Supporting Information

Thioacids-Catalyzed Selective Photochemical Oxidation Reactions under Mild Conditions

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1. General Remarks

Unless otherwise noted, reagents, catalysts, and solvents were obtained from commercial suppliers and used without further purification. All substrates were used as received from commercial suppliers unless otherwise stated. Alkyl arenes, alcohols and amines were purchased from commercial suppliers, Adamas, Aladdin, TCI (Shanghai) Development Co., Ltd, Energy Chemical reagent suppliers, Alfa-Aesar and Sigma-Aldrich unless otherwise noted.

NMR spectra were recorded on a Bruker Avance 400 MHz spectrometer. ^{1}H NMR, ^{13}C NMR and ^{19}F NMR are recorded on an NMR spectrometer with $CDCl_3$ as solvent. Chemical shifts of ^{1}H, ^{13}C, and ^{19}F NMR spectra are reported in parts per million (ppm). The ^{19}F NMR spectra is $\{^{1}H\}$ decoupled and the ^{13}C NMR spectra is $\{^{1}H\}$ decoupled. The residual solvent signals were used as standard, and the chemical shifts were converted to the corresponding scale ($CDCl_3$: δ H = 7.26 ppm, δ C = 77.16 ppm). All coupling constants (*J* values) were reported in hertz (Hz). Multiplicities are reported as follows: singlet (s), doublet (d), triplet (t), quartet (q), and multiplet (m). All the experiments were monitored by analytical thin layer chromatography (TLC) performed on silica gel GF254 pre-coated plates. The UV-Vis spectra has been recorded on a UV-6000T spectrometer. Fluorescence quenching experiment was recorded using a Edinburgh FLS1000. Cyclic voltammetry was performed on an CHi660 electrochemical analyzer. Electron paramagnetic resonance (EPR) spectra was recorded on a Bruker EMXplus-6/1.

2. Setup for Photocatalytic Reactions

The photochemical setup is depicted in Fig. S1. Reaction Set-up for Irradiation of Mixture with Blue LED: A commercially available Blue LED (30 W, λ = 400–450 nm)/Purple LED (30 W, λ = 365–370 nm) purchased from Yi Tongchuang Technology Co., LTD: model 30w-30v-4240-B as the reaction light source. All the reactions were run in a 25 mL Quartz tubes equipped with magnetic stirring bar. The distance between the lamp and the Quartz tubes was set 6 cm. All the reactions were stirred at the speed of 300 rpm with external fan cooling so that the ambient temperature of the reaction vessel did not exceed 35 °C.

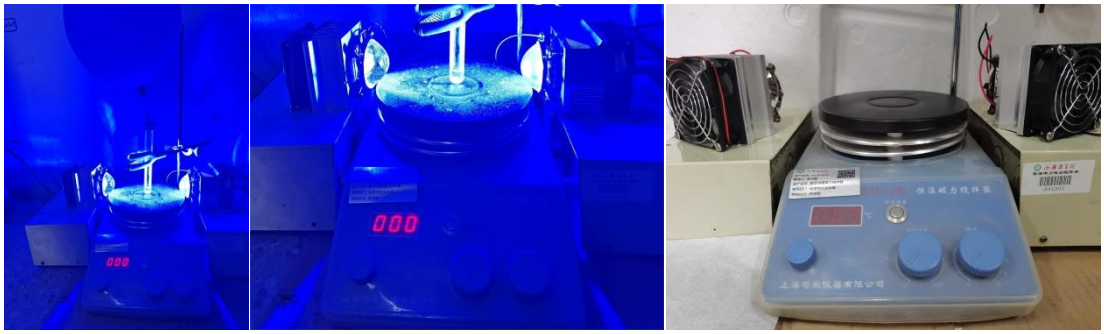
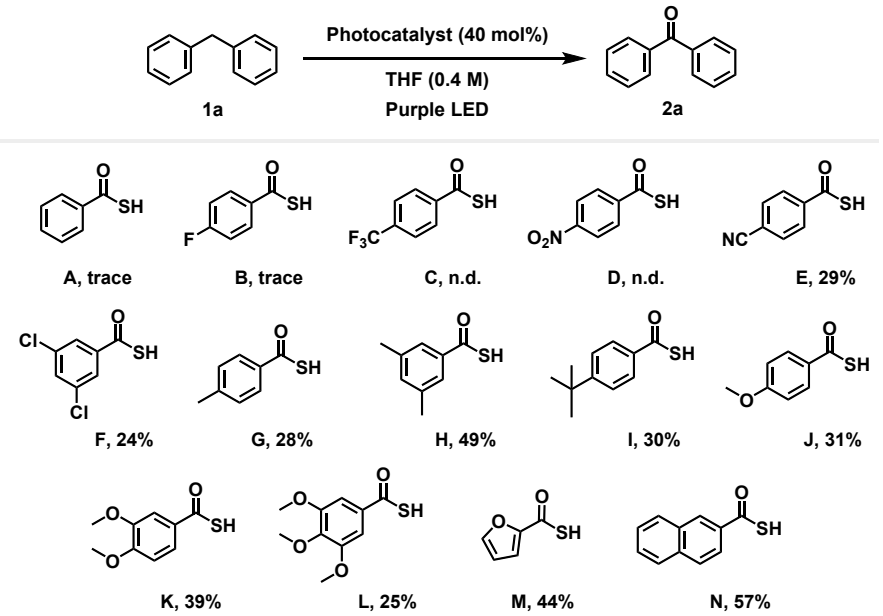


Fig. S1 LED reaction setup for photocatalytic reactions.

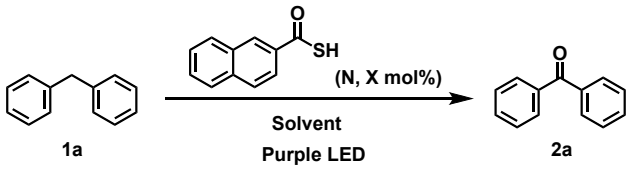
3. Optimization Results of the Reaction Conditions

Table S1. Screening of diphenylmethane photocatalytic oxidative coupling conditions—Evaluation of thioacids photocatalysts



[a]Reaction conditions: diphenylmethane 1a (0.2 mmol, 33.4 uL), photocatalysts (40 mol%), THF (0.4 M), air, r.t., 30 W purple LED, 20 h. [b]Isolated yields.

Table S2. Screening of diphenylmethane photocatalytic oxidative coupling conditions

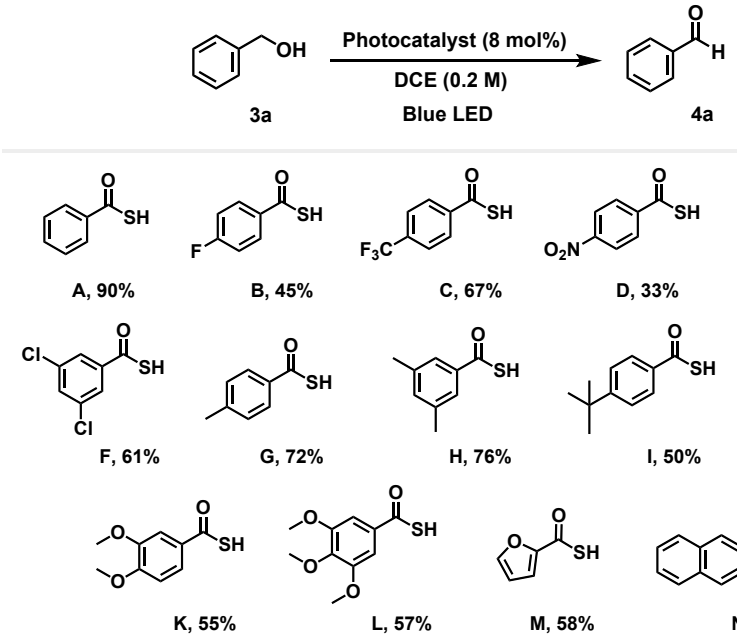


Entry	Naphthalene-2-carbothioic *S*-acid	Solvent	Yield (%)[b]
1	**N**, 40 mol%	DMAc	41
2	**N**, 40 mol%	NMP	38
3	**N**, 40 mol%	CH_3CN	46
4	**N**, 40 mol%	1,4-dioxane	trace

5	**N**, 40 mol%	DCE	trace
6	**N**, 40 mol%	EtOH	23
7	**N**, 40 mol%	DMSO	70
8	**N**, 30 mol%	DMSO	56
9	**N**, 50 mol%	DMSO	65
10	**N**, 40 mol%	DMSO (0.2 M)	64

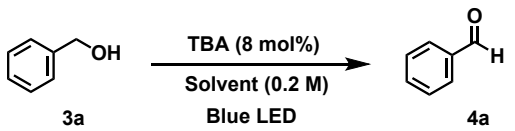
[a]Reaction conditions: diphenylmethane **1a** (0.2 mmol, 33.4 uL), naphthalene-2-carbothioic-*S*-acid **N** (X mol%), solvent (0.4 M), 30 W purple LED, 20 h. [b]Isolated yields.

Table S3. Screening of benzylalcohol photocatalytic oxidative coupling conditions—Evaluation of thioacids photocatalysts



[a]Reaction conditions: benzylalcohol 3a (0.2 mmol, 21 uL), photocatalysts (8 mol%), DCE (0.2 M), air, r.t., 30 W blue LED, 8 h. [b]Isolated yields.

Table S4. Screening of benzylalcohol photocatalytic oxidative coupling conditions

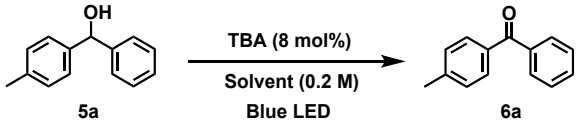


Entry	Solvent	Yield (%)[b]
1	CH_3CN	80
2	THF	trace
3	MeOH	22
4	Acetone	45
5	H_2O	n.d.
6	1,4-dioxane	34
7	DCE	90

8	DMF	56

[a]Reaction conditions: benzylalcohol **3a** (0.2 mmol, 21 uL), TBA (8 mol%, 1.9 uL), solvent (0.2 M), air, 30 W blue LED, 8 h. [b]Isolated yields. n.d. = not detected.

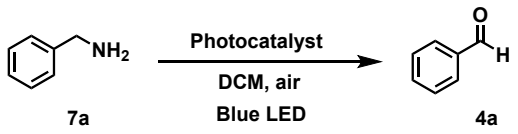
Table S5. Screening of diphenylmethanol photocatalytic oxidative coupling conditions

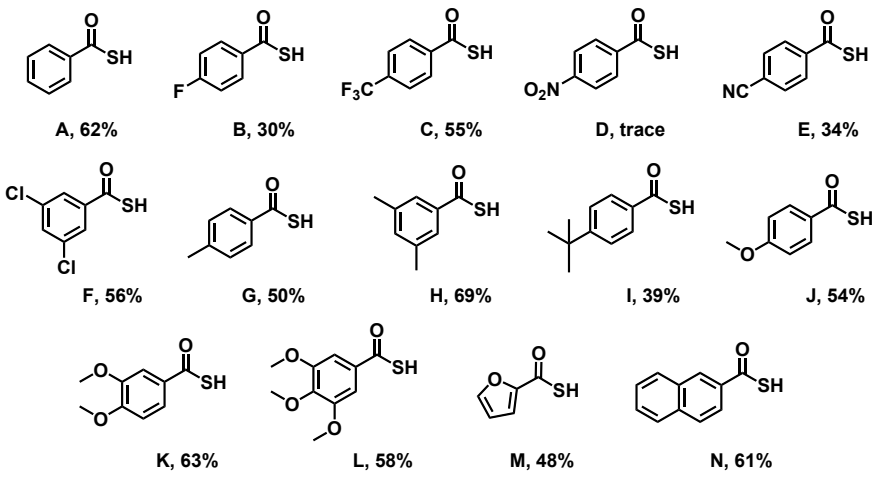


Entry	Solvent	Yield (%)[b]
1	CH_3CN	45
2	THF	22
3	MeOH	trace
4	Acetone	41
5	1,4-dioxane	84
6	DCE	39
7	DMF	trace
8	DMSO	trace
9	EA	26

[a]Reaction conditions: phenyl(*p*-tolyl)methanol **5a** (0.2 mmol, 39.6 mg), TBA (8 mol%, 1.9 uL), solvent (0.2 M), air, 30 W blue LED, 8 h. [b]Isolated yields.

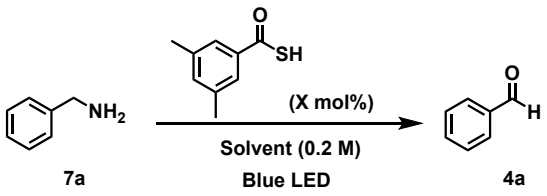
Table S6. Screening of benzylamine photocatalytic oxidative coupling conditions—Evaluation of thioacids photocatalysts





[a]Reaction conditions: benzylamine 7a (0.2 mmol, 22 uL), photocatalysts (20 mol%), DCM (0.2 M), air, r.t., 30 W blue LED, 8 h. [b]Isolated yields.

Table S7. Screening of benzylamine photocatalytic oxidative coupling conditions

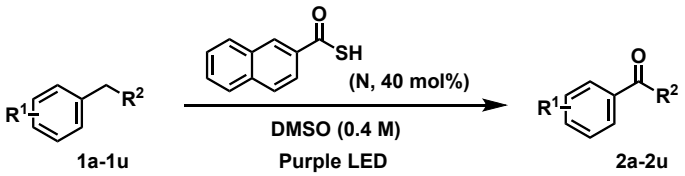


Entry	3,5-dimethylbenzothioic *S*-acid	Solvent	Yield (%)[b]
1	**H**, 20 mol%	CH_3CN	45
2	**H**, 20 mol%	$CHCl_3$	56
3	**H**, 20 mol%	1,4-Dioxane	28
4	**H**, 20 mol%	MeOH	trace
5	**H**, 20 mol%	THF	68
6	**H**, 20 mol%	Acetone	trace
7	**H**, 20 mol%	DCE	42
8	**H**, 20 mol%	DMSO	23
9	**H**, 20 mol%	DMF	25
10	**H**, 20 mol%	H_2O	NR
11	**H**, 10 mol%	DCM	57
12	**H**, 30 mol%	DCM	66
13[c]	**H**, 20 mol%	DCM	85

[a]Reaction conditions: benzylamine **7a** (0.2 mmol, 22 uL), 3,5-dimethylbenzothioic *S*-acid (X mol%), solvent (0.2 M), 30 W blue LED, 8 h. [b]Isolated yields. [c]O_2.

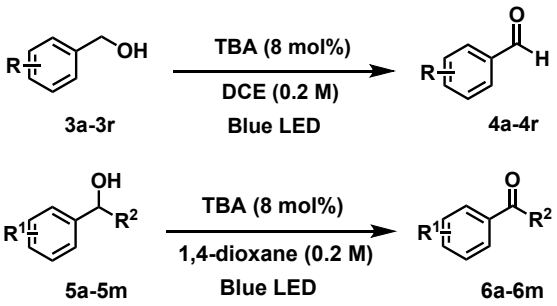
4. Experimental Procedures

4.1 General Procedures A for the Oxidation of the Benzylic sp^3 C-H Bonds using Purple LED



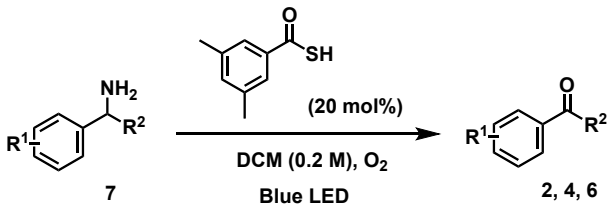
An oven-dried 25 mL Quartz tubes equipped with magnetic stirring bar were charged with naphthalene-2-carbothioic *S*-acid **N** (40 mol%, 15 mg) and the benzylic sp^3 C-H bonds **1a-1v** (0.2 mmoL) in DMSO (0.4 M) with an ambient air at room temperature. The resulting mixture was stirred for 20–36 h under 30 W purple LED irradiation (the progress can be monitored *via* TLC). After cooling to room temperature, the mixture was diluted with dichloromethane, the volatiles were removed under vacuum and the residue was purified by preparative thin layer chromatography (petroleum ether/ethyl acetate 20:1-5:1) to give pure product **2a-2v**.

4.2 General Procedures B for the Oxidation of Primary and Secondary Benzylic Alcohols using Blue LED



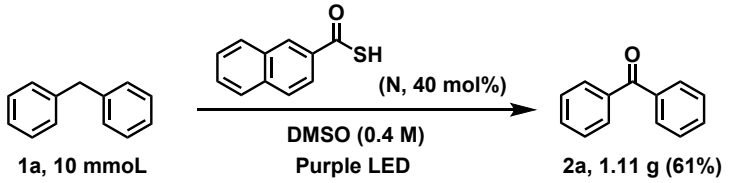
An oven-dried 25 mL Quartz tubes equipped with magnetic stirring bar were charged with thiobenzoic acid **A** (8 mol%, 1.9 uL), primary benzylic alcohols **3a-3r** (0.2 mmoL) or secondary benzylic alcohols **5a-5m** (0.2 mmoL) in DCE (0.2 M) or 1,4-dioxane (0.2 M) with an ambient air at room temperature. The resulting mixture was stirred for 8–24 h under 30 W blue LED irradiation (the progress can be monitored *via* TLC). After cooling to room temperature, the mixture was diluted with dichloromethane, the volatiles were removed under vacuum and the residue was purified by preparative thin layer chromatography (petroleum ether/ethyl acetate 50:1-20:1) to give pure product **4a-4r** and **6a-6m**.

4.3 General Procedures C for the Oxidation of Substituted Benzylamines using Blue LED

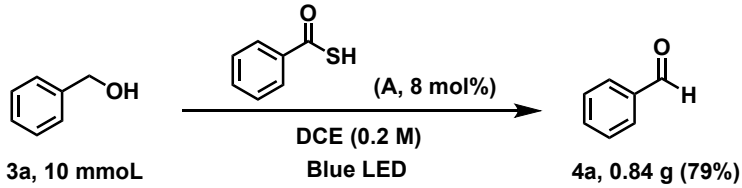


An oven-dried 25 mL Quartz tubes equipped with magnetic stirring bar were charged with 3,5-dimethylbenzothioic *S*-acid **H** (20 mol%, 6.6 mg), substituted benzylamines **7** (0.2 mmoL) in DCM (0.2 M) with an O_2 atmosphere at room temperature. The resulting mixture was stirred for 8–24 h under 30 W blue LED irradiation (the progress can be monitored *via* TLC). After cooling to room temperature, the mixture was diluted with dichloromethane, the volatiles were removed under vacuum and the residue was purified by preparative thin layer chromatography (petroleum ether/ethyl acetate 50:1-20:1) to give pure product **2, 4, 6**.

4.4 Scale-up Experiments

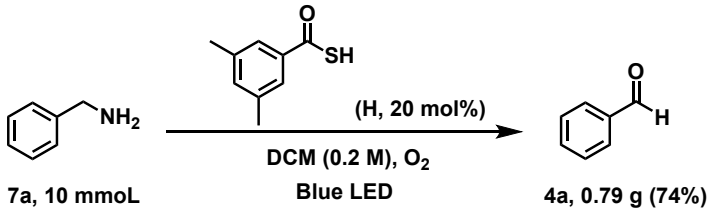


An oven-dried 25 mL Quartz tubes equipped with magnetic stirring bar were charged with naphthalene-2-carbothioic *S*-acid **N** (40 mol%, 752.1 mg), diphenylmethane **1a** (10 mmoL, 1.67 mL) in DMSO (0.4 M) with an ambient air at room temperature. The resulting mixture was stirred for 72 h under 30 W purple LED irradiation (the progress can be monitored *via* TLC). After cooling to room temperature, the mixture was diluted with dichloromethane, the volatiles were removed under vacuum and the residue was purified by preparative thin layer chromatography (petroleum ether/ethyl acetate 20:1) to give pure product **2a** (1.11 g, 62%).



An oven-dried 25 mL Quartz tubes equipped with magnetic stirring bar were charged with thiobenzoic acid **A** (8 mol%, 94.2 uL), benzylalcohol **3a** (10 mmoL, 1.04 mL) in DCE (0.2 M) with an ambient air at room temperature. The resulting mixture was stirred for 24 h under 30 W blue LED irradiation (the progress can be monitored *via* TLC).

After cooling to room temperature, the mixture was diluted with dichloromethane, the volatiles were removed under vacuum and the residue was purified by preparative thin layer chromatography (petroleum ether/ethyl acetate 50:1) to give pure product **4a** (0.84 g, 79%).



An oven-dried 25 mL Quartz tubes equipped with magnetic stirring bar were charged with 3,5-dimethylbenzothioic *S*-acid **H** (20 mol%, 332.1 mg), benzylamine **7a** (10 mmol, 1.04 mL) in DCM (0.2 M) with an O_2 atmosphere at room temperature. The resulting mixture was stirred for 24 h under 30 W blue LED irradiation (the progress can be monitored *via* TLC). After cooling to room temperature, the mixture was diluted with dichloromethane, the volatiles were removed under vacuum and the residue was purified by preparative thin layer chromatography (petroleum ether/ethyl acetate 50:1) to give pure product **4a** (0.79 g, 74%).

5. Mechanism Research

5.1 Radical Trapped Experiments

A mixture of naphthalene-2-carbothioic *S*-acid **N** (40 mol%, 15 mg), diphenylmethane **1a** (0.2 mmol, 33.4 uL) in DMSO (0.4 M) and 2,2,6,6-tetramethylpiperidinooxy (Tempo, 0.4 mmol)/1,4-diazabicyclo[2.2.2]octane (DABCO, 0.4 mmol)/1,1-diphenyl -2-picrylhydrazyl (DPPH, 0.4 mmol) was added to a 25 mL Quartz tubes with an ambient air at room temperature, then the contents were stirred at 30 W purple LED irradiation for 20 h. The reaction mixture was cooled down to room temperature and isolated by preparative thin layer chromatography.

A mixture of thiobenzoic acid **A** (8 mol%, 1.9 uL), benzylalcohol **3a** (0.2 mmol, 21 uL) in DCE (0.2 M) and 2,2,6,6-tetramethylpiperidinooxy (Tempo, 0.4 mmol)/ 1,4-diazabicyclo[2.2.2]octane (DABCO, 0.4 mmol)/1,1-diphenyl-2-picrylhydrazyl (DPPH, 0.4 mmol) was added to a 25 mL Quartz tubes with an ambient air at room temperature, then the contents were stirred at 30 W blue LED irradiation for 8 h. The reaction mixture was cooled down to room temperature and isolated by preparative thin layer chromatography.

A mixture of 3,5-dimethylbenzothioic *S*-acid **H** (20 mol%, 6.6 uL), benzylamine **7a** (0.2 mmol, 22 uL) in DCM (0.2 M) and 2,2,6,6-tetramethylpiperidinooxy (Tempo, 0.4 mmol)/1,4-diazabicyclo[2.2.2]octane (DABCO, 0.4 mmol)/2,2-diphenyl-1-picrylhydrazyl (DPPH, 0.4 mmol) and benzoquinone (0.4 mmol) was added to a 25 mL Quartz tubes with an O_2 atmosphere at room temperature, then the contents were stirred at 30 W blue LED irradiation for 8 h. The reaction mixture was cooled down to room temperature and isolated by preparative thin layer chromatography.

5.2 Electron Paramagnetic Resonance (EPR) study

An oven-dried 25 mL Quartz tubes equipped with magnetic stirring bar were charged with naphthalene-2-carbothioic *S*-acid **N** (40 mol%, 15 mg), 5,5-Dimethyl-1-pyrroline *N*-oxide (DMPO, 0.4 mmol, 41.1 uL) and diphenylmethane **1a** (0.2 mmol, 33.4 uL) in DMSO (0.4 M) with an ambient air at room temperature, the contents were stirred at 30 W purple LED irradiation for 2 h. Then, this reaction solution was taken out by capillary and was analyzed by EPR at room temperature (Fig. S2). A signal of the trapping radical was captured, the spectrum and hyperfine coupling constants of which are in good consistent with the literature values for the adduct of $O_2^{\bullet-}$ with DMPO (g = 2.0000, α_N = 15.1 G). These results illustrate that $O_2^{\bullet-}$ generated from molecular oxygen is the active species in this photocatalytic reaction.

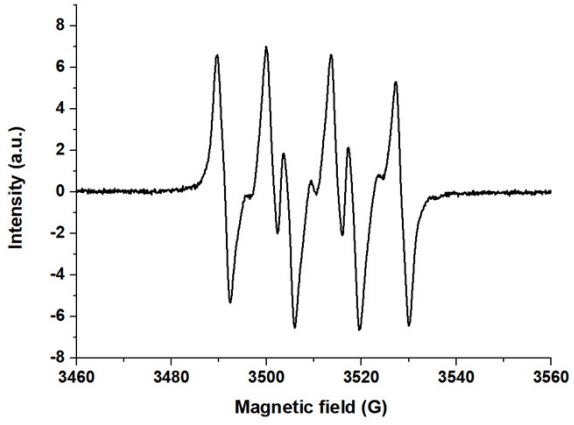


Fig. S2 EPR spectra of a solution of **N** (40 mol%), DMPO (0.4 mmol) and **1a** (0.2 mmol) in DMSO under purple LED irradiation for 2 h.

5.3 Emission Spectra of the Photocatalyst $[A^-]^*$, $[H^-]^*$ and $[N^-]^*$

Emission intensities were recorded using a Edinburgh FLS1000. A 0.01 M solution of **A·Et$_3$N**, **H·Et$_3$N**, **N·Et$_3$N** (obtained by dissolving **A, H, N** and **Et$_3$N** in a 1:1 ratio) in methanol were placed in a 10 mm light path quartz fluorescence cuvette.[1] The excitation

wavelength was fixed at 400 nm, 360 nm or 320 nm, while the emission light was acquired from 440 nm to 800 nm.

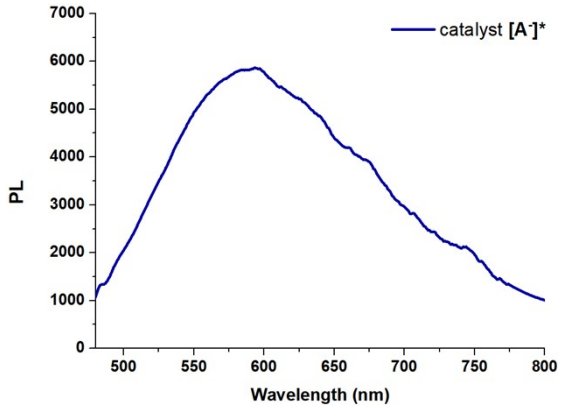


Fig. S3 Normalized emission of [**A**$^-$]* upon 400 nm irradiation in MeOH.

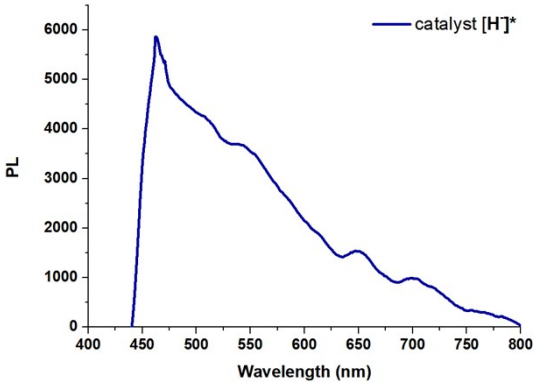


Fig. S4 Normalized emission of [**H**$^-$]* upon 360 nm irradiation in MeOH.

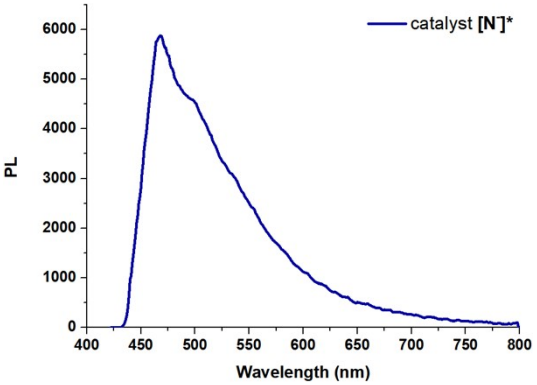


Fig. S5 Normalized emission of [**N**$^-$]* upon 320 nm irradiation in MeOH.

5.4 General Procedure for Cyclic Voltammetry (CV) Experiments

Cyclic voltammetry and square wave voltammetry were performed on an CHi660 electrochemical analyzer. The voltammetric cell consisted of a glassy carbon electrode, a platinum wire, and an Ag/AgCl reference electrode. Potentials are quoted with the following notation: E_p^C refers to the cathodic peak potential, E_p^A refers to the anodic

peak potential. Tetrabutylammonium hexafluorophosphate ($TBAPF_6$) (0.1 M) was employed as the electrolyte, and CH_3CN was employed as the solvent. The mixture was poured into the electrochemical cell in cyclic voltammetry experiments, and the scan rate was 0.10 V/s.

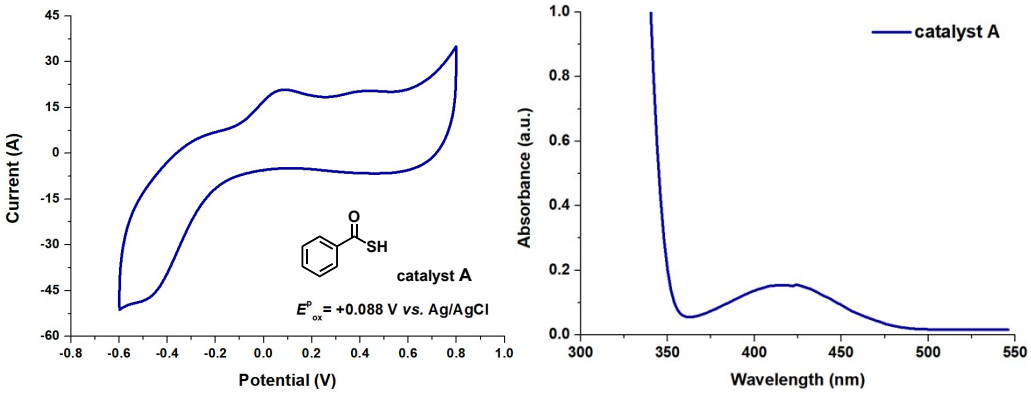


Fig. S6 Cyclic voltammogram of catalyst **A** (0.5 M) in CH_3CN. **$E(A^{\cdot}/[A^{-}]^{*}) = -2.86$ V *vs* SCE** and optimal excitation wavelength.

The zero-zero vibrational state excitation energy $E_{0,0}$ of catalyst **A** was estimated by the corresponding energy of the wavelength at optimal excitation wavelength (420 nm). Excited state oxidation and reduction potentials were calculated by the following approximating formulas[1-3]:

$E(\mathbf{A}^{\cdot}/[\mathbf{A}^{-}]^{*}) = E(\mathbf{A}^{\cdot}/\mathbf{A}^{-}) - E_{0\text{-}0}([\mathbf{A}^{-}]^{*}/\mathbf{A}^{-})$ [Eq. 1]

The excited state oxidation potentials for catalyst **A** were thus calculated:

$E_{0\text{-}0}([\mathbf{A}^{-}]^{*}/\mathbf{A}^{-}) = hc/\lambda = 6.626\times10^{-34} \times 3.0 \times10^{8}/420\times10^{-9}$ J $= 4.733\times10^{-19}$ J

$E_{0\text{-}0}([\mathbf{A}^{-}]^{*}/\mathbf{A}^{-}) = 4.733\times10^{-19}$ J$/1.602\times10^{-19}$ J $= 2.952$ V

$E(\mathbf{A}^{\cdot}/[\mathbf{A}^{-}]^{*}) = E(\mathbf{A}^{\cdot}/\mathbf{A}^{-}) - E_{0\text{-}0}([\mathbf{A}^{-}]^{*}/\mathbf{A}^{-}) = 0.088$ V $- 2.952$ V

$E(\mathbf{A}^{\cdot}/[\mathbf{A}^{-}]^{*}) = -2.86$ V *vs* SCE

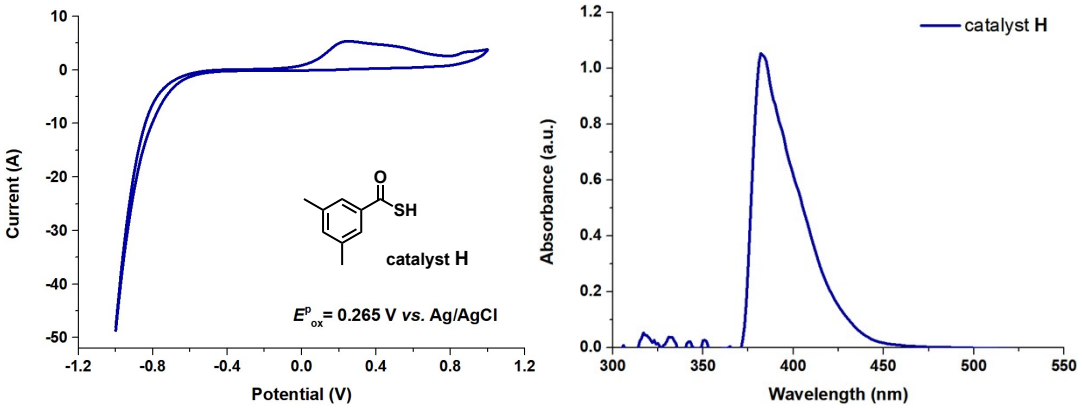


Fig. S7 Cyclic voltammogram of catalyst **H** (0.5 M) in CH_3CN. **$E(H^{\cdot}/[H^{-}]^{*}) = -2.98$ V *vs* SCE** and optimal excitation wavelength.

The zero-zero vibrational state excitation energy $E_{0,0}$ of catalyst **H** was estimated by the corresponding energy of the wavelength at optimal excitation wavelength (382 nm). Excited state oxidation and reduction potentials were calculated by the following approximating formulas[1-3]:

$E(\mathbf{H}^{\cdot}/[\mathbf{H}^{-}]^{*}) = E(\mathbf{H}^{\cdot}/\mathbf{H}^{-}) - E_{0\text{-}0}([\mathbf{H}^{-}]^{*}/\mathbf{H}^{-})$ [Eq. 1]

The excited state oxidation potentials for catalyst **H** were thus calculated:

$E_{0\text{-}0}([\mathbf{H}^{-}]^{*}/\mathbf{H}^{-}) = hc/\lambda = 6.626\times10^{-34} \times 3.0 \times10^{8}/382\times10^{-9}$ J $= 5.204\times10^{-19}$ J

$E_{0\text{-}0}([\mathbf{H}^{-}]^{*}/\mathbf{H}^{-}) = 5.204\times10^{-19}$ J$/1.602\times10^{-19}$ J $= 3.248$V

$E(\mathbf{H}^{\cdot}/[\mathbf{H}^{-}]^{*}) = E(\mathbf{H}^{\cdot}/\mathbf{H}^{-}) - E_{0\text{-}0}([\mathbf{H}^{-}]^{*}/\mathbf{H}^{-}) = 0.265\text{V} - 3.248$ V

$E(H^{\cdot}/[H^{-}]^{*}) = -2.98$ V *vs* SCE

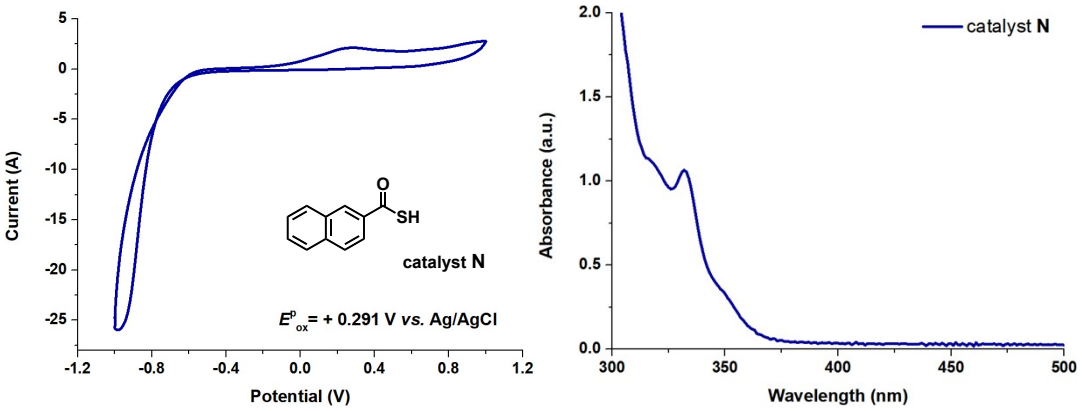


Fig. S8 Cyclic voltammogram of catalyst **N** (0.5 M) in CH_3CN. **$E(N^{\cdot}/[N^{-}]^{*}) = -3.45$ V *vs* SCE** and optimal excitation wavelength.

The zero-zero vibrational state excitation energy $E_{0,0}$ of catalyst **N** was estimated by the corresponding energy of the wavelength at optimal excitation wavelength (332 nm). Excited state oxidation and reduction potentials were calculated by the following approximating formulas[1-3]:

$E(\mathbf{N}^{\cdot}/[\mathbf{N}^{-}]^{*}) = E(\mathbf{N}^{\cdot}/\mathbf{N}^{-}) - E_{0\text{-}0}([\mathbf{N}^{-}]^{*}/\mathbf{N}^{-})$ [Eq. 1]

The excited state oxidation potentials for catalyst **N** were thus calculated:

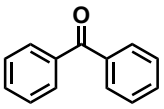
$E_{0\text{-}0}([\mathbf{N}^{-}]^{*}/\mathbf{N}^{-}) = hc/\lambda = 6.626\times10^{-34} \times3.0 \times10^{8}/332\times10^{-9}$ J $= 5.987\times10^{-19}$ J

$E_{0\text{-}0}([\mathbf{N}^{-}]^{*}/\mathbf{N}^{-}) = 5.987\times10^{-19}$ J$/1.602\times10^{-19}$ J $= 3.737$V

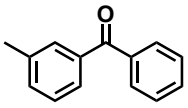
$E(\mathbf{N}^{\cdot}/[\mathbf{N}^{-}]^{*}) = E(\mathbf{N}^{\cdot}/\mathbf{N}^{-}) - E_{0\text{-}0}([\mathbf{N}^{-}]^{*}/\mathbf{N}^{-}) = 0.291\text{V} - 3.737$ V

$E(\mathbf{N}^{\cdot}/[\mathbf{N}^{-}]^{*}) = -3.45$ V *vs* SCE

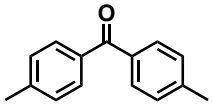
6. Characterization Data of Products



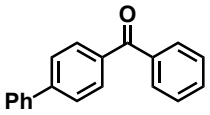
Benzophenone (2a)[4] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2a** (25.4 mg, 70% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 – 7.78 (m, 4H), 7.59 (t, *J* = 7.4 Hz, 2H), 7.49 (t, *J* = 7.6 Hz, 4H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 196.9, 137.7, 132.5, 130.2, 128.4.



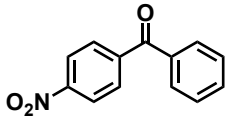
Phenyl(*m*-tolyl)methanone (2b)[4] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2b** (29.1 mg, 74% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80 – 7.78 (m, 2H), 7.65 – 7.63 (m, 1H), 7.61 – 7.55 (m, 2H), 7.50 – 7.45 (m, 2H), 7.44 – 7.32 (m, 2H), 2.42 (s, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 196.8, 138.1, 137.7, 137.6, 133.2, 132.3, 130.4, 130.0, 128.2, 128.1, 127.3, 21.3.



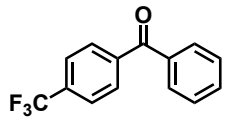
Di-*p*-tolylmethanone (2c)[5] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2c** (34.8 mg, 83% yield) as a white solid. Mp: 82 – 83 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 – 7.60 (m, 4H), 7.19 (dd, *J* = 8.4, 0.5 Hz, 4H), 2.36 (s, 6H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 196.3, 143.0, 135.3, 130.3, 129.0, 21.7.



[1,1'-Biphenyl]-4-yl(phenyl)methanone (2d)[5] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2d** (38.7 mg, 75% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 – 7.88 (m, 2H), 7.87 – 7.83 (m, 2H), 7.73 – 7.70 (m, 2H), 7.67 – 7.58 (m, 3H), 7.53 – 7.47 (m, 4H), 7.44 – 7.39 (m, 1H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 196.5, 145.4, 140.1, 137.9, 136.4, 132.5, 130.9, 130.1, 129.1, 128.4, 128.3, 127.4, 127.1.

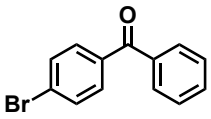


(4-Nitrophenyl)(phenyl)methanone (2e)[6] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **2e** (25.0 mg, 55% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.37 – 8.32 (m, 2H), 7.96 – 7.92 (m, 2H), 7.82 – 7.78 (m, 2H), 7.68 – 7.63 (m, 1H), 7.56 – 7.50 (m, 2H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 194.9, 149.9, 143.0, 136.4, 133.6, 130.8, 130.2, 128.8, 123.7.

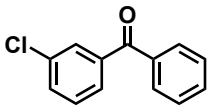


Phenyl(4-(trifluoromethyl)phenyl)methanone (2f)[5] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **2f** (26.5 mg, 53% yield) as a white solid. Mp: 101 – 103 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.90 (d, *J* = 8.0 Hz, 2H), 7.83 – 7.79 (m, 2H), 7.76 (d, *J* = 8.1 Hz, 2H), 7.66 – 7.61 (m, 1H), 7.54 – 7.49 (m, 2H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 195.7, 140.9, 136.9, 133.9 (q, *J* = 32.3 Hz), 133.2, 130.3, 130.2,

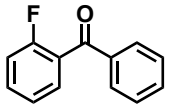
128.7, 125.5 (q, J = 3.7 Hz), 123.8 (q, J = 272.7 Hz). ^{19}F NMR (376 MHz, $CDCl_3$) δ -62.99.



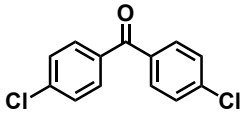
(4-Bromophenyl)(phenyl)methanone (2g)[5] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2g** (33.2 mg, 64% yield) as a white solid. Mp: 95 – 96 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.77 (dd, J = 5.2, 3.2 Hz, 2H), 7.70 – 7.66 (m, 2H), 7.65 – 7.57 (m, 3H), 7.49 (dd, J = 10.5, 4.7 Hz, 2H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 195.6, 137.2, 136.3, 132.7, 131.6, 131.5, 129.9, 128.4, 127.5.



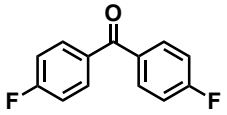
(3-Chlorophenyl)(phenyl)methanone (2h)[5] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2h** (26.4 mg, 61% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83 – 7.76 (m, 3H), 7.69 – 7.65 (m, 1H), 7.66 – 7.59 (m, 1H), 7.58 – 7.54 (m, 1H), 7.53 – 7.48 (m, 2H), 7.43 (t, J = 7.8 Hz, 1H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 195.2, 139.2, 136.9, 134.5, 132.8, 132.3, 130.0, 129.9, 129.6, 128.4, 128.1.



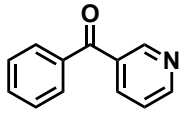
(2-Fluorophenyl)(phenyl)methanone (2i)[5] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2i** (22.7 mg, 57% yield) as a white solid. Mp: 63 – 65 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.87 – 7.80 (m, 2H), 7.61 – 7.49 (m, 3H), 7.49 – 7.44 (m, 2H), 7.29 – 7.21 (m, 1H), 7.19 – 7.12 (m, 1H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 193.4, 160.0 (d, J = 252.5 Hz), 137.4, 133.4, 133.0 (d, J = 8.2 Hz), 130.7 (d, J = 2.8 Hz), 129.8, 128.4, 127.0 (d, J = 14.7 Hz), 124.2 (d, J = 3.6 Hz), 116.2 (d, J = 21.6 Hz). ^{19}F NMR (376 MHz, $CDCl_3$) δ -110.96 – -111.09 (m).



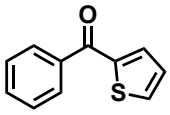
Bis(4-chlorophenyl)methanone (2j)[5] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2j** (29.6 mg, 59% yield) as a white solid. Mp: 110 – 112 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75 – 7.71 (m, 4H), 7.49 – 7.45 (m, 4H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 194.3, 139.2, 135.6, 131.4, 128.9.



Bis(4-fluorophenyl)methanone (2k)[7] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2k** (26.2 mg, 60% yield) as a white solid. Mp: 104 – 105 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 – 7.77 (m, 4H), 7.19 – 7.12 (m, 4H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 193.9, 165.5 (d, J = 254.3 Hz), 133.8 (d, J = 3.1 Hz), 132.6 (d, J = 9.2 Hz), 115.7 (d, J = 21.9 Hz). ^{19}F NMR (376 MHz, $CDCl_3$) δ -105.71.

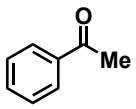


Phenyl(pyridin-3-yl)methanone (2l)[7] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **2l** (15.1 mg, 41% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.99 (dd, J = 2.1, 0.7 Hz, 1H), 8.81 (dd, J = 4.9, 1.7 Hz, 1H), 7.86 – 7.77 (m, 1H), 7.56 – 7.47 (m, 2H), 7.65 – 7.61 (m, 1H), 7.53 – 7.48 (m, 2H), 7.47 – 7.42 (m, 1H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 194.6, 152.7, 150.7, 137.0, 136.5, 133.0, 129.8, 128.5, 123.2.

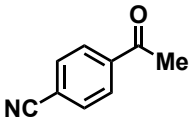


Phenyl(thiophen-2-yl)methanone (2m)[5] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **2m** (15.0 mg, 40% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.90 – 7.83 (m, 2H), 7.72 (dd, J = 5.0, 1.1 Hz, 1H), 7.65 (dd, J = 3.8, 1.1 Hz, 1H), 7.62 – 7.57 (m, 1H), 7.55 – 7.45 (m, 2H), 7.16 (dd, J = 5.0, 3.8 Hz,

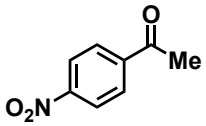
1H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 188.3, 143.7, 138.2, 135.0, 134.3, 132.4, 129.3, 128.5, 128.1.



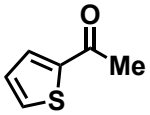
Acetophenone (2n, 6j)[5] was prepared following the General Procedure **A/B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2n** (17.1 mg, 71% yield)/**6j** (18.8 mg, 78% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.99 – 7.93 (m, 2H), 7.59 – 7.53 (m, 1H), 7.49 – 7.43 (m, 2H), 2.61 (s, 3H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 198.3, 137.3, 133.2, 128.7, 128.4, 26.7.



4-Acetylbenzonitrile (2o)[7] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2n** (18.2 mg, 63% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.02 (dd, J = 5.0, 3.6 Hz, 2H), 7.78 – 7.74 (m, 2H), 2.63 (s, 3H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 196.6, 140.0, 132.6, 128.8, 118.0, 116.5, 26.9.

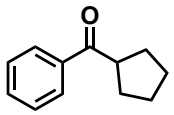


1-(4-Nitrophenyl)ethan-1-one (2p)[7] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2o** (17.8 mg, 54% yield) as a white solid. Mp: 134 – 136 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.33 – 8.28 (m, 2H), 8.13 – 8.08 (m, 2H), 2.68 – 2.66 (m, 3H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 196.4, 150.5, 141.5, 129.4, 124.0, 27.1.

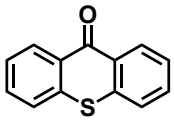


1-(Thiophen-2-yl)ethan-1-one (2q)[8] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **2p** (13.1 mg, 52% yield) as a colorless oil. ^{1}H NMR (400 MHz,

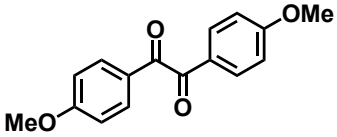
$CDCl_3$) δ 7.67 – 7.61 (m, 1H), 7.60 – 7.54 (m, 1H), 7.10 – 7.02 (m, 1H), 2.52 – 2.46 (m, 3H). $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 190.7, 144.5, 133.8, 132.5, 128.1, 26.8.



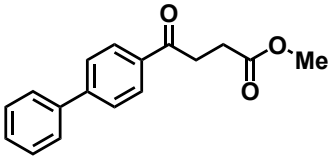
Cyclopentyl(phenyl)methanone (2r)[9] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **2q** (16.6 mg, 48% yield) as a colorless oil. ^1H NMR (400 MHz, $CDCl_3$) δ 7.96 – 7.89 (m, 2H), 7.50 – 7.42 (m, 1H), 7.41 – 7.34 (m, 2H), 3.70 – 3.59 (m, 1H), 1.90 – 1.81 (m, 4H), 1.71 – 1.55 (m, 4H). $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 202.5, 136.8, 132.5, 128.4, 128.3, 46.2, 29.8, 26.2.



9*H*-thioxanthen-9-one (2s)[8] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2r** (20.9 mg, 60% yield) as a colorless oil. ^1H NMR (400 MHz, $CDCl_3$) δ 8.62 (d, J = 8.0 Hz, 2H), 7.65 – 7.55 (m, 4H), 7.48 (t, J = 7.3 Hz, 2H). $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 180.1, 137.4, 132.4, 130.0, 129.4, 126.4, 126.1.

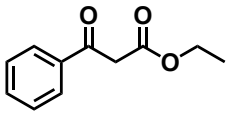


1,2-Bis(4-methoxyphenyl)ethane-1,2-dione (2t)[10] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 5:1) to give the product **2s** (37.2 mg, 69% yield) as a yellow solid. Mp: 132 – 133 °C. ^1H NMR (400 MHz, $CDCl_3$) δ 7.97 – 7.91 (m, 4H), 6.95 (t, J = 5.8 Hz, 4H), 3.87 (s, 6H). $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 193.6, 165.0, 132.5, 126.4, 114.4, 55.8.

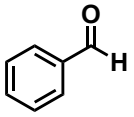


Methyl 4-([1,1'-biphenyl]-4-yl)-4-oxobutanoate (2u)[11] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica

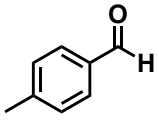
gel (PE/EA = 5:1) to give the product **2t** (20.0 mg, 37% yield) as a white solid. Mp: 103 – 104 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.08 – 8.04 (m, 2H), 7.72 – 7.67 (m, 2H), 7.63 (dd, *J* = 5.2, 3.3 Hz, 2H), 7.50 – 7.44 (m, 2H), 7.41 (dt, *J* = 9.5, 4.2 Hz, 1H), 3.72 (s, 3H), 3.35 (t, *J* = 6.6 Hz, 2H), 2.79 (t, *J* = 6.6 Hz, 2H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 197.7, 173.5, 145.9, 139.9, 135.3, 129.0, 128.7, 128.3, 127.3, 77.4, 77.1, 76.8, 51.9, 33.5, 28.1.



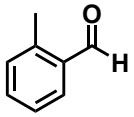
Ethyl 3-oxo-3-phenylpropanoate (2v)[12] was prepared following the General Procedure **A**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **2u** (11.6 mg, 30% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 12.57 (s, enol), 7.96 – 7.92 (m, 2H), 7.79 – 7.75 (m, enol), 7.59 (t, *J* = 7.4 Hz, 1H), 7.47 (t, *J* = 7.6 Hz, 2H), 7.44 – 7.38 (m, enol), 5.66 (s, enol), 4.29 – 4.25 (m, enol), 4.21 (q, *J* = 7.2 Hz, 2H), 3.98 (s, 2H), 1.33 (t, *J* = 7.1 Hz, enol), 1.25 (t, *J* = 7.1 Hz, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 192.6, 167.6, 136.2, 133.8, 131.3, 128.9, 128.7, 128.6, 126.2, 87.5, 61.6, 46.1, 14.2.



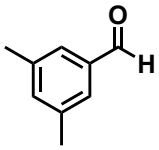
Benzaldehyde (4a) was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 50:1) to give the product **4a** (18.3 mg, 90% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 10.01 (s, 1H), 7.90 – 7.84 (m, 2H), 7.65 – 7.58 (m, 1H), 7.54 – 7.48 (m, 2H). The experimental data are in agreement with the literature report.[13]



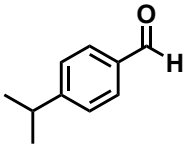
4-Methylbenzaldehyde (4b)[13] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **4b** (19.9 mg, 83% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.93 (s, 1H), 7.74 (d, *J* = 8.0 Hz, 2H), 7.29 (d, *J* = 7.7 Hz, 2H), 2.40 (s, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 192.2, 145.7, 134.3, 130.0, 129.9, 22.1.



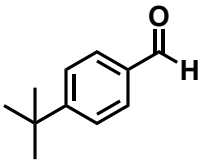
Methylbenzaldehyde (4c)[13] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **4c** (15.8 mg, 66% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) 10.20 – 10.15 (m, 1H), 7.74 – 7.69 (m, 1H), 7.43 – 7.37 (m, 1H), 7.28 (t, *J* = 7.3 Hz, 1H), 7.17 (d, *J* = 7.4 Hz, 1H), 2.60 (d, *J* = 4.7 Hz, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 193.0, 140.8, 134.3, 133.8, 132.2, 131.9, 126.5, 19.8.



3,5-Dimethylbenzaldehyde (4d)[13] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **4d** (22.8 mg, 85% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.94 (s, 1H), 7.48 (s, 2H), 7.26 (s, 1H), 2.39 (s, 6H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 193.0, 138.9, 136.7, 136.3, 127.7, 21.2.

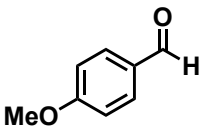


Isopropylbenzaldehyde (4e)[14] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **4e** (23.8 mg, 80% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.95 (d, *J* = 1.8 Hz, 1H), 7.79 (dd, *J* = 8.0, 1.5 Hz, 2H), 7.39 – 7.33 (m, 2H), 2.99 – 2.93 (m, 1H), 1.27 – 1.24 (m, 6H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 192.2, 156.4, 134.6, 130.1, 127.3, 34.6, 23.8.

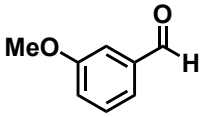


(*Tert*-butyl)benzaldehyde (4f)[14] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **4f** (24.7 mg, 76% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$)

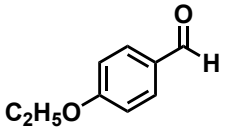
δ 9.96 (s, 1H), 7.80 (d, *J* = 8.4 Hz, 2H), 7.53 (d, *J* = 8.3 Hz, 2H), 1.33 (d, *J* = 0.7 Hz, 9H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 192.2, 158.6, 134.2, 129.8, 126.1, 35.5, 31.2.



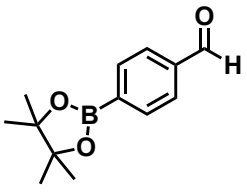
4-Methoxybenzaldehyde (4g)[13] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **4g** (18.6 mg, 68% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.88 (s, 1H), 7.83 (d, *J* = 8.8 Hz, 2H), 7.00 (d, *J* = 8.7 Hz, 2H), 3.88 (s, 3H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 190.9, 164.7, 132.1, 130.1, 114.4, 55.7.



3-Methoxybenzaldehyde (4h)[13] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **4h** (16.0 mg, 59% yield) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) 9.92 – 9.79 (m, 1H), 7.41 – 7.24 (m, 3H), 7.13 – 7.01 (m, 1H), 3.80 – 3.67 (m, 3H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 192.2, 160.3, 138.0, 130.2, 123.6, 121.6, 112.2, 55.6.

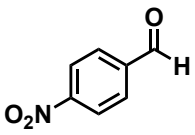


4-Ethoxybenzaldehyde (4i)[15] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **4i** (18.6 mg, 63% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.88 (s, 1H), 7.87 – 7.79 (m, 2H), 7.02 – 6.95 (m, 2H), 4.12 (q, *J* = 7.0 Hz, 2H), 1.45 (dd, *J* = 8.3, 5.6 Hz, 3H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 190.8, 164.1, 132.0, 129.7, 114.7, 63.9, 14.6.

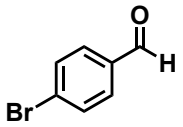


4-(4,4,5,5-Tetramethyl-1,3,2-dioxaborolan-2-yl)benzaldehyde (4j)[16] was prepared following the General Procedure **B**. The crude product was purified by flash

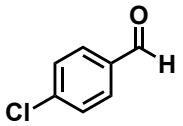
chromatography on silica gel (PE/EA = 20:1) to give the product **4j** (30.2 mg, 65% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 10.05 (s, 1H), 7.96 (d, *J* = 8.0 Hz, 2H), 7.88 – 7.85 (m, 2H), 1.36 (s, 12H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) 192.8, 138.2, 135.3, 128.8, 84.5, 25.0.



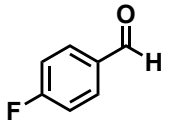
4-Nitrobenzaldehyde (4k)[17] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **4k** (17.4 mg, 58% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 10.16 (s, 1H), 8.44 – 8.36 (m, 2H), 8.12 – 8.04 (m, 2H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 190.4, 151.2, 140.1, 130.6, 124.4.



4-Bromobenzaldehyde (4l)[17] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **4l** (22.3 mg, 61% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.98 (s, 1H), 7.79 – 7.73 (m, 2H), 7.73 – 7.66 (m, 2H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 191.2, 135.2, 132.5, 131.1, 129.9.

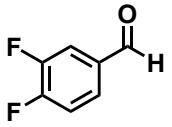


4-Chlorobenzaldehyde (4m)[17] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **4m** (17.9 mg, 64% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.91 (d, *J* = 0.9 Hz, 1H), 7.88 – 7.82 (m, 2H), 7.19 – 7.10 (m, 2H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 190.9, 141.0, 134.8, 131.0, 129.5.

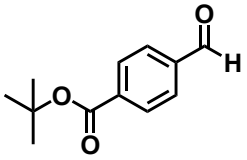


4-Fluorobenzaldehyde (4n)[17] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **4n** (17.1 mg, 69% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$)

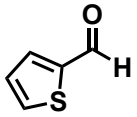
δ 9.98 (s, 1H), 7.82 (d, J = 8.4 Hz, 2H), 7.51 (d, J = 8.3 Hz, 2H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 190.6, 166.7 (d, J = 256.8 Hz), 133.0 (d, J = 9.5 Hz), 132.4 (d, J = 9.7 Hz), 116.49 (d, J = 22.3 Hz). ^{19}F NMR (376 MHz, $CDCl_3$) δ -102.40.



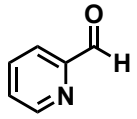
3,4-Difluorobenzaldehyde (4o)[17] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **4o** (19.9 mg, 70% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.93 (d, J = 2.0 Hz, 1H), 7.76 – 7.65 (m, 2H), 7.39 – 7.31 (m, 1H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 189.6, 155.9 (d, J = 13.1 Hz), 153.4 (d, J = 13.0 Hz), 152.4 (d, J = 13.3 Hz), 149.9 (d, J = 13.3 Hz), 133.7, 127.4 (dd, J = 7.7, 3.4 Hz), 118.3 (d, J = 18.3 Hz), 117.8 (d, J = 17.5 Hz). ^{19}F NMR (376 MHz, $CDCl_3$) δ -126.86 (d, J = 20.5 Hz), -135.22 (d, J = 20.5 Hz).



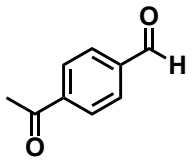
***Tert*-butyl 4-formylbenzoate (4p)**[18] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 5:1) to give the product **4p** (29.6 mg, 72% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 10.09 (s, 1H), 8.14 (d, J = 8.2 Hz, 2H), 7.93 (d, J = 8.7 Hz, 2H), 1.61 (s, 9H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 191.9, 164.8, 138.9, 137.2, 130.1, 129.5, 82.1.



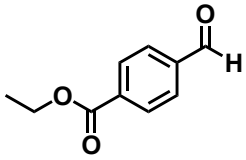
Thiophene-2-carbaldehyde (4q)[17] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **4q** (13.9 mg, 62% yield) as a yellow oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.94 (d, J = 1.2 Hz, 1H), 7.80 – 7.74 (m, 2H), 7.21 (dd, J = 4.8, 3.8 Hz, 1H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 183.1, 144.1, 136.5, 135.3, 128.4.



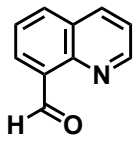
Picolinaldehyde (4r)[17] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **4r** (12.4 mg, 58% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.87 – 9.70 (m, 1H), 8.56 – 8.50 (m, 1H), 7.73 – 7.60 (m, 2H), 7.33 – 7.25 (m, 1H). $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 193.6, 152.9, 150.3, 137.2, 128.0, 121.8.



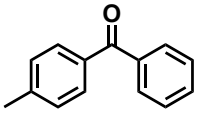
4-Acetylbenzaldehyde (4s)[19] was prepared following the General Procedure **C**. The crude product was purified by flash chromatography on silica gel (PE/EA = 5:1) to give the product **4s** (16.4 mg, 55% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 10.11 (s, 1H), 8.10 (d, J = 8.3 Hz, 2H), 7.98 (d, J = 8.3 Hz, 2H), 2.66 (s, 3H). $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 197.5, 191.8, 141.3, 139.2, 130.0, 129.0, 27.1.



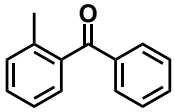
Ethyl 4-formylbenzoate (4t)[18] was prepared following the General Procedure **C**. The crude product was purified by flash chromatography on silica gel (PE/EA = 5:1) to give the product **4t** (20.4 mg, 57% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 10.10 (s, 1H), 8.22 – 8.16 (m, 2H), 8.16 – 8.13 (m, 1H), 7.97 – 7.93 (m, 1H), 4.45 – 4.39 (m, 2H), 1.42 (t, J = 7.1 Hz, 3H). $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 191.9, 165.7, 139.2, 135.6, 130.3, 129.6, 61.8, 14.4.



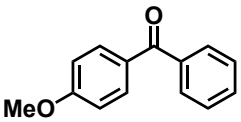
Quinoline-8-carbaldehyde (4u)[20] was prepared following the General Procedure **C**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **4u** (19.6 mg, 62% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 11.47 (s, 1H), 9.07 (dd, J = 4.1, 1.6 Hz, 1H), 8.36 – 8.32 (m, 1H), 8.26 (dd, J = 8.3, 1.5 Hz, 1H), 8.11 (dd, J = 8.1, 1.3 Hz, 1H), 7.69 (t, J = 7.7 Hz, 1H), 7.53 (dd, J = 8.3, 4.2 Hz, 1H). $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$) δ 192.6, 151.4, 147.7, 136.4, 134.4, 131.8, 129.4, 128.4, 126.3, 121.9.



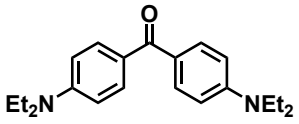
Phenyl(*p*-tolyl)methanone (6a)[5] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **6a** (32.9 mg, 84% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80 – 7.77 (m, 2H), 7.74 – 7.71 (m, 2H), 7.62 – 7.53 (m, 1H), 7.53– 7.43 (m, 2H), 7.30 – 7.27 (m, 2H), 2.44 (s, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 196.6, 143.3, 138.0, 135.0, 132.2, 130.4, 130.0, 129.1, 128.3, 21.7.



Phenyl(*o*-tolyl)methanone (6b)[5] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **6b** (30.6 mg, 78% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.83 – 7.79 (m, 2H), 7.60 – 7.56 (m, 1H), 7.48 – 7.43 (m, 2H), 7.42 – 7.35 (m, 1H), 7.34 – 7.21 (m, 3H), 2.34 (s, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 198.8, 138.7, 137.9, 136.9, 133.3, 131.1, 130.4, 130.2, 128.63, 128.58, 125.3, 20.1.

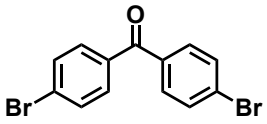


(4-Methoxyphenyl)(phenyl)methanone (6c)[5] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **6c** (31.9 mg, 75% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.85 – 7.81 (m, 2H), 7.78 – 7.74 (m, 2H), 7.59 – 7.54 (m, 1H), 7.52 –7.43 (m, 2H), 6.99 – 6.94 (m, 2H), 3.89 (s, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 195.6, 163.3, 138.4, 132.7, 132.0, 130.2, 129.8, 128.3, 113.7, 55.6.

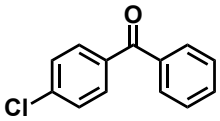


Bis(4-(diethylamino)phenyl)methanone (6d)[21] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **6d** (45.4 mg, 70% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.79 – 7.72 (m, 2H), 6.65 (d, J = 8.9 Hz, 2H), 3.42 (q, J = 7.1 Hz,

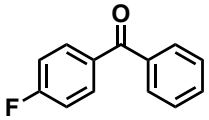
4H), 1.24 – 1.18 (m, 6H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 193.6, 150.4, 132.6, 125.7, 110.1, 44.6, 12.7.



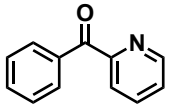
Bis(4-bromophenyl)methanone (6e)[22] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **6e** (48.0 mg, 71% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 – 7.60 (m, 8H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 194.6, 136.0, 131.9, 131.5, 127.9.



(4-Chlorophenyl)(phenyl)methanone (6f)[5] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **6f** (47.0 mg, 74% yield) as a white solid. Mp: 70 – 72 °C. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.79 – 7.72 (m, 4H), 7.63 – 7.58 (m, 1H), 7.52 – 7.44 (m, 4H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 195.6, 139.0, 137.4, 136.0, 132.8, 131.6, 130.1, 128.8, 128.5.

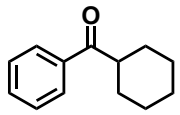


(4-Fluorophenyl)(phenyl)methanone (6g)[5] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **6g** (30.5 mg, 76% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.88 – 7.82 (m, 2H), 7.80 – 7.75 (m, 2H), 7.62 – 7.57 (m, 1H), 7.51 – 7.46 (m, 2H), 7.19 – 7.13 (m, 2H). $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$) δ 195.4, 165.5 (d, J = 254.1 Hz), 137.6, 133.9 (d, J = 3.1 Hz), 132.8 (d, J = 9.2 Hz), 132.6, 130.0, 128.5, 115.7. ^{19}F NMR (376 MHz, $CDCl_3$) δ -105.86 – -105.98 (m).

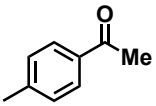


Phenyl(pyridin-2-yl)methanone (6h)[7] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA =

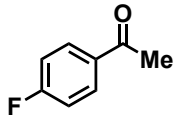
20:1) to give the product **6h** (28.1 mg, 77% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.68 (s, 1H), 8.10 – 7.95 (m, 3H), 7.88 – 7.80 (m, 1H), 7.58 – 7.52 (m, 1H), 7.49 – 7.38 (m, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 193.6, 154.9, 148.4, 136.9, 136.1, 132.7, 130.8, 128.0, 126.0, 124.4.



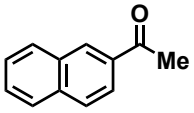
Cyclohexyl(phenyl)methanone (6i)[9] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **6i** (24.5 mg, 65% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.98 – 7.92 (m, 2H), 7.57 – 7.52 (m, 1H), 7.49 – 7.43 (m, 2H), 3.31 – 3.21 (m, 1H), 1.93 – 1.81 (m, 4H), 1.78 – 1.70 (m, 1H), 1.55 – 1.34 (m, 4H), 1.33 – 1.22 (m, 1H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 204.0, 136.5, 132.9, 128.7, 128.4, 45.8, 29.6, 26.1, 26.0.



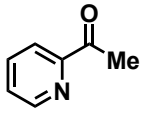
(*p*-Tolyl)ethan-1-one (6k)[7] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **6k** (20.9 mg, 78% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.88 (d, J = 8.2 Hz, 2H), 7.28 (d, J = 8.0 Hz, 2H), 2.60 (s, 3H), 2.43 (s, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 197.5, 143.7, 134.6, 129.1, 128.3, 26.3, 21.4.



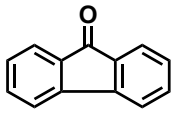
(4-Fluorophenyl)ethan-1-one (6l)[7] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **6l** (17.4 mg, 63% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.01 – 7.94 (m, 2H), 7.16 – 7.09 (m, 2H), 2.59 (d, J = 0.7 Hz, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 196.6, 165.9 (d, J = 254.6 Hz), 133.7 (d, J = 2.9 Hz), 131.1 (d, J = 9.4 Hz), 115.9, 26.7. ^{19}F NMR (376 MHz, $CDCl_3$) δ -105.34.



1-(Naphthalen-2-yl)ethan-1-one (6m)[7] was prepared following the General Procedure **B**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **6m** (26.5 mg, 78% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.47 (s, 1H), 8.04 (dd, *J* = 8.6, 1.7 Hz, 1H), 7.97 (d, *J* = 8.0 Hz, 1H), 7.92 – 7.87 (m, 2H), 7.63 – 7.54 (m, 2H), 2.73 (s, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 198.2, 135.7, 134.6, 132.6, 130.3, 129.7, 128.6, 128.5, 127.9, 126.9, 124.0, 26.8.



1-(Pyridin-2-yl)ethan-1-one (6n)[8] was prepared following the General Procedure **C**. The crude product was purified by flash chromatography on silica gel (PE/EA = 10:1) to give the product **6n** (18.7 mg, 77% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.61 – 8.54 (m, 1H), 7.97 – 7.91 (m, 1H), 7.75 – 7.70 (m, 1H), 7.41 – 7.32 (m, 1H), 2.65 – 2.61 (m, 3H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 200.0, 153.5, 148.9, 136.8, 127.0, 121.5, 25.7.



9*H*-Fluoren-9-one (6o)[7] was prepared following the General Procedure **C**. The crude product was purified by flash chromatography on silica gel (PE/EA = 20:1) to give the product **6o** (29.8 mg, 83% yield) as a colorless oil. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 – 7.64 (m, 2H), 7.54 – 7.46 (m, 4H), 7.32 – 7.27 (m, 2H). ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$) δ 194.0, 144.5, 134.8, 134.2, 129.2, 124.4, 120.4.

7. References

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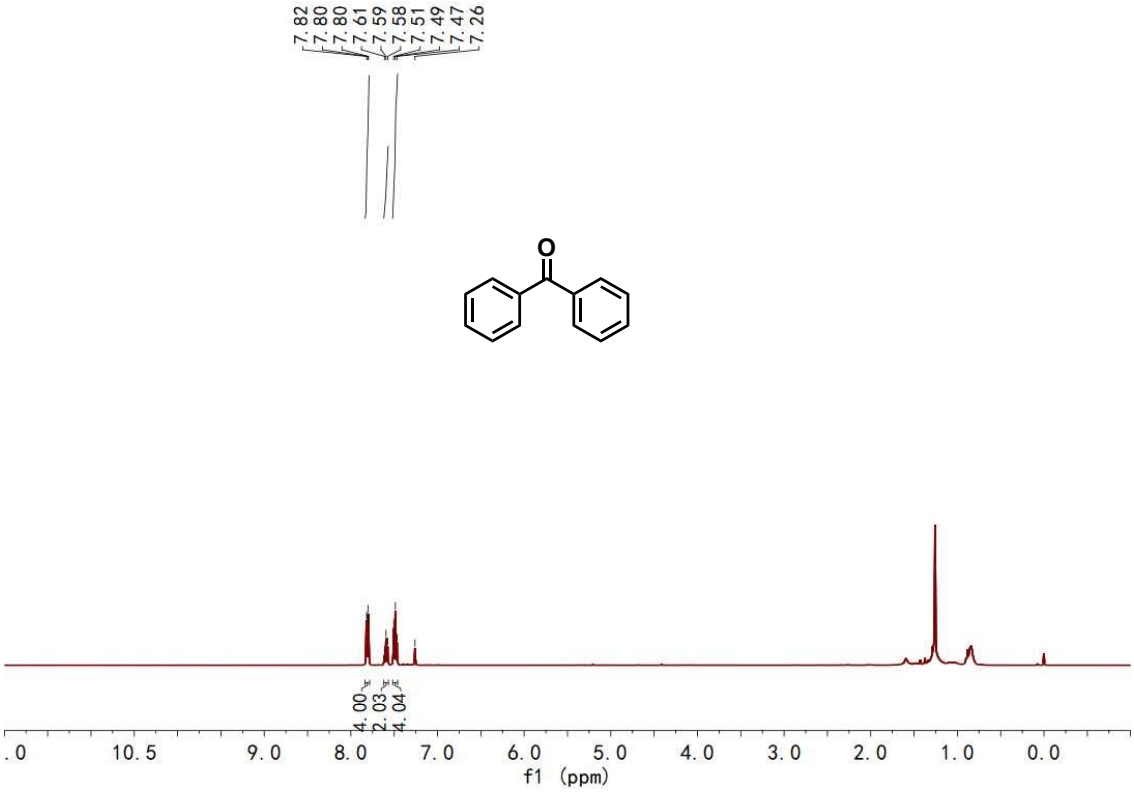
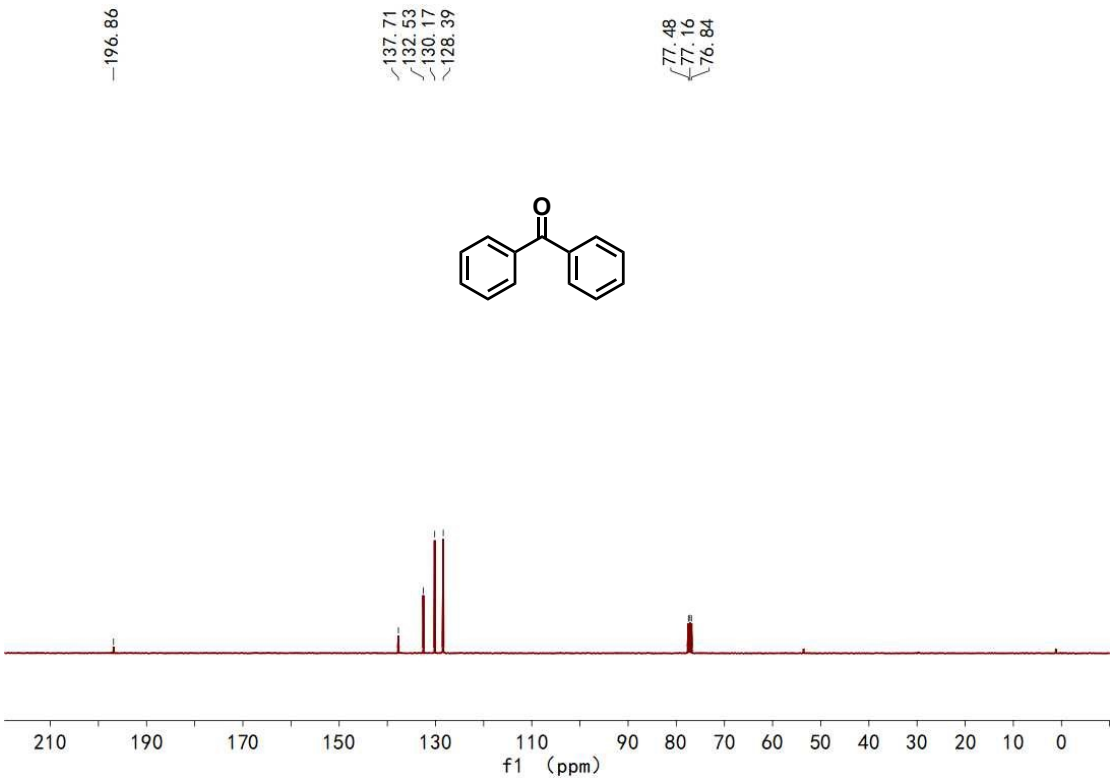
8. NMR Spectra

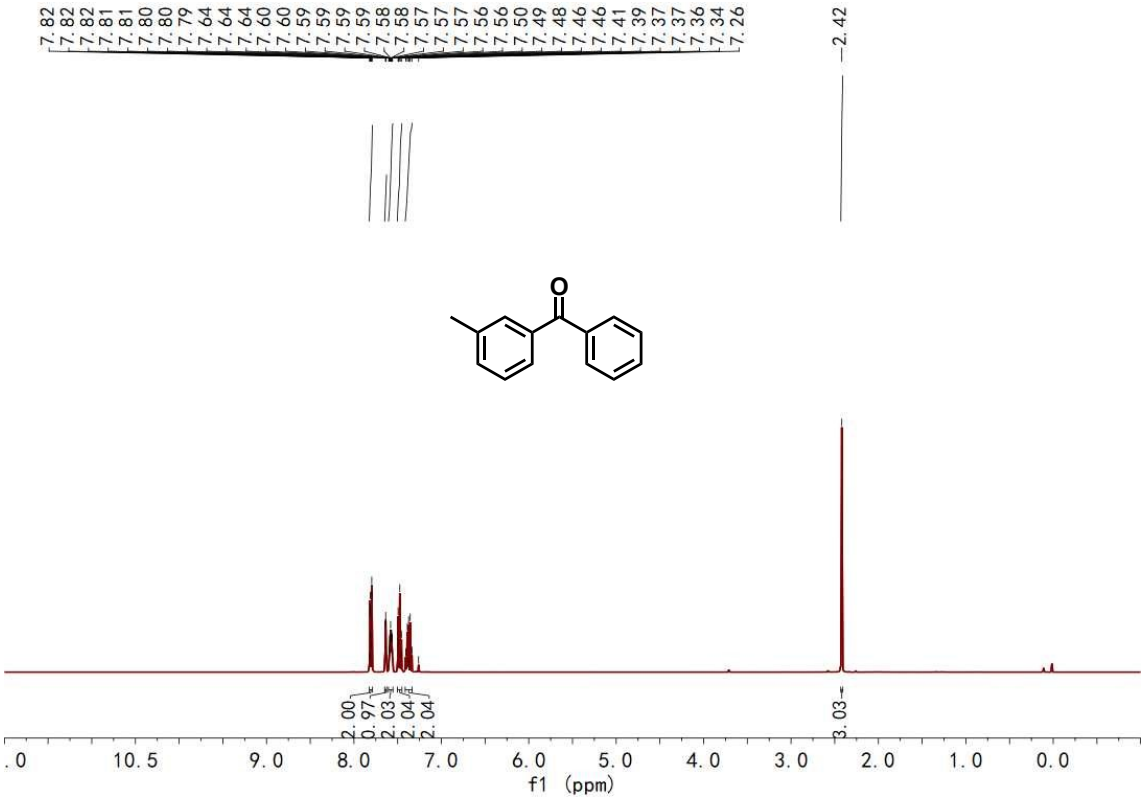
Benzophenone (2a): ^{1}H NMR (400 MHz, $CDCl_3$)



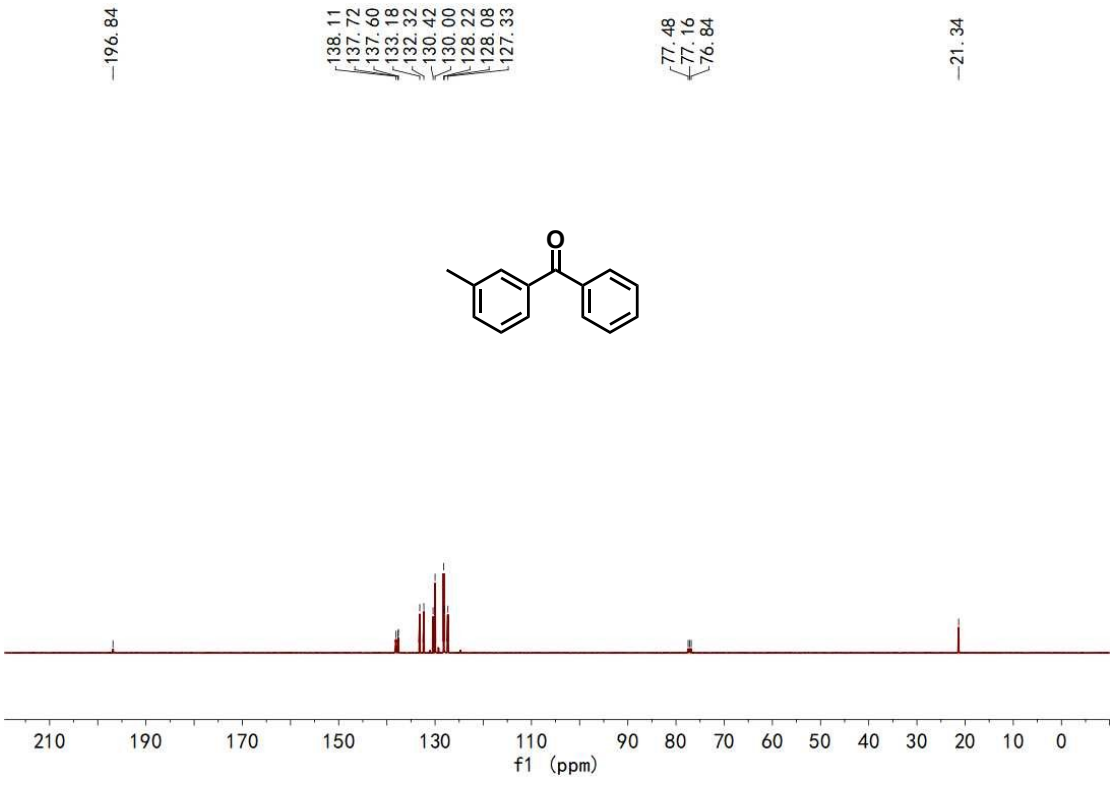
Benzophenone (2a): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



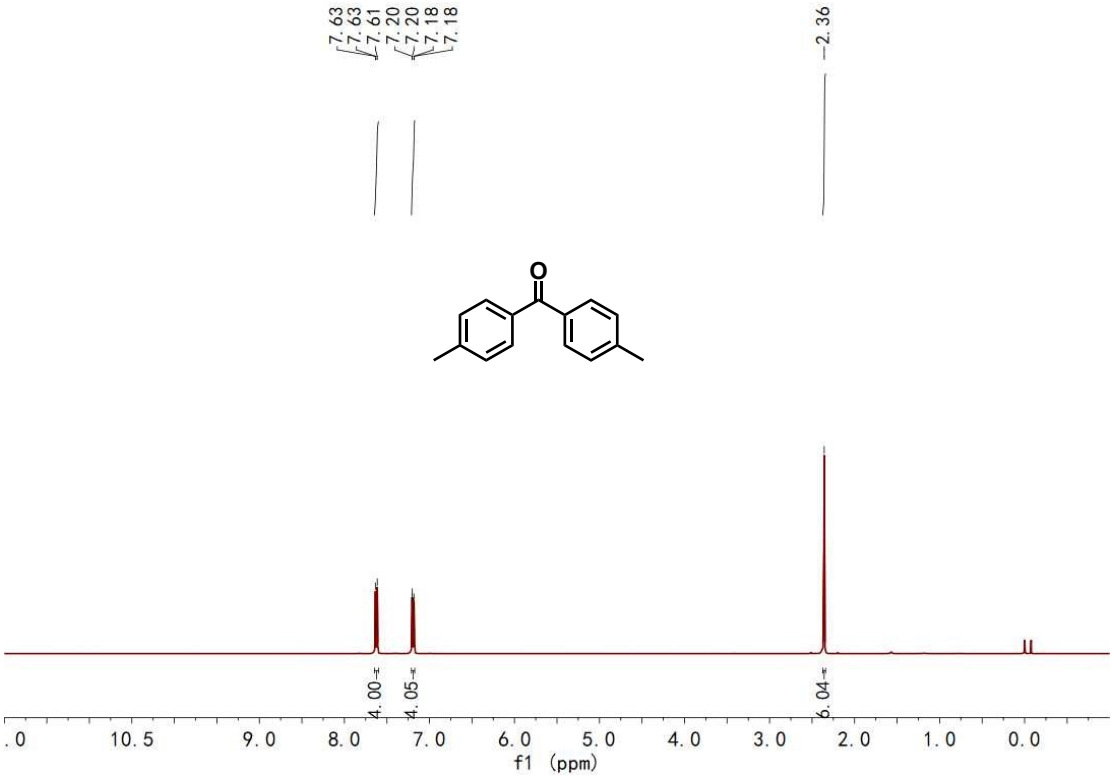
Phenyl(*m*-tolyl)methanone (2b): ^{1}H NMR (400 MHz, $CDCl_3$)



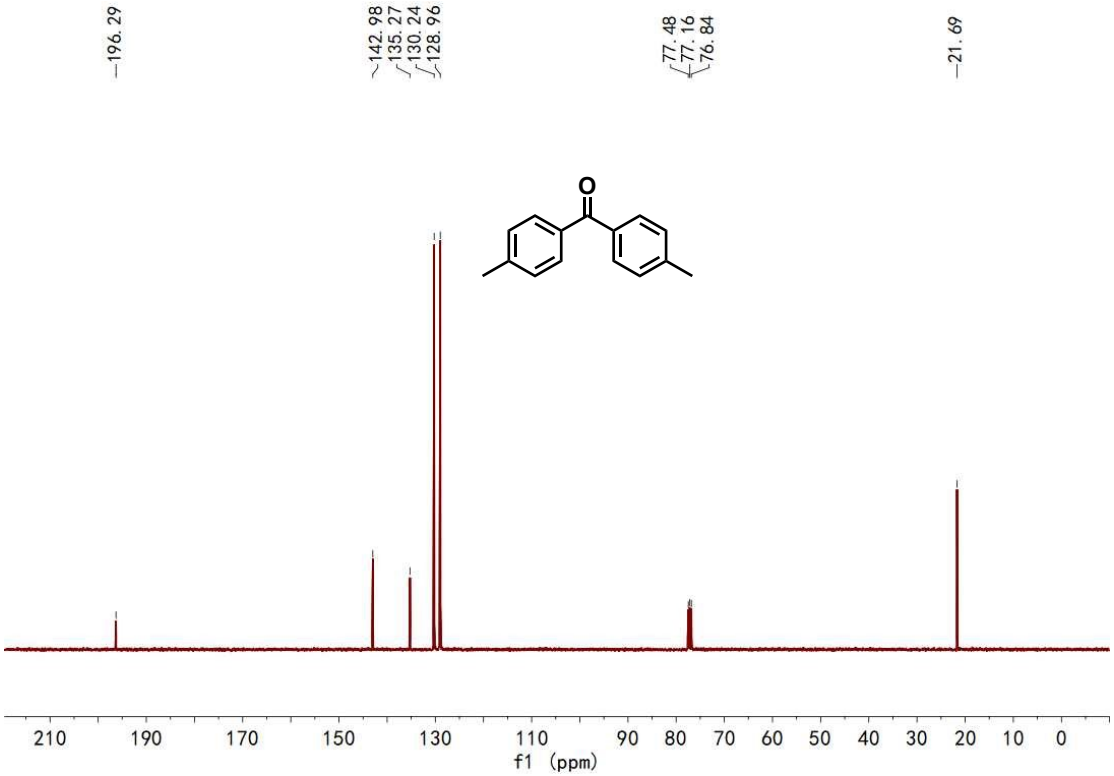
Phenyl(*m*-tolyl)methanone (2b): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



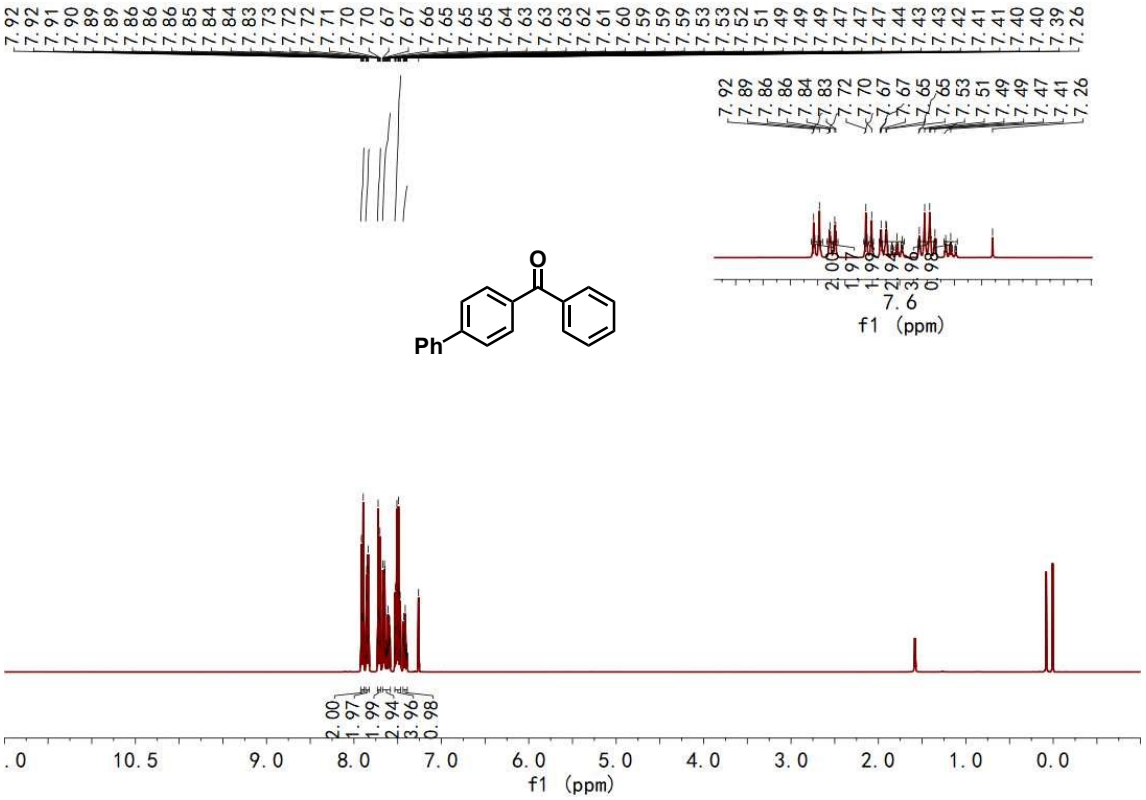
Di-*p*-tolylmethanone (2c): ^{1}H NMR (400 MHz, $CDCl_3$)



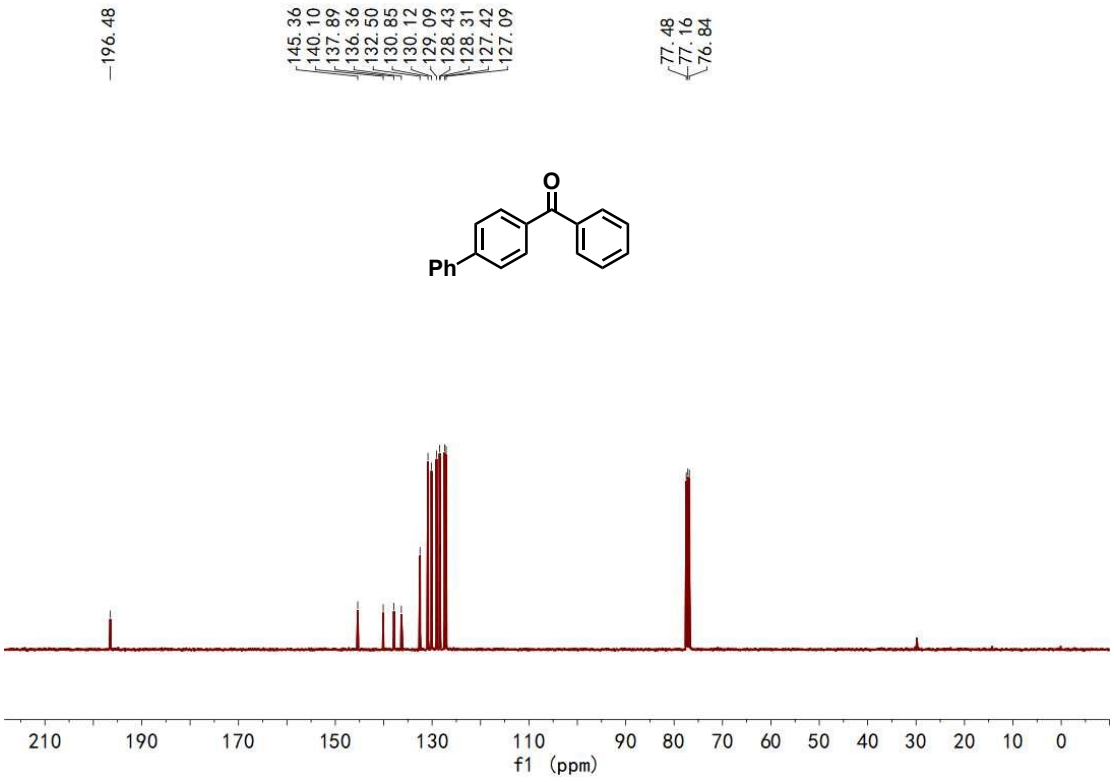
Di-*p*-tolylmethanone(2c): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



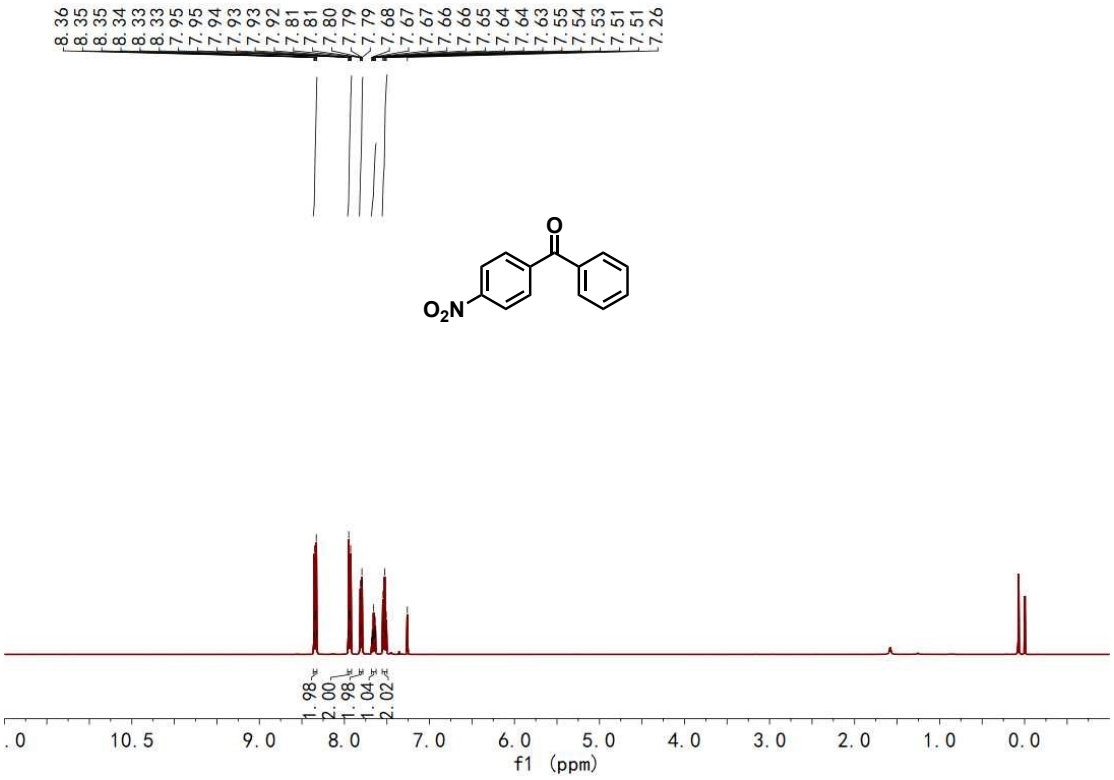
[1,1'-Biphenyl]-4-yl(phenyl)methanone (2d): ^{1}H NMR (400 MHz, $CDCl_3$)



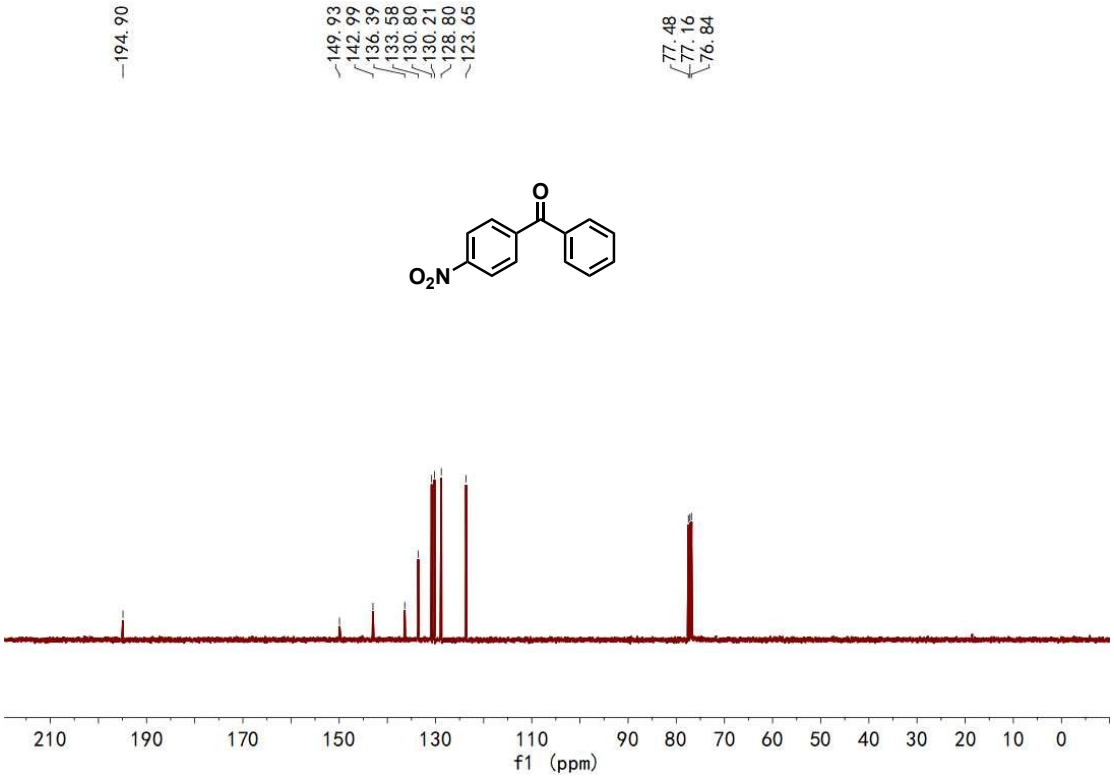
[1,1'-Biphenyl]-4-yl(phenyl)methanone (2d): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



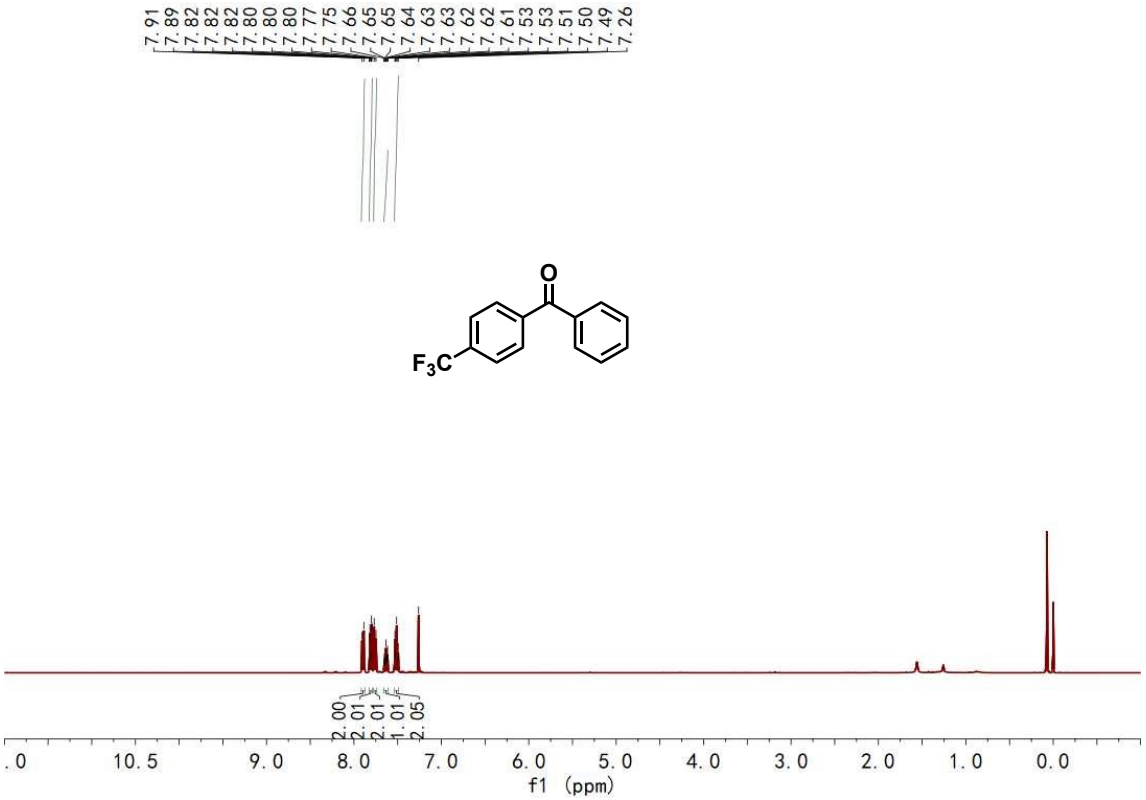
(4-Nitrophenyl)(phenyl)methanone (2e): ^{1}H NMR (400 MHz, $CDCl_3$)



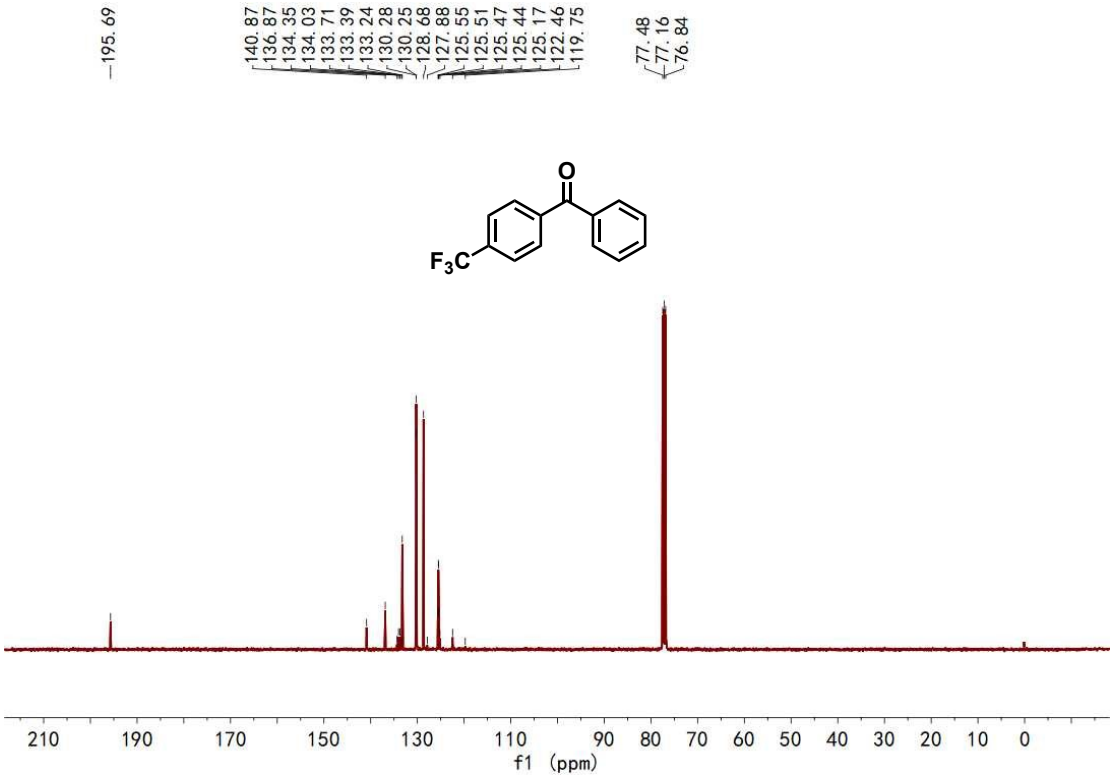
(4-Nitrophenyl)(phenyl)methanone (2e): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



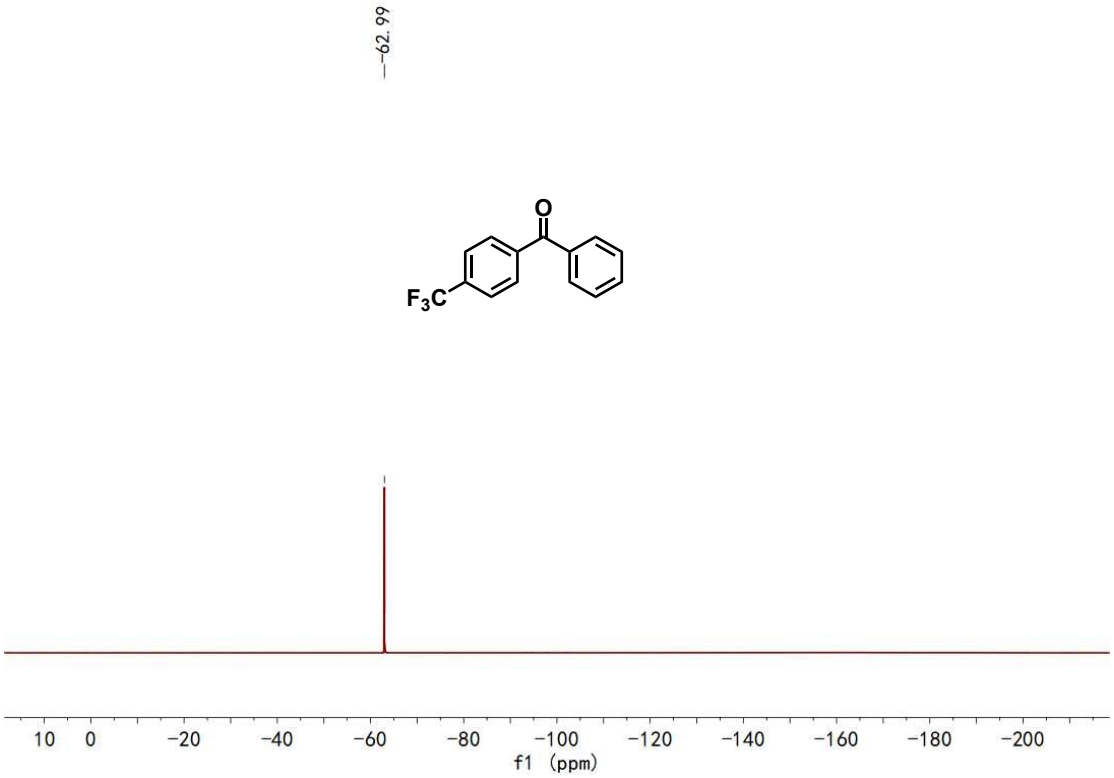
Phenyl(4-(trifluoromethyl)phenyl)methanone (2f): ^{1}H NMR (400 MHz, $CDCl_3$)



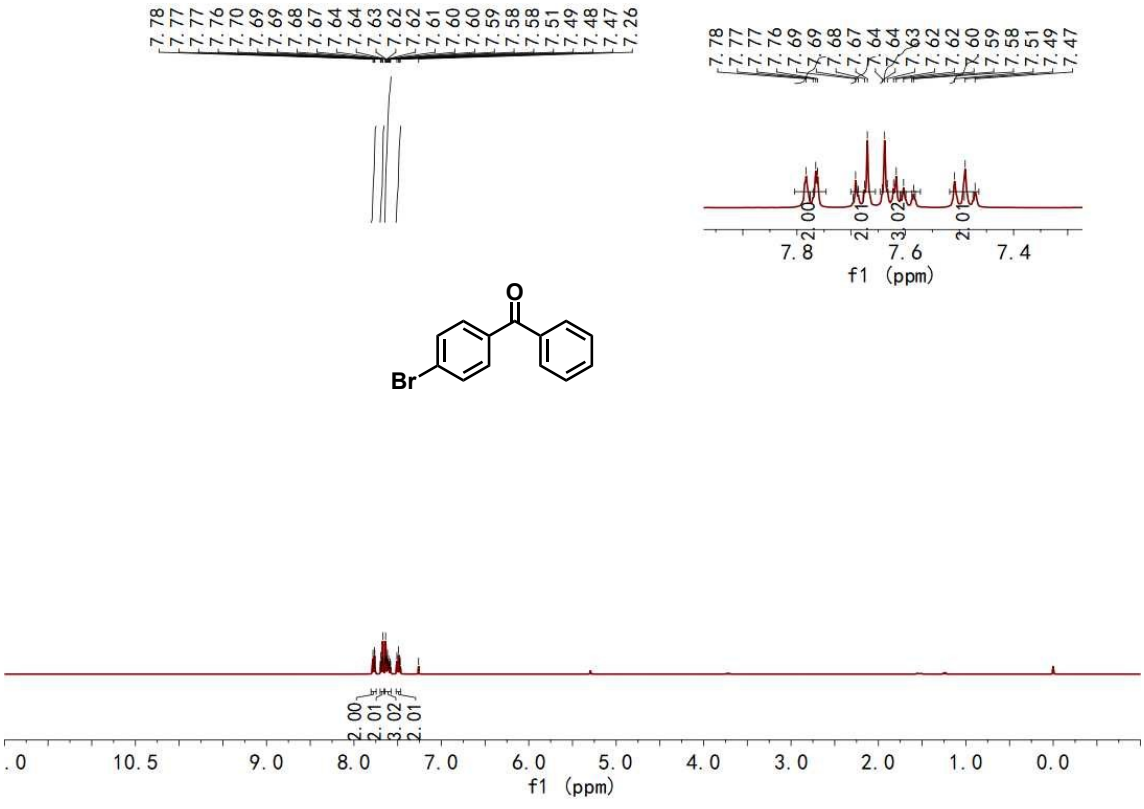
Phenyl(4-(trifluoromethyl)phenyl)methanone (2f): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



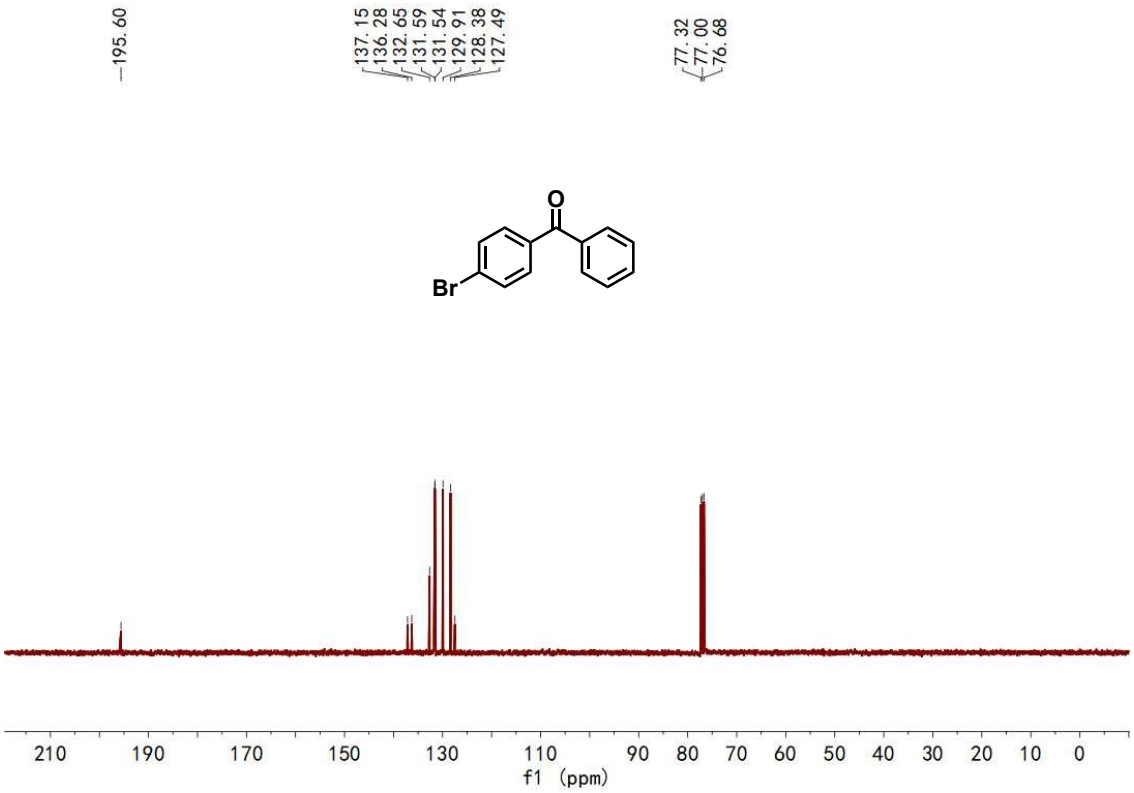
Phenyl(4-(trifluoromethyl)phenyl)methanone (2f): ^{19}F NMR (376 MHz, $CDCl_3$)



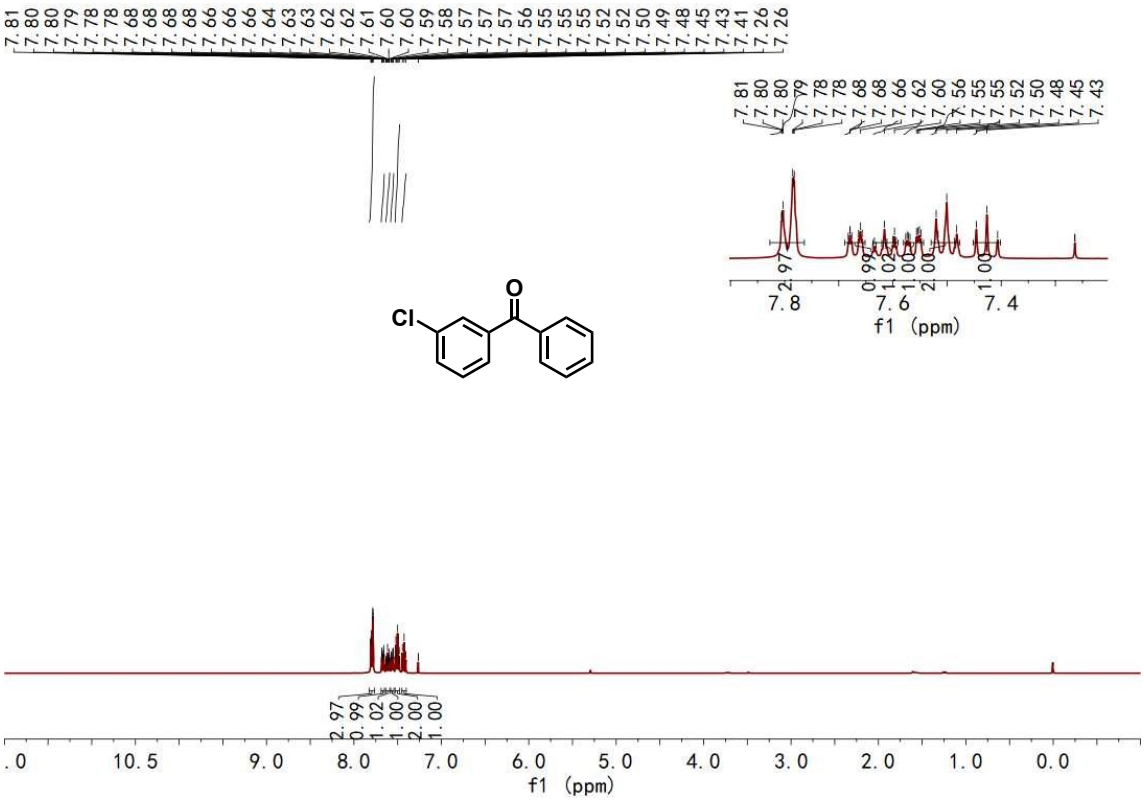
(4-Bromophenyl)(phenyl)methanon (2g): ^{1}H NMR (400 MHz, $CDCl_3$)



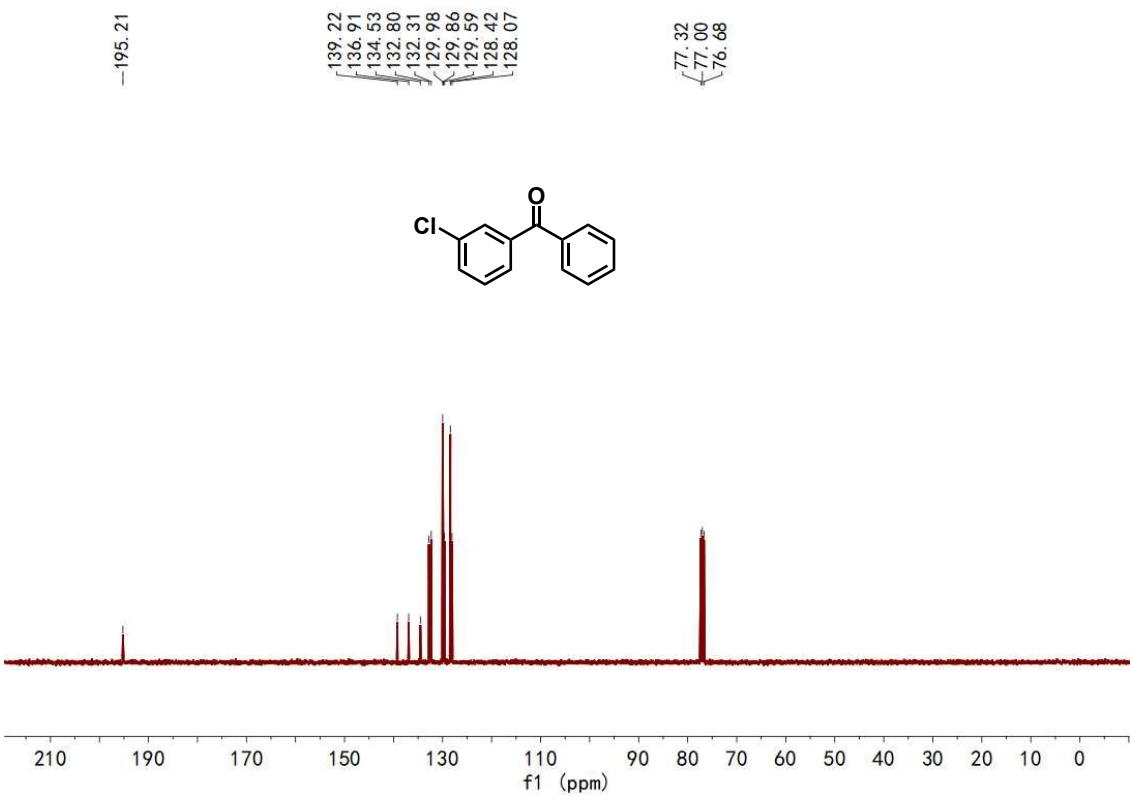
(4-Bromophenyl)(phenyl)methanon (2g): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



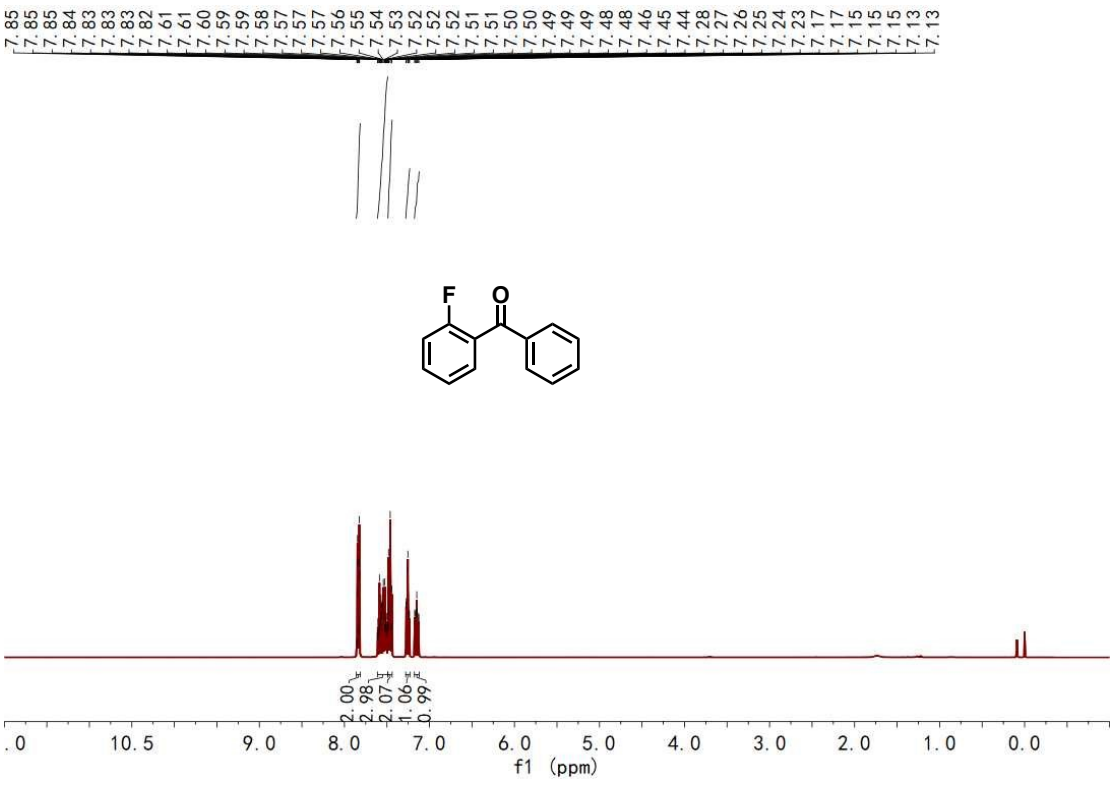
(3-Chlorophenyl)(phenyl)methanone (2h): ^{1}H NMR (400 MHz, $CDCl_3$)



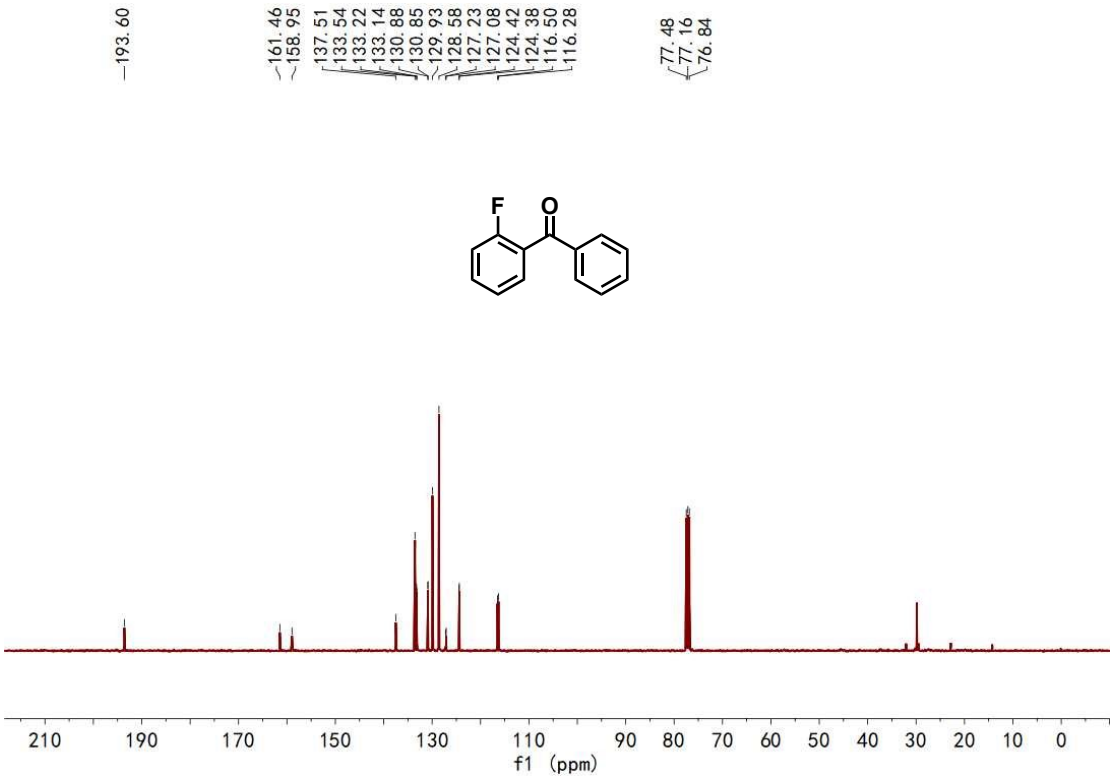
(3-Chlorophenyl)(phenyl)methanone (2h): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



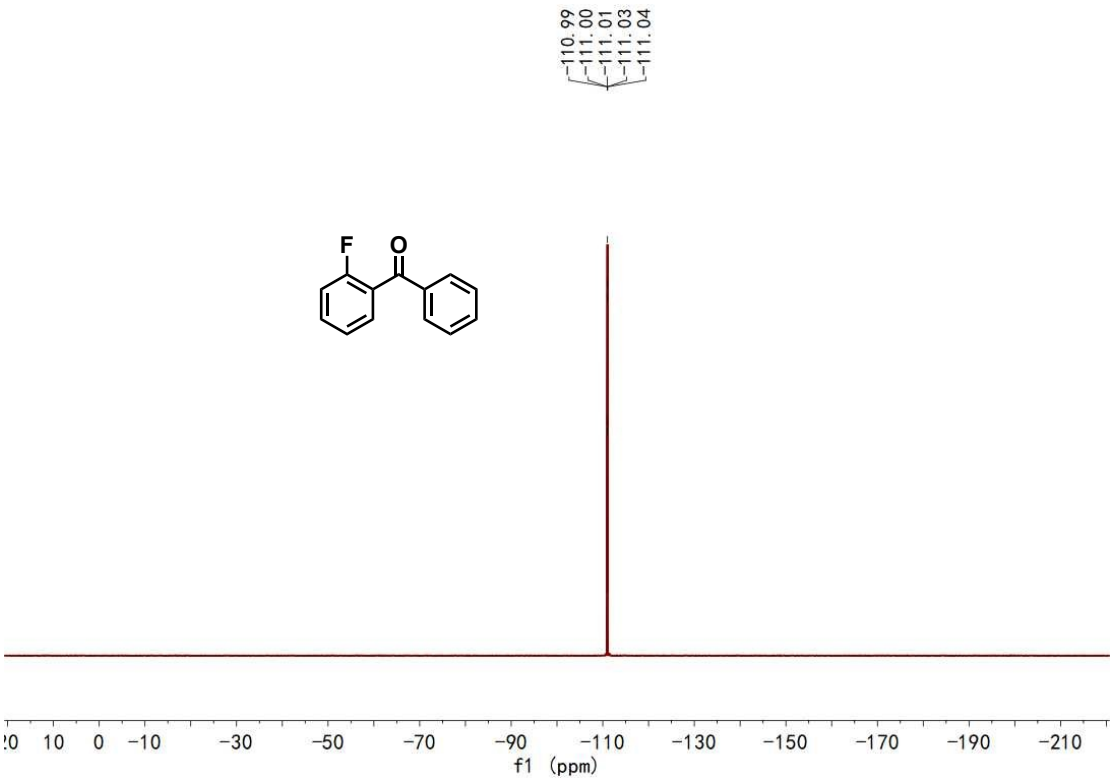
(2-Fluorophenyl)(phenyl)methanone (2i): ^{1}H NMR (400 MHz, $CDCl_3$)



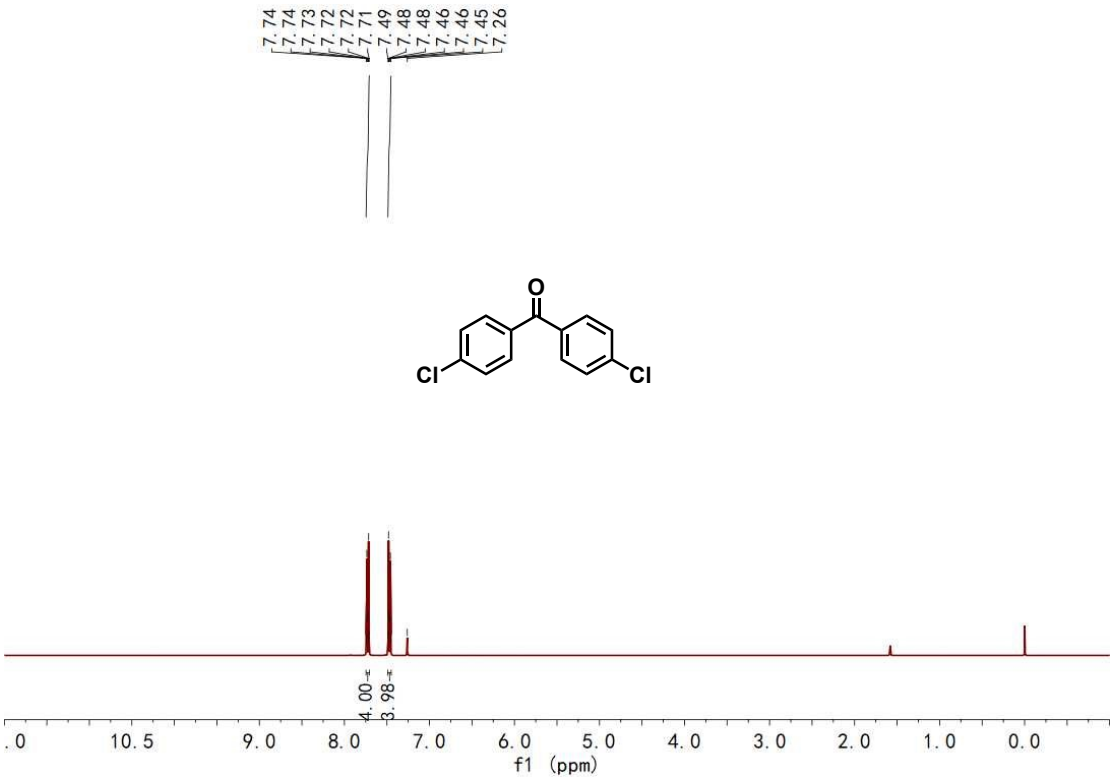
(2-Fluorophenyl)(phenyl)methanone (2i): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



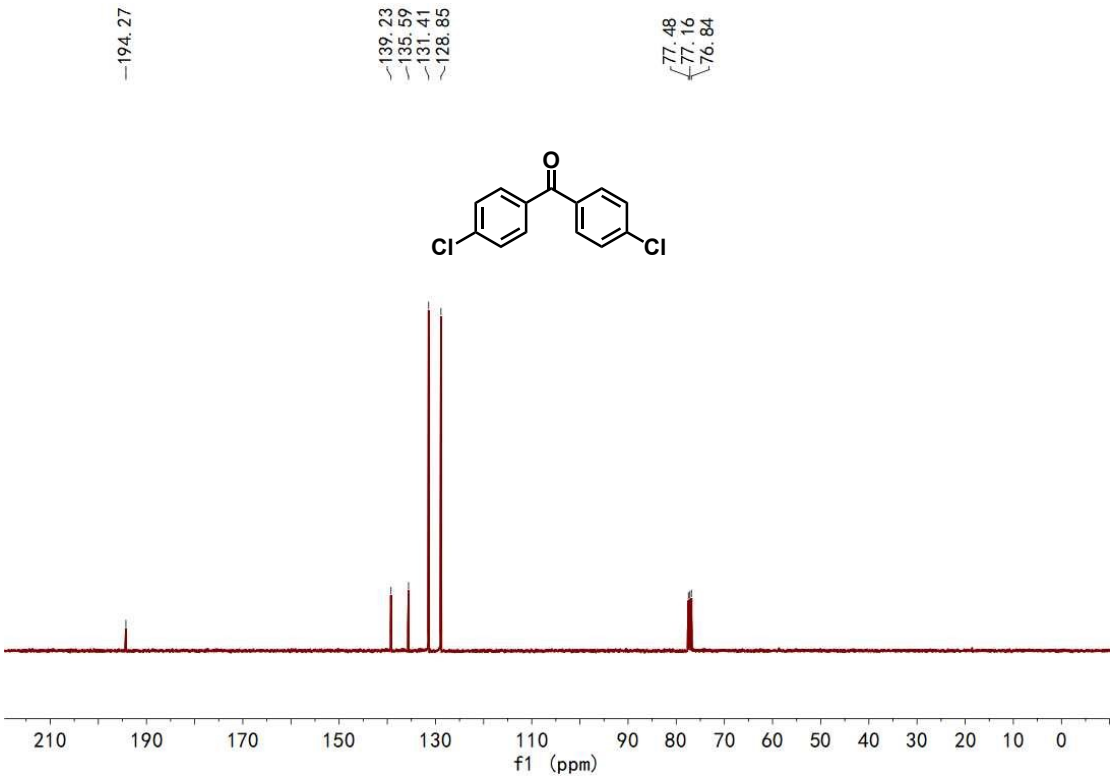
(2-Fluorophenyl)(phenyl)methanone (2i): ^{19}F NMR (376 MHz, $CDCl_3$)



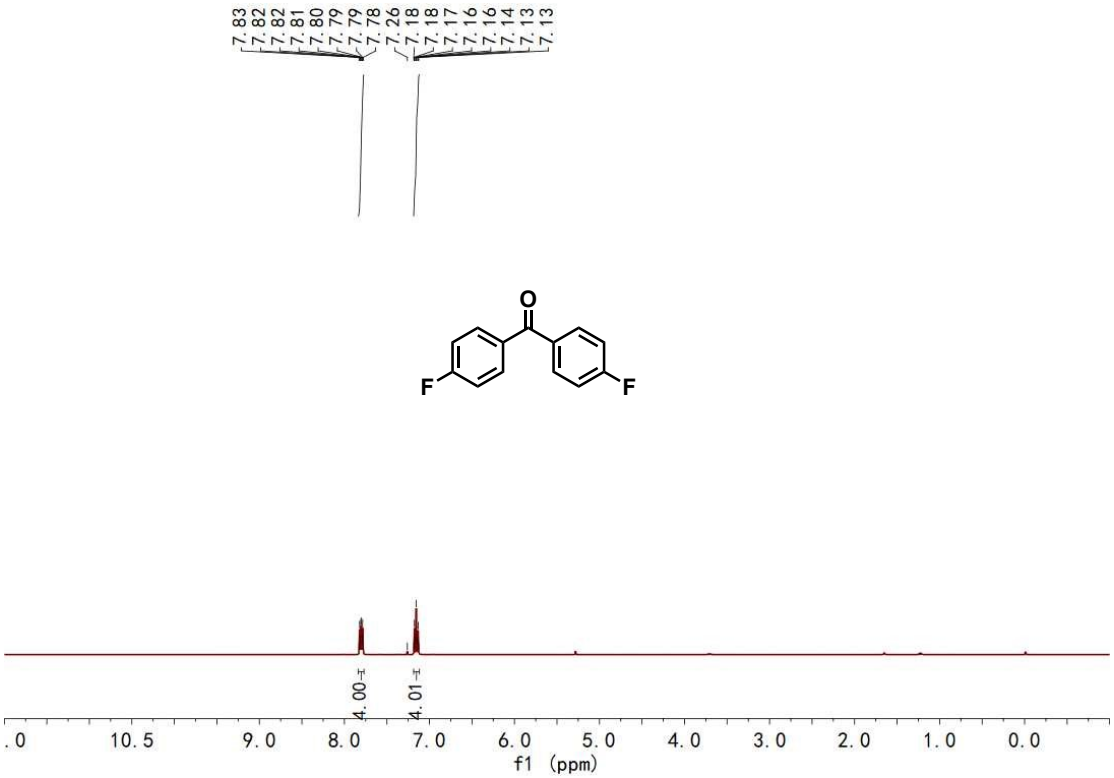
Bis(4-chlorophenyl)methanone (2j): ^{1}H NMR (400 MHz, $CDCl_3$)



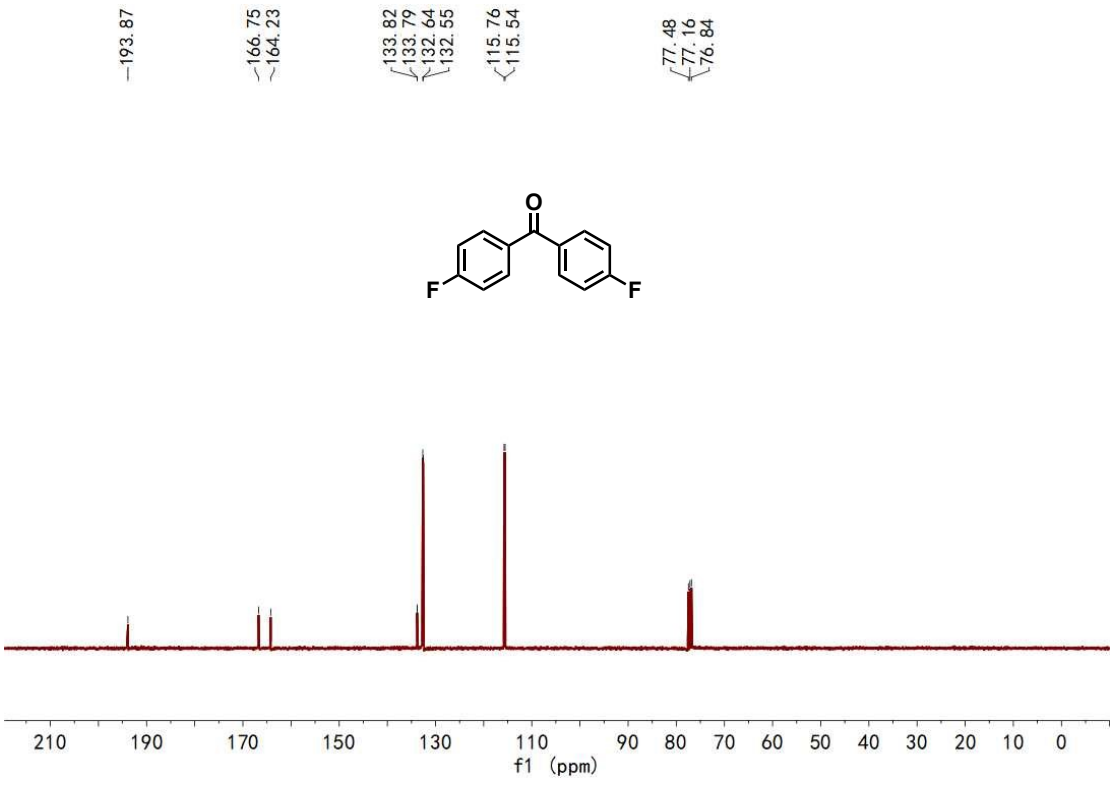
Bis(4-chlorophenyl)methanone (2j): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



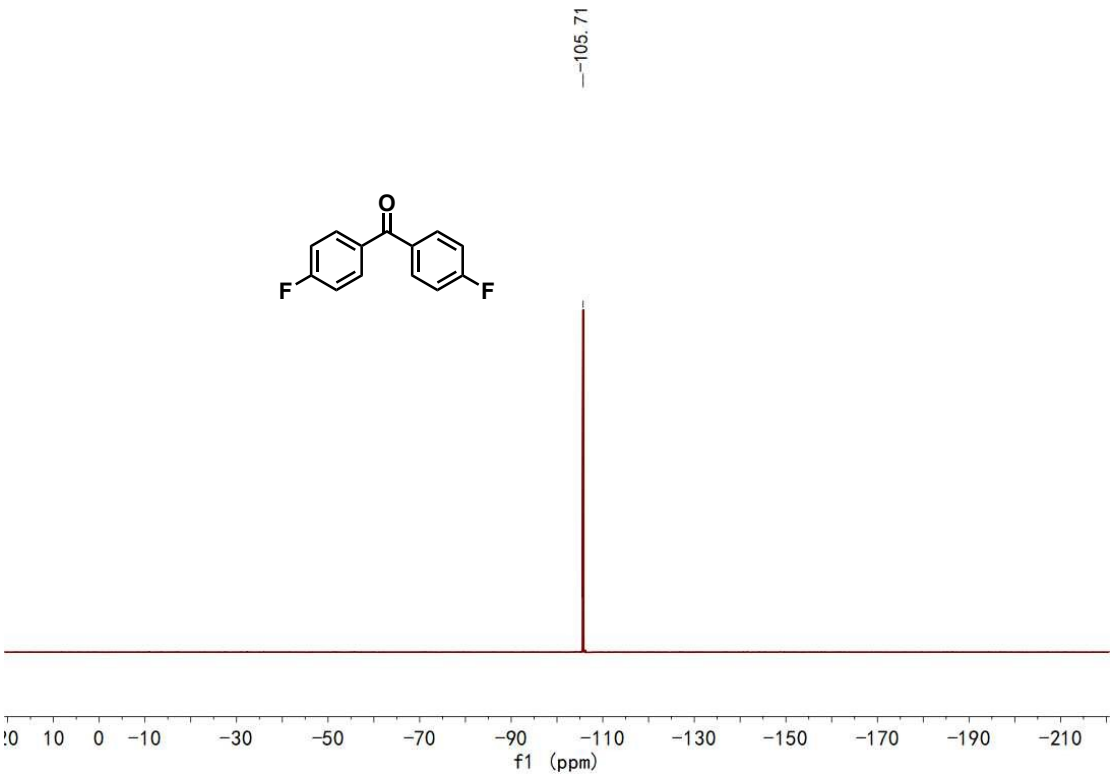
Bis(4-fluorophenyl)methanone (2k): ^{1}H NMR (400 MHz, $CDCl_3$)



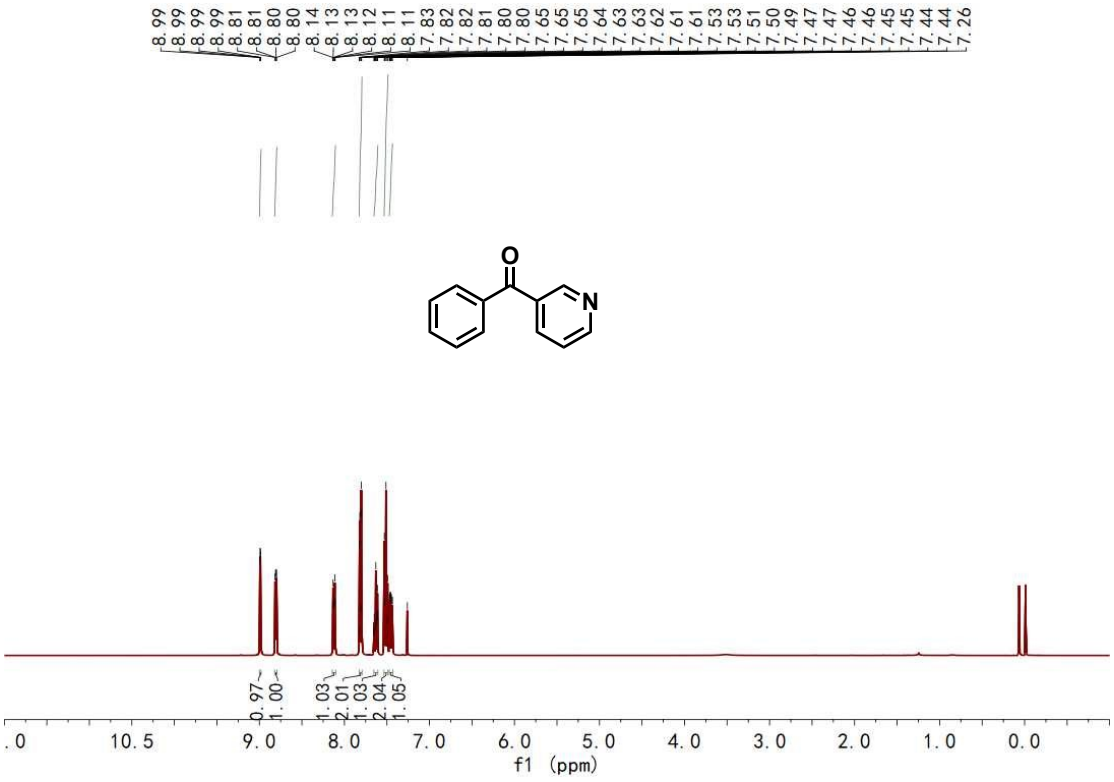
Bis(4-fluorophenyl)methanone (2k): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



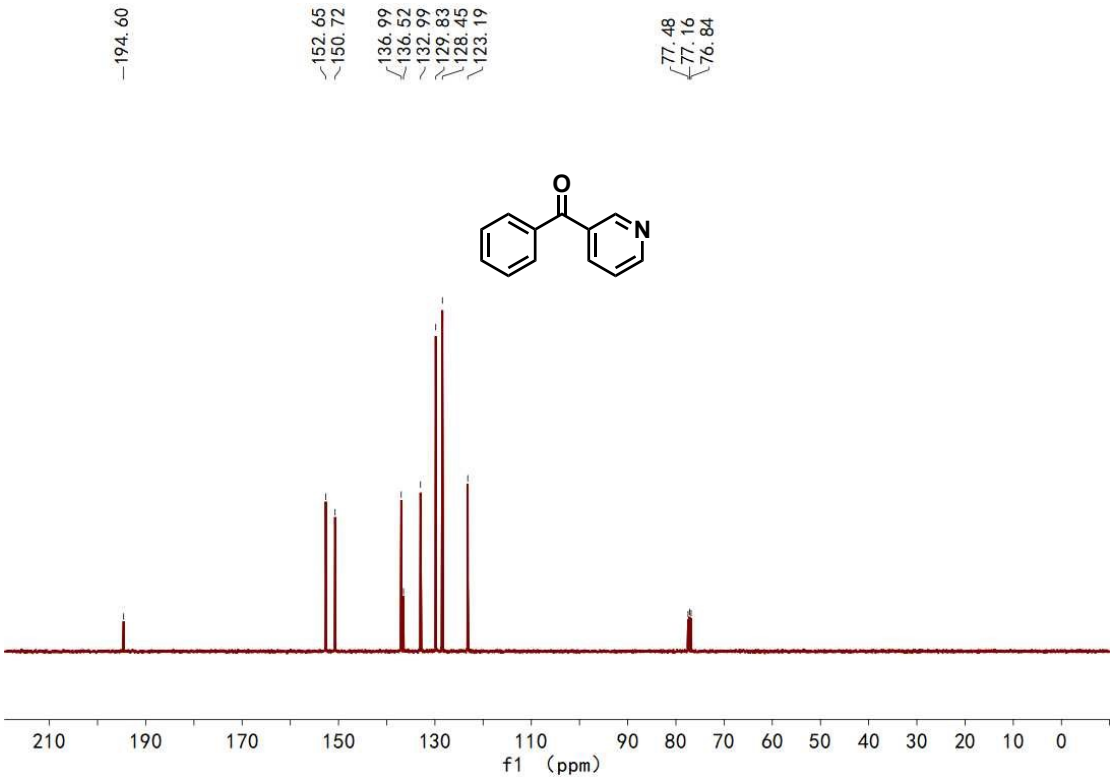
Bis(4-fluorophenyl)methanone (2k): ^{19}F NMR (376 MHz, $CDCl_3$)



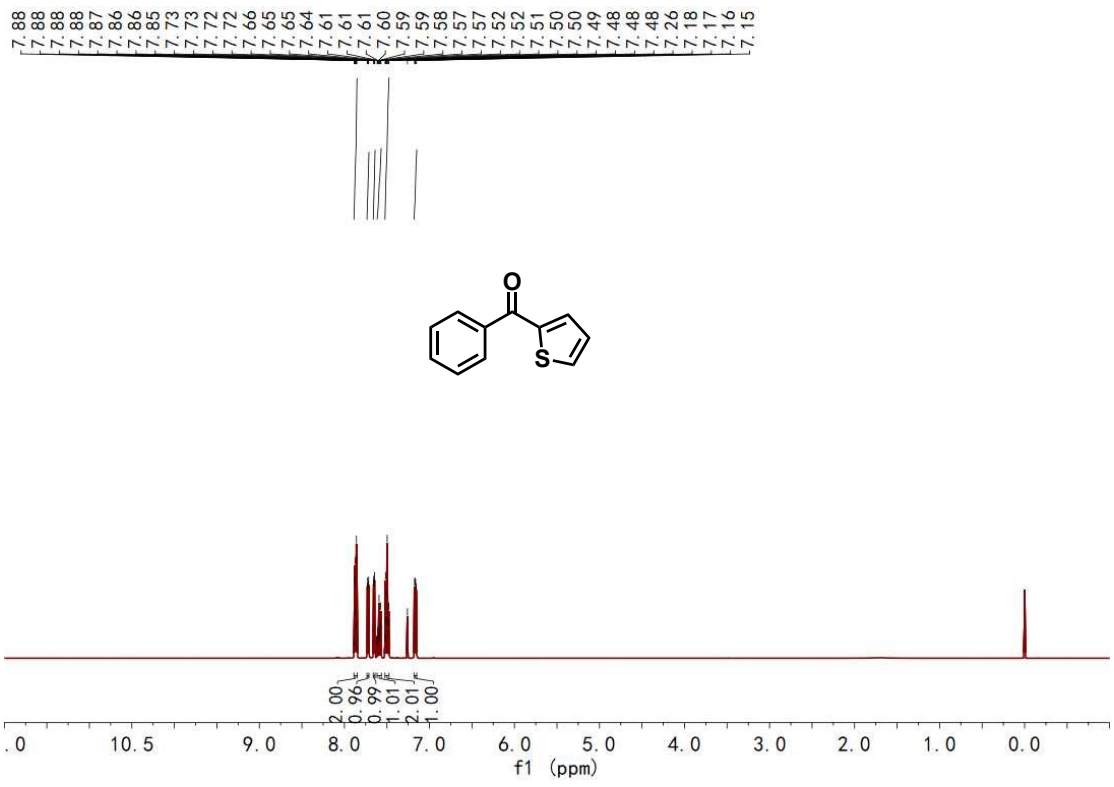
Phenyl(pyridin-3-yl)methanone (2l): ^{1}H NMR (400 MHz, $CDCl_3$)



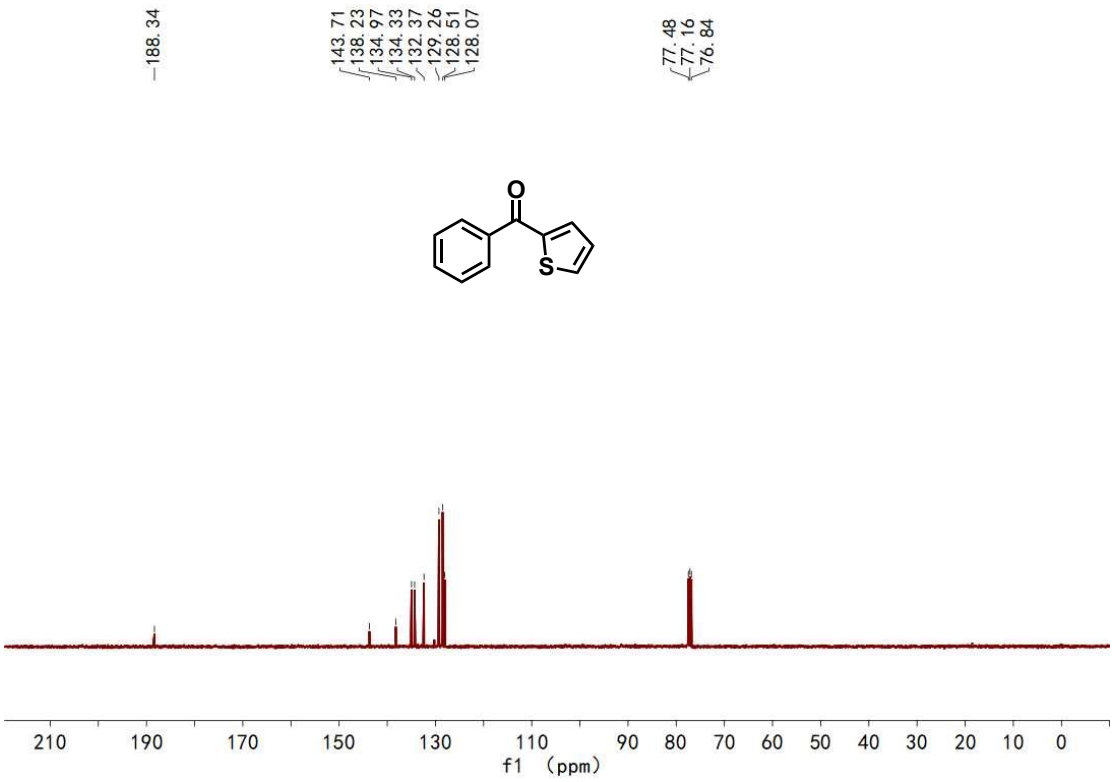
Phenyl(pyridin-3-yl)methanone (2l): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



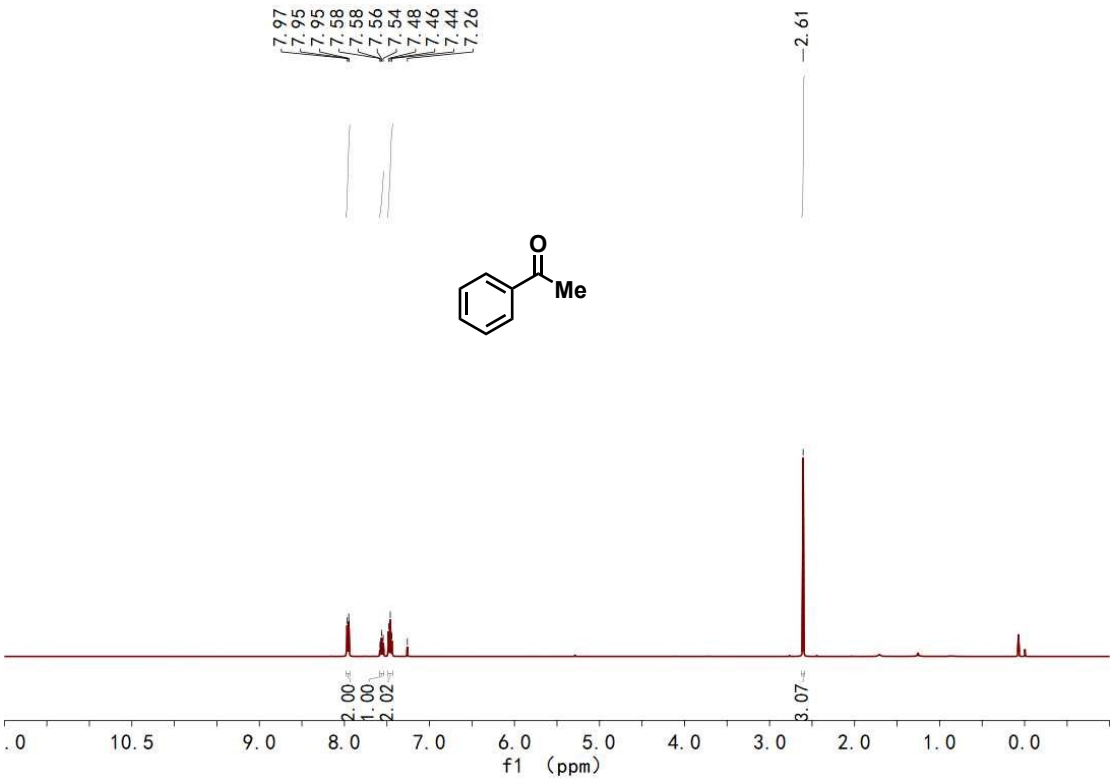
Phenyl(thiophen-2-yl)methanone (2m): ^{1}H NMR (400 MHz, $CDCl_3$)



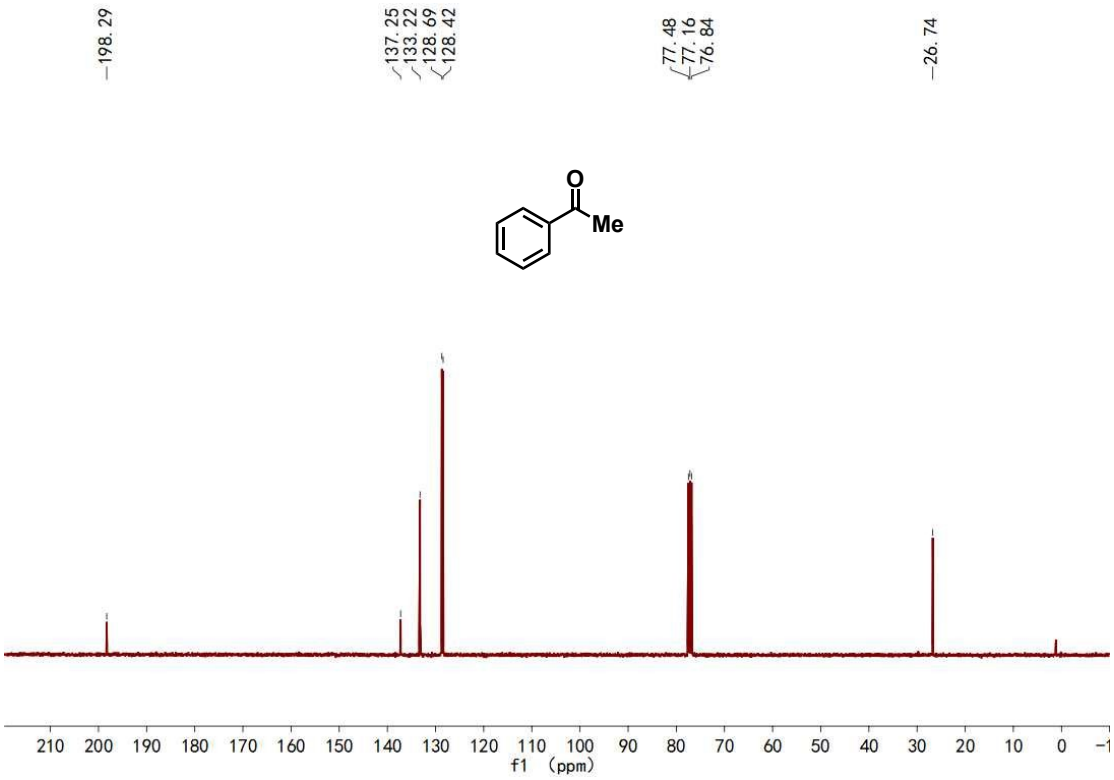
Phenyl(thiophen-2-yl)methanone (2m): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



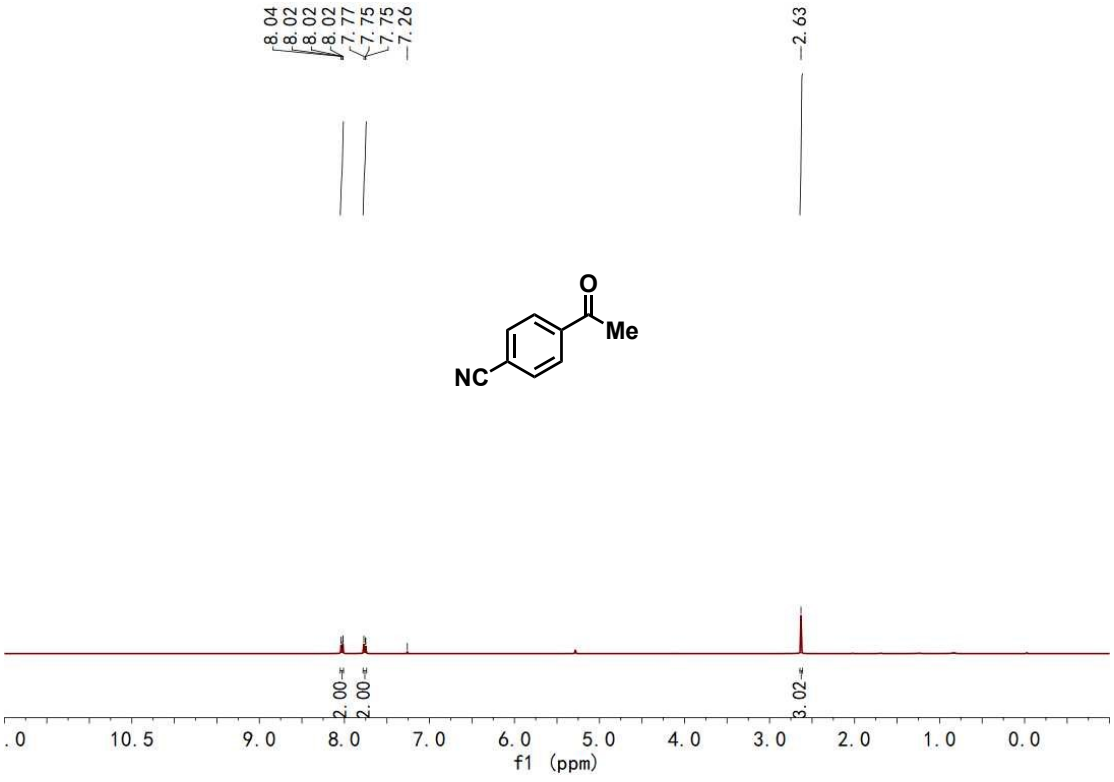
Acetophenone (2n, 6j): ^{1}H NMR (400 MHz, $CDCl_3$)



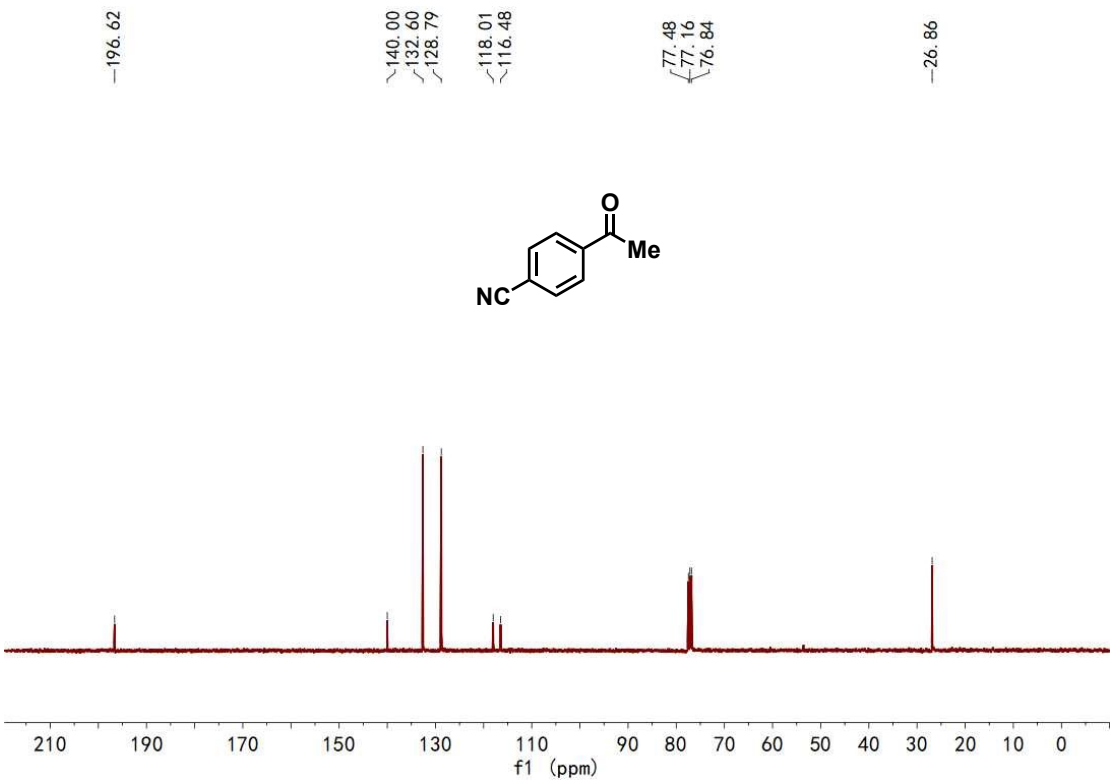
Acetophenone (2n, 6j): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



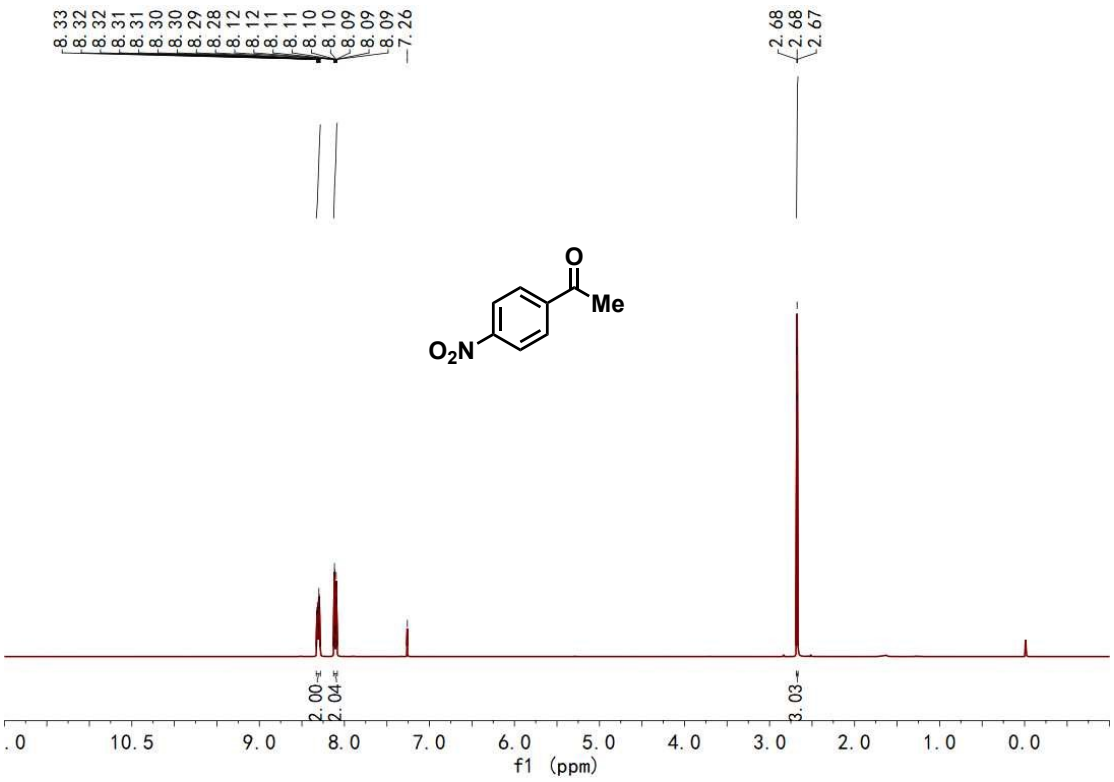
4-Acetylbenzonitrile (2o): ^{1}H NMR (400 MHz, $CDCl_3$)



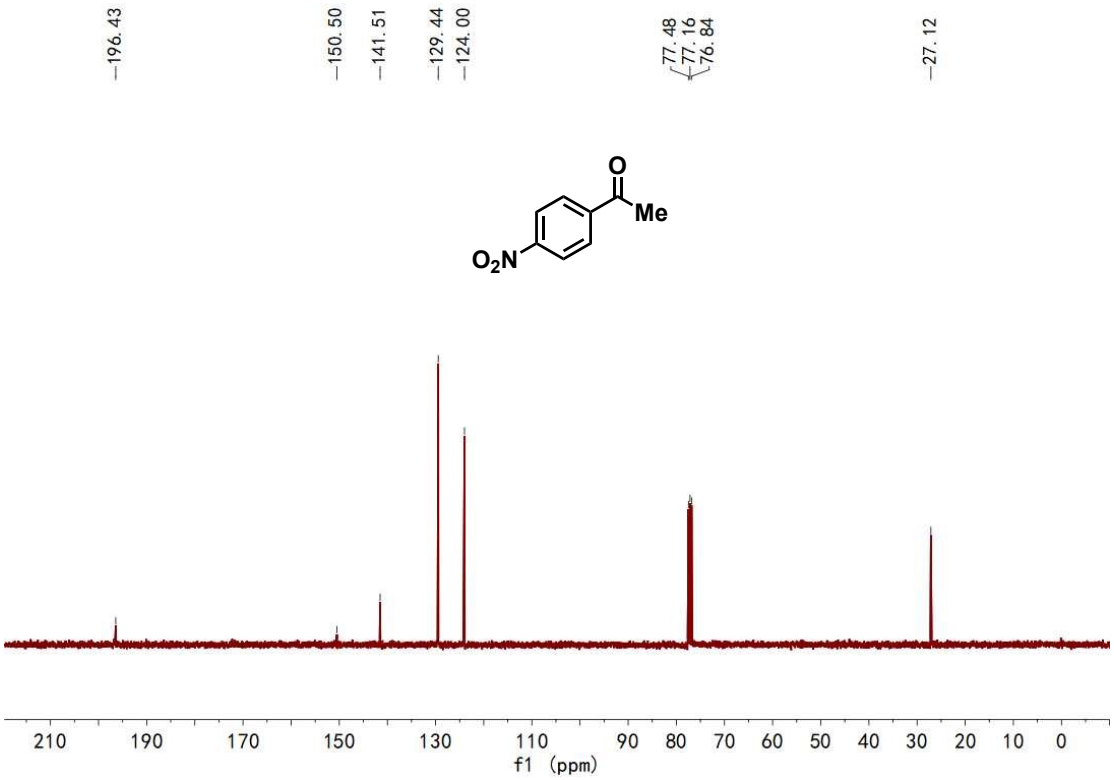
4-Acetylbenzonitrile (2o): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



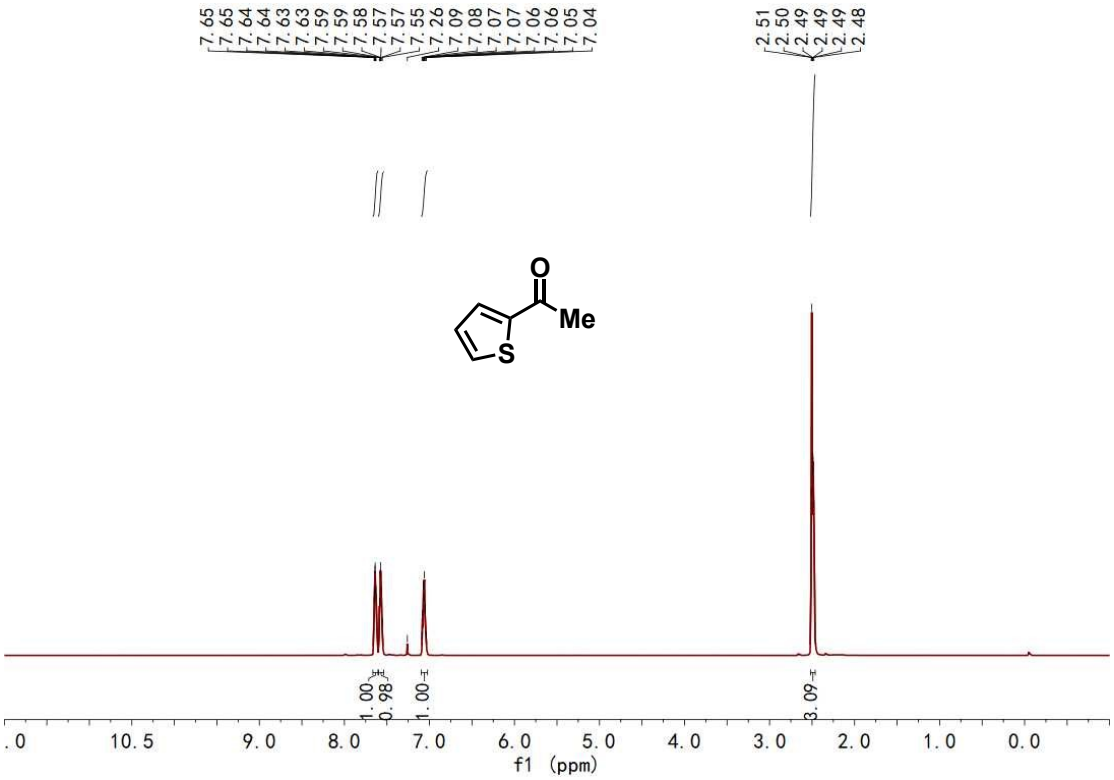
1-(4-Nitrophenyl)ethan-1-one (2p): ^{1}H NMR (400 MHz, $CDCl_3$)



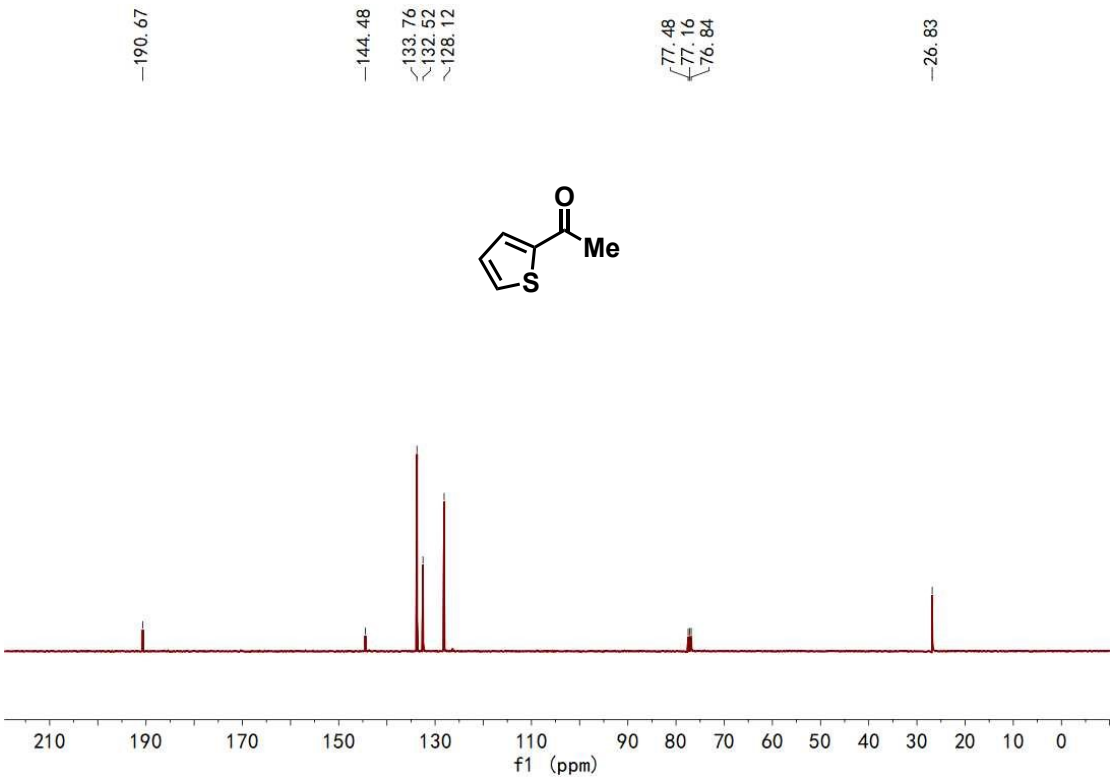
1-(4-Nitrophenyl)ethan-1-one (2p): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



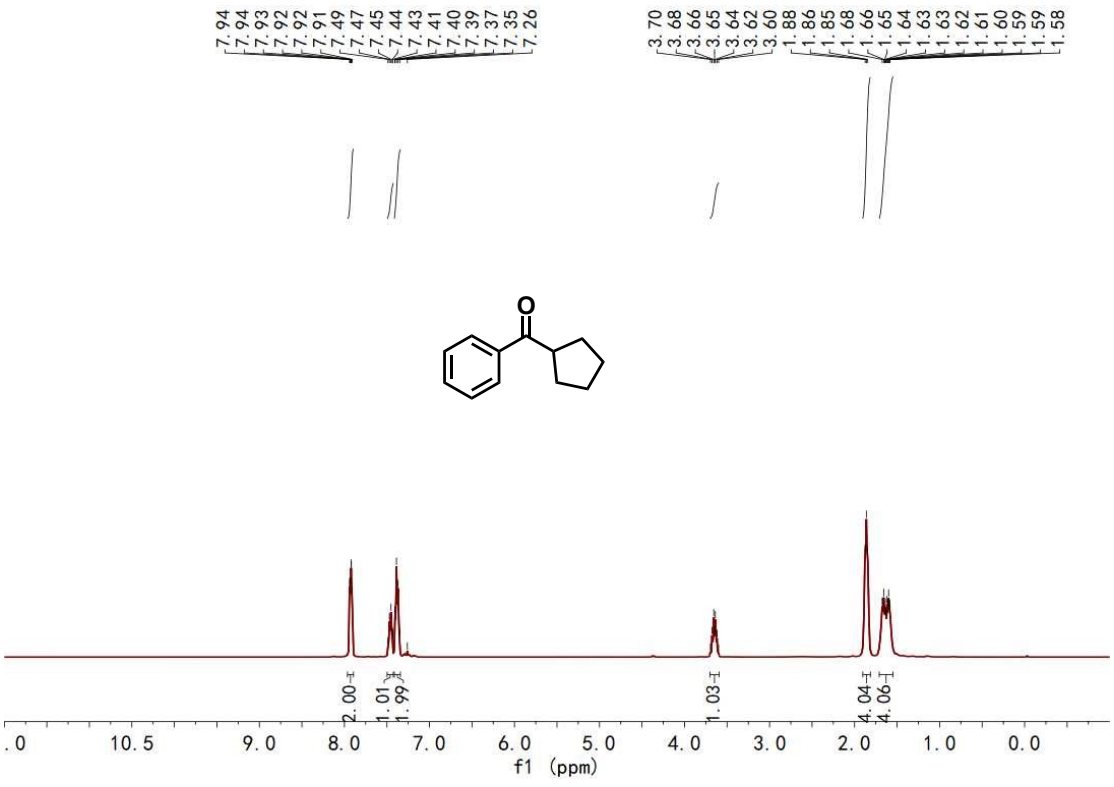
1-(Thiophen-2-yl)ethan-1-one (2q): ^{1}H NMR (400 MHz, $CDCl_3$)



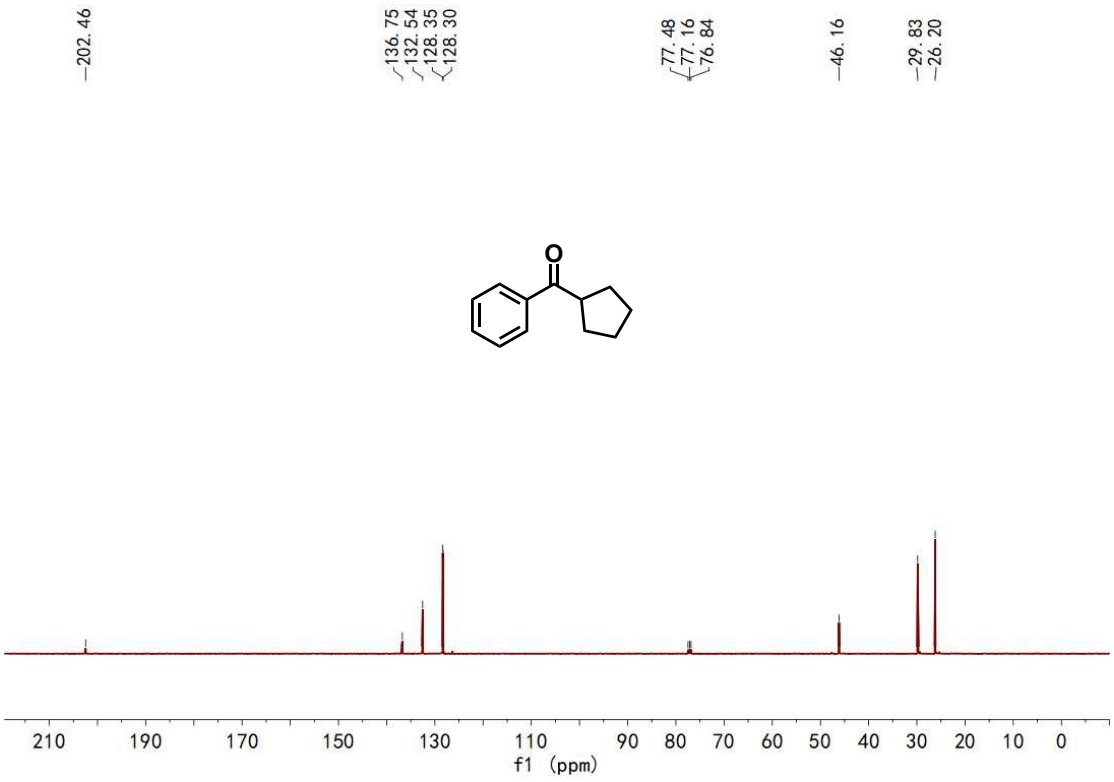
1-(Thiophen-2-yl)ethan-1-one (2q): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



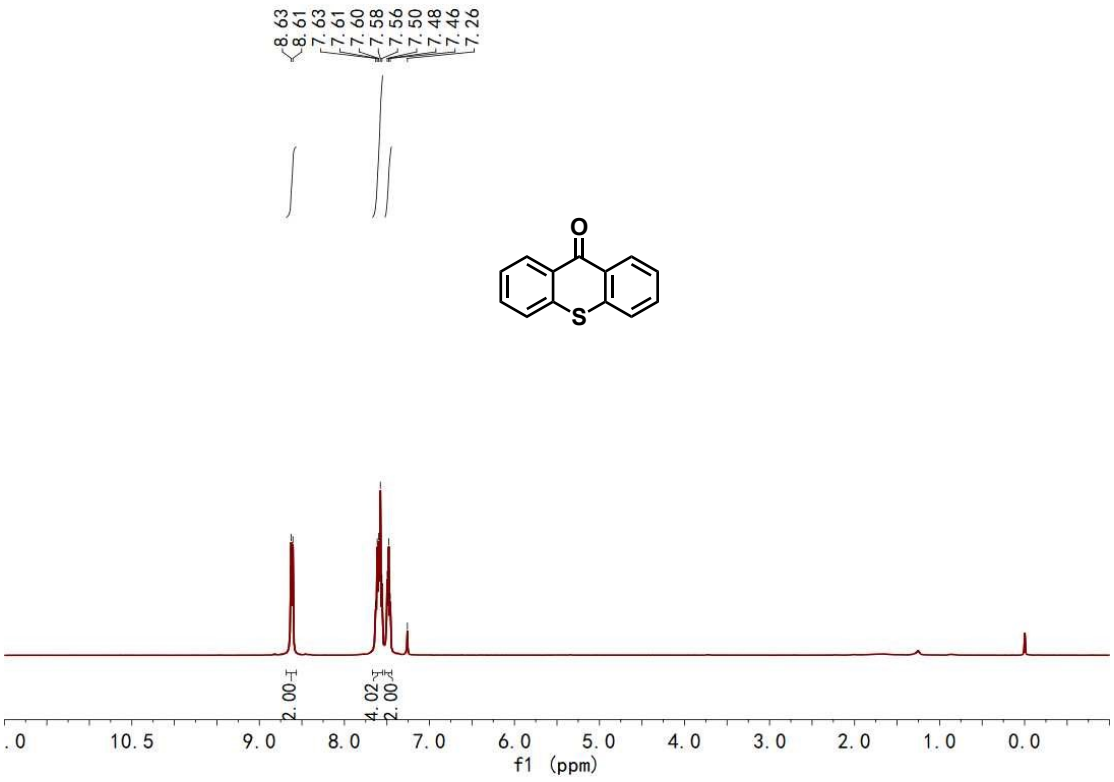
Cyclopentyl(phenyl)methanone (2r): ^{1}H NMR (400 MHz, $CDCl_3$)



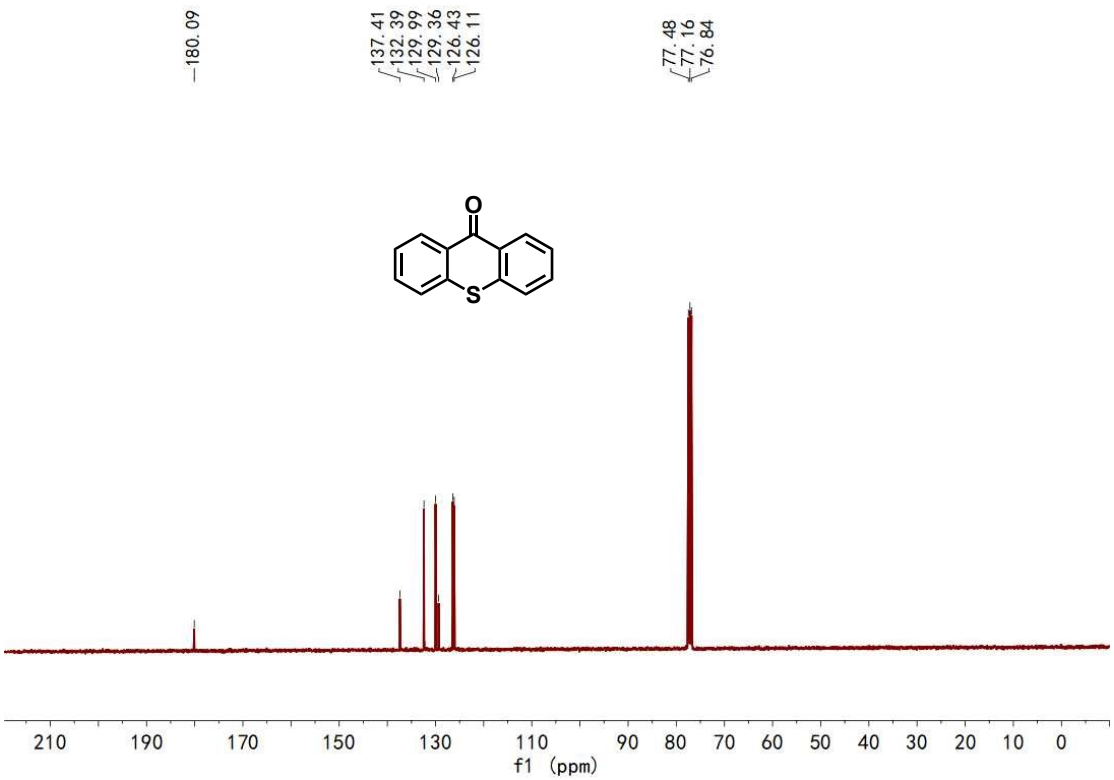
Cyclopentyl(phenyl)methanone (2r): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



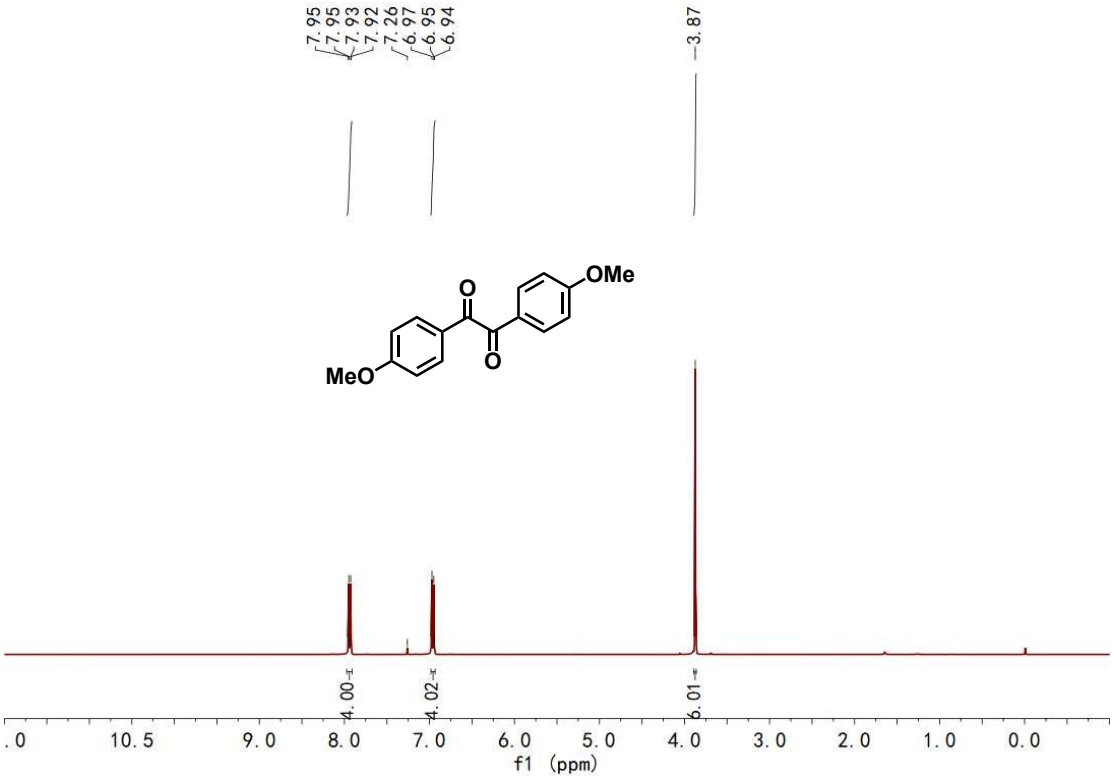
9*H*-thioxanthen-9-one (2s): ^{1}H NMR (400 MHz, $CDCl_3$)



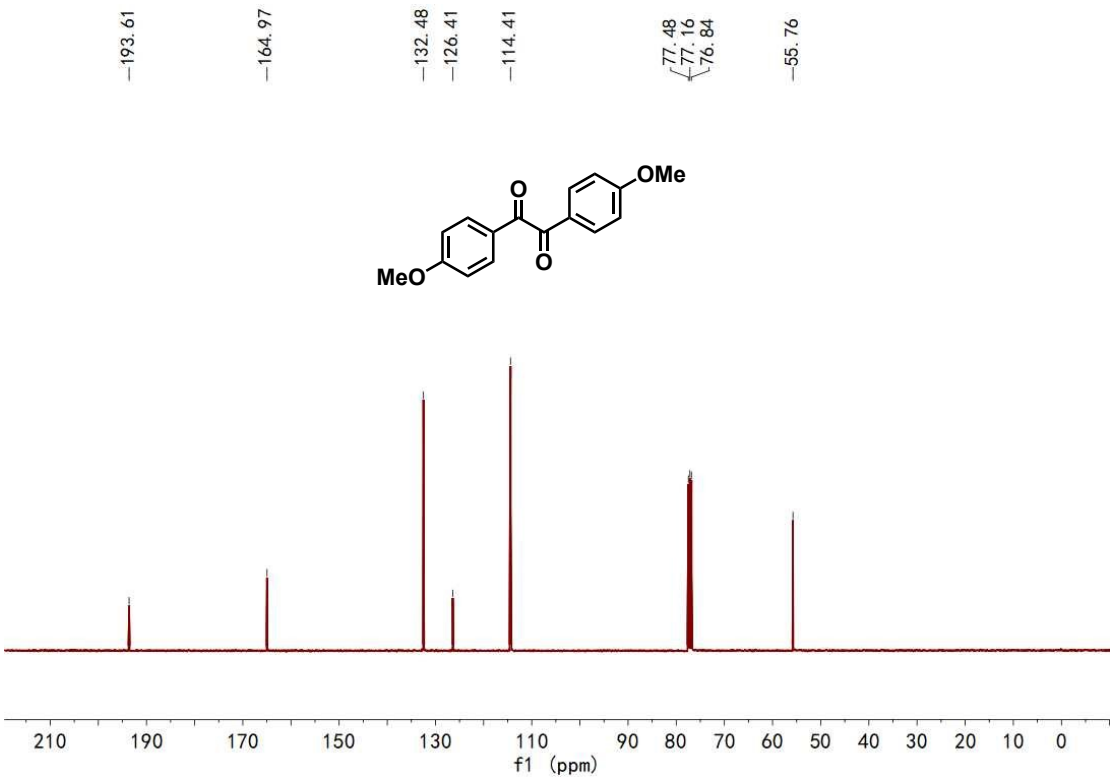
9*H*-thioxanthen-9-one (2s): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



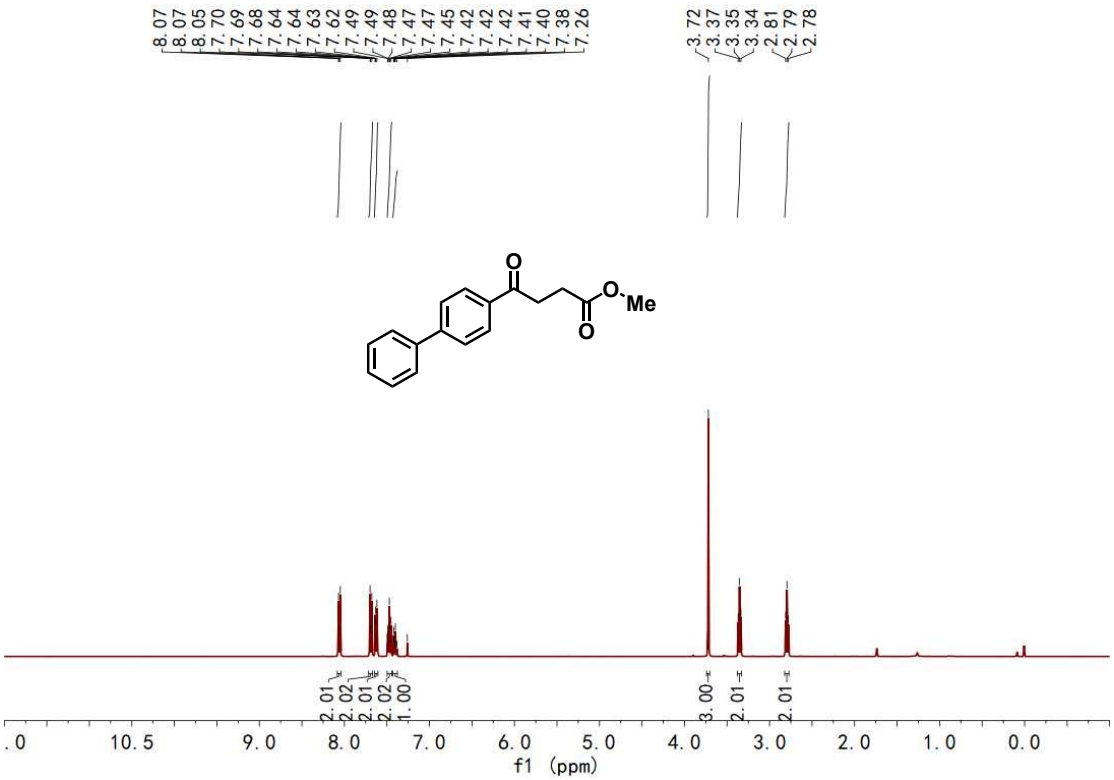
1,2-Bis(4-methoxyphenyl)ethane-1,2-dione (2t): ^{1}H NMR(400 MHz, $CDCl_3$)



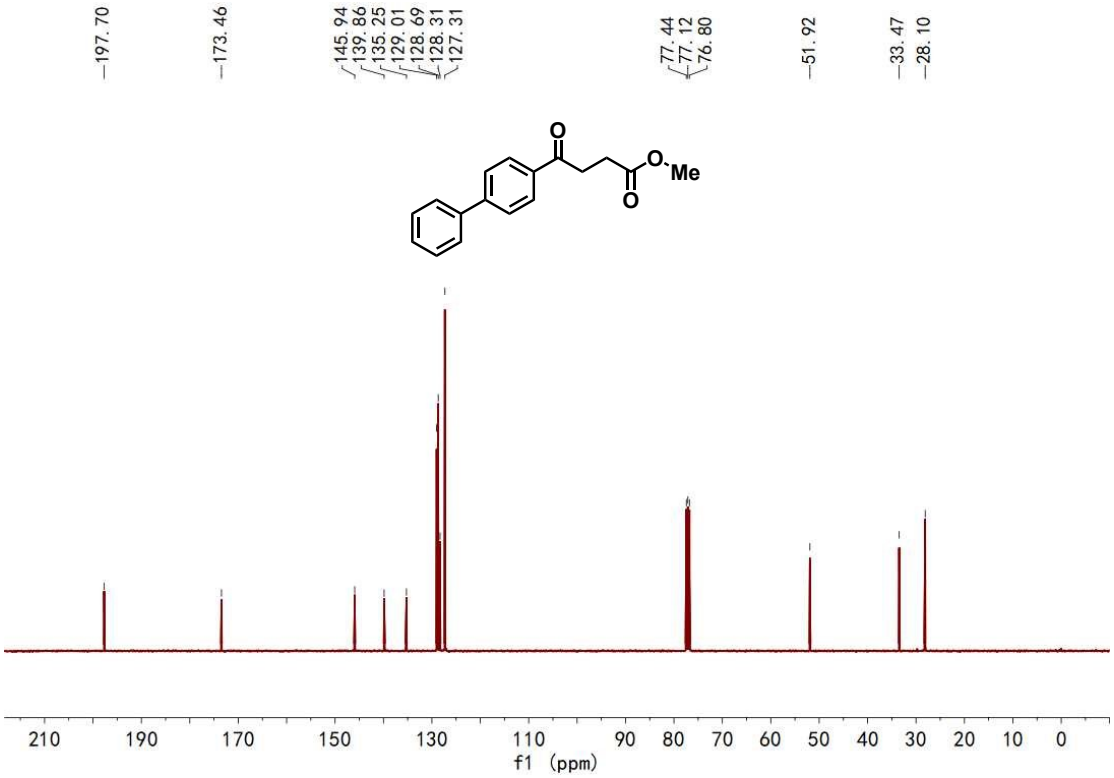
1,2-Bis(4-methoxyphenyl)ethane-1,2-dione (2t): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



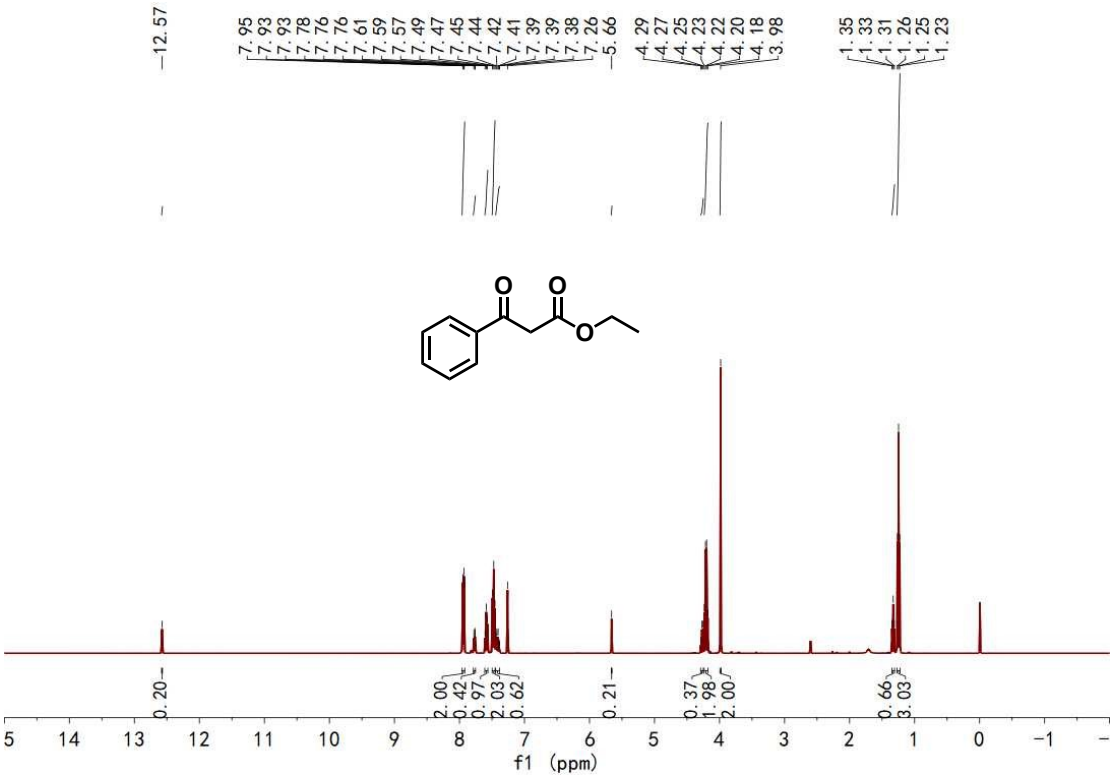
Methyl 4-([1,1'-biphenyl]-4-yl)-4-oxobutanoate (2u): ^{1}H NMR (400 MHz, $CDCl_3$)



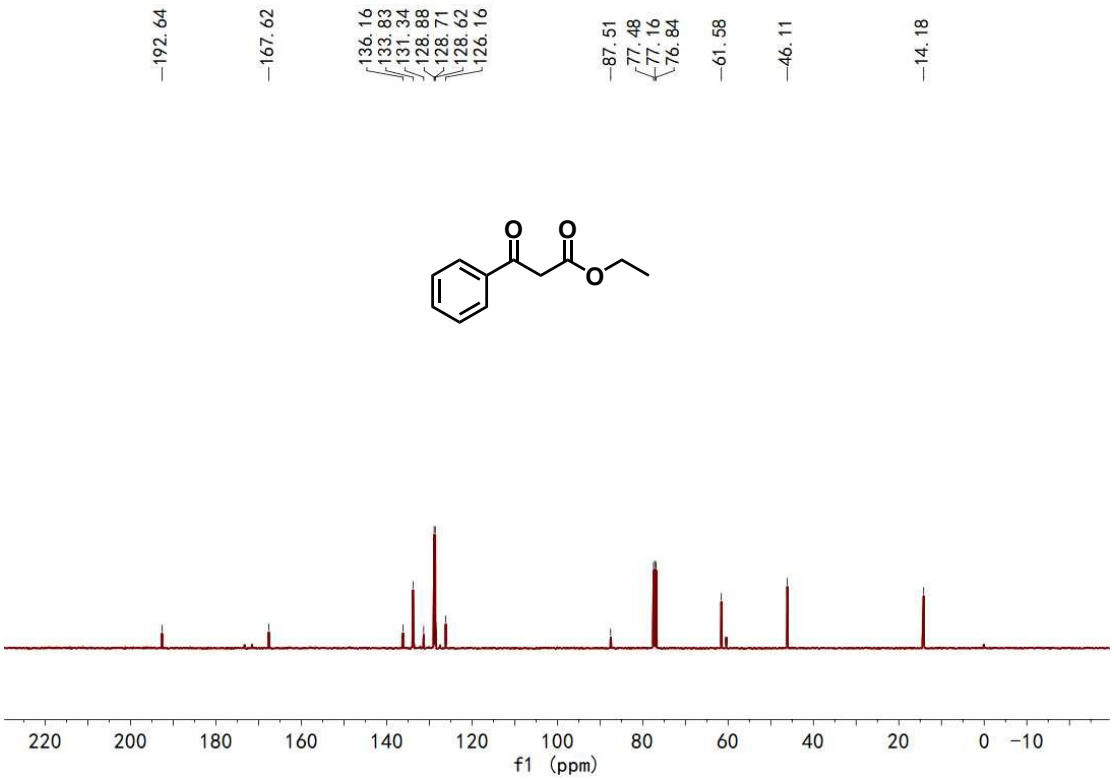
Methyl 4-([1,1'-biphenyl]-4-yl)-4-oxobutanoate (2u): $^{13}C\{^1H\}$ NMR (101 MHz, $CDCl_3$)



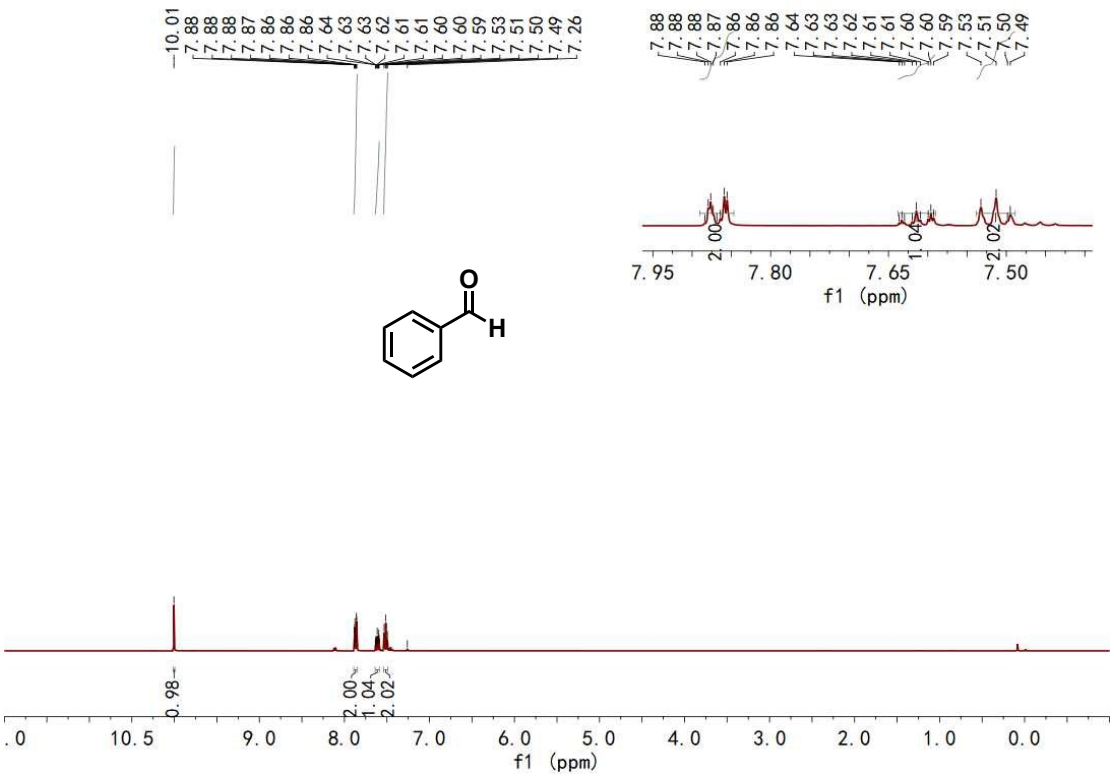
Ethyl 3-oxo-3-phenylpropanoate (2v): ^1H NMR (400 MHz, $CDCl_3$)



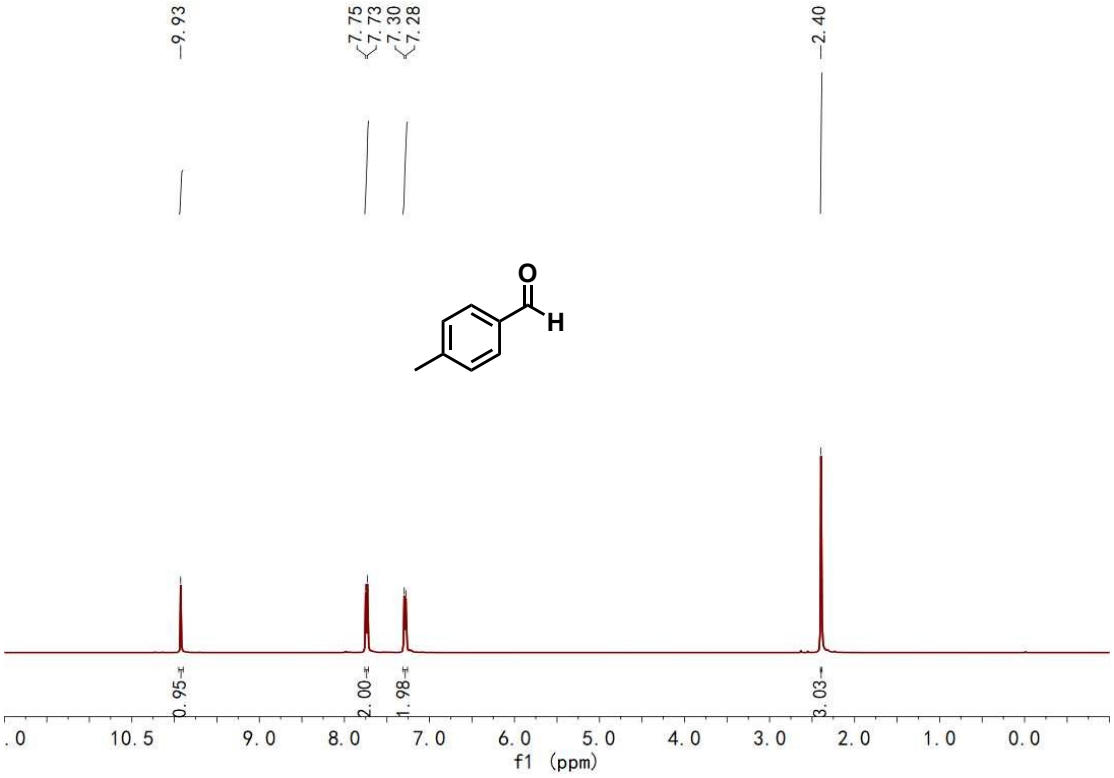
Ethyl 3-oxo-3-phenylpropanoate (2v): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



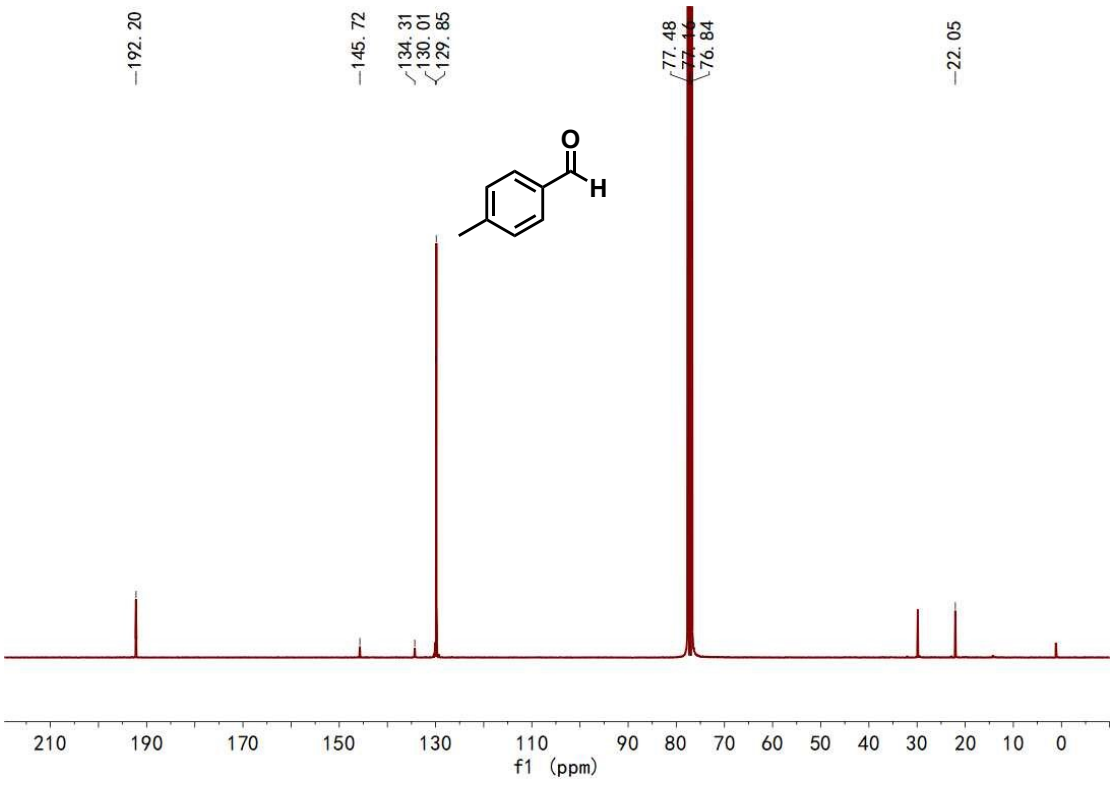
Benzaldehyde (4a): ^{1}H NMR (400 MHz, $CDCl_3$)



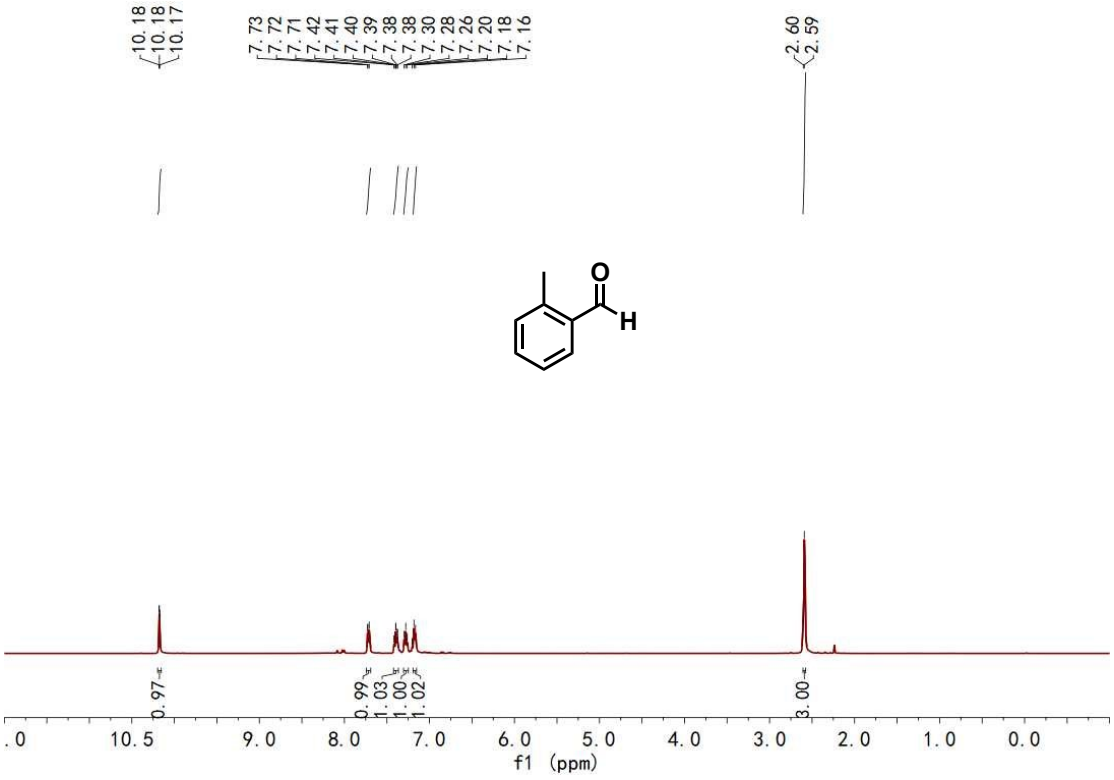
4-Methylbenzaldehyde (4b): ^{1}H NMR (400 MHz, $CDCl_3$)



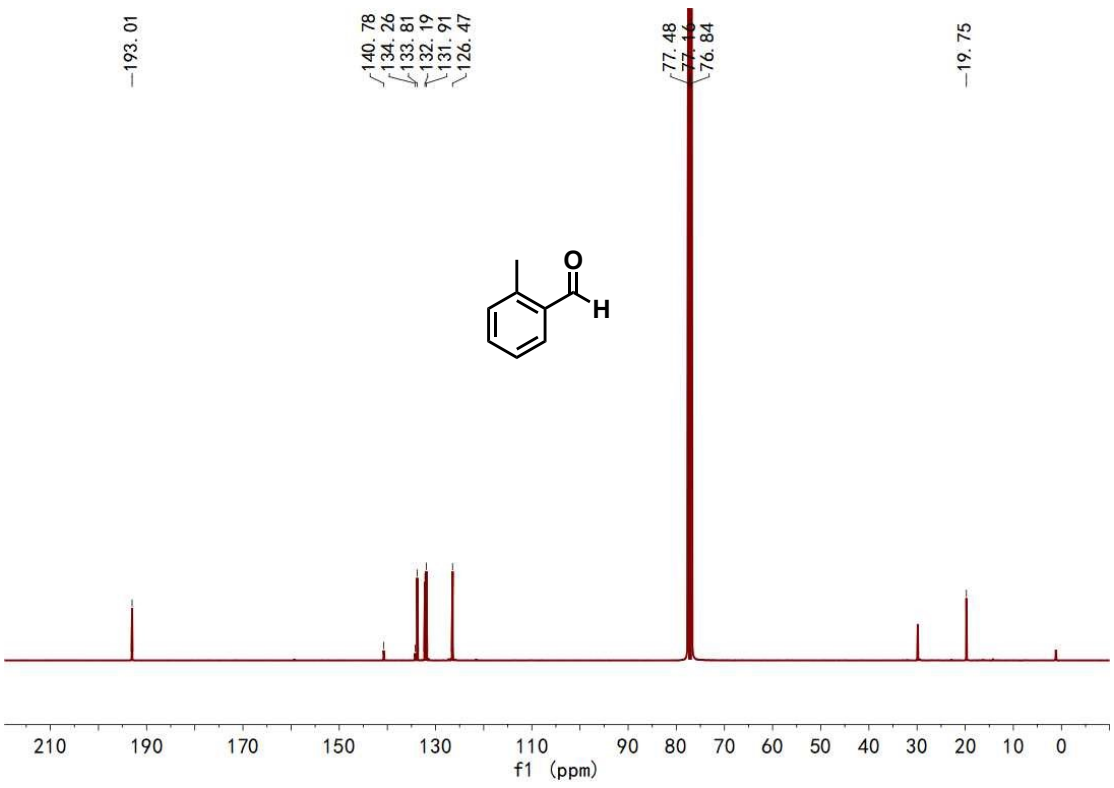
4-Methylbenzaldehyde (4b): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



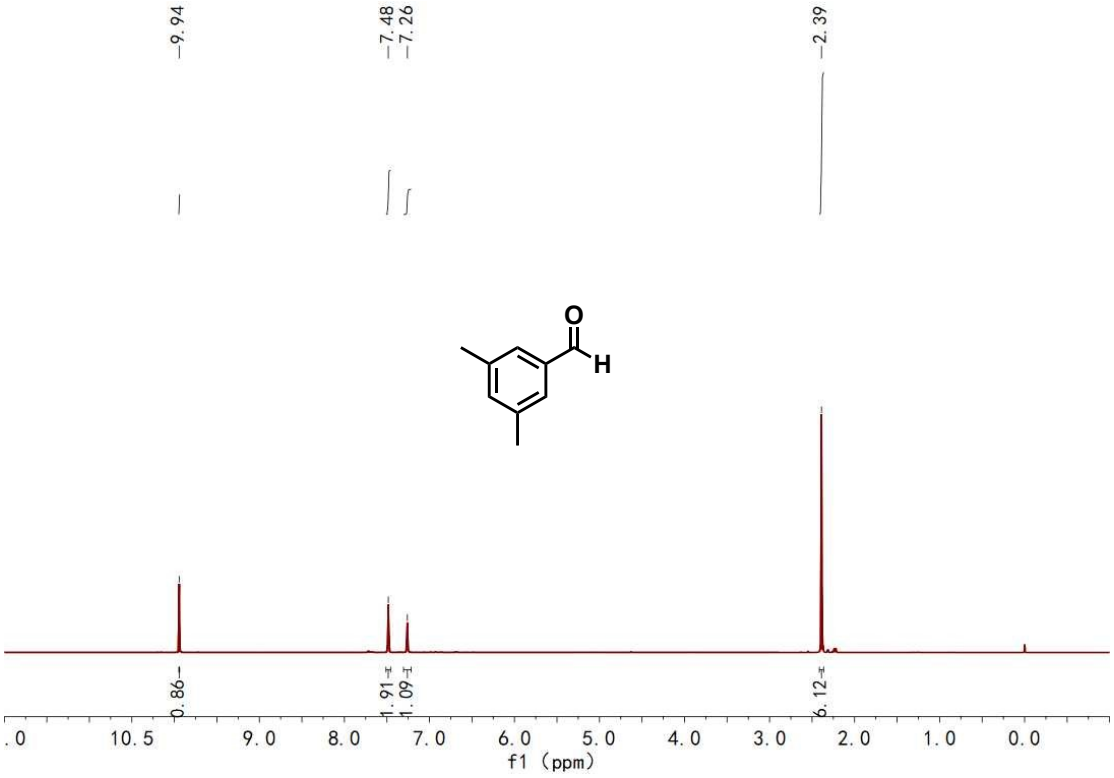
2-Methylbenzaldehyde (4c): ^{1}H NMR (400 MHz, $CDCl_3$)



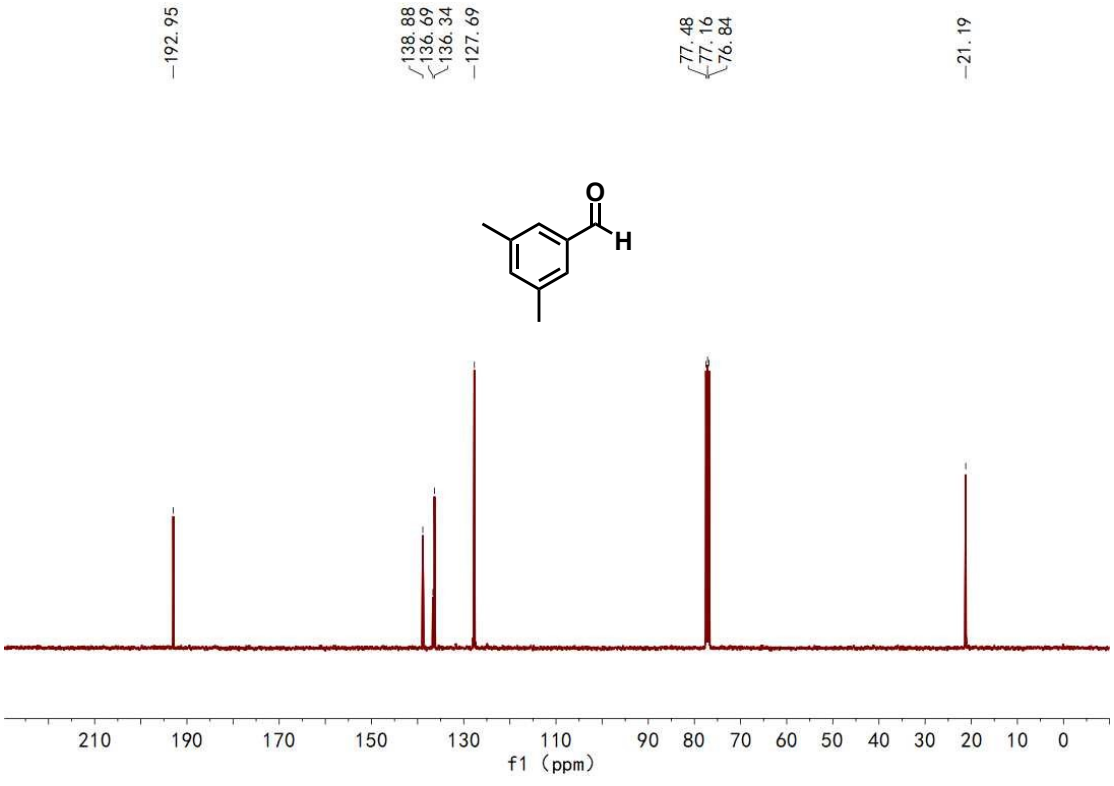
2-Methylbenzaldehyde (4c): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



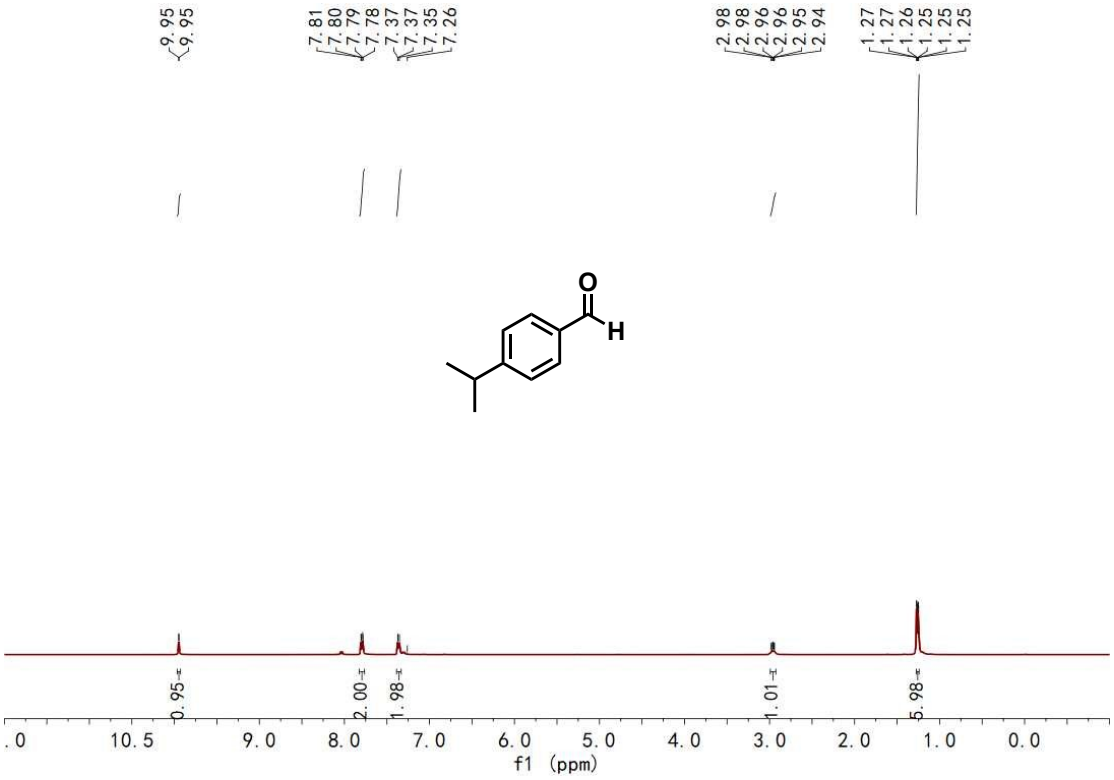
3,5-Dimethylbenzaldehyde (4d): ^{1}H NMR (400 MHz, $CDCl_3$)



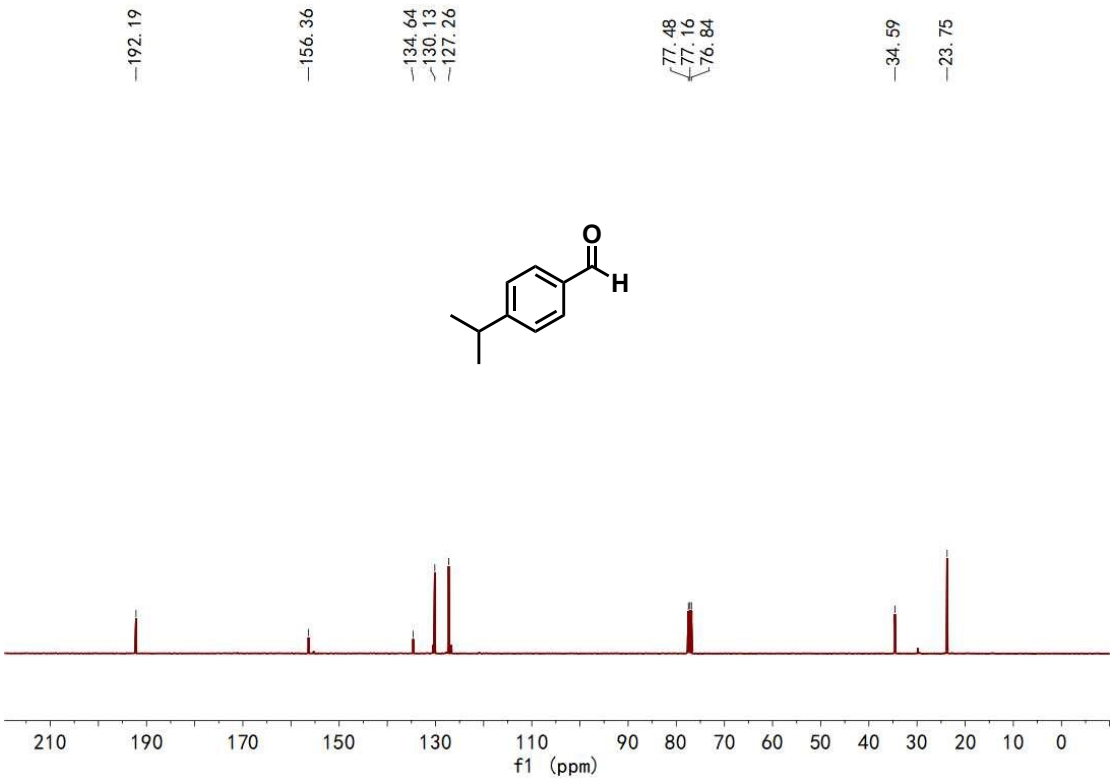
3,5-Dimethylbenzaldehyde (4d): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



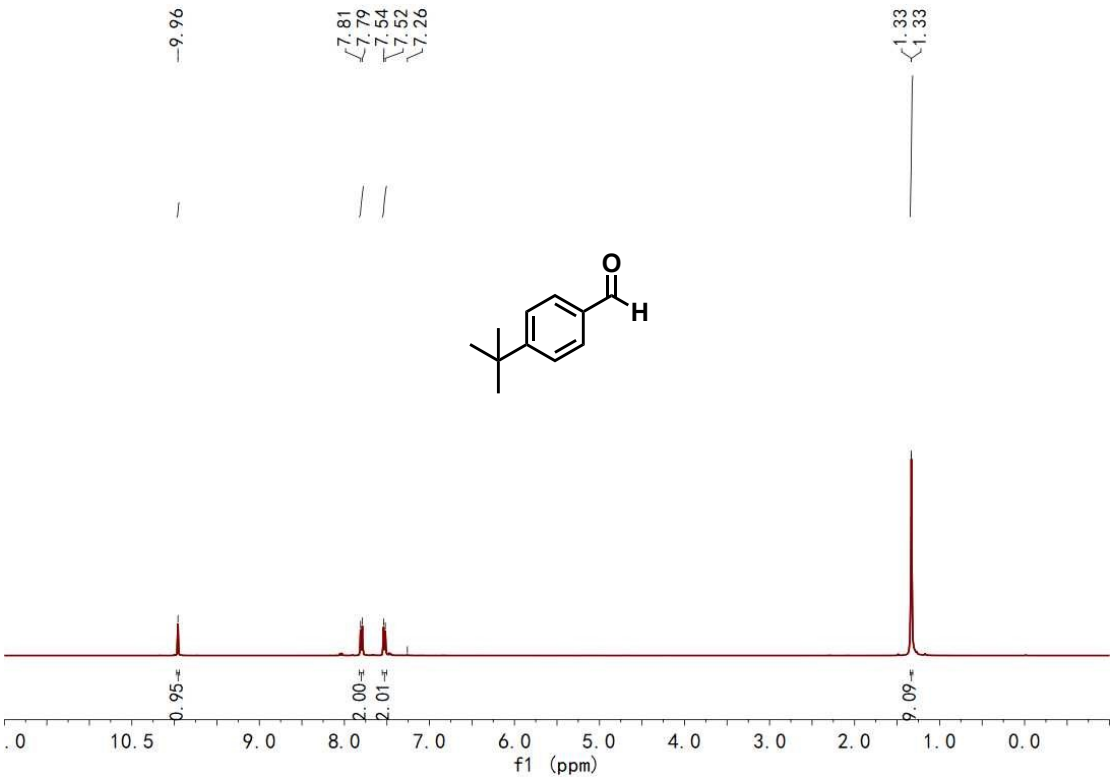
4-Isopropylbenzaldehyde (4e): ^{1}H NMR (400 MHz, $CDCl_3$)



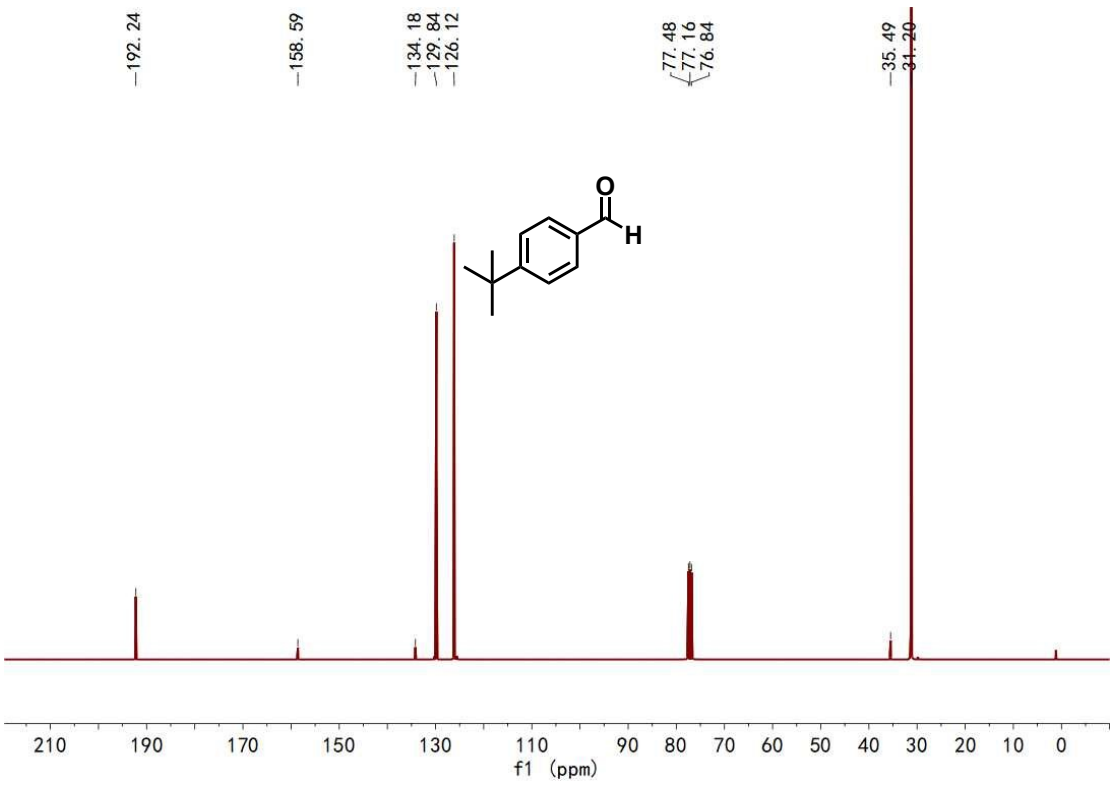
4-Isopropylbenzaldehyde (4e): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



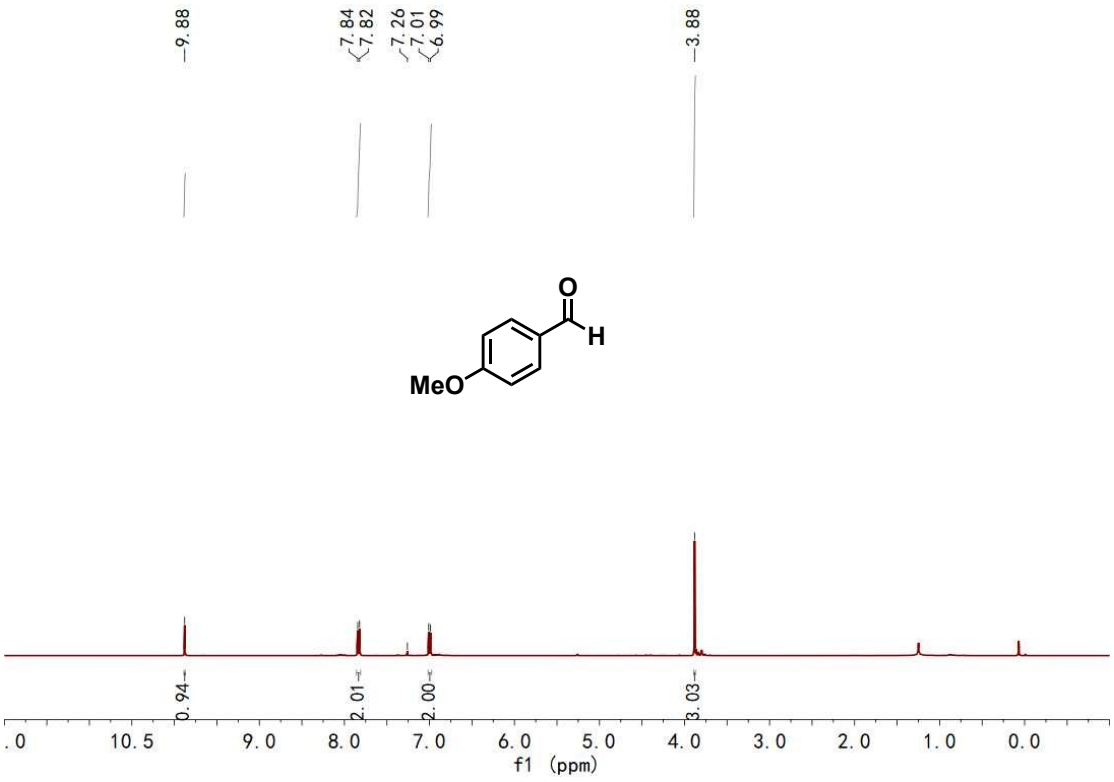
4-(*Tert*-butyl)benzaldehyde (4f): ^{1}H NMR (400 MHz, $CDCl_3$)



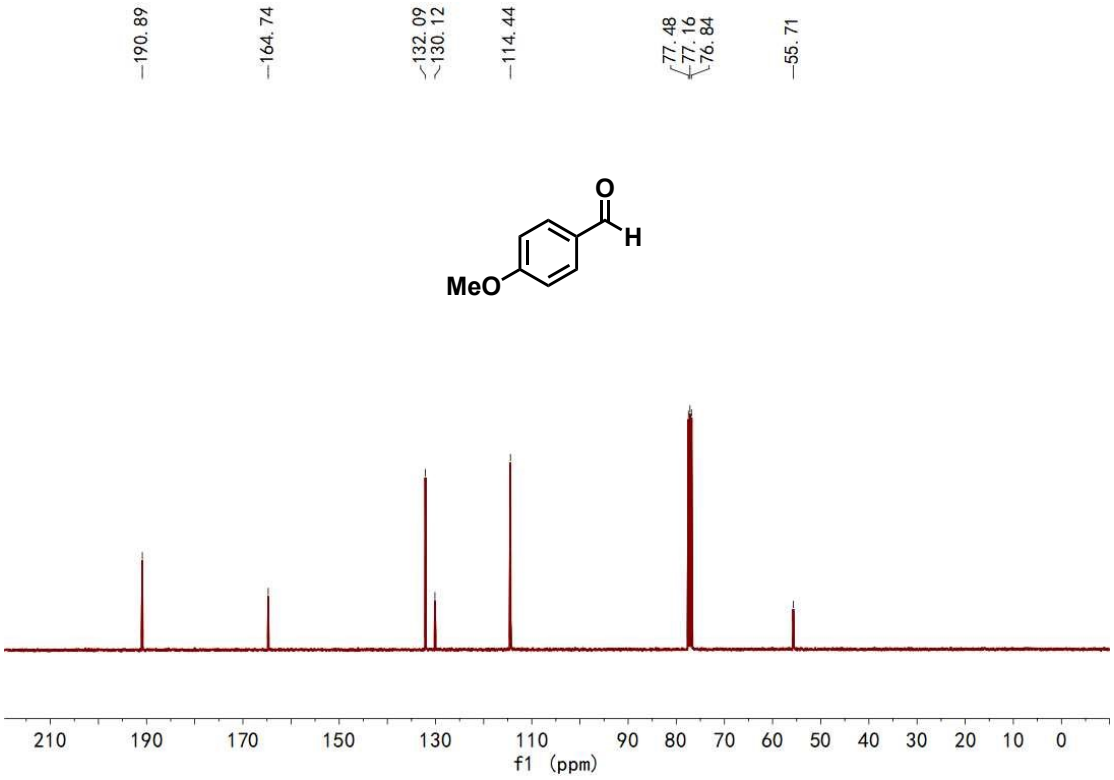
4-(*Tert*-butyl)benzaldehyde (4f): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



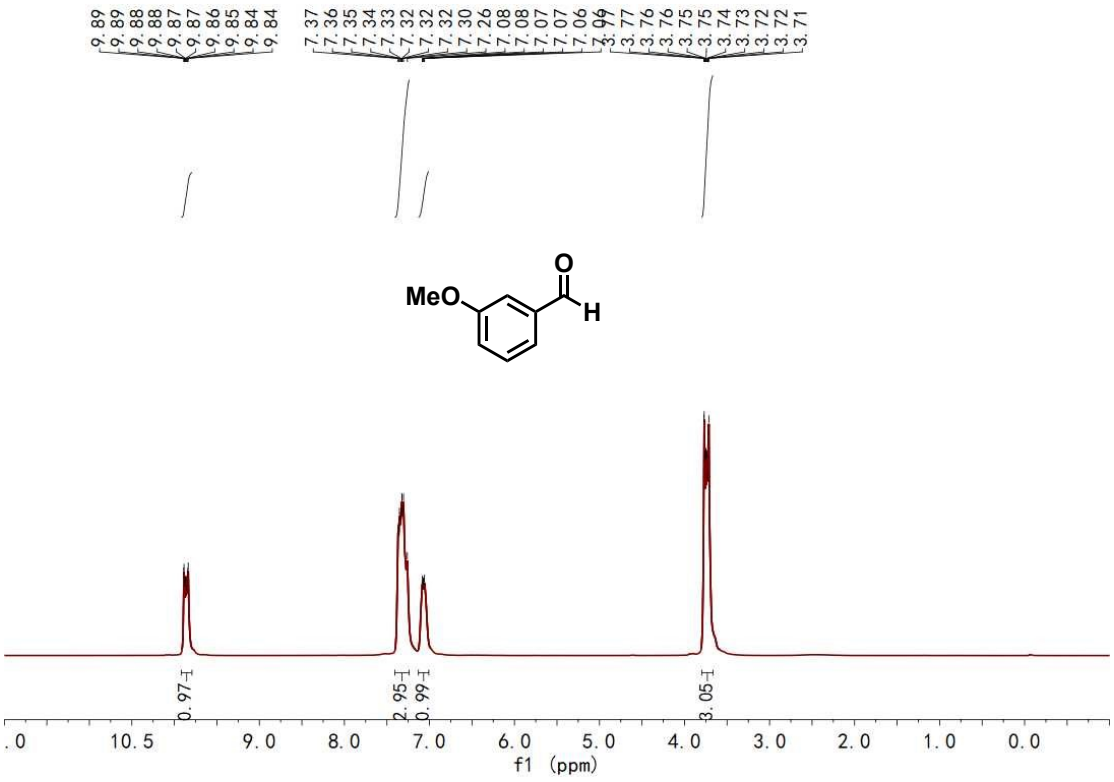
4-Methoxybenzaldehyde (4g): ^{1}H NMR (400 MHz, $CDCl_3$)



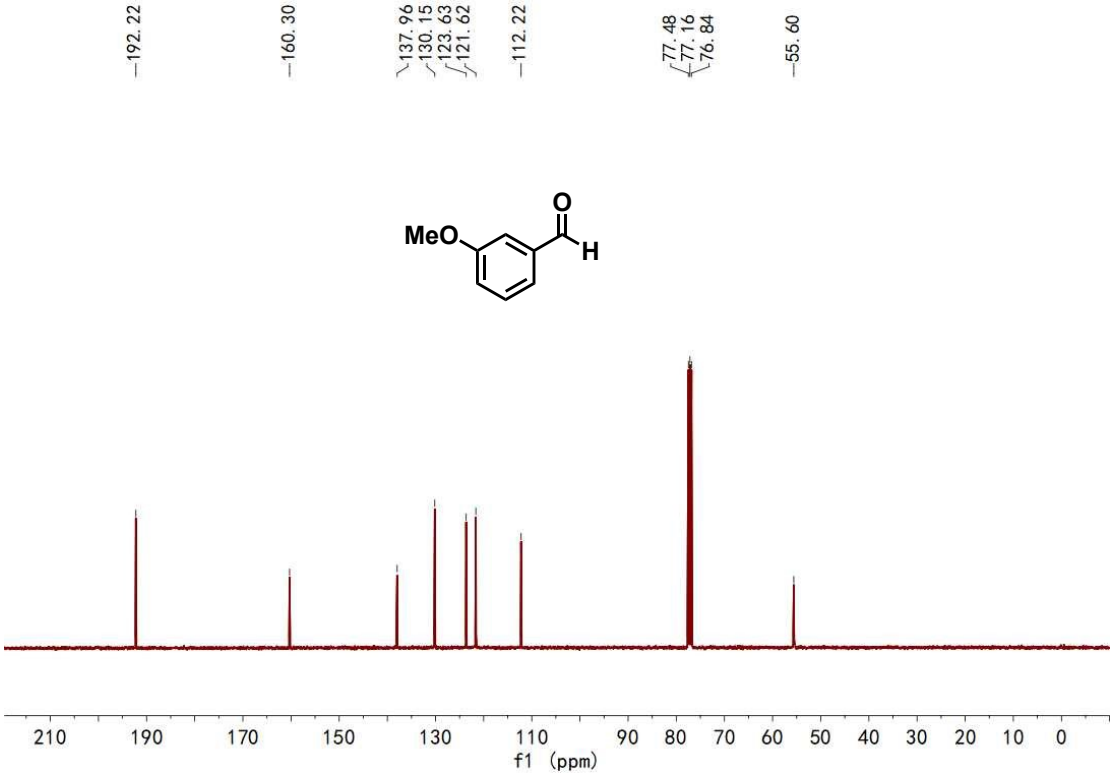
4-Methoxybenzaldehyde (4g): ^{13}C{^{1}H}NMR (101MHz,$CDCl_3$)



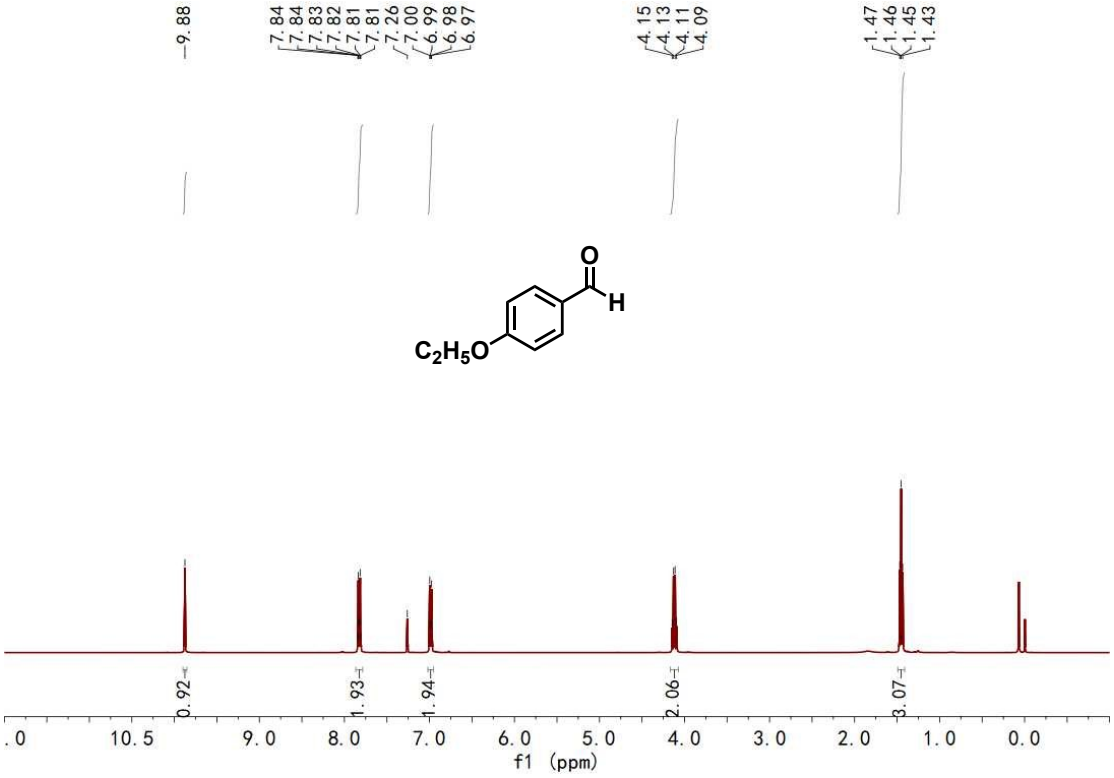
3-Methoxybenzaldehyde (4h): ^{1}H NMR (400 MHz, $CDCl_3$)



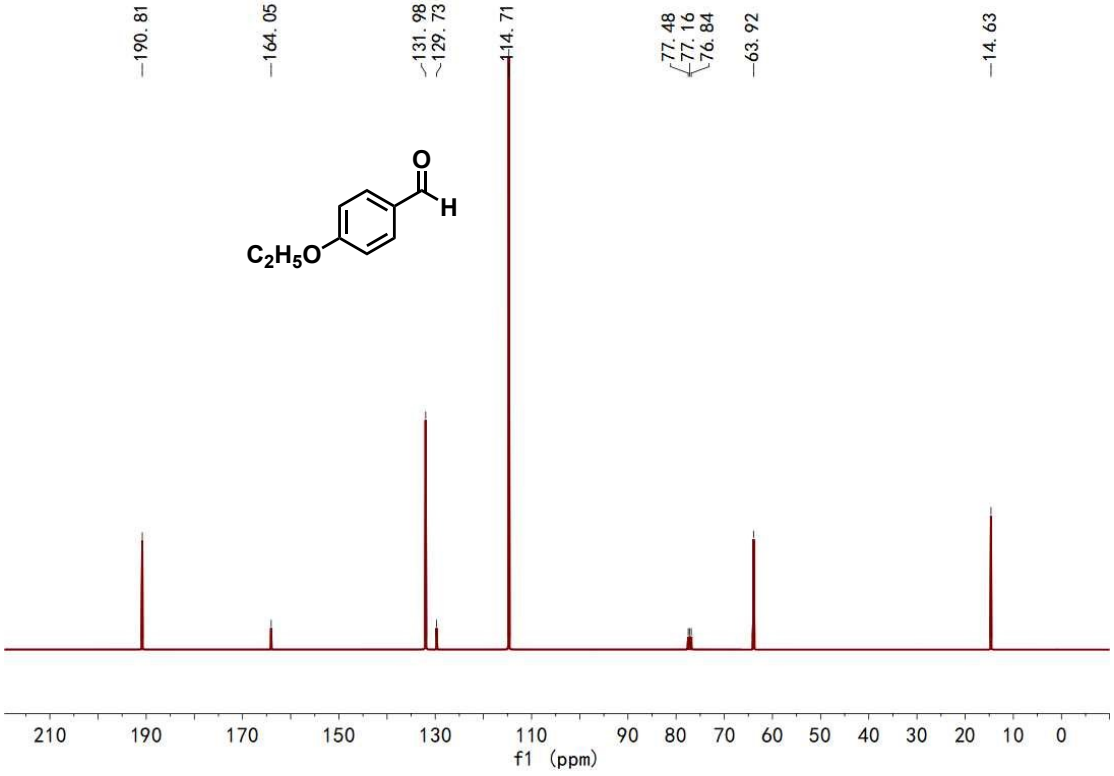
3-Methoxybenzaldehyde (4h): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



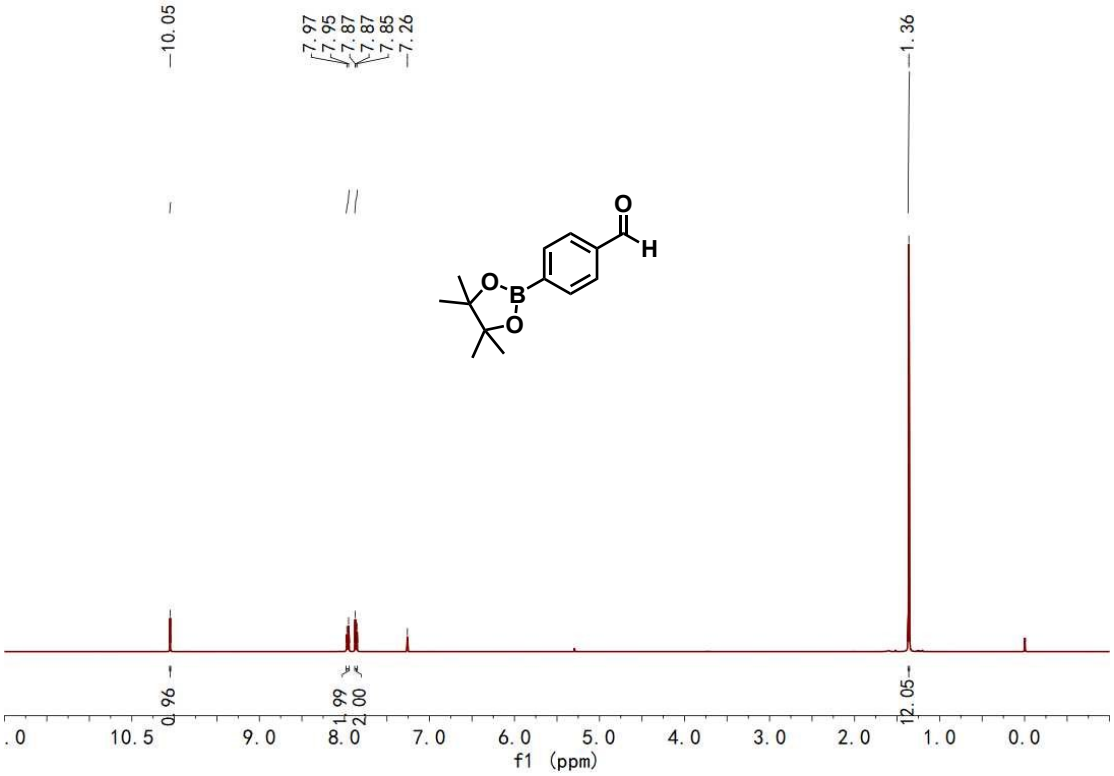
4-Ethoxybenzaldehyde (4i): ^{1}H NMR(400 MHz, $CDCl_3$)



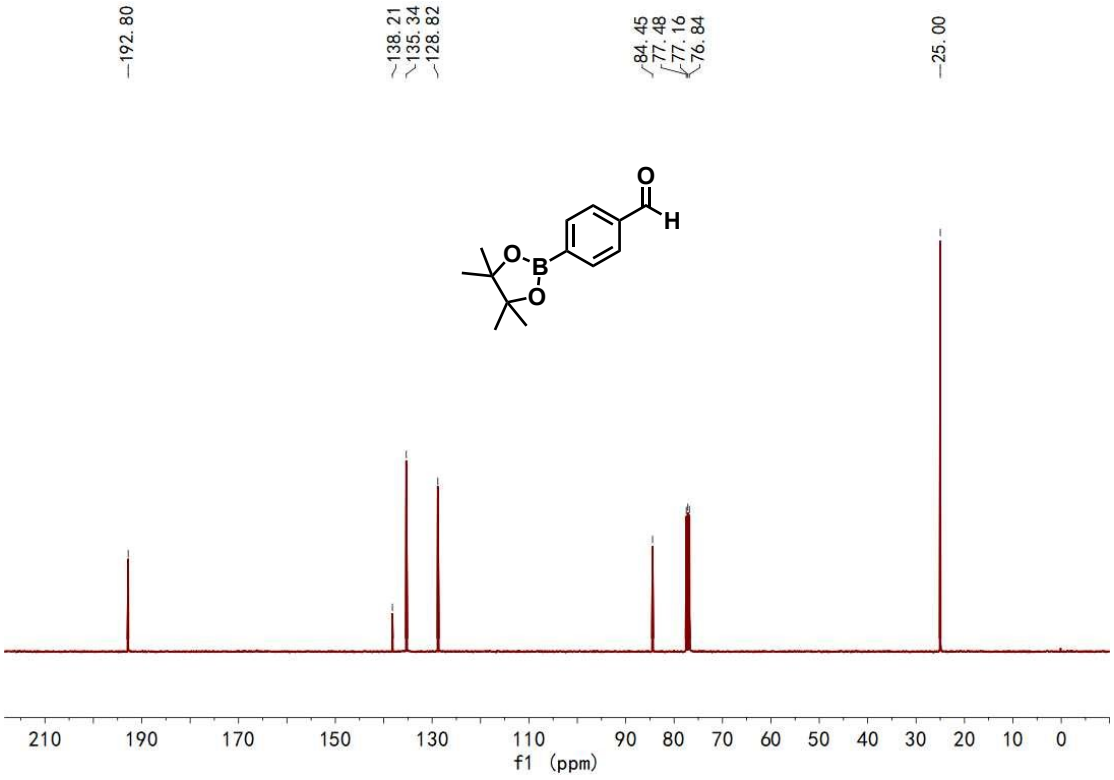
4-Ethoxybenzaldehyde (4i): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



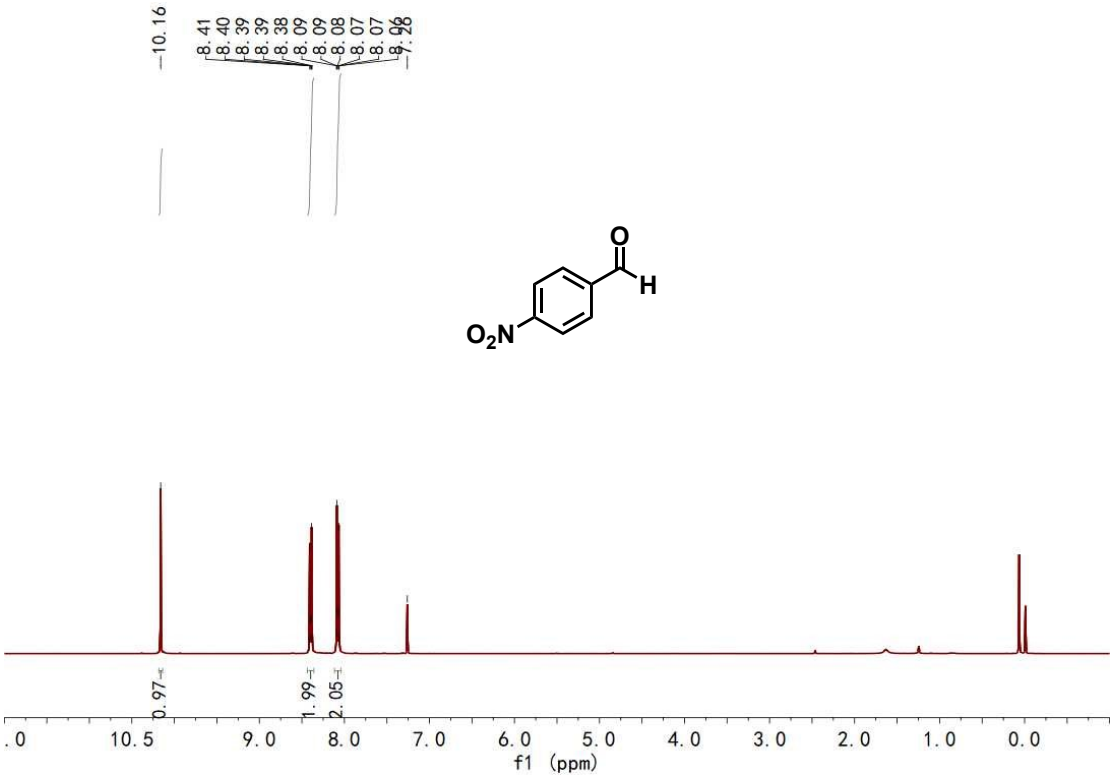
4-(4,4,5,5-Tetramethyl-1,3,2-dioxaborolan-2-yl)benzaldehyde (4j): ^{1}H NMR (400 MHz, $CDCl_3$)



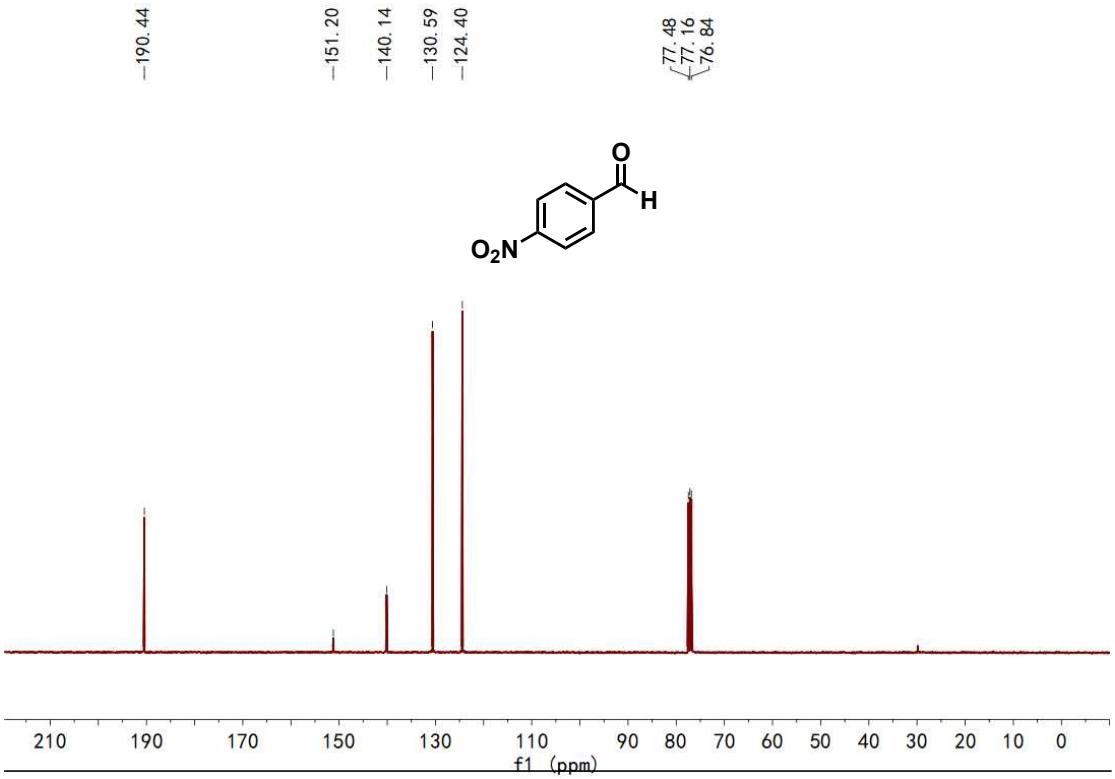
4-(4,4,5,5-Tetramethyl-1,3,2-dioxaborolan-2-yl)benzaldehyde (4j): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



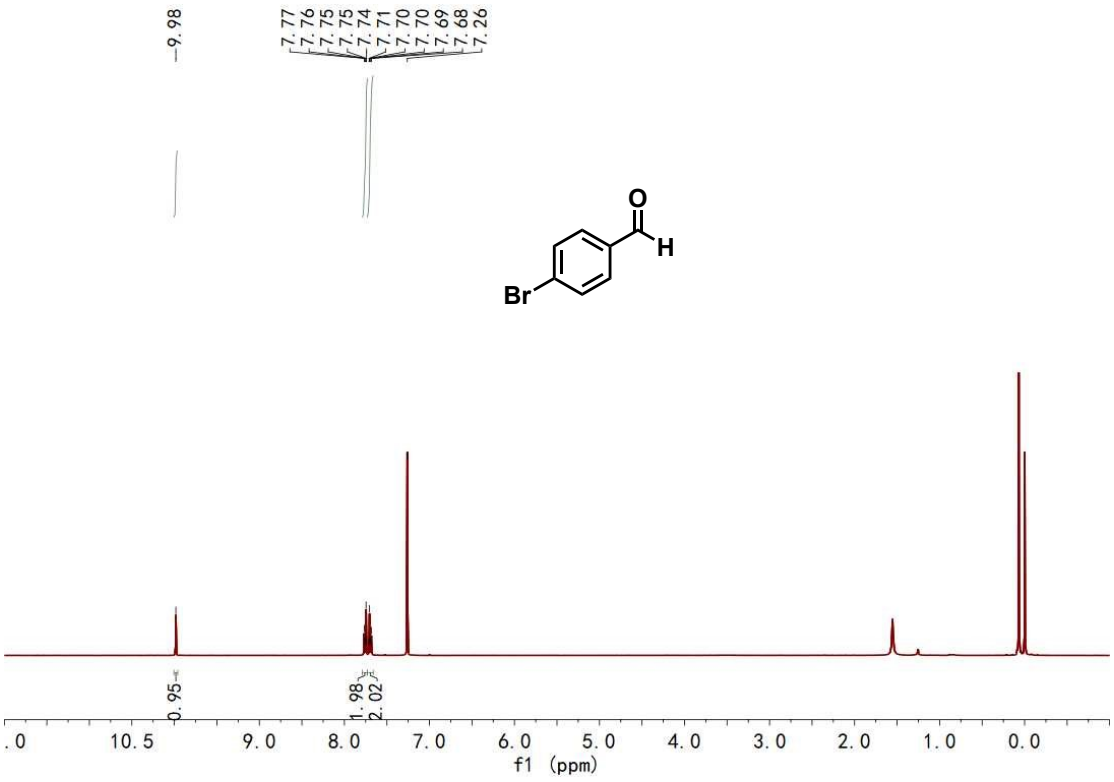
4-Nitrobenzaldehyde (4k): ^{1}H NMR(400 MHz, $CDCl_3$)



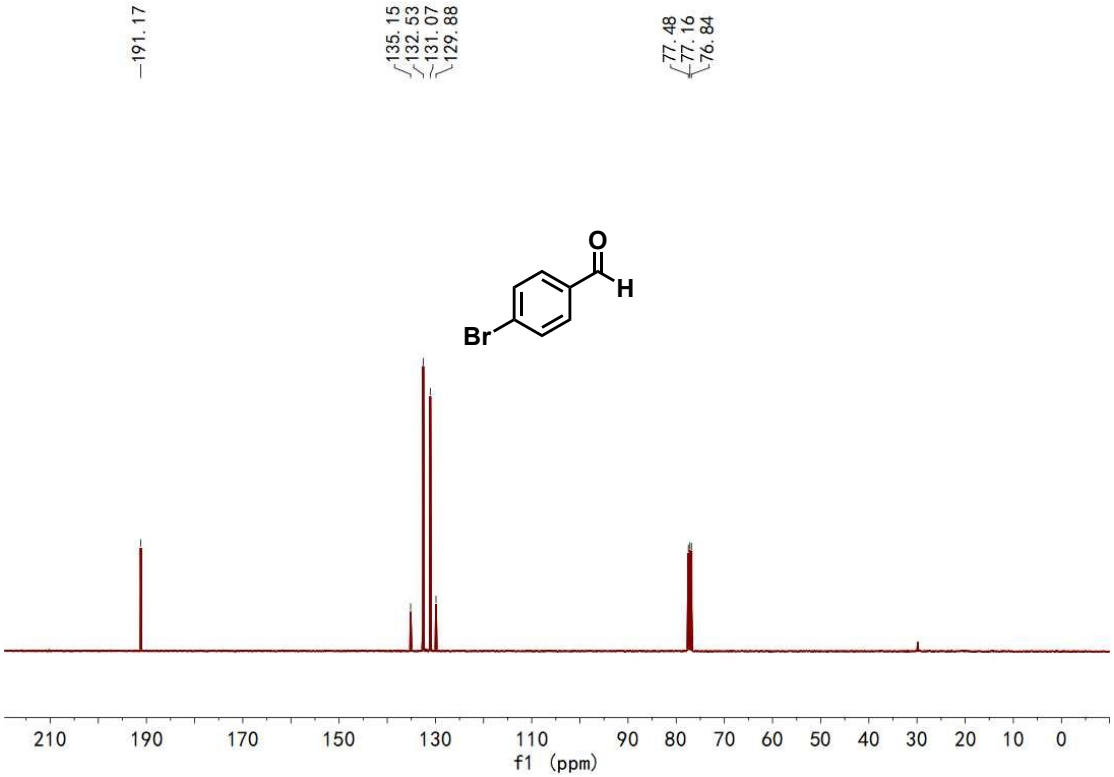
4-Nitrobenzaldehyde (4k): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



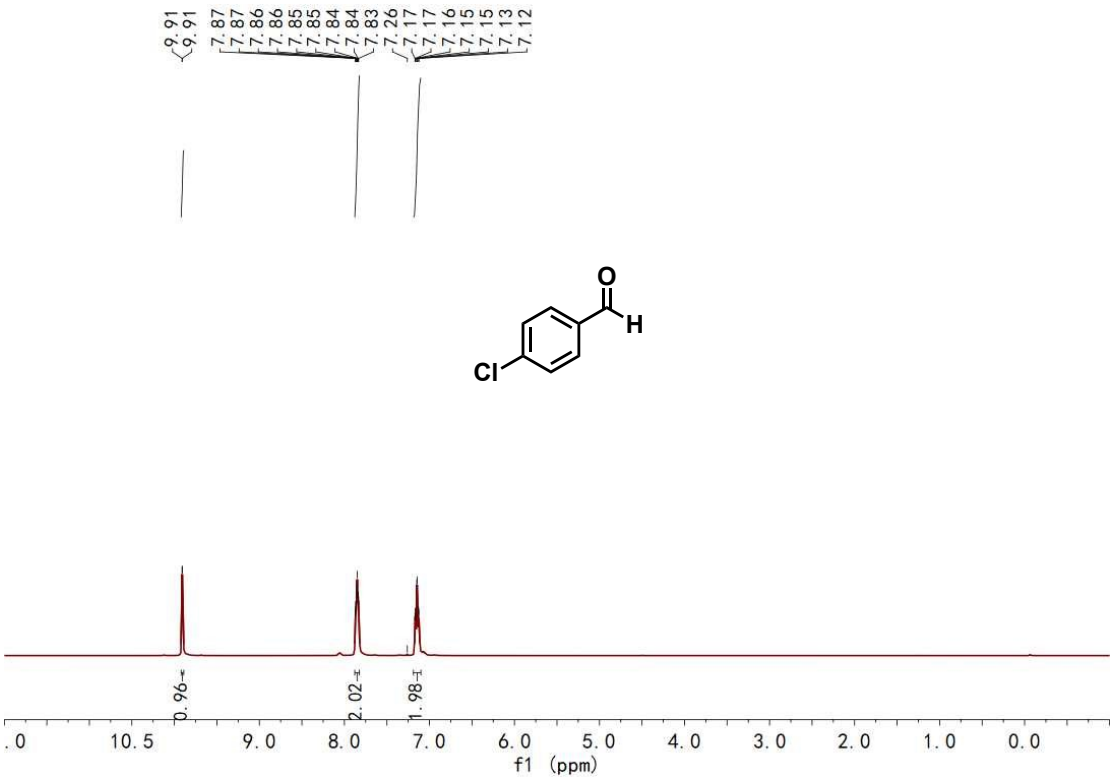
4-Bromobenzaldehyde (4l): ^{1}H NMR(400 MHz, $CDCl_3$)



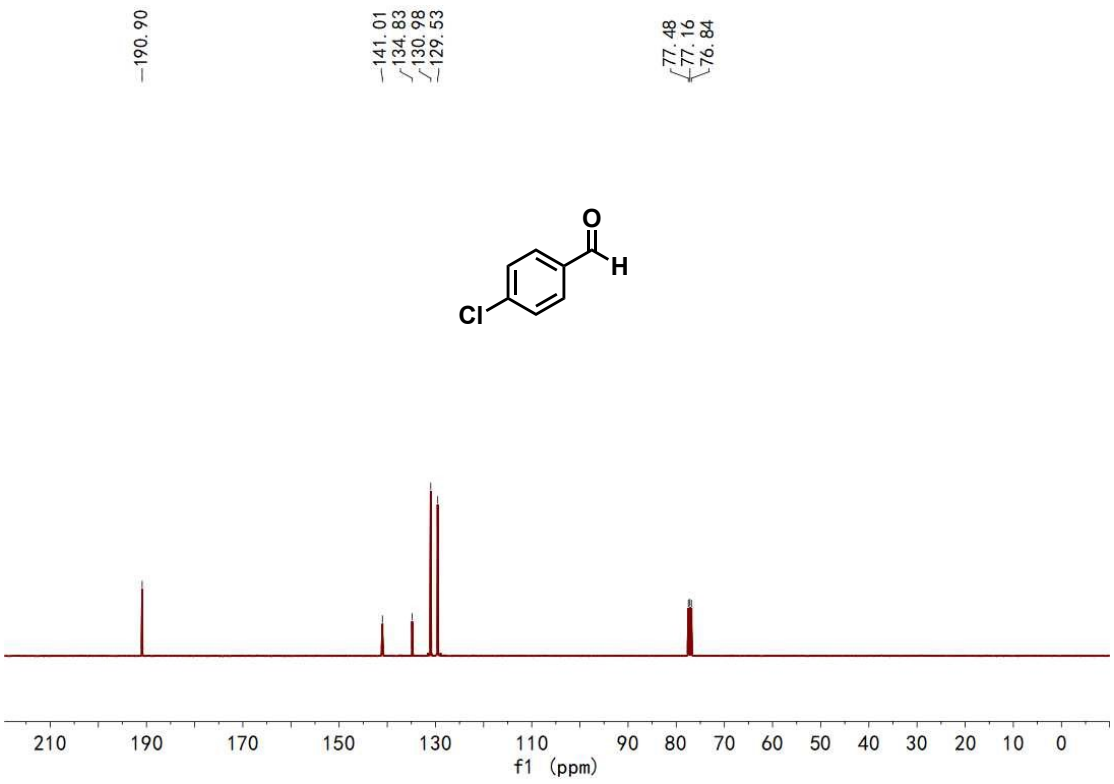
4-Bromobenzaldehyde (4l): ^{13}C{^{1}H} NMR(101 MHz, $CDCl_3$)



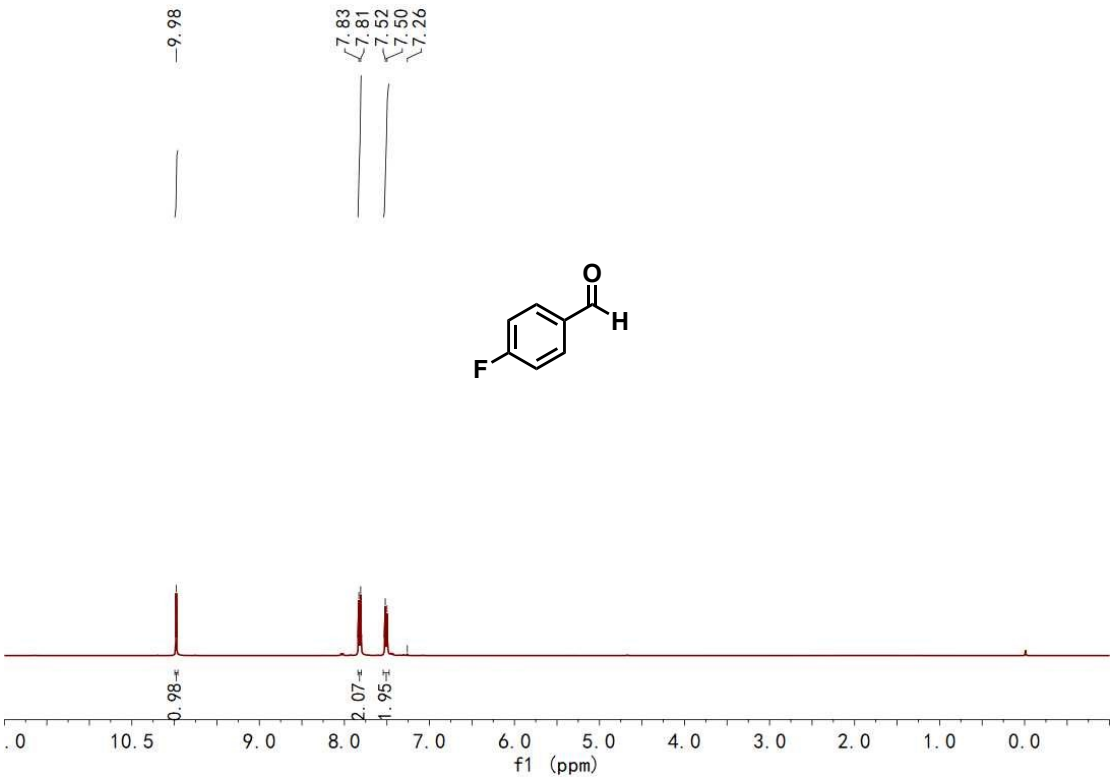
4-Chlorobenzaldehyde (4m): ^{1}H NMR (400 MHz, $CDCl_3$)



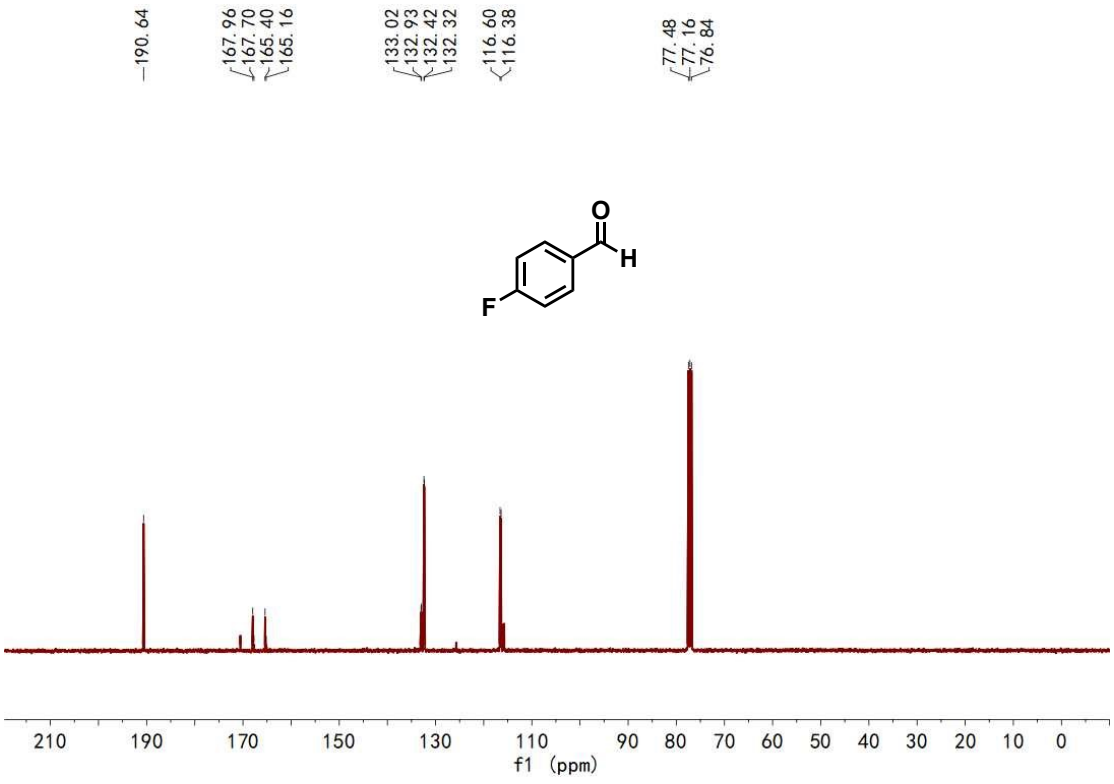
4-Chlorobenzaldehyde (4m): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



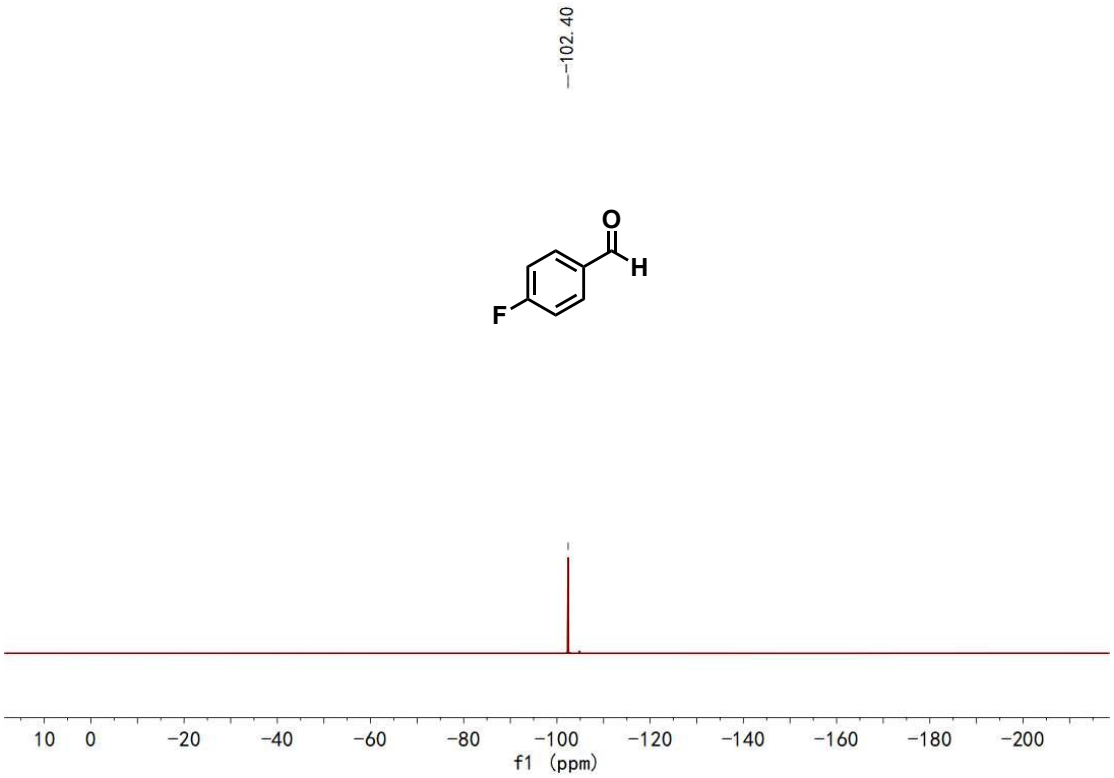
4-Fluorobenzaldehyde (4n): ^{1}H NMR (400 MHz, $CDCl_3$)



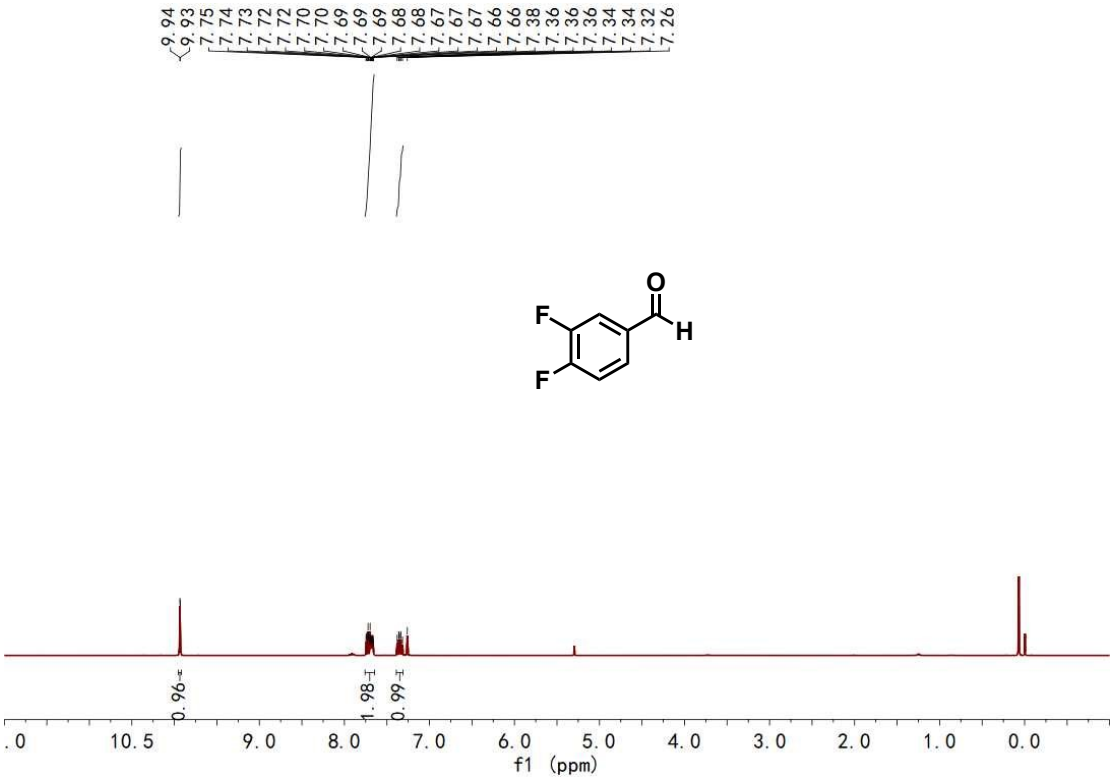
4-Fluorobenzaldehyde (4n): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



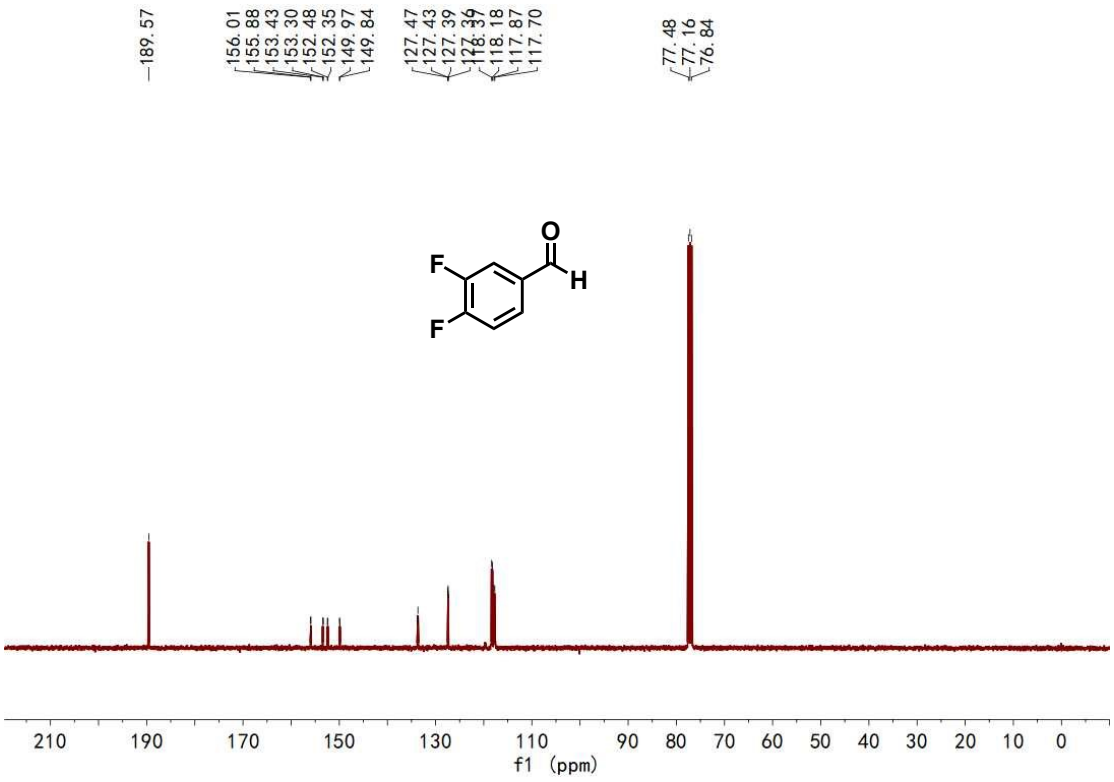
4-Fluorobenzaldehyde (4n): ^{19}F NMR (376 MHz, $CDCl_3$)



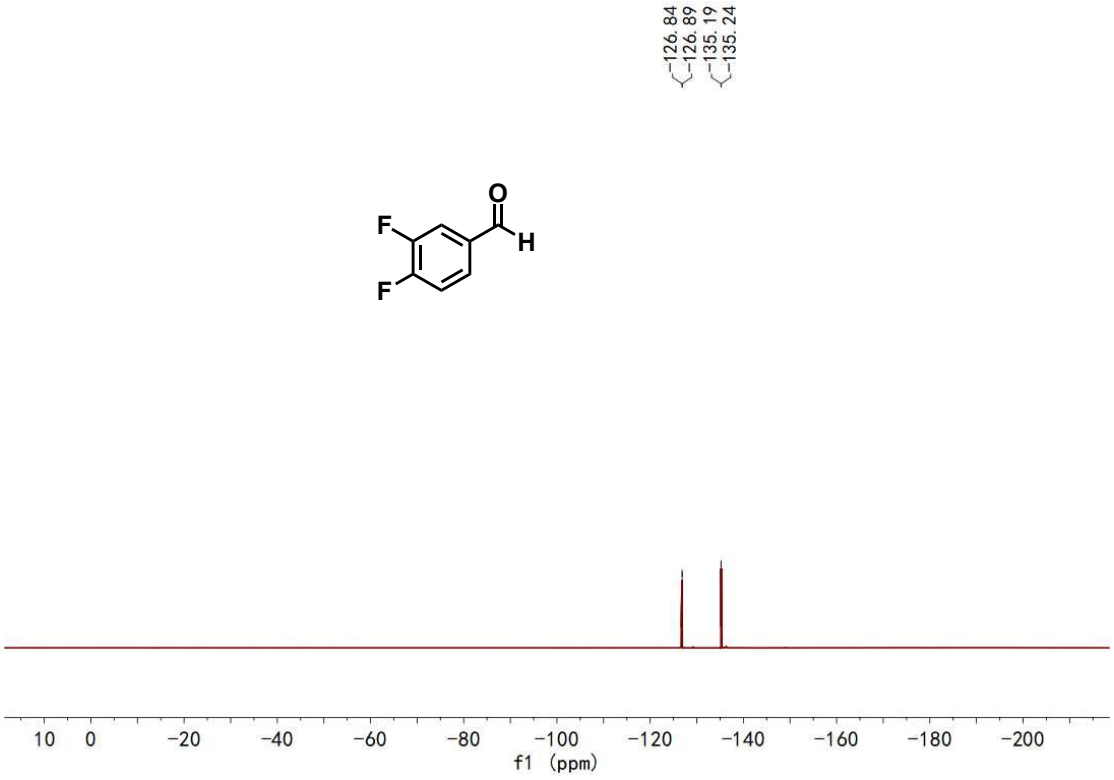
3,4-Difluorobenzaldehyde (4o): ^{1}H NMR(400 MHz, $CDCl_3$)



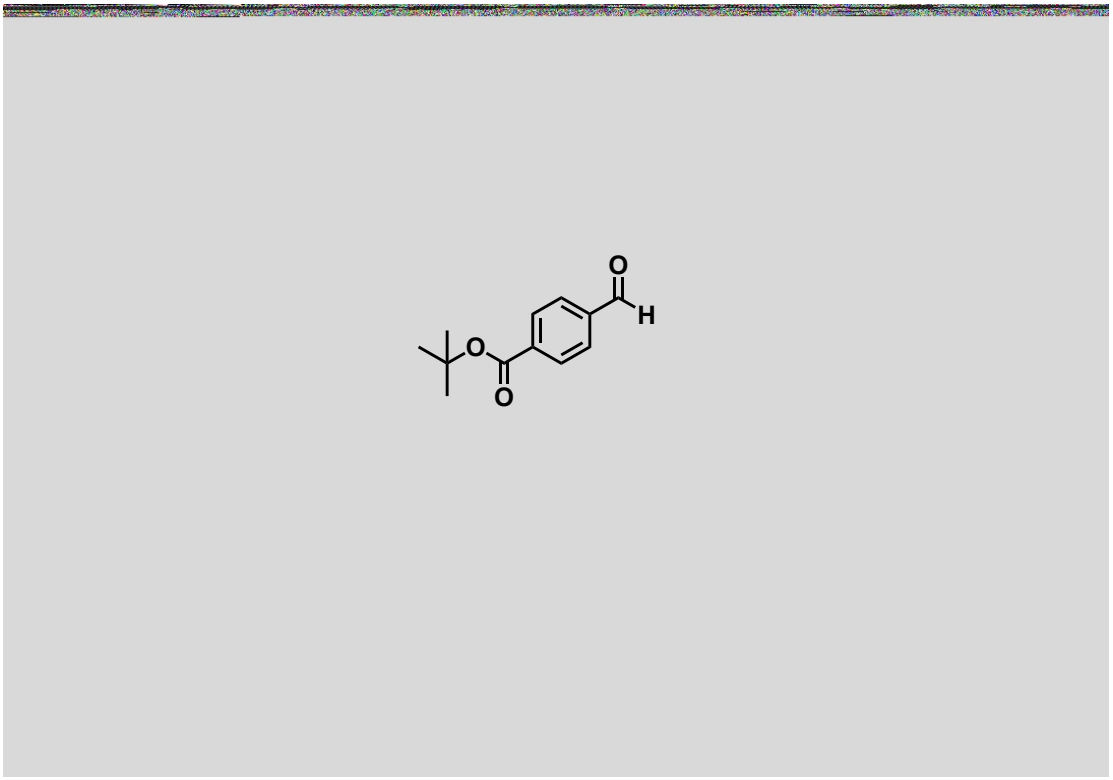
3,4-Difluorobenzaldehyde (4o): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



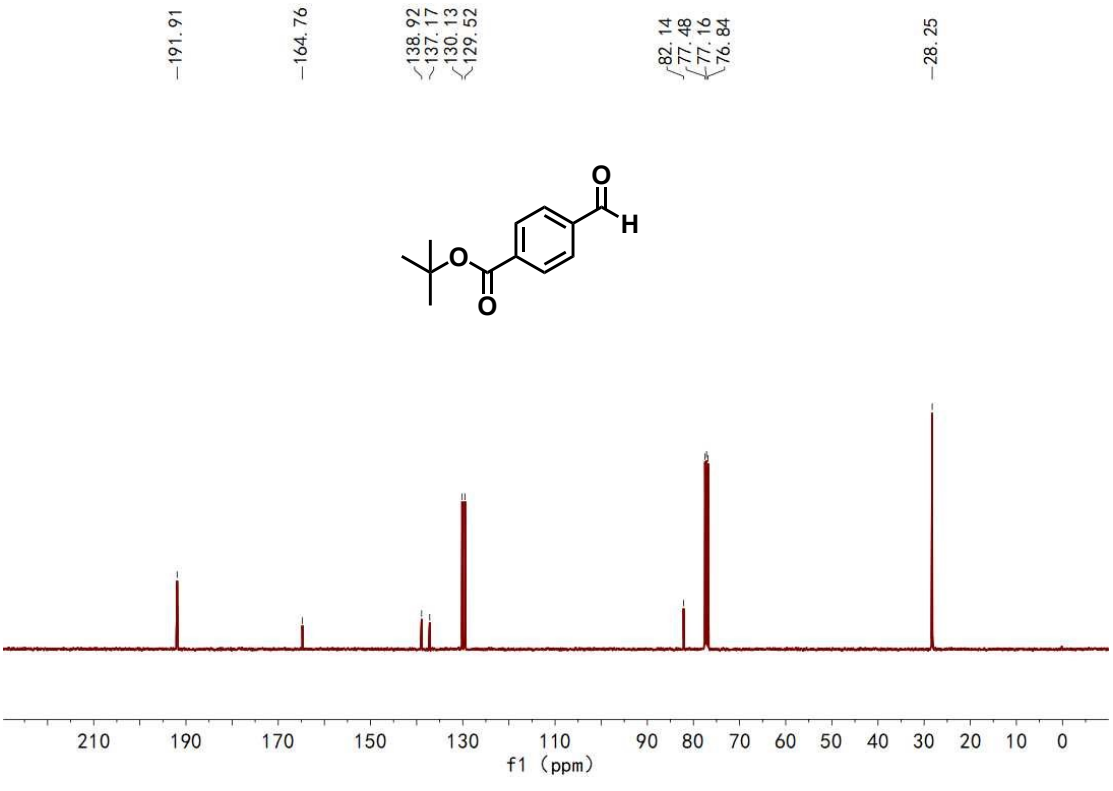
3,4-Difluorobenzaldehyde (4o): ^{19}F NMR (376 MHz, $CDCl_3$)



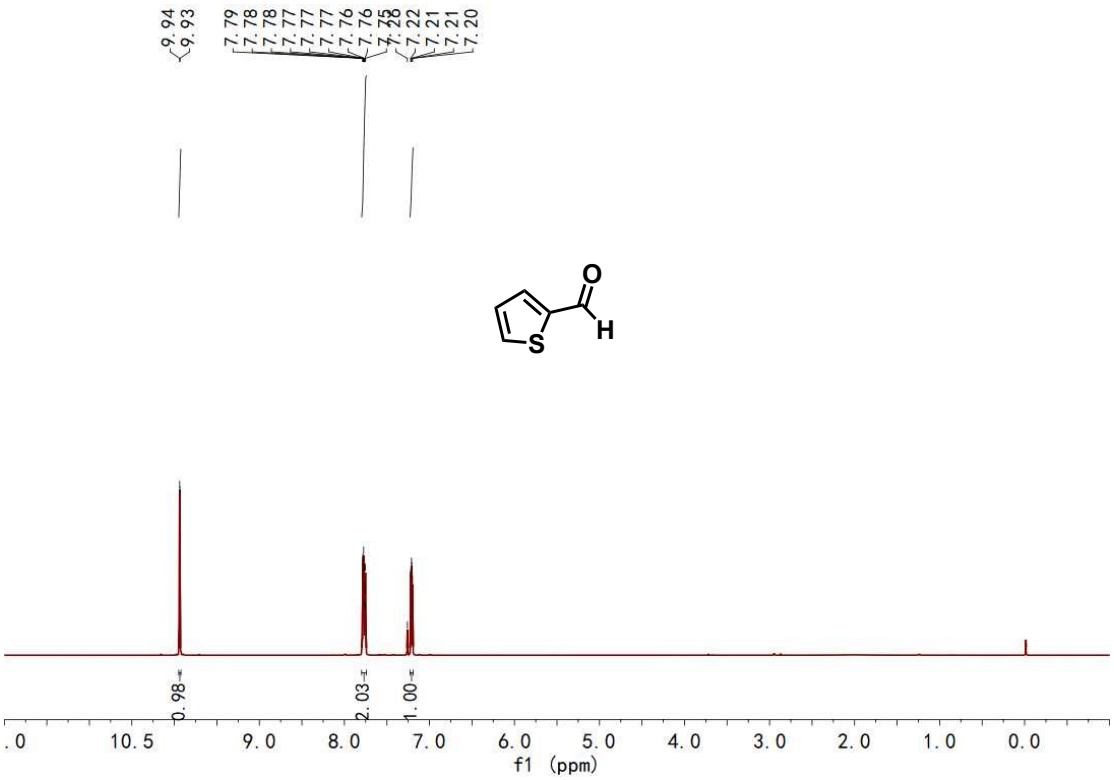
***Tert*-butyl 4-formylbenzoate (4p): ^{1}H NMR (400 MHz, $CDCl_3$)**



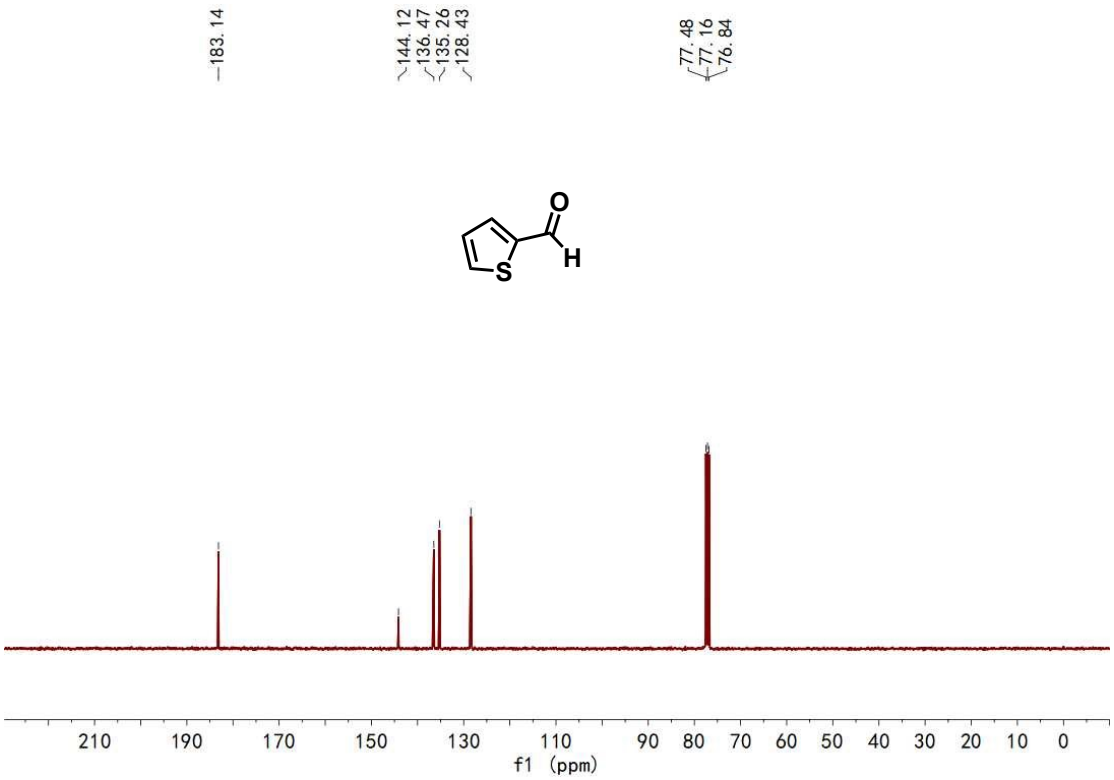
***Tert*-butyl 4-formylbenzoate (4p): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)**



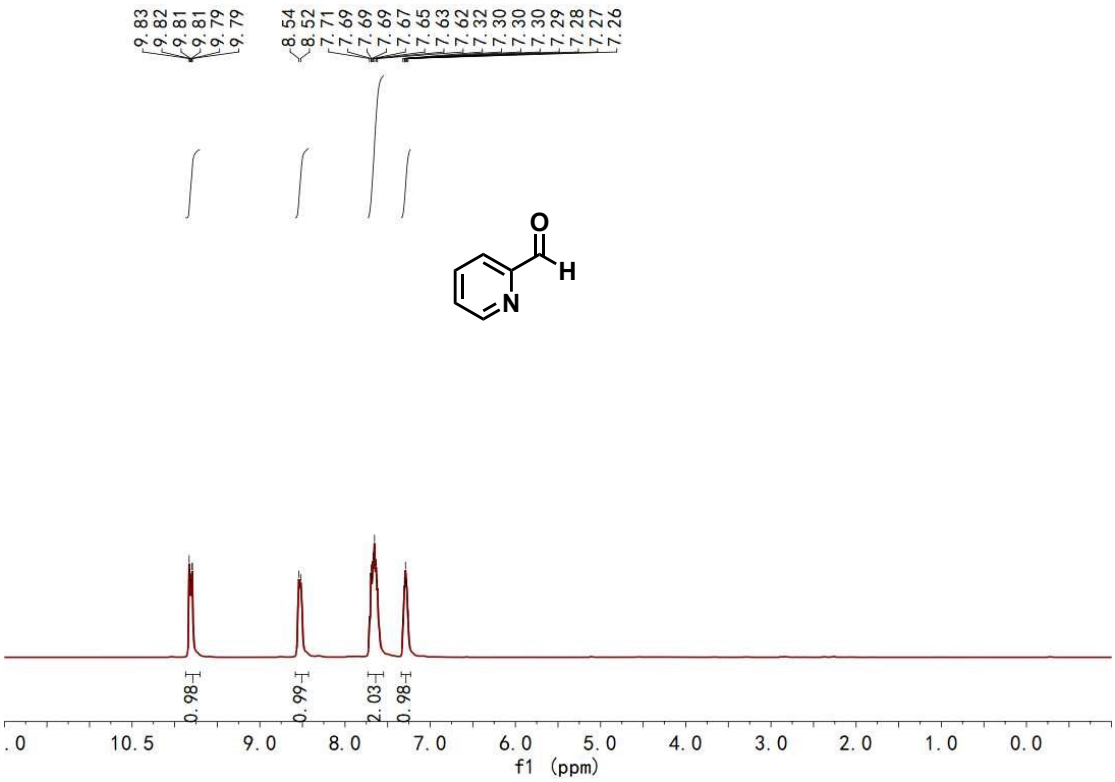
Thiophene-2-carbaldehyde (4q): ^{1}H NMR (400 MHz, $CDCl_3$)



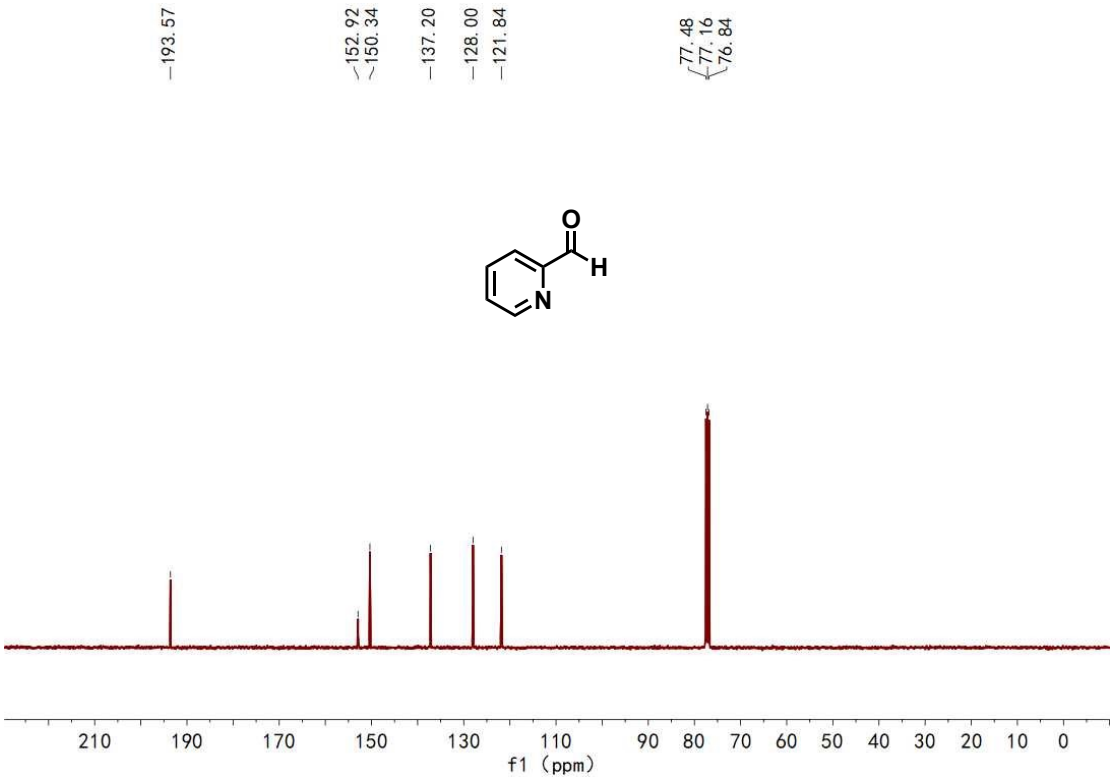
Thiophene-2-carbaldehyde (4q): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



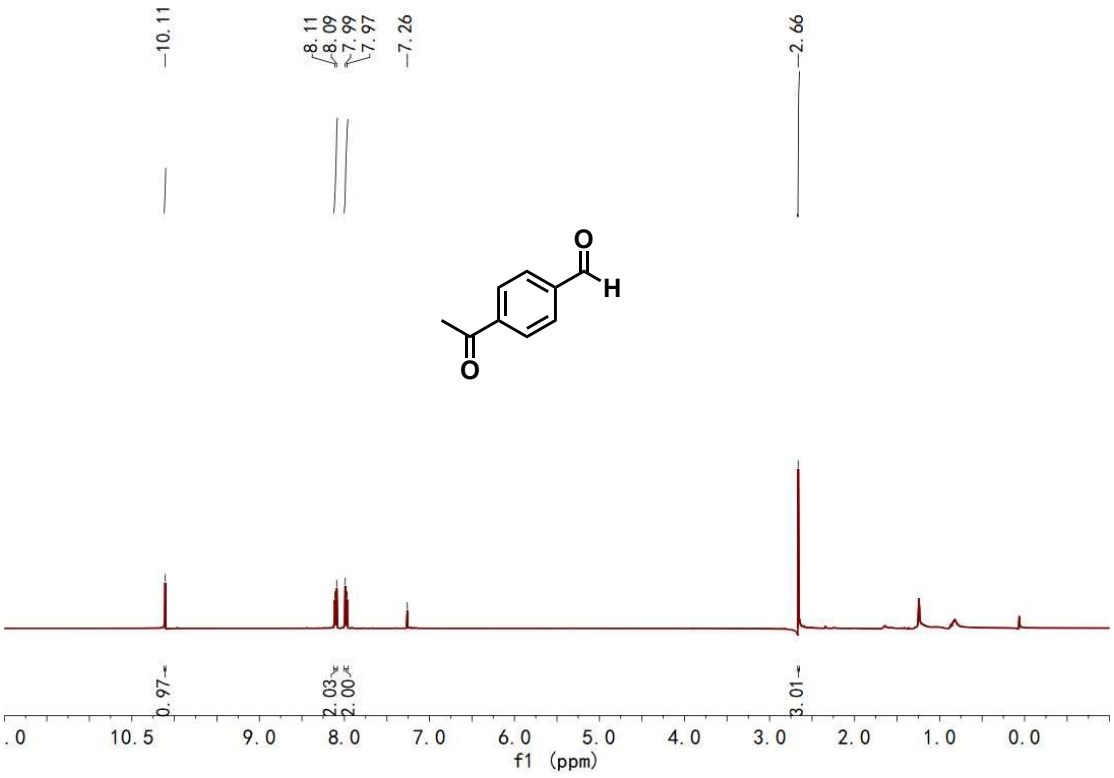
Picolinaldehyde (4r): ^{1}HNMR (400MHz, $CDCl_3$)



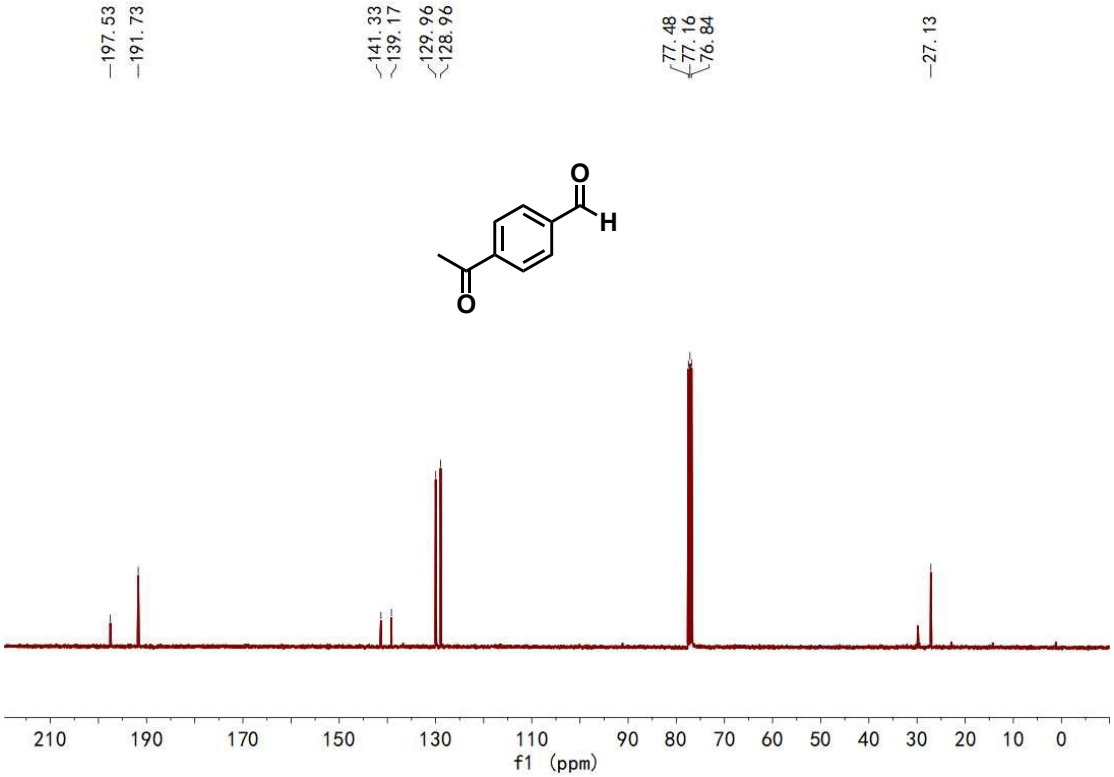
Picolinaldehyde (4r): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



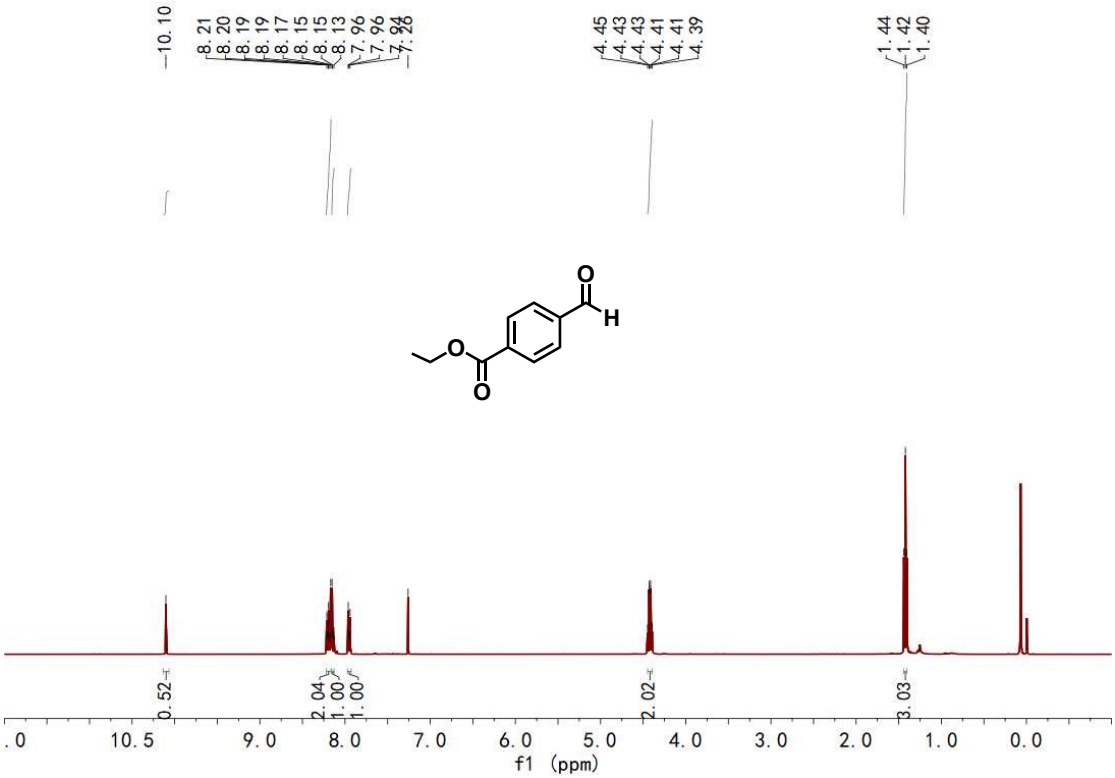
4-Acetylbenzaldehyde (4s): ^{1}H NMR (400 MHz, $CDCl_3$)



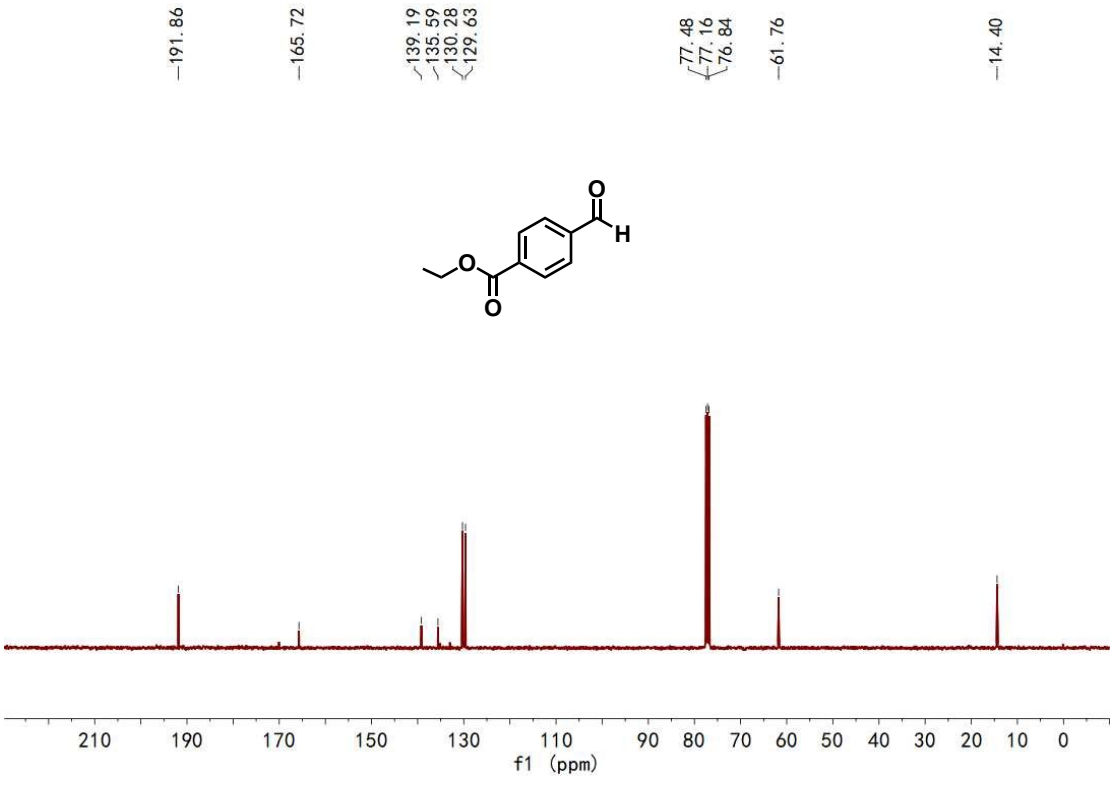
Acetylbenzaldehyde (4s): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



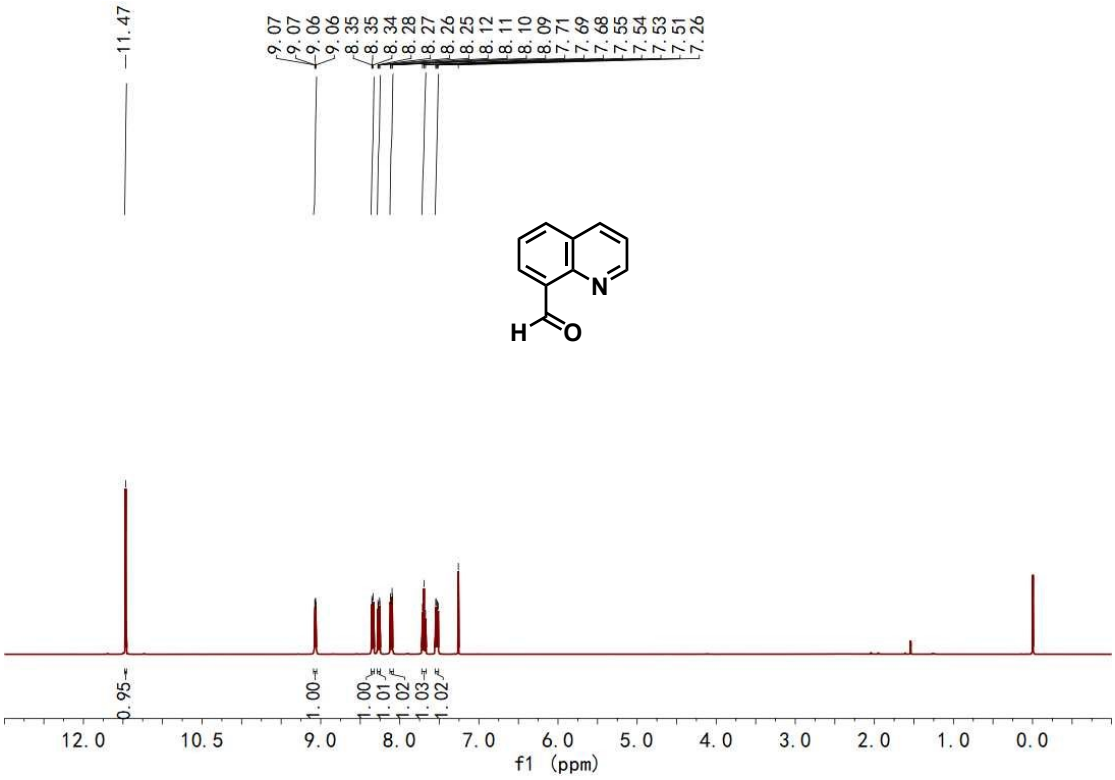
Ethyl 4-formylbenzoate (4t): ^{1}H NMR(400 MHz, $CDCl_3$)



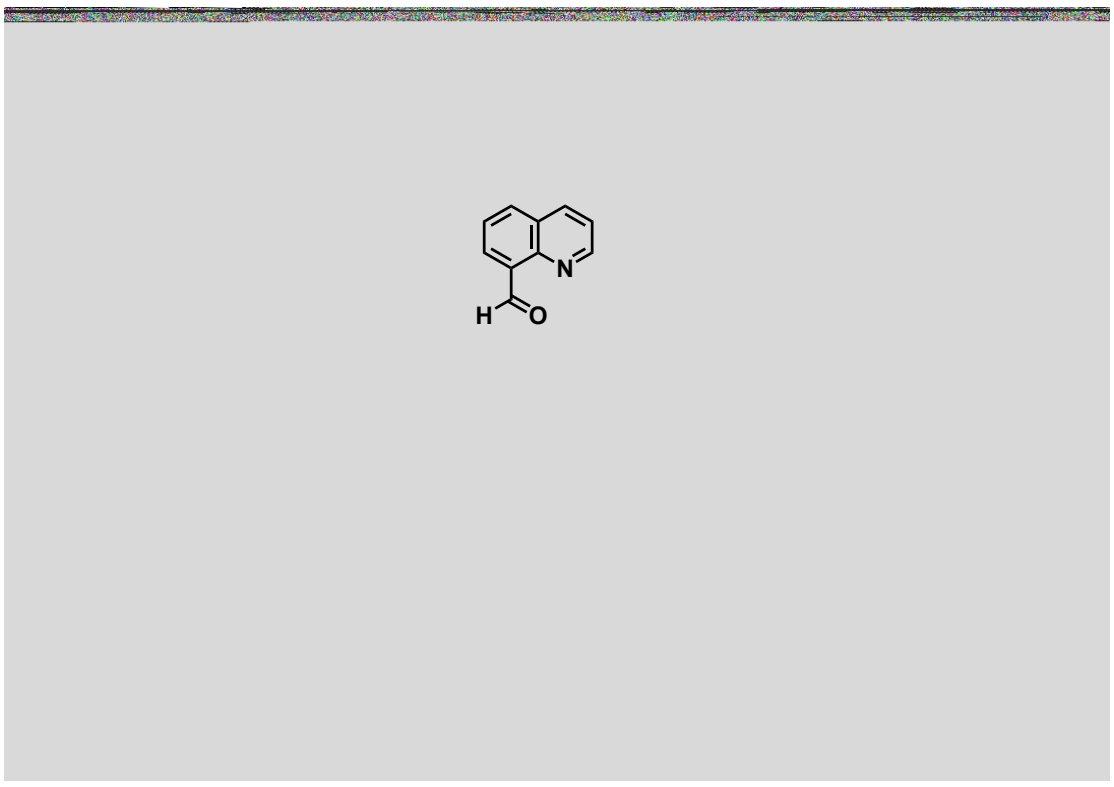
Ethyl 4-formylbenzoate (4t): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



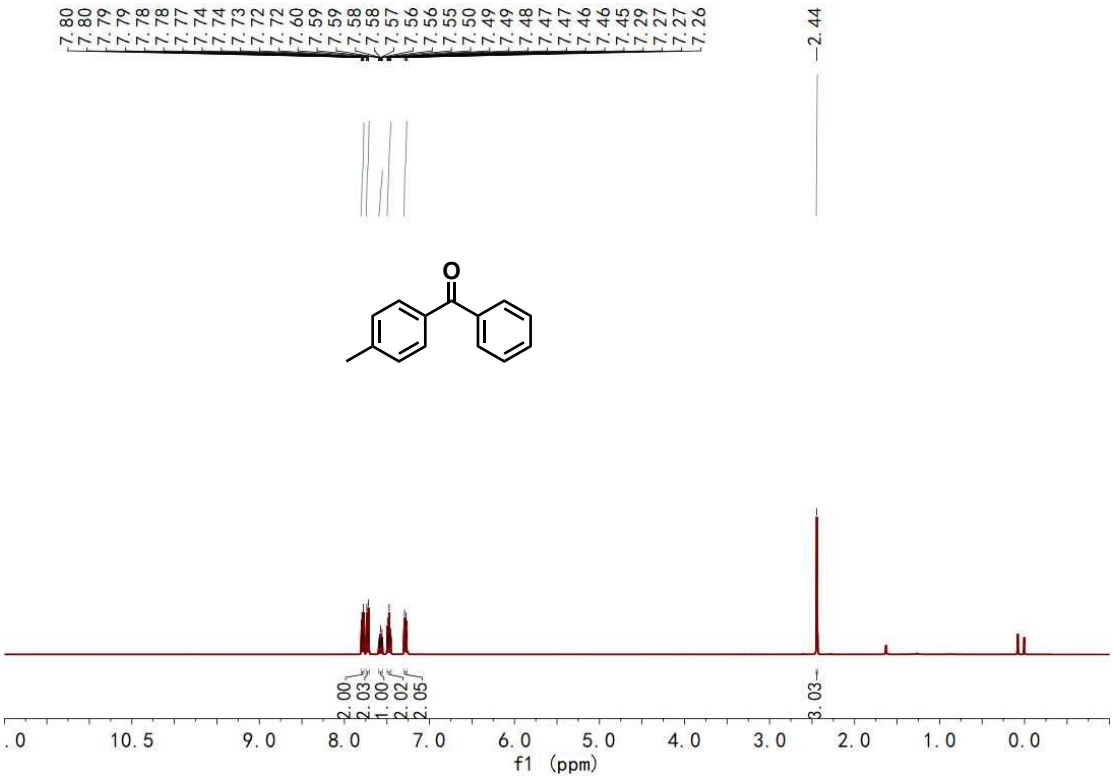
Quinoline-8-carbaldehyde (4u): ^{1}H NMR(400 MHz, $CDCl_3$)



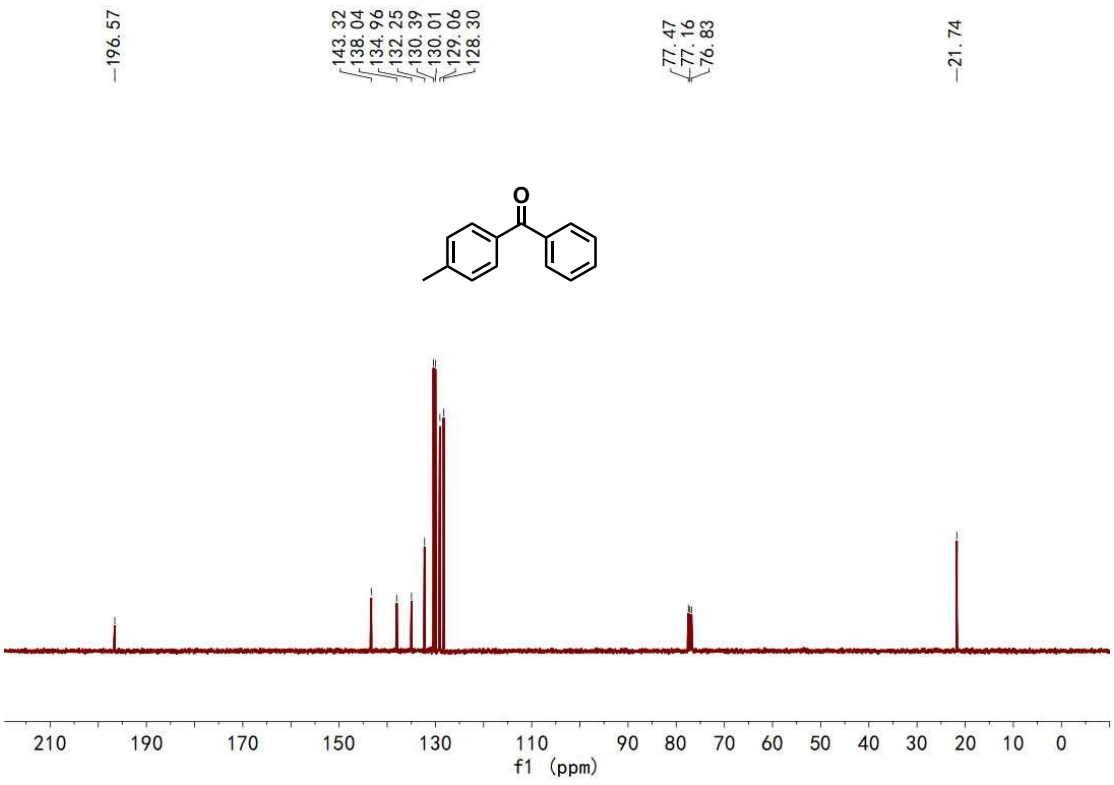
Quinoline-8-carbaldehyde (4u): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



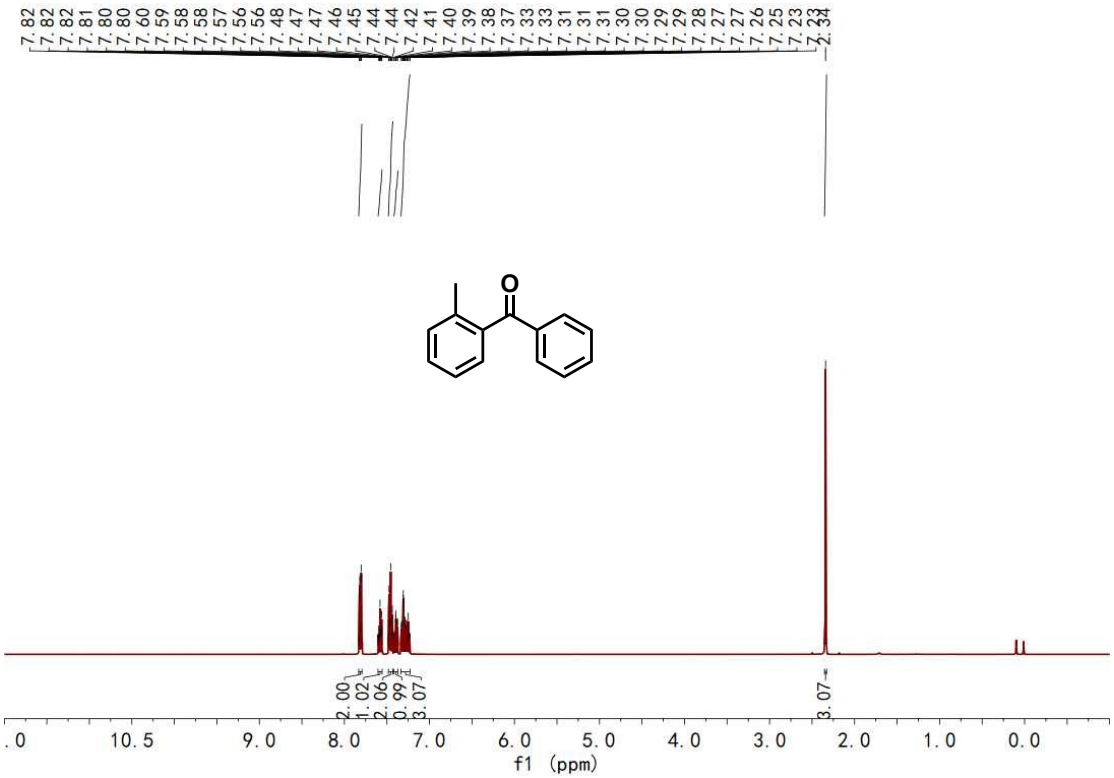
Phenyl(*p*-tolyl)methanone (6a): ^{1}H NMR (400 MHz, $CDCl_3$)



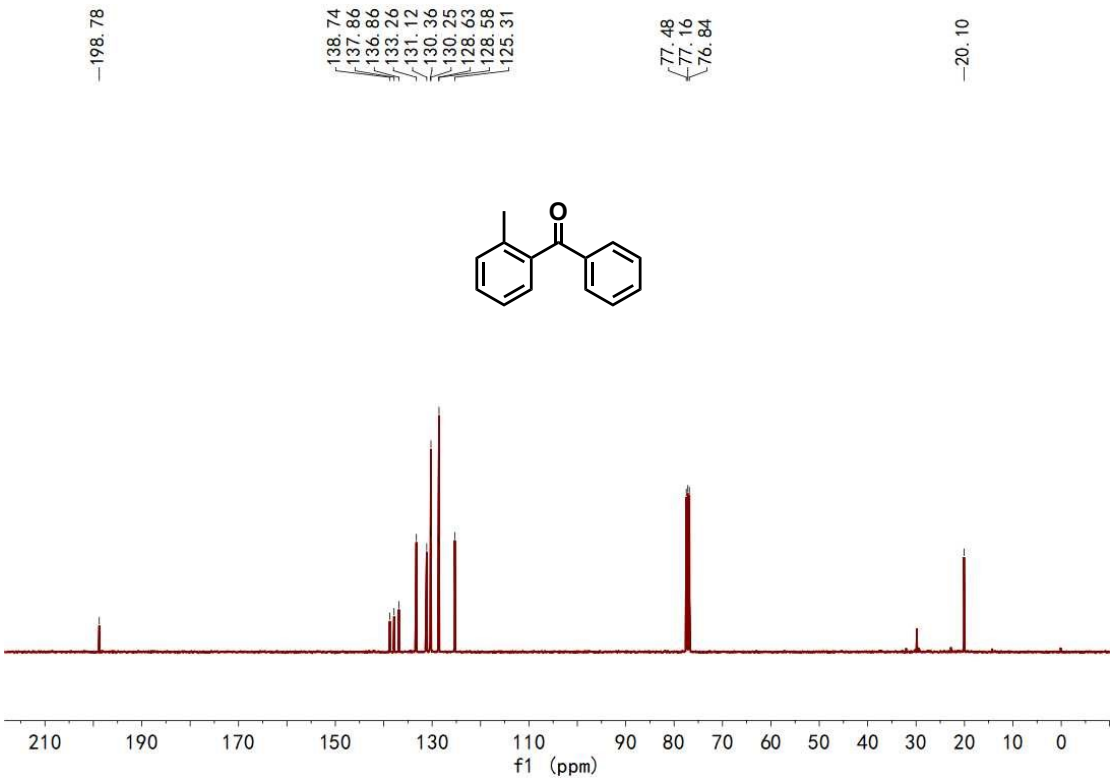
Phenyl(*p*-tolyl)methanone (6a): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



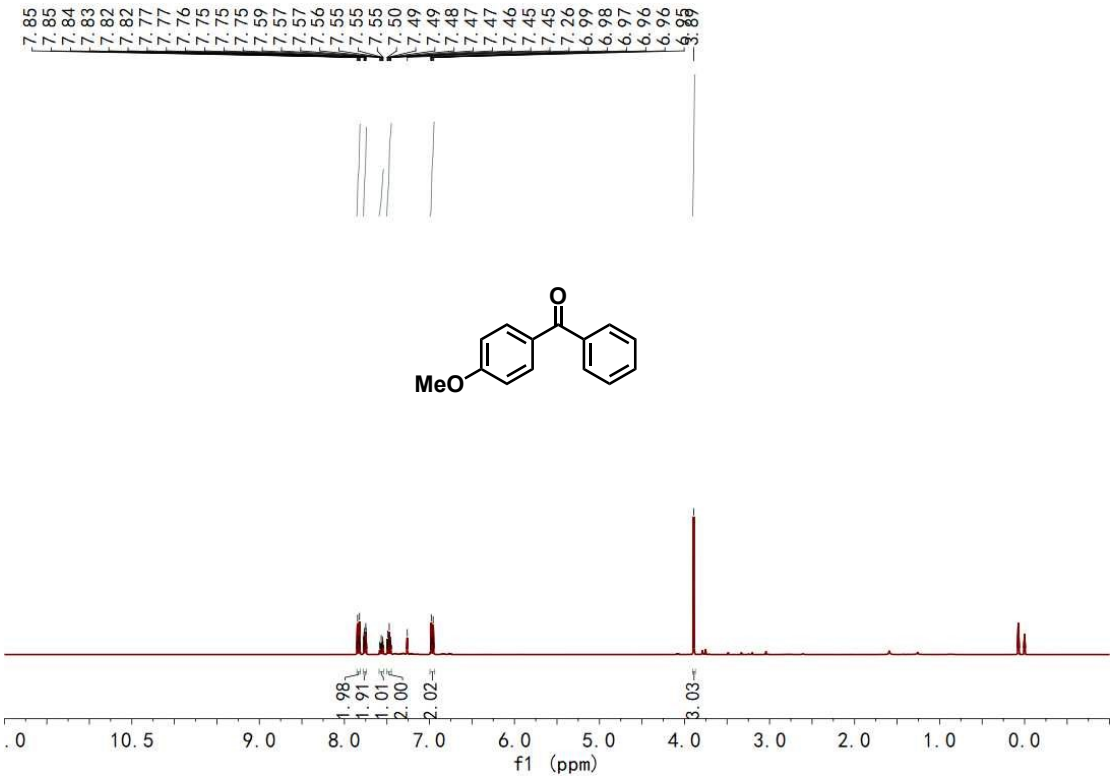
Phenyl(*o*-tolyl)methanone (6b): ^{1}H NMR (400 MHz, $CDCl_3$)



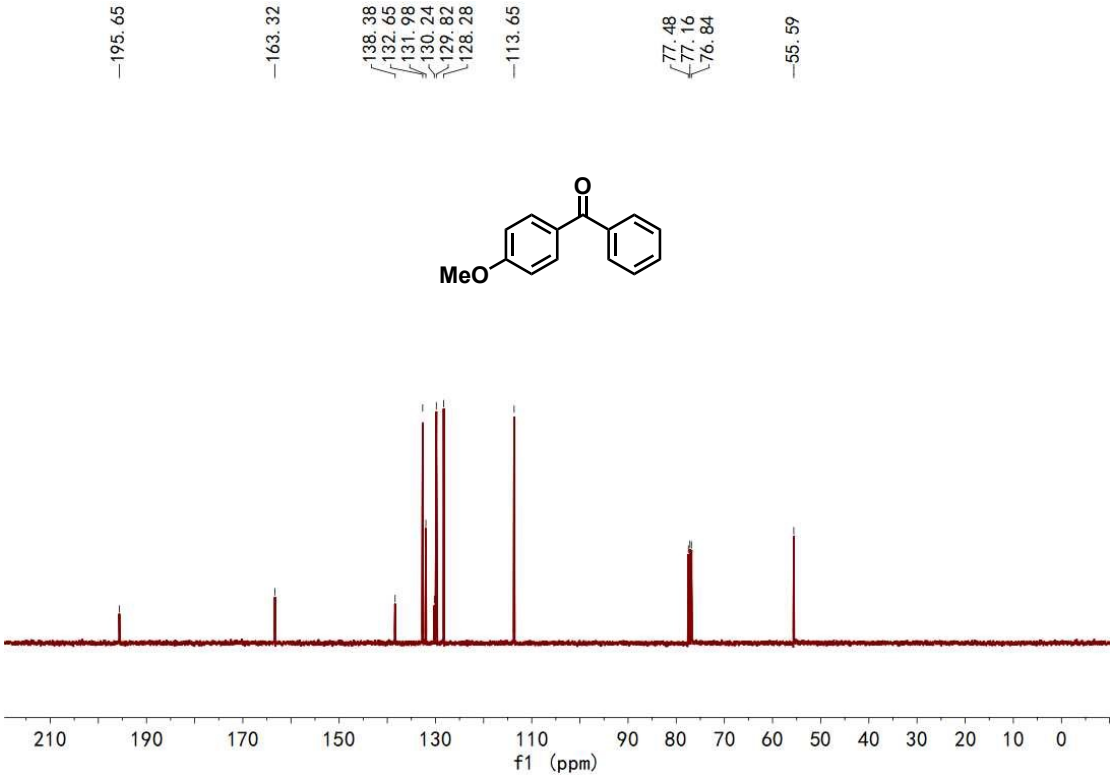
Phenyl(*o*-tolyl)methanone (6b): ^{13}C{^{1}H} NMR (101MHz, $CDCl_3$)



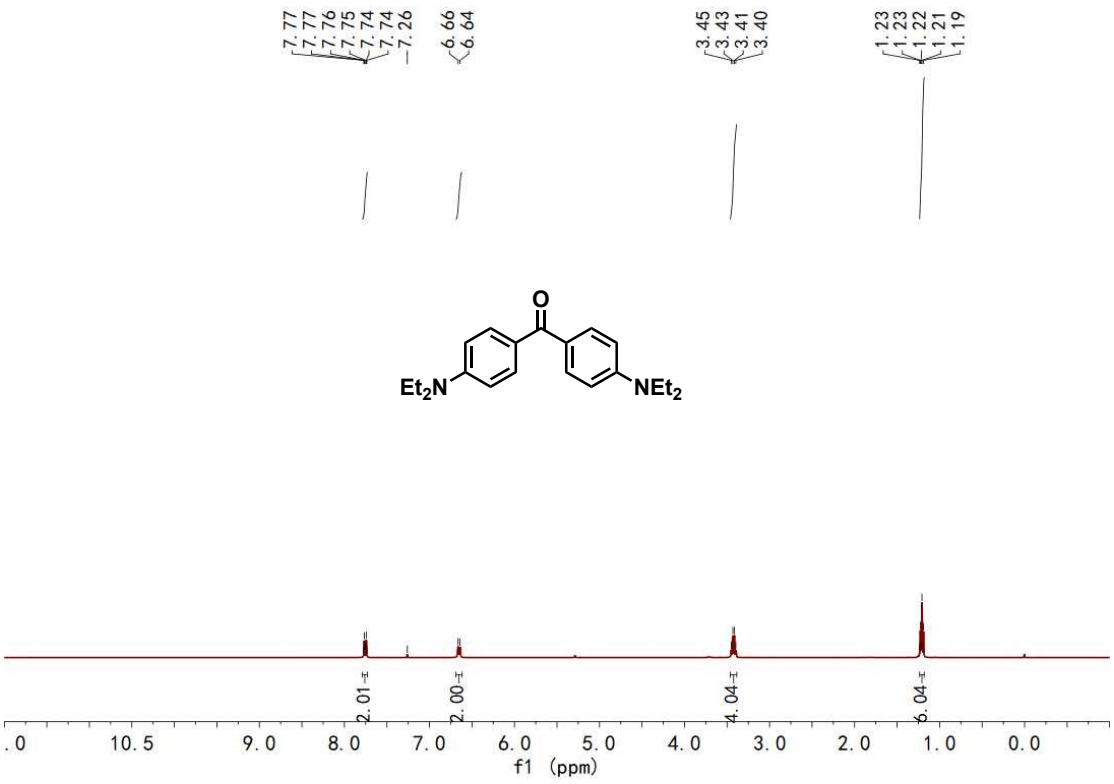
(4-Methoxyphenyl)(phenyl)methanone (6c): ^{1}H NMR (400 MHz, $CDCl_3$)



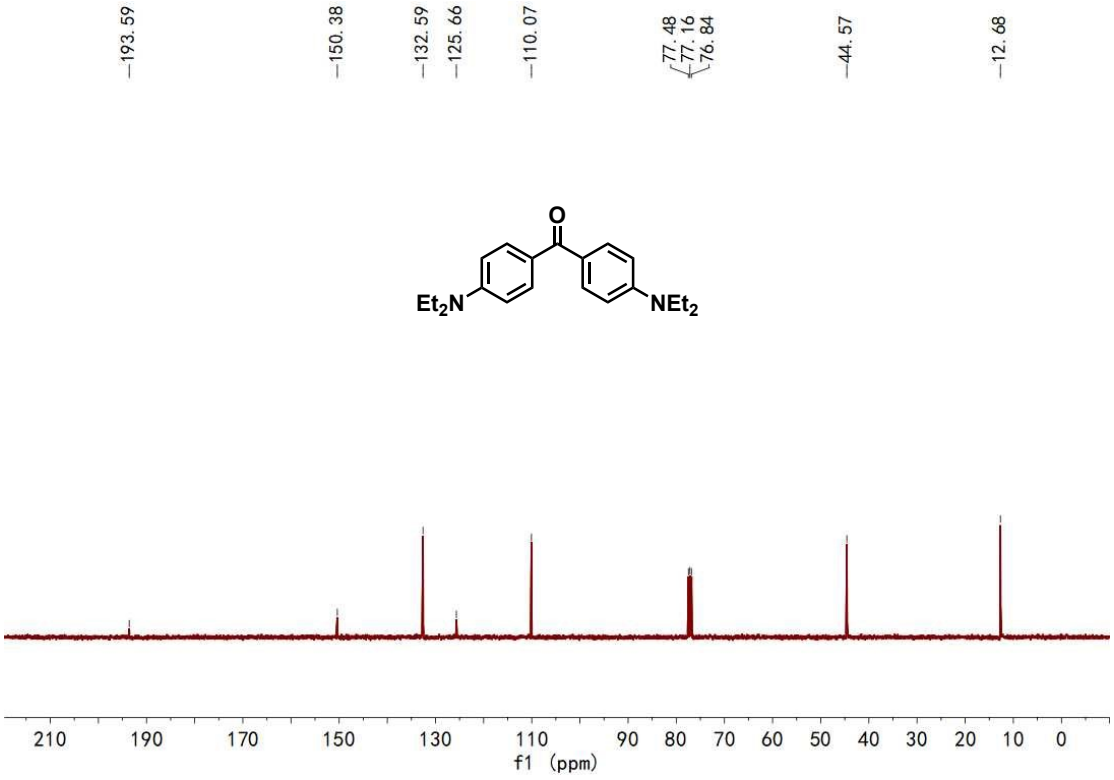
(4-Methoxyphenyl)(phenyl)methanone (6c): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



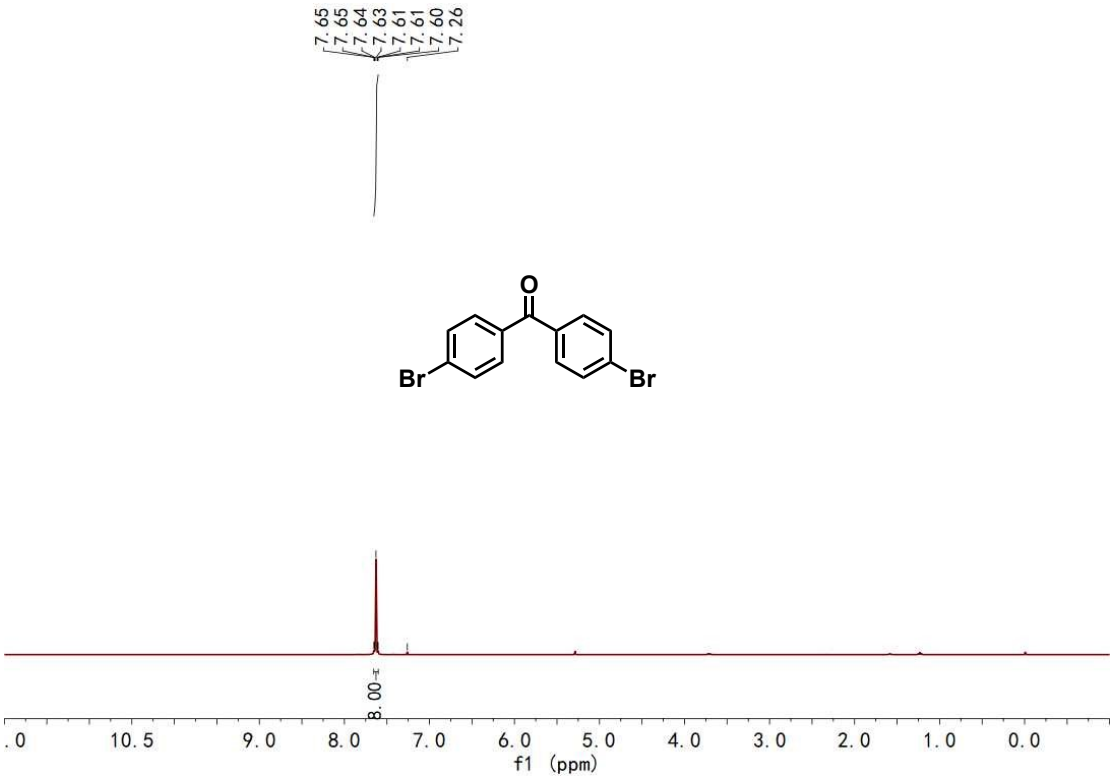
Bis(4-(diethylamino)phenyl)methanone (6d): ^{1}H NMR (400 MHz, $CDCl_3$)



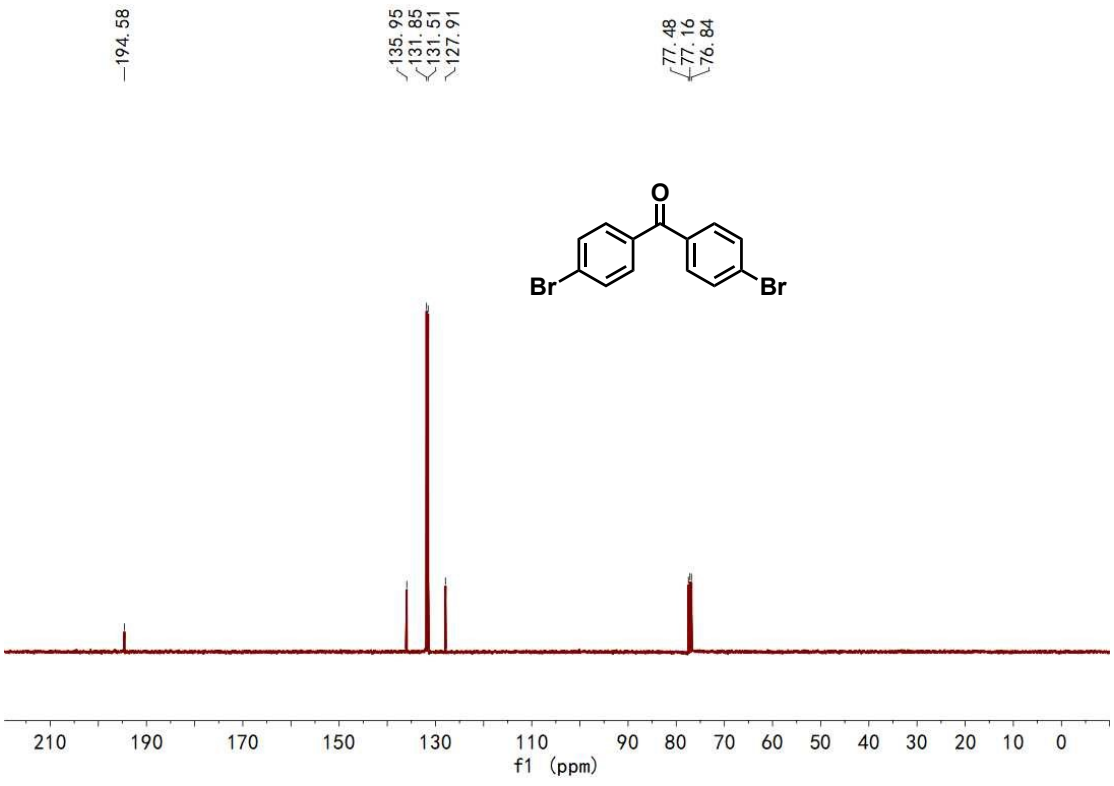
Bis(4-(diethylamino)phenyl)methanone (6d): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



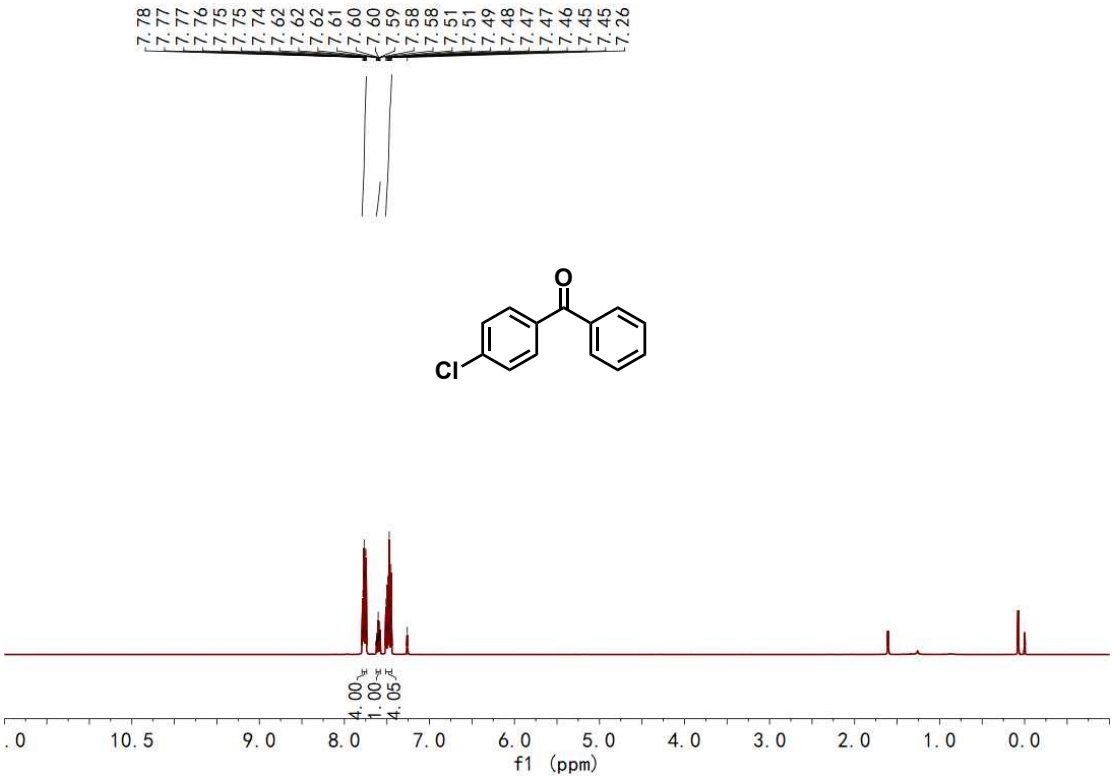
Bis(4-bromophenyl)methanone (6e): ^{1}H NMR (400 MHz, $CDCl_3$)



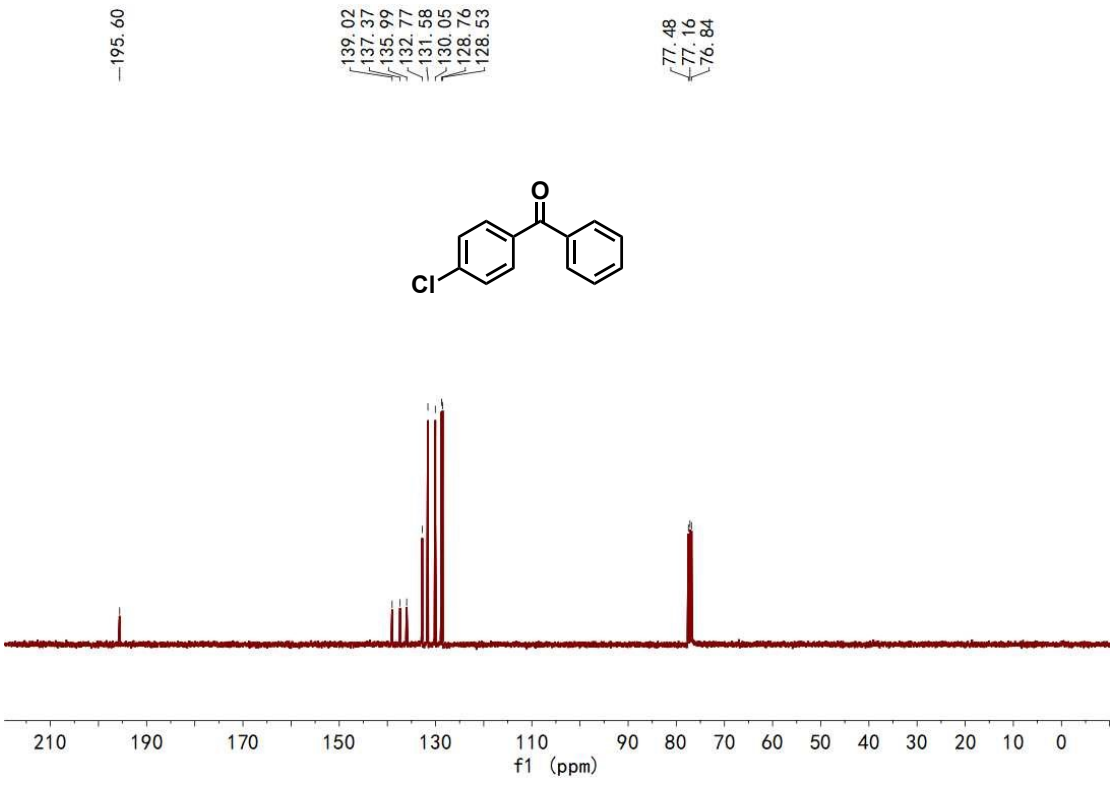
Bis(4-bromophenyl)methanone (6e): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



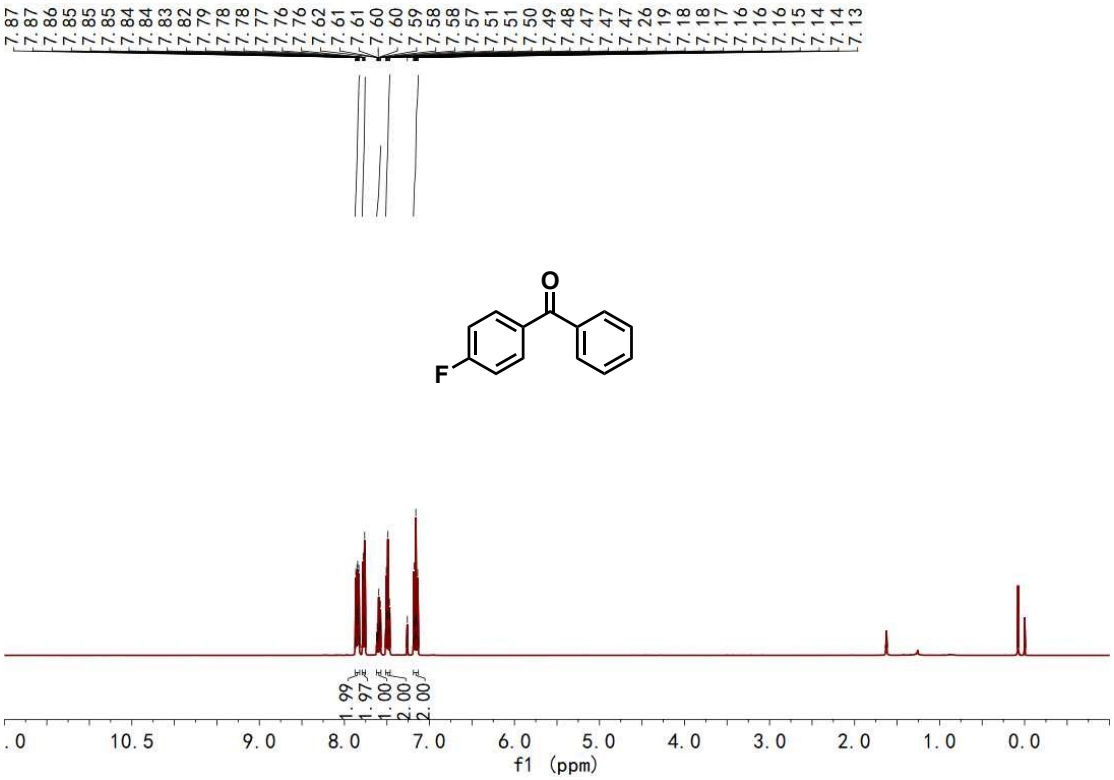
(4-Chlorophenyl)(phenyl)methanone (6f): ^{1}H NMR (400 MHz, $CDCl_3$)



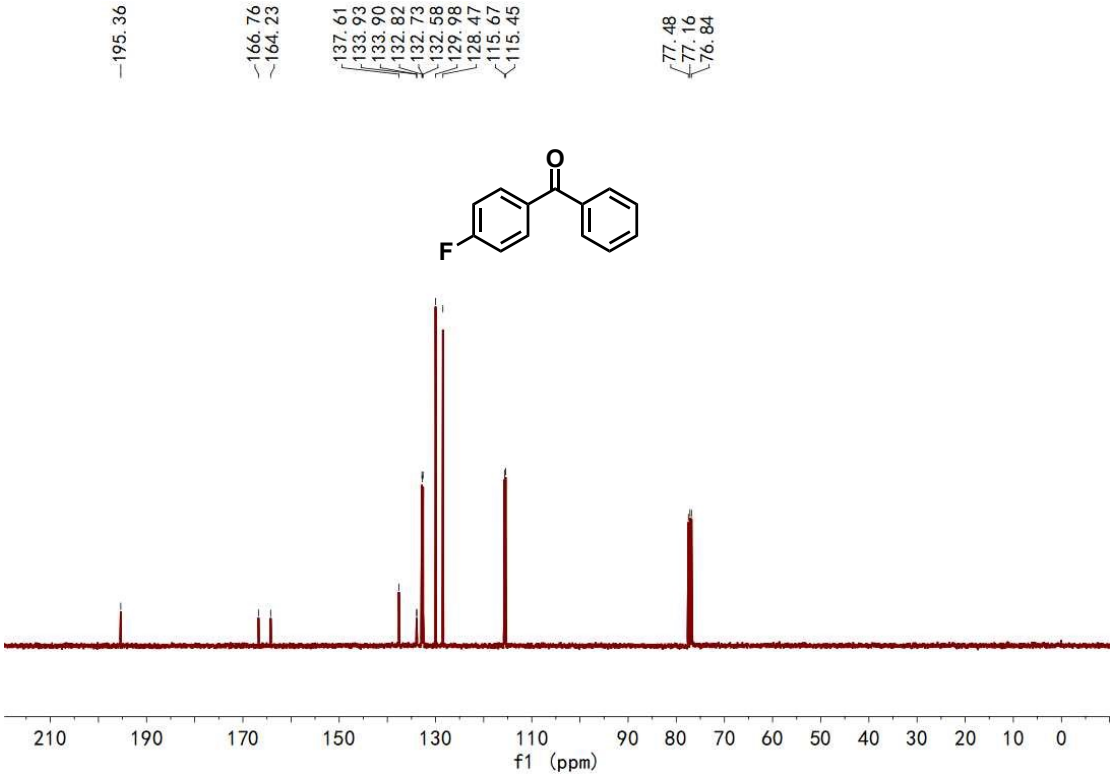
(4-Chlorophenyl)(phenyl)methanone (6f): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



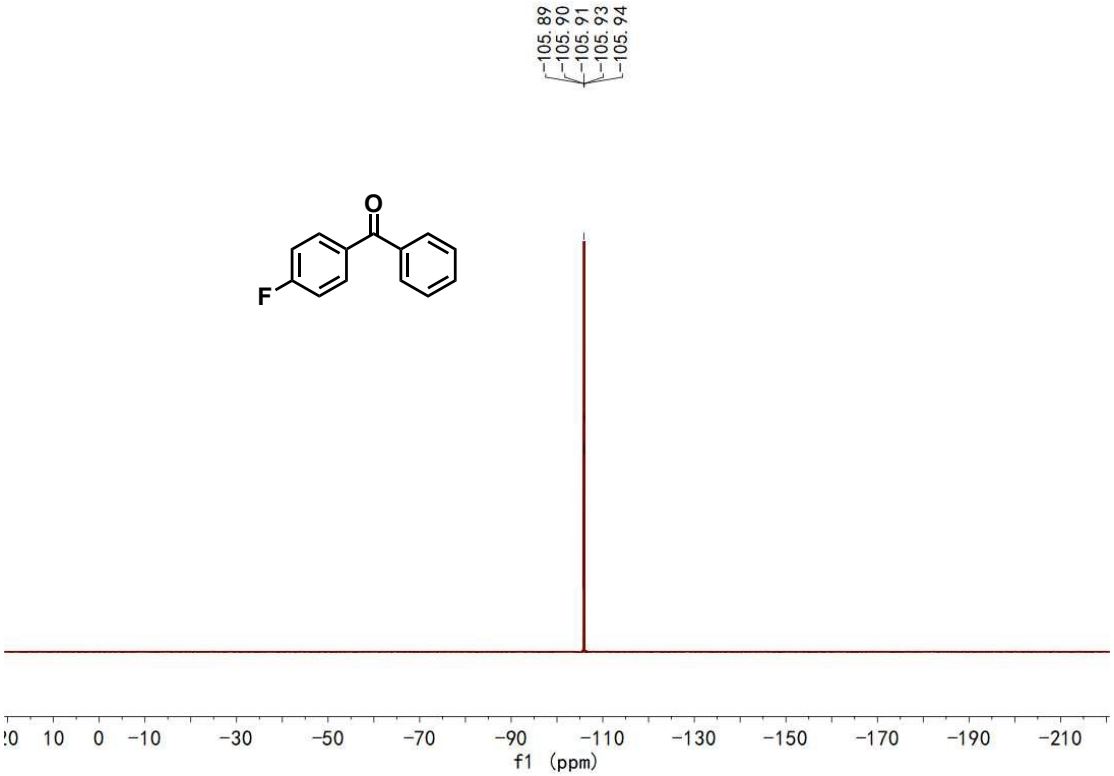
(4-Fluorophenyl)(phenyl)methanone (6g): ^{1}H NMR (400 MHz, $CDCl_3$)



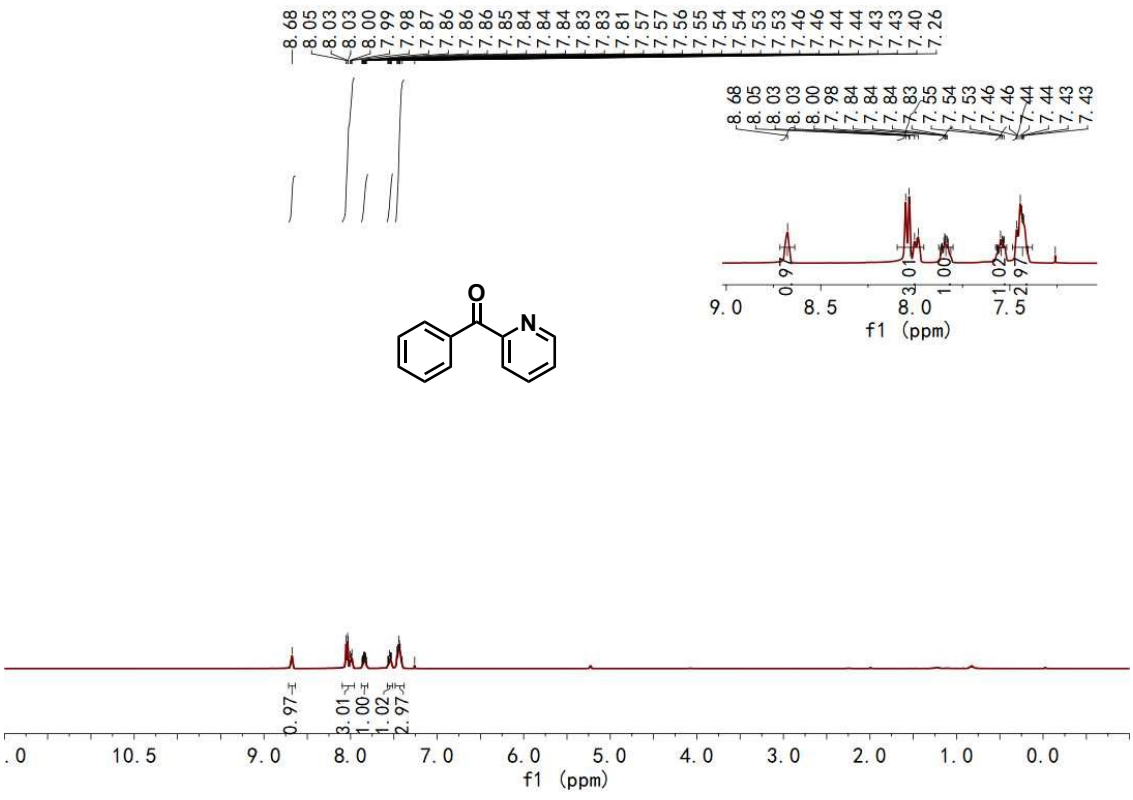
(4-Fluorophenyl)(phenyl)methanone (6g): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



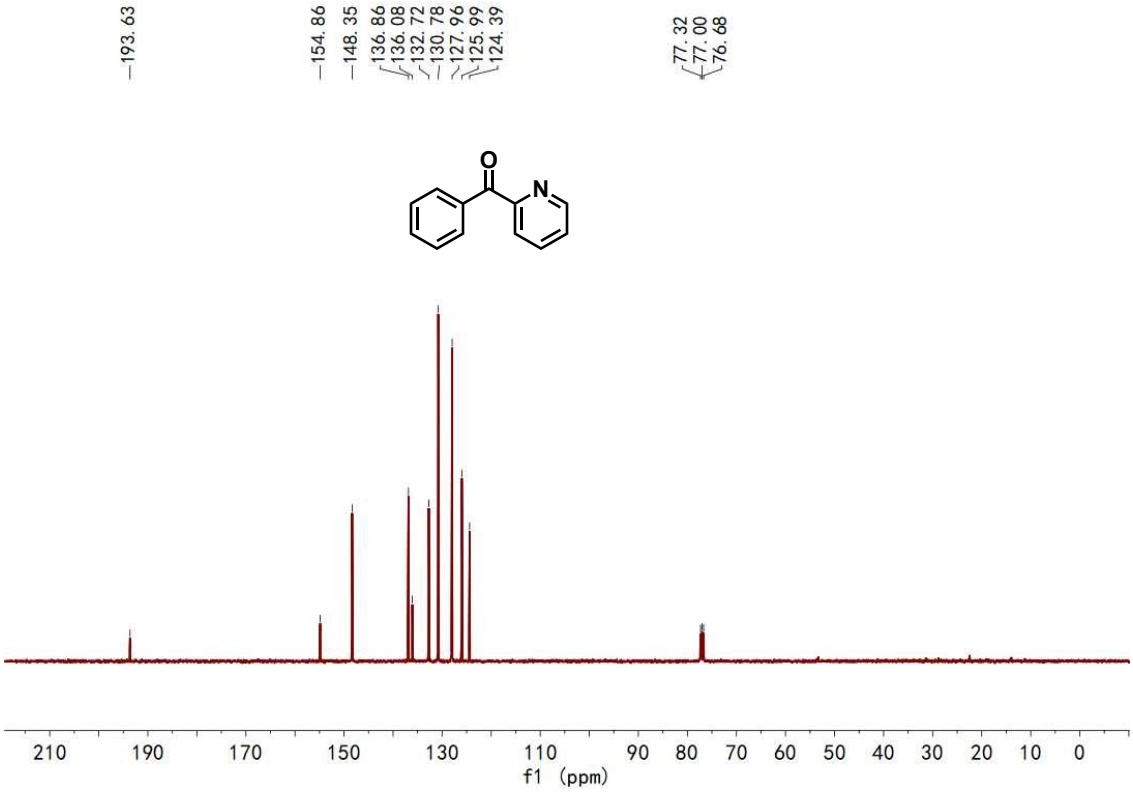
(4-Fluorophenyl)(phenyl)methanone (6g): ^{19}F NMR (376 MHz, $CDCl_3$)



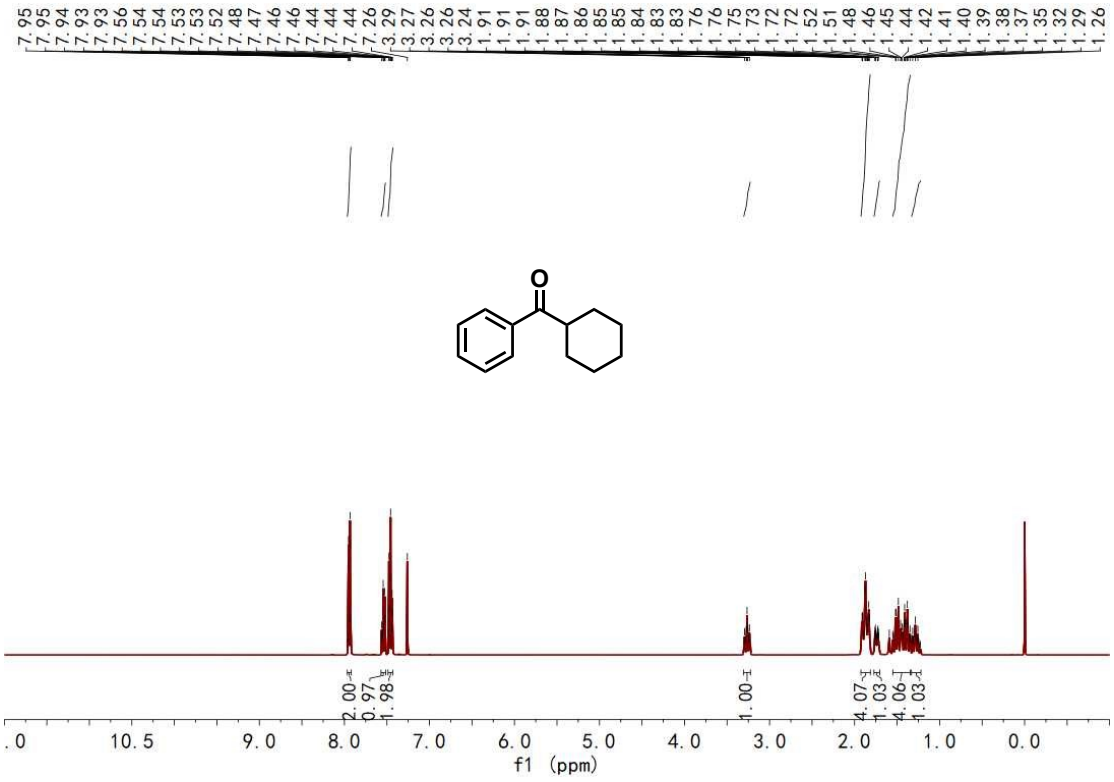
Phenyl(pyridin-2-yl)methanone (6h): ^{1}H NMR (400 MHz, $CDCl_3$)



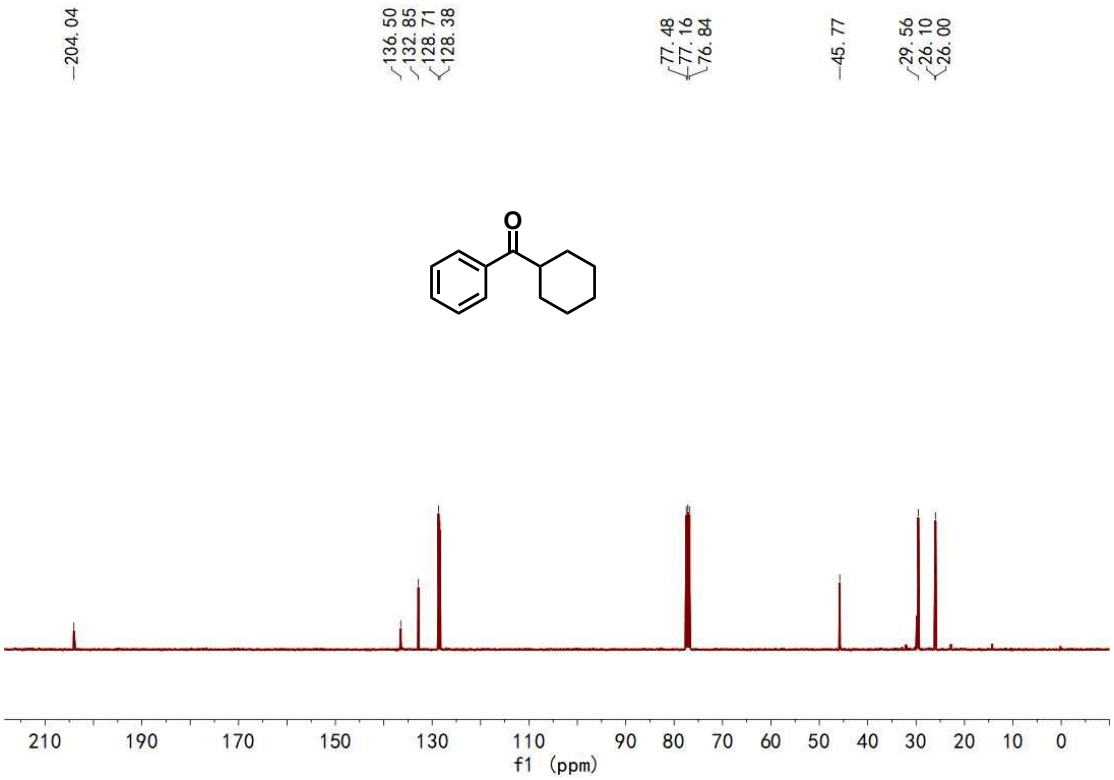
Phenyl(pyridin-2-yl)methanone (6h): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



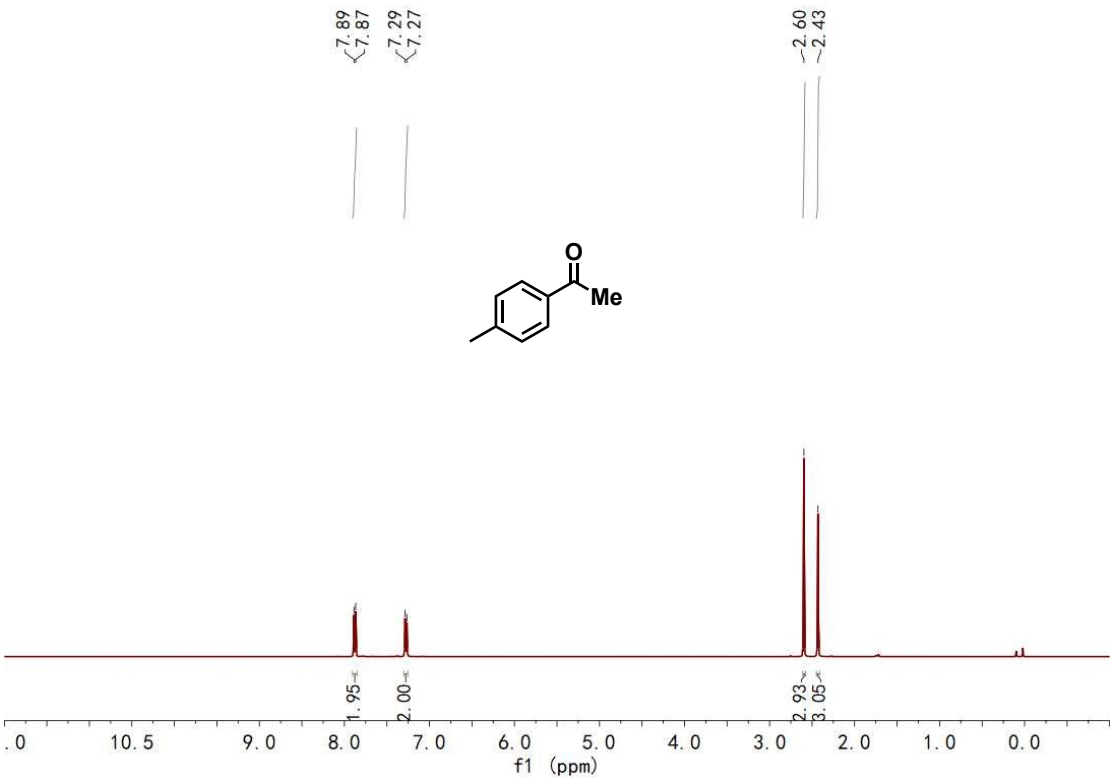
Cyclohexyl(phenyl)methanone (6i): ^{1}H NMR (400 MHz, $CDCl_3$)



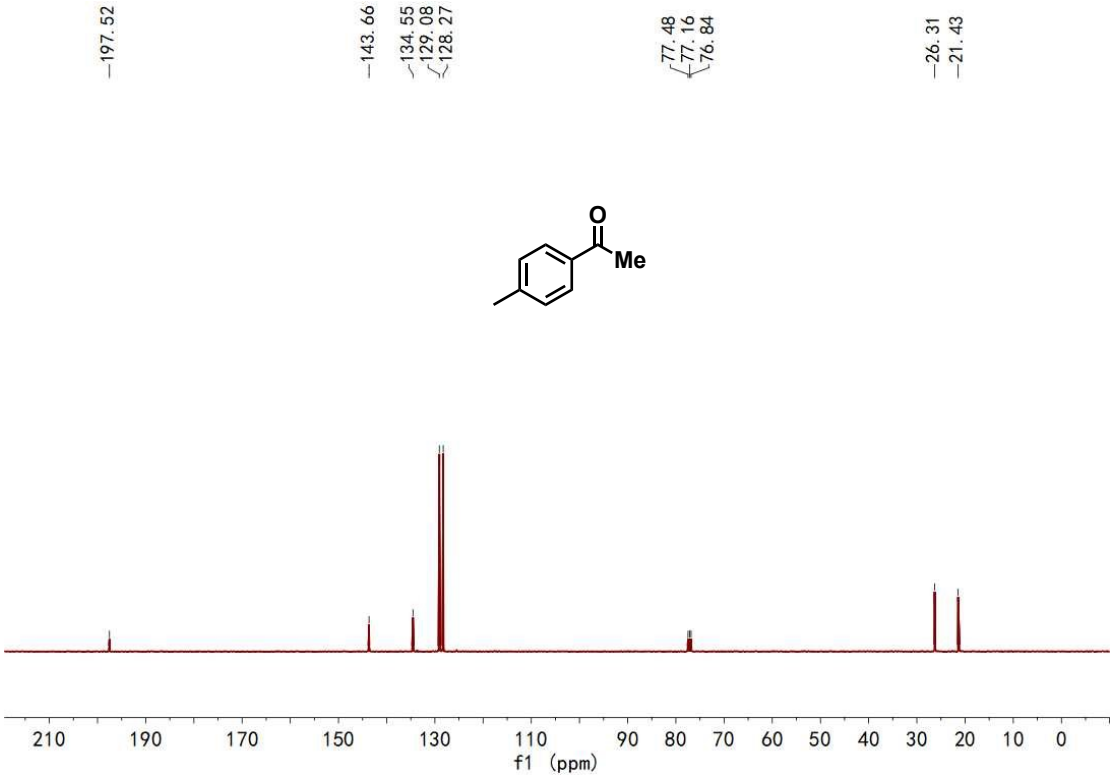
Cyclohexyl(phenyl)methanone (6i): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



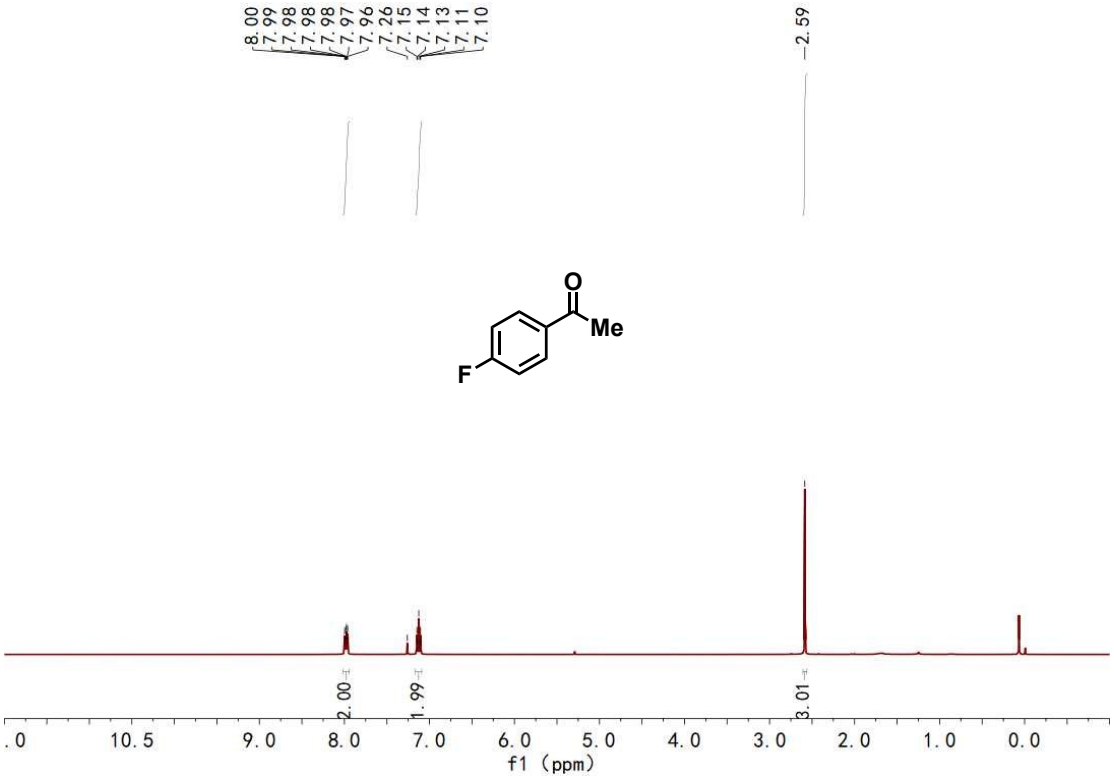
1-(*p*-Tolyl)ethan-1-one (6k): ^{1}H NMR (400 MHz, $CDCl_3$)



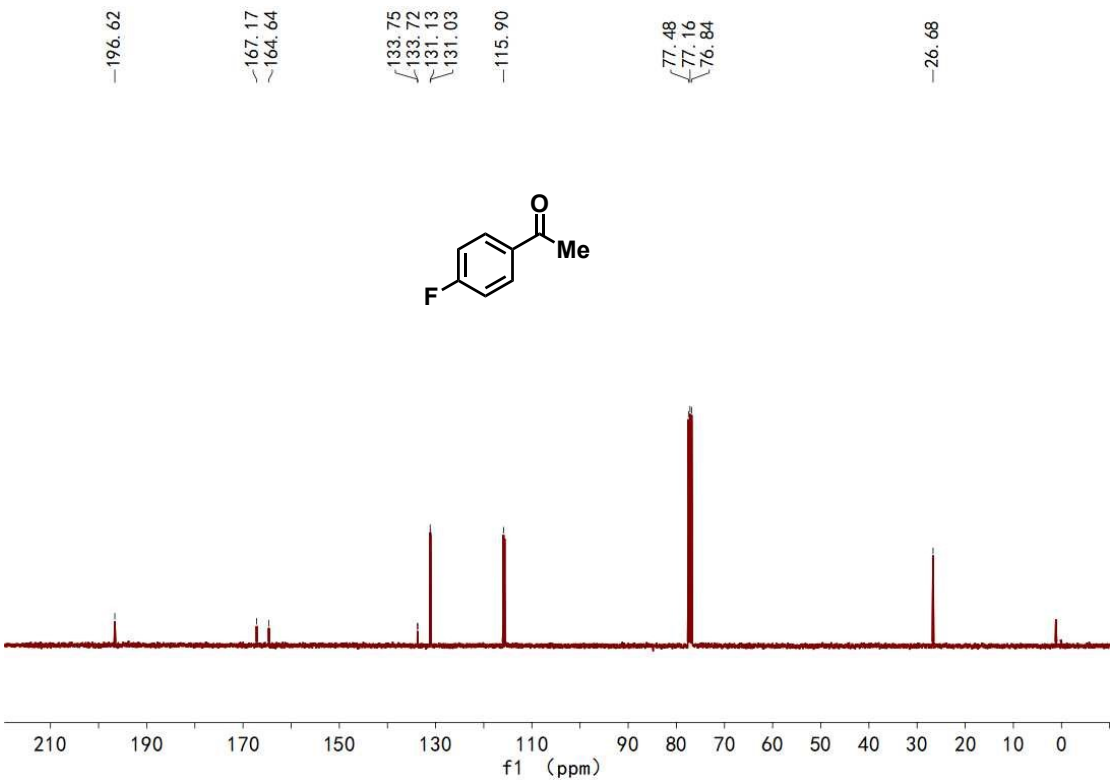
1-(*p*-Tolyl)ethan-1-one (6k): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



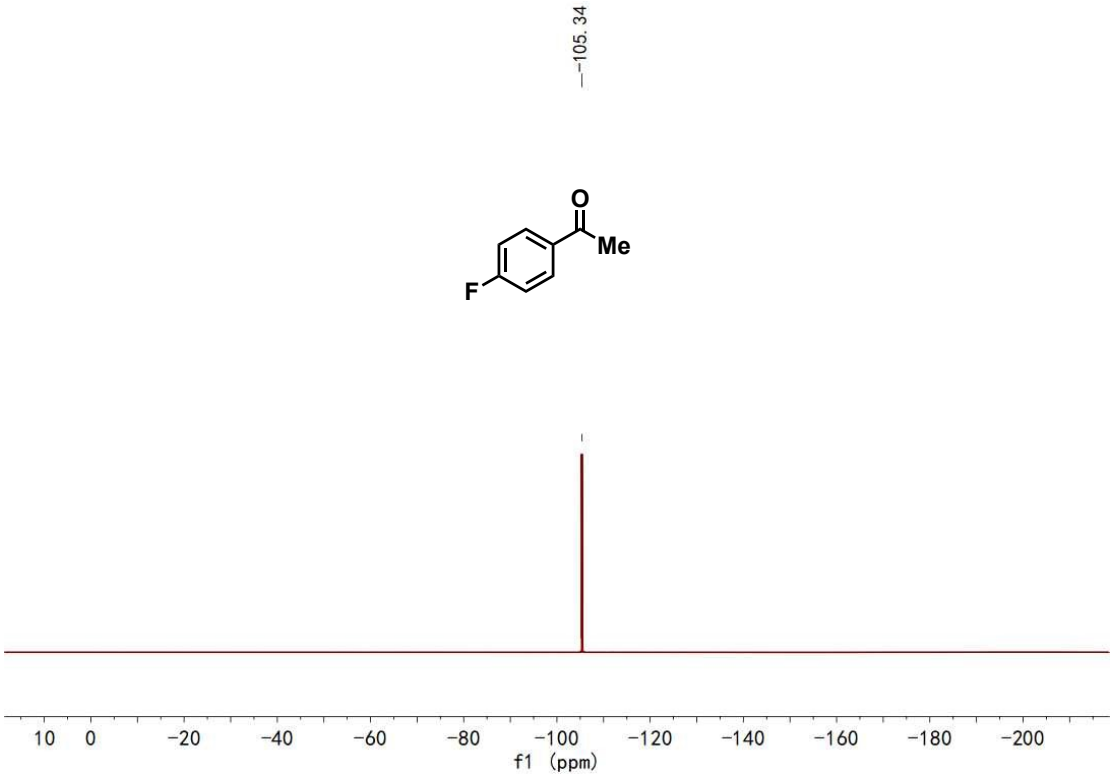
1-(4-Fluorophenyl)ethan-1-one (6l): ^{1}H NMR (400 MHz, $CDCl_3$)



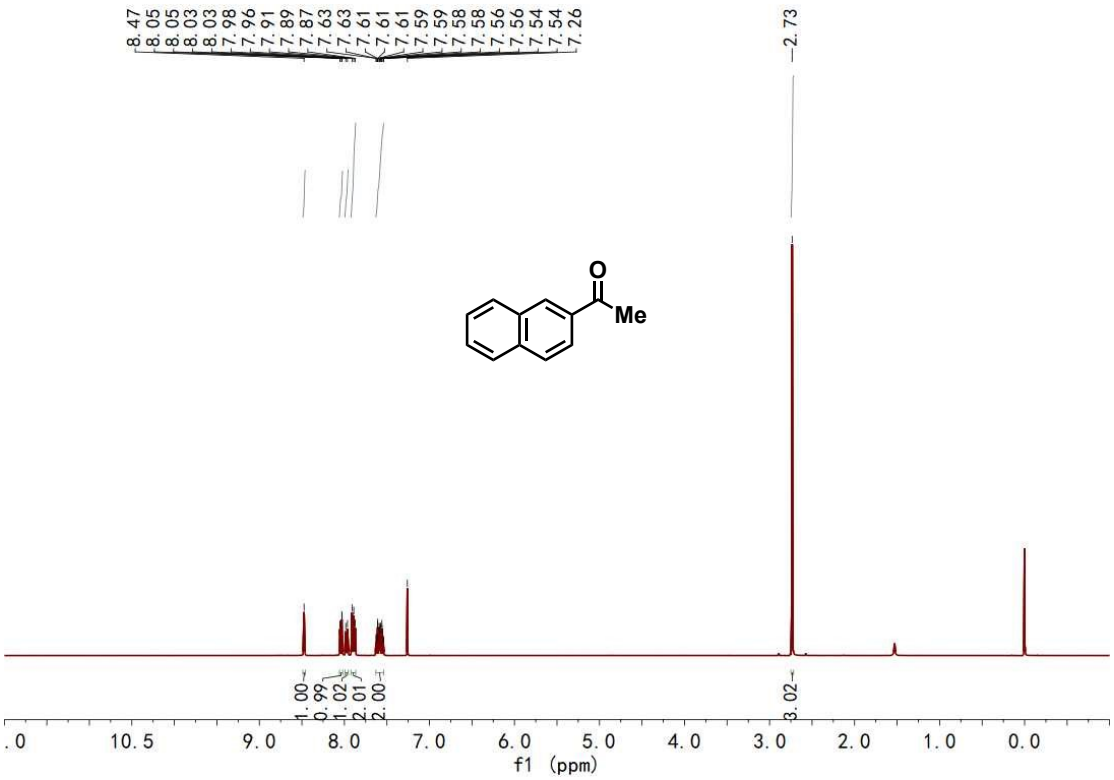
(4-Fluorophenyl)ethan-1-one (6l): $^{13}C\{^{1}H\}$ NMR (101 MHz, $CDCl_3$)



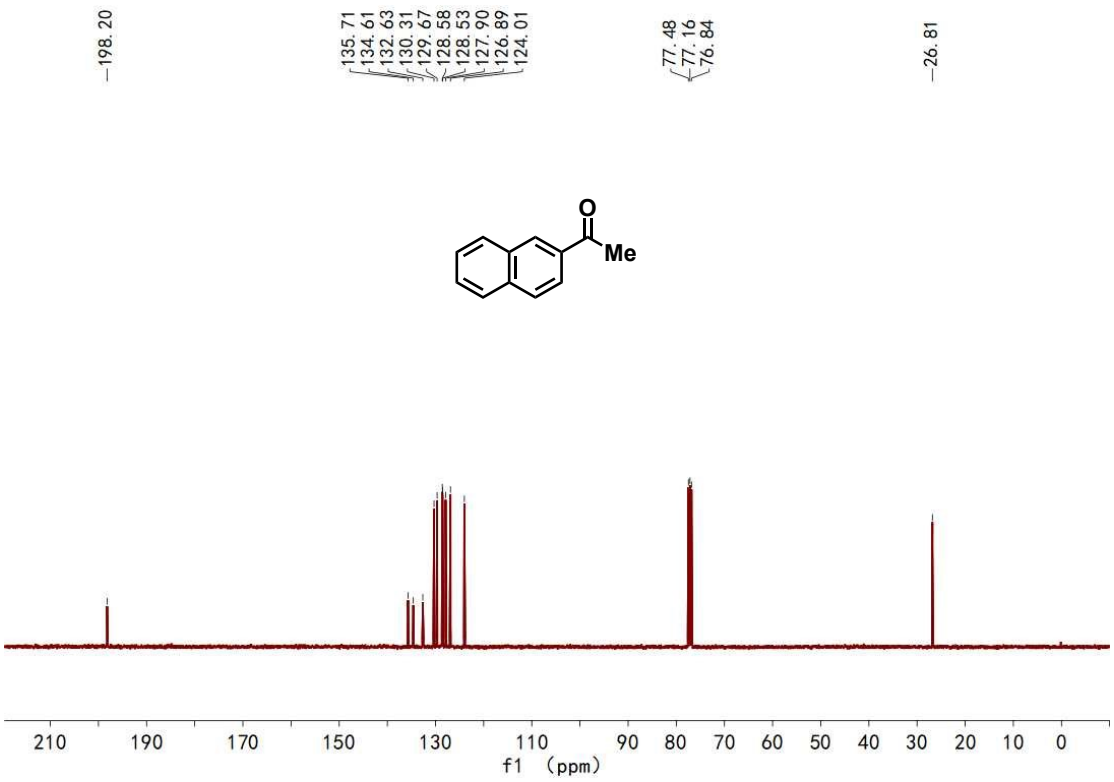
1-(4-Fluorophenyl)ethan-1-one (6l): ^{19}F NMR (376 MHz, $CDCl_3$)



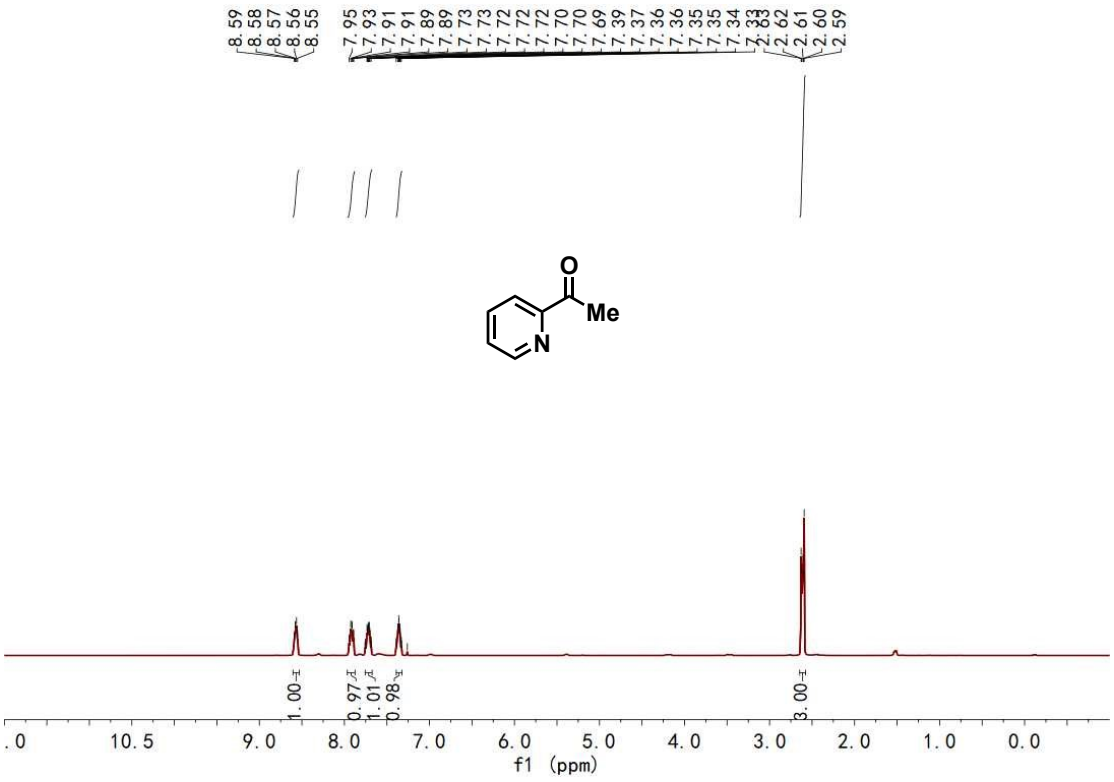
1-(Naphthalen-2-yl)ethan-1-one (6m): ^{1}H NMR (400 MHz, $CDCl_3$)



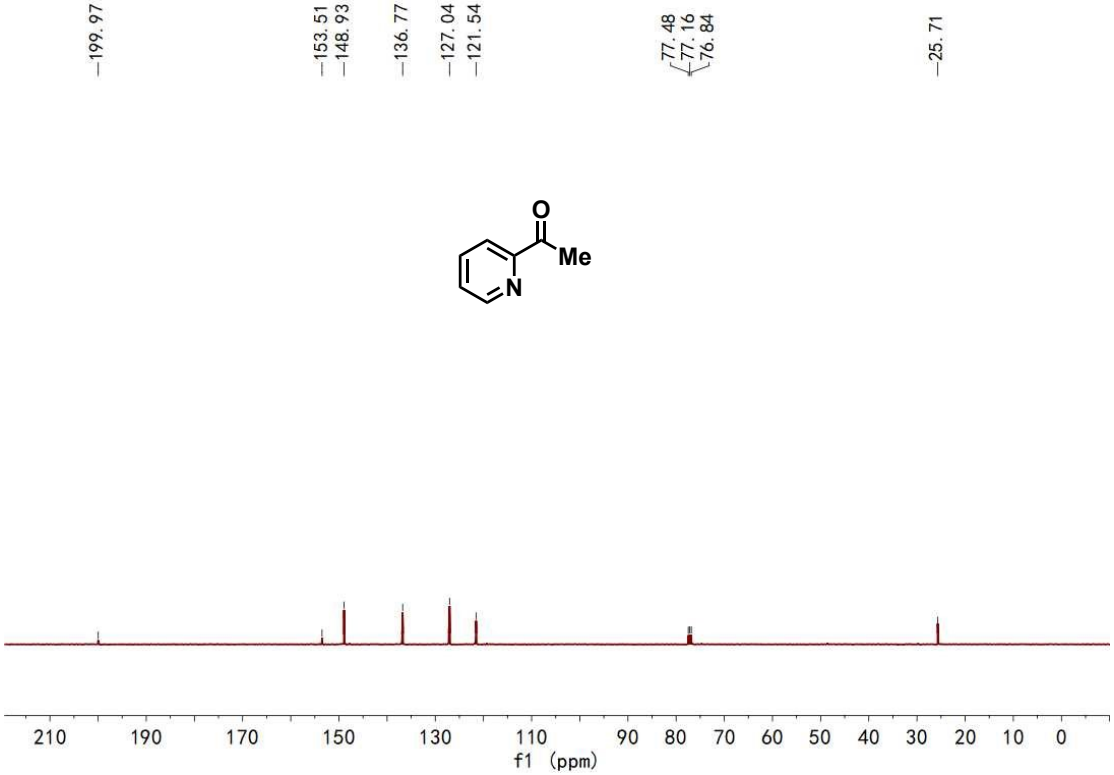
1-(Naphthalen-2-yl)ethan-1-one (6m): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



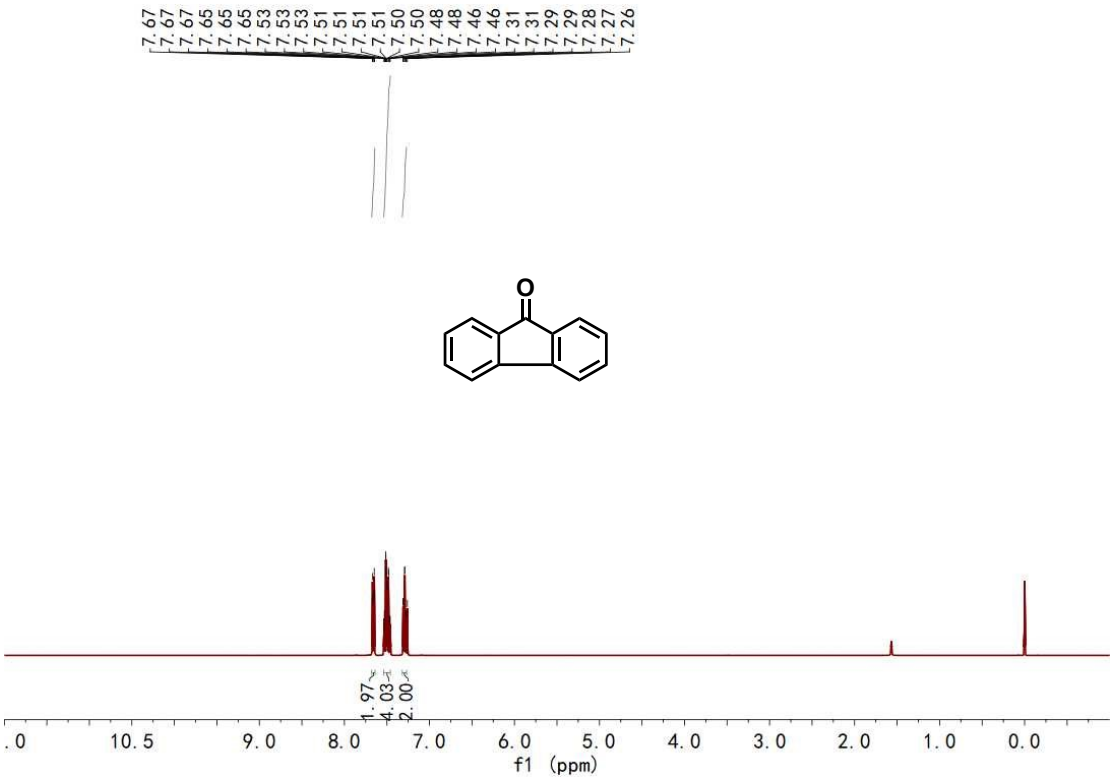
1-(Pyridin-2-yl)ethan-1-one (6n): ^{1}H NMR (400 MHz, $CDCl_3$)



1-(Pyridin-2-yl)ethan-1-one (6n): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)



9*H*-Fluoren-9-one (6o): ^{1}H NMR (400 MHz, $CDCl_3$)



9*H*-Fluoren-9-one (6o): ^{13}C{^{1}H} NMR (101 MHz, $CDCl_3$)