

Supplementary Material

**C(sp²)-C(sp²) cross coupling reaction catalyzed by an active and highly
stable magnetically separable Pd nanocatalyst in aqueous phase**

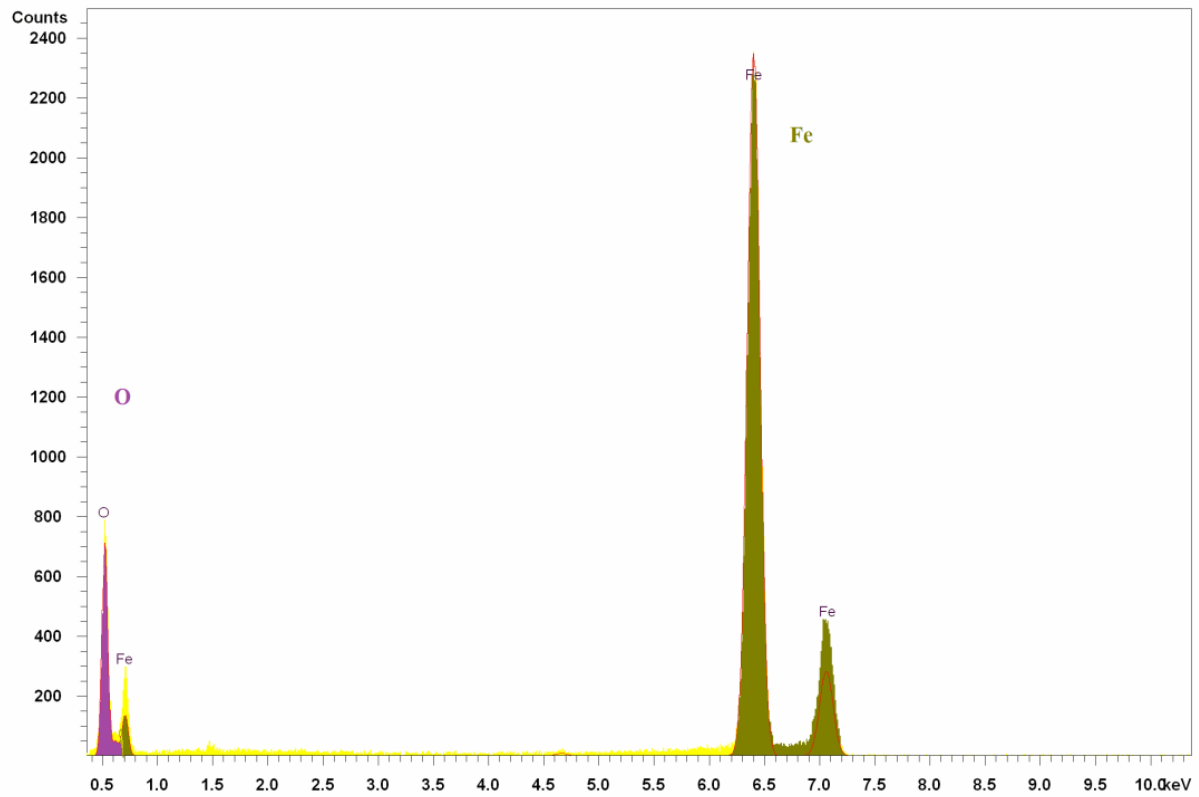
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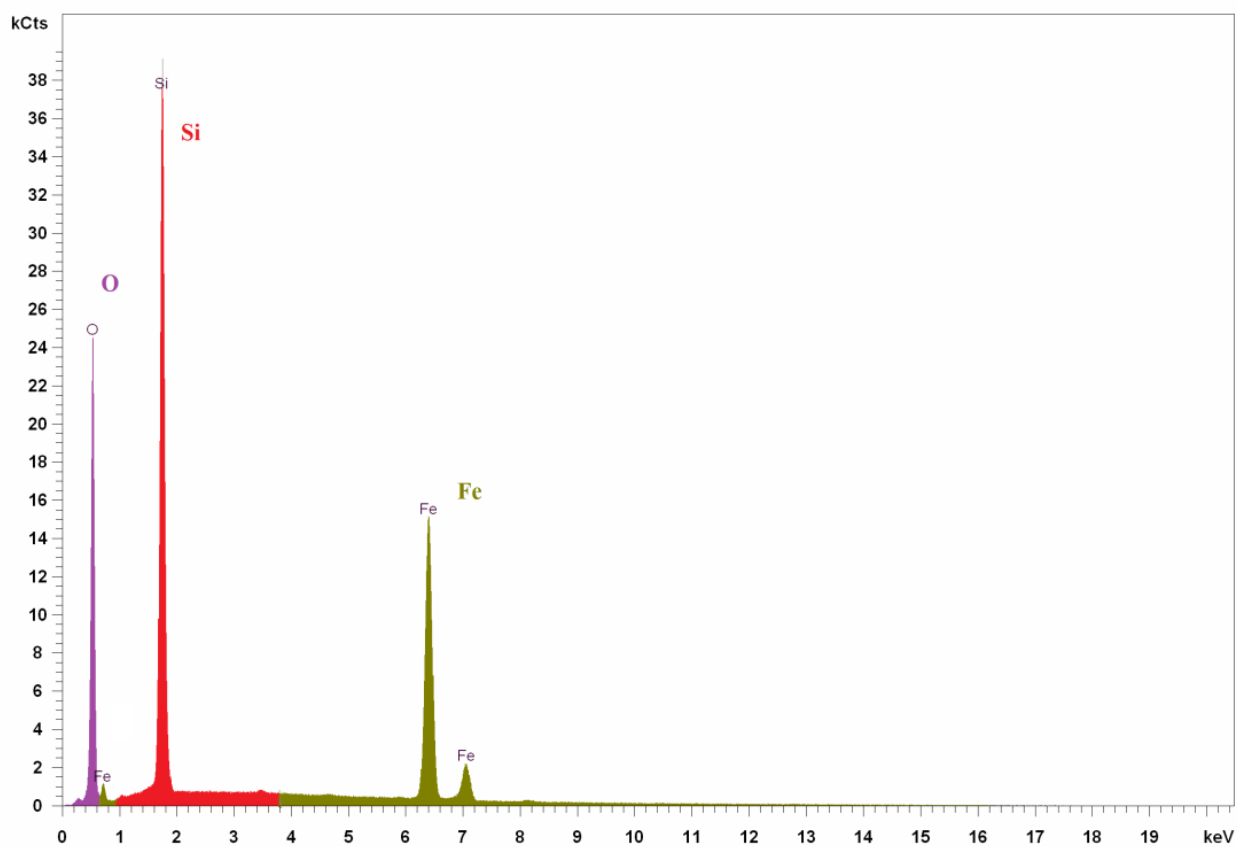
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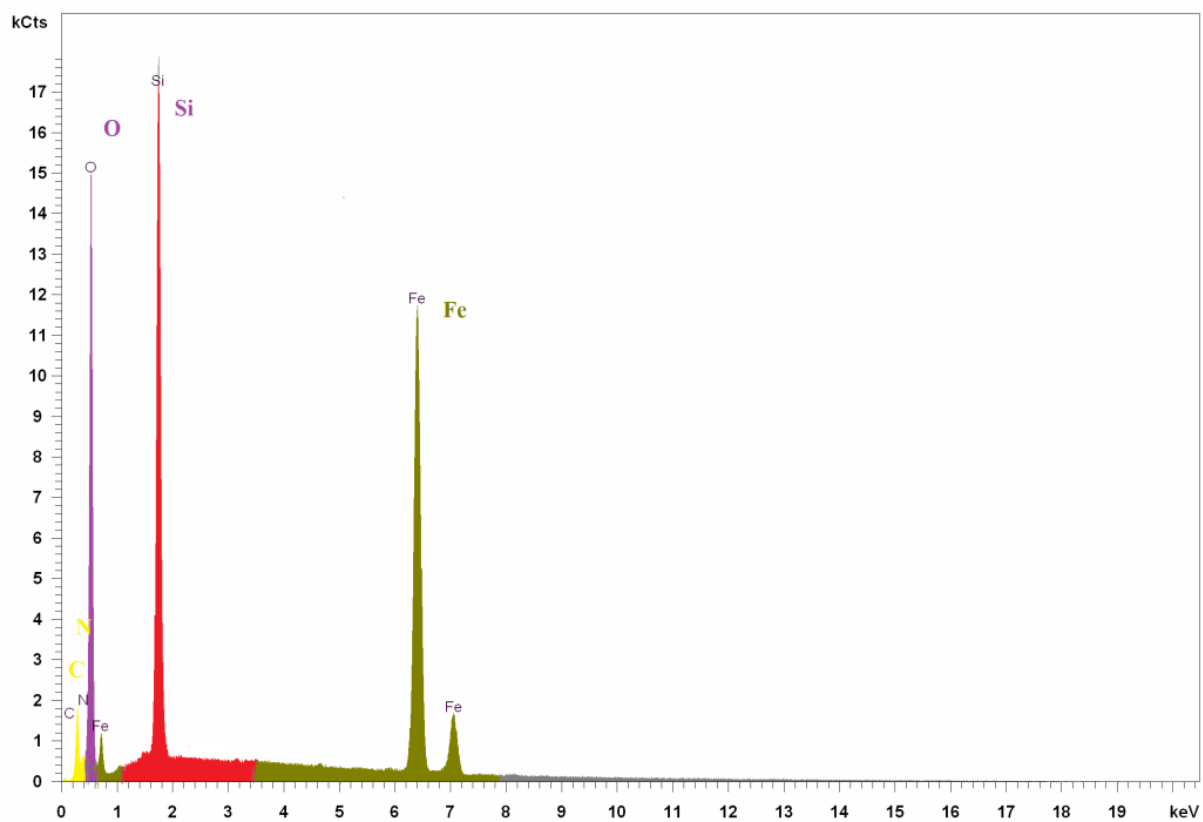
Energy dispersive x-ray (EDX) analysis



EDX Fe_3O_4



EDX $\text{Fe}_3\text{O}_4@\text{SiO}_2$



EDX of SMANPs-NH₂

Selected ^1H NMR and ^{13}C NMR of products

1)4-Cyanobiphenyl¹

^1H NMR (CD_2Cl_2 , 300 MHz) = 7.39-7.55(m,3 H); 7.6(d,2 H); 7.68-7.8(m,4 H); ^{13}C NMR (CD_2Cl_2 , 300 MHz) = 111.07, 119.01, 127.34, 127.8, 128.7, 129.2, 132.7, 139.2,145.62

2) 4-Nitro-biphenyl¹

^1H NMR 300 MHz, CD_2Cl_2): δ = 8.2-8.36(d, 2H), 7.73-7.84 (d, 2H), 7.71-7.62 (m, 2H), 7.59-7.4 (m, 3H); ^{13}C NMR (300 MHz, CD_2Cl_2): δ = 147.6, 147.2, 138.87, 129.23, 129, 127.92,127.48, 124.13;

3) 4-Methoxybiphenyl²

^1H NMR (300 MHz, CD_2Cl_2): δ =7.64–7.54 (m, 4H), 7.45-7.25 (m, 3H), 6.98–7.02 (m, 2H), 3.85 (s, 3H); ^{13}C NMR (CD_2Cl_2 , 300 MHz) =55.38, 114.2, 126.6, 128.09, 128.88, 133.68,140.8,136.5, 161.0

4)4-Methylbiphenyl¹

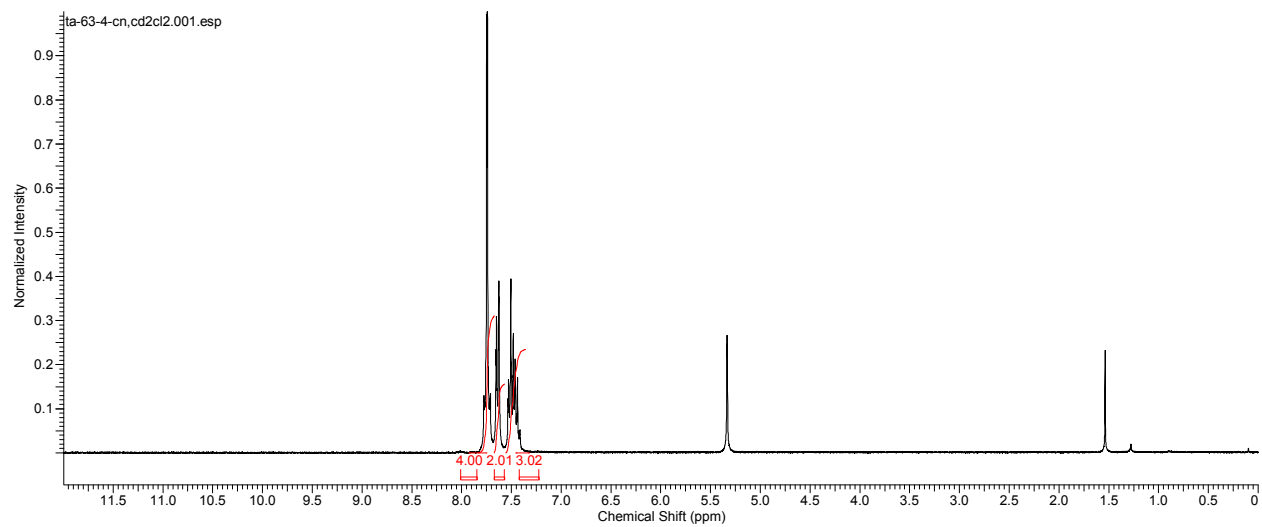
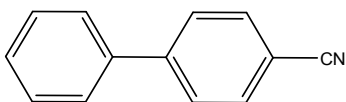
^1H NMR (300 MHz, CD_2Cl_2): δ = 7.60–7.63 (m, 2H), 7.51-7.55 (m, 2H), 7.43-7.48 (m, 2H), 7.32-7.35 (m, 1H), 7.3–7.32 (m, 2H),2.44 (s, 3H); ^{13}C NMR (175 MHz, CD_2Cl_2): δ = 141.1, 138.3, 135.7, 129.57, 128.85, 128.0,127.06, 126.92, 20.84;

5)2-Phenyl-naphthalene¹

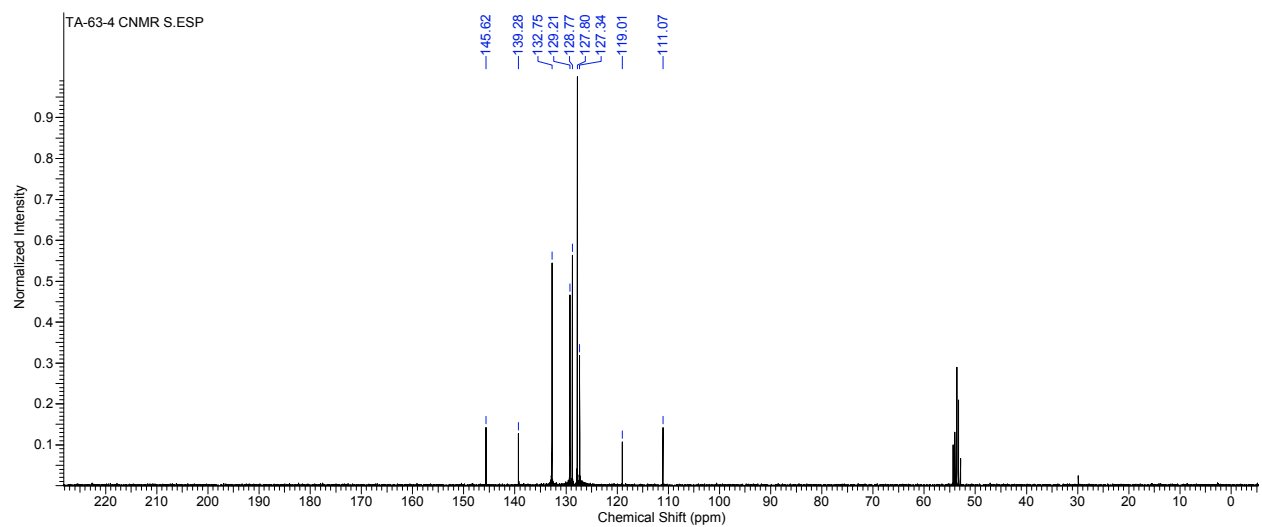
^1H NMR (400M Hz, CD_2Cl_2): δ (ppm) 7.39-42 (t, 1H), 7.49-7.55 (m, 4H), 7.74-7.8 (m, 3H), 7.88-7.95(m, 3H), 8.07 (s, 1H). ^{13}C NMR (300M Hz, CD_2Cl_2): δ = 141.12, 138.6, 133.8, 132.8, 129.0, 128.56, 128.33, 127.75, 127.57, 127.48, 126.4, 126.14, 125.8, 125.64.

6)2-p-Tolyl-naphthalene

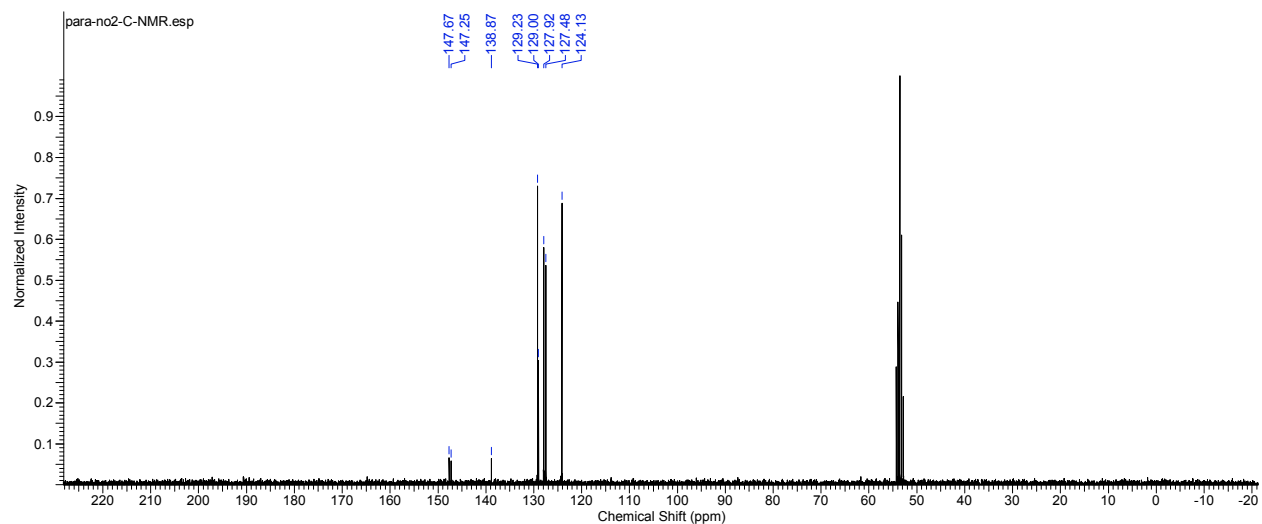
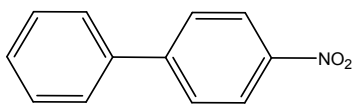
^1H NMR (300M Hz, CD_2Cl_2): δ (ppm) 7.41 (t, J = 7.3, 1H), 7.48-7.55 (m, 4H), 7.74-7.79 (m, 3H),7.88-7.95(m,3H),8.07(s,1H). ^{13}C NMR(300MHz, CD_2Cl_2) δ =138,55,138.17,137.52,133.98, 132.75,129.79,128.51,128.29,127.77,127.28,126.44,125.99,125.60,125.42,21.04.



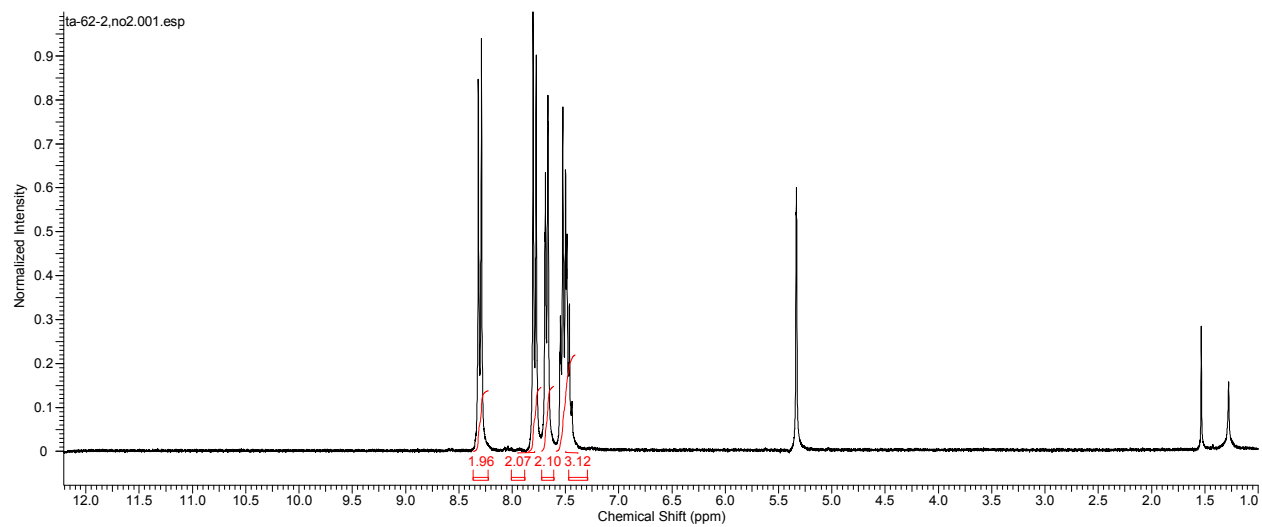
¹H NMR4-Cyanobiphenyl



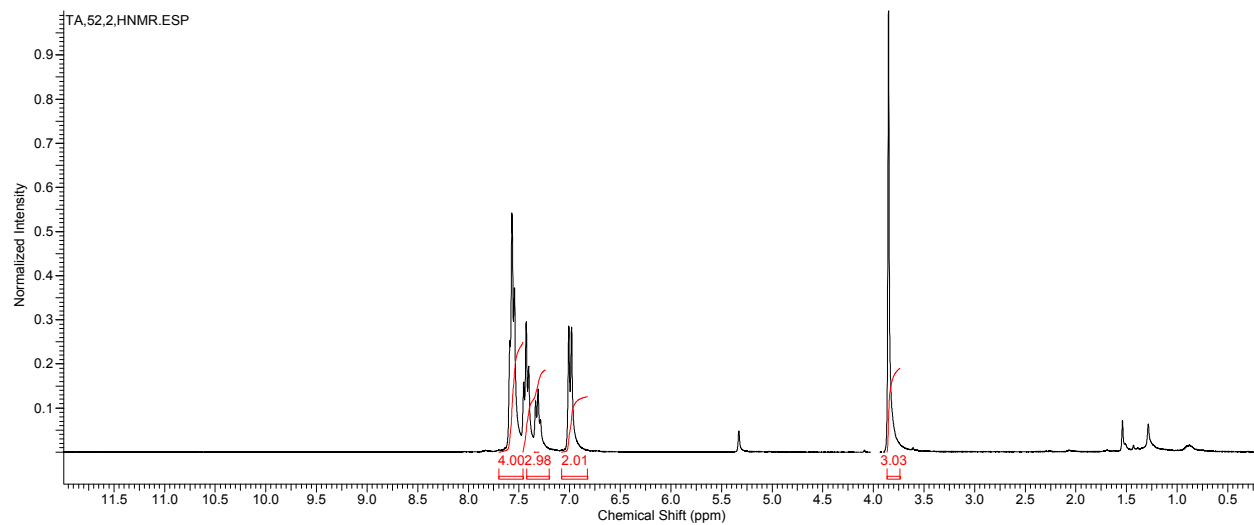
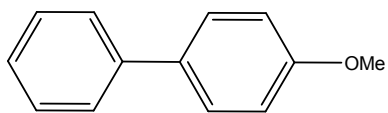
¹³C NMR4-Cyanobiphenyl



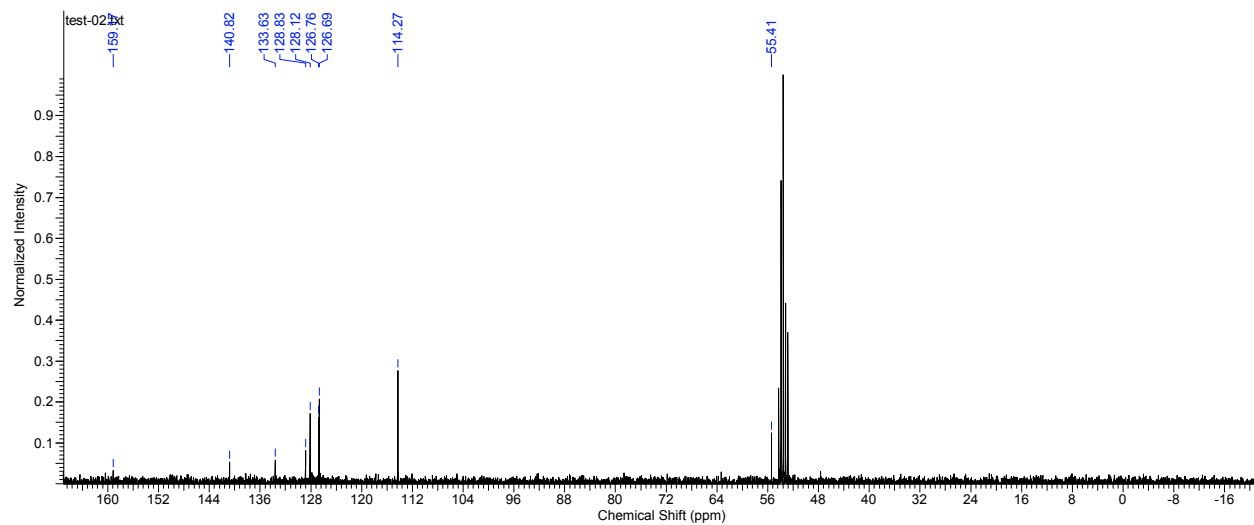
¹³CNMR4-Nitro-biphenyl



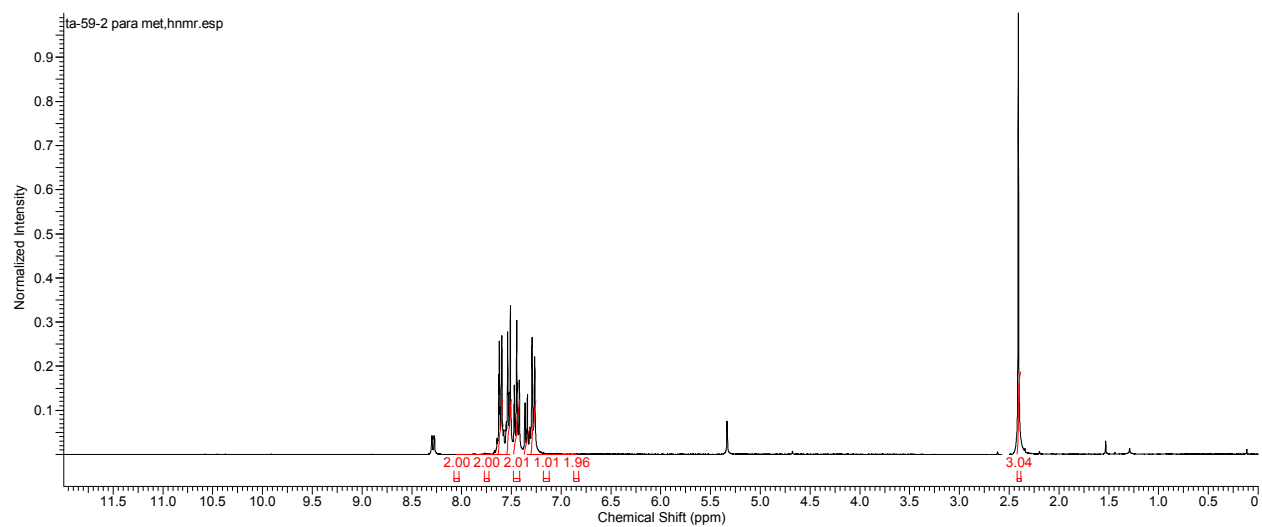
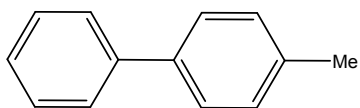
¹HNMR4-Nitro-biphenyl



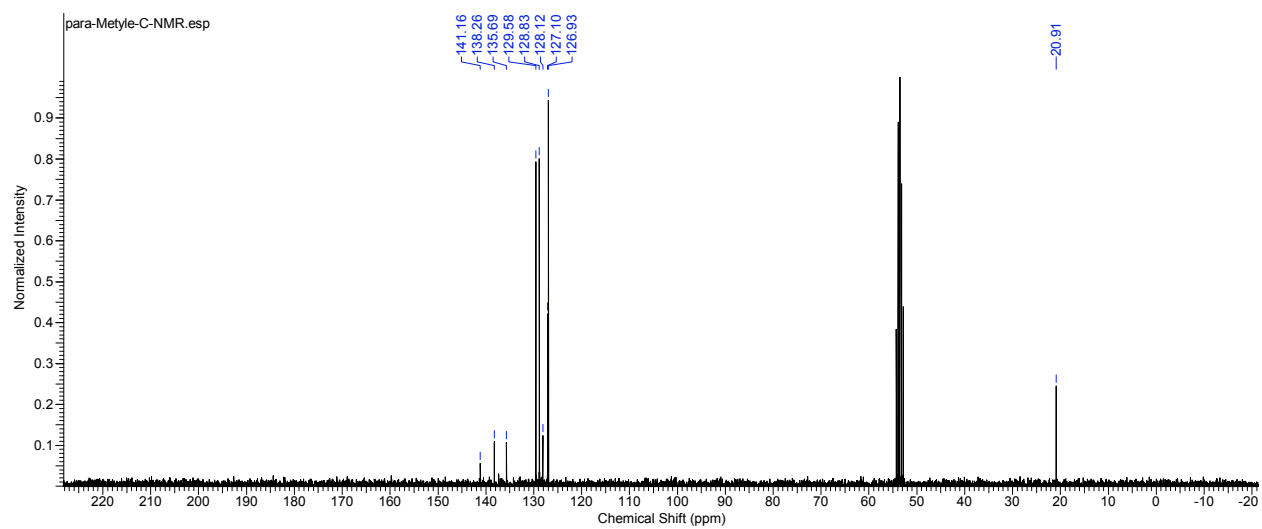
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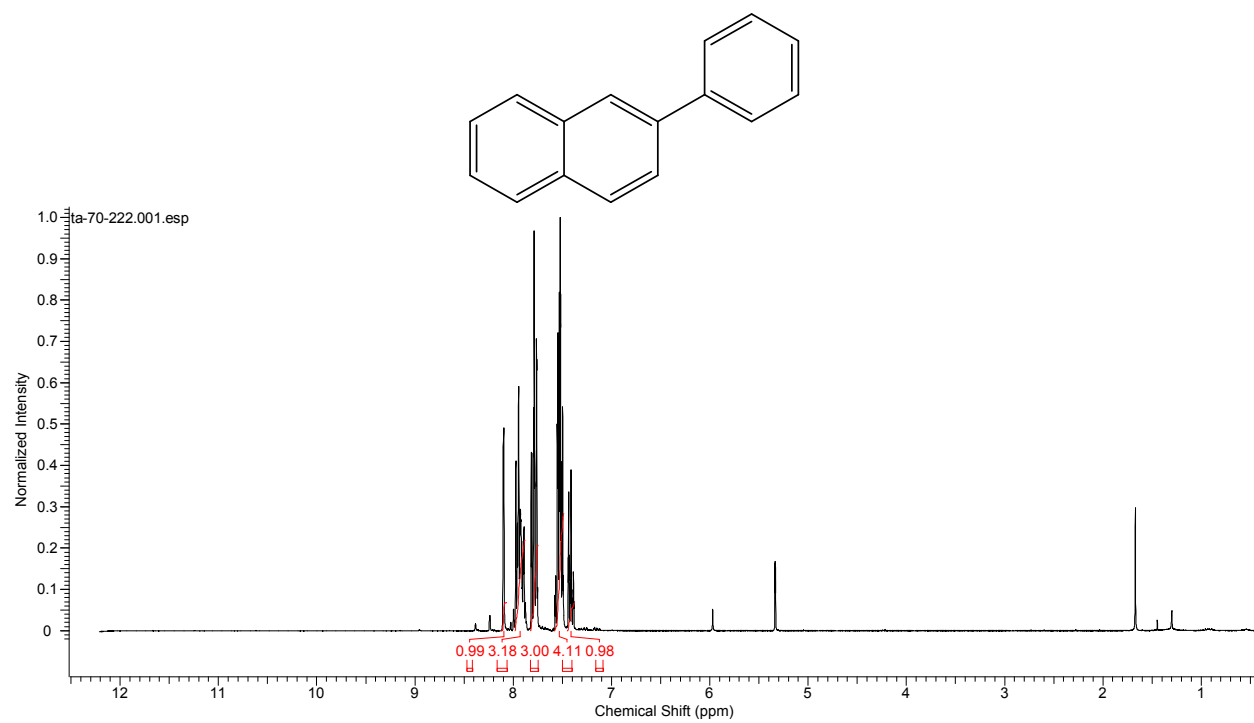
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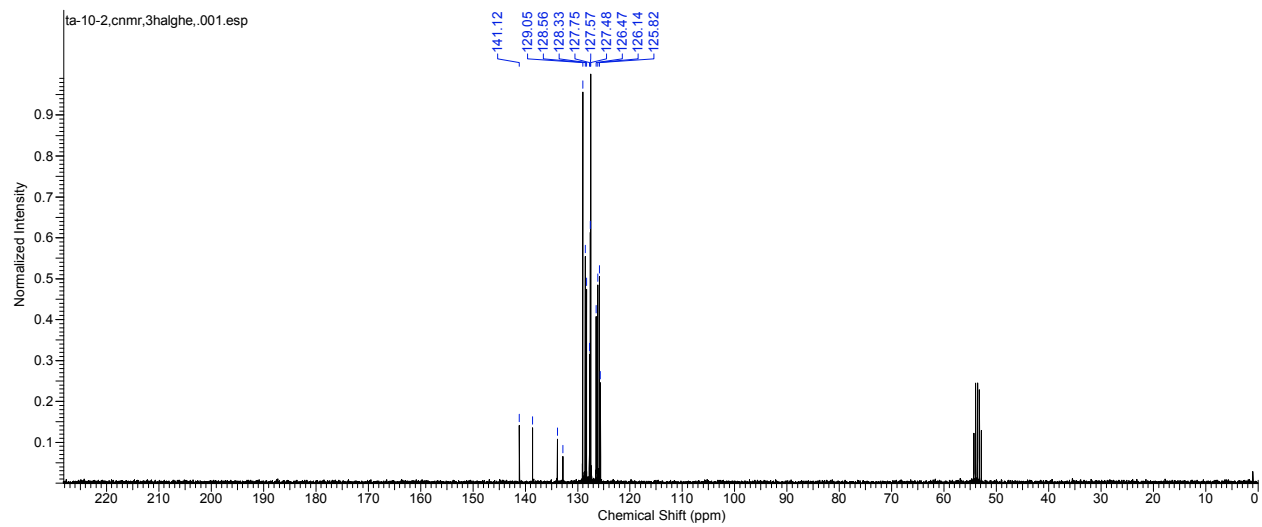
¹H NMR 4-Methylbiphenyl



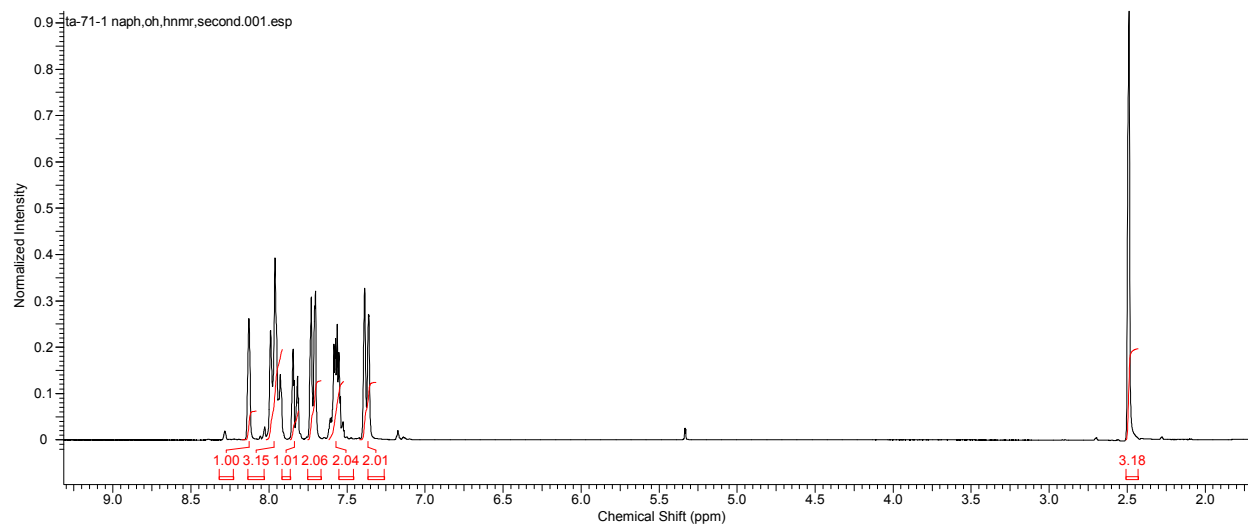
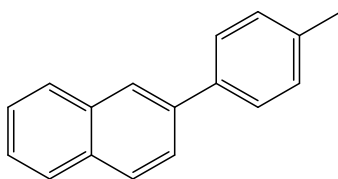
¹³C NMR 4-Methylbiphenyl



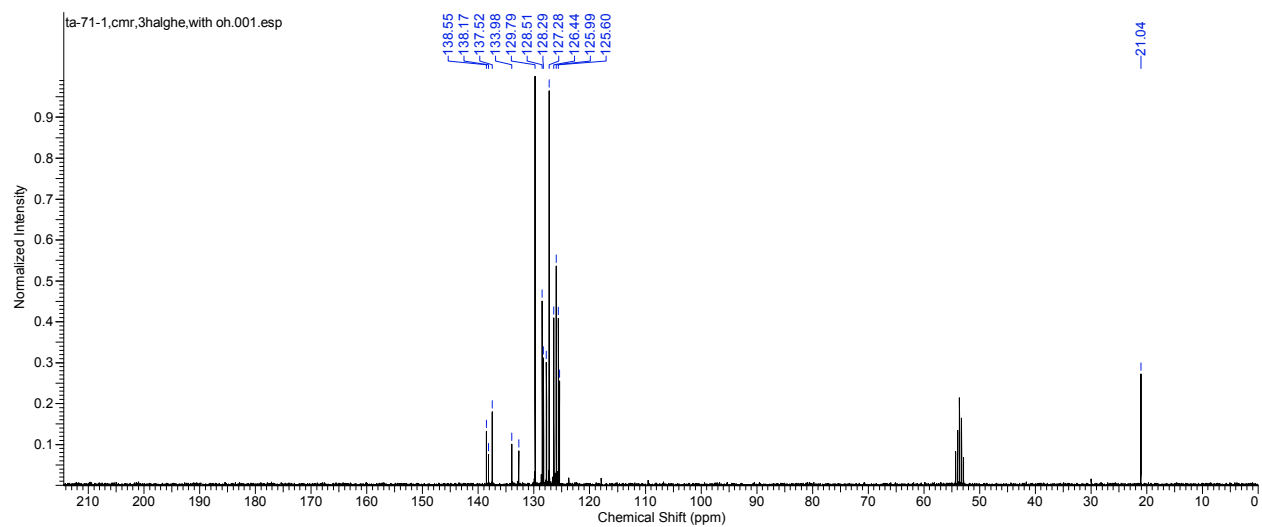
^1H NMR2-Phenyl-naphthalene



^{13}C NMR2-Phenyl-naphthalene



¹HNMR2-p-Tolyl-naphthalene



¹³CNMR2-p-Tolyl-naphthalene

References:

1. L. Zhang, T. Meng, and J. Wu, *JOC*, 2007, 9346–9349.
2. J. Yang and L. Wang, *Dalton Trans.*, 2012, **41**, 12031–7.