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Supplementary Information

$Mg(O^tBu)_2$-Catalyzed C-H Oxidation of α-Azido Arylethanones Using TBHP as the Oxidant and Carbonyl Oxygen Source: Facile Access to Primary α-Ketoamides

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(A) General Experimental Procedure

(a) General information

^{1}H NMR and ^{13}C NMR spectra were recorded on a Bruker 500 MHz advance spectrometer at room temperature in $CDCl_3$ using TMS as internal standard or DMSO-d6. Low-resolution mass spectra (LRMS) data were measured on GCMS-QP2010 Ultra. High-resolution mass spectra (HRMS) was recorded on an electrospray ionization (ESI) apparatus using Q-Exactive (QE) mass spectrometry. Melting Points were recorded on Hanon MP100 Apparatus. All starting materials and solvents were commercially available and were used without further purification. Column chromatography was performed on silica gel (300-400 mesh) using petroleum ether (PE) / ethyl acetate (EA). All α-azido arylethanones were synthesized according to the known procedures.[1]

(b) General procedure for the synthesis α-Ketoamides

I. Syntheis of ketoamides (2) from oxidation of α-azido arylethanones (1)

Substrate **1** (0.5 mmol) and ethyl acetate (2 mL) was added to a 10 mL tube. Then, TBHP (5~6 M in decane, 1 mmol) was added to the solvent at room temperature. After stirring for 5 mins, $Mg(O^tBu)_2$ (10 mol%) was added to the mixture. The content of the tube was stirred at room temperature under atmospheric environment for 20 h. Then, the reaction mixture was concentrated under reduced pressure. Purification by column chromatography (Hexanes / EtOAc : 3/1 to 5/1) afforded corresponding ketoamides **2**.

Notice: $Mg(O^tBu)_2$ (10 mol%) should be added to the mixture after adding TBHP.

II. Syntheis of ketoamides from one-pot azidation/oxidation progress of α-bromo phenylethanone.

α-Bromo phenylethanone (0.5 mmol) and NaN_3 (0.5 mmol) was added to a 10 mL tube. Then, ethyl acetate (2 mL) and dimethyl sulfoxide (0.2 mL) was added as solvent. After vigorous stirring for 2 hours, TBHP (5~6 M in decane, 1 mmol) and $Mg(O^tBu)_2$ (10 mol%) was added to the mixture in turn. The content of the tube was stirred at room temperature under atmospheric environment for 20 h. Then, the reaction mixture was concentrated under reduced pressure. Purification by column

chromatography (Hexanes / EtOAc : 3/1 to 5/1) afforded corresponding ketoamide **2**.

III. Syntheis of ketoamides from oxidation of α-azido arylethanones on a gram scale.

Substrate **1a** (12 mmol, 1.93 g) and ethyl acetate (20 mL) was added to a 50 mL tube. Then, TBHP (5-6 M in decane, 24 mmol) was added to the solvent at room temperature. After stirring for 5 mins, $Mg(O^tBu)_2$ (10 mol%) was added to the mixture. The content of the tube was stirred at room temperature under atmospheric environment for 20 h. Then, the reaction mixture was concentrated under reduced pressure. Purification by column chromatography (Hexanes / EtOAc : 3/1 to 5/1) afforded corresponding ketoamide **2a**.

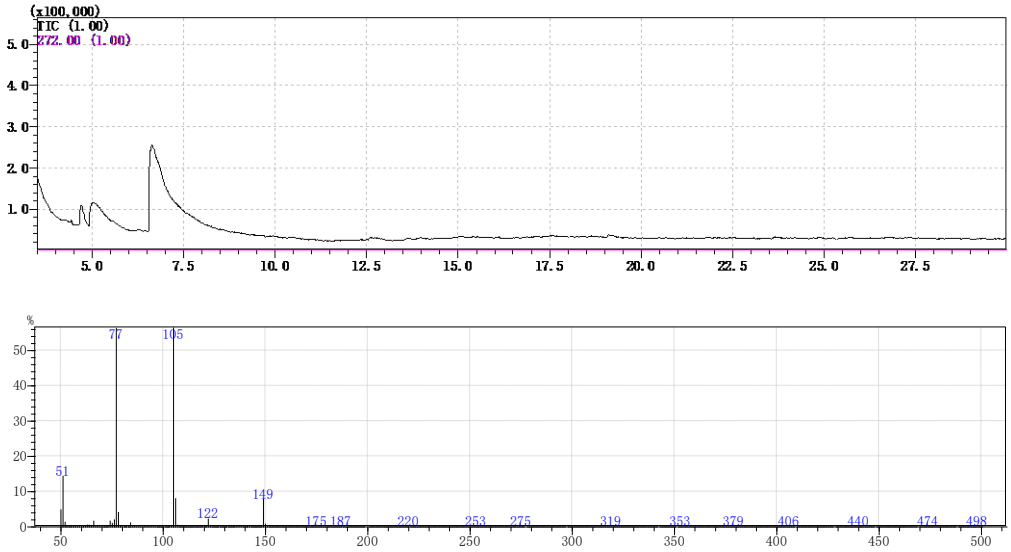
(c) General procedure for the synthesis 2-hydroxy-2-phenylacetamide (4a)

Substrate **2a** (1 mmol, 149 mg) and methanol (3 mL) was added to a 25 mL tube. Then, $NaBH_4$ (2 mmol, 76 mg) was added to the solvent at room temperature. Then the tube was stirred at room temperature until complete consumption of **2a** as monitored by TLC. After the reaction was finished, the reaction mixture was concentrated under reduced pressure. Purification by column chromatography (Hexanes / EtOAc : 1/1 to 2/1) afforded corresponding 2-hydroxy-2-phenylacetamide **4a**.

(B) Control experiment.

I. O^{18}-labeled experiment

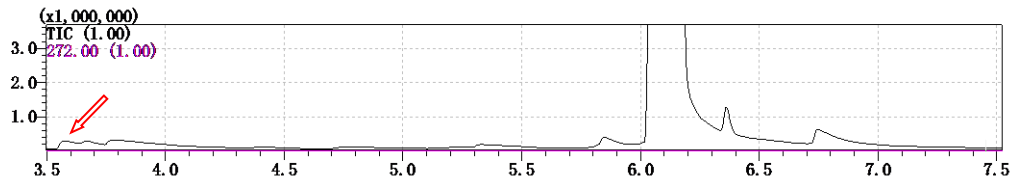
Under the standard conditions, O_2^{18} or H_2O^{18} was added to the reaction of **1a**, $Mg(O^tBu)_2$ and TBHP. After the reaction was finished, the reaction mixture was monitored by GC-MS. It was found that ^{16}O-**2a** was obtained from the reaction.



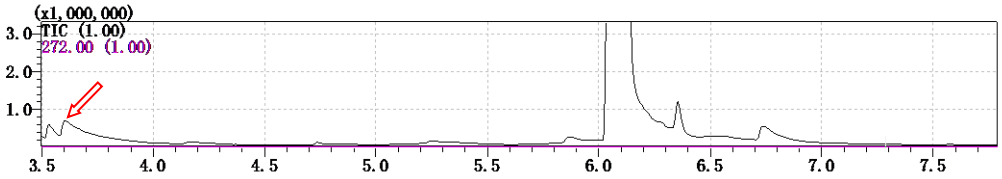
II. The denitrogenative reactions of 2-azido-1-phenylethanone (**1a**)

To the solution of 2-azido-1-phenylethanone (**1a**) in ethyl acetate **ii-1**, **ii-2**, **ii-3**, **ii-4**, **ii-5** (0.5 mmol; ethyl acetate, 6 mL) was added $Mg(O^tBu)_2$ 20 mol%, 40 mol%, 60 mol%, 80 mol% and 100 mol% respectively. The solution was stirred at room temperature for 1 min. Immediately, 1 mL reaction solution was taken for GC-MS determination respectively. From the results of GC-MS, it was found that a peak at 3.5 min became more strength with the increase of $Mg(O^tBu)_2$. The molecular weight (131) indicates that this new compound is benzoyl cyanide (**5a**).

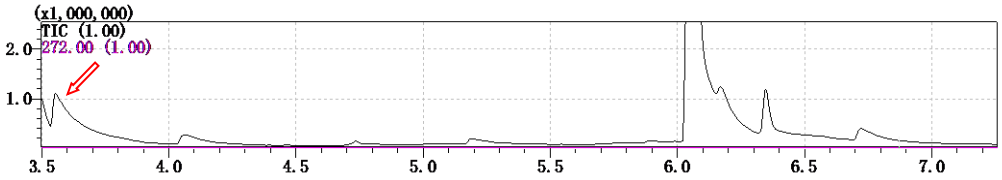
ii-1: 20 mol% $Mg(O^tBu)_2$



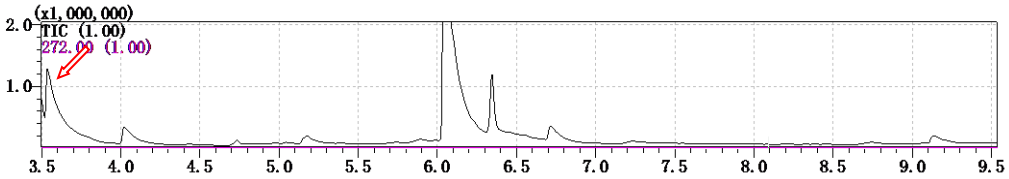
ii-2: 40 mol% $Mg(O^tBu)_2$



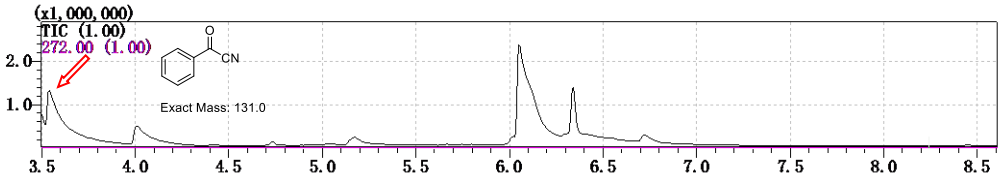
ii-3: 60 mol% $Mg(O^tBu)_2$

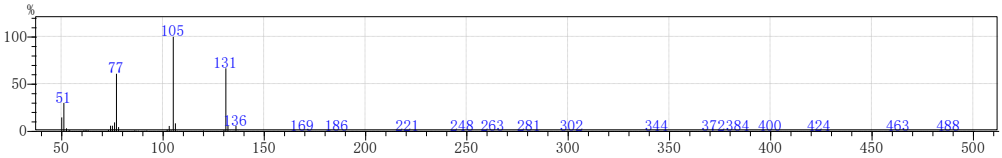


ii-4: 80 mol% $Mg(O^tBu)_2$

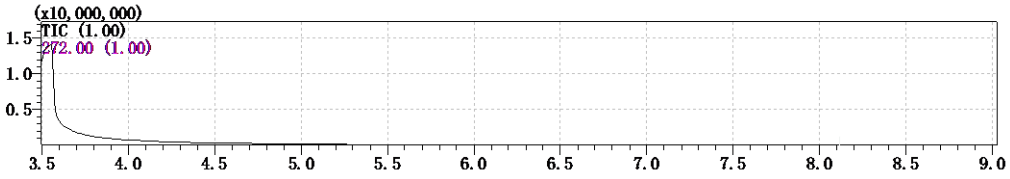


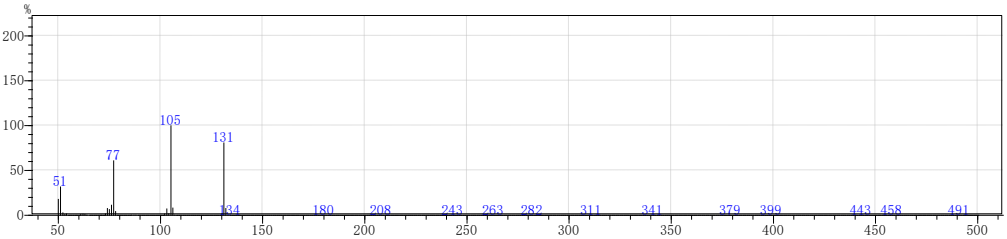
ii-5: 100 mol% $Mg(O^tBu)_2$





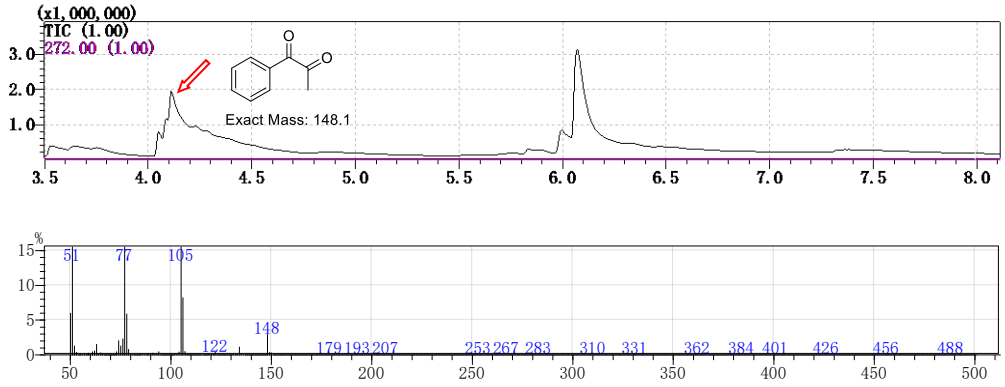
The compound benzoyl cyanide directly purchased from Energy Chemical was also determined by GC-MS.



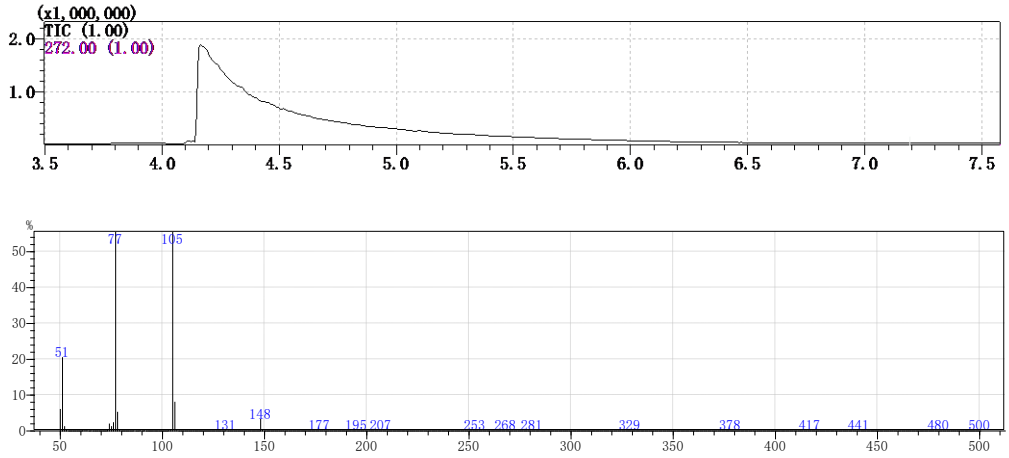


III. The denitrogenative reactions of 2-azido-1-phenylpropan-1-one (**1y**)

To a solution of 2-azido-1-phenylpropan-1-one (**1x**) in ethyl acetate (0.5 mmol; ethyl acetate, 6 mL) was added $Mg(O^tBu)_2$ 100 mol%. The solution was stirred at room temperature for 20 h. Then, 1 mL reaction solution was taken for GC-MS determination. 1-Phenylpropane-1,2-dione (FW: 148, **3x**) was detected from the reaction solution.



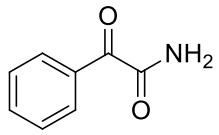
The compound 1-phenylpropane-1,2-dione directly purchased from Energy Chemical was also determined by GC-MS.



(C) Analytical data.

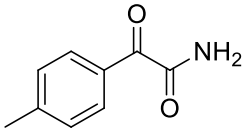
2a–**2d**, **2f**–**2i, 2m**–**2v** and **4a** are reported in the literatures 2-8, all the ^{1}H NMR and ^{13}C NMR spectra are in accordance with the literature.

2-oxo-2-phenylacetamide (2a)[2-4]



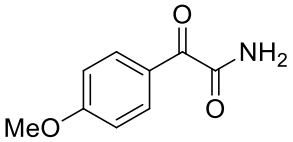
56.6 mg, 76% yield; light yellow solid; m.p. 68 - 70 ^{o}C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.35 (s, 1H), 8.02 (s, 1H), 7.96 (d, *J* = 5.0 Hz, 2H), 7.72 (t, *J* = 7.5 Hz, 1H), 7.58 (t, *J* = 7.5 Hz, 2H); ^{13}C NMR (125 MHz, DMSO) δ 191.4, 167.8, 135.1, 133.3, 130.2, 129.5.

2-oxo-2-(p-tolyl)acetamide (2b)[2-4]



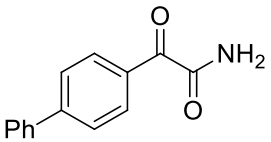
57.1 mg, 70% yield; light yellow solid; m.p. 132 - 135 ^{o}C (uncorrected); ^{1}H NMR (500 MHz, CDCl3) δ 8.21 (d, *J* = 10.0 Hz, 2H), 7.28 (d, *J* = 10.0 Hz, 2H), 7.05 (s, 1H), 6.36 (s, 1H), 2.42 (s, 3H); ^{13}C NMR (125 MHz, CDCl3) δ 187.0, 164.5, 145.7, 131.2, 130.5, 129.3.

2-(4-methoxyphenyl)-2-oxoacetamide (2c)[2-4]



61.8 mg, 69% yield; light yellow solid; m.p. 145 - 148 ^{o}C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.27 (s, 1H), 7.98 (d, *J* = 5.0 Hz, 2H), 7.92 (s, 1H), 7.10 (d, *J* = 10.0 Hz, 2H), 3.86 (s, 3H); ^{13}C NMR (125 MHz, DMSO) δ 189.8, 168.0, 164.7, 132.7, 126.1, 114.8, 56.2.

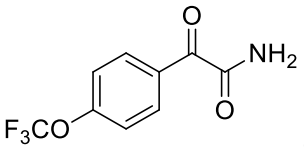
2-([1,1'-biphenyl]-4-yl)-2-oxoacetamide (2d)[3, 4]



83.3 mg, 74% yield; light yellow solid; m.p. 176 - 179 ^{o}C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.37 (s, 1H), 8.07 (d, *J* = 5.0 Hz, 2H), 8.04 (s, 1H), 7.90 (d, *J* = 5.0 Hz, 2H), 7.77 (d, *J* = 10.0 Hz, 2H), 7.52 (t, *J* = 7.5 Hz, 2H), 7.45 (t, *J* = 7.5 Hz, 1H); ^{13}C NMR (125 MHz, DMSO) δ 190.8, 167.6, 146.2, 139.2, 132.1, 130.9,

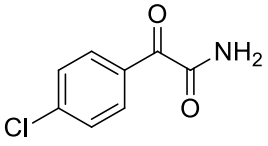
129.7, 129.2, 127.6, 127.6.

2-oxo-2-(4-(trifluoromethoxy)phenyl)acetamide (2e)



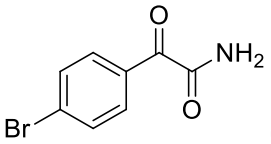
87.4 mg, 75% yield; light yellow solid; m.p. 86 - 87 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.38 (s, 1H), 8.13 (d, *J* = 10.0 Hz, 2H), 8.08 (s, 1H), 7.55 (d, *J* = 10.0 Hz, 2H); ^{13}C NMR (125 MHz, DMSO) δ 189. 6, 166. 9, 152.8, 132.9, 132.2, 121.4, 120.4 (q, *J* = 250.0 Hz, 1C). HRMS m/z (ESI) calcd for $C_9H_7F_3NO_3$ $[M+H]^+$ 234.0373, found 234.0373.

2-(4-chlorophenyl)-2-oxoacetamide (2f)[3, 4]



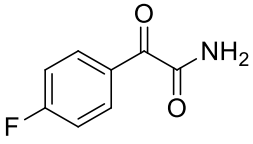
72.3 mg, 79% yield; light yellow solid; m.p. 130 - 133 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.36 (s, 1H), 8.06 (s, 1H), 8.00 (d, *J* = 10.0 Hz, 2H), 7.67 (d, *J* = 5.0 Hz, 2H); ^{13}C NMR (125 MHz, DMSO) δ 189.9, 167.0, 139.9, 132.1, 132.0, 129.7.

2-(4-bromophenyl)-2-oxoacetamide (2g) [2-4]



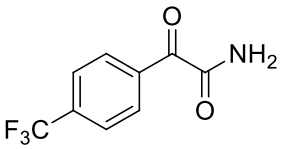
69.2 mg, 61% yield; light yellow solid; m.p. 124 - 126 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.36 (s, 1H), 8.06 (s, 1H), 7.92 (d, *J* = 5.0 Hz, 2H), 7.80 (d, *J* = 10.0 Hz, 2H); ^{13}C NMR (125 MHz, DMSO) δ 190.1, 167.0, 132.6, 132.3, 132.1, 129.3.

2-(4-fluorophenyl)-2-oxoacetamide (2h)[2-4]



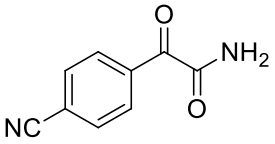
67.6 mg, 81% yield; light yellow solid; m.p. 150 - 153 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.35 (s, 1H), 8.08 (dd, *J* = 10.0, 5.0 Hz, 2H), 8.04 (s, 1H), 7.41 (t, *J* = 7.5 Hz, 2H); ^{13}C NMR (125 MHz, DMSO) δ 189.6, 167.2, 166.2 (d, *J* = 250.0 Hz, 1C), 133.4, 133.3, 130.1, 116.8, 116.6.

2-oxo-2-(4-(trifluoromethyl)phenyl)acetamide (2i)[2]



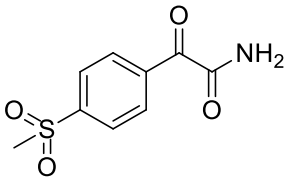
78.1 mg, 72% yield; light yellow solid; m.p. 89 - 90 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.43 (s, 1H), 8.19 (d, *J* = 5.0 Hz, 2H), 8.14 (s, 1H), 7.94 (d, *J* = 10.0 Hz, 2H); ^{13}C NMR (125 MHz, DMSO) δ 190.0, 166.6, 136.6, 134.0 (q, *J* = 250.0 Hz, 1C), 131.1, 126.4 (q, *J* = 100.0 Hz, 1C), 124.2 (q, *J* = 275.0 Hz, 1C).

2-(4-cyanophenyl)-2-oxoacetamide (2j)



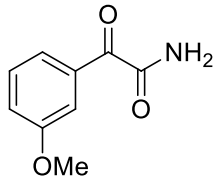
53.1 mg, 61% yield; y light yellow solid; m.p. 165 - 166 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.42 (s, 1H), 8.12 – 7.96 (m, 4H), 7.80 (s, 1H); ^{13}C NMR (125 MHz, DMSO) δ 189. 8, 166.3, 136.7, 133.4, 130.8, 118.6, 116.6. HRMS m/z (ESI) calcd for $C_9H_7N_2O_2$ $[M+H]^+$ 175.0502, found 175.0505.

2-(4-(methylsulfonyl)phenyl)-2-oxoacetamide (2k)



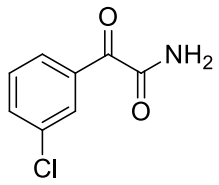
65.8 mg, 58% yield; light yellow solid; m.p. 163 - 164 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.43 (s, 1H), 8.20 (d, *J* = 8.4 Hz, 2H), 8.14 (s, 1H), 8.12 (d, *J* = 10.0 Hz, 2H), 3.30 (s, 3H); ^{13}C NMR (125 MHz, DMSO) δ 190.0, 166.4, 145.6, 137.1, 131.1, 128.0, 43.7. HRMS m/z (ESI) calcd for $C_9H_9NNaO_4S$ $[M+Na]^+$ 250.0144, found 250.0145.

2-(3-methoxyphenyl)-2-oxoacetamide (2m)[3,4]



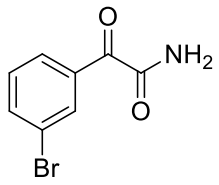
62.7 mg, 70% yield; light yellow solid; m.p. 97 - 99 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.34 (s, 1H), 8.01 (s, 1H), 7.56 (d, *J* = 5.0 Hz, 1H), 7.50 (t, *J* = 10.0 Hz, 1H), 7.45 (s, 1H), 7.30 (d, *J* = 10.0 Hz, 1H), 3.82 (s, 3H); ^{13}C NMR (125 MHz, DMSO) δ 191.1, 167.7, 160.0, 134.6, 130.7, 123.1, 121.2, 114.0, 55.9.

2-(3-chlorophenyl)-2-oxoacetamide (2n)[5]



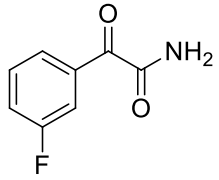
65.0 mg, 71% yield; light yellow solid; m.p. 81 - 82 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.39 (s, 1H), 8.10 (s, 1H), 7.96 (s, 1H), 7.94 (d, *J* = 10.0 Hz, 1H), 7.79 (d, *J* = 10.0 Hz, 1H), 7.62 (t, *J* = 7.5 Hz, 1H); ^{13}C NMR (125 MHz, DMSO) δ 189.5, 166.6, 135.2, 134.6, 134.2, 131.5, 129.6, 129.0.

2-(3-bromophenyl)-2-oxoacetamide (2o)[6]



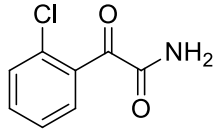
71.5 mg, 63% yield; light yellow solid; m.p. 84 - 85 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.39 (s, 1H), 8.09 (s, 2H), 7.98 (d, *J* = 5.0 Hz, 1H), 7.93 (dd, *J* = 10.0, 5.0 Hz, 1H), 7.55 (t, *J* = 7.5 Hz, 1H); ^{13}C NMR (125 MHz, DMSO) δ 189.5, 166.6, 137.5, 135.4, 132.5, 131. 8, 129.3, 122.6.

2-(3-fluorophenyl)-2-oxoacetamide (2p)[4]



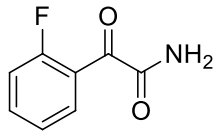
61.8 mg, 74% yield; light yellow solid; m.p. 102 - 103 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.39 (s, 1H), 8.08 (s, 1H), 7.84 (d, *J* = 5.0 Hz, 1H), 7.73 (d, *J* = 10.0 Hz, 1H), 7.67-7.57 (m, 2H); ^{13}C NMR (125 MHz, DMSO) δ 189.7, 166.8, 162.5 (d, *J* = 250.0 Hz, 1C), 135.5 (d, *J* = 6.3 Hz, 1C), 131.8 (d, *J* = 7.5 Hz, 1C), 126.8 (d, *J* = 2.5 Hz, 1C), 122.0 (d, *J* = 25.0 Hz, 1C), 116.2 (d, *J* = 25.0 Hz, 1C).

2-(2-chlorophenyl)-2-oxoacetamide (2q)[7]



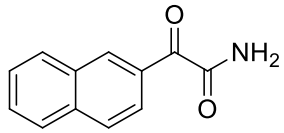
59.5 mg, 65% yield; light yellow solid; m.p. 130 - 131 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.40 (s, 1H), 8.02 (s, 1H), 7.67 (d, *J* = 10.0 Hz, 1H), 7.62 – 7.56 (m, 2H), 7.49 (t, *J* = 5.0 Hz, 1H); ^{13}C NMR (125 MHz, DMSO) δ 191.6, 165.4, 134.8, 134.1, 132.1, 131.8, 130.8, 127.9.

2-(2-fluorophenyl)-2-oxoacetamide (2r)[4]



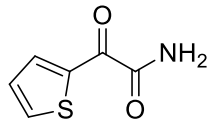
59.3 mg, 71% yield; light yellow solid; m.p. 106 - 107 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.29 (s, 1H), 7.96 (s, 1H), 7.83 (t, *J* = 7.5 Hz, 1H), 7.74 (dd, *J* = 15.0, 5.0 Hz, 1H), 7.38 (dd, *J* = 15.0, 5.0 Hz, 2H); ^{13}C NMR (125 MHz, DMSO) δ 189.3, 167.3, 161.9 (d, *J* = 250.0 Hz, 1C), 136.8 (d, *J* = 8.8 Hz, 1C), 131.6 (d, *J* = 1.3 Hz, 1C), 125.5 (d, *J* = 3.8 Hz, 1C), 122.8 (d, J = 11.3 Hz, 1C), 117.2 (d, J = 21.3 Hz, 1C).

2-(naphthalen-2-yl)-2-oxoacetamide (2s)[2, 3]



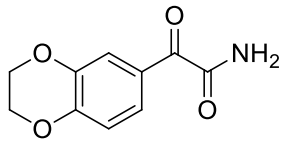
77.6 mg, 78% yield; light yellow solid; m.p. 181 - 182 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.66 (s, 1H), 8.42 (s, 1H), 8.18 (d, *J* = 5.0 Hz, 1H), 8.09 (d, *J* = 5.0 Hz, 1H), 8.07 (s, 1H), 8.03 (d, *J* = 5.0 Hz, 1H), 7.99 (d, *J* = 10.0 Hz, 1H), 7.72 (t, *J* = 7.5 Hz, 1H), 7.64 (t, *J* = 7.5 Hz, 1H); ^{13}C NMR (125 MHz, DMSO) δ 191.3, 167.7, 136.1, 133.2, 132.4, 130.6, 130.4, 129.9, 129.2, 128.3, 127.7, 124.4.

2-oxo-2-(thiophen-2-yl)acetamide (2t)[3, 4]



55.1 mg, 71% yield; light yellow solid; m.p. 84 - 86 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.32 (s, 1H), 8.16 – 8.13 (m, 2H), 8.01 (s, 1H), 7.28 (t, *J* = 5.0 Hz, 1H); ^{13}C NMR (125 MHz, DMSO) δ 181.1, 164.8, 139.2, 137.9, 137.6, 129.2.

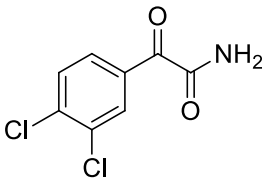
2-(2,3-dihydrobenzo[b][1,4]dioxin-6-yl)-2-oxoacetamide (2u)[4]



65.2 mg, 63% yield; light yellow solid; m.p. 136 - 137 °C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.26 (s, 1H), 7.91 (s, 1H), 7.51 (dd, *J* = 10.0, 5.0 Hz, 1H), 7.45 (d, *J* = 5.0 Hz, 1H), 7.03 (d, *J* = 10.0 Hz, 1H), 4.36 (d, *J* = 5.0 Hz, 2H), 4.30 (d, *J* = 5.0 Hz, 2H); ^{13}C NMR (125 MHz, DMSO) δ 189.6, 167.8, 149.6, 143.9,

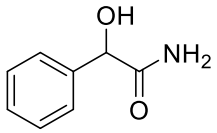
126.7, 124.6, 118.8, 118.0, 65.2, 64.4.

2-(3,4-dichlorophenyl)-2-oxoacetamide (2v)[3, 4]



68.3 mg, 63% yield; light yellow solid; m.p. 186 - 189 ^{o}C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 8.40 (s, 1H), 8.14 (d, *J* = 3.0 Hz, 1H), 8.11 (s, 1H), 7.96 (d, *J* = 10.0 Hz, 1H), 7.86 (d, *J* = 10.0 Hz, 1H); ^{13}C NMR (125 MHz, DMSO) δ 188.3, 166.0, 137.8, 133.6, 132.3, 131.9, 131.8, 130.4.

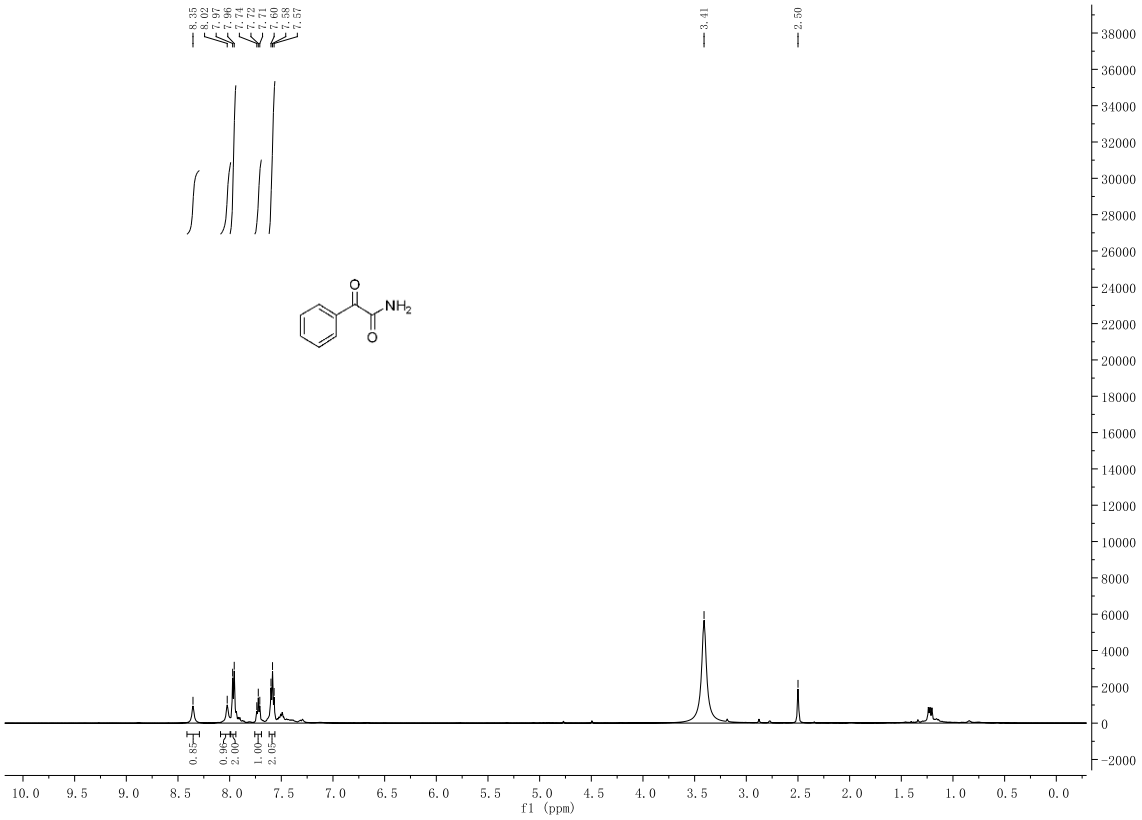
2-hydroxy-2-phenylacetamide (4a)[8]



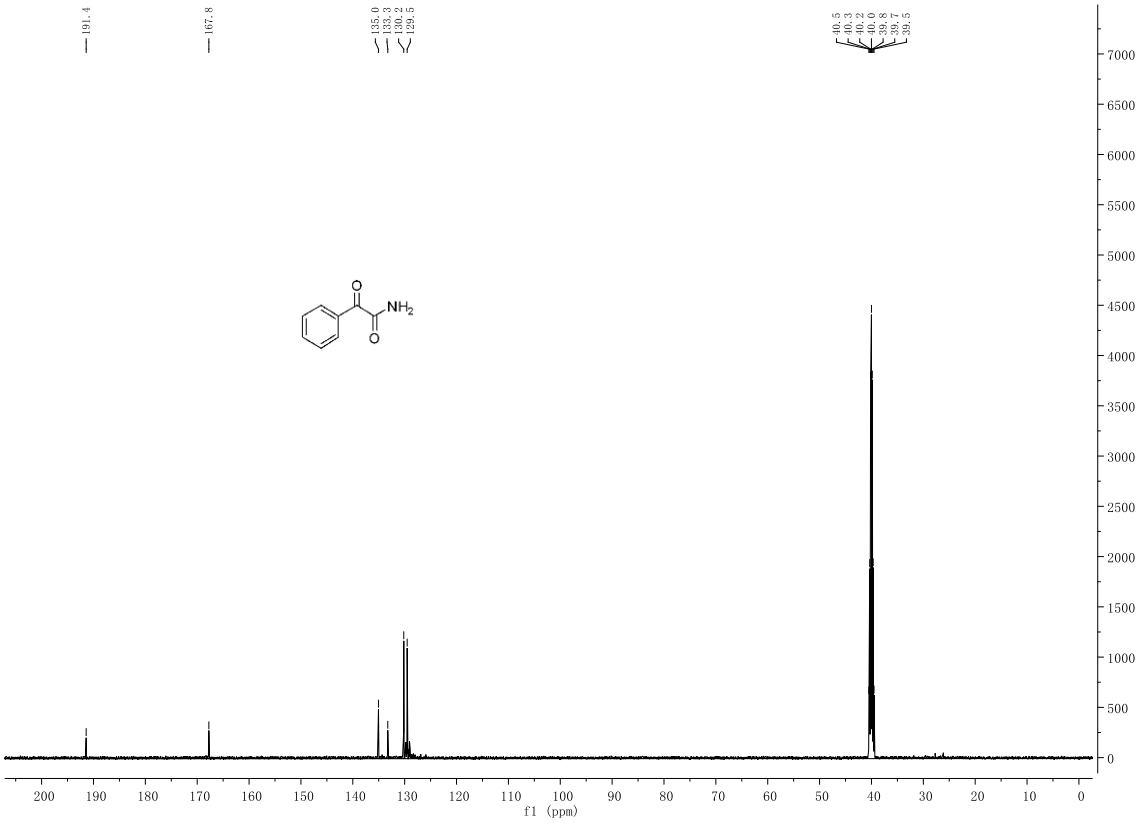
144.9 mg, 96% yield; light yellow solid; m.p. 125 - 127 ^{o}C (uncorrected); ^{1}H NMR (500 MHz, DMSO) δ 7.42 (d, *J* = 7.5 Hz, 2H), 7.38 (s, 1H), 7.32 (t, *J* = 7.5 Hz, 2H), 7.26 (t, *J* = 7.5 Hz, 1H), 7.17 (s, 1H), 6.00 (d, *J* = 5.0 Hz, 1H), 4.85 (d, *J* = 5.0 Hz, 1H); ^{13}C NMR (125 MHz, DMSO) δ 175.1, 141.8, 128.4, 127.8, 126.98, 73.9.

(D) Spectra of 2 and 4a

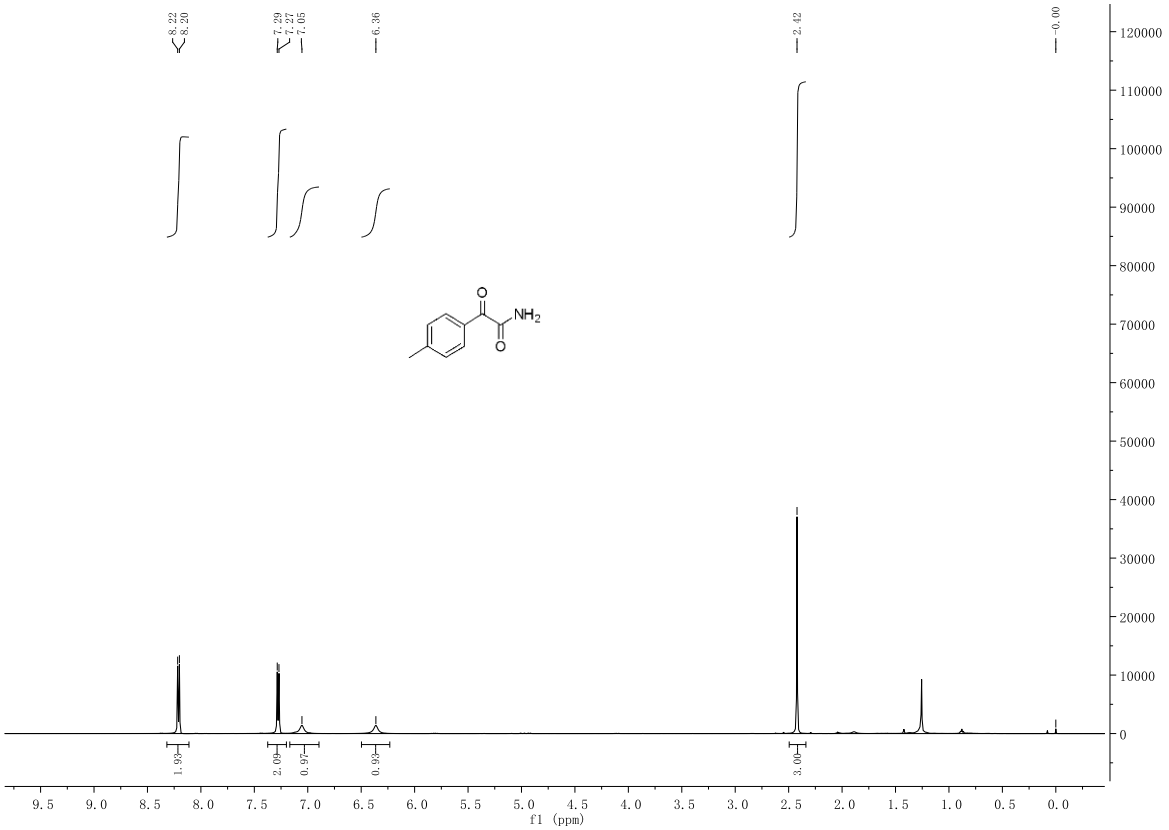
2-oxo-2-phenylacetamide (**2a**, ^{1}H NMR, 500 MHz, DMSO-D6)



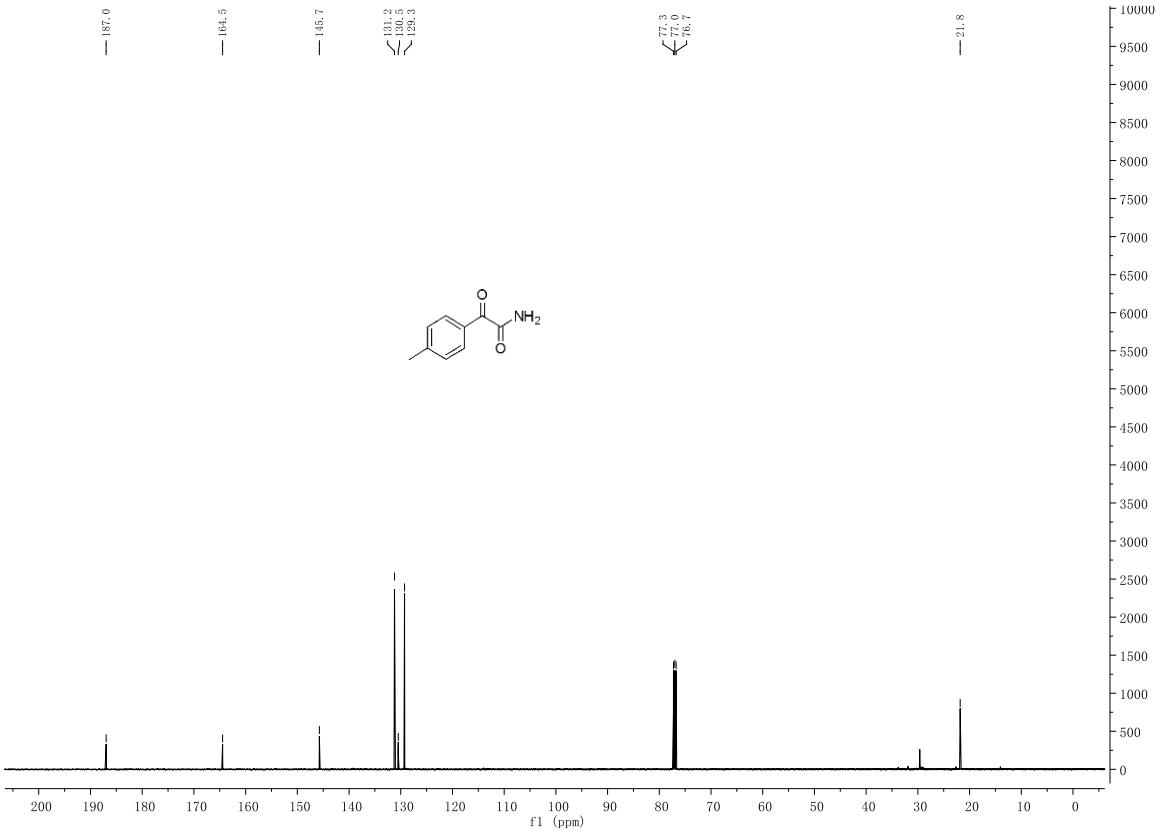
2-oxo-2-phenylacetamide (**2a**, ^{13}C NMR, 125 MHz, DMSO-D6)



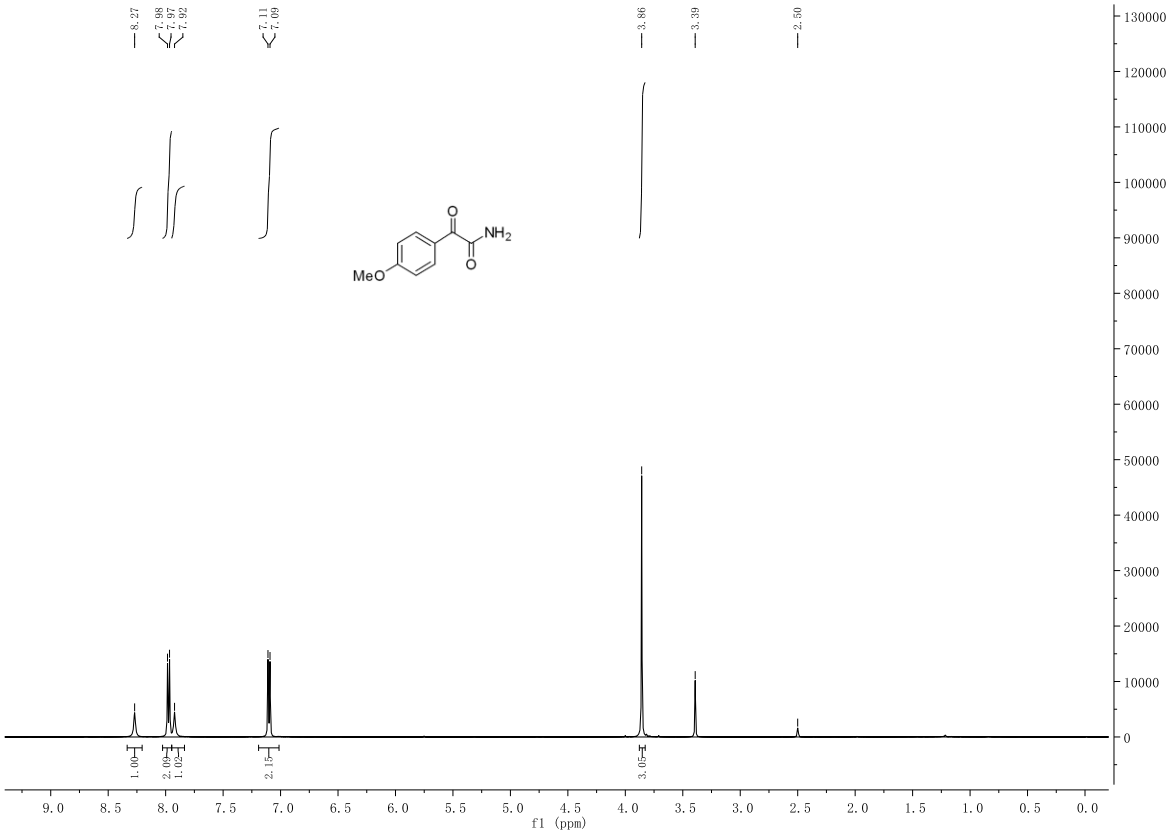
2-oxo-2-(p-tolyl)acetamide (**2b**, ^{1}H NMR, 500 MHz, $DCCl_3$)



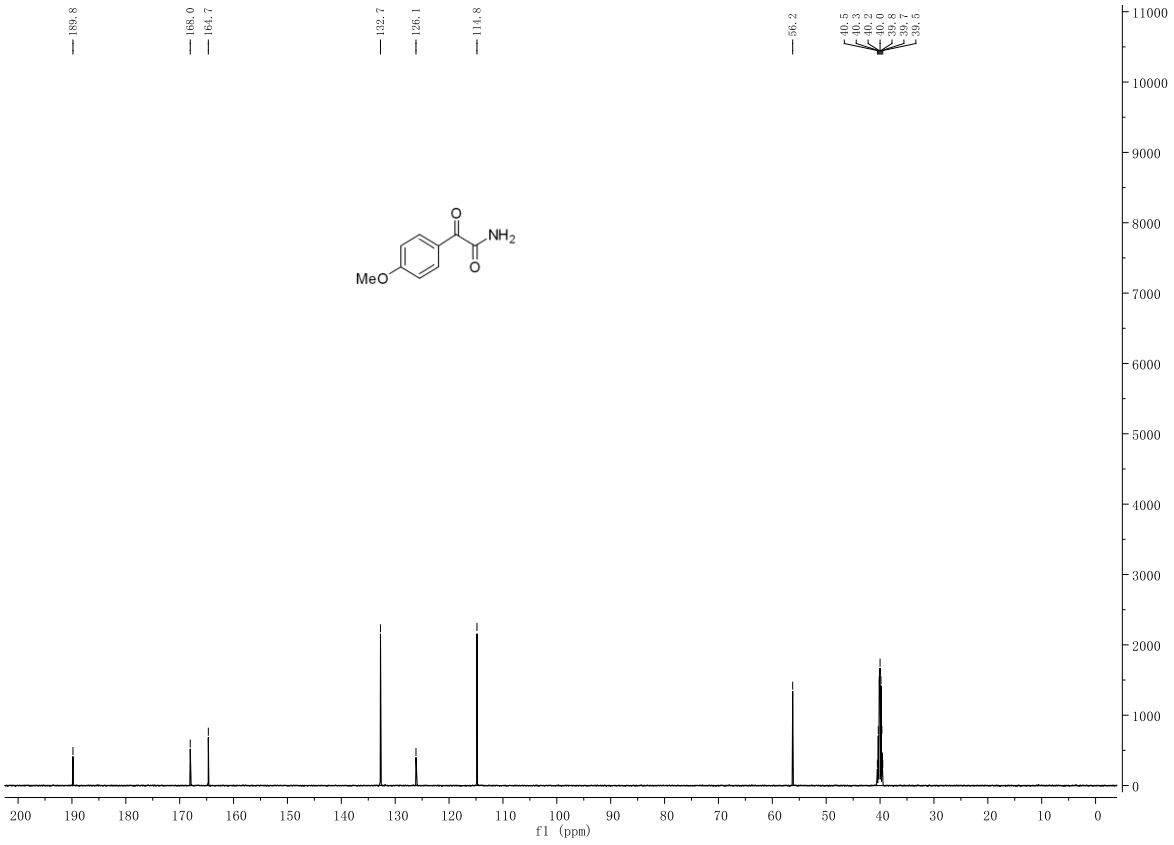
2-oxo-2-(p-tolyl)acetamide (**2b**, ^{13}C NMR, 125 MHz, $DCCl_3$)



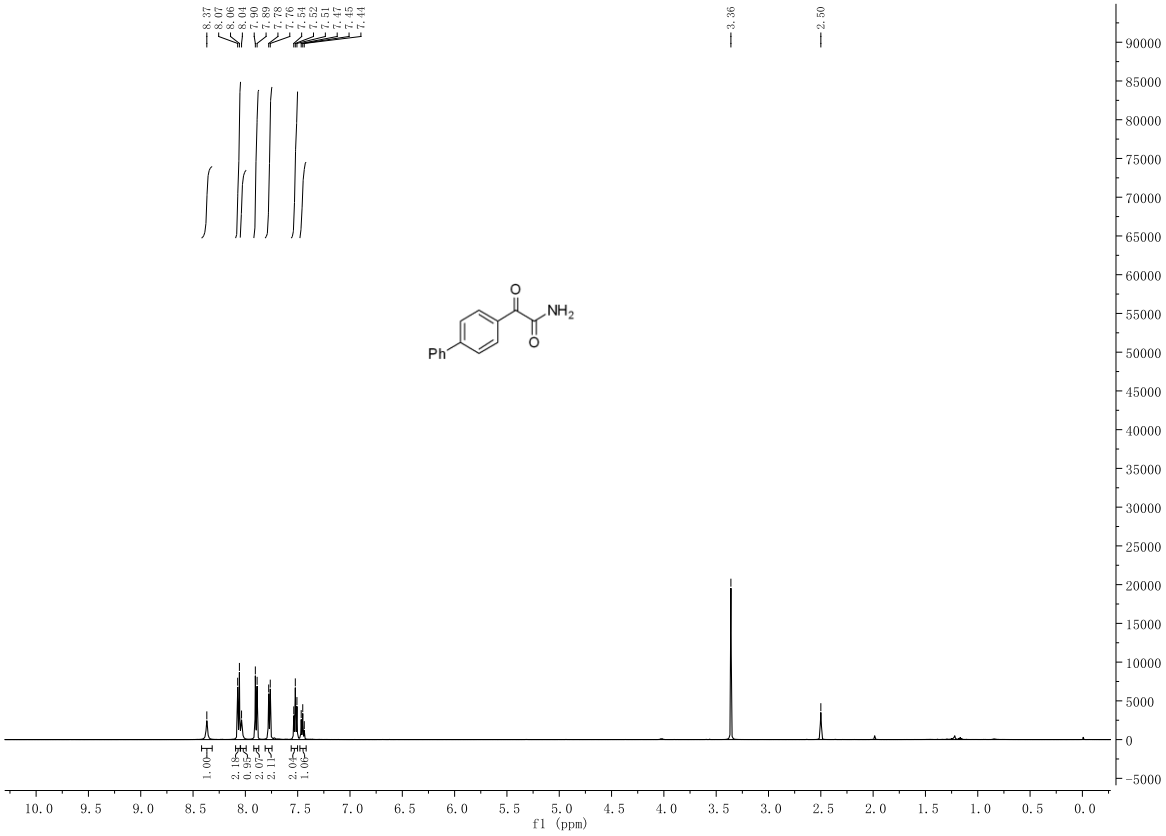
2-(4-methoxyphenyl)-2-oxoacetamide (**2c**, ^{1}H NMR, 500 MHz, DMSO-D6)



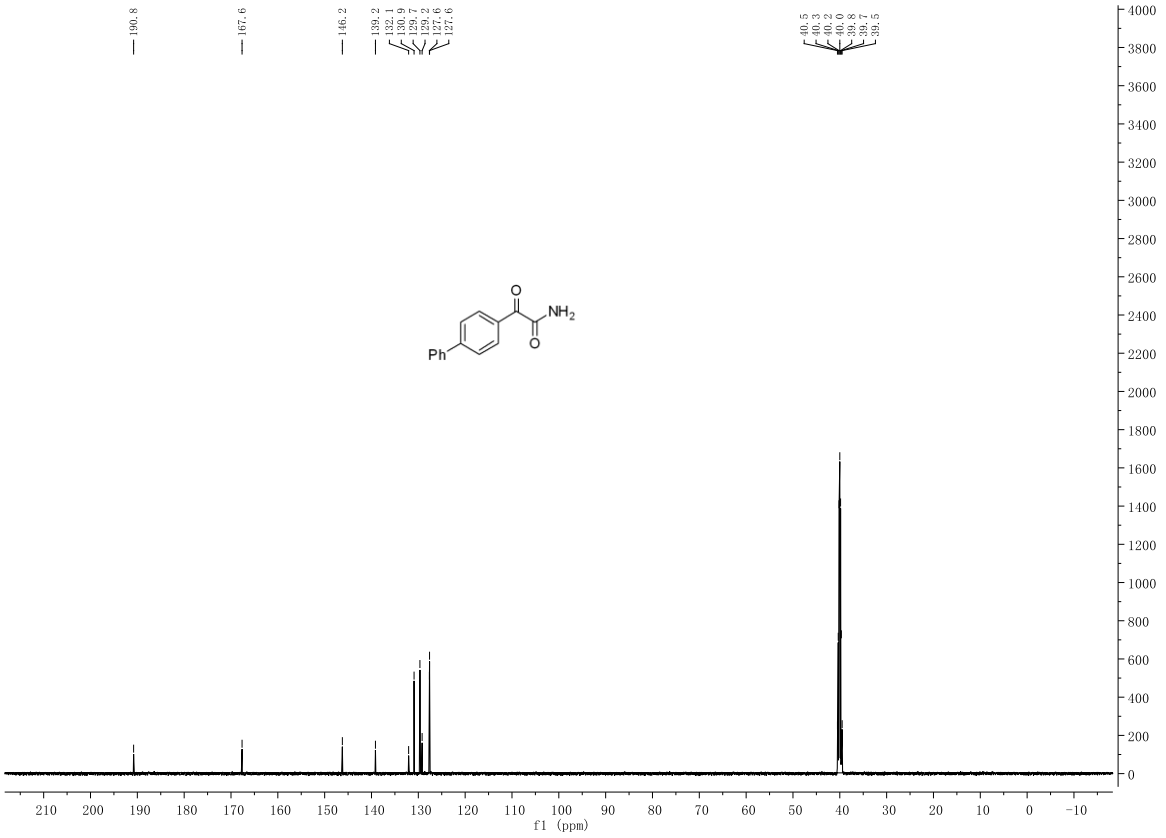
2-(4-methoxyphenyl)-2-oxoacetamide (**2c**, ^{13}C NMR, 125 MHz, DMSO-D6)



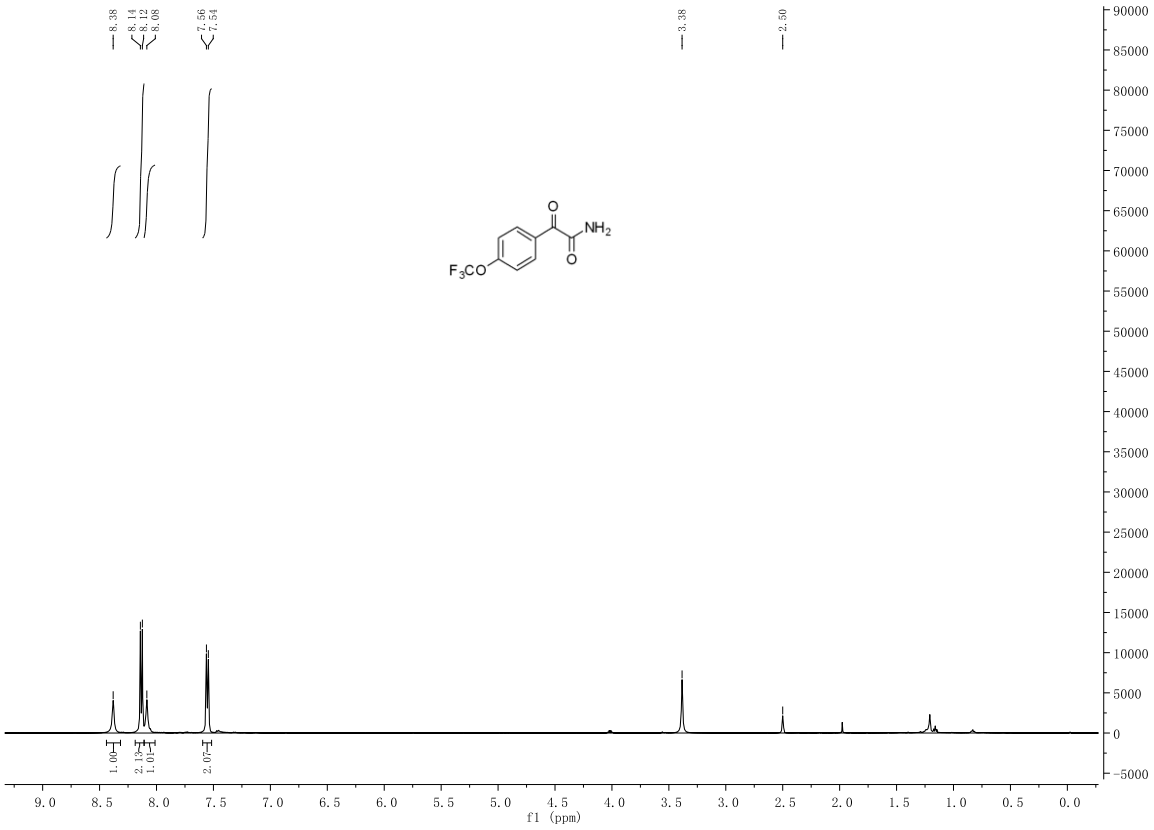
2-([1,1'-biphenyl]-4-yl)-2-oxoacetamide (**2d**, ^{1}H NMR, 500 MHz, DMSO-D6)



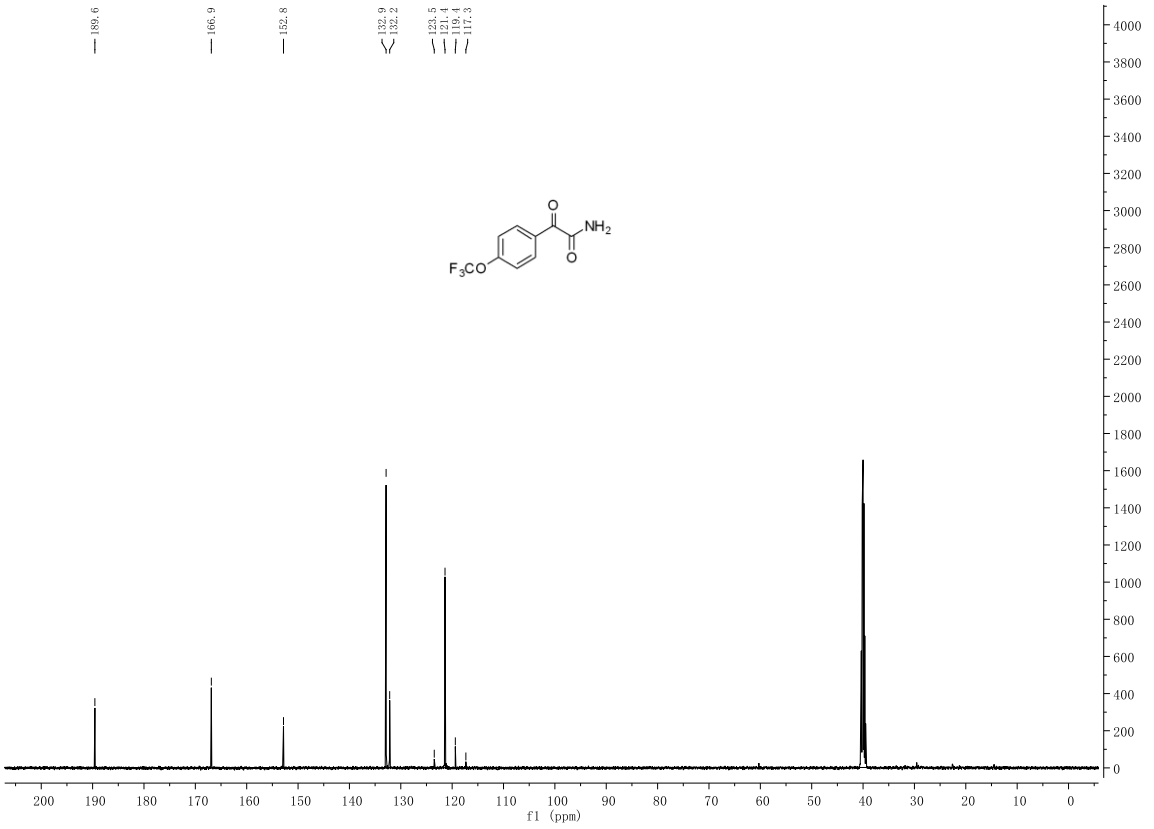
2-([1,1'-biphenyl]-4-yl)-2-oxoacetamide (**2d**, ^{13}C NMR, 125 MHz, DMSO-D6)



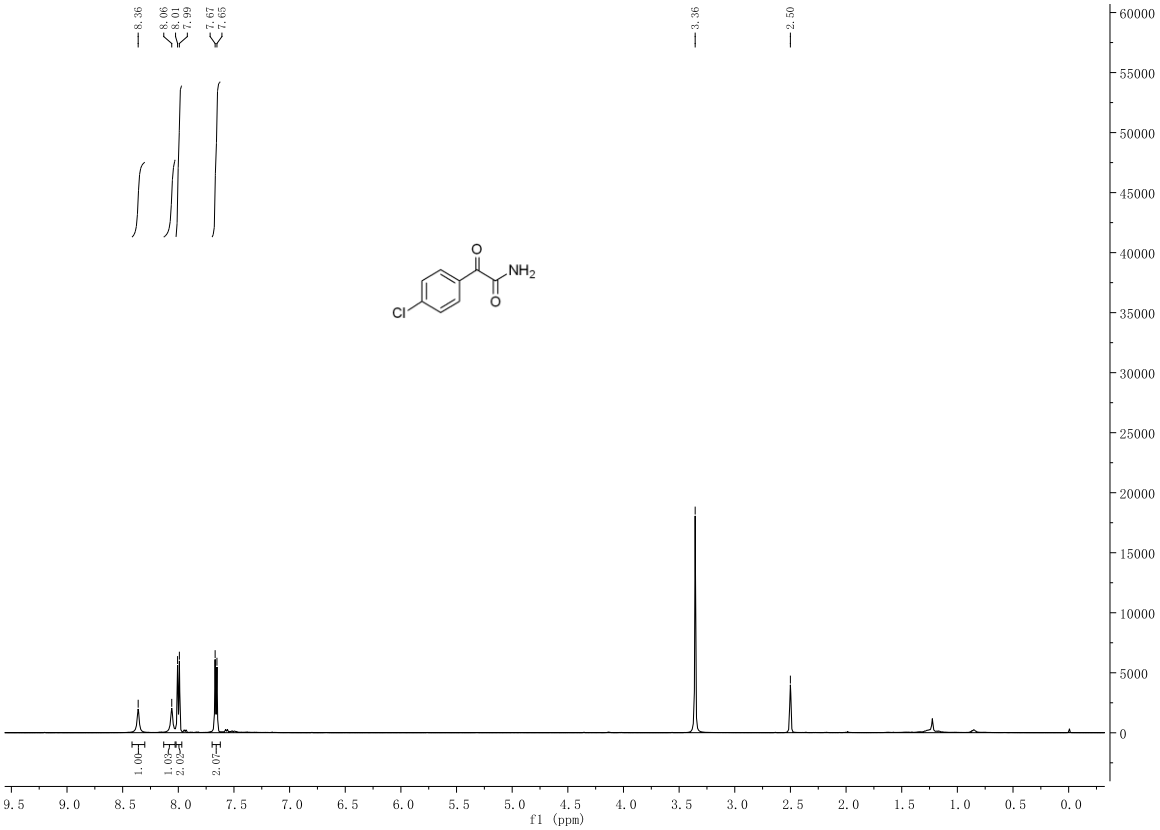
2-oxo-2-(4-(trifluoromethoxy)phenyl)acetamide (**2e**, ^{1}H NMR, 500 MHz, DMSO-D6)



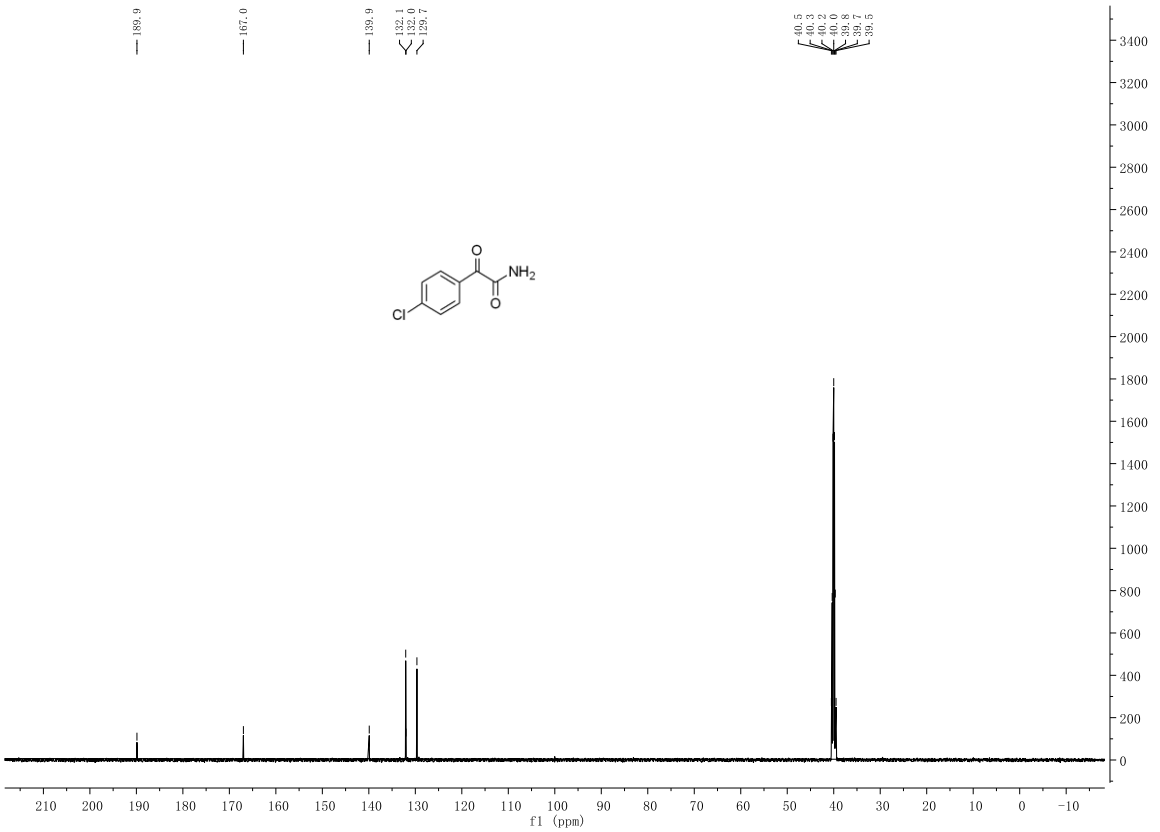
2-oxo-2-(4-(trifluoromethoxy)phenyl)acetamide (**2e**, ^{13}C NMR, 125 MHz, DMSO-D6)



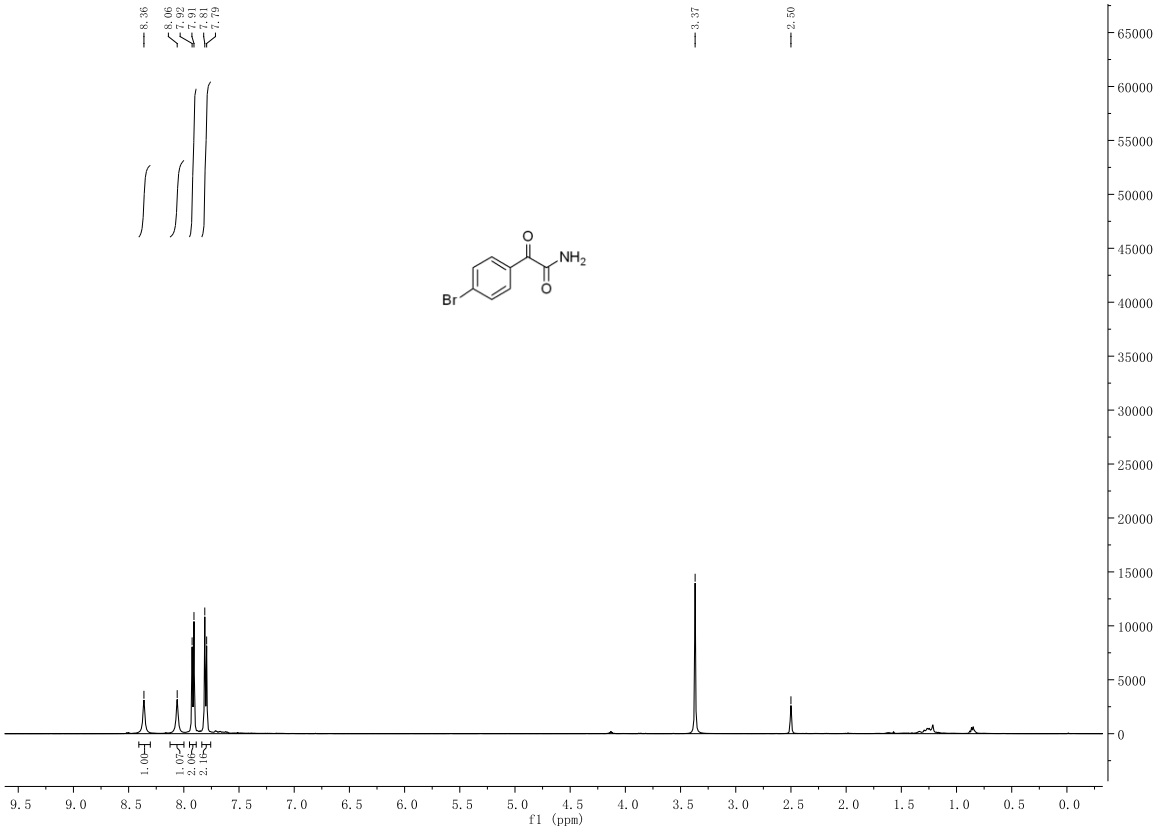
2-(4-chlorophenyl)-2-oxoacetamide (**2f**, ^{1}H NMR, 500 MHz, DMSO-D6)



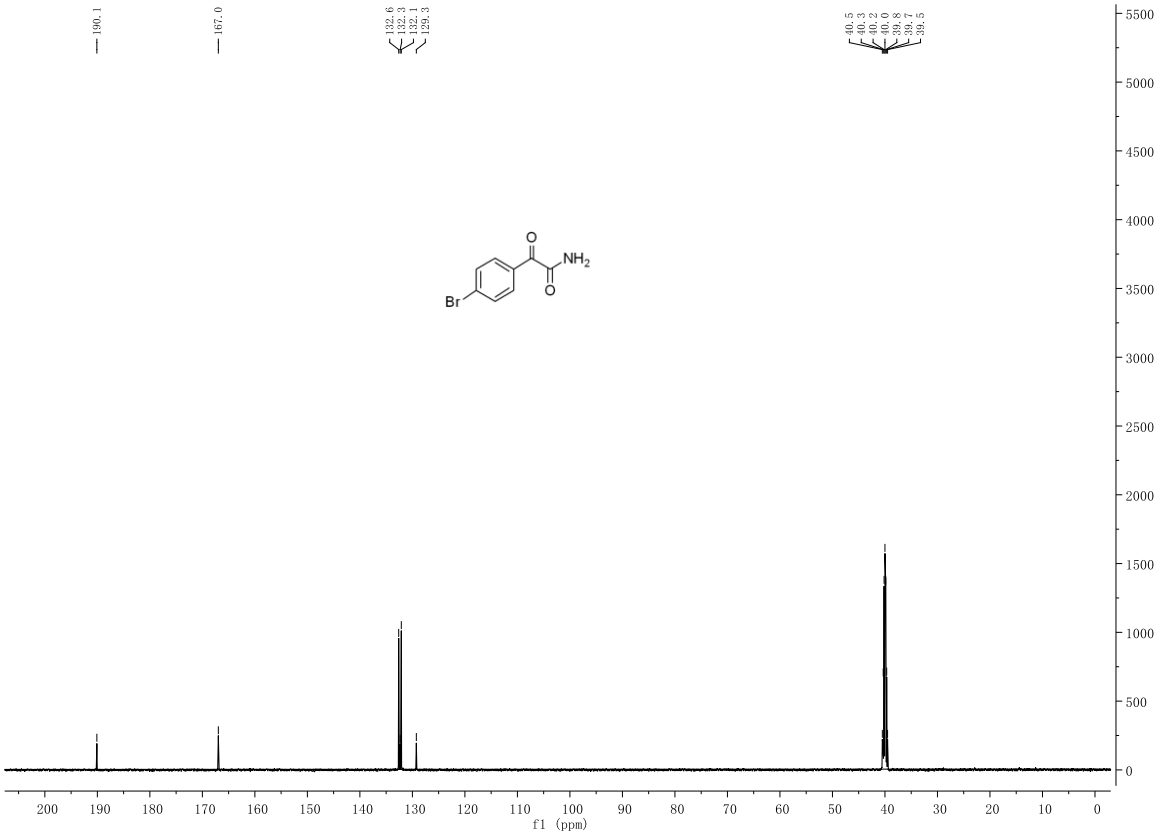
2-(4-chlorophenyl)-2-oxoacetamide (**2f**, ^{13}C NMR, 125 MHz, DMSO-D6)



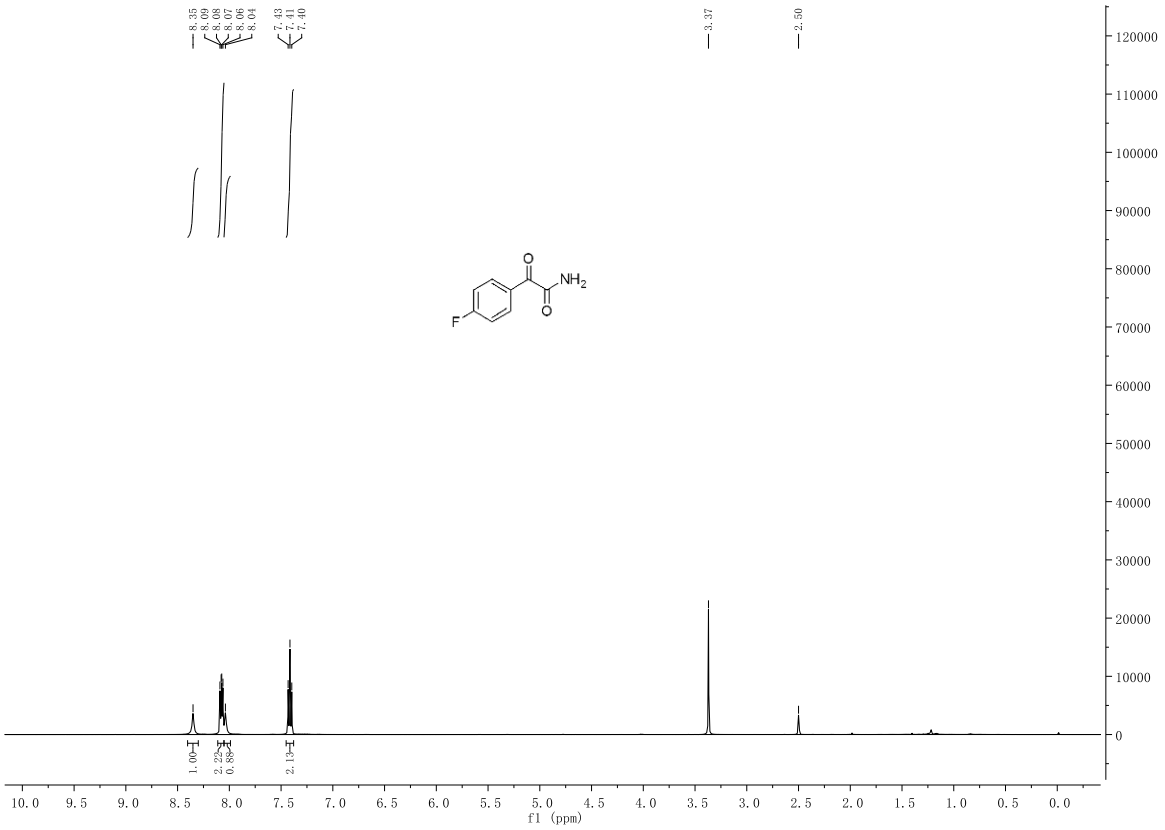
2-(4-bromophenyl)-2-oxoacetamide (**2g**, ^{1}H NMR, 500 MHz, DMSO-D6)



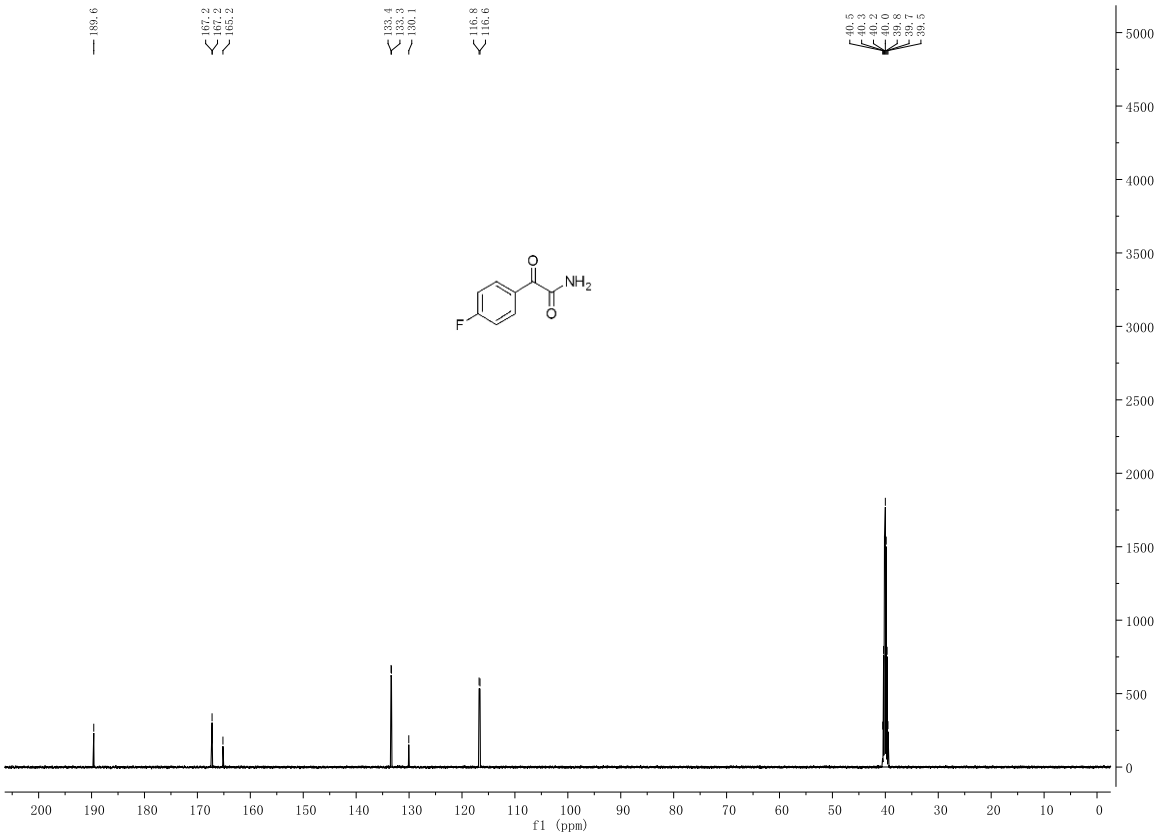
2-(4-bromophenyl)-2-oxoacetamide (**2g**, ^{13}C NMR, 125 MHz, DMSO-D6)



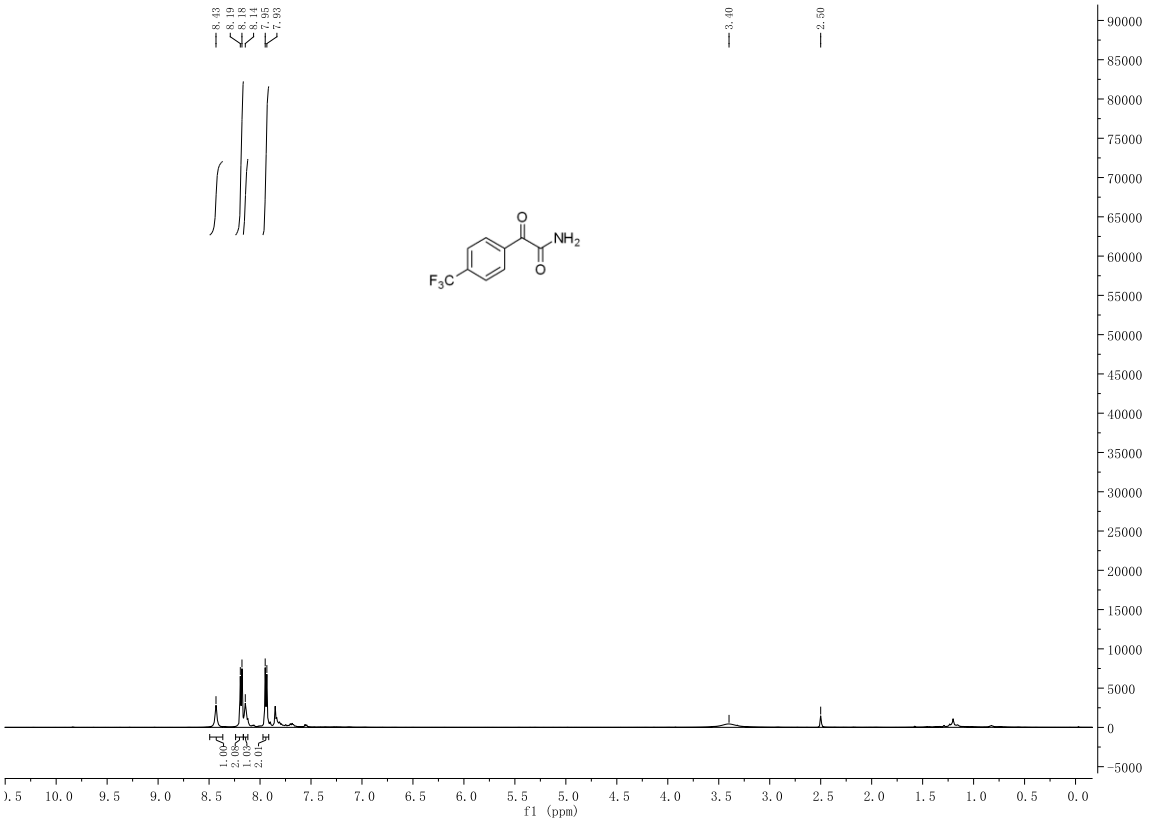
2-(4-fluorophenyl)-2-oxoacetamide (**2h**, ^{1}H NMR, 500 MHz, DMSO-D6)



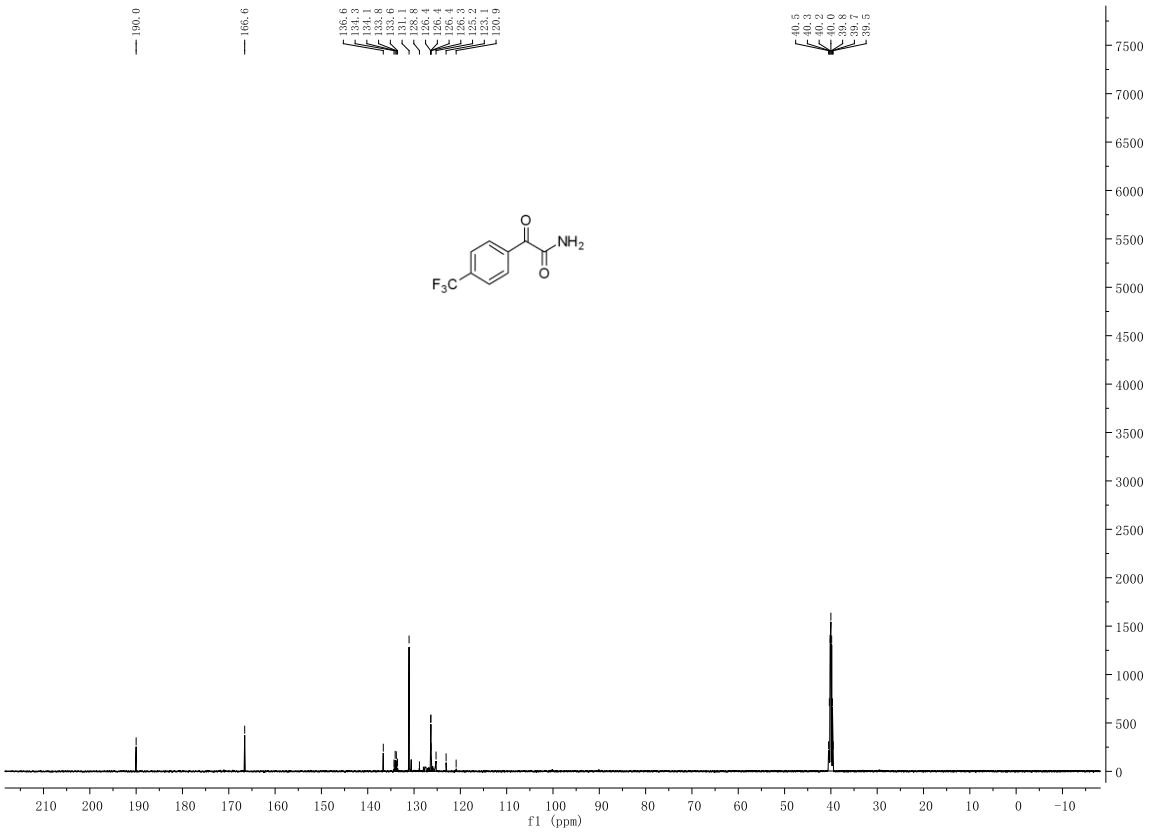
2-(4-fluorophenyl)-2-oxoacetamide (**2h**, ^{13}C NMR, 125 MHz, DMSO-D6)



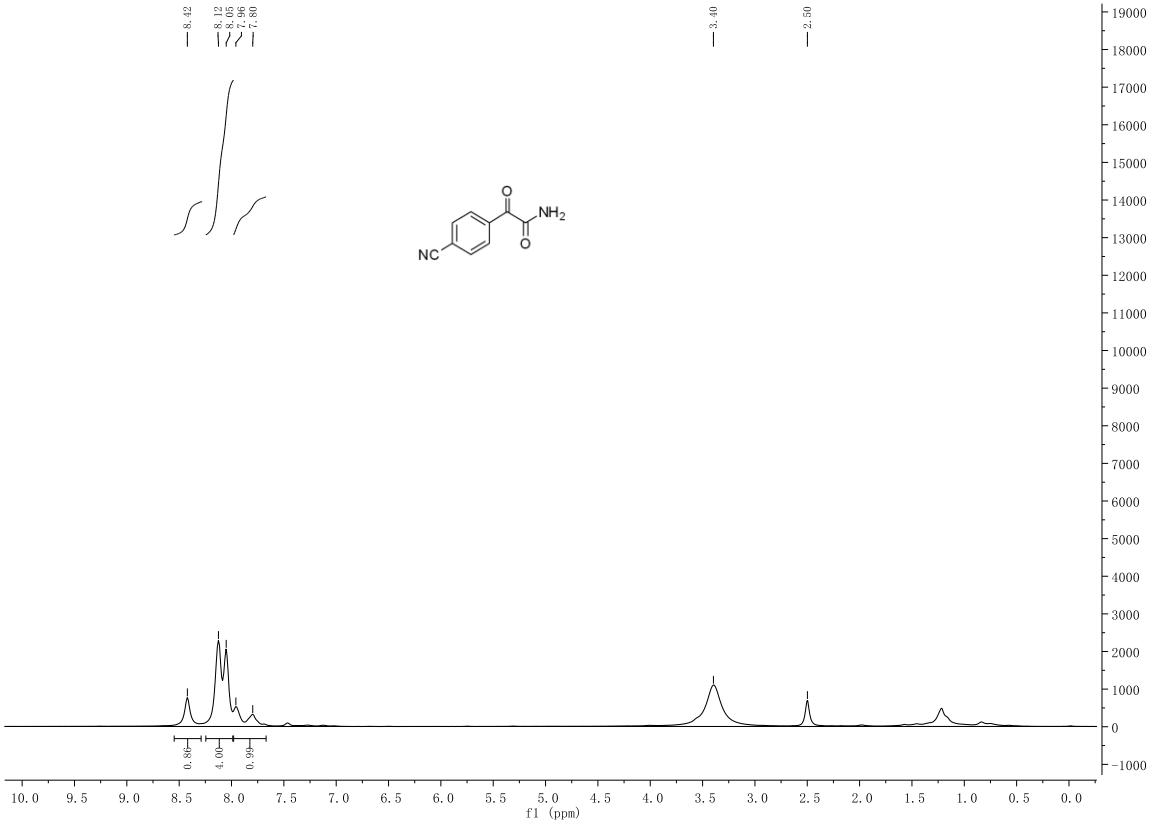
2-oxo-2-(4-(trifluoromethyl)phenyl)acetamide (**2i**, ^{1}H NMR, 500 MHz, DMSO-D6)



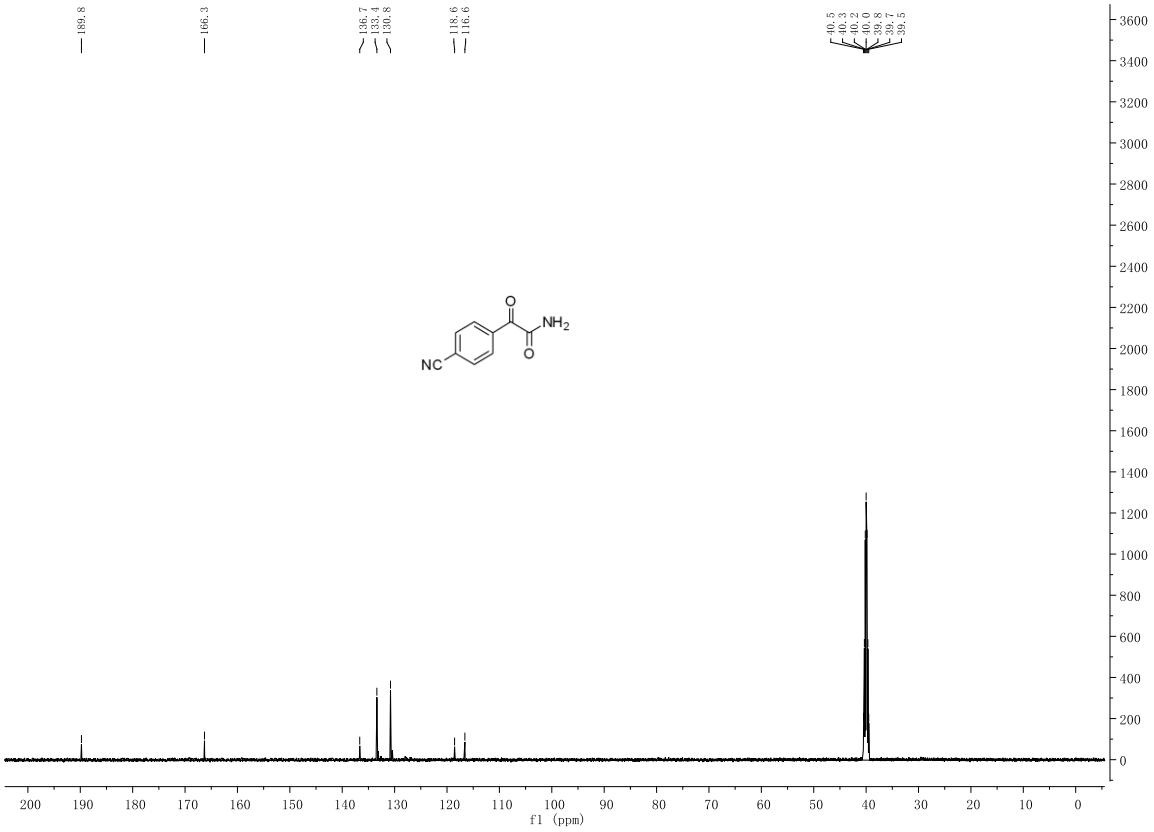
2-oxo-2-(4-(trifluoromethyl)phenyl)acetamide (**2i**, ^{13}C NMR, 125 MHz, DMSO-D6)



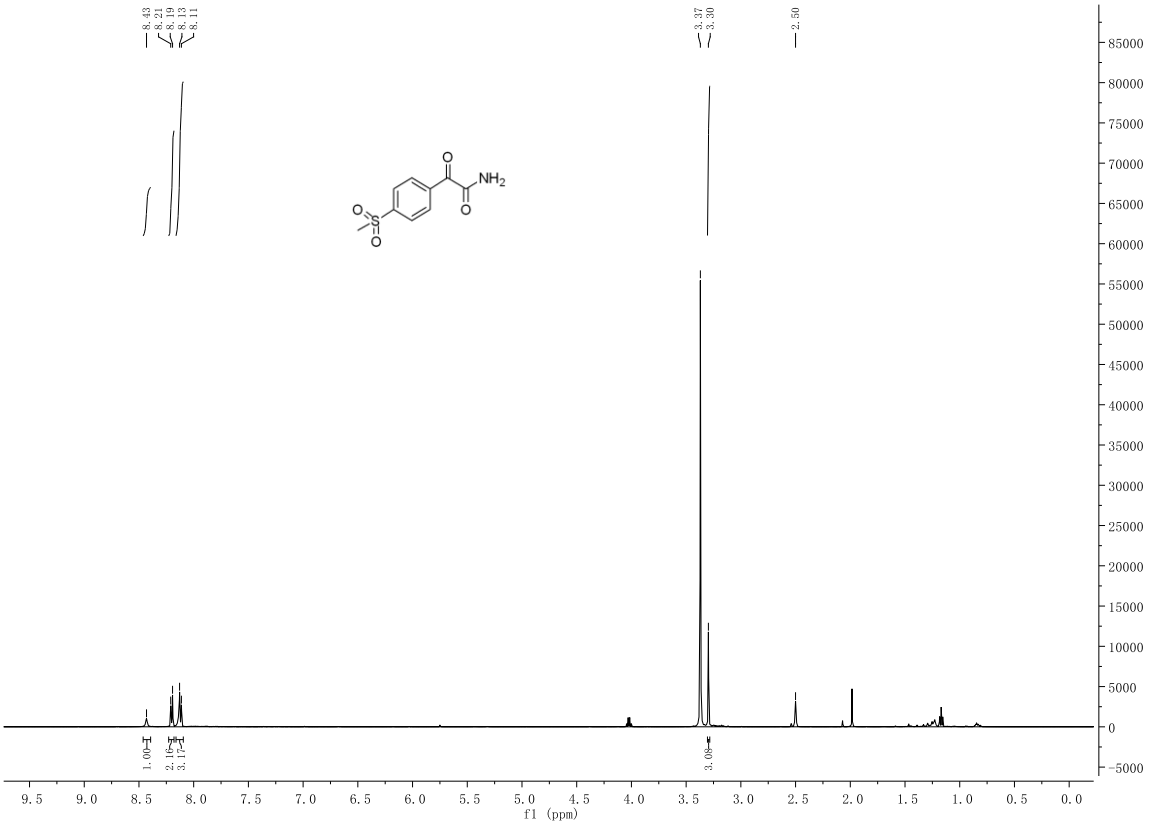
2-(4-cyanophenyl)-2-oxoacetamide (**2j**, ^{1}H NMR, 500 MHz, DMSO-D6)



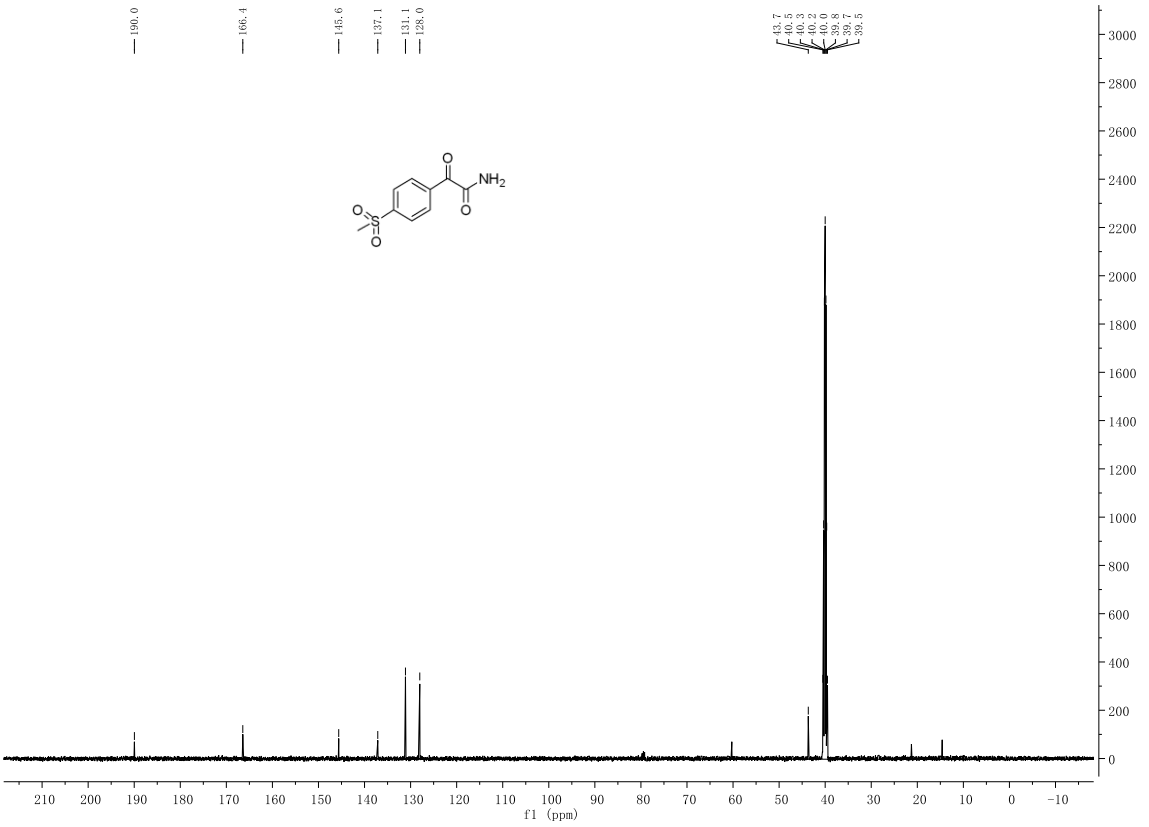
2-(4-cyanophenyl)-2-oxoacetamide (**2j**, ^{13}C NMR, 125 MHz, DMSO-D6)



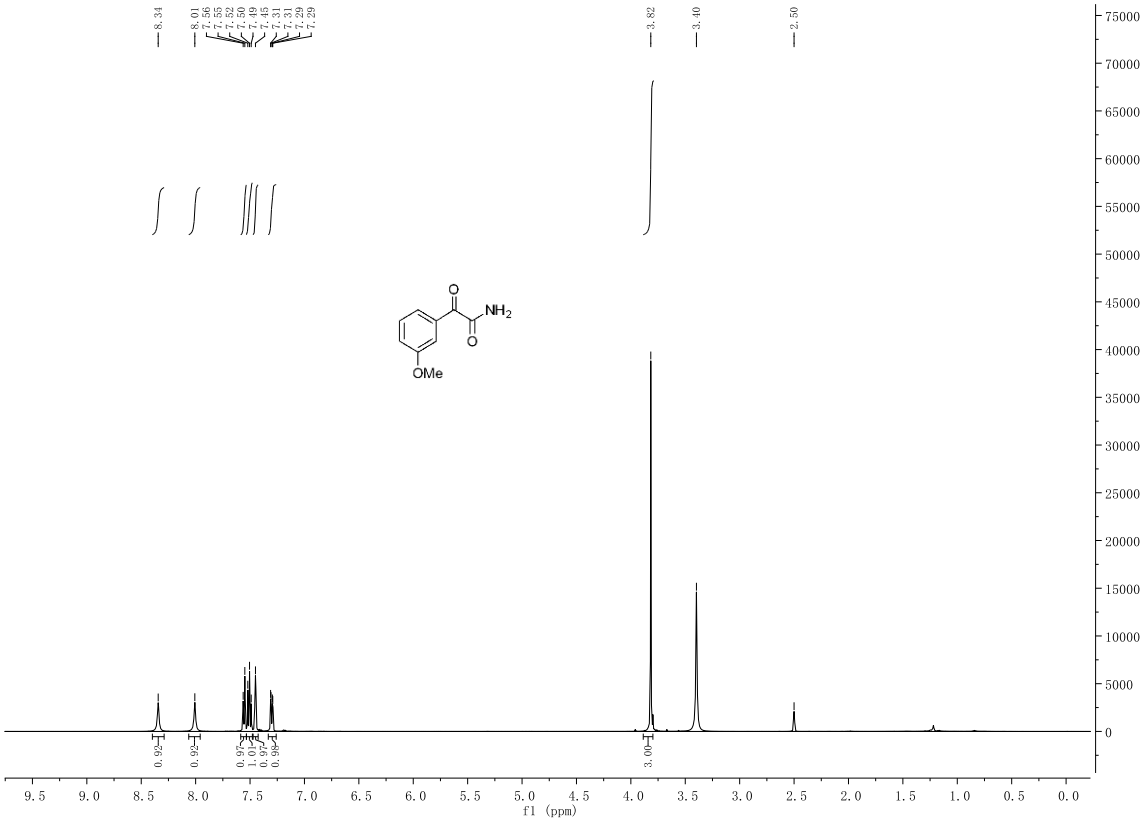
2-(4-(methylsulfonyl)phenyl)-2-oxoacetamide (**2k**, ^{1}H NMR, 500 MHz, DMSO-D6)



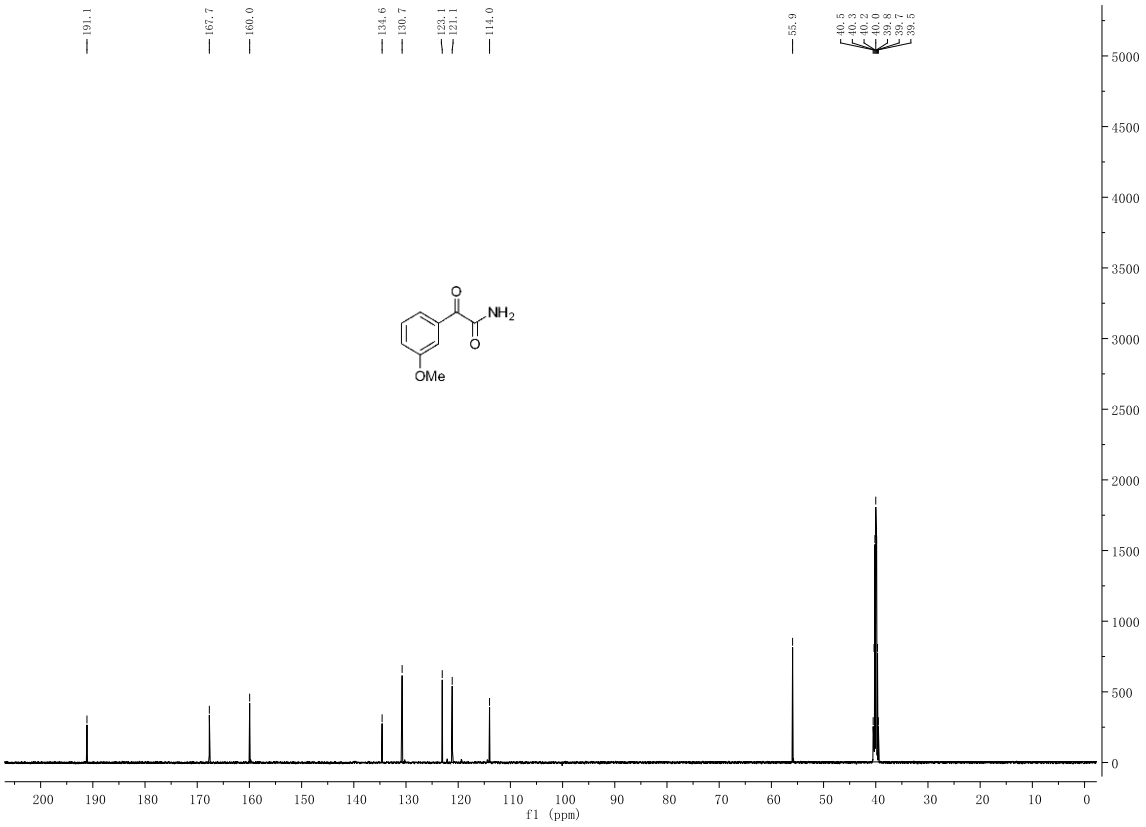
2-(4-(methylsulfonyl)phenyl)-2-oxoacetamide (**2k**, ^{13}C NMR, 125 MHz, DMSO-D6)



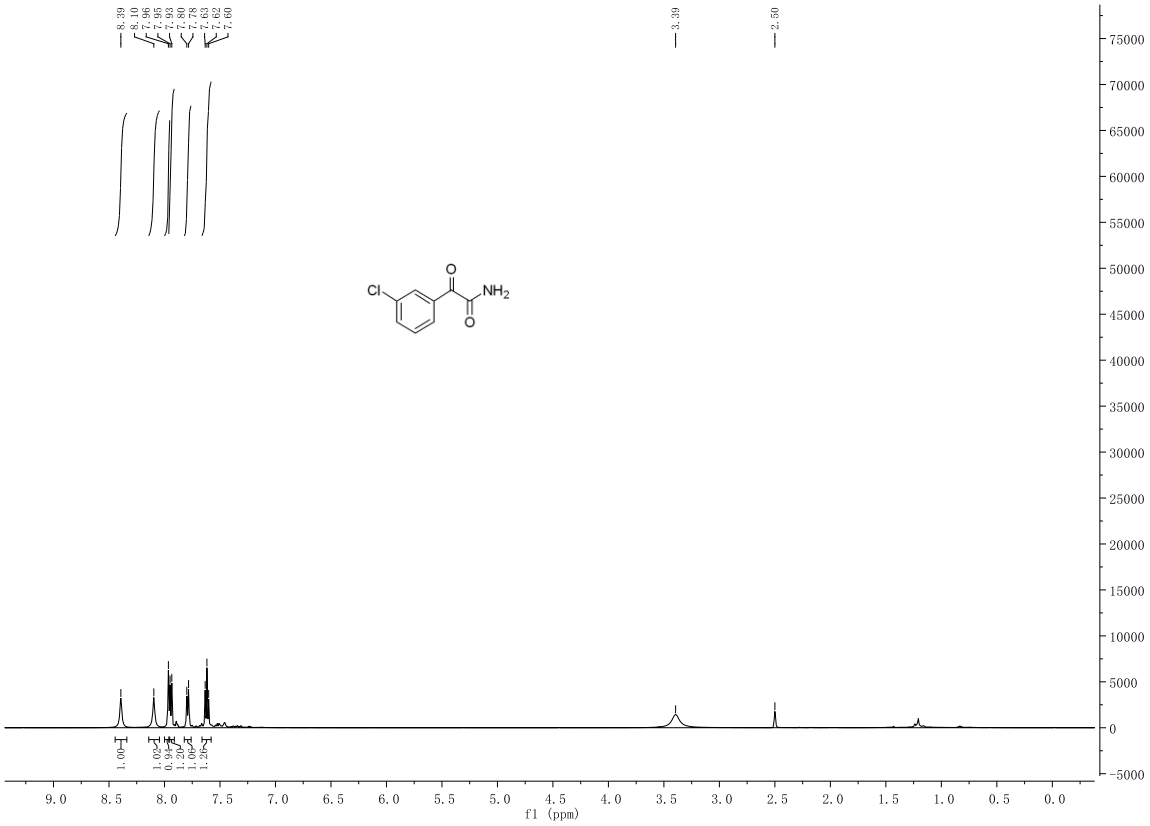
2-(3-methoxyphenyl)-2-oxoacetamide (**2l**, ^{1}H NMR, 500 MHz, DMSO-D6)



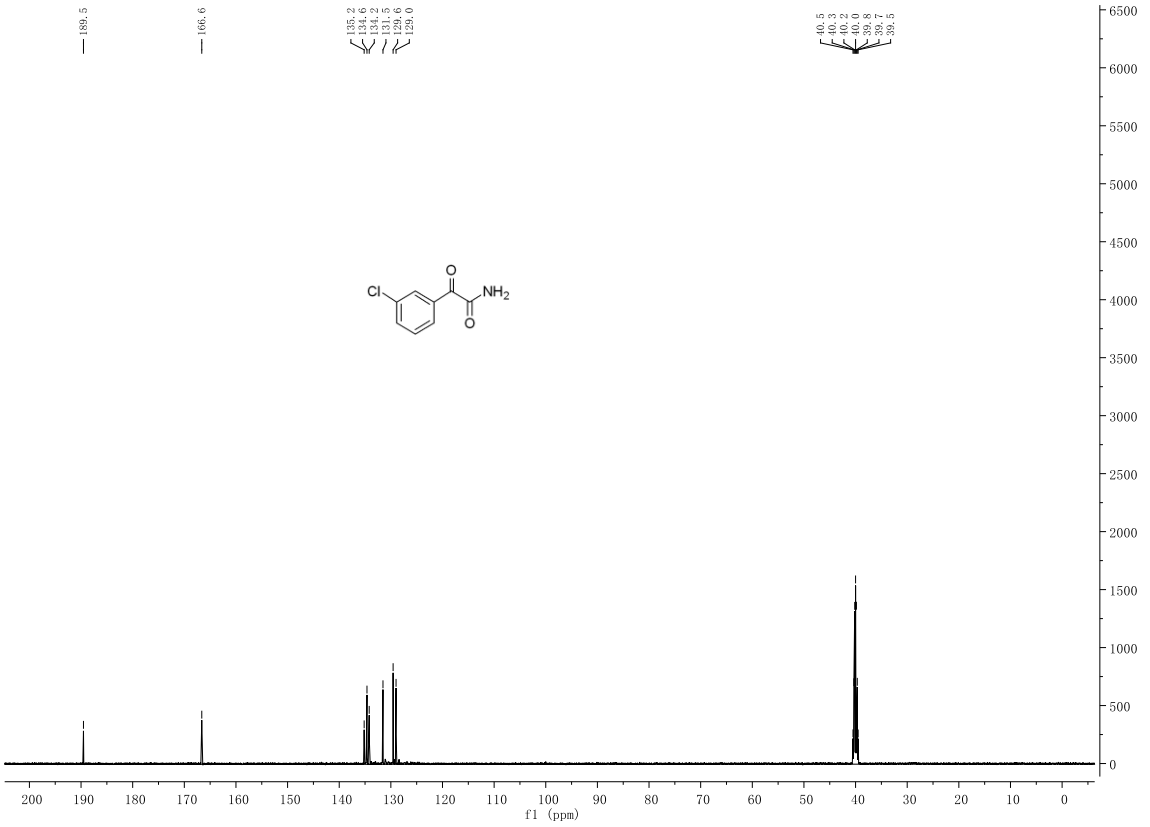
2-(3-methoxyphenyl)-2-oxoacetamide (**2l**, ^{13}C NMR, 125 MHz, DMSO-D6)



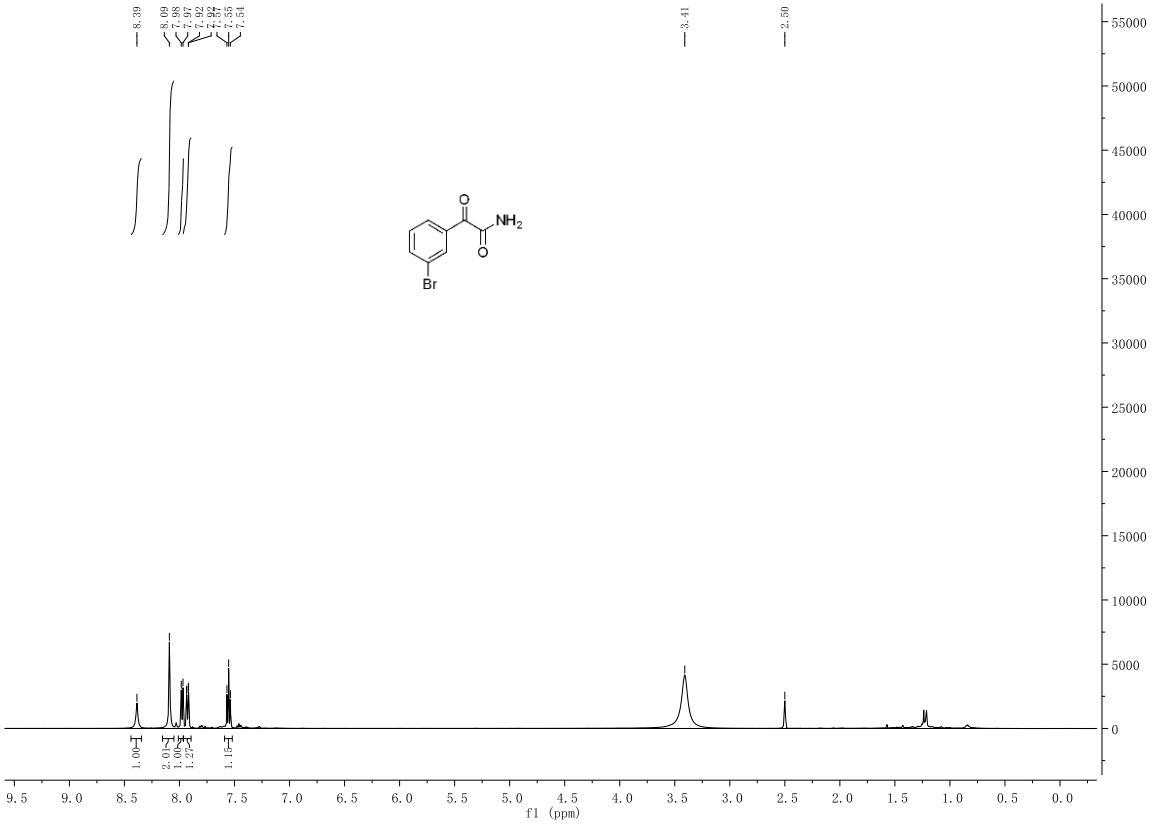
2-(3-chlorophenyl)-2-oxoacetamide (**2m**, ^{1}H NMR, 500 MHz, DMSO-D6)



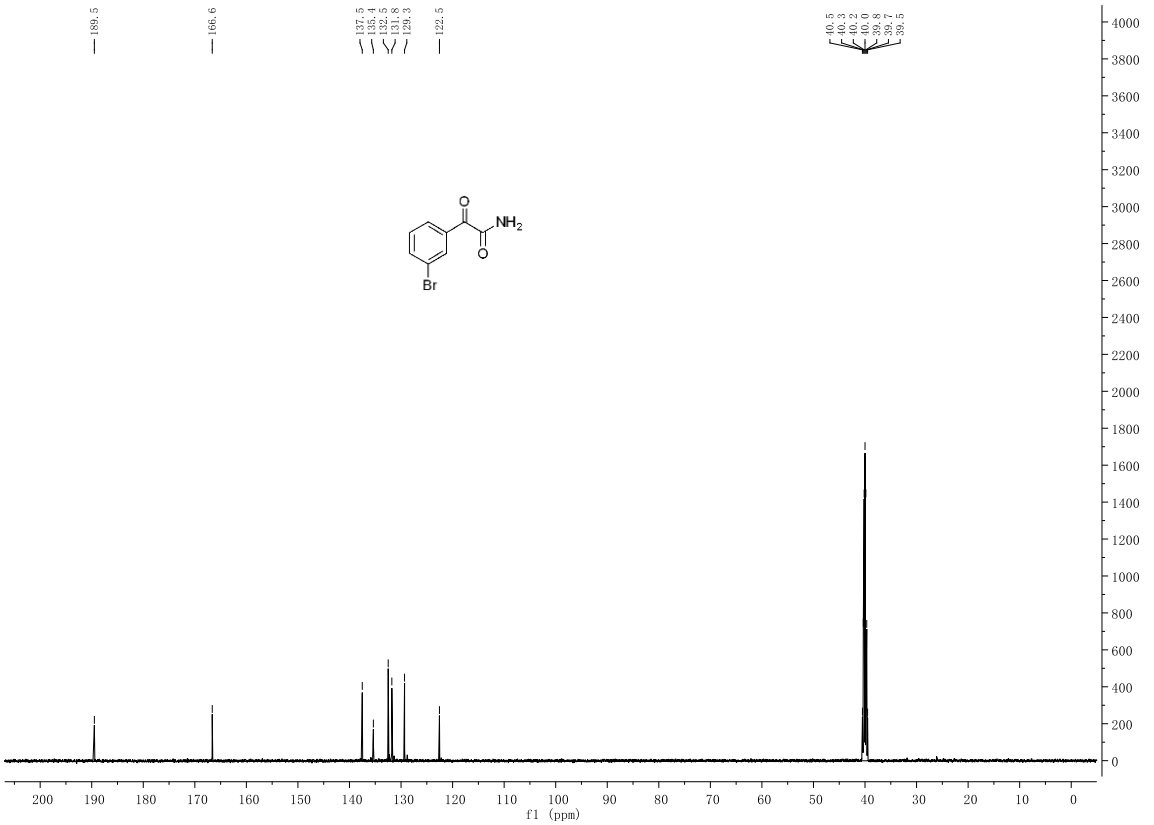
2-(3-chlorophenyl)-2-oxoacetamide (**2m**, ^{13}C NMR, 125 MHz, DMSO-D6)



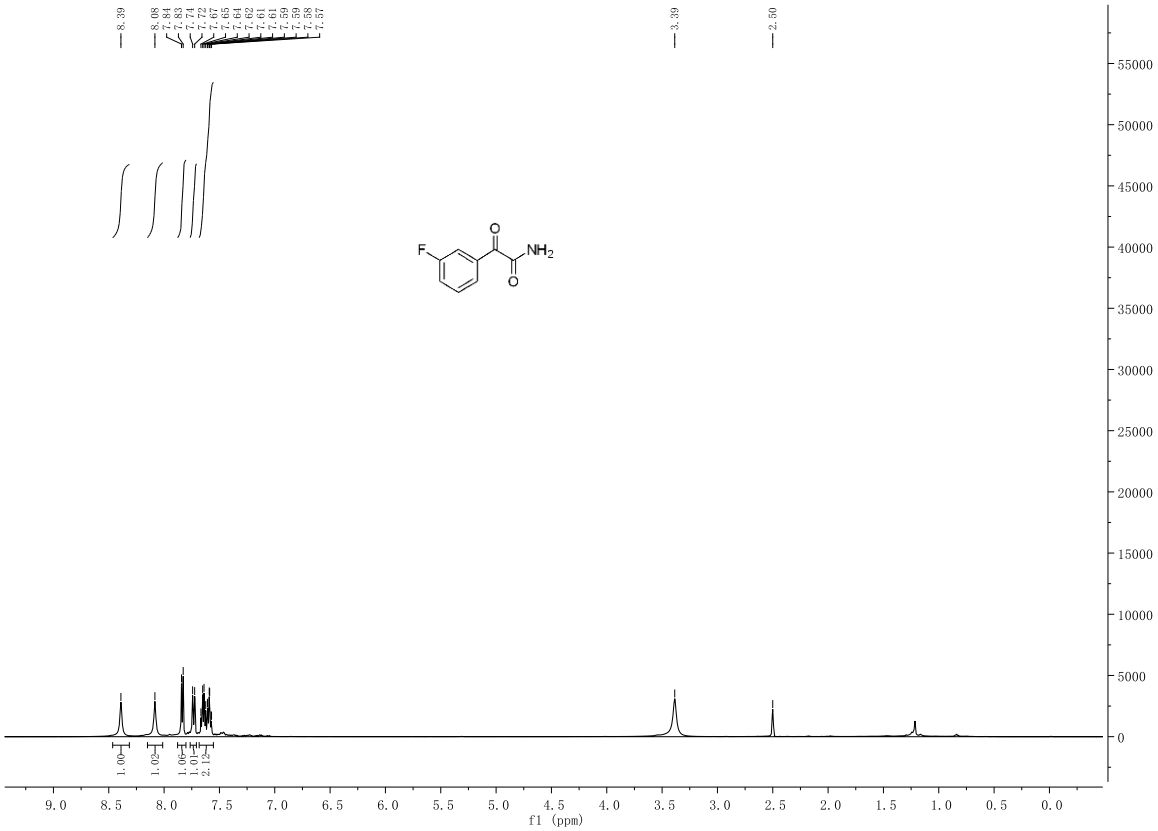
2-(3-bromophenyl)-2-oxoacetamide (**2n**, ^{1}H NMR, 500 MHz, DMSO-D6)



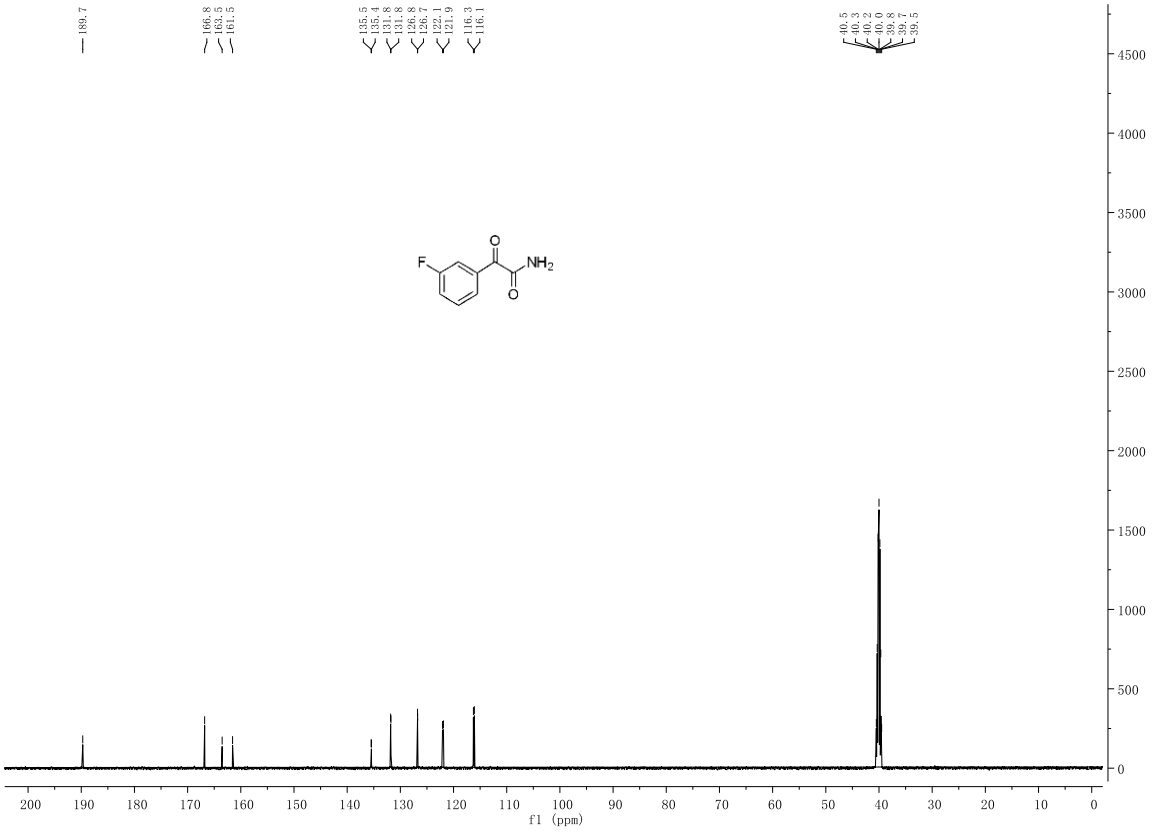
2-(3-bromophenyl)-2-oxoacetamide (**2n**, ^{13}C NMR, 125 MHz, DMSO-D6)



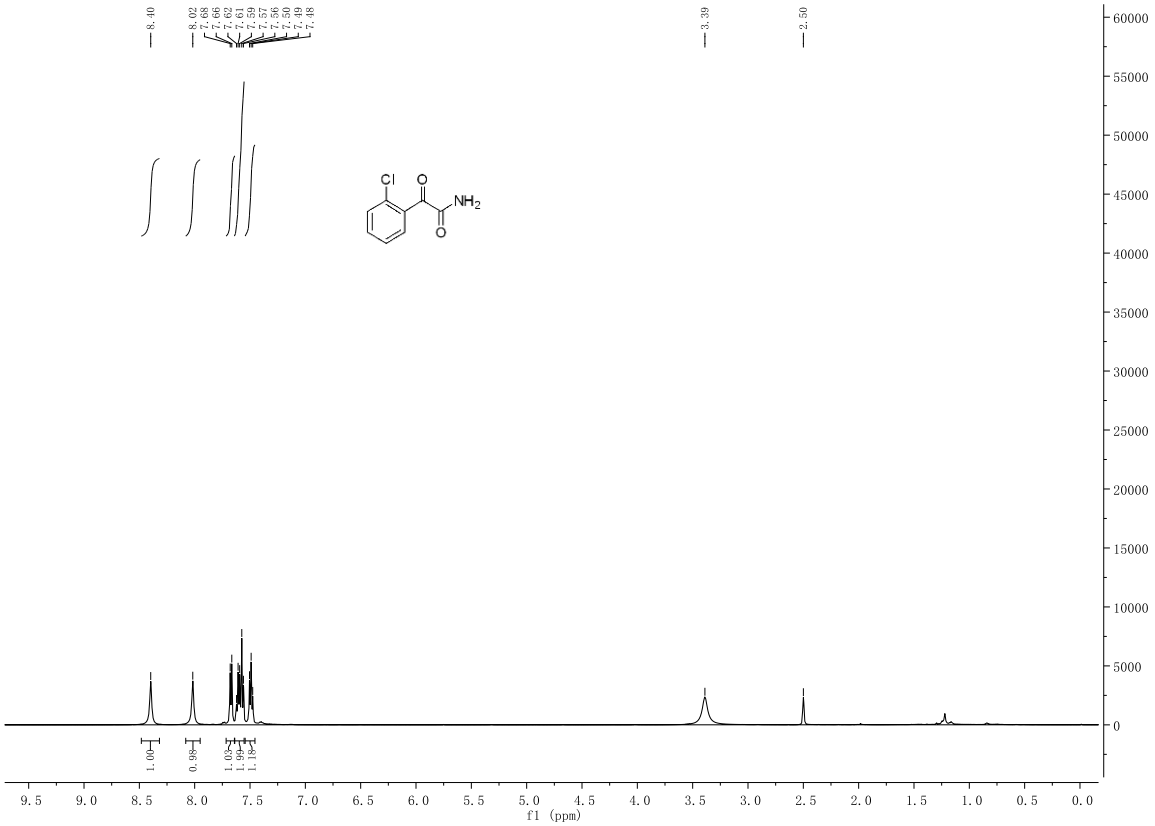
2-(3-fluorophenyl)-2-oxoacetamide (**2o**, ^{1}H NMR, 500 MHz, DMSO-D6)



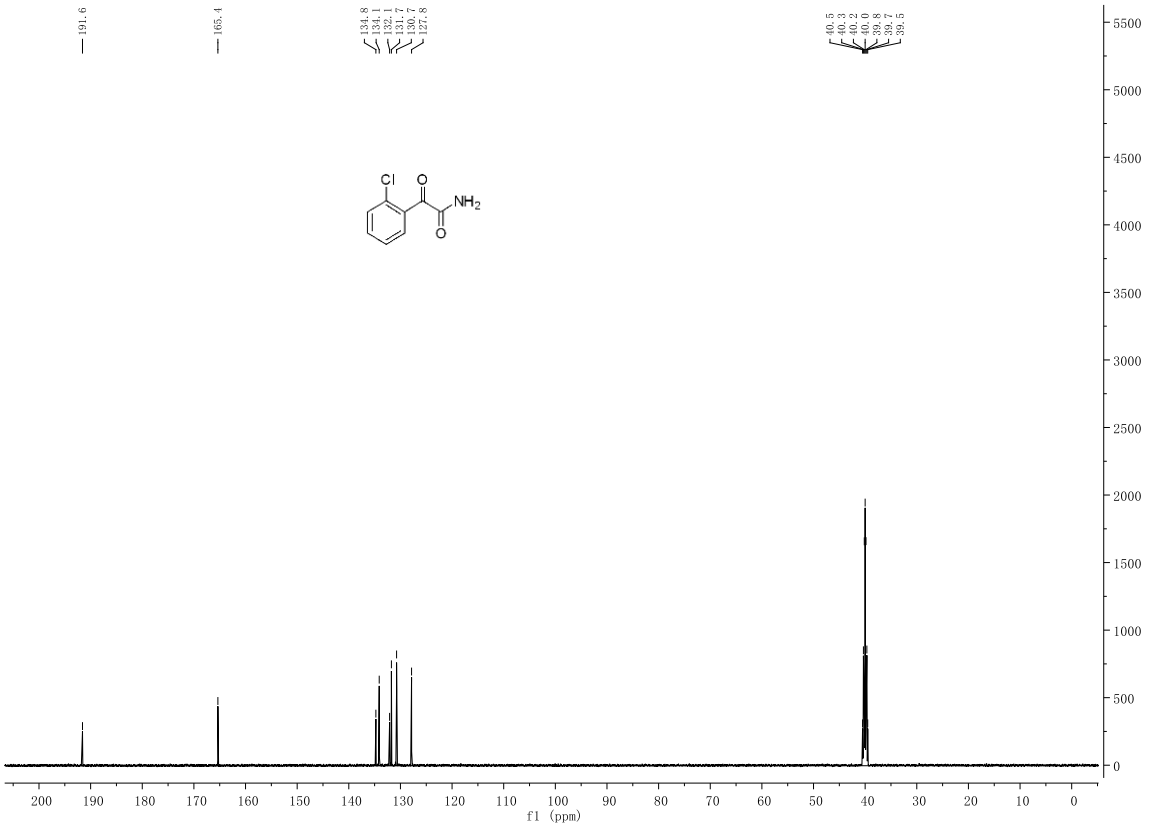
2-(3-fluorophenyl)-2-oxoacetamide (**2o**, ^{13}C NMR, 125 MHz, DMSO-D6)



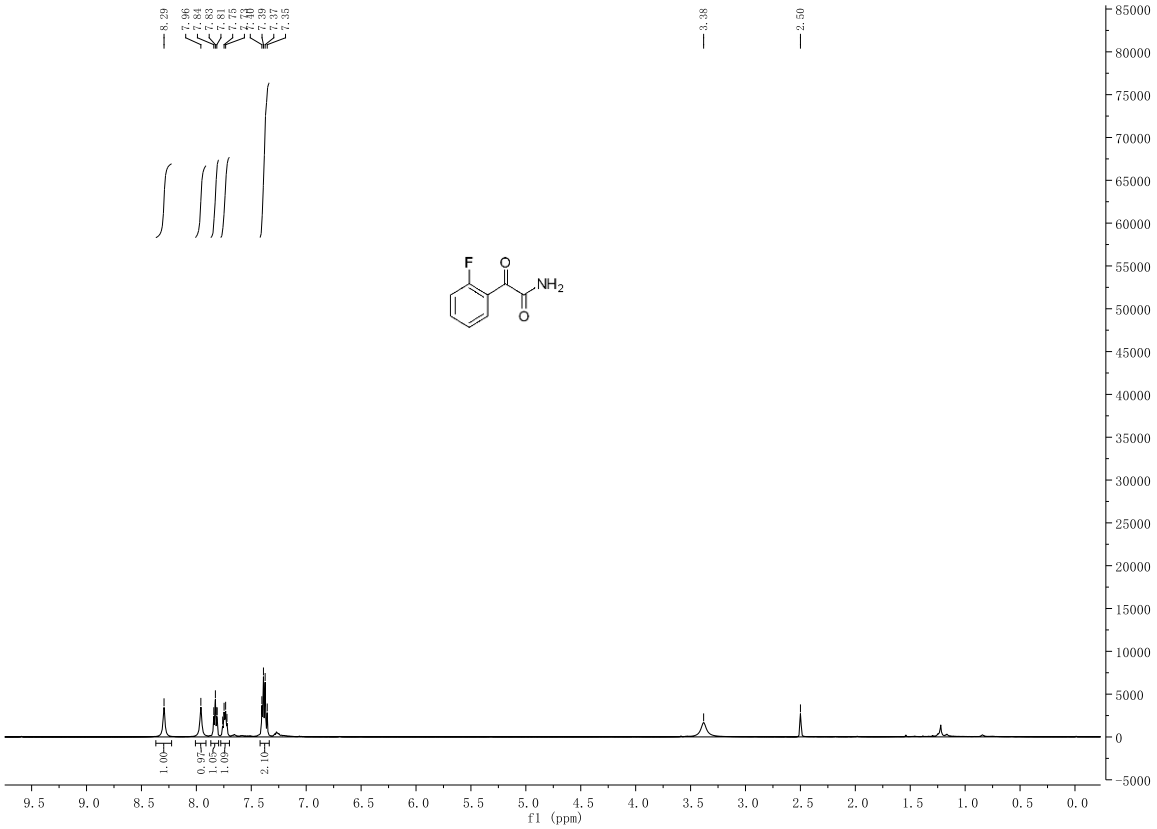
2-(2-chlorophenyl)-2-oxoacetamide (**2p**, ^{1}H NMR, 500 MHz, DMSO-D6)



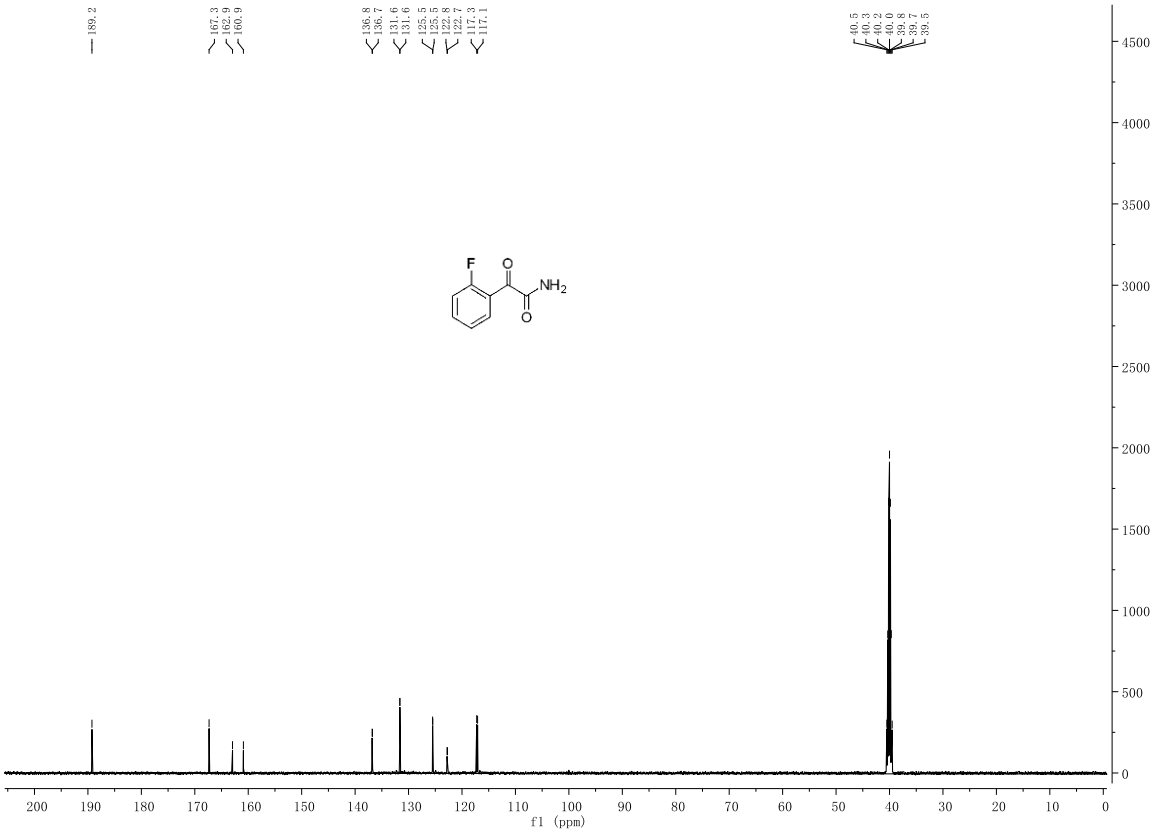
2-(2-chlorophenyl)-2-oxoacetamide (**2p**, ^{13}C NMR, 125 MHz, DMSO-D6)



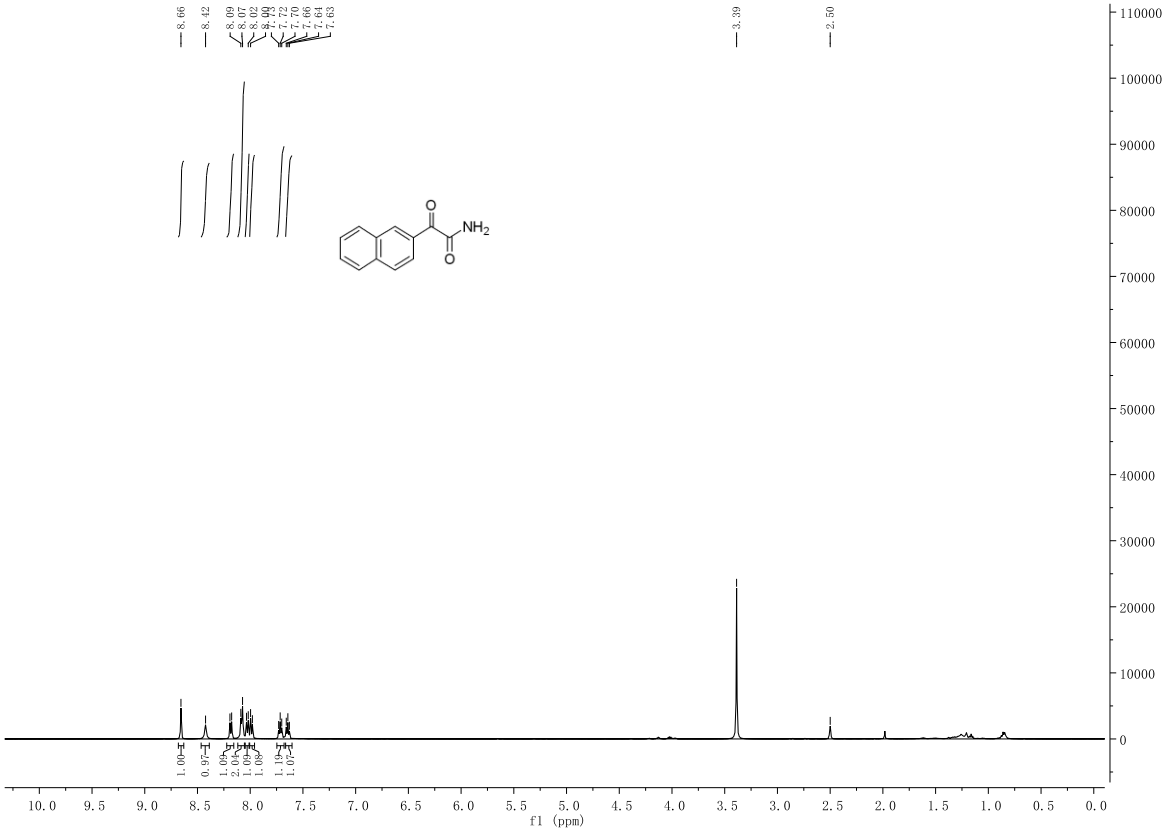
2-(2-fluorophenyl)-2-oxoacetamide (**2q**, ^{1}H NMR, 500 MHz, DMSO-D6)



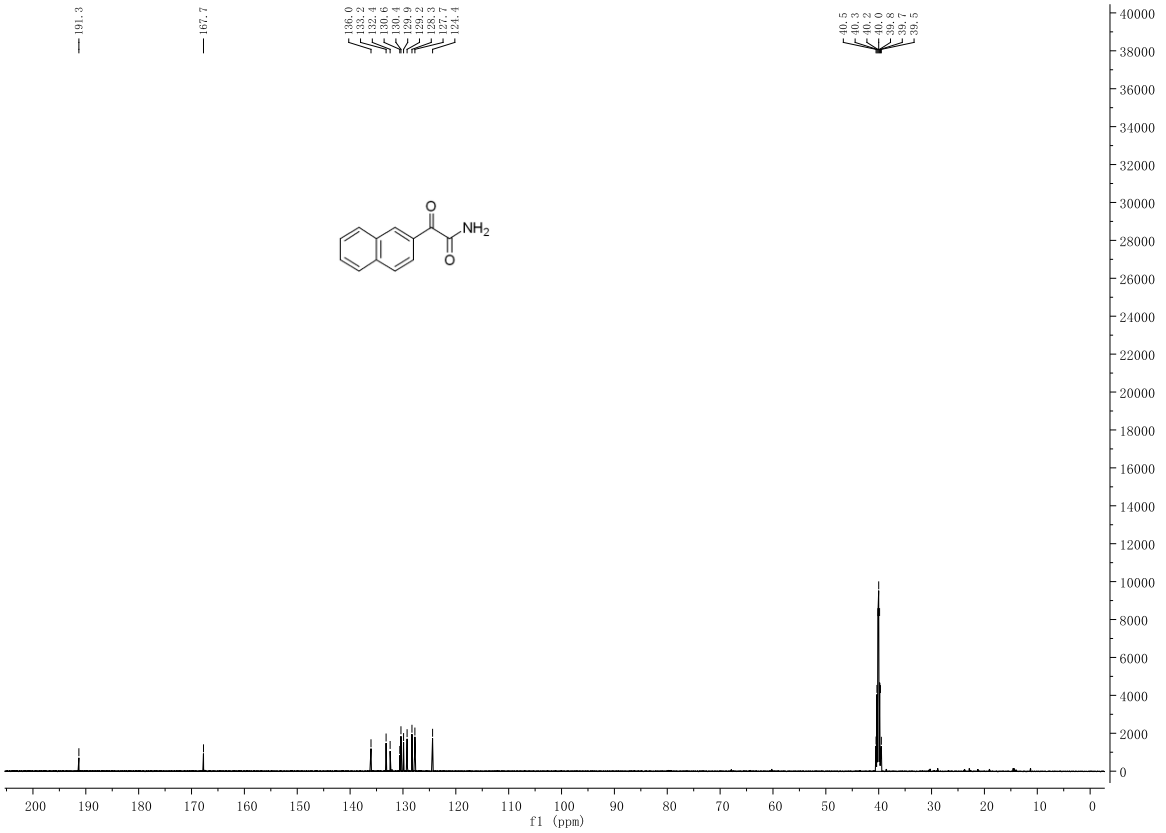
2-(2-fluorophenyl)-2-oxoacetamide (**2q**, ^{13}C NMR, 125 MHz, DMSO-D6)



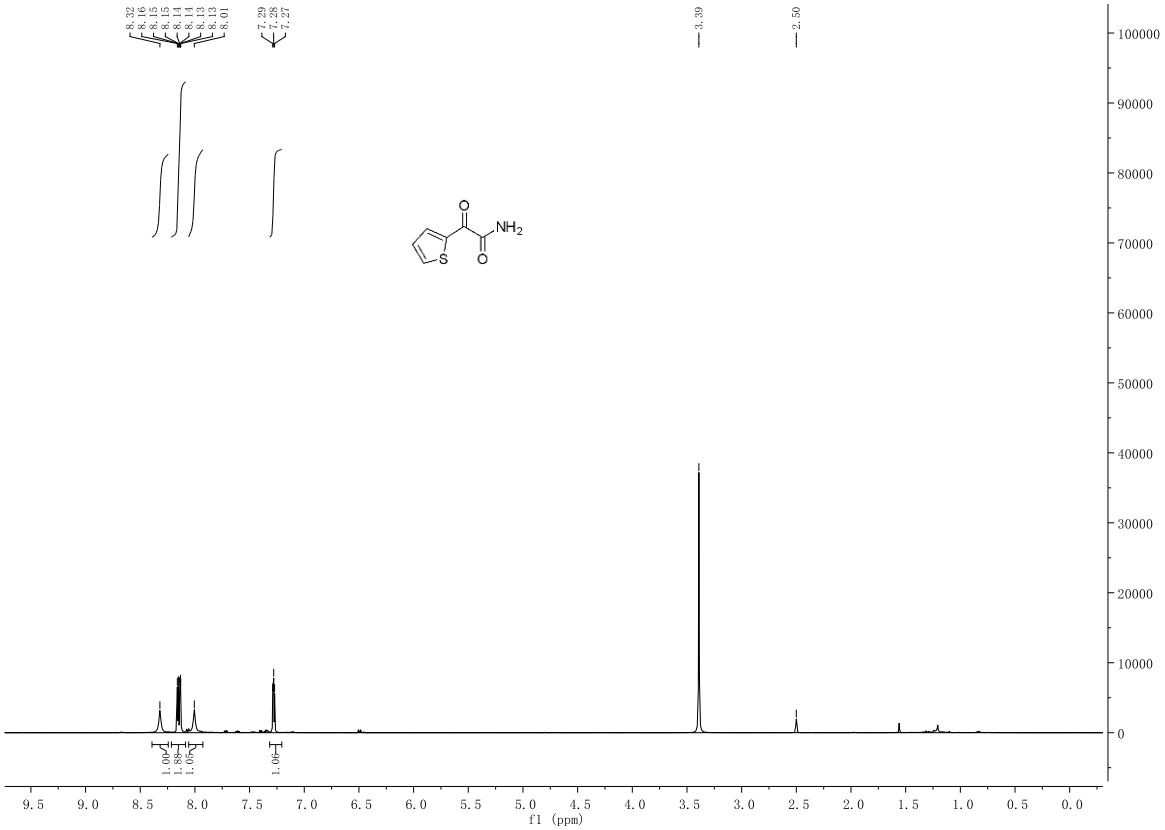
2-(naphthalen-2-yl)-2-oxoacetamide (**2r**, ^{1}H NMR, 500 MHz, DMSO-D6)



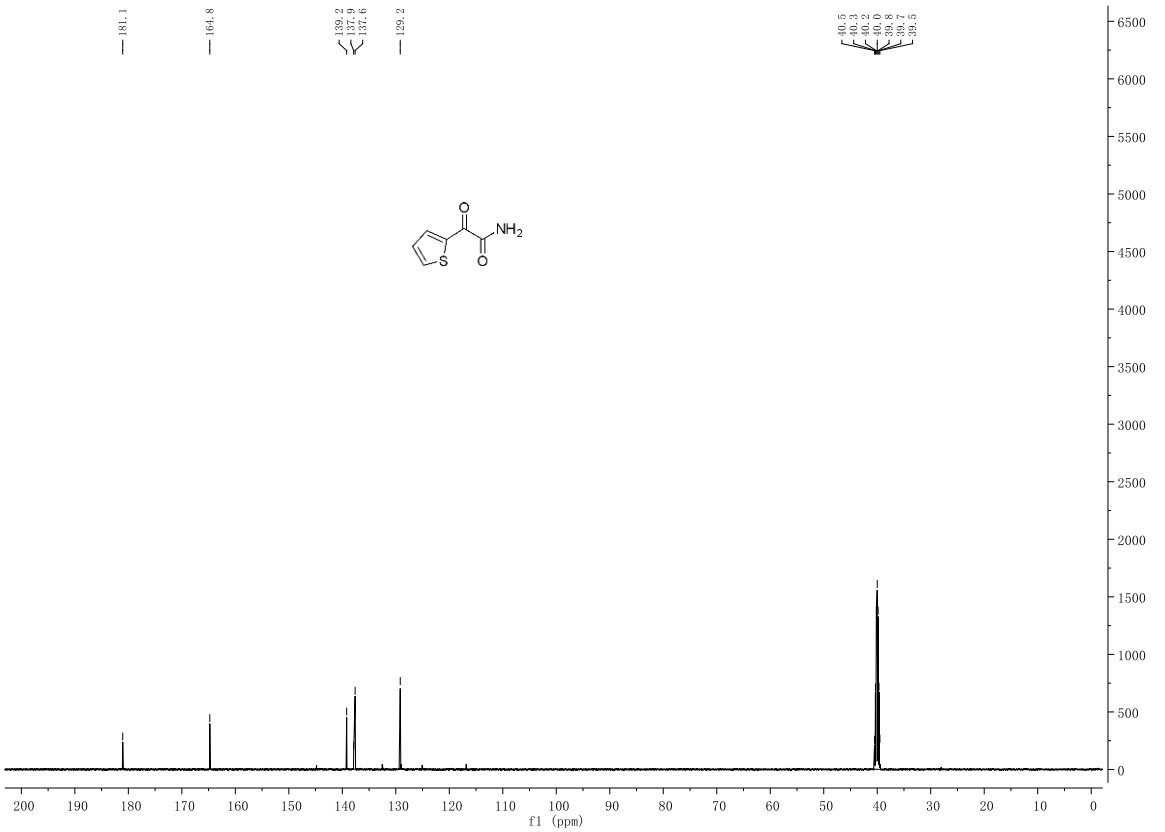
2-(naphthalen-2-yl)-2-oxoacetamide (**2r**, ^{13}C NMR, 125 MHz, DMSO-D6)



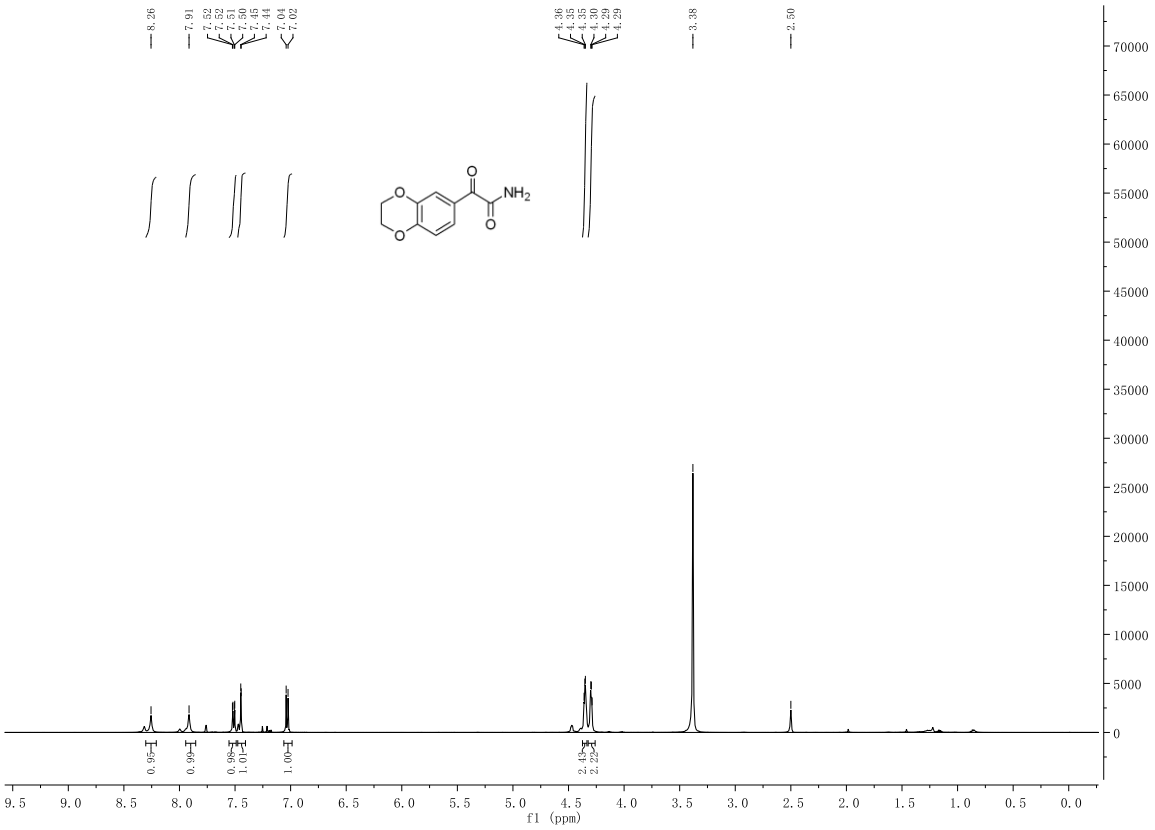
2-oxo-2-(thiophen-2-yl)acetamide (**2s**, ^{1}H NMR, 500 MHz, DMSO-D6)



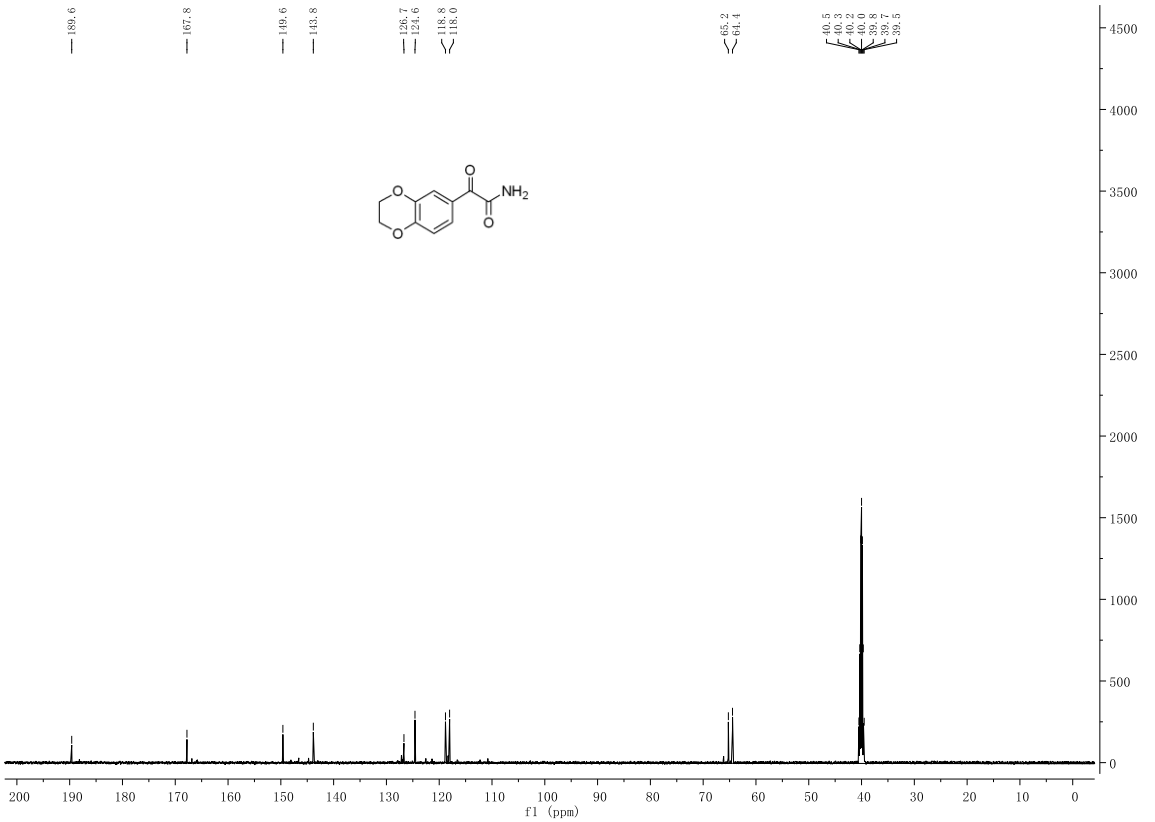
2-oxo-2-(thiophen-2-yl)acetamide (**2s**, ^{13}C NMR, 125 MHz, DMSO-D6)



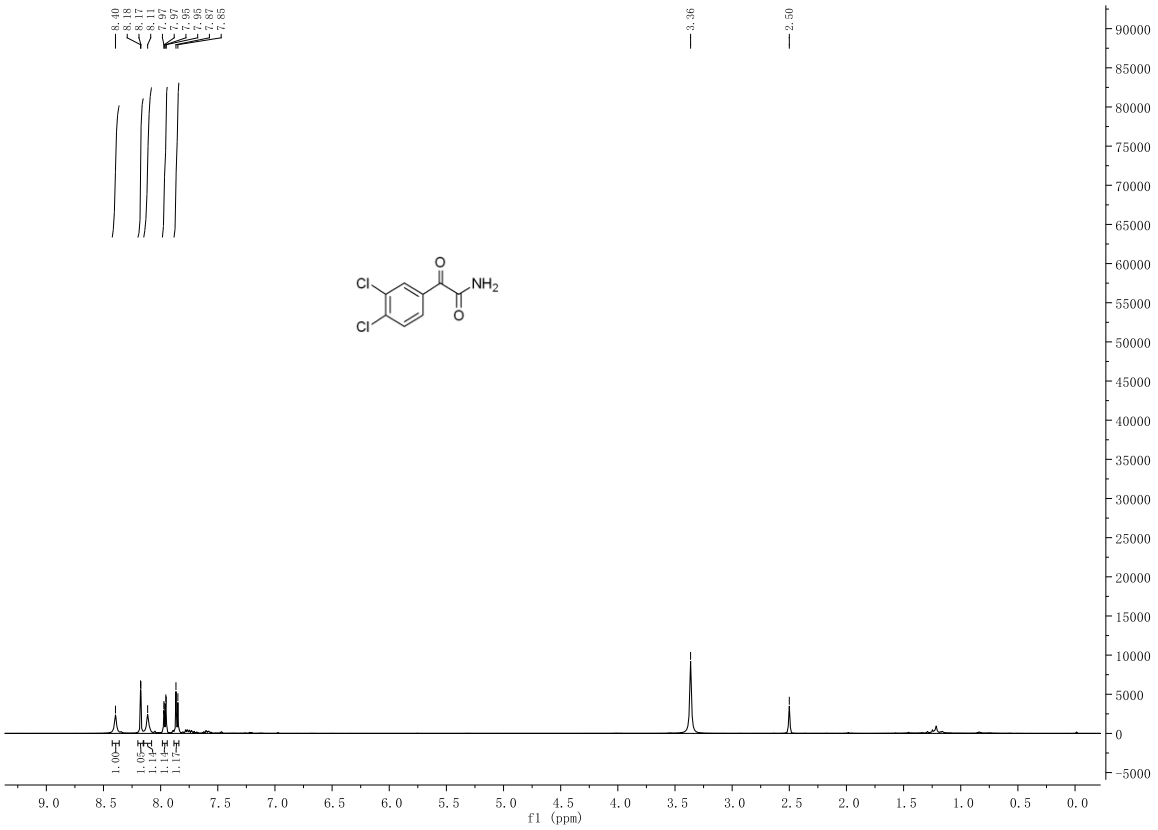
2-(2,3-dihydrobenzo[b][1,4]dioxin-6-yl)-2-oxoacetamide (**2t,** ^{1}H NMR, 500 MHz, DMSO-D6)



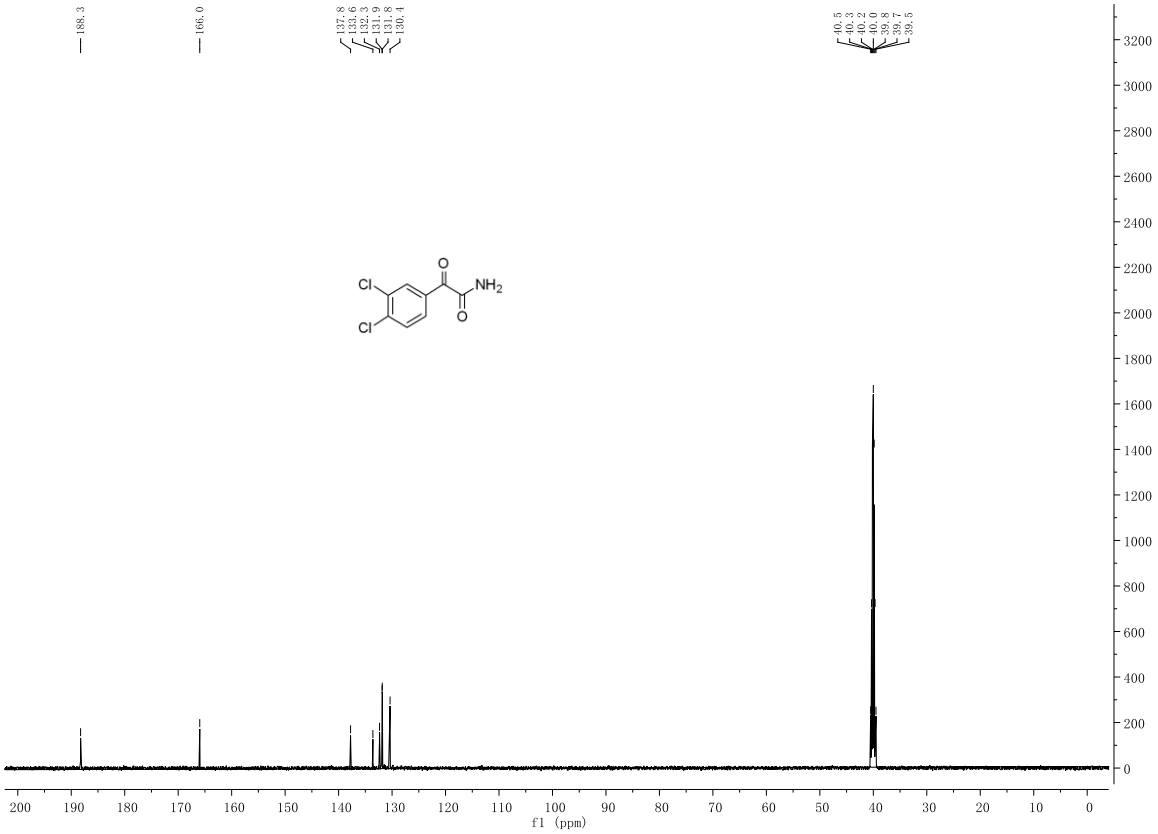
2-(2,3-dihydrobenzo[b][1,4]dioxin-6-yl)-2-oxoacetamide (**2t**, ^{13}C NMR, 125 MHz, DMSO-D6)



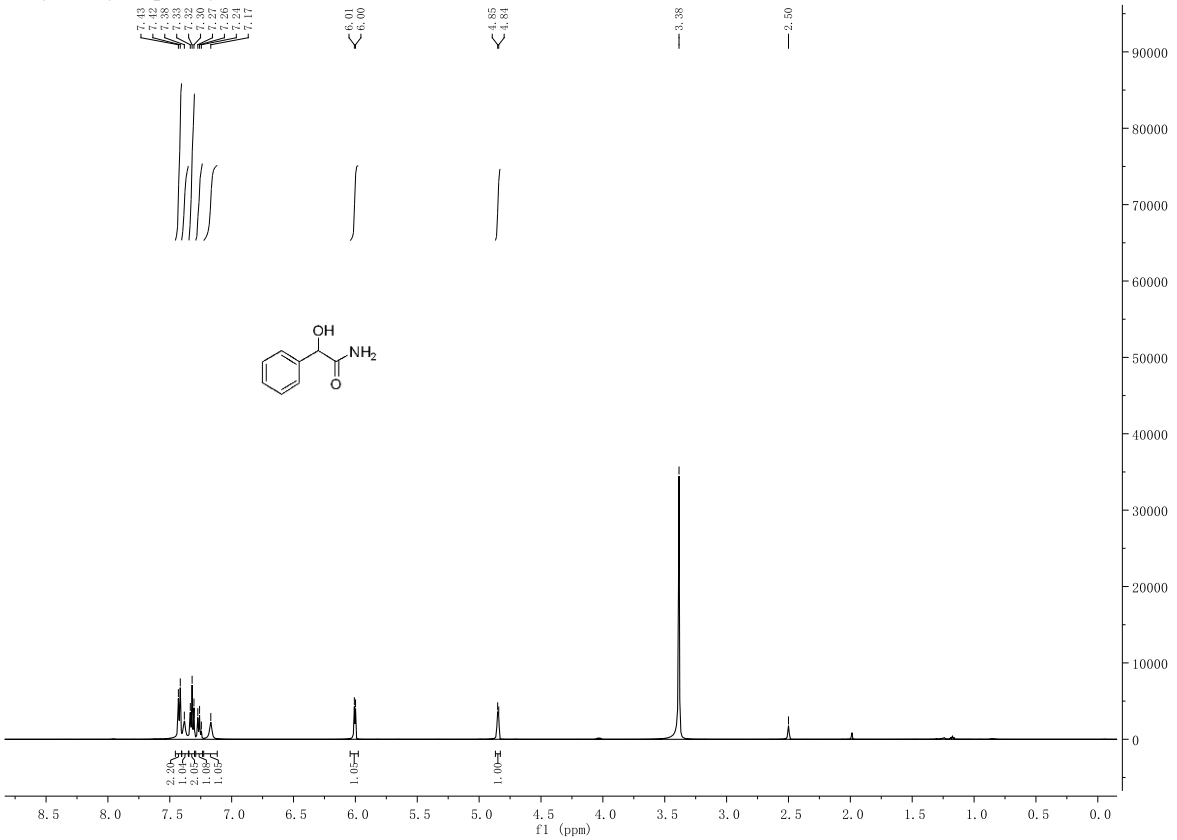
2-(3,4-dichlorophenyl)-2-oxoacetamide (**2u**, ^{1}H NMR, 500 MHz, DMSO-D6)



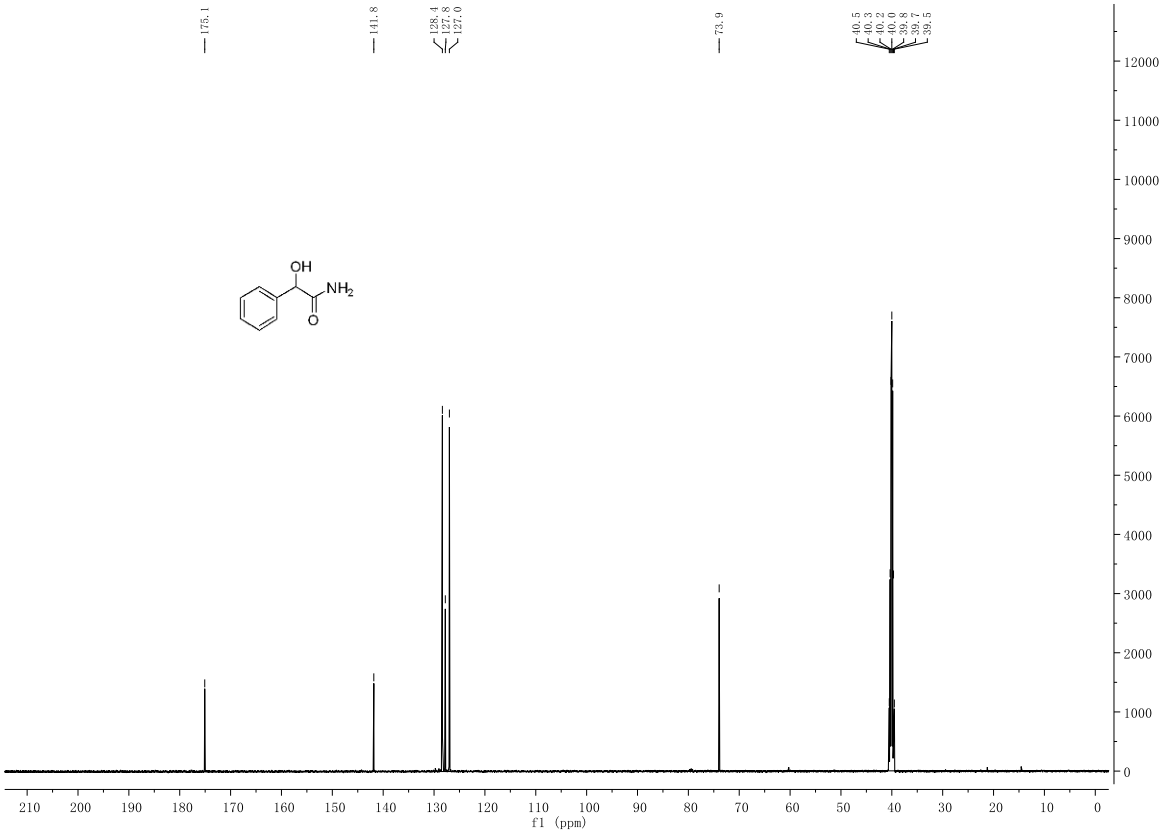
2-(3,4-dichlorophenyl)-2-oxoacetamide (**2u**, ^{13}C NMR, 125 MHz, DMSO-D6)



2-hydroxy-2-phenylacetamide (**4a**, ^{1}H NMR, 500 MHz, DMSO-D6)



2-hydroxy-2-phenylacetamide (**4a**, ^{13}C NMR, 125 MHz, DMSO-D6)



(E) References

1 J. H. Schrittwieser, F. Coccia, S. Kara, B. Grischek, W. Kroutil, N. d'Alessandro and F. Hollmann, One-pot combination of enzyme and Pd nanoparticle catalysis for the synthesis of enantiomerically pure 1, 2-amino alcohols. *Green Chem.*, 2013, **15**, 3318-3331.

2 Z. Zhang, J. Su, Z. Zha and Z. Wang, A novel approach for the one-pot preparation of α-ketoamides by anodic oxidation. *Chem. Commun.*, 2013, **49**, 8982-8984.

3 S. Liu, Q. Gao, X. Wu, J. Zhang, K. Ding and A. Wu, Formamidine hydrochloride as an amino surrogate: I_2-catalyzed oxidative amidation of aryl methyl ketones leading to free (N–H) α-ketoamides. *Org. Biomol. Chem.*, 2015, **13**, 2239-2242.

4 Y. Kumar, M. Shaw, R. Thakur and A. Kumar, Copper(II)-Mediated Aerobic Oxidation of Benzylimidates: Synthesis of Primary α-Ketoamides. *J. Org. Chem.,* 2016, **81**, 6617-6625.

5 K. Ishihara, H. Yamamoto, K. Mitsuhashi, K. Nishikawa, S. Tsuboi, H. Tsuji and N. Nakajima, Purification and characterization of α-keto amide reductase from Saccharomyces cerevisiae. *Biosci., Biotech., and Bioch.*, 2004, **68**, 2306-2312.

6 H. Wang, Y. Zhao, Y. Zheng, S. Fang, J. Li and X. Wan, Oxidative Coupling of Diazo and NH4I: A Route to Primary Oxamates and α-Ketoamides. *J. Org. Chem.*, 2020, **85**, 3050-3058.

7 A. Veerareddy, S. Gogireddy and P. K. Dubey, Regioselective Synthesis of 1-Substituted Indazole-3-carboxylic Acids. *J. Heterocycl. Chem.*, 2015, 51, 1311-1321.

8 (*a*) N. C. Mamillapalli and G. Sekar, Metal free chemoselective reduction of α-keto amides using TBAF as catalyst. *RSC Advances*, 2014, **4**, 61077-61085; (*b*) J. Otevrel, D. Svestka and P. Bobal, One-pot method for the synthesis of 1-aryl-2-aminoalkanol derivatives from the corresponding amides or nitriles. *RSC Adv.*, 2020, **10**, 25029-25045.