Supporting Information

Selective amination of aryl chlorides catalyzed by $Ni(PMe_3)_4$

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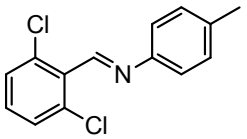
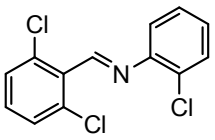
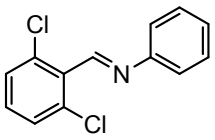
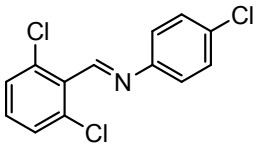
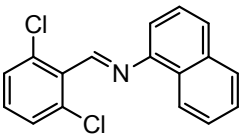
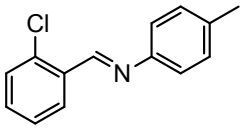
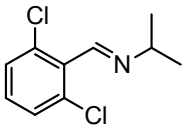
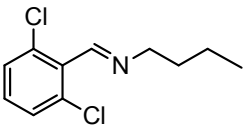
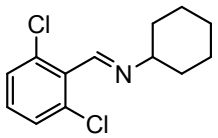
General information

All the reactions for C-N cross-coupling were carried out using standard Schlenk techniques under N_2 atmosphere. Toluene was dried by Na using benzophenone as indicator and distilled under N_2. CH_3CN, DMSO and DMF were refluxed with CaH_2 and distilled under N_2. Other chemicals obtained commercially were used as received without further purification. ^1H NMR, ^{13}C NMR and ^{19}F NMR were recorded on 300 or 400 MHz Bruker instruments. Chemical shifts were referenced by external standard expressing in ppm (tetramethysilane, 0 ppm, $CDCl_3$).

General procedure for synthesis of the chloro-substituted Schiff bases (**1a-1i**)

The imines were prepared from 1:1 ratio of corresponding aldehyde and amine in ethanol. **1a-1f** were recrystallized in pentane. **1g-1i** are gained as yellow oil. The scope of the substrates is shown in Table S1.

Table S1. Substrates 1a-1i.

		
1a	1b	1c
		
1d	1e	1f
		
1g	1h	1i

General procedure for C-N coupling reactions (Procedure A)

To a sealed tube was added 1 (1.5 mmol), amines, NaOH and $^{n}Bu_4NBr$ (0.075 mmol). Then the tube was evacuated and recharged by N_2 for three times. Toluene (4 mL) and $Ni(PMe_3)_4$ (0.060 mmol in its toluene solution)was added under N_2 atmosphere by syringe. The sealed tube was put in a 80°C oil bath. After reaction completed, the solvent was removed in vacuo completely and the product was extracted by pentane (15mL*3). Pure products were obtained by recrystallation from pentane, producing yellow powder or crystals.

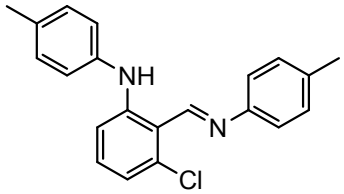
General procedure for reducing of imines (Procedure B)

After the reaction of C-N coupling finished, solvent was removed and the crude products were extracted by pentane (15mL*3). After pentane was removed in vacuo, the imines were dissolved in 10mL of petroleum ether. Few drops of acetic acid was

added. Then $NaBH_4$ was added in a 30 mg amount over an interval of 2 minutes until the yellow color of imines faded into colorless. The precipitate was filtered off, and the solvent was concentrated. The products were obtained by silica gel column chromatography (petroleum ether : ethyl acetate 10:1).

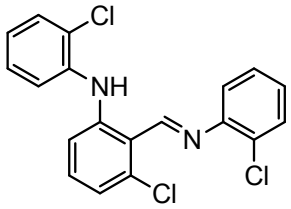
Analytical data for 2a-2q

N-(4-methylphenyl)-2-[[(4-methylphenyl)imino]methyl]-3-chlorobenzenamine (**2a**).



Following procedure A, **1a** (0.396 g, 1.5 mmol) was used as substrate. The amount of 4-methylaniline and NaOH are both 1.5 mmol. After 12h heating, product **2a** (0.477 g, 95%) is obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 11.76 (s, 1H), 9.26 (s, 1H), 7.25-7.15 (m, 8H), 7.12-7.05 (m, 2H), 6.76 (dd, $^3J_{HH}$ = 5.7Hz, $^4J_{HH}$ = 2.7Hz, 1H), 2.38 (s, 3H), 2.35 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 159.88, 149.53, 149.17, 138.89, 138.53, 136.74, 134.47, 132.70, 130.65, 130.55, 124.22, 121.81, 118.48, 114.82, 112.55, 21.68, 21.58. HRMS-ESI (m/z) Calcd for $C_{21}H_{19}ClN_2$ [M+H]: 335.1315; Found: 335.1260.

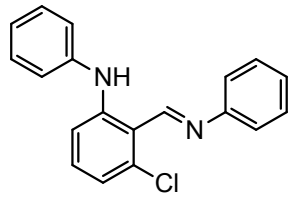


N-(2-chlorophenyl)-2-[[(2-chlorophenyl)imino]methyl]-3-chloro-benzenamine (**2b**).

Following procedure A, **1b** (0.427 g, 1.5 mmol) was used as substrate. The amount of 2-chloroaniline and NaOH are both 1.5 mmol. After 12h heating, product **2b** (0.490 g, 87%) was obtained.

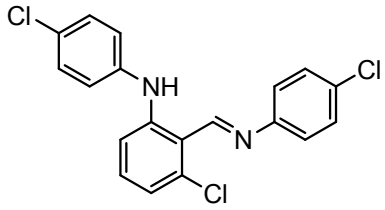
^{1}H NMR (300 MHz, $CDCl_3$) δ 11.77 (s, 1H), 9.24 (s, 1H), 7.51-7.44 (m, 3H), 7.35-7.23 (m, 2H), 7.21-7.13 (m, 3H), 7.08 (td, $^3J_{HH}$ = 7.8, $^4J_{HH}$ = 1.5 Hz, 1H), 7.02 (d, $^3J_{HH}$ = 8.4 Hz, 1H), 6.85 (dd, $^3J_{HH}$ = 7.8, $^4J_{HH}$ = 0.9 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.67, 148.10, 148.07, 138.46, 137.88, 132.63, 130.52, 130.04, 129.23, 129.00, 127.80, 127.26, 127.07, 125.24, 124.77, 119.94, 118.94, 115.19, 112.78. HRMS-ESI (m/z) Calcd for $C_{19}H_{13}Cl_3N_2$ [M+H]: 375.0223; Found: 375.0136.

N-phenyl-2-[(phenylimino)methyl]-3-chloro-benzenamine (**2c**).



Following procedure A, **1c** (0.375 g, 1.5 mmol) was used as substrate. The amount of aniline and NaOH are both 1.5 mmol. After 12h heating, product **2c** (0.405 g, 88%) was obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 11.82 (s, 1H), 9.26 (s, 1H), 7.45-7.28 (m, 8H), 7.25-7.19(m, 2H), 7.15-7.10(m, 2H), 6.81 (dd, $^3J_{HH}$ = 7.5, $^4J_{HH}$ = 1.2Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.00, 150.94, 148.36, 140.51, 138.38, 132.26, 129.42, 129.29, 126.24, 123.96, 123.05, 121.28, 118.27, 114.37, 112.10. HRMS-ESI (m/z) Calcd for $C_{19}H_{15}ClN_2$ [M+H]: 307.1002; Found: 307.0953.

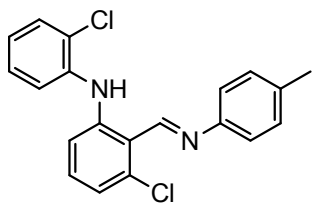


N-(4-chlorophenyl)-2-[[(4-chlorophenyl)imino]methyl]-3-chloro-benzenamine (**2d**).

Following procedure A, **1d** (0.427 g, 1.5 mmol) was used as substrate. The amount of 4-chloroaniline and NaOH are both 1.5 mmol. After 12h heating, product **2d** (0.513 g, 91%) was obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 11.66 (s, 1H), 9.22 (s, 1H), 7.40-7.31 (m, 4H), 7.24-7.11 (m, 6H), 6.83 (dd, $^3J_{HH}$ = 6.9, $^4J_{HH}$ = 2.1 Hz, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.53, 149.54, 148.41, 139.28, 138.81, 132.91, 132.27, 129.82, 129.72, 129.40, 124.53, 122.82, 119.08, 114.71, 112.37. HRMS-ESI (m/z) Calcd for $C_{19}H_{13}Cl_3N_2$ [M+H]: 375.0223; Found: 375.0133.

N-(2-chlorophenyl)-2-[[(4-methylphenyl)imino]methyl]-3-chloro-benzenamine (**2e**).

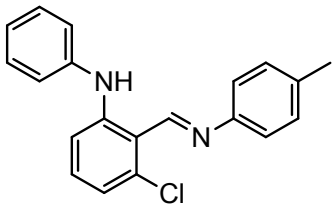


Following procedure A, **1a** (0.396 g, 1.5 mmol) was used as substrate. The amount of 2-chloroaniline and NaOH were both 1.5 mmol. After 12h heating, product **2e** (0.426 g, 80%) was obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 12.13 (s, 1H), 9.28 (s, 1H), 7.55 (dd, $^3J_{HH}$ = 8.1, $^4J_{HH}$ =

1.5 Hz, 1H), 7.46 (dd, $^3J_{HH}$ = 7.8, $^4J_{HH}$ = 1.2 Hz, 1H), 7.24-7.12 (m, 7H), 7.00 (td, $^3J_{HH}$ = 7.8, $^4J_{HH}$ = 1.2 Hz, 1H), 6.87 (dd, $^3J_{HH}$ = 7.5, $^4J_{HH}$ = 1.2 Hz, 1H), 2.38 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 158.27, 147.89, 146.77, 138.25, 138.17, 136.48, 131.85, 130.35, 129.94, 127.13, 126.97, 123.81, 121.96, 121.29, 119.39, 116.06, 112.68, 21.09. HRMS-ESI (m/z) Calcd for $C_{20}H_{16}Cl_2N_2$ [M+H]: 355.0769; Found: 355.0767.

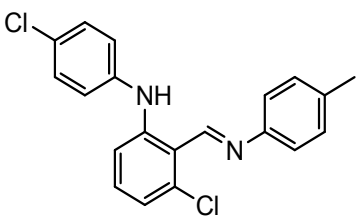
N-phenyl-2-[[(4-methylphenyl)imino]methyl]-3-chloro-benzenamine (**2f**).



Following procedure A, **1a** (0.396 g, 1.5 mmol) was used as substrate. The amount of aniline and NaOH were both 1.5 mmol. After 12h heating, product **2f** (0.418g, 87%) was obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 11.88 (s, 1H), 9.26 (s, 1H), 7.40-7.28 (m, 4H), 7.24-7.09 (m, 7H), 6.80 (dd, $^3J_{HH}$ = 7.5, $^4J_{HH}$ = 1.2Hz, 1H), 2.38 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.18, 148.39, 148.28, 140.66, 138.29, 136.23, 132.08, 129.94, 129.45, 123.89, 122.99, 121.17, 118.31, 114.54, 112.10, 21.07. HRMS-ESI (m/z) Calcd for $C_{20}H_{17}ClN_2$ [M+H]: 321.1159; Found: 321.1164.

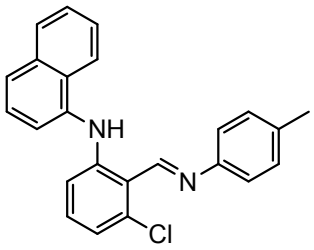
N-(4-chlorophenyl)-2-[[(4-methylphenyl)imino]methyl]-3-chloro-benzenamine (**2g**).



Following procedure A, **1a** (0.396 g, 1.5 mmol) was used as substrate. The amount of 4-chloroaniline and NaOH were both 1.5 mmol. After 12h heating, product **2g** (0.437 g, 82%) was obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 11.89 (s, 1H), 9.25 (s, 1H), 7.33-7.30 (m, 2H), 7.24-7.18 (m, 6H), 7.16-7.13 (m, 2H), 6.83 (dd, $^3J_{HH}$ = 5.4, $^4J_{HH}$ = 3.3 Hz, 1H), 2.38 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.12, 148.18, 147.85, 139.29, 138.36, 136.40, 132.15, 129.96, 129.48, 128.72, 123.96, 121.14, 118.76, 114.79, 112.00, 21.07. HRMS-ESI (m/z) Calcd for $C_{20}H_{16}Cl_2N_2$ [M+H]: 355.0769; Found: 355.0770.

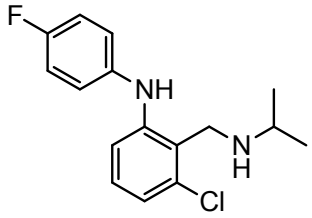
N-naphthyl-2-[[(4-methylphenyl)imino]methyl]-3-chloro-benzenamine (**2h**)



Following procedure A, **1a** (0.396 g, 1.5 mmol) was used as substrate. The amount of naphthyl amine and NaOH were both 1.5 mmol. After 12h heating, product **2h** (0.511g, 92%) was obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 12.31 (s, 1H), 9.38 (s, 1H), 8.20-8.17 (m, 1H), 8.91-8.88 (m, 1H), 7.70 (d, $^3J_{HH}$ = 7.8 Hz, 1H), 7.58 (d, $^3J_{HH}$ = 7.2 Hz, 1H), 7.53-7.48 (m, 3H), 7.21 (s, 4H), 7.10-7.00 (m, 2H), 6.80 (dd, $^3J_{HH}$ = 7.2, $^4J_{HH}$ = 1.5 Hz, 1H), 2.37 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.21, 149.46, 148.24, 138.18, 136.73, 136.28, 134.82, 132.14, 129.95, 129.58, 128.39, 126.34, 126.32, 125.78, 124.96, 122.80, 121.23, 120.43, 118.08, 114.60, 112.43, 21.04. HRMS-ESI (m/z) Calcd for $C_{24}H_{19}ClN_2$ [M+H]: 371.1315; Found: 371.1286.

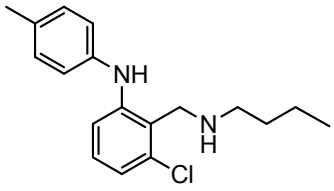
N-*iso*propyl-2-(4-fluorophenyl)amino-6-chloro-benzenemethanamine (**2i**).



Following procedure A, **1g** (0.324 g, 1.5 mmol) was used as substrate. The amount of 4-fluoroaniline and NaOH were both 1.5 mmol. After 12h heating, it was handled following procedure B. Product **2i** (0.351 g, 80%) was obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 8.83 (s, 1H), 7.09-7.04 (m, 2H), 7.01-6.97(m, 4H), 6.83(dd, $^3J_{HH}$ = 7.8, $^4J_{HH}$ = 1.5 Hz, 1H), 4.06 (s, 2H), 2.86(m, 1H), 1.15 (d, $^3J_{HH}$ = 6.3 Hz, 6H), 0.89 (m, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.81(d, $^1J_{CF}$ = 238.3Hz), 146.46, 138.88 (d, $^4J_{CF}$ = 2.3 Hz), 134.46, 128.42, 123.75, 120.55 (d, $^3J_{CF}$ = 7.7 Hz), 120.22, 115.92 (d, $^2J_{CF}$ = 22.3 Hz), 112.66, 48.43, 45.79, 23.09. ^{19}F NMR (376 MHz, $CDCl_3$) δ 122.36-122.43(m, 1F). HRMS-ESI (m/z) Calcd for $C_{16}H_{18}ClFN_2$ [M+H]: 293.1221; Found: 293.2237.

N-nomalbutyl-2-(4-methylphenyl)amino-6-chloro-benzenemethanamine (**2j**).

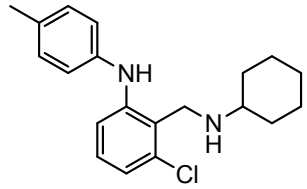


Following procedure A, **1h** (0.345 g, 1.5 mmol) was used as substrate. The amount of 4-methylaniline and NaOH were both 1.5 mmol. After 12h heating, it was handled

following procedure B. Product **2j** (0.284 g, 63%) was obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 8.72 (s, 1H), 7.15 (dd, $^3J_{HH}$ = 8.1, $^4J_{HH}$ = 0.9 Hz, 1H), 7.10-6.96 (m, 5H), 6.81 (dd, $^3J_{HH}$ = 7.8, $^4J_{HH}$ = 1.1 Hz, 1H), 4.05 (s, 2H), 2.68 (t, $^3J_{HH}$ = 6.9 Hz, 2H), 2.31 (s, 3H), 1.57-1.48 (m, 2H), 1.47-1.34 (m, 2H), 1.18 (s, 1H), 0.93 (t, $^3J_{HH}$ = 7.2 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 146.54, 140.19, 134.50, 130.65, 129.85, 128.36, 123.57, 119.89, 119.25, 112.96, 48.71, 48.18, 32.23, 20.72, 20.48, 13.99. HRMS-ESI (m/z) Calcd for $C_{18}H_{23}ClN_2$ [M+H]: 303.1628; Found: 303.3047.

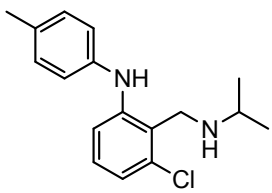
N-cyclohexyl-2-(4-methylphenyl)amino-6-chloro-benzenemethanamine (**2k**).



Following procedure A, **1i** (0.384 g, 1.5 mmol) was used as substrate. The amount of 4-methylaniline and NaOH were both 1.5 mmol. After 12h heating, it was handled following procedure B. Product **2k** (0.402g, 82%) was obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 8.67 (s, 1H), 7.30 (dd, $^3J_{HH}$ = 8.1, $^4J_{HH}$ = 0.9 Hz, 1H), 7.17-7.06 (m, 3H), 7.00 (dt, $^3J_{HH}$ = 8.4, $^4J_{HH}$ = 2.1 Hz, 2H), 6.75 (td, $^3J_{HH}$ = 7.5, $^4J_{HH}$ = 1.2 Hz, 1H), 3.84 (s, 2H), 2.55-2.46 (m, 1H), 2.30 (s, 3H), 1.98-1.94 (m, 2H), 1.76-1.71 (m, 2H), 1.63-1.58 (m, 2H), 1.32-1.27 (m, 2H), 1.19-1.12 (m, 2H), 0.91 (s, 1H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 144.43, 140.79, 129.91, 129.80, 129.75, 128.04, 126.85, 118.93, 118.38, 114.58, 56.09, 50.58, 33.59, 26.21, 24.88, 20.70. HRMS-ESI (m/z) Calcd for $C_{20}H_{25}ClN_2$ [M+H]: 329.1785; Found: 329.1722.

N-*iso*propyl-2-(4-methylphenyl)amino-6-chloro-benzenemethanamine (**2l**).

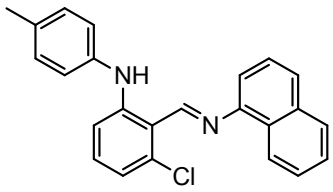


Following procedure A, **1g** (0.324 g, 1.5 mmol) was used as substrate. The amount of 4-methylaniline and NaOH were both 1.5 mmol. After 12h heating, it was handled following procedure B. Product **2l** (0.370 g, 86%) was obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 8.76 (s, 1H), 7.18-6.96 (m, 6H), 6.82 (d, $^3J_{HH}$ = 7.8 Hz, 1H), 4.05 (s, 2H), 2.91-2.83 (m, 1H), 2.31 (s, 3H), 1.15 (d, $^3J_{HH}$ = 6.3 Hz, 6H), 1.02 (s, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 146.44, 140.29, 134.42, 130.55, 129.93, 128.40, 123.85, 120.01, 119.03, 113.05, 48.50, 45.87, 23.17, 20.78. HRMS-ESI (m/z) Calcd

for $C_{17}H_{21}ClN_2$ [M+H]:289.1472; Found: 289.3189.

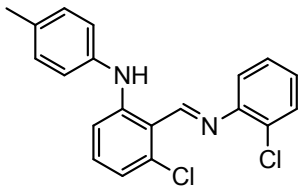
N-(4-methylphenyl)-2-[(naphthylimino)methyl]-3-chloro-benzenamine (**2m**).



Following procedure A, **1e** (0.450 g, 1.5 mmol) was used as substrate. The amount of 4-methylaniline and NaOH were both 1.5 mmol. After 12h heating, product **2m** (0.550 g, 99%) was obtained.

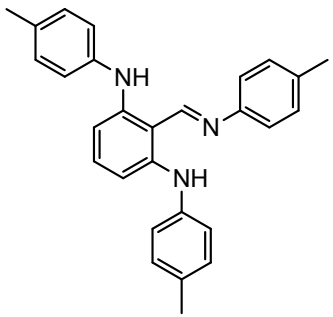
^{1}H NMR (300 MHz, $CDCl_3$) δ 11.91 (s, 1H), 9.35 (s, 1H), 8.28 (dd, $^3J_{HH}$ = 6.9, $^4J_{HH}$ = 2.7 Hz, 1H), 7.87, (dd, $^3J_{HH}$ = 7.2, $^4J_{HH}$ = 2.4 Hz, 1H), 7.75 (d, $^3J_{HH}$ = 8.4 Hz, 1H), 7.55-7.48 (m, 3H), 7.25-7.12 (m, 7H), 6.81 (dd, $^3J_{HH}$ = 7.2, $^4J_{HH}$ = 1.5 Hz, 1H), 2.36 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 160.39, 149.05, 148.55, 138.44, 137.72, 133.97, 133.89, 132.47, 130.05, 128.54, 127.88, 126.44, 126.21, 126.17, 123.43, 117.95, 114.51, 113.86, 112.02, 20.93. HRMS-ESI (m/z) Calcd for $C_{24}H_{19}ClN_2$ [M+H]:371.1315; Found: 371.1286.

N-(4-methylphenyl)-2-[[(2-chlorophenyl)imino]methyl]-3-chloro-benzenamine (**2n**).



Following procedure A, **1b** (0.427 g, 1.5 mmol) was used as substrate. The amount of 4-methylaniline and NaOH were both 1.5 mmol. After 12h heating, product **2n** (0.368 g, 69%) was obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 11.94 (s, 1H), 9.29 (s, 1H), 7.47 (dd, $^3J_{HH}$ = 7.8, $^4J_{HH}$ = 1.4 Hz, 1H), 7.36-7.28 (m, 2H), 7.24-7.09 (m, 7H), 6.77 (dd, $^3J_{HH}$ = 7.2, $^4J_{HH}$ = 1.4 Hz, 1H), 2.35 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 159.97, 149.14, 147.48, 138.40, 137.73, 133.78, 132.67, 129.96, 129.94, 129.83, 127.81, 127.05, 123.44, 119.21, 117.71, 114.05, 112.07, 20.93. HRMS-ESI (m/z) Calcd for $C_{20}H_{16}Cl_2N_2$ [M+H]:355.0769; Found: 355.0770.



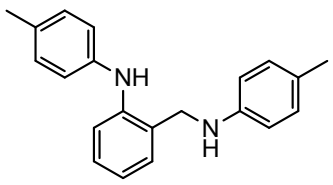
N-(4-methylphenyl)-2-[[(4-methylphenyl)imino]methyl]-3-(4-methylphenyl)amino -benzenamine (**2o**).

Following procedure A, **1a** (0.396 g, 1.5 mmol) was used

as substrate. The amount of 4-methylaniline and NaOH were both 3.0 mmol. After 24h heating, product **2o** (0.395 g, 65%) is obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 8.95 (s, 1H), 8.54 (s, 2H), 7.15-7.09 (m, 7H), 7.04-6.98 (m, 6H), 6.74 (d, $^3J_{HH}$ = 8.1 Hz, 2H), 2.33 (s, 3H), 2.31 (s, 6H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 158.63, 149.58, 147.42, 141.01, 135.88, 133.19, 132.02, 130.30, 130.18, 121.47, 120.84, 111.52, 109.27, 21.38, 21.18. HRMS-ESI (m/z) Calcd for $C_{28}H_{27}N_3$ [M+H]: 406.2283; Found: 406.2242.

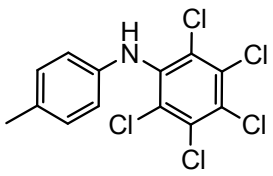
N-(4-methylphenyl)-2-(4-methylphenyl)amino-benzenemethanamine (**2p**).



Following procedure A, **1f** (0.344 g, 1.5 mmol) was used as substrate. The amount of 4-methylaniline and NaOH were both 1.5 mmol. After 12h/24h heating, it was handled following procedure B. Product **2p** [0.076 g, 17% (12h) / 0.315 g, 70% (24h)] was obtained.

^{1}H NMR (300 MHz, $CDCl_3$) δ 7.33 (s, 1H), 7.29 (d, $^3J_{HH}$ = 5.7 Hz, 1H), 7.22 (t, $^3J_{HH}$ = 7.8 Hz, 1H), 7.07 (dd, $^3J_{HH}$ = 8.4, $^4J_{HH}$ = 2.7 Hz, 4H), 6.96 (d, $^3J_{HH}$ = 8.4 Hz, 2H), 6.89-6.85 (m, 2H), 6.72 (d, $^3J_{HH}$ = 8.4 Hz, 2H), 4.26 (s, 2H), 3.59 (s, 1H), 2.30 (s, 3H), 2.29 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 145.98, 143.79, 140.38, 130.67, 130.44, 129.88, 129.86, 128.75, 128.29, 126.26, 120.00, 119.13, 116.09, 114.41, 48.25, 20.72, 20.50. HRMS-ESI (m/z) Calcd for $C_{21}H_{22}N_2$ [M+H]: 303.1861; Found: 303.1867.

N-(4-methyphenyl)-perchloroaniline (**2q**).

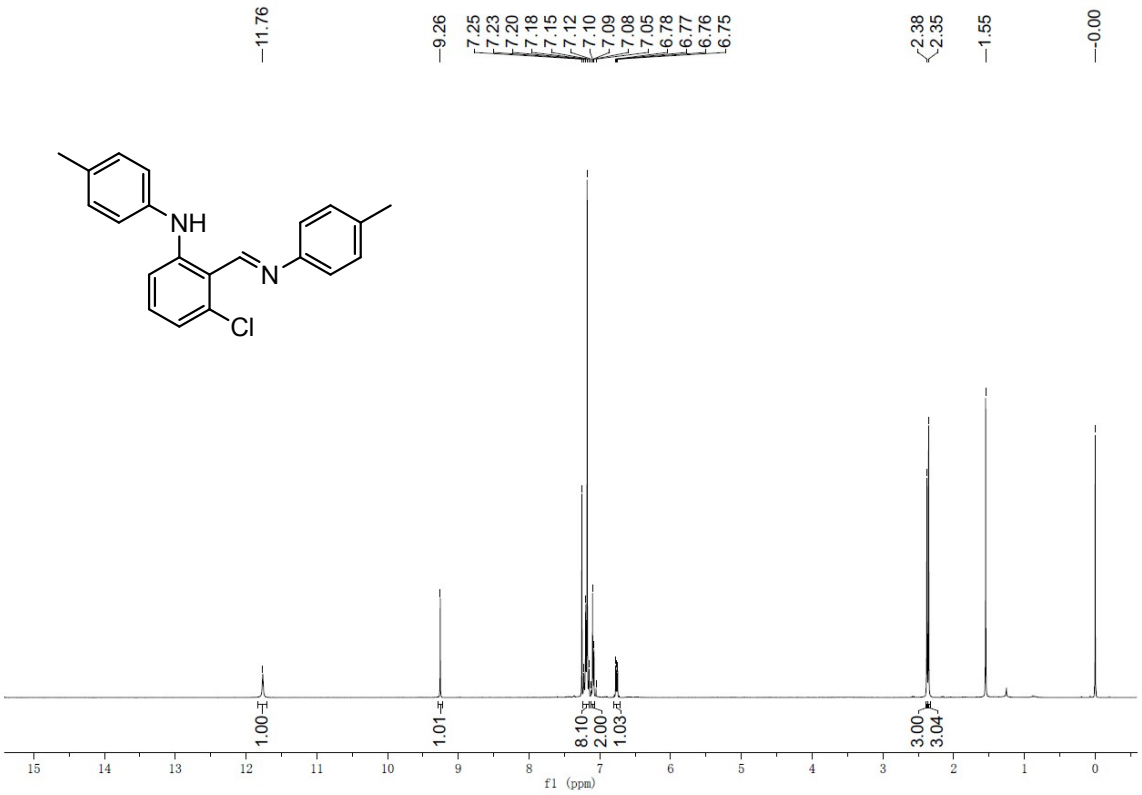


Following procedure A, hexachlorobenzene (0.428 g, 1.5 mmol) was used as substrate. The amount of 4-methylaniline and NaOH were both 1.5 mmol. After 12h heating, the crude product was purified by column chromatography using petroleum ether as eluent. Pure product **2q** (0.304 g, 57%) is obtained.

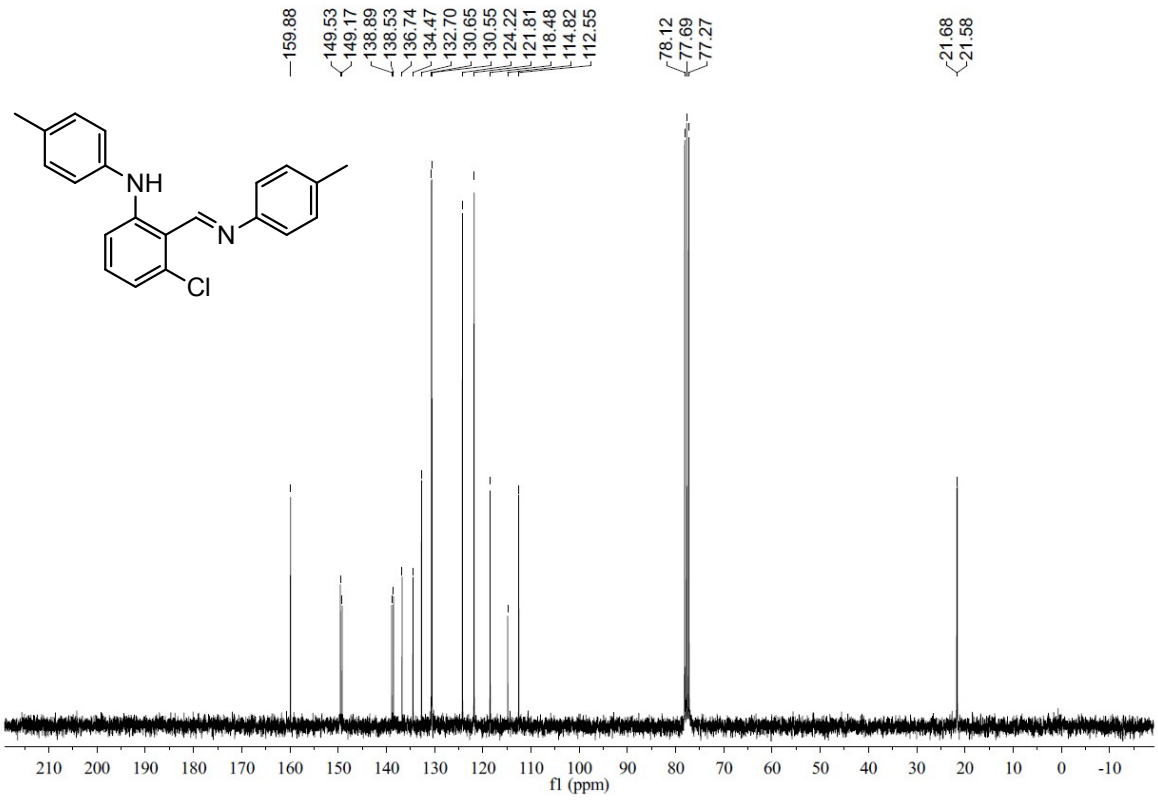
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.07 (d, $^3J_{HH}$ = 8.1 Hz, 2H), 6.65 (d, $^3J_{HH}$ = 8.1 Hz, 2H), 5.95 (s, 1H), 2.30 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 139.61, 138.05, 132.06, 131.93, 129.69, 127.86, 127.58, 117.84, 20.69. HRMS-ESI (m/z) Calcd for

$C_{13}H_8Cl_5N$ [M+H]: 355.9148; Found: 355.9078.

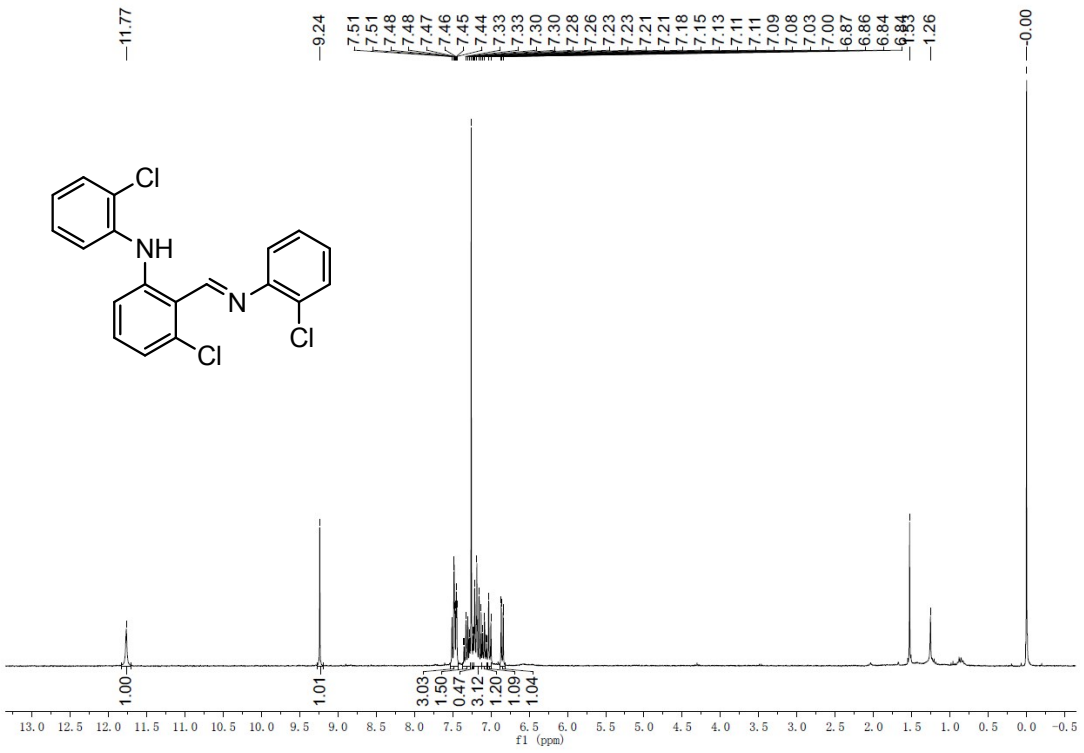
^{1}H NMR of **2a**



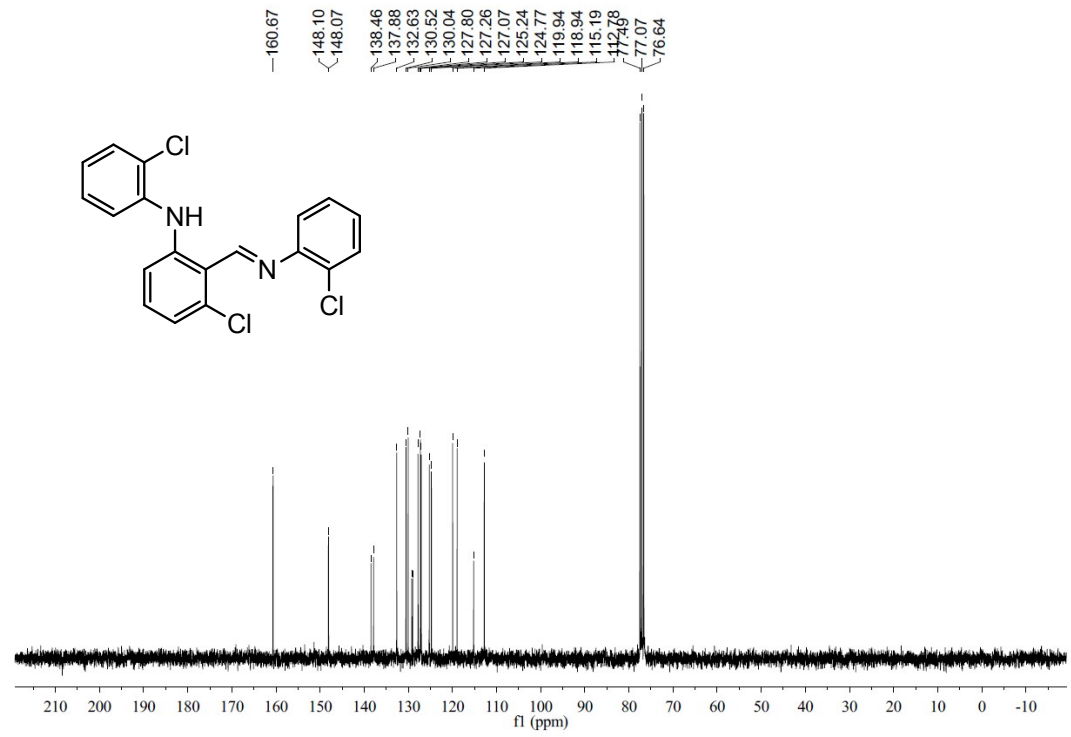
^{13}C NMR of **2a**



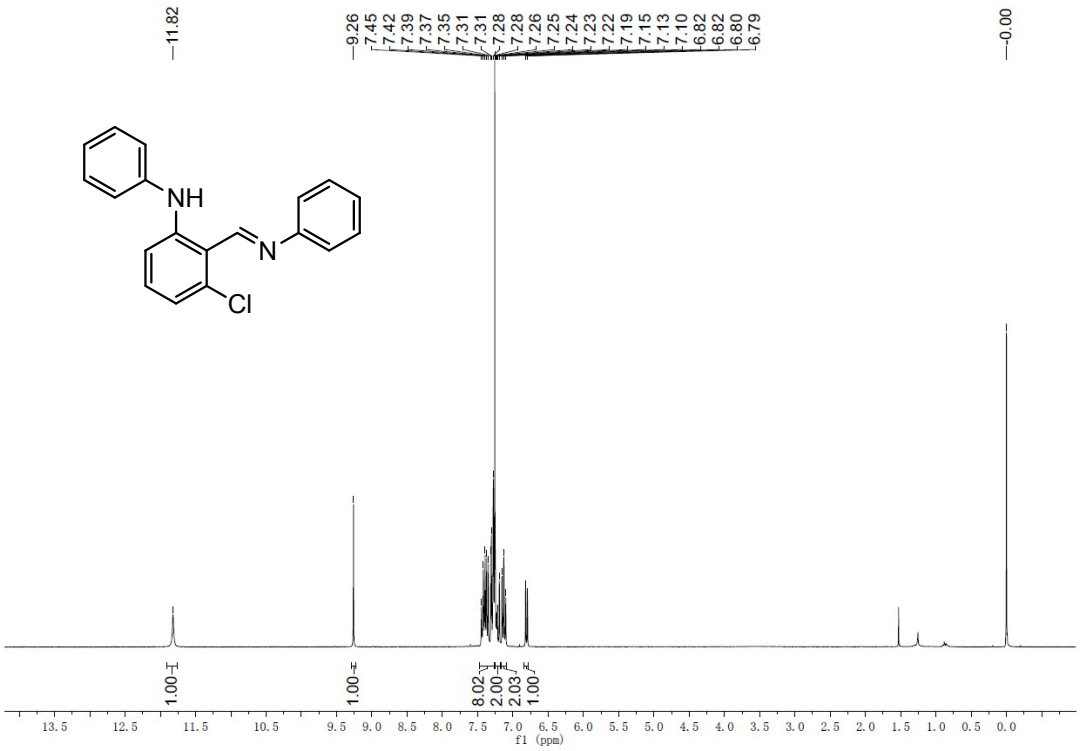
^{1}H NMR of **2b**



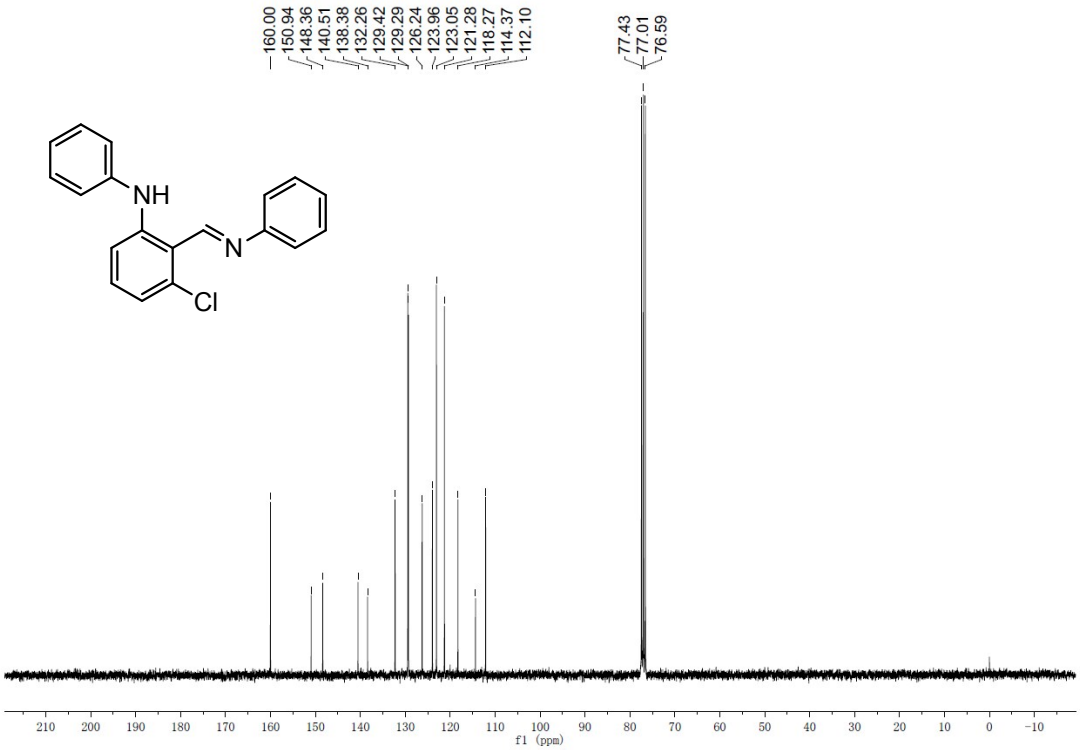
^{13}C NMR of **2b**



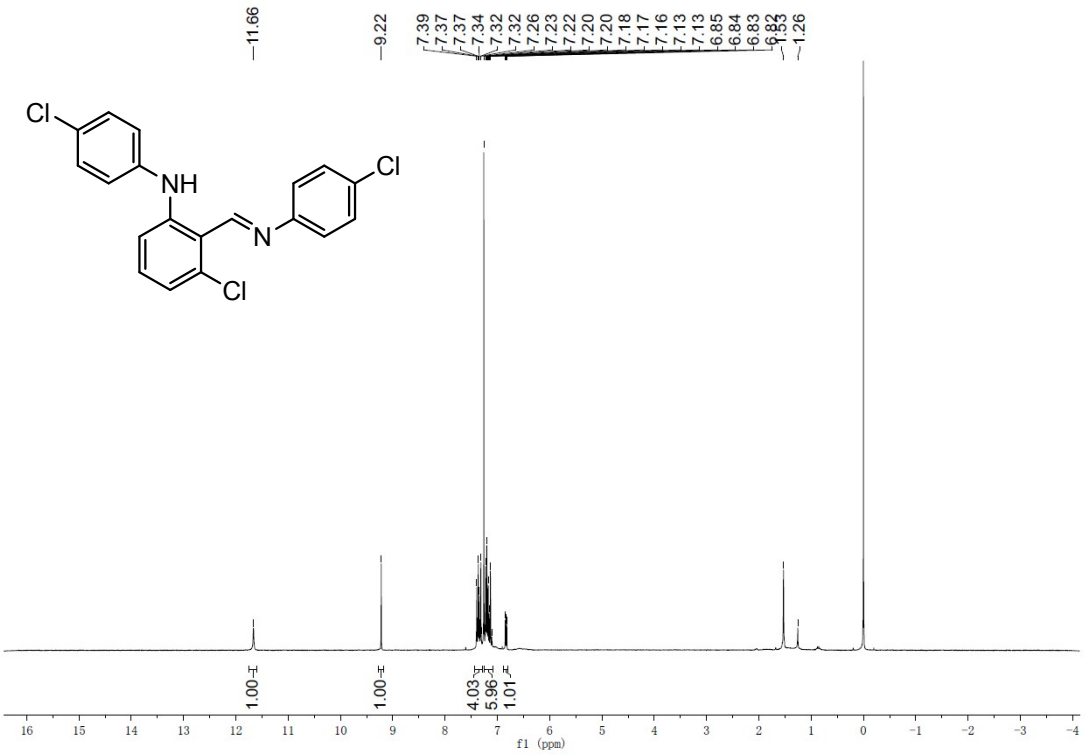
^{1}H NMR of **2c**



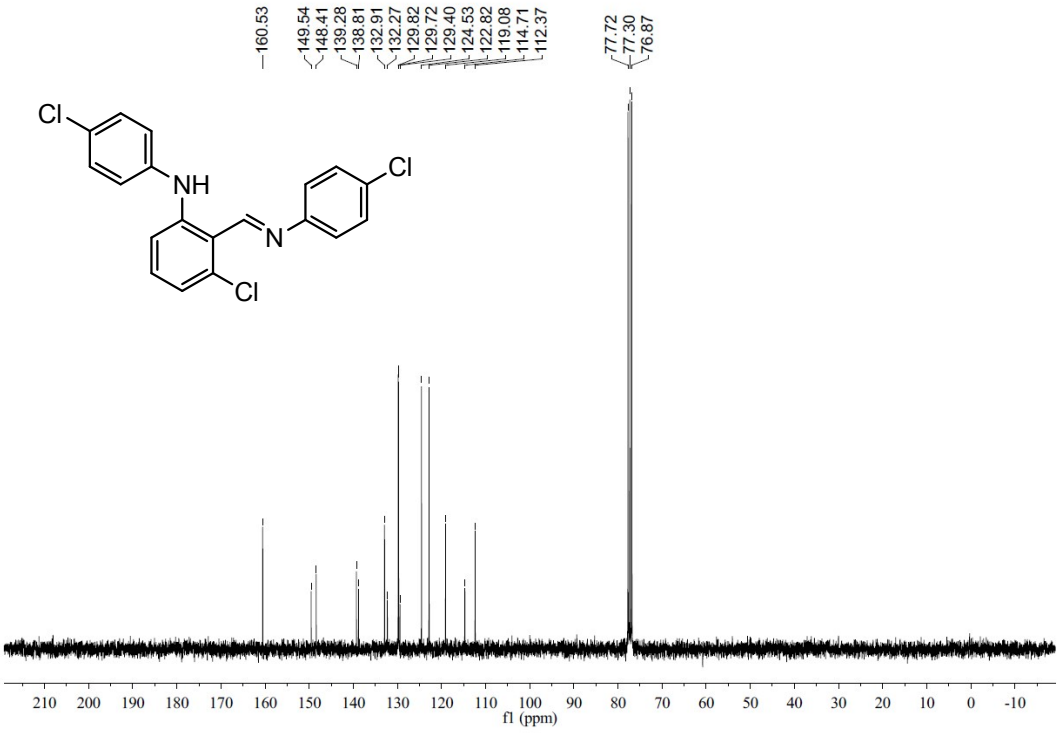
^{13}C NMR of **2c**



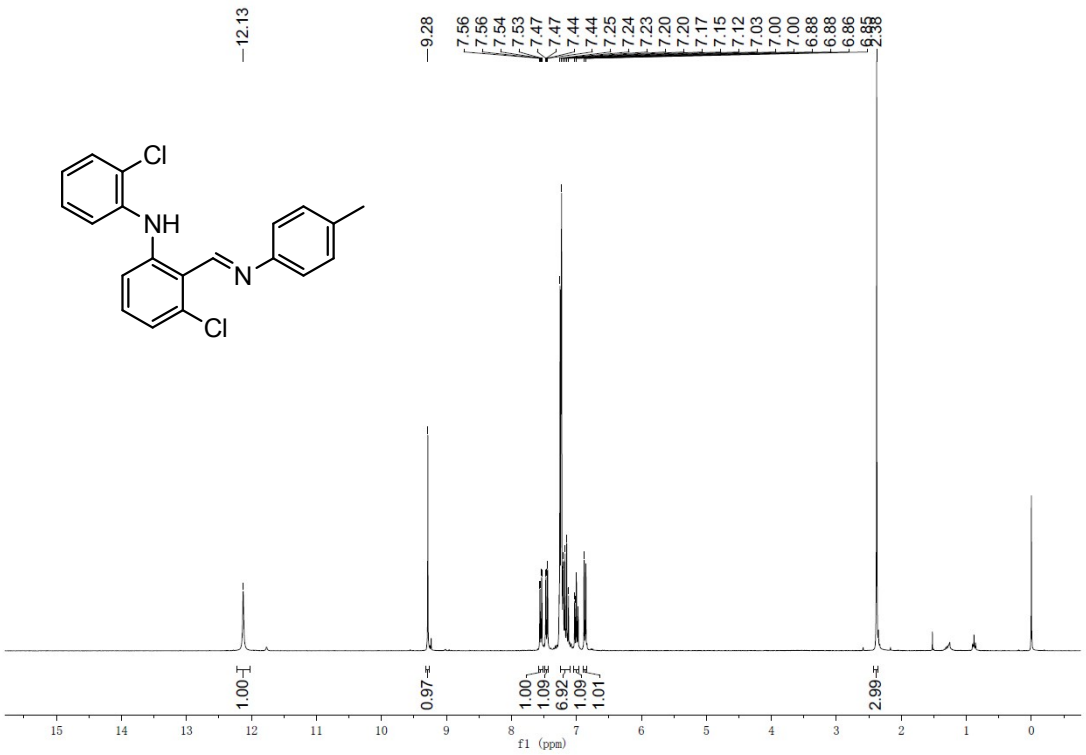
^{1}H NMR of **2d**



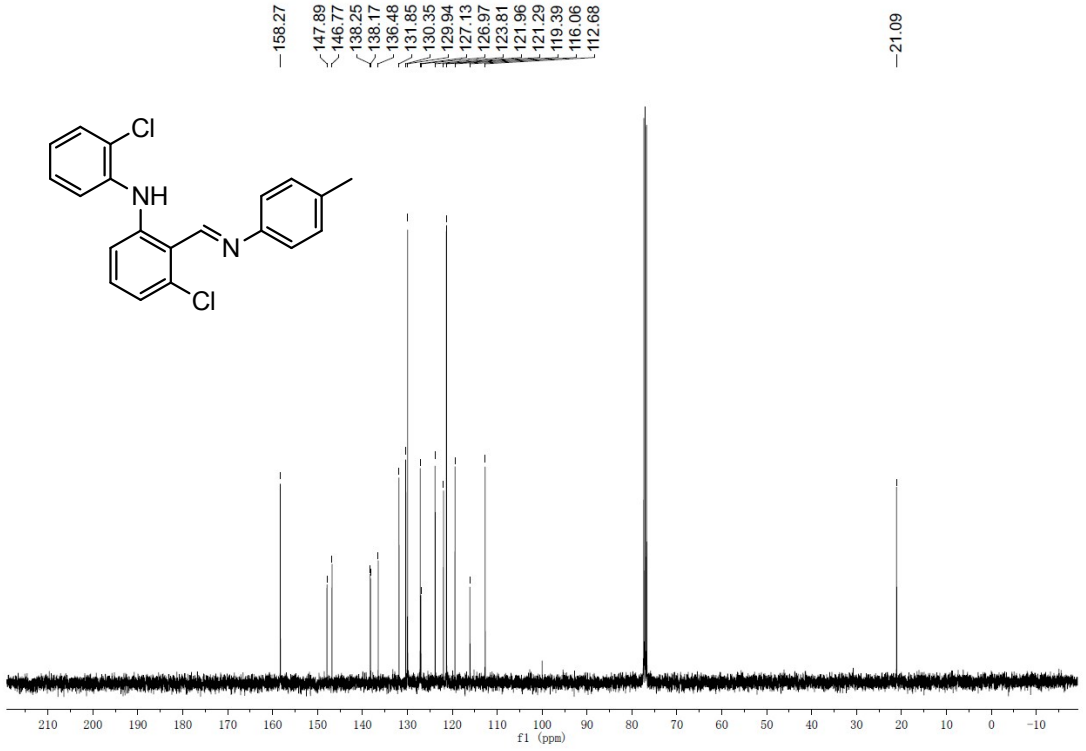
^{13}C NMR of **2d**



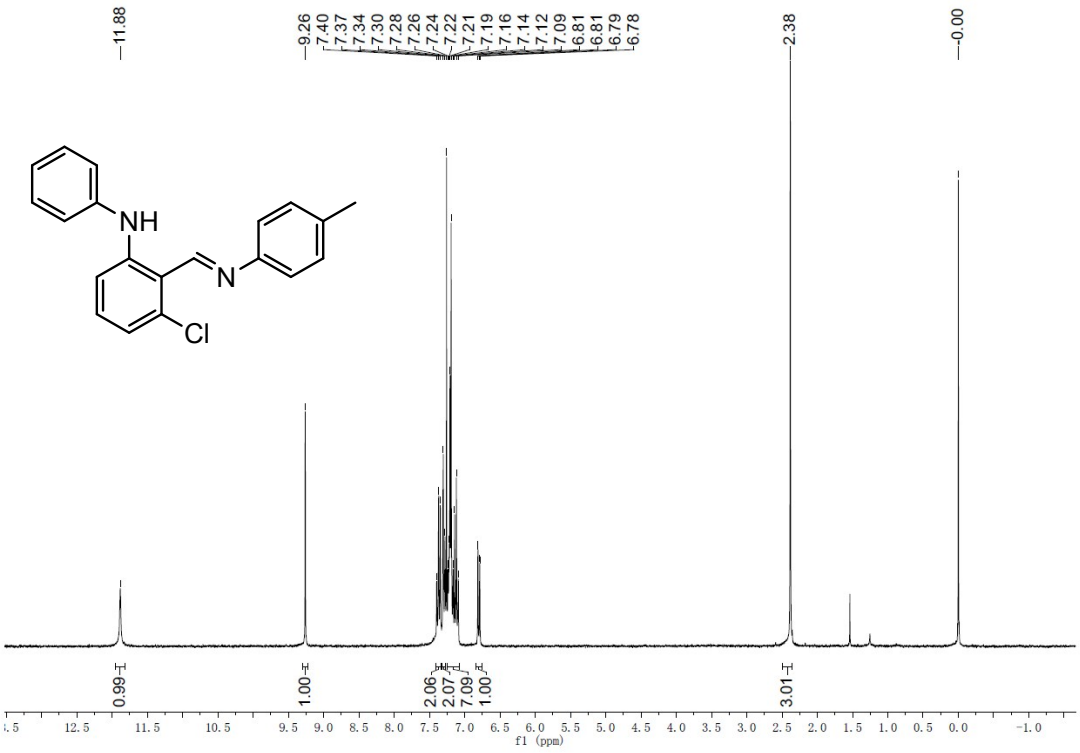
^{1}H NMR of **2e**



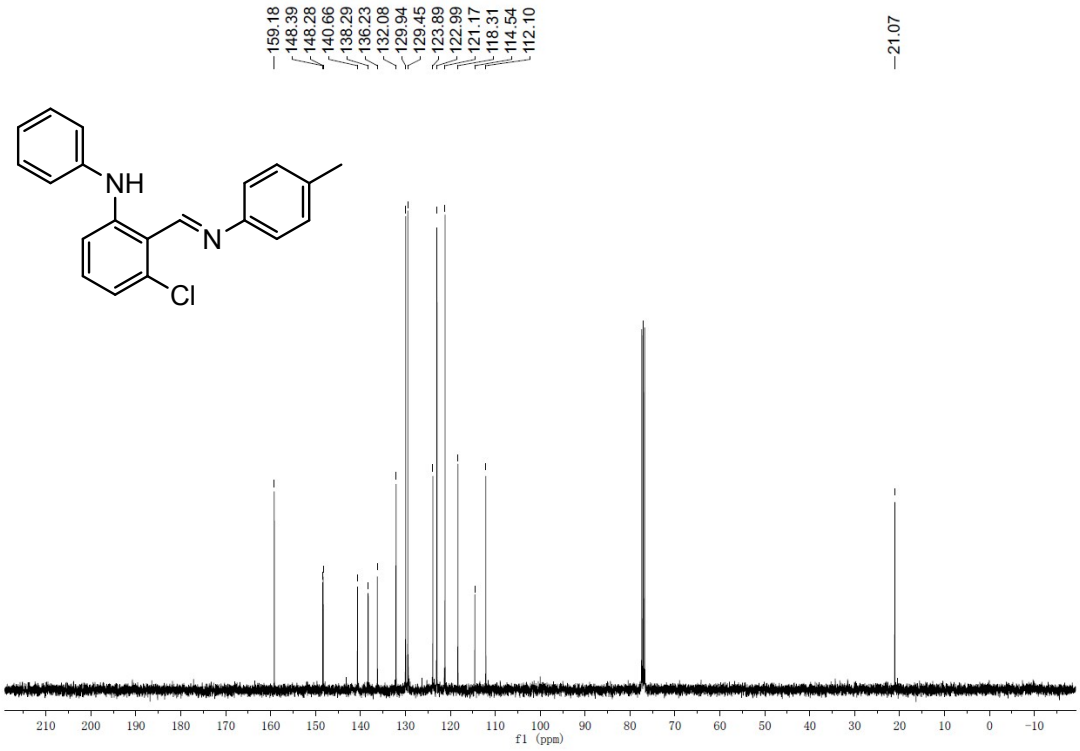
^{13}C NMR of **2e**



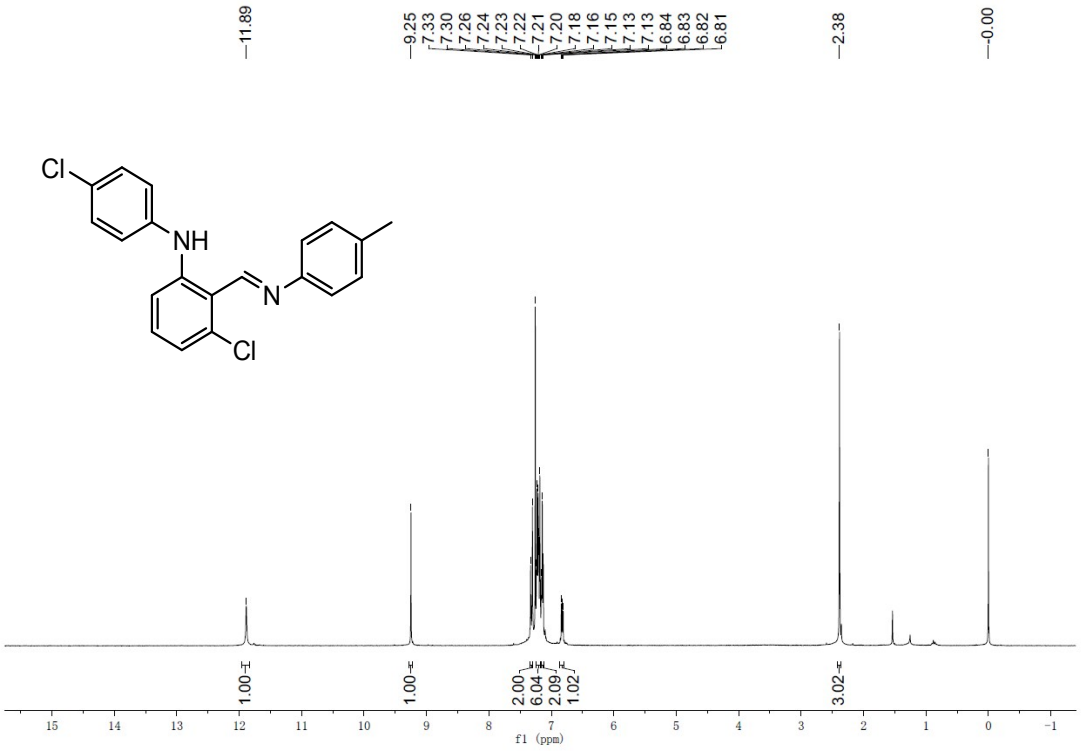
^{1}H NMR of **2f**



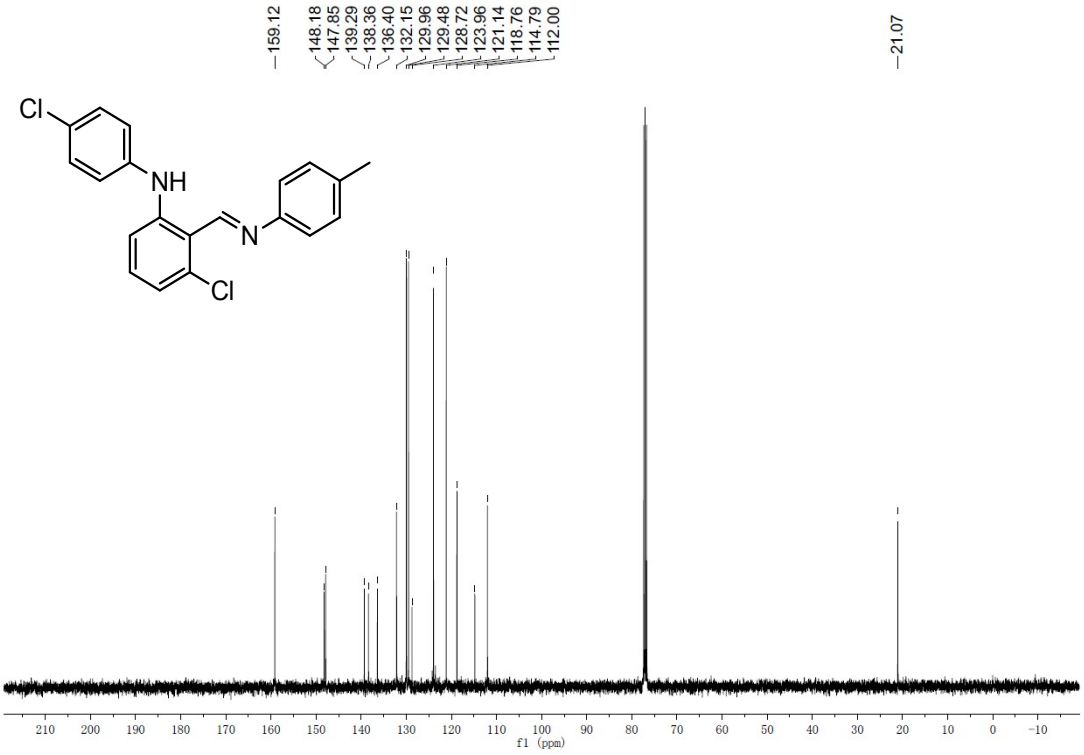
^{13}C NMR of **2f**



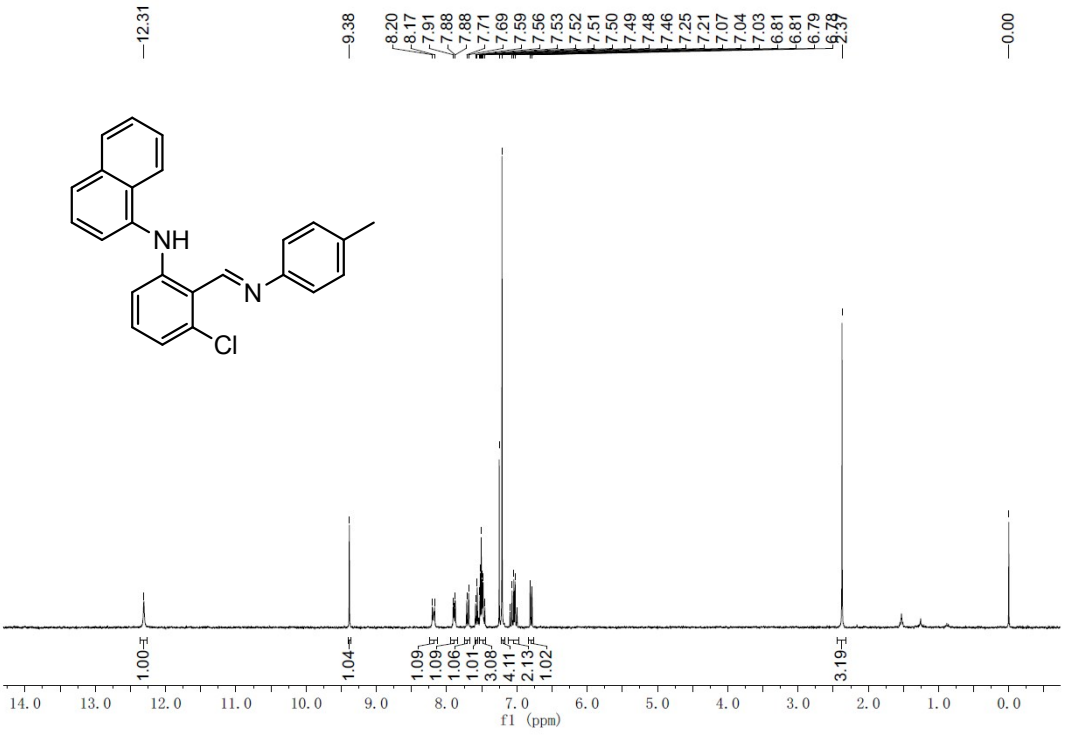
^{1}H NMR of **2g**



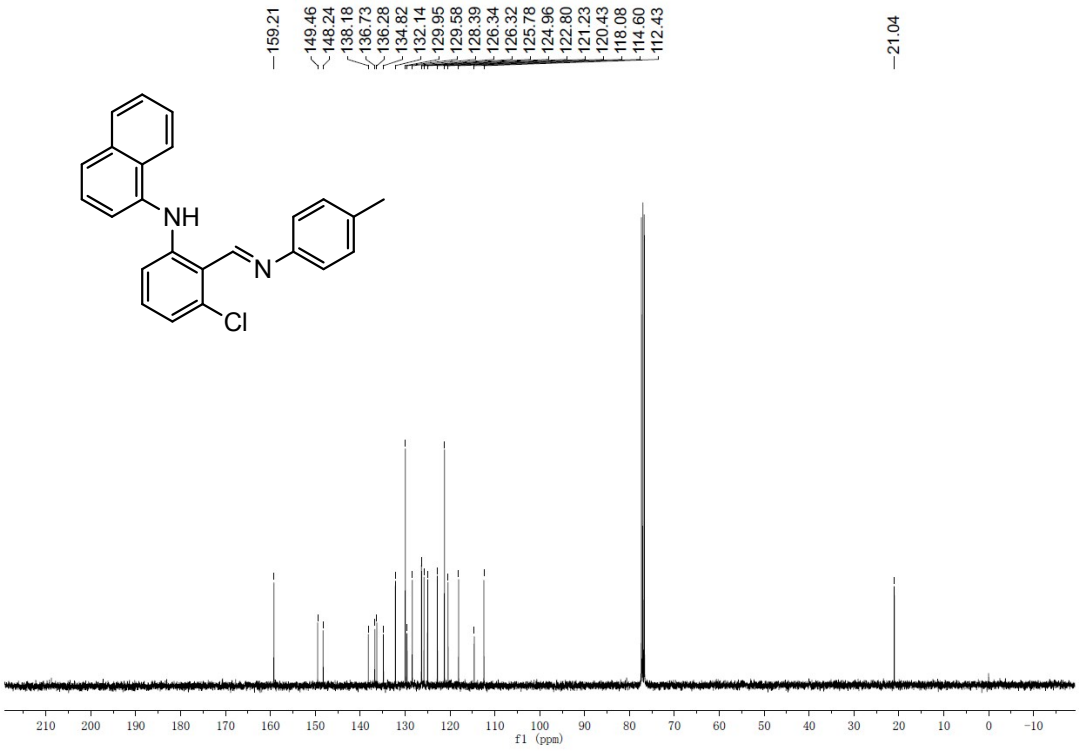
^{13}C NMR of **2g**



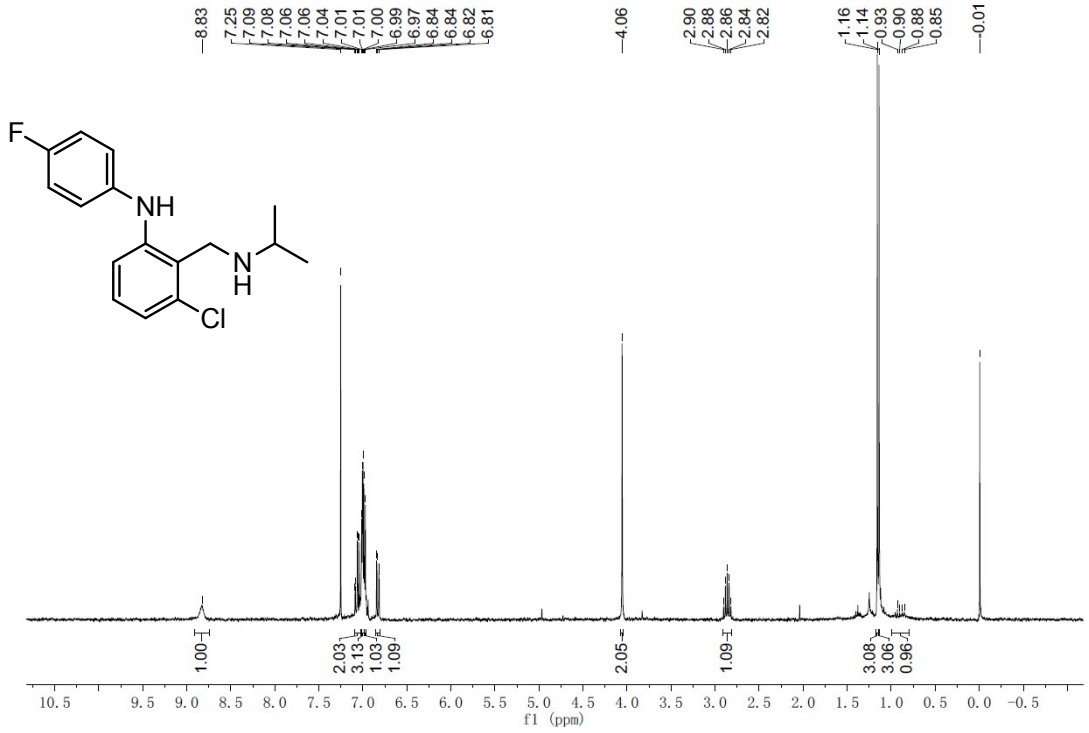
^{1}H NMR of **2h**



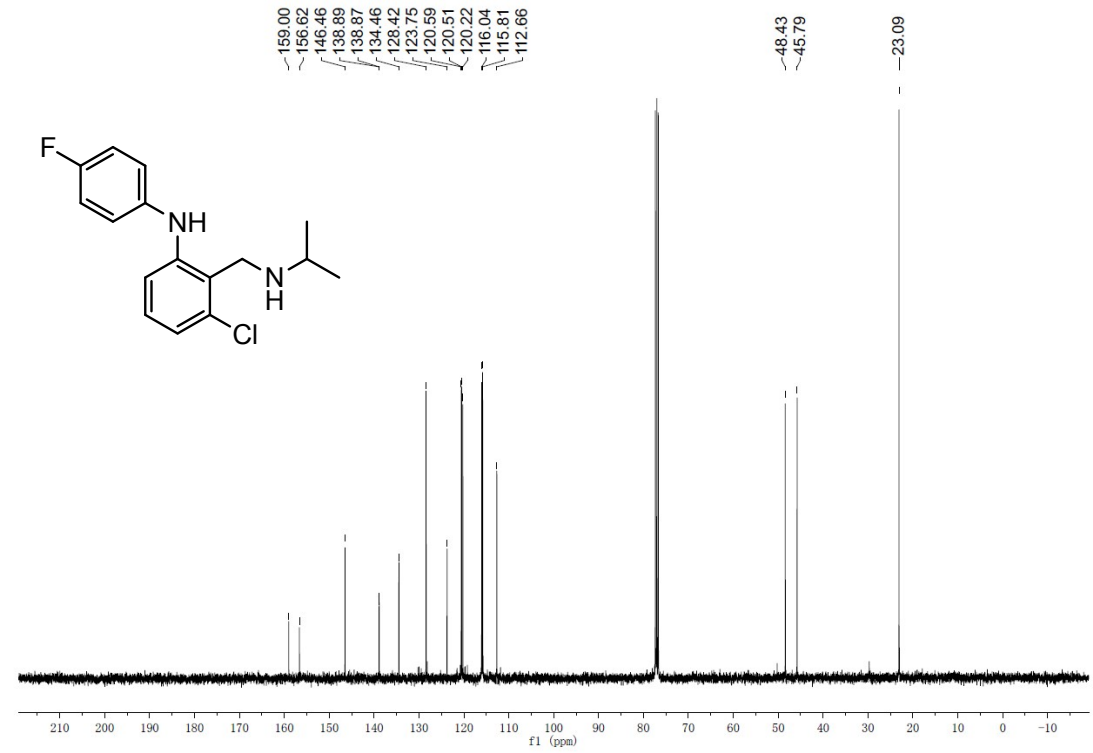
^{13}C NMR of **2h**



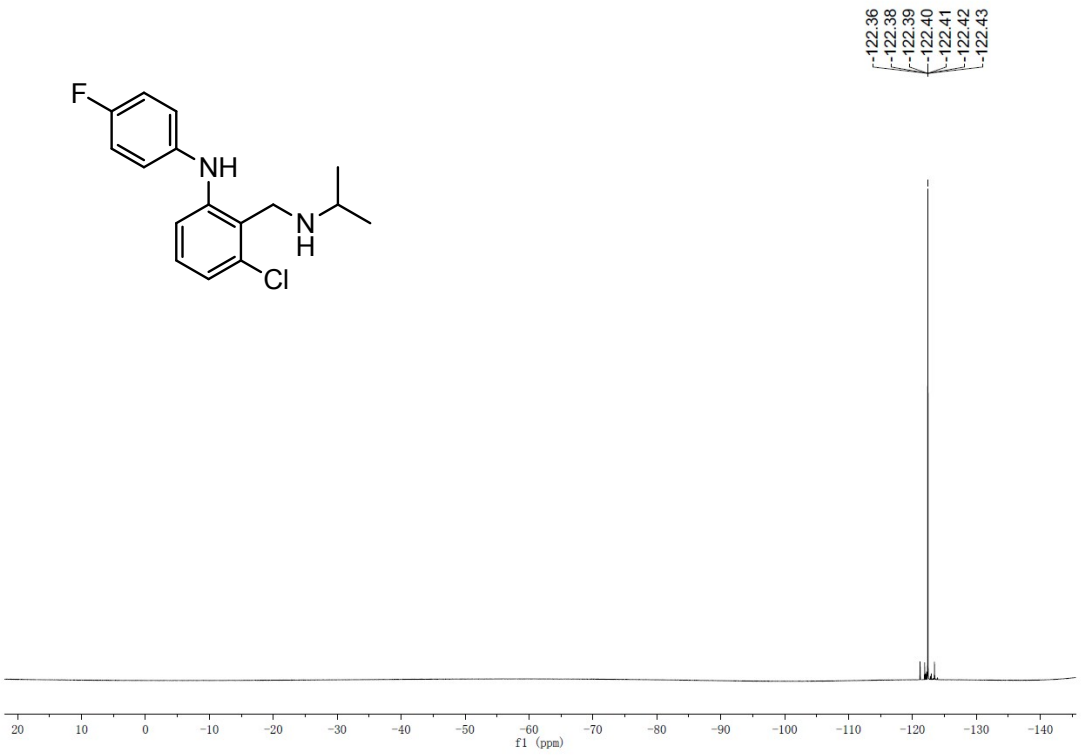
^{1}H NMR of **2i**



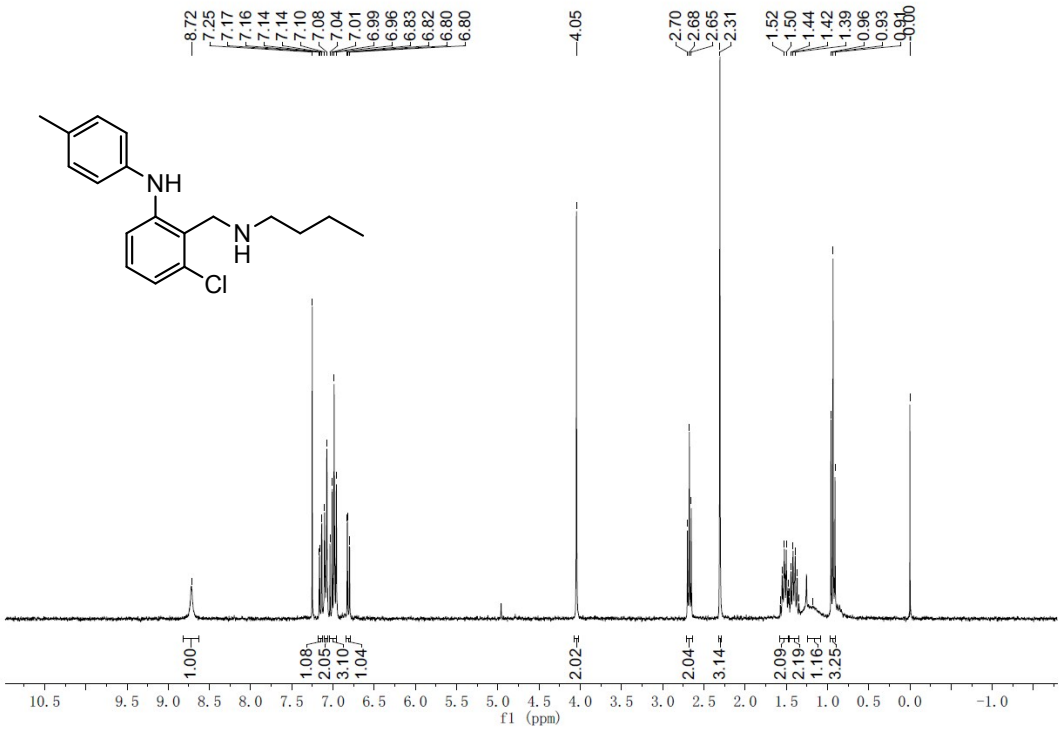
^{13}C NMR of **2i**



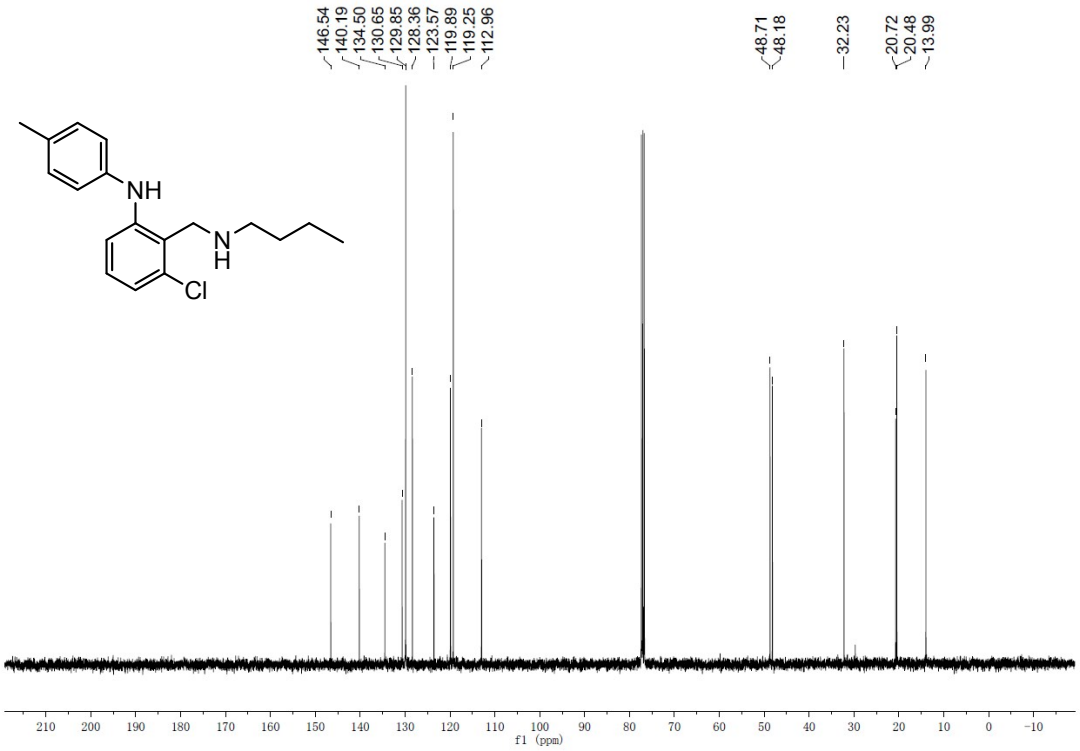
^{19}F NMR of **2i**



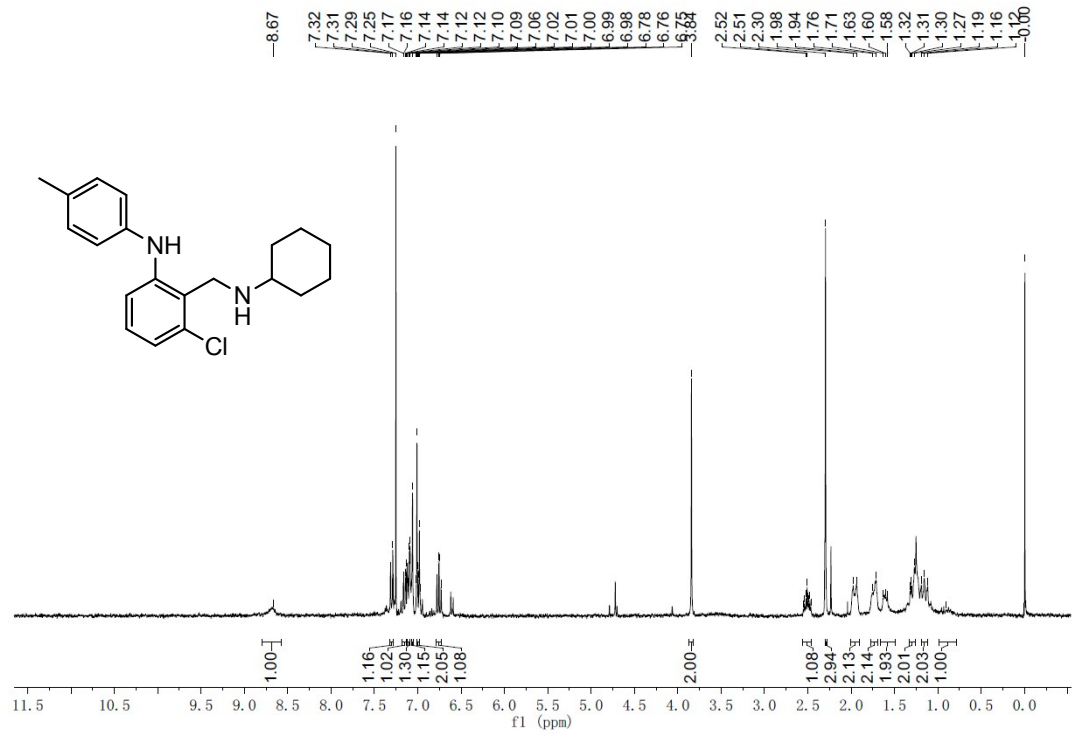
^{1}H NMR of **2j**



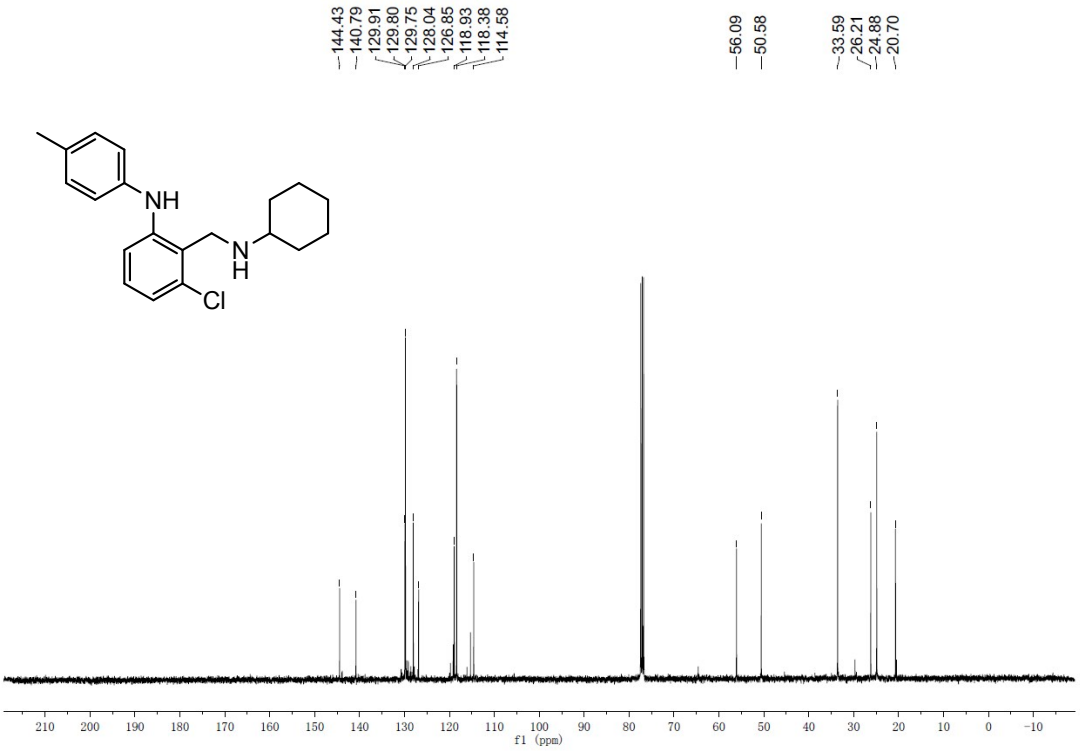
^{13}C NMR of **2j**



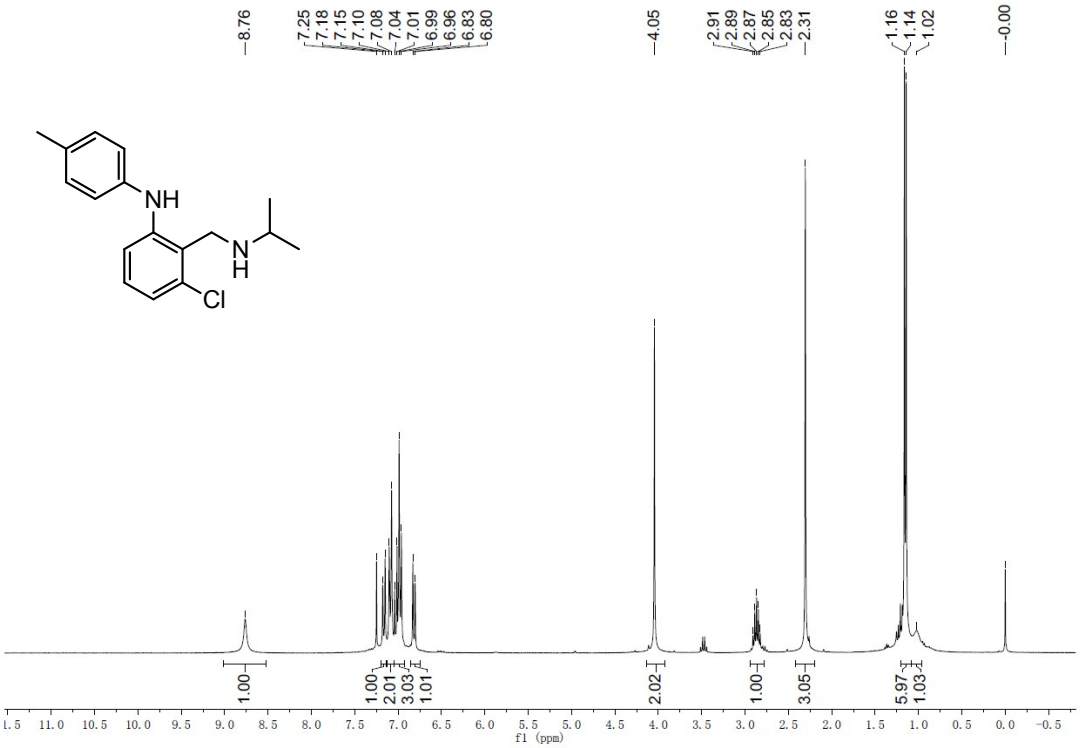
^{1}H NMR of **2k**



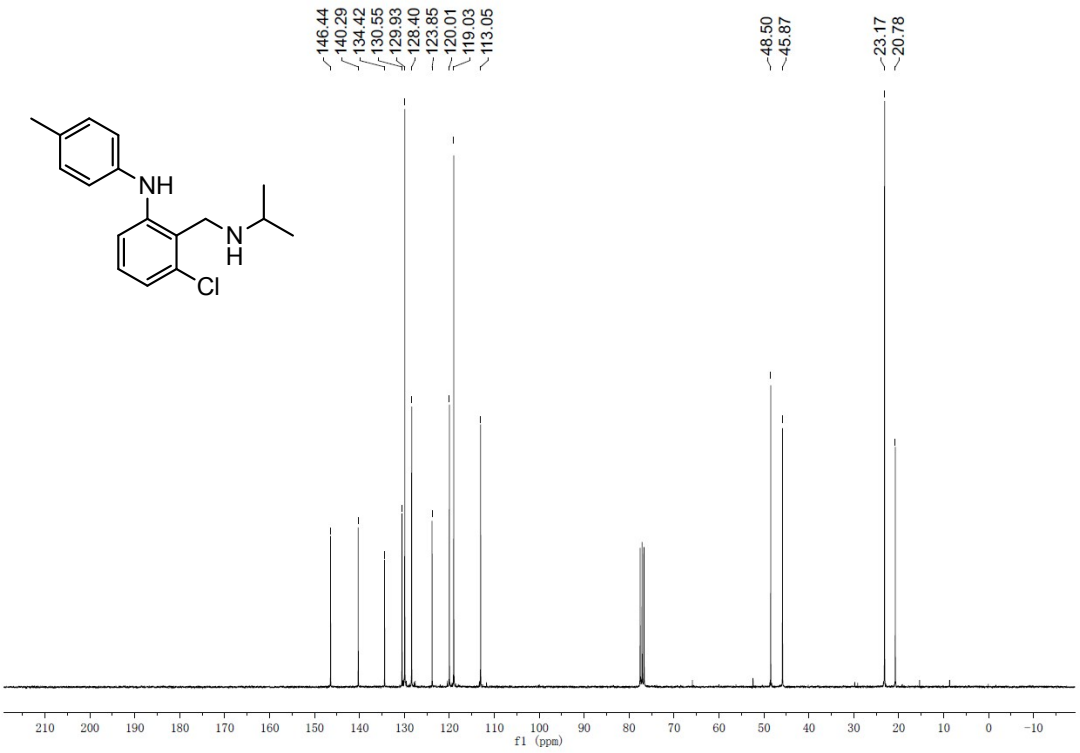
^{13}C NMR of **2k**



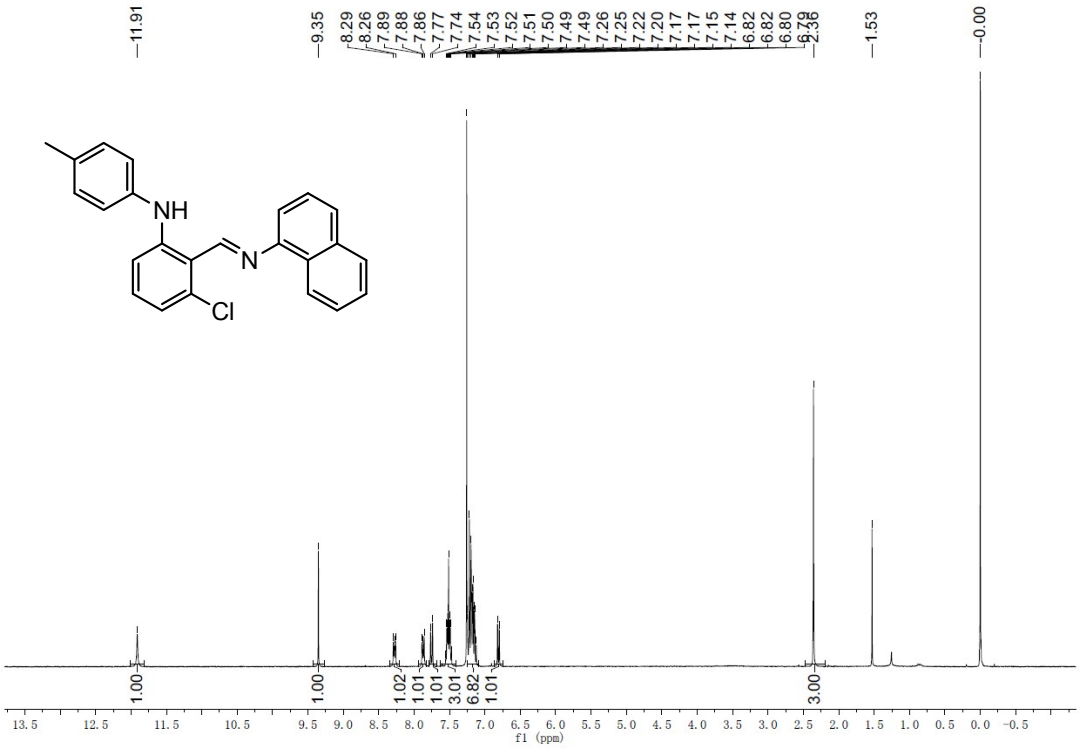
^{1}H NMR of **2l**



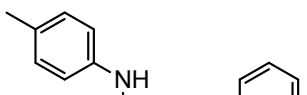
^{13}C NMR of **2l**

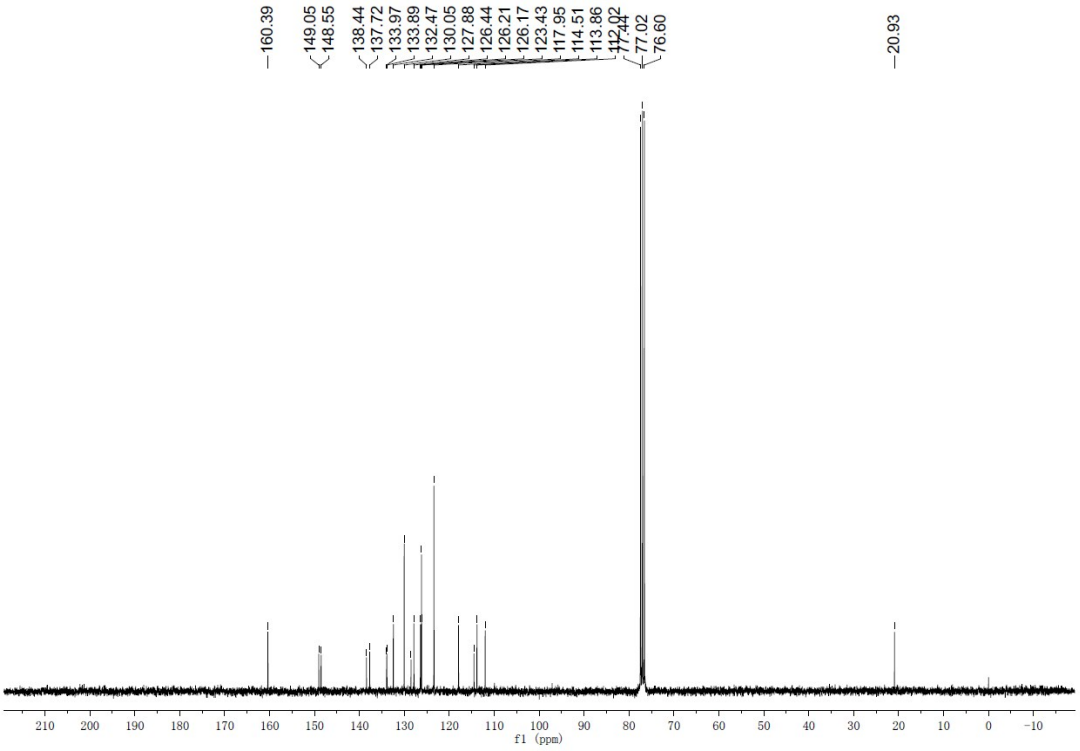


^{1}H NMR of **2m**

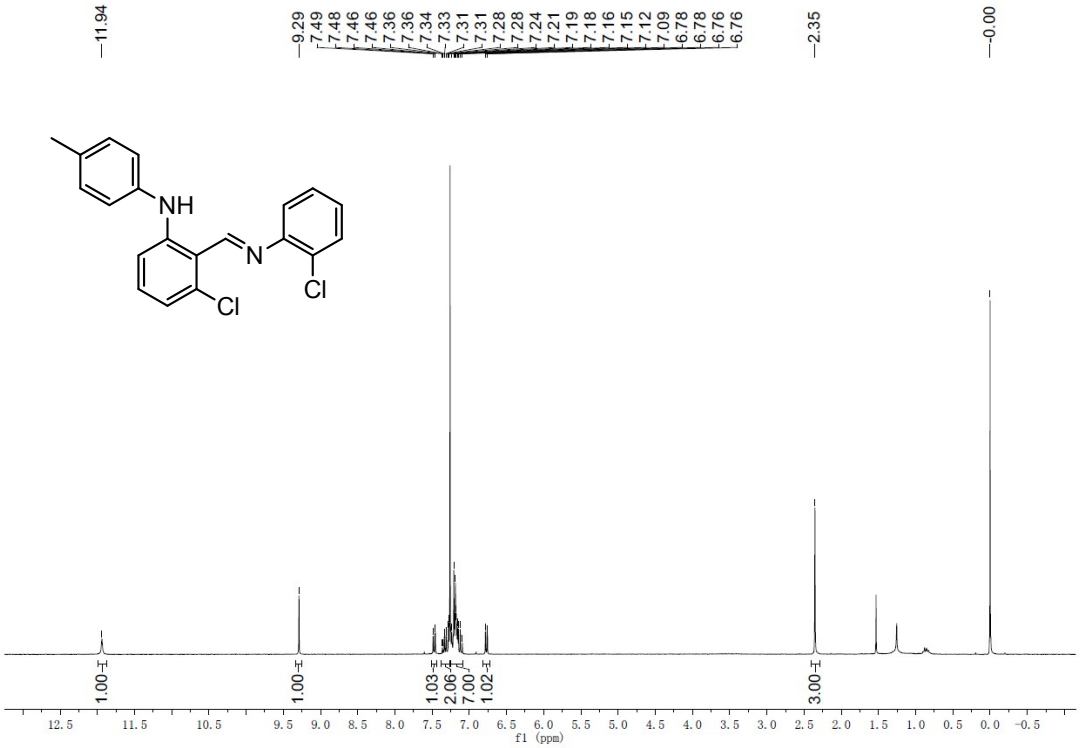


^{13}C NMR of **2m**

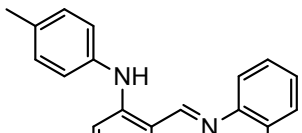


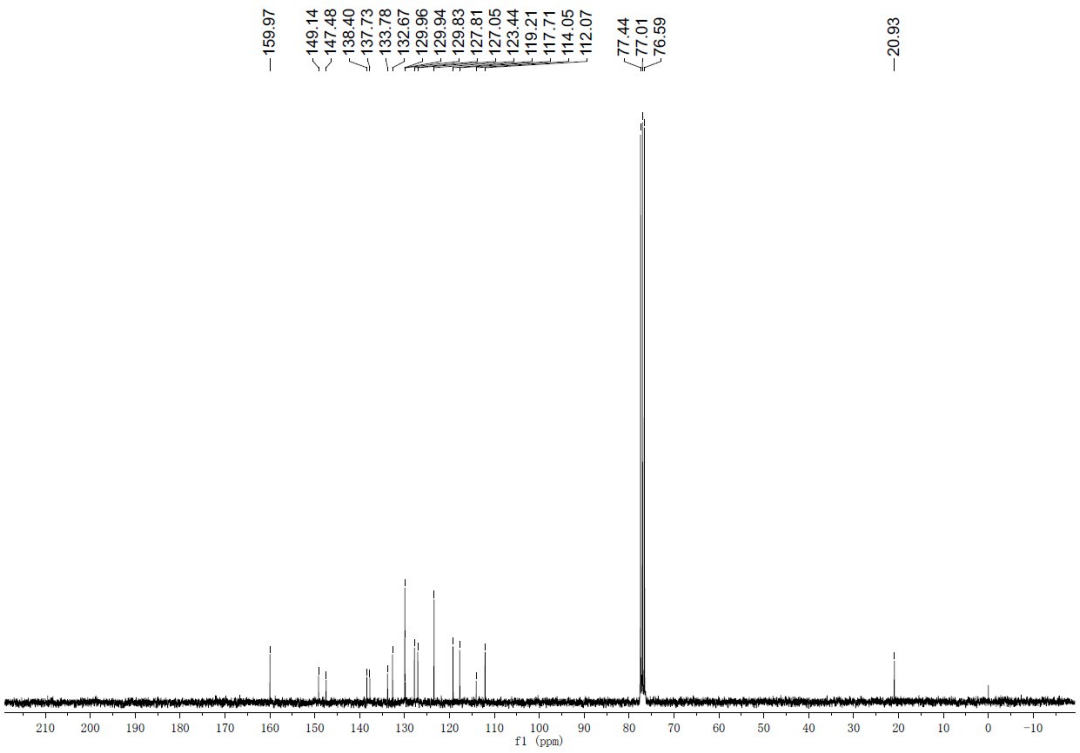


^{1}H NMR of **2n**

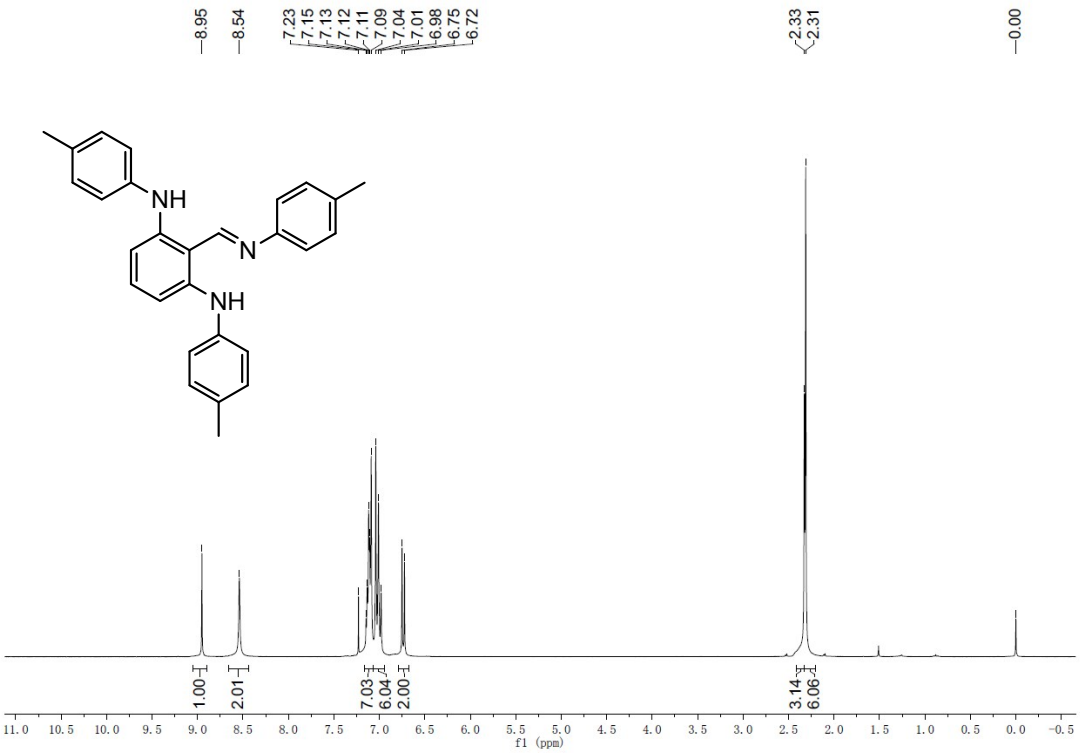


^{13}C NMR of **2n**

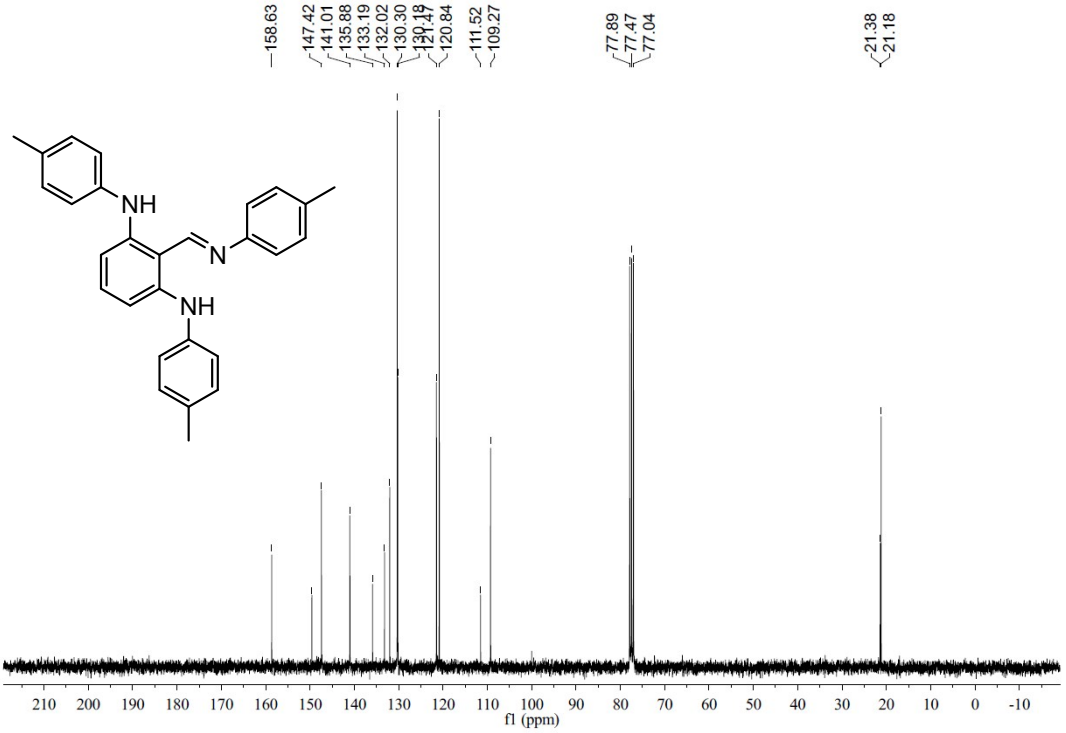




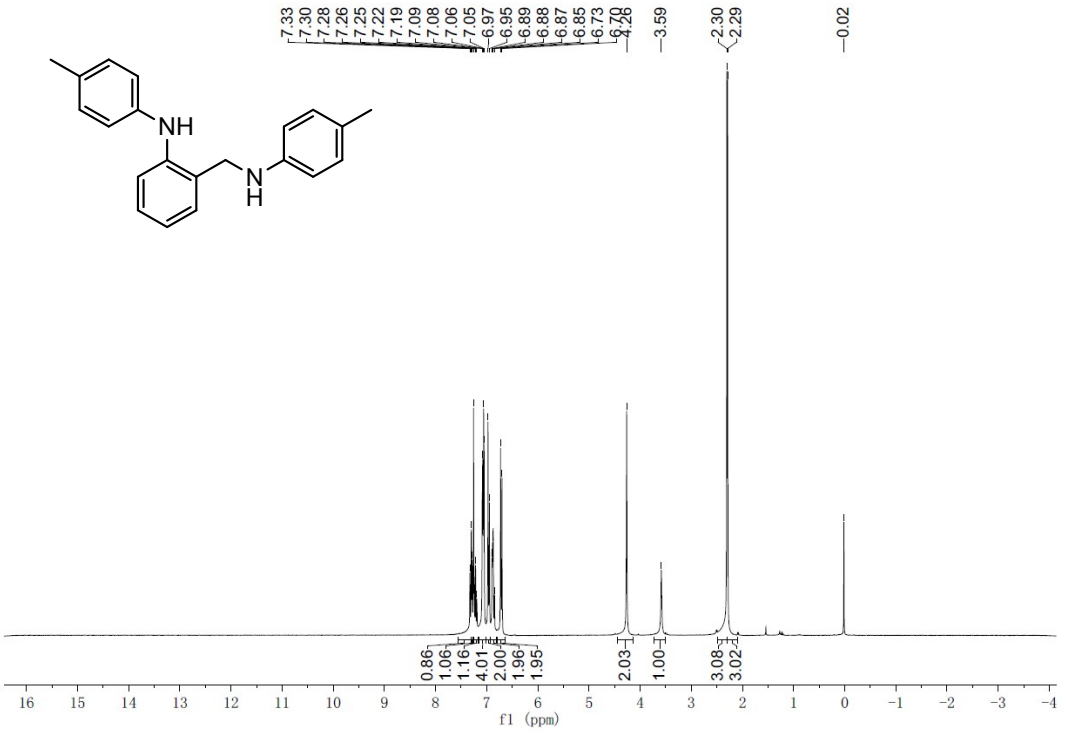
^{1}H NMR of **2o**



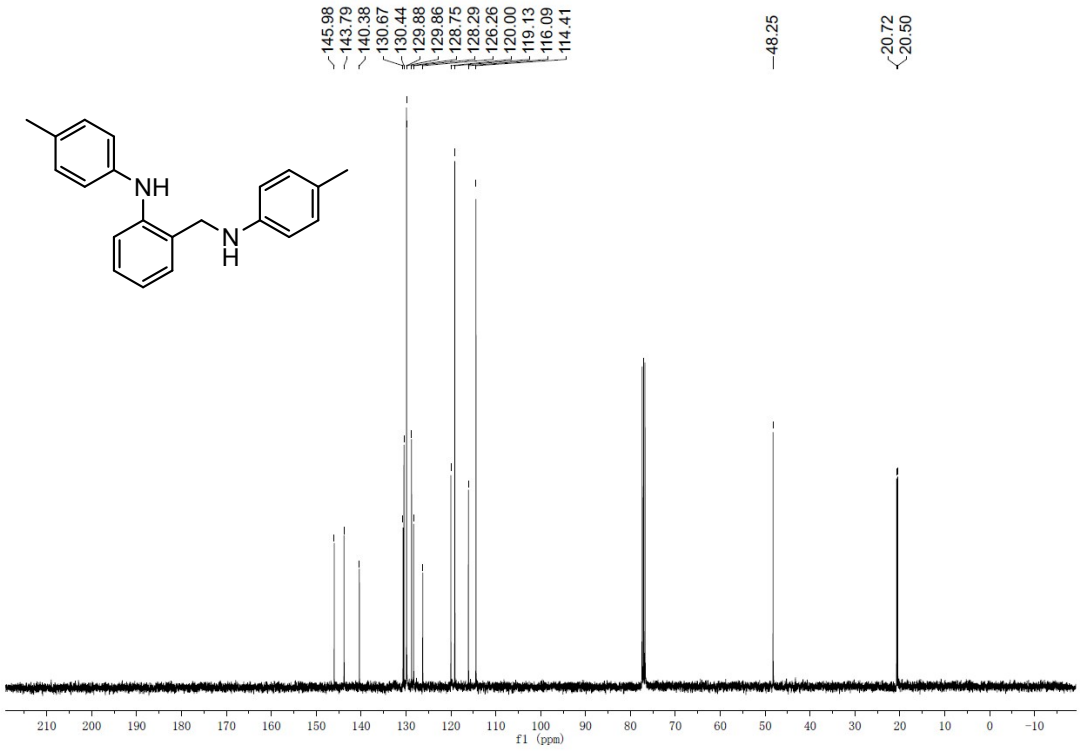
^{13}C NMR of **2o**



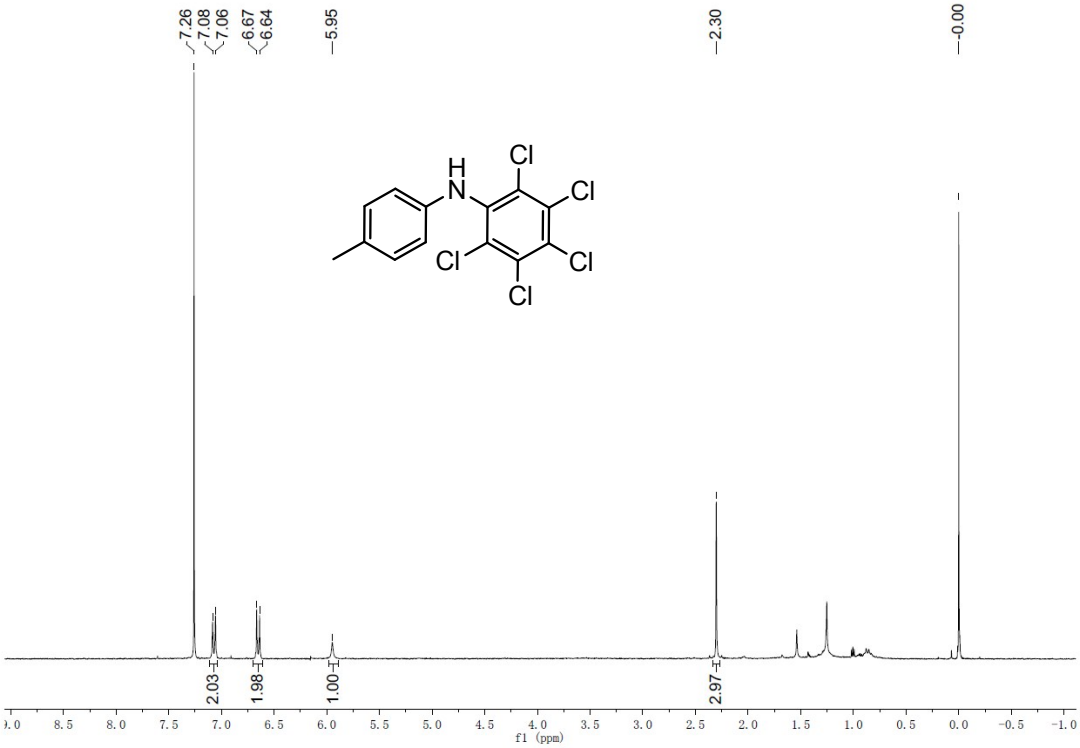
^{1}H NMR of **2p**



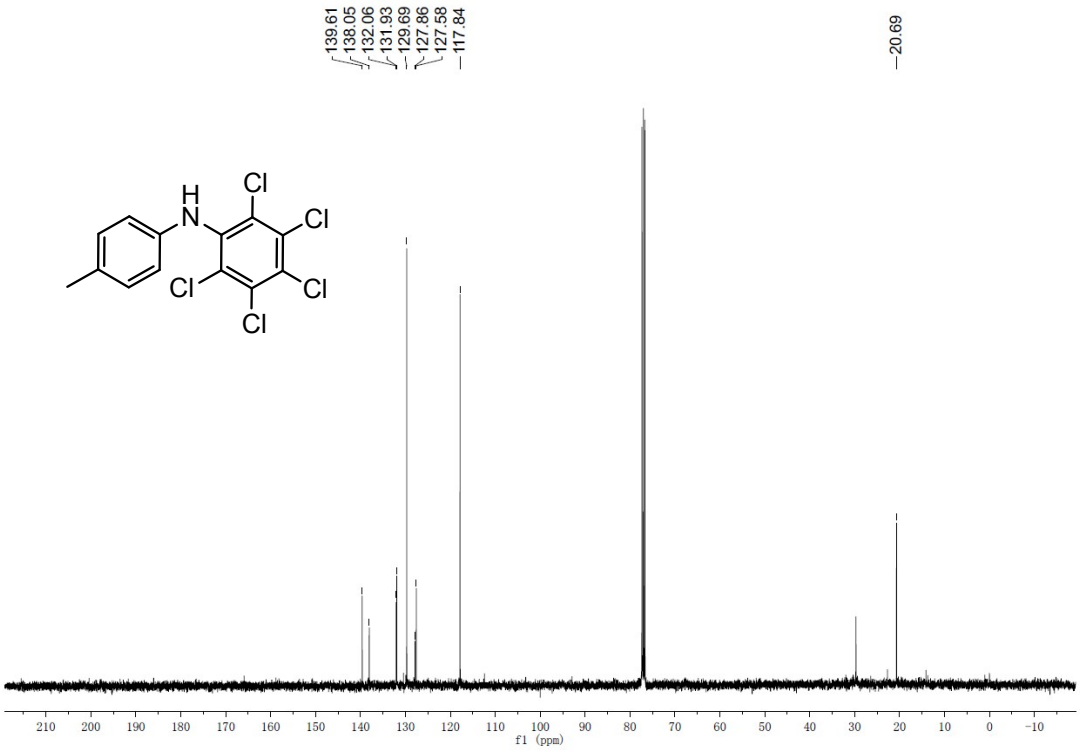
^{13}C NMR of **2p**



^{1}H NMR of **2q**



^{13}C NMR of **2q**


139.61
138.05
132.06
131.93
129.69
127.86
127.58
117.84
20.69
H
N
Cl
Cl
Cl
Cl
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210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)