

Supporting Information

Copper-based catalysts derived from salen-type ligands: Synthesis of 5-substituted-1H-tetrazoles *via* [3+2] cycloaddition and propargylamines *via* A³-coupling reactions

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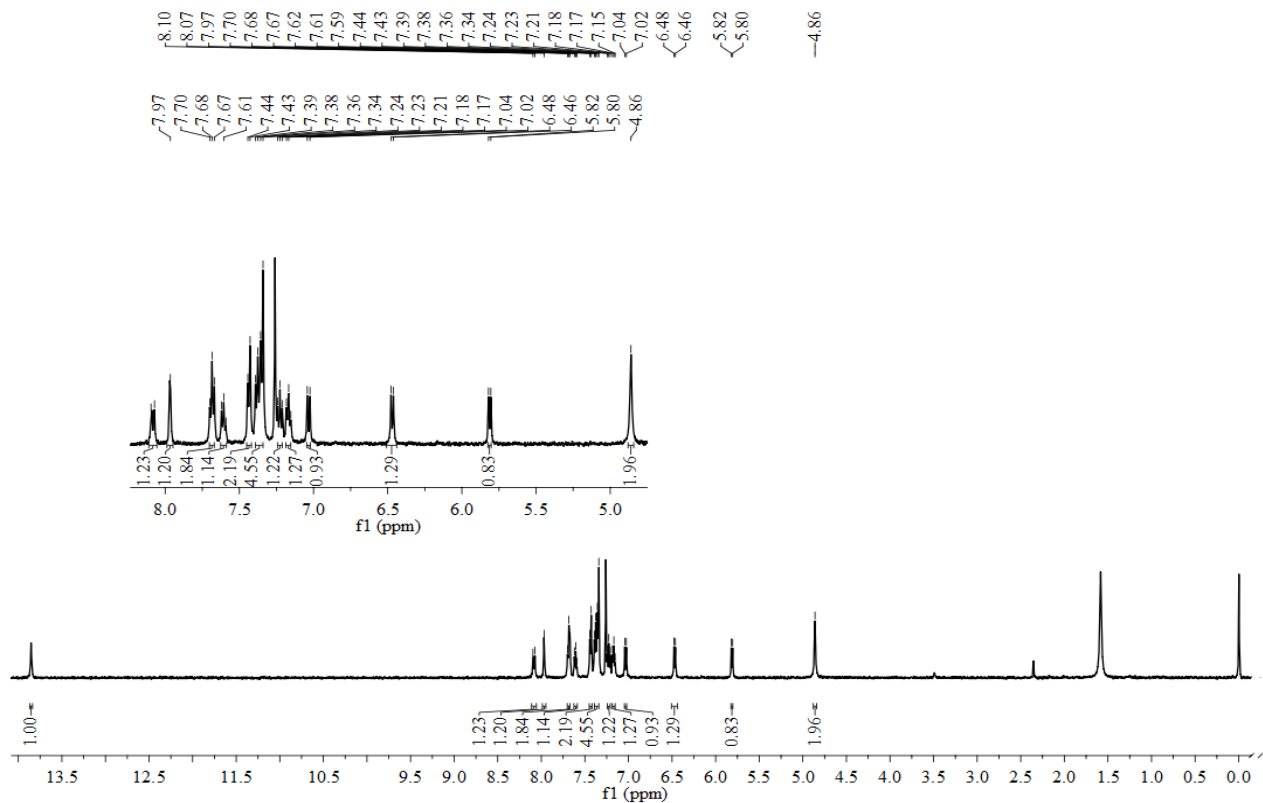


Figure S1: ^1H NMR spectrum of L^1H taking CDCl_3 as solvent.

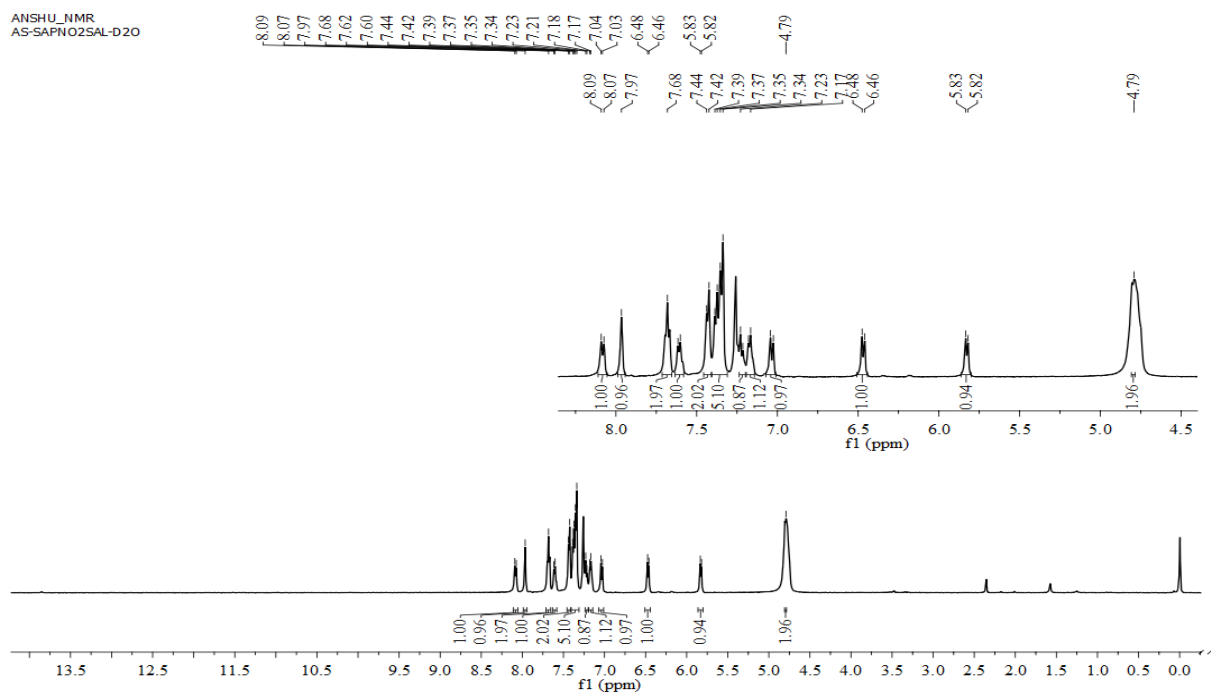


Figure S2: D_2O exchange of ^1H NMR spectrum of L^1H taking CDCl_3 as solvent.

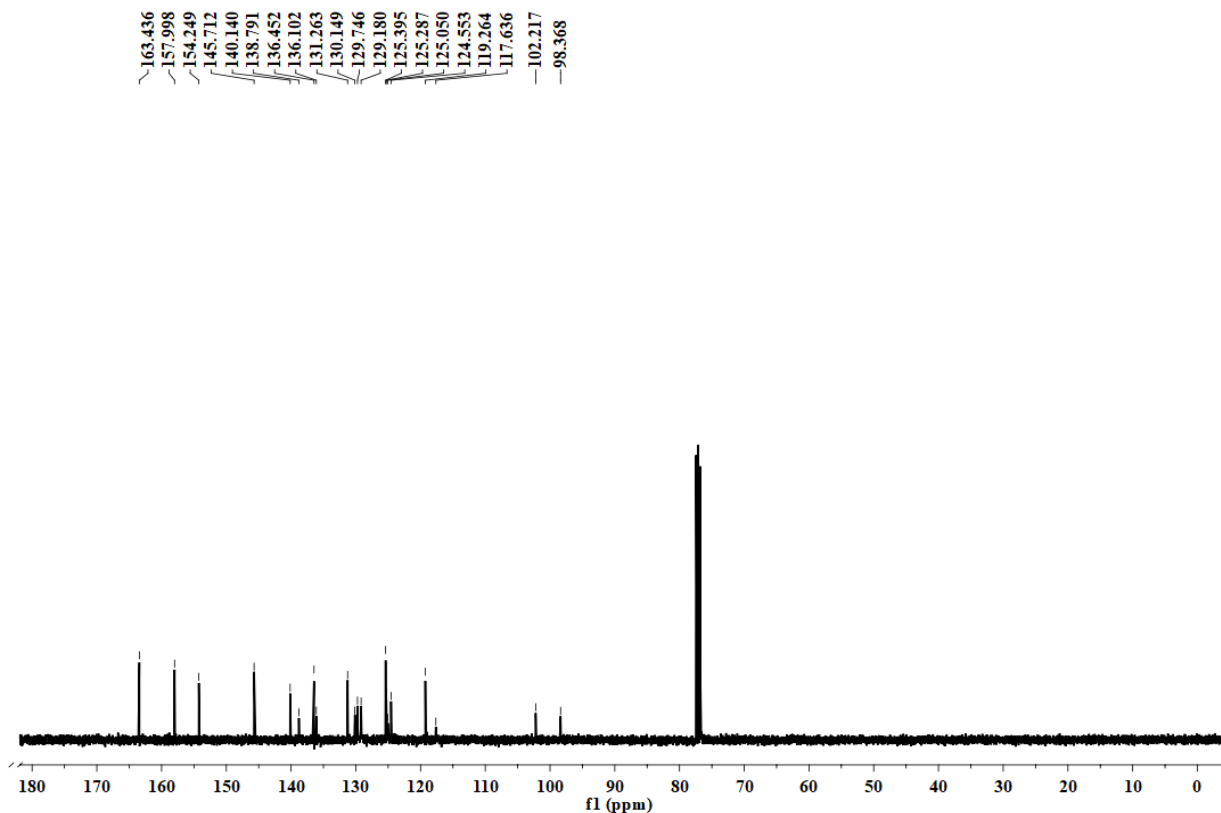


Figure S3: ^{13}C NMR spectrum of L^1H taking CDCl_3 as solvent.

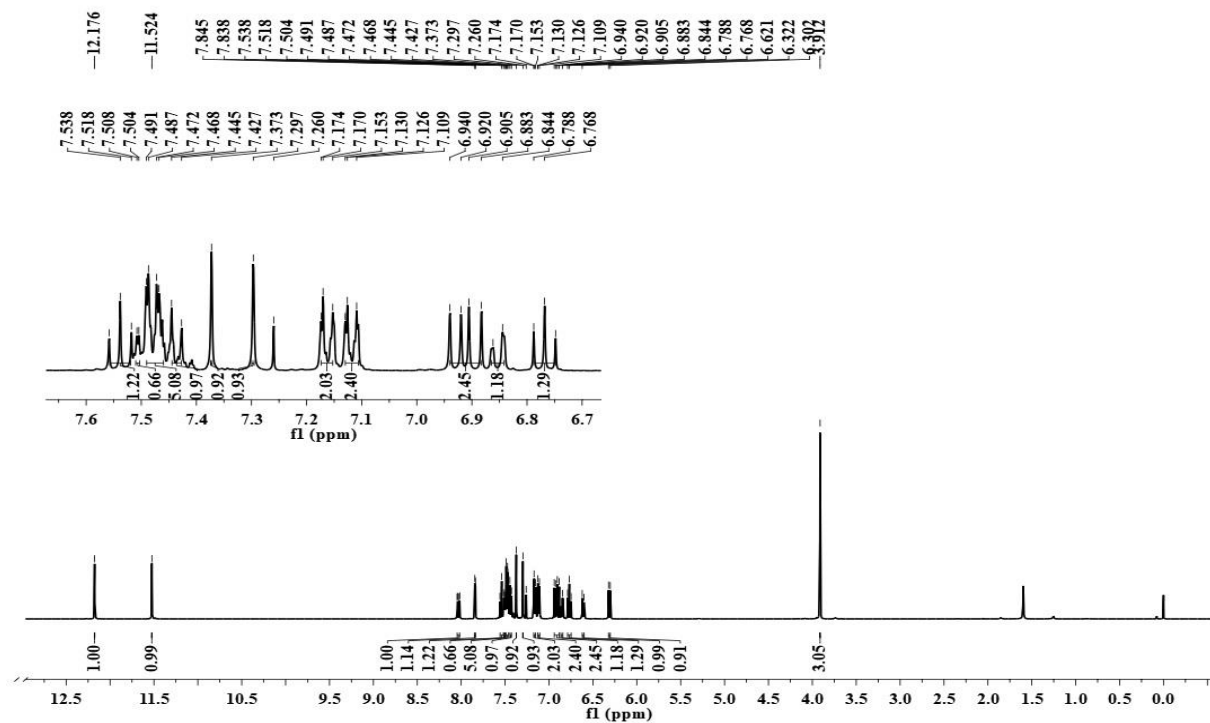


Figure S4: ^1H NMR spectrum of L^2H taking CDCl_3 as solvent.

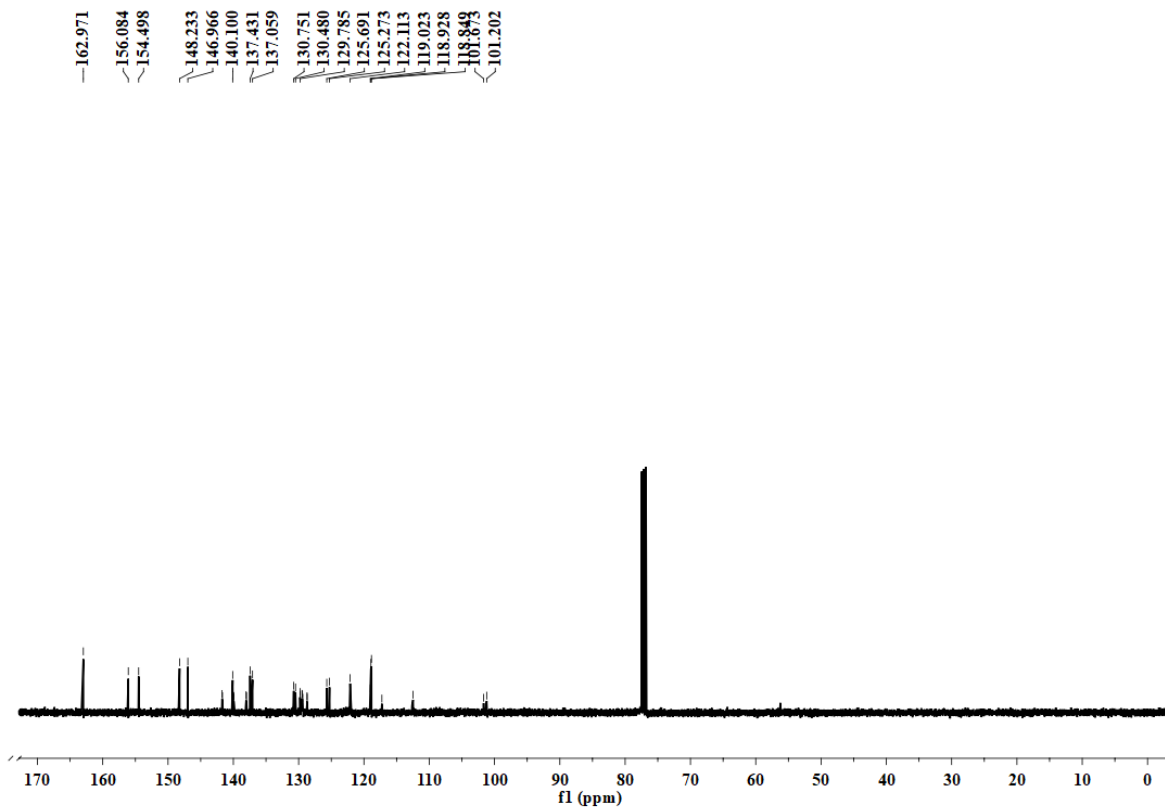


Figure S5: ^{13}C NMR spectrum of L^2H taking CDCl_3 as solvent.

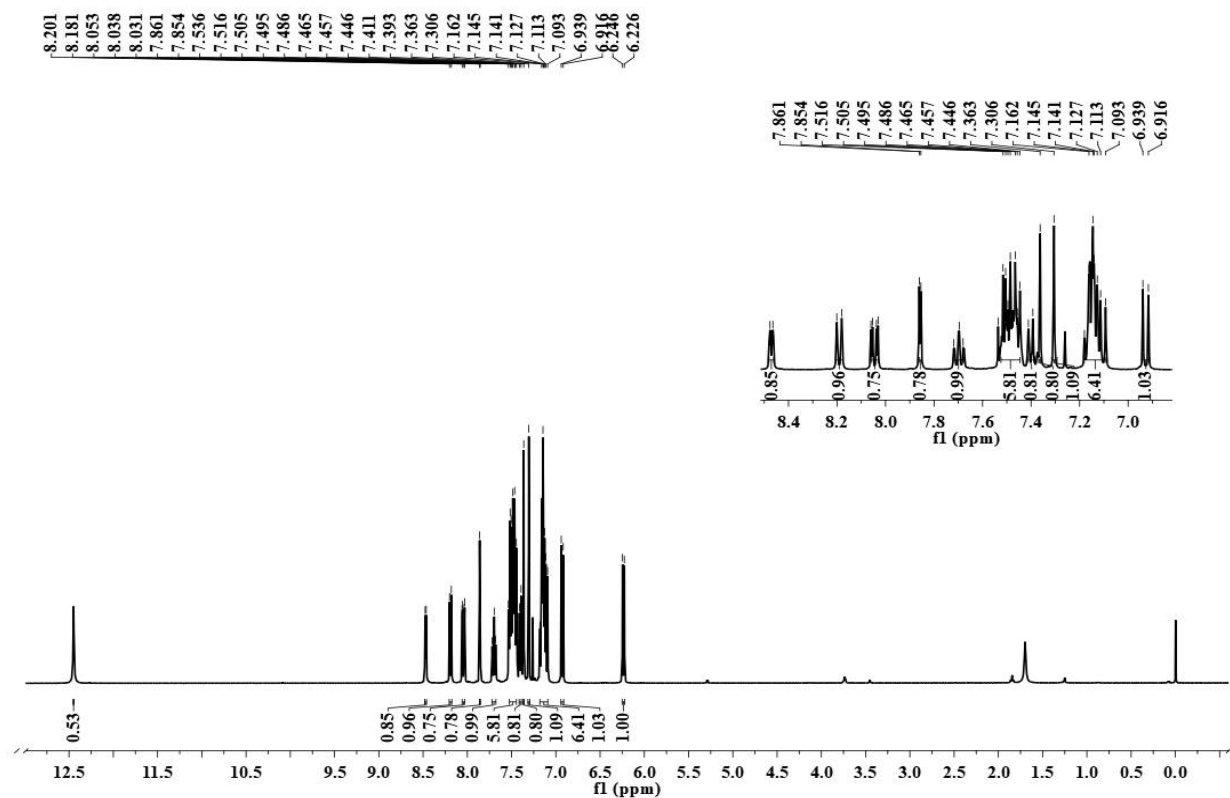


Figure S6: ^1H NMR spectrum of L^3H taking CDCl_3 as solvent.

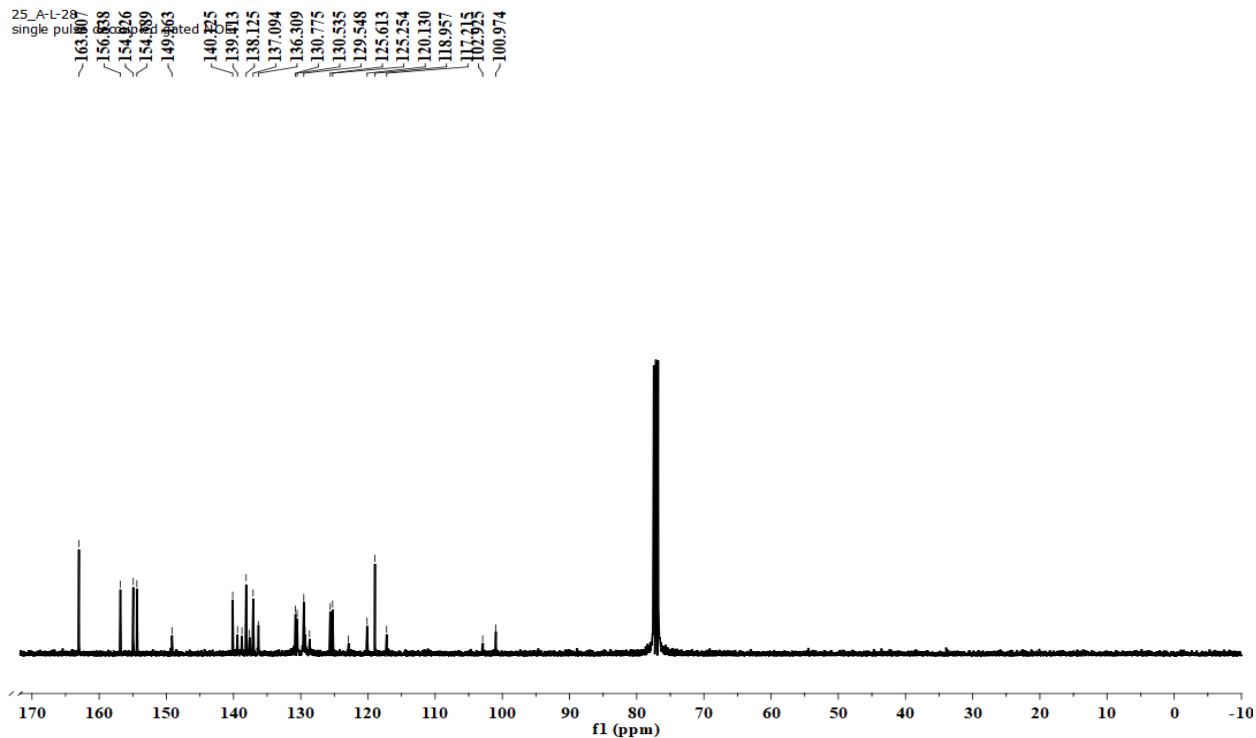


Figure S7: ^{13}C NMR spectrum of L^3H taking CDCl_3 as solvent.

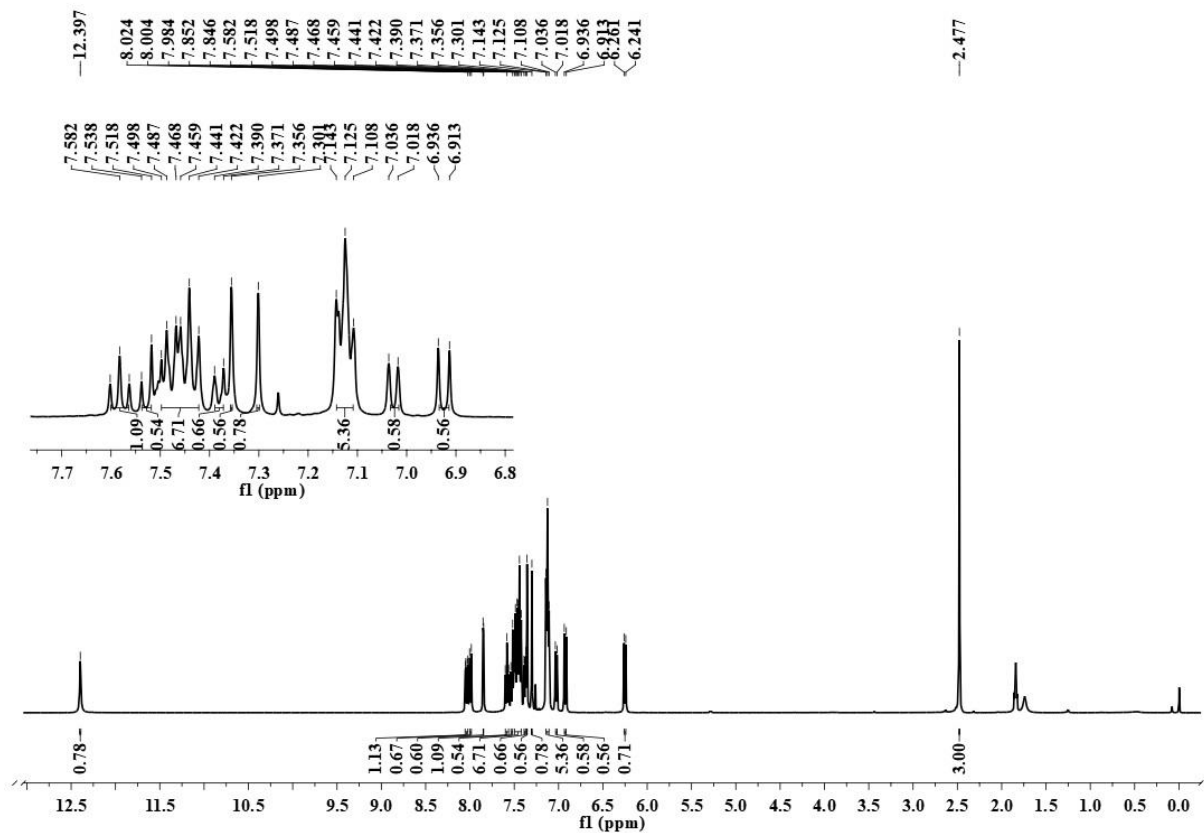


Figure S8: ^1H NMR spectrum of L^4H taking CDCl_3 as solvent.

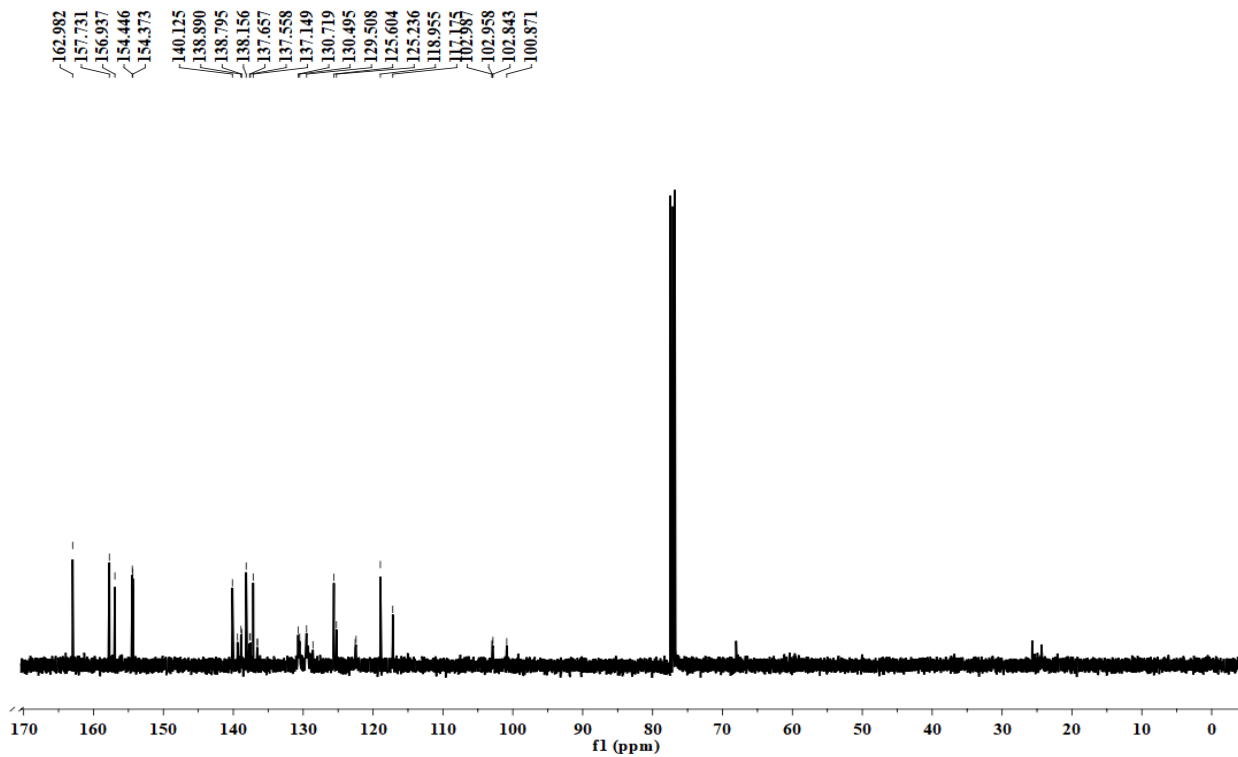


Figure S9: ^{13}C NMR spectrum of L^4H taking CDCl_3 as solvent.

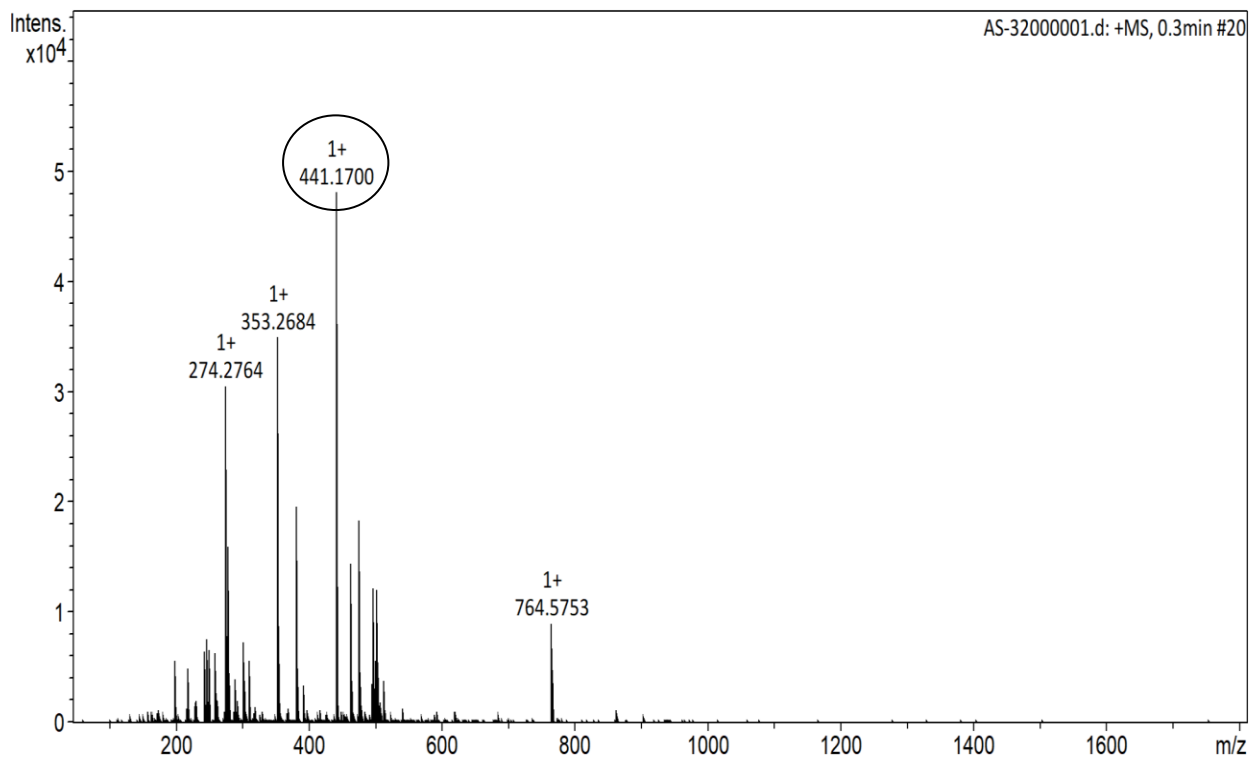


Figure S10: ESI-MS Spectrum of L^1H using acetonitrile as solvent.

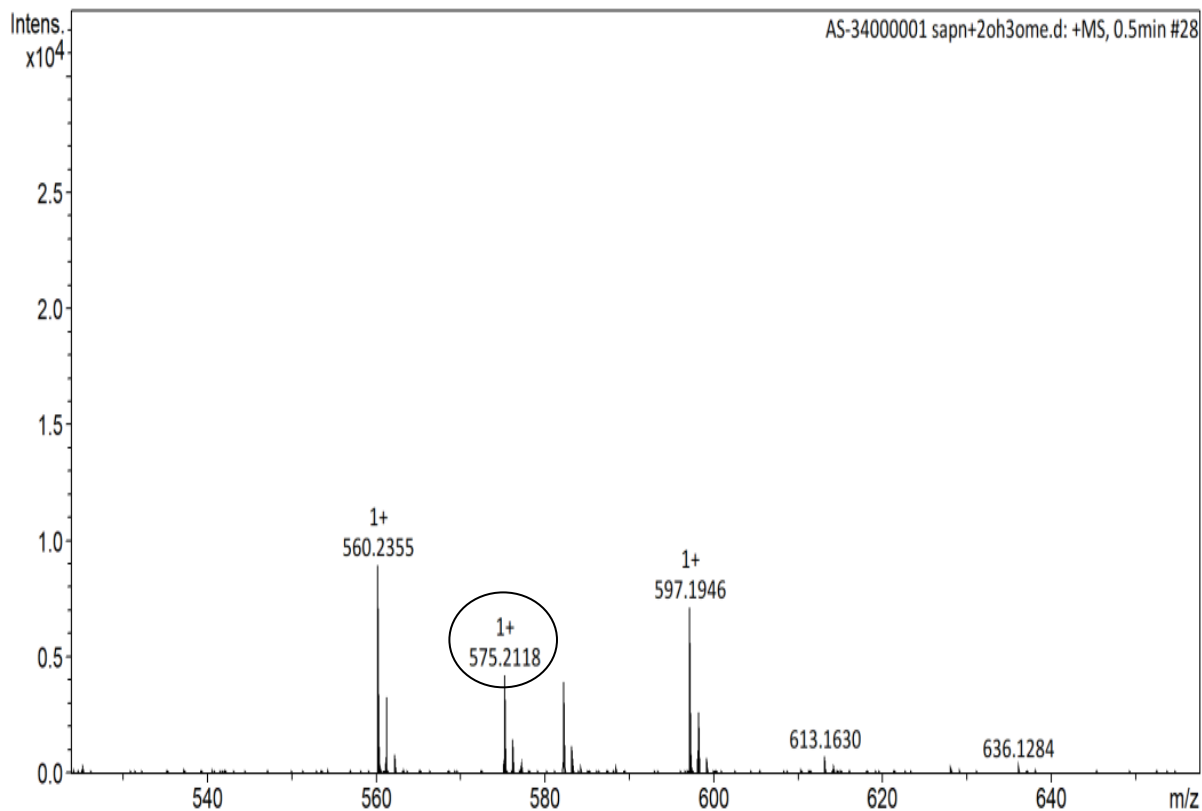


Figure S11: ESI-MS Spectrum of L²H using acetonitrile as solvent.

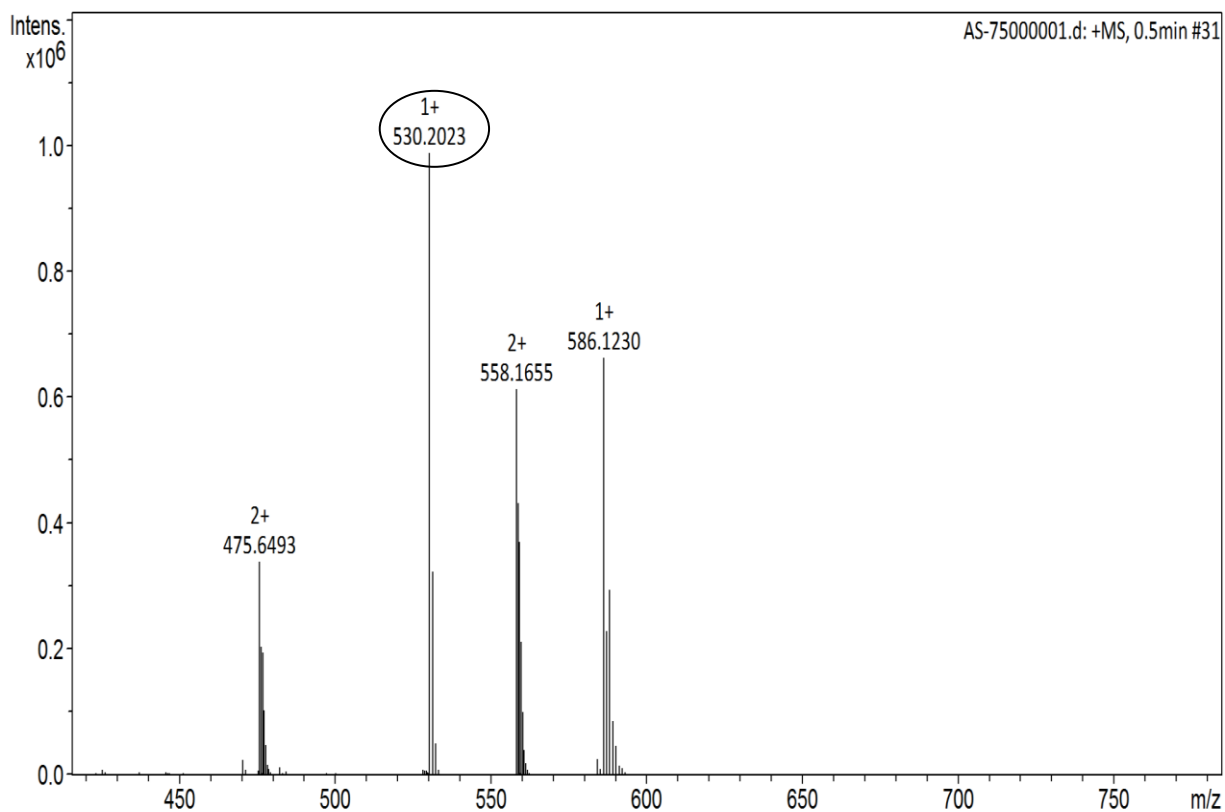


Figure S12: ESI-MS Spectrum of L³H using acetonitrile as solvent.

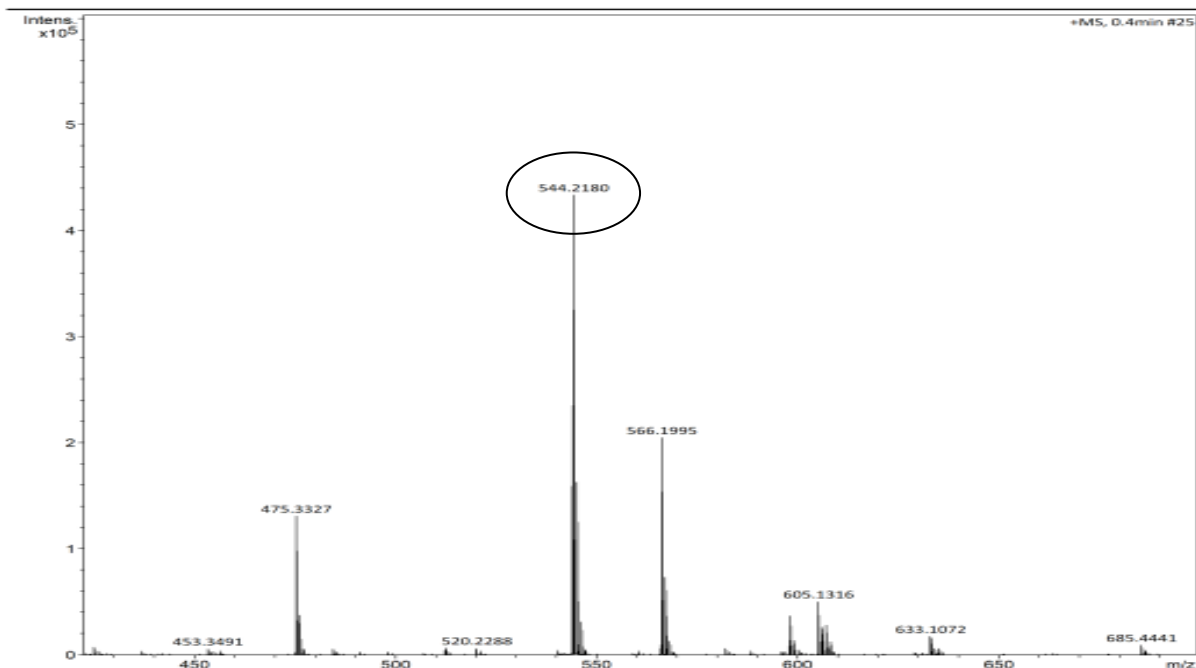
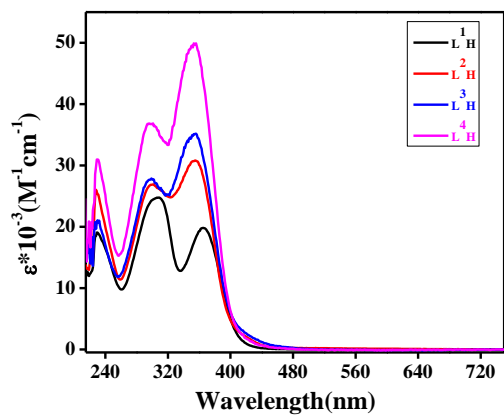
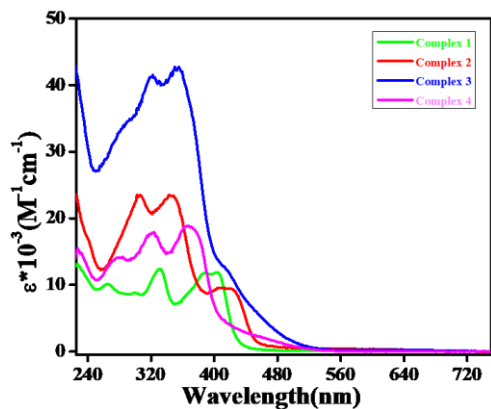


Figure S13: ESI-MS Spectrum of L⁴H using acetonitrile as solvent.



| Molecule | λ_{\max} (nm) | ϵ ($M^{-1}cm^{-1}$) |
|------------------|-----------------------|--------------------------------|
| L ¹ H | 230, 307, 365 | 19130, 24920, 20160 |
| L ² H | 227, 298, 355 | 26130, 27020, 31020 |
| L ³ H | 231, 297, 355 | 21380, 28170, 35510 |
| L ⁴ H | 229, 297, 355 | 31230, 37010, 50180 |

Figure S14: Electronic absorption spectra and spectral data of ligands L¹H-L⁴H in dichloromethane solution.



| Molecule | λ_{\max} (nm) | ϵ ($M^{-1}cm^{-1}$) |
|-----------|-----------------------|--------------------------------|
| Complex 1 | 264, 331, 386, 404 | 10200, 12560, 11990, 12000 |
| Complex 2 | 304, 344, 406, 422 | 23550, 23670, 9770, 9650 |
| Complex 3 | 282, 320, 351, 418 | 33490, 41720, 42660, 11950 |
| Complex 4 | 280, 321, 364, 456 | 14280, 17990, 19110, 2420 |

Figure S15: Electronic absorption spectra and spectral data of complexes 1-4 in dichloromethane solution.

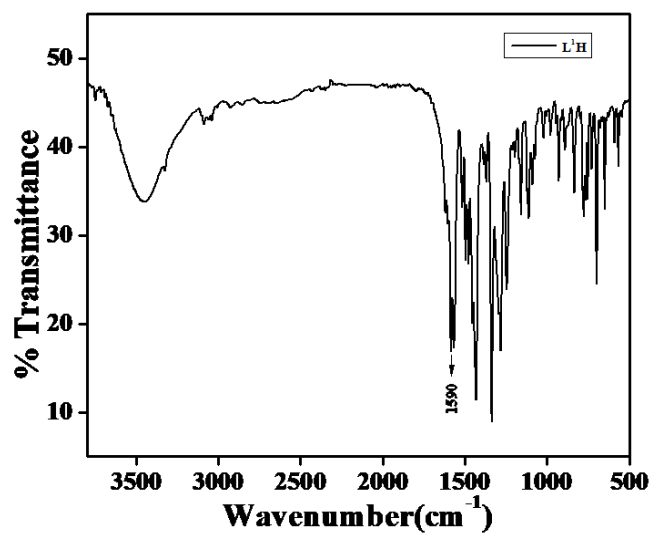


Figure S16: IR spectrum of ligand L¹H.

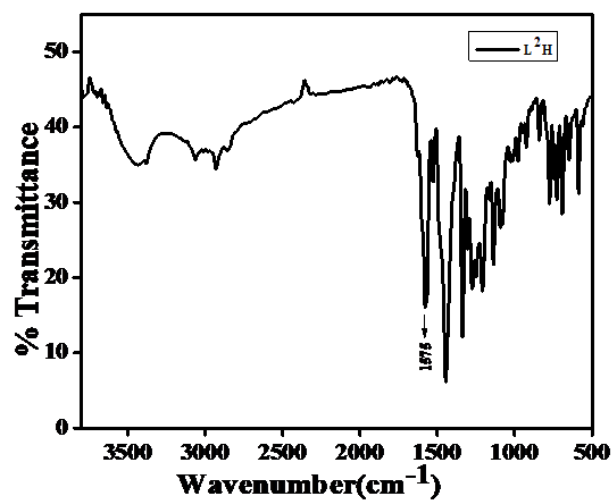


Figure S17: IR spectrum of ligand L²H.

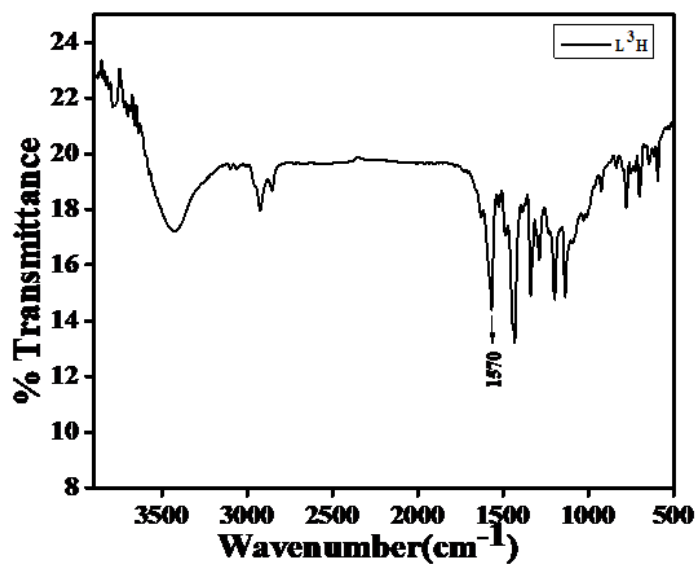


Figure S18: IR spectrum of ligand L³H.

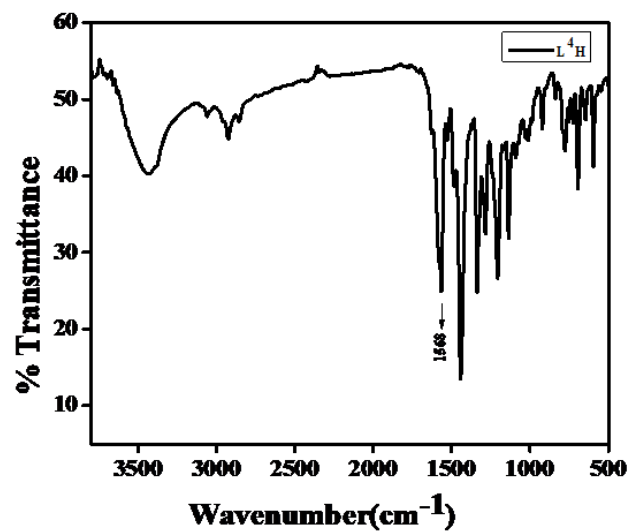


Figure S19: IR spectrum of ligand L⁴H.

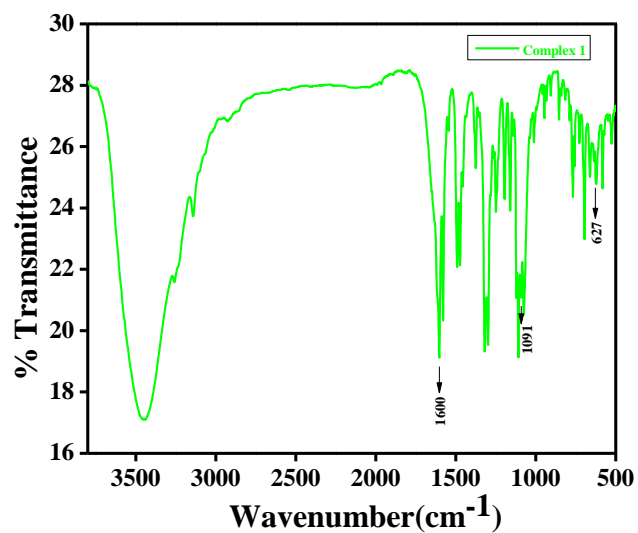


Figure S20: IR spectrum of complex 1.

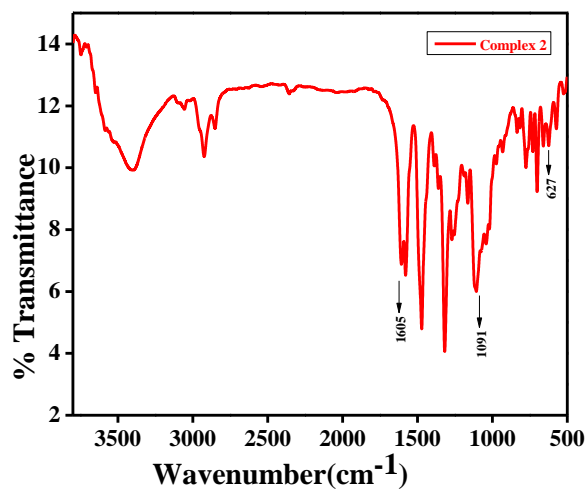


Figure S21: IR spectrum of complex 2.

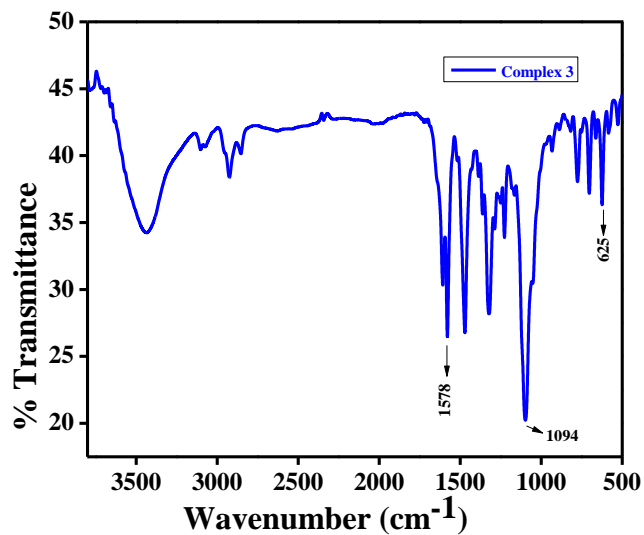


Figure S22: IR spectrum of complex 3.

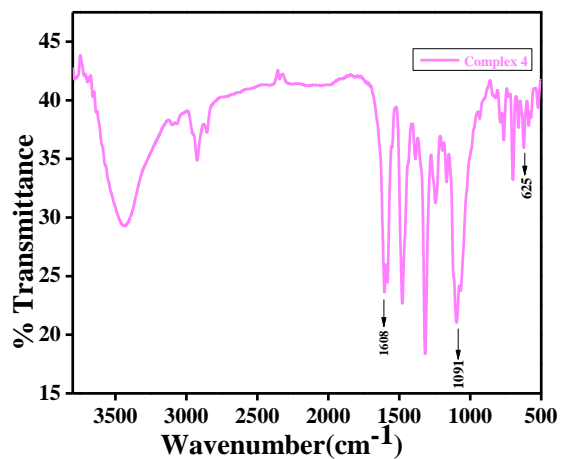


Figure S23: IR spectrum of complex 4.

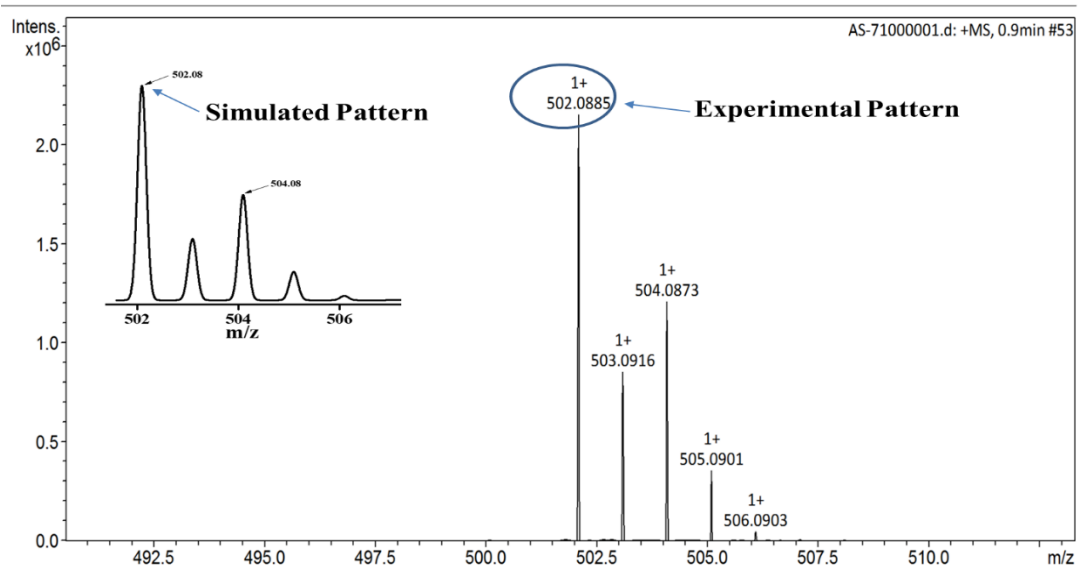


Figure S24: ESI-MS spectrum of complex 1 using acetonitrile as solvent.

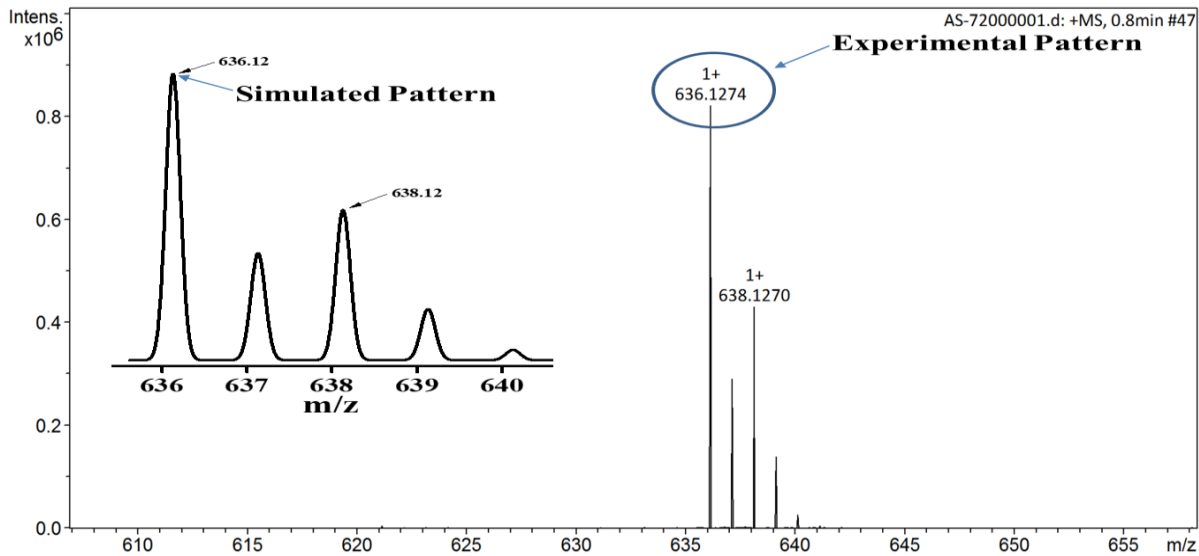


Figure S25: ESI-MS spectrum of complex **2** using acetonitrile as solvent.

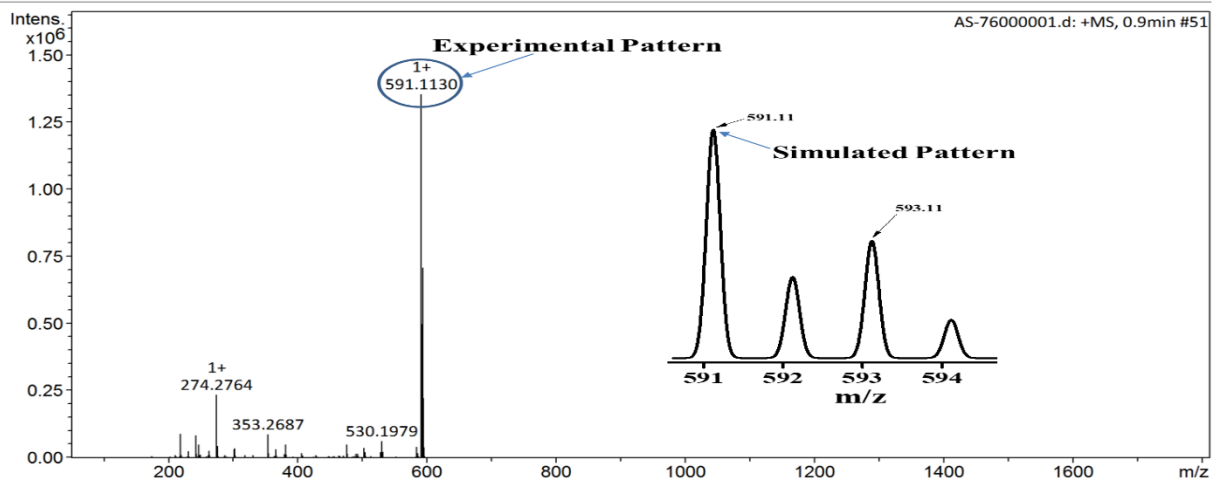


Figure S26: ESI-MS spectrum of complex **3** using acetonitrile as solvent.

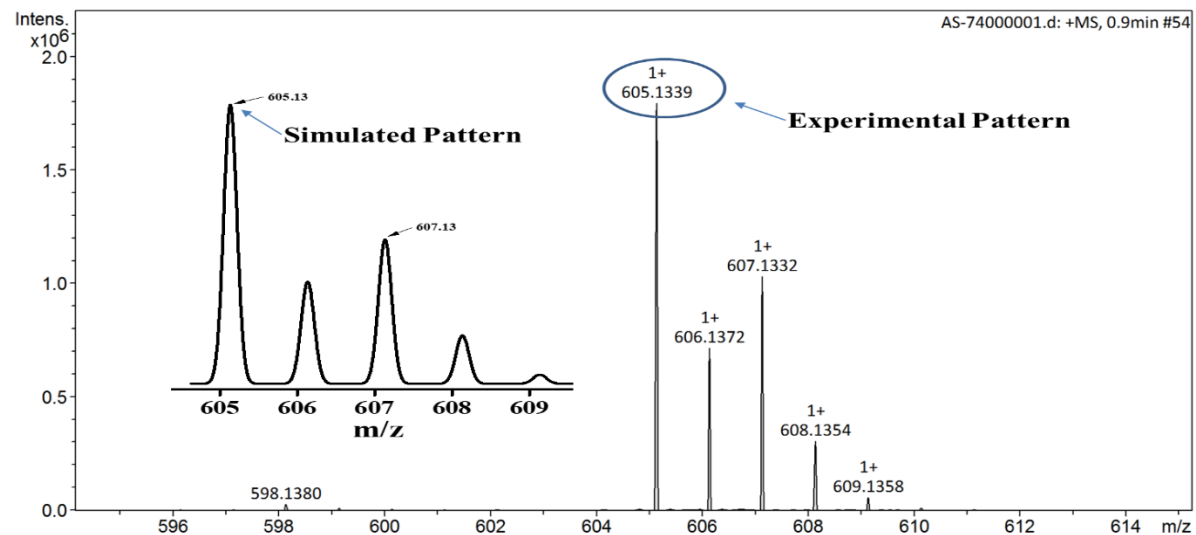


Figure S27: ESI-MS spectrum of complex **4** using acetonitrile as solvent.

Table S1: Crystal data and structural refinement parameters for complexes **1**, **2** and **4**.

| Empirical formula | C24 H19 Cu N6 O3, Cl O4 | C32 H25 Cl Cu N6 O9, 0.35(C7 H8), 0.15(C O) | C31 H25 Cl2 Cu N7 O11 [+ solvent] |
|--|---|---|---|
| Color | Green | Green | Green |
| Formula weight | 602.44 | 773.02 | 806.03 |
| Temperature (K) | 293(2) | 296(2) | 293(2) |
| λ (Å) (Mo-K α) | 0.71073 | 0.71073 | 0.71073 |
| Crystal system | monoclinic | triclinic | triclinic |
| Space group | <i>P</i> 21/ <i>n</i> | <i>P</i> -1 | <i>P</i> -1 |
| <i>a</i> (Å) | 12.216(3) | 11.0303(12) | 10.1909(4) |
| <i>b</i> (Å) | 15.250(4) | 13.7093(13) | 12.3887(5) |
| <i>c</i> (Å) | 13.903(4) | 14.831(2) | 15.5047(5) |
| α (°) | 90 | 88.132(8) | 77.781(2) |
| β (°) | 111.406(12) | 68.696(6) | 77.754(2) |
| γ (°) | 90 | 70.091(6) | 69.406(2) |
| Z | 4 | 2 | 2 |
| ρ_{calc} (gcm ⁻³) | 1.659 | 1.314 | 1.512 |
| F(000) | 1228.0 | 793 | 822.0 |
| θ range for data collection | 2.326–28.564 | 2.927–25.349 | 2.720–28.312 |
| Index ranges | -16< <i>h</i> <16, -14< <i>k</i> <20 -18< <i>l</i> <17 | -13< <i>h</i> <13, -16< <i>k</i> <16 -17< <i>l</i> <17 | -13< <i>h</i> <13, -16< <i>k</i> <16 -20< <i>l</i> <20 |
| Refinement method | Full matrix least-squares on F ² | Full matrix least-squares on F ² | Full matrix least-squares on F ² |
| Data/restraint/parameters | 6016/13/ 350 | 7079/1/464 | 8667/0/470 |
| GOF ^a on F ² | 1.051 | 1.066 | 1.046 |
| R ₁ ^b [<i>I</i> > 2 σ (<i>I</i>)] | 0.0434 | 0.0729 | 0.0597 |
| R ₁ (all data) | 0.0551 | 0.1163 | 0.1114 |
| wR ₂ ^c (<i>I</i> > 2 σ (<i>I</i>)) | 0.1266 | 0.2135 | 0.1623 |
| wR ₂ (all data) | 0.1363 | 0.2476 | 0.1893 |

^aGOF = $[\sum[w(\text{Fo}^2 - \text{Fc}^2)^2] / (\text{M} - \text{N})]^{1/2}$ (M = number of reflections, N = number of parameters refined). ^bR₁ = $\sum ||\text{Fo}| - |\text{Fc}|| / \sum |\text{Fo}|$,

^cwR₂ = $[\sum[w(\text{Fo}^2 - \text{Fc}^2)_2] / \sum [w(\text{Fo}_2)_2]]^{1/2}$

Table S2: Selected bond angles and bond distances of complex **1**.

| Bond Lengths (Å) | | Bond Angles(°) | |
|------------------|------------|----------------|-----------|
| Cu1—O1 | 1.8552(18) | O1—Cu1—N3 | 174.73(8) |
| Cu1—N3 | 1.883(2) | O1—Cu1—N1 | 103.20(8) |
| Cu1—N1 | 2.075(2) | O1—Cu1—N5 | 94.91(8) |
| Cu1—N5 | 1.974(2) | N3—Cu1—N1 | 81.00(9) |
| | | N3—Cu1—N5 | 80.72(8) |
| | | N5—Cu1—N1 | 161.53(8) |

Table S3: Selected bond angles and bond distances of complex **2**.

| Bond Lengths (Å) | | Bond Angles(°) | |
|------------------|----------|----------------|------------|
| Cu1—O1 | 1.854(3) | O1—Cu1—N3 | 168.85(18) |
| Cu1—N3 | 1.887(4) | O1—Cu1—N1 | 104.67(15) |
| Cu1—N1 | 2.090(4) | O1—Cu1—N5 | 94.97(15) |
| Cu1—N5 | 1.973(4) | N3—Cu1—N1 | 79.93(17) |
| | | N3—Cu1—N5 | 80.09(17) |
| | | N5—Cu1—N1 | 160.02(17) |

Table S4: Selected bond angles and bond distances of complex 4.

| | | | |
|---------------|----------|------------------|------------|
| Cu1—O1 | 1.857(2) | O1—Cu1—N3 | 176.58(11) |
| Cu1—N3 | 1.891(3) | O1—Cu1—N1 | 105.81(10) |
| Cu1—N1 | 2.193(3) | O1—Cu1—N5 | 95.25(10) |
| Cu1—N5 | 1.959(3) | N3—Cu1—N1 | 77.51(11) |
| | | N3—Cu1—N5 | 81.58(12) |
| | | N5—Cu1—N1 | 157.33(11) |

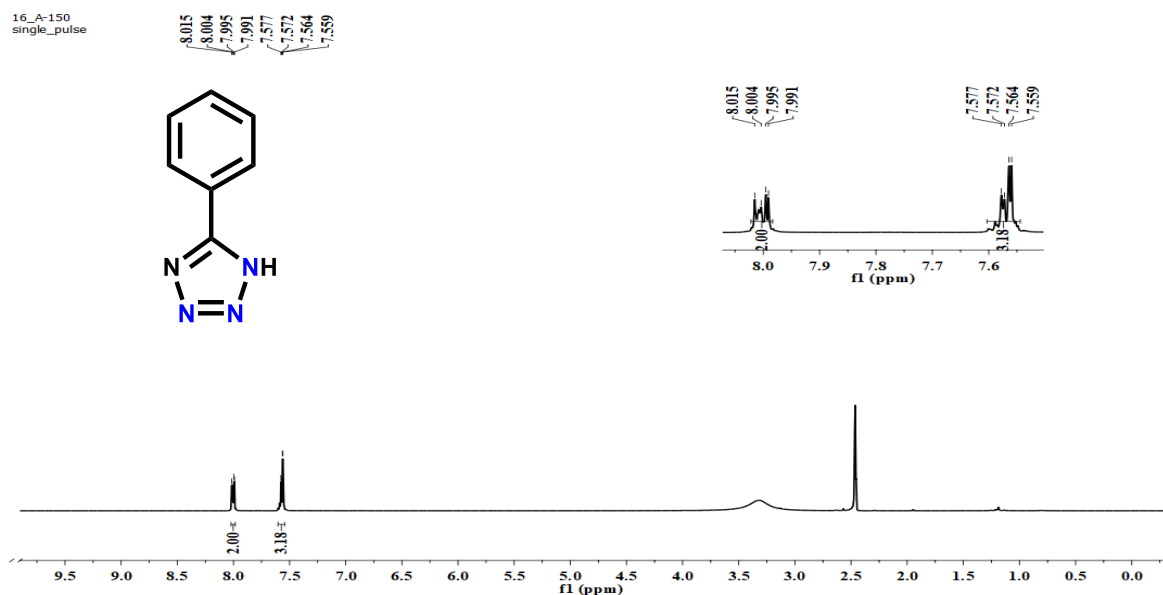


Figure S28: ^1H NMR spectrum of 3a taking DMSO as solvent.

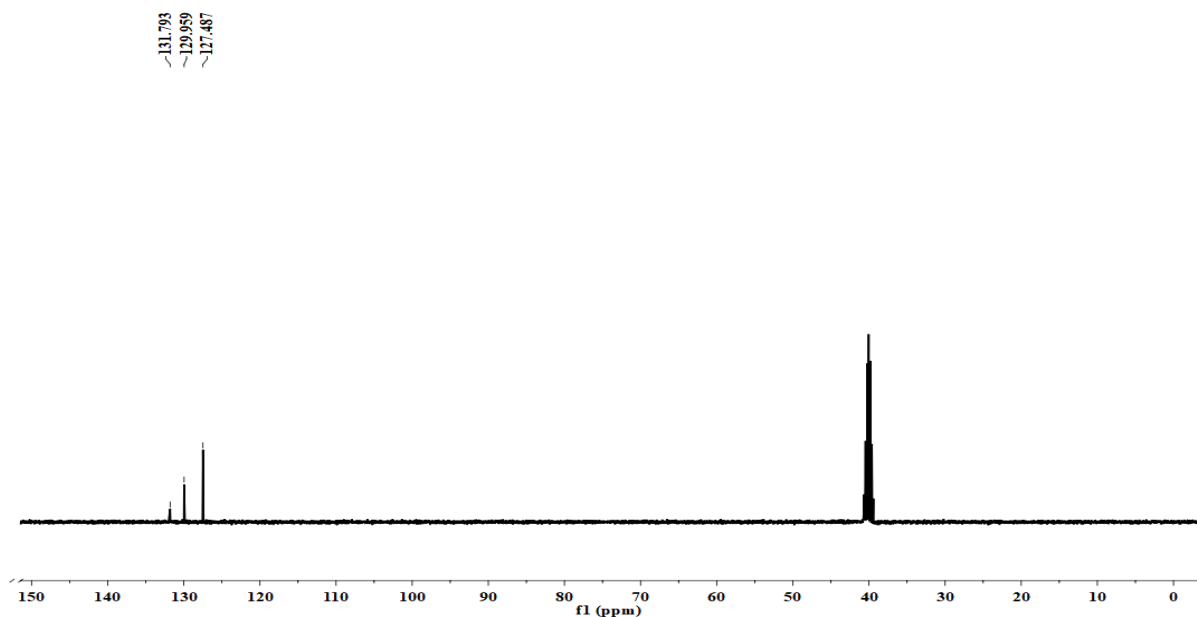


Figure S29: ^{13}C NMR spectrum of taking 3a DMSO as solvent.

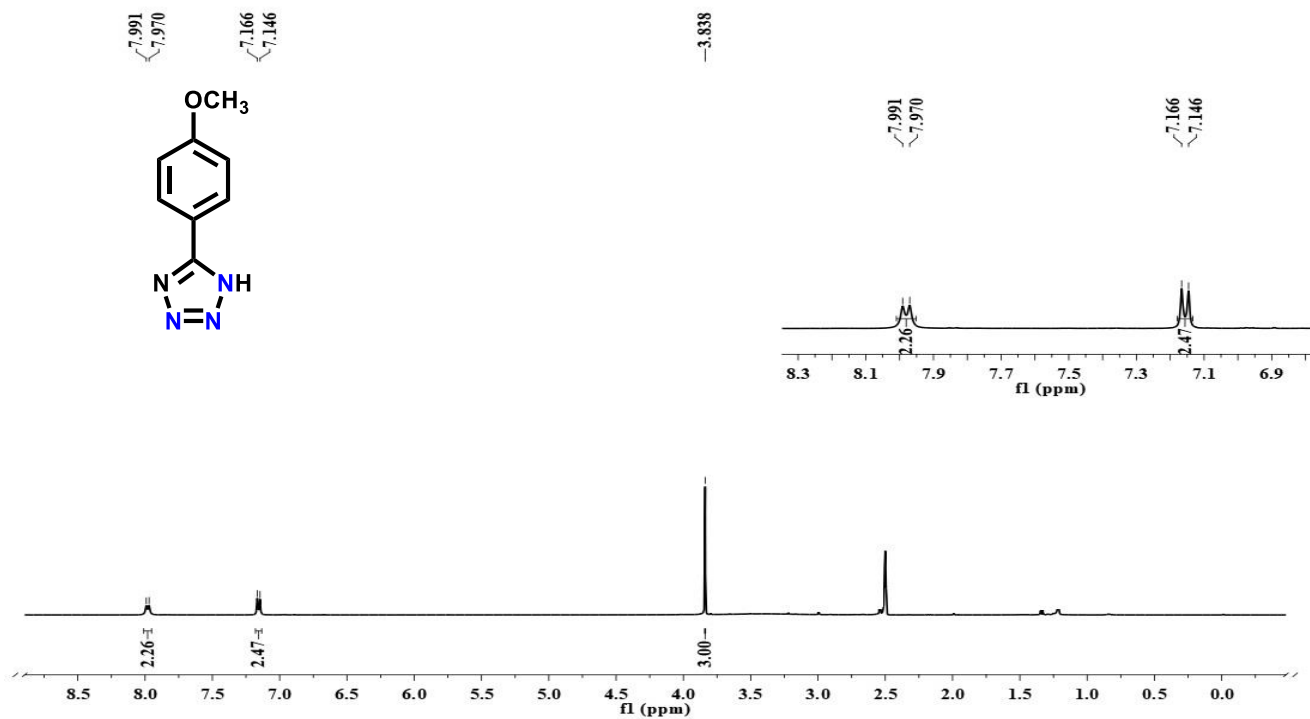


Figure S30: ¹H NMR spectrum of 3b taking DMSO as solvent.

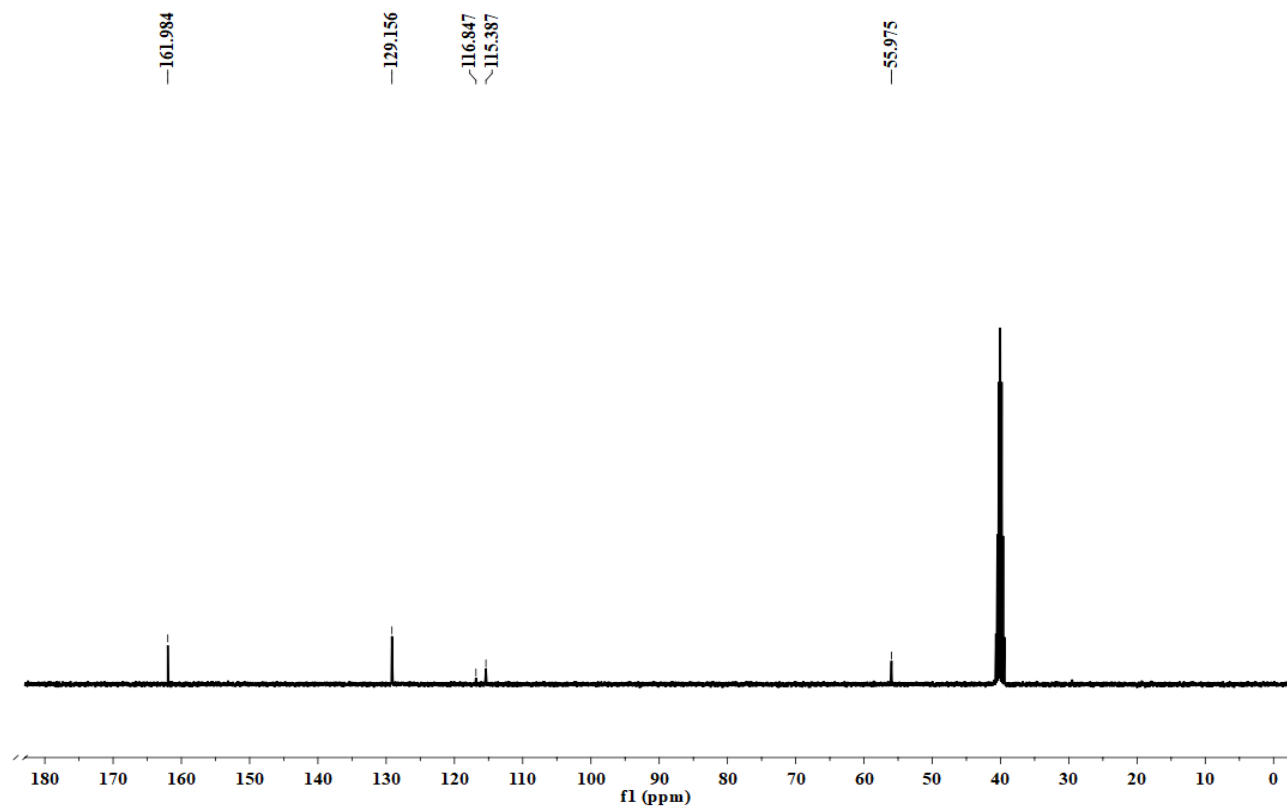


Figure S31: ¹³C NMR spectrum of 3b taking DMSO as solvent.

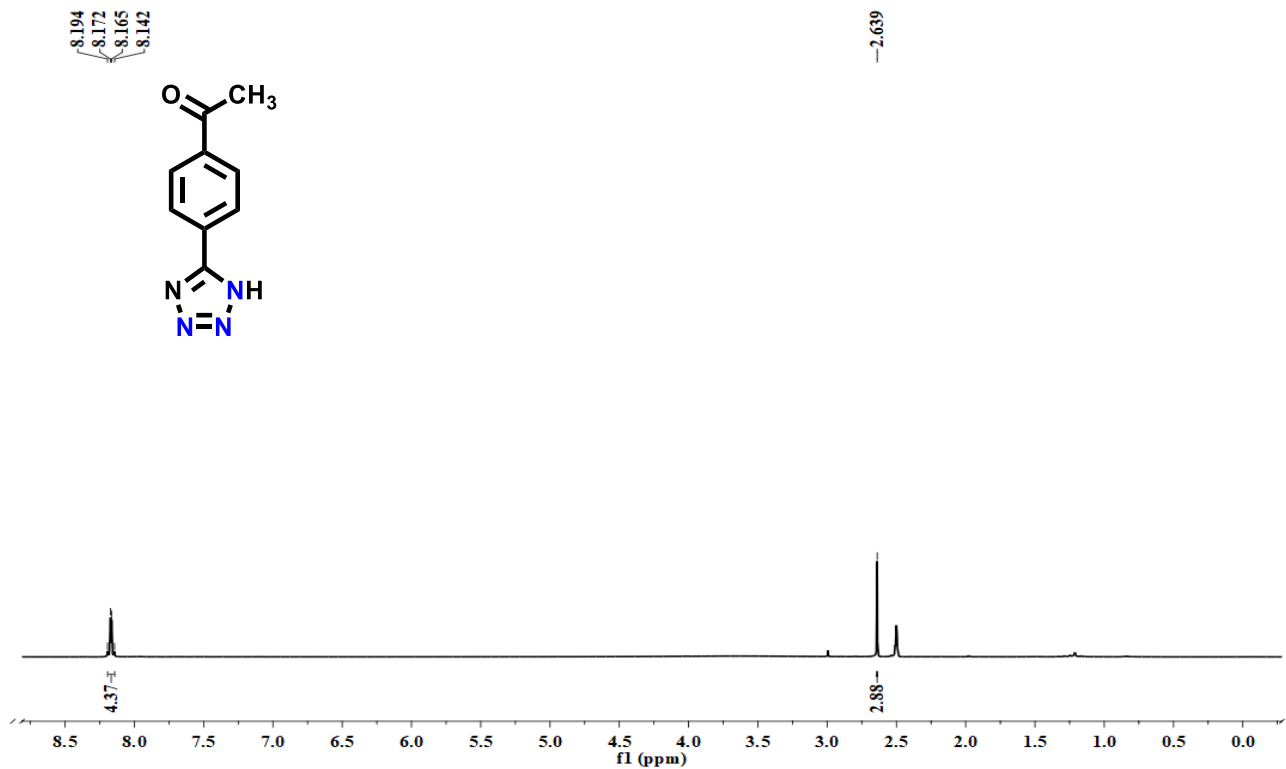


Figure S32: ¹H NMR spectrum of taking 3c DMSO as solvent.

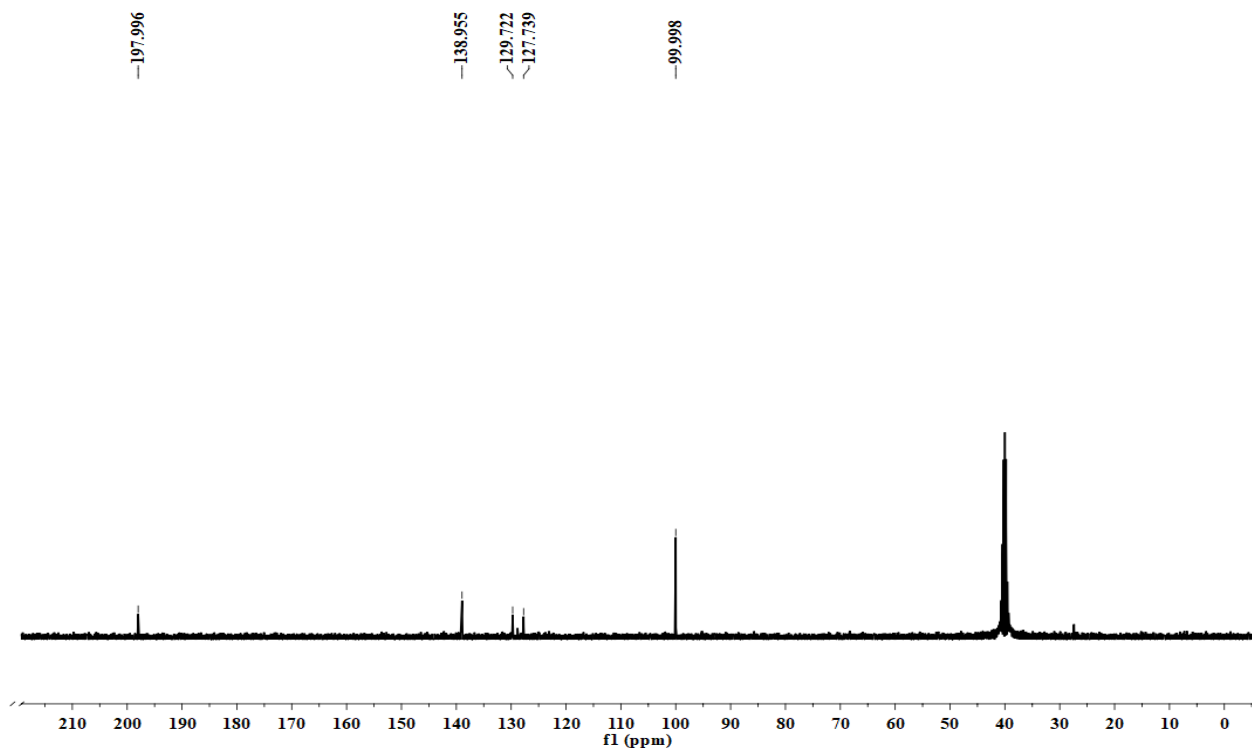


Figure S33: ¹³C NMR spectrum of 3c taking DMSO as solvent.

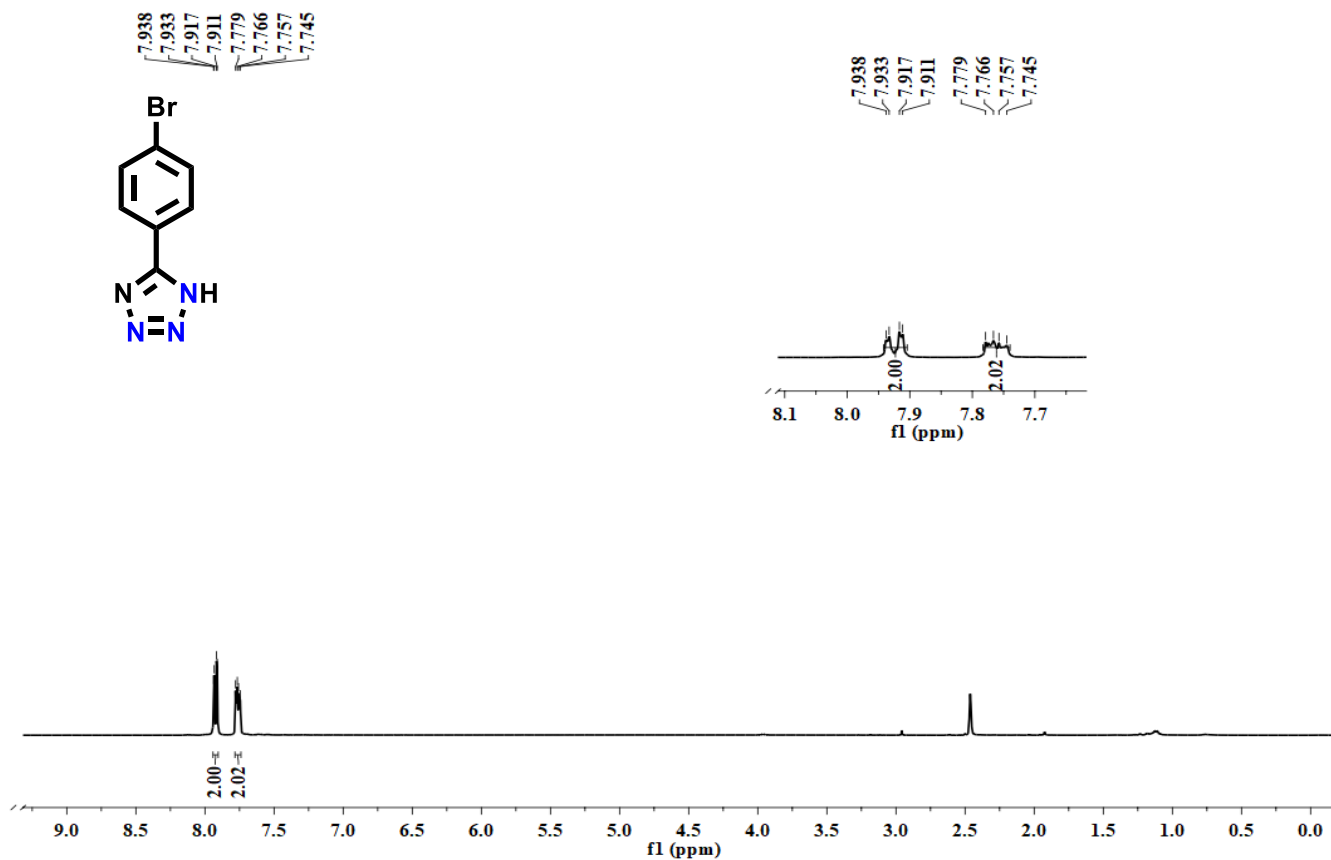


Figure S34: ¹H NMR spectrum of 3d taking DMSO as solvent.

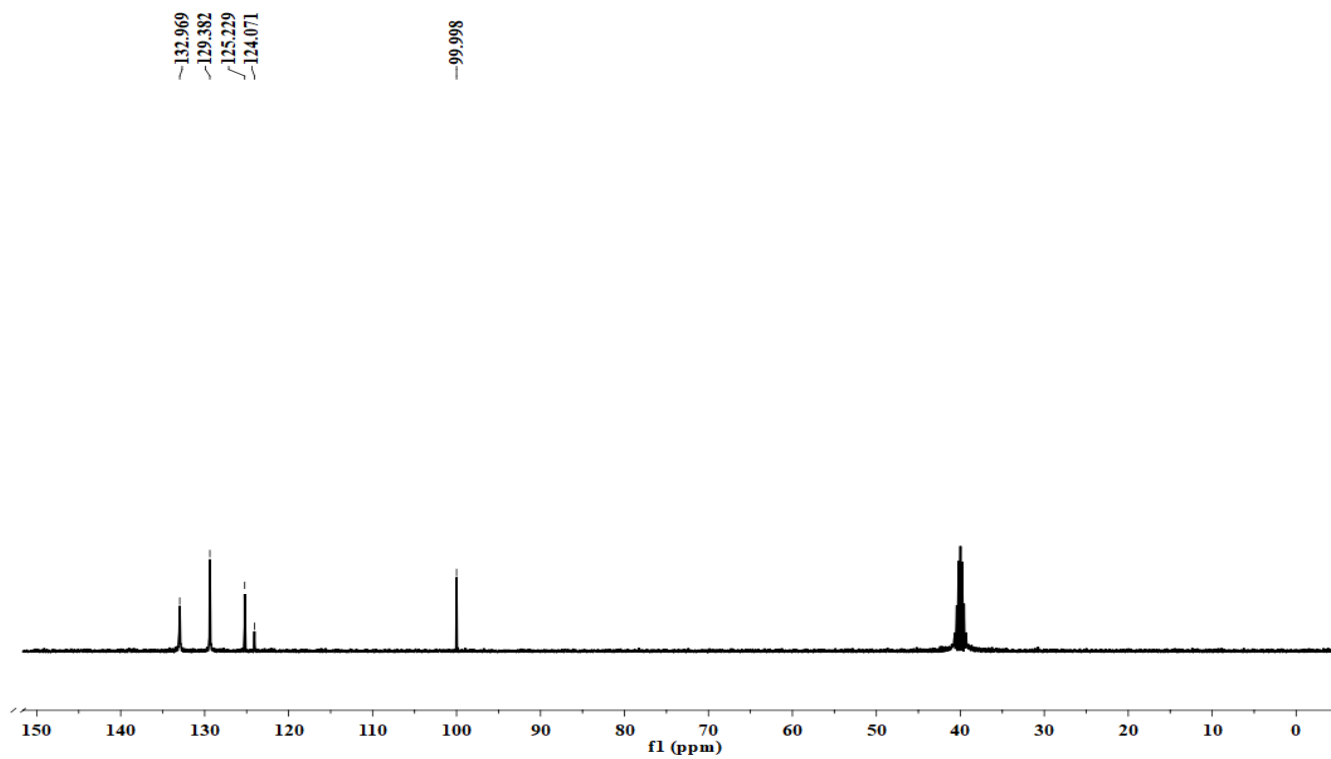


Figure S35: ¹³C NMR spectrum of 3d taking DMSO as solvent.

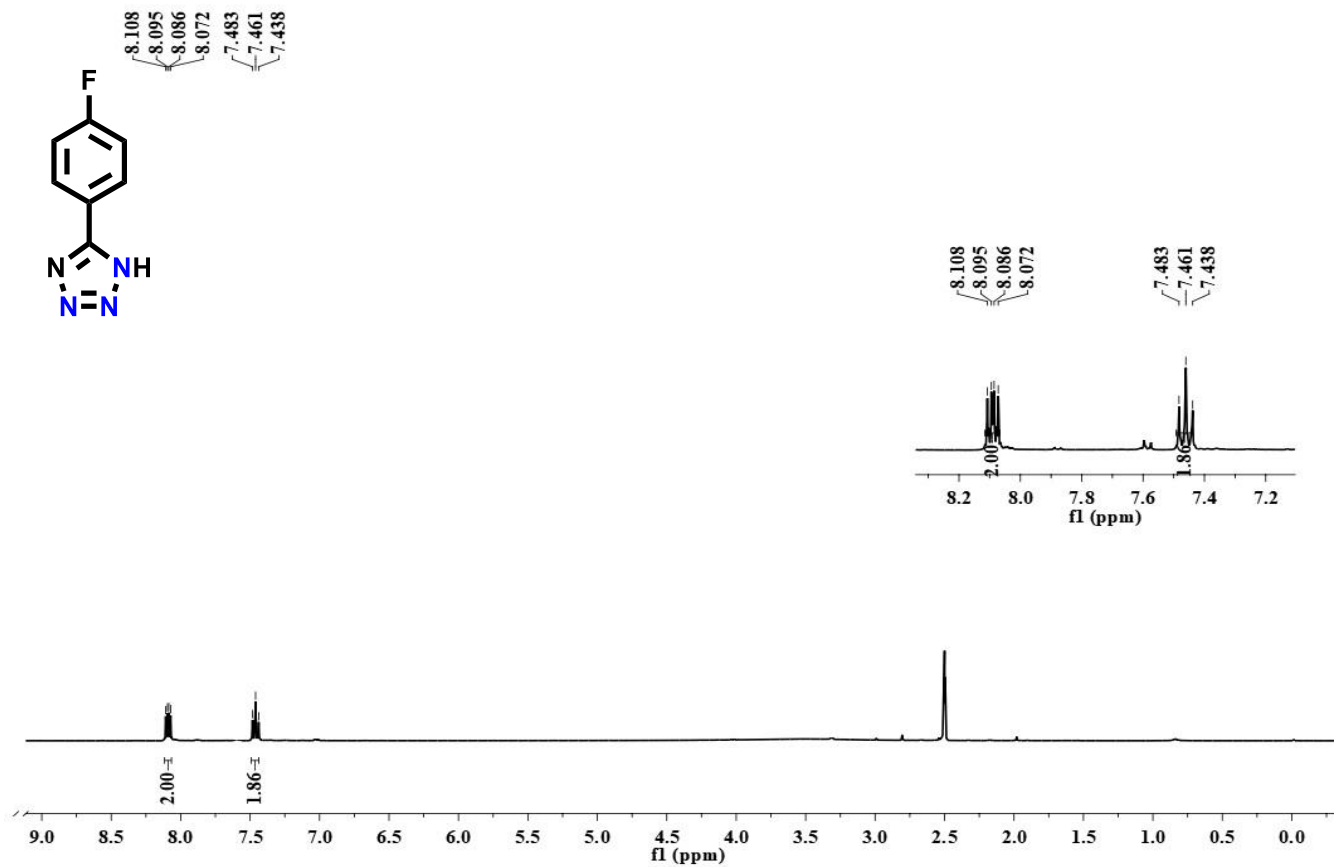


Figure S36: ¹H NMR spectrum of 3e taking DMSO as solvent.

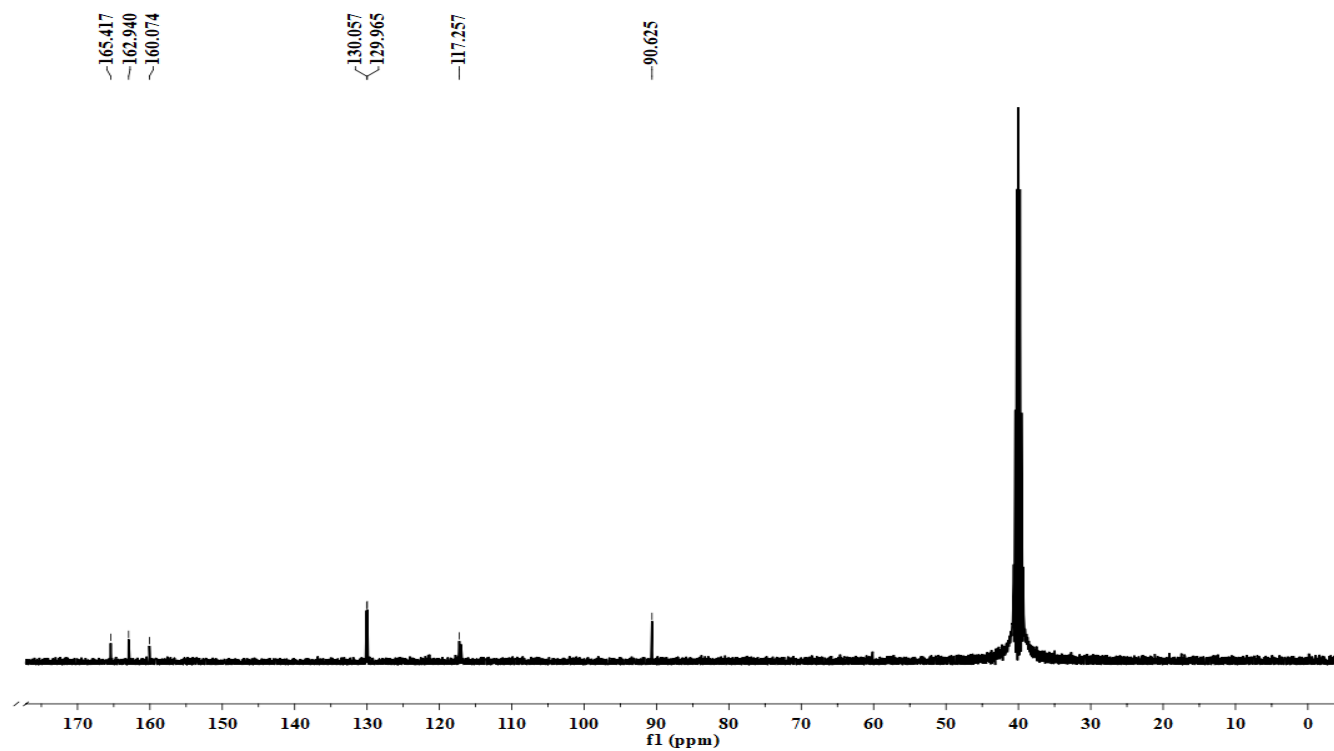


Figure S37: ¹³C NMR spectrum of 3e taking DMSO as solvent.

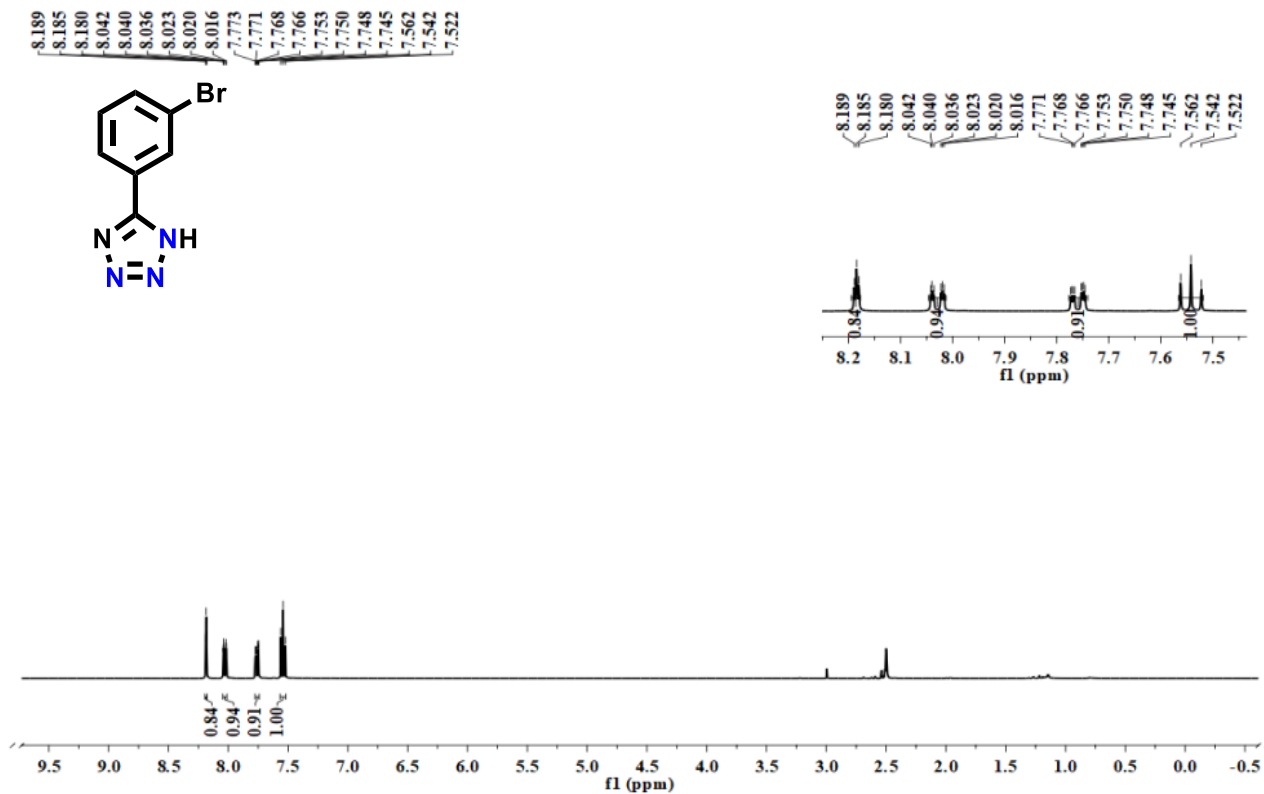


Figure S38: ¹H NMR spectrum of 3f taking DMSO as solvent.

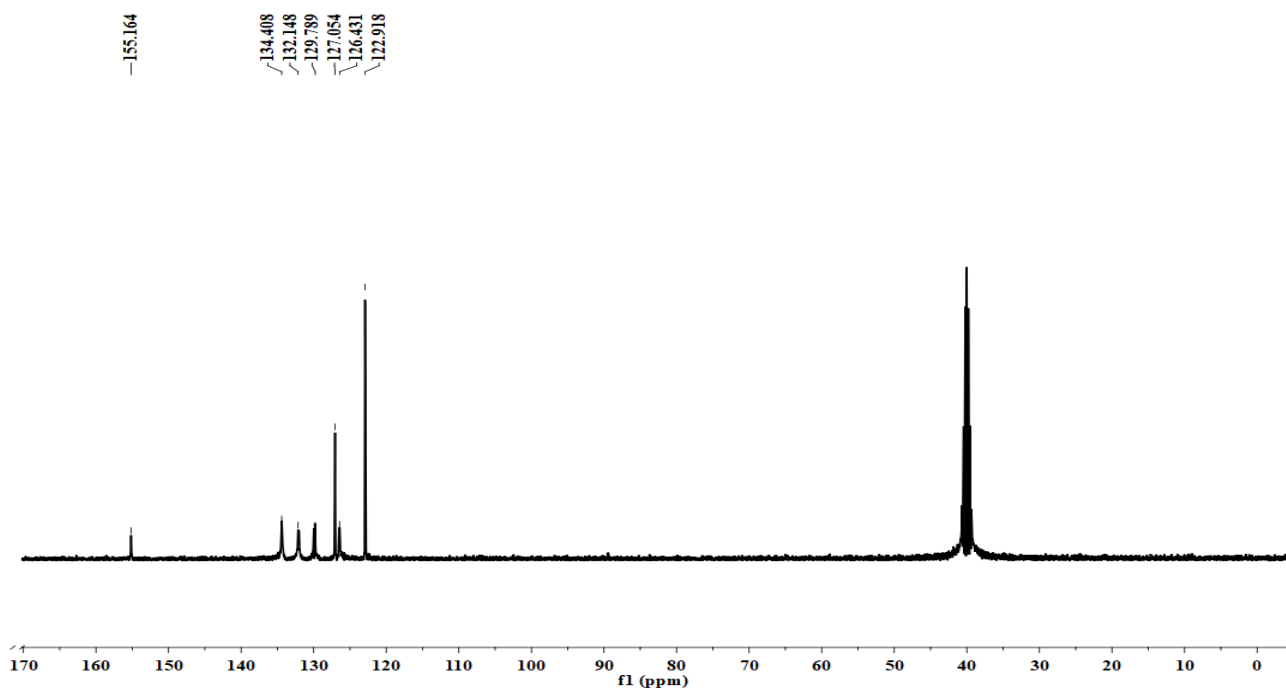


Figure S39: ¹³C NMR spectrum of 3f taking DMSO as solvent.

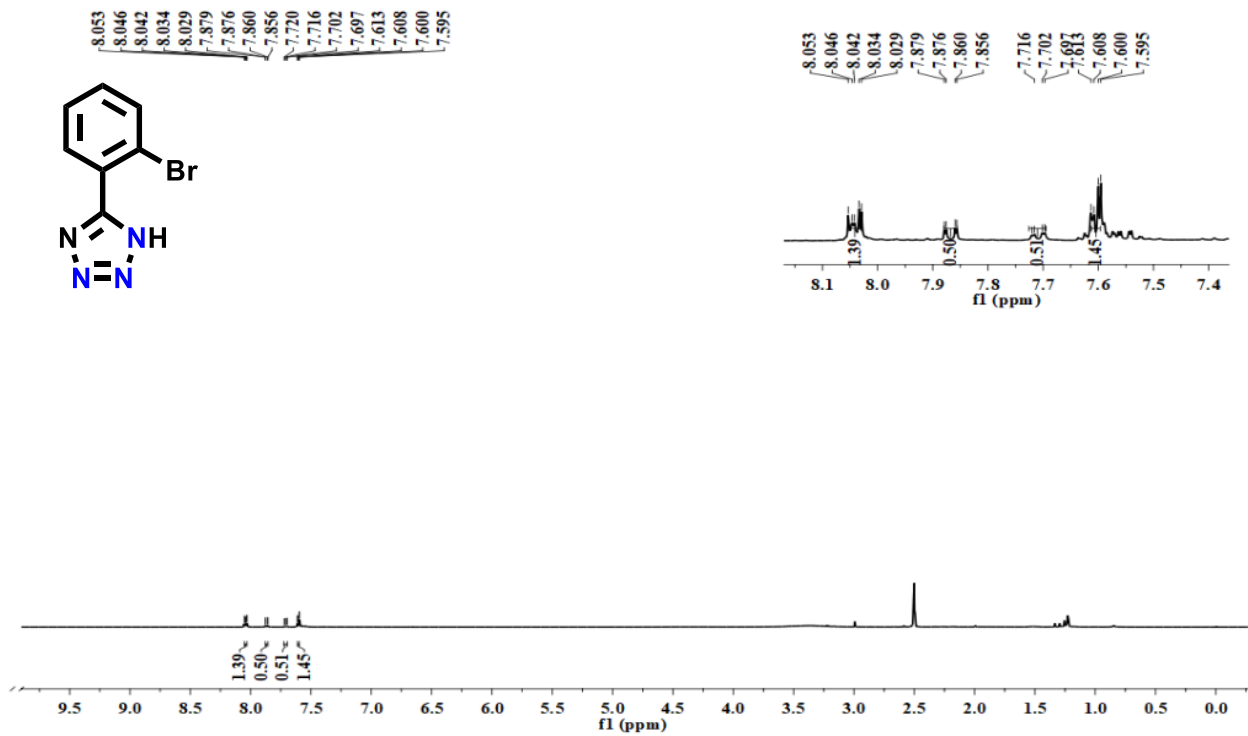


Figure S40: ¹H NMR spectrum of 3g taking DMSO as solvent.

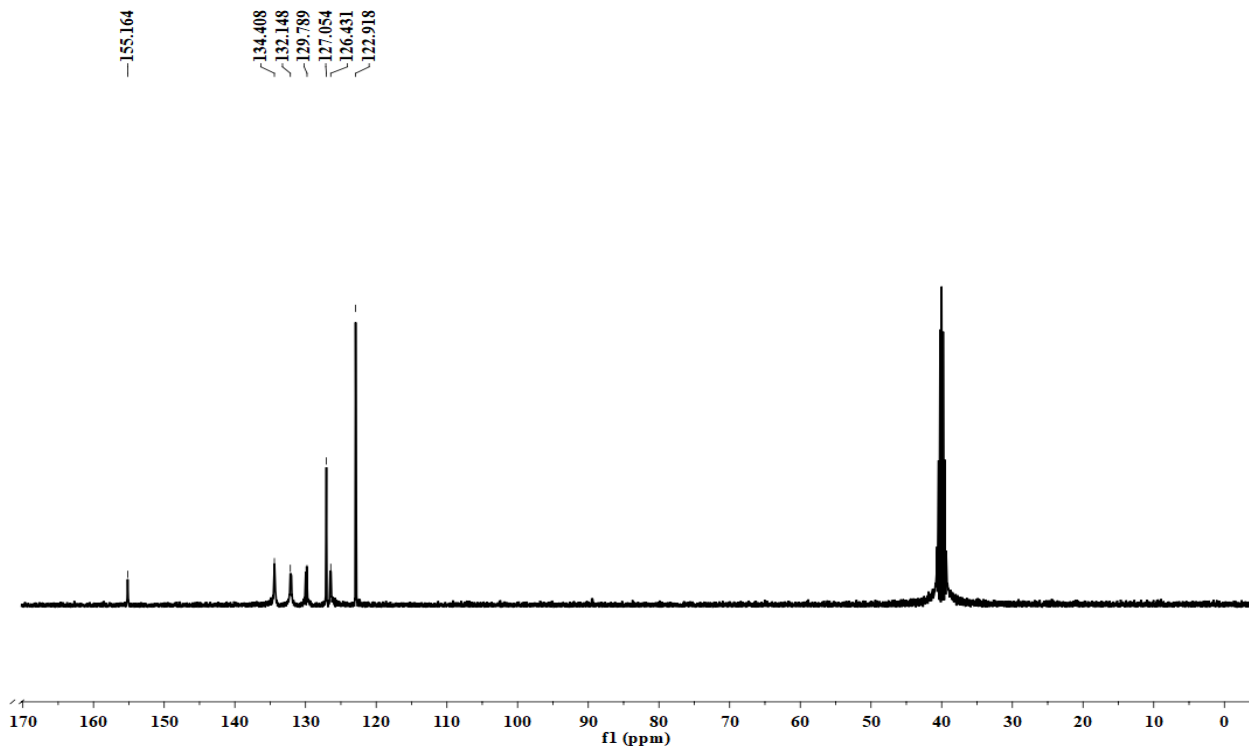


Figure S41: ¹³C NMR spectrum of 3g taking DMSO as solvent.

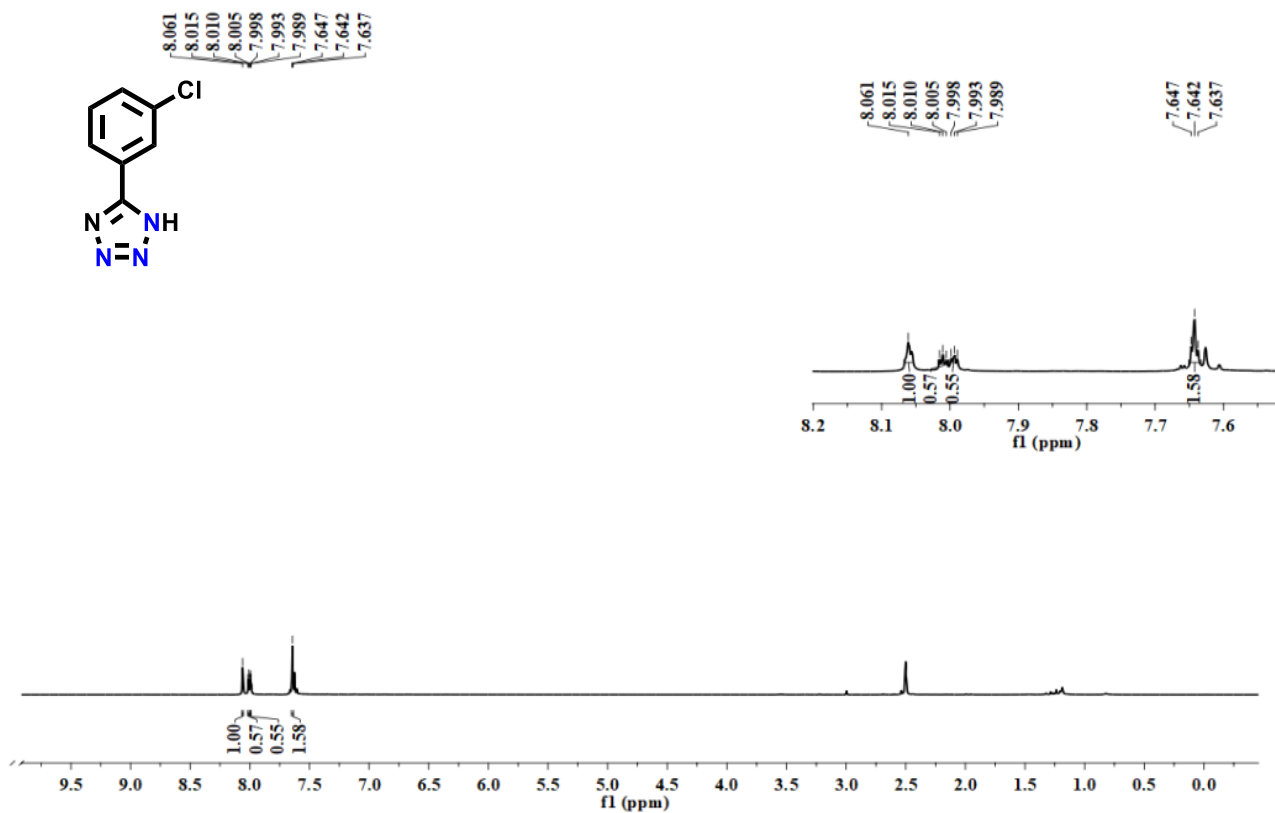


Figure S42: ¹H NMR spectrum of 3h taking DMSO as solvent

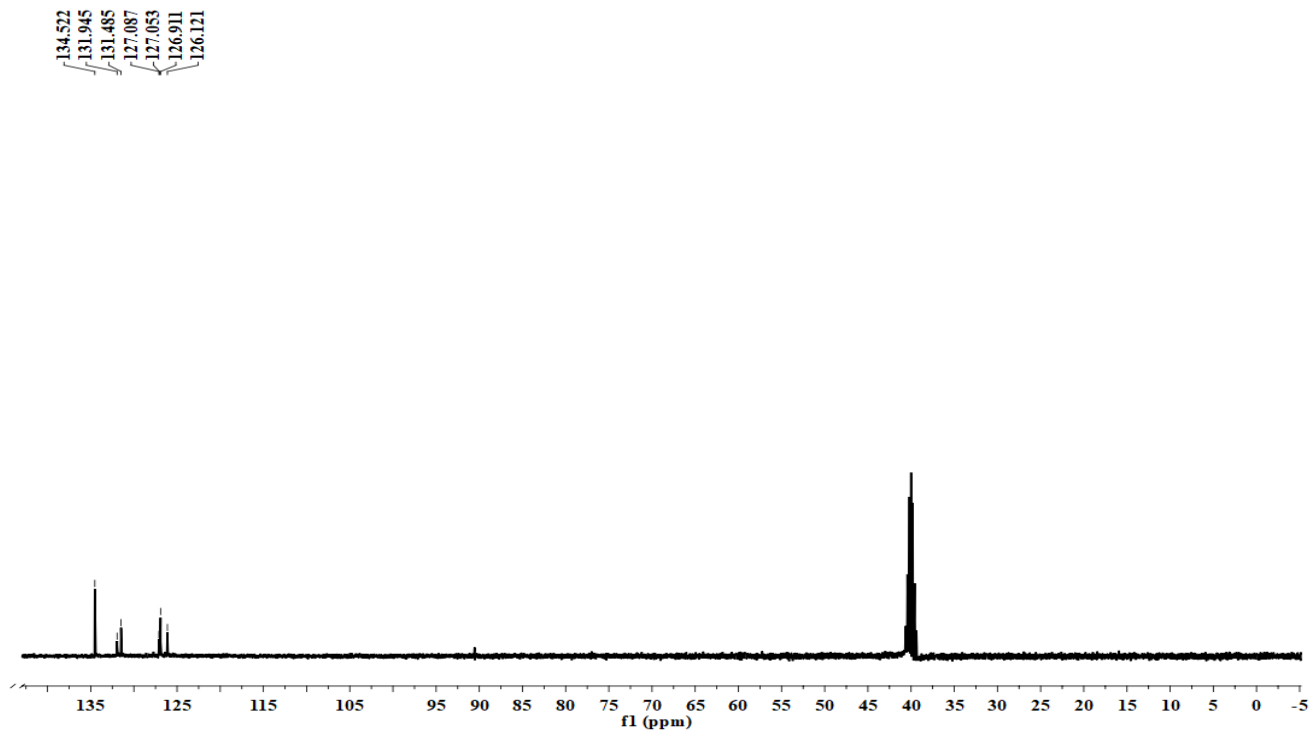


Figure S43: ¹³C NMR spectrum of 3h taking DMSO as solvent.

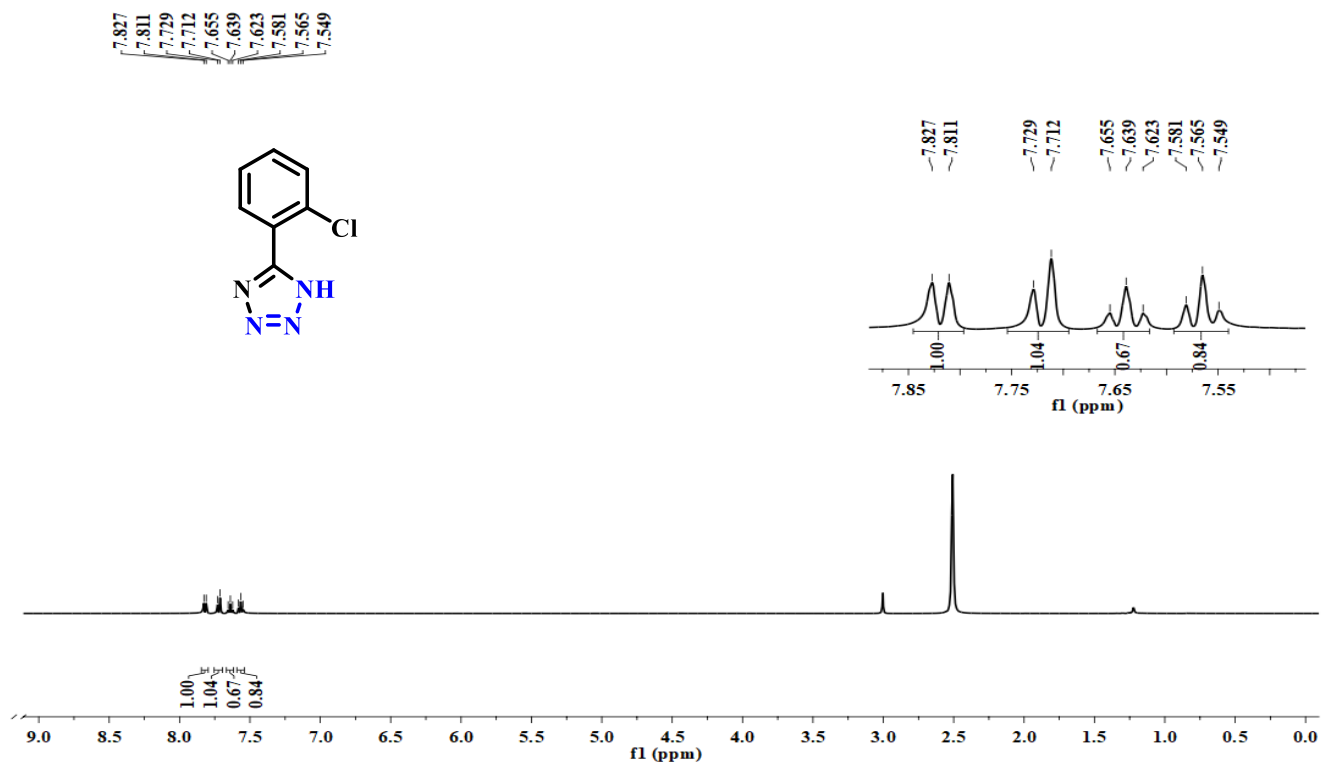


Figure S44: ¹H NMR spectrum of 3i taking DMSO as solvent

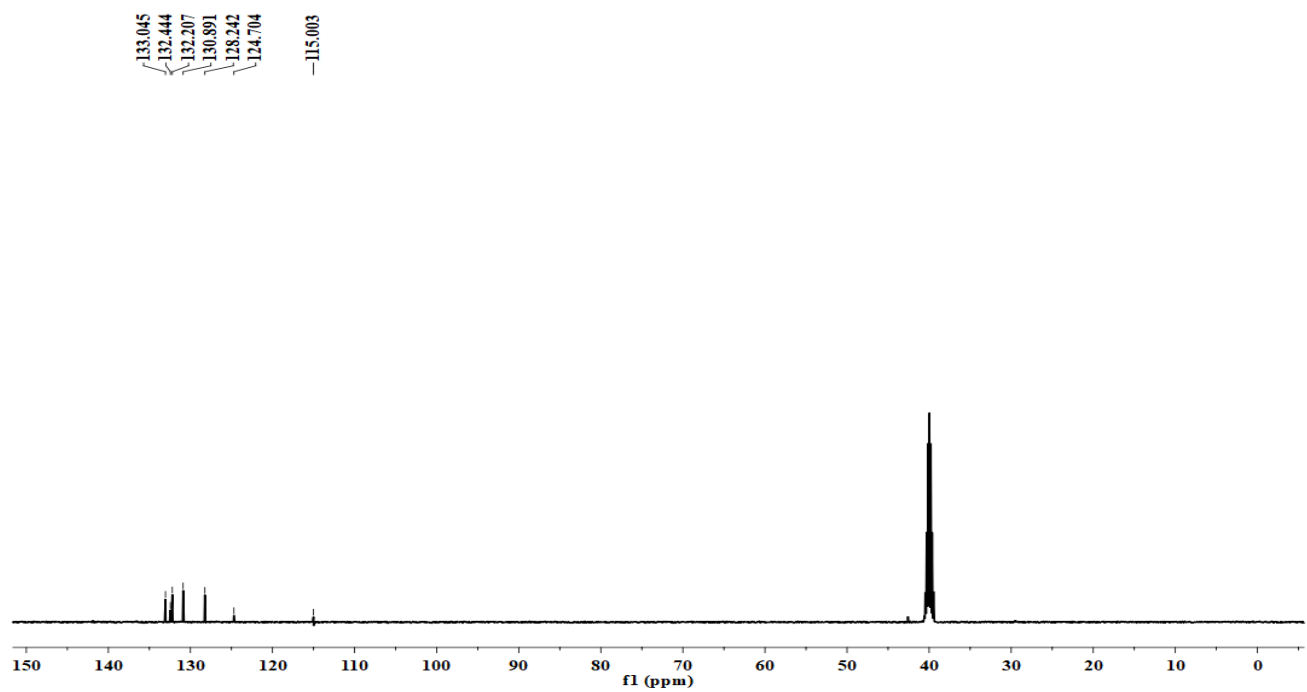


Figure S45: ¹³C NMR spectrum of 3i taking DMSO as solvent.

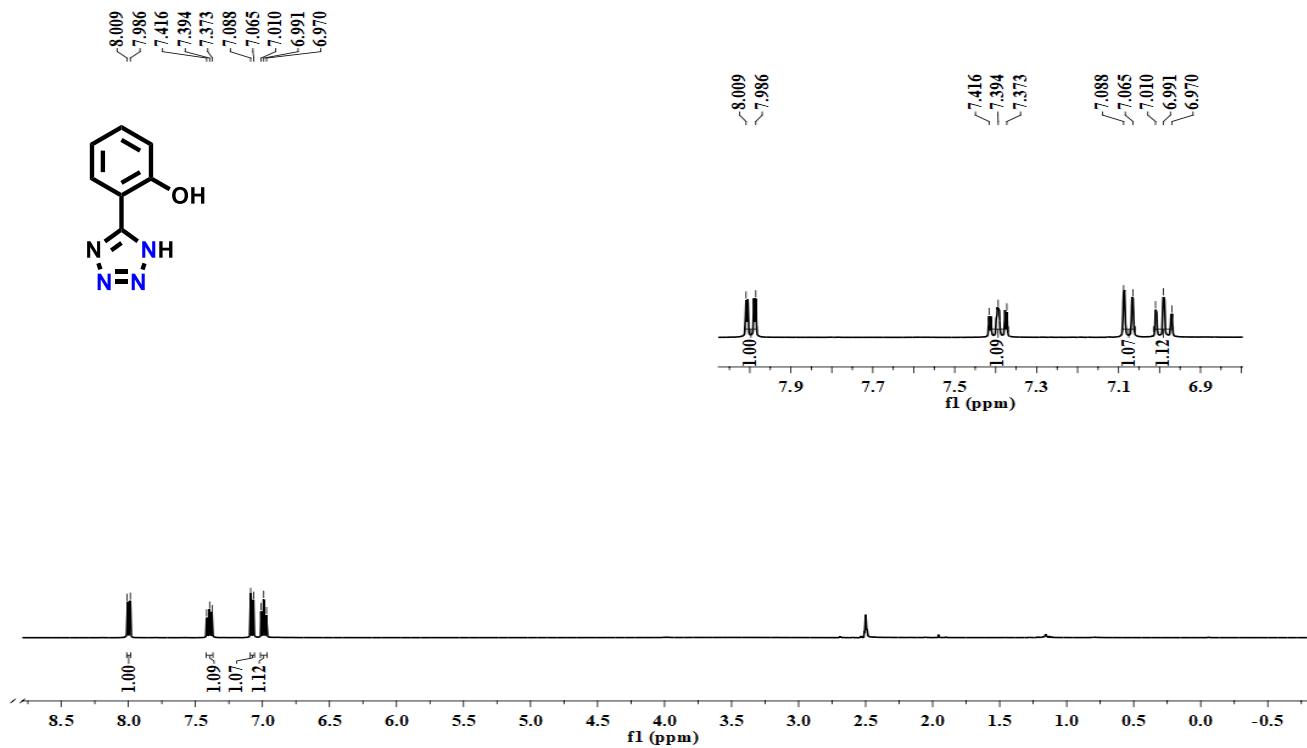


Figure S46: ¹H NMR spectrum of 3j taking DMSO as solvent

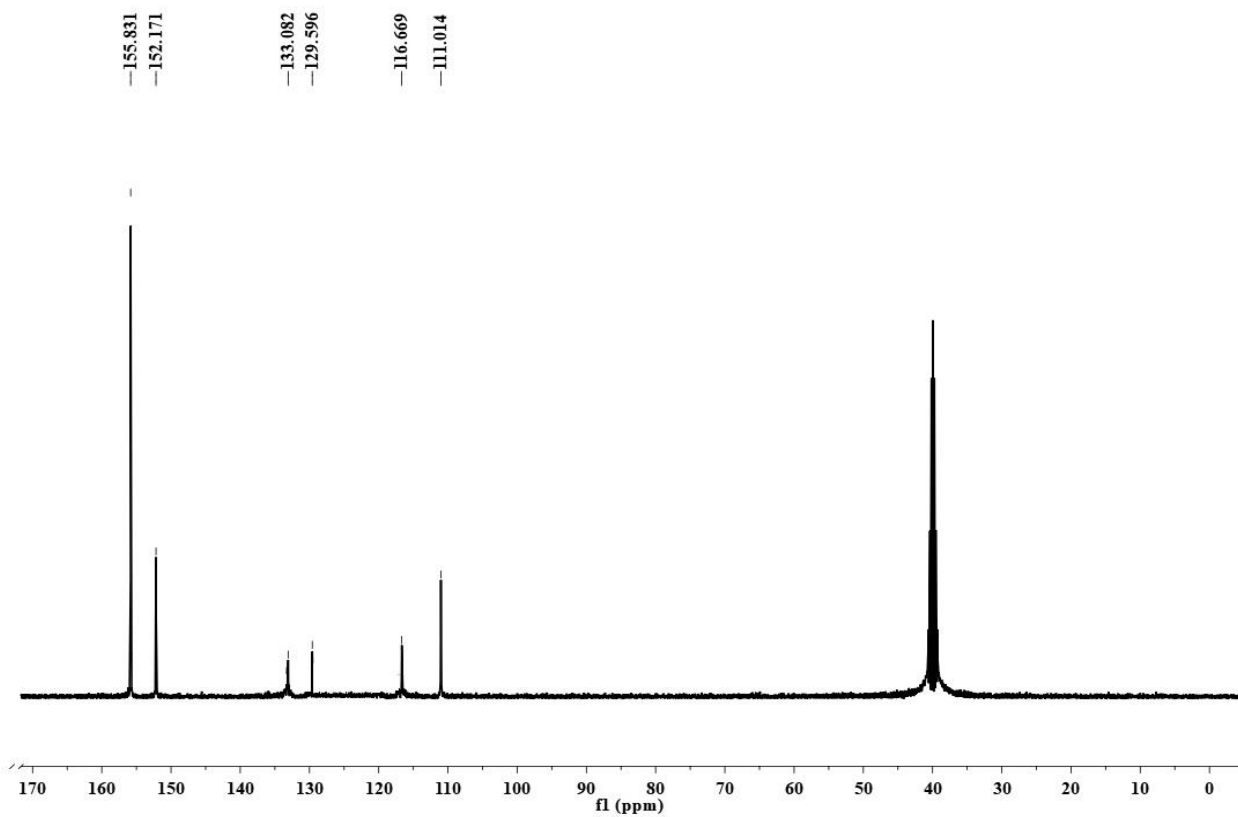


Figure S47: ¹³C NMR spectrum of 3j taking DMSO as solvent.

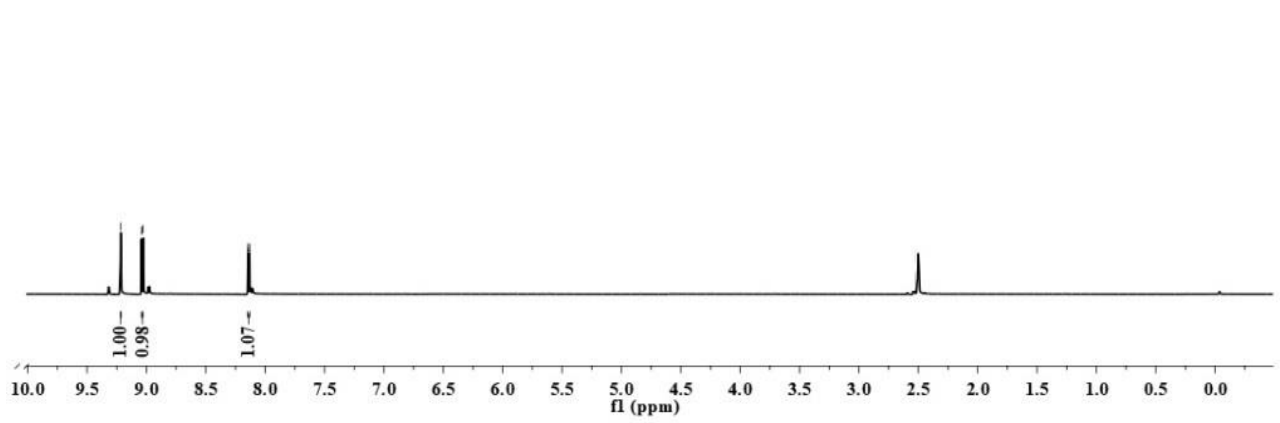


Figure S48: ¹H NMR spectrum of 3k taking DMSO as solvent

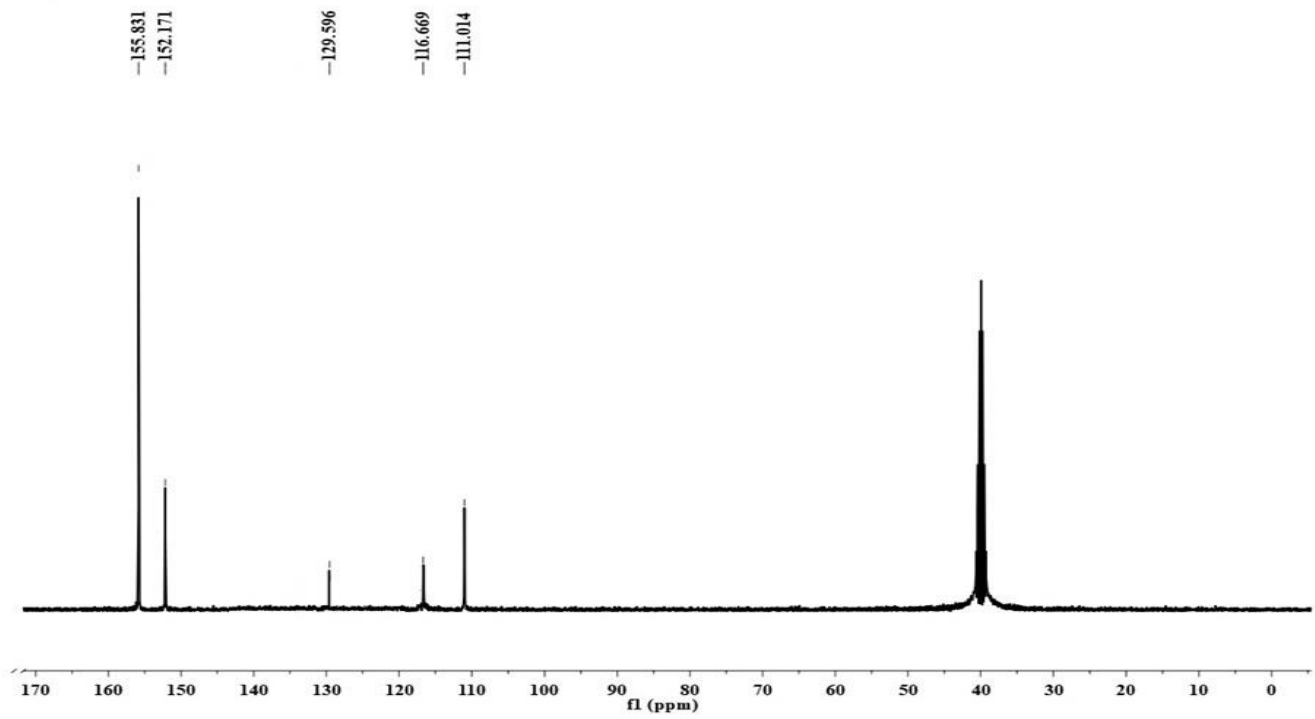


Figure S49: ¹³C NMR spectrum of 3k taking DMSO as solvent.

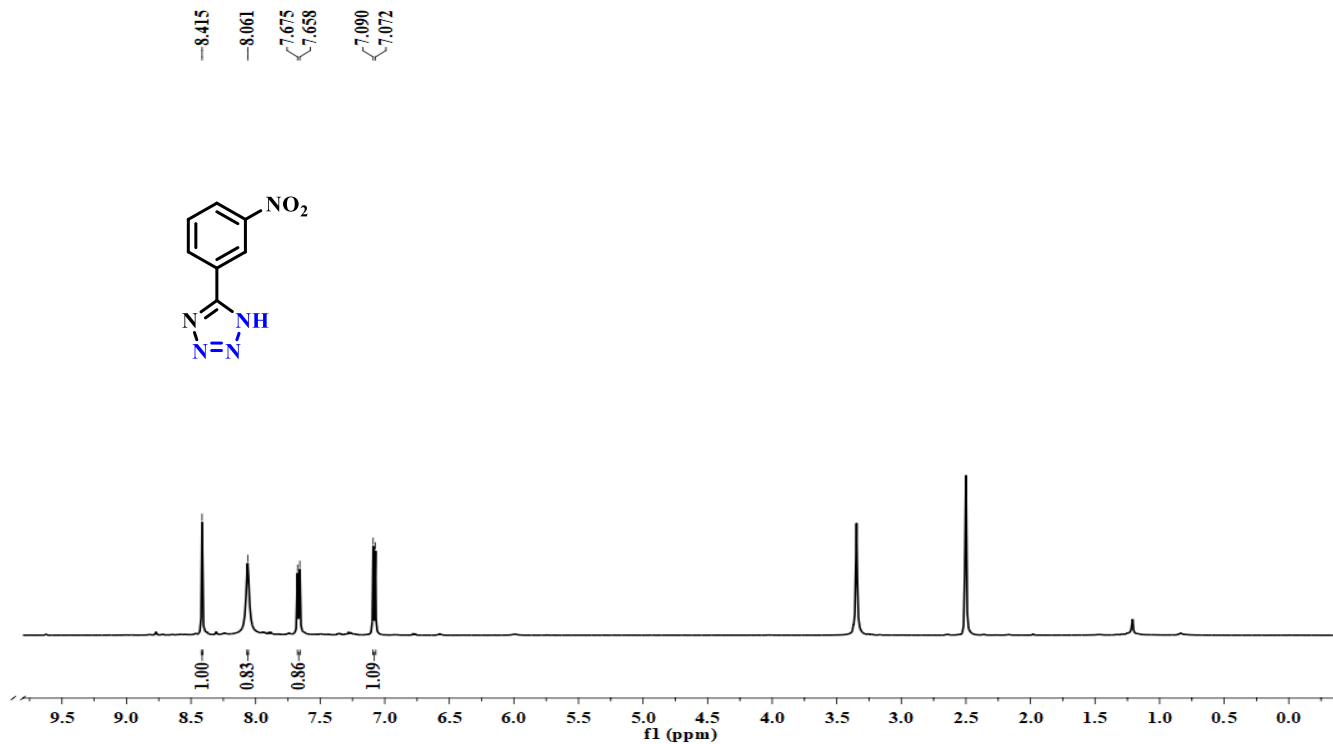


Figure S50: ^1H NMR spectrum of 3l taking DMSO as solvent

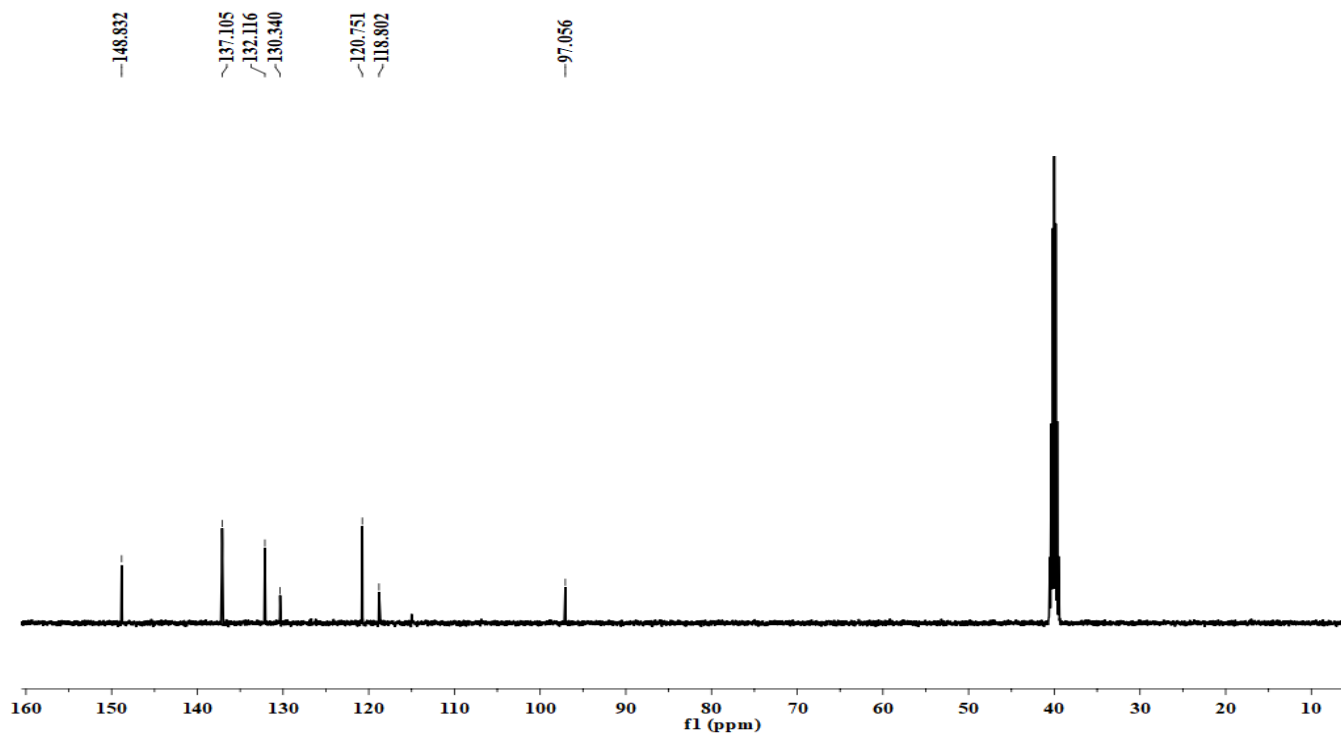


Figure S51: ^{13}C NMR spectrum of 3l taking DMSO as solvent.

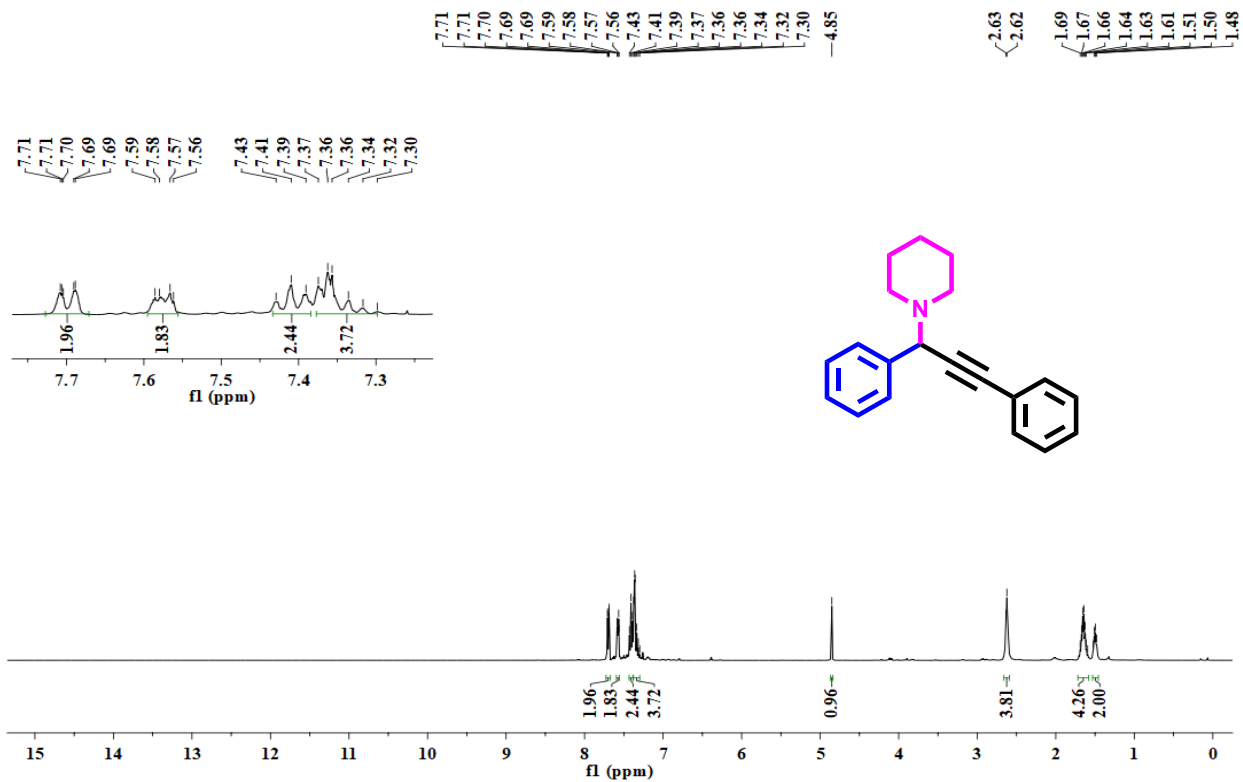


Figure S52: ¹H NMR spectrum 7aa of taking CDCl₃ as solvent.

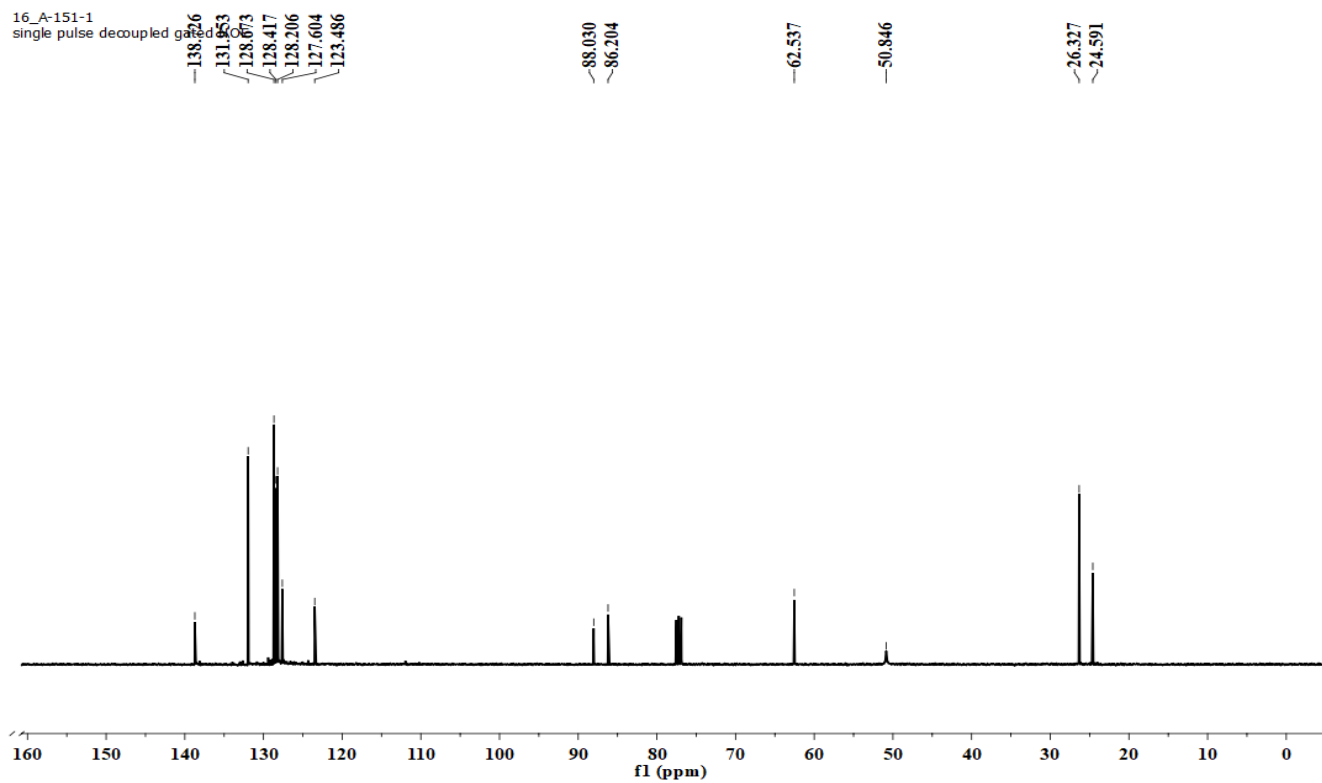


Figure S53: ¹³C NMR spectrum of 7aa taking CDCl₃ as solvent.

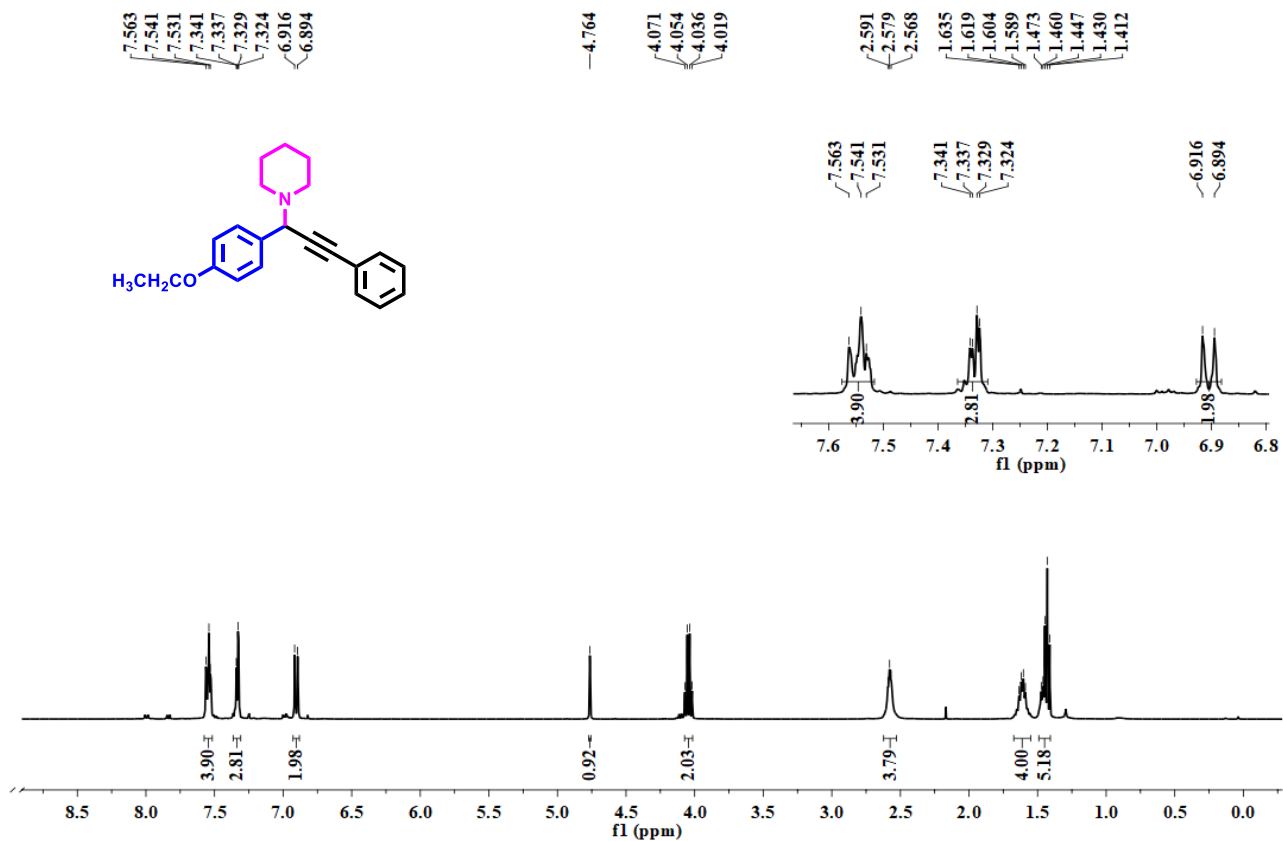


Figure S54: ¹H NMR spectrum of 7ab taking CDCl₃ as solvent.

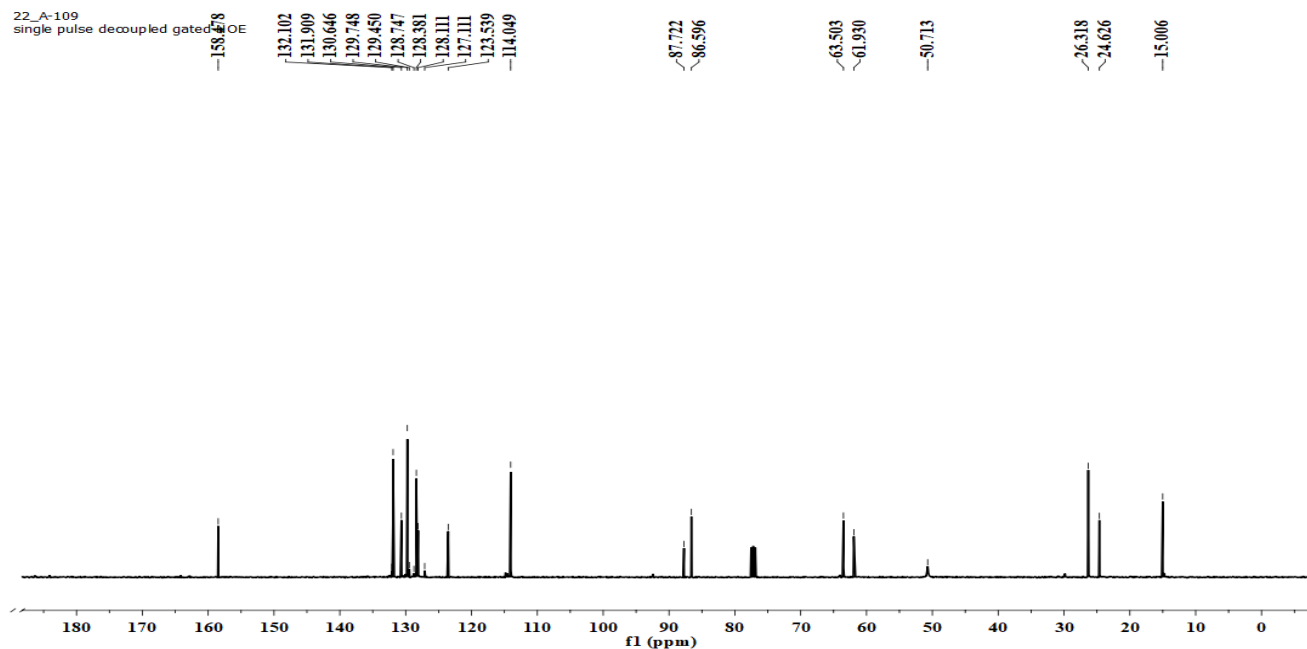


Figure S55: ¹³C NMR spectrum of 7ab taking CDCl₃ as solvent.

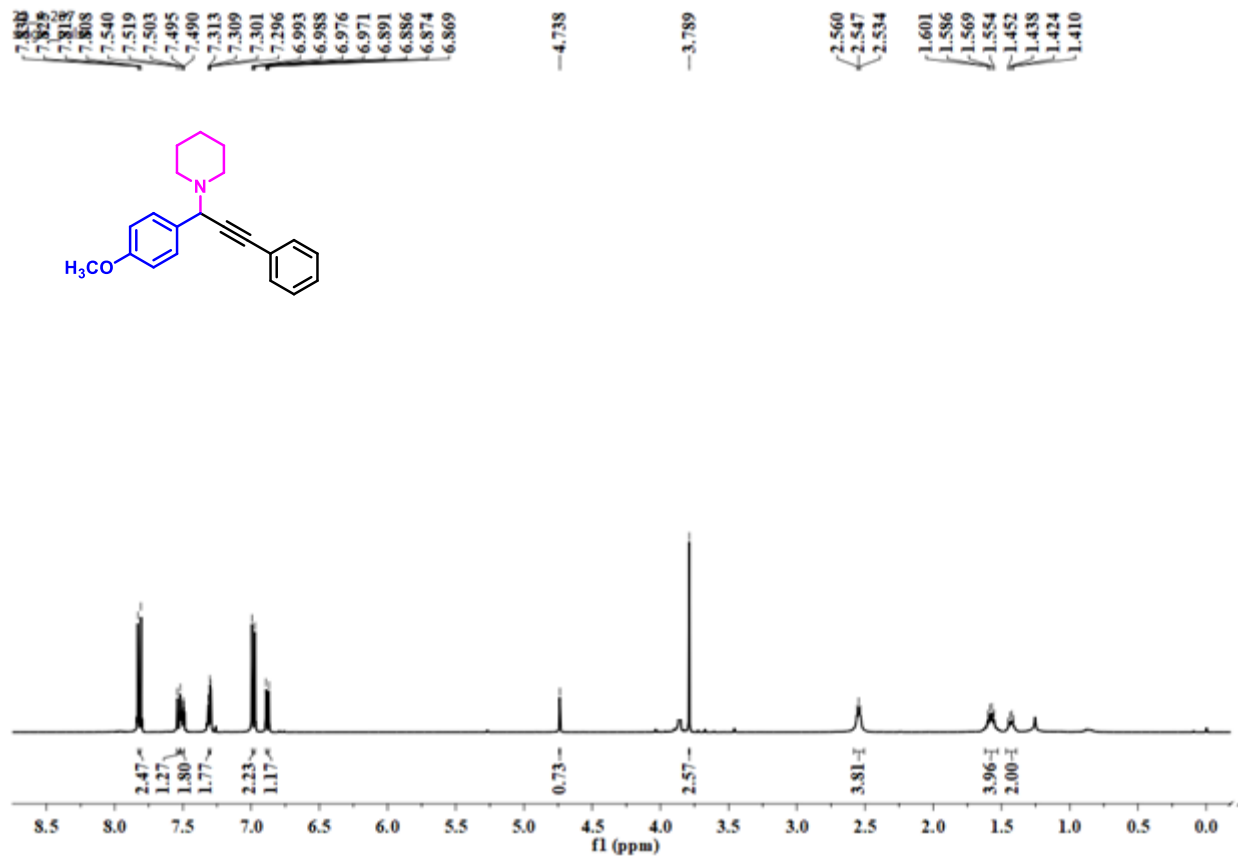


Figure S56: ¹H NMR spectrum of 7ac taking CDCl₃ as solvent.

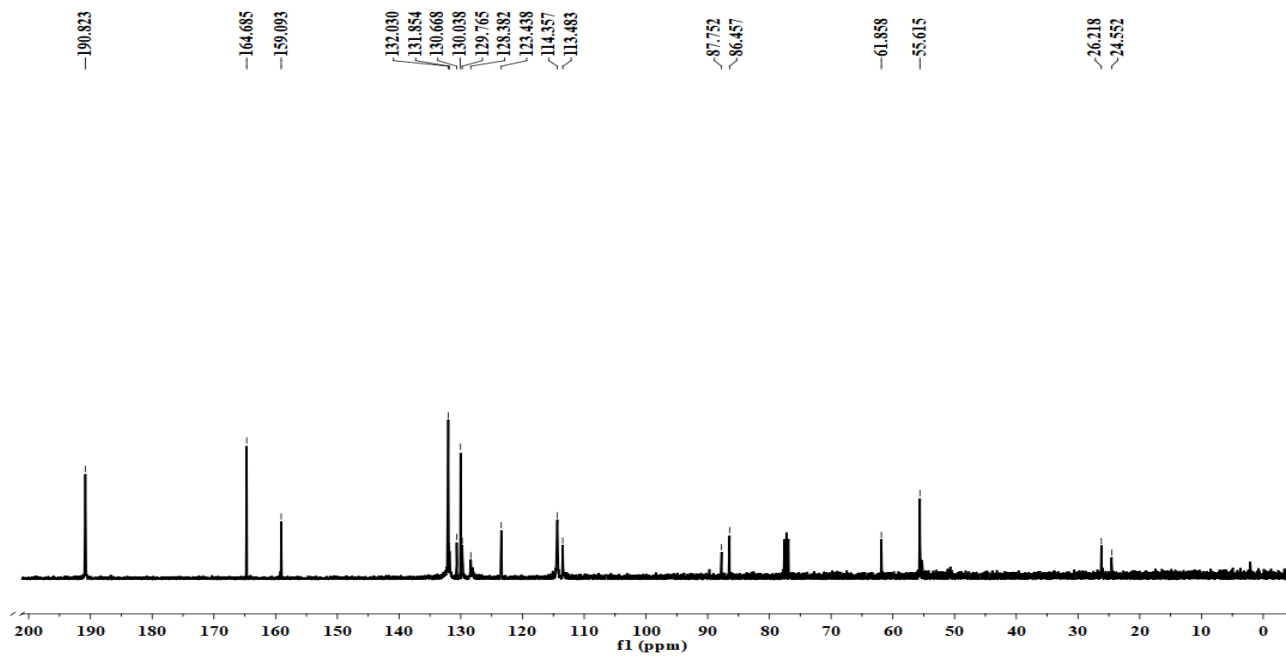


Figure S57: ¹³C NMR spectrum of 7ac taking CDCl₃ as solvent.

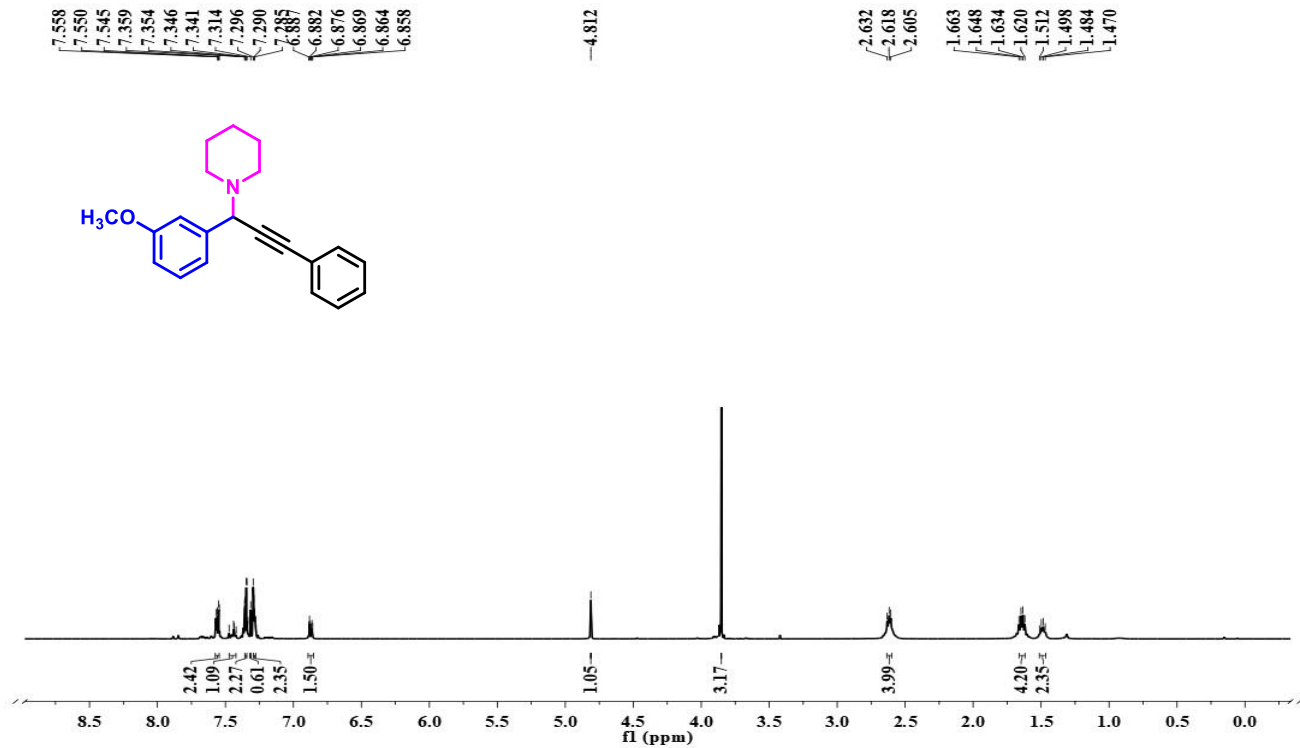


Figure S58: ¹H NMR spectrum of 7ad taking CDCl₃ as solvent.

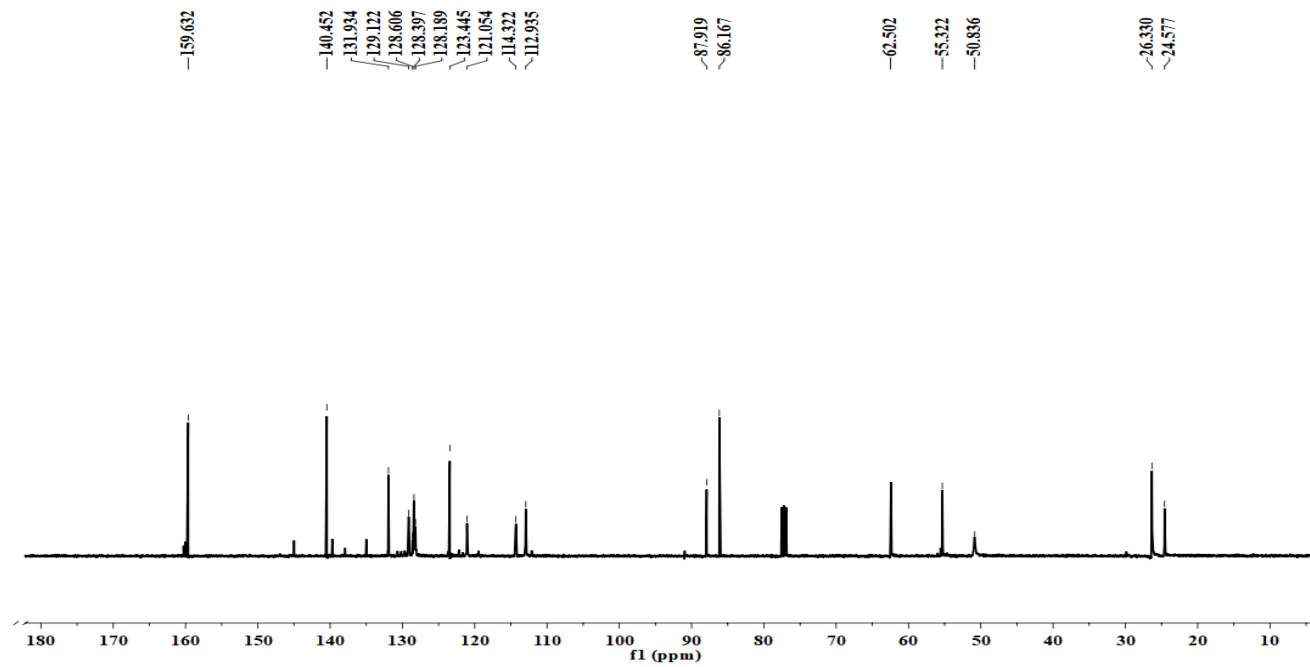


Figure S59: ¹³C NMR spectrum of 7ad taking CDCl₃ as solvent.

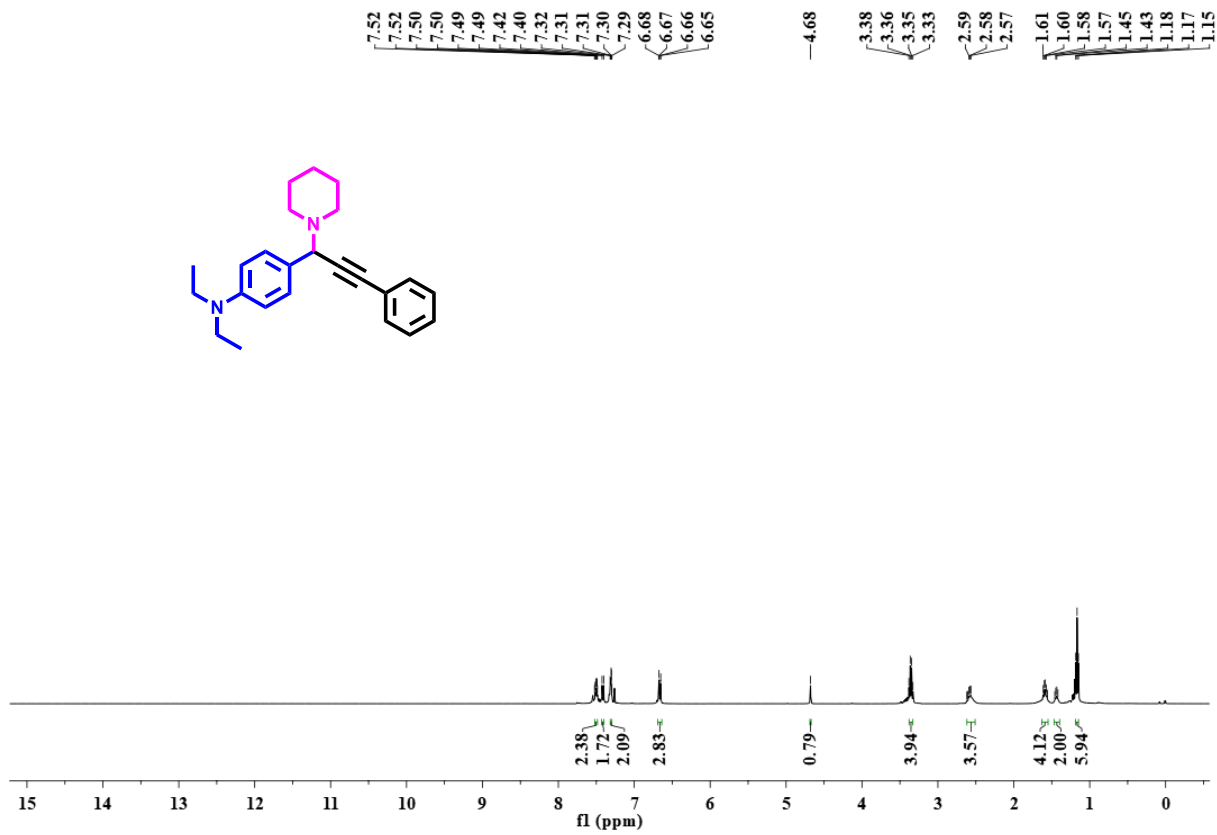


Figure S60: ¹H NMR spectrum of 7ae taking CDCl₃ as solvent.

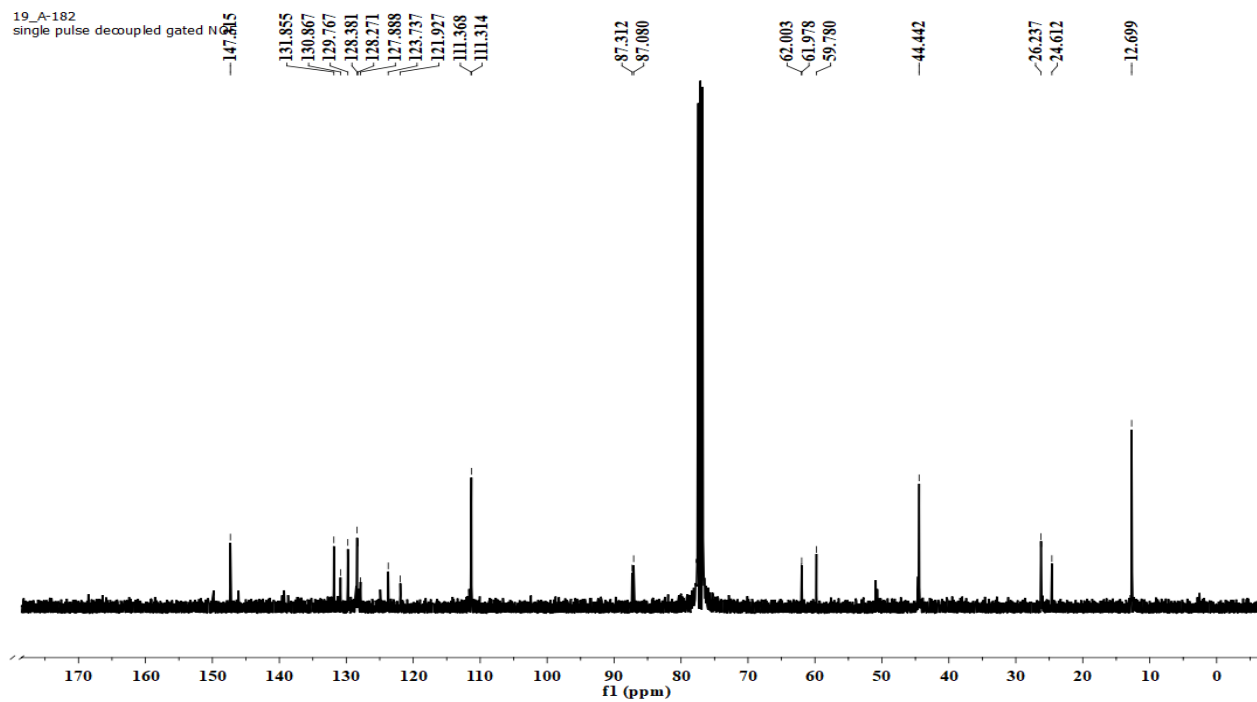


Figure S61: ¹³C NMR spectrum of 7ae taking CDCl₃ as solvent.

19_A-181
single_pulse

7.745
7.723
7.486
7.481
7.458
7.436
7.309
7.304
7.297
7.291
6.728
6.707
6.686

2.942
2.565
2.551
2.539
1.598
1.583
1.569
1.555
1.434
1.420
1.406

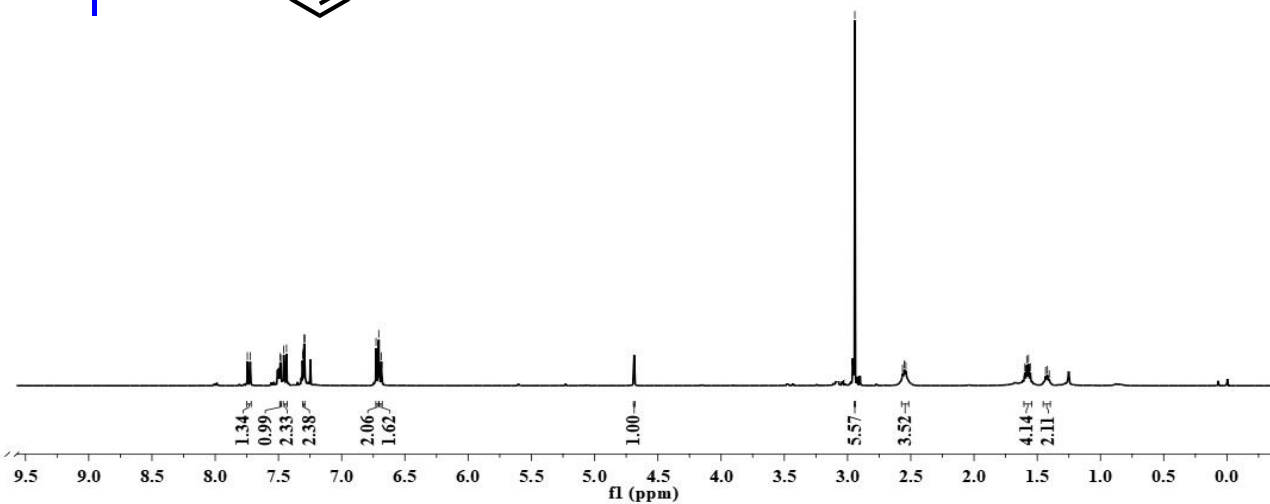
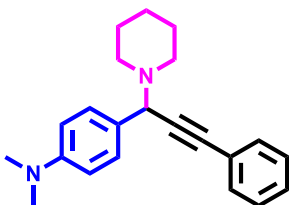


Figure S62: ¹H NMR spectrum of 7af taking CDCl₃ as solvent.

22_A-181
single_pulse decoupled gated NOE

190.415

150.116

131.862

129.500

128.294

127.933

126.348

125.286

123.696

112.159

111.086

87.226

87.158

61.973

40.736

40.162

26.283

24.622

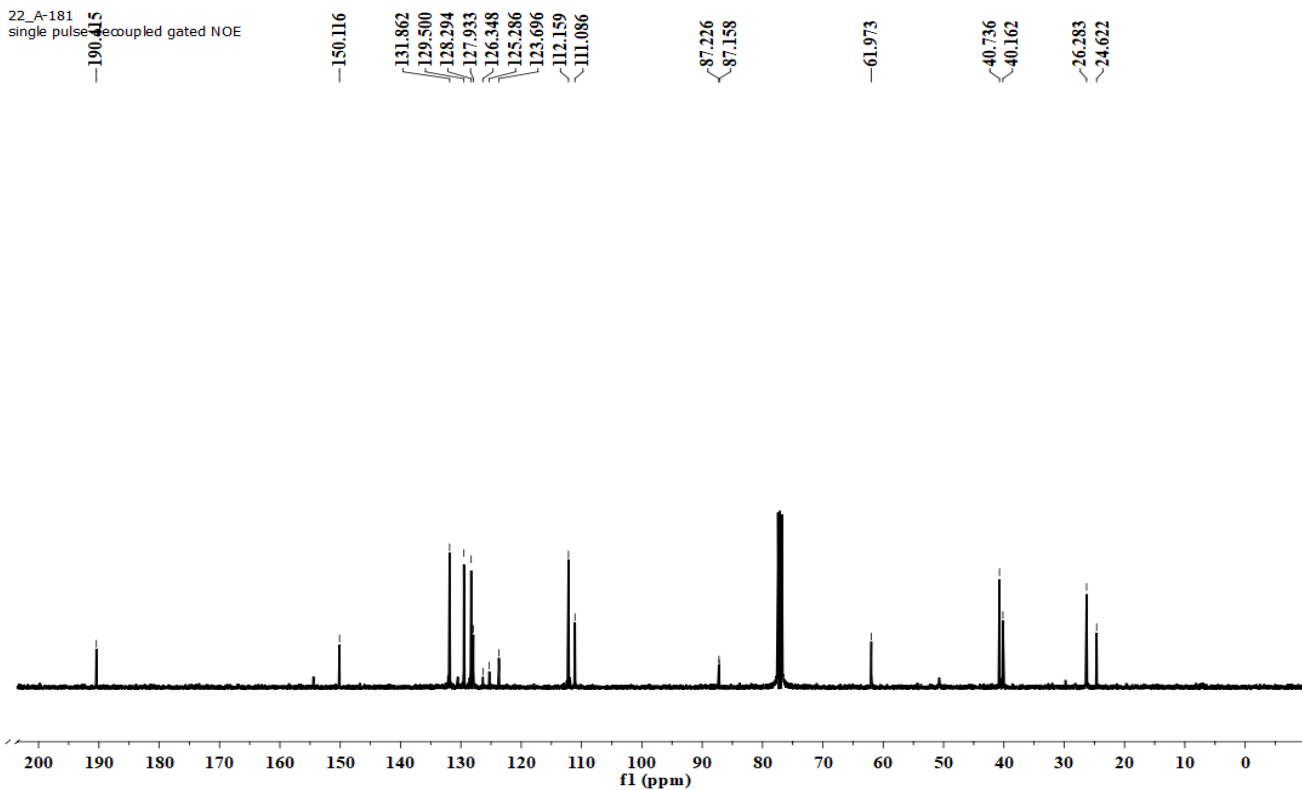


Figure S63: ¹³C NMR spectrum of 7af taking CDCl₃ as solvent.

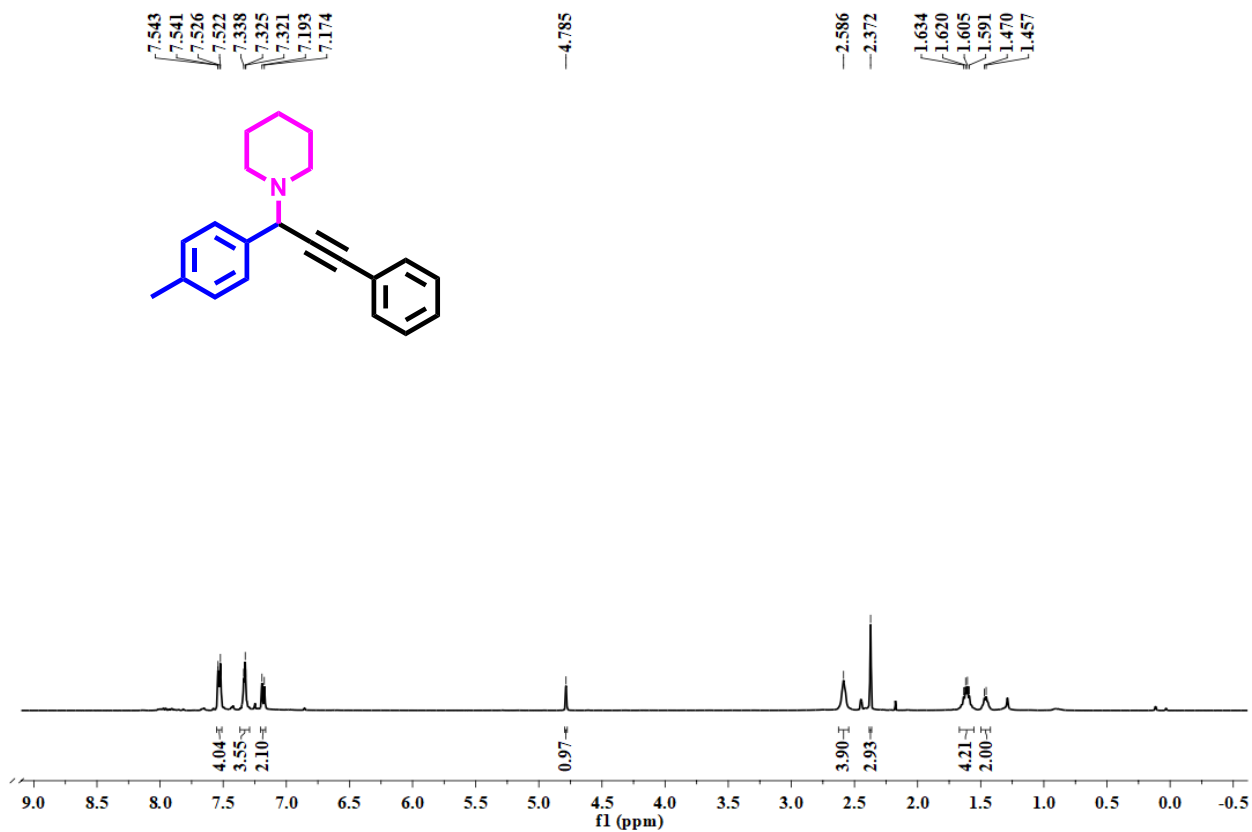


Figure S64: ¹H NMR spectrum of 7ag taking CDCl₃ as solvent.

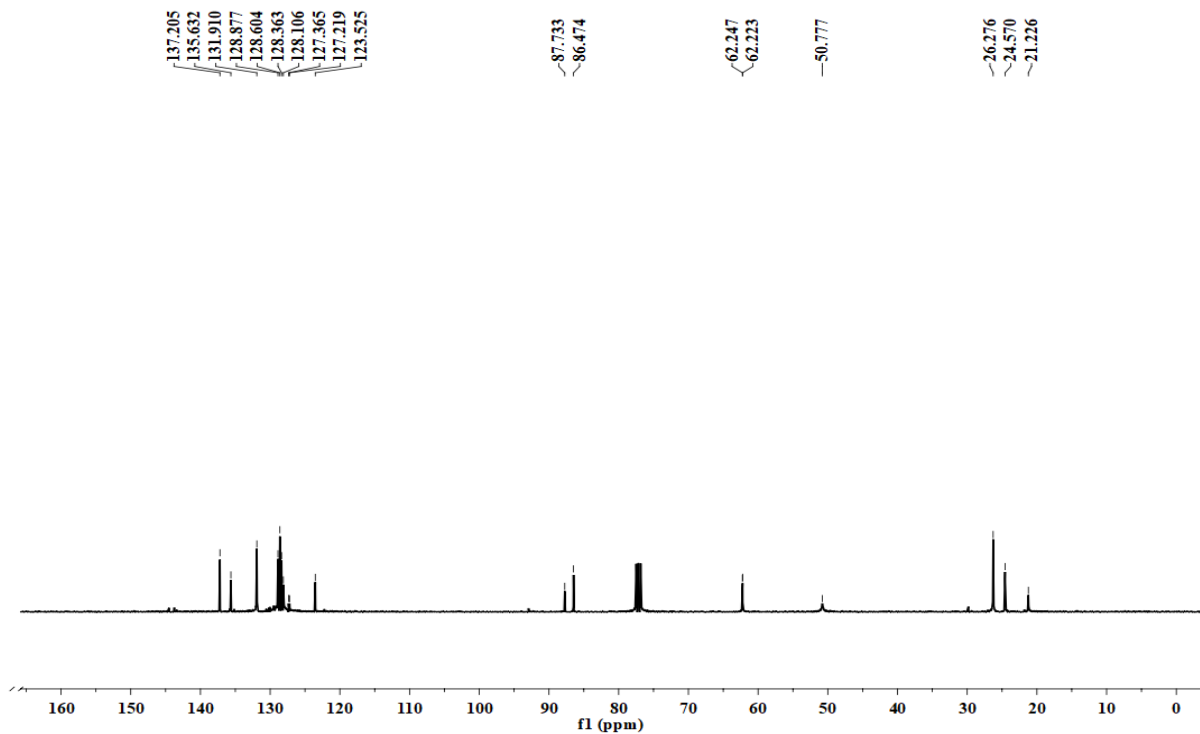


Figure S65: ¹³C NMR spectrum of 7ag taking CDCl₃ as solvent.

28_A-198
single_pulse

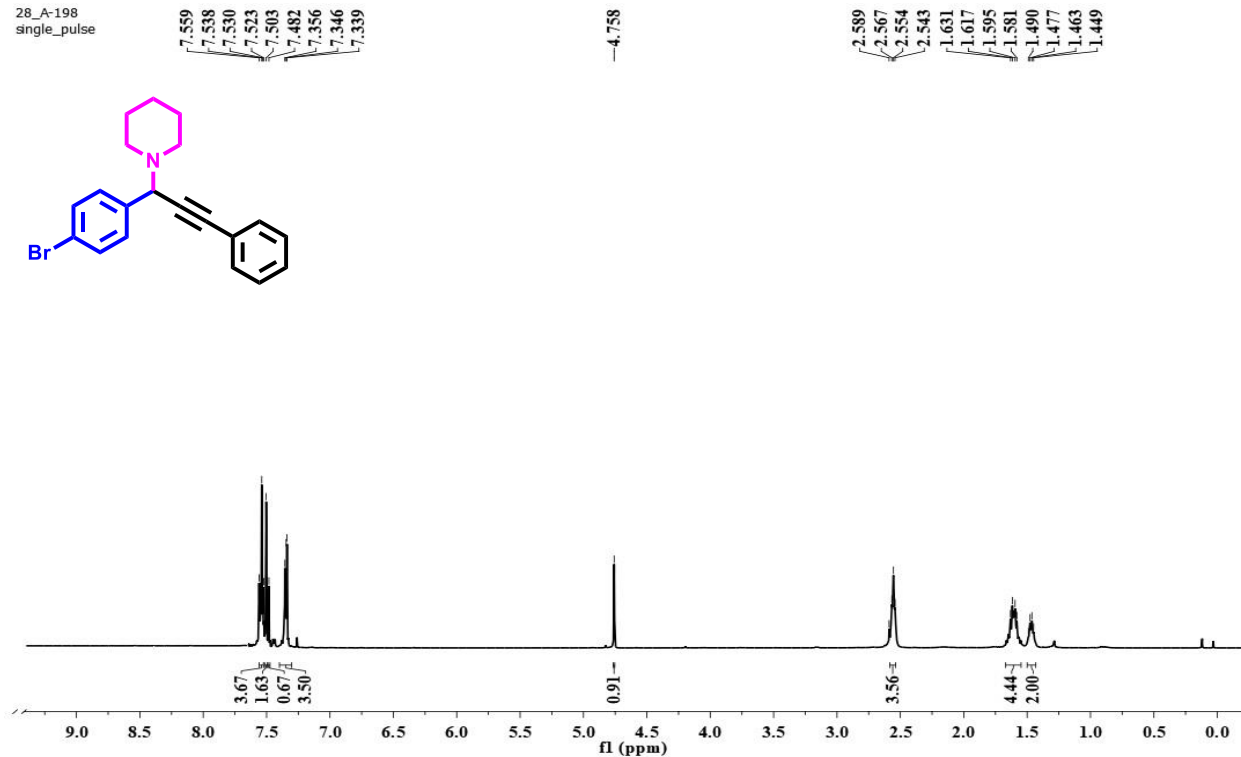
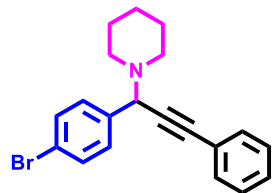


Figure S66: ^1H NMR spectrum of 7ah taking CDCl_3 as solvent.

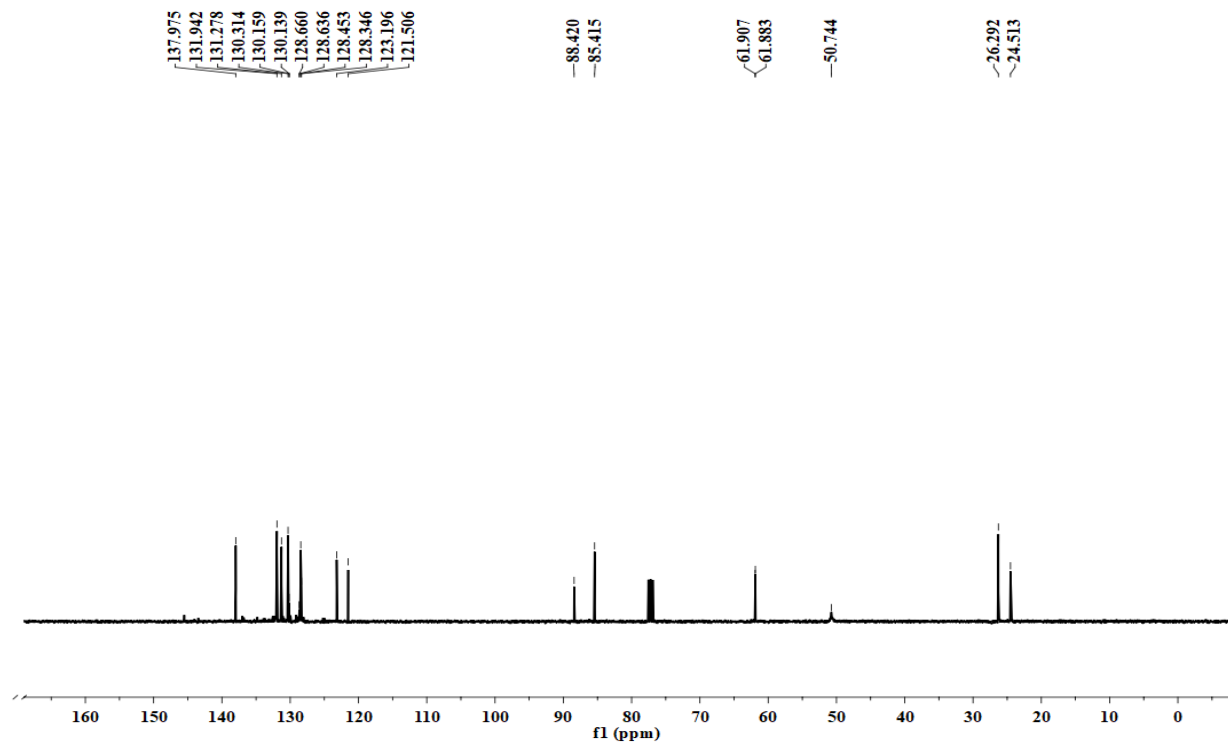


Figure S67: ^{13}C NMR spectrum of 7ah taking CDCl_3 as solvent

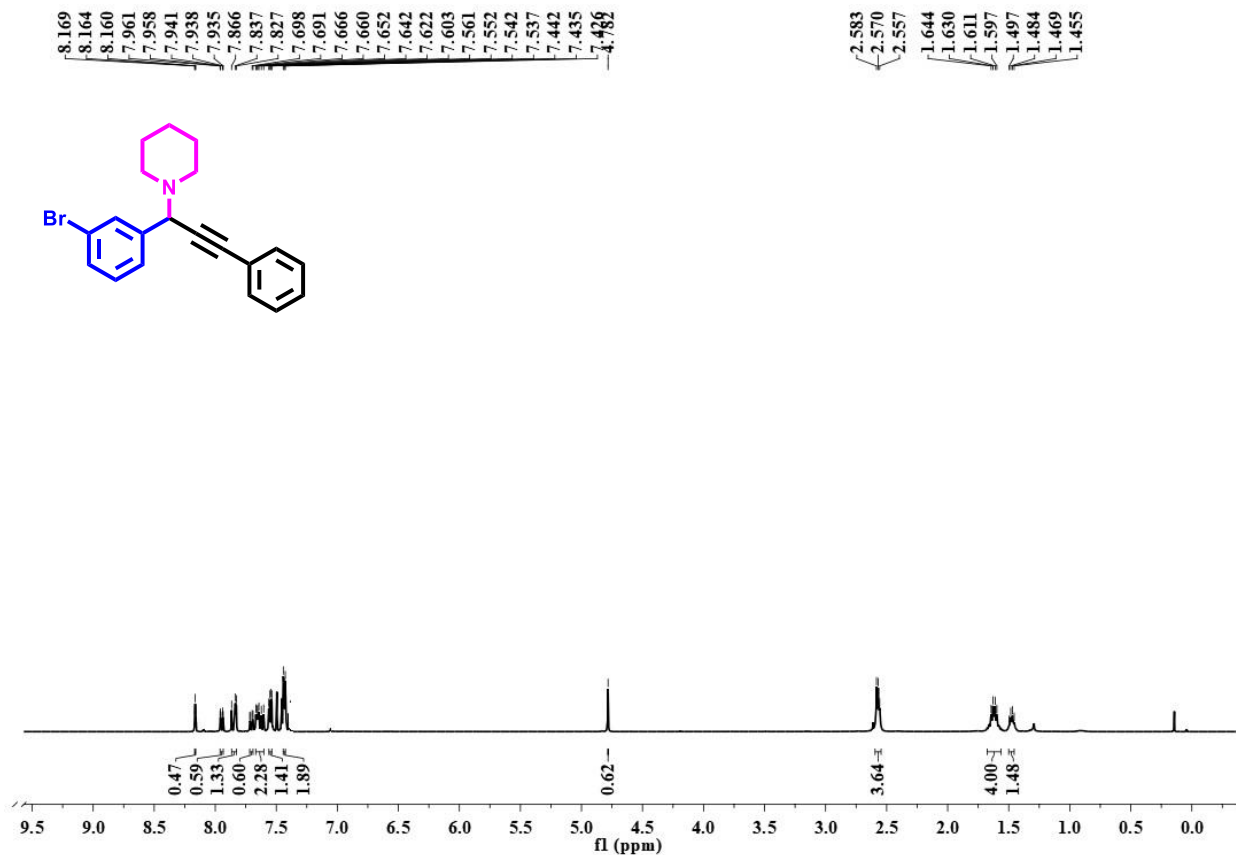


Figure S68: ¹H NMR spectrum of 7ai taking CDCl₃ as solvent.

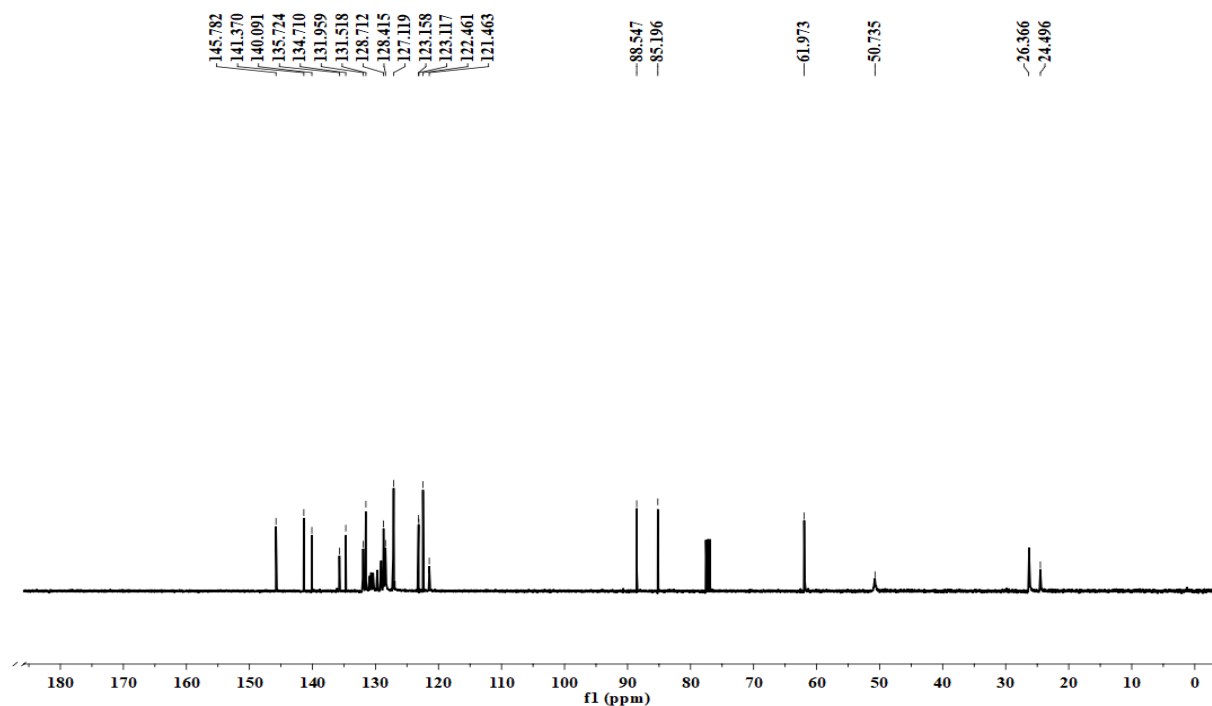


Figure S69: ¹³C NMR spectrum of 7ai taking CDCl₃ as solvent

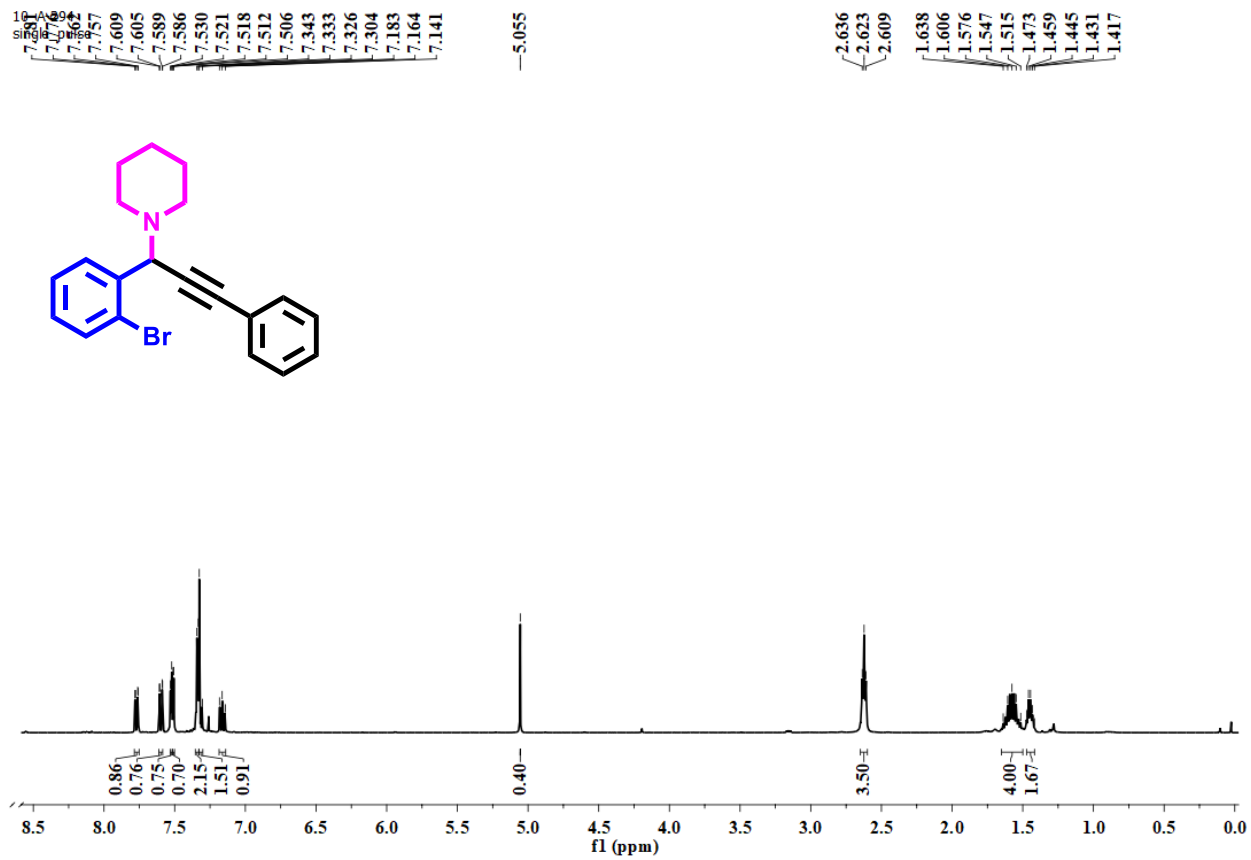


Figure S70: ¹H NMR spectrum of 7aj taking CDCl₃ as solvent.

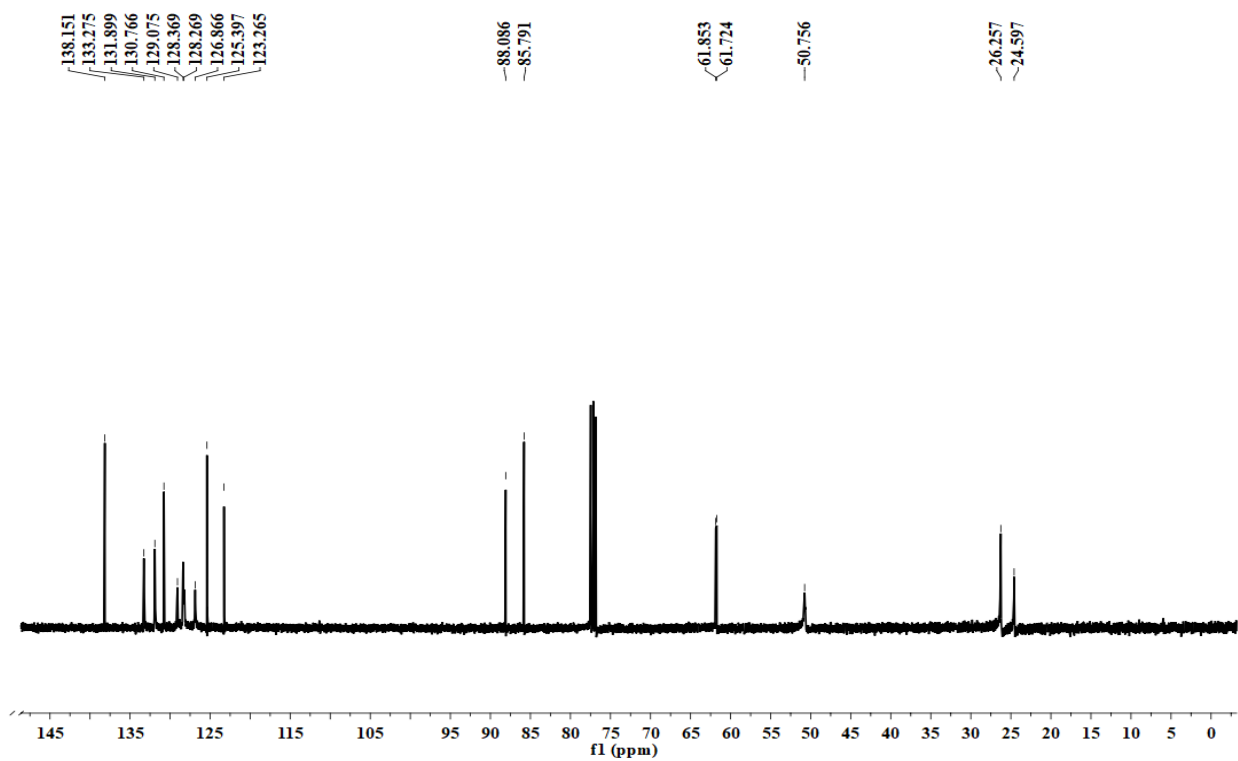


Figure S71: ¹³C NMR spectrum of 7aj taking CDCl₃ as solvent

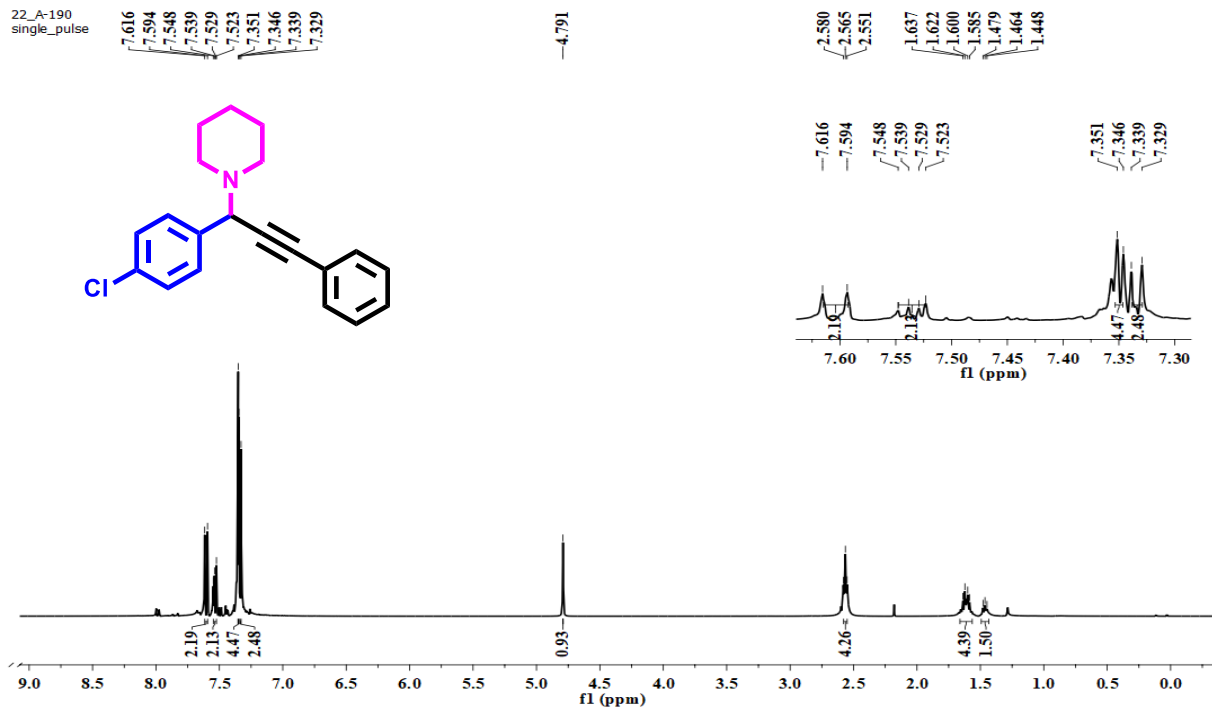


Figure S72: ^1H NMR spectrum of 7ak taking CDCl_3 as solvent.

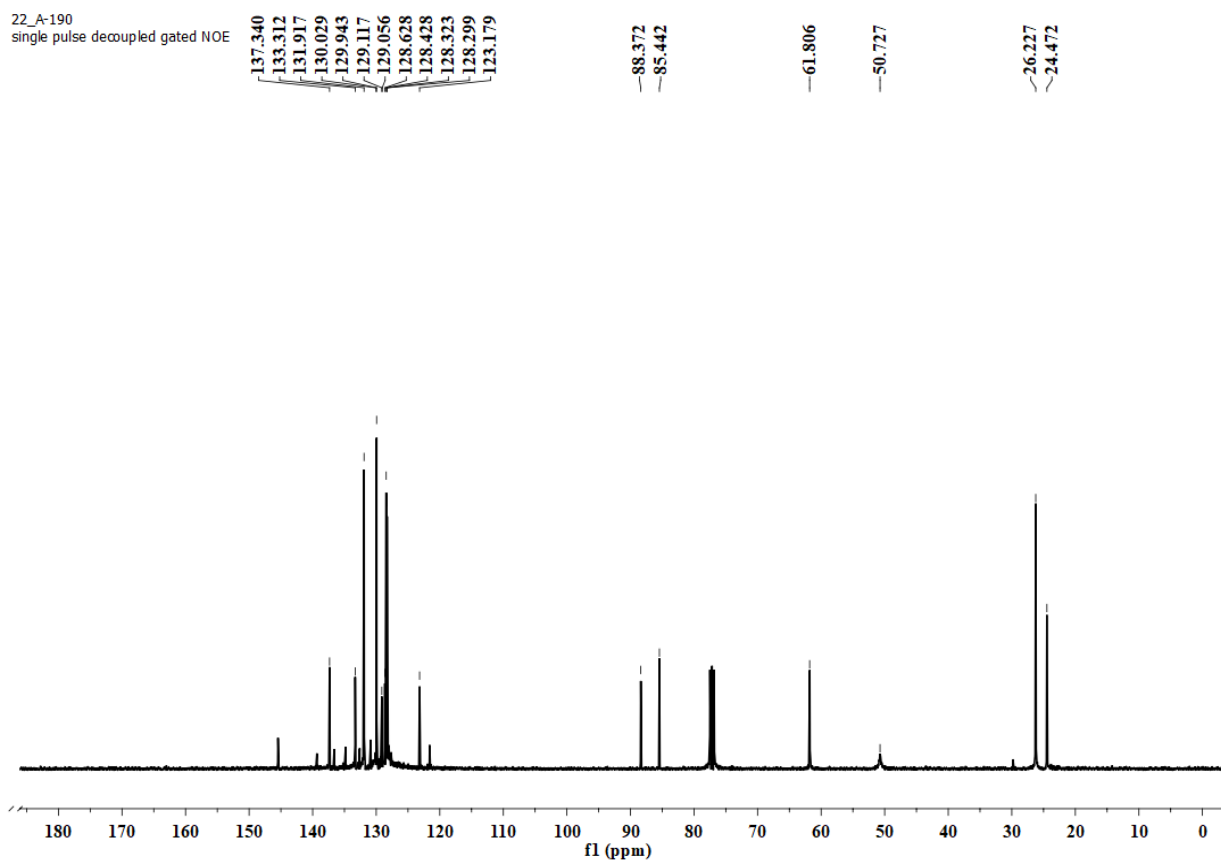


Figure S73: ^{13}C NMR spectrum of 7ak taking CDCl_3 as solvent

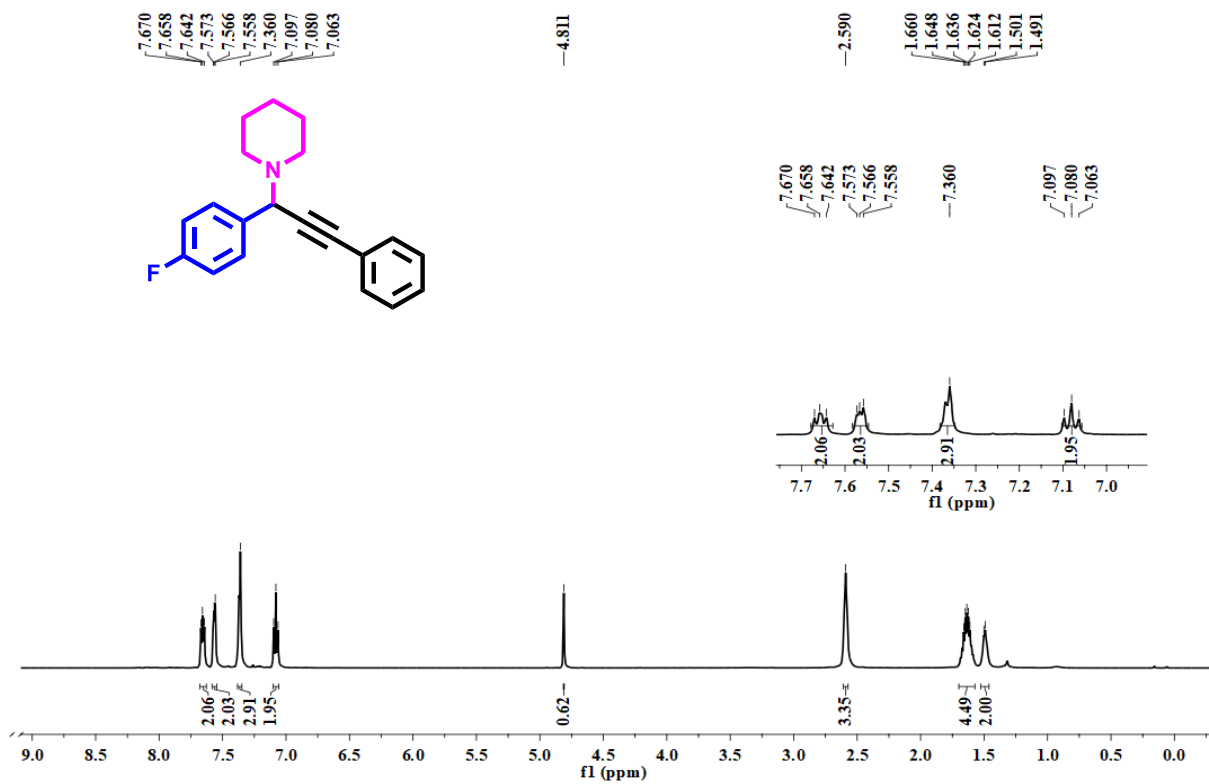


Figure S74: ¹H NMR spectrum of 7al taking CDCl₃ as solvent.

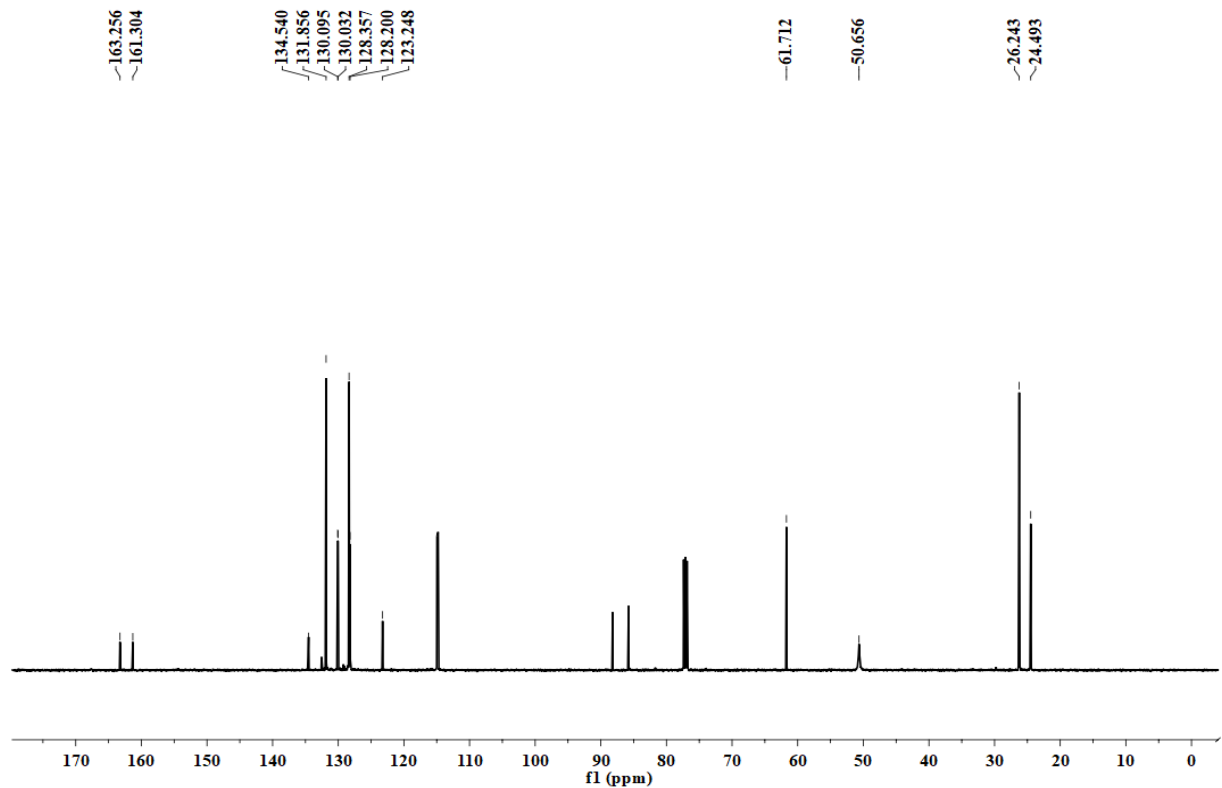


Figure S75: ¹³C NMR spectrum of 7al taking CDCl₃ as solvent

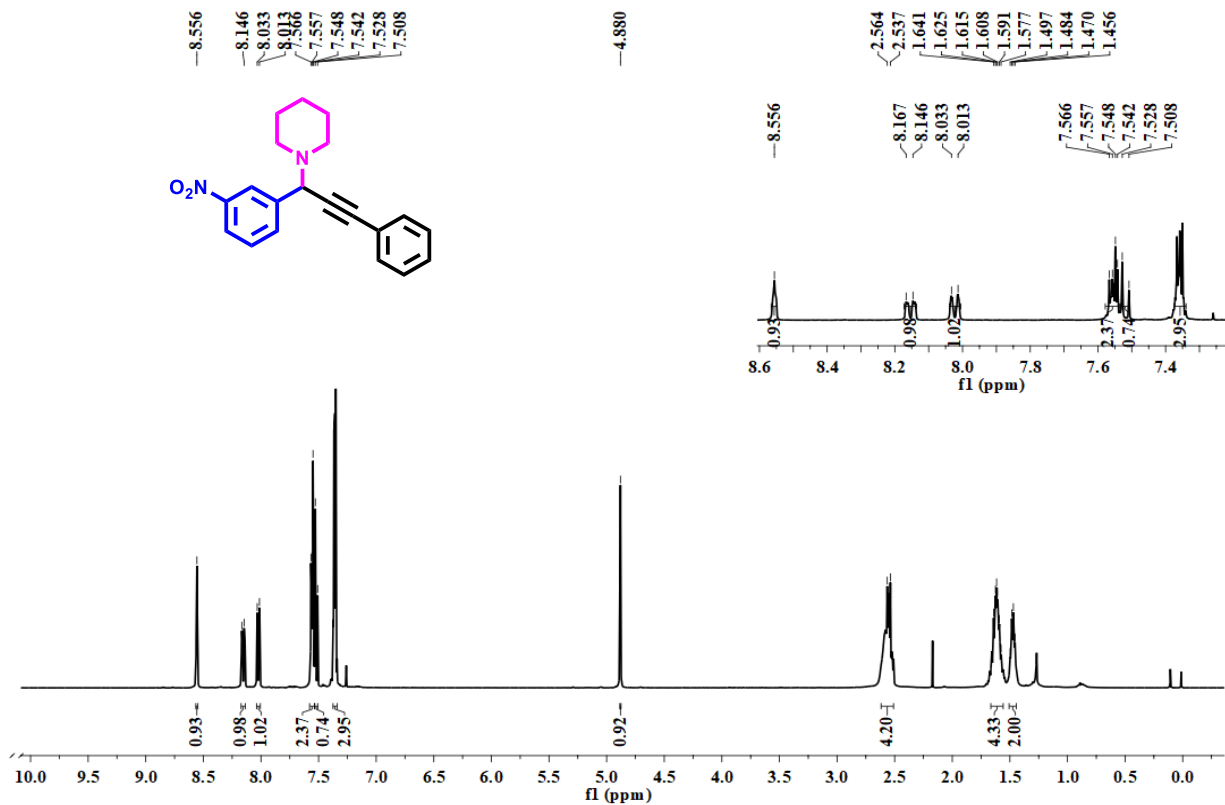


Figure S76: ¹H NMR spectrum of 7am taking CDCl₃ as solvent.

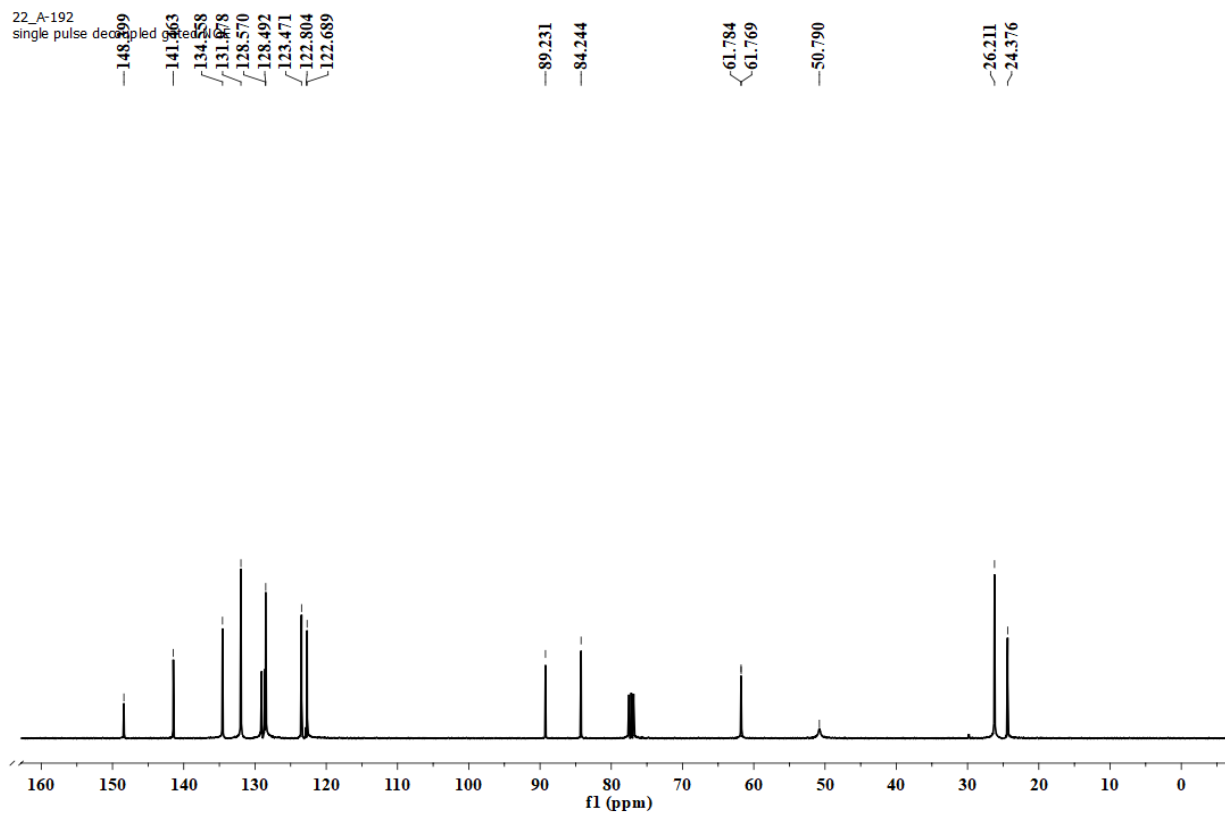


Figure S77: ¹³C NMR spectrum of 7am taking CDCl₃ as solvent

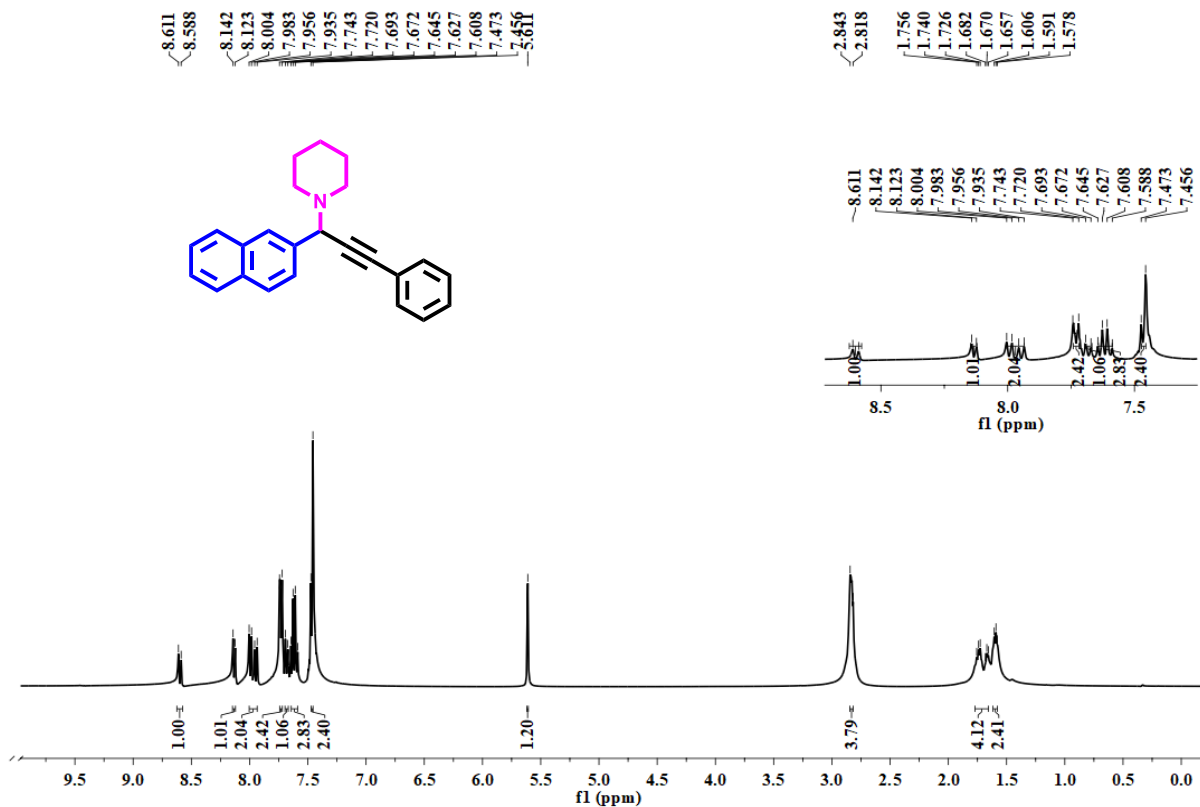


Figure S78: ¹H NMR spectrum of 7an taking CDCl₃ as solvent.

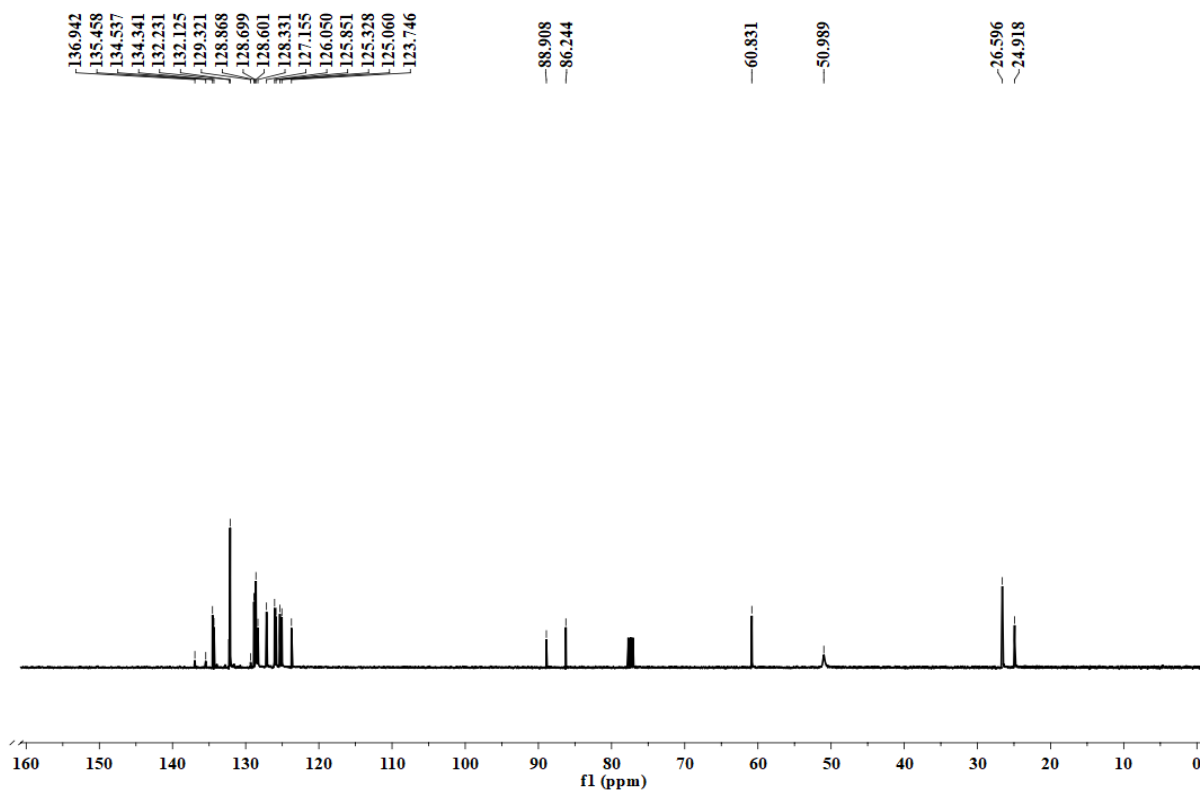


Figure S79: ¹³C NMR spectrum of 7an taking CDCl₃ as solvent.

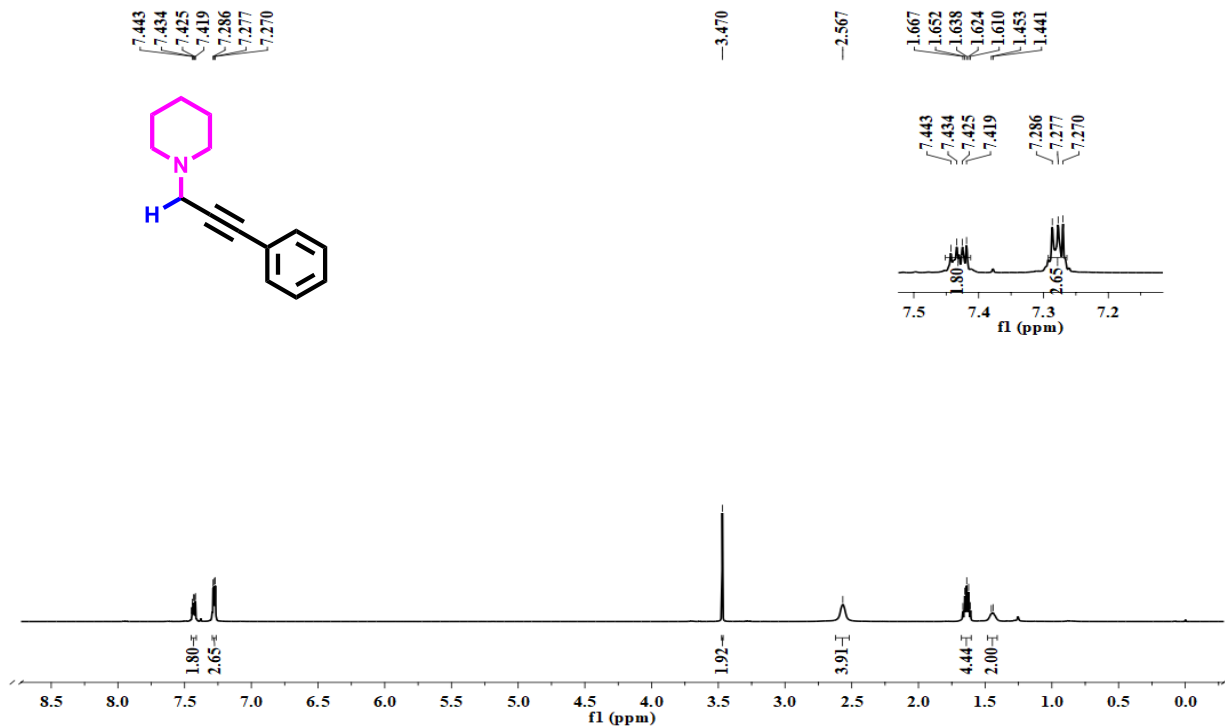


Figure S80: ¹H NMR spectrum of 7ao taking CDCl₃ as solvent.

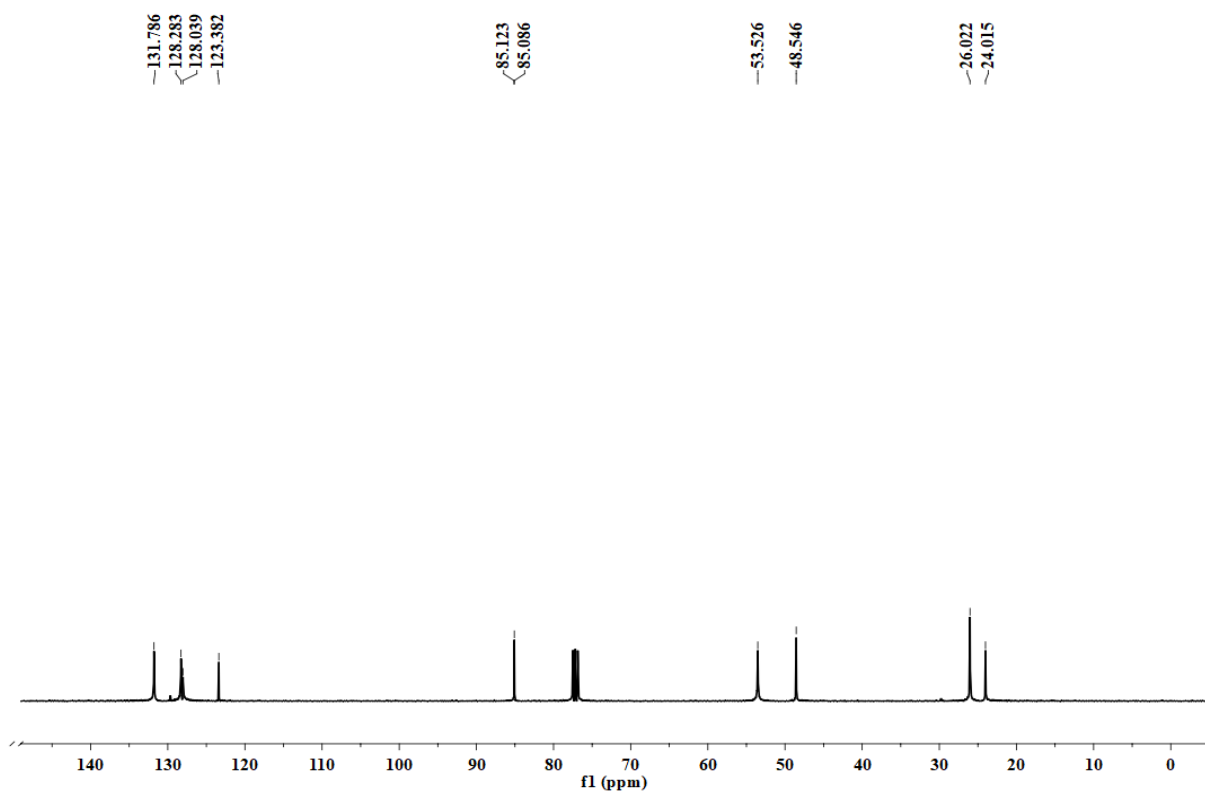


Figure S81: ¹³C NMR spectrum of 7ao taking CDCl₃ as solvent.

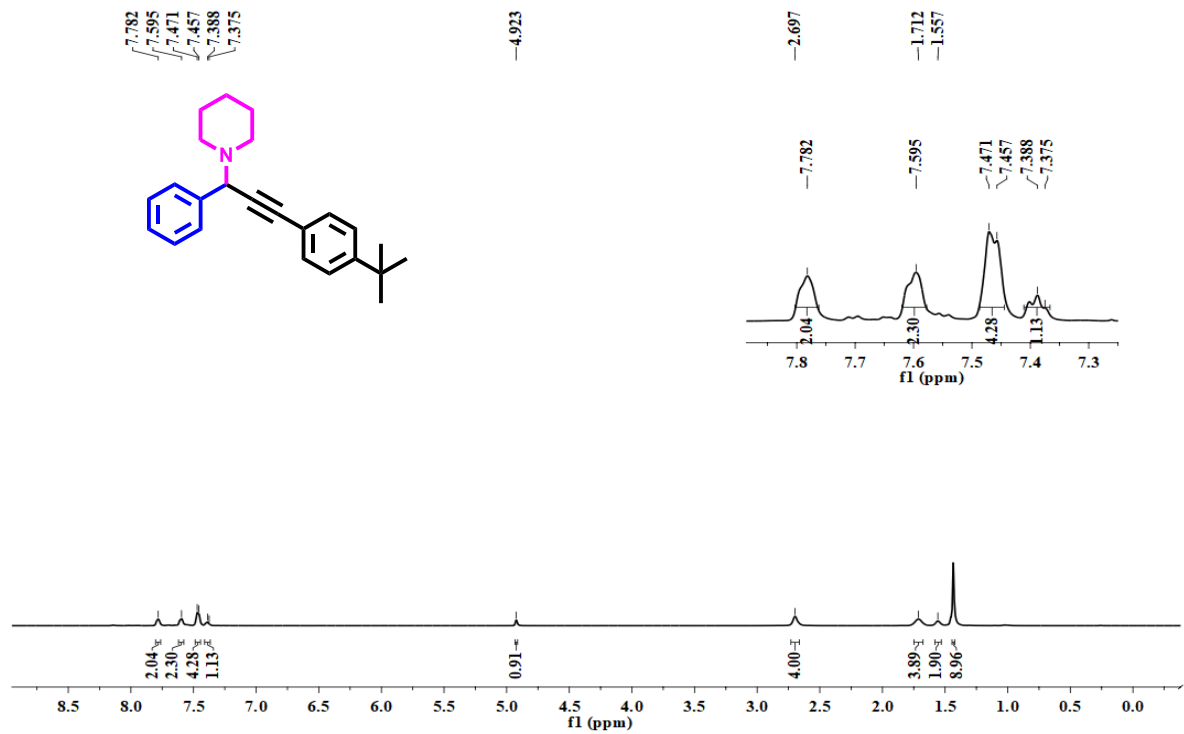


Figure S82: ¹H NMR spectrum of 8aa taking CDCl₃ as solvent.

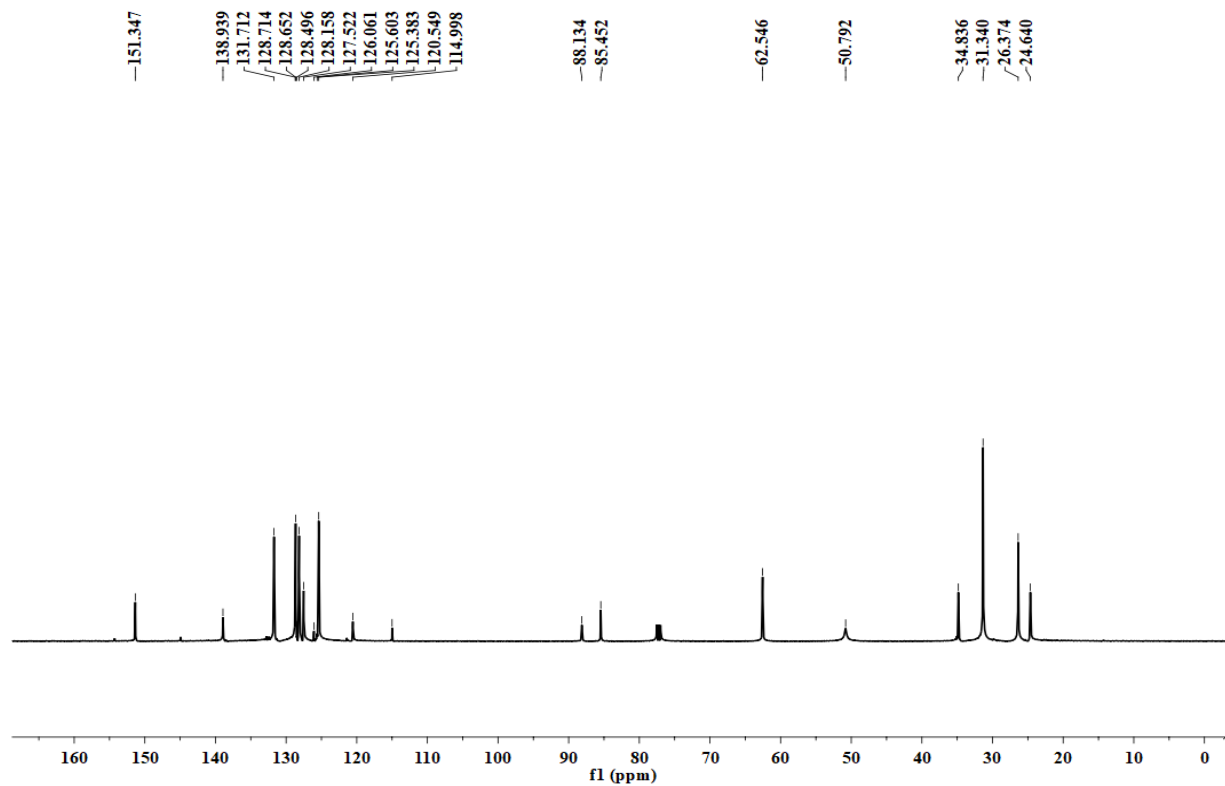


Figure S83: ¹³C NMR spectrum of 8aa taking CDCl₃ as solvent.

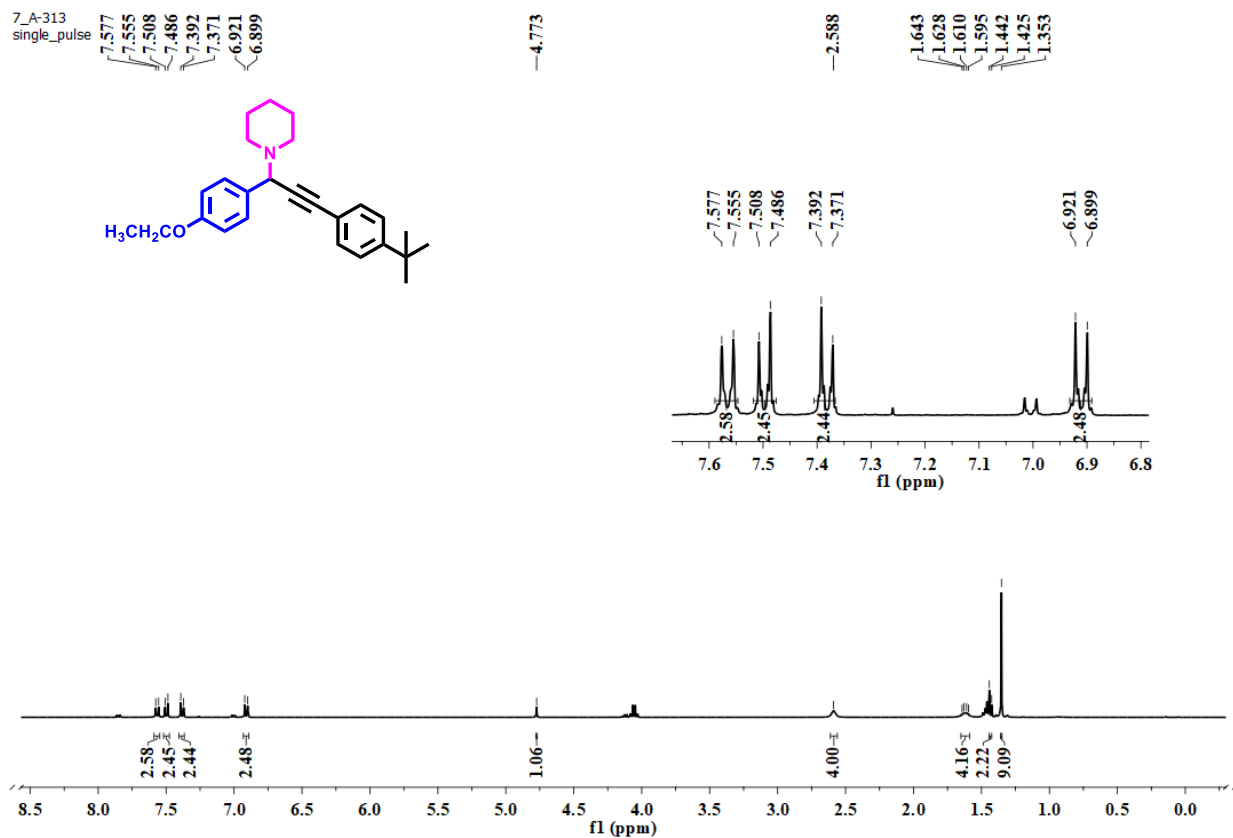


Figure S84: ^1H NMR spectrum of 8ab taking CDCl_3 as solvent.

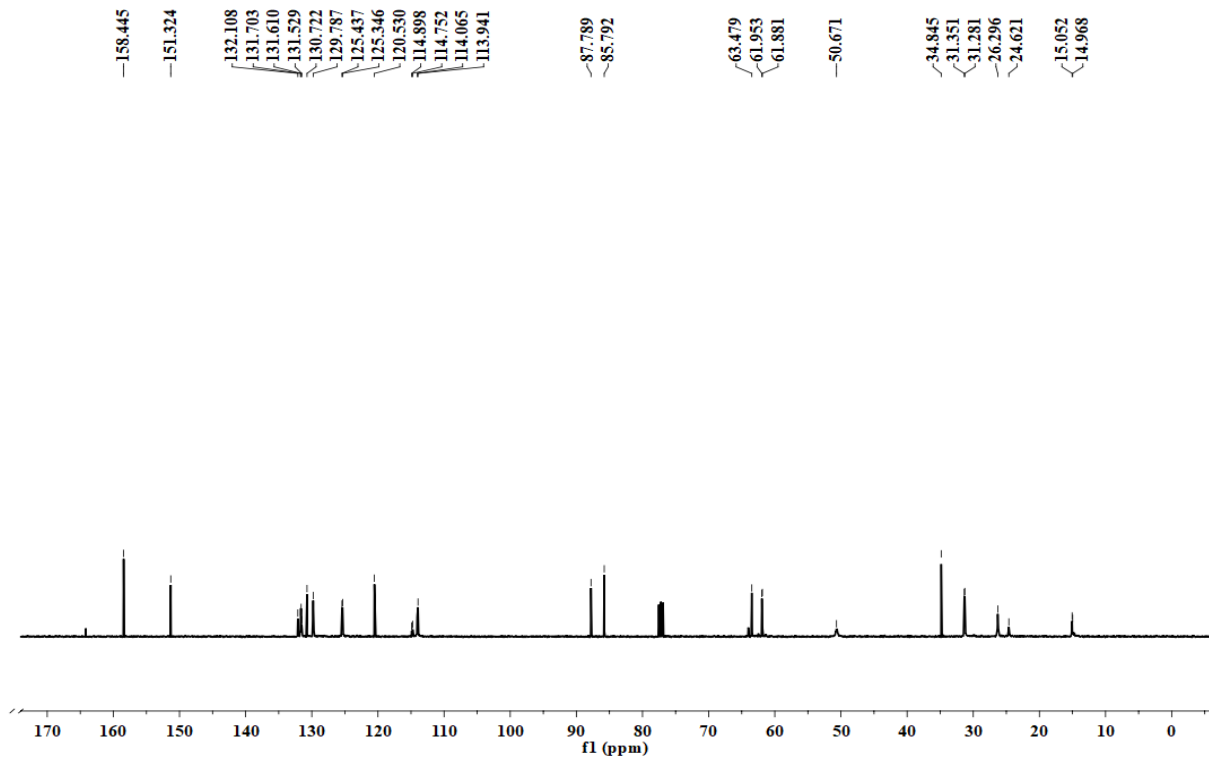


Figure S85: ^{13}C NMR spectrum of 8ab taking CDCl_3 as solvent.

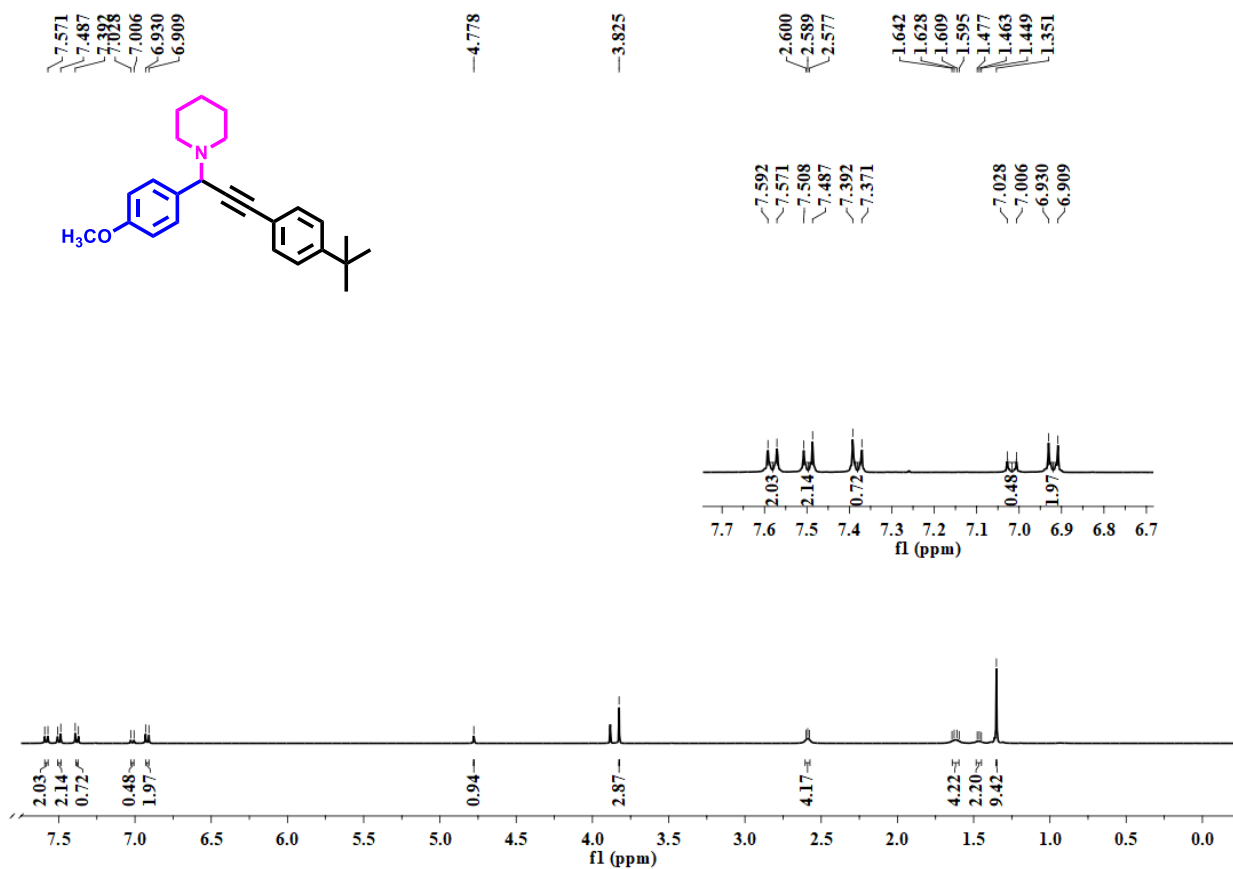


Figure S86: ¹H NMR spectrum of 8ac taking CDCl₃ as solvent.

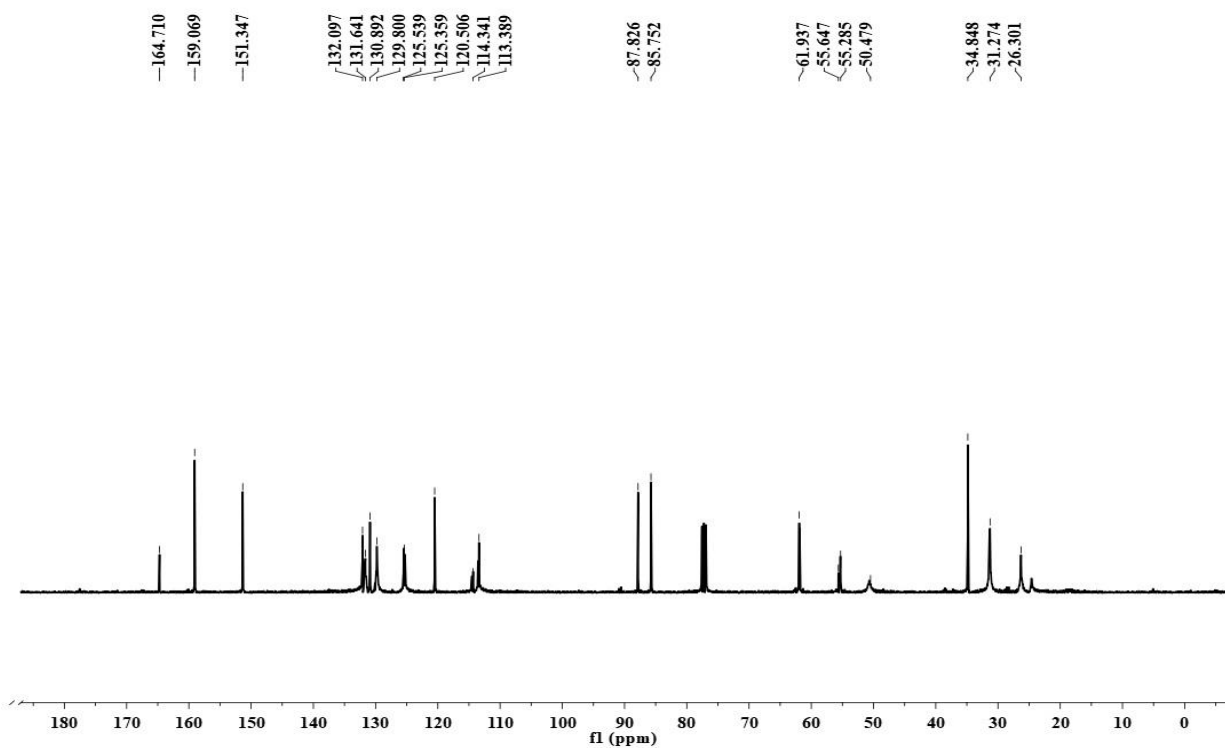


Figure S87: ¹³C NMR spectrum of 8ac taking CDCl₃ as solvent.

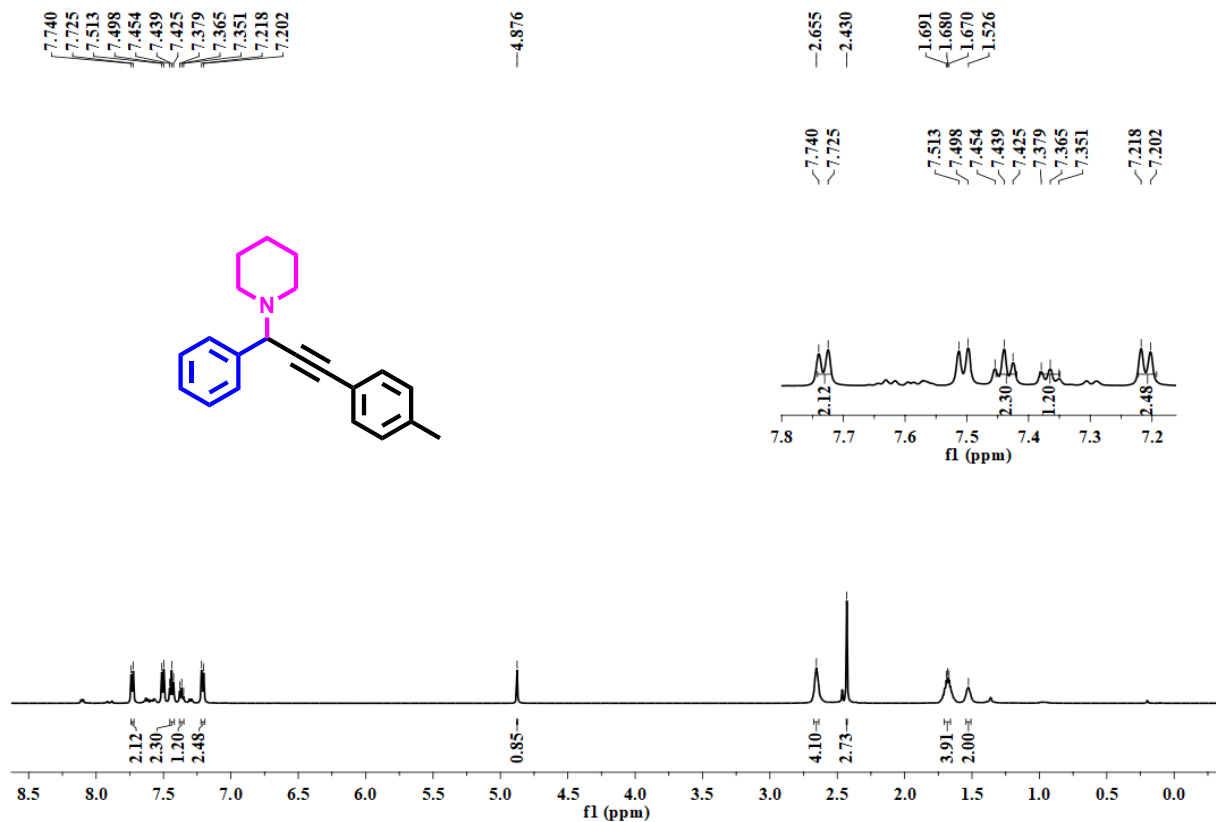


Figure S88: ¹H NMR spectrum of 8ad taking CDCl₃ as solvent.

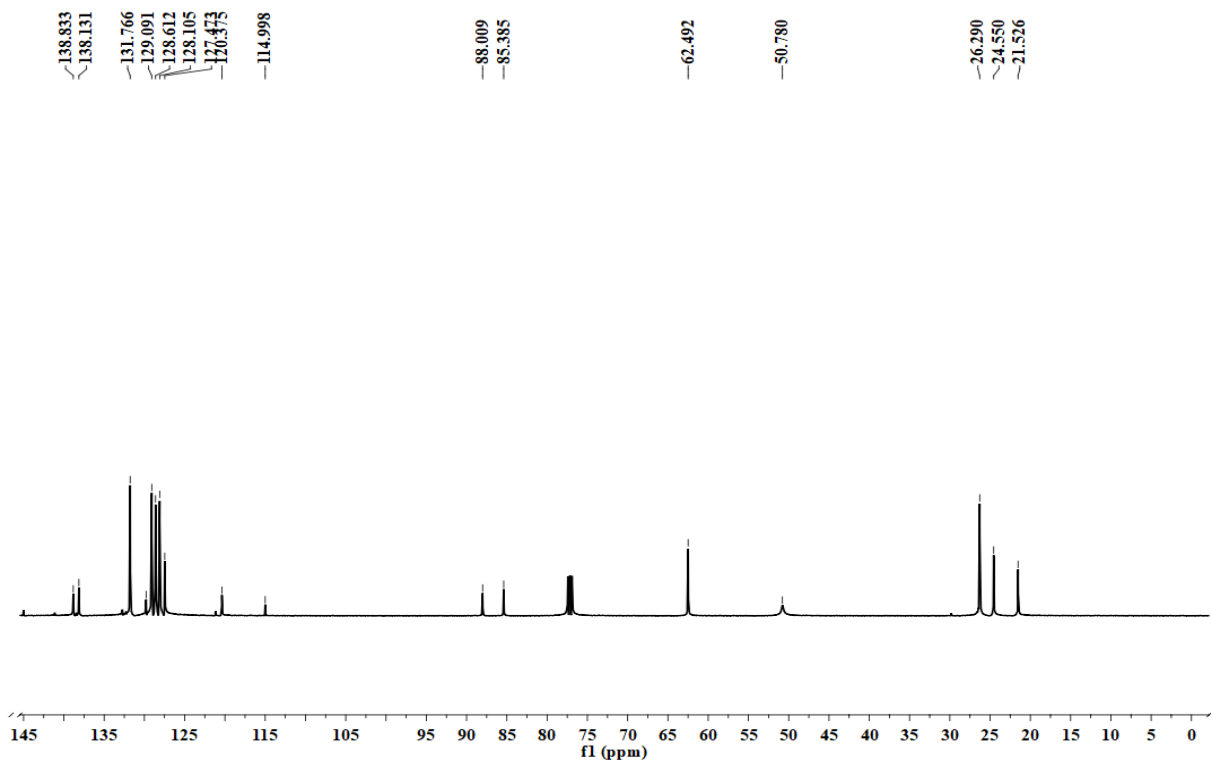


Figure S89: ¹³C NMR spectrum of 8ad taking CDCl₃ as solvent.

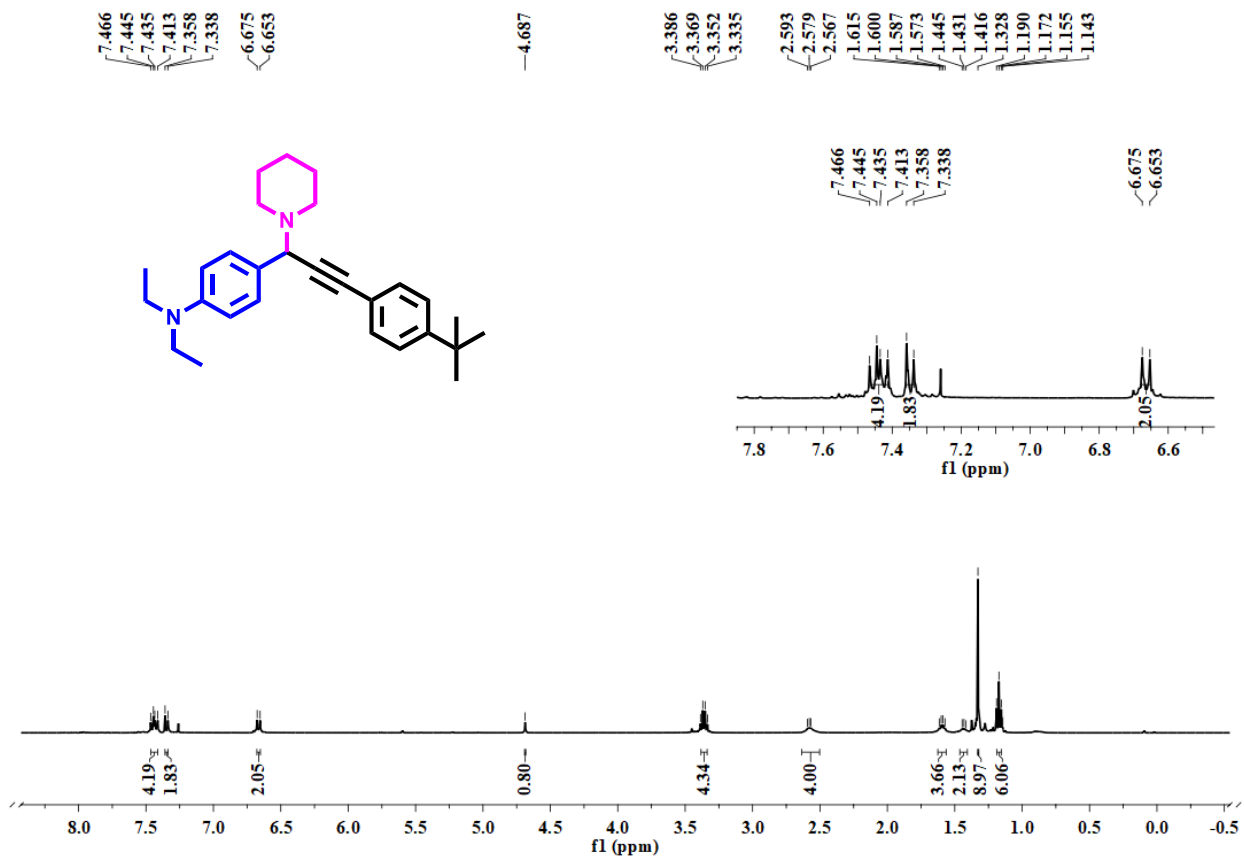


Figure S90: ¹H NMR spectrum of 8ae taking CDCl₃ as solvent.

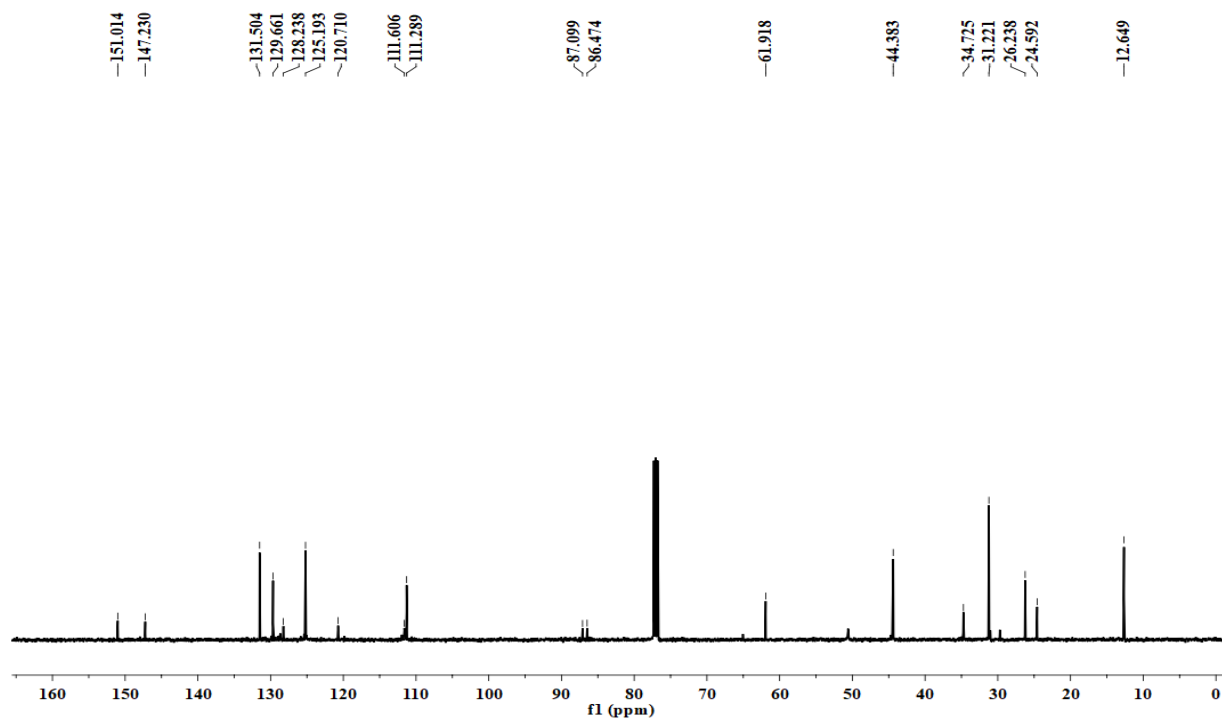


Figure S91: ¹³C NMR spectrum of 8ae taking CDCl₃ as solvent.

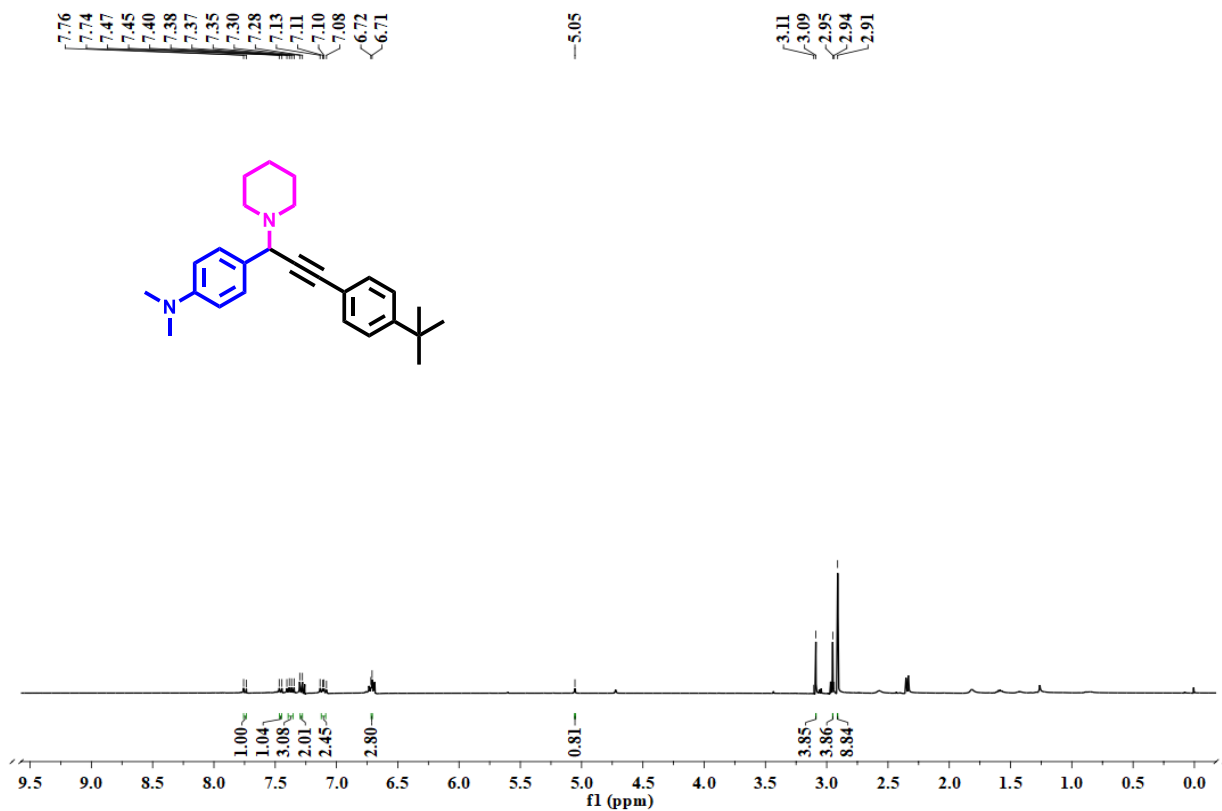


Figure S92: ¹H NMR spectrum of 8af taking CDCl₃ as solvent.

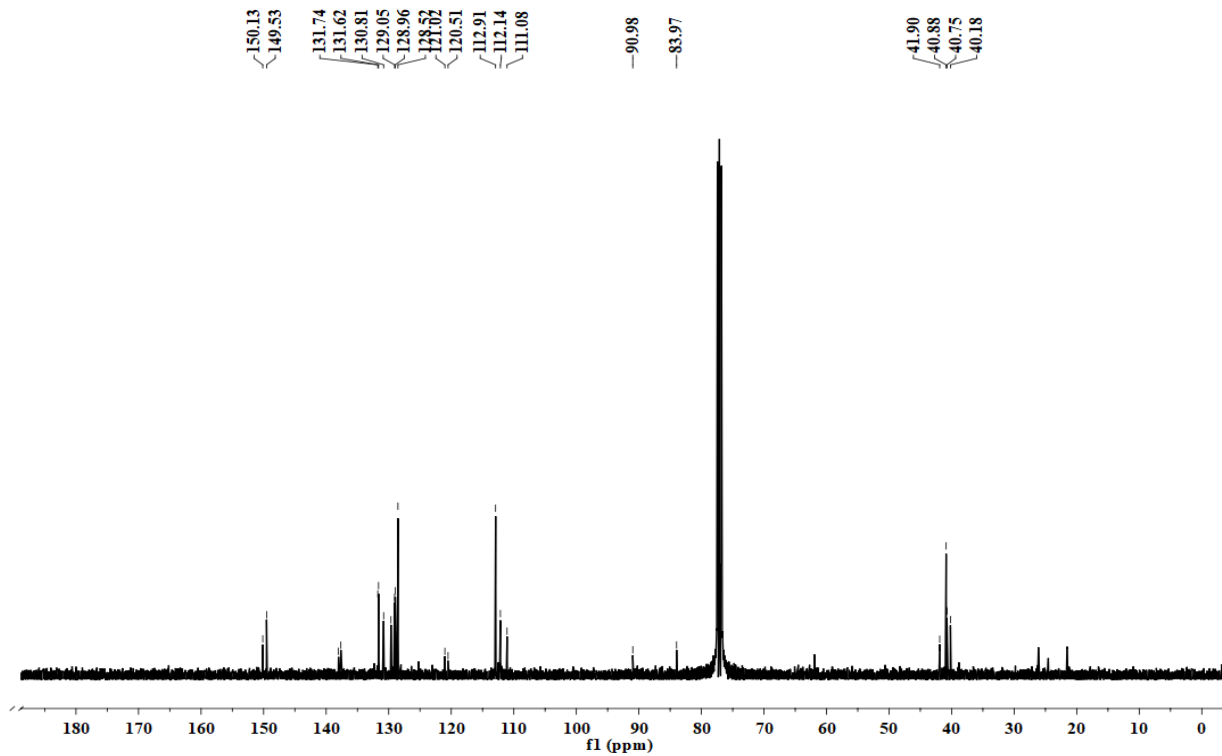


Figure S93: ¹³C NMR spectrum of 8af taking CDCl₃ as solvent.

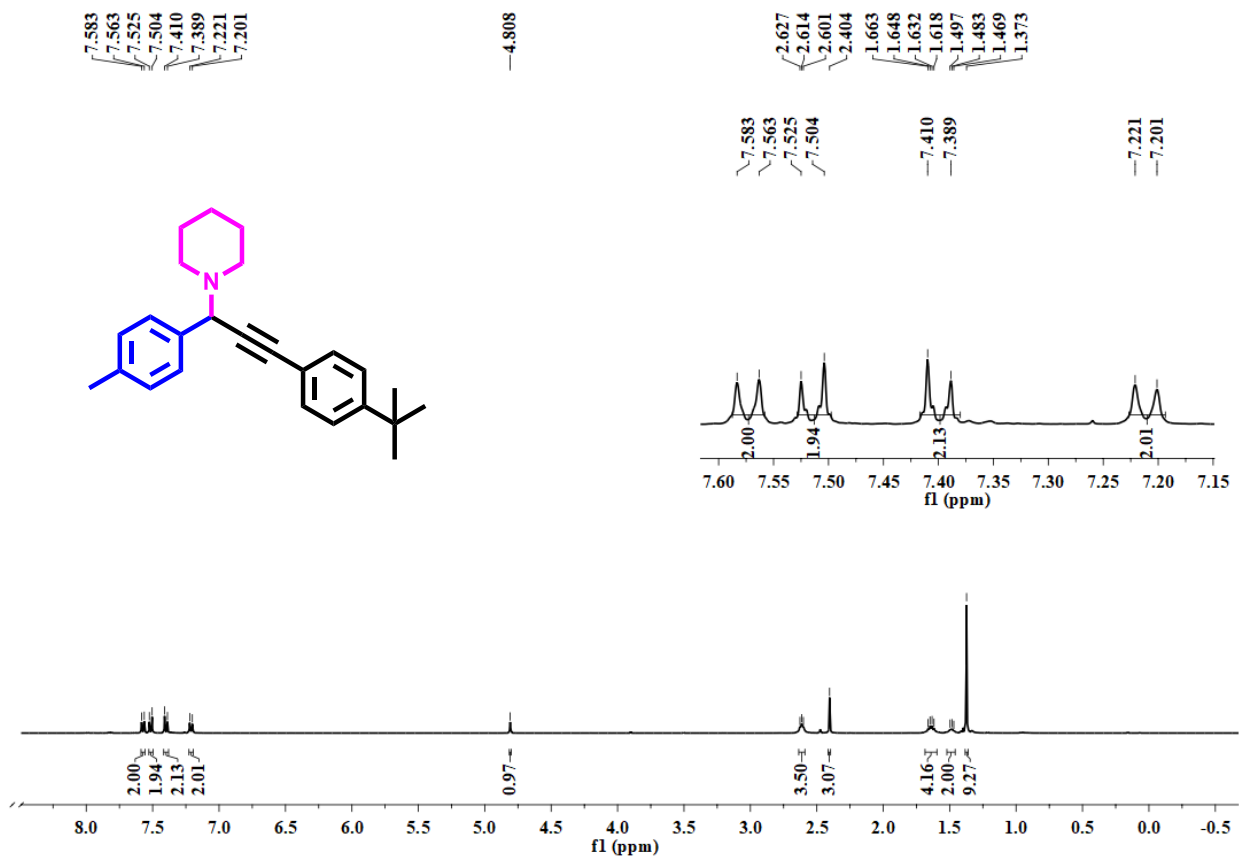


Figure S94: ¹H NMR spectrum of 8ag taking CDCl₃ as solvent.

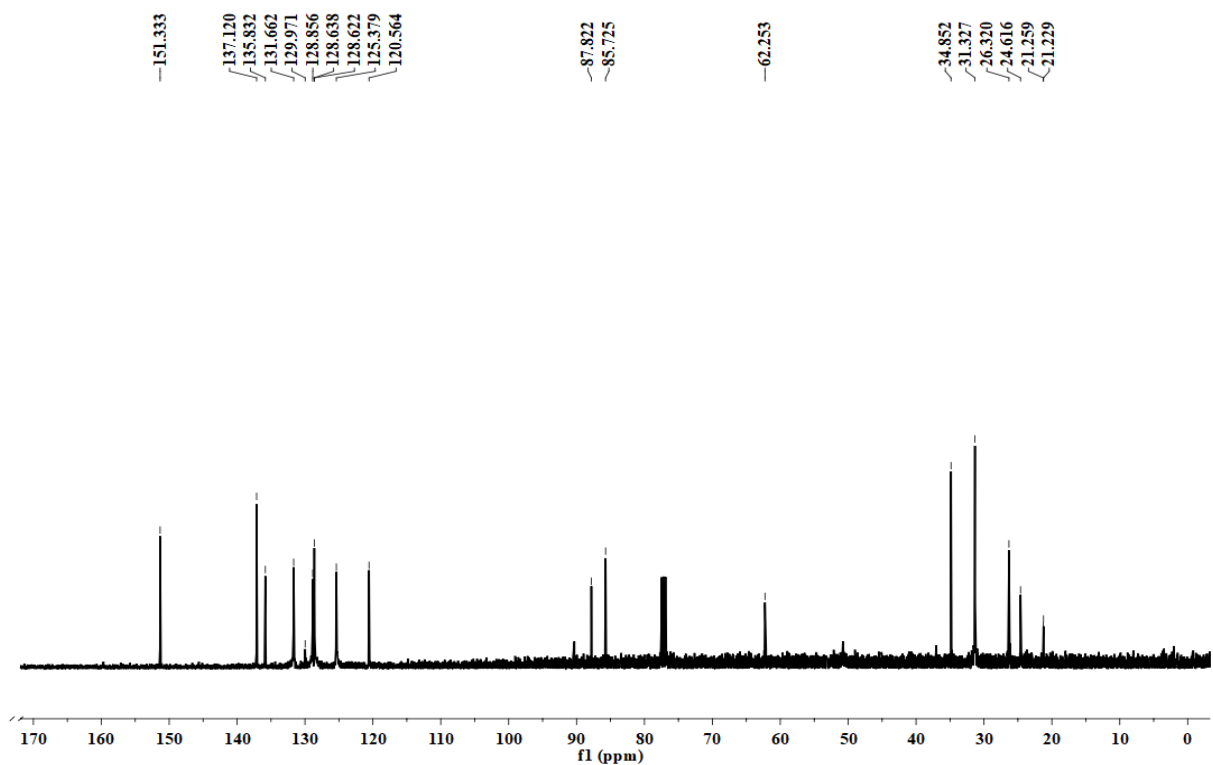


Figure S95: ¹³C NMR spectrum of 8ag taking CDCl₃ as solvent.

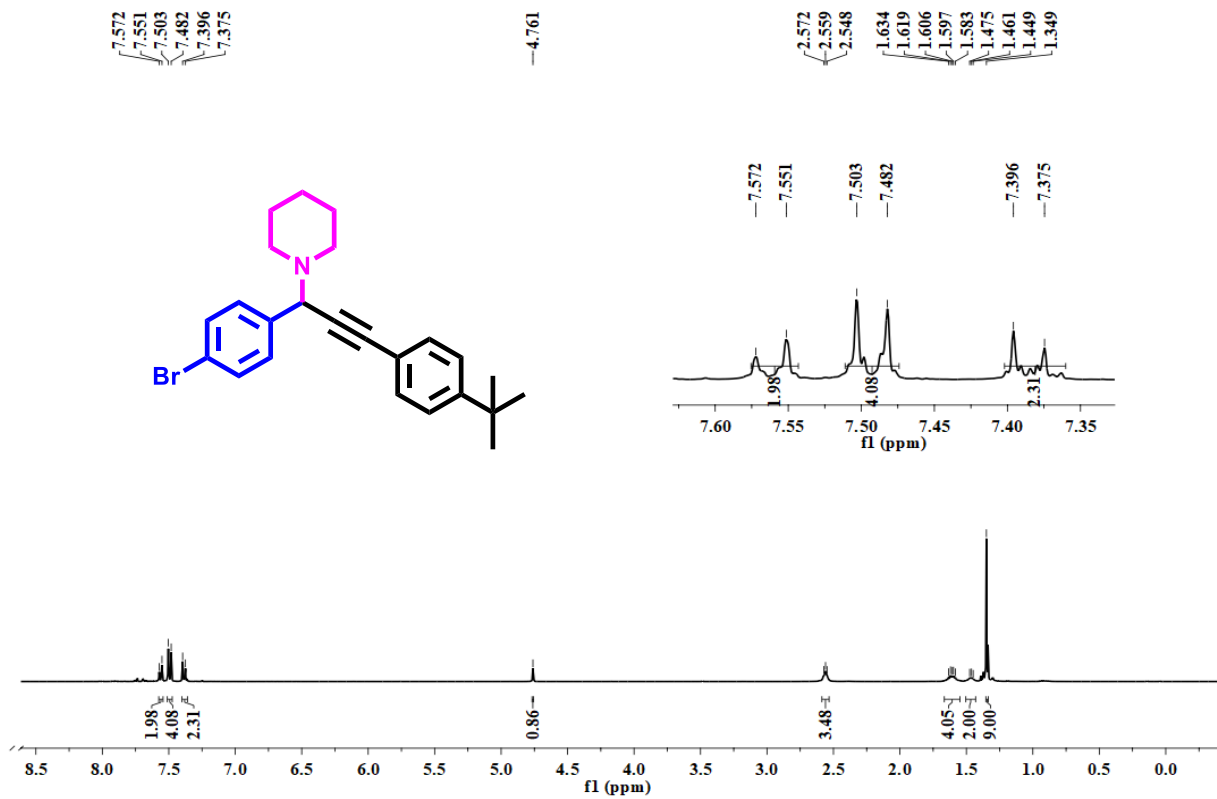


Figure S96: ¹H NMR spectrum of 8ah taking CDCl₃ as solvent.

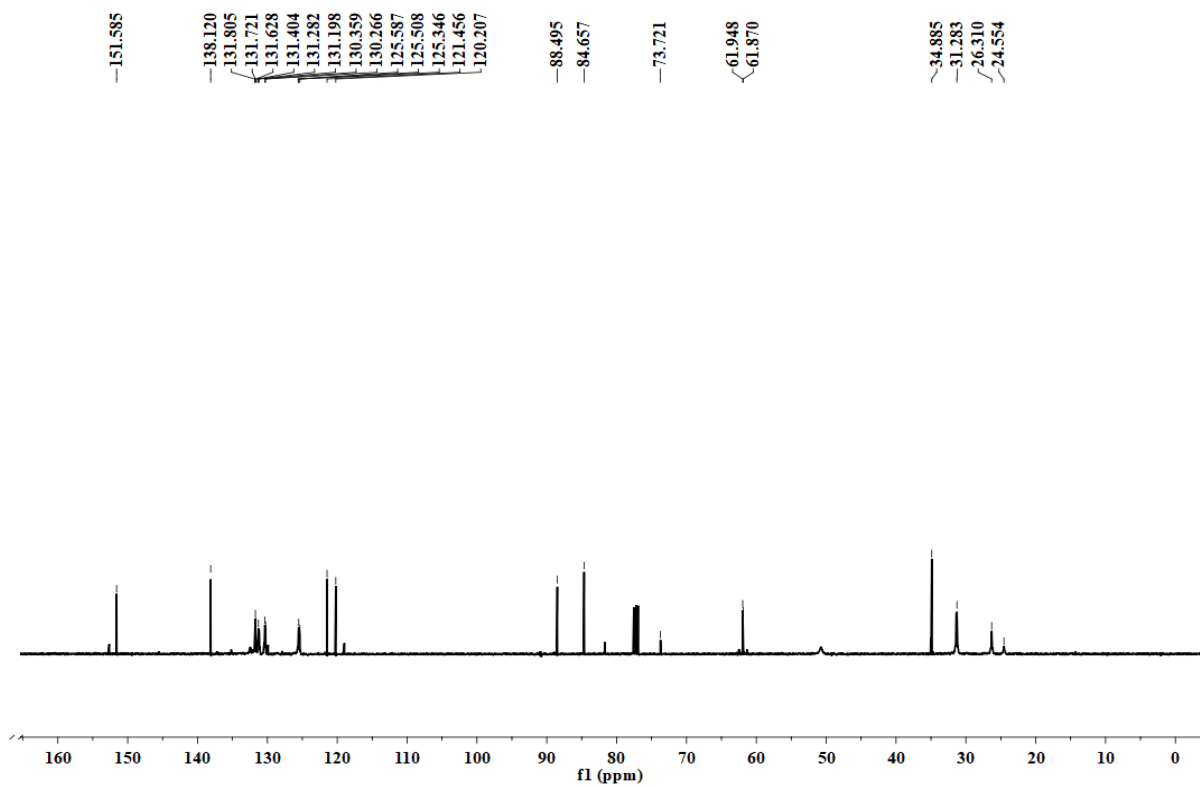


Figure S97: ¹³C NMR spectrum of 8ah taking CDCl₃ as solvent.

5_A-426
single_pulse

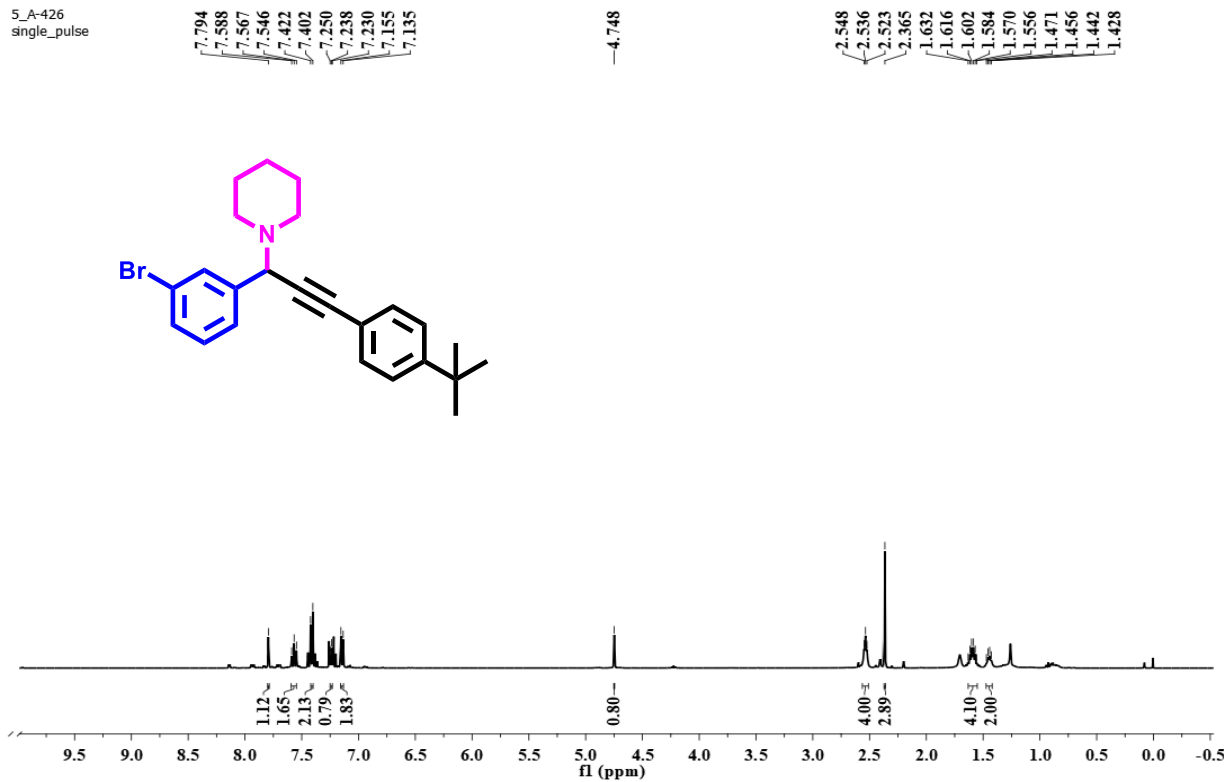


Figure S98: ¹H NMR spectrum of 8ai taking CDCl₃ as solvent.

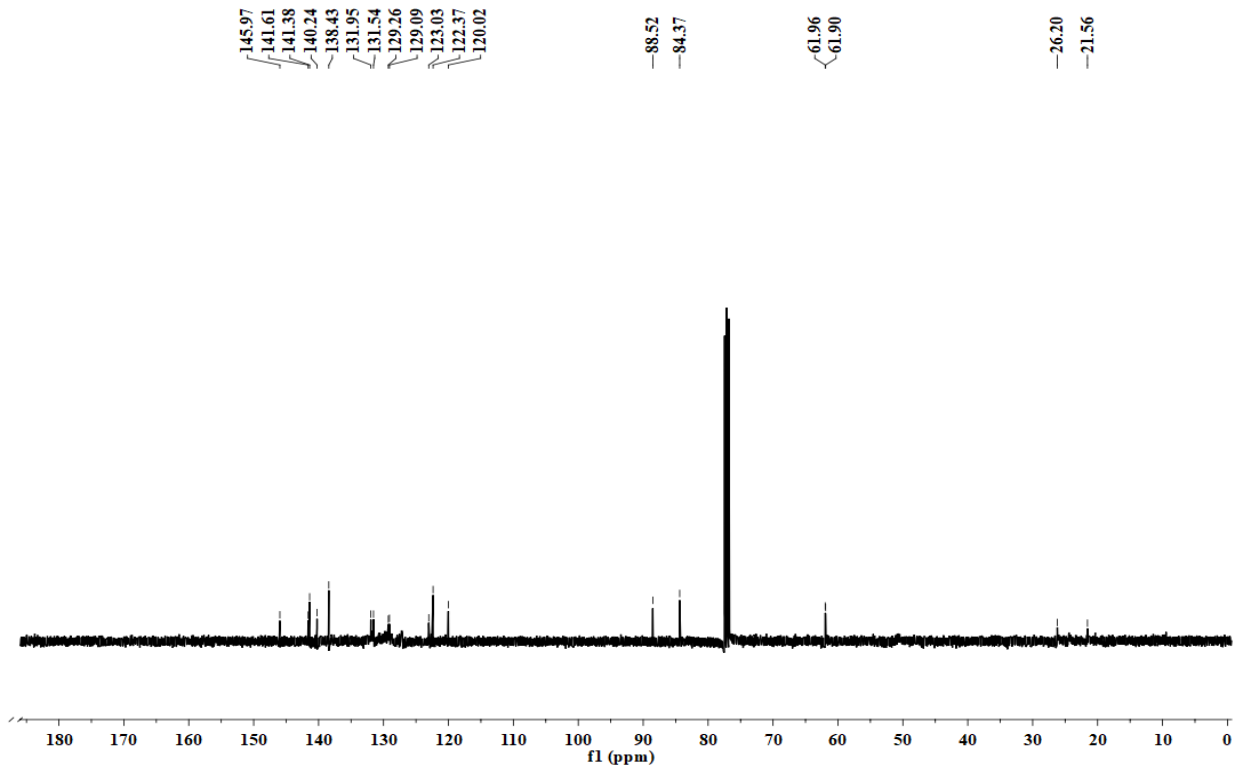


Figure S99: ¹³C NMR spectrum of 8ai taking CDCl₃ as solvent.

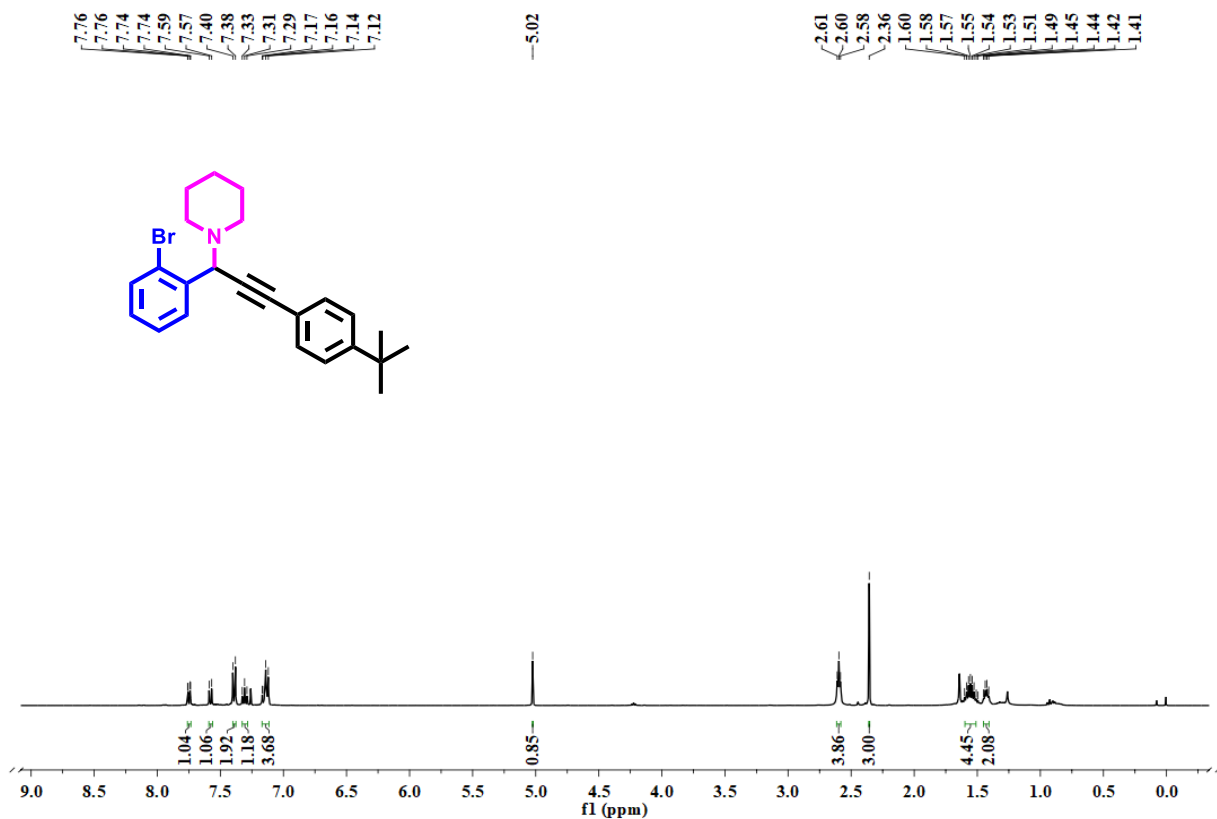


Figure S100: ¹H NMR spectrum of 8aj taking CDCl₃ as solvent.

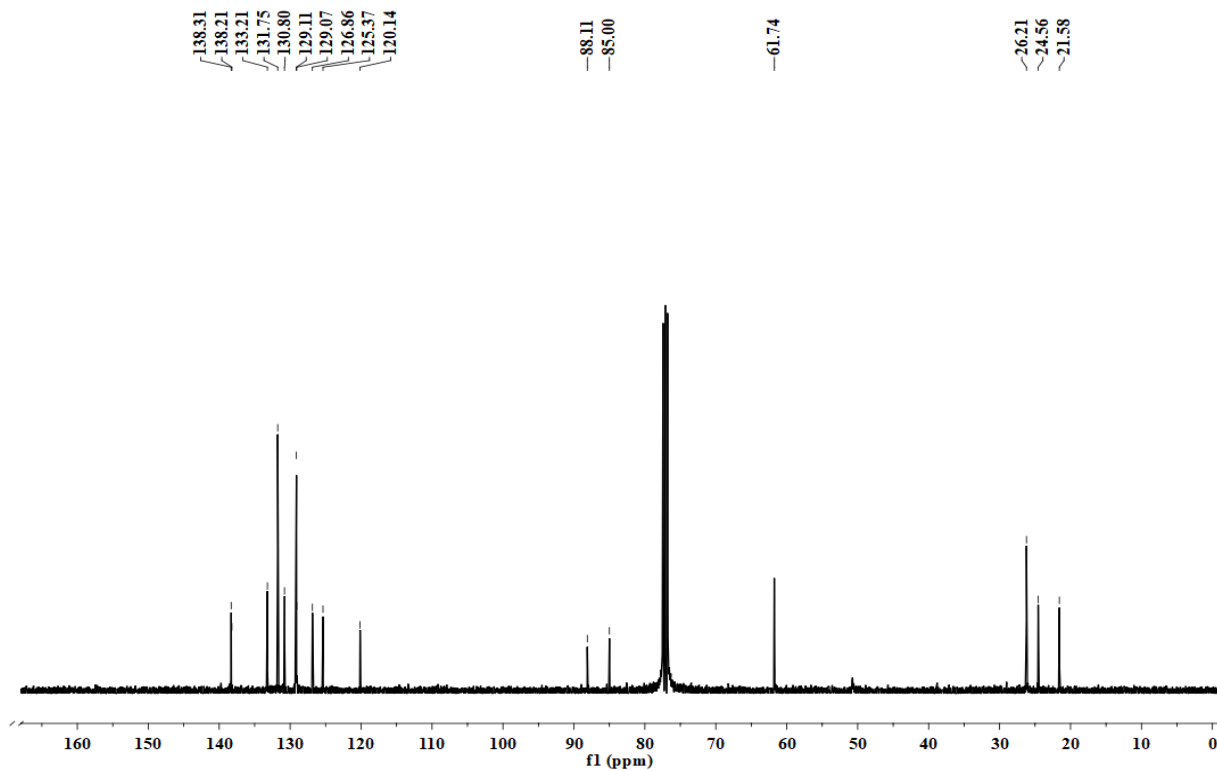


Figure S101: ¹³C NMR spectrum of 8aj taking CDCl₃ as solvent.

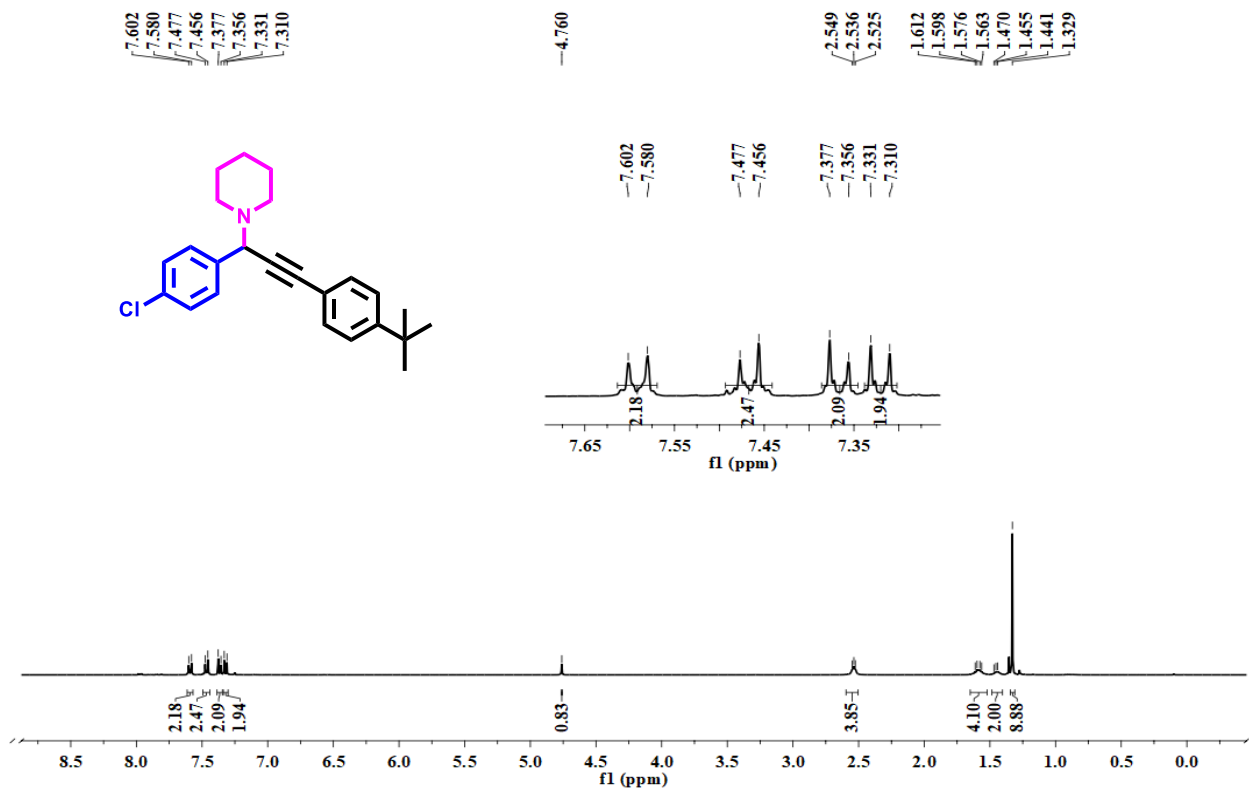


Figure S102: ¹H NMR spectrum of 8ak taking CDCl₃ as solvent.

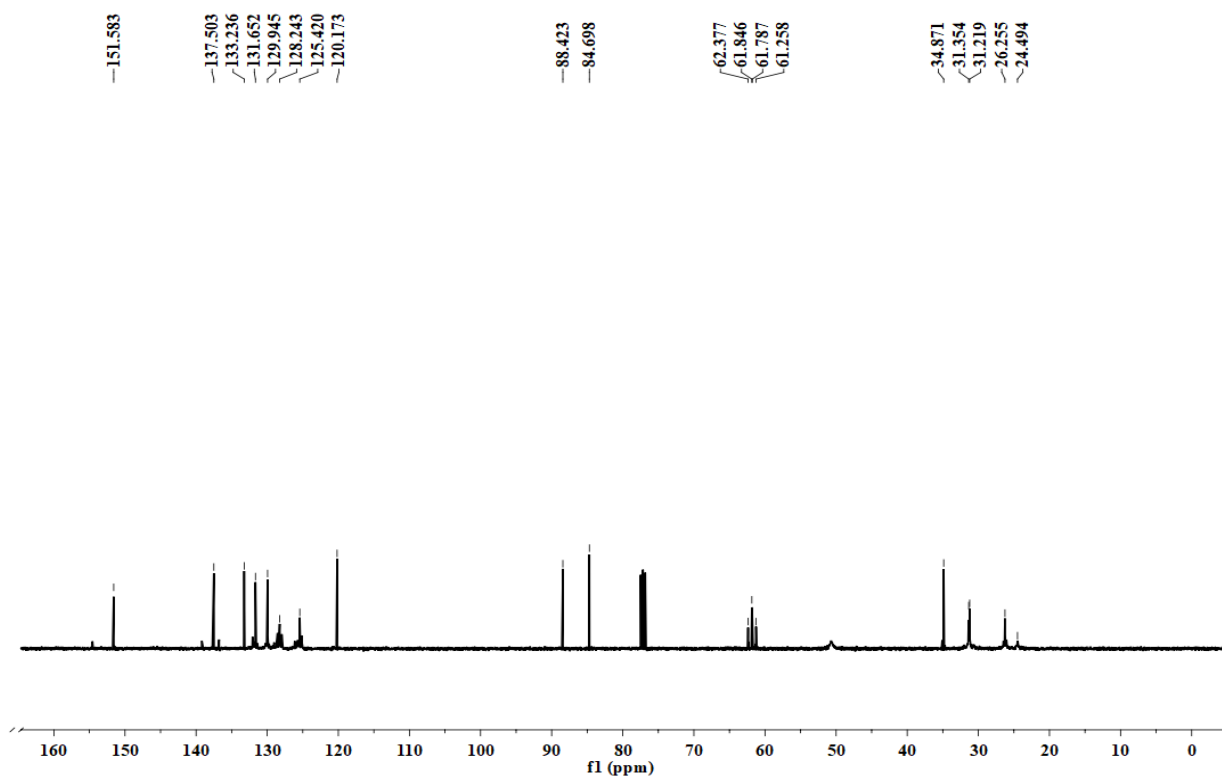


Figure S103: ¹³C NMR spectrum of 8ak taking CDCl₃ as solvent.

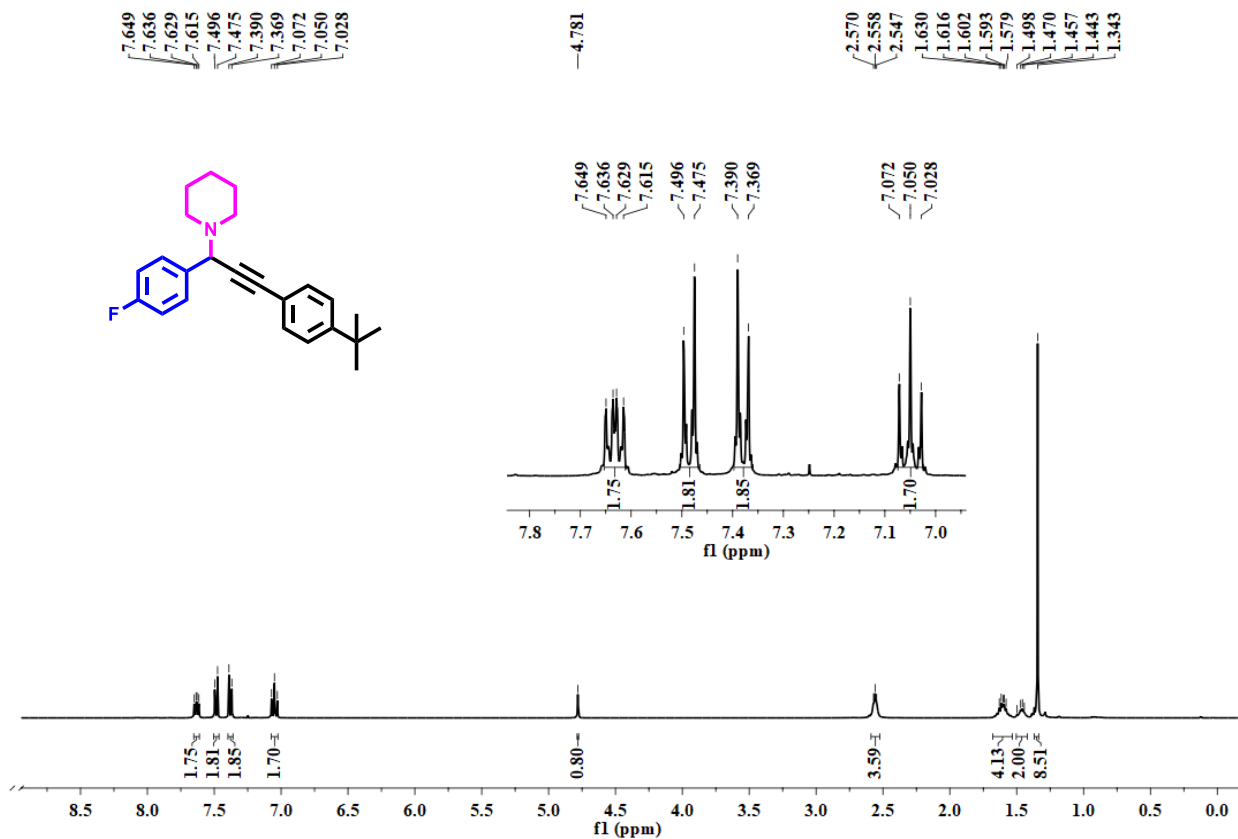


Figure S104: ^1H NMR spectrum of 8ak taking CDCl_3 as solvent.

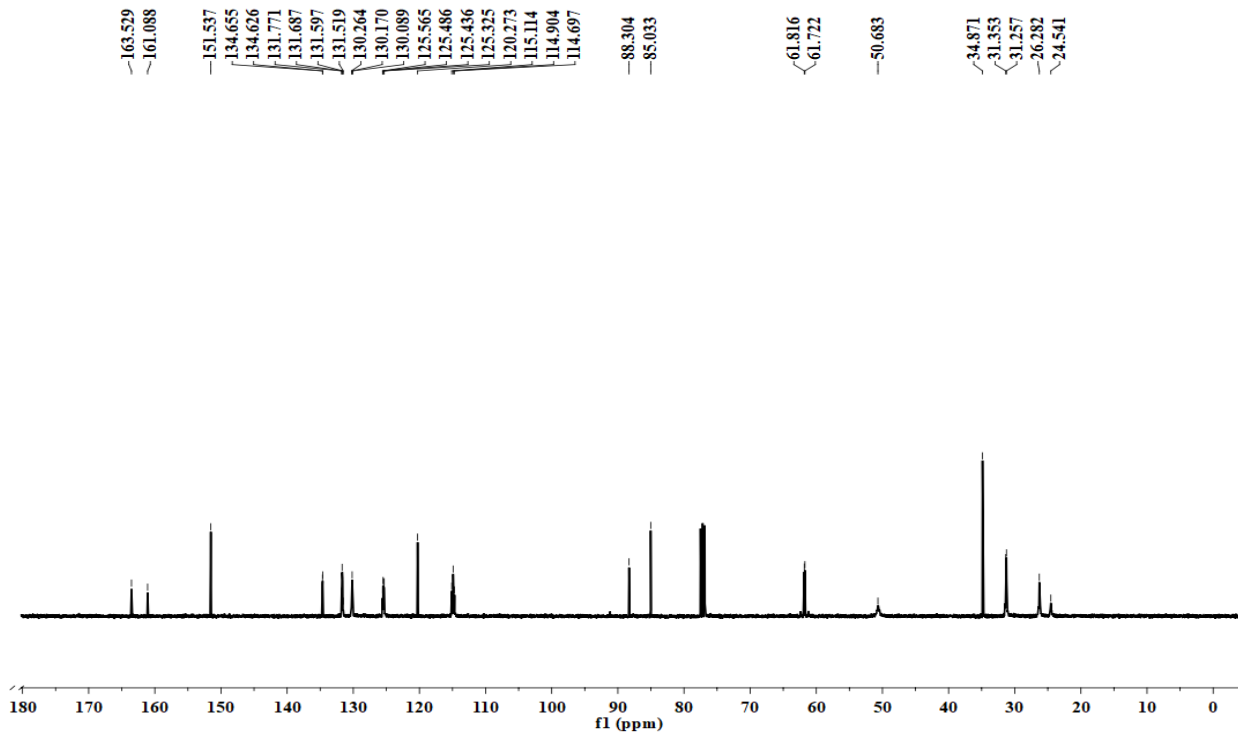


Figure S105: ^{13}C NMR spectrum of 8ak taking CDCl_3 as solvent.

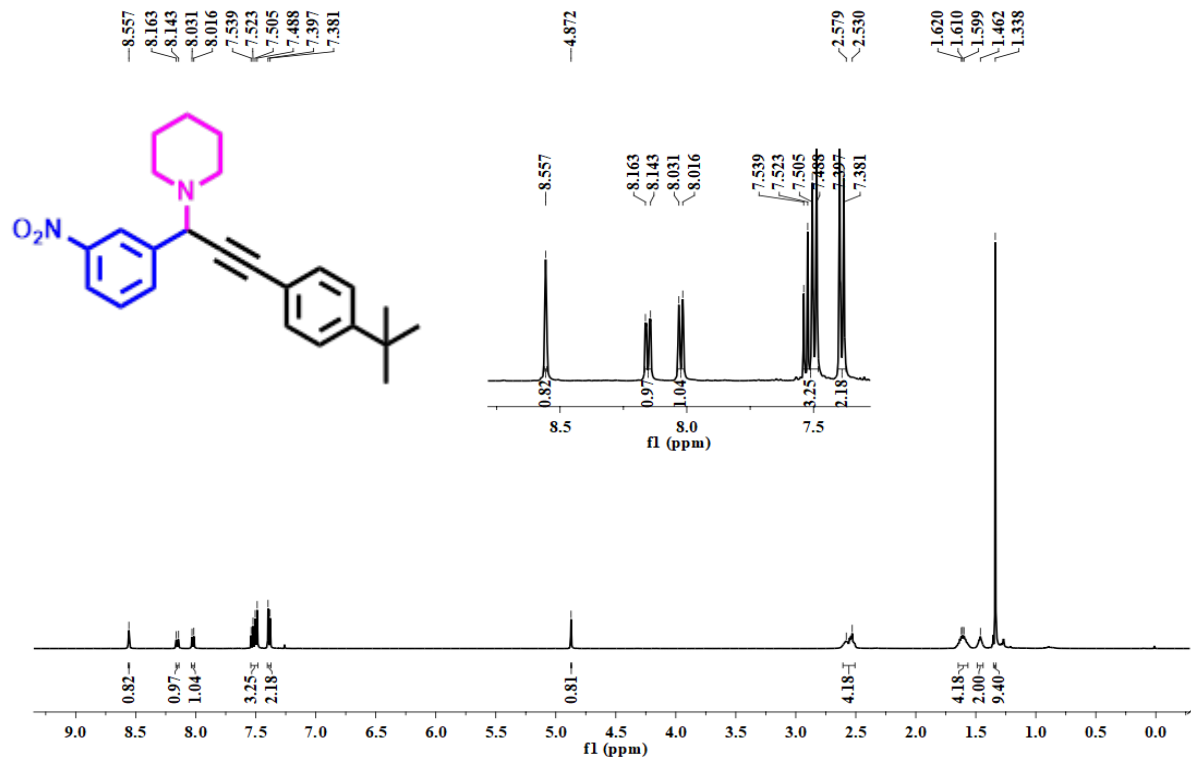


Figure S106: ¹H NMR spectrum of 8al taking CDCl₃ as solvent.

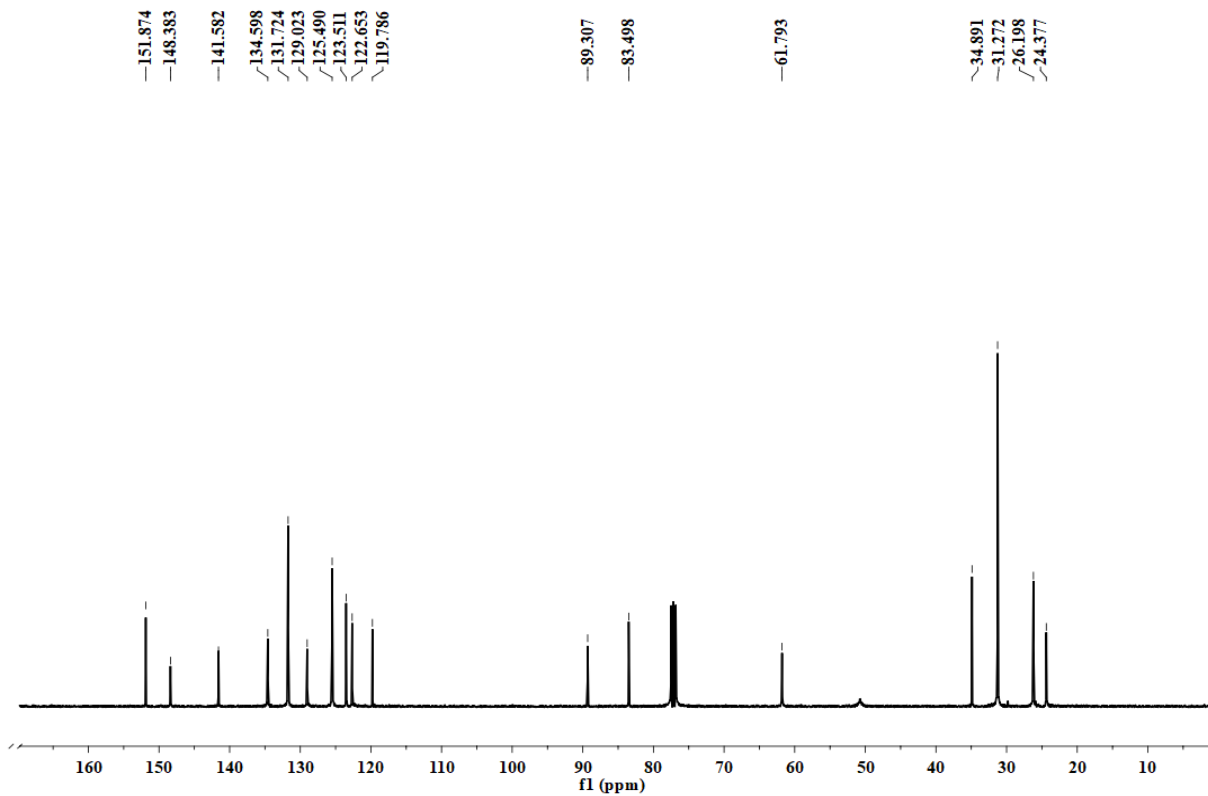


Figure S107: ¹³C NMR spectrum of 8al taking CDCl₃ as solvent.

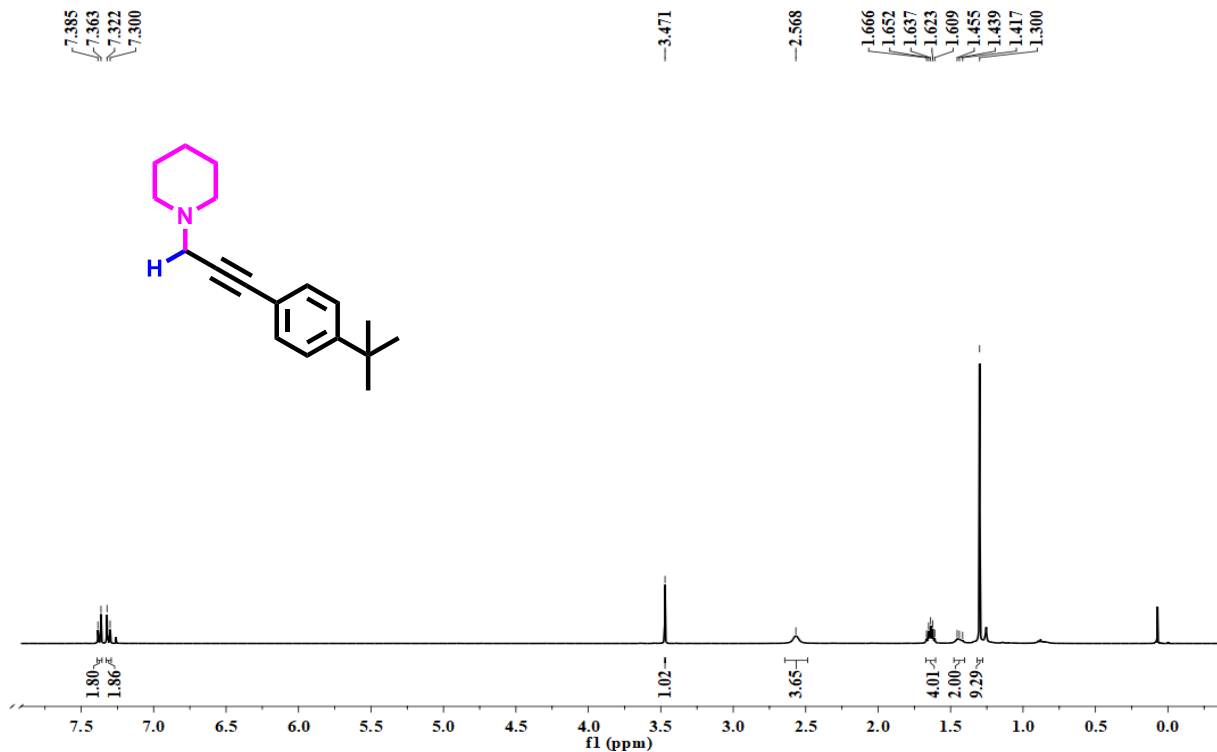


Figure S108: ¹H NMR spectrum of 8am taking CDCl₃ as solvent.

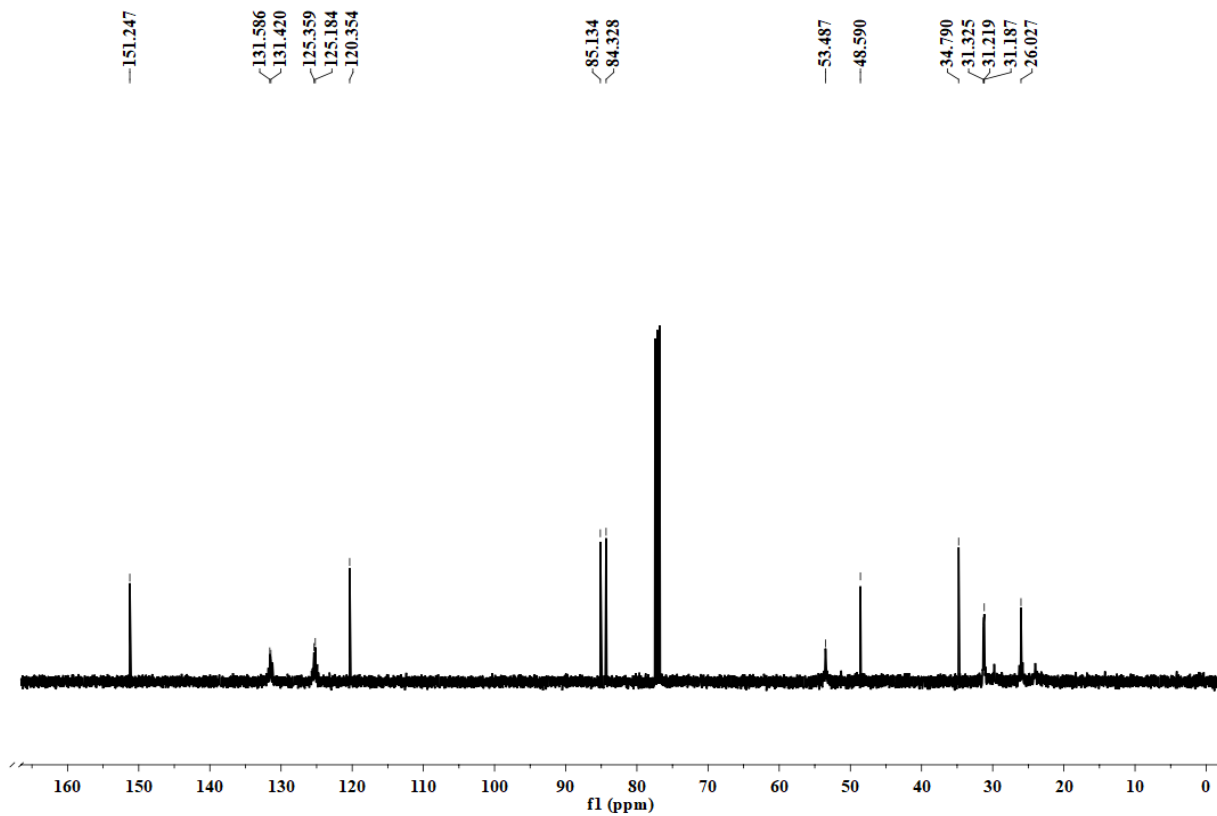


Figure S109: ¹³C NMR spectrum of 8am taking CDCl₃ as solvent.

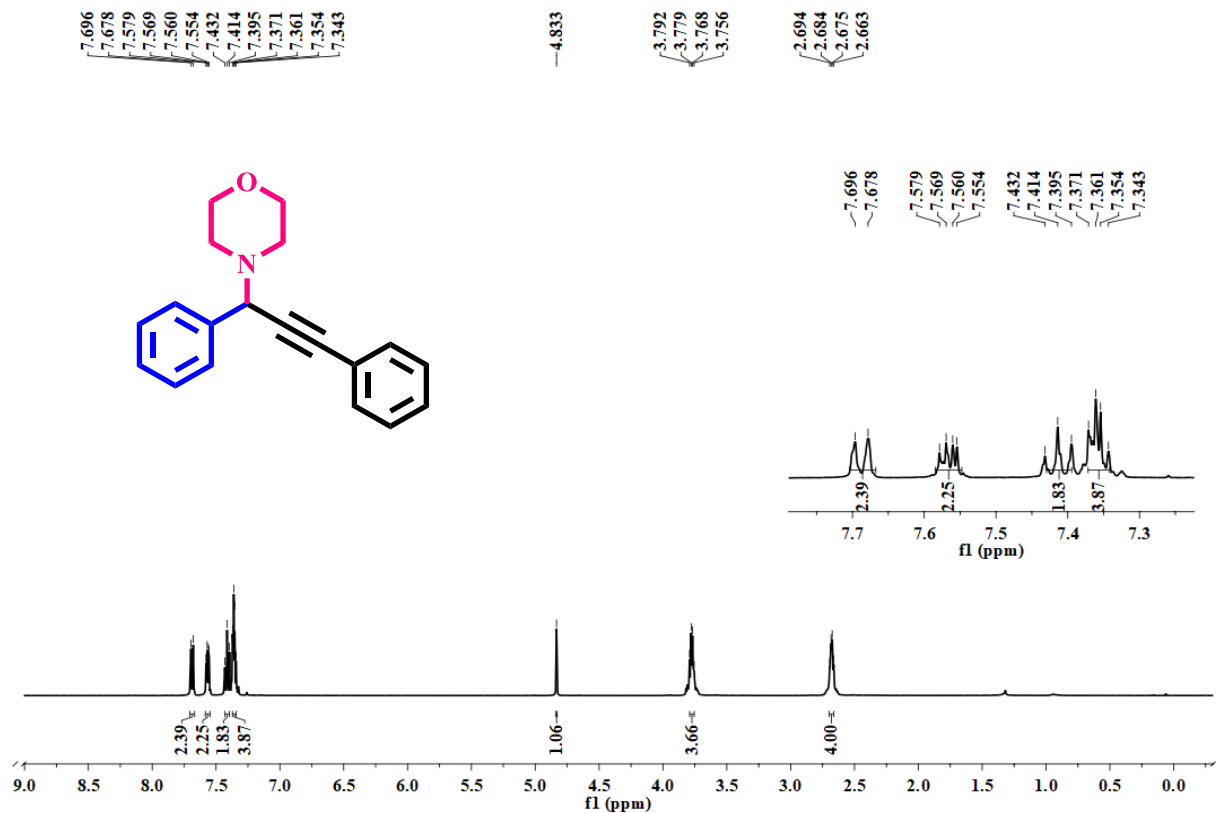


Figure S110: ¹H NMR spectrum of 9aa taking CDCl₃ as solvent.

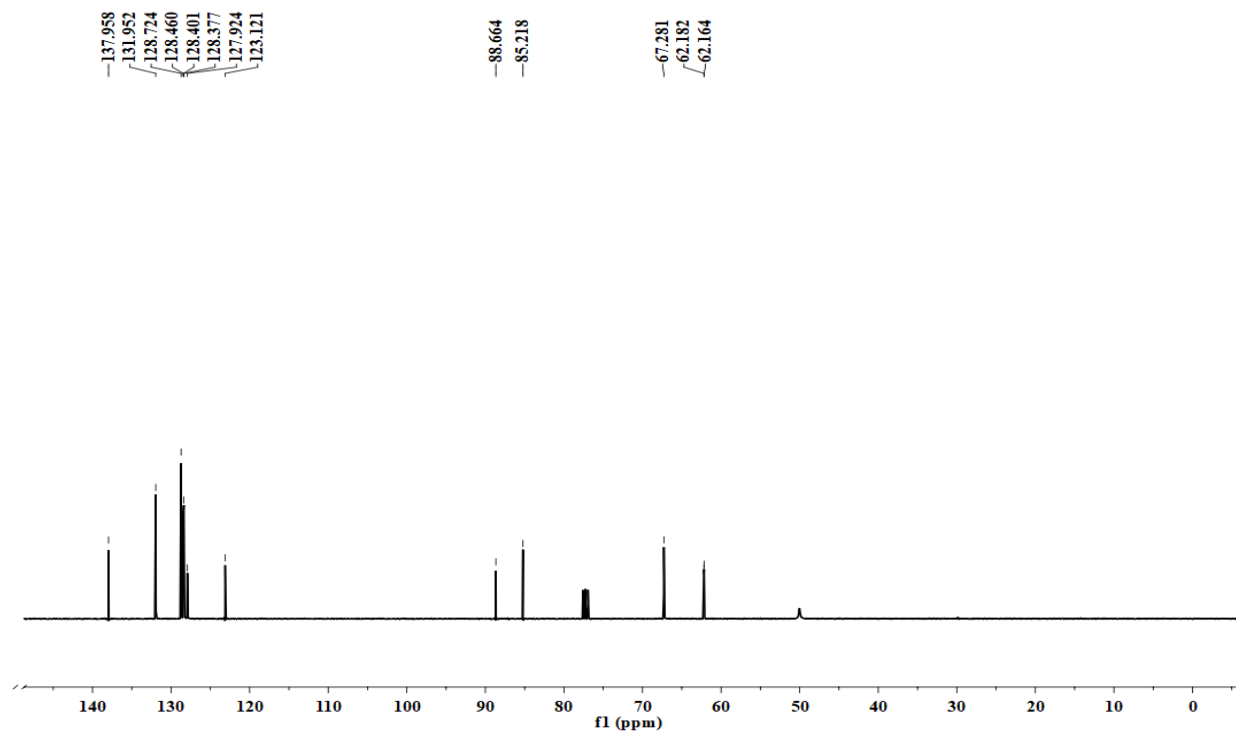


Figure S111: ¹³C NMR spectrum of 9aa taking CDCl₃ as solvent.

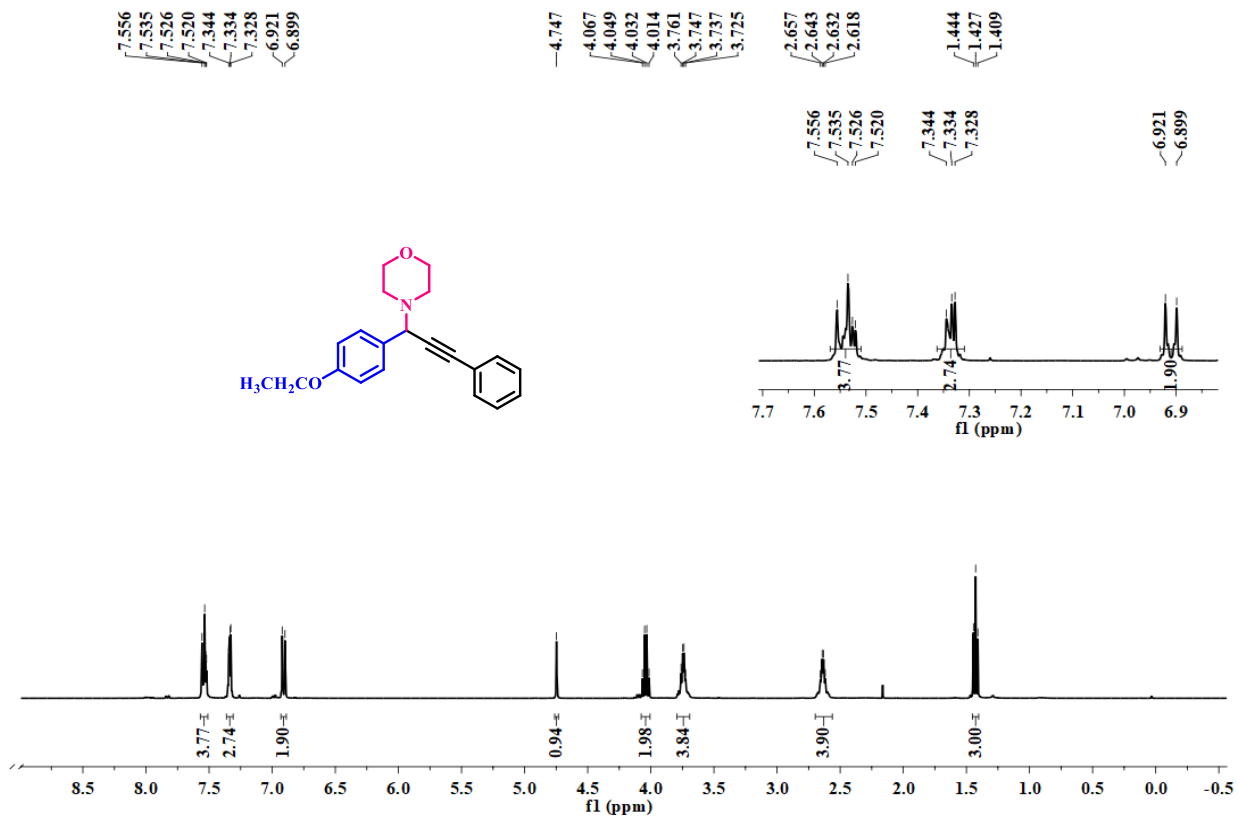


Figure S112: ¹H NMR spectrum of 9ab taking CDCl₃ as solvent.

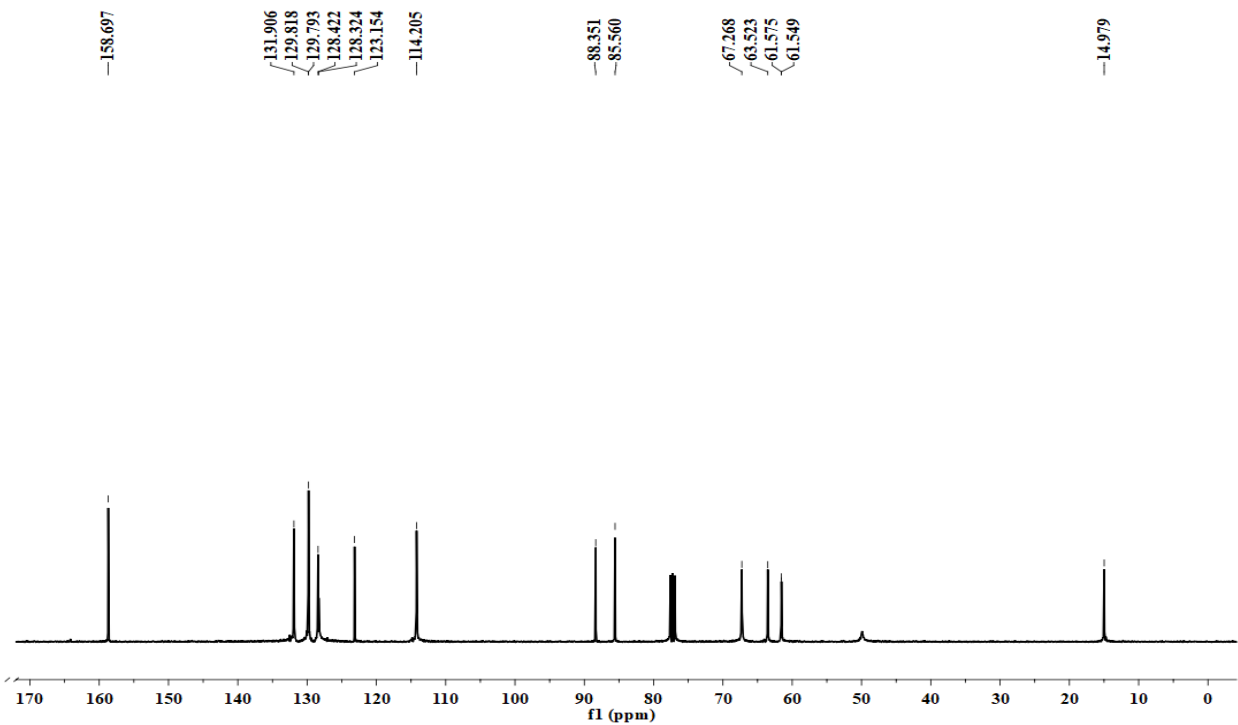


Figure S113: ¹³C NMR spectrum of 9ab taking CDCl₃ as solvent.

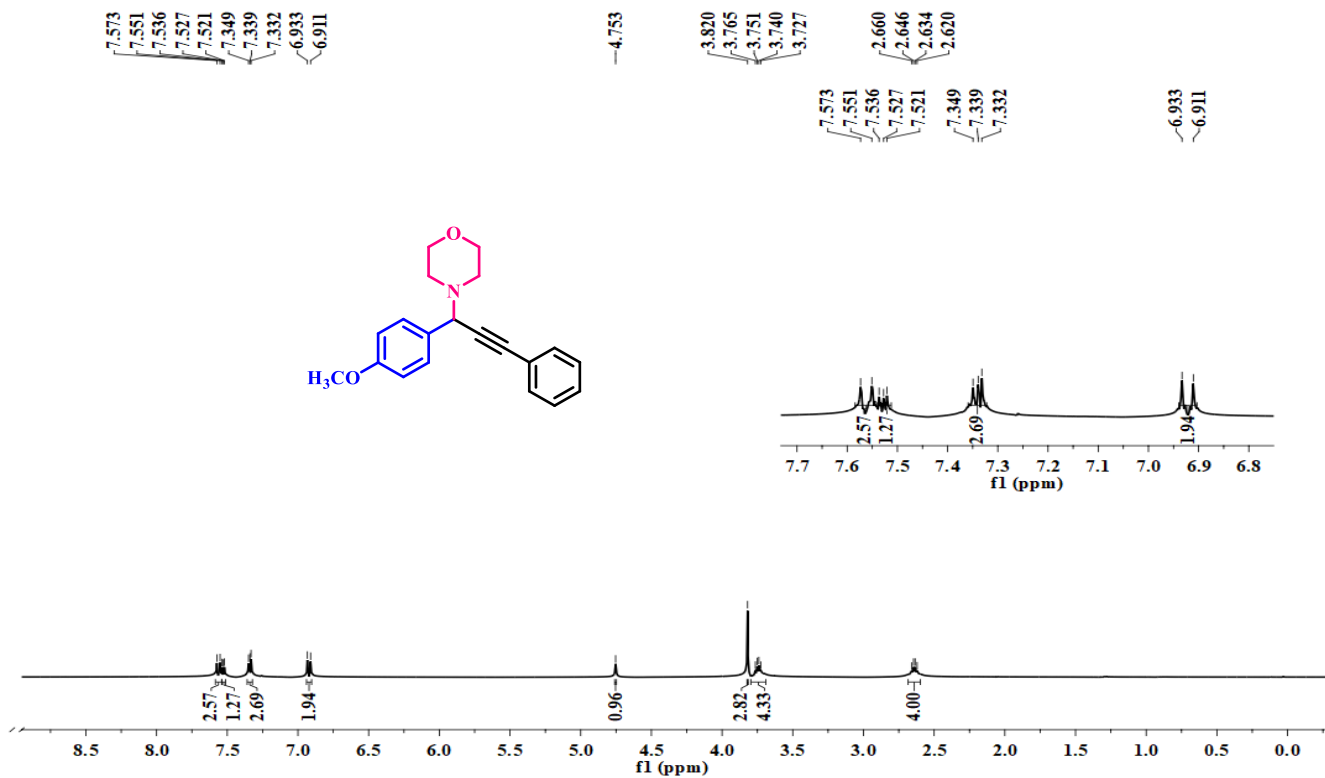


Figure S114: ¹H NMR spectrum of 9ac taking CDCl₃ as solvent.

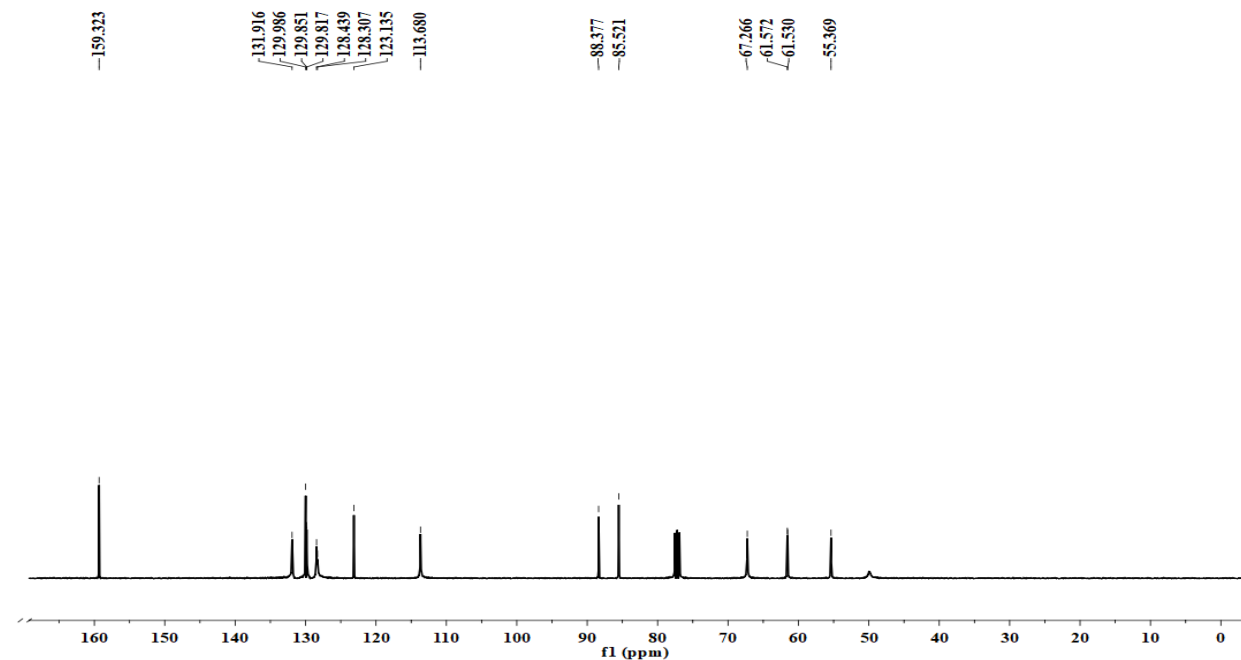


Figure S115: ¹³C NMR spectrum of 9ac taking CDCl₃ as solvent.

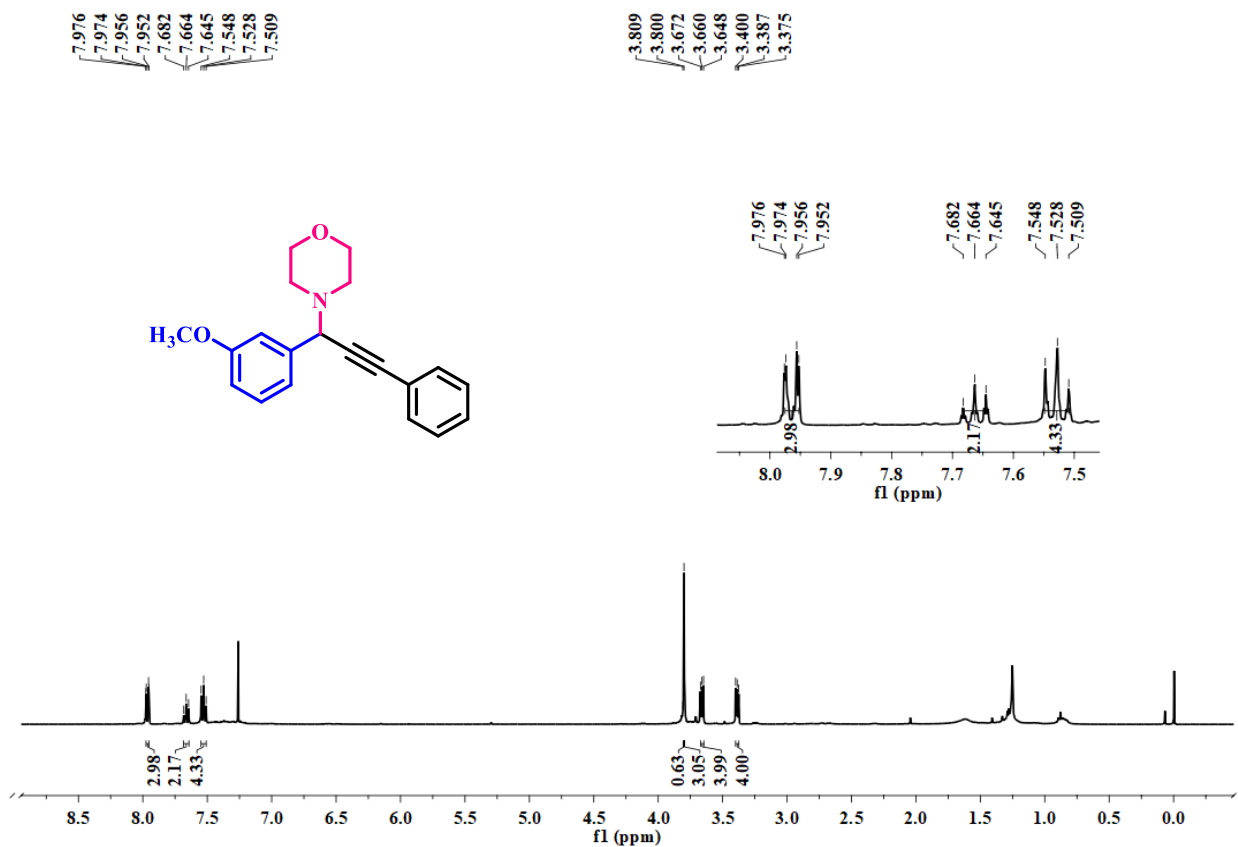


Figure S116: ¹H NMR spectrum of 9ad taking CDCl₃ as solvent.

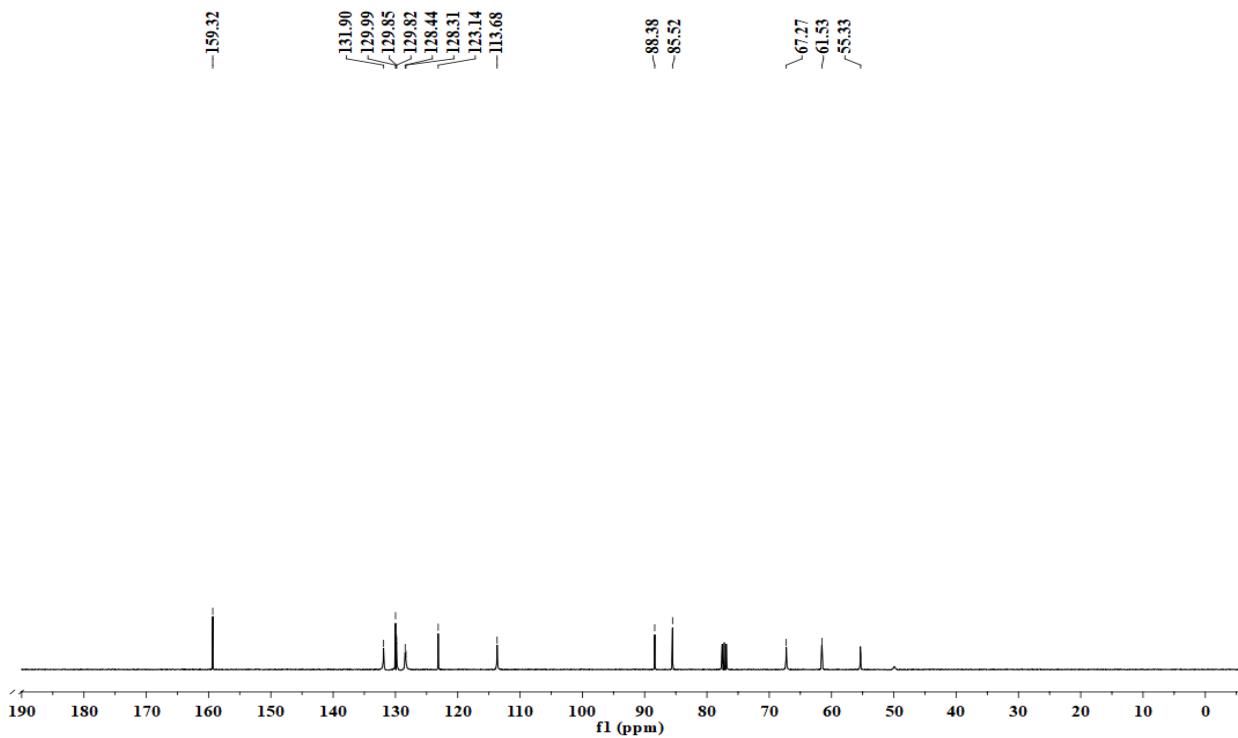


Figure S117: ¹³C NMR spectrum of 9ad taking CDCl₃ as solvent.

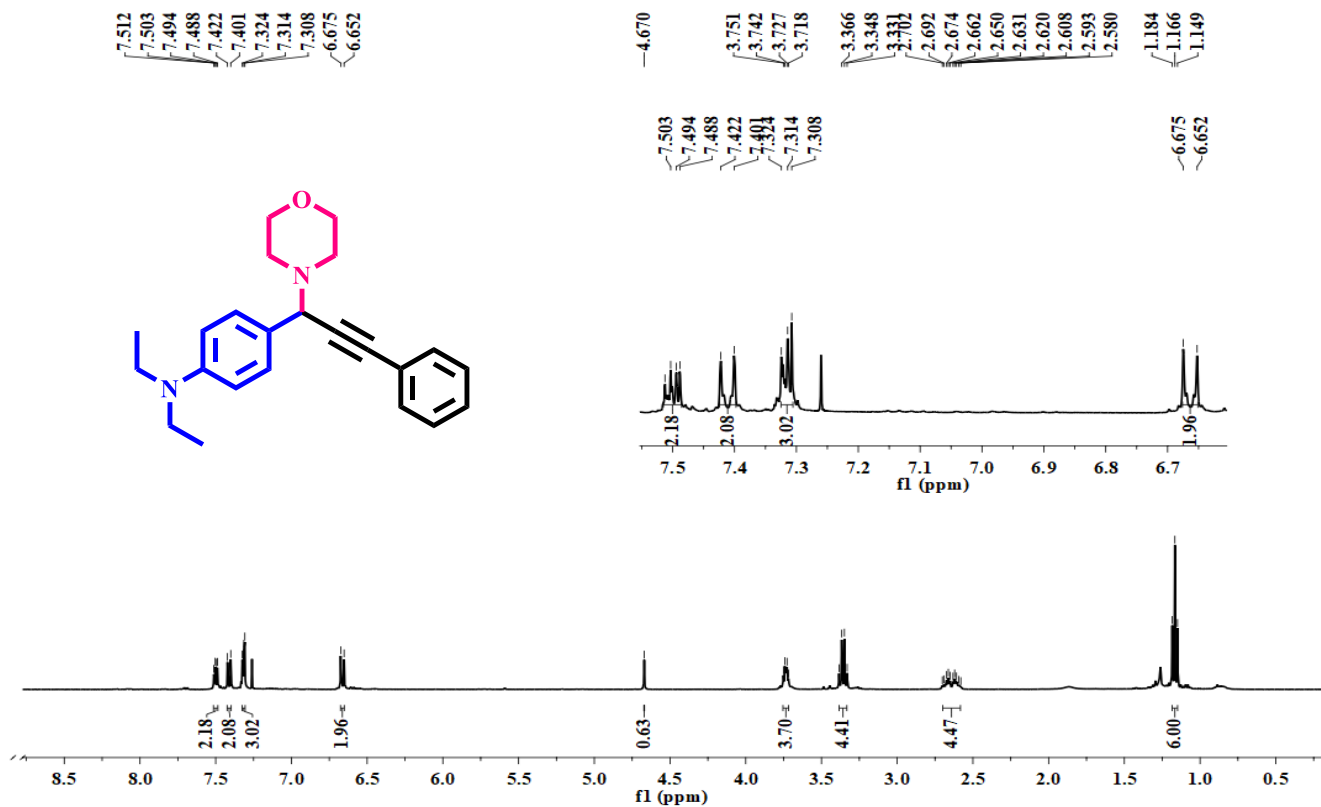


Figure S118: ¹H NMR spectrum of 9ae taking CDCl₃ as solvent.

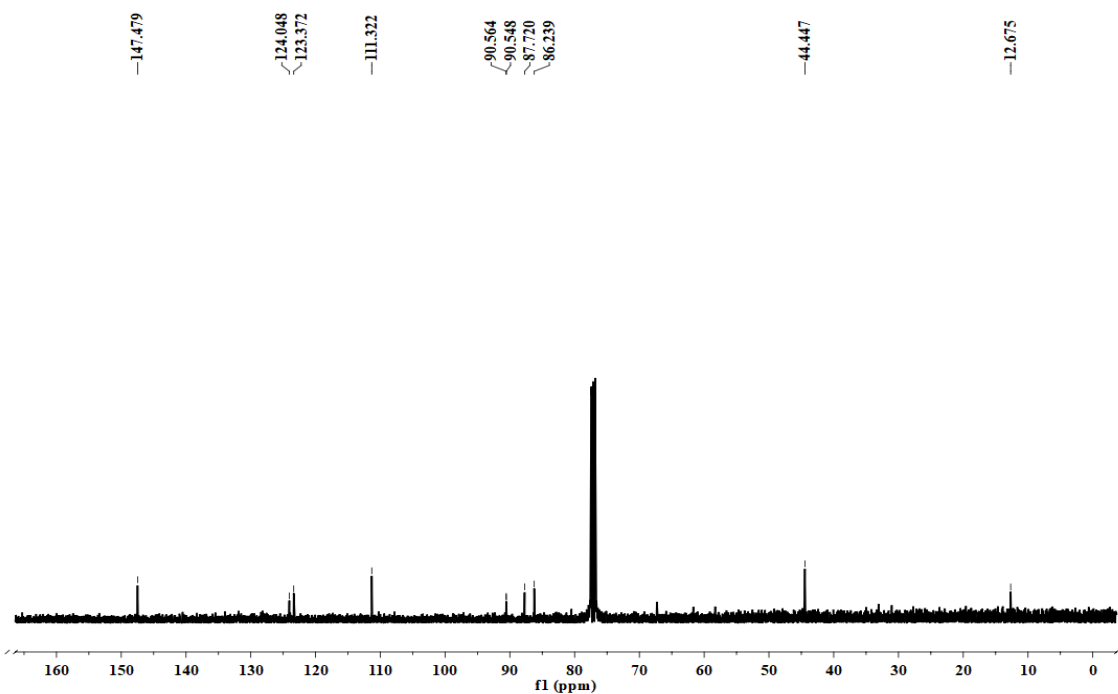


Figure S119: ¹³C NMR spectrum of 9ae taking CDCl₃ as solvent.

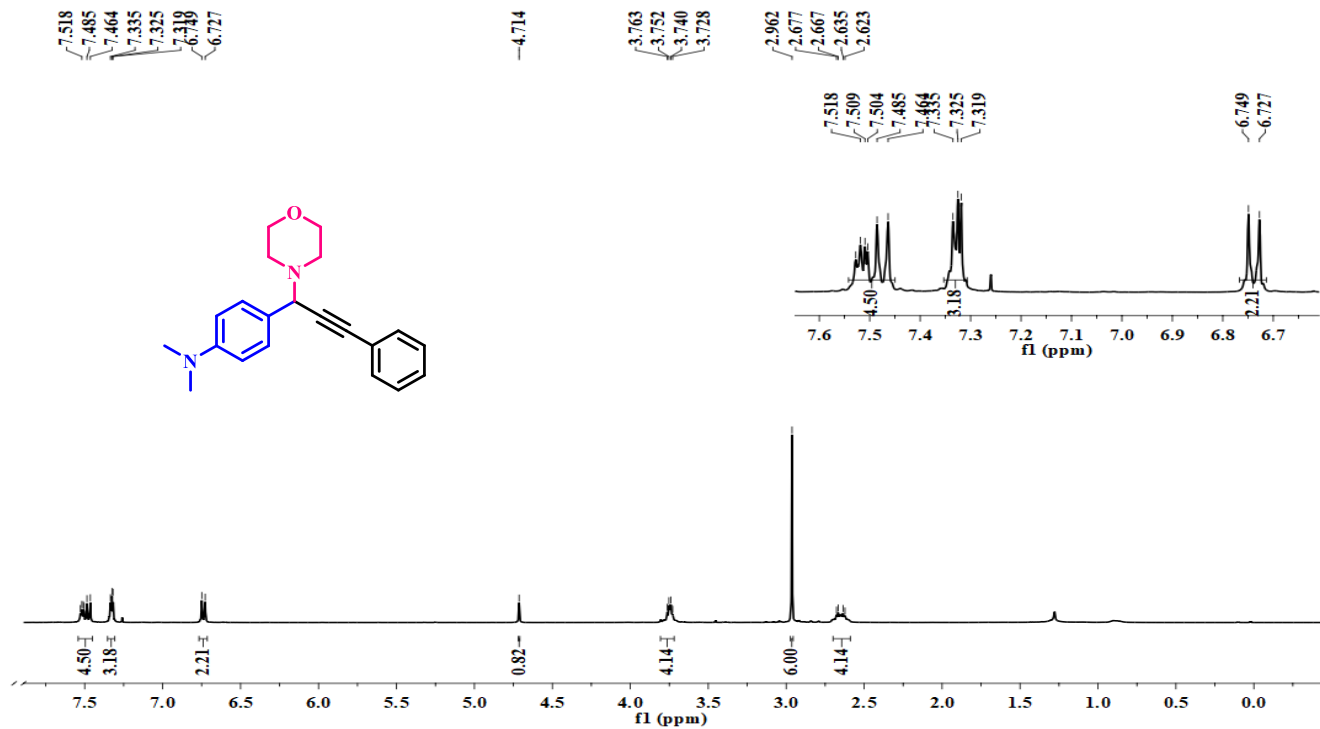


Figure S120: ¹H NMR spectrum of 9af taking CDCl₃ as solvent.

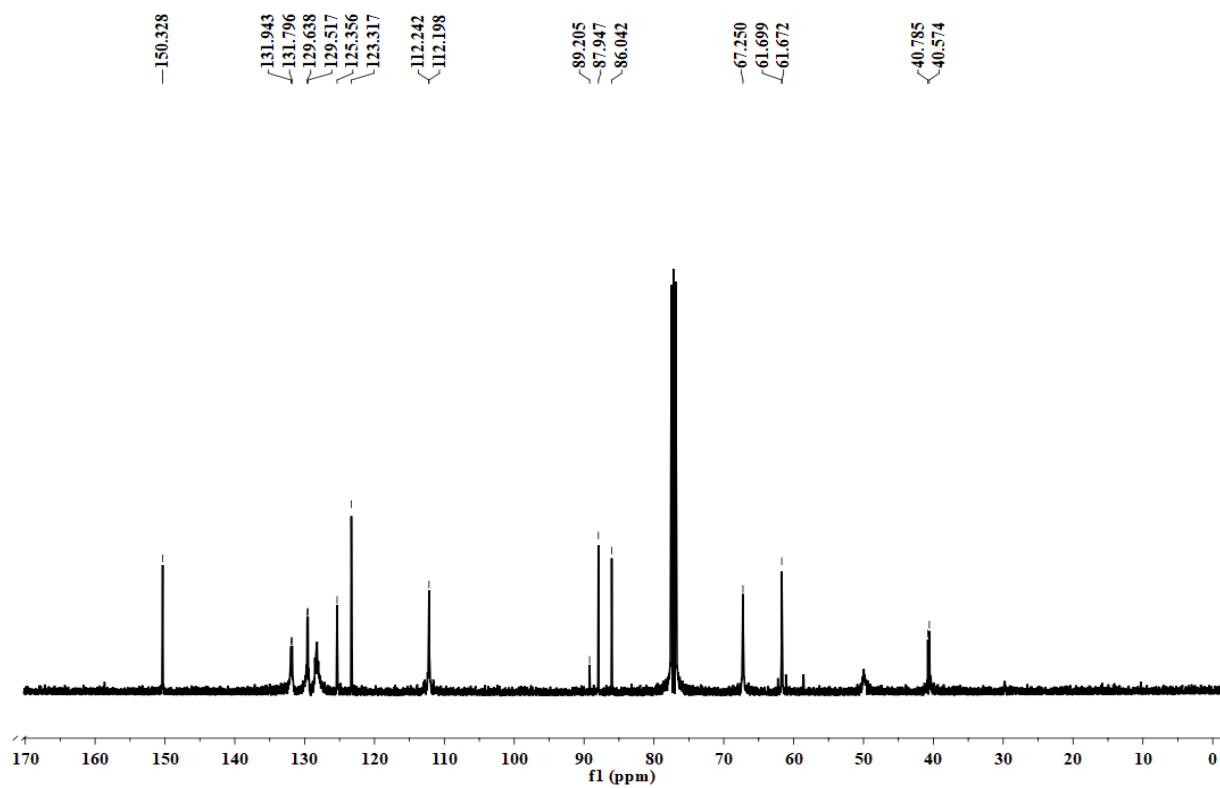


Figure S121: ¹³C NMR spectrum of 9af taking CDCl₃ as solvent.

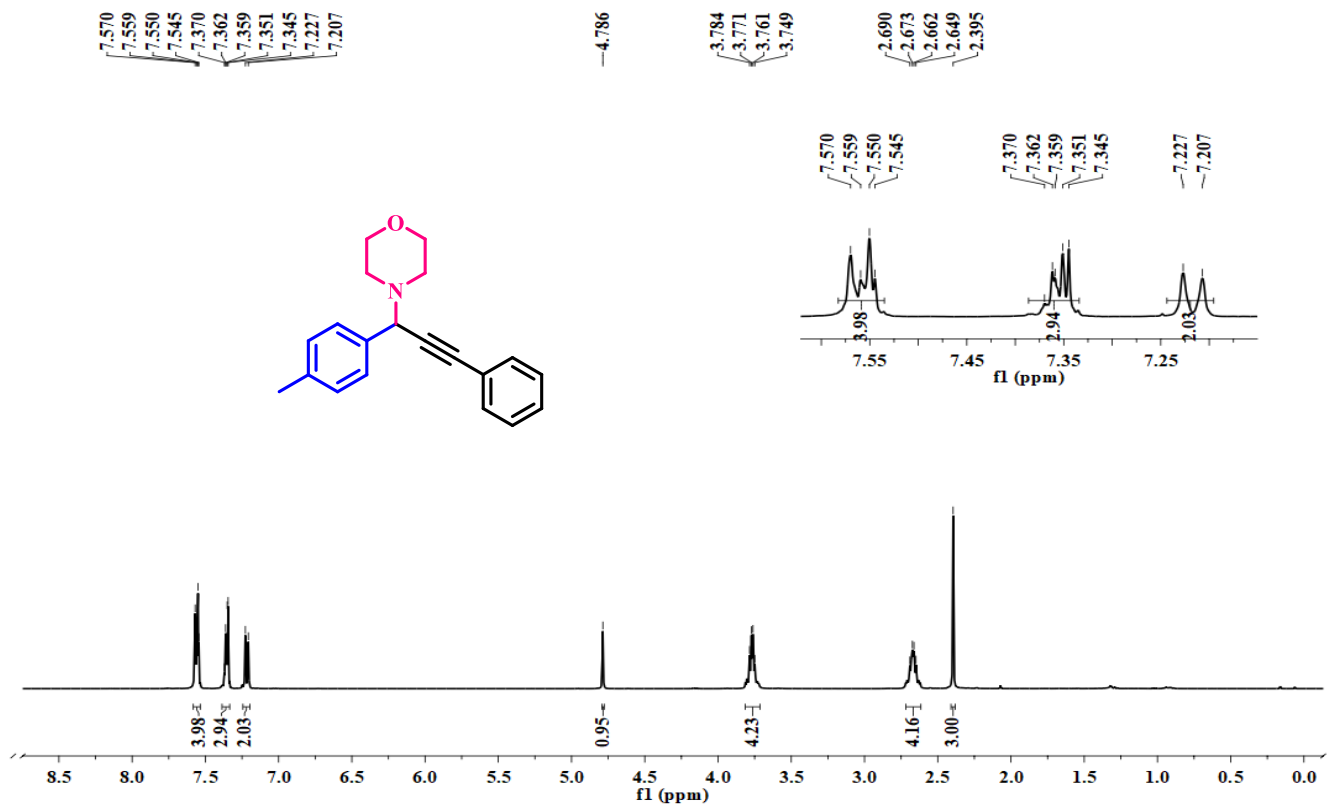


Figure S122: ¹H NMR spectrum of 9ag taking CDCl₃ as solvent.

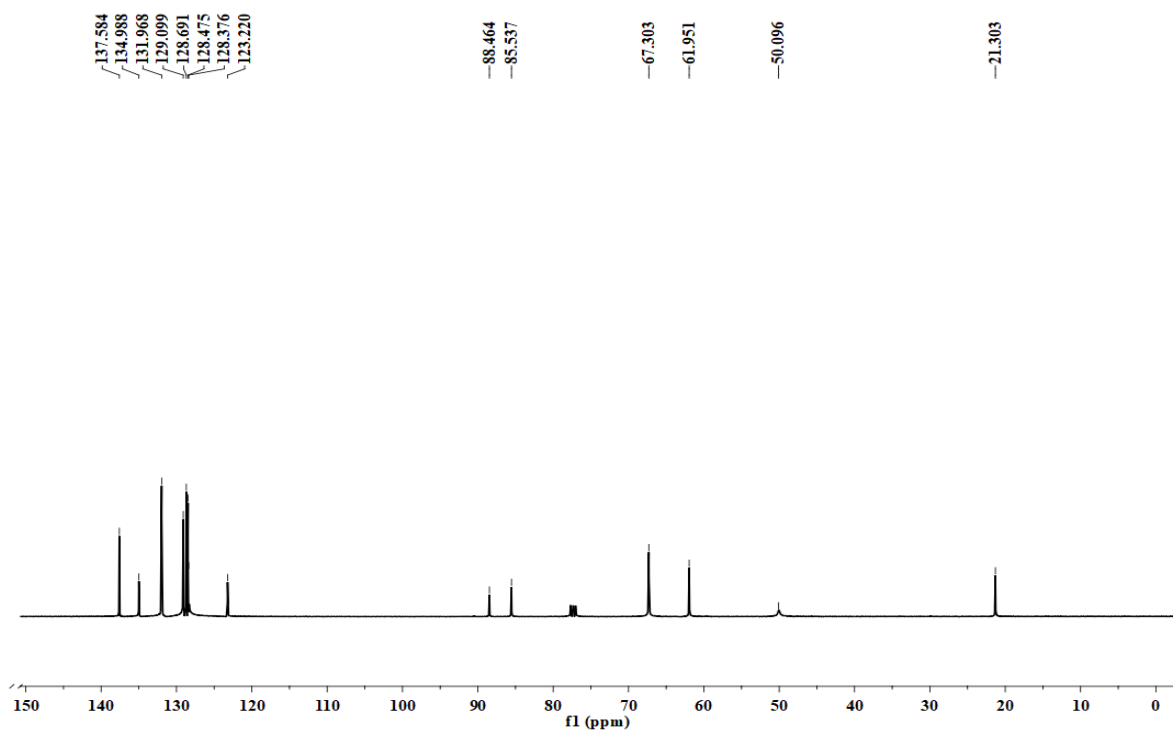


Figure S123: ¹³C NMR spectrum of 9ag taking CDCl₃ as solvent.

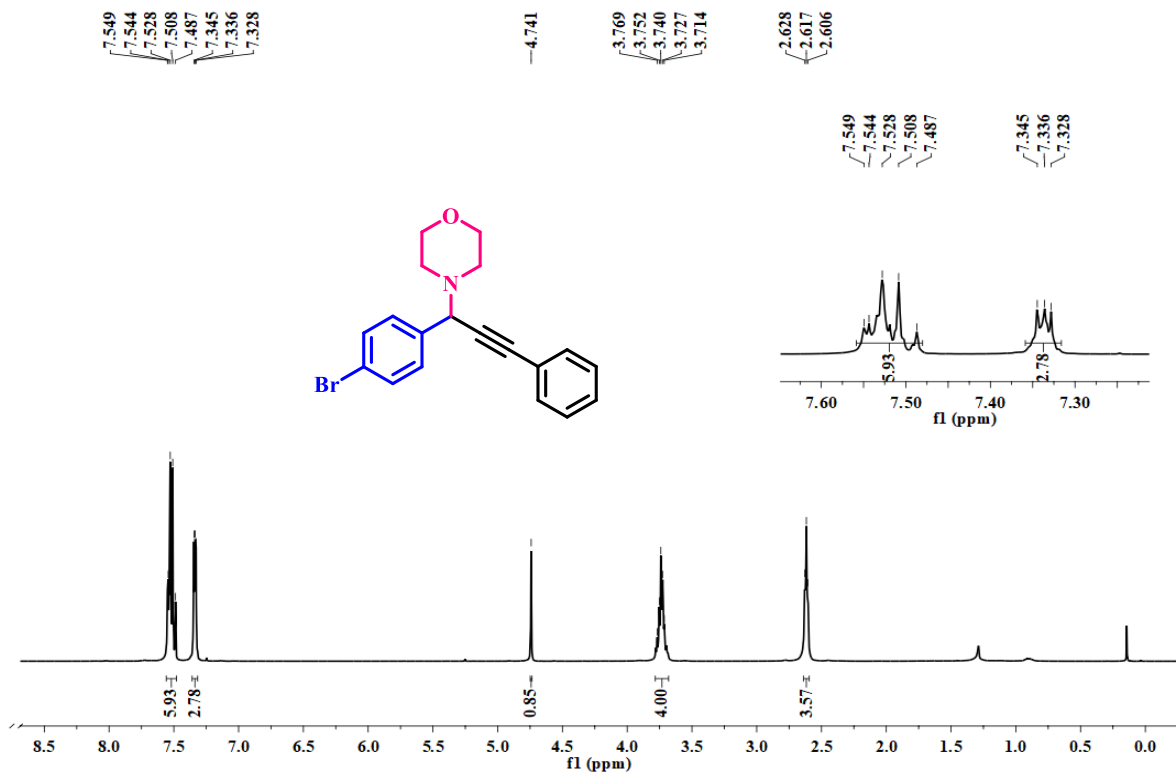


Figure S124: ¹H NMR spectrum of taking 9ah CDCl₃ as solvent.

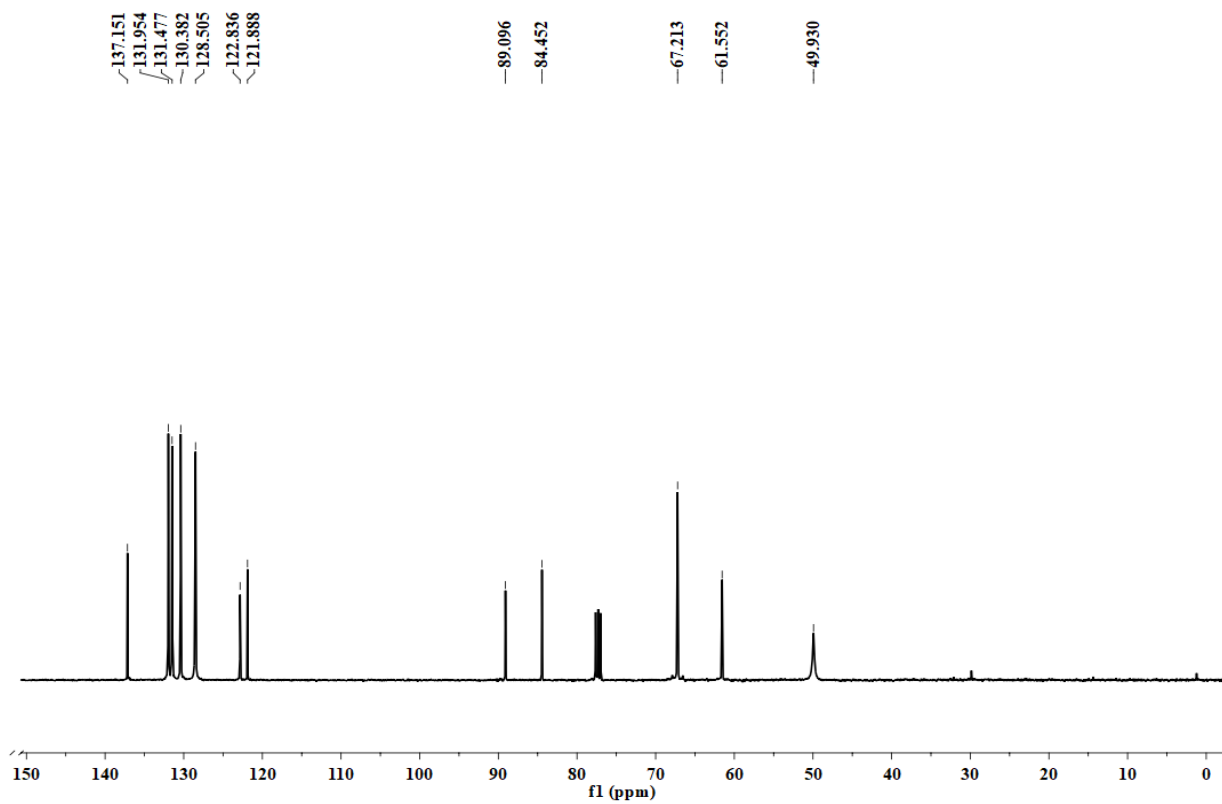


Figure S125: ¹³C NMR spectrum of 9ah taking CDCl₃ as solvent.

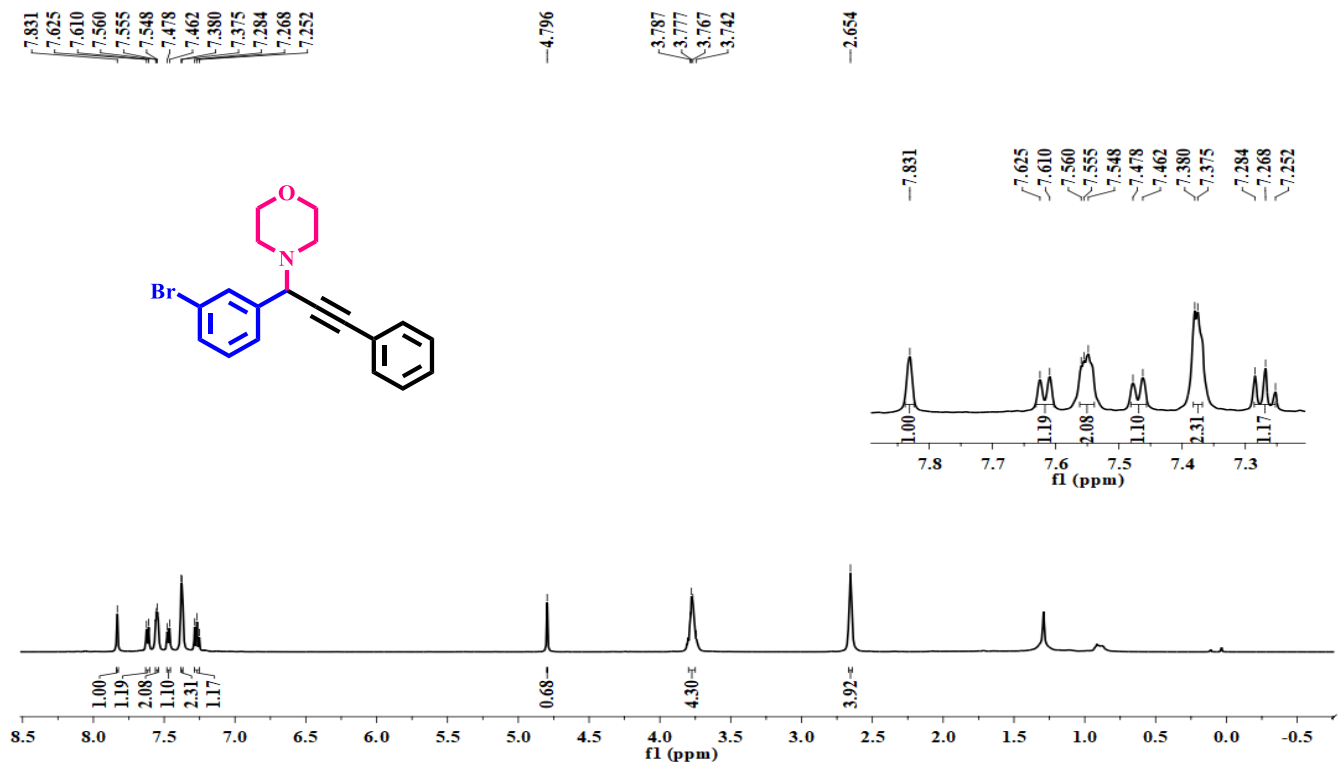


Figure S126: ¹H NMR spectrum of 9ai taking CDCl₃ as solvent.

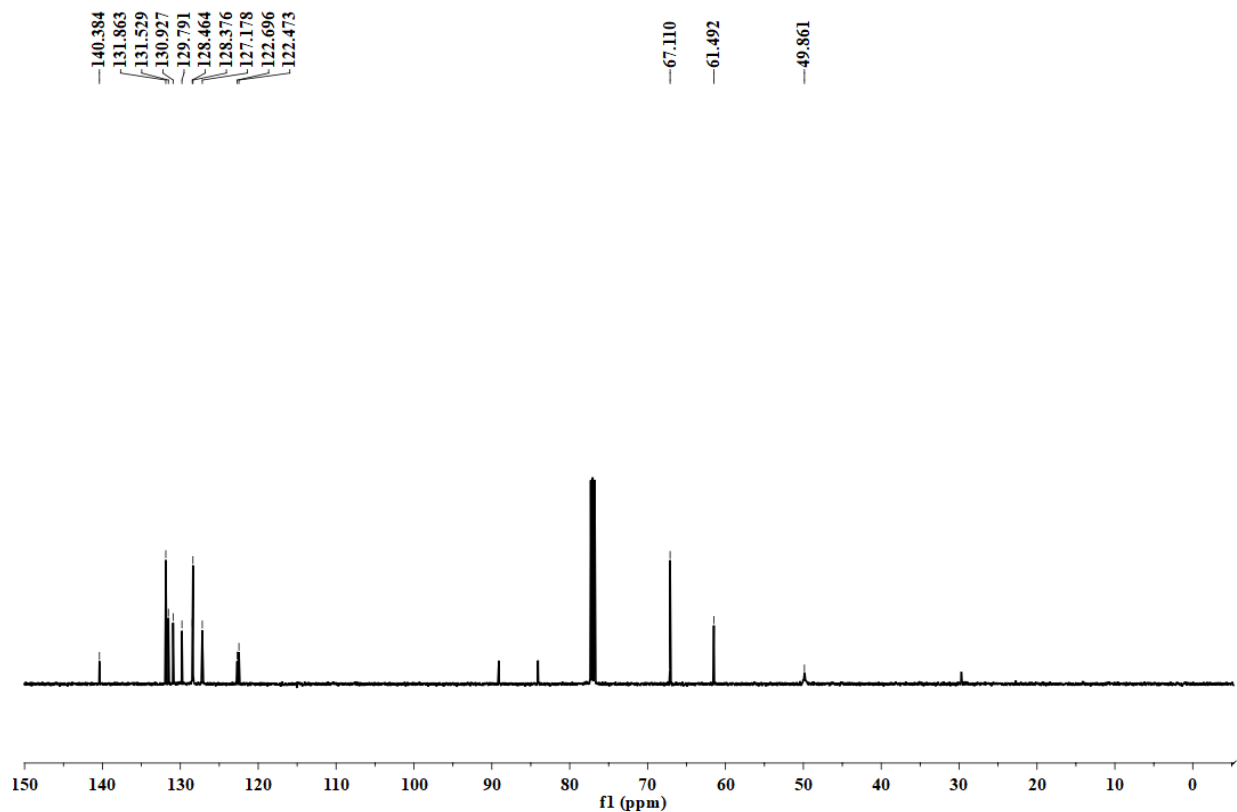


Figure S127: ¹³C NMR spectrum of 9ai taking CDCl₃ as solvent.

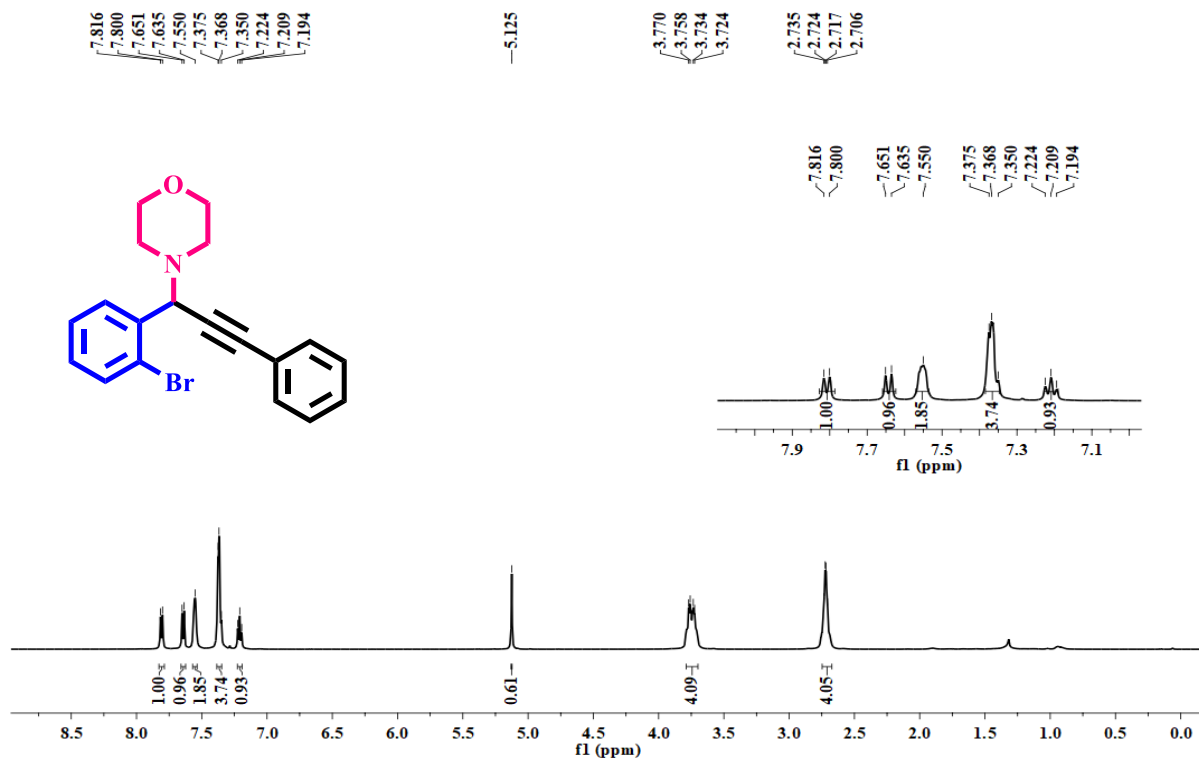


Figure S128: ¹H NMR spectrum of 9aj taking CDCl₃ as solvent.

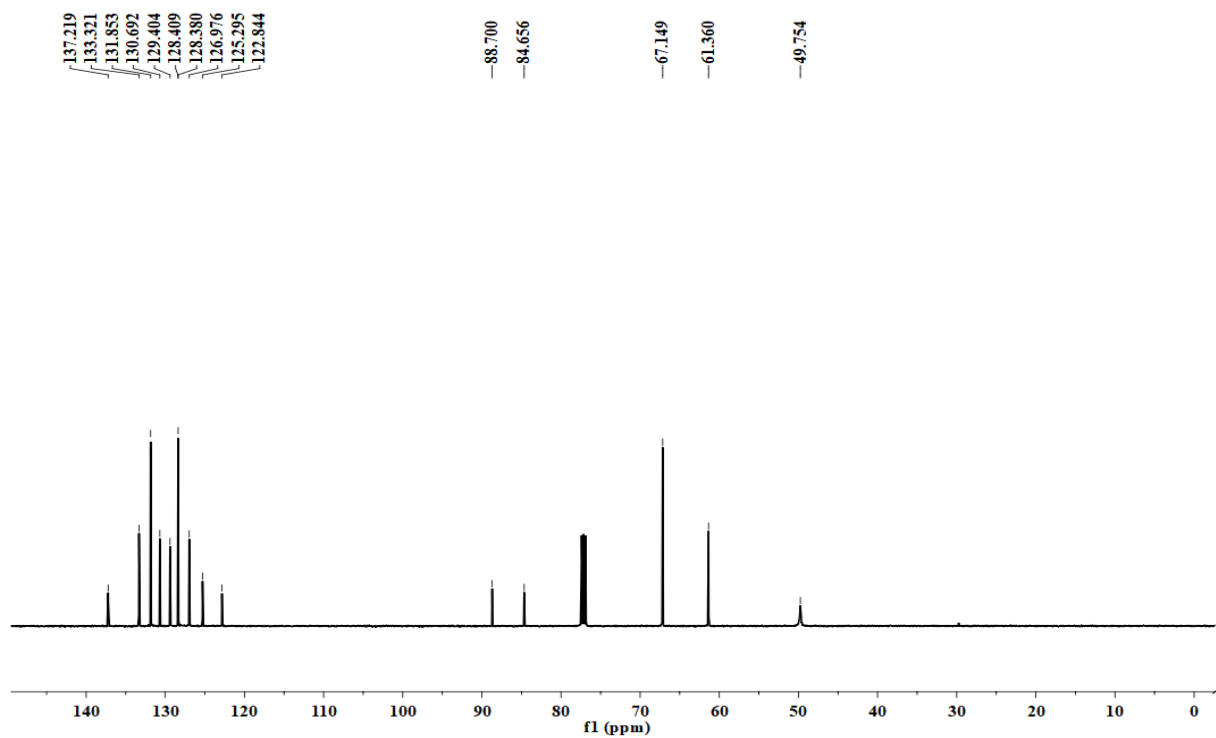


Figure S129: ¹³C NMR spectrum of 9aj taking CDCl₃ as solvent.

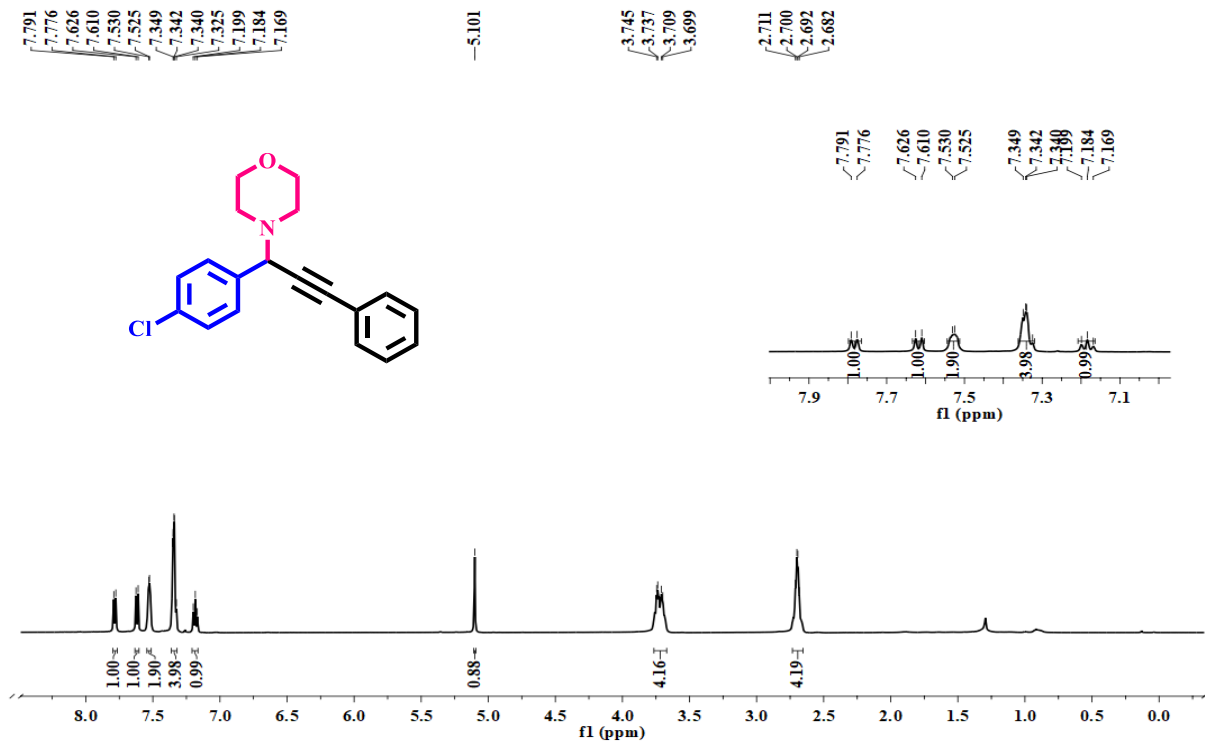


Figure S130: ¹H NMR spectrum of 9ak taking CDCl₃ as solvent.

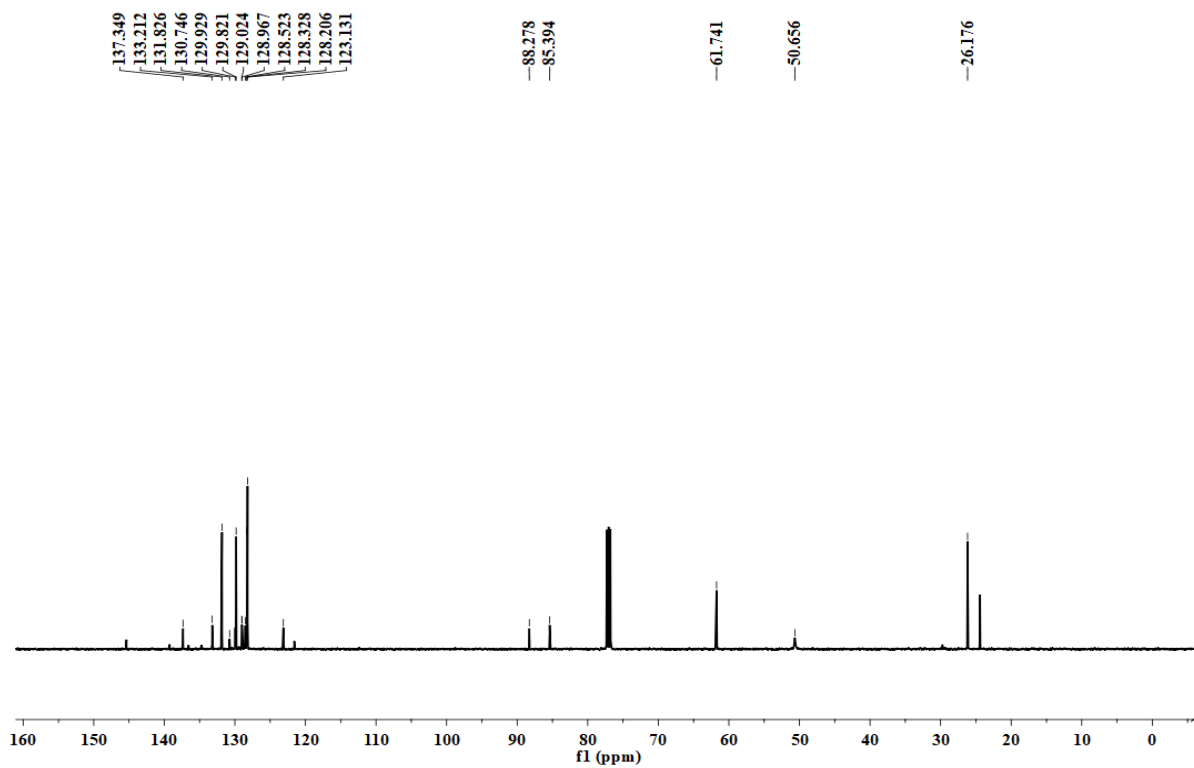


Figure S131: ¹³C NMR spectrum of 9ak taking CDCl₃ as solvent.

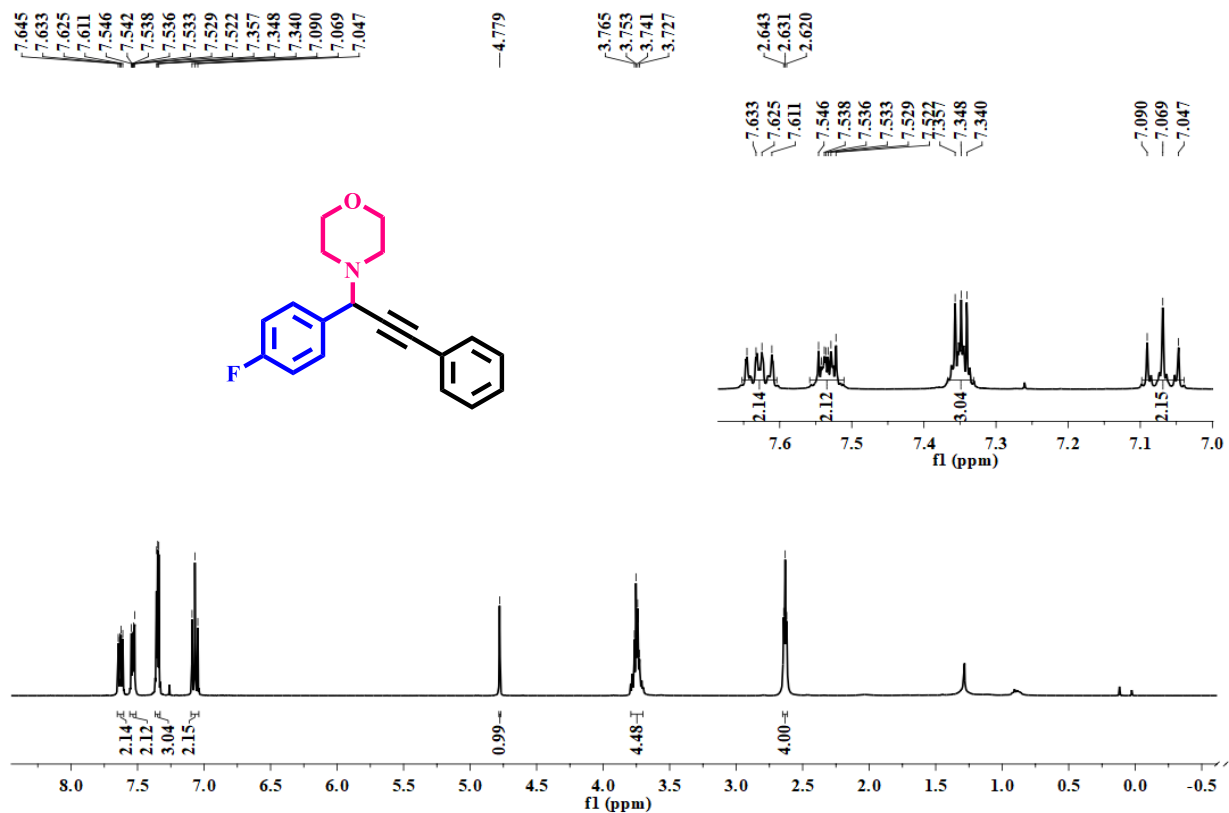


Figure S132: ¹H NMR spectrum of 9al taking CDCl₃ as solvent.

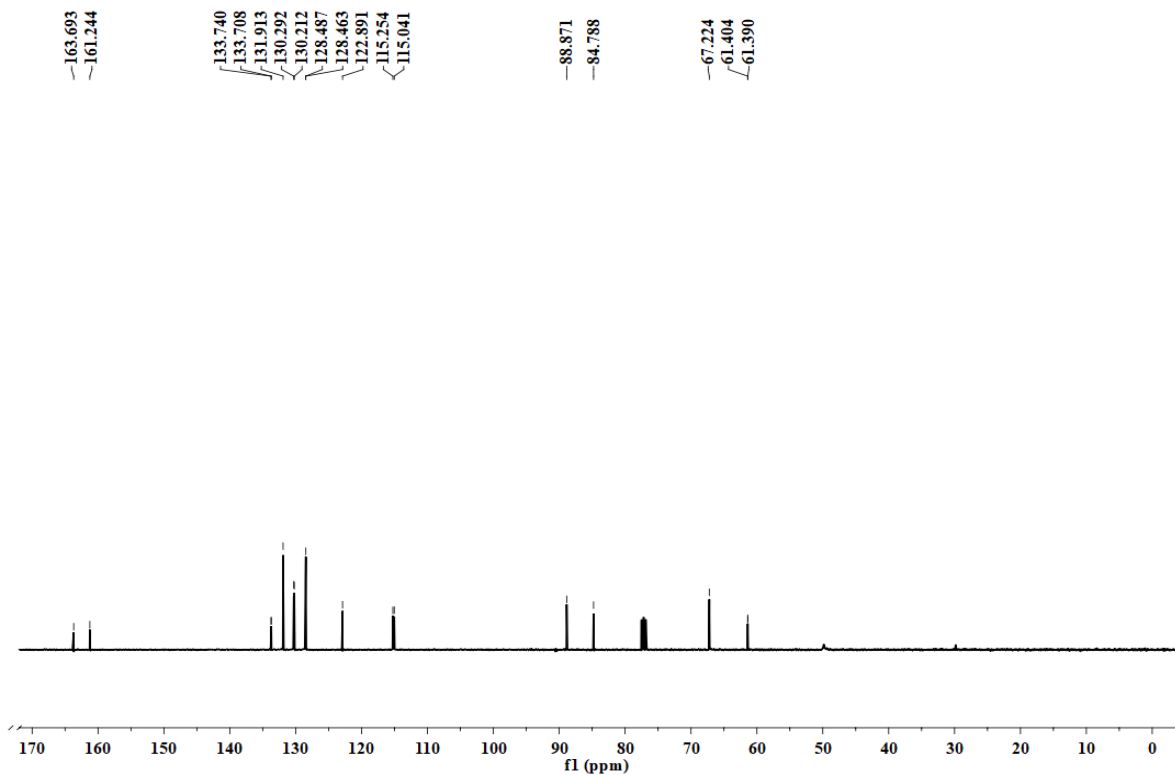


Figure S133: ¹³C NMR spectrum of 9al taking CDCl₃ as solvent.

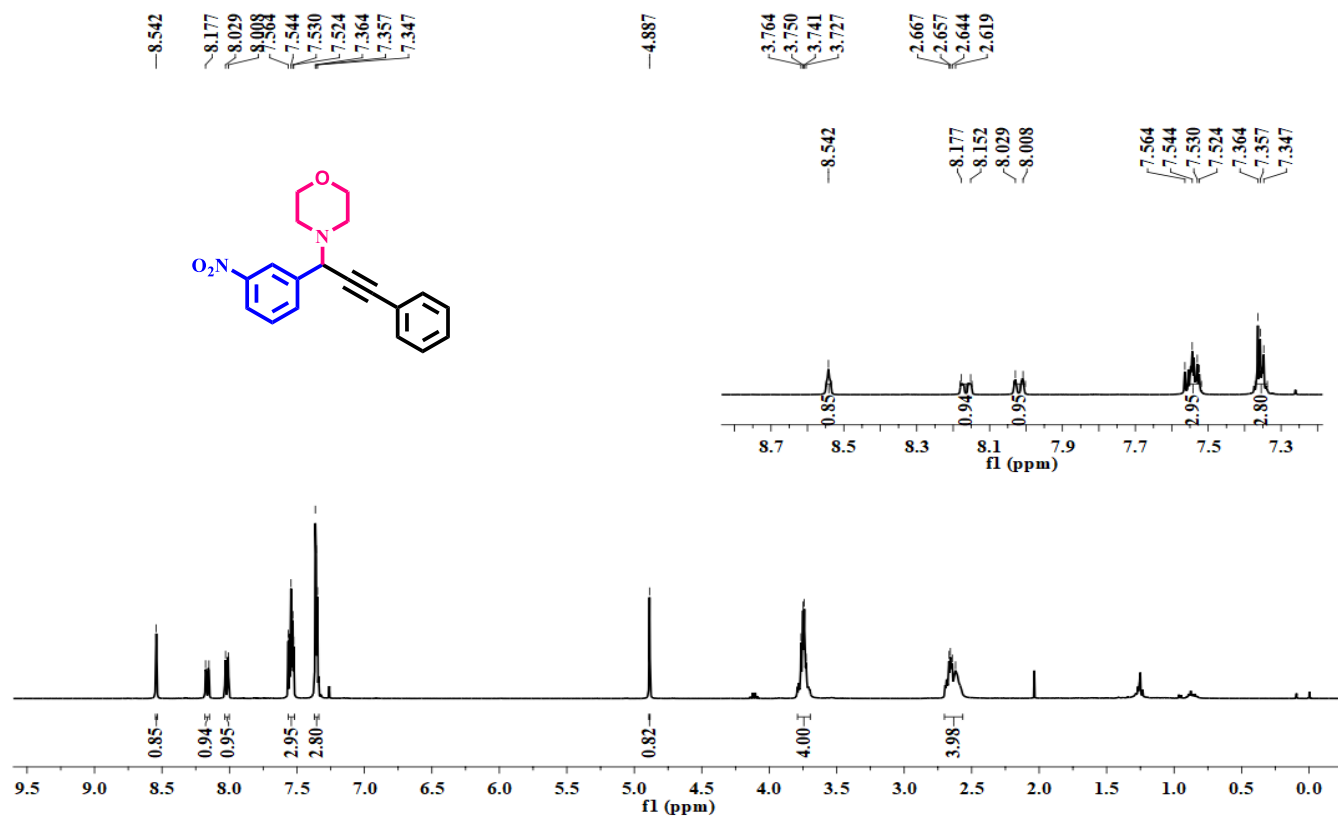


Figure S134: ¹H NMR spectrum of 9am taking CDCl₃ as solvent.

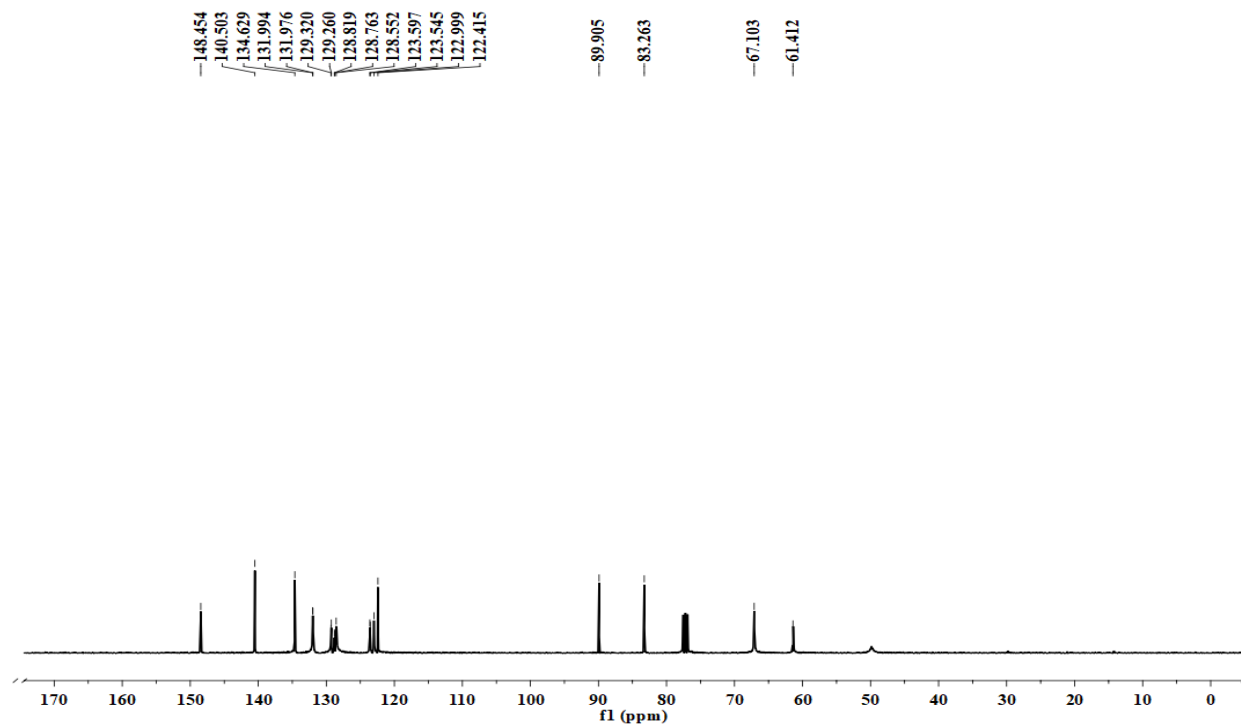


Figure S135: ¹³C NMR spectrum of 9am taking CDCl₃ as solvent.

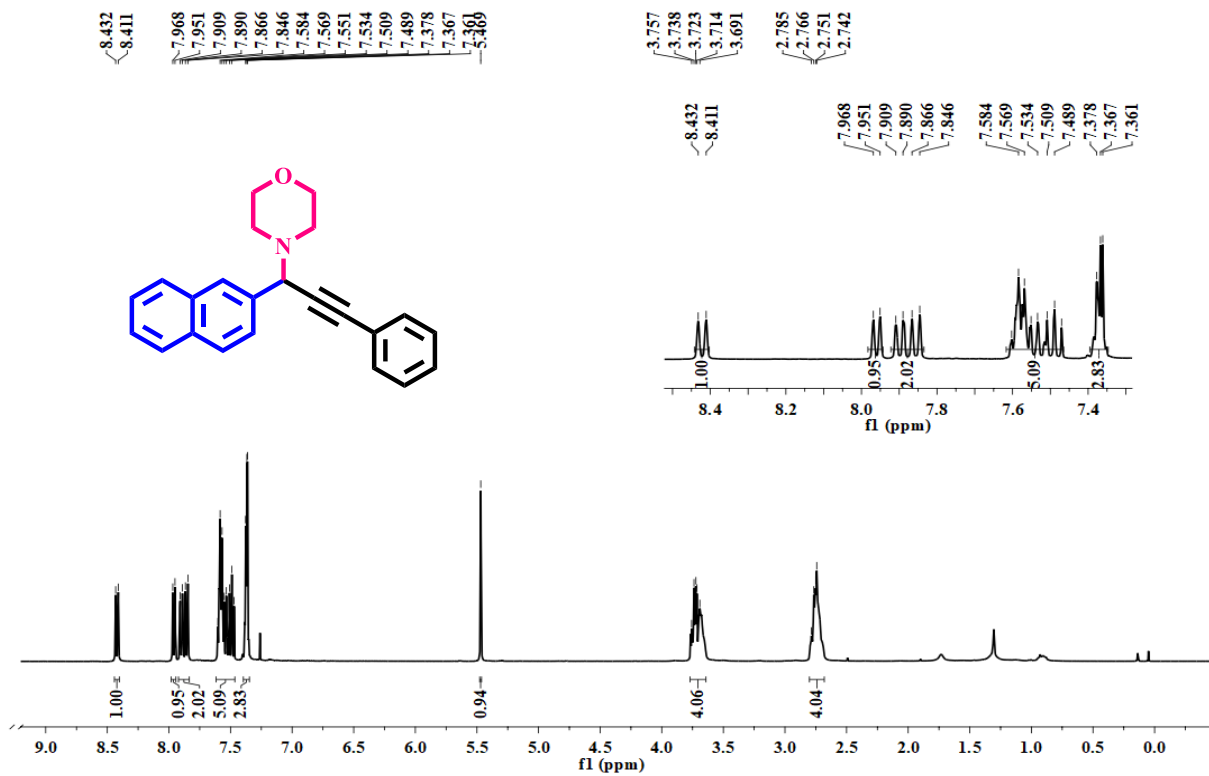


Figure S136: ¹H NMR spectrum of 9an taking CDCl₃ as solvent.

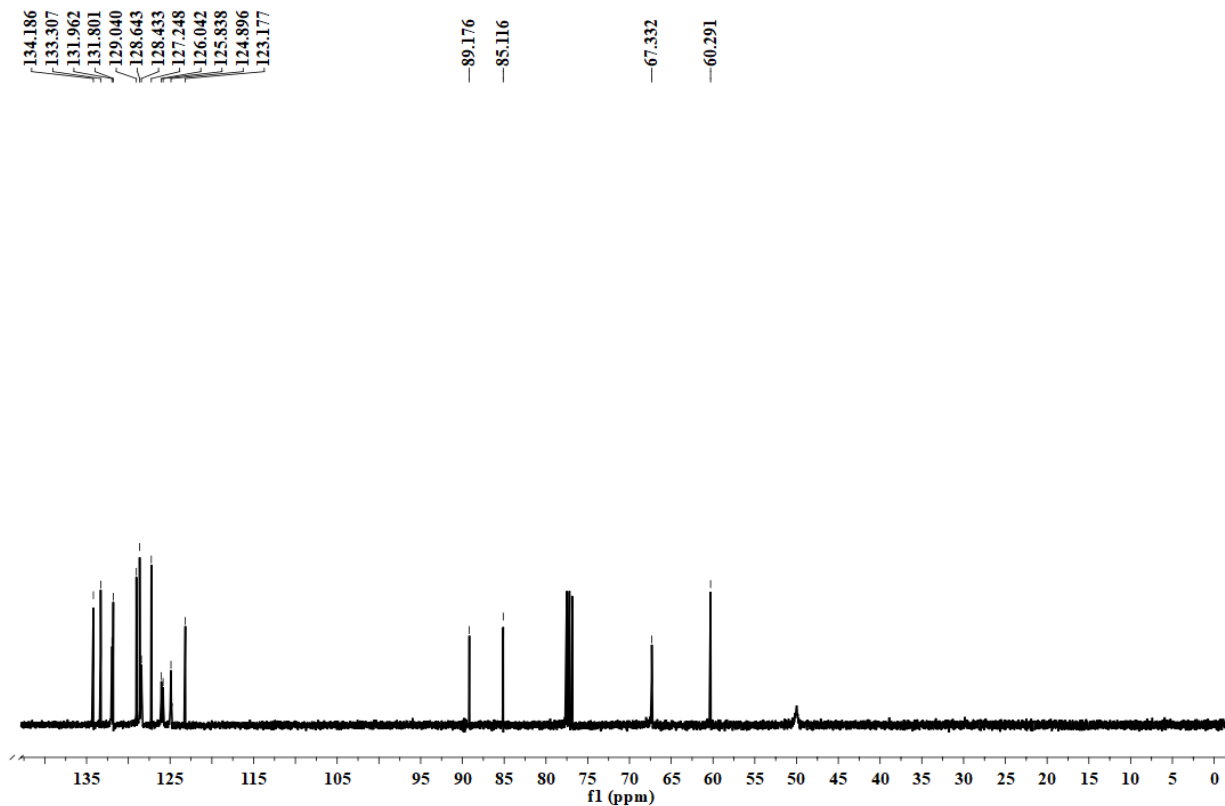


Figure S137: ¹³C NMR spectrum of 9an taking CDCl₃ as solvent.

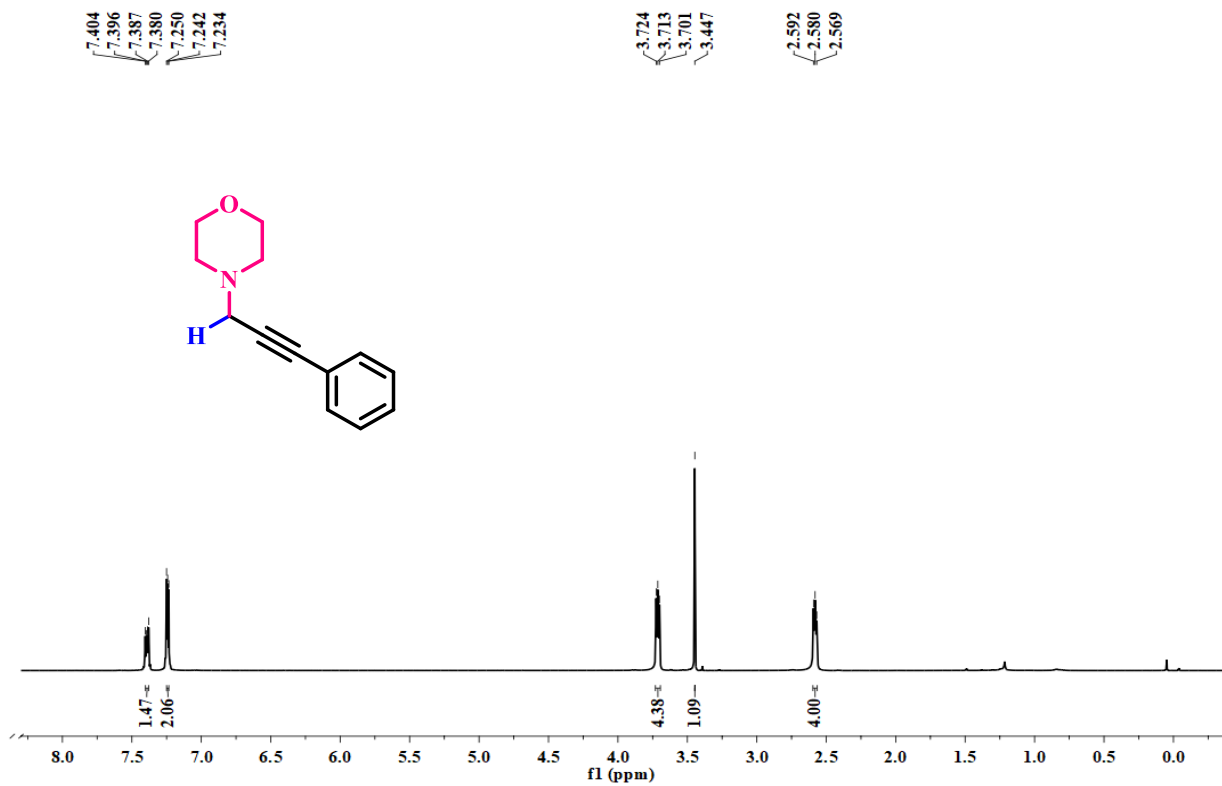


Figure S138: ¹H NMR spectrum of 9ao taking CDCl₃ as solvent.

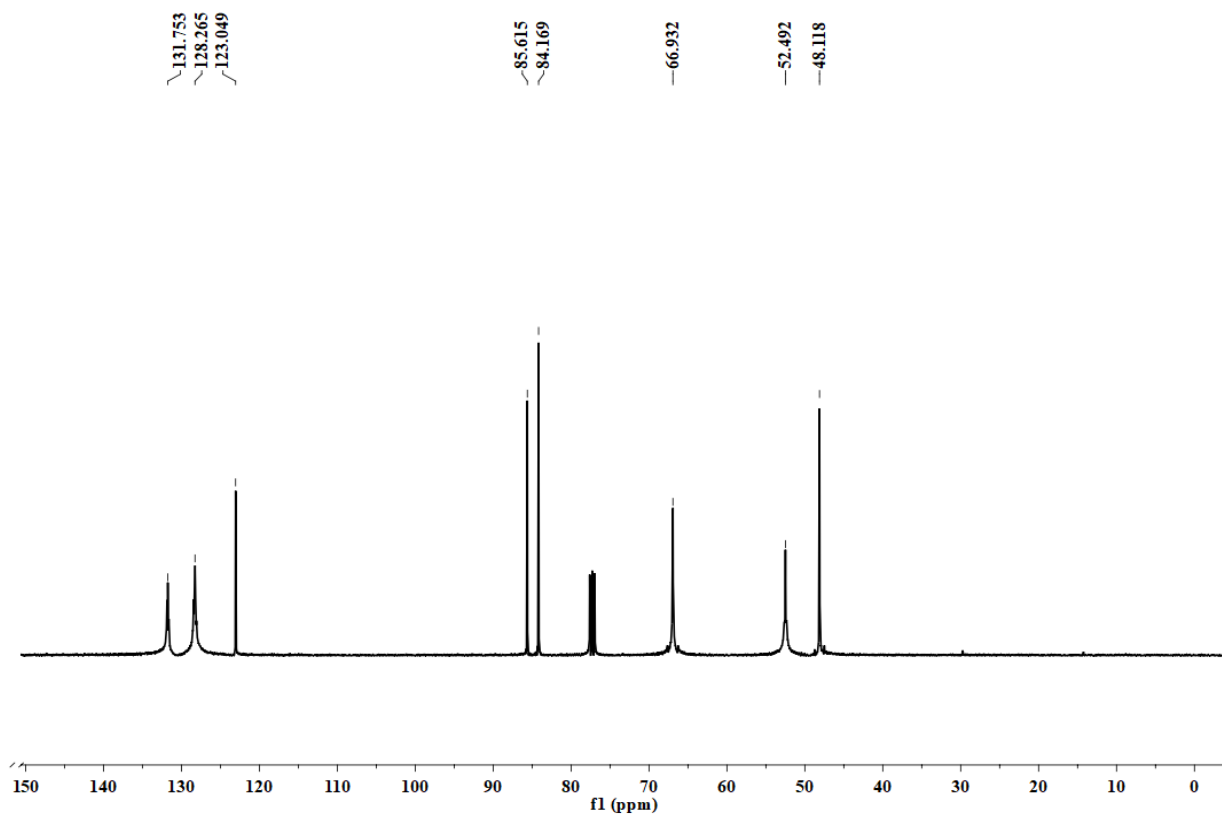


Figure S139: ¹³C NMR spectrum of 9ao taking CDCl₃ as solvent.

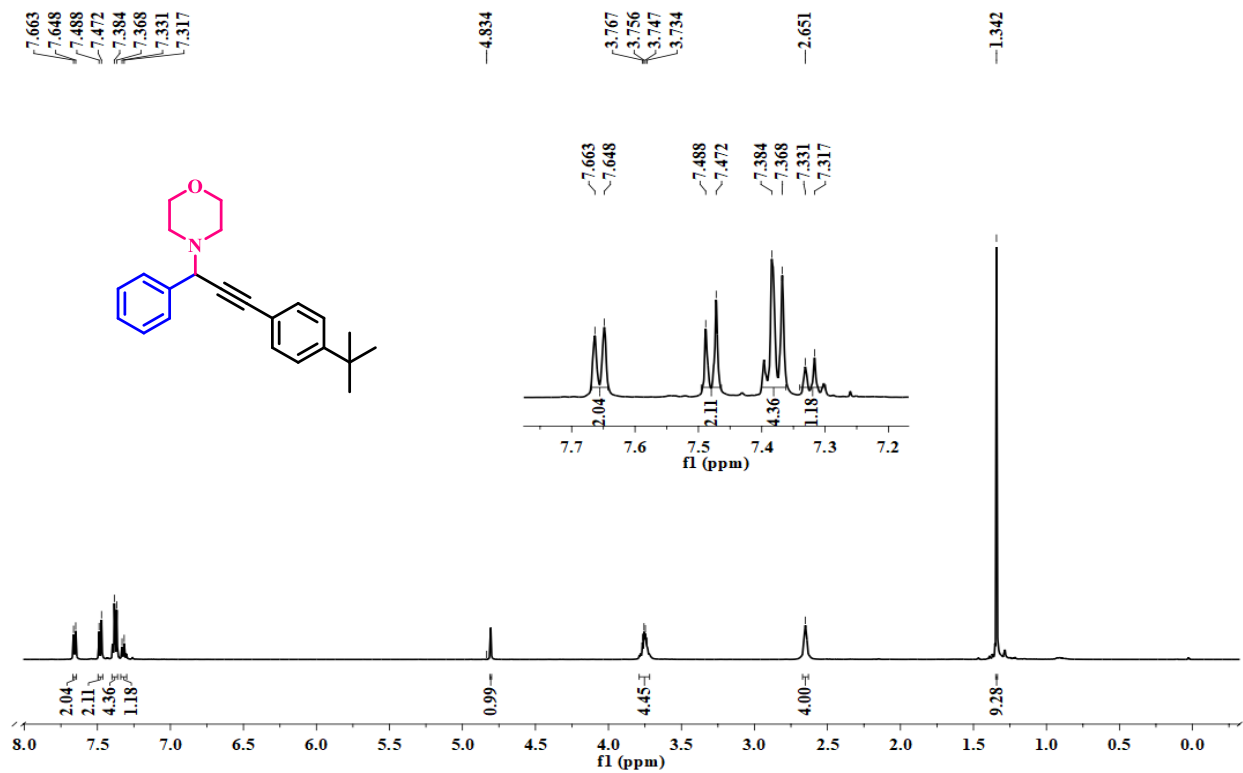


Figure S140: ¹H NMR spectrum of 10a taking CDCl₃ as solvent.

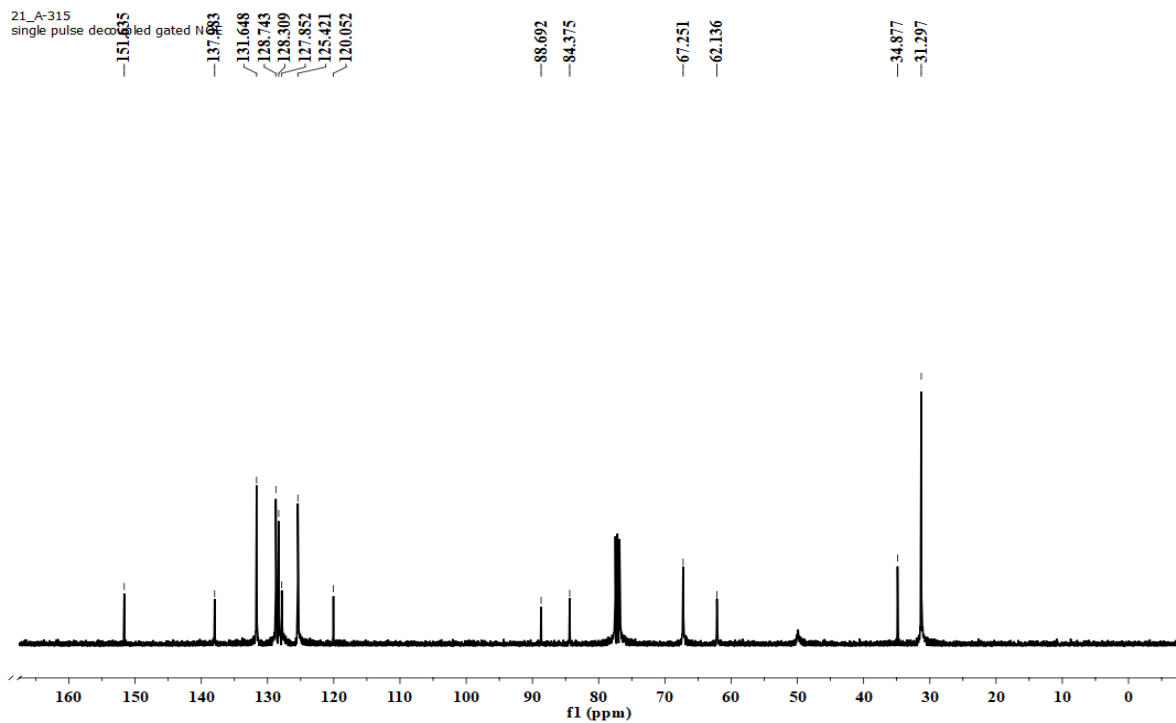


Figure S141: ¹³C NMR spectrum of 10a taking CDCl₃ as solvent.

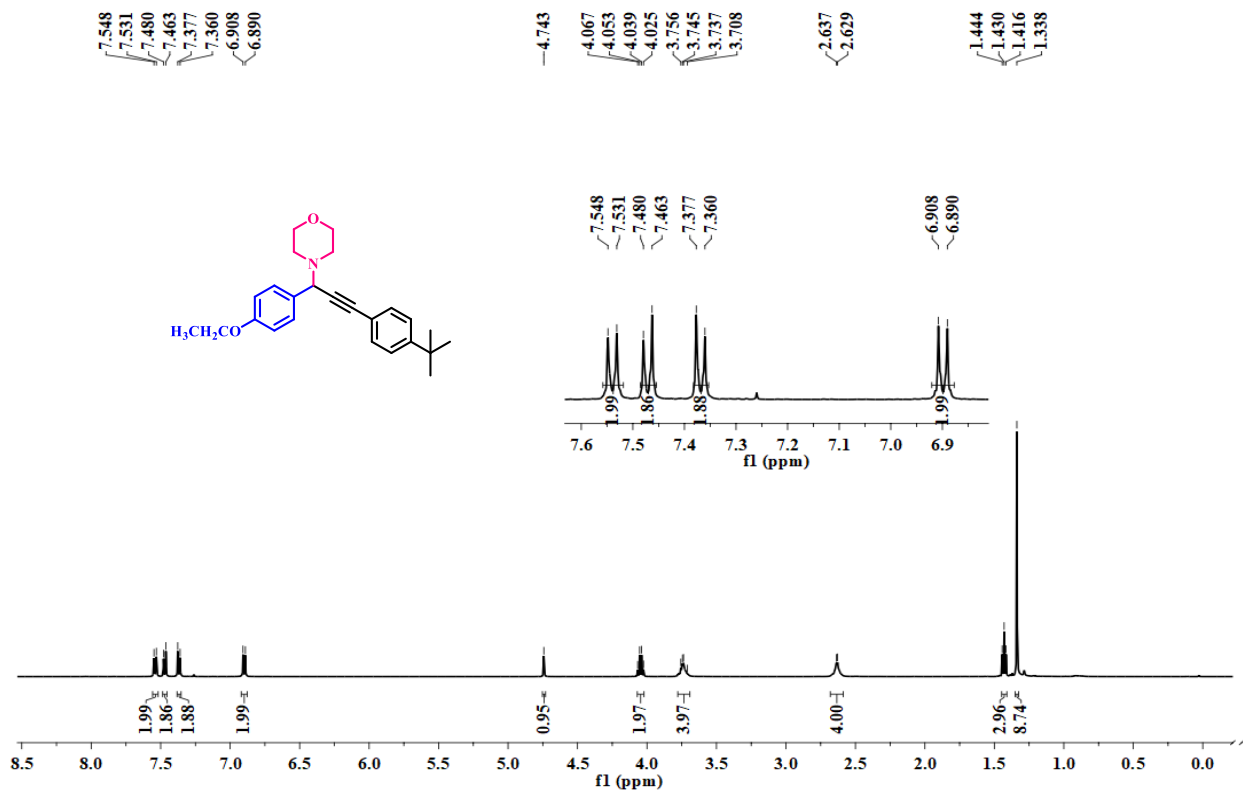


Figure S142: ¹H NMR spectrum of 10ab taking CDCl₃ as solvent.

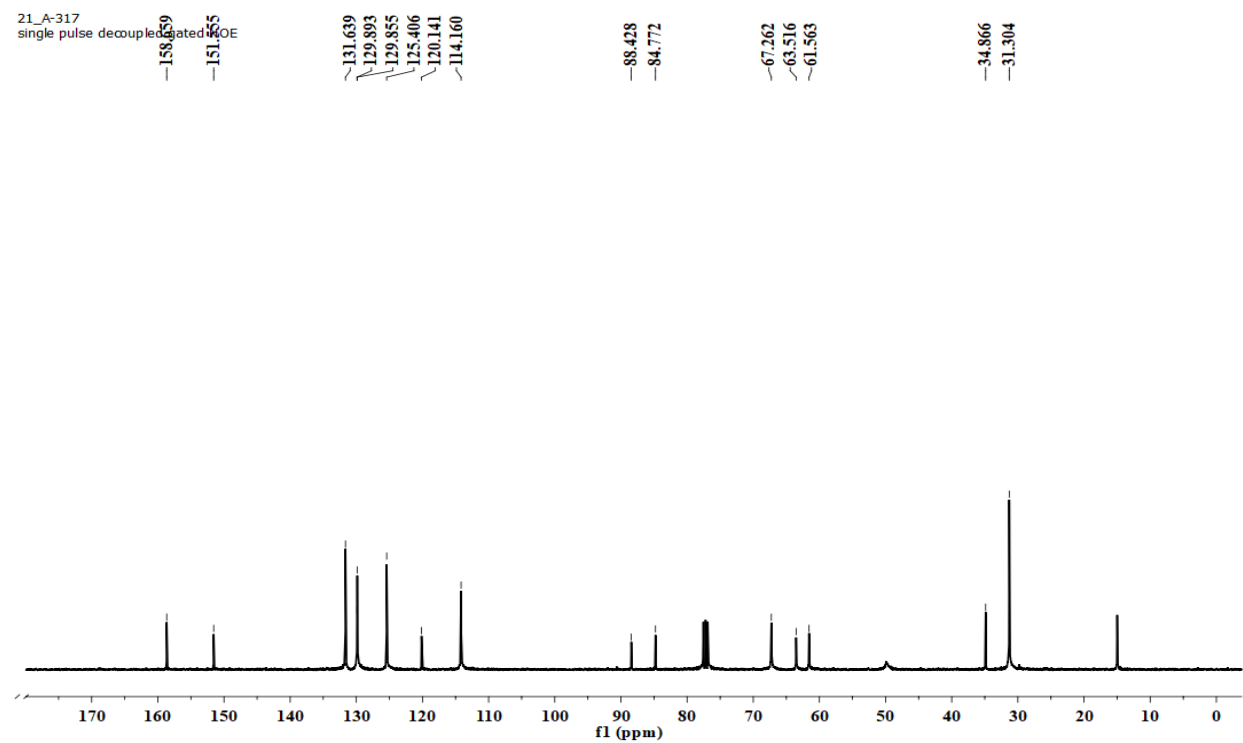


Figure S143: ¹³C NMR spectrum of 10ab taking CDCl₃ as solvent.

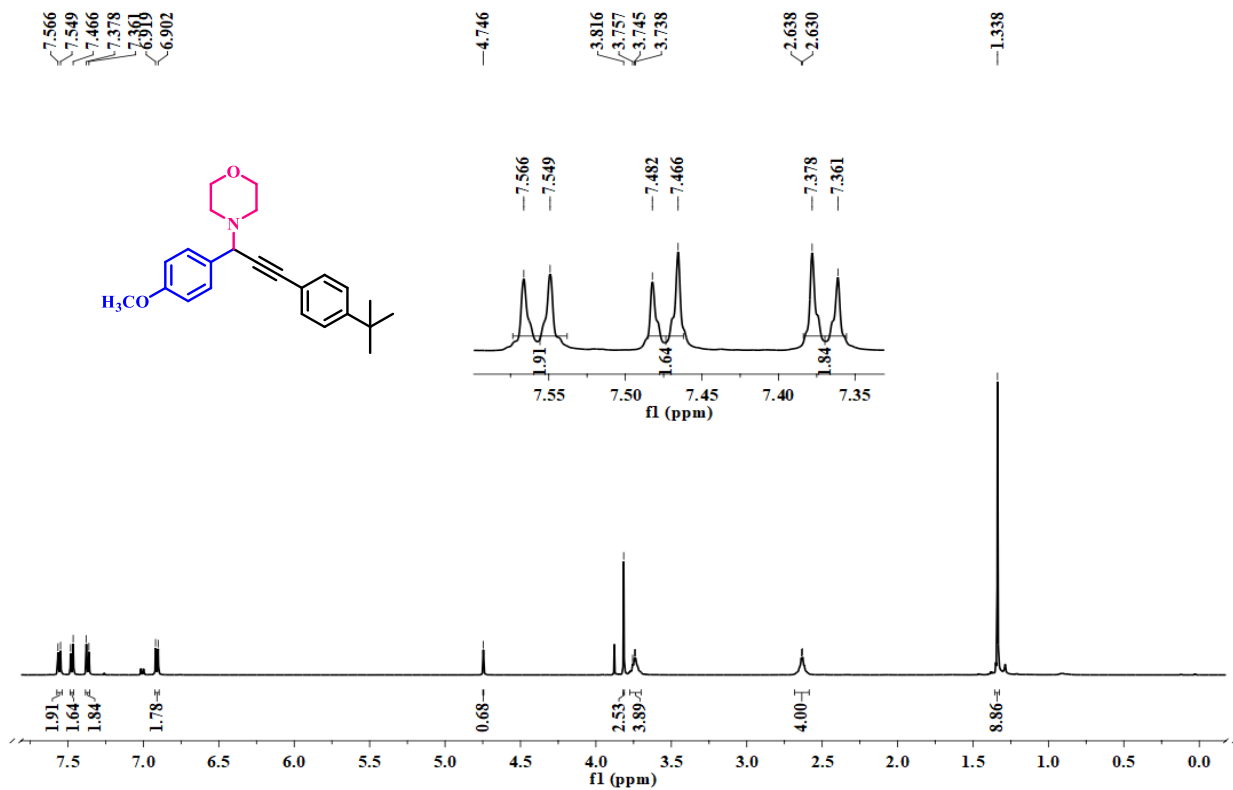


Figure S144: ¹H NMR spectrum of 10ac taking CDCl₃ as solvent.

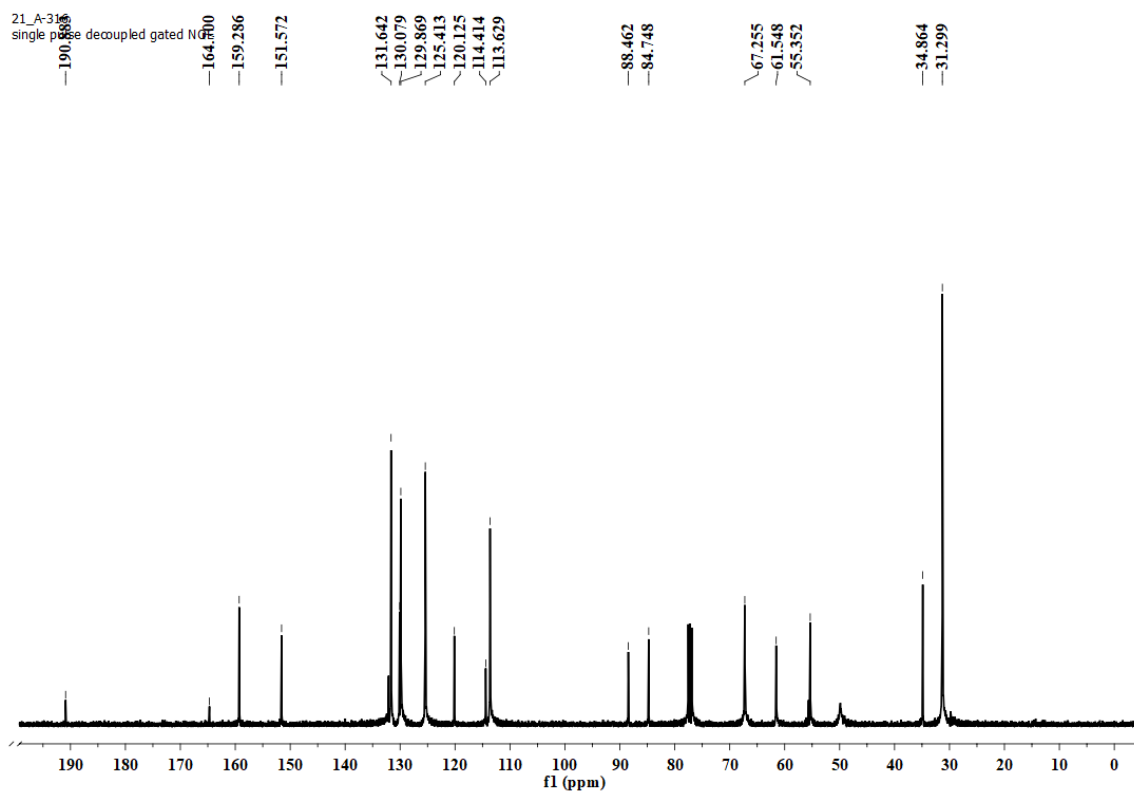


Figure S145: ¹³C NMR spectrum of 10ac taking CDCl₃ as solvent.

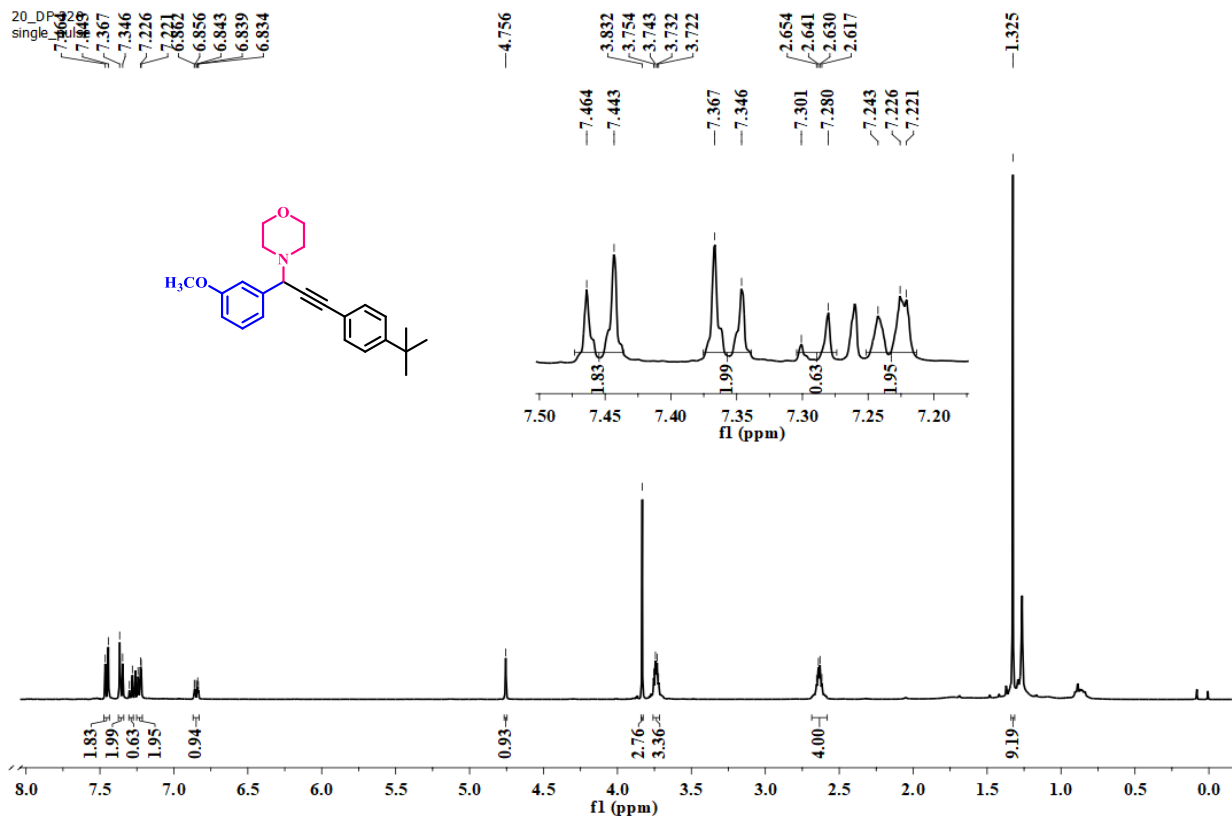


Figure S146: ^1H NMR spectrum of 10ad taking CDCl_3 as solvent.

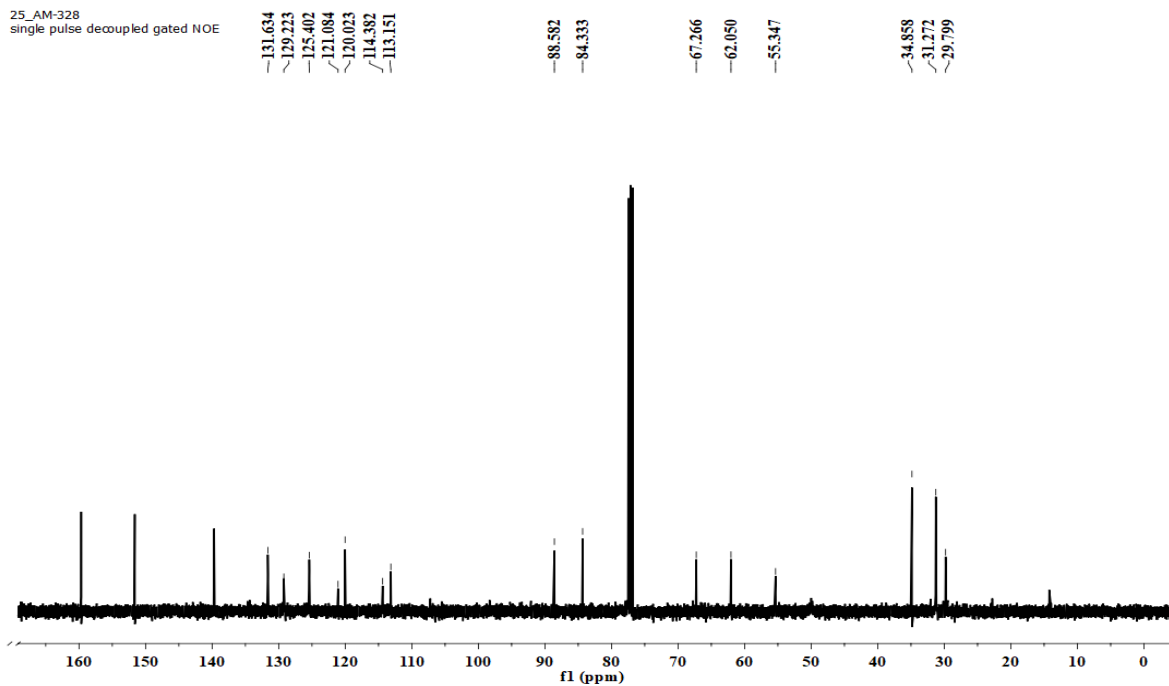


Figure S147: ^{13}C NMR spectrum of 10ad taking CDCl_3 as solvent.

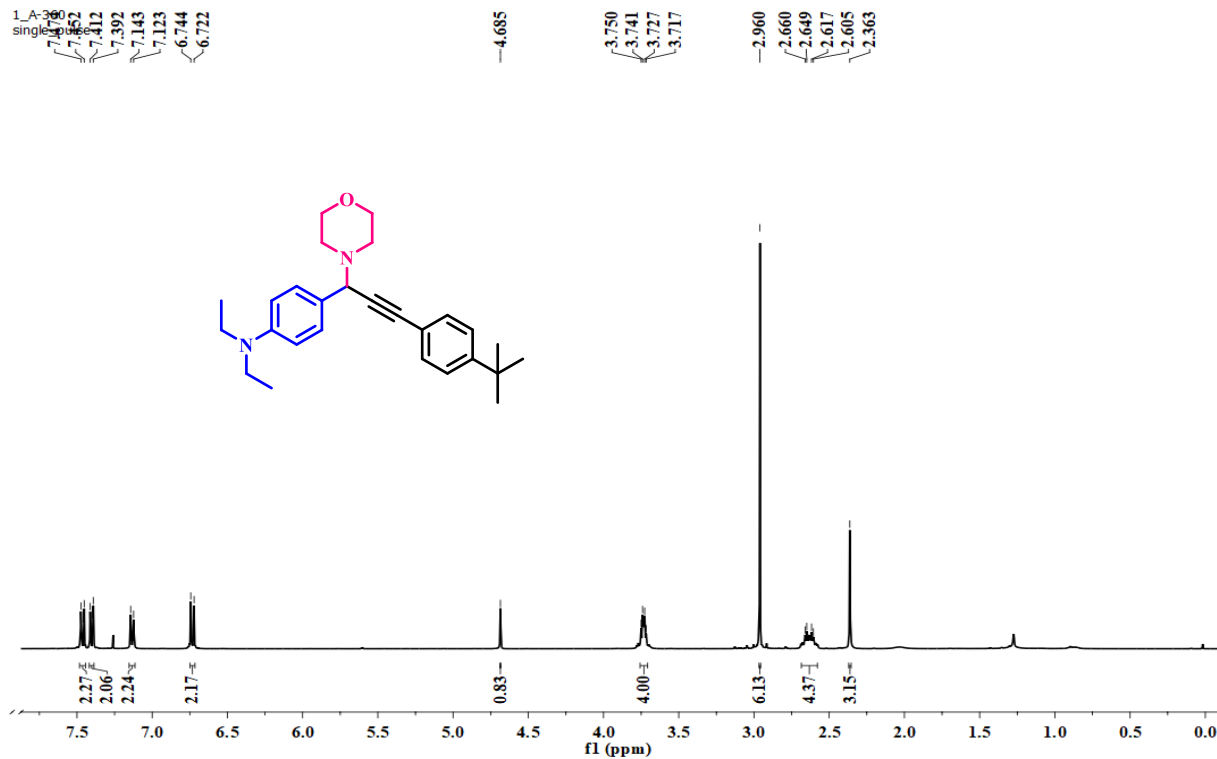


Figure S148: ^1H NMR spectrum of 10ae taking CDCl_3 as solvent.

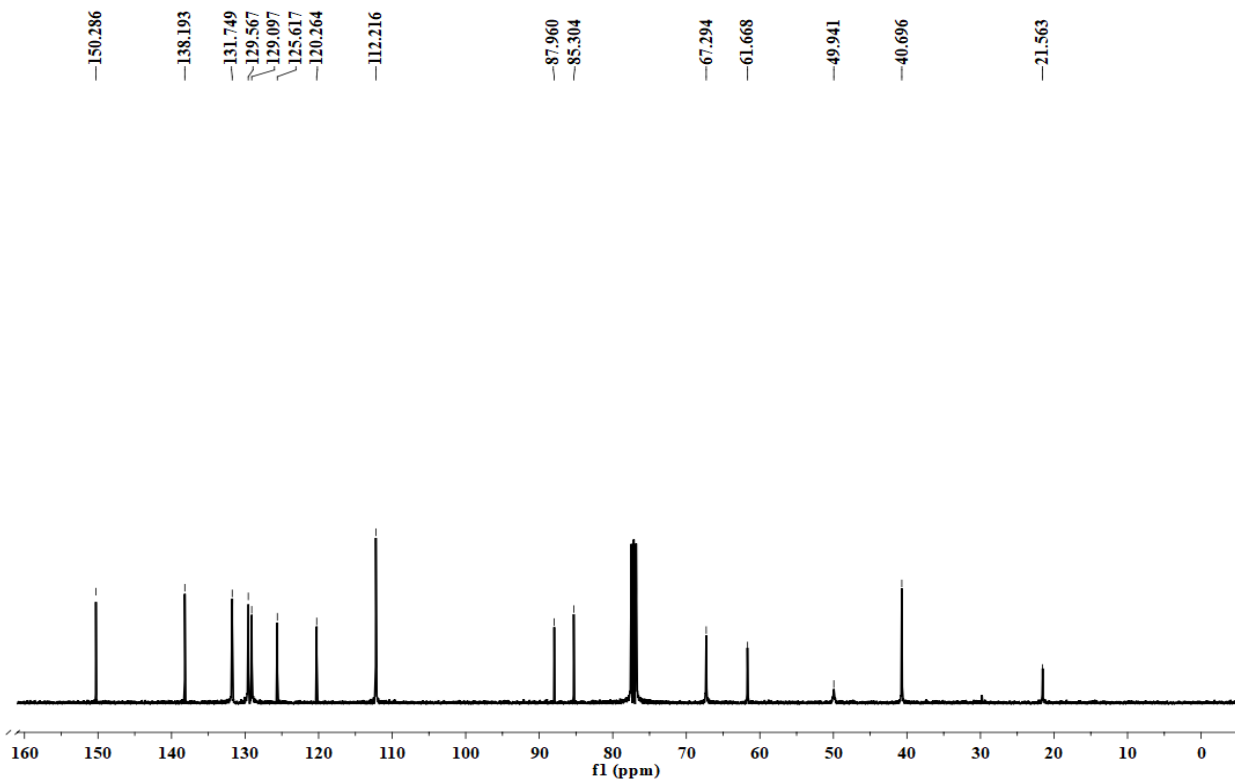


Figure S149: ^{13}C NMR spectrum of 10ae taking CDCl_3 as solvent.

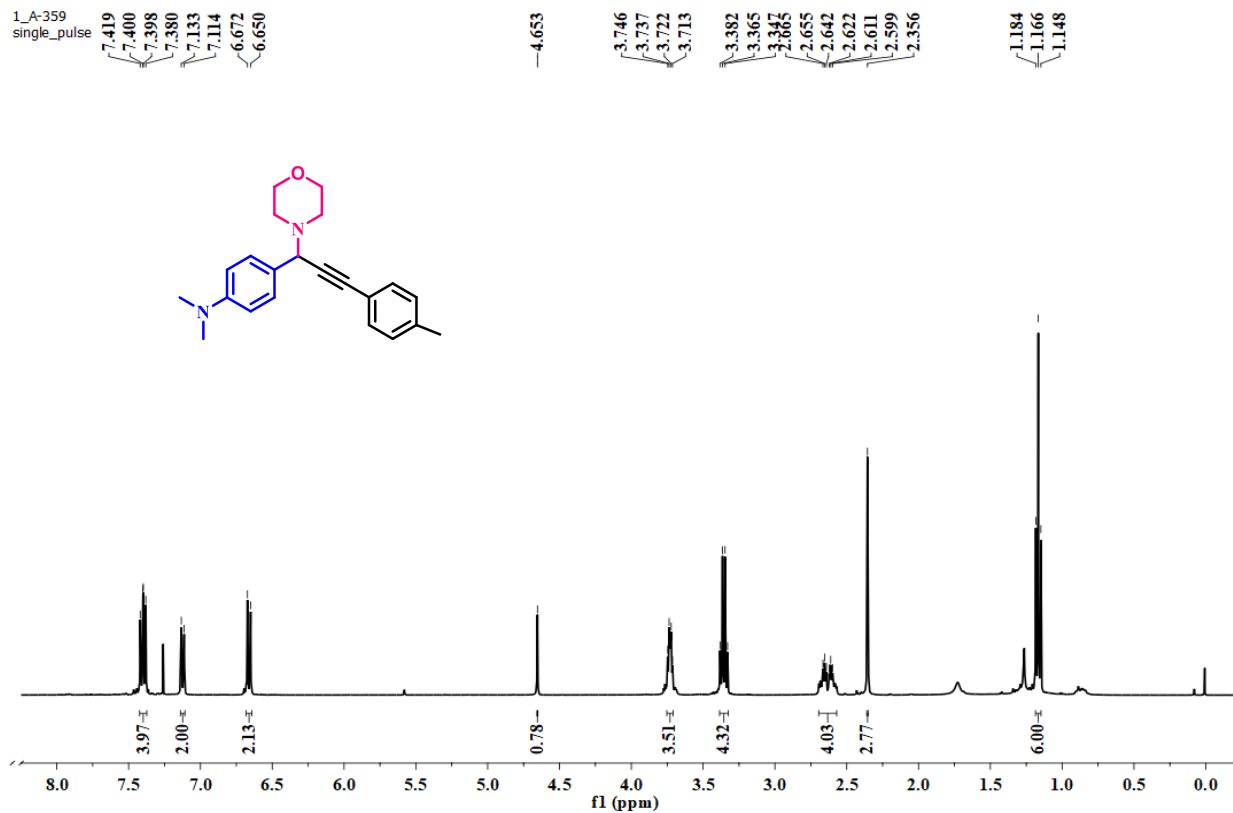


Figure S150: ^1H NMR spectrum of 10af taking CDCl_3 as solvent.

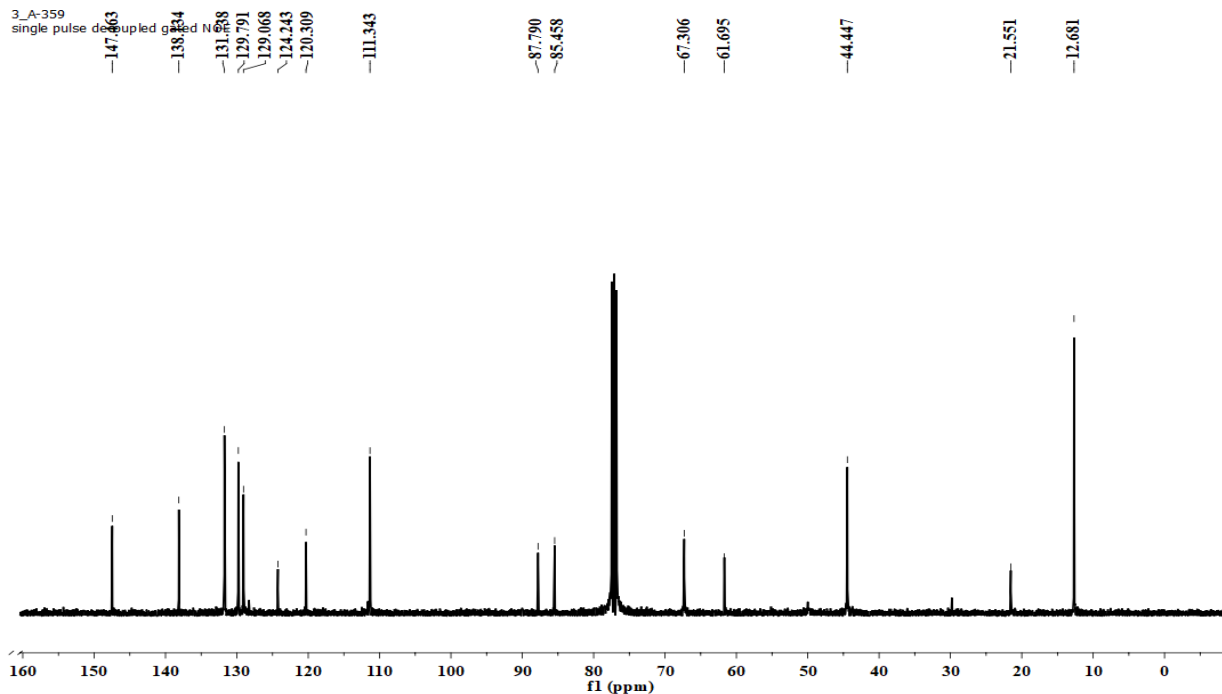


Figure S151: ^{13}C NMR spectrum of 10af taking CDCl_3 as solvent.

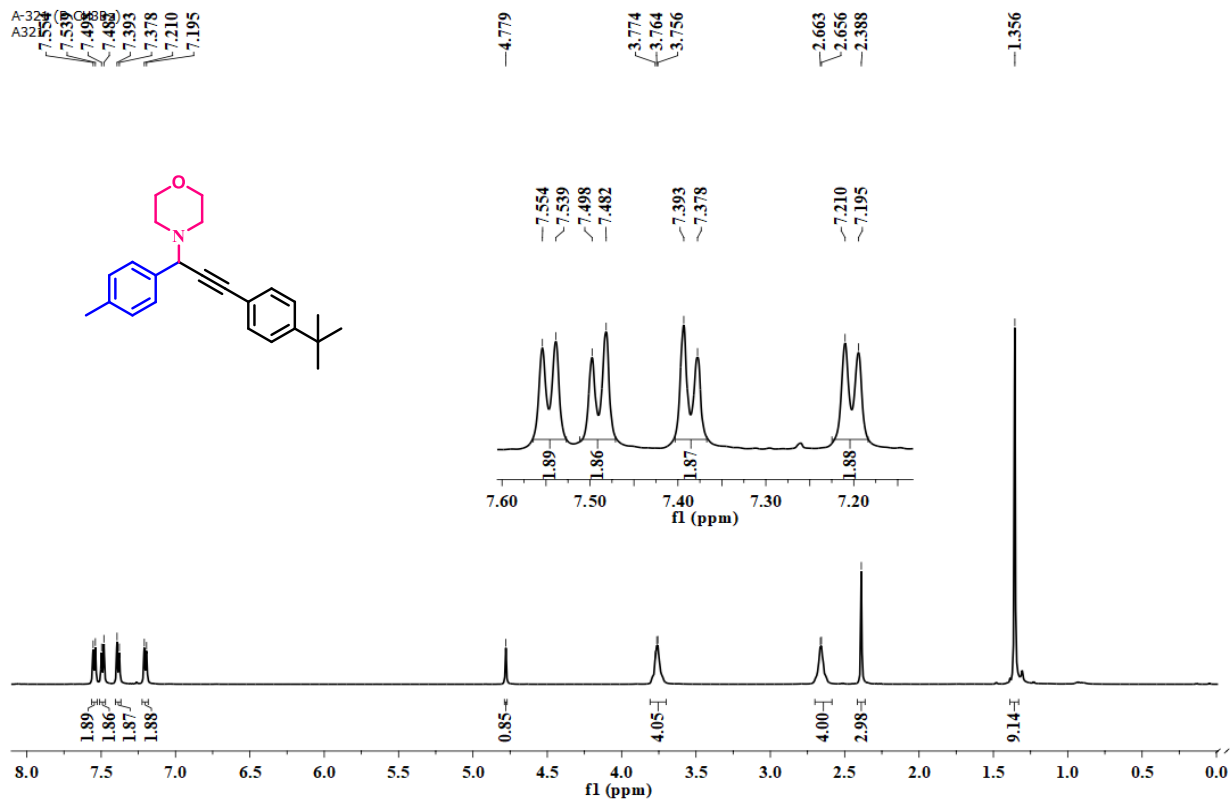


Figure S152: ¹H NMR spectrum of 10ag taking CDCl₃ as solvent.

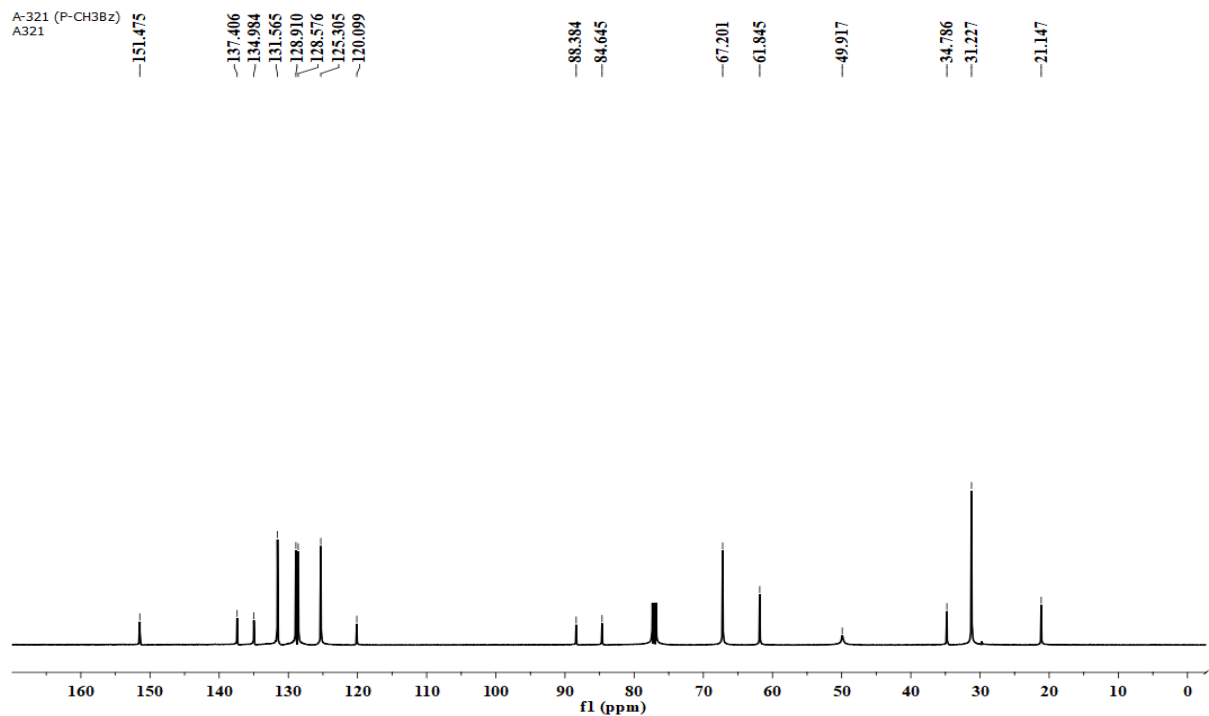


Figure S153: ¹³C NMR spectrum of 10ag taking CDCl₃ as solvent.

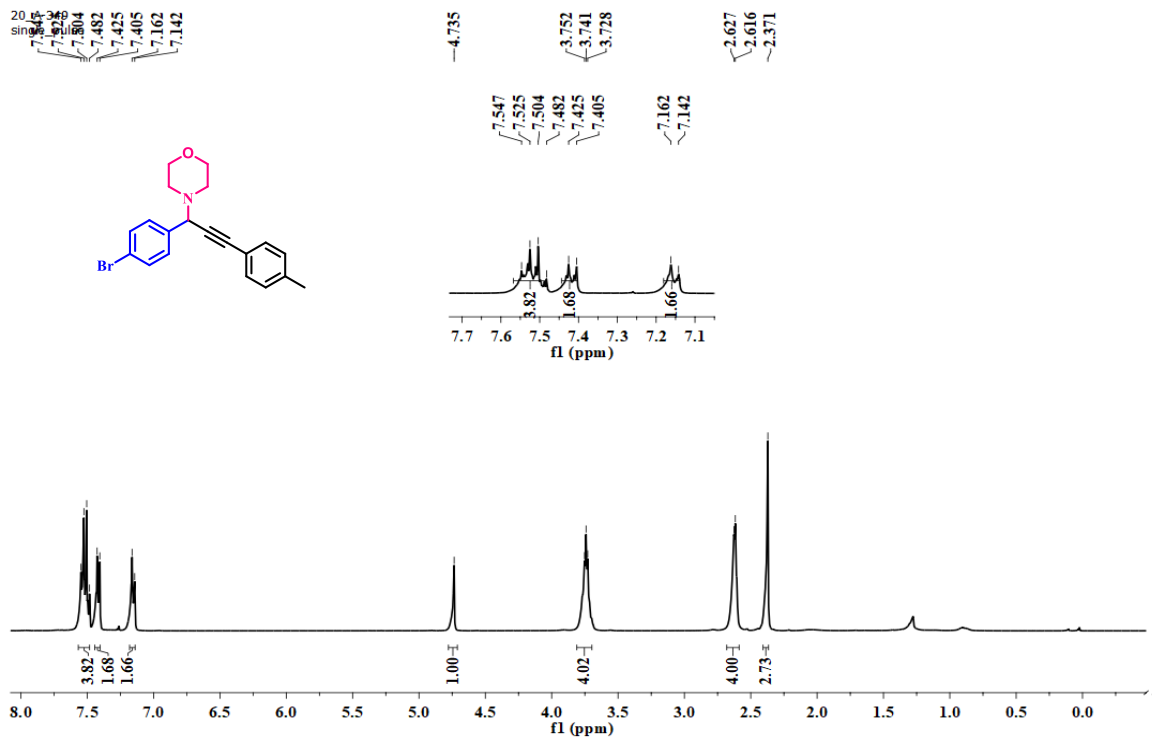


Figure S154: ¹H NMR spectrum of 10ah taking CDCl₃ as solvent.

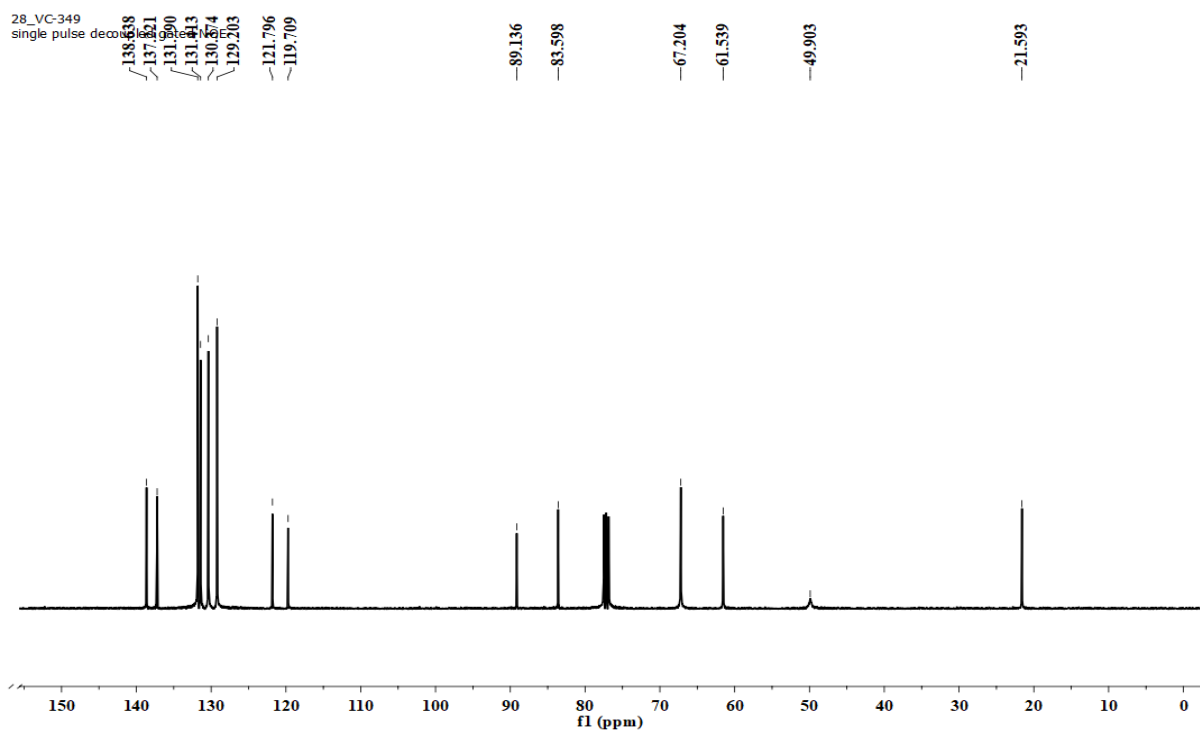


Figure S155: ¹³C NMR spectrum of 10ah taking CDCl₃ as solvent.

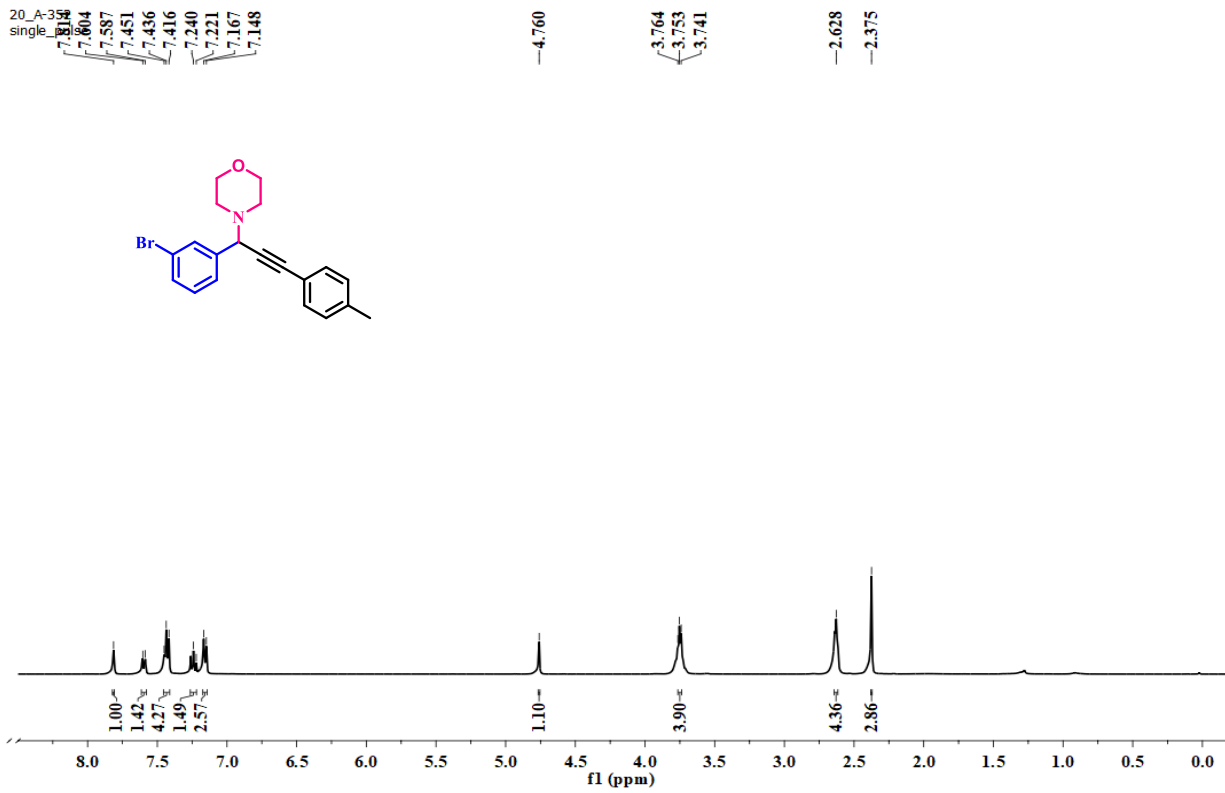


Figure S156: ^1H NMR spectrum of 10ai taking CDCl_3 as solvent.

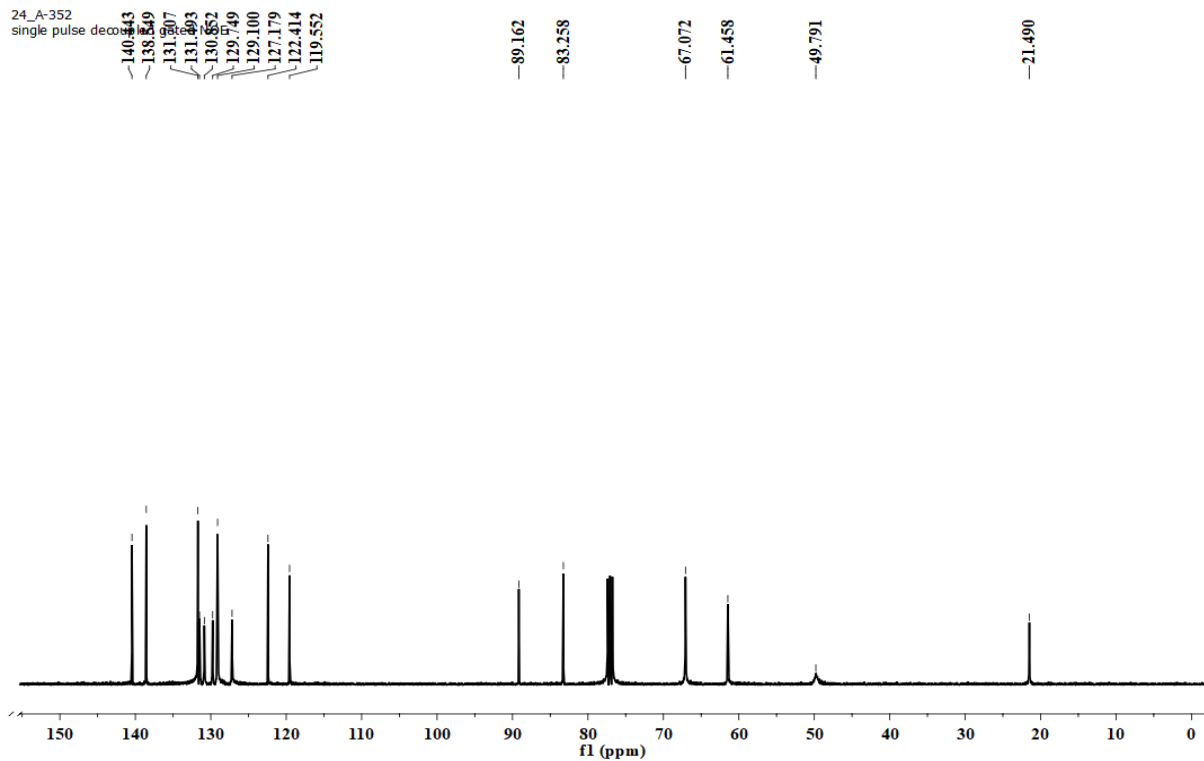


Figure S157: ^{13}C NMR spectrum of 10ai taking CDCl_3 as solvent.

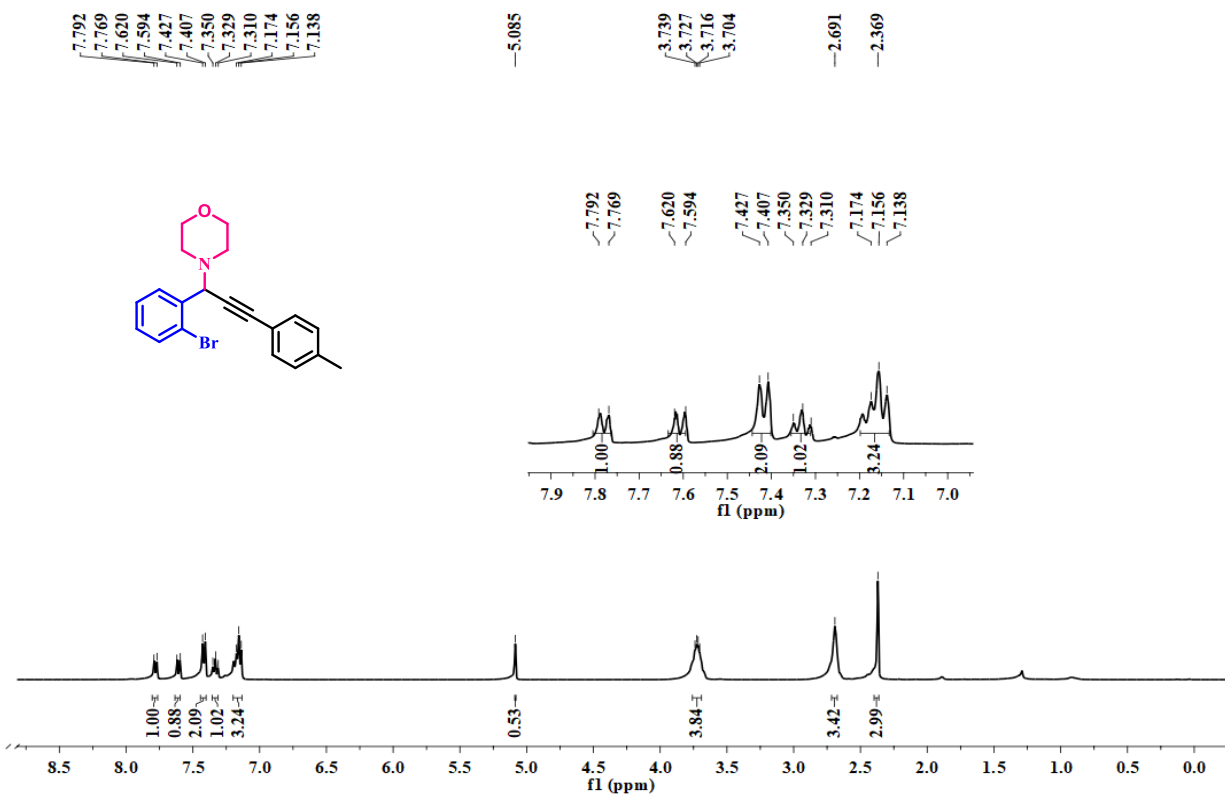


Figure S158: ¹H NMR spectrum of 10aj taking CDCl₃ as solvent.

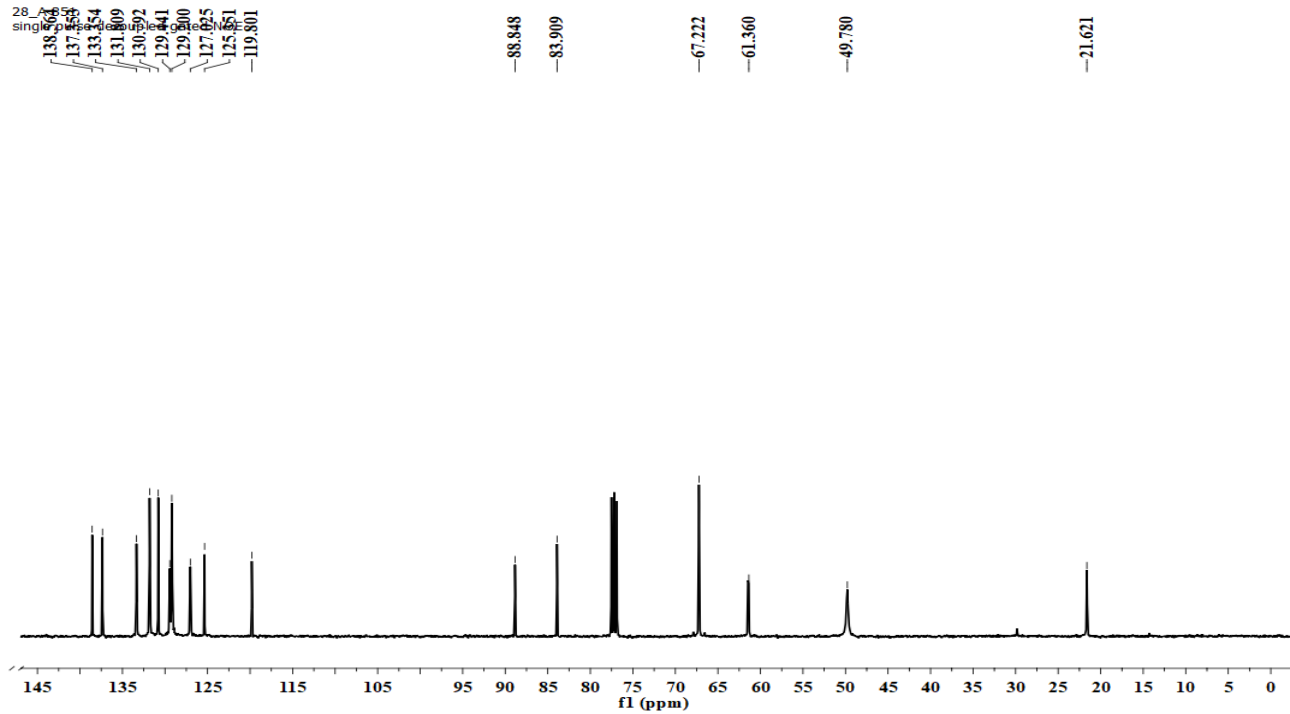


Figure S159: ¹³C NMR spectrum of 10aj taking CDCl₃ as solvent.

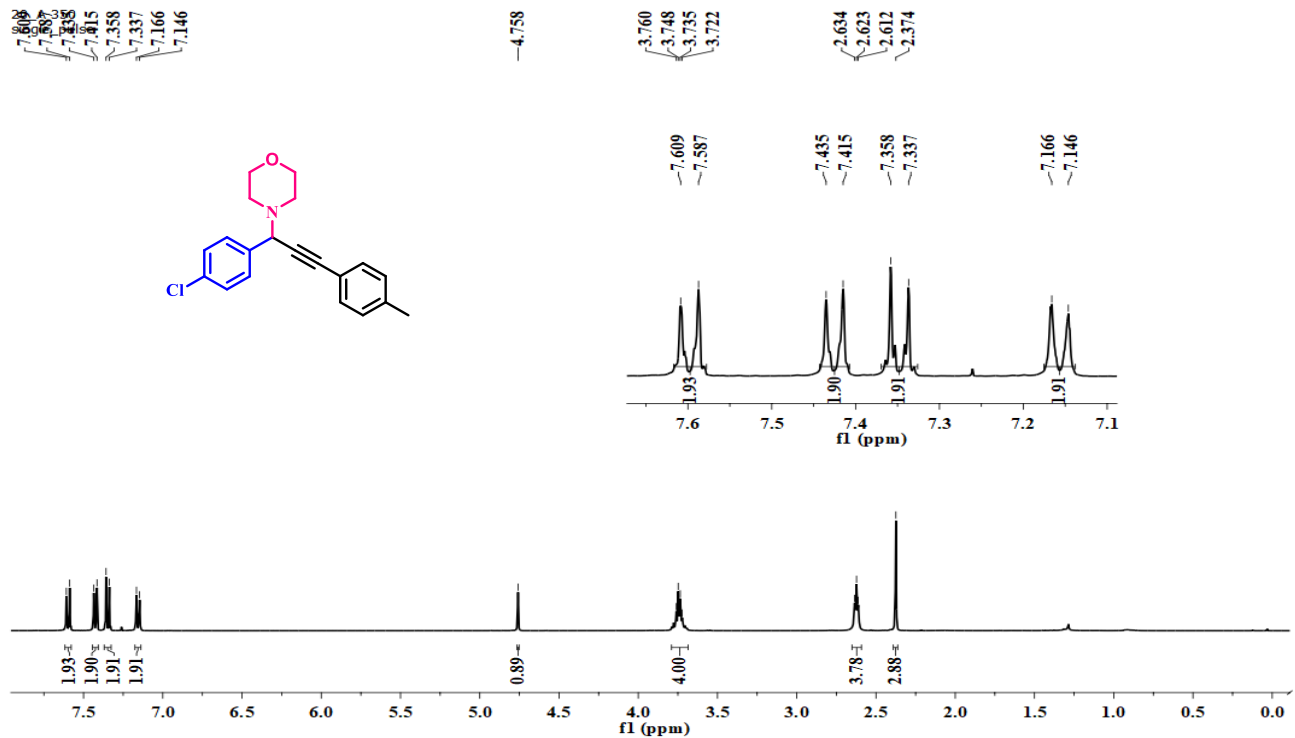


Figure S160: ¹H NMR spectrum of 10ak taking CDCl₃ as solvent.

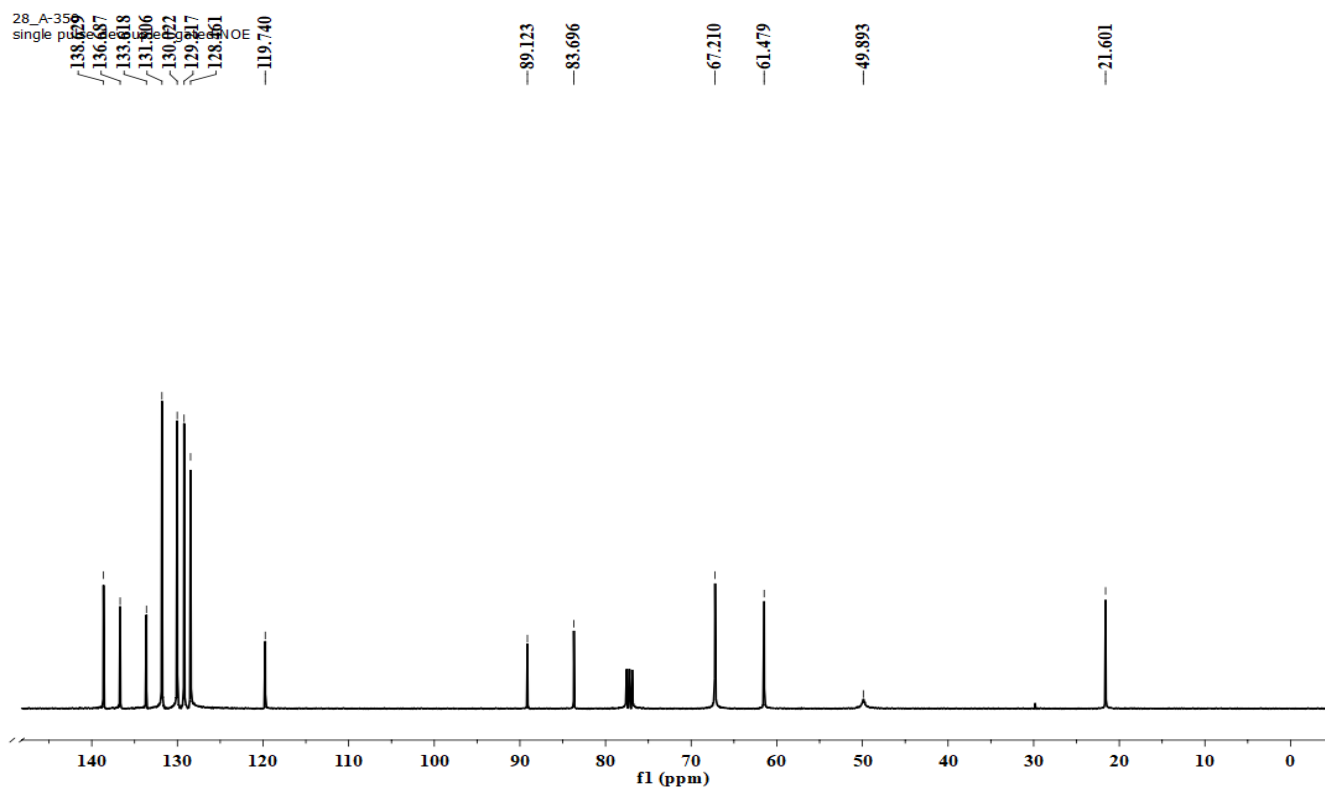


Figure S161: ¹³C NMR spectrum of 10ak taking CDCl₃ as solvent.

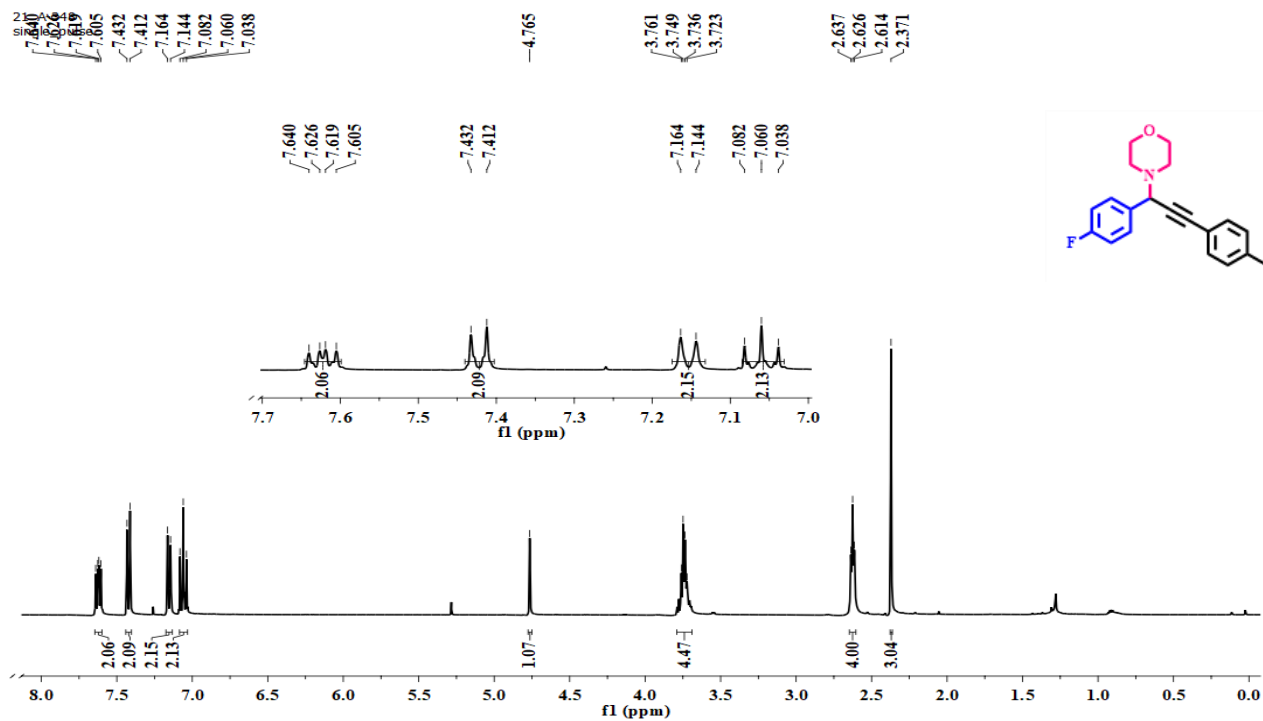


Figure S162: ¹H NMR spectrum of 10al taking CDCl₃ as solvent

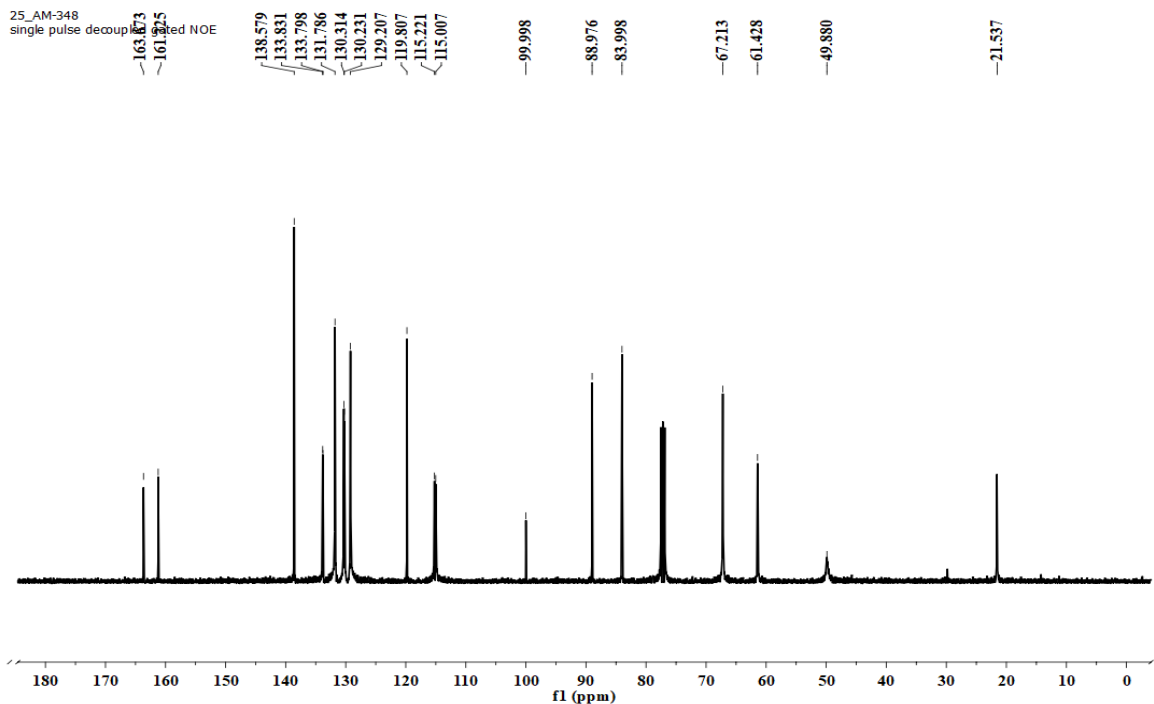


Figure S163: ¹³C NMR spectrum of 10al taking CDCl₃ as solvent.

1_A-361
single_pulse

8.541
8.157
8.026
8.007
7.961
7.541
7.521
7.440
7.420
7.172
7.153

4.874

3.764
3.750
3.741
3.727

2.690
2.681
2.662
2.653
2.616
2.373

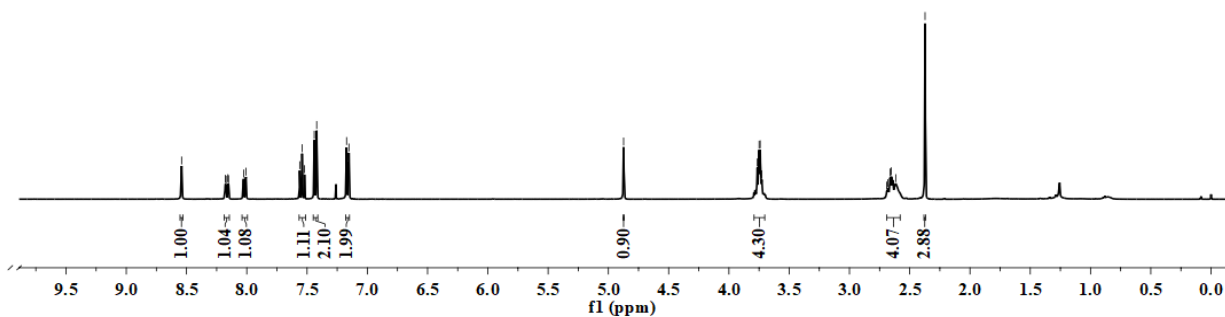
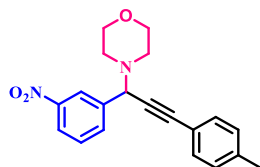


Figure S164: ¹H NMR spectrum of 10am taking CDCl₃ as solvent.

148.458
140.643
138.942
134.638
131.852
129.264
123.603
122.954
119.327

90.034

82.493

67.113

61.419

49.936

29.786

21.596

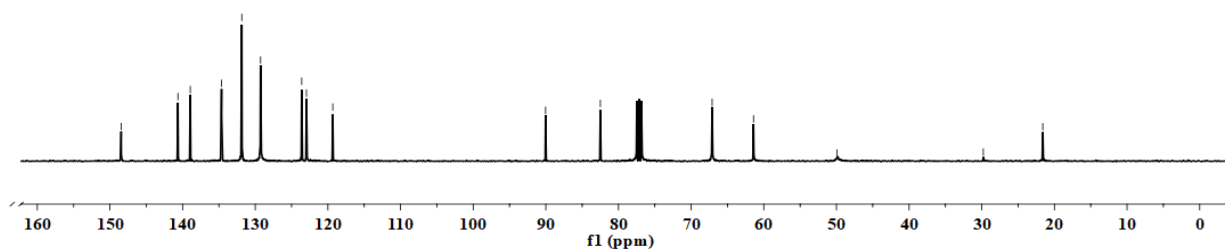


Figure S165: ¹³C NMR spectrum of 10am taking CDCl₃ as solvent.

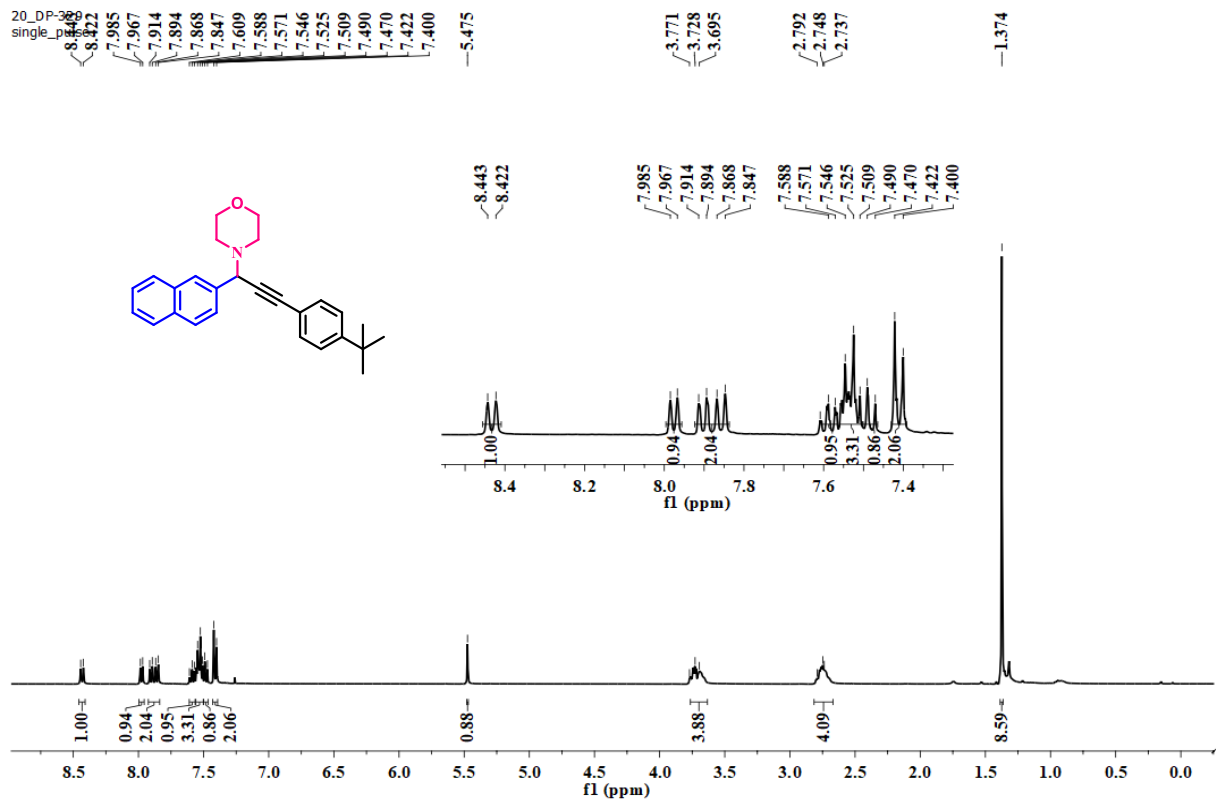


Figure S166: ¹H NMR spectrum of 10a taking CDCl₃ as solvent.

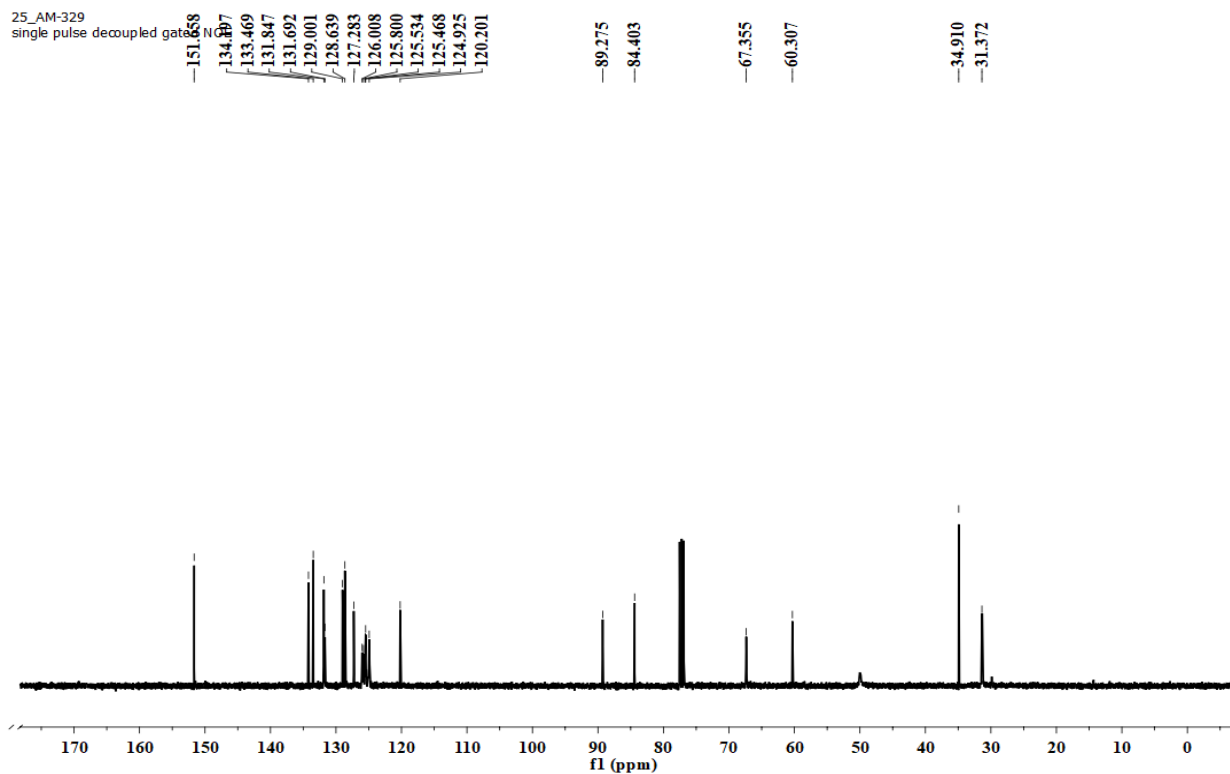


Figure S167: ¹³C NMR spectrum of 10a taking CDCl₃ as solvent.

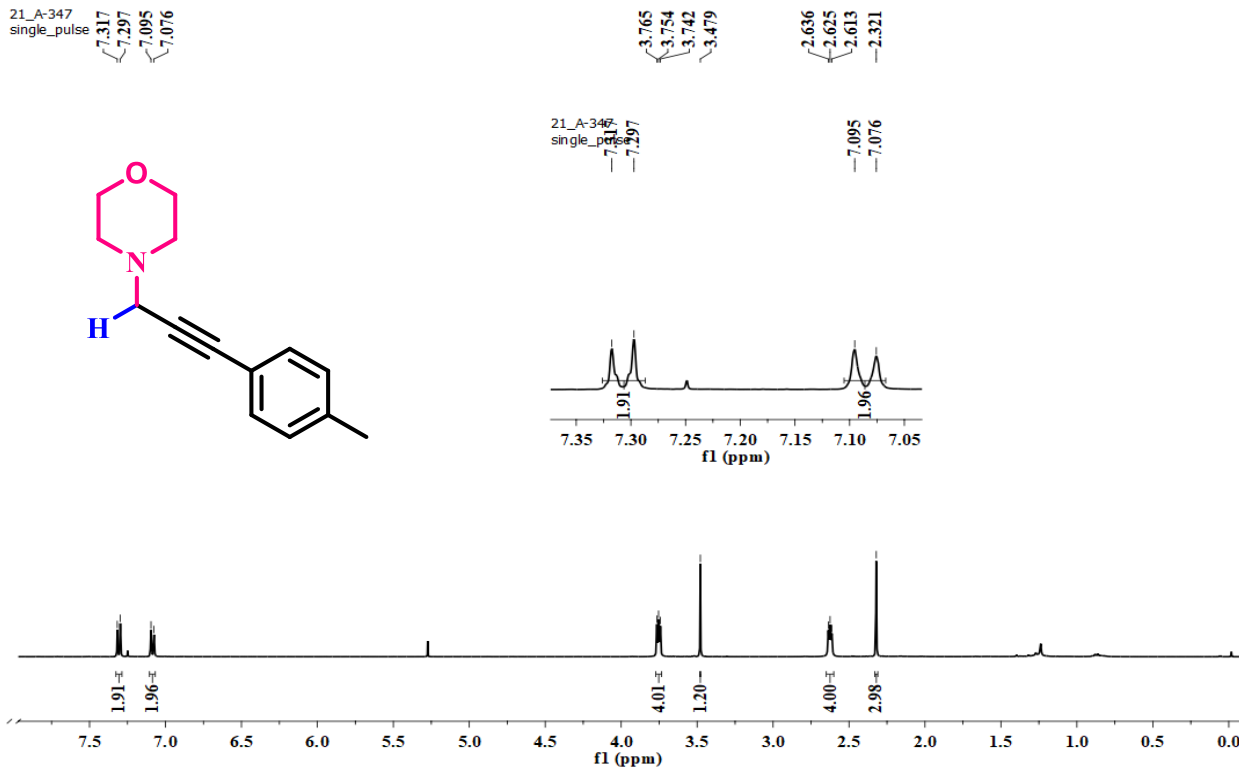


Figure S168: ^1H NMR spectrum of 10ao taking CDCl_3 as solvent.

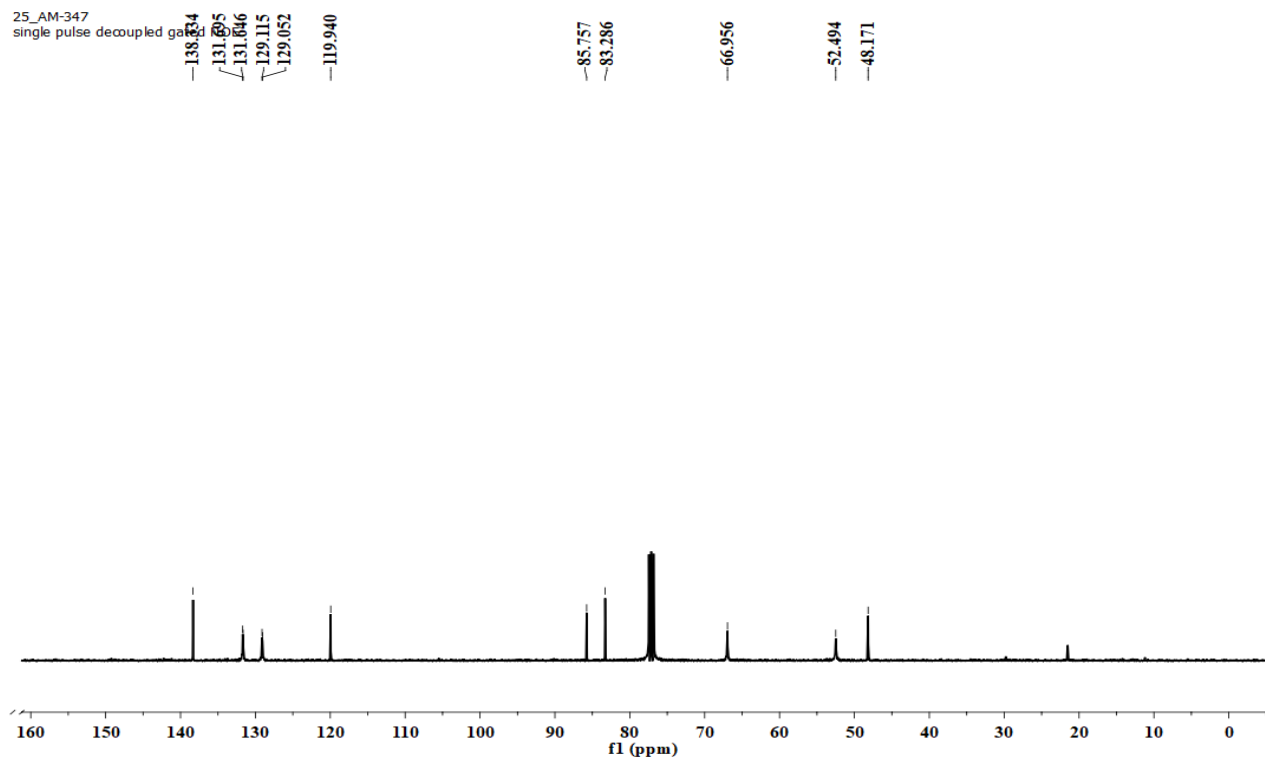


Figure S169: ^{13}C NMR spectrum of 10ao taking CDCl_3 as solvent.