Supporting Information

Free-Amine Directed Arylation of Biaryl-2-amines with Aryl Iodides by Palladium Catalysis

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Content

General Information ……..……..……S 2

Experimental Procedures……S 2

1. General Procedure for Preparation of Biphenylamine Derivatives ……S 2

2. General Procedure for Arylation of Biphenylamine with Various Aryl iodides……S 8

3. Mechanistic Study……S 27

References …… …… ……S 29

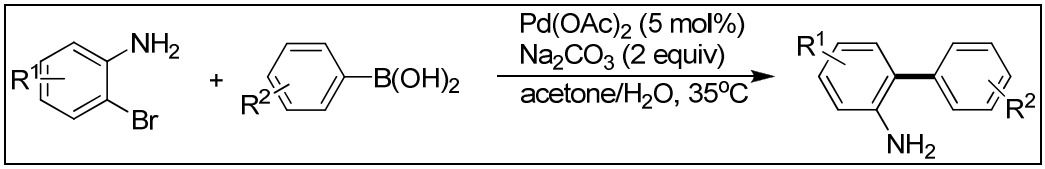
NMR Spectrum of Compounds…… …… ……S 30

General Information

The materials and solvents were purchased from common commercial sources and used without additional purification, if there is no special version. NMR spectra were recorded for ^{1}H NMR at 400 MHz or 500 MHz, and ^{13}C NMR at 100 MHz or 125 MHz using TMS as internal standard. The following abbreviations were used to describe peak patterns where appropriate: singlet (s), doublet (d), triplet (t), quintuplet (q), multiplet (m), doublet of doublet (dd), broad resonances (br). Mass spectroscopy data of the products were collected on an HRMS-APCI instrument or a low-resolution MS instrument using EI or ESI ionization.

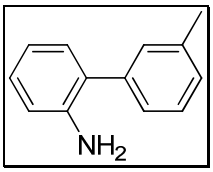
Experimental Procedures

1. General Procedure for Preparation of Biphenylamine Derivatives [1]



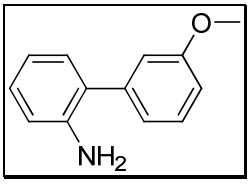
A vessel with a magnetic stir bar was charged with Na_2CO_3 (2.120 g, 20 mmol, 2.0 equiv), $Pd(OAc)_2$ (112 mg, 0.5 mmol, 5 mol%), 2-bromoaniline (10 mmol, 1.0 equiv), arylboronic acid (15 mmol, 1.5 equiv), distilled water (35 mL) and acetone (30 mL). Then the mixture was stirred for 12 h at 35°C. Afterwards the resulting solution was filtered through a plug of Celite and the residue was washed with ethyl acetate (30 mL). The filtrate was extracted three times with diethyl ether (3 × 30mL). The combined organic phases were washed with brine (40 mL), dried over anhydrous sodium sulfate, filtered and concentrated. The residue was purified by flash column chromatography with ethyl acetate (EA) and petroleum ether (Pet) as eluent to afford the corresponding 2-amidobiphenyl derivatives **1**.

Characterization data of the substrates:



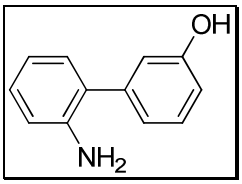
3'-methylbiphenyl-2-amine (**1a**)[1b, 1c, 1d]

Brown oil; Yield 92% (1.68 g); R*f* = 0.45; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.33 (t, 1H, *J* = 7.2 Hz), 7.24−7.26 (m, 2H), 7.11−7.16 (m, 3H), 6.81 (t, 1H, *J* = 7.6 Hz), 6.76 (d, 1H, *J* = 7.6 Hz), 3.68 (br s, 2H), 3.39 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.0, 139.4, 138.5, 130.5, 129.9, 128.7, 128.4, 128.1, 128.0, 126.1, 119.0, 115.9, 21.5.



3'-methoxybiphenyl-2-amine (**1b**)[1c, 1d]

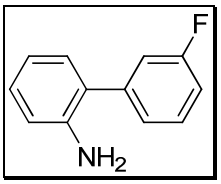
Brown solid; Yield 85% (1.69 g); mp 45−46 ^{o}C; R*f* = 0.45; (PE/EtOAc = 3:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.35 (t, 1H, *J* = 8.0 Hz), 7.12−7.17 (m, 2H), 7.03 (d, 1H, *J* = 7.2 Hz), 6.99 (s, 1H), 6.89 (d, 1H, *J* = 8.0 Hz), 6.81 (t, 1H, *J* = 7.6 Hz), 6.76 (d, 1H, *J* = 8.0 Hz), 3.83 (s, 3H), 3.66 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 159.9, 143.1, 140.9, 130.4, 129.9, 128.6, 127.7, 121.4, 118.9, 115.8, 114.5, 113.0, 55.3.



2'-aminobiphenyl-3-ol (**1c**)[1d]

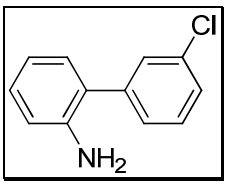
Brown solid; Yield 78% (1.44 g); mp 151−152 ^{o}C; R*f* = 0.13; (PE/EtOAc = 3:1); ^{1}H NMR (400 MHz, CD_3SOCD_3, TMS) δ 9.47 (br s, 1H), 7.24 (t, 1H, *J* = 8.2 Hz), 7.03 (t, 1H, *J* = 7.8 Hz), 6.96 (d, 1H, *J* = 7.2 Hz), 6.81−6.82 (m, 2H), 6.73−6.74 (m, 2H), 6.62 (t,

1H, *J* = 7.4 Hz), 4.68 (br s, 2H). ^{13}C NMR (100 MHz, CD_3SOCD_3, TMS) δ 157.8, 145.1, 141.3, 130.1, 130.1, 128.4, 126.2, 119.6, 117.1, 115.7, 115.5, 114.1.



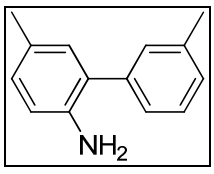
3'-fluorobiphenyl-2-amine (**1d**)[1c, 1d]

Brown oil; Yield 83% (1.55 g); R*f* = 0.45; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.36−7.42 (m, 1H), 7.22−7.24 (m, 1H), 7.14−7.18(m, 2H), 7.10 (d, 1H, *J* = 7.2 Hz), 7.01−7.05 (m, 1H), 6.82 (t, 1H, *J* = 7.74), 6.76 (d, 1H, *J* = 7.6 Hz), 3.64 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 163.0 (d, *J* = 244.0 Hz), 143.3, 141.7 (d, *J* = 7.8 Hz), 130.3 (d, *J* = 8.4 Hz), 130.3, 128.9, 126.3, 124.8 (d, *J* = 3.8 Hz), 118.8, 116.1 (d, *J* = 21.3 Hz), 115.8, 114.1 (d, *J* = 21.1 Hz).



3'-chlorobiphenyl-2-amine (**1e**)[1c, 1d]

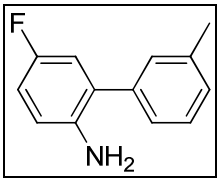
Brown solid; Yield 86% (1.75 g); mp 44−45 ^{o}C; R*f* = 0.42; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.46 (s, 1H), 7.31−7.39 (m, 3 H), 7.16 (t, 1H, *J* = 7.6 Hz), 7.09 (d, 1H, *J* = 7.6 Hz), 6.83 (t, 1H, *J* = 7.4 Hz), 6.76 (d, 1H, *J* = 8.0 Hz), 3.74 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.2, 141.3, 134.7, 130.4, 130.1, 129.2, 129.0, 127.4, 127.3, 126.3, 118.9, 115.9.



3',5-dimethylbiphenyl-2-amine (**1g**)[1c]

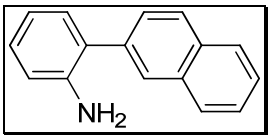
Brown oil; Yield 76% (1.50 g); R*f* = 0.36; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ (t, 1H, *J* = 7.2 Hz), 7.27−7.29 (m, 2H), 7.18 (d, 1H, *J* = 7.6 Hz),

6.99−7.01 (m, 2H), 6.71 (d, 1H, *J* = 7.6 Hz), 3.60 (br s, 2H), 2.43 (s, 3H), 2.31 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 140.8, 139.5, 138.3, 130.9, 129.8, 128.9, 128.6, 127.8, 127.8, 126.0, 115.8, 21.5, 20.4.



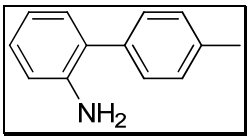
5-fluoro-3'-methylbiphenyl-2-amine (**1h**)[1e]

Brown oil; Yield 75% (1.51 g); R*f* = 0.38; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.33 (t, 1H, *J* = 7.4 Hz), 7.21−7.23 (m, 2H), 7.17 (d, 1H, *J* = 7.2 Hz), 6.83−6.86 (m, 2H), 6.65−6.68 (m, 1H), 3.59 (br s, 2H), 2.39 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 156.2 (d, *J* = 234.7 Hz), 139.5, 138.6, 138.4, 129.5, 128.8, 128.8,128.3, 125.8, 116.5 (d, *J* = 21.8 Hz), 116.4 (d, *J* = 7.4 Hz), 114.7 (d, *J* = 22.1 Hz), 21.4.



2-(naphthalen-2-yl)aniline (**1i**)[1c]

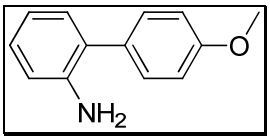
Light brown solid; Yield 82% (1.80 g); mp 95−96 ^{o}C; R*f* = 0.35; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.85−7.93 (m, 4H), 7.59 (d, 1H, *J* = 8.8 Hz), 7.19−7.52 (m, 2H), 7.18−7.22 (m, 2H), 6.87 (t, 1H, *J* = 7.6 Hz), 6.81 (d, 1H, *J* = 8.0 Hz), 3.88 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.7, 137.0, 133.7, 132.5, 130.7, 128.7, 128.5, 128.0, 127.9, 127.8, 127.6, 127.5, 126.4, 126.1, 118.8, 115.8.



4'-methylbiphenyl-2-amine (**1k**)[1c, 1d]

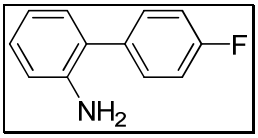
Brown oil; Yield 91% (1.67 g); R*f* = 0.42; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.34 (d, 2H, *J* = 8.0 Hz), 7.25 (t, 2H, *J* = 4.0 Hz), 7.11−7.16 (m, 2H), 6.76–6.84 (m, 2H), 3.75 (br s, 2H), 2.39 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ

143.5, 136.8, 136.5, 130.4, 129.5, 128.9, 128.3, 127.6, 118.6, 115.6, 21.2.



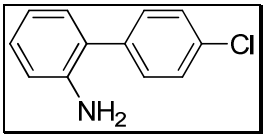
4'-methoxybiphenyl-2-amine (**1l**)[1c, 1d]

Brown solid; Yield 76% (1.51 g); mp 41−42 °C; R*f* = 0.40; (PE/EtOAc = 3:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.37 (d, 2H, *J* = 6.4 Hz), 7.09–7.12 (m, 2H), 6.97 (d, 2H, *J* = 6.8 Hz), 6.80 (t, 1H, *J* = 7.0 Hz), 6.74 (d, 1H, *J* = 8.4 Hz), 3.83 (s, 3H), 3.60 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 158.8, 143.6, 131.8, 130.5, 130.2, 128.2, 127.4, 118.7, 115.6, 114.3, 55.4.



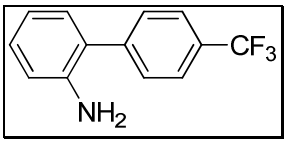
4'-fluorobiphenyl-2-amine (**1m**)[1c, 1d]

Brown solid; Yield 78% (1.46 g); mp 40−41 °C; R*f* = 0.45; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.39−7.43 (m, 2H), 7.07−7.17 (m, 4H), 6.81 (t, 1H, *J* = 7.6 Hz), 6.75 (d, 1H, *J* = 8.0 Hz), 3.64 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 162.1 (d, *J* = 244.8 Hz), 143.5, 135.4 (d, *J* = 3.6 Hz), 130.8 (d, *J* = 7.9 Hz), 130.5, 128.7, 126.7, 118.8, 115.8 (d, *J* = 11.3 Hz), 115.7.



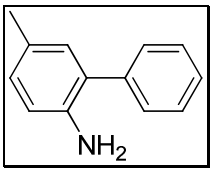
4'-chlorobiphenyl-2-amine (**1n**)[1c, 1d]

Brown oil; Yield 85% (1.73 g); R*f* = 0.42; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.38−7.42 (m, 4H), 7.16 (t, 1H, *J* = 7.6 Hz), 7.08 (d, 1H, *J* = 7.2 Hz), 6.82 (t, 1H, *J* = 7.6 Hz), 6.75 (d, 1H, *J* = 7.6 Hz), 3.70 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.4, 137.9, 133.1, 130.5, 130.3, 129.0, 128.8, 126.3, 118.8, 115.7.



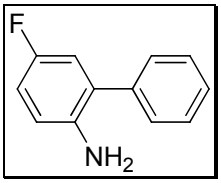
4'-(trifluoromethyl)biphenyl-2-amine (**1o**)[1c, 1d]

Brown oil; Yield 83% (1.97 g); R*f* = 0.39; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.69 (d, 2H, *J* = 8.0 Hz), 7.57 (d, 2H, *J* = 7.6 Hz), 7.18 (t, 1H, *J* = 7.6 Hz), 7.10 (d, 1H, *J* = 7.6 Hz), 6.84 (t, 1H, *J* = 7.6 Hz), 6.76 (d, 1H, *J* = 8.0 Hz), 3.73 (br s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 143.4, 132.6, 130.4, 129.5, 129.3, 128.4, 126.1, 125.8 (q, *J* = 3.8 Hz), 124.3 (q, *J* = 270.3 Hz), 118.9, 116.0.



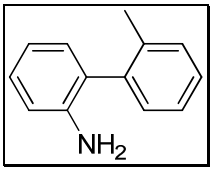
5-methylbiphenyl-2-amine (**1p**)[1c, 1d]

Brown oil; Yield 85% (1.56 g); R*f* = 0.42; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.41−7.46 (m, 4H), 7.31−7.35 (m, 1H), 6.96−6.99 (m, 2H), 6.70 (d, 1H, *J* = 8.0 Hz), 3.54 (br s, 2H), 2.28 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 141.0, 139.7, 131.0, 129.1, 129.0, 128.8, 127.9, 127.8, 127.1, 115.9, 20.5.



5-fluorobiphenyl-2-amine (**1q**)[1d]

Brown oil; Yield 76% (1.42 g); R*f* = 0.38; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.43−7.46 (m, 4H), 7.36−7.37 (m, 1H), 6.85−6.87 (m, 2H), 6.67−6.70 (m, 1H), 3.60 (br s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 156.3 (d, *J* = 235.5 Hz), 139.4, 138.4, 128.9, 128.8, 128.6 (d, *J* = 7.7 Hz), 127.5, 116.6 (d, *J* = 28.6 Hz), 116.5, 114.8 (d, *J* = 22.1 Hz).



2'-methylbiphenyl-2-amine (**1f**) was prepared according to the method of ref. 2.

To a 100 mL round bottom flask equipped with a magnetic stir bar, *o*-tolylboronic acid (15 mmol, 1.5 equiv), K_2CO_3 (5.520 g, 40 mmol, 4.0 equiv) and $Pd(PPh_3)_4$ (1.154 g, 1.0 mmol, 0.1 equiv) were dissolved in 45 mL of toluene followed by the addition of 9 mL of H_2O and 15 mL of EtOH. Then 2-Bromoaniline (10 mmol, 1.0 equiv) was added and the resulting mixture was stirred at 100 °C for 16 h. After cooling to room temperature, the biphasic solution was diluted with 50 mL of saturated aqueous NH_4Cl and 30 mL of CH_2Cl_2. The aqueous phase was extracted with diethyl ether (3×30 mL) and the combined organic layers were washed with brine (40 mL), dried over anhydrous sodium sulfate, filtered and concentrated. The residue was purified by flash column chromatography with ethyl acetate (EA) and petroleum ether (Pet) as eluent to afford the corresponding 2'-methylbiphenyl-2-amine (**1f**).[1b, 1c, 1d]

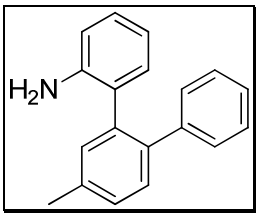
Brown oil; Yield 48% (0.88 g); R*f* = 0.43; (PE/EtOAc = 20:1); ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.16−7.28 (m, 5H), 7.01 (d, 1H, *J* = 7.2 Hz), 6.80 (t, 1H, *J* = 7.4 Hz), 6.76 (d, 1H, *J* = 7.6 Hz), 3.44 (br s, 2H), 2.17 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 143.5, 138.6, 136.9, 130.2, 130.0, 130.0, 128.3, 127.7, 127.4, 126.1, 118.2, 115.0, 19.6.

2. General Procedure for Arylation of Biphenylamine with Various Aryl iodides

A 10 mL round bottom flask with a magnetic stir bar and reflux condenser was charged with $Pd(OAc)_2$ (mono-arylation reaction: 0.0125 mmol, 3 mg, 2.5 mol%; diarylation reaction: 0.025 mmol, 6 mg, 5 mol%), AgOAc (mono-arylation reaction: 0.75 mmol, 125 mg, 1.5 equiv; diarylation reaction: 1.5 mmol, 251 mg, 3.0 equiv), biphenylamine **1** (0.5 mmol, 1.0 equiv), aryl iodides **2** (mono-arylation reaction: 3.0 mmol, 612 mg, 6 equiv; diarylation reaction: 5.0 mmol, 1020 mg, 10 equiv), TFA (1.0 mL) and TFEtOH (1.0 mL). The mixture was stirred for 10 minutes at room temperature,

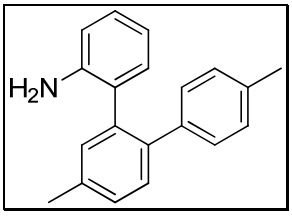
then heated to 100 ^{o}C and stirred for 12 hours. After cooling to room temperature, the mixture was filtered through a plug of Celite, the residue was washed with ethyl acetate (2 × 20 mL). Then saturated Na_2CO_3 (30 mL) was added, and the organic layer was collected. The aqueous phase was extracted with ethyl acetate (3 × 20 mL). The combined organic phases were washed with brine (40 mL), dried over anhydrous sodium sulfate, filtered and concentrated. The residue was purified by flash column chromatography with ethyl acetate (EA) and petroleum ether (Pet) as eluent to afford the corresponding products.

Characterization data of the products:



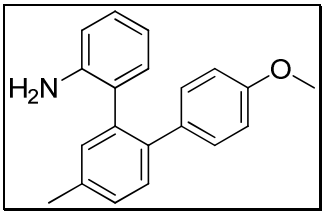
5'-methyl-2'-phenylbiphenyl-2-amine [**3a**, new compound]

White solid; Yield (111 mg, 86%); R*f* = 0.42 (PE/EA = 20:1), Purified by PE/EA = 30:1; mp 110−111 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.38 (d, 1H, *J* = 7.6 Hz), 7.24−7.26 (m, 1H), 7.17−7.20 (m, 6H), 7.02−7.06 (m, 1H), 6.95 (dd, 1H, *J* = 7.8, 1.4 Hz), 6.66−6.70 (m, 1H), 6.58 (dd, 1H, *J* = 8.0, 0.4 Hz), 3.25 (br s, 2H), 2.41 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.5, 141.0, 138.3, 137.5, 137.4, 131.8, 131.1, 130.3, 129.0, 128.7, 128.1, 127.8, 127.5, 126.5, 118.3, 115.3, 21.1. HRMS (EI) Calcd for $C_{19}H_{17}N$ (M^+) 259.1361; Found, 259.1359. IR (neat, cm^{-1}) υ 3436, 3377, 3023, 2919, 1611, 1494, 1477, 1448, 1297, 1263, 877, 740, 699.



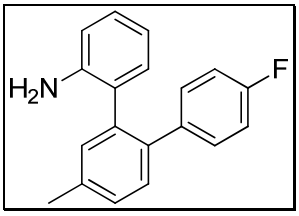
2'-(4-methylphenyl)-5'-methylbiphenyl-2-amine [**3b**, new compound]

White solid; Yield (109 mg, 80%); R*f* = 0.41 (PE/EA = 20:1), Purified by PE/EA = 30:1; mp 135−136 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.36 (d, 1H, *J* = 8.0 Hz), 7.22−7.24 (m, 1H), 7.18 (s, 1H), 7.03−7.09 (m, 3H), 6.97−7.00 (m, 3H), 6.68−6.72 (m, 1H), 6.58 (dd, 1H, *J* = 8.0, 0.8 Hz), 3.24 (br s, 2H), 2.40 (s, 3H), 2.27 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 143.4, 138.2, 138.0, 137.3, 137.2, 136.1, 131.8, 131.1, 130.3, 128.8, 128.6, 128.5, 128.0, 127.7, 118.3, 115.3, 21.0, 21.0.HRMS (EI) Calcd for $C_{20}H_{19}N$ (M^+) 273.1517; Found, 273.1520. IR (neat, cm^{-1}) υ 3436, 3375, 3021, 2919, 1612, 1481, 1450, 1298, 810, 747.



2'-(4-methoxyphenyl)-5'-methylbiphenyl-2-amine [**3c**, new compound]

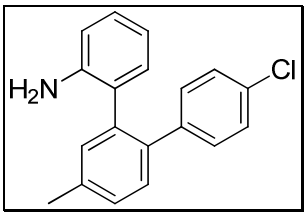
White solid; Yield (101 mg, 70%); R*f* = 0.38 (PE/EA = 10:1), Purified by PE/EA = 10:1; mp 97−98 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.34 (d, 1H, *J* = 8.0 Hz), 7.22−7.24 (m, 1H), 7.17 (s, 1H), 7.12 (d, 2H, *J* = 8.8 Hz), 7.03−7.07 (m, 1H), 6.98 (dd, 1H, *J* = 7.6, 1.4 Hz), 6.69−6.73 (m, 3H), 6.58 (d, 1H, *J* = 87.6 Hz), 3.74 (s, 3H), 3.36 (br s, 2H), 2.40 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 158.3, 143.4, 137.8, 137.3, 137.0, 133.3, 131.8, 131.1, 130.1, 130.0, 128.6, 128.0, 127.7, 118.3, 115.3, 113.2, 55.0, 20.9. HRMS (EI) Calcd for $C_{20}H_{19}NO$ (M^+) 289.1467; Found, 289.1469. IR (neat, cm^{-1}) υ 3466, 3375, 3019, 2917, 2835, 1610, 1517, 1481, 1448, 1295, 1245, 1178, 1035, 816, 740.



2'-(4-flourphenyl)-5'-methylbiphenyl-2-amine [**3d**, new compound]

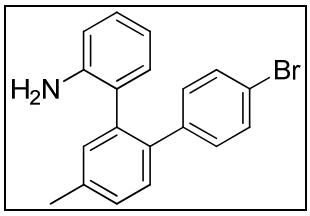
White solid; Yield (113 mg, 82%); R*f* = 0.50 (PE/EA = 10:1), Purified by PE/EA = 20:1; mp 134−135 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.34 (d, 1H, *J* = 8.0 Hz), 7.23−7.25

(m, 1H), 7.19 (s, 1H), 7.13−7.16 (m, 2H), 7.03−7.08 (m, 1H), 6.92 (dd, 1H, *J* = 7.6, 1.2 Hz), 6.87 (t, 2H, *J* = 8.8 Hz), 6.68 (t, 1H, *J* = 7.6 Hz), 6.59 (d, 1H, *J* = 8.0 Hz), 3.40 (br s, 2H), 2.41 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 161.7 (d, *J* = 244.5 Hz), 143.5, 137.6, 137.4, 136.9 (d, J = 3.6 Hz), 131.8, 131.0, 130.5 (d, J = 7.0 Hz), 130.2, 128.8, 128.2, 127.2, 118.3, 115.3, 114.7 (d, J = 21.4 Hz), 21.0. HRMS (EI) Calcd for $C_{19}H_{16F}N$ (M^+) 277.1267; Found, 277.1264. IR (neat, cm^{-1}) υ 3473, 3378, 3023, 2919, 1719, 1621, 1515, 1481, 1450, 1298, 1224, 818, 750.



2'-(4-chlorophenyl)-5'-methylbiphenyl-2-amine [**3e**, new compound]

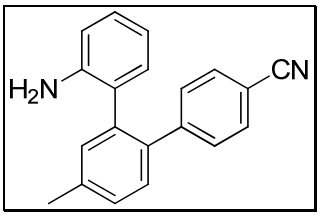
White solid; Yield (118 mg, 81%); R*f* = 0.41 (PE/EA = 20:1), Purified by PE/EA = 30:1; mp 180−181 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.33 (d, 1H, *J* = 8.0 Hz), 7.23−7.25 (m, 1H), 7.19 (s, 1H), 7.10−7.16 (m, 4H), 7.04−7.08 (m, 1H), 6.92 (dd, 1H, *J* = 7.6, 1.6 Hz), 6.68 (t, 1H, *J* = 7.4 Hz), 6.59 (d, 1H, *J* = 8.0 Hz), 3.29 (br s, 2H), 2.41 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.5, 139.5, 138.0, 137.4, 137.2, 132.6, 131.9, 131.1, 130.4, 130.2, 128.9, 128.4, 128.1, 127.1, 118.4, 115.4, 21.1. HRMS (EI) Calcd for $C_{19}H_{16}ClN$ (M^+) 293.0971; Found, 293.0971. IR (neat, cm^{-1}) υ 3461, 3374, 3019, 2915, 1613, 1476, 1449, 1389, 1298, 1092, 815, 751.



2'-(4-bromophenyl)-5'-methylbiphenyl-2-amine [**3f**, new compound]

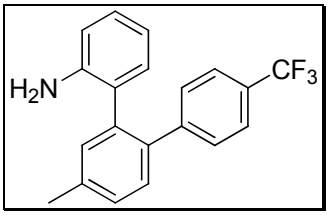
White solid; Yield (152 mg, 90%); R*f* = 0.41 (PE/EA = 20:1), Purified by PE/EA = 30:1; mp 207−208 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.29−7.34 (m, 3H), 7.23−7.25 (m, 1H), 7.19 (s, 1H), 7.04−7.08 (m, 3H), 6.92 (d, 1H, *J* = 7.6 Hz), 6.68 (t, 1H, *J* = 7.2 Hz),

6.60 (d, 1H, J = 8.0 Hz), 3.25 (br s, 2H), 2.41 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.5, 140.0, 138.0, 137.4, 137.2, 131.9, 131.1, 131.0, 130.7, 130.2, 128.9, 128.4, 127.0, 120.9, 118.4, 115.4, 21.2. HRMS (EI) Calcd for $C_{19}H_{16}BrN$ (M^+) 337.0466; Found, 337.0460. IR (neat, cm^{-1}) υ 3462, 3372, 3019, 1612, 1475, 1450, 1387, 1260, 1101, 1005, 837, 814, 751.



2'-(2-aminophenyl)-4'-methylbiphenyl-4-carbonitrile [**3g**, new compound]

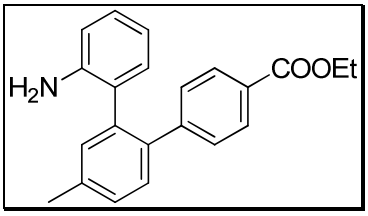
White solid; Yield (120 mg, 85%); Rf = 0.3 (PE/EA = 10:1), Purified by PE/EA = 20:1; mp 143−144 ^{o}C; ^{1}H NMR (500 MHz, $CDCl_3$, TMS) δ 7.45 (d, 2H, J = 8.0 Hz), 7.35 (d, 1H, J = 7.5 Hz), 7.27–7.29 (m, 3H), 7.23 (s, 1H), 7.06 (t, 1H, J = 7.5 Hz), 6.86 (d, 1H, J = 7.5 Hz), 6.66 (t, 1H, J = 7.5 Hz), 6.60 (d, 1H, J = 8.0 Hz), 3.46 (br s, 2H), 2.42 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.4, 140.9, 136.4, 134.9, 134.2, 129.4, 129.1, 128.4, 127.7, 127.2, 126.5, 126.1, 123.9, 116.6, 115.9, 112.8, 107.7, 18.7. HRMS (EI) Calcd for $C_{20}H_{16}N_2$ (M^+) 284.1313; Found, 284.1313. IR (neat, cm^{-1}) υ 3470, 3375, 3023, 2921, 2226, 1725, 1608, 1480, 1451, 1397, 1297, 1265, 848, 817, 736.



2'-(4-trifluoromethylphenyl)-5'-methylbiphenyl-2-amine [**3h**, new compound]

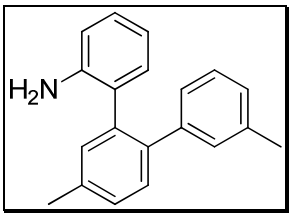
White solid; Yield (103 mg, 63%); Rf = 0.51 (PE/EA = 10:1), Purified by PE/EA = 20:1; mp 154−155 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.43 (d, 2H, J = 8.0 Hz), 7.36 (d, 1H, J = 8.0 Hz), 7.26−7.31 (m, 3H), 7.23 (s, 1H), 7.04−7.08 (m, 1H), 6.90 (d, 1H, J = 7.6, 1.4 Hz), 6.65−6.69 (m, 1H), 6.61 (d, 1H, J = 7.6 Hz), 3.25 (br s, 2H), 2.42 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 144.7, 143.5, 138.4, 137.5, 137.1, 131.9, 131.0, 130.4,

129.3, 128.9, 128.5 (q, J = 32.1 Hz), 128.5, 126.7, 124.7 (q, J = 3.7 Hz), 123.9 (q, J = 235.9 Hz), 118.4, 115.3, 21.1. HRMS (EI) Calcd for $C_{20}H_{16}F_3N$ (M^+) 327.1235; Found, 327.1234. IR (neat, cm^{-1}) υ 3473, 3381, 3024, 2924, 1614, 1497, 1451, 1322, 1163, 1112, 1069, 850, 749.



ethyl 2'-(2-aminophenyl)-4'-methylbiphenyl-4-carboxylate [**3i**, new compound]

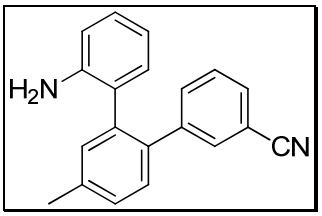
White solid; Yield (124 mg, 75%); R*f* = 0.33 (PE/EA = 10:1), Purified by PE/EA = 20:1; mp 105−106 °C; ^{1}H NMR (500 MHz, $CDCl_3$, TMS) δ 7.86 (d, 2H, J = 8.0 Hz), 7.37 (d, 1H, J = 7.5 Hz), 7.21−7.26 (m, 4H), 7.04 (t, 1H, J = 7.5 Hz), 6.90 (d, 1H, J = 7.0 Hz), 6.65 (t, 1H, J = 7.3 Hz), 6.56 (d, 1H, J = 8.0 Hz), 4.32 (q, 2H, J = 7.0 Hz), 3.45 (br s, 2H), 2.41 (s, 3H), 1.34 (t, 3H, J = 7.3 Hz). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 166.6, 145.8, 143.6, 138.3, 137.5, 137.5, 131.9, 131.1, 130.3, 129.2, 129.0, 128.9, 128.5, 128.4, 126.9, 118.4, 115.4, 60.9, 21.2, 14.4. HRMS (EI) Calcd for $C_{22}H_{21}NO_2$ (M^+) 331.1572; Found, 331.1576. IR (neat, cm^{-1}) υ 3471, 3374, 2981, 1709, 1609, 1479, 1450, 1395, 1270, 1178, 1103, 1024, 1005, 860, 822, 777, 741, 704.



2'-(3-methylphenyl)-5'-methylbiphenyl-2-amine [**3j**, new compound]

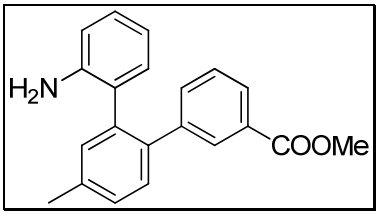
White solid; Yield (110 mg, 81%); R*f* = 0.42 (PE/EA = 20:1), Purified by PE/EA = 30:1; mp 73−74 °C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.37 (d, 1H, J = 7.6 Hz), 7.24−7.25 (m, 1H), 7.19 (s, 1H), 7.02−7.07 (m, 3H), 6.95−6.98 (m, 3H), 6.67−6.71 (m, 1H), 6.59 (dd, 1H, J = 8.0, 0.8 Hz), 3.38 (br s, 2H), 2.41 (s, 3H), 2.22 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 143.3, 140.8, 138.3, 137.3, 137.3, 131.8, 131.1, 130.3, 129.8, 128.7,

128.0, 127.6, 127.2, 126.1, 118.3, 115.3, 21.4, 21.0. HRMS (EI) Calcd for $C_{20}H_{19}N$ (M^+) 273.1517; Found, 273.1521. IR (neat, cm^{-1}) υ 3464, 3378, 3023, 2919, 1610, 1490, 1476, 1449, 1297, 1264, 824, 787, 741, 703.



2'-(2-aminophenyl)-4'-methylbiphenyl-3-carbonitrile [**3k**, new compound]

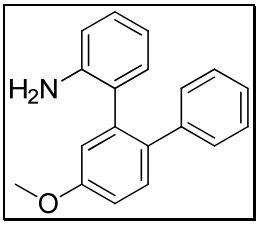
Yellow solid; Yield (74 mg, 52%); R*f* = 0.24 (PE/EA = 10:1), Purified by PE/EA = 10:1; mp 84−85 °C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.50 (s, 1H), 7.43 (d, 1H, *J* = 7.6 Hz), 7.38 (d, 1H, *J* = 6.0 Hz), 7.32–7.34 (m, 1H), 7.22−7.28 (m, 3H), 7.05 (t, 1H, *J* = 7.6 Hz), 6.86 (d, 1H, *J* = 7.2 Hz), 6.65 (t, 1H, *J* = 7.2 Hz), 6.59 (d, 1H, *J* = 7.6 Hz), 3.43 (br s, 2H), 2.42 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.5, 142.4, 138.7, 137.5, 136.4, 133.6, 132.6, 131.9, 130.9, 130.2, 129.1, 128.7, 128.5, 126.2, 119.0, 118.4, 115.3, 111.9, 21.2. HRMS (EI) Calcd for $C_{20}H_{16}N_2$ (M^+) 284.1313; Found, 284.1314. IR (neat, cm^{-1}) υ 3470, 3376, 3027, 2959, 2867, 2229, 1726, 1614, 1493, 1473, 1451, 1296, 1074, 823, 799, 747, 695.



methyl 2'-(2-aminophenyl)-4'-methylbiphenyl-3-carboxylate [**3l**, new compound]

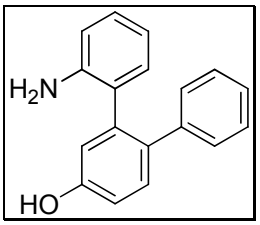
White solid; Yield (111 mg, 70%); R*f* = 0.52 (PE/EA = 10:1), Purified by PE/EA = 20:1; mp 148−149 °C; ^{1}H NMR (500 MHz, $CDCl_3$, TMS) δ 7.99 (s, 1H), 7.83 (d, 1H, *J* = 8.0 Hz), 7.39 (d, 1H, *J* = 7.5 Hz), 7.25−7.30 (m, 2H), 7.21 (s, 1H), 7.18 (t, 1H, *J* = 7.8 Hz), 7.01−7.05 (m, 1H), 6.92 (dd, 1H, *J* = 7.5, 1.5 Hz), 6.66 (t, 1H, *J* = 7.3 Hz), 6.57 (d, 1H, *J* = 8.0 Hz), 3.86 (s, 3H), 3.42 (br s, 2H), 2.42 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 167.0, 143.4, 141.3, 138.0, 137.4, 137.4, 133.6, 131.8, 131.0, 130.3, 130.1, 129.9, 128.9,

128.3, 127.7, 127.7, 126.9, 118.3, 115.2, 52.0, 21.1. HRMS (EI) Calcd for $C_{21}H_{19}NO_2$ (M^+) 317.1416; Found, 317.1422. IR (neat, cm^{-1}) υ 3471, 3375, 3024, 2950, 2921, 1718, 1612, 1581, 1492, 1439, 1304, 1266, 1234, 1110, 817, 747, 697.



5'-methoxy-2'-phenylbiphenyl-2-amine [**3m**, new compound]

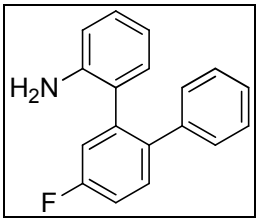
White solid; Yield (110 mg, 80%); R*f* = 0.33 (PE/EA = 10:1), Purified by PE/EA = 20:1; mp 111−112 °C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.40 (d, 1H, *J* = 8.4 Hz), 7.14−7.18 (m, 5H), 7.03−7.07 (m, 1H), 6.97−7.00 (m, 2H), 6.92 (d, 1H, *J* = 6.4 Hz), 6.67−6.71 (m, 1H), 6.58 (d, 1H, *J* = 8.0 Hz), 3.85 (s, 3H), 3.28 (br s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 159.0, 143.4, 140.7, 138.7, 133.7, 131.6, 131.0, 129.0, 128.3, 127.8, 127.2, 126.3, 118.2, 115.9, 115.3, 113.9, 55.3. HRMS (EI) Calcd for $C_{19}H_{17}NO$ (M^+) 275.1310; Found, 275.1314. IR (neat, cm^{-1}) υ 3463, 3376, 3024, 2936, 1606, 1447, 1407, 1293, 1177, 1156, 1037, 1014, 823, 750, 700.



2'-amino-6-phenylbiphenyl-3-ol [**3n**, new compound]

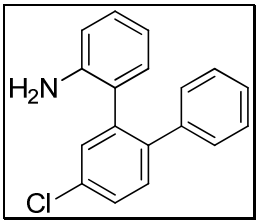
White solid; Yield (95 mg, 73%); R*f* = 0.23 (PE/EA = 10:1), Purified by PE/EA = 10:1; mp 198−199 °C; ^{1}H NMR (400 MHz, CD_3SOCD_3, TMS) δ 9.61 (br s, 1H), 7.13−7.24 (m, 6H), 6.85−6.91 (m, 2H), 6.58−6.68 (m, 3H), 6.43 (s, 1H), 4.44 (br s, 2H). ^{13}C NMR (100 MHz, CD_3SOCD_3, TMS) δ 157.1, 145.3, 141.4, 139.1, 132.1, 131.9, 130.7, 129.1, 128.1, 128.0, 126.4, 126.2, 117.7, 116.5, 115.2, 114.9. HRMS (EI) Calcd for $C_{18}H_{15}NO$ (M^+) 261.1154; Found, 261.1159. IR (KBr plate, cm^{-1}) υ 3385, 3316, 3052, 3030, 1609, 1579,

1561, 1480, 1446, 1310, 1205, 911, 822, 757, 698.



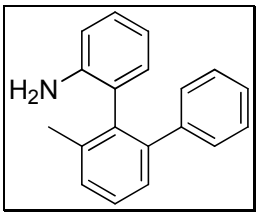
5'-fluoro-2'phenylbiphenyl-2-amine [**3o**, new compound]

Brown oil; Yield (81 mg, 62%); R*f* = 0.35 (PE/EA = 20:1), Purified by PE/EA = 20:1; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.48 (t, 1H, *J* = 6.8 Hz), 7.15−7.26 (m, 7H), 7.10 (t, 1H, *J* = 7.6 Hz), 6.98 (d, 1H, *J* = 7.6 Hz), 6.72 (t, 1H, *J* = 7.4 Hz), 6.61 (d, 1H, *J* = 8.0 Hz), 3.38 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 162.2 (d, *J* = 246.3 Hz), 143.5, 140.2, 139.7 (d, *J* = 8.6 Hz), 137.5 (d, *J* = 3.3 Hz), 132.2 (d, *J* = 7.8 Hz), 131.1, 129.1, 128.7, 128.0, 126.9, 126.2, 118.4, 117.9 (d, *J* = 20.9 Hz), 115.5, 114.9 (d, *J* = 20.9 Hz). HRMS (EI) Calcd for $C_{18}H_{14}FlN$ (M^+) 263.1110; Found, 263.1109. IR (neat, cm^{-1}) υ 3348, 3381, 3058, 3027, 1612, 1580, 1496, 1474, 1449, 1299, 1258, 1180, 890, 825, 749, 700.



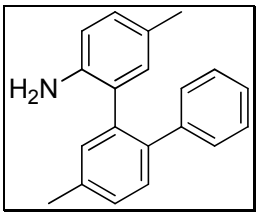
5'-chloro-2'phenylbiphenyl-2-amine [**3p**, new compound]

White solid; Yield (113 mg, 81%); R*f* = 0.35 (PE/EA = 20:1), Purified by PE/EA = 20:1; mp 113−114 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.38–7.40 (m, 3H), 7.17 (m, 5H), 7.04 (t, 1H, *J* = 7.6 Hz), 6.91 (d, 1H, *J* = 7.6 Hz), 6.66 (t, 1H, *J* = 7.6 Hz), 6.56 (d, 1H, *J* = 8.0 Hz), 3.35 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.4, 139.9, 139.8, 139.3, 133.4, 131.7, 131.0, 131.0, 128.9, 128.7, 128.0, 128.0, 127.1, 125.9, 118.4, 115.4. HRMS (EI) Calcd for $C_{18}H_{14}ClN$ (M^+) 279.0815; Found, 279.0823. IR (neat, cm^{-1}) υ 3467, 3380, 3056, 3025, 1613, 1551, 1495, 1466, 1447, 1299, 1096, 827, 746, 699.



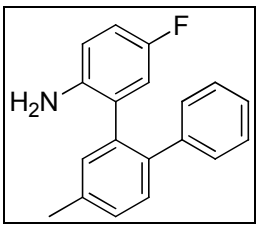
2'-methyl-5'-phenylbiphenyl-2-amine [**3q**, new compound]

Light yellow oil; Yield (105 mg, 81%); R*f* = 0.35 (PE/EA = 20:1), Purified by PE/EA = 20:1; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.30−7.35 (m, 3H), 7.12−7.15 (m, 5H), 7.00 (t, 1H, *J* = 7.4 Hz), 6.77 (d, 1H, *J* = 7.6 Hz), 6.58−6.62 (m, 2H), 3.28 (br s, 2H), 2.14 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.7, 142.3, 141.6, 137.7, 136.7, 130.8, 129.3, 129.1, 127.9, 127.6, 127.4, 126.3, 125.9, 118.1, 114.9, 20.3. HRMS (EI) Calcd for $C_{19}H_{17}N$ (M^+) 259.1361; Found, 259.1358. IR (neat, cm^{-1}) υ 3472, 3379, 3023, 2920, 612, 1496, 1456, 1296, 748, 699.



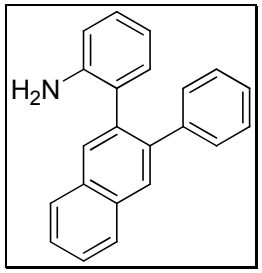
5,5'-dimethyl-2'-phenylbiphenyl-2-amine [**3r**, new compound]

White solid; Yield (110 mg, 81%); R*f* = 0.36 (PE/EA = 20:1), Purified by PE/EA = 20:1; mp 83−84 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.36 (d, 1H, *J* = 7.6 Hz), 7.23−7.25 (m, 1H), 7.16−7.21 (m, 6H), 6.86 (dd, 1H, *J* = 8.0, 1.6 Hz), 6.82 (s, 1H), 6.49 (d, 1H, *J* = 8.0 Hz), 3.16 (br s, 2H), 2.41 (s, 3H), 2.18 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 141.1, 140.9, 138.2, 137.6, 137.4, 131.9, 131.6, 130.3, 129.0, 128.7, 128.6, 127.8, 127.7, 127.5, 126.5, 115.6, 21.1, 20.4. HRMS (EI) Calcd for $C_{20}H_{19}N$ (M^+) 273.1517; Found, 273.1518. IR (neat, cm^{-1}) υ 3457, 3372, 3019, 2919, 1617, 1502, 1478, 1260, 1152, 816, 785, 762, 736, 700.



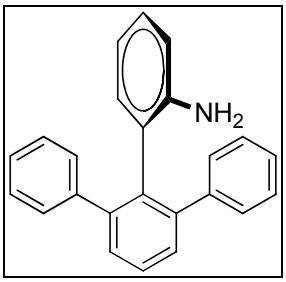
5-fluoro-5'-methyl-2'-phenylbiphenyl-2-amine [**3s**, new compound]

White solid; Yield (104 mg, 75%); R*f* = 0.36 (PE/EA = 20:1), Purified by PE/EA = 20:1; mp 107−108 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.37 (d, 1H, *J* = 7.6 Hz), 7.27 (dd, 1H, *J* = 8.0, 1.2 Hz), 7.17−7.21 (m, 6H), 6.71−6.79 (m, 2H), 6.49−6.52 (m, 1H), 3.10 (br s, 2H), 2.42 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 156.1 (d, *J* = 235.1 Hz), 140.7, 139.7 (d, *J* = 2.0 Hz), 138.3, 137.7, 136.5, 131.6, 130.5, 129.2, 129.0, 128.8 (d, *J* = 7.9 Hz), 128.0, 126.8, 117.4 (d, *J* = 21.5 Hz), 116.3 (d, *J* = 7.9 Hz), 114.7 (d, *J* = 22.4 Hz), 21.1. HRMS (EI) Calcd for $C_{19}H_{16}FN$ (M^+) 277.1267; Found, 277.1266. IR (neat, cm^{-1}) υ3453, 3373, 3024, 2920, 1605, 1495, 1479, 1421, 1267, 1201, 1164, 1136, 786, 764, 735.



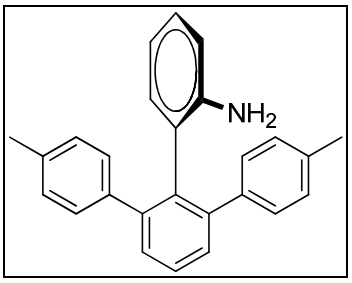
2-(3-phenylnaphthalen-2-yl)aniline [**3t**, new compound]

White solid; Yield (119 mg, 81%); R*f* = 0.51 (PE/EA = 10:1), Purified by PE/EA = 20:1; mp 121−122 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.94 (s, 1H), 7.85−7.91 (m, 3H), 7.48−7.54 (m, 2H), 7.28−7.31 (m, 2H), 7.21−7.24 (m, 3H), 7.05−7.09 (m, 1H), 7.01 (dd, 1H, *J* = 7.6, 1.2 Hz), 6.69−6.73 (m, 1H), 6.61 (dd, 1H, *J* = 8.0, 0.8 Hz), 3.36 (br s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 143.7, 140.9, 139.7, 136.1, 133.0, 132.7, 131.3, 130.0, 129.3, 129.2, 128.3, 127.8, 127.6, 127.1, 126.8, 126.4, 126.3, 118.2, 115.3. HRMS (EI) Calcd for $C_{22}H_{17}N$ (M^+) 295.1361; Found, 295.1362. IR (neat, cm^{-1}) υ 3464, 3379, 3053, 1612, 1491, 1454, 1297, 1263, 1191, 1155, 893, 738, 699.



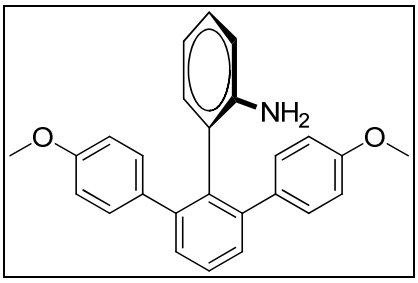
2', 6'-diphenyl biphenyl-2-amine [**4a**, new compound]

White solid; Yield (133 mg, 76%); R*f* = 0.38 (PE/EA = 20:1), Purified by PE/EA = 20:1; mp 164−165 ^{o}C;^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.49−7.57 (m, 3H), 7.21−7.26 (m, 10H), 6.91 (t, 1H, *J* = 7.6 Hz), 6.76 (d, 1H, *J* = 6.8 Hz), 6.50 (t, 1H, *J* = 7.4 Hz), 6.41 (d, 1H, *J* = 8.0 Hz), 3.29 (br s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 143.8, 142.5, 141.3, 135.7, 132.3, 129.7, 129.2, 127.9, 127.8, 127.5, 126.5, 125.4, 117.9, 115.0. HRMS (EI) Calcd for $C_{24}H_{19}N$ (M^+) 321.1517; Found, 349.1515. IR (neat, cm^{-1}) υ 3462, 3379, 3055, 3026, 1614, 1497, 1454, 1419, 1298, 1181, 754, 700.



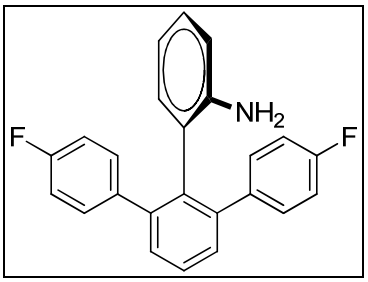
2', 6'-di(4-methylphenyl)biphenyl-2-amine [**4b**, new compound]

White solid; Yield (125 mg, 72%); R*f* = 0.35 (PE/EA = 20:1), Purified by PE/EA = 20:1; mp 224−225 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.46−7.53 (m, 3H), 7.10 (d, 4H, *J* = 7.6 Hz), 7.01 (d, 4H, *J* = 7.6 Hz), 6.93 (t, 1H, *J* = 7.6 Hz), 6.77 (d, 1H, *J* = 6.8 Hz), 6.52 (t, 1H, *J* = 7.4 Hz), 6.43 (d, 1H, *J* = 8.0 Hz), 3.30 (br s, 2H), 2.30 (s, 6H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 143.9, 142.4, 138.5, 136.0, 135.5, 132.3, 129.6, 129.1, 128.3, 127.9, 127.7, 125.8, 118.0, 115.0, 21.1. HRMS (EI) Calcd for $C_{26}H_{23}N$ (M^+) 349.1830; Found, 349.1835. IR (neat, cm^{-1}) υ 3458, 3375, 3018, 2920, 1611, 1511, 1495, 1448, 1298, 1265, 815, 796, 739.



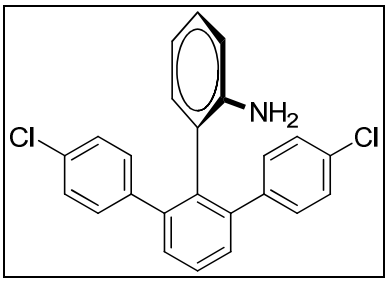
2', 6'-di(4-methoxyphenyl)biphenyl-2-amine [**4c**, new compound]

White solid; Yield (95 mg, 50%); R*f* = 0.24 (PE/EA = 10:1), Purified by PE/EA = 10:1; mp 195−196 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.38−7.46 (m, 3H), 7.08 (d, 4H, *J* = 8.8 Hz), 6.93 (t, 1H, *J* = 7.4 Hz), 6.68−6.72 (m, 5H), 6.48 (t, 1H, *J* = 7.4 Hz), 6.39 (d, 1H, *J* = 8.0 Hz), 3.72 (s, 6H), 3.16 (br s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 158.2, 143.8, 142.1, 135.6, 133.9, 132.3, 130.2, 129.3, 127.8, 127.7, 125.8, 118.0, 115.1, 112.9, 55.0. HRMS (EI) Calcd for $C_{26}H_{23}NO_2$ (M^+) 381.1729; Found, 381.1730. IR (neat, cm^{-1}) υ 3484, 3390, 3003, 2932, 2834, 1610, 1510, 1452, 1292, 1244, 1176, 1034, 830, 805, 737.



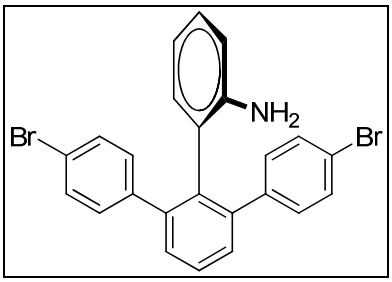
2', 6'-di(4-fluorophenyl)biphenyl-2-amine [**4d**, new compound]

White solid; Yield (143 mg, 80%); R*f* = 0.35 (PE/EA = 20:1), Purified by PE/EA = 20:1; mp 157−158 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.41−7.51 (m, 3H), 7.11−7.14 (m, 4H), 6.83−6.91 (m, 5H), 6.68 (d, 1H, *J* = 7.2 Hz), 6.48 (t, 1H, *J* = 7.0 Hz), 6.39 (d, 1H, *J* = 8.4 Hz), 3.23 (br s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 161.6 (d, *J* = 243.1 Hz), 143.7, 141.6, 137.1 (d, *J* = 2.8 Hz), 135.7, 132.1, 130.7 (d, *J* = 8.3 Hz), 129.7, 128.1, 128.0, 124.9, 118.0, 115.0, 114.4 (d, J = 21.7 Hz). HRMS (EI) Calcd for $C_{24}H_{17}F2N$ (M^+) 357.1329; Found, 357.1328. IR (neat, cm^{-1}) υ 3472, 3383, 3055, 1610, 1509, 1475, 1449, 1221, 1158, 836, 808, 737.



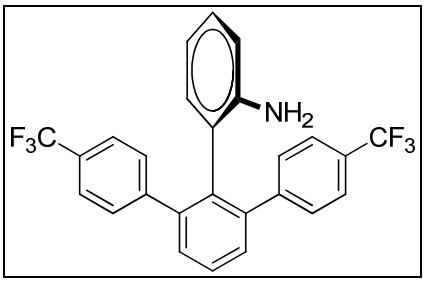
2', 6'-di(4-chlorophenyl)biphenyl-2-amine [**4e**, new compound]

White solid; Yield (144 mg, 74%); R*f* = 0.40 (PE/EA = 20:1), Purified by PE/EA = 30:1; mp 250−251 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.48−7.51 (m, 1H), 7.42−7.43 (m, 2H), 7.12−7.14 (m, 2H), 7.08−7.10 (m, 2H), 6.91 (t, 1H, *J* = 7.5 Hz), 6.67 (d, 1H, *J* = 7.0 Hz), 6.49 (t, 1H, *J* = 7.5 Hz), 6.40 (d, 1H, *J* = 8.0 Hz), 3.17 (br s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 143.7, 141.6, 139.7, 135.7, 132.7, 132.1, 130.5, 129.9, 128.3, 128.2, 127.8, 124.7, 118.2, 115.2. HRMS (EI) Calcd for $C_{24}H_{17}Cl_2N$ (M^+) 389.0738; Found, 389.0742. IR (neat, cm^{-1}) υ 3468, 3381, 3054, 2917, 2849, 1613, 1493, 1449, 1300, 1264, 1128,1088, 1014, 826, 801, 747, 701.



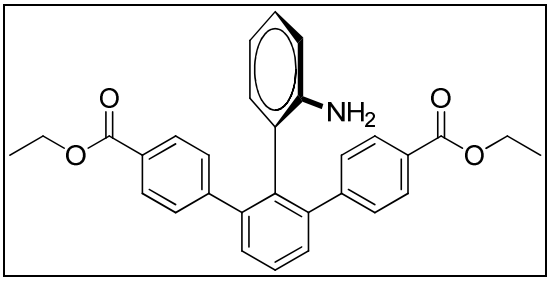
2', 6'-di(4-bromophenyl)biphenyl-2-amine [**4f**, new compound]

White solid; Yield (169 mg, 71%); R*f* = 0.54 (PE/EA = 10:1), Purified by PE/EA = 30:1; mp 257−258 ^{o}C; ^{1}H NMR (500 MHz, $CDCl_3$, TMS) δ 7.48−7.51 (m, 1H), 7.41−7.43 (m, 2H), 7.28 (d, 4H, *J* = 8.5 Hz), 7.03 (d, 4H, *J* = 8.0 Hz), 6.92 (t, 1H, *J* = 7.5 Hz), 6.67 (d, 1H, *J* = 7.0 Hz), 6.49 (t, 1H, *J* = 6.0 Hz), 6.40 (d, 1H, *J* = 8.0 Hz), 3.07 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.7, 141.6, 140.2, 135.6, 132.1, 130.8, 130.7, 129.9, 128.4, 128.2, 124.6, 121.0, 118.2, 115.2. HRMS (EI) Calcd for $C_{24}H_{17}Br_2N$ (M^+) 476.9728; Found, 476.9718. IR (neat, cm^{-1}) υ 3462, 3379, 2920, 2852, 1610, 1490, 1449, 1157, 1069, 1005, 821, 798, 748.



2', 6'-di(4-trifluoromethylphenyl)biphenyl-2-amine [**4g**, new compound]

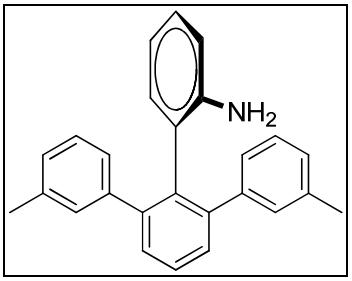
White solid; Yield (121 mg, 53%); R*f* = 0.57 (PE/EA = 10:1), Purified by PE/EA = 30:1; mp 178−179 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.53−7.56 (m, 1H), 7.47−7.49 (m, 2H), 7.43 (d, 4H, *J* = 8. 4 Hz), 7.29 (d, 4H, *J* = 8.0 Hz), 6.90 (t, 1H, *J* = 7.6 Hz), 6.68 (d, 1H, *J* = 7.6 Hz), 6.47 (t, 1H, *J* = 7.6 Hz), 6.38 (d, 1H, *J* = 8.0 Hz), 3.23 (br s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 144.7, 143.7, 141.5, 135.7, 131.9, 130.2, 129.4, 128.7 (q, *J* = 32.2 Hz), 128.5, 128.2, 124.5 (q, *J* = 3.4 Hz), 124.1 (q, J = 270.3 Hz), 124.0, 118.2, 115.1. HRMS (EI) Calcd for $C_{26}H_{17}F_6N$ (M^+) 457.1265; Found, 457.1267. IR (neat, cm^{-1}) υ 3482, 3387, 3057, 1615, 1498, 1456, 1403, 1322, 1158, 1112, 1065, 1016, 842, 806, 743.



ethyl 2'-(2-aminophenyl)-3'-(4-ethoxycarbonylphenyl)-biphenyl-4-carboxylate [**4h**, new compound]

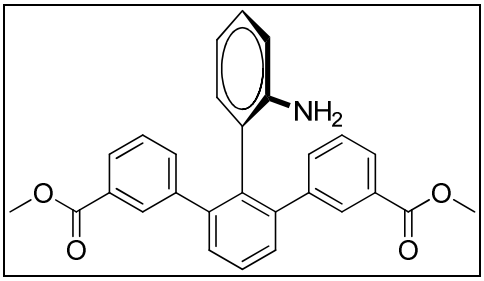
White solid; Yield (165 mg, 71%); R*f* = 0.24 (PE/EA = 8:1), Purified by PE/EA = 10:1; mp 190−191 ^{o}C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.86 (d, 4H, *J* = 7.6 Hz), 7.47−7.56 (m, 3H), 7.25 (d, 4H, *J* = 8.0 Hz), 6.88 (t, 1H, *J* = 7.6 Hz), 6.68 (d, 1H, *J* = 7.6 Hz), 6.45 (t, 1H, *J* = 7.4 Hz), 6.37 (d, 1H, *J* = 8.4 Hz), 4.33 (q, 4H, *J* = 6.8 Hz), 3.26 (br s, 2H), 1.36 (t, 6H, *J* = 7.0 Hz). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 166.5, 145.8, 143.7, 141.8, 135.6, 132.0, 130.1, 129.1, 128.8, 128.5, 128.4, 128.1, 124.3, 118.0, 115.0, 60.8, 14.2.

HRMS (EI) Calcd for $C_{30}H_{27}NO_4$ (M^+) 465.1940; Found, 465.1938. IR (neat, cm^{-1}) υ 3467, 3369, 3305, 2984, 1708, 1607, 1452, 1398, 1367, 1267, 1179, 1100, 1020, 860, 812, 771, 741, 705.



2', 6'-di(3-methylphenyl)biphenyl-2-amine [**4i**, new compound]

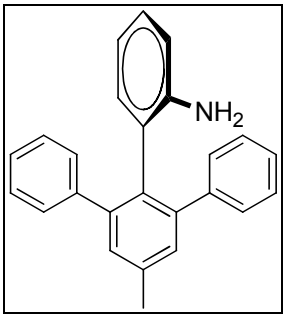
White solid; Yield (129 mg, 74%); R*f* = 0.42 (PE/EA = 20:1), Purified by PE/EA = 30:1; mp 90−91 °C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.43−7.45 (m, 3H), 6.96−7.02 (m, 8H), 6.85 (t, 1H, *J* = 6.6 Hz), 6.71 (d, 1H, *J* = 6.8 Hz), 6.46 (t, 1H, *J* = 7.0 Hz), 6.36 (d, 1H, *J* = 8.0 Hz), 3.19 (br s, 2H), 2.21 (s, 6H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 143.9, 142.6, 141.3, 137.0, 135.7, 132.3, 130.1, 129.6, 127.8, 127.8, 127.3, 127.2, 126.3, 125.7, 117.9, 115.0, 21.4. HRMS (EI) Calcd for $C_{26}H_{23}N$ (M^+) 349.1830; Found, 349.1834. IR (neat, cm^{-1}) υ 3461, 3380, 3050, 2919, 1610, 1583, 1496, 1450, 1264, 783, 735, 703.



methyl 2'-(2-aminophenyl)-3'-(3-methoxycarbonylphenyl)-biphenyl-3-carboxylate [**4j**, new compound]

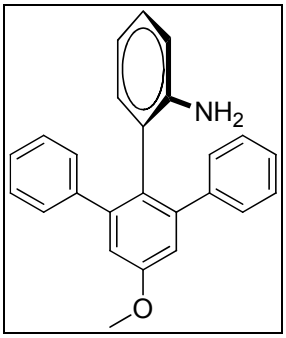
White solid; Yield (153 mg, 70%); R*f* = 0.25 (PE/EA = 8:1), Purified by PE/EA = 10:1; mp 157−158 °C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 8.00 (s, 2H), 7.83 (d, 2H, *J* = 7.6 Hz), 7.49−7.56 (m, 3H), 7.27 (t, 2H, *J* = 7.2 Hz), 7.17 (t, 1H, *J* = 7.8 Hz), 6.85 (t, 1H, *J* = 7.6 Hz), 6.70 (d, 1H, *J* = 7.6 Hz), 6.44 (t, 1H, *J* = 7.6 Hz), 6.36 (d, 1H, *J* = 7.6 Hz), 3.86 (s, 6H), 3.31 (br s, 2H). ^{13}C NMR (100 MHz, $CDCl_3$, TMS) δ 166.9, 143.7, 141.6, 141.4,

135.8, 133.8, 132.0, 130.2, 130.0, 129.5, 128.2, 128.2, 127.8, 127.4, 124.3, 117.9, 114.9, 52.0. HRMS (EI) Calcd for $C_{28}H_{23}NO_4$ (M^+) 437.1627; Found, 437.1632. IR (neat, cm^{-1}) υ 3472, 3377, 3056, 2951, 1716, 1615, 1581, 1497, 1437, 1297, 1253, 1190, 1085, 734, 698.



4'-methyl-2', 6'-diphenylbiphenyl-2-amine [**4k**, new compound]

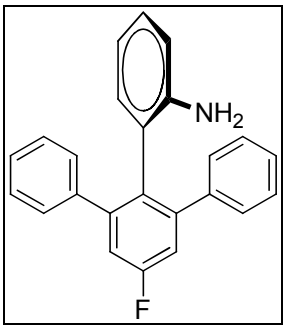
White solid; Yield (119 mg, 71%); R*f* = 0.41 (PE/EA = 20:1), Purified by PE/EA = 30:1; mp 187−188 ^oC; ^1H NMR (500 MHz, $CDCl_3$, TMS) δ 7.28 (s, 2H), 7.14−7.16 (m, 10H), 6.84 (t, 1H, *J* = 7.3 Hz), 6.70 (d, 1H, *J* = 7.0 Hz), 6.44 (t, 1H, *J* = 7.0 Hz), 6.35 (d, 1H, *J* = 7.5 Hz), 3.17 (br s, 2H), 2.47 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 144.1, 142.5, 141.5, 137.5, 132.9, 132.5, 130.5, 129.2, 127.8, 127.5, 126.5, 125.5, 117.9, 115.0, 21.2. HRMS (EI) Calcd for $C_{25}H_{21}N$ (M^+) 335.1674; Found, 335.1676. IR (neat, cm^{-1}) υ 3461, 3378, 3025, 1612, 1491, 1447, 1297, 1264, 740, 698.



4'-methoxy-2', 6'-diphenylbiphenyl-2-amine [**4l**, new compound]

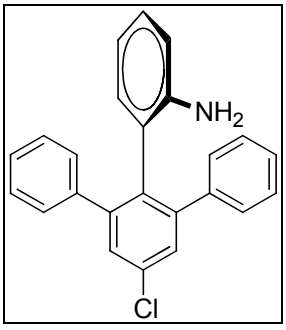
White solid; Yield (111 mg, 34%); R*f* = 0.30 (PE/EA = 10:1), Purified by PE/EA = 10:1; mp 172−173 ^oC;^1H NMR (500 MHz, $CDCl_3$, TMS) δ 7.15−7.17 (m, 10H), 7.02 (s, 2H), 6.84 (t, 1H, *J* = 7.3 Hz), 6.69 (d, 1H, *J* = 6.5 Hz), 6.44 (t, 1H, *J* = 7.5 Hz), 6.36 (d, 1H, *J* = 7.5 Hz), 3.89 (s, 3H), 3.18 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 158.8,

144.2, 143.9, 141.4, 132.8, 129.1, 128.3, 127.8, 127.5, 126.7, 125.3, 117.9, 115.2, 115.0, 55.4. HRMS (EI) Calcd for $C_{25}H_{21}NO$ (M^+) 351.1623; Found, 351.1626. IR (neat, cm^{-1}) υ 3476, 3383, 3055, 3028, 2937, 2835, 1610, 1594, 1571, 1496, 1463, 1422, 1337, 1203, 1038, 1022, 760, 744, 701.



4'-fluoro-2', 6'-diphenylbiphenyl-2-amine [**4m**, new compound]

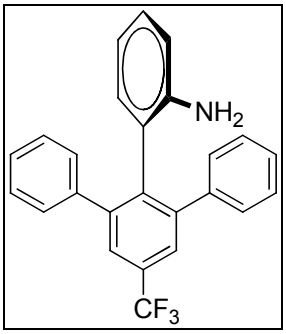
White solid; Yield (80 mg, 47%); R*f* = 0.32 (PE/EA = 20:1), Purified by PE/EA = 20:1; mp 152−153 ^oC; ^1H NMR (400 MHz, $CDCl_3$, TMS) δ 7.16−7.18 (m, 12H), 6.86 (t, 1H, *J* = 7.4 Hz), 6.67 (d, 1H, *J* = 7.2 Hz), 6.44 (t, 1H, *J* = 7.6 Hz), 6.35 (d, 1H, *J* = 8.0 Hz), 3.22 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 161.9 (d, *J* = 246.3 Hz), 144.8 (d, *J* = 7.9 Hz), 144.2, 140.5, 132.6, 131.9 (d, *J* = 3.1 Hz), 129.1, 128.2, 127.7, 127.1, 124.6, 118.1, 116.4, 116.3, 115.1. HRMS (EI) Calcd for $C_{24}H_{18}FN$ (M^+) 339.1423; Found, 339.1420. IR (neat, cm^{-1}) υ 3473, 3383, 3054, 1614, 1591, 1498, 1458, 1421, 1298, 1165, 734, 700.



4'-chloro-2', 6'-diphenylbiphenyl-2-amine [**4n**, new compound]

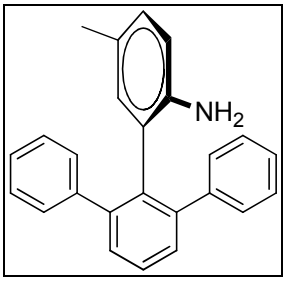
White solid; Yield (99 mg, 56%); R*f* = 0.33 (PE/EA = 20:1), Purified by PE/EA = 20:1; mp 144−145 ^oC;^1H NMR (400 MHz, $CDCl_3$, TMS) δ 7.45 (s, 2H), 7.15 (m, 10H), 6.85 (t, 1H, *J* = 7.4 Hz), 6.66 (d, 1H, *J* = 6.8 Hz), 6.44 (t, 1H, *J* = 7.2 Hz), 6.34 (d, 1H, *J* = 8.0

Hz), 3.22 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 144.4, 144.0, 140.2, 134.5, 133.6, 132.3, 129.5, 129.1, 128.3, 127.8, 127.1, 124.4, 118.1, 115.2. HRMS (EI) Calcd for $C_{24}H_{18}ClN$ (M^+) 355.1128; Found, 355.1131. IR (neat, cm^{-1}) υ 3458, 3382, 3056, 1614, 1564, 1495, 1451, 1418, 1400, 1301, 1264, 757, 735, 698.



4'-trifluoromethyl-2', 6'-diphenylbiphenyl-2-amine [**4o**, new compound]

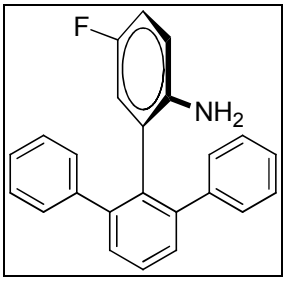
White solid; Yield (70 mg, 36%); R*f* = 0.35 (PE/EA = 20:1), Purified by PE/EA = 20:1; mp 186−187 °C; ^{1}H NMR (500 MHz, $CDCl_3$, TMS) δ 7.71 (s, 2H), 7.18 (m, 10H), 6.89 (t, 1H, *J* = 6.8 Hz), 6.68 (d, 1H, *J* = 7.5 Hz), 6.48 (t, 1H, *J* = 7.5 Hz), 6.38 (d, 1H, *J* = 8.0 Hz), 3.22 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 143.6, 143.6, 140.1, 139.6, 132.0, 130.2 (q, *J* = 32.3 Hz), 129.1, 128.5, 127.8, 127.2, 126.3 (q, *J* = 3.2 Hz), 124.2, 124.1 (q, *J* = 270.9 Hz), 118.2, 115.3. HRMS (EI) Calcd for $C_{25}H_{18}F_3N$ (M^+) 389.1391; Found, 389.1394. IR (neat, cm^{-1}) υ 3471, 3383, 3058, 1613, 1497, 1415, 1358, 1262, 1175, 1109, 919, 788, 744, 698.



5-methyl-2', 6'-diphenylbiphenyl-2-amine [**4p**, new compound]

White solid; Yield (112 mg, 67%); R*f* = 0.36 (PE/EA = 20:1), Purified by PE/EA = 20:1; mp 165−166 °C; ^{1}H NMR (400 MHz, $CDCl_3$, TMS) δ 7.43−7.50 (m, 3H), 7.14−7.17 (m, 10H), 6.66 (d, 1H, *J* = 8.0 Hz), 6.52 (s, 1H), 6.27 (d, 1H, *J* = 8.0 Hz), 3.04 (br s, 2H),

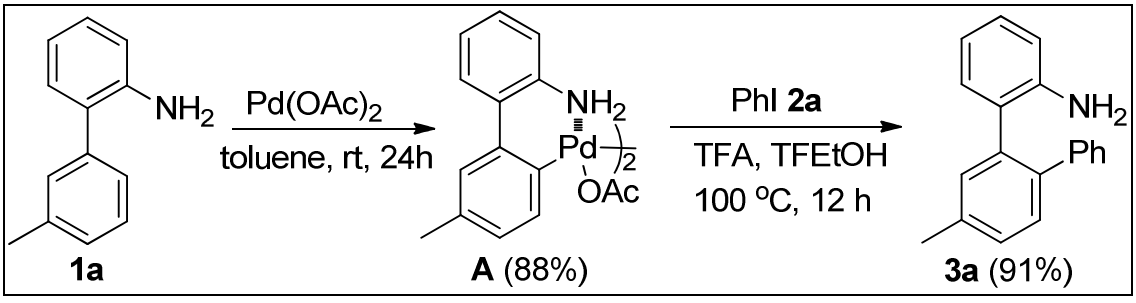
1.97 (s, 3H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 142.6, 141.5, 141.4, 136.0, 132.8, 129.7, 129.2, 128.4, 127.8, 127.5, 126.9, 126.5, 125.6, 115.2, 20.3. HRMS (EI) Calcd for $C_{25}H_{21}N$ (M^+) 335.1674; Found, 335.1682. IR (neat, cm^{-1}) υ 3451, 3373, 3053, 3022, 2919, 1618, 1601, 1503, 1448, 1432, 1298, 1266, 813, 758, 736, 699.



5-fluoro-2', 6'-diphenylbiphenyl-2-amine [**4q**, new compound]

White solid; Yield (110 mg, 65%); R*f* = 0.35 (PE/EA = 20:1), Purified by PE/EA = 20:1; mp 182−183 ^{o}C; ^{1}H NMR (500 MHz, $CDCl_3$, TMS) δ 7.49−7.52 (m, 1H), 7.44−7.46 (m, 2H), 7.17 (m, 10H), 6.55−7.59 (m, 1H), 6.46−6.48 (m, 1H), 6.26−6.29 (m, 1H), 3.09 (br s, 2H). ^{13}C NMR (125 MHz, $CDCl_3$, TMS) δ 155.7 (d, *J* = 234.4 Hz), 142.5, 141.1, 140.3 (d, *J* = 2.5 Hz), 134.7, 129.8, 129.1, 128.3, 127.7, 126.8, 126.7, 118.3 (d, *J* = 21.6 Hz), 115.9 (d, *J* = 6.5 Hz), 114.6 (d, *J* = 22.6 Hz). HRMS (EI) Calcd for $C_{24}H_{18}FN$ (M^+) 339.1423; Found, 339.1428. IR (neat, cm^{-1}) υ 3449, 3363, 3058, 1604, 1499, 1455, 1435, 1263, 1174, 887, 816, 736, 687.

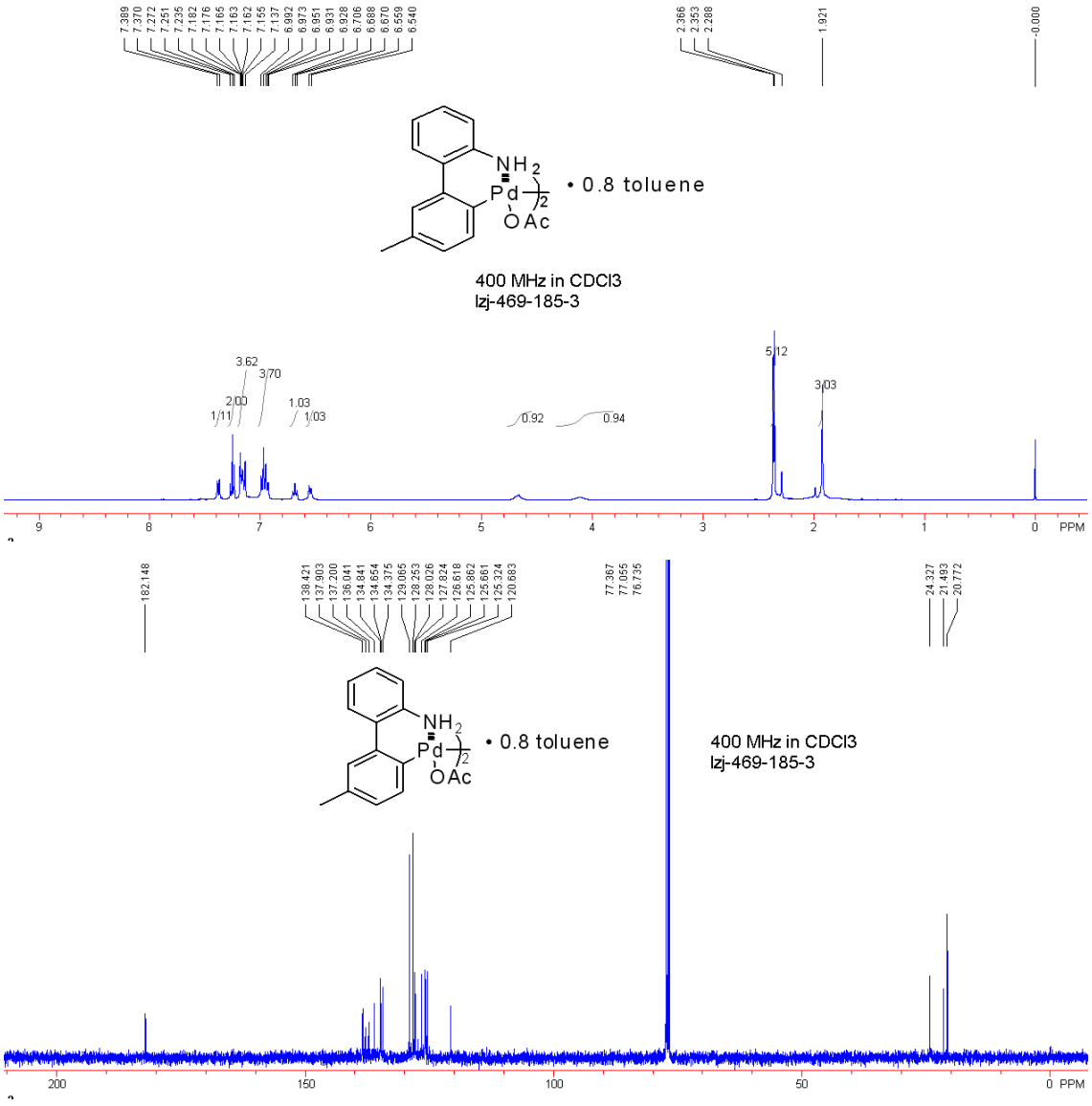
3. Mechanistic Study

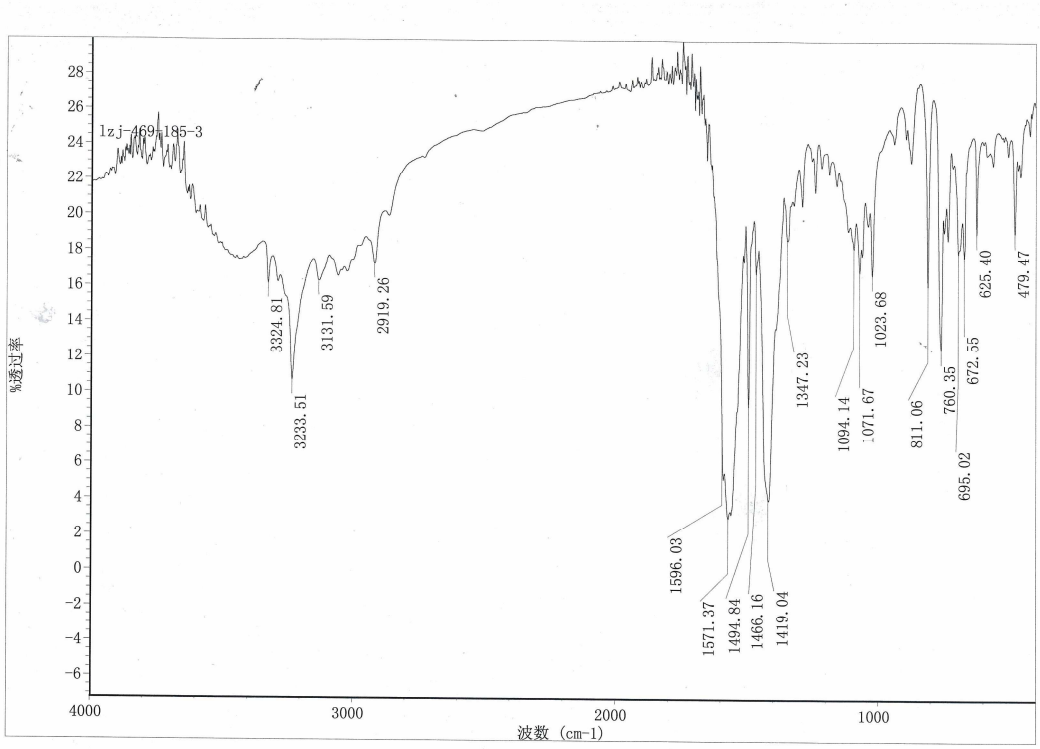


3.1 The Preparation of Palladacycle Intermediate A[3]

Palladacycle Intermediate A: A suspension formed by 3'-methylbiphenyl-2-amine **1a** (3.0 mmol, 549

mg), $Pd(OAc)_2$ (3.0 mmol, 667 mg) and toluene (15 mL) was stirred at room temperature for 24 h. The precipitate was filtered, washed with 15 mL toluene, 20 mL diethylether and dried under vacuum. Palladacycle **A** is a light brown powder, yield: 88% (in relation to the isolated **A·0.8 toluene**).





3.2 Arylation of Palladacycle A with Iodobenzene

The arylation reaction of palladacycle **A** with iodobenzene **2a** was performed under standard reaction conditions in the absence of AgOAc. We got the mono-arylated product **3a** in 91% yield, which shows that this arylation reaction most likely involves a free-amine directed C−H cleavage pathway.

Reference

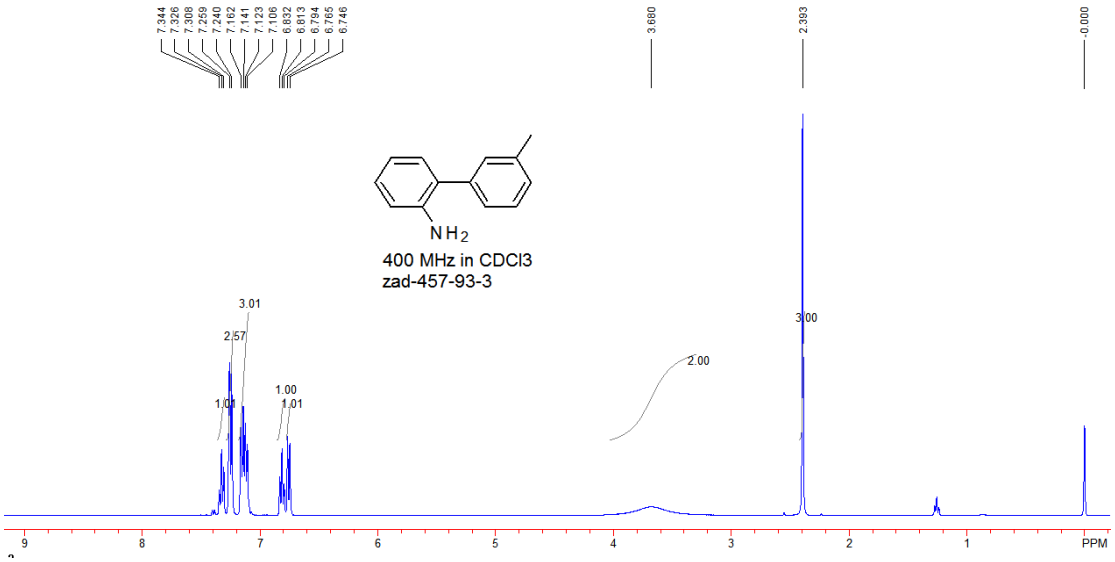
1. (a) Liu, L. ; Zhang, Y. ; Xin, B. *J. Org. Chem.* **2006**, *71*, 3994−3997. (b) Rajeshkumar, V.; Chan, F.-W.; Chuang, S.-C. *Adv. Synth. Catal.* **2012**, *354*, 2473−2483. (c) Liang, Z.; Ju. L.; Xie, Y.; Huang, L.; Zhang, Y. *Chem. Eur. J.* **2012**, *18*, 15816−15821. (d) Liang, Z.; Zhang, J.; Liu, Z.; Wang, K.; Zhang, Y. *Tetrahedron* **2013**, *69*, 6519−6526. (e) Hutchinson, I.; Stevens, M. F. G. *Org. Biomol. Chem.* **2007**, *5*, 114−120.

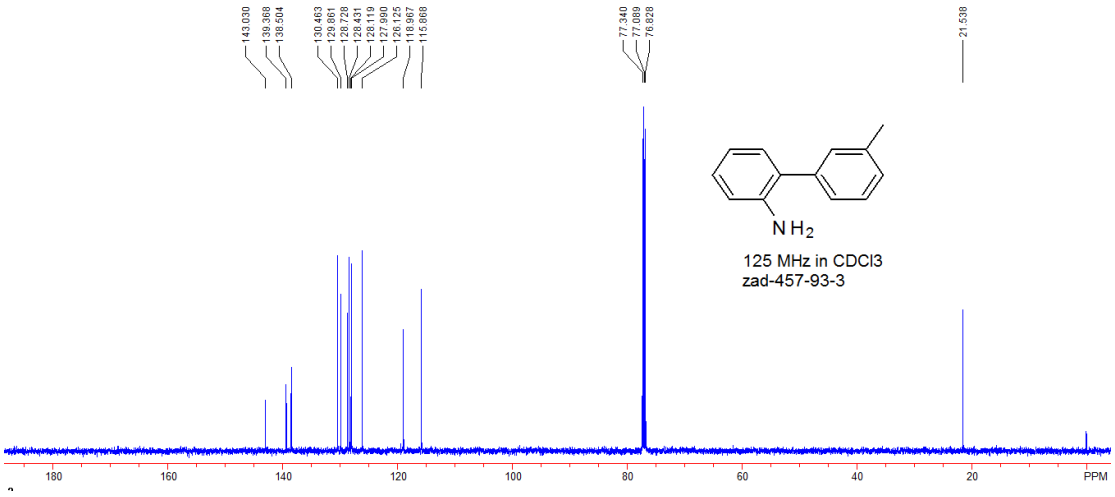
2. (a) Stokes, B. J.; Jovanović, B.; Dong, H.; Richert, K. J.; Riell, R. D.; Driver, T. G.; *J. Org. Chem.* **2009**, *74*, 3225−3228.

3. Albert, J.; Granell, J.; Zafrilla, J.; Font-Bardia, M.; Solans, X. *J. Organomet. Chem.* **2005**, *690*, 422−429.

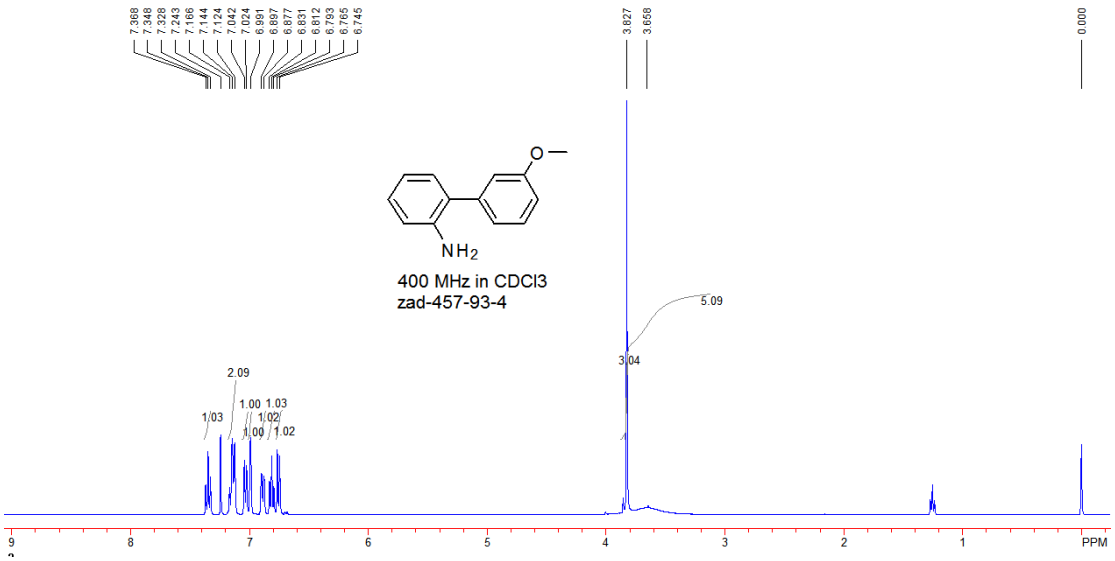
NMR Spectrum of Compounds

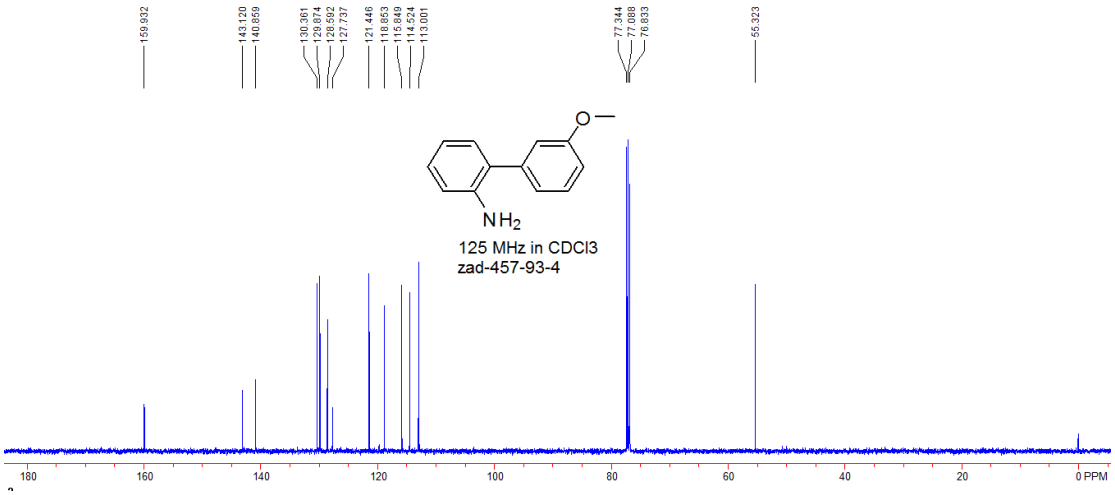
3'-methylbiphenyl-2-amine (1a)



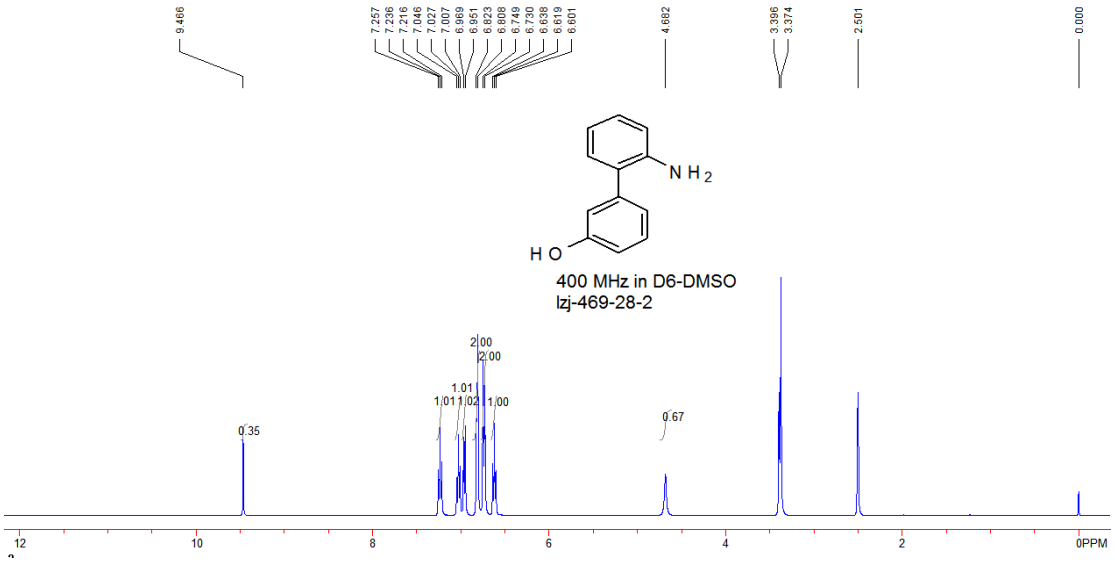


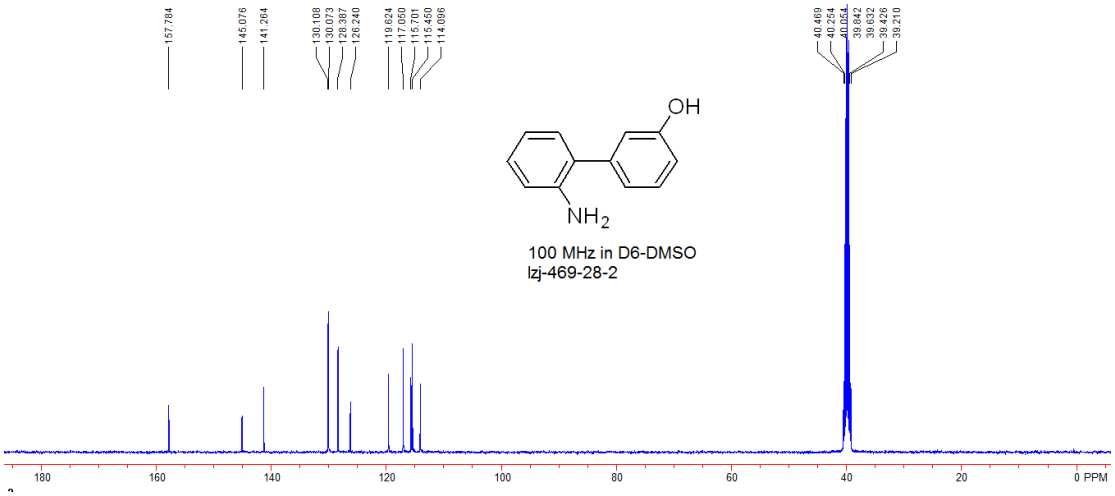
3'-methoxybiphenyl-2-amine (1b)



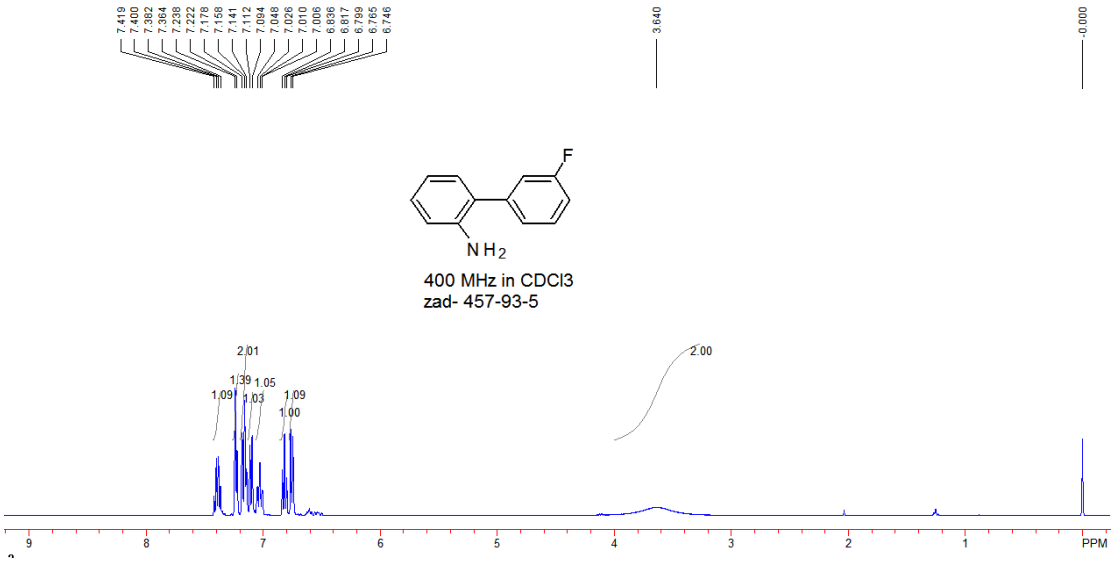


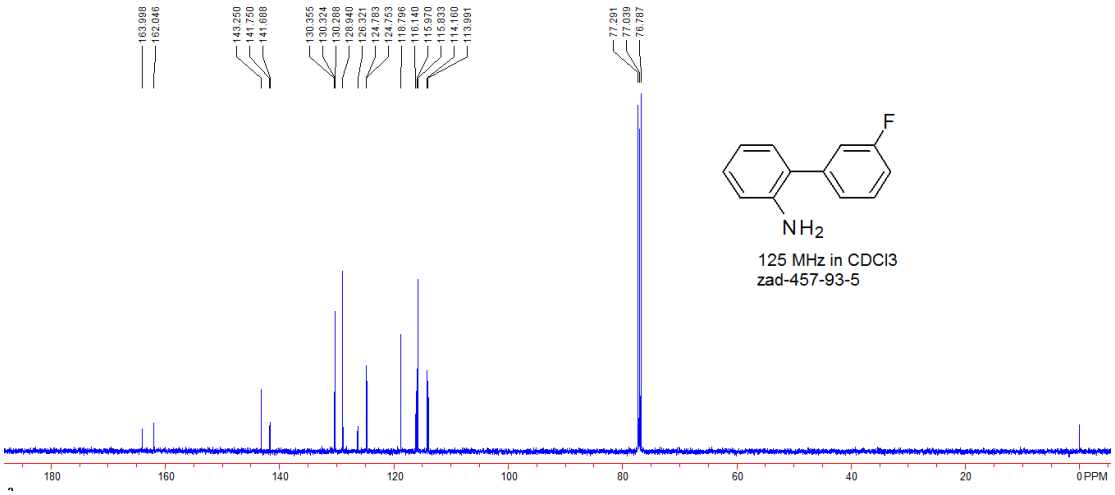
2'-aminobiphenyl-3-ol (1c)



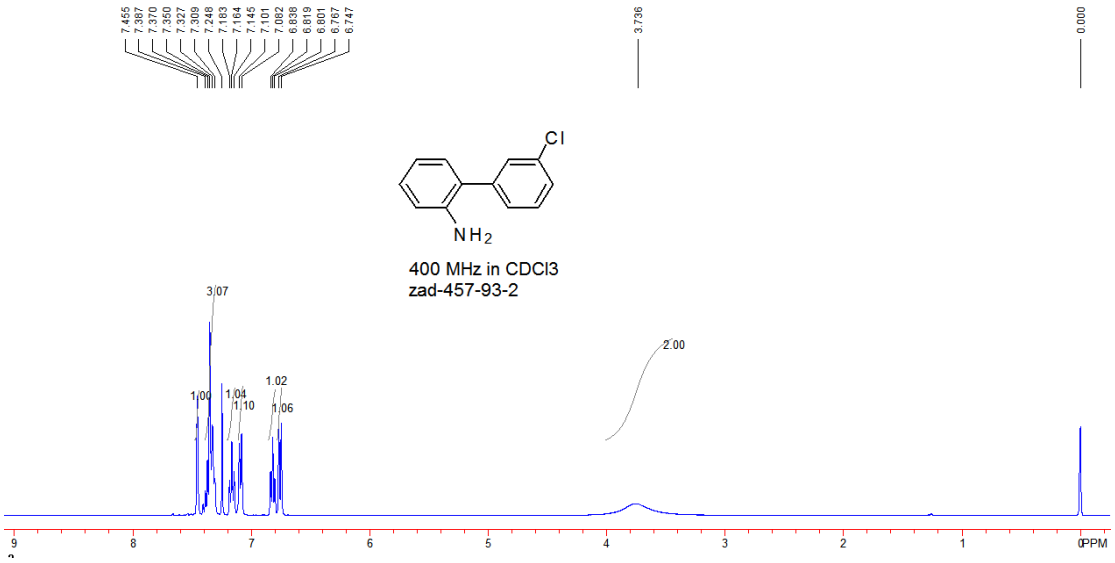


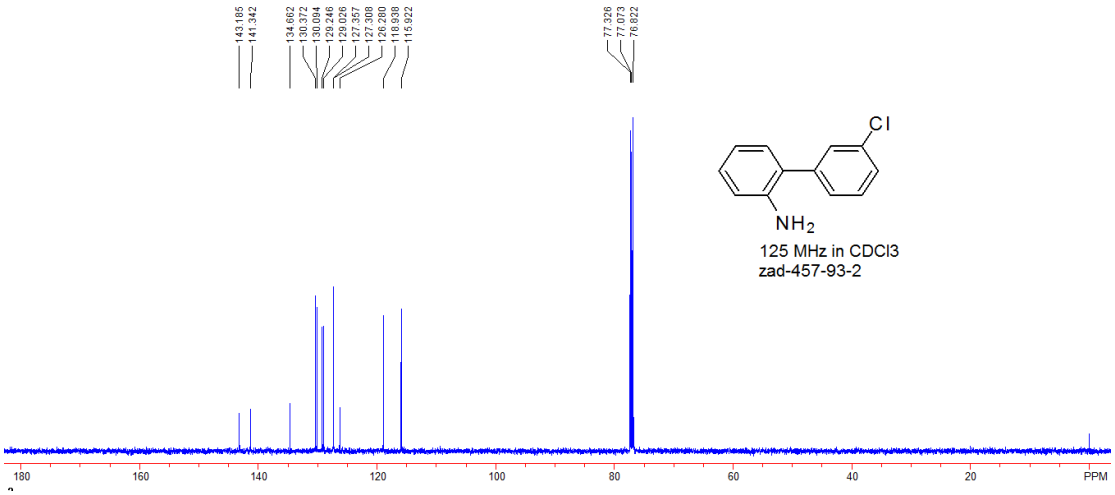
3'-fluorobiphenyl-2-amine (1d)



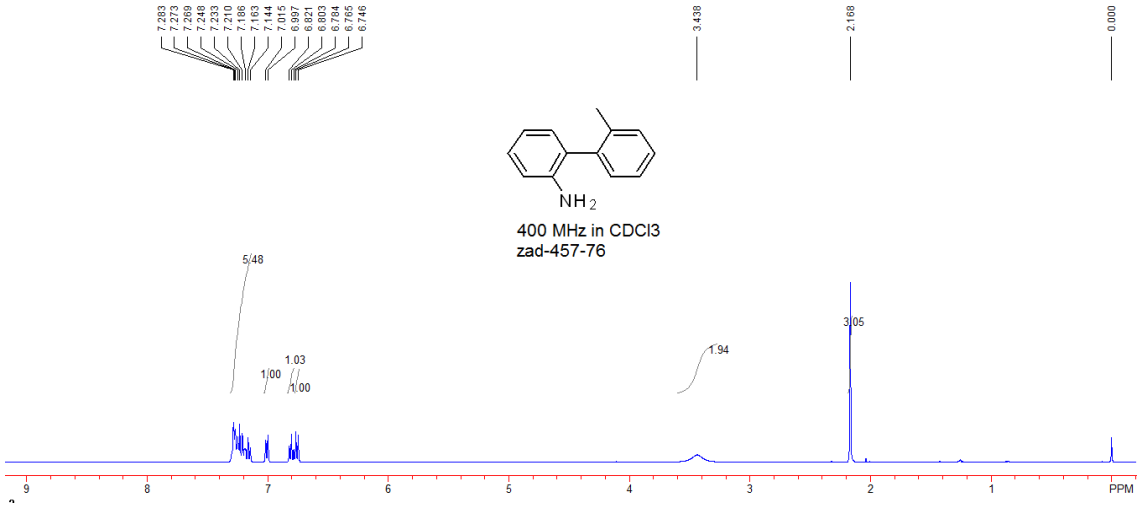


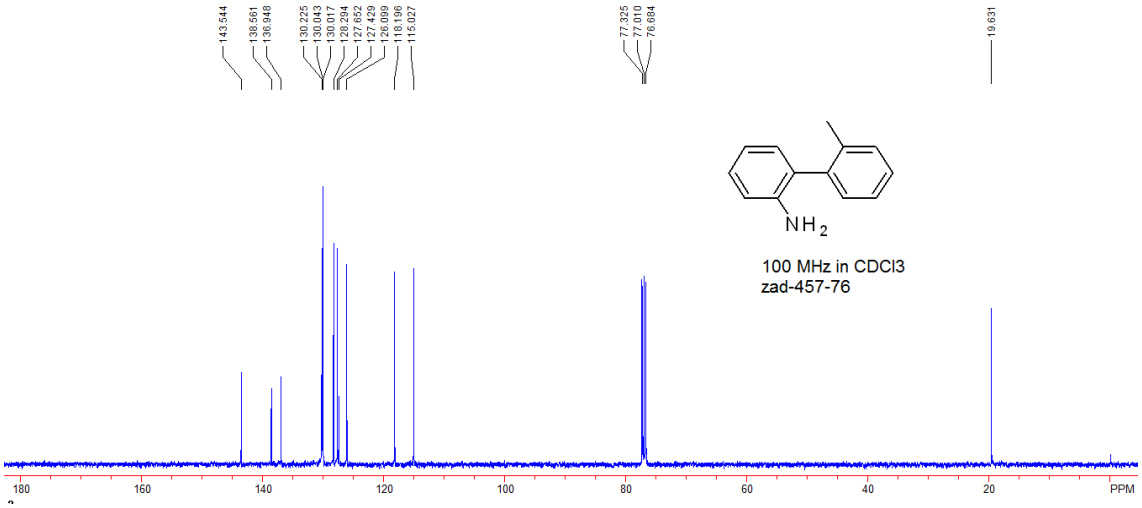
3'-chlorobiphenyl-2-amine (1e)



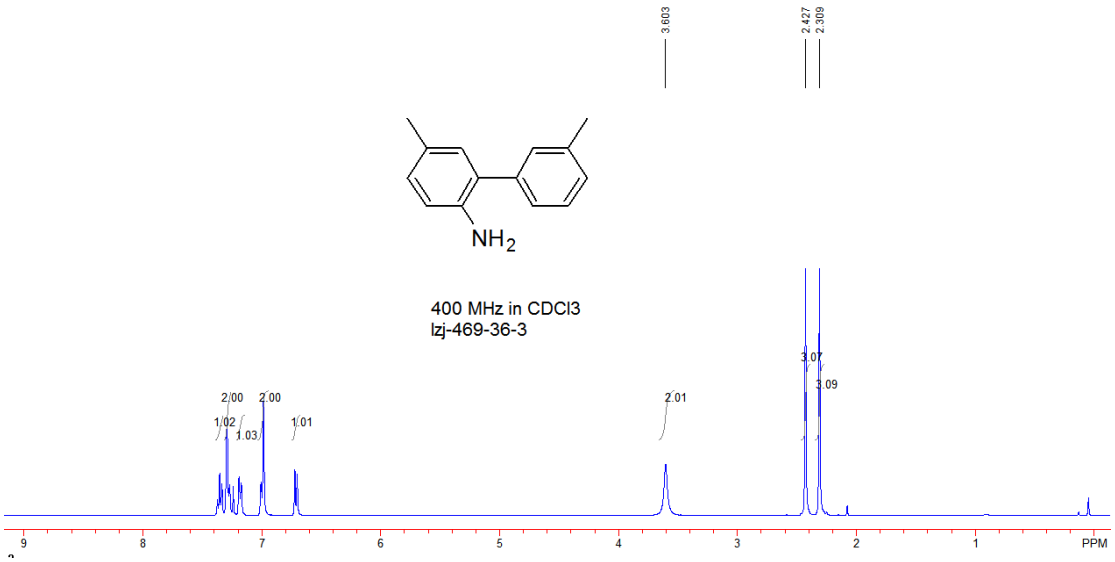


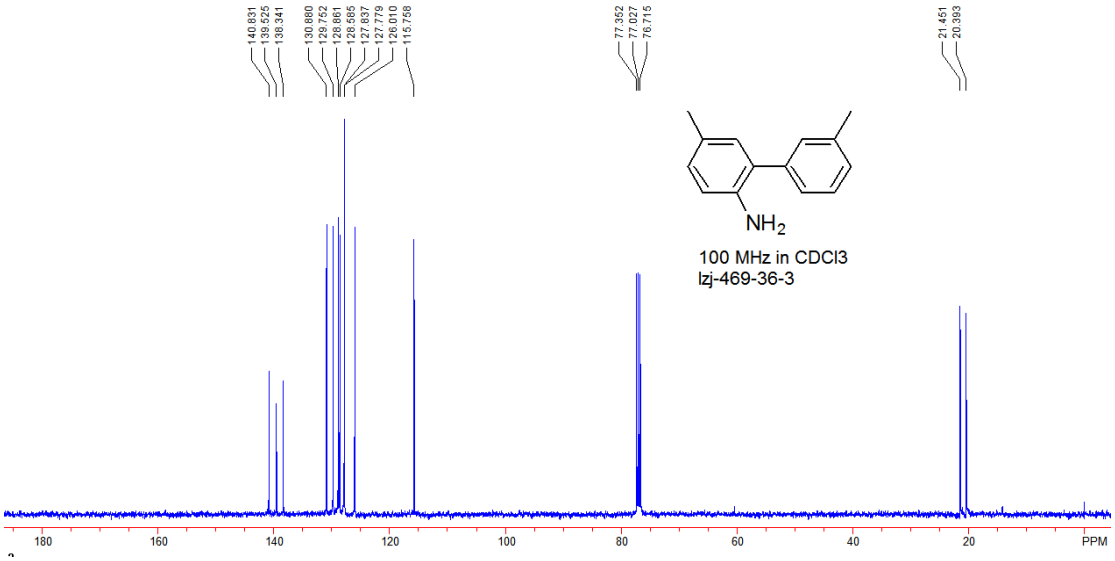
2'-methylbiphenyl-2-amine (1f)



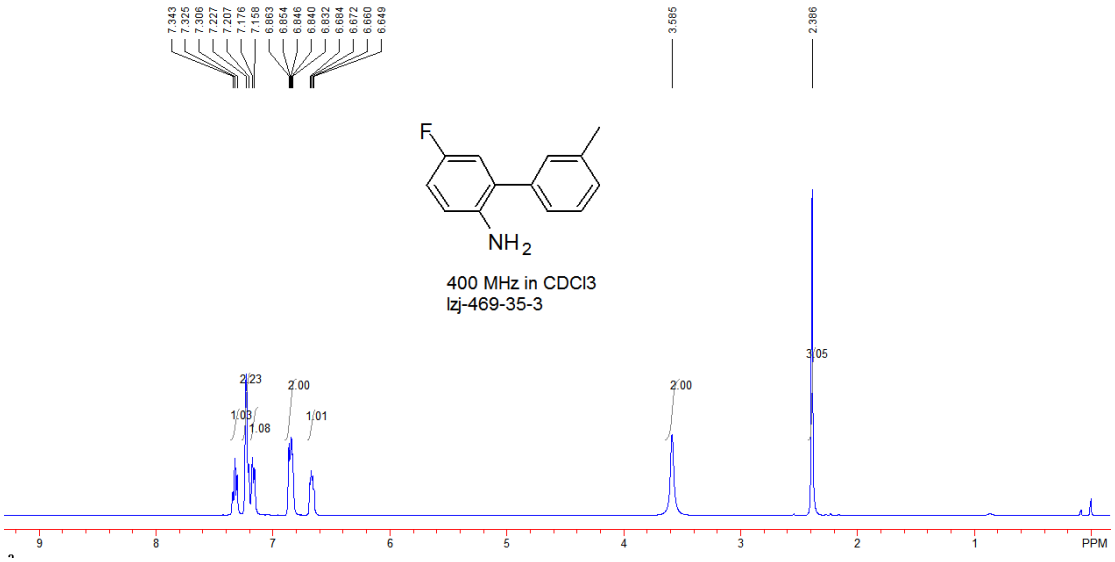


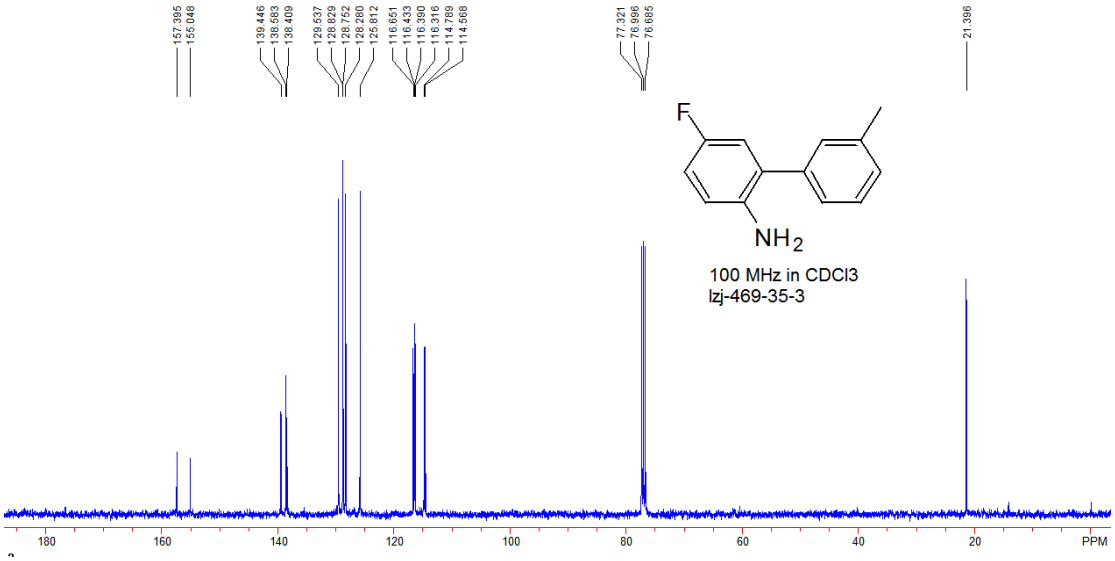
3',5-dimethylbiphenyl-2-amine (1g)



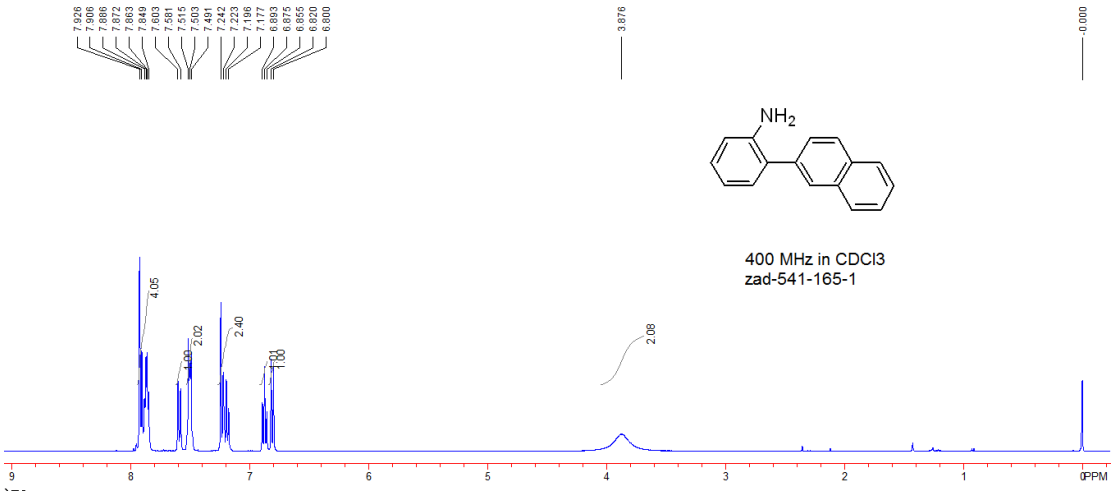


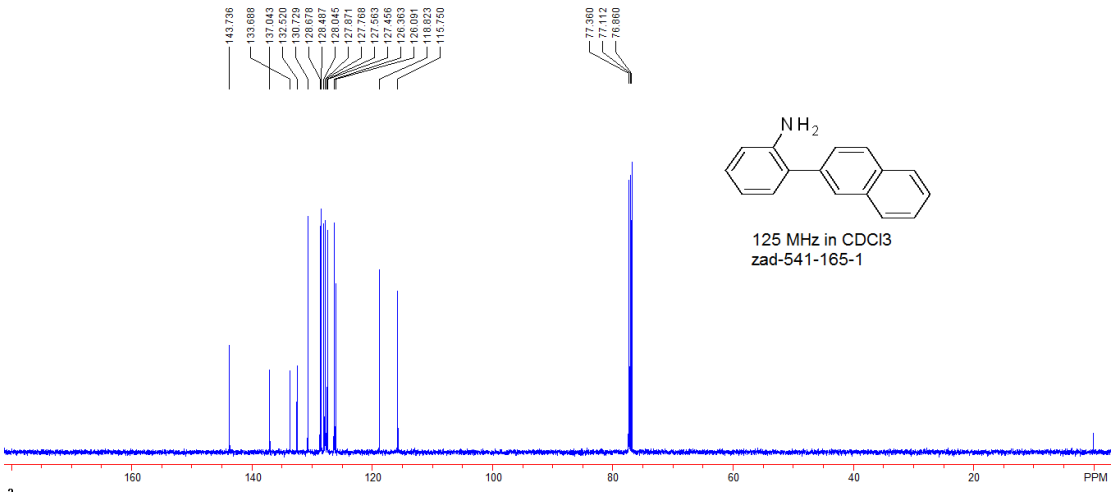
5-fluoro-3'-methylbiphenyl-2-amine (1h)



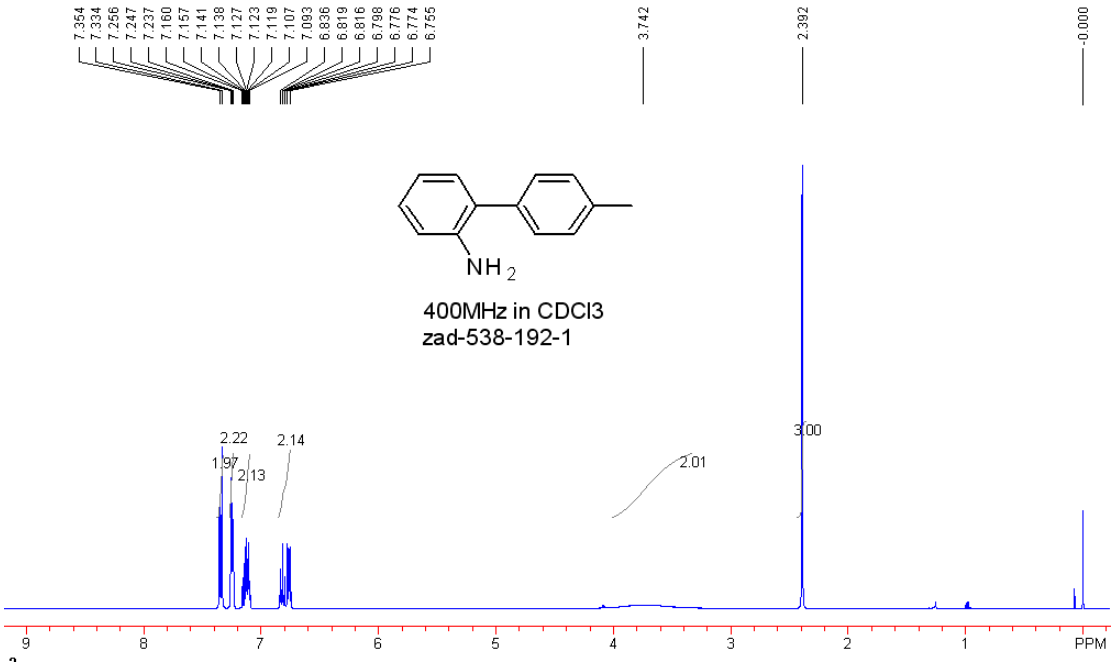


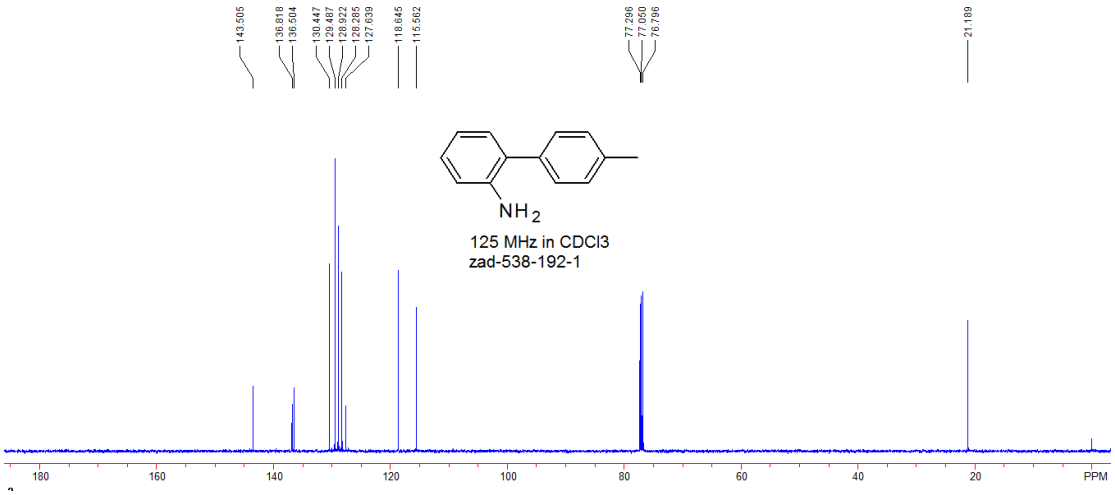
2-(naphthalen-2-yl)aniline (1i)



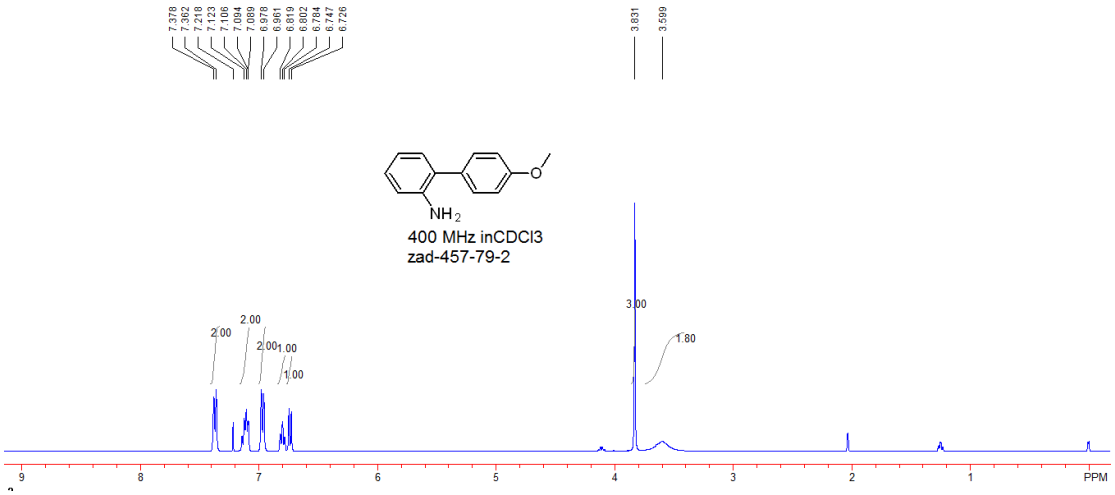


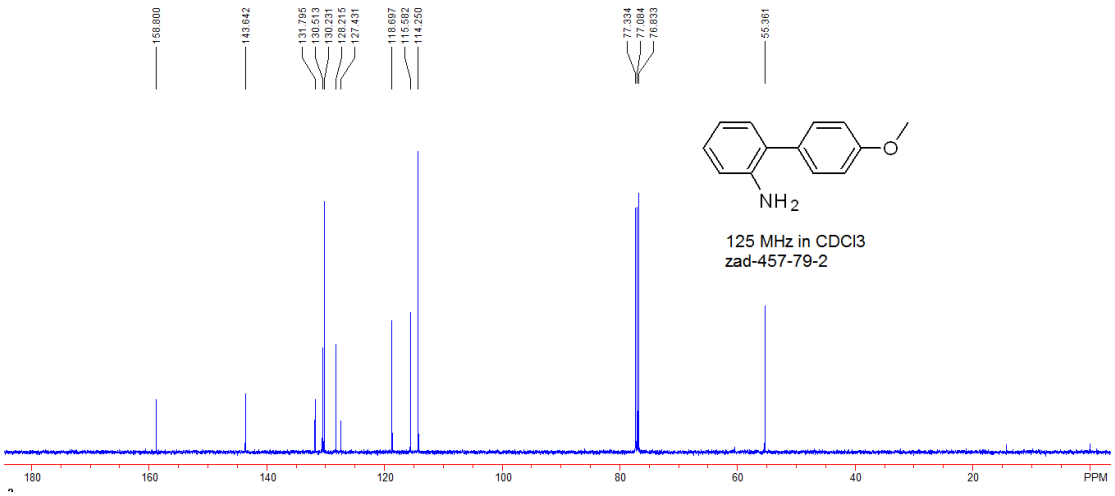
4'-methylbiphenyl-2-amine (1k)



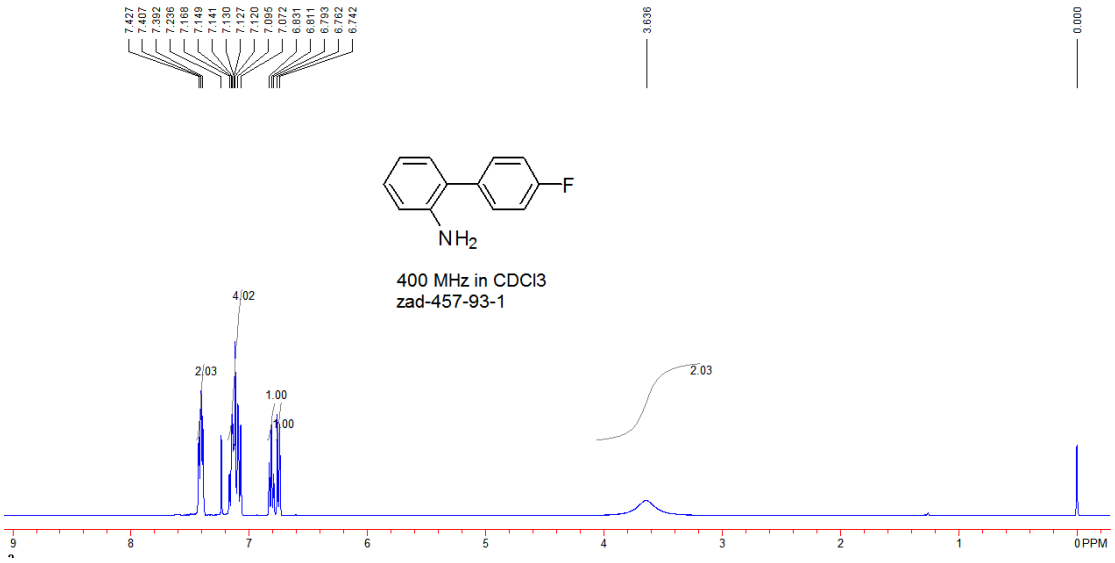


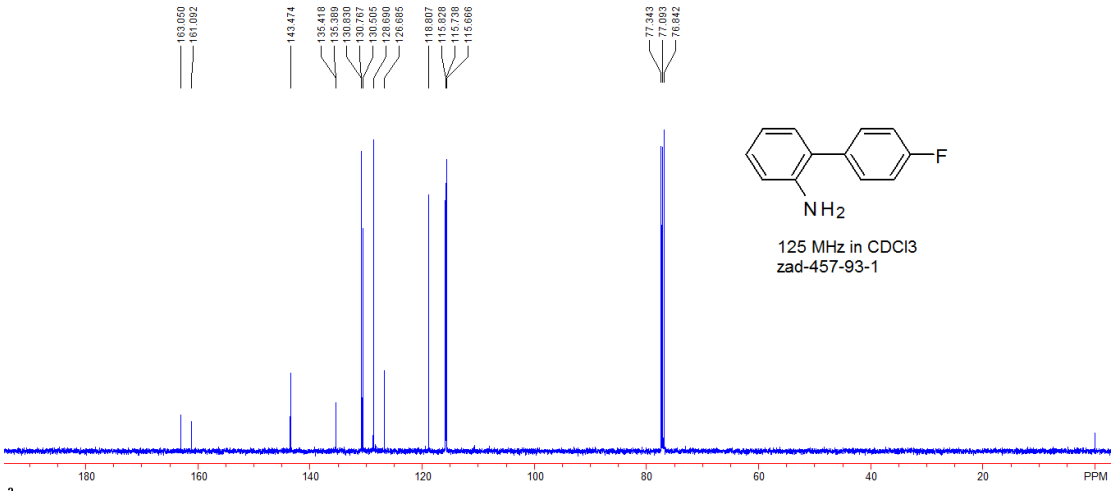
4'-methoxybiphenyl-2-amine (1l)



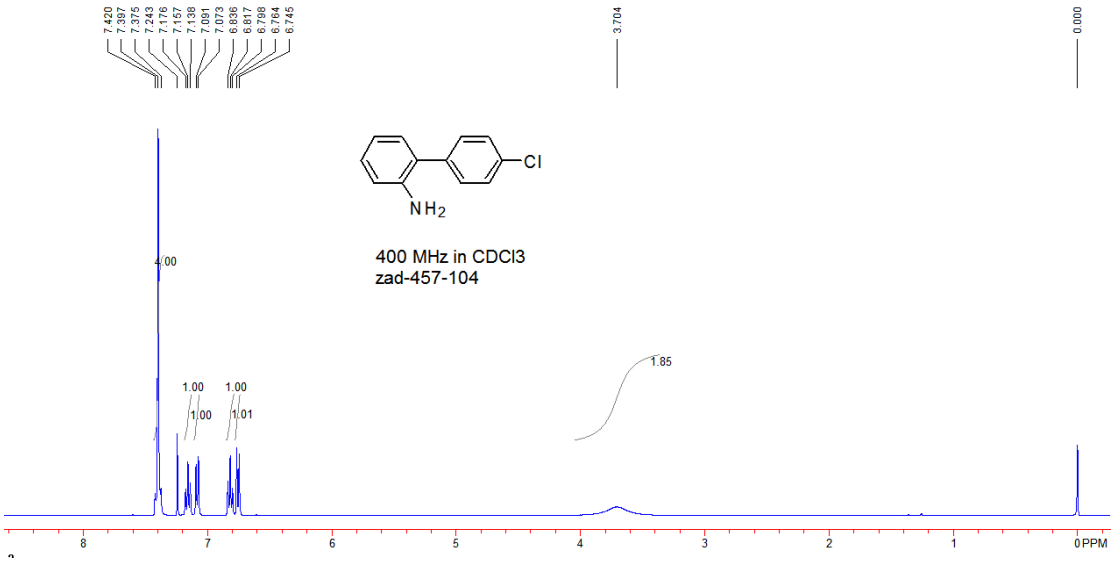


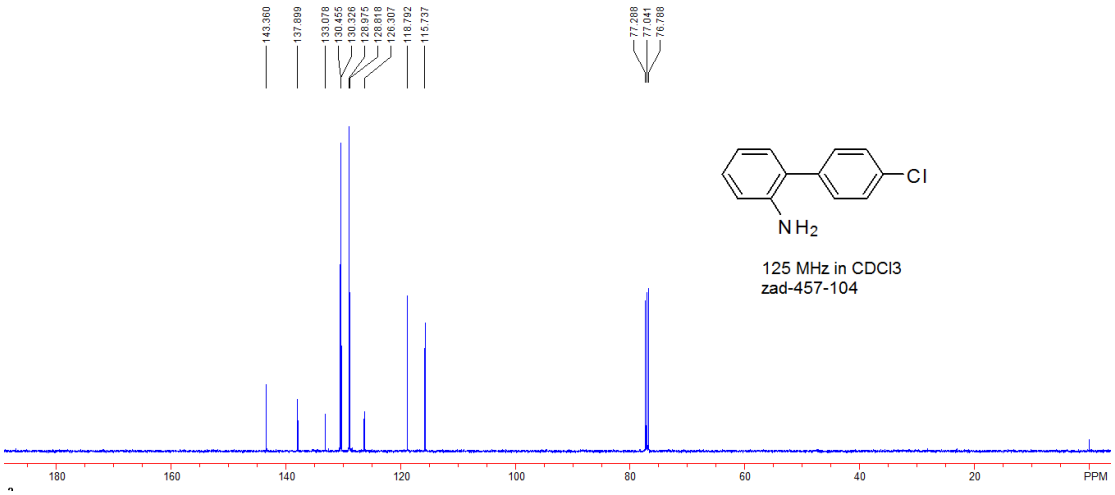
4'-fluorobiphenyl-2-amine (1m)



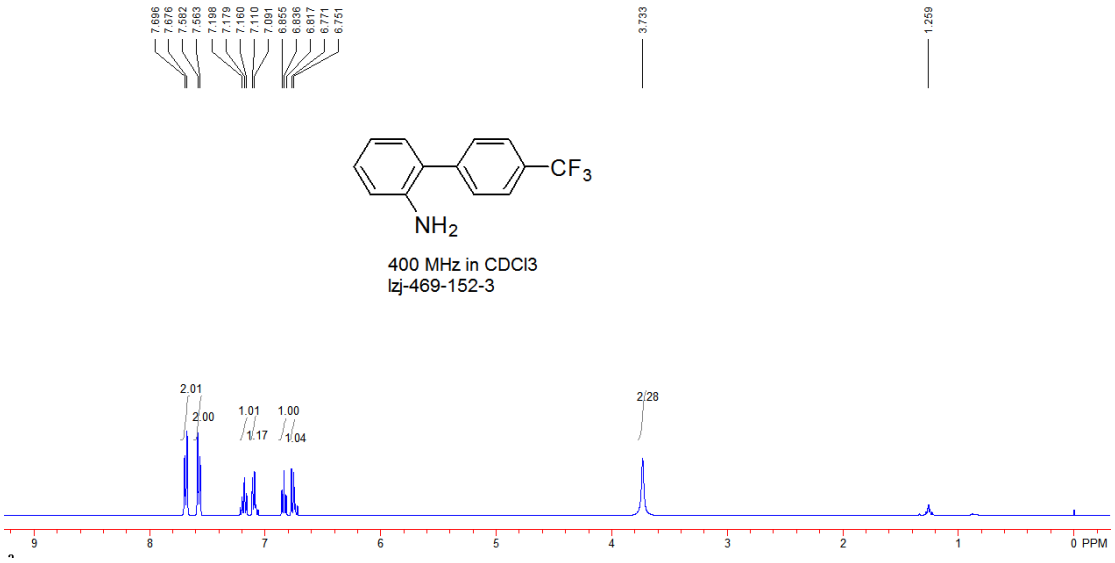


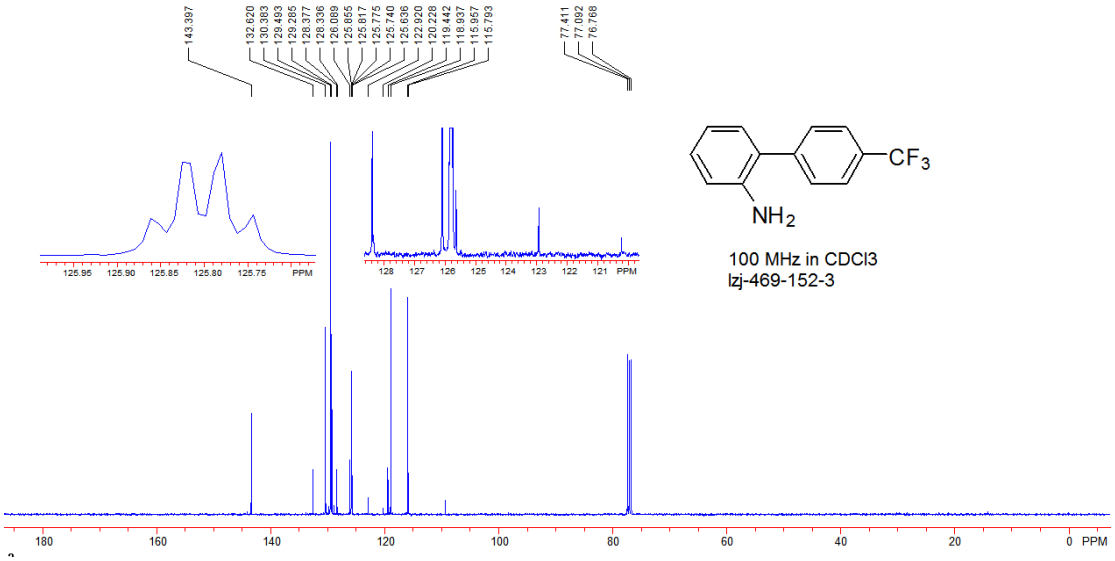
4'-chlorobiphenyl-2-amine (1n)



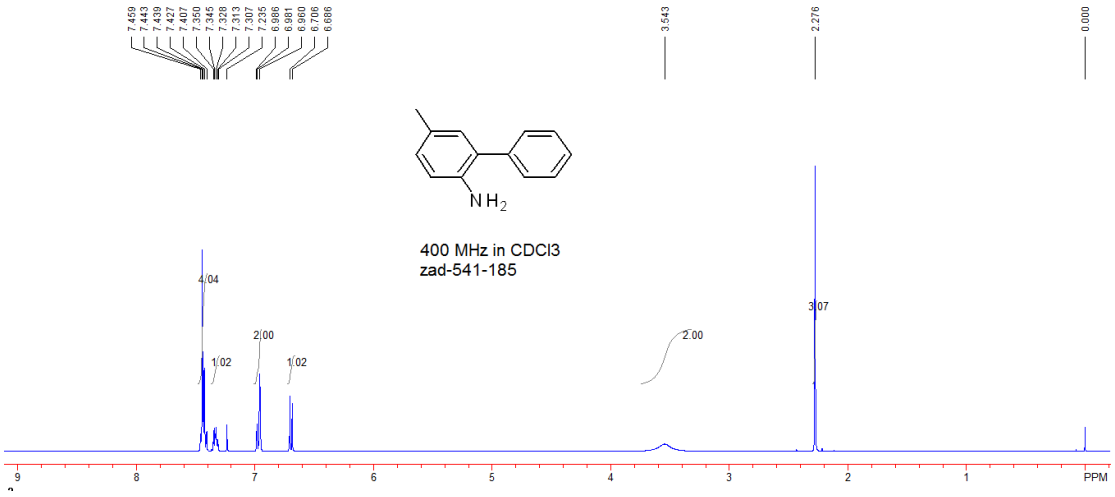


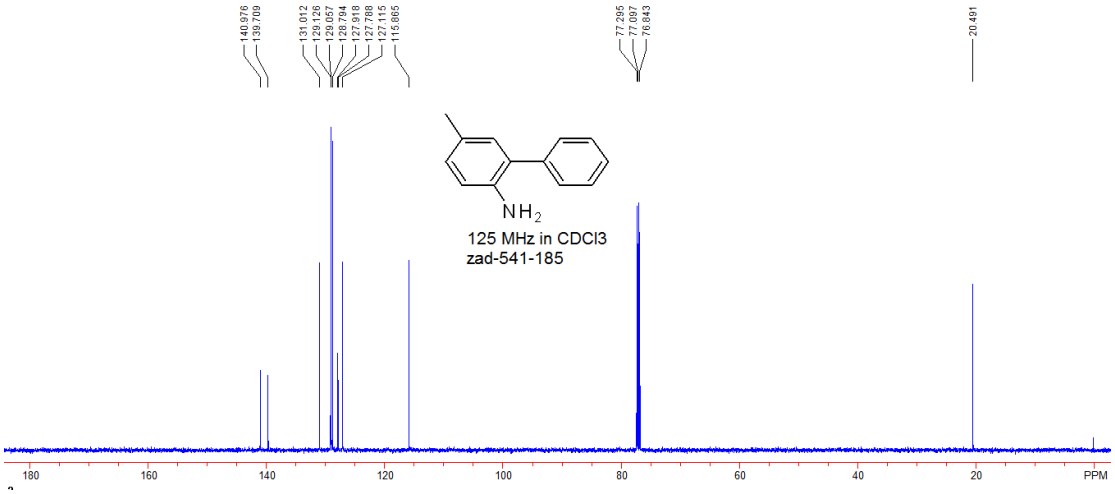
4'-(trifluoromethyl)biphenyl-2-amine (1o)



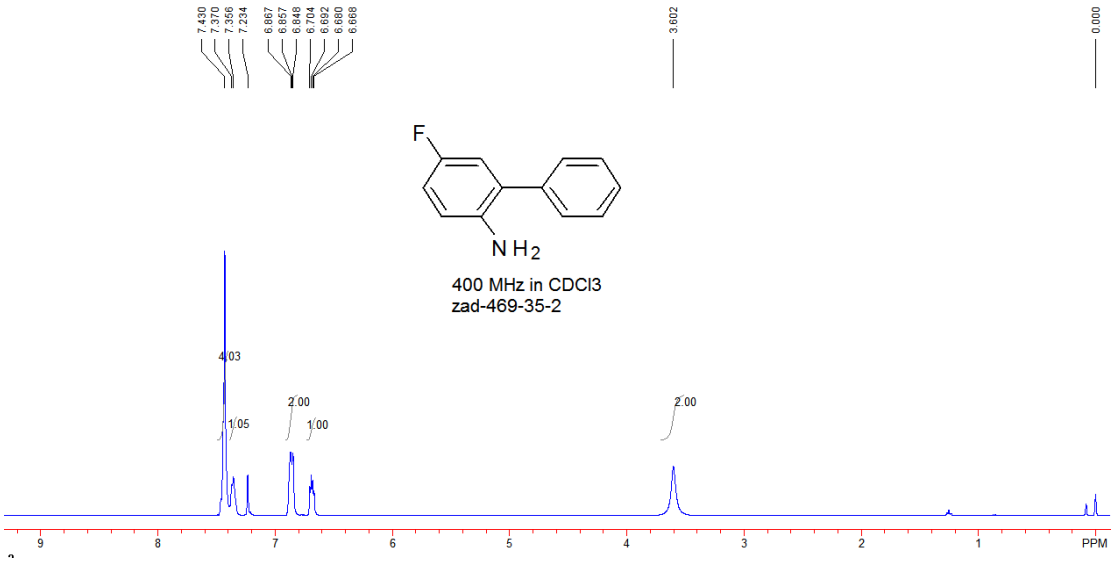


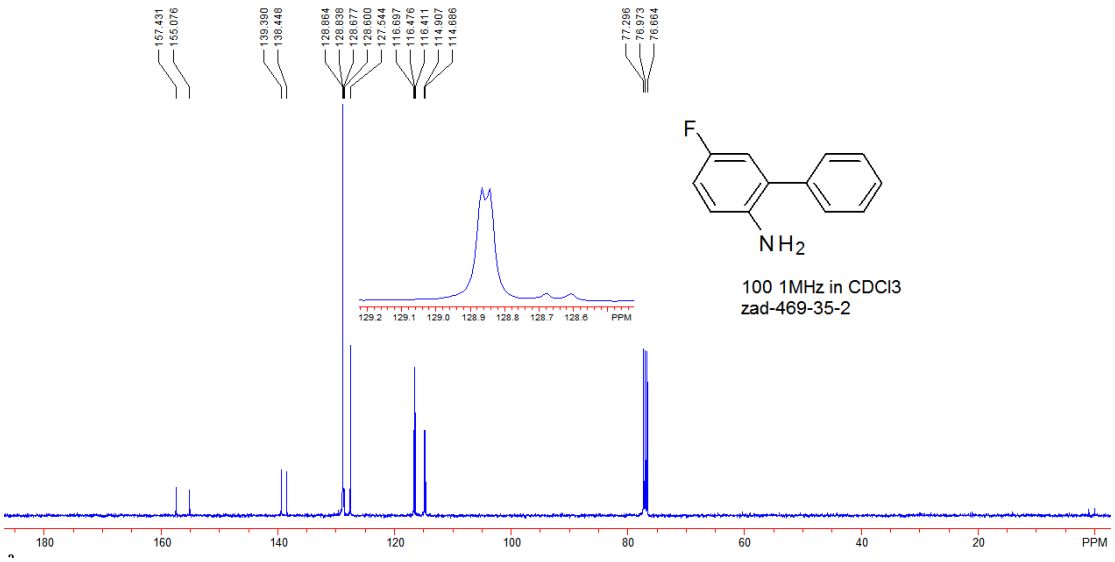
5-methylbiphenyl-2-amine (1p)



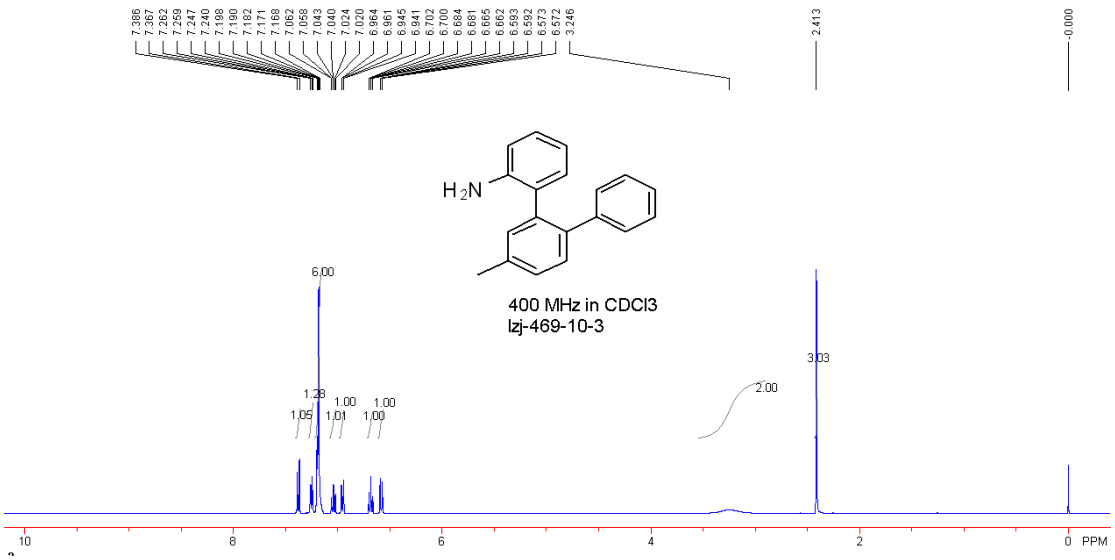


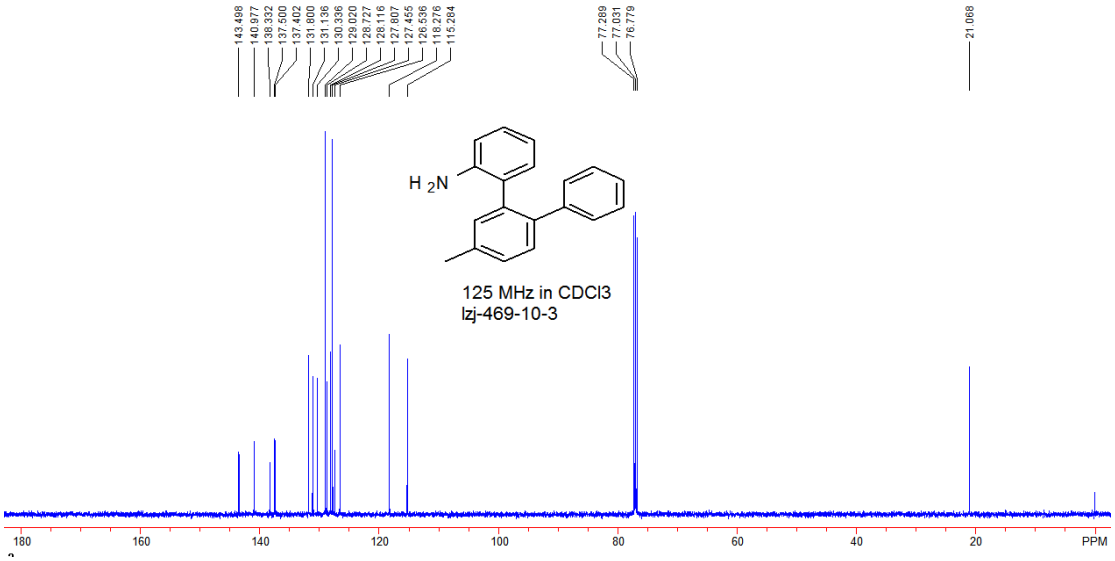
5-fluorobiphenyl-2-amine (1q)



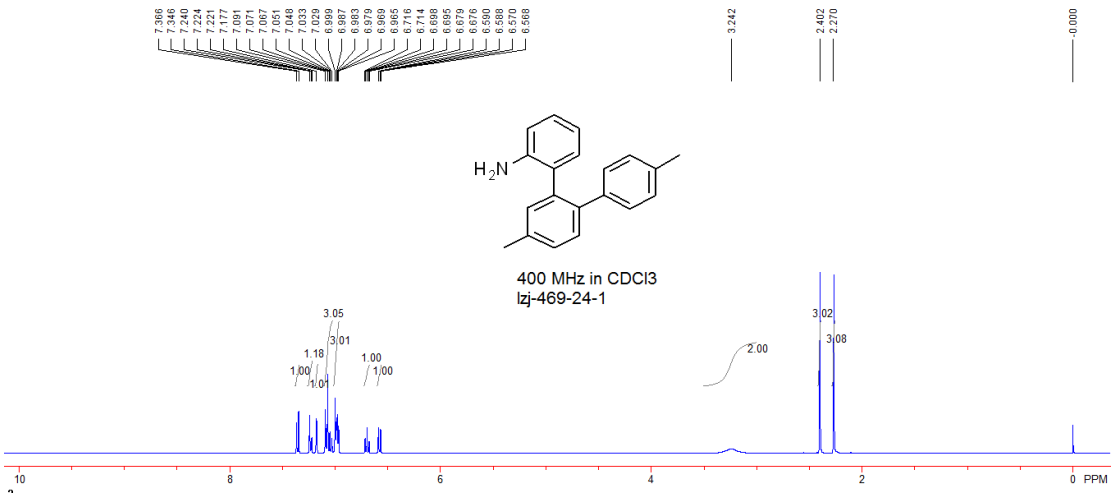


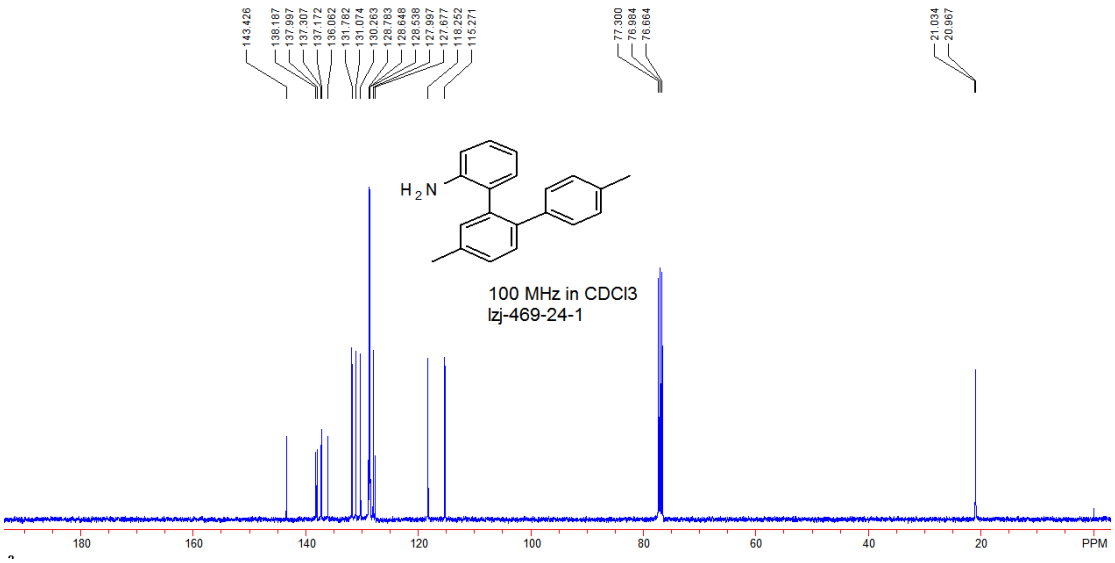
5'-methyl-2'-phenylbiphenyl-2-amine (3a)



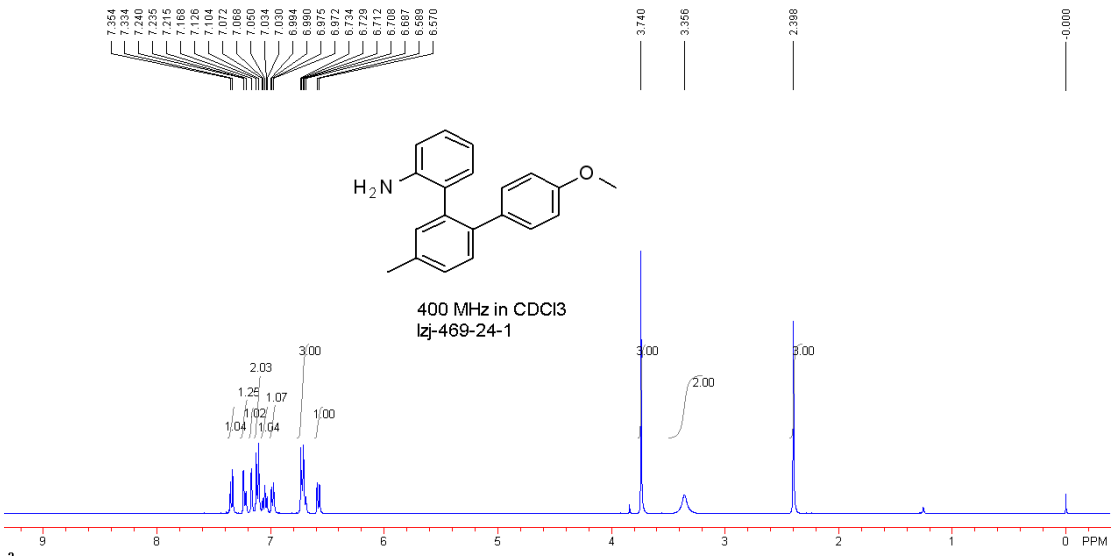


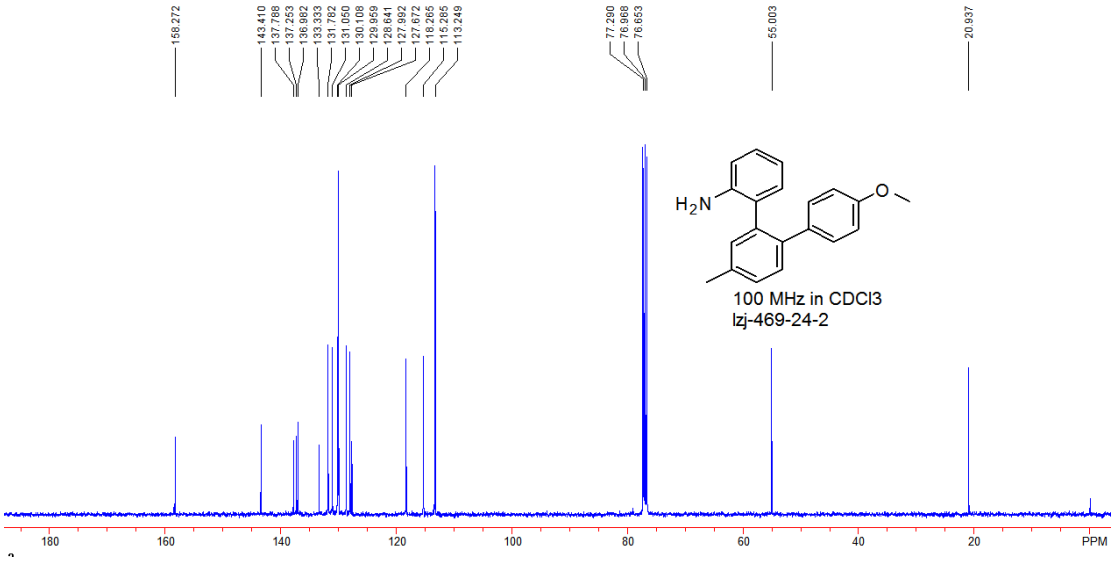
2'-(4-methylphenyl)-5'-methylbiphenyl-2-amine (3b)



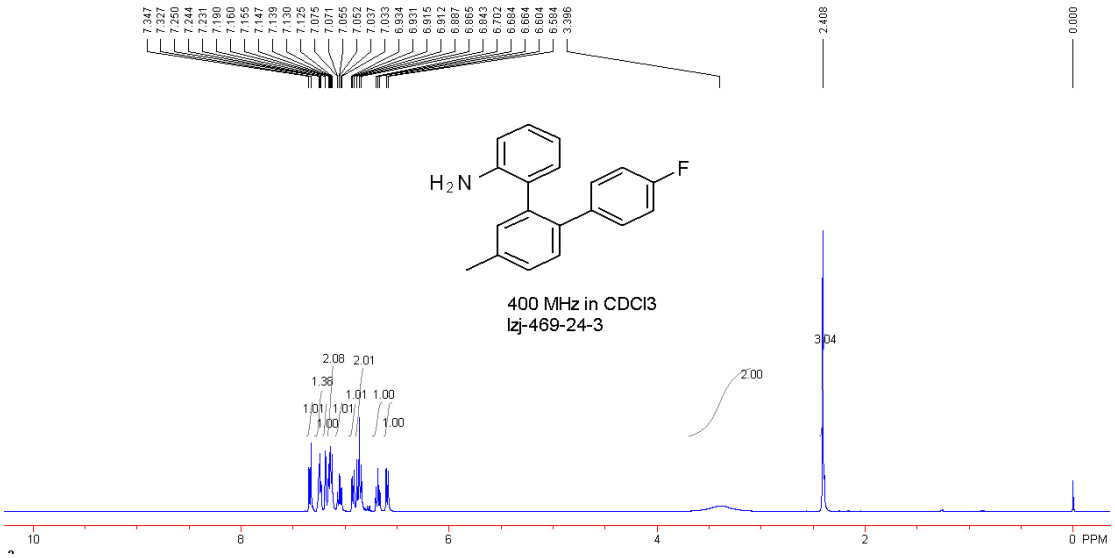


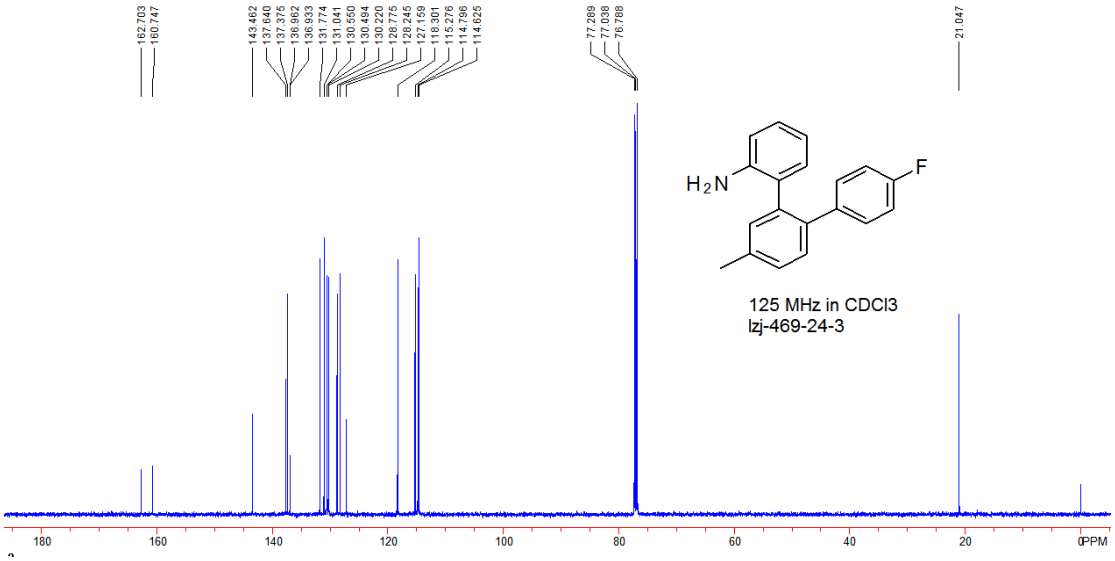
2'-(4-methoxyphenyl)-5'-methylbiphenyl-2-amine (3c)



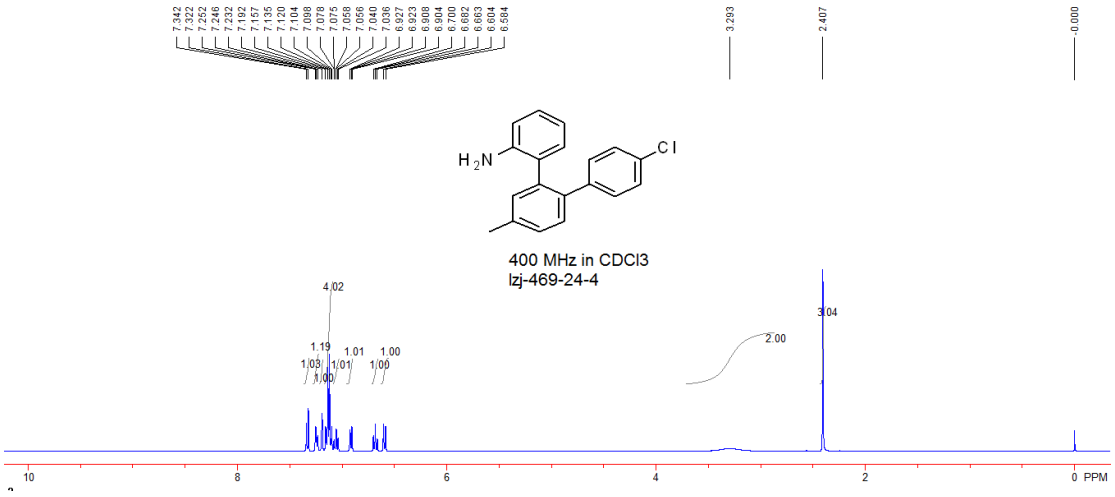


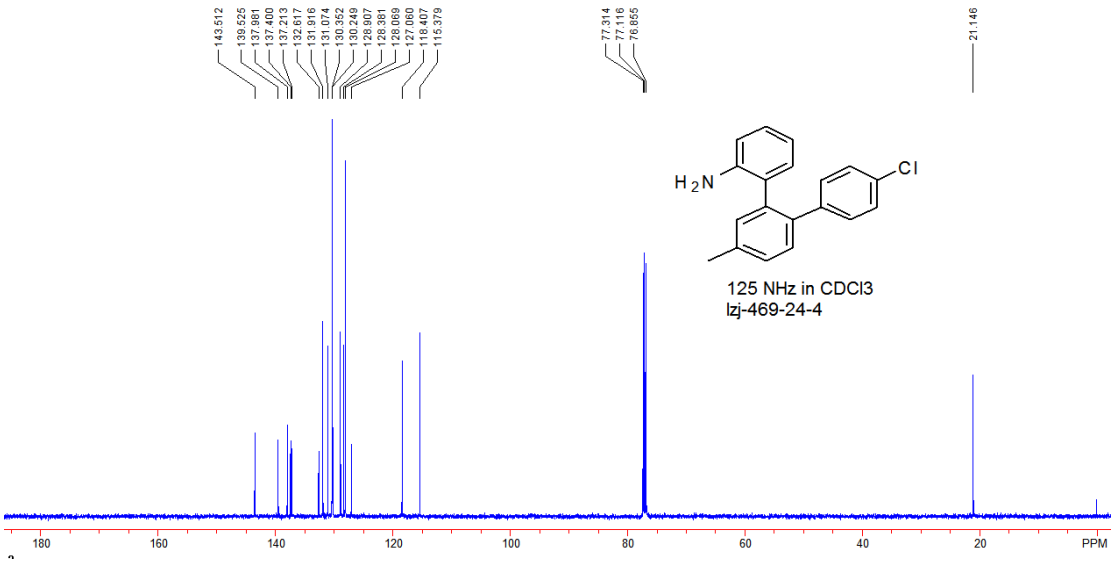
2'-(4-flourphenyl)-5'-methylbiphenyl-2-amine (3d)



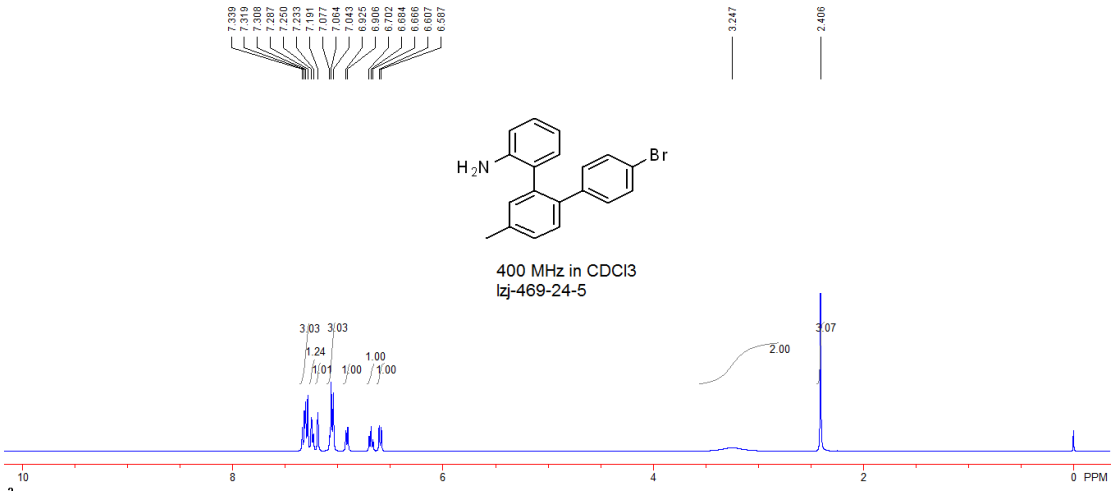


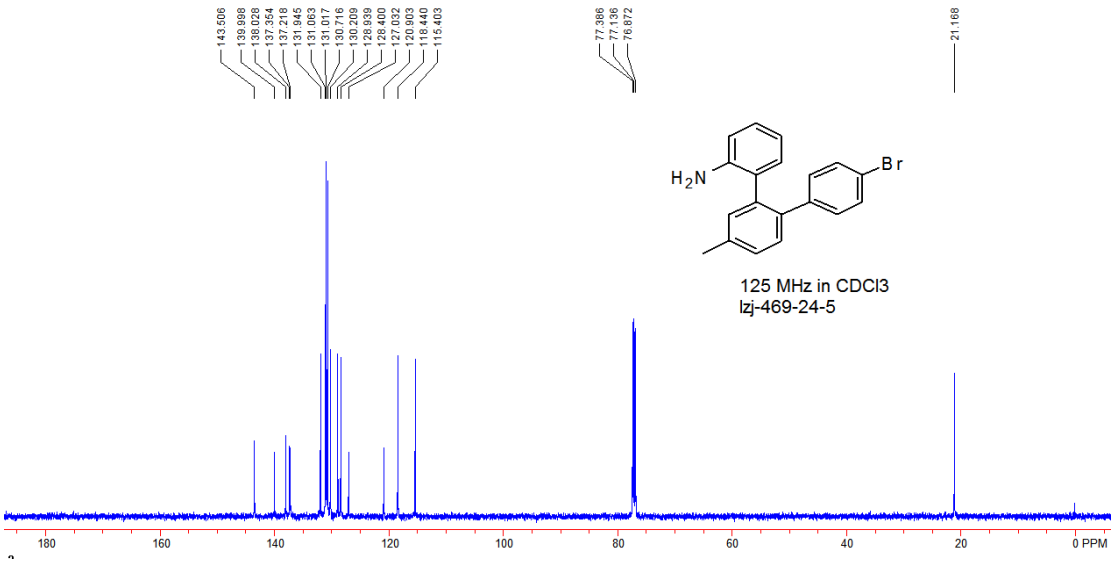
2'-(4-chlorophenyl)-5'-methylbiphenyl-2-amine (3e)



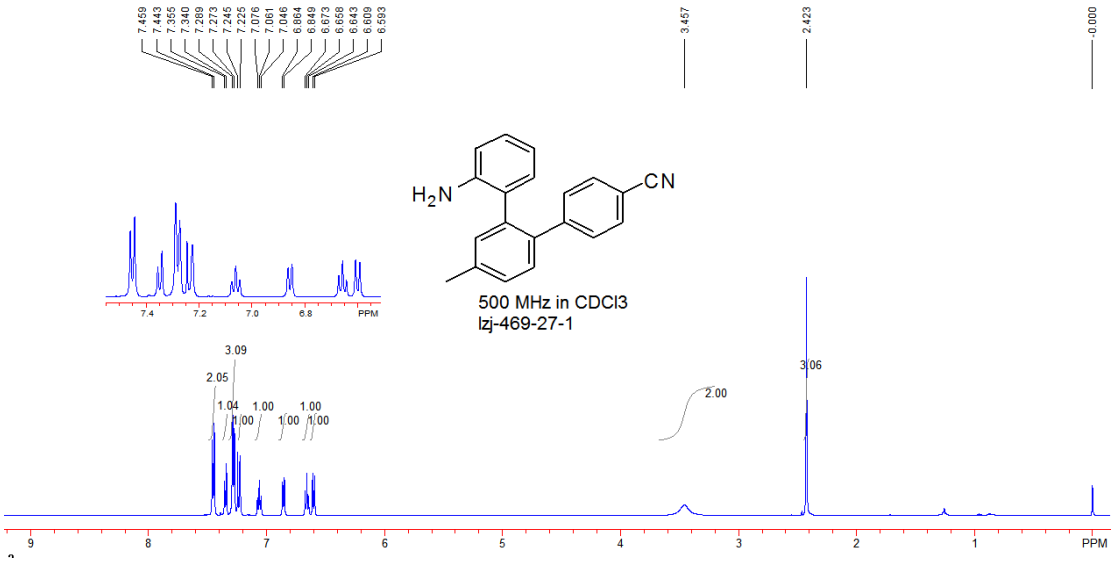


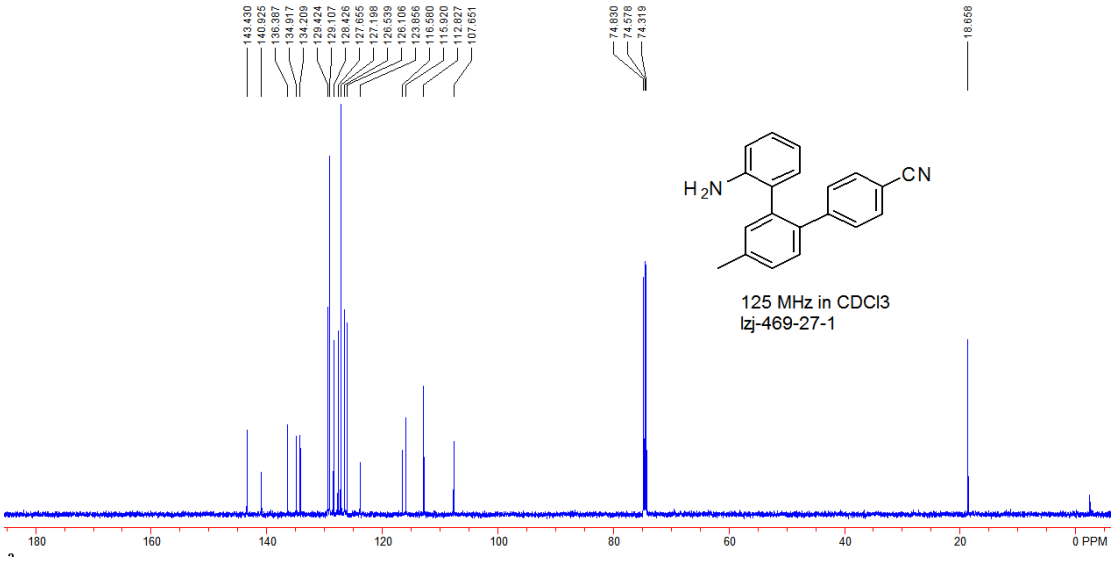
2'-(4-bromophenyl)-5'-methylbiphenyl-2-amine (3f)



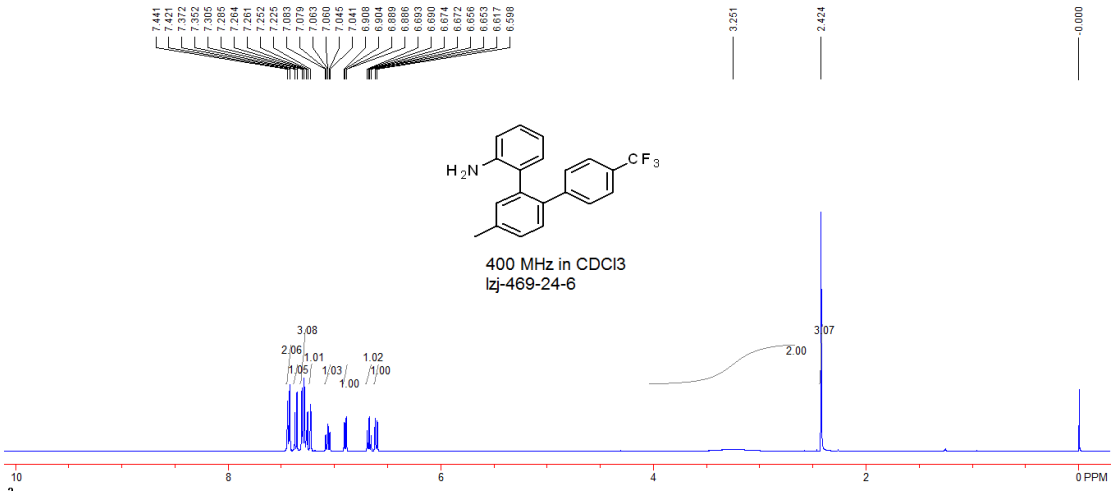


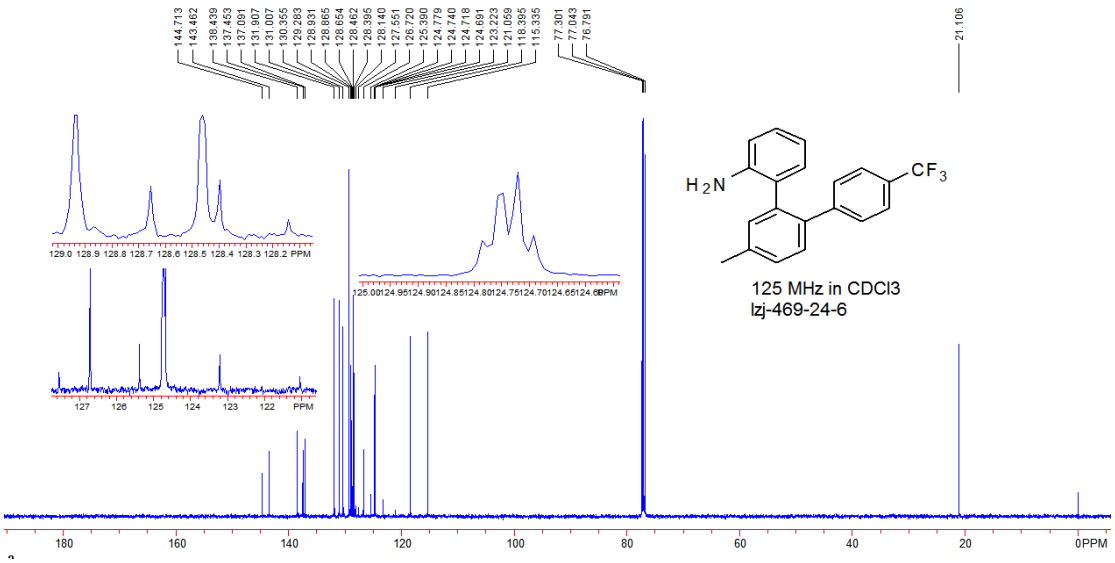
2'-(2-aminophenyl)-4'-methylbiphenyl-4-carbonitrile (3g)



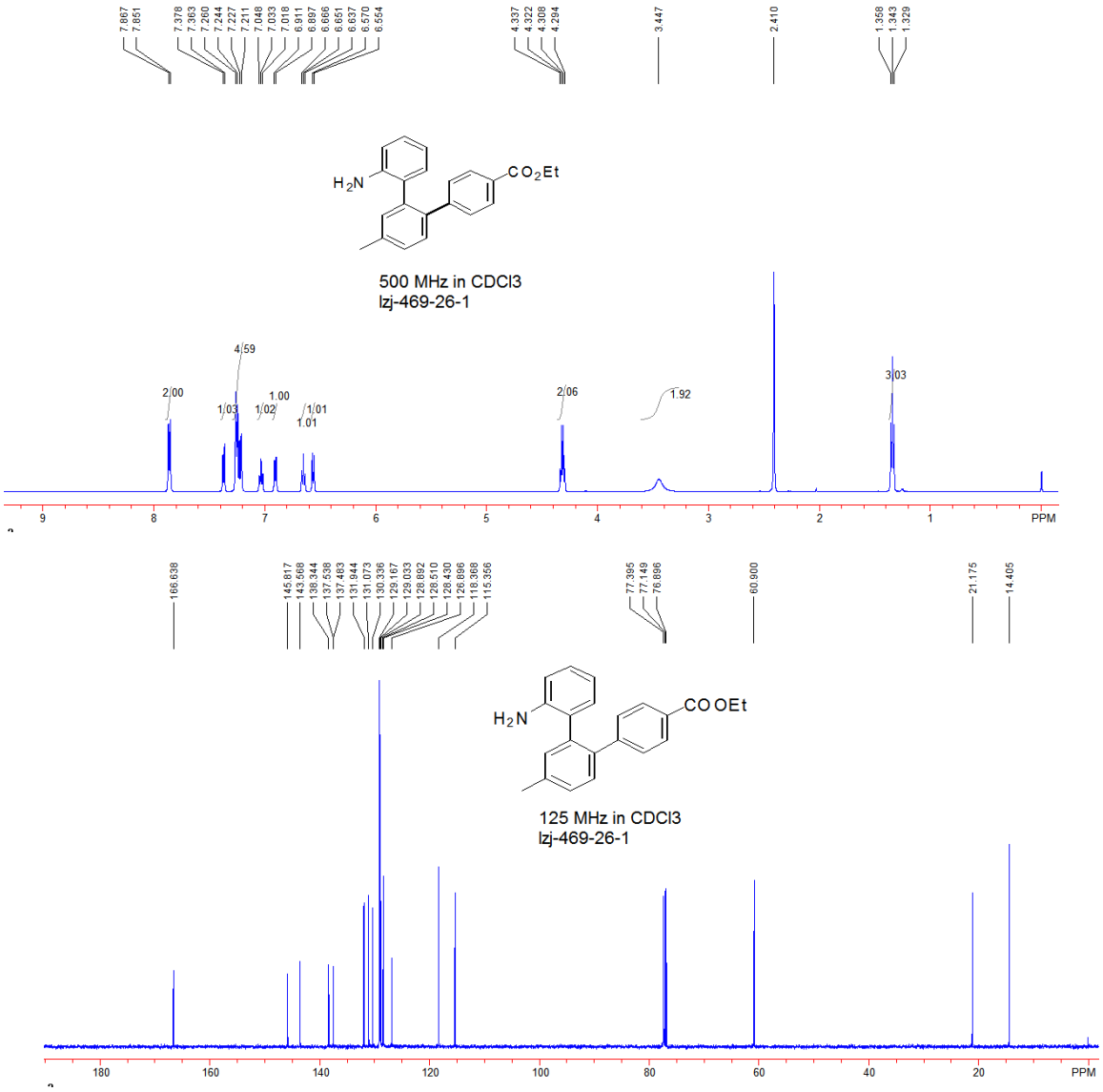


2'-(4-trifluoromethylphenyl)-5'-methylbiphenyl-2-amine (3h)

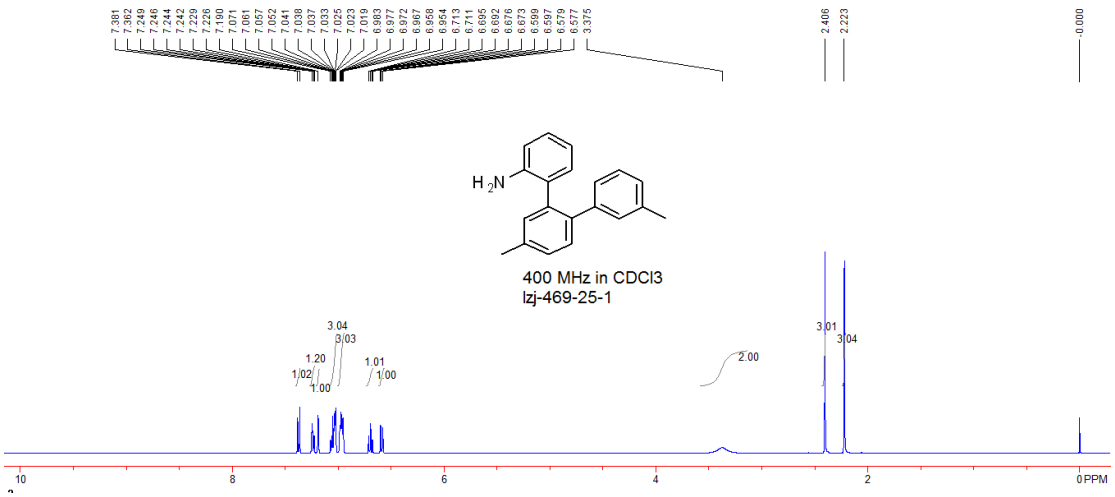


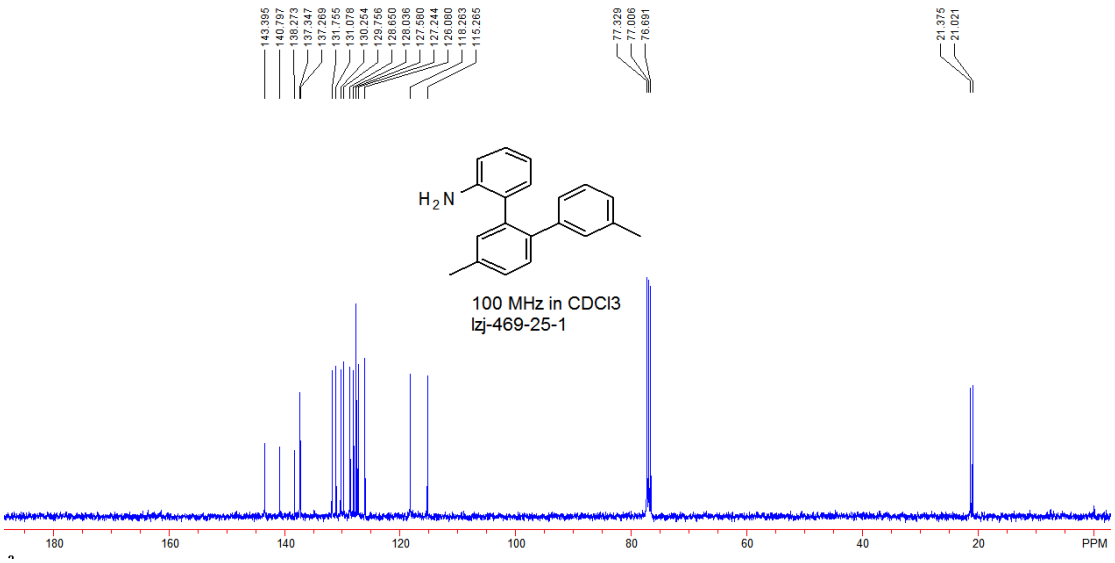


ethyl 2'-(2-aminophenyl)-4'-methylbiphenyl-4-carboxylate (3i)

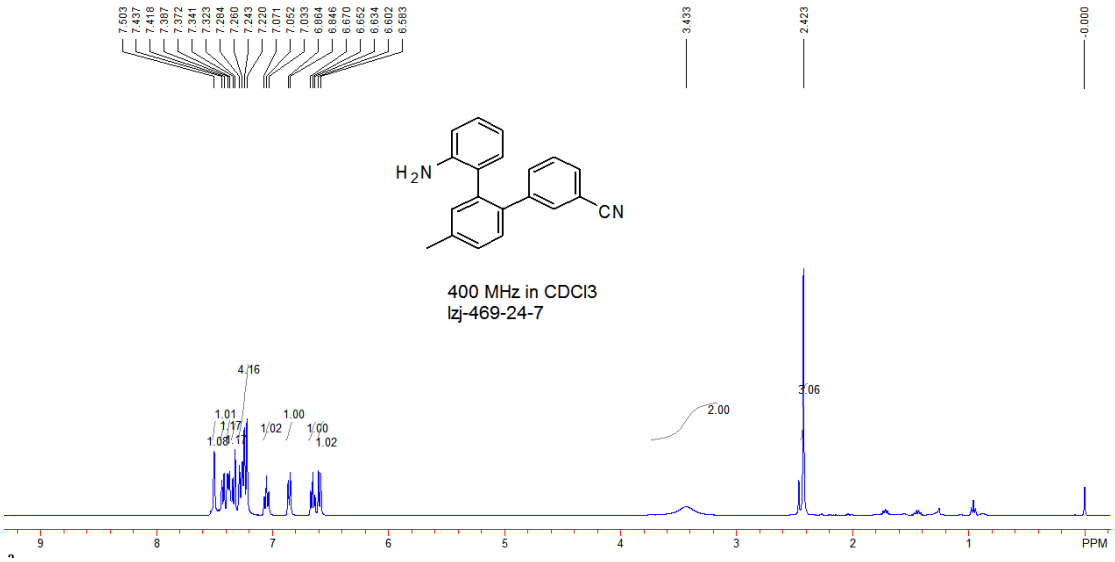


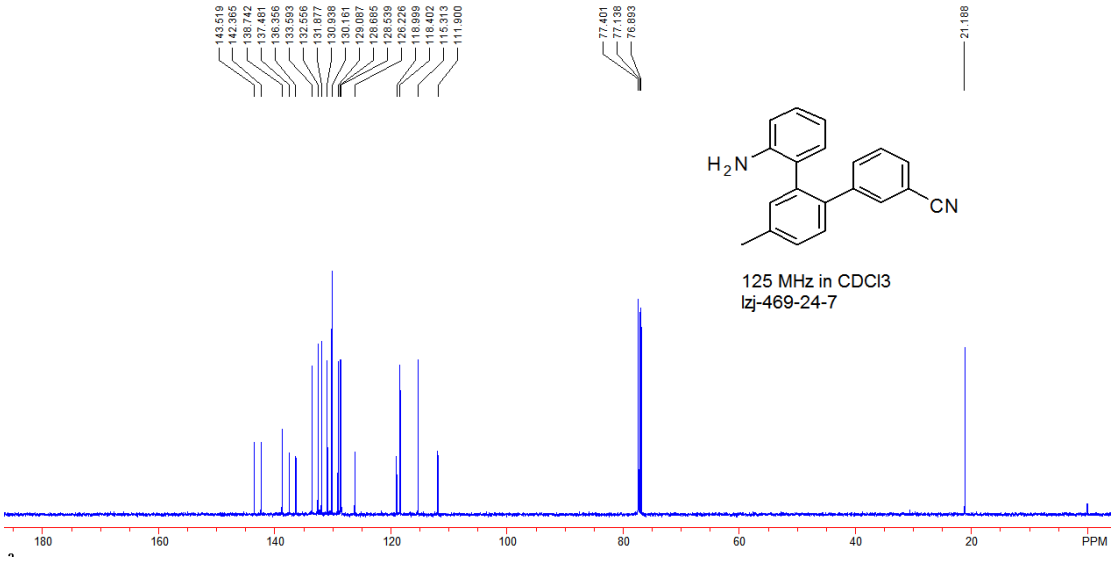
2'-(3-methylphenyl)-5'-methylbiphenyl-2-amine (3j)



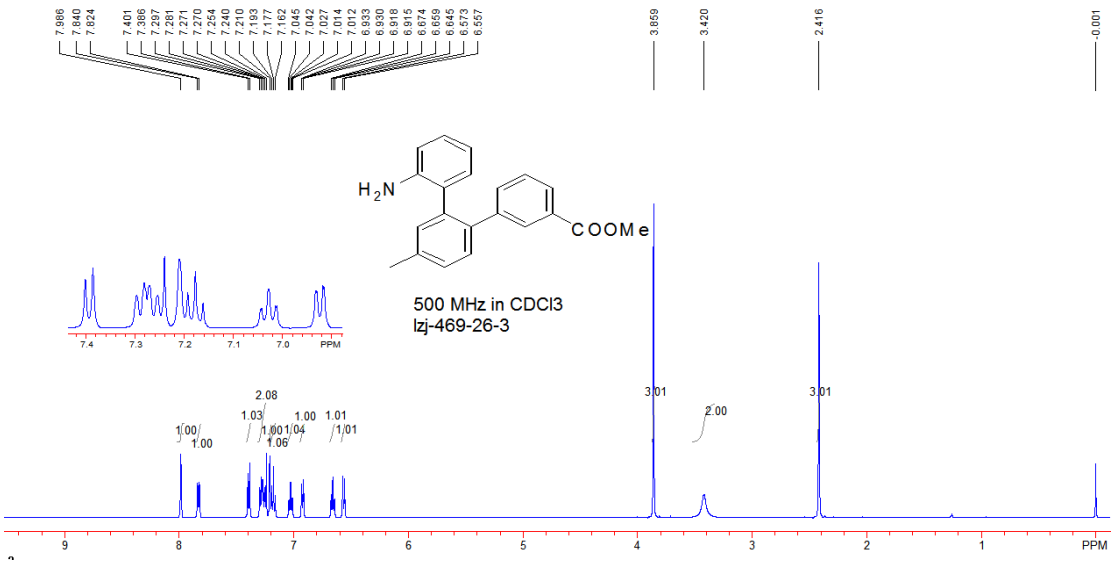


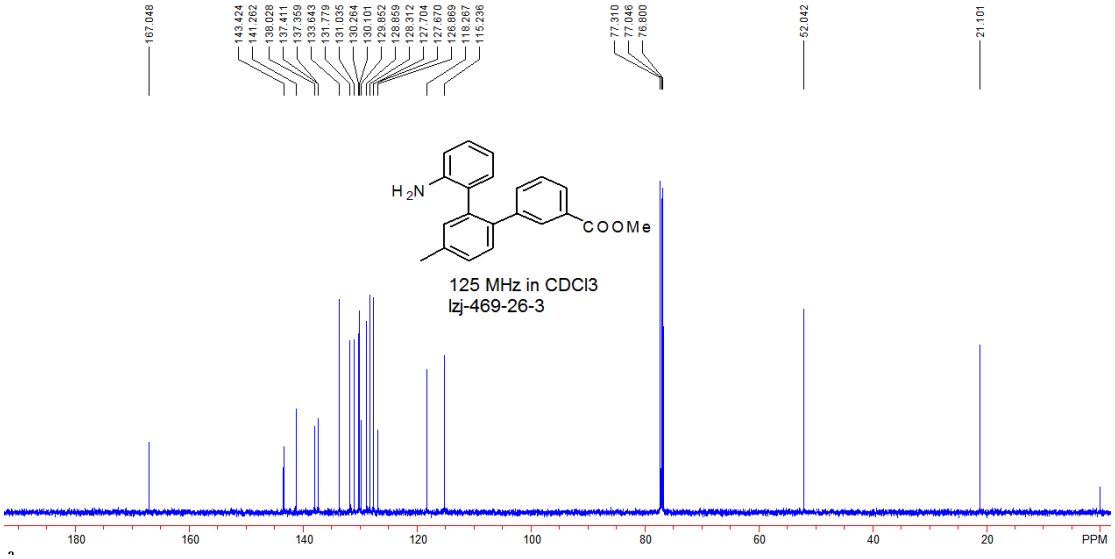
2'-(2-aminophenyl)-4'-methylbiphenyl-3-carbonitrile (3k)



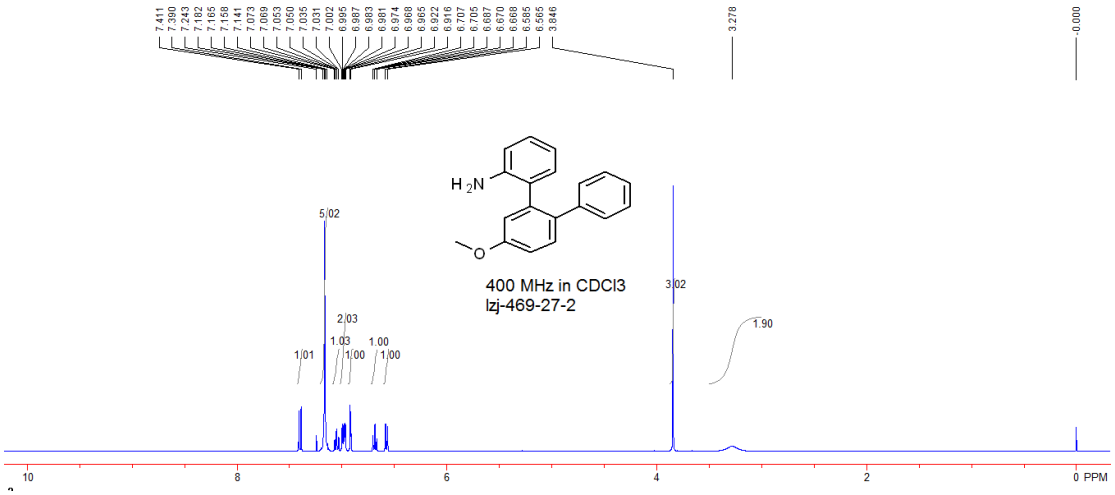


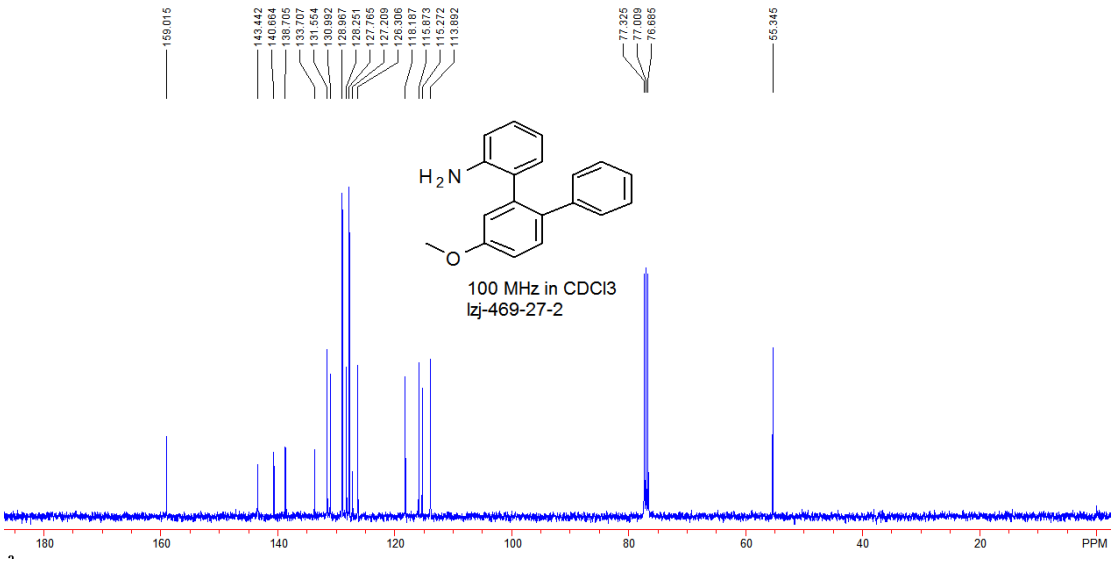
methyl 2'-(2-aminophenyl)-4'-methylbiphenyl-3-carboxylate (3l)



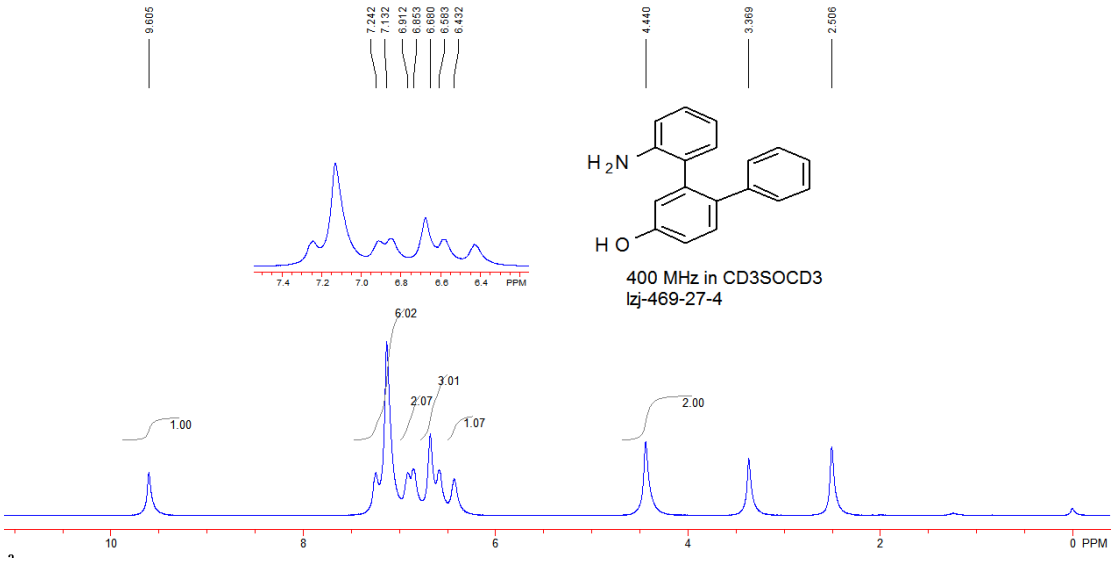


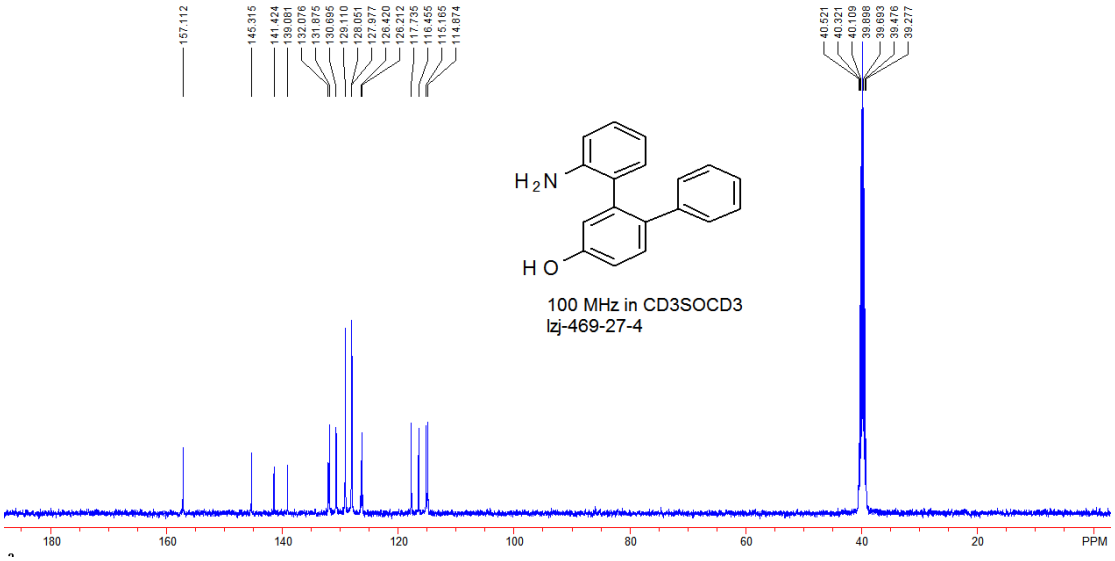
5'-methoxy-2'-phenylbiphenyl-2-amine (3m)



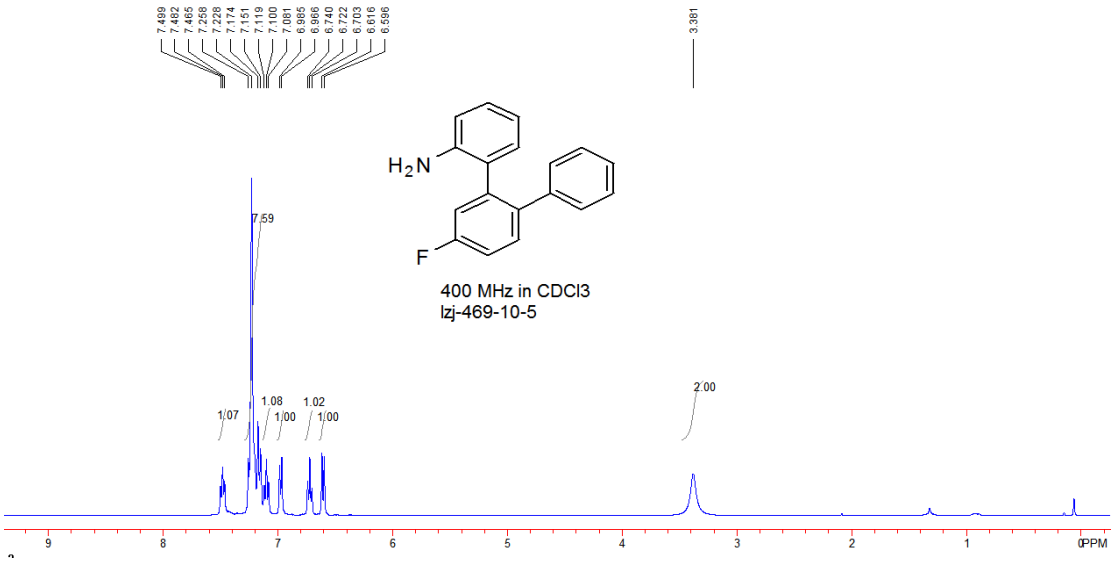


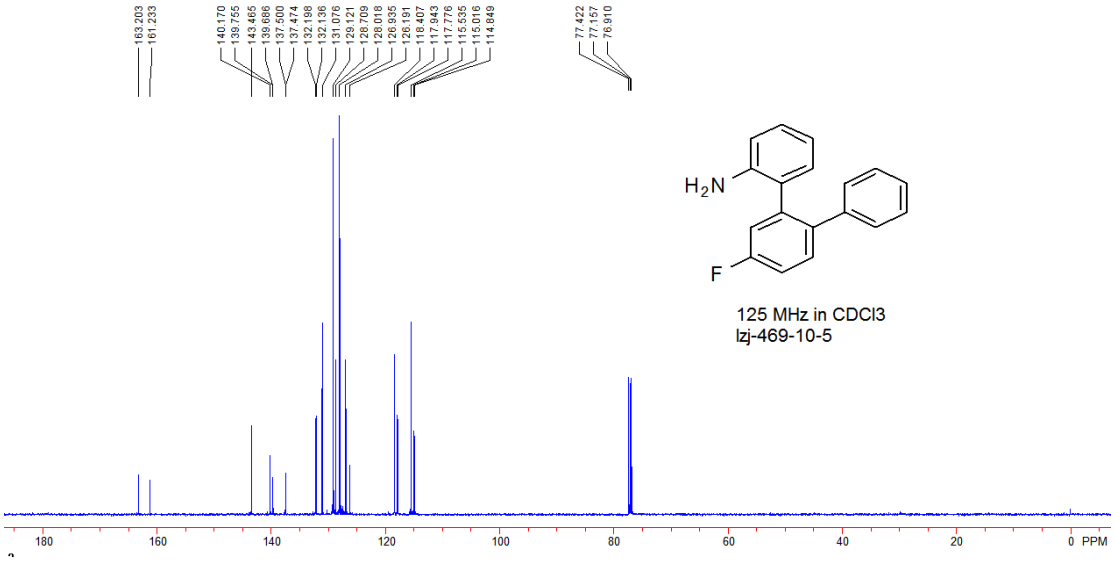
2'-amino-6-phenylbiphenyl-3-ol (3n)



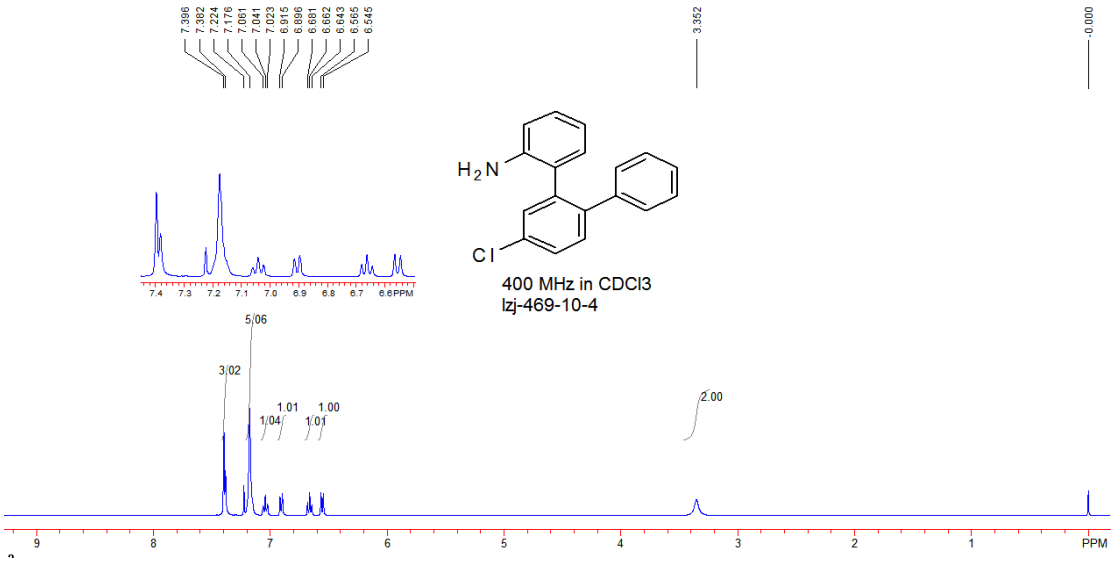


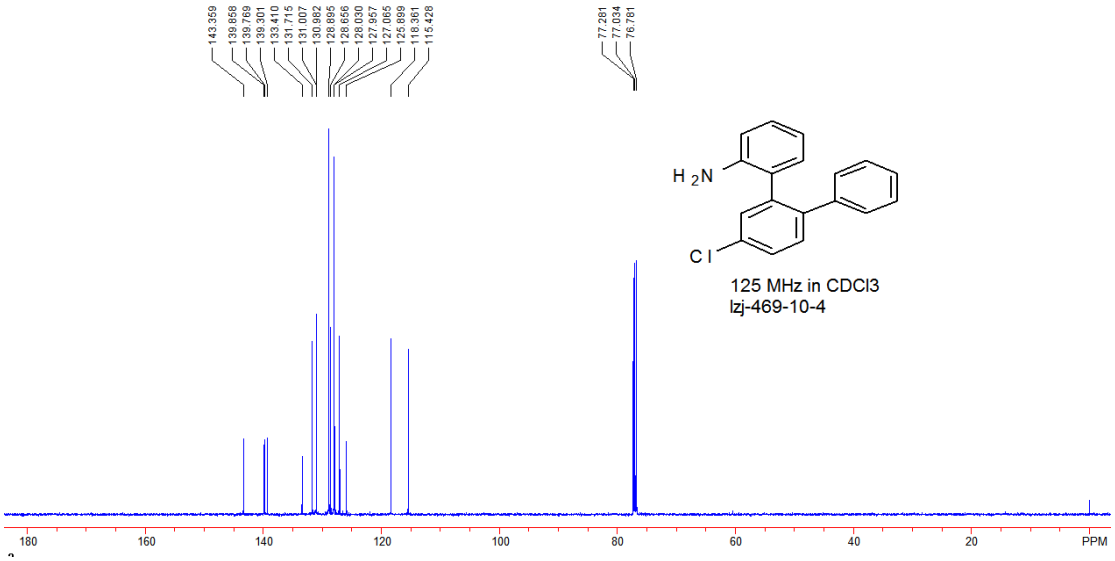
5'-fluoro-2'phenylbiphenyl-2-amine (3o)



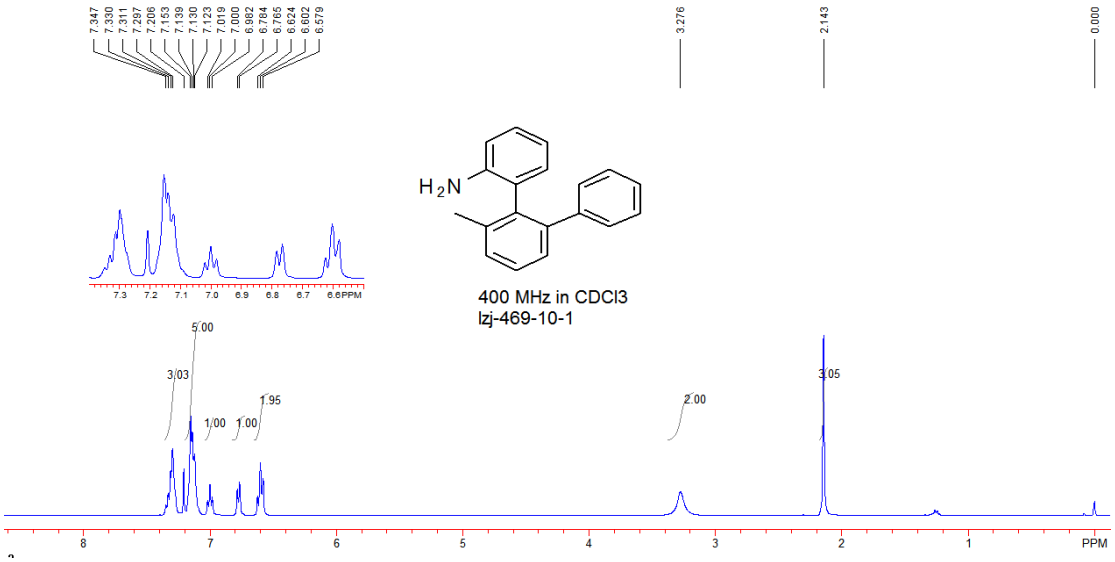


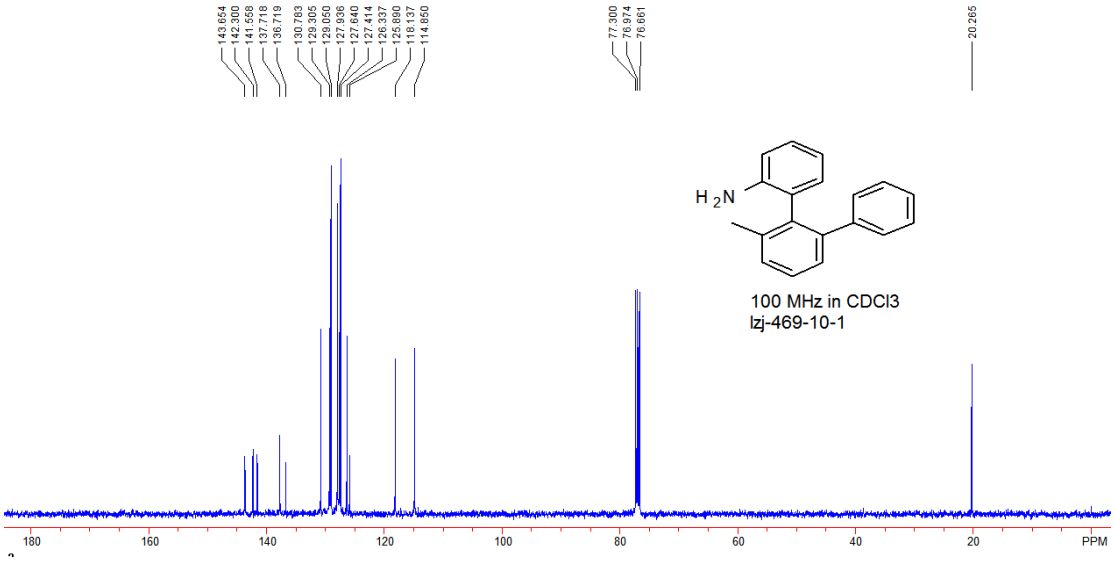
5'-chloro-2'phenylbiphenyl-2-amine (3p)



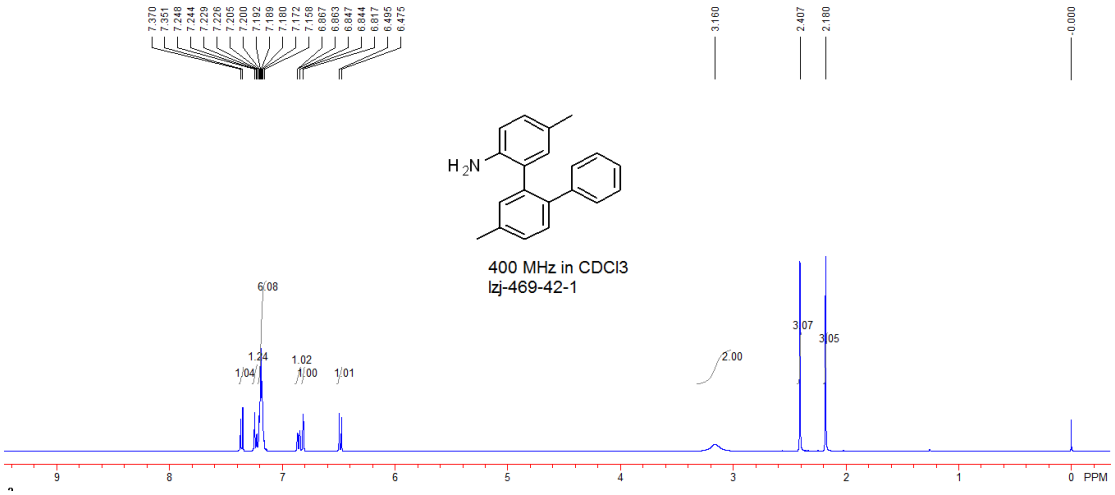


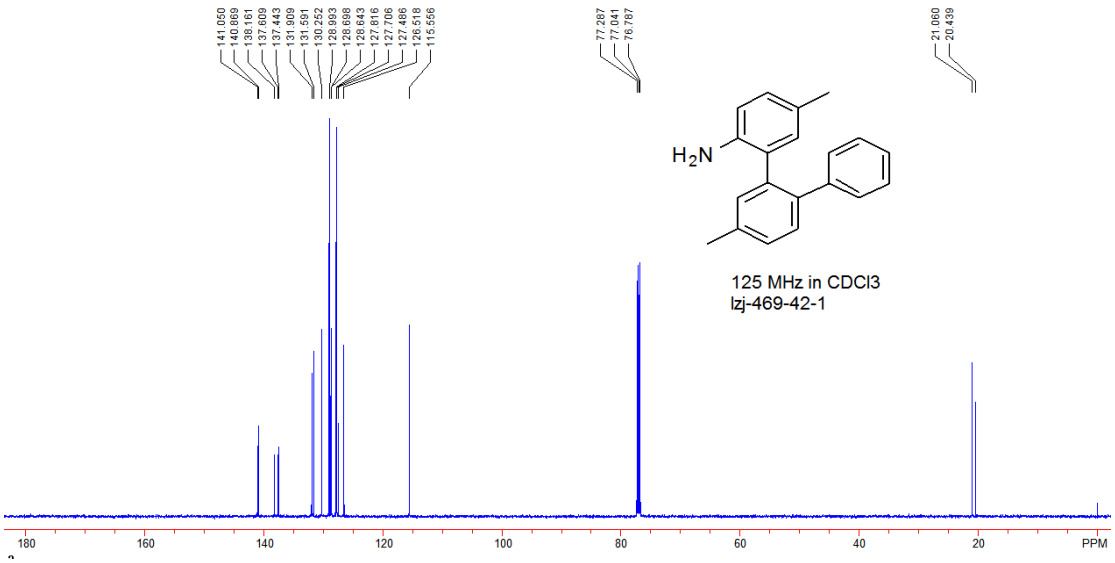
2'-methyl-5'-phenylbiphenyl-2-amine (3q)



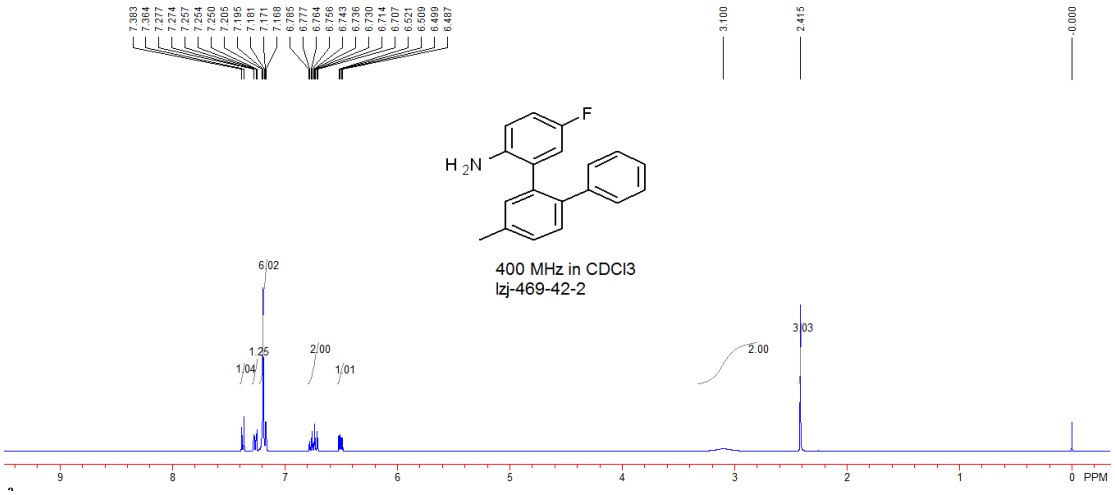


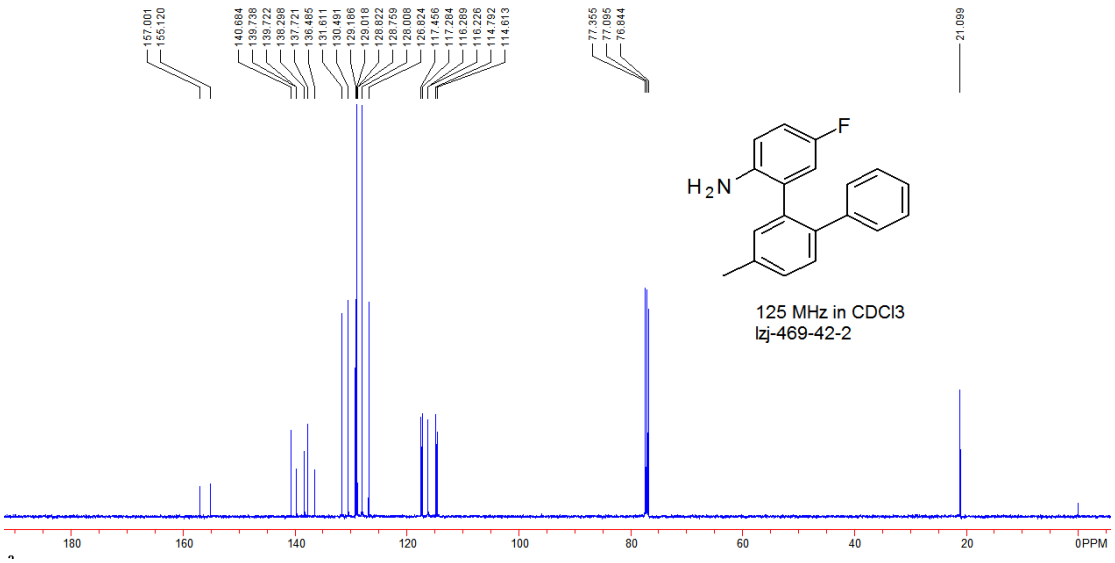
5,5'-dimethyl-2'-phenylbiphenyl-2-amine (3r)



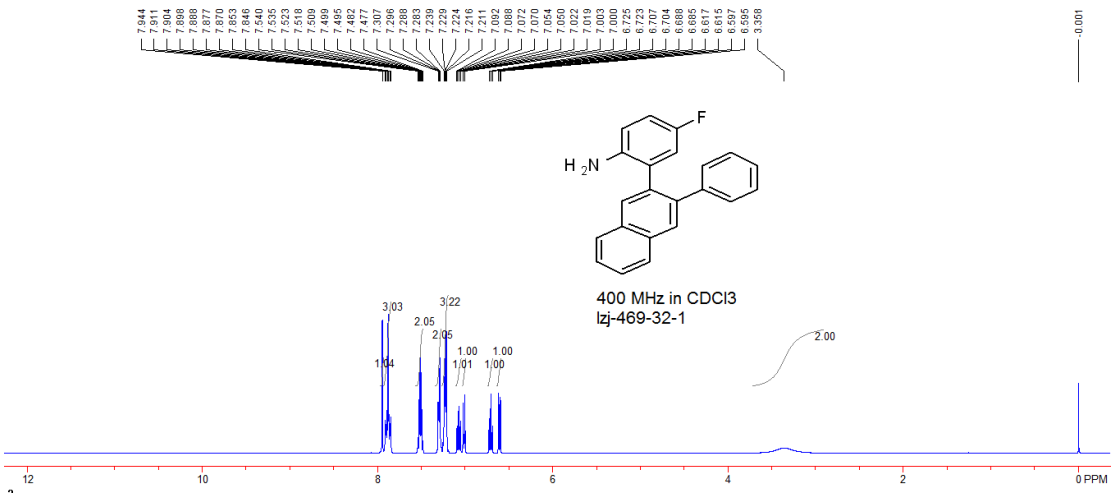


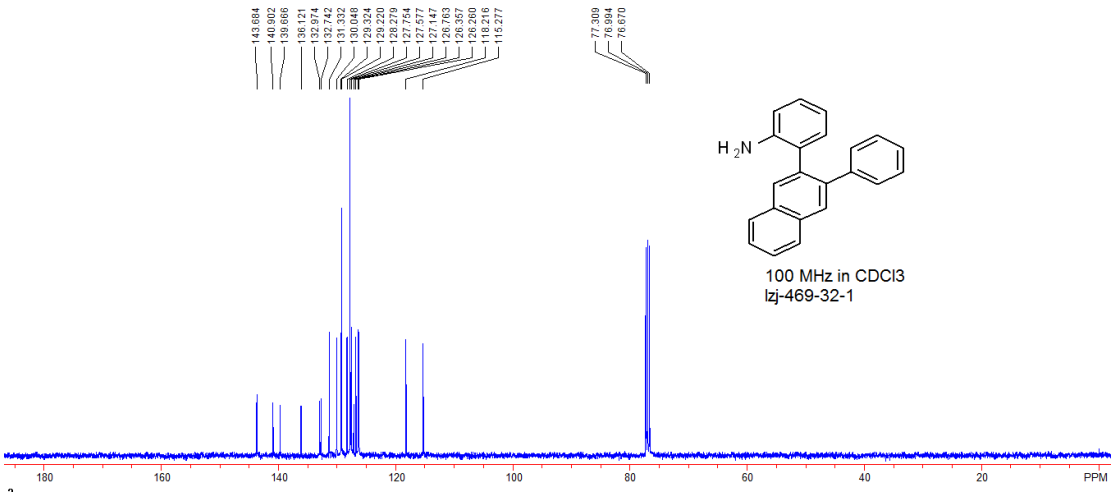
5-fluoro-5'-methyl-2'-phenylbiphenyl-2-amine (3s)



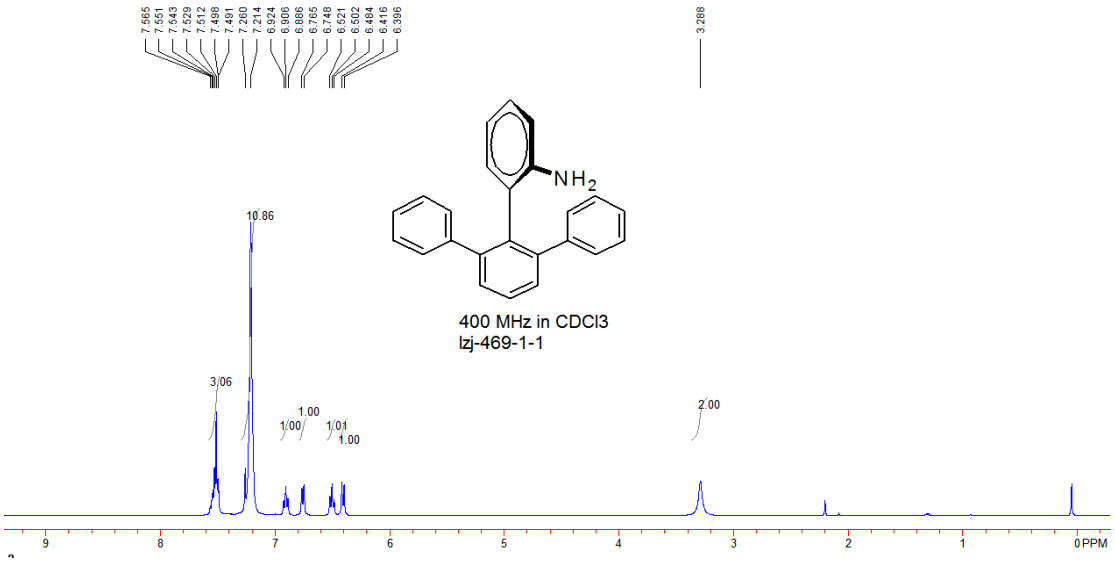


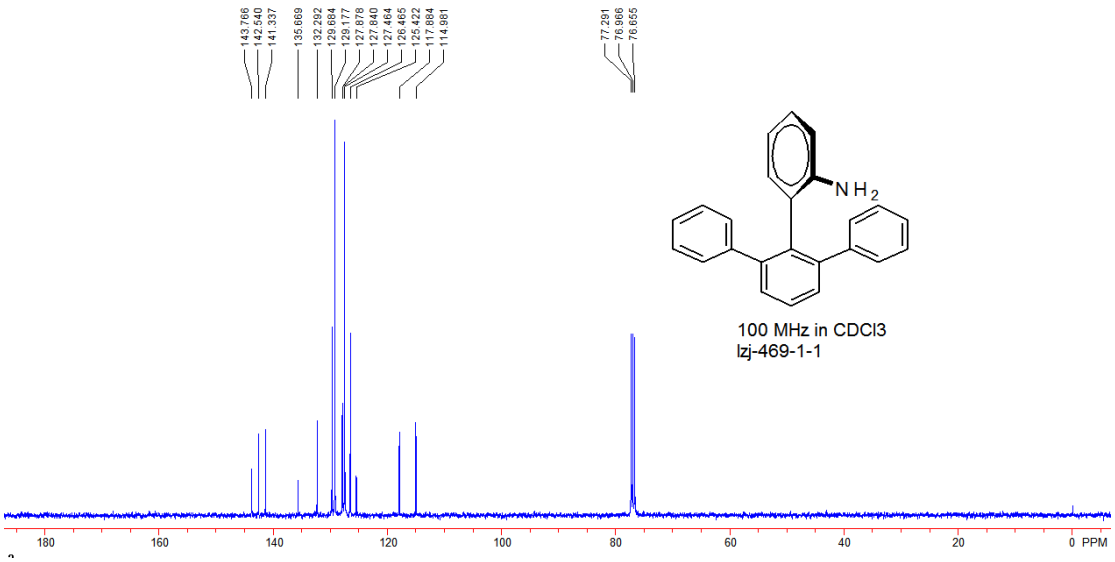
2-(3-phenylnaphthalen-2-yl)aniline (3t)



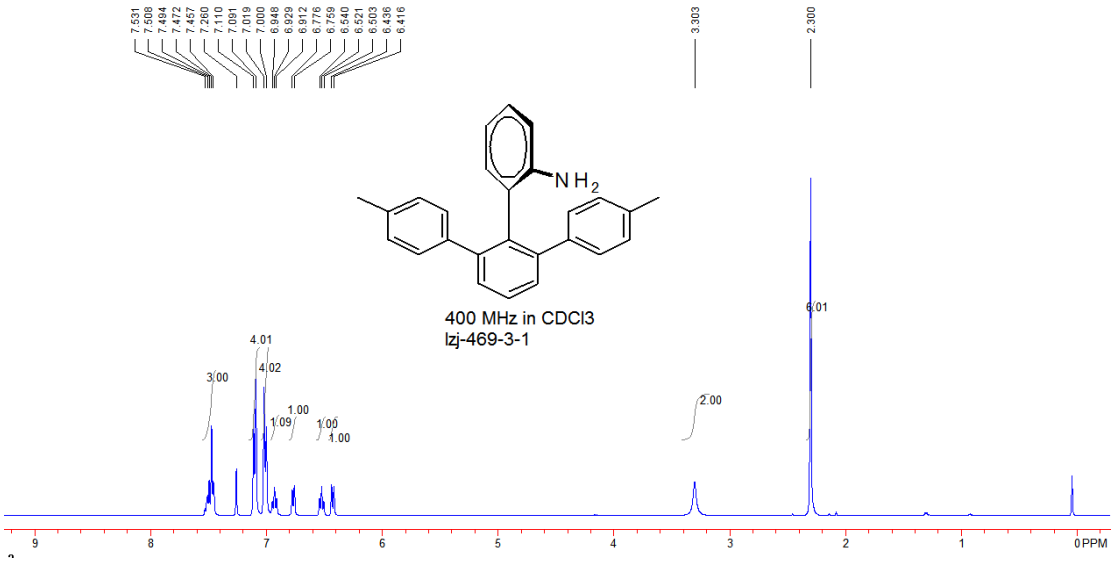


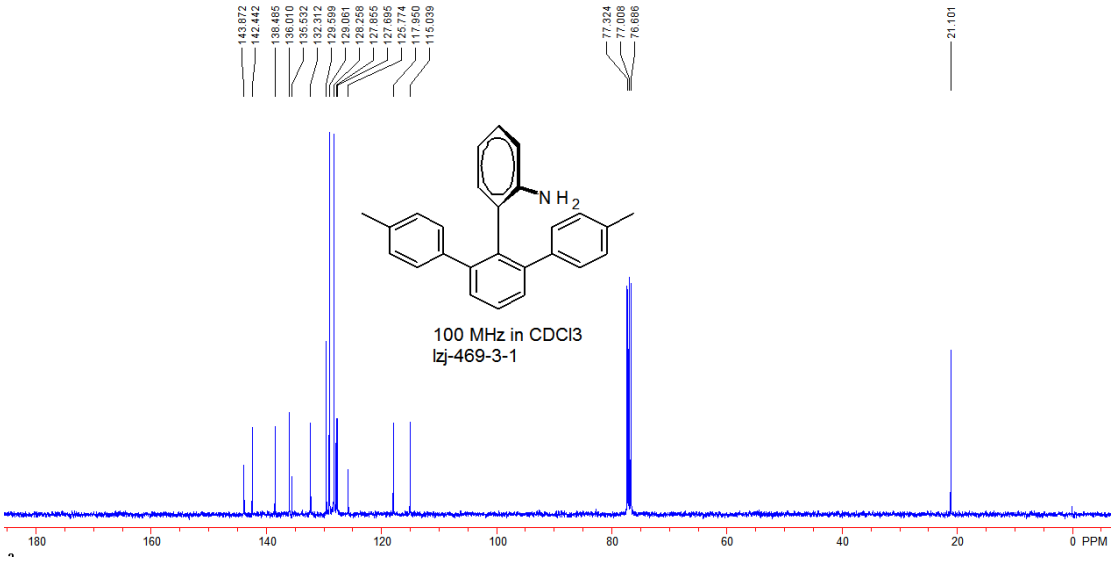
2', 6'-diphenyl biphenyl-2-amine (4a)



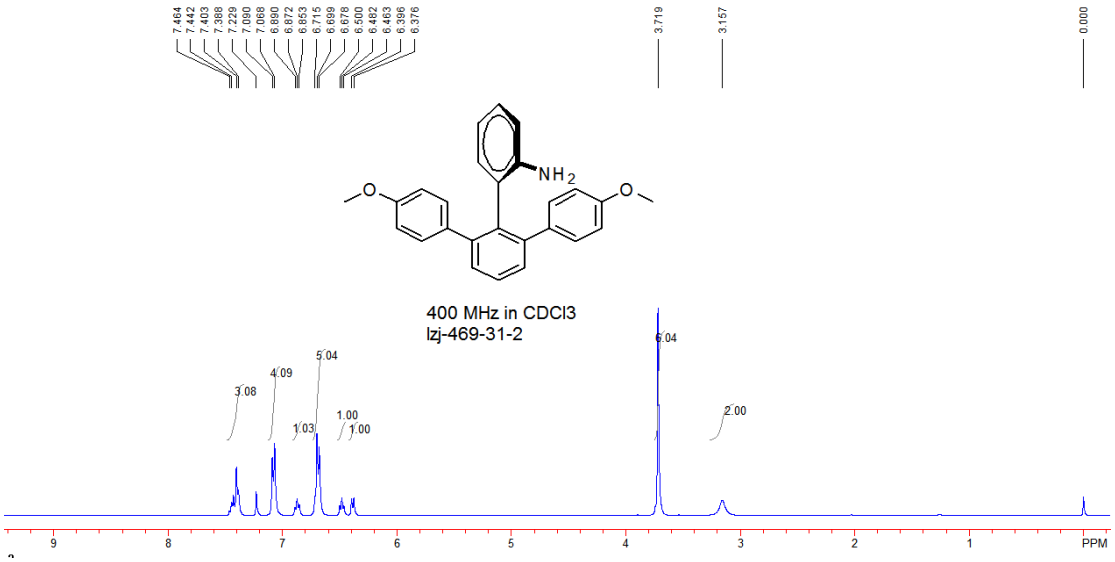


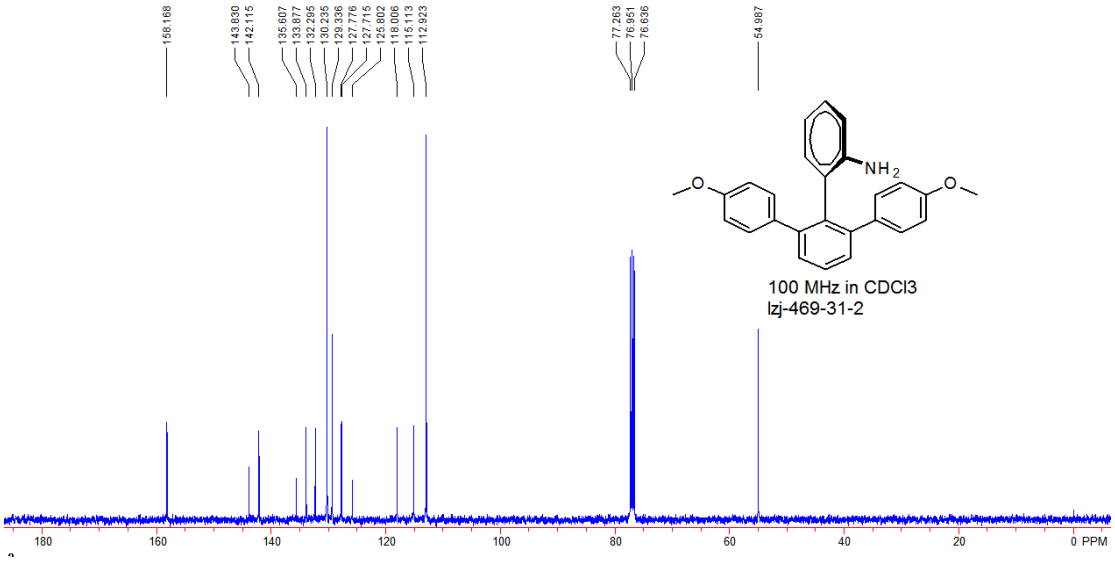
2', 6'-di(4-methylphenyl)biphenyl-2-amine (4b)



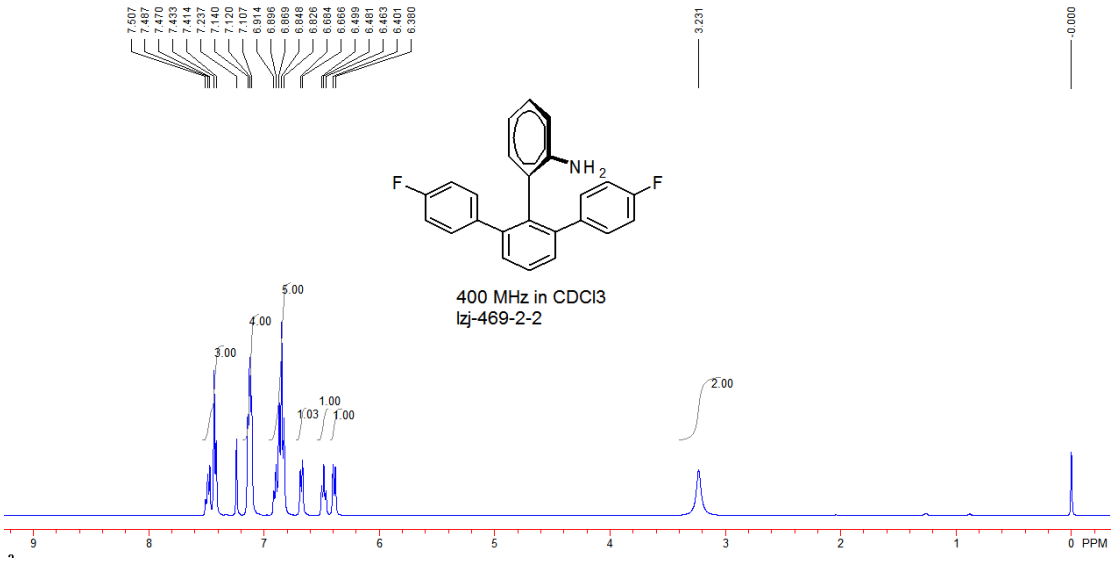


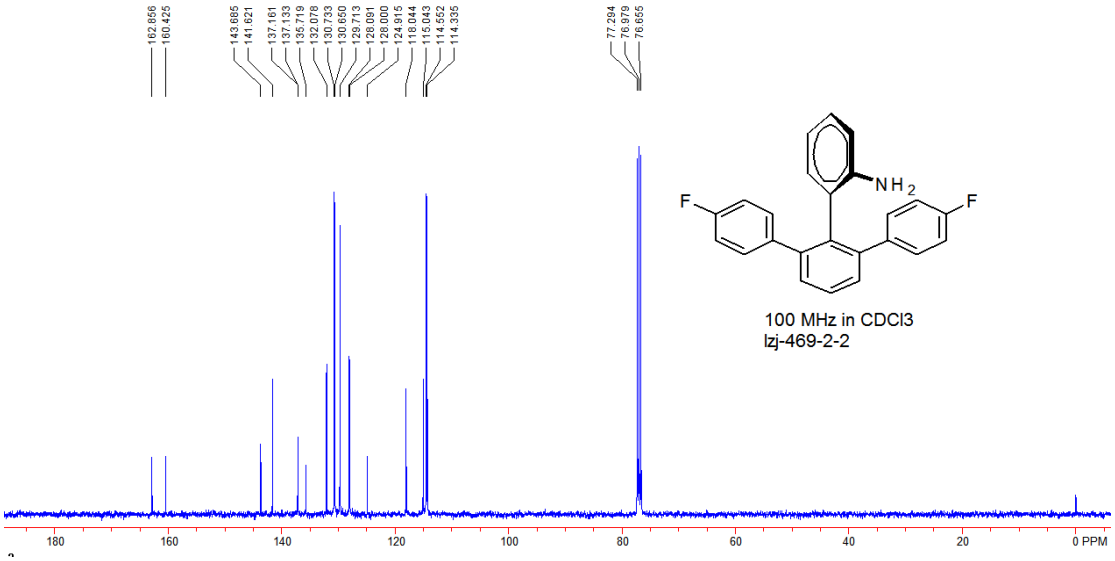
2', 6'-di(4-methoxyphenyl)biphenyl-2-amine (4c)



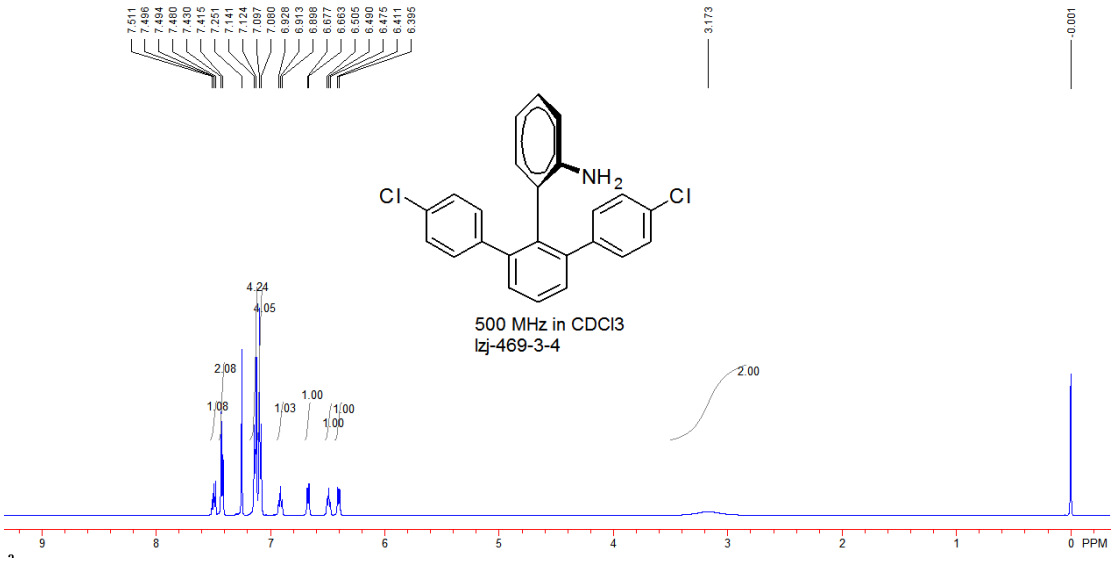


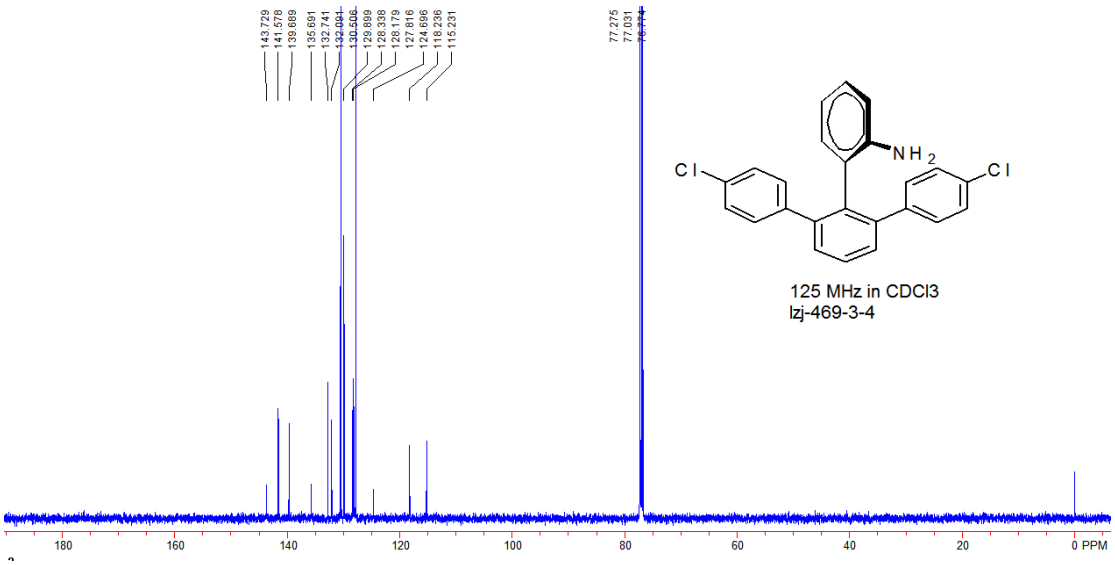
2', 6'-di(4-fluorophenyl)biphenyl-2-amine (4d)



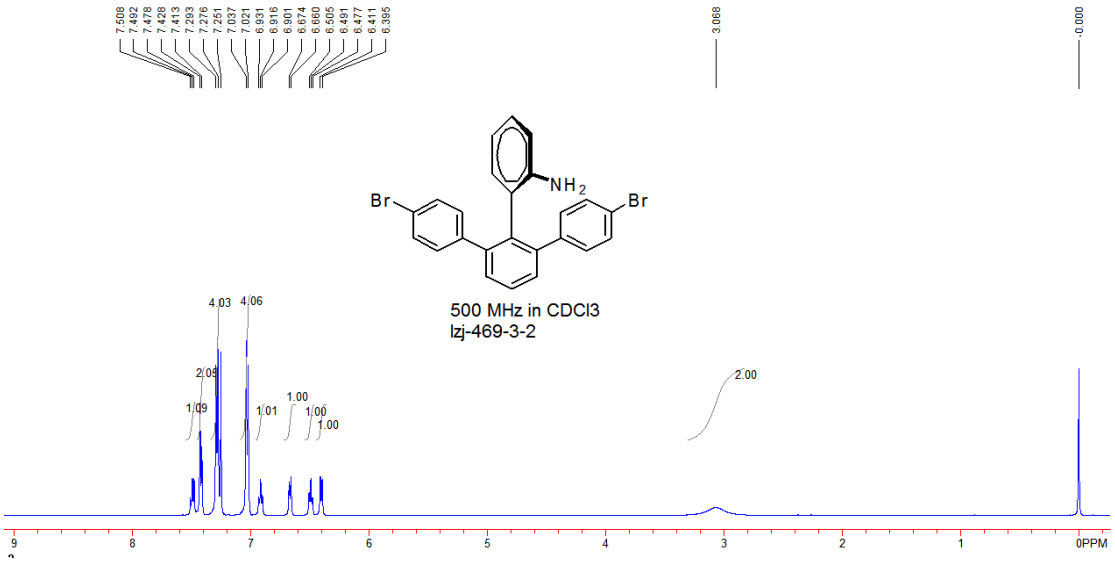


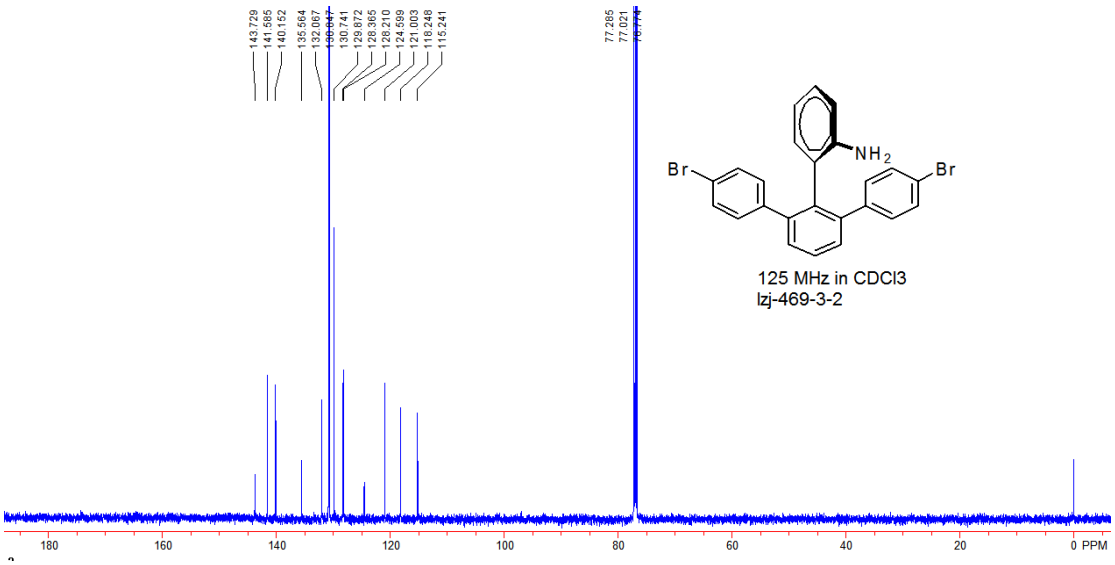
2', 6'-di(4-chlorophenyl)biphenyl-2-amine (4e)



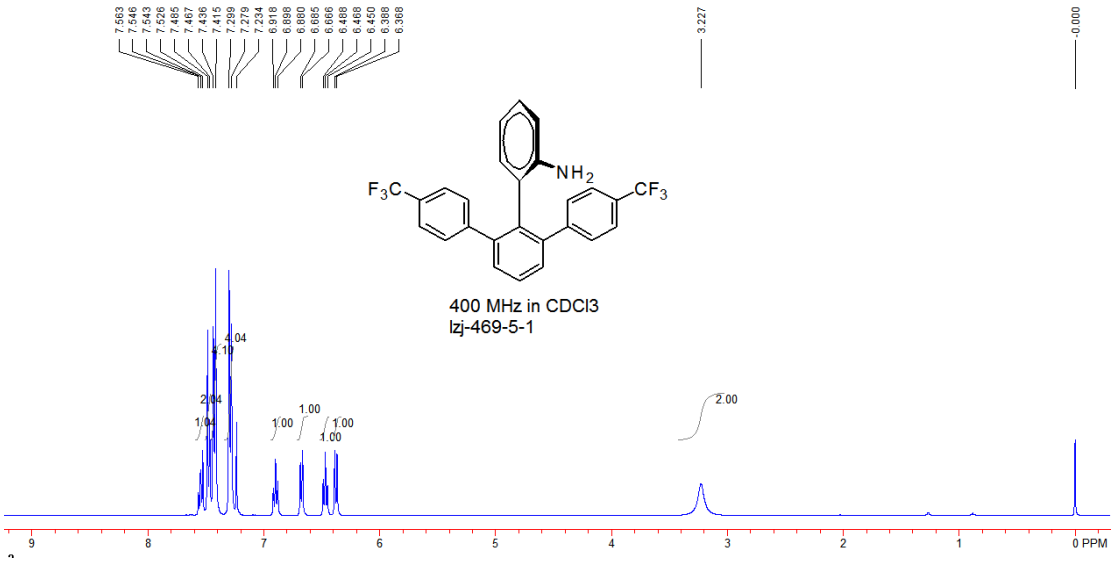


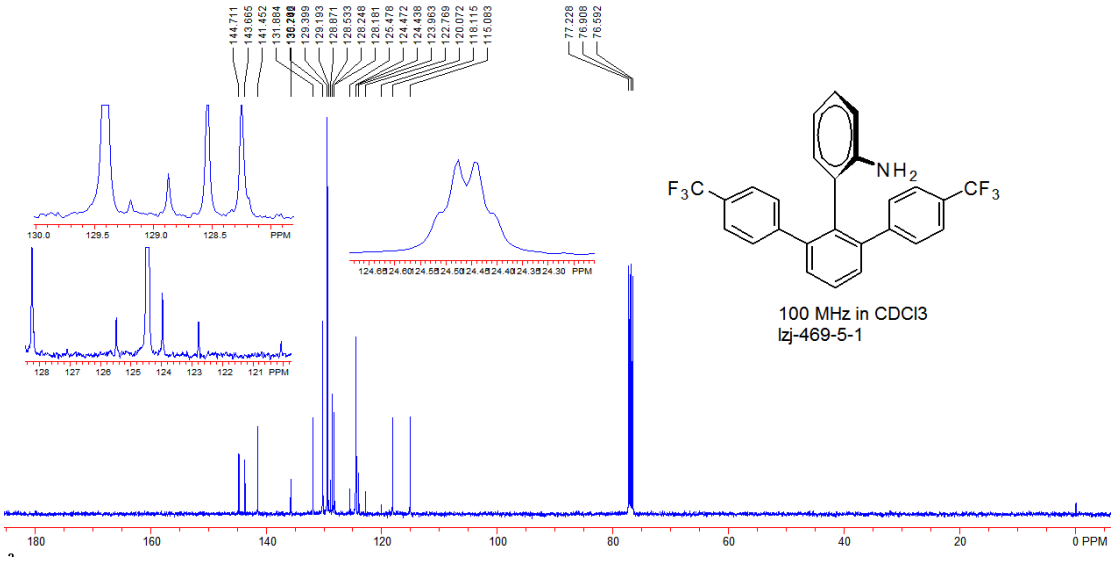
2', 6'-di(4-bromophenyl)biphenyl-2-amine (4f)



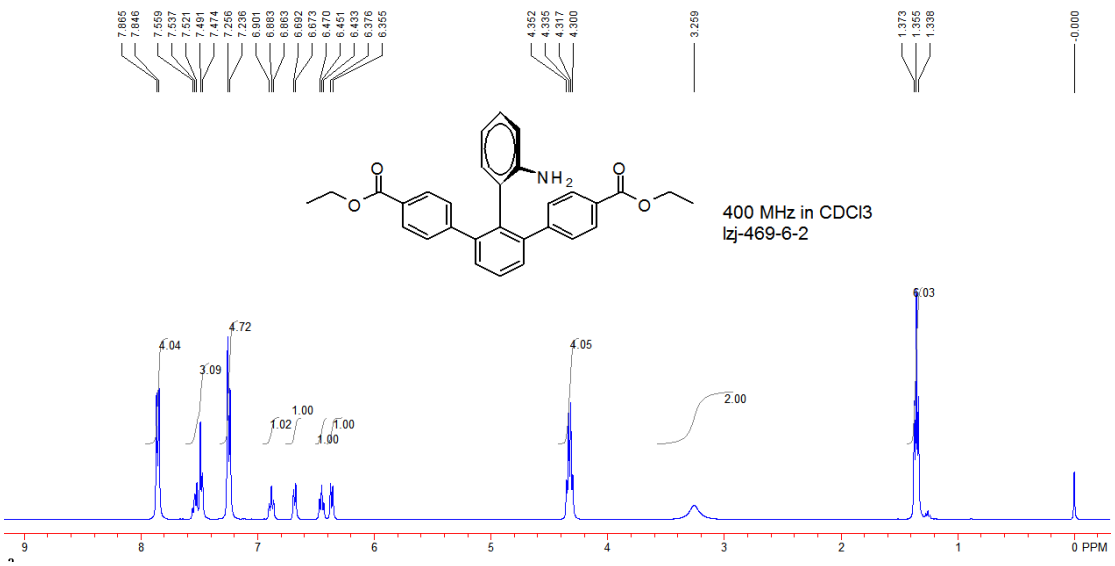


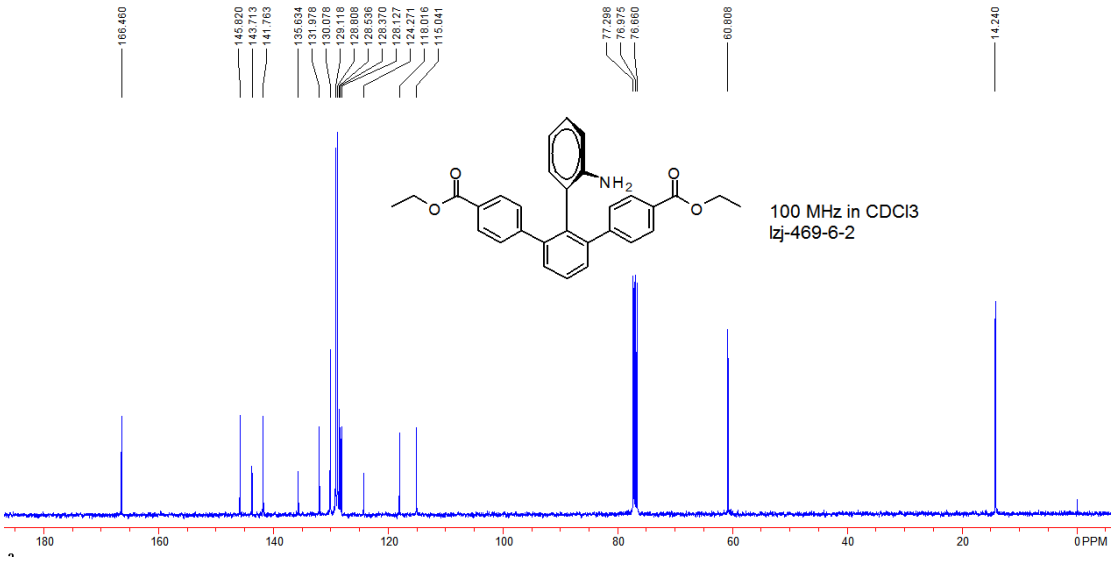
2', 6'-di(4-trifluoromethylphenyl)biphenyl-2-amine (4g)



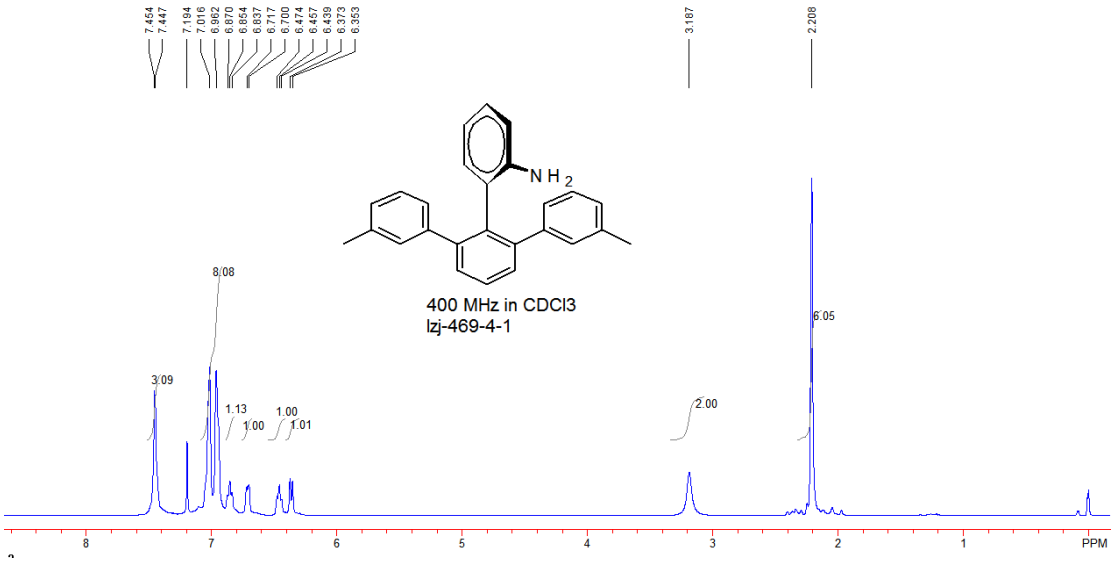


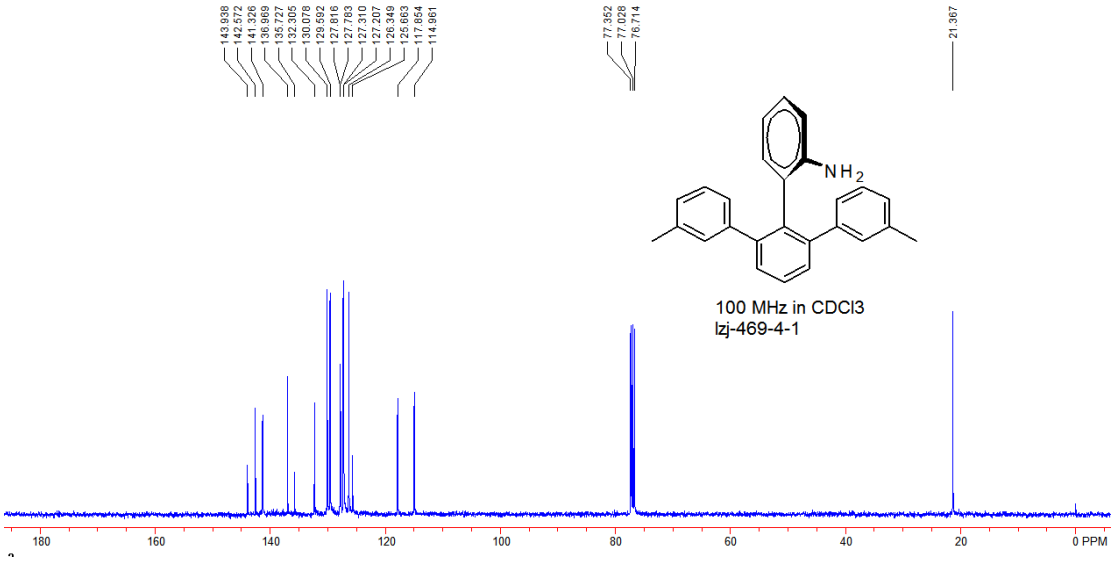
ethyl 2'-(2-aminophenyl)-3'-(4-ethoxycarbonylphenyl)-biphenyl-4-carboxylate (4h)



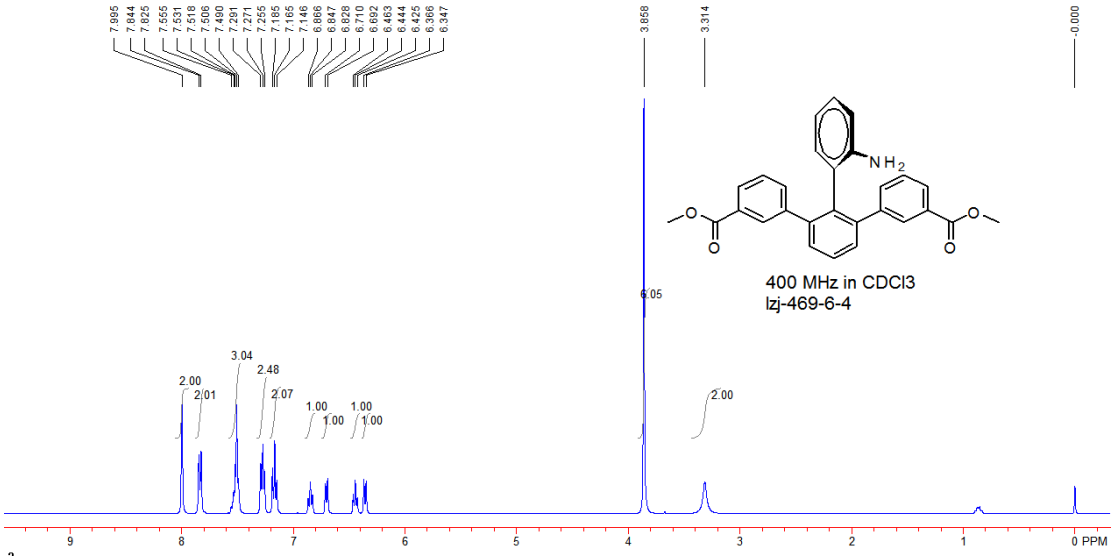


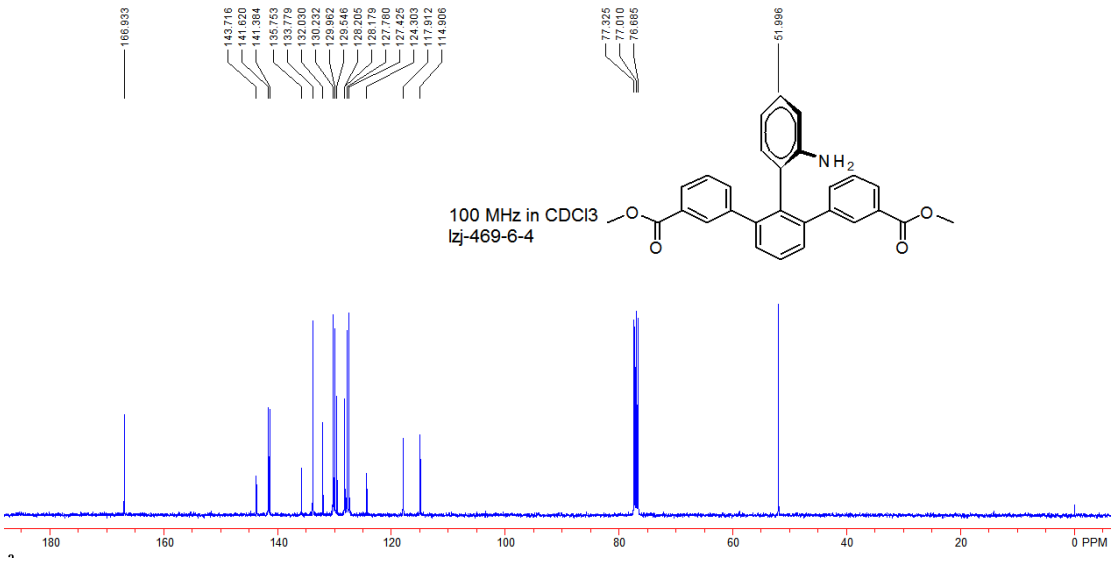
2', 6'-di(3-methylphenyl)biphenyl-2-amine (4i)



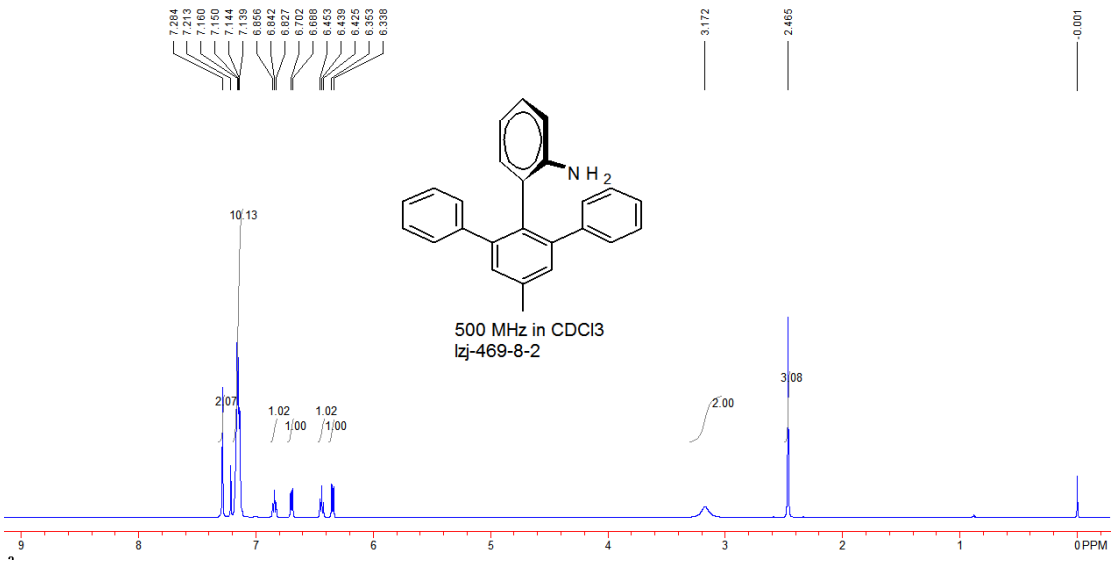


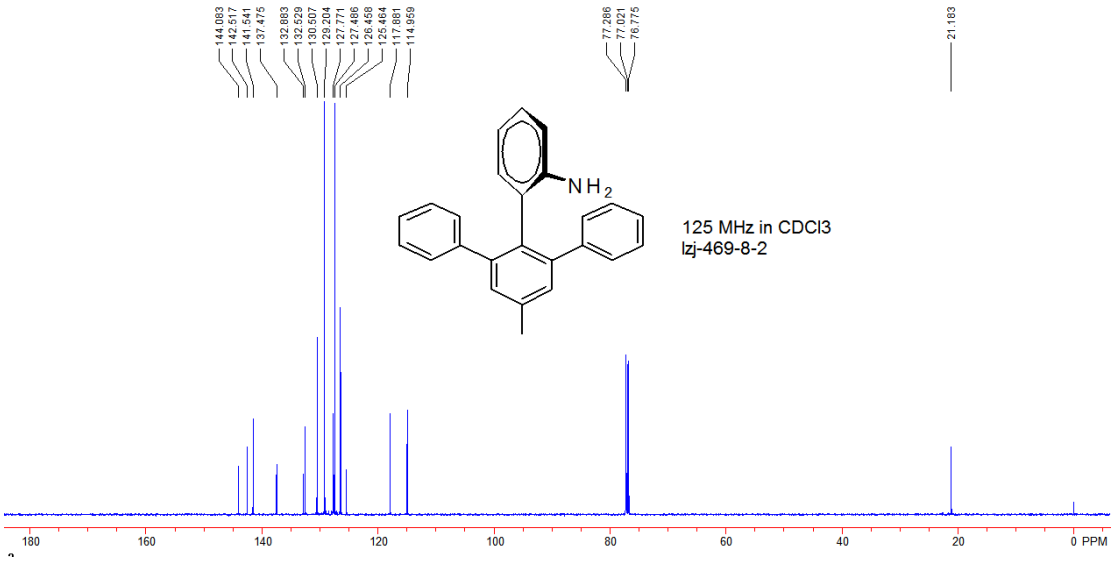
Methyl 2'-(2-aminophenyl)-3'-(3-methoxycarbonylphenyl)-biphenyl-3-carboxylate (4j)



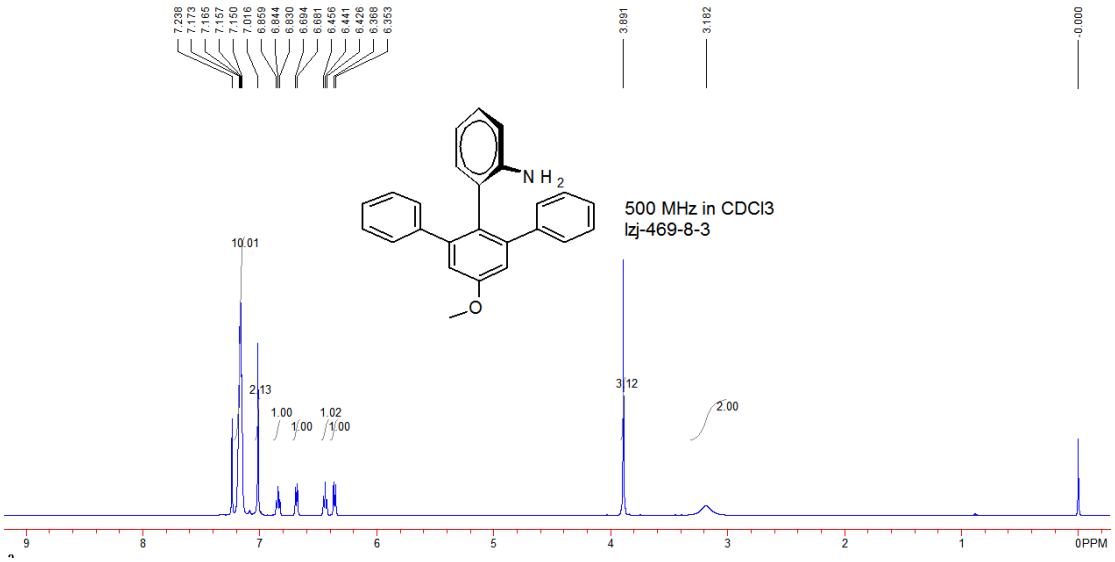


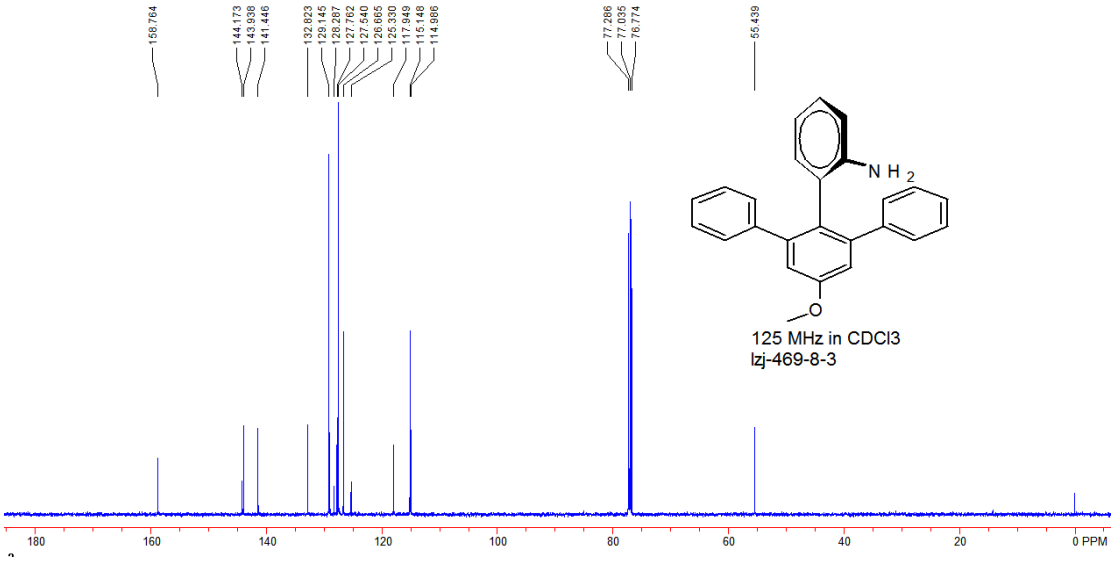
4'-methyl-2', 6'-diphenylbiphenyl-2-amine (4k)



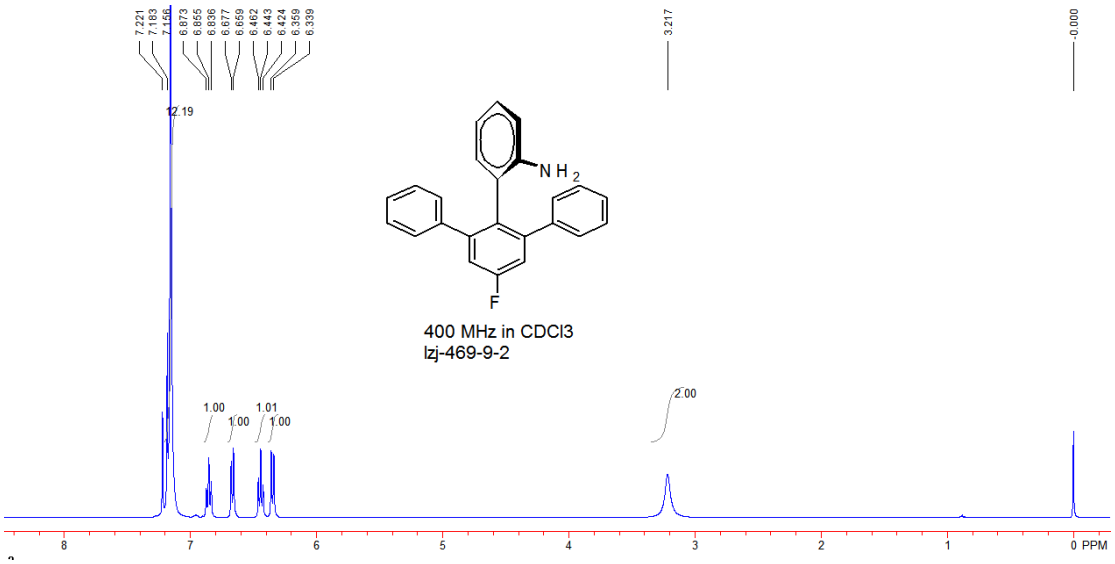


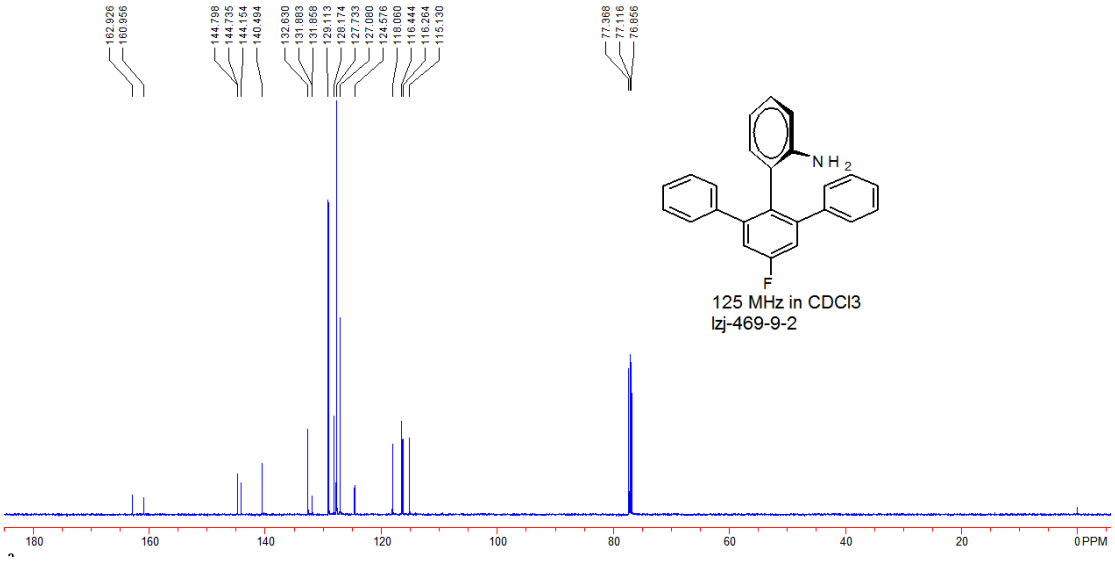
4'-methoxy-2', 6'-diphenylbiphenyl-2-amine (4l)



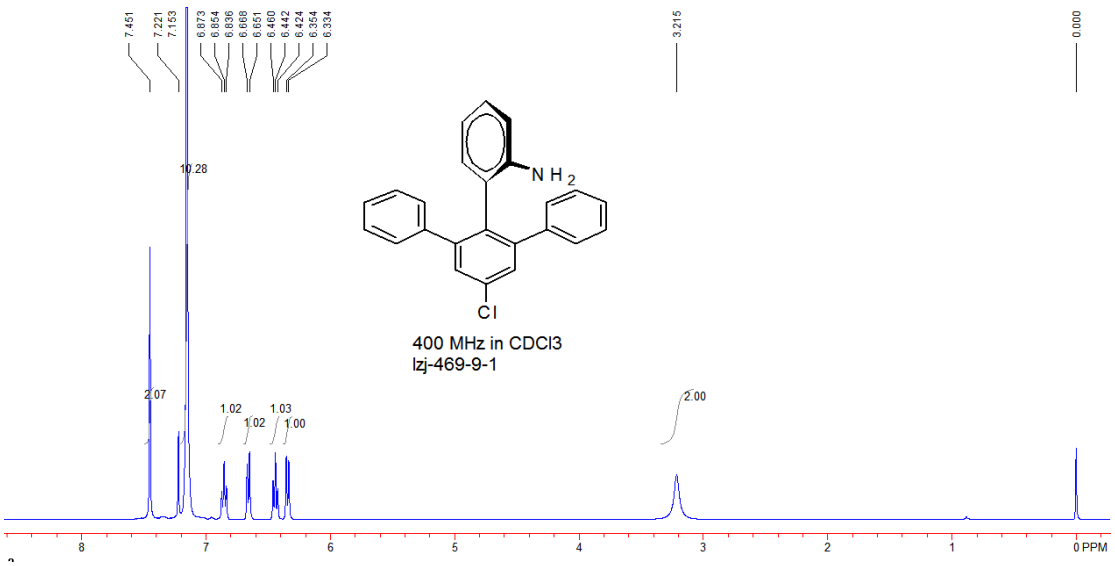


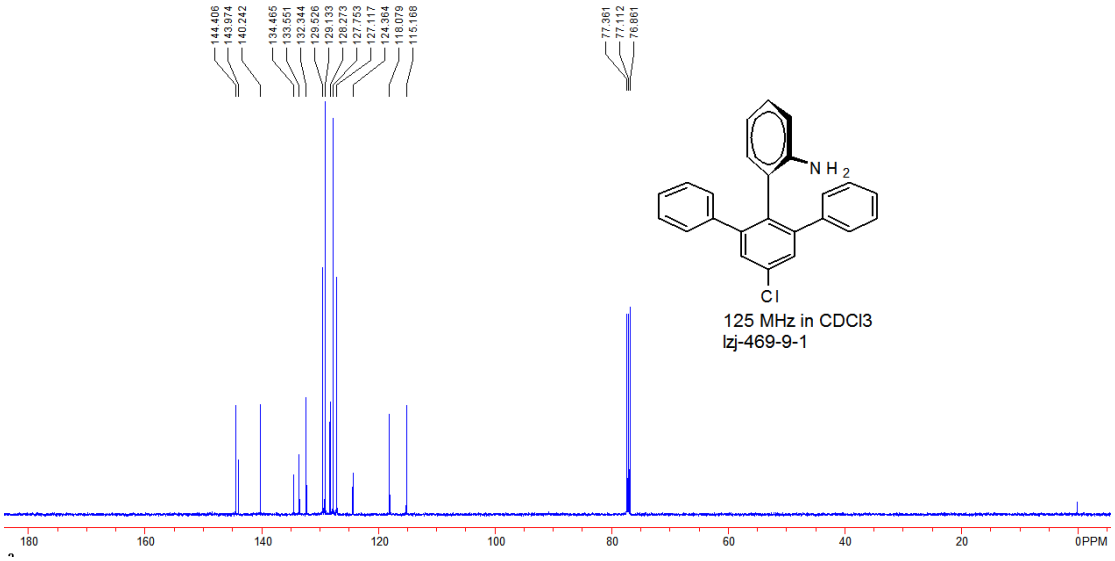
4'-fluoro-2', 6'-diphenylbiphenyl-2-amine (4m)



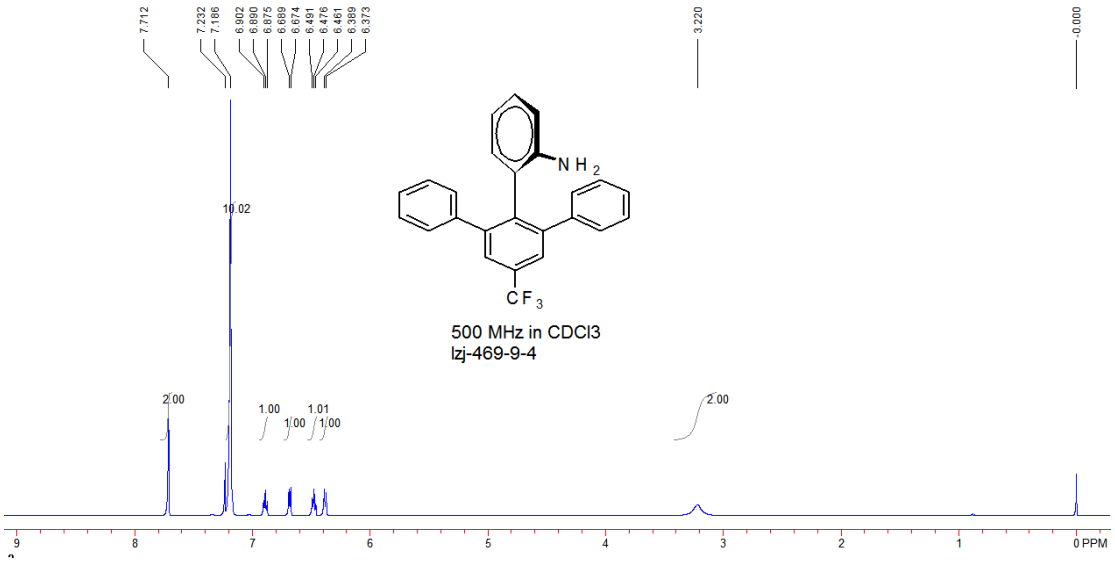


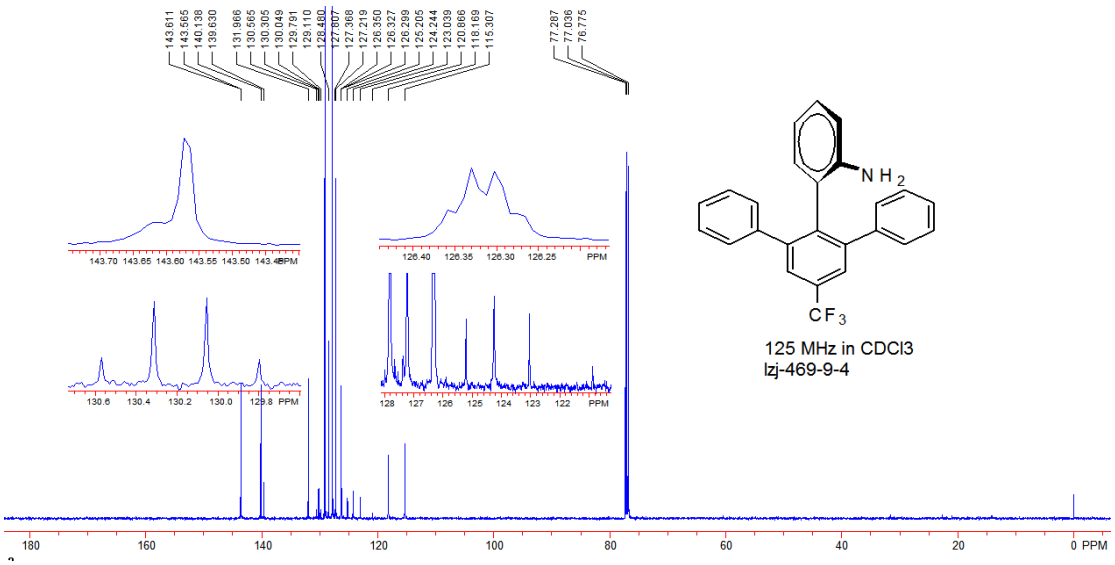
4'-chloro-2', 6'-diphenylbiphenyl-2-amine (4n)



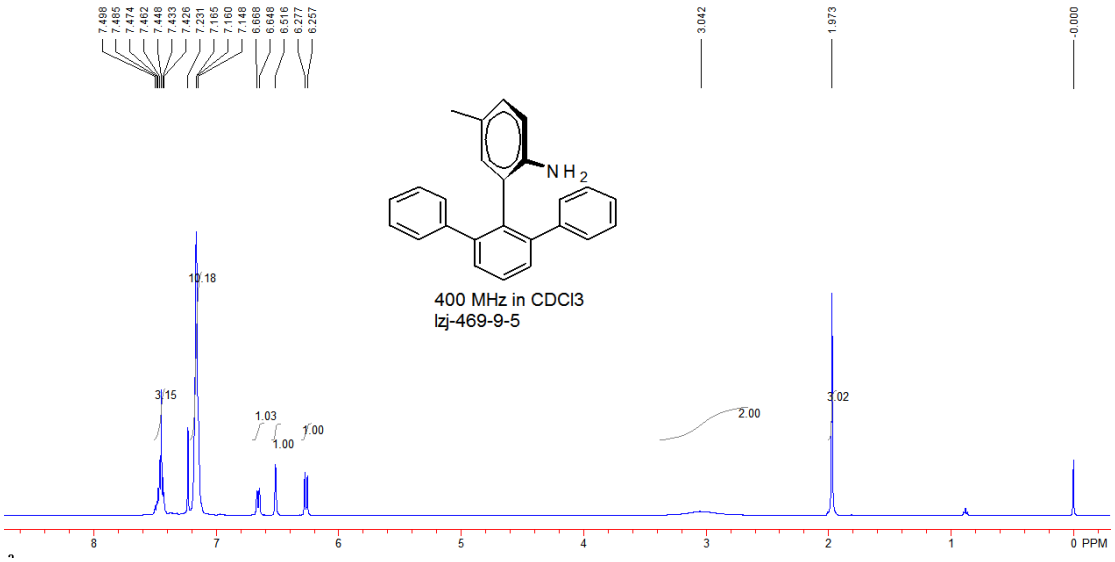


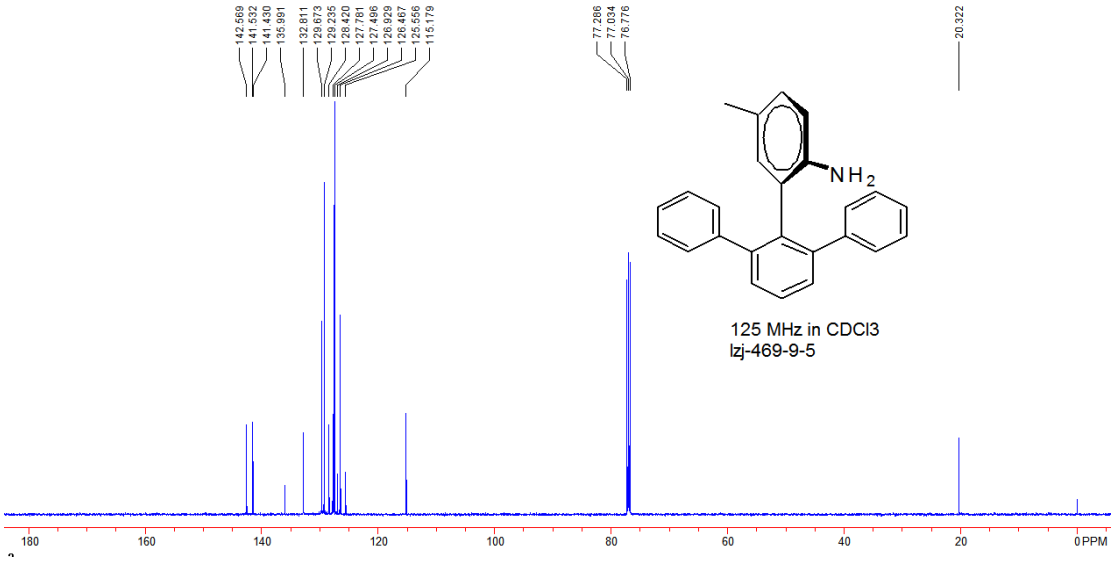
4'-trifluoromethyl-2', 6'-diphenylbiphenyl-2-amine (4o)





5-methyl-2', 6'-diphenylbiphenyl-2-amine (4p)





5-fluoro-2', 6'-diphenylbiphenyl-2-amine (4q)