

Transition-metal-free, Visible-light Induced Cyclization of Arylsulfonyl Chlorides with *o*-Azidoarylalkynes: A Regiospecific Route to Unsymmetrical 2,3-Disubstituted Indoles

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(A) Materials and equipment

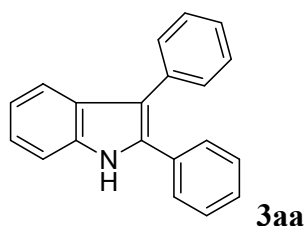
Reagents were obtained commercially and used as received. Solvents were purified and dried by standard methods. *o*-Azidoarylalkynes **2** were prepared according the literature methods.¹ All title products were characterized by ¹H NMR, ¹³C NMR, MS and High Resolution mass spectrometer (HRMS). ¹H NMR spectra were recorded on 400 MHz in CDCl₃, and ¹³C NMR spectra were recorded on 100 MHz in CDCl₃ using tetramethylsilane (TMS) as an internal standard. Chemical shift values (δ) are given in ppm. Coupling constants (*J*) were measured in Hz. Mass spectra were obtained with ionization voltages of 70 eV. HRMS spectra were obtained by ESI on a TOF mass. 200-300 mesh silica gel was used for column chromatography.

(B) Typical experimental procedure

Typical Experimental Procedure for the Synthesis of compounds **3**:

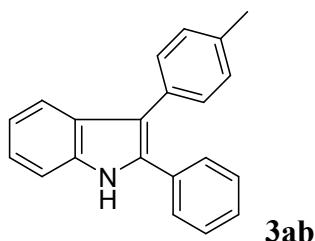
To a Schlenk tube were added arylsulfonyl chlorides **1** (0.35 mmol), *o*-azidoarylalkynes **2** (0.3 mmol), Eosin Y (3 mol%), MeCN (2.0 mL), 1,4-CHD (0.45 mmol), Na₂HPO₄ (0.3 mmol). Then the tube was charged with argon, and was stirred at room temperature with the irradiation of a 5 W blue LED ($\lambda_{\text{max}} = 455 \text{ nm}$) for about 12 h. After the reaction was finished, the reaction mixture was diluted in 35 mL ethyl acetate, washed with a saturated solution of brine (8 mL), saturated NaHCO₃ (10 mL), a saturated solution of brine (8 mL), dried (Na₂SO₄) and concentrated in vacuum, and the resulting residue was purified by silica gel column chromatography (hexane/ethyl acetate) to afford the desired products **3**.

(C) Analytical data



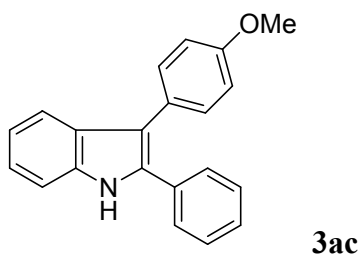
2,3-Diphenyl-1H-indole (**3aa**):

¹H NMR (400 MHz, CDCl₃) δ : 8.23 (brs, 1H), 7.71 (d, *J* = 8.0 Hz, 1H), 7.54-7.27 (m, 12H), 7.16 (d, *J* = 8.4 Hz, 1H); ¹³C NMR (100 MHz, CDCl₃) δ : 136.0 135.1, 134.2, 132.8, 132.6, 130.2, 128.8, 128.7, 128.5, 128.2, 127.7, 126.4, 122.8, 120.5, 119.7, 110.6; LRMS (EI 70 ev) *m/z* (%): 269 (M⁺, 100); HRMS *m/z* (ESI) calcd for C₂₀H₁₆N (M+H)⁺ 270.1283, found 270.1279.



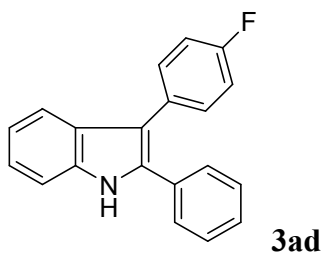
2-Phenyl-3-*p*-tolyl-1H-indole (3ab):

^1H NMR (400 MHz, CDCl_3) δ : 8.20 (brs, 1H), 7.74 (d, $J = 80$ Hz, 1H), 7.50-7.20 (m, 12H), 2.44 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 136.0, 135.9, 134.1, 132.8, 132.1, 130.0, 129.3, 129.0, 128.7, 128.2, 127.7, 122.7, 120.5, 119.8, 115.1, 111.1, 21.5; LRMS (EI 70 ev) m/z (%): 283 (M^+ , 100); HRMS m/z (ESI) calcd for $\text{C}_{21}\text{H}_{18}\text{N}$ ($\text{M}+\text{H}$) $^+$ 284.1435, found 284.1441.



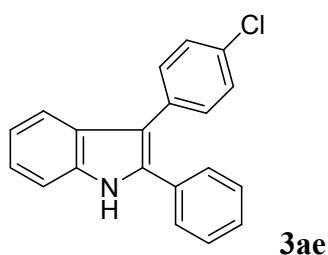
3-(4-Methoxyphenyl)-2-phenyl-1H-indole (3ac):

^1H NMR (400 MHz, CDCl_3) δ : 8.20 (brs, 1H), 7.55-7.51 (m, 3H), 7.48-7.46 (m, 1H), 7.35-7.30 (m, 4H), 7.27-7.25 (m, 1H), 7.16 (t, $J = 6.8$ Hz, 1H), 7.06 (t, $J = 6.8$ Hz, 1H), 6.98 (t, $J = 7.6$ Hz, 2H), 3.84 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 158.2, 136.4, 133.8, 133.2, 130.9, 128.8, 128.4, 128.3, 128.1, 127.6, 127.1, 122.1, 119.6, 118.7, 114.1, 111.3, 54.5; LRMS (EI 70 ev) m/z (%): 299 (M^+ , 100); HRMS m/z (ESI) calcd for $\text{C}_{21}\text{H}_{18}\text{NO}$ ($\text{M}+\text{H}$) $^+$ 300.1383, found 300.1390.



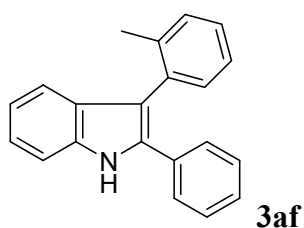
3-(4-Fluorophenyl)-2-phenyl-1H-indole (3ad):

^1H NMR (400 MHz, CDCl_3) δ : 8.18 (s, 1H), 7.63 (d, $J = 8.0$ Hz, 1H), 7.40-7.34 (m, 5H), 7.31-7.28 (m, 3H), 7.23-7.20 (m, 1H), 7.16-7.13 (m, 1H), 7.09-7.04 (m, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ : 162.7 (d, $J = 241.3$ Hz), 136.0, 134.3, 132.7, 131.88 (d, $J = 6.0$ Hz), 131.1, 131.0, 129.05 (d, $J = 34.5$ Hz), 128.4, 128.0, 122.9, 120.7, 119.5, 115.4 (d, $J = 26.5$ Hz), 114.2, 111.1; LRMS (EI 70 ev) m/z (%): 287 (M^+ , 100); HRMS m/z (ESI) calcd for $\text{C}_{20}\text{H}_{15}\text{FN}$ ($\text{M}+\text{H}$) $^+$ 288.1189, found 288.1193.



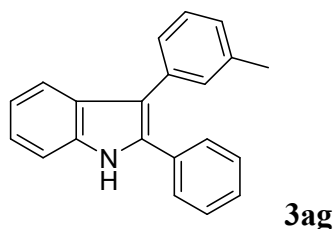
3-(4-Chlorophenyl)-2-phenyl-1H-indole (3ae):

^1H NMR (400 MHz, CDCl_3) δ : 8.19 (brs, 1H), 7.65 (d, $J = 8.0$ Hz, 1H), 7.46-7.30 (m, 10H), 7.25 (t, $J = 6.2$ Hz, 1H), 7.18 (t, $J = 8.0$ Hz, 1H); ^{13}C NMR (100 MHz, CDCl_3) δ : 136.1, 134.5, 133.7, 132.4, 132.0, 131.4, 129.1, 128.8, 128.5, 128.3, 128.1, 123.0, 120.8, 119.5, 113.9, 111.0; LRMS (EI 70 eV) m/z (%): 303 (M^+ , 72); HRMS m/z (ESI) calcd for $\text{C}_{20}\text{H}_{15}\text{ClN}$ ($\text{M}+\text{H}$) $^+$ 304.0894, found 304.0898.



2-Phenyl-3-o-tolyl-1H-indole (3af):

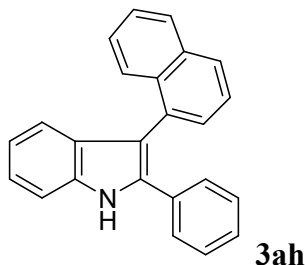
^1H NMR (400 MHz, CDCl_3) δ : 8.25 (brs, 1H), 7.47 (d, $J = 8.0$ Hz, 1H), 7.37-7.29 (m, 7H), 7.25-7.19 (m, 4H), 7.12 (dd, $J = 10.8$ Hz, $J = 1.6$ Hz, 1H), 2.08 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 137.8, 136.1, 134.6, 133.8, 133.1, 131.7, 130.3, 129.8, 128.8, 127.7, 127.2, 126.8, 125.9, 122.8, 120.3, 120.2, 114.9, 110.8, 20.4; LRMS (EI 70 eV) m/z (%): 283 (M^+ , 100); HRMS m/z (ESI) calcd for $\text{C}_{21}\text{H}_{18}\text{N}$ ($\text{M}+\text{H}$) $^+$ 284.1435, found 284.1444.



2-Phenyl-3-m-tolyl-1H-indole (3ag):

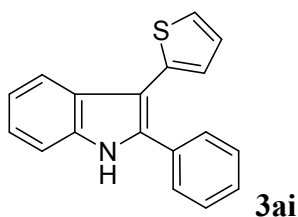
^1H NMR (400 MHz, CDCl_3) δ : 8.24 (brs, 1H), 7.78 (d, $J = 8.0$ Hz, 1H), 7.50-7.46 (m, 3H), 7.41-7.35 (m, 4H), 7.34-7.19 (m, 5H), 2.43 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 138.8, 136.4, 136.1,

135.5, 134.1, 133.0, 129.3, 129.0, 128.8, 128.3, 127.4, 126.0, 125.3, 124.3, 122.1, 120.1, 118.7, 111.4, 25.1; LRMS (EI 70 ev) m/z (%): 283 (M^+ , 100); HRMS m/z (ESI) calcd for $C_{21}H_{18}NO$ ($M+H$)⁺ 284.1435, found 284.1439.



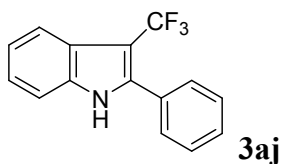
3-(Naphthalen-1-yl)-2-phenyl-1H-indole (3ah):

¹H NMR (400 MHz, $CDCl_3$) δ : 8.21 (brs, 1H), 7.99 (d, $J = 7.2$ Hz, 1H), 7.84 (d, $J = 8.0$ Hz, 1H), 7.58-7.45 (m, 5H), 7.40-7.36 (m, 2H), 7.33-7.24 (m, 3H), 7.18 (t, $J = 7.4$ Hz, 3H), 7.09-7.05 (m, 1H); ¹³C NMR (100 MHz, $CDCl_3$) δ : 137.5, 136.4, 134.6, 134.2, 133.4, 132.2, 130.2, 129.9, 129.5, 129.1, 129.0, 128.3, 127.1, 126.9, 126.7, 126.4, 126.0, 123.1, 120.8, 116.7, 112.3, 111.9; LRMS (EI 70 ev) m/z (%): 319 (M^+ , 100); HRMS m/z (ESI) calcd for $C_{24}H_{18}N$ ($M+Na$)⁺ 320.1434, found 320.1429.



2-Phenyl-3-(thiophen-2-yl)-1H-indole (3ai):

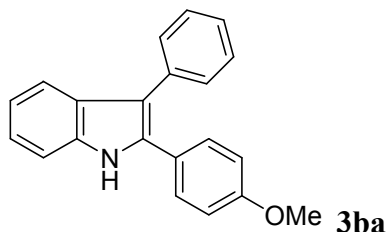
¹H NMR (400 MHz, $CDCl_3$) δ : 8.23 (brs, 1H), 7.80 (d, $J = 5.6$ Hz, 1H), 7.54-7.49 (m, 2H), 7.41 (d, $J = 7.2$ Hz, 1H), 7.38-7.31 (m, 3H), 7.30 (dd, $J = 0.8$ Hz, $J = 4.8$ Hz, 1H), 7.27-7.23 (m, 1H), 7.20-7.17 (m, 1H), 7.08 (dd, $J = 2.8$ Hz, $J = 3.6$ Hz, 1H), 7.05 (dd, $J = 1.2$ Hz, $J = 0.8$, 1H); ¹³C NMR (100 MHz, $CDCl_3$) δ : 136.3, 135.6, 135.2, 132.3, 128.8, 128.6, 128.3, 128.0, 127.3, 126.3, 124.6, 122.9, 120.7, 119.8, 110.8, 108.1; LRMS (EI 70 ev) m/z (%): 275 (M^+ , 100); HRMS m/z (ESI) calcd for $C_{18}H_{14}NS$ ($M+H$)⁺ 276.0841, found 276.0837.



3-(Trifluoromethyl)-2-phenyl-1H-indole (3aj):

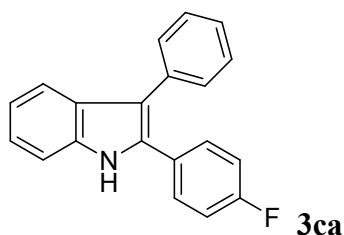
¹H NMR (400 MHz, $CDCl_3$) δ : 8.30 (brs, 1H), 7.84 (d, $J = 8.0$ Hz, 1H), 7.60-7.57 (m, 2H), 7.51-7.47 (m, 3H), 7.41-7.39 (m, 1H), 7.30-7.23 (m, 2H); ¹³C NMR (100 MHz, $CDCl_3$) δ : 138.7 (q, $J = 4.7$

Hz), 135.0, 131.1, 129.9, 129.5, 129.2, 129.1, 128.8, 127.8, 127.3, 125.8 (d, $J = 1.7$ Hz), 123.6, 121.9, 120.2 (d, $J = 2.2$ Hz), 111.1, 104.1 (q, $J = 35.8$ Hz); LRMS (EI 70 ev) m/z (%): 261 (M^+ , 100); HRMS m/z (ESI) calcd for $C_{15}H_{11}F_3N$ ($M+H$) $^+$ 262.0839, found 262.0845.



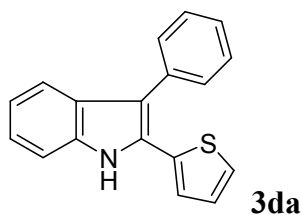
2-(4-Methoxyphenyl)-3-phenyl-1H-indole (3ba):

1H NMR (400 MHz, $CDCl_3$) δ : 8.20 (brs, 1H), 7.75 (d, $J = 7.2$ Hz, 1H), 7.58 (d, $J = 8.0$ Hz, 1H), 7.54-7.36 (m, 7H), 7.29 (t, $J = 7.2$ Hz, 1H), 7.18 (d, $J = 5.4$ Hz, 1H), 6.85 (d, $J = 8.0$ Hz, 2H), 3.82 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ : 160.3, 137.2, 136.7, 135.1, 130.8, 130.2, 129.5, 129.2, 126.7, 126.0, 122.7, 120.6, 119.5, 114.7, 112.0, 111.8, 55.4; LRMS (EI 70 ev) m/z (%): 299 (M^+ , 100); HRMS m/z (ESI) calcd for $C_{21}H_{18}NO$ ($M+H$) $^+$ 300.1383, found 300.1389.



2-(4-Fluorophenyl)-3-phenyl-1H-indole (3ca):

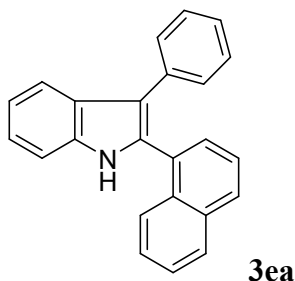
1H NMR (400 MHz, $CDCl_3$) δ : 8.17 (brs, 1H), 7.67 (d, $J = 7.6$ Hz, 1H), 7.47-7.37 (m, 5H), 7.32-7.29 (m, 1H), 7.27-7.21 (m, 2H), 7.16 (dd, $J = 10.4$ Hz, $J = 2.0$ Hz, 2H), 7.10-7.06 (m, 1H), 6.99-6.93 (m, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ : 164.1 (d, $J = 244.4$ Hz), 136.0, 134.8 (d, $J = 13.6$ Hz), 134.6, 132.7, 130.4, 130.3, 128.9, 128.8, 126.7, 123.9 (d, $J = 3.4$ Hz), 123.2, 120.7, 120.0, 116.0, 115.1 (d, $J = 24.6$ Hz), 114.7, 114.5, 111.0; LRMS (EI 70 ev) m/z (%): 287 (M^+ , 100); HRMS m/z (ESI) calcd for $C_{20}H_{15}FN$ ($M+H$) $^+$ 288.1189, found 288.1197.



3-Phenyl-2-(thiophen-2-yl)-1H-indole (3da):

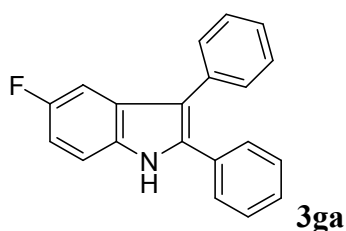
1H NMR (400 MHz, $CDCl_3$) δ : 8.26 (brs, 1H), 7.56-7.52 (m, 3H), 7.49 (dd, $J = 10.0$ Hz, $J = 2.4$

Hz, 2H), 7.42-7.37 (m, 3H), 7.23 (dd, $J = 1.2$ Hz, $J = 8.4$ Hz, 1H), 7.14-7.10 (m, 1H), 6.38 (dd, $J = 3.2$ Hz, $J = 2.8$ Hz, 1H), 6.35 (d, $J = 3.6$ Hz, 2H); ^{13}C NMR (100 MHz, CDCl_3) δ : 147.2, 141.5, 135.4, 134.7, 130.3, 128.9, 128.5, 127.1, 125.4, 123.0, 120.4, 119.5, 114.7, 112.0, 110.8, 106.9; HRMS m/z (ESI) calcd for $\text{C}_{18}\text{H}_{14}\text{NS}$ ($\text{M}+\text{H}$) $^+$ 276.0841, found 276.0844.



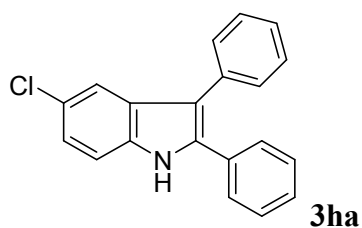
2-(Naphthalen-1-yl)-3-phenyl-1H-indole (3ea):

^1H NMR (400 MHz, CDCl_3) δ : 8.15 (brs, 1H), 7.91-7.82 (m, 4H), 7.46-7.37 (m, 4H), 7.34-7.31 (m, 3H), 7.28 (t, $J = 6.8$ Hz, 1H), 7.22-7.14 (m, 3H), 7.11 (t, $J = 7.4$ Hz, 1H); ^{13}C NMR (100 MHz, CDCl_3) δ : 136.0, 135.0, 133.7, 133.2, 132.3, 130.7, 129.3, 128.8, 128.5, 128.2, 127.7, 126.7, 126.2, 126.1, 125.8, 125.4, 122.7, 120.5, 119.8, 116.8, 111.1; LRMS (EI 70 ev) m/z (%): 319 (M^+ , 100); HRMS m/z (ESI) calcd for $\text{C}_{24}\text{H}_{18}\text{N}$ ($\text{M}+\text{H}$) $^+$ 320.1434, found 320.1439.



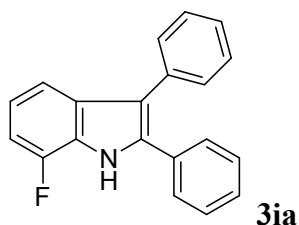
5-Fluoro-2,3-diphenyl-1H-indole (3ga):

^1H NMR (400 MHz, CDCl_3) δ : 8.21 (brs, 1H), 7.54-7.41 (m, 6H), 7.40-7.28 (m, 6H), 7.03-6.99 (m, 1H); ^{13}C NMR (100 MHz, CDCl_3) δ : 159.4 (d, $J = 234.1$ Hz), 135.7, 134.4, 132.4, 130.0, 129.2 (d, $J = 8.4$ Hz), 128.8 (d, $J = 9.8$ Hz), 128.0, 127.8, 126.5, 115.2, 111.6 (d, $J = 10.7$ Hz), 111.2, 110.9, 104.7 (d, $J = 23.8$ Hz); LRMS (EI 70 ev) m/z (%): 287 (M^+ , 100); HRMS m/z (ESI) calcd for $\text{C}_{20}\text{H}_{15}\text{FN}$ ($\text{M}+\text{H}$) $^+$ 288.1189, found 288.1196.



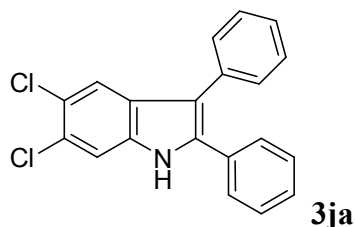
5-Chloro-2,3-diphenyl-1H-indole (3ha):

^1H NMR (400 MHz, CDCl_3) δ : 8.24 (brs, 1H), 7.67 (d, $J = 2.8$ Hz, 1H), 7.51-7.43 (m, 5H), 7.41-7.29 (m, 6H), 7.22 (dd, $J = 6.8$ Hz, $J = 2.4$ Hz, 1H); ^{13}C NMR (100 MHz, CDCl_3) δ : 135.3, 134.2, 134.1, 132.0, 130.1, 129.8, 128.7, 128.6, 128.1, 128.0, 126.6, 126.2, 122.9, 119.1, 114.8, 111.7; LRMS (EI 70 ev) m/z (%): 303 (M^+ , 66); HRMS m/z (ESI) calcd for $\text{C}_{20}\text{H}_{15}\text{ClN}$ ($\text{M}+\text{H}$) $^+$ 304.0894, found 304.0890.



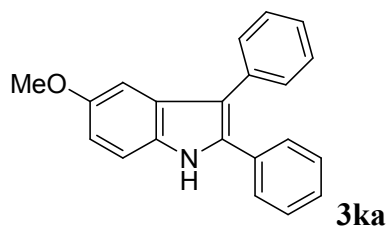
7-Fluoro-2,3-diphenyl-1H-indole (3ia):

^1H NMR (400 MHz, CDCl_3) δ : 8.39 (brs, 1H), 7.55-7.29 (m, 11H), 7.10-7.04 (m, 1H), 7.03 (ddd, $J = 6.0$ Hz, $J = 2.4$ Hz, $J = 4.4$ Hz, 1H); ^{13}C NMR (100 MHz, CDCl_3) δ : 151.1 (d, $J = 353.8$ Hz), 135.1, 134.7, 132.5 (d, $J = 2.5$ Hz), 132.3, 130.1, 128.9, 128.3 (d, $J = 28.9$ Hz), 126.5, 124.4, 124.1, 120.7, 115.7 (d, $J = 10.8$ Hz), 115.3, 107.5 (d, $J = 14.3$ Hz); LRMS (EI 70 ev) m/z (%): 287 (M^+ , 100); HRMS m/z (ESI) calcd for $\text{C}_{20}\text{H}_{15}\text{FN}$ ($\text{M}+\text{H}$) $^+$ 288.1189, found 288.1191.



5,6-Dichloro-2,3-diphenyl-1H-indole (3ja):

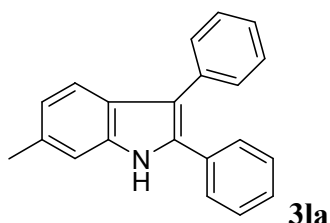
^1H NMR (400 MHz, CDCl_3) δ : 8.22 (brs, 1H), 7.69 (s, 1H), 7.53 (s, 1H), 7.45-7.29 (m, 10H); ^{13}C NMR (100 MHz, CDCl_3) δ : 135.8, 134.5, 133.7, 131.6, 129.8, 128.8, 128.7, 128.5, 128.1, 128.0, 126.6, 126.1, 124.5, 120.5, 114.6, 112.2; LRMS (EI 70 ev) m/z (%): 337 (M^+ , 67); HRMS m/z (ESI) calcd for $\text{C}_{20}\text{H}_{14}\text{Cl}_2\text{N}$ ($\text{M}+\text{H}$) $^+$ 338.0504 found 338.0510



5-Methoxy-2,3-diphenyl-1H-indole (3ka):

^1H NMR (400 MHz, CDCl_3) δ : 8.14 (brs, 1H), 7.47-7.34 (m, 6H), 7.32-7.28 (m, 5H), 7.15 (d, J

= 2.4 Hz, 1H), 6.94 (dd, $J = 10.0$ Hz, $J = 2.4$ Hz, 1H), 3.83 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 154.7, 135.3, 134.8, 132.6, 131.1, 130.0, 129.2, 128.6, 128.5, 128.1, 127.6, 126.2, 114.8, 112.9, 111.7, 101.2, 55.8; LRMS (EI 70 eV) m/z (%): 299 (M^+ , 100); HRMS m/z (ESI) calcd for $\text{C}_{21}\text{H}_{18}\text{NO}$ ($\text{M}+\text{H}$) $^+$ 300.1383, found 300.1380.



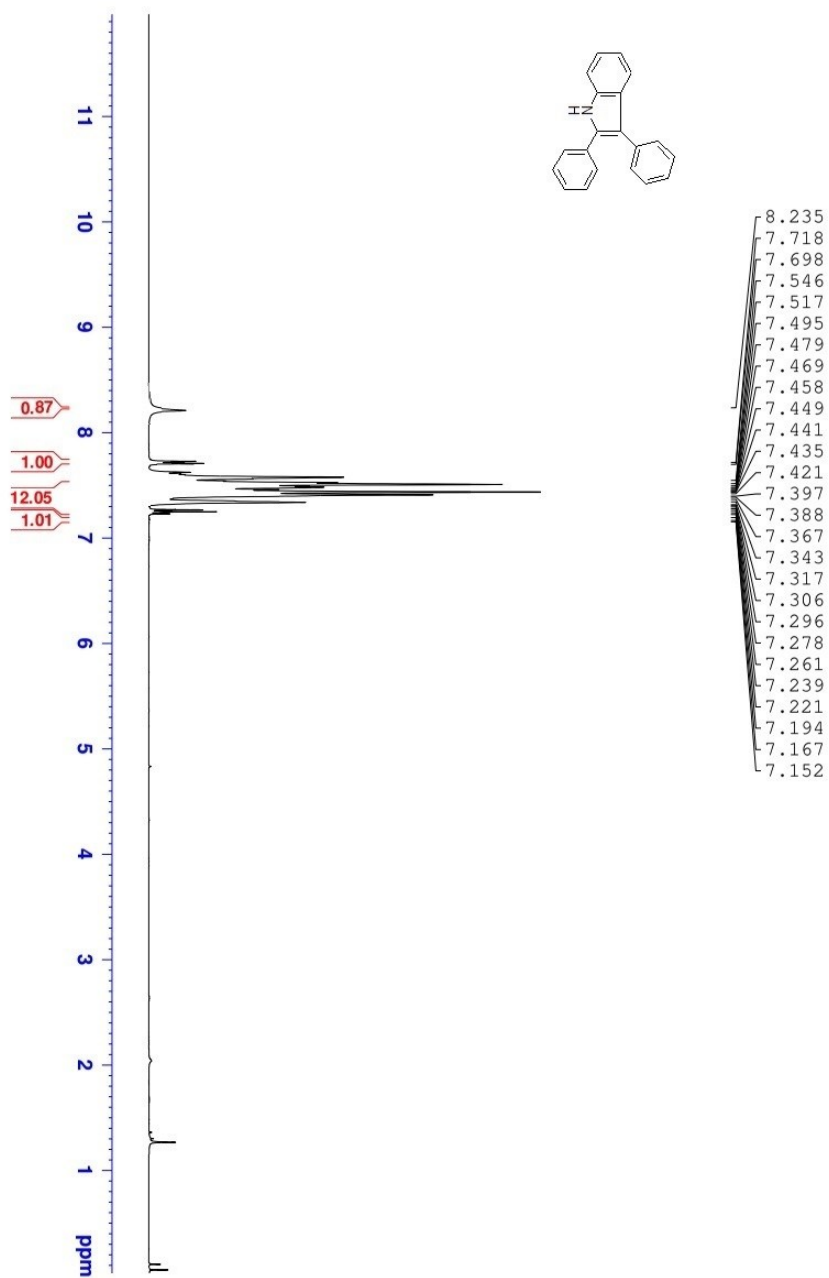
6-Methyl-2,3-diphenyl-1H-indole (3la):

^1H NMR (400 MHz, CDCl_3) δ : 8.09 (brs, 1H), 7.61 (d, $J = 8.0$ Hz, 1H), 7.51-7.29 (m, 10H), 7.23 (s, 1H), 7.05 (dd, $J = 8.4$ Hz, $J = 0.8$ Hz, 1H), 2.51 (s, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 136.3, 135.2, 133.4, 132.7, 132.5, 130.0, 128.7, 128.3, 127.9, 127.4, 126.5, 126.0, 122.1, 119.5, 114.9, 110.6, 21.4; LRMS (EI 70 eV) m/z (%): 283 (M^+ , 100); HRMS m/z (ESI) calcd for $\text{C}_{21}\text{H}_{18}\text{N}$ ($\text{M}+\text{H}$) $^+$ 284.1435, found 284.1437.

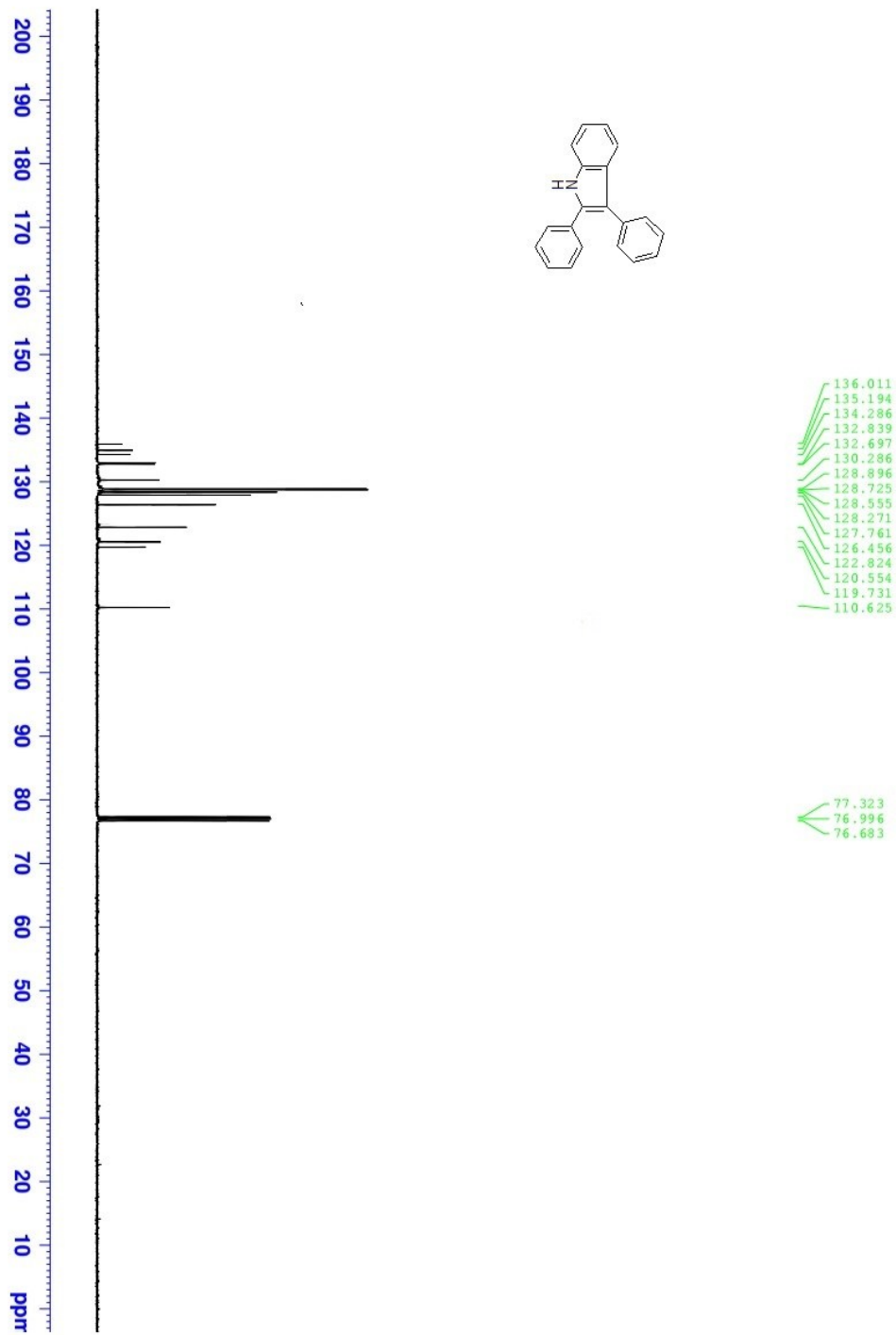
References

1. Lu, B.; Luo, Y.; Liu, L.; Ye, L.; Wang, Y.; Zhang, L. *Angew. Chem. Int. Ed.* **2011**, *50*, 8358.

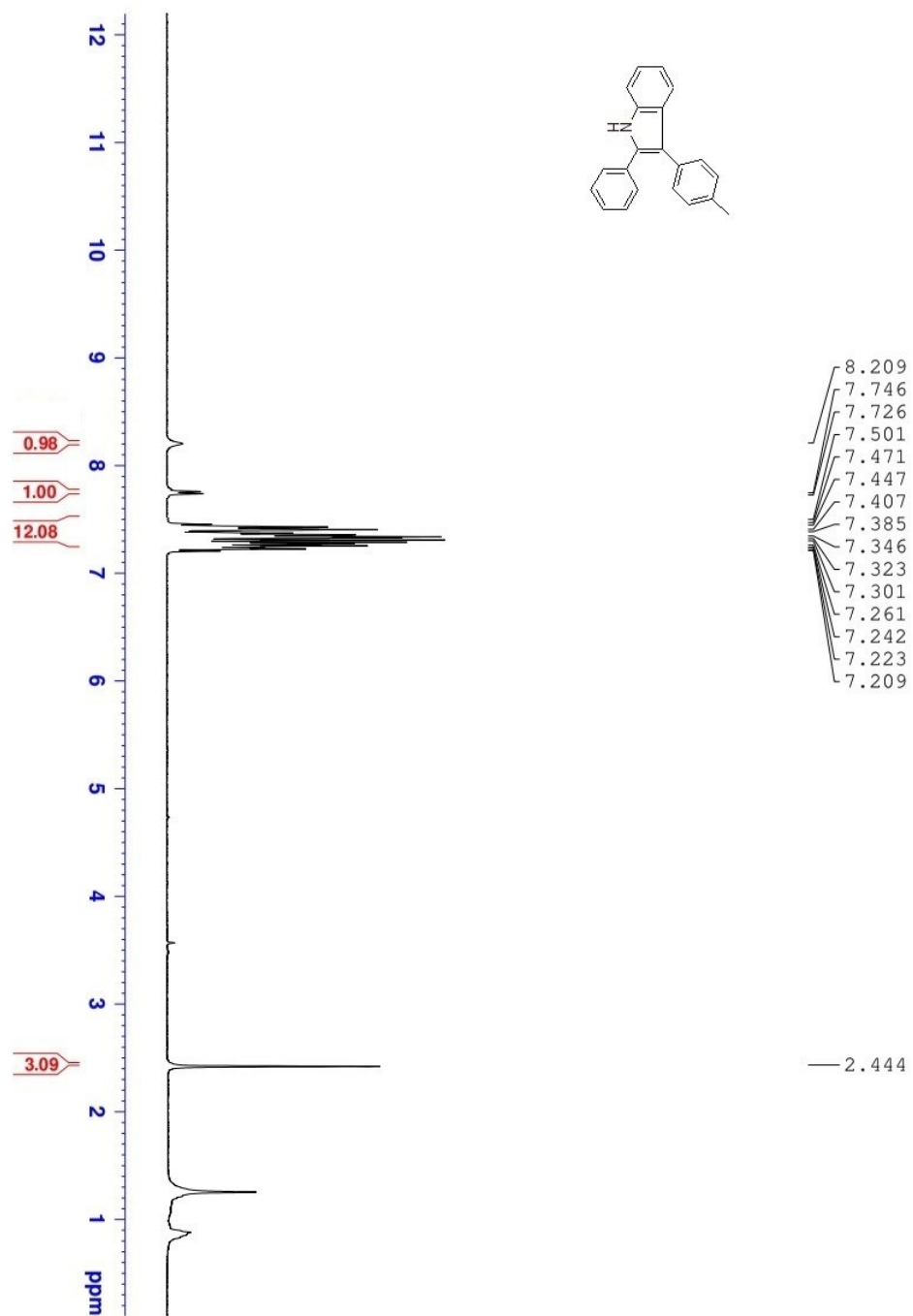
(E) Spectra



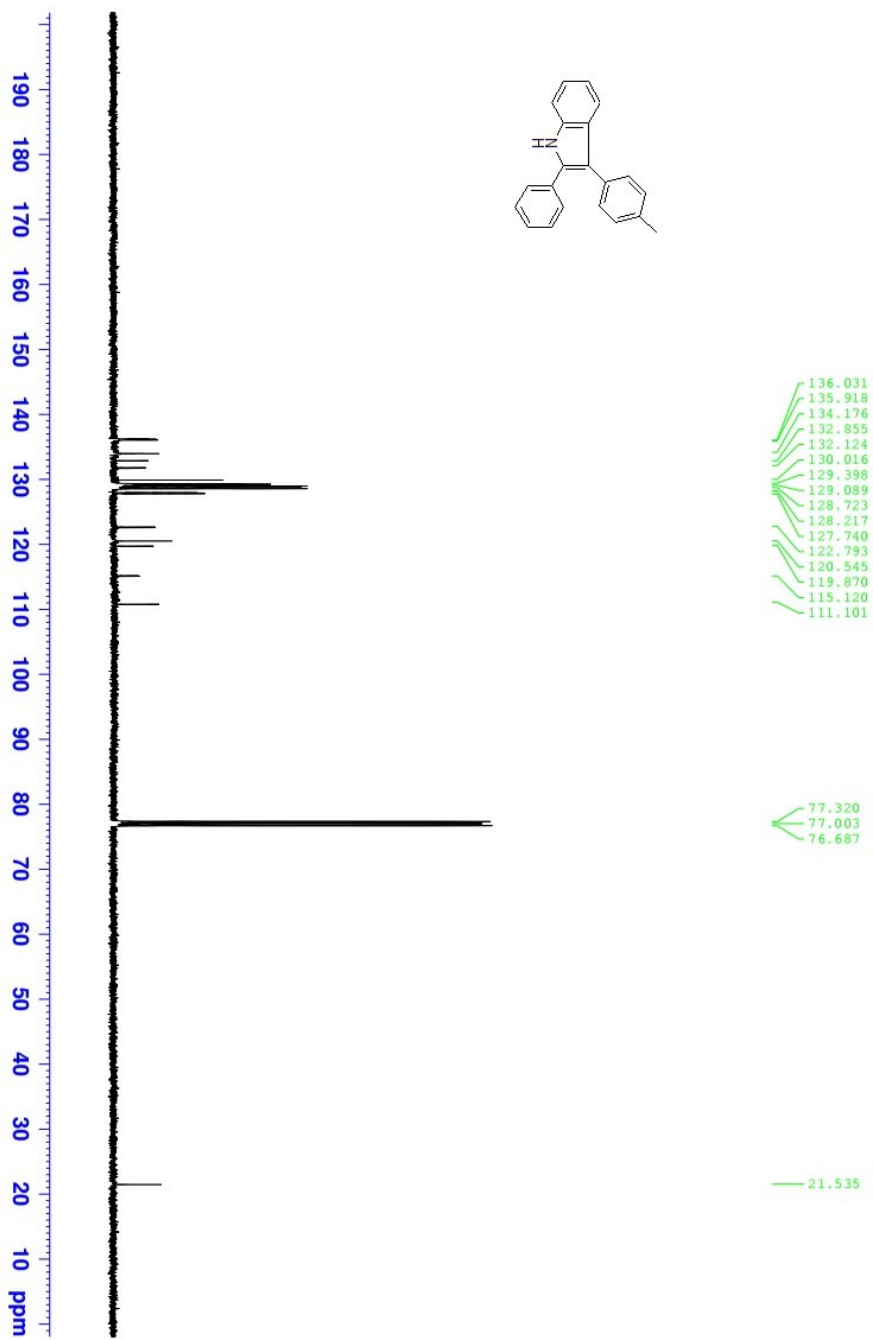
¹H NMR of Compound 3aa



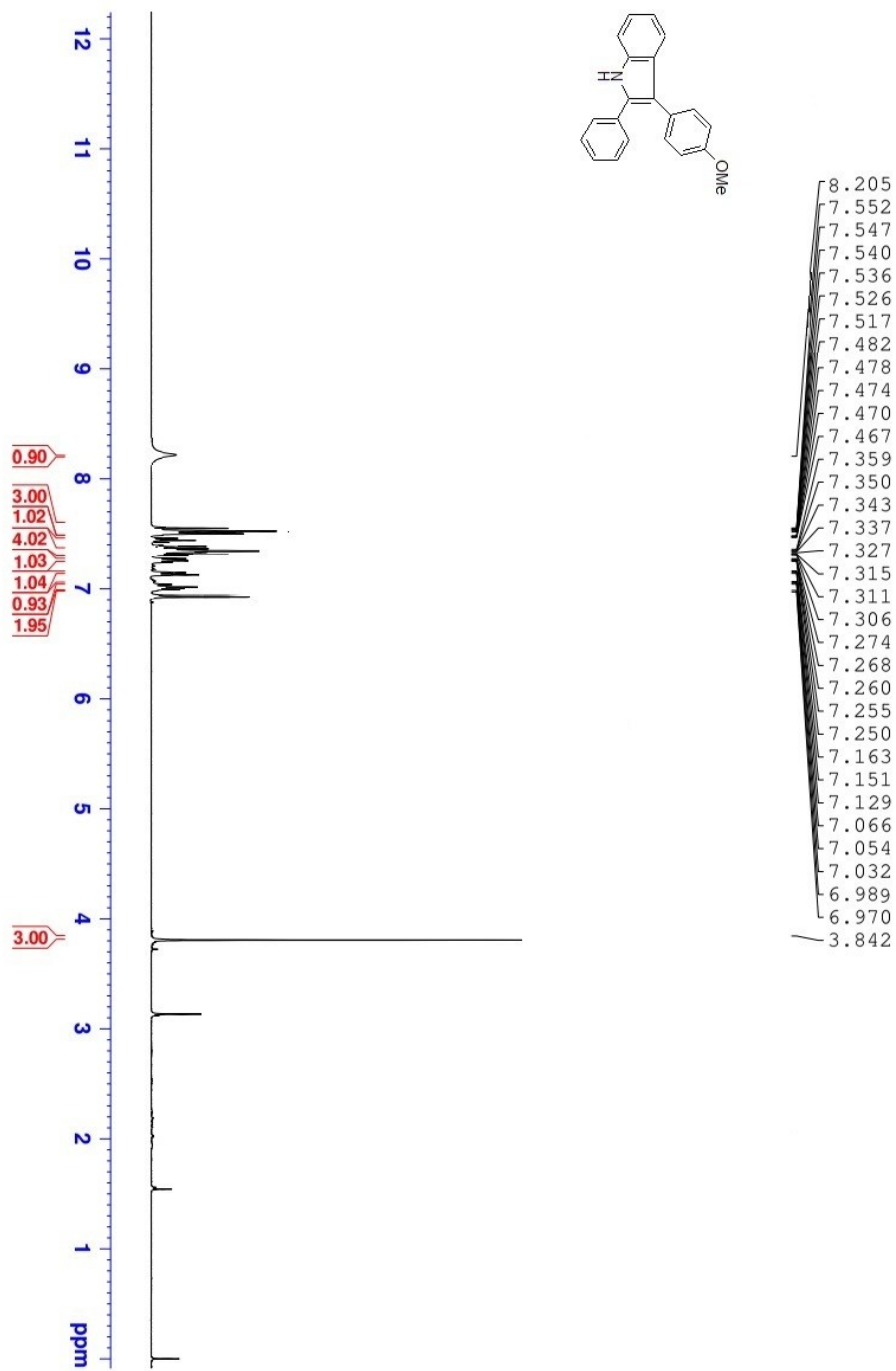
¹³C NMR of Compound 3aa



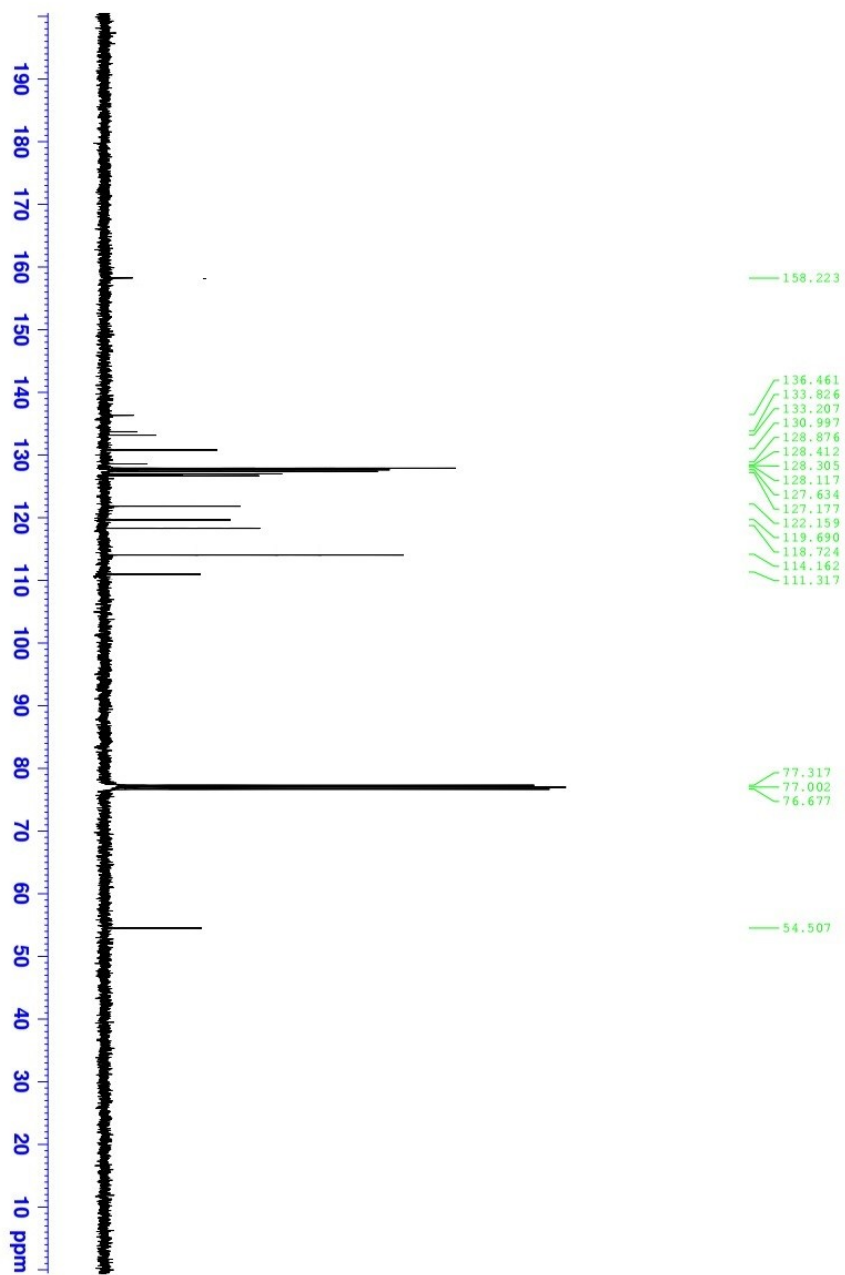
¹H NMR of Compound 3ab



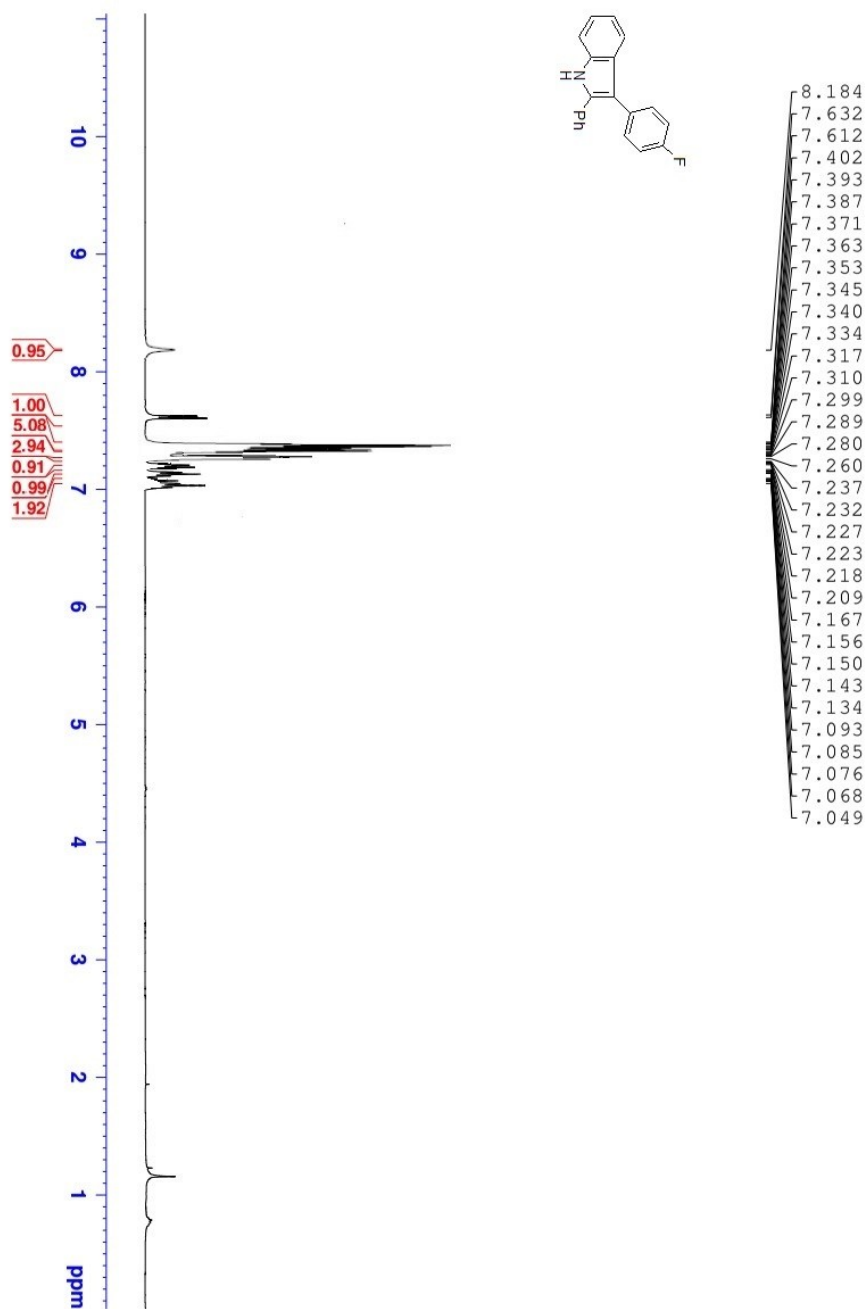
¹³C NMR of Compound 3ab



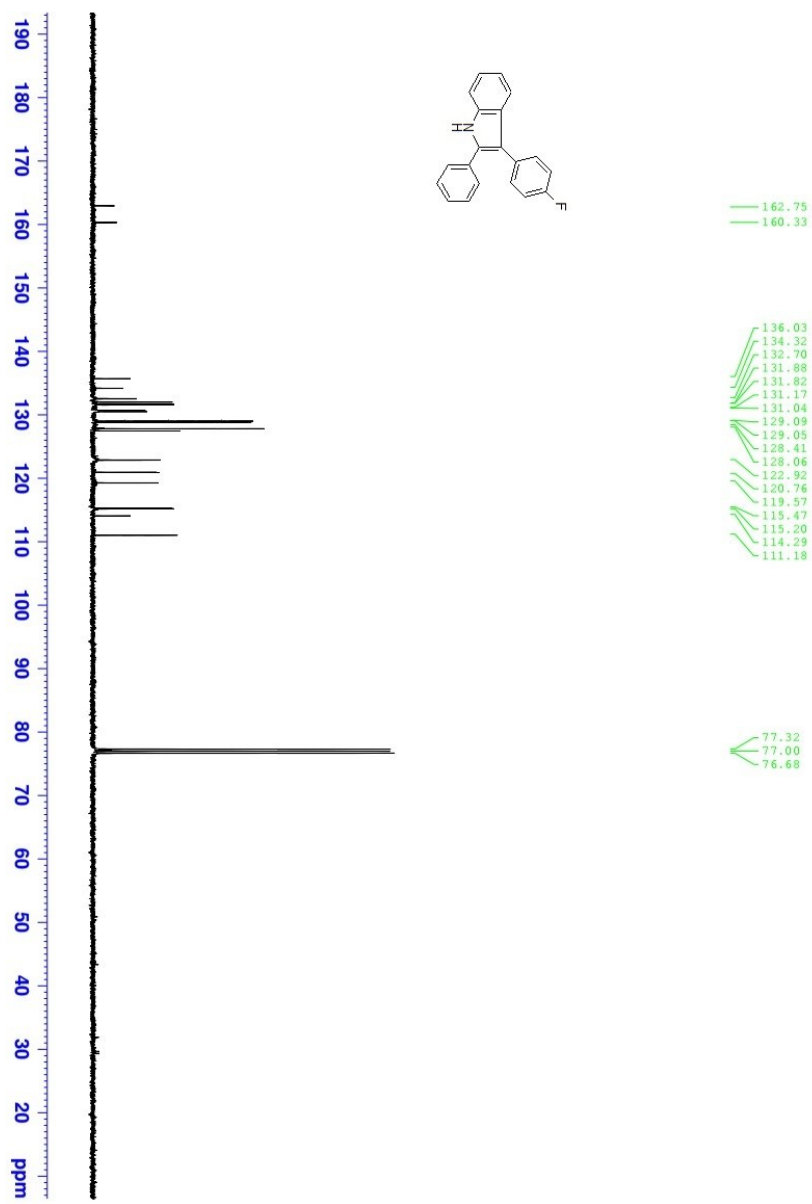
¹H NMR of Compound 3ac



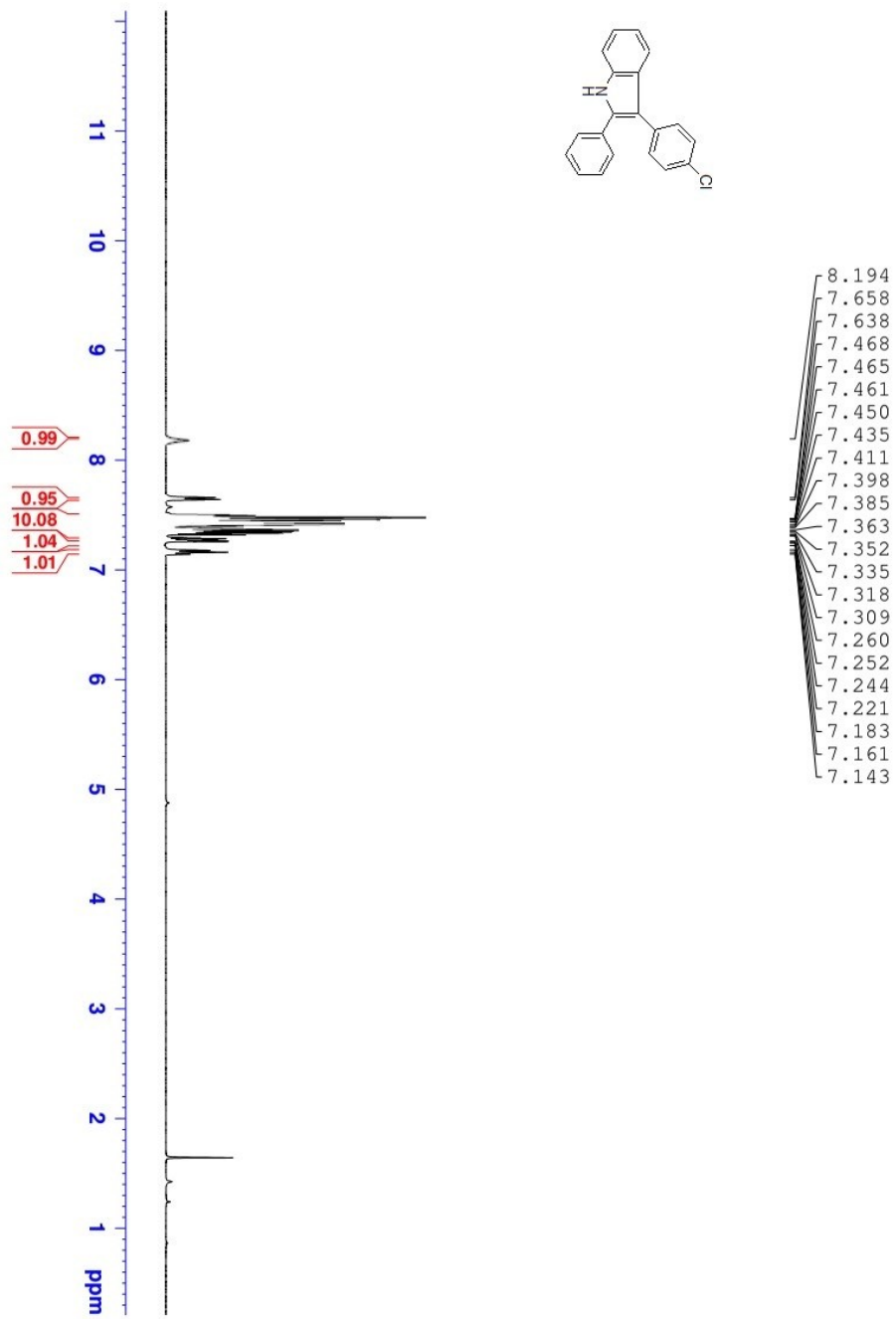
¹³C NMR of Compound 3ac



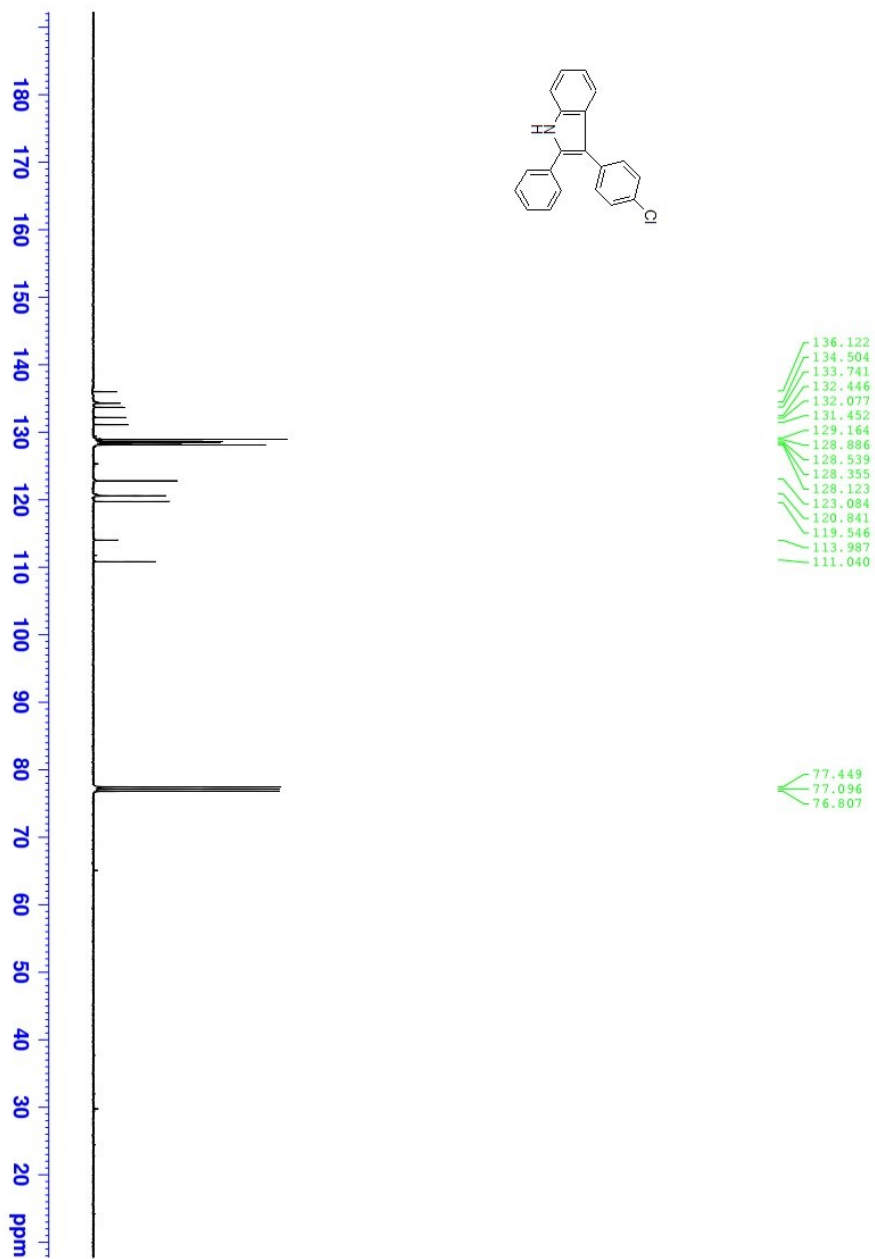
¹H NMR of Compound 3ad



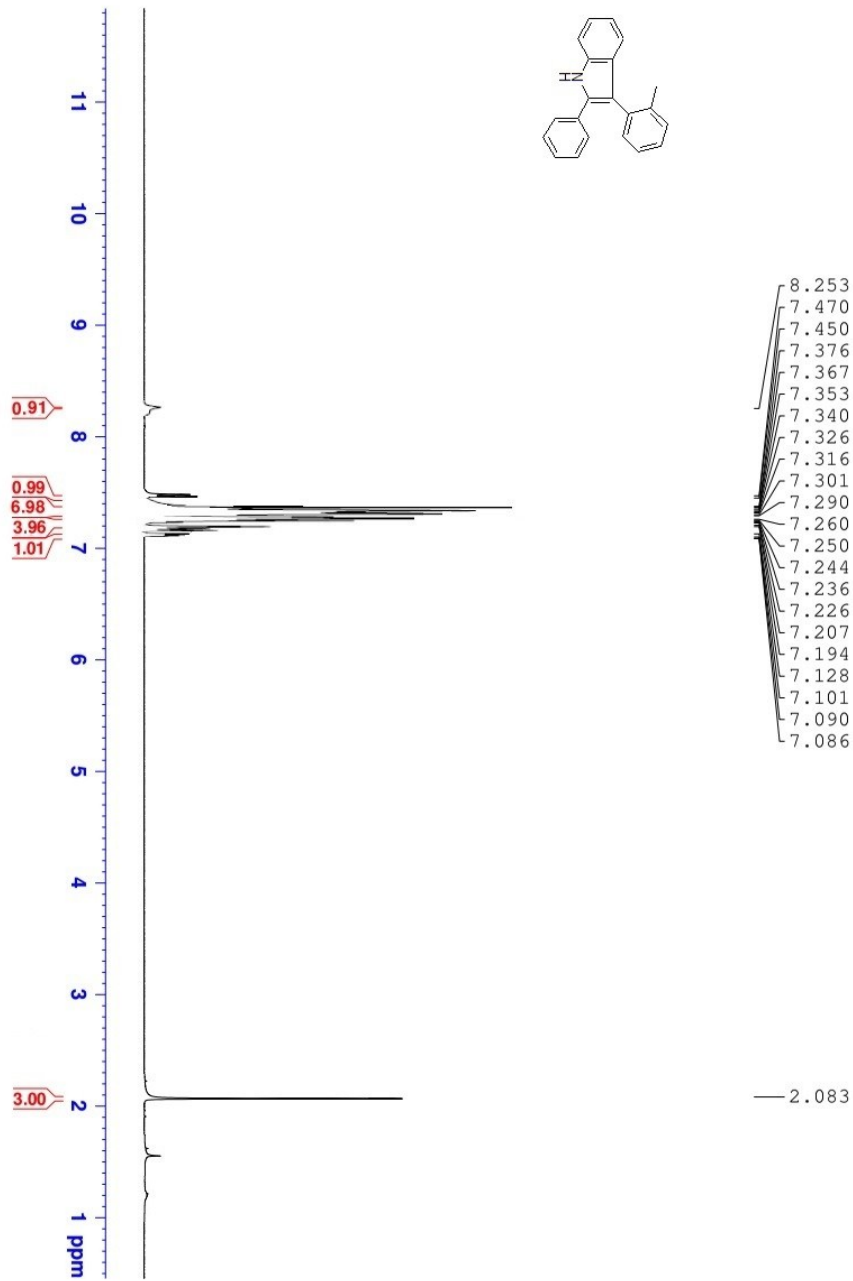
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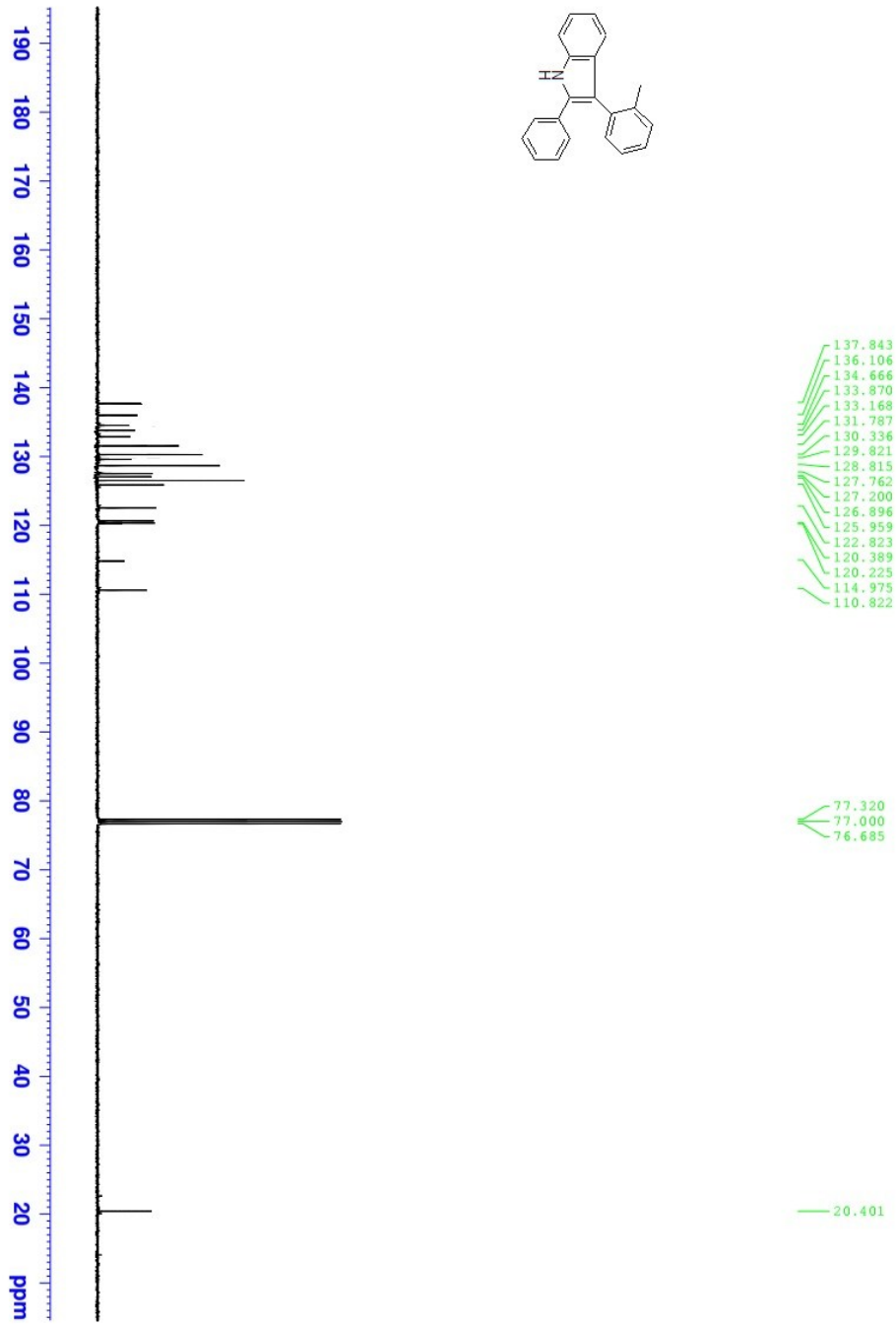
¹H NMR of Compound 3ae



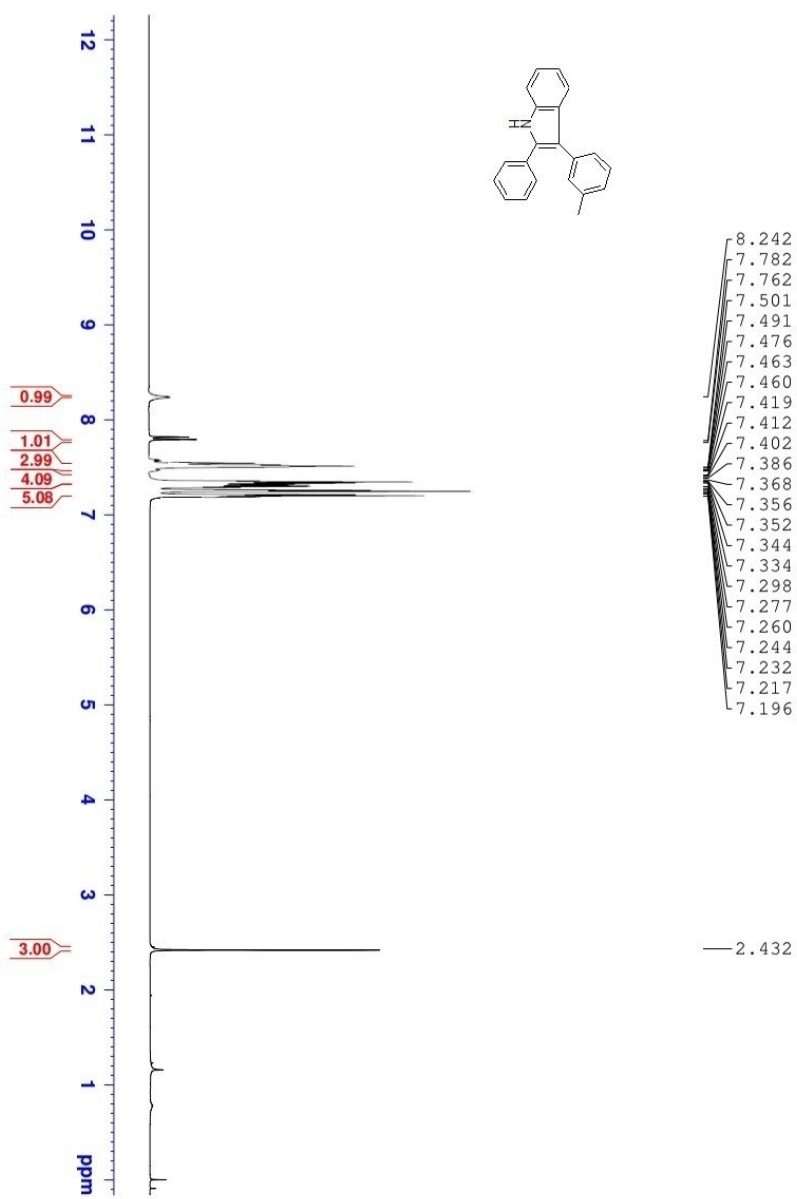
¹³C NMR of Compound 3ae



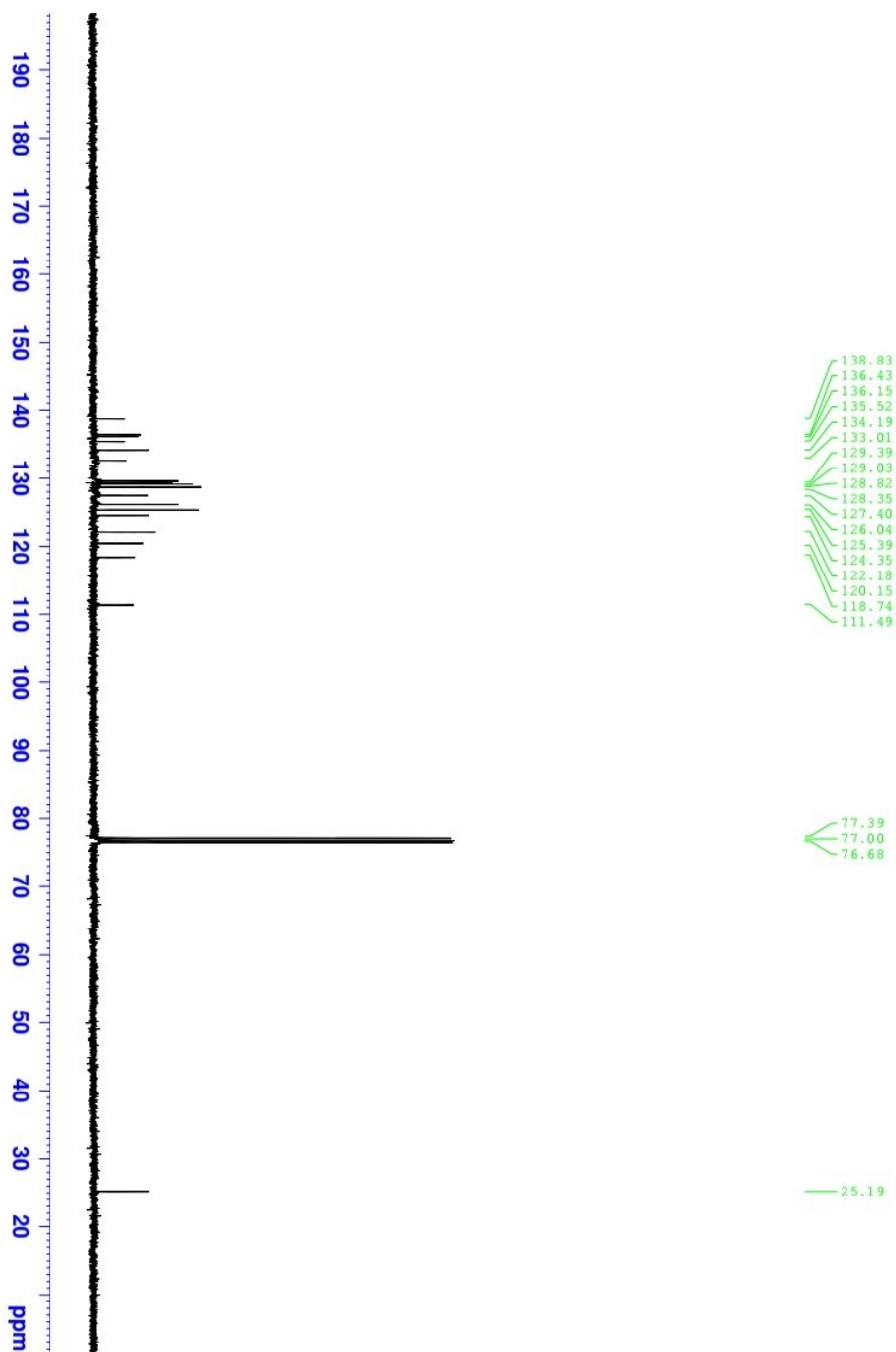
¹H NMR of Compound 3af



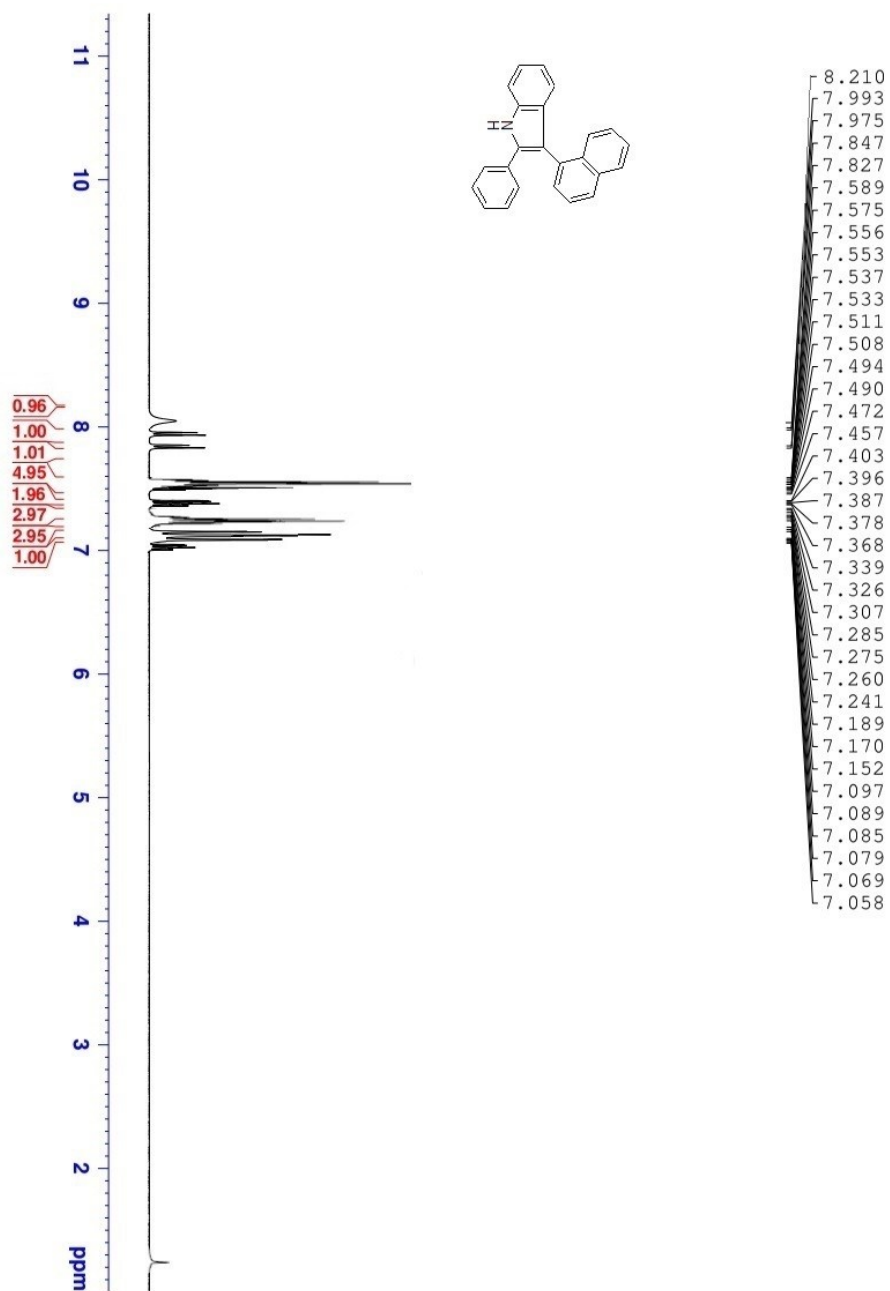
¹³C NMR of Compound 3af



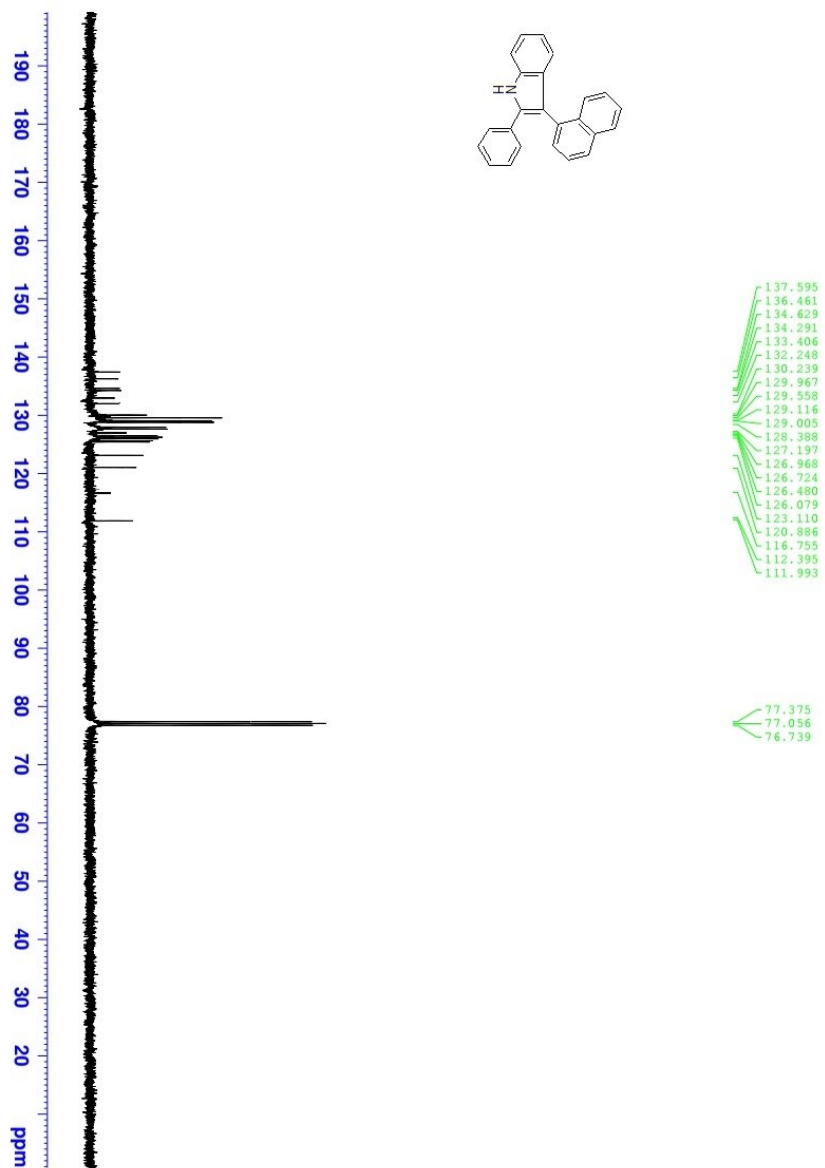
¹H NMR of Compound 3ag



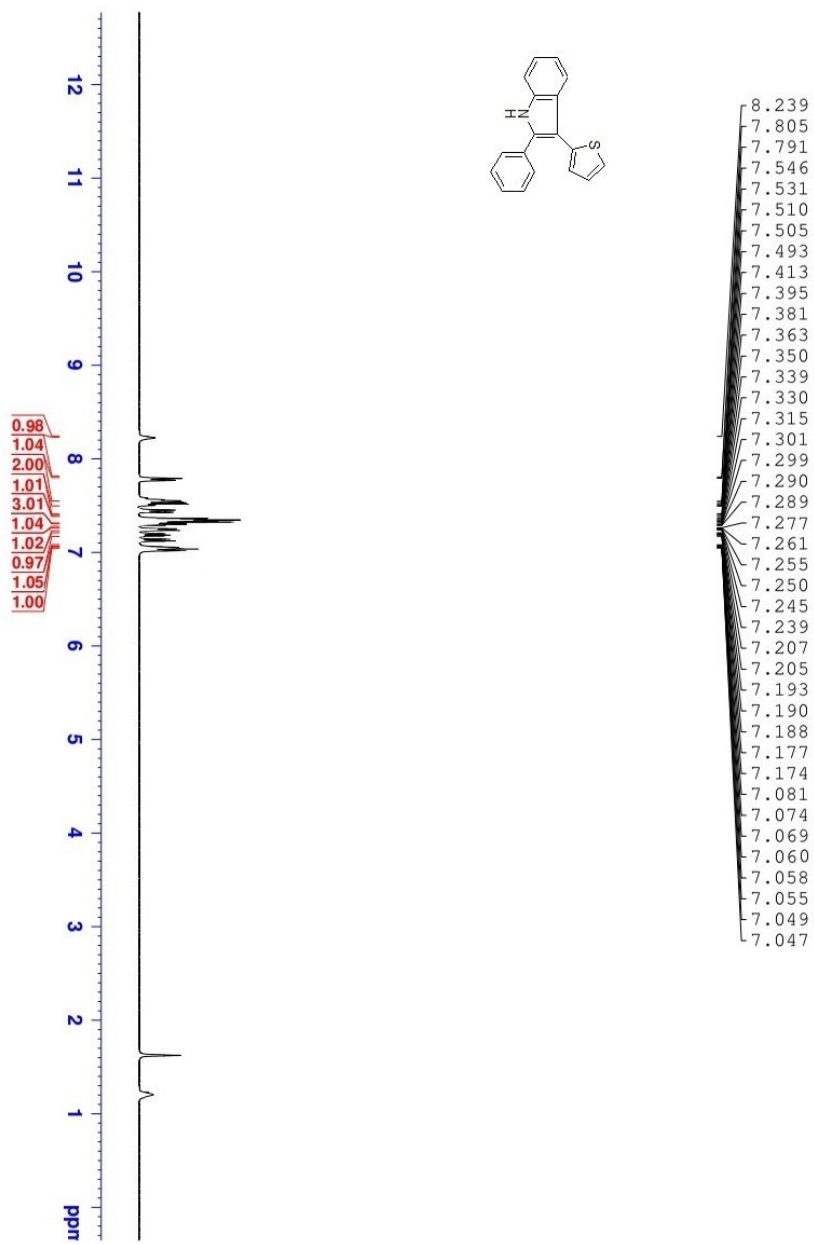
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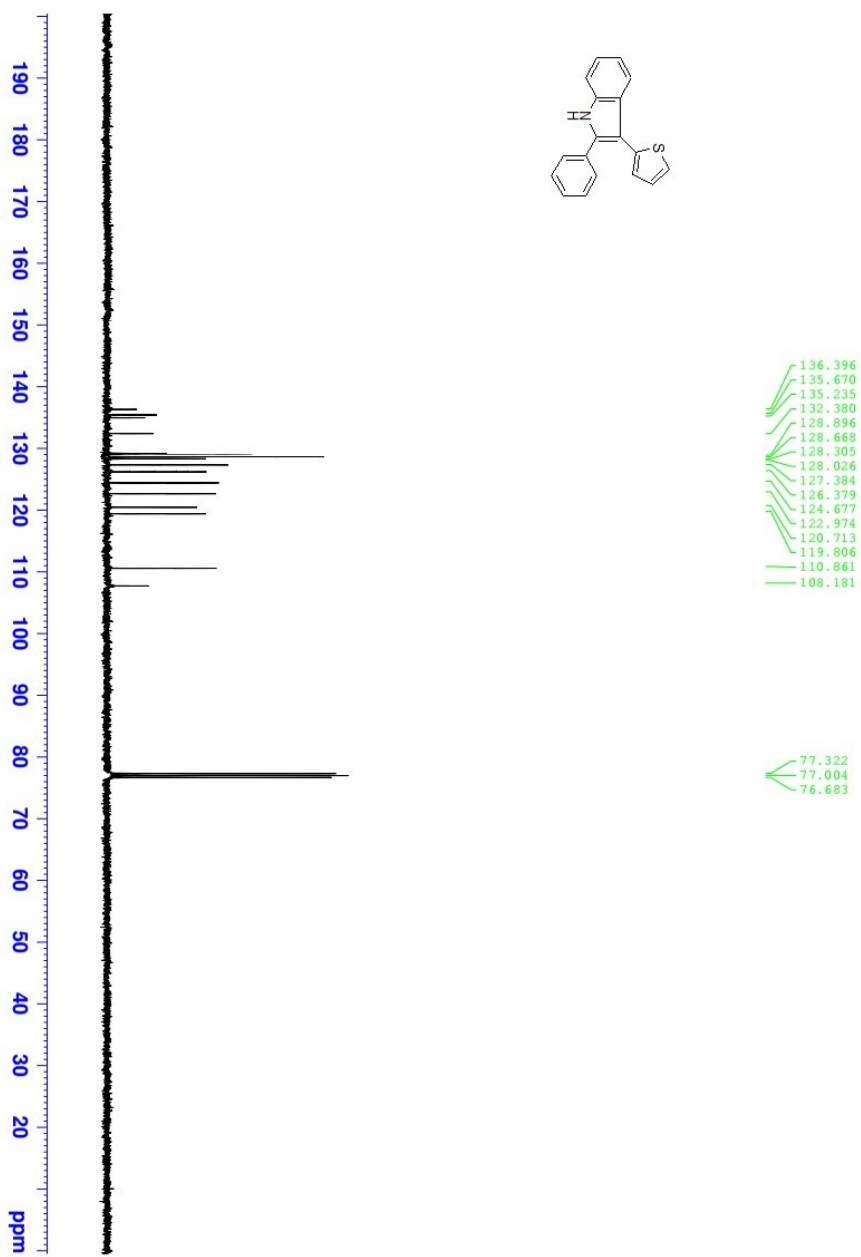
¹H NMR of Compound 3ah



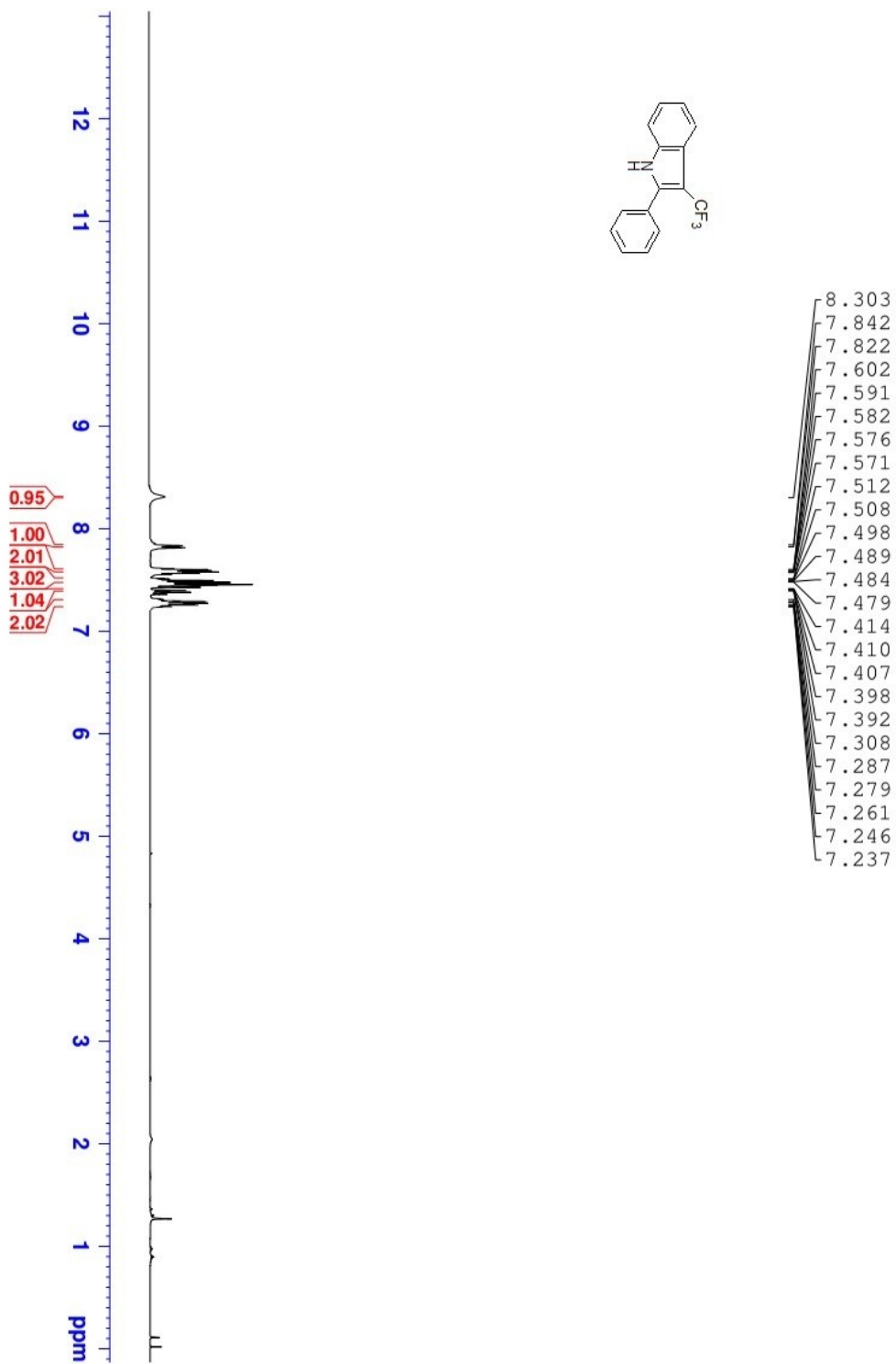
¹³C NMR of Compound 3ah



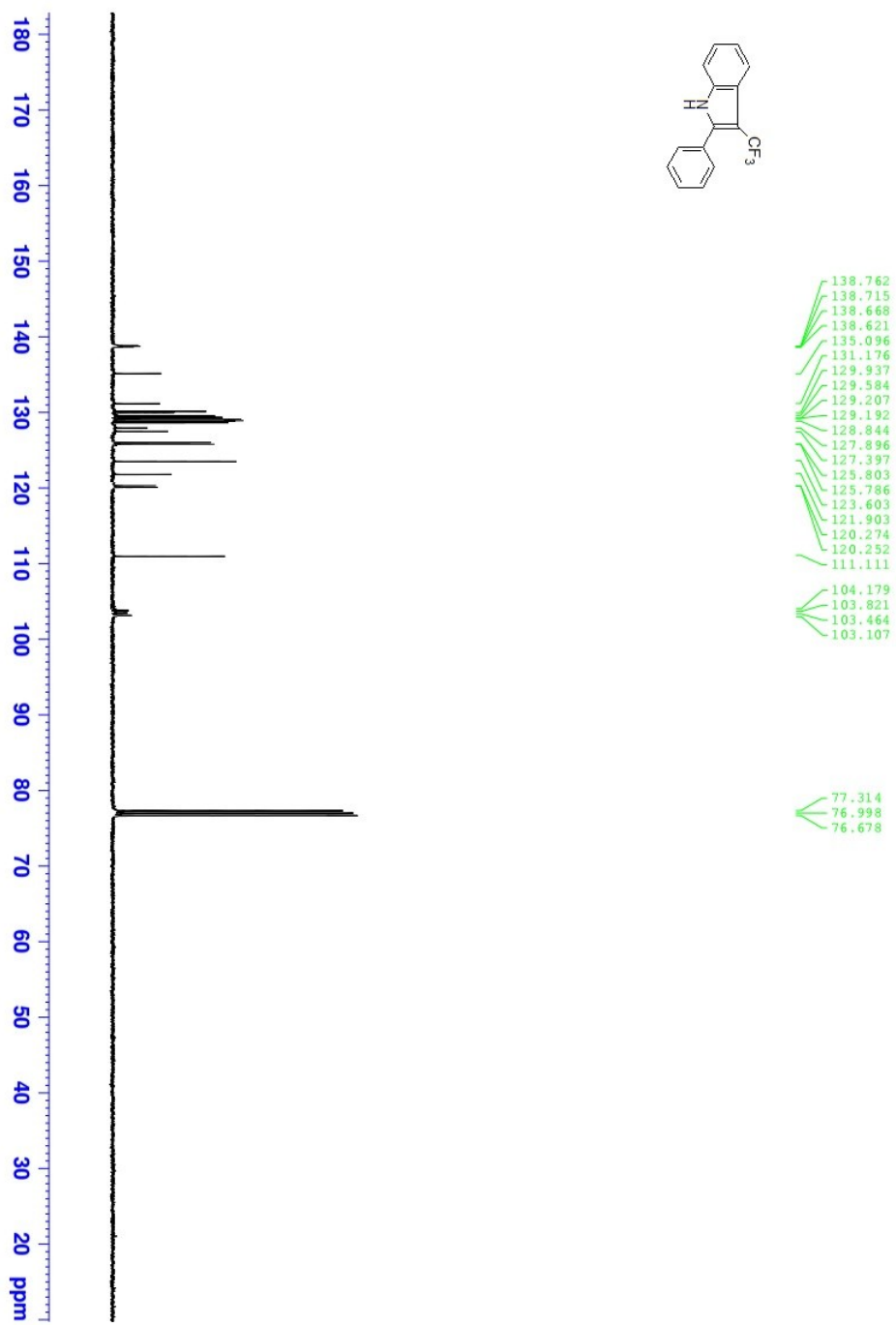
¹H NMR of Compound 3ai



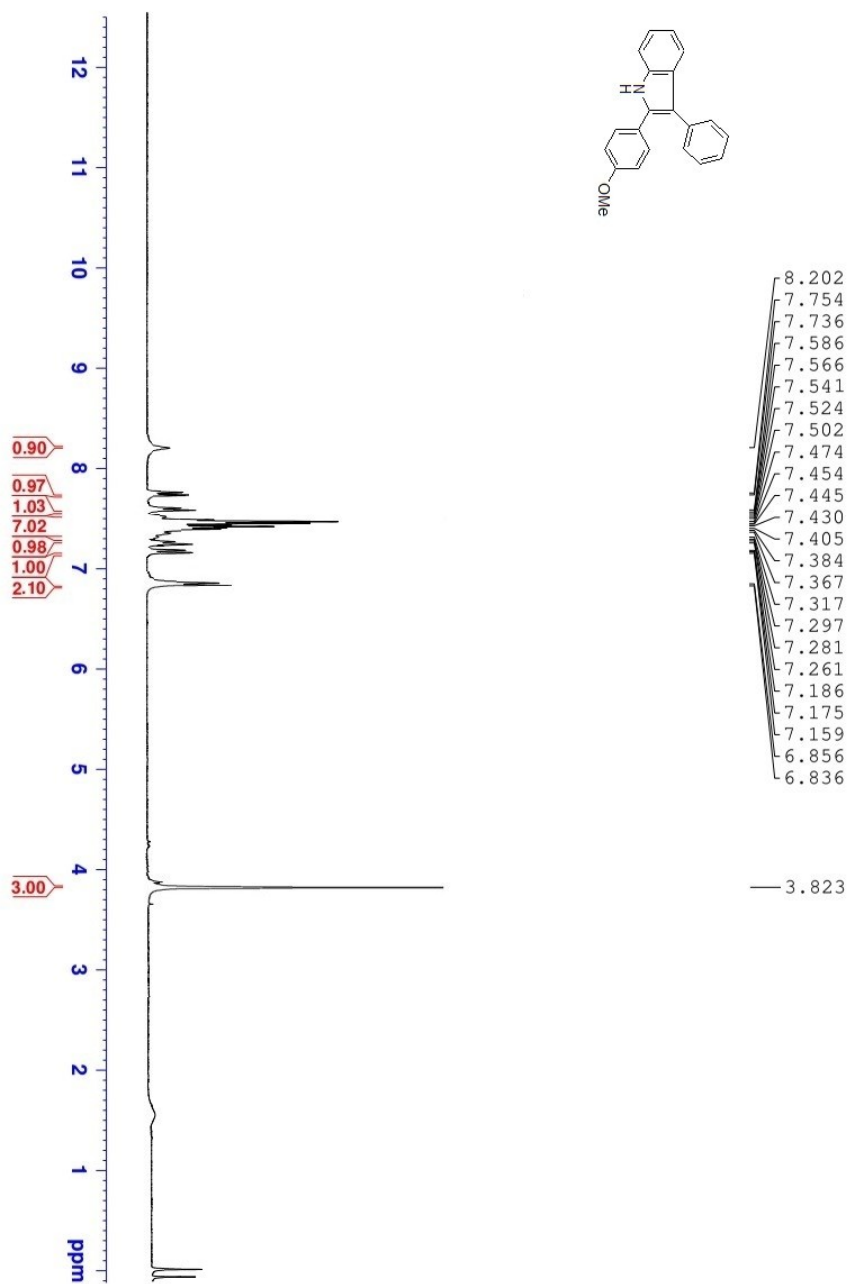
¹³C NMR of Compound 3ai



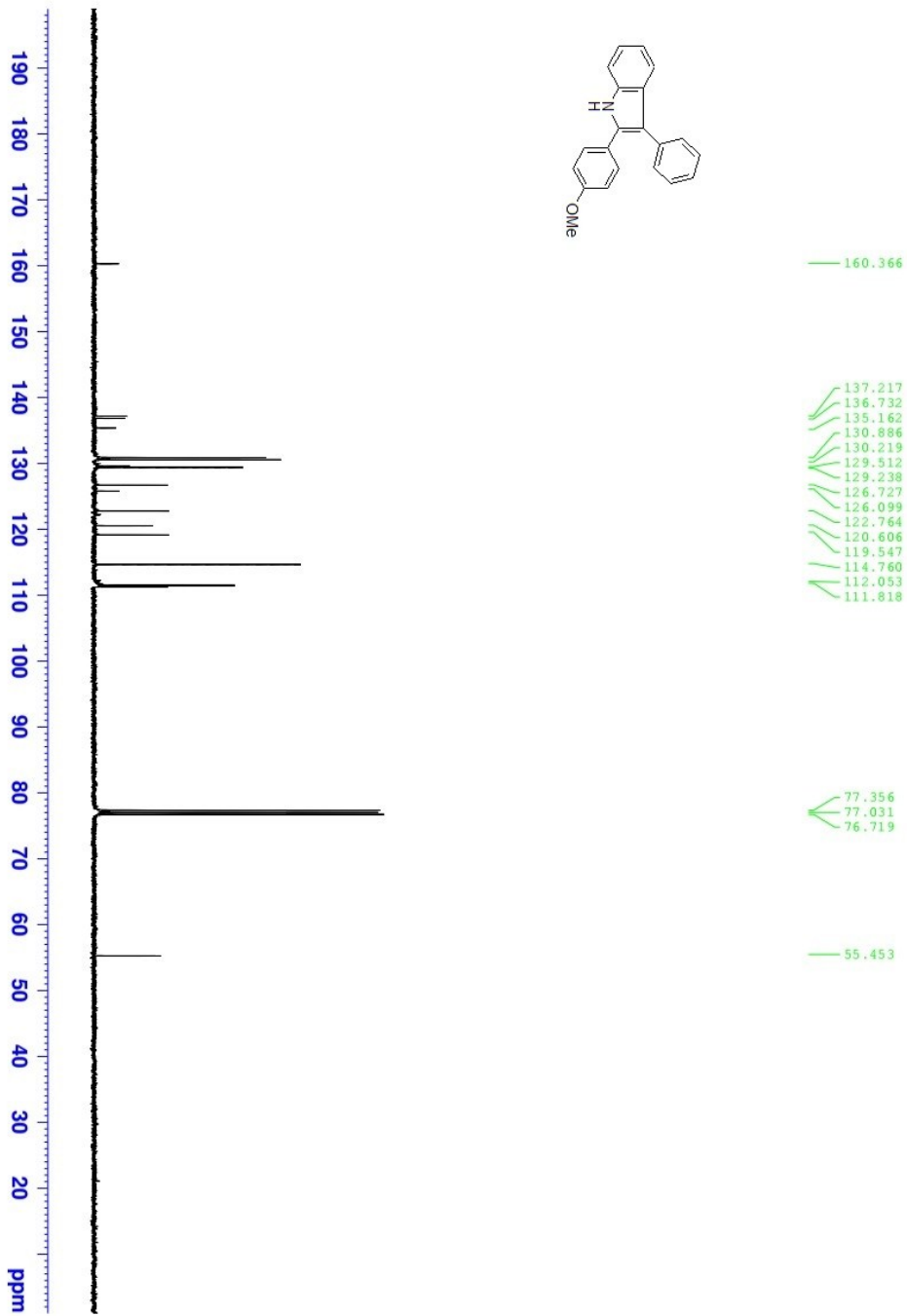
¹H NMR of Compound 3aj



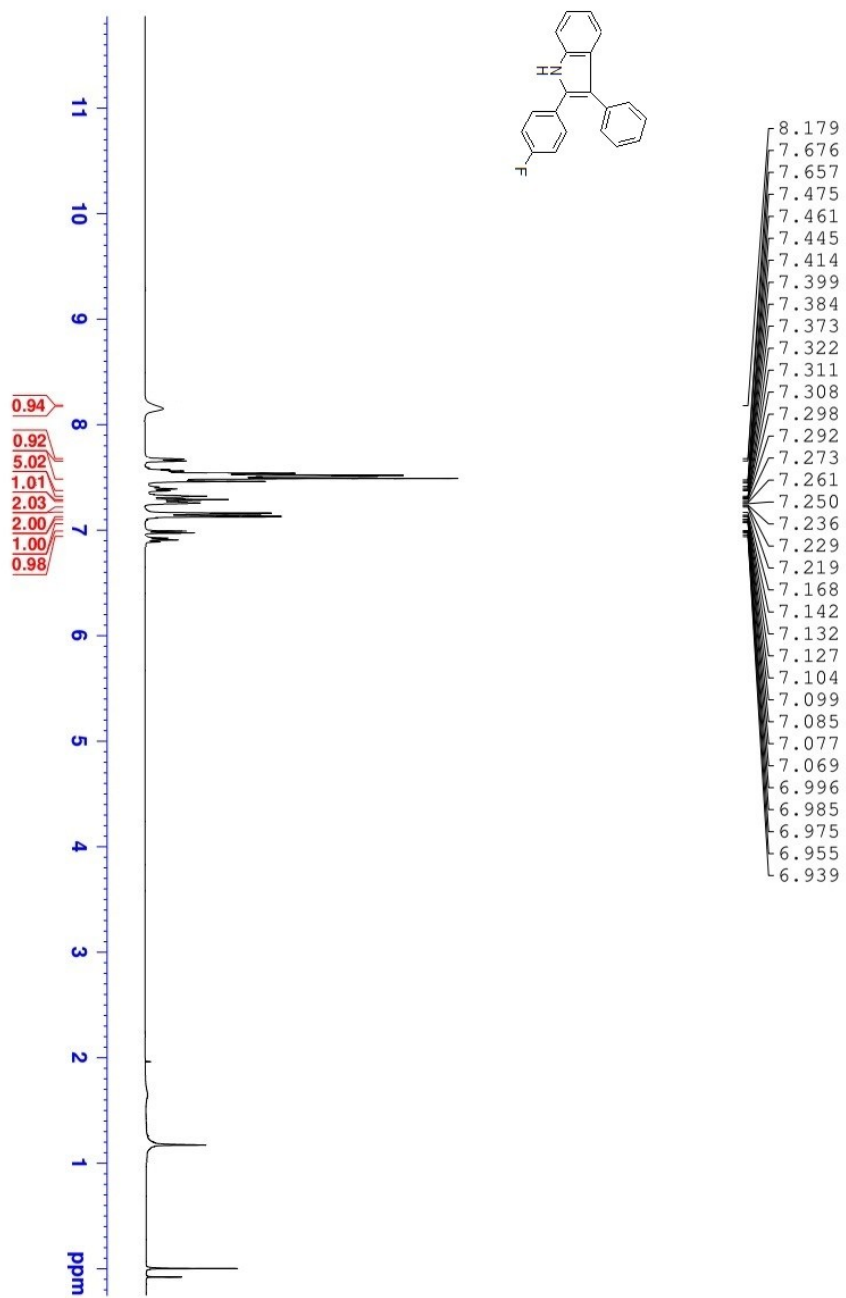
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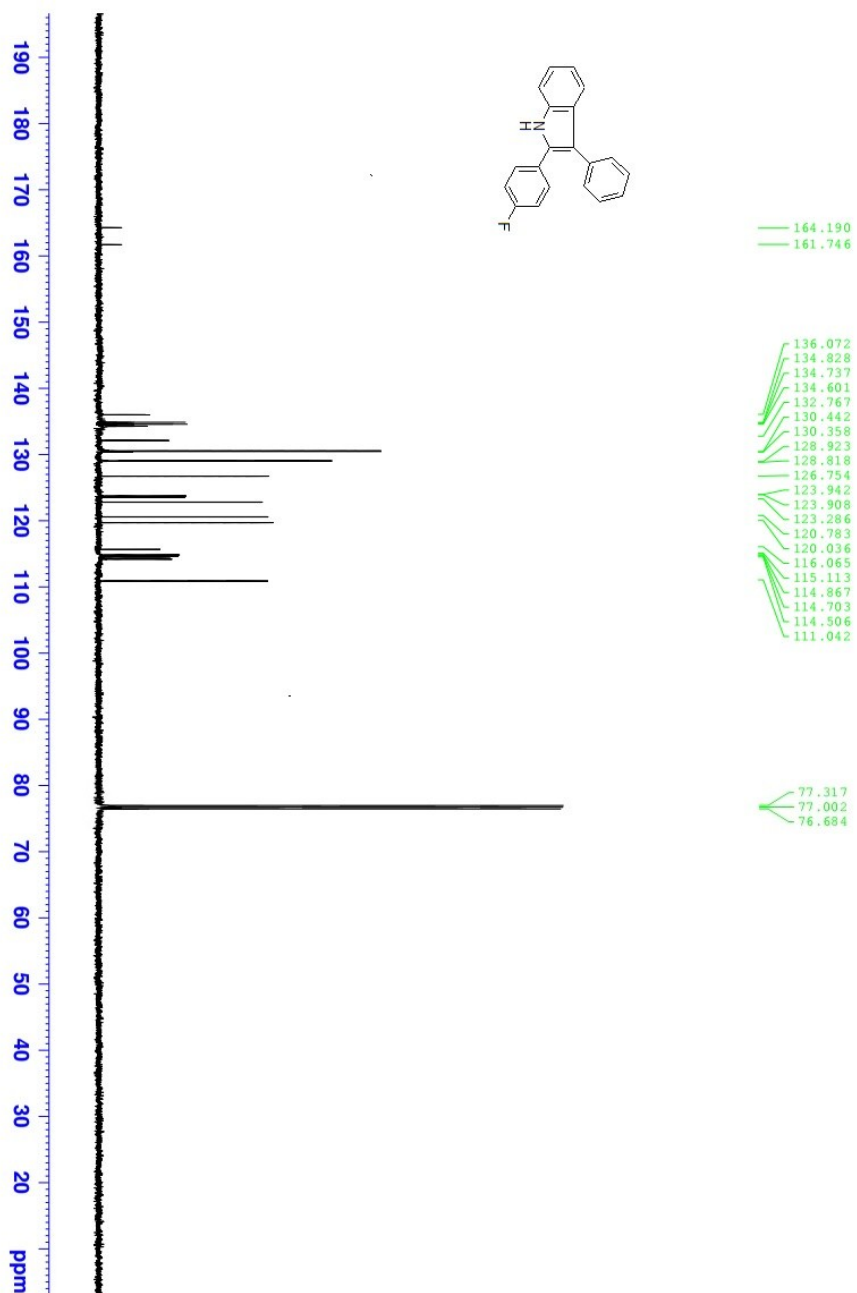
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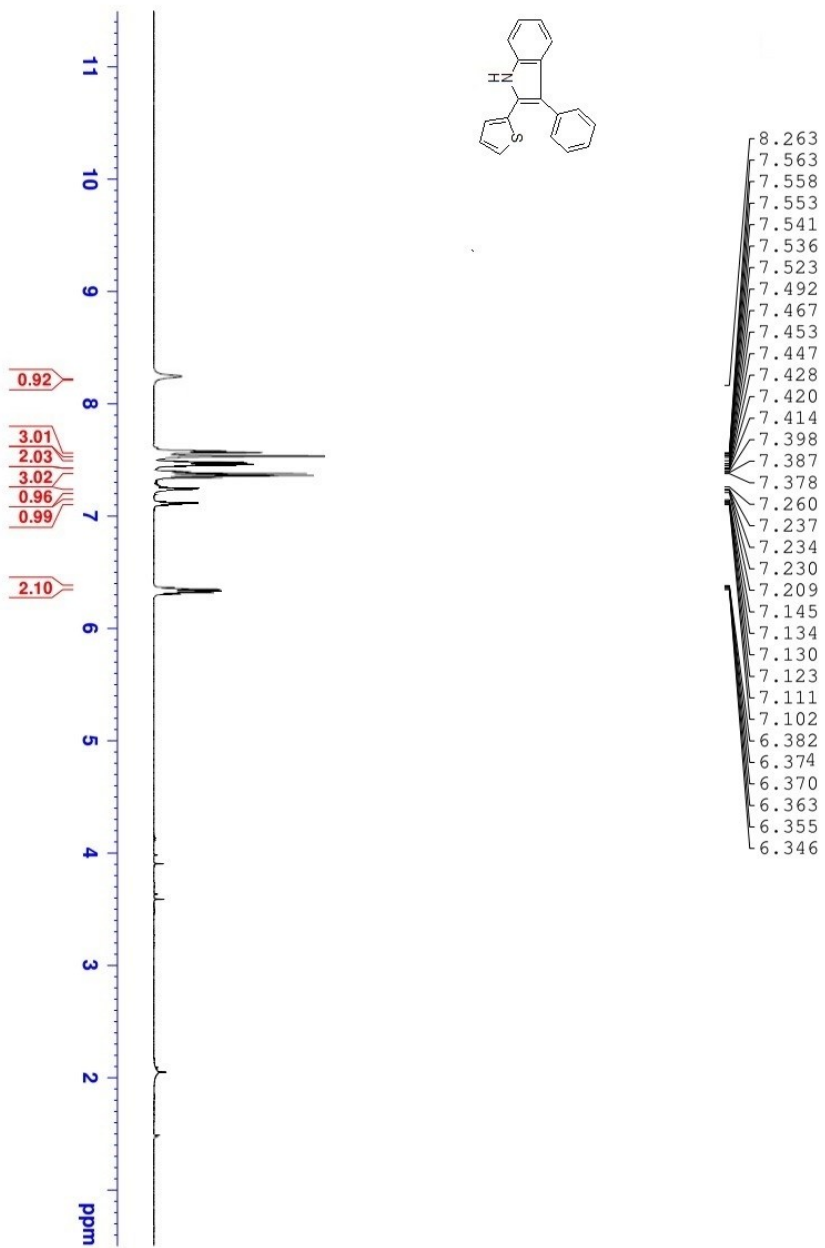
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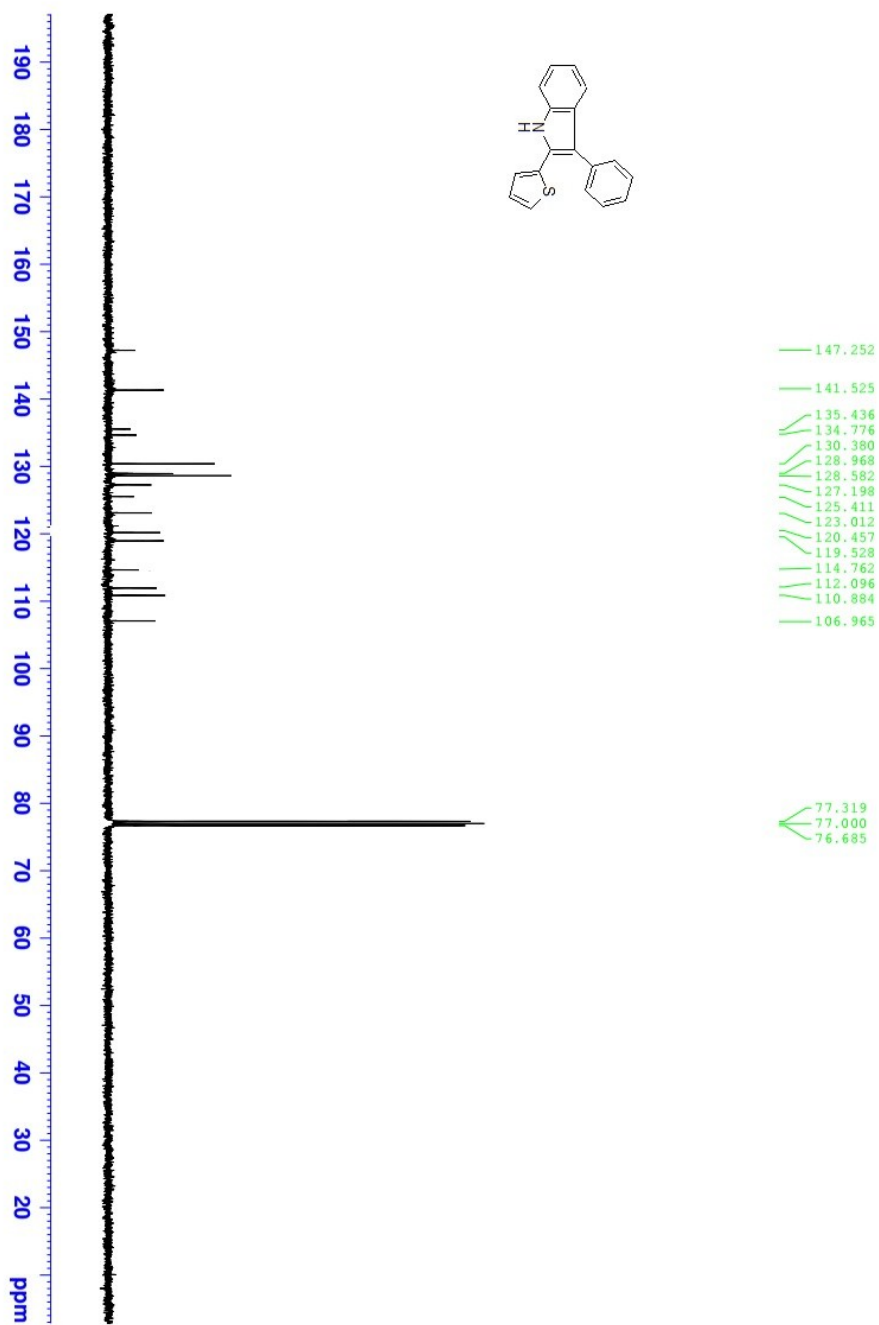
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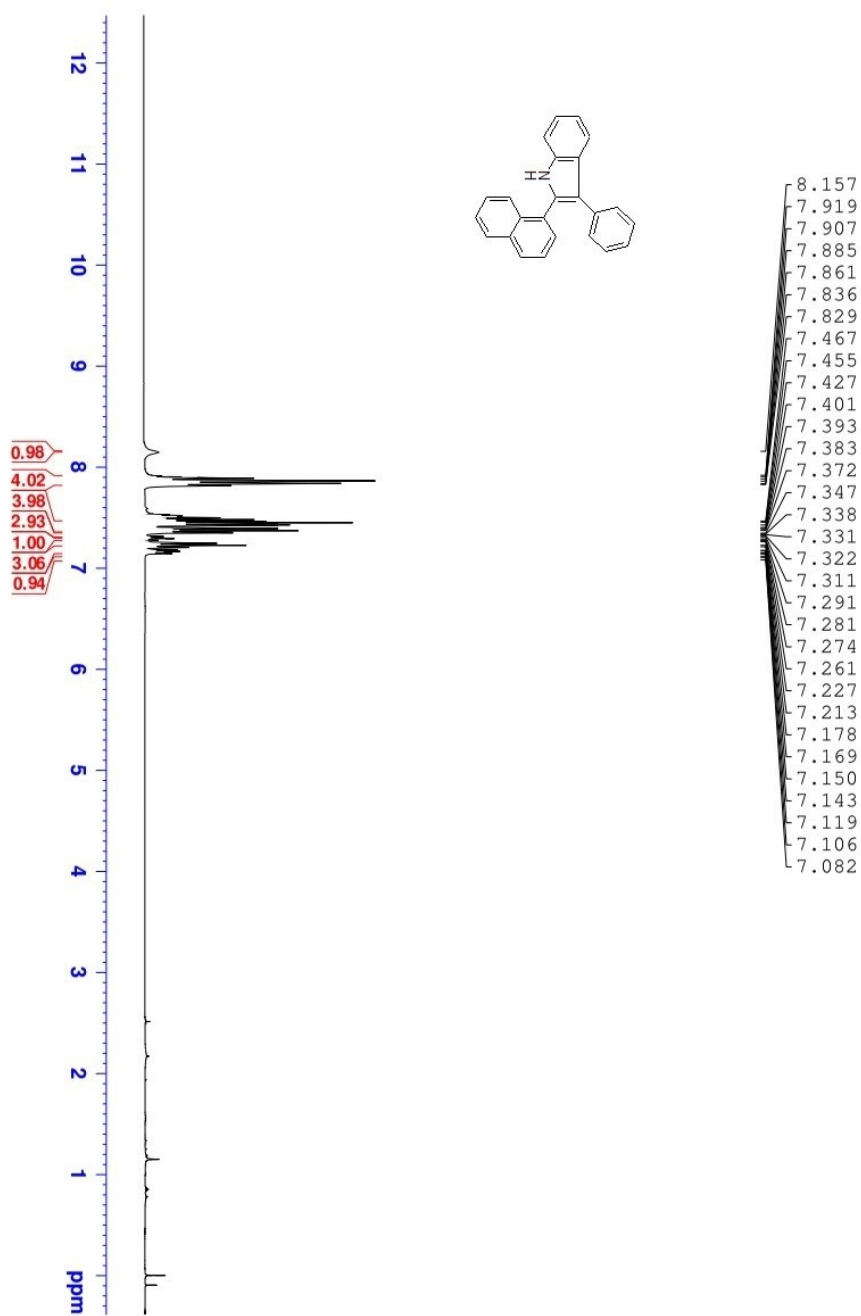
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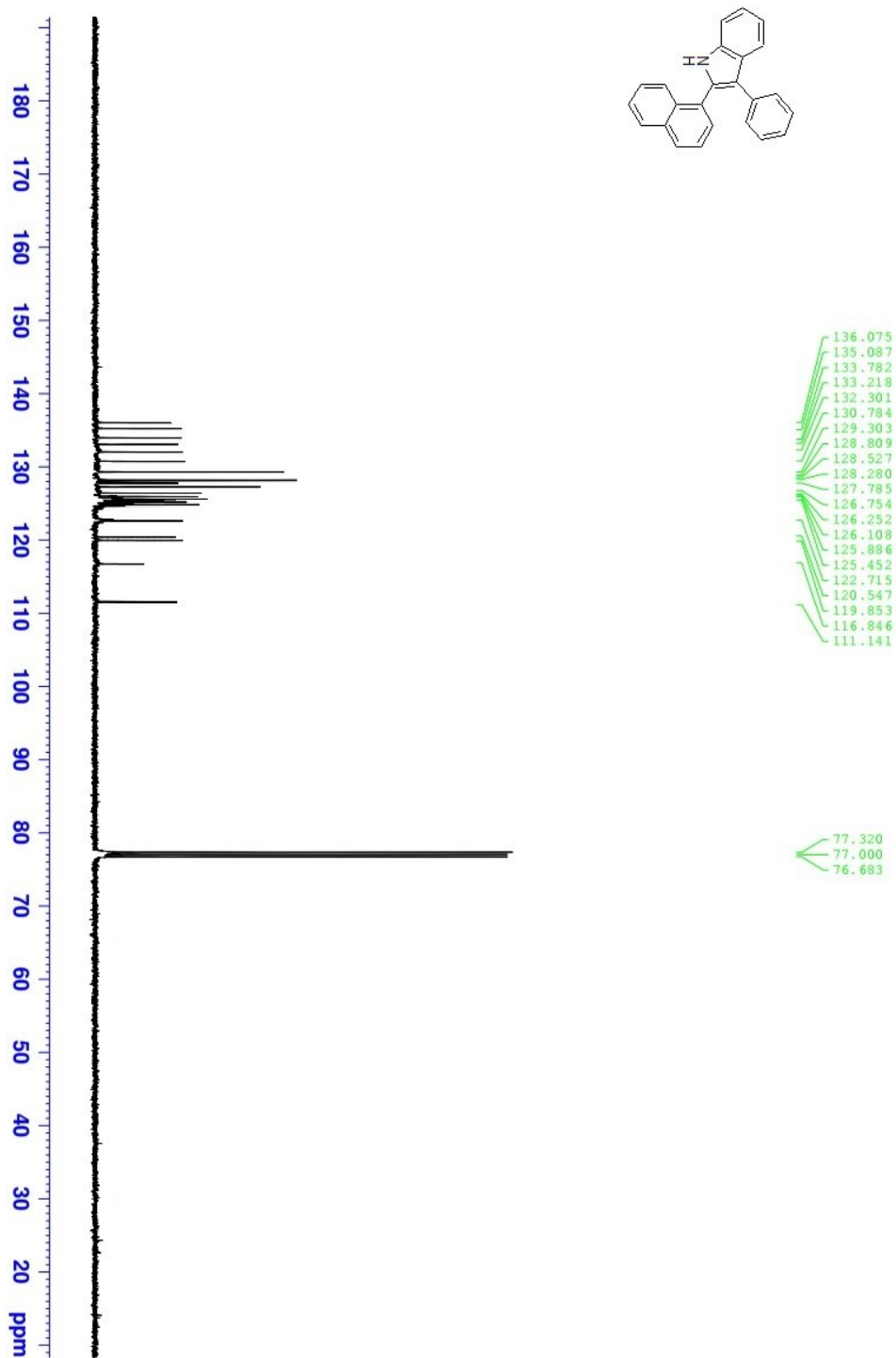
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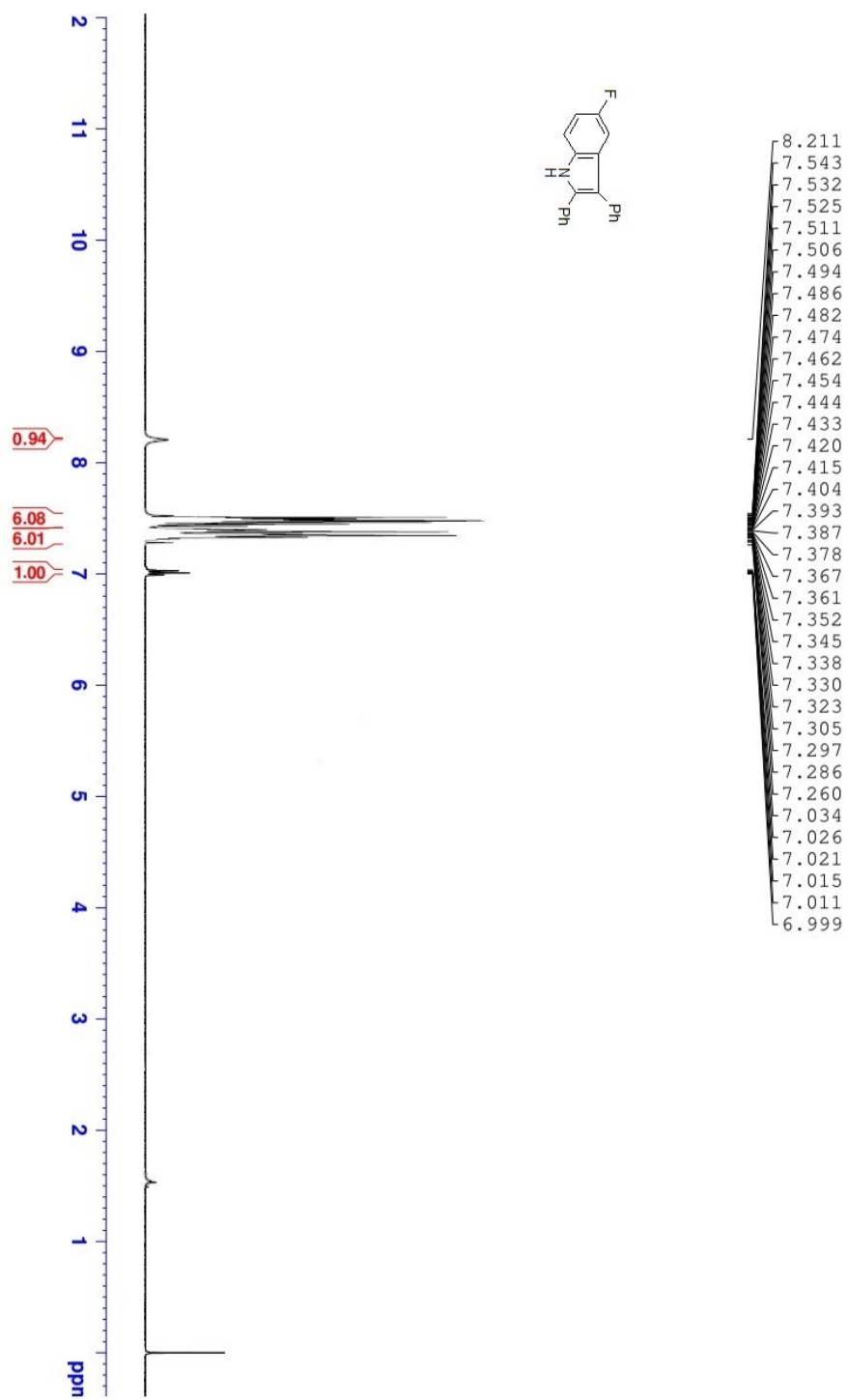
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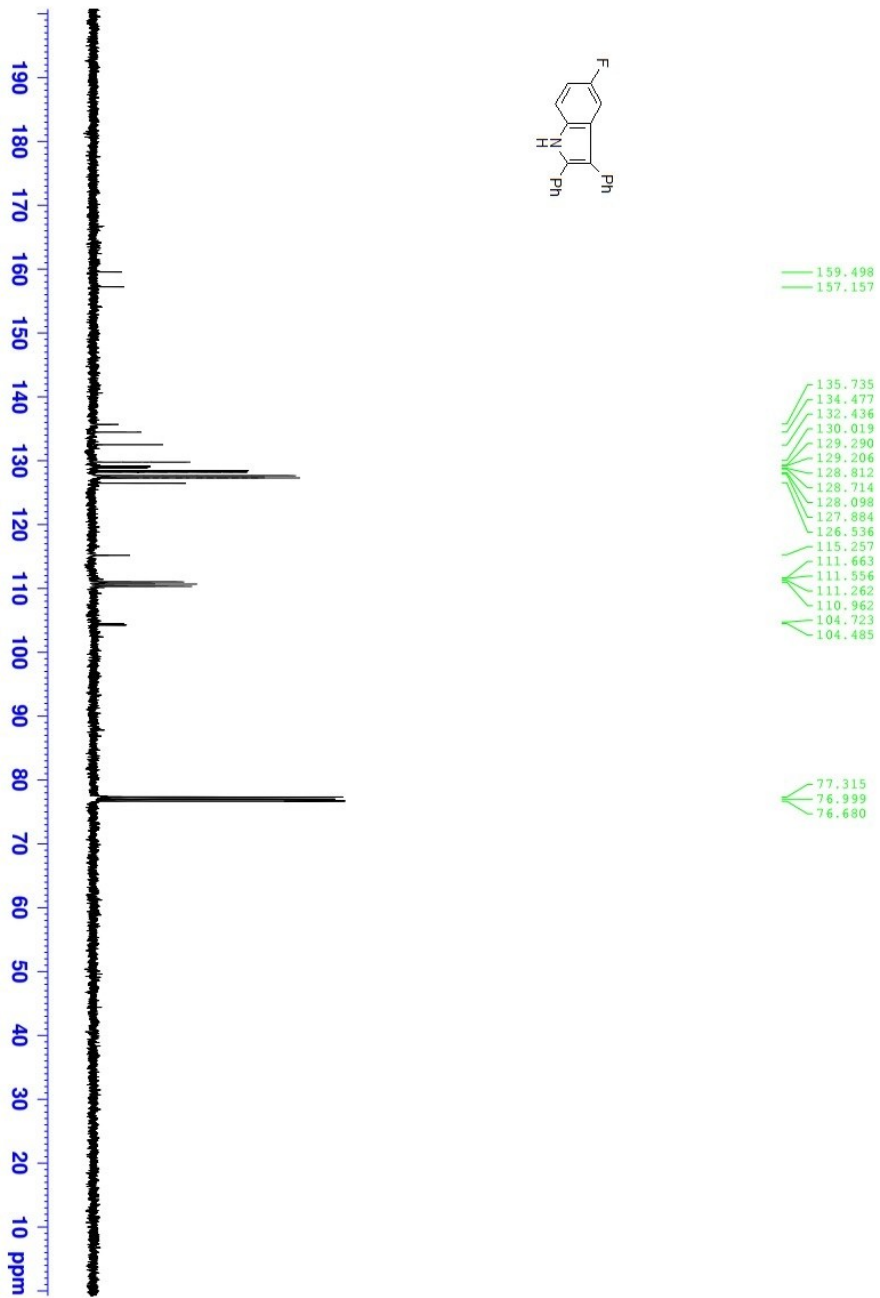
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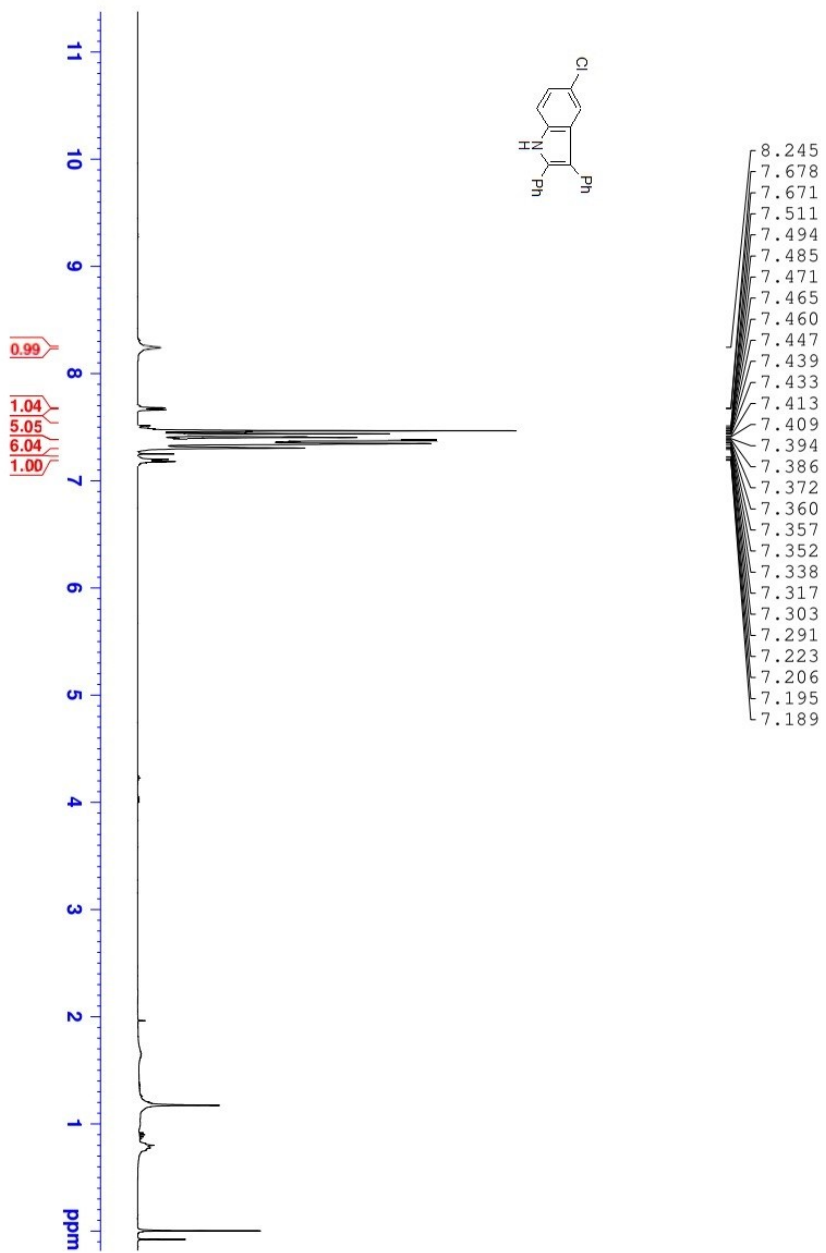
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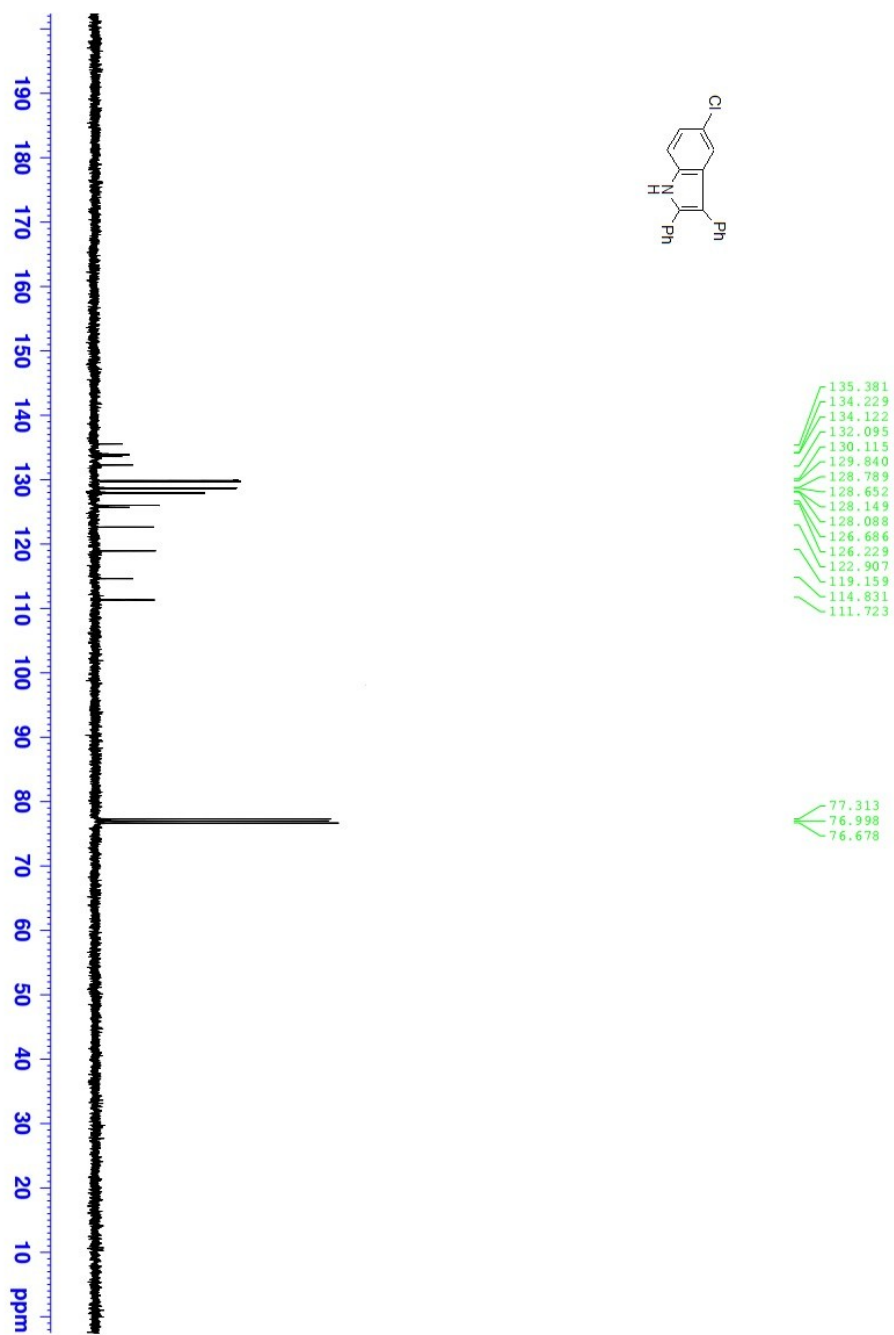
¹H NMR of Compound 3ga



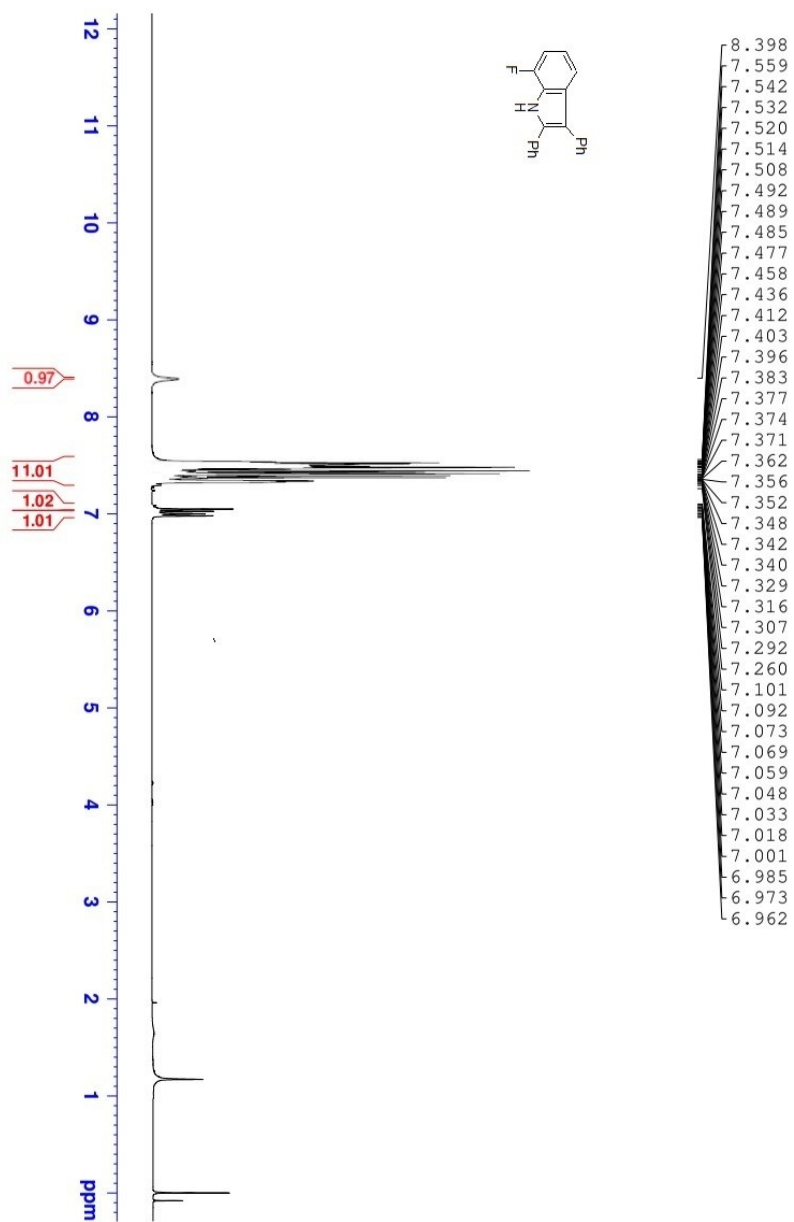
¹³C NMR of Compound 3ga



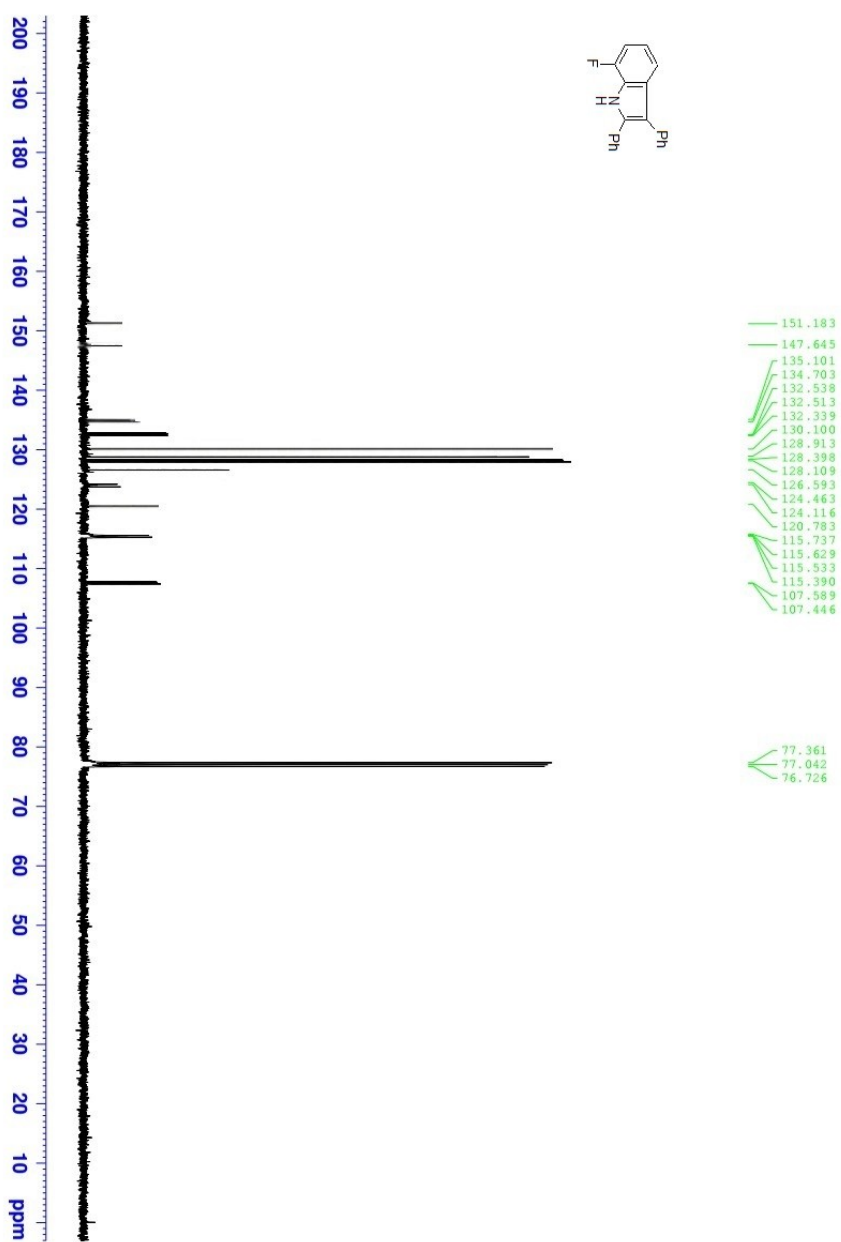
¹H NMR of Compound 3ha



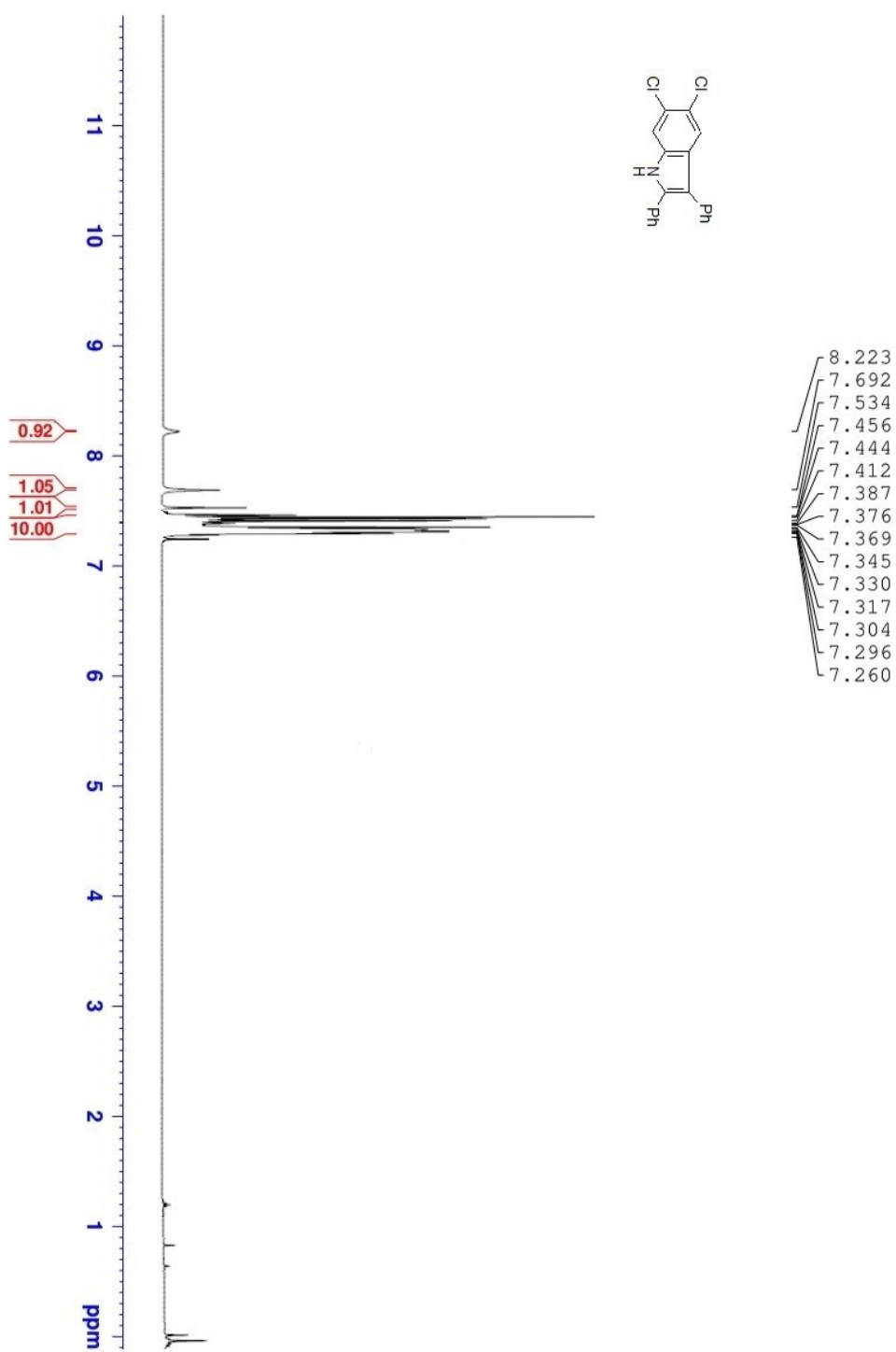
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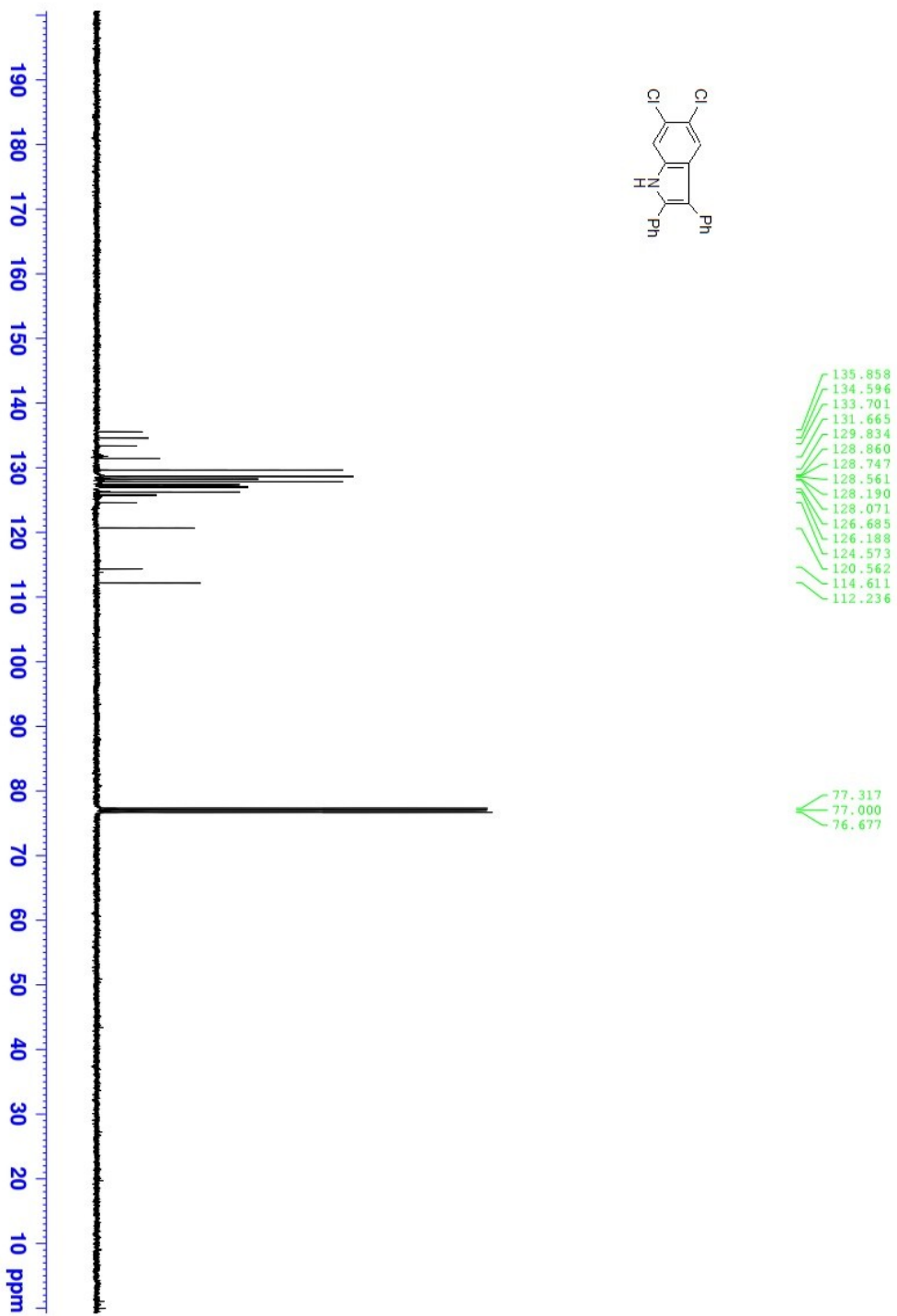
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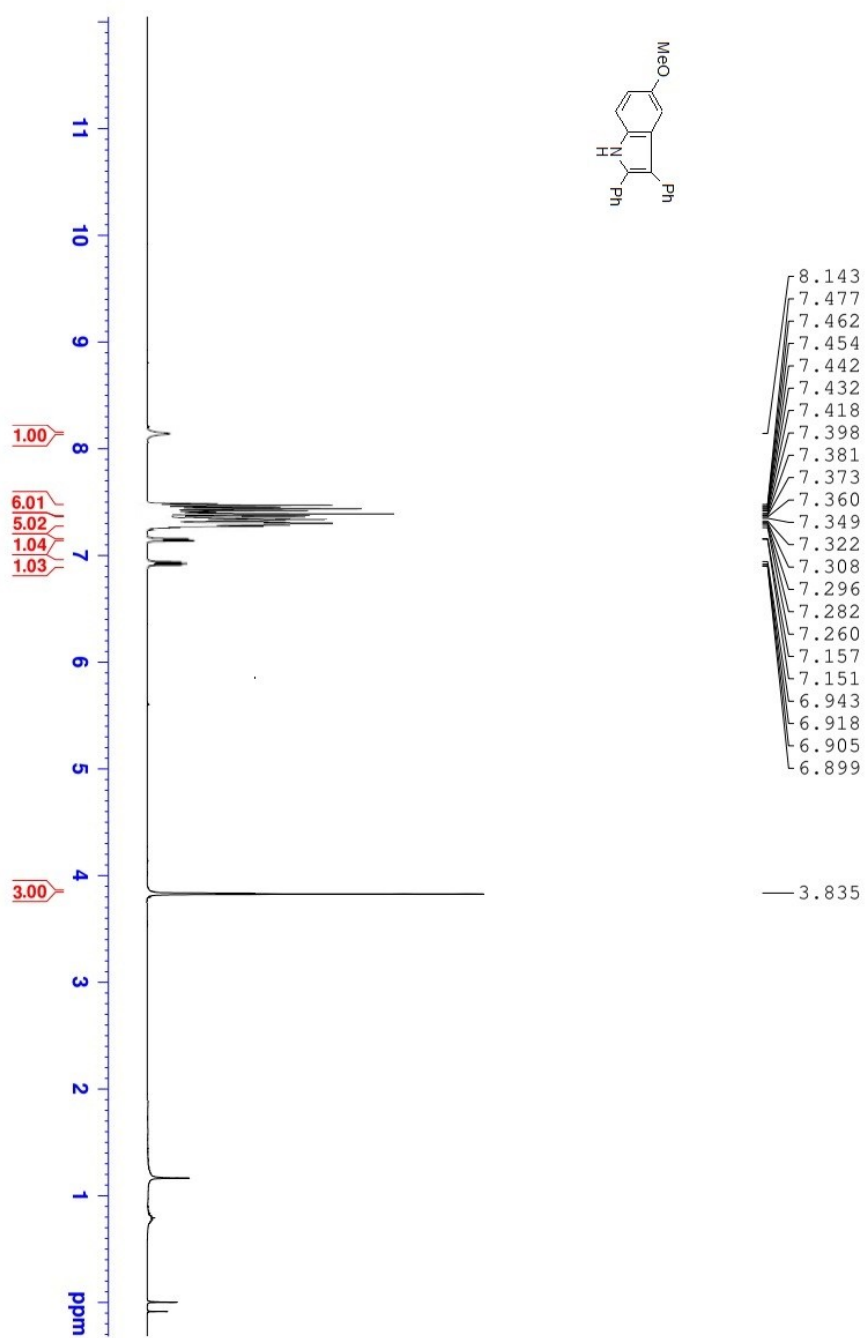
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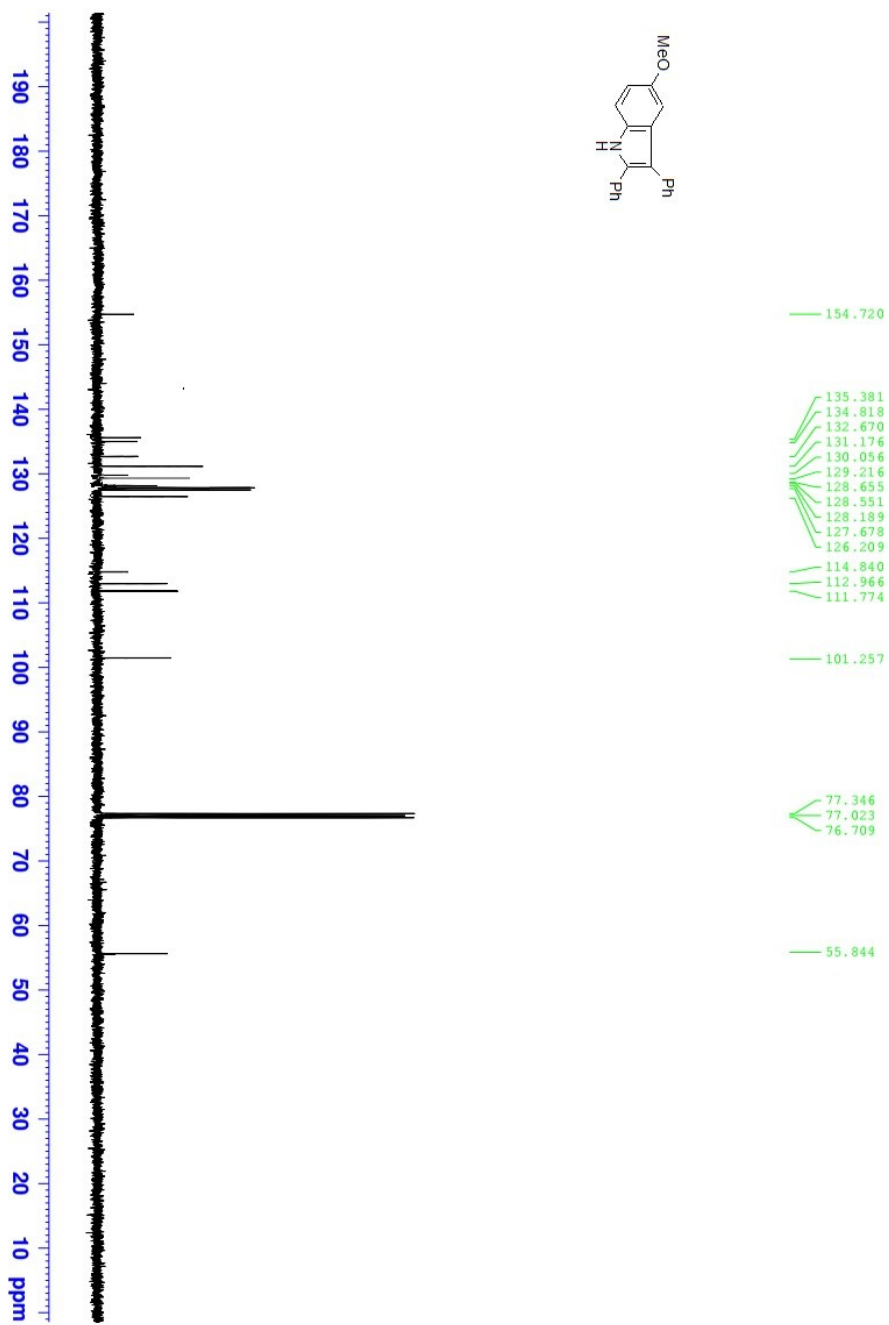
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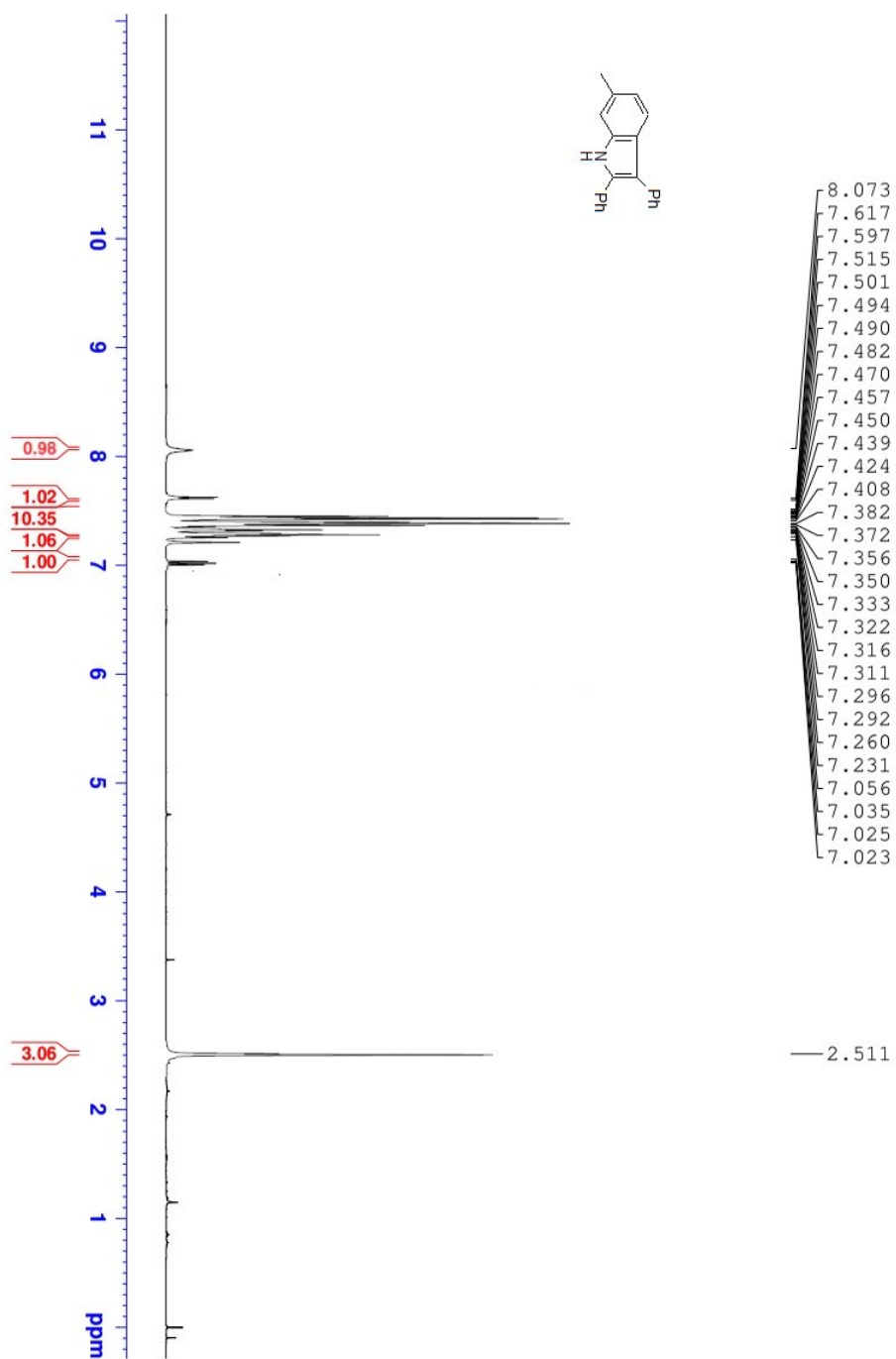
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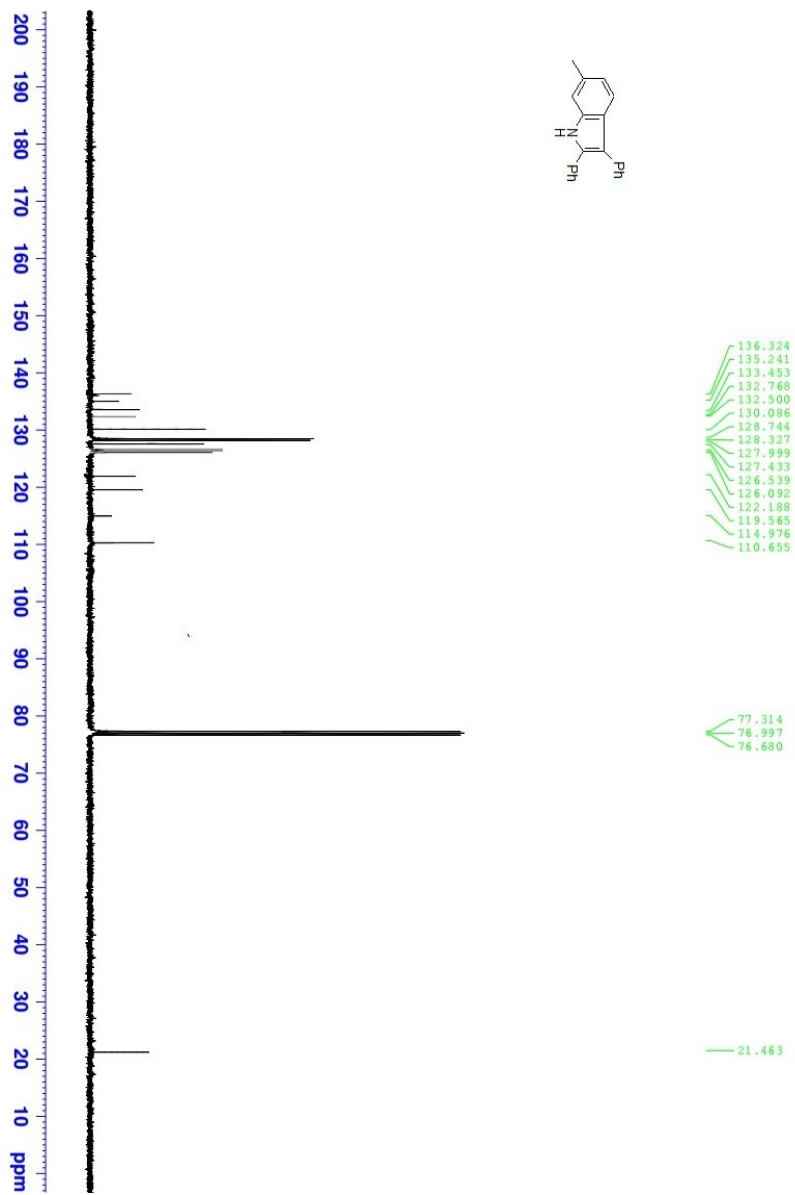
¹H NMR of Compound 3ka



¹³C NMR of Compound 3ka



¹H NMR of Compound 3la



¹³C NMR of Compound 3la