Electronic Supplementary Material (ESI) for New Journal of Chemistry.

Supporting Information

A novel environmentally sustainable synthesis of Au-Ag@AgCl nanocomposites and their application as an efficient and recyclable catalyst for quinoline synthesis

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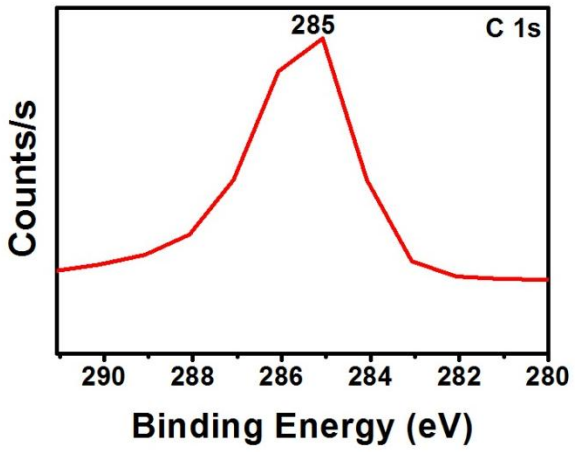


Figure S1. XPS spectrum of C 1s of Au-Ag@AgCl NCs.

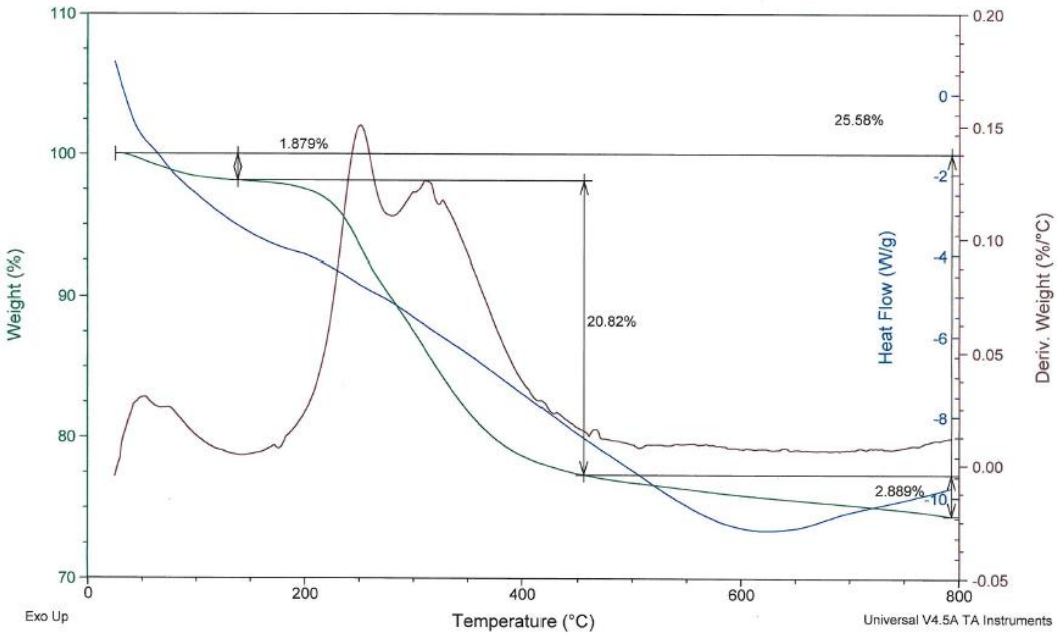


Figure S2. DSC-TGA spectra of Au-Ag@AgCl NCs.

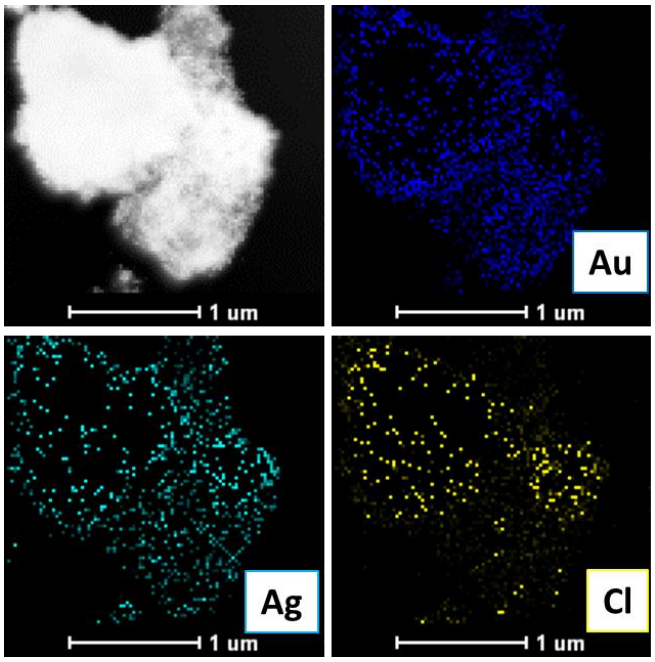


Figure S3. HAADF-STEM image of recycled recycled Au-Ag@AgCl NCs after after 5th catalytic cycle at 1 μm with the EDS elemental mapping of Au, Ag and Cl.

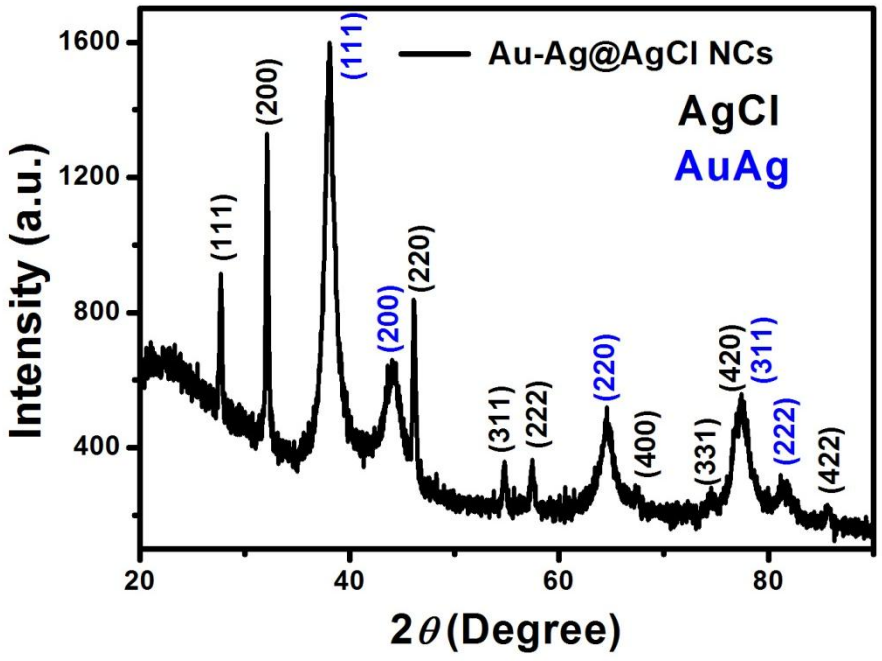


Figure S4. XRD patterns of one-pot synthesized Au-Ag@AgCl NCs

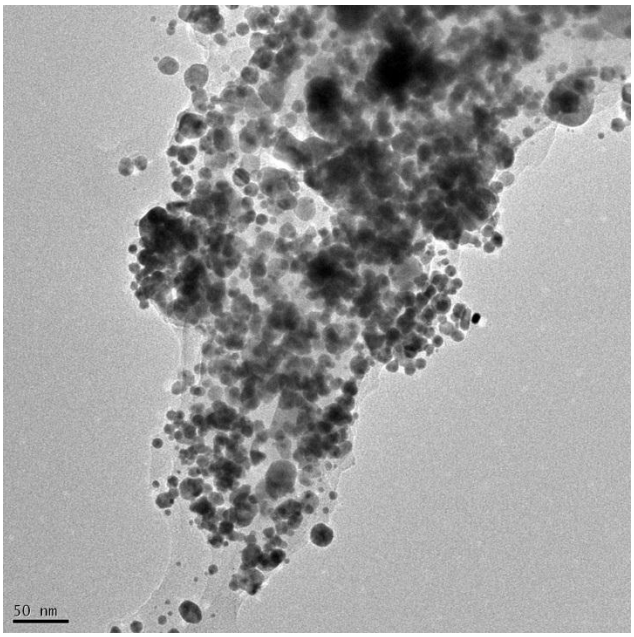
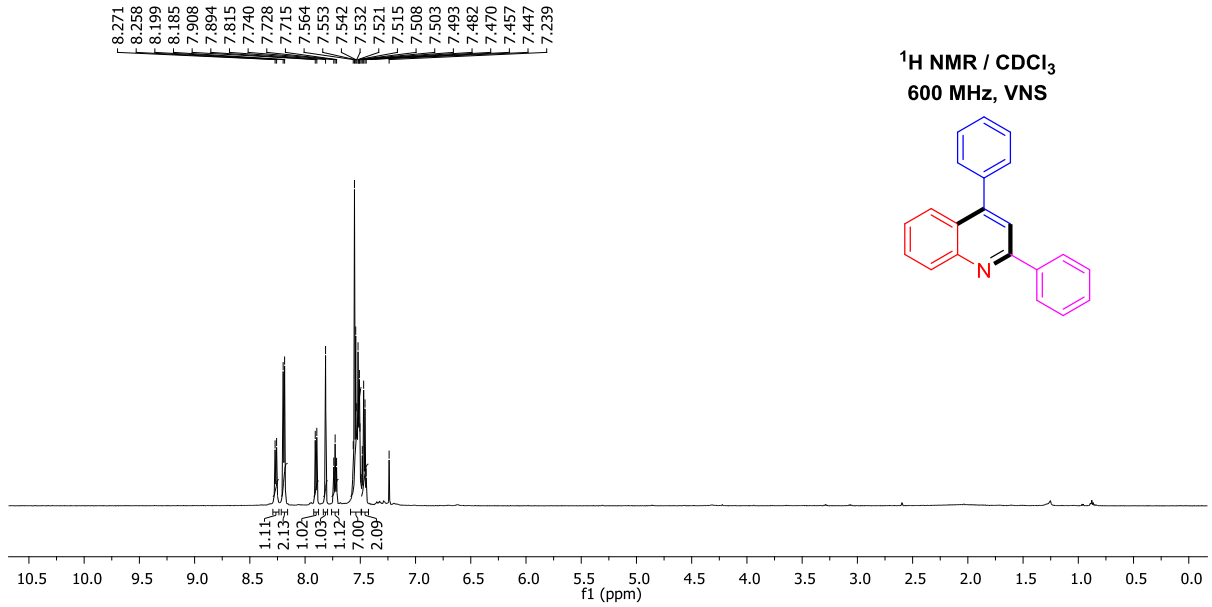
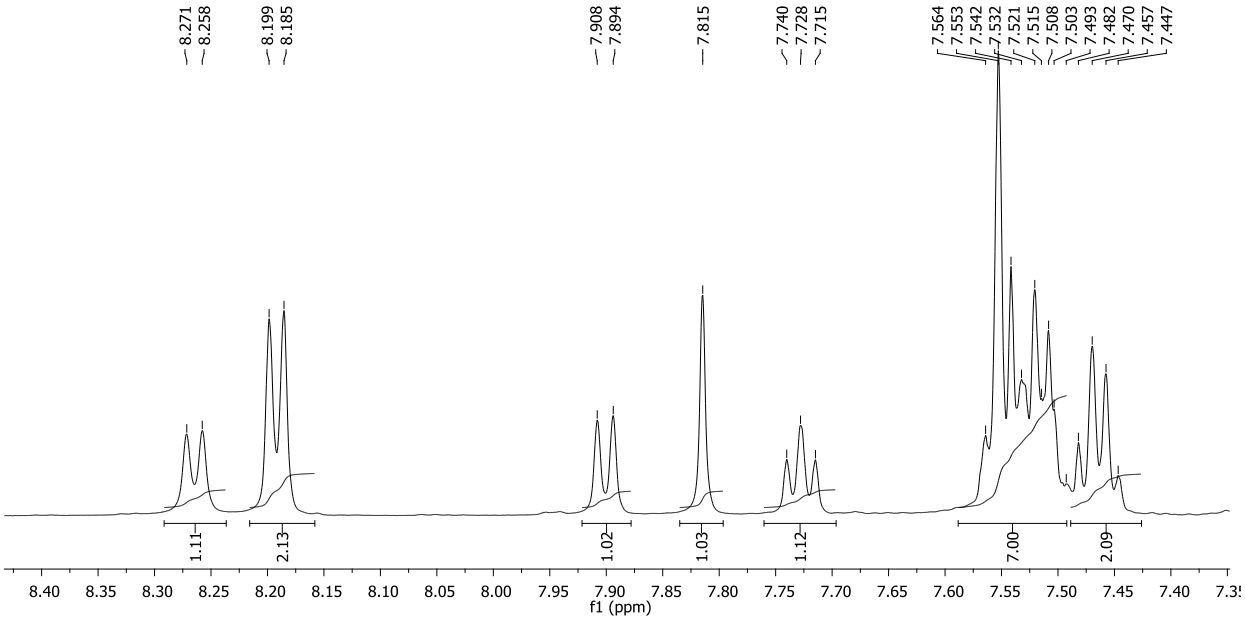


Figure S5. TEM images of one-pot synthesized Au-Ag@AgCl NCs at scale bar 50 nm.

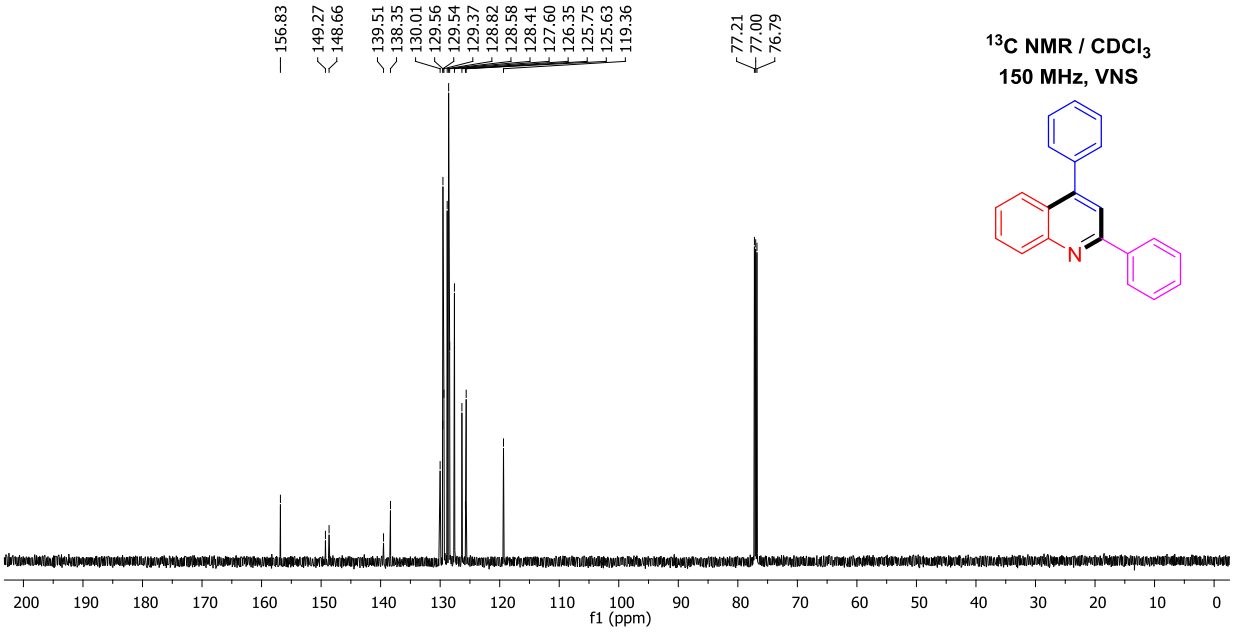
^{1}H NMR and ^{13}C NMR data and spectra of compounds 4a-4f

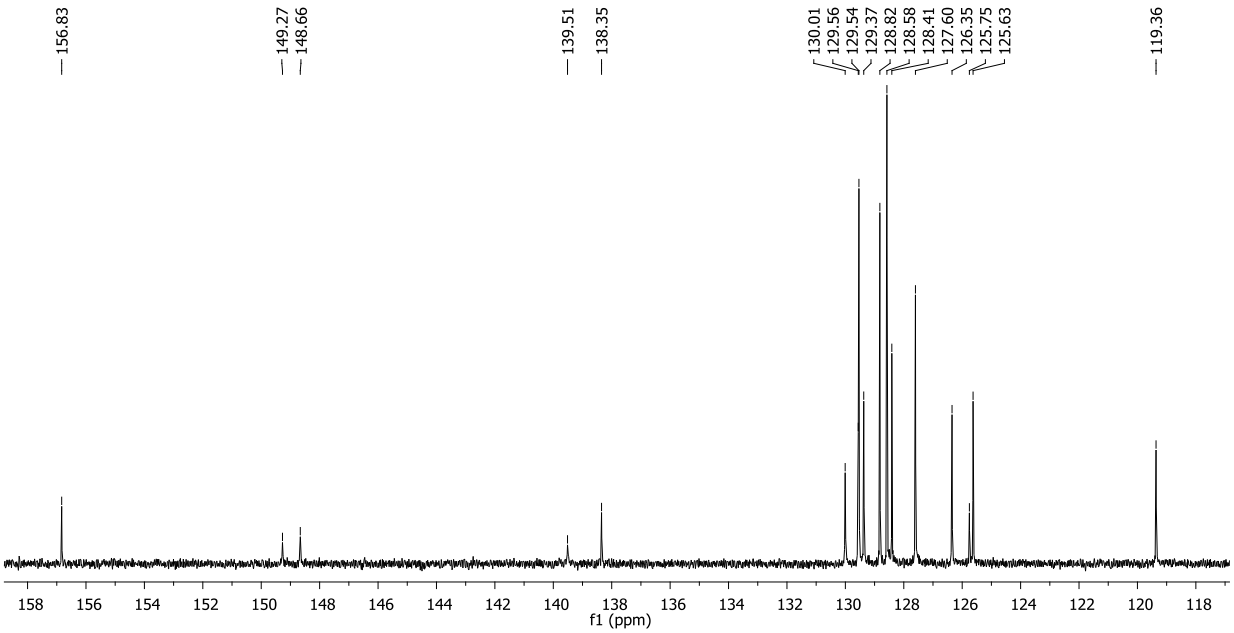
2,4-Diphenylquinoline (**4a**): ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.26 (d, J = 8.2 Hz, 1H), 8.19 (d, J = 7.9 Hz, 2H), 7.90 (d, J = 8.5 Hz, 1H), 7.81 (s, 1H), 7.73 (t, J = 7.6 Hz, 1H), 7.56 – 7.49 (m, 7H), 7.49 – 7.44 (m, 2H).



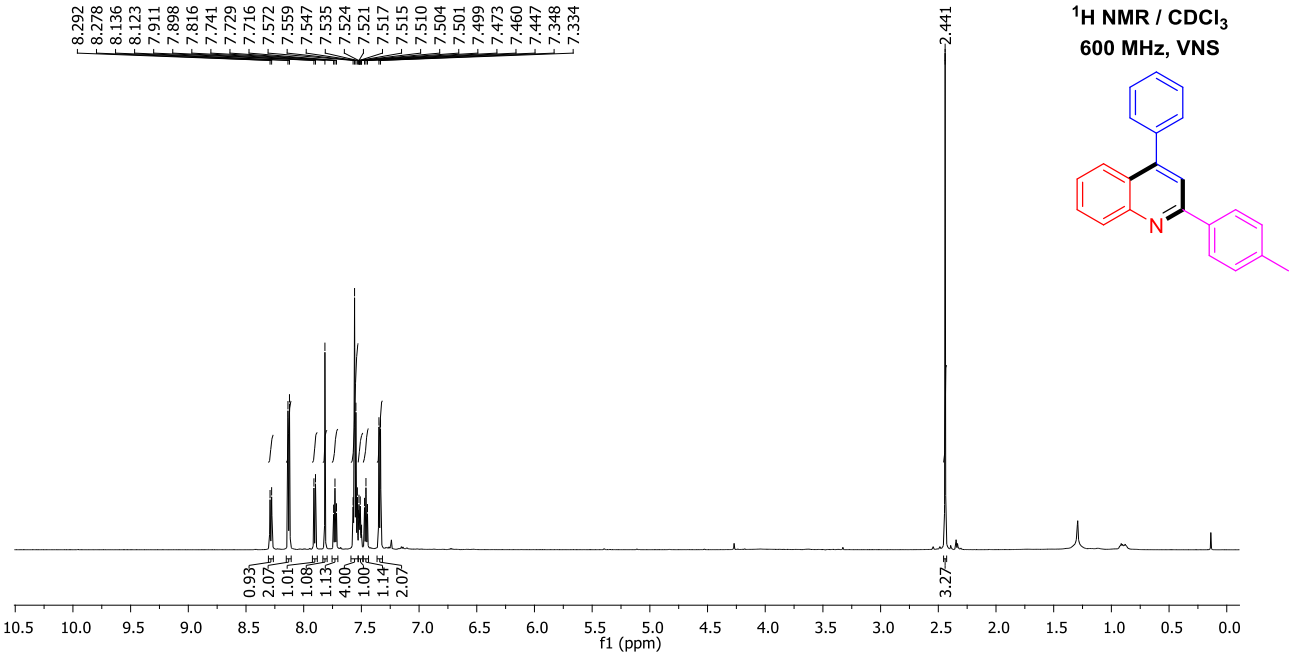


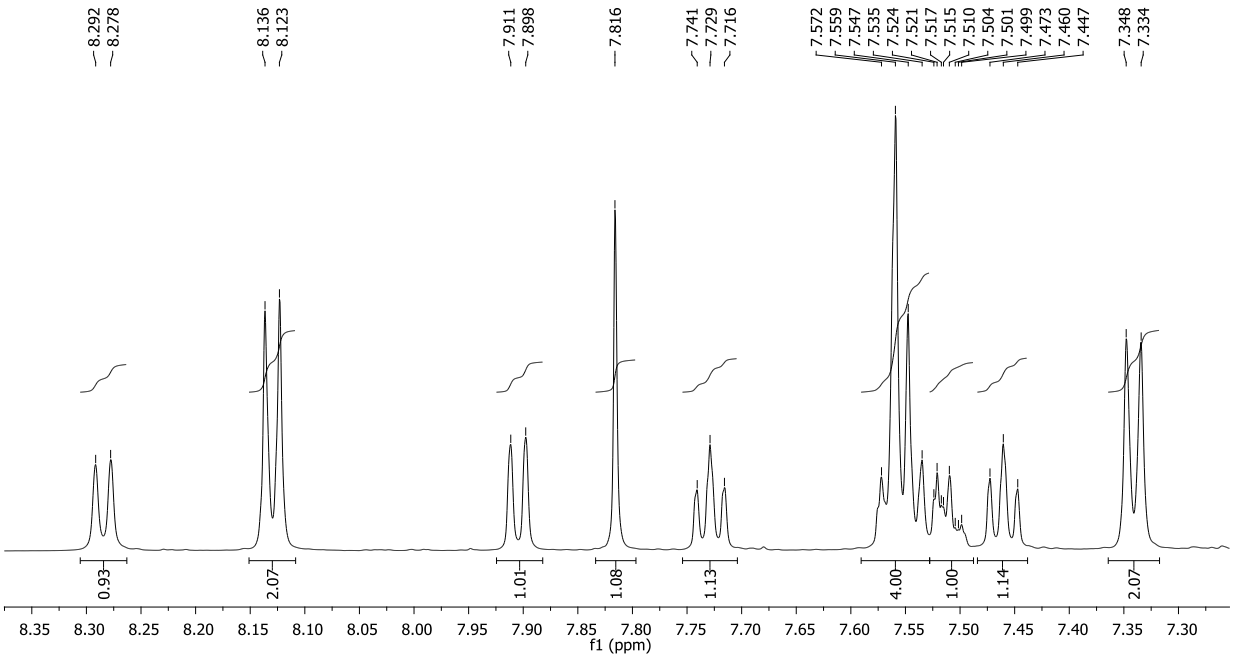
2,4-Diphenylquinoline (**4a**): ^{13}C NMR (150 MHz, $CDCl_3$) δ 156.83, 149.27, 148.66, 139.51, 138.35, 130.01, 129.56, 129.54, 129.37, 128.82, 128.58, 128.41, 127.60, 126.35, 125.75, 125.63, 119.36.



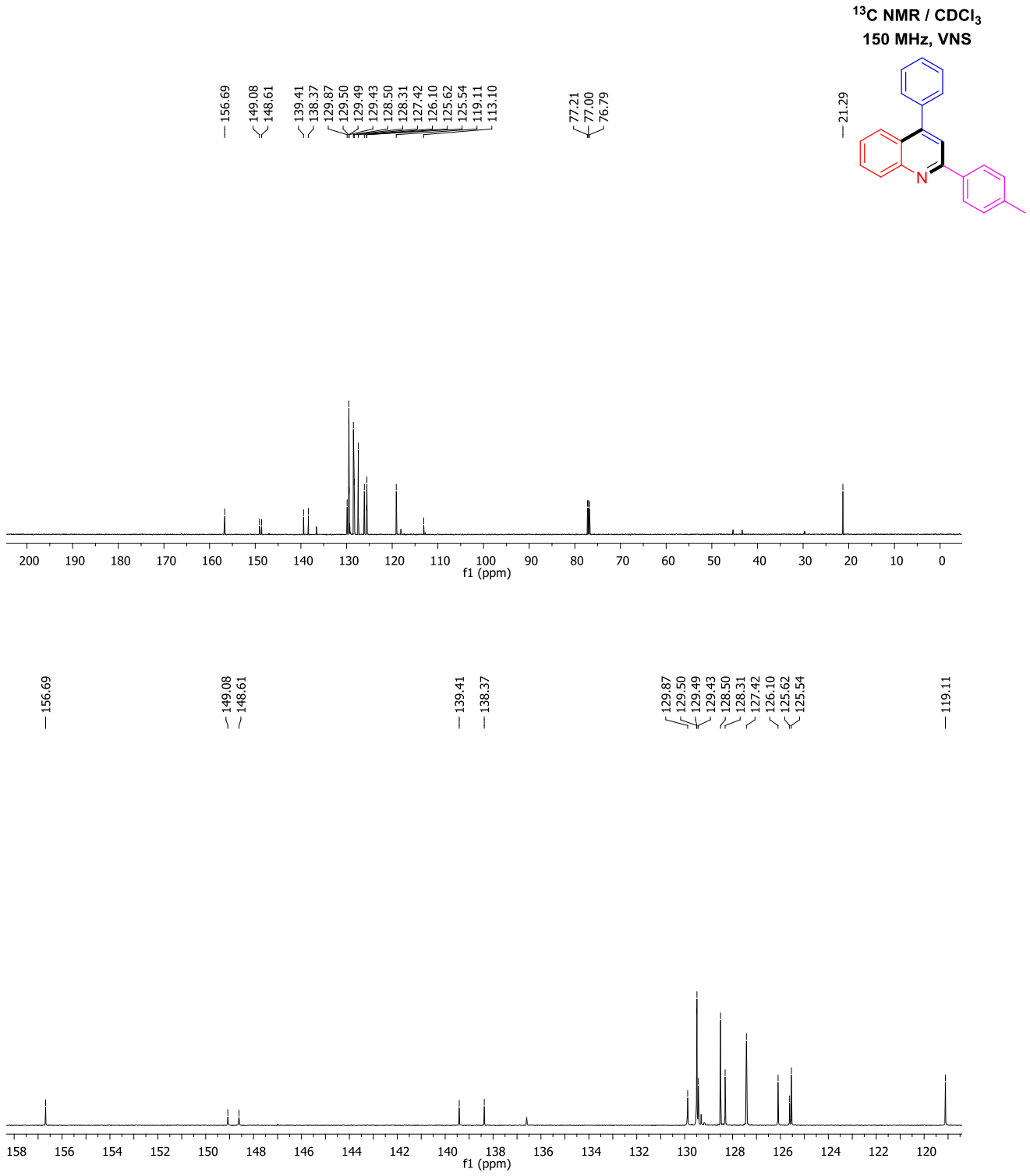


4-Phenyl-2-(*p*-tolyl)quinolone (**4b**): ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.28 (d, J = 8.2 Hz, 1H), 8.13 (d, J = 7.9 Hz, 2H), 7.90 (d, J = 8.2 Hz, 1H), 7.82 (s, 1H), 7.73 (t, J = 7.5 Hz, 1H), 7.57–7.53 (m, 4H), 7.52 – 7.49 (m, 1H), 7.46 (t, J = 7.6 Hz, 1H), 7.34 (d, J = 8.2 Hz, 2H), 2.44 (s, 3H).

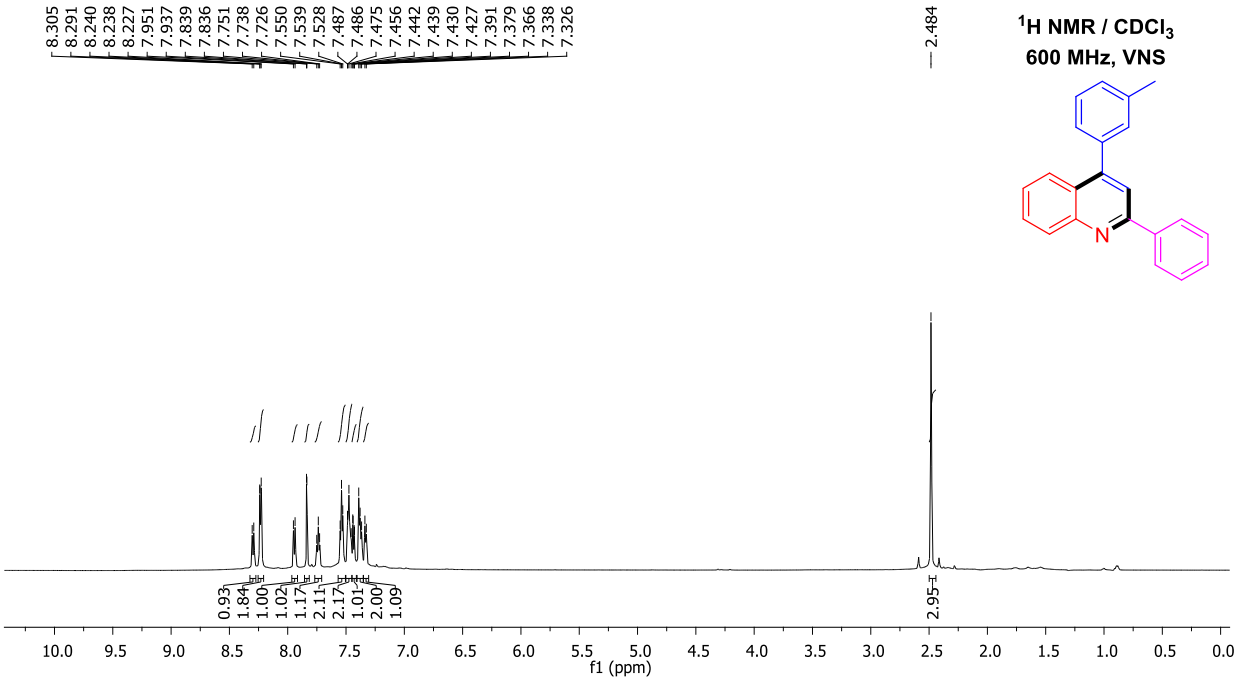


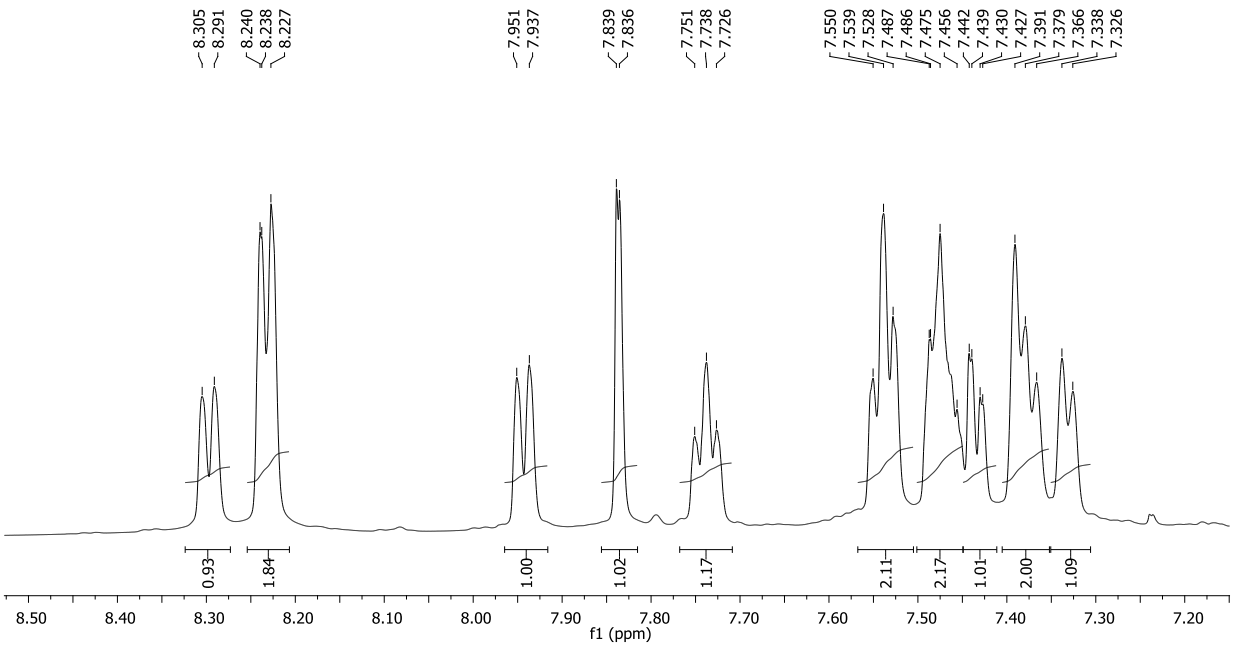


4-Phenyl-2-(*p*-tolyl)quinolone (**4b**):^{13}C NMR (150 MHz, $CDCl_3$) δ 156.69, 149.08, 148.61, 139.41, 138.37, 129.87, 129.50, 129.49, 129.43, 128.50, 128.31, 127.42, 126.10, 125.62, 125.54, 119.11, 113.10, 21.29.

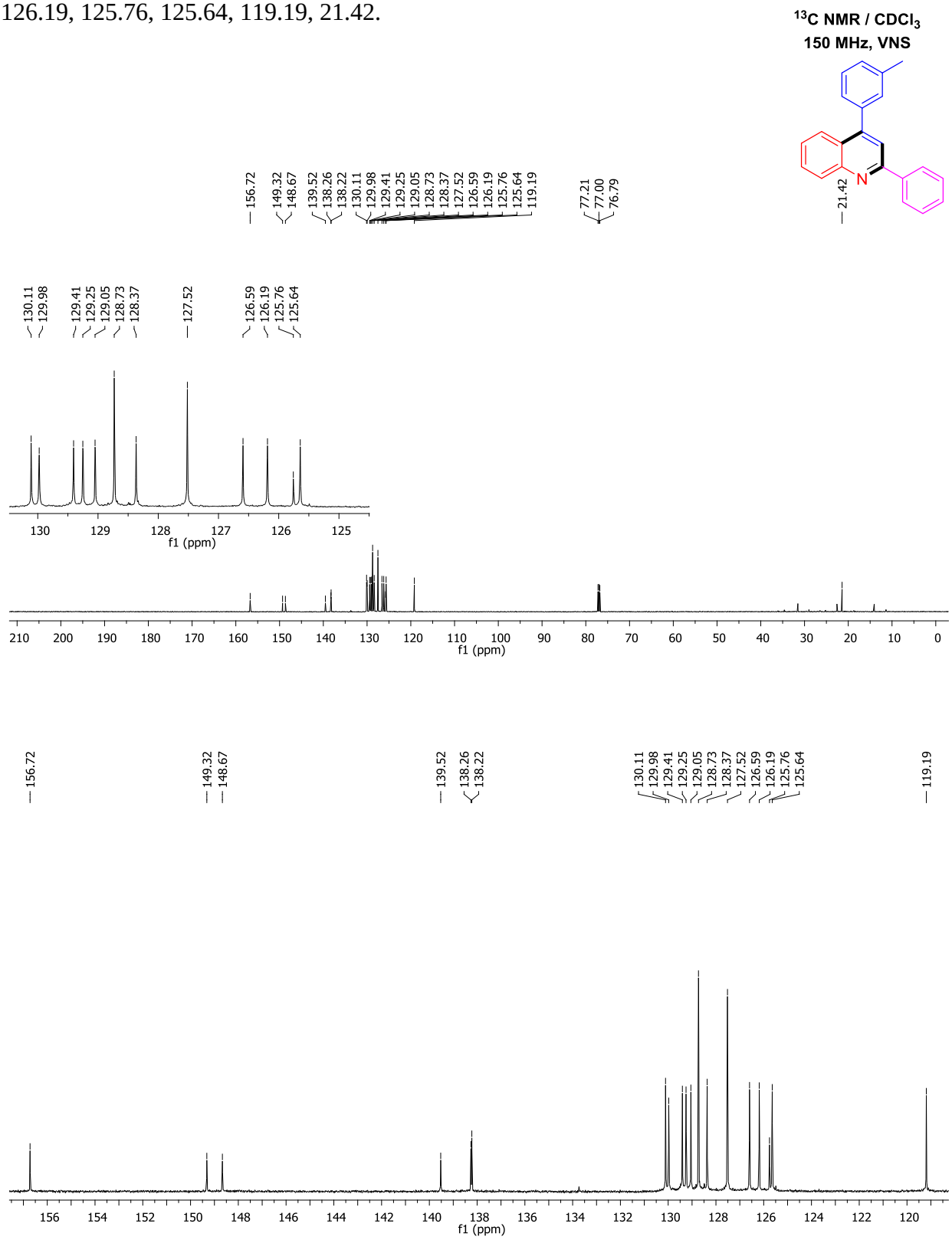


2-Phenyl-4-(m-tolyl)quinolone (**4c**): ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.30 (d, J = 8.2 Hz, 1H), 8.25 – 8.21 (m, 2H), 7.94 (d, J = 8.5 Hz, 1H), 7.84 (d, J = 2.1 Hz, 1H), 7.74 (t, J = 7.3 Hz, 1H), 7.54 (t, J = 6.7 Hz, 2H), 7.48 (dd, J = 12.6, 6.2 Hz, 2H), 7.43 (dd, J = 7.3, 1.8 Hz, 1H), 7.41 – 7.35 (m, 2H), 7.33 (d, J = 7.3 Hz, 1H), 2.48 (s, 3H).

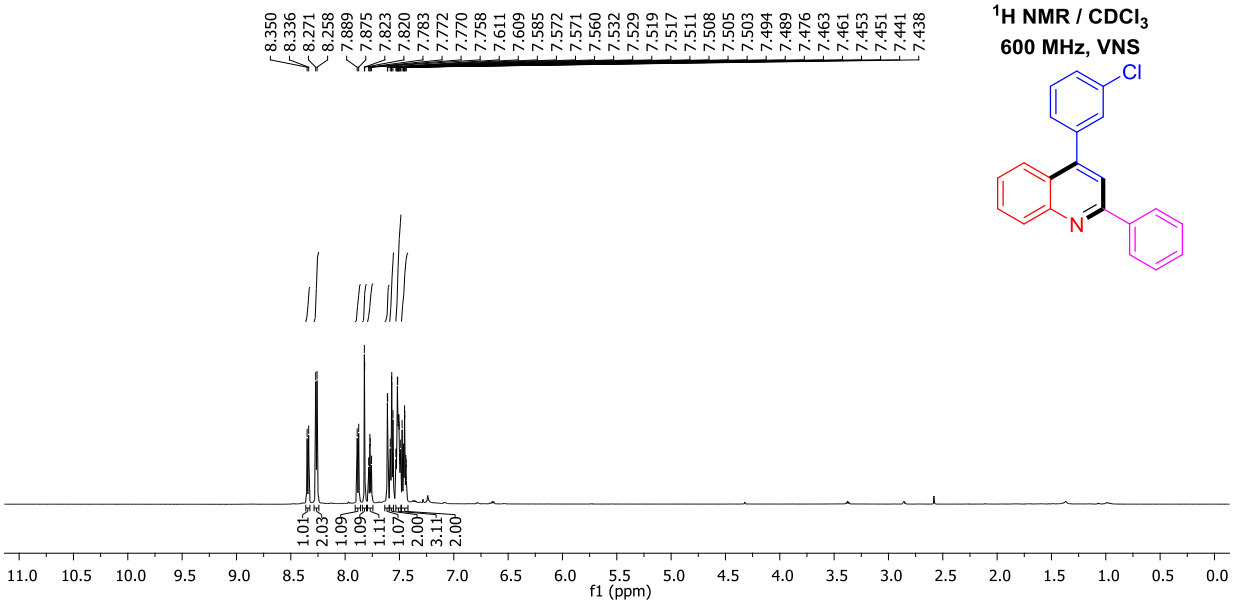


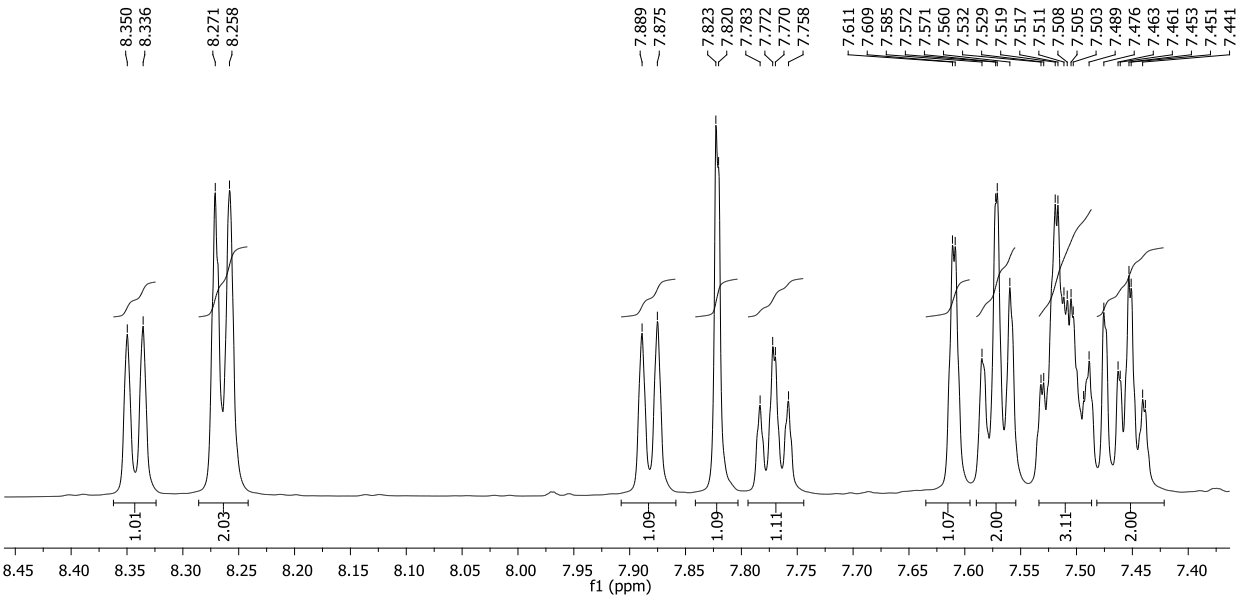


2-Phenyl-4-(m-tolyl)quinolone (**4c**): ^{13}C NMR (150 MHz, $CDCl_3$) δ 156.72, 149.32, 148.67, 139.52, 138.26, 138.22, 130.11, 129.98, 129.41, 129.25, 129.05, 128.73, 128.37, 127.52, 126.59, 126.19, 125.76, 125.64, 119.19, 21.42.

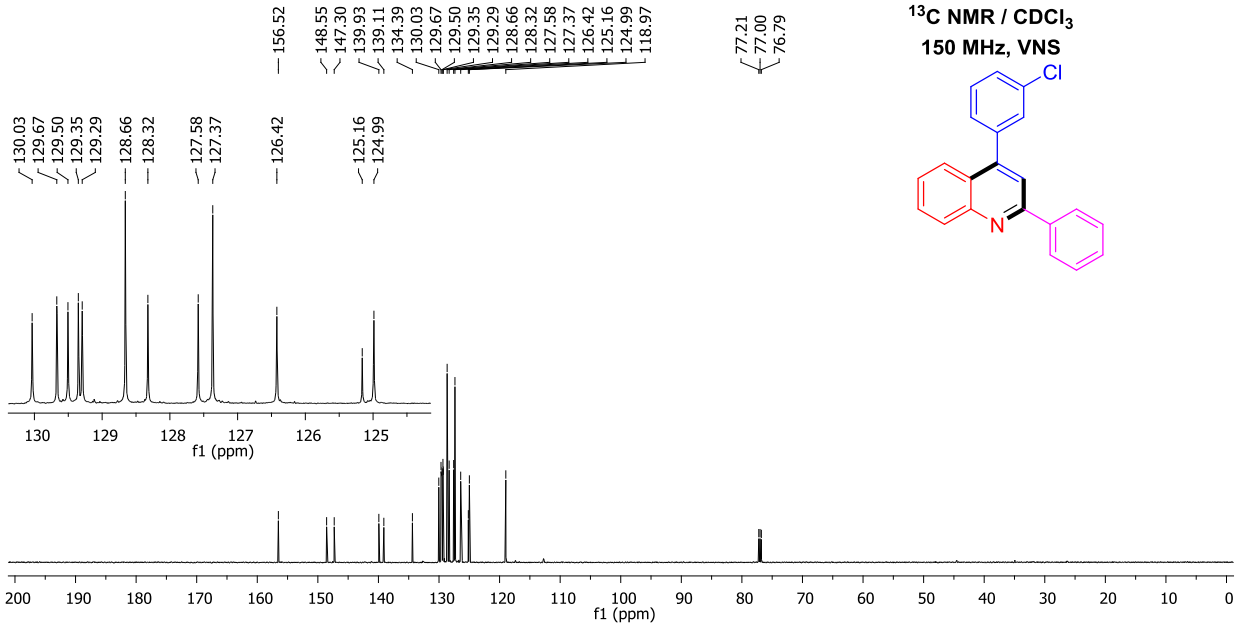


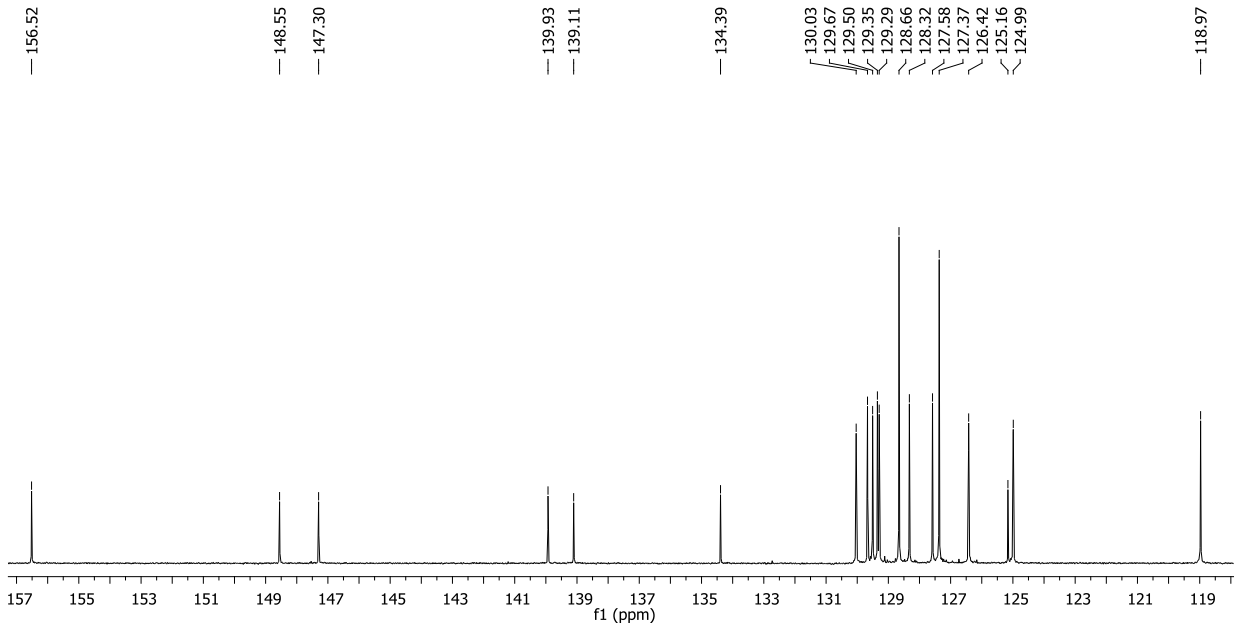
4-(3-Chlorophenyl)-2-phenylquinoline (**4d**): ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.34 (d, *J* = 8.5 Hz, 1H), 8.26 (d, *J* = 7.6 Hz, 2H), 7.88 (d, *J* = 8.2 Hz, 1H), 7.82 (d, *J* = 1.5 Hz, 1H), 7.77 (t, *J* = 8.4 Hz, 1H), 7.61 (d, *J* = 1.5 Hz, 1H), 7.57 (t, *J* = 7.9 Hz, 2H), 7.53 – 7.49 (m, 3H), 7.48 – 7.42 (m, 2H).



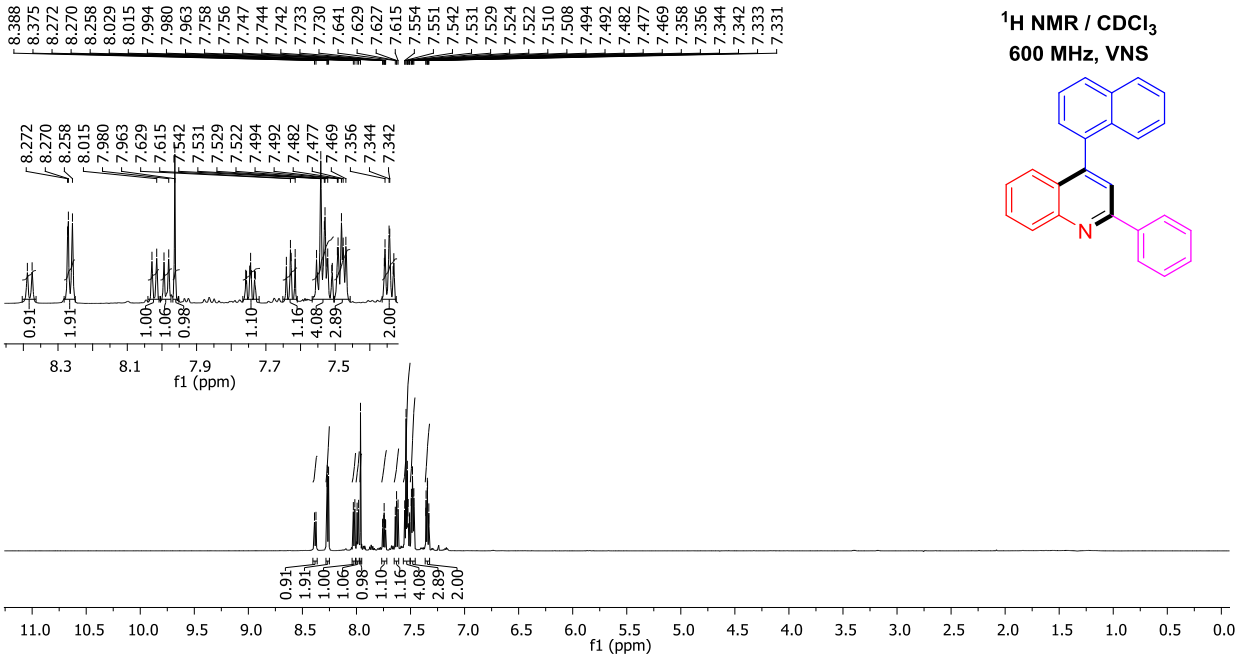


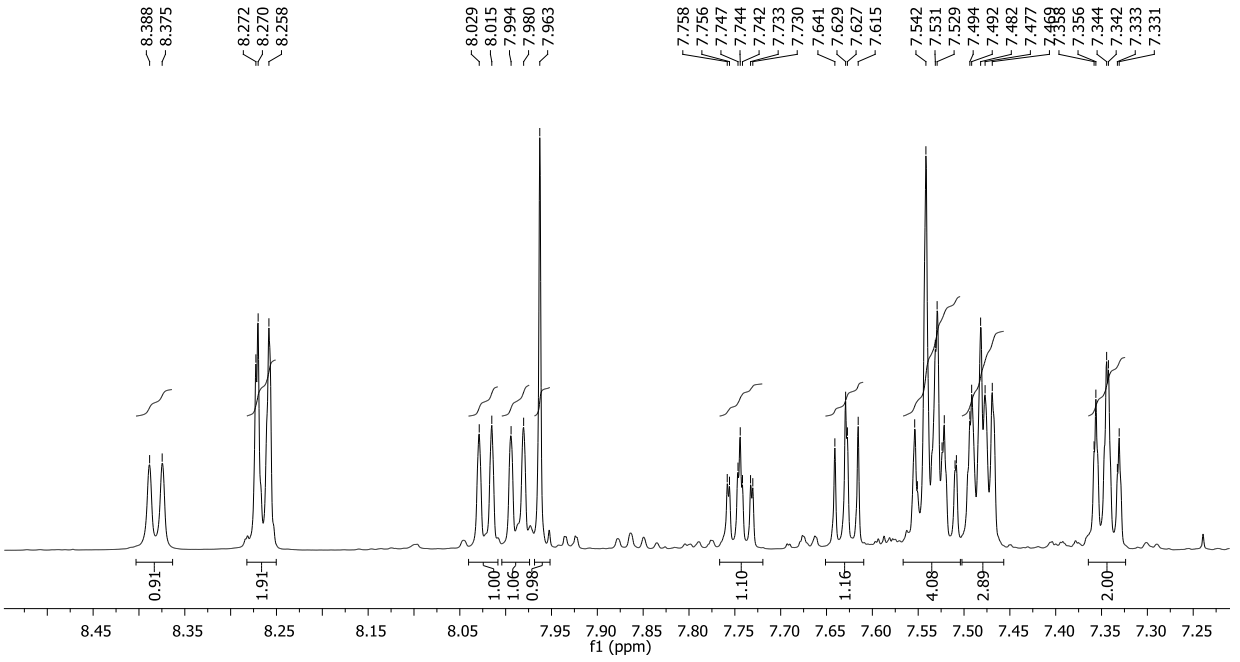
4-(3-Chlorophenyl)-2-phenylquinoline (**4d**): ^{13}C NMR (150 MHz, $CDCl_3$) δ 156.52, 148.55, 147.30, 139.93, 139.11, 134.39, 130.03, 129.67, 129.50, 129.35, 129.29, 128.66, 128.32, 127.58, 127.37, 126.42, 125.16, 124.99, 118.97.



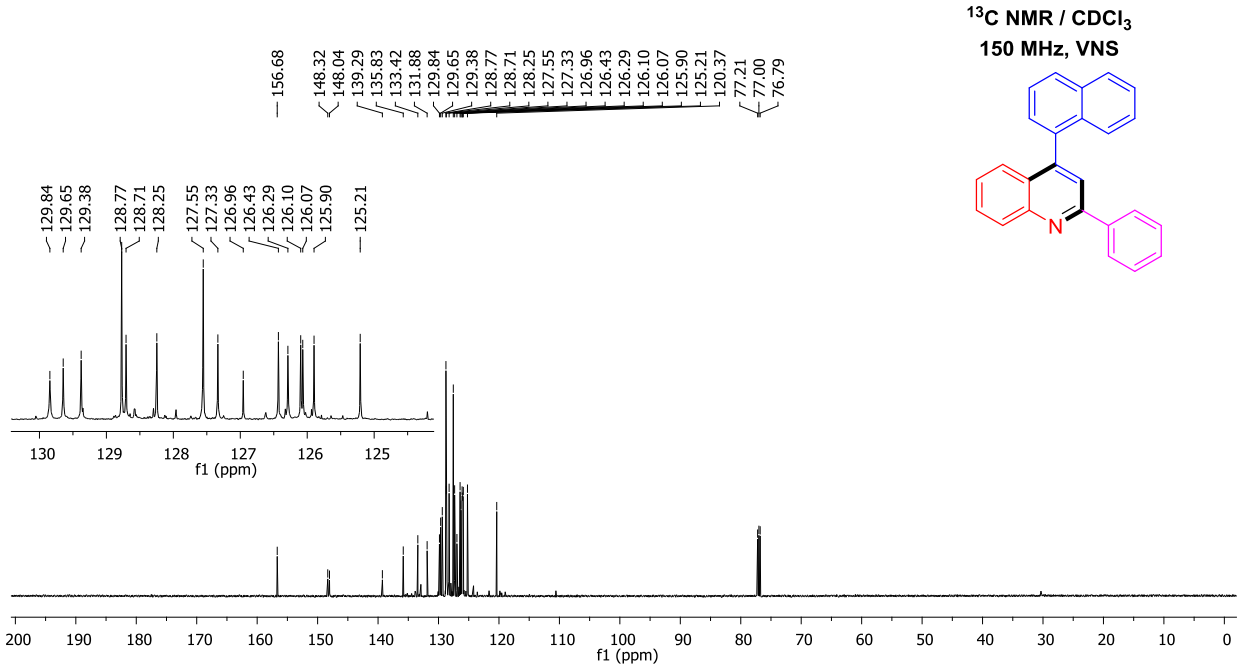


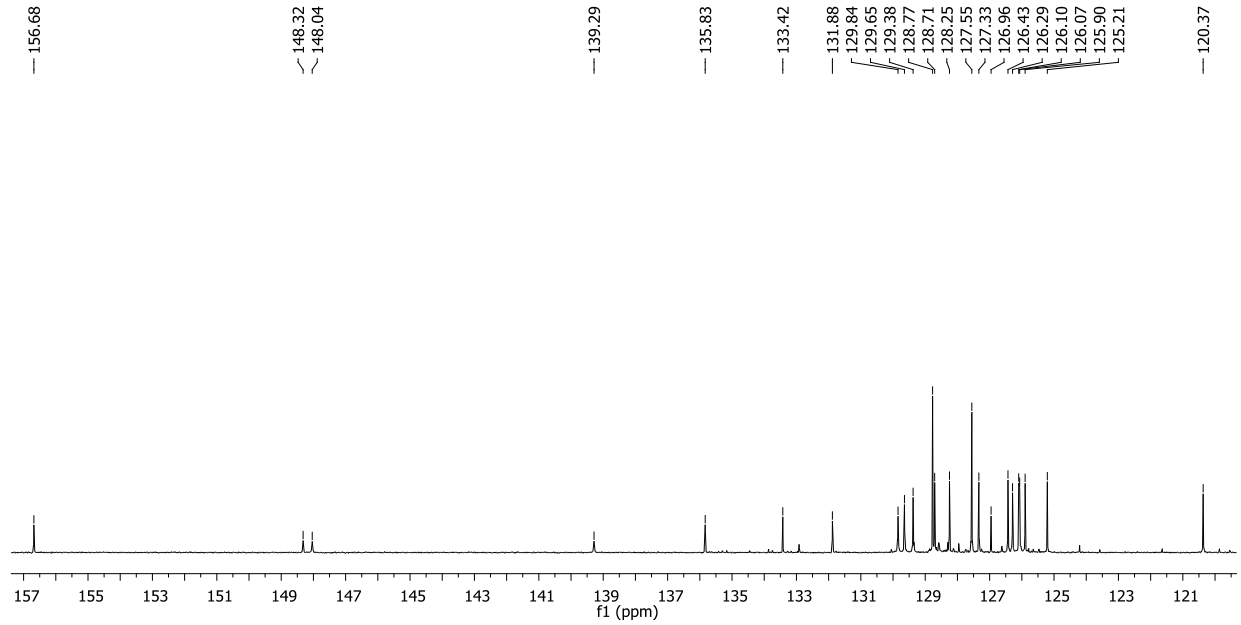
4-(Naphthalen-1-yl)-2-phenylquinoline (**4e**): ^{1}H NMR (600 MHz, $CDCl_3$) δ 8.38 (d, J = 8.2 Hz, 1H), 8.28 – 8.25 (m, 2H), 8.02 (d, J = 8.2 Hz, 1H), 7.99 (d, J = 8.2 Hz, 1H), 7.96 (s, 1H), 7.74 (td, J = 8.2, 1.5 Hz, 1H), 7.63 (t, J = 8.2 Hz, 1H), 7.57 – 7.50 (m, 4H), 7.50 – 7.46 (m, 3H), 7.36 – 7.32 (m, 2H).



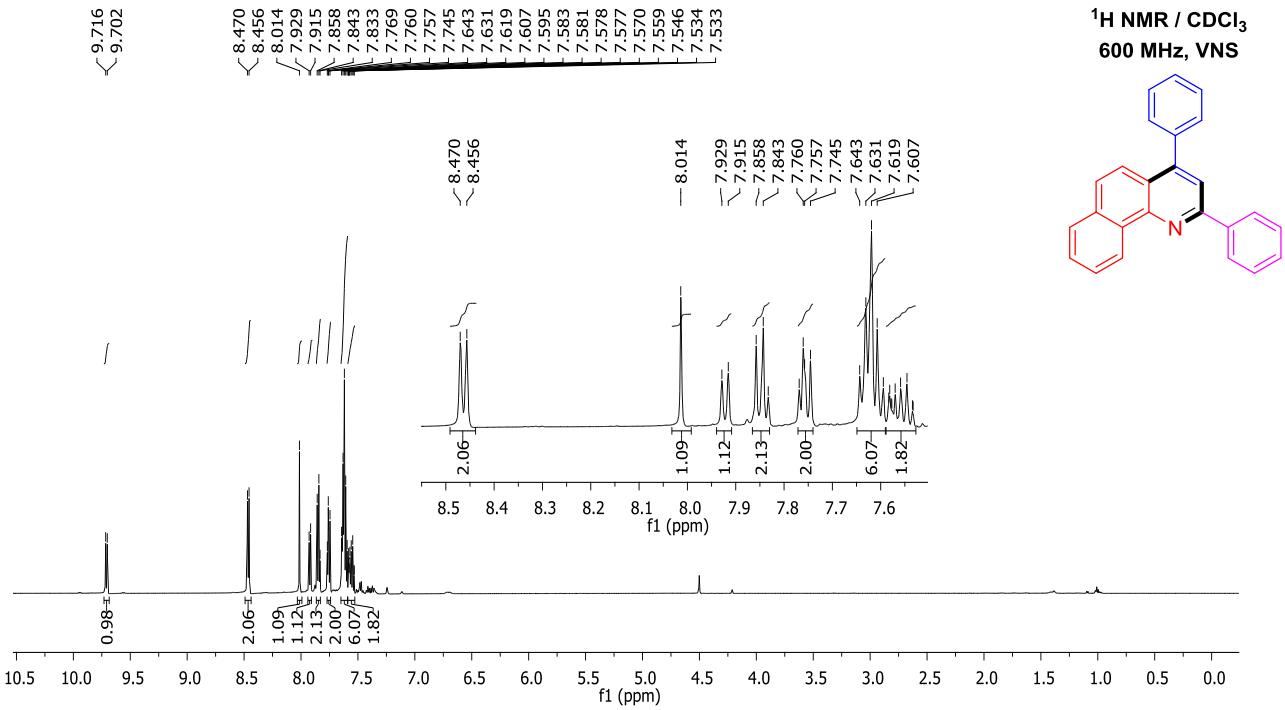


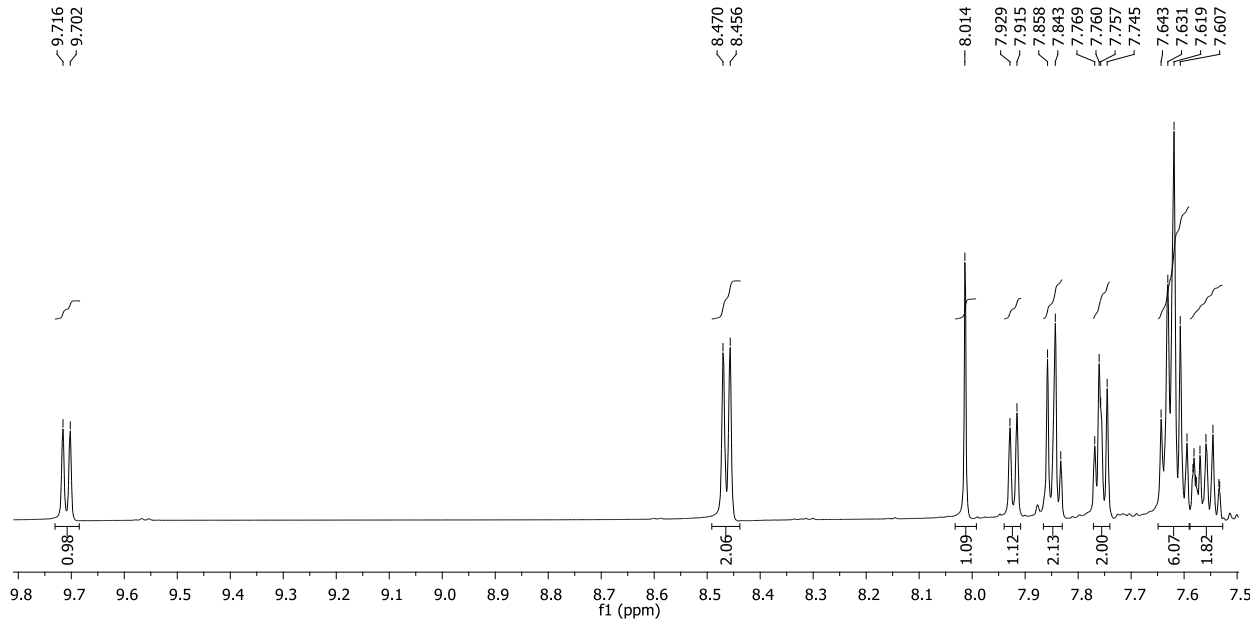
4-(Naphthalen-1-yl)-2-phenylquinoline (**4e**): ^{13}C NMR (150 MHz, $CDCl_3$) δ 156.68, 148.32, 148.04, 139.29, 135.83, 133.42, 131.88, 129.84, 129.65, 129.38, 128.77, 128.71, 128.25, 127.55, 127.33, 126.96, 126.43, 126.29, 126.10, 126.07, 125.90, 125.21, 120.37.





2,4-Diphenylbenzo[*h*]quinolone (4f): ^{1}H NMR (600 MHz, $CDCl_3$) δ 9.71 (d, *J* = 8.2 Hz, 1H), 8.46 (d, *J* = 8.2 Hz, 2H), 8.01 (s, 1H), 7.92 (d, *J* = 7.9 Hz, 1H), 7.84 (t, *J* = 7.5 Hz, 2H), 7.76 – 7.74 (m, 2H), 7.65 – 7.59 (m, 6H), 7.59 – 7.53 (m, 2H).





2,4-Diphenylbenzo[*h*]quinolone (4f): ^{13}C NMR (150 MHz, $CDCl_3$) δ 154.70, 148.89, 146.65, 139.60, 138.71, 133.50, 131.94, 129.59, 129.14, 128.71, 128.48, 128.17, 128.12, 127.51, 127.39, 127.19, 126.78, 125.15, 123.21, 122.76, 119.34.

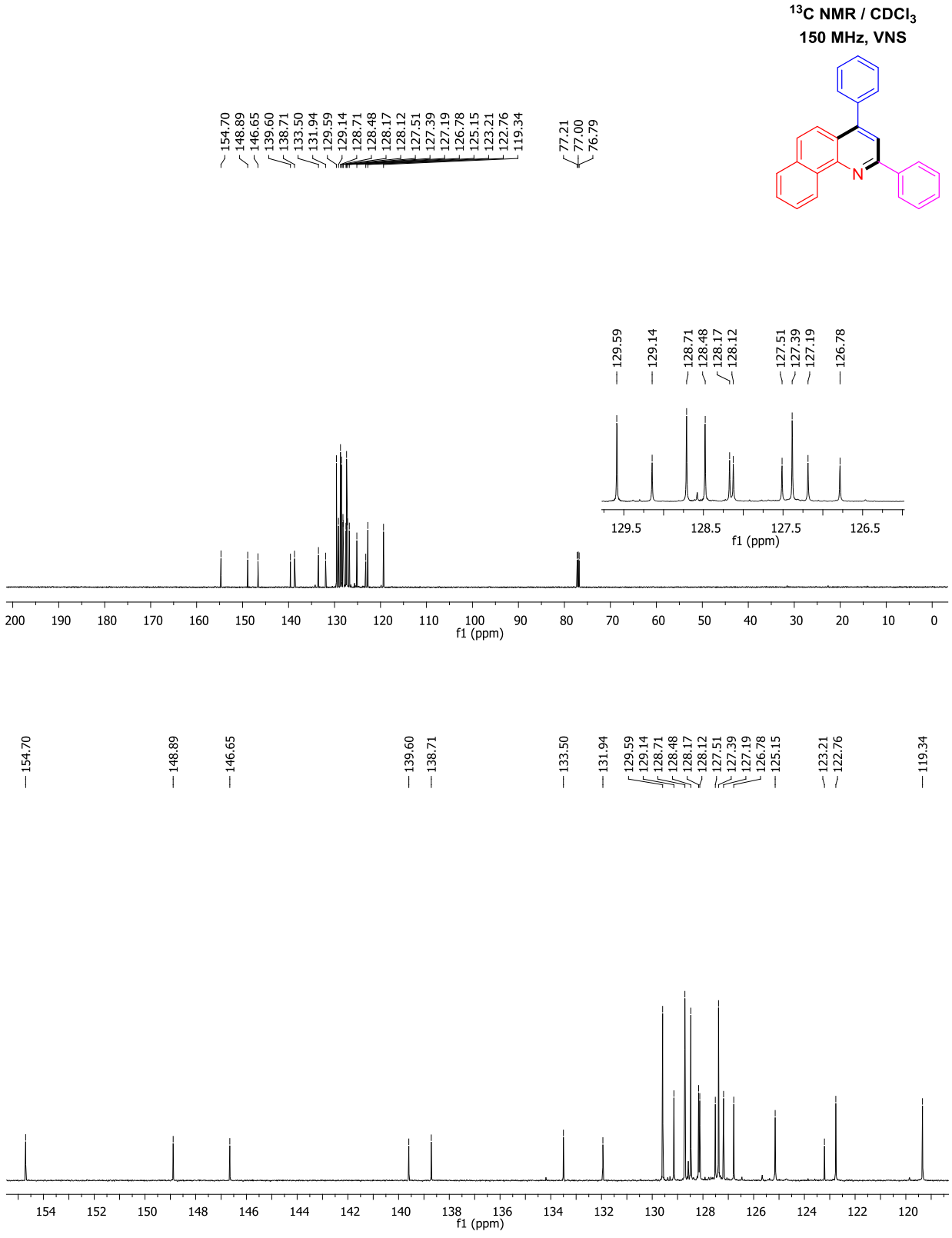
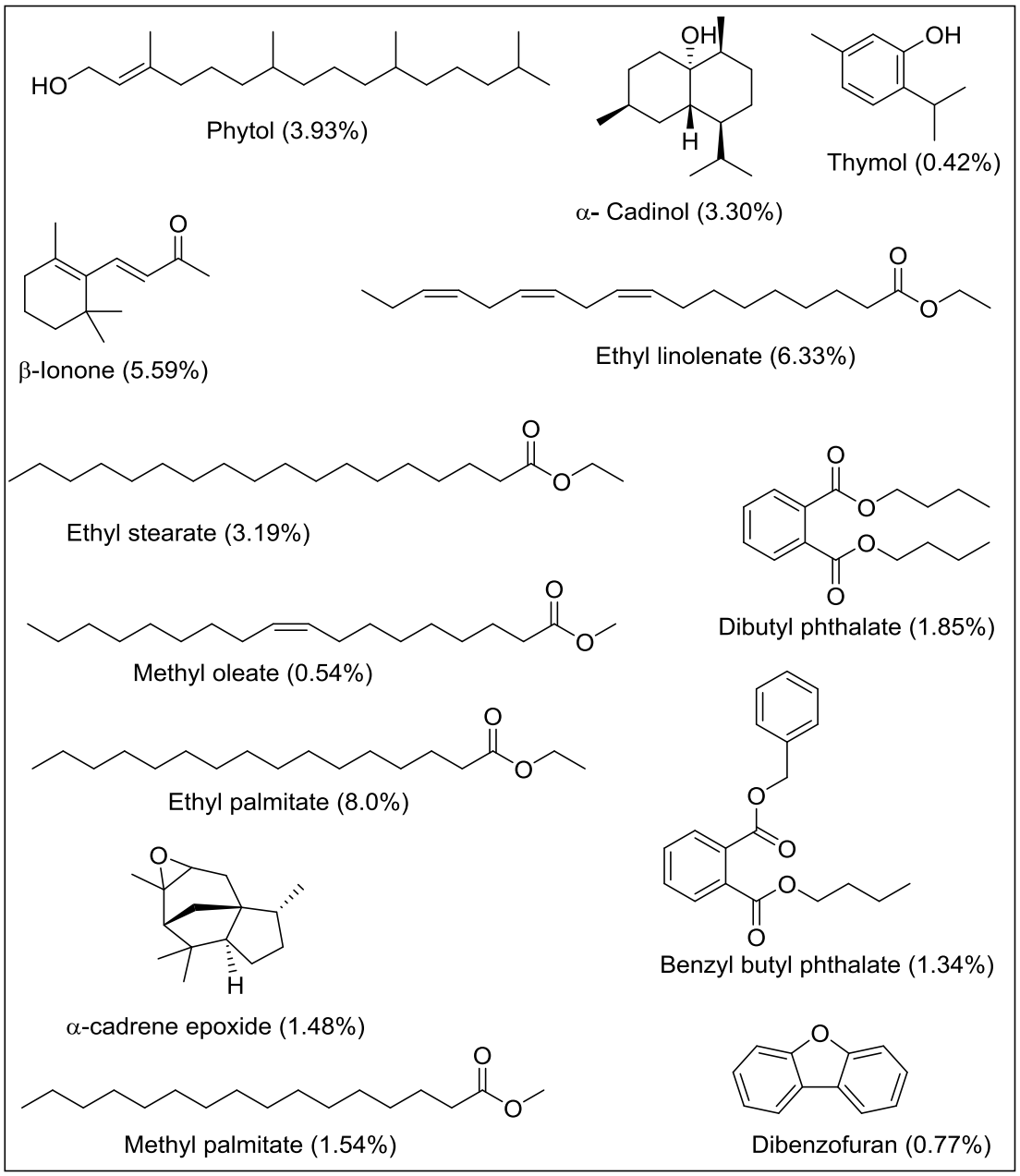


Table S1: Reported GC/MS analysis of volatile chemical constituents of *Nephrolepis cordifolia*



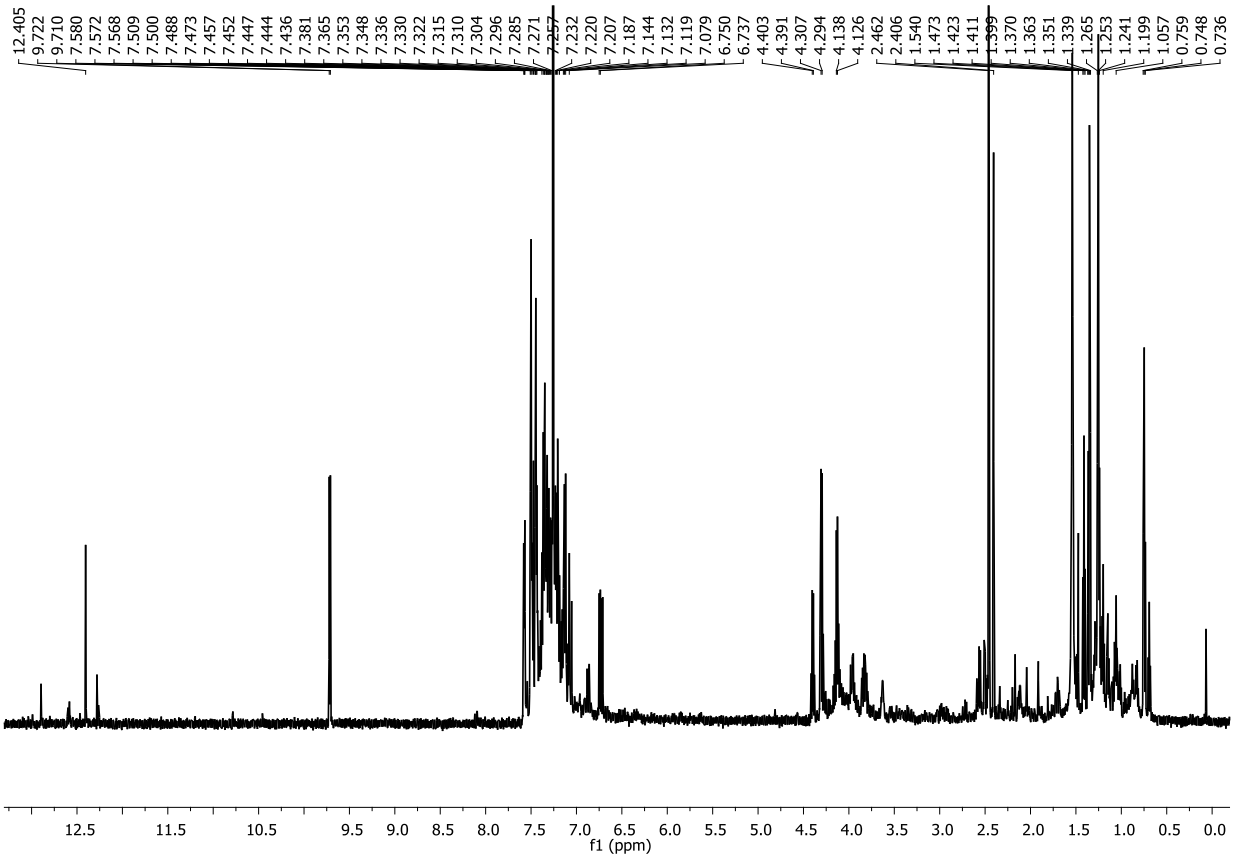


Figure S6: ^{1}H NMR analysis of crude $CHCl_3$ extract of *Nephrolepis cordifolia* tuber using VNS 600 MHz spectrometer using $CDCl_3$ as NMR solvent.