Supporting Information

Aerobic cross-dehydrogenative couplings of *N*-heteroarenes with toluene derivatives at room temperature

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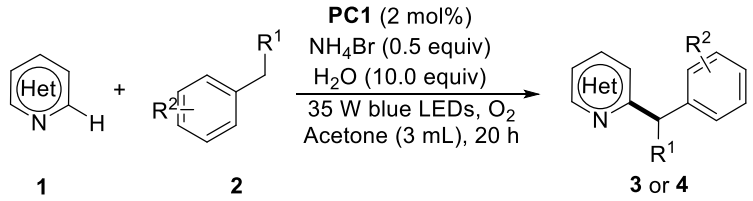
1. General Information

All reactions were carried out with magnetic stirring and in dried glassware. Standard syringe techniques were applied for transfer of dry solvents. All reagents and solvents were commercially available and used without any further purification unless specified. Proton (^{1}H NMR) and carbon (^{13}C NMR) nuclear magnetic resonance spectra were recorded at 400 MHz and 100MHz, respectively. The chemical shifts are given in parts per million (ppm) on the delta (δ) scale. The solvent peak was used as a reference value, for ^{1}H NMR: TMS = 0.00 ppm, for ^{13}C NMR: $CDCl_3$ = 77.00 ppm. The following abbreviations were used to explain multiplicities: s = singlet, d = doublet, dd = doublet of doublet, t = triplet, td = triplet of doublet, q = quartet, m = multiplet, and br = broad. Analytical TLC was performed on precoated silica gel plates. High-resolution mass spectra (HRMS) were obtained on an Agilent mass spectrometer using ESI-TOF (electrospray ionization-time of flight).

2. Experiment Section

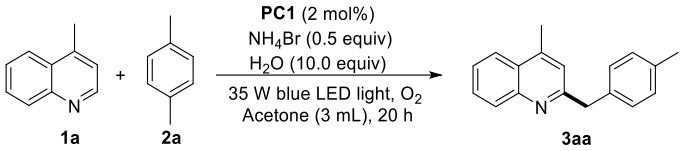
2.1 Typical experimental procedure for the benzylation



To a Schlenk tube were added **1** (0.2 mmol), **2** (2 mmol, 10.0 eqiuv), **PC1** (0.004 mmol, 2 mol%), NH_4Br (0.1 mmol, 0.5 equiv), H_2O (2 mmol, 10.0 equiv), acetone (3 mL). Then the mixture was stirred at room temperature in oxygen atmosphere (1 atm) under 35 W blue LED light for 20 h until complete consumption of starting material as monitored by TLC and GC-MS analysis. After the reaction was finished, the reaction mixture was washed with brine. The aqueous phase was re-extracted with EtOAc (3×10 mL). The combined organic extracts were dried over Na_2SO_4 and concentrated in vacuum. The residue was purified by silica gel flash column chromatography (hexane/ethyl acetate = 15 : 1 to 5 : 1) to afford the desired products **3** or **4**.

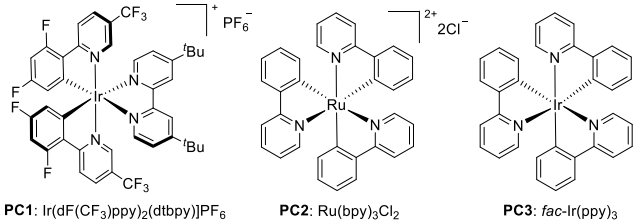
2.2 Optimization of reaction conditions

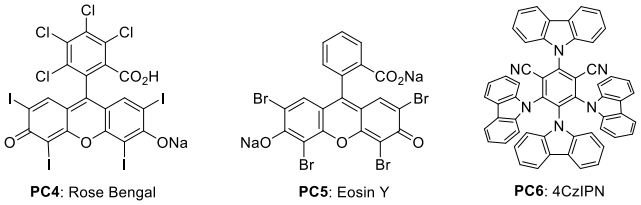
Table S1



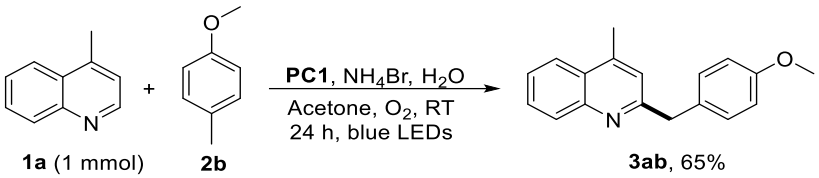
entry	variation from the standard conditions	yield (%)[b]
1	none	74
2	without **PC1**	0
3	without light	0
4	**PC2** instead of **PC1**	trace
5	**PC3** instead of **PC1**	trace
6	**PC4** instead of **PC1**	trace
7	**PC5** instead of **PC1**	trace
8	**PC6** instead of **PC1**	18
9	without NH_4Br	0
10	LiBr instead of NH_4Br	51
11	NaBr instead of NH_4Br	20
12	TBAB instead of NH_4Br	32
13	LiCl instead of NH_4Br	0
14	NH_4I instead of NH_4Br	0
15	CH_3CN instead of Acetone	38
16	1,4-dioxane instead of Acetone	56
17	DMSO instead of Acetone	0
18	DCM instead of Acetone	68
19	PhCl instead of Acetone	62
20	NMP instead of Acetone	0
21	under air	65
22	without H_2O	58

[a] Reaction conditions: **1a** (0.2 mmol), **2a** (2 mmol, 10 equiv), catalyst (2 mol%), additive (0.5 equiv), H_2O (10 equiv), solvent (3 mL), at 35 °C under O_2 atmosphere and 35 W blue LED irradiation for 20 h. [b] Isolated yield.





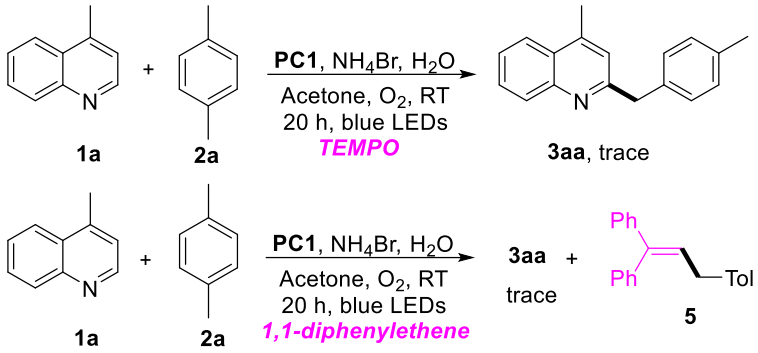
2.3 Scale-up experiment:



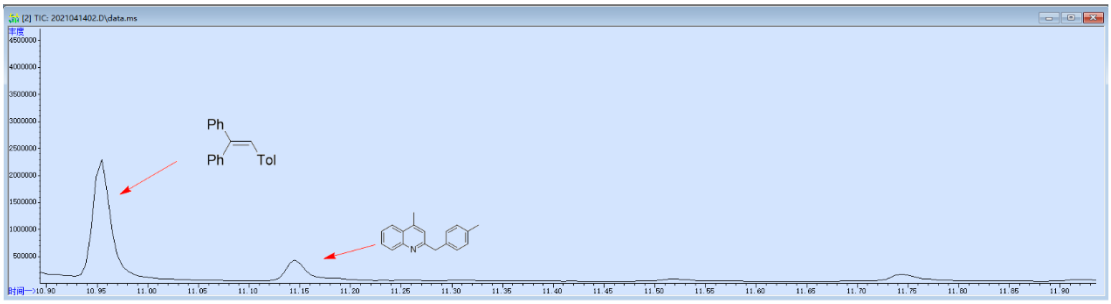
A 50 mL Schlenk tube were added 4-methylquinoline (**1a**, 1.0 mmol, 1.0 equiv), 1-methoxy-4-methylbenzene (**2b**, 10 mmol, 10.0 eqiuv), **PC1** (0.02 mmol, 2 mol%), NH_4Br (0.5 mmol, 0.5 equiv), H_2O (10 mmol, 10.0 equiv), acetone (15 mL). Then the mixture was stirred at room temperature in oxygen atmosphere (1 atm) under 35 W blue LED light for 24 h. After the reaction was finished, the reaction mixture was washed with brine. The aqueous phase was re-extracted with EtOAc (3×10 mL). The combined organic extracts were dried over Na_2SO_4 and concentrated in vacuum. The residue was purified by silica gel flash column chromatography (hexane/ethyl acetate = 10 : 1) to afford the desired products **3ab** in 65% yield.

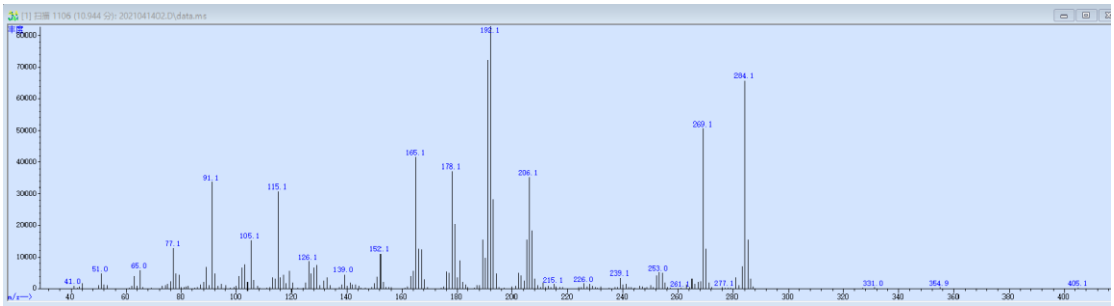
3. Mechanistic studies

3.1 Radical trapping experiments

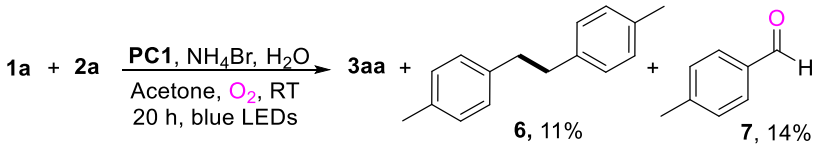


Two reactions of radical trapping experiments were performed. A solution of TEMPO (3.0 equiv, 0.6 mmol), or 1,1-diphenylethene (3 equiv, 0.6 mmol), 4-methylquinoline (**1a**, 0.2 mmol), *p*-xylene (**2a**, 2 mmol, 10 equiv), **PC1** (0.004 mmol, 2 mol%), NH_4Br (0.1 mmol, 0.5 equiv), H_2O (2 mmol, 10.0 equiv), Acetone (3 mL). Then the mixture was stirred at room temperature in oxygen atmosphere (1 atm) under 35 W blue LED light for 20 h. The benzylation were completely quenched and no benzylation products were detected. The benzyl trapping product (3-(*p*-tolyl)prop-1-ene-1,1-diyl)dibenzene (**5**) could be detected by GC-MS.

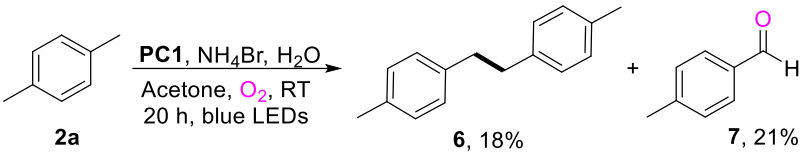




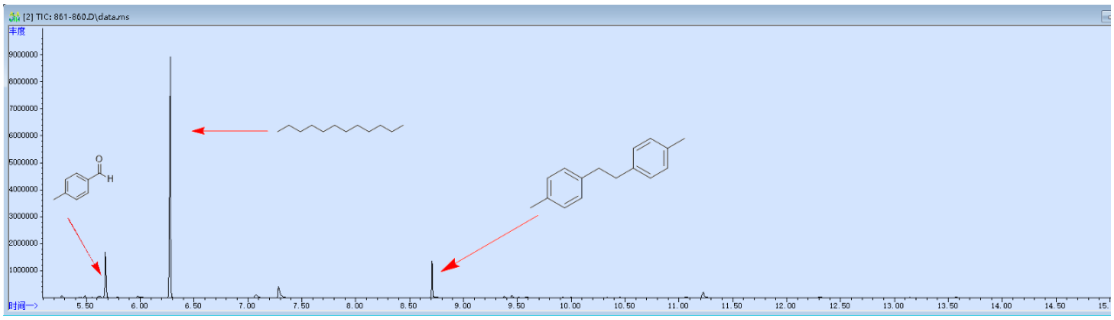
3.2 Side reaction



To a Schlenk tube were added 4-methylquinoline (**1a**, 0.2 mmol), *p*-xylene (**2a**, 2 mmol, 10.0 eqiuv), **PC1** (0.004 mmol, 2 mol%), NH_4Br (0.1 mmol, 0.5 equiv), H_2O (2 mmol, 10.0 equiv), acetone (3 mL). Then the mixture was stirred at room temperature in oxygen atmosphere (1 atm) under 35 W blue LED light for 20 h. 4-Methylbenzaldehyde (**6)** and 1,2-di-*p*-tolylethane (**7)** could be detected by GC-MS and the yield was determined by GC analysis of the crude reaction mixture using dodecane as the internal standard.



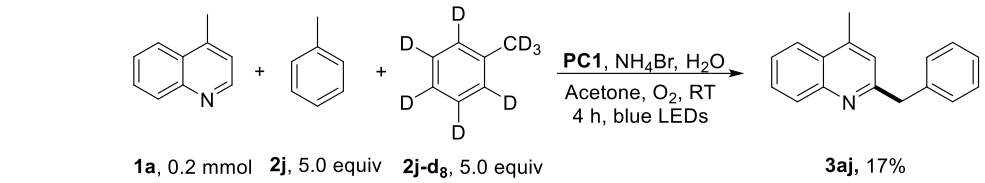
To a Schlenk tube were added *p*-xylene (**2a**, 0.2 mmol), **PC1** (0.004 mmol, 2 mol%), NH_4Br (0.1 mmol, 0.5 equiv), H_2O (2 mmol, 10.0 equiv), acetone (3 mL). Then the mixture was stirred at room temperature in oxygen atmosphere (1 atm) under 35 W blue LED light for 20 h. 4-Methylbenzaldehyde and 1,2-di-*p*-tolylethane could be detected by GC-MS and the yield was determined by GC analysis of the crude reaction mixture using dodecane as the internal standard.

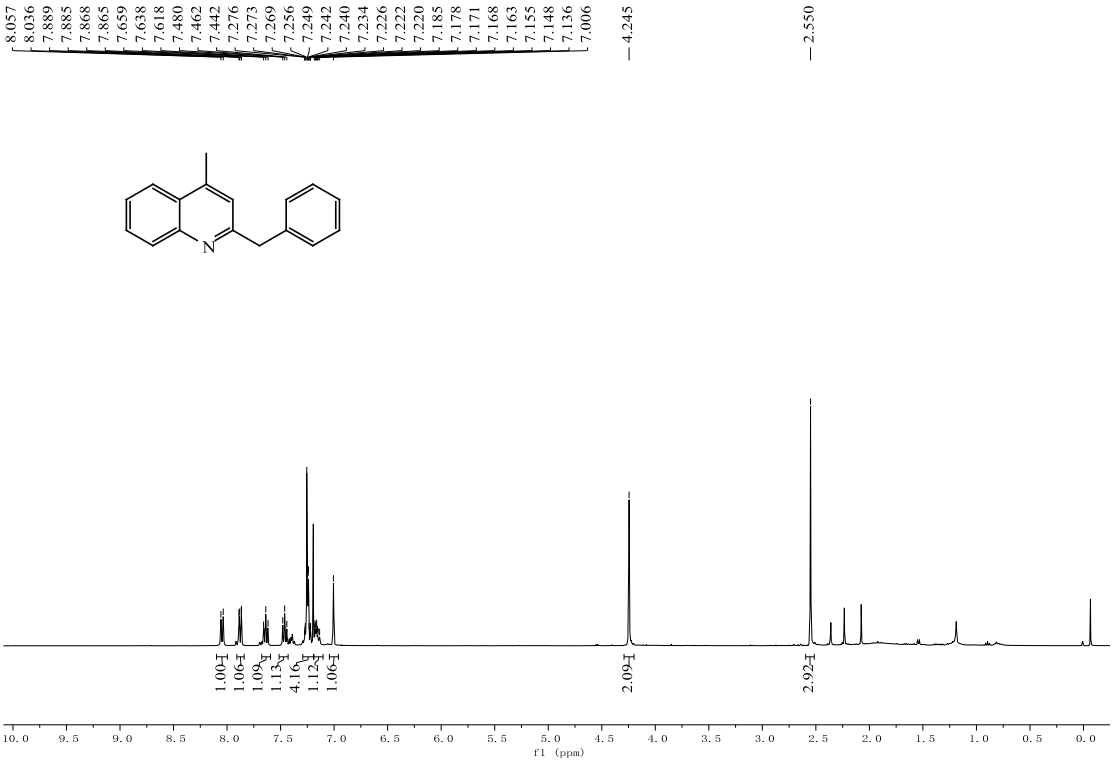


3.2 Kinetic isotope effect

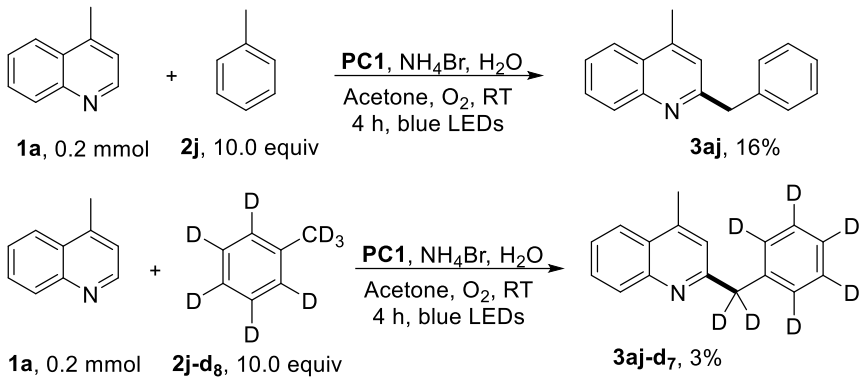
(a) A solution of toluene (**2j**, 5.0 equiv, 92.14 mg), and toluene-d_8 (**2j-d$_8$**, 5.0 equiv, 100.19 mg), 4-methylquinoline (**1a**, 0.2 mmol), **PC1** (0.004 mmol, 2 mol%), NH_4Br (0.1 mmol, 0.5 equiv), H_2O (2 mmol, 10.0 equiv), acetone (3 mL). Then the mixture was stirred at room temperature in oxygen atmosphere (1 atm) under 35 W blue LED light for 4 h. the reaction mixture was washed with brine. The

aqueous phase was re-extracted with EtOAc (3×10 mL). The combined organic extracts were dried over Na_2SO_4 and concentrated in vacuum. The residue was purified by silica gel flash column chromatography (hexane/ethyl acetate = 10 : 1) to afford product **3aj** in 17% yield.





(b) Two parallel reactions of toluene (**2j)** or toluene-d_8 (**2j-d_8**) were performed. A solution of toluene (**2j**, 10.0 equiv, 184.28 mg), or toluene- d_8 (**2j-d_8**, 10.0 equiv, 200.38 mg), 4-methylquinoline (**1a**, 0.2 mmol), **PC1** (0.004 mmol, 2 mol%), NH_4Br (0.1 mmol, 0.5 equiv), H_2O (2 mmol, 10.0 equiv), Acetone (3 mL). Then the mixture was stirred at room temperature in oxygen atmosphere (1 atm) under 35 W blue LED light for 4 h. the reaction mixture was washed with brine. The aqueous phase was re-extracted with EtOAc (3×10 mL). The combined organic extracts were dried over Na_2SO_4 and concentrated in vacuum. The solvent was removed on a rotary evaporator under reduced pressure. The residue was measured by GC, and the product **3aj** in 16% yield and **3aj-d_7** in 3% yield by using dodecane as the internal standard.

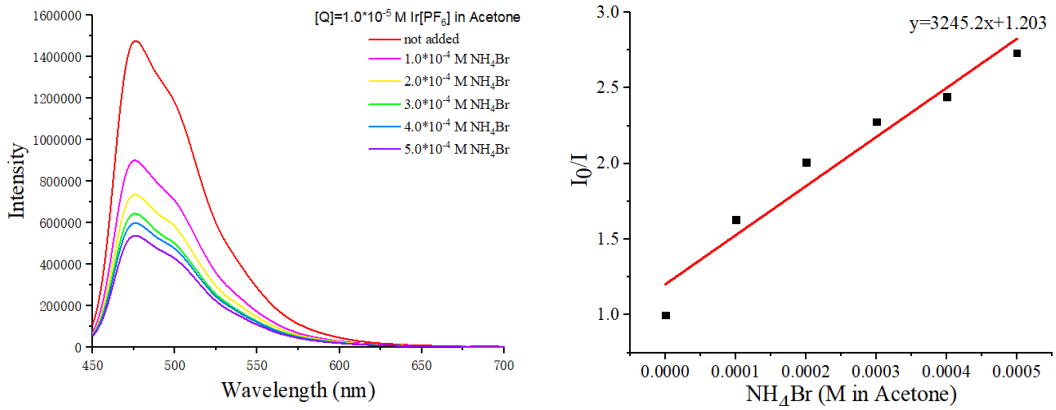


3.3. Stern–Volmer Quenching[1]

Formulation solution: 4-Methylquinoline (357.7 mg) was dissolved in acetone in a 25 mL volumetric flask to set the concentration to be 0.1 M. *p*-Xylene (616.5 μL) was dissolved in acetone in a 25 mL volumetric flask to set the concentration to be 0.5 M. NH_4Br (122.4 mg) was dissolved in acetone in a 25 mL volumetric flask to set the concentration to be 0.05 M. Photocatalyst $Ir[dF(CF_3)ppy]_2(dtbbpy)PF_6$ (2.8 mg) was dissolved in acetone (25.0 mL) to set the concentration to be 0.1 mM.

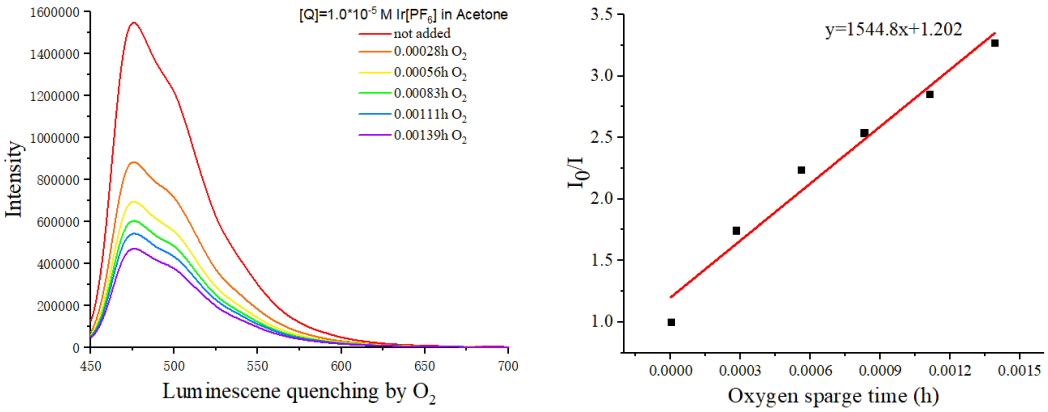
Experimental procedure: The resulting 0.1 M solution (50 μL) was added to cuvette to obtain different concentrations of catalyst solution. This solution was then diluted to a volume of 2.0 mL by adding further solvent (acetone) to prepare a 2.5 μM solution. The resulting mixture was sparged with nitrogen for 3 minutes and then irradiated at 375 nm. Fluorescence emission spectra were recorded (3 trials per sample). Into this solution, 10.0 μL of a 4-methylquinoline solution was successively added and uniformly stirred, and the resulting mixture was bubbled with nitrogen for 3 minutes and irradiated at 375 nm. Fluorescence emission spectra of 0 μL, 20.0 μL, 40.0 μL, 60.0 μL, 80.0 μL, 100.0 μL, fluorescence intensity. Follow this method and make changes to the amount to obtain the Stern–Volmer relationship in turn.

(a) $Ir[dF(CF_3)ppy]_2(dtbbpy)PF_6$ quenched by NH_4Br in acetone



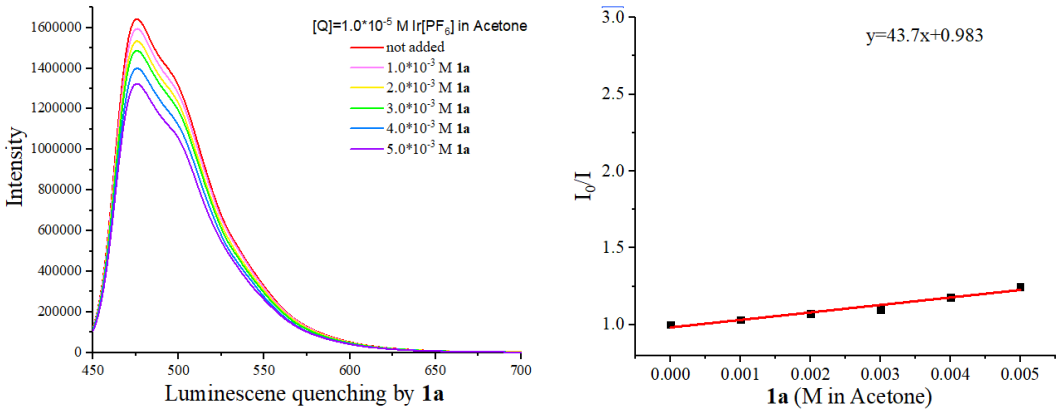
The emission intensity of the Ir[dF(CF$_3$)ppy]$_2$(dtbbpy)PF$_6$ catalyst solution strongly affected by the gradual increase of the amount of NH_4Br.

(b) Ir[dF(CF$_3$)ppy]$_2$(dtbbpy)PF$_6$ quenched by O_2 in acetone



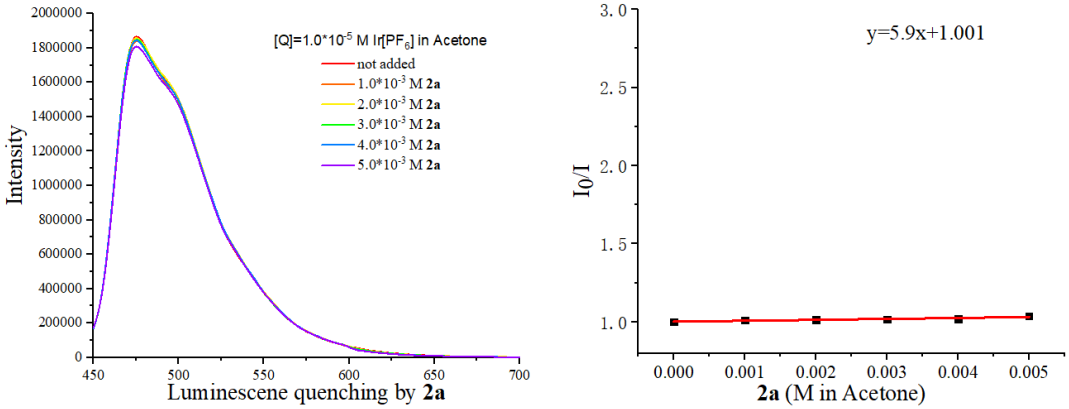
The emission intensity of the Ir[dF(CF$_3$)ppy]$_2$(dtbbpy)PF$_6$ catalyst solution strongly affected by the gradual increase of the amount of O_2.

(c) Ir[dF(CF$_3$)ppy]$_2$(dtbbpy)PF$_6$ quenched by **1a** in acetone.



The emission intensity of the Ir[dF(CF$_3$)ppy]$_2$(dtbbpy)PF$_6$ catalyst solution slightly affected by the gradual increase of the amount of **1a**.

(d) Ir[dF(CF$_3$)ppy]$_2$(dtbbpy)PF$_6$ quenched by **2a** in acetone. Linear quenching is not observed.



3.4 Quantum yield determination

Determination of the light intensity at 415 nm:

According to the procedure of Yoon[2] the photon flux of the blue LED (λ_{max} = 415 nm) was determined by standard ferrioxalate actinometry. A 0.15 M solution of ferrioxalate was prepared by dissolving 2.21 g of potassium ferrioxalate hydrate in 30 mL of 0.05 M H_2SO_4. A buffered solution of phenanthroline was prepared by dissolving 50 mg of phenanthroline and 11.25 g of sodium acetate in 50 mL of 0.5 M H_2SO_4. Both solutions were stored in the dark. To determine the photon flux of the spectrophotometer, 2.0 mL of the ferrioxalate solution was placed in a cuvette and irradiated for 90.0 seconds at λ = 415 nm with an emission slit width at 10.0 nm. After irradiation, 0.35 mL of the phenanthroline solution was added to the cuvette. The solution was then allowed to rest for 1 h to allow the ferrous ions to completely coordinate to the phenanthroline. The absorbance of the solution was measured at 510 nm. A non-irradiated sample was also prepared and the absorbance at 510 nm measured. Conversion was calculated using eq 1.

$$\text{mol of } Fe^{2+} = \frac{V \cdot \Delta A_{510\,nm}}{l \cdot \varepsilon} \qquad (1)$$

$$\text{mol of } Fe^{2+} = \frac{(0.00235\ L) \cdot (0.913)}{(1.00\ cm) \cdot (11{,}100\ \frac{L}{mol}\ cm^{-1})} = 1.933 \times 10^{-7}$$

Where V is the total volume (0.00235 L) of the solution after addition of phenanthroline, ΔA is the difference in absorbance at 510 nm between the irradiated and non-irradiated solutions, l is the path length (1.000 cm), and ε is the molar absorptivity of the ferrioxalate actinometer at 510 nm (11,100 L mol^{-1} cm^{-1}).[3] The photon flux can be calculated using eq 2.

$$\text{Photo flux} = \frac{mol\ of\ Fe^{2+}}{\emptyset \cdot t \cdot f} \qquad (2)$$

$$\text{Photo flux} = \frac{1.933 \times 10^{-7}}{(1.12) \cdot (90\ s) \cdot (1)} = 1.92 \times 10^{-9}\ einstein/s$$

Where Φ is the quantum yield for the ferrioxalate actinometer (1.12 at λ = 415 nm),[4] t is the time (90.0 s), and f is the fraction of light absorbed at 415 nm by the ferrioxalate actinometer. This value is calculated using eq 3 where $A_{415\ nm}$ is the absorbance of the ferrioxalate solution at 415 nm. An absorption spectrum gave an $A_{415\ nm}$ value of > 3, indicating that the fraction of absorbed light (f) is > 0.999.

$$f = 1 - 10^{-A_{415\ nm}} \qquad (3)$$

The photon flux was thus calculated to be 1.92 $\times 10^{-9}$ einsteins s^{-1}

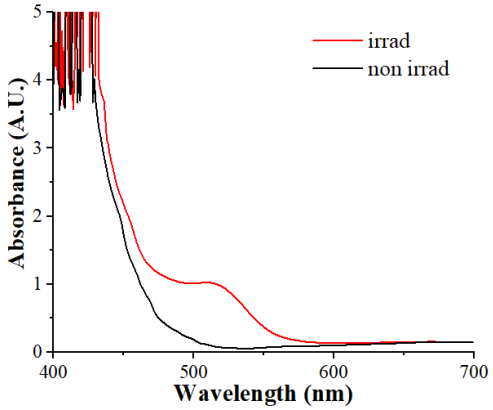
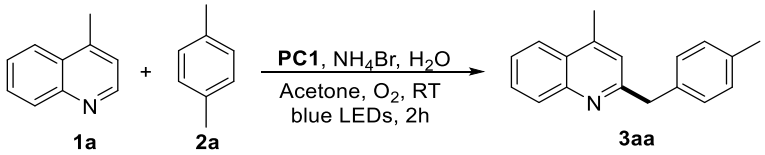


Figure S1. Absorbance of the ferrioxalate actinometer solution.

Determination of the reaction quantum yield.



A cuvette was charged with 4-methylquinoline (**1a**, 0.2 mmol), *p*-xylene (**2a**, 2 mmol, 10.0 eqiuv), **PC1** (0.004 mmol, 2 mol%), NH_4Br (0.1 mmol, 0.5 equiv), H_2O (2 mmol, 10.0 equiv), acetone (3 mL). The reaction mixture was stirred at room temperature for 2 h (7,200 s) under blue LED irradiation (λ = 415 nm). The solvent was removed in vacuo and the yield of formed product was determined by ^1H NMR based on dibromomethane as internal standard. The quantum yield was determined using eq 4.

$$\emptyset = \frac{mol\ of\ product}{flux \cdot t \cdot f} \qquad (4)$$

$$\emptyset = \frac{7.2 \times 10^{-5}}{(1.92 \times 10^{-9} einstein\ s^{-1}) \cdot (7200) \cdot (0.995)} = 0.52$$

The photon flux is 1.92 $\times 10^{-9}$ einsteins s^{-1}, t is the reaction time (7,200 s). f is the fraction of incident light absorbed by the catalyst, determined using eq 3. An absorption spectrum of the catalyst (0.001 M)

gave an absorbance value of 2.31 at 415 nm (figure S2), indicating that the fraction of light absorbed by the photocatalyst (f) is 0.995.

Absorbance of catalyst:

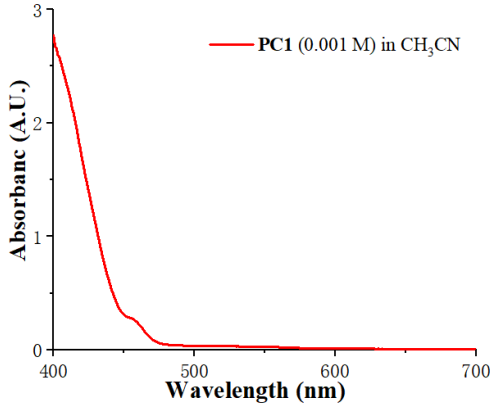
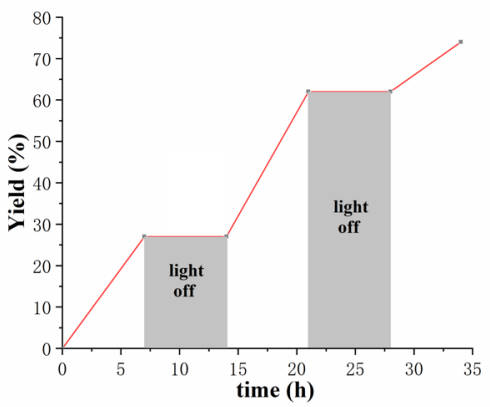


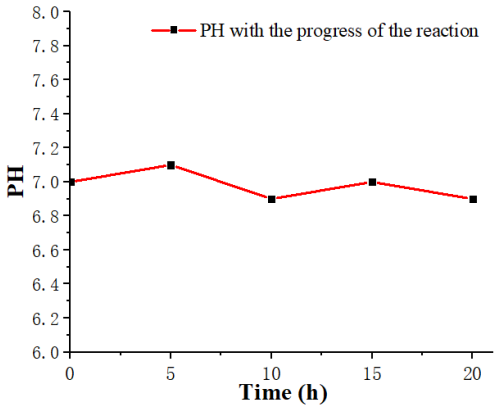
Figure S2. Absorption spectrum of **PC1** [0.001 M] in acetonitrile

3.5 Light on/off experiment



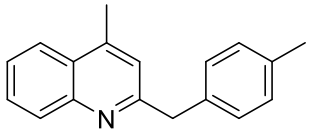
The above depicted reaction was performed according to the general protocol established. The reaction was irradiated with Blue LEDs for 7 hour and then stirred in the dark for 7 hour. This procedure was repeated for 35 hours, and the yield of the product was determined by ^{1}H NMR with dibromomethane as an internal standard at each point the light was turned off or on. The results are shown in the graph above. This result shows that constant light irradiation is needed to progress the reaction.

3.6 System PH with the progress of the reaction



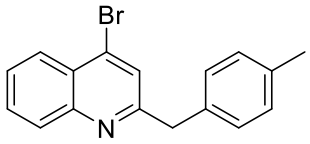
The above depicted reaction was performed according to the general protocol established. The PH of the reaction was measured at 5 hours intervals by PH meter. The results are shown in the graph above. This result indicates that the H+ which is generated from HBr can not acidifies the system.

4. Analytical data



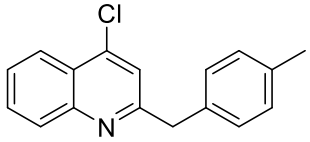
4-Methyl-2-(4-methylbenzyl)quinoline (3aa)[5]

Yield: 36.6 mg, 74%; yellow solid; mp 63-65 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.11 (d, *J* = 8.4 Hz, 1H), 7.92 (d, *J* = 8.0 Hz, 1H), 7.71-7.67 (m, 1H), 7.51 (t, *J* = 7.6 Hz, 1H), 7.21 (d, *J* = 7.6 Hz, 2H), 7.11 (d, *J* = 7.6 Hz, 2H), 7.06 (s, 1H), 4.27 (s, 2H), 2.60 (s, 3H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 161.1, 147.5, 144.6, 136.2, 136.0, 129.4, 129.3, 129.1, 129.0, 126.8, 125.7, 123.6, 122.1, 45.0, 21.0, 18.7.



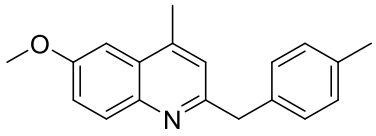
4-Bromo-2-(4-methylbenzyl)quinoline (3ba)

Yield: 42.3 mg, 68%; yellow solid; mp 68-71 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.13-8.07 (m, 2H), 7.74 (t, *J* = 8.0 Hz, 1H), 7.58 (t, *J* = 8.0 Hz, 1H), 7.51 (s, 1H), 7.20 (d, *J* = 7.6 Hz, 2H), 7.13 (d, *J* = 8.0 Hz, 2H), 4.26 (s, 2H), 2.33 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 161.3, 148.2, 136.3, 135.3, 1345, 130.4, 129.4, 129.3, 129.1, 127.1, 126.6, 126.3, 125.3, 44.6, 21.0. HRMS (ESI) m/z calcd for $C_{17}H_{14}BrNNa^{+}$ $(M+Na)^{+}$ 312.0382, found 312.0386.



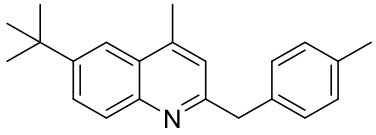
4-Chloro-2-(4-methylbenzyl)quinoline (3ca)

Yield: 40.6 mg, 76%; yellow solid; mp 71-75 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.16 (d, *J* = 8.4 Hz, 1H), 8.10 (d, *J* = 8.4 Hz, 1H), 7.75 (t, *J* = 8.0 Hz, 1H), 7.59 (t, *J* = 7.2 Hz, 1H), 7.30 (s, 1H), 7.20 (d, *J* = 7.6 Hz, 2H), 7.13 (d, *J* = 7.6 Hz, 2H), 4.27 (s, 2H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 161.4, 148.4, 142.9, 136.3, 135.3, 130.4, 129.4, 129.2, 129.1, 126.9, 125.0, 123.9, 121.4, 44.8, 21.0. HRMS (ESI) m/z calcd for $C_{17}H_{14}ClNNa^{+}$ $(M+Na)^{+}$ 290.0707, found 290.0709.



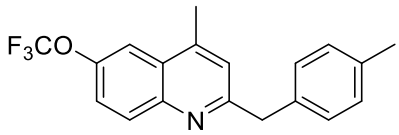
6-Methoxy-4-methyl-2-(4-methylbenzyl)quinoline (3da)

Yield: 24.9 mg, 45%; white solid; mp 121-123 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.00 (d, *J* = 9.2 Hz, 1H), 7.35 (dd, *J* = 9.2, 2.8 Hz, 1H), 7.20 (d, *J* = 7.6 Hz, 2H), 7.14 (d, *J* = 2.8 Hz, 2H), 7.11 (d, *J* = 7.6 Hz, 2H), 7.03 (s, 1H), 4.22 (s, 2H), 3.93 (s, 3H), 2.55 (s, 3H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 158.5, 157.2, 143.3, 143.2, 136.5, 135.9, 130.8, 129.2, 129.0, 127.6, 122.3, 121.1, 102.1, 55.5, 44.7, 21.0, 18.9. HRMS (ESI) m/z calcd for $C_{19}H_{20}NO^+$ $(M+H)^+$ 278.1539, found 278.1546.



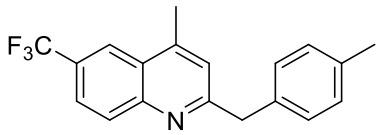
6-(*tert*-Butyl)-4-methyl-2-(4-methylbenzyl)quinoline (4ea)

Yield: 28.5 mg, 47%; yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.04 (d, *J* = 8.8 Hz, 1H), 7.83 (s, 1H), 7.79 (d, *J* = 8.8, Hz, 1H), 7.18 (d, *J* = 7.8 Hz, 2H), 7.10 (d, *J* = 7.8 Hz, 2H), 7.03 (s, 1H), 4.24 (s, 2H), 2.60 (s, 3H), 2.31 (s, 3H), 1.43 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.3, 148.5, 145.8, 144.6, 136.4, 135.9, 129.2, 129.0, 128.8, 128.0, 126.3, 122.2, 118.4, 44.8, 35.0, 31.3, 21.0, 18.8. HRMS (ESI) m/z calcd for $C_{22}H_{26}N^+$ $(M+H)^+$ 304.2060, found 304.2065.



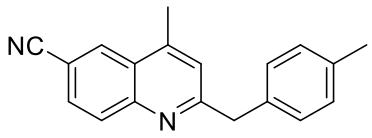
4-Methyl-2-(4-methylbenzyl)-6-(trifluoromethoxy)quinoline (3fa)

Yield: 53.6 mg, 81%; yellow solid; mp 96-99 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.12 (d, *J* = 9.2 Hz, 1H), 7.72 (s, 1H), 7.57-7.54 (m, 1H), 7.19 (d, *J* = 8.0 Hz, 2H), 7.13-7.11 (m, 3H), 4.25 (s, 2H), 2.58 (s, 3H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 161.7, 146.4, 145.9, 144.5, 136.1, 135.9, 131.6, 129.3, 129.0, 127.2, 123.1, 123.0, 120.6 (d, *J* = 255.9 Hz), 114.5, 44.9, 21.0, 18.6. HRMS (ESI) m/z calcd for $C_{19}H_{16}F_3NONa^+$ $(M+Na)^+$ 354.1076, found 354.1079.



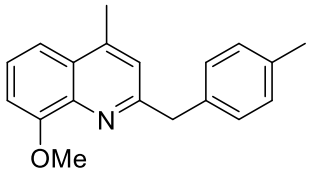
4-Methyl-2-(4-methylbenzyl)-6-(trifluoromethyl)quinoline (3ga)

Yield: 47.9 mg, 76%; yellow solid; mp 97-99 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.12 (d, *J* = 9.2 Hz, 1H), 7.72 (s, 1H), 7.57-7.54 (m, 1H), 7.19 (d, *J* = 8.0 Hz, 2H), 7.13-7.11 (m, 3H), 4.256 (s, 2H), 2.58 (s, 3H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 163.5, 148.6, 145.6, 136.2, 135.6, 130.5, 129.4, 129.0, 127.3 (d, *J* = 32.1 Hz), 126.0, 124.9 (d, *J* = 3.3 Hz), 124.2 (d, *J* = 270.5 Hz), 123.3, 121.6 (q, *J* = 13.0 Hz), 45.0, 21.0, 18.6. HRMS (ESI) m/z calcd for $C_{19}H_{17}F_3N^+$ $(M+H)^+$ 316.1308, found 316.1311.



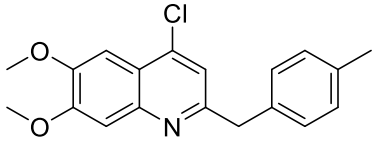
4-Methyl-2-(4-methylbenzyl)quinoline-6-carbonitrile (3ha)

Yield: 44.6 mg, 82%; white solid; mp 87-90 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.33 (s, 1H), 8.15 (d, *J* = 8.8 Hz, 1H), 7.83 (d, *J* = 8.8 Hz, 1H), 7.19 (t, *J* = 8.0 Hz, 3H), 7.13 (d, *J* = 7.6 Hz, 2H), 4.27 (s, 2H), 2.63 (s, 3H), 2.33 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 164.5, 148.7, 145.2, 136.4, 135.3, 130.9, 131.2, 130.0, 129.4, 129.0, 126.5, 123.7, 119.0, 109.2, 45.1, 21.0, 18.6. HRMS (ESI) m/z calcd for $C_{20}H_{19}N_2Na^+$ $(M+Na)^+$ 295.1206, found 295.1209.



8-Methoxy-4-methyl-2-(4-methylbenzyl)quinoline (3ia)

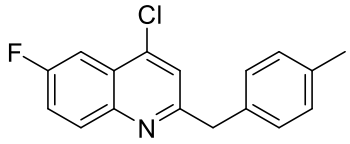
Yield: 22.7 mg, 41%; brown solid; mp 91-94 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.50 (dd, *J* = 8.4, 1.2 Hz, 1H), 7.44 (t, *J* = 8.0 Hz, 1H), 7.20 (d, *J* = 7.6 Hz, 2H), 7.12 (d, *J* = 7.6 Hz, 2H), 7.07 (d, *J* = 7.6 Hz, 1H), 7.03 (s, 1H), 4.36 (s, 2H), 4.10 (s, 3H), 2.57 (s, 3H), 2.33 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.2, 155.4 144.6, 139.1, 136.3, 135.9, 129.3, 129.2, 127.9, 125.7, 122.6, 115.5, 107.6, 56.1, 45.0, 21.0, 19.2. HRMS (ESI) m/z calcd for $C_{19}H_{19}NNaO^+$ $(M+Na)^+$ 300.1359, found 300.1361.



4-Chloro-6,7-dimethoxy-2-(4-methylbenzyl)quinoline (3ja)

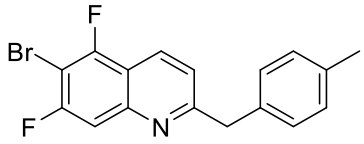
Yield: 30.7 mg, 47%; yellow solid; mp 151-153 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.42 (s, 1H), 7.34 (s, 1H), 7.18 (t, *J* = 8.0 Hz, 3H), 7.13 (d, *J* = 7.6 Hz, 2H), 4.21 (s, 2H), 4.04 (s, 6H), 2.32 (s,

3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 159.2, 153.0, 150.01, 145.5, 140.8, 136.1, 135.7, 129.3, 129.0, 120.2, 119.6, 108.0, 101.6, 56.2, 56.1, 44.5, 21.0. HRMS (ESI) m/z calcd for $C_{19}H_{18}ClNNaO_2^+$ $(M+Na)^+$ 350.0918, found 350.0921.



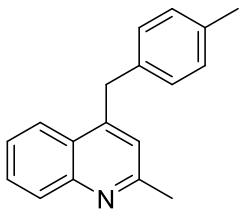
4-Chloro-6-fluoro-2-(4-methylbenzyl)quinoline (3ka)

Yield: 41.6 mg, 73%; yellow solid; mp 86-89 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.09 (dd, *J* = 9.2, 5.6 Hz, 1H), 7.78 (dd, *J* = 9.2, 2.8 Hz, 1H), 7.51 (ddd, *J* = 9.2, 8.0, 2.8 Hz, 1H), 7.33 (s, 1H), 7.19 (d, *J* = 8.0 Hz, 2H), 7.13 (d, *J* = 8.0 Hz, 2H), 4.25 (s, 2H), 2.33 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.8 (d, *J* = 246.9 Hz), 160.8 (d, *J* = 2.8 Hz), 145.5, 142.0, 136.4, 135.2, 131.9 (d, *J* = 8.9 Hz), 129.5, 129.0, 125.9 (d, *J* = 10.2 Hz), 122.0, 120.5 (d, *J* = 25.5 Hz), 107.8 (d, *J* = 24.1 Hz), 44.70, 21.04. HRMS (ESI) m/z calcd for $C_{17}H_{13}ClFNNa^+$ $(M+Na)^+$ 308.0613, found 308.0617.



6-Bromo-5,7-difluoro-2-(4-methylbenzyl)quinoline (3la)

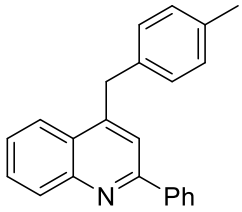
Yield: 52.7 mg, 76%; yellow solid; mp 125-127 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.23 (d, *J* = 8.8 Hz, 1H), 7.66 (d, *J* = 9.2 Hz, 1H), 7.28 (d, *J* = 8.8 Hz, 1H), 7.18 (d, *J* = 7.6 Hz, 2H), 7.13 (d, *J* = 8.0 Hz, 2H), 4.28 (s, 2H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 164.14, 158.8 (dd, *J* = 249.0, 5.4 Hz), 155.5 (dd, *J* = 254.4, 6.1 Hz), 146.8, 144.5, 136.42, 135.16, 129.46, 129.06, 121.7 (dd, *J* = 3.4, 3.4 Hz), 114.8 (dd, *J* = 16.7, 1.3 Hz), 113.8, 109.6 (dd, *J* = 22.1, 4.5 Hz), 45.02, 21.04. HRMS (ESI) m/z calcd for $C_{17}H_{12}BrF_2NNa^+$ $(M+Na)^+$ 370.0013, found 370.0016.



2-Methyl-4-(4-methylbenzyl)quinoline (3ma)

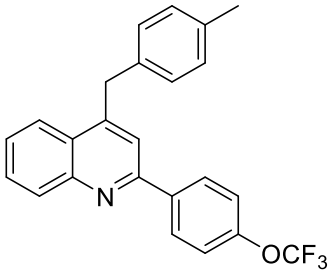
Yield: 27.2 mg, 55%; yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.09 (d, *J* = 8.4 Hz, 1H), 7.93 (d, *J* = 8.4 Hz, 1H), 7.69 (t, *J* = 8.0 Hz, 1H), 7.51 (t, *J* = 8.0 Hz, 1H), 7.20 (d, *J* = 8.0 Hz, 1H), 7.11 (d, *J* = 8.0

Hz, 2H), 7.06 (s, 1H), 4.25 (s, 2H), 2.60 (s, 3H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 161.1, 147.5, 144.6, 136.2, 135.9, 129.4, 129.3, 129.1, 129.0, 126.8, 125.7, 123.6, 122.1, 45.0, 21.0, 18.7. HRMS (ESI) m/z calcd for $C_{18}H_{18}N^+$ $(M+H)^+$ 248.1434, found 248.1437.



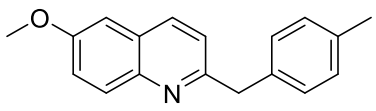
4-(4-Methylbenzyl)-2-phenylquinoline (3na)

Yield: 35.8 mg, 58%; yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.22 (d, *J* = 8.4 Hz, 1H), 8.12 (d, *J* = 8.0 Hz, 2H), 8.04 (d, *J* = 8.4 Hz, 1H), 7.73-7.71 (m, 1H), 7.66 (s, 1H), 7.54-7.44 (m, 4H), 7.16-7.10 (m, 4H), 4.46 (s, 2H), 2.34 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 157.1, 148.4, 147.4, 139.7, 136.1, 135.5, 130.3, 129.4, 129.3, 129.2, 128.7, 128.7, 127.5, 126.6, 126.2, 123.7, 119.8, 38.1, 21.0. HRMS (ESI) m/z calcd for $C_{23}H_{19}NNa^+$ $(M+Na)^+$ 332.1410, found 332.1413.



4-(4-Methylbenzyl)-2-(4-(trifluoromethoxy)phenyl)quinoline (3oa)

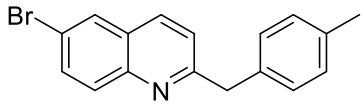
Yield: 51.1 mg, 65%; yellow solid; mp 85-88 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.18 (d, *J* = 8.4 Hz, 1H), 8.14-8.12 (m, 2H), 8.03 (d, *J* = 8.4 Hz, 1H), 7.71 (ddd, *J* = 8.4, 6.8, 1.6 Hz, 1H), 7.59 (s, 1H), 7.51 (ddd, *J* = 8.4, 6.8, 1.2 Hz, 1H), 7.34 (d, *J* = 8.0 Hz, 2H), 7.12 (s, 4H), 4.46 (s, 2H), 2.33 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 155.6, 150.0, 148.3, 147.8, 138.3, 136.3, 135.4, 130.3, 129.6, 129.4, 129.0, 128.7, 126.6, 126.5, 123.8, 121.1, 120.4 (d, *J* = 255.8 Hz), 119.3, 38.1, 21.0. HRMS (ESI) m/z calcd for $C_{24}H_{18}F_3NNaO^+$ $(M+Na)^+$ 416.1233, found 416.1237.



6-Methoxy-2-(4-methylbenzyl)quinoline (3pa)

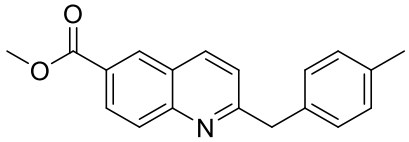
Yield: 21.0 mg, 40%; yellow solid; mp 59-63 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.99 (d, *J* = 9.2 Hz, 1H), 7.92 (d, *J* = 8.4 Hz, 1H), 7.35 (dd, *J* = 9.2, 2.8 Hz, 1H), 7.18 (t, *J* = 8.0 Hz, 3H), 7.11 (d,

J = 7.6 Hz, 2H), 7.03 (d, *J* = 2.8 Hz, 1H), 4.27 (s, 2H), 3.91 (s, 3H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 159.0, 157.3, 143.6, 136.3, 136.0, 135.4, 130.2, 129.3, 129.0, 127.6, 122.0, 121.7, 105.1, 55.5, 44.8, 21.0. HRMS (ESI) m/z calcd for $C_{18}H_{18}NO^+$ $(M+H)^+$ 264.1383, found 264.1387.



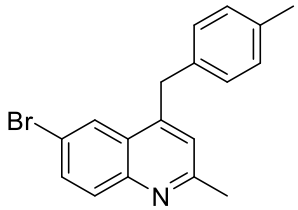
6-Bromo-2-(4-methylbenzyl)quinoline (3qa)

Yield: 41.0 mg, 66%; yellow solid; mp 84-87 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.97-7.91 (m, 3H), 7.76 (dd, *J* = 8.8, 2.0 Hz, 1H), 7.24 (d, *J* = 8.4 Hz, 1H), 7.19 (d, *J* = 8.0 Hz, 2H), 7.12 (d, *J* = 8.0 Hz, 2H), 4.29 (s, 2H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 162.0, 146.2, 136.2, 135.5, 132.9, 130.6, 129.5, 129.4, 129.1, 128.1, 127.8, 122.3, 119.7, 45.0, 21.0. HRMS (ESI) m/z calcd for $C_{17}H_{15}BrN^+$ $(M+H)^+$ 312.0382, found 3121.0383.



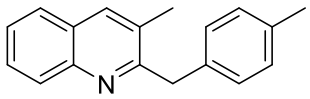
Methyl 2-(4-methylbenzyl)quinoline-6-carboxylate (3ra)

Yield: 41.9 mg, 72%; yellow solid; mp 119-121 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.53 (s, 1H), 8.29 (d, *J* = 8.8 Hz, 1H), 8.13 (d, *J* = 8.8 Hz, 2H), 7.30 (d, *J* = 8.4 Hz, 1H), 7.21 (d, *J* = 7.6 Hz, 2H), 7.13 (d, *J* = 8.0 Hz, 2H), 4.33 (s, 2H), 3.99 (s, 3H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 166.7, 163.9, 149.5, 137.8, 136.3, 135.5, 130.7, 129.4, 129.4, 129.1, 129.1, 127.5, 125.9, 122.3, 45.1, 21.0. HRMS (ESI) m/z calcd for $C_{19}H_{18}NO_2^+$ $(M+H)^+$ 292.1332, found 292.1336.



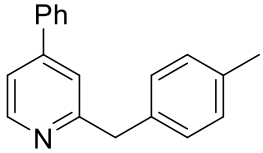
6-Bromo-2-methyl-4-(4-methylbenzyl)quinoline (3sa)

Yield: 40.9 mg, 63%; white solid; mp 135-138 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.14 (s, 1H), 7.89 (d, *J* = 8.8 Hz, 1H), 7.73-7.70 (m, 1H), 7.14 (d, *J* = 7.6 Hz, 2H), 7.08 (d, *J* = 8.0 Hz, 2H), 7.01 (s, 1H), 4.30 (s, 2H), 2.66 (s, 3H), 2.34 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 159.3, 146.5, 146.1, 136.4, 134.9, 132.5, 130.9, 129.4, 128.8, 1272, 126.0, 132.2, 119.6, 37.5, 25.3, 21.0. HRMS (ESI) m/z calcd for $C_{18}H_{17}BrN^+$ $(M+H)^+$ 326.0539, found 326.0542.



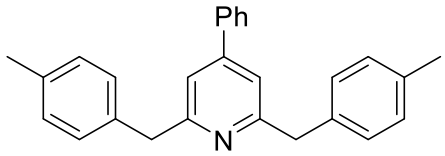
3-Methyl-2-(4-methylbenzyl)quinoline (3ta)

Yield: 25.7 mg, 52%; yellow solid; mp 58-61 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.10 (d, *J* = 8.4 Hz, 1H), 7.81 (s, 1H), 7.70 (d, *J* = 8.0 Hz, 1H), 7.64 (t, *J* = 8.0 Hz, 1H), 7.46 (d, *J* = 7.2 Hz, 1H), 7.10 (d, *J* = 8.0 Hz, 2H), 7.04 (d, *J* = 8.0 Hz, 2H), 4.38 (s, 2H), 2.33 (s, 3H), 2.27 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.4, 146.4, 136.4, 135.6, 135.3, 130.3, 129.0, 128.6, 128.5, 128.4, 127.5, 126.7, 125.9, 42.8, 20.9, 19.3. HRMS (ESI) m/z calcd for $C_{18}H_{18}N^+$ $(M+H)^+$ 248.1434, found 248.1435.



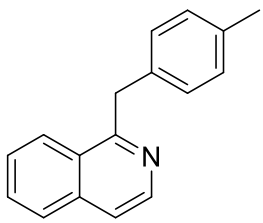
2-(4-Methylbenzyl)-4-phenylpyridine (3ua)

Yield: 19.3 mg, 37%; yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.58 (d, *J* = 6.4 Hz, 1H), 7.58-7.55 (m, 2H), 7.47-7.40 (m, 3H), 7.33-7.31 (m, 2H), 7.20 (d, *J* = 8.0 Hz, 2H), 7.12 (d, *J* = 8.0 Hz, 2H), 4.18 (s, 2H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 161.7, 149.6, 149.0, 138.3, 136.3, 135.9, 129.3, 129.0, 128.9, 128.9, 127.0, 121.0, 119.3, 44.3, 21.0. HRMS (ESI) m/z calcd for $C_{19}H_{18}N^+$ $(M+H)^+$ 260.1434, found 260.1438.



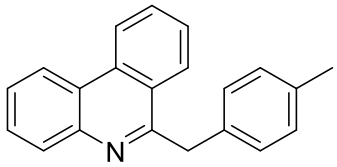
2,6-Bis(4-methylbenzyl)-4-phenylpyridine (3ua')

Yield: 10.9 mg, 15%; yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.47-7.44 (m, 2H), 7.41-7.35 (m, 3H), 7.21 (d, *J* = 7.6 Hz, 4H), 7.13-7.08 (m, 6H), 4.19 (s, 4H), 2.32 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 161.1, 138.6, 136.4, 135.8, 129.2, 129.0, 128.8, 128.7, 128.1, 127.1, 118.7, 44.1, 21.1. HRMS (ESI) m/z calcd for $C_{27}H_{26}N^+$ $(M+H)^+$ 364.2060, found 364.2063.



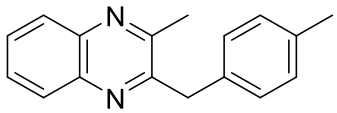
1-(4-Methylbenzyl)isoquinoline (3va)

Yield: 28.5 mg, 61%; yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.49 (d, *J* = 5.6 Hz, 1H), 8.15 (d, *J* = 8.4 Hz, 1H), 7.80 (d, *J* = 8.0 Hz, 1H), 7.62 (t, *J* = 7.6 Hz, 1H), 7.56-7.50 (m, 2H), 7.17 (d, *J* = 8.0 Hz, 2H), 7.06 (d, *J* = 8.0 Hz, 2H), 4.63 (s, 2H), 2.27 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.3, 141.9, 136.5, 136.3, 135.7, 129.8, 129.2, 128.4, 127.3, 127.2, 127.1, 125.8, 119.8, 41.6, 21.0. HRMS (ESI) m/z calcd for $C_{17}H_{16}N^+$ $(M+H)^+$ 234.1277, found 234.1284.



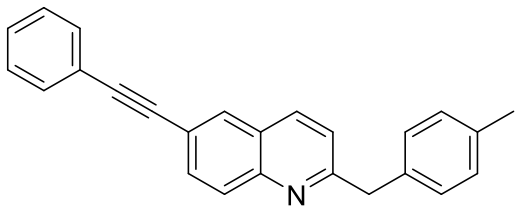
6-(4-Methylbenzyl)phenanthridine (3wa)

Yield: 36.8 mg, 65%; white solid; mp 100-102 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.58 (d, *J* = 8.0 Hz, 1H), 8.52 (d, *J* = 8.4 Hz, 1H), 8.19 (t, *J* = 8.0 Hz, 2H), 7.73 (t, *J* = 7.6 Hz, 2H), 7.63 (t, *J* = 7.6 Hz, 2H), 7.55 (t, *J* = 7.6 Hz, 2H), 7.20 (d, *J* = 8.0 Hz, 2H), 7.04 (d, *J* = 7.6 Hz, 2H), 4.71 (s, 2H), 2.25 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.3, 143.6, 135.9, 135.7, 133.2, 130.3, 129.7, 129.2, 128.6, 128.3, 127.3, 127.0, 126.6, 125.3, 123.9, 122.3, 121.9, 42.6, 21.0. HRMS (ESI) m/z calcd for $C_{21}H_{17}NNa^+$ $(M+Na)^+$ 306.1253, found 306.1259.



2-Methyl-3-(4-methylbenzyl)quinoxaline (3xa)

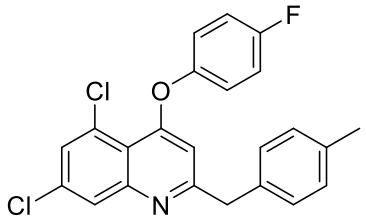
Yield: 28.8 mg, 58%; yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.09-8.07 (m, 1H), 8.01-7.98 (m, 1H), 7.71-7.69 (m, 2H), 7.12-7.07 (m, 4H), 4.36 (s, 2H), 2.64 (s, 3H), 2.30 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 155.1, 153.7, 141.0, 141.0, 136.3, 134.0, 129.3, 129.2, 129.0, 128.7, 128.6, 128.2, 42.3, 23.0, 21.0. HRMS (ESI) m/z calcd for $C_{17}H_{17}N_2^+$ $(M+H)^+$ 249.1386, found 249.1394.



2-(4-Methylbenzyl)-6-(phenylethynyl)quinoline (3ya)

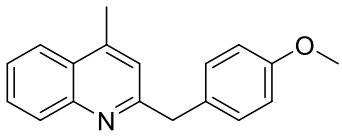
Yield: 28.8 mg, 58%; white solid; mp 72-74 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.06 (d, *J* = 8.8 Hz, 1H), 8.00 (t, *J* = 8.4 Hz, 1H), 7.81 (d, *J* = 8.4 Hz, 1H), 7.59-7.56 (m, 2H), 7.39-7.35 (m, 3H),

7.23 (dd, *J* = 14.4, 8.8 Hz, 3H), 7.13 (d, *J* = 7.6 Hz, 2H), 4.31 (s, 2H), 2.32 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 162.2, 136.3, 136.2, 135.8, 132.3, 131.6, 131.6, 130.8, 129.4, 129.1, 128.9, 128.5, 128.4, 126.5, 123.0, 122.2, 120.9, 90.4, 89.1, 45.0, 21.1. HRMS (ESI) m/z calcd for $C_{25}H_{20}N^+$ $(M+H)^+$ 334.1590, found 334.1596.



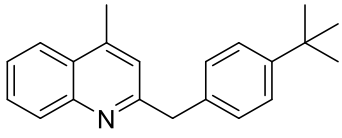
5,7-Dichloro-4-(4-fluorophenoxy)-2-(4-methylbenzyl)quinoline (3za)

Yield: 21.4 mg, 26%; yellow solid; mp 100-103 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 7.99 (d, *J* = 2.1 Hz, 1H), 7.52 (d, *J* = 2.1 Hz, 1H), 7.12-7.06 (m, 6H), 7.04-7.00 (m, 2H), 6.45 (s, 1H), 4.08 (s, 2H), 2.29 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 164.1, 162.5, 159.8 (d, *J* = 242.7 Hz), 151.2, 149.9, 136.2, 135.1, 135.0, 130.0, 129.3, 128.9, 128.7, 127.4, 121.9 (d, *J* = 8.4 Hz), 116.9 (d, *J* = 23.4 Hz), 116.8, 107.3, 44.7, 21.0. HRMS (ESI) m/z calcd for $C_{23}H_{16}Cl_2FNNaO^+$ $(M+Na)^+$ 434.0485, found 434.0489.



2-(4-Methoxybenzyl)-4-methylquinoline (3ab)

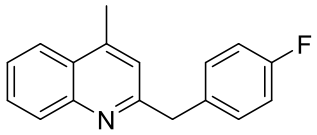
Yield: 41.0 mg, 74%; yellow solid; mp 74-76 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.09 (d, *J* = 8.4 Hz, 1H), 7.93 (d, *J* = 8.0 Hz, 1H), 7.69 (t, *J* = 8.3 Hz, 1H), 7.51 (t, *J* = 8.2 Hz, 1H), 7.23 (d, *J* = 8.4 Hz, 2H), 7.05 (s, 1H), 6.85 (d, *J* = 8.8 Hz, 2H), 4.23 (s, 2H), 3.78 (s, 3H), 2.61 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 161.2, 158.2, 147.8, 144.6, 131.4, 130.1, 129.4, 129.2, 126.8, 125.7, 123.6, 122.1, 114.0, 55.2, 44.5, 18.7. HRMS (ESI) m/z calcd for $C_{18}H_{18}NO^+$ $(M+H)^+$ 264.1383, found 264.1390.



2-(4-(*tert*-Butyl)benzyl)-4-methylquinoline (3ac)

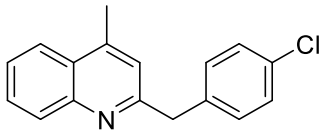
Yield: 46.2 mg, 80%; yellow solid; ^{1}H NMR (400 MHz, $CDCl_3$) δ:8.10 (d, *J* = 8.4 Hz, 1H), 7.94 (d, *J* = 8.4 Hz, 1H), 7.69 (t, *J* = 8.3 Hz, 1H), 7.52 (t, *J* = 8.0 Hz, 1H), 7.33 (d, *J* = 8.4 Hz, 2H), 7.26-.25 (m, 2H),

7.10 (s, 1H), 4.27 (s, 1H), 2.62 (s, 3H), 1.30 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 161.0, 149.2, 147.4, 144.7, 136.2, 129.3, 129.2, 128.8, 126.9, 125.7, 125.5, 123.6, 122.2, 44.9, 34.4, 31.3, 18.8. HRMS (ESI) m/z calcd for $C_{21}H_{23}N^+$ $(M+H)^+$ 290.1903, found 290.1913.



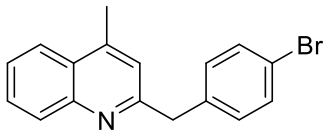
2-(4-Fluorobenzyl)-4-methylquinoline (3ad)[6]

Yield: 29.1 mg, 58%; yellow solid; mp 110.4-112.0 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.08 (d, *J* = 8.4 Hz, 1H), 7.94 (d, *J* = 8.0 1H), 7.69 (t, *J* = 7.6 Hz, 1H), 7.52 (t, *J* = 7.6 Hz, 1H), 7.28-7.25 (m, 2H), 7.04 (s, 1H), 7.00-6.96 (m, 2H), 4.25 (s, 2H), 2.61 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 161.6 (d, *J* = 242.9 Hz), 160.5, 147.6, 144.8, 135.0 (d, *J* = 3.2 Hz), 130.5 (d, *J* = 7.8 Hz), 129.5, 129.2, 126.9, 125.8, 123.6, 122.0, 115.3 (d, *J* = 21.1 Hz), 44.6, 18.7.



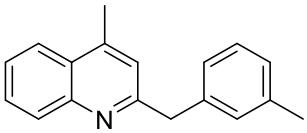
2-(4-Chlorobenzyl)-4-methylquinoline (3ae)[5]

Yield: 27.8 mg, 52%; orange solid; mp 51-52 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.08 (dd, *J* = 8.4, 1.2 Hz, 1H), 7.94 (dd, *J* = 8.4, 1.2 Hz, 1H), 7.70 (t, *J* = 7.7 Hz, 1H), 7.52 (t, *J* = 7.6 Hz, 1H), 7.28-7.22 (m, 4H), 7.03 (s, 1H), 4.25 (s, 2H), 2.61 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.2, 147.7, 144.9, 137.8, 132.3, 130.5, 129.4, 129.3, 128.7, 126.9, 125.9, 123.6, 122.0, 44.7, 18.7.



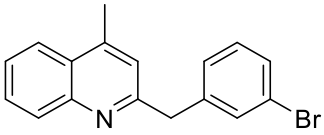
2-(4-Bromobenzyl)-4-methylquinoline (3af)[5]

Yield: 29.2 mg, 47%; brown solid; mp 70-71 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.07 (d, *J* = 8.4 Hz, 1H), 7.93 (d, *J* = 8.0 Hz, 1H), 7.69 (t, *J* = 7.6 Hz, 1H), 7.52 (t, *J* = 7.2 Hz, 1H), 7.41 (d, *J* = 8.4 Hz, 2H), 7.18 (d, *J* = 8.4 Hz, 2H), 7.02 (s, 1H), 4.23 (s, 2H), 2.61 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.1, 147.5, 144.9, 138.3, 131.6, 130.8, 129.4, 129.3, 126.8, 125.9, 123.6, 122.0, 120.3, 44.7, 18.7.



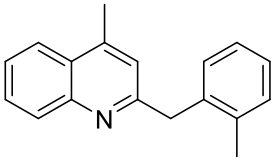
4-Methyl-2-(3-methylbenzyl)quinoline (3ag)[6]

Yield: 28.7 mg, 58%; yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.09 (d, *J* = 8.4 Hz, 1H), 7.92 (d, *J* = 8.0 Hz, 1H), 7.69 (t, *J* = 8.3 Hz, 1H), 7.51 (t, *J* = 8.1 Hz, 1H), 7.19 (t, *J* = 7.4 Hz, 1H), 7.11 (d, *J* = 8.0 Hz, 2H), 7.06-7.03 (m, 2H), 4.25 (s, 2H), 2.60 (s, 3H), 2.31 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 161.0, 147.6, 144.5, 139.2, 138.2, 130.0, 129.5, 129.1, 128.4, 127.2, 126.9, 126.2, 125.7, 123.6, 122.2, 45.4, 21.4, 18.7.



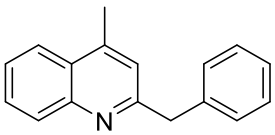
2-(3-Bromobenzyl)-4-methylquinoline (3ah)[6]

Yield: 25.5 mg, 41%; white solid; mp 55-56 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.08 (d, *J* = 8.4 Hz, 1H), 7.94 (d, *J* = 7.6 Hz, 1H), 7.70 (t, *J* = 7.6 Hz, 1H), 7.52 (t, *J* = 8.2 Hz, 1H), 7.46 (s, 1H), 7.35 (d, *J* = 8.0 Hz, 1H), 7.24 (d, *J* = 7.6 Hz, 1H), 7.16 (t, *J* = 7.8 Hz, 1H), 7.04 (s, 1H), 4.25 (s, 2H), 2.62 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 159.8, 147.6, 144.9, 141.6, 132.1, 130.1, 129.6, 129.5, 129.3, 127.8, 126.9, 125.9, 123.6, 122.6, 122.0, 44.9, 18.7.



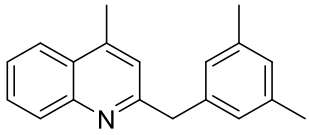
4-Methyl-2-(2-methylbenzyl)quinoline (3ai)[6]

Yield: 25.7 mg, 52%; white solid; mp 53-55 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.08 (d, *J* = 8.4 Hz, 1H), 7.93 (d, *J* = 8.0 Hz, 1H), 7.69 (t, *J* = 8.4 Hz, 1H), 7.51 (t, *J* = 8.0 Hz, 1H), 7.20-7.16 (m, 4H), 6.94 (s, 1H), 4.31 (s, 2H), 2.58 (s, 3H), 2.30 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.6, 147.5, 144.6, 137.4, 137.1, 130.4, 130.1, 129.4, 129.1, 126.8, 126.8, 126.1, 125.7, 123.6, 121.6, 43.2, 19.9, 18.7.



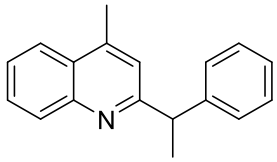
2-Benzyl-4-methylquinoline (3aj)[6]

Yield: 27.0 mg, 58%; yellow solid; mp 63-65 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.09 (d, *J* = 8.4, 1H), 7.92 (d, *J* = 8.4, Hz, 1H), 7.69 (t, *J* = 8.4 Hz, 1H), 7.51 (t, *J* = 8.2 Hz, 1H), 7.33-7.28 (m, 4H), 7.25-7.20 (m, 1H), 7.06 (s, 1H), 4.29 (s, 2H), 2.60 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.8, 147.6, 144.6, 139.3, 129.4, 129.2, 129.1, 128.6, 126.8, 126.4, 125.7, 123.6, 122.1, 45.4, 18.7.



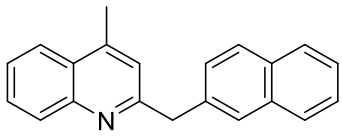
2-(3,5-Dimethylbenzyl)-4-methylquinoline (3ak)

Yield: 36.0 mg, 69%; yellow solid; mp 68-70 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.10 (d, *J* = 8.4 Hz, 1H), 7.93 (d, *J* = 8.4 Hz, 1H), 7.69 (t, *J* = 8.4 Hz, 1H), 7.51 (t, *J* = 8.2 Hz, 1H), 7.07 (s, 1H), 6.93 (s, 2H), 6.86 (s, 1H), 4.22 (s, 2H), 2.61 (s, 3H), 2.27 (s, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 161.1, 147.5, 144.5, 139.1, 138.1, 129.5, 129.1, 128.1, 127.0, 126.9, 125.7, 123.6, 122.2, 45.4, 21.2, 18.7. HRMS (ESI) m/z calcd for $C_{19}H_{20}N^+$ $(M+H)^+$ 262.1590, found 262.1598.



4-Methyl-2-(1-phenylethyl)quinoline (3al)

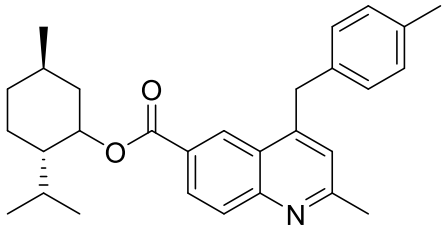
Yield: 22.2 mg, 45%; yellow solid; mp 65-68 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.11 (d, *J* = 8.4 Hz, 1H), 7.91 (d, *J* = 7.6 Hz, 1H), 7.68 (t, *J* = 8.4 Hz, 1H), 7.50 (t, *J* = 8.2 Hz, 1H), 7.36 (d, *J* = 7.6 Hz, 2H), 7.30 (t, *J* = 7.6 Hz, 2H), 7.20 (t, *J* = 7.2 Hz, 1H), 7.02 (s, 1H), 4.45 (q, *J* = 7.2 Hz, 1H), 2.59 (s, 3H), 1.78 (d, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 164.8, 147.4, 144.7, 144.3, 129.7, 129.0, 128.4, 127.8, 127.0, 126.3, 125.7, 123.5, 121.2, 48.0, 20.4, 18.8. HRMS (ESI) m/z calcd for $C_{18}H_{17}N^+$ $(M+H)^+$ 248.1434, found 248.1443.



4-Methyl-2-(naphthalen-2-ylmethyl)quinoline (3am)[5]

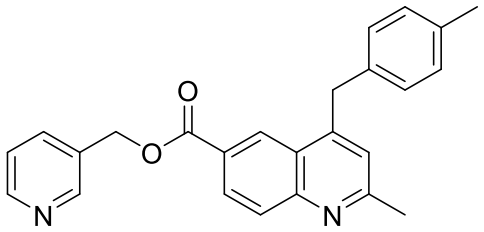
Yield: 18.7 mg, 33%; yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.12 (d, *J* = 8.0 Hz, 1H), 7.93 (d, *J* = 8.4 Hz, 1H), 7.81-7.76 (m, 4H), 7.70 (t, *J* = 7.6 Hz, 1H), 7.52 (t, *J* = 7.6 Hz, 1H), 7.47-7.41 (m, 3H), 7.08 (s, 1H), 4.45 (s, 2H), 2.58 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 160.7, 147.6, 144.7, 136.9, 133.6,

132.2, 129.5, 129.2, 128.2, 127.7, 127.6, 127.6, 127.5, 126.9, 126.0, 125.8, 125.5, 123.6, 122.3, 45.6, 18.6.



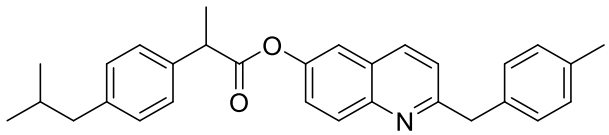
(2*S*,5*R*)-2-Isopropyl-5-methylcyclohexyl 2-methyl-4-(4-methylbenzyl)quinoline-6-carboxylate (4a)

Yield: 38.6 mg, 45%; yellow solid; mp 110.4-112.0 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.81 (s, 1H), 8.25 (dd, *J* = 8.8, 1.6 Hz, 1H), 8.05 (d, *J* = 8.8 Hz, 1H), 7.13 (s, 4H), 7.08 (s, 1H), 4.97 (td, *J* = 10.9, 4.4 Hz, 1H), 4.46-4.36 (m, 2H), 2.70 (s, 3H), 2.33 (s, 3H), 2.18-2.15 (m, 1H), 2.00-1.96 (m, 1H), 1.78-1.72 (m, 2H), 1.64-1.56 (m, 2H), 1.17-1.08 (m, 2H), 0.94 (d, *J* = 7.2 Hz, 7H), 0.80 (d, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 165.8, 161.1, 149.9, 148.4, 136.2, 135.1, 129.4, 129.3, 128.8, 128.7, 127.7, 126.8, 125.1, 123.1, 75.1, 47.2, 40.9, 37.7, 34.3, 31.4, 26.5, 25.5, 23.6, 22.0, 21.0, 20.8, 16.5. HRMS (ESI) m/z calcd for $C_{29}H_{35}NNaO_2^+$ $(M+Na)^+$ 452.2560, found 452.2567.



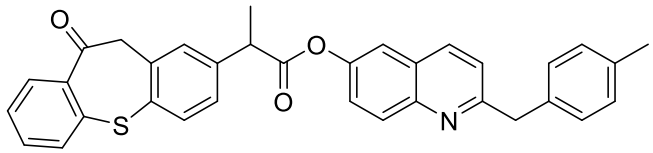
Pyridin-3-ylmethyl 2-methyl-4-(4-methylbenzyl)quinoline-6-carboxylate (4b)

Yield: 39.0 mg, 51%; yellow solid; mp 110.4-112.0 ºC (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.83 (s, 1H), 8.75 (s, 1H), 8.64 (d, *J* = 4.9 Hz, 1H), 8.26 (d, *J* = 8.8 Hz, 1H), 8.08 (d, *J* = 8.8 Hz, 1H), 7.81 (d, *J* = 8.0 Hz, 1H), 7.36 (dd, *J* = 7.6, 4.8 Hz, 1H), 7.13-7.08 (m, 5H), 5.42 (s, 2H), 4.40 (s, 2H), 2.72 (s, 3H), 2.33 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 166.0, 161.5, 149.7, 149.7, 136.4, 136.1, 134.9, 131.5, 129.5, 129.4, 129.3, 128.9, 128.8, 127.2, 126.6, 126.6, 125.2, 123.6, 123.3, 64.4, 37.7, 25.4, 21.1. HRMS (ESI) m/z calcd for $C_{25}H_{22}N_2NaO_2^+$ $(M+Na)^+$ 391.1417, found 391.1421.



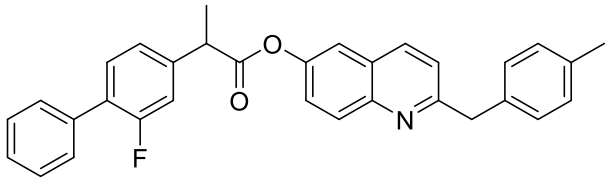
2-(4-Methylbenzyl)quinolin-6-yl 2-(4-isobutylphenyl)propanoate (4c)

Yield: 59.5 mg, 68%; yellow solid; mp 110.4-112.0 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.06 (d, *J* = 9.2 Hz, 1H), 7.94 (d, *J* = 8.4 Hz, 1H), 7.41 (s, 1H), 7.33 (d, *J* = 8.0 Hz, 3H), 7.23-7.16 (m, 5H), 7.11 (d, *J* = 8.0 Hz, 2H), 4.28 (s, 2H), 3.99 (q, *J* = 7.2 Hz, 1H), 2.48 (d, *J* = 7.2 Hz, 2H), 2.31 (s, 3H), 1.90-1.86 (m, 1H), 1.64 (d, *J* = 7.2 Hz, 3H), 0.93 (s, 3H), 0.91 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 173.3, 161.3, 148.2, 140.9, 137.0, 136.2, 136.1, 135.9, 130.2, 129.6, 129.3, 129.0, 127.2, 126.9, 124.5, 122.0, 118.0, 45.3, 45.1, 44.9, 30.2, 22.4, 21.1, 18.5. HRMS (ESI) m/z calcd for $C_{30}H_{32}NO_2^+$ $(M+H)^+$ 438.2428, found 438.2438.



2-(4-Methylbenzyl)quinolin-6-yl 2-(10-oxo-10,11-dihydrodibenzo[*b,f*]thiepin-2-yl)propanoate (4d)

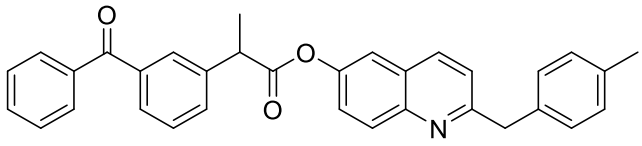
Yield:56.0 mg, 53%; yellow solid; mp 110.4-112.0 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.21 (dd, *J* = 8.0, 1.6 Hz, 1H), 8.06 (d, *J* = 8.8 Hz, 1H), 7.96 (d, *J* = 8.8 Hz, 1H), 7.67 (d, *J* = 8.0 Hz, 1H), 7.61 (d, *J* = 8.0 Hz, 1H), 7.52 (d, *J* = 1.6 Hz, 1H), 7.47-7.40 (m, 2H), 7.34-7.27 (m, 3H), 7.22-7.16 (m, 3H), 7.10 (d, *J* = 8.0 Hz, 2H), 4.40 (s, 2H), 4.28 (s, 2H), 4.02 (q, *J* = 7.2 Hz, 1H), 2.31 (s, 3H), 1.63 (d, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 191.2, 172.4, 161.4, 148.0, 145.5, 142.0, 140.0, 138.2, 136.3, 136.1, 135.8, 133.6, 132.5, 131.7, 131.5, 130.8, 130.3, 129.3, 129.3, 129.0, 129.0, 128.7, 126.9, 126.3, 124.3, 122.1, 118.0, 51.0, 45.3, 44.9, 21.0, 18.5. HRMS (ESI) m/z calcd for $C_{34}H_{28}NNaO_3S^+$ $(M+H)^+$ 530.1784, found 530.1799.



2-(4-Methylbenzyl)quinolin-6-yl 2-(2-fluoro-[1,1'-biphenyl]-4-yl)propanoate (4e)

Yield: 57.0 mg, 60%; yellow solid; mp 110.4-112.0 °C (uncorrected); ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.09 (d, *J* = 9.2 Hz, 1H), 7.96 (d, *J* = 8.4 Hz, 1H), 7.58-7.55 (m, 2H), 7.49-7.43 (m, 4H), 7.4-7.36 (m, 2H), 7.30-7.23 (m, 2H), 7.23-7.17 (m, 3H), 7.11 (d, *J* = 7.6 Hz, 2H), 4.29 (s, 2H), 4.05 (q, *J* = 7.2 Hz, 1H), 2.31 (s, 3H), 1.69 (d, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 172.5, 161.4, 159.8 (d, *J* = 247.2 Hz), 148.1, 145.6, 141.0 (d, *J* = 7.5 Hz), 136.3, 136.1 135.8, 135.3, 131.1 (d, *J* = 3.8 Hz), 130.3, 129.3, 129.0, 128.9, 128.9, 128.5, 127.7, 126.9, 124.3, 123.6 (d, *J* = 3.3 Hz), 122.1, 118.0, 115.3 (d, *J* =

23.7 Hz), 45.1, 44.9, 21.0, 18.4. HRMS (ESI) m/z calcd for $C_{32}H_{26}FNNaO_2^+$ $(M+Na)^+$ 498.1840, found 498.1856.



2-(4-Methylbenzyl)quinolin-6-yl 2-(3-benzoylphenyl)propanoate (4f)

Yield: 68.9 mg, 71%; yellow oil; ^{1}H NMR (400 MHz, $CDCl_3$) δ: 8.08 (d, *J* = 8.8 Hz, 1H), 7.96 (d, *J* = 8.4 Hz, 1H), 7.90 (s, 1H), 7.83 (d, *J* = 7.2 Hz, 2H), 7.75 (d, *J* = 7.6, 1.6 Hz, 1H), 7.68 (d, *J* = 7.6 Hz, 1H), 7.60 (d, *J* = 7.4 Hz, 1H), 7.54-7.44 (m, 4H), 7.35 (dd, *J* = 9.2, 2.8 Hz, 1H), 7.23 (d, *J* = 8.4 Hz, 1H), 7.18 (d, *J* = 8.0 Hz, 2H), 7.11 (d, *J* = 8.0 Hz, 2H), 4.29 (s, 2H), 4.12 (q, *J* = 7.2 Hz, 1H), 2.31 (s, 3H), 1.70 (d, *J* = 7.2 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ: 196.4, 172.6, 161.5, 148.1, 145.6, 140.2, 138.1, 137.4, 136.2, 136.1, 135.9, 132.6, 131.5, 130.3, 130.1, 129.3, 129.2, 129.0, 128.9, 128.8, 128.3, 126.9, 124.3, 122.1, 118.0, 45.5, 44.9, 21.0, 18.5. HRMS (ESI) m/z calcd for $C_{33}H_{27}NNaO_3^+$ $(M+Na)^+$ 508.1883, found 508.1893.

5. Reference

[1] Nacsa, E. D.; MacMillan, D. W. C. Spin-Center Shift-Enabled Direct Enantioselective α-Benzylation of Aldehydes with Alcohols. *J. Am. Chem. Soc.* **2018**, *140*, 3322–3330.

[2] Cismesia M. A.; Yoon, T. P. Characterizing chain processes in visible light photoredox catalysis. *Chem. Sci.* **2015**, *6*, 5426-5434.

[3] Hatchard, C. G.; Parker, C. A. *Proc. Roy. Soc.* (*London*) **1956**, *A235*, 518–536.

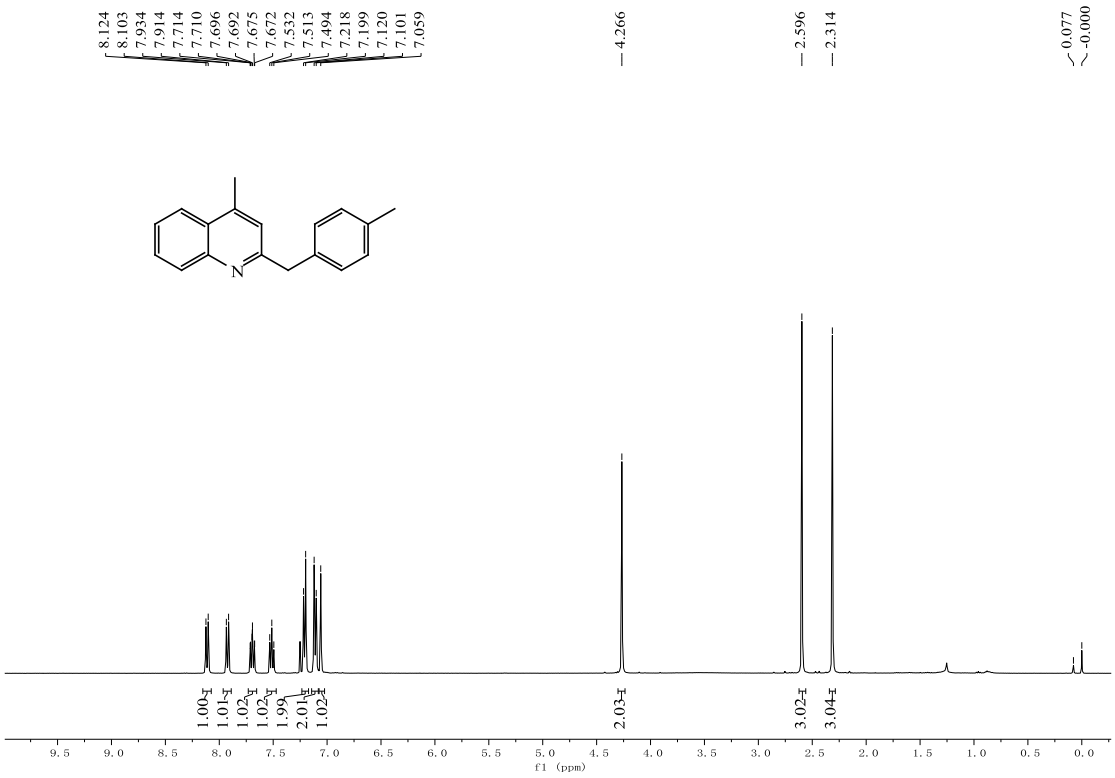
[4] Kim, I.; Park, B.; Kang, G.; Kim, J.; Jung, H.; Lee, H.; Baik, M.-H.; Hong, S. *Angew. Chem. Int. Ed.* **2018**, *57*, 15517-15522.

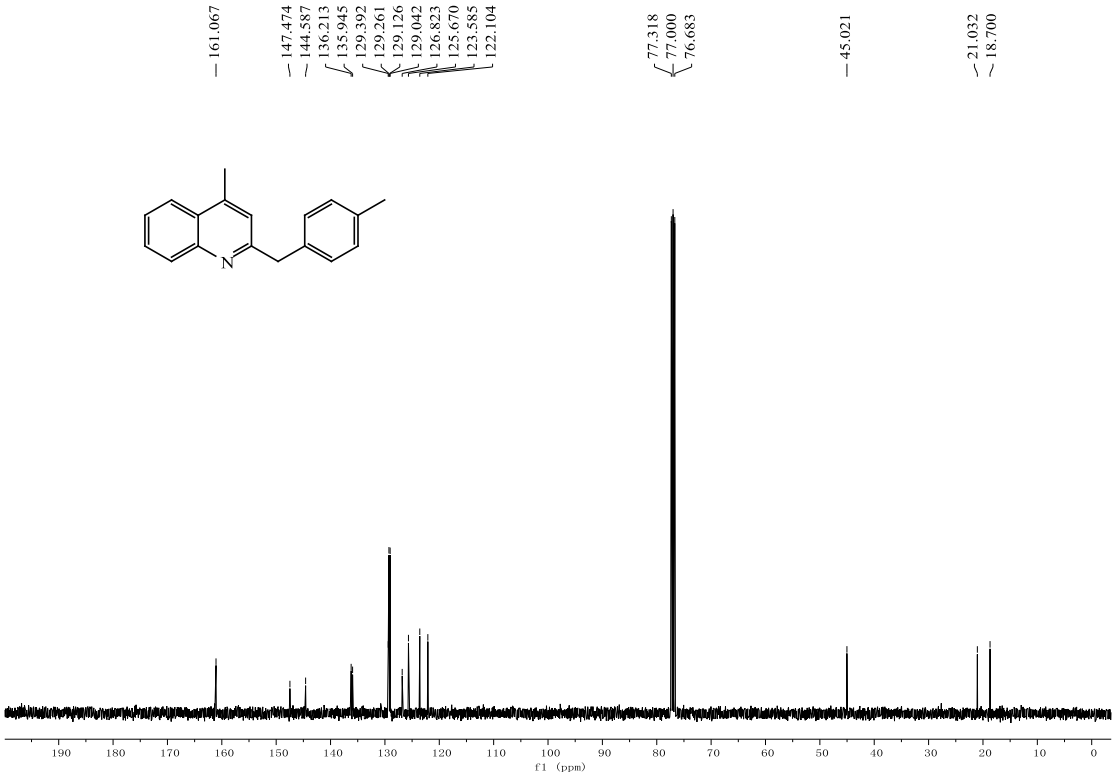
[5] Z. Wang, Q. Liu, X. Ji, G.-J. Deng, H, Huang, Bromide-Promoted Visible-Light-Induced Reductive Minisci Reaction with Aldehydes. *ACS Catal.* **2020**, *10*, 154-159

[6] S. Zhong, G.-J. Deng, Z. Dai, H, Huang, Visible-light-induced 4CzIPN/LiBr system: a tireless electron shuttle to enable reductive deoxygenation of N-heteroaryl carbonyls. *Org. Chem. Front.***, 2021**, doi: 10.1039/D1QO00634G

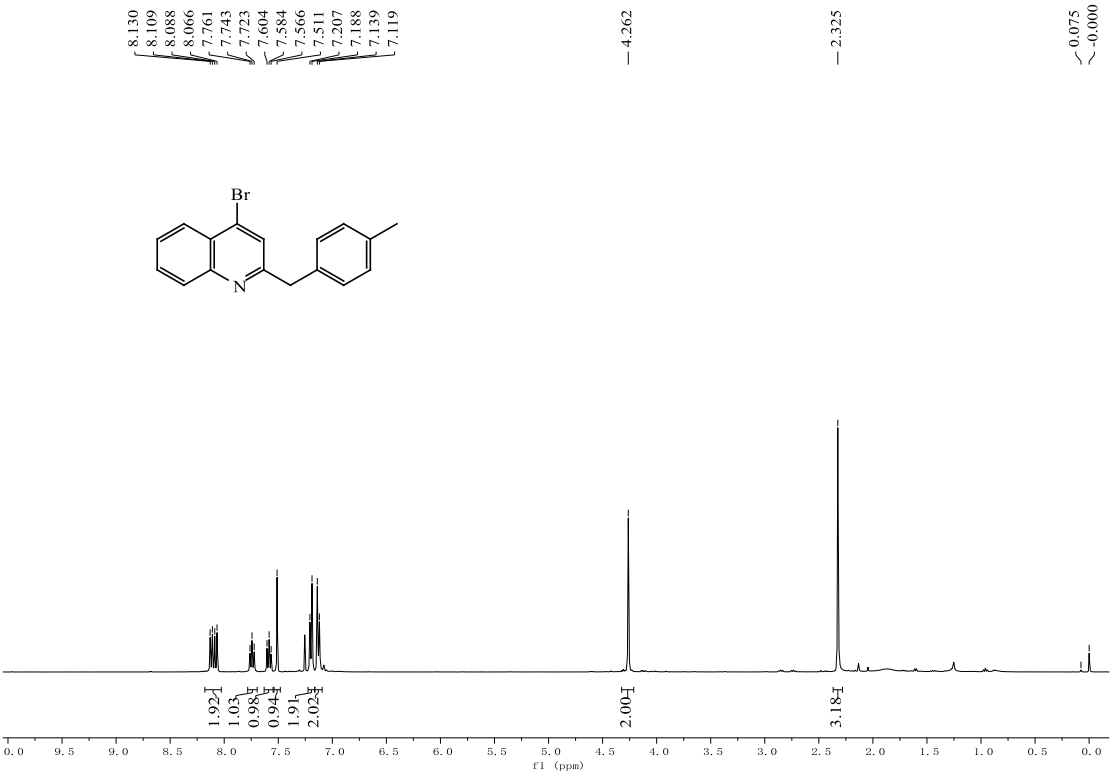
6. Copies of NMR spectra

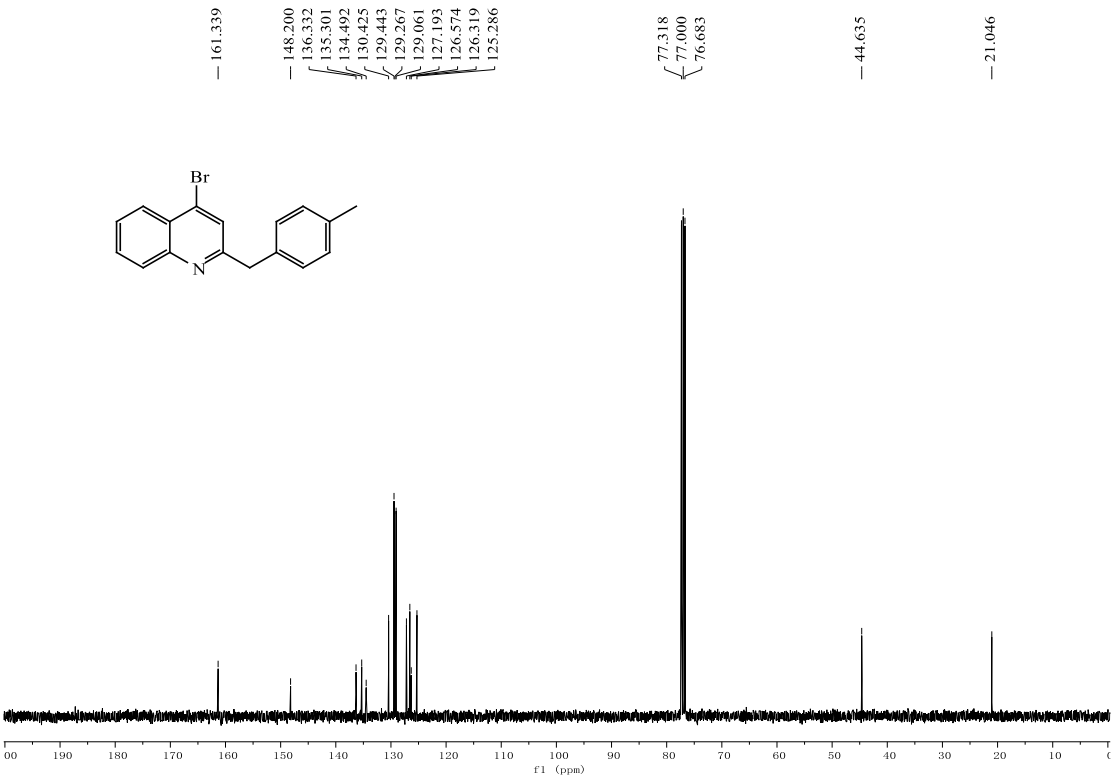
4-methyl-2-(4-methylbenzyl)quinoline (3aa)



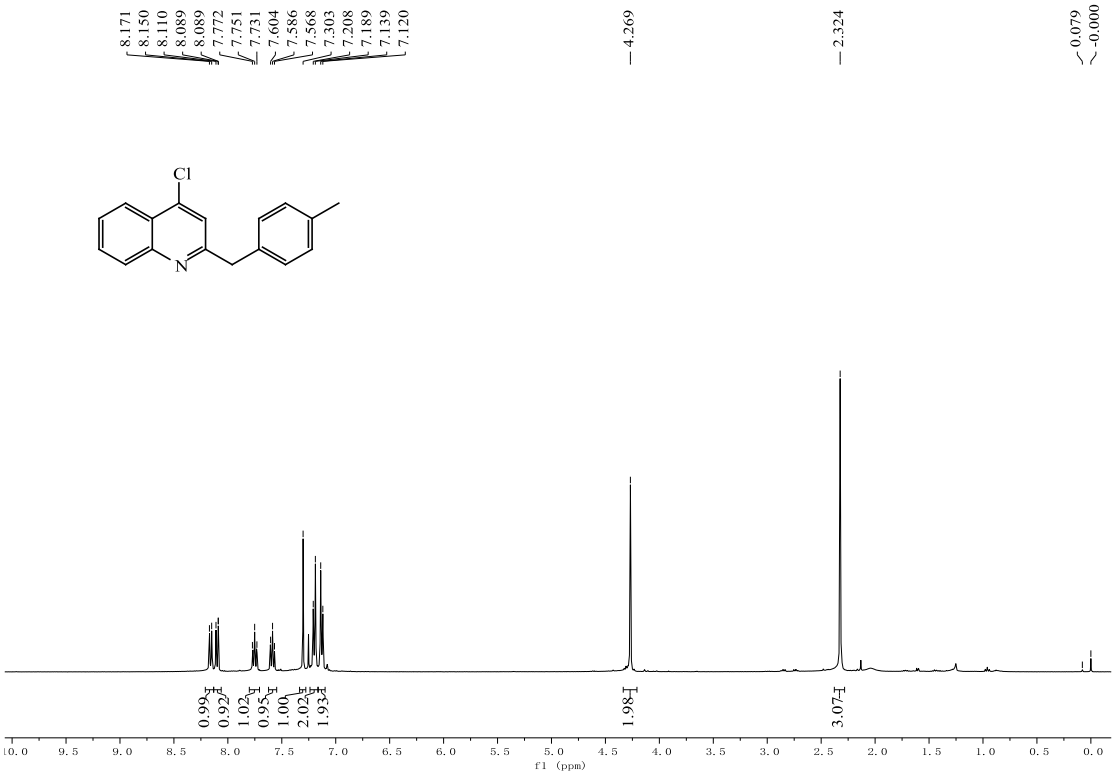


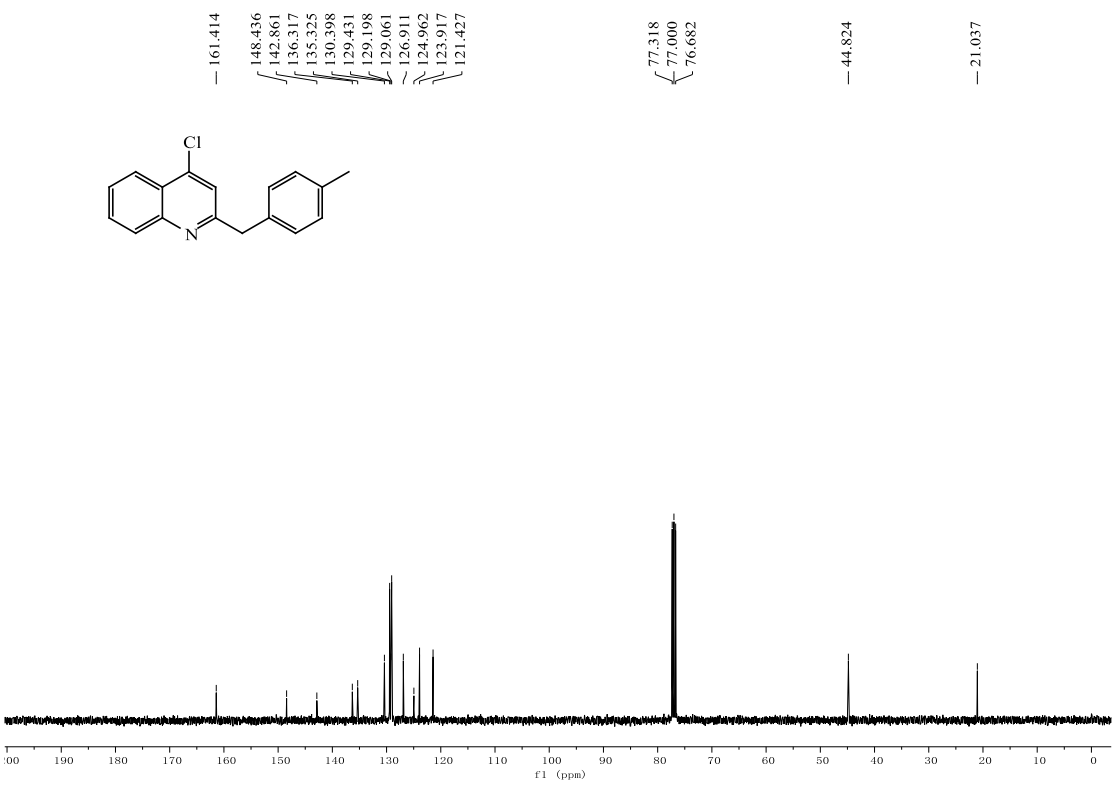
4-bromo-2-(4-methylbenzyl)quinoline (3ba)



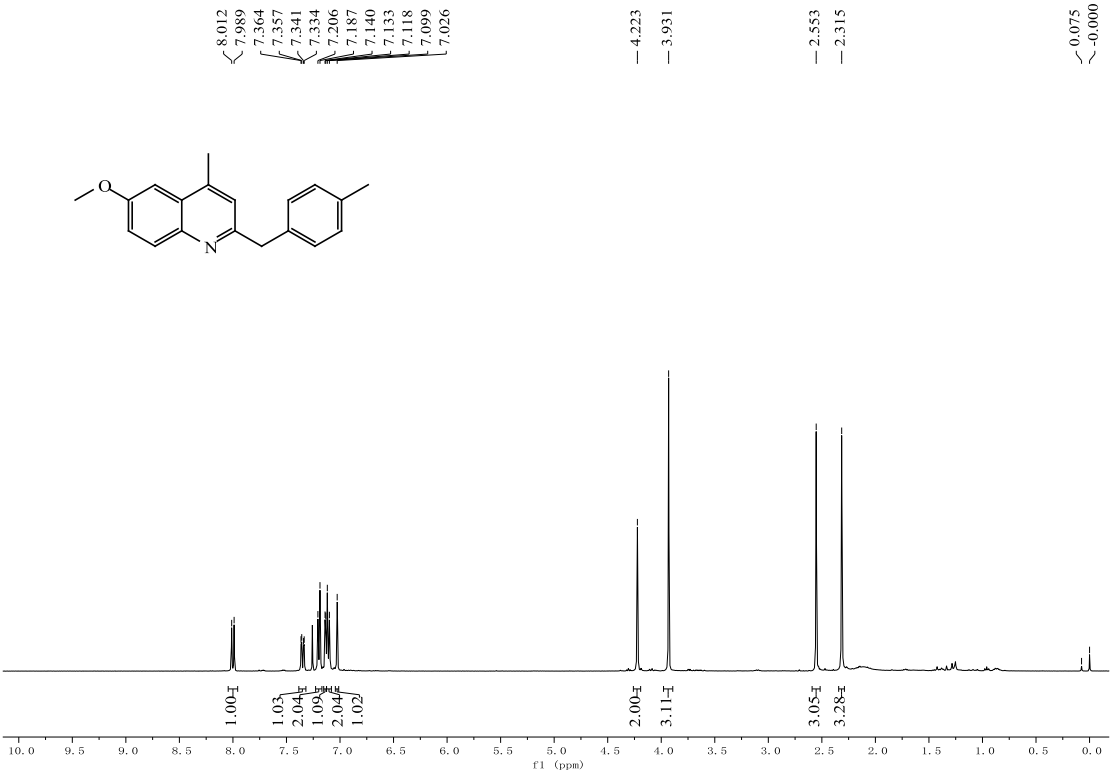


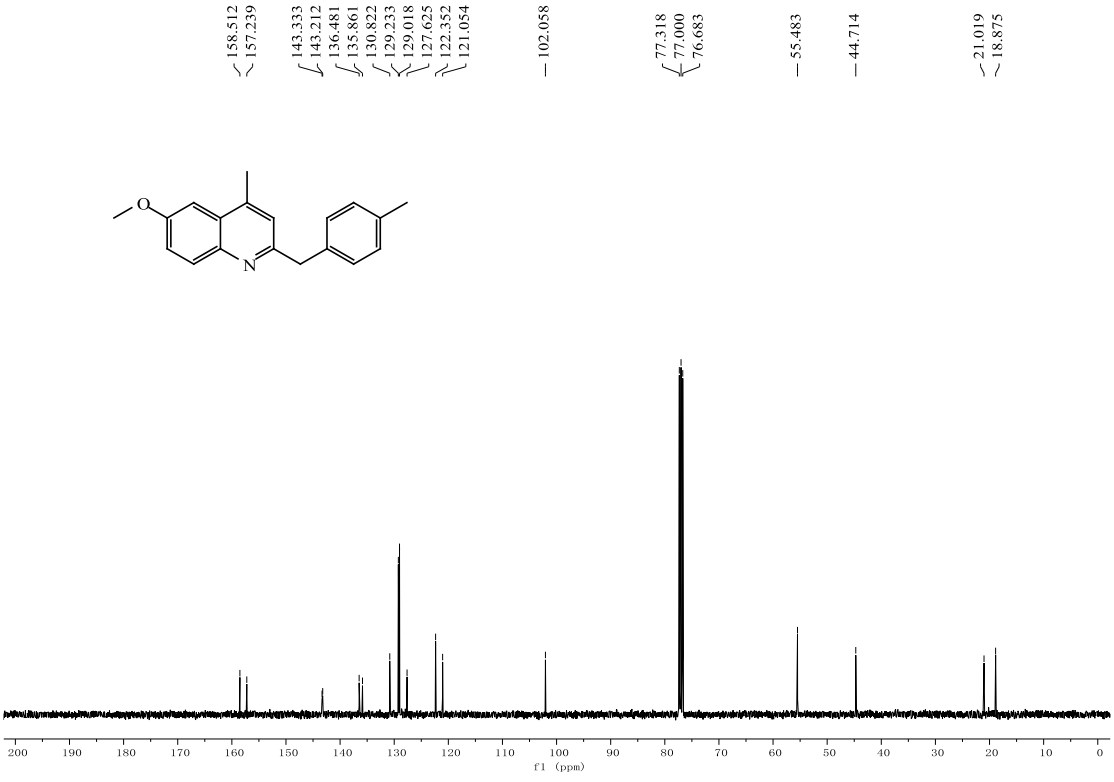
4-chloro-2-(4-methylbenzyl)quinoline (3ca)



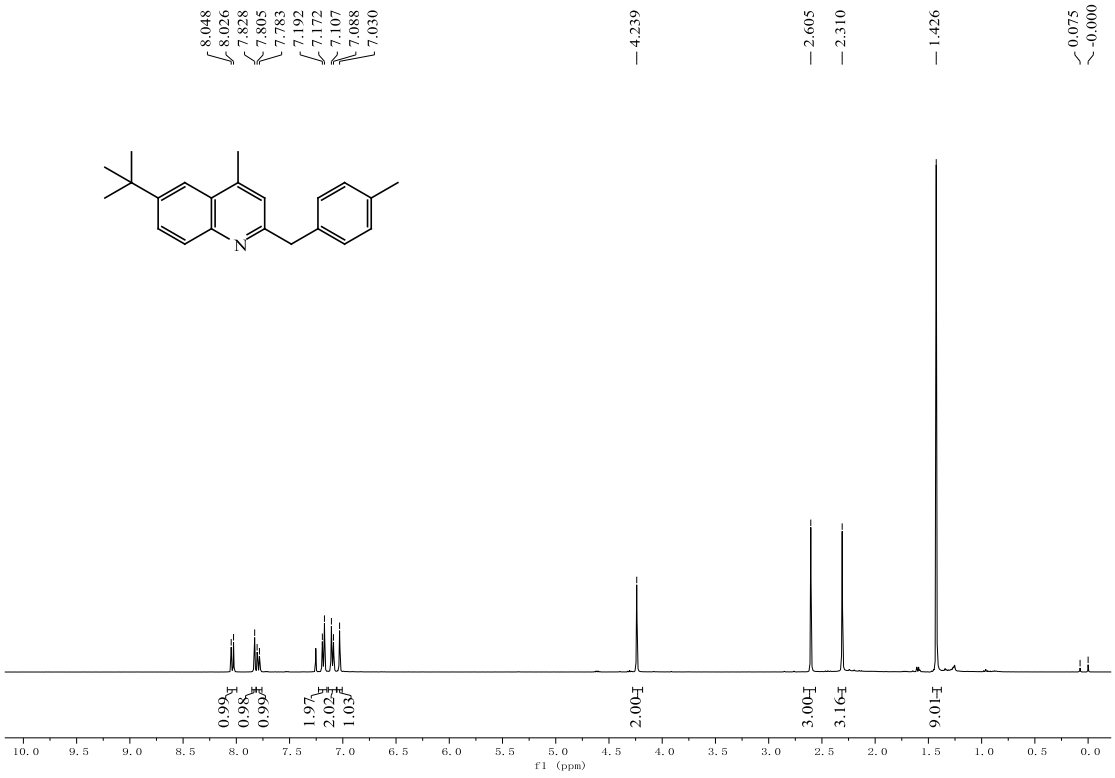


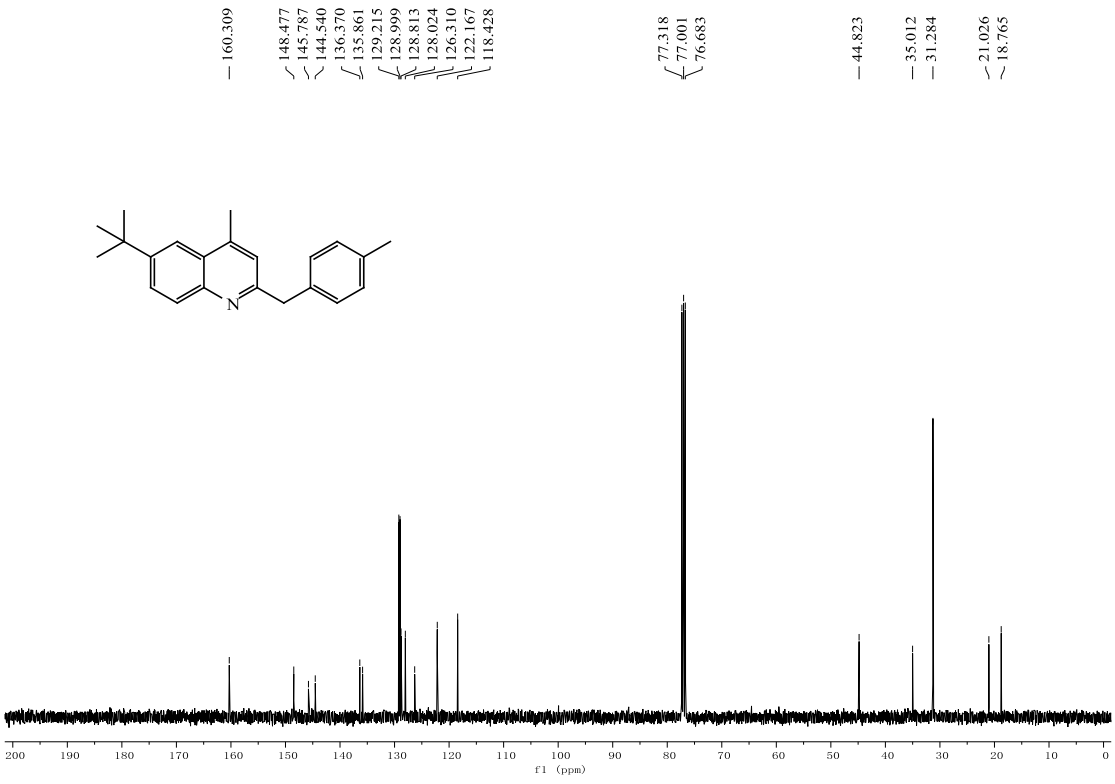
6-methoxy-4-methyl-2-(4-methylbenzyl)quinoline (3da)



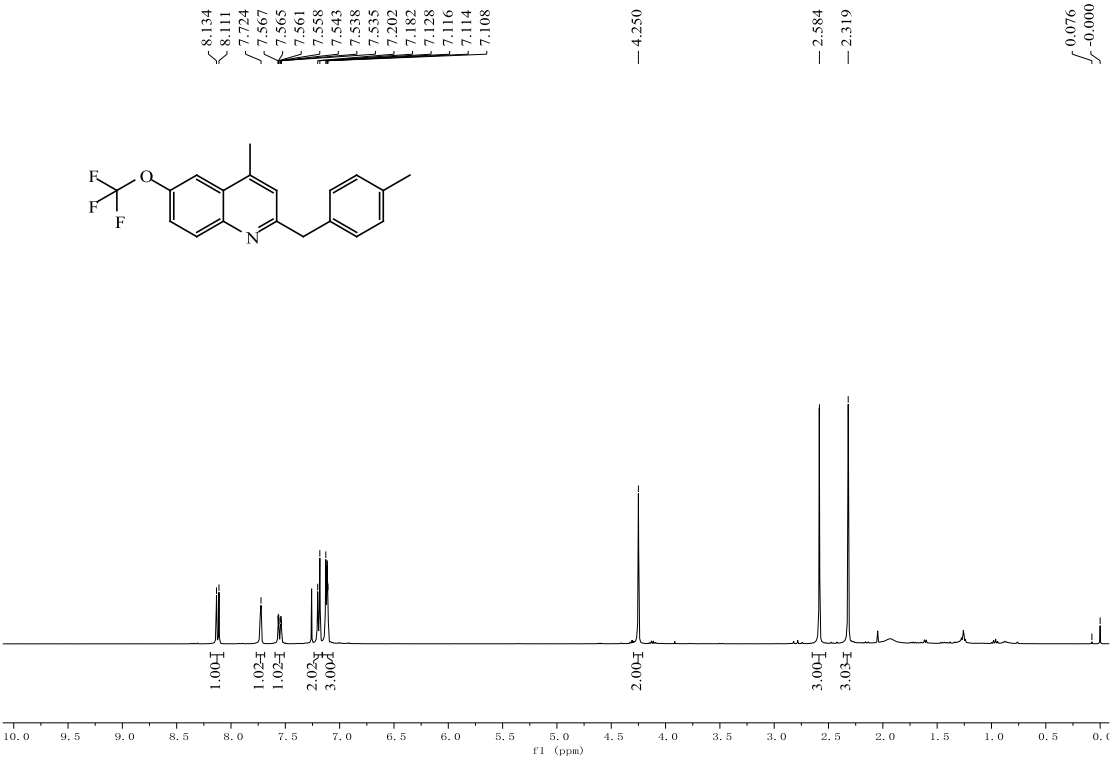


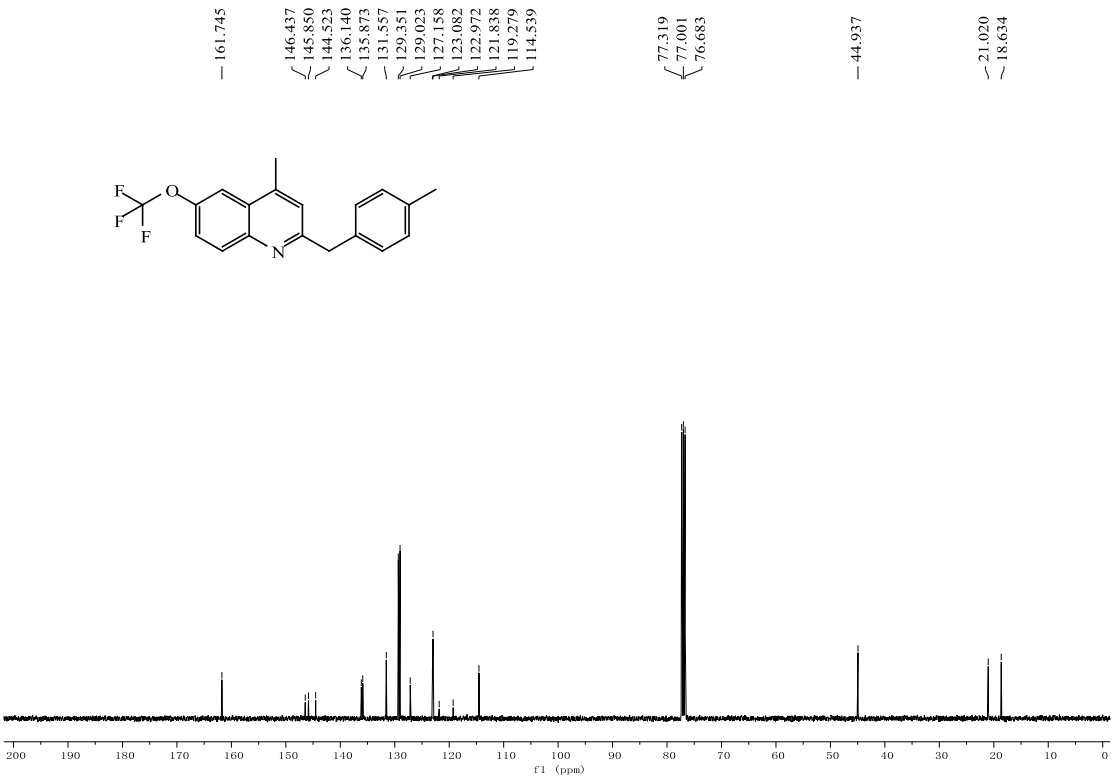
6-(*tert*-butyl)-4-methyl-2-(4-methylbenzyl)quinoline (4ea)



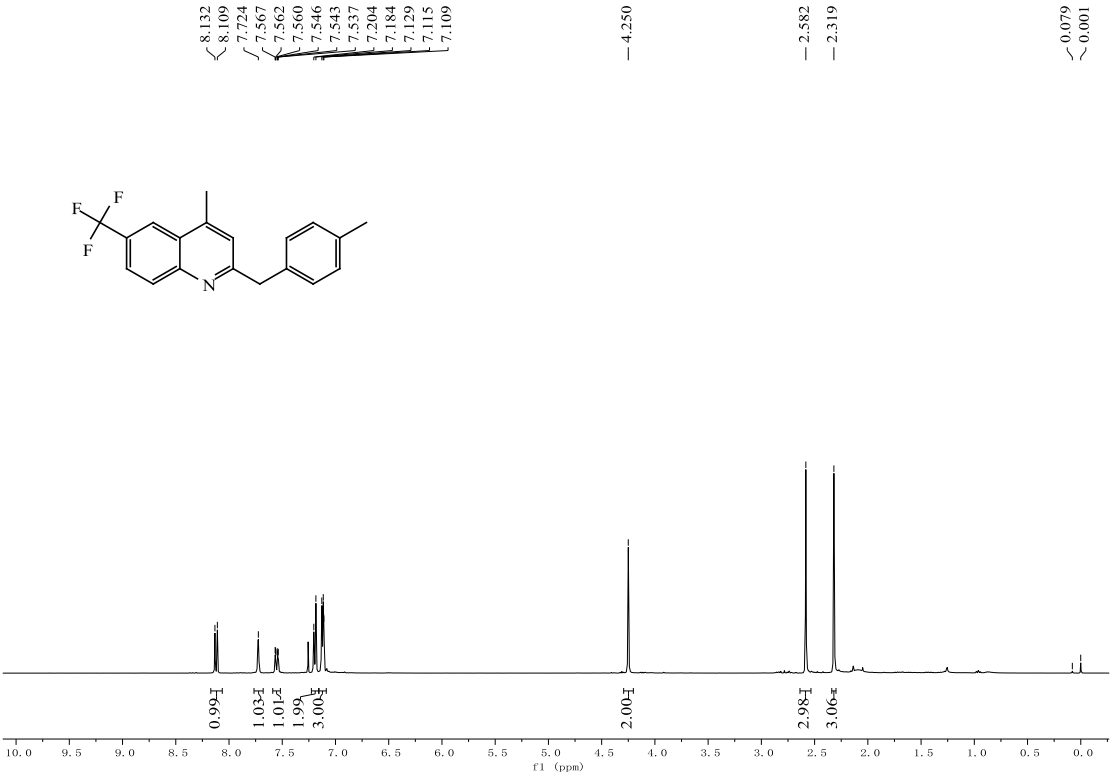


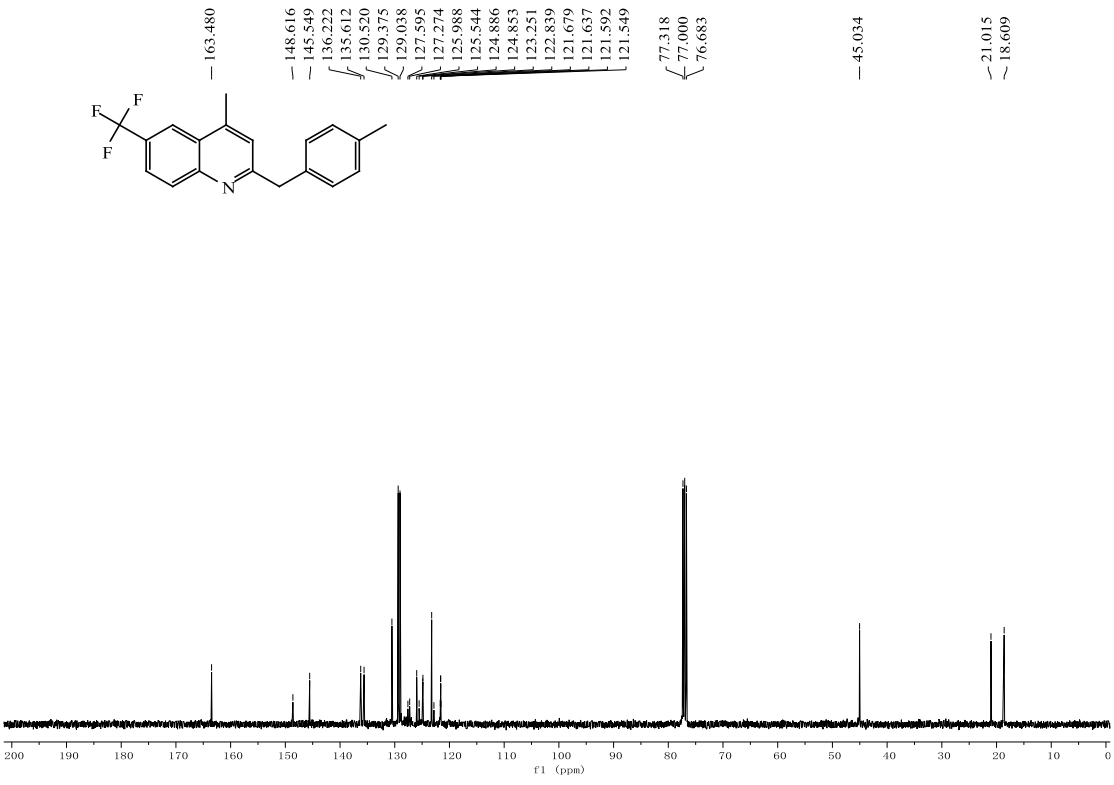
4-methyl-2-(4-methylbenzyl)-6-(trifluoromethoxy)quinoline (3fa)



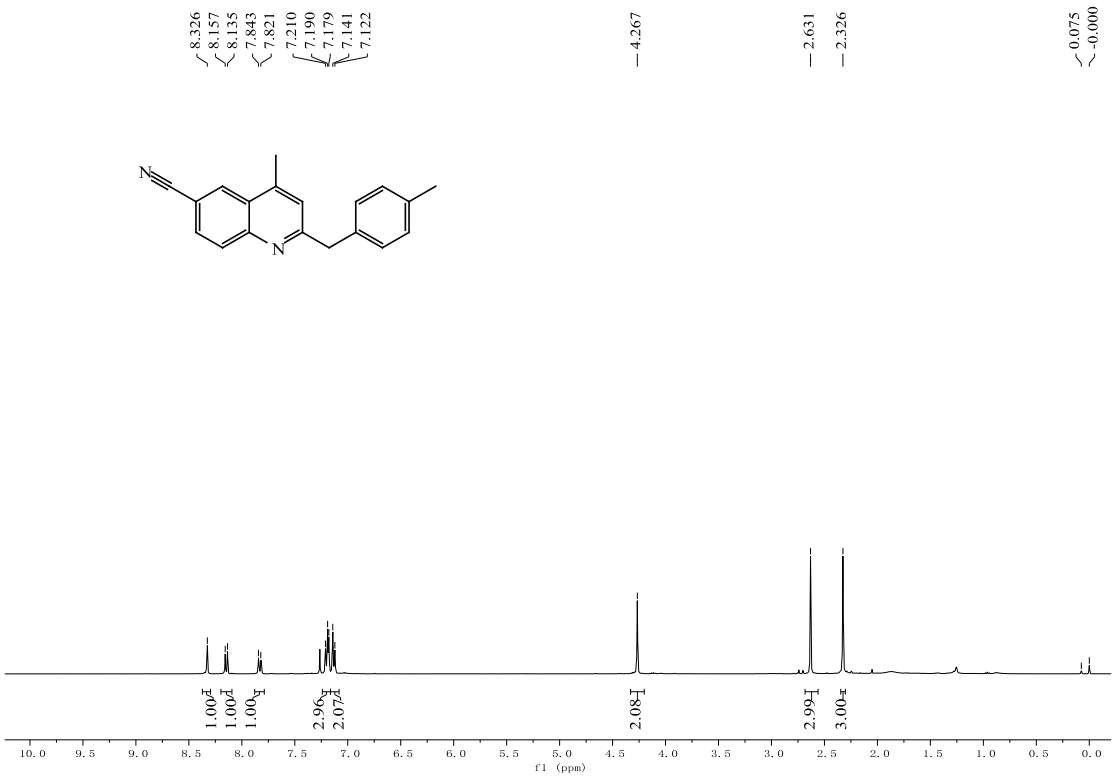


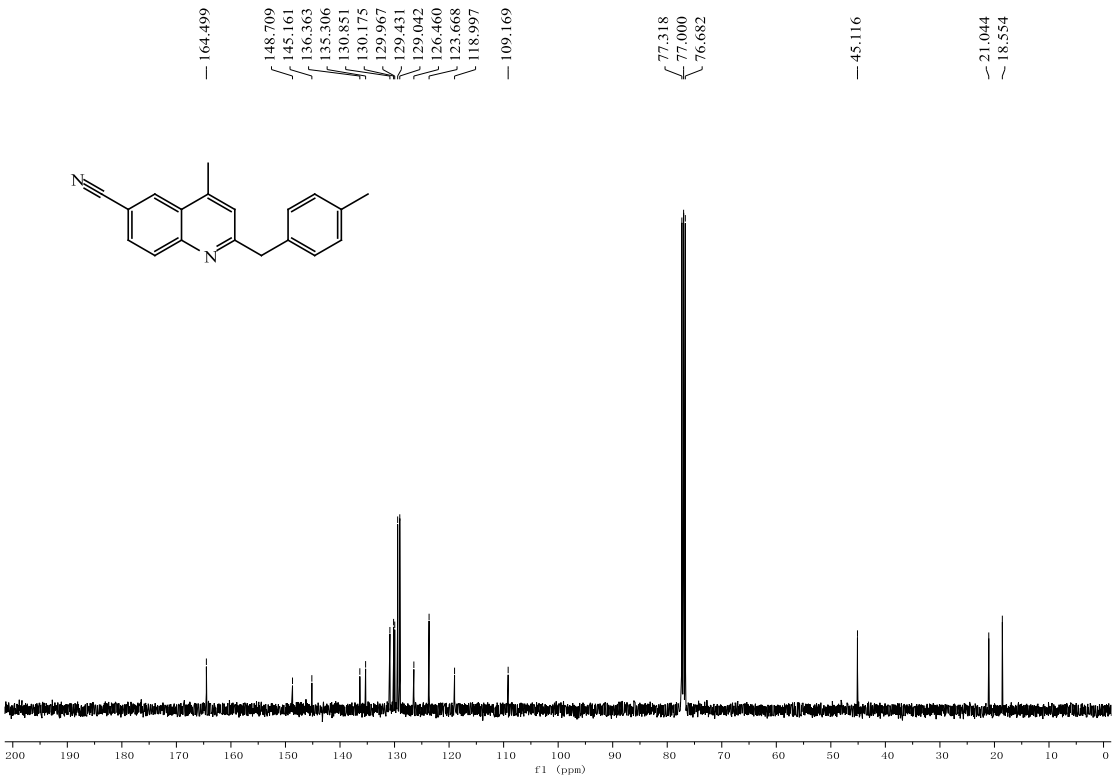
4-methyl-2-(4-methylbenzyl)-6-(trifluoromethyl)quinoline (3ga)



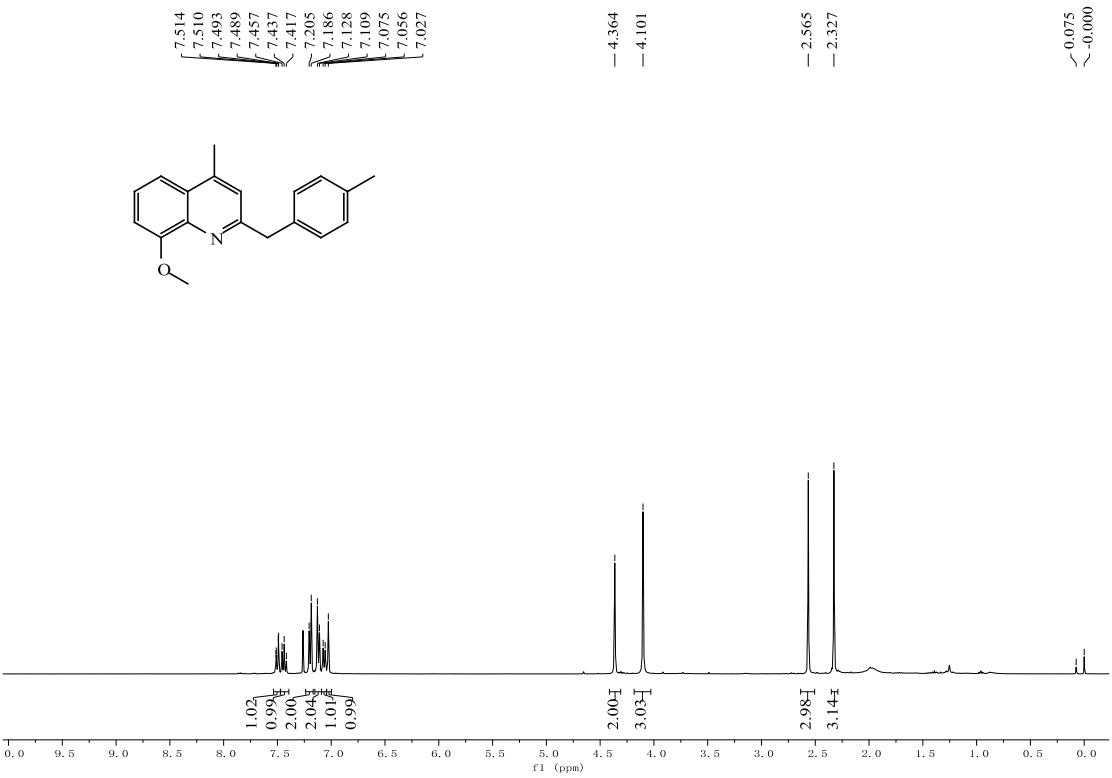


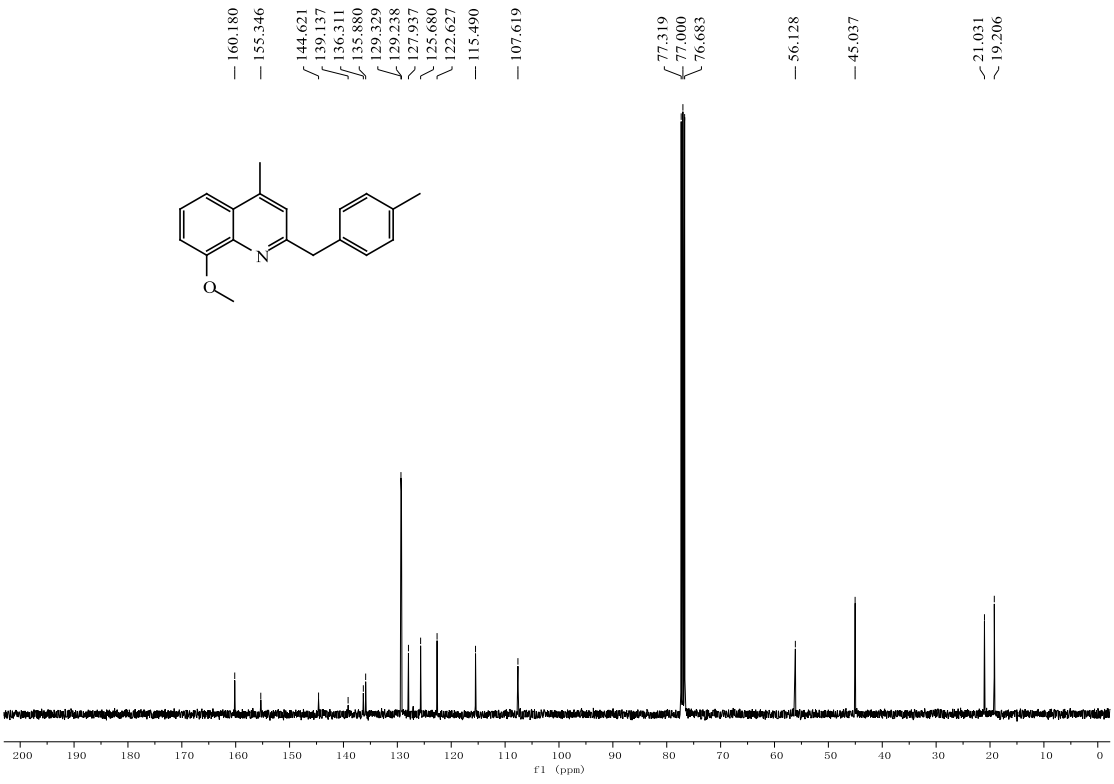
4-methyl-2-(4-methylbenzyl)quinoline-6-carbonitrile (3ha)



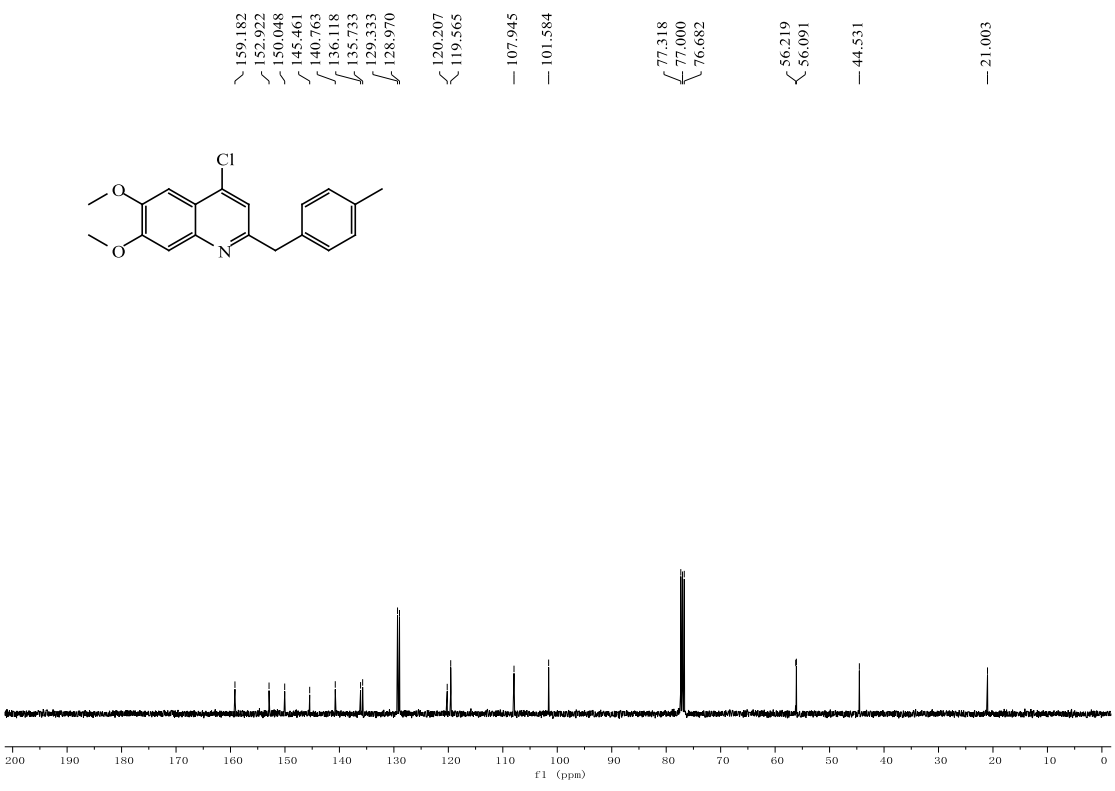


8-methoxy-4-methyl-2-(4-methylbenzyl)quinoline (3ia)

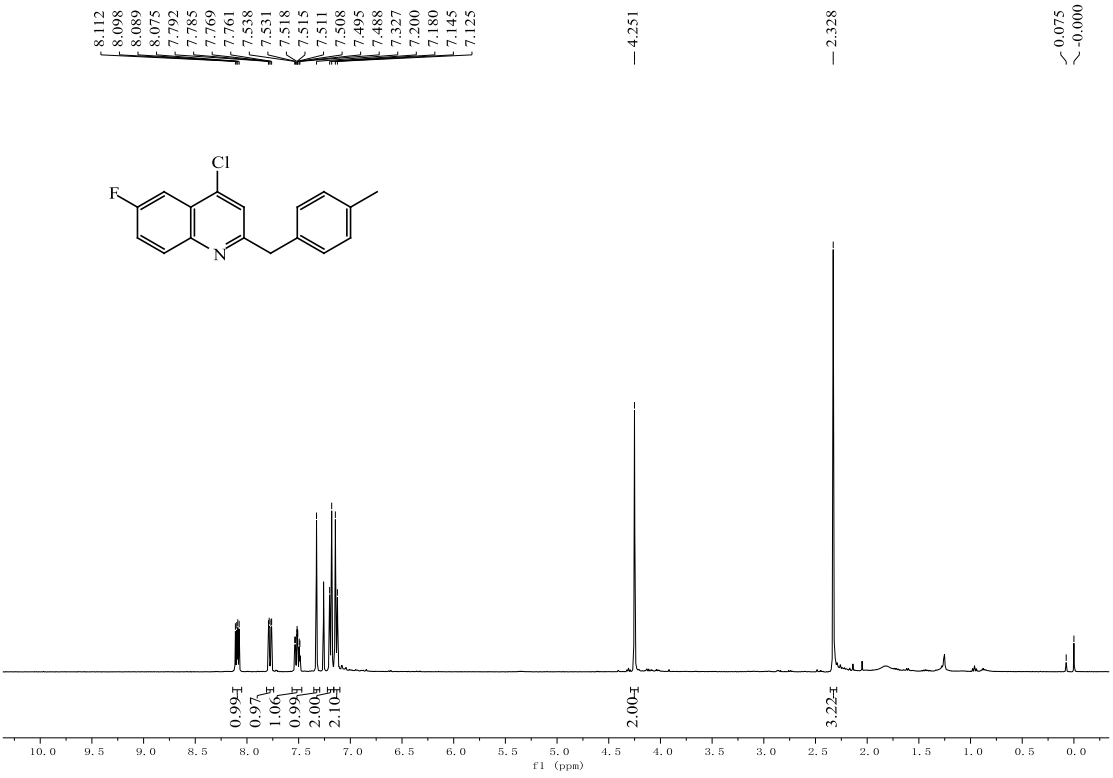


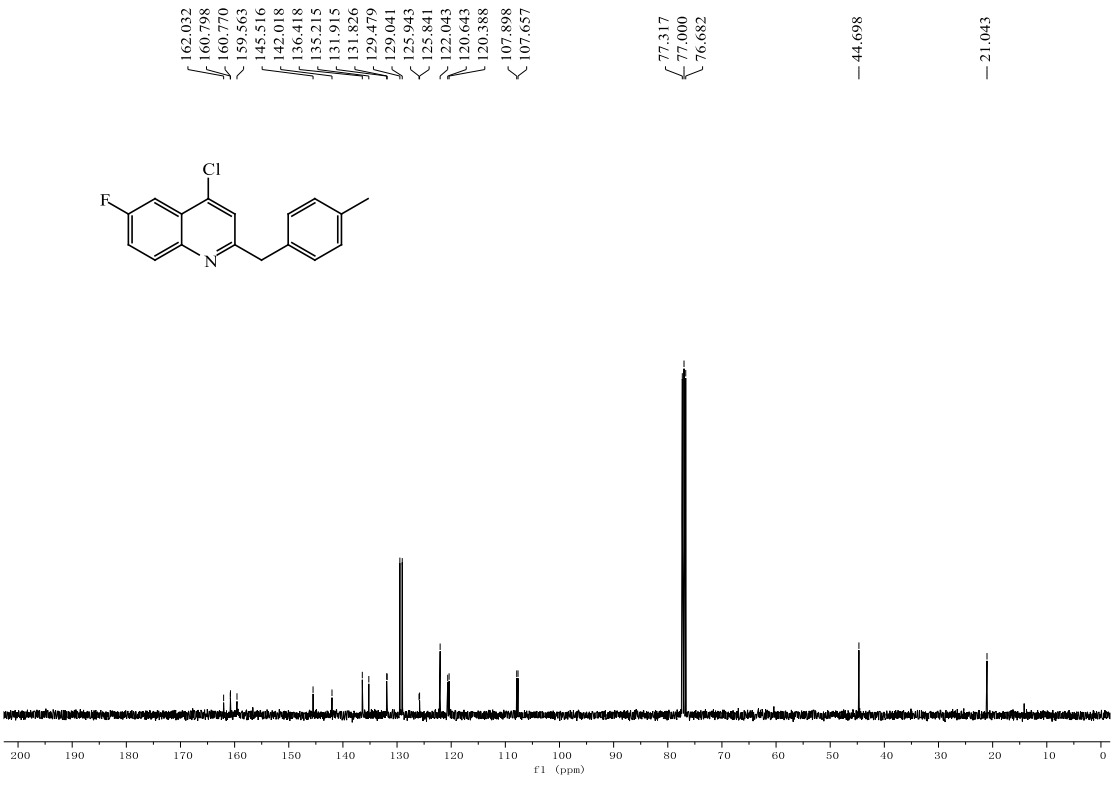


4-chloro-6,7-dimethoxy-2-(4-methylbenzyl)quinoline (3ja)

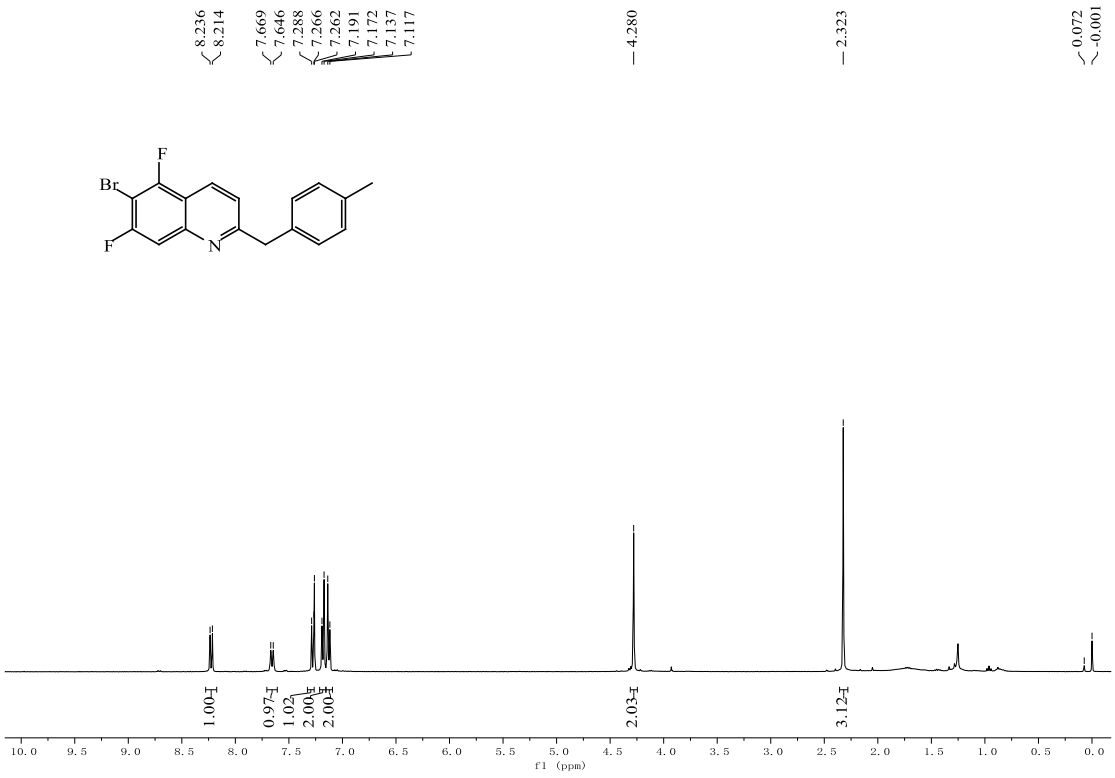


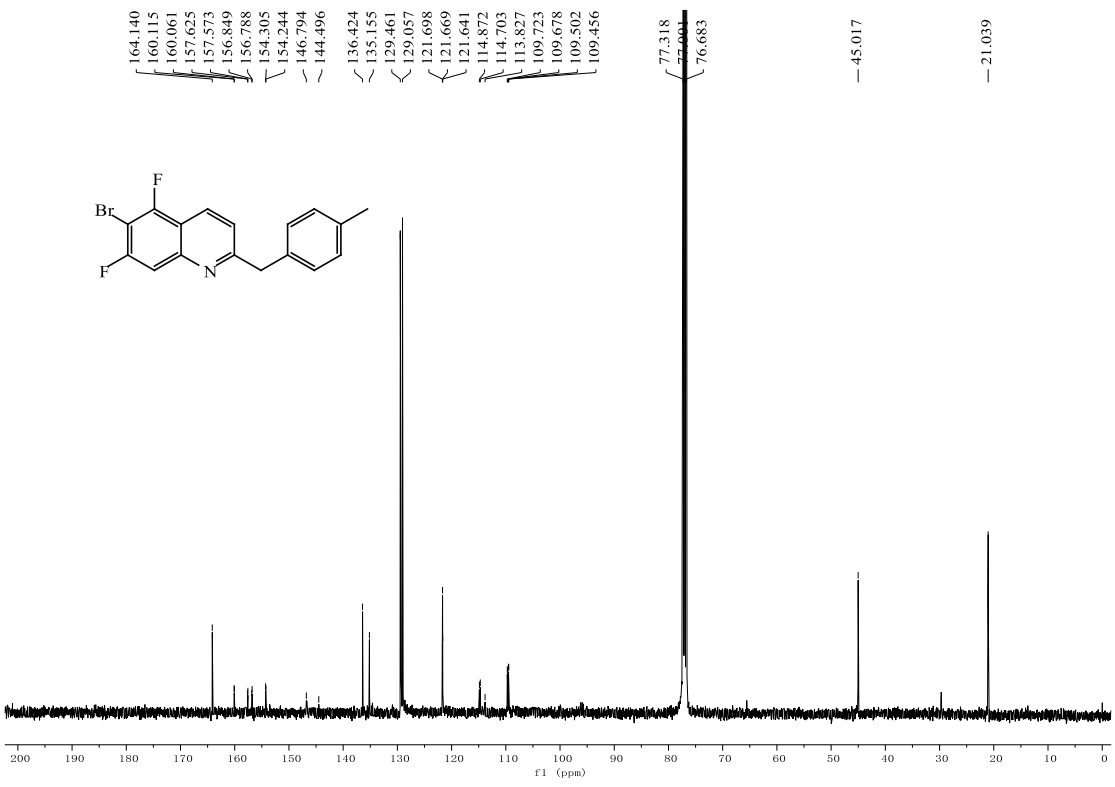
4-chloro-6-fluoro-2-(4-methylbenzyl)quinoline (3ka)



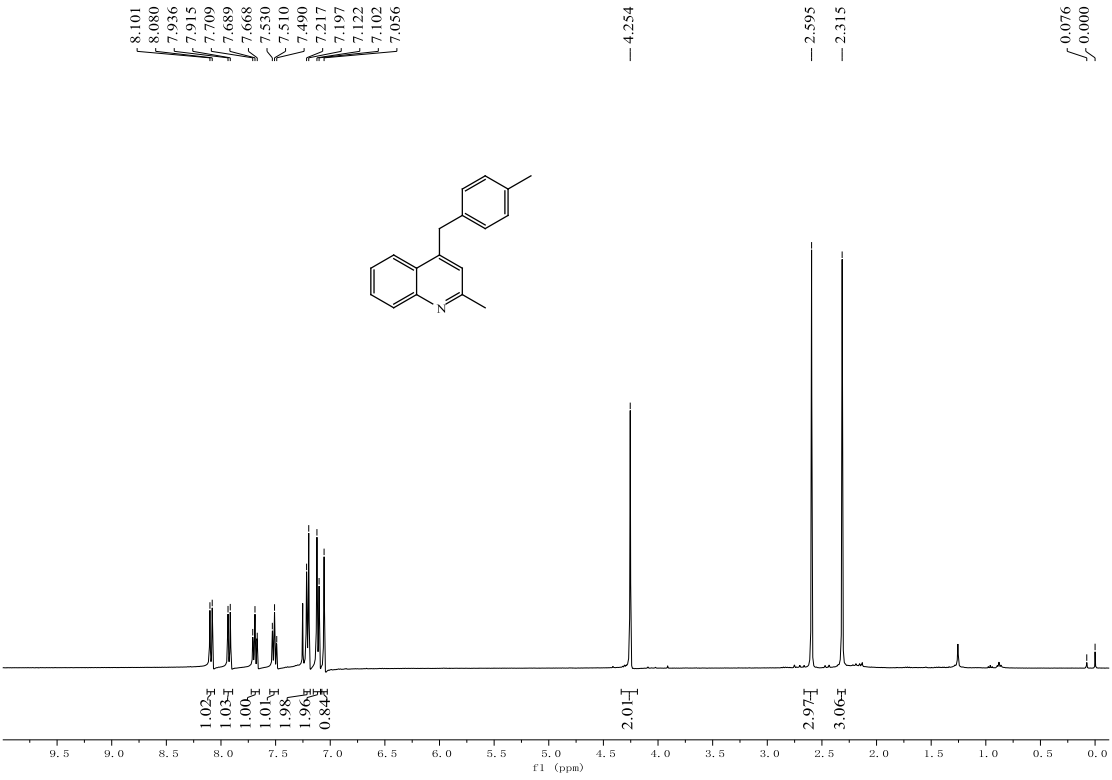


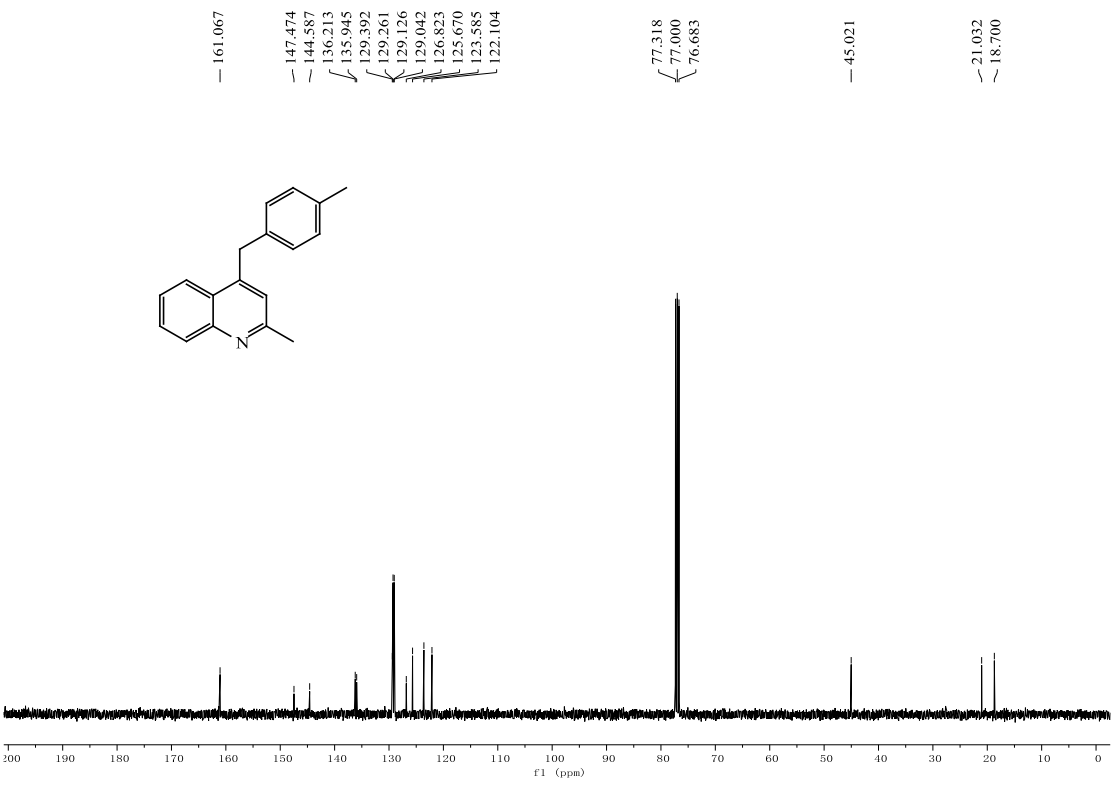
6-bromo-5,7-difluoro-2-(4-methylbenzyl)quinolone (3la)



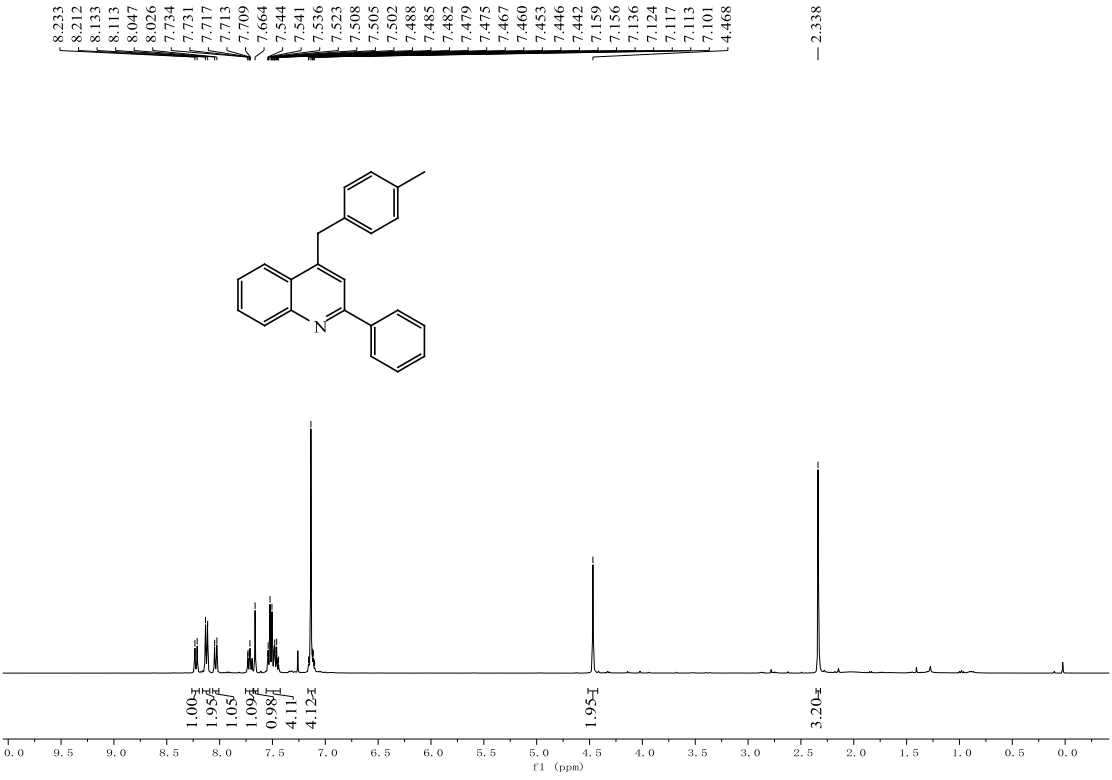


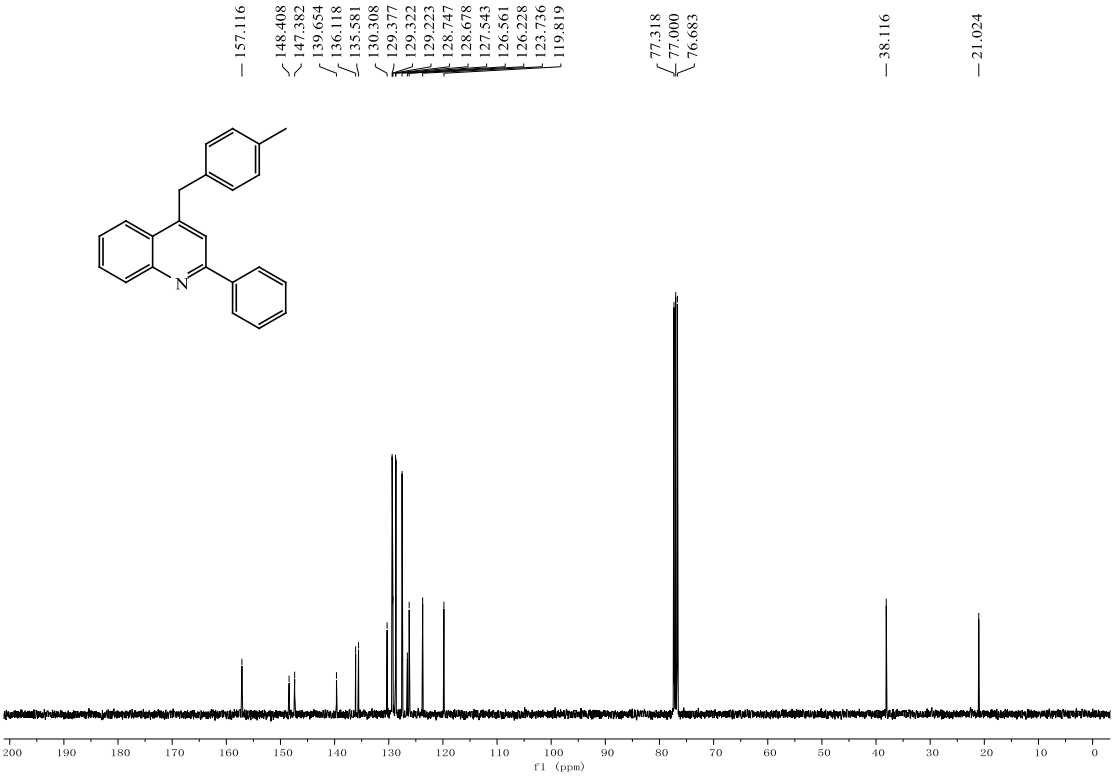
2-methyl-4-(4-methylbenzyl)quinoline (3ma)



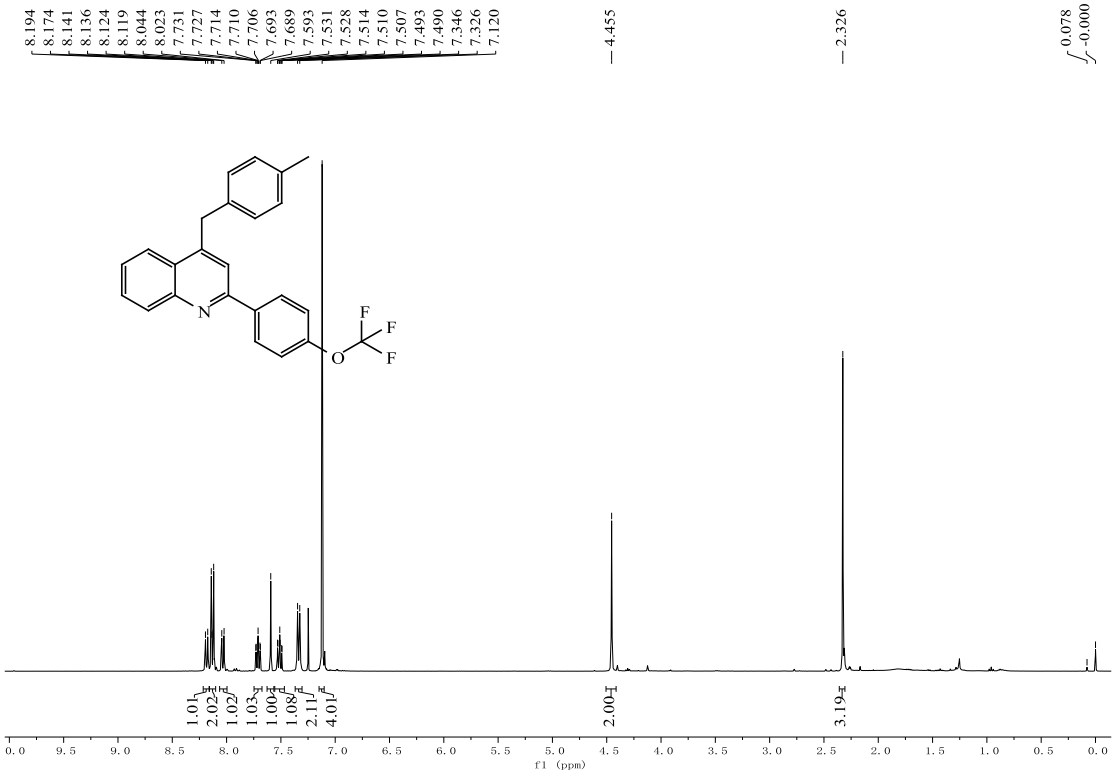


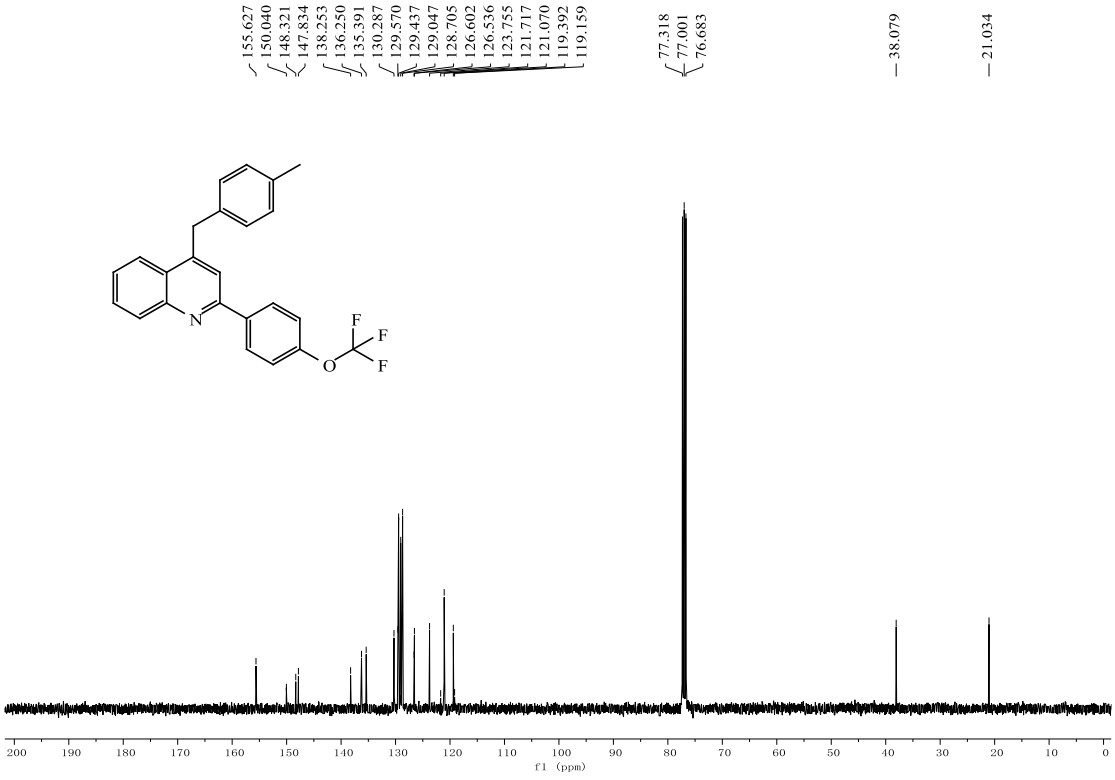
4-(4-methylbenzyl)-2-phenylquinoline (3na)



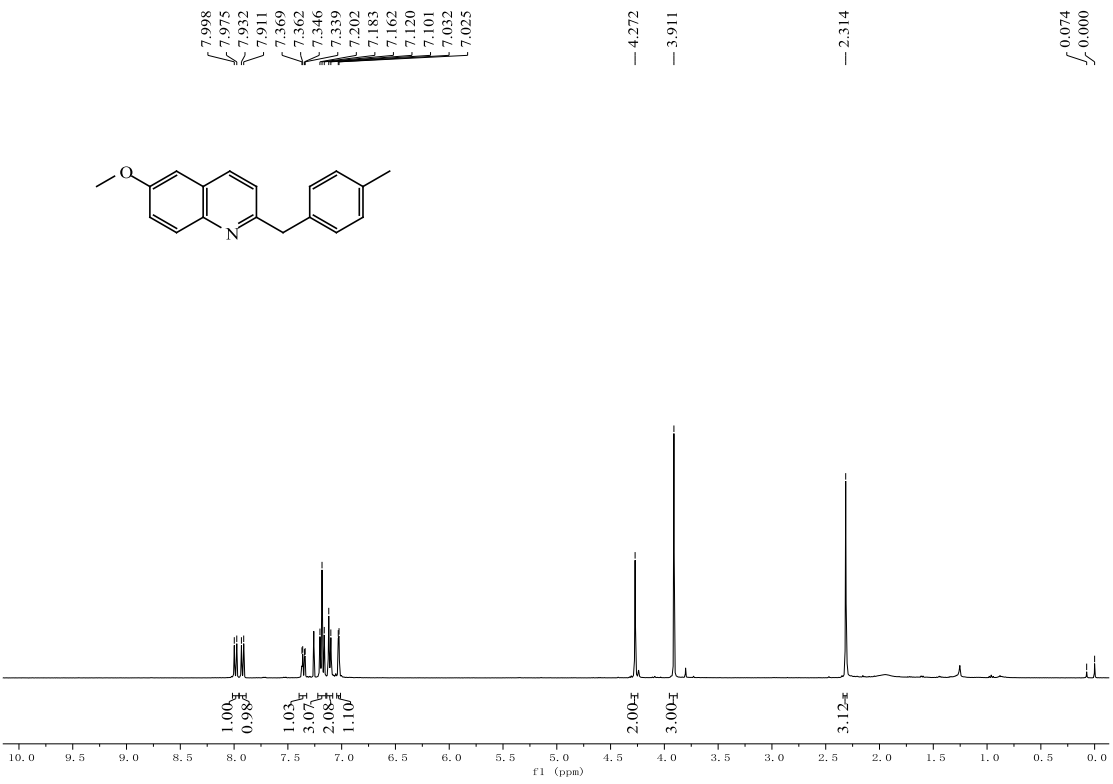


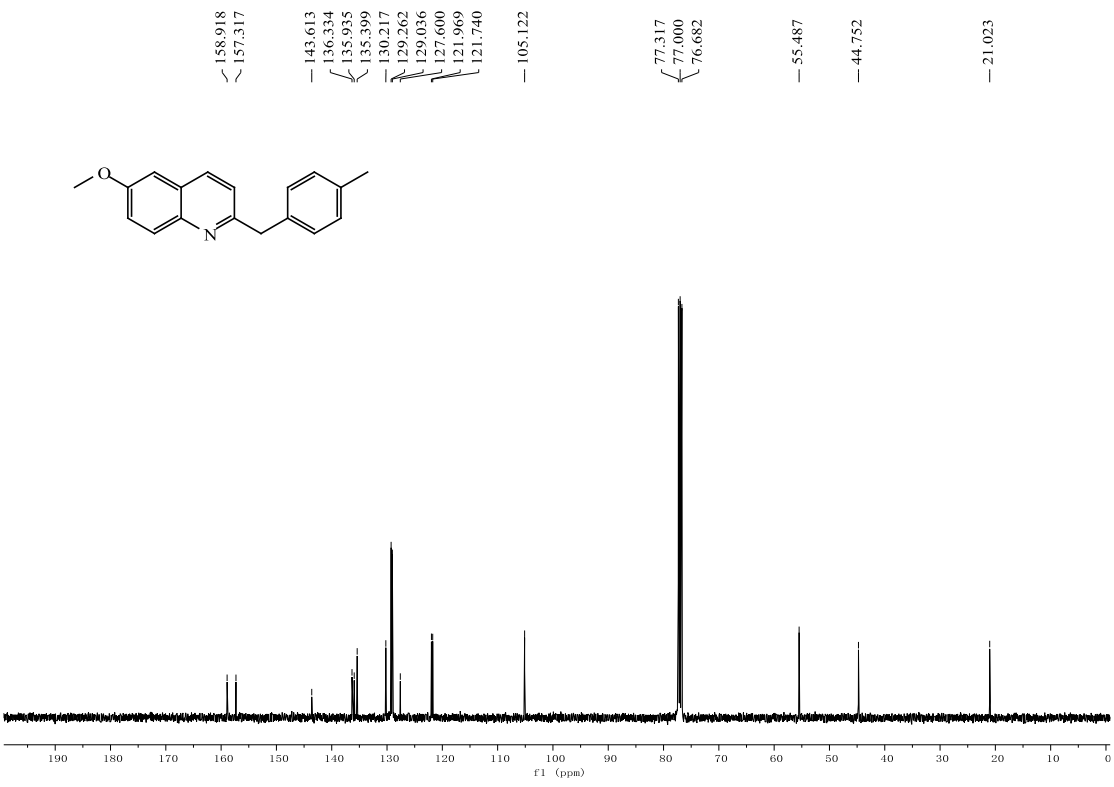
4-(4-methylbenzyl)-2-(4-(trifluoromethoxy)phenyl)quinoline (3oa)



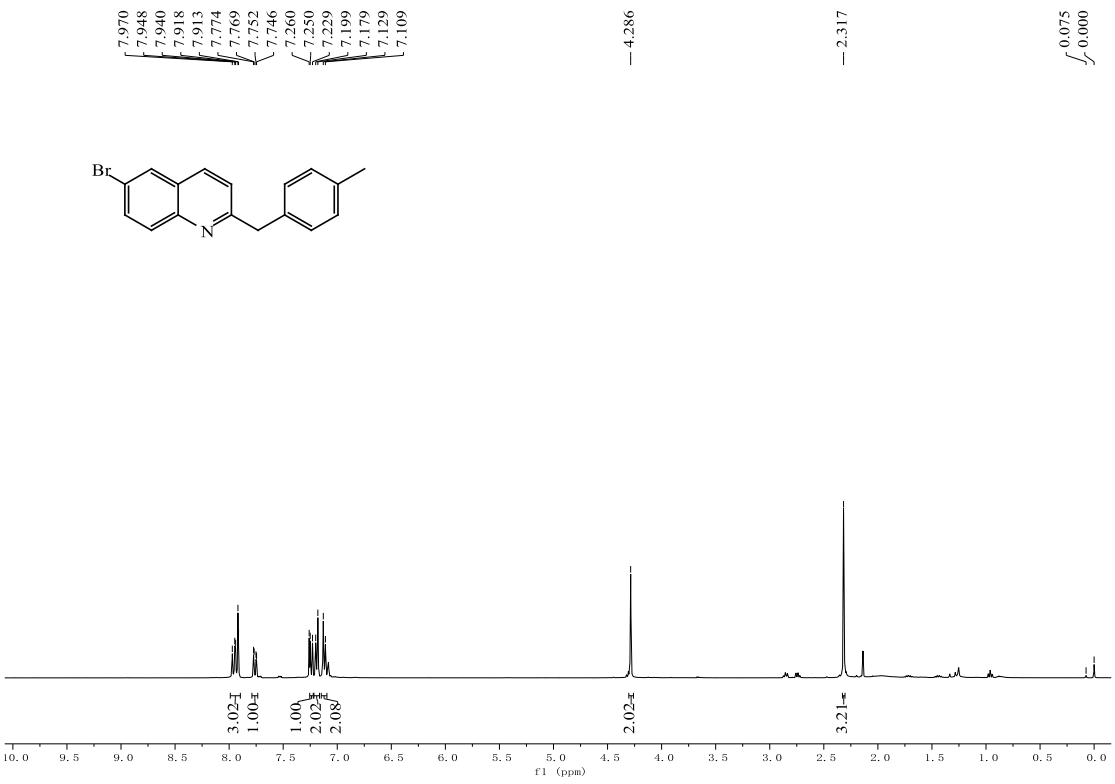


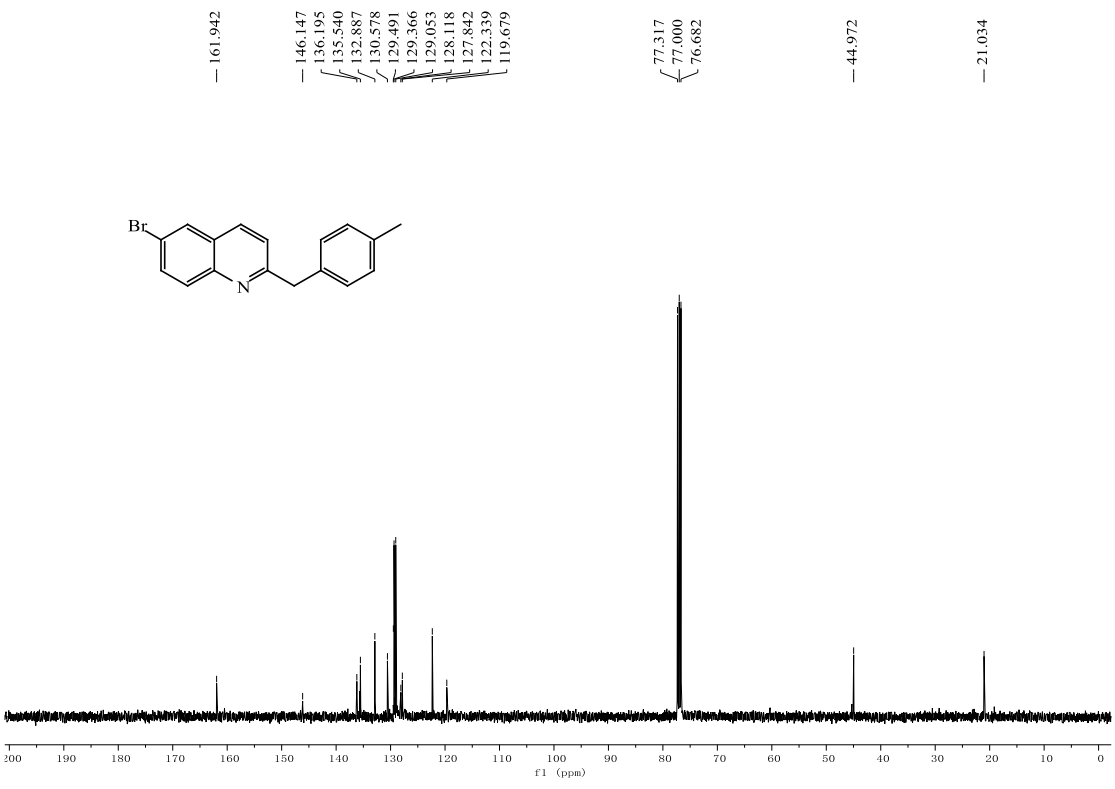
6-methoxy-2-(4-methylbenzyl)quinoline (3pa)



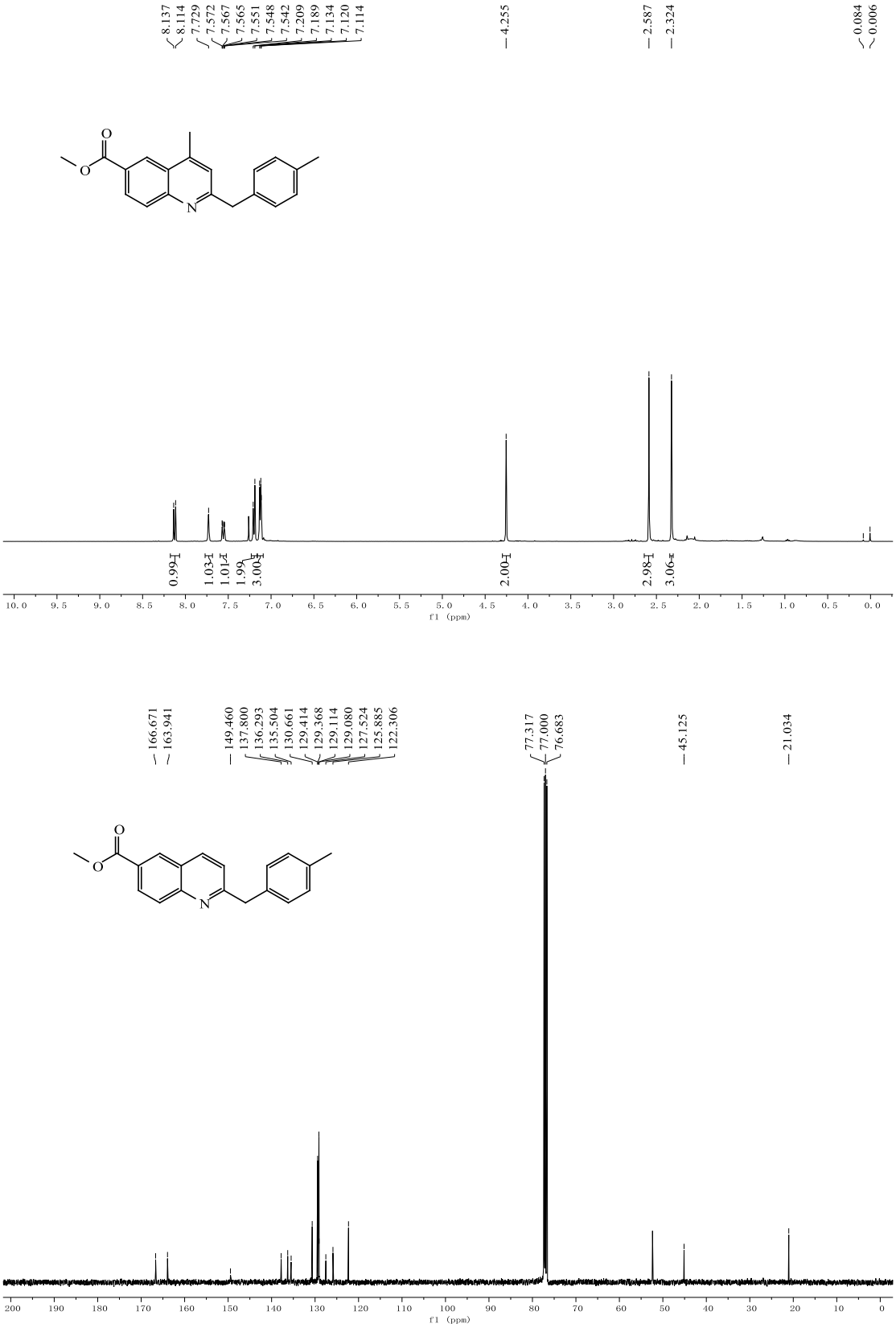


6-bromo-2-(4-methylbenzyl)quinoline (3qa)

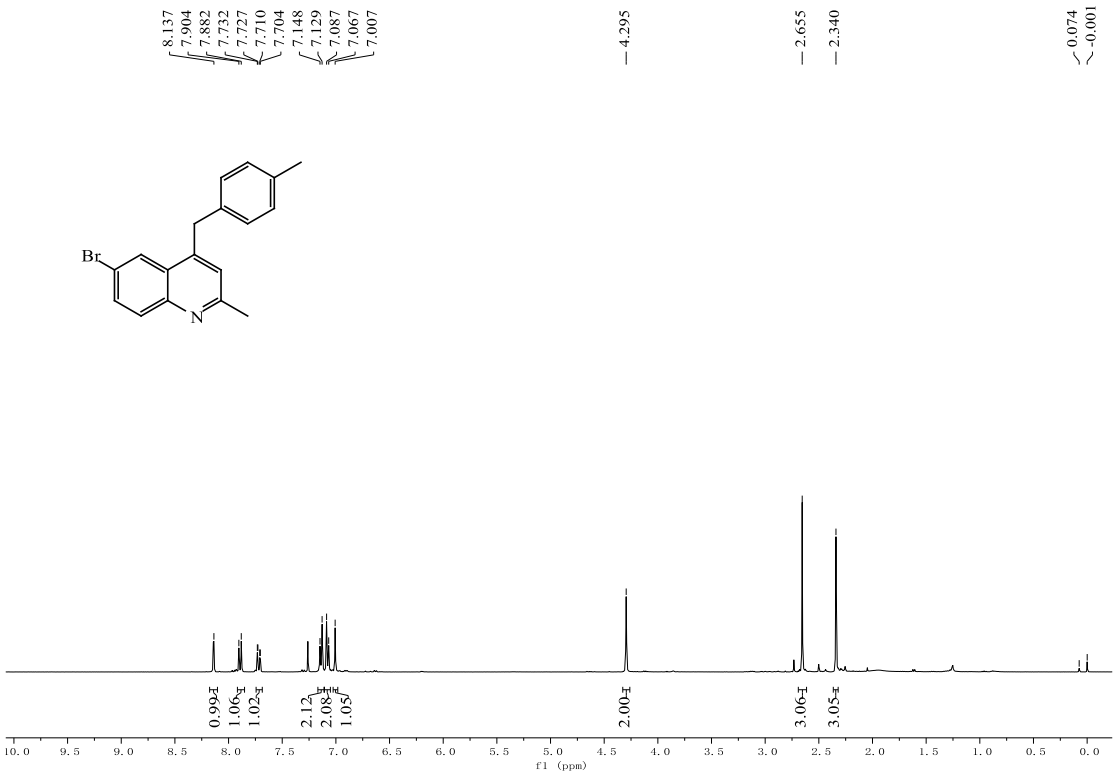


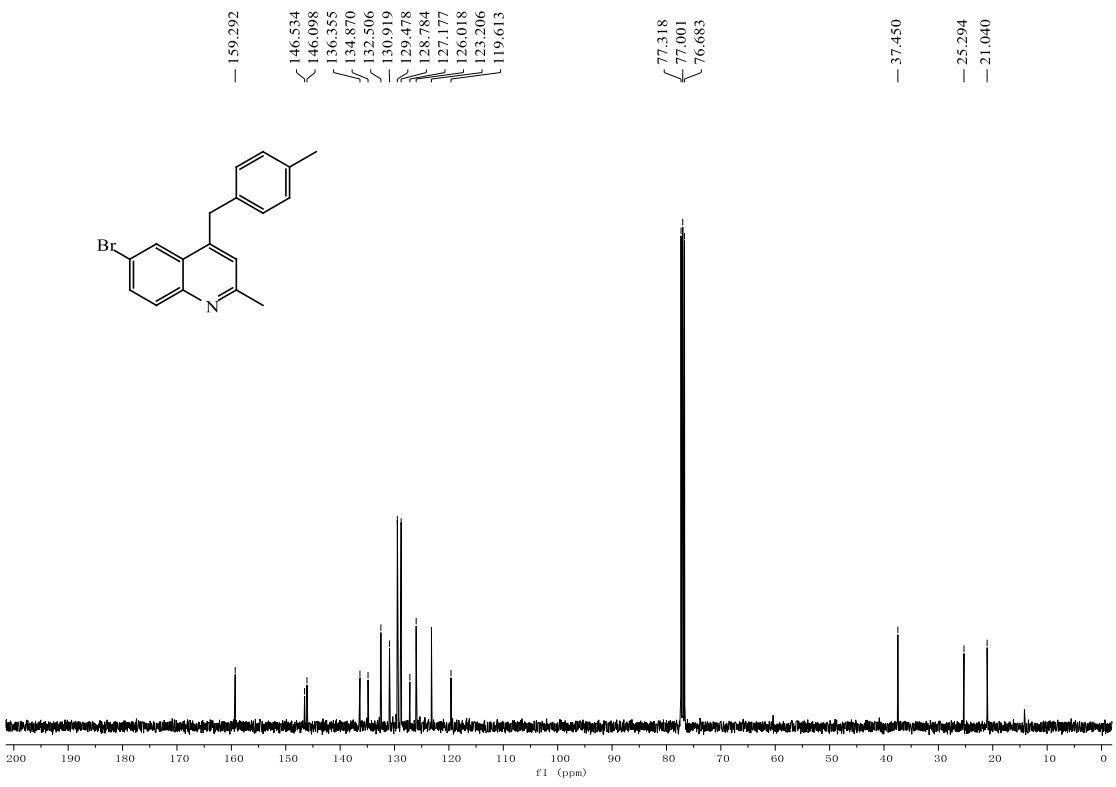


methyl 2-(4-methylbenzyl)quinoline-6-carboxylate (3ra)

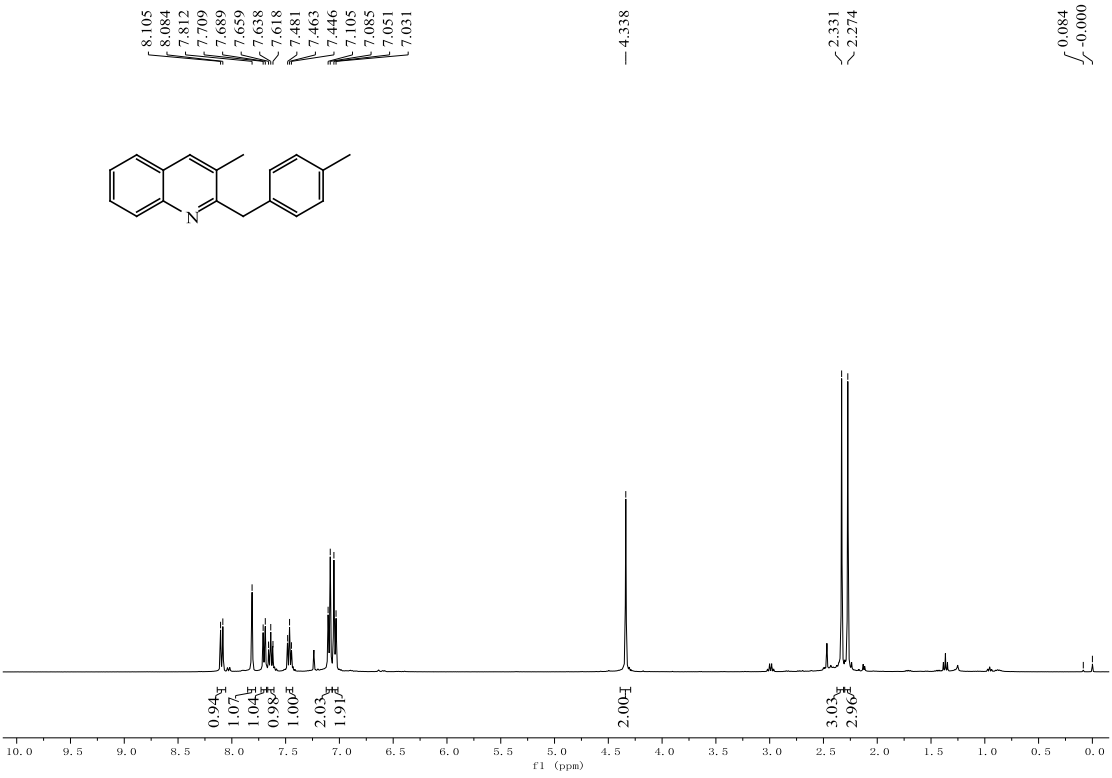


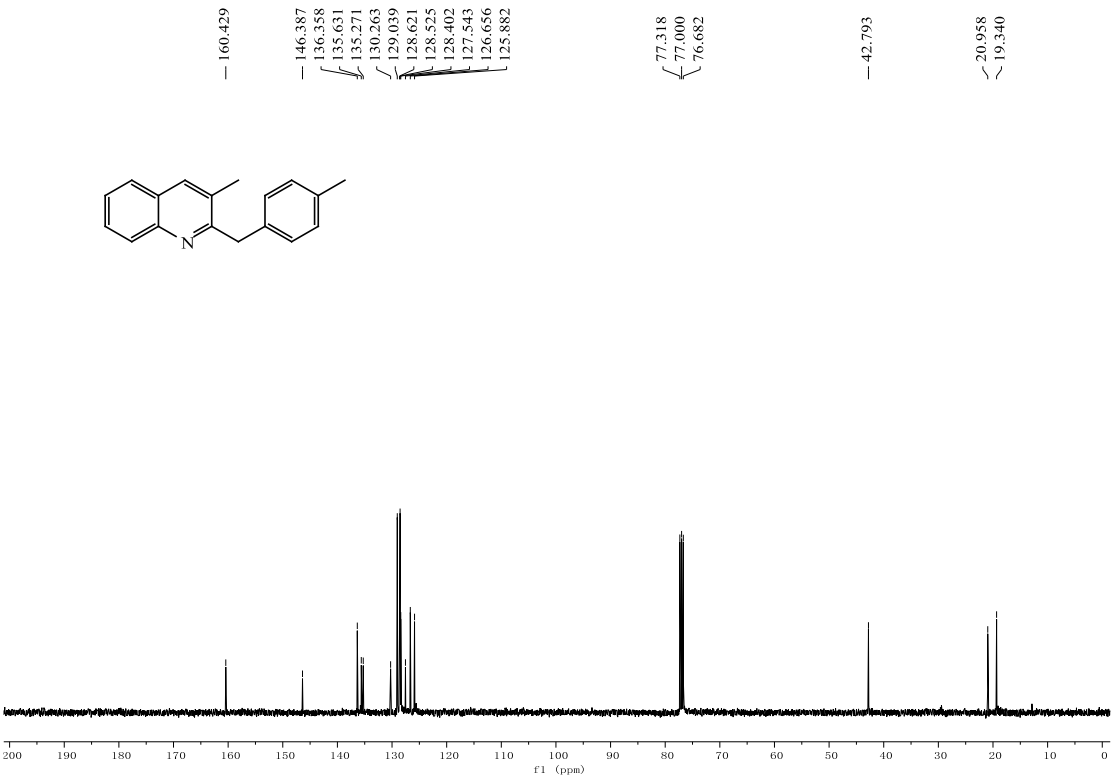
6-bromo-2-methyl-4-(4-methylbenzyl)quinoline (3sa)



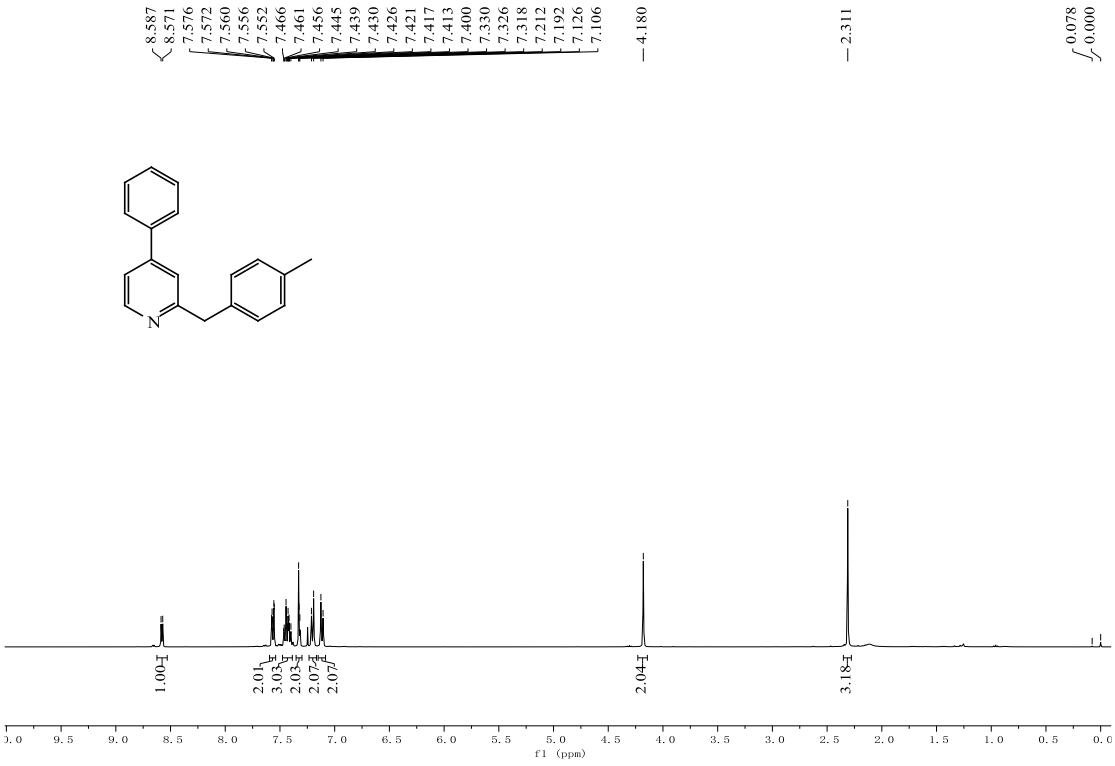


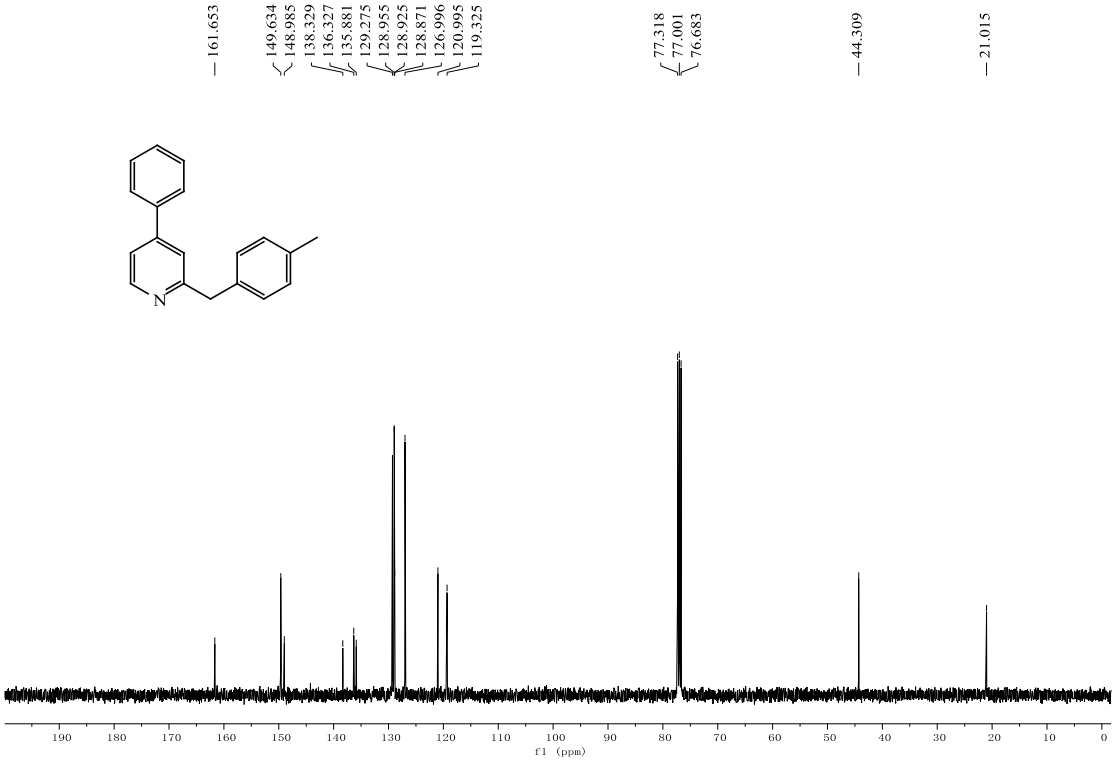
3-methyl-2-(4-methylbenzyl)quinoline (3ta)



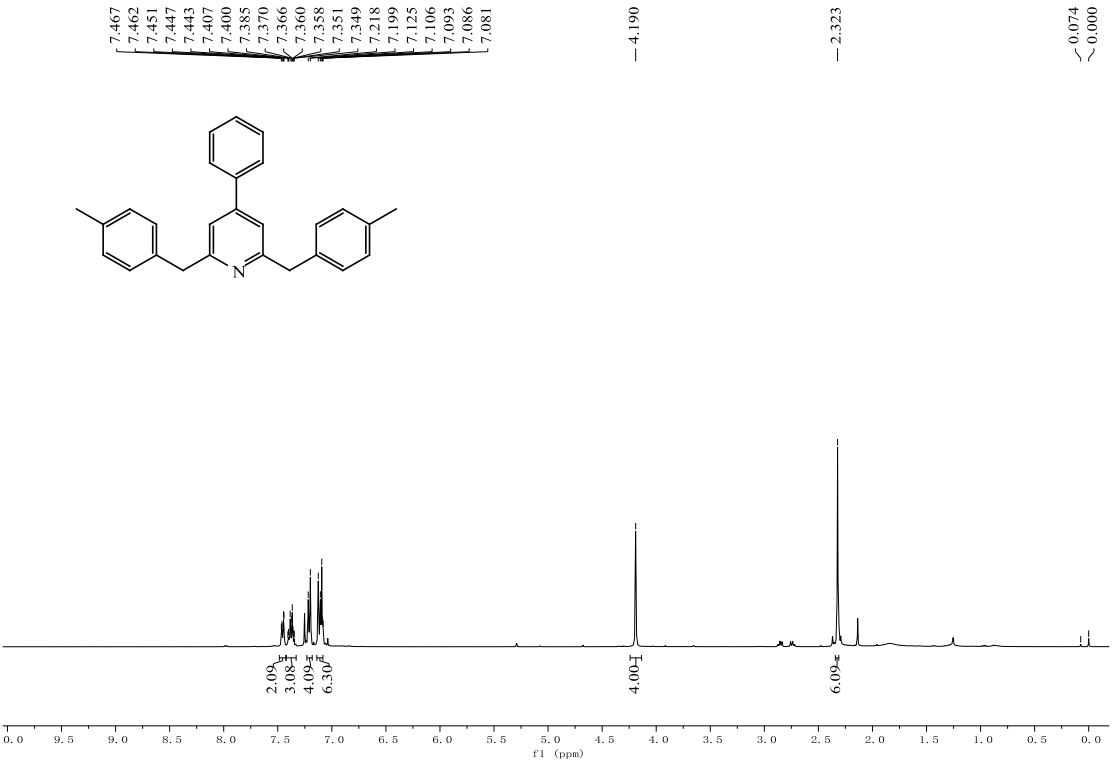


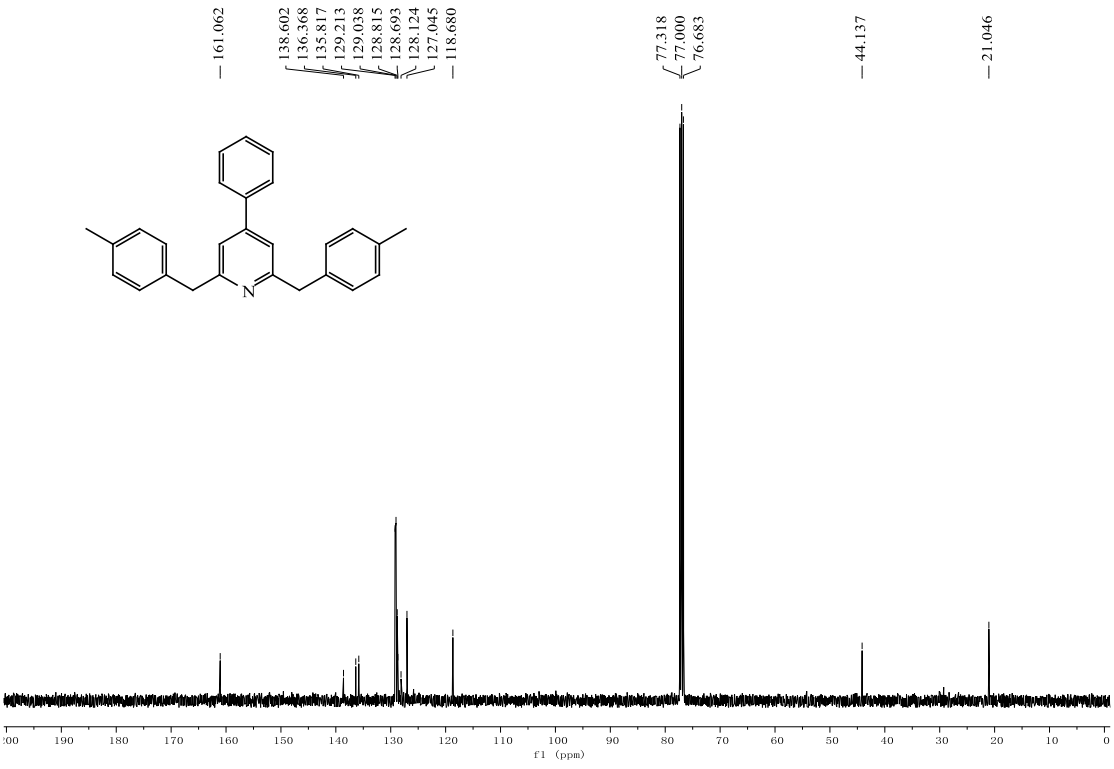
2-(4-methylbenzyl)-4-phenylpyridine (3ua)



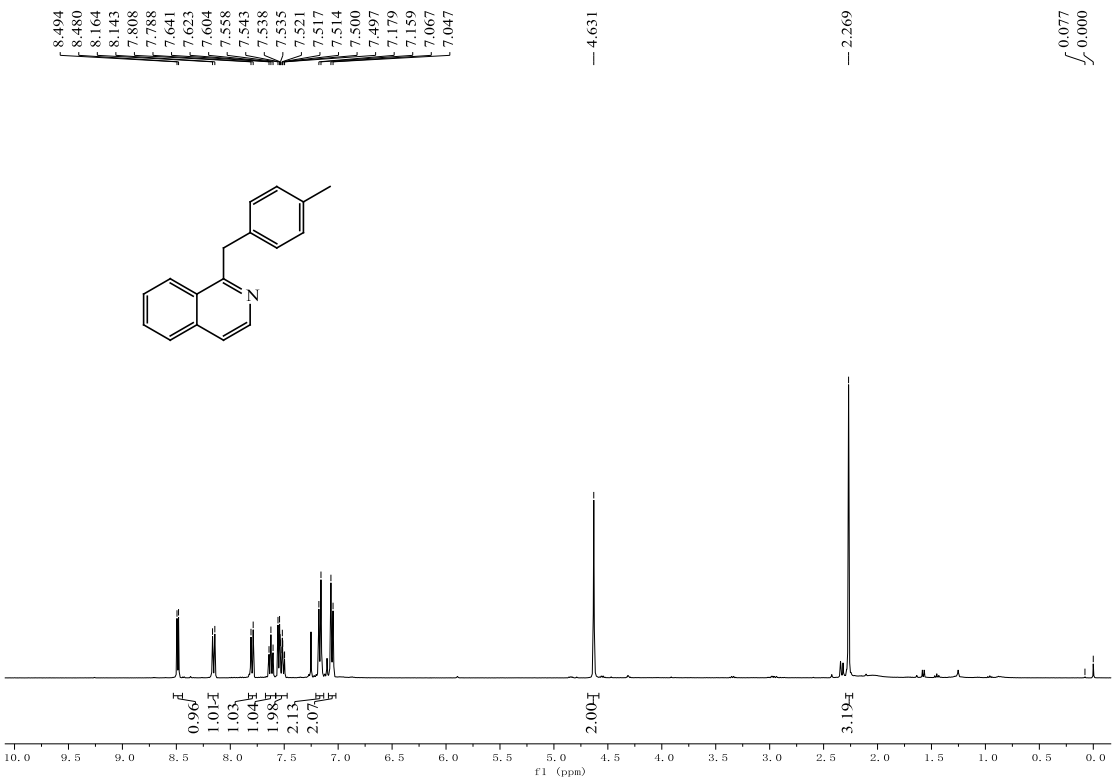


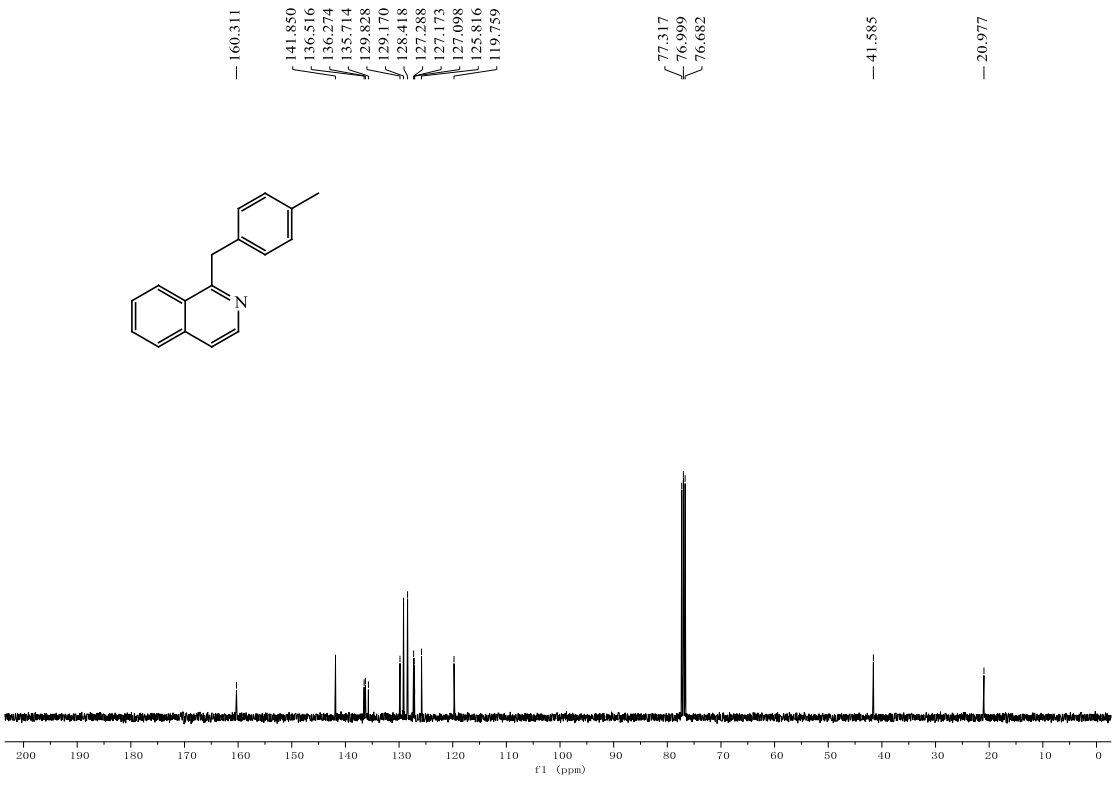
2,6-bis(4-methylbenzyl)-4-phenylpyridine (3ua')



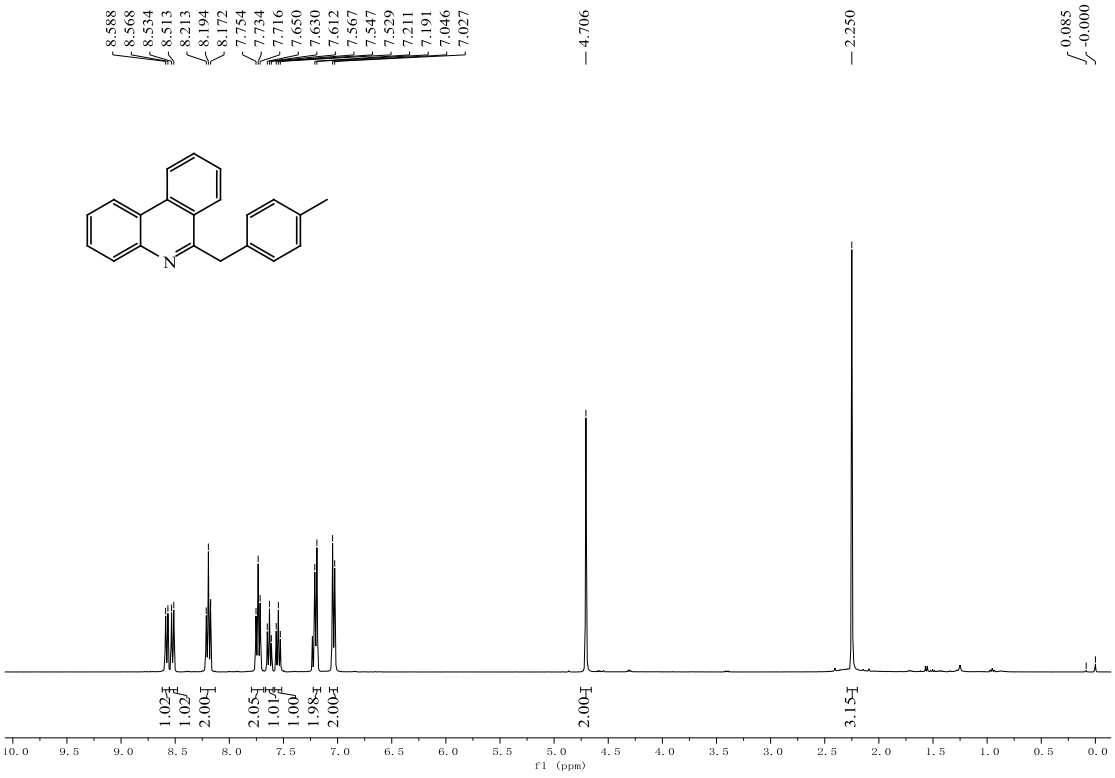


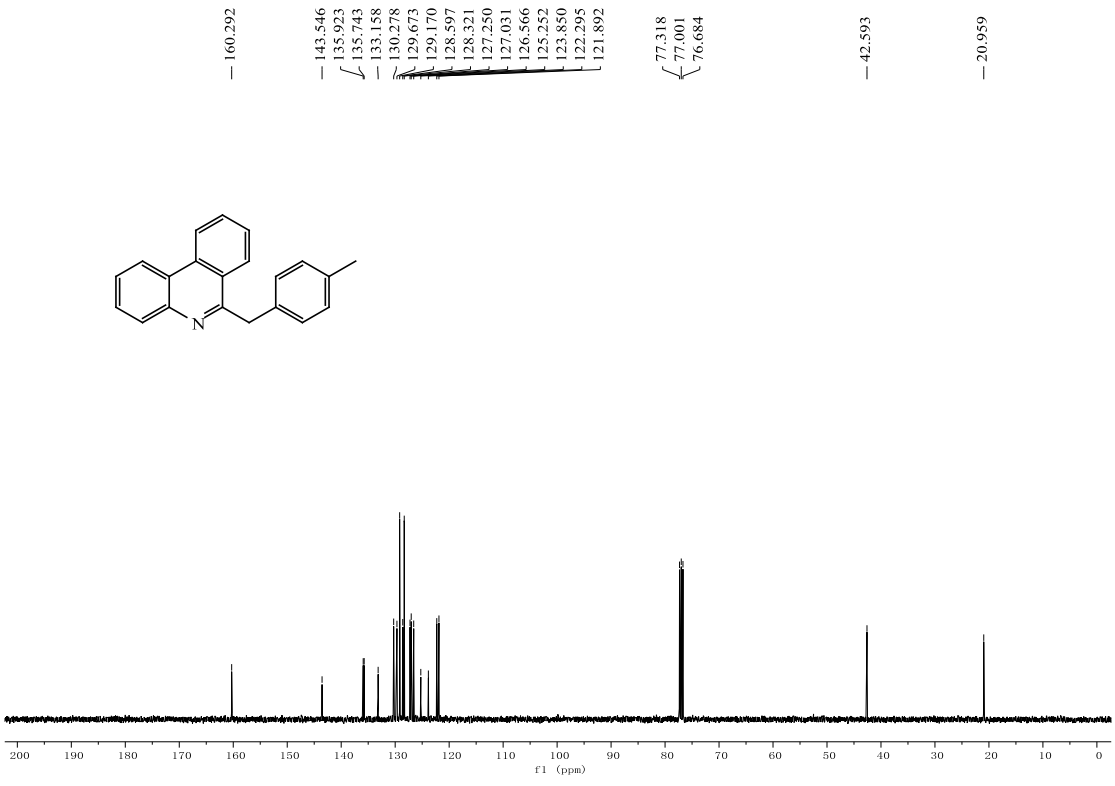
1-(4-methylbenzyl)isoquinoline (3va)



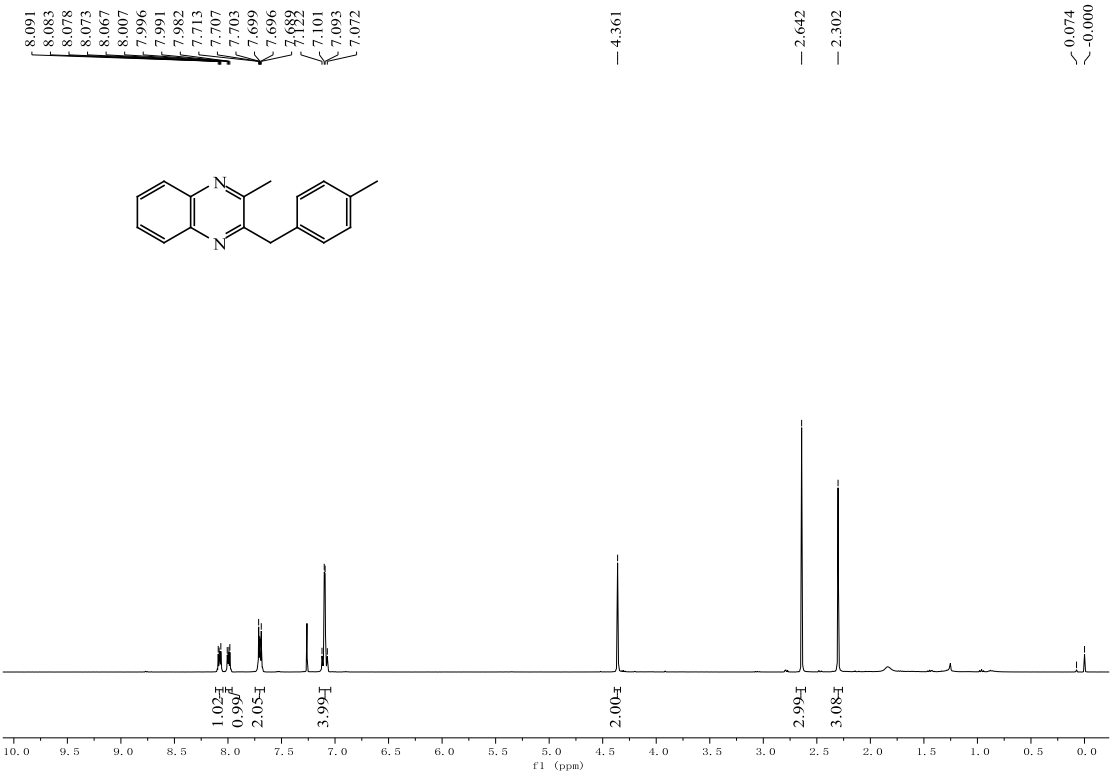


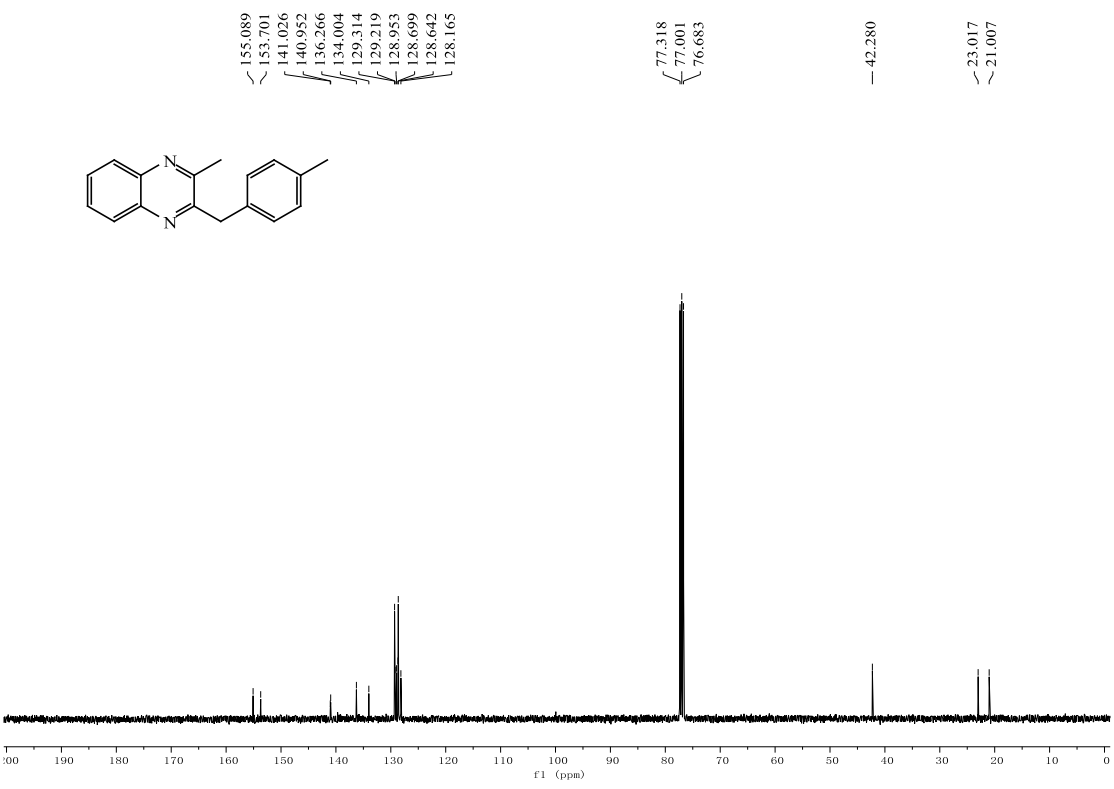
6-(4-methylbenzyl)phenanthridine (3wa)



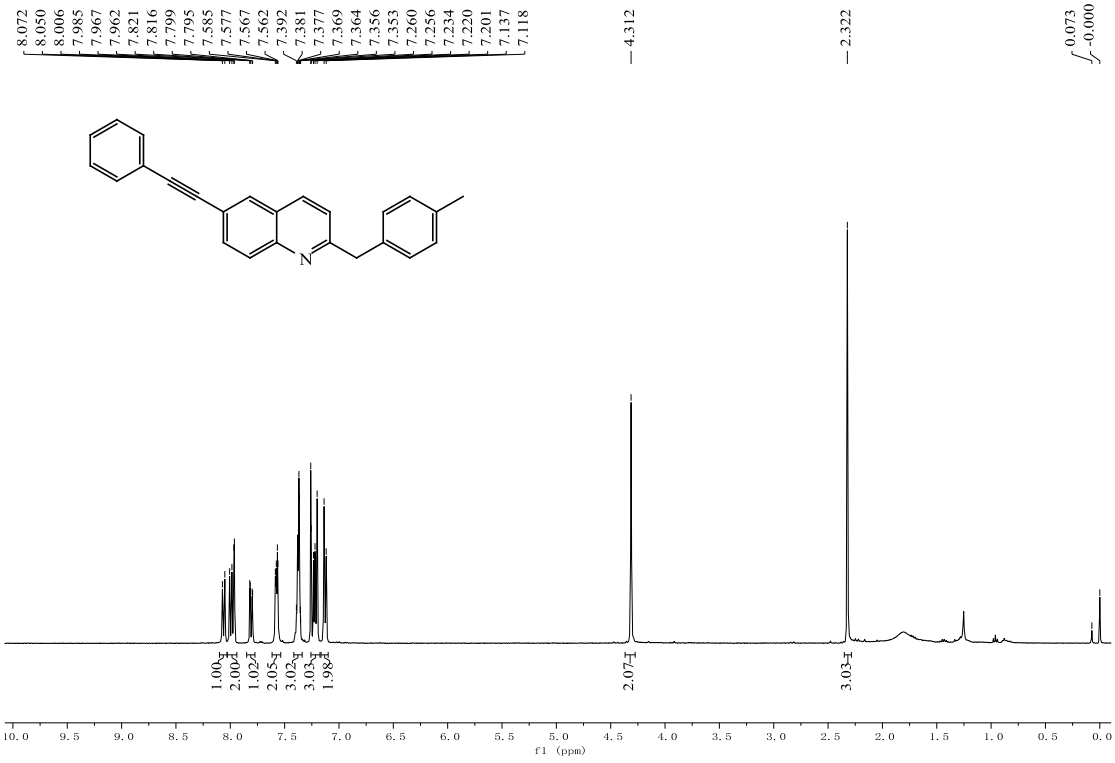


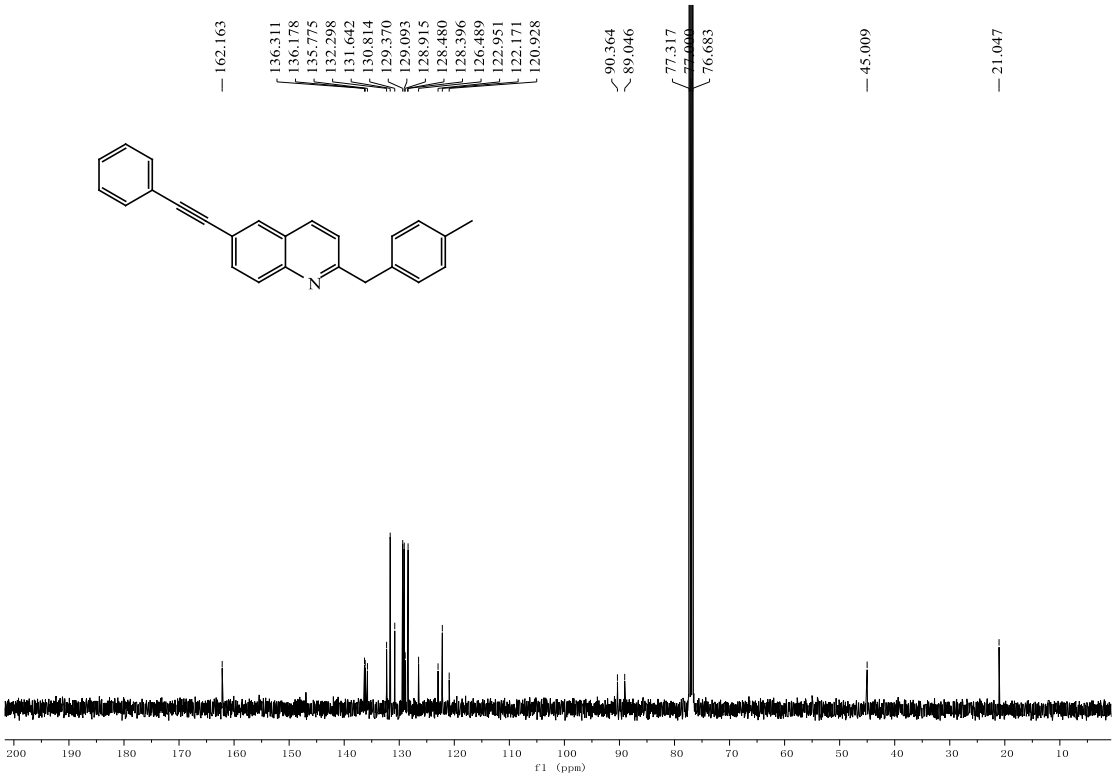
2-methyl-3-(4-methylbenzyl)quinoxaline (3xa)



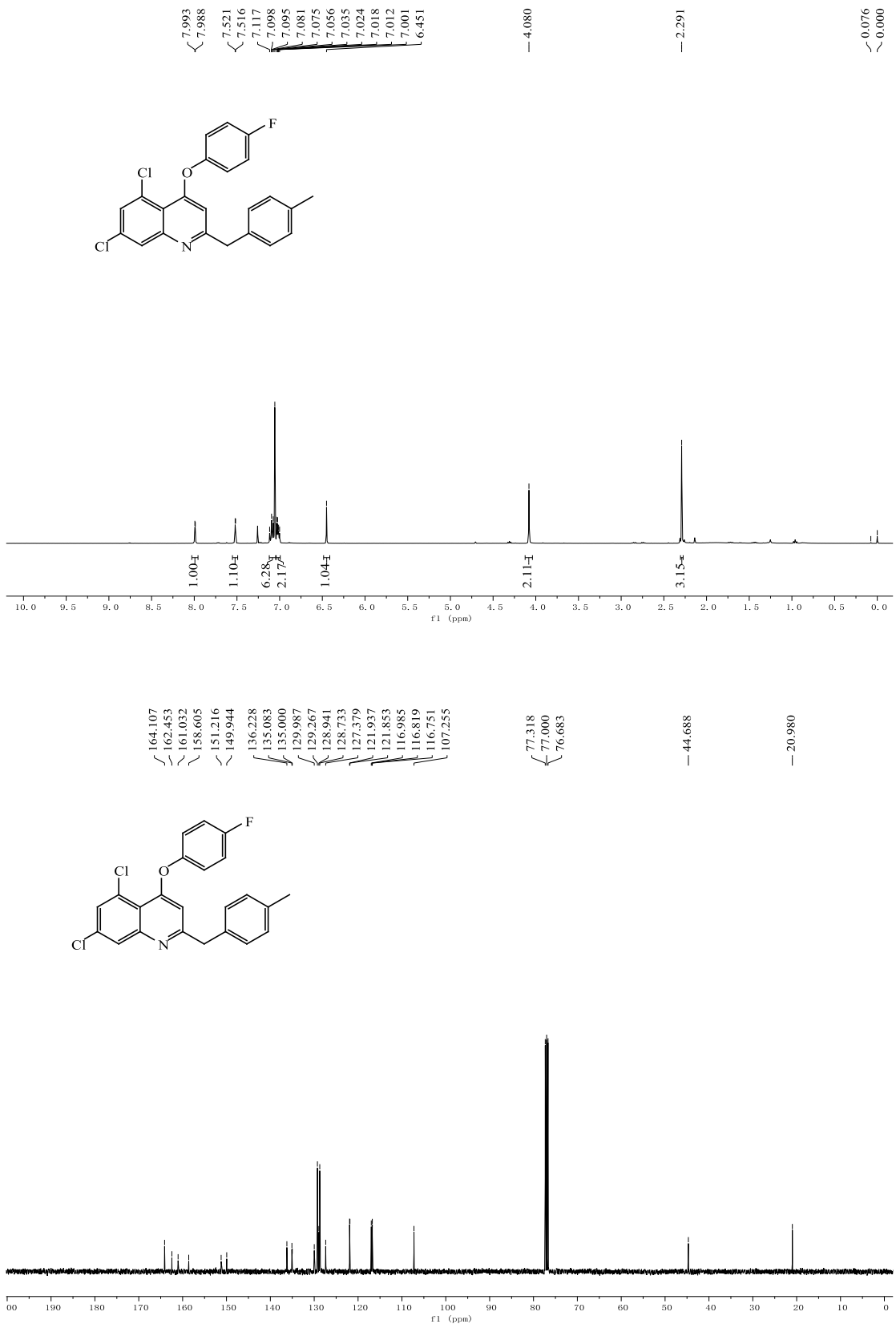


2-(4-methylbenzyl)-6-(phenylethynyl)quinoline (3ya)

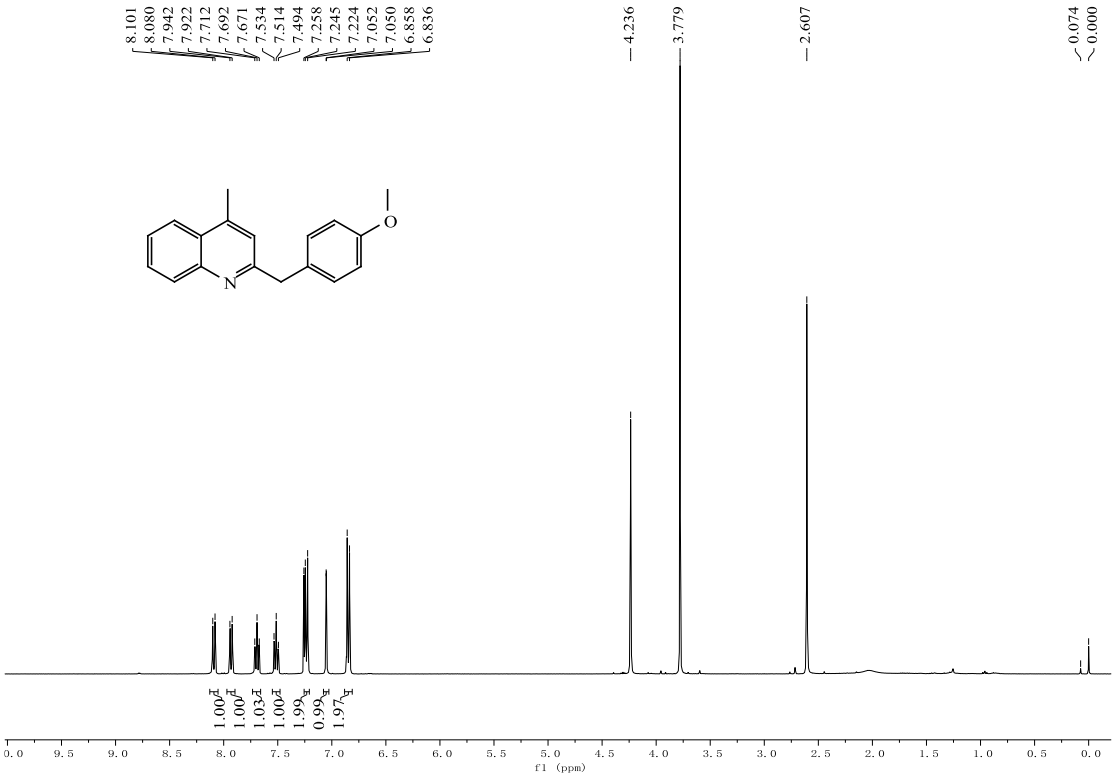


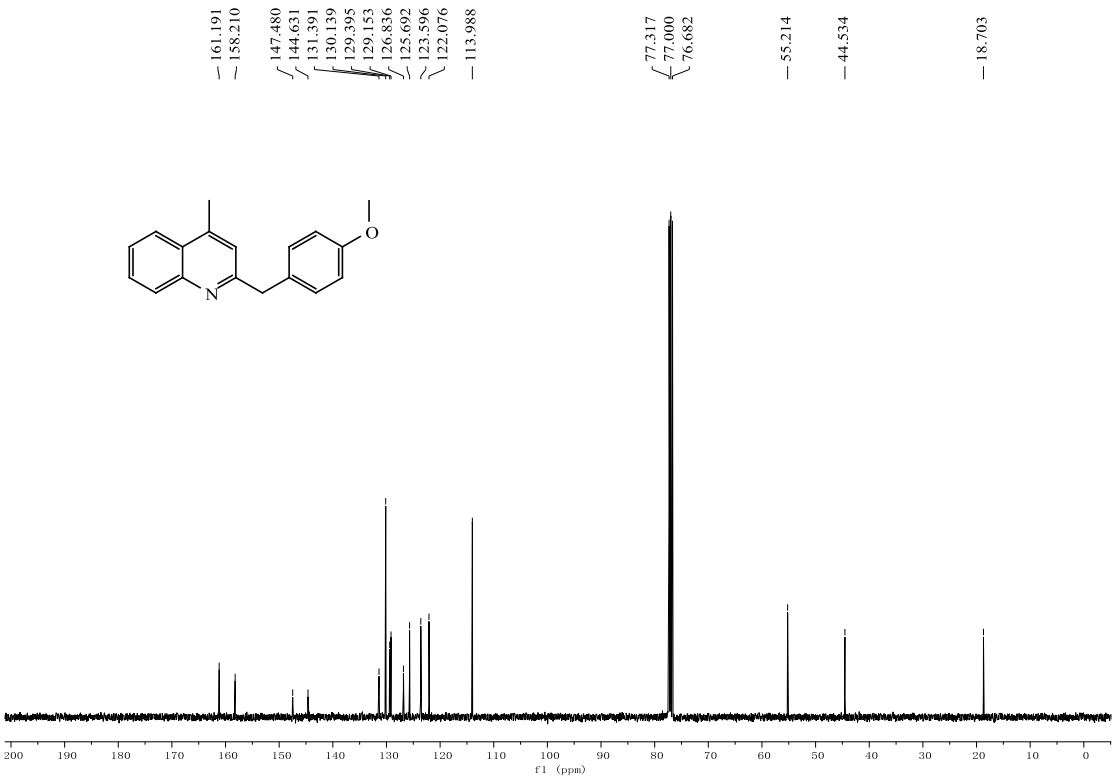


5,7-dichloro-4-(4-fluorophenoxy)-2-(4-methylbenzyl)quinoline (3za)

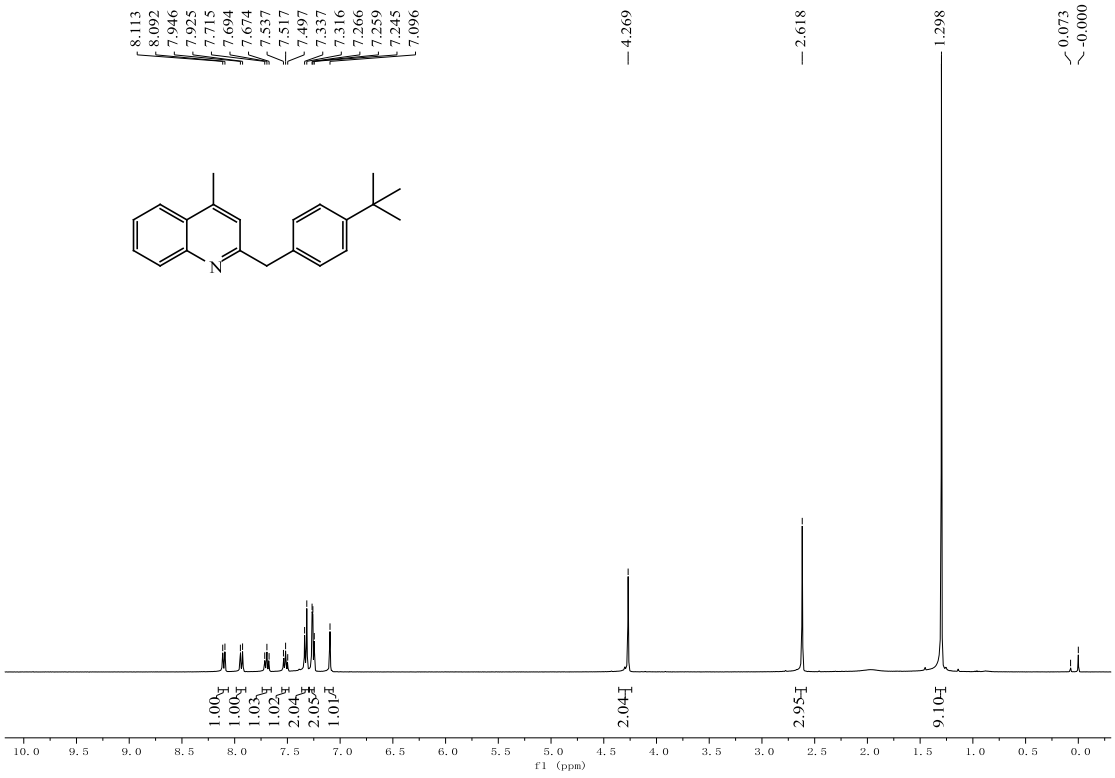


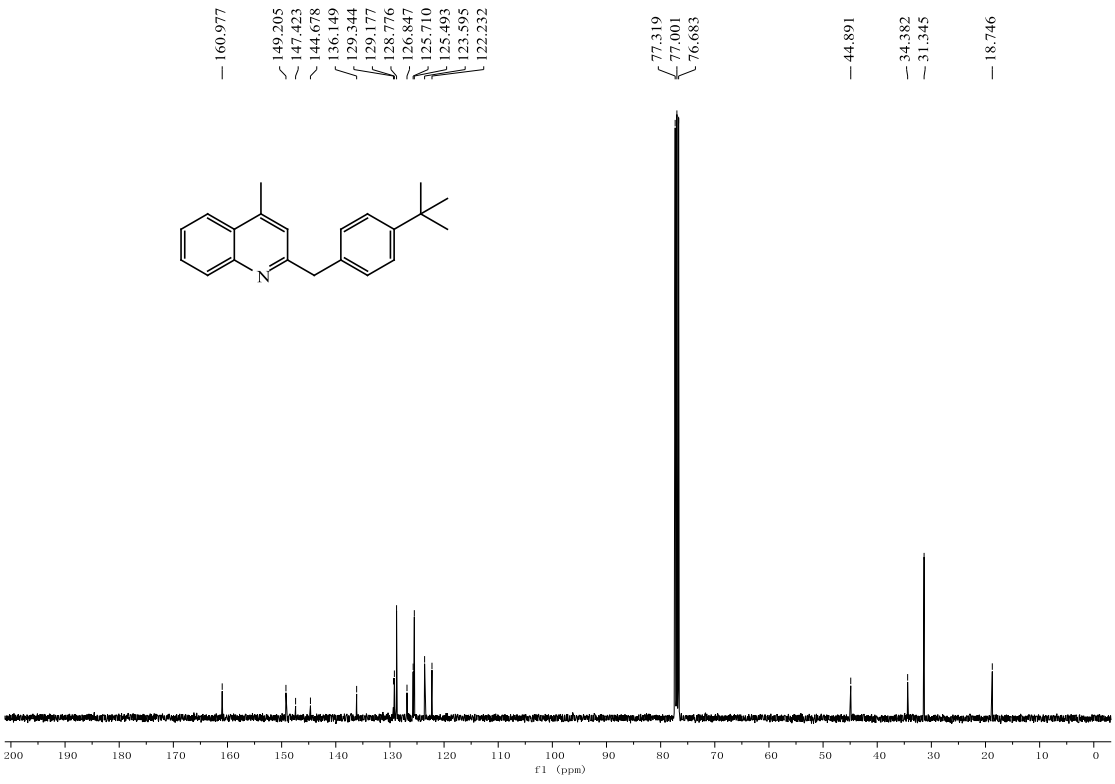
2-(4-methoxybenzyl)-4-methylquinoline (3ab)



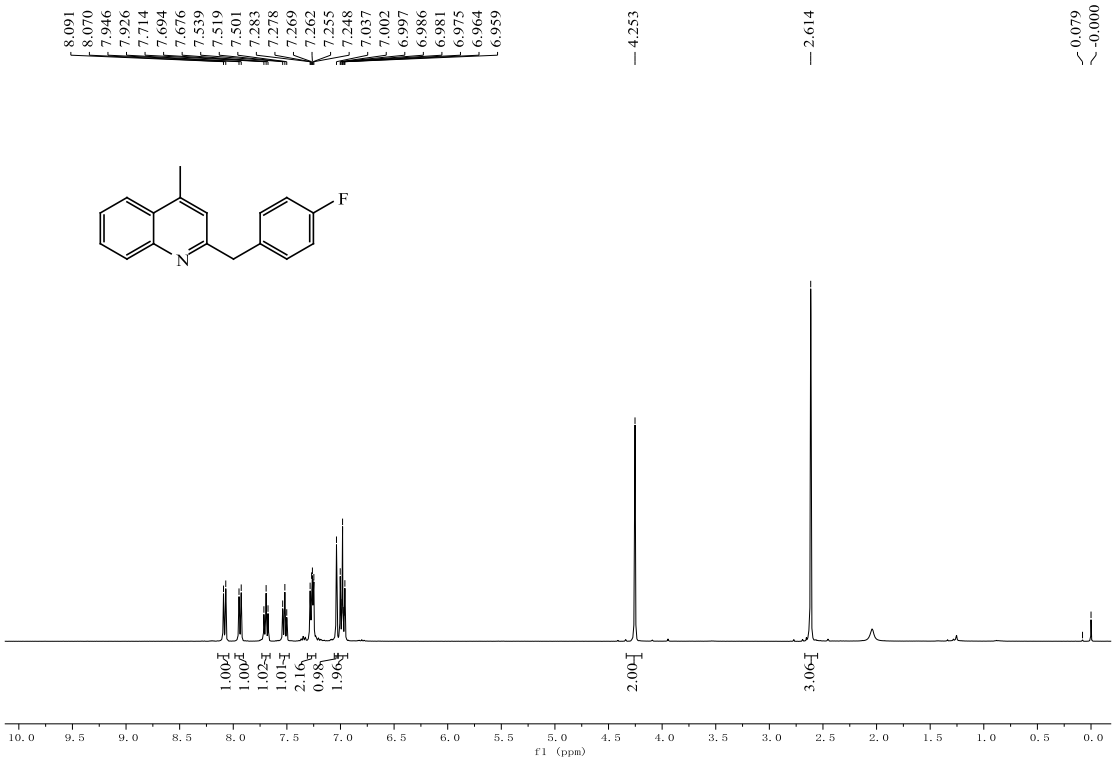


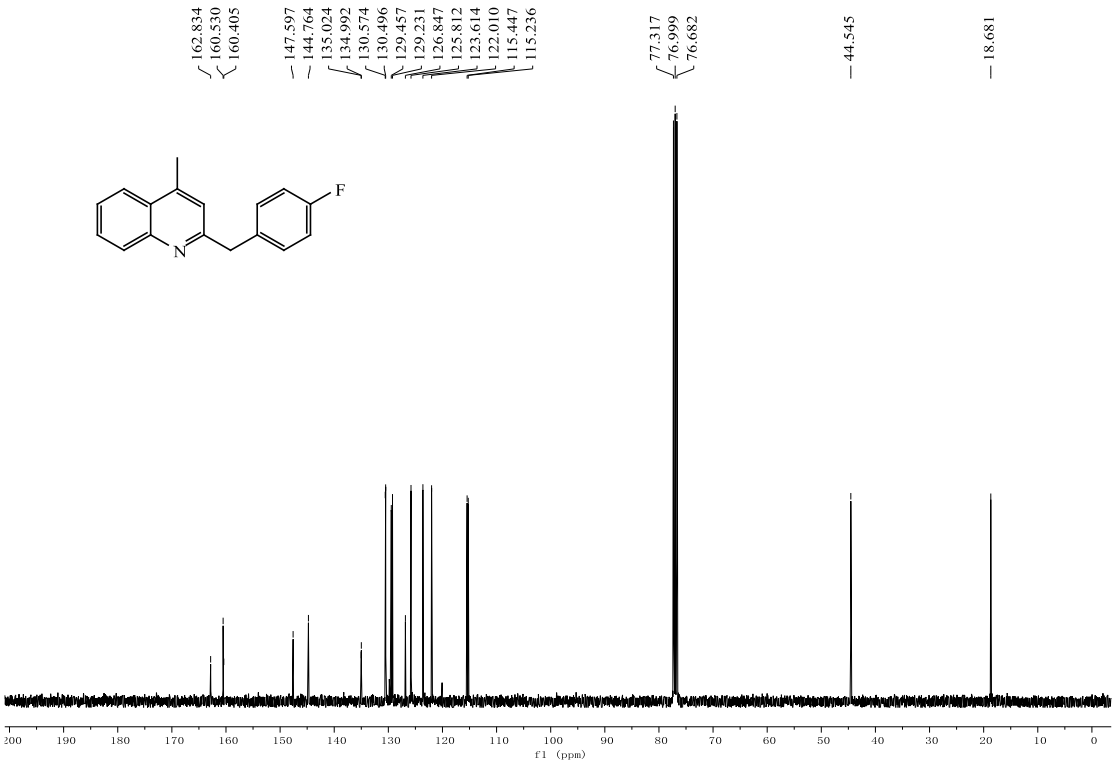
2-(4-(*tert*-butyl)benzyl)-4-methylquinoline (3ac)



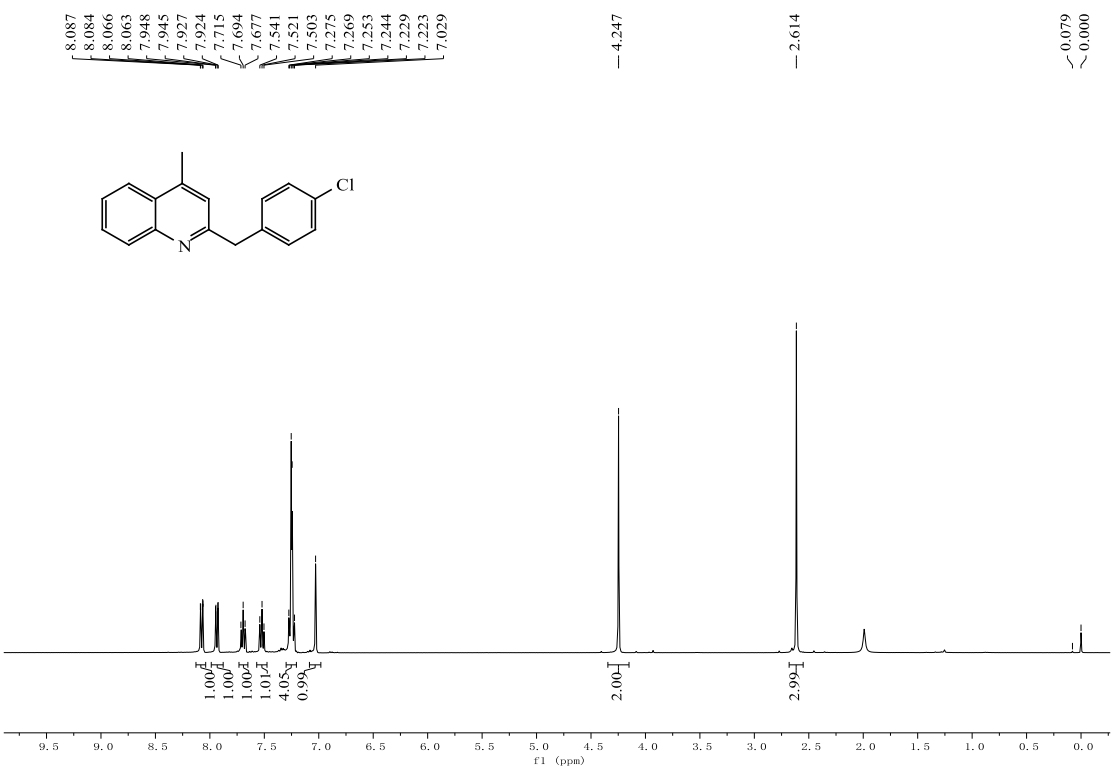


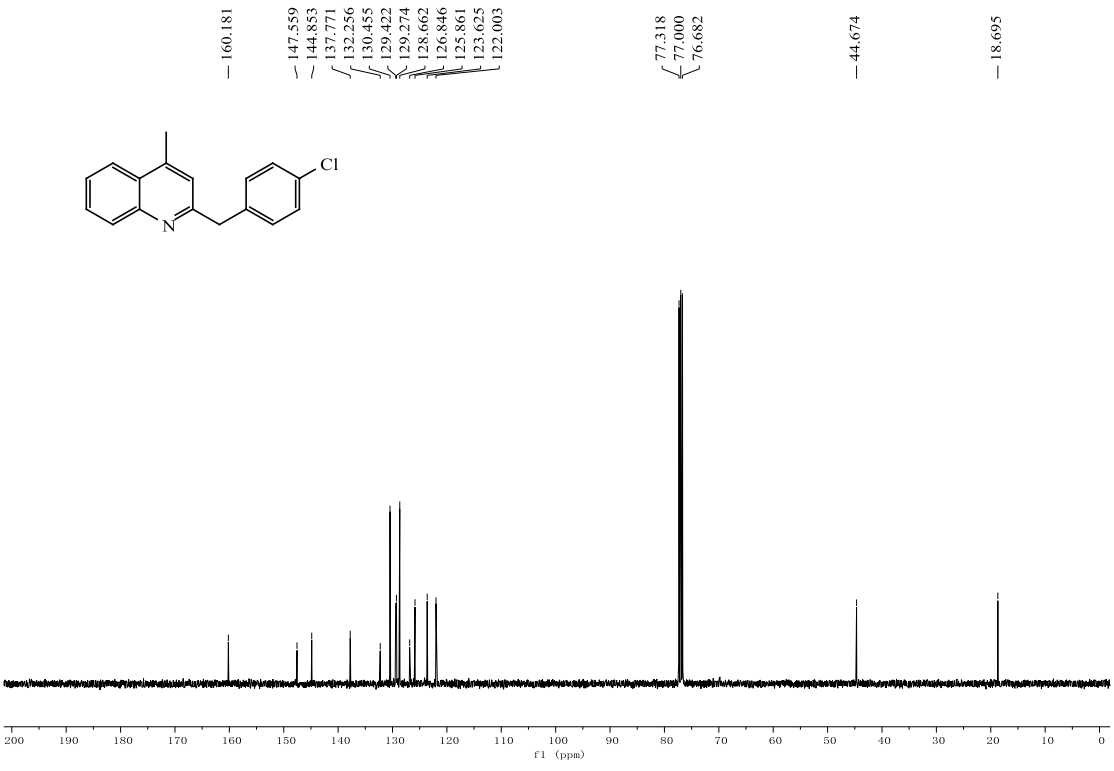
2-(4-fluorobenzyl)-4-methylquinoline (3ad)



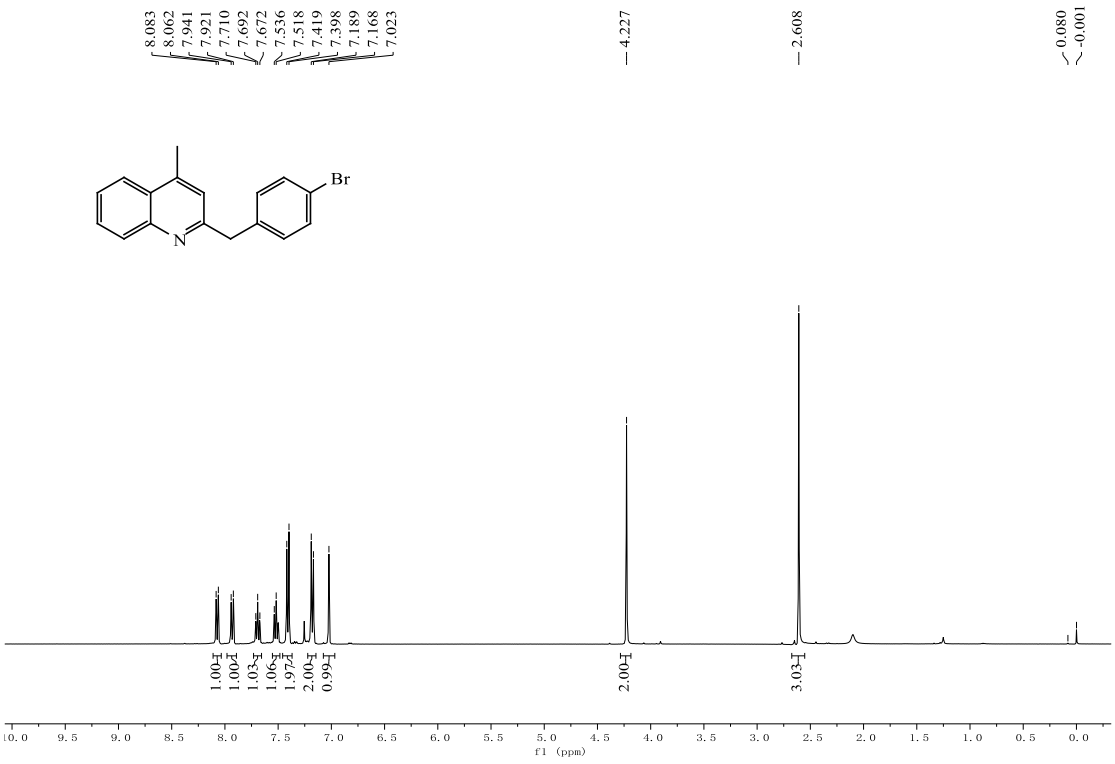


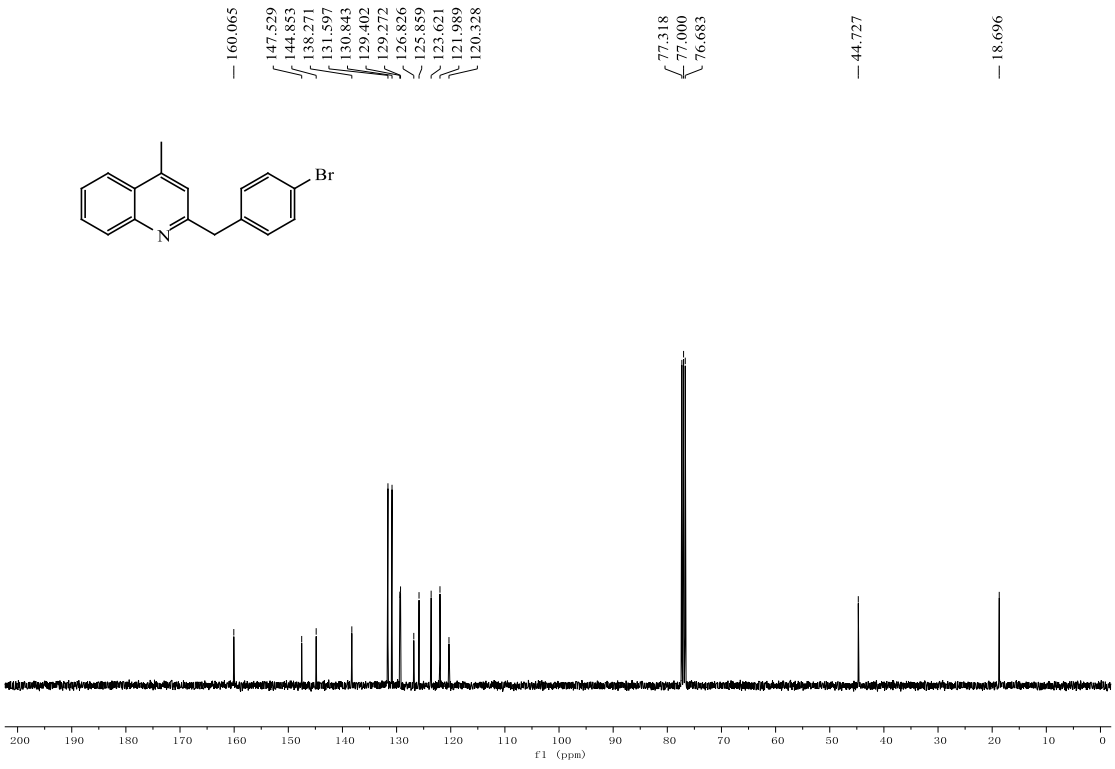
2-(4-chlorobenzyl)-4-methylquinoline (3ae)



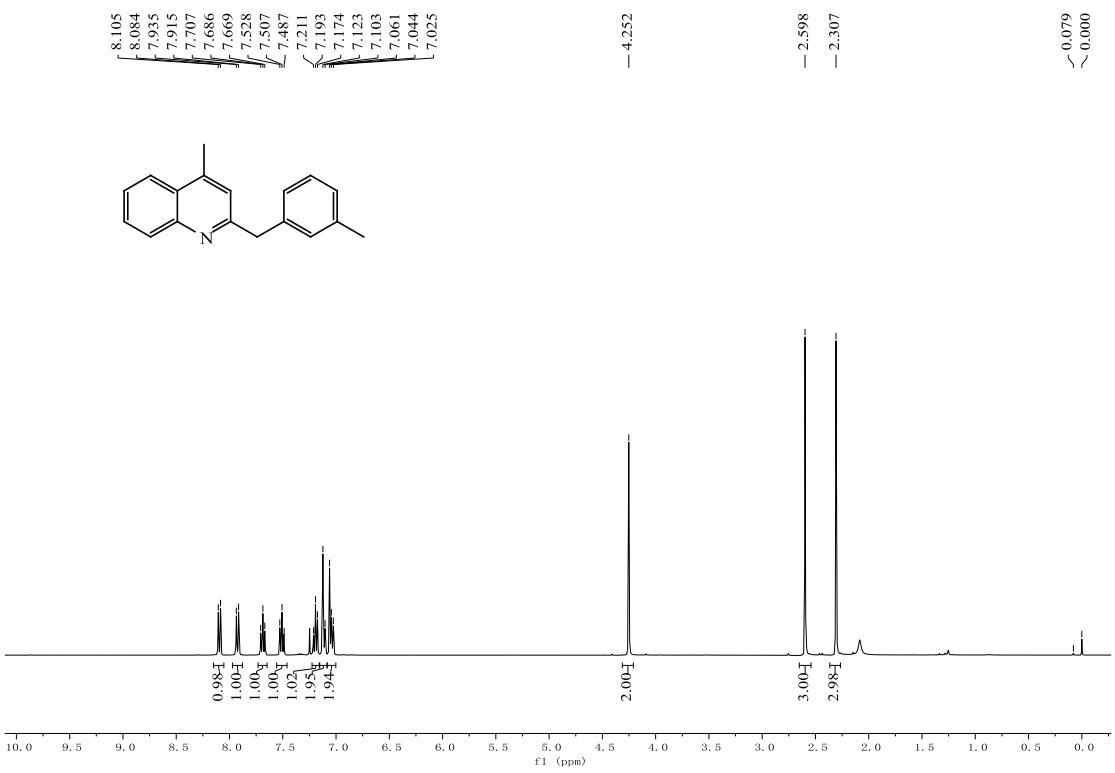


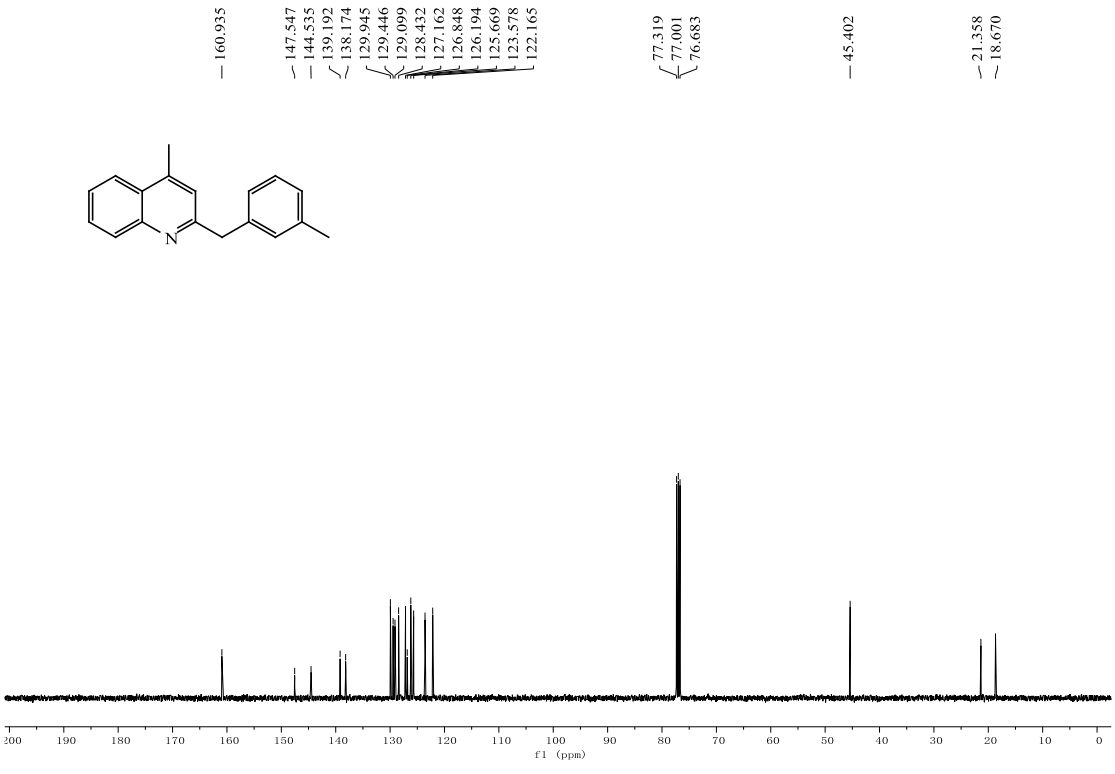
2-(4-bromobenzyl)-4-methylquinoline (3af)



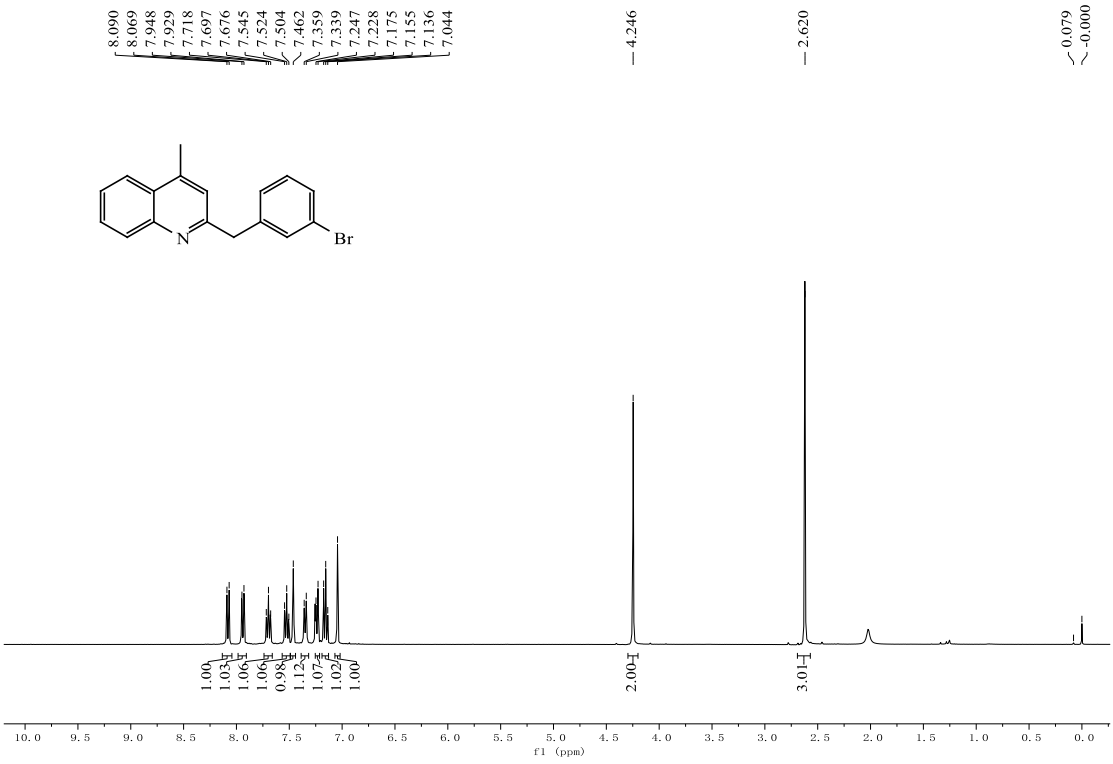


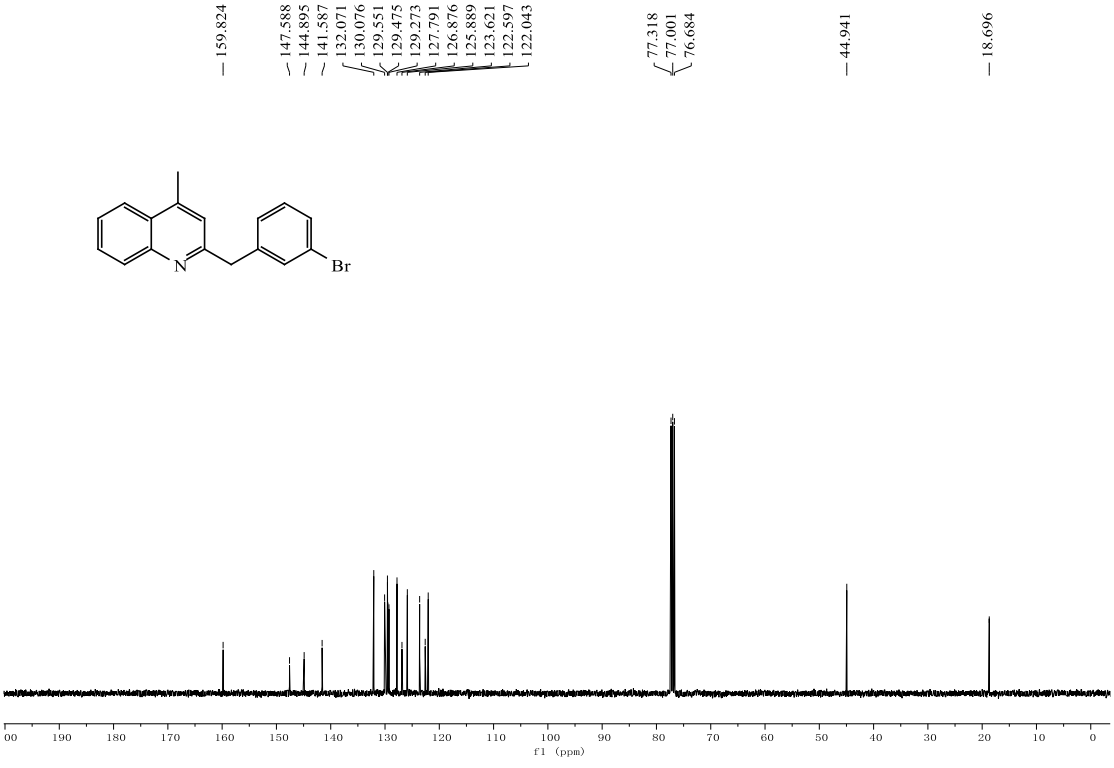
4-methyl-2-(3-methylbenzyl)quinoline (3ag)



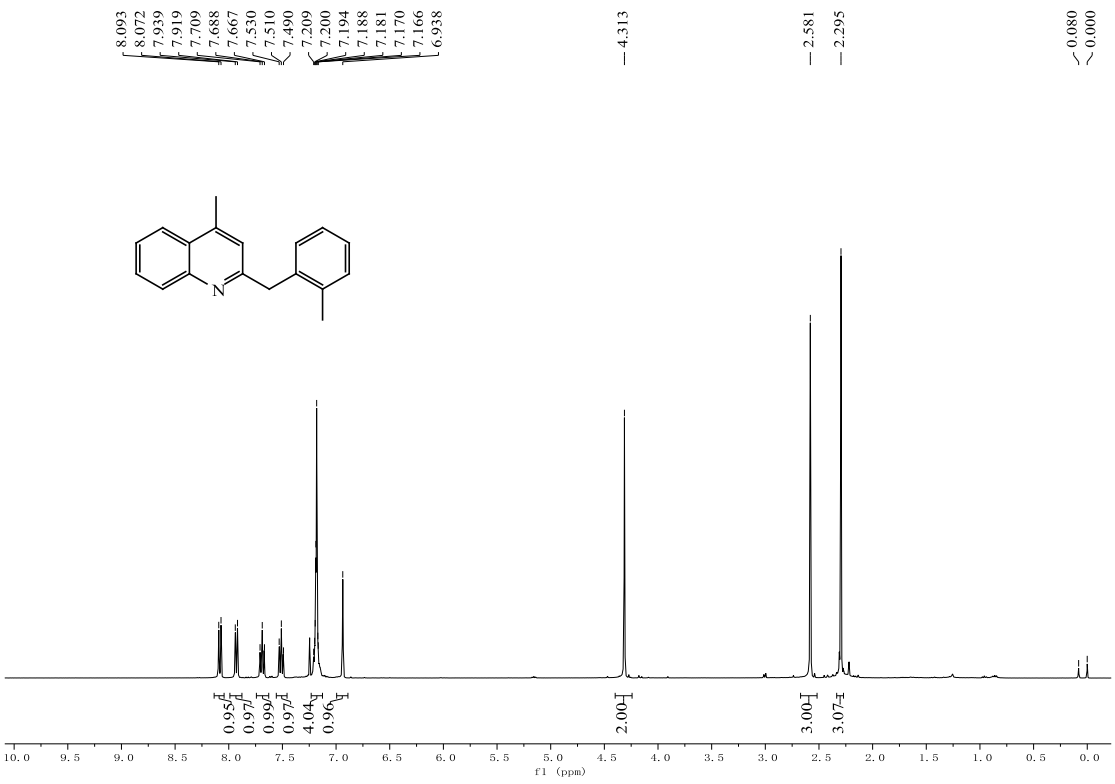


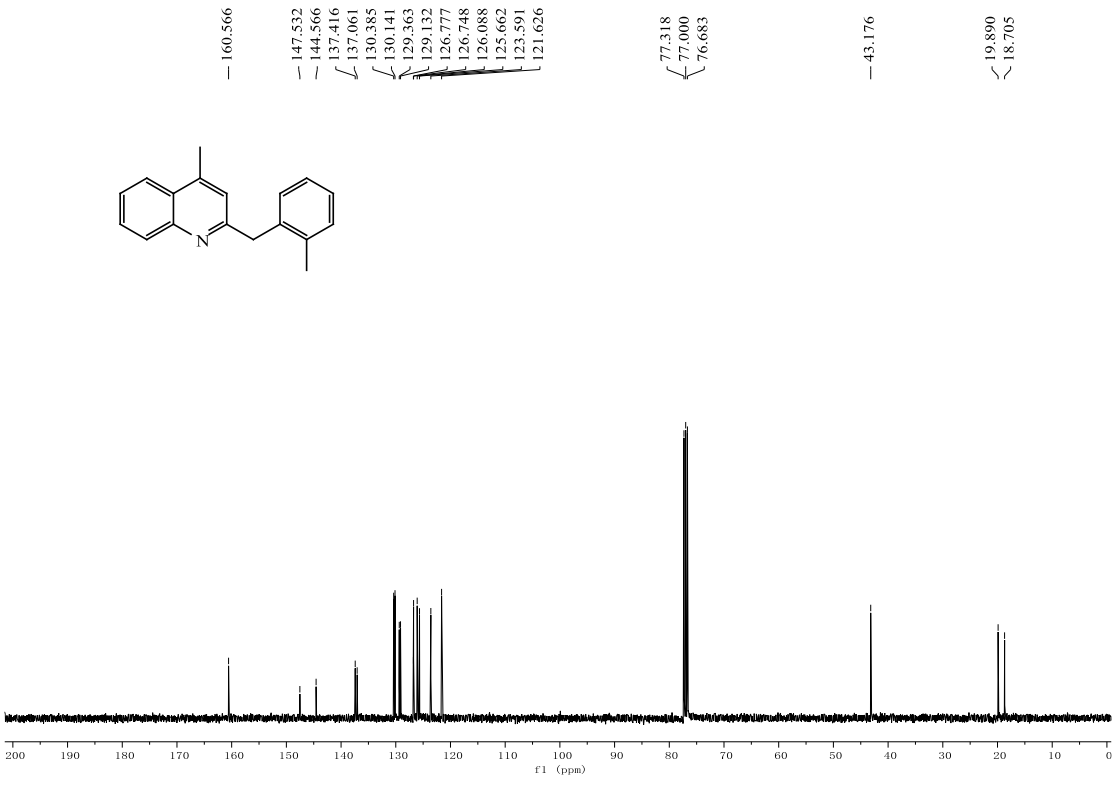
2-(3-bromobenzyl)-4-methylquinoline (3ah)



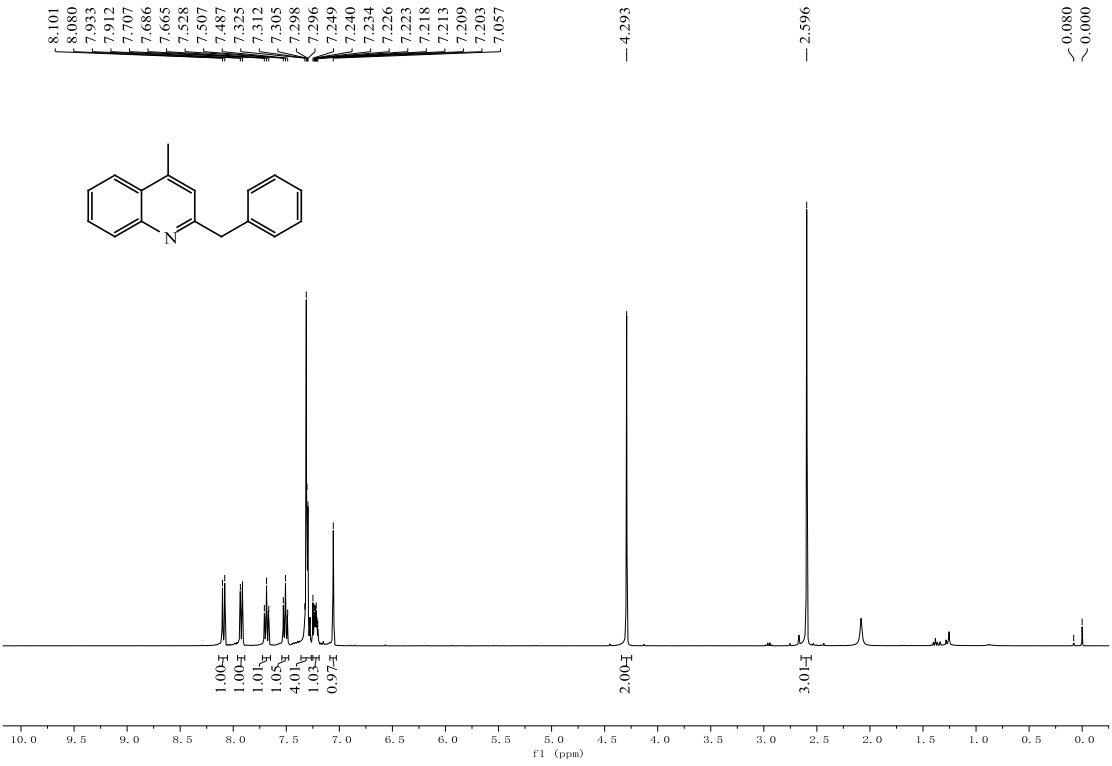


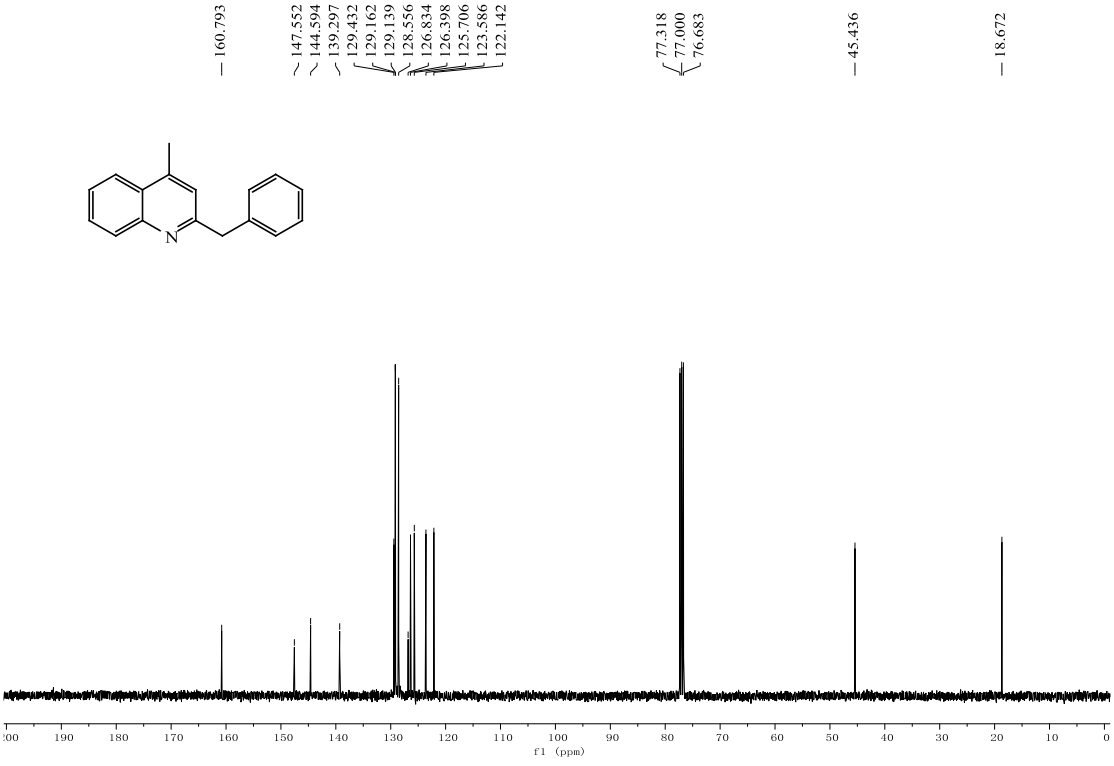
4-methyl-2-(2-methylbenzyl)quinoline (3ai)



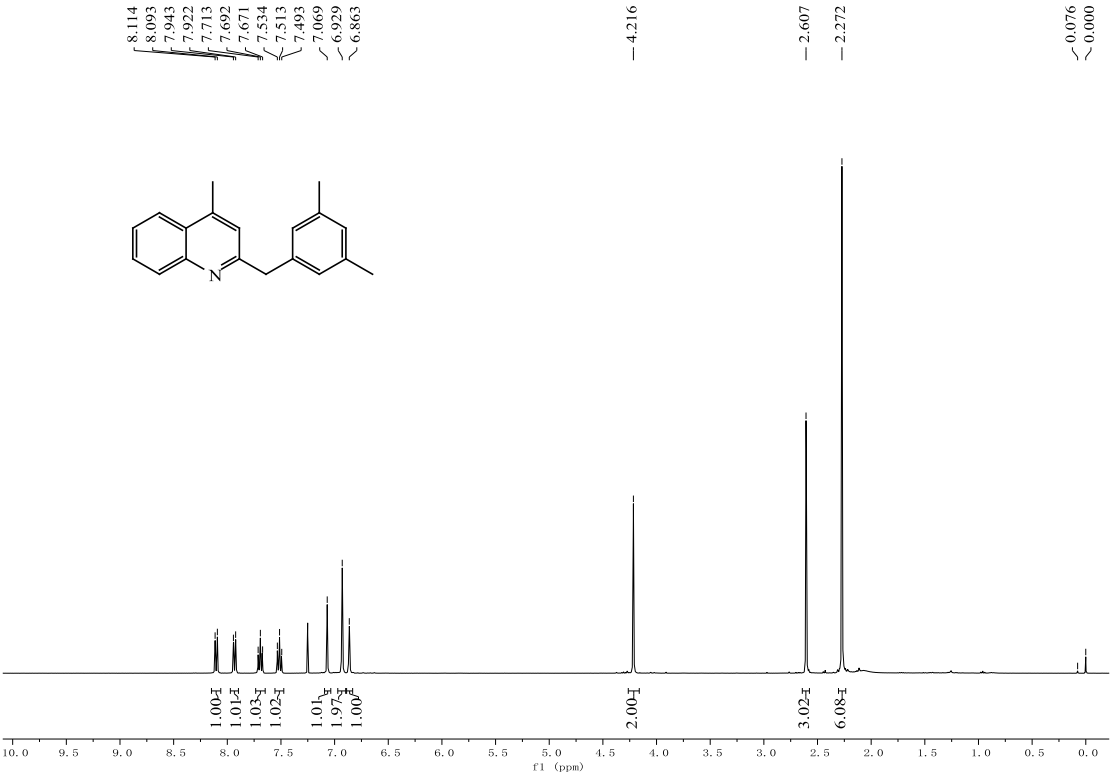


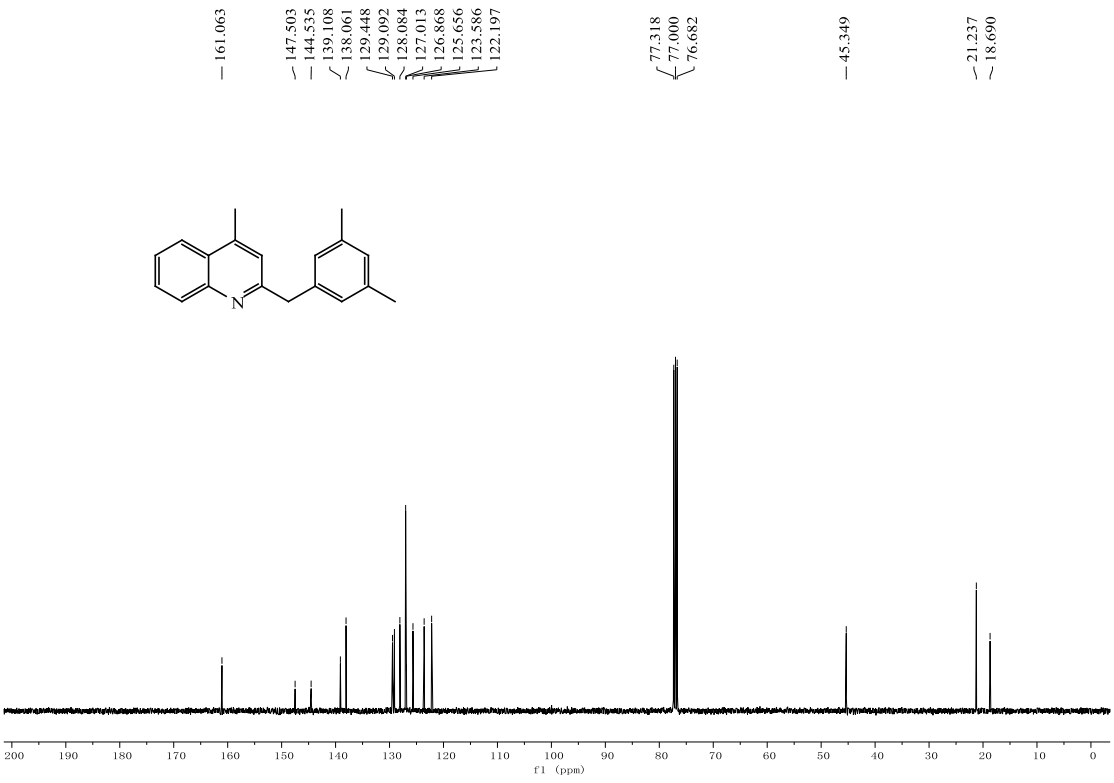
2-benzyl-4-methylquinoline (3aj)



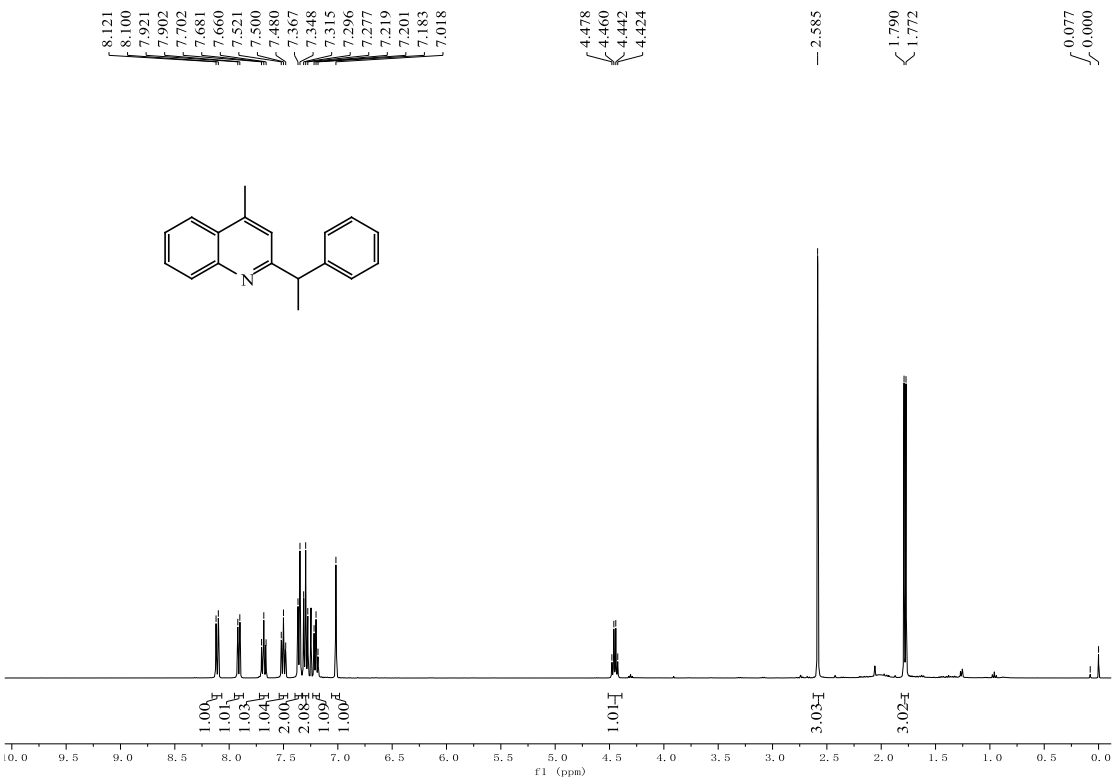


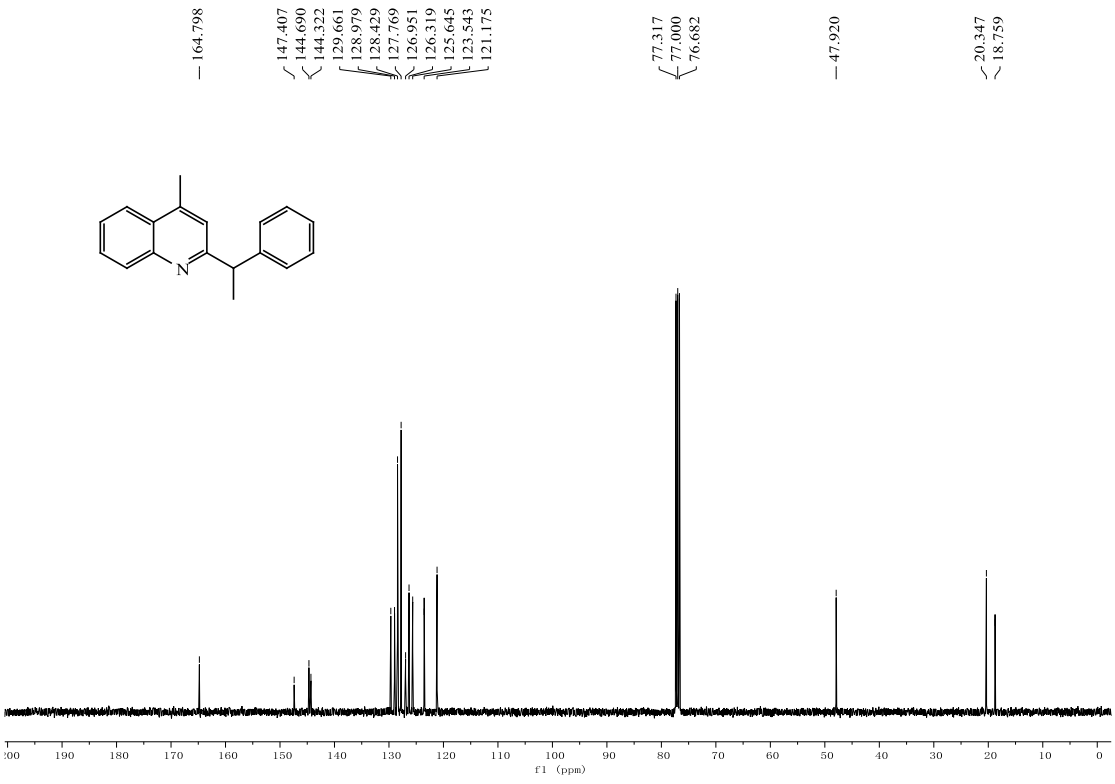
2-(3,5-dimethylbenzyl)-4-methylquinoline (3ak)



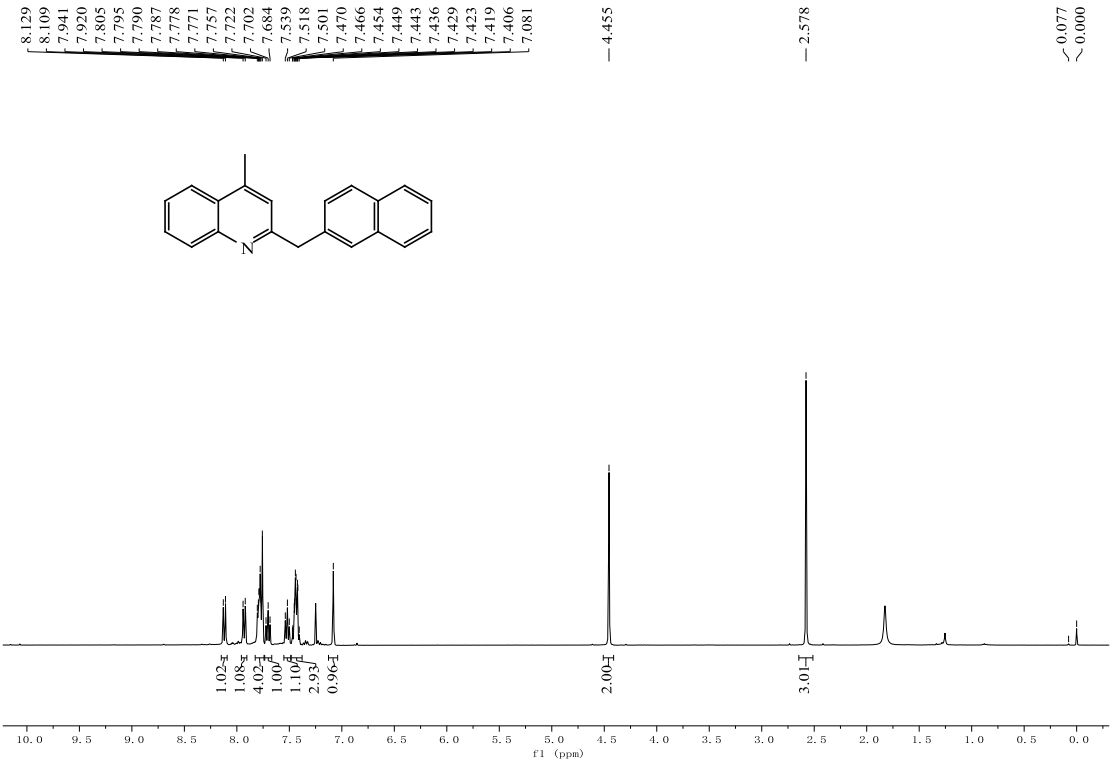


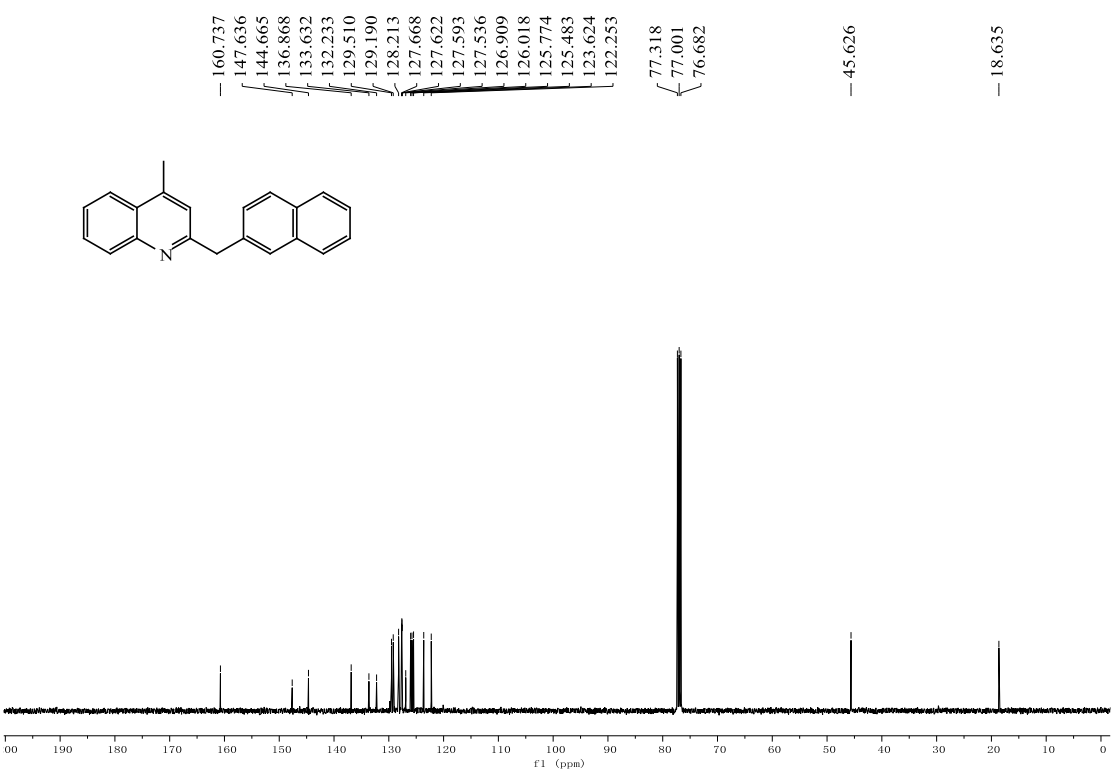
4-methyl-2-(1-phenylethyl)quinoline (3al)



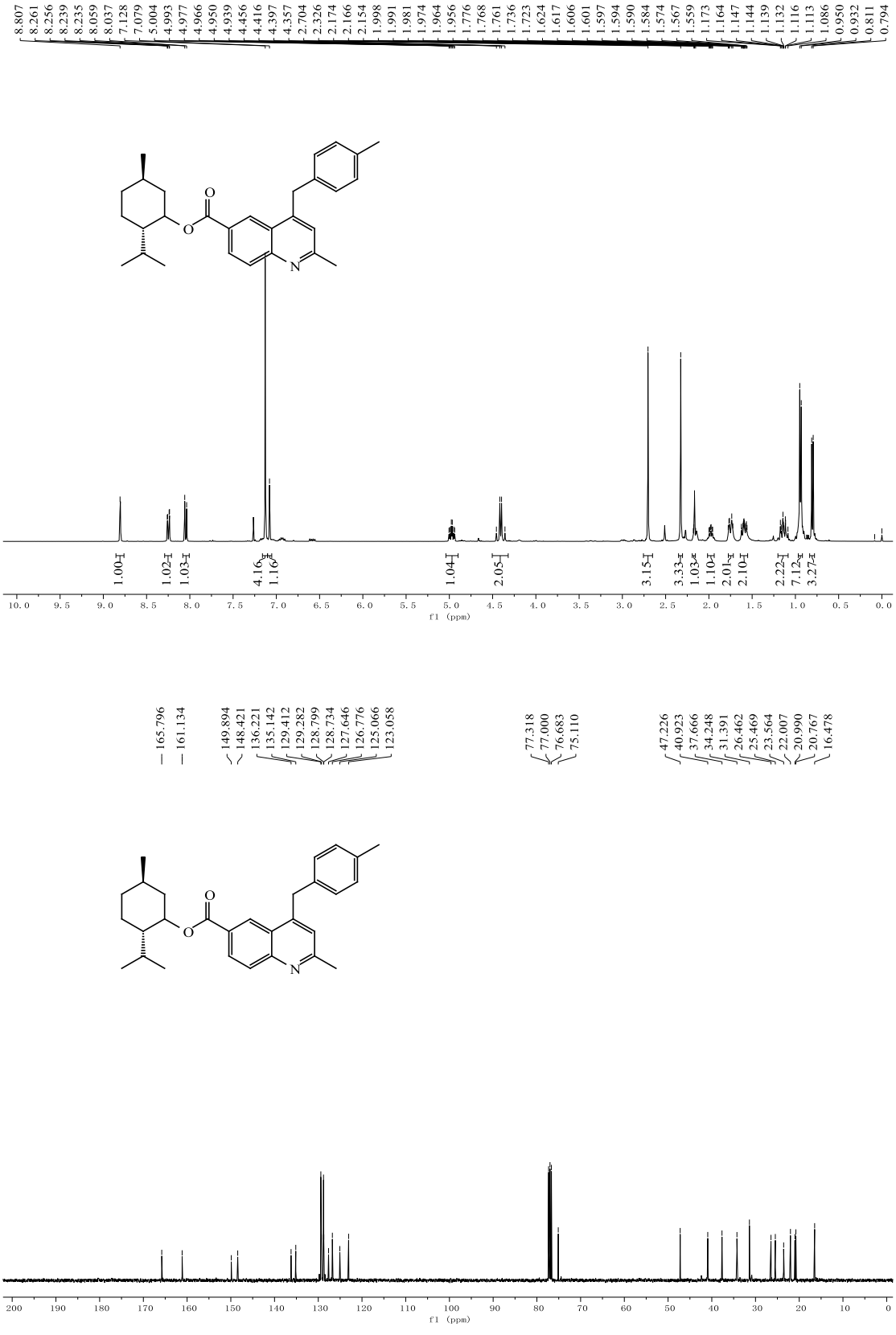


4-methyl-2-(naphthalen-2-ylmethyl)quinoline (3am)

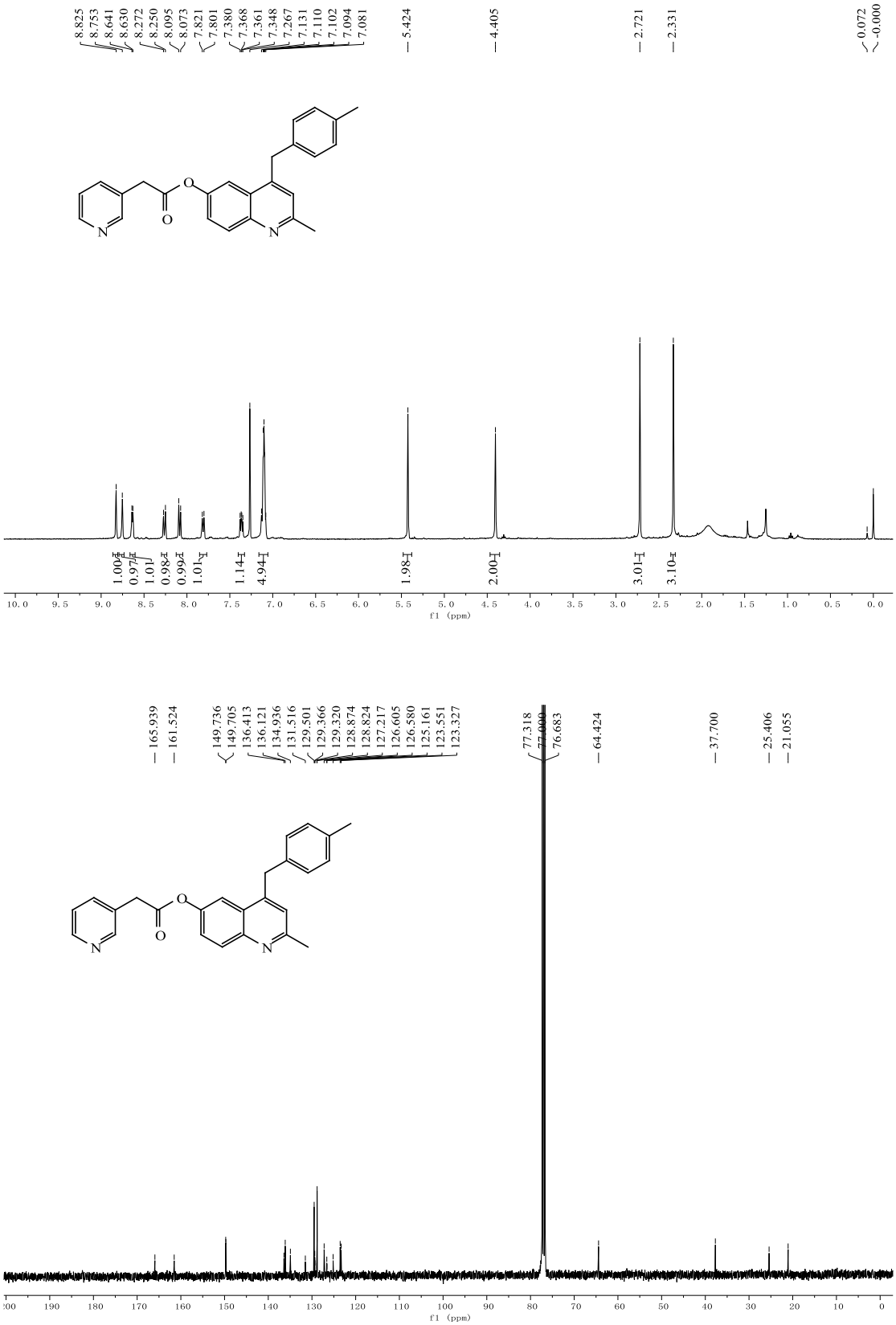




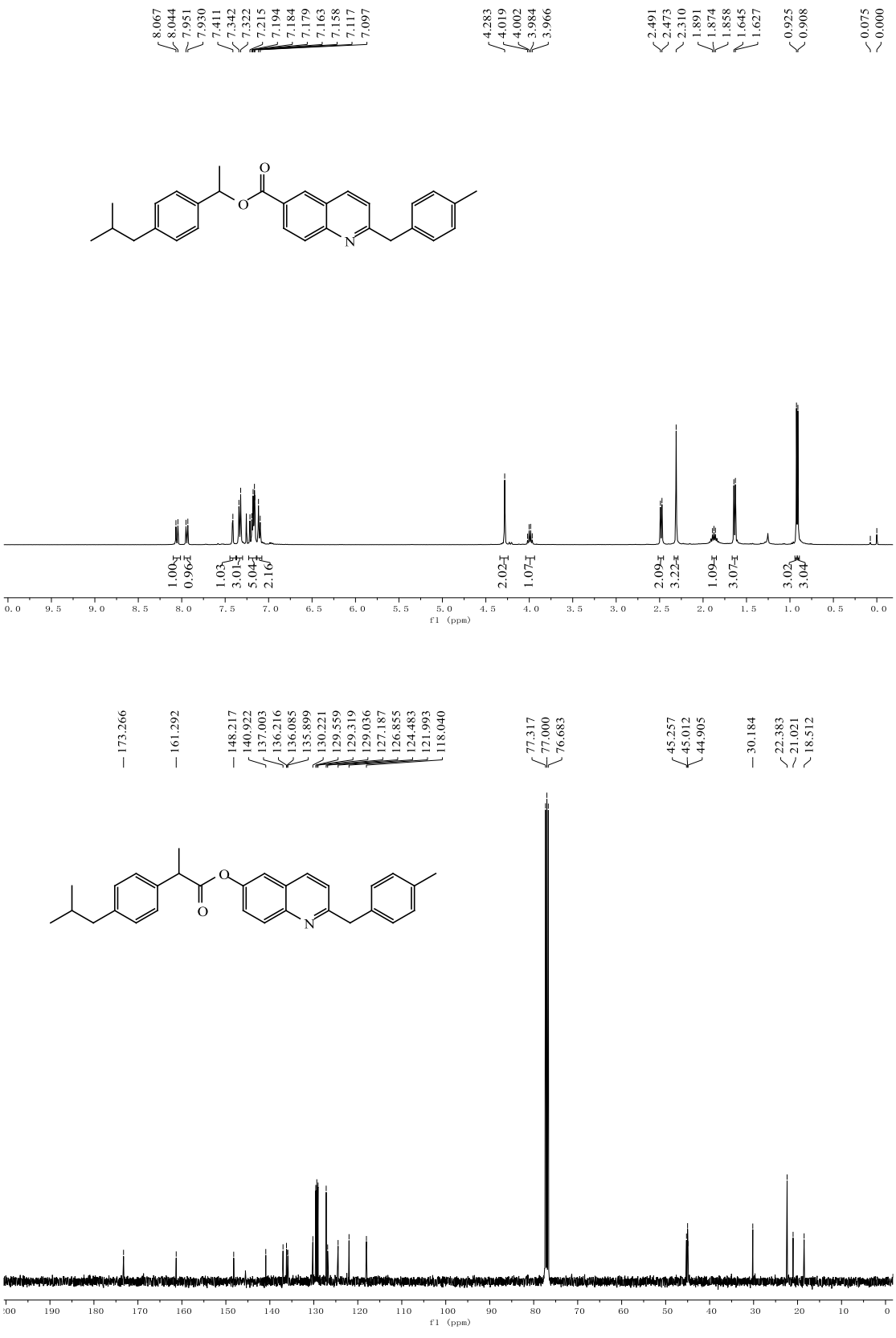
(2*S*,5*R*)-2-isopropyl-5-methylcyclohexyl 2-(4-methylbenzyl)quinoline-6-carboxylate (4a)



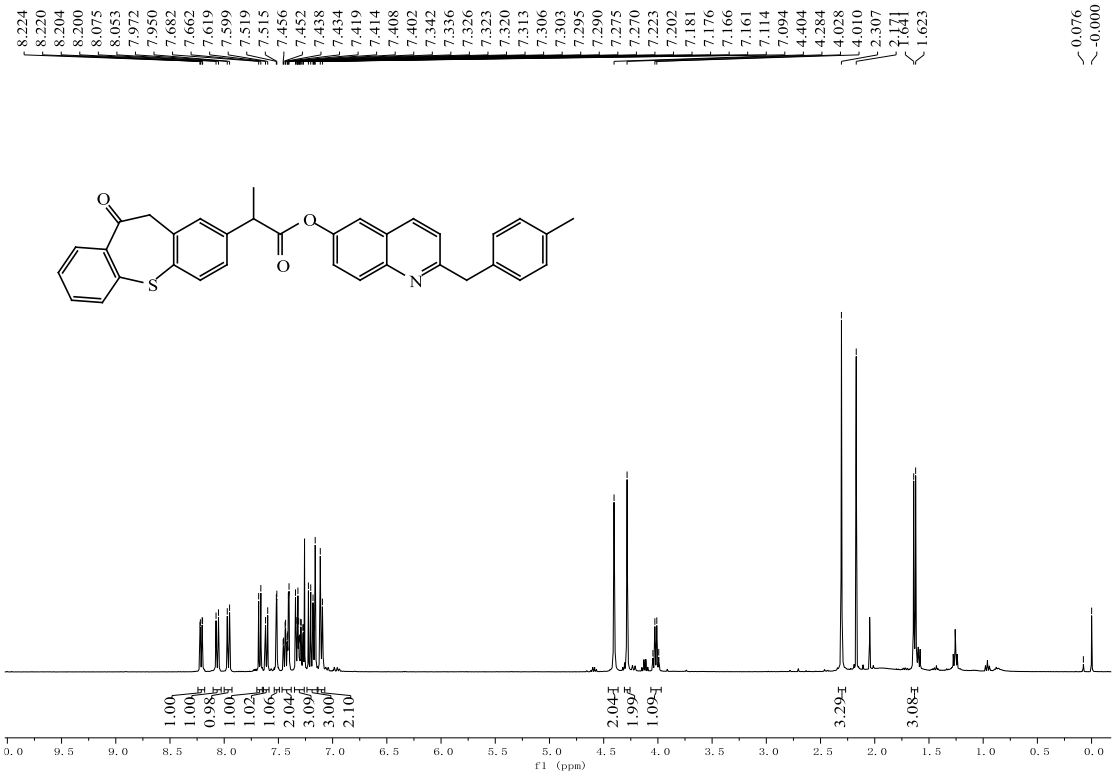
pyridin-3-ylmethyl 2-(4-methylbenzyl)quinoline-6-carboxylate (4b)

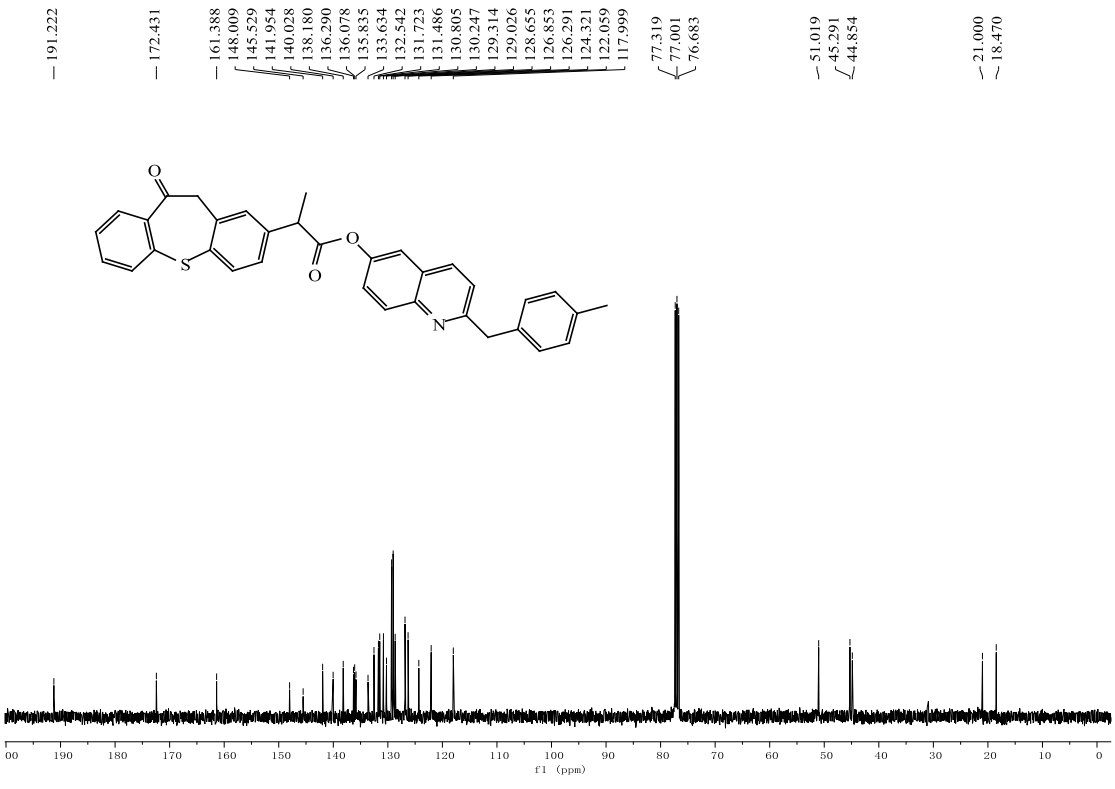


2-(4-methylbenzyl)quinolin-6-yl 2-(4-isobutylphenyl)propanoate (4c)

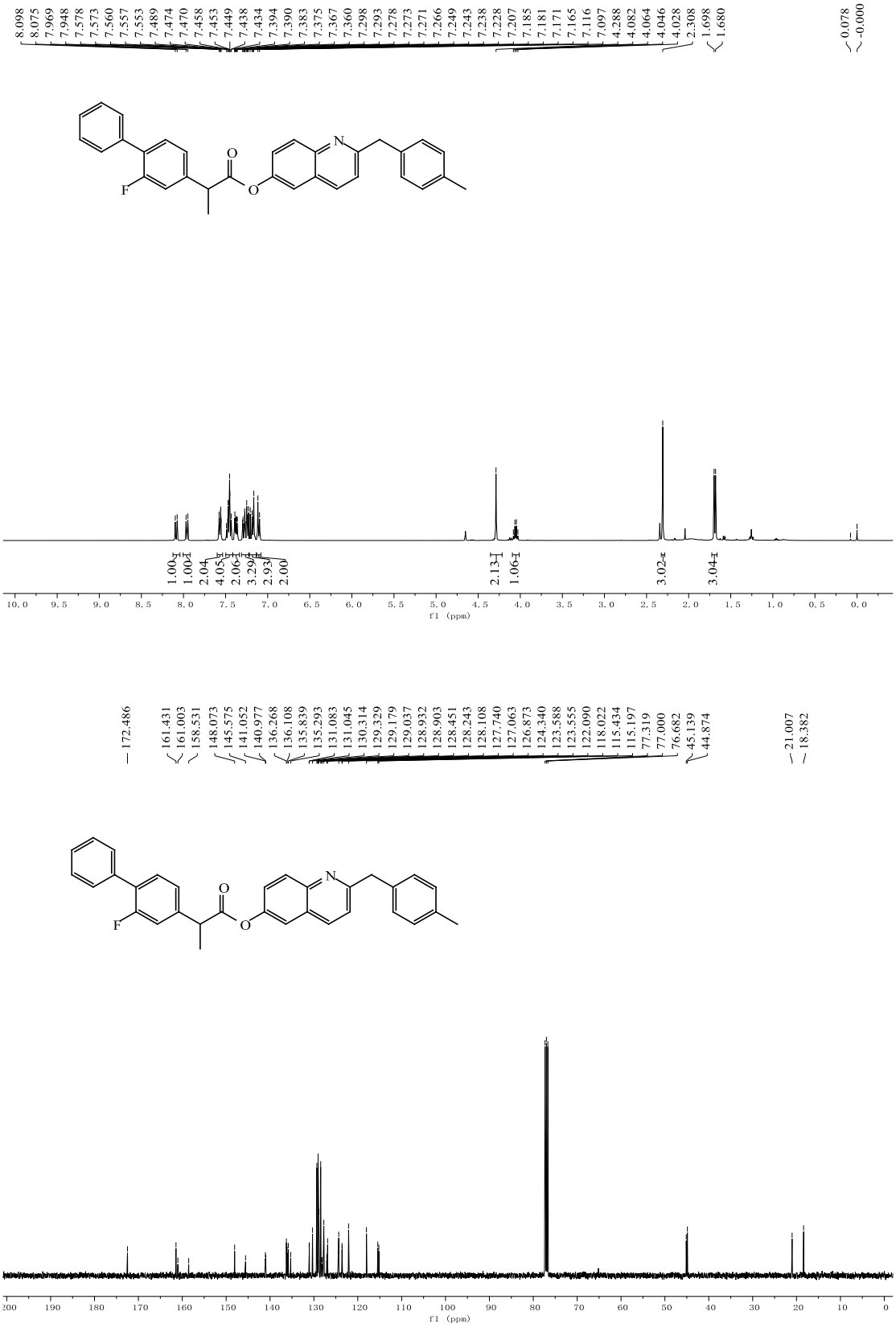


2-(4-methylbenzyl)quinolin-6-yl 2-(10-oxo-10,11-dihydrodibenzo[*b*,*f*]thiepin-2-yl)propanoate (4d)





2-(4-methylbenzyl)quinolin-6-yl 2-(2-fluoro-[1,1'-biphenyl]-4-yl)propanoate (4e)



2-(4-methylbenzyl)quinolin-6-yl 2-(3-benzoylphenyl)propanoate (4f)