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Supporting information

Copper immobilized at covalent organic framework: an efficient and recyclable heterogeneous catalyst for Chan−Lam coupling reaction of aryl boronic acids and amines

Yi Han, Mo Zhang, Ya-Qing Zhang, and Zhan-Hui Zhang*

National Demonstration Center for Experimental Chemistry Education, Key Laboratory of Inorganic Nanomaterials of Hebei Province, College of Chemistry and Material Science, Hebei Normal University, Shijiazhuang, 050024, China.

E-mail: zhanhui@mail.nankai.edu.cn; zhanhui@hebtu.edu.cn

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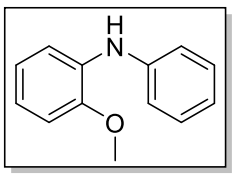
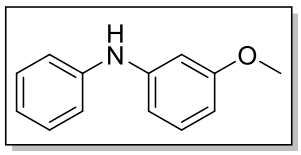
2-Methoxy-*N*-phenylaniline (3a)



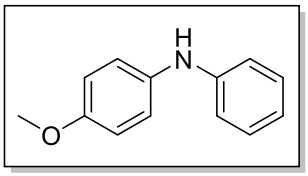
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.41-7.35 (m, 3H), 7.24 (d, 1H, *J* = 7.6 Hz), 7.03 (t, 2H, *J* = 7.2 Hz), 6.98-6.92 (m, 3H), 6.24 (brs, 1H), 3.97 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 148.3, 142.7, 133.0, 129.3, 121.2, 120.9, 119.9, 118.6, 114.7, 110.5, 55.6 ppm; ESI-MS: m/z = 200 $(M+1)^+$.

3-Methoxy-*N*-phenylaniline (3b)



Yellow solid ; ^{1}H NMR (400 MHz, $CDCl_3$): 7.24 (t, 2H, *J* = 7.8 Hz), 7.14 (t, 1H, *J* = 8.2 Hz), 7.06 (d, 2H, *J* = 8.0 Hz), 6.92 (t, 1H, *J* = 7.2 Hz), 6.62 (d, 2H, *J* = 7.6 Hz), 6.46 (s, 1H), 5.64 (brs, 1H), 3.74 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 160.8, 144.7, 142.9, 130.2, 129.4, 121.3, 118.4, 110.3, 106.2, 103.3, 55.3 ppm; ESI-MS: m/z = 200 $(M+1)^+$.

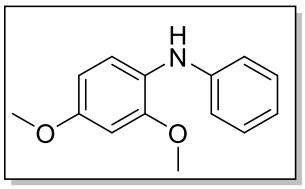
4-Methoxy-*N*-phenylaniline (3c)



Yellow solid; ^{1}H NMR (500 MHz, $CDCl_3$):7.21 (t, 2H, *J* = 7.5 Hz), 7.07 (d, 2H, *J* = 7.0 Hz), 6.91 (d, 2H, *J* = 7.5 Hz), 6.87-6.83 (m, 3H), 5.54 (brs, 1H), 3.80 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$) : 155.3, 145.2, 135.7, 129.3, 122.2, 119.6, 115.6, 114.7, 55.6 ppm; ESI-MS: m/z = 200 $(M+1)^+$.

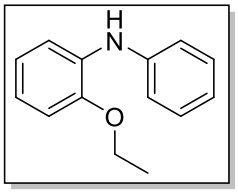
2,4-Dimethoxy-*N*-phenylaniline (3d)

Colorless liquid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.29-7.25 (m, 3H), 7.04 (d, 2H, *J* = 6.0 Hz), 6.89 (t, 1H, *J* = 5.8 Hz), 6.58 (d, 1H, *J* = 2.0 Hz), 6.49 (dd, 1H, *J* =



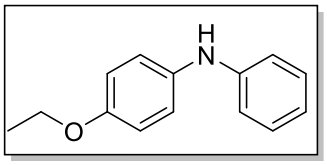
8.8, 2.8 Hz), 5.80 (brs, 1H), 3.88 (s, 3H), 3.85 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 155.1, 151.1, 144.6, 129.3, 125.7, 119.9, 118.9, 116.4, 103.7, 99.5, 55.68, 55.66 ppm; ESI-MS: m/z = 230 $(M+1)^+$.

2-Ethoxy-*N*-phenylaniline (3e)



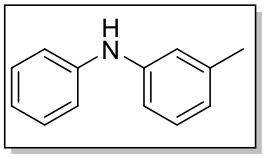
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.30-7.22 (m, 3H), 7.13 (d, 2H, *J* = 7.6 Hz), 6.91 (t, 1H, *J* = 7.2 Hz), 6.86-6.79 (m, 3H), 6.16 (brs, 1H), 4.03 (q, 2H, *J* = 6.8 Hz), 1.40 (t, 3H, *J* = 7.0 Hz) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 147.6, 142.9, 133.2, 129.4, 121.3, 120.8, 120.0, 118.8, 114.7, 111.7, 64.1, 15.2 ppm; ESI-MS: m/z = 214 $(M+1)^+$.

4-Ehoxy-*N*-phenylaniline (3f)



Yellow solid ; ^{1}H NMR (400 MHz, $CDCl_3$): 7.19 (t, 2H, *J* = 7.6 Hz), 7.03 (d, 2H, *J* = 8.8 Hz), 6.88 (d, 2H, *J* = 8.4 Hz), 6.84-6.79 (m, 3H), 5.46 (brs, 1H), 3.99 (q, 2H, *J* = 6.8 Hz), 1.39 (t, 3H, *J* = 6.8 Hz) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 154.7, 145.3, 135.7, 129.4, 122.3, 119.6, 115.7, 115.4, 63.9, 15.1 ppm; ESI-MS: m/z = 214 $(M+1)^+$.

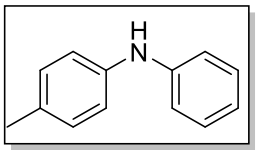
3-Methyl-*N*-phenylaniline (3g)



Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.25 (t, 2H, *J* = 8.0 Hz), 7.14 (t, 1H, *J* = 8.0 Hz), 7.05 (d, 2H, *J* = 7.6 Hz), 6.93-6.87 (m, 3H), 6.74 (d, 1H, *J* = 7.2 Hz), 5.63 (brs, 1H), 2.30 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 143.3, 143.1, 139.3, 129.4, 129.2, 121.9, 120.9,

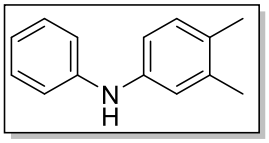
118.5, 117.9, 114.9, 21.6 ppm; ESI-MS: m/z = 184 $(M+1)^+$.

4-Methyl-*N*-phenylaniline (3h)



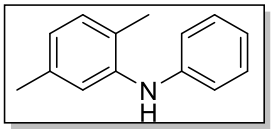
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.25-7.22 (m, 2H), 7.08 (d, 2H, *J* = 8.0 Hz), 7.02-6.99 (m, 4H), 6.87 (t, 1H, *J* = 7.2 Hz), 5.67 (brs, 1H), 2.30 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 142.8, 139.2, 129.9, 128.8, 128.3, 119.2, 117.8, 115.8, 19.7 ppm; ESI-MS: m/z = 184 $(M+1)^+$.

3,4-Dimethyl-*N*-phenylaniline (3i)



Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.21 (t, 2H, *J* = 7.8 Hz), 7.02-6.97 (m, 3H), 6.86-6.81 (m, 3H), 5.51 (brs, 1H), 2.20 (s, 3H), 2.19 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 144.1, 140.7, 137.7, 130.5, 129.8, 129.4, 120.4, 120.3, 116.9, 116.3, 20.1, 19.2 ppm; ESI-MS: m/z = 198 $(M+1)^+$.

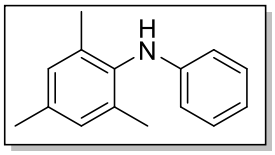
2,5-Dimethyl-*N*-phenylaniline (3j)



Yellow liquid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.22 (t, 2H, *J* = 7.8 Hz), 7.06 (d, 2H, *J* = 8.0 Hz), 6.93-6.85 (m, 3H), 6.74 (d, 1H, *J* = 7.6 Hz), 5.29 (brs, 1H), 2.25 (s, 3H), 2.18 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 144.2, 141.1, 136.6, 130.9, 129.4, 125.4, 122.9, 120.4, 119.7, 117.5, 21.3, 17.6 ppm; ESI-MS: m/z = 198 $(M+1)^+$.

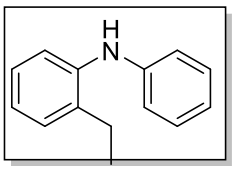
2,4,6-Trimethyl-*N*-phenylaniline (3k)

Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.12 (t, 2H, *J* = 7.8 Hz), 6.93 (s, 2H), 6.71 (t, 1H, *J* = 7.2 Hz), 6.47 (d, 2H, *J* = 8.0 Hz), 5.06 (brs, 1H), 2.29 (s, 3H),



2.16 (s, 6H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$) : 146.7, 136.0, 135.6, 135.5, 129.3, 117.9, 113.3, 21.0, 18.4 ppm; ESI-MS: m/z = 212 $(M+1)^+$.

2-Ethyl-*N*-phenylaniline (3l)

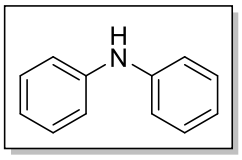


Brown liquid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.25-7.20 (m, 4H), 7.12 (t, 1H, *J* = 7.8 Hz), 6.98 (t, 1H, *J* = 7.8 Hz), 6.91 (d, 2H, *J* = 7.6 Hz), 6.86 (t, 1H, *J* = 7.6 Hz), 5.37 (brs, 1H), 2.60 (q, 2H, *J* = 7.6 Hz), 1.23 (t, 3H, *J* = 7.6 Hz) ppm. ^{13}C NMR (100 MHz, $CDCl_3$) : 144.6, 140.6, 134.8, 129.4, 129.1, 126.8, 122.7, 120.3, 120.1, 117.2, 24.4, 14.0 ppm; ESI-MS: m/z = 198 $(M+1)^+$.

4-(*tert*-Butyl)-*N*-phenylaniline (3m)

White solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.28 (d, 2H, *J* = 8.4 Hz), 7.23 (t, 2H, *J* = 8.0 Hz), 7.05-7.01 (m, 4H), 6.87 (t, 1H, *J* = 7.8 Hz), 5.60 (brs, 1H), 1.30 (s, 9H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 144.2, 143.8, 140.4, 129.4, 126.2, 120.5, 118.2, 117.2, 34.3, 31.6 ppm; ESI-MS: m/z = 226 $(M+1)^+$.

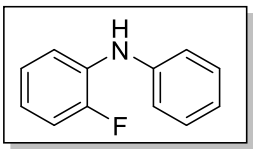
Diphenylamine (3n)



White solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.26-7.23 (m, 4H), 7.05 (d, 2H, *J* = 8.4 Hz), 6.92 (t, 2H, *J* = 7.4 Hz), 5.69 (br, s, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 143.1, 129.4, 121.1, 117.8 ppm; ESI-MS: m/z = 170 $(M+1)^+$.

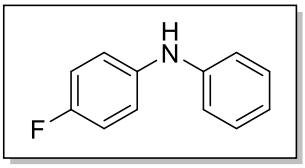
2-Fluoro-*N*-phenylaniline (3o)

Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.41-7.35 (m, 3H), 7.20-7.04 (m,



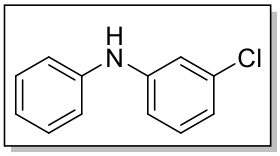
5H), 6.94-6.88 (m, 1H), 5.85 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 153.0 (d, J_{CF} = 239.5 Hz), 142.0, 129.5, 124.3(d, J_{CF} =3.5 Hz), 121.9, 120.5 (d, J_{CF} = 7.2 Hz), 118.7, 117.1, 115.5 (d, J_{CF} =19.0 Hz) ppm; ESI-MS: m/z = 188 $(M+1)^+$.

4-Fluoro-*N*-phenylaniline (3p)



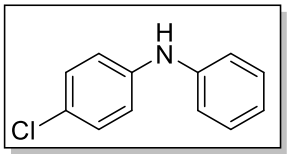
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.24 (t, 2H, *J* = 7.8 Hz), 7.04-7.01 (m, 2H), 6.98-6.94 (m, 4H), 6.89 (t, 1H, *J* = 7.4 Hz), 5.54 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 158.1 (d, J_{CF} = 238.7 Hz), 144.0, 139.0, 129.5, 120.6, 120.5, 116.8, 116.0 (d, J_{CF} = 22.3 Hz) ppm; ESI-MS: m/z = 188 $(M+1)^+$.

3-Chloro-*N*-phenylaniline (3q)



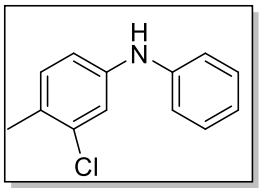
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.30 (t, 2H, *J* = 7.8 Hz), 7.15 (t, 1H, *J* = 8.0 Hz), 7.09 (d, 2H, *J* = 7.6 Hz), 7.04 (s, 1H), 6.99 (t, 1H, *J* = 7.2 Hz), 6.90-6.85 (m, 2H), 5.71 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 144.8, 141.9, 135.0, 130.4, 129.5, 122.1, 120.5, 119.0, 116.6, 115.1 ppm; ESI-MS: m/z = 204 $(M+1)^+$.

4-Chloro-*N*-phenylaniline (3r)



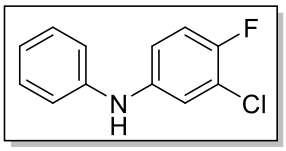
Yellow solid ; ^{1}H NMR (400 MHz, $CDCl_3$): 7.26 (t, 2H, *J* = 8.0 Hz), 7.18 (d, 2H, *J* = 8.8 Hz), 7.02 (d, 2H, *J* = 7.6 Hz), 6.97-6.92 (m, 3H), 5.63 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 142.7, 141.9, 129.5, 129.3, 125.5, 121.6, 118.8, 118.1 ppm; ESI-MS: m/z = 204 $(M+1)^+$.

3-Chloro-4-methyl-*N*-phenylaniline (3s)



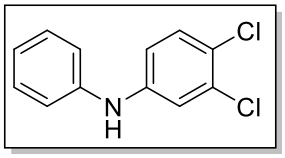
Brown solid ; ^{1}H NMR (400 MHz, $CDCl_3$): 7.25 (t, 2H, *J* = 8.0 Hz), 7.06 (d, 2H, *J* = 8.8 Hz), 7.0 (d, 2H, *J* = 7.6 Hz), 6.92 (t, 1H, *J* = 7.4 Hz), 6.83 (dd, 1H, *J* = 8.0, 2.4 Hz), 5.56 (brs, 1H), 2.29 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 142.8, 142.2, 134.8, 131.4, 129.5, 128.2, 121.4, 118.2, 117.9, 116.5, 19.3 ppm; ESI-MS: m/z = 218 $(M+1)^+$.

3-Chloro-4-fluoro-*N*-phenylaniline (3t)



Brown liquid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.26 (t, 2H, *J* = 8.0 Hz), 7.07 (dd, 1H, *J* = 6.4, 2.8 Hz), 7.02-6.93 (m, 4H), 6.87-6.83 (m, 1H), 5.55 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 153.0 (d, J_{CF} = 240.6 Hz), 142.8, 140.2, 129.7, 121.7, 119.6, 118.0, 117.7, 117.6, 117.1 (d, J_{CF} = 21.9 Hz) ppm; ESI-MS: m/z = 222 $(M+1)^+$.

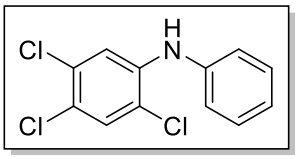
3,4-Dichloro-*N*-phenylaniline (3u)



Yellow solid ; ^{1}H NMR (400 MHz, $CDCl_3$): 7.32-7.23 (m, 3H), 7.10 (d, 1H, *J* = 2.8 Hz), 7.06-6.99 (m, 3H), 6.83 (dd, 1H, *J* = 8.4, 2.8 Hz), 5.67 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 143.3, 141.6, 133.0, 130.8, 129.6, 123.0, 122.5, 119.2, 118.1, 116.4 ppm; ESI-MS: m/z = 238 $(M+1)^+$.

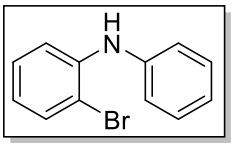
2,4,5-Trichloro-*N*-phenylaniline (3v)

Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.42 (s, 1H), 7.37 (t, 2H, *J* = 7.8 Hz), 7.25 (s, 1H), 7.17-7.11 (m, 3H), 6.07 (brs, 1H) ppm. ^{13}C NMR (100 MHz,



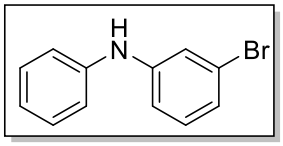
$CDCl_3$): 141.8, 141.7, 131.3, 130.7, 129.9, 123.2, 121.4, 121.2, 120.9, 117.4 ppm; ESI-MS: m/z = 273 $(M+1)^+$.

2-Bromo-*N*-phenylaniline (3w)



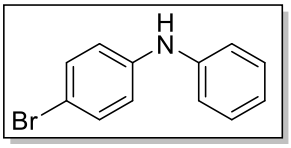
Brown solid; ^1H NMR (400 MHz, $CDCl_3$): 7.53-7.51 (m, 1H), 7.32 (t, 2H, *J* = 7.8 Hz), 7.26-7.24 (m, 1H), 7.17-7.14 (m, 3H), 7.04 (t, 1H, *J* = 7.4 Hz), 6.75-6.71 (m, 1H), 6.08 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 141.6, 141.5, 133.1, 129.5, 128.2, 122.8, 121.0, 120.3, 115.8, 112.2 ppm; ESI-MS: m/z = 249 $(M+1)^+$.

3-Bromo-*N*-phenylaniline (3x)



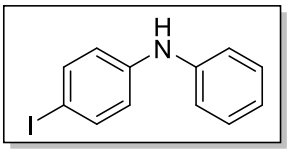
Brown liquid; ^1H NMR (400 MHz, $CDCl_3$): 7.27 (t, 2H, *J* = 8.0 Hz), 7.15 (s, 1H), 7.08-7.04 (m, 3H), 6.97 (t, 2H, *J* = 7.4 Hz), 6.91-6.89 (m, 1H), 5.66 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 145.0, 141.9, 130.7, 129.6, 123.4, 123.2, 122.2, 119.6, 119.0, 115.6 ppm; ESI-MS: m/z = 249 $(M+1)^+$.

4-Bromo-*N*-phenylaniline (3y)



Yellow solid; ^1H NMR (400 MHz, $CDCl_3$): 7.39 (d, 2H, *J* = 8.8 Hz), 7.35-7.30 (m, 2H), 7.11 (d, 2H, *J* = 7.6 Hz), 7.04-6.98 (m, 3H), 5.73 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 142.4, 132.2, 129.5, 123.2, 121.7, 119.0, 118.3, 112.6 ppm; ESI-MS: m/z = 249 $(M+1)^+$.

4-Iodo-*N*-phenylaniline (3z)

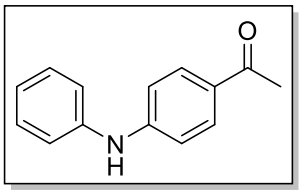


Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.58 (d, 2H, *J* = 8.8 Hz), 7.6 (t, 2H, *J* = 8.0 Hz), 7.13 (d, 2H, *J* = 8.0 Hz), 7.05 (t, 1H, *J* = 7.4 Hz), 6.89 (d, 2H, *J* = 8.8 Hz), 5.74 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 143.4, 142.2, 138.1, 129.5, 121.9, 119.3, 118.6, 82.2 ppm; ESI-MS: m/z = 296 $(M+1)^+$.

***N*-Phenyl-3-(trifluoromethyl)aniline (3aa)**

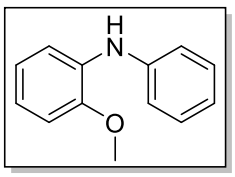
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.32-7.28 (m, 3H), 7.24 (s, 1H), 7.15 (d, 1H, *J* = 8.4 Hz), 7.12-7.07 (m, 3H), 7.00 (t, 1H, *J* = 7.4 Hz), 5.77 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$):144.1, 141.8, 131.8(q, J_{CF} = 31.8 Hz), 129.9, 129.6, 124.2 (q, J_{CF} = 270.9 Hz), 122.4, 119.8, 119.0, 116.9 (q, J_{CF} = 3.7 Hz), 113.2 (q, J_{CF} = 3.8 Hz) ppm; ESI-MS: m/z = 238 $(M+1)^+$.

1-(4-(Phenylamino)phenyl)ethan-1-one (3ab)



Yellow solid ; ^{1}H NMR (400 MHz, $CDCl_3$): 7.92 (d, 2H, *J* = 8.8 Hz), 7.41-7.37 (m, 2H), 7.23 (d, 2H, *J* = 8.4 Hz), 7.15-7.11 (m, 1H), 7.04 (d, 2H, *J* = 8.4 Hz), 6.16 (brs, 1H), 2.58 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 196.4, 148.3, 140.6, 130.7, 129.6, 129.0, 123.4, 120.7, 114.4, 26.2 ppm; ESI-MS: m/z = 212 $(M+1)^+$.

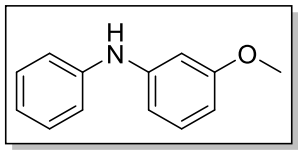
2-Methoxy-*N*-phenylaniline (3ad)



Yellow solid; ^{1}H NMR (400 MHz, DMSO-d_6): 7.20 (brs, 1H), 7.18 (t, 3H, *J* = 8.0 Hz), 7.05-6.98 (m, 3H), 6.90-6.84 (m, 2H), 6.78 (t, 1H, *J* = 7.2 Hz), 3.81 (s, 3H) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 150.1, 144.3, 132.6, 129.4, 121.4, 121.0, 119.8, 117.4, 117.3,

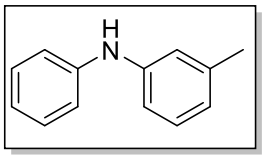
112.0, 55.9 ppm; ESI-MS: m/z = 200 $(M+1)^+$.

3-Methoxy-*N*-phenylaniline (3ae)



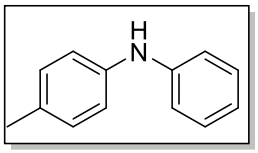
Yellow solid ; ^{1}H NMR (400 MHz, DMSO-d_6): 8.12 (brs, 1H), 7.23 (t, 2H, J = 7.8 Hz), 7.14-7.07 (m, 3H), 6.83 (t, 1H, J = 7.2 Hz), 6.67-6.60 (m, 2H), 6.41-6.39 (m, 1H), 3.71 (s, 3H) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 160.7, 145.3, 143.7, 130.3, 129.6, 120.3, 117.7, 109.6, 105.6, 102.7, 55.3 ppm; ESI-MS: m/z = 200 $(M+1)^+$.

3-Methyl-*N*-phenylaniline (3af)



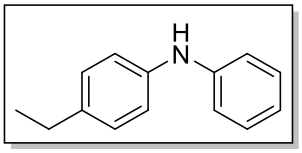
Yellow solid; ^{1}H NMR (400 MHz, DMSO-d_6): 8.02 (brs, 1H), 7.21 (t, 2H, J = 7.8 Hz), 7.12-7.05 (m, 3H), 6.88-6.78 (m, 3H), 6.63 (d, 1H, J = 3.8 Hz), 3.31 (s, 1H) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 144.0, 143.9, 138.7, 129.6, 129.4, 120.9, 119.9, 117.8, 117.3, 114.5, 21.7 ppm; ESI-MS: m/z = 184 $(M+1)^+$.

4-Methyl-*N*-phenylaniline (3ag)



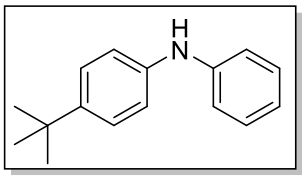
Yellow solid; ^{1}H NMR (400 MHz, DMSO-d_6): 7.94 (brs, 1H), 7.18 (t, 2H, J = 8.0 Hz), 7.05-6.97 (m, 6H), 6.76 (t, 1H, J = 7.2 Hz), 2.22 (s, 3H) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 144.6, 141.2, 130.0, 129.5, 129.2, 119.5, 118.1, 116.4, 20.7 ppm; ESI-MS: m/z = 184 $(M+1)^+$.

4-Ethyl-*N*-phenylaniline (3ah)



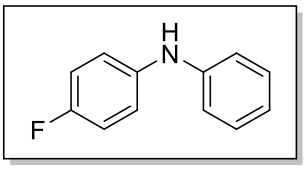
Yellow solid; ^{1}H NMR (400 MHz, DMSO-d_6): 7.96 (brs, 1H), 7.18 (t, 2H, J = 7.8 Hz), 7.07-6.98 (m, 6H), 6.76 (t, 1H, J = 7.2 Hz), 2.52 (q, 2H, J = 7.2 Hz), 1.15 (t, 3H, J = 7.6 Hz) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 144.6, 141.4, 135.8, 129.5, 128.8, 119.5, 118.0, 116.5, 27.9, 16.3 ppm; ESI-MS: m/z = 198 $(M+1)^+$.

4-(*tert*-butyl)-*N*-phenylaniline (3ai)



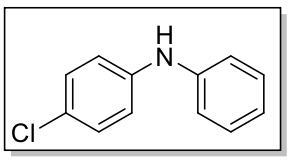
White solid; ^{1}H NMR (400 MHz, DMSO-d_6): 8.00 (brs, 1H), 7.28 (d, 2H, J = 8.4 Hz), 7.22 (t, 2H, J = 7.8 Hz), 7.07-7.03 (m, 4H), 6.79 (t, 1H, J = 7.2 Hz), 1.29 (s, 9H) ppm. ^{13}C NMR (100 MHz, DMSO-d_6) : 144.5, 142.7, 141.2, 129.5, 126.2, 119.5, 117.6, 116.5, 34.2, 31.8 ppm; ESI-MS: m/z = 226 $(M+1)^+$.

4-Fluoro-*N*-phenylaniline (3aj)



Yellow solid; ^{1}H NMR (400 MHz, DMSO-d_6): 8.04 (brs, 1H), 7.21 (t, 2H, J = 7.8 Hz), 7.07 (d, 4H, J = 6.8 Hz), 6.99 (d, 2H, J = 7.6 Hz), 6.79 (t, 1H, J = 7.4 Hz) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 156.8 (d, J_{CF} = 234.5 Hz), 144.0, 140.2, 129.6, 119.9, 119.4 (d, J_{CF} = 7.6 Hz), 116.5, 116.1 (d, J_{CF} = 22.1 Hz) ppm; ESI-MS: m/z = 188 $(M+1)^+$.

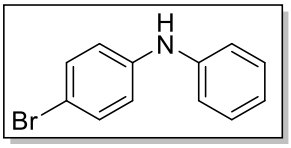
4-Chloro-*N*-phenylaniline (3ak)



Yellow solid ; ^{1}H NMR (400 MHz, DMSO-d_6): 8.25 (brs, 1H), 7.27-7.22 (m, 4H), 7.08-7.04 (m, 4H), 6.86 (d, 1H, J = 7.2 Hz) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 143.3,

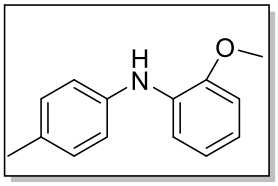
143.1, 129.7, 129.4, 123.1, 120.8, 118.2, 117.8 ppm; ESI-MS: m/z = 204 $(M+1)^+$.

4-Bromo-*N*-phenylaniline (3al)



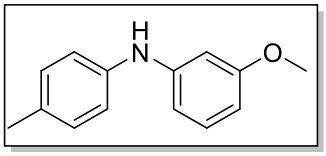
Yellow solid; ^{1}H NMR (400 MHz, DMSO-d_6): 8.29 (s, 1H), 7.38 (d, 2H, *J* = 8.8 Hz), 7.28 (t, 2H, *J* = 8.0 Hz), 7.11-7.02 (m, 4H), 6.90 (t, 1H, *J* = 7.2 Hz) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 143.5, 143.1, 132.2, 129.7, 120.9, 118.6, 117.9, 110.6 ppm; ESI-MS: m/z = 249 $(M+1)^+$.

2-Methoxy-*N*-(*p*-tolyl)aniline (3am)



Brown solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.22-7.20 (m, 1H), 7.11-7.05 (m, 4H), 6.88-6.79 (m, 3H), 6.07 (brs, 1H), 3.89 (s, 3H), 2.31 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 147.8, 139.9, 133.8, 131.1, 129.8, 120.8, 119.7, 119.2, 113.7, 110.3, 55.6, 20.7 ppm. ESI-MS: m/z = 214 $(M+1)^+$.

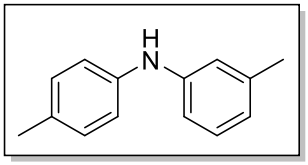
3-Methoxy-*N*-(*p*-tolyl)aniline (3an)



White solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.12 (t, 1H, *J* = 6.6 Hz), 7.08 (d, 2H, *J* = 6.4 Hz), 7.00 (d, 2H, *J* = 6.8 Hz), 6.57 (d, 2H, *J* = 6.8 Hz), 6.43 (s, 1H), 5.62 (brs, 1H), 3.75 (s, 3H), 2.29 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 160.8, 145.5, 140.0, 131.2, 130.1, 129.9, 119.4, 109.4, 105.5, 102.4, 55.2, 20.8 ppm. ESI-MS: m/z = 214 $(M+1)^+$.

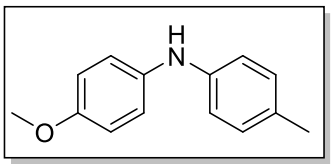
3-Methyl-*N*-(*p*-tolyl)aniline (3ao)

Yellow liquid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.11 (t, 1H, *J* = 6.4 Hz), 7.07 (d, 2H,



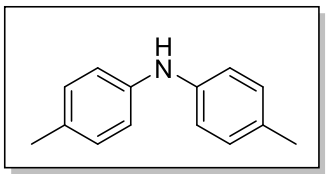
J = 6.8 Hz), 6.98 (d, 2H, *J* = 6.8 Hz), 6.81 (d, 2H, *J* = 7.2 Hz), 6.69 (s, 1H), 5.54 (brs, 1H), 2.29 (s, 3 H), 2.28 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 143.9, 140.4, 139.2, 130.9, 129.9, 129.2, 121.3, 118.9, 117.6, 114.1, 21.6, 20.8 ppm; ESI-MS: m/z = 198 $(M+1)^+$.

4-Methoxy-*N*-(*p*-tolyl)aniline (3ap)



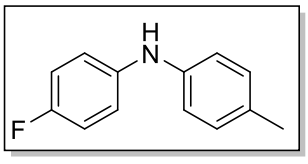
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.02-7.04 (m, 4H), 6.84 (d, 4H, *J* = 8.8 Hz), 5.45 (brs, 1H), 3.79 (s, 3H), 2.28 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 154.8, 142.4, 136.6, 129.9, 129.3, 121.1, 116.5, 114.7, 55.6, 20.6 ppm; ESI-MS: m/z = 214 $(M+1)^+$.

Di-*p*-tolylamine (3aq)



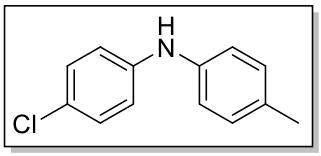
White solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.05-7.02 (m, 4H), 6.96-6.92 (m, 4H), 5.50 (brs, 1H), 2.29 (s, 6H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 141.1, 130.2, 129.9, 117.2, 20.7 ppm; ESI-MS: m/z = 198 $(M+1)^+$.

4-Fluoro-*N*-(*p*-tolyl)aniline (3ar)



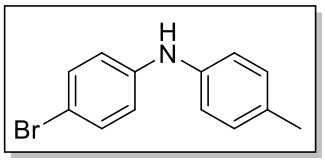
Gray solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.05 (d, 2H, *J* = 8.4 Hz), 6.96-6.93 (m, 4H), 6.90 (d, 2H, *J* = 8.4 Hz), 5.45 (brs, 1H), 2.28 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 157.6 (d, J_{CF} = 237.7 Hz), 141.1, 139.8, 130.5, 129.9, 119.4 (d, J_{CF} = 7.6 Hz), 117.9, 115.9 (d, J_{CF} = 22.3 Hz), 20.7 ppm; ESI-MS: m/z = 202 $(M+1)^+$.

4-Chloro-*N*-(*p*-tolyl)aniline (3as)



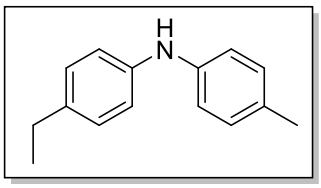
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.15 (d, 2H, *J* = 8.8 Hz), 7.08 (d, 2H, *J* = 8.4 Hz), 6.94 (d, 2H, *J* = 8.4 Hz), 6.88 (d, 2H, *J* = 8.8 Hz), 5.34 (brs, 1H), 2.29 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 142.7, 139.8, 131.5, 130.0, 129.3, 124.7, 119.2, 117.9, 20.81 ppm; ESI-MS: m/z = 219 $(M+1)^+$.

4-Bromo-*N*-(*p*-tolyl)aniline (3at)



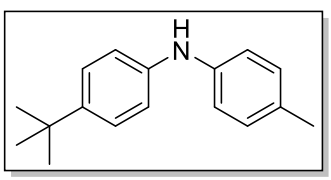
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.30 (d, 2H, *J* = 8.4 Hz), 7.09 (d, 2H, *J* = 7.6 Hz), 6.97 (d, 2H, *J* = 8.0 Hz), 6.86 (d, 2H, *J* = 8.4 Hz), 5.60 (brs, 1H), 2.31 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 143.2, 139.6, 132.1, 131.7, 130.0, 119.4, 118.1, 111.9, 20.8 ppm; ESI-MS: m/z = 263 $(M+1)^+$.

4-Ethyl-*N*-(*p*-tolyl)aniline (3au)



Brown solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.07 (d, 4H, *J* = 8.0 Hz), 6.95 (d, 4H, *J* = 5.8 Hz), 5.51 (brs, 1H), 2.58 (q, 2H, *J* = 6.0 Hz), 2.28 (s, 3H), 1.22 (t, 3H, *J* = 6.2 Hz) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 141.4, 141.1, 136.7, 130.2, 129.9, 128.7, 118.1, 117.8, 28.2, 20.7, 15.9 ppm; ESI-MS: m/z = 212 $(M+1)^+$.

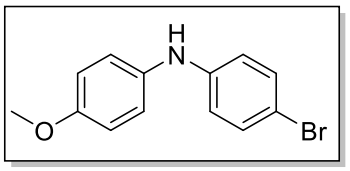
4-(*tert*-Butyl)-*N*-(*p*-tolyl)aniline (3av)



Yellow liquid ; ^{1}H NMR (400 MHz, $CDCl_3$): 7.26 (d, 2H, *J* = 6.8 Hz), 7.05 (d, 2H, *J* = 6.4 Hz), 6.97-6.95 (m, 4H), 5.51 (brs, 1H), 3.28 (s, 3H), 1.30 (s, 9H) ppm. ^{13}C NMR

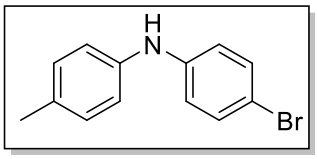
(100 MHz, $CDCl_3$): 143.5, 141.2, 140.9, 130.3, 129.9, 126.2, 118.2, 117.2, 34.2, 31.6, 20.8 ppm; ESI-MS: m/z = 240 $(M+1)^+$.

4-Bromo-*N*-(4-methoxyphenyl)aniline (3aw)



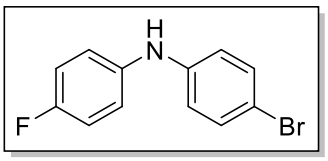
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.27 (d, 2H, *J* = 7.2 Hz), 7.04-6.99 (m, 2H), 6.86 (d, 2H, *J* = 7.2 Hz), 6.75 (d, 2H, *J* = 6.0 Hz), 5.49 (brs, 1H), 3.80 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 144.5, 135.0, 132.1, 124.4, 122.8, 1170, 114.8, 111.0, 55.6 ppm; ESI-MS: m/z = 279 $(M+1)^+$.

4-Bromo-*N*-(*p*-tolyl)aniline (3ax)



Brown solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.35 (d, 2H, *J* = 6.8 Hz), 7.15 (d, 2H, *J* = 6.4 Hz), 7.02 (d, 2H, *J* = 6.8 Hz), 6.91 (d, 2H, *J* = 7.2 Hz), 5.62 (brs, 1H), 3.36 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 143.2, 139.6, 132.1, 131.7, 130.0, 119.4, 118.1, 111.8, 20.8 ppm; ESI-MS: m/z = 263 $(M+1)^+$.

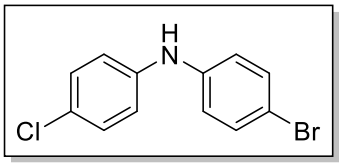
4-Bromo-*N*-(4-fluorophenyl)aniline (3ay)



Brown solid ; ^{1}H NMR (400 MHz, $CDCl_3$): 7.35 (d, 2H, *J* = 7.2 Hz), 7.08-7.00 (m, 4H), 6.86 (d, 2H, *J* = 7.2 Hz), 5.59 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 158.1 (d, J_{CF} = 239.4 Hz), 143.2, 138.3, 132.3, 121.2 (d, J_{CF} = 7.7 Hz), 118.1, 116.1 (d, J_{CF} = 22.4 Hz), 112.2 ppm; ESI-MS: m/z = 267 $(M+1)^+$.

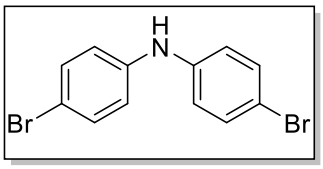
4-Bromo-*N*-(4-chlorophenyl)aniline (3az)

Brown solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.34 (d, 4H, *J* = 5.2,Hz), 6.98 (d, 4H,



J = 5.6 Hz), 5.71 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 142.8, 142.2, 132.4, 129.5, 123.8, 119.1, 118.9, 111.3 ppm; ESI-MS: m/z = 283 $(M+1)^+$.

Bis(4-bromophenyl)amine (3ba)

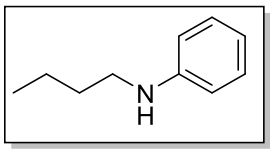


Brown solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.35 (d, 4H, *J* = 4.0 Hz), 6.91 (d, 4H, *J* = 4.0 Hz), 5.63 (brs, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 141.7, 132.4, 119.5, 113.4 ppm; ESI-MS: m/z = 328 $(M+1)^+$.

***N*-(*p*-Tolyl)-[1,1'-biphenyl]-4-amine (3bb)**

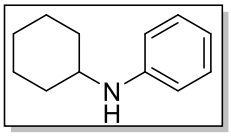
White solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.61 (d, 2H, *J* = 5.6 Hz), 7.53 (d, 2H, *J* = 6.8 Hz), 7.45 (t, 2H, *J* = 6.2 Hz), 7.33 (t, 1H, *J* = 5.8 Hz), 7.16 (d, 2H, *J* = 6.8 Hz), 7.13-7.08 (m, 4H), 5.73 (brs, 1H), 2.37 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 143.4, 140.9, 140.0, 133.1, 131.2, 129.9, 128.8, 128.0, 126.5, 119.2, 116.9, 20.8 ppm; ESI-MS: m/z = 336 $(M+1)^+$.

***N*-Butylaniline (6a)**



Colorless liquid ; ^{1}H NMR (400 MHz, $CDCl_3$): 7.17 (t, 2H, *J* = 7.6 Hz), 6.68 (t, 1H, *J* = 7.8 Hz), 6.60 (d, 2H, *J* = 8.0 Hz), 3.10 (t, 2H, *J* = 7.2 Hz), 1.64-1.56 (m, 2H), 1.47-1.38 (m, 2H), 0.96 (t, 3H, *J* = 7.2 Hz) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 148.5, 129.3, 117.1, 112.7, 43.7, 31.7, 20.4, 13.9 ppm; ESI-MS: m/z = 150 $(M+1)^+$.

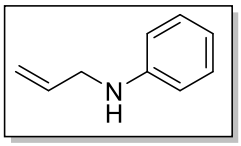
***N*-Cyclohexylaniline (6b)**



Yellow solid ; ^{1}H NMR (400 MHz, $CDCl_3$): 7.15 (t, 2H, *J* = 7.6

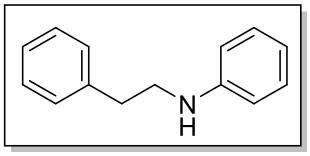
Hz), 6.65 (t, 1H, *J* = 7.0 Hz), 6.58 (d, 2H, *J* = 7.6 Hz), 2.07-2.04 (m, 2H), 1.77-1.74 (m, 2H), 1.66-1.62 (m, 1H), 1.41-1.12 (m, 6H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 147.4, 129.3, 116.9, 113.2, 51.7, 33.5, 25.9, 25.1 ppm. ESI-MS: m/z = 176 $(M+1)^+$;

***N*-Allylaniline (6c)**



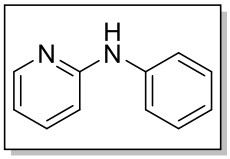
Colorless liquid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.17 (t, 2H, *J* = 7.8 Hz), 6.70 (t, 1H, *J* = 7.2 Hz), 6.61 (d, 2H, *J* = 8.0 Hz), 5.99-5.89 (m, 1H), 5.30-5.25 (m, 1H), 5.17-5.14 (m, 1H), 3.75 (d, 2H, *J* = 5.2 Hz) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 148.1, 135.5, 129.3, 117.6, 116.3, 113.0, 46.6 ppm; ESI-MS: m/z = 134 $(M+1)^+$.

***N*-Phenethylaniline (6d)**



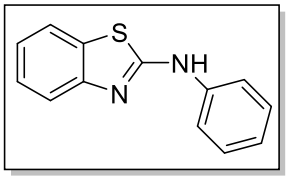
Yellow solid ; ^{1}H NMR (400 MHz, $CDCl_3$): 7.32 (t, 2H, *J* = 7.2 Hz), 7.25-7.17 (m, 5H), 6.72 (t, 1H, *J* = 7.2 Hz), 6.34 (d, 2H, *J* = 7.6 Hz), 3.41 (t, 2H, *J* = 7.0 Hz), 2.93 (t, 2H, *J* = 7.2 Hz) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 147.7, 139.2, 129.3, 128.8, 128.6, 126.5, 117.8, 113.2, 45.2, 35.4 ppm; ESI-MS: m/z = 198 $(M+1)^+$.

***N*-Phenylpyridin-2-amine (6e)**



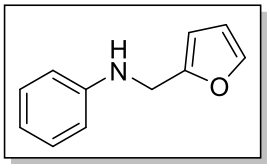
Yellow solid ; ^{1}H NMR (400 MHz, $CDCl_3$): 8.19 (brs, 1H), 7.50 (t, 1H, *J* = 8.6 Hz), 7.34-7.33 (m, 4H), 7.08-7.03 (m, 1H), 6.89 (d, 1H, *J* = 8.4 Hz), 6.74 (t, 1H, *J* = 6.2 Hz), 6.69-6.67 (m, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 155.9, 148.2, 140.3, 137.8, 129.3, 122.9, 120.4, 115.1, 108.3 ppm; ESI-MS: m/z = 171 $(M+1)^+$.

***N*-Phenylbenzo[d]thiazol-2-amine (6f)**



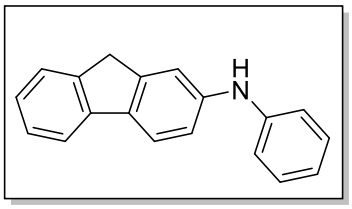
Yellow solid ; ^{1}H NMR (400 MHz, DMSO-d_6): 10.48 (s, 1H), 7.89-7.81 (m, 3H), 7.60 (d, 1H, *J* = 8.0 Hz), 7.39-7.31 (m, 3H), 7.16 (t, 1H, *J* = 7.6 Hz), 7.02 (t, 1H, *J* = 7.4 Hz) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 164.3, 151.2, 139.7, 129.8, 129.6, 126.2, 124.4, 122.6, 120.9, 120.0, 119.4 ppm; ESI-MS: m/z = 227 $(M+1)^+$.

***N*-(Furan-2-ylmethyl)aniline (6g)**



Yellow liquid; ^{1}H NMR (400 MHz, DMSO-d_6): 7.59 (s, 1H), 7.08 (t, 2H, *J* = 7.8 Hz), 6.66 (d, 2H, *J* = 7.6 Hz), 6.56 (t, 1H, *J* = 7.4 Hz), 6.41-6.39 (m, 1H), 6.31 (d, 1H, *J* = 3.2 Hz), 6.08 (t, 1H, *J* = 6.0 Hz), 4.25 (d, 2H, *J* = 6.0 Hz) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 153.9, 148.8, 142.4, 129.3, 116.5, 112.8, 110.8, 107.3, 40.28 ppm; ESI-MS: m/z = 174 $(M+1)^+$.

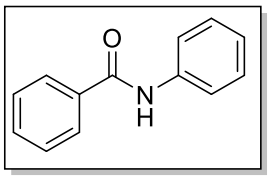
***N*-Phenyl-9*H*-fluoren-2-amine (6h)**



Yellow solid; ^{1}H NMR (400 MHz, DMSO-d_6): 8.32 (s, 1H), 7.75 (d, 2H, *J* = 8.0 Hz), 7.52 (d, 1H, *J* = 7.2 Hz), 7.36-7.27 (m, 4H), 7.22 (t, 1H, *J* = 7.4 Hz), 7.17-7.11 (m, 3H), 6.87 (t, 1H, *J* = 7.2 Hz), 3.87 (s, 2H) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 145.0, 143.9, 143.3, 142.7, 142.0, 133.7, 129.7, 127.1, 125.7, 125.3, 121.1, 120.2, 119.2, 117.4, 116.3, 113.6, 36.9 ppm; ESI-MS: m/z = 258 $(M+1)^+$.

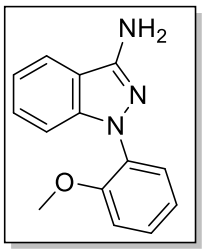
***N*-Phenylbenzamide (6i)**

Yellow solid; ^{1}H NMR (400 MHz, DMSO-d_6): 10.27 (s, 1H), 7.98 (d, 2H, *J* =



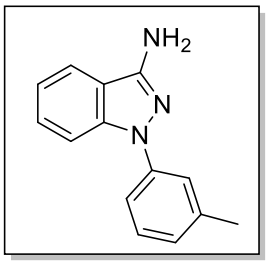
8.4 Hz), 7.80 (d, 2H, *J* = 8.4 Hz), 7.62-7.54 (m, 3H), 7.38 (t, 2H, *J* = 7.8 Hz), 7.13 (t, 1H, *J* = 7.4 Hz) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 166.0, 139.6, 135.5, 132.0, 129.1, 128.8, 128.1, 124.1, 120.8 ppm; ESI-MS: m/z = 198 $(M+1)^+$.

1-(2-Methoxyphenyl)-1*H*-indazol-3-amine (6j)



Brown liquid; ^{1}H NMR (400 MHz, DMSO-d_6): 7.78 (d, 1H, *J* = 8.0 Hz), 7.35 (t, 2H, *J* = 8.0 Hz), 7.30-7.22 (m, 2H), 7.08-7.04 (m, 1H), 7.02-6.96 (m, 2H), 5.72 (brs, 2H), 3.78 (s, 3H) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 153.4, 150.9, 141.3, 129.3, 128.2, 127.8, 127.2, 121.1, 120.9, 118.7, 116.5, 113.1, 111.0, 55.9 ppm.; ESI-MS: m/z = 240 $(M+1)^+$.

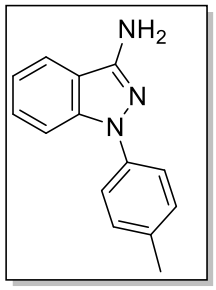
1-(M-tolyl)-1*H*-indazol-3-amine (6k)



Brown liquid; ^{1}H NMR (400 MHz, DMSO-d_6): 7.84 (d, 1H, *J* = 7.6 Hz), 7.74 (d, 1H, *J* = 8.4 Hz), 7.49-7.45 (m, 2H), 7.42-7.36 (m, 2H), 7.09 (t, 1H, *J* = 7.4 Hz), 7.01 (d, 1H, *J* = 7.6 Hz), 5.91 (brs, 2H), 2.39 (s, 3H) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 151.1, 141.1, 139.2, 139.1, 129.6, 128.3, 125.1, 121.5, 120.9, 119.8, 117.6, 117.4, 110.5, 21.7 ppm; ESI-MS: m/z = 224 $(M+1)^+$.

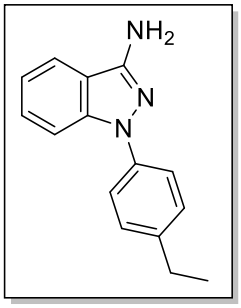
1-(*p*-Tolyl)-1*H*-indazol-3-amine (6l)

White solid; ^{1}H NMR (400 MHz, DMSO-d_6): 7.83 (d, 1H, *J* = 8.0 Hz), 7.68 (d, 1H, *J* = 8.4 Hz), 7.55 (d, 2H, *J* = 8.4 Hz), 7.38 (t, 1H, *J* = 7.8 Hz), 7.29 (d, 2H, *J* = 8.0 Hz), 7.07 (t, 1H, *J* = 7.4 Hz), 5.88 (brs, 2H), 3.34 (s, 3H) ppm. ^{13}C NMR



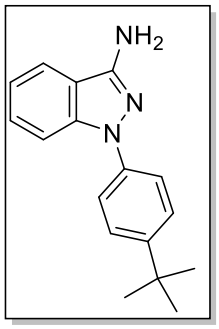
(100 MHz, $CDCl_3$): 148.7, 139.8, 138.0, 135.1, 129.9, 127.8, 121.6, 119.8, 119.7, 116.3, 110.3, 21.0 ppm; ESI-MS: m/z = 224 $(M+1)^+$.

1-(4-Ethylphenyl)-1*H*-indazol-3-amine (6m)



Brown liquid; ^{1}H NMR (400 MHz, DMSO-d_6): 7.86 (d, 1H, *J* = 8.0 Hz), 7.21 (d, 1H, *J* = 8.4 Hz), 7.60 (d, 2H, *J* = 8.4 Hz), 7.41 (t, 1H, *J* = 7.8 Hz), 7.35 (d, 2H, *J* = 8.4 Hz), 7.10 (t, 1H, *J* = 7.4 Hz), 5.91 (s, 2H), 2.66 (q, 2H, *J* = 7.6 Hz), 1.24 (t, 3H, *J* = 7.6 Hz) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 151.0, 139.9, 139.1, 139.0, 129.0, 128.2, 121.5, 120.5, 119.6, 117.4, 110.3, 28.1, 16.2 ppm; ESI-MS: m/z = 238 $(M+1)^+$.

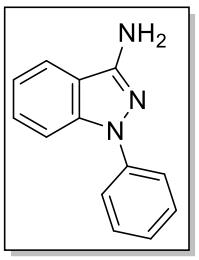
1-(4-(*tert*-Butyl)phenyl)-1*H*-indazol-3-amine (6n)



Brown liquid; ^{1}H NMR (400 MHz, DMSO-d_6): 7.86 (d, 1H, *J* = 8.0 Hz), 7.23 (d, 1H, *J* = 8.4 Hz), 7.62 (d, 2H, *J* = 8.8 Hz), 7.52 (d, 1H, *J* = 8.8 Hz), 7.41 (t, 2H, *J* = 8.2 Hz), 7.12-7.08 (m, 1H), 5.92 (brs, 2H), 1.35 (s, 9H) ppm. ^{13}C NMR (100 MHz, DMSO): 151.0, 146.7, 139.1, 138.7, 128.2, 126.5, 121.5, 120.1, 119.6, 117.4, 110.3, 34.6, 31.7 ppm; ESI-MS: m/z = 266 $(M+1)^+$.

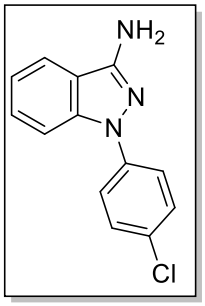
1-Phenyl-1*H*-indazol-3-amine (6o)

Brown solid; ^{1}H NMR (400 MHz, DMSO-d_6): 7.86 (d, 1H, *J* = 8.0 Hz), 7.74 (d, 1H, *J* = 8.4 Hz), 7.68 (d, 2H, *J* = 8.0 Hz), 7.49 (t, 2H, *J* = 6.2 Hz), 7.28 (t, 1H, *J*



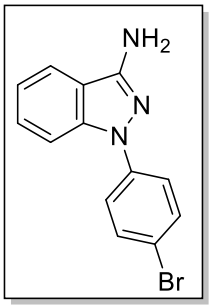
= 6.2 Hz), 7.19 (t, 1H, *J* = 6.2 Hz), 7.11 (t, 1H, *J* = 6.2 Hz), 5.93 (brs, 2H) ppm. ^{13}C NMR (100 MHz, DMSO-d_6):151.2, 141.1, 139.2, 129.8, 128.4, 124.3, 121.5, 120.3, 119.8, 117.7, 110.4 ppm; ESI-MS: m/z = 210 $(M+1)^+$.

1-(4-Chlorophenyl)-1*H*-indazol-3-amine (6p)



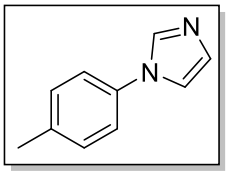
Brown liquid ; ^{1}H NMR (400 MHz, DMSO-d_6): 7.89 (d, 1H, *J* = 8.0 Hz), 7.79-7.72 (m, 3H), 7.54 (d, 2H, *J* = 8.8 Hz), 7.46 (t, 1H, *J* = 7.6 Hz), 7.15 (t, 1H, *J* = 7.4 Hz), 6.04 (brs, 2H) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 151.6, 140.0, 139.1, 129.7, 128.6, 127.8, 121.6, 121.5, 120.2, 118.0, 110.5 ppm; ESI-MS: m/z = 244 $(M+1)^+$.

1-(4-Bromophenyl)-1*H*-indazol-3-amine (6q)



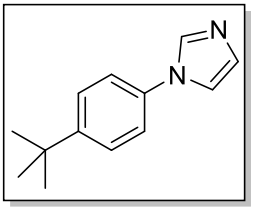
Brown solid; ^{1}H NMR (400 MHz, DMSO-d_6): 7.86 (d, 1H, *J* = 8.0 Hz), 7.76 (d, 1H, *J* = 8.4 Hz), 7.67-7.62 (m, 4H), 7.45-7.40 (m, 1H), 7.13 (t, 1H, *J* = 7.4 Hz), 6.03 (brs, 2H) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 149.3, 139.6, 132.4, 132.0, 128.2, 122.7, 120.3, 119.9, 117.9, 116.9, 110.2 ppm; ESI-MS: m/z = 288 $(M+1)^+$.

1-(*p*-Tolyl)-1*H*-imidazole (6r)



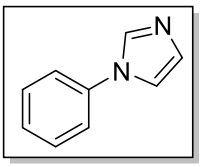
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.85 (s, 1H), 7.27-7.19 (m, 6H), 2.40 (s, 3H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 137.6, 134.9, 133.8, 130.4, 128.2, 121.5, 118.5, 20.9 ppm; ESI-MS: m/z = 159 $(M+1)^+$.

1-(4-(*tert*-Butyl)phenyl)-1*H*-imidazole (6s)



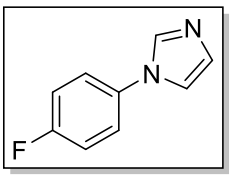
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.86 (s, 1H), 7.49 (d, 2H, *J* = 8.8 Hz), 7.32-7.22 (m, 4H), 1.35 (s, 9H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$) : 150.8, 134.9, 133.6, 130.0, 126.8, 121.3, 118.5, 34.7, 31.3 ppm; ESI-MS: m/z = 201 $(M+1)^+$.

1-Phenyl-1*H*-imidazole (6t)



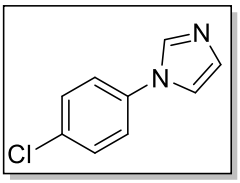
Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.83 (s, 1H), 7.43 (t, 2H, *J* = 7.8 Hz), 7.33 (d, 3H, *J* = 8.0 Hz), 7.25 (m, 1H), 7.18 (s, 1H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 137.3, 135.5, 130.3, 129.9, 127.4, 121.4, 118.2 ppm; ESI-MS: m/z = 145 $(M+1)^+$.

1-(4-Fluorophenyl)-1*H*-imidazole (6u)



Yellow liquid ; ^{1}H NMR (400 MHz, $CDCl_3$): 7.94 (d, 1H, *J* = 8.4 Hz), 7.45 (d, 2H, *J* = 8.8 Hz), 7.36-7.27 (m, 4H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 160.8 (d, J_{CF} = 246.4 Hz), 135.6, 133.5, 130.0, 123.5 (d, J_{CF} = 8.4 Hz), 118.7, 116.8 (d, J_{CF} = 22.9 Hz) ppm; ESI-MS: m/z = 163 $(M+1)^+$.

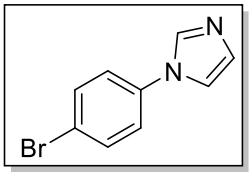
1-(4-Chlorophenyl)-1*H*-imidazole (6v)



Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.83 (s, 1H), 7.38-7.34 (m, 2H), 7.23-7.15 (m, 4H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 135.6, 135.0, 133.7, 130.2, 127.7, 122.9, 118.6 ppm; ESI-MS: m/z = 179 $(M+1)^+$.

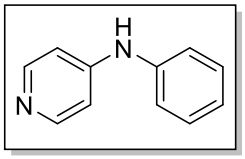
1-(4-Bromophenyl)-1*H*-imidazole (6w)

Yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$): 7.86 (s, 1H), 7.59 (d, 2H, *J* = 8.4 Hz),



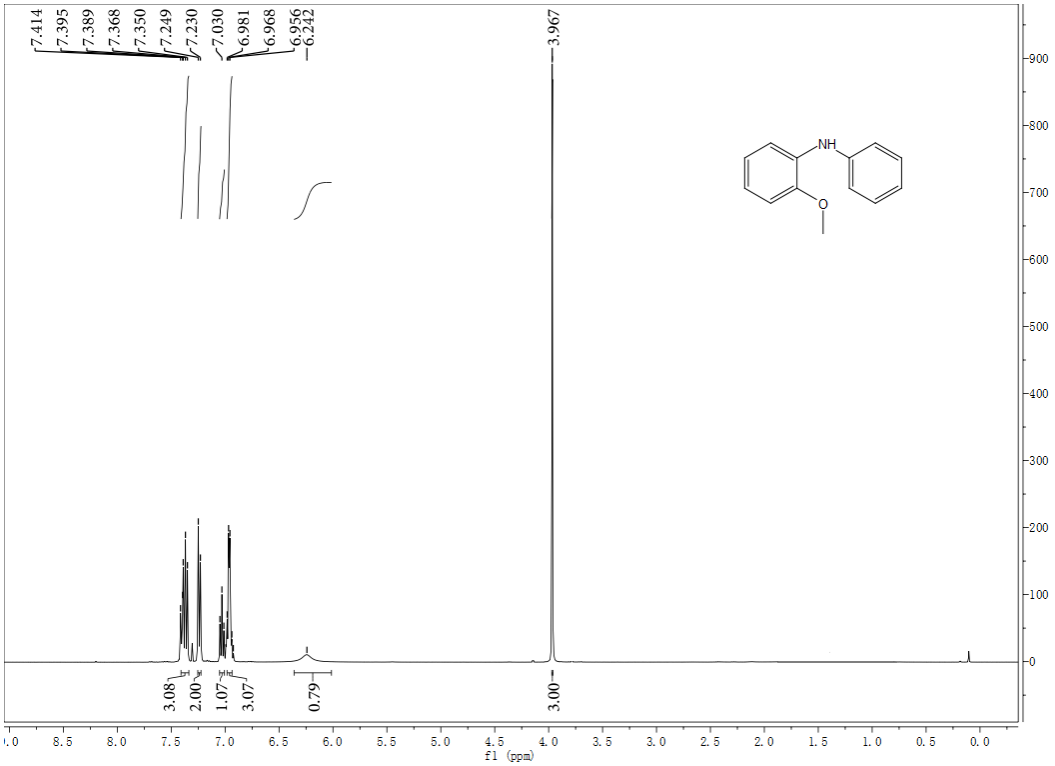
7.29-7.23 (m, 4H) ppm. ^{13}C NMR (100 MHz, $CDCl_3$): 136.2, 135.3, 133.0, 130.4, 122.9, 121.1, 118.2 ppm; ESI-MS: m/z = 224 $(M+1)^+$.

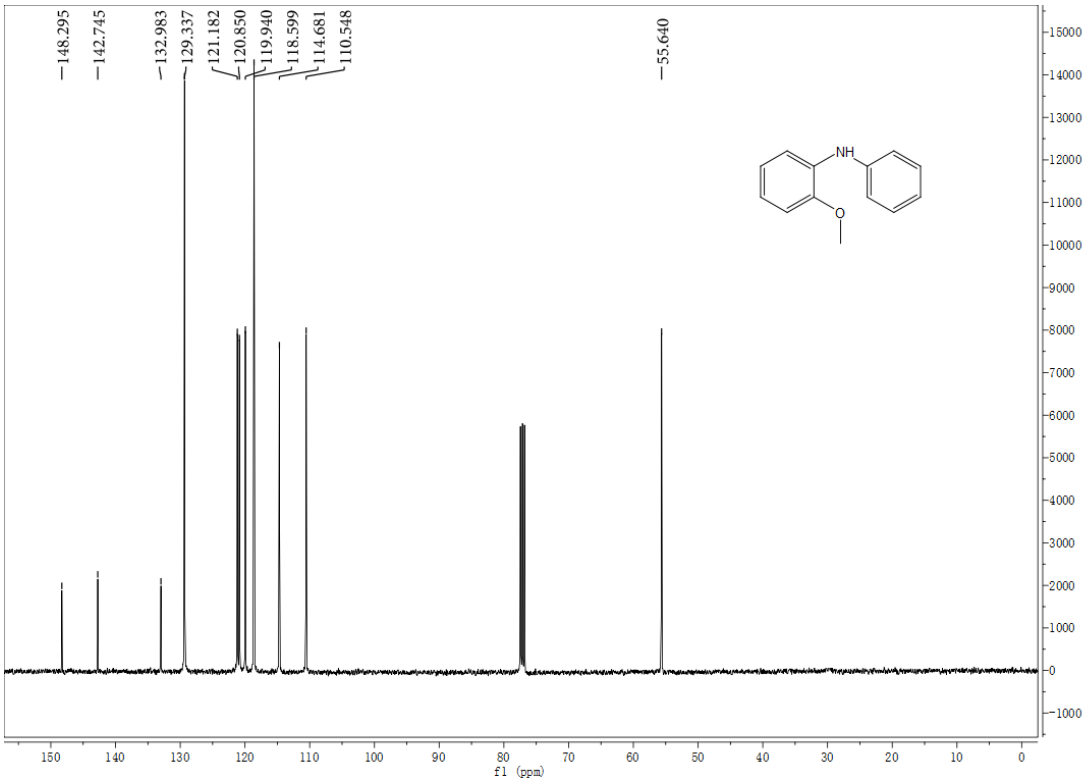
_N_-Phenylpyridin-4-amine (6x)



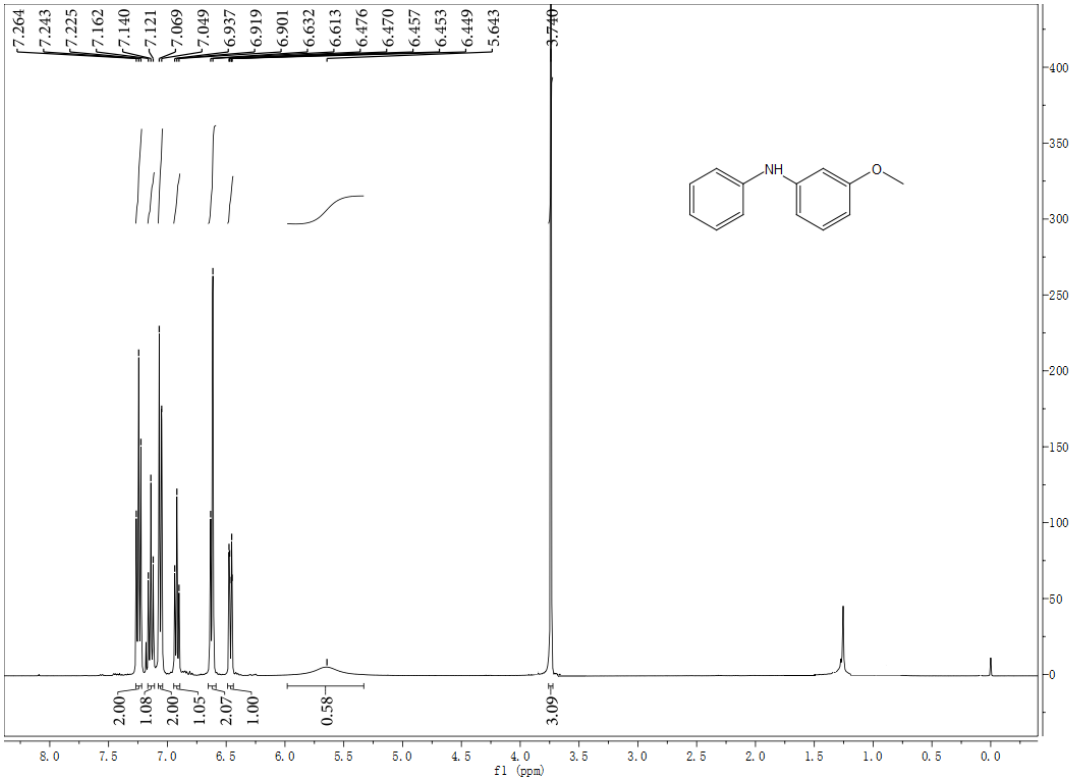
Yellow solid; ^{1}H NMR (400 MHz, DMSO-d_6): 8.82(s, 1H), 7.86 (d, 4H, J = 5.6 Hz), 7.37 (t, 2H, J = 7.8 Hz), 7.22 (d, 2H, J = 8.0 Hz), 7.06 (t, 1H, J = 7.2 Hz) ppm. ^{13}C NMR (100 MHz, DMSO-d_6): 151.0, 144.8, 140.9, 129.8, 123.0, 121.8, 120.5 ppm; ESI-MS: m/z = 171 $(M+1)^+$.

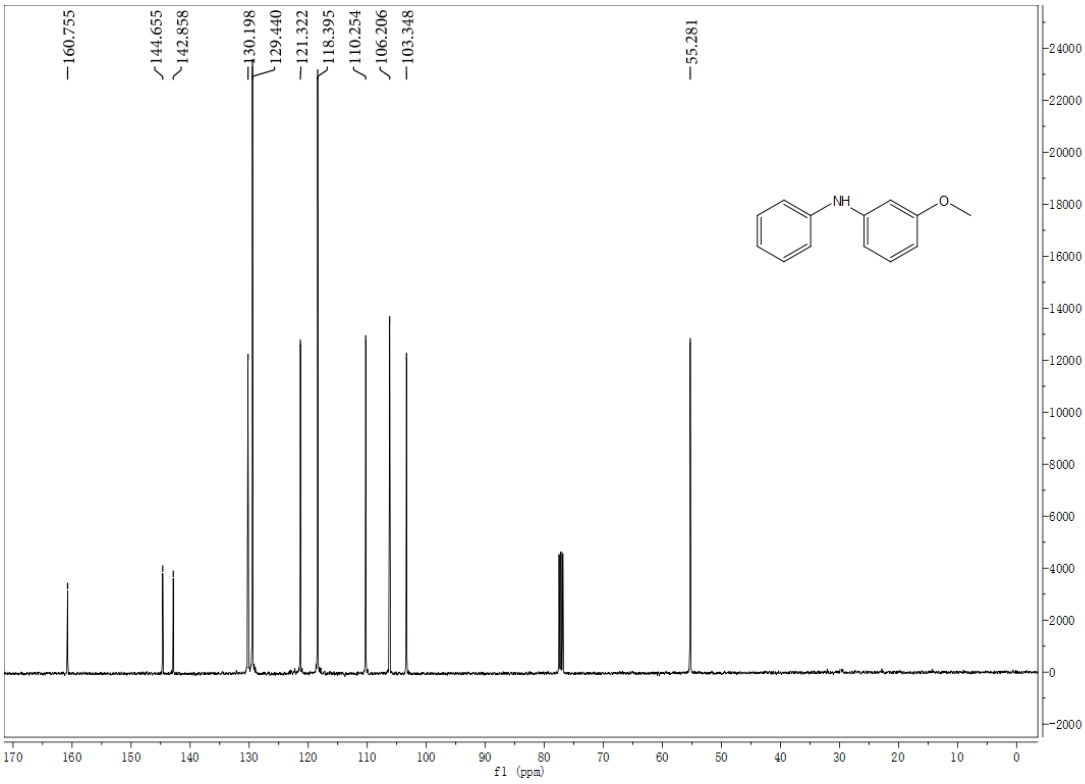
^{1}H NMR and ^{13}C NMR of compound (3a)



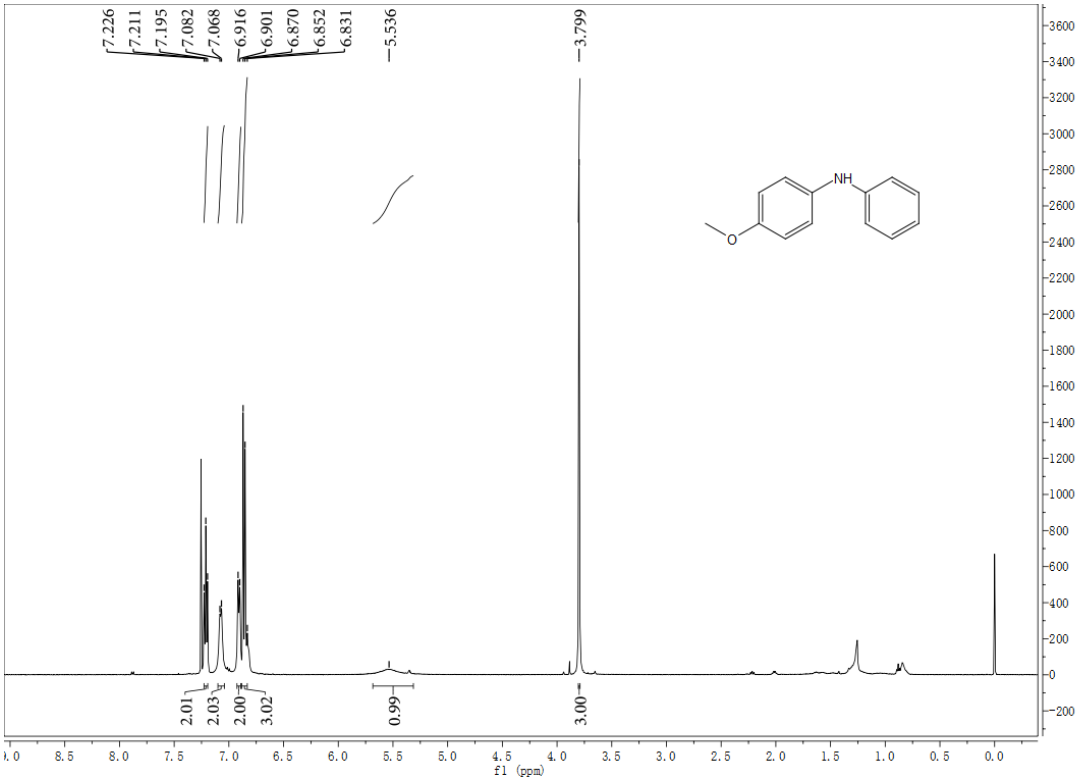


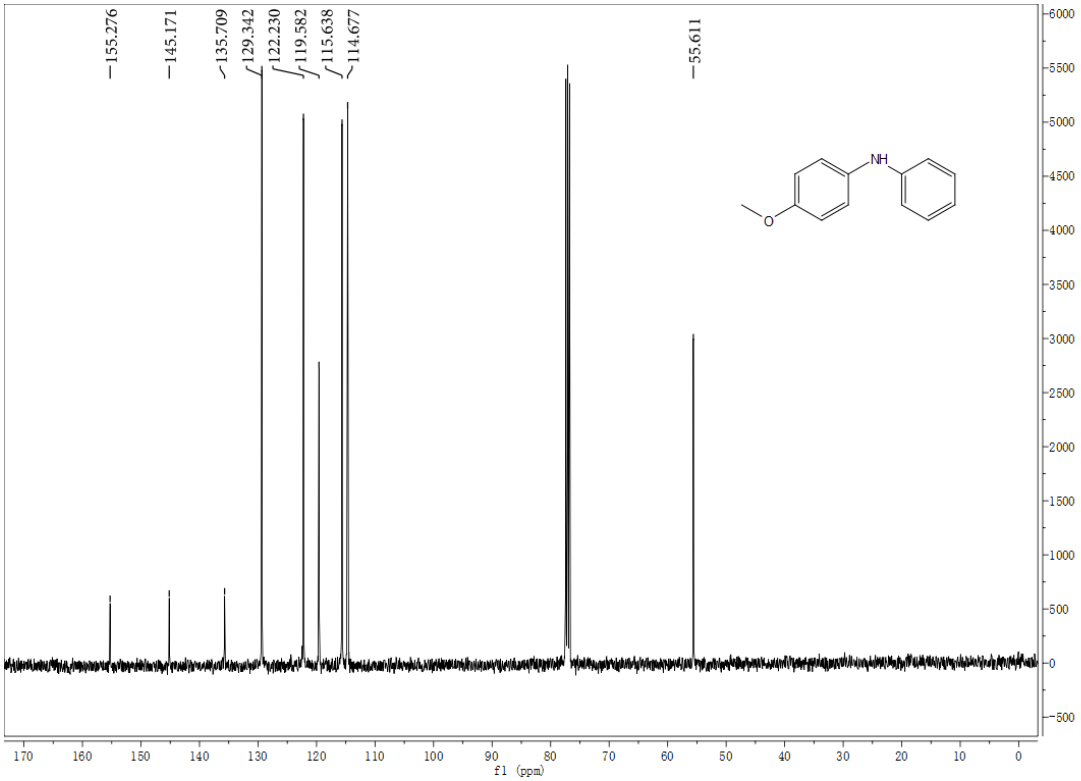
^{1}H NMR and ^{13}C NMR of compound (3b)



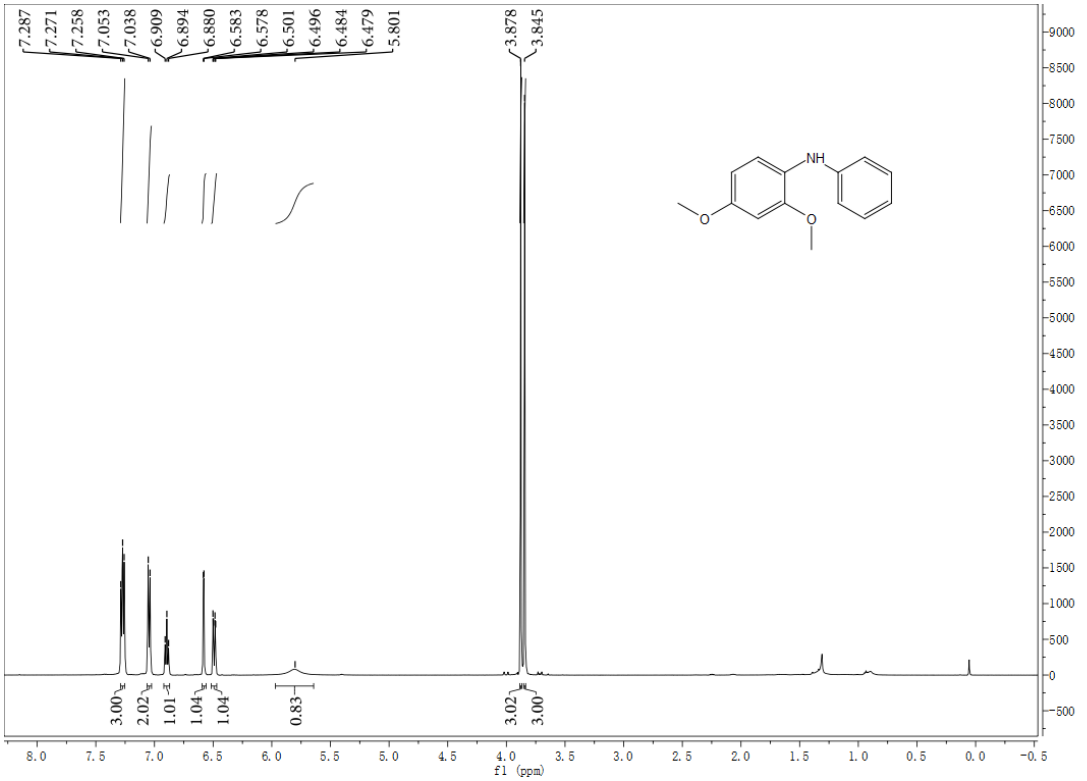


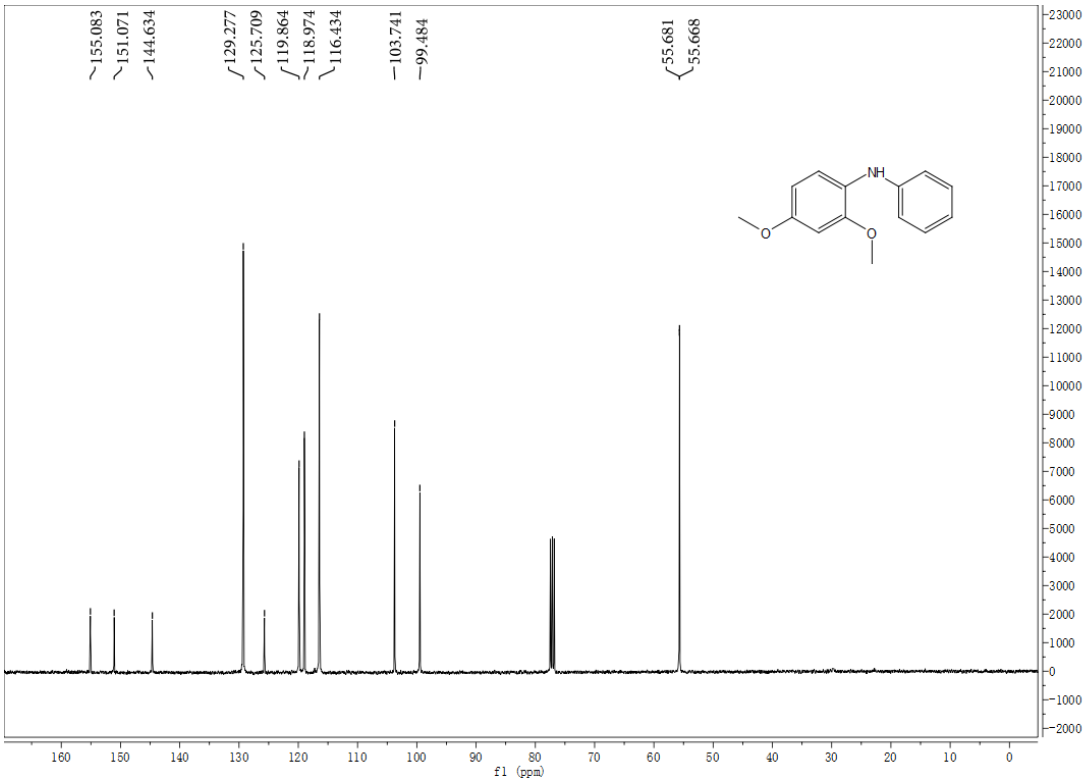
^{1}H NMR and ^{13}C NMR of compound (3c)



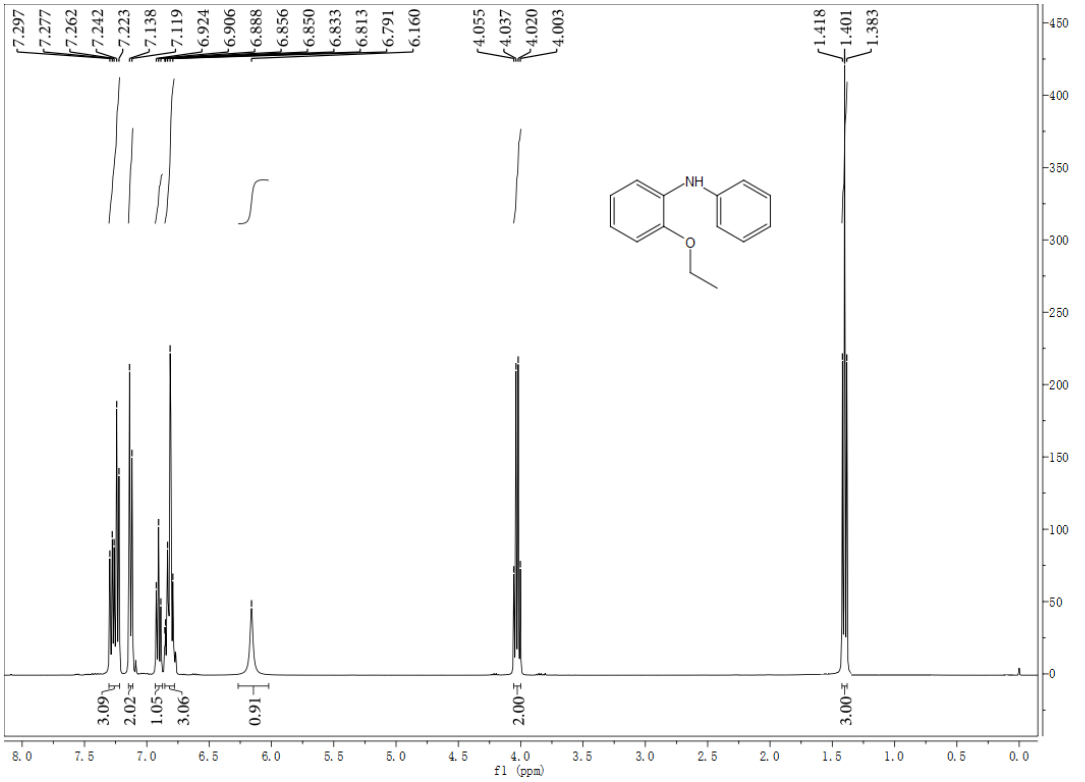


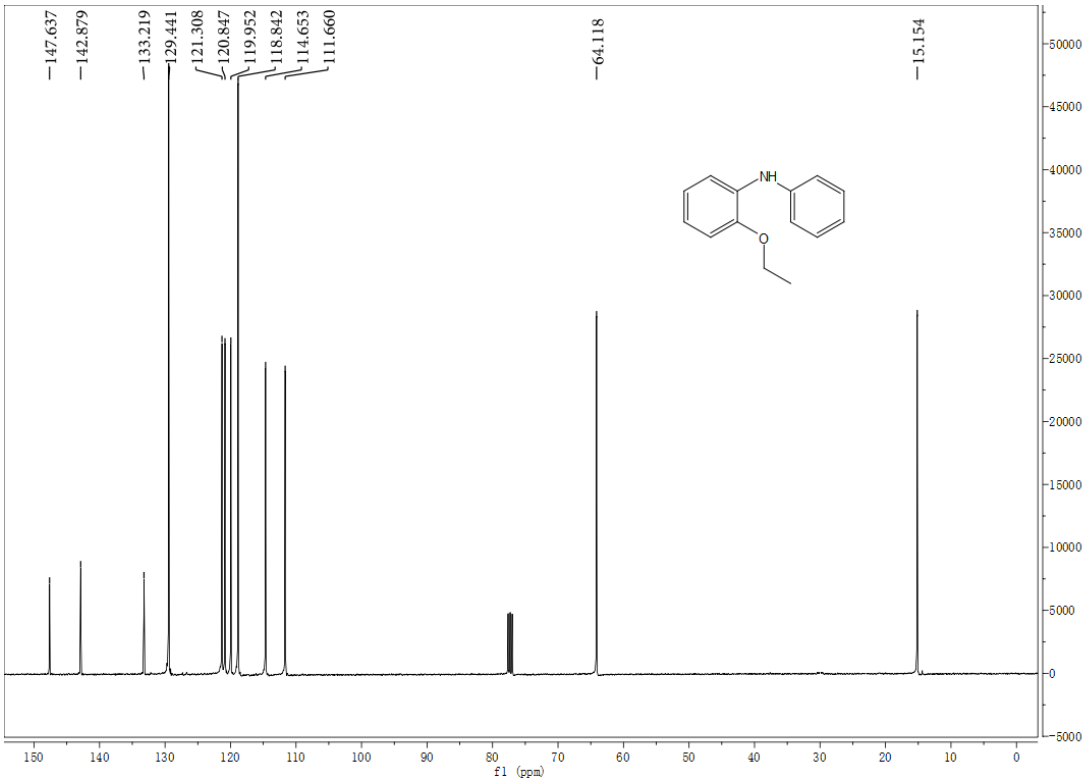
^{1}H NMR and ^{13}C NMR of compound (3d)



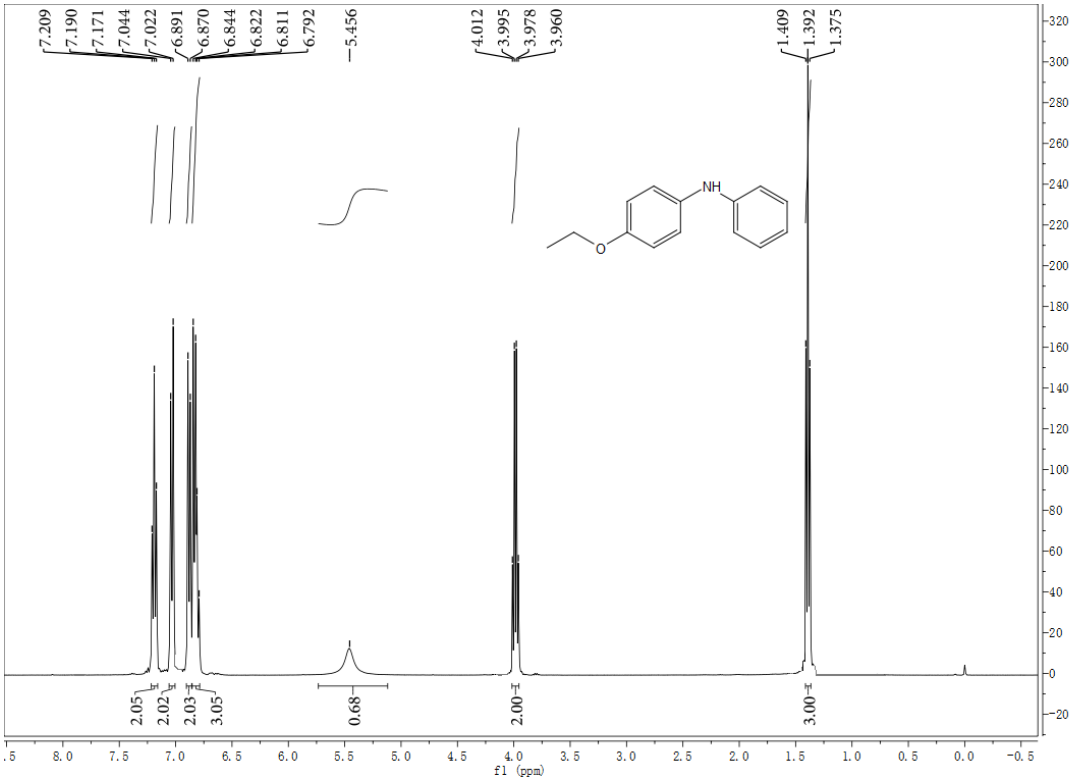


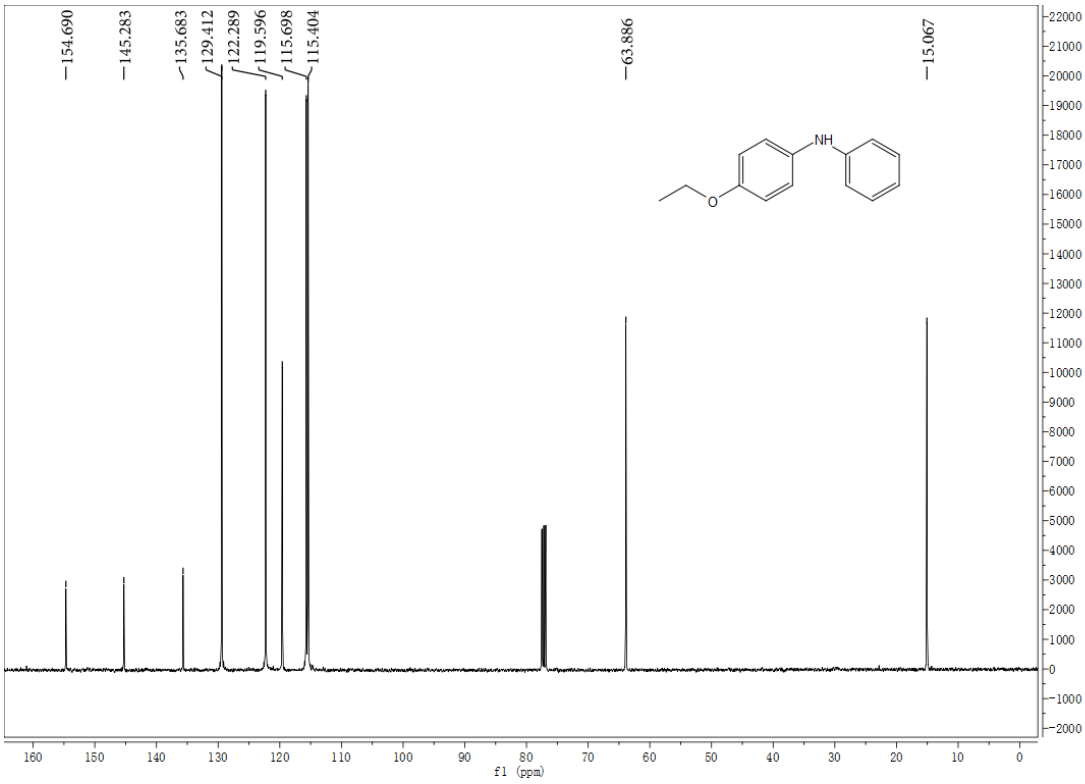
^{1}H NMR and ^{13}C NMR of compound (3e)



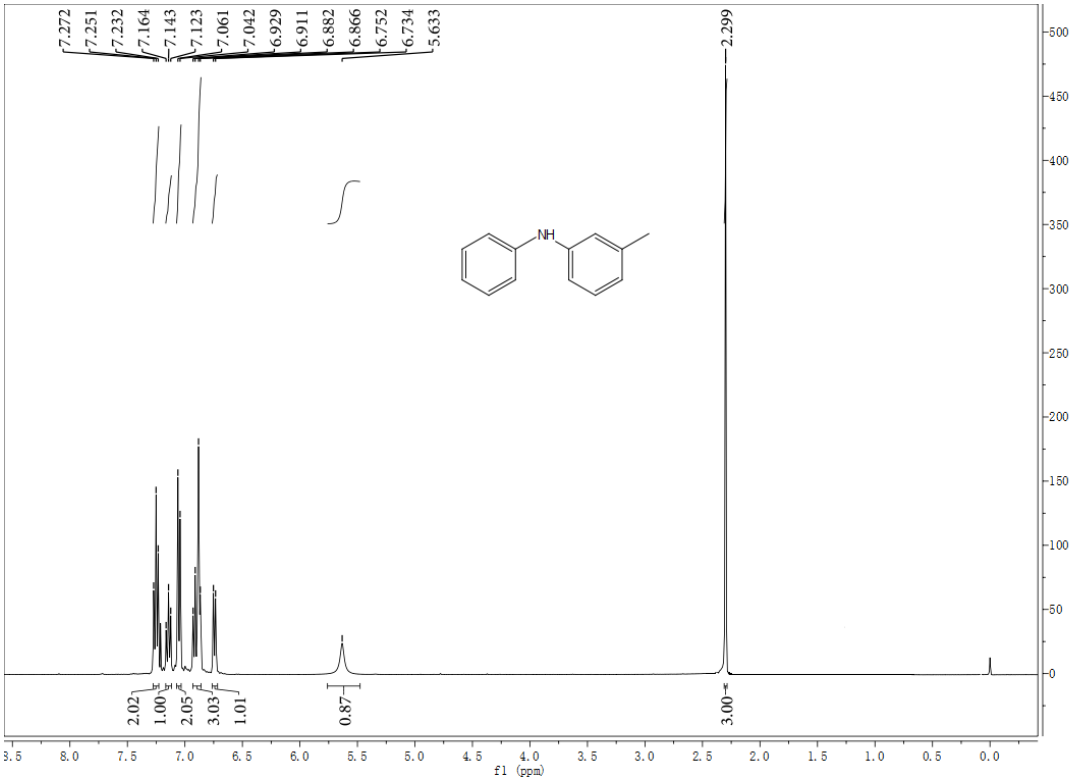


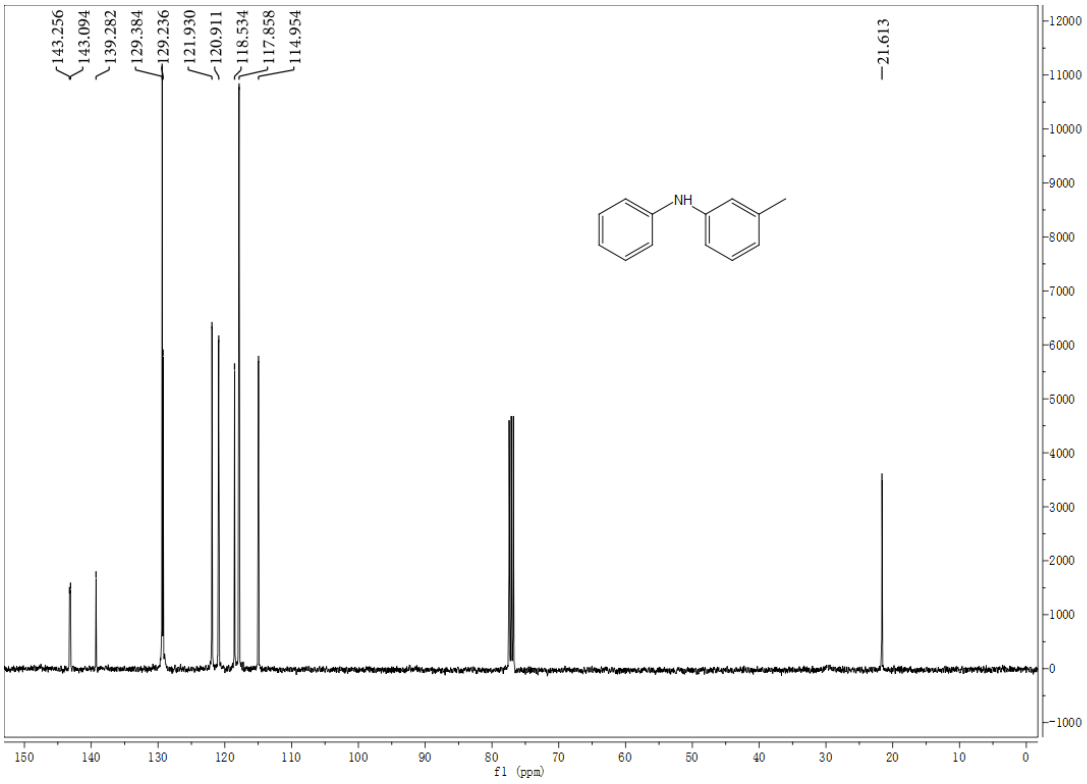
^{1}H NMR and ^{13}C NMR of compound (3f)



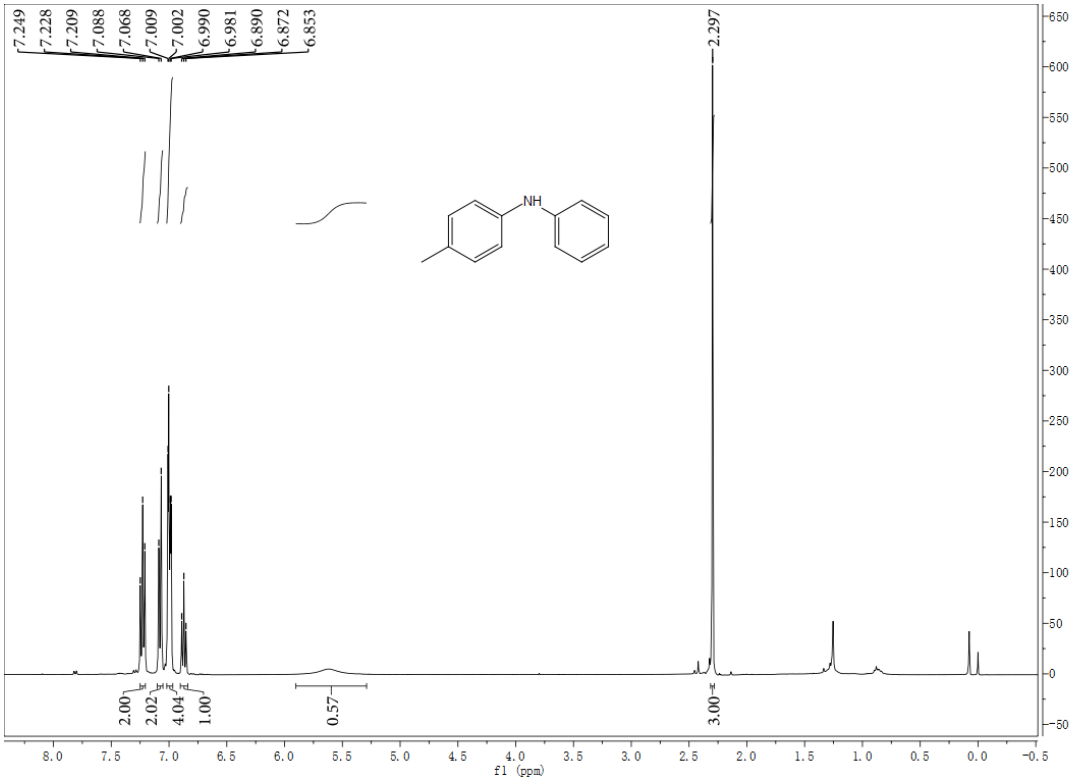


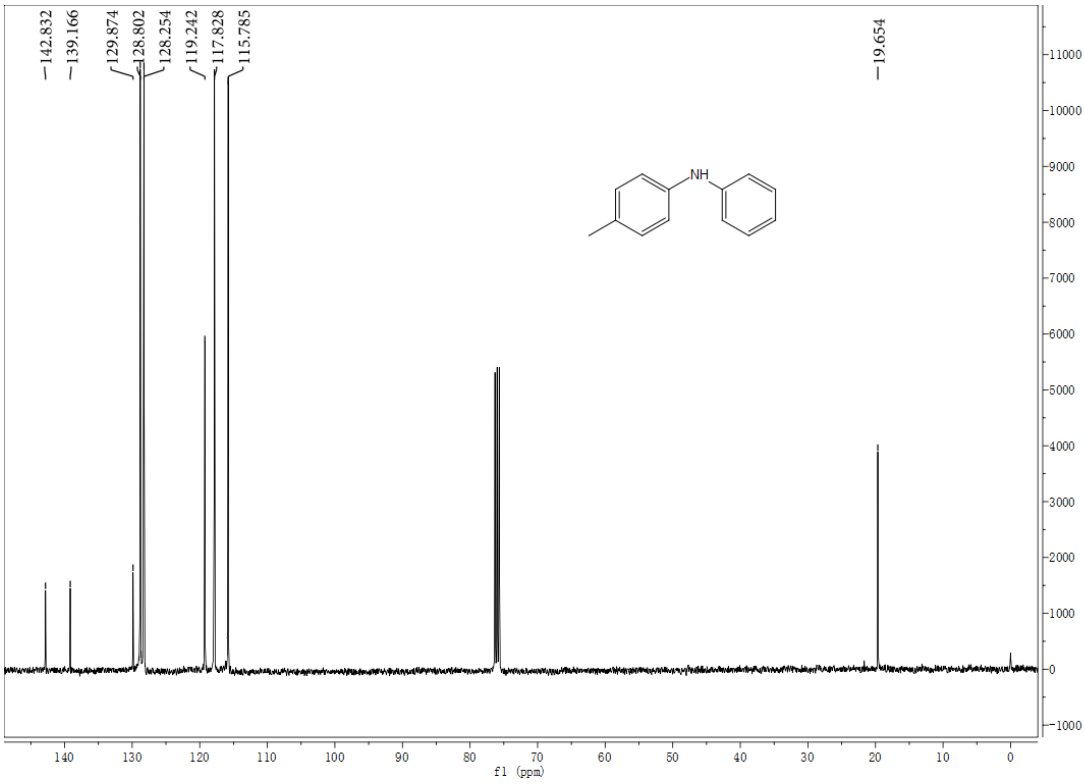
^{1}H NMR and ^{13}C NMR of compound (3g)



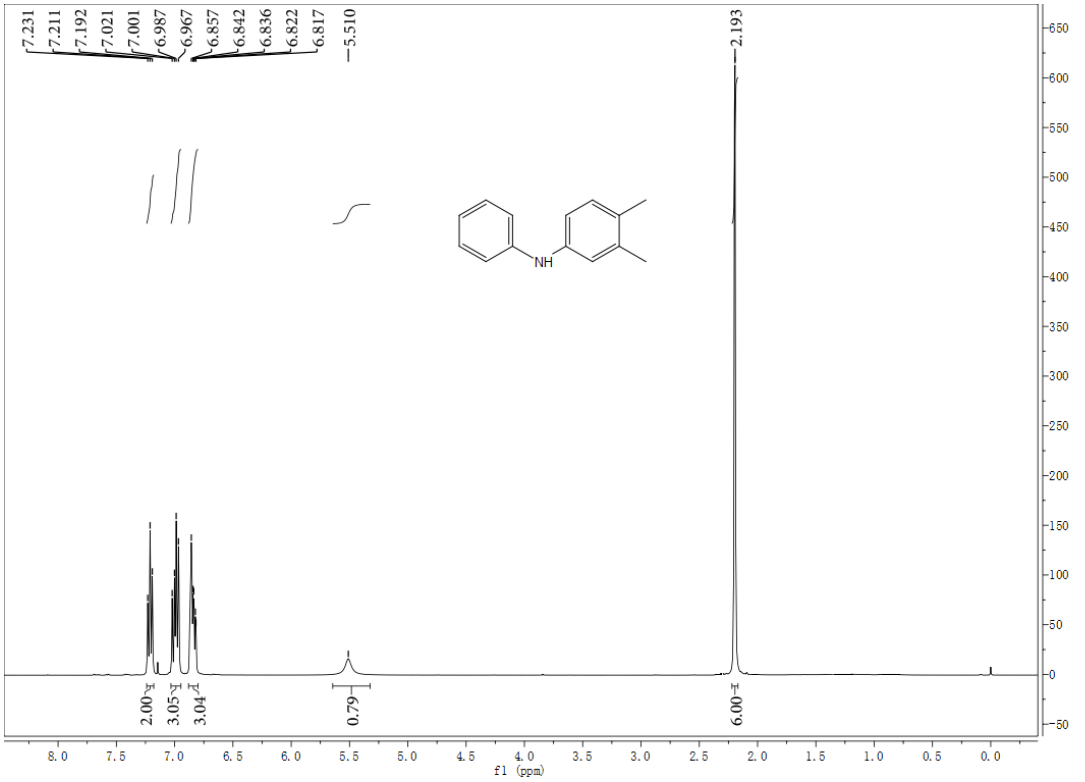


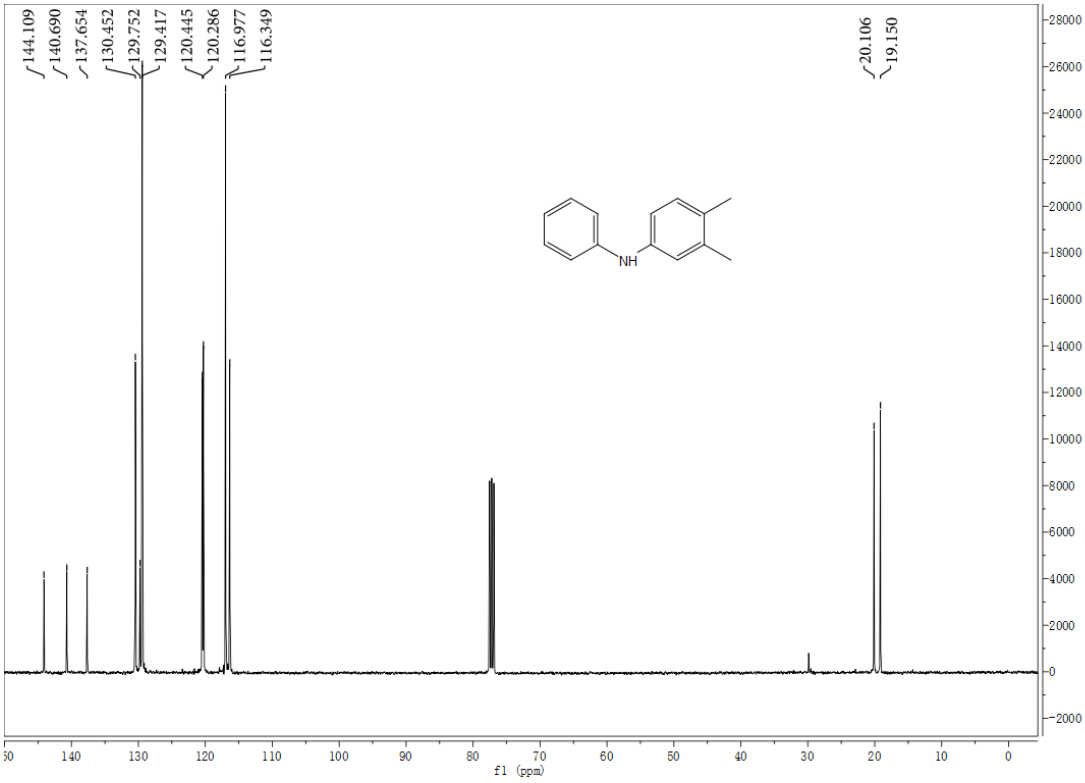
^{1}H NMR and ^{13}C NMR of compound (3h)



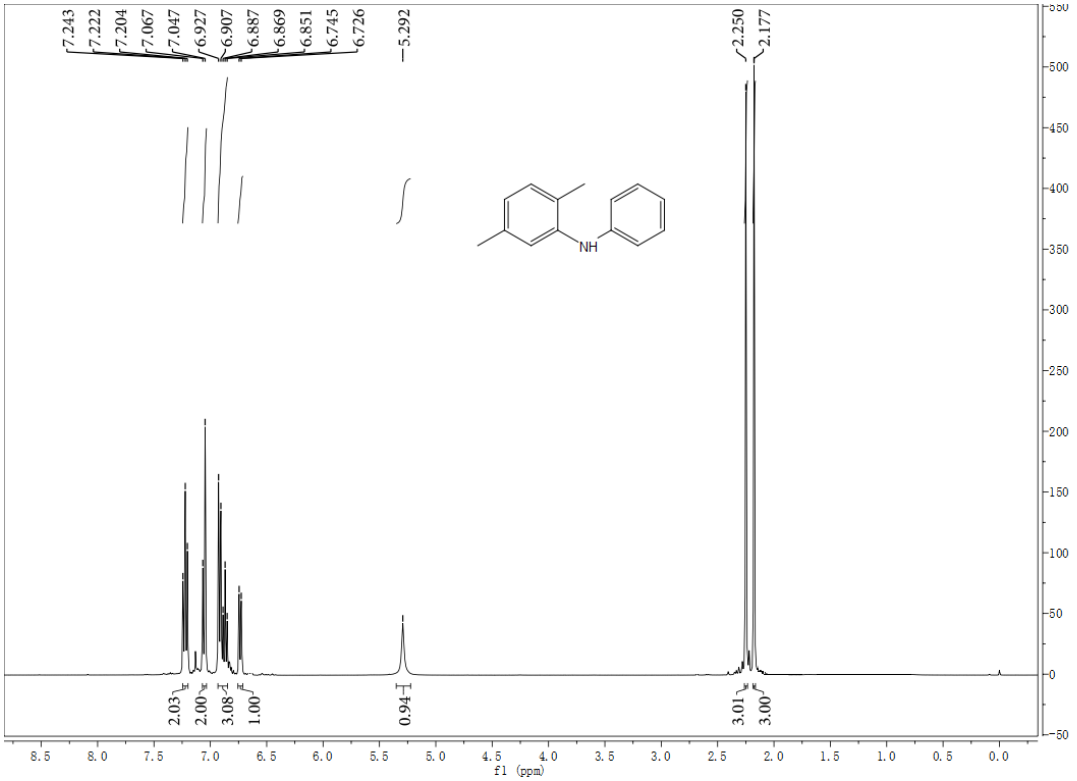


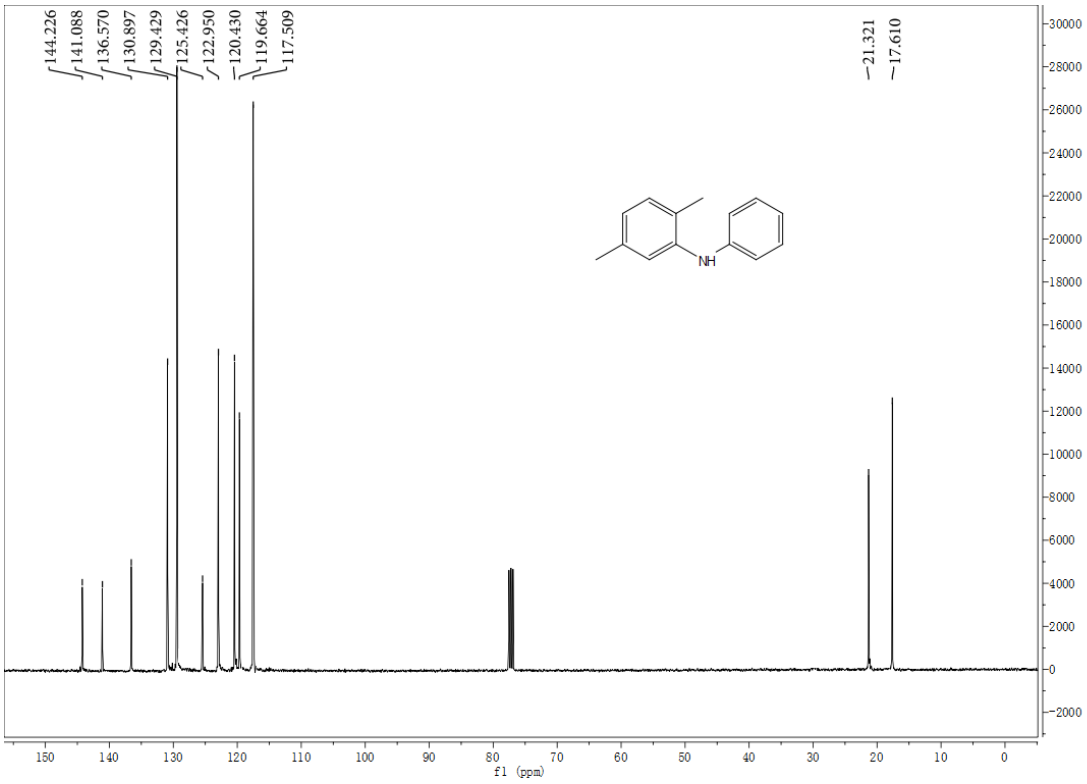
^{1}H NMR and ^{13}C NMR of compound (3i)



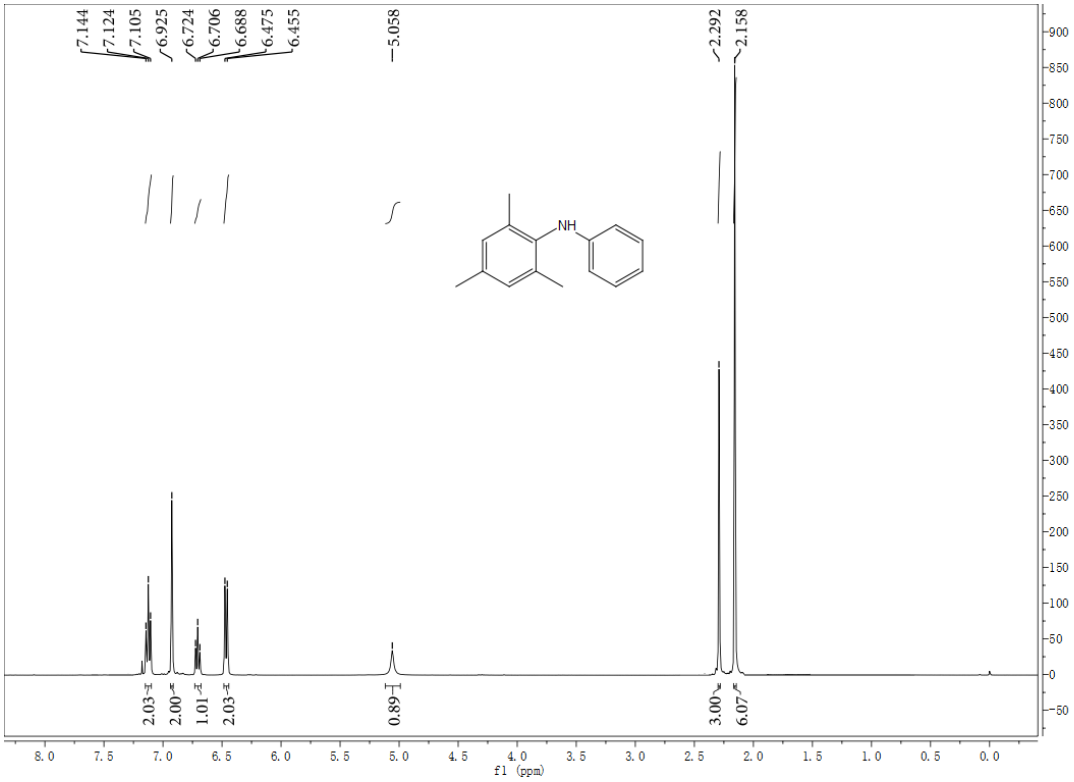


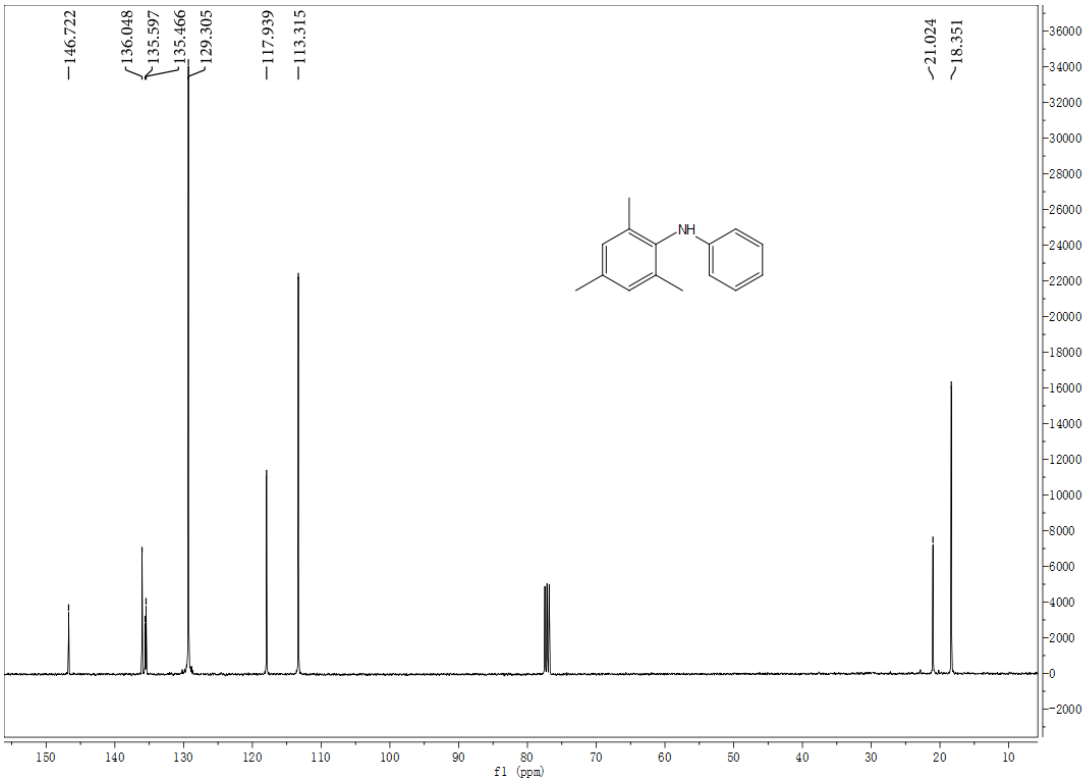
^{1}H NMR and ^{13}C NMR of compound (3j)



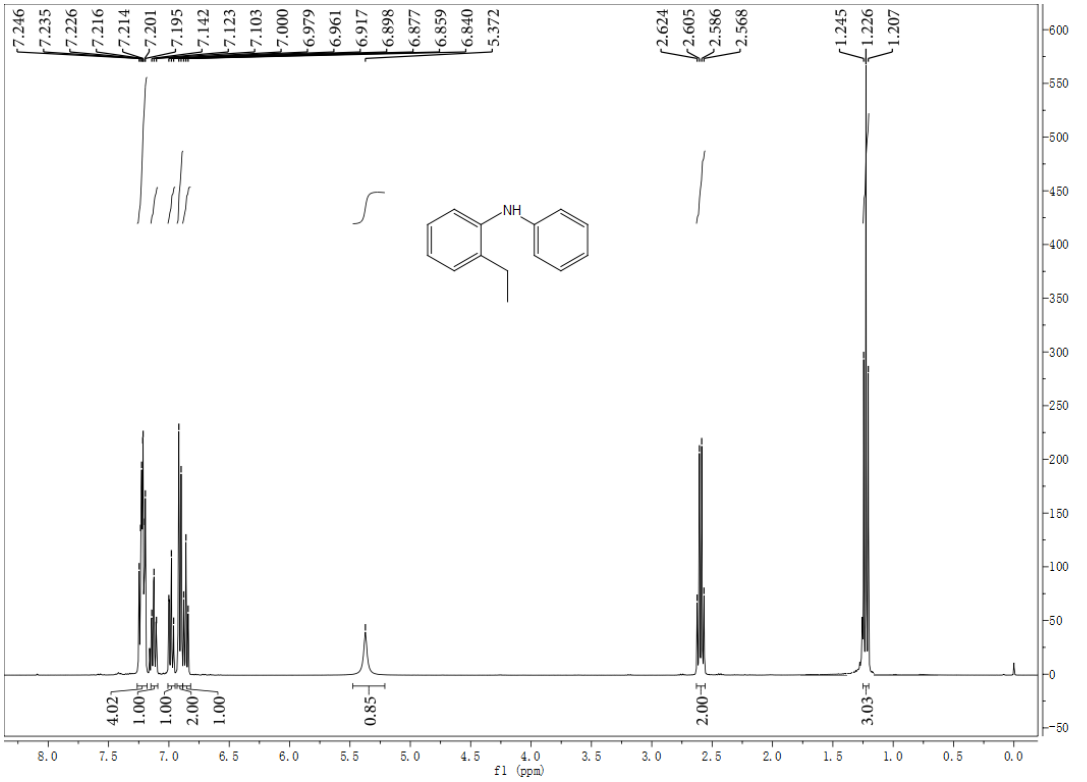


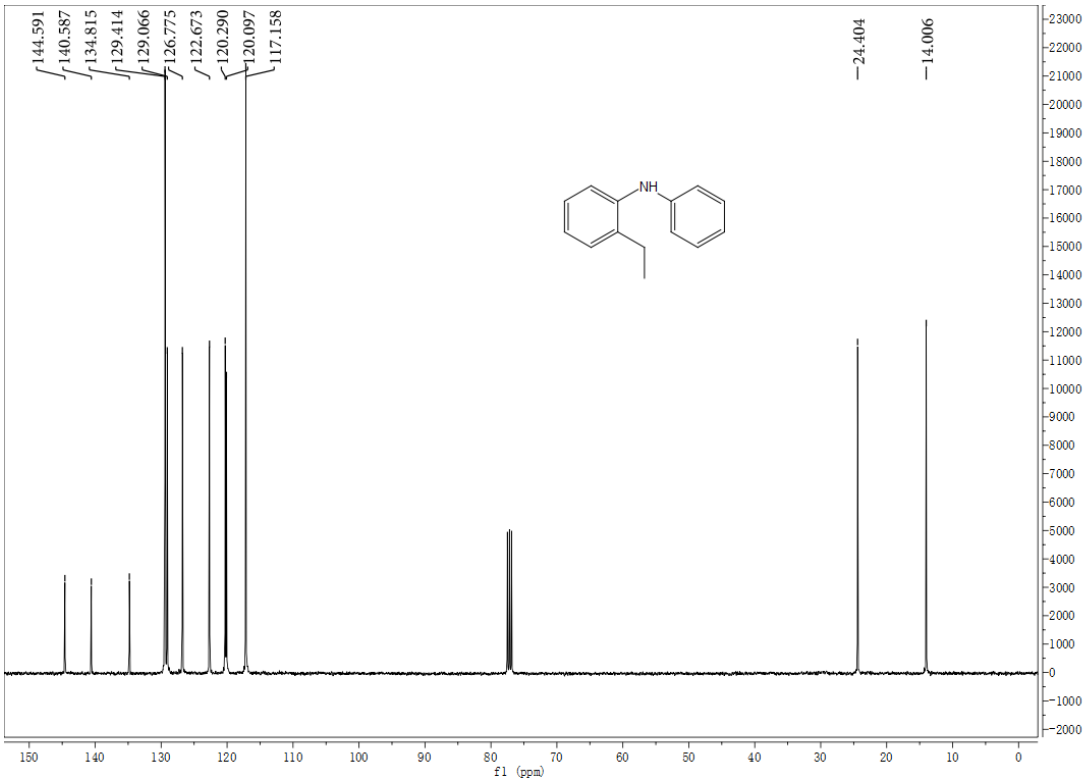
^{1}H NMR and ^{13}C NMR of compound (3k)



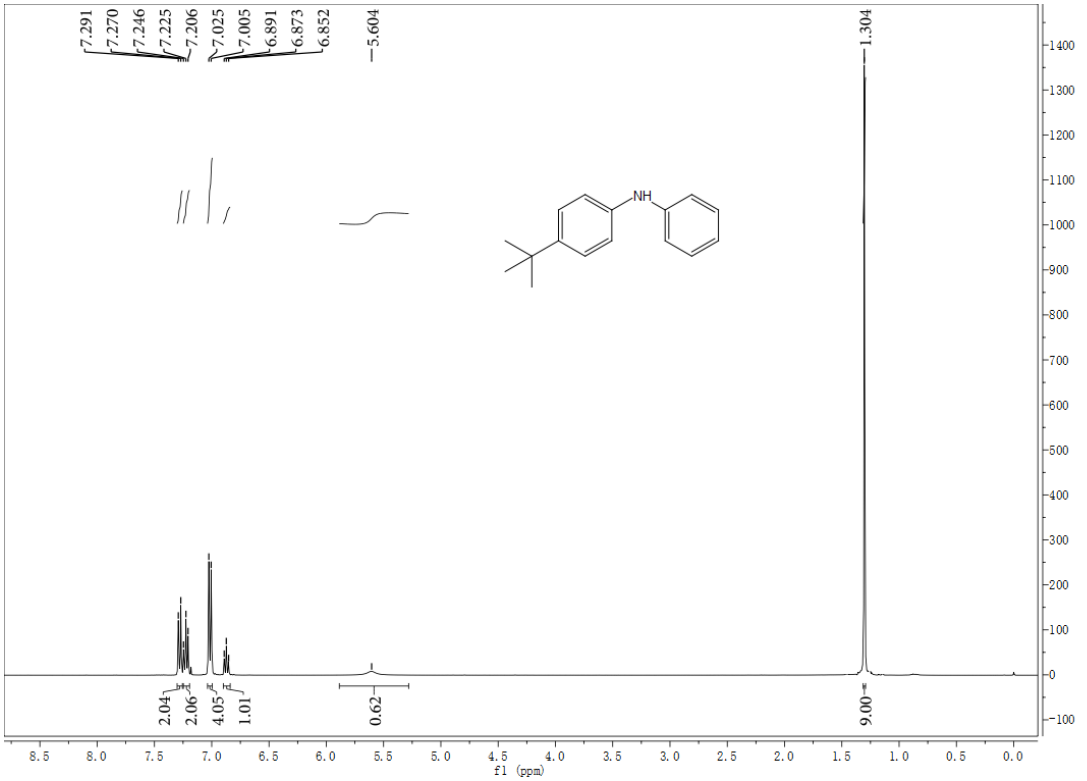


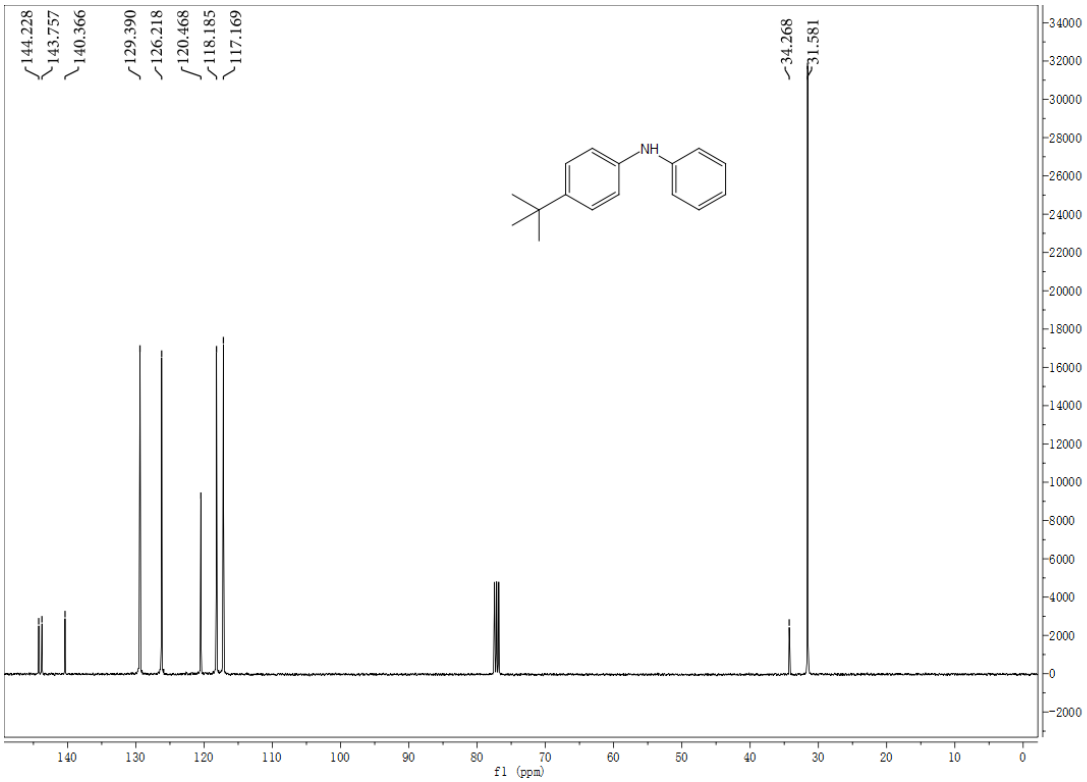
^{1}H NMR and ^{13}C NMR of compound (3l)



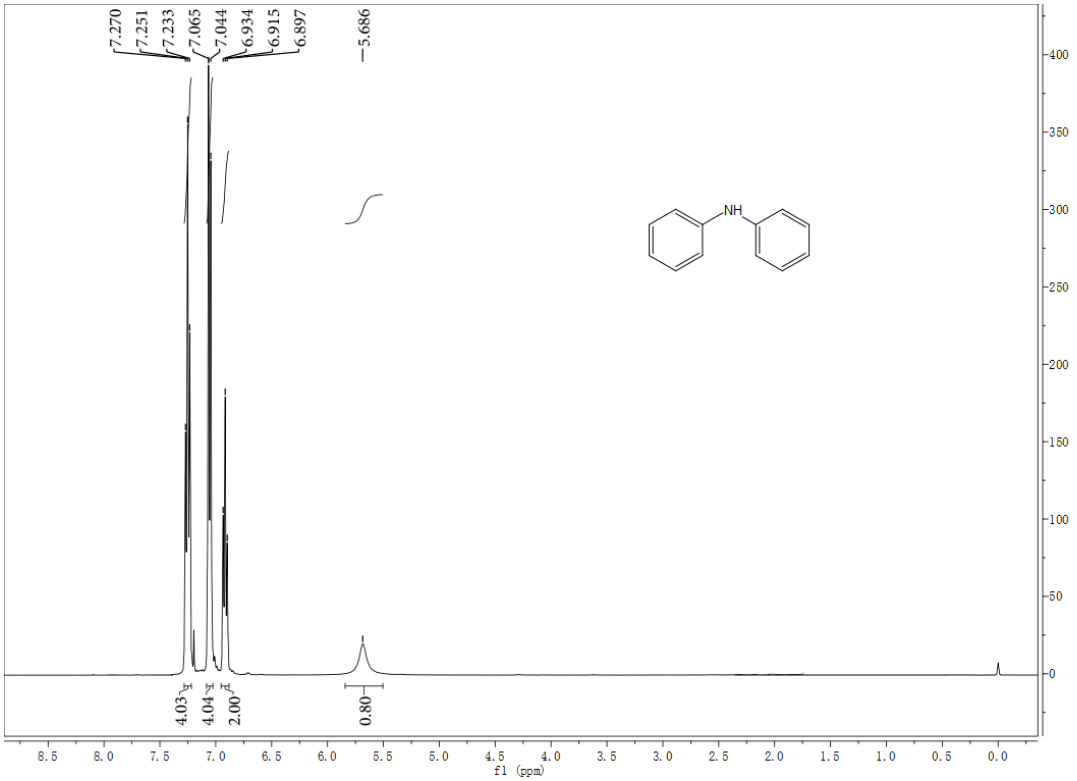


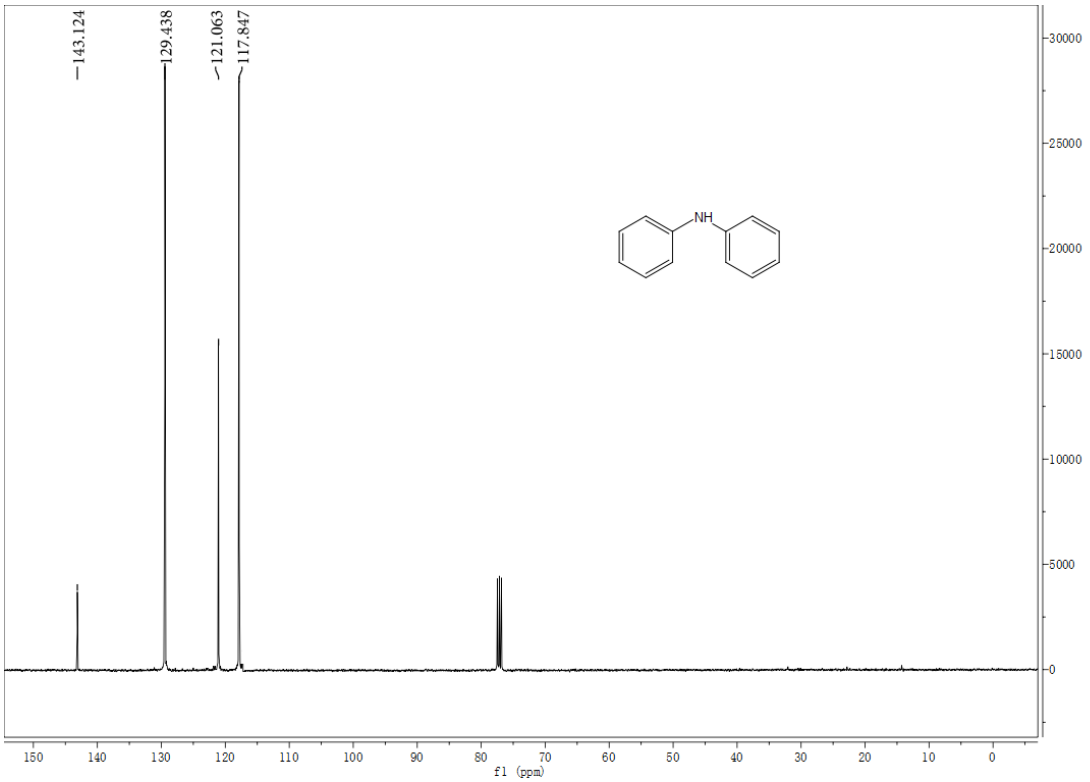
^{1}H NMR and ^{13}C NMR of compound (3m)



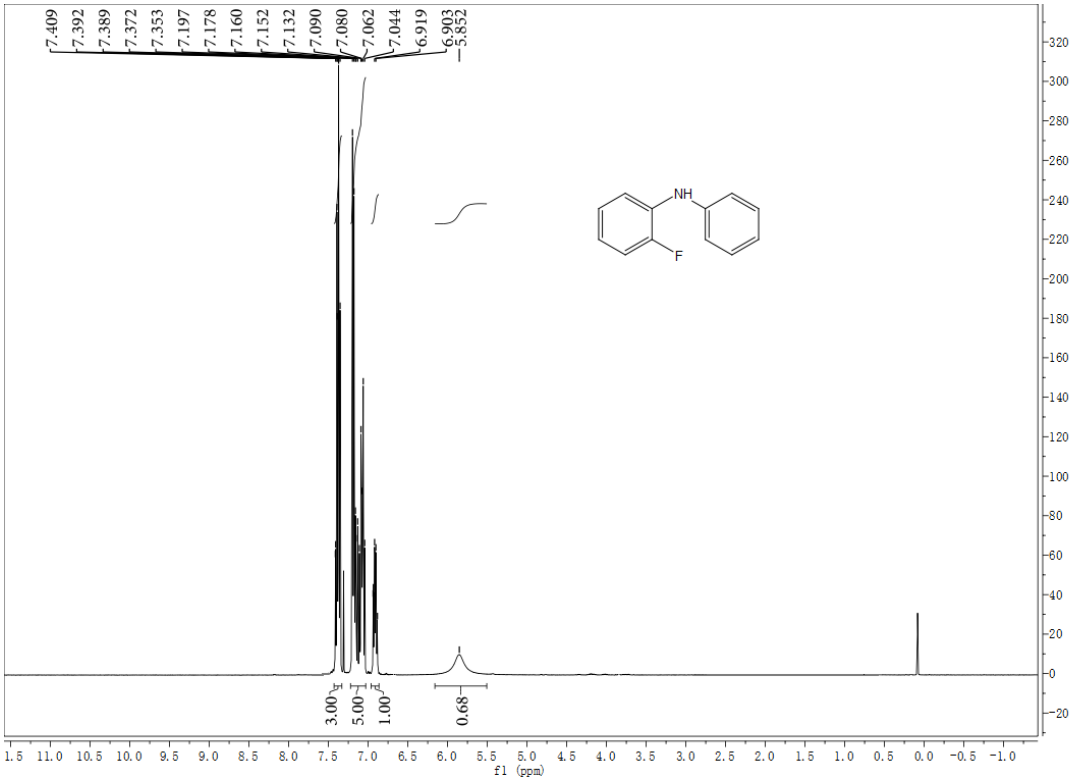


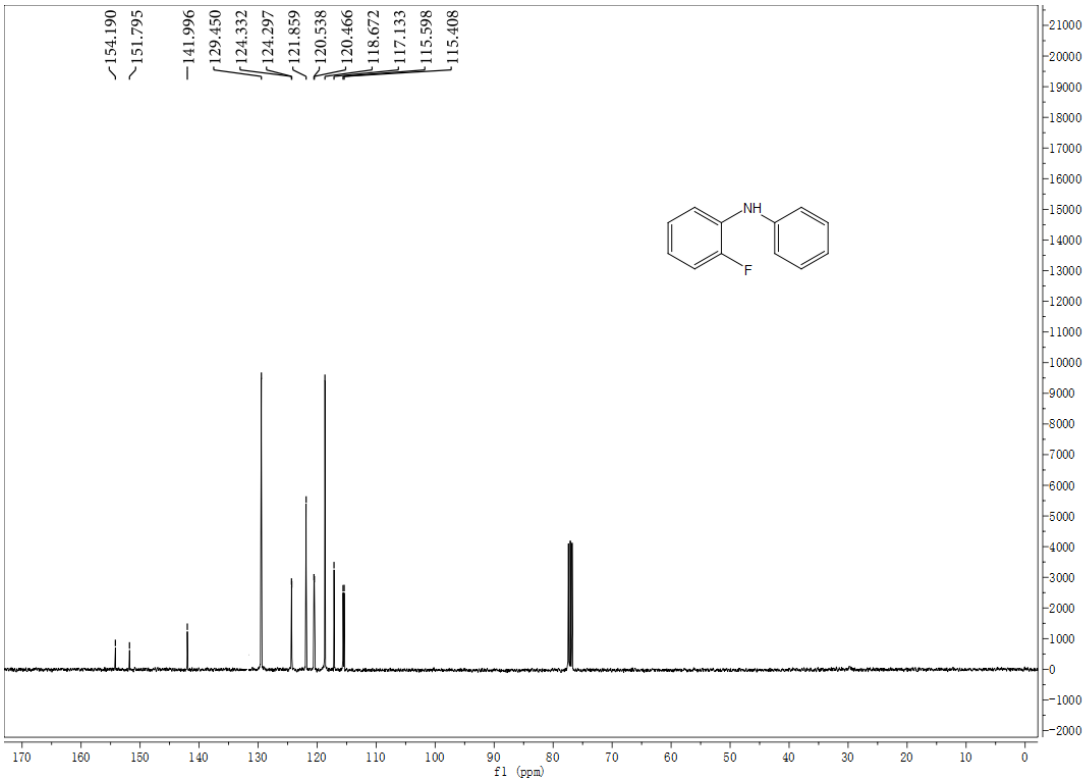
^{1}H NMR and ^{13}C NMR of compound (3n)



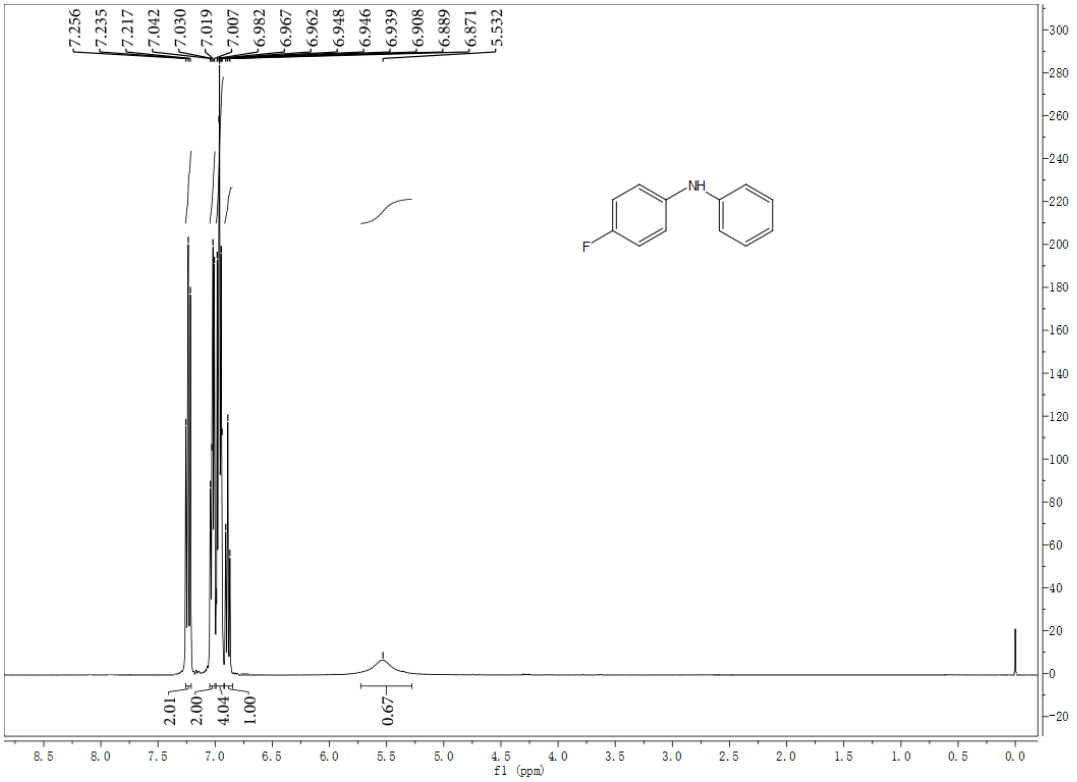


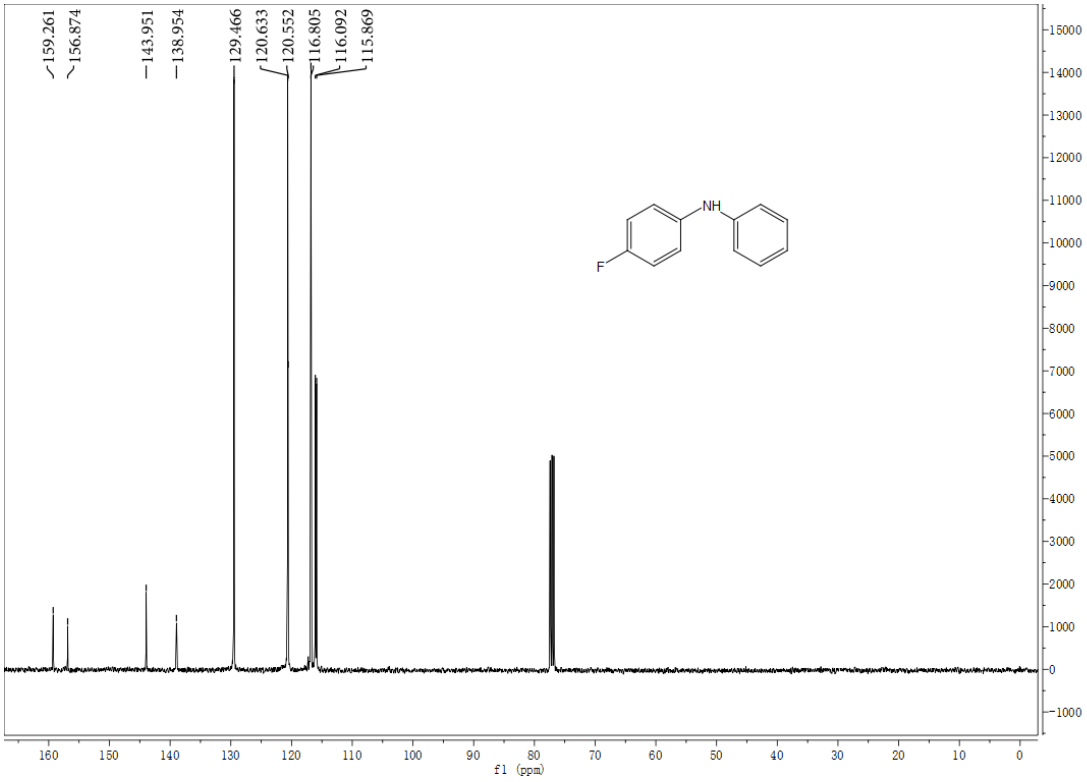
^{1}H NMR and ^{13}C NMR of compound (3o)



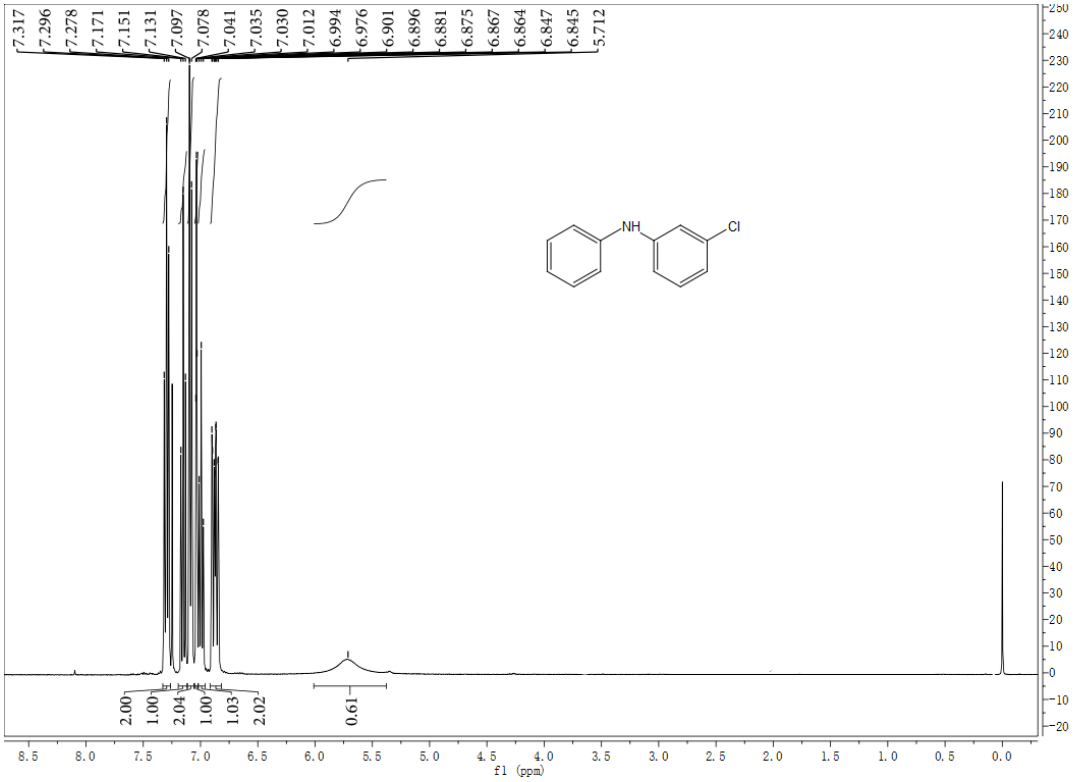


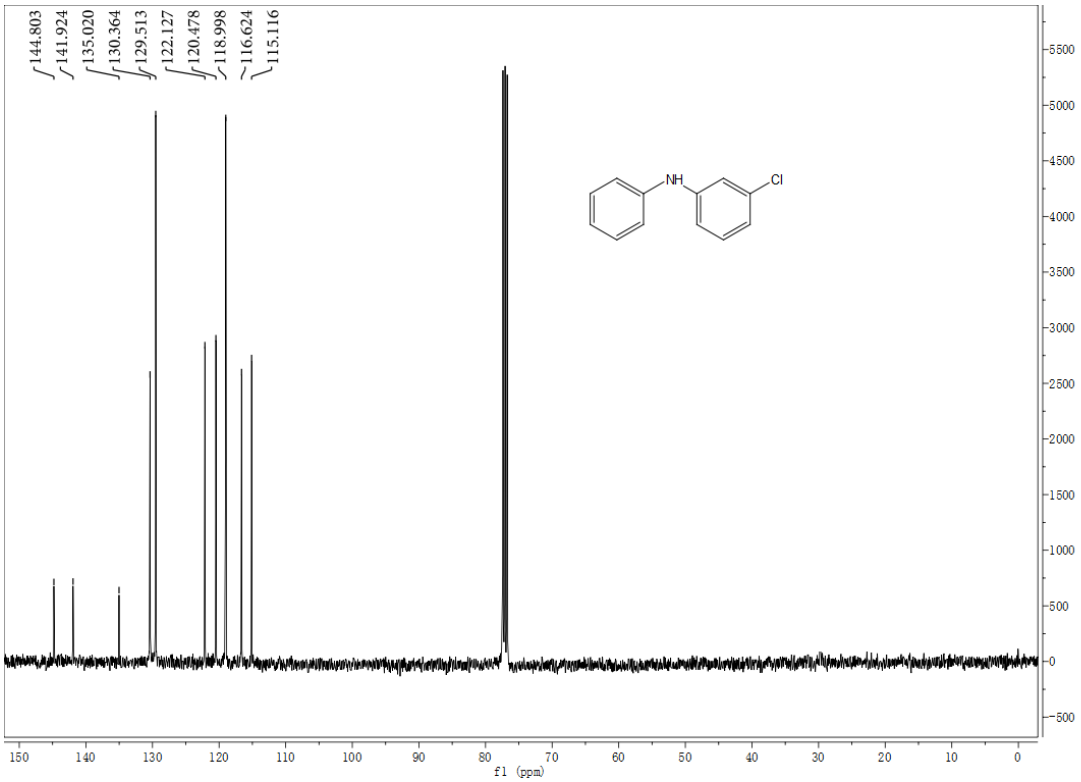
^{1}H NMR and ^{13}C NMR of compound (3p)



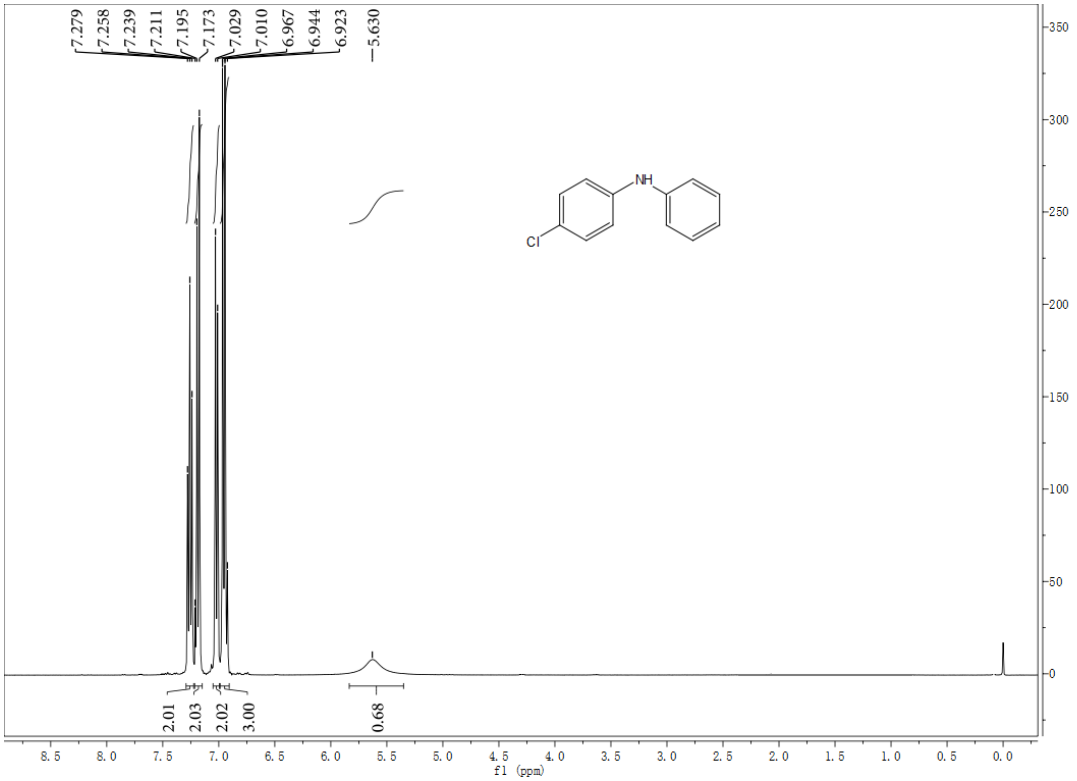


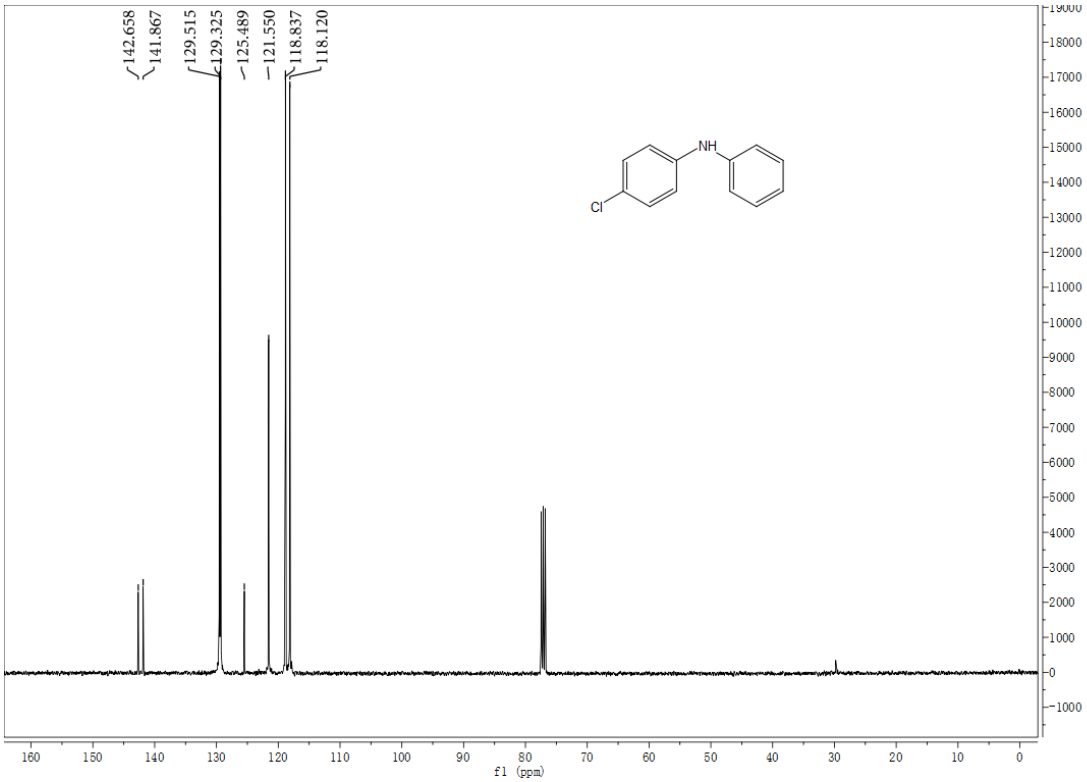
^{1}H NMR and ^{13}C NMR of compound (3q)



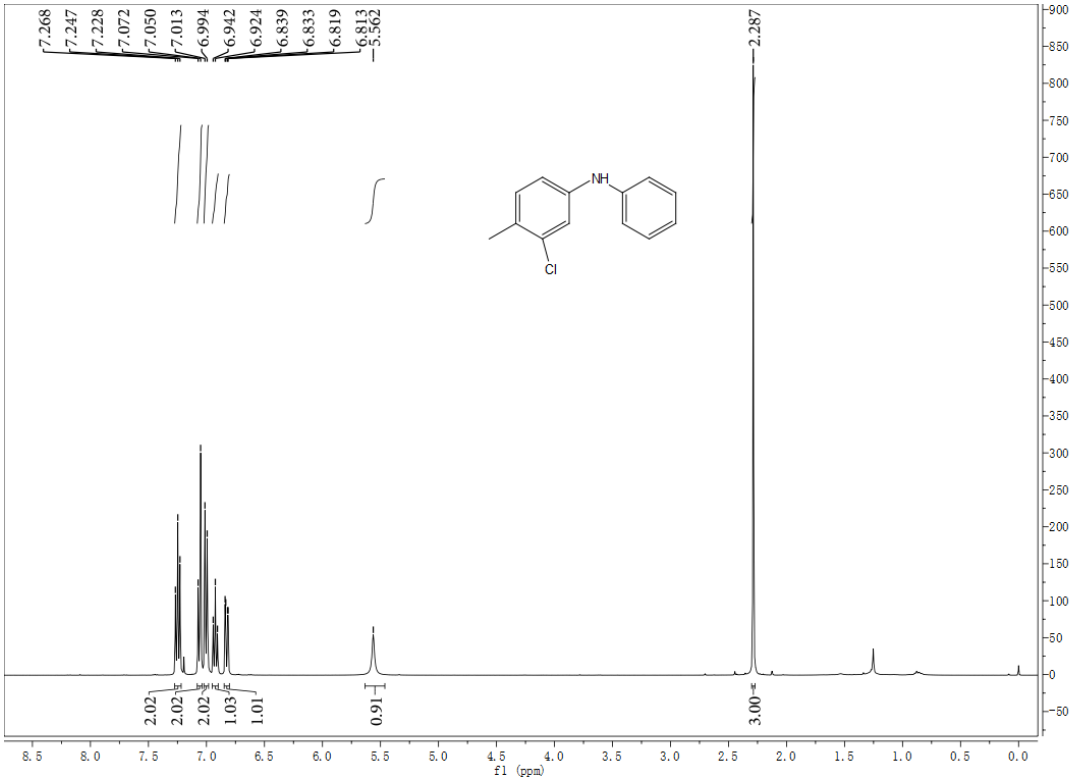


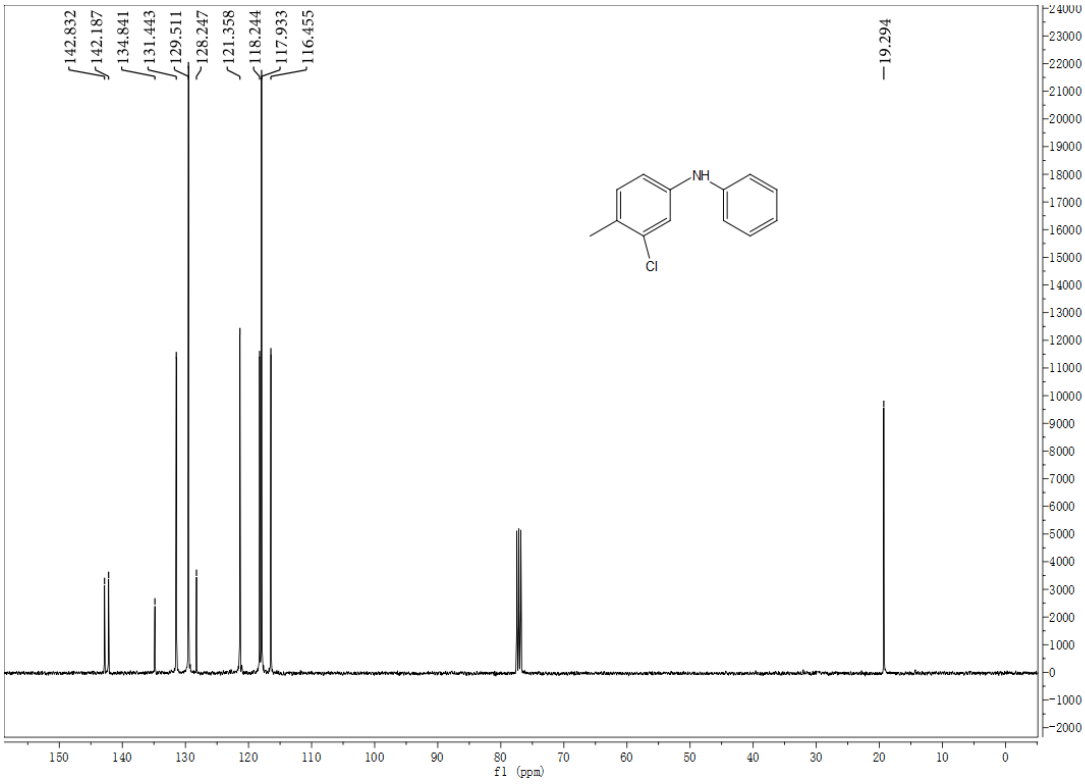
^{1}H NMR and ^{13}C NMR of compound (3r)



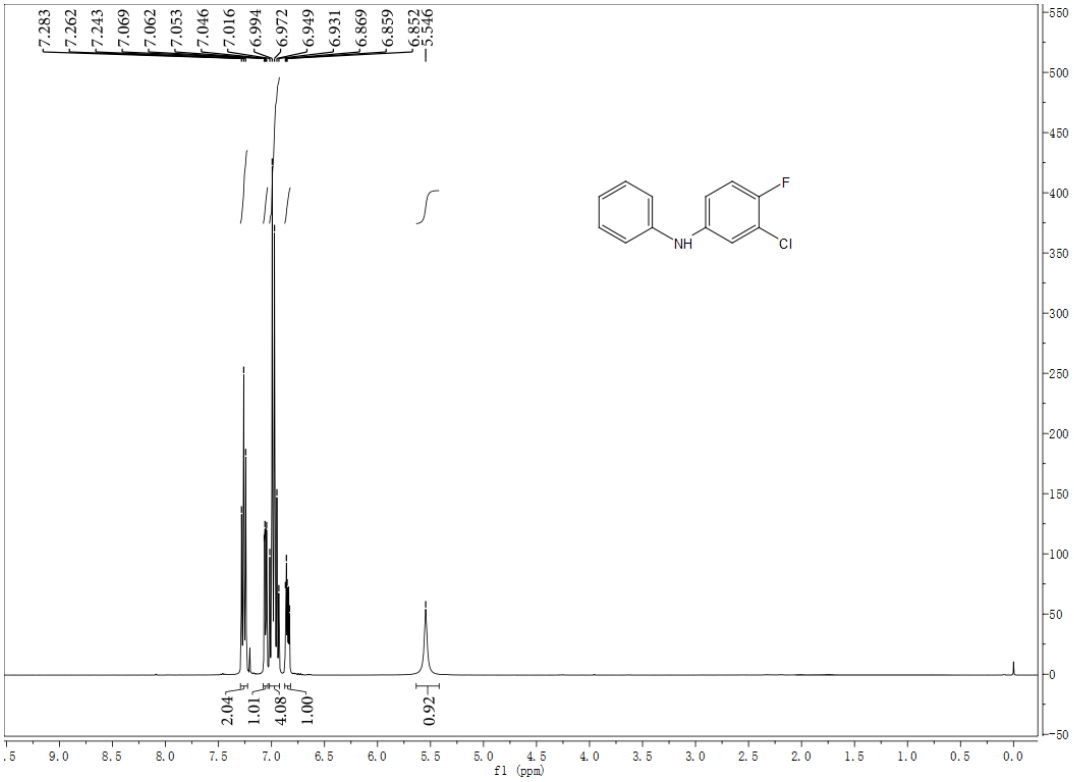


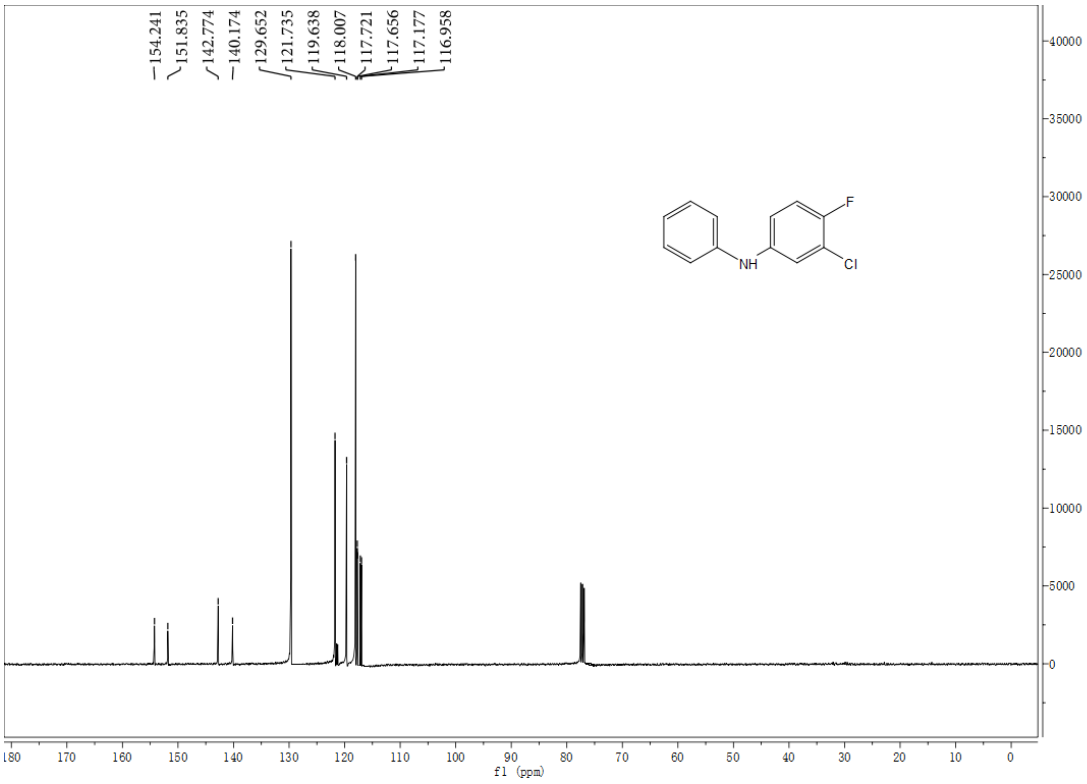
^{1}H NMR and ^{13}C NMR of compound (3s)



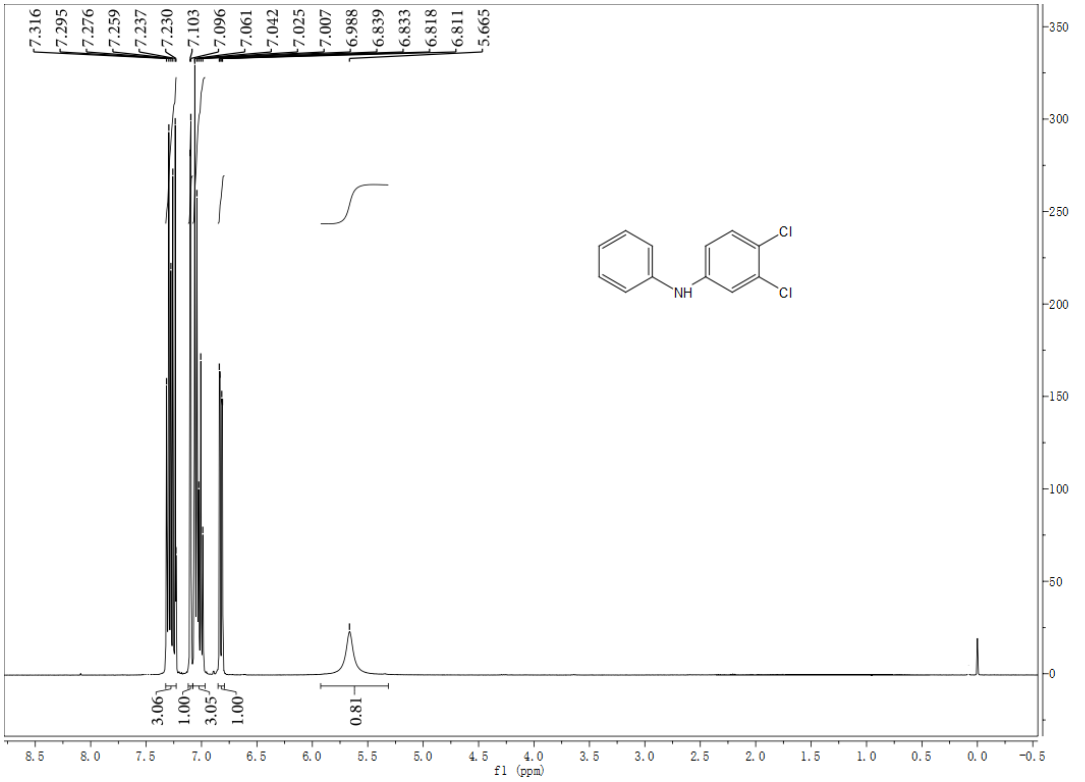


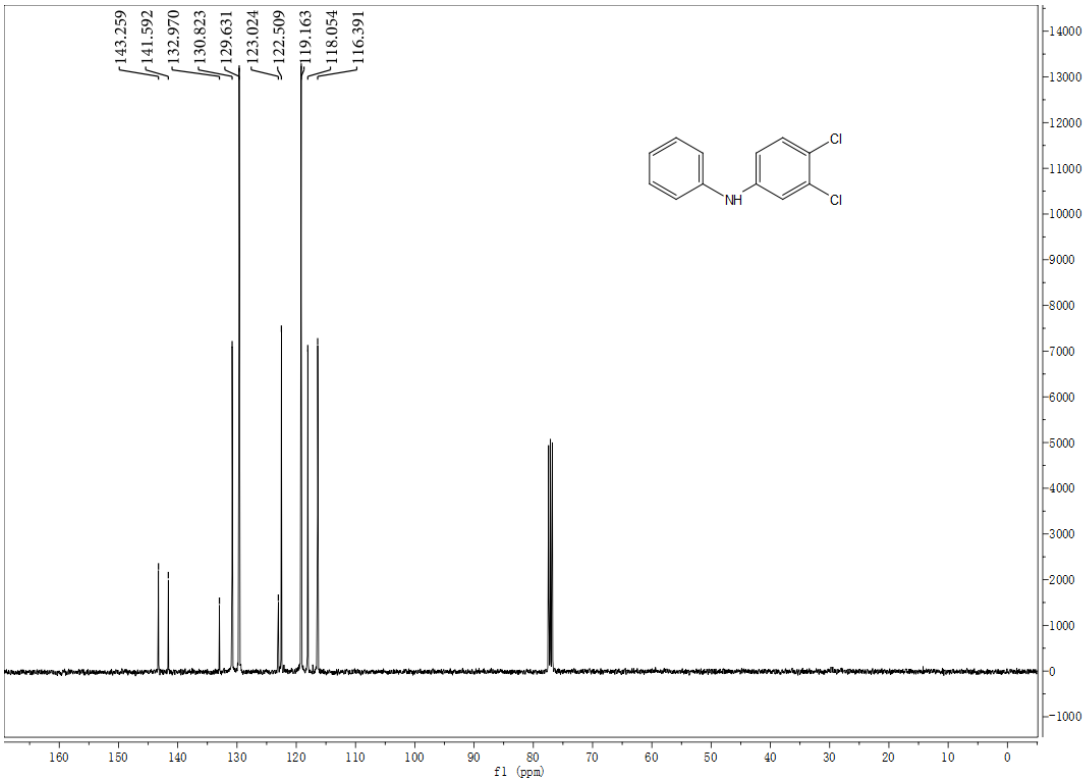
^{1}H NMR and ^{13}C NMR of compound (3t)



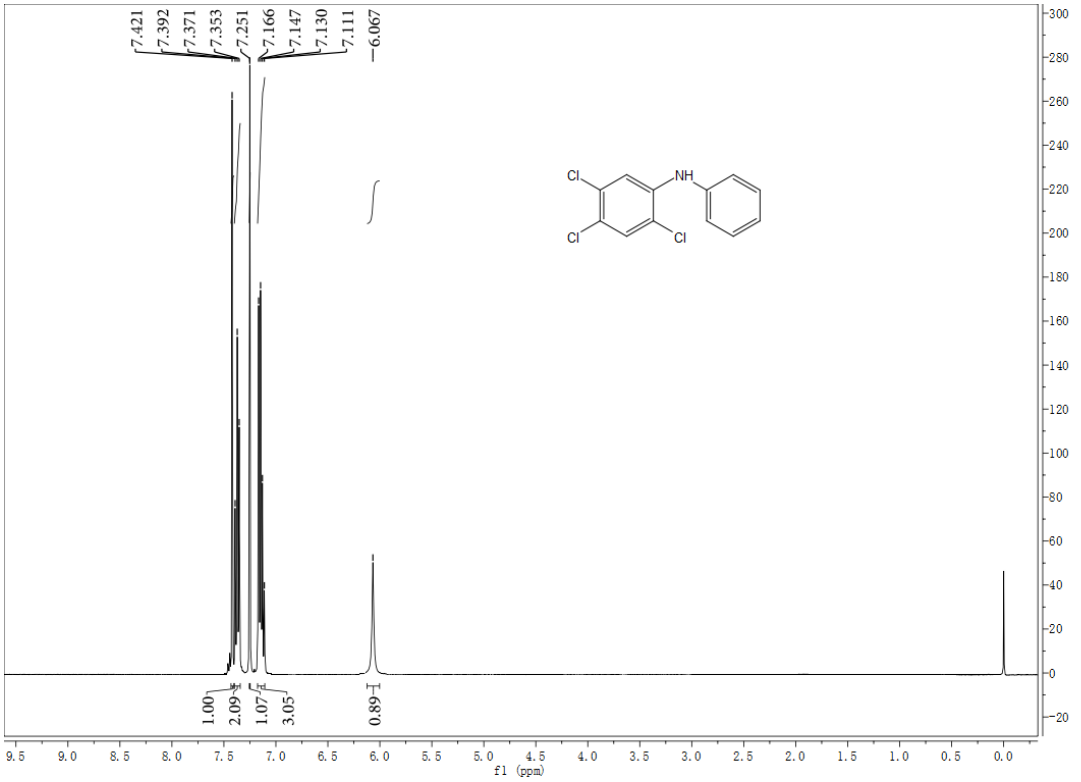


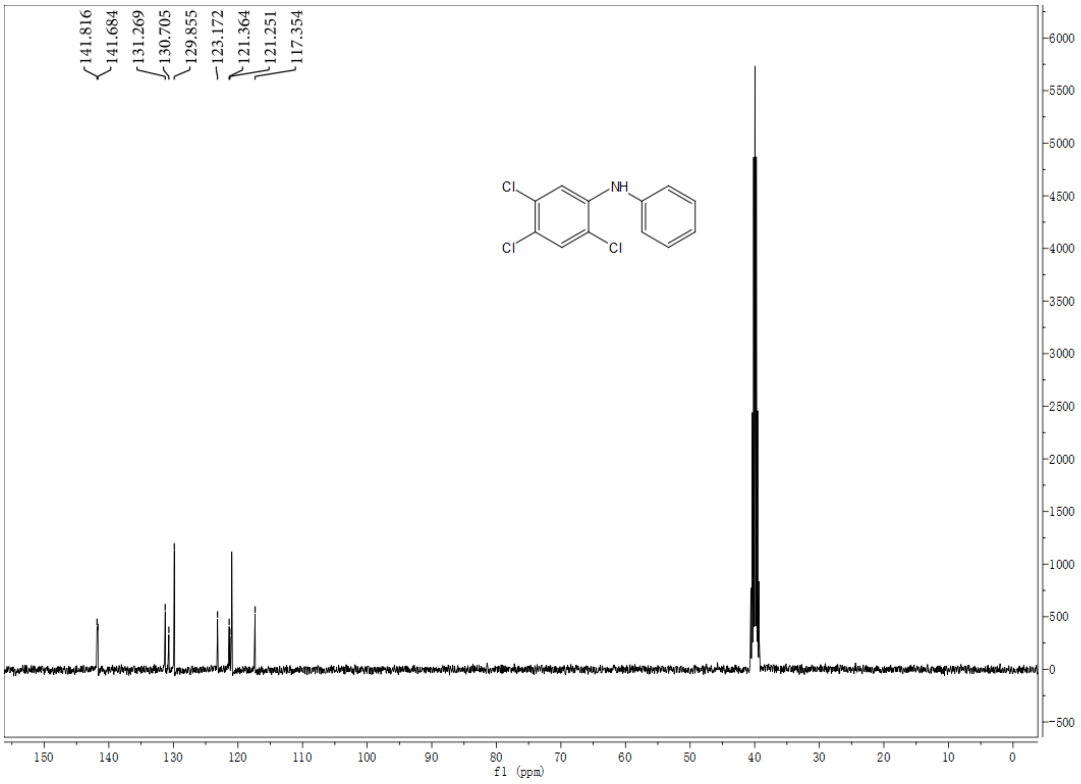
^{1}H NMR and ^{13}C NMR of compound (3u)



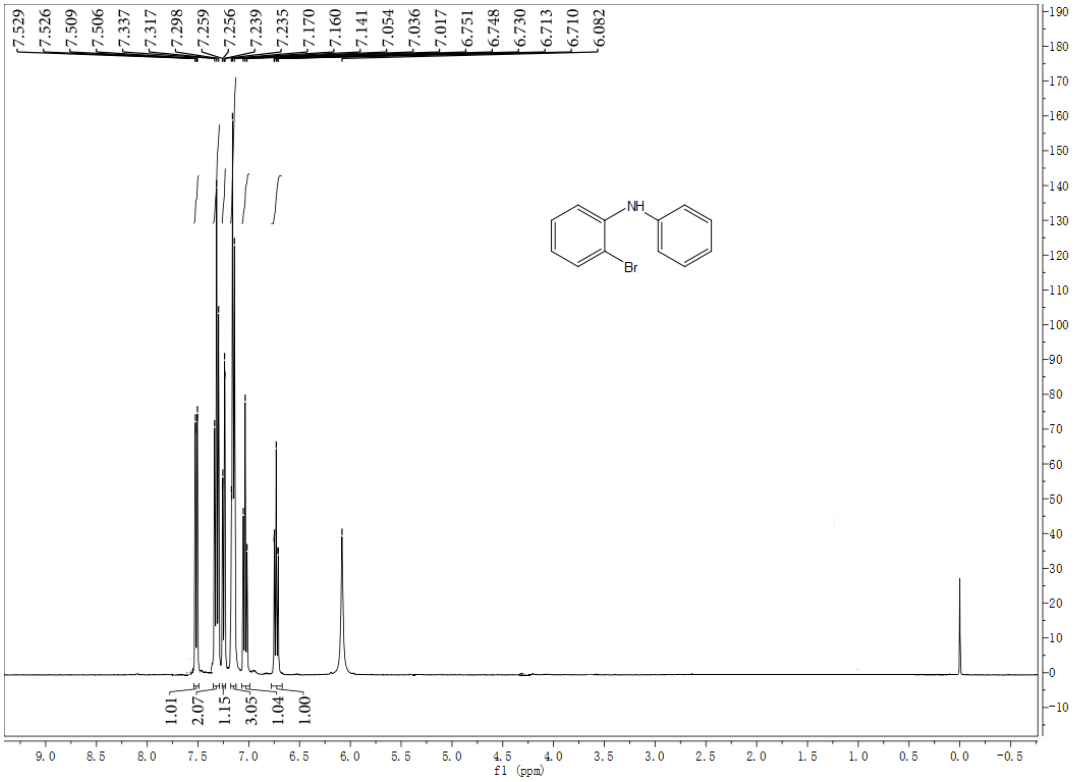


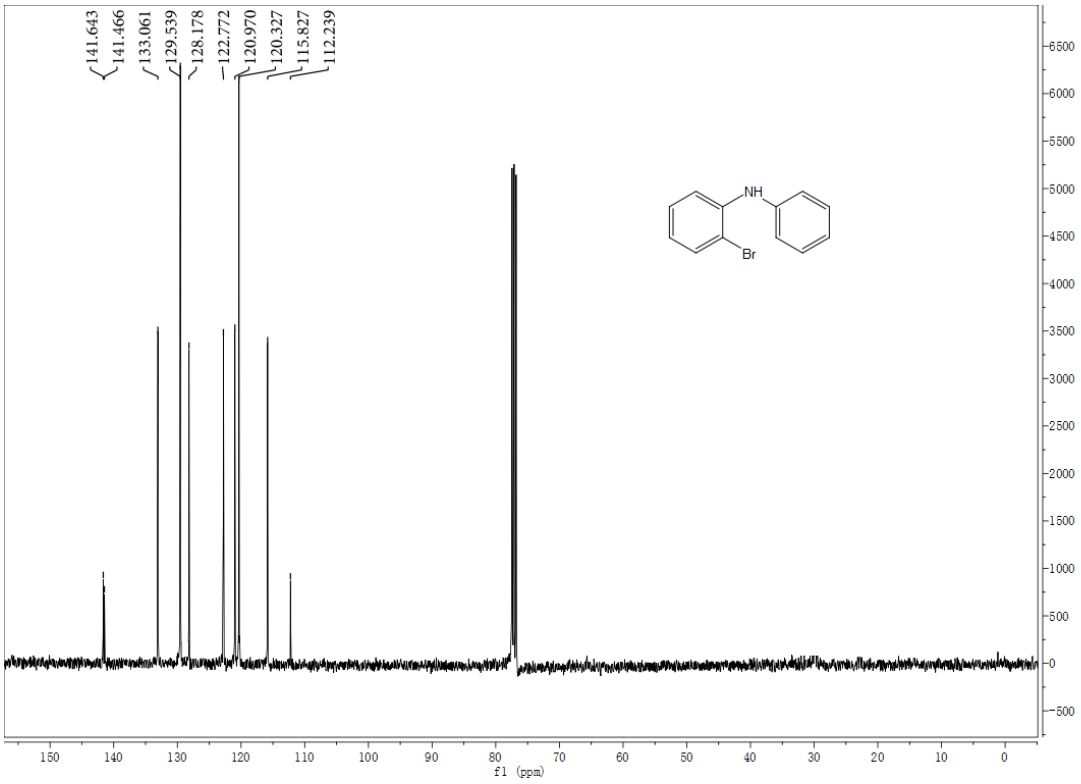
^{1}H NMR and ^{13}C NMR of compound (3v)



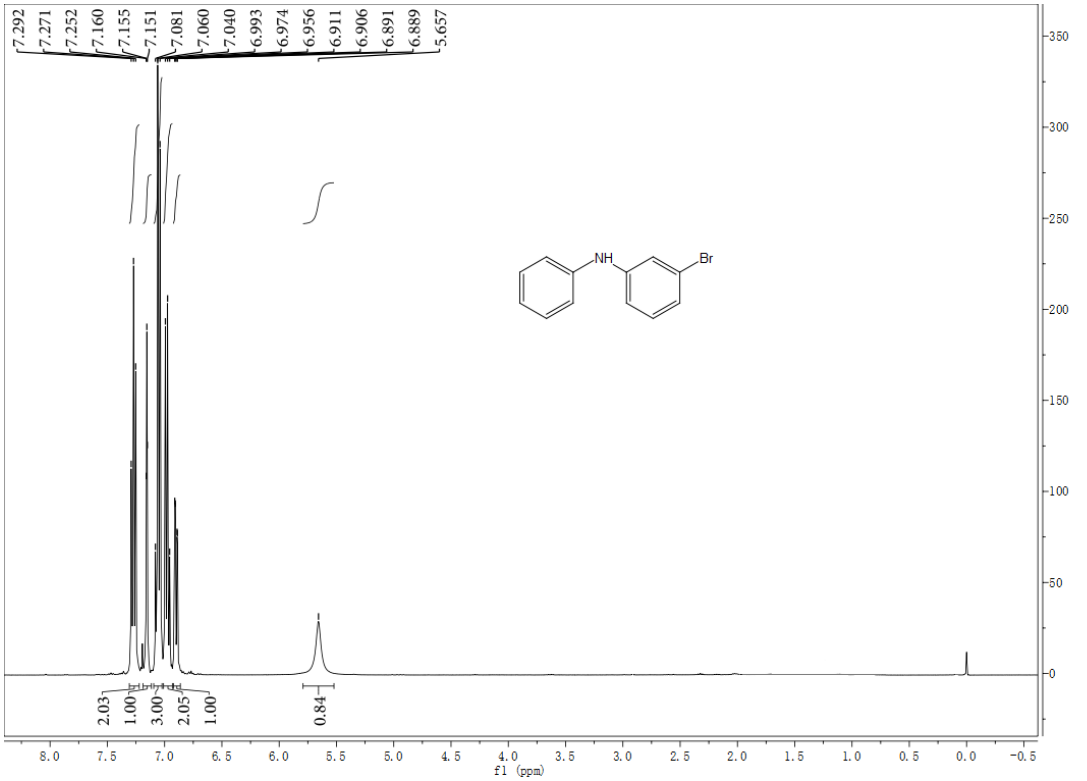


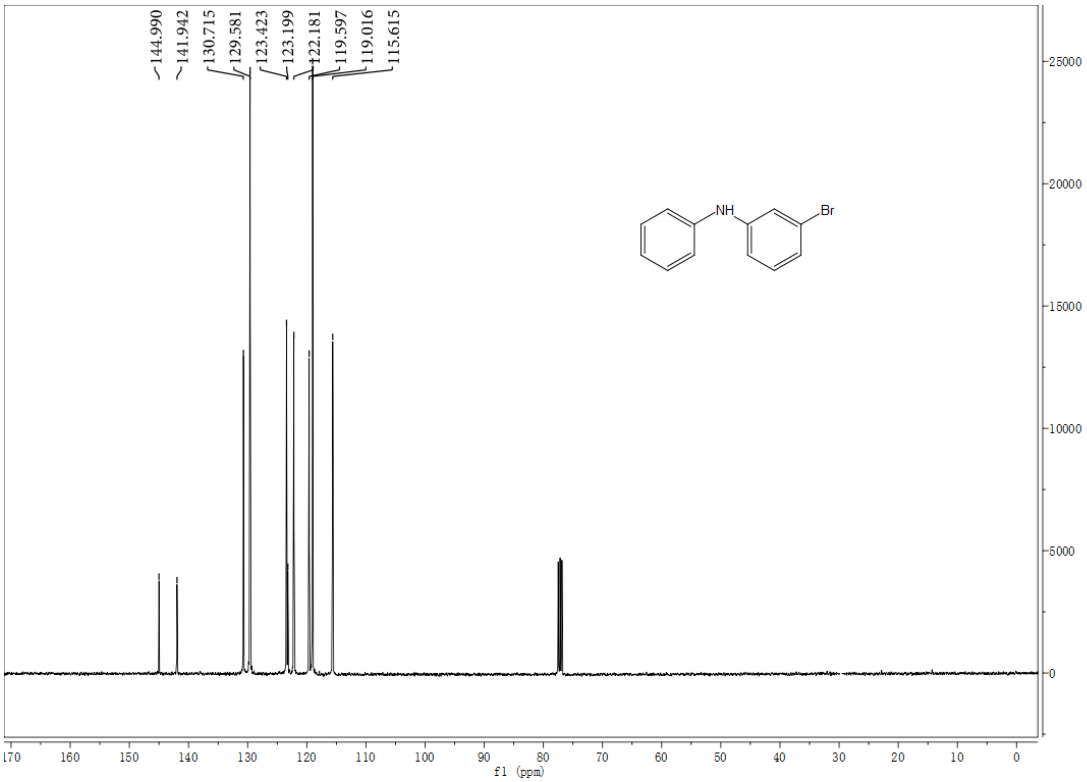
^{1}H NMR and ^{13}C NMR of compound (3w)



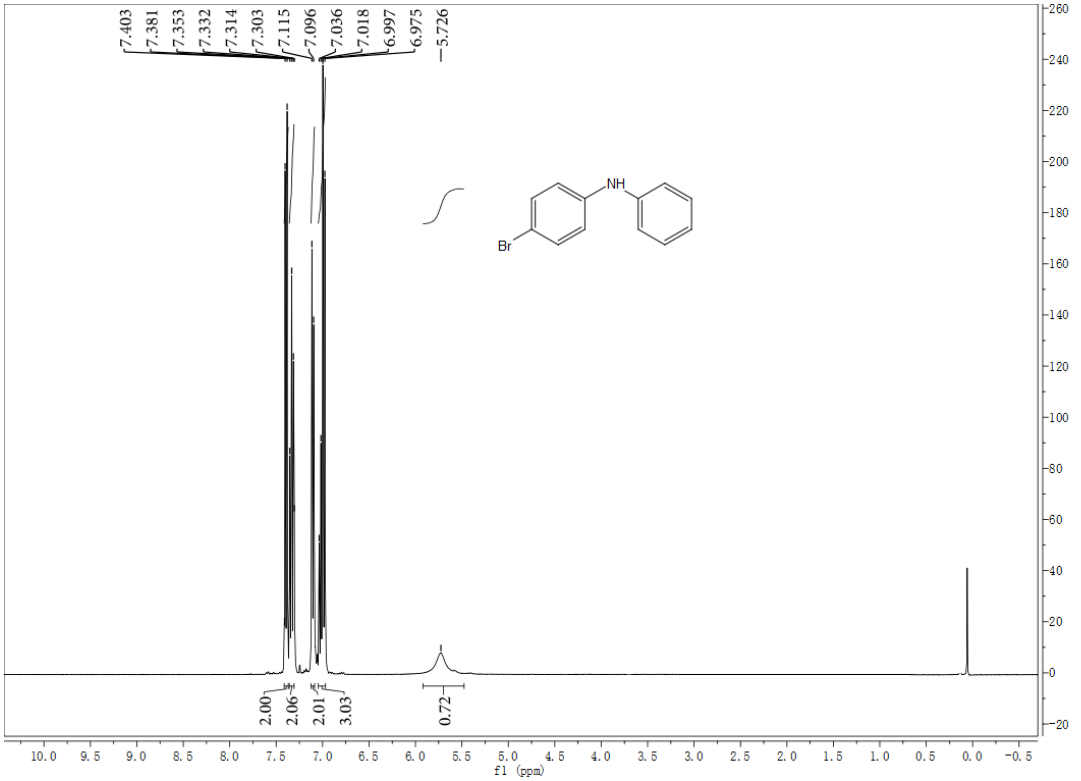


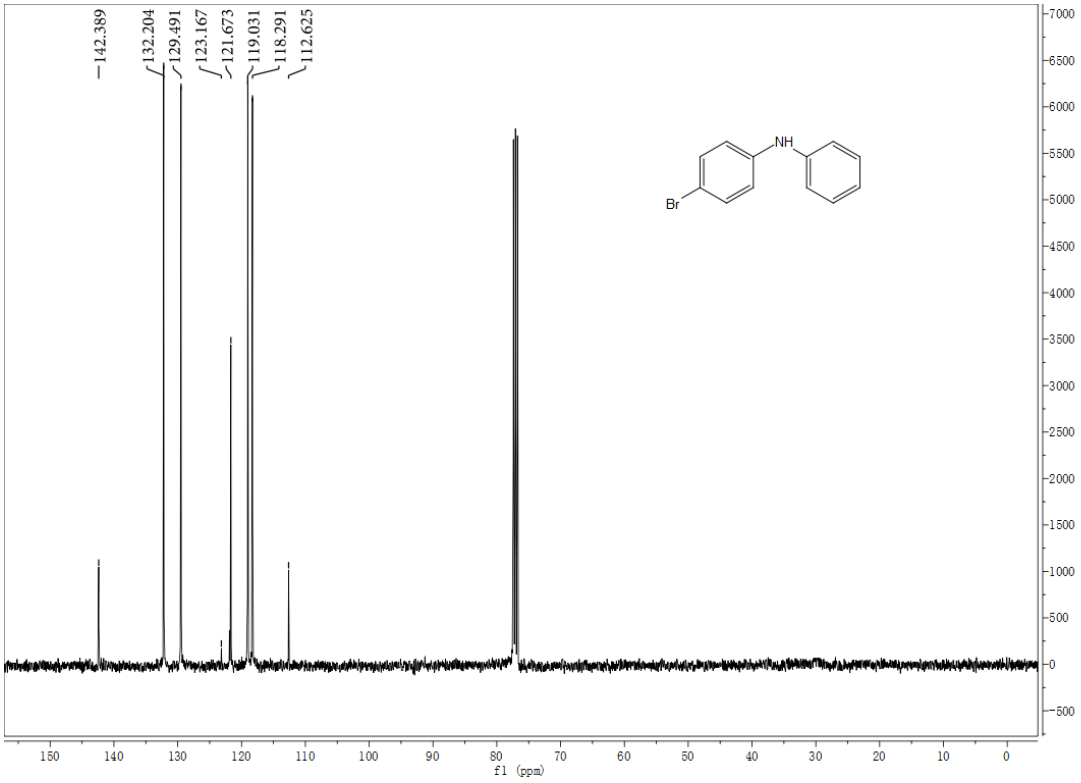
^{1}H NMR and ^{13}C NMR of compound (3x)



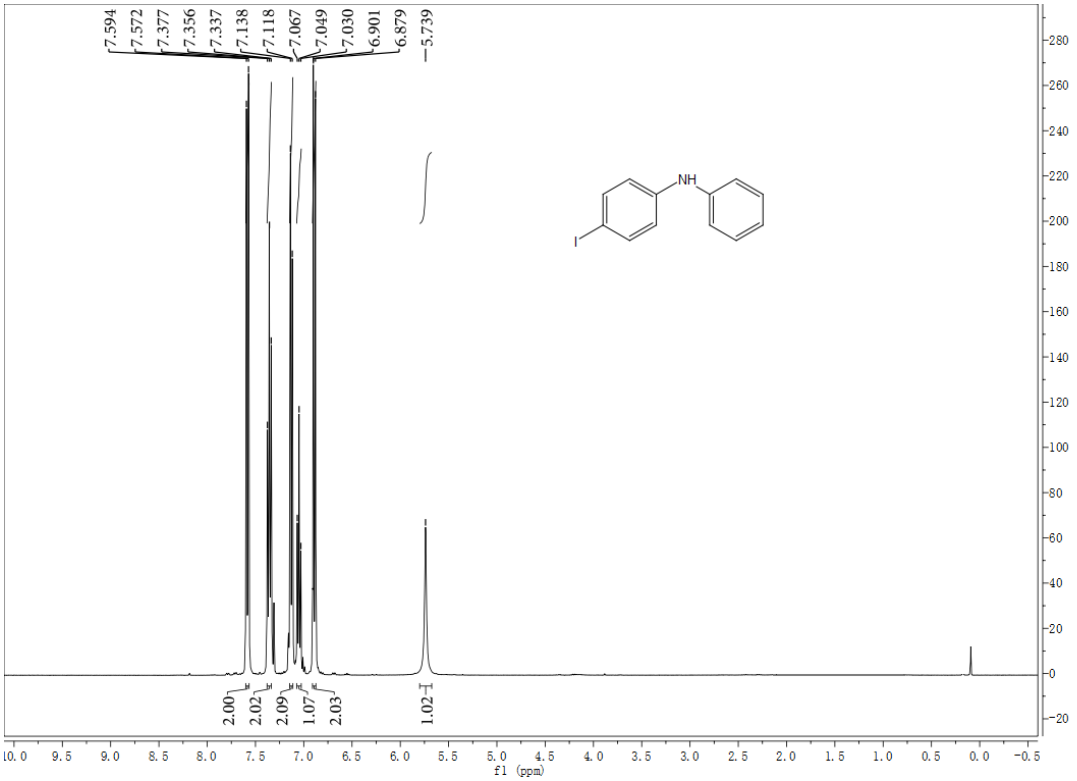


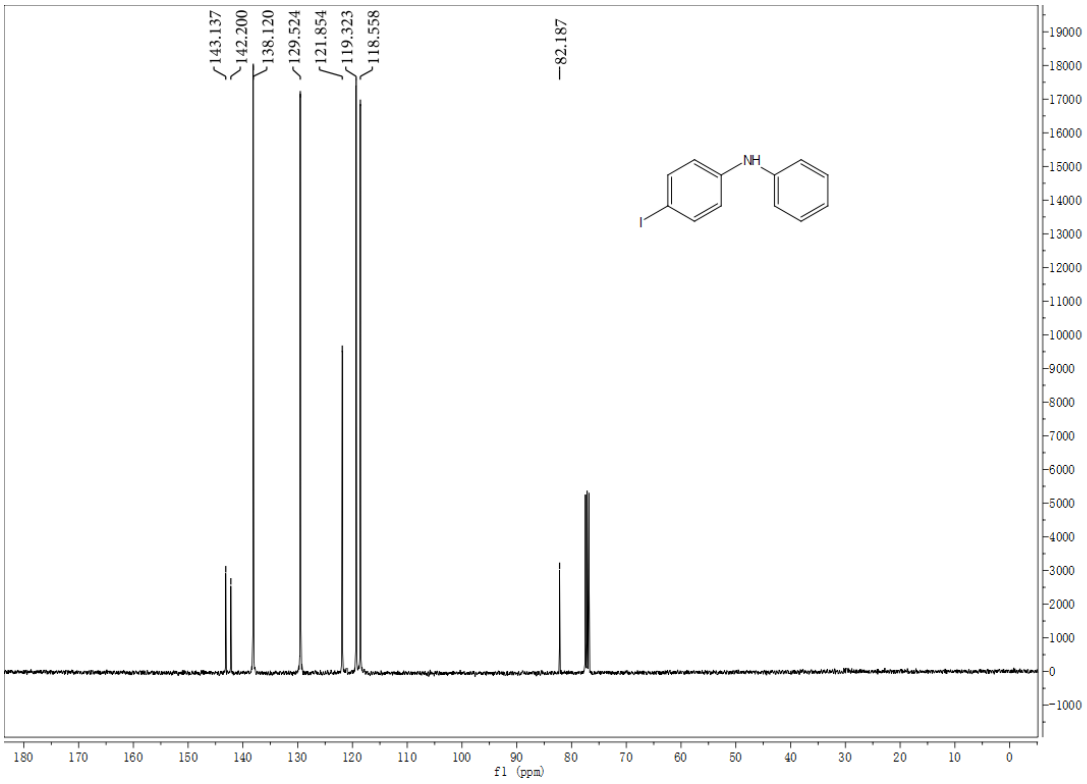
^{1}H NMR and ^{13}C NMR of compound (3y)



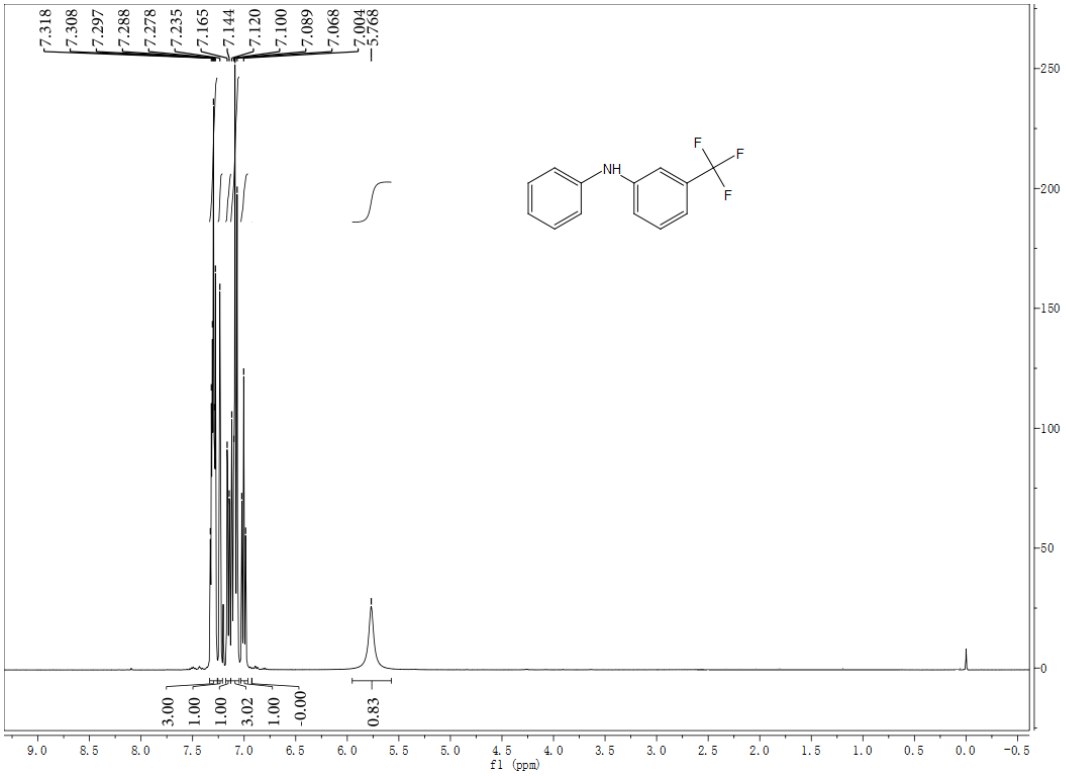


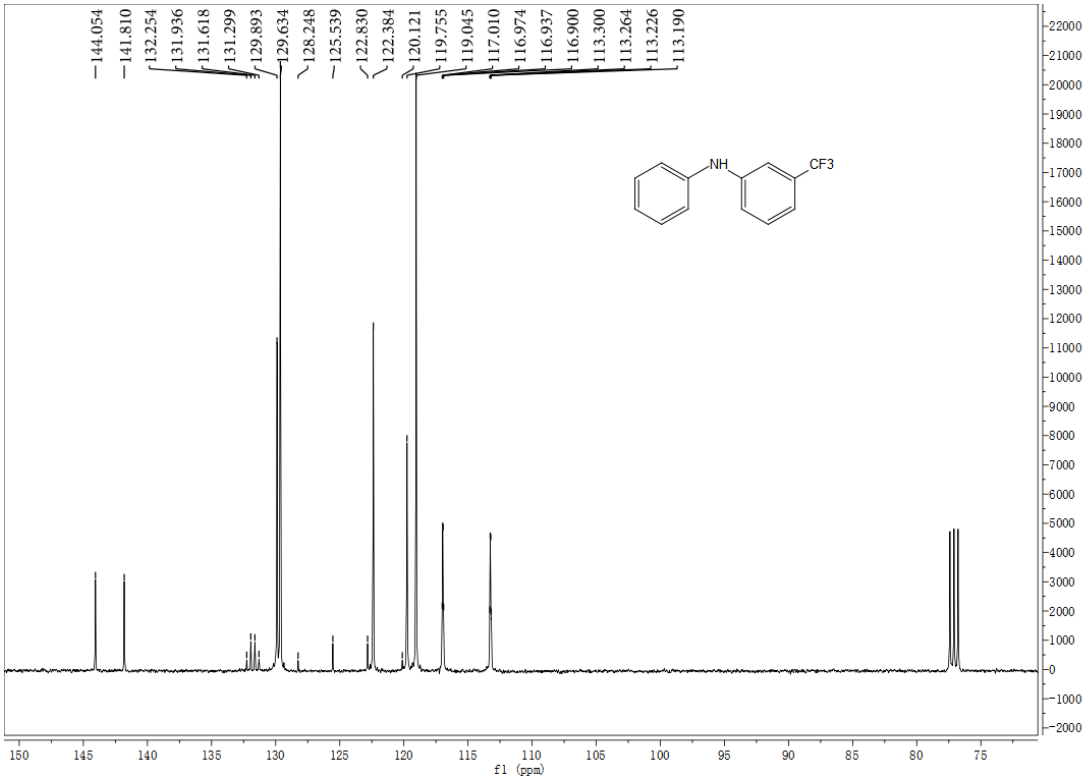
^{1}H NMR and ^{13}C NMR of compound (3z)



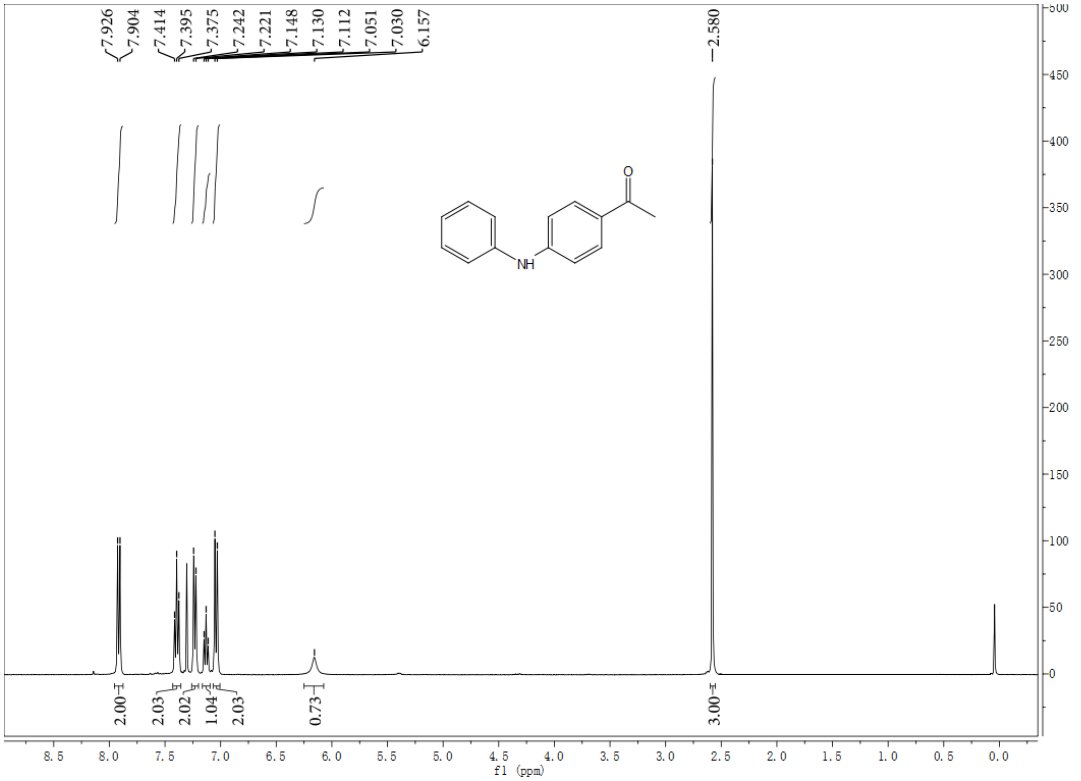


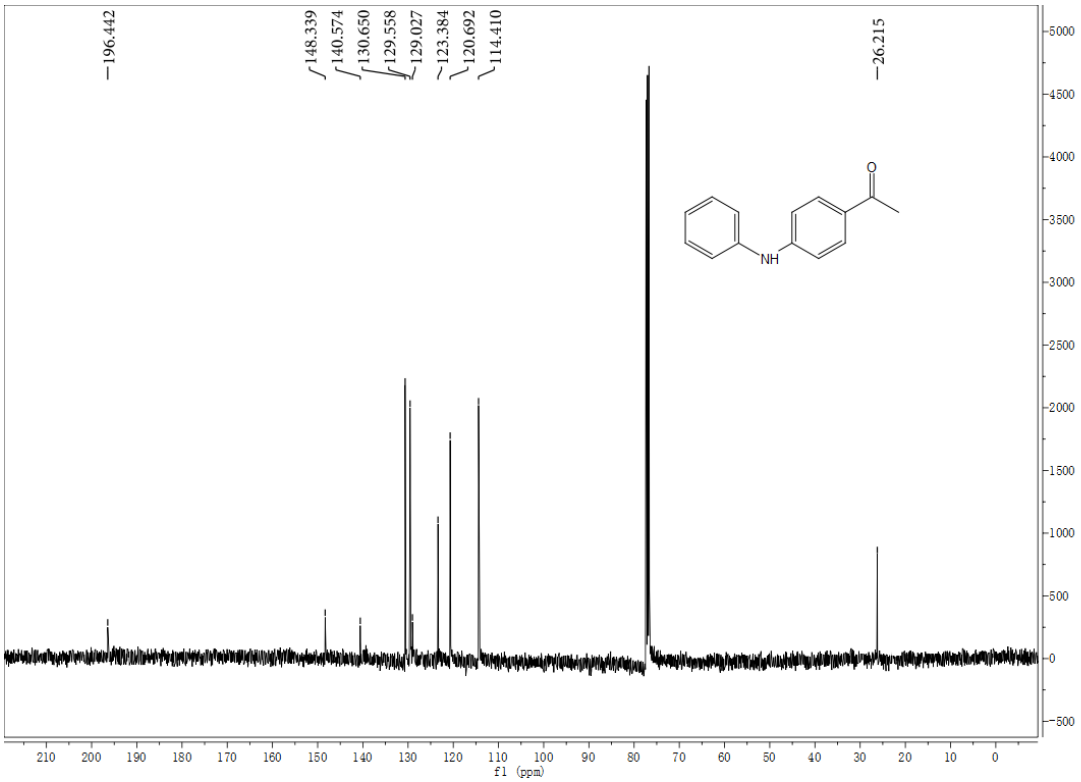
^{1}H NMR and ^{13}C NMR of compound (3aa)



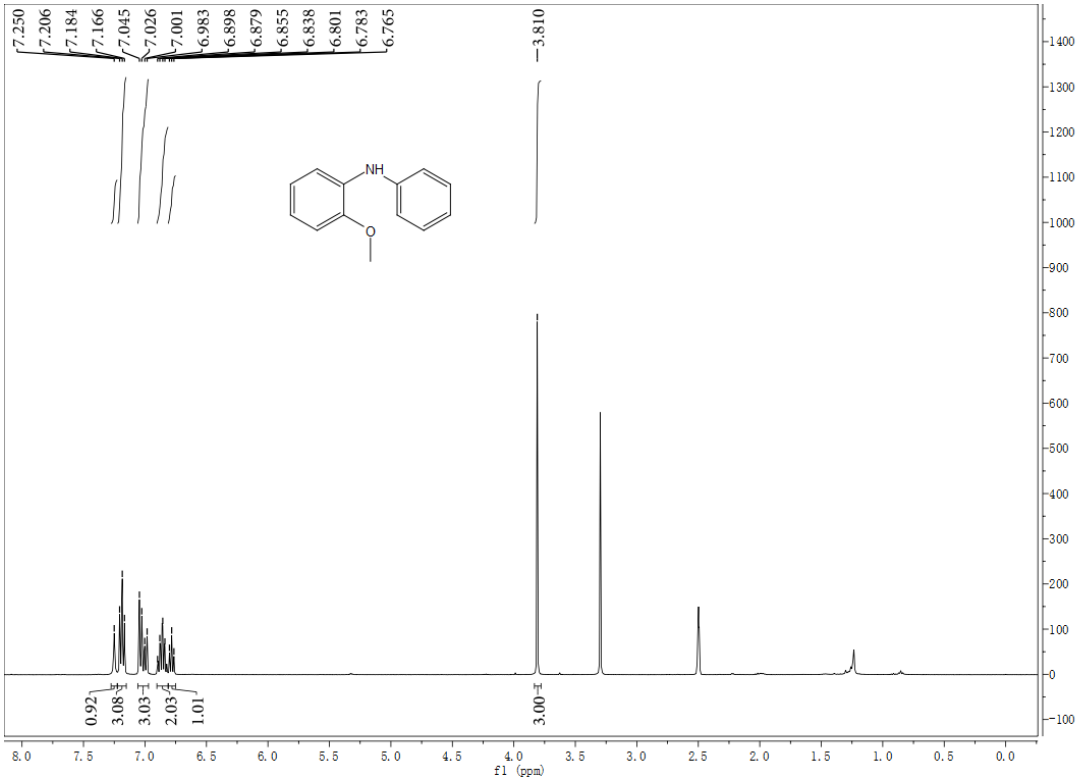


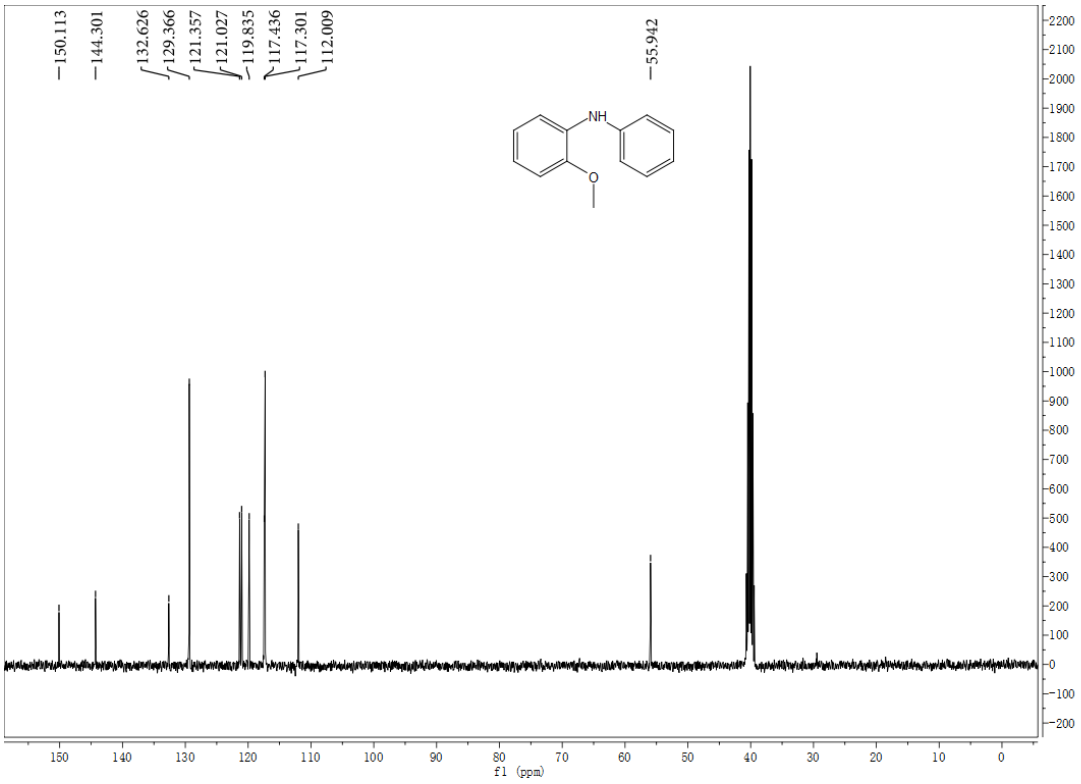
^{1}H NMR and ^{13}C NMR of compound (3ab)



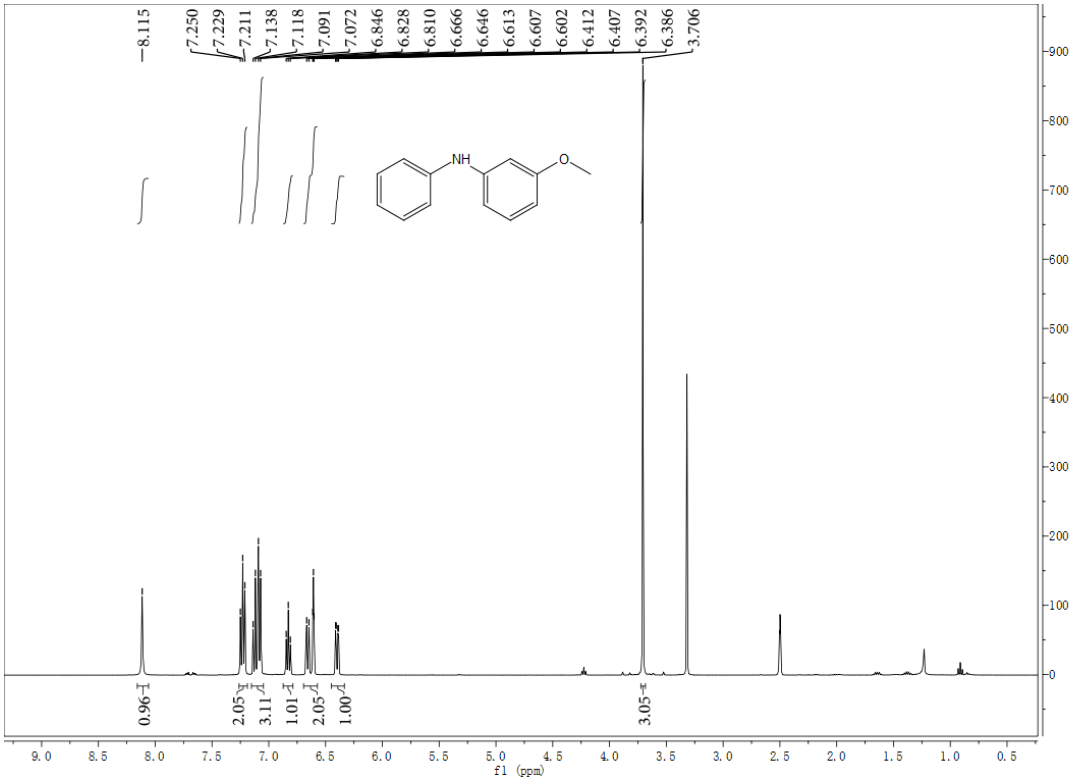


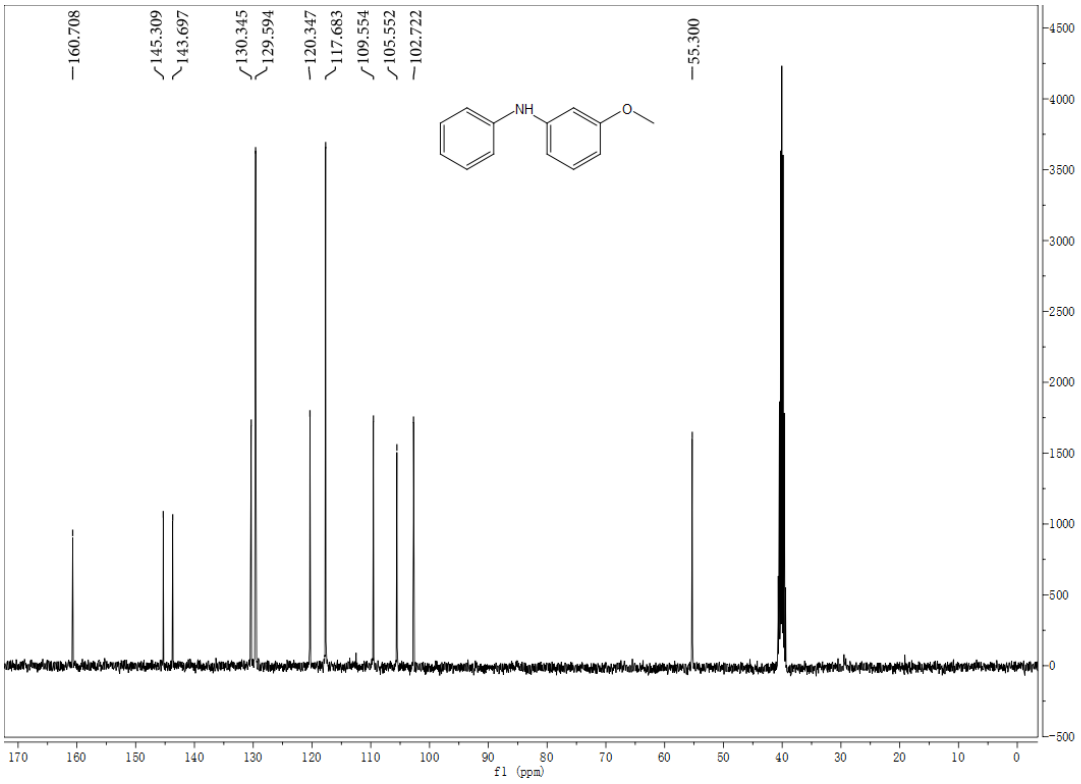
^{1}H NMR and ^{13}C NMR of compound (3ad)



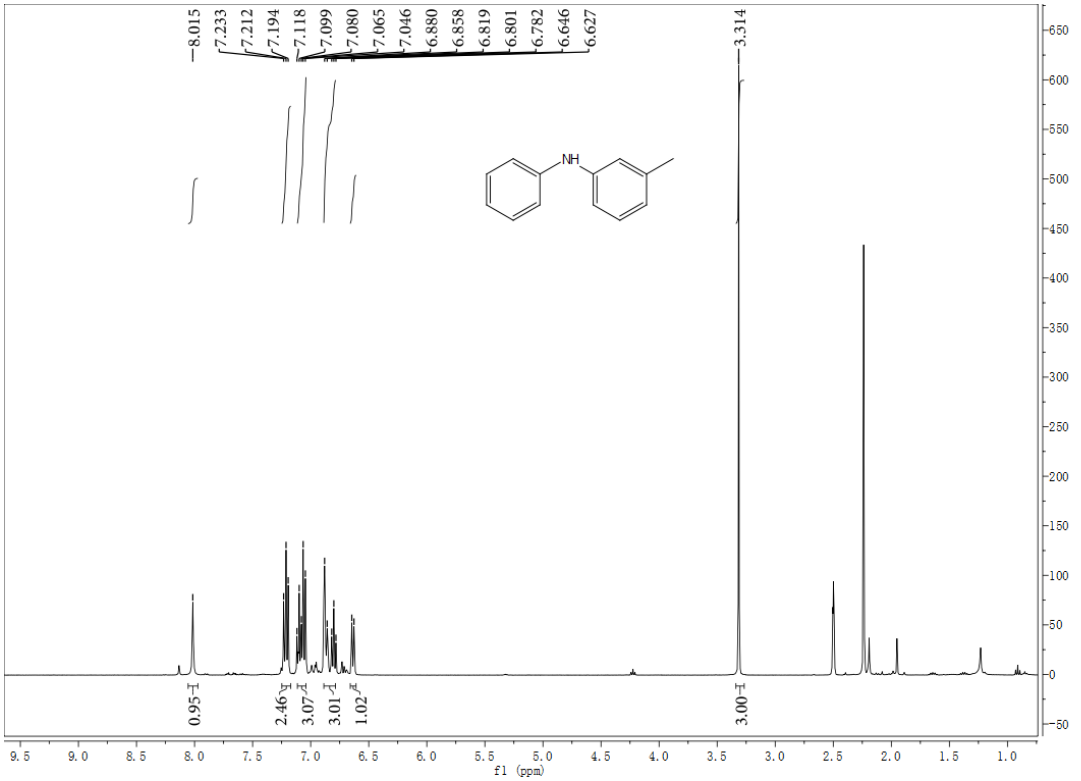


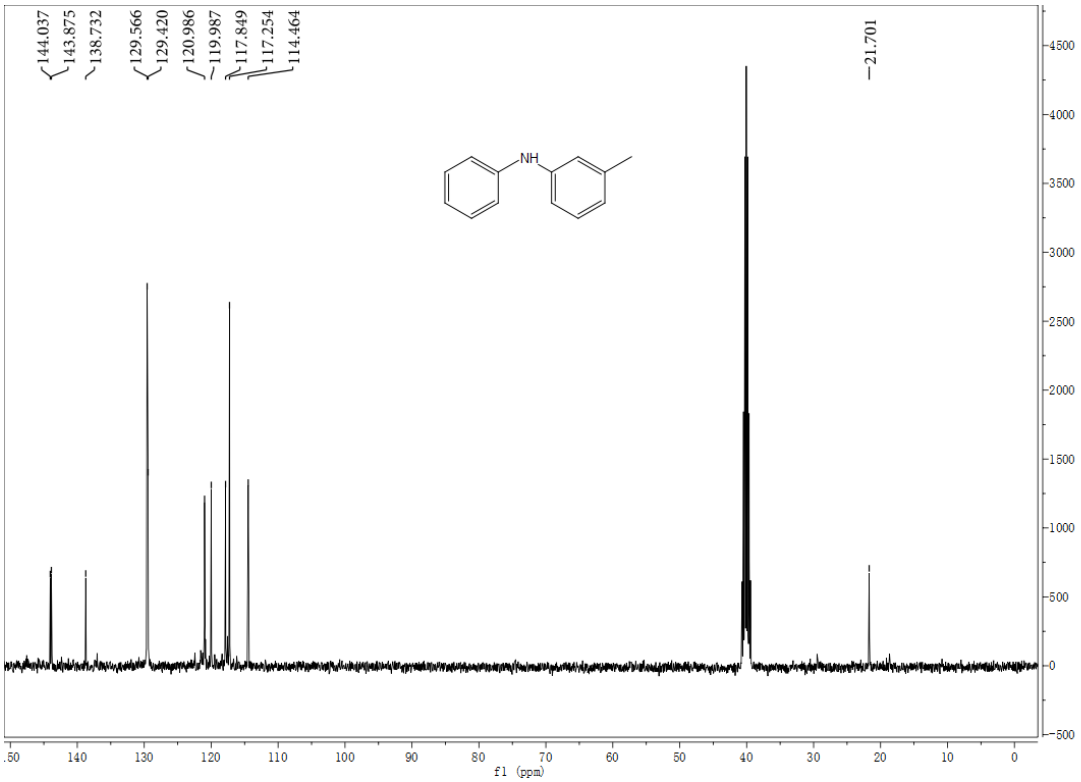
^{1}H NMR and ^{13}C NMR of compound (3ae)



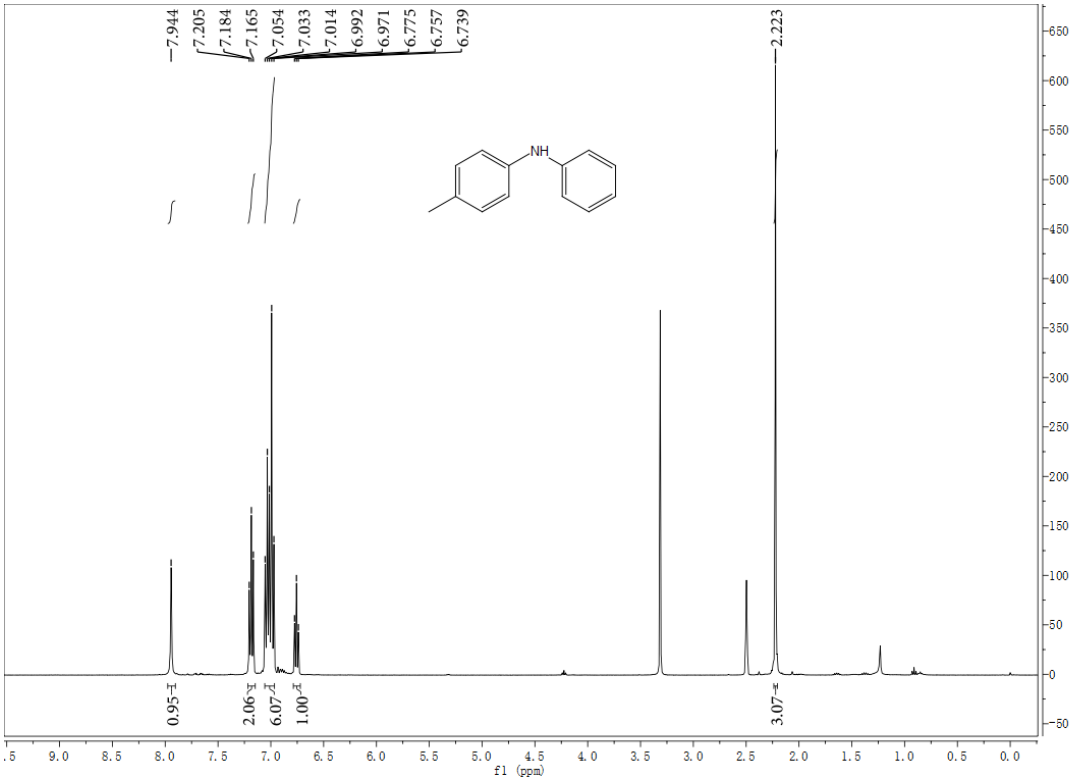


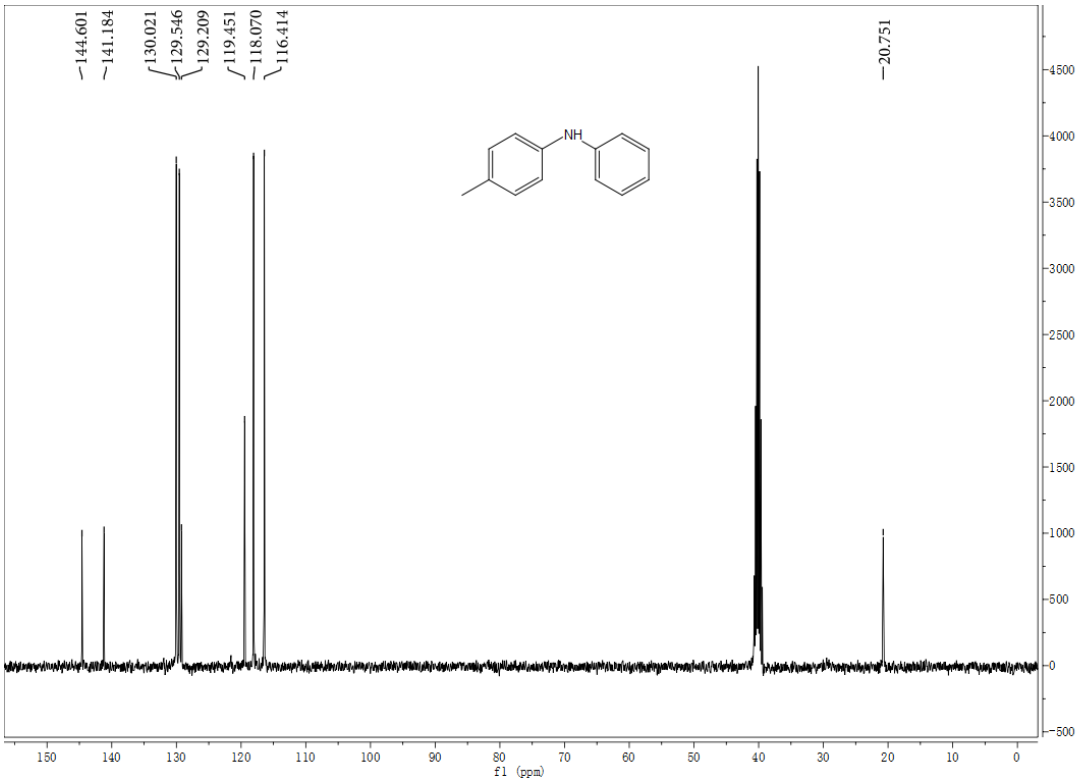
^{1}H NMR and ^{13}C NMR of compound (3af)



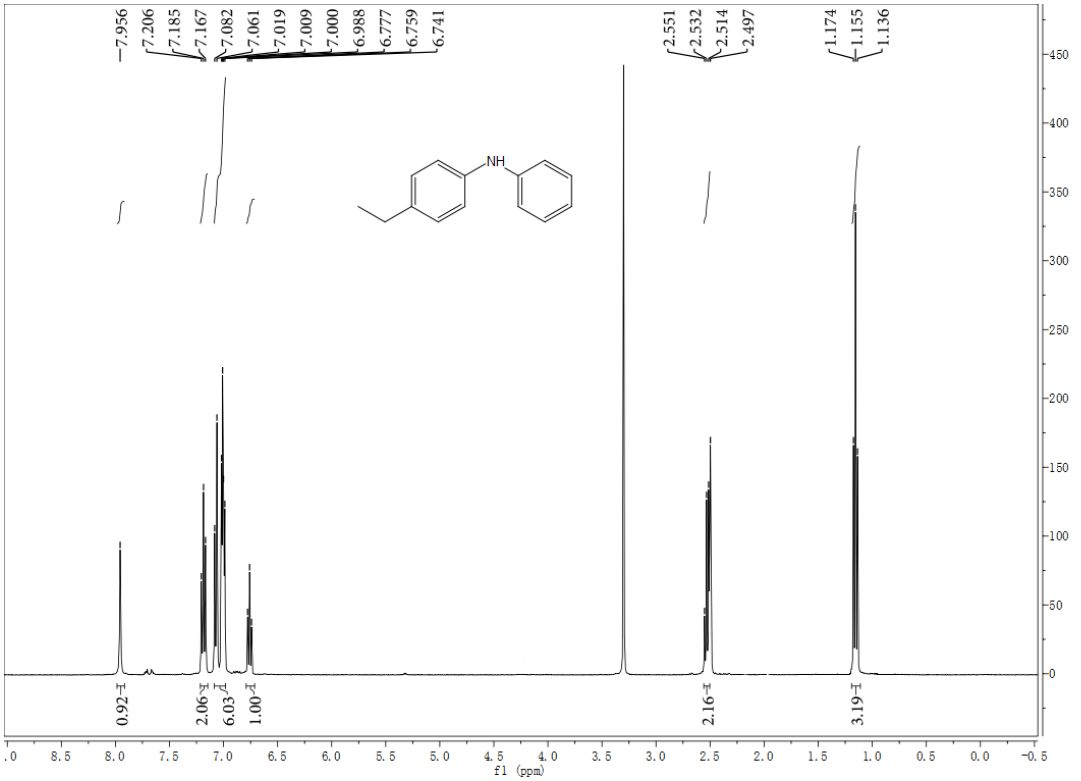


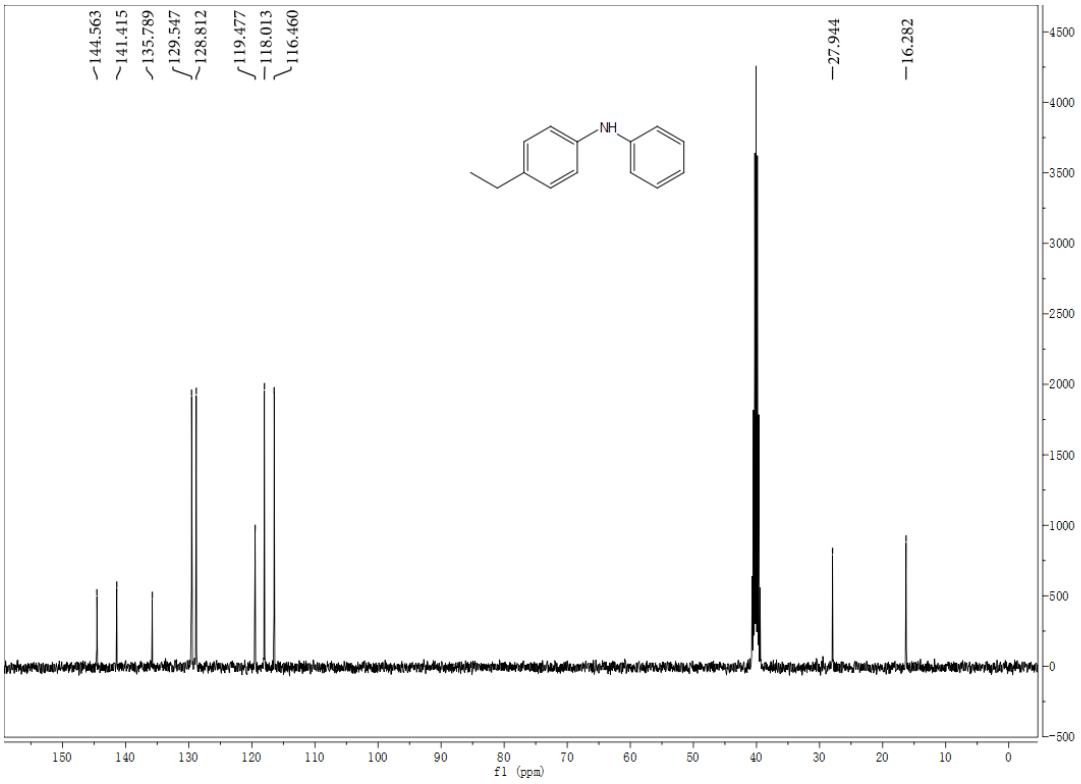
^{1}H NMR and ^{13}C NMR of compound (3ag)



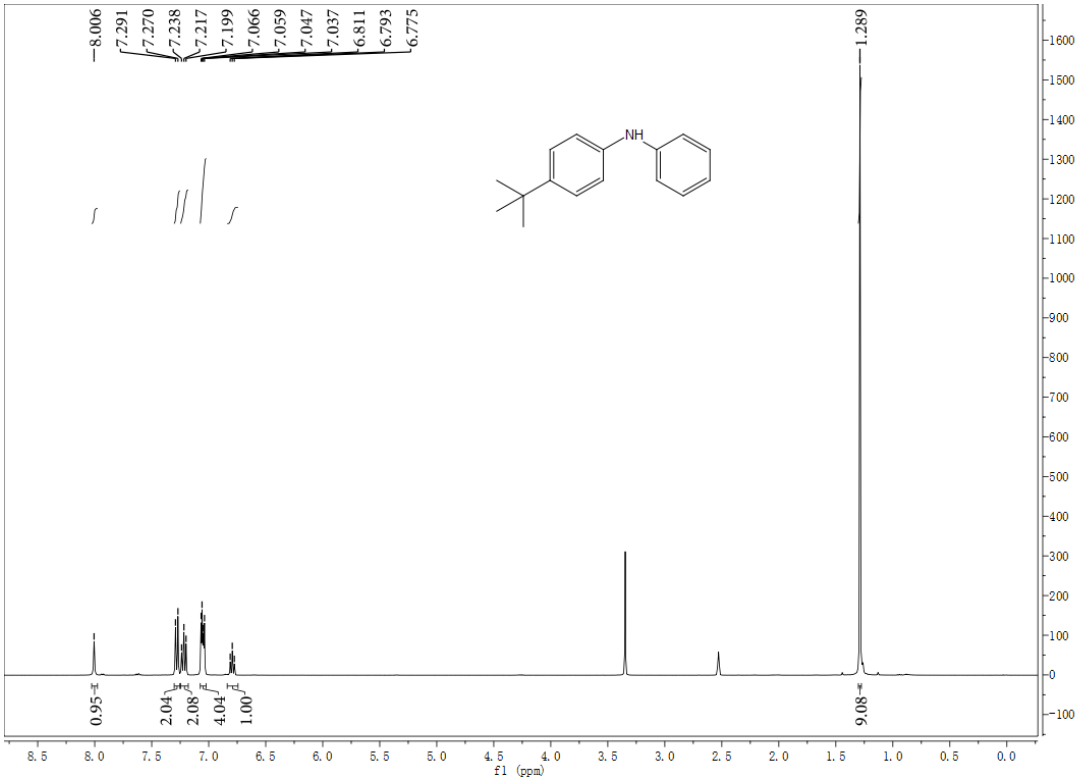


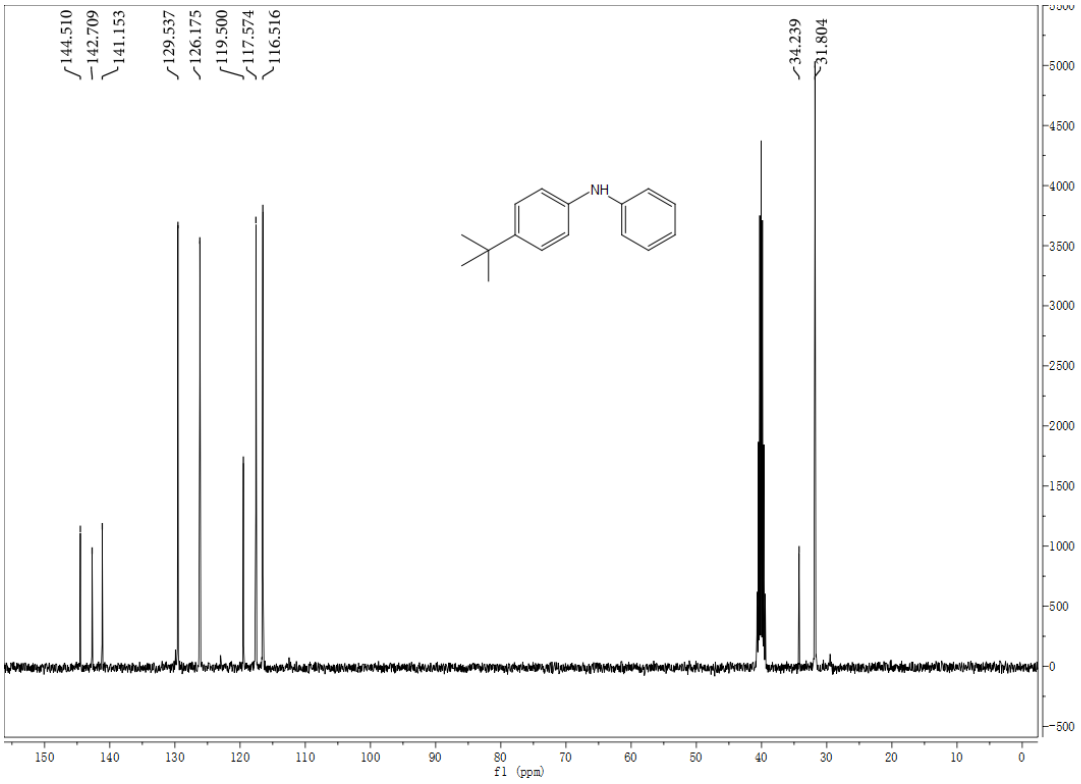
^{1}H NMR and ^{13}C NMR of compound (3ah)



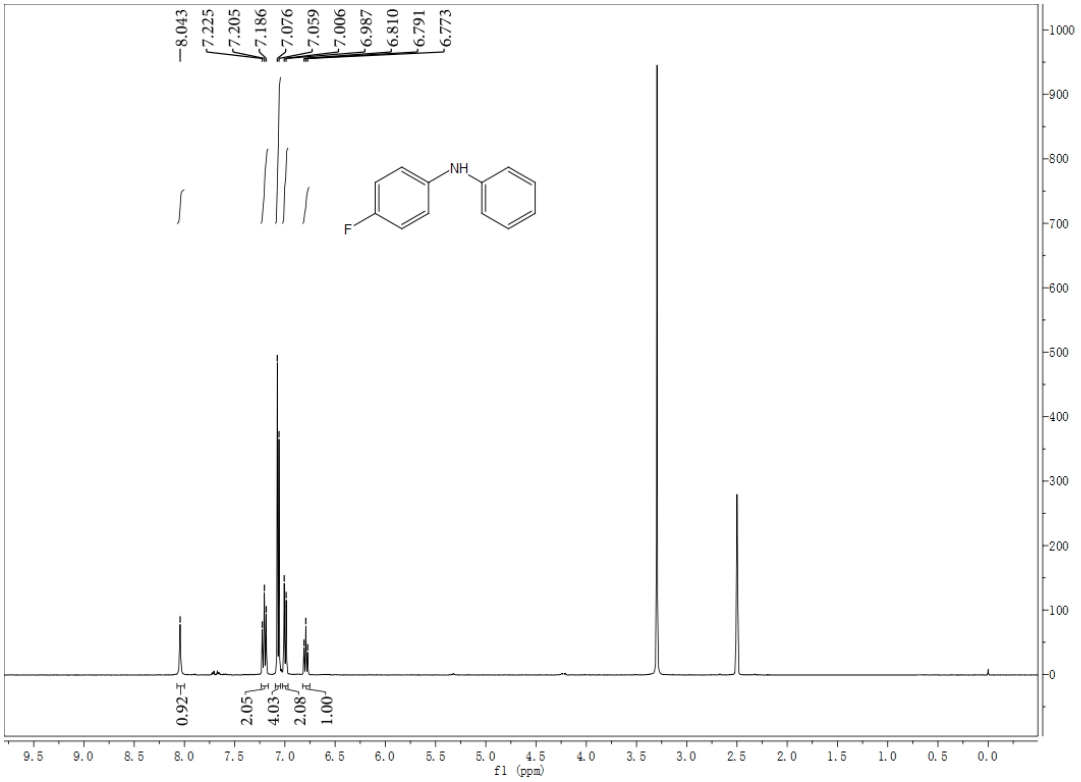


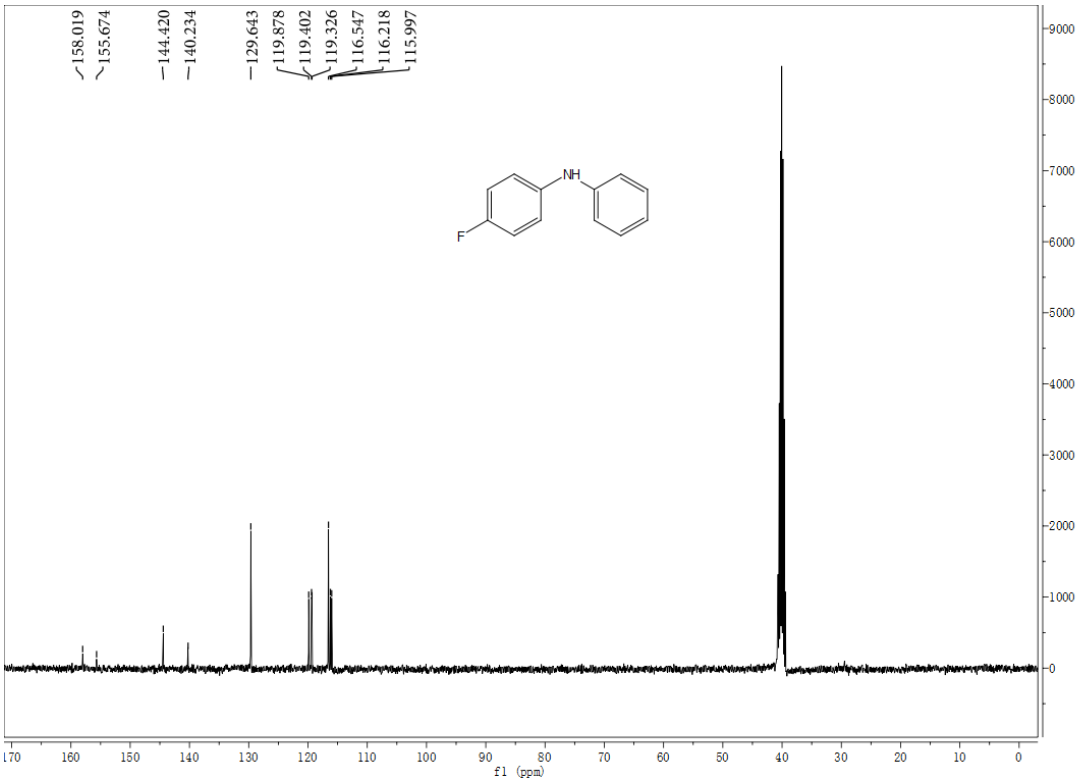
^{1}H NMR and ^{13}C NMR of compound (3ai)



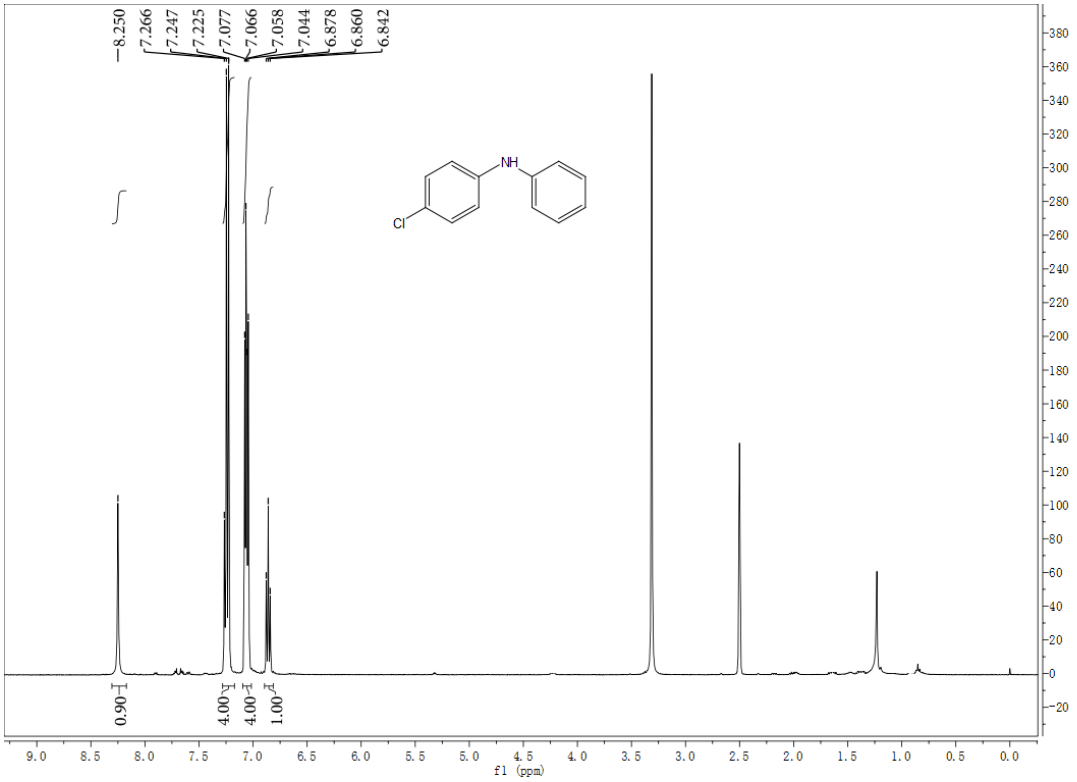


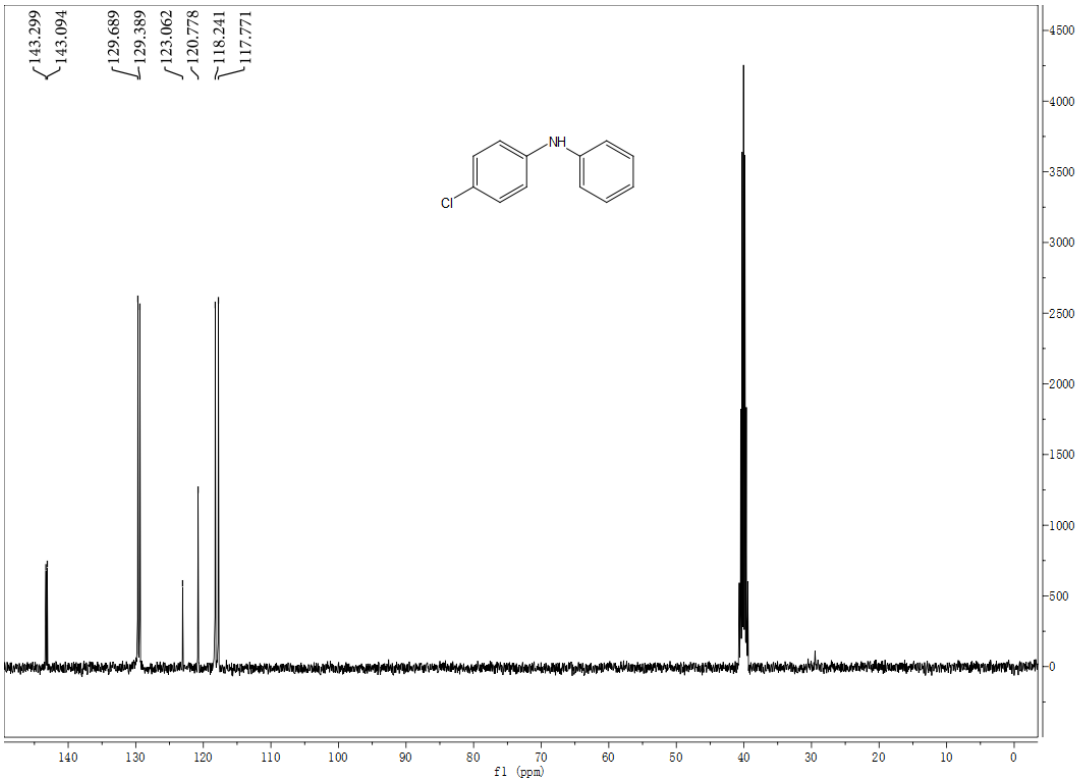
^{1}H NMR and ^{13}C NMR of compound (3aj)



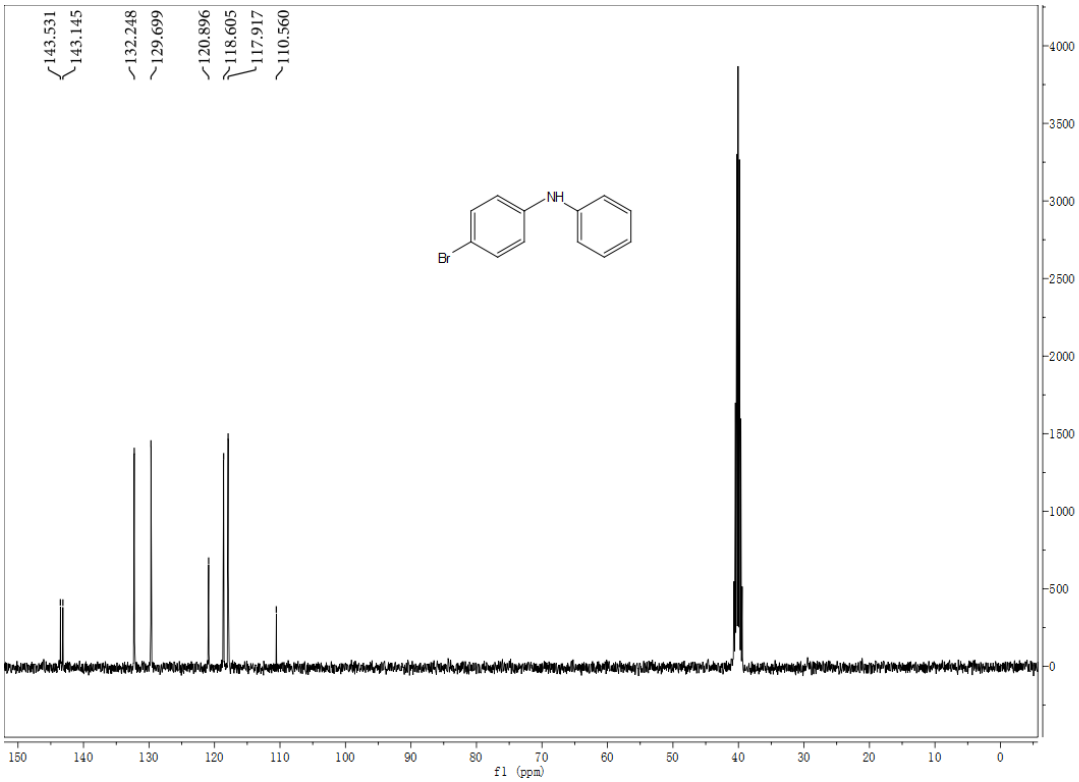


^{1}H NMR and ^{13}C NMR of compound (3ak)

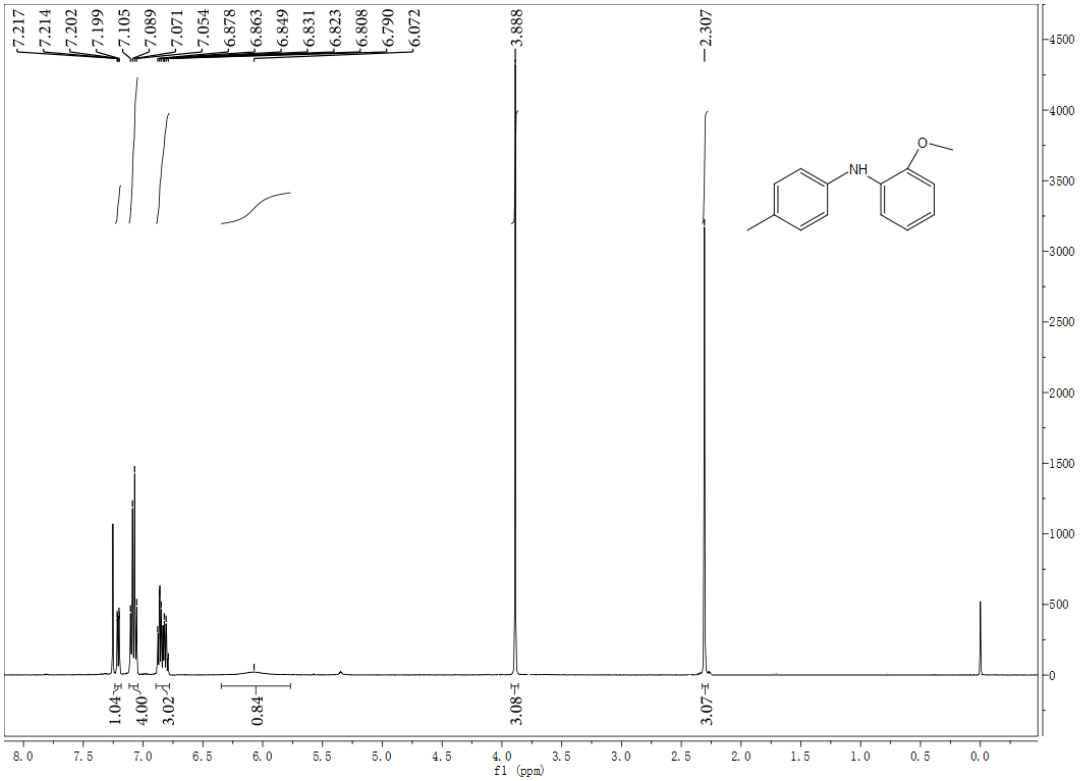


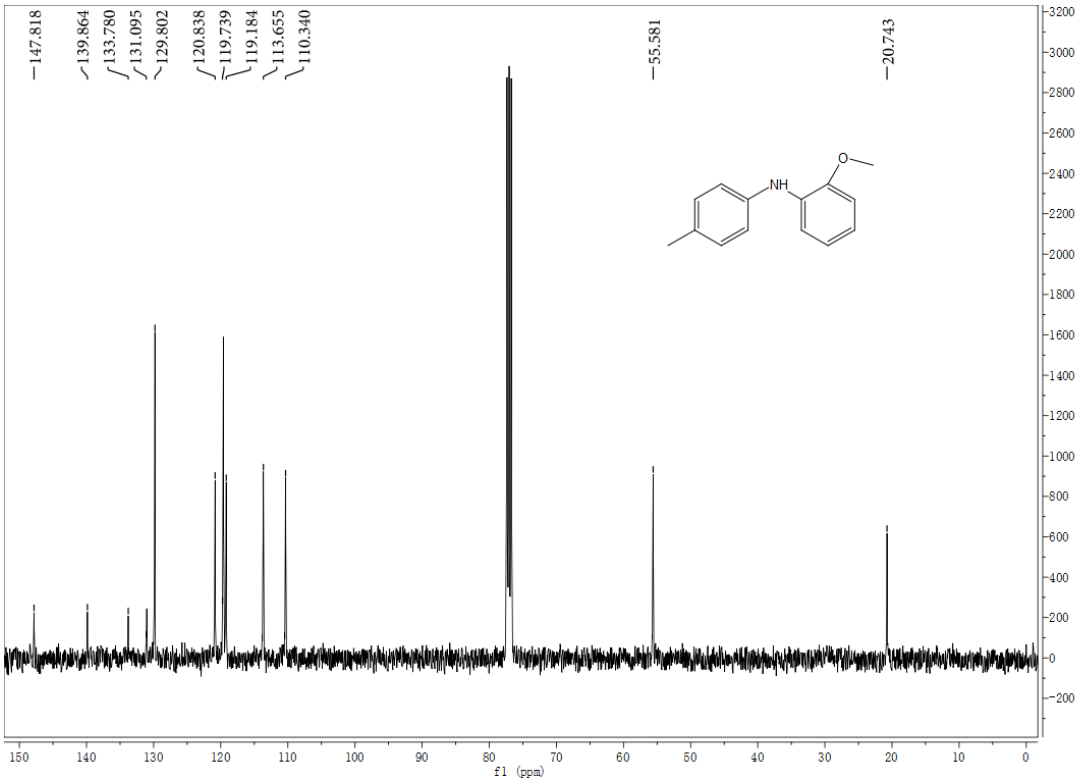


^{1}H NMR and ^{13}C NMR of compound (3al)

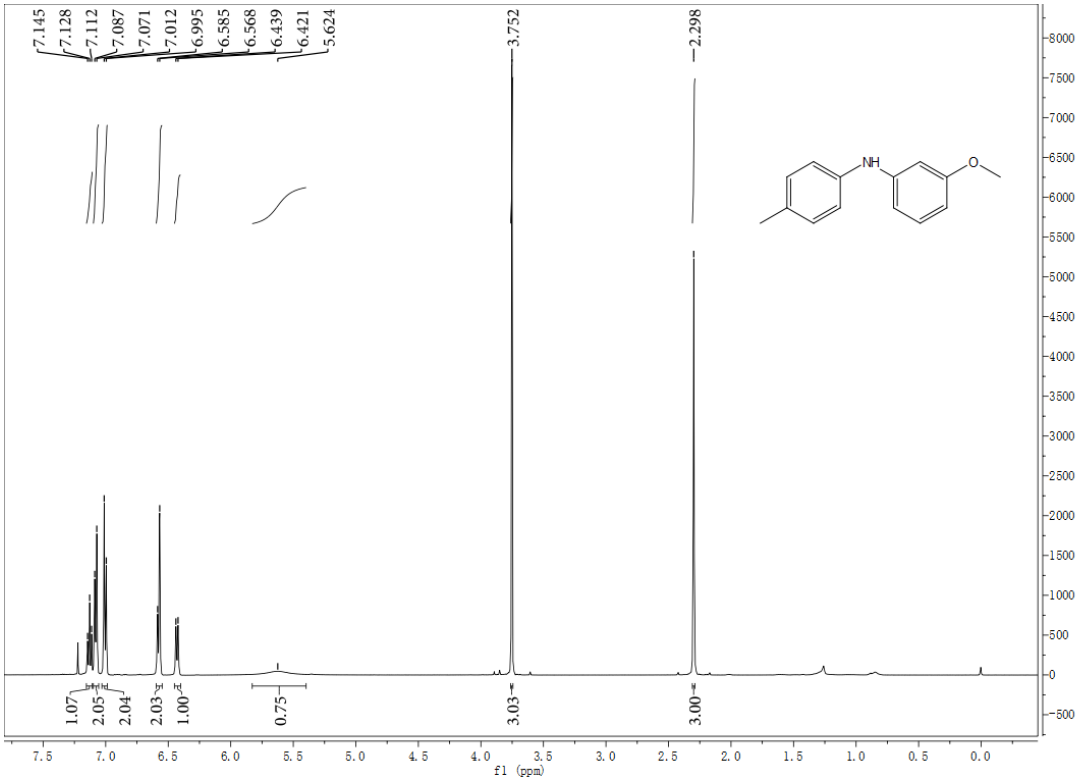


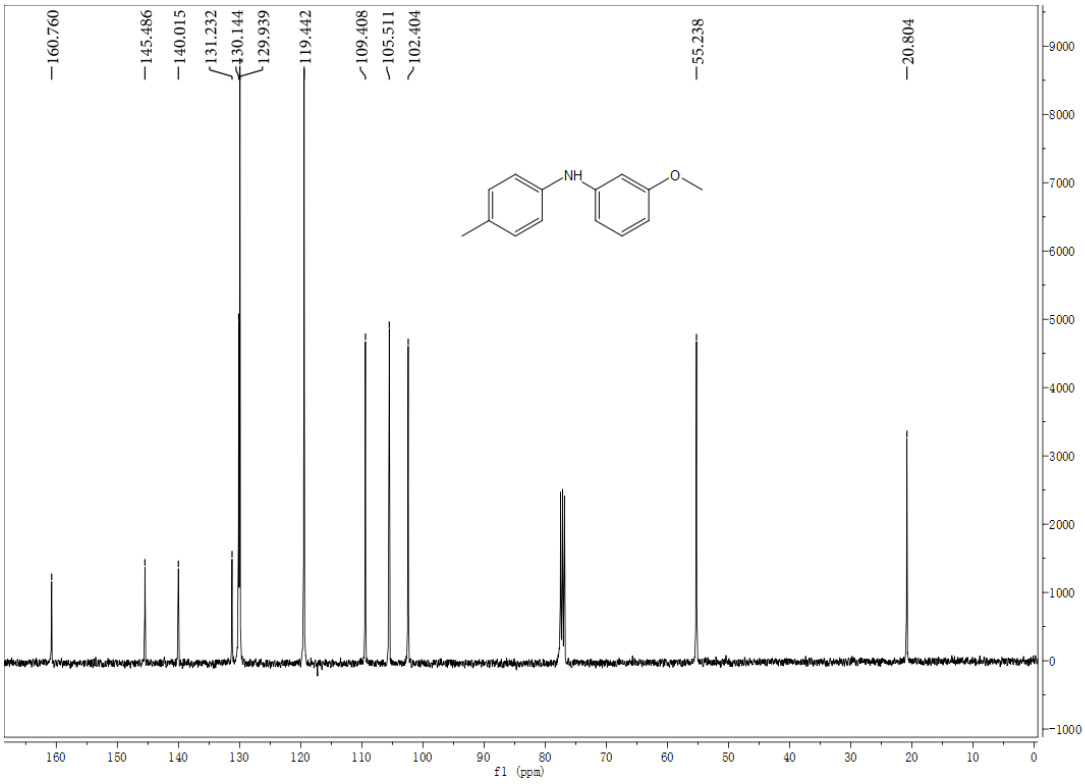
^{1}H NMR and ^{13}C NMR of compound (3am)



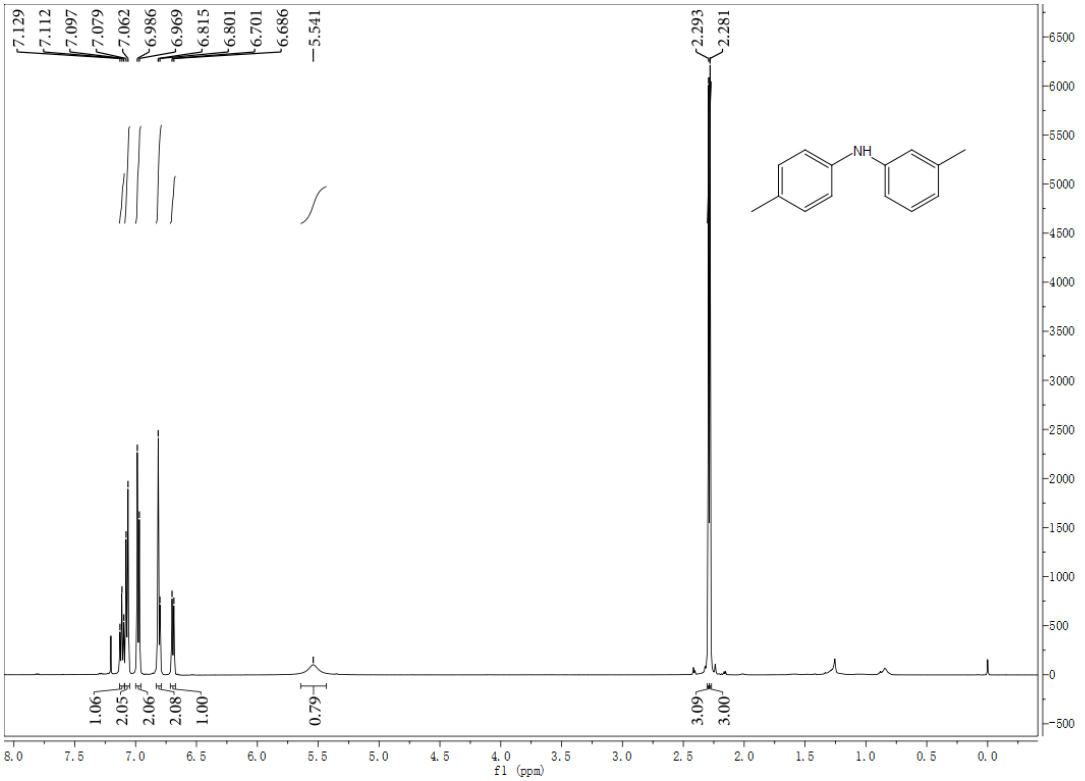


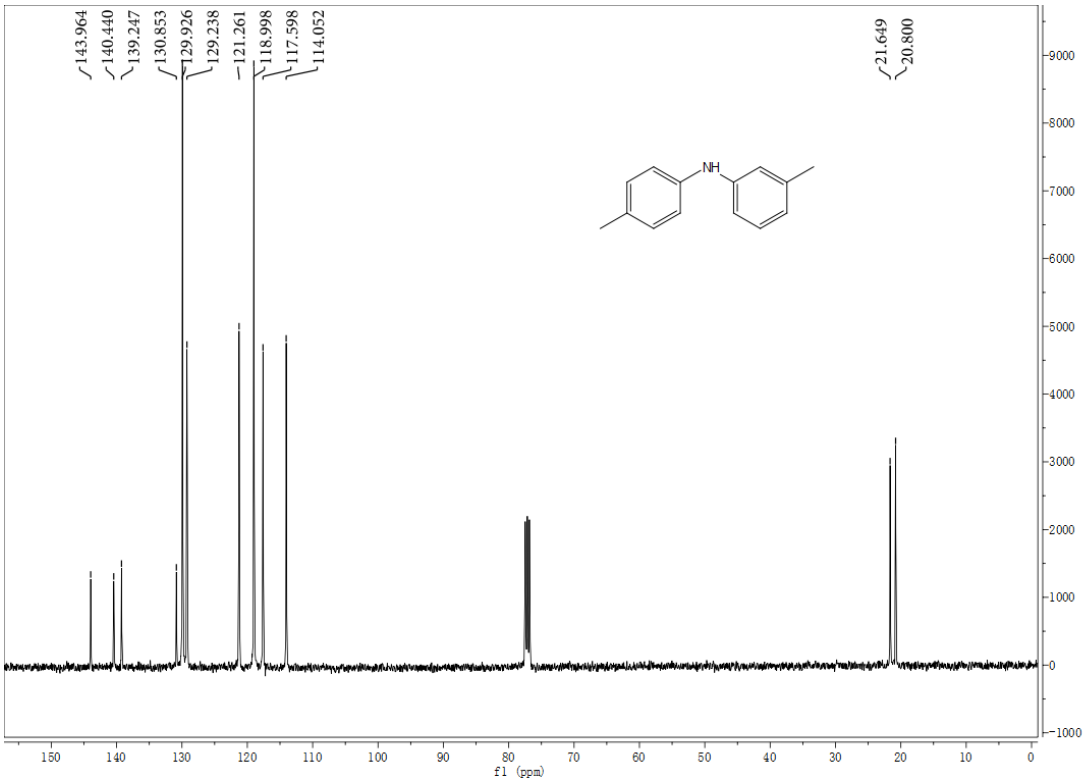
^{1}H NMR and ^{13}C NMR of compound (3an)



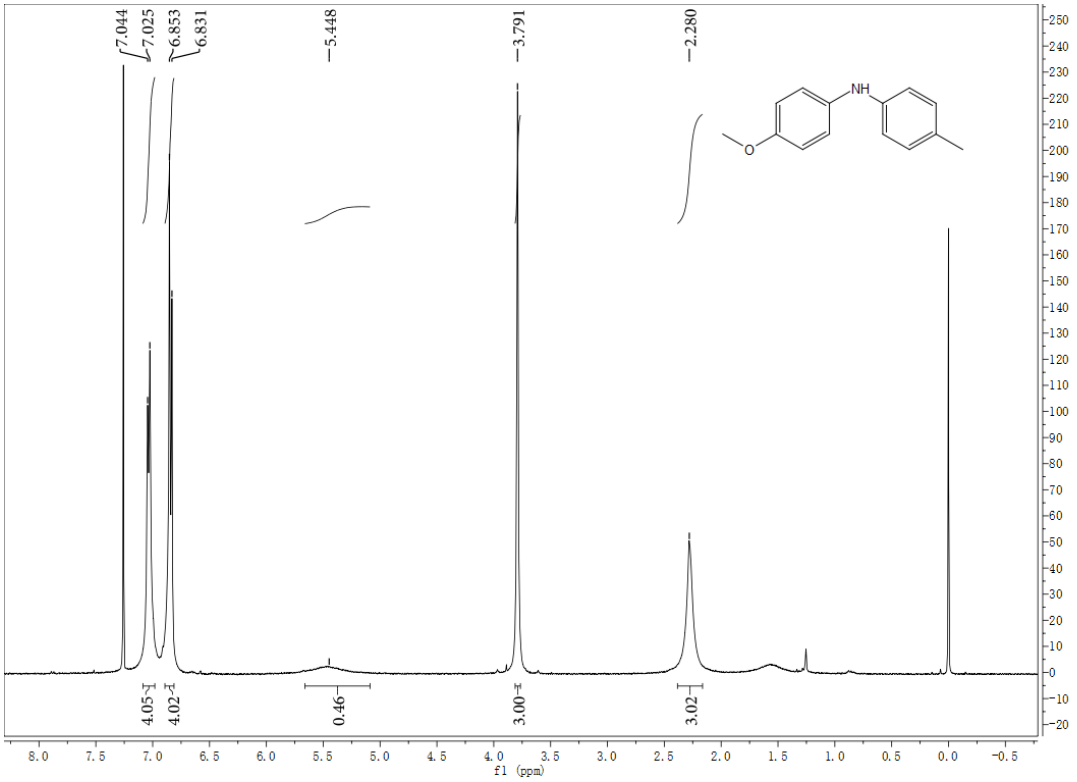


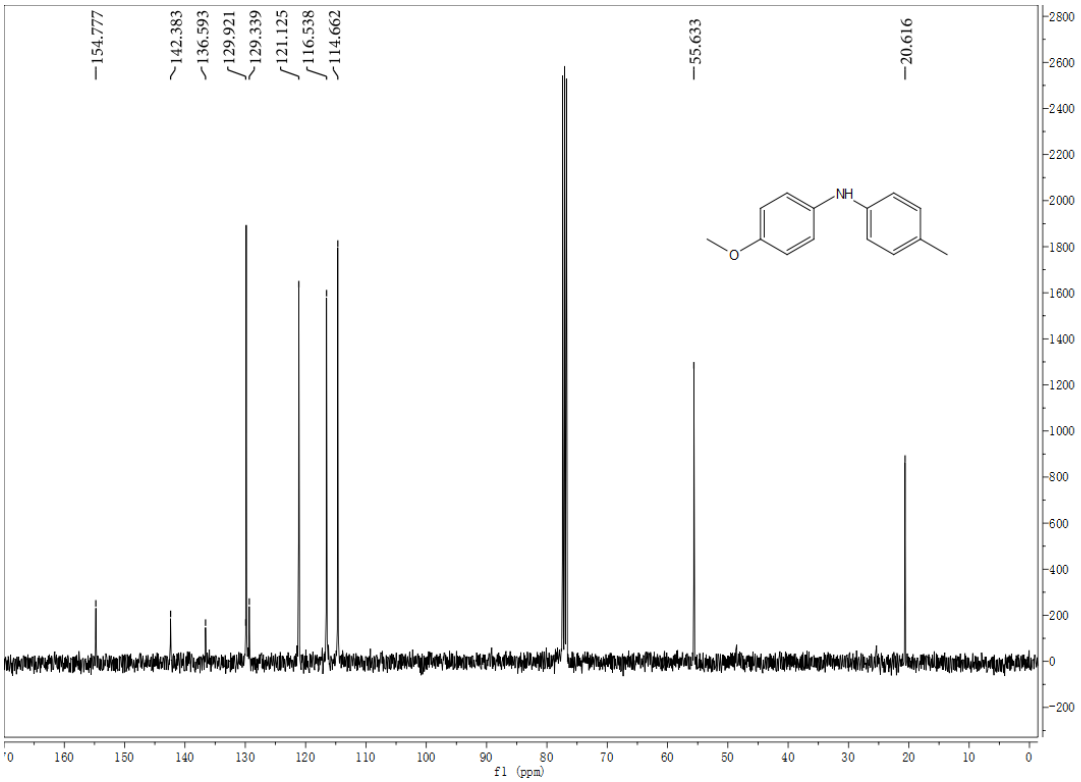
^{1}H NMR and ^{13}C NMR of compound (3ao)



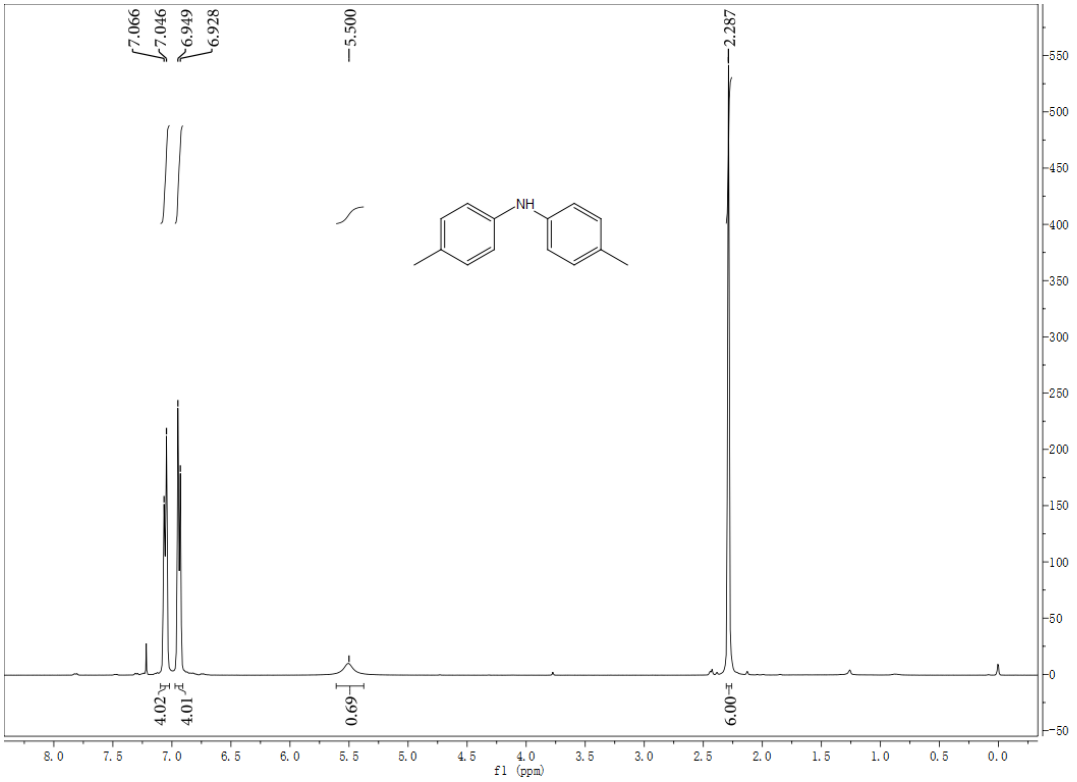


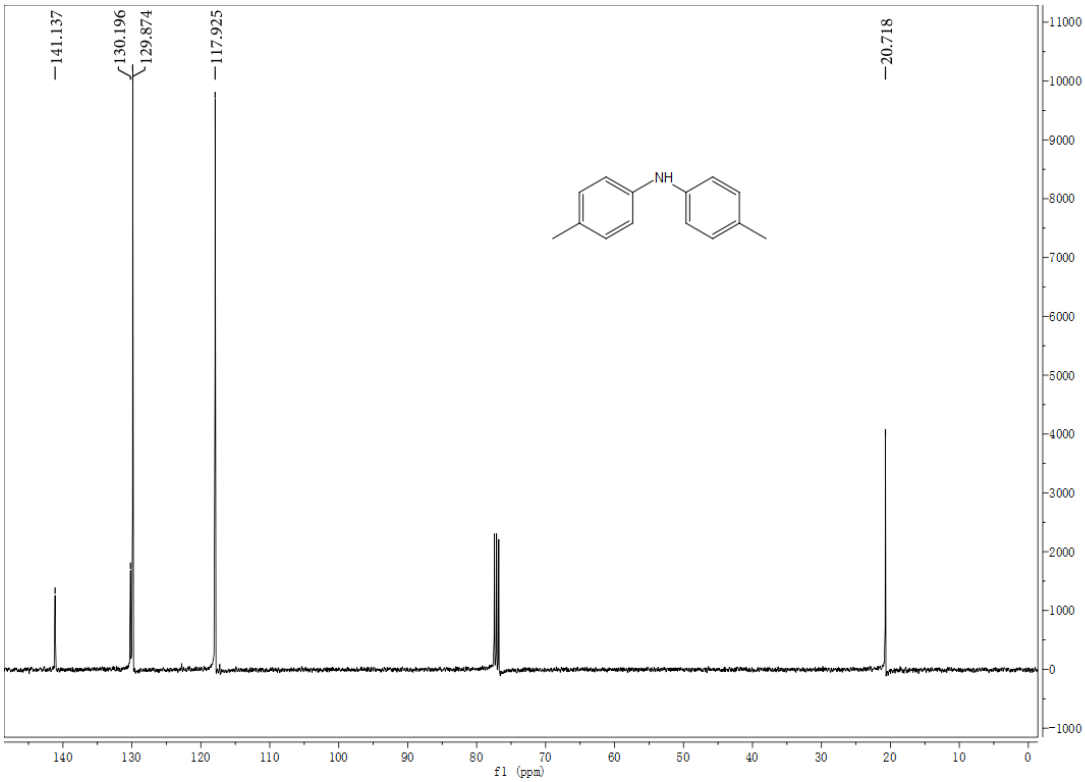
^{1}H NMR and ^{13}C NMR of compound (3ap)



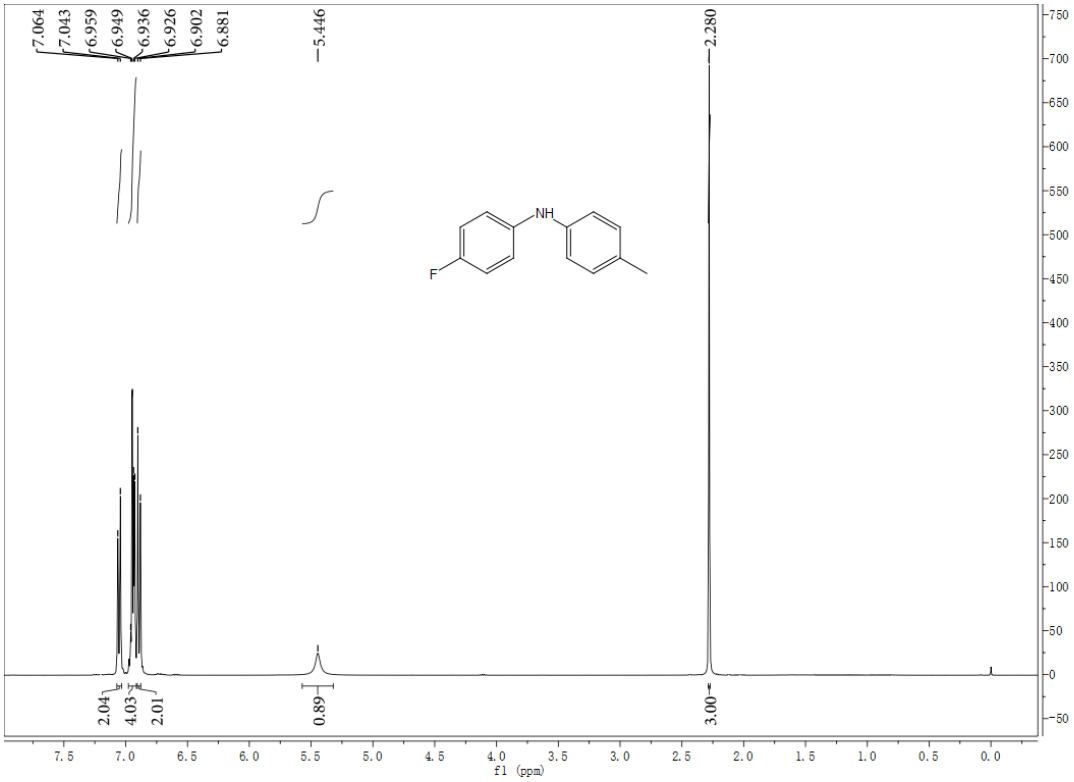


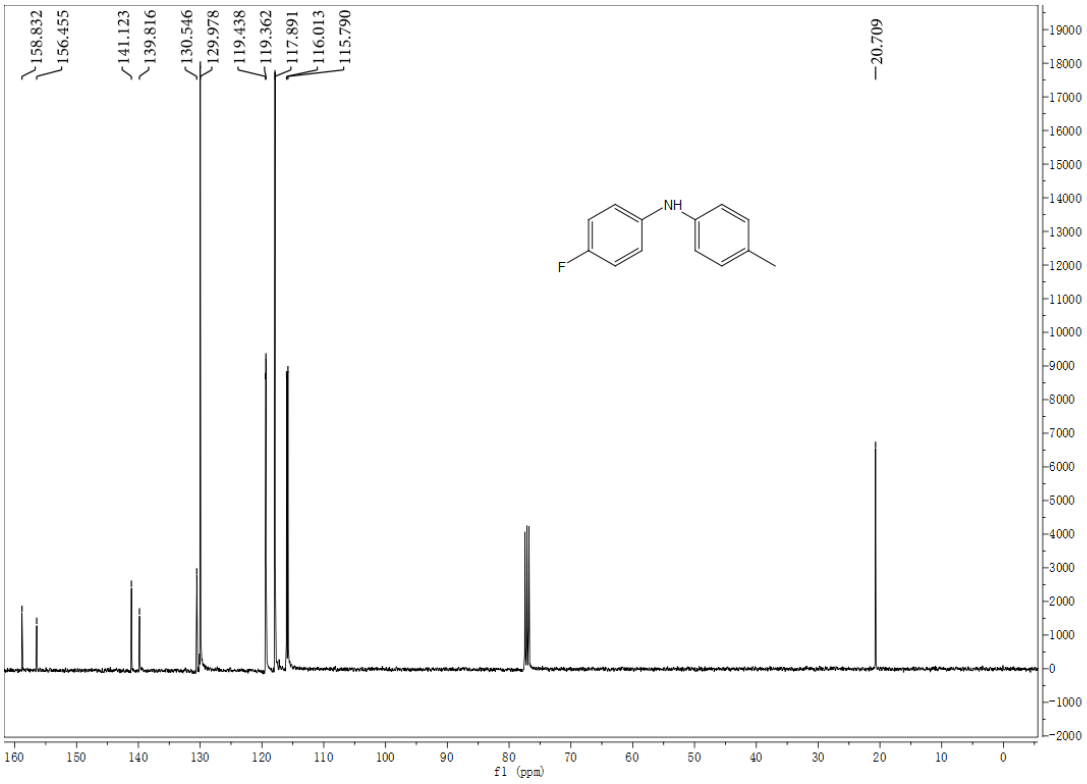
^{1}H NMR and ^{13}C NMR of compound (3aq)



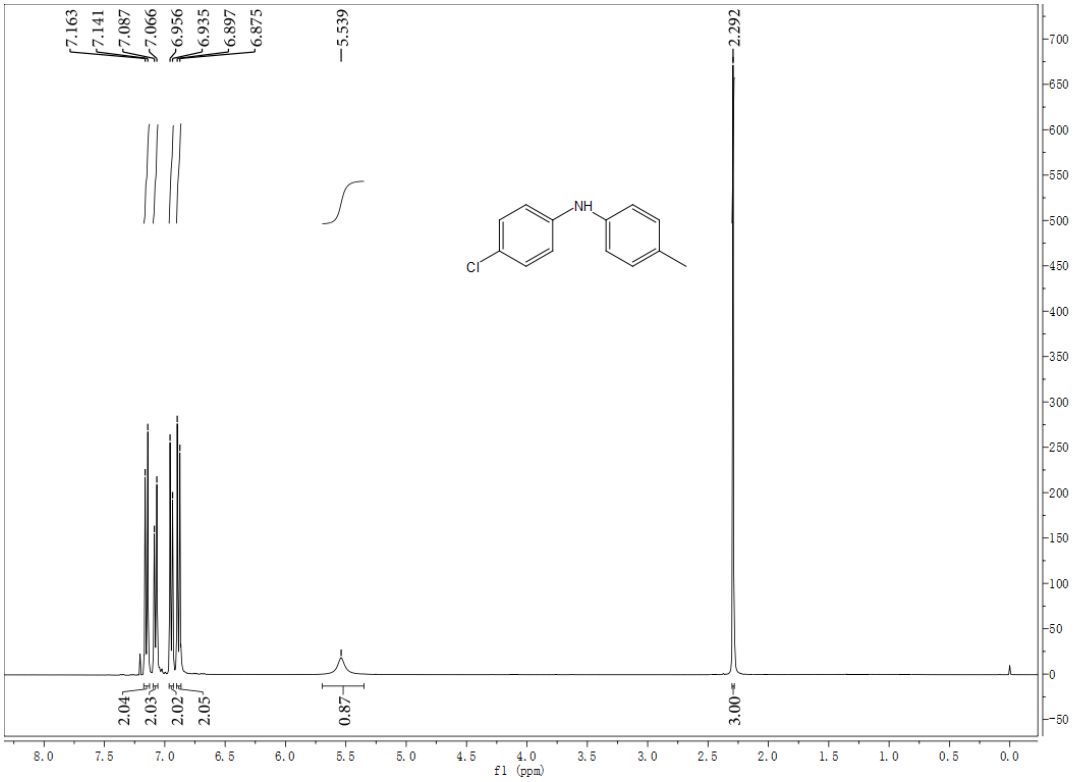


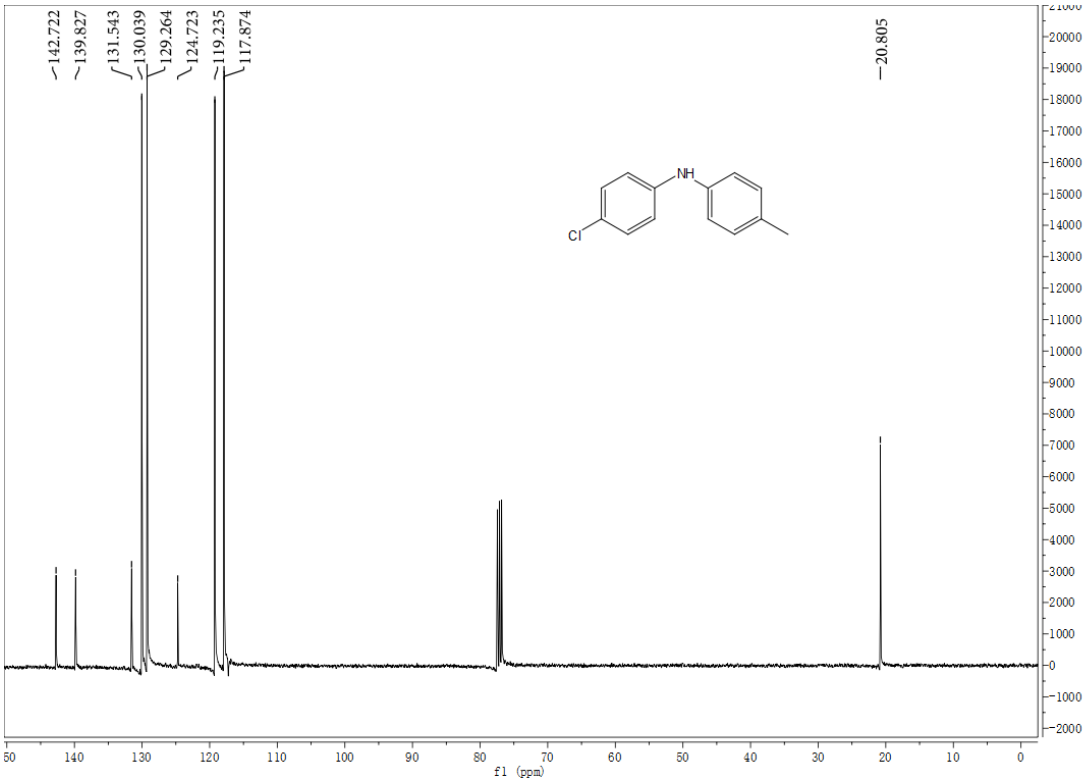
^{1}H NMR and ^{13}C NMR of compound (3ar)



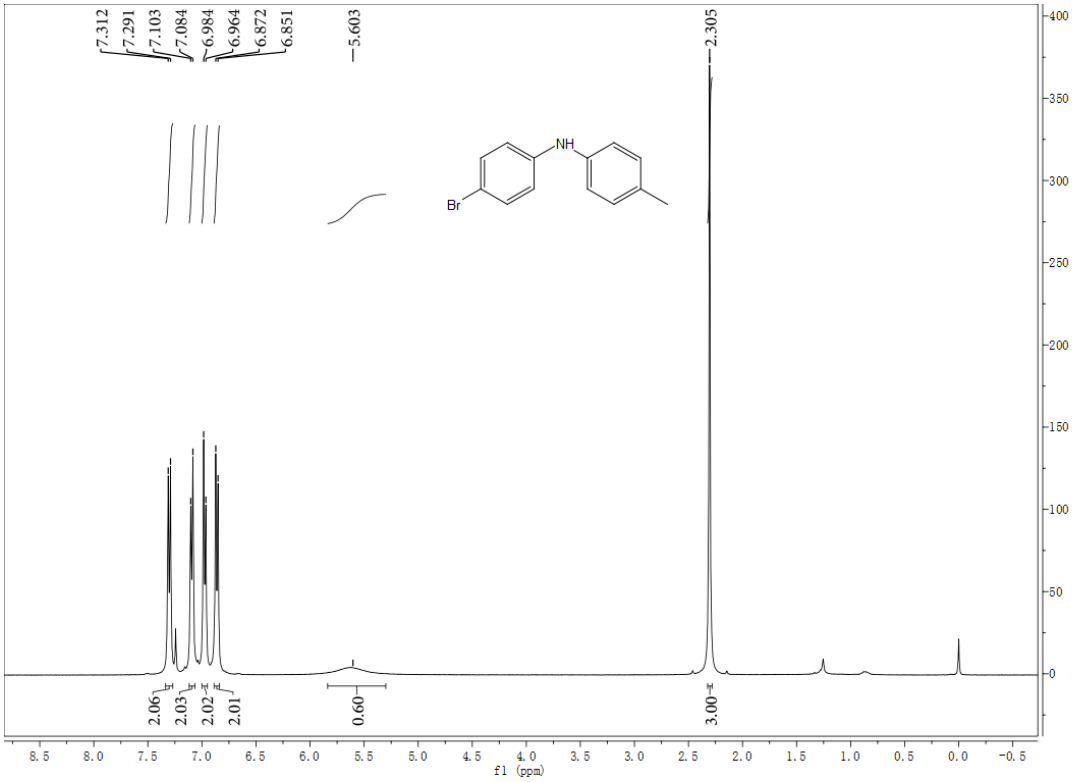


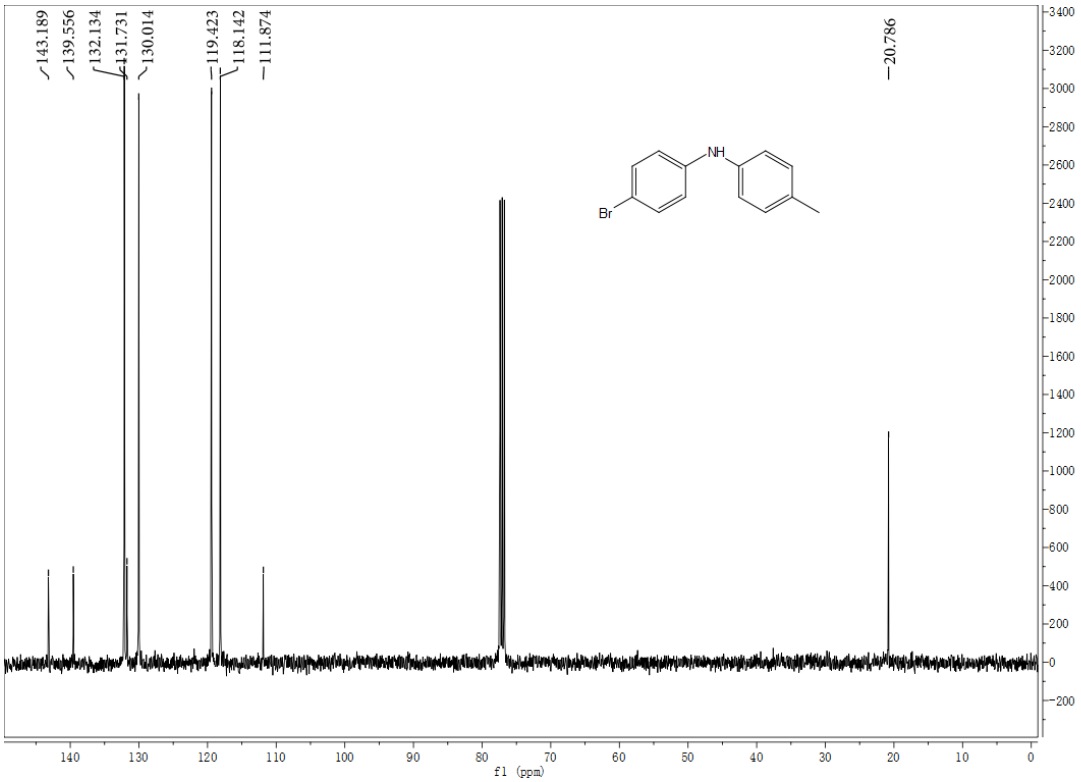
^{1}H NMR and ^{13}C NMR of compound (3as)



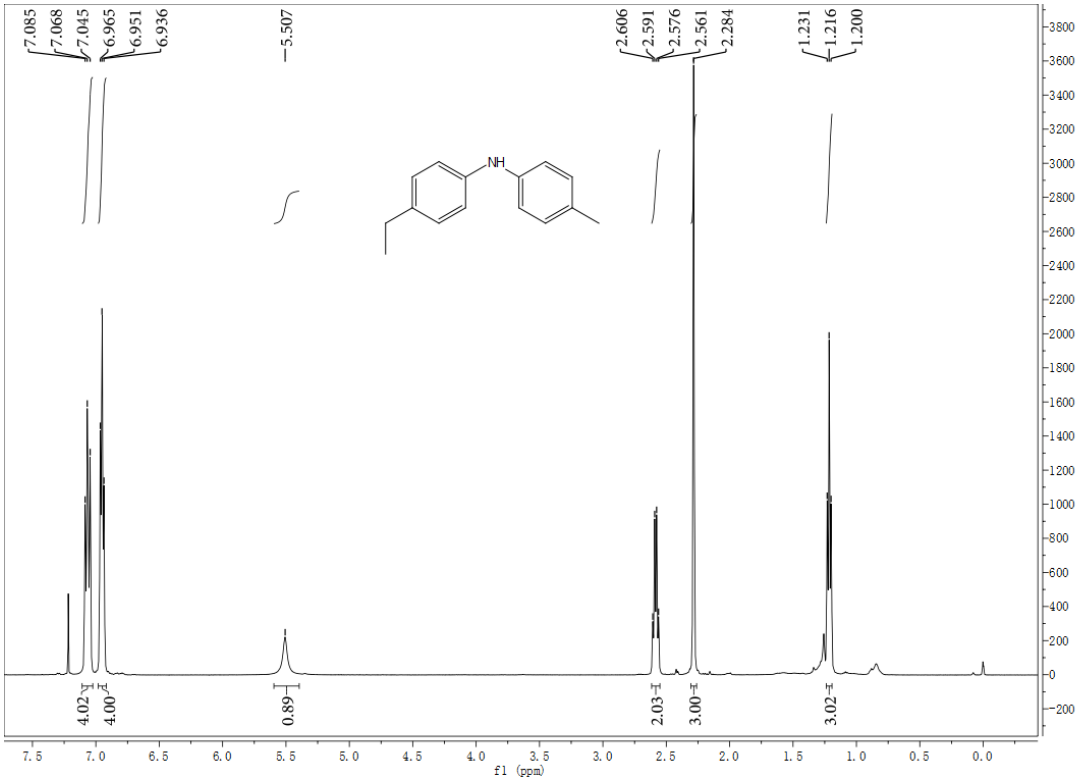


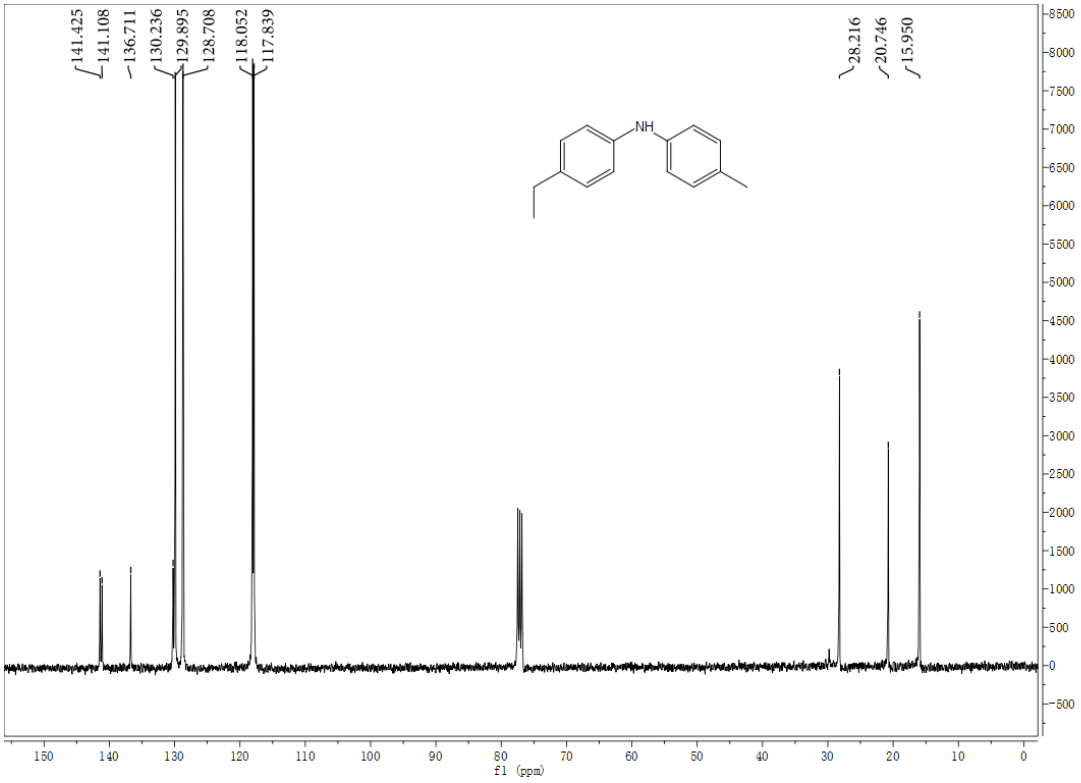
^{1}H NMR and ^{13}C NMR of compound (3at)



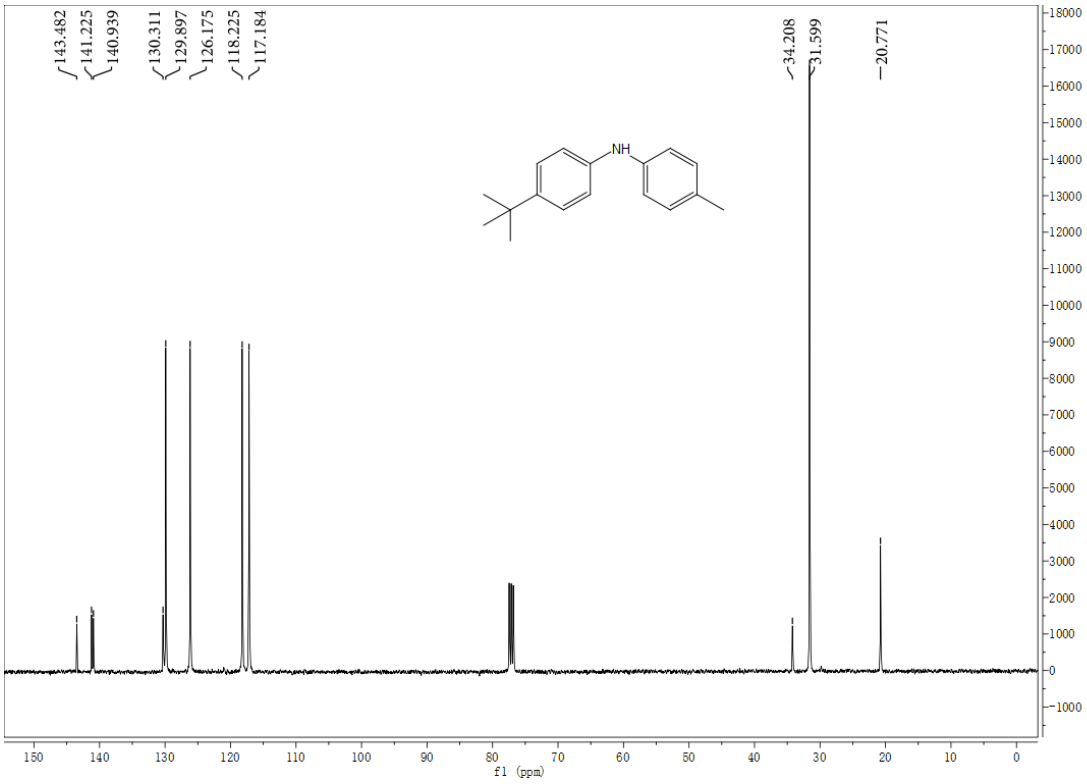


^{1}H NMR and ^{13}C NMR of compound (3au)

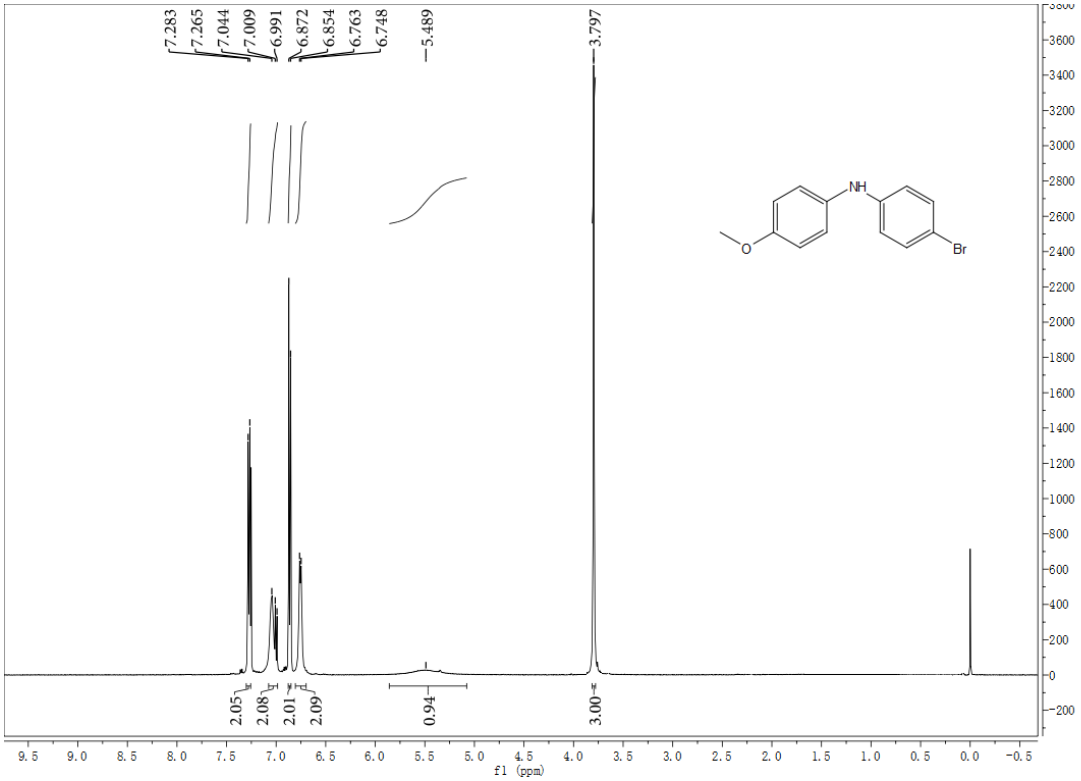


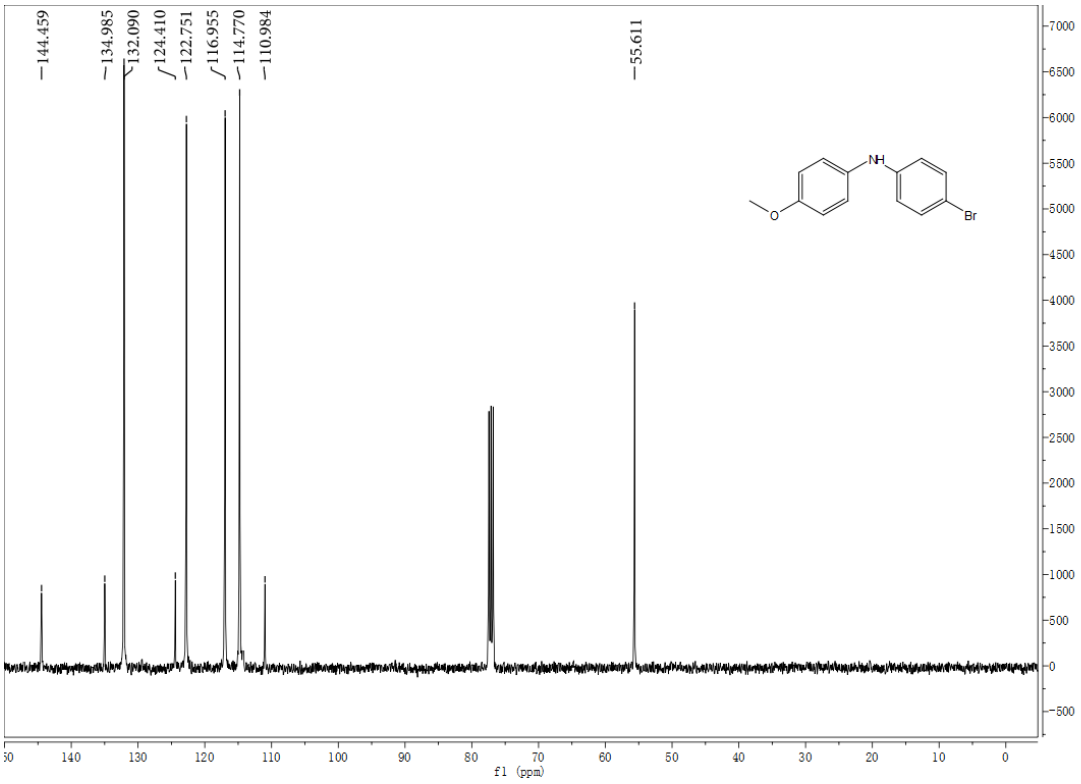


^{1}H NMR and ^{13}C NMR of compound (3av)

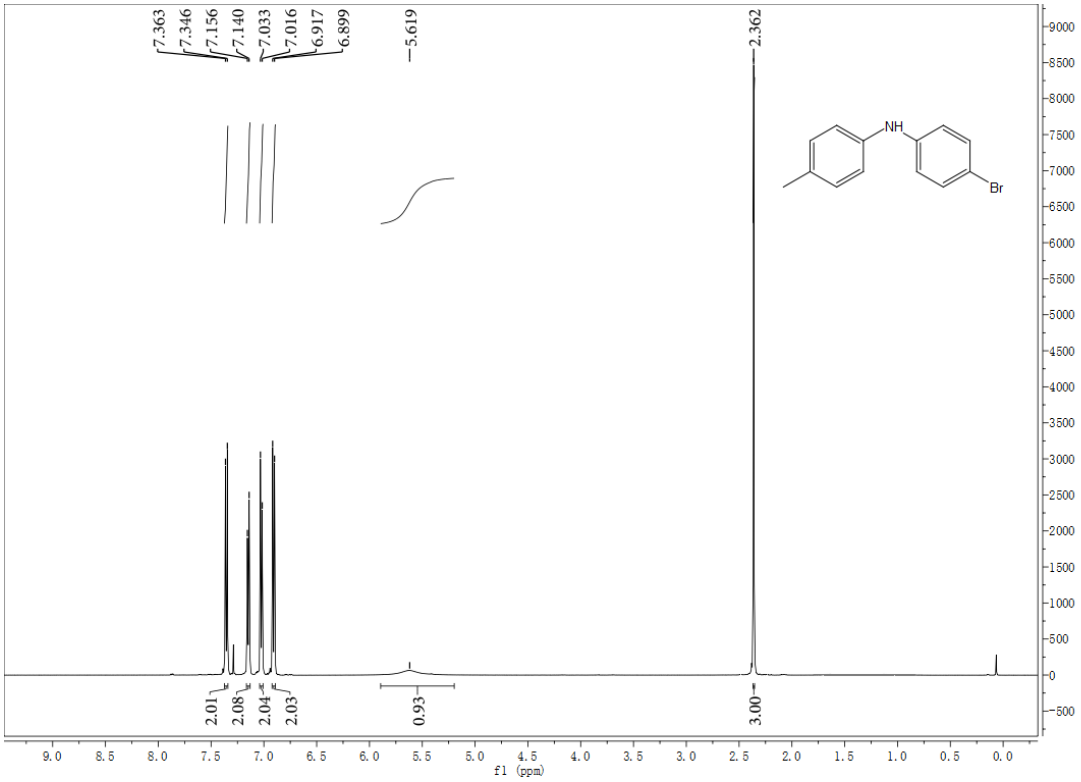


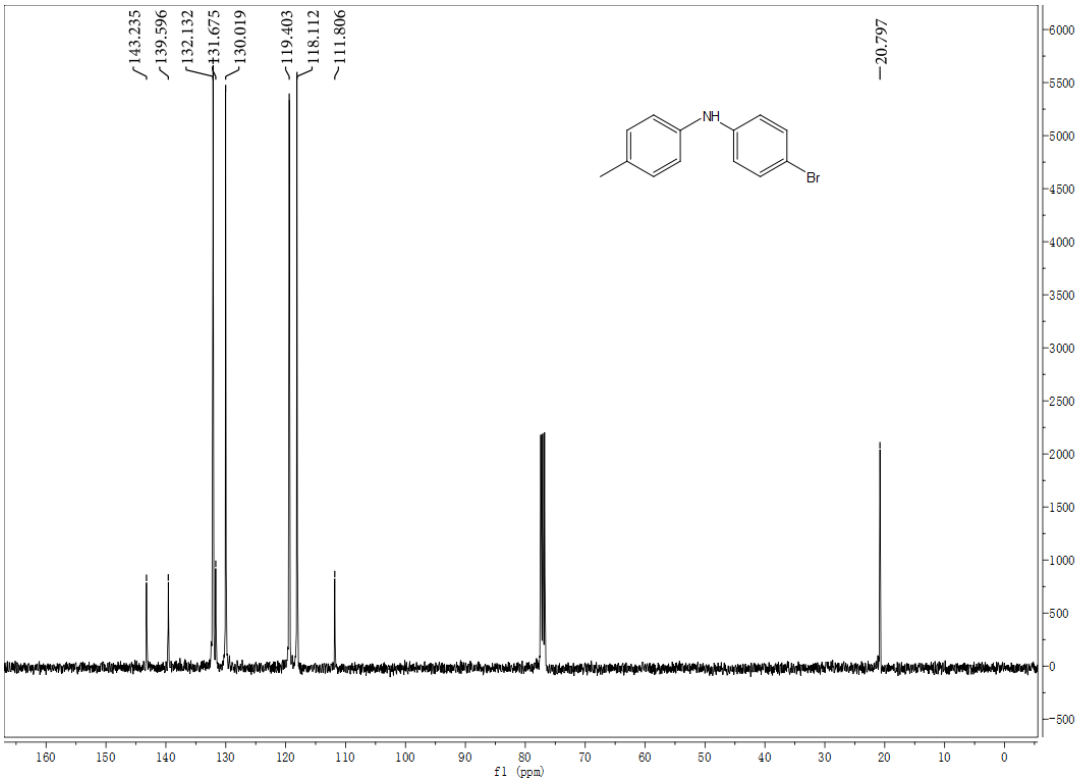
^{1}H NMR and ^{13}C NMR of compound (3aw)



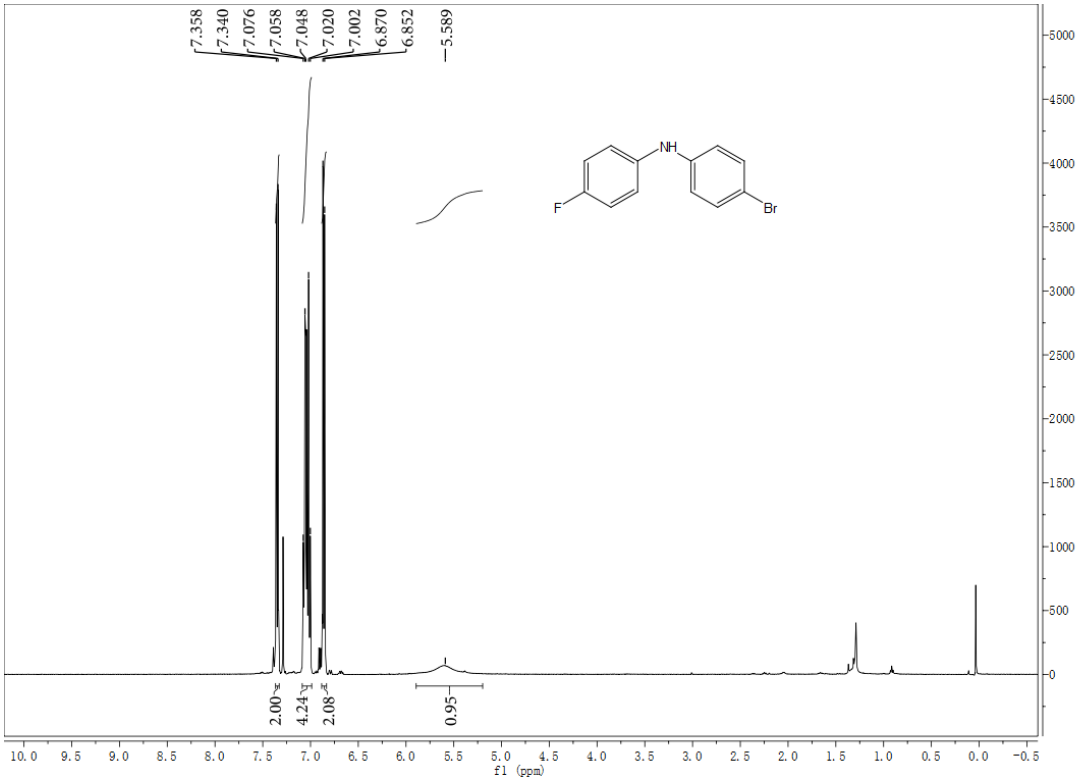


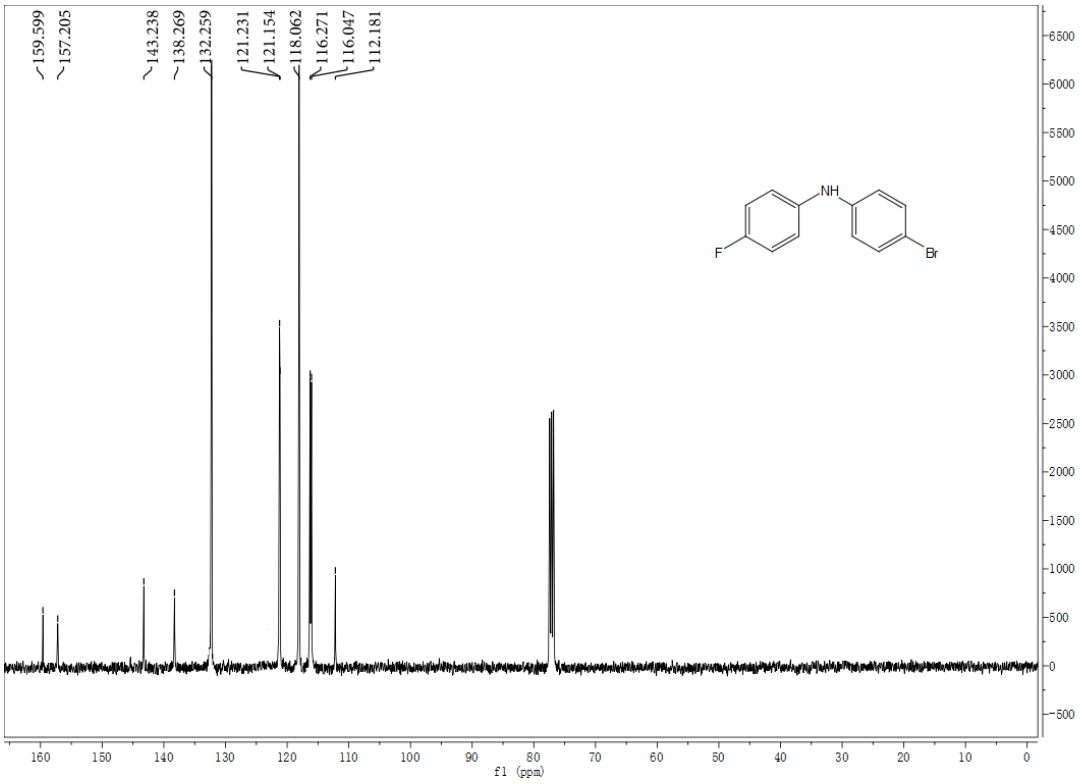
^{1}H NMR and ^{13}C NMR of compound (3ax)



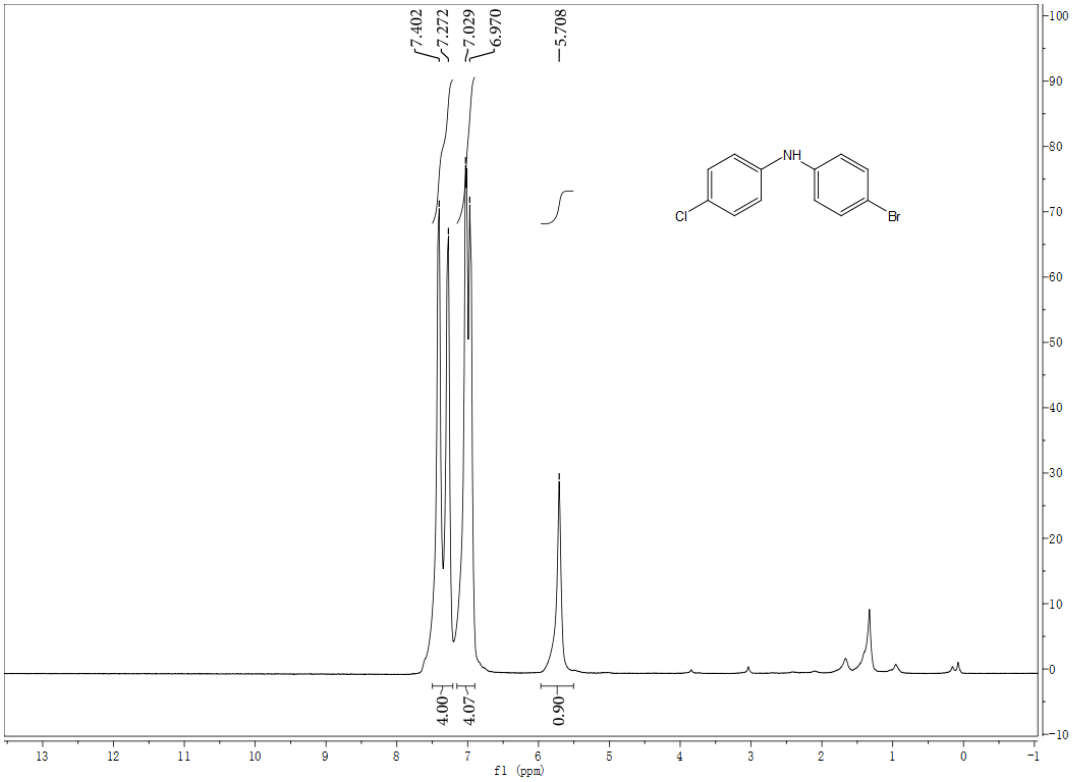


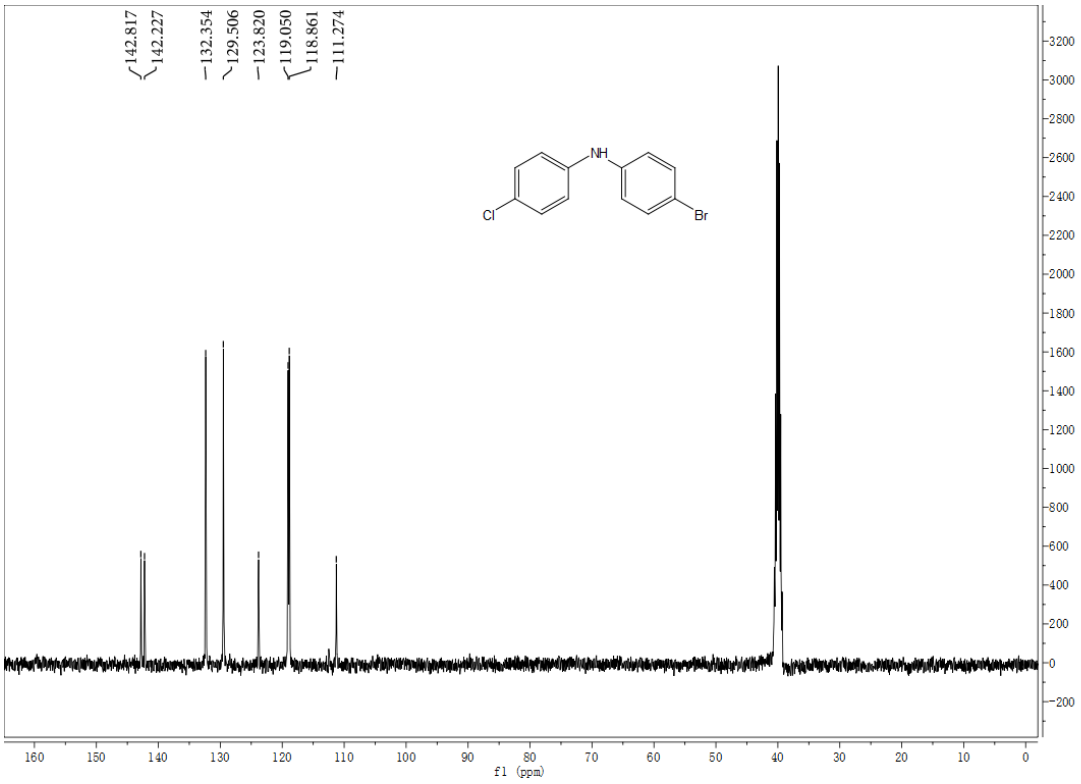
^{1}H NMR and ^{13}C NMR of compound (3ay)



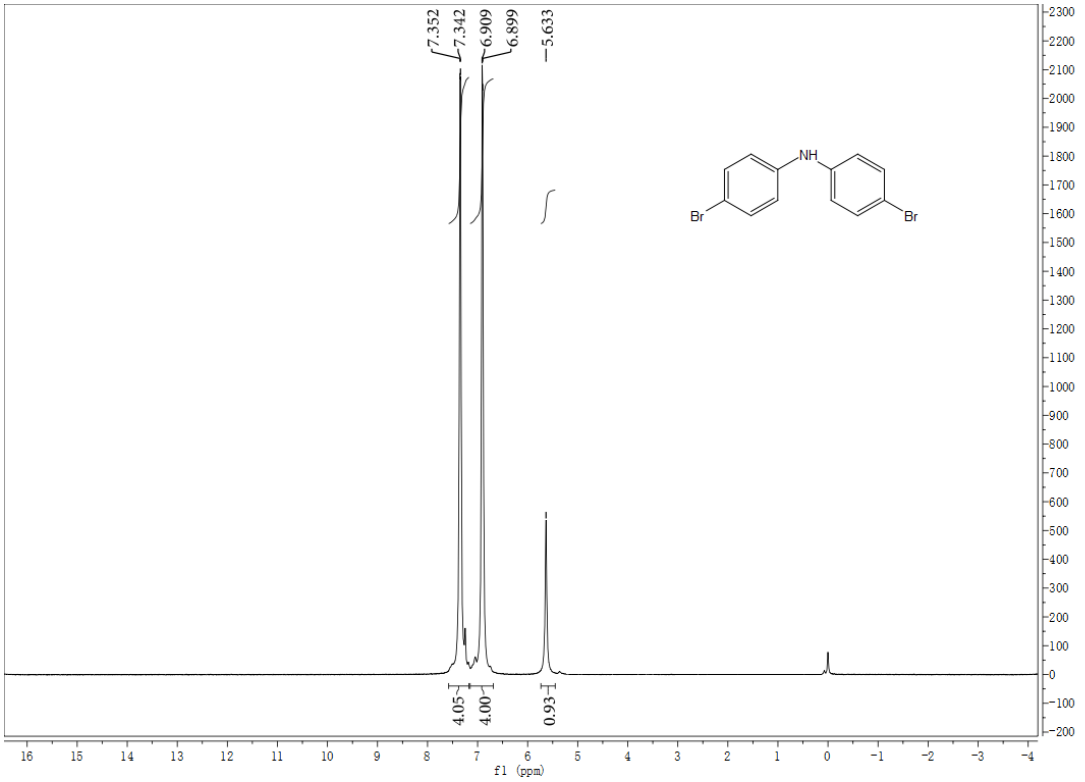


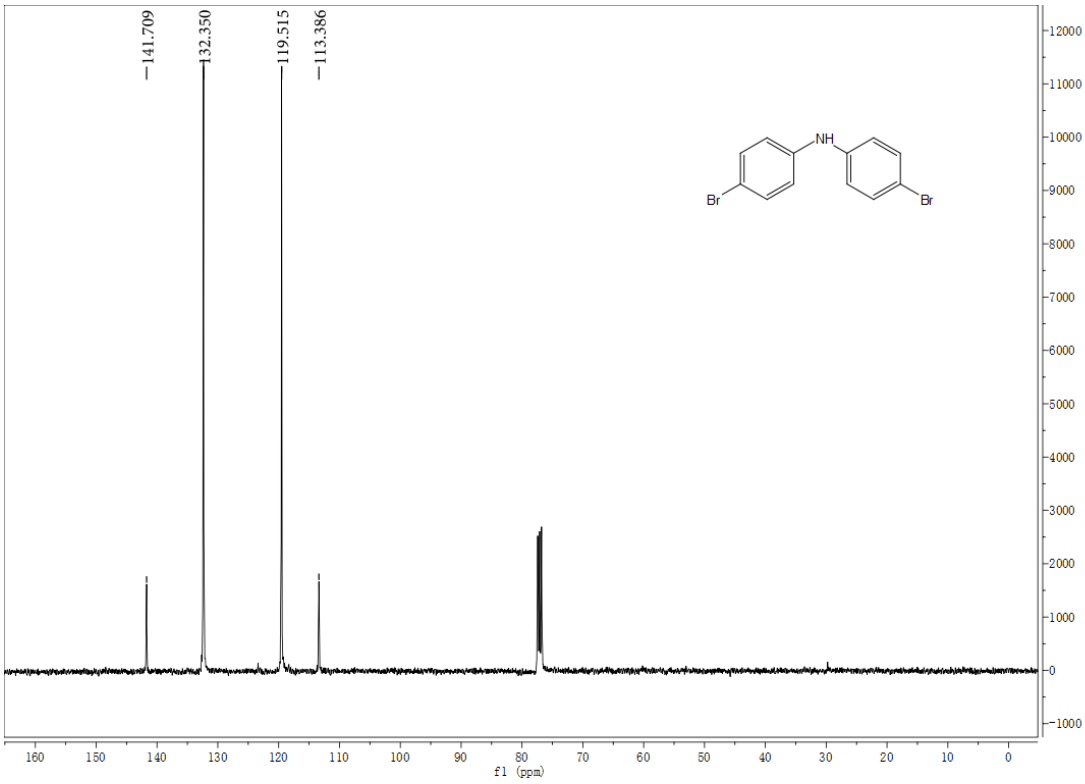
^{1}H NMR and ^{13}C NMR of compound (3az)



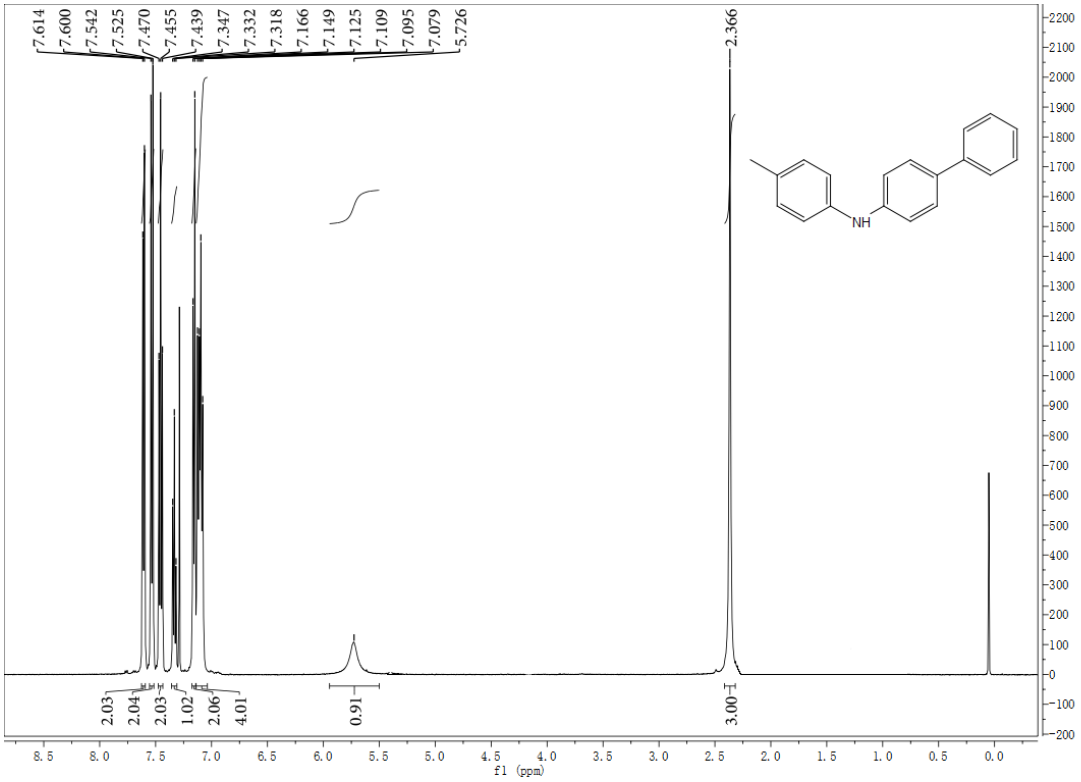


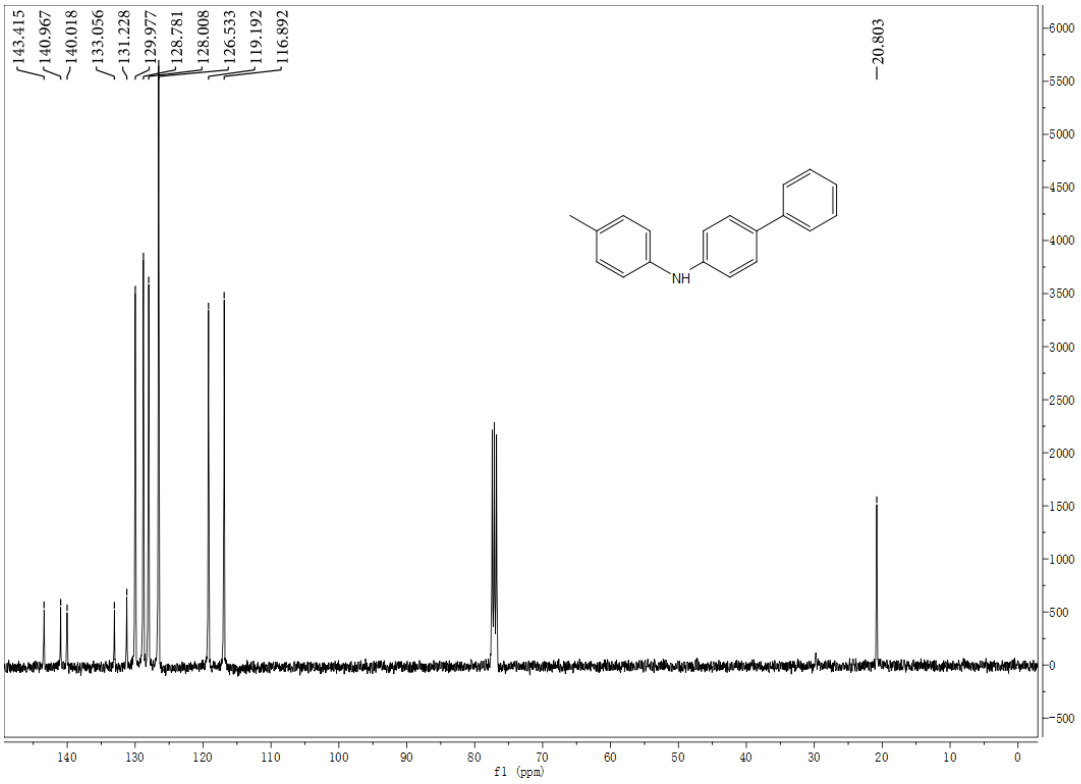
^{1}H NMR and ^{13}C NMR of compound (3ba)



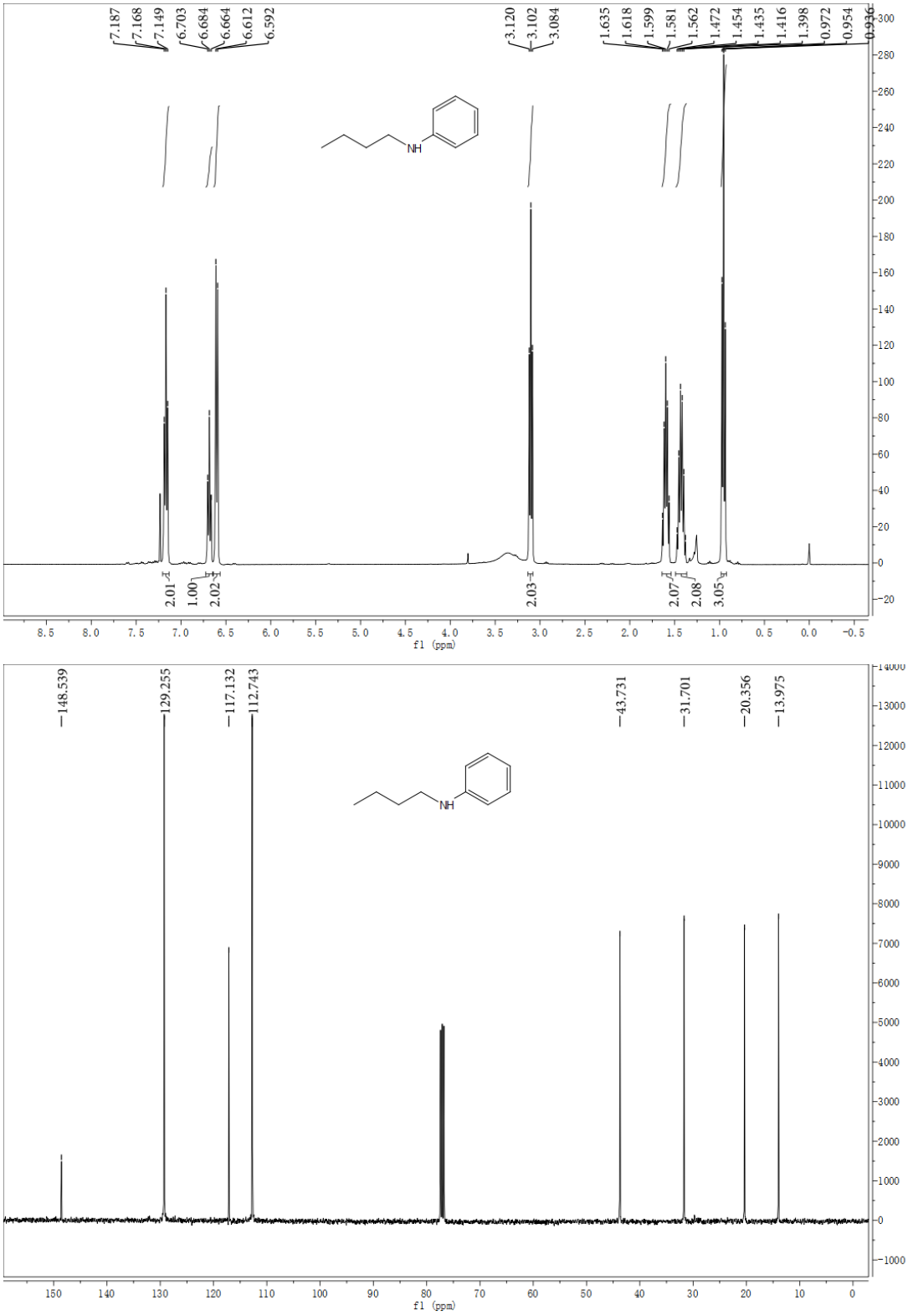


^{1}H NMR and ^{13}C NMR of compound (3bb)

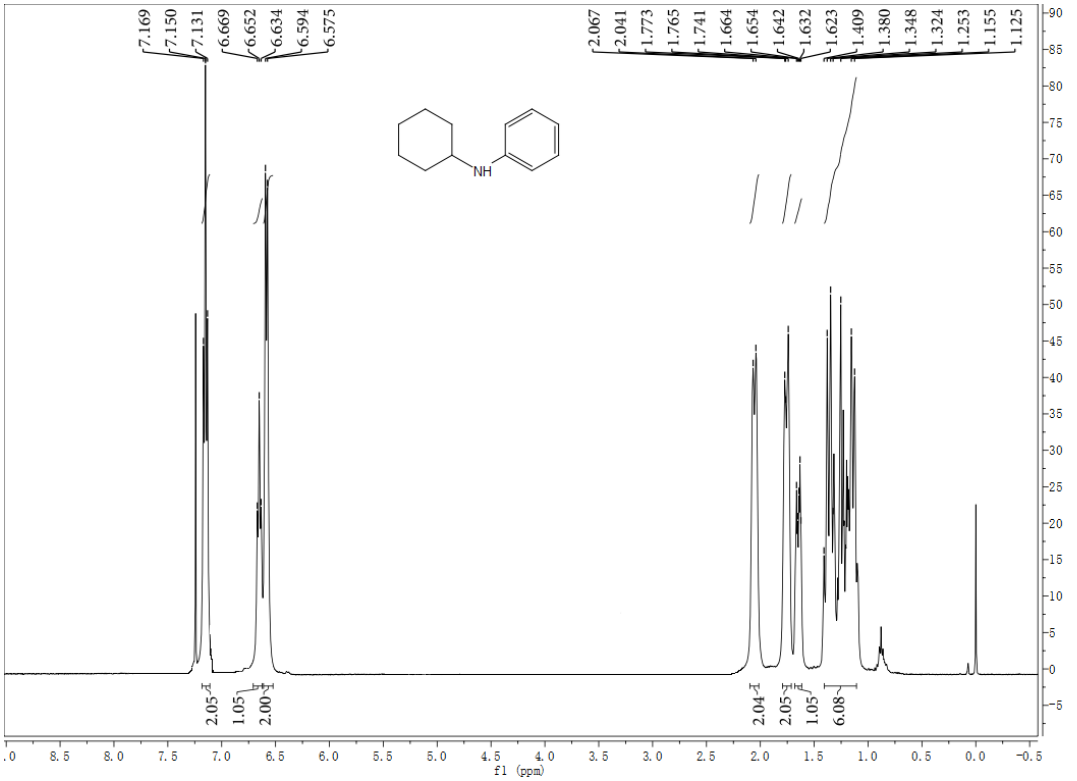


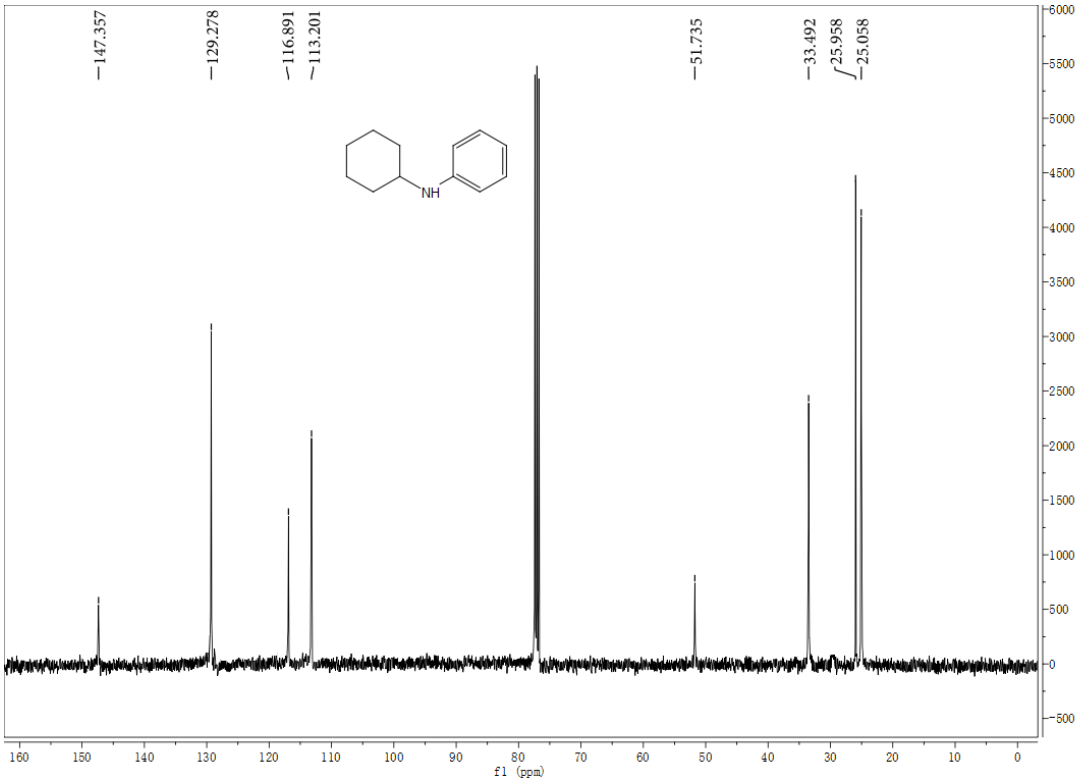


^{1}H NMR and ^{13}C NMR of compound (6a)

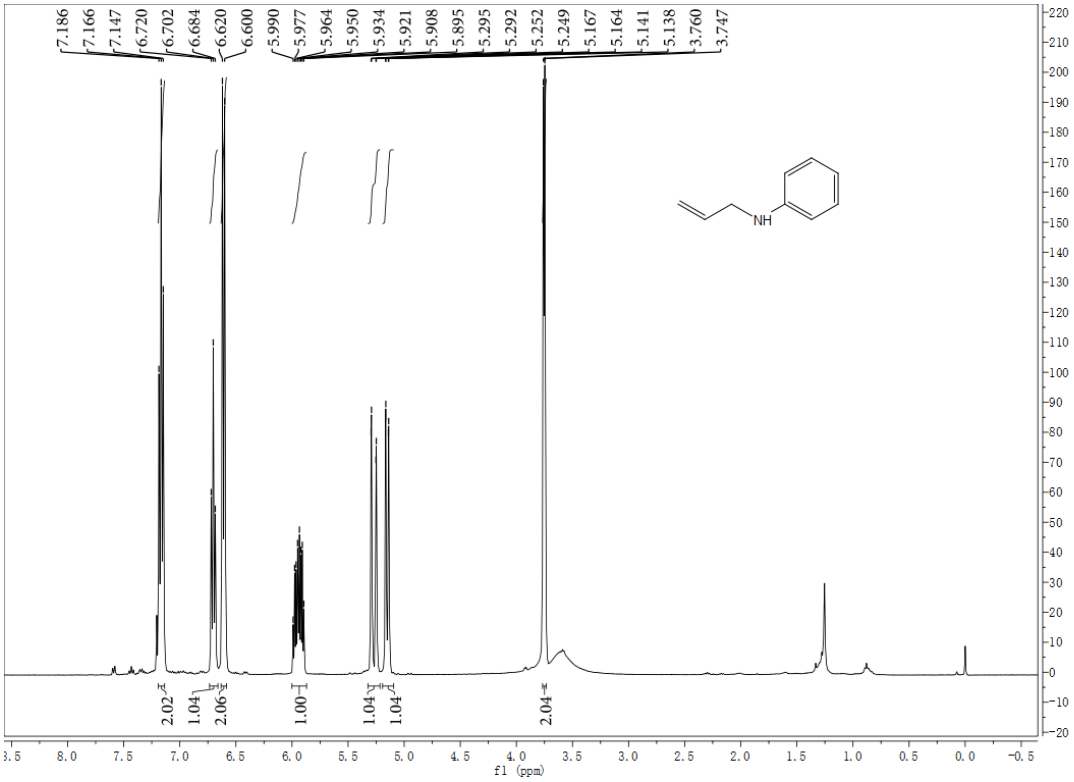


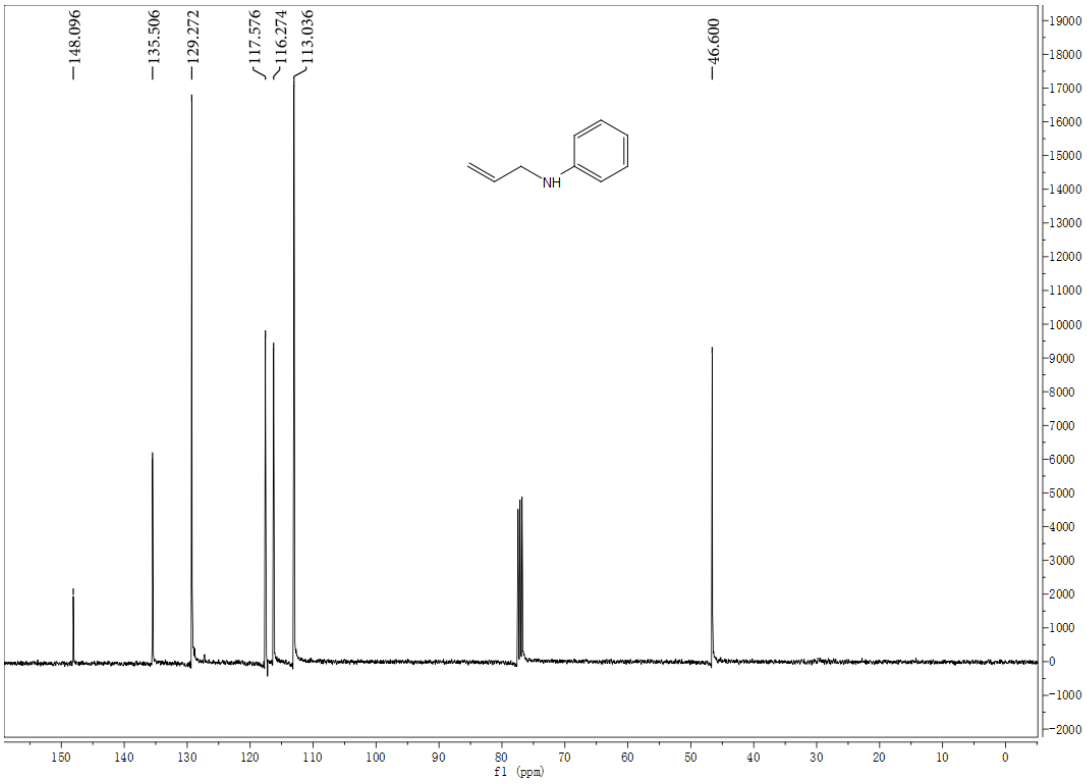
^{1}H NMR and ^{13}C NMR of compound (6b)



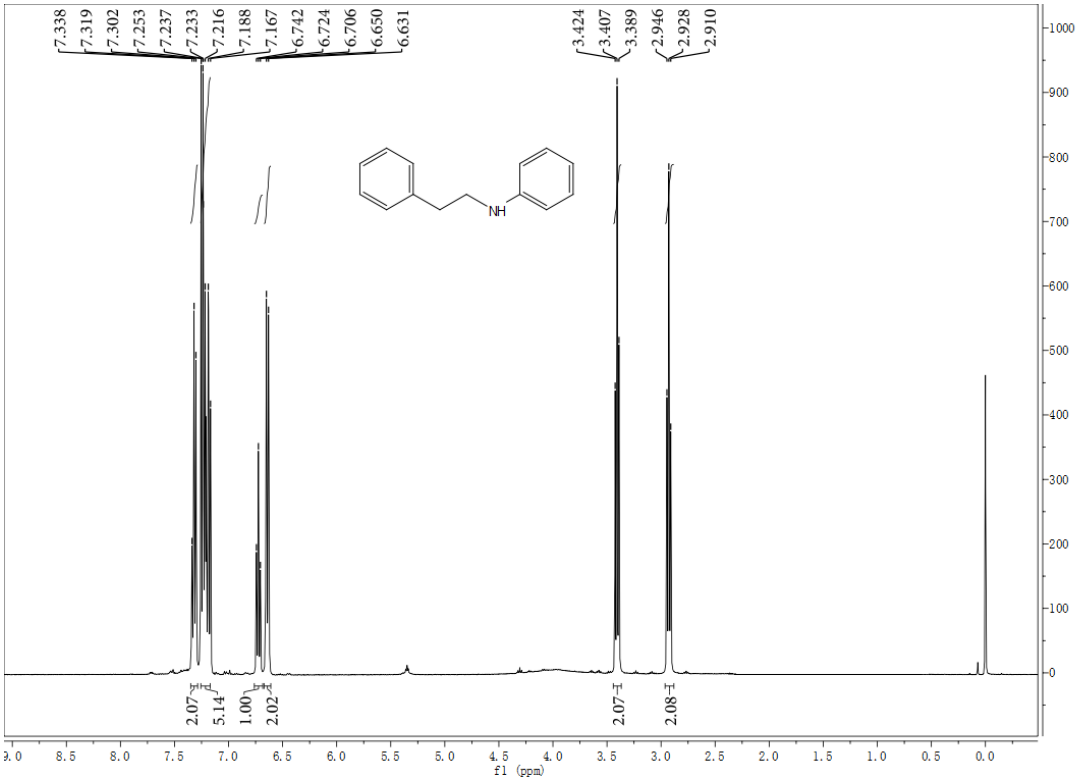


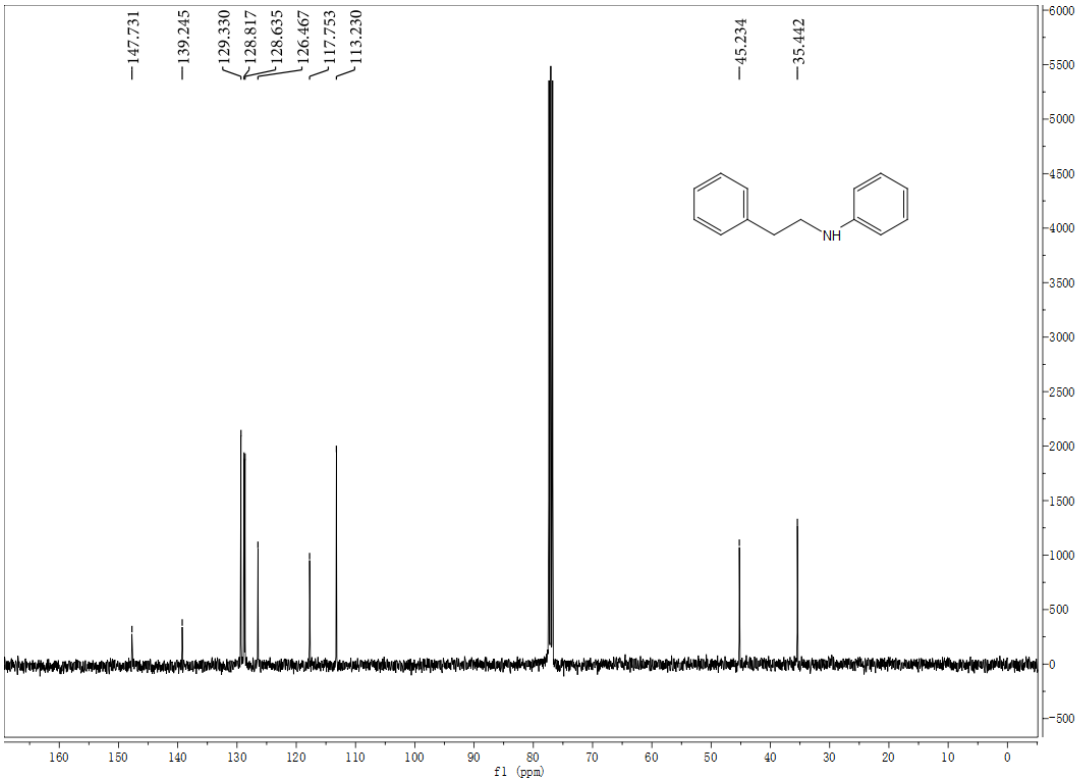
^{1}H NMR and ^{13}C NMR of compound (6c)



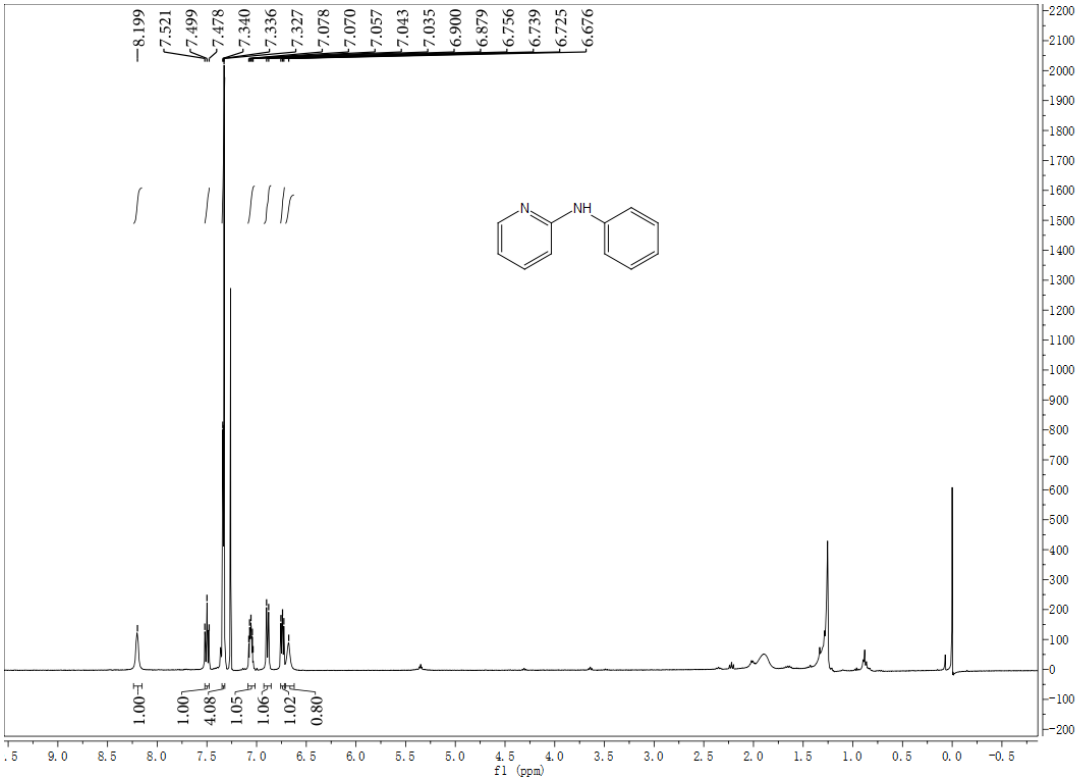


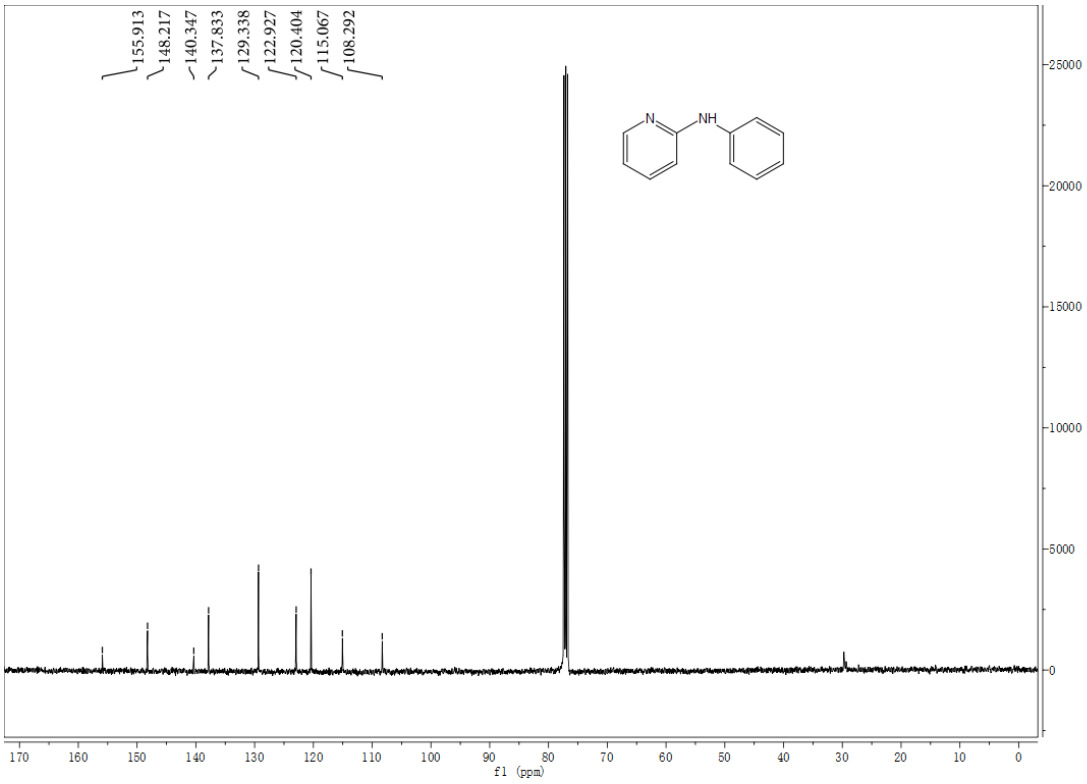
^{1}H NMR and ^{13}C NMR of compound (6d)



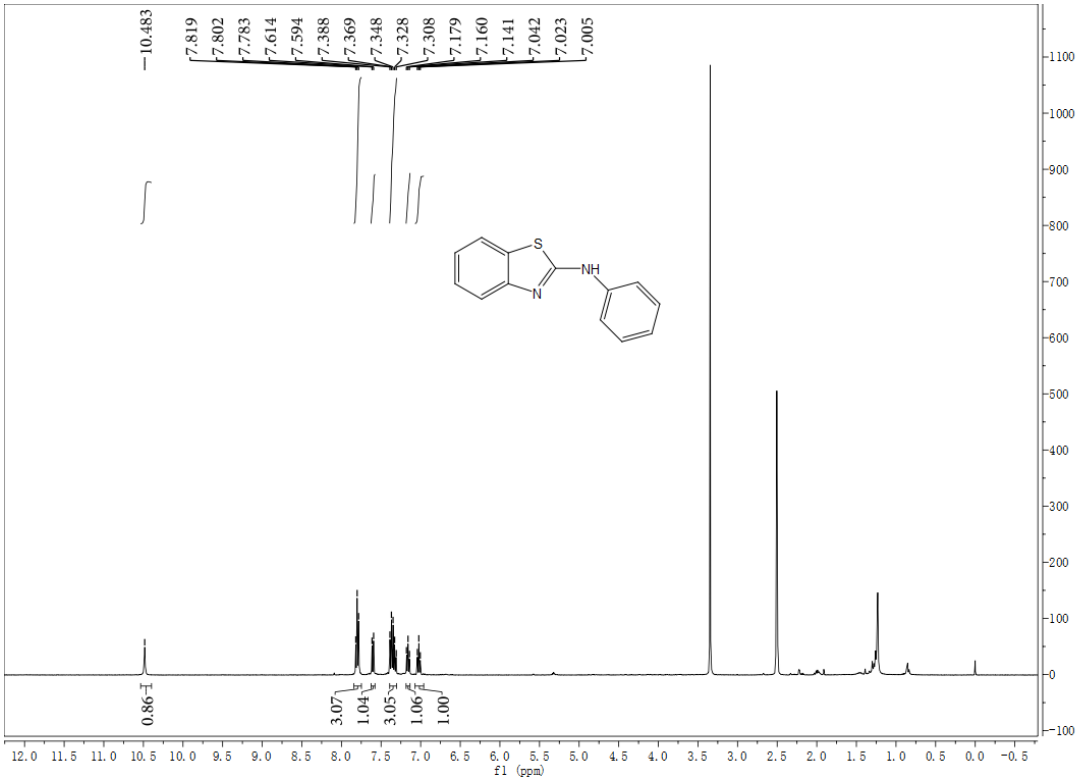


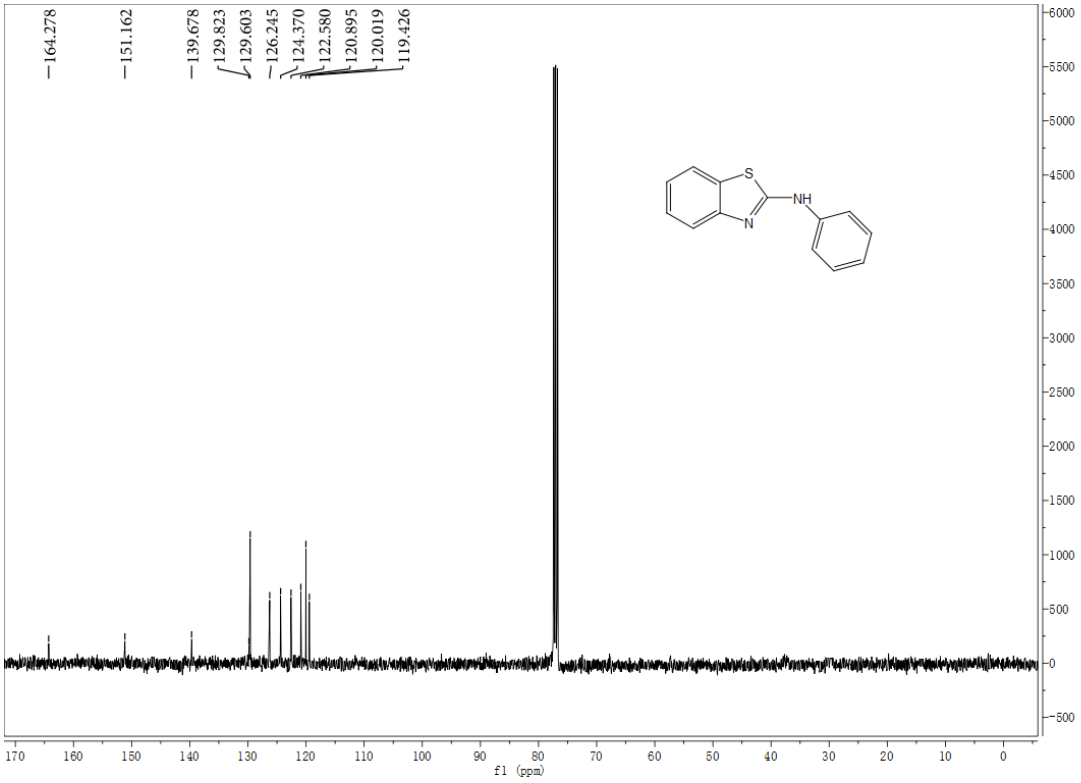
^{1}H NMR and ^{13}C NMR of compound (6e)



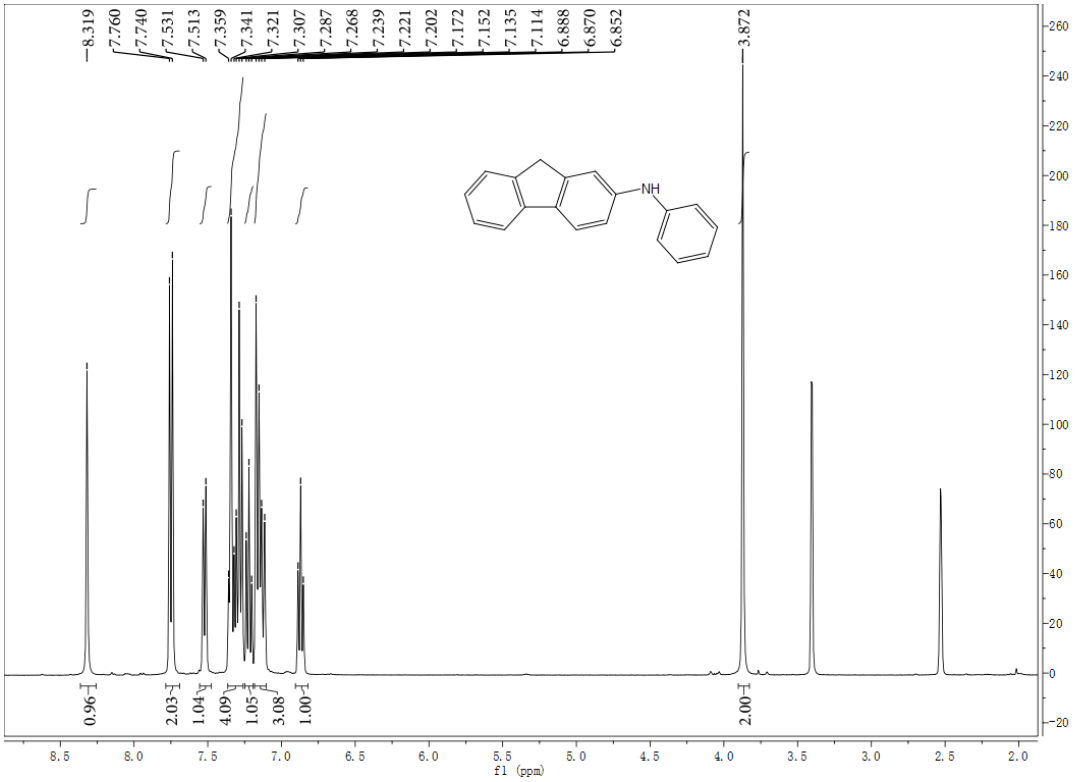


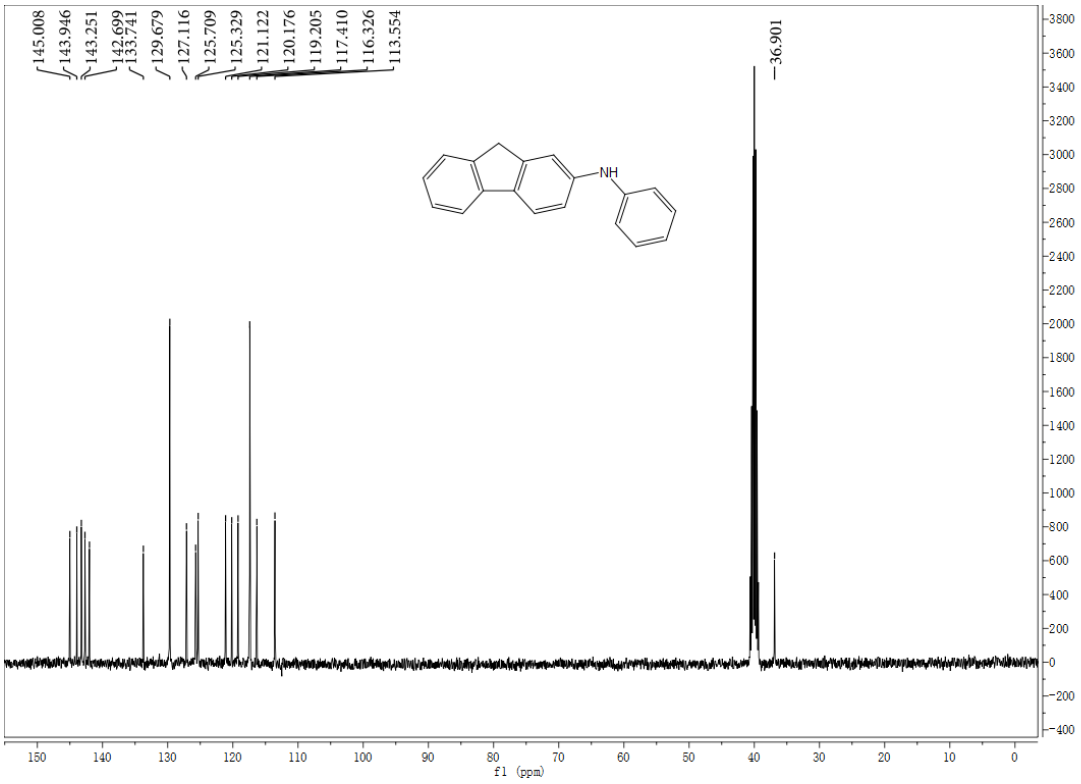
^{1}H NMR and ^{13}C NMR of compound (6f)



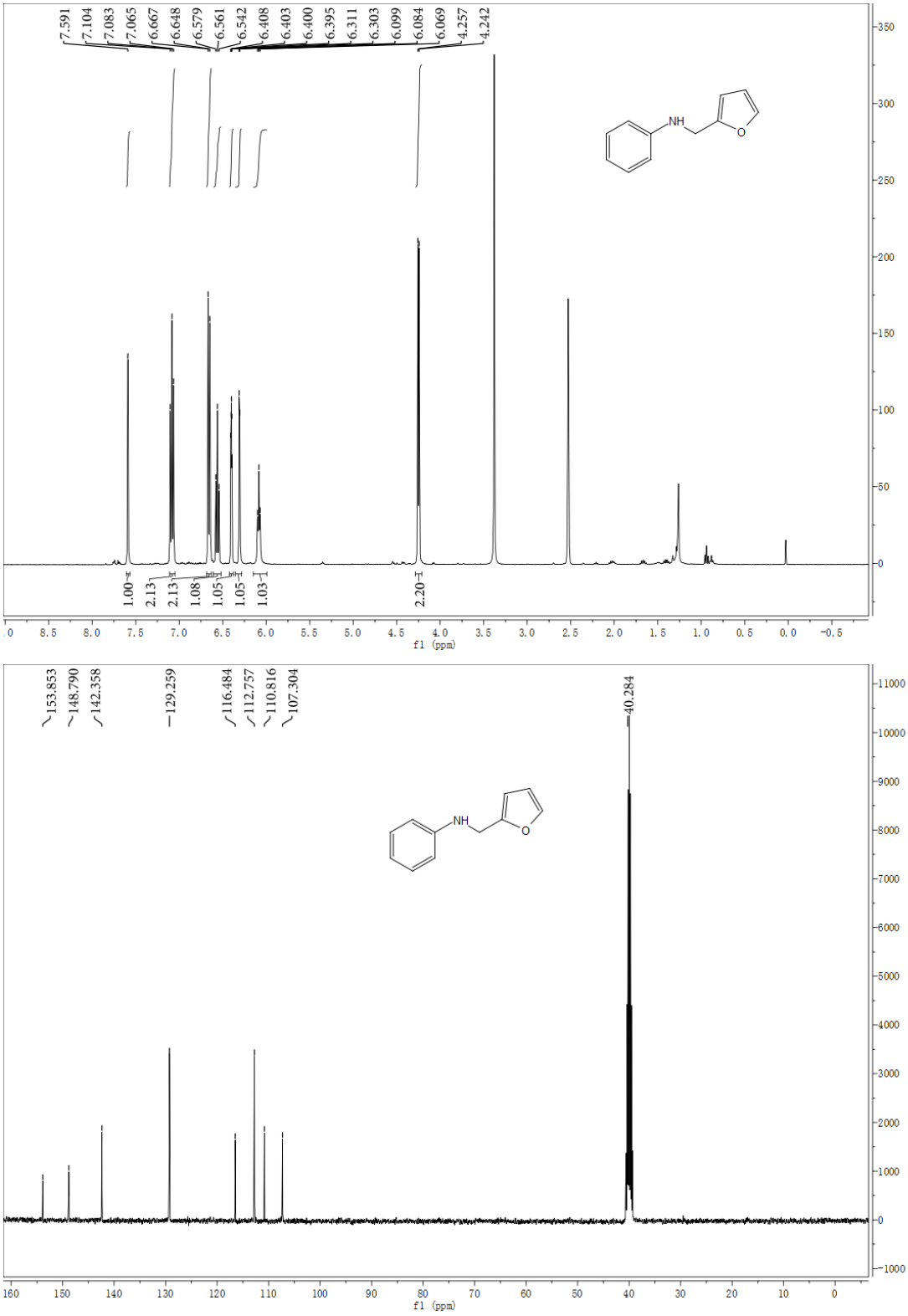


^{1}H NMR and ^{13}C NMR of compound (6g)

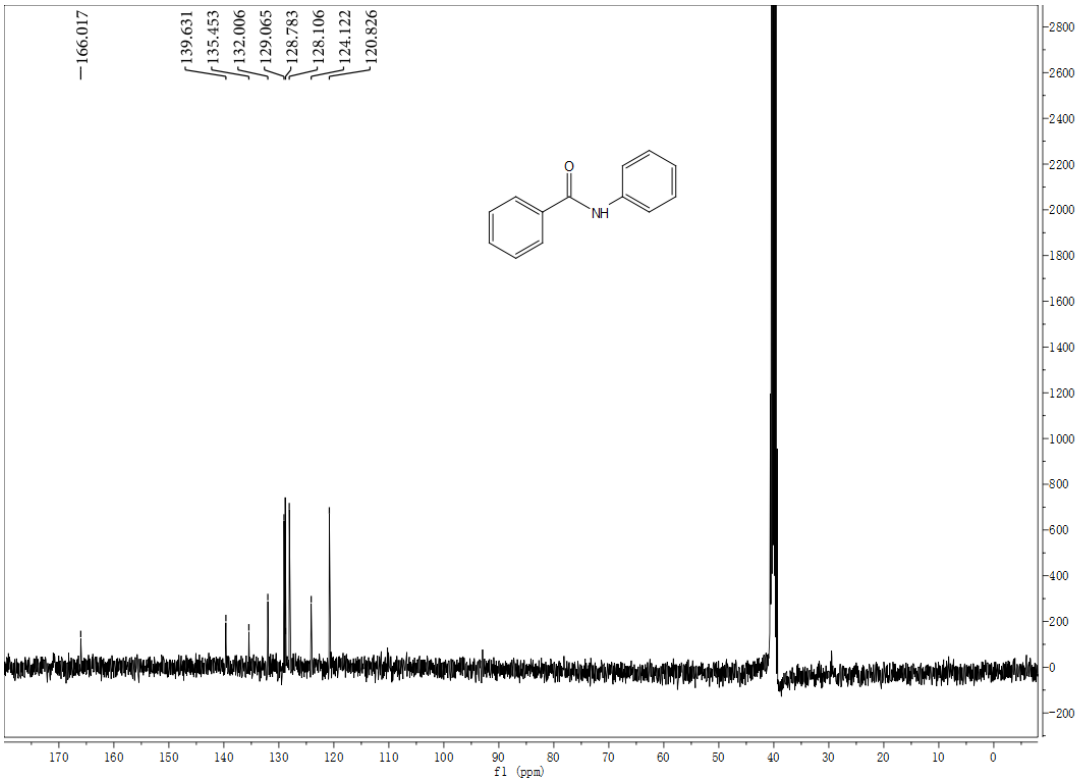




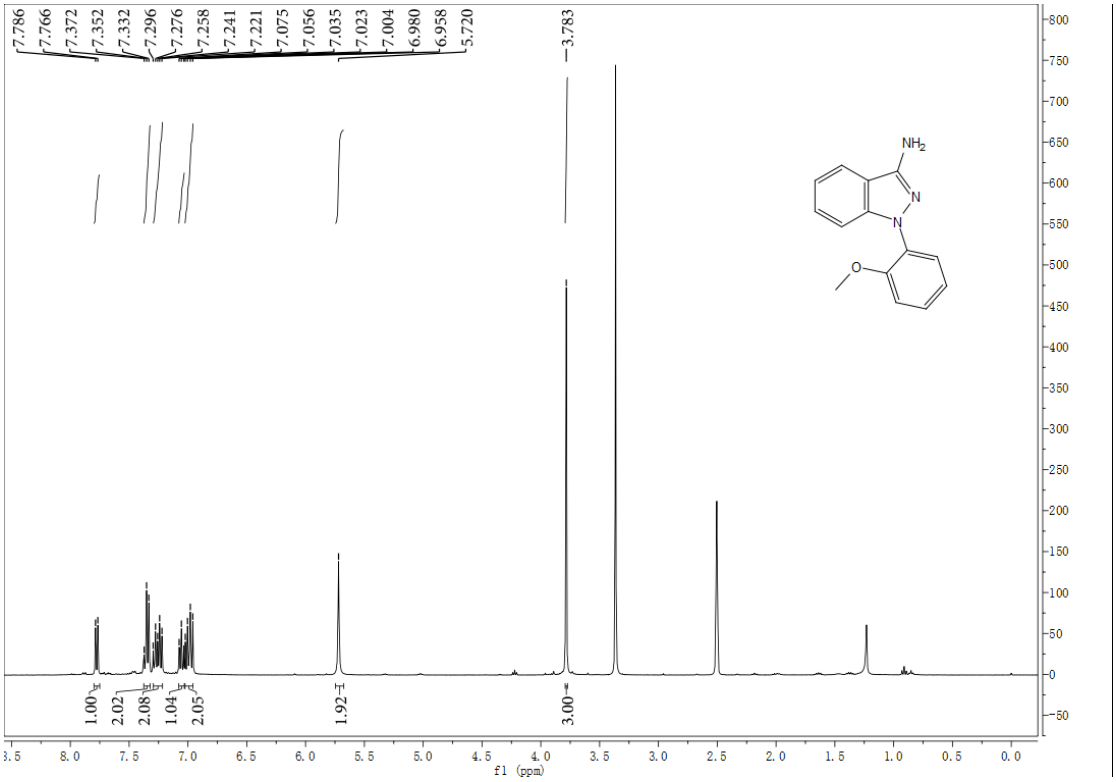
^{1}H NMR and ^{13}C NMR of compound (6h)

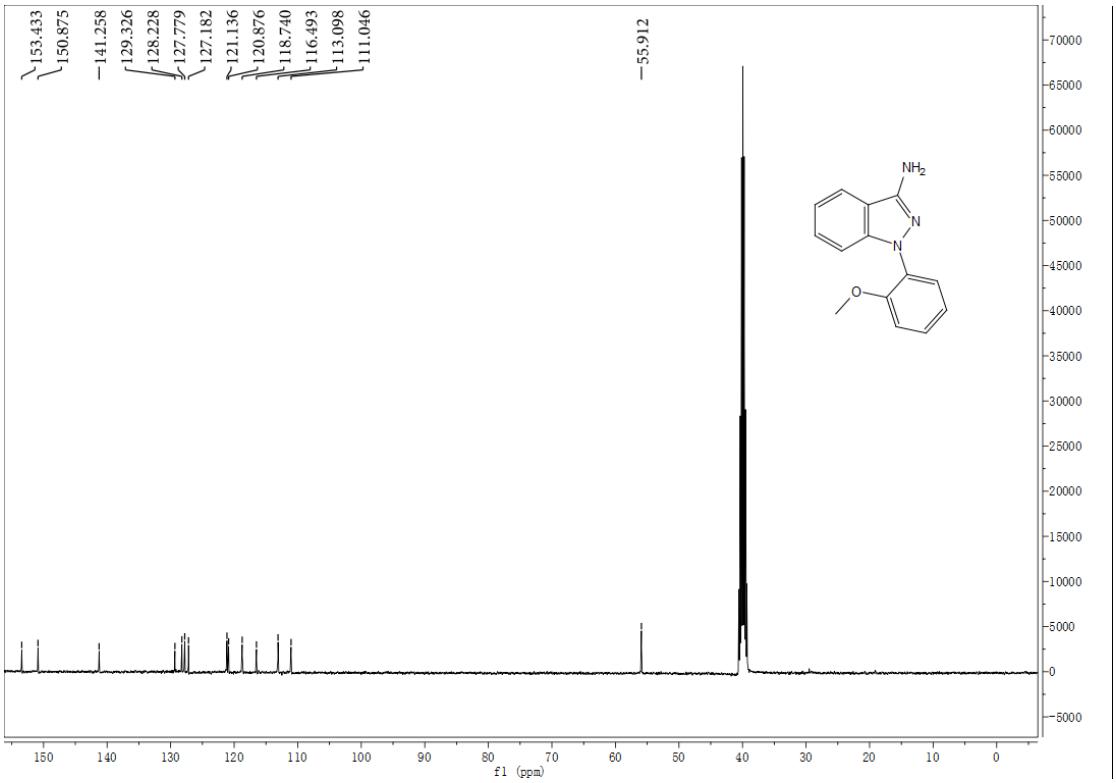


^{1}H NMR and ^{13}C NMR of compound (6i)

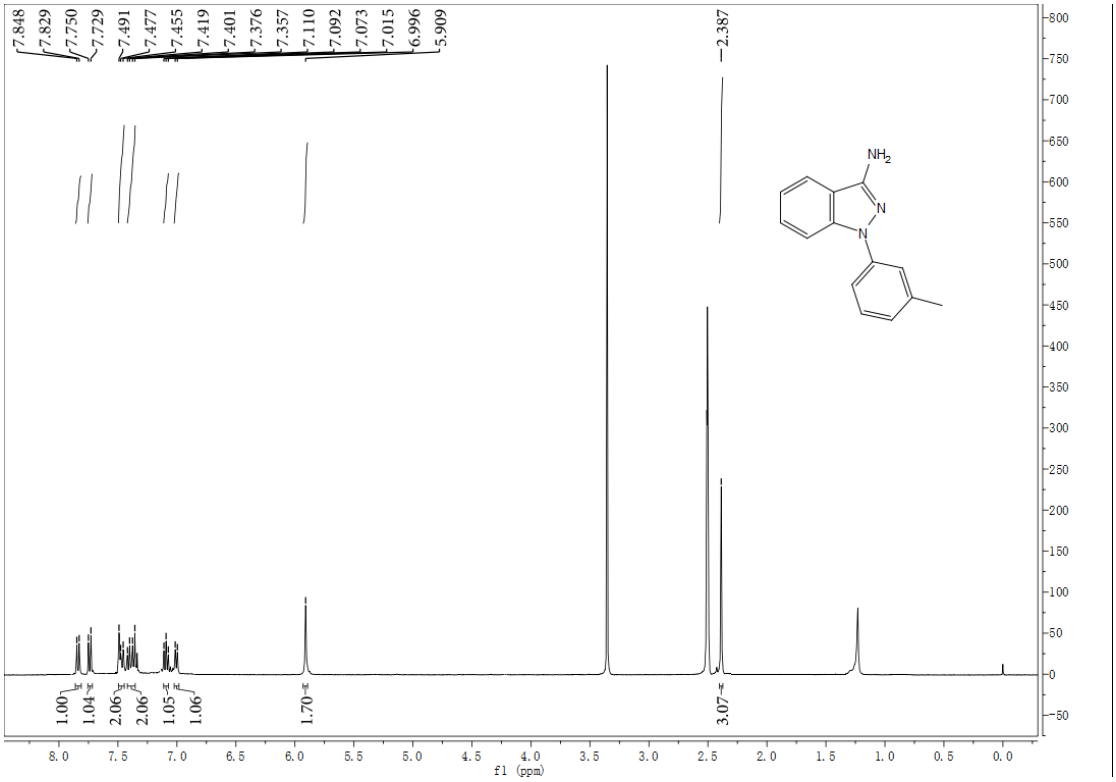


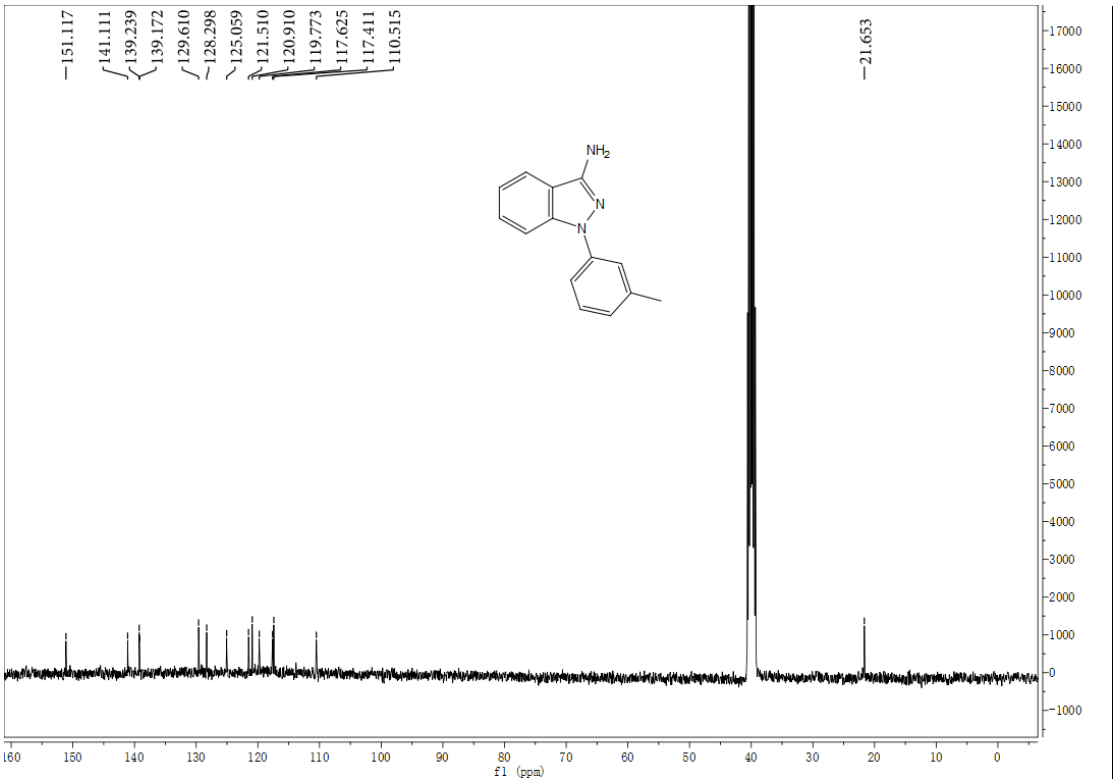
^{1}H NMR and ^{13}C NMR of compound (6j)



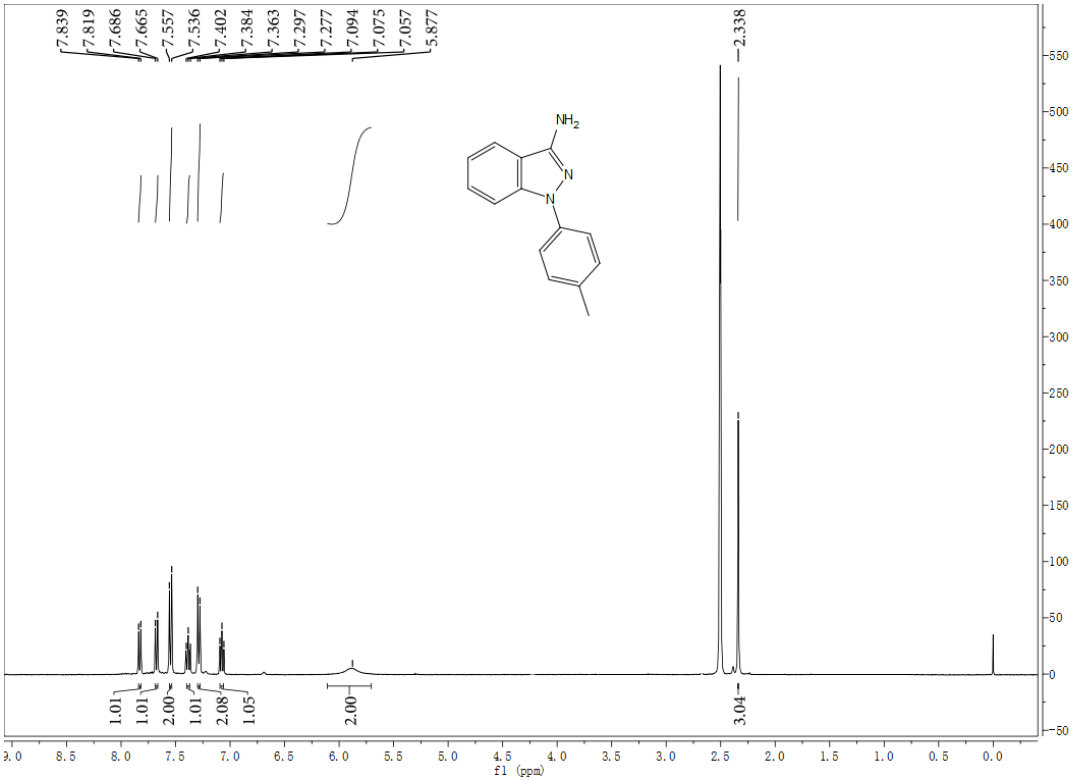


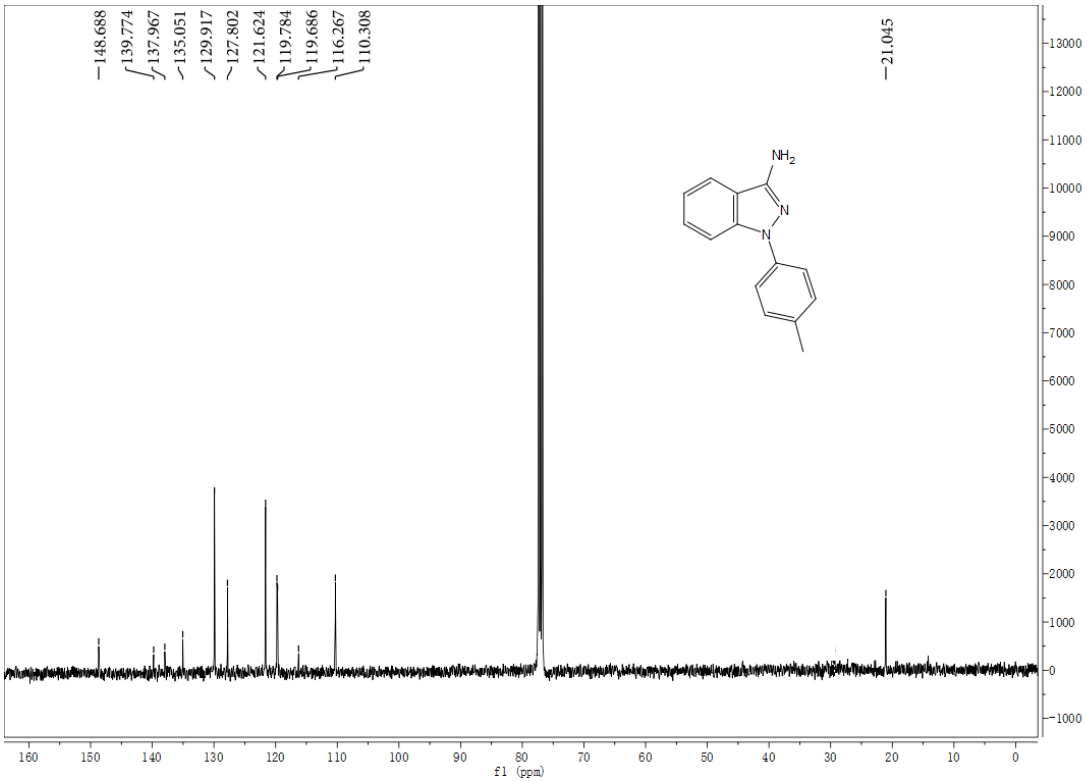
^{1}H NMR and ^{13}C NMR of compound (6k)



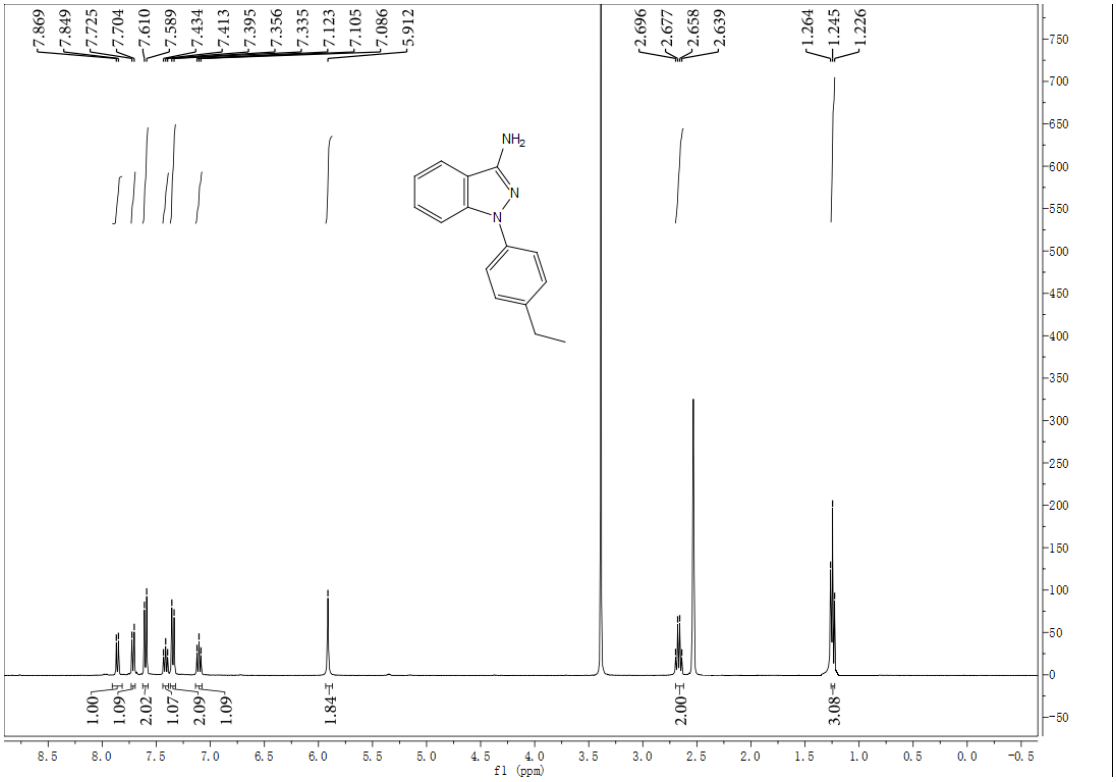


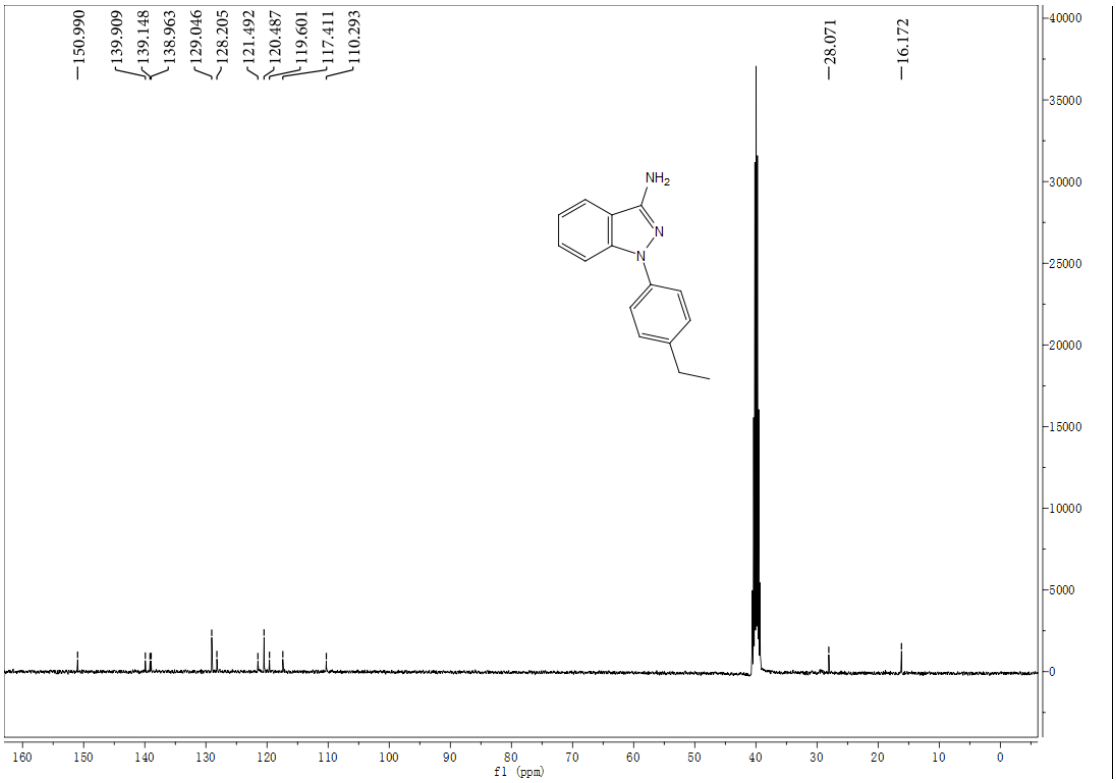
^{1}H NMR and ^{13}C NMR of compound (6l)



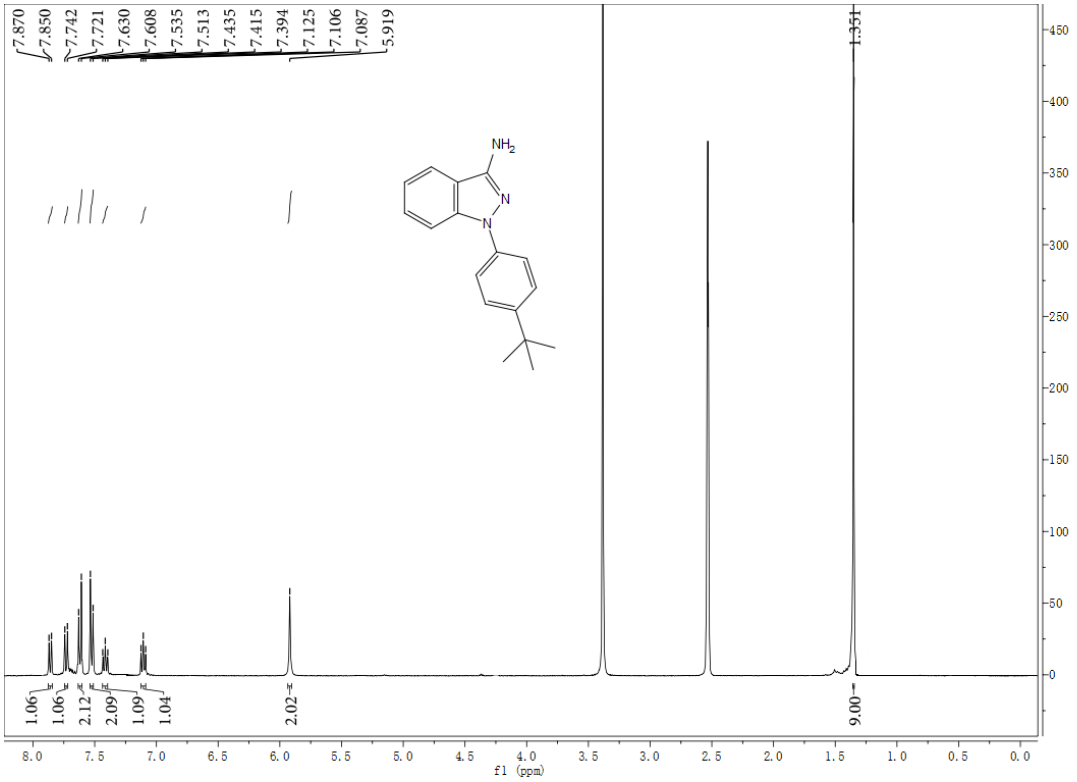


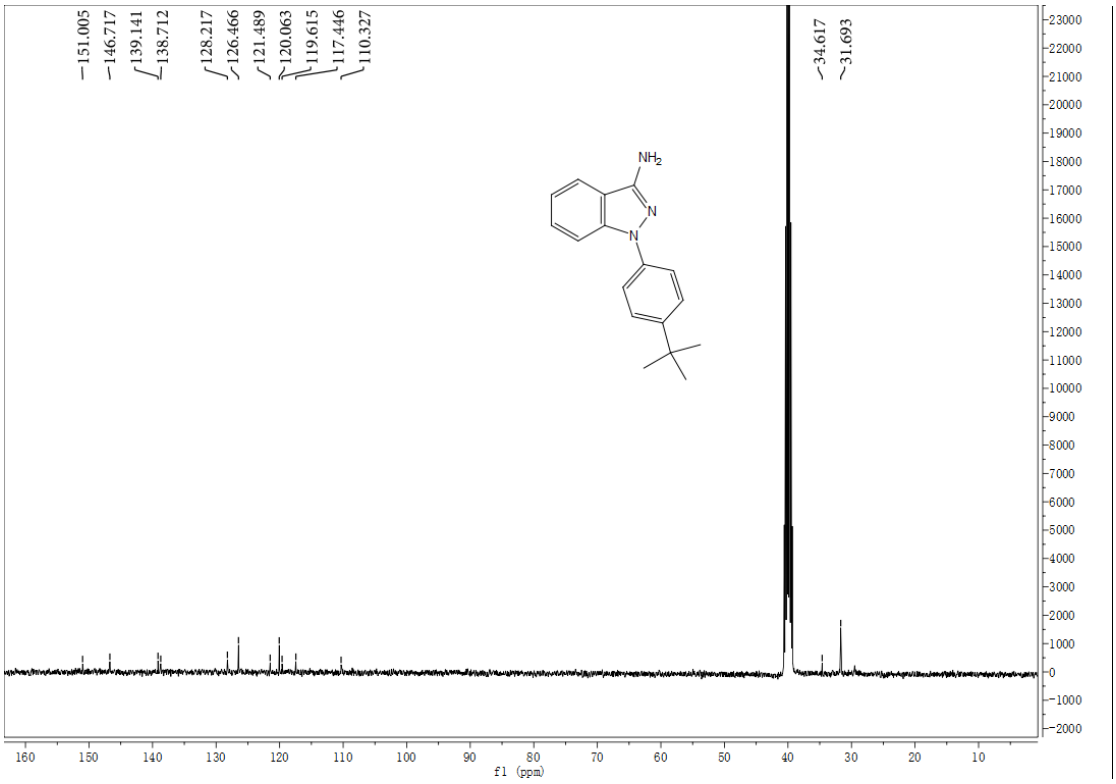
^{1}H NMR and ^{13}C NMR of compound (6m)



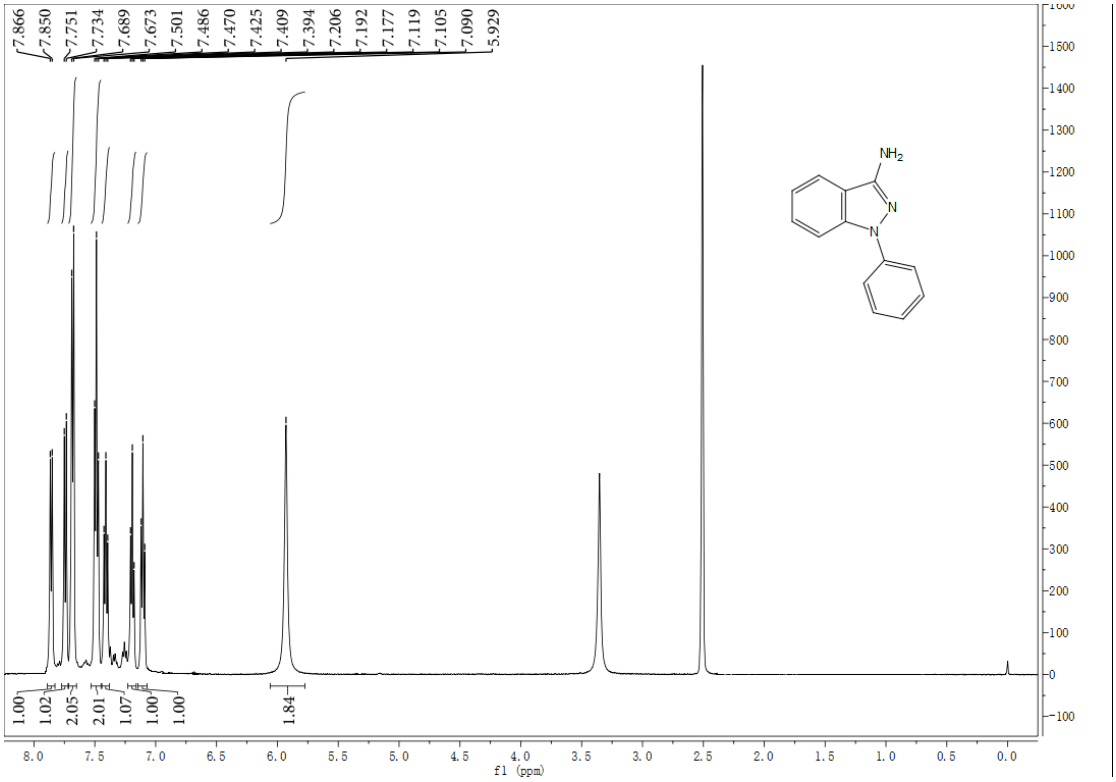


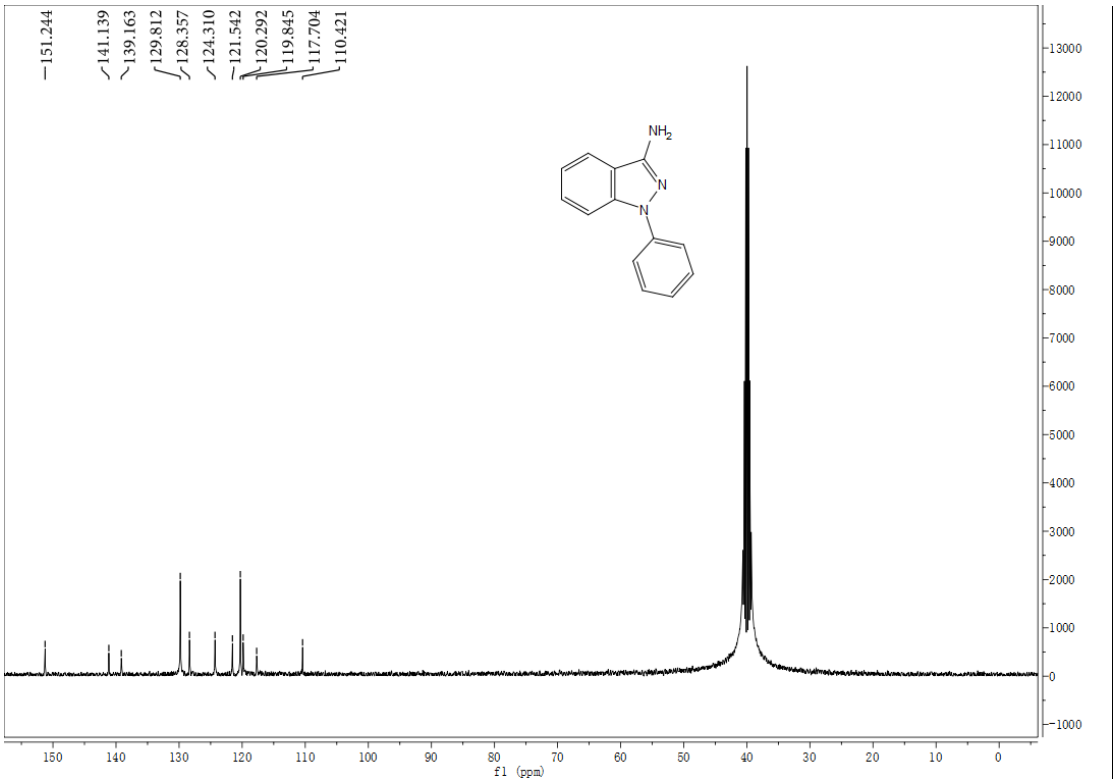
^{1}H NMR and ^{13}C NMR of compound (6n)



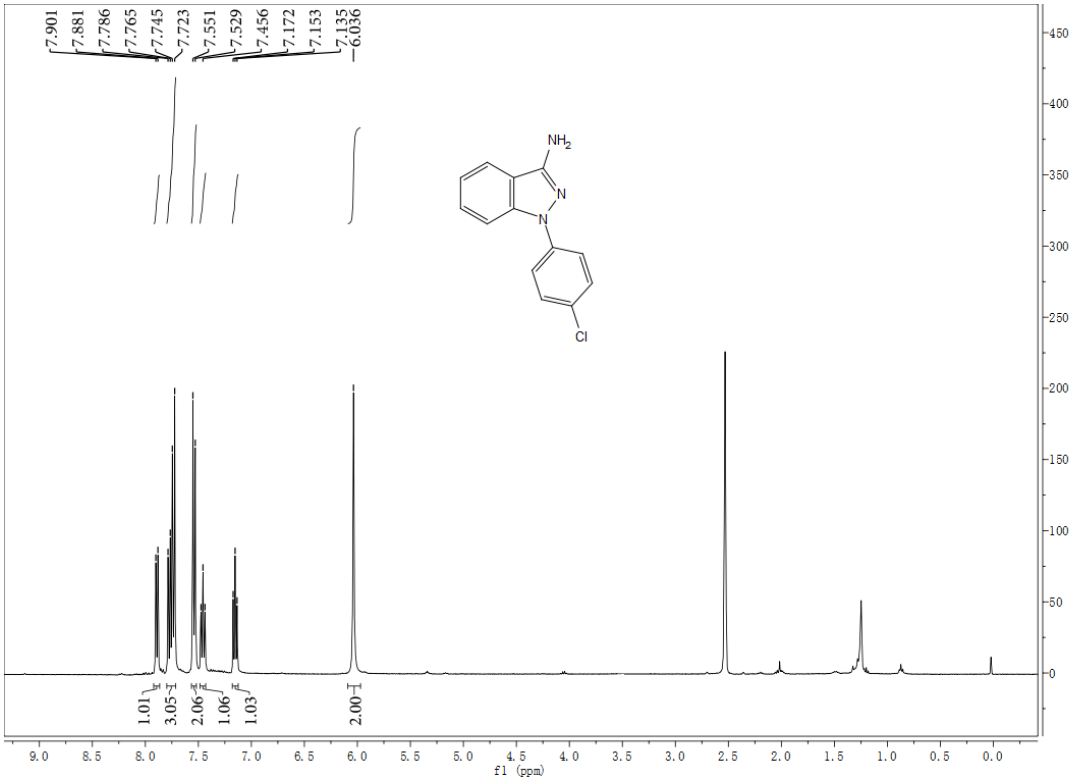


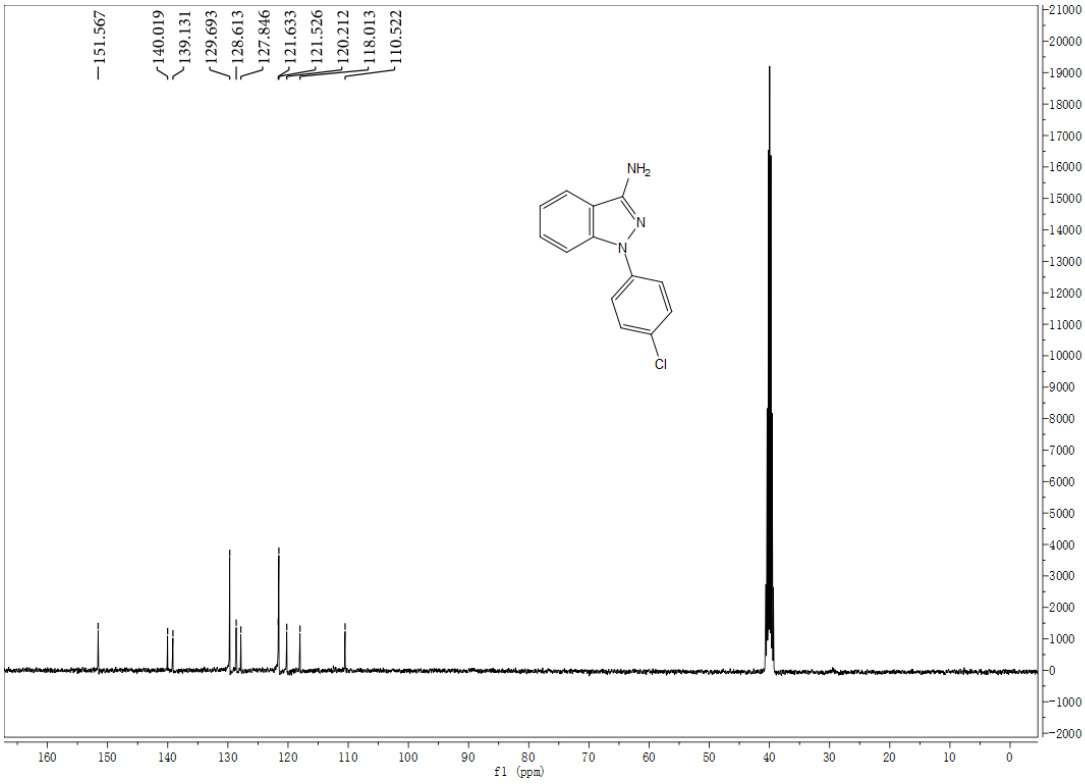
^{1}H NMR and ^{13}C NMR of compound (6o)



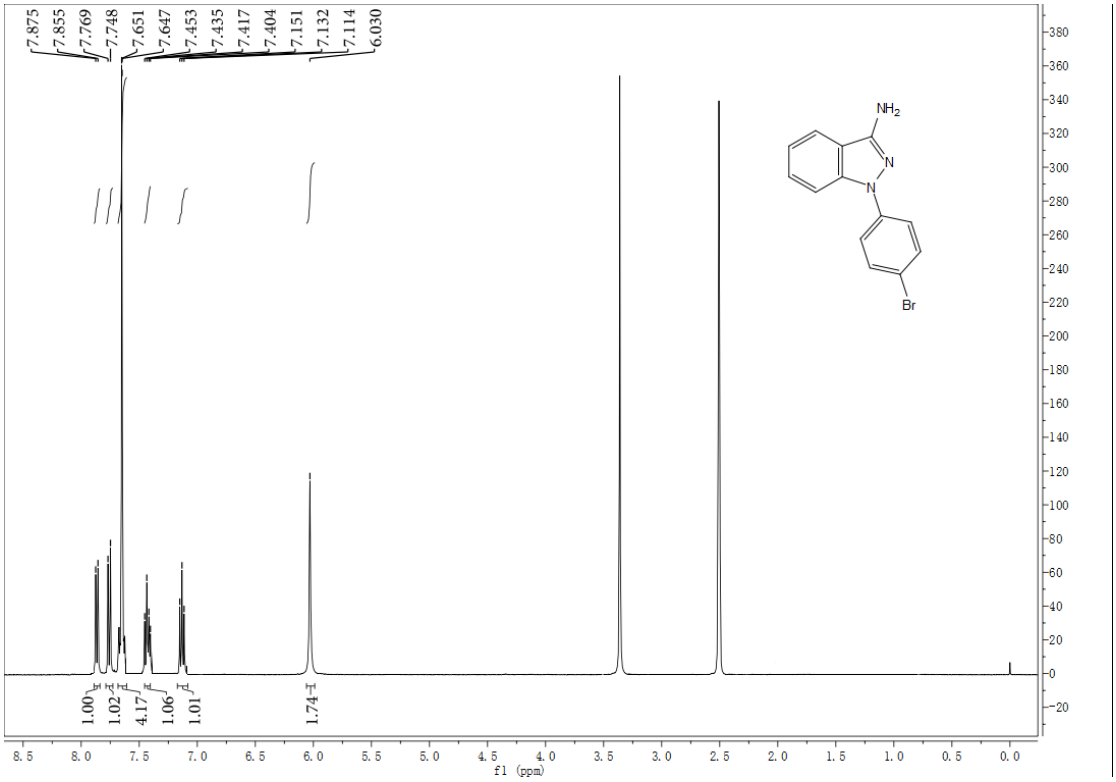


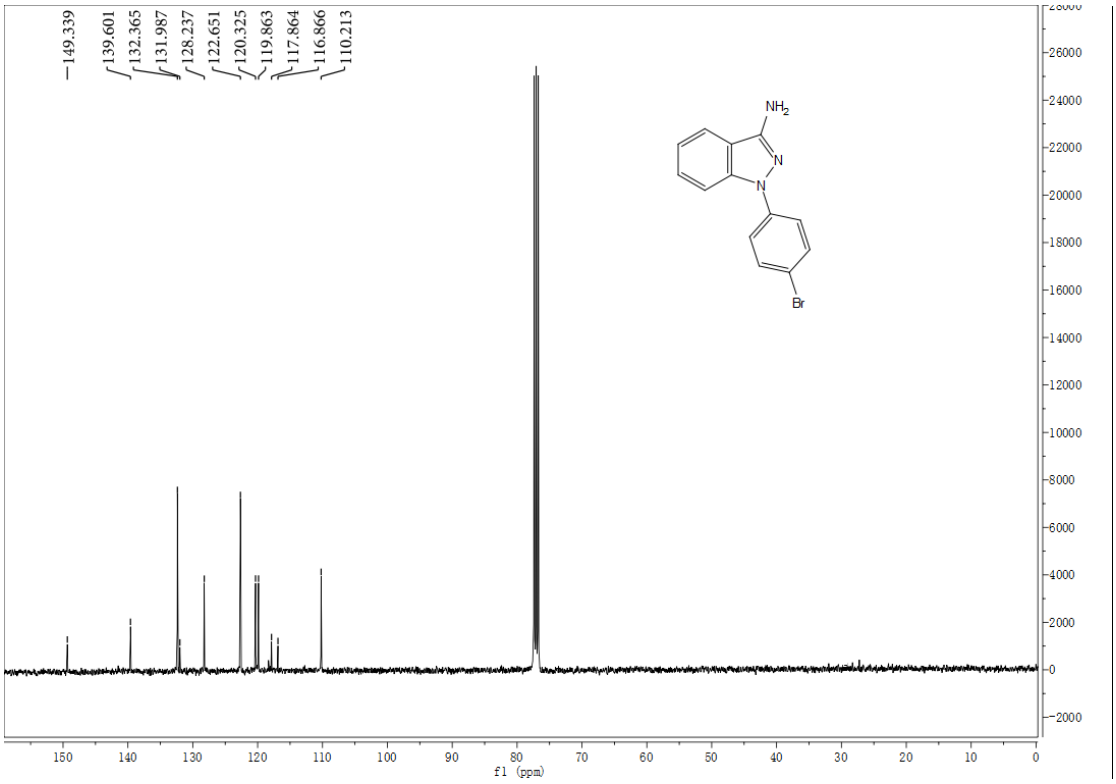
^{1}H NMR and ^{13}C NMR of compound (6p)



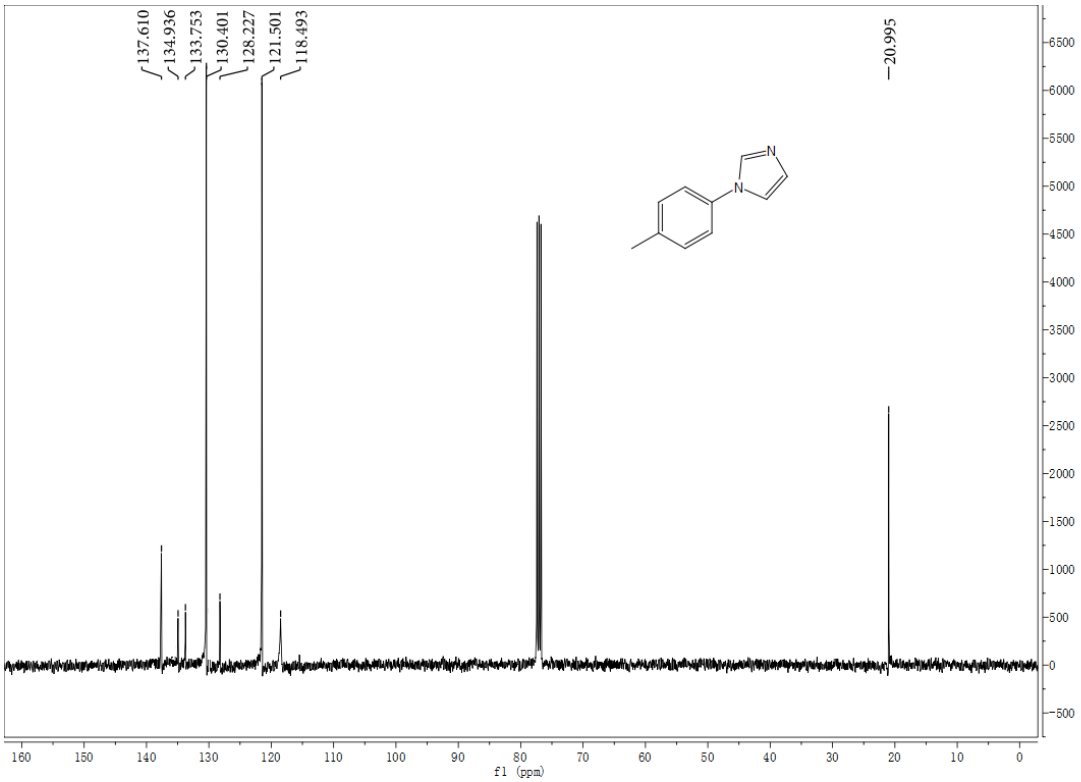


^{1}H NMR and ^{13}C NMR of compound (6q)

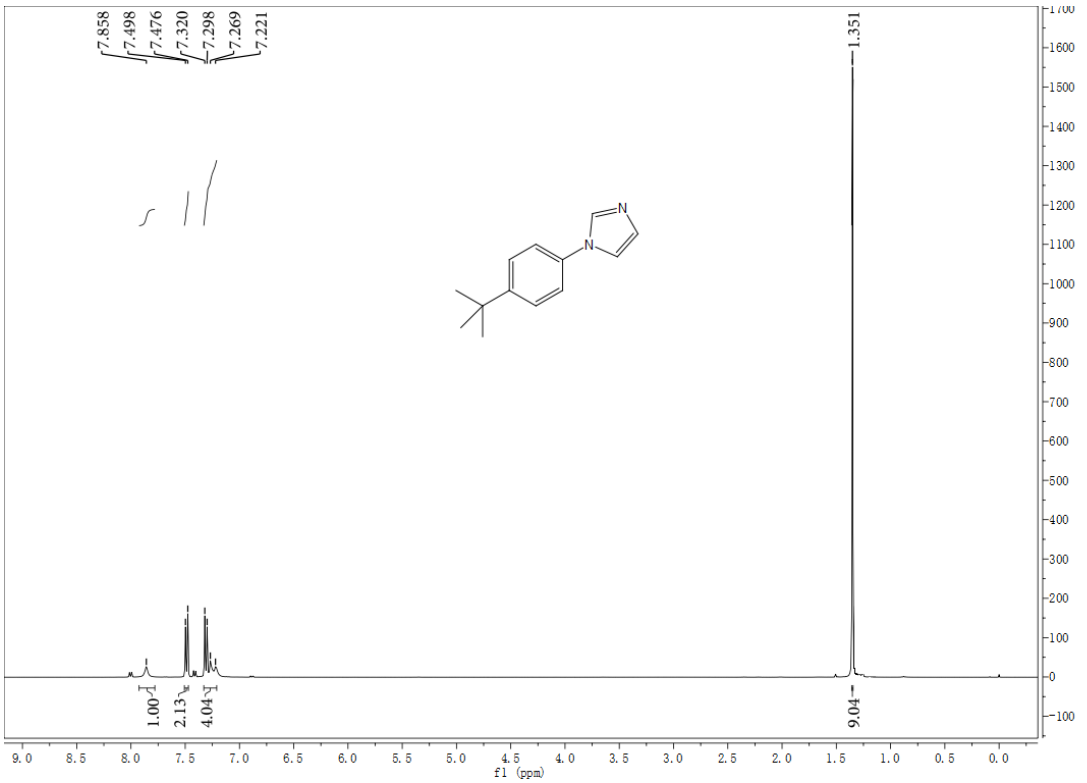


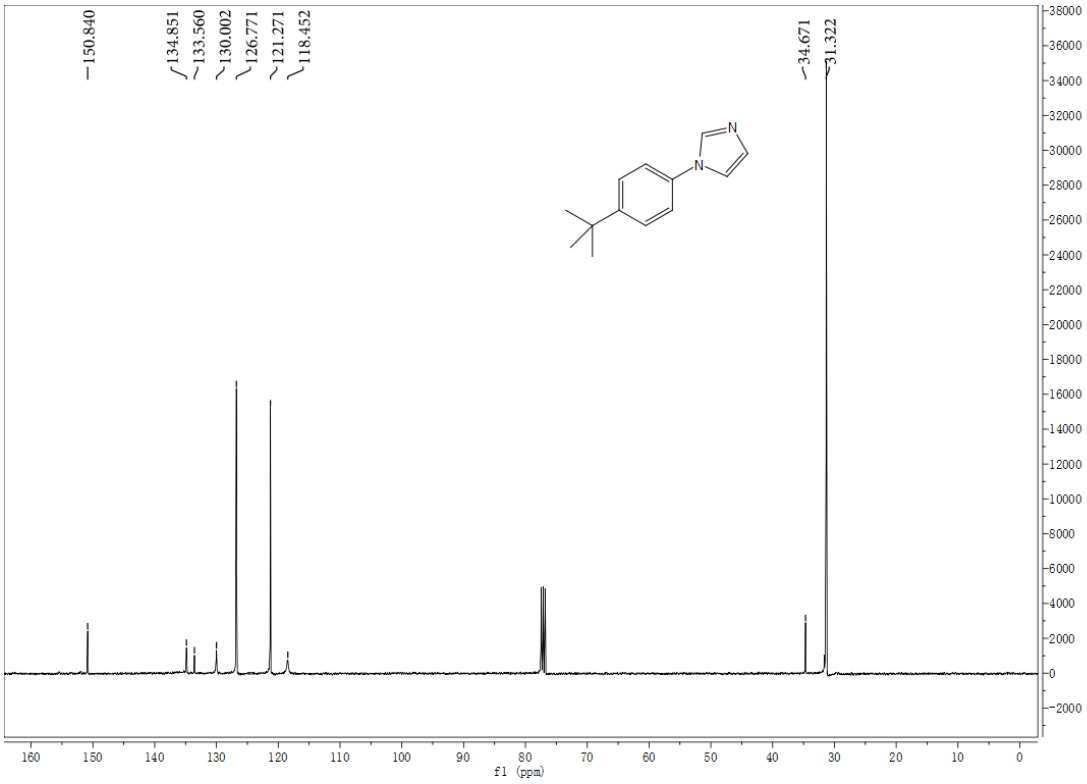


^{1}H NMR and ^{13}C NMR of compound (6r)

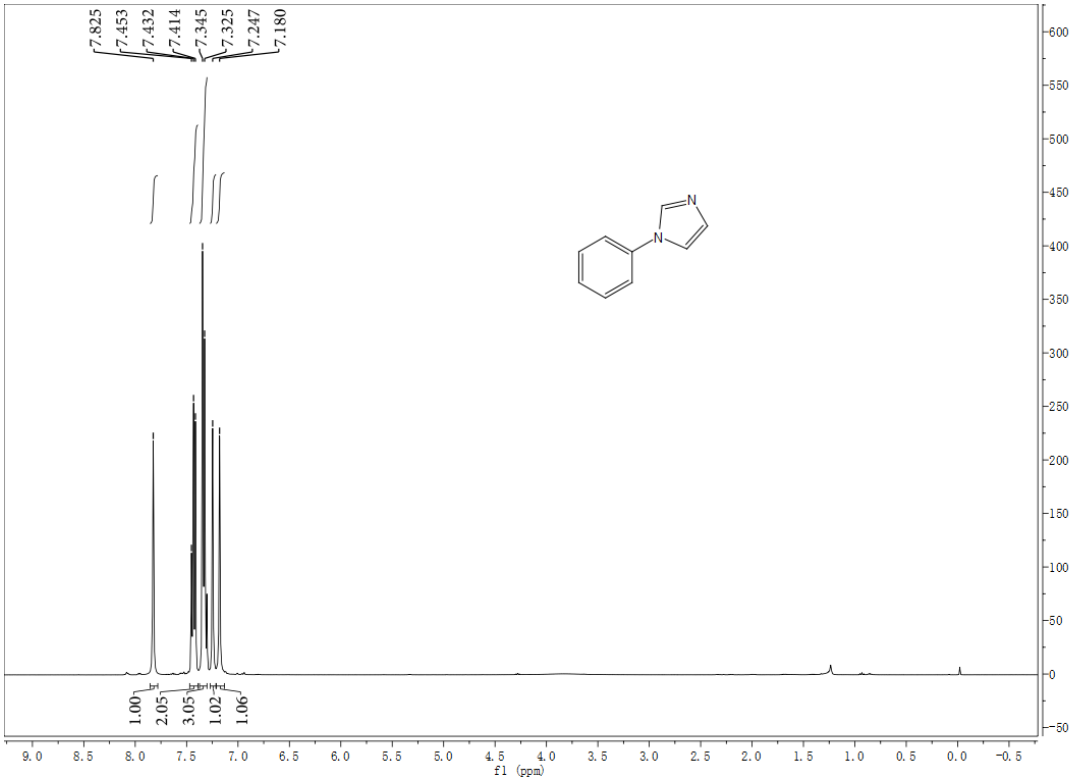


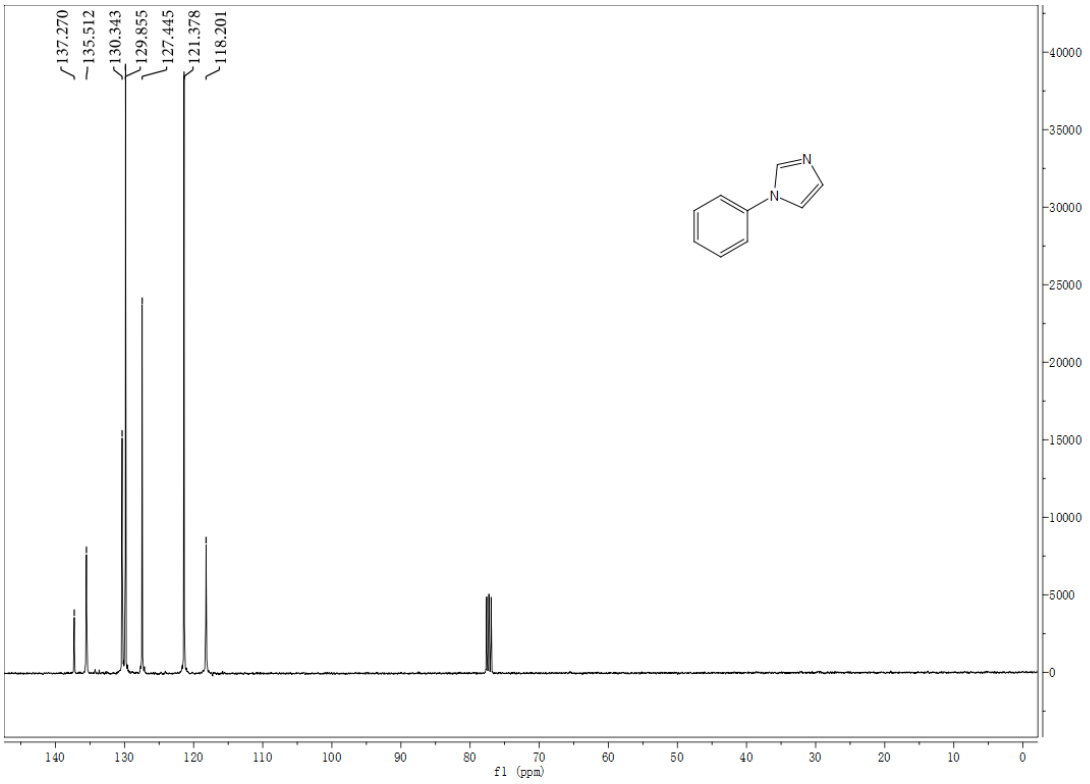
^{1}H NMR and ^{13}C NMR of compound (6s)



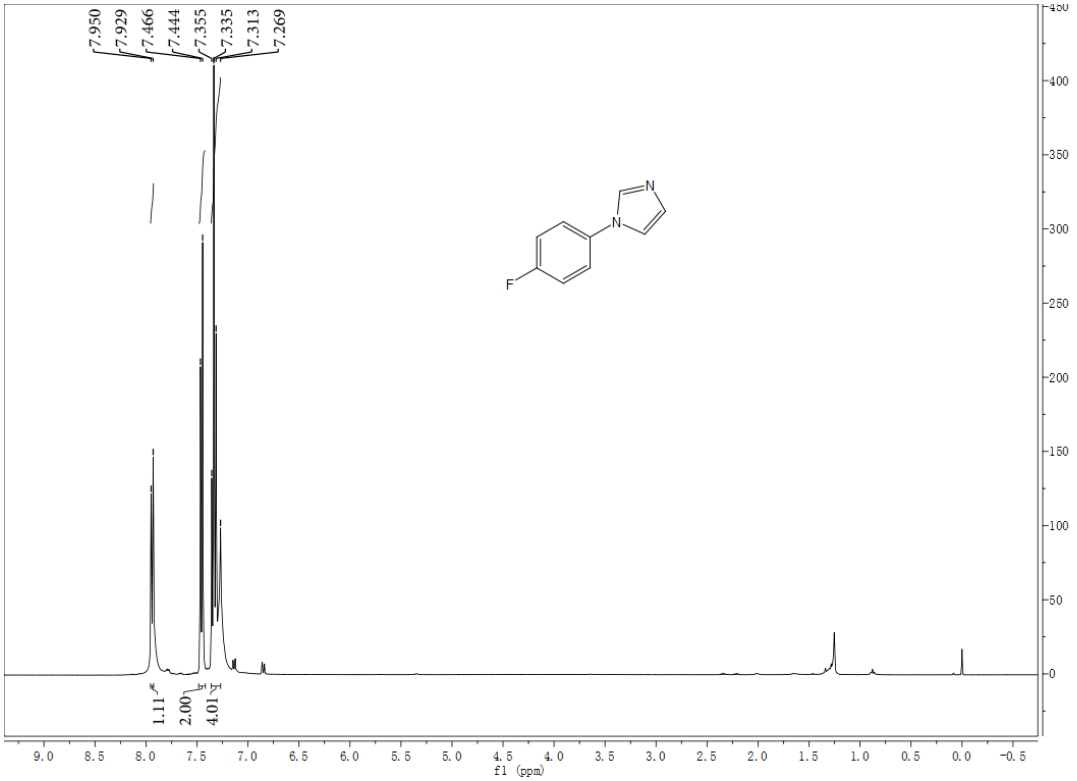


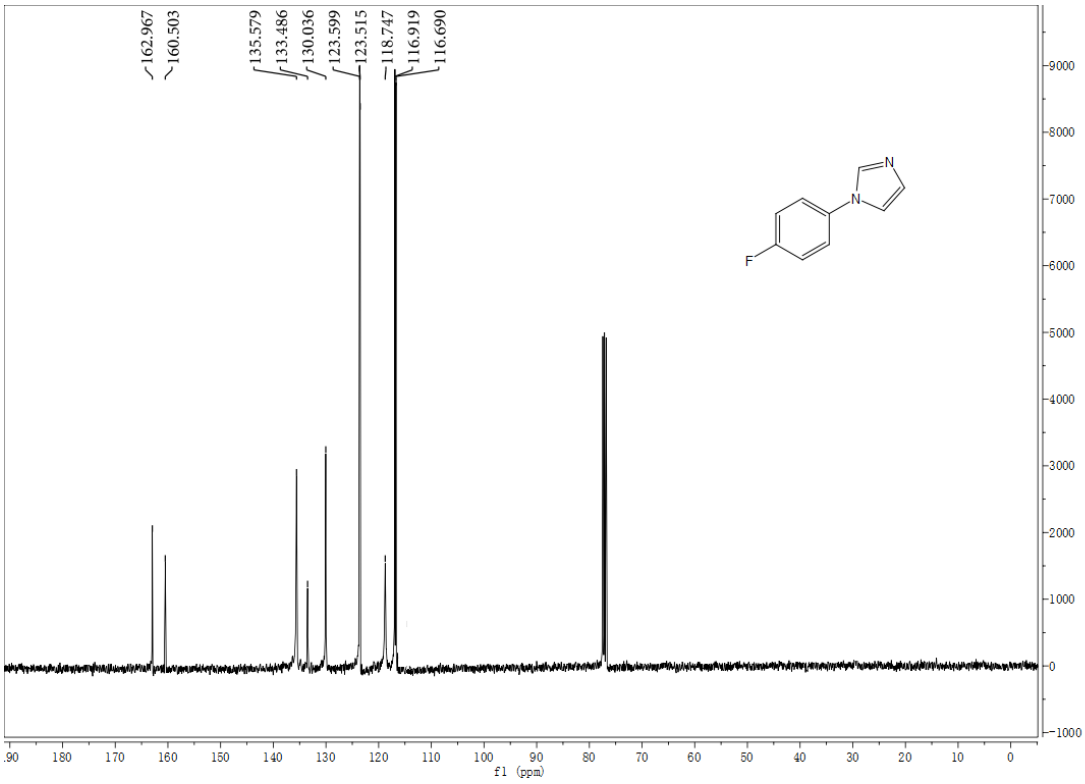
^{1}H NMR and ^{13}C NMR of compound (6t)



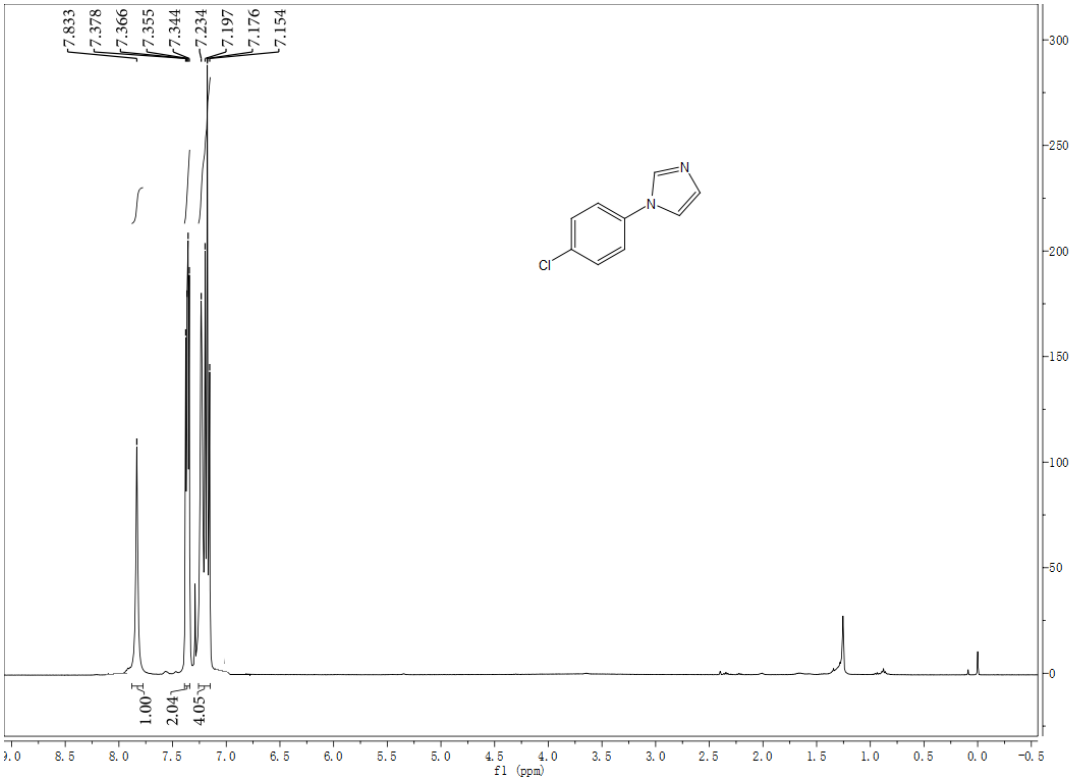


^{1}H NMR and ^{13}C NMR of compound (6u)

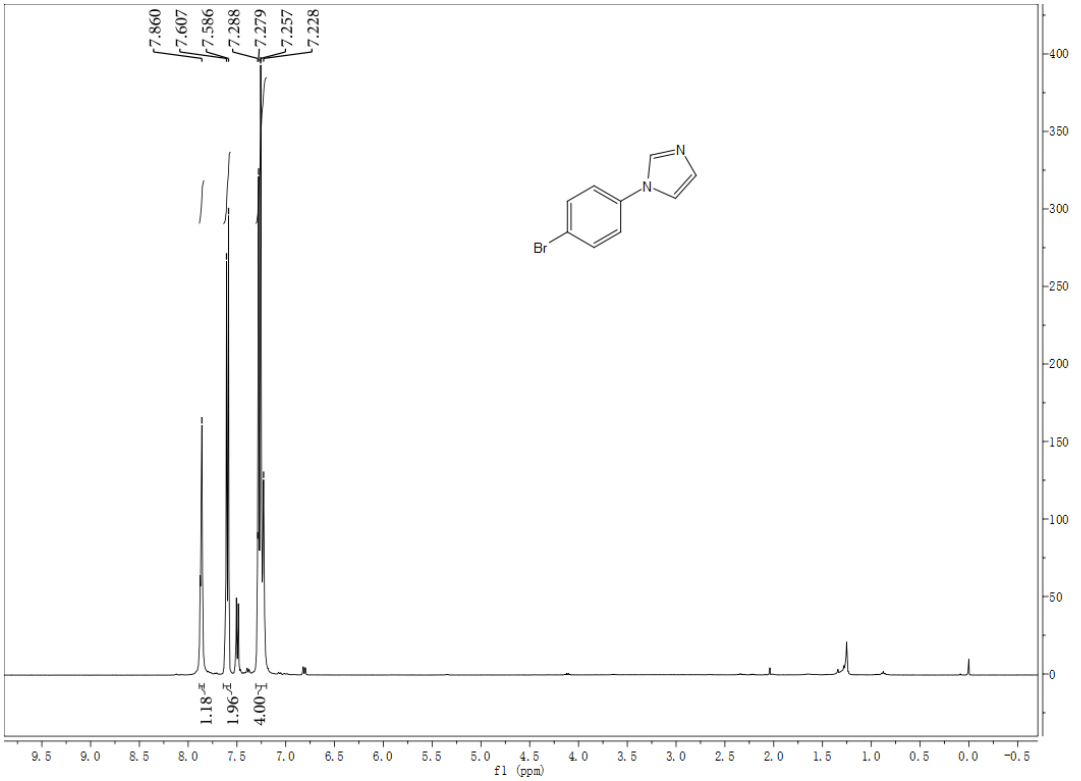


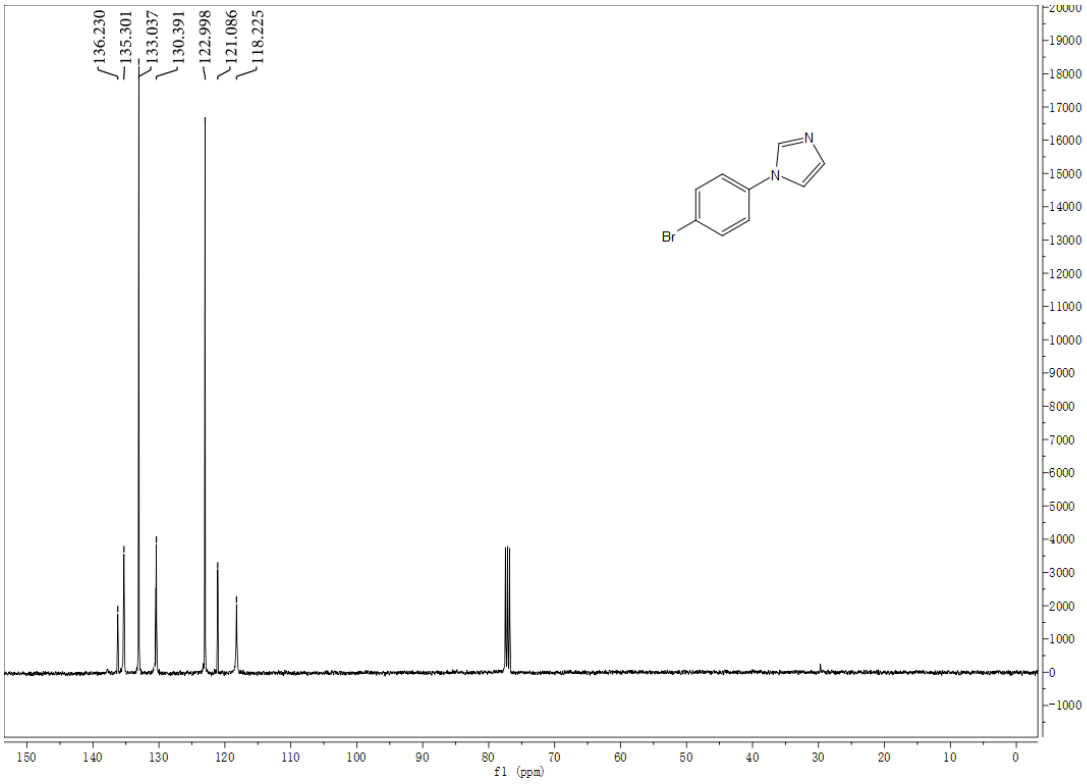


^{1}H NMR and ^{13}C NMR of compound (6v)



^{1}H NMR and ^{13}C NMR of compound (6w)





^{1}H NMR and ^{13}C NMR of compound (6x)