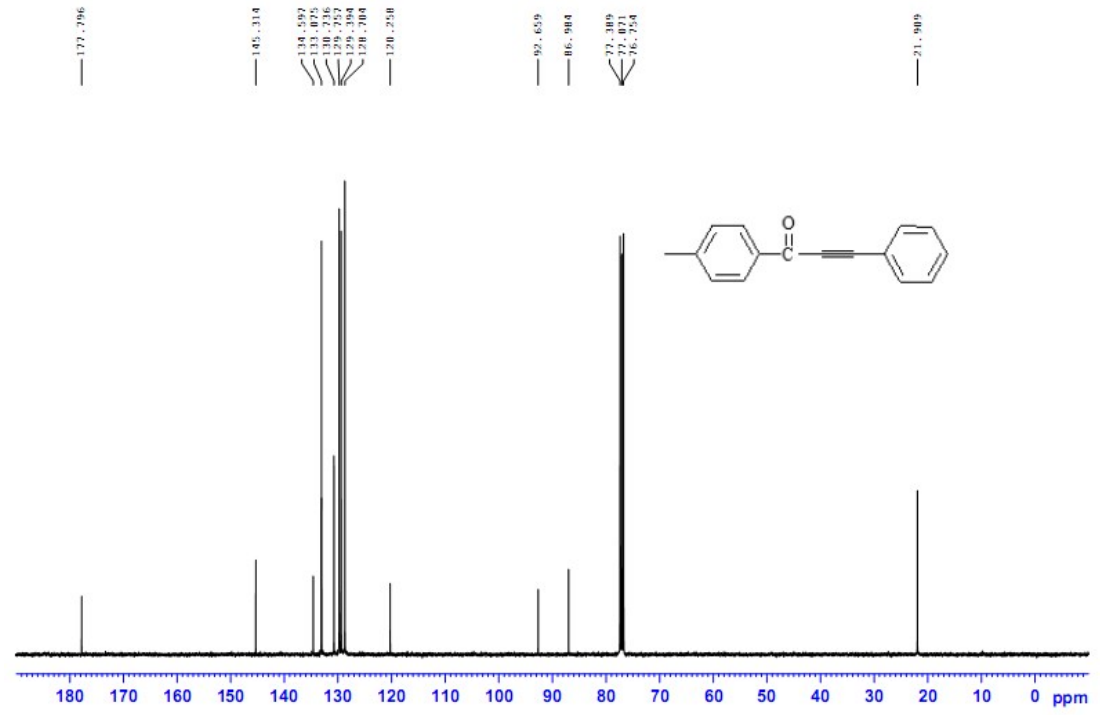
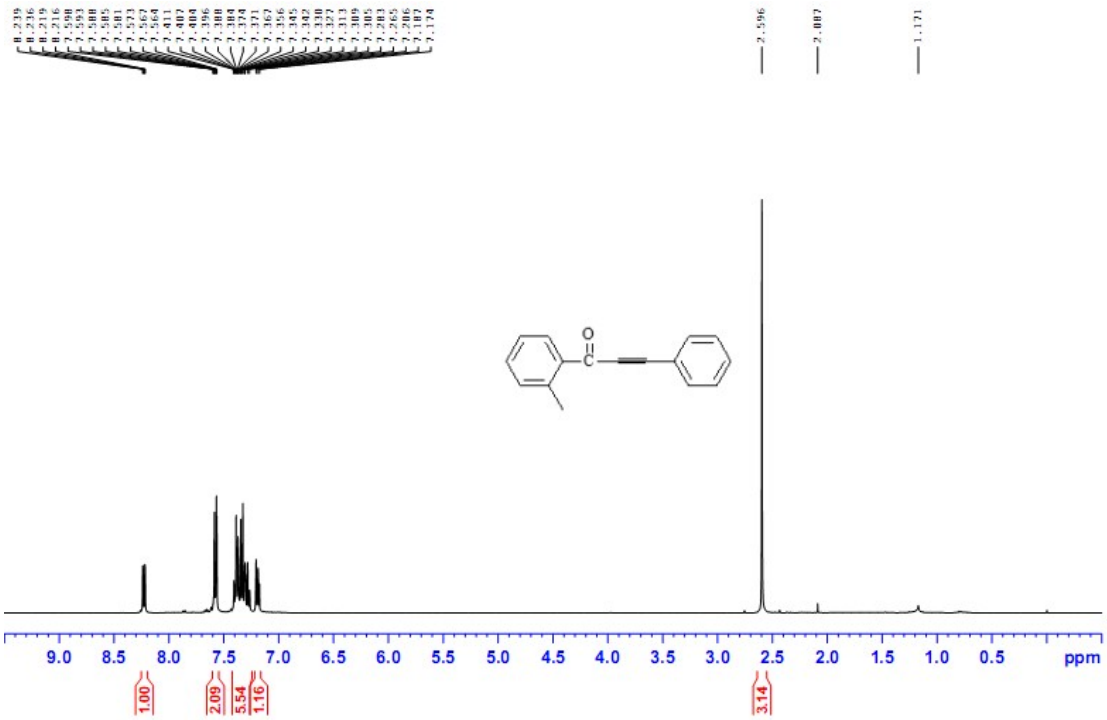
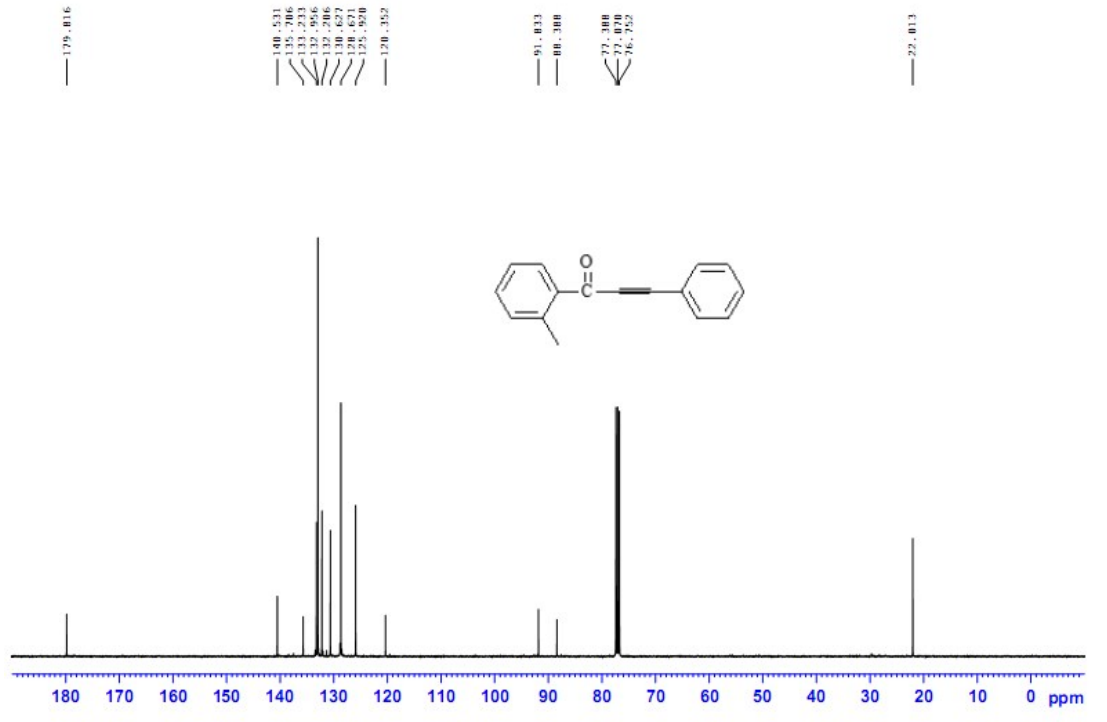
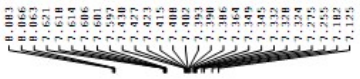
7.409
7.403
7.394
7.391
7.387
7.364
7.361
7.349
7.346
7.332
7.329
7.324
7.240
7.220
7.183
2.372
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
2.00
2.01
3.08
2.06
3.14

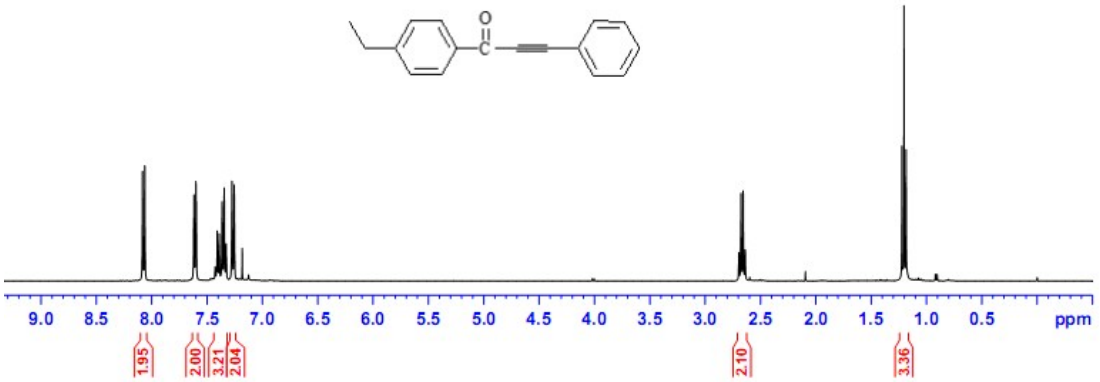

177.796
145.314
134.592
133.075
130.236
129.252
129.194
128.704
120.258
92.659
86.984
77.389
77.071
76.754
21.909
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

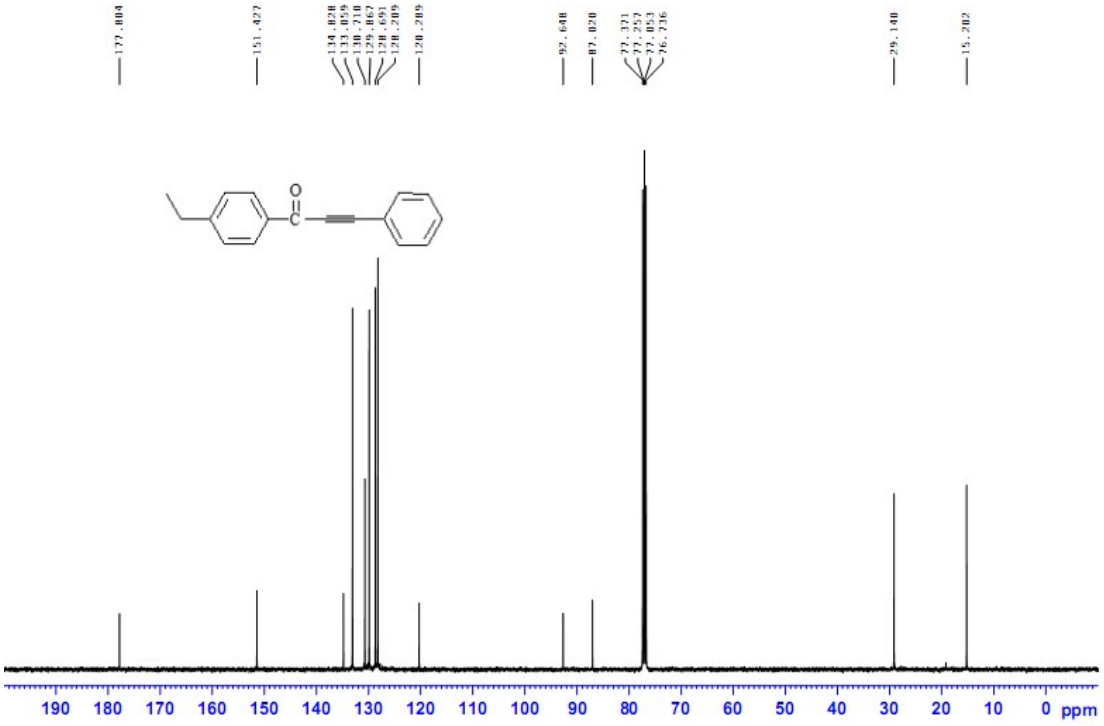

8.239
8.216
8.215
8.216
7.598
7.593
7.588
7.585
7.581
7.573
7.567
7.564
7.411
7.407
7.404
7.396
7.388
7.384
7.374
7.371
7.367
7.356
7.345
7.342
7.330
7.327
7.313
7.309
7.305
7.283
7.265
7.206
7.187
7.174
2.596
2.007
1.171
O
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
1.00
2.09
5.54
1.16
3.14

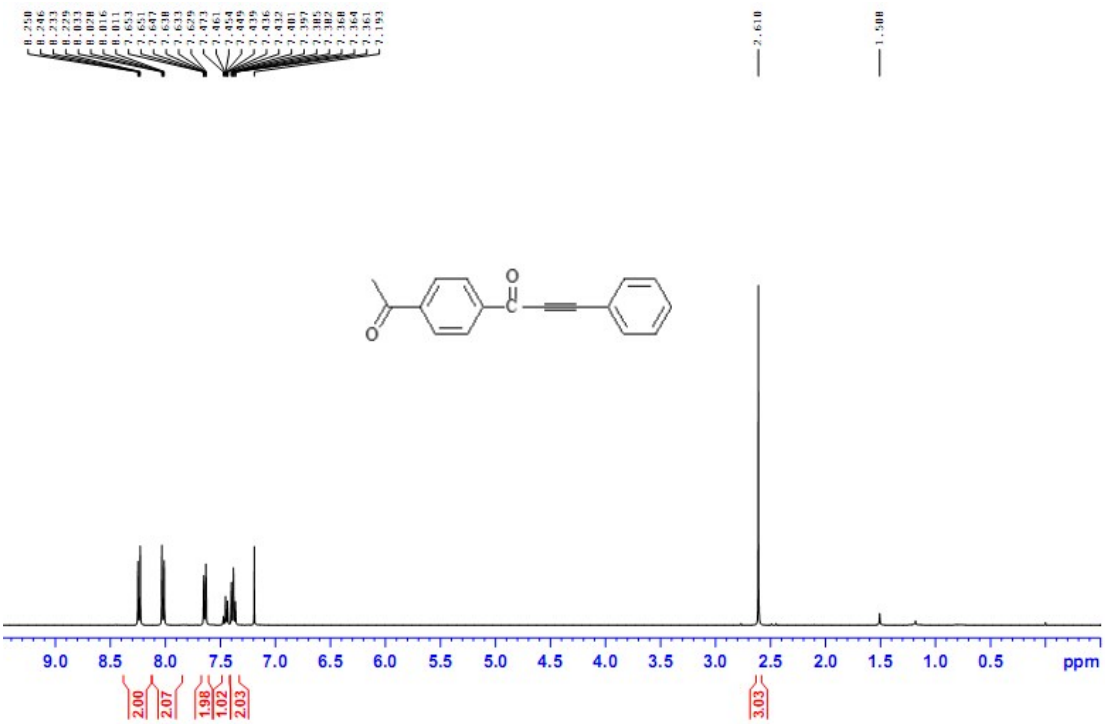

179.816
140.531
135.706
133.233
132.956
132.206
130.627
130.571
125.920
120.352
91.833
88.388
77.388
77.070
76.752
22.813
O
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

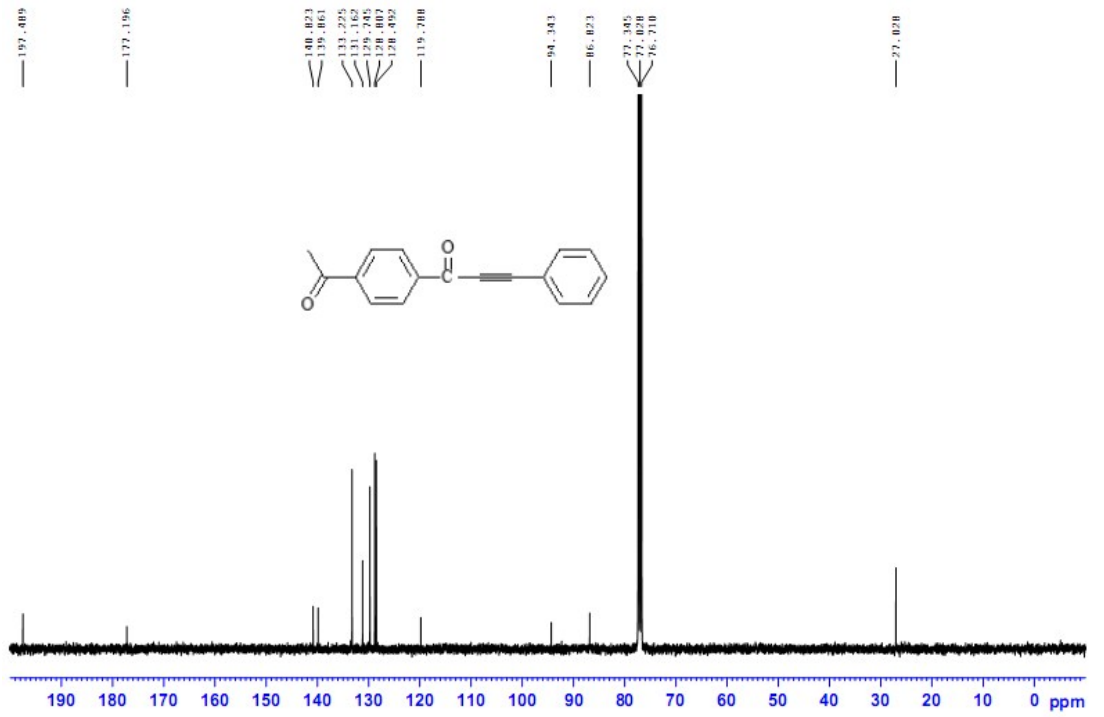

8.083
8.066
8.063
7.621
7.618
7.614
7.606
7.601
7.597
7.430
7.427
7.423
7.415
7.408
7.402
7.393
7.390
7.386
7.364
7.349
7.345
7.332
7.328
7.324
7.275
7.255
7.182
7.125

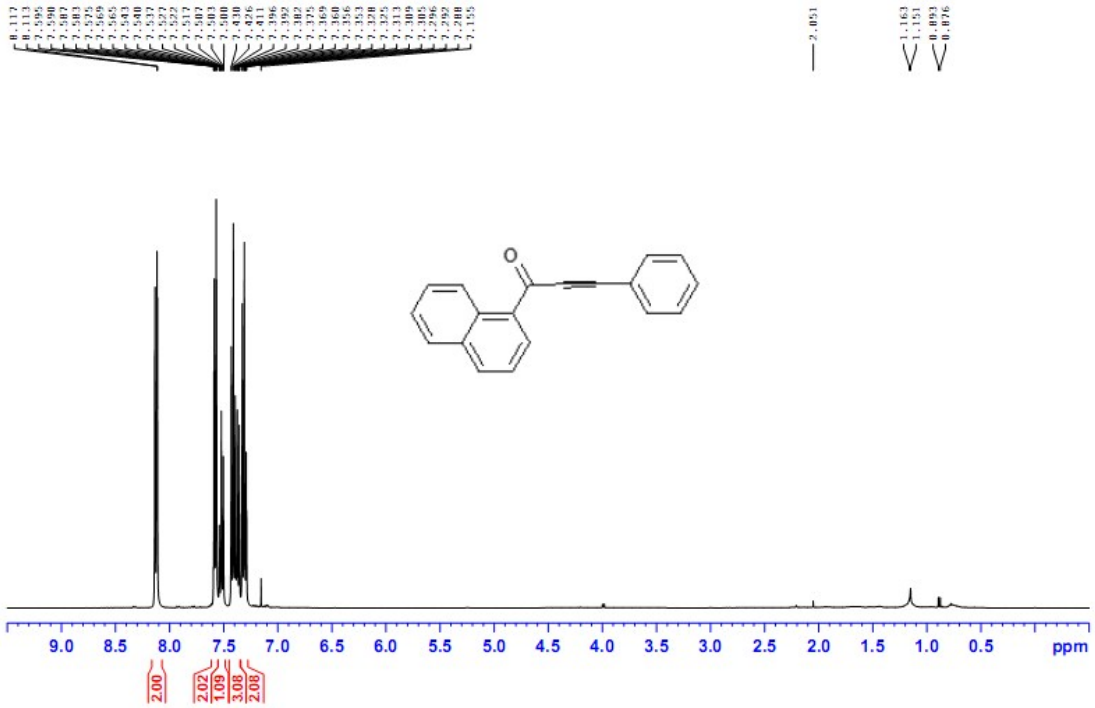

2.695
2.676
2.657
2.638
2.094
1.222
1.203
1.184
0.920
0.903

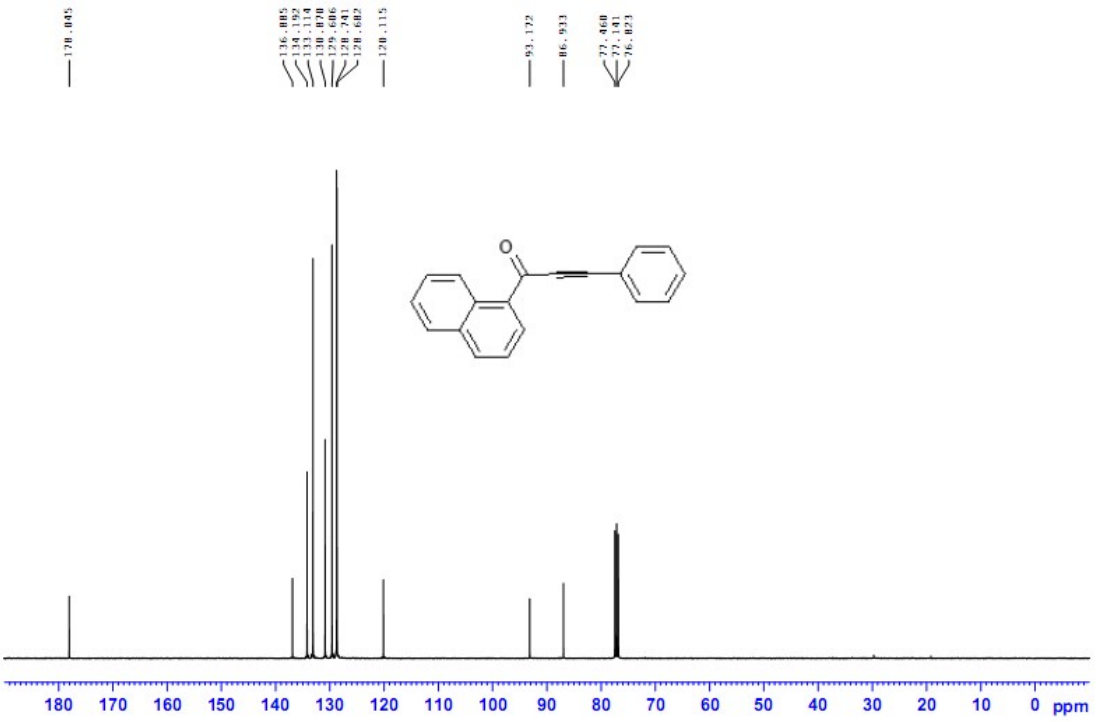

O
C
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
1.95
2.00
3.21
2.04
2.10
3.36

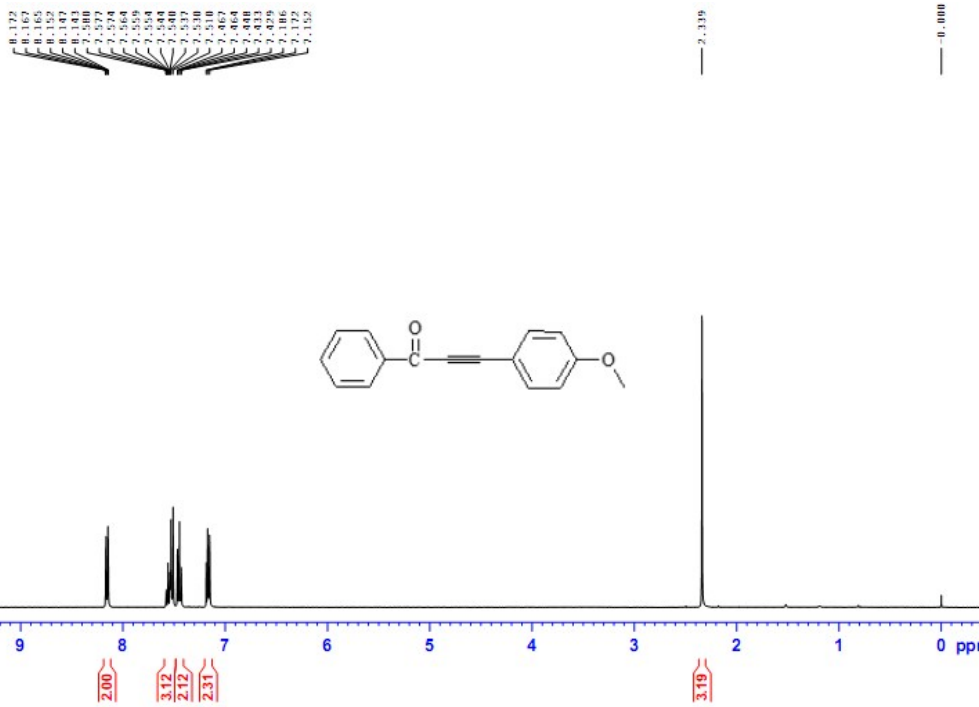

177.804
151.427
134.828
133.059
130.710
129.867
128.691
128.209
120.289
92.648
87.020
77.371
77.253
77.053
76.736
29.140
15.202
O
C
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

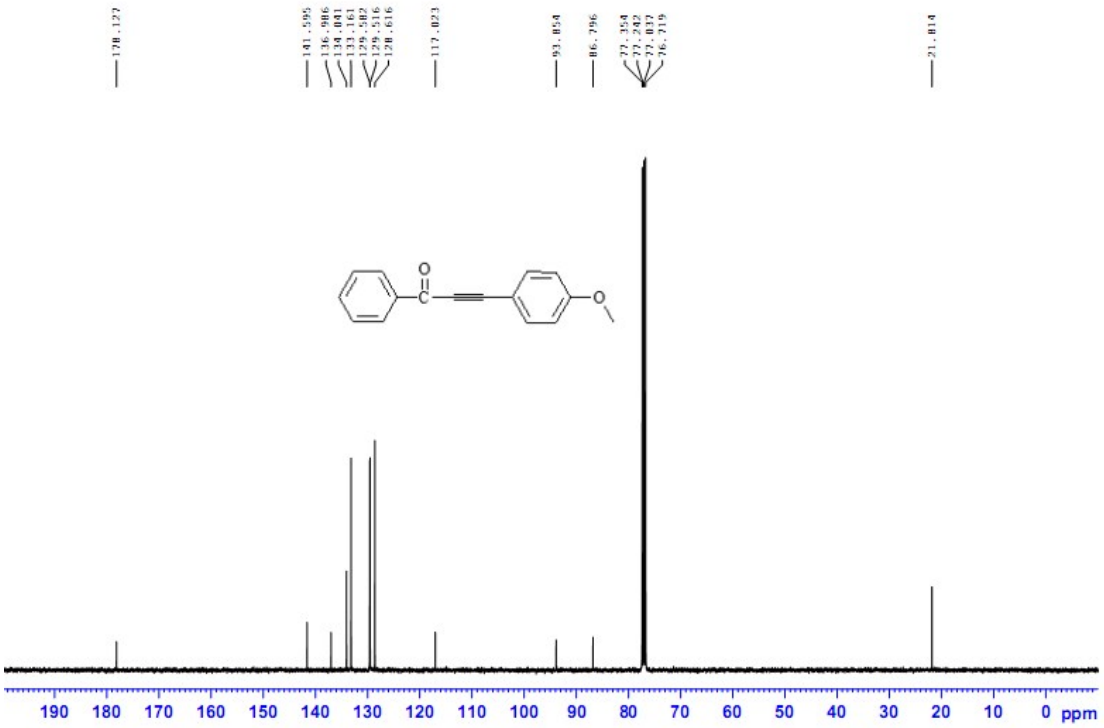

8.250
8.246
8.233
8.229
8.033
8.028
8.016
8.011
7.653
7.651
7.642
7.638
7.633
7.629
7.473
7.461
7.454
7.449
7.439
7.436
7.432
7.401
7.397
7.385
7.382
7.368
7.364
7.361
7.193
2.610
1.500
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
ppm
2.00
2.07
1.98
1.02
2.03
3.03

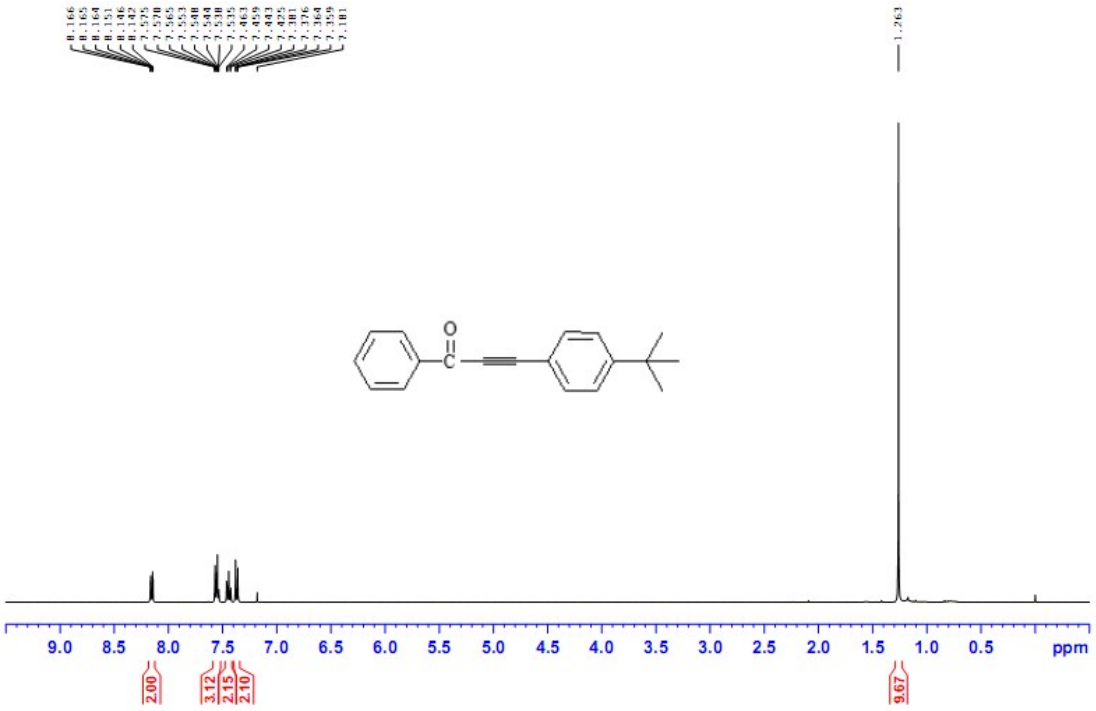

192.489
177.196
140.823
139.861
133.225
131.162
129.745
128.807
128.492
119.288
94.343
86.823
77.345
77.028
76.710
27.028
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
ppm

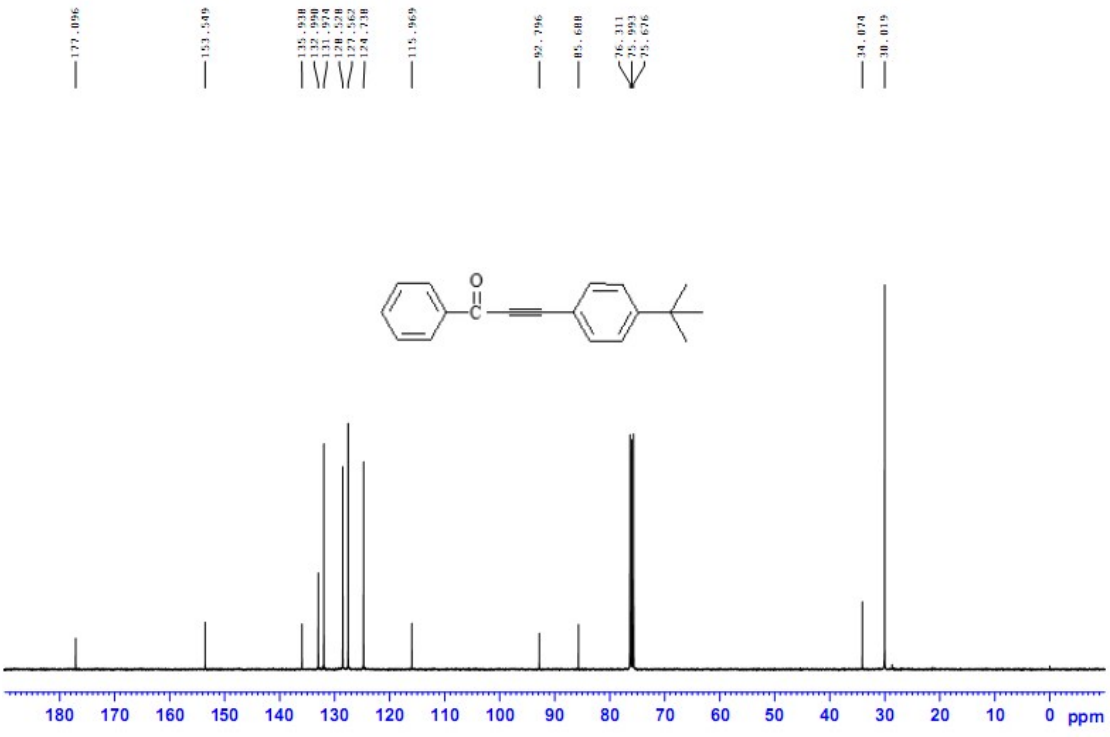

8.117
8.113
7.595
7.590
7.583
7.581
7.575
7.569
7.565
7.543
7.540
7.537
7.522
7.517
7.507
7.503
7.500
7.430
7.426
7.411
7.396
7.392
7.382
7.375
7.369
7.360
7.356
7.353
7.338
7.325
7.313
7.309
7.305
7.296
7.292
7.288
7.155
2.051
1.163
1.151
0.893
0.876
O
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 ppm
2.00
2.02
1.09
3.08
2.08

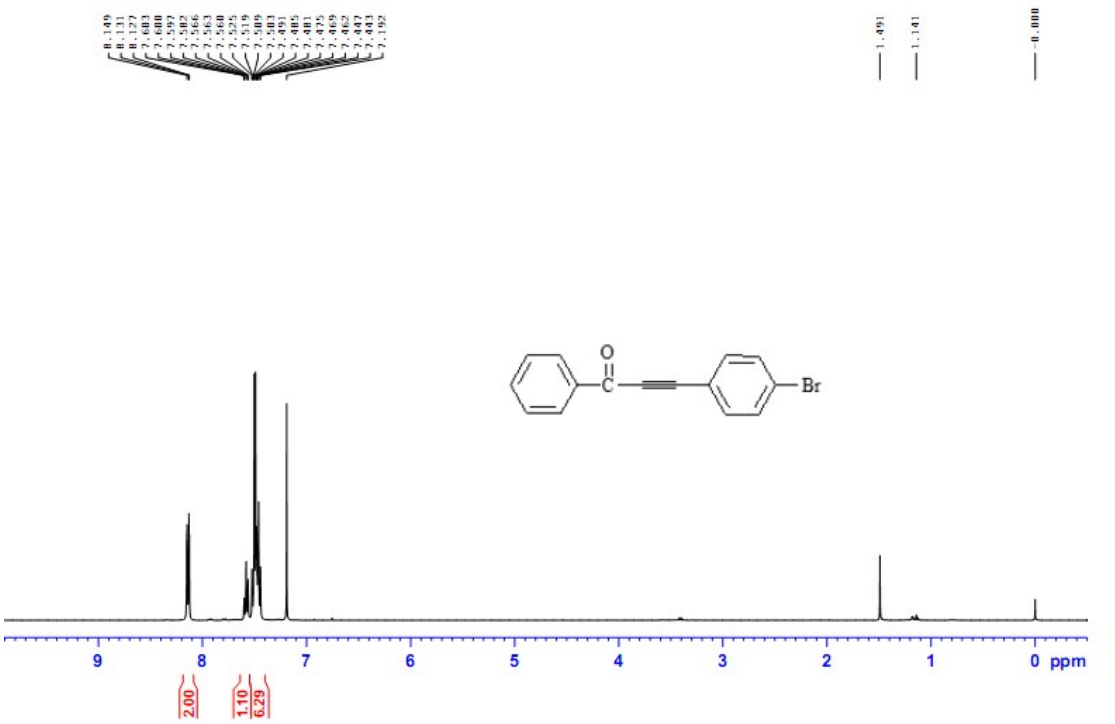

178.045
136.885
134.192
133.114
130.878
130.606
129.741
128.682
120.115
93.172
86.933
77.460
77.141
76.823
O
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm

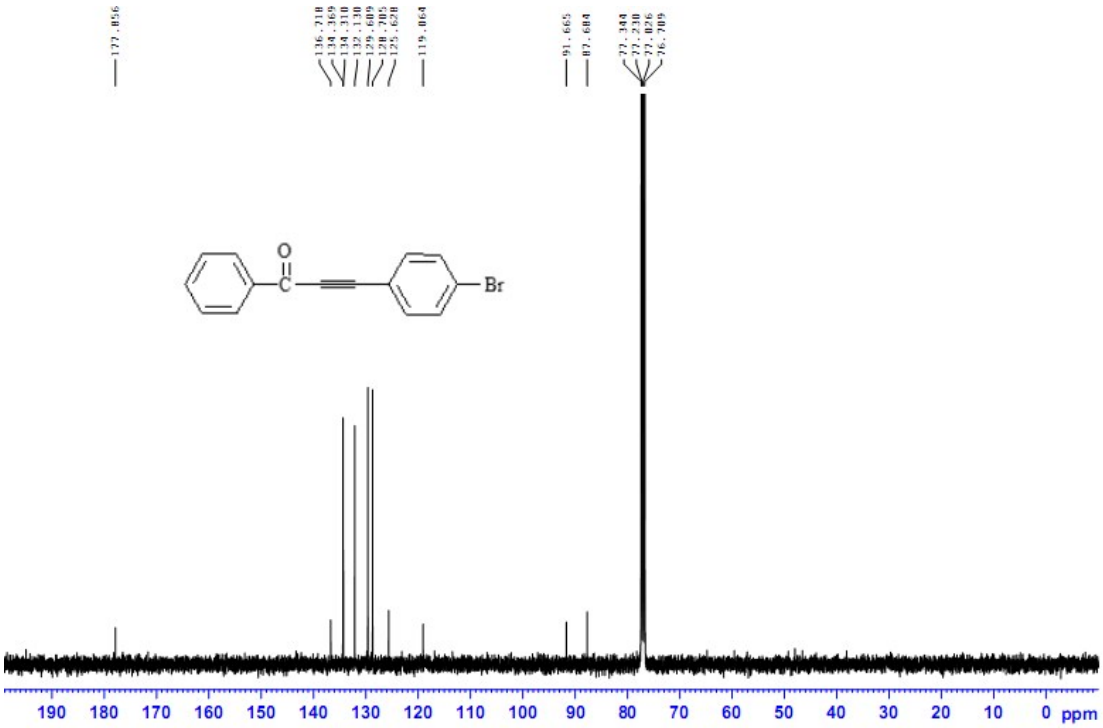

8.172
8.167
8.165
8.152
8.147
8.143
7.588
7.577
7.574
7.564
7.559
7.554
7.544
7.540
7.537
7.530
7.518
7.467
7.464
7.448
7.433
7.429
7.186
7.172
7.152
2.339
0.000
O
C
O
9
8
7
6
5
4
3
2
1
0 ppm
2.00
3.12
2.12
2.31
3.19


178.127
141.595
136.986
134.041
133.161
129.582
129.516
128.616
117.023
93.854
86.796
77.354
77.242
77.037
76.719
21.814
O
C
O
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0 ppm


8.166
8.165
8.164
8.151
8.146
8.142
7.575
7.570
7.565
7.553
7.548
7.544
7.538
7.535
7.463
7.459
7.443
7.425
7.381
7.376
7.364
7.359
7.181
1.263
O
C
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 ppm
2.00
3.12
2.15
2.10
9.67


177.096
153.549
135.938
132.990
131.974
128.528
127.562
124.738
115.969
92.796
85.688
76.311
75.993
75.676
34.874
30.819
O
C
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 ppm


8.149
8.131
8.127
7.603
7.600
7.597
7.569
7.566
7.563
7.560
7.525
7.519
7.509
7.503
7.491
7.481
7.475
7.469
7.462
7.447
7.443
7.192
1.491
1.141
0.000
O
C
Br
9
8
7
6
5
4
3
2
1
0 ppm
2.00
1.10
6.29


177.856
136.718
134.369
134.310
132.130
129.609
128.705
125.628
119.864
91.665
87.684
77.344
77.230
77.026
76.709
O
C
Br
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0 ppm