

Synthesis of copper nanoparticles supported on a microporous covalent triazine polymer: an efficient and reusable catalyst for *O*-arylation reaction

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Characterization data of catalytic products

1-Phenoxybenzene (3a)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.38-7.34 (m, 4H), 7.15-7.10 (m, 2H), 7.06-7.03 (m, 4H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 157.3, 129.7, 123.2, 118.9.

1-Methyl-4-phenoxybenzene (3b)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.34-7.30 (m, 2H), 7.16-7.06 (m, 3H), 7.01-6.98 (dd, 2H), 6.95-6.93 (d, 2H), 2.35 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 157.8, 154.6, 132.8, 130.2, 129.6, 122.7, 119.1, 118.3, 20.6.

1-Methoxy-4-phenoxybenzene (3c)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.32-7.28 (m, 2H), 7.07-6.88 (m, 7H), 3.80 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 158.6, 155.9, 150.2, 129.7, 122.5, 120.9, 117.7, 114.9, 55.7.

1-Nitro-4-phenoxybenzene (3d)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 8.21-8.18 (d, 2H), 7.45-7.41 (t, 2H), 7.27-7.23 (t, 1H), 7.10-7.08 (d, 2H), 7.02-7.00 (d, 2H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 163.3, 154.7, 142.6, 130.3, 125.9, 125.4, 120.5, 117.1.

4-Phenoxybenzonitrile (3e)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.61-7.57 (m, 2H), 7.43-7.39 (m, 2H), 7.26-7.21 (m, 1H), 7.08-7.05 (m, 2H), 7.02-6.98 (m, 2H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 161.6, 154.7, 134.1, 130.2, 125.1, 120.4, 118.8, 117.9, 105.8.

1-Fluoro-4-phenoxybenzene (3f)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.36-7.31 (m, 2H), 7.12-6.97 (m, 7H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 160.0, 157.7, 157.6, 152.9, 129.8, 123.1, 120.6, 120.5, 118.2, 116.4, 116.1.

1-Chloro-4-phenoxybenzene (3g)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.38-7.32 (m, 2H), 7.31-7.26 (m, 2H), 7.15-7.11 (m, 1H), 7.03-7.00 (m, 2H), 6.96-6.94 (m, 2H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 156.8, 155.9, 129.8, 129.7, 128.2, 123.6, 120.0, 118.9.

1-(4-Phenoxyphenyl)ethanone (3h)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.96-7.92 (m, 2H), 7.42-7.37 (m, 2H), 7.22-7.18 (m, 1H), 7.09-7.06 (m, 2H), 7.02-6.98 (m, 2H), 2.57 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 196.7, 161.9, 155.5, 131.9, 130.6, 130.0, 124.6, 120.2, 117.3, 26.4.

1-Trifluoromethyl-4-phenoxybenzene (3i)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.60-7.57 (m, 2H), 7.42-7.38 (m, 2H), 7.22-7.18 (m, 1H), 7.09-7.04 (m, 4H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 160.5, 155.7, 130.0, 127.1, 127.0, 124.5, 119.9, 117.8.

1-Methyl-3-phenoxybenzene (3j)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.32-7.27 (m, 2H), 7.20-7.16 (m, 1H), 7.08-7.04 (m, 1H), 7.00-6.97 (m, 2H), 6.90-6.87 (m, 1H), 6.82-6.77 (m, 2H), 2.30 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 157.3, 157.2, 139.9, 129.7, 129.4, 124.0, 123.0, 119.5, 118.8, 115.9, 21.4.

1-Methoxy-3-phenoxybenzene (3k)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.36-7.32 (m, 2H), 7.26-7.20 (m, 1H), 7.13-7.11 (m, 1H), 7.04-7.01 (m, 2H), 6.67-6.64 (m, 1H), 6.61-6.58 (m, 2H), 3.78 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 160.9, 158.5, 156.9, 130.1, 129.7, 123.3, 119.1, 110.9, 108.8, 104.8, 55.3.

1-Nitro-2-phenoxybenzene (3l)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.96-7.94 (m, 1H), 7.52-7.48 (m, 1H), 7.40-7.36 (m, 2H), 7.22-7.17 (m, 2H), 7.07-7.00 (m, 3H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 155.7, 150.7, 134.1, 130.0, 125.7, 124.6, 123.1, 120.4, 119.2.

1-(*p*-Tolyloxy)-4-methylbenzene (3m)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.13-7.11 (d, 4H), 6.91-6.89 (d, 4H), 2.33 (s, 6H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 155.3, 132.4, 130.1, 118.6, 20.6.

1-(*p*-Tolyloxy)-3-methylbenzene (3n)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.23-7.14 (m, 3H), 6.94-6.89 (m, 3H), 6.83-6.79 (m, 2H), 2.35 (s, 3H), 2.34 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 157.8, 154.8, 139.8, 132.7, 130.2, 129.3, 123.6, 119.1, 119.0, 115.4, 21.4, 20.7.

1-(4-(4-Methoxyphenoxy)phenyl)ethanone (3o)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.92-7.90 (d, 2H), 7.02-7.00 (d, 2H), 6.95-6.91 (m, 4H), 3.82 (s, 3H), 2.56 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 196.8, 163.0, 156.8, 148.6, 131.5, 130.6, 121.8, 116.4, 115.2, 55.7, 26.5.

1-(4-Nitrophenoxy)-4-nitrobenzene (3p)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 8.32-8.27 (m, 4H), 7.19-7.15 (m, 4H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 160.6, 144.2, 126.2, 119.3.

1-(4-(4-Nitrophenoxy)phenyl)ethanone (3q)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 8.26-8.24 (d, 2H), 8.04-8.02 (d, 2H), 7.15-7.08 (m, 4H), 2.61 (s, 3H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 196.7, 161.8, 159.2, 143.6, 133.9, 130.9, 126.2, 119.6, 118.5, 26.6.

1-(4-Fluorophenoxy)-4-fluorobenzene (3r)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.05-6.99 (m, 4H), 6.97-6.92 (m, 4H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 159.9, 157.5, 153.4, 119.9, 119.8, 116.4, 116.2.

4-(4-Fluorophenoxy)benzonitrile (3s)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.62-7.58 (m, 2H), 7.14-7.08 (m, 2H), 7.06-7.02 (m, 2H), 6.99-6.96 (m, 2H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 161.7, 160.9, 158.6, 150.5, 134.2, 122.0, 121.9, 118.7, 117.5, 116.9, 116.8, 105.9.

4-Phenoxypyridine (3t)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 8.46-8.44 (m, 2H), 7.44-7.40 (m, 2H), 7.26-7.22 (m, 1H), 7.10-7.08 (m, 2H), 6.83-6.81 (m, 2H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 164.7, 151.4, 149.6, 130.2, 125.4, 120.8, 112.1.

1,4-Diphenoxybenzene (3u)

¹H NMR (400 MHz, CDCl₃): δ (ppm) = 7.36-7.31 (m, 4H), 7.11-7.07 (m, 2H), 7.03-6.99 (m, 8H).

¹³C NMR (100 MHz, CDCl₃): δ (ppm) = 157.8, 152.7, 129.7, 122.9, 120.4, 118.3.

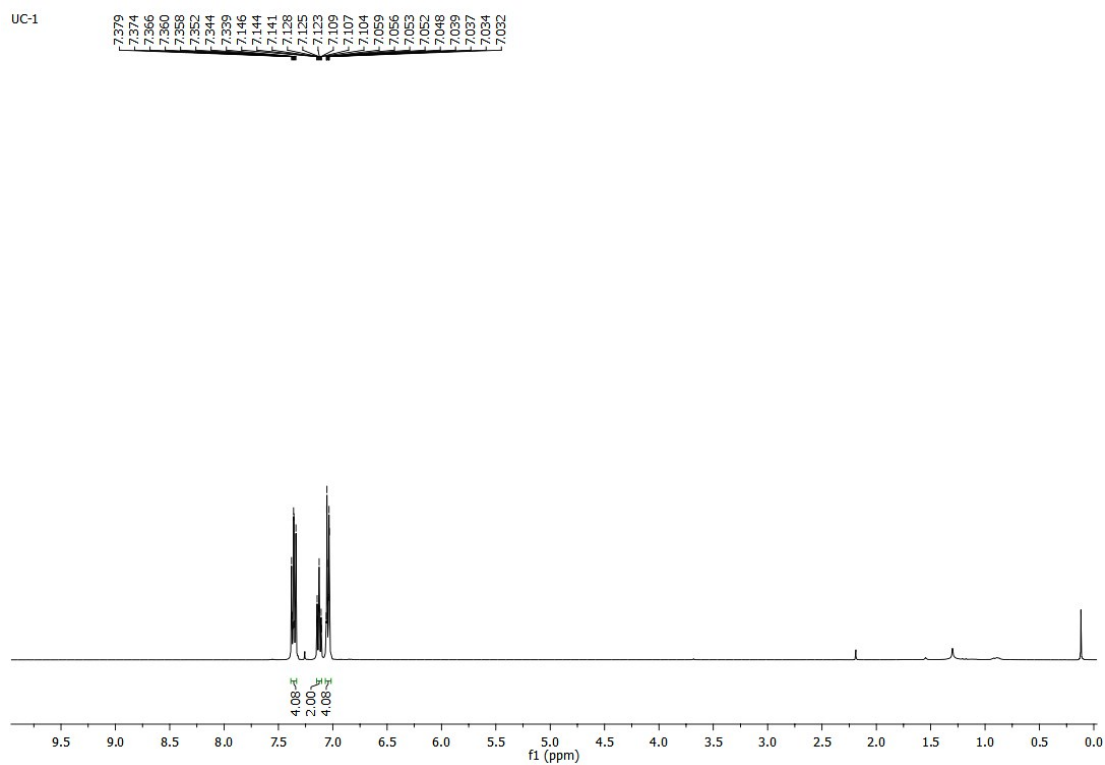


Figure S1. ^1H NMR spectrum of 1-phenoxybenzene (**3a**)

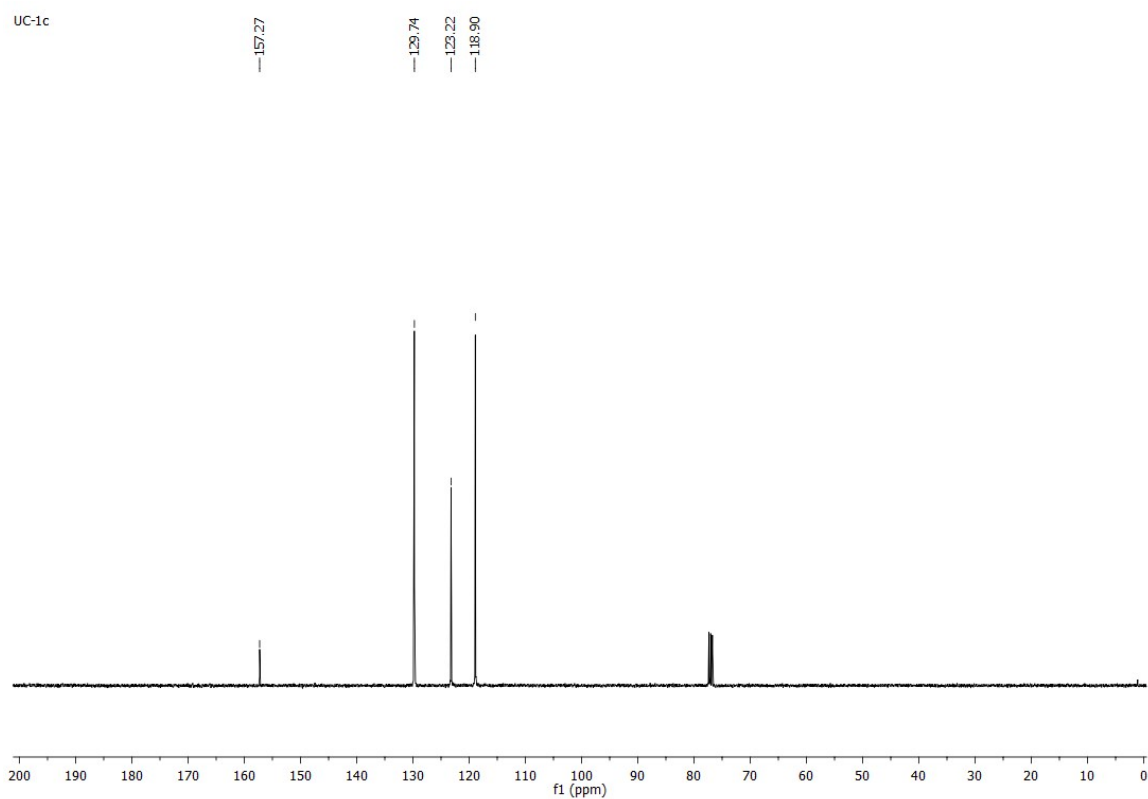


Figure S2. ^{13}C NMR spectrum of 1-phenoxybenzene (**3a**)

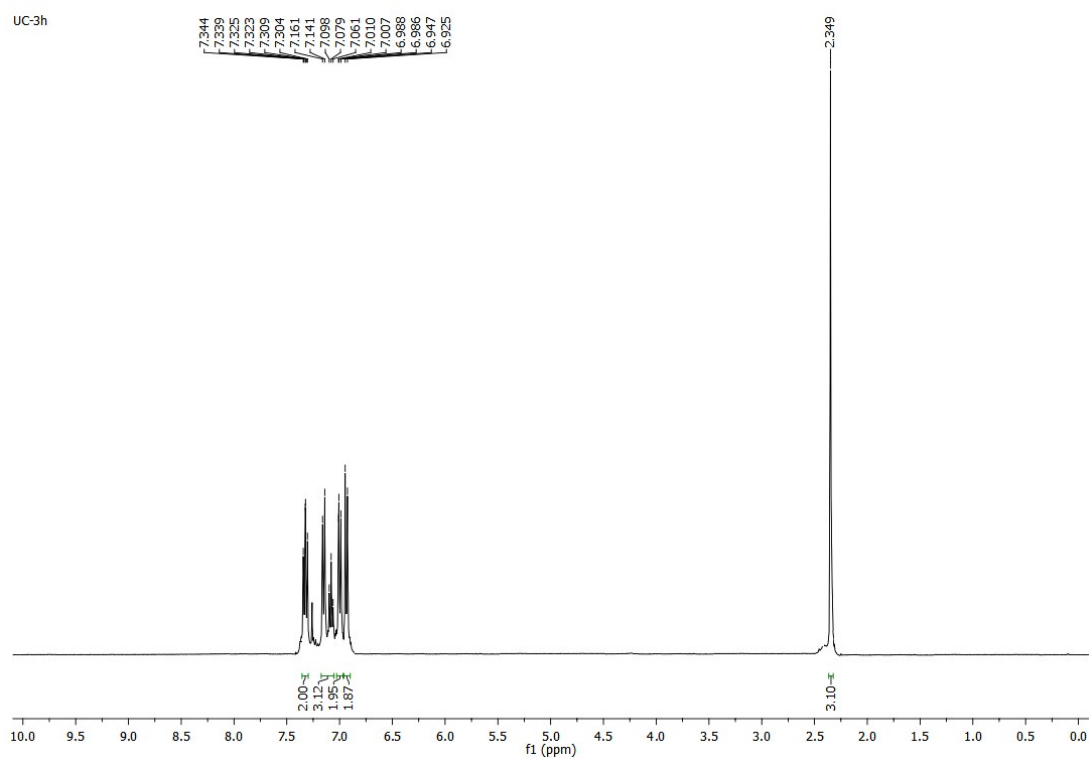


Figure S3. ^1H NMR spectrum of 1-methyl-4-phenoxybenzene (**3b**)

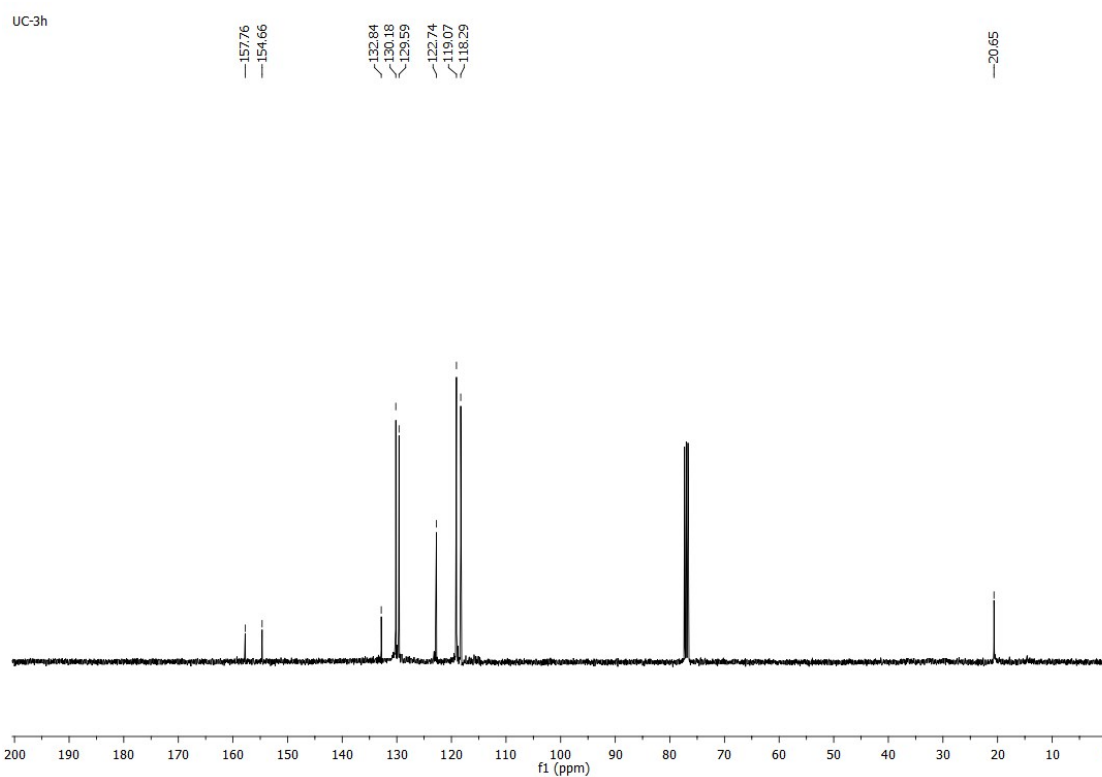


Figure S4. ^{13}C NMR spectrum of 1-methyl-4-phenoxybenzene (**3b**)

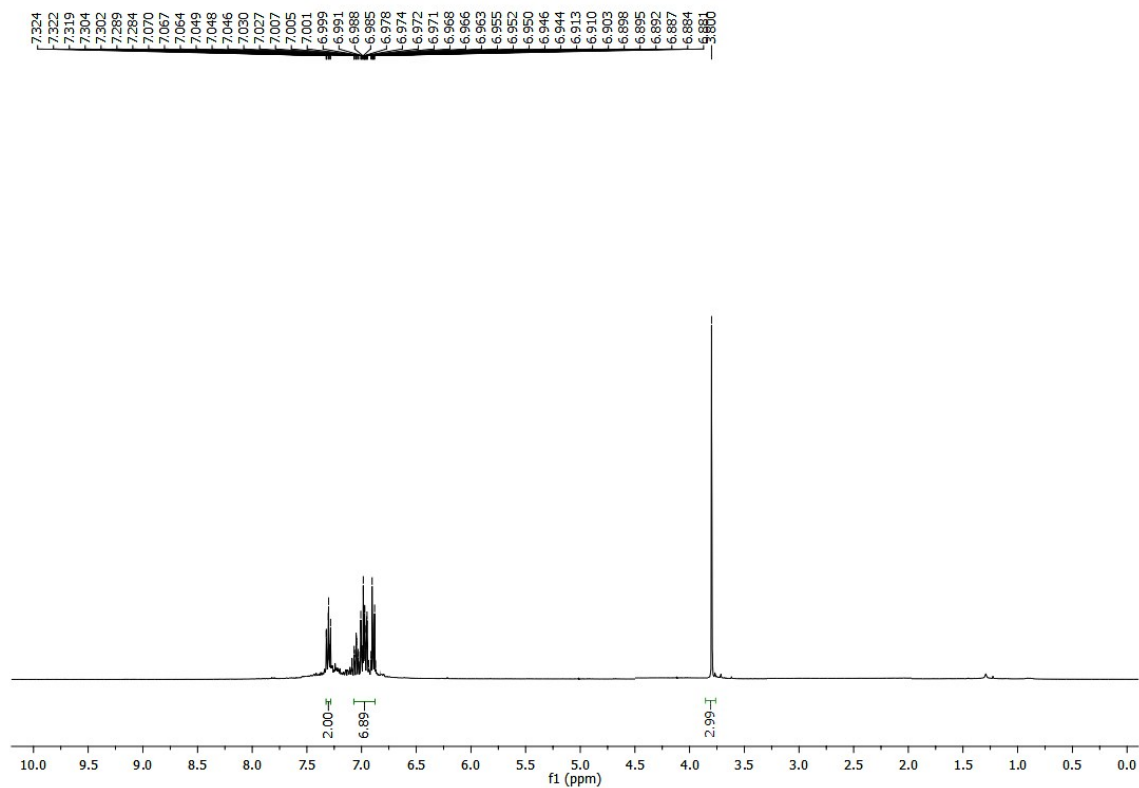


Figure S5. ¹H NMR spectrum of 1-methoxy-4-phenoxybenzene (3c)

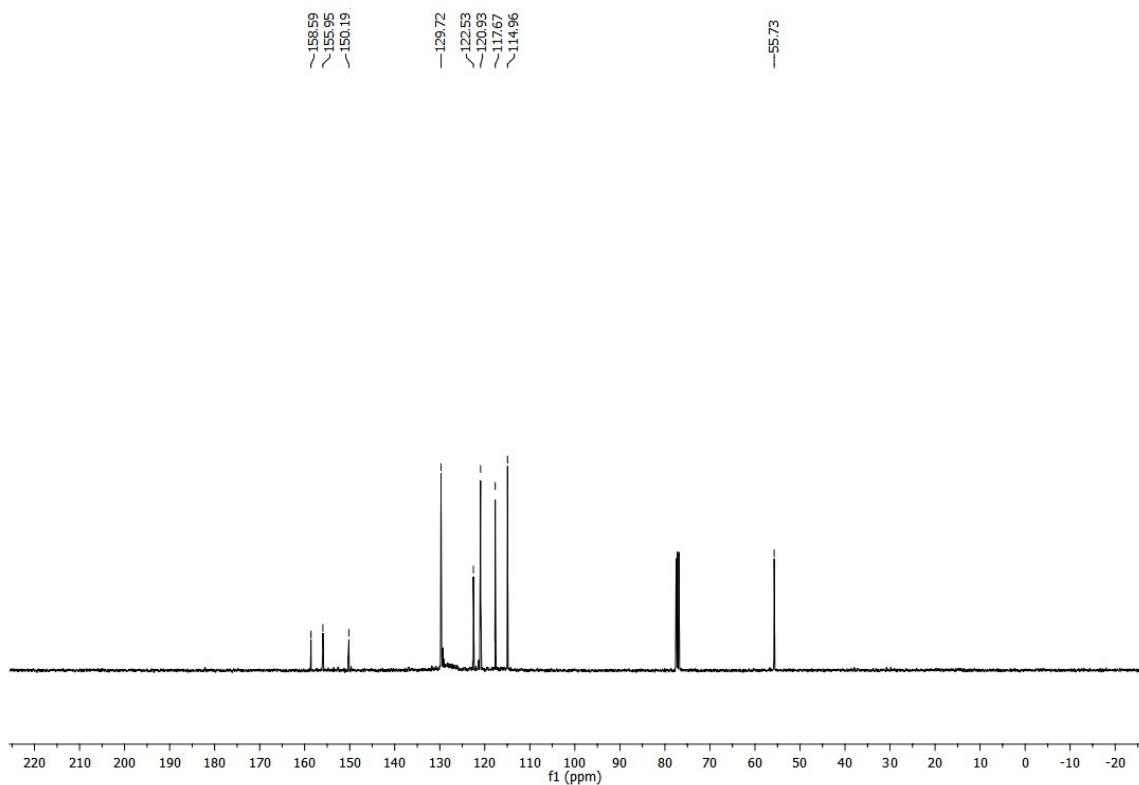


Figure S6. ¹³C NMR spectrum of 1-methoxy-4-phenoxybenzene (3c)

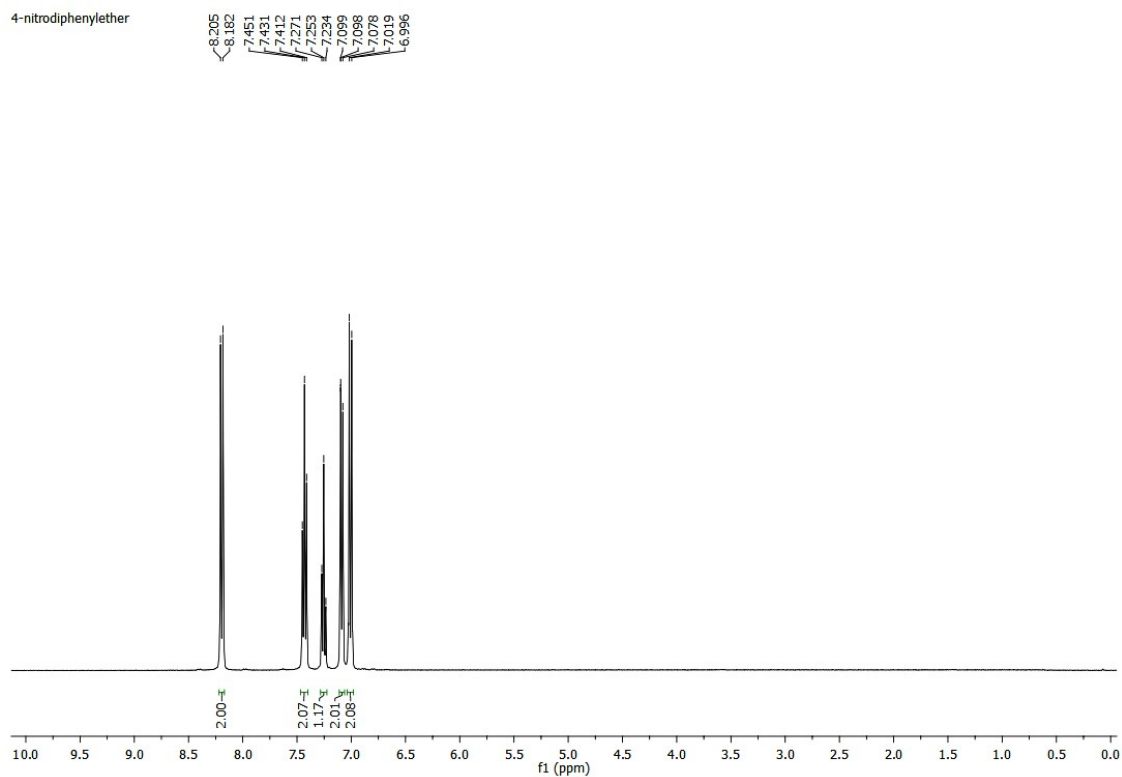


Figure S7. ^1H NMR spectrum of 1-nitro-4-phenoxybenzene (**3d**)

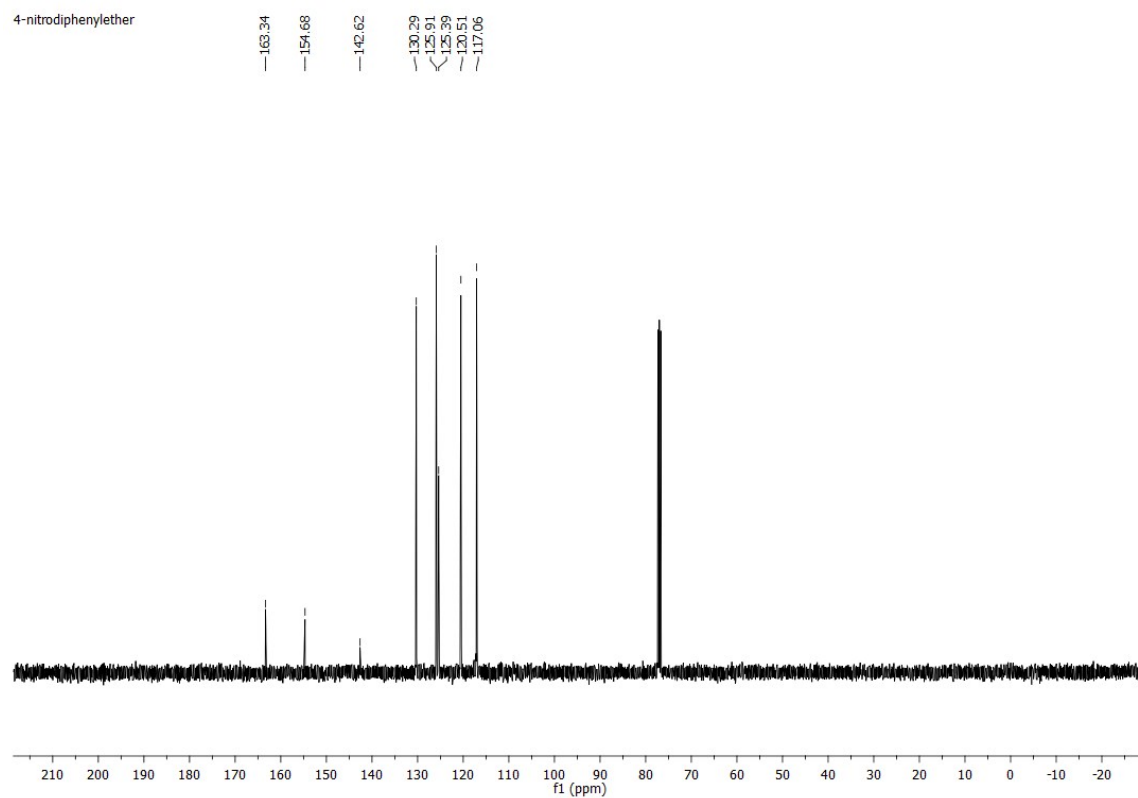


Figure S8. ^{13}C NMR spectrum of 1-nitro-4-phenoxybenzene (**3d**)

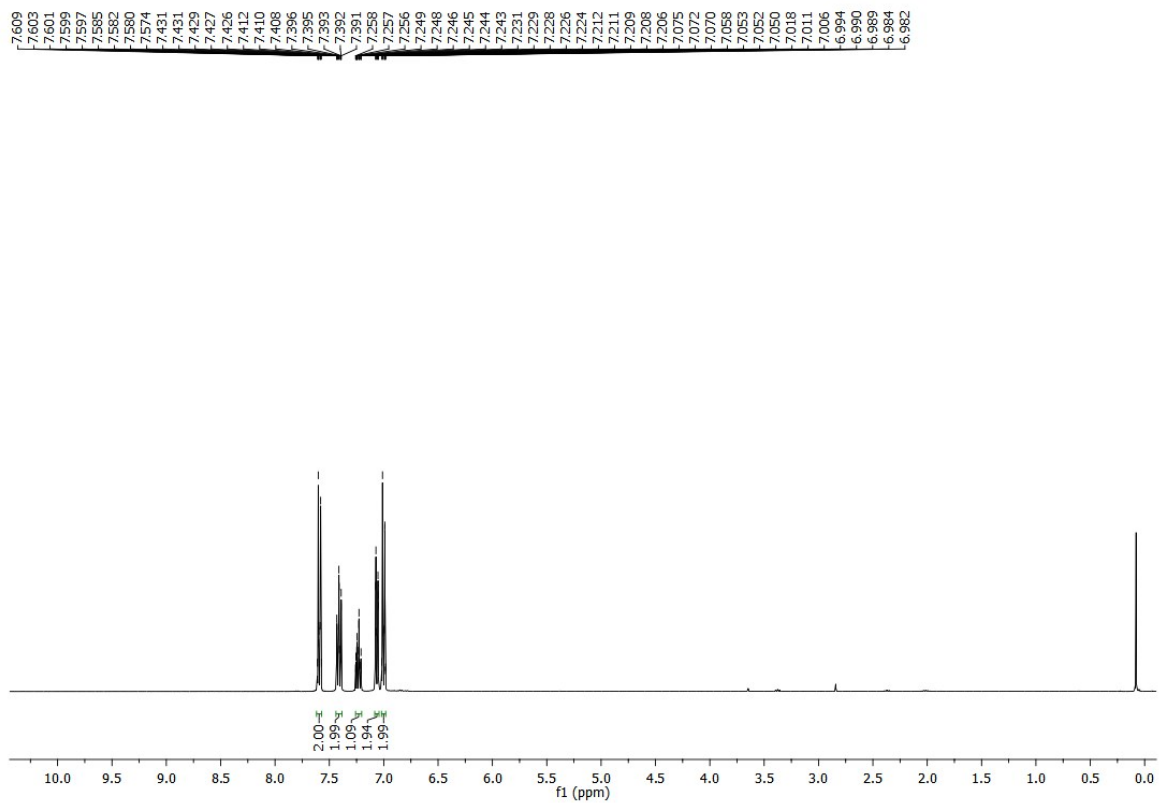


Figure S9. ^1H NMR spectrum of 4-phenoxybenzonitrile (**3e**)

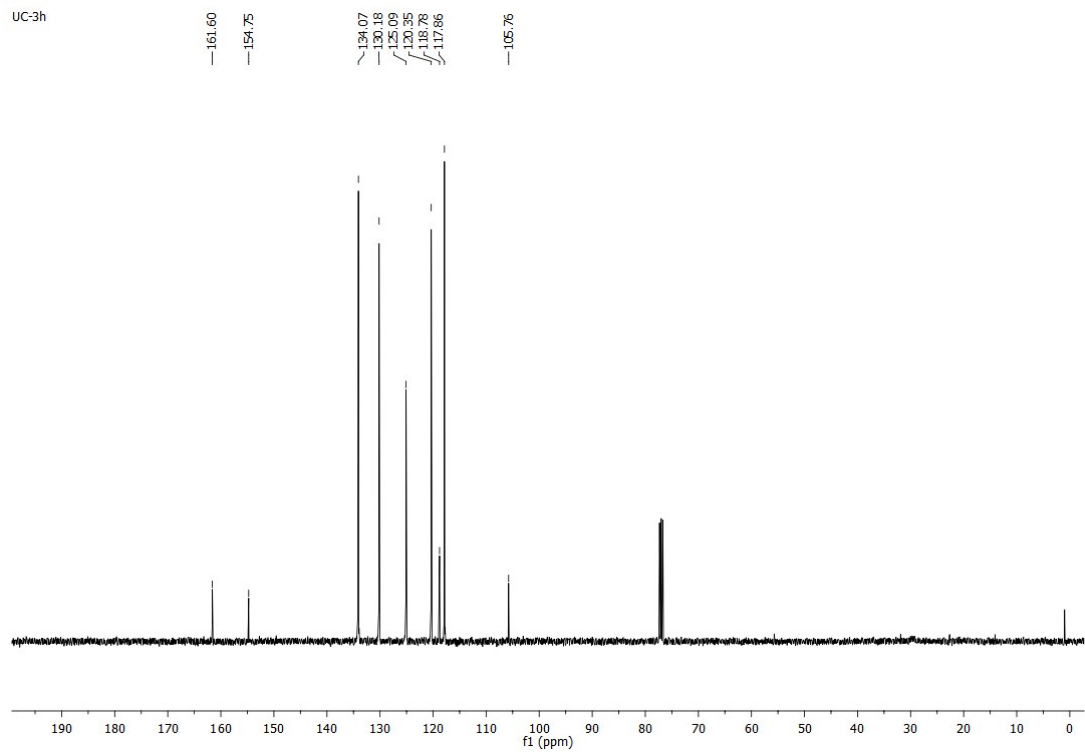


Figure S10. ^{13}C NMR spectrum of 4-phenoxybenzonitrile (**3e**)

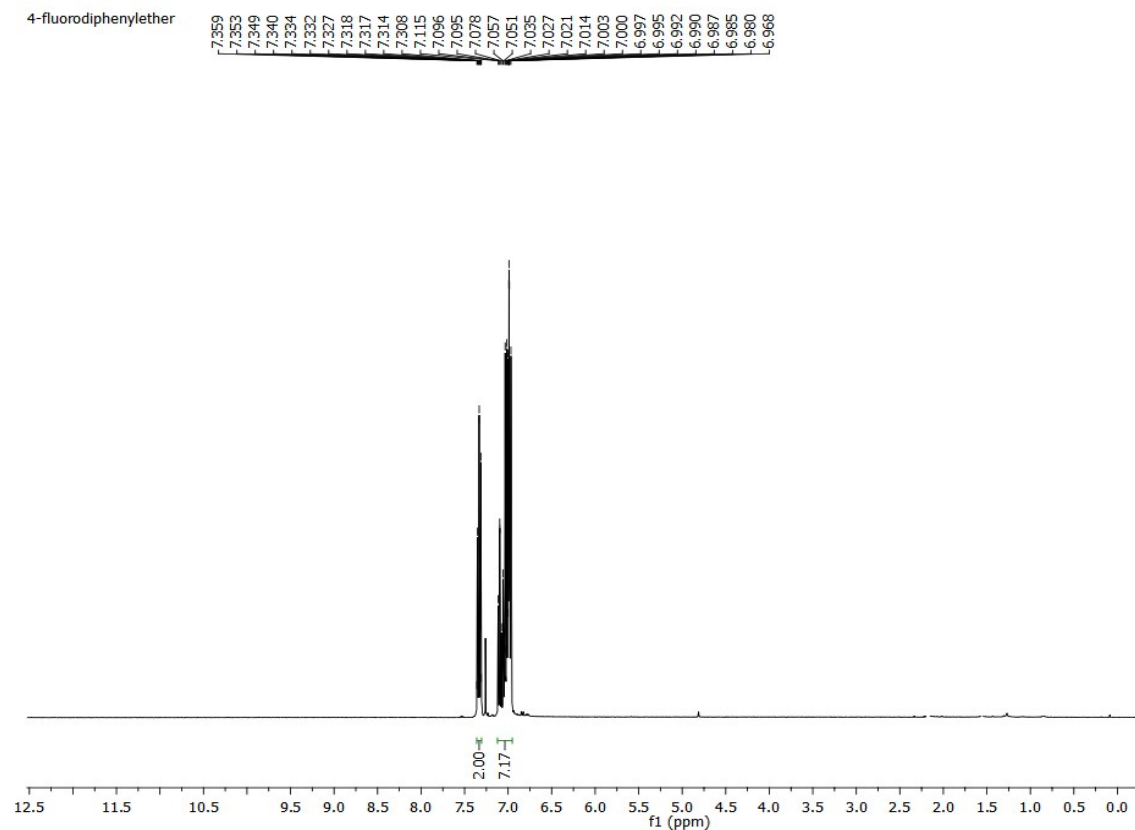


Figure S11. ¹H NMR spectrum of 1-fluoro-4-phenoxybenzene (**3f**)

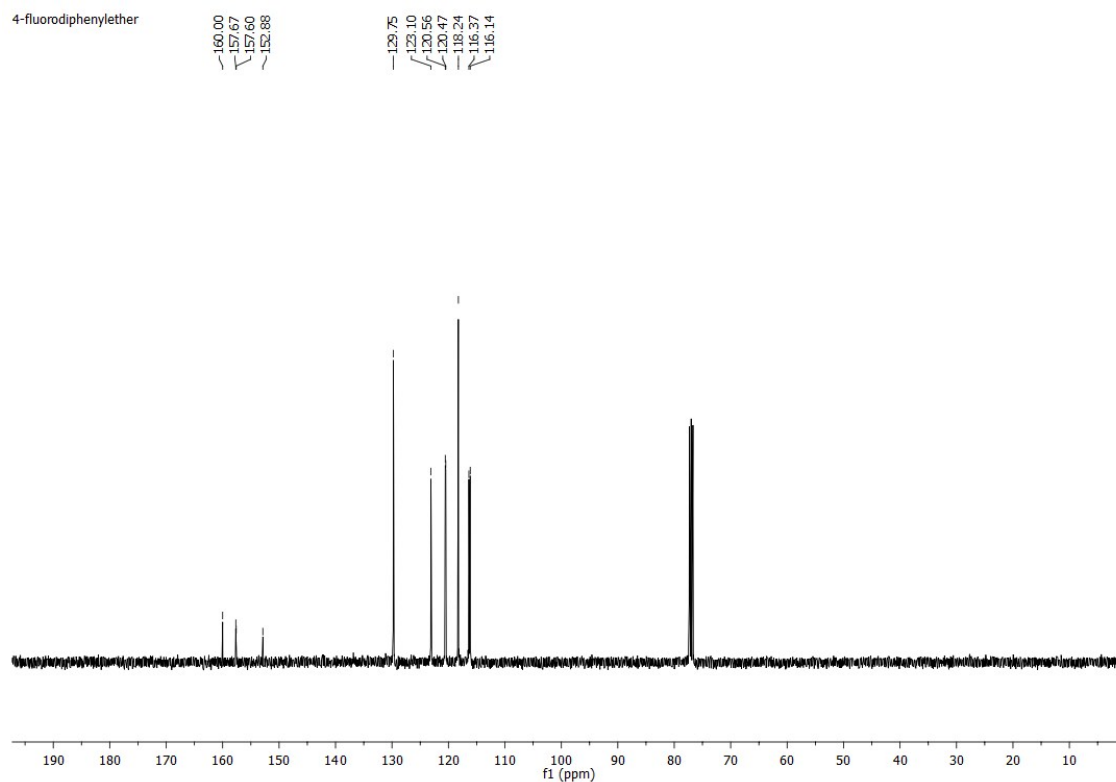


Figure S12. ¹³C NMR spectrum of 1-fluoro-4-phenoxybenzene (**3f**)

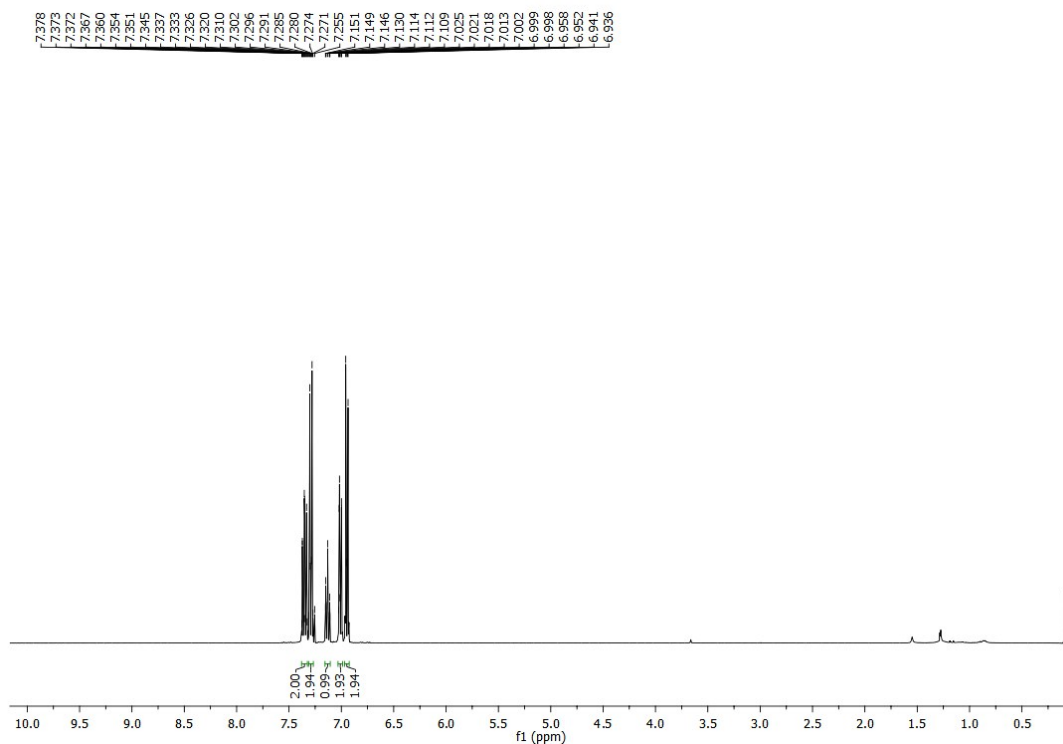


Figure S13. ¹H NMR spectrum of 1-chloro-4-phenoxybenzene (**3g**)

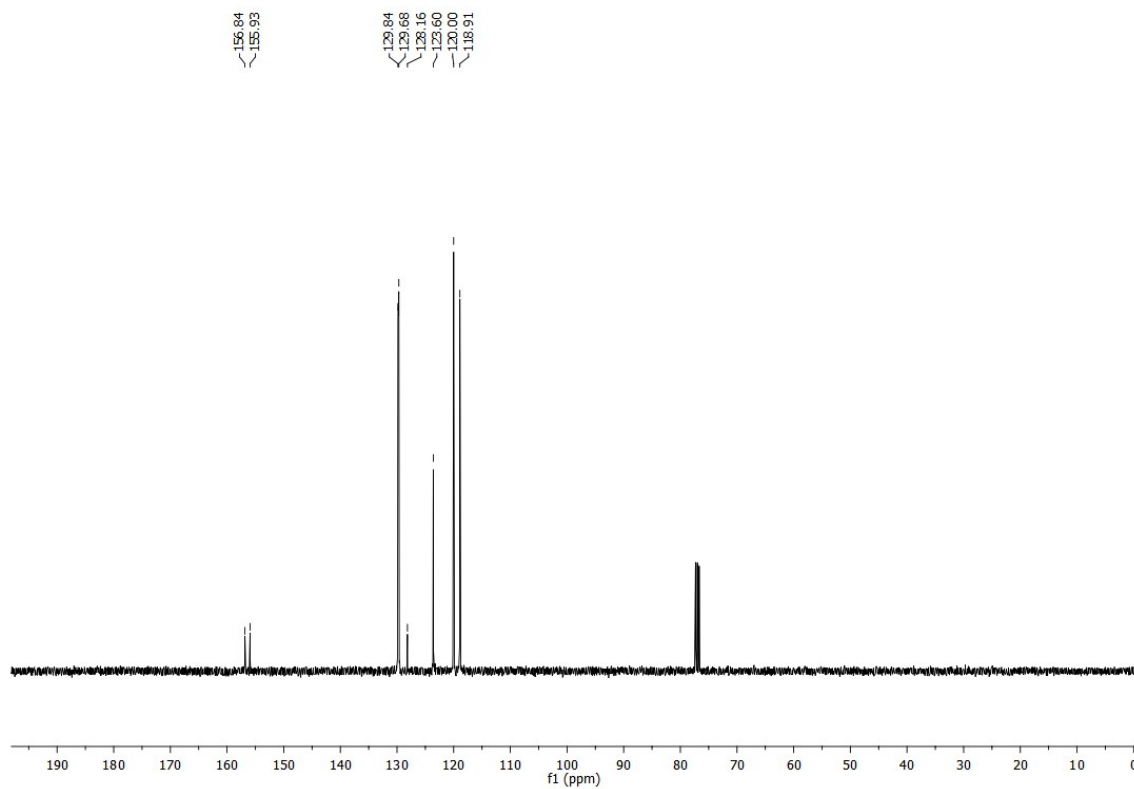


Figure S14. ¹³C NMR spectrum of 1-chloro-4-phenoxybenzene (**3g**)

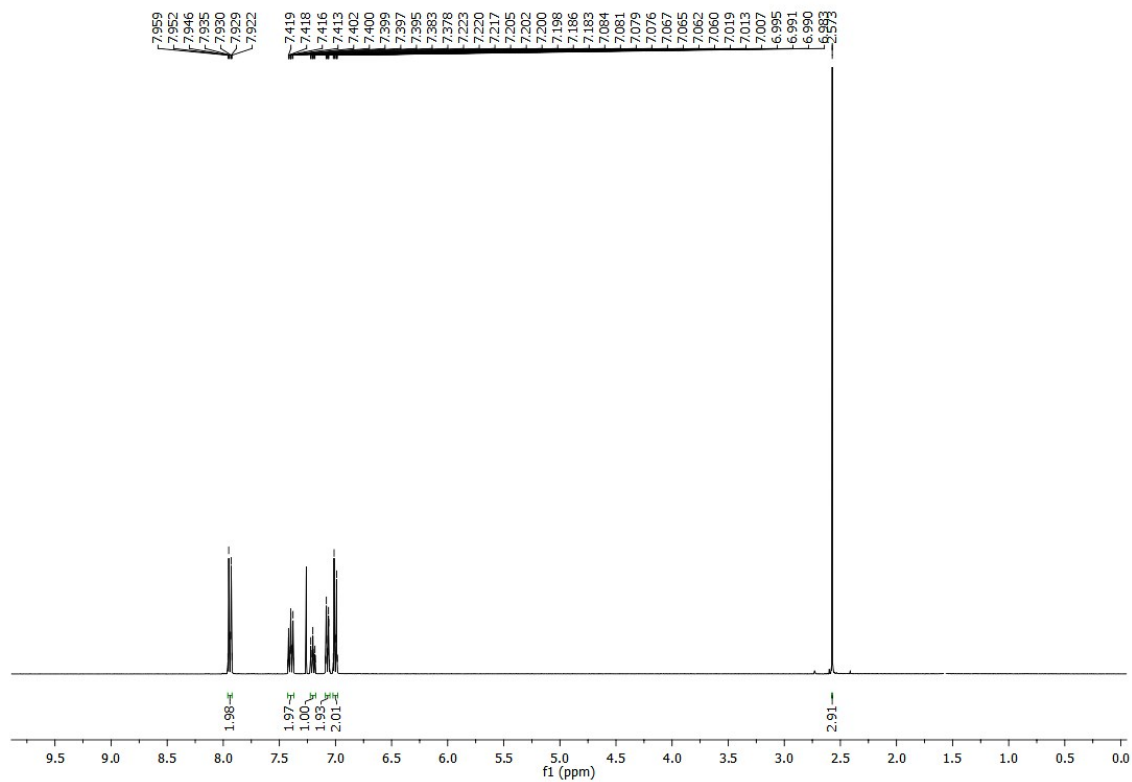


Figure S15. ¹H NMR spectrum of 1-(4-phenoxyphenyl)ethanone (**3h**)

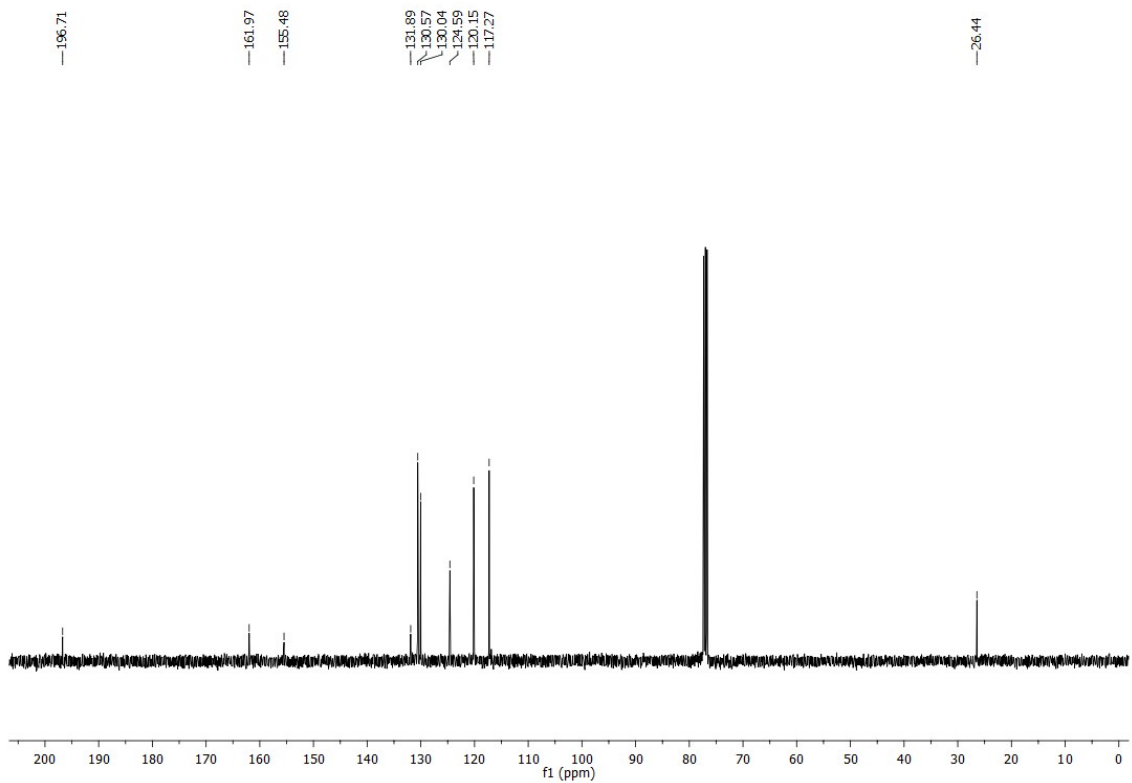


Figure S16. ¹³C NMR spectrum of 1-(4-phenoxyphenyl)ethanone (**3h**)

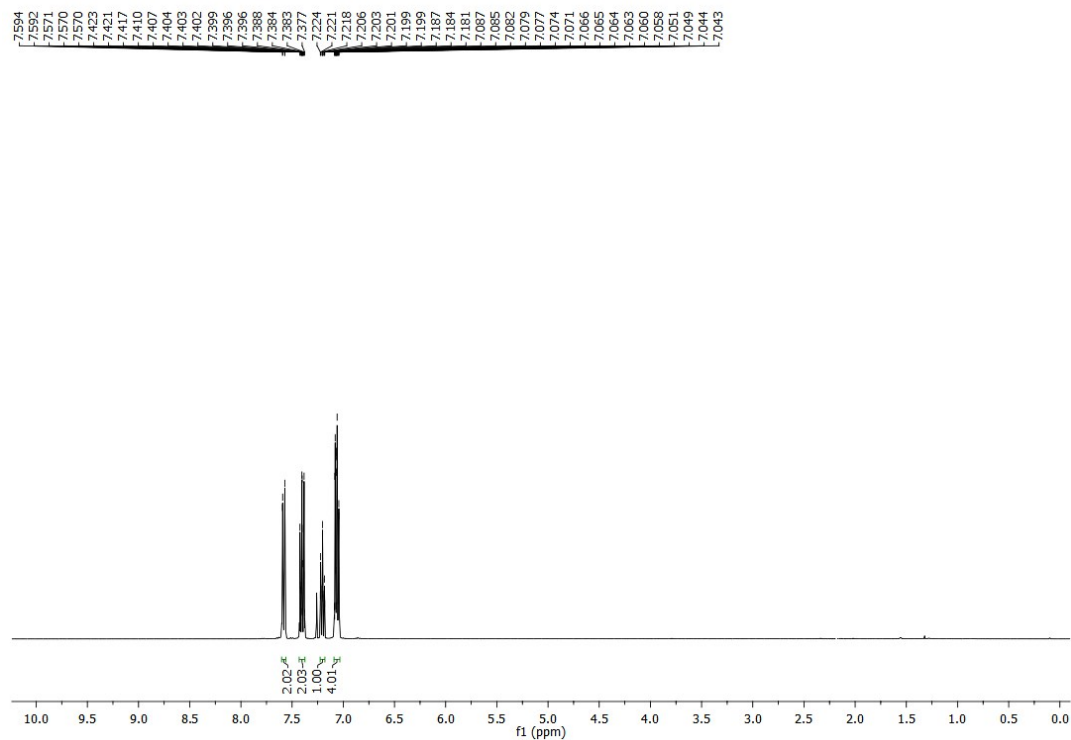


Figure S17. ¹H NMR spectrum of 1-trifluoromethyl-4-phenoxybenzene (**3i**)

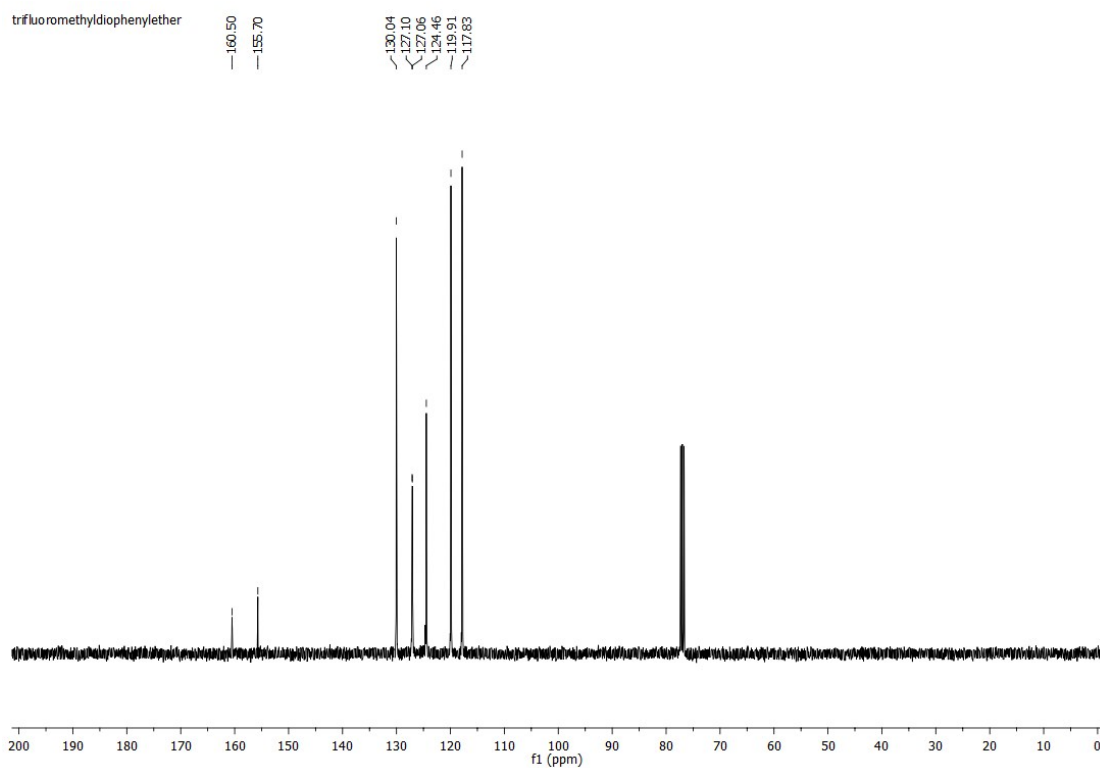


Figure S18. ¹³C NMR spectrum of 1-trifluoromethyl-4-phenoxybenzene (**3i**)

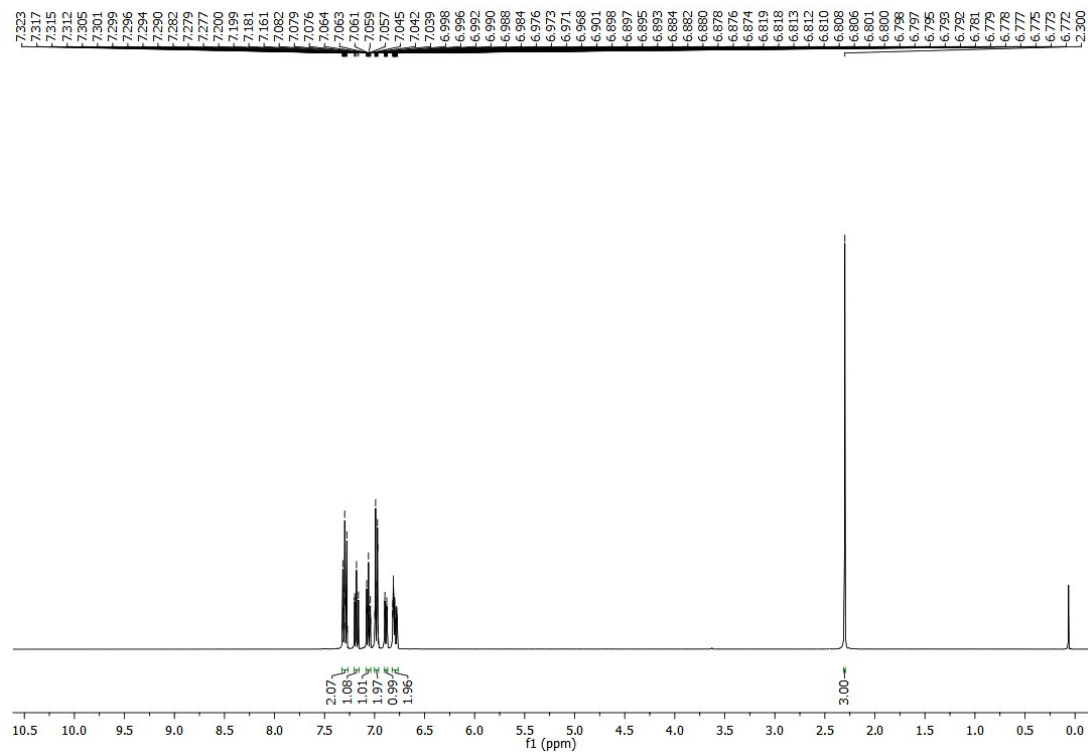


Figure S19. ¹H NMR spectrum of 1-methyl-3-phenoxybenzene (**3j**)

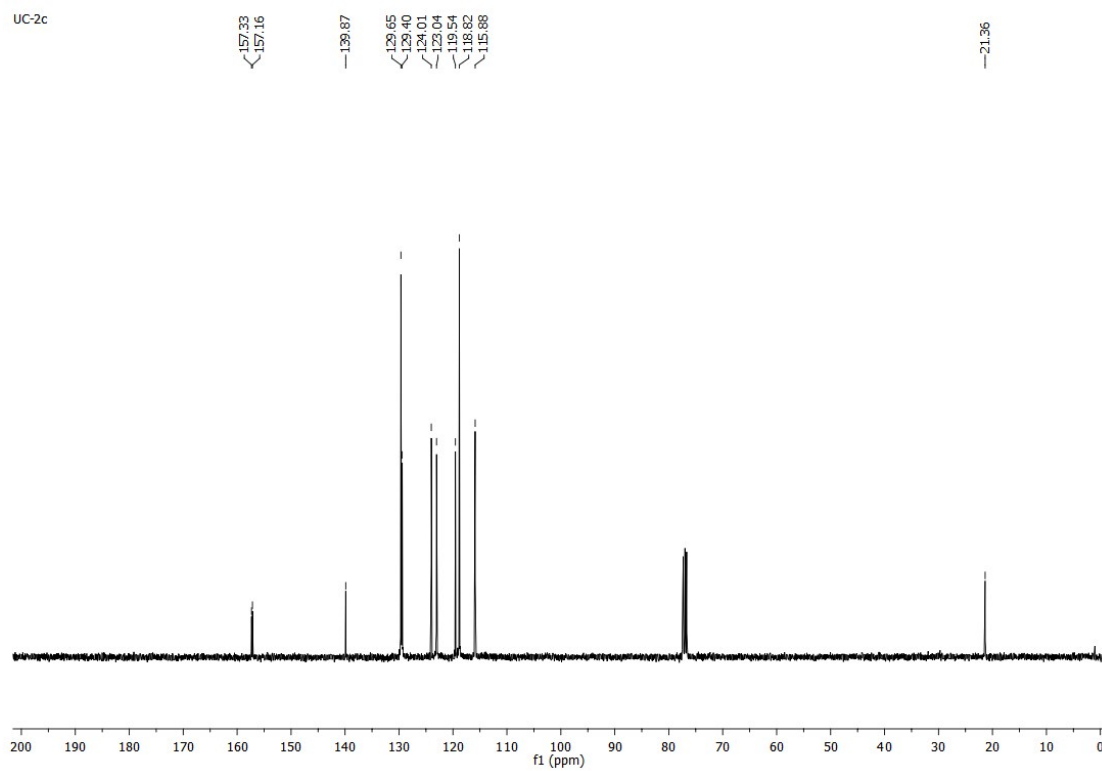


Figure S20. ¹³C NMR spectrum of 1-methyl-3-phenoxybenzene (**3j**)

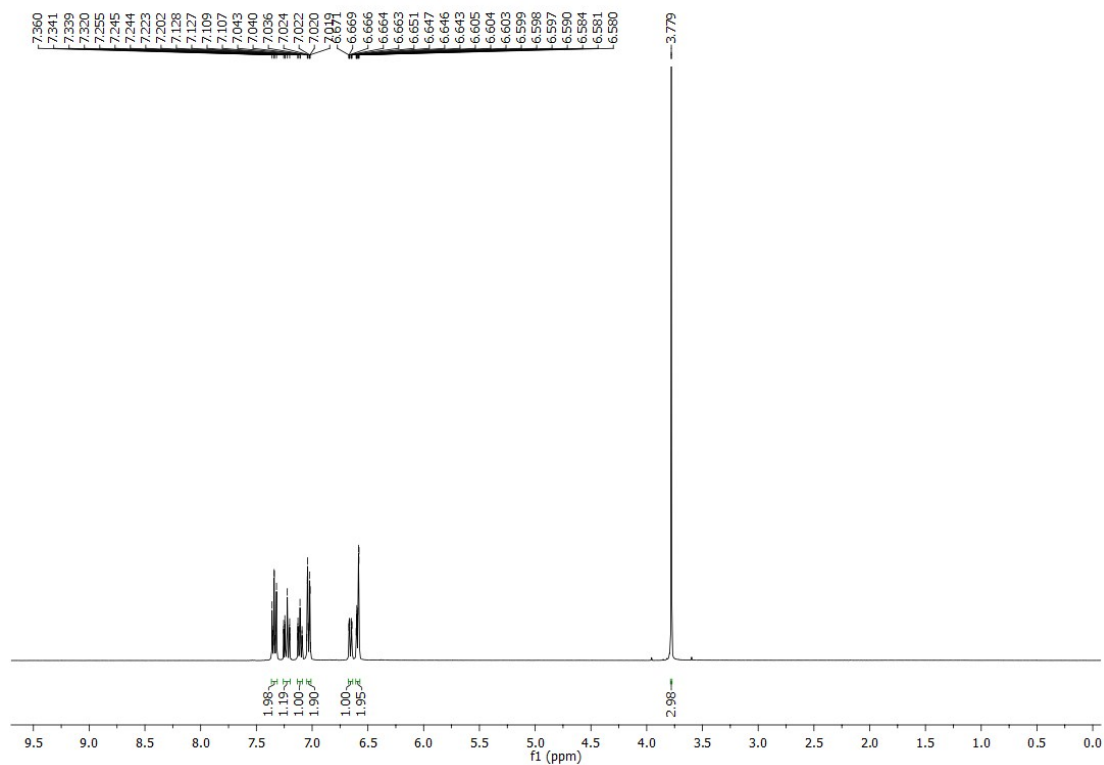


Figure S21. ¹H NMR spectrum of 1-methoxy-3-phenoxybenzene (3k)

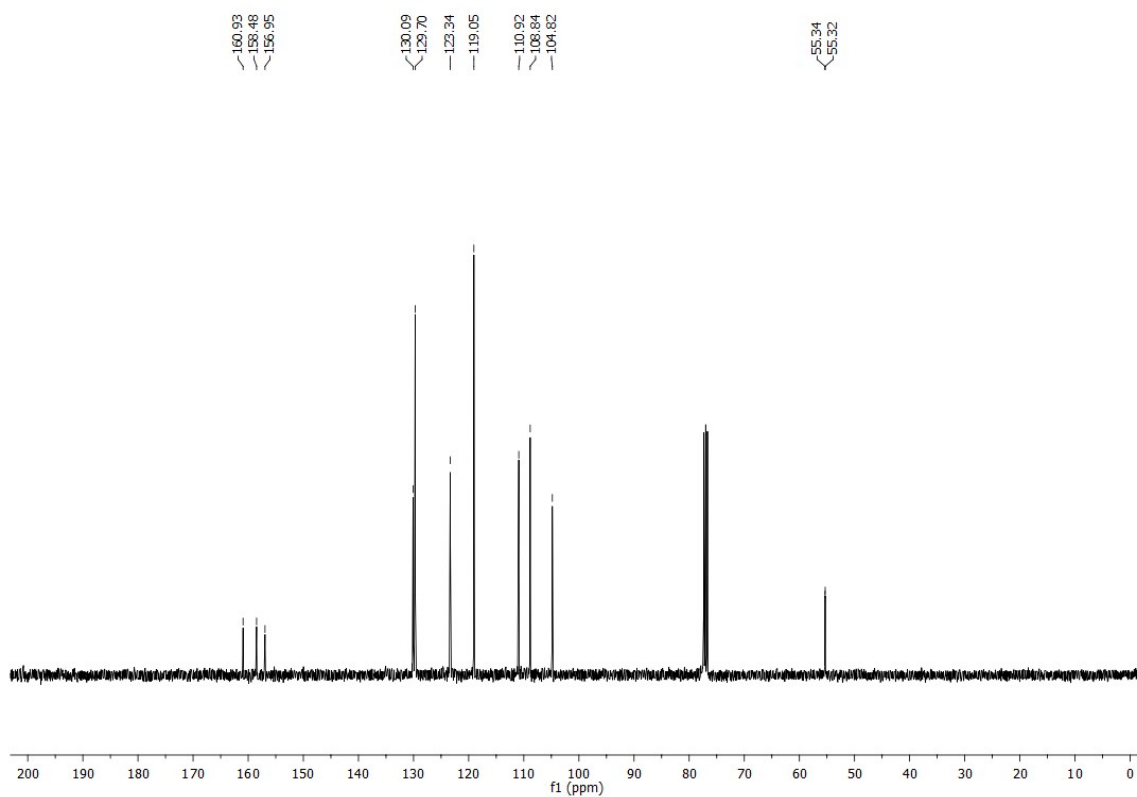


Figure S22. ¹³C NMR spectrum of 1-methoxy-3-phenoxybenzene (3k)

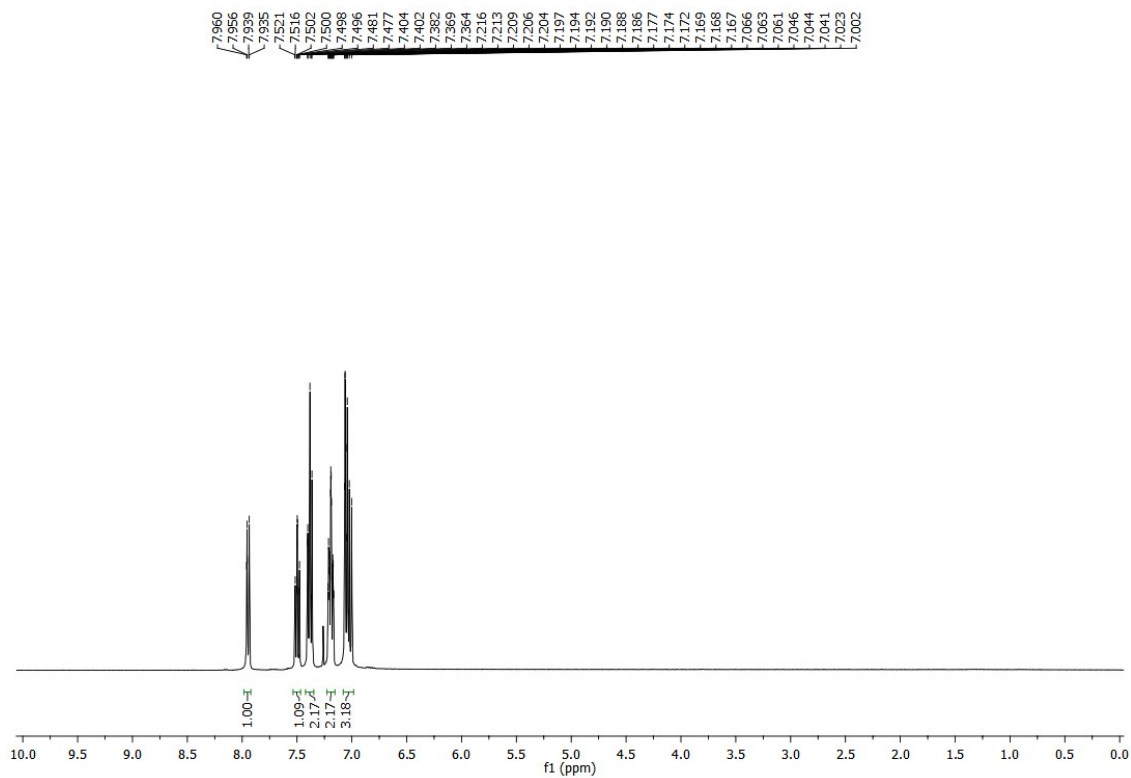


Figure S23. ¹H NMR spectrum of 1-nitro-2-phenoxybenzene (3I)

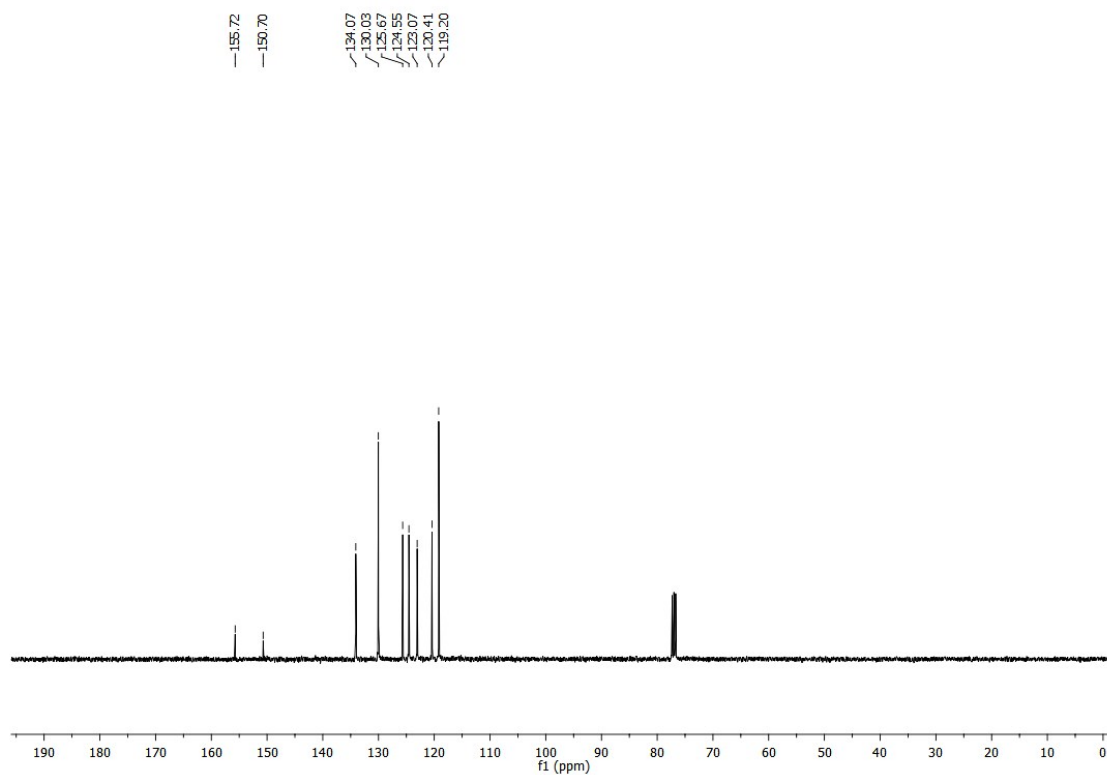


Figure S24. ¹³C NMR spectrum of 1-nitro-2-phenoxybenzene (3I)

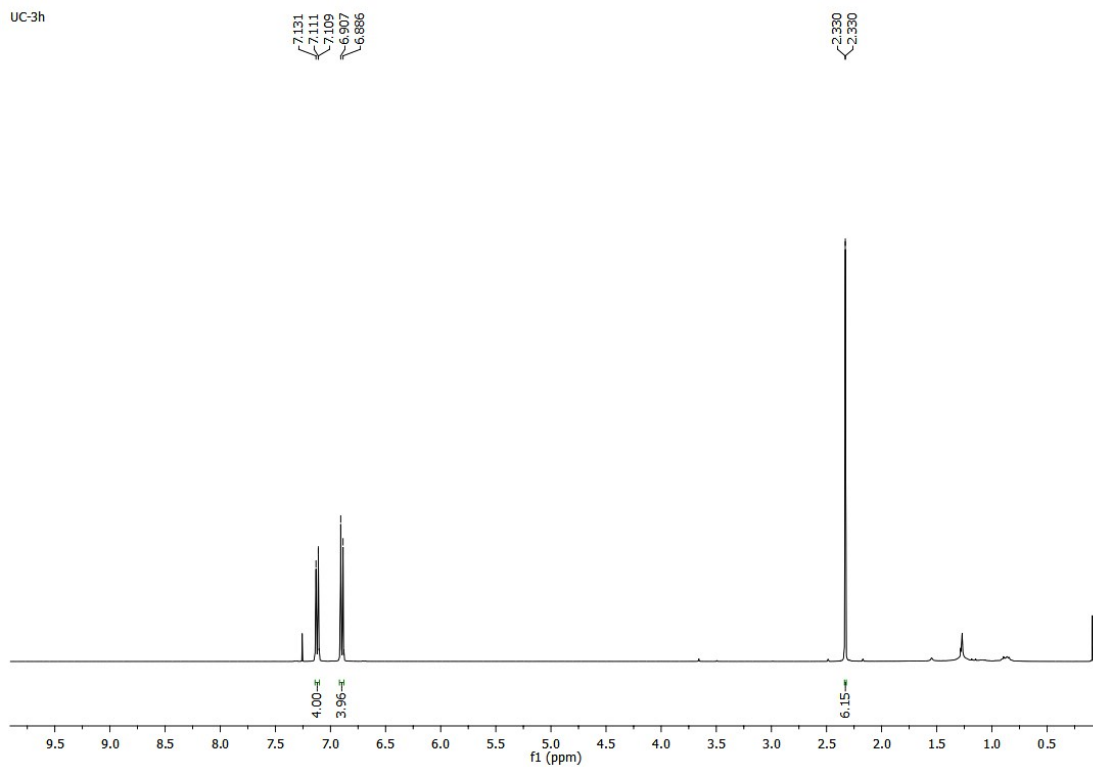


Figure S25. ^1H NMR spectrum of 1-(*p*-tolylloxy)-4-methylbenzene (**3m**)

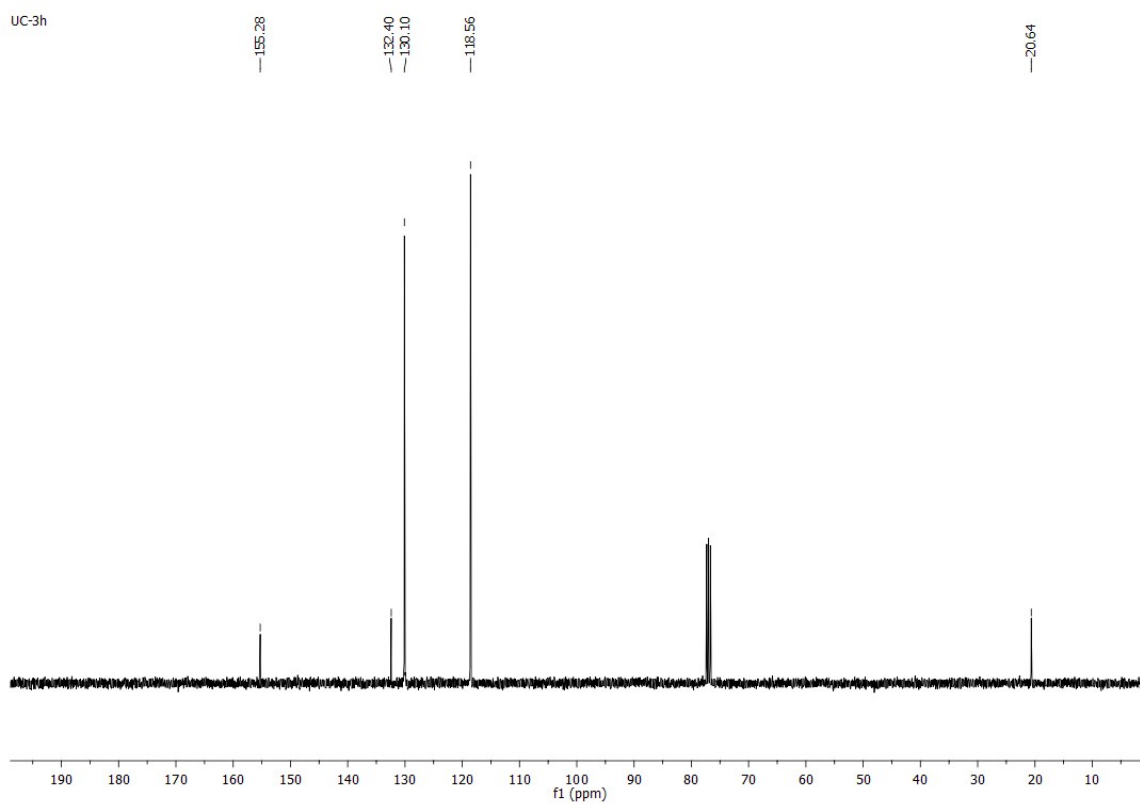


Figure S26. ^{13}C NMR spectrum of 1-(*p*-tolylloxy)-4-methylbenzene (**3m**)

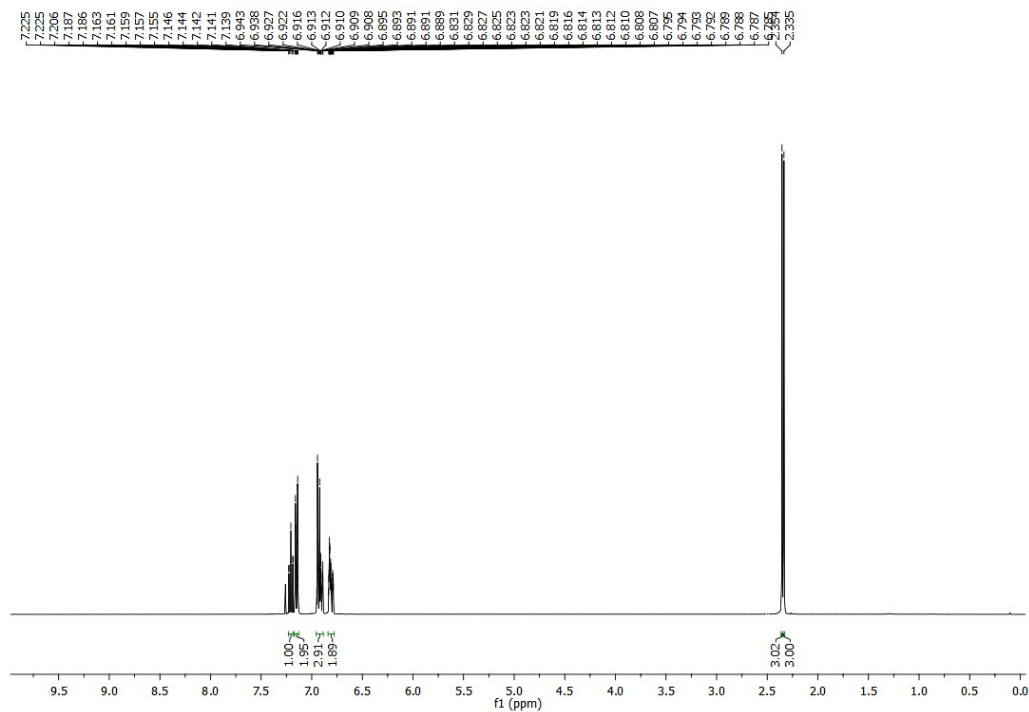


Figure S27. ¹H NMR spectrum of 1-(*p*-tolylloxy)-3-methylbenzene (**3n**)

3,4'-dimethyldiphenylether

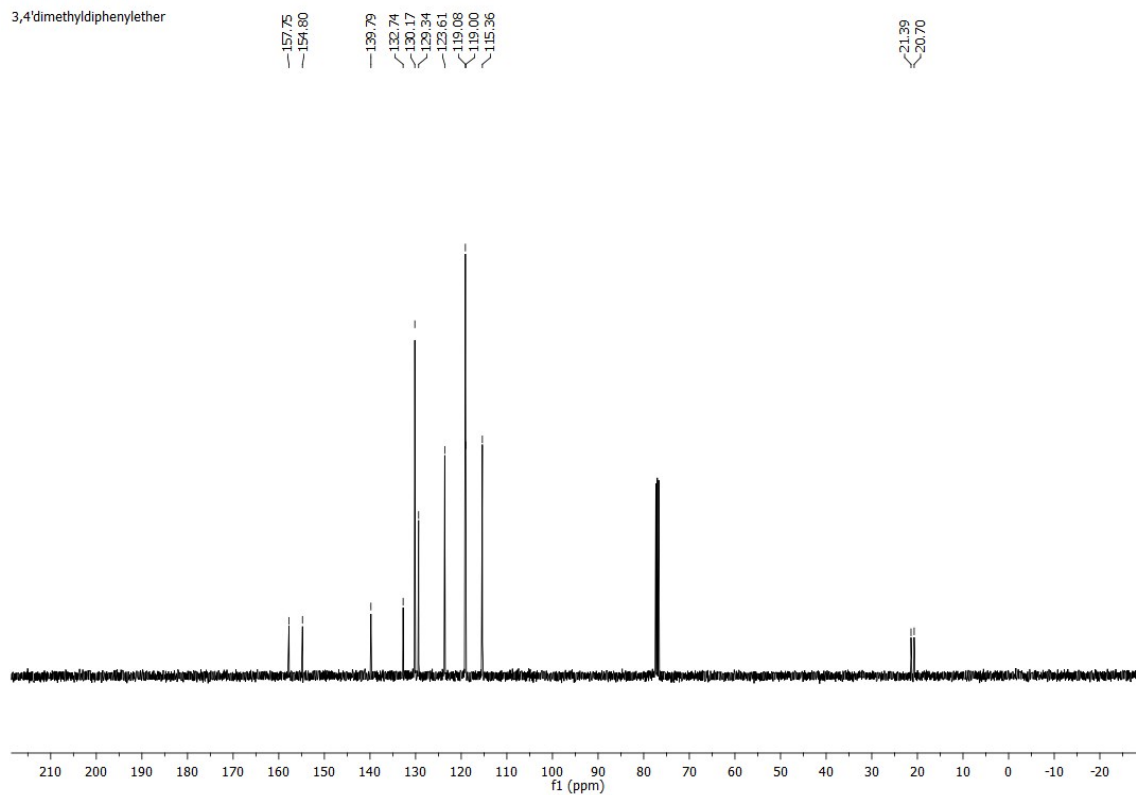


Figure S28. ¹³C NMR spectrum of 1-(*p*-tolylloxy)-3-methylbenzene (**3n**)

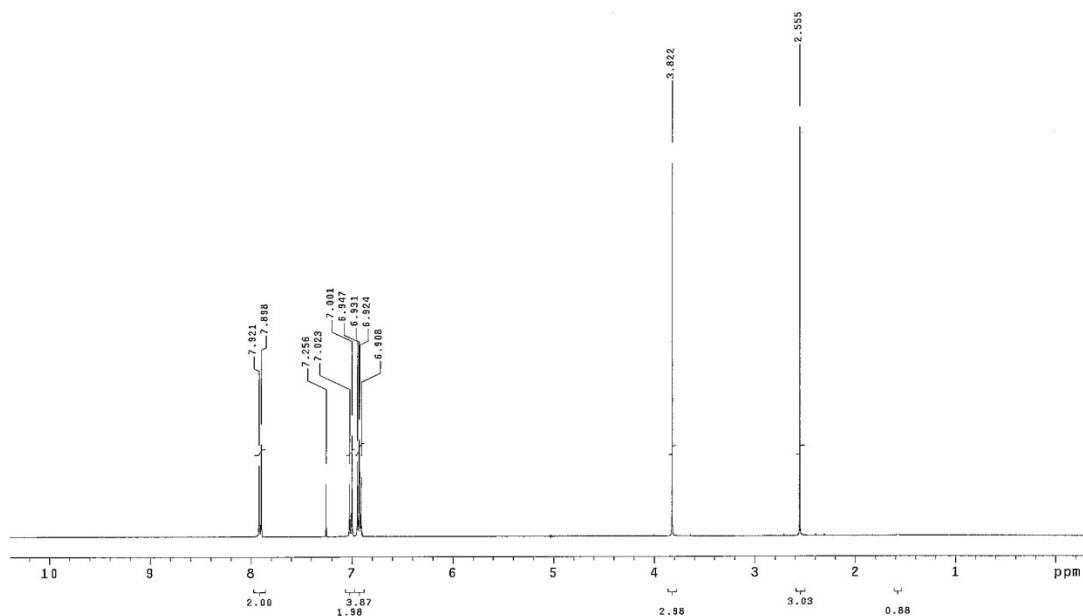


Figure S29. ^1H NMR spectrum of 1-(4-(4-methoxyphenoxy)phenyl)ethanone (**30**)

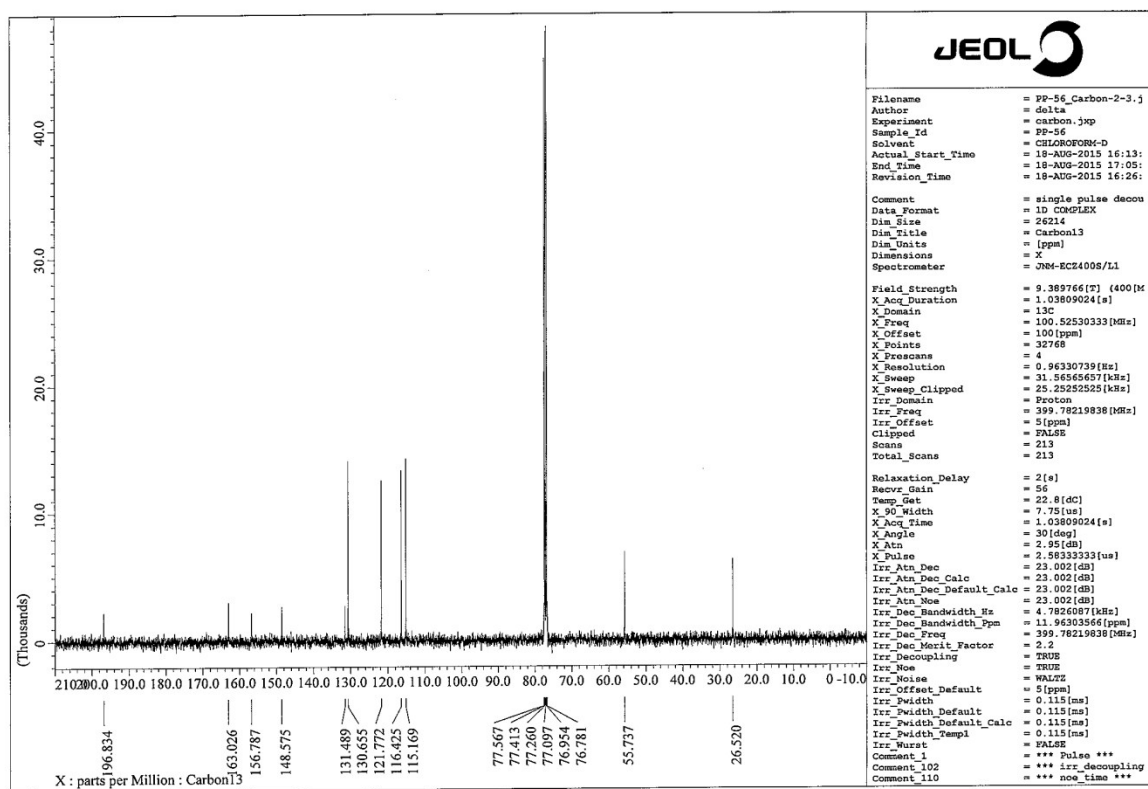


Figure S30. ^{13}C NMR spectrum of 1-(4-(4-methoxyphenoxy)phenyl)ethanone (**30**)

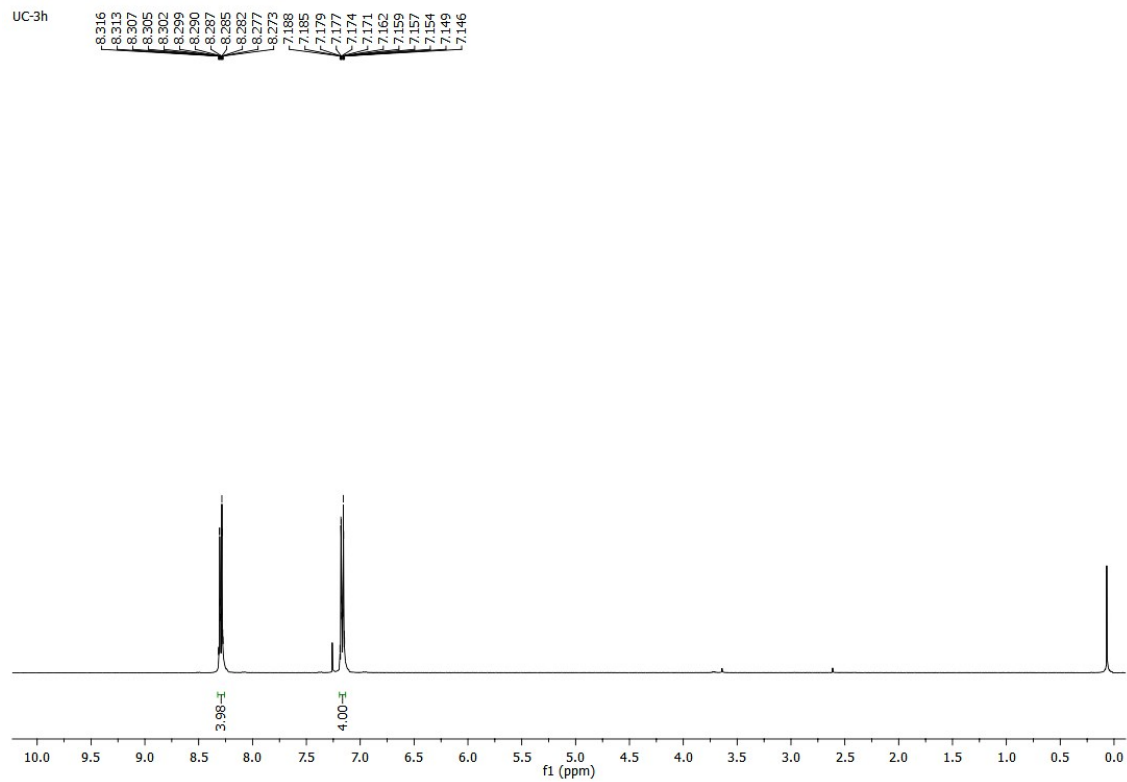


Figure S31. ¹H NMR spectrum of 1-(4-nitrophenoxy)-4-nitrobenzene (**3p**)

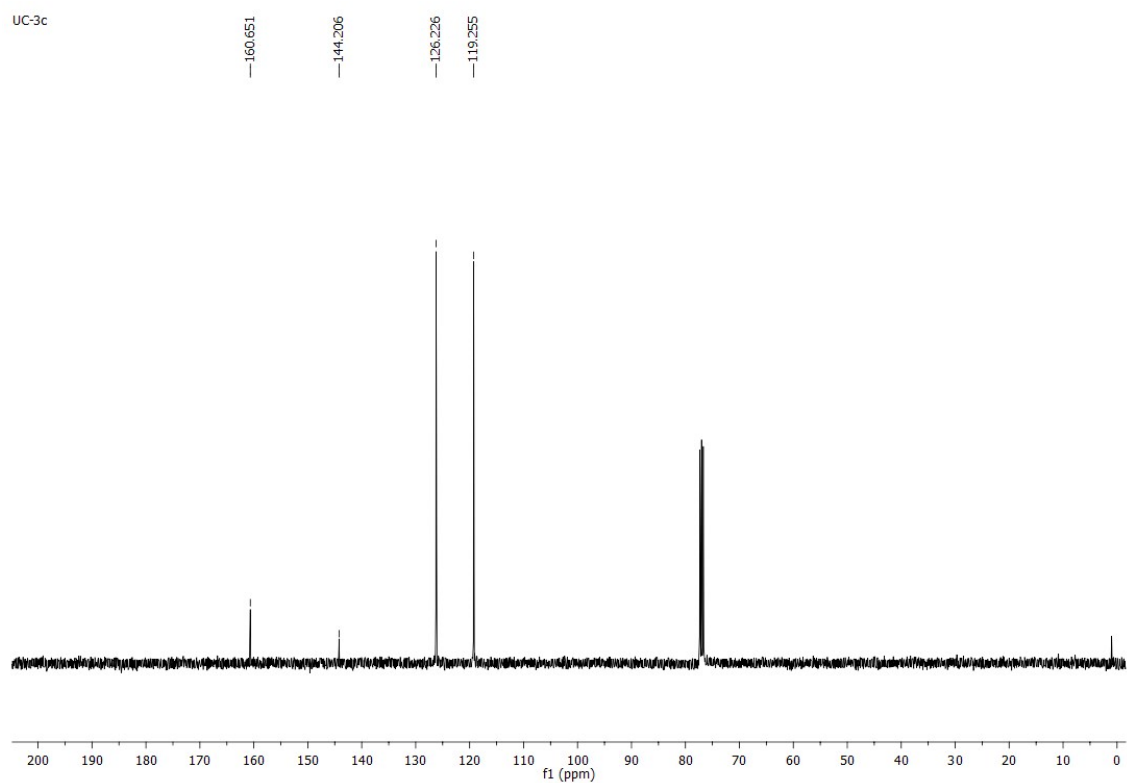


Figure S32. ¹³C NMR spectrum of 1-(4-nitrophenoxy)-4-nitrobenzene (**3p**)

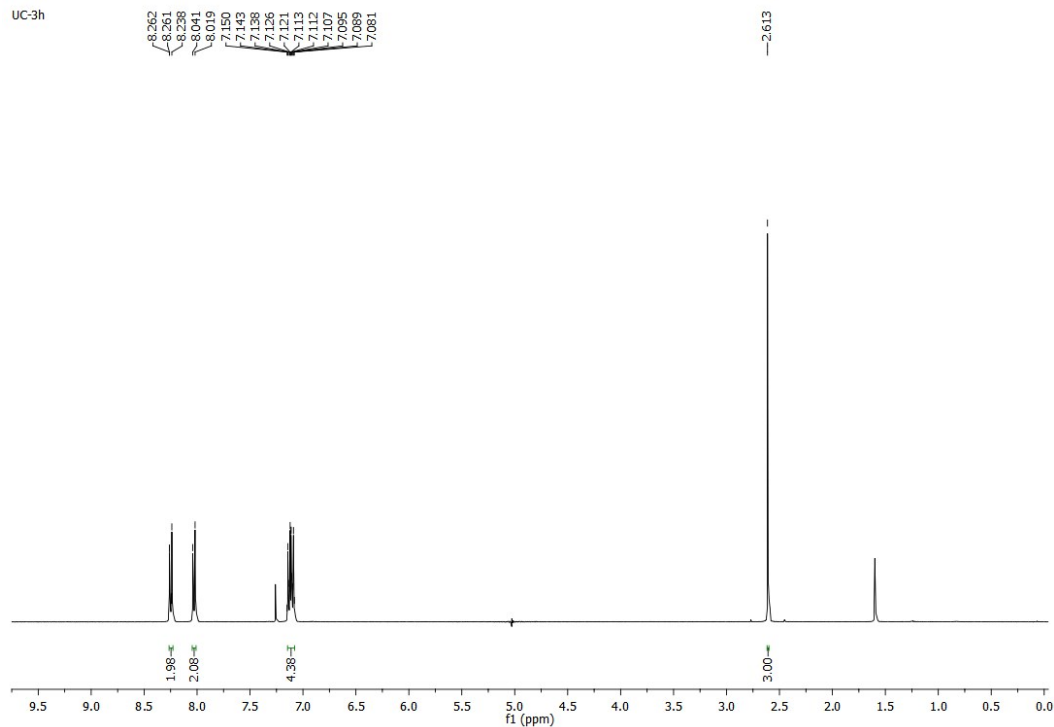


Figure S33. ^1H NMR spectrum of 1-(4-(4-nitrophenoxy)phenyl)ethanone (**3q**)

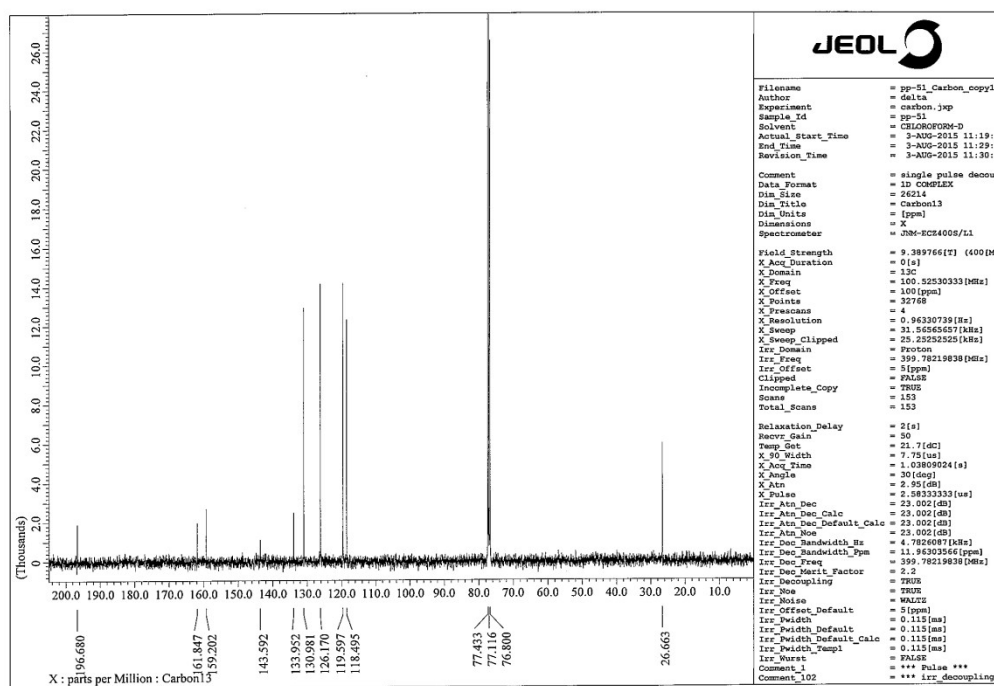


Figure S34. ^{13}C NMR spectrum of 1-(4-(4-nitrophenoxy)phenyl)ethanone (**3q**)

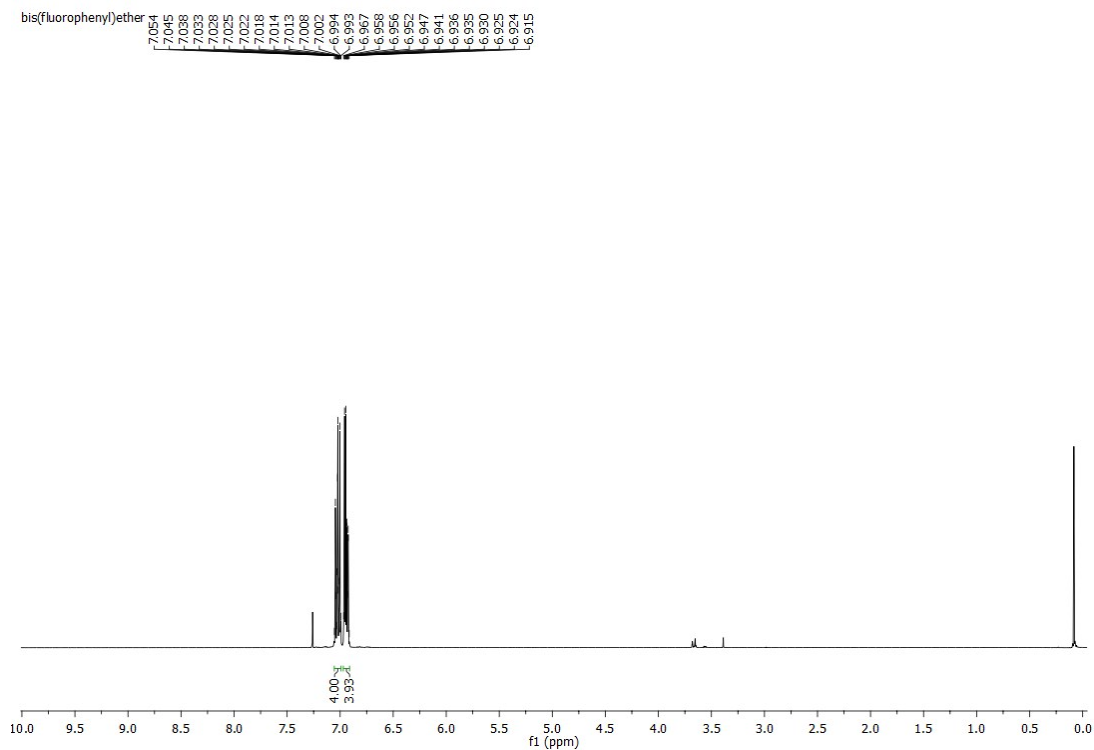


Figure S35. ^1H NMR spectrum of 1-(4-fluorophenoxy)-4-fluorobenzene (**3r**)

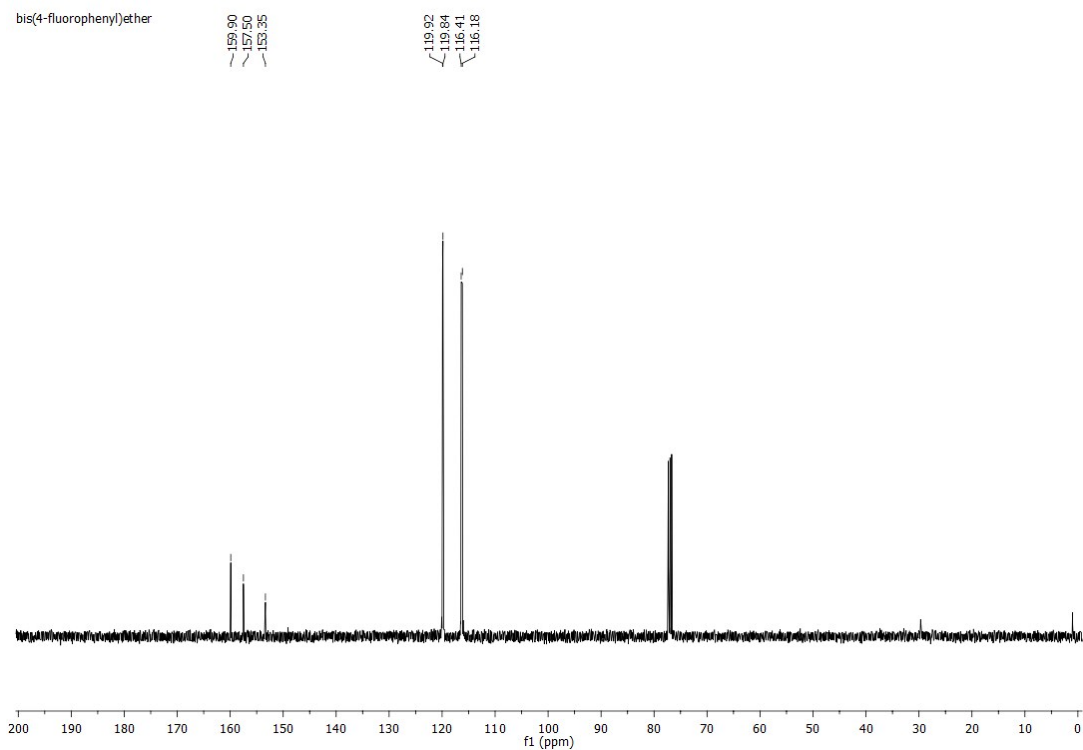


Figure S36. ^{13}C NMR spectrum of 1-(4-fluorophenoxy)-4-fluorobenzene (**3r**)

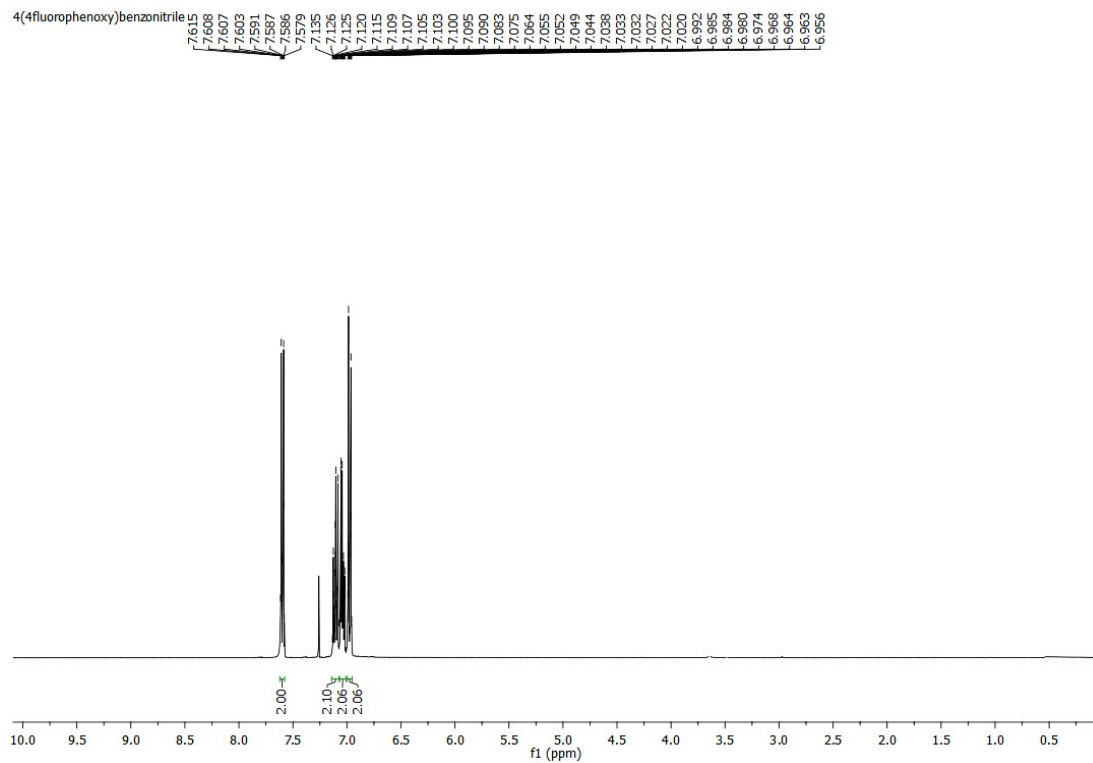


Figure S37. ^1H NMR spectrum of 4-(4-fluorophenoxy)benzonitrile (**3s**)

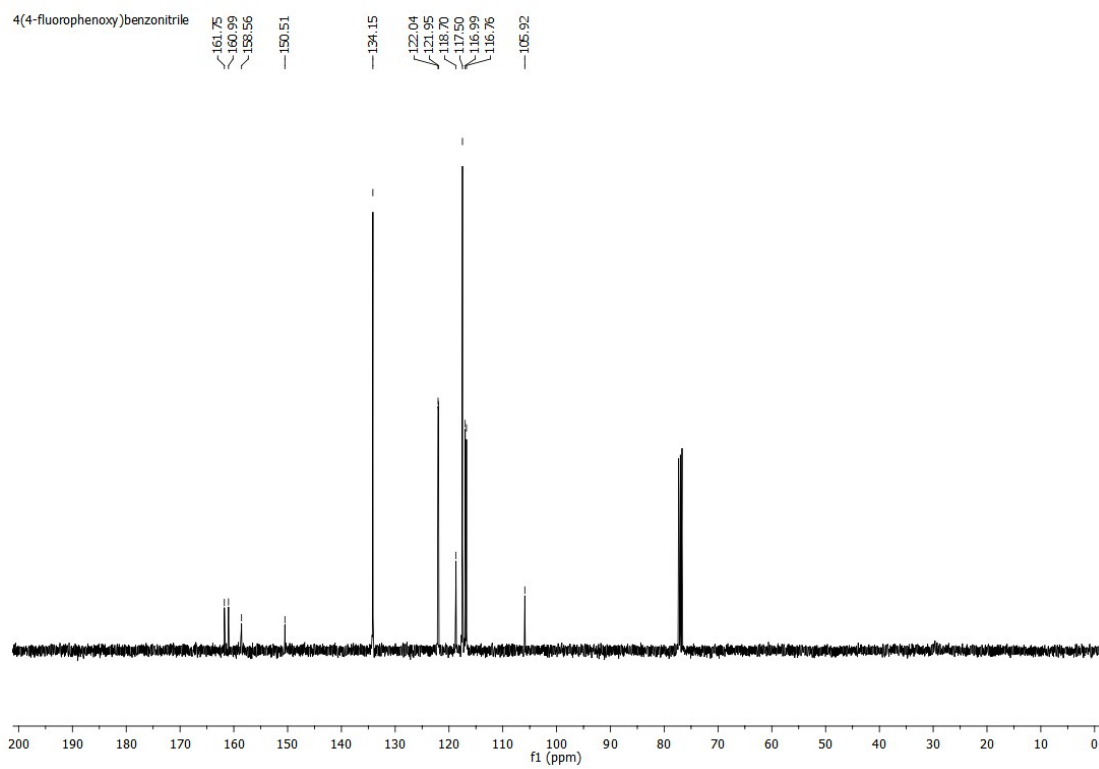


Figure S38. ^{13}C NMR spectrum of 4-(4-fluorophenoxy)benzonitrile (**3s**)

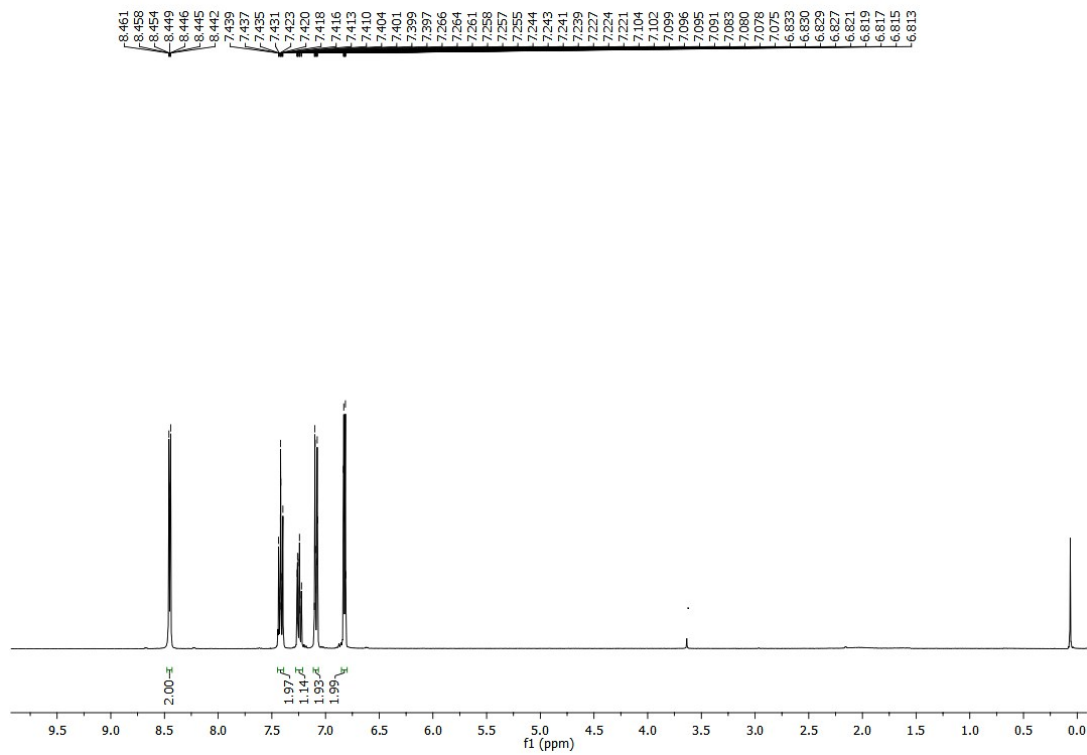


Figure S39. ^1H NMR spectrum of 4-phenoxyphenylpyridine (**3t**)

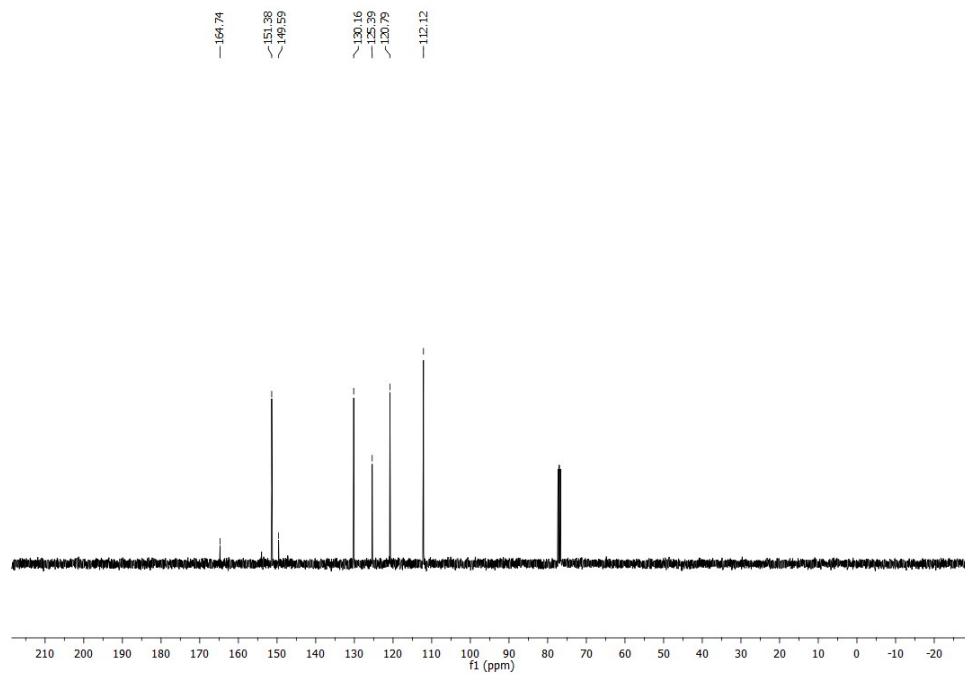


Figure S40. ^{13}C NMR spectrum of 4-phenoxyphenylpyridine (**3t**)

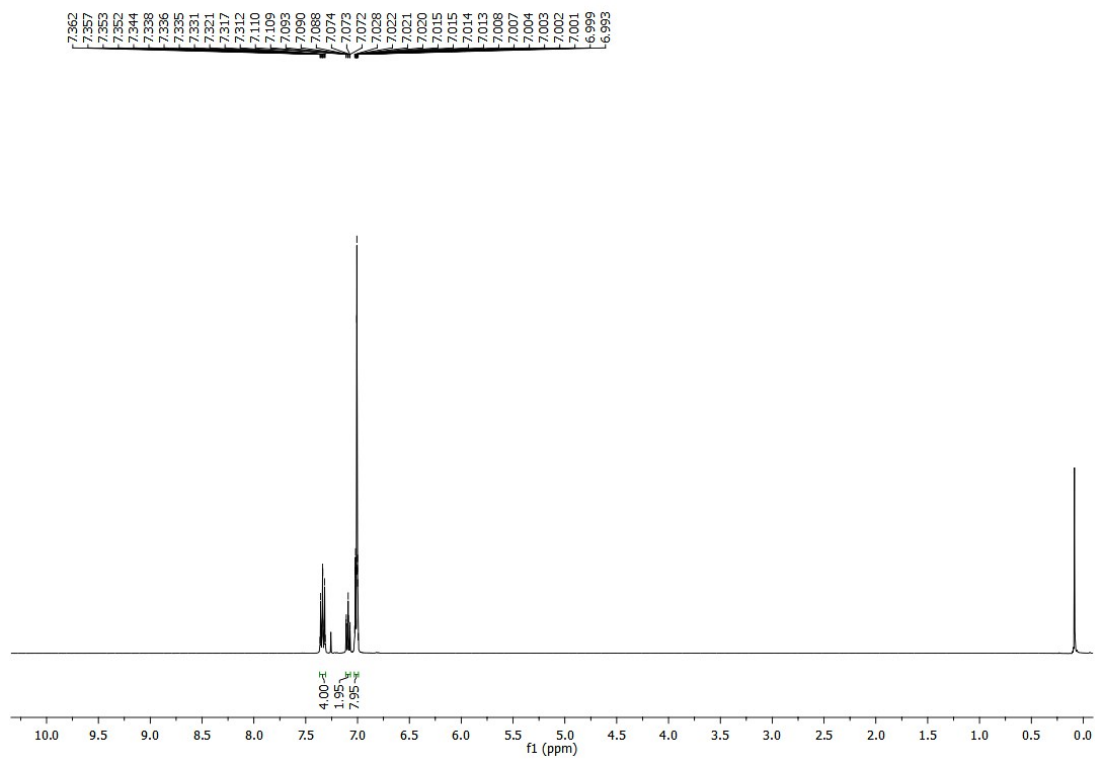


Figure S41. ¹H NMR spectrum of 1,4-diphenoxybenzene (**3u**)

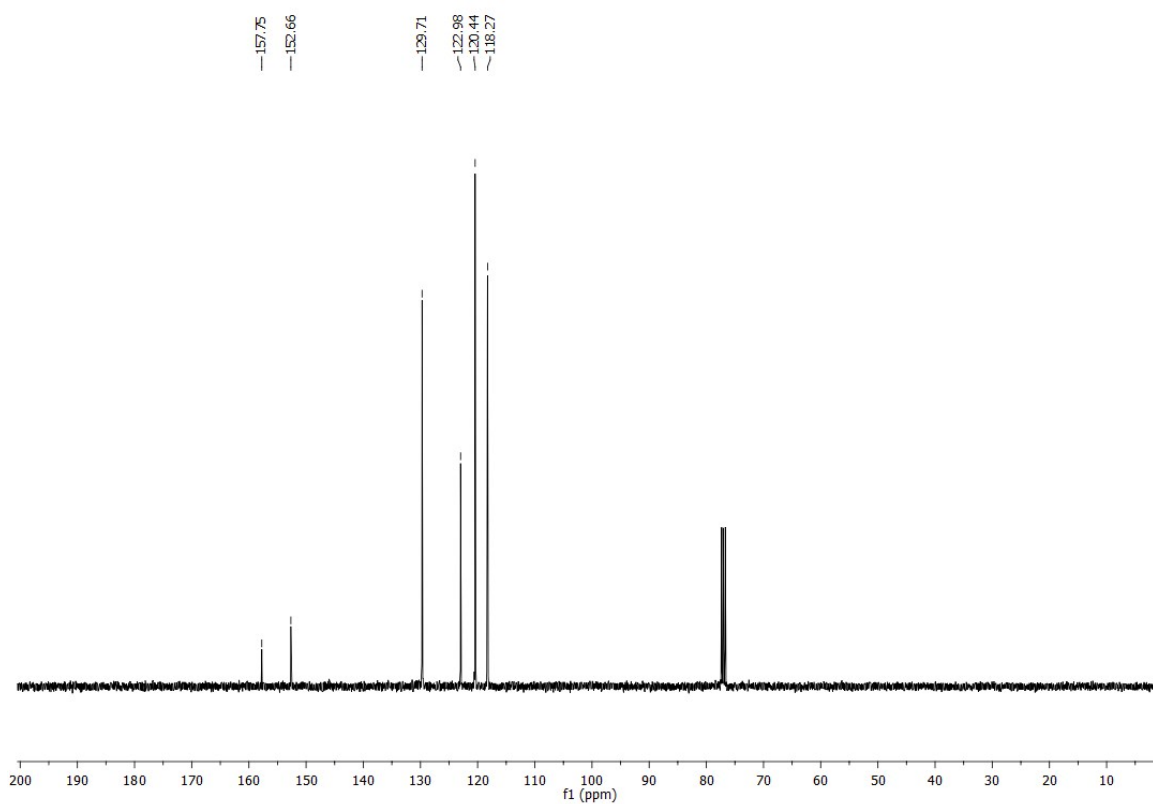


Figure S42. ¹³C NMR spectrum of 1,4-diphenoxybenzene (**3u**)