Supporting Information

The Merger of Electro-reduction and Hydrogen Bonding Activation for a Radical Smiles Rearrangement

Liyuan Lan, Kun Xu,[a,*] Chengchu Zeng [a]

[a.] *College of Chemistry and Life Science, Beijing University of Technology, Beijing 100124, China.*

kunxu@bjut.edu.cn

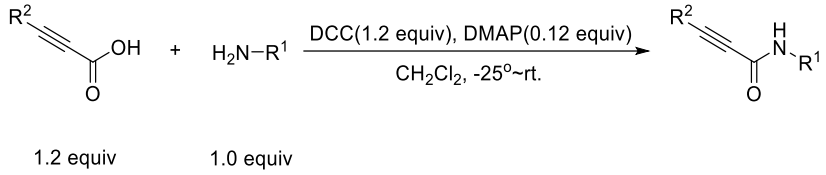
Table of Contents

1. General information

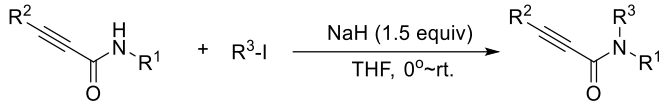
All air and moisture sensitive reactions were carried out under nitrogen atmosphere. Unless otherwise special indicated, all the reagents were purchased from commercial supplies. All the solvents were used without any purification. Flash column chromatography was performed using silica gel (200-300 mesh). NMR spectra were obtained on a Bruker AV300 or 400 MHz NMR or 600 MHz NMR in $CDCl_3$ using TMS as internal standard. Chemical shifts (δ) are given in ppm and coupling constants (*J*) in Hz. High resolution mass spectra (HRMS) analysis was recorded on Thermo Scientific Q Exactive hybrid quadrupole-Orbitrap mass spectrometer (APCI source). Cyclic voltammograms were obtained on a CHI 600E potentiostat.

2. General procedure for the synthesis of starting materials

The starting materials (N-phenylpropiolamides) were synthesized via a two-step procedure according to previous reports.[1-3]



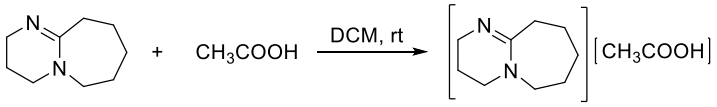
To a flask (100 mL) was added alkynoic acid (6 mmol, 1.2 equiv), 4-dimethylaminopyridine (0.6 mmol, 0.12 equiv), and DCM (30 mL). Then, a solution of *N*, *N′*-dicyclohexylcarbodiimide (6 mmol, 1.2 equiv) in DCM (10 mL) was added slowly at 0 °C. The resulting mixture was stirred at room temperature for 0.5 h, and then amine (5 mmol, 1.0 equiv) was added. The resulting mixture was stirred at room temperature for 12 h, during which time the reaction mixture became cloudy and a white solid precipitated from the solution. The white solid was removed via vacuum filtration and the filtrate was removed under reduced pressure. The residue was purified by flash column chromatography to give the corresponding alkynamide.



1.0 equiv 1.2 equiv

To an oven-dried flask (100 mL) was added the corresponding alkynamide (5 mmol, 1.0 equiv), and THF (20 mL). The reaction mixture was cooled to 0 °C and sodium hydride (6 mmol, 1.5 equiv) was added slowly under N_2. The resulting mixture was stirred at 0 °C for 0.5 h. Then, alkyl iodine (6 mmol, 1.2 equiv) in THF (10 mL) was added slowly at 0 °C. The reaction was warmed to 60 °C and stirred for 10 h. After the completion of the reaction, the reaction was quenched by water. The aqueous solution was extracted with EtOAc (3×15 mL), and the combined extracts were washed with brine (3 × 10 mL), dried with anhydrous Na_2SO_4. The solvent was removed under reduced pressure by rotary evaporation. Then, the corresponding amide was purified by flash column chromatography on silica gel.

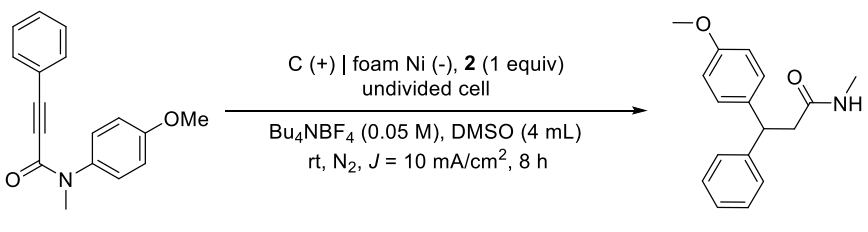
The synthesis of ionic liquid **2** was performed according to the following procedure:



2

To an oven-dried flask (50 mL) was added DBU (5 mmol, 1.0 equiv) and DCM (20 mL). The reaction mixture was cooled to 0 °C. Then, CH_3COOH (5 mmol, 1.0 equiv) was added dropwise. The reaction was stirred at rt for 4 h. After the reaction, the solvent was removed under reduced pressure by rotary evaporation. The corresponding ionic liquid **2** was used without further purification.

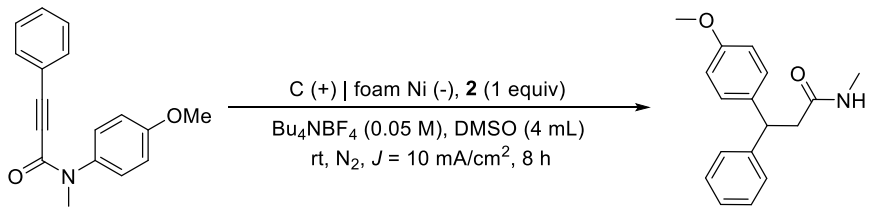
3. General procedure for the synthesis of diphenylpropanamides



1a **3**

To an oven-dried undivided cell (10 mL) equipped with a graphite anode (10× 10× 2 mm) and a foamed nickel cathode (10× 10× 2 mm), **1a** (0.3 mmol, 79.5 mg), **2** (0.3 mmol, 63.6 mg), *n*-Bu_4NBF_4 (0.2 mmol, 65.8 mg), and dry DMSO (4 mL) were added sequentially. The resulting mixture was electrolyzed at a constant current of 10 mA at room temperature under nitrogen atmosphere for 8 h. After the reaction, water (30 mL) was added, and the solution was extracted with EtOAc (3×15 mL). The combined organic layers were washed with brine (3×10 mL), dried over Na_2SO_4 and concentrated in vacuo. Then, the crude mixture was purified by flash column chromatography on silica gel (eluent: petroleum /ethyl acetate = 1/1 to 3:1) to give product **3** as a white solid (49.4 mg, 61% yield).

4. The optimization of reaction conditions



1a **3**

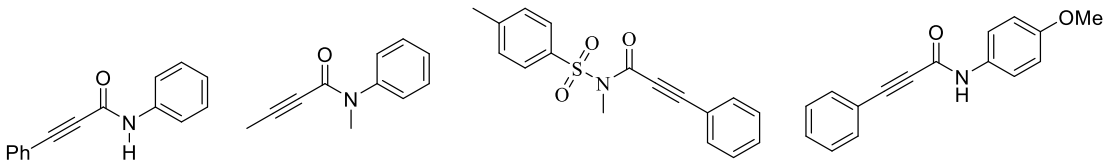
Table S1. The effect of the concentration of **2** on this reaction

Entry	**2** (equiv)	Yield (**3**, %)
1	0.5	28
2	2	56
3	1	61

Table S2. The effect of hydrogen donors on this reaction

Entry	Additive instead of **2**	Yield (**3**, %)
1	HFIP	8
2	HCl	trace
3	HOAc	9

5. The failed substrates



6. General procedure for cyclic voltammetry (CV)

Cyclic voltammetry experiments were performed in a three-electrode cell at room temperature. The working electrode was a steady glassy carbon electrode, the counter electrode was a platinum wire. The reference electrode was an $Ag/AgNO_3$ (0.1 M in CH_3CN) electrode. The scan rete is 0.1 V/s.

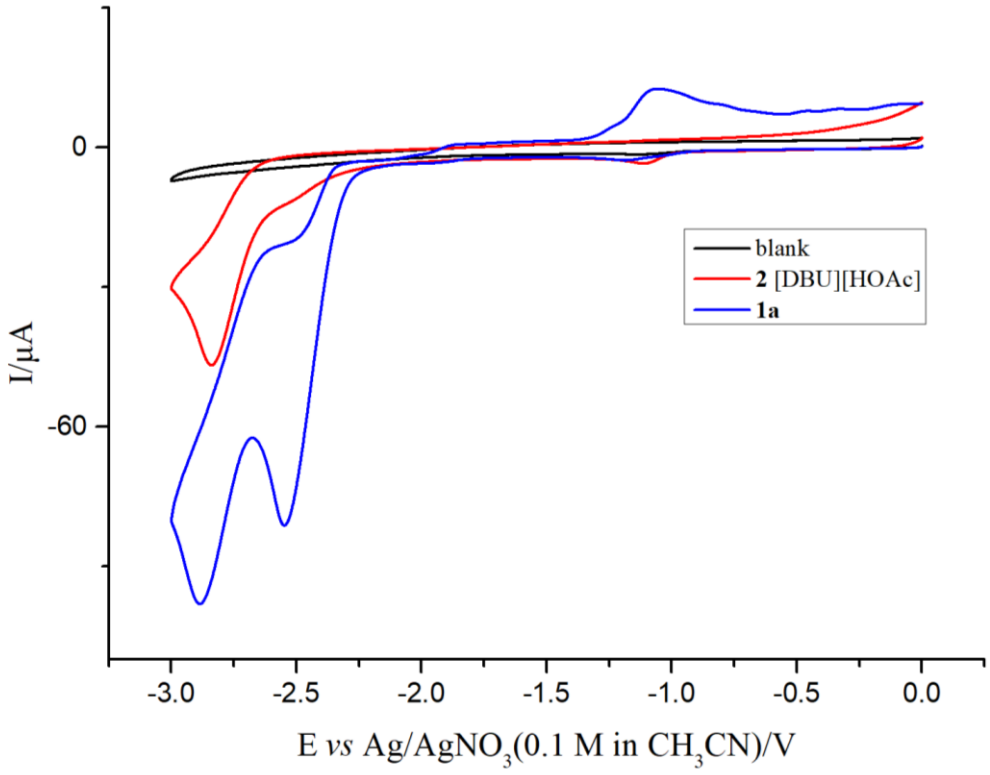


Figure S1. Cyclic voltammograms of related compound in 0.05 M *n*-Bu_4NBF_4/DMSO: background (black line), substrate **2** (3 mM, red line), substrate **1a** (3 mM, navy blue line).

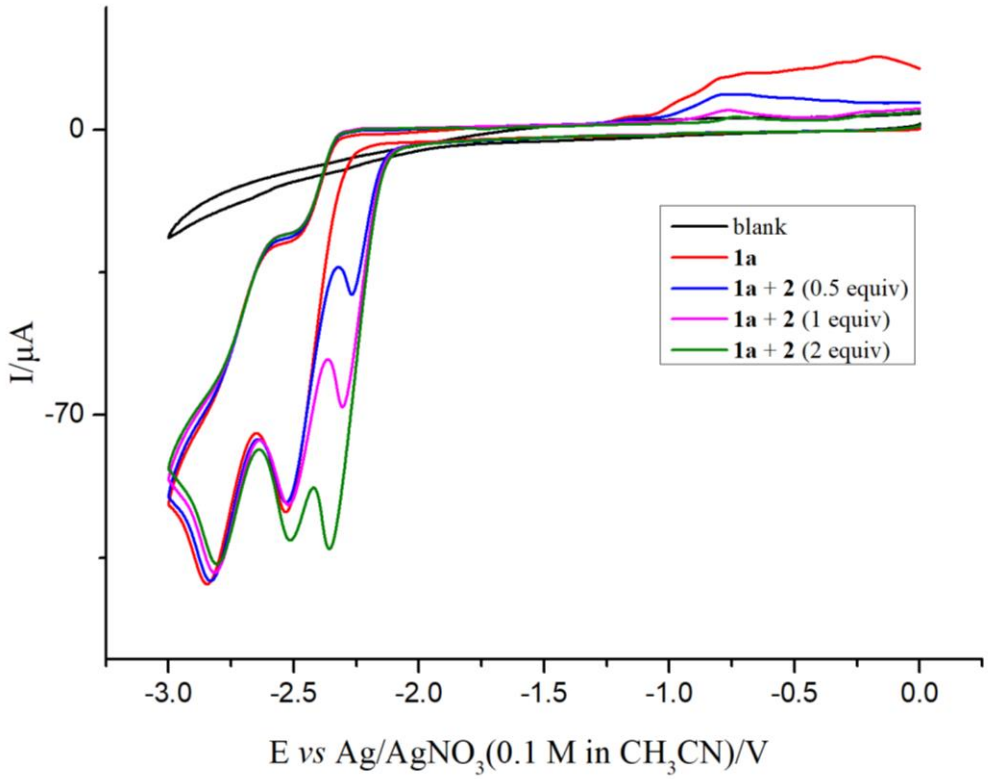


Figure S2. Cyclic voltammograms of related compound in 0.05 M *n*-Bu_4NBF_4/DMSO: background (black line), substrate **1a** (3 mM, red line), substrate **1a** / **2** = 2/1 (3 mM/1.5 mM, navy blue line), substrate **1a**/ **2** = 1/1 (3 mM/3 mM, pink line), substrate **1a**/ **2** = 1/2 (3 mM/6 mM, green line).

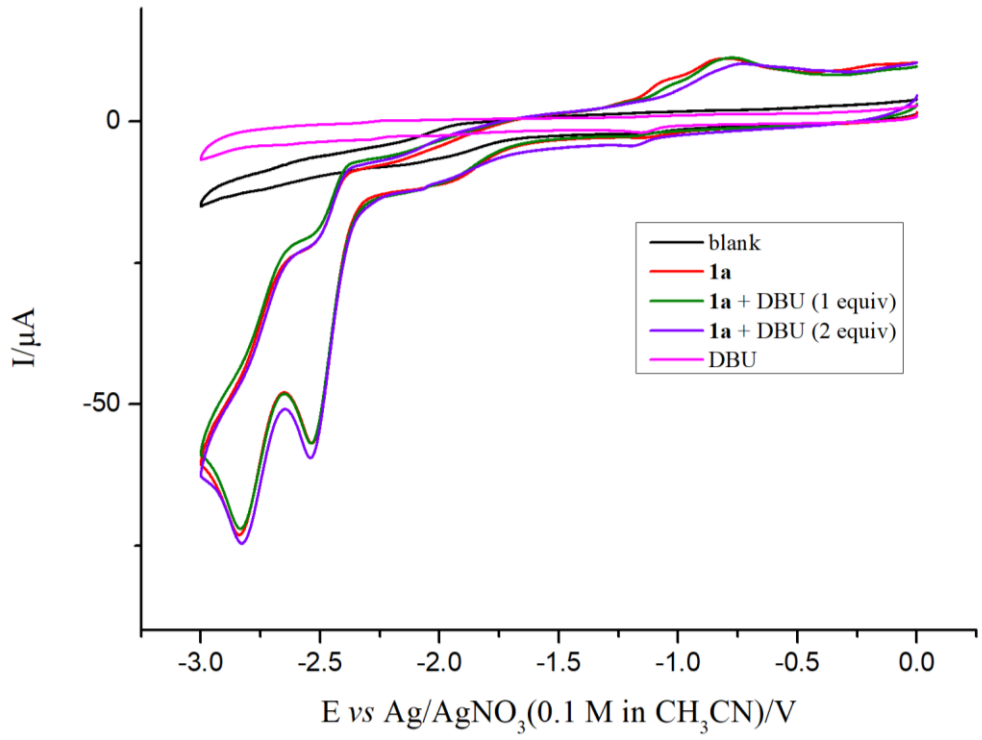


Figure S3. Cyclic voltammograms of related compound in 0.05 M *n*-Bu_4NBF_4/DMSO: background (black line), substrate **1a** (3 mM, red line), substrate **1a**/DBU = 1/1 (3 mM/3 mM, green line), substrate **1a**/DBU = 1/2 (3 mM/6 mM, purple line), DBU (3 mM, pink line).

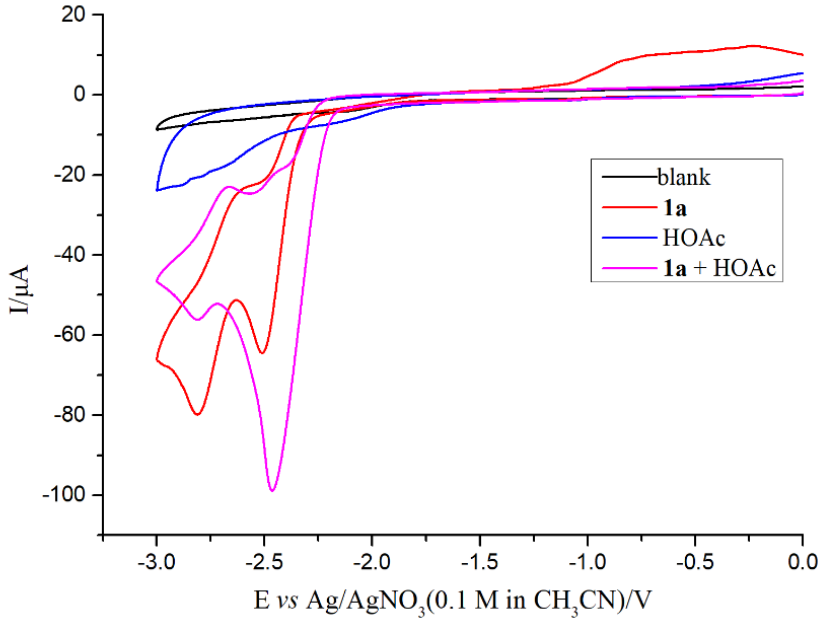


Figure S4. Cyclic voltammograms of related compound in 0.05 M *n*-Bu_4NBF_4/DMSO: background (black line), substrate **1a** (3 mM, red line), HOAc (3 mM, navy blue line), substrate **1a**/HOAc = 1/1 (3 mM/3 mM, pink line).

7. NMR analysis for determining the hydrogen bonding

7.1 ^{1}H NMR analysis

Step 1: To an NMR tube was added **34** (0.05 mmol). Then, d_6-DMSO (0.6 mL) was added into the NMR tube. The ^{1}H NMR spectrum of the resulting sample **(Sample 1)** is shown as below.

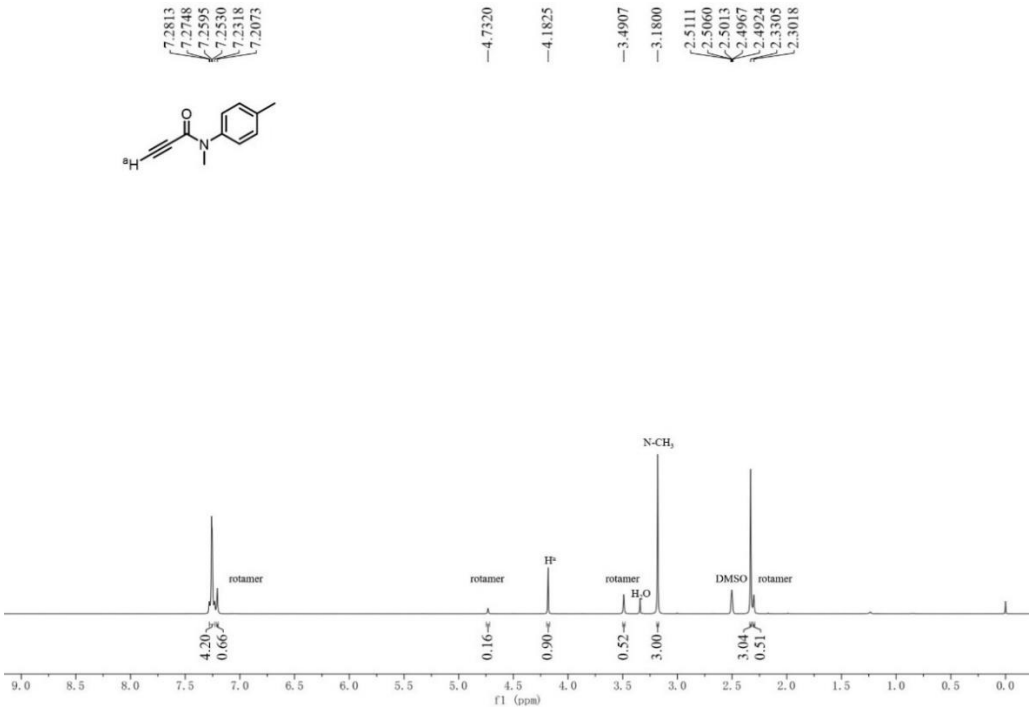


Figure S5. ^{1}H NMR of **34** in d_6-DMSO

Step 2: To an NMR tube was added **2** (0.05 mmol). Then, d_6-DMSO (0.6 mL) was added. The ^{1}H NMR spectrum of the resulting sample **(Sample 2)** is shown as below.

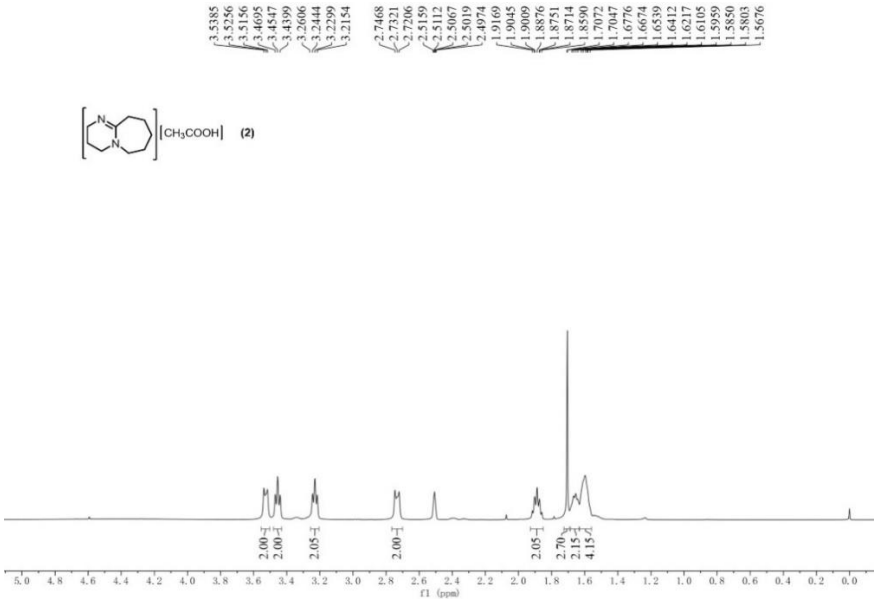


Figure S6. ^{1}H NMR of **2** in d_6-DMSO

Step 3: To the solution of **34** in d_6-DMSO **(Sample 1)** was added **2** (0.05 mmol, 1 equiv). The ^{1}H NMR spectrum of the resulting sample **(Sample 3)** was recorded.

Step 4: To the sample as described in Step 3, an additional portion of **2** (0.05 mmol, 1 equiv) was added. For this sample **(Sample 4)**, the molar ratio between **32** and **2** is 1:2. Then, the ^{1}H NMR spectrum was recorded.

Upon addition of **2** (1 equiv) into the mixture of **34**/ d^6-DMSO, the chemical shift value of the alkyne proton shifted to down-field (4.23 ppm). This value shifted to down-filed again (4.26 ppm) when another portion of **2** was added.

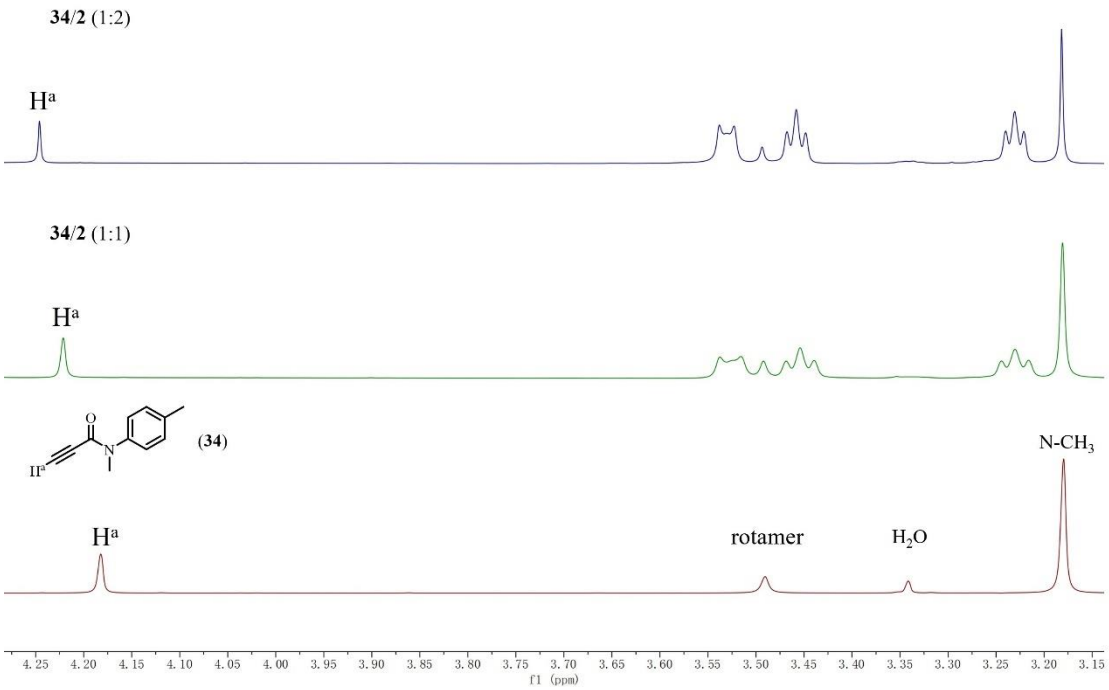


Figure S7. ^{1}H NMR of the mixture of **34**/**2** in d_6-DMSO

7.2 ^{13}C NMR analysis

Step 1: To an NMR tube was added **1a** (0.05 mmol). Then, $CDCl_3$ (0.6 mL) was added into the NMR tube. The ^{13}C NMR spectrum of the resulting sample **(Sample 1)** is shown as below. ***The chemical shift of the amide carbon is 154.57 ppm.***

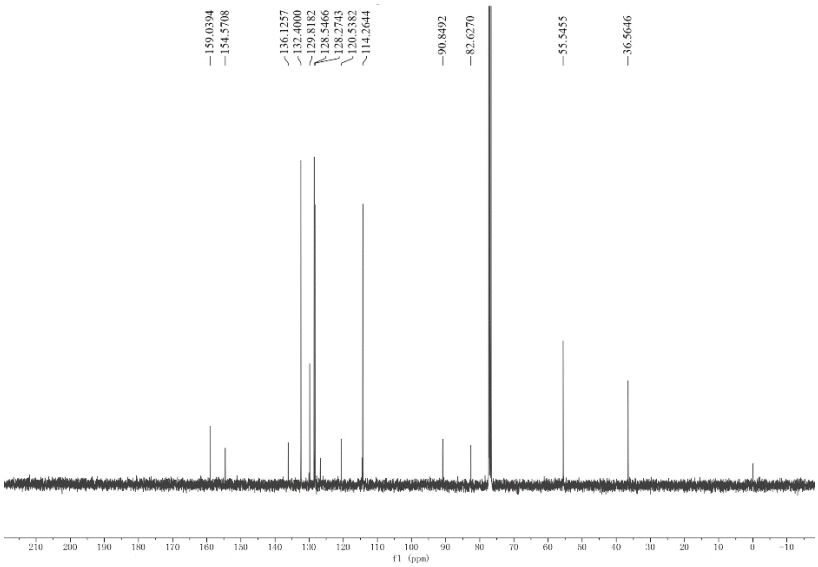


Figure S8. ^{13}C NMR of the substrate **1a** in $CDCl_3$

Step 2: To the solution of **1a** in $CDCl_3$ **(Sample 1)** was added **2** (0.05 mmol, 1 equiv). The ^{13}C NMR spectrum of the resulting sample **(Sample 2)** was recorded. However, upon addition of **2** (1 equiv) into the mixture of **1a**/ $CDCl_3$, the chemical shift value of the alkyne and amide carbons shifted slightly (about 0.1 ppm).

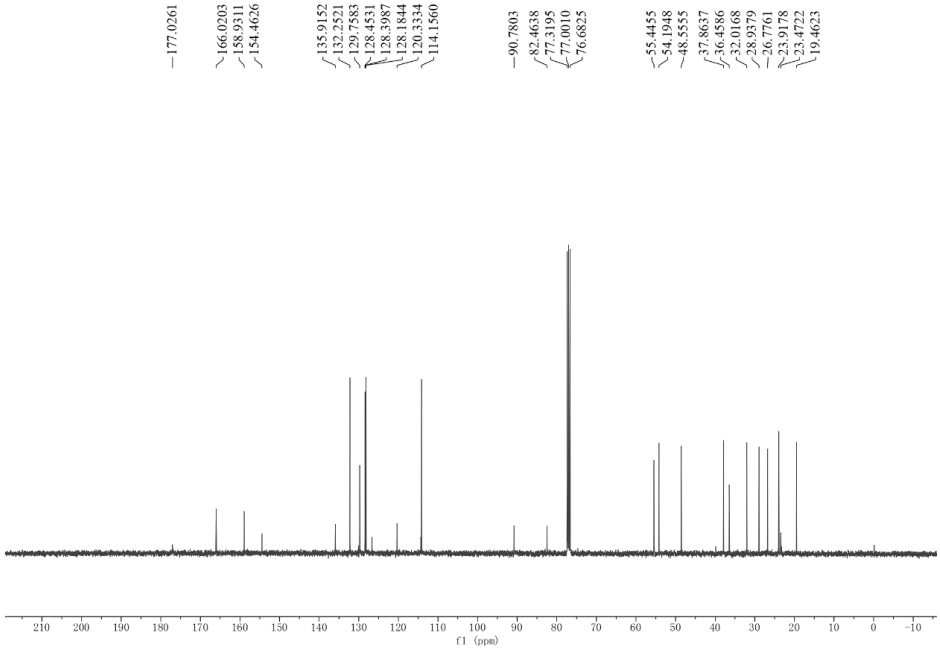
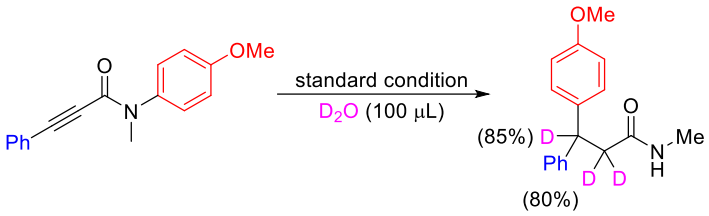


Figure S9. ^{13}C NMR of the mixture of **1a**/**2** in $CDCl_3$

8. Deuterium experiments



1a **3-d^3**, 23% yield

To an oven-dried undivided cell (10 mL) was added **1a** (0.3 mmol, 79.5 mg), *n*-Bu_4NBF_4 (0.2 mmol, 65.8 mg), and **2** (0.3 mmol, 63.6 mg). Then, the electrolytic cell was equipped with a graphite anode (10× 10× 2 mm) and a foamed nickel cathode (10× 10× 2 mm). The cell was evacuated and backfilled with argon for 3 times. D_2O (5.5 mmol, 100 μL) and anhydrous DMSO (4 mL) were added by syringe. The mixture was electrolyzed at a constant current of 10 mA at room temperature for 8 h under nitrogen atmosphere. When the reaction was completed, water (30 mL) was added, the solution was extract by EtOAc (3×15 mL), and the combined organic layers were washed with brine (3×10 mL), dried over Na_2SO_4 and concentrated in vacuo. Then, the pure product **3-d^3** was obtained by flash column chromatography on silica gel (eluent: petroleum /ethyl acetate = 1/1) as white solid (18.7 mg, 23% yield). The ^{1}H NMR spectrum of **3-d^3** is shown as below, and the deuterium ratios for the two benzylic positions were determined to be 85% and 80%, respectively.

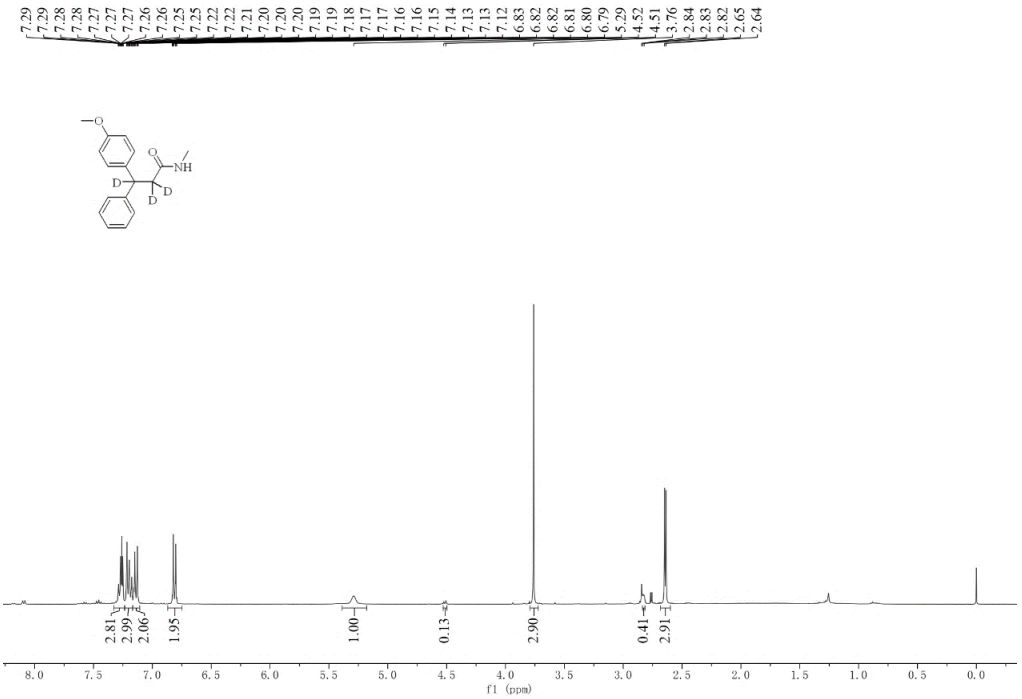
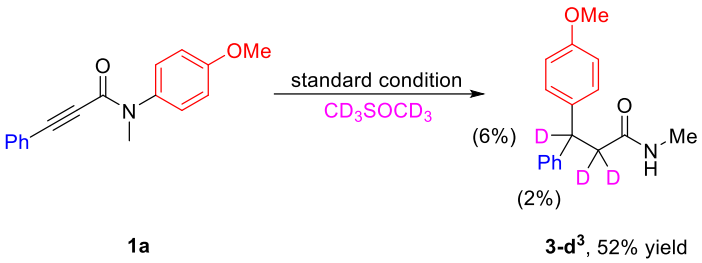


Figure S10. ^{1}H NMR of **3-d^{3}** in $CDCl_3$



1a **3-d^{3}**, 52% yield

To an oven-dried undivided cell (10 mL) was added **1a** (0.3 mmol, 79.5 mg), *n*-Bu_4NBF_4 (0.2 mmol, 65.8 mg), and **2** (0.3 mmol, 63.6 mg). Then, the electrolytic cell was equipped with a graphite anode (10× 10× 2 mm) and a foamed nickel cathode (10× 10× 2 mm). The cell was evacuated and backfilled with argon for 3 times. Subsequently, CD_3SOCD_3 (4 mL) was added by syringe. The mixture was electrolyzed at a constant current of 10 mA at room temperature for 8 h under nitrogen atmosphere. When the reaction was completed, water (30 mL) was added, the solution was extract by EtOAc (3×15 mL), and the combined organic layers were washed with brine (3×10 mL), dried over Na_2SO_4 and concentrated in vacuo. Then, the pure product **3-d^{3}** was obtained by flash column chromatography on silica gel (eluent: petroleum /ethyl acetate = 1/1) as white solid (42.4 mg, 52% yield). The deuterium ratios for the two benzylic positions

were determined to be 6% and 2%, respectively.

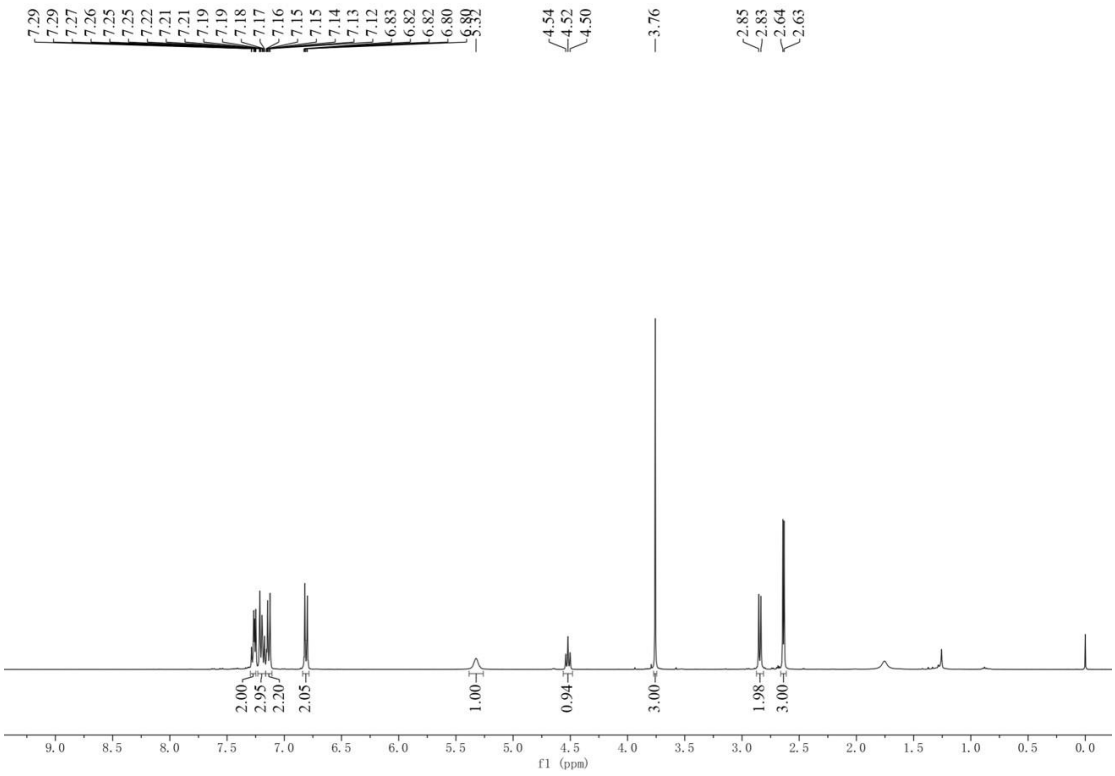
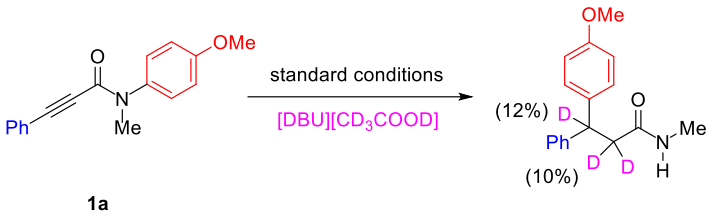


Figure S11. ^{1}H NMR analysis to determine the deuterium ratio



1a

3-d^{3}, 50% yield

To an oven-dried undivided cell (10 mL) was added **1a** (0.3 mmol, 79.5 mg), *n*-Bu_4NBF_4 (0.2 mmol, 64.8 mg), and [DBU][CD_3COOD] (0.3 mmol, 64.2 mg). Then, the electrolytic cell was equipped with a graphite anode (10× 10× 2 mm) and a foamed nickel cathode (10× 10× 2 mm). The cell was evacuated and backfilled with argon for 3 times. Subsequently, DMSO (4 mL) was added by syringe. The mixture was electrolyzed at a constant current of 10 mA at room temperature for 8 h under nitrogen atmosphere. When the reaction was completed, water (30 mL) was added, the solution was extract by EtOAc (3×15 mL), and the combined organic layers were washed with brine (3×10 mL), dried over Na_2SO_4 and concentrated in vacuo. Then, the pure product

3-d^3 was obtained by flash column chromatography on silica gel (eluent: petroleum /ethyl acetate = 1/1) as white solid (40.8 mg, 50% yield). The deuterium ratios for the two benzylic positions were determined to be 12% and 10%, respectively.

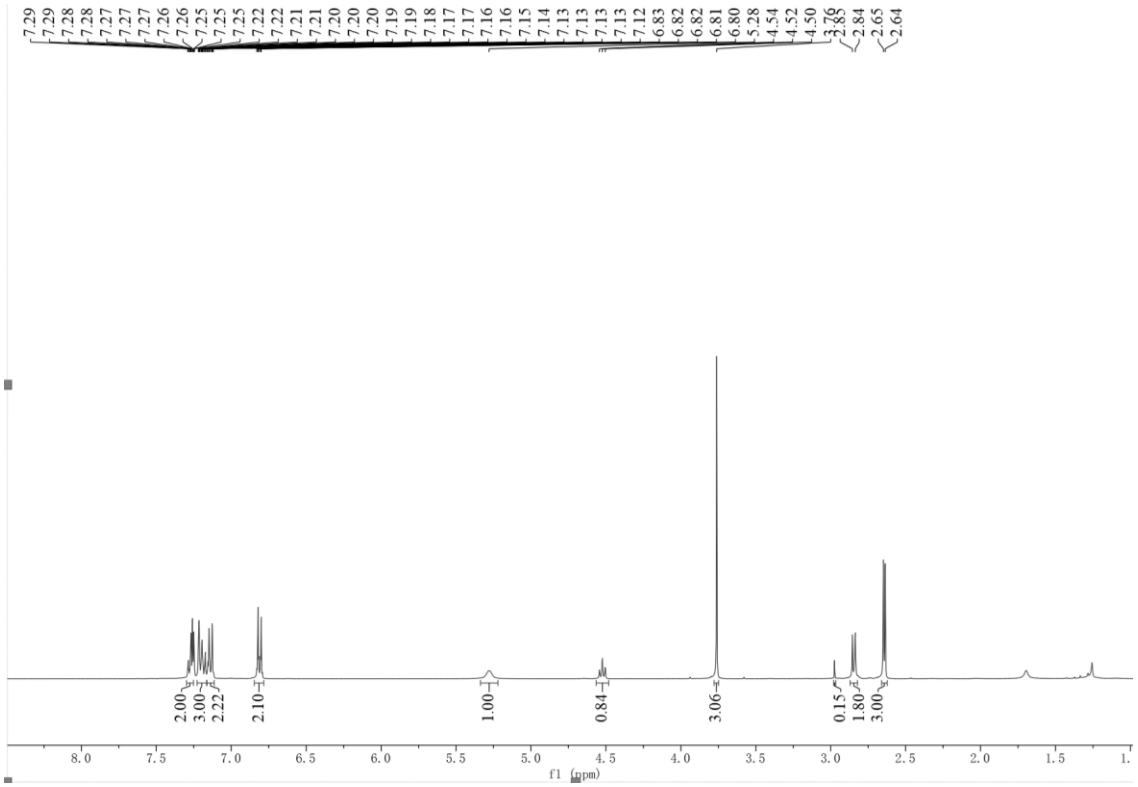
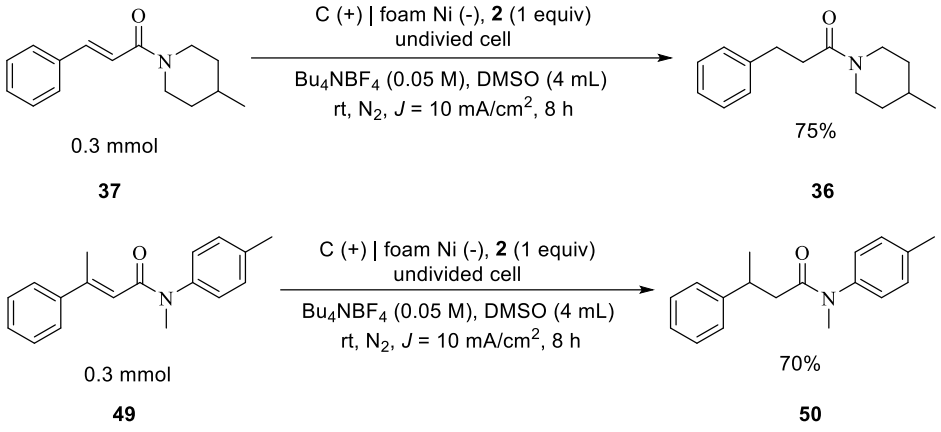


Figure S12. ^{1}H NMR analysis to determine the deuterium ratio

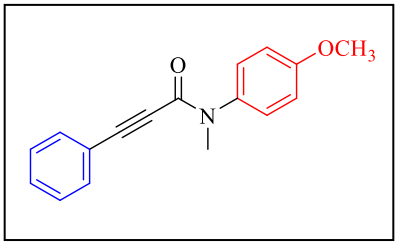
9. The application of this system for alkene hydrogenation

This electrochemical dual activation mode could be applied to the alkene hydrogenation including disubstituted alkene (**37**) and trisubstituted alkene (**49**). Under the standard conditions, the hydrogenated products **36** and **50** were obtained in 75% and 70% yields, respectively.



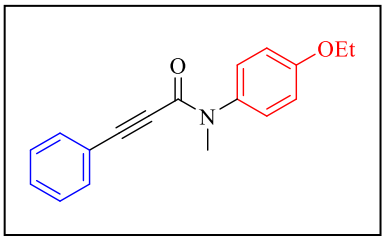
10. Characterization data of starting materials

N-(4-methoxyphenyl)-N-methyl-3-phenylpropiolamide [4]



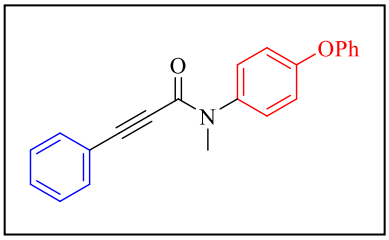
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.28-7.22 (m, 5H), 7.19-7.16 (m, 2H), 6.98-6.91 (m, 2H), 3.85 (s, 3H), 3.35 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.0, 154.6, 136.1, 132.4, 129.8, 128.5, 128.3, 120.5, 114.3, 90.8, 82.6, 55.5, 36.6. Analytical data are identical to those previously reported.

N-(4-ethoxyphenyl)-N-methyl-3-phenylpropiolamide



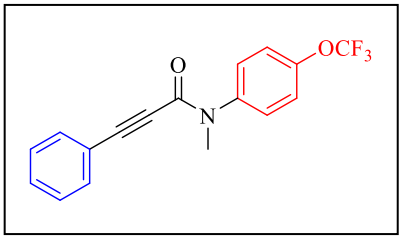
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.26-7.16 (m, 7H), 6.97 -6.89 (m, 2H), 4.07 (q, J = 7.0 Hz, 2H), 3.35 (s, 3H), 1.44 (t, J = 7.0 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 158.4, 154.6, 135.9, 132.4, 129.8, 128.5, 128.7, 120.6, 114.8, 90.8, 82.7, 63.8, 36.6, 14.7.

N-methyl-N-(4-phenoxyphenyl)-3-phenylpropiolamide



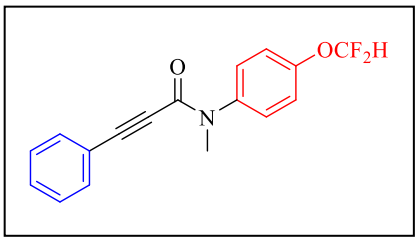
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.38-7.19 (m, 9H), 7.16-7.10 (m, 1H), 7.09-6.99 (m, 4H), 3.38 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 156.8, 156.8, 154.4, 138.3, 132.3, 129.9, 129.8, 128.8, 128.3, 123.7, 120.4, 119.1, 118.9, 90.9, 82.6, 36.4.

N-methyl-3-phenyl-N-(4-(trifluoromethoxy)phenyl)propiolamide



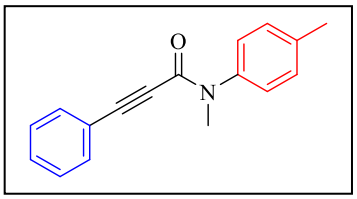
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.72 (d, J = 8.1 Hz, 2H), 7.52 (d, J = 8.2 Hz, 2H), 7.38-7.28 (m, 2H), 7.26-7.13 (m, 3H), 3.42 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 153.8, 146.3, 132.3, 130.2, 128.4, 127.6, 126.2, 126.2, 126.2, 119.9, 91.4, 82.1, 36.1.

N-(4-(difluoromethoxy)phenyl)-N-methyl-3-phenylpropiolamide



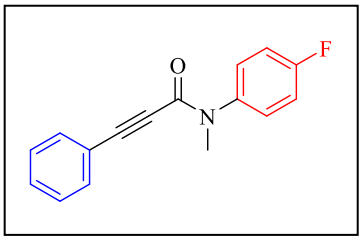
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.4-7.31 (m, 3H), 7.28-7.14 (m, 6H), 6.57 (t, J = 73.3 Hz, 1H), 3.38 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 154.1, 150.0, 140.4, 132.3, 130.0, 128.8, 128.3, 120.4, 120.1, 118.9, 115.5 (t, J = 259.9 Hz), 112.0, 91.2, 82.7, 36.2.

N-methyl-3-phenyl-N-(p-tolyl)propiolamide [4]



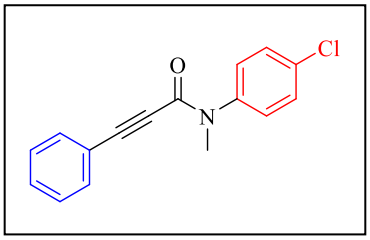
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.26-7.21 (m, 7H), 7.18-7.14 (m, 2H), 3.36 (s, 3H), 2.41 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 154.4, 140.6, 137.8, 132.3, 129.8, 129.7, 128.2, 127.1, 120.6, 90.7, 82.7, 36.4, 21.1. Analytical data are identical to those previously reported.

N-(4-fluorophenyl)-N-methyl-3-phenylpropiolamide [4]



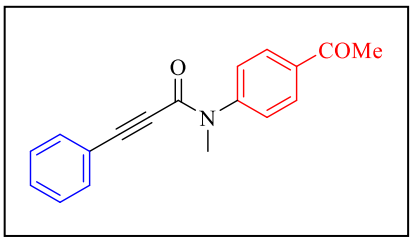
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.37-7.30 (m, 3H), 7.29-7.23 (m, 2H), 7.18-7.10 (m, 4H), 3.36 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 163.5, 154.3, 139.2, 132.3, 130.0, 129.3, 129.2, 128.3, 120.2, 116.2, 115.9, 91.2, 82.3, 36.4. Analytical data are identical to those previously reported.

N-(4-chlorophenyl)-N-methyl-3-phenylpropiolamide [4]



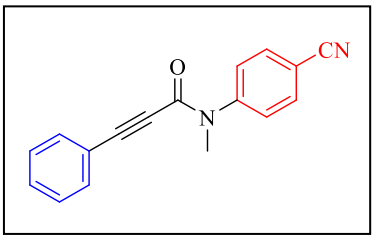
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.43-7.35 (m, 3H), 7.33-7.24 (m, 5H), 7.20-7.17 (m, 2H), 3.37 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 154.0, 141.7, 133.6, 132.3, 130.1, 129.3, 128.7, 128.4, 120.2, 91.2, 82.3, 36.3. Analytical data are identical to those previously reported.

N-(4-acetylphenyl)-N-methyl-3-phenylpropiolamide



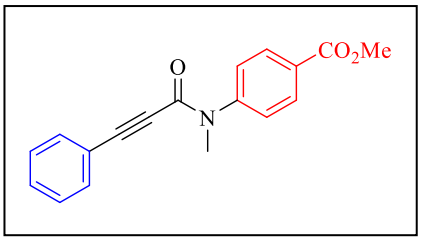
^{1}H NMR (300 MHz, $CDCl_3$) δ 8.04 (d, J = 8.2 Hz, 2H), 7.51-7.48 (m, 2H), 7.36-7.20 (m, 5H), 3.43 (s, 3H), 2.64 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 1196.8, 153.7, 147.1, 135.9, 132.3, 130.1, 129.1, 128.4, 126.9, 120.0, 91.1, 82.2, 36.1, 26.6.

N-(4-cyanophenyl)-N-methyl-3-phenylpropiolamide



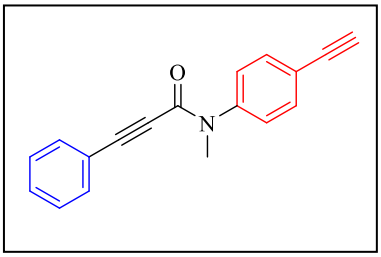
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.73 (d, J = 8.1 Hz, 2H), 7.52 (d, J = 8.5 Hz, 2H), 7.43-7.20 (m, 5H), 3.42 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 153.4, 146.8, 132.8, 132.2, 130.3, 128.4, 127.6, 119.6, 118.0, 111.1, 91.4, 81.8, 35.9.

methyl 4-(N-methyl-3-phenylpropiolamido)benzoate



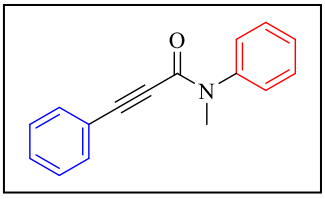
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.10 (d, J = 8.1 Hz, 2H), 7.46-7.44 (m, 2H), 7.35-7.16 (m, 5H), 3.93 (s, 3H), 3.40 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.2, 153.8, 147.1, 132.3, 130.4, 130.1, 129.2, 128.4, 126.9, 120.1, 91.1, 82.2, 52.2, 36.1.

N-(4-ethynylphenyl)-N-methyl-3-phenylpropiolamide



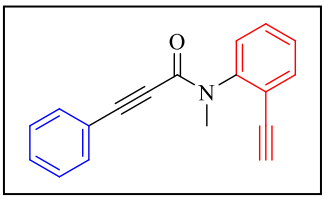
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.56 (d, J = 8.1 Hz, 2H), 7.37-7.29 (m, 4H), 7.24-7.18 (m, 3H), 3.38 (s, 3H), 3.15 (s, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 153.9, 143.3, 132.8, 132.3, 130.0, 128.3, 127.1, 121.6, 120.1, 91.0, 82.6, 82.3, 82.3, 78.3, 36.1.

N-methyl-N,3-diphenylpropiolamide [4]



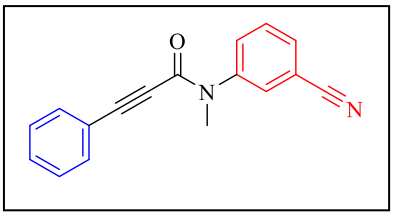
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.48-7.33 (m, 6H), 7.25-7.20 (m, 2H), 7.15-7.12 (m, 2H), 3.39 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 154.3, 143.2, 132.4, 129.9, 129.1, 128.2, 127.9, 127.3, 120.4, 90.8, 82.5, 36.3.

N-(2-ethynylphenyl)-N-methyl-3-phenylpropiolamide



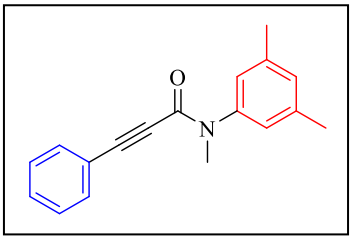
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.64-7.61 (m, 1H), 7.48-7.33 (m, 4H), 7.24-7.19 (m, 2H), 7.12-7.08 (m, 2H), 3.38 (s, 3H), 3.29 (s, 1H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 154.4, 145.1, 133.6, 132.4, 129.8, 129.7, 129.0, 128.3, 128.2, 122.1, 120.4, 90.3, 82.7, 82.4, 79.3, 35.4.

N-(3-cyanophenyl)-N-methyl-3-phenylpropiolamide



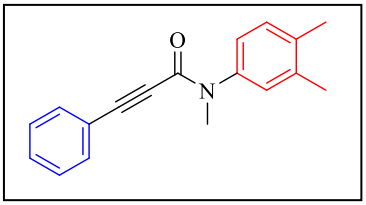
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.71-7.63 (m, 4H), 7.38-7.28 (m, 3H), 7.21-7.18 (m, 2H), 3.41 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 153.6, 143.9, 132.2, 131.8, 131.2, 130.7, 130.3, 130.1, 128.4, 119.6, 117.6, 113.2, 91.7, 81.8, 36.0.

N-(3,5-dimethylphenyl)-N-methyl-3-phenylpropiolamide [5]



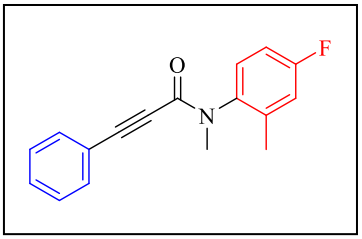
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.33-7.30 (m, 1H), 7.25-7.24 (m, 1H), 7.22-7.06 (m, 6H), 3.36 (s, 3H), 2.31-2.29 (m, 6H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 154.3, 140.8, 137.4, 136.3, 132.3, 130.0, 129.7, 128.2, 128.0, 124.4, 120.6, 90.5, 82.7, 36.4, 19.7, 19.4. Analytical data are identical to those previously reported.

N-(3,4-dimethylphenyl)-N-methyl-3-phenylpropiolamide



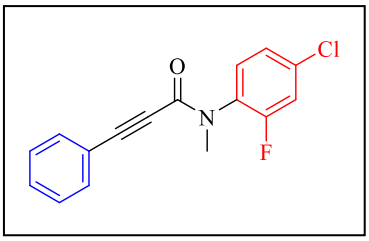
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.33-7.29 (m, 1H), 7.25-7.24 (m, 1H),7.22-7.06 (m, 6H), 3.36 (s, 3H), 2.31-2.29 (m, 6H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 154.3, 137.4, 136.3, 132.3, 130.1, 129.7, 128.2, 128.1, 124.5, 120.7, 90.5, 82.8, 36.4, 19.8, 19.4 .

N-(4-fluoro-2-methylphenyl)-N-methyl-3-phenylpropiolamide



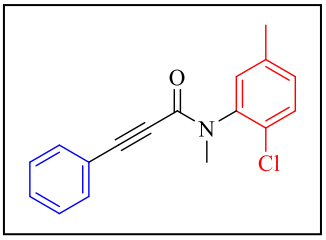
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.36-7.30 (m, 1H), 7.26-7.20 (m, 3H), 7.13-7.09 (m, 2H), 7.05-6.94 (m, 2H), 3.28 (s, 3H), 2.30 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 163.7, 160.4, 154.7, 138.9, 138.8, 138.0, 137.9, 132.4, 130.3, 130.1, 130.0, 128.3, 120.1, 117.6, 117.3, 113.9, 113.6, 90.2, 82.0, 35.4, 17.6, 17.6.

N-(4-chloro-2-fluorophenyl)-N-methyl-3-phenylpropiolamide



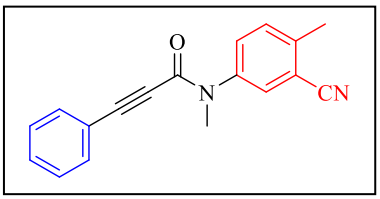
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.39-7.32 (m, 2H), 7.30-7.27(m, 2H), 7.25-7.21 (m, 2H), 7.20-7.16 (m, 2H), 3.32 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 159.8, 156.4, 154.1, 134.9, 134.8, 132.4, 132.2, 130.8, 130.8, 130.1, 128.5, 128.3, 124.8, 124.8, 119.8, 117.4, 117.1, 90.5, 81.5, 35.4, 35.4.

N-(2-chloro-5-methylphenyl)-N-methyl-3-phenylpropiolamide



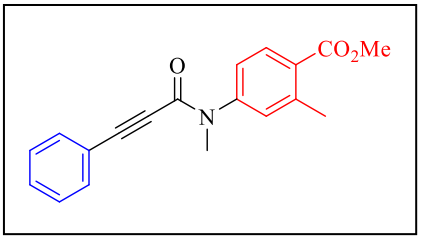
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.43-7.39 (m, 1H), 7.35-7.30 (m, 1H), 7.22-7.16 (m, 4H), 7.12-7.09 (m, 2H), 3.31 (s, 3H), 2.37 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 154.5, 140.1, 138.0, 132.5, 130.9, 130.5, 130.3, 129.9, 128.6, 128.3, 120.4, 90.1, 82.2, 35.1, 20.7.

N-(3-cyano-4-methylphenyl)-N-methyl-3-phenylpropiolamide



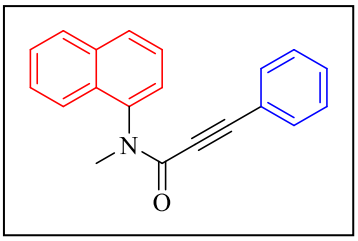
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.64-7.61(m, 1H), 7.53-7.49 (m, 1H), 7.42-7.35 (m, 3H), 7.31-7.29 (m, 1H), 7.23-7.30 (m, 2H), 3.38 (s, 3H), 2.61 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 153.7, 141.4, 141.2, 132.1, 131.5, 131.1, 130.7, 130.1, 128.4, 119.8, 116.9, 113.3, 91.5, 81.9, 36.1, 20.0.

methyl 2-methyl-4-(N-methyl-3-phenylpropiolamido)benzoate



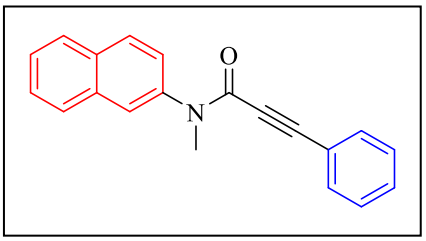
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.99 (d, J = 8.2 Hz, 1H), 7.37-7.27 (m, 4H), 7.25-7.19 (m, 3H), 3.91 (s, 3H), 3.39 (s, 3H), 2.64 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.2, 153.8, 146.0, 141.6, 132.4, 131.6, 130.1, 129.9, 128.6, 128.4, 124.1, 120.2, 91.0, 82.3, 51.9, 36.1, 21.8.

N-methyl-N-(naphthalen-1-yl)-3-phenylpropiolamide [5]



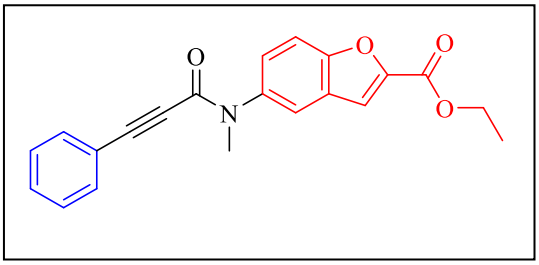
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.93-7.84 (m, 4H), 7.57-7.51 (m, 2H), 7.49-7.48 (m, 1H), 7.28-7.22 (m, 1H), 7.16-7.11 (m, 2H), 7.04-7.00 (m, 2H), 3.48 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 154.4, 140.5, 133.3, 132.4, 132.3, 129.8, 129.0, 128.2, 127.8, 127.7, 126.8, 126.6, 125.7, 125.2, 120.3, 90.9, 82.7, 36.5. Analytical data are identical to those previously reported.

N-methyl-N-(naphthalen-2-yl)-3-phenylpropiolamide



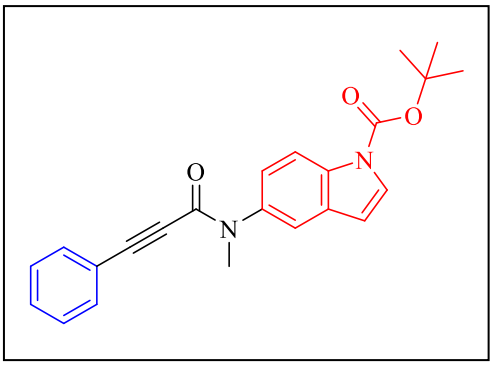
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.98-7.85 (m, 3H), 7.59-7.51 (m, 4H), 7.24-7.18 (m, 1H), 7.11-7.06 (m, 2H), 6.80-6.75 (m, 2H), 3.50 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 155.3, 139.6, 134.5, 132.3, 130.7, 129.8, 129.0, 128.5, 128.1, 127.4, 126.6, 126.2, 125.6, 122.6, 120.2, 90.5, 82.6, 36.5.

ethyl 5-(N-methyl-3-phenylpropiolamido)benzofuran-2-carboxylate



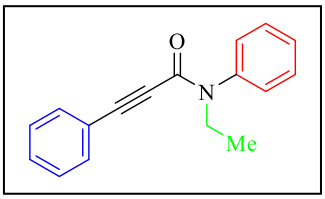
^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68-7.66 (m, 1H), 7.64-7.59 (m, 1H), 7.54 (d, J = 1.0 Hz, 1H), 7.45-7.42 (m, 1H), 7.31-7.27 (m, 1H), 7.21-7.16 (m, 2H), 7.06-7.03 (m, 2H), 4.46 (q, J = 7.1 Hz, 2H), 3.42 (s, 3H), 1.43 (t, J = 7.1 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 159.2, 154.6, 154.5, 147.2, 139.4, 132.3, 130.0, 128.3, 127.5, 127.3, 121.6, 120.2, 113.5, 112.9, 91.3, 82.4, 61.8, 36.8, 14.3.

tert-butyl 5-(N-methyl-3-phenylpropiolamido)-1H-indole-1-carboxylate



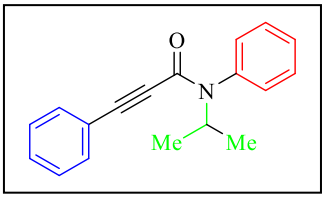
^{1}H NMR (400 MHz, $CDCl_3$) δ 8.19 (d, J = 8.9 Hz, 1H), 7.66 (d, J = 3.7 Hz, 1H), 7.54 (d, J = 2.1 Hz, 1H), 7.29-7.26 (m, 1H), 7.26-7.23 (m, 1H), 7.19-7.13 (m, 2H), 7.10-7.05 (m, 2H), 6.60-7.59 (m, 1H), 3.41 (s, 3H), 1.68 (s, 9H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 154.5, 149.4, 138.0, 134.2, 132.2, 130.8, 129.6, 128.1, 127.2, 123.2, 120.4, 119.6, 115.5, 107.0, 90.7, 84.0, 82.6, 36.8, 28.0.

N-ethyl-N,3-diphenylpropiolamide [4]



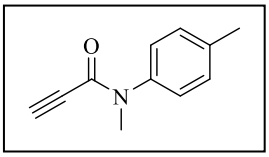
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.46-7.40 (m, 3H), 7.34-7.28 (m, 3H), 7.24-7.19 (m, 2H), 7.12-7.08 (m, 2H), 3.88 (q, J = 7.2 Hz, 2H), 1.19 (t, J = 7.2 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 153.9, 141.7, 132.4, 129.9, 129.2, 128.7, 128.3, 128.1, 120.5, 90.7, 82.8, 43.5, 13.0. Analytical data are identical to those previously reported.

N-isopropyl-N,3-diphenylpropiolamide



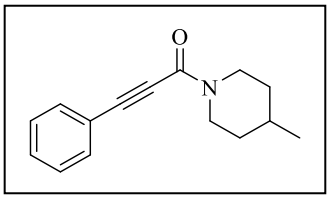
^{1}H NMR (300 MHz, $CDCl_3$) δ 7.47-7.43 (m, 3H), 7.30-7.25 (m, 3H), 7.22-7.16 (m, 2H), 7.04-7.00 (m, 2H), 5.08-4.95 (m, 1H), 1.16 (d, J = 6.8 Hz, 6H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 154.2, 138.4, 132.4, 130.9, 129.7, 128.8, 128.5, 128.2, 120.5, 91.0, 83.0, 46.4, 20.9.

N-methyl-N-(p-tolyl)propiolamide (34)



^{1}H NMR (300 MHz, DMSO-d_6) δ 7.28-7.20 (m, 4H), 4.18 (s, 1H), 3.18 (s, 3H), 2.33 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 153.0, 140.0, 138.1, 129.8, 126.9, 125.1, 79.4, 36.5, 21.0.

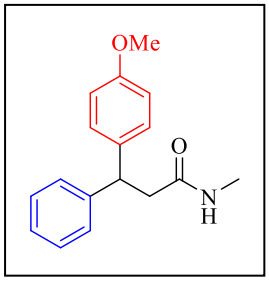
1-(4-methylpiperidin-1-yl)-3-phenylprop-2-yn-1-one (35) [8]



^{1}H NMR (600 MHz, $CDCl_3$) δ 7.56-7.55 (m, 2H), 7.43-7.41 (m, 1H), 7.38-7.37 (m, 2H), 4.58 (d, *J* = 13.2 Hz, 1H), 4.43 (d, *J* = 13.2 Hz, 1H), 3.14 (t, *J* = 12.5 Hz, 1H), 2.70 (t, *J* = 12.5 Hz, 1H), 1.77-1.71 (m, 2H), 1.26-1.21 (m, 2H), 1.15-1.13 (m, 1H), 0.99-0.97 (m, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 152.8, 132.2, 129.8, 128.4, 120.6, 90.1, 81.4, 47.4, 41.6, 34.5, 33.5, 31.0, 21.5. Analytical data are identical to those previously reported.

11. Characterization data of products

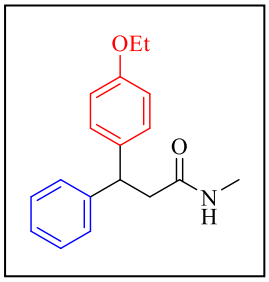
3-(4-methoxyphenyl)-N-methyl-3-phenylpropanamide (3) [6]



Following the general procedure, the title compound was obtained as white solid, 49.2 mg, m. p. 122-123 ℃, 61% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.29-7.11 (m, 7H), 6.80 (d, J = 8.7 Hz, 2H), 5.42 (s, 1H), 4.53 (t, J = 7.8 Hz, 1H), 3.75 (s, 3H), 2.85 (d, J = 7.7 Hz, 2H), 2.63 (d, J = 4.8 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.8, 158.0, 144.1, 135.8, 128.6, 128.5, 127.6, 126.4, 113.9, 55.2, 46.5, 43.4, 26.2. Analytical data are identical to those previously reported.

V = 3435 cm^{-1}, 1636 cm^{-1}, 1401 cm^{-1}, 1083 cm^{-1}

3-(4-ethoxyphenyl)-N-methyl-3-phenylpropanamide (4)

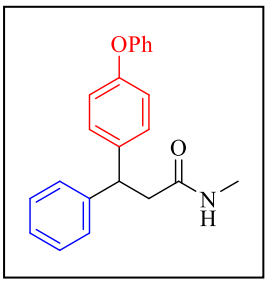


Following the general procedure, the title compound was obtained as white solid, 47.5 mg, m. p. 108-109 ℃, 56% yield. =^{1}H NMR (300 MHz, $CDCl_3$) δ 7.29-7.17 (m, 5H), 7.12 (d, J = 8.2 Hz, 2H), 6.79 (d, J = 8.2 Hz, 2H), 5.45 (s, 1H), 4.52 (t, J = 7.7 Hz, 1H), 3.97 (q, J = 7.0 Hz, 2H), 2.84 (d, J = 7.6 Hz, 2H), 2.62 (d, J = 4.7 Hz, 3H), 1.37 (t, J = 6.9 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.8, 157.4, 144.1, 135.6, 128.6, 128.4, 127.5, 126.3, 114.4, 63.3, 46.5, 43.3, 26.2, 14.8.

HRMS (APCI) m/z calculated for $C_{18}H_{22}NO_2^+$ ($M+H^+$) 284.1645, Found 284.1639.

V = 3433 cm^{-1}, 1643 cm^{-1}, 1515 cm^{-1}, 1249 cm^{-1}, 702 cm^{-1}

N-methyl-3-(4-phenoxyphenyl)-3-phenylpropanamide (5)



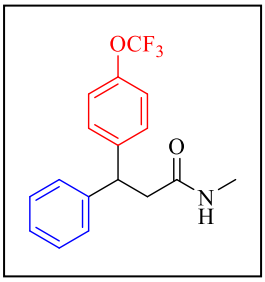
Following the general procedure, the title compound was obtained as white solid, 54.6 mg, m. p. 118-119 ℃, 55% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.34-7.26 (m, 4H), 7.24-7.16 (m, 5H), 7.10-7.06 (m, 1H), 7.00-6.95 (m, 2H), 6.93-6.89 (m, 2H), 5.40 (s, 1H), 4.58 (t, J = 7.8 Hz, 1H), 2.87 (d, J = 7.8 Hz, 2H), 2.66 (d, J = 4.8 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 171.7,

157.1, 155.7, 143.8, 138.6, 129.7, 128.9, 128.6, 127.6, 126.5, 123.2, 118.8, 118.7, 46.6, 43.3, 26.2.

HRMS (APCI) m/z calculated for $C_{22}H_{22}NO_2^+$ ($M+H^+$) 332.1645, Found 332.1640.

V = 3433 cm^{-1}, 1643 cm^{-1}, 1515 cm^{-1}, 1249 cm^{-1}, 702 cm^{-1}

N-methyl-3-phenyl-3-(4-(trifluoromethoxy)phenyl)propanamide (6)

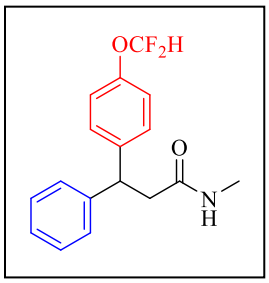


Following the general procedure, the title compound was obtained as white solid, 58.1 mg, m. p. 67-68 ℃, 60% yield. ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.30-7.28 (m, 2H), 7.25-7.20 (m, 5H), 7.11 (d, *J* = 8.1 Hz, 2H), 5.37 (s, 1H), 4.62 (t, *J* = 7.7 Hz, 1H), 2.89-2.82 (m, 2H), 2.65 (d, *J* = 4.8 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 171.3, 147.7, 143.1, 142.5, 129.0, 128.7, 127.7, 126.8, 121.0, 110.42 (q, $J_{C\text{-}F}$ = 255.2 Hz), 46.6, 43.1, 26.3. ^{19}F NMR (600 MHz, $CDCl_3$) δ -57.9.

HRMS (APCI) m/z calculated for $C_{17}H_{17}F_3NO_2^+$ ($M+H^+$) 324.1206, Found 324.1199.

V = 3311 cm^{-1}, 1637 cm^{-1}, 1270 cm^{-1}

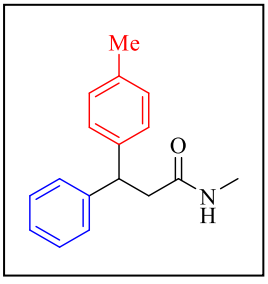
3-(4-(difluoromethoxy)phenyl)-N-methyl-3-phenylpropanamide (7)



Following the general procedure, the title compound was obtained as white solid, 60.4 mg, m. p. 66-67 ℃, 66% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30-7.27 (m, 3H), 7.23-7.17 (m, 5H), 7.03-6.99 (m, 2H), 6.45 (t, *J* = 74.1 Hz, 1H), 5.48 (s, 1H), 4.60 (t, *J* = 7.8 Hz, 1H), 2.85 (dd, *J* = 7.7, 1.8 Hz, 2H), 2.65 (d, *J* = 4.8 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.5, 149.7, 143.4, 141.0, 129.0, 128.6, 127.6, 126.7, 119.5, 115.9 (q, $J_{C\text{-}F}$ = 257.8 Hz), 113.3, 46.5, 43.1, 43.1, 26.3. ^{19}F NMR (600 MHz, $CDCl_3$) δ -80.5, -80.7.

V = 3307 cm^{-1}, 1637 cm^{-1}, 1128 cm^{-1}

N-methyl-3-phenyl-3-(p-tolyl)propanamide (8)[5]

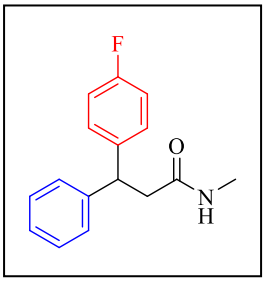


Following the general procedure, the title compound was obtained as white solid, 36.4 mg, m. p. 112-113 ℃, 48% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.27-7.25 (m, 4H), 7.23-7.20 (m, 2H), 7.19-7.15 (m, 1H), 7.13-7.07 (m, 4H), 5.24 (s, 1H), 4.53 (t, *J* = 7.8 Hz, 1H), 2.86 (d, *J* = 7.7 Hz, 2H), 2.65 (d, *J* = 4.8 Hz,

3H), 2.29 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.8, 144.0, 140.7, 135.9, 129.2, 128.5, 127.6, 127.5, 126.3, 46.9, 43.2, 26.2, 20.9. Analytical data are identical to those previously reported.

V = 3281 cm^{-1}, 1639 cm^{-1}, 1570 cm^{-1}, 700 cm^{-1}

3-(4-fluorophenyl)-N-methyl-3-phenylpropanamide (9)

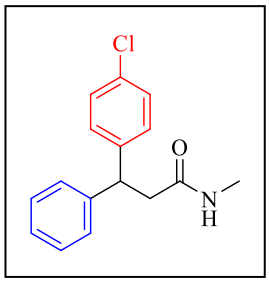


Following the general procedure, the title compound was obtained as white solid, 51.6mg, m. p. 110-111 ℃, 67% yield. ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.29-7.26 (m, 2H), 7.20-7.16 (m, 5H), 6.95 (t, J = 8.5 Hz, 2H), 5.46 (s, 1H), 4.58 (t, J = 7.7 Hz, 1H), 2.88-2.81 (m, 2H), 2.64 (d, J = 4.8 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 171.5, 162.2, 160.6, 143.5, 139.5, 139.5, 129.1, 129.1, 128.6, 127.6, 126.6, 115.3, 115.2, 46.5, 43.3, 26.2. ^{19}F NMR (600 MHz, $CDCl_3$) δ -116.6.

HRMS (APCI) m/z calculated for $C_{16}H_{16}FNO^+$ (M-H$^+$) 257.1210, Found 257.1180.

V = 3275 cm^{-1}, 1646 cm^{-1}, 1561 cm^{-1}, 700 cm^{-1}

3-(4-chlorophenyl)-N-methyl-3-phenylpropanamide (10)

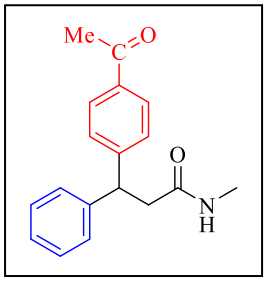


Following the general procedure, the desired compound was obtained as white solid, 48.3 mg, m. p. 141-142 ℃, 59% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.30-7.13 (m, 9H), 5.61 (s, 1H), 4.58 (t, J = 7.7 Hz, 1H), 2.84 (d, J = 4.7 Hz, 2H), 2.63 (d, J = 3.0 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.4, 143.2, 142.3, 132.2, 129.1, 128.7, 128.6, 127.6, 126.7, 46.6, 43.1, 26.3.

HRMS (APCI) m/z calculated for $C_{16}H_{17}ClNO^+$ (M+H$^+$) 274.0993, Found 274.0986.

V = 3271 cm^{-1}, 1634 cm^{-1}

3-(4-acetylphenyl)-N-methyl-3-phenylpropanamide (11)



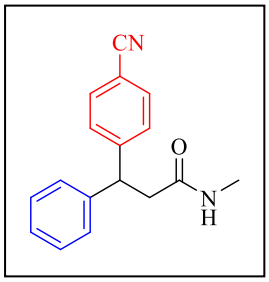
Following the general procedure, the title compound was obtained as white solid, 53.1 mg, m. p. 124-125 ℃, 63% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.87 (d, J = 8.3 Hz, 2H), 7.34-7.27 (m, 4H), 7.23-7.19 (m, 3H), 5.31 (s, 1H), 4.68 (t, J = 7.7 Hz, 1H), 2.89 (d, J = 7.7 Hz, 2H), 2.67 (d, J = 4.8 Hz, 3H), 2.56 (s, 1H).

^{13}C NMR (150 MHz, $CDCl_3$) δ 197.8, 171.2, 149.3, 142.9, 135.5, 128.8, 128.7, 128.0, 127.7, 126.9, 47.2, 42.8, 26.6, 26.4.

HRMS (APCI) m/z calculated for $C_{18}H_{20}NO_2^+$ ($M+H^+$) 282.1489, Found 282.1485.

V = 3436 cm^{-1}, 1648 cm^{-1}, 1606 cm^{-1}, 1270 cm^{-1}, 701 cm^{-1}

3-(4-cyanophenyl)-N-methyl-3-phenylpropanamide (12)

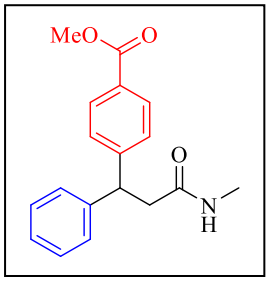


Following the general procedure, the title compound was obtained as white solid, 57.1 mg, m. p. 108-109 ℃, 72% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.54 (d, J = 7.8 Hz, 2H), 7.35-7.27 (m, 4H), 7.24-7.17 (m, 3H), 5.71 (s, 1H), 4.68 (t, J = 6.0 Hz, 1H), 2.89 (d, J = 7.7 Hz, 2H), 2.66 (d, J = 7.7 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 170.8, 149.4, 142.3, 132.3, 128.8, 128.6, 127.6, 127.0, 118.8, 110.2, 47.1, 42.3, 26.3.

HRMS (APCI) m/z calculated for $C_{17}H_{17}N_2O^+$ ($M+H^+$) 265.1335, Found 265.1330.

V = 3436 cm^{-1}, 2227 cm^{-1}, 1639 cm^{-1}, 1318 cm^{-1}

methyl 4-(3-(methylamino)-3-oxo-1-phenylpropyl)benzoate (13)

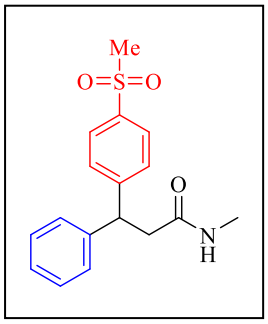


Following the general procedure, the title compound was obtained as white solid, 53.4 mg, m. p. 88-89 ℃, 60% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.93 (d, J = 7.9 Hz, 2H), 7.31-7.24 (m, 4H), 7.21-7.18 (m, 3H), 5.83 (s, 1H), 4.67 (t, J = 7.7 Hz, 1H), 3.87 (s, 3H), 2.90 (d, J = 7.8 Hz, 2H), 2.62 (d, J = 4.7 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.2, 166.9, 149.1, 142.9, 129.8, 128.6, 128.3, 127.8, 127.6, 126.7, 52.0, 47.1, 42.7, 26.2.

HRMS (APCI) m/z calculated for $C_{18}H_{20}NO_3$+ ($M+H^+$) 298.1438, Found 298.1432.

V = 3435 cm^{-1}, 1718 cm^{-1}, 1637 cm^{-1}, 1402 cm^{-1}, 1070 cm^{-1}

N-methyl-3-(4-(methylsulfonyl)phenyl)-3-phenylpropanamide (14)

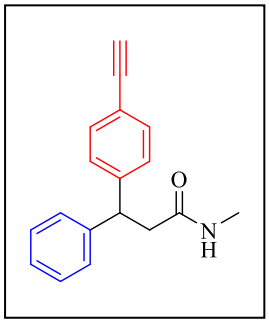


Following the general procedure, the title compound was obtained as white solid, 48.5 mg, m. p. 123-124 ℃, 51% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.82 (d, J = 8.3 Hz, 2H), 7.43 (d, J = 8.4 Hz, 2H), 7.31-7.27 (m, 2H), 7.24-7.18 (m, 3H), 5.68 (s, 1H), 4.72 (t, J = 7.7 Hz, 1H), 3.02 (s, 3H), 2.90 (d, J = 7.7 Hz, 2H), 2.65 (d, J = 4.8 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 170.9, 150.4, 142.4, 138.4, 128.8, 127.6, 127.5, 126.9, 47.0, 44.4, 42.2, 26.2.

HRMS (APCI) m/z calculated for $C_{17}H_{20}NO_3S^+$ ($M+H^+$) 318.1158, Found 318.1154.

V = 3435 cm^{-1}, 1639 cm^{-1}, 1299 cm^{-1}, 1156 cm^{-1}

3-(4-ethynylphenyl)-N-methyl-3-phenylpropanamide (15)

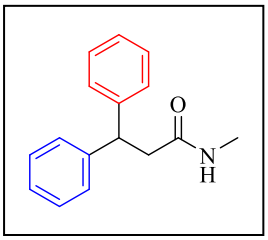


Following the general procedure, the title compound was obtained as white solid, 43.4 mg, m. p. 115-116 ℃, 55% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41-7.39 (m, 2H), 7.33-7.29 (m, 1H), 7.22-7.17 (m, 6H), 5.27 (s, 1H), 4.60 (t, J = 7.7 Hz, 1H), 3.03 (s, 1H), 2.87-2.84 (m, 2H), 2.66-2.65 (m, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 171.4, 144.7, 143.2, 132.3, 128.7, 127.8, 127.7, 126.7, 120.3, 113.5, 83.4, 47.1, 43.0, 26.3.

HRMS (APCI) m/z calculated for $C_{18}H_{18}NO^+$ ($M+H^+$) 264.1383, Found 264.1378.

V = 3435 cm^{-1}, 1629 cm^{-1}, 1401 cm^{-1}, 1069 cm^{-1}

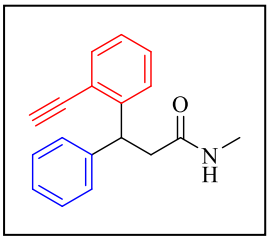
N-methyl-3,3-diphenylpropanamide (16) [7]



Following the general procedure, the title compound was obtained as white solid, 45.2 mg, m. p. 82-83 ℃, 63% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.29-7.14 (m, 10H), 5.49 (s, 1H), 4.58 (t, J = 7.8 Hz, 1H), 2.87 (d, J = 7.8 Hz, 2H), 2.61 (d, J = 4.8 Hz, 3H). ^{13}C NMR (75MHz, $CDCl_3$) δ 171.7, 143.7, 128.5, 127.7, 126.4, 47.2, 43.1, 26.2. Analytical data are identical to those previously reported.

V = 3343 cm^{-1}, 1638 cm^{-1}, 1552 cm^{-1}, 700 cm^{-1}

3-(2-ethynylphenyl)-N-methyl-3-phenylpropanamide (17)

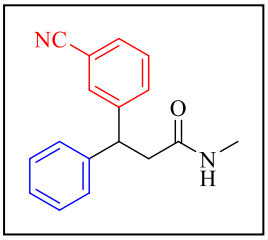


Following the general procedure, the title compound was obtained as white solid, 54.4 mg, m. p. 122-123 ℃, 69% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 (dd, J = 7.6, 1.4 Hz, 1H), 7.31 (dd, J = 7.7, 1.5 Hz, 1H), 7.28-7.27 (m, 4H), 7.22 (dd, J = 8.0, 1.3 Hz, 1H), 7.20-7.14 (m, 2H), 5.32 (s, 1H), 5.12 (dd, J = 8.4, 7.4 Hz, 1H), 3.33 (s, 1H), 3.01-2.89 (m, 2H), 2.67 (d, J = 4.8 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 171.37, 145.9, 142.7, 133.5, 129.2, 128.5, 127.9, 126.9, 126.6, 126.4, 121.7, 82.2, 82.1, 44.7, 42.5, 26.3.

HRMS (APCI) m/z calculated for $C_{18}H_{18}NO^+$ ($M+H^+$) 264.1383, Found 264.1379.

V = 3434 cm^{-1}, 1638 cm^{-1}, 1402 cm^{-1}, 1070 cm^{-1}

3-(3-cyanophenyl)-N-methyl-3-phenylpropanamide (18)

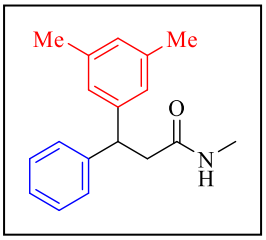


Following the general procedure, the title compound was obtained as white solid, 49.9 mg, m. p. 82-83 ℃, 63% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.51-7.47 (m, 3H), 7.40-7.17 (m, 6H), 5.54 (s, 1H), 4.67 (t, J = 7.6 Hz, 1H), 2.88 (d, J = 7.6 Hz, 2H), 2.68 (d, J = 4.7 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 170.8, 145.3, 142.4, 132.7, 131.0, 130.2, 129.3, 128.8, 127.6, 127.0, 118.9, 112.4, 46.6, 42.5, 26.3.

HRMS (APCI) m/z calculated for $C_{17}H_{17}N_2O^+$ ($M+H^+$) 265.1335, Found 265.1330.

V = 3435 cm^{-1}, 2230 cm^{-1}, 1646 cm^{-1}, 704 cm^{-1}

3-(3,5-dimethylphenyl)-N-methyl-3-phenylpropanamide (19)

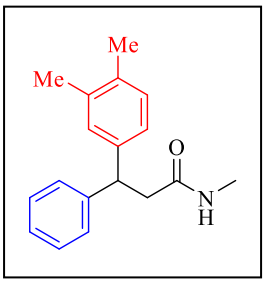


Following the general procedure, the title compound was obtained as colorless oil, 52.1 mg, 65% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.29-7.14 (m, 5H), 6.83 (s, 3H), 5.47 (s, 1H), 4.49 (t, J = 7.8 Hz, 1H), 2.86 (d, J = 8.2 Hz, 2H), 2.62 (d, J = 4.7 Hz, 3H), 2.25 (s, 6H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.8, 143.9, 143.6, 137.9, 128.4, 128.1, 127.6, 126.3, 125.4, 47.2, 43.1, 26.2, 21.3.

HRMS (APCI) m/z calculated for $C_{18}H_{22}NO^+$ ($M+H^+$) 268.1696, Found 268.1690.

V = 3435 cm^{-1}, 1637 cm^{-1}, 704 cm^{-1}

3-(3,4-dimethylphenyl)-N-methyl-3-phenylpropanamide (20)

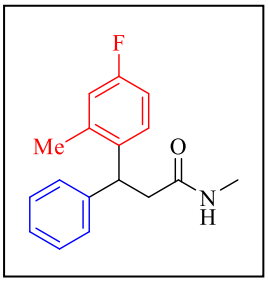


Following the general procedure, the title compound was obtained as white solid, 54.5 mg, m. p. 104-105 ℃, 68% yield. ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.26-7.21 (m, 4H), 7.17-7.15 (m, 1H), 7.02 (d, J = 7.7 Hz, 1H), 6.98-6.94 (m, 2H), 5.43 (s, 1H), 4.49 (t, J = 7.8 Hz, 1H), 2.85 (d, J = 7.5 Hz, 2H), 2.63-2.61 (m, 3H), 2.19 (s, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 171.9, 144.1, 141.1, 136.6, 134.6, 129.7, 129.1, 128.5, 127.6, 126.3, 124.8, 46.9, 43.2, 26.2, 19.8, 19.2.

HRMS (APCI) m/z calculated for $C_{18}H_{22}NO^+$ ($M+H^+$) 268.1696, Found 268.1691.

V = 3298 cm^{-1}, 1646 cm^{-1}, 1560 cm^{-1}, 700 cm^{-1}

3-(4-fluoro-2-methylphenyl)-N-methyl-3-phenylpropanamide (21)

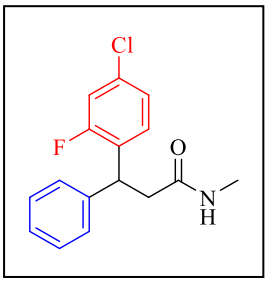


Following the general procedure, the desired compound was obtained as white solid, 55.3 mg, m. p. 98-99 ℃, 68% yield. ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.26-7.22 (m, 2H), 7.19-7.15 (m, 2H), 7.12 (d, J = 7.6 Hz, 3H), 6.87-6.82 (m, 2H), 5.57 (s, 1H), 4.73 (t, J = 7.7 Hz, 1H), 2.85-2.77 (m, 2H), 2.63 (d, J = 4.7 Hz, 3H), 2.24 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 171.6, 162.0, 160.3, 143.3, 139.0, 138.9, 137.2, 137.2, 128.4, 127.7, 127.5, 127.4, 126.4, 117.4, 117.3, 112.4, 112.3, 43.5, 42.7, 26.2, 19.8. ^{19}F NMR (600 MHz, $CDCl_3$) δ -117.3.

HRMS (APCI) m/z calculated for $C_{17}H_{19}FNO^+$ ($M+H^+$) 272.1445, Found 272.1438.

V = 3427 cm^{-1}, 1643 cm^{-1}, 1460 cm^{-1}, 1070 cm^{-1}

3-(4-chloro-2-fluorophenyl)-N-methyl-3-phenylpropanamide (22)

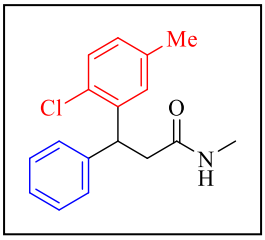


Following the general procedure, the desired compound was obtained as white solid, 48.0 mg, m. p. 88-89 ℃, 55% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.30-7.17 (m, 6H), 7.08-7.00 (m, 2H), 5.61 (s, 1H), 4.80 (t, J = 7.9 Hz, 1H), 2.90 (d, J = 7.8 Hz, 2H), 2.67 (d, J = 4.8 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.0, 162.0, 158.7, 142.0, 133.1, 132.9, 129.7, 129.6, 129.4, 129.2, 128.6, 127.5, 126.8, 124.5, 124.5, 116.7, 116.3, 41.4, 41.4, 40.9, 40.9, 26.2.

HRMS (APCI) m/z calculated for $C_{16}H_{16}ClFNO^+$ ($M+H^+$) 292.0899, Found 292.0890.

V = 3435 cm^{-1}, 1636 cm^{-1}, 1402 cm^{-1}, 1074 cm^{-1}

3-(2-chloro-5-methylphenyl)-N-methyl-3-phenylpropanamide (23)

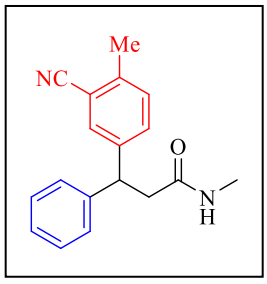


Following the general procedure, the title compound was obtained as white solid, 54.2 mg, m. p. 144-145 ℃, 63% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30-7.27 (m, 2H), 7.25-7.17 (m, 4H), 7.04 (d, J = 2.1 Hz, 1H), 6.95 (ddd, J = 8.1, 2.2, 0.8 Hz, 1H), 5.30 (s, 1H), 4.98 (t, J = 7.8 Hz, 1H), 2.95-2.84 (m, 2H), 2.68 (d, J = 4.8 Hz, 3H), 2.29 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.3, 142.3, 140.5, 136.6, 130.9, 129.6, 128.9, 128.5, 128.4, 127.8, 126.5, 43.4, 42.2, 26.2, 21.1.

HRMS (APCI) m/z calculated for $C_{17}H_{19}ClNO^{+}$ ($M+H^{+}$) 288.1150, Found 288.1142.

V = 3435 cm^{-1}, 1644 cm^{-1}, 1402 cm^{-1}, 1047 cm^{-1}

3-(3-cyano-4-methylphenyl)-N-methyl-3-phenylpropanamide (24)

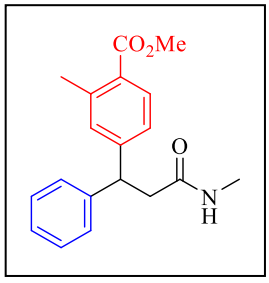


Following the general procedure, the title compound was obtained as white solid, 45.1 mg, m. p. 88-89 ℃, 54% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.45 (s, 1H), 7.38-7.35 (m, 1H), 7.32-7.16 (m, 6H), 5.66 (s, 1H), 4.61 (t, J = 7.8 Hz, 1H), 2.86 (d, J = 7.5 Hz, 2H), 2.67 (d, J = 4.9 Hz, 3H), 2.48 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.0, 142.7, 142.3, 140.0, 132.6, 131.2, 130.4, 128.8, 127.5, 126.9, 118.2, 112.7, 46.3, 42.5, 26.3, 19.9.

HRMS (APCI) m/z calculated for $C_{18}H_{19}N_2O^{+}$ ($M+H^{+}$) 279.1492, Found 279.1486.

V = 3332 cm^{-1}, 2224 cm^{-1}, 1638 cm^{-1}, 1554 cm^{-1}, 700 cm^{-1}

methyl 2-methyl-4-(3-(methylamino)-3-oxo-1-phenylpropyl)benzoate (25)

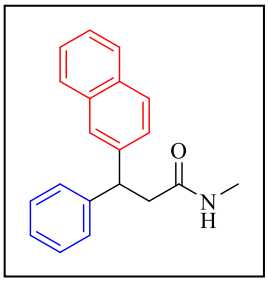


Following the general procedure, the title compound was obtained as white solid, 56.0 mg, m. p. 98-99 ℃, 60% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.83 (d, J = 8.2 Hz, 1H), 7.29-7.19 (m, 5H), 7.12-7.10 (m, 2H), 5.59 (s, 1H), 4.60 (t, J = 7.7 Hz, 1H), 3.85 (s, 3H), 2.87 (d, J = 7.8 Hz, 2H), 2.64 (d, J = 4.8 Hz, 3H), 2.54 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.3, 167.8, 147.9, 143.0, 140.5, 131.2, 130.9, 128.6, 127.6, 126.6, 124.9, 51.7, 47.0, 42.6, 26.2, 21.8.

HRMS (APCI) m/z calculated for $C_{19}H_{22}NO_3^{+}$ ($M+H^{+}$) 312.1594, Found 312.1587.

V = 3296 cm^{-1}, 1719 cm^{-1}, 1647 cm^{-1}, 1263 cm^{-1}, 1086 cm^{-1}

N-methyl-3-(naphthalen-2-yl)-3-phenylpropanamide (26)

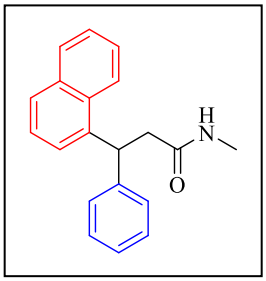


Following the general procedure, the title compound was obtained as white solid, 54.6 mg, m. p. 160-161 ℃, 63% yield. ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.75 (d, J = 7.7 Hz, 2H), 7.70 (d, J = 8.3 Hz, 1H), 7.68 (s, 1H), 7.44-7.39 (m, 2H), 7.29 (d, J = 8.4 Hz, 1H), 7.24 (s, 4H), 7.18-7.16 (m, 6H), 5.56 (s, 1H), 4.74 (t, J = 7.7 Hz, 1H), 2.99-2.93 (m, 2H), 2.58-2.57 (m, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 171.7, 143.6, 141.2, 133.4, 132.2, 128.5, 128.2, 127.8, 127.7, 127.5, 126.5, 126.4, 126.0, 125.7, 125.6, 47.3, 43.0, 26.2.

HRMS (APCI) m/z calculated for $C_{20}H_{20}NO^+$ ($M+H^+$) 290.1539, Found 290.1532.

V = 3306 cm^{-1}, 1634 cm^{-1}, 779cm^{-1}

N-methyl-3-(naphthalen-1-yl)-3-phenylpropanamide (27)

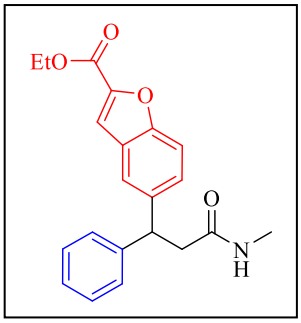


Following the general procedure, the title compound was obtained as white solid, 54.2 mg, m. p. 148-149 ℃, 62% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 8.13-8.12 (d, J = 3.0 Hz, 1H), 7.82-7.80 (m, 1H), 7.74 (d, J = 4.0 Hz, 1H), 7.44-7.42 (m, 3H), 7.39-7.37 (m, 1H), 7.27-7.24 (m, 4H), 7.16-7.14 (m, 1H), 5.39 (t, J = 3.8 Hz, 1H), 5.26 (s, 1H), 3.06-3.03 (m, 1H), 2.95-2.91 (m, 1H), 2.64 (s, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 171.7, 143.7, 139.2, 134.1, 131.6, 128.7, 128.6, 127.8, 127.5, 126.5, 126.2, 125.6, 125.2, 124.1, 124.0, 43.7, 43.0, 26.3.

HRMS (APCI) m/z calculated for $C_{20}H_{20}NO^+$ ($M+H^+$) 290.1539, Found 290.1533.

V = 3414 cm^{-1}, 1619 cm^{-1}, 1402 cm^{-1}, 1069 cm^{-1}

ethyl 5-(3-(methylamino)-3-oxo-1-phenylpropyl)benzofuran-2-carboxylate (28)



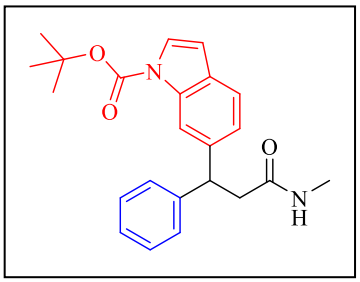
Following the general procedure, the title compound was obtained as white solid, 45.3 mg, m. p. 110-111 ℃, 43% yield. ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.53 (s, 1H), 7.47-7.44 (m, 2H), 7.30-7.27 (m, 3H), 7.24-7.22 (m, 2H), 7.21-7.18 (m, 1H), 5.44 (s, 1H), 4.72 (t, J = 8.0 Hz, 1H), 4.44-4.40 (m, 2H), 2.96-2.89 (m, 2H), 2.64 (s, 3H), 1.43-1.40 (m, 3H). ^{13}C NMR (150 MHz,

$CDCl_3$) δ 171.5, 159.5, 154.5, 146.0, 143.7, 139.7, 128.6, 127.8, 127.6, 127.1, 126.6, 121.4, 113.8, 112.3, 61.5, 47.0, 43.4, 26.2, 14.3.

HRMS (APCI) m/z calculated for $C_{21}H_{22}NO_4^+$ ($M+H^+$) 352.1543, Found 352.1539.

V = 3415 cm^{-1}, 1724 cm^{-1}, 1642 cm^{-1}, 1298 cm^{-1}, 1191 cm^{-1}

tert-butyl 6-(3-(methylamino)-3-oxo-1-phenylpropyl)-1H-indole-1-carboxylate (29)

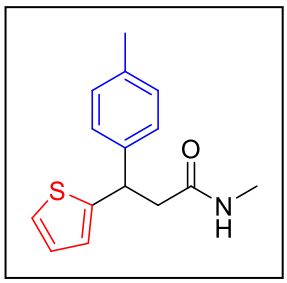


Following the general procedure, the title compound was obtained as white solid, 51.1 mg, m. p. 115-116 ℃, 45% yield. ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.02 (d, J = 8.6 Hz, 1H), 7.55 (d, J = 3.7 Hz, 1H), 7.41 (d, J = 1.8 Hz, 1H), 7.28-7.22 (m, 4H), 7.19-7.14 (m, 2H), 6.48 (d, J = 3.8 Hz, 1H), 5.37 (s, 1H), 4.67 (t, J = 7.8 Hz, 1H), 2.93 (d, J = 7.8 Hz, 2H), 2.61 (d, J = 4.8 Hz, 3H), 1.64 (s, 9H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.9, 149.7, 144.2, 138.2, 133.8, 130.8, 128.5, 127.6, 126.3, 126.2, 124.2, 119.8, 115.2, 107.3, 83.6, 47.2, 43.5, 28.1, 26.2.

HRMS (APCI) m/z calculated for $C_{23}H_{27}N_2O_3^+$ ($M+H^+$) 379.2016, Found 379.2008.

V = 3415 cm^{-1}, 1735 cm^{-1}, 1643 cm^{-1}, 1370 cm^{-1}, 1129 cm^{-1}, 700 cm^{-1}

N-methyl-3-(thiophen-2-yl)-3-(p-tolyl)propanamide (30)

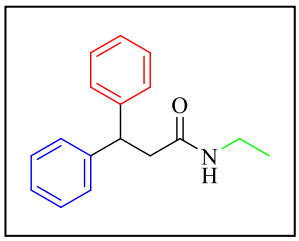


^{1}H NMR (400 MHz, $CDCl_3$) δ 7.18-7.16 (m, 2H), 7.14-7.09 (m, 3H), 6.89 (dd, J = 5.1, 3.5 Hz, 1H), 6.82 (dd, J = 3.4, 1.0 Hz, 1H), 5.35 (s, 1H), 4.77 (t, J = 7.7 Hz, 1H), 2.93 (dd, J = 14.1, 7.5 Hz, 1H), 2.82 (dd, J = 14.2, 7.8 Hz, 1H), 2.67 (d, J = 4.8 Hz, 3H), 2.31 (s, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.2, 148.1, 140.4, 136.5, 129.3, 127.4, 126.6, 124.2, 123.8, 44.8, 42.8, 26.3, 21.0.

HRMS (APCI) m/z calculated for $C_{15}H_{18}NOS^+$ ($M+H^+$) 260.1104, Found 260.1098.

V = 3430 cm^{-1}, 1635 cm^{-1}, 1401 cm^{-1}, 700 cm^{-1}

N-ethyl-3,3-diphenylpropanamide (31)

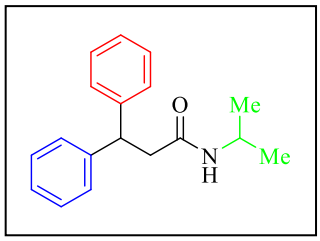


Following the general procedure, the title compound was obtained as white solid, 50.1 mg, m. p. 121-122 ℃, 66% yield. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.30-7.15 (m, 10H), 5.29 (s, 1H), 4.56 (t, J = 7.9 Hz, 1H), 3.16-3.07 (m, 2H), 2.86 (d, J = 7.8 Hz, 2H), 0.88 (t, J = 7.2 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 170.9, 143.7, 128.5, 127.7, 126.5, 47.4, 43.4, 34.2, 14.6.

HRMS (APCI) m/z calculated for $C_{17}H_{20}NO^+$ ($M+H^+$) 254.1539, Found 254.1533.

V = 3425 cm^{-1}, 1633 cm^{-1}, 1401 cm^{-1}, 1069 cm^{-1}

N-isopropyl-3,3-diphenylpropanamide (32)

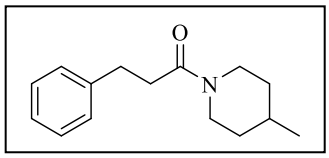


Following the general procedure, the title compound was obtained as white solid, 47.2 mg, m. p. 126-127 ℃, 59% yield. ^{1}H NMR (600 MHz, $CDCl_3$) δ 7.29-7.22 (m, 8H), 7.20-7.17 (m, 2H), 5.00 (s, 1H), 4.54 (t, J = 7.8 Hz, 1H), 3.94-3.89 (m, 1H), 2.83 (d, J = 7.6 Hz, 2H), 0.89 (d, J = 6.6 Hz, 6H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 170.1, 143.7, 128.5, 127.8, 126.5, 47.7, 43.7, 41.1, 22.5.

HRMS (APCI) m/z calculated for $C_{18}H_{22}NO^+$ ($M+H^+$) 268.1696, Found 268.1689.

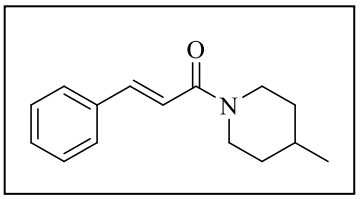
V = 3284 cm^{-1}, 1635 cm^{-1}, 1401 cm^{-1}, 1074 cm^{-1}

1-(4-methylpiperidin-1-yl)-3-phenylpropan-1-one (36) [9]



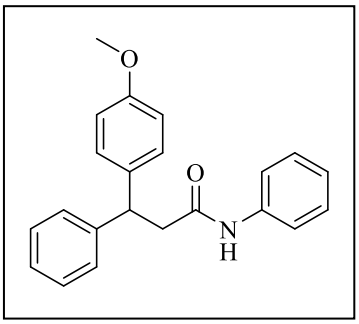
Following the general procedure, the title compound was obtained as Colorless liquid. ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.30-7.26 (m, 2H), 7.23-7.19 (m, 3H), 4.60 (d, J = 8.0 Hz, 1H), 3.75 (d, J = 12.0 Hz, 1H), 2.98-2.95 (m, 2H), 2.91 (t, J = 8.0 Hz, 1H), 2.63-2.61 (m, 2H), 2.52 (t, J = 12.0 Hz, 1H), 1.66-1.55 (m, 3H), 1.08-1.02 (m, 1H), 0.97-0.95 (m, 1H), 0.93-0.91 (m, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 170.4, 141.5, 128.5, 128.5, 126.1, 45.9, 42.1, 35.2, 34.5, 33.8, 31.6, 31.1, 21.7. Analytical data are identical to those previously reported.

(E)-1-(4-methylpiperidin-1-yl)-3-phenylprop-2-en-1-one (37) [9]



Following the general procedure, the title compound was obtained as white solid. ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.63 (d, J = 15.5 Hz, 1H), 7.53-7.49 (m, 2H), 7.36-7.33 (m, 3H), 6.90 (d, J = 15.5 Hz, 1H), 4.67 (d, J = 13.2 Hz, 1H), 4.07 (d, J = 9.3 Hz, 1H), 3.09 (t, J = 13.0 Hz, 1H), 2.66 (t, J = 9.3 Hz, 1H), 1.74-1.57 (m, 3H), 1.15 (tdd, J = 12.6, 10.9, 4.2 Hz, 2H), 0.96 (d, J = 6.3 Hz, 3H). ^{13}C NMR (150 MHz, $CDCl_3$) δ 165.3, 142.1, 135.5, 129.3, 128.7, 127.6, 117.8, 46.2, 42.7, 34.8, 33.8, 31.1, 21.6. Analytical data are identical to those previously reported.

3-(4-methoxyphenyl)-N,3-diphenylpropanamide (48)

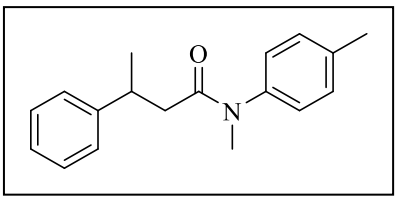


^{1}H NMR (400 MHz, $CDCl_3$) δ 7.31-7.26 (m, 5H), 7.24-7.17 (m, 5H), 7.07-7.05 (m, 1H), 6.97 (s, 1H), 6.85-6.81 (m, 2H), 4.58 (t, J = 7.7 Hz, 1H), 3.76 (s, 3H), 3.04 (d, J = 7.8 Hz, 2H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 169.6, 158.2, 143.9, 137.6, 135.6, 128.8, 128.8, 128.6, 127.6, 126.5, 124.3, 120.1, 114.1, 55.2, 46.6, 44.4.

HRMS (APCI) m/z calculated for $C_{22}H_{22}NO_2^+$ ($M+H^+$) 332.1645, Found 332.1641.

V = 3430 cm^{-1}, 1640 cm^{-1}, 1515 cm^{-1}, 702 cm^{-1}

N-methyl-3-phenyl-N-(p-tolyl)butanamide (50)



^{1}H NMR (400 MHz, $CDCl_3$) δ 7.24-7.22 (m, 2H), 7.16-7.13 (m, 3H), 7.09-7.07 (m, 2H), 6.81 (d, J = 7.9 Hz, 2H), 3.40-3.31 (m, 1H), 3.17 (s, 3H), 2.39-2.24 (m, 5H), 1.21 (d, J = 7.0 Hz, 3H). ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.8, 146.3, 141.4, 137.5, 130.2, 128.2, 127.1, 126.9, 126.0, 42.4, 37.3, 36.7, 21.3, 21.0.

HRMS (APCI) m/z calculated for $C_{18}H_{22}NO^+$ ($M+H^+$) 268.1696, Found 268.1689.

V = 1649 cm^{-1}, 1120 cm^{-1}, 700 cm^{-1}

12. Reference

[1] L.-F. Duan, Jiang K, Zhu, H and B.-L. Yin, *Org. Biomol. Chem*., 2021, *19*, 365.

[2] D.-Y. Qian and J.-L. Zhang, *Chem. Commun*., 2012, **48**, 7082.

[3] B. Yu, P. Yang, X. Gao, Z.-Z. Yang, Y.-F. Zhao, H.-Y. Zhang and Z.-M. Liu, *New J. Chem*., 2017, **41**, 9250.

[4] C.-S. Wang, T. Roisnel, P. H. Dixneuf and J.-F. Soulé, *Adv. Synth. Catal*., 2019, **361**, 445.

[5] H.-L. Hua, Y.-T. He, Y.-F. Qiu, Y.-X. Li, B. Song, P. Gao, X.-R. Song, D.-H. Guo, X.-Y. Liu, Y.-M. Liang, *Chem. Eur. J*., 2015, **21**, 1468.

[6] D. N. Zakusilo, D. S. Ryabukhin, I. A. Boyarskaya, O. S. Yuzikhin and A. V. Vasilyev, *Tetrahedron*., 2015, **71**, 102.

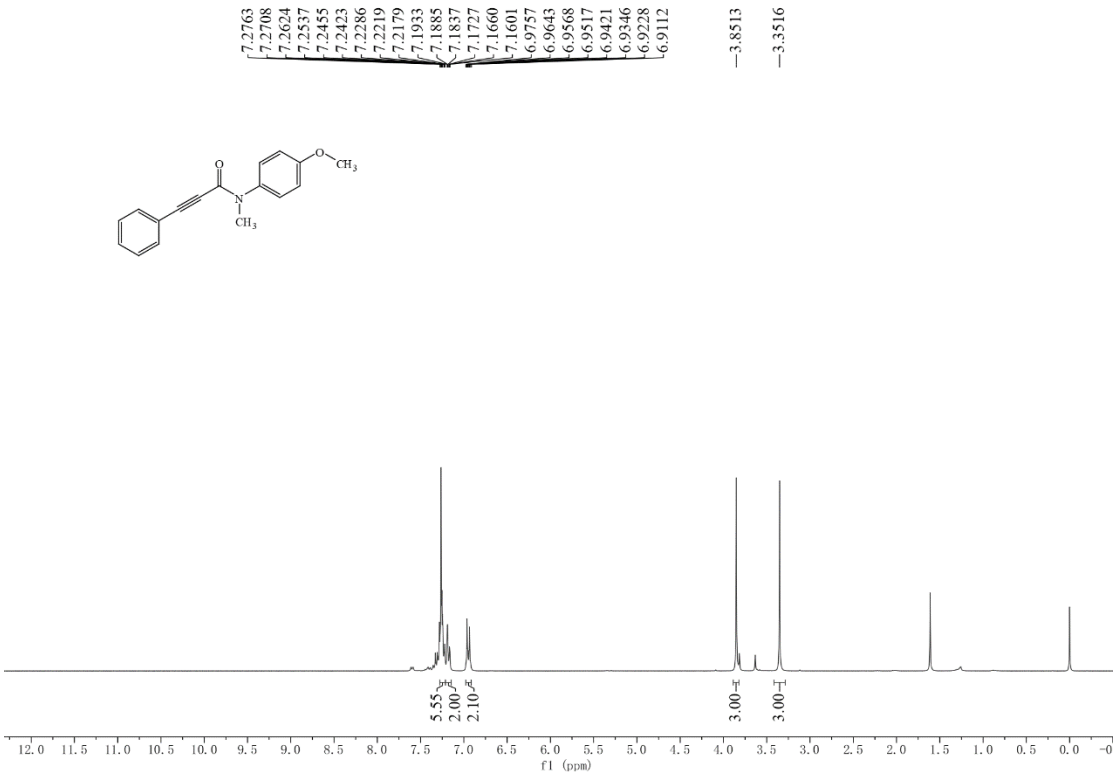
[7] B. Reichart, G. G. de la Cruz, K. Zangger, C. O. Kappe and T. Glasnov, *Adv. Synth. Catal*., 2016, **358**, 50.

[8] C.-S. Kuai, J.-X. Xu, B. Chen and X.-F. Wu, *Org. Lett*., 2022, **24**, 4464.

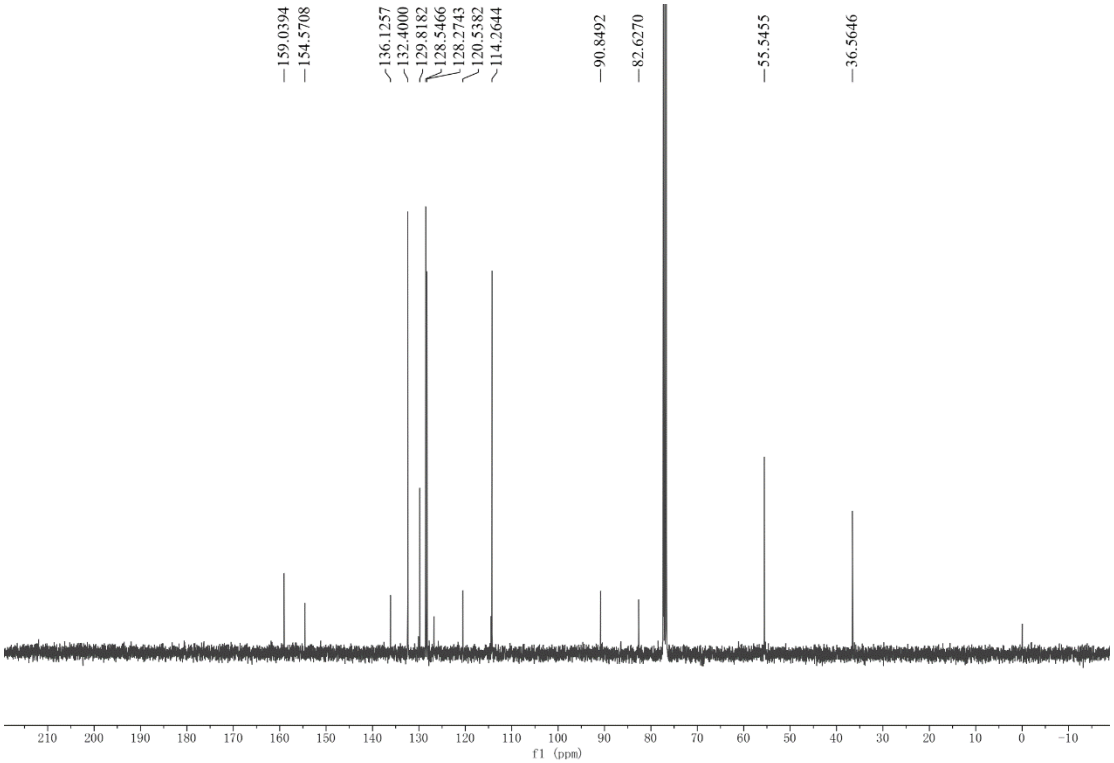
[9] T.-L. Yang, M.-L. Lu, Z.-W. Lin, M.-Q. Huang and S.-Y. Cai, *Org. Biomol. Chem*., 2019, **17**, 449.

13. The NMR spectra for starting materials (most of these spectra contain rotamers)

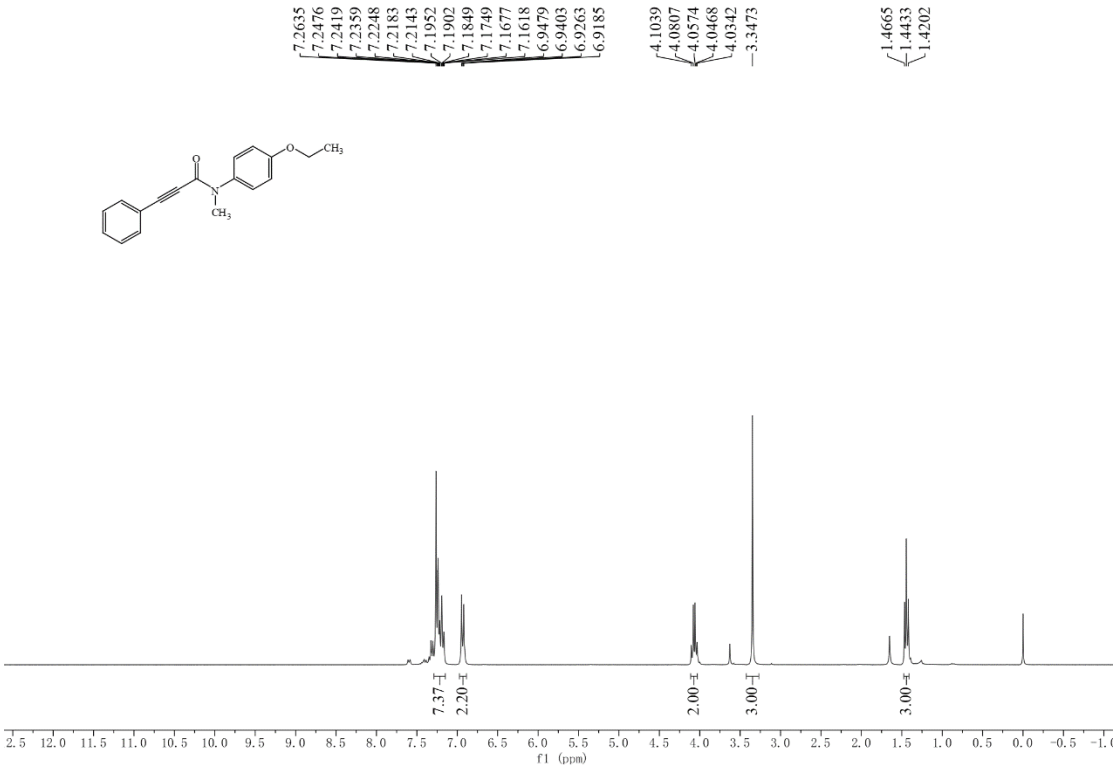
^{1}H NMR of N-(4-methoxyphenyl)-N-methyl-3-phenylpropiolamide [4]



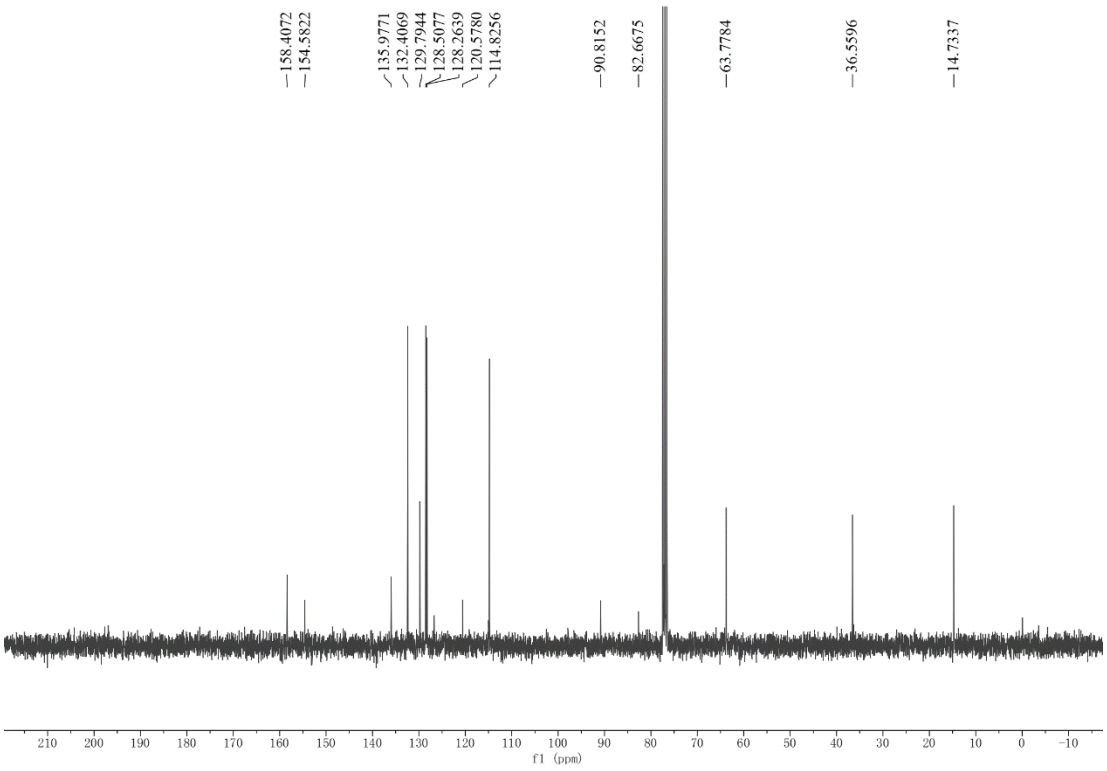
^{13}C NMR of N-(4-methoxyphenyl)-N-methyl-3-phenylpropiolamide [4]



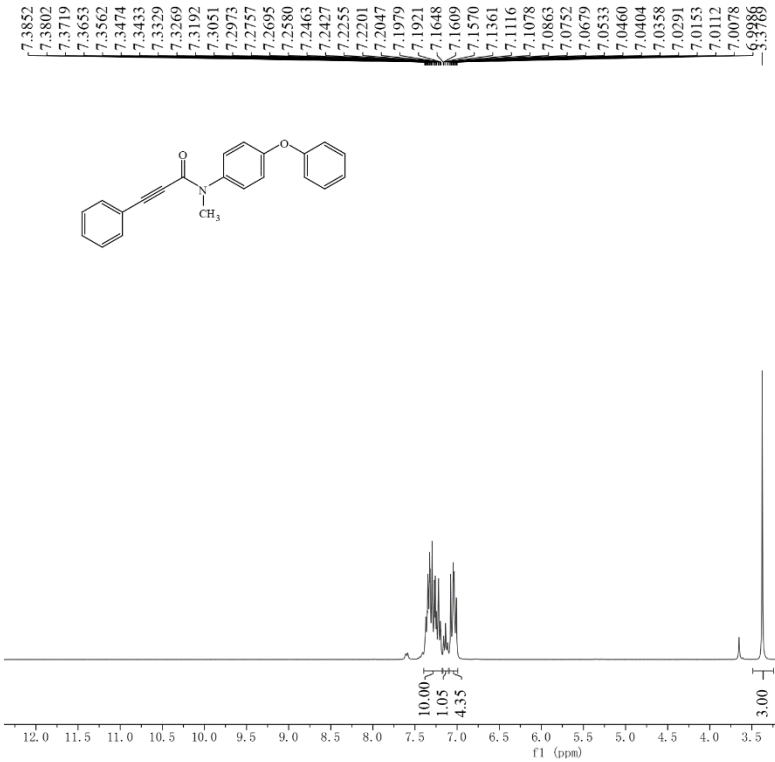
^{1}H NMR of N-(4-ethoxyphenyl)-N-methyl-3-phenylpropiolamide



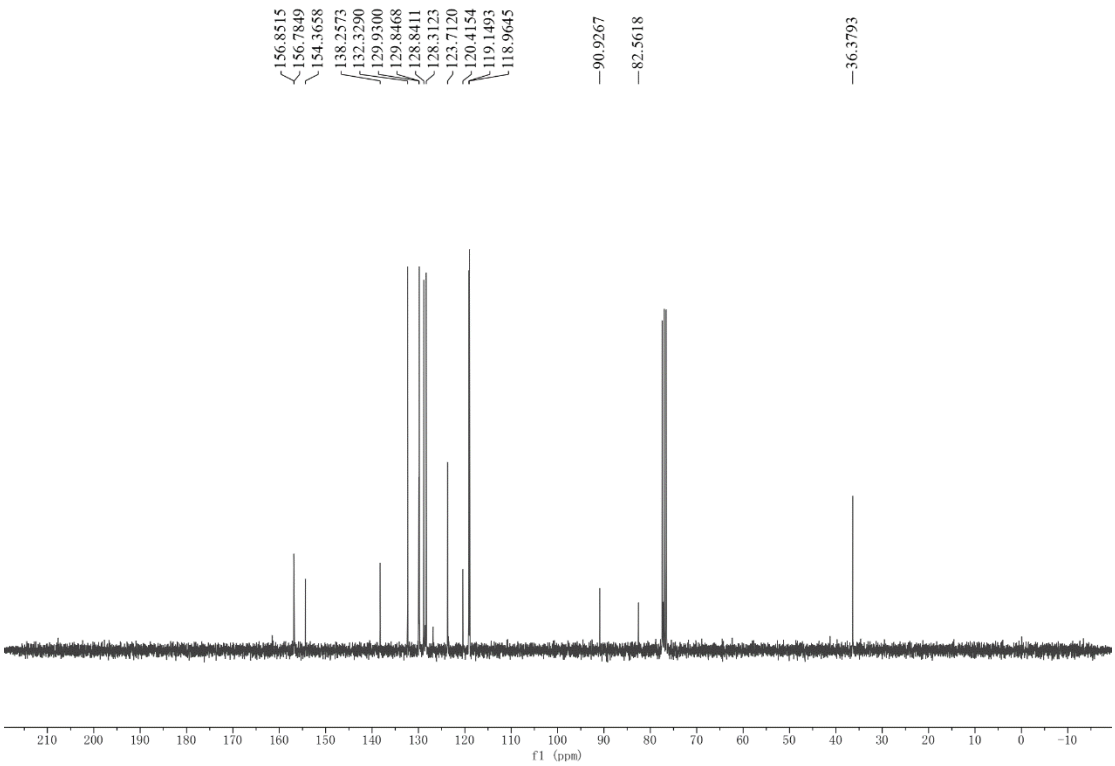
^{13}C NMR of N-(4-ethoxyphenyl)-N-methyl-3-phenylpropiolamide



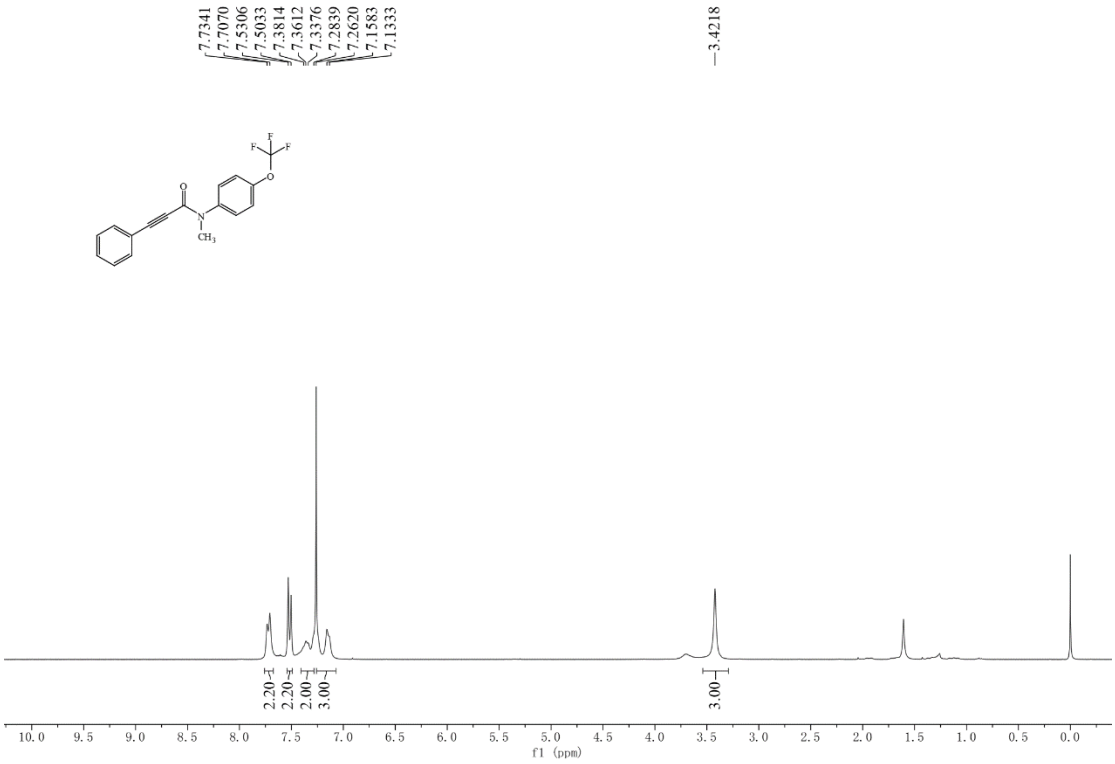
^{1}H NMR of N-methyl-N-(4-phenoxyphenyl)-3-phenylpropiolamide



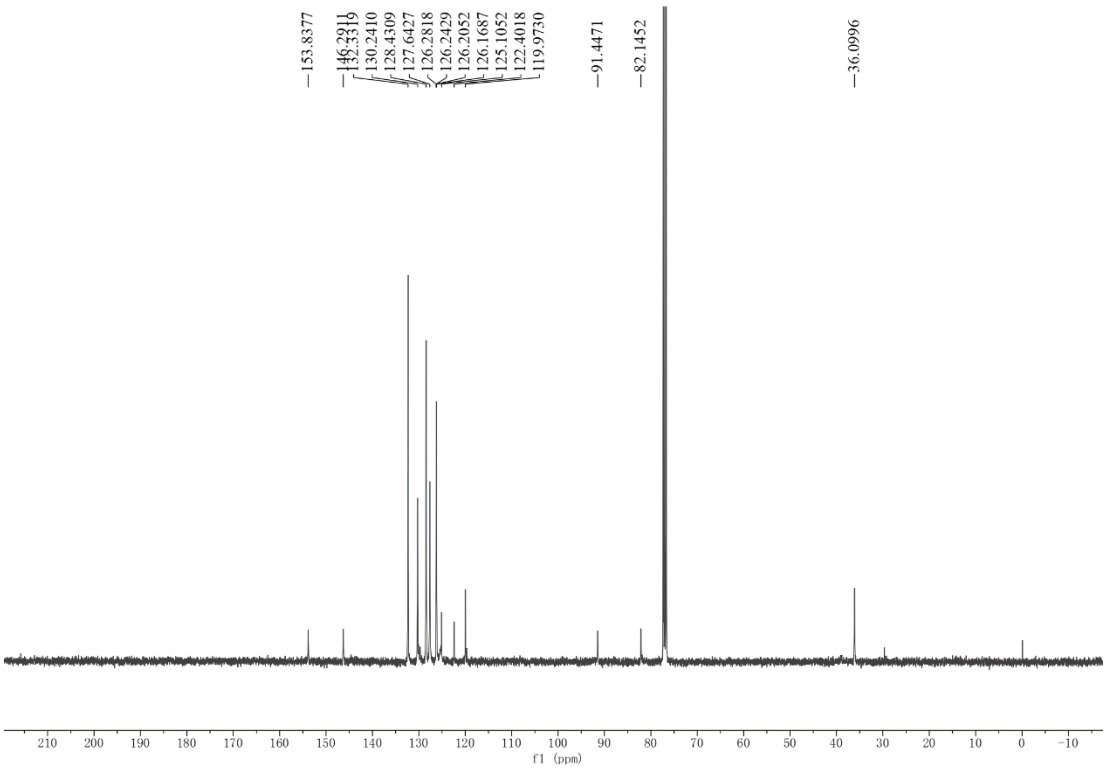
^{13}C NMR of N-methyl-N-(4-phenoxyphenyl)-3-phenylpropiolamide



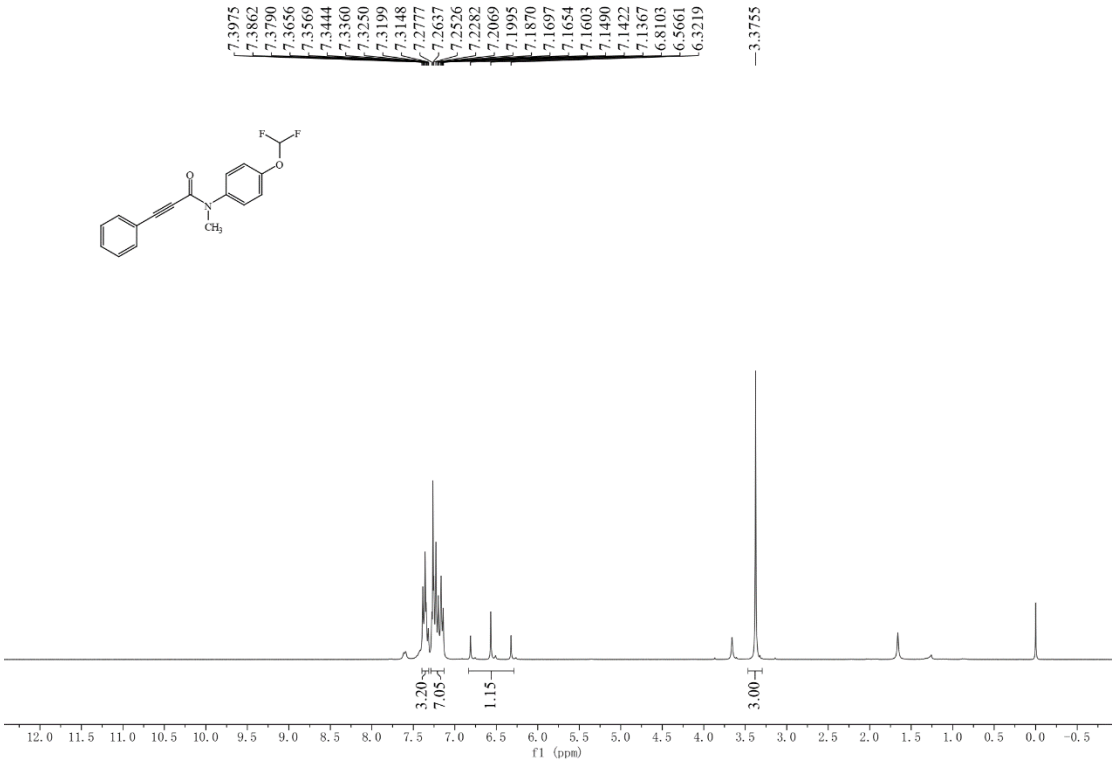
^{1}H NMR of N-methyl-3-phenyl-N-(4-(trifluoromethoxy)phenyl)propiolamide



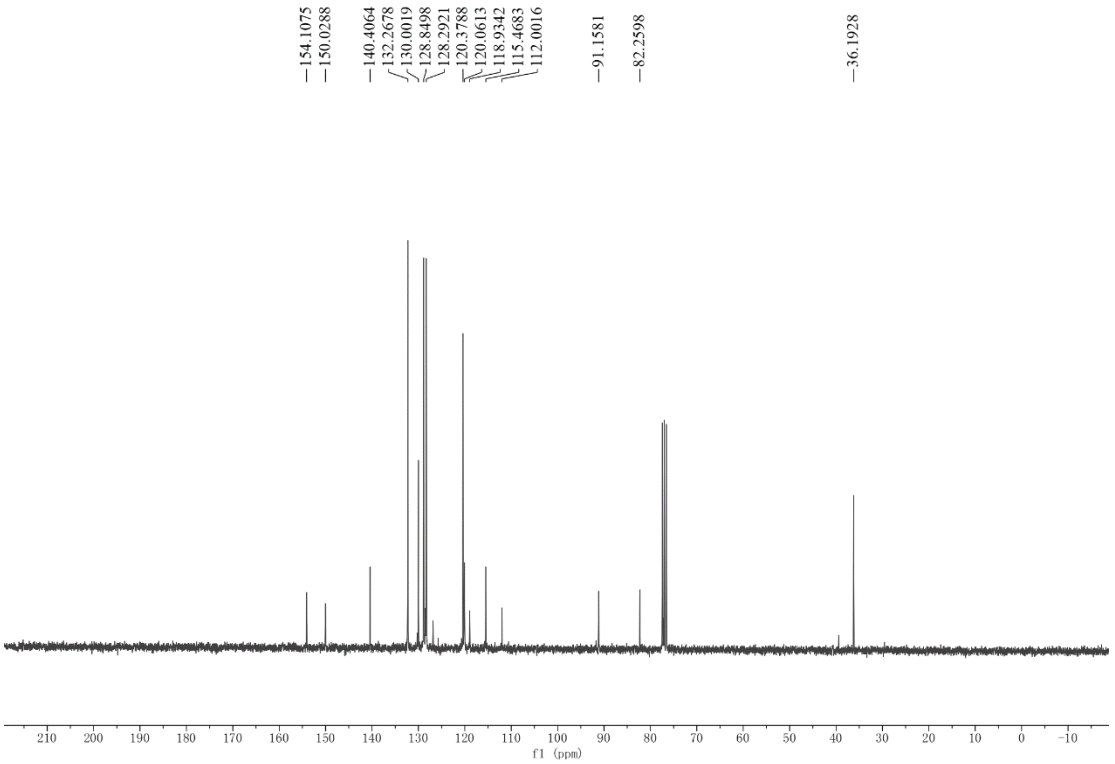
^{13}C NMR of N-methyl-3-phenyl-N-(4-(trifluoromethoxy)phenyl)propiolamide



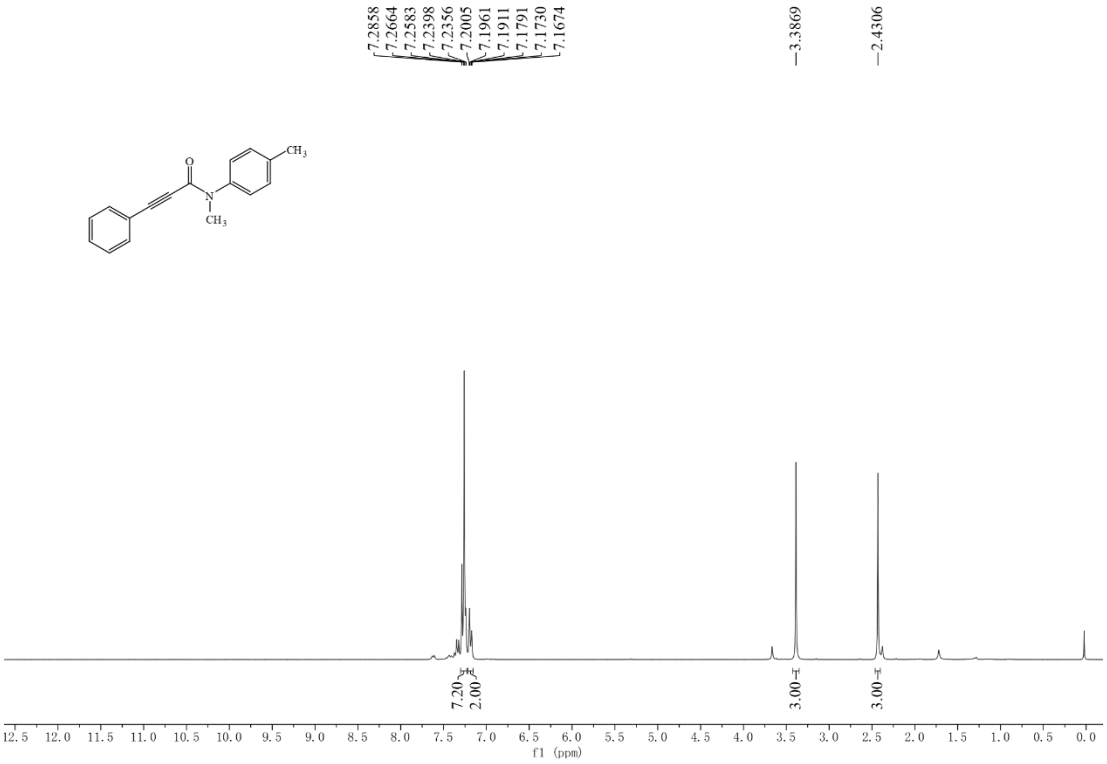
^{1}H NMR of N-(4-(difluoromethoxy)phenyl)-N-methyl-3-phenylpropiolamide



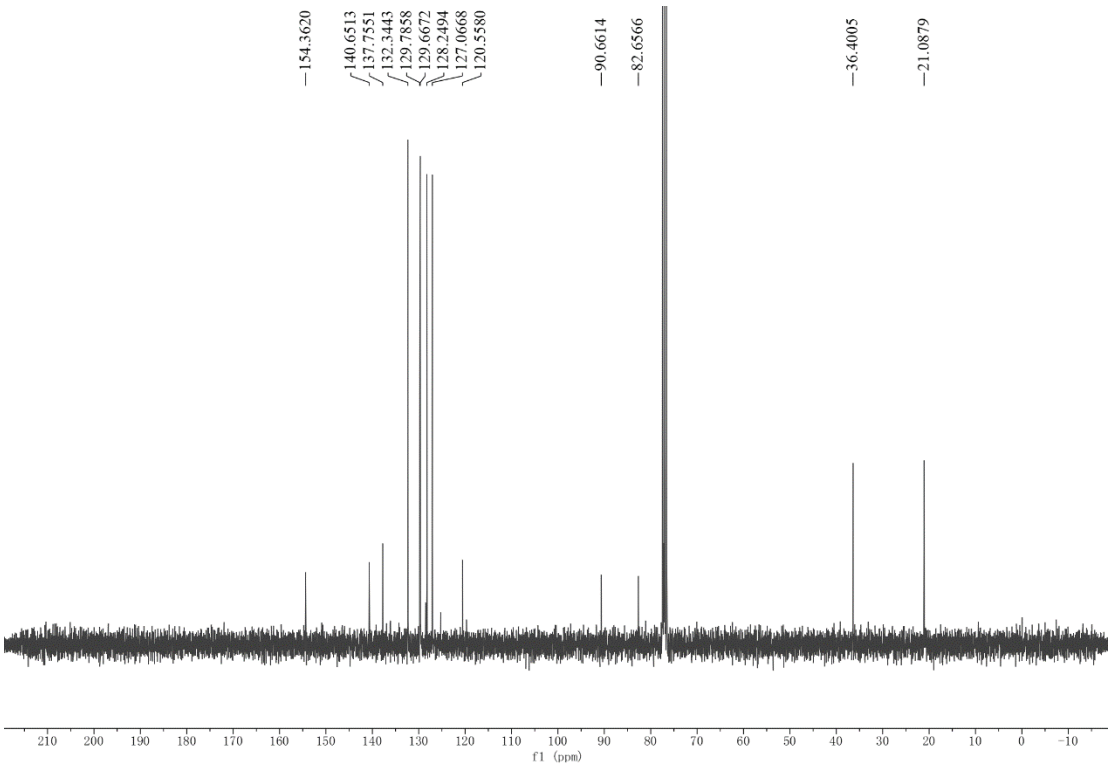
^{13}C NMR of N-(4-(difluoromethoxy)phenyl)-N-methyl-3-phenylpropiolamide



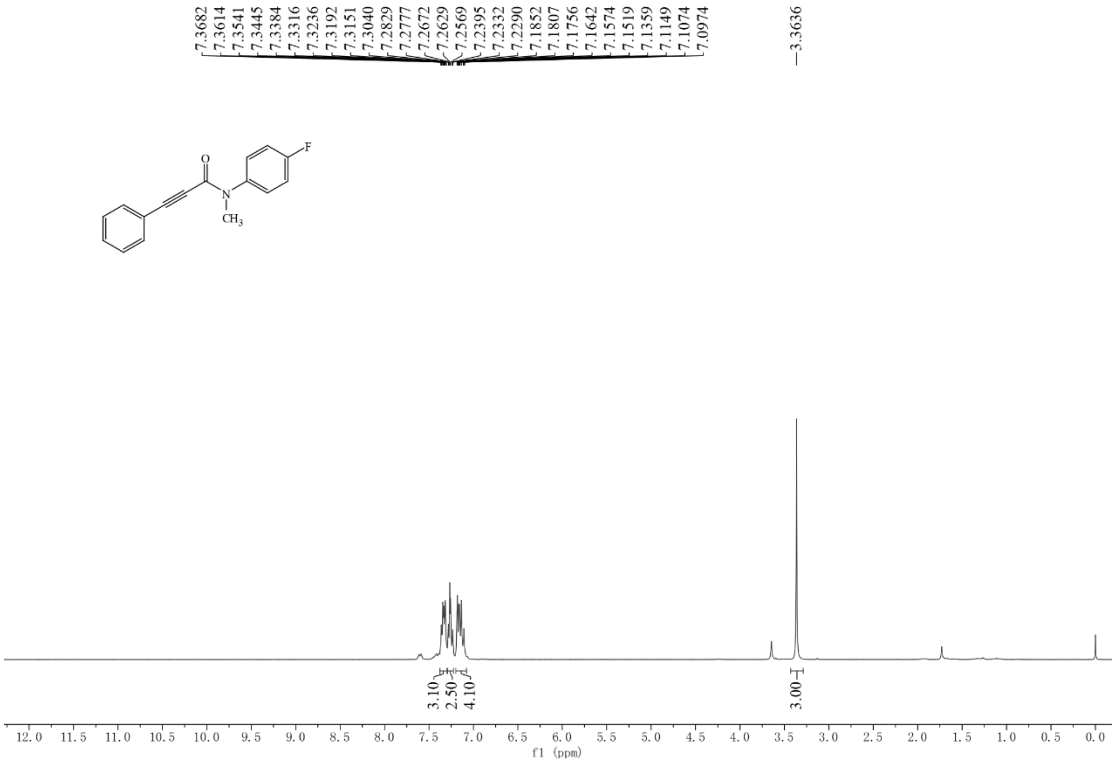
^{1}H NMR of N-methyl-3-phenyl-N-(p-tolyl)propiolamide [4]



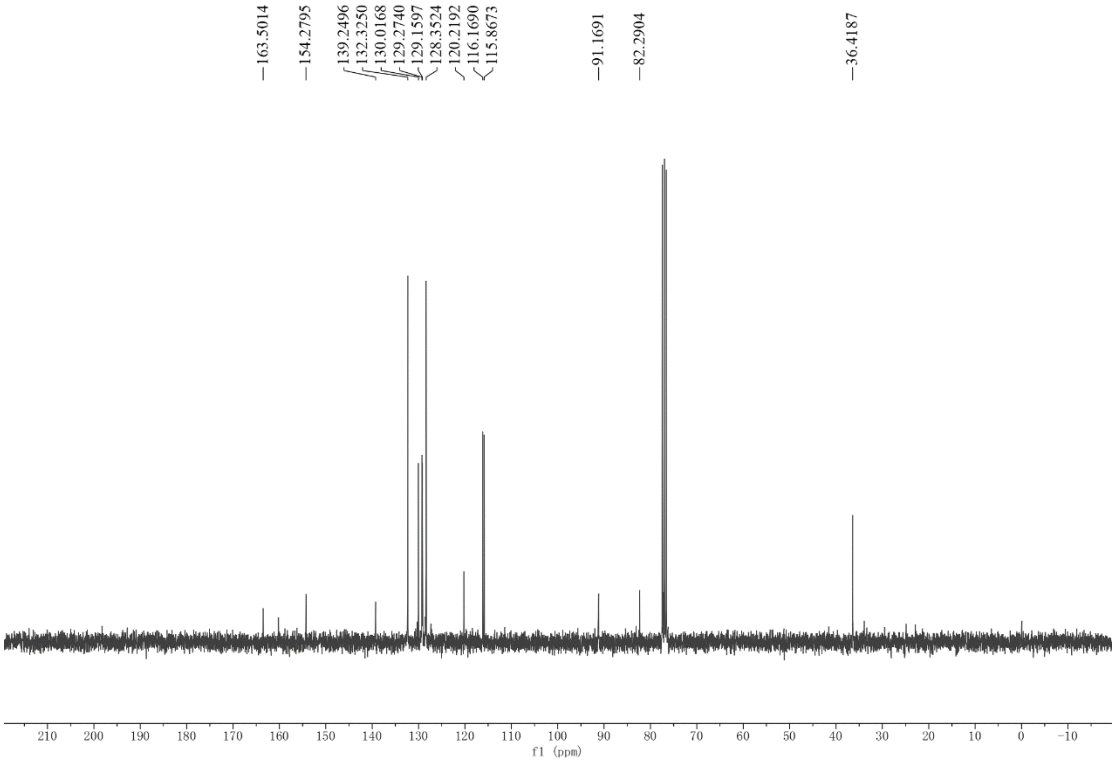
^{13}C NMR of N-methyl-3-phenyl-N-(p-tolyl)propiolamide [4]



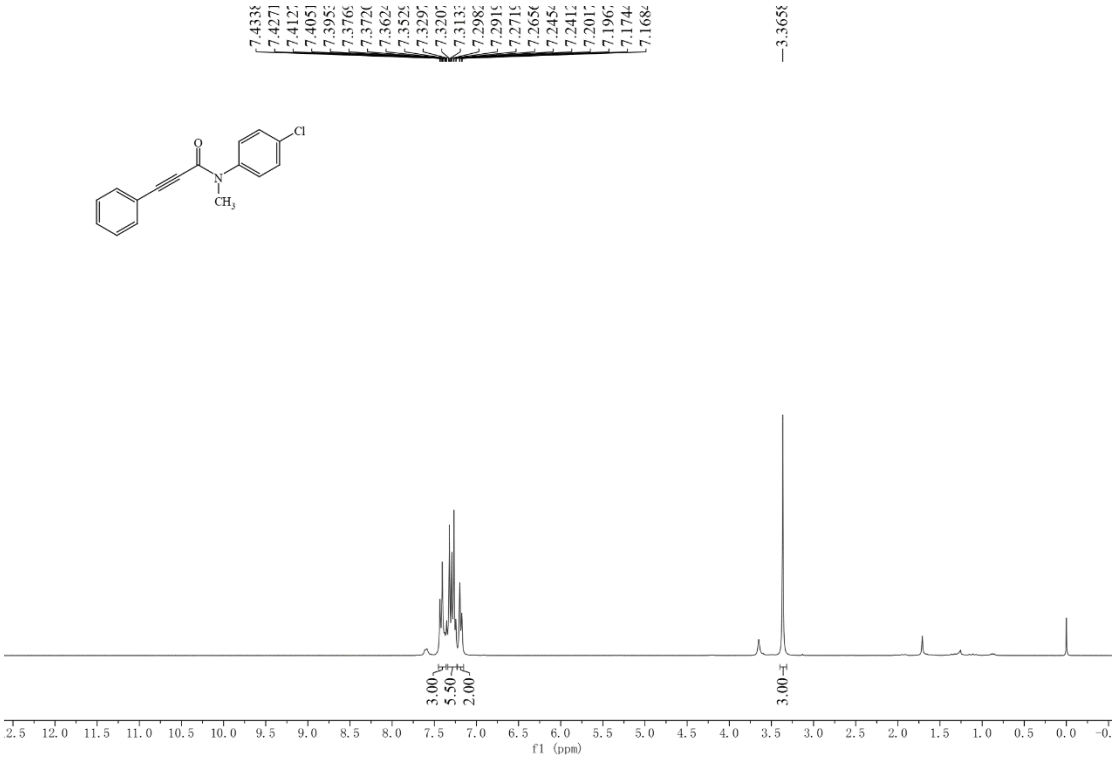
^{1}H NMR of N-(4-fluorophenyl)-N-methyl-3-phenylpropiolamide [4]



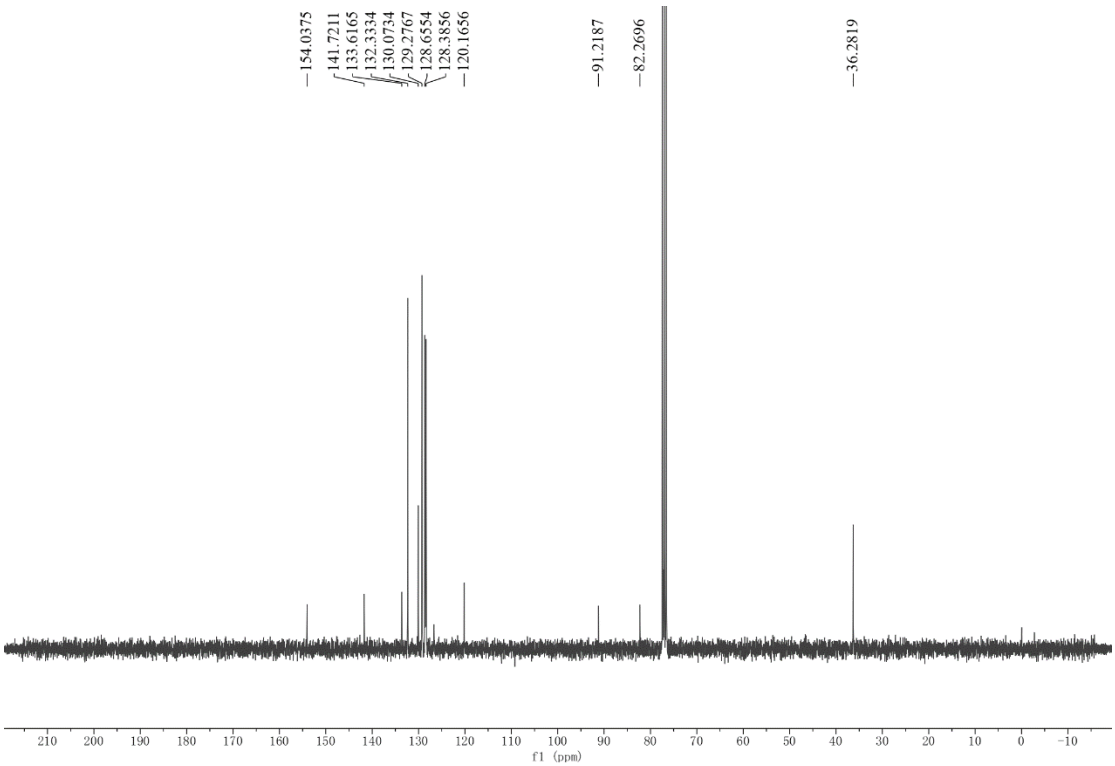
^{13}C NMR of N-(4-fluorophenyl)-N-methyl-3-phenylpropiolamide [4]



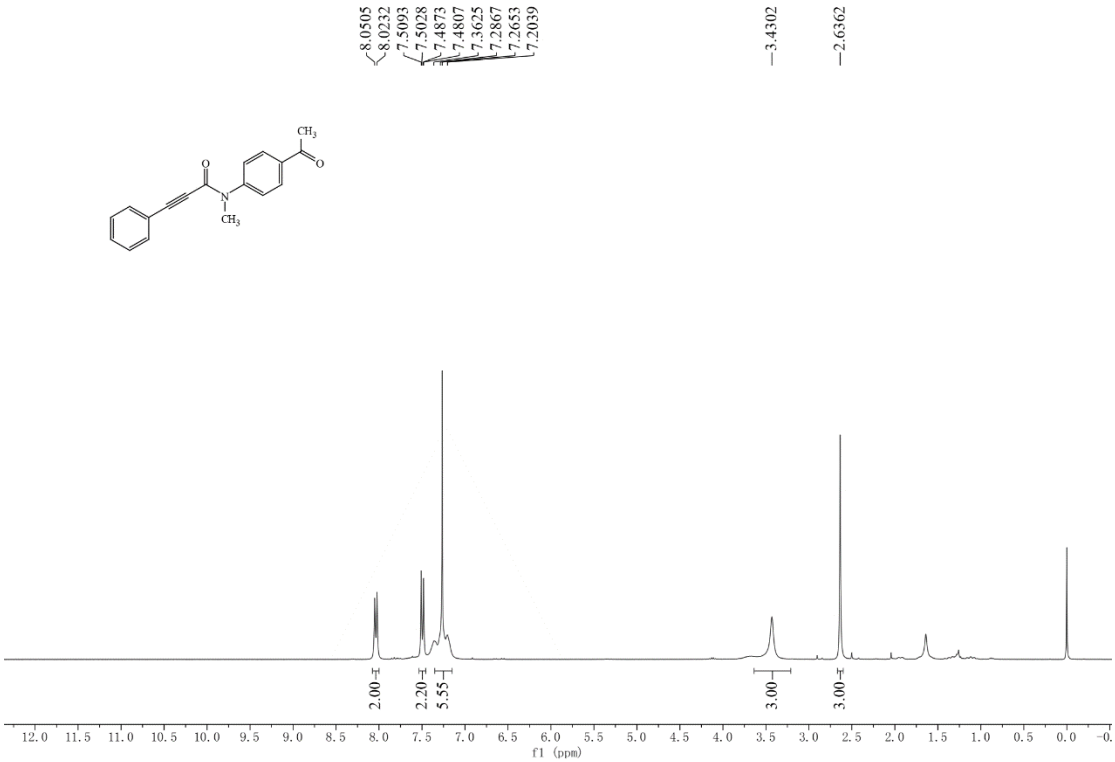
^{1}H NMR of N-(4-chlorophenyl)-N-methyl-3-phenylpropiolamide [4]



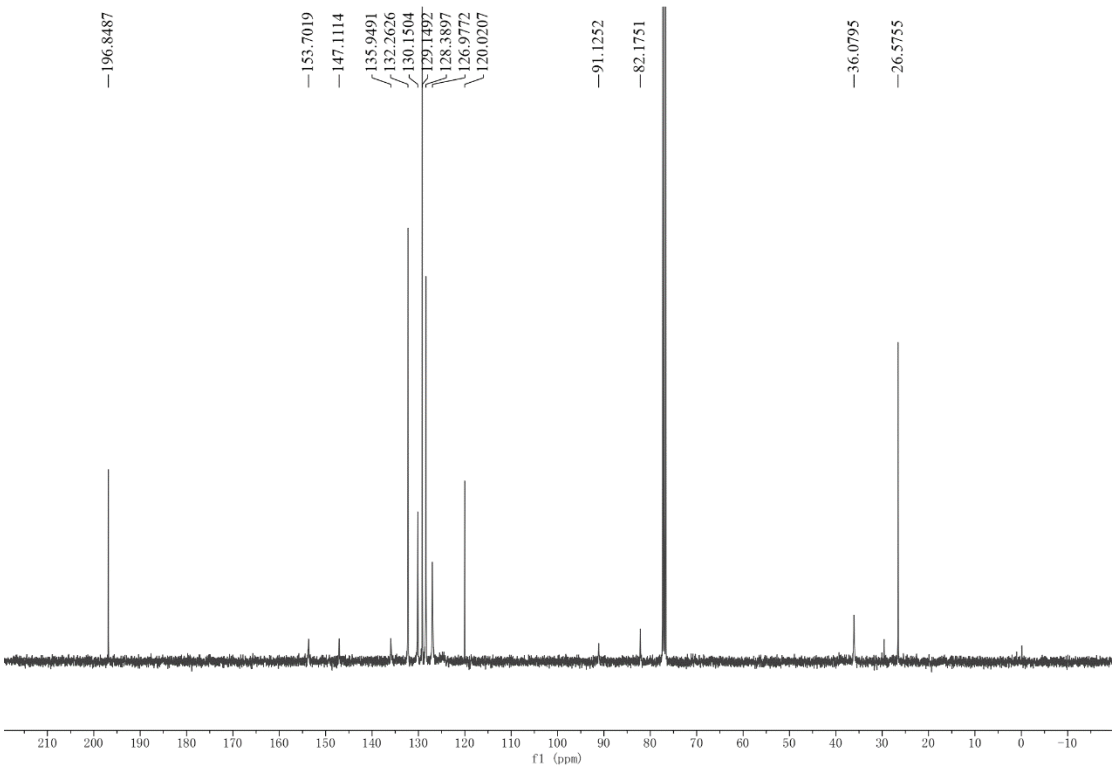
^{13}C NMR of N-(4-chlorophenyl)-N-methyl-3-phenylpropiolamide [4]



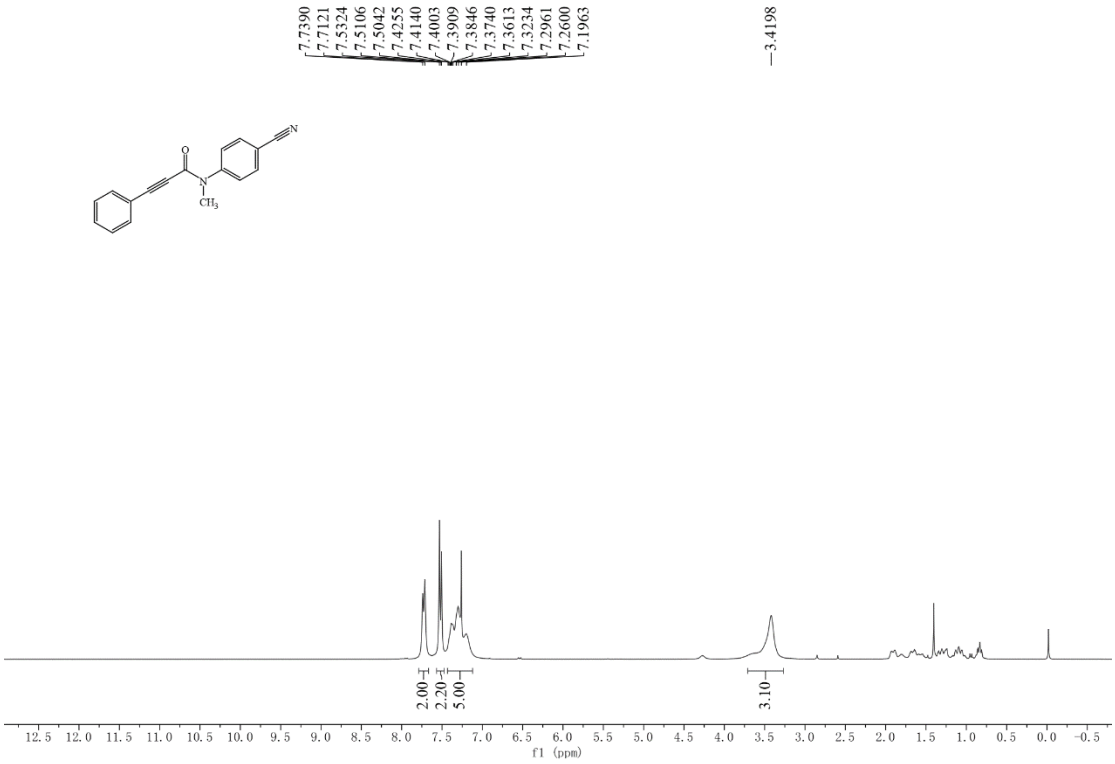
^{1}H NMR of N-(4-acetylphenyl)-N-methyl-3-phenylpropiolamide



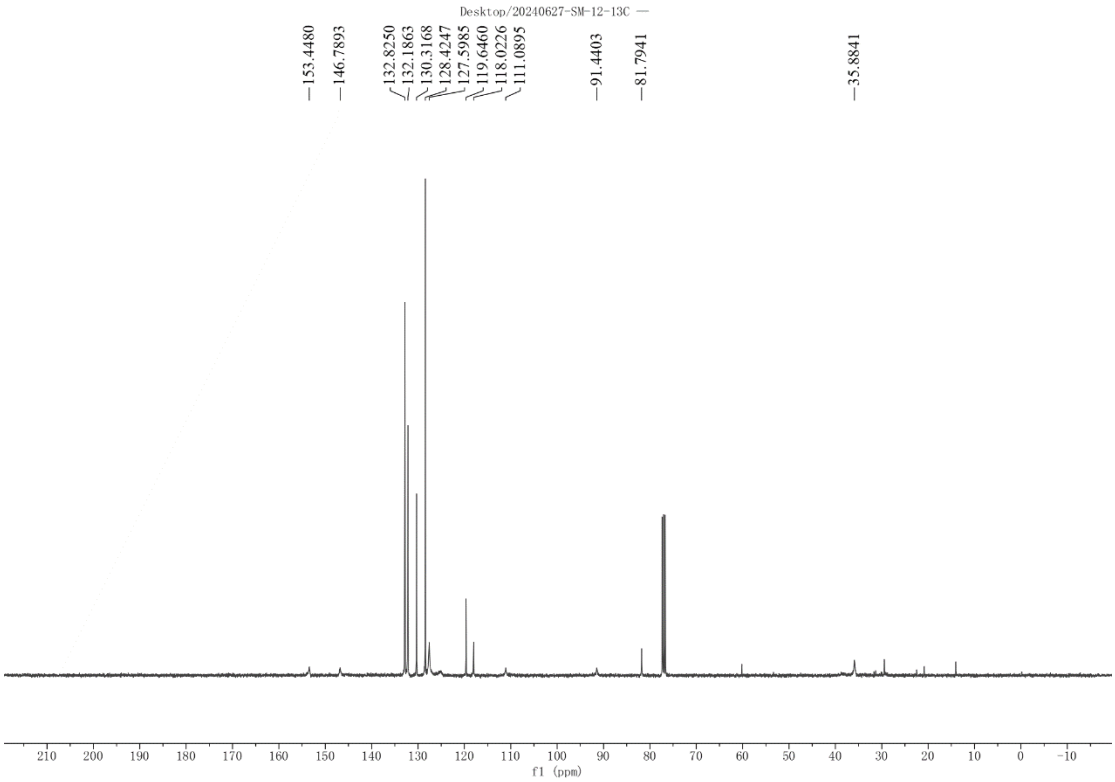
^{13}C NMR of N-(4-acetylphenyl)-N-methyl-3-phenylpropiolamide



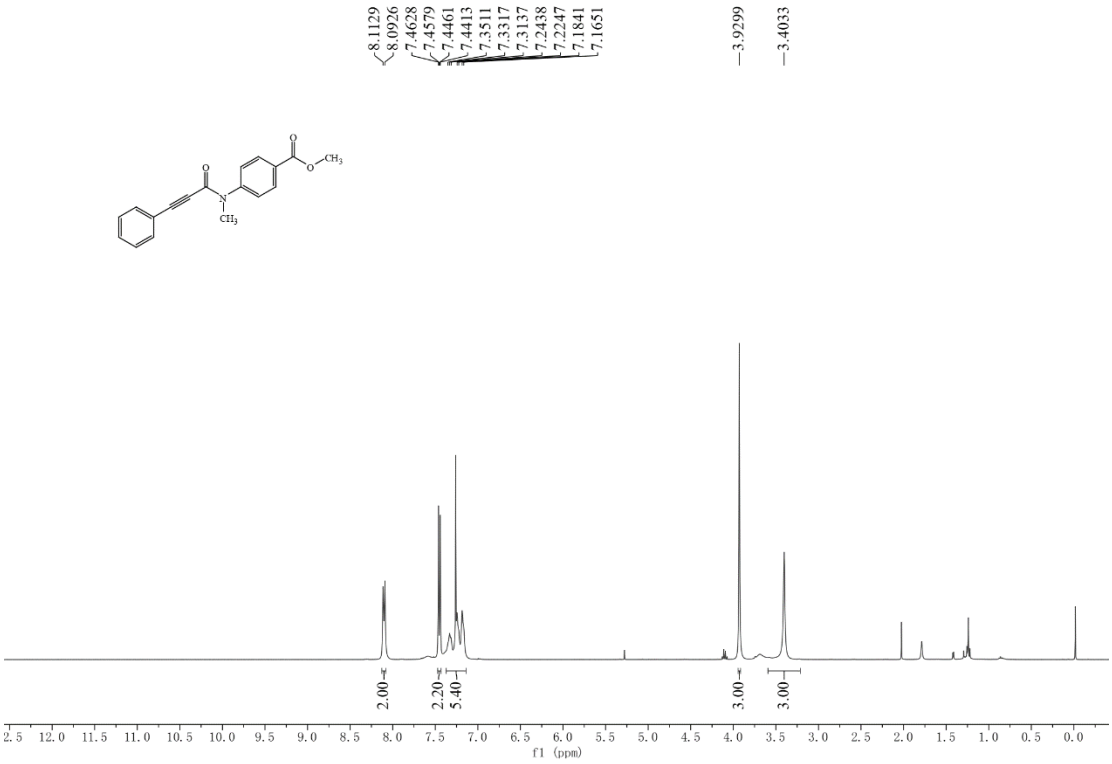
^{1}H NMR of N-(4-cyanophenyl)-N-methyl-3-phenylpropiolamide



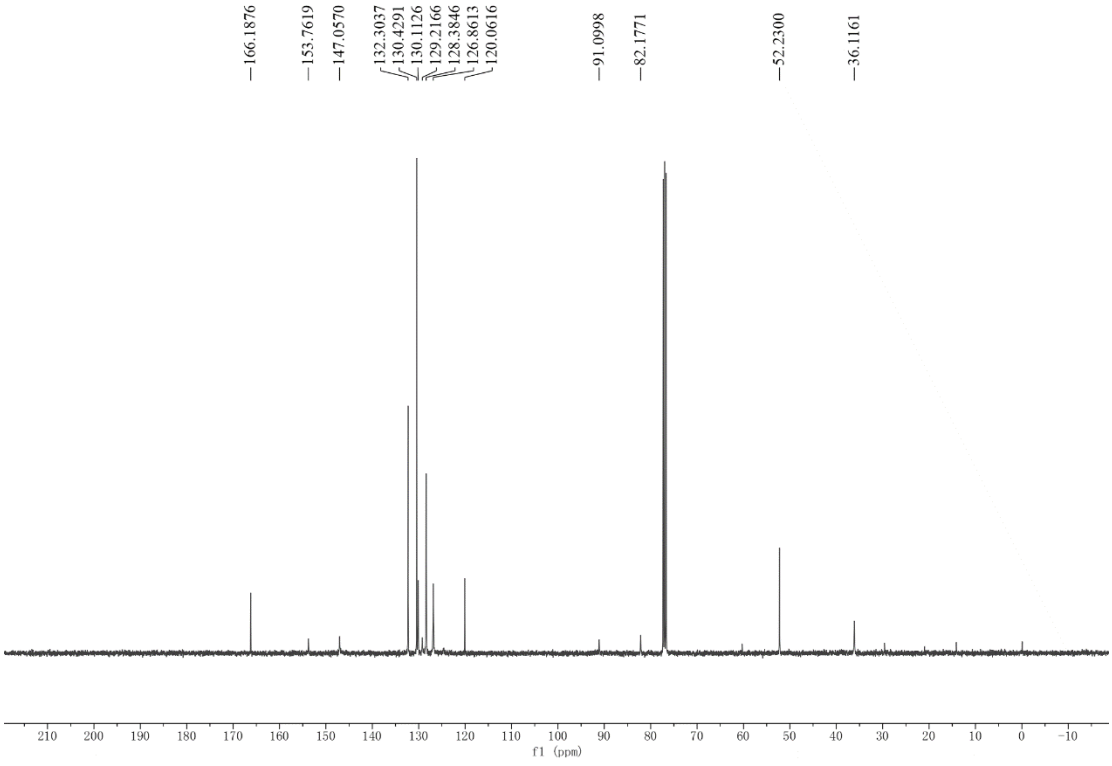
^{13}C NMR of N-(4-cyanophenyl)-N-methyl-3-phenylpropiolamide



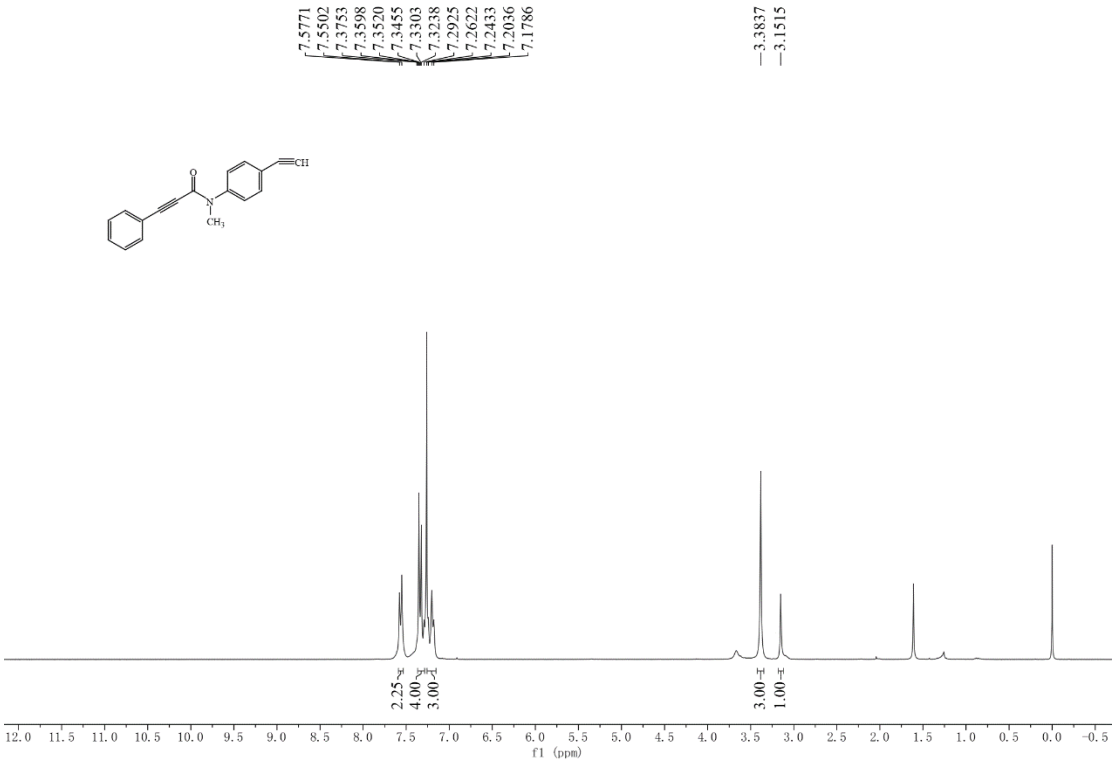
^{1}H NMR of methyl 4-(N-methyl-3-phenylpropiolamido)benzoate



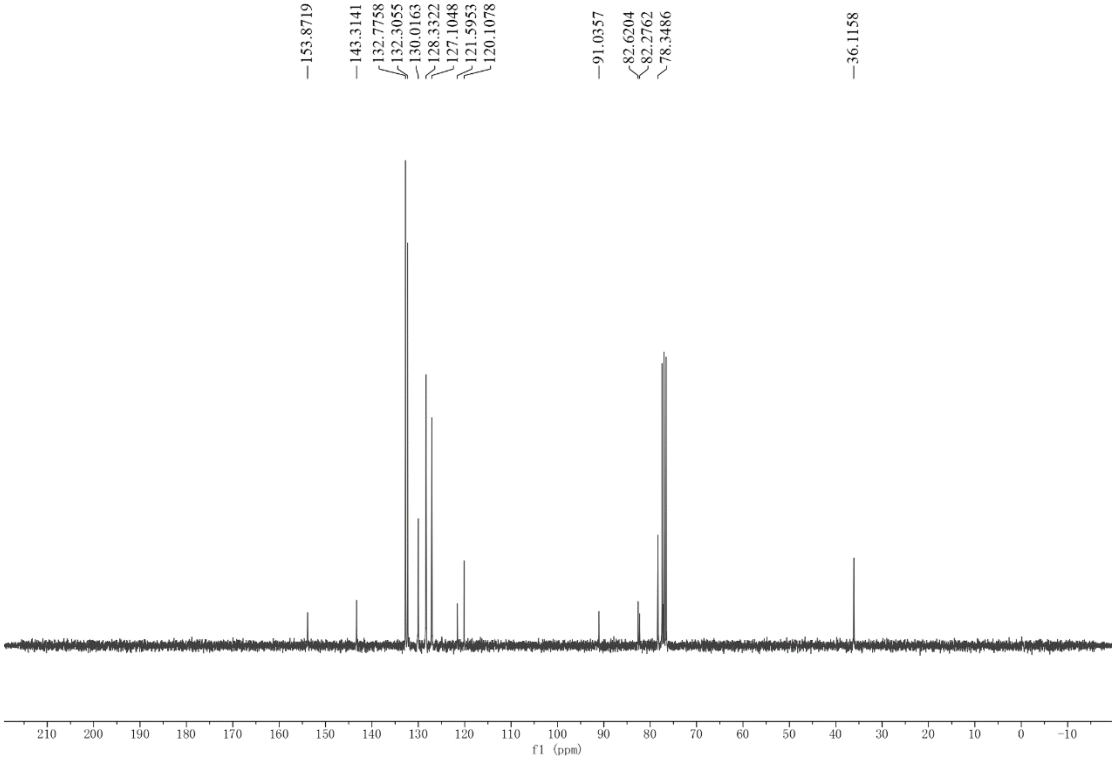
^{13}C NMR of methyl 4-(N-methyl-3-phenylpropiolamido)benzoate



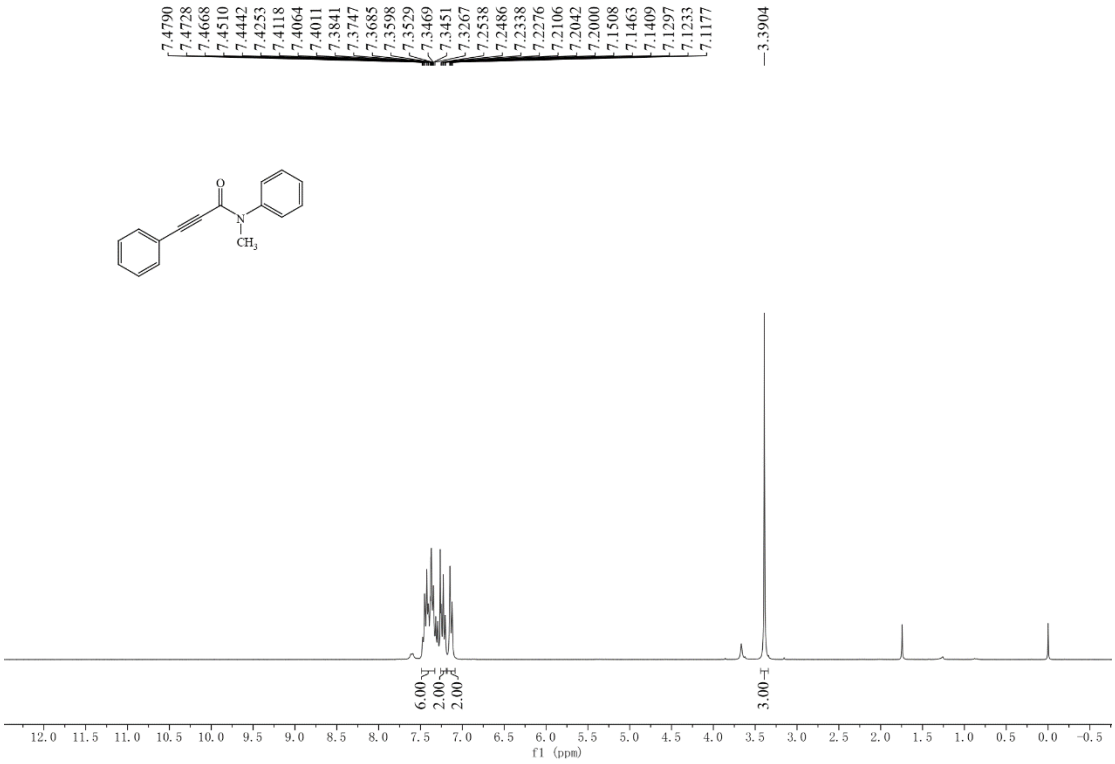
^{1}H NMR of N-(4-ethynylphenyl)-N-methyl-3-phenylpropiolamide



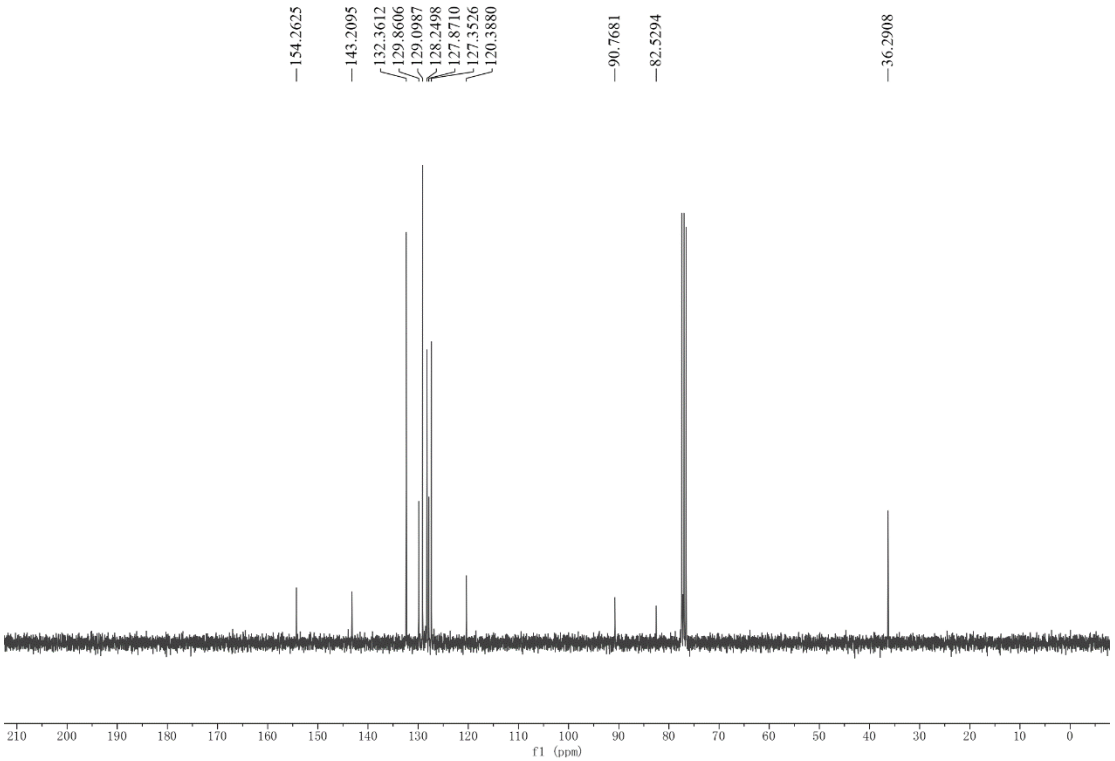
^{13}C NMR of N-(4-ethynylphenyl)-N-methyl-3-phenylpropiolamide



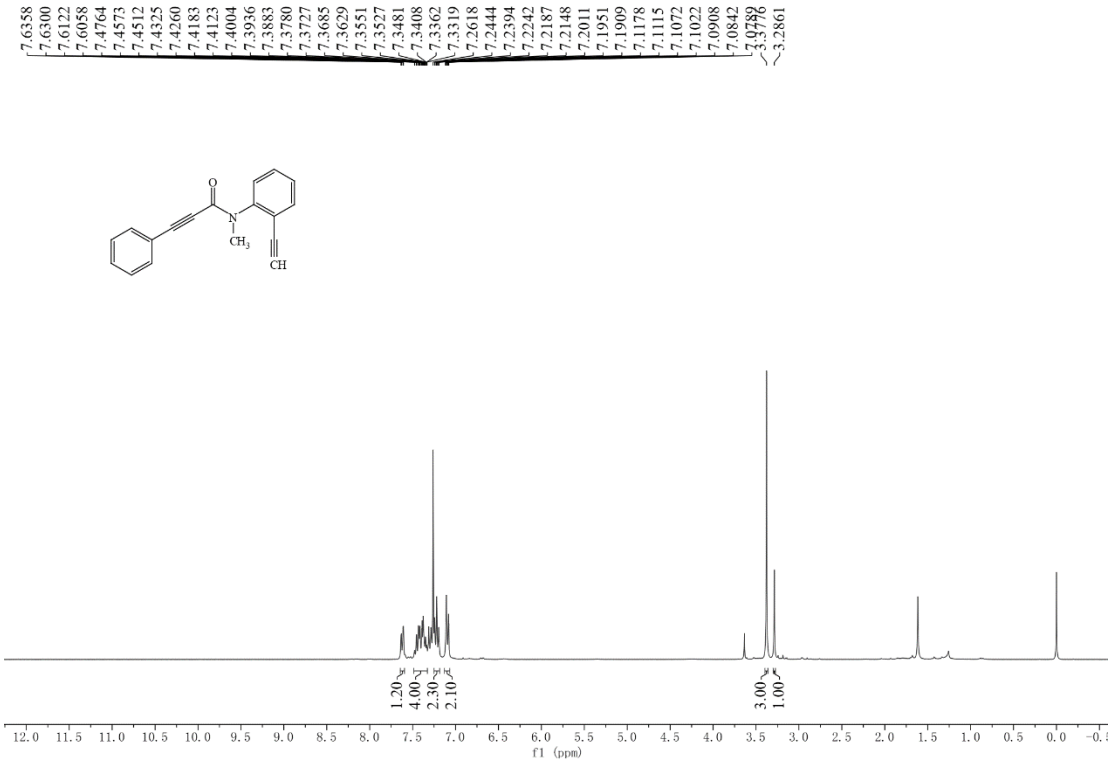
^{1}H NMR of N-methyl-N,3-diphenylpropiolamide [4]



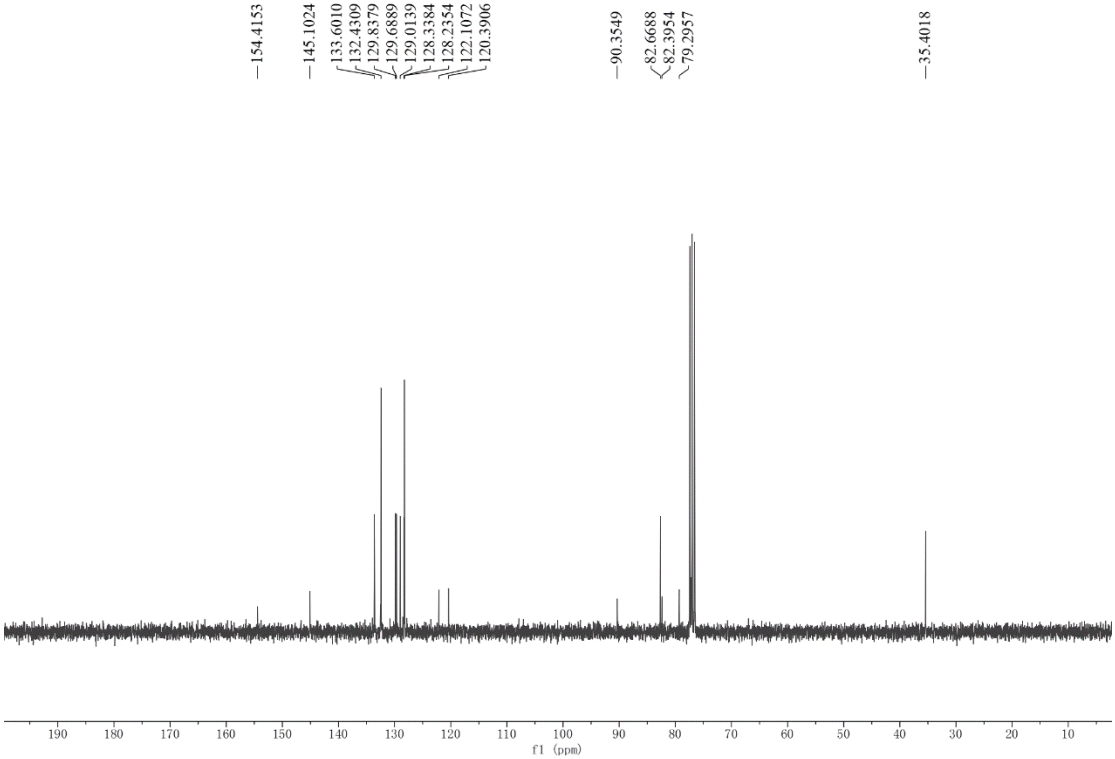
^{13}C NMR of N-methyl-N,3-diphenylpropiolamide [4]



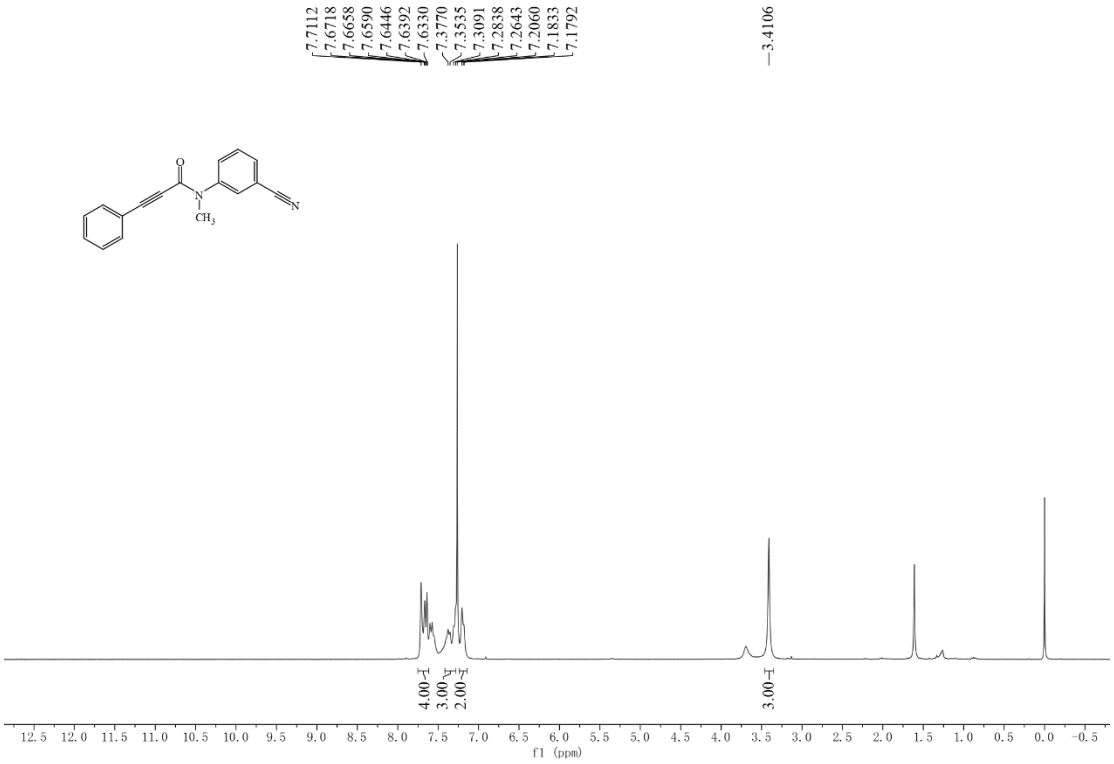
^{1}H NMR of N-(2-ethynylphenyl)-N-methyl-3-phenylpropiolamide



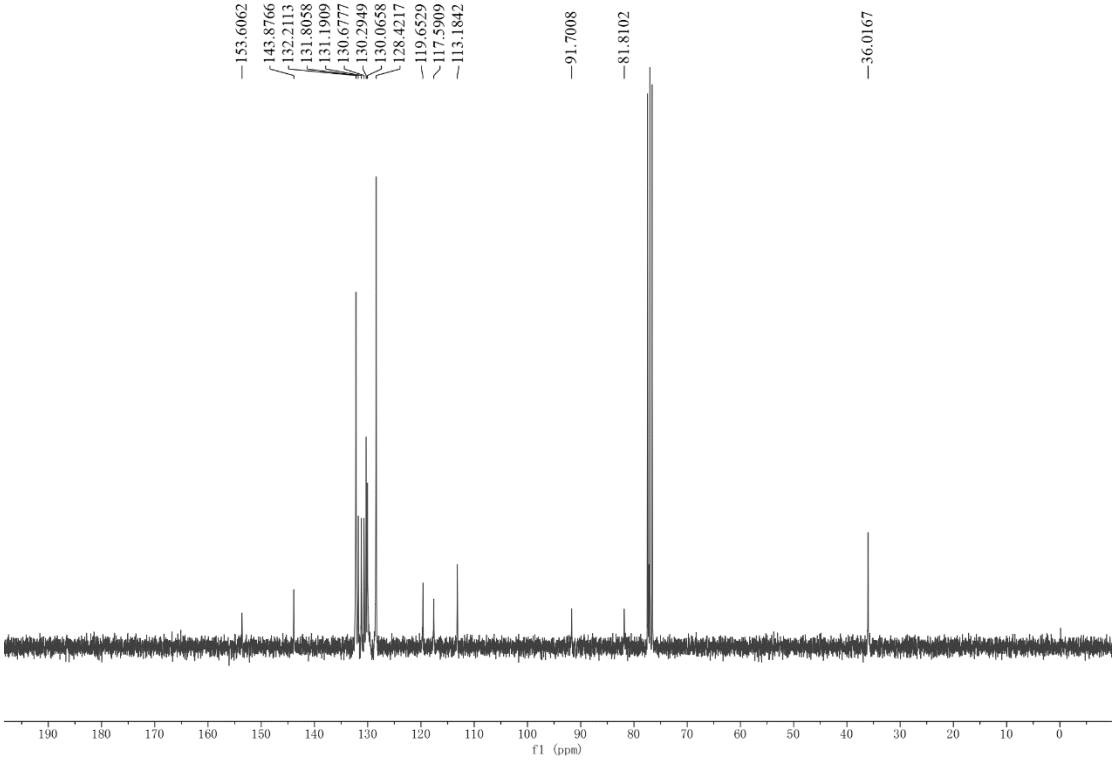
^{13}C NMR of N-(2-ethynylphenyl)-N-methyl-3-phenylpropiolamide



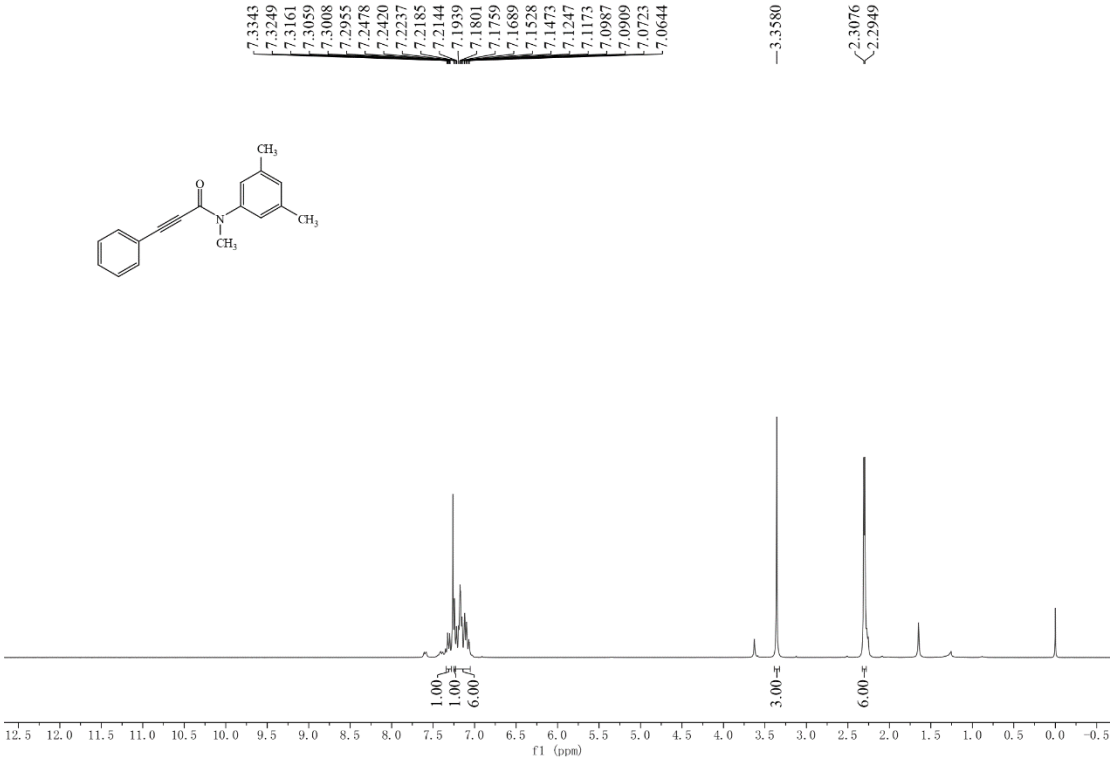
^{1}H NMR of N-(3-cyanophenyl)-N-methyl-3-phenylpropiolamide



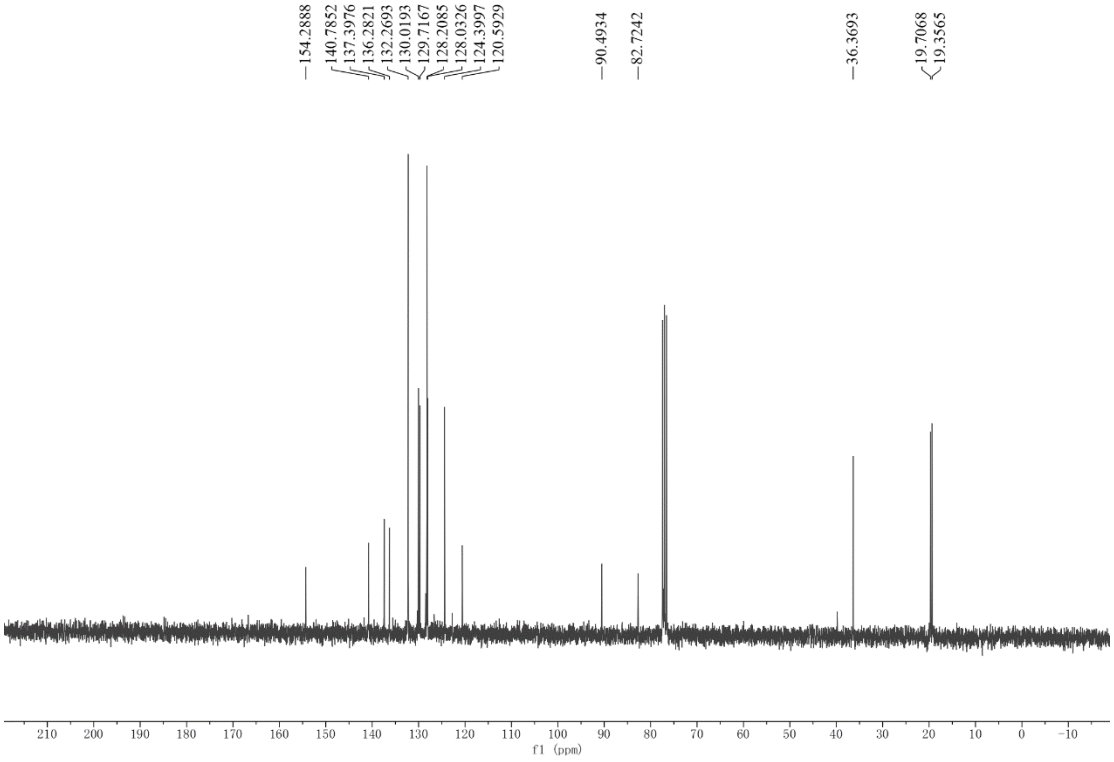
^{13}C NMR of N-(3-cyanophenyl)-N-methyl-3-phenylpropiolamide



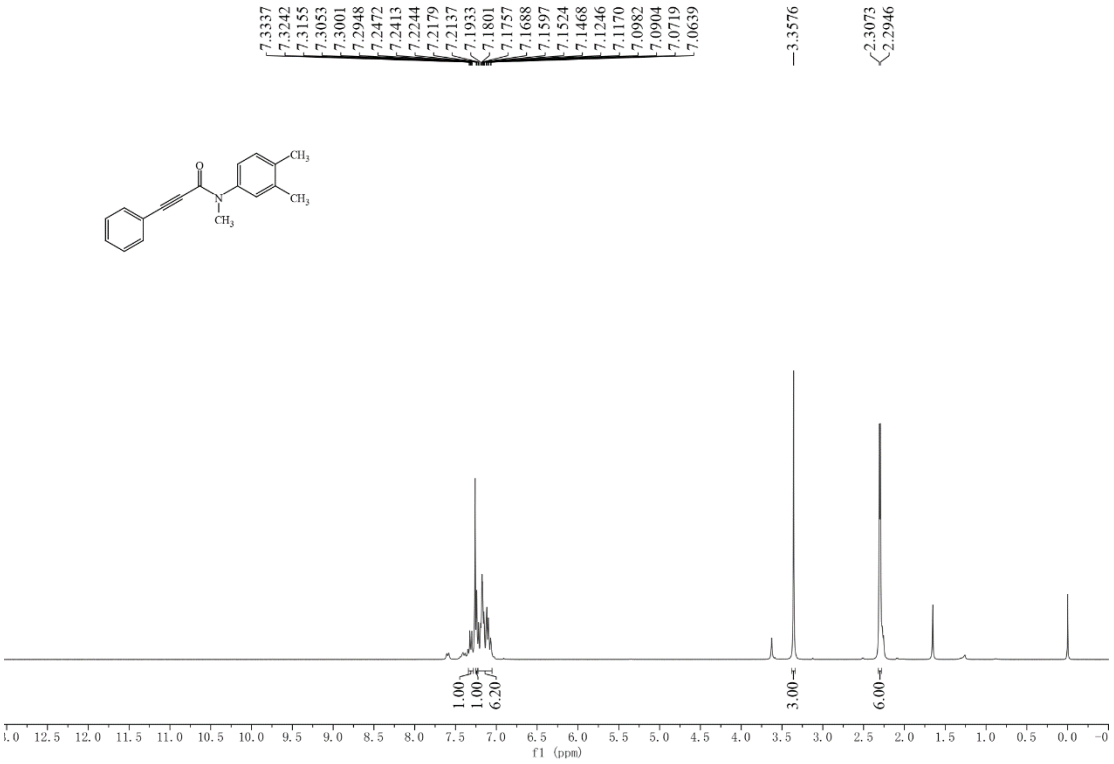
^{1}H NMR of N-(3,5-dimethylphenyl)-N-methyl-3-phenylpropiolamide [5]



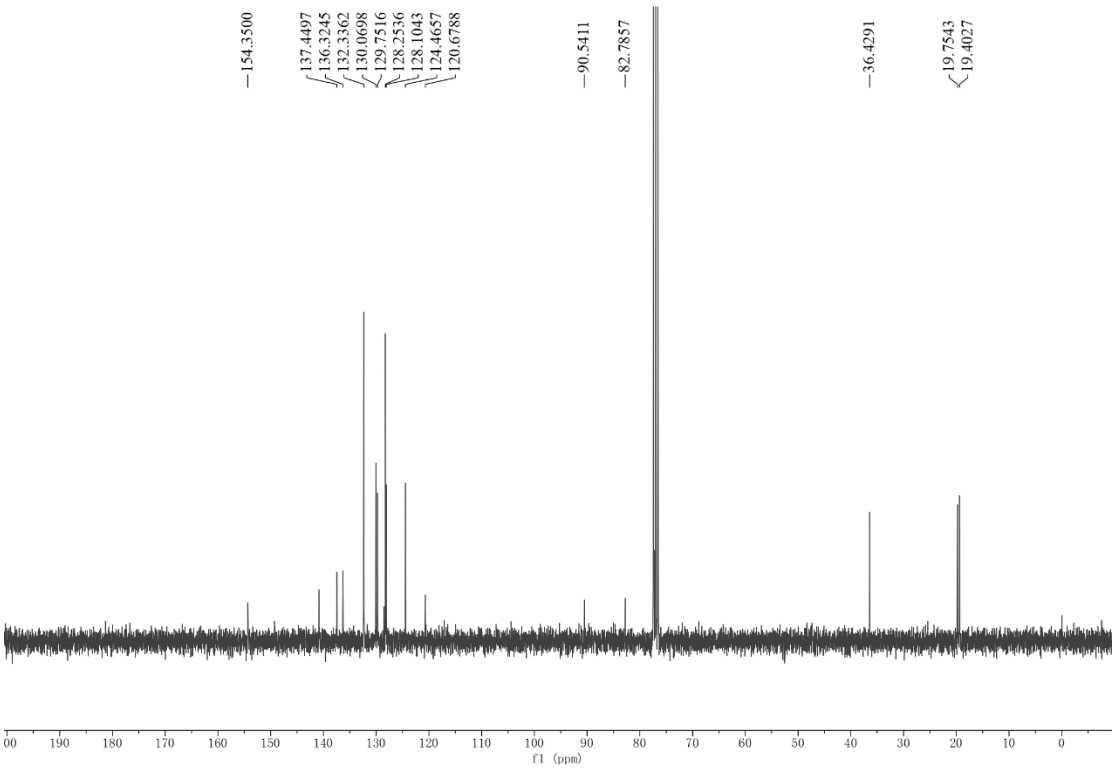
^{13}C NMR of N-(3,5-dimethylphenyl)-N-methyl-3-phenylpropiolamide [5]



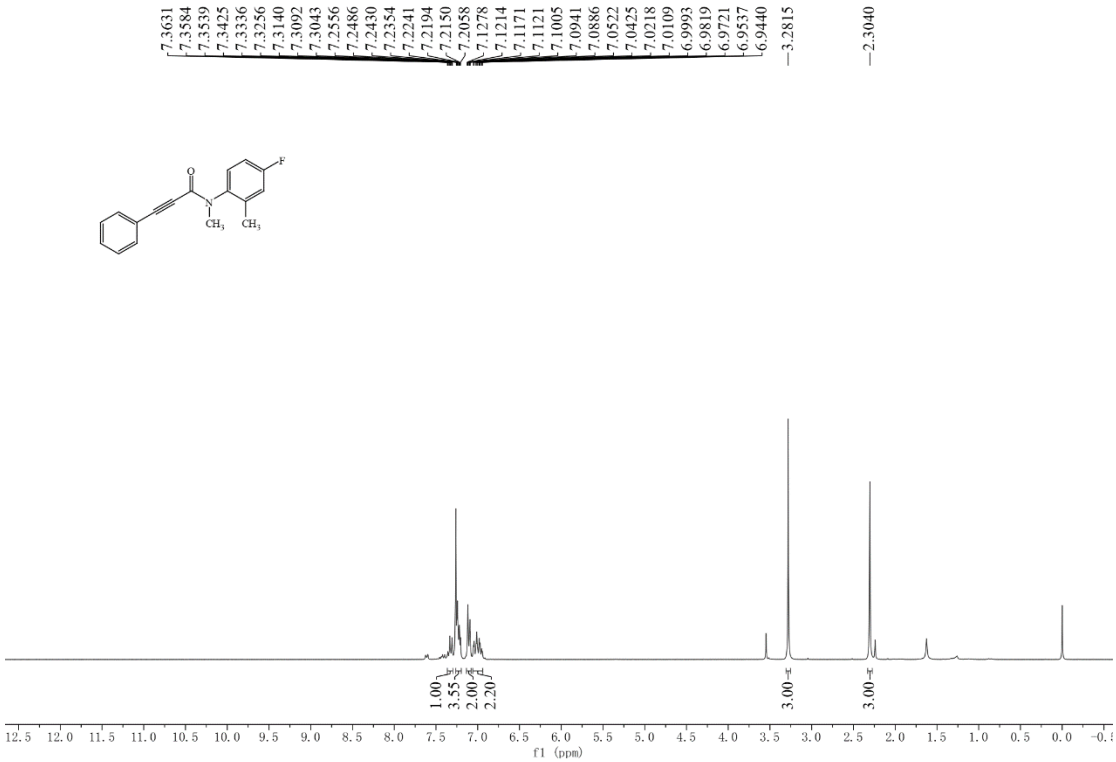
^{1}H NMR of N-(3,4-dimethylphenyl)-N-methyl-3-phenylpropiolamide



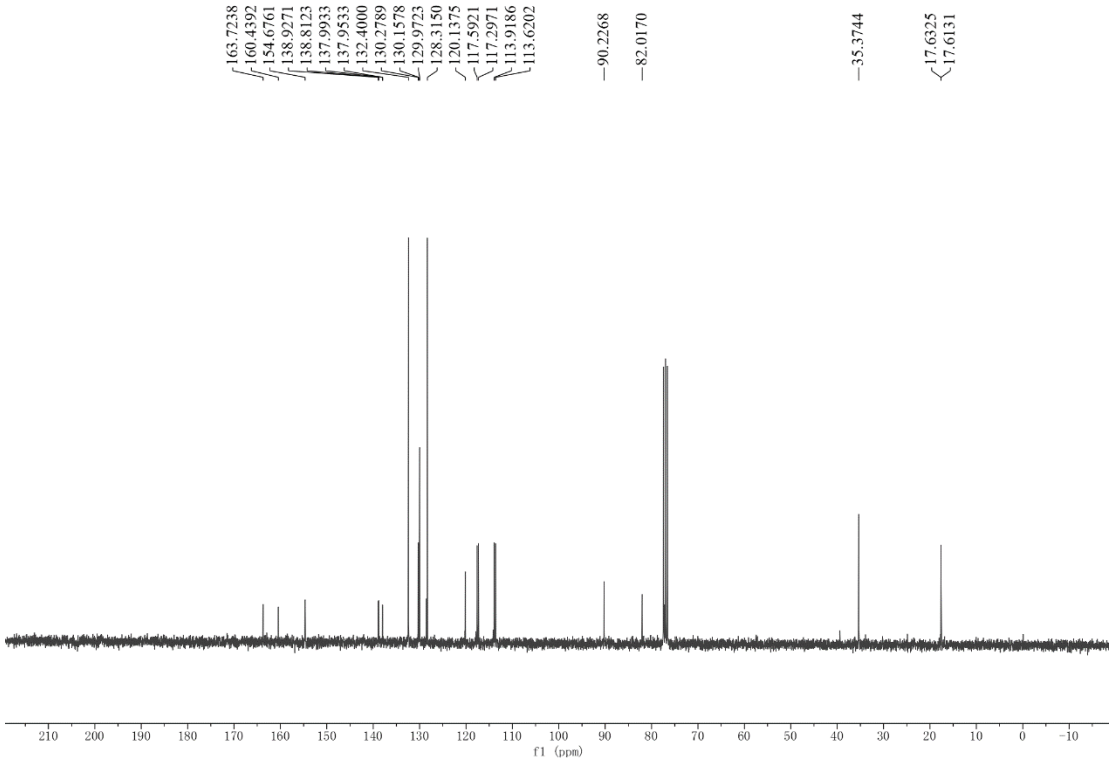
^{13}C NMR of N-(3,4-dimethylphenyl)-N-methyl-3-phenylpropiolamide



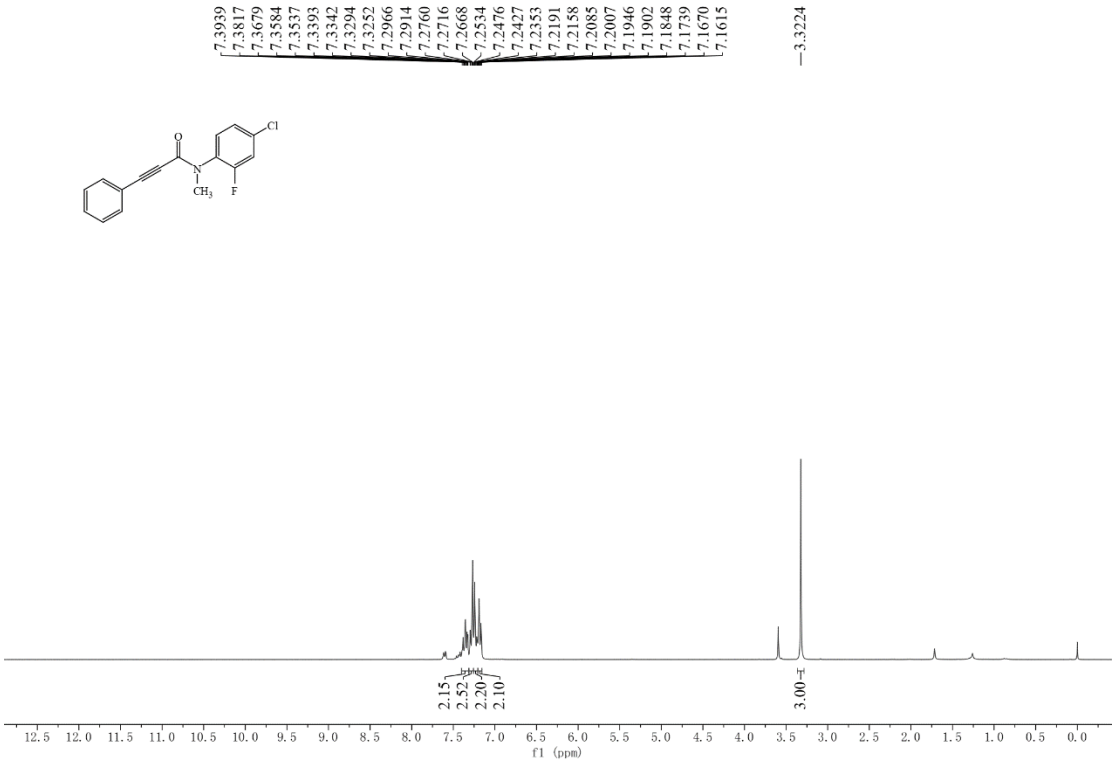
^{1}H NMR of N-(4-fluoro-2-methylphenyl)-N-methyl-3-phenylpropiolamide



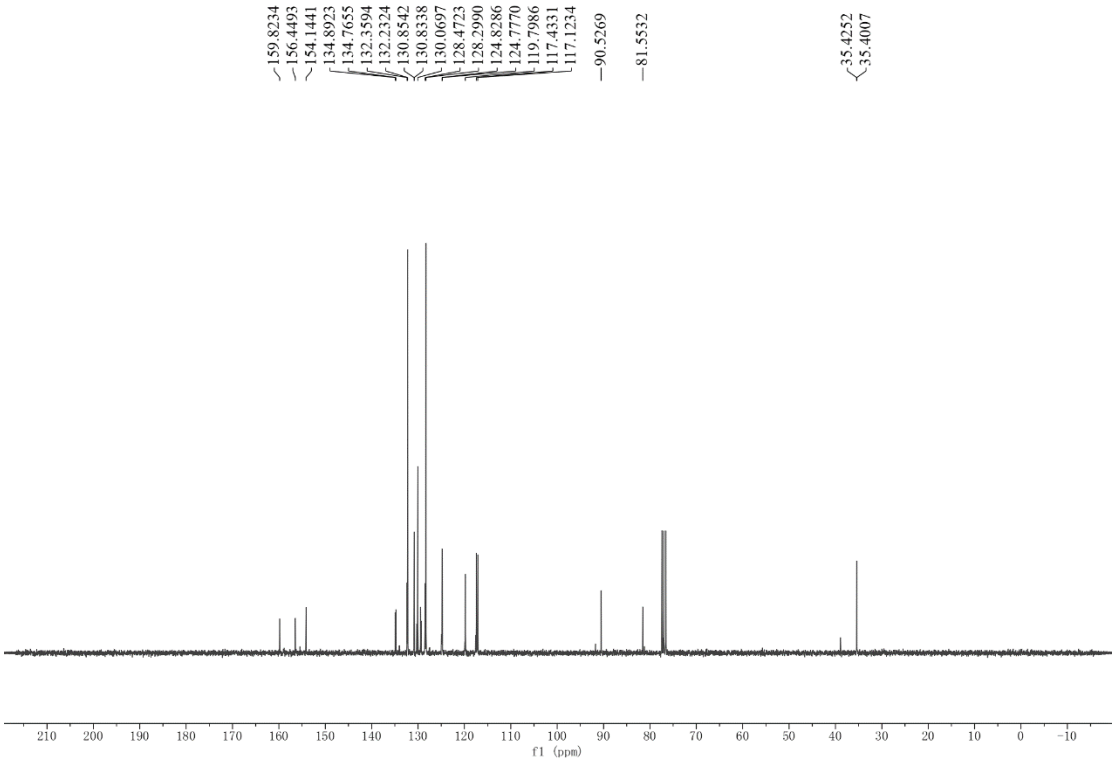
^{13}C NMR of N-(4-fluoro-2-methylphenyl)-N-methyl-3-phenylpropiolamide



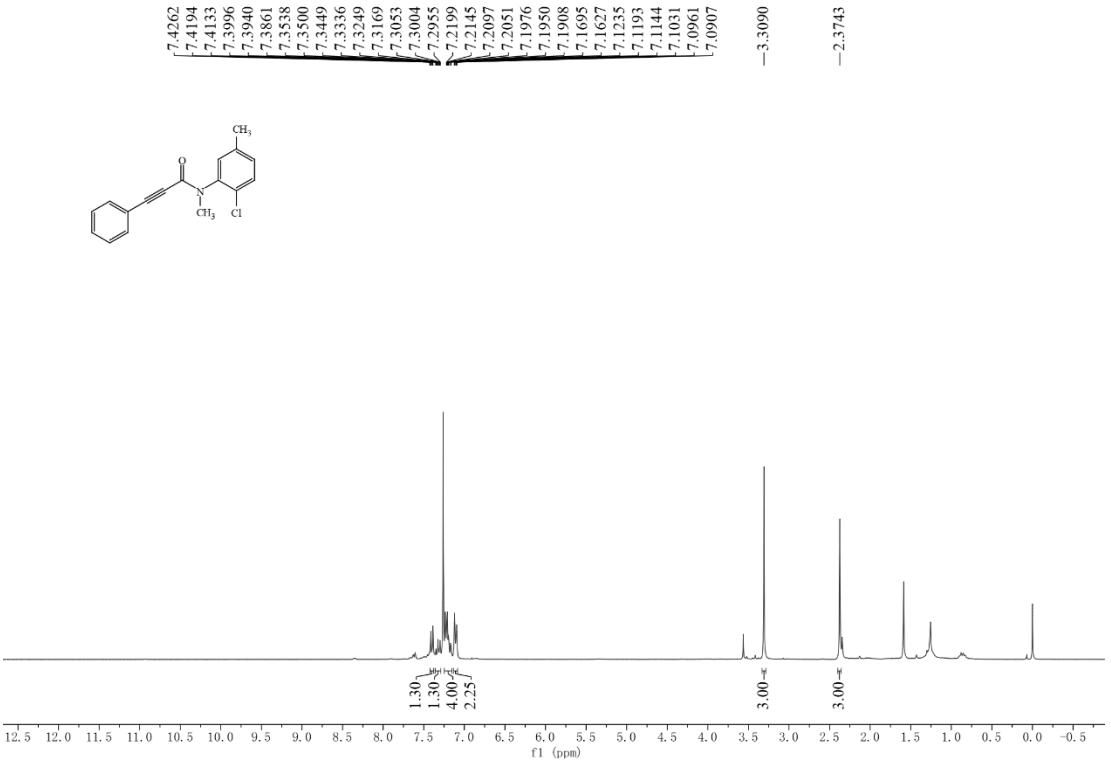
^{1}H NMR of N-(4-chloro-2-fluorophenyl)-N-methyl-3-phenylpropiolamide



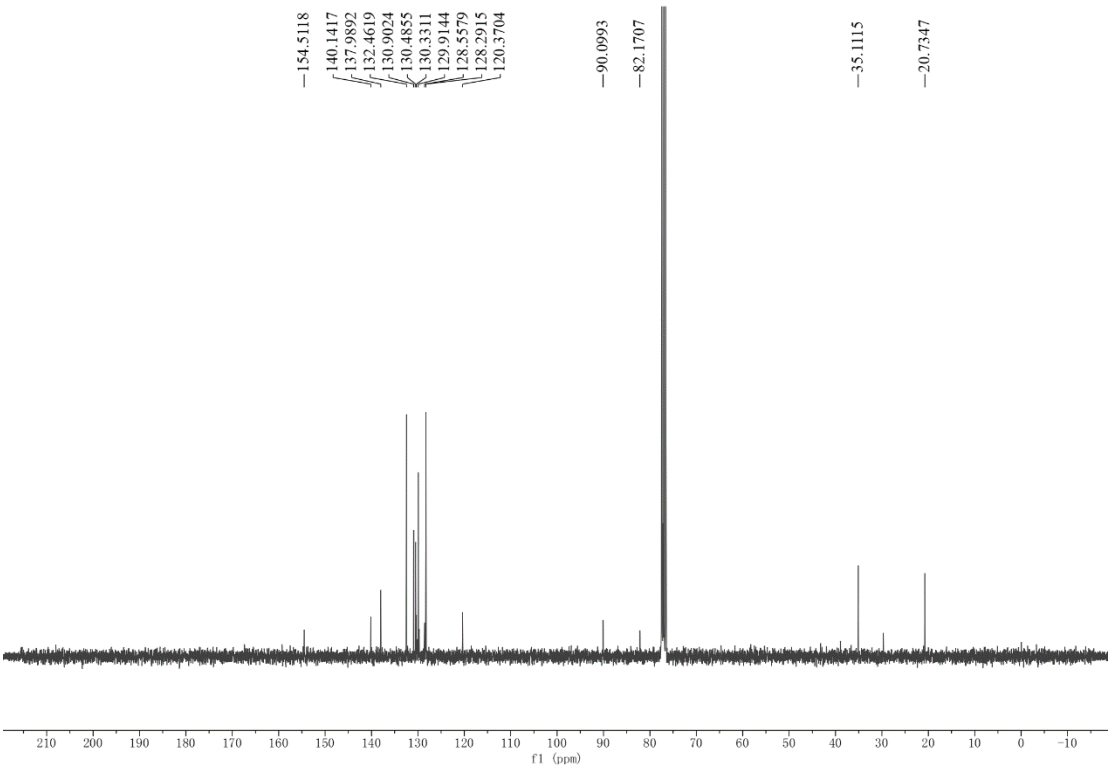
^{13}C NMR of N-(4-chloro-2-fluorophenyl)-N-methyl-3-phenylpropiolamide



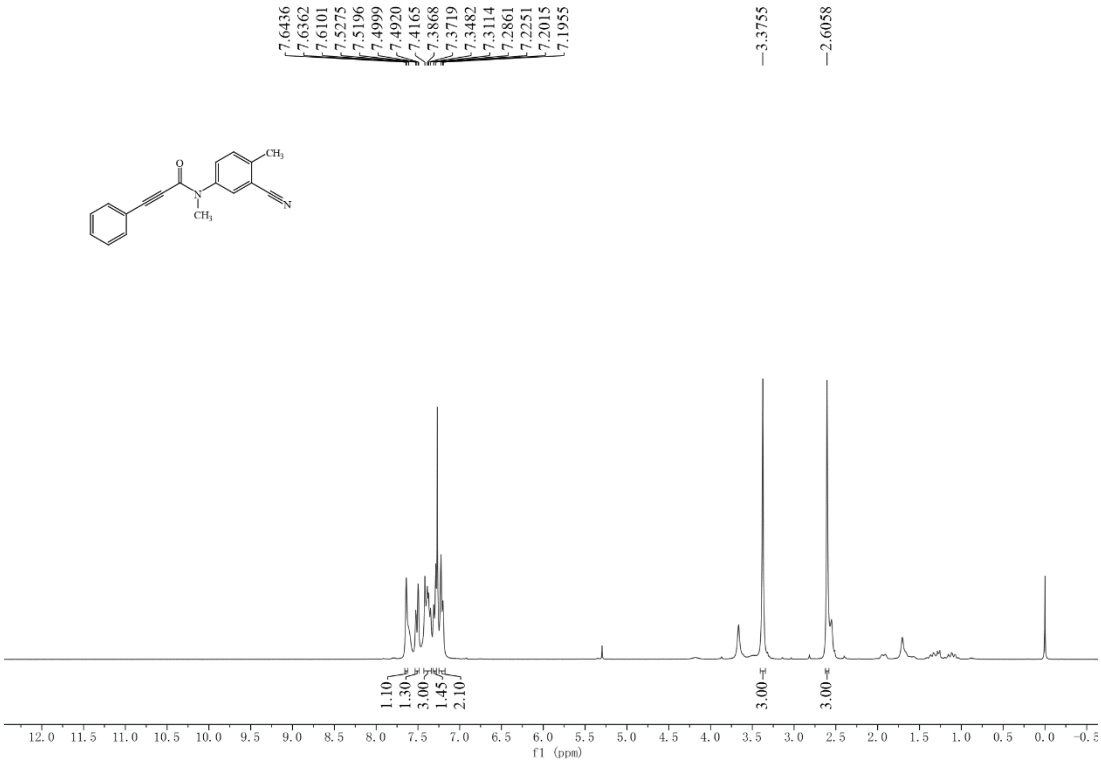
^{1}H NMR of N-(2-chloro-5-methylphenyl)-N-methyl-3-phenylpropiolamide



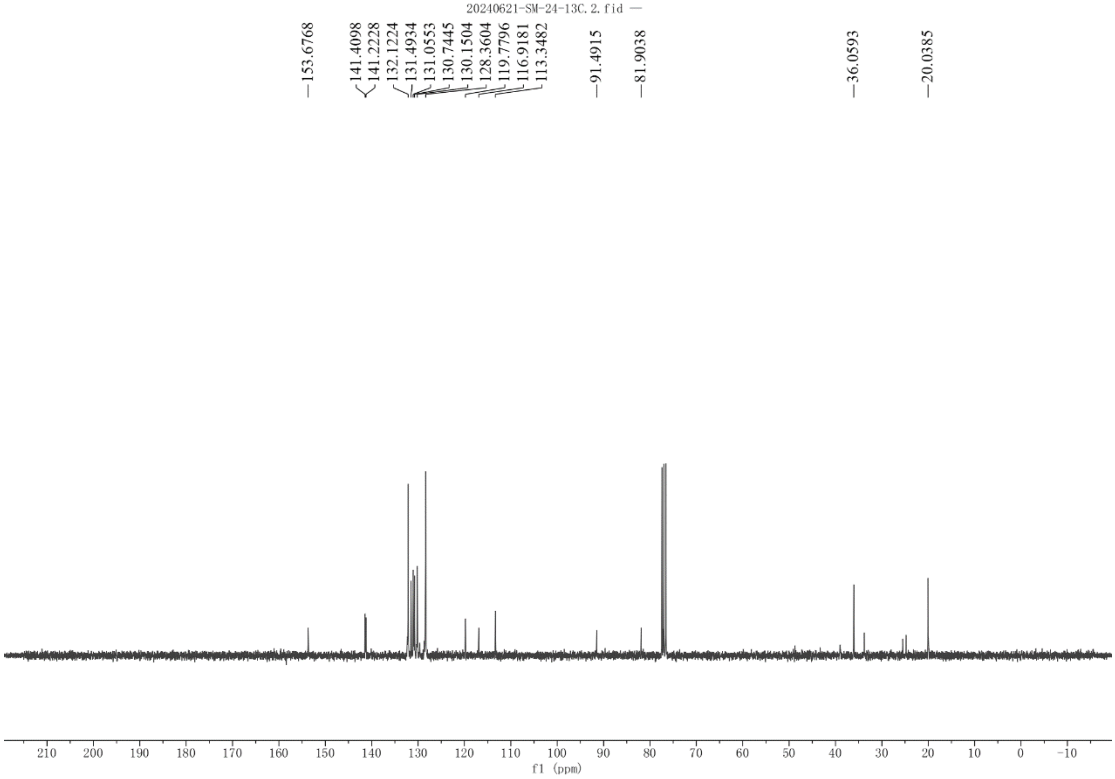
^{13}C NMR of N-(2-chloro-5-methylphenyl)-N-methyl-3-phenylpropiolamide



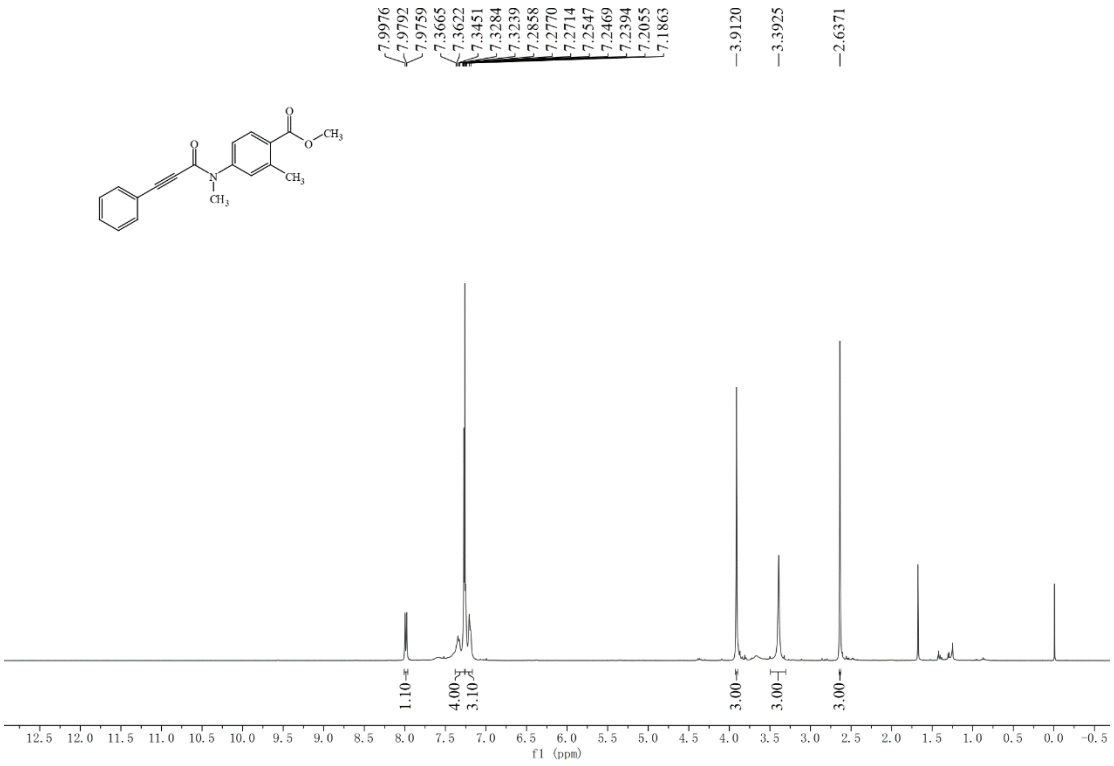
^{1}H NMR of N-(3-cyano-4-methylphenyl)-N-methyl-3-phenylpropiolamide



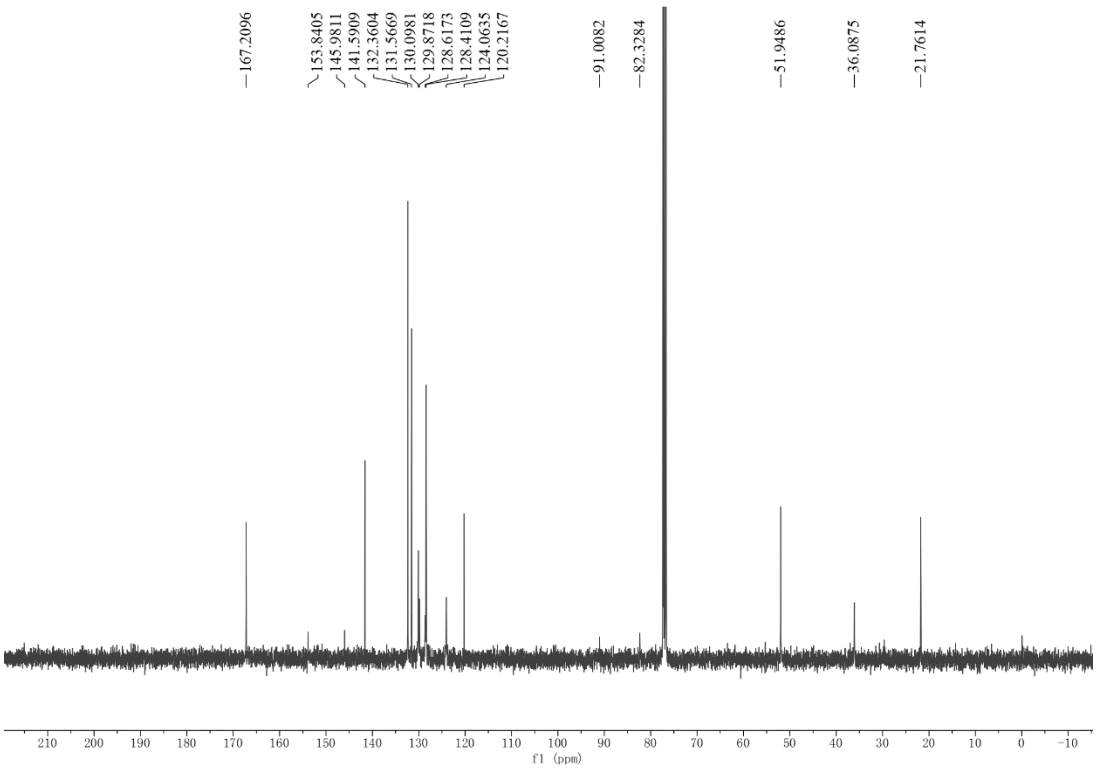
^{13}C NMR of N-(3-cyano-4-methylphenyl)-N-methyl-3-phenylpropiolamide



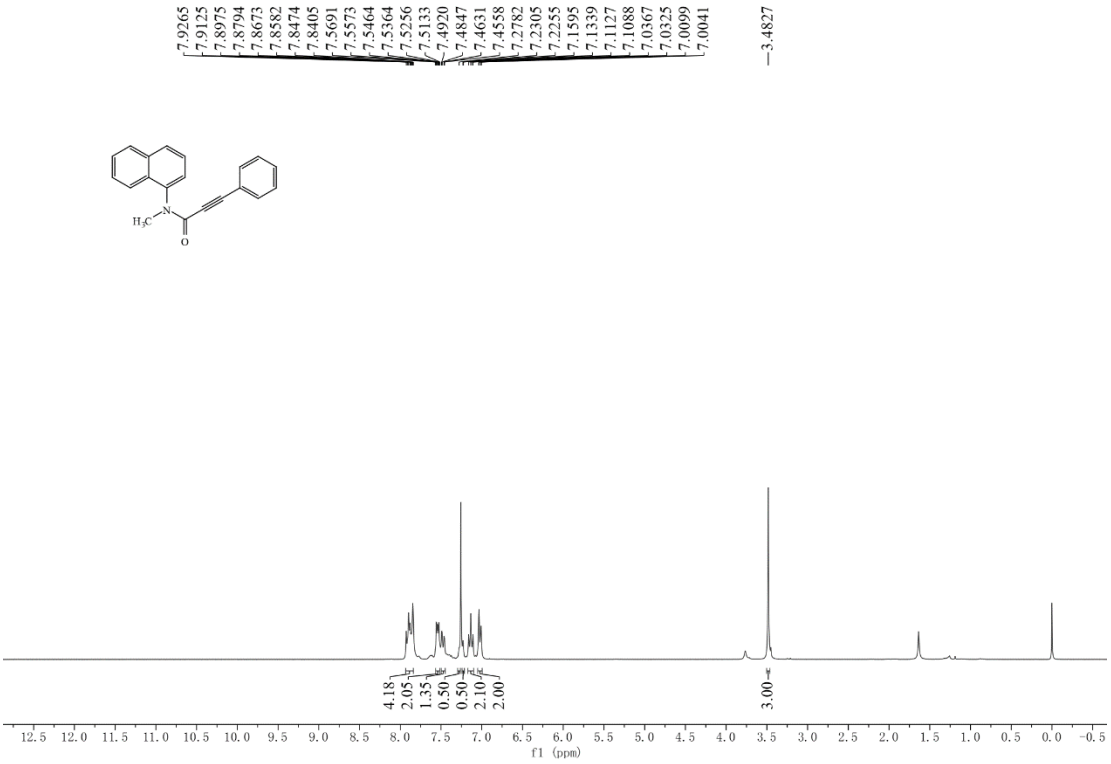
^{1}H NMR of methyl 2-methyl-4-(N-methyl-3-phenylpropiolamido)benzoate



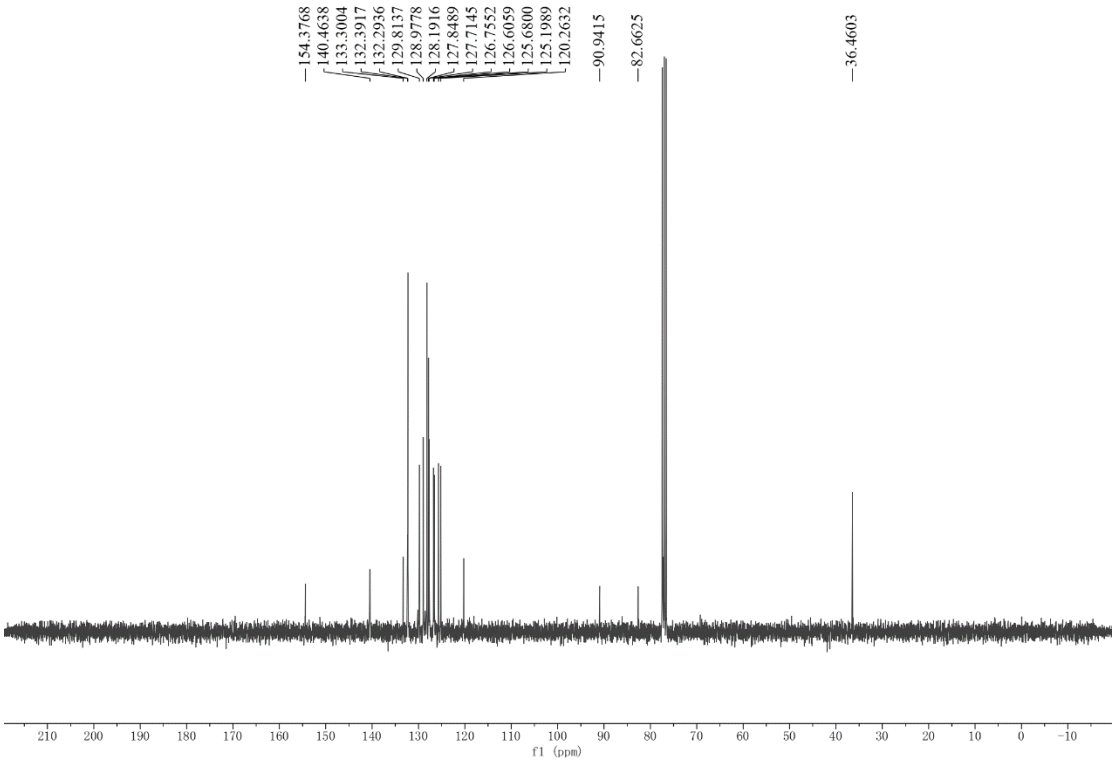
^{13}C NMR of methyl 2-methyl-4-(N-methyl-3-phenylpropiolamido)benzoate



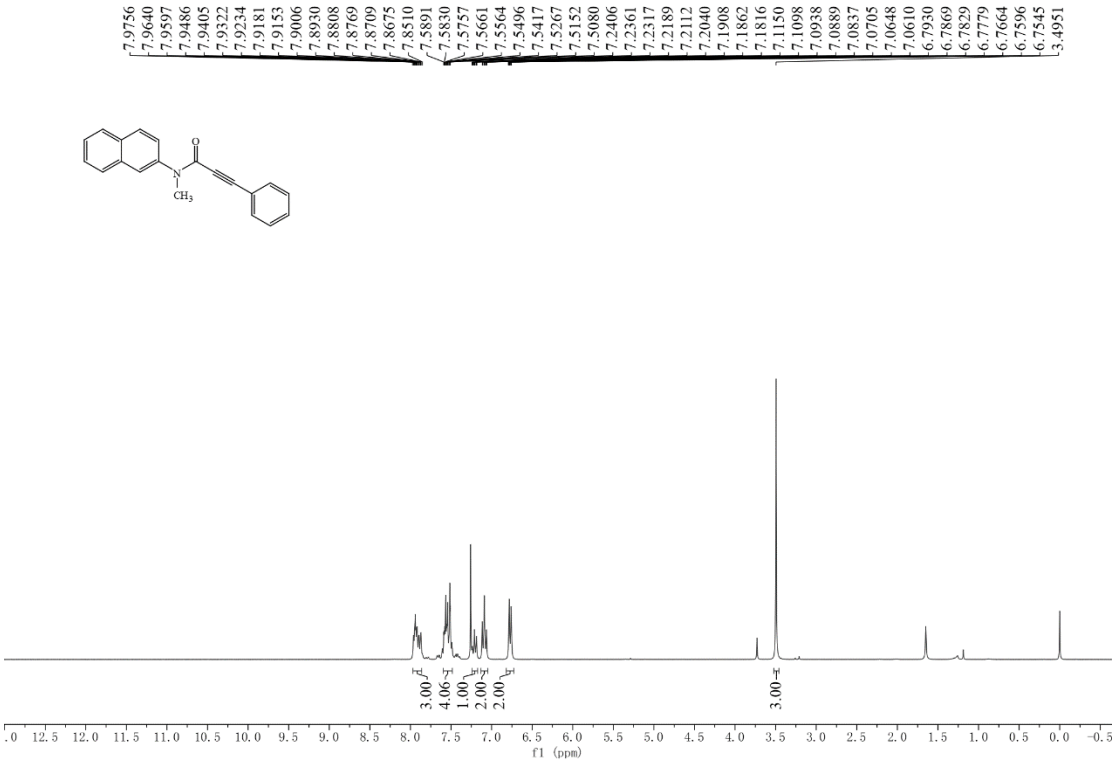
^{1}H NMR of N-methyl-N-(naphthalen-1-yl)-3-phenylpropiolamide [5]



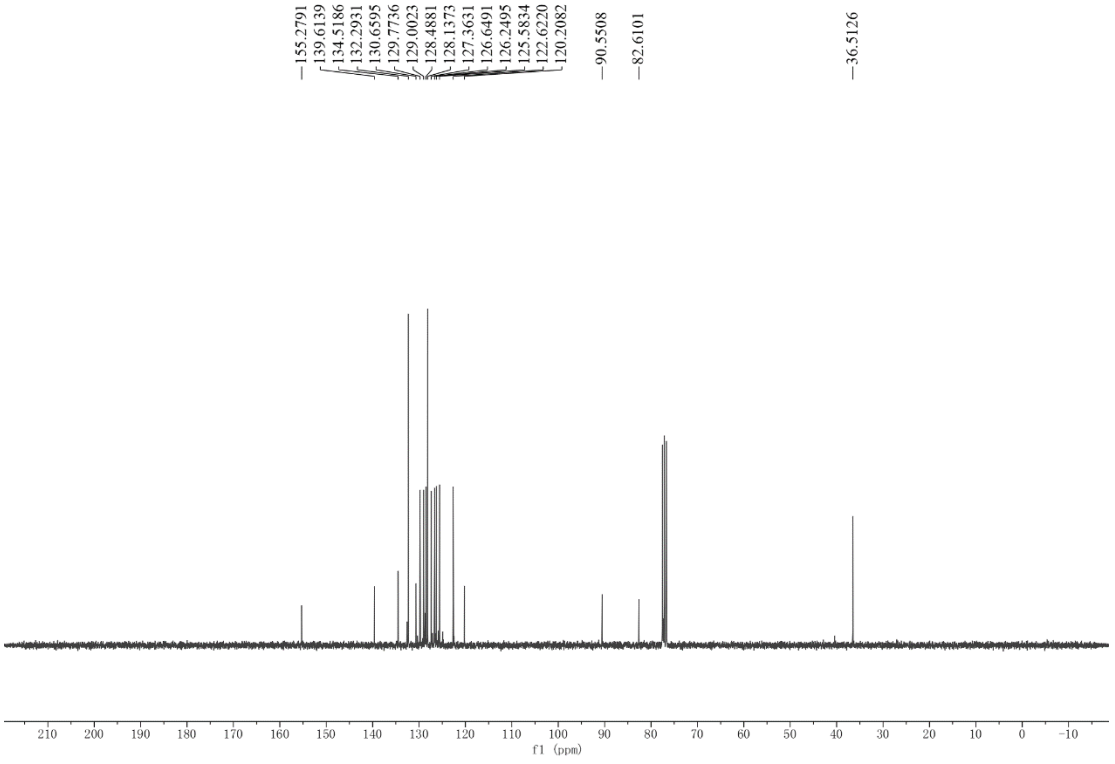
^{13}C NMR of N-methyl-N-(naphthalen-1-yl)-3-phenylpropiolamide [5]



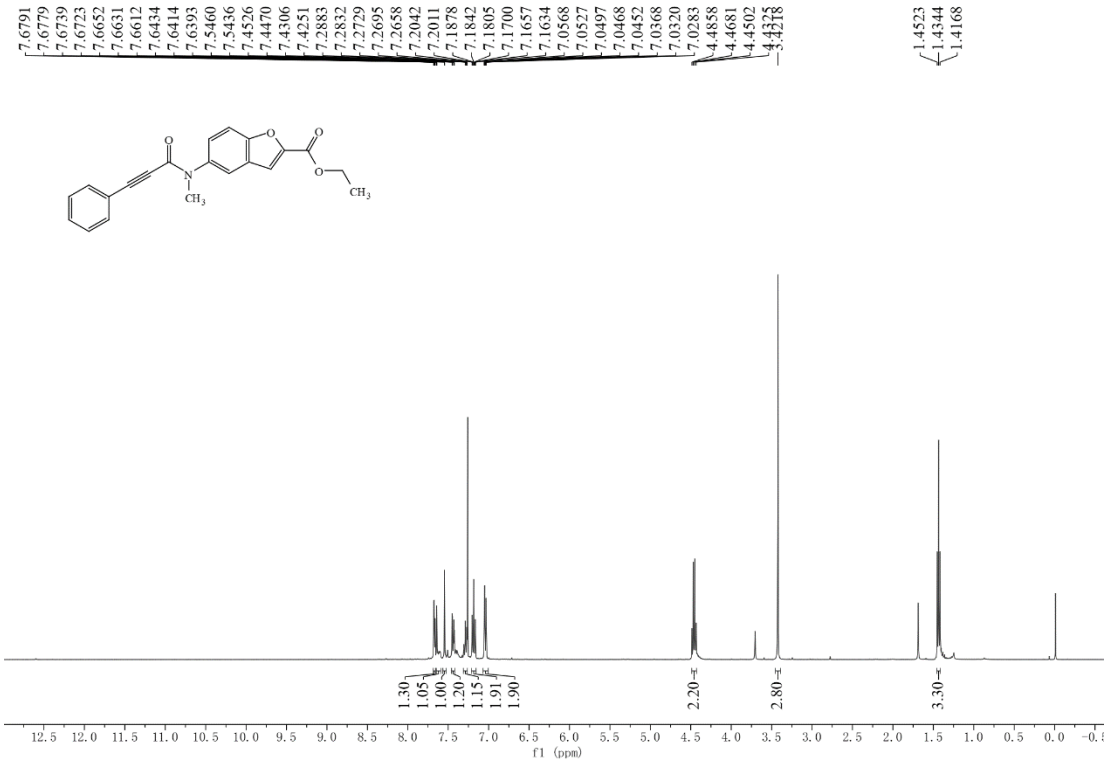
^{1}H NMR of N-methyl-N-(naphthalen-2-yl)-3-phenylpropiolamide



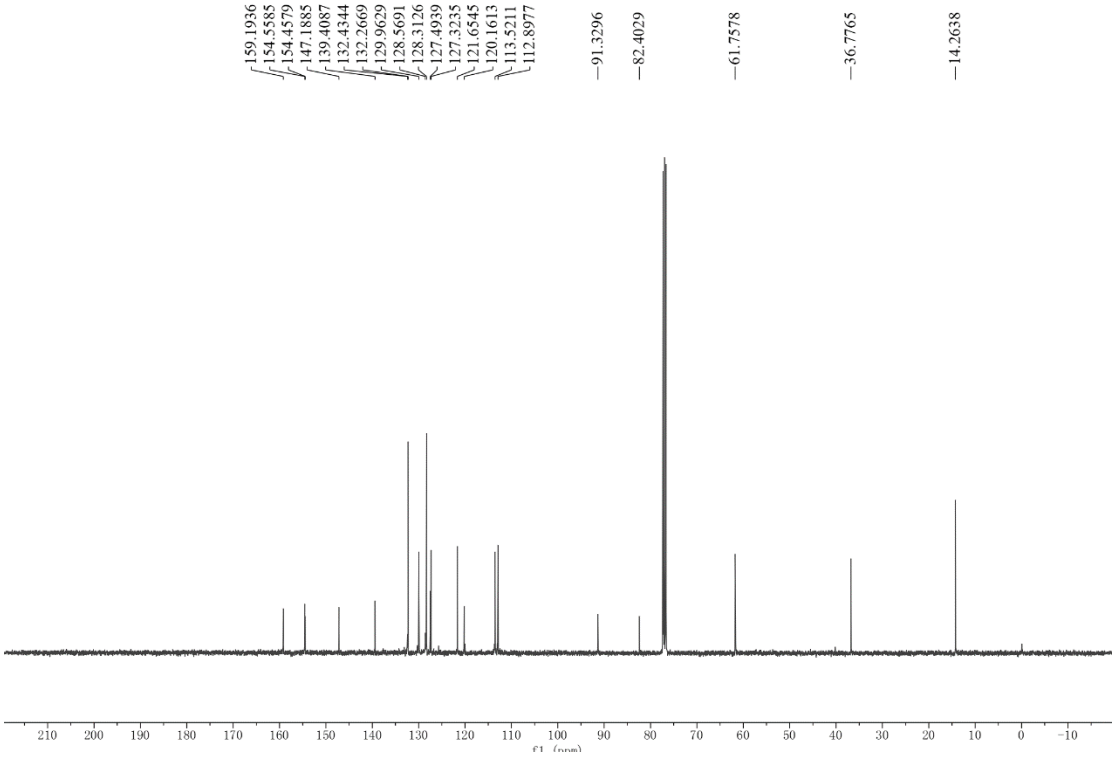
^{13}C NMR of N-methyl-N-(naphthalen-2-yl)-3-phenylpropiolamide



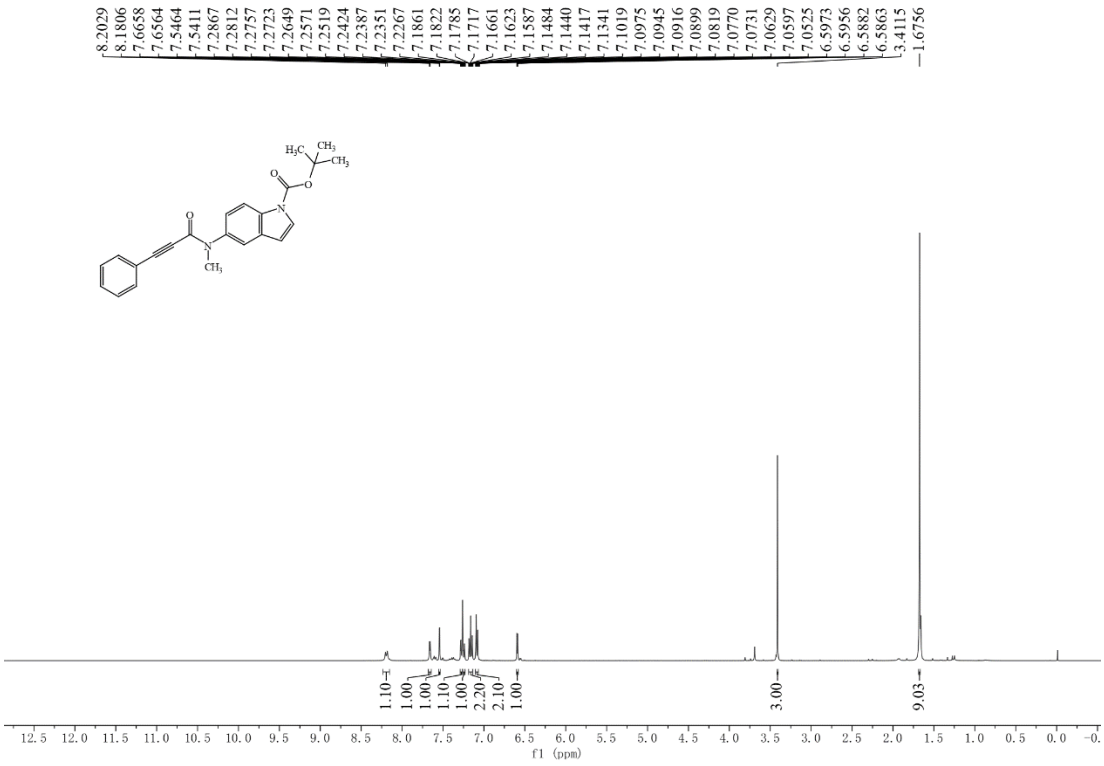
^{1}H NMR of ethyl 5-(N-methyl-3-phenylpropiolamido)benzofuran-2-carboxylate



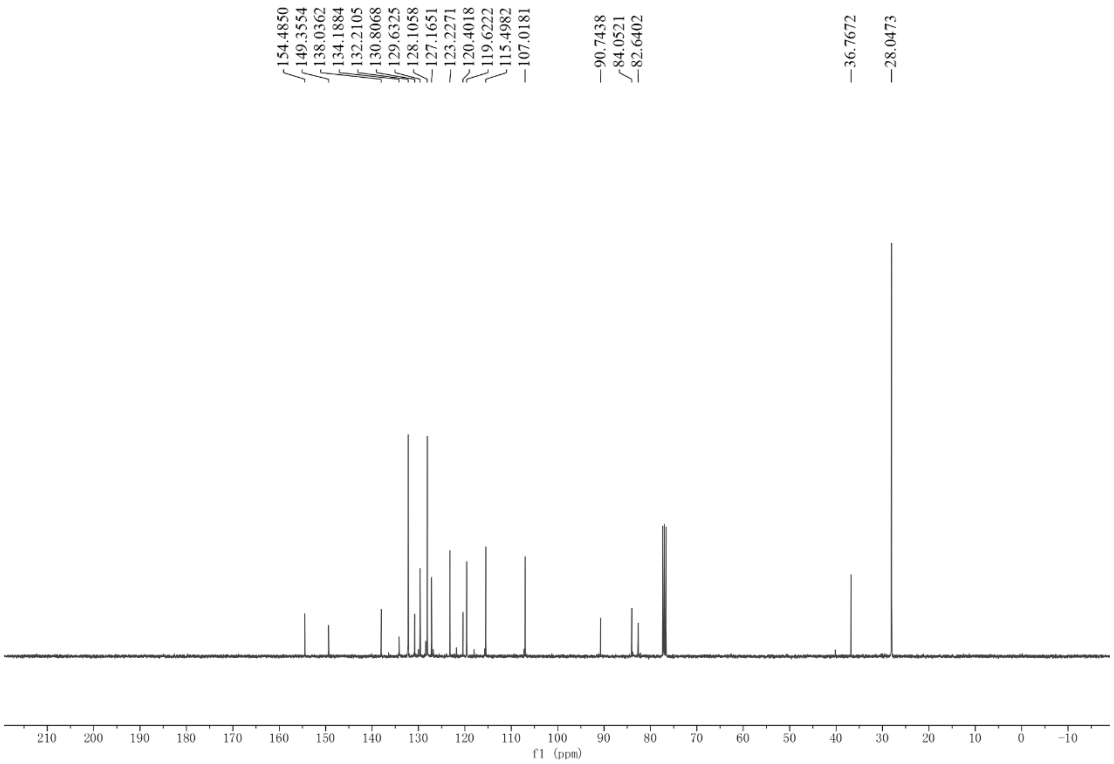
^{13}C NMR of ethyl 5-(N-methyl-3-phenylpropiolamido)benzofuran-2-carboxylate



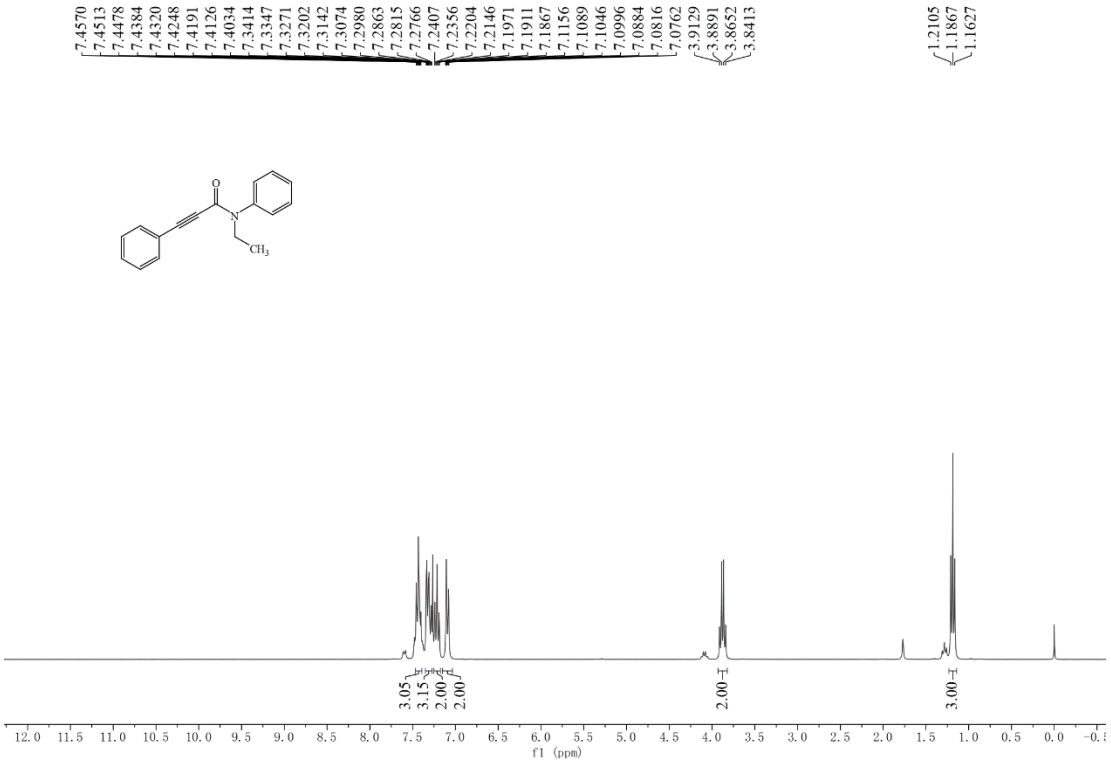
^{1}H NMR of tert-butyl 5-(N-methyl-3-phenylpropiolamido)-1H-indole-1-carboxylate



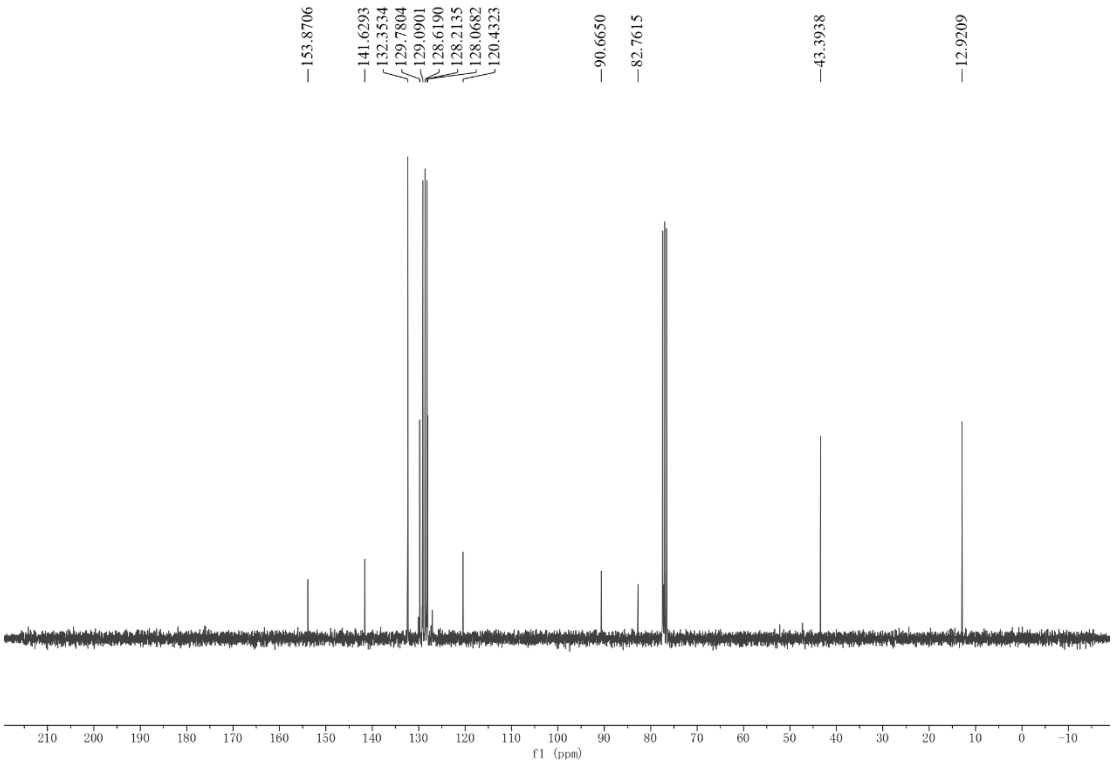
^{13}C NMR of tert-butyl 5-(N-methyl-3-phenylpropiolamido)-1H-indole-1-carboxylate



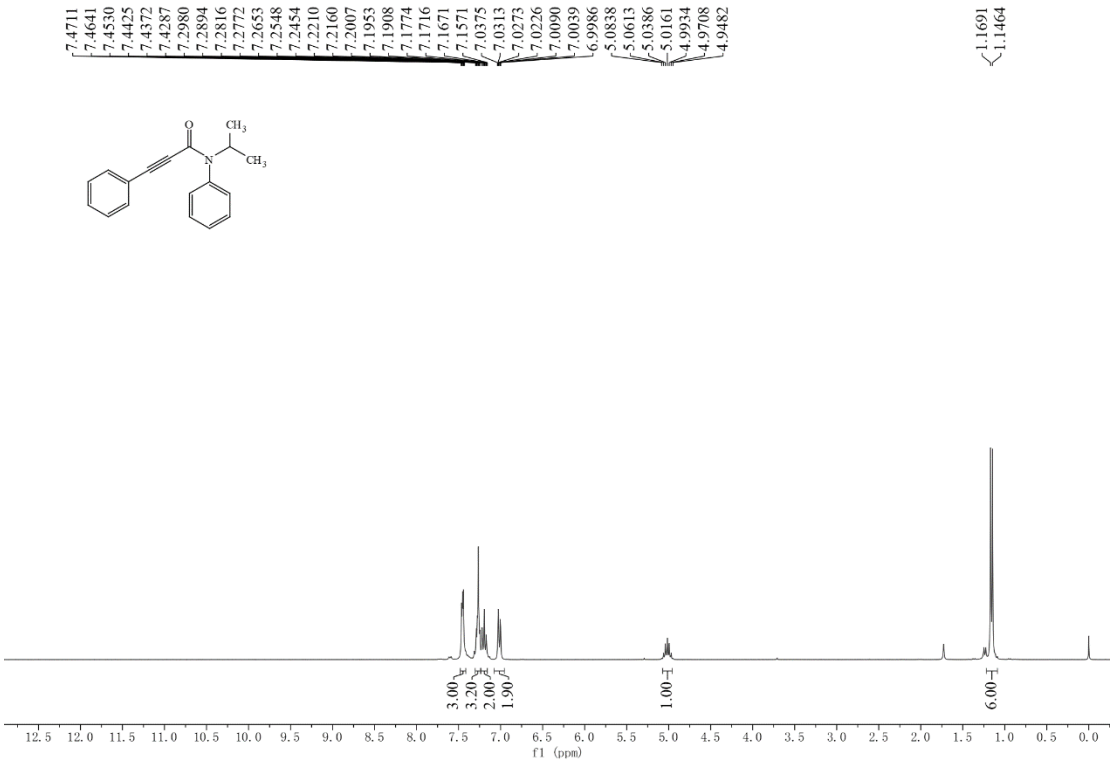
^{1}H NMR of N-ethyl-N,3-diphenylpropiolamide [4]



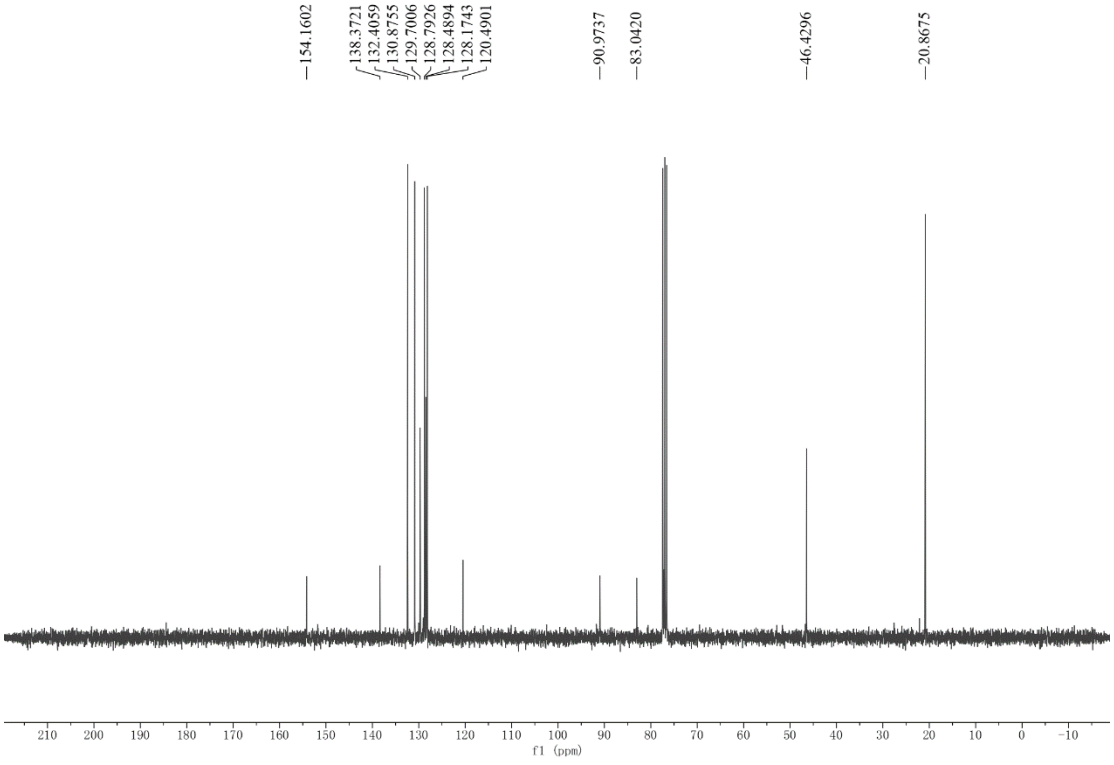
^{13}C NMR of N-ethyl-N,3-diphenylpropiolamide [4]



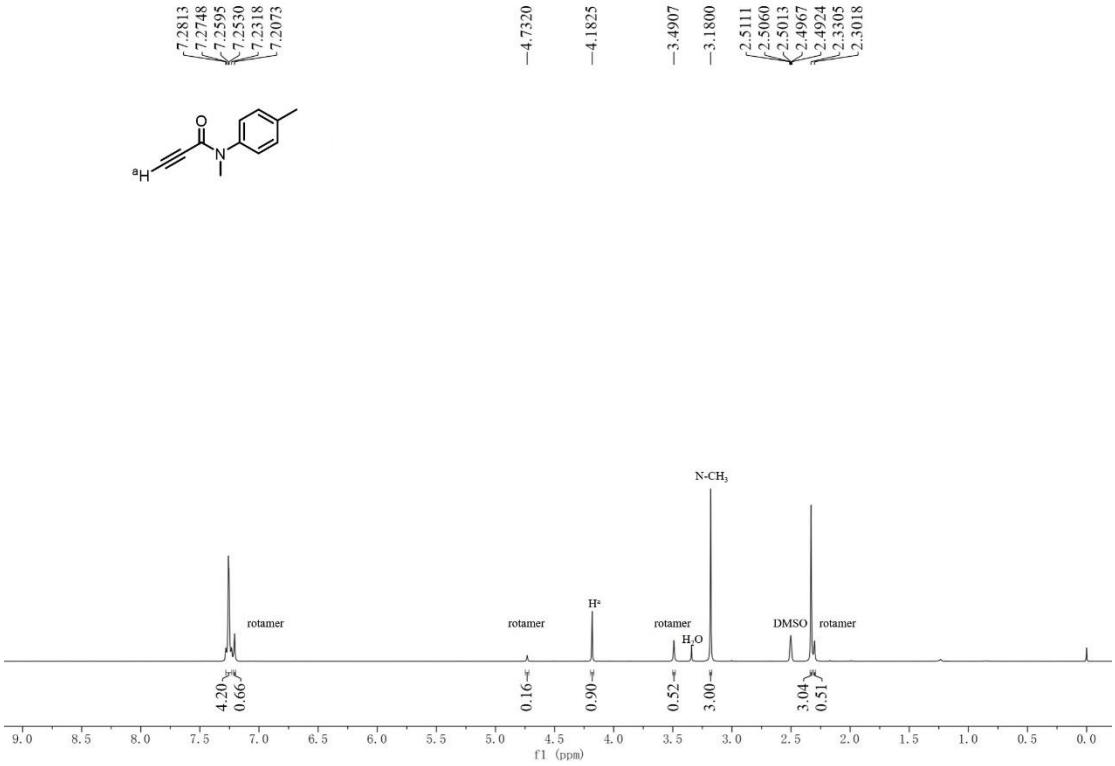
^{1}H NMR of N-isopropyl-N,3-diphenylpropiolamide



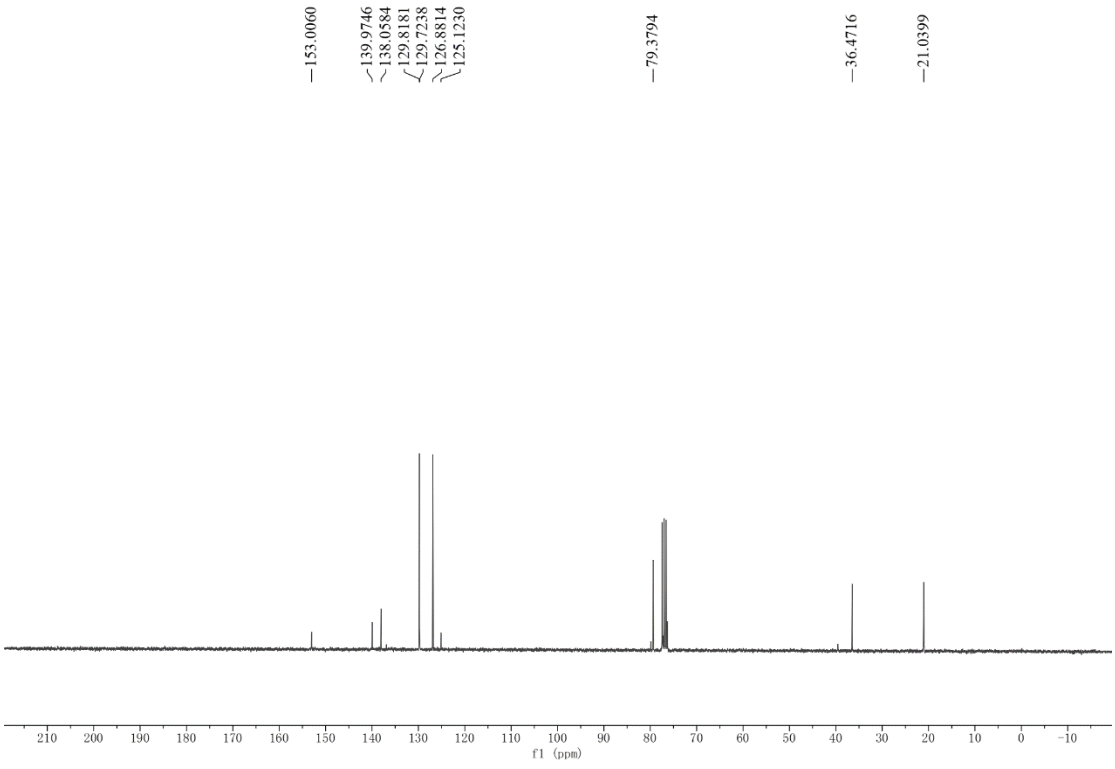
^{13}C NMR of N-isopropyl-N,3-diphenylpropiolamide



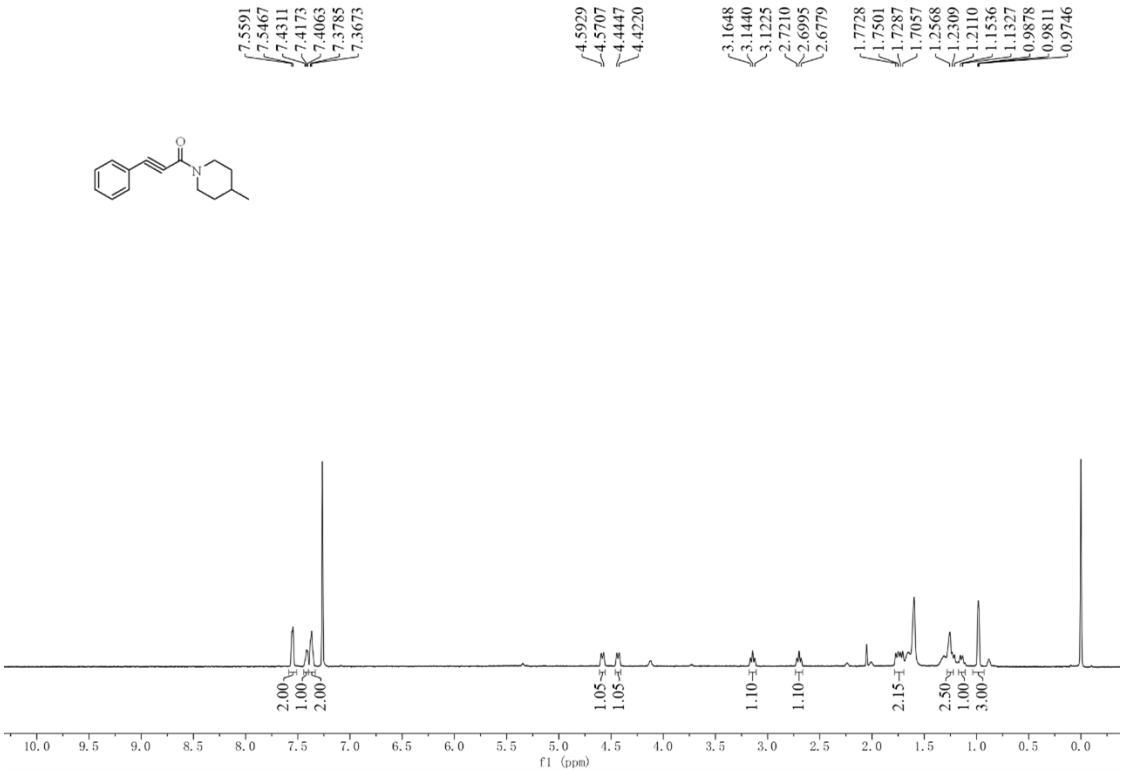
^{1}H NMR of N-methyl-N-(p-tolyl)propiolamide (34)



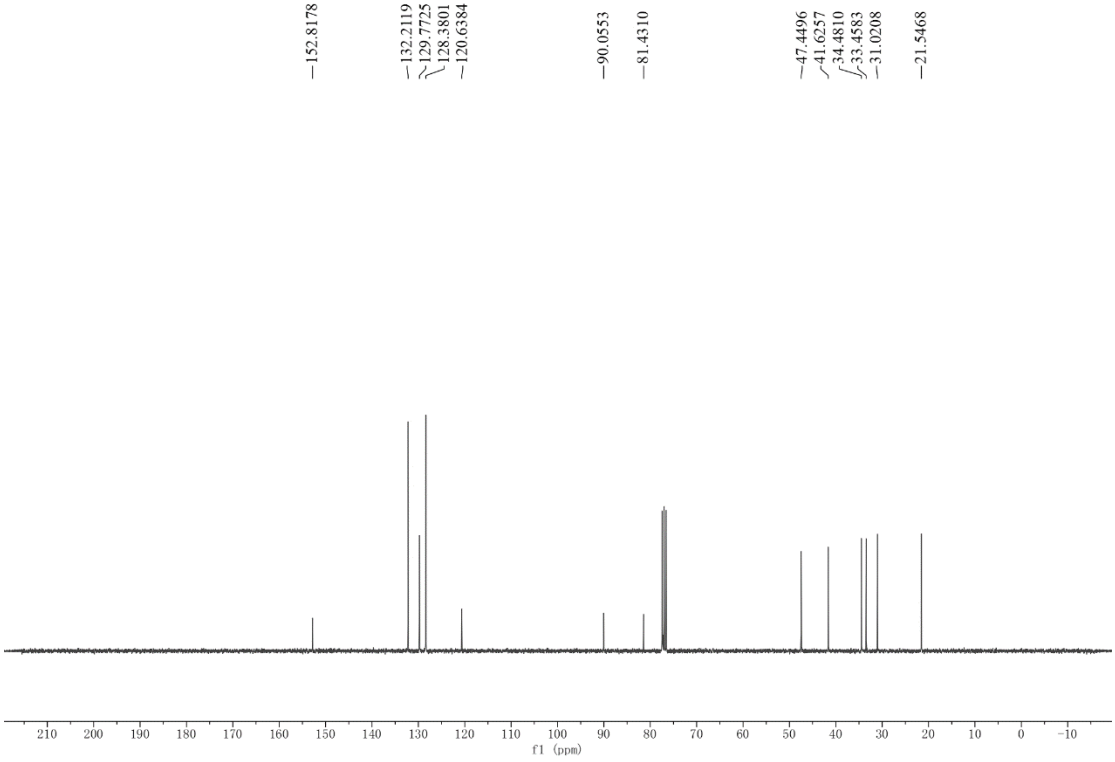
^{13}C NMR of N-methyl-N-(p-tolyl)propiolamide (34)



^{1}H NMR of 1-(4-methylpiperidin-1-yl)-3-phenylprop-2-yn-1-one (35) [8]

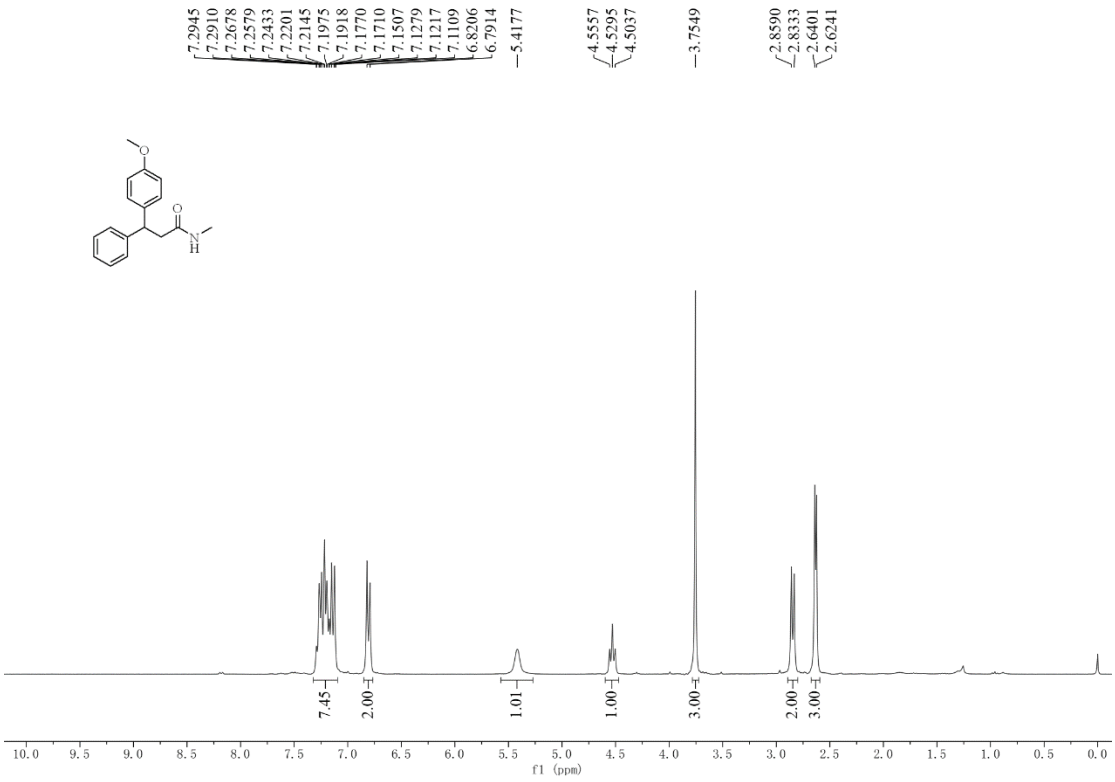


^{13}C NMR of 1-(4-methylpiperidin-1-yl)-3-phenylprop-2-yn-1-one (35) [8]

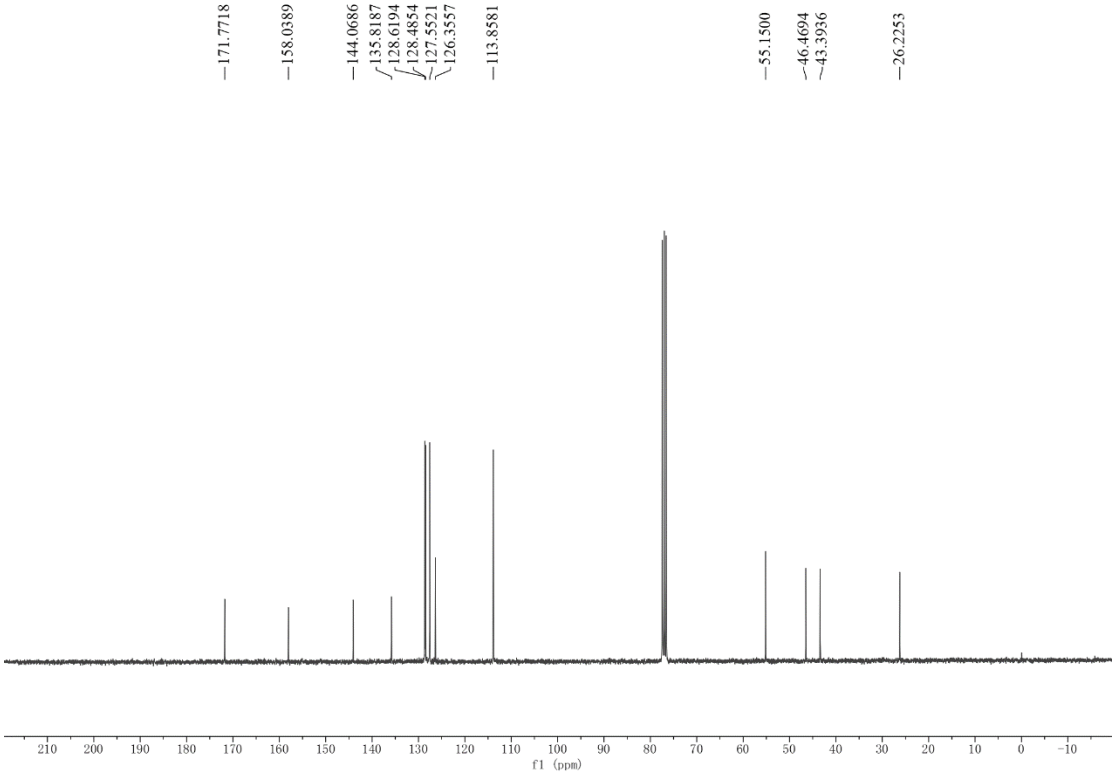


14. The NMR and HRMS spectra for products

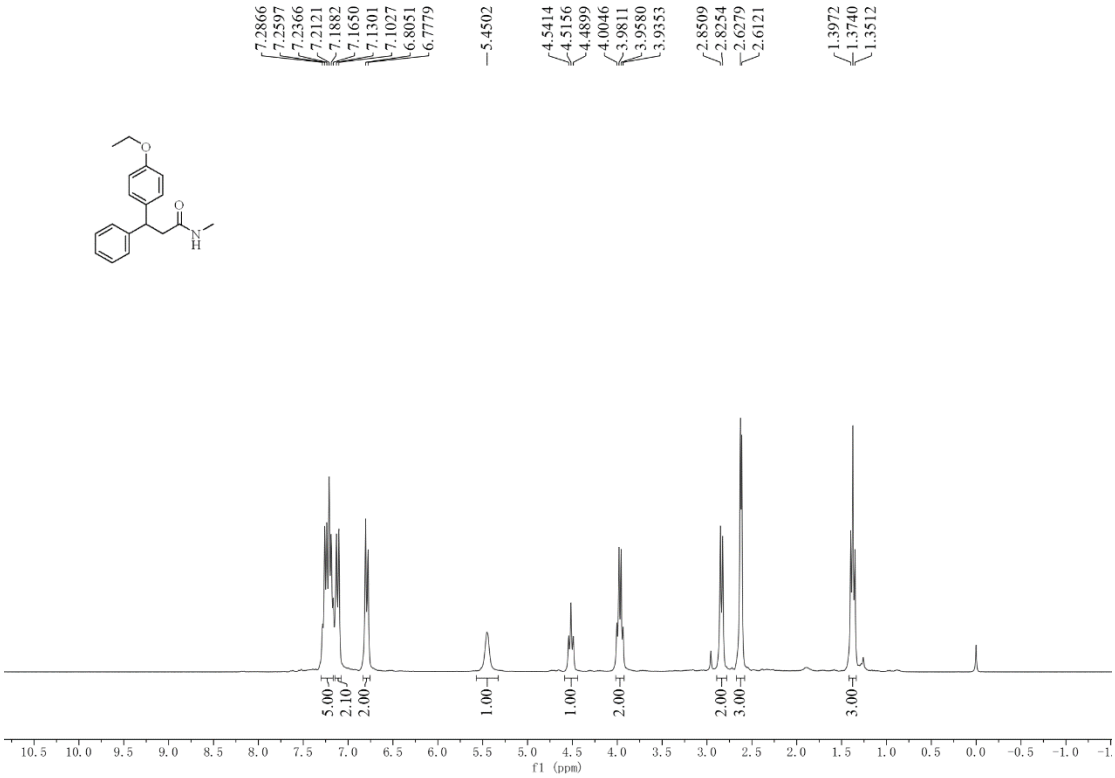
^{1}H NMR of 3-(4-methoxyphenyl)-N-methyl-3-phenylpropanamide (3) [6]



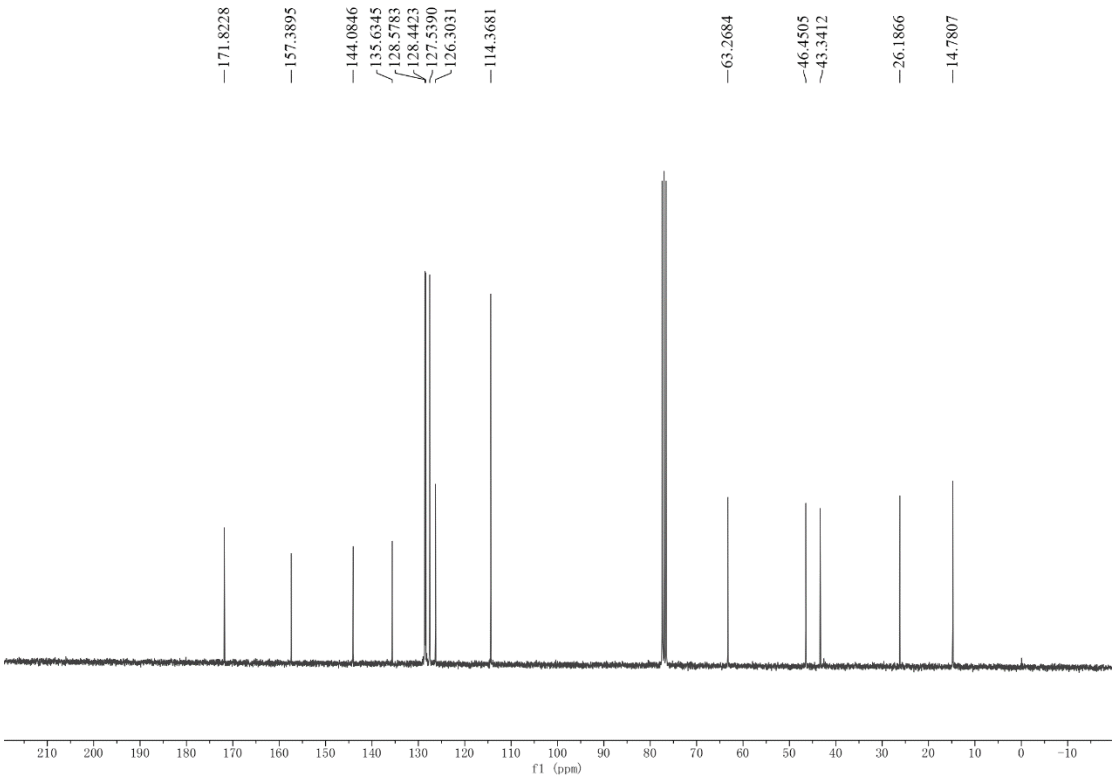
^{13}C NMR of 3-(4-methoxyphenyl)-N-methyl-3-phenylpropanamide (3) [6]



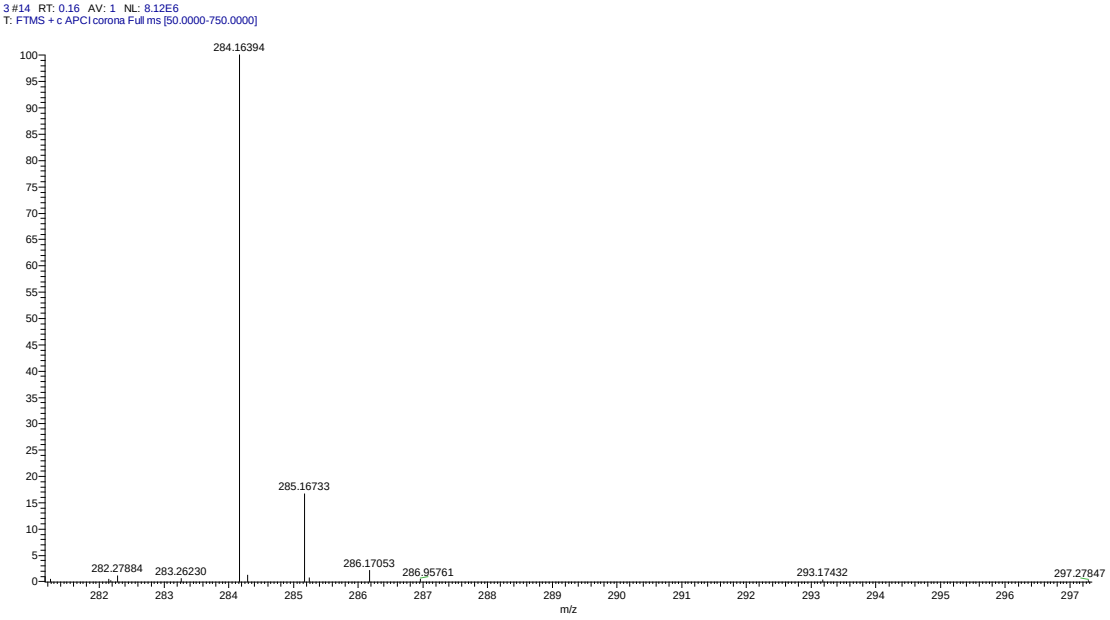
^{1}H NMR of 3-(4-ethoxyphenyl)-N-methyl-3-phenylpropanamide (4)



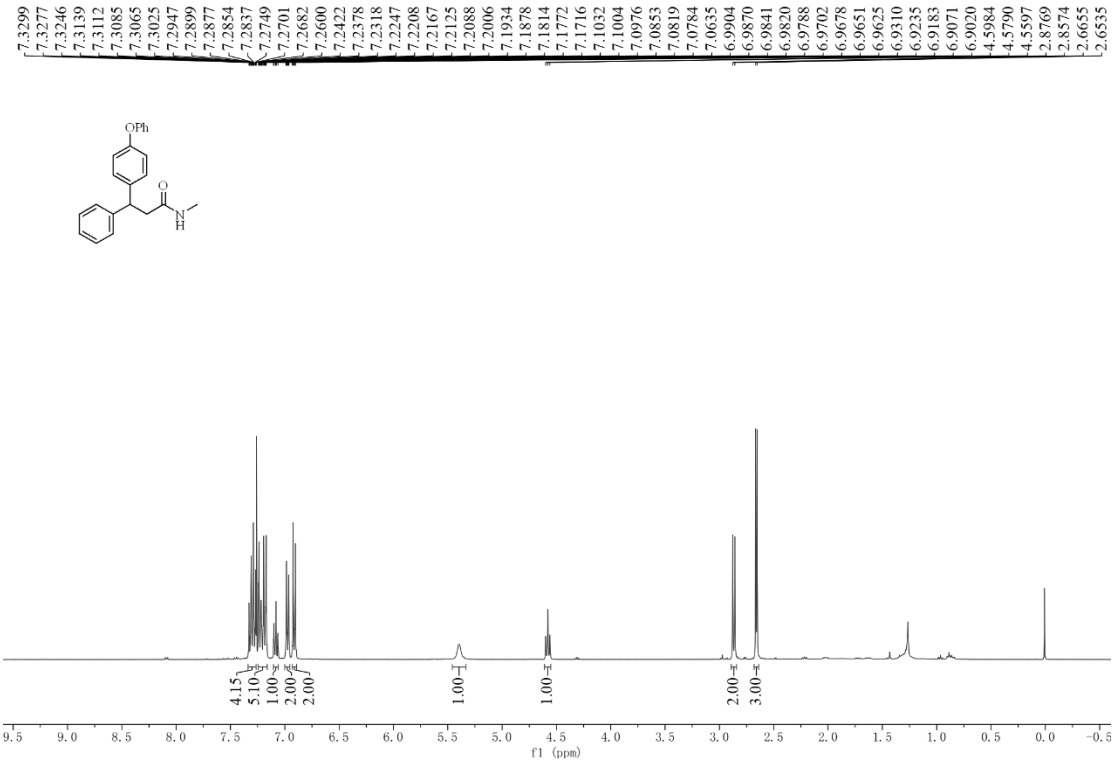
^{13}C NMR of 3-(4-ethoxyphenyl)-N-methyl-3-phenylpropanamide (4)



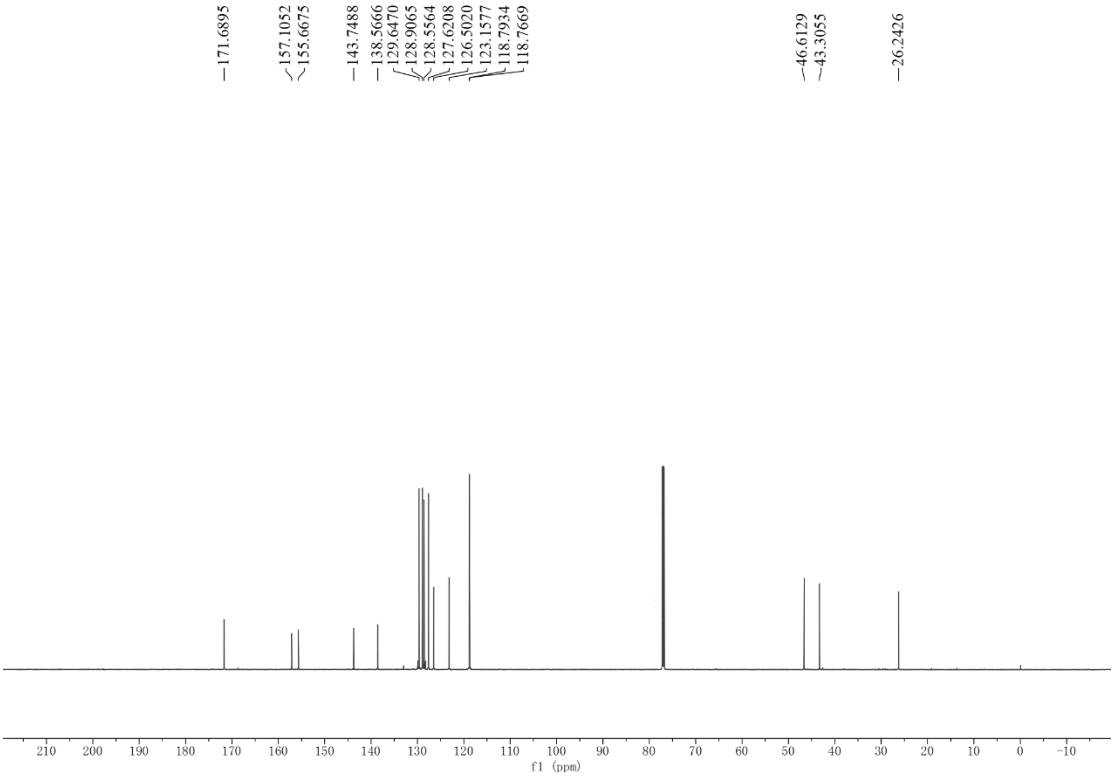
HRMS of 3-(4-ethoxyphenyl)-N-methyl-3-phenylpropanamide (4)



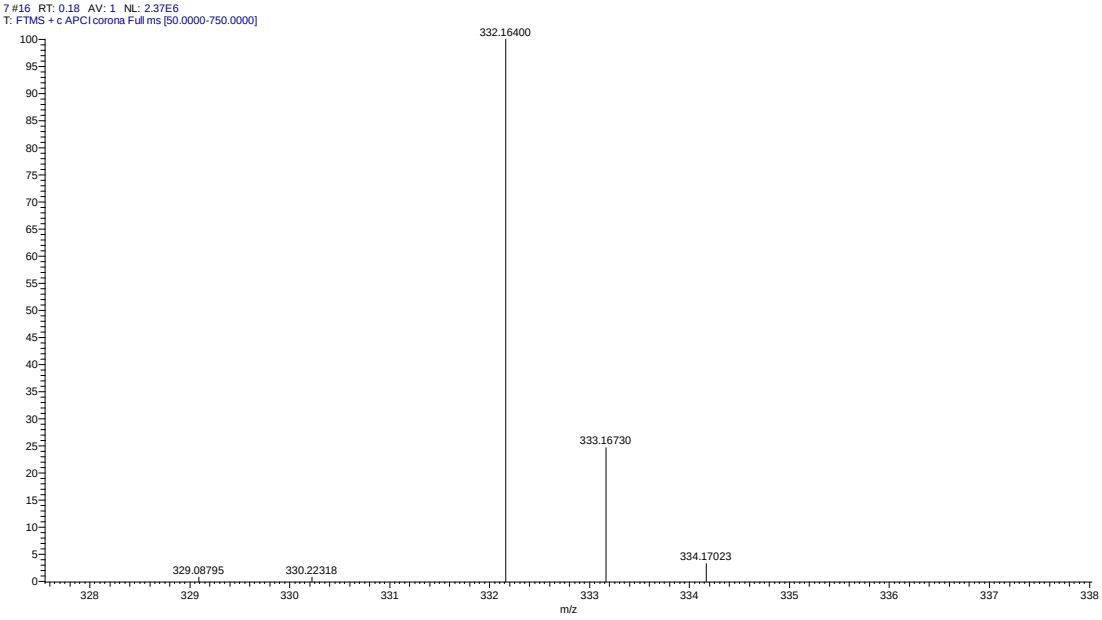
^{1}H NMR of N-methyl-3-(4-phenoxyphenyl)-3-phenylpropanamide (5)



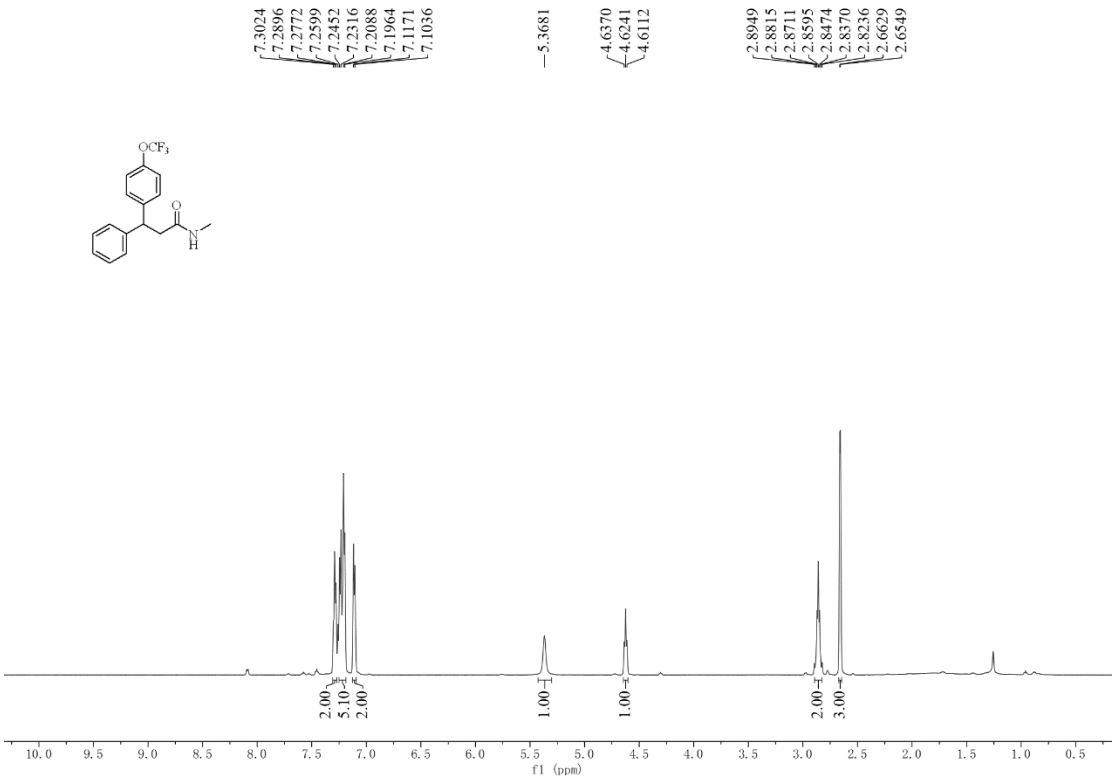
^{13}C NMR of N-methyl-3-(4-phenoxyphenyl)-3-phenylpropanamide (5)



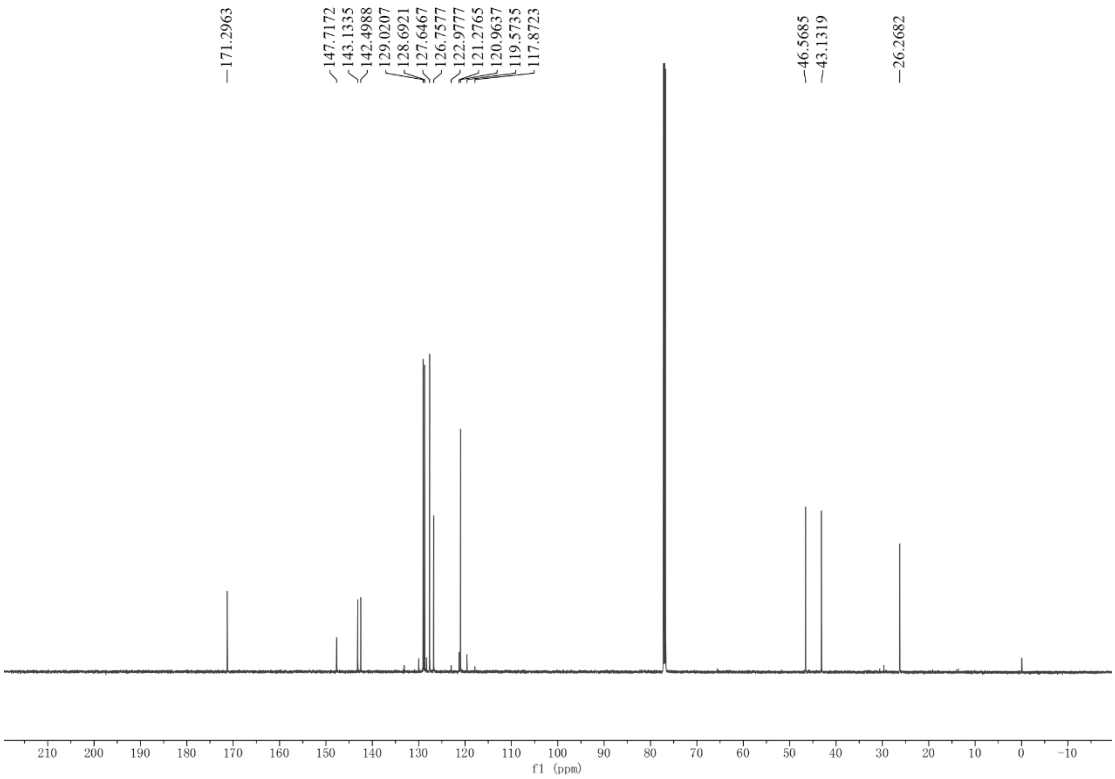
HRMS of N-methyl-3-(4-phenoxyphenyl)-3-phenylpropanamide (5)



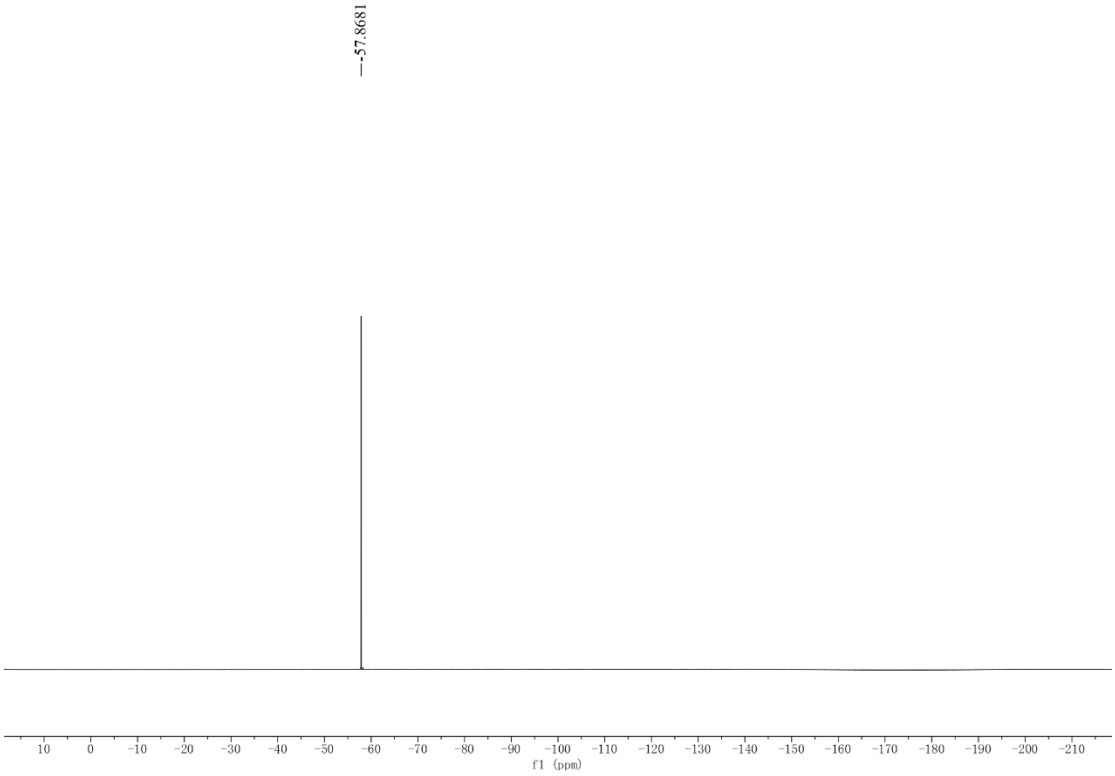
^{1}H NMR of N-methyl-3-phenyl-3-(4-(trifluoromethoxy)phenyl) propanamide (6)



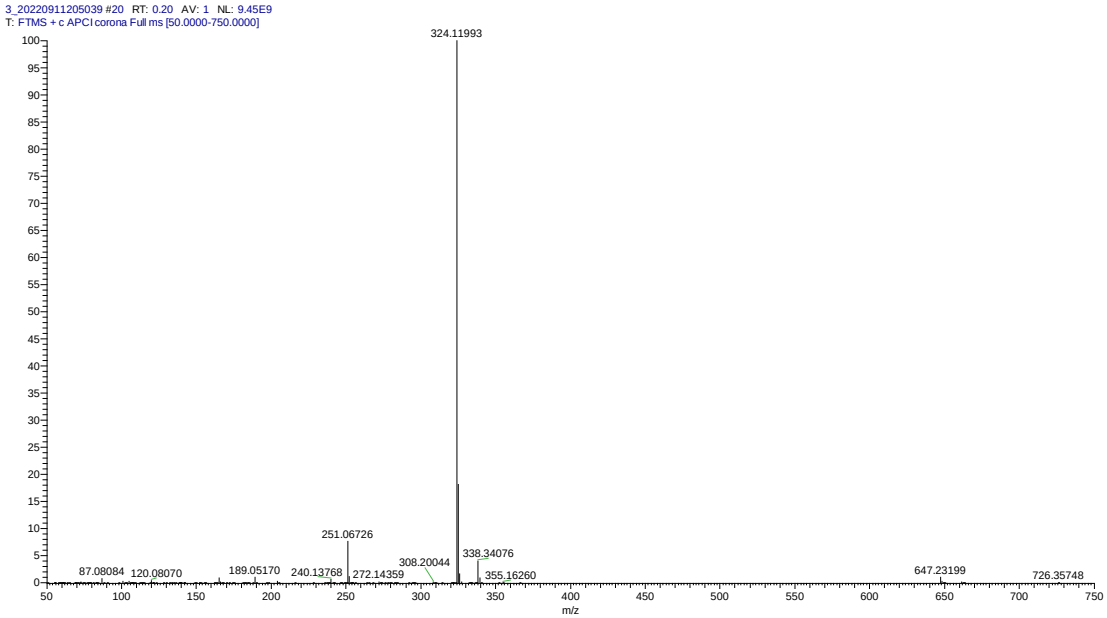
^{13}C NMR of N-methyl-3-phenyl-3-(4-(trifluoromethoxy)phenyl)propanamide (6)



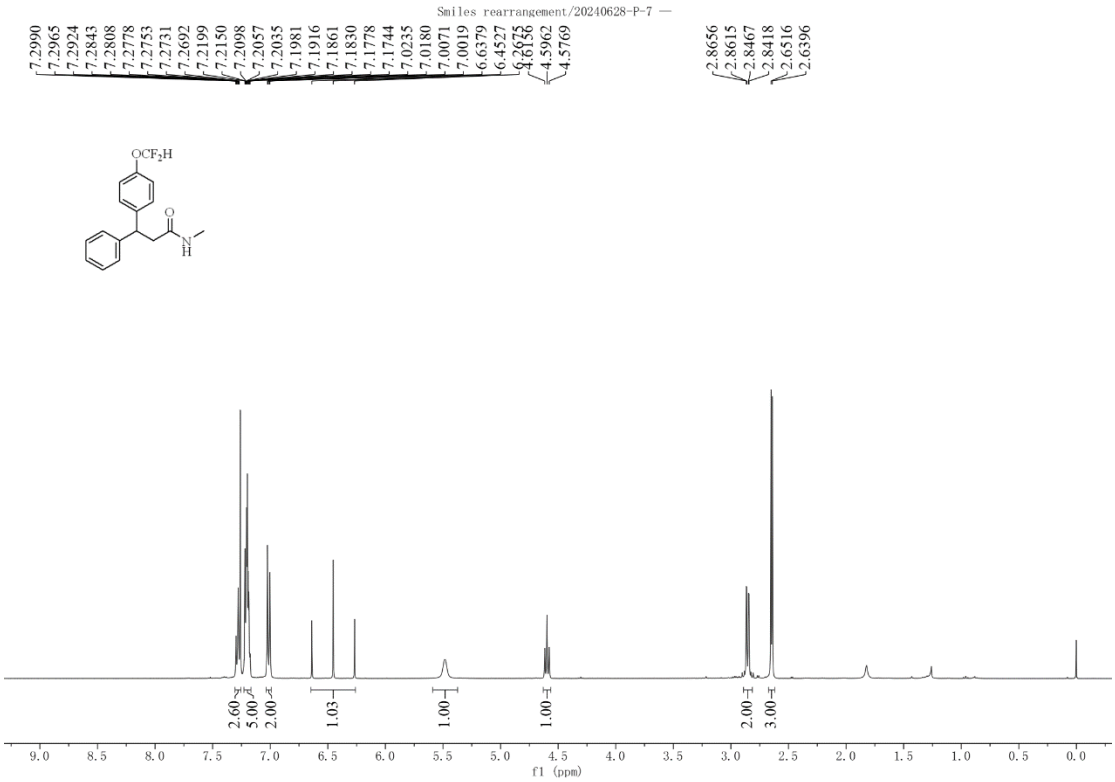
^{19}F NMR of N-methyl-3-phenyl-3-(4-(trifluoromethoxy)phenyl)propanamide (6)



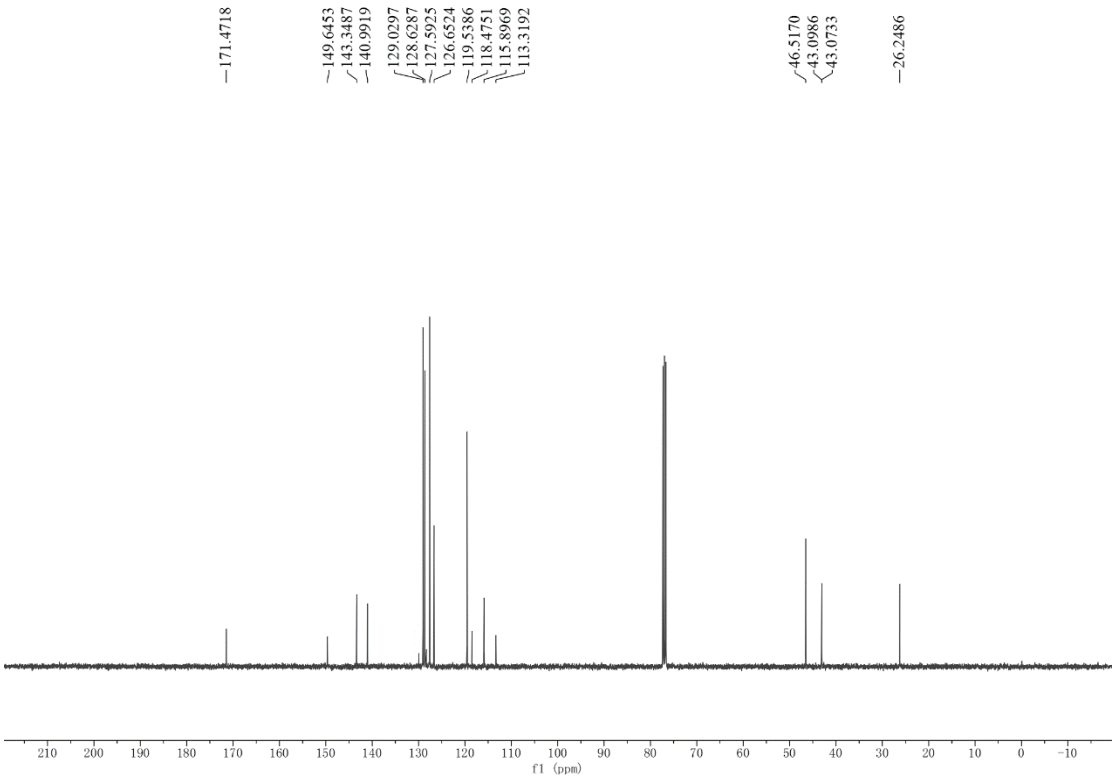
HRMS of N-methyl-3-phenyl-3-(4-(trifluoromethoxy)phenyl)propan-amide (6)



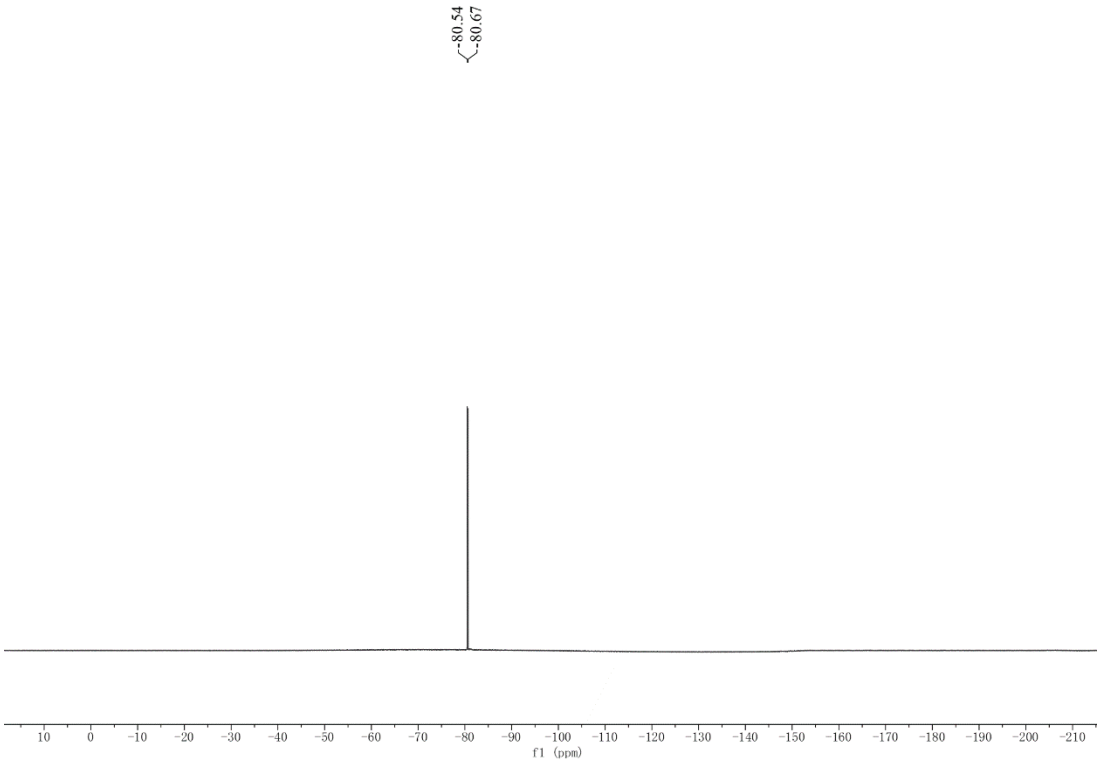
^{1}H NMR of 3-(4-(difluoromethoxy)phenyl)-N-methyl-3-phenylpropanamide (7)



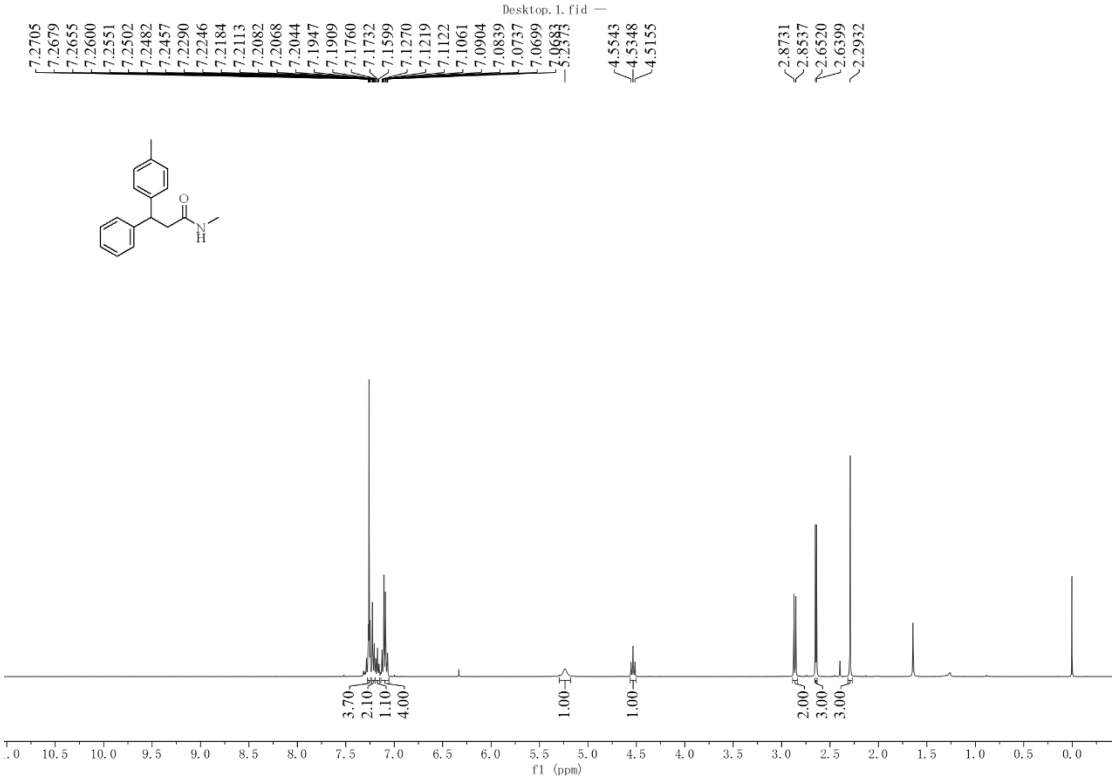
^{13}C NMR of 3-(4-(difluoromethoxy)phenyl)-N-methyl-3-phenylpropanamide (7)



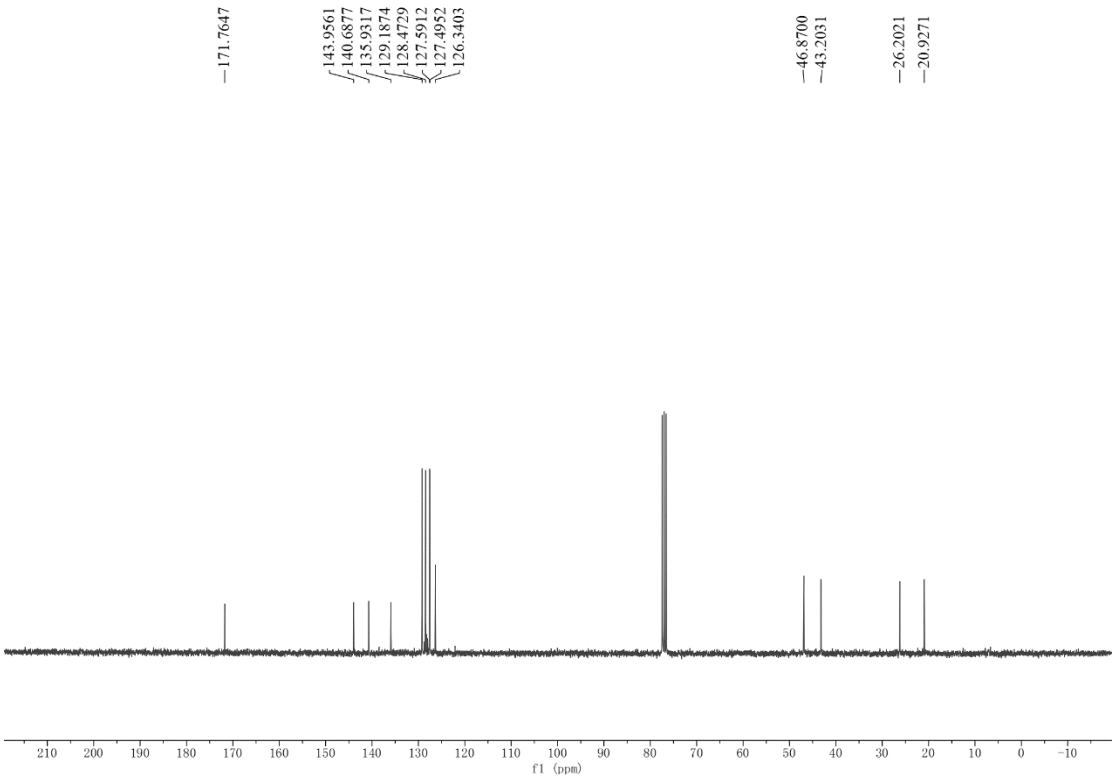
^{19}F NMR of 3-(4-(difluoromethoxy)phenyl)-N-methyl-3-phenylpropanamide (7)



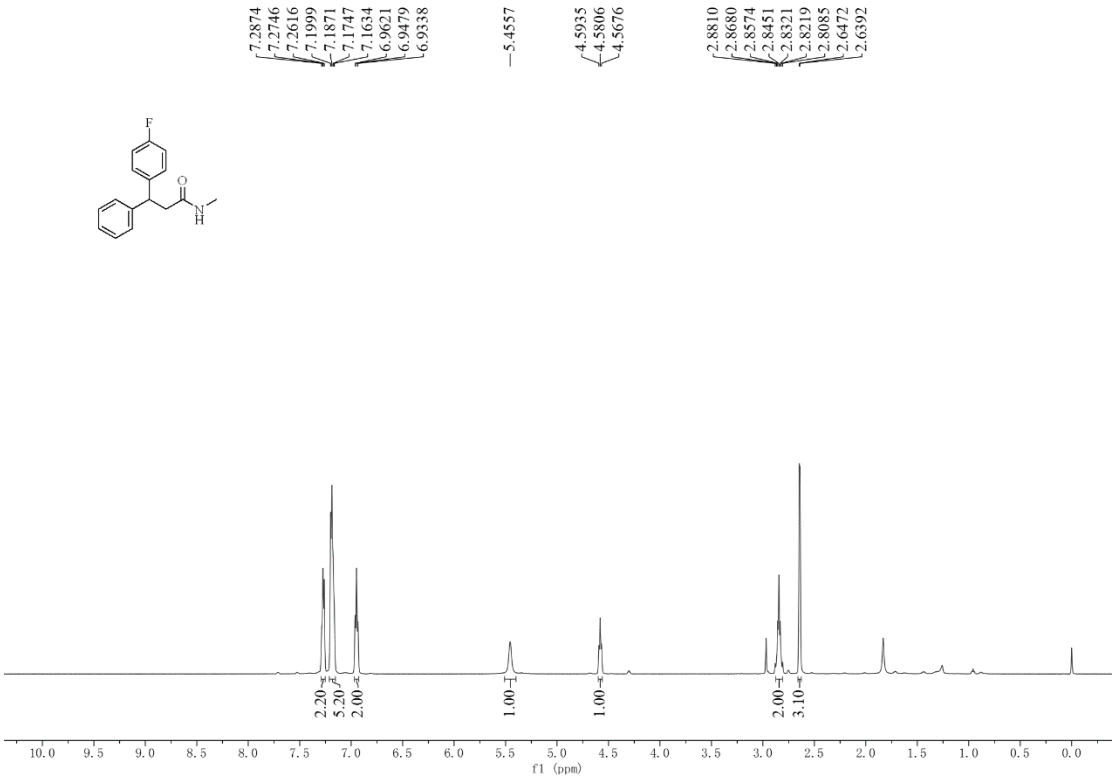
^{1}H NMR of N-methyl-3-phenyl-3-(p-tolyl)propanamide (8)



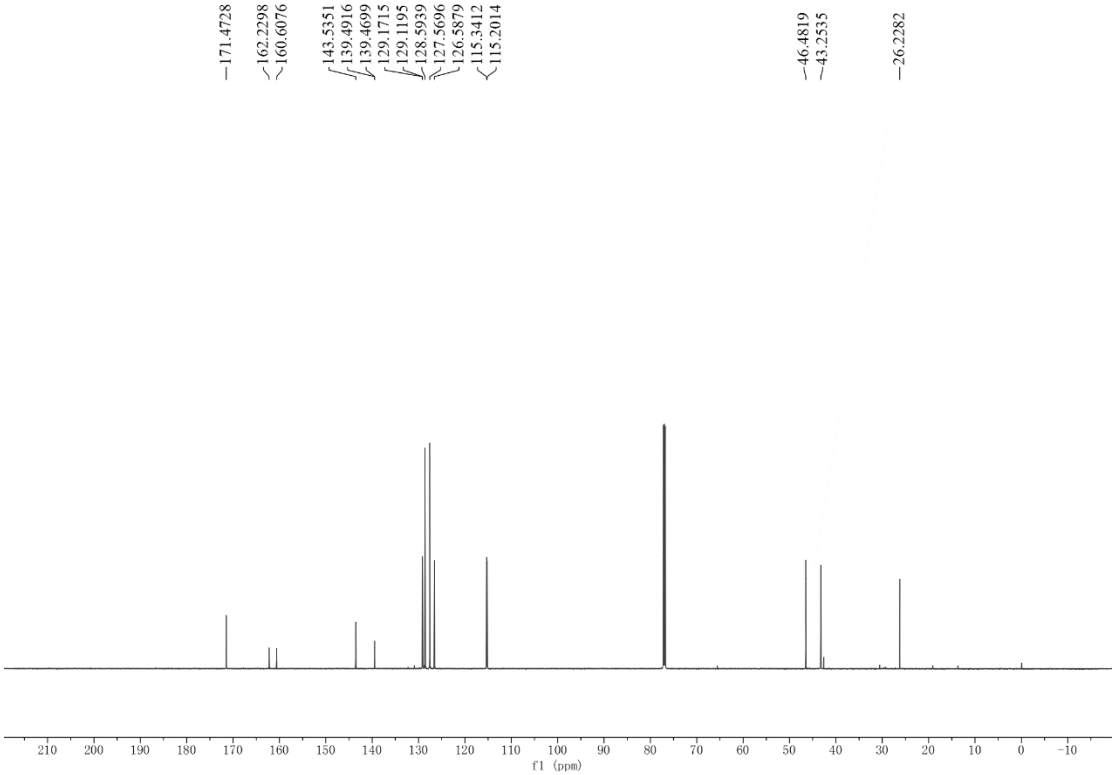
^{13}C NMR of N-methyl-3-phenyl-3-(p-tolyl)propanamide (8)



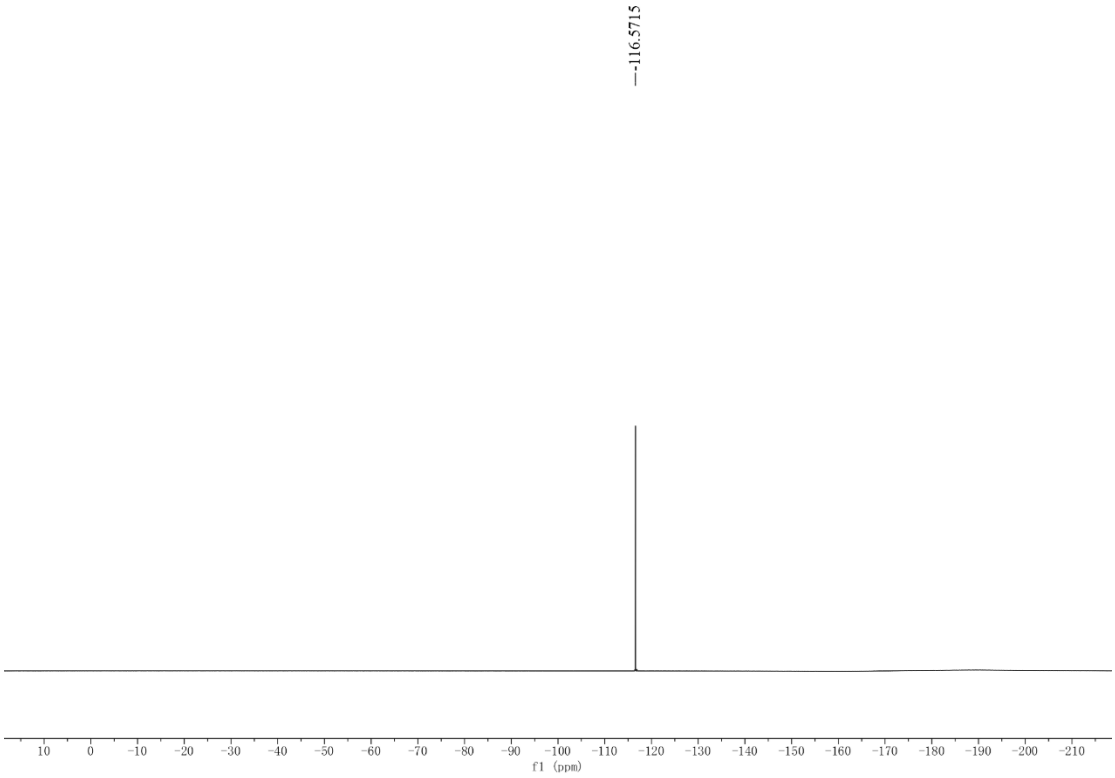
^{1}H NMR of 3-(4-fluorophenyl)-N-methyl-3-phenylpropanamide (9)



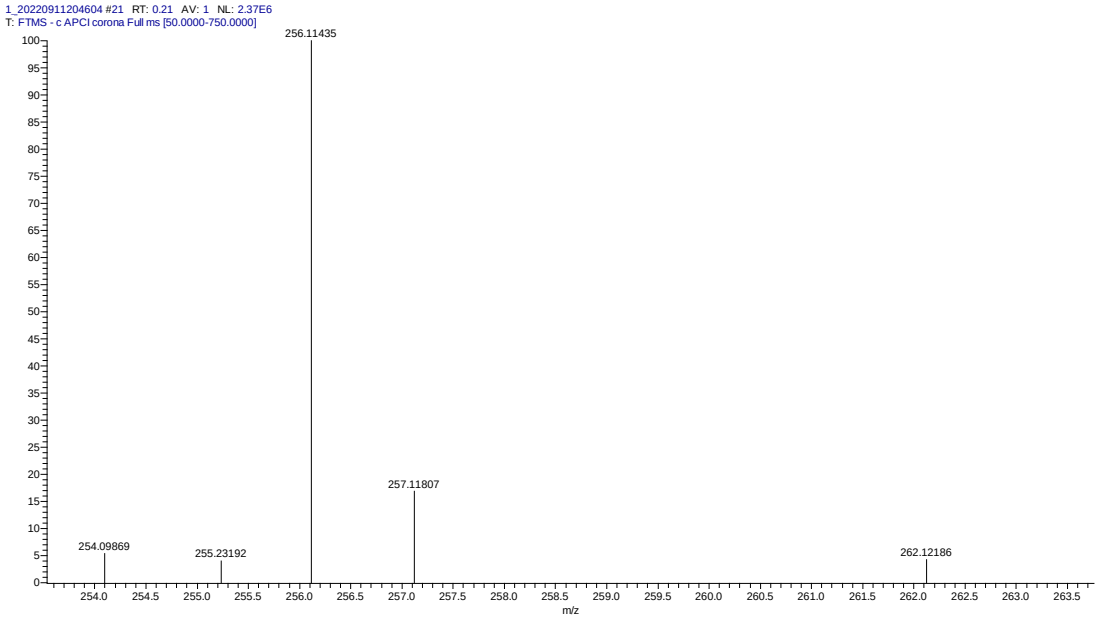
^{13}C NMR of 3-(4-fluorophenyl)-N-methyl-3-phenylpropanamide (9)



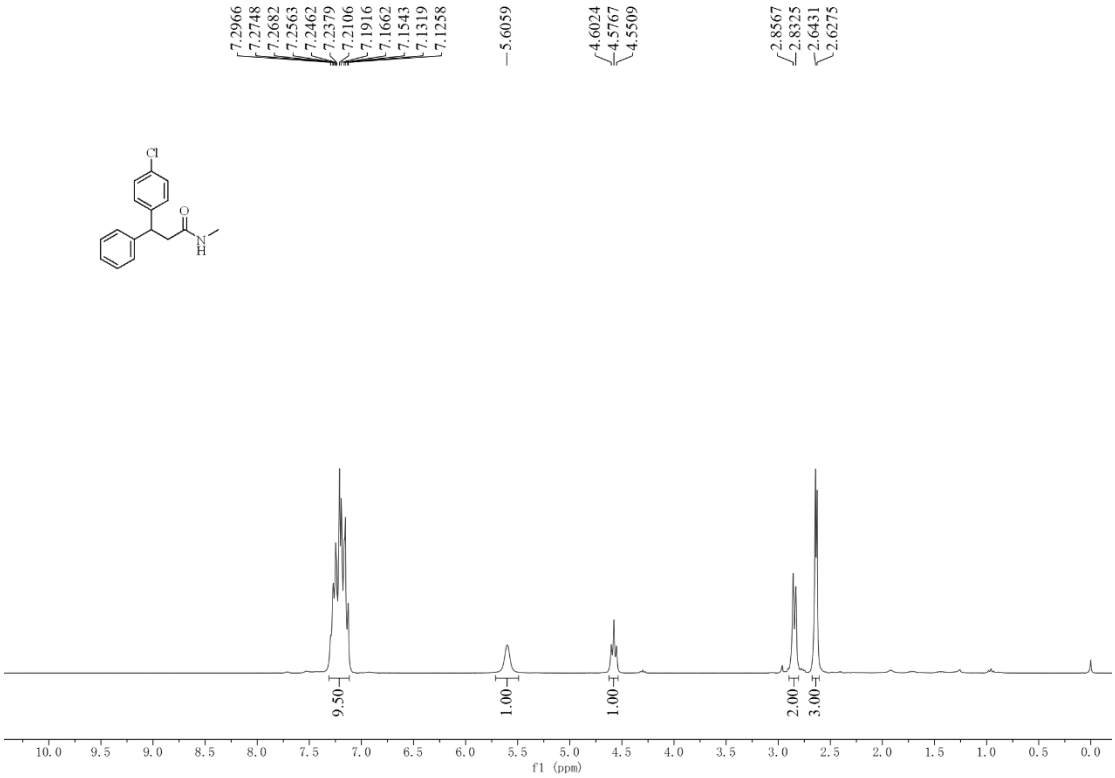
^{19}F NMR of 3-(4-fluorophenyl)-N-methyl-3-phenylpropanamide (9)



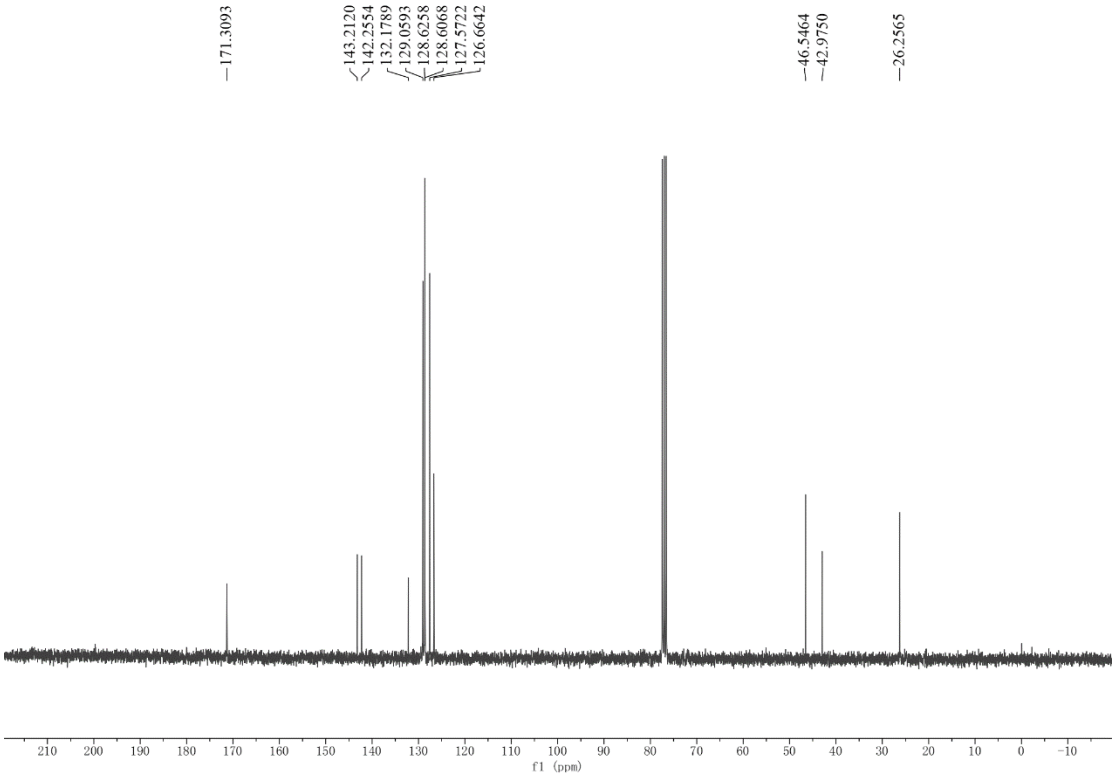
HRMS of 3-(4-fluorophenyl)-N-methyl-3-phenylpropanamide (9)



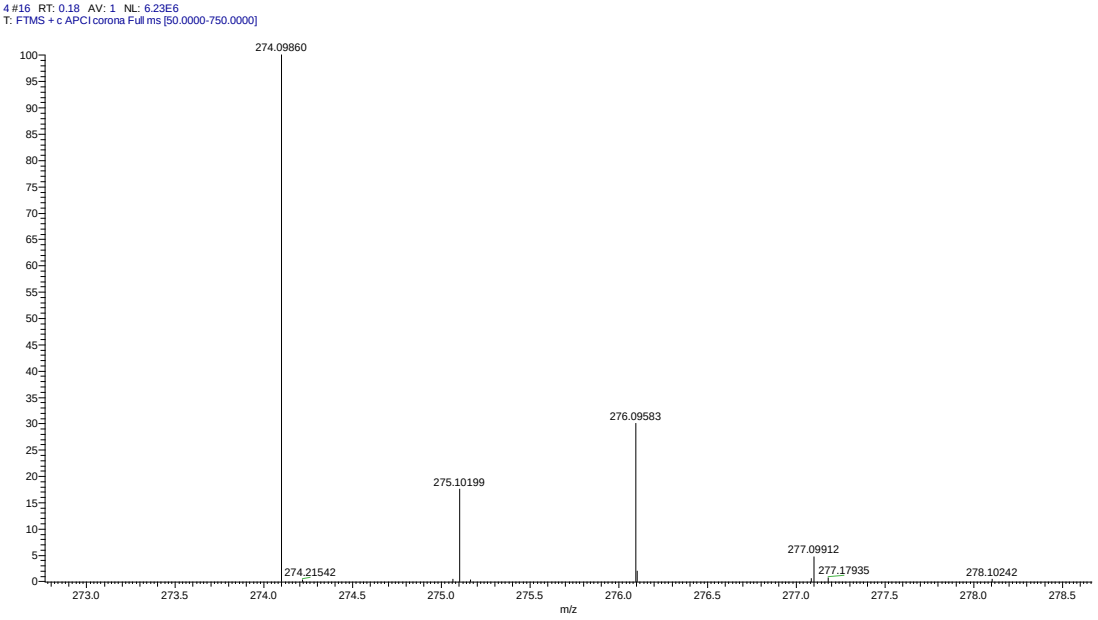
^{1}H NMR of 3-(4-chlorophenyl)-N-methyl-3-phenylpropanamide (10)



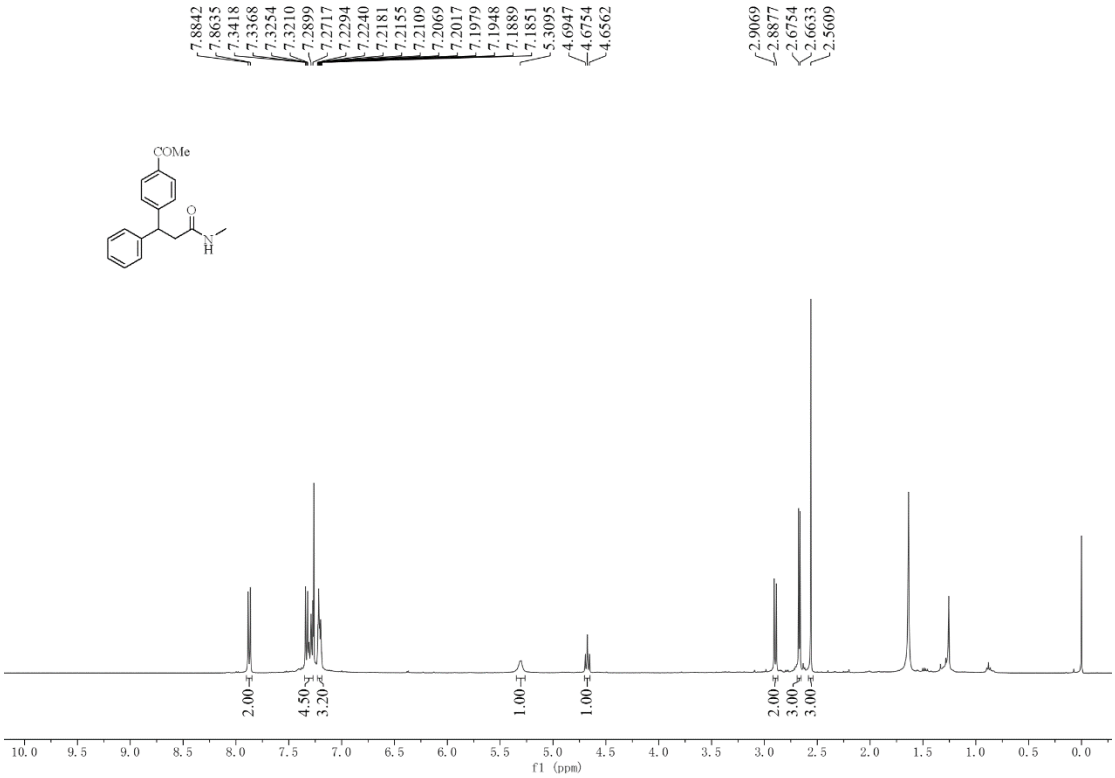
^{13}C NMR of 3-(4-chlorophenyl)-N-methyl-3-phenylpropanamide (10)



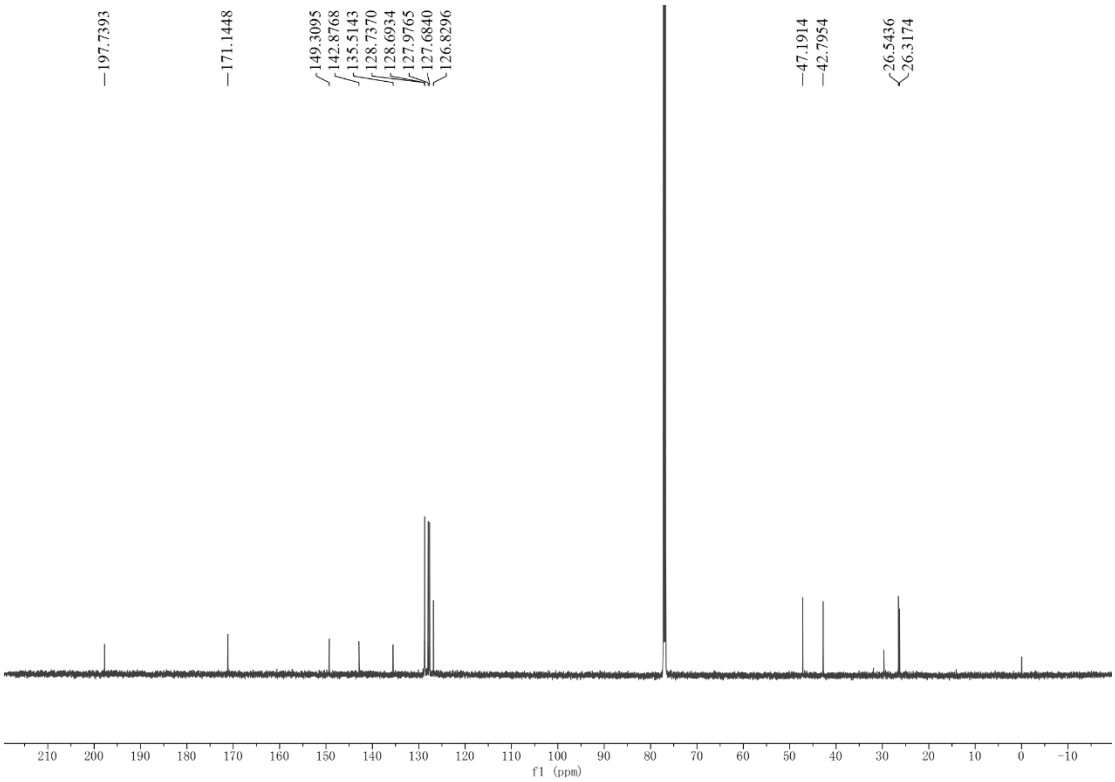
HRMS of 3-(4-chlorophenyl)-N-methyl-3-phenylpropanamide (10)



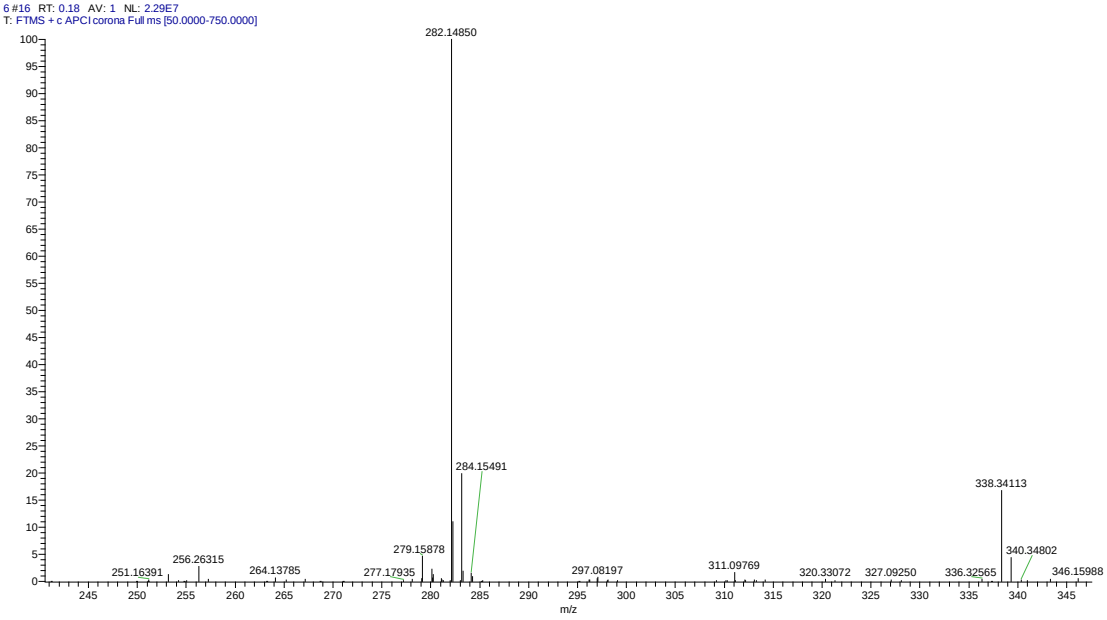
^{1}H NMR of 3-(4-acetylphenyl)-N-methyl-3-phenylpropanamide (11)



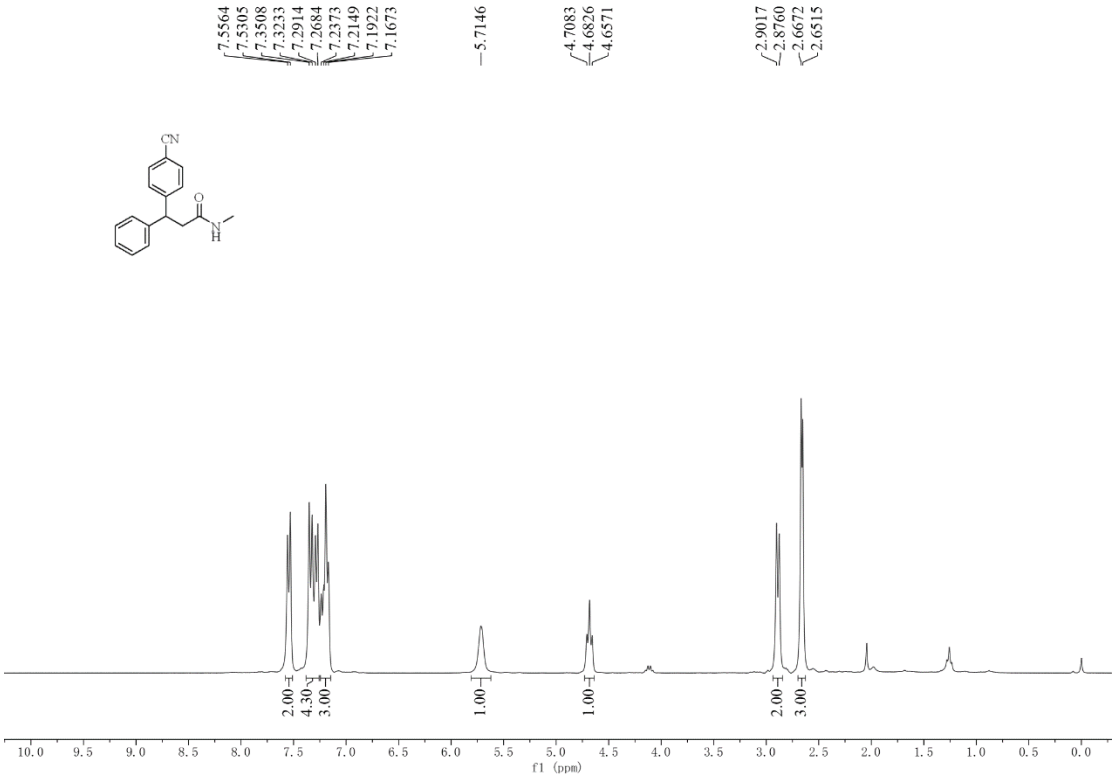
^{13}C NMR of 3-(4-acetylphenyl)-N-methyl-3-phenylpropanamide (11)



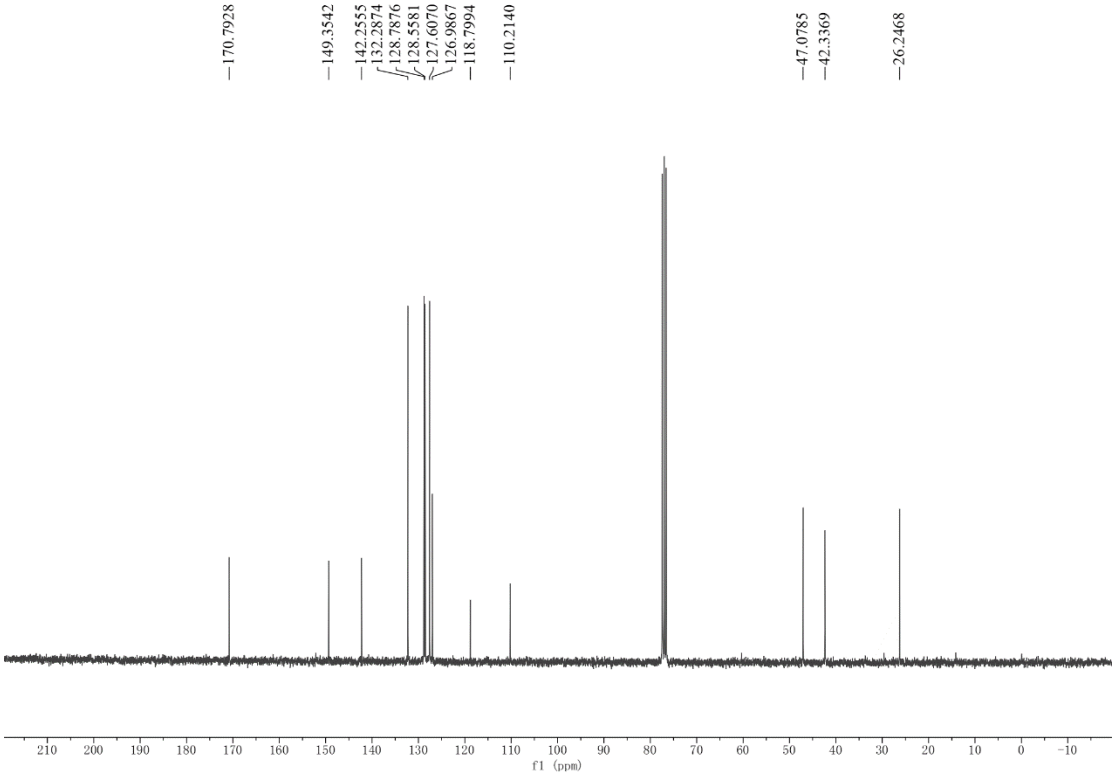
HRMS of 3-(4-acetylphenyl)-N-methyl-3-phenylpropanamide (11)



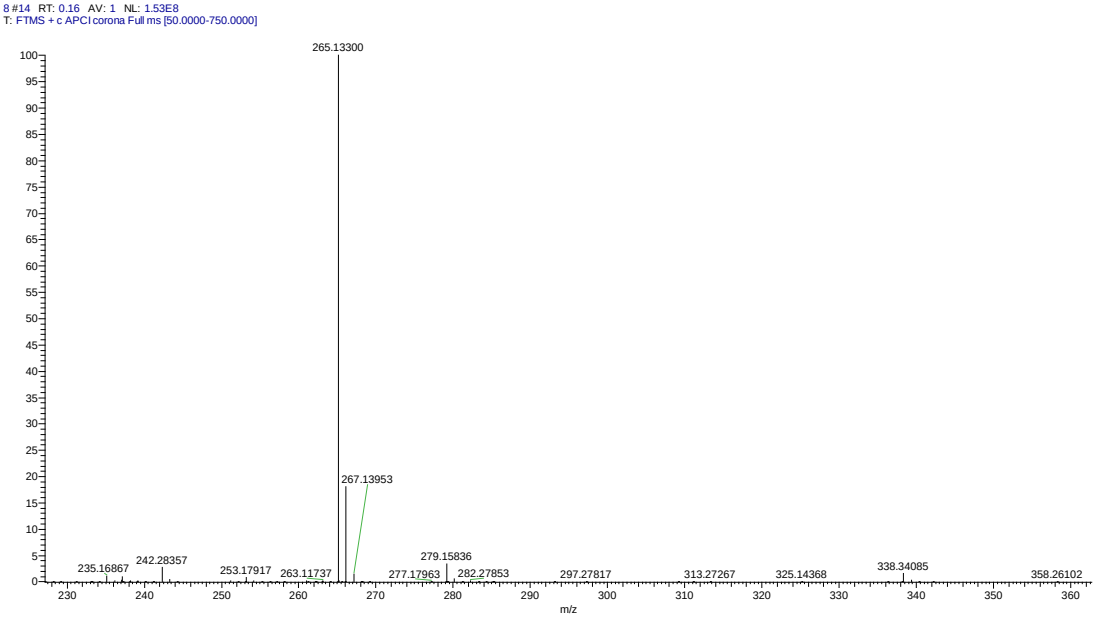
^{1}H NMR of 3-(4-cyanophenyl)-N-methyl-3-phenylpropanamide (12)



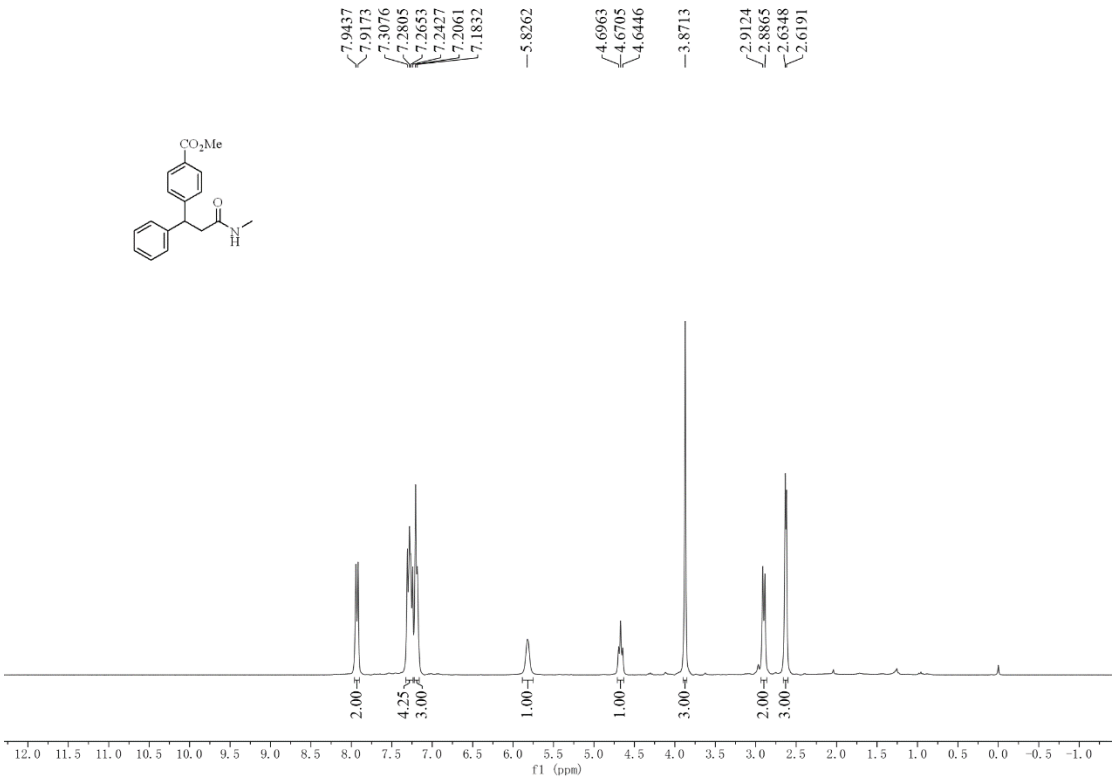
^{13}C NMR of 3-(4-cyanophenyl)-N-methyl-3-phenylpropanamide (12)



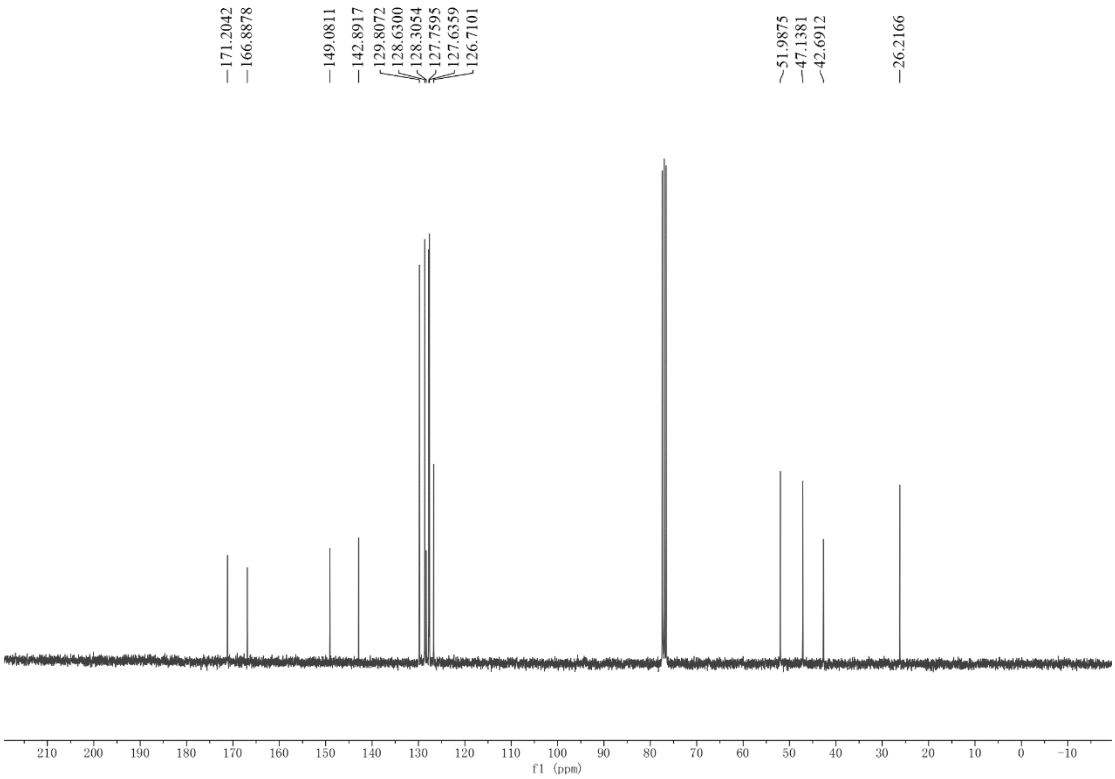
HRMS of 3-(4-cyanophenyl)-N-methyl-3-phenylpropanamide (12)



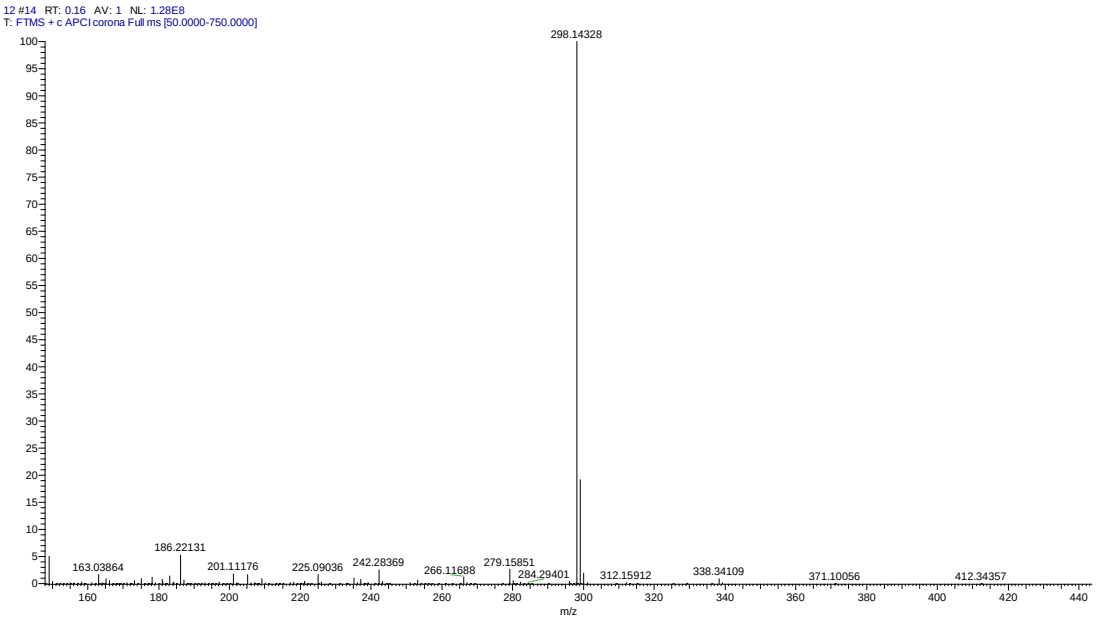
^{1}H NMR of methyl 4-(3-(methylamino)-3-oxo-1-phenylpropyl)benzoate (13)



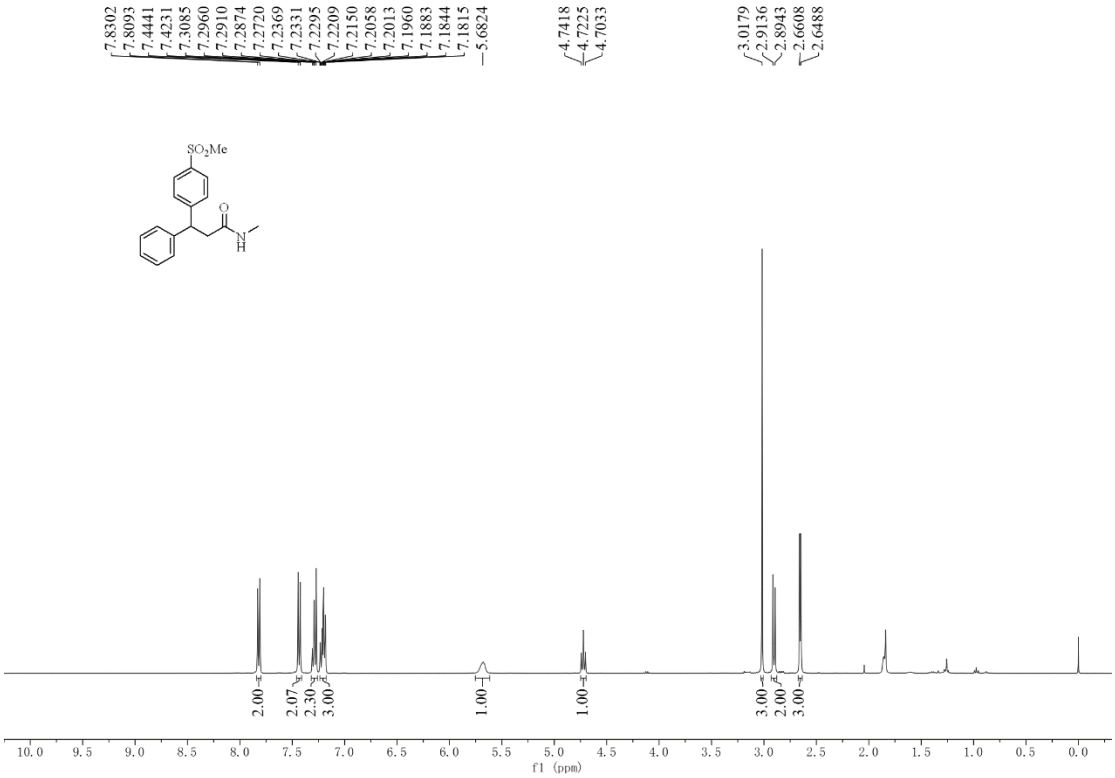
^{13}C NMR of methyl 4-(3-(methylamino)-3-oxo-1-phenylpropyl)benzoate (13)



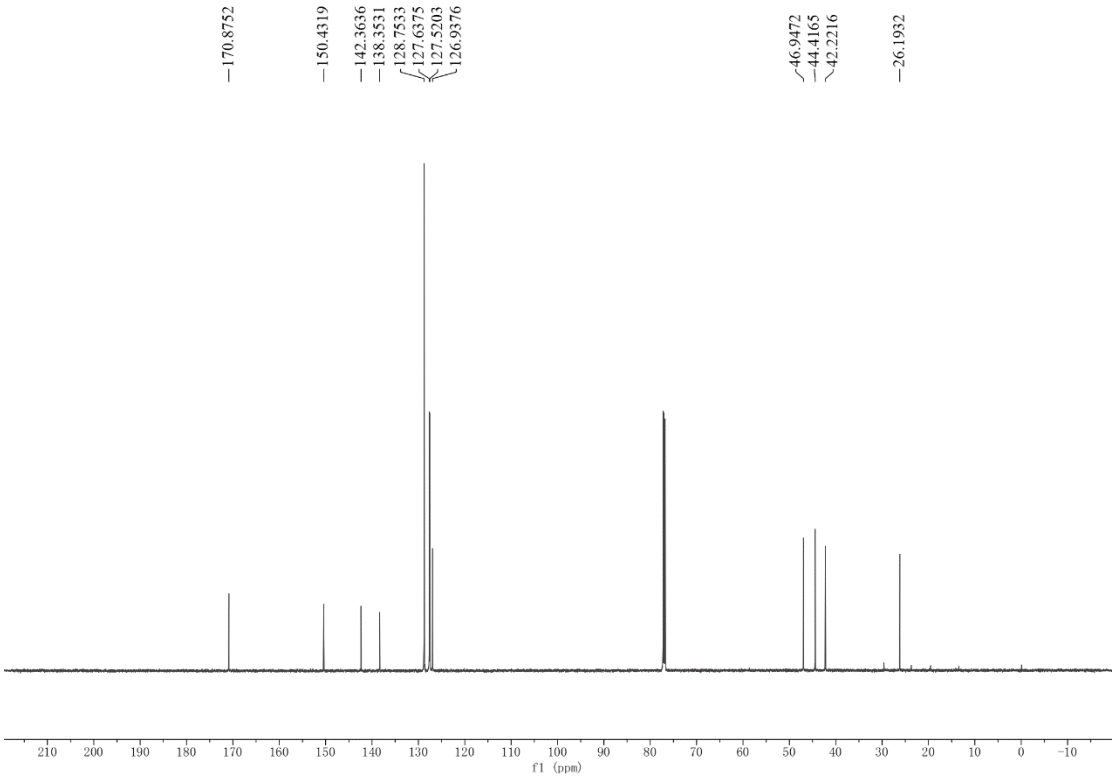
HRMS of methyl 4-(3-(methylamino)-3-oxo-1-phenylpropyl)benzoate (13)



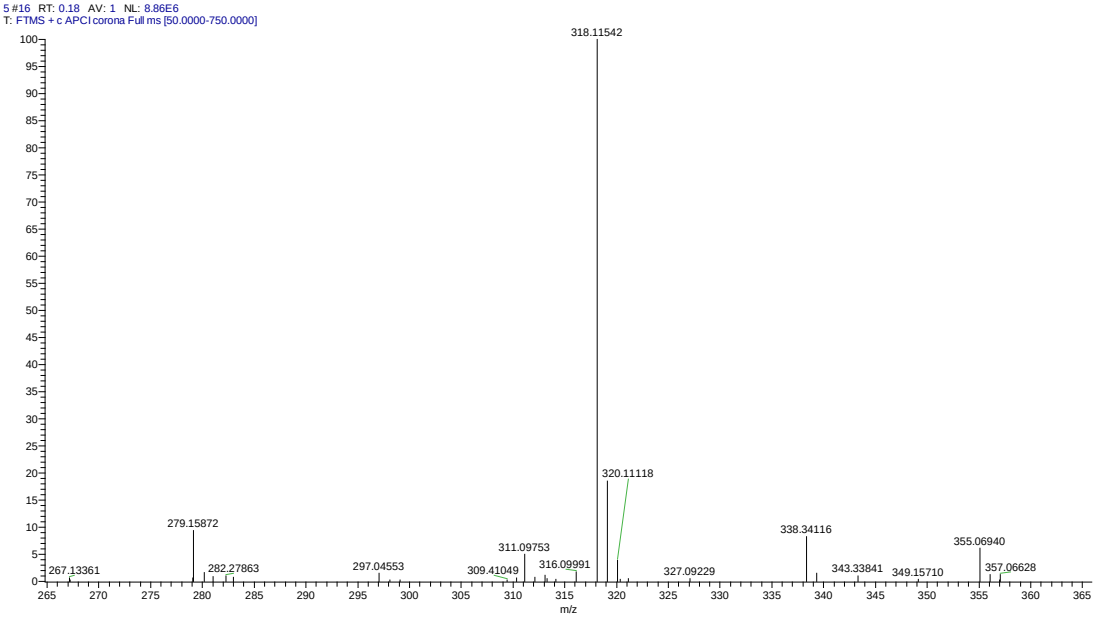
^{1}H NMR of N-methyl-3-(4-(methylsulfonyl)phenyl)-3-phenylpropanamide (14)



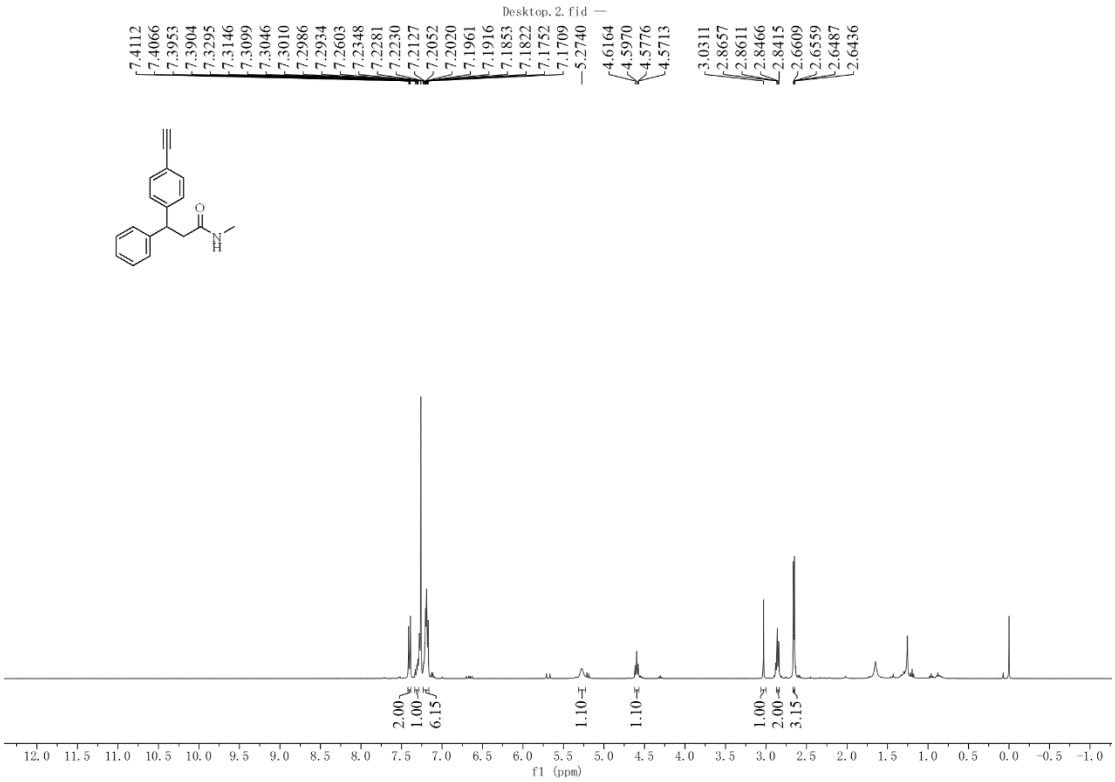
^{13}C NMR of N-methyl-3-(4-(methylsulfonyl)phenyl)-3-phenylpropanamide (14)



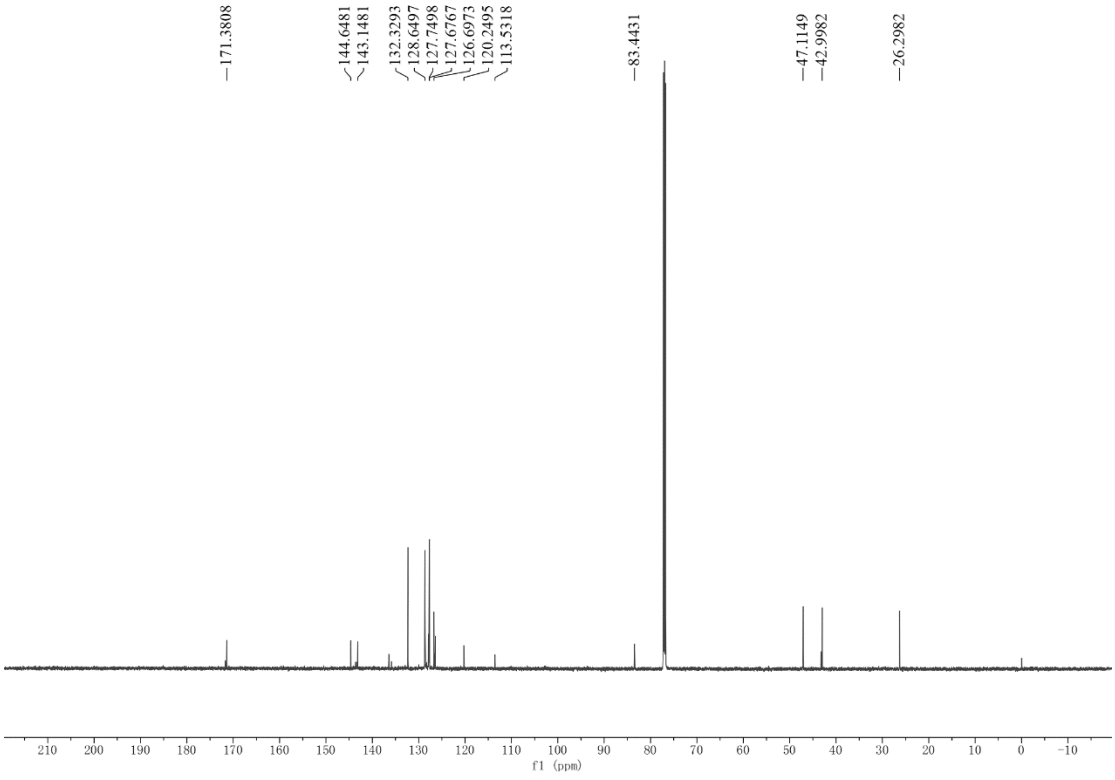
HRMS of N-methyl-3-(4-(methylsulfonyl)phenyl)-3-phenylpropanamide (14)



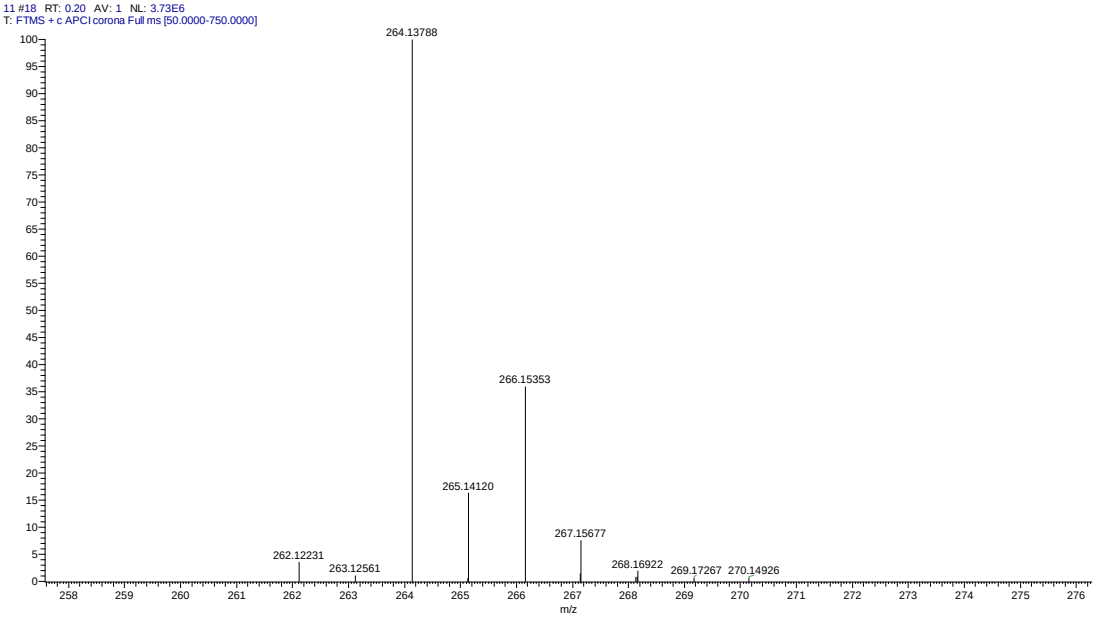
^{1}H NMR of 3-(4-ethynylphenyl)-N-methyl-3-phenylpropanamide (15)



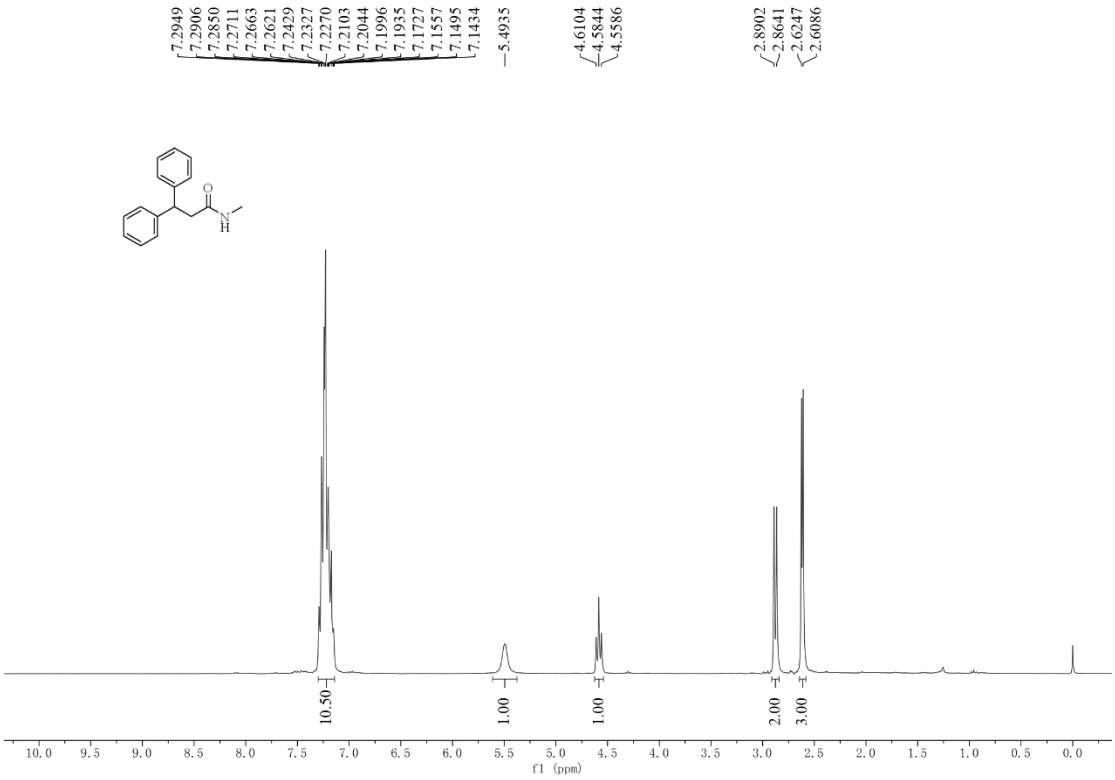
^{13}C NMR of 3-(4-ethynylphenyl)-N-methyl-3-phenylpropanamide (15)



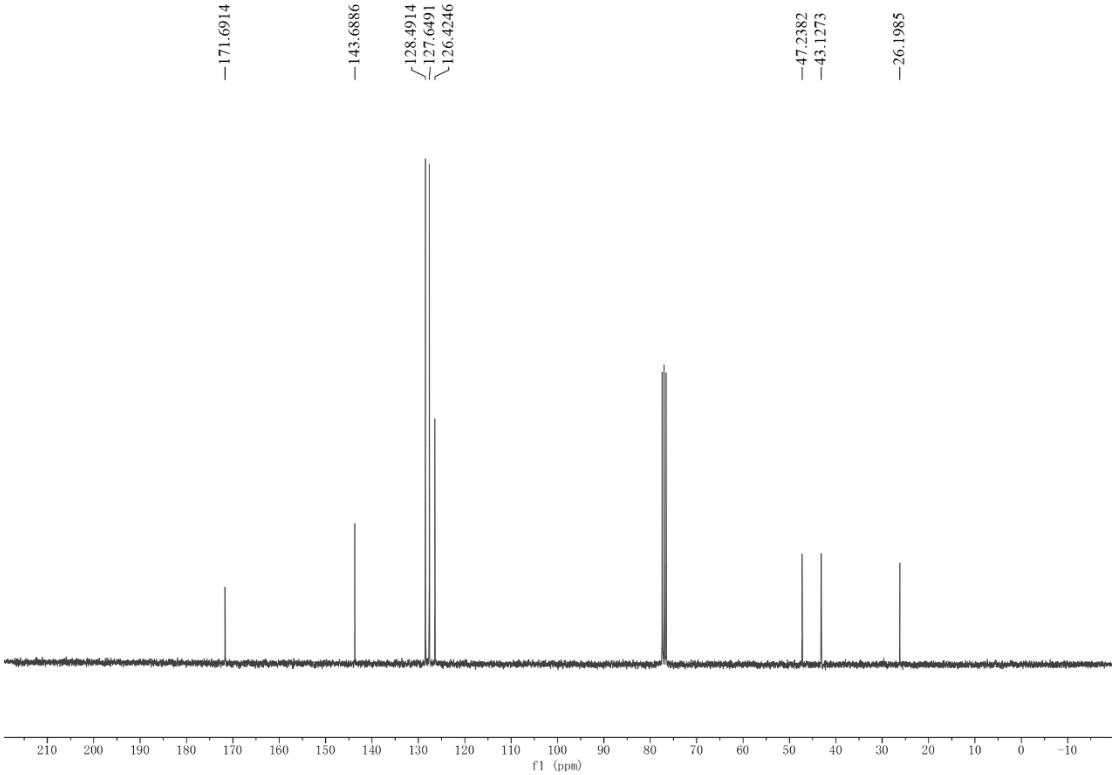
HRMS of 3-(4-ethynylphenyl)-N-methyl-3-phenylpropanamide (15)



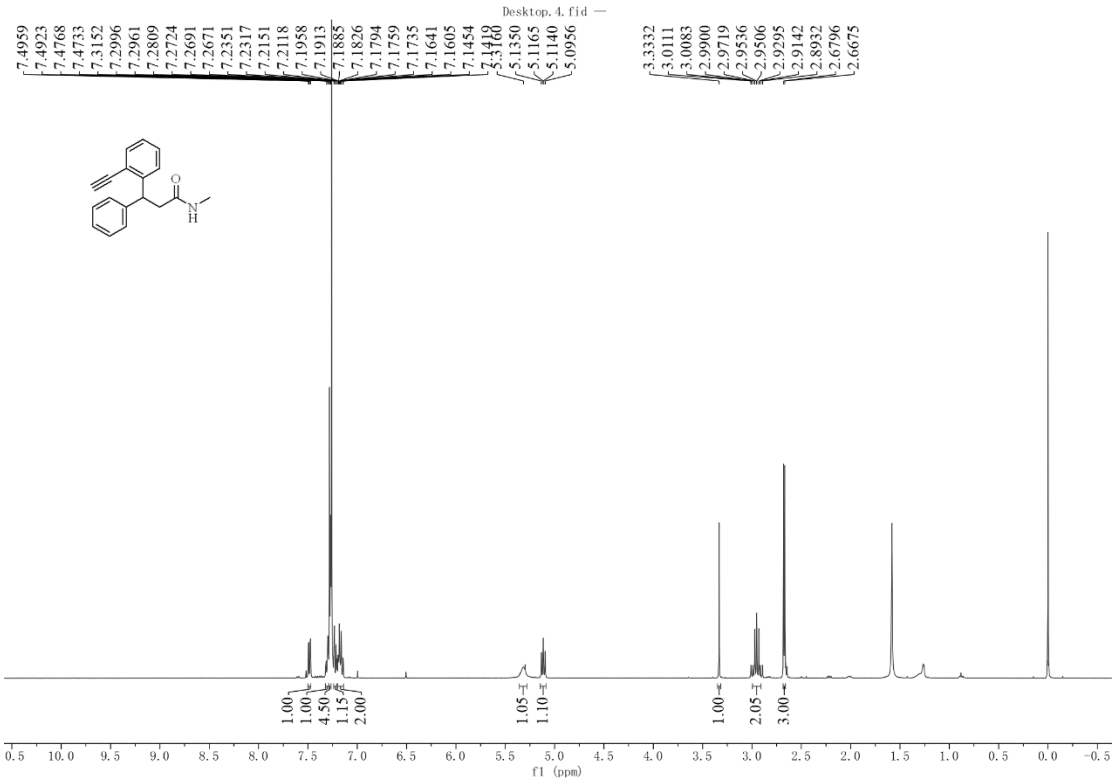
^{1}H NMR of N-methyl-3,3-diphenylpropanamide (16) [7]



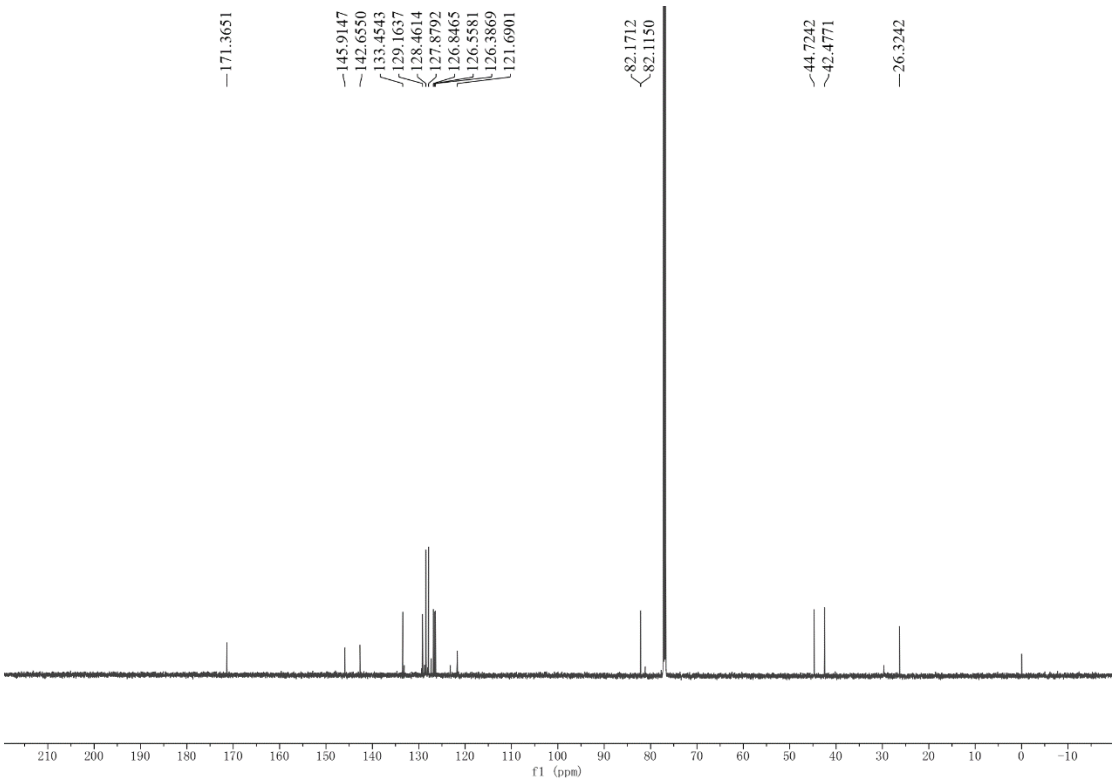
^{13}C NMR of N-methyl-3,3-diphenylpropanamide (16) [7]



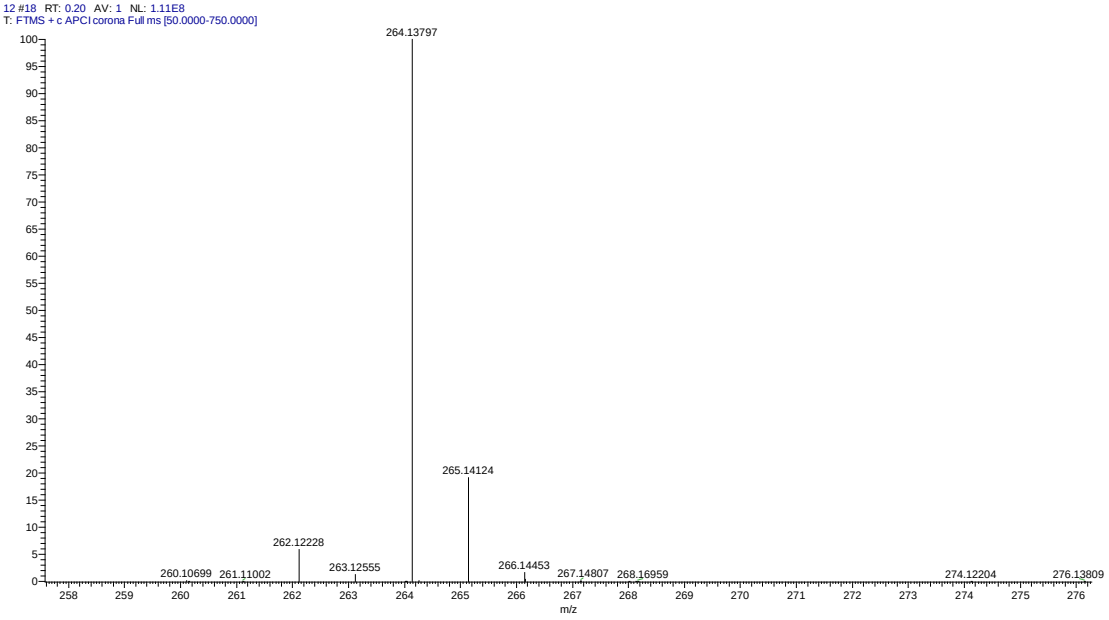
^{1}H NMR of 3-(2-ethynylphenyl)-N-methyl-3-phenylpropanamide (17)



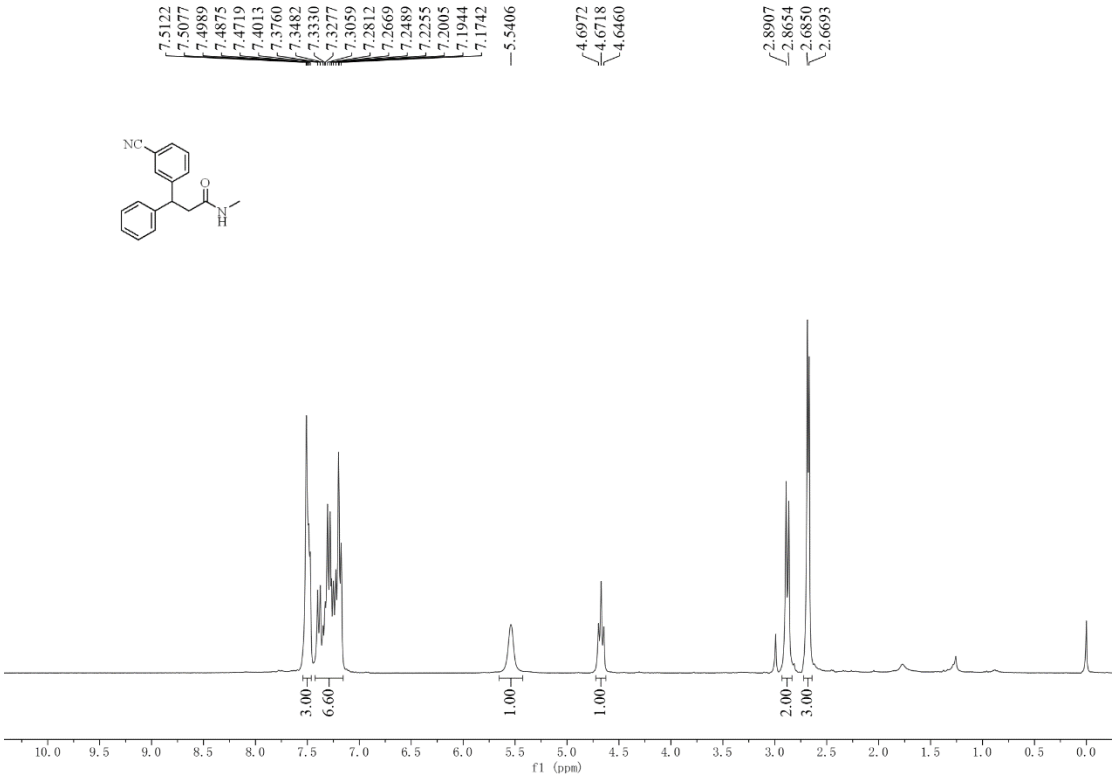
^{13}C NMR of 3-(2-ethynylphenyl)-N-methyl-3-phenylpropanamide (17)



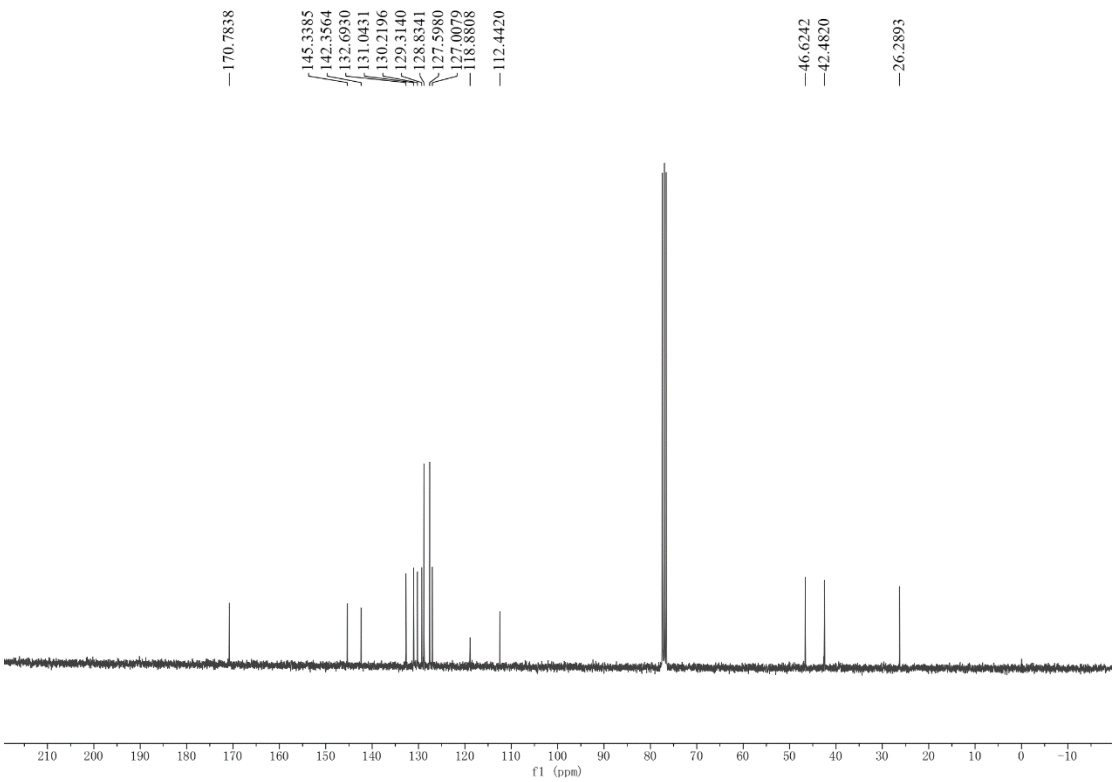
HRMS of 3-(2-ethynylphenyl)-N-methyl-3-phenylpropanamide (17)



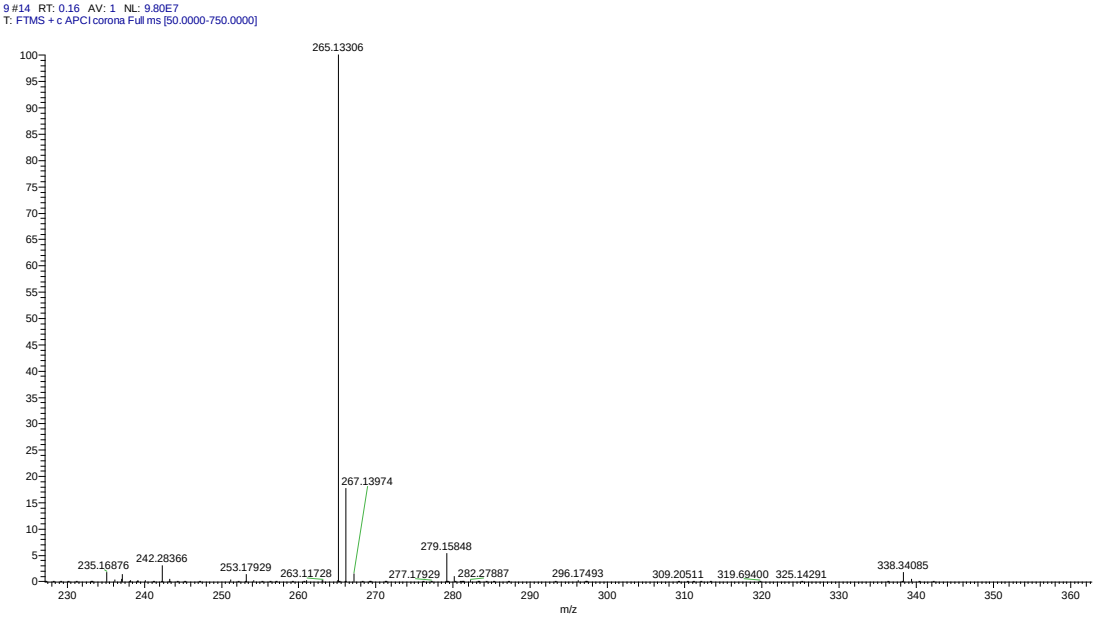
^{1}H NMR of 3-(3-cyanophenyl)-N-methyl-3-phenylpropanamide (18)



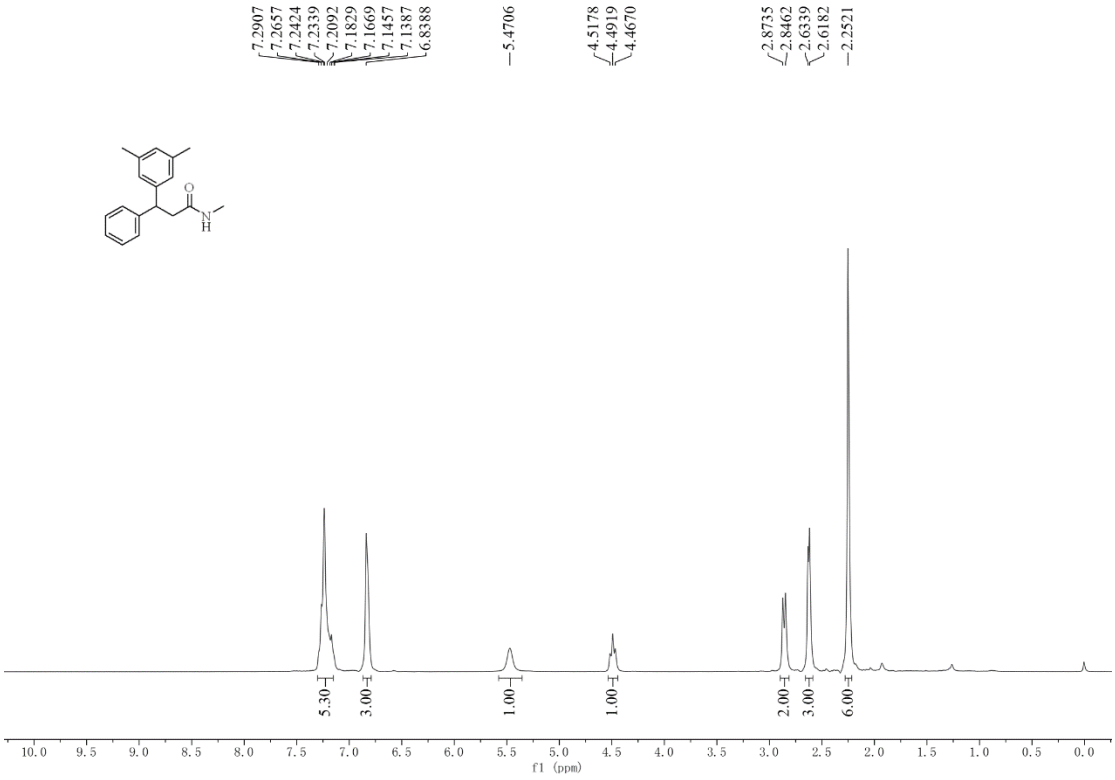
^{13}C NMR of 3-(3-cyanophenyl)-N-methyl-3-phenylpropanamide (18)



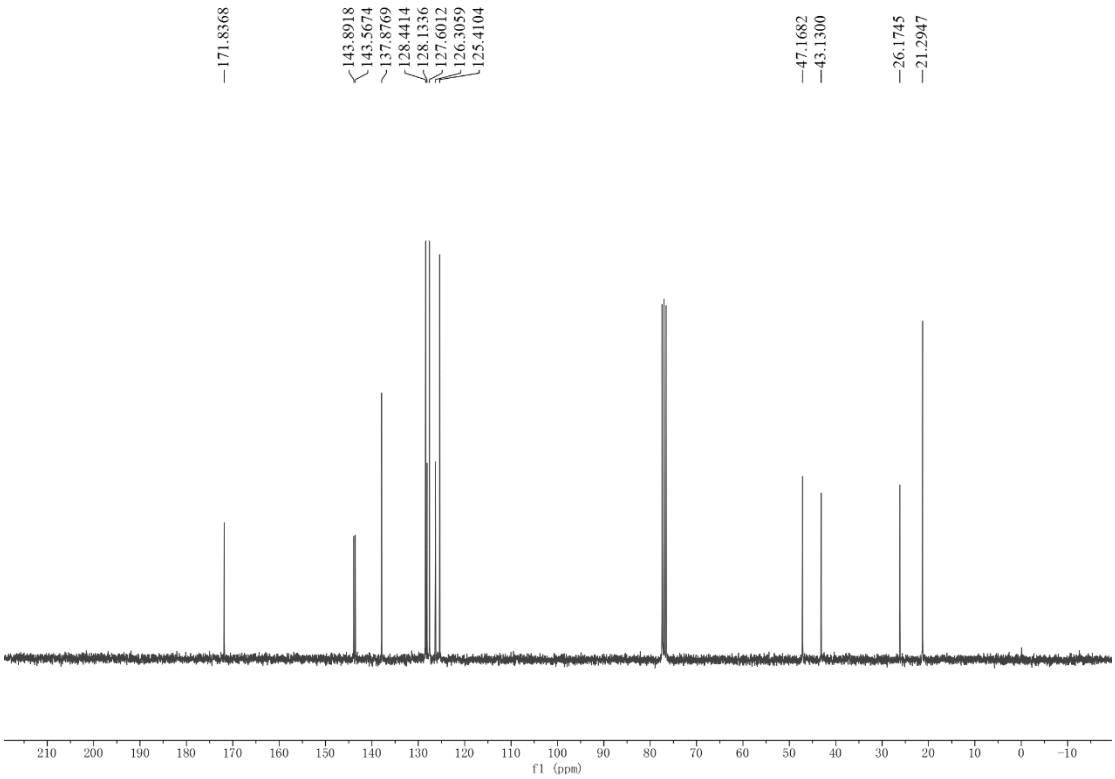
HRMS of 3-(3-cyanophenyl)-N-methyl-3-phenylpropanamide (18)



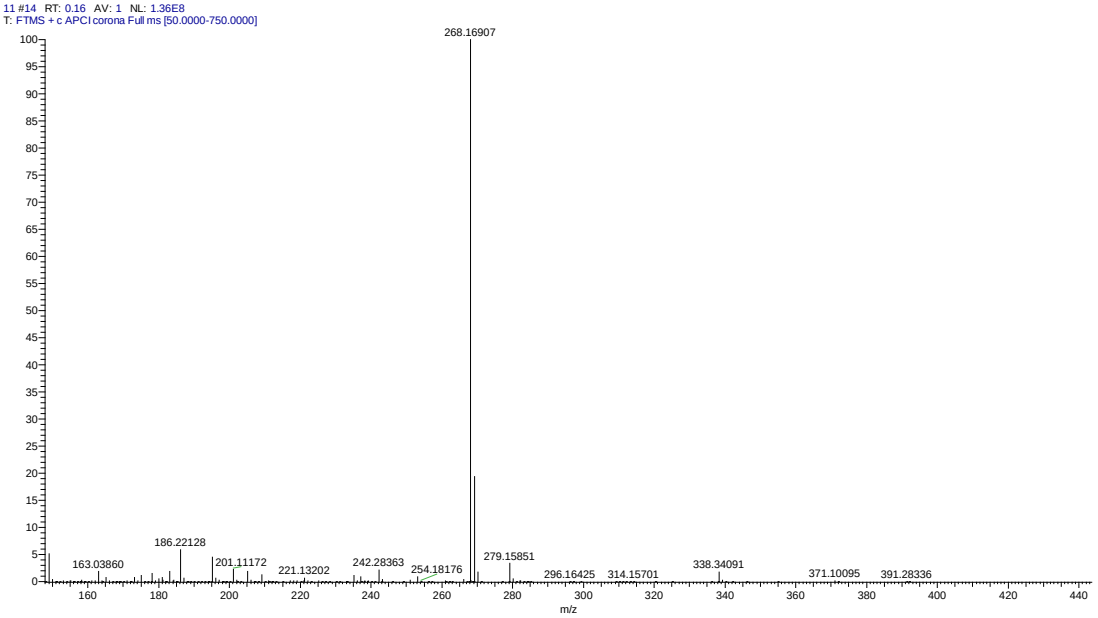
^{1}H NMR of 3-(3,5-dimethylphenyl)-N-methyl-3-phenylpropanamide (19)



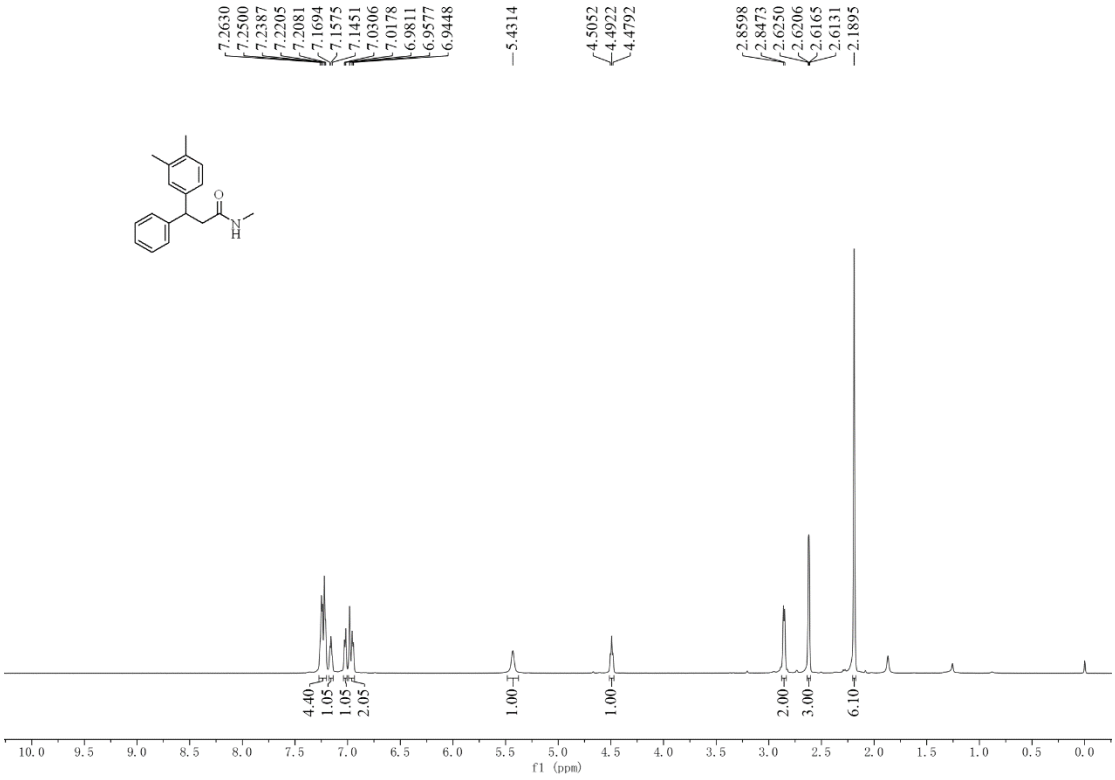
^{13}C NMR of 3-(3,5-dimethylphenyl)-N-methyl-3-phenylpropanamide (19)



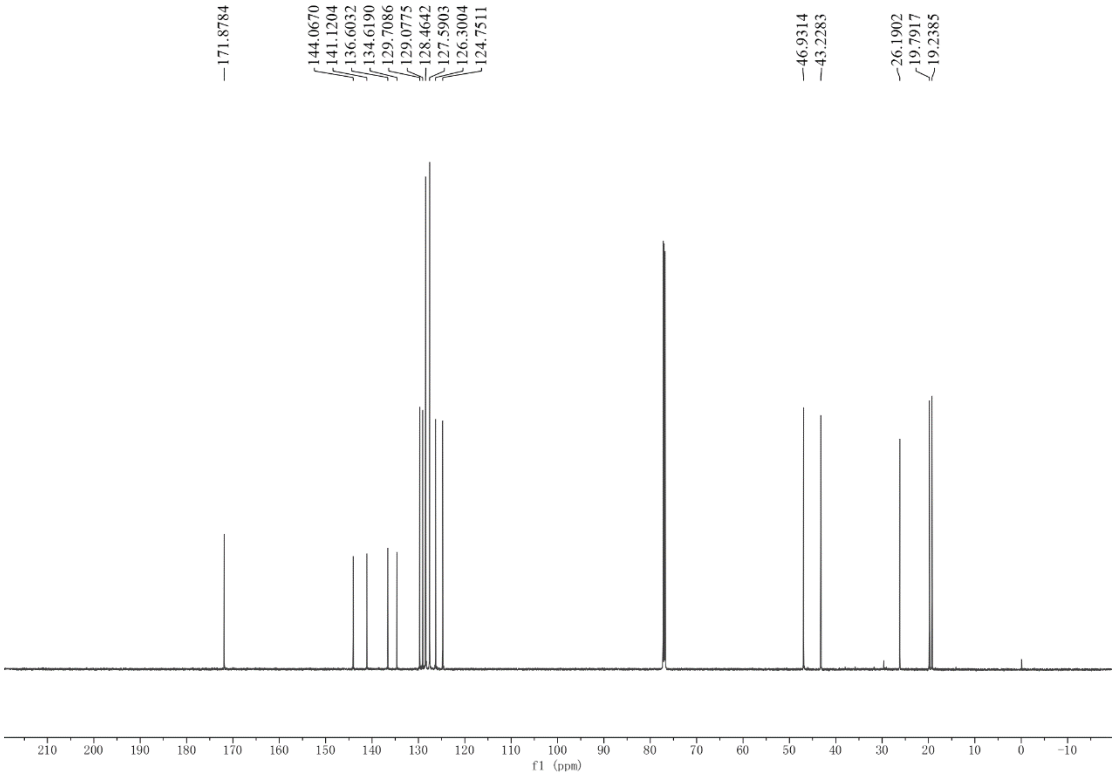
HRMS of 3-(3,5-dimethylphenyl)-N-methyl-3-phenylpropanamide (19)



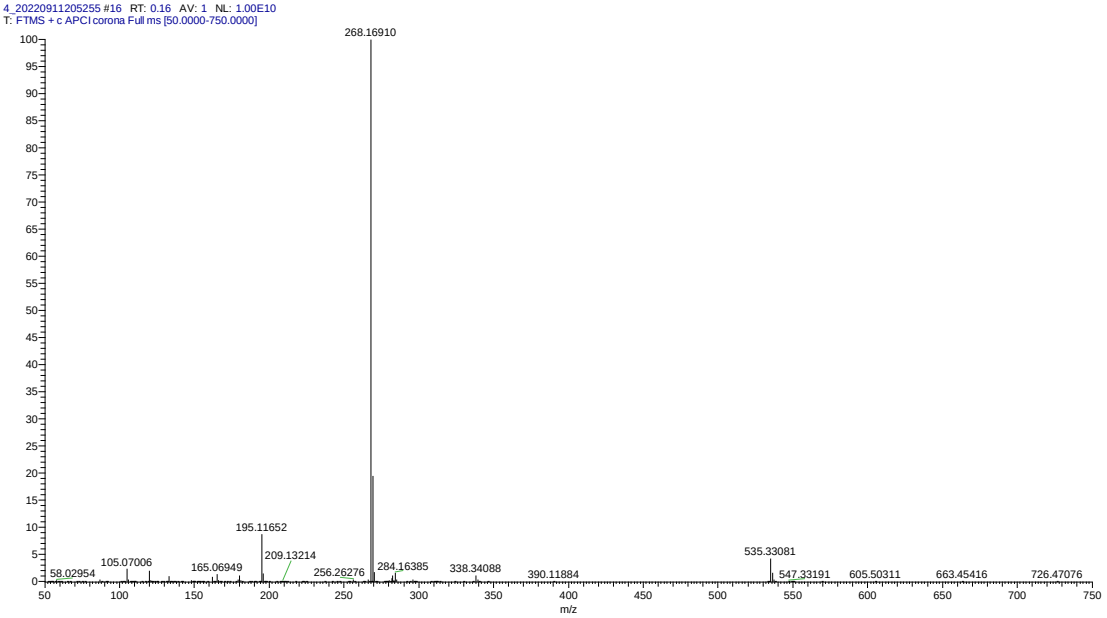
^{1}H NMR of 3-(3,4-dimethylphenyl)-N-methyl-3-phenylpropanamide (20)



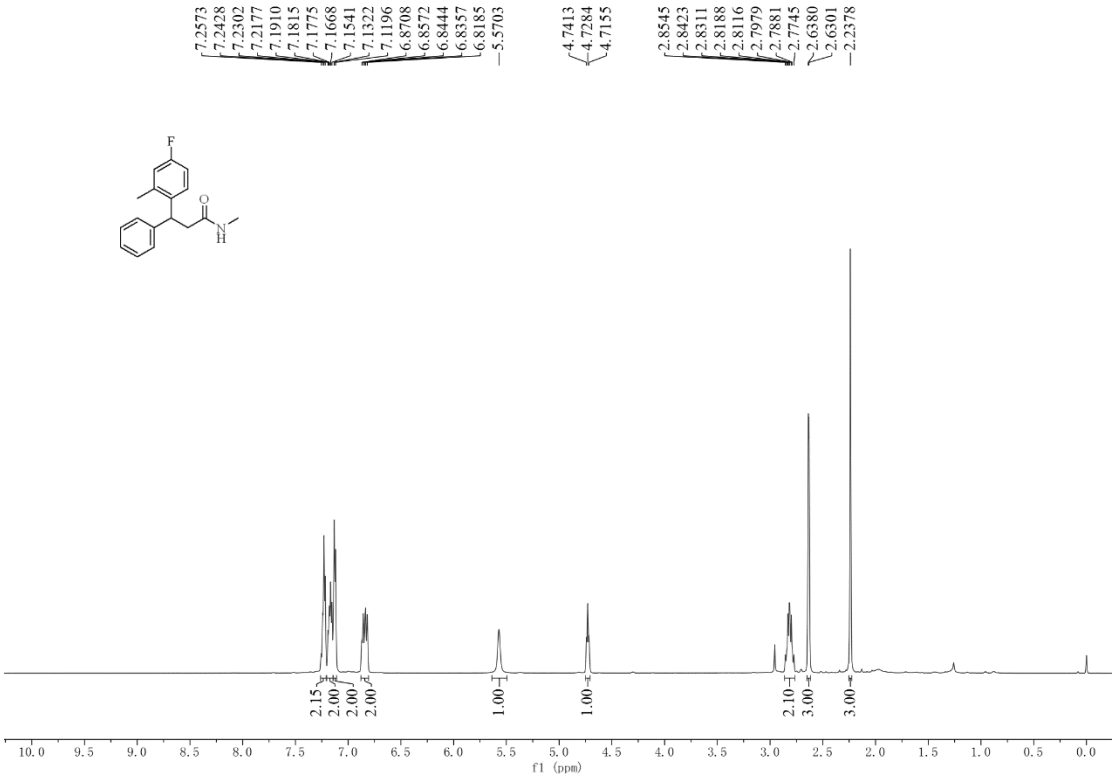
^{13}C NMR of 3-(3,4-dimethylphenyl)-N-methyl-3-phenylpropanamide (20)



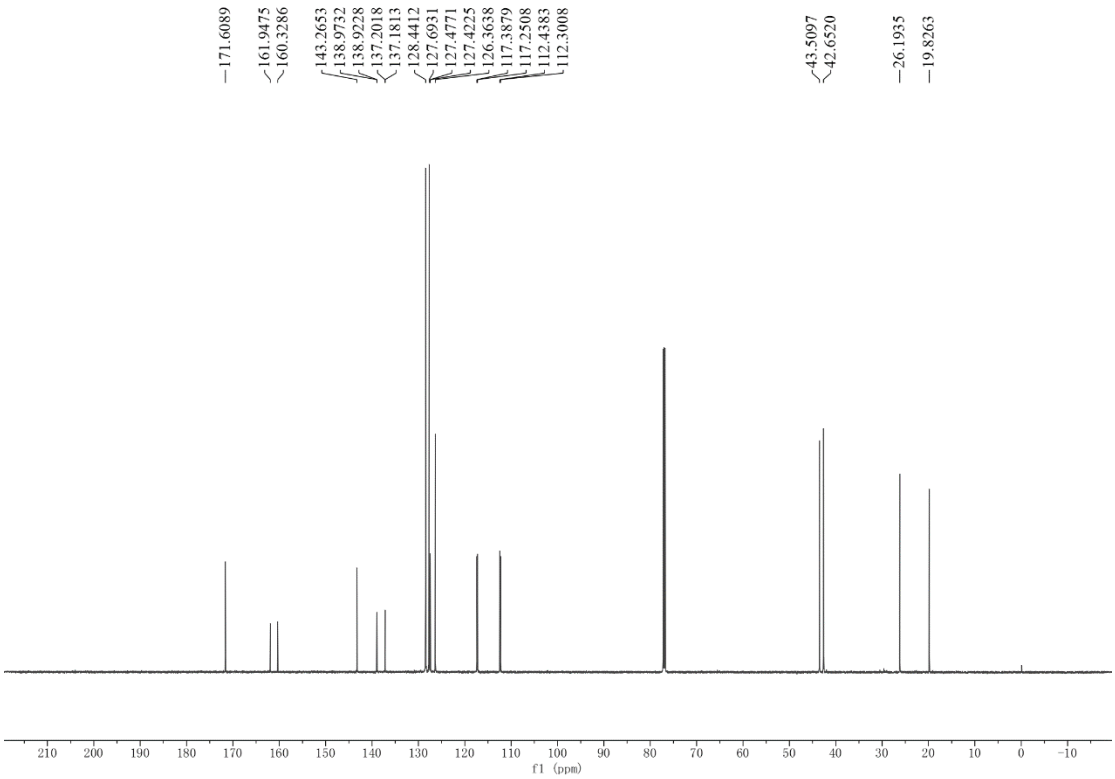
HRMS of 3-(3,4-dimethylphenyl)-N-methyl-3-phenylpropanamide (20)



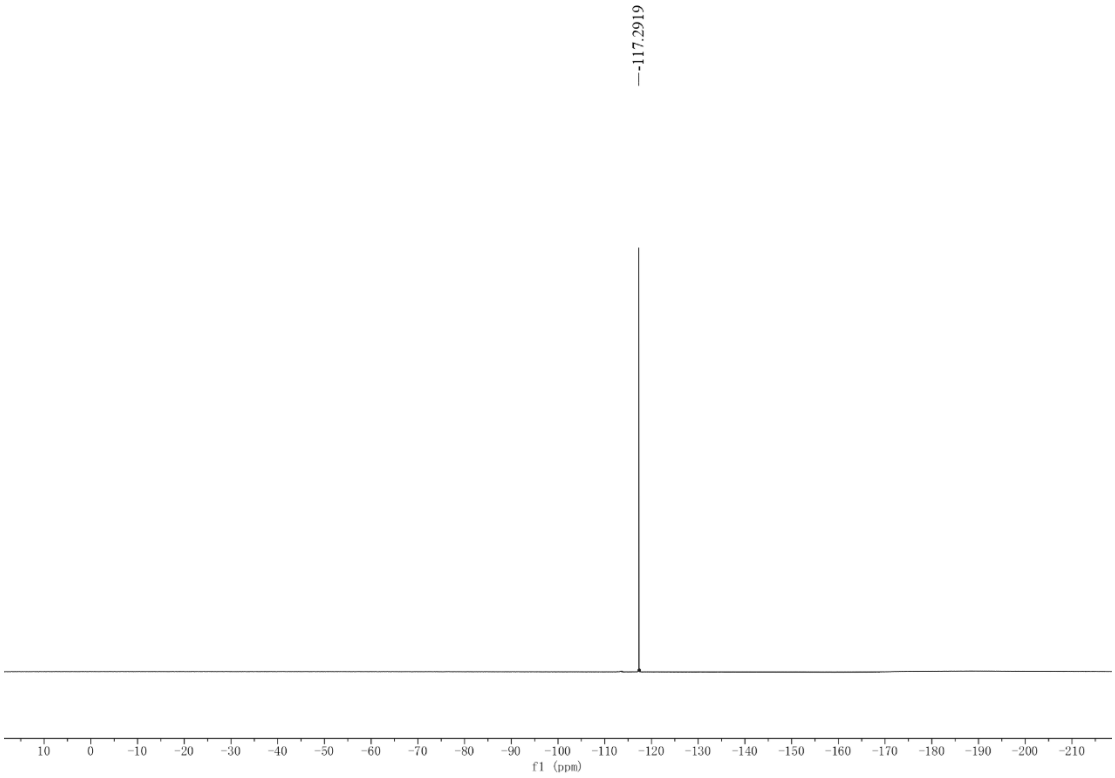
^{1}H NMR of 3-(4-fluoro-2-methylphenyl)-N-methyl-3-phenylpropanamide (21)



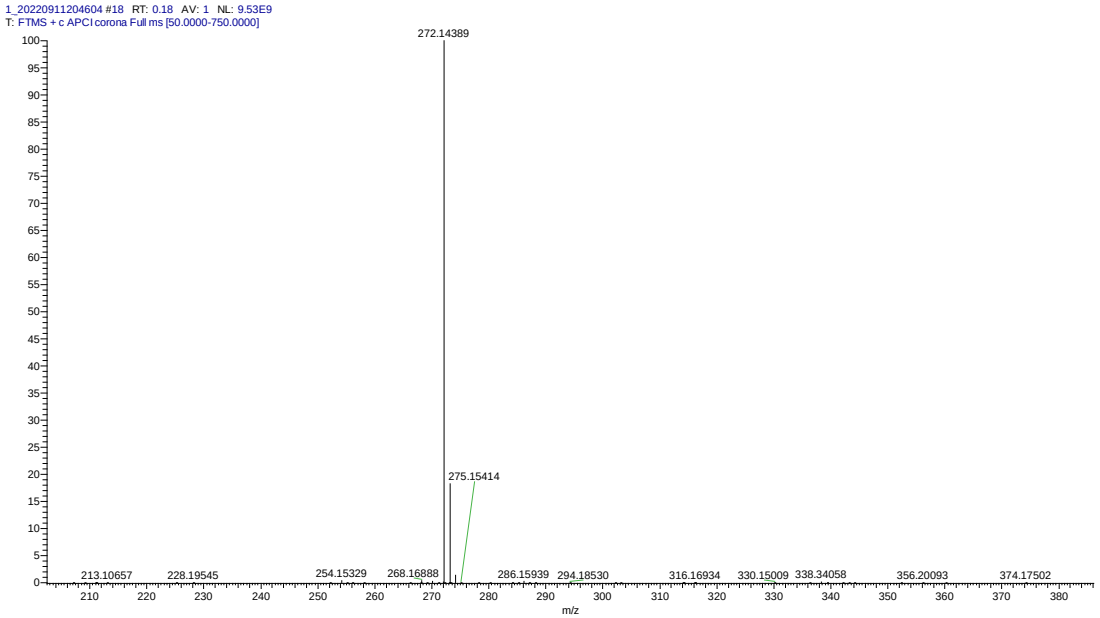
^{13}C NMR of 3-(4-fluoro-2-methylphenyl)-N-methyl-3-phenylpropanamide (21)



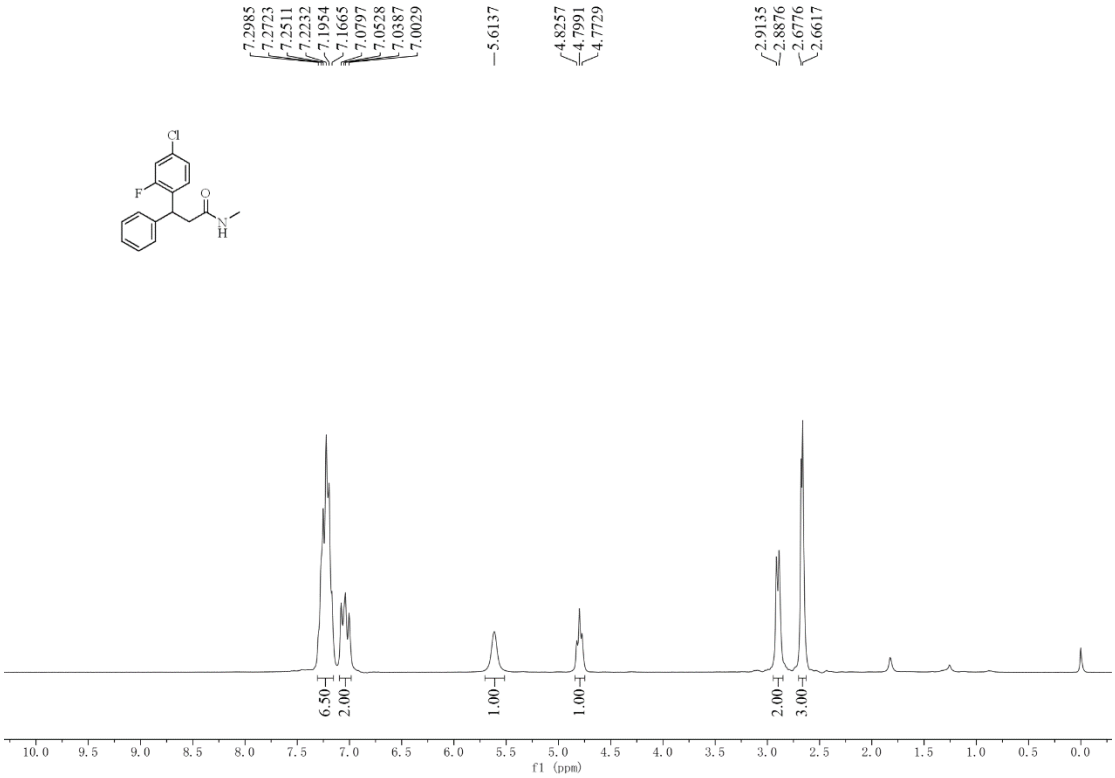
^{19}F NMR of 3-(4-fluoro-2-methylphenyl)-N-methyl-3-phenylpropanamide (21)



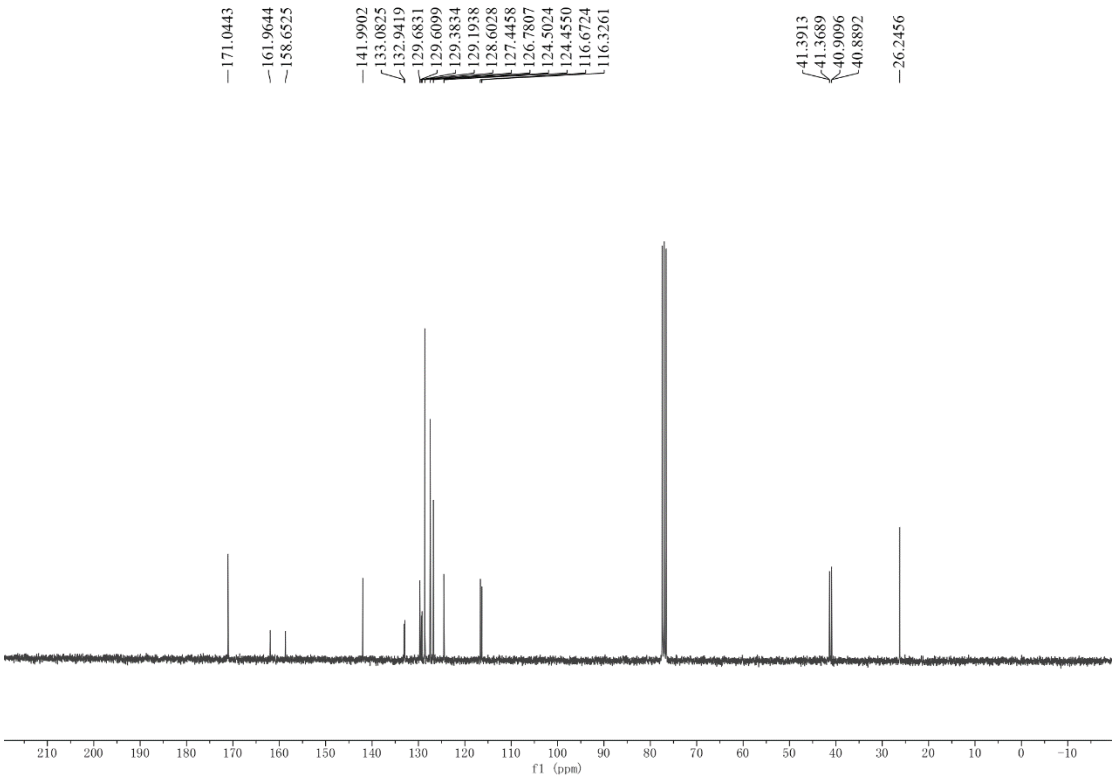
HRMS of 3-(4-fluoro-2-methylphenyl)-N-methyl-3-phenylpropanamide (21)



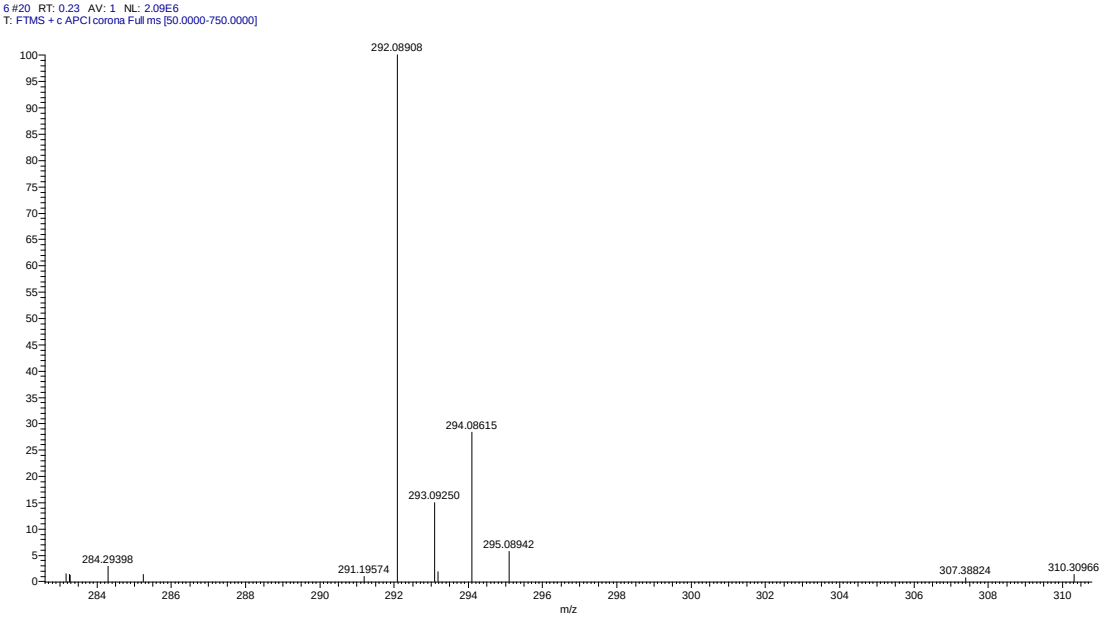
^{1}H NMR of 3-(4-chloro-2-fluorophenyl)-N-methyl-3-phenylpropanamide (22)



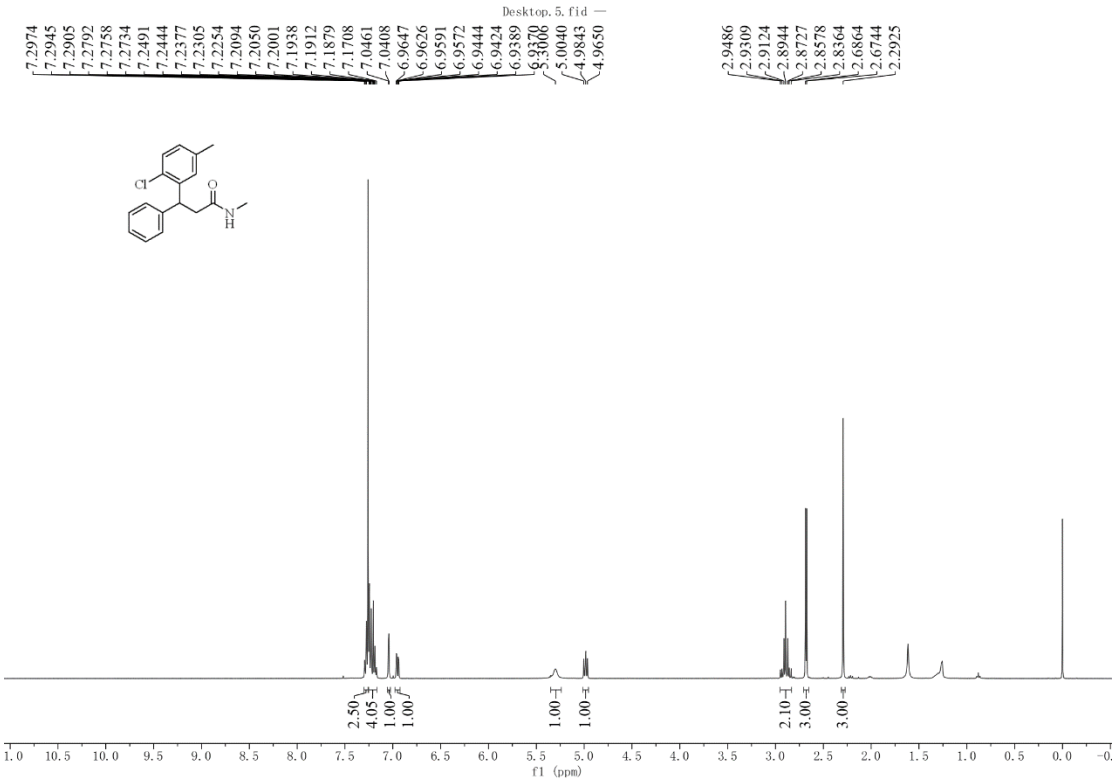
^{13}C NMR of 3-(4-chloro-2-fluorophenyl)-N-methyl-3-phenylpropanamide (22)



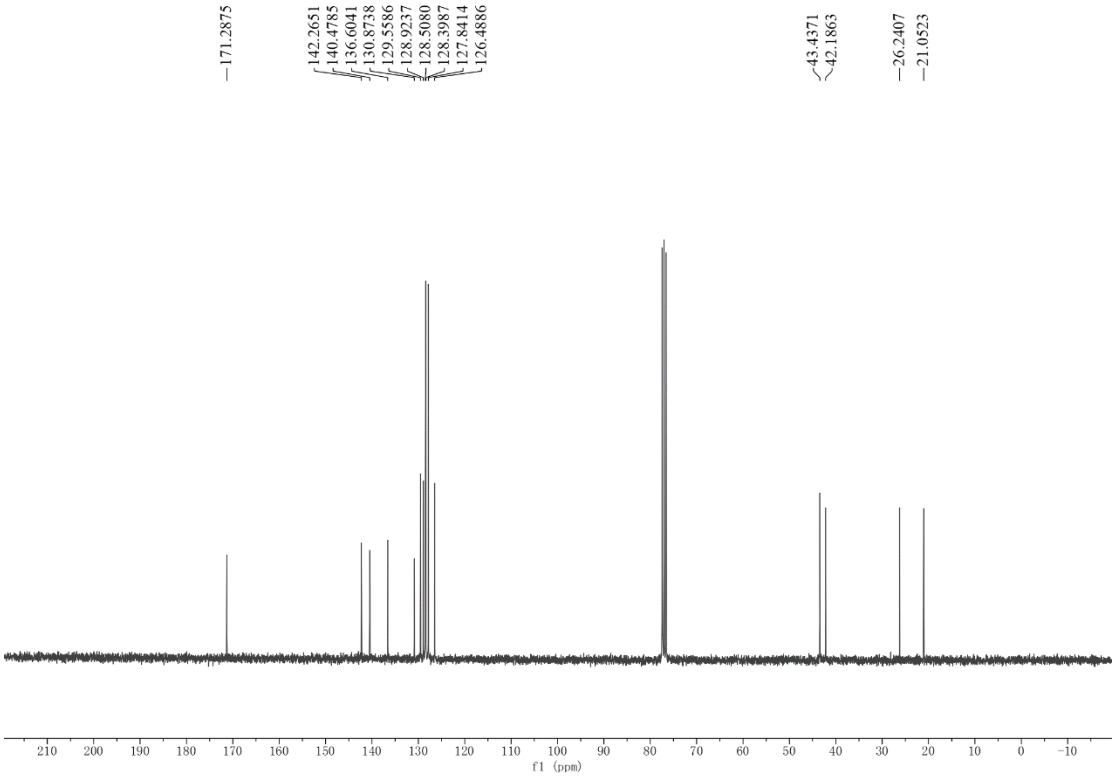
HRMS of 3-(4-chloro-2-fluorophenyl)-N-methyl-3-phenylpropanamide (22)



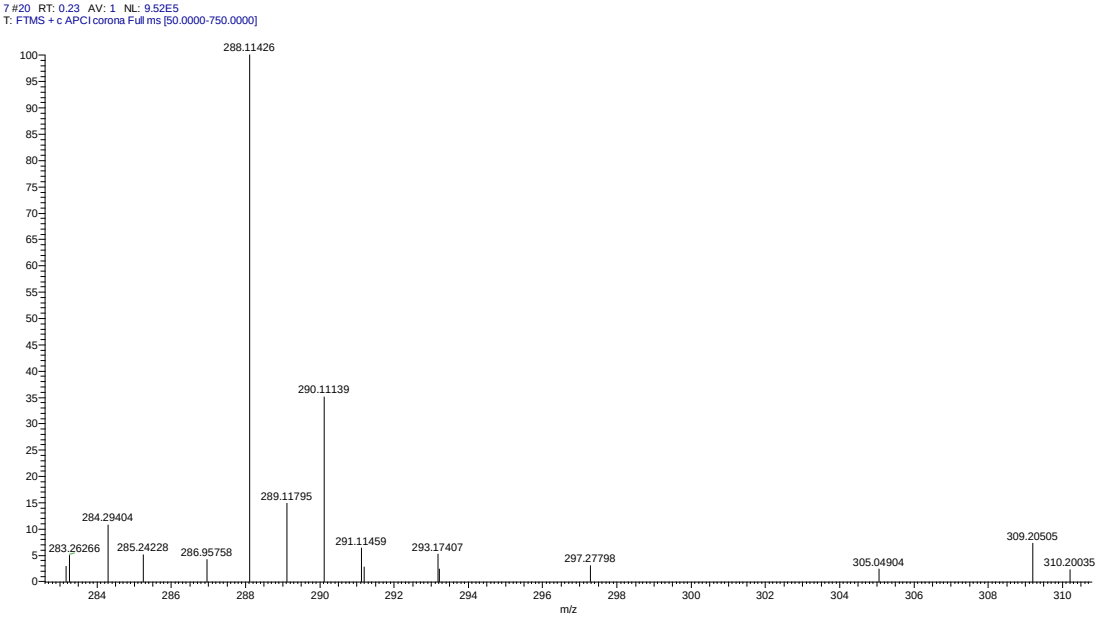
^{1}H NMR of 3-(2-chloro-5-methylphenyl)-N-methyl-3-phenylpropanamide (23)



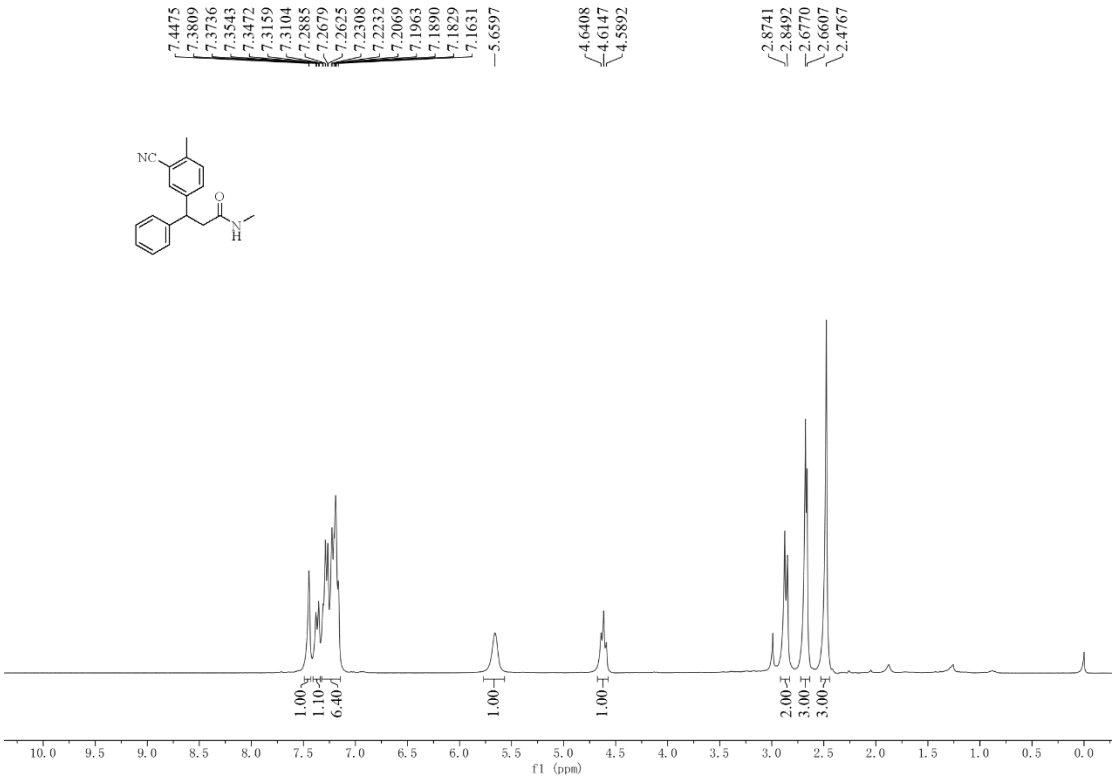
^{13}C NMR of 3-(2-chloro-5-methylphenyl)-N-methyl-3-phenylpropanamide (23)



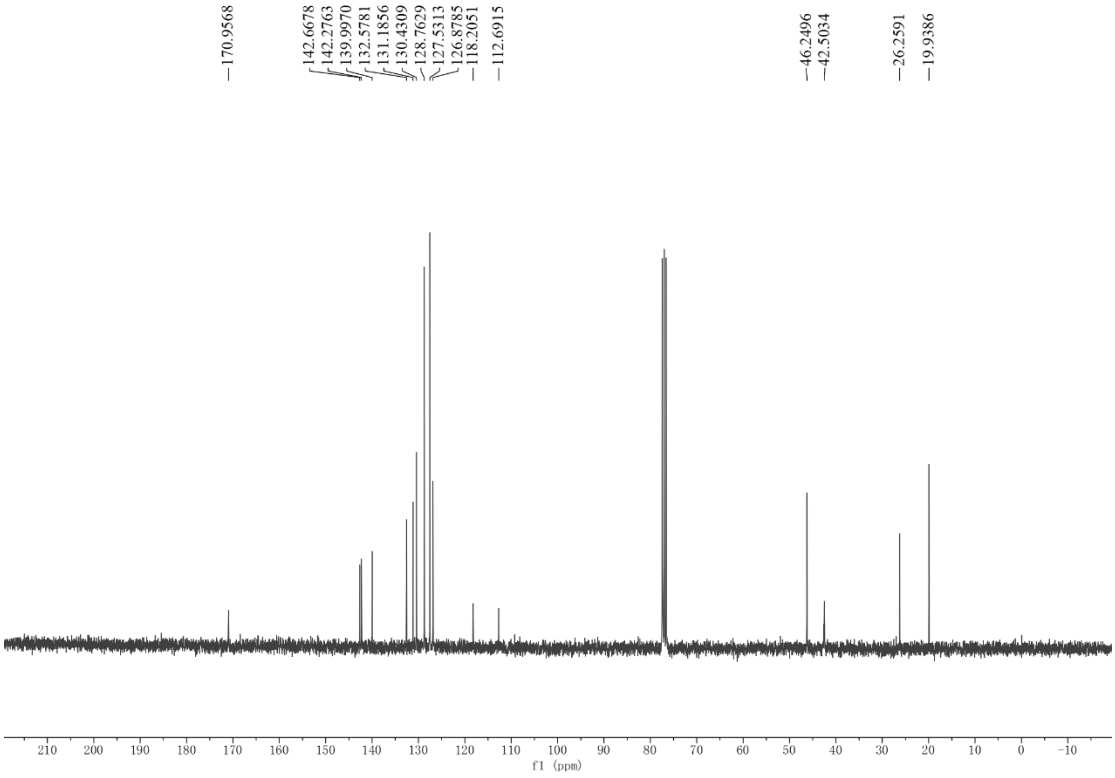
HRMS of 3-(2-chloro-5-methylphenyl)-N-methyl-3-phenylpropanamide (23)



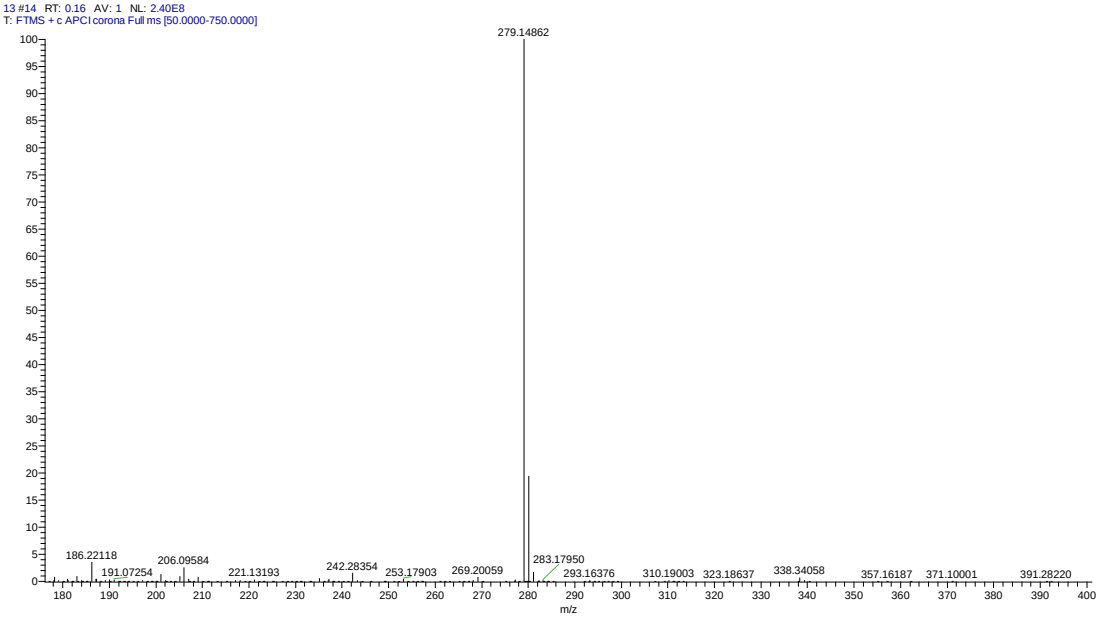
^{1}H NMR of 3-(3-cyano-4-methylphenyl)-N-methyl-3-phenylpropanamide (24)



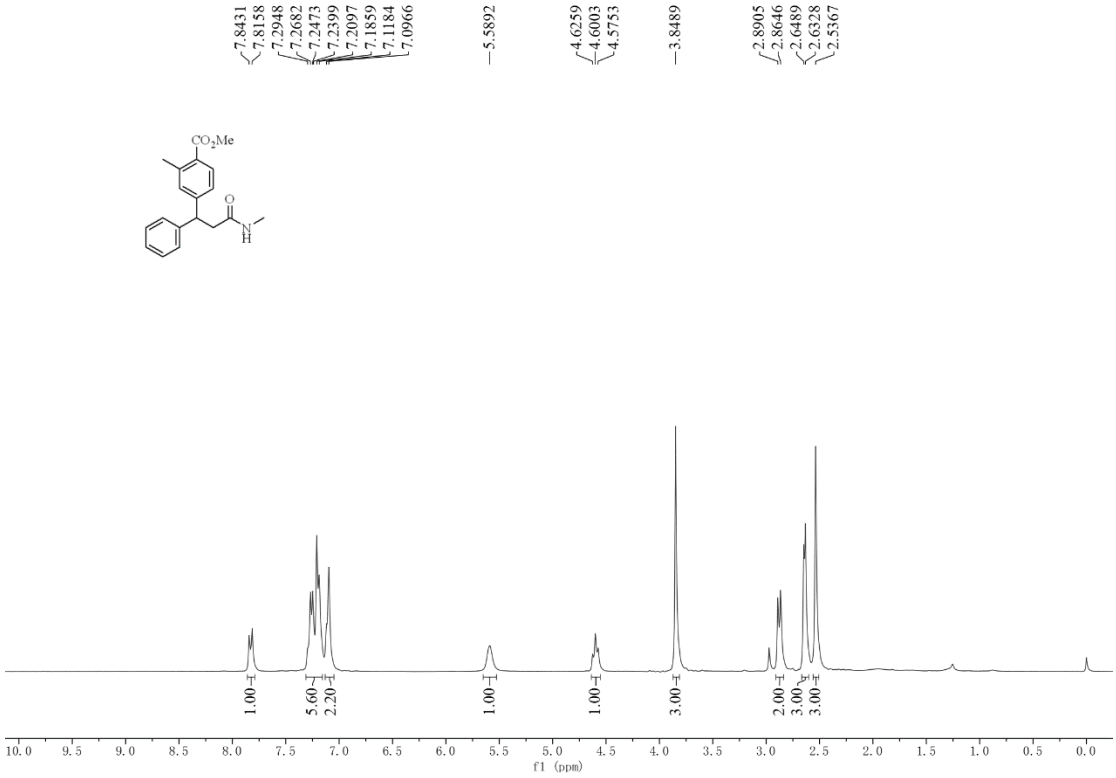
^{13}C NMR of 3-(3-cyano-4-methylphenyl)-N-methyl-3-phenylpropanamide (24)



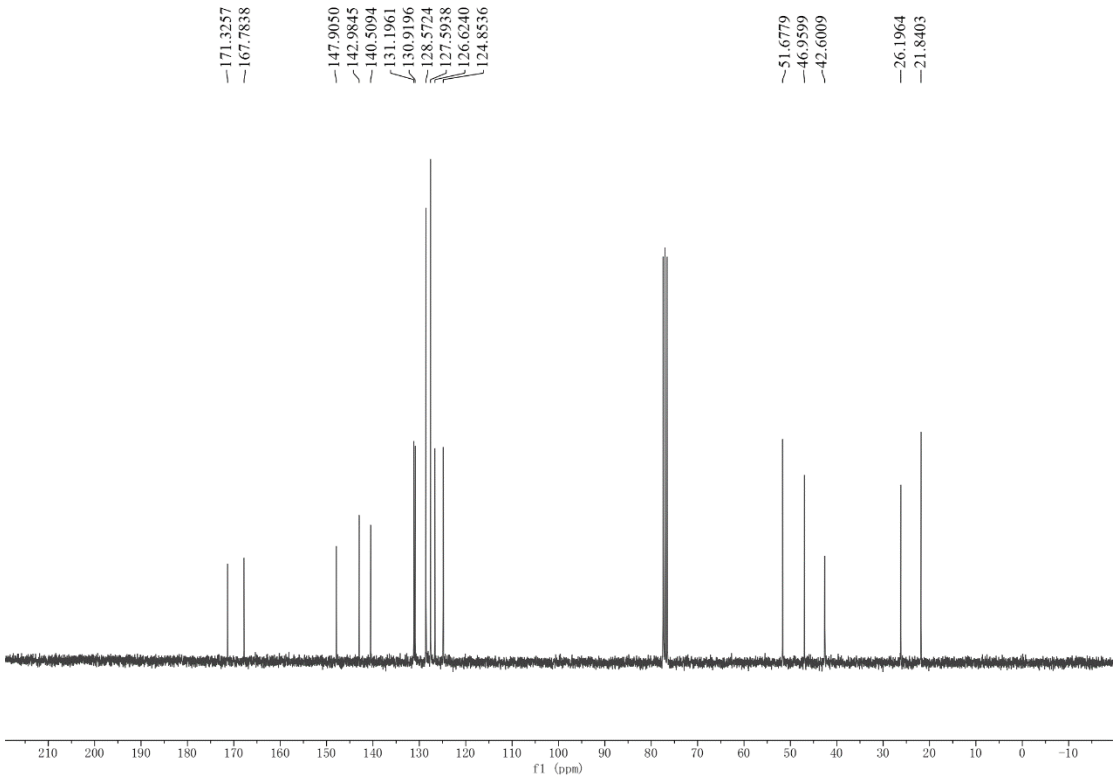
HRMS of 3-(3-cyano-4-methylphenyl)-N-methyl-3-phenylpropanamide (24)



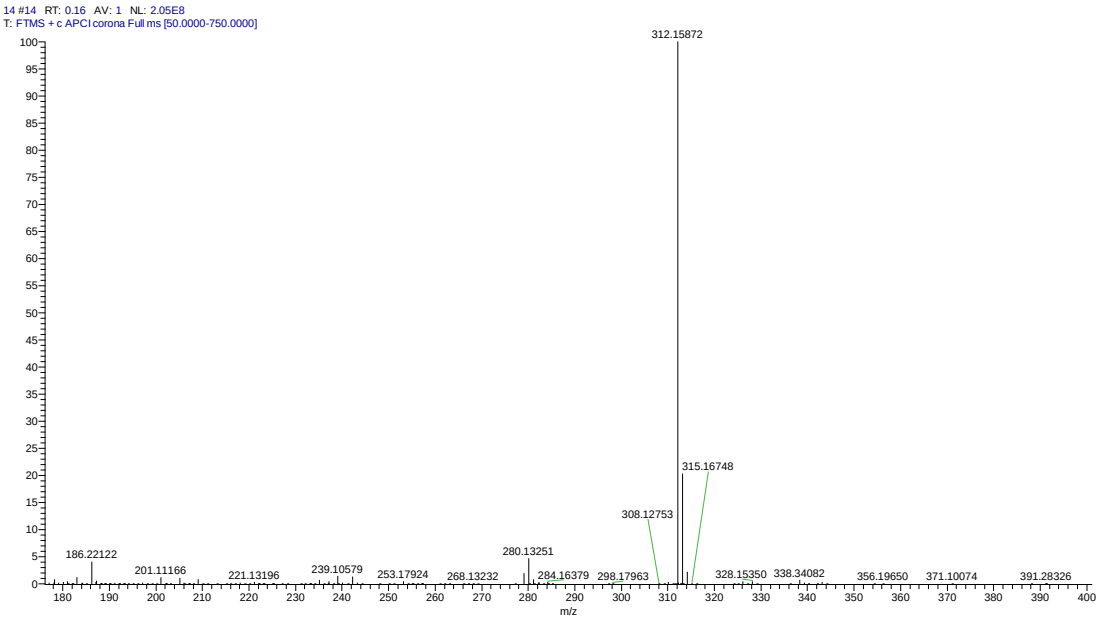
^{1}HNMR of methyl 2-methyl-4-(3-(methylamino)-3-oxo-1-phenylpropyl)benzoate (25)



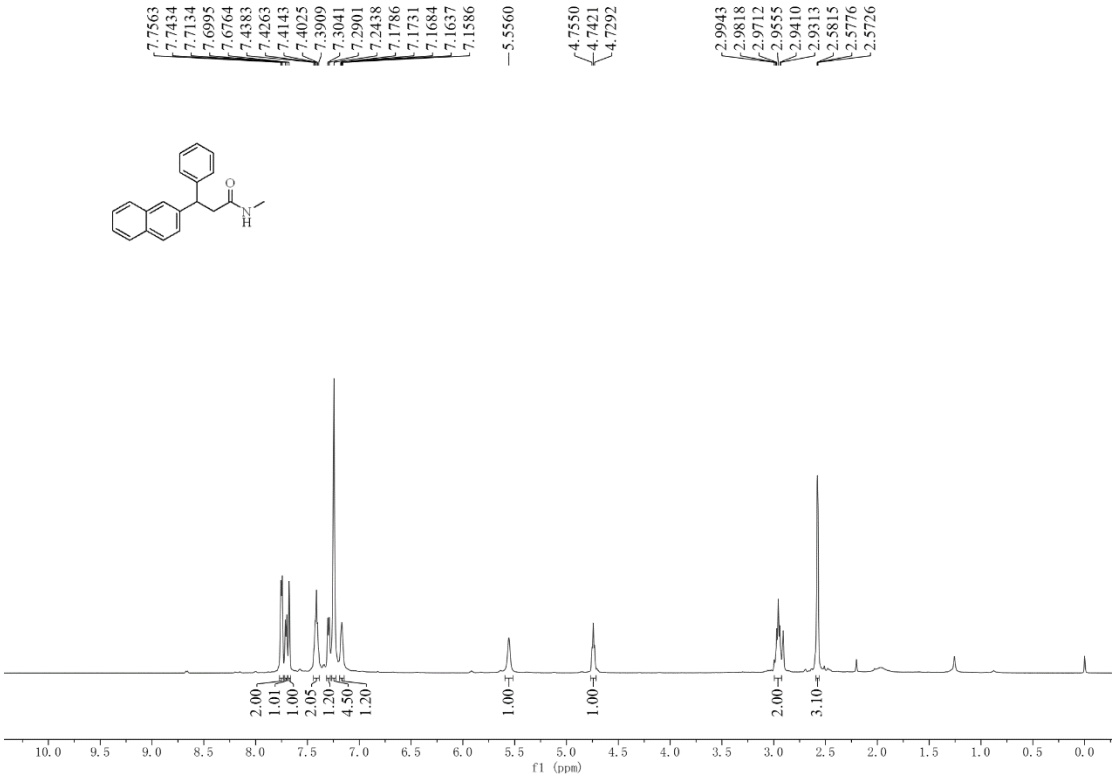
^{13}C NMR of methyl 2-methyl-4-(3-(methylamino)-3-oxo-1-phenylpropyl)benzoate (25)



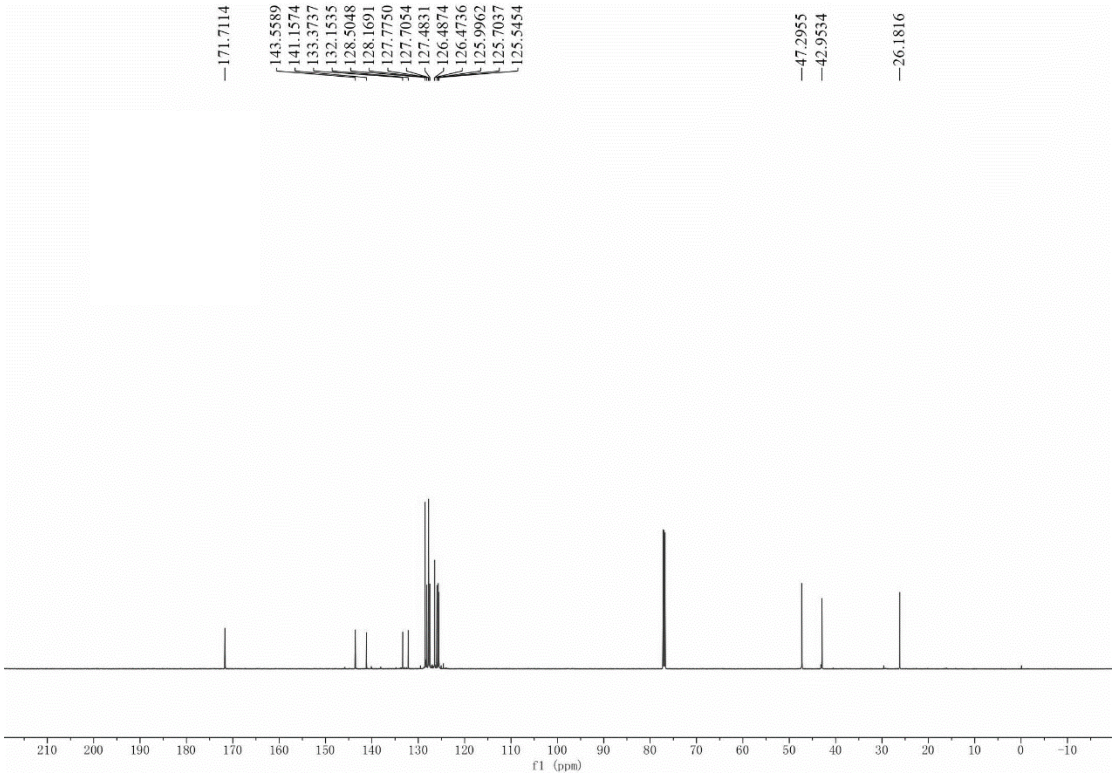
HRMS of methyl 2-methyl-4-(3-(methylamino)-3-oxo-1-phenylpro-pyl) benzoate (25)



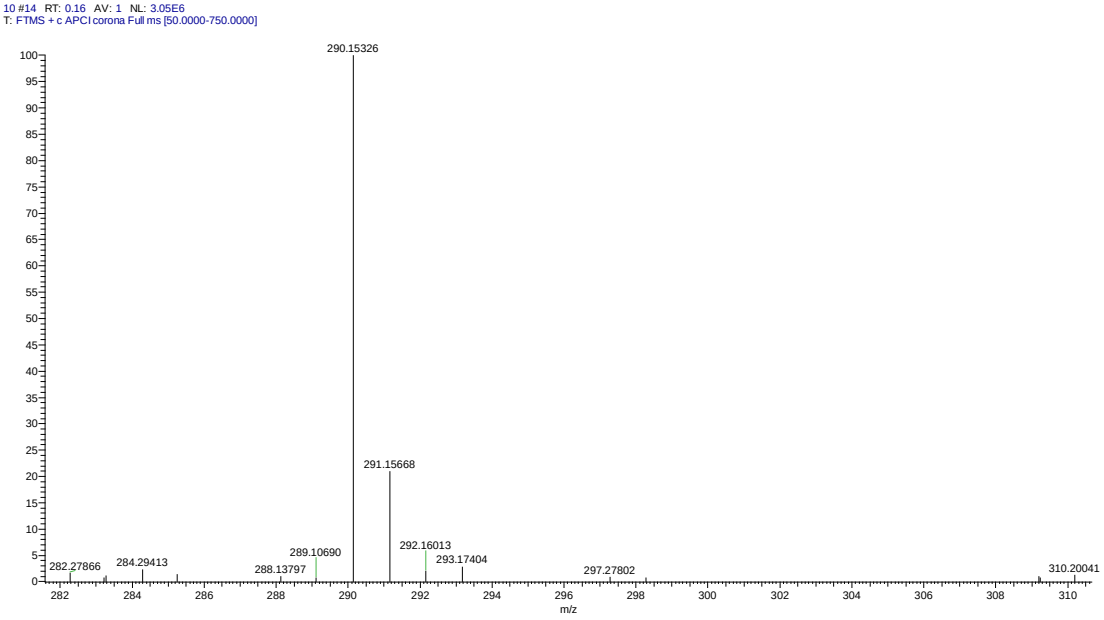
^{1}H NMR of N-methyl-3-(naphthalen-2-yl)-3-phenylpropanamide (26)



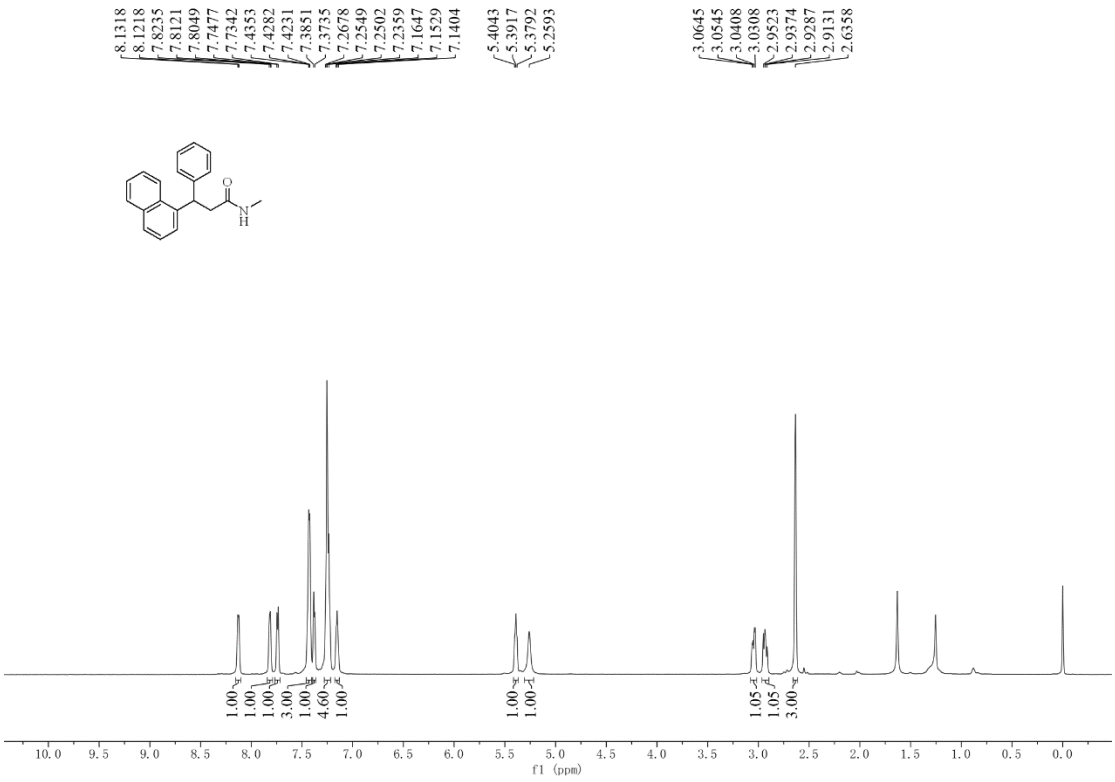
^{13}C NMR of N-methyl-3-(naphthalen-2-yl)-3-phenylpropanamide (26)



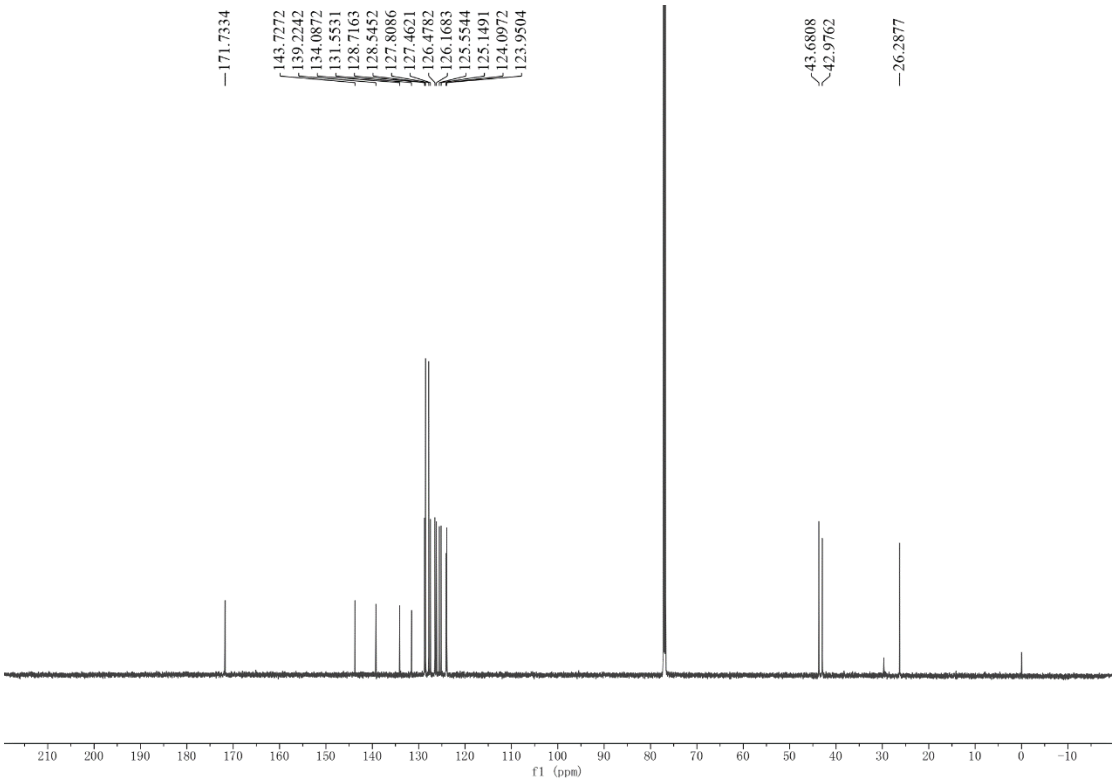
HRMS of N-methyl-3-(naphthalen-2-yl)-3-phenylpropanamide (26)



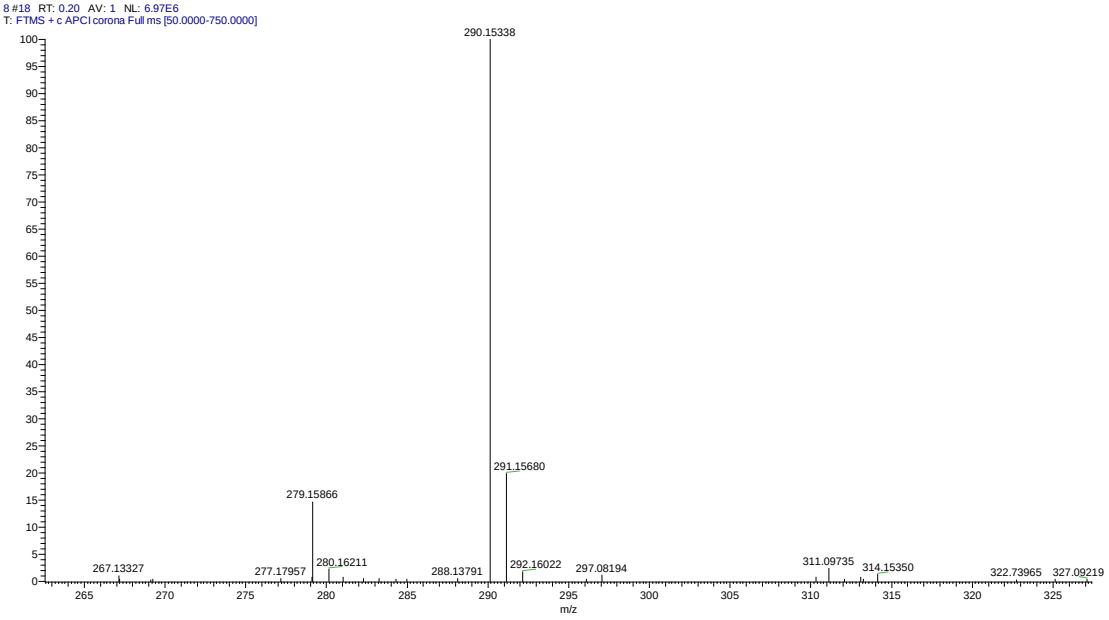
^{1}H NMR of N-methyl-3-(naphthalen-1-yl)-3-phenylpropanamide (27)



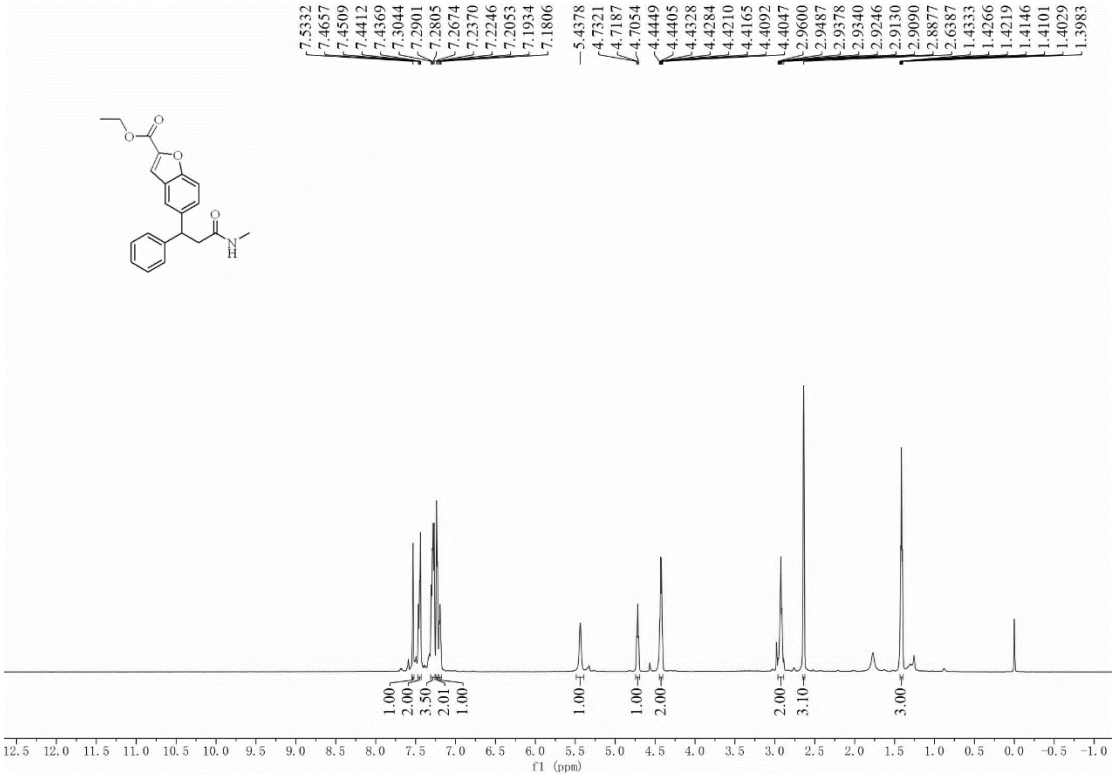
^{13}C NMR of N-methyl-3-(naphthalen-1-yl)-3-phenylpropanamide (27)



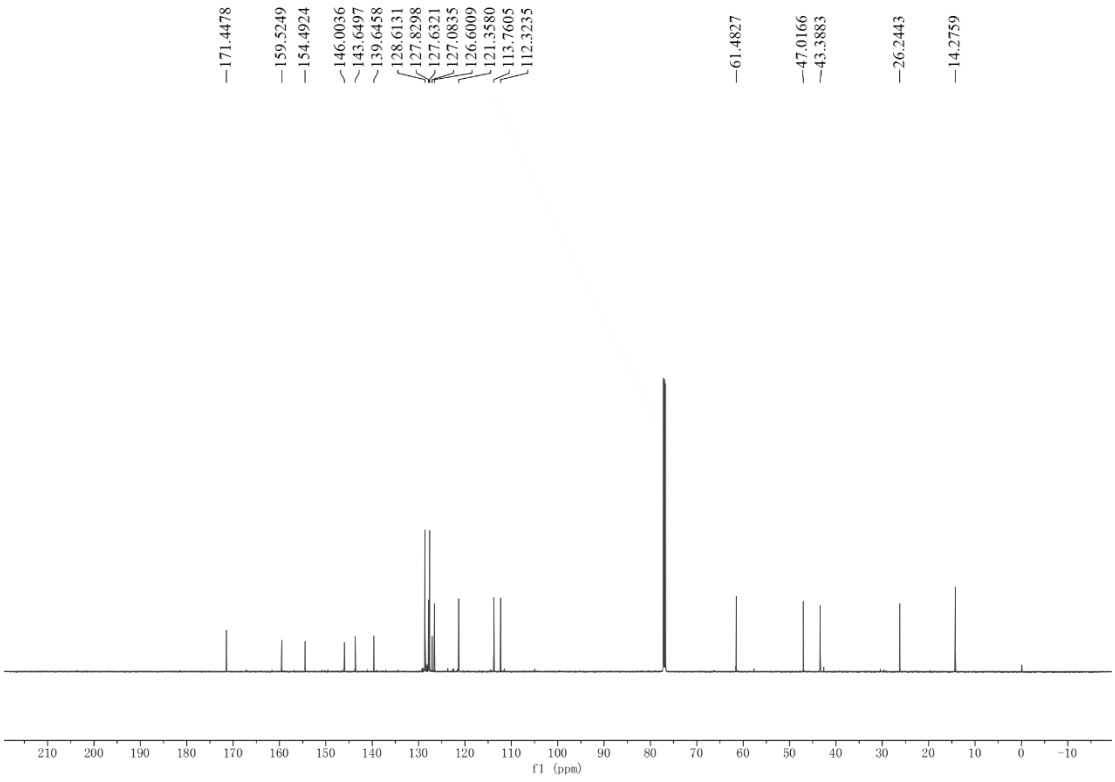
HRMS of N-methyl-3-(naphthalen-1-yl)-3-phenylpropanamide (27)



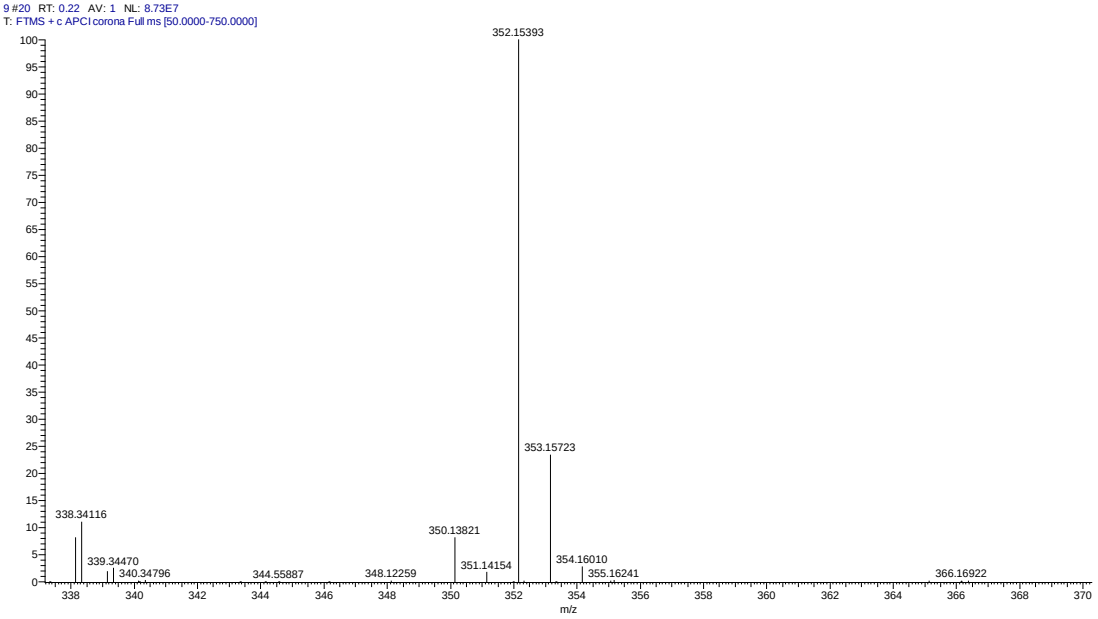
^{1}H NMR of ethyl 5-(3-(methylamino)-3-oxo-1-phenylpropyl)benzofuran-2-carboxylate (28)



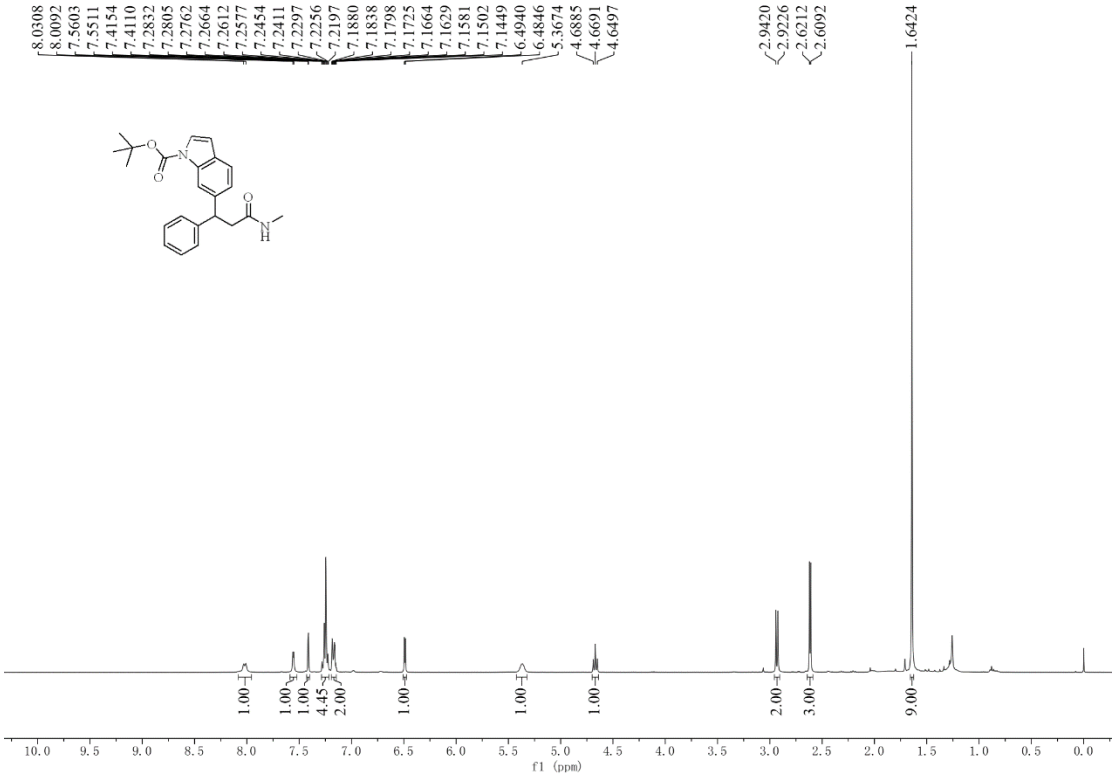
^{13}C NMR of ethyl 5-(3-(methylamino)-3-oxo-1-phenylpropyl)benzofuran-2-carboxylate (28)



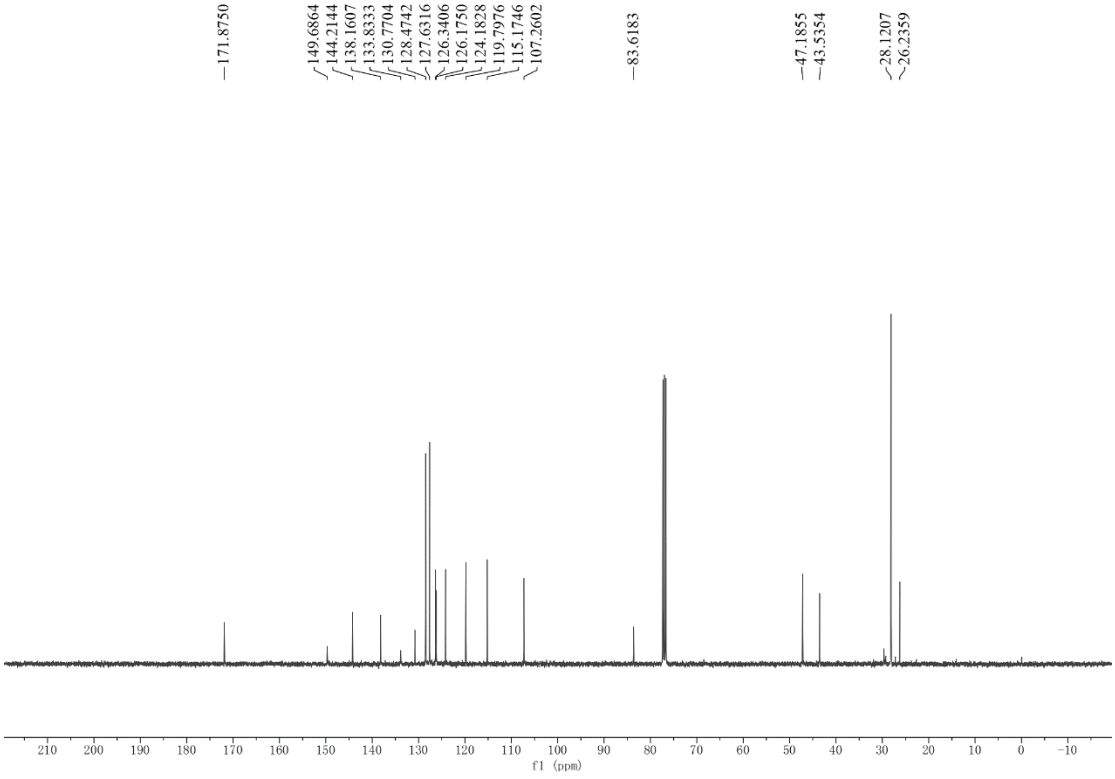
HRMS of ethyl 5-(3-(methylamino)-3-oxo-1-phenylpropyl)benzofuran-2-carboxylate (28)



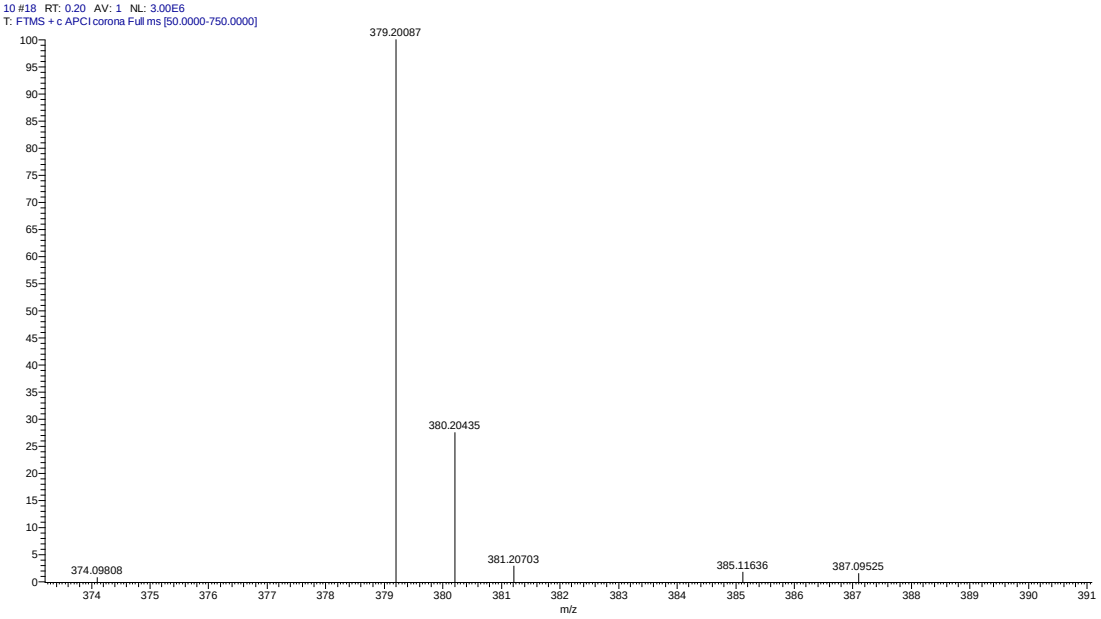
^{1}H NMR of tert-butyl 6-(3-(methylamino)-3-oxo-1-phenylpropyl)-1H-indole-1-carboxylate (29)



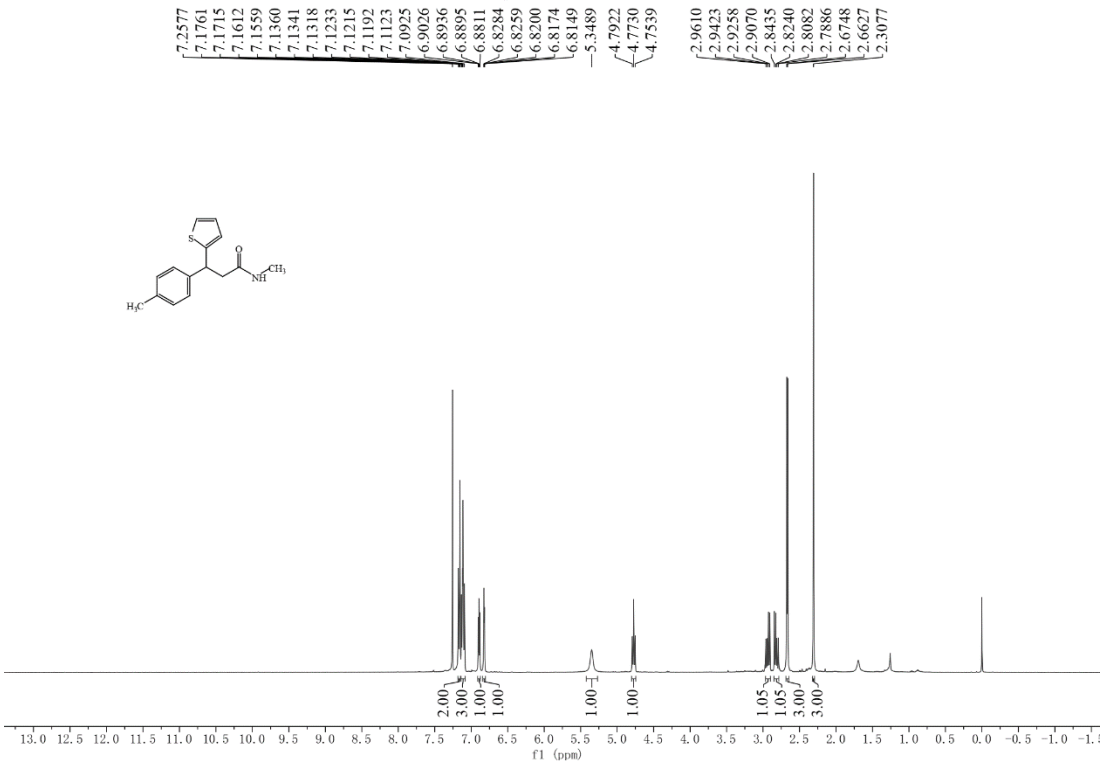
^{13}C NMR of tert-butyl 6-(3-(methylamino)-3-oxo-1-phenylpropyl)-1H-indole-1-carboxylate (29)



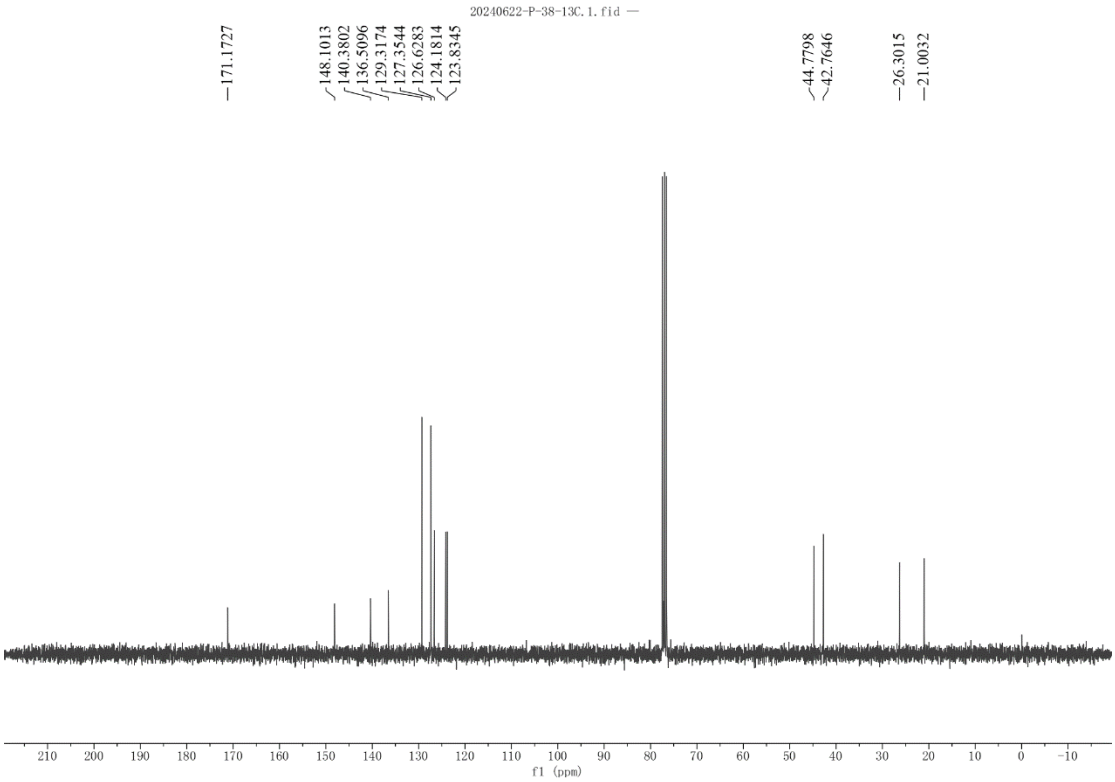
HRMS of tert-butyl 6-(3-(methylamino)-3-oxo-1-phenylpropyl)-1H-indole-1-carboxylate (29)



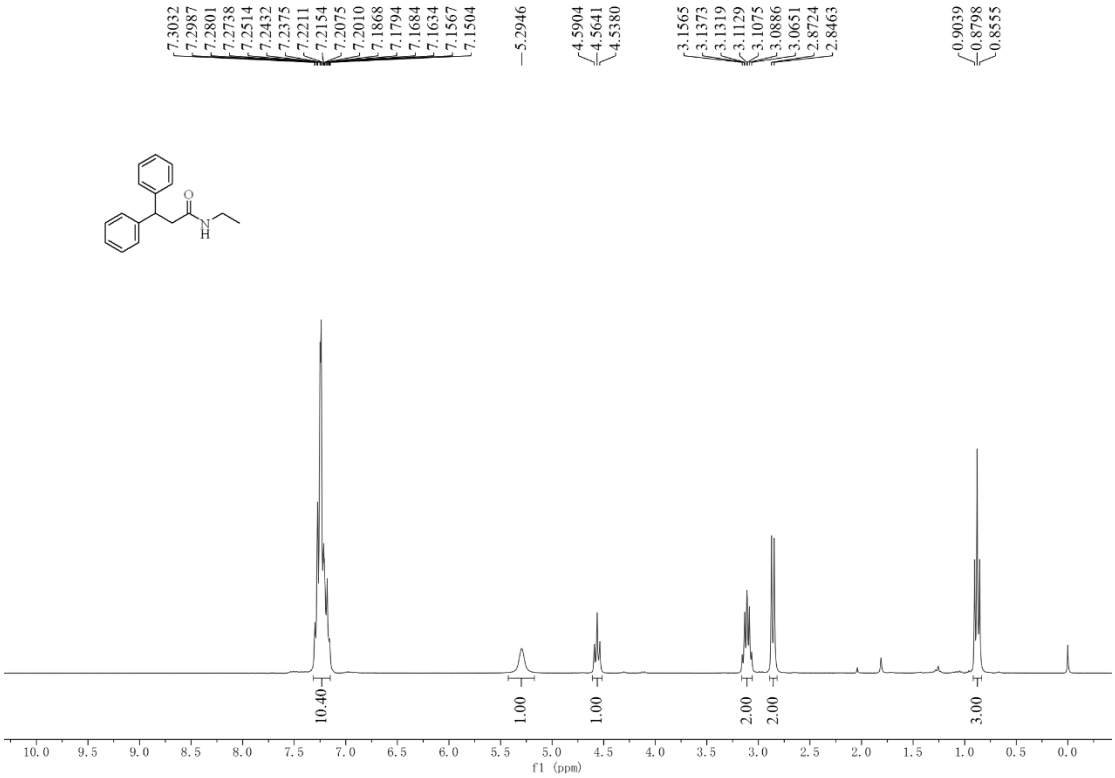
^{1}H NMR of N-methyl-3-(thiophen-2-yl)-3-(p-tolyl)propanamide (30)



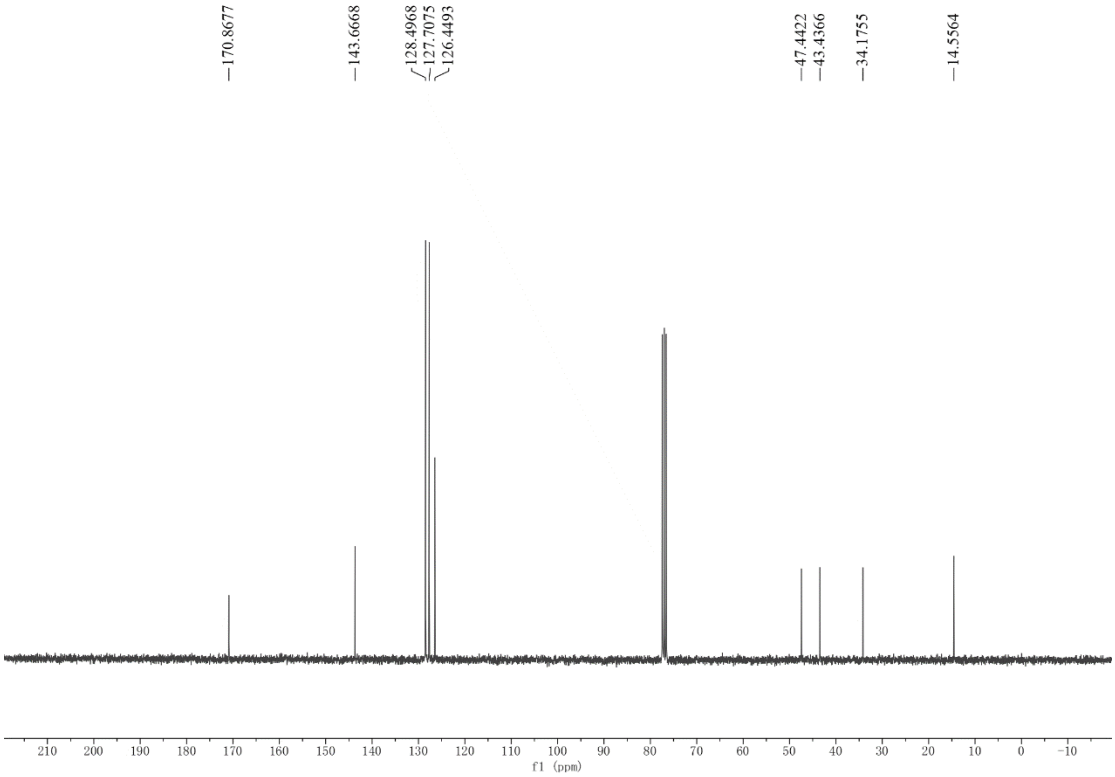
^{13}C NMR of N-methyl-3-(thiophen-2-yl)-3-(p-tolyl)propanamide (30)



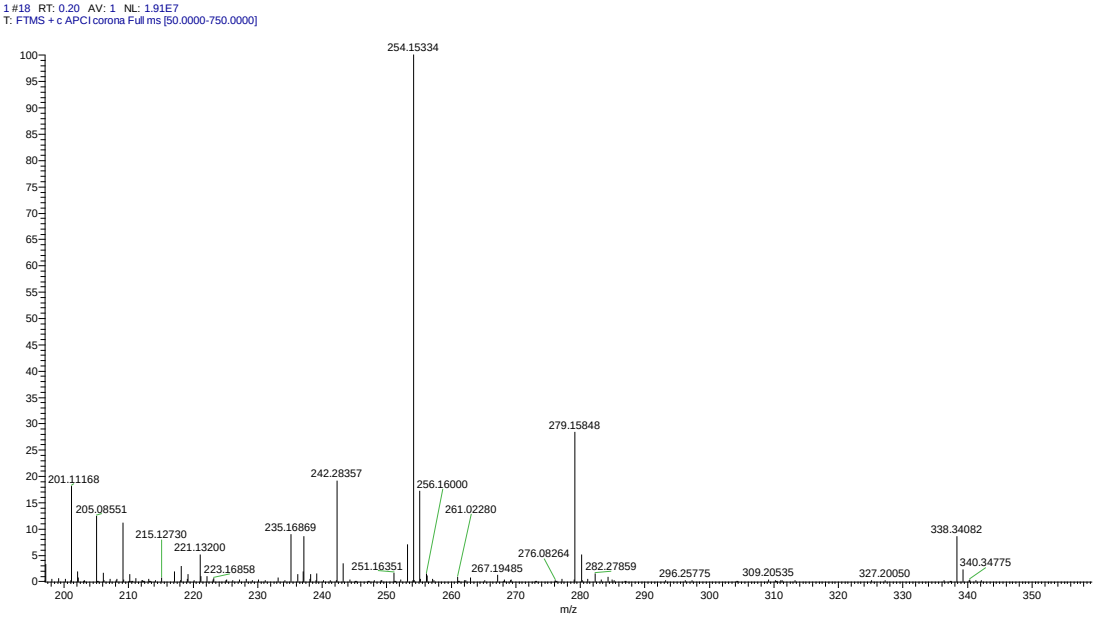
^{1}H NMR of N-ethyl-3,3-diphenylpropanamide (31)



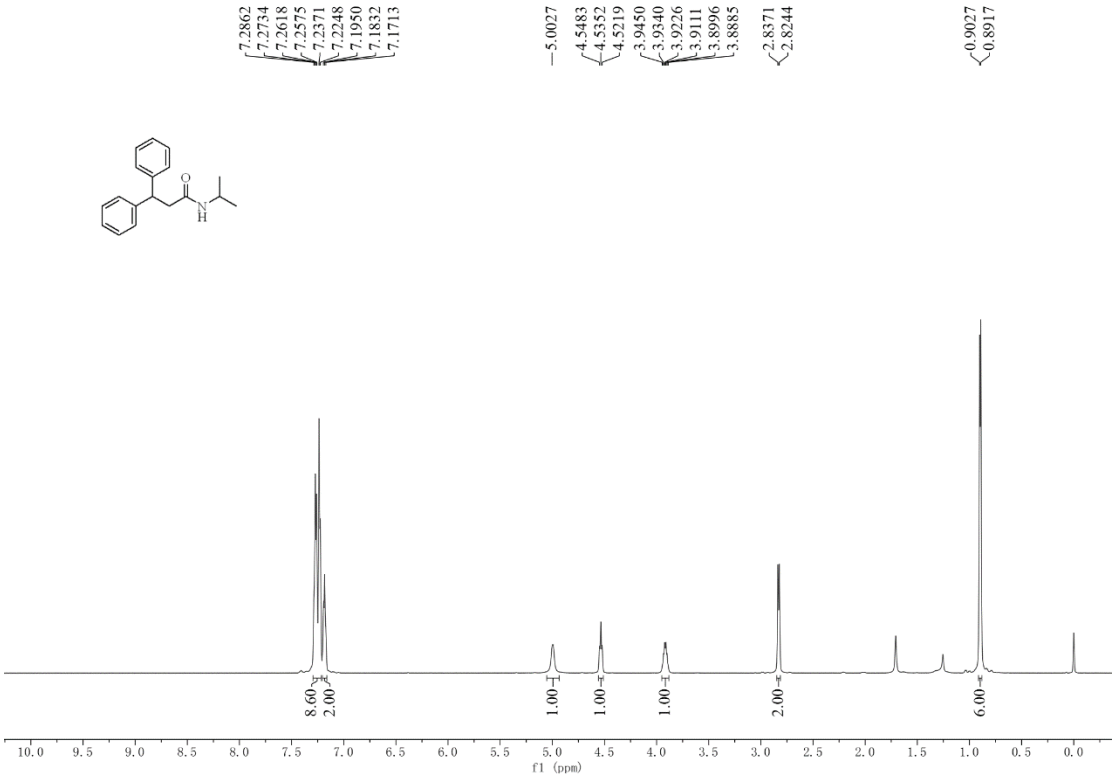
^{13}C NMR of N-ethyl-3,3-diphenylpropanamide (31)



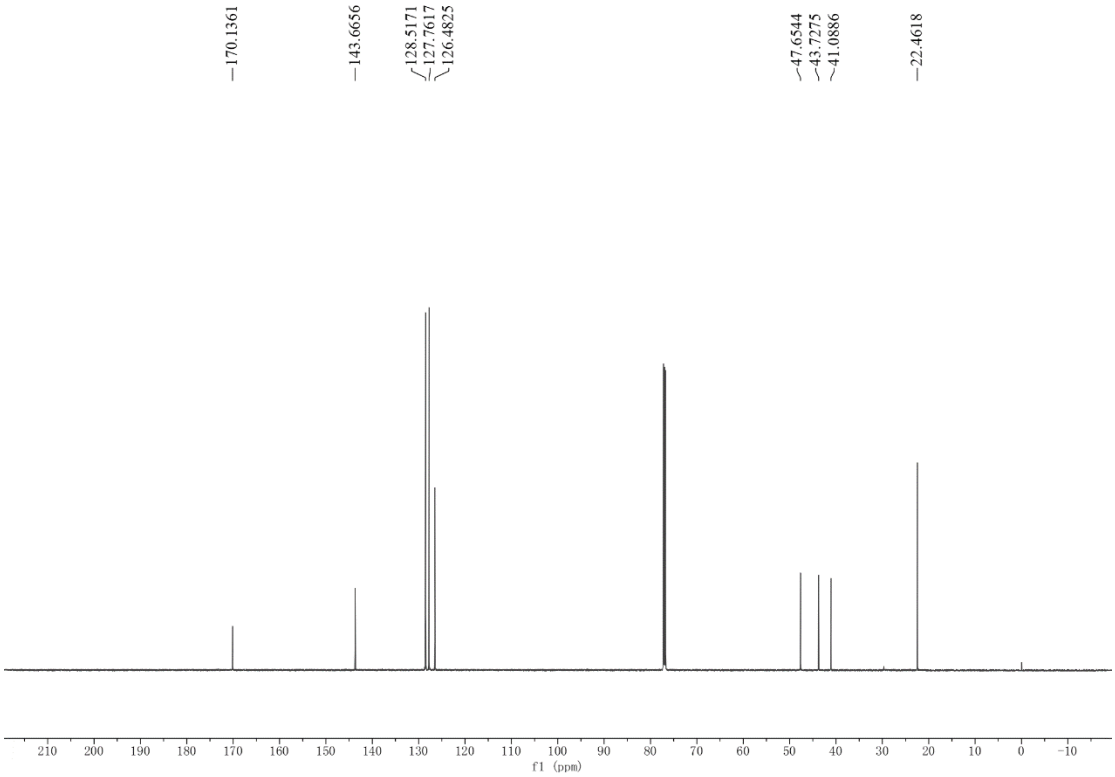
HRMS of N-ethyl-3,3-diphenylpropanamide (31)



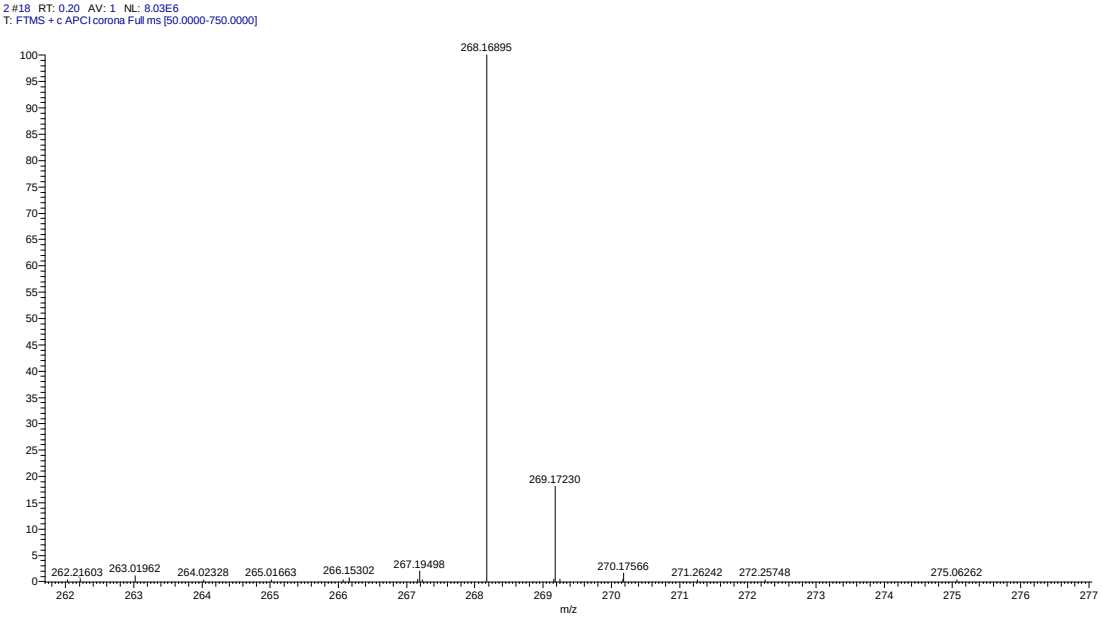
^{1}H NMR of N-isopropyl-3,3-diphenylpropanamide (32)



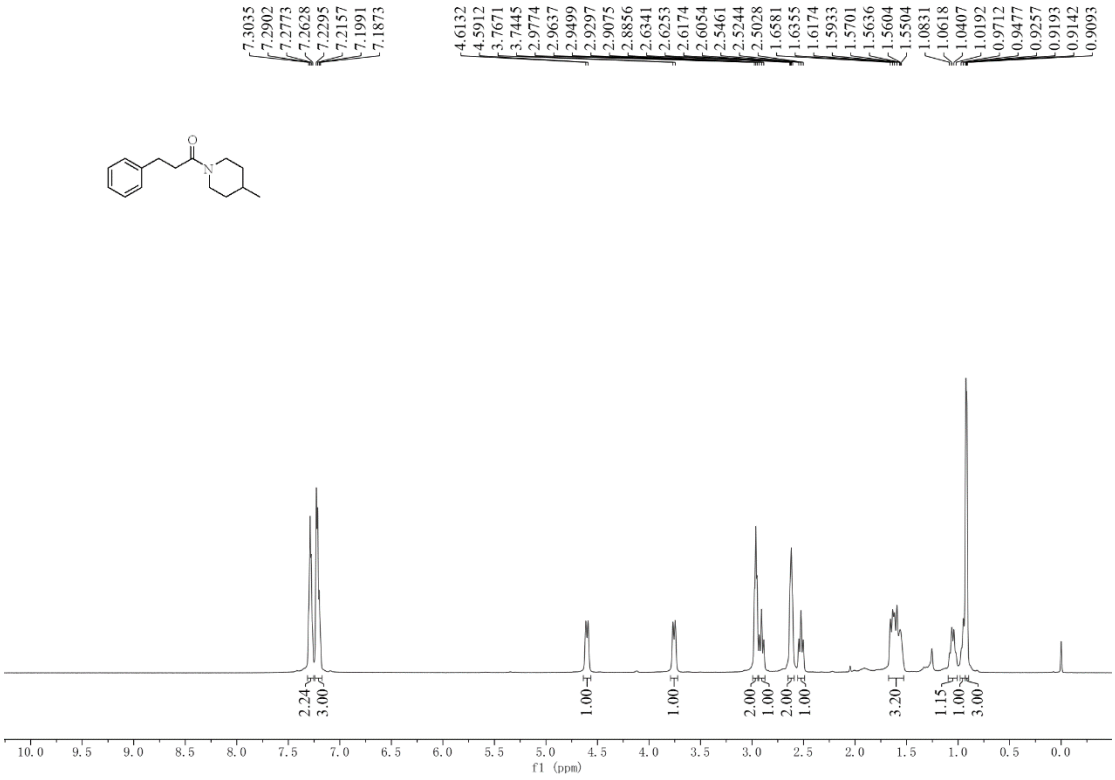
^{13}C NMR of N-isopropyl-3,3-diphenylpropanamide (32)



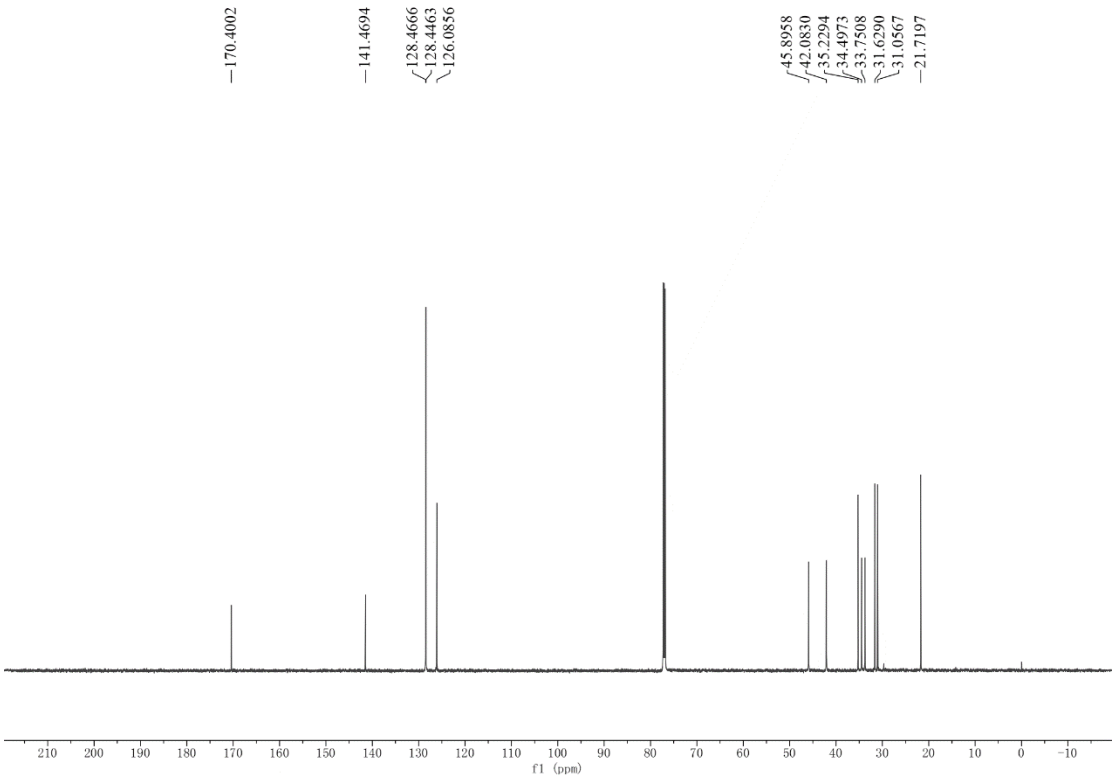
HRMS of N-isopropyl-3,3-diphenylpropanamide (32)



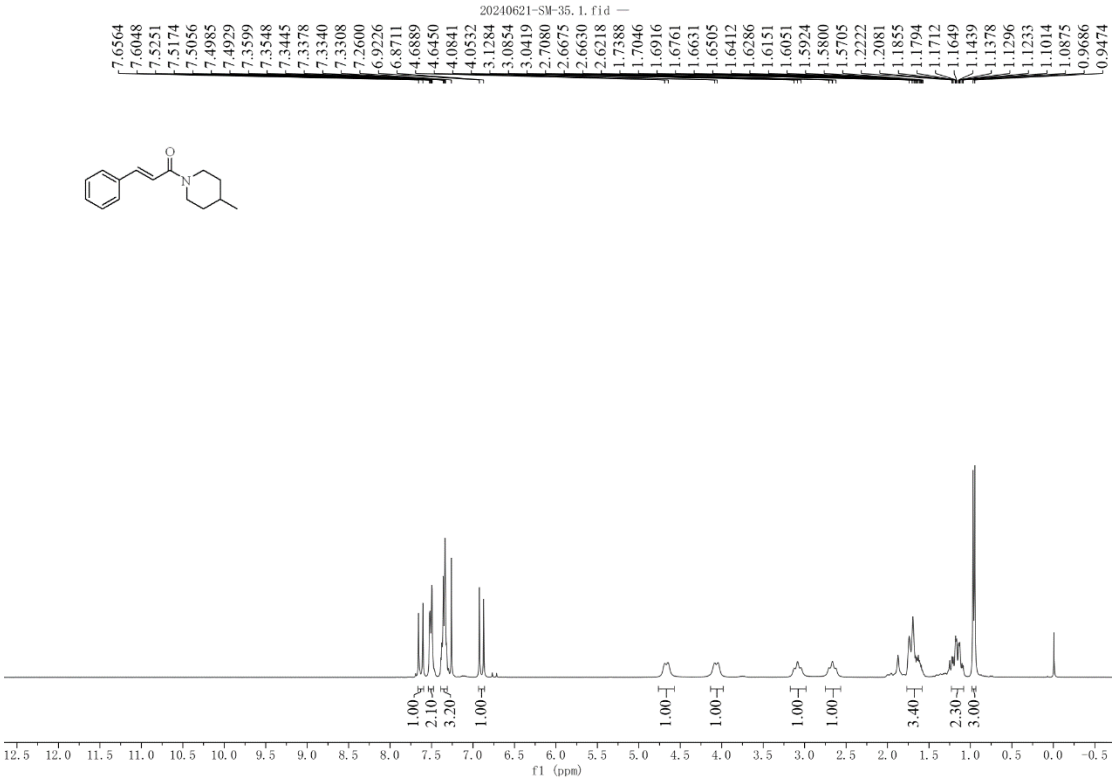
^{1}H NMR of 1-(4-methylpiperidin-1-yl)-3-phenylpropan-1-one (36) [9]



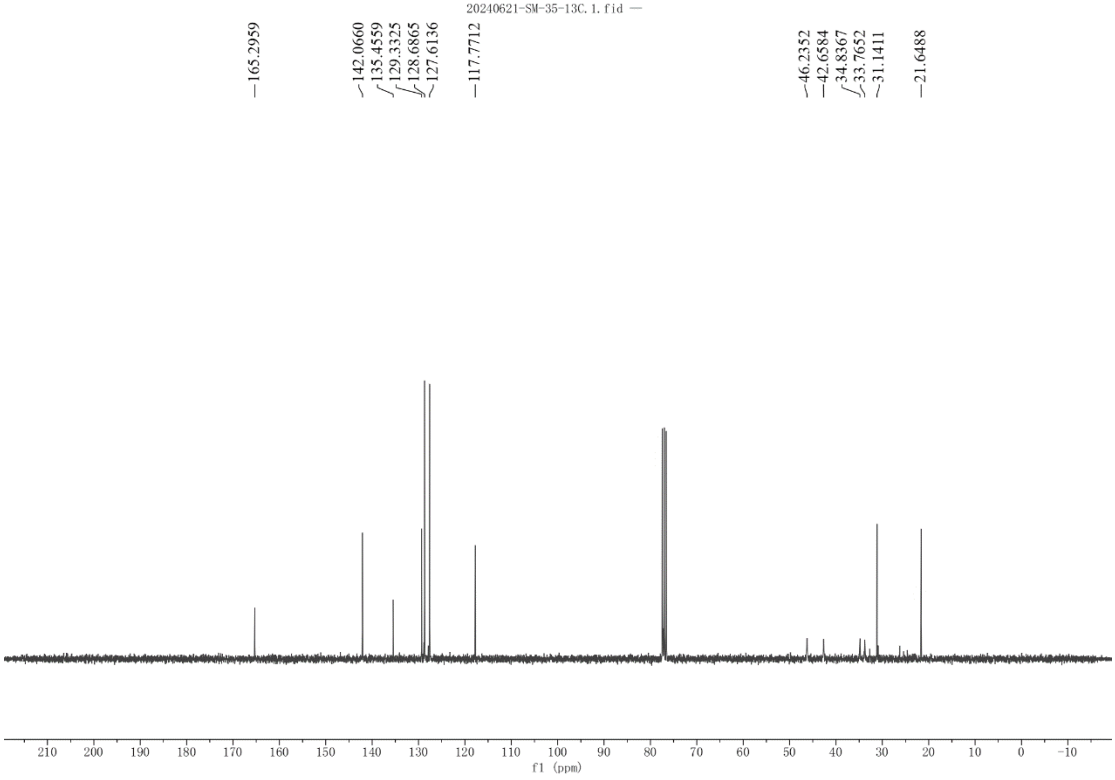
^{13}C NMR of 1-(4-methylpiperidin-1-yl)-3-phenylpropan-1-one (36) [9]



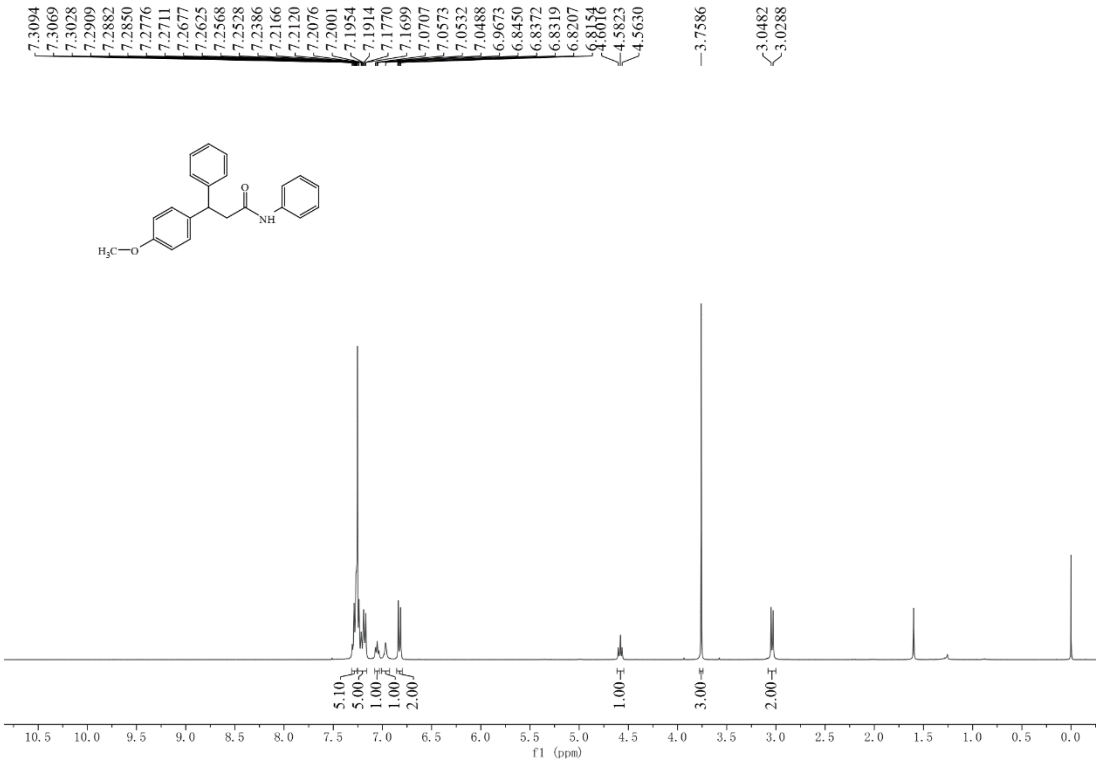
^{1}H NMR of 1-(4-methylpiperidin-1-yl)-3-phenylprop-2-en-1-one (37) [9]



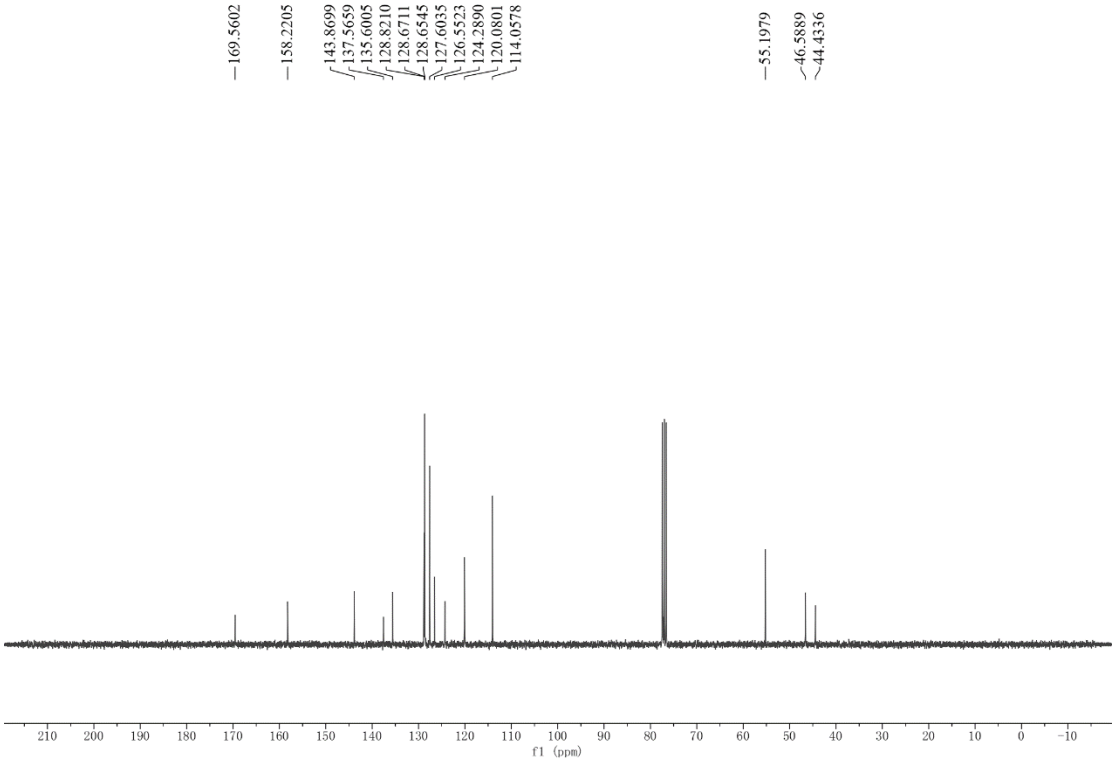
^{13}C NMR of 1-(4-methylpiperidin-1-yl)-3-phenylprop-2-en-1-one (37) [9]



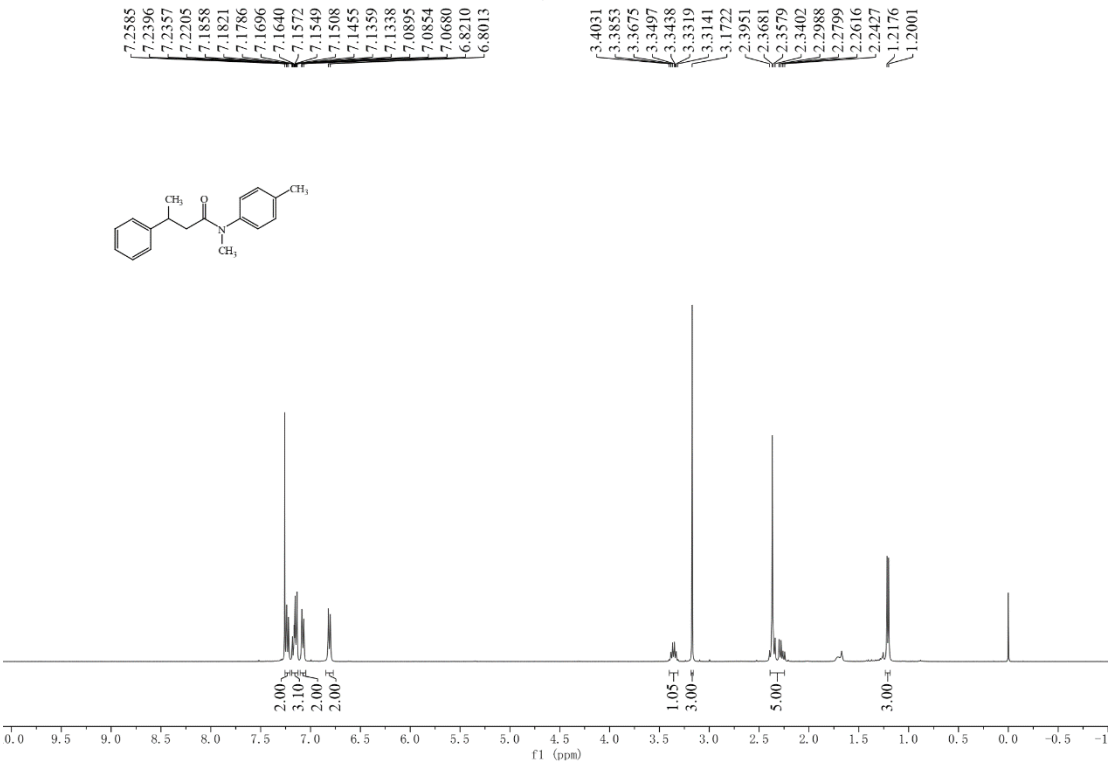
^{1}H NMR of 3-(4-methoxyphenyl)-N,3-diphenylpropanamide (48)



^{13}C NMR of 3-(4-methoxyphenyl)-N,3-diphenylpropanamide (48)



^{1}H NMR of N-methyl-3-phenyl-N-(p-tolyl)butanamide (50)



^{13}C NMR of N-methyl-3-phenyl-N-(p-tolyl)butanamide (50)