

## Supporting Information

### **Intramolecular Dehydrogenative Amination of Alkene via Dual Organic Photoredox and Cobalt Catalysis without Hydrogen**

#### **Acceptor**

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#### **Contents**

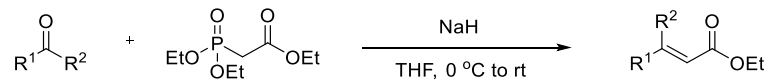
1. General Information.....	S2
2. General Preparation of Substrates.....	S3
3. General Procedure for the Acceptorless Dehydrogenative Amination.....	S7
4. Initial Studies and Reaction Optimization .....	S9
5. Stern-Volmer Fluorescence Quenching Studies .....	S13
6. Cyclic Voltammetry Experiments.....	S19
7. Determination of the Quantum Yield .....	S21
8. Intermolecular Kinetic Isotope Effect Experiment .....	S22
9. Proposed Mechanism .....	S24
10. Characterization of Products.....	S26
11. NMR Spectra of Compounds.....	S41

## 1. General Information

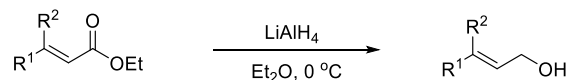
All glassware was thoroughly oven-dried. Chemicals and solvents were either purchased from commercial suppliers or purified by standard techniques. Thin-layer chromatography plates were visualized by exposure to ultraviolet light and/or staining with phosphomolybdic acid followed by heating on a hot plate. Flash chromatography was carried out using silica gel (200–300 mesh).  $^1\text{H}$  NMR and  $^{13}\text{C}$  NMR spectra were recorded on 400 MHz and 600 MHz spectrometer. The spectra were recorded in deuteriochloroform ( $\text{CDCl}_3$ ) as solvent at room temperature, and  $^1\text{H}$  and  $^{13}\text{C}$  NMR chemical shifts are reported in ppm relative to the residual solvent peak. The residual solvent signals were used as references, and the chemical shifts were converted to the TMS scale ( $\text{CDCl}_3$ :  $\delta\text{H} = 7.26$  ppm,  $\delta\text{C} = 77.0$  ppm). Data for  $^1\text{H}$  NMR are reported as follows: chemical shift ( $\delta$  ppm), multiplicity (s = singlet, d = doublet, t = triplet, m = multiplet, dd = doublet doublet, br = broad), integration, coupling constant (Hz), and assignment. Data for  $^{13}\text{C}$  NMR are reported as chemical shift. HRMS analysis was performed on a Bruker Apex II mass instrument (ESI).

## 2. General Preparation of Substrates

### General Procedure Synthesis of Allylic Alcohols

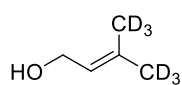


The reaction was proceeded according to a literature procedure.<sup>1</sup> A suspension of 60% NaH in mineral oil (1.2 equiv.) in dried THF (0.2 M) was cooled to 0 °C under nitrogen. A solution of triethyl phosphonoacetate (1.3 equiv.) in dried THF (0.2 M) was then added. After bubbling ceased, ketone (1 equiv.) was added, and the resulting mixture was warmed up to room temperature and stirred overnight. The mixture was quenched by the addition of water, then extracted with diethyl ether. The combined organic extracts were washed with water, then brine. The organic layer was dried over anhydrous MgSO<sub>4</sub>, and the solvent was removed *in vacuo*. The crude product was purified by flash chromatography (pentane: diethyl ether = 19:1) to give the desired product.



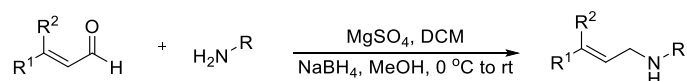
To a suspension of LiAlH<sub>4</sub> (1.5 equiv.) in dried Et<sub>2</sub>O (0.2 M) at 0 °C, under nitrogen, a solution of ester (1 equiv.) in dried Et<sub>2</sub>O (0.2 M) was carefully added. The mixture was stirred for 3 h before being quenched by dropwise addition of 2M HCl. The organic layer was separated, and the aqueous layer was further extracted with diethyl ether. The combined organic layers were washed with water and brine, then dried over anhydrous MgSO<sub>4</sub>. The solvent was removed *in vacuo* to afford the alcohol, which was directly used without further purification.

### 3-(methyl-d3)but-2-en-4,4,4-d3-1-ol



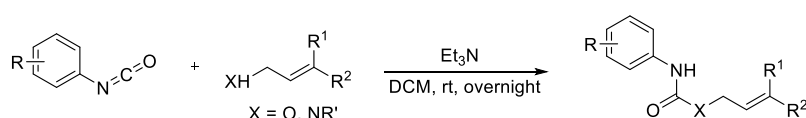
The reaction was proceeded according to a literature procedure. And the <sup>1</sup>H and <sup>13</sup>C NMR spectra were in agreement with literature values.<sup>1</sup>

### General Procedure Synthesis of Allylic Amines



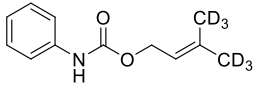
The reaction was proceeded according to a literature procedure.<sup>2</sup> A round-bottom flask equipped with a magnetic stir bar and a rubber septum was attached to a double manifold. It was flame-dried and cooled under vacuum. The flask was backfilled with N<sub>2</sub>, the septum was removed. Oven-dried MgSO<sub>4</sub> (2.0 equiv.) was added to the flask. The septum was replaced, and the flask was evacuated and backfilled with N<sub>2</sub> for four times. Unsaturated aldehyde (1.0-1.2 equiv.) and anhydrous DCM were added sequentially to the flask via syringe. Primary amine (1.0 equiv.) was added dropwisely to the suspension via syringe. The mixture was stirred at rt for 1 h, then filtered through a glass frit and concentrated in vacuo. The crude material was dissolved in anhydrous MeOH and cooled to 0 °C in an ice bath under N<sub>2</sub>. NaBH<sub>4</sub> (1.0-1.5 equiv.) was added slowly in four portions. The reaction warmed up to rt and stirred for 16 h. The reaction was quenched with saturated aqueous NaHCO<sub>3</sub> solution (2 X volume as MeOH) and extracted with DCM (2 X volume as MeOH) for three times. The combined extracts were dried over MgSO<sub>4</sub> and concentrated in vacuo to give the targeted allylic amine, which was used without further purification.

### General Procedure Synthesis of Carbamates and Ureas

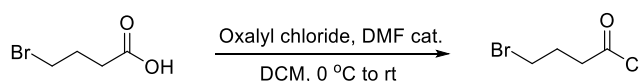


The reaction was proceeded according to a literature procedure.<sup>3</sup> To a solution of the alcohol or amine (1.0 equiv.) in dichloromethane (0.1 M) was added corresponding isocyanate (1.2 equiv.) at room temperature, followed by Et<sub>3</sub>N (3 equiv.). The resulting reaction mixture was stirred until complete consumption of the starting material (monitored by TLC). The solvent was removed under reduced pressure. The residue was purified by flash chromatography using petroleum ether and ethyl acetate (PE/EA = 10:1, v/v) as the eluent on silical gel to afford desired product.

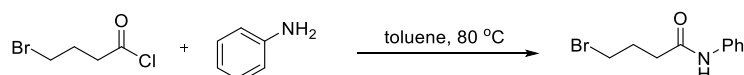
### 3-(methyl-d<sub>3</sub>)but-2-en-1-yl-4,4,4-d<sub>3</sub> phenylcarbamate (D<sub>6</sub>-1a)


 $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.38-7.37 (m, 2H), 7.29-7.26 (m, 2H), 7.04 (t,  $J = 4.9$  Hz, 1H), 6.84-6.81 (m, 1H), 5.39 (t,  $J = 4.8$  Hz, 1H), 4.66 (d,  $J = 4.8$  Hz, 2H);  $^{13}\text{C NMR}$  (150 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 153.6, 139.0, 137.9, 128.9, 123.2, 118.7, 118.6, 61.9, 25.0-24.4 (m), 17.5-16.8 (m); HRMS (ESI) for  $\text{C}_{12}\text{H}_{10}\text{D}_6\text{NO}_2^+$   $[\text{M}+\text{H}]^+$  calcd 212.1552, found 212.1551.

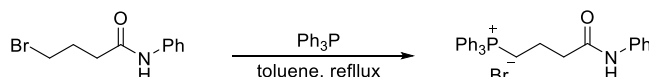
### General Procedure Synthesis of Amides



The reaction was proceeded according to a literature procedure.<sup>4</sup> To a solution of the 4-bromobutyric acid (1.0 equiv.) in DCM (0.2 M) at 0 °C was added oxalyl chloride (2.0 equiv.) dropwise followed by 1 to 2 drops of DMF. The resulting solution was stirred for 2 h and then concentrated to remove excess oxalyl chloride to give the acid chloride, which was used without further purification.

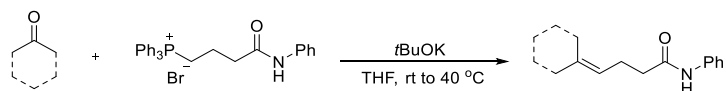


The acid chloride (1.0 equiv.) was then added dropwise to a solution of aniline (2.0 equiv.) in toluene (0.2 M) at 0 °C. The reaction mixture was stirred at 0 °C for 5 minutes and then stirred at 80 °C overnight. After quenched with 1M HCl (aq.), the mixture was washed with water, dried over  $\text{Na}_2\text{SO}_4$ , and concentrated *in vacuo* to give dark residue, which was then purified by flash chromatography using petroleum ether and ethyl acetate (10:1, v/v) as the eluent on silical gel to afford 4-bromo-*N*-phenylbutanamide.



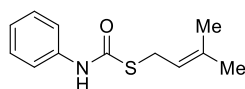
Subsequently, to a solution of 4-bromo-*N*-phenylbutanamide (1.0 equiv.) in toluene (0.5 M) was

added triphenylphosphine (2.0 equiv.) at 25 °C. The reaction mixture was stirred at 120 °C overnight and cooled to room temperature. The white precipitate was filtered, washed with *tert*-butyl methyl ether, and dried at 65 °C in an oven to give the phosphonium.



Finally, to a solution of the above phosphonium (1.0 equiv.) in THF (0.5 M) was slowly added potassium *tert*-butoxide (1.0 equiv.). The mixture was stirred at room temperature for 2 hours, and a solution of ketone (2.0 equiv.) was added. Then the reaction mixture was stirred at 40 °C overnight. After quenched with saturated NH<sub>4</sub>Cl (aq.) and diluted with ethyl acetate, the aqueous layer was extracted with ethyl acetate twice. The combined organic phase was dried over Na<sub>2</sub>SO<sub>4</sub>, and concentrated *in vacuo* to give dark residue, which was then purified by flash chromatography using petroleum ether and ethyl acetate (10:1, *v/v*) as the eluent on silical gel to afford the amide substrate.

### Synthesis of Carbamothioate (1at)



The reaction was proceeded according to a literature procedure.<sup>5</sup> A flame dried round-bottomed flask was charged with dry, oil-free KH (672 mg, 16.75 mmol) inside a glove box. THF (20 mL) was added and the suspension was cooled to 0 °C. 2-methyl-3-buten-2-ol (1.75 mL, 16.75 mmol) was added and the reaction mixture was allowed to warm to room temperature and stirred for 30 minutes. Phenyl isothiocyanate (2 mL, 16.75 mmol) was then added and the reaction was stirred for 6 hours or until complete consumption of alcohol was seen by TLC. The reaction was quenched with sat. NH<sub>4</sub>Cl solution and extracted with Et<sub>2</sub>O three times. The combined organic layers were then washed with brine, dried with Na<sub>2</sub>SO<sub>4</sub>, and concentrated to yield the crude product, which was then purified by recrystallization from petroleum ether and ethyl acetate to afford the desired product.

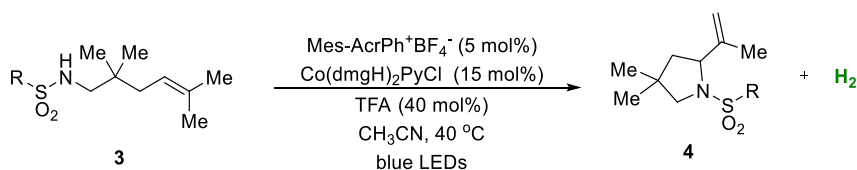
### 3. General Procedure for the Acceptorless Dehydrogenative Amination

#### General procedure A for synthesis of oxazolidinones, imidazolidone and pyrrolidones



To a 10 mL Schlenk tube equipped with a magnetic stir bar was added Mes-AcrPh<sup>+</sup>BF<sub>4</sub><sup>-</sup> (0.006 mmol) and Co(dmgh)<sub>2</sub>PyCl (0.016 mmol). Dry acetonitrile (2.0 mL) was added, after which the substrate **1** (0.2 mmol) and trifluoroacetic acid (0.04 mmol) were added respectively at room temperature. The heterogeneous mixture was degassed by three cycles of freeze–pump–thaw under argon and then placed in the irradiation apparatus equipped with 18 W blue light emitting diodes (LED, λ = 450-460 nm). The resulting mixture was stirred at room temperature until the starting material was completely consumed as monitored by TLC. Upon completion of the reaction, the reaction mixture was concentrated under reduced pressure, and the resulting crude mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1-4:1, v/v), which furnished the title compounds **2** as described.

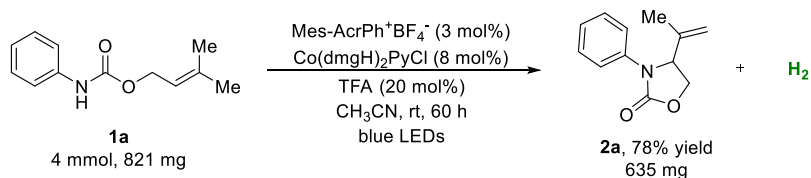
#### General procedure B for synthesis of pyrrolidine



To a 10 mL Schlenk tube equipped with a magnetic stir bar was added Mes-AcrPh<sup>+</sup>BF<sub>4</sub><sup>-</sup> (0.01 mmol) and Co(dmgh)<sub>2</sub>PyCl (0.03 mmol). Dry acetonitrile (2.0 mL) was added, after which the substrate **3** (0.2 mmol) and trifluoroacetic acid (0.08 mmol) were added respectively at room temperature. The heterogeneous mixture was degassed by three cycles of freeze–pump–thaw under argon and then placed in the irradiation apparatus equipped with 18 W blue light emitting diodes (LED, λ = 450-460 nm). The resulting mixture was stirred at 40 °C for 84 h. Then, the reaction mixture was concentrated under reduced pressure, and the resulting crude mixture was purified by column

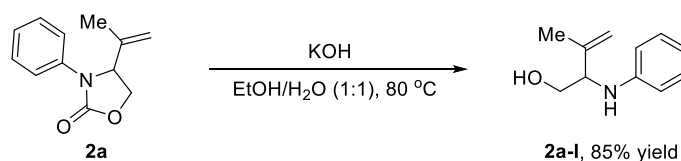
chromatography on silica gel (petroleum ether/EtOAc = 25:1-10:1, v/v), which furnished the title compounds **4** as described.

### Gram-Scale Preparation of **2a**



To a 150 mL round-bottom flask equipped with a magnetic stir bar was added Mes-AcrPh<sup>+</sup>BF<sub>4</sub><sup>-</sup> (0.12 mmol) and Co(dmgH)<sub>2</sub>PyCl<sub>2</sub> (0.32 mmol). Dry acetonitrile (40 mL, 0.1 M) was added, after which the substrate **1a** (4 mmol) and trifluoroacetic acid (0.8 mmol) were added respectively at room temperature. The heterogeneous mixture was degassed by three cycles of freeze–pump–thaw under argon and then placed in the irradiation apparatus equipped with 18 W blue light emitting diodes (LED,  $\lambda = 450\text{-}460$  nm). The resulting mixture was stirred at room temperature until the starting material was completely consumed as monitored by TLC after 60 h. Upon completion of the reaction, the reaction mixture was concentrated under reduced pressure, and the resulting crude mixture was purified by column chromatography on silica gel (petroleum ether/EtOAc = 5:1), which furnished the title compounds **2a** as a white solid (635 mg, 78% yield).

### Hydrolysis of **2a**



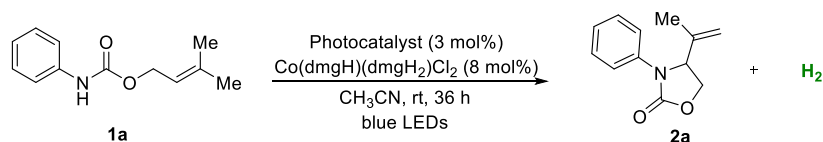
To a 50 mL round-bottom flask equipped with a magnetic stir bar was added **2a** (0.4 mmol) and KOH (8 mmol). EtOH (10 mL) and H<sub>2</sub>O (10 mL) were added. The reaction mixture was heated in an oil bath setting at 80 °C for 10 h. Upon completion of the reaction, the mixture was cooled to room temperature. EtOH was removed under reduced pressure. The leftover aqueous solution was extracted three times with CH<sub>2</sub>Cl<sub>2</sub>. The combined organic phase was dried over Na<sub>2</sub>SO<sub>4</sub>, filtered and concentrated under reduced pressure. The resulting crude mixture was purified by column



chromatography on silica gel (petroleum ether/EtOAc = 6:1), which furnished the title compounds **2a-I** as a colorless oil (60.4 mg, 85% yield).

#### 4. Initial Studies and Reaction Optimization

**Table S1. Screen of the photocatalysts**



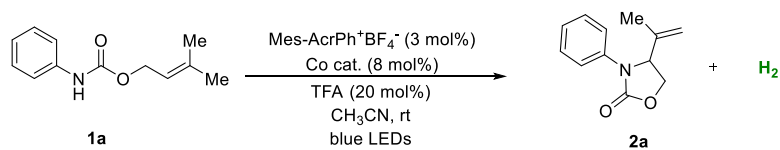
Entry	Photocatalyst	Yield (%) <sup>a,b</sup>
1	Ir[dF(CF <sub>3</sub> )ppy] <sub>2</sub> (dtbbpy)PF <sub>6</sub>	0
2	Ir(ppy) <sub>2</sub> (dtbbpy) PF <sub>6</sub>	0
3	Ir(ppy) <sub>3</sub>	0
4	Ru(bpy) <sub>3</sub> (PF <sub>6</sub> ) <sub>2</sub>	0
5	4CzIPN	0
6	Mes-AcrMe <sup>+</sup> ClO <sub>4</sub> <sup>-</sup>	18
7	Mes-AcrPh <sup>+</sup> BF <sub>4</sub> <sup>-</sup>	21
8	Mes-Acr-di- <i>t</i> BuPh <sup>+</sup> BF <sub>4</sub> <sup>-</sup>	16
9	TPP	0
10	Eosin Y	0

<sup>a</sup>Unless otherwise noted, reaction conditions are as follows: **1a** (0.2 mmol), photocatalyst (0.006 mmol), Co(dmgh)(dmgh<sub>2</sub>)Cl<sub>2</sub> (0.016 mmol), acetonitrile (2 mL), 18 W blue LED ( $\lambda = 450\text{--}460$  nm) under an argon atmosphere. H<sub>2</sub> was detected by gas chromatography. <sup>b</sup>Isolated yield. dmgh = dimethylglyoximate.

**Table S2. Screen of the additives**

Entry	Additive	Time (h)	Yield (%) <sup>a,b</sup>
1	Pyridine (1.0 equiv.)	48	13
2	TsOH (10 mol%)	36	22
3	DCA (10 mol%)	36	39
4	TFA (10 mol%)	36	45
5	TfOH (10 mol%)	36	trace
6	MsOH (10 mol%)	36	trace
7	HFIP (1.0 equiv.)	36	13
8	TFA (20 mol%)	24	83
9	DCA (20 mol%)	36	69
10	TFA (30 mol%)	24	81
11	TFA (1.0 equiv.)	24	57

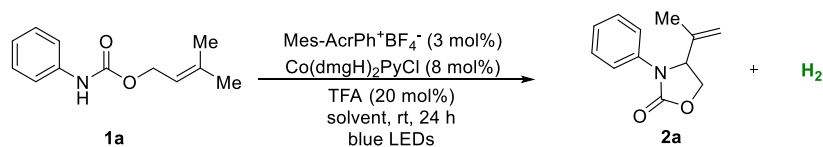
<sup>a</sup>Unless otherwise noted, reaction conditions are as follows: **1a** (0.2 mmol), Mes-AcrPh<sup>+</sup>BF<sub>4</sub><sup>-</sup> (0.006 mmol), Co(dmgh)(dmgh<sub>2</sub>)Cl<sub>2</sub> (0.016 mmol), additive (0.02-0.2 mmol), acetonitrile (2 mL), 18 W blue LED ( $\lambda = 450\text{-}460$  nm) under an argon atmosphere. H<sub>2</sub> was detected by gas chromatography. <sup>b</sup>Isolated yield. dmgh = dimethylglyoximate, TsOH = *p*-toluenesulfonic acid, DCA = dichloroacetic acid, TFA = trifluoroacetic acid, TfOH = trifluoromethanesulfonic acid, MsOH = methanesulfonic acid, HFIP = 1,1,1,3,3,3-hexafluoro-2-propanol.

**Table S3. Screen of the Co catalysts**

Entry	Co catalyst	Time (h)	Yield (%) <sup>a,b</sup>
1	Co(dmghBF <sub>2</sub> ) <sub>2</sub> ·2H <sub>2</sub> O	36	60
2	Co(dmgh) <sub>2</sub> PyCl	24	88
3	Co(dmgh) <sub>2</sub> DMAPCl	24	77

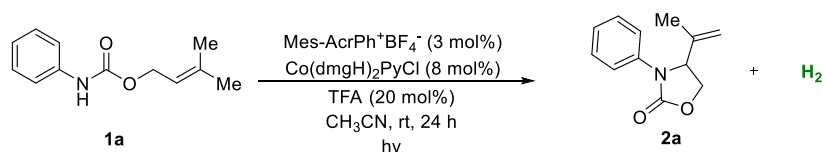
<sup>a</sup>Unless otherwise noted, reaction conditions are as follows: **1a** (0.2 mmol), Mes-AcrPh<sup>+</sup>BF<sub>4</sub><sup>-</sup> (0.006 mmol), [Co] (0.016 mmol), TFA (0.04 mmol), acetonitrile (2 mL), 18 W blue LED ( $\lambda = 450\text{-}460$  nm) under an argon atmosphere. H<sub>2</sub> was detected by gas chromatography. <sup>b</sup>Isolated yield. dmg = dimethylglyoximate

**Table S4. Screen of the Solvents**



Entry	Solvent	Yield (%) <sup>a,b</sup>
1	CH <sub>2</sub> Cl <sub>2</sub>	75
2	DCE	80
3	THF	trace
4	acetone	trace
5	DMF	0
6	toluene	0
7	DMSO	0
8	DMA	0
9	H <sub>2</sub> O	0
10	MeOH	trace

<sup>a</sup>Unless otherwise noted, reaction conditions are as follows: **1a** (0.2 mmol), Mes-AcrPh<sup>+</sup>BF<sub>4</sub><sup>-</sup> (0.006 mmol), Co(dmgH)<sub>2</sub>PyCl (0.016 mmol), TFA (0.04 mmol), solvent (2 mL), 18 W blue LED ( $\lambda = 450\text{-}460$  nm) under an argon atmosphere for 24 h. H<sub>2</sub> was detected by gas chromatography. <sup>b</sup>Isolated yield. dmg = dimethylglyoximate.

**Table S5. Control Experiments**

Entry	Photocatalyst	Co catalyst	Light	Yield (%) <sup>a,b</sup>
1	-	$\text{Co}(\text{dmgh})_2\text{PyCl}$	18W Blue LEDs	0
2	$\text{Mes-AcrPh}^+\text{BF}_4^-$	-	18W Blue LEDs	0
3	$\text{Mes-AcrPh}^+\text{BF}_4^-$	$\text{Co}(\text{dmgh})_2\text{PyCl}$	-	0
4	$\text{Mes-AcrPh}^+\text{BF}_4^-$	$\text{Co}(\text{dmgh})_2\text{PyCl}$	5 W sunlamp	34

<sup>a</sup>Unless otherwise noted, reaction conditions are as follows: **1a** (0.2 mmol),  $\text{Mes-AcrPh}^+\text{BF}_4^-$  (0.006 mmol),  $\text{Co}(\text{dmgh})_2\text{PyCl}$  (0.016 mmol), TFA (0.04 mmol), acetonitrile (2 mL), 18 W blue LED ( $\lambda = 450\text{--}460$  nm) under an argon atmosphere for 24 h. <sup>b</sup>Isolated yield. dmgh = dimethylglyoximate.

**Table S6. Optimized Reaction Conditions of 3a**

Entry	Additive (mol%)	T (°C)	Time (h)	Yield (%) <sup>a,b</sup>
1	-	25	48	7
2	TFA (20 mol%)	25	48	19
3	TFA (40 mol%)	25	48	28
4	TsOH (40 mol%)	25	48	17
5	TFA (40 mol%)	40	84	55

<sup>a</sup>Unless otherwise noted, reaction conditions are as follows: **3a** (0.2 mmol),  $\text{Mes-AcrPh}^+\text{BF}_4^-$  (0.01 mmol),  $\text{Co}(\text{dmgh})_2\text{PyCl}$  (0.03 mmol), additive (0.04–0.08 mmol), acetonitrile (2 mL), 18 W blue LED ( $\lambda = 450\text{--}460$  nm), 25–40 °C and under an argon atmosphere.  $\text{H}_2$  was detected by gas chromatography. <sup>b</sup>Isolated yield. dmgh = dimethylglyoximate.

## 5. Stern-Volmer Fluorescence Quenching Studies

Stern-Volmer fluorescence quenching experiments were run with freshly prepared solutions of  $5 \times 10^{-4}$  M Mes-AcrPh<sup>+</sup>BF<sub>4</sub><sup>-</sup> and varying concentrations of quencher in acetonitrile at room temperature. The solutions were irradiated at 432 nm and fluorescence was measured from 440 nm to 700 nm. The Stern–Volmer equation,  $I_0/I = 1 + k_{sv}[Q]$ , where  $I_0$  and  $I$  are the emission intensity in the absence and presence of quencher, respectively,  $k_{sv}$  is the quenching rate constant, and  $[Q]$  is the concentration of quencher.

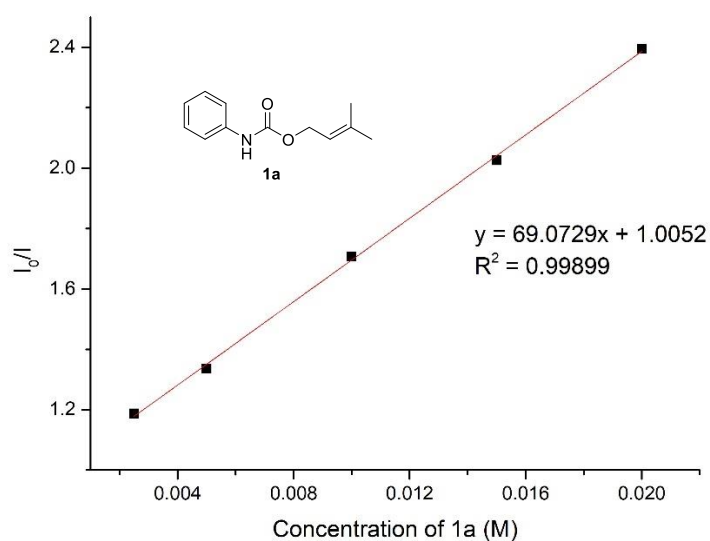
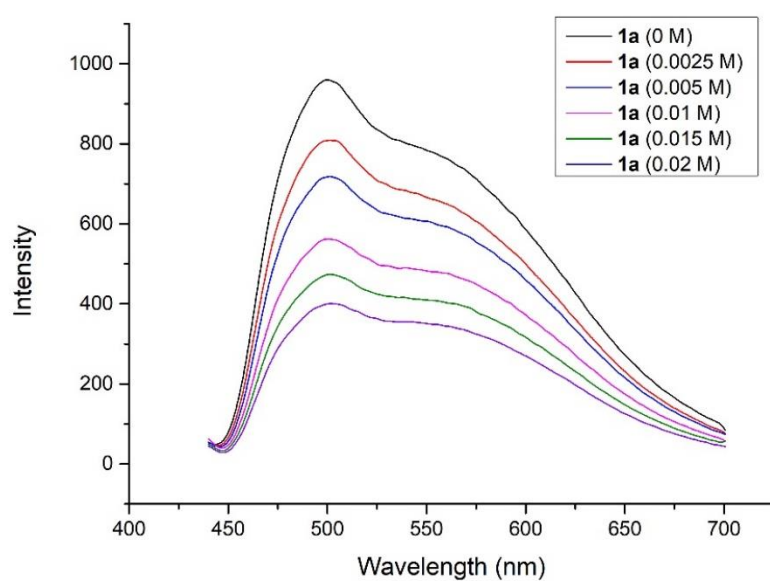
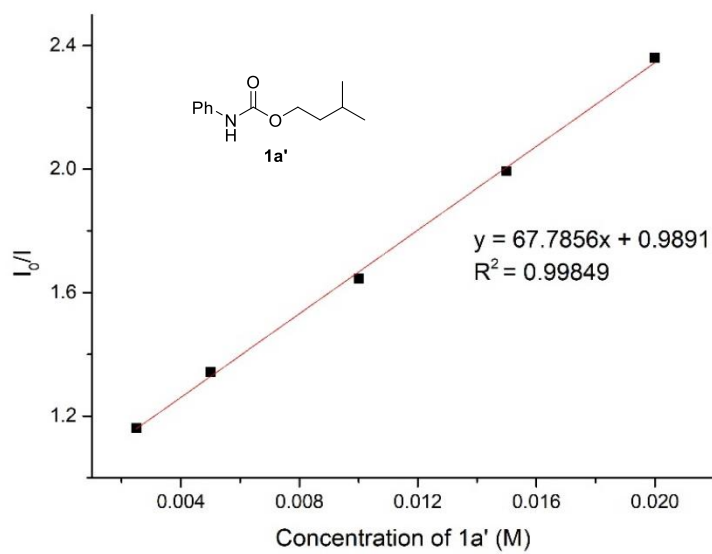
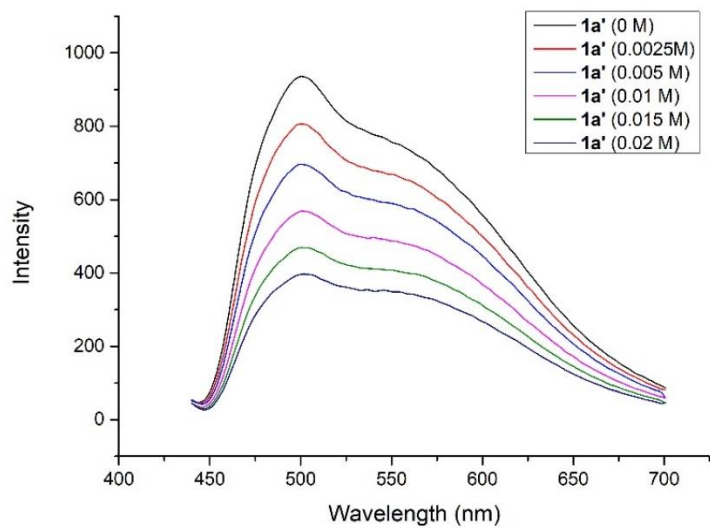
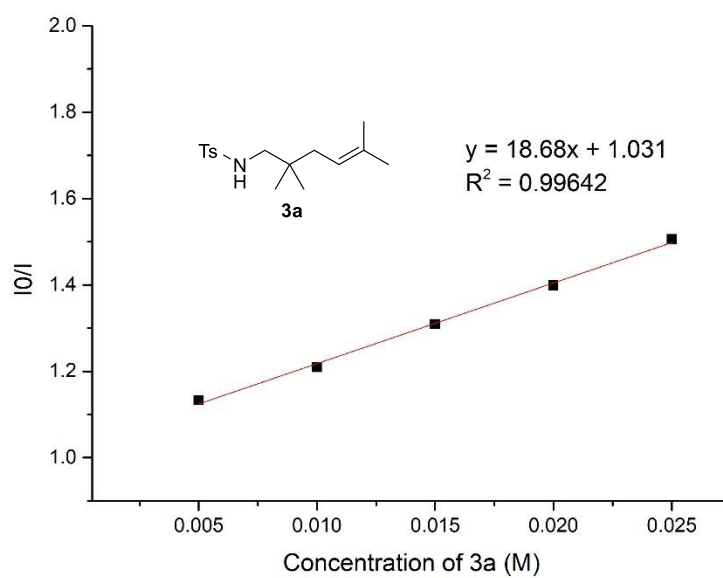
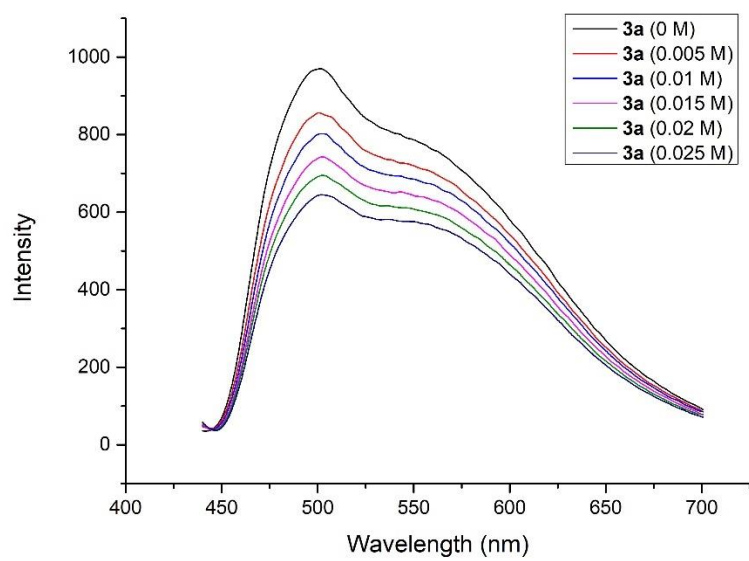


Figure S1. 1a as a quencher



**Figure S2. 1a' as a quencher**



**Figure S3. 3a as a quencher**

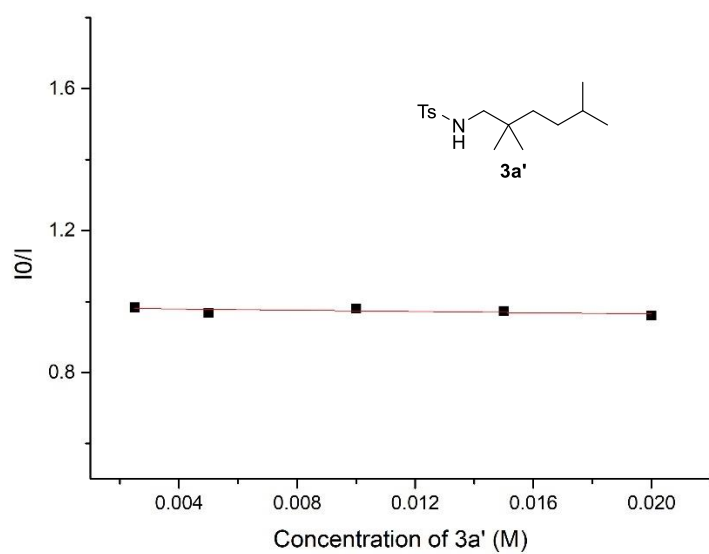
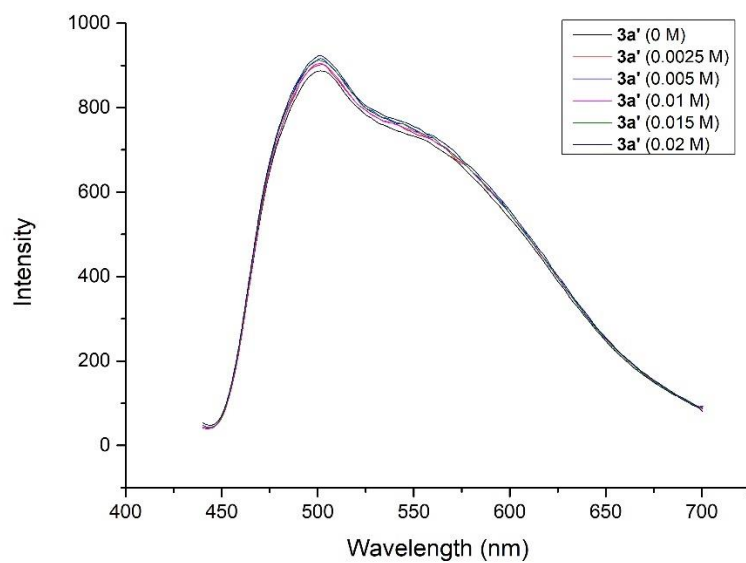
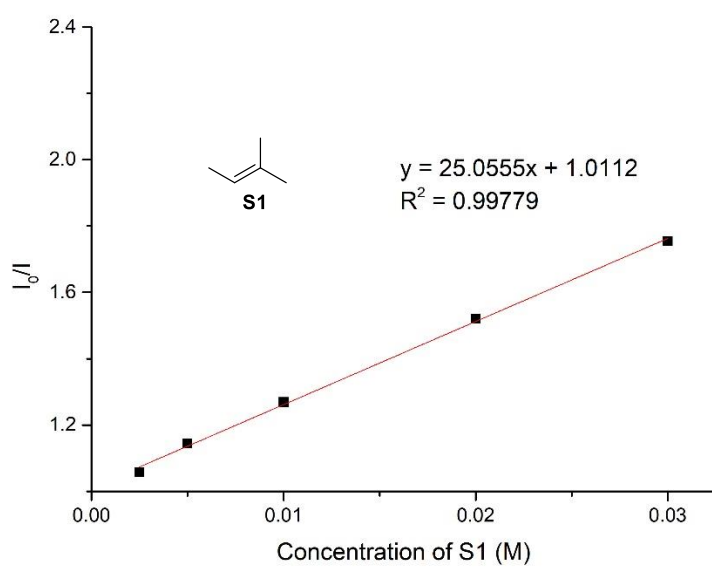
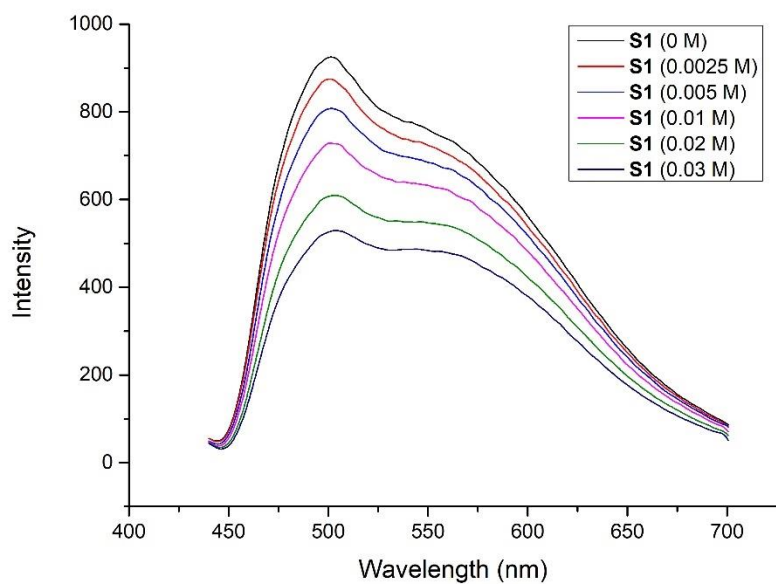
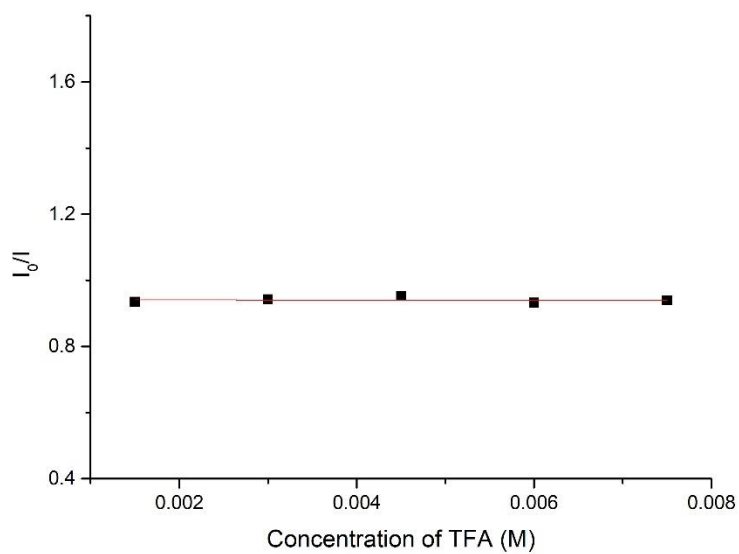
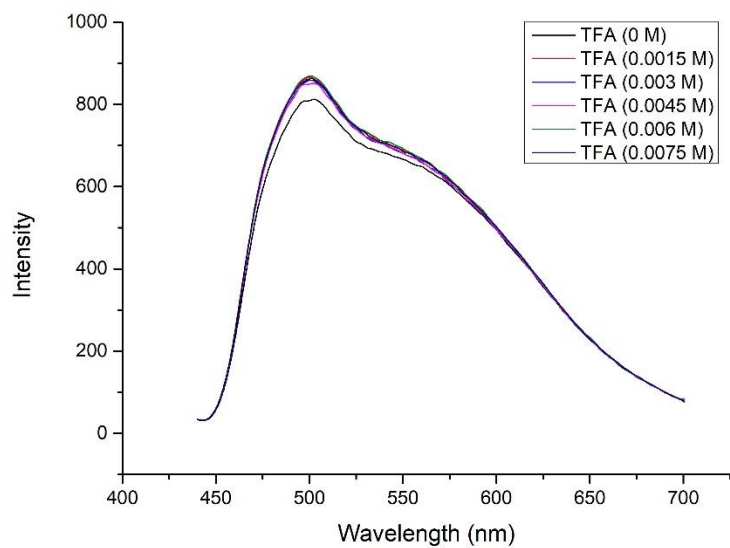


Figure S4. 3a' as a quencher





**Figure S5.** 2-Methyl-2-butene as a quencher



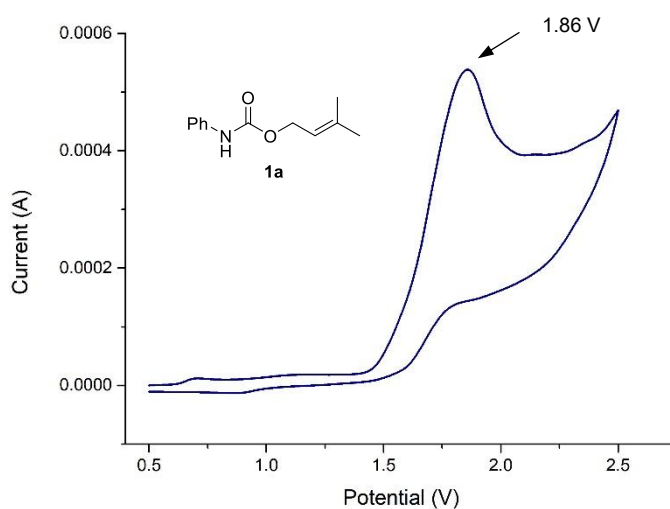
**Figure S6.** TFA as a quencher

**Table S7.** The Stern-Volmer quenching constant ( $k_{sv}$ ) of different quenchers

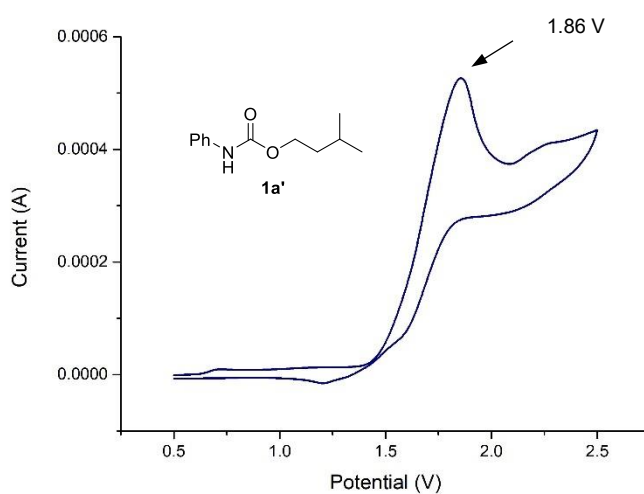
<b>1a</b>	<b>1a'</b>	<b>3a</b>	<b>3a'</b>	<b>S1</b>	<b>TFA</b>
69.07 M <sup>-1</sup>	67.79 M <sup>-1</sup>	18.68 M <sup>-1</sup>	-	25.06 M <sup>-1</sup>	-

## 6. Cyclic Voltammetry Experiments

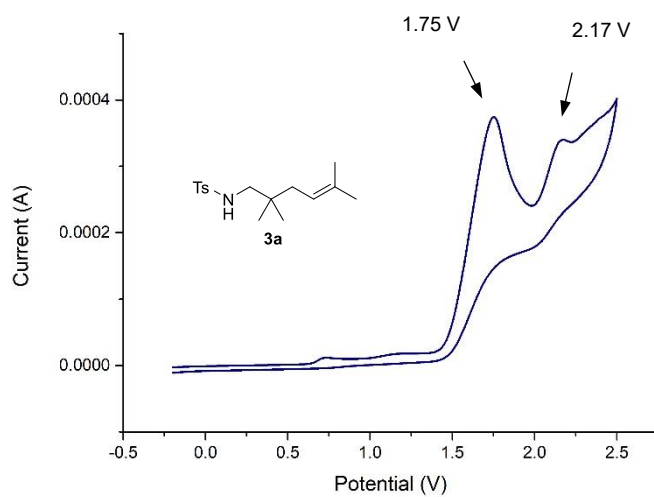
Determination of the potential of carbamates was performed by cyclic voltammetry using a CHI660D potentiostat. The electrochemical measurements were made using a polished glassy carbon electrode ( $\varnothing = 2$  mm) as the working electrode, platinum mesh as counter electrode and a saturated calomel electrode as reference electrode. Measurements of carbamates (0.01M) were performed in 0.1 M of  $\text{Bu}_4\text{NBF}_4/\text{CH}_3\text{CN}$  with a sweep rate of 100 mV/s under anhydrous and anaerobic conditions.



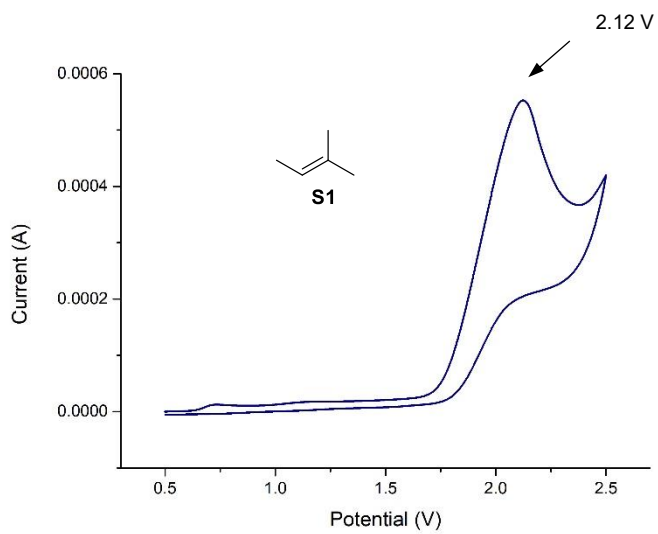
**Figure S7.** Cyclic voltammetry of **1a**



**Figure S8.** Cyclic voltammetry of **1a'**



**Figure S9.** Cyclic voltammetry of **3a**



**Figure S10.** Cyclic voltammetry of 2-methyl-2-butene

## 7. Determination of the Quantum Yield



Following the literature procedure.<sup>6</sup> The reaction was conducted under standard conditions in a quartz tube: A mixture of Mes-AcrPh<sup>+</sup>BF<sub>4</sub><sup>-</sup> (0.006 mmol), Co(dmgh)<sub>2</sub>PyCl (0.016 mmol), **1a** (0.2 mmol), TFA (0.04 mmol), and dry acetonitrile (2 mL) in an oven-dried 8 mL quartz vial with a magnetic stirring bar was degassed by three cycles of freeze-pump-thaw. The mixture was stirred under argon atmosphere at room temperature while irradiated by blue light (420-425 nm) for 20 minutes (1200 s).

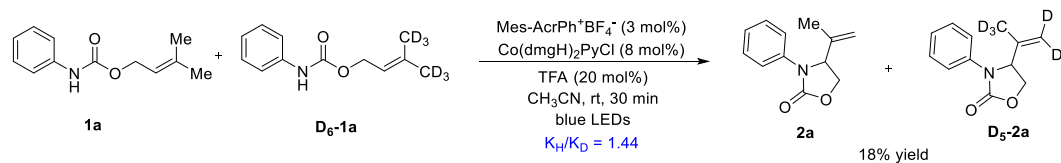
The reaction was irradiated in Parallel Light Reactor (WP-TEC-1020) (the diameter of hole was 16 mm with intensity of 191.24 mW·cm<sup>-2</sup>). After irradiation, the yield of the product **1a** was determined by <sup>1</sup>H NMR based on a 1,3,5-trimethoxybenzene standard and the final yield was 14%.

Then we determined the quantum yield as follows:

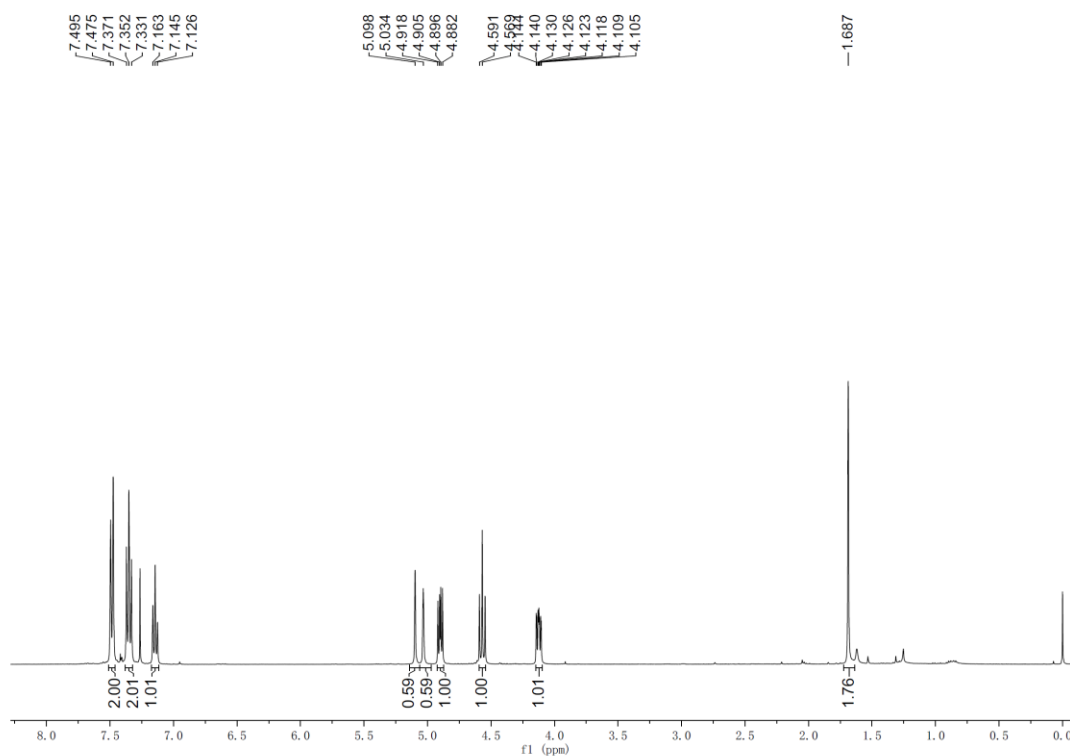
$$\Phi = \text{Mole number for product} / \text{Mole number for absorption of photon} = \frac{N_A \times n_1 \times h \times c}{P \times \lambda \times t} = 0.0087$$

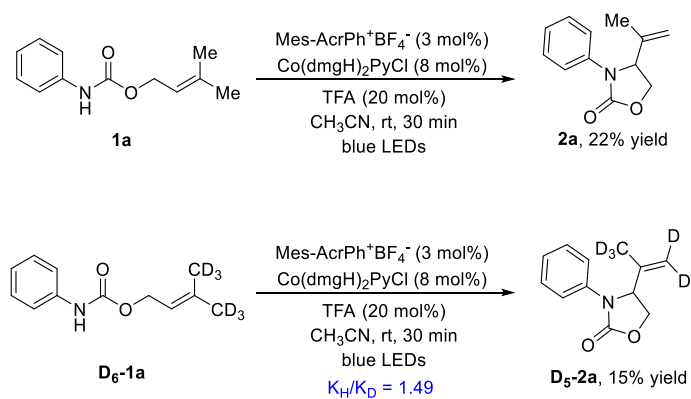
$n_1$ : the mole number of the product **1** ( $n_1 = 1.4 \times 10^{-5}$  mol);  $t$ : the reaction time ( $t = 1200$  s);  $N_A = 6.02 \times 10^{23}$  mol<sup>-1</sup>;  $P = E \times S$  ( $E$ : illumination intensity,  $E = 0.19124$  W/cm<sup>2</sup>;  $S$ : the area irradiated  $S = 2.0$  cm<sup>2</sup>);  $\lambda$ : wavelength ( $\lambda = 4.20 \times 10^{-7}$  m);  $h$ : planck constant ( $h = 6.626 \times 10^{-34}$  J·s);  $c$ : velocity of light ( $c = 3 \times 10^8$  m/s). The result excluded the chain process and the reaction was likely to undergo a photocatalyzed process.

## 8. Intermolecular Kinetic Isotope Effect Experiment



The reaction was conducted under standard conditions in a 10 mL Schlenk tube: A mixture of Mes-AcrPh<sup>+</sup>BF<sub>4</sub><sup>-</sup> (0.006 mmol), Co(dmgh)<sub>2</sub>PyCl (0.016 mmol), **1a** (0.1 mmol), **D<sub>6</sub>-1a** (0.1 mmol), TFA (0.04 mmol) and dry acetonitrile (2 mL) with a magnetic stirring bar was degassed by three cycles of freeze-pump-thaw. The mixture was stirred under argon atmosphere at room temperature while irradiated by 18 W blue LEDs for 30 min. The resulting crude mixture was purified by column chromatography on silica gel (PE/EA = 5:1) to obtain the final product (7.4 mg) as white solid. KIE value ( $K_H/K_D = 1.44$ ) was tested by <sup>1</sup>H NMR spectra.

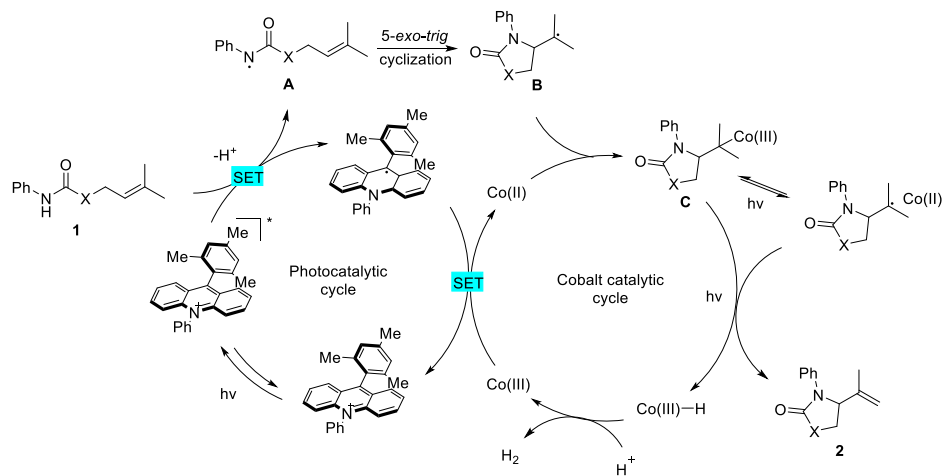




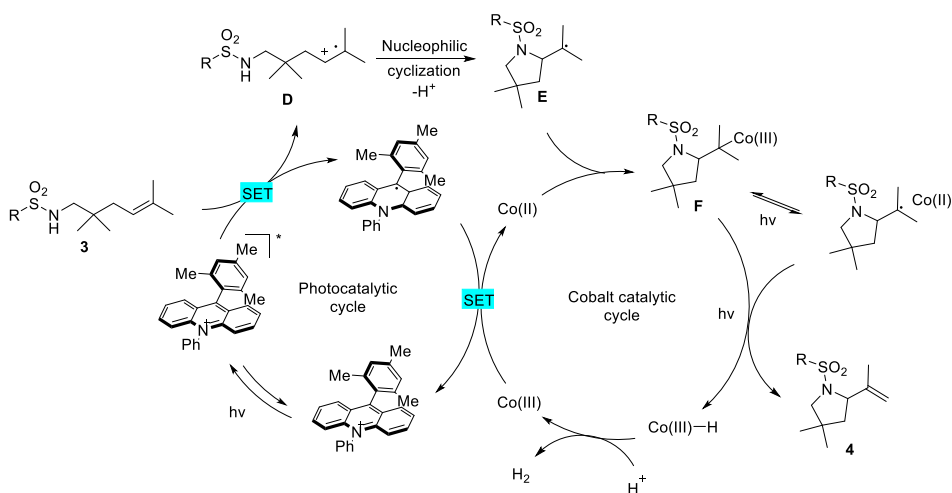
The reaction was conducted under standard conditions in a 10 mL Schlenk tube: A mixture of Mes-AcrPh<sup>+</sup>BF<sub>4</sub><sup>-</sup> (0.006 mmol), Co(dmgH)<sub>2</sub>PyCl (0.016 mmol), **1a** (0.2 mmol) or **D<sub>6</sub>-1a** (0.2 mmol), respectively. TFA (0.04 mmol) and dry acetonitrile (2 mL) with a magnetic stirring bar were degassed by three cycles of freeze-pump-thaw. The mixtures were stirred under argon atmosphere at room temperature while irradiated by 18 W blue LEDs for 30 min. The resulting crude mixtures were purified by flash column chromatography on silica gel (PE/EA = 5:1) to obtain the final product **2a** (9.0 mg) and **D<sub>5</sub>-2a** (6.2 mg) as white solids. KIE value (K<sub>H</sub>/K<sub>D</sub>) was 1.49.

## 9. Proposed mechanism

A possible pathway for substrate **1**



A possible pathway for substrate **3**



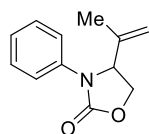


## Reference

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2. F. Xu, S. A. Shuler, D. A. Watson, *Angew. Chem. Int. Ed.* **2018**, *57*, 12081–12085.
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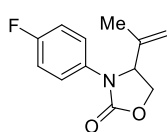
## 10. Characterization of Products

### 3-phenyl-4-(prop-1-en-2-yl)oxazolidin-2-one (2a)



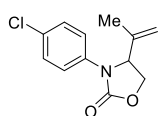
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 5:1); White solid; 35.8 mg, 88% yield, reaction time 24 h; mp = 72-74 °C;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.48 (dd,  $J$  = 8.7, 0.9 Hz, 2H), 7.39-7.28 (m, 2H), 7.13 (t,  $J$  = 7.4 Hz, 1H), 5.08 (s, 1H), 5.04-4.97 (m, 1H), 4.88 (dd,  $J$  = 9.1, 5.5 Hz, 1H), 4.53 (t,  $J$  = 8.9 Hz, 1H), 4.09 (dd,  $J$  = 8.8, 5.5 Hz, 1H), 1.67 (s, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 155.6, 141.1, 137.1, 128.8, 124.5, 120.2, 116.1, 66.0, 61.8, 16.3; HRMS (ESI) for  $\text{C}_{12}\text{H}_{14}\text{NO}_2$   $[\text{M}+\text{H}]^+$  calcd 204.1019, found 204.1019.

### 3-(4-fluorophenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2b)



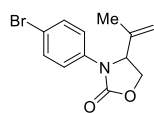
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Pale yellow oil; 35.7 mg, 81% yield, reaction time 24 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.48-7.38 (m, 2H), 7.06-7.01 (m, 2H), 5.08 (s, 1H), 5.04 (s, 1H), 4.85 (dd,  $J$  = 9.1, 5.7 Hz, 1H), 4.56 (t,  $J$  = 9.0 Hz, 1H), 4.12 (dd,  $J$  = 8.8, 5.7 Hz, 1H), 1.67 (s, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 159.6 (d,  $J$  = 243.0 Hz), 155.7, 140.9, 133.2 (d,  $J$  = 2.8 Hz), 122.2 (d,  $J$  = 8.1 Hz), 116.6, 115.7 (d,  $J$  = 23.0 Hz), 66.0, 62.3, 16.3;  $^{19}\text{F NMR}$  (376 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = -117.6; HRMS (ESI) for  $\text{C}_{12}\text{H}_{13}\text{FNO}_2$   $[\text{M}+\text{H}]^+$  calcd 222.0925, found 222.0924.

### 3-(4-chlorophenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2c)



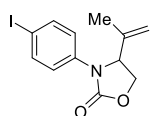
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Colorless oil; 42.2 mg, 89% yield, reaction time 24 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.48-7.38 (m, 2H), 7.33-7.27 (m, 2H), 5.09 (d,  $J$  = 0.5 Hz, 1H), 5.05 (s, 1H), 4.85 (dd,  $J$  = 9.1, 5.5 Hz, 1H), 4.57 (t,  $J$  = 9.0 Hz, 1H), 4.12 (dd,  $J$  = 8.8, 5.5 Hz, 1H), 1.67 (s, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 155.4, 140.9, 135.8, 129.8, 128.9, 121.3, 116.5, 66.1, 61.9, 16.4; HRMS (ESI) for  $\text{C}_{12}\text{H}_{13}\text{ClNO}_2$   $[\text{M}+\text{H}]^+$  calcd 238.0629, found 238.0627.

### 3-(4-bromophenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2d)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Pale yellow oil; 51.7 mg, 92% yield, reaction time 24 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.49-7.41 (m, 2H), 7.41-7.33 (m, 2H), 5.09 (s, 1H), 5.05 (s, 1H), 4.85 (dd,  $J$  = 9.1, 5.5 Hz, 1H), 4.56 (t,  $J$  = 9.0 Hz, 1H), 4.11 (dd,  $J$  = 8.8, 5.5 Hz, 1H), 1.66 (s, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 155.3, 140.8, 136.4, 131.9, 121.6, 117.5, 116.5, 66.1, 61.8, 16.4; HRMS (ESI) for  $\text{C}_{12}\text{H}_{13}\text{BrNO}_2$   $[\text{M}+\text{H}]^+$  calcd 282.0124, found 282.0122.

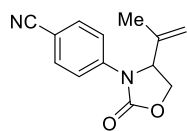
### 3-(4-iodophenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2e)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Pale yellow oil; 44.7 mg, 68% yield, reaction time 24 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.63 (d,  $J$  = 8.8 Hz, 2H), 7.27 (d,  $J$  = 8.8 Hz, 2H), 5.09 (s, 1H), 5.05 (s, 1H), 4.84 (dd,  $J$  = 9.1, 5.4 Hz, 1H), 4.56 (t,  $J$  = 9.0 Hz, 1H), 4.11

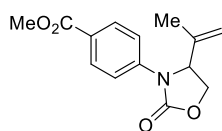
(dd,  $J = 8.7, 5.5$  Hz, 1H), 1.66 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 155.2, 140.8, 137.8, 137.1, 121.8, 116.4, 88.2, 66.1, 61.7, 16.4; HRMS (ESI) for  $\text{C}_{12}\text{H}_{13}\text{INO}_2$   $[\text{M}+\text{H}]^+$  calcd 329.9985, found 329.9984.

#### 4-(2-oxo-4-(prop-1-en-2-yl)oxazolidin-3-yl)benzotrile (2f)



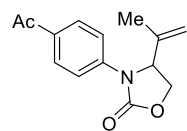
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 4:1); Colorless oil; 35.6 mg, 78% yield, reaction time 24 h;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.71-7.65 (m, 2H), 7.65-7.59 (m, 2H), 5.14 (d,  $J = 0.6$  Hz, 1H), 5.11 (s, 1H), 4.92 (dd,  $J = 9.0, 4.9$  Hz, 1H), 4.62 (t,  $J = 9.0$  Hz, 1H), 4.16 (dd,  $J = 8.8, 5.0$  Hz, 1H), 1.69 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 154.8, 141.3, 140.4, 132.9, 119.3, 118.5, 116.4, 107.2, 66.3, 61.3, 16.5; HRMS (ESI) for  $\text{C}_{13}\text{H}_{13}\text{N}_2\text{O}_2$   $[\text{M}+\text{H}]^+$  calcd 229.0972, found 229.0971.

#### methyl 4-(2-oxo-4-(prop-1-en-2-yl)oxazolidin-3-yl)benzoate (2g)



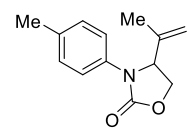
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 4:1); White solid; 31.4 mg, 60% yield, reaction time 24 h; mp = 104-106 °C;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 8.12-7.87 (m, 2H), 7.69-7.47 (m, 2H), 5.12 (s, 1H), 5.07 (s, 1H), 4.92 (dd,  $J = 9.1, 5.1$  Hz, 1H), 4.59 (t,  $J = 8.9$  Hz, 1H), 4.14 (dd,  $J = 8.8, 5.1$  Hz, 1H), 3.90 (s, 3H), 1.68 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 166.4, 155.0, 141.4, 140.8, 130.4, 125.6, 118.8, 116.2, 66.3, 61.6, 52.0, 16.5; HRMS (ESI) for  $\text{C}_{14}\text{H}_{16}\text{NO}_4$   $[\text{M}+\text{H}]^+$  calcd 262.1074, found 262.1073.

#### 3-(4-acetylphenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2h)



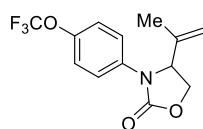
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 4:1); White solid; 34.9 mg, 71% yield, reaction time 24 h; mp = 99-101 °C;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 8.00-7.89 (m, 2H), 7.69-7.56 (m, 2H), 5.13 (s, 1H), 5.09 (s, 1H), 4.94 (dd,  $J = 9.1, 5.1$  Hz, 1H), 4.61 (t,  $J = 8.9$  Hz, 1H), 4.15 (dd,  $J = 8.8, 5.1$  Hz, 1H), 2.58 (s, 3H), 1.69 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 196.9, 155.0, 141.5, 140.8, 132.8, 129.3, 118.9, 116.3, 66.3, 61.5, 26.4, 16.5; HRMS (ESI) for  $\text{C}_{14}\text{H}_{16}\text{NO}_3$   $[\text{M}+\text{H}]^+$  calcd 246.1125, found 246.1124.

#### 4-(prop-1-en-2-yl)-3-(p-tolyl)oxazolidin-2-one (2i)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Colorless oil; 35.5 mg, 82% yield, reaction time 24 h;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.38-7.31 (m, 2H), 7.14 (d,  $J = 8.4$  Hz, 2H), 5.06 (s, 1H), 5.00 (s, 1H), 4.86 (dd,  $J = 9.1, 5.6$  Hz, 1H), 4.53 (t,  $J = 9.0$  Hz, 1H), 4.09 (dd,  $J = 8.7, 5.6$  Hz, 1H), 2.31 (s, 3H), 1.67 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 155.7, 141.2, 134.5, 134.3, 129.4, 120.5, 116.2, 66.0, 62.1, 20.7, 16.3; HRMS (ESI) for  $\text{C}_{13}\text{H}_{16}\text{NO}_2$   $[\text{M}+\text{H}]^+$  calcd 218.1176, found 218.1175.

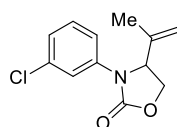
#### 4-(prop-1-en-2-yl)-3-(4-(trifluoromethoxy)phenyl)oxazolidin-2-one (2j)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 4:1); Colorless oil; 43.0 mg, 75% yield, reaction time 24 h;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.62-7.44 (m, 2H), 7.20 (dd,  $J = 9.1, 0.7$  Hz,

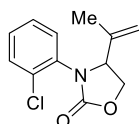
2H), 5.11 (d,  $J = 0.6$  Hz, 1H), 5.08-5.04 (m, 1H), 4.87 (dd,  $J = 9.1, 5.5$  Hz, 1H), 4.58 (t,  $J = 9.0$  Hz, 1H), 4.13 (dd,  $J = 8.8, 5.5$  Hz, 1H), 1.68 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 155.5, 145.5 (q,  $J = 2.0$  Hz), 140.9, 135.9, 121.5, 121.2, 120.4 (q,  $J = 256.0$  Hz), 116.6, 66.1, 62.0, 16.3;  $^{19}\text{F}$  NMR (376 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = -58.1; HRMS (ESI) for  $\text{C}_{13}\text{H}_{13}\text{F}_3\text{NO}_3$   $[\text{M}+\text{H}]^+$  calcd 288.0842, found 288.0840.

### 3-(3-chlorophenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2k)



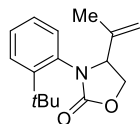
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 5:1); Pale yellow oil; 40.3 mg, 85% yield, reaction time 24 h;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.57 (t,  $J = 2.1$  Hz, 1H), 7.39-7.36 (m, 1H), 7.26 (t,  $J = 8.1$  Hz, 1H), 7.11 (ddd,  $J = 8.0, 1.8, 0.8$  Hz, 1H), 5.11 (s, 1H), 5.07 (s, 1H), 4.85 (dd,  $J = 9.1, 5.3$  Hz, 1H), 4.57 (t,  $J = 8.9$  Hz, 1H), 4.12 (dd,  $J = 8.8, 5.3$  Hz, 1H), 1.68 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 155.2, 140.8, 138.5, 134.6, 129.8, 124.5, 120.1, 117.9, 116.4, 66.2, 61.8, 16.4; HRMS (ESI) for  $\text{C}_{12}\text{H}_{13}\text{ClNO}_2$   $[\text{M}+\text{H}]^+$  calcd 238.0629, found 238.0628.

### 3-(2-chlorophenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2l)



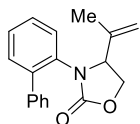
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 5:1); White solid; 42.5 mg, 89% yield, reaction time 24 h; mp = 68-70 °C;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.47-7.44 (m, 1H), 7.34-7.22 (m, 3H), 5.02-4.93 (m, 2H), 4.93-4.89 (m, 1H), 4.63 (t,  $J = 8.9$  Hz, 1H), 4.26 (dd,  $J = 8.9, 6.2$  Hz, 1H), 1.79 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 156.4, 139.8, 133.4, 132.0, 130.5, 129.4, 129.1, 127.5, 118.0, 66.3, 63.2, 16.1; HRMS (ESI) for  $\text{C}_{12}\text{H}_{13}\text{ClNO}_2$   $[\text{M}+\text{H}]^+$  calcd 238.0629, found 238.0627.

### 3-(2-(tert-butyl)phenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2m)



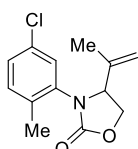
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Colorless oil; 29.0 mg, 56% yield, reaction time 24 h;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.53 (dd,  $J = 8.1, 1.4$  Hz, 1H), 7.30 (td,  $J = 7.8, 1.5$  Hz, 1H), 7.19 (td,  $J = 7.7, 1.5$  Hz, 1H), 6.94 (dd,  $J = 7.8, 1.4$  Hz, 1H), 4.96 (t,  $J = 1.2$  Hz, 1H), 4.81 (s, 1H), 4.61 (t,  $J = 8.6$  Hz, 1H), 4.46 (dd,  $J = 8.3, 2.2$  Hz, 1H), 4.31 (dd,  $J = 9.1, 2.3$  Hz, 1H), 1.95 (s, 3H), 1.44 (s, 9H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 157.4, 148.6, 141.0, 133.3, 131.8, 128.8, 128.7, 126.8, 118.9, 66.5, 66.1, 35.8, 31.8, 16.8; HRMS (ESI) for  $\text{C}_{16}\text{H}_{22}\text{NO}_2$   $[\text{M}+\text{H}]^+$  calcd 260.1645, found 260.1644.

### 3-([1,1'-biphenyl]-2-yl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2n)



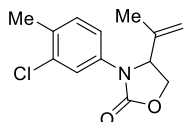
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Pale yellow oil; 39.9 mg, 72% yield, reaction time 24 h;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.47-7.42 (m, 3H), 7.42-7.33 (m, 6H), 4.72 (s, 1H), 4.53 (s, 1H), 4.12 (t,  $J = 9.0$  Hz, 1H), 3.99 (dd,  $J = 8.8, 5.4$  Hz, 1H), 3.73 (dd,  $J = 9.1, 5.4$  Hz, 1H), 1.61 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 157.5, 140.3, 139.2, 139.1, 133.4, 130.8, 129.1, 128.7, 128.4, 128.3, 128.0, 127.8, 117.3, 66.0, 62.5, 16.0; HRMS (ESI) for  $\text{C}_{18}\text{H}_{18}\text{NO}_2$   $[\text{M}+\text{H}]^+$  calcd 280.1332, found 280.1330.

### 3-(5-chloro-2-methylphenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2o)



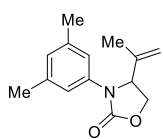
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); White solid; 36.9 mg, 73% yield, reaction time 24 h; mp = 110-112 °C; <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.22-7.16 (m, 2H), 7.11 (s, 1H), 5.00 (s, 1H), 4.98 (s, 1H), 4.81 (t, *J* = 8.1 Hz, 1H), 4.58 (t, *J* = 8.9 Hz, 1H), 4.22 (t, *J* = 8.2 Hz, 1H), 2.29 (s, 3H), 1.73 (s, 3H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) δ (ppm) = 155.9, 139.4, 135.8, 134.1, 132.5, 131.5, 127.7, 125.6, 118.3, 66.2, 64.0, 17.9, 16.3; HRMS (ESI) for C<sub>13</sub>H<sub>15</sub>ClNO<sub>2</sub> [M+H]<sup>+</sup> calcd 252.0786, found 252.0785.

### 3-(3-chloro-4-methylphenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2p)



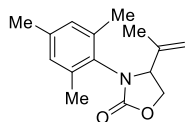
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); White solid; 43.1 mg, 86% yield, reaction time 24 h; mp = 92-94 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.52 (d, *J* = 2.3 Hz, 1H), 7.29 (dd, *J* = 8.4, 2.3 Hz, 1H), 7.18 (d, *J* = 8.4 Hz, 1H), 5.10 (s, 1H), 5.05 (s, 1H), 4.84 (dd, *J* = 9.1, 5.4 Hz, 1H), 4.56 (t, *J* = 9.0 Hz, 1H), 4.11 (dd, *J* = 8.8, 5.4 Hz, 1H), 2.33 (s, 3H), 1.68 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 155.4, 141.0, 136.0, 134.5, 132.3, 130.9, 120.8, 118.4, 116.5, 66.1, 62.0, 19.4, 16.4; HRMS (ESI) for C<sub>13</sub>H<sub>15</sub>ClNO<sub>2</sub> [M+H]<sup>+</sup> calcd 252.0786, found 252.0784.

### 3-(3,5-dimethylphenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2q)



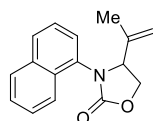
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Colorless oil; 32.8 mg, 71% yield, reaction time 24 h; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.08 (s, 2H), 6.79 (s, 1H), 5.07 (s, 1H), 5.01 (s, 1H), 4.86 (dd, *J* = 9.1, 5.5 Hz, 1H), 4.54 (t, *J* = 8.9 Hz, 1H), 4.10 (dd, *J* = 8.7, 5.5 Hz, 1H), 2.30 (s, 6H), 1.69 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 155.7, 141.5, 138.5, 137.0, 126.6, 118.4, 116.0, 66.1, 62.2, 21.5, 16.5; HRMS (ESI) for C<sub>14</sub>H<sub>18</sub>NO<sub>2</sub> [M+H]<sup>+</sup> calcd 232.1332, found 232.1331.

### 3-mesityl-4-(prop-1-en-2-yl)oxazolidin-2-one (2r)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 8:1); White solid; 29.3 mg, 60% yield, reaction time 24 h; mp = 60-62 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 6.89 (d, *J* = 1.6 Hz, 2H), 4.92 (t, *J* = 1.2 Hz, 1H), 4.87 (s, 1H), 4.66-4.54 (m, 2H), 4.36 (dd, *J* = 8.4, 5.8 Hz, 1H), 2.25 (s, 6H), 2.22 (s, 3H), 1.82 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 156.5, 140.0, 138.0, 137.6, 135.1, 130.9, 129.71, 129.66, 118.1, 66.1, 63.5, 20.9, 18.6, 18.5, 17.4; HRMS (ESI) for C<sub>15</sub>H<sub>20</sub>NO<sub>2</sub> [M+H]<sup>+</sup> calcd 246.1489, found 246.1488.

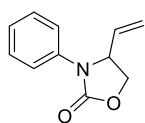
### 3-(naphthalen-1-yl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2s)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 5:1); White solid; 26.0 mg, 51% yield, reaction time 48 h; mp = 66-68 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.92 (d, *J* = 8.2 Hz, 1H), 7.86 (d, *J* = 8.0 Hz, 1H), 7.80 (d, *J* = 8.2 Hz, 1H), 7.59-7.49 (m, 2H), 7.44 (t, *J* = 7.8 Hz, 1H), 7.33 (d, *J* = 7.3 Hz, 1H), 4.97-4.91 (m, 1H), 4.84-4.82 (m, 2H), 4.69 (t, *J* = 8.9 Hz, 1H), 4.38-4.25 (m, 1H), 1.74 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 157.0, 139.9, 134.5, 132.3, 129.6, 128.5, 128.4, 126.6, 126.2, 125.1, 122.6, 117.9, 66.3, 64.9, 16.2; HRMS (ESI) for C<sub>16</sub>H<sub>16</sub>NO<sub>2</sub> [M+H]<sup>+</sup> calcd

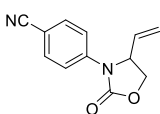
254.1176, found 254.1174.

### 3-phenyl-4-vinylloxazolidin-2-one (2t)



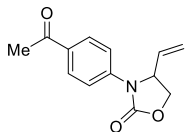
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Colorless oil; 22.5 mg, 59% yield, reaction time 60 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.45-7.41 (m, 2H), 7.39-7.31 (m, 2H), 7.19-7.11 (m, 1H), 5.84-5.74 (m, 1H), 5.37 (d,  $J$  = 17.1 Hz, 1H), 5.32 (d,  $J$  = 10.2 Hz, 1H), 4.87 (dd,  $J$  = 14.9, 7.9 Hz, 1H), 4.58 (t,  $J$  = 8.6 Hz, 1H), 4.11 (dd,  $J$  = 8.7, 6.4 Hz, 1H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 155.6, 136.8, 134.6, 128.8, 124.9, 121.3, 120.5, 67.0, 59.5; HRMS (ESI) for  $\text{C}_{11}\text{H}_{12}\text{NO}_2$   $[\text{M}+\text{H}]^+$  calcd 190.0863, found 190.0862.

### 4-(2-oxo-4-vinylloxazolidin-3-yl)benzonitrile (2u)



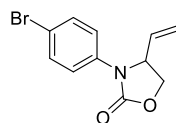
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 4:1); White solid; 18.4 mg, 43% yield, reaction time 60 h; mp = 108-110 °C;  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.64 (s, 4H), 5.83 (m, 1H), 5.44 (d,  $J$  = 10.5 Hz, 1H), 5.42 (d,  $J$  = 3.6 Hz, 1H), 4.93 (dd,  $J$  = 13.8, 8.0 Hz, 1H), 4.64 (t,  $J$  = 8.7 Hz, 1H), 4.17 (dd,  $J$  = 8.7, 5.6 Hz, 1H);  $^{13}\text{C NMR}$  (150 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 154.7, 141.1, 133.8, 132.9, 120.9, 120.0, 118.6, 107.3, 67.1, 58.6; HRMS (ESI) for  $\text{C}_{12}\text{H}_{11}\text{N}_2\text{O}_2$   $[\text{M}+\text{H}]^+$  calcd 215.0815, found 215.0814.

### 3-(4-acetylphenyl)-4-vinylloxazolidin-2-one (2v)



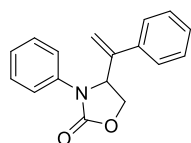
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 4:1); Pale yellow oil; 21.8 mg, 47% yield, reaction time 60 h;  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.95 (d,  $J$  = 8.7 Hz, 2H), 7.59 (d,  $J$  = 8.8 Hz, 2H), 5.86-5.79 (m, 1H), 5.42 (d,  $J$  = 17.1 Hz, 1H), 5.39 (d,  $J$  = 10.3 Hz, 1H), 4.96 (dd,  $J$  = 13.8, 8.0 Hz, 1H), 4.63 (t,  $J$  = 8.6 Hz, 1H), 4.16 (dd,  $J$  = 8.6, 5.7 Hz, 1H), 2.58 (s, 3H);  $^{13}\text{C NMR}$  (150 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 196.8, 154.9, 141.2, 134.1, 132.7, 129.2, 120.5, 119.5, 67.1, 58.7, 26.4; HRMS (ESI) for  $\text{C}_{13}\text{H}_{14}\text{NO}_3$   $[\text{M}+\text{H}]^+$  calcd 232.0968, found 232.0967.

### 3-(4-bromophenyl)-4-vinylloxazolidin-2-one (2w)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 5:1); Colorless oil; 35.3 mg, 66% yield, reaction time 60 h;  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.48-7.44 (m, 2H), 7.36-7.32 (m, 2H), 5.81-5.75 (m, 1H), 5.39-5.34 (m, 2H), 4.86-4.81 (m, 1H), 4.60 (t,  $J$  = 8.7 Hz, 1H), 4.12 (dd,  $J$  = 8.7, 6.2 Hz, 1H);  $^{13}\text{C NMR}$  (150 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 155.2, 136.0, 134.3, 131.9, 122.6, 120.8, 117.8, 67.0, 59.3; HRMS (ESI) for  $\text{C}_{11}\text{H}_{11}\text{BrNO}_2$   $[\text{M}+\text{H}]^+$  calcd 267.9968, found 267.9967.

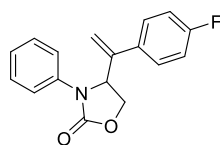
### 3-phenyl-4-(1-phenylvinyl)oxazolidin-2-one (2x)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 8:1); Pale yellow oil; 43.1 mg, 81% yield, reaction time 24 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.55 (d,  $J$  = 8.1 Hz, 2H), 7.39-7.31 (m, 7H), 7.13 (t,  $J$  = 7.4 Hz, 1H), 5.51 (s, 1H), 5.31 (dd,  $J$  = 8.8, 4.4 Hz, 1H), 5.27 (d,  $J$  = 0.6 Hz, 1H), 4.61 (t,  $J$  = 8.6 Hz, 1H), 4.14 (dd,  $J$  = 8.4, 4.4 Hz, 1H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 155.4, 143.9, 137.4, 137.3, 128.93, 128.87, 128.6, 126.3, 124.3, 119.6, 115.6, 67.6, 59.3; HRMS (ESI)

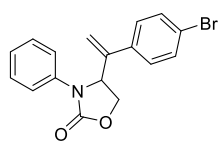
for C<sub>17</sub>H<sub>16</sub>NO<sub>2</sub> [M+H]<sup>+</sup> calcd 266.1176, found 266.1174.

#### 4-(1-(4-fluorophenyl)vinyl)-3-phenyloxazolidin-2-one (2y)



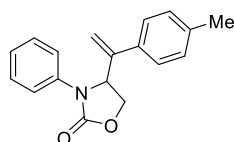
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 8:1); Colorless oil; 43.8 mg, 77% yield, reaction time 24 h; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.53 (d, *J* = 7.8 Hz, 2H), 7.38-7.33 (m, 2H), 7.32-7.25 (m, 2H), 7.14 (t, *J* = 7.4 Hz, 1H), 7.11-6.99 (m, 2H), 5.46 (s, 1H), 5.31-5.24 (m, 2H), 4.62 (t, *J* = 8.7 Hz, 1H), 4.13 (dd, *J* = 8.5, 4.5 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 162.8 (d, *J* = 247.0 Hz), 155.4, 143.2, 137.2, 133.4 (d, *J* = 4.0 Hz), 129.0, 128.3 (d, *J* = 9.0 Hz), 124.5, 119.7, 116.2, 115.9 (d, *J* = 22.0 Hz), 67.3, 59.6; <sup>19</sup>F NMR (282 MHz, CDCl<sub>3</sub>) δ (ppm) = -113.5; HRMS (ESI) for C<sub>17</sub>H<sub>15</sub>FNO<sub>2</sub> [M+H]<sup>+</sup> calcd 284.1081, found 284.1080.

#### 4-(1-(4-bromophenyl)vinyl)-3-phenyloxazolidin-2-one (2z)



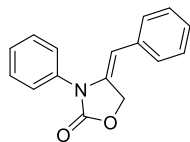
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 8:1); White solid; 43.1 mg, 63% yield, reaction time 24 h; mp = 46-48 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.54-7.47 (m, 4H), 7.35 (t, *J* = 8.0 Hz, 2H), 7.21-7.10 (m, 3H), 5.50 (s, 1H), 5.32 (s, 1H), 5.26 (dd, *J* = 8.8, 4.4 Hz, 1H), 4.62 (t, *J* = 8.7 Hz, 1H), 4.12 (dd, *J* = 8.5, 4.5 Hz, 1H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 155.3, 143.2, 137.2, 136.3, 132.1, 129.0, 128.1, 124.5, 122.8, 119.7, 116.6, 67.4, 59.4; HRMS (ESI) for C<sub>17</sub>H<sub>15</sub>BrNO<sub>2</sub> [M+H]<sup>+</sup> calcd 344.0281, found 344.0278.

#### 3-phenyl-4-(1-(p-tolyl)vinyl)oxazolidin-2-one (2aa)



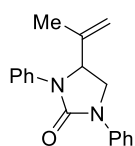
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 8:1); Pale yellow solid; 41.2 mg, 74% yield, reaction time 24 h; mp = 125-127 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.61-7.44 (m, 2H), 7.40-7.29 (m, 2H), 7.24-7.17 (m, 4H), 7.12 (t, *J* = 7.4 Hz, 1H), 5.48 (s, 1H), 5.29 (dd, *J* = 8.6, 4.2 Hz, 1H), 5.22 (s, 1H), 4.61 (t, *J* = 8.6 Hz, 1H), 4.13 (dd, *J* = 8.4, 4.4 Hz, 1H), 2.37 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 155.5, 143.7, 138.6, 137.4, 134.5, 129.6, 128.9, 126.2, 124.3, 119.6, 114.7, 67.7, 59.4, 21.1; HRMS (ESI) for C<sub>18</sub>H<sub>18</sub>NO<sub>2</sub> [M+H]<sup>+</sup> calcd 280.1332, found 280.1331.

#### (E)-4-benzylidene-3-phenyloxazolidin-2-one (2ab)



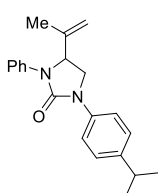
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 5:1); White solid; 19.4 mg, 39% yield, reaction time 60 h; mp = 154-156 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.55 (t, *J* = 7.6 Hz, 2H), 7.48-7.44 (m, 1H), 7.41 (d, *J* = 7.3 Hz, 2H), 7.32 (t, *J* = 7.7 Hz, 2H), 7.18 (t, *J* = 7.4 Hz, 1H), 6.98 (d, *J* = 7.6 Hz, 2H), 5.65 (t, *J* = 2.2 Hz, 1H), 5.39 (d, *J* = 2.4 Hz, 2H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 155.6, 137.0, 135.0, 133.6, 129.9, 128.8, 127.6, 127.0, 126.1, 101.6, 67.5; HRMS (ESI) for C<sub>16</sub>H<sub>14</sub>NO<sub>2</sub> [M+H]<sup>+</sup> calcd 252.1019, found 252.1017.

#### 1,3-diphenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ac)



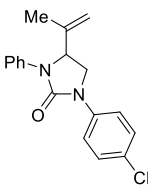
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20:1); White solid; 47.8 mg, 86% yield, reaction time 24 h; mp = 93-95 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.59 (dd, *J* = 8.7, 0.9 Hz, 2H), 7.50 (dd, *J* = 8.7, 0.9 Hz, 2H), 7.40-7.26 (m, 4H), 7.12-7.02 (m, 2H), 5.10 (s, 1H), 4.99 (t, *J* = 1.2 Hz, 1H), 4.78 (dd, *J* = 9.6, 5.7 Hz, 1H), 4.06 (t, *J* = 9.4 Hz, 1H), 3.60 (dd, *J* = 9.1, 5.8 Hz, 1H), 1.68 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 155.1, 142.4, 139.8, 138.7, 128.8, 128.6, 123.6, 122.9, 120.5, 117.9, 115.3, 58.4, 47.5, 16.7; HRMS (ESI) for C<sub>18</sub>H<sub>19</sub>N<sub>2</sub>O [M+H]<sup>+</sup> calcd 279.1492, found 279.1489.

#### 1-(4-isopropylphenyl)-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ad)



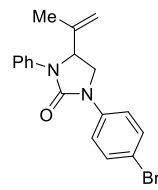
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20:1); White solid; 52.0 mg, 81% yield, reaction time 24 h; mp = 92-94 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.55-7.47 (m, 4H), 7.34-7.29 (m, 2H), 7.22 (d, *J* = 8.6 Hz, 2H), 7.07 (t, *J* = 7.4 Hz, 1H), 5.11 (s, 1H), 4.99 (t, *J* = 1.2 Hz, 1H), 4.79 (dd, *J* = 9.6, 5.7 Hz, 1H), 4.08 (t, *J* = 9.4 Hz, 1H), 3.61 (dd, *J* = 9.1, 5.7 Hz, 1H), 2.93-2.85 (m, 1H), 1.68 (s, 3H), 1.24 (d, *J* = 6.9 Hz, 6H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 155.2, 143.6, 142.6, 138.9, 137.5, 128.6, 126.8, 123.5, 120.3, 118.1, 115.2, 58.5, 47.7, 33.4, 24.0, 16.7; HRMS (ESI) for C<sub>21</sub>H<sub>25</sub>N<sub>2</sub>O [M+H]<sup>+</sup> calcd 321.1961, found 321.1959.

#### 1-(4-chlorophenyl)-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ae)



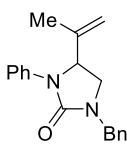
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20:1); White solid; 51.9 mg, 83% yield, reaction time 24 h; mp = 108-110 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.58-7.51 (m, 2H), 7.49 (dd, *J* = 8.7, 0.9 Hz, 2H), 7.38-7.27 (m, 4H), 7.11 (t, *J* = 7.4 Hz, 1H), 5.12 (s, 1H), 5.05-4.98 (t, *J* = 1.2 Hz, 1H), 4.83 (dd, *J* = 9.6, 5.8 Hz, 1H), 4.07 (t, *J* = 9.4 Hz, 1H), 3.60 (dd, *J* = 9.1, 5.8 Hz, 1H), 1.69 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 155.0, 142.2, 138.4, 128.8, 128.7, 128.0, 124.0, 120.6, 119.0, 115.6, 58.5, 47.5, 16.7; HRMS (ESI) for C<sub>18</sub>H<sub>18</sub>ClN<sub>2</sub>O [M+H]<sup>+</sup> calcd 313.1102, found 313.1100.

#### 1-(4-bromophenyl)-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2af)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20:1); White solid; 55.4 mg, 78% yield, reaction time 24 h; mp = 110-112 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.53-7.41 (m, 6H), 7.37-7.29 (m, 2H), 7.10 (t, *J* = 7.4 Hz, 1H), 5.11 (s, 1H), 5.00 (t, *J* = 1.2 Hz, 1H), 4.80 (dd, *J* = 9.6, 5.8 Hz, 1H), 4.03 (t, *J* = 9.4 Hz, 1H), 3.57 (dd, *J* = 9.1, 5.8 Hz, 1H), 1.67 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 154.9, 142.1, 138.9, 138.4, 131.7, 128.6, 123.9, 120.6, 119.3, 115.6, 115.5, 58.4, 47.3, 16.7; HRMS (ESI) for C<sub>18</sub>H<sub>18</sub>BrN<sub>2</sub>O [M+H]<sup>+</sup> calcd 357.0597, found 357.0594.

#### 1-benzyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ag)

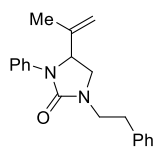


The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20:1); Colorless oil; 48.0 mg, 82% yield, reaction time 24 h; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.52 (d, *J* = 8.1 Hz, 2H), 7.36-7.27 (m, 7H), 7.03 (t, *J* = 7.4 Hz, 1H), 5.00 (s, 1H), 4.90 (s, 1H), 4.65 (dd, *J* = 9.8, 5.5 Hz, 1H), 4.47 (s, 2H), 3.51



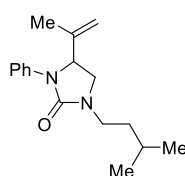
(t,  $J = 9.4$  Hz, 1H), 3.03 (dd,  $J = 9.0, 5.5$  Hz, 1H), 1.59 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 157.8, 142.9, 139.3, 136.7, 128.6, 128.5, 128.1, 127.5, 122.9, 119.5, 114.4, 58.8, 47.9, 46.9, 16.8; HRMS (ESI) for  $\text{C}_{19}\text{H}_{21}\text{N}_2\text{O}$   $[\text{M}+\text{H}]^+$  calcd 293.1648, found 293.1645.

### 1-phenethyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ah)



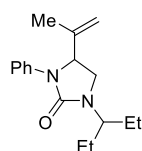
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); White solid; 54.5 mg, 89% yield, reaction time 24 h; mp = 90-92 °C;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.50-7.43 (m, 2H), 7.33-7.18 (m, 7H), 7.00 (t,  $J = 7.4$  Hz, 1H), 4.97 (s, 1H), 4.93-4.83 (m, 1H), 4.59 (dd,  $J = 9.7, 5.5$  Hz, 1H), 3.66-3.56 (m, 1H), 3.52-3.44 (m, 2H), 3.03 (dd,  $J = 8.8, 5.5$  Hz, 1H), 2.88 (t,  $J = 7.4$  Hz, 2H), 1.55 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 157.6, 142.8, 139.4, 138.8, 128.6, 128.43, 128.40, 126.3, 122.7, 119.3, 114.2, 58.8, 47.9, 45.1, 34.1, 16.7; HRMS (ESI) for  $\text{C}_{20}\text{H}_{23}\text{N}_2\text{O}$   $[\text{M}+\text{H}]^+$  calcd 307.1805, found 307.1803.

### 1-isopentyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ai)



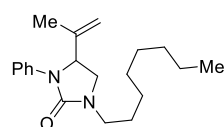
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); White solid; 50.1 mg, 92% yield, reaction time 24 h; mp = 74-76 °C;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.54-7.43 (m, 2H), 7.33-7.20 (m, 2H), 7.00 (t,  $J = 7.4$  Hz, 1H), 5.03 (s, 1H), 4.93 (t,  $J = 1.2$  Hz, 1H), 4.66 (dd,  $J = 9.7, 5.5$  Hz, 1H), 3.62 (t,  $J = 9.3$  Hz, 1H), 3.38-3.21 (m, 2H), 3.13 (dd,  $J = 8.9, 5.6$  Hz, 1H), 1.64 (s, 1H), 1.67-1.57 (m, 1H), 1.46-1.40 (m, 2H), 0.95 (d,  $J = 1.6$  Hz, 3H), 0.94 (d,  $J = 1.2$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 157.7, 143.0, 139.5, 128.4, 122.5, 119.2, 114.2, 58.7, 47.4, 42.0, 36.1, 25.6, 22.4, 16.8; HRMS (ESI) for  $\text{C}_{17}\text{H}_{25}\text{N}_2\text{O}$   $[\text{M}+\text{H}]^+$  calcd 273.1961, found 273.1958.

### 1-(pentan-3-yl)-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2aj)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20:1); Colorless oil; 47.3 mg, 87% yield, reaction time 24 h;  $^1\text{H}$  NMR (600 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.51 (d,  $J = 8.4$  Hz, 2H), 7.27 (t,  $J = 8.0$  Hz, 2H), 7.00 (t,  $J = 7.4$  Hz, 1H), 5.04 (s, 1H), 4.95 (s, 1H), 4.69 (dd,  $J = 9.9, 5.6$  Hz, 1H), 3.82-3.77 (m, 1H), 3.52 (t,  $J = 9.4$  Hz, 1H), 3.03 (dd,  $J = 8.9, 5.6$  Hz, 1H), 1.68 (s, 3H), 1.57-1.48 (m, 2H), 1.49-1.38 (m, 2H), 0.93 (t,  $J = 7.4$  Hz, 3H), 0.89 (t,  $J = 7.4$  Hz, 3H);  $^{13}\text{C}$  NMR (150 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 158.0, 143.0, 139.6, 128.3, 122.4, 119.1, 114.0, 58.7, 55.0, 42.1, 25.2, 25.0, 17.0, 10.9; HRMS (ESI) for  $\text{C}_{17}\text{H}_{25}\text{N}_2\text{O}$   $[\text{M}+\text{H}]^+$  calcd 273.1961, found 273.1959.

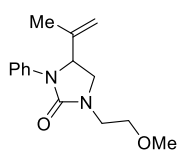
### 1-octyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ak)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); White solid; 46.1 mg, 73% yield, reaction time 24 h; mp = 48-50 °C;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.51-7.48 (m, 2H), 7.31-7.24 (m, 2H), 7.01 (t,  $J = 7.4$  Hz, 1H), 5.03 (s, 1H), 4.94 (t,  $J = 1.2$  Hz, 1H), 4.67 (dd,  $J = 9.7, 5.5$  Hz, 1H), 3.64 (t,  $J = 9.3$  Hz, 1H), 3.37-3.19 (m, 2H), 3.15 (dd,  $J = 8.9, 5.5$  Hz, 1H), 1.66 (s, 3H), 1.59-1.48 (m, 2H), 1.35-1.22 (m, 10H), 0.88 (t,  $J = 6.8$  Hz, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 157.8, 143.1, 139.5, 128.5, 122.6, 119.3, 114.2, 58.8, 47.5, 43.7, 31.7, 29.24, 29.16, 27.4, 26.7, 22.6, 16.9, 14.1; HRMS (ESI) for  $\text{C}_{20}\text{H}_{31}\text{N}_2\text{O}$   $[\text{M}+\text{H}]^+$  calcd 315.2431, found

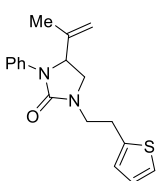
315.2428.

### 1-(2-methoxyethyl)-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2al)



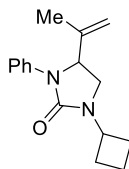
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15:1); White solid; 44.7 mg, 86% yield, reaction time 24 h; mp = 65-67 °C; <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.52-7.46 (m, 2H), 7.32-7.24 (m, 2H), 7.01 (t, *J* = 7.4 Hz, 1H), 5.02 (s, 1H), 4.94-4.91 (m, 1H), 4.68 (dd, *J* = 9.7, 5.6 Hz, 1H), 3.78 (t, *J* = 9.4 Hz, 1H), 3.56 (t, *J* = 5.2 Hz, 2H), 3.49-3.45 (m, 2H), 3.36 (s, 3H), 3.28 (dd, *J* = 9.0, 5.7 Hz, 1H), 1.65 (s, 3H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) δ (ppm) = 157.8, 143.0, 139.4, 128.4, 122.7, 119.4, 114.2, 71.4, 59.0, 58.6, 48.8, 43.5, 16.7; HRMS (ESI) for C<sub>15</sub>H<sub>21</sub>N<sub>2</sub>O<sub>2</sub> [M+H]<sup>+</sup> calcd 261.1598, found 261.1595.

### 3-phenyl-4-(prop-1-en-2-yl)-1-(2-(thiophen-2-yl)ethyl)imidazolidin-2-one (2am)



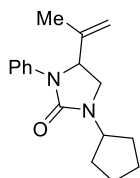
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15:1); White solid; 43.7 mg, 70% yield, reaction time 24 h; mp = 104-106 °C; <sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.47 (d, *J* = 7.8 Hz, 2H), 7.28 (t, *J* = 8.0 Hz, 2H), 7.15 (dd, *J* = 5.1, 1.1 Hz, 1H), 7.02 (t, *J* = 7.4 Hz, 1H), 6.94-6.91 (m, 1H), 6.89-6.87 (m, 1H), 5.00 (s, 1H), 4.91 (s, 1H), 4.64 (dd, *J* = 9.7, 5.6 Hz, 1H), 3.68-3.47 (m, 3H), 3.15-3.03 (m, 3H), 1.58 (s, 3H); <sup>13</sup>C NMR (100 MHz, CDCl<sub>3</sub>) δ (ppm) = 157.7, 142.8, 141.2, 139.3, 128.5, 126.9, 125.2, 123.8, 122.8, 119.5, 114.4, 59.0, 48.0, 45.5, 28.4, 16.8; HRMS (ESI) for C<sub>18</sub>H<sub>21</sub>N<sub>2</sub>OS [M+H]<sup>+</sup> calcd 313.1369, found 313.1367.

### 1-cyclobutyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2an)



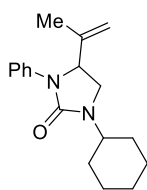
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20:1); White solid; 41.8 mg, 81% yield, reaction time 24 h; mp = 112-114 °C; <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.47 (d, *J* = 7.9 Hz, 2H), 7.29-7.25 (m, 2H), 7.01 (t, *J* = 7.3 Hz, 1H), 5.03 (s, 1H), 4.94 (s, 1H), 4.67 (dd, *J* = 9.7, 5.6 Hz, 1H), 4.61-4.51 (m, 1H), 3.72 (t, *J* = 9.3 Hz, 1H), 3.22 (dd, *J* = 8.8, 5.6 Hz, 1H), 2.22-2.08 (m, 4H), 1.73-1.65 (m, 2H), 1.65 (s, 3H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) δ (ppm) = 156.8, 143.1, 139.4, 128.4, 122.7, 119.5, 114.3, 58.9, 47.3, 43.9, 27.1, 27.0, 16.9, 14.8; HRMS (ESI) for C<sub>16</sub>H<sub>21</sub>N<sub>2</sub>O [M+H]<sup>+</sup> calcd 257.1648, found 257.1646.

### 1-cyclopentyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ao)



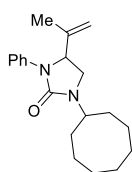
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20:1); White solid; 40.1 mg, 74% yield, reaction time 24 h; mp = 85-87 °C; <sup>1</sup>H NMR (600 MHz, CDCl<sub>3</sub>) δ (ppm) = 7.49 (dd, *J* = 8.7, 1.0 Hz, 2H), 7.32-7.23 (m, 2H), 7.05-6.97 (m, 1H), 5.03 (s, 1H), 4.96-4.91 (m, 1H), 4.67 (dd, *J* = 9.7, 5.5 Hz, 1H), 4.44-4.38 (m, 1H), 3.65 (t, *J* = 6.2 Hz, 1H), 3.13 (dd, *J* = 8.8, 5.5 Hz, 1H), 1.92-1.82 (m, 2H), 1.73-1.67 (m, 2H), 1.65 (s, 3H), 1.64-1.58 (m, 2H), 1.57-1.52 (m, 2H); <sup>13</sup>C NMR (150 MHz, CDCl<sub>3</sub>) δ (ppm) = 157.5, 143.3, 139.5, 128.5, 122.6, 119.4, 114.2, 58.9, 53.5, 43.5, 28.5, 28.3, 24.04, 24.02, 16.9; HRMS (ESI) for C<sub>17</sub>H<sub>23</sub>N<sub>2</sub>O [M+H]<sup>+</sup> calcd 271.1805, found 271.1804.

### 1-cyclohexyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ap)



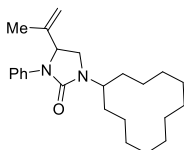
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 20:1); White solid; 45.5 mg, 80% yield, reaction time 24 h; mp = 72-74 °C;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.54-7.44 (m, 2H), 7.31-7.23 (m, 2H), 7.00 (t,  $J$  = 7.4 Hz, 1H), 5.02 (s, 1H), 4.92 (t,  $J$  = 1.2 Hz, 1H), 4.64 (dd,  $J$  = 9.8, 5.3 Hz, 1H), 3.87-3.81 (m, 1H), 3.63 (t,  $J$  = 9.3 Hz, 1H), 3.12 (dd,  $J$  = 8.9, 5.3 Hz, 1H), 1.84-1.75 (m, 4H), 1.69-1.65 (m, 1H), 1.64 (s, 3H), 1.42-1.33 (m, 4H), 1.13-1.03 (m, 1H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 157.0, 143.4, 139.6, 128.4, 122.4, 119.2, 114.0, 58.9, 51.2, 43.4, 30.1, 30.0, 25.43, 25.42, 16.8; HRMS (ESI) for  $\text{C}_{18}\text{H}_{25}\text{N}_2\text{O}$   $[\text{M}+\text{H}]^+$  calcd 285.1961, found 285.1958.

#### 1-cyclooctyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2aq)



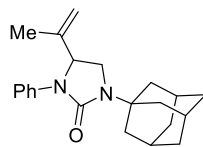
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); White solid; 44.6 mg, 71% yield, reaction time 24 h; mp = 71-73 °C;  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.50 (dd,  $J$  = 8.6, 0.9 Hz, 2H), 7.30-7.23 (m, 2H), 6.99 (t,  $J$  = 7.4 Hz, 1H), 5.01 (s, 1H), 4.92 (t,  $J$  = 0.8 Hz, 1H), 4.63 (dd,  $J$  = 9.8, 5.3 Hz, 1H), 4.13-4.09 (m, 1H), 3.65 (t,  $J$  = 9.3 Hz, 1H), 3.14 (dd,  $J$  = 8.8, 5.3 Hz, 1H), 1.76-1.68 (m, 6H), 1.65 (s, 3H), 1.65-1.52 (m, 8H);  $^{13}\text{C NMR}$  (150 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 156.9, 143.3, 139.6, 128.4, 122.4, 119.1, 114.0, 58.9, 51.9, 43.6, 31.0, 30.8, 26.6, 25.8, 24.63, 24.56, 16.9; HRMS (ESI) for  $\text{C}_{20}\text{H}_{29}\text{N}_2\text{O}$   $[\text{M}+\text{H}]^+$  calcd 313.2274, found 313.2271.

#### 1-cyclododecyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ar)



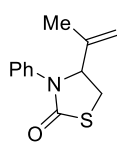
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); White solid; 40.4 mg, 55% yield, reaction time 24 h; mp = 92-94 °C;  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.52-7.50 (m, 2H), 7.26 (t,  $J$  = 8.0 Hz, 2H), 6.98 (t,  $J$  = 7.3 Hz, 1H), 5.02 (s, 1H), 4.92 (s, 1H), 4.66 (dd,  $J$  = 9.8, 5.4 Hz, 1H), 4.25-4.20 (m, 1H), 3.59 (t,  $J$  = 9.4 Hz, 1H), 3.08 (dd,  $J$  = 8.9, 5.4 Hz, 1H), 1.69-1.53 (m, 8H), 1.43-1.27 (m, 17H);  $^{13}\text{C NMR}$  (150 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 157.4, 143.3, 139.6, 128.3, 122.3, 119.1, 113.9, 58.8, 46.7, 42.9, 27.9, 27.7, 24.13, 24.11, 23.9, 22.7, 22.6, 22.36, 22.33, 22.31, 16.8; HRMS (ESI) for  $\text{C}_{24}\text{H}_{37}\text{N}_2\text{O}$   $[\text{M}+\text{H}]^+$  calcd 369.2900, found 369.2897.

#### 1-adamantan-1-yl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2as)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); White solid; 32.3 mg, 48% yield, reaction time 24 h; mp = 122-124 °C;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.45 (dd,  $J$  = 8.7, 1.0 Hz, 2H), 7.33-7.20 (m, 2H), 7.00 (t,  $J$  = 7.4 Hz, 1H), 5.02 (s, 1H), 4.97-4.86 (m, 1H), 4.58 (dd,  $J$  = 9.4, 6.2 Hz, 1H), 3.67 (t,  $J$  = 9.1 Hz, 1H), 3.21 (dd,  $J$  = 8.8, 6.2 Hz, 1H), 2.15-2.10 (m, 9H), 1.75-1.69 (m, 6H), 1.66 (s, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 157.6, 143.3, 139.6, 128.3, 122.7, 119.8, 114.2, 58.5, 54.3, 44.7, 39.6, 36.4, 29.6, 17.1; HRMS (ESI) for  $\text{C}_{22}\text{H}_{29}\text{N}_2\text{O}$   $[\text{M}+\text{H}]^+$  calcd 337.2274, found 337.2272.

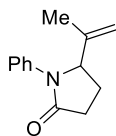
#### 3-phenyl-4-(prop-1-en-2-yl)thiazolidin-2-one (2at)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 5:1); White solid; 22.3 mg, 51% yield, reaction time 60 h; mp = 83-84 °C;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.32 (m, 4H), 7.24-7.15 (m, 1H), 5.05 (d,  $J$  = 0.5 Hz, 1H), 5.01-4.93 (m, 1H), 4.88 (dd,  $J$  = 7.9, 6.6 Hz, 1H), 3.54 (dd,  $J$  = 11.1, 8.1

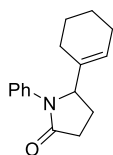
Hz, 1H), 3.21 (dd,  $J = 11.1, 6.4$  Hz, 1H), 1.72 (s, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 171.6, 141.7, 138.1, 128.8, 126.0, 124.0, 116.1, 66.7, 30.1, 17.3; HRMS (ESI) for  $\text{C}_{12}\text{H}_{14}\text{NOS}$   $[\text{M}+\text{H}]^+$  calcd 220.0791, found 220.0789.

#### 1-phenyl-5-(prop-1-en-2-yl)pyrrolidin-2-one (2au)



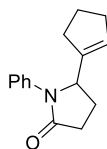
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 5:1); White solid; 34.3 mg, 85% yield, reaction time 24 h; mp = 105-107 °C;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.46 (d,  $J = 7.9$  Hz, 2H), 7.34 (t,  $J = 7.9$  Hz, 2H), 7.14 (t,  $J = 7.4$  Hz, 1H), 4.92 (s, 1H), 4.88 (s, 1H), 4.68 (dd,  $J = 8.4, 4.6$  Hz, 1H), 2.72-2.63 (m, 1H), 2.62-2.47 (m, 1H), 2.39-2.29 (m, 1H), 1.98-1.89 (m, 1H), 1.66 (s, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 174.6, 143.2, 138.1, 128.6, 124.9, 122.1, 113.6, 65.1, 31.3, 24.1, 17.6; HRMS (ESI) for  $\text{C}_{13}\text{H}_{16}\text{NO}$   $[\text{M}+\text{H}]^+$  calcd 202.1226, found 202.1225.

#### 5-(cyclohex-1-en-1-yl)-1-phenylpyrrolidin-2-one (2av)



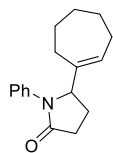
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); White solid; 38.2 mg, 79% yield, reaction time 24 h; mp = 66-68 °C;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.43 (d,  $J = 7.9$  Hz, 2H), 7.32 (t,  $J = 7.8$  Hz, 2H), 7.13 (t,  $J = 7.3$  Hz, 1H), 5.62 (s, 1H), 4.56 (dd,  $J = 7.9, 4.8$  Hz, 1H), 2.69-2.60 (m, 1H), 2.57-2.45 (m, 1H), 2.35-2.20 (m, 1H), 1.99-1.85 (m, 4H), 1.80-1.73 (m, 1H), 1.63-1.55 (m, 1H), 1.54-1.39 (m, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 174.6, 138.2, 135.7, 128.4, 125.2, 124.8, 122.4, 65.8, 31.4, 24.8, 24.2, 23.4, 22.3, 22.2; HRMS (ESI) for  $\text{C}_{16}\text{H}_{20}\text{NO}$   $[\text{M}+\text{H}]^+$  calcd 242.1539, found 242.1538.

#### 5-(cyclopent-1-en-1-yl)-1-phenylpyrrolidin-2-one (2aw)



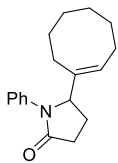
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Pale yellow oil; 29.0 mg, 64% yield, reaction time 24 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.45 (dd,  $J = 8.5, 0.9$  Hz, 2H), 7.35-7.30 (m, 2H), 7.13 (t,  $J = 7.4$  Hz, 1H), 5.56 (s, 1H), 4.88 (dd,  $J = 8.1, 4.4$  Hz, 1H), 2.71-2.62 (m, 1H), 2.57-2.49 (m, 1H), 2.35-2.18 (m, 4H), 2.19-2.03 (m, 1H), 1.98-1.65 (m, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 174.4, 142.8, 138.3, 128.6, 128.3, 124.9, 122.2, 60.5, 32.1, 31.5, 30.9, 24.4, 23.2; HRMS (ESI) for  $\text{C}_{15}\text{H}_{18}\text{NO}$   $[\text{M}+\text{H}]^+$  calcd 228.1383, found 228.1381.

#### 5-(cyclohept-1-en-1-yl)-1-phenylpyrrolidin-2-one (2ax)



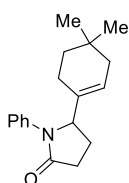
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Colorless oil; 36.7 mg, 72% yield, reaction time 24 h;  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.42-7.36 (m, 2H), 7.33-7.30 (m, 2H), 7.13 (t,  $J = 7.4$  Hz, 1H), 5.81 (t,  $J = 6.5$  Hz, 1H), 4.62 (t,  $J = 7.1$  Hz, 1H), 2.64-2.58 (m, 1H), 2.55-2.49 (m, 1H), 2.25-2.19 (m, 1H), 2.09-1.98 (m, 3H), 1.91-1.83 (m, 2H), 1.66-1.58 (m, 2H), 1.43-1.37 (m, 1H), 1.37-1.31 (m, 1H), 1.29-1.21 (m, 1H), 1.02-0.92 (m, 1H);  $^{13}\text{C NMR}$  (150 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 174.6, 141.3, 137.8, 130.7, 128.3, 124.8, 122.8, 67.1, 32.3, 31.3, 28.2, 27.6, 26.6, 26.5, 24.1; HRMS (ESI) for  $\text{C}_{17}\text{H}_{22}\text{NO}$   $[\text{M}+\text{H}]^+$  calcd 256.1696, found 256.1693.

#### (E)-5-(cyclooct-1-en-1-yl)-1-phenylpyrrolidin-2-one (2ay)



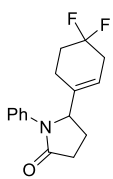
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 8:1); Colorless oil; 30.9 mg, 57% yield, reaction time 24 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.54-7.42 (m, 2H), 7.38-7.28 (m, 2H), 7.18-7.02 (m, 1H), 5.50 (t,  $J$  = 8.2 Hz, 1H), 4.68 (dd,  $J$  = 8.2, 4.0 Hz, 1H), 2.72-2.60 (m, 1H), 2.55-2.47 (m, 1H), 2.38-2.24 (m, 1H), 2.19-1.88 (m, 5H), 1.48-1.40 (m, 3H), 1.36-1.23 (m, 5H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 174.9, 138.3, 137.9, 128.5, 127.3, 124.7, 122.2, 65.6, 31.2, 29.4, 28.9, 26.2, 26.1, 25.70, 25.66, 24.6; HRMS (ESI) for  $\text{C}_{18}\text{H}_{24}\text{NO}$   $[\text{M}+\text{H}]^+$  calcd 270.1852, found 270.1849.

#### 5-(4,4-dimethylcyclohex-1-en-1-yl)-1-phenylpyrrolidin-2-one (2az)



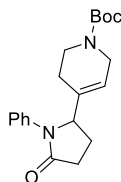
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 8:1); Colorless oil; 44.3 mg, 82% yield, reaction time 24 h;  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.43 (d,  $J$  = 7.7 Hz, 2H), 7.32 (t,  $J$  = 8.0 Hz, 2H), 7.12 (t,  $J$  = 7.4 Hz, 1H), 5.58 (s, 1H), 4.63 (dd,  $J$  = 8.1, 5.3 Hz, 1H), 2.68-2.62 (m, 1H), 2.59-2.48 (m, 1H), 2.32-2.25 (m, 1H), 1.99-1.88 (m, 2H), 1.76-1.67 (m, 3H), 1.34-1.29 (m, 1H), 1.26-1.21 (m, 1H), 0.84 (s, 3H), 0.64 (s, 3H);  $^{13}\text{C NMR}$  (150 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 174.5, 138.1, 134.4, 128.4, 124.8, 124.7, 122.4, 65.6, 38.8, 35.0, 31.5, 28.6, 28.3, 27.3, 24.2, 21.1; HRMS (ESI) for  $\text{C}_{18}\text{H}_{24}\text{NO}$   $[\text{M}+\text{H}]^+$  calcd 270.1852, found 270.1850.

#### 5-(4,4-difluorocyclohex-1-en-1-yl)-1-phenylpyrrolidin-2-one (2ba)



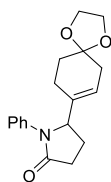
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Colorless oil; 42.4 mg, 76% yield, reaction time 24 h;  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.40 (dd,  $J$  = 8.6, 1.0 Hz, 2H), 7.37-7.29 (m, 2H), 7.15 (t,  $J$  = 7.3 Hz, 1H), 5.52 (s, 1H), 4.67 (dd,  $J$  = 8.2, 5.0 Hz, 1H), 2.68-2.62 (m, 1H), 2.60-2.51 (m, 1H), 2.46 (t,  $J$  = 14.2 Hz, 2H), 2.39-2.29 (m, 1H), 2.26-2.20 (m, 1H), 2.11-2.08 (m, 1H), 2.05-1.95 (m, 1H), 1.95-1.88 (m, 1H), 1.88-1.75 (m, 1H);  $^{13}\text{C NMR}$  (150 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 174.4, 137.8, 135.7, 128.7, 125.2, 122.4 (t,  $J$  = 159.0 Hz), 122.3, 120.1 (t,  $J$  = 3.5 Hz), 64.6, 34.3 (t,  $J$  = 17.5 Hz), 31.2, 29.2 (t,  $J$  = 16.5 Hz), 24.2, 22.0 (t,  $J$  = 3.5 Hz);  $^{19}\text{F NMR}$  (376 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = -95.8, -96.5, -97.1, -97.7; HRMS (ESI) for  $\text{C}_{16}\text{H}_{18}\text{F}_2\text{NO}$   $[\text{M}+\text{H}]^+$  calcd 278.1351, found 278.1349.

#### tert-butyl 4-(5-oxo-1-phenylpyrrolidin-2-yl)-3,6-dihydropyridine-1(2H)-carboxylate (2bb)



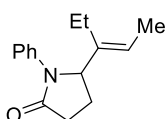
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Colorless oil; 40.5 mg, 59% yield, reaction time 24 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.40 (d,  $J$  = 7.9 Hz, 2H), 7.34 (t,  $J$  = 7.9 Hz, 2H), 7.17-7.12 (m, 1H), 5.68-5.52 (m, 1H), 4.68 (dd,  $J$  = 7.8, 5.3 Hz, 1H), 3.92-3.86 (m, 1H), 3.74 (dd,  $J$  = 18.6, 2.2 Hz, 1H), 3.57 (brs, 1H), 3.11 (brs, 1H), 2.72-2.49 (m, 2H), 2.41-2.25 (m, 1H), 2.05 (brs, 1H), 1.99-1.83 (m, 2H), 1.43 (s, 9H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 174.5, 154.7, 137.8, 135.0, 128.7, 125.1, 122.4, 121.6, 79.7, 64.8, 43.0, 39.2, 31.2, 28.3, 24.1, 23.8; HRMS (ESI) for  $\text{C}_{20}\text{H}_{27}\text{N}_2\text{O}_3$   $[\text{M}+\text{H}]^+$  calcd 343.2016, found 343.2012.

#### 1-phenyl-5-(1,4-dioxaspiro[4.5]dec-7-en-8-yl)pyrrolidin-2-one (2bc)



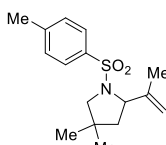
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 4:1); Colorless oil; 31.8 mg, 53% yield, reaction time 24 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.42 (dd,  $J$  = 8.6, 1.0 Hz, 2H), 7.33 (t,  $J$  = 7.9 Hz, 2H), 7.14 (t,  $J$  = 7.3 Hz, 1H), 5.53 (s, 1H), 4.62 (dd,  $J$  = 8.2, 4.7 Hz, 1H), 3.98-3.85 (m, 4H), 2.70-2.61 (m, 1H), 2.59-2.48 (m, 1H), 2.38-2.26 (m, 1H), 2.26-2.12 (m, 3H), 2.10-1.91 (m, 2H), 1.77-1.67 (m, 1H), 1.58-1.47 (m, 1H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 174.5, 138.0, 135.5, 128.5, 125.0, 122.52, 122.47, 107.6, 65.2, 64.3, 35.4, 31.3, 30.6, 24.2, 22.7; HRMS (ESI) for  $\text{C}_{18}\text{H}_{22}\text{NO}_3$   $[\text{M}+\text{H}]^+$  calcd 300.1594, found 300.1592.

#### (E)-5-(pent-2-en-3-yl)-1-phenylpyrrolidin-2-one (2bd)



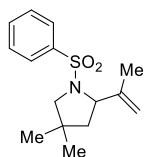
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Colorless oil; 34.1 mg, 74% yield, reaction time 24 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.48 (dd,  $J$  = 8.6, 1.0 Hz, 2H), 7.36-7.27 (m, 2H), 7.11 (t,  $J$  = 7.4 Hz, 1H), 5.36 (q,  $J$  = 6.8 Hz, 1H), 4.62 (dd,  $J$  = 8.2, 3.9 Hz, 1H), 2.72-2.57 (m, 1H), 2.53-2.46 (m, 1H), 2.36-2.22 (m, 1H), 2.17-2.08 (m, 1H), 1.99-1.83 (m, 2H), 1.57 (d,  $J$  = 6.8 Hz, 3H), 0.96 (t,  $J$  = 7.6 Hz, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 174.9, 138.7, 138.5, 128.5, 124.6, 121.9, 121.5, 65.1, 31.1, 25.0, 20.5, 13.03, 12.98; HRMS (ESI) for  $\text{C}_{15}\text{H}_{20}\text{NO}$   $[\text{M}+\text{H}]^+$  calcd 230.1539, found 230.1538.

#### 4,4-dimethyl-2-(prop-1-en-2-yl)-1-tosylpyrrolidine (4a)



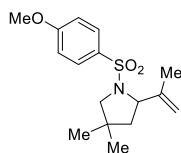
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); White solid; 32.3 mg, 55% yield, reaction time 84 h; mp = 77-79 °C;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.70 (d,  $J$  = 8.2 Hz, 2H), 7.30 (d,  $J$  = 8.0 Hz, 2H), 4.96 (s, 1H), 4.89 – 4.77 (m, 1H), 4.06 (t,  $J$  = 8.4 Hz, 1H), 3.26 (dd,  $J$  = 10.6, 0.7 Hz, 1H), 3.19 (d,  $J$  = 10.6 Hz, 1H), 2.42 (s, 3H), 1.72 (s, 3H), 1.65-1.62 (m, 2H), 1.03 (s, 3H), 0.58 (s, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 145.2, 143.1, 135.3, 129.4, 127.5, 111.9, 65.5, 61.9, 46.3, 37.3, 26.2, 25.8, 21.5, 16.9; HRMS (ESI) for  $\text{C}_{16}\text{H}_{24}\text{NO}_2\text{S}$   $[\text{M}+\text{H}]^+$  calcd 294.1522, found 294.1518.

#### 4,4-dimethyl-1-(phenylsulfonyl)-2-(prop-1-en-2-yl)pyrrolidine (4b)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); Colorless oil; 32.4 mg, 58% yield, reaction time 84 h;  $^1\text{H NMR}$  (600 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.87-7.78 (m, 2H), 7.60-7.56 (m, 1H), 7.52 (t,  $J$  = 7.6 Hz, 2H), 4.97 (s, 1H), 4.83 (t,  $J$  = 0.8 Hz, 1H), 4.08 (dd,  $J$  = 9.1, 7.9 Hz, 1H), 3.28 (dd,  $J$  = 10.7, 1.0 Hz, 1H), 3.20 (d,  $J$  = 10.7 Hz, 1H), 1.72 (s, 3H), 1.67-1.59 (m, 2H), 1.03 (s, 3H), 0.54 (s, 3H);  $^{13}\text{C NMR}$  (150 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 145.1, 138.1, 132.4, 128.8, 127.4, 112.0, 65.6, 61.8, 46.2, 37.4, 26.1, 25.6, 16.9; HRMS (ESI) for  $\text{C}_{15}\text{H}_{22}\text{NO}_2\text{S}$   $[\text{M}+\text{H}]^+$  calcd 280.1366, found 280.1364.

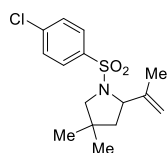
#### 1-((4-methoxyphenyl)sulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4c)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); Colorless oil; 29.0 mg, 47% yield, reaction time 84 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.78-7.74 (m, 2H), 6.99-6.95 (m, 2H), 4.96 (s, 1H), 4.87-4.78 (m, 1H), 4.04 (t,  $J$  = 8.8 Hz, 1H), 3.87 (s, 3H), 3.25 (d,  $J$  = 10.8 Hz,

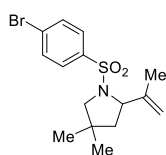
1H), 3.19 (d,  $J = 10.4$  Hz, 1H), 1.73 (s, 3H), 1.66-1.59 (m, 2H), 1.04 (s, 3H), 0.60 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 162.7, 145.3, 130.0, 129.5, 113.9, 111.8, 65.5, 61.9, 55.5, 46.2, 37.3, 26.2, 25.9, 16.9; HRMS (ESI) for  $\text{C}_{16}\text{H}_{24}\text{NO}_3\text{S}$   $[\text{M}+\text{H}]^+$  calcd 310.1471, found 310.1469.

#### 1-((4-chlorophenyl)sulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4d)



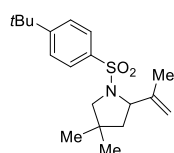
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); White solid; 30.8 mg, 49% yield, reaction time 84 h; mp = 69-71 °C;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.80-7.70 (m, 2H), 7.54-7.39 (m, 2H), 4.94 (s, 1H), 4.83-4.82 (m, 1H), 4.10 (dd,  $J = 9.4, 7.6$  Hz, 1H), 3.29 (dd,  $J = 10.6, 1.1$  Hz, 1H), 3.18 (d,  $J = 10.6$  Hz, 1H), 1.78-1.54 (m, 2H), 1.68 (s, 3H), 1.05 (s, 3H), 0.66 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 144.7, 138.8, 137.0, 129.1, 128.8, 112.4, 65.6, 61.9, 46.1, 37.5, 26.0, 25.8, 16.8; HRMS (ESI) for  $\text{C}_{15}\text{H}_{21}\text{ClNO}_2\text{S}$   $[\text{M}+\text{H}]^+$  calcd 314.0976, found 314.0972.

#### 1-((4-bromophenyl)sulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4e)



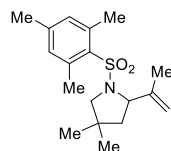
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); White solid; 36.3 mg, 51% yield, reaction time 84 h; mp = 75-76 °C;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.78-7.51 (m, 4H), 4.94 (s, 1H), 4.83 (s, 1H), 4.10 (dd,  $J = 9.2, 7.7$  Hz, 1H), 3.29 (dd,  $J = 10.6, 0.9$  Hz, 1H), 3.18 (d,  $J = 10.6$  Hz, 1H), 1.76-1.55 (m, 2H), 1.67 (s, 1H), 1.05 (s, 3H), 0.66 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 144.7, 137.6, 132.0, 128.9, 127.3, 112.4, 65.6, 61.9, 46.1, 37.5, 26.0, 25.9, 16.8; HRMS (ESI) for  $\text{C}_{15}\text{H}_{21}\text{BrNO}_2\text{S}$   $[\text{M}+\text{H}]^+$  calcd 358.0471, found 358.0468.

#### 1-((4-(tert-butyl)phenyl)sulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4f)



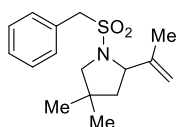
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); White solid; 41.5 mg, 62% yield, reaction time 84 h; mp = 69-71 °C;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.74 (d,  $J = 8.5$  Hz, 2H), 7.51 (d,  $J = 8.5$  Hz, 2H), 4.97 (s, 1H), 4.83 (s, 1H), 4.15-3.97 (m, 1H), 3.26 (d,  $J = 10.7$  Hz, 1H), 3.19 (d,  $J = 10.6$  Hz, 1H), 1.73 (s, 3H), 1.66-1.57 (m, 2H), 1.34 (s, 9H), 1.03 (s, 3H), 0.54 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 156.2, 145.3, 135.0, 127.3, 125.7, 111.8, 65.5, 61.8, 46.3, 37.4, 35.1, 31.1, 26.2, 25.6, 17.0; HRMS (ESI) for  $\text{C}_{19}\text{H}_{30}\text{NO}_2\text{S}$   $[\text{M}+\text{H}]^+$  calcd 336.1992, found 336.1988.

#### 1-(mesitylsulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4g)



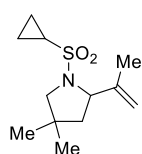
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); White solid; 38.5 mg, 60% yield, reaction time 84 h; mp = 92-94 °C;  $^1\text{H}$  NMR (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 6.86 (s, 2H), 4.75 (s, 1H), 4.50-4.38 (m, 2H), 3.83 (dd,  $J = 10.5, 1.7$  Hz, 1H), 3.11 (d,  $J = 10.5$  Hz, 1H), 2.58 (s, 6H), 2.27 (s, 3H), 1.83 (ddd,  $J = 12.5, 7.4, 1.6$  Hz, 1H), 1.68-1.57 (m, 1H), 1.25 (s, 3H), 1.13 (s, 3H), 1.10 (s, 3H);  $^{13}\text{C}$  NMR (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 143.8, 141.8, 139.5, 134.8, 131.5, 112.3, 65.2, 62.3, 46.9, 37.5, 25.8, 25.7, 22.9, 20.9, 16.1; HRMS (ESI) for  $\text{C}_{18}\text{H}_{28}\text{NO}_2\text{S}$   $[\text{M}+\text{H}]^+$  calcd 322.1835, found 322.1832.

#### 1-(benzylsulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4h)



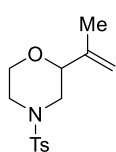
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); Colorless oil; 42.4 mg, 72% yield, reaction time 84 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.43-7.38 (m, 2H), 7.37-7.34 (m, 3H), 5.04 (d,  $J = 0.6$  Hz, 1H), 4.89-4.87 (m, 1H), 4.50 (dd,  $J = 9.1, 7.8$  Hz, 1H), 4.25 (d,  $J = 13.6$  Hz, 1H), 4.14 (d,  $J = 13.6$  Hz, 1H), 3.30 (dd,  $J = 10.5, 1.4$  Hz, 1H), 2.78 (d,  $J = 10.5$  Hz, 1H), 1.86-1.80 (m, 1H), 1.71 (s, 3H), 1.58 (dd,  $J = 12.5, 9.5$  Hz, 1H), 1.04 (s, 3H), 1.03 (s, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 144.7, 130.7, 129.2, 128.5, 128.4, 112.7, 65.2, 61.7, 59.3, 45.8, 38.3, 25.6, 25.5, 17.6; HRMS (ESI) for  $\text{C}_{16}\text{H}_{24}\text{NO}_2\text{S}$   $[\text{M}+\text{H}]^+$  calcd 294.1522, found 294.1519.

#### 1-(cyclopropylsulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4i)



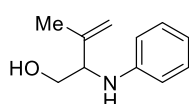
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 25:1); Colorless oil; 32.3 mg, 66% yield, reaction time 84 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 5.01 (s, 1H), 4.84 (s, 1H), 4.50-4.36 (m, 1H), 3.49 (d,  $J = 10.4$  Hz, 1H), 3.12 (d,  $J = 10.4$  Hz, 1H), 2.40-2.33 (m, 1H), 1.90-1.85 (m, 1H), 1.77 (s, 3H), 1.65 (dd,  $J = 12.5, 9.7$  Hz, 1H), 1.21-1.14 (m, 2H), 1.13 (s, 3H), 1.11 (s, 3H), 0.96-0.91 (m, 2H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 145.3, 111.9, 65.0, 61.6, 46.2, 38.0, 29.2, 25.8, 25.7, 17.1, 5.0, 4.9; HRMS (ESI) for  $\text{C}_{12}\text{H}_{22}\text{NO}_2\text{S}$   $[\text{M}+\text{H}]^+$  calcd 244.1366, found 244.1364.

#### 2-(prop-1-en-2-yl)-4-tosylmorpholine (4j)



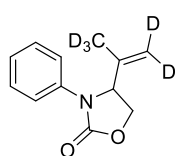
The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 15:1); White solid; 17.5 mg, 31% yield, reaction time 84 h; mp = 107-109 °C;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.64 (d,  $J = 8.2$  Hz, 2H), 7.35 (d,  $J = 8.1$  Hz, 2H), 4.99 (s, 1H), 4.92 (s, 1H), 4.00-3.89 (m, 2H), 3.77-3.63 (m, 2H), 3.54 (d,  $J = 11.5$  Hz, 1H), 2.45 (s, 3H), 2.44-2.36 (m, 1H), 2.18-2.08 (m, 1H), 1.72 (s, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 143.9, 142.1, 132.1, 129.8, 127.8, 112.7, 78.1, 65.8, 49.5, 45.4, 21.6, 19.2; HRMS (ESI) for  $\text{C}_{14}\text{H}_{20}\text{NO}_3\text{S}$   $[\text{M}+\text{H}]^+$  calcd 282.1158, found 282.1156.

#### 3-methyl-2-(phenylamino)but-3-en-1-ol (2a-I)



The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 6:1); Colorless oil; 60.4 mg, 85% yield (0.4 mmol scale), reaction time 10 h;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.15 (t,  $J = 7.9$  Hz, 2H), 6.71 (t,  $J = 7.3$  Hz, 1H), 6.59 (d,  $J = 7.7$  Hz, 2H), 5.03 (s, 1H), 4.99 (s, 1H), 4.15 (brs, 1H), 3.89-3.84 (m, 1H), 3.78-3.74 (m, 1H), 3.67-3.62 (m, 1H), 2.00 (brs, 1H), 1.76 (s, 3H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 147.3, 142.7, 129.1, 117.7, 113.6, 113.2, 63.9, 60.7, 19.5; HRMS (ESI) for  $\text{C}_{11}\text{H}_{16}\text{NO}$   $[\text{M}+\text{H}]^+$  calcd 178.1226, found 178.1224.

#### 3-phenyl-4-(prop-1-en-2-yl-d5)oxazolidin-2-one (D5-2a)

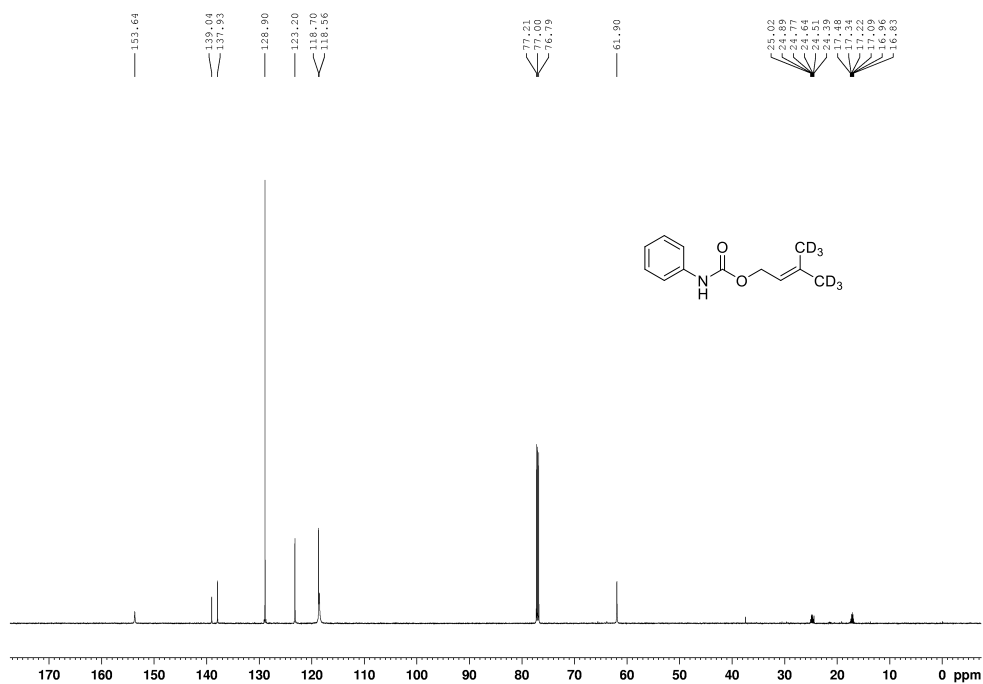
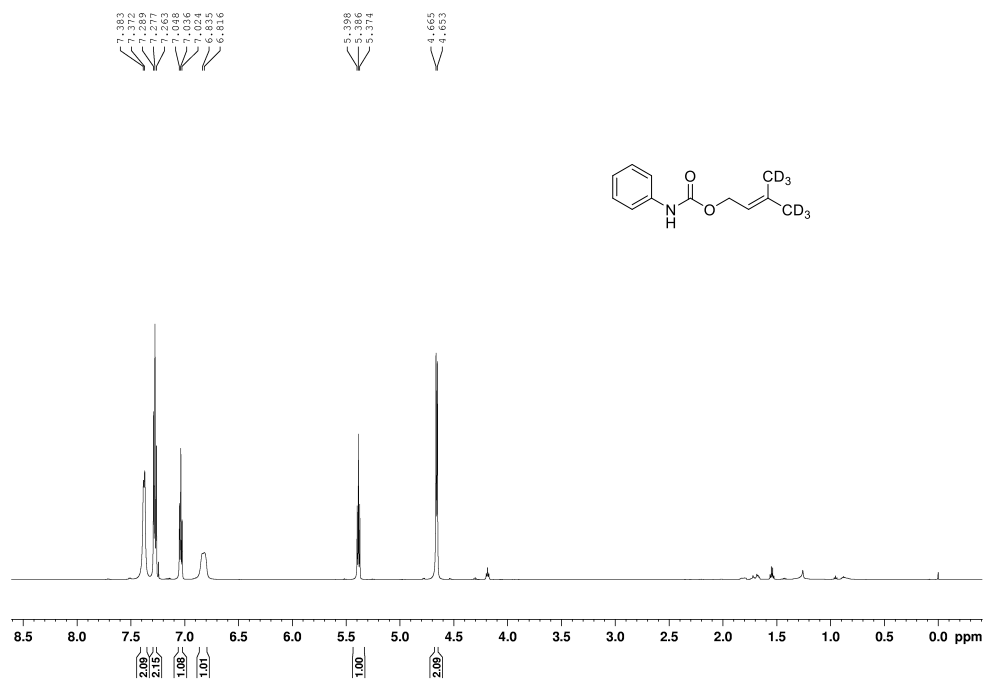


The product was purified by column chromatography on silica gel (petroleum ether/EtOAc = 5:1); White solid; 6.2 mg, 15% yield, reaction time 30 min; mp = 89-91 °C;  $^1\text{H NMR}$  (400 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 7.52-7.42 (m, 2H), 7.37-7.32 (m, 2H), 7.14 (t,  $J = 7.4$  Hz, 1H), 4.90 (dd,  $J = 9.1, 5.6$  Hz, 1H), 4.56 (t,  $J = 8.9$  Hz, 1H), 4.11 (dd,  $J = 8.8, 5.5$  Hz, 1H);  $^{13}\text{C NMR}$  (100 MHz,  $\text{CDCl}_3$ )  $\delta$  (ppm) = 155.6, 141.0, 137.2, 128.8, 124.6, 120.3, 116.2-115.2 (m), 66.1, 61.9, 15.9-15.1 (m); HRMS (ESI) for  $\text{C}_{12}\text{H}_9\text{D}_5\text{NO}_2$   $[\text{M}+\text{H}]^+$  calcd 209.1333, found 209.1332.

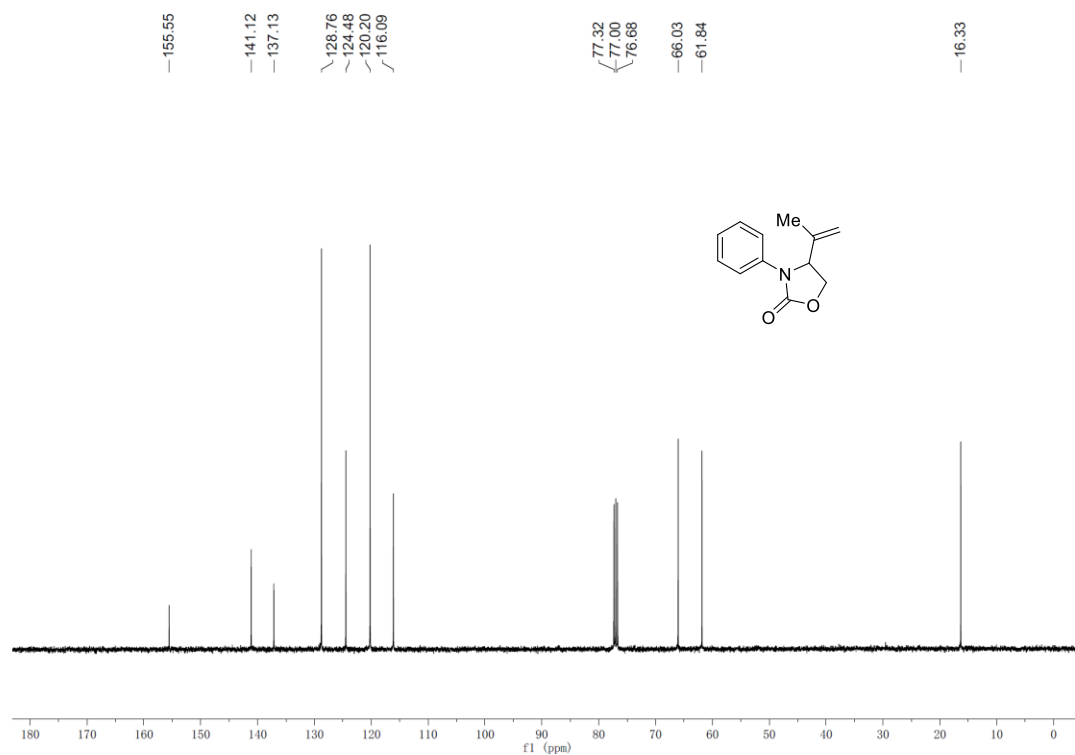
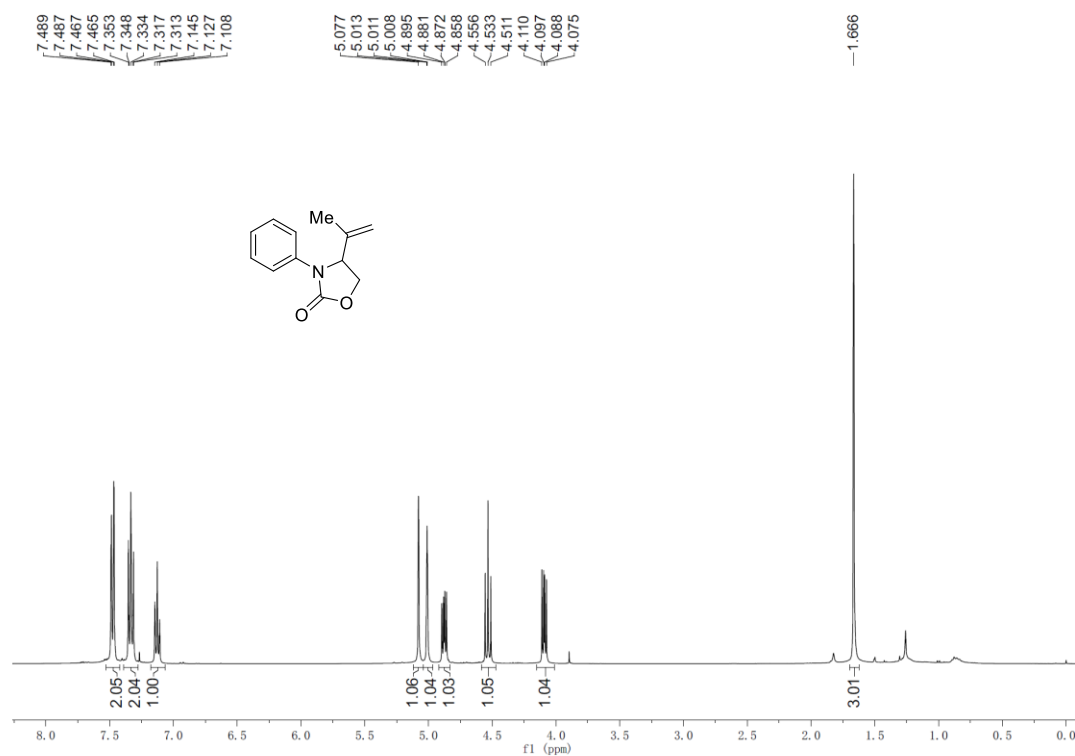


## 11. NMR Spectra of Compounds

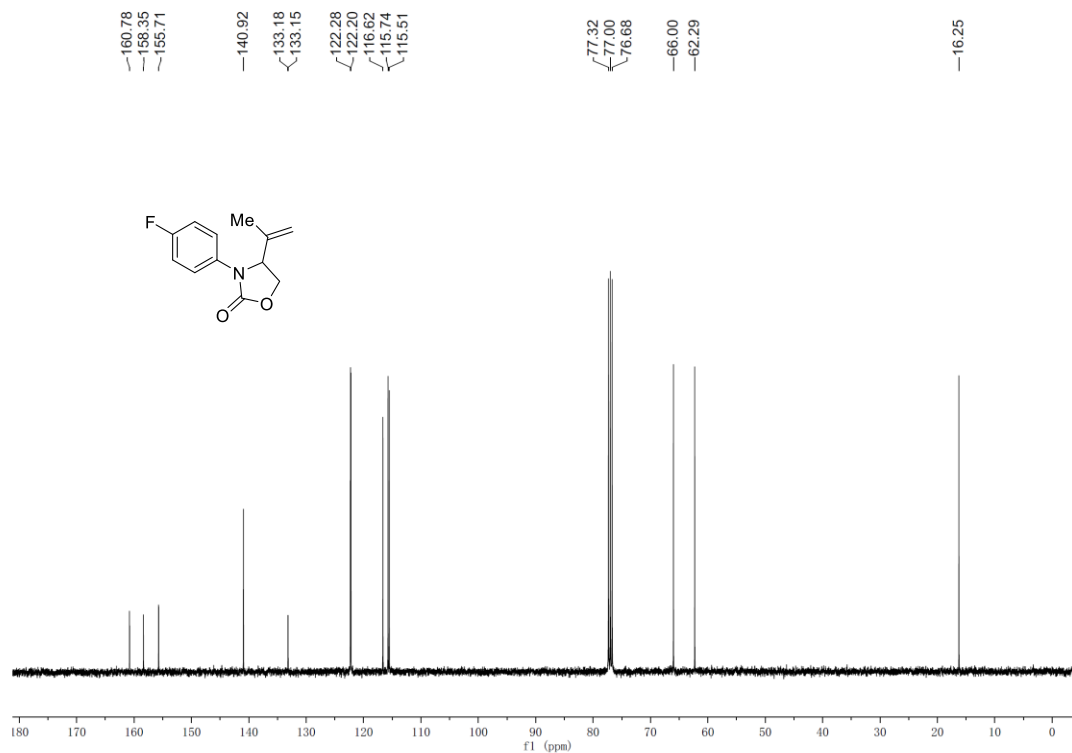
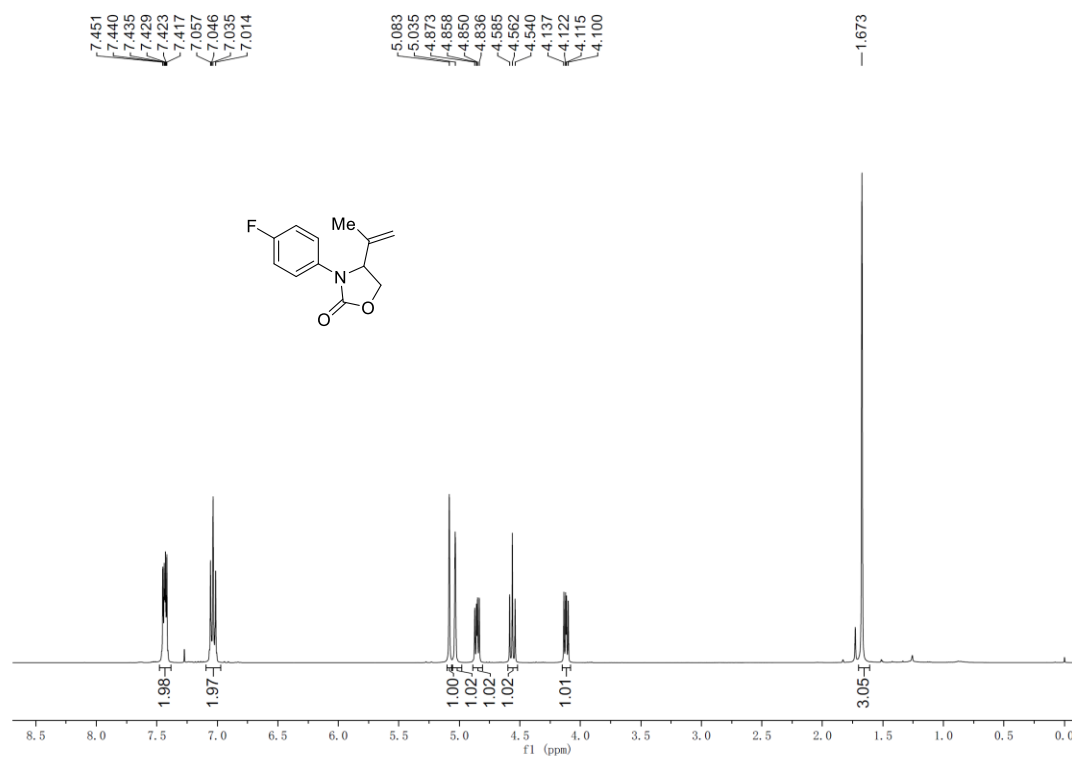
### 3-(methyl-d3)but-2-en-1-yl-4,4-d3 phenylcarbamate (D<sub>6</sub>-1a)

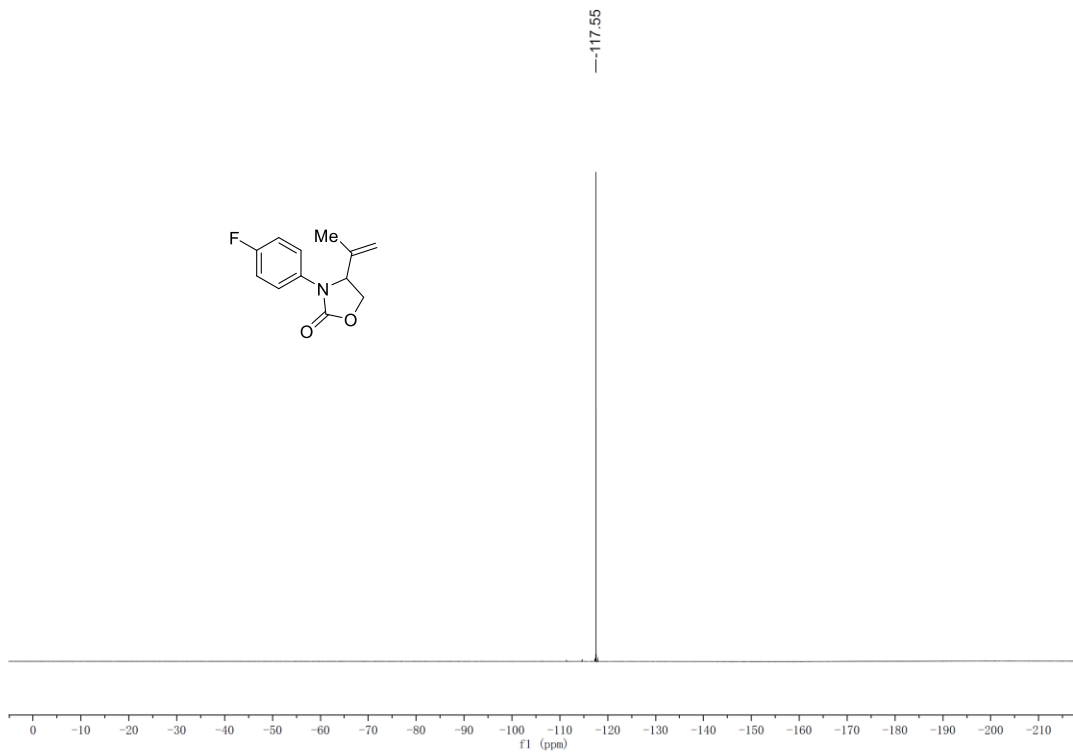


### 3-phenyl-4-(prop-1-en-2-yl)oxazolidin-2-one (2a)

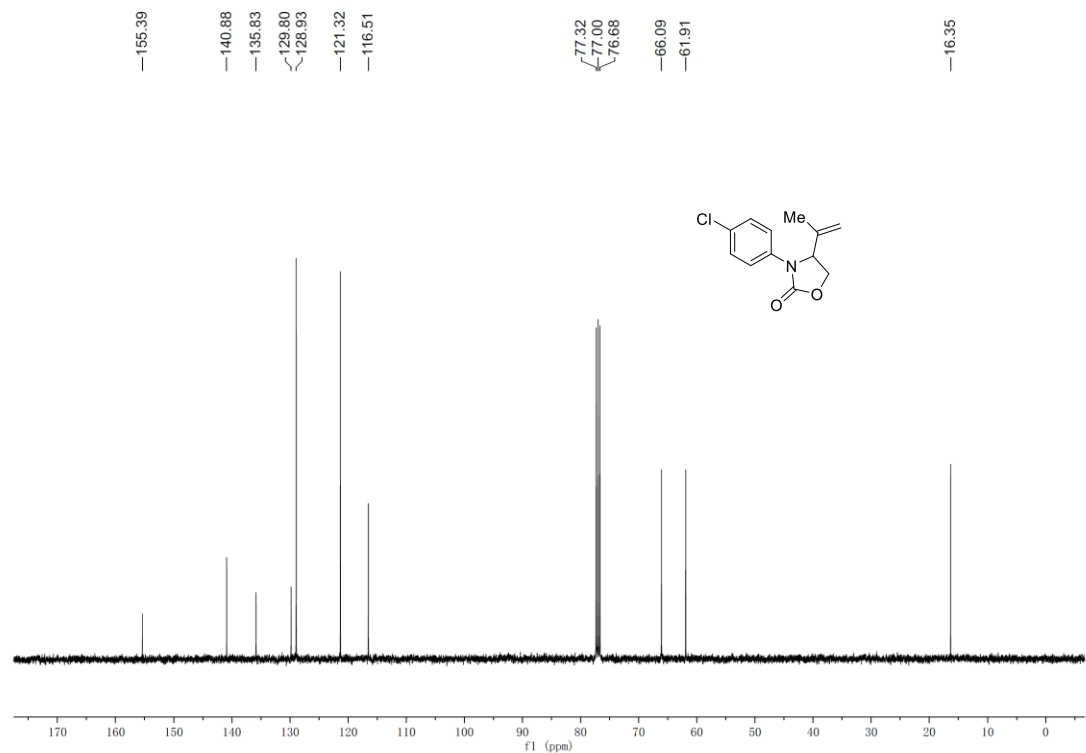
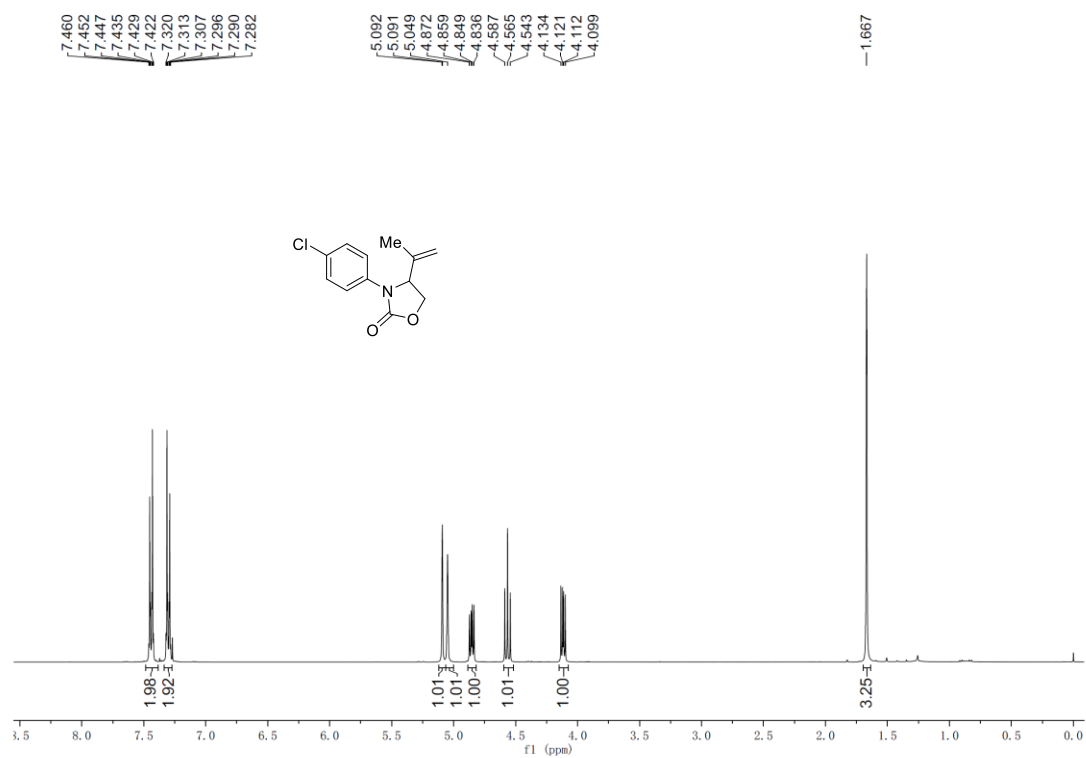


**3-(4-fluorophenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2b)**

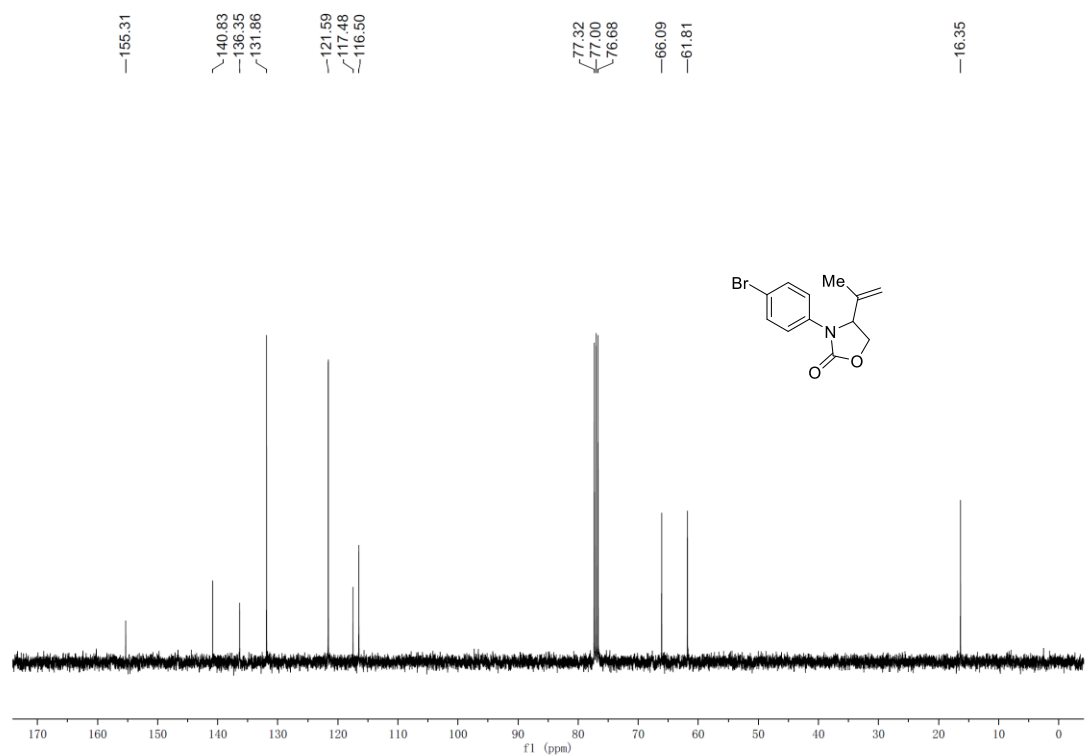
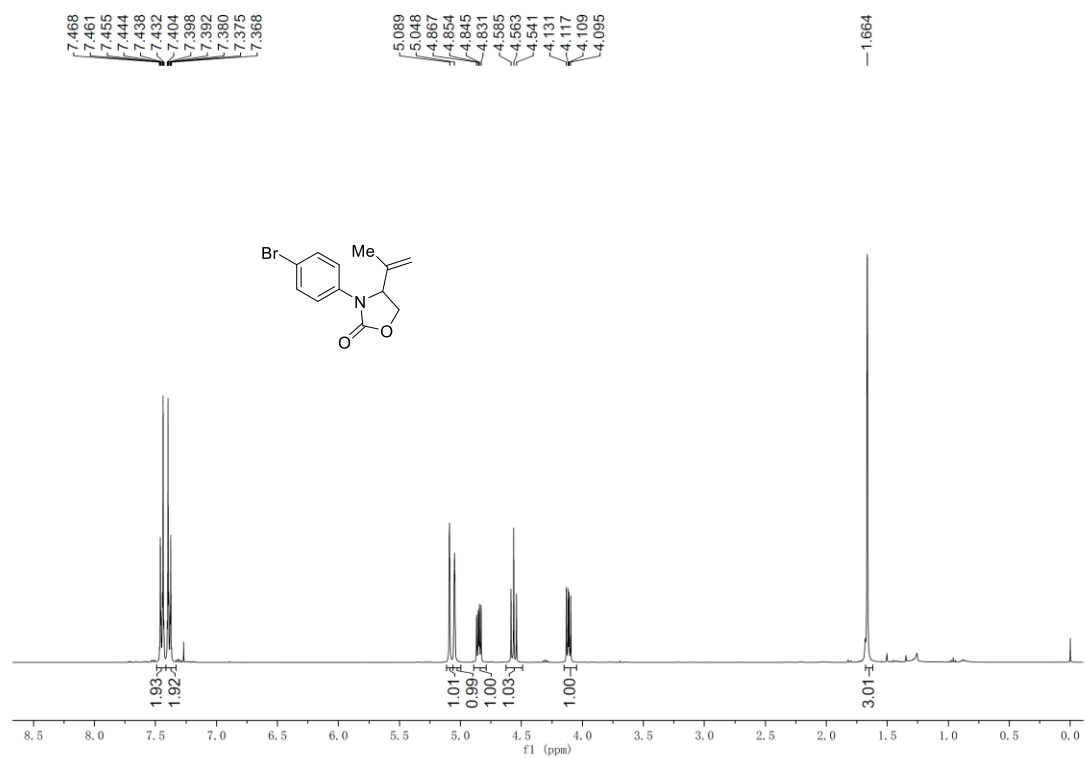




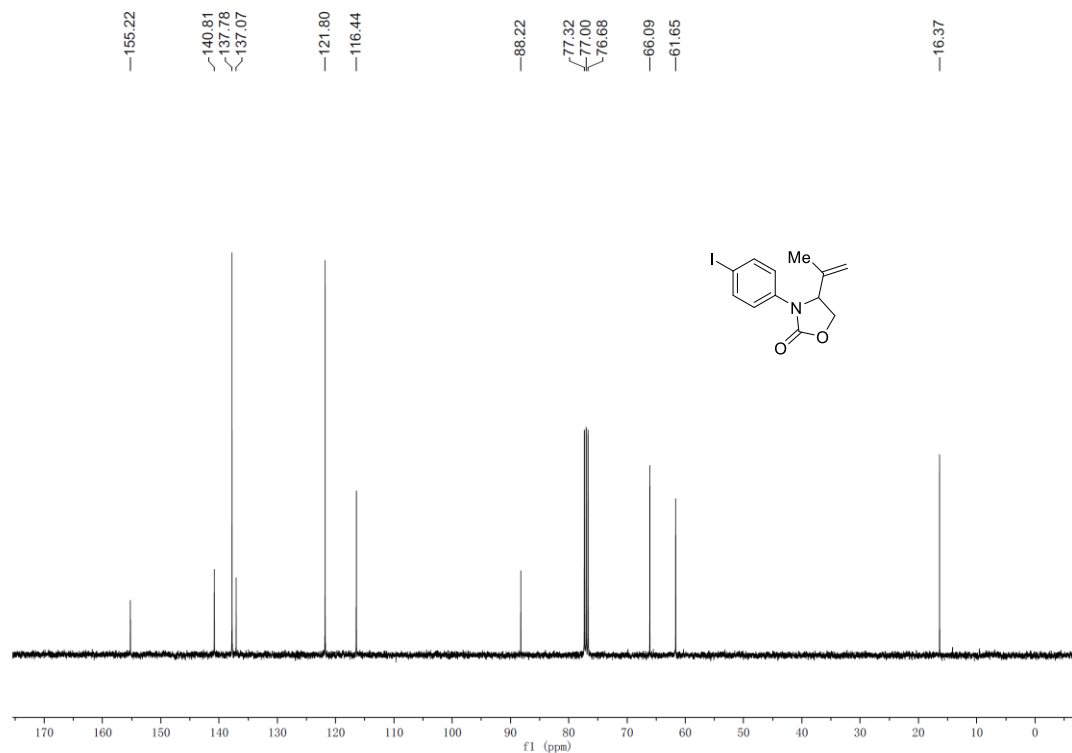
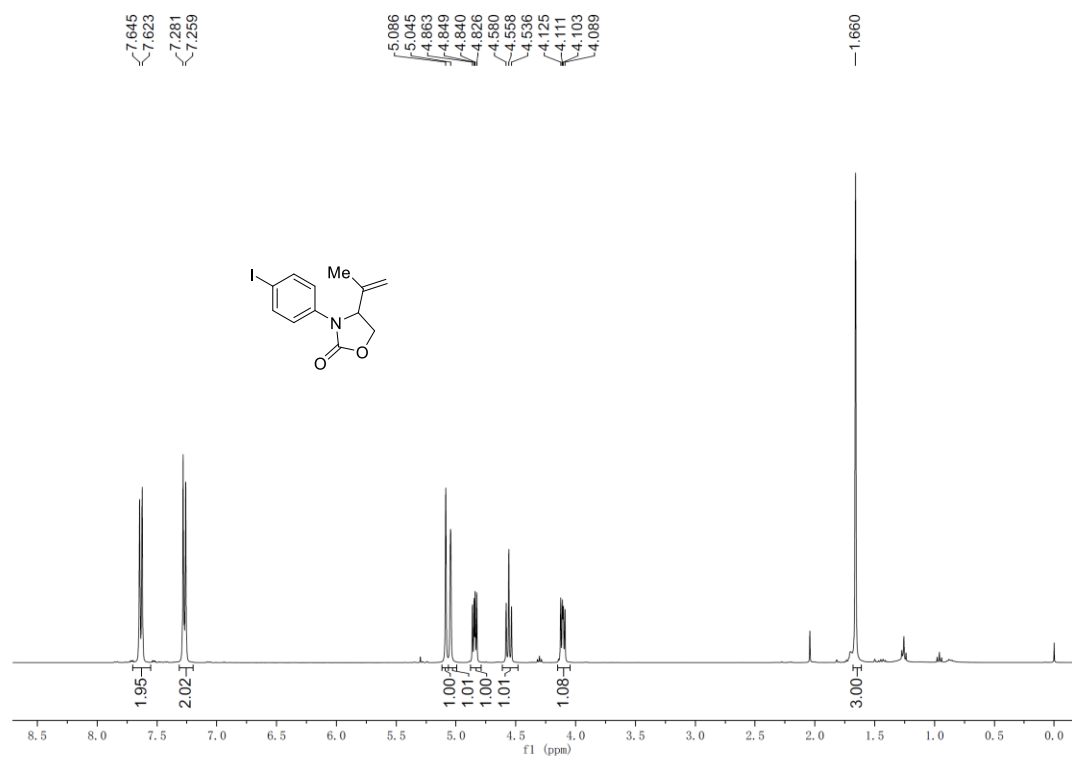
**3-(4-chlorophenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2c)**



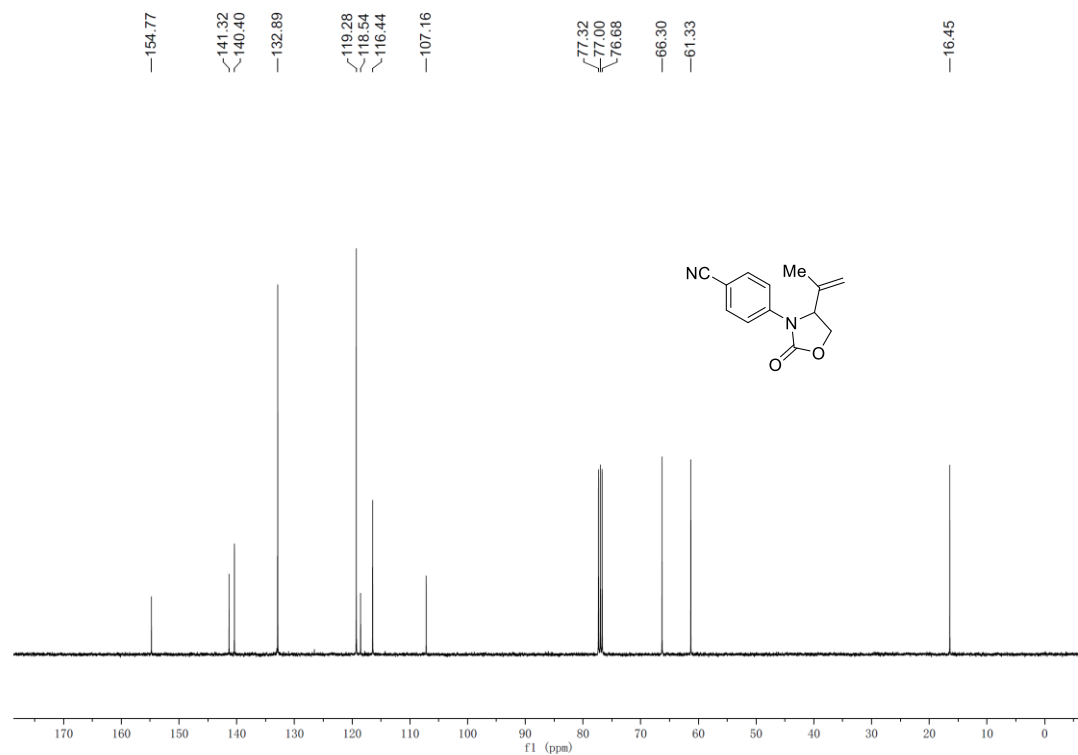
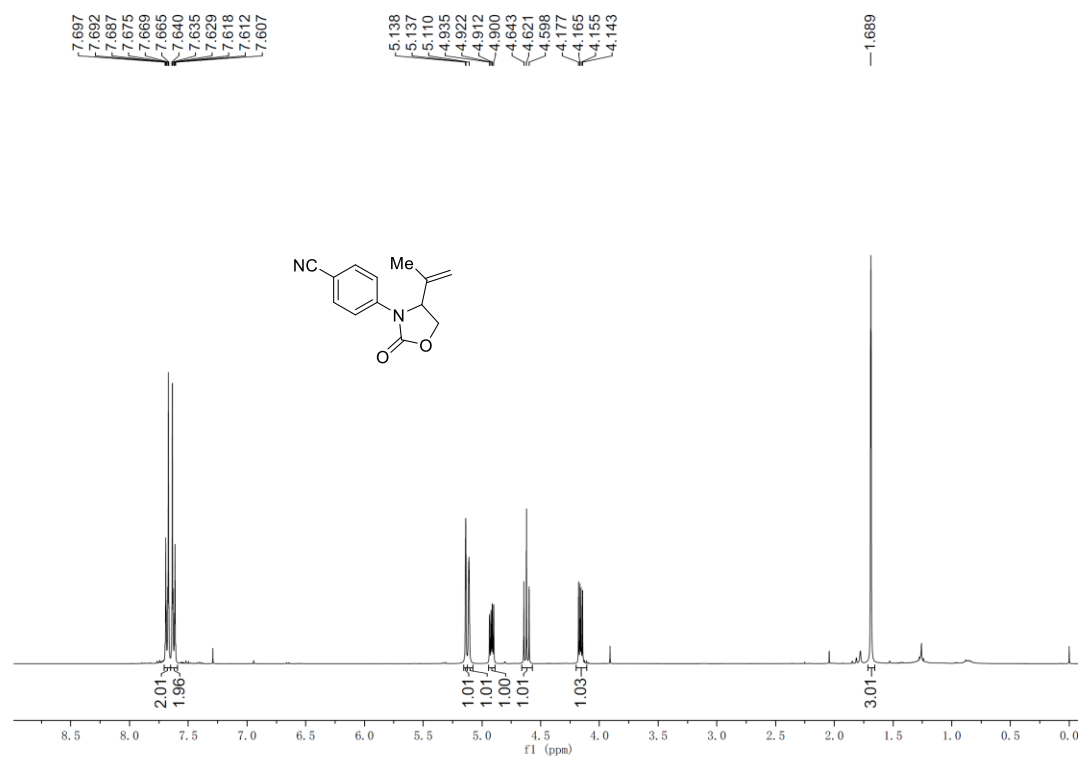
### 3-(4-bromophenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2d)



### 3-(4-iodophenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2e)

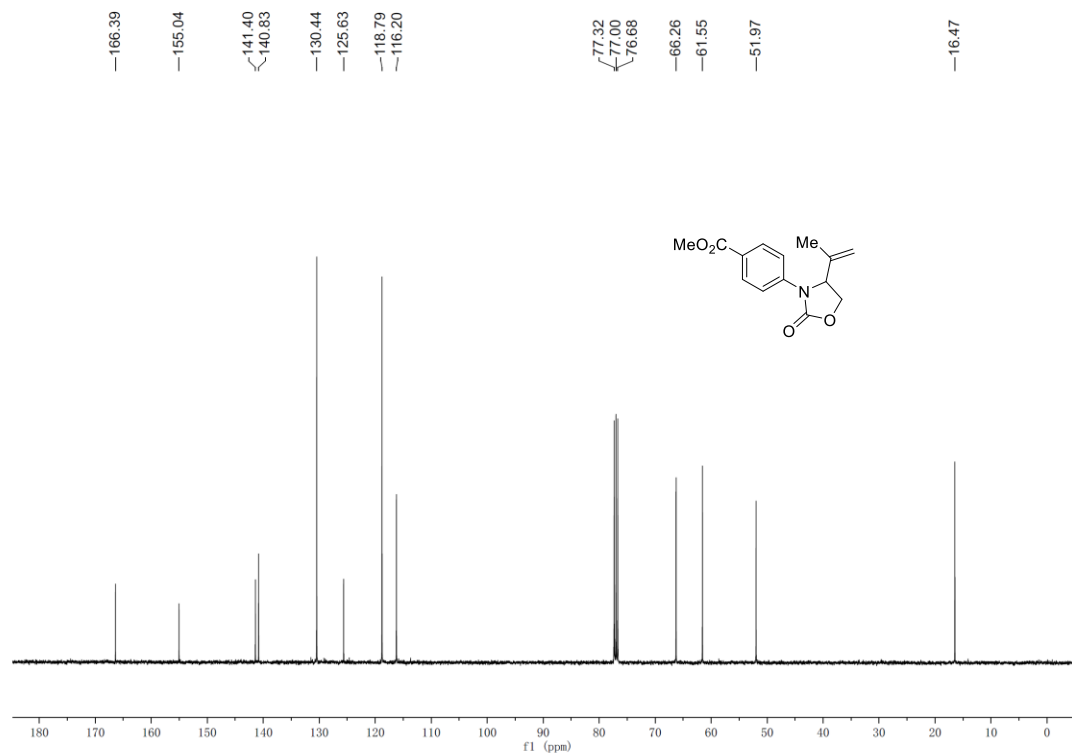
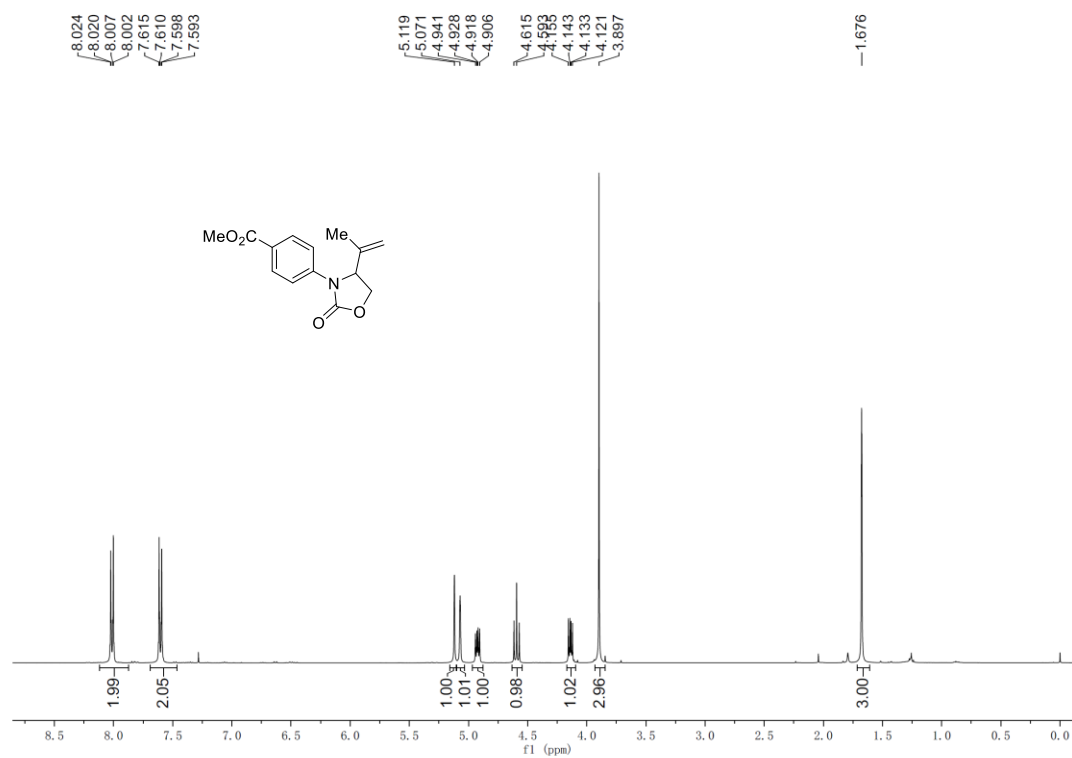


# 4-(2-oxo-4-(prop-1-en-2-yl)oxazolidin-3-yl)benzotrile (2f)

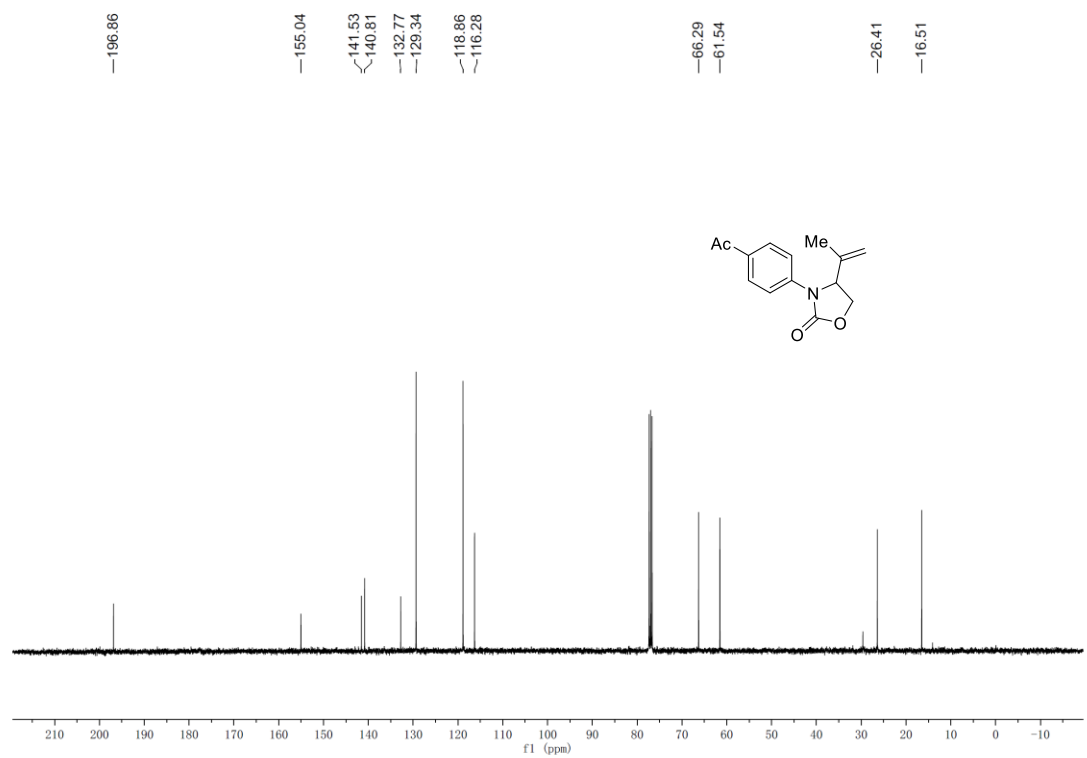
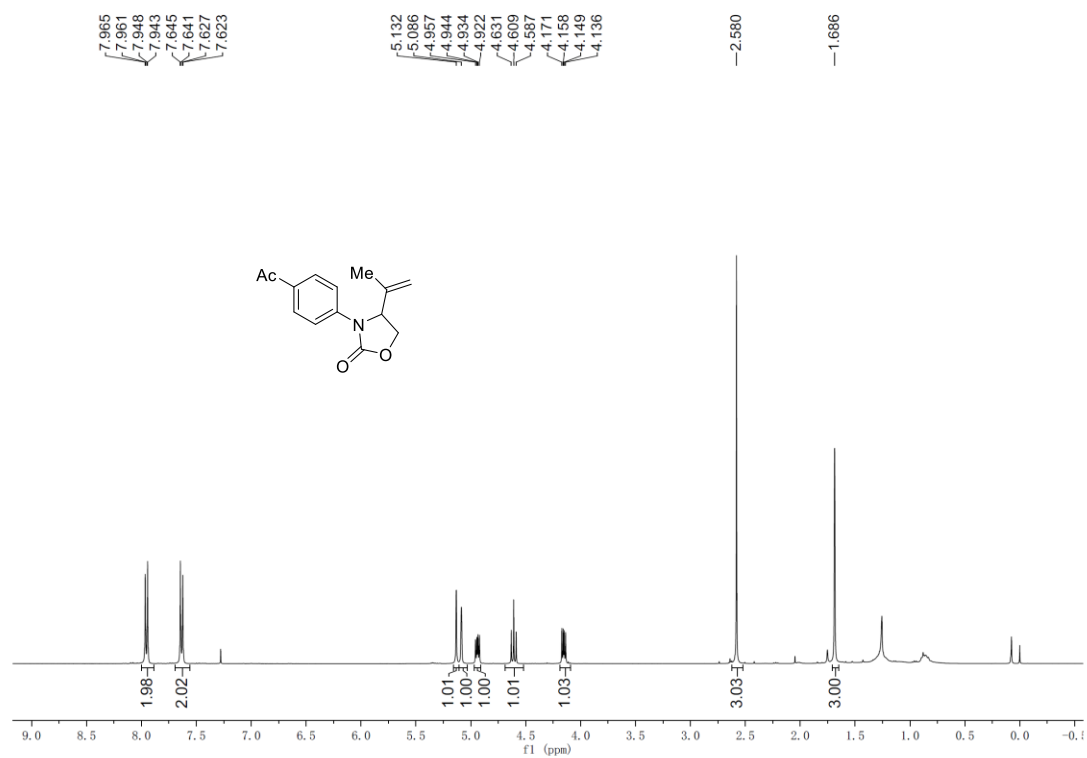




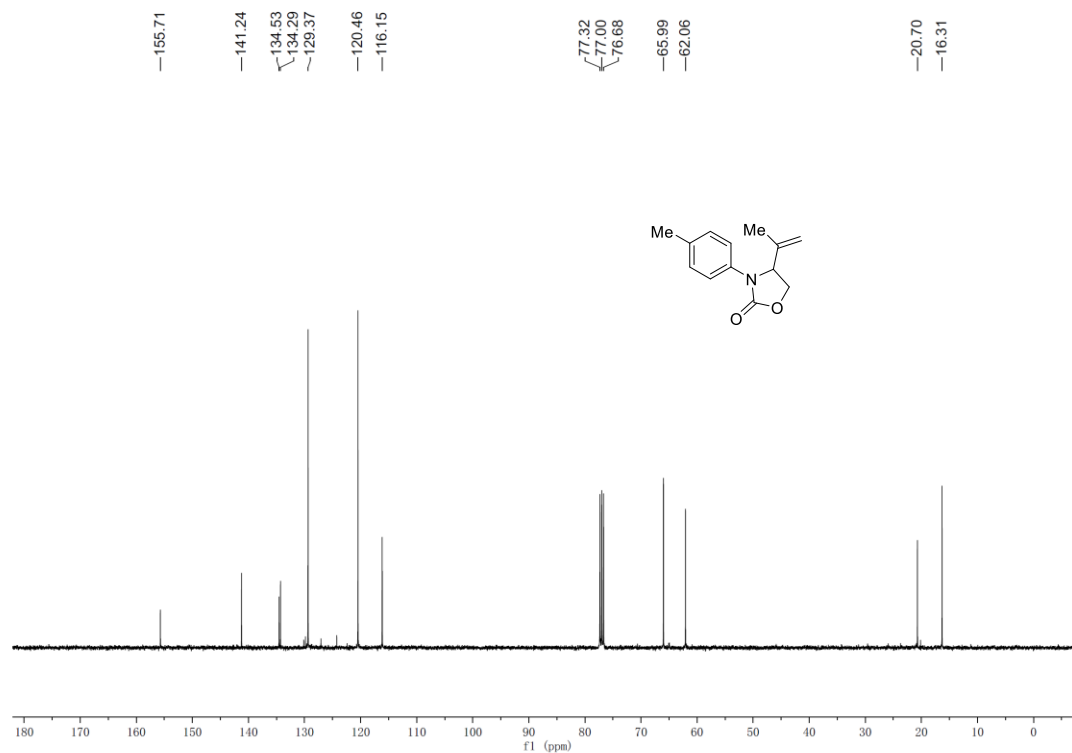
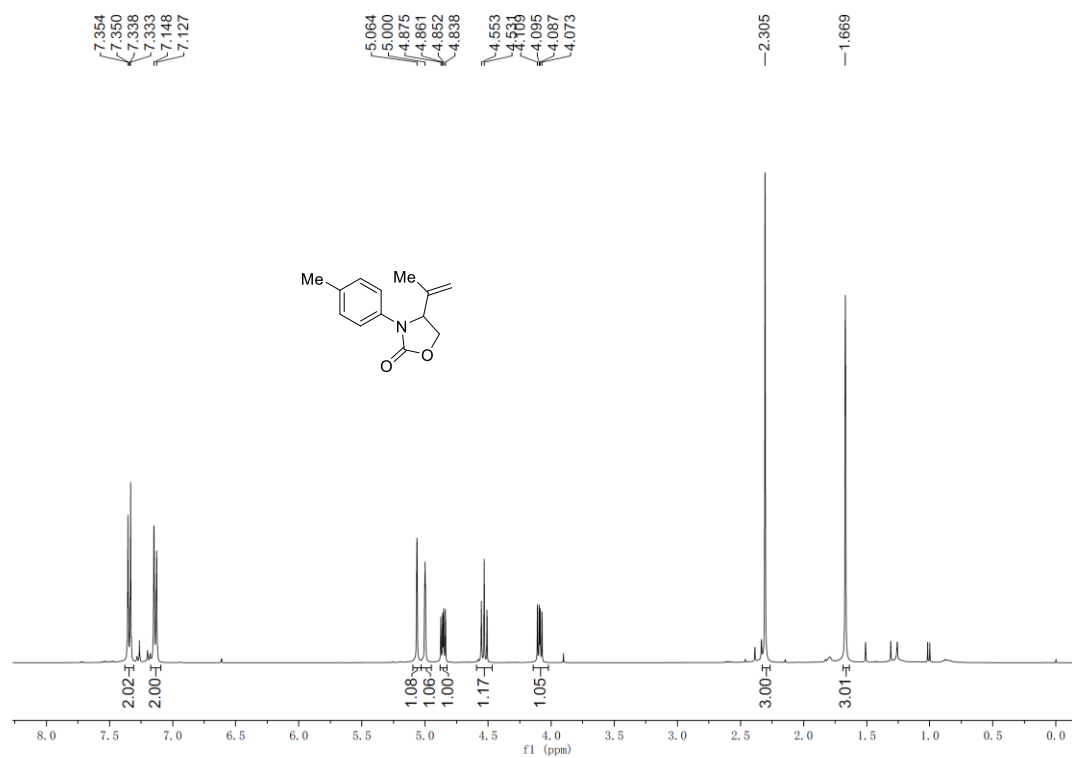
methyl 4-(2-oxo-4-(prop-1-en-2-yl)oxazolidin-3-yl)benzoate (2g)



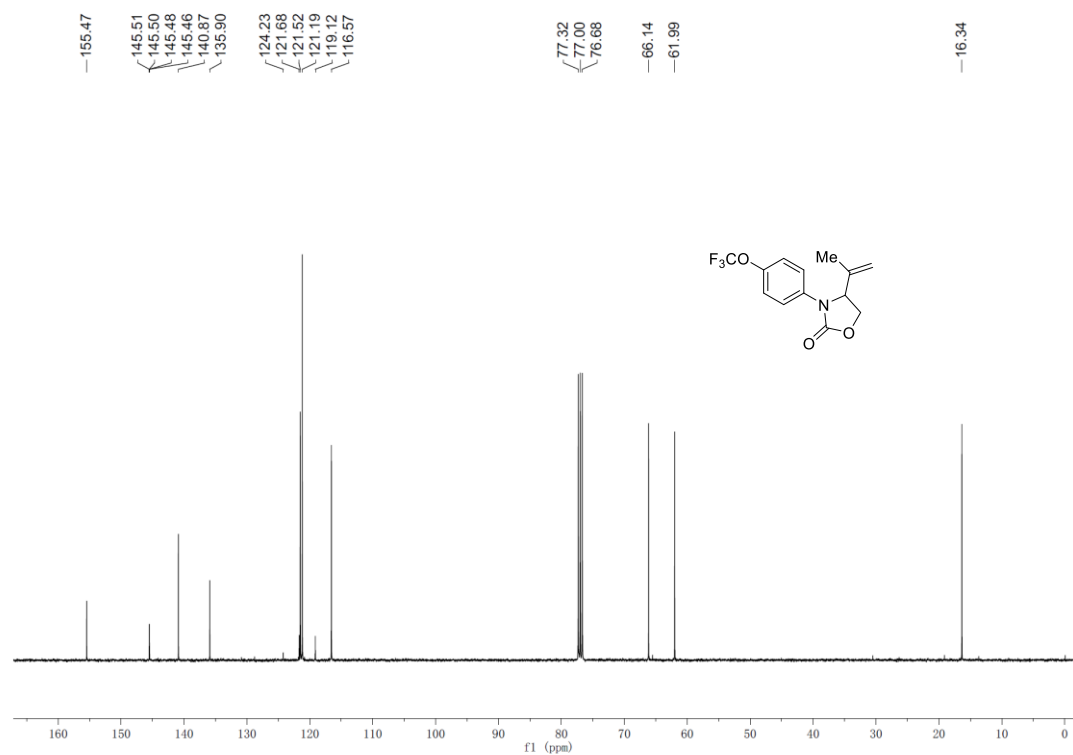
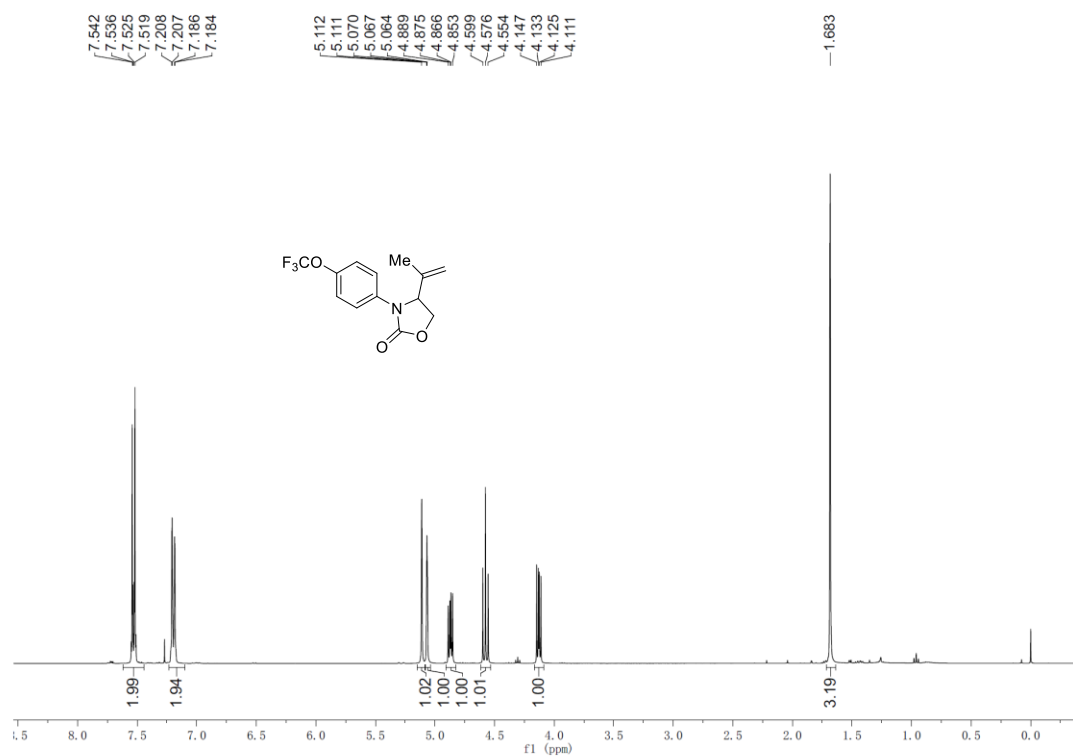
### 3-(4-acetylphenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2h)

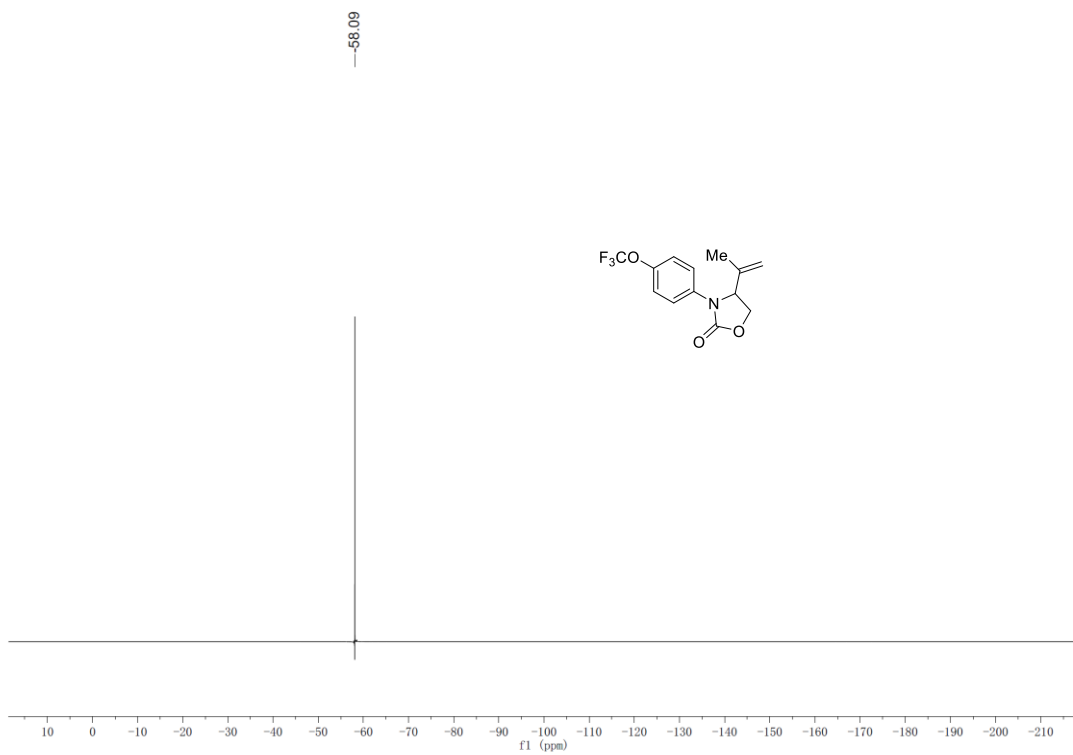


4-(prop-1-en-2-yl)-3-(p-tolyl)oxazolidin-2-one (2i)

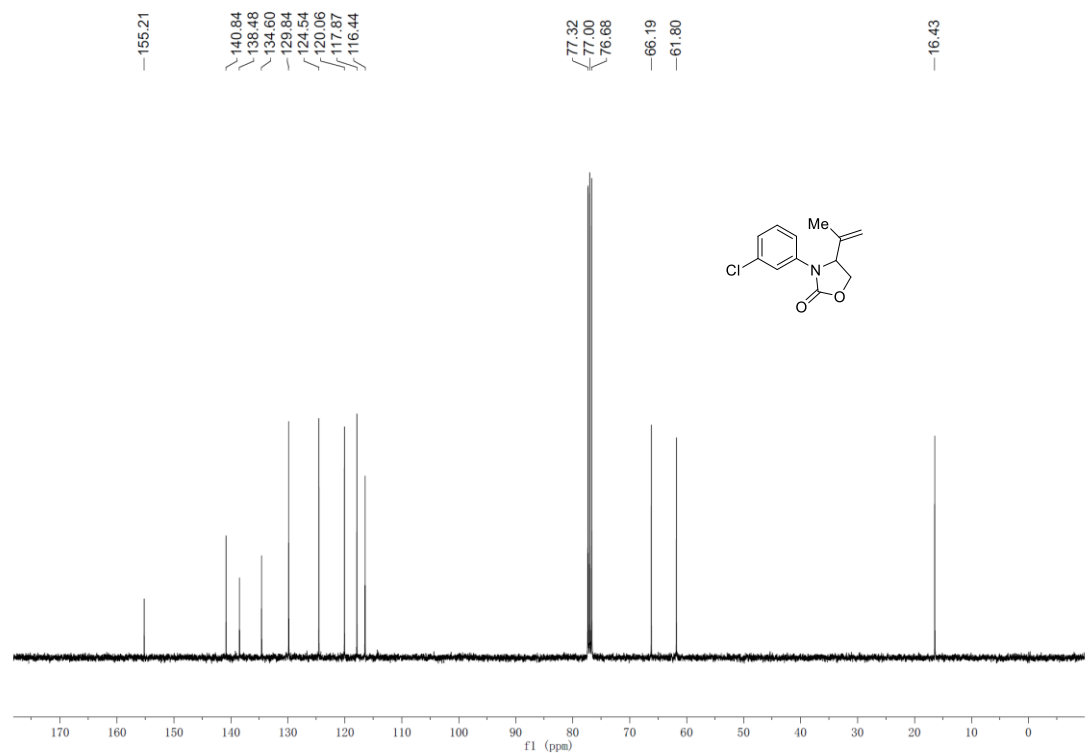
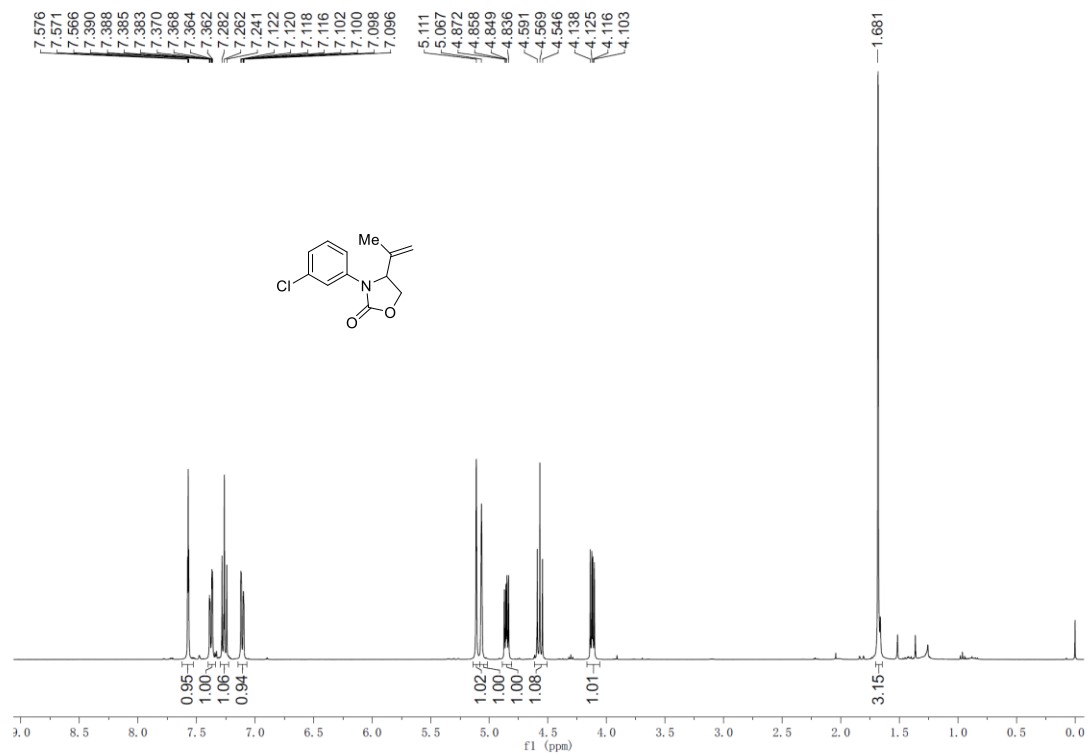


4-(prop-1-en-2-yl)-3-(4-(trifluoromethoxy)phenyl)oxazolidin-2-one (2j)

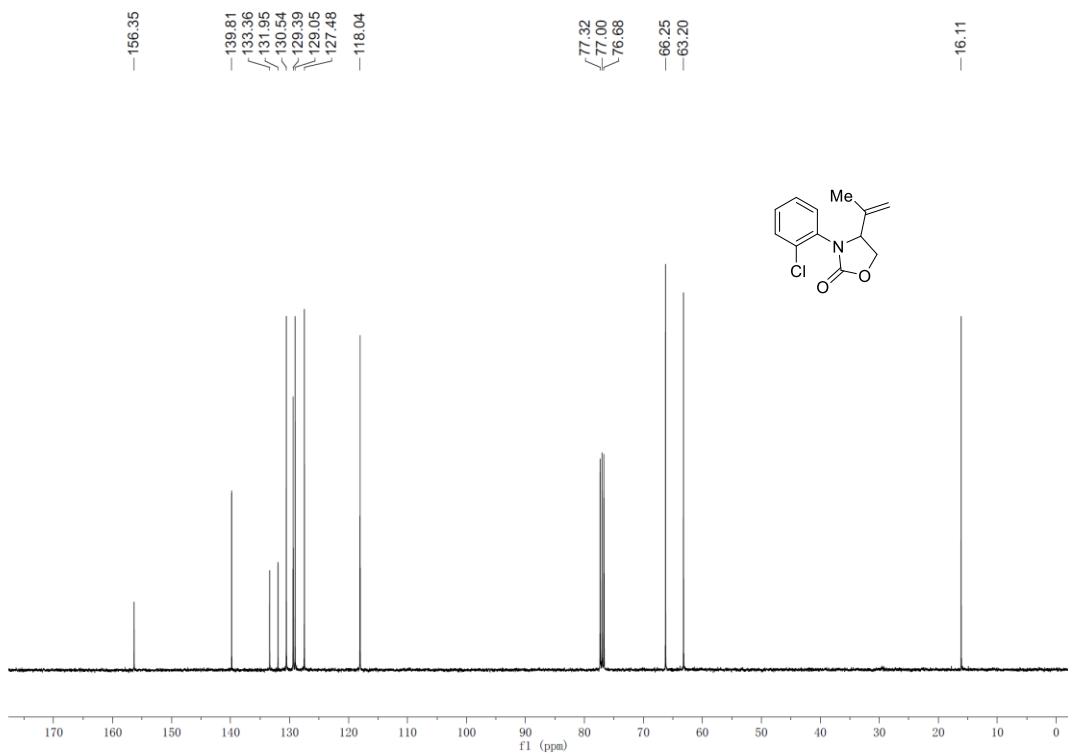
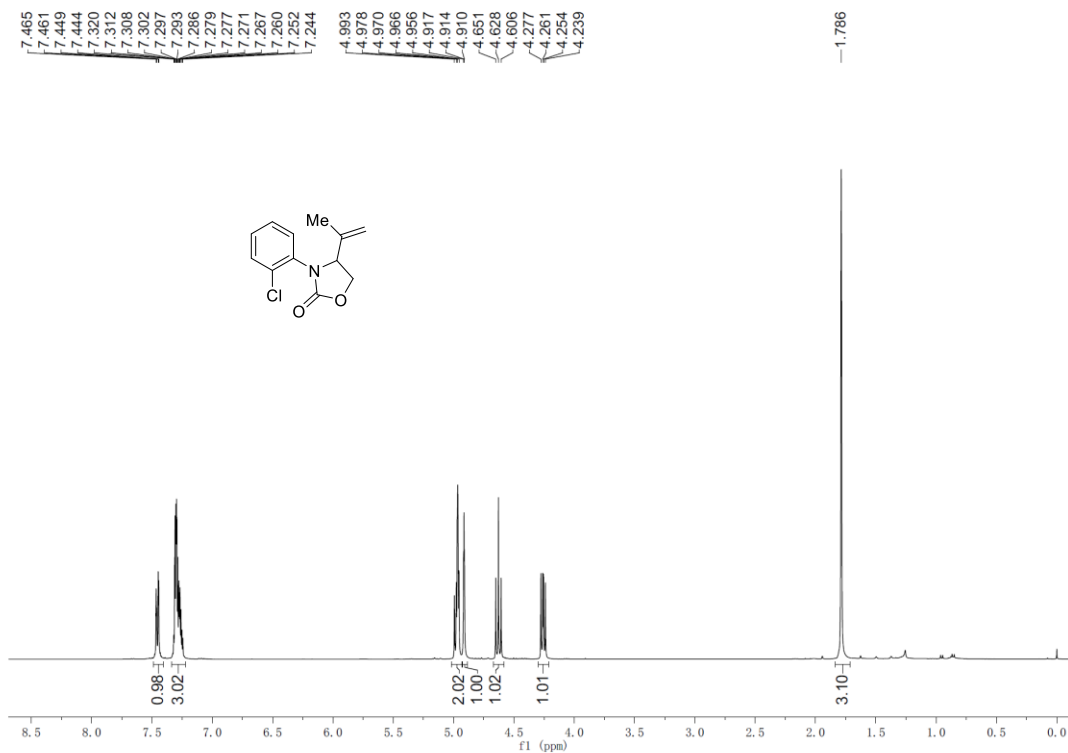




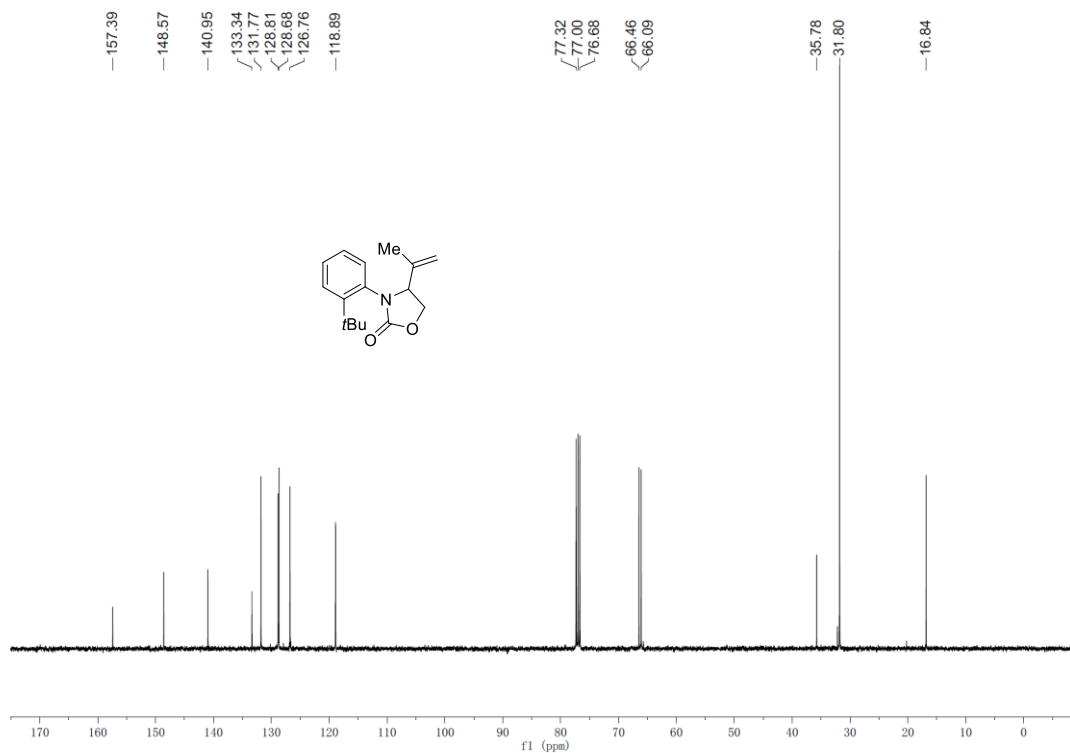
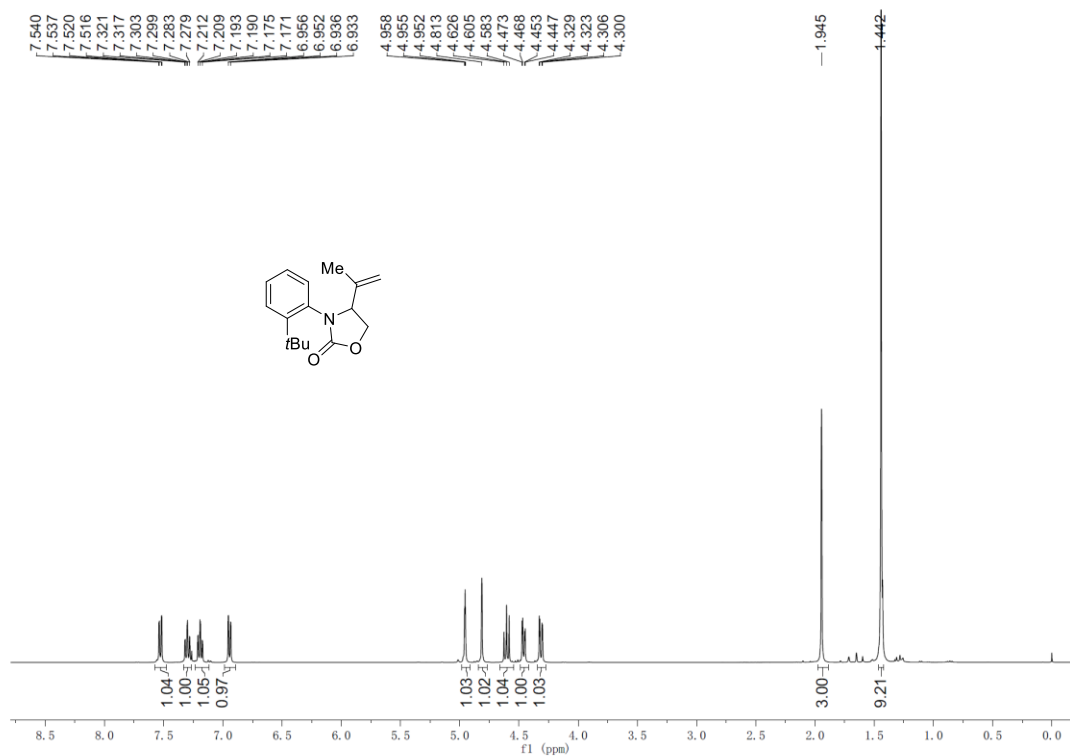
3-(3-chlorophenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2k)



### 3-(2-chlorophenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2l)

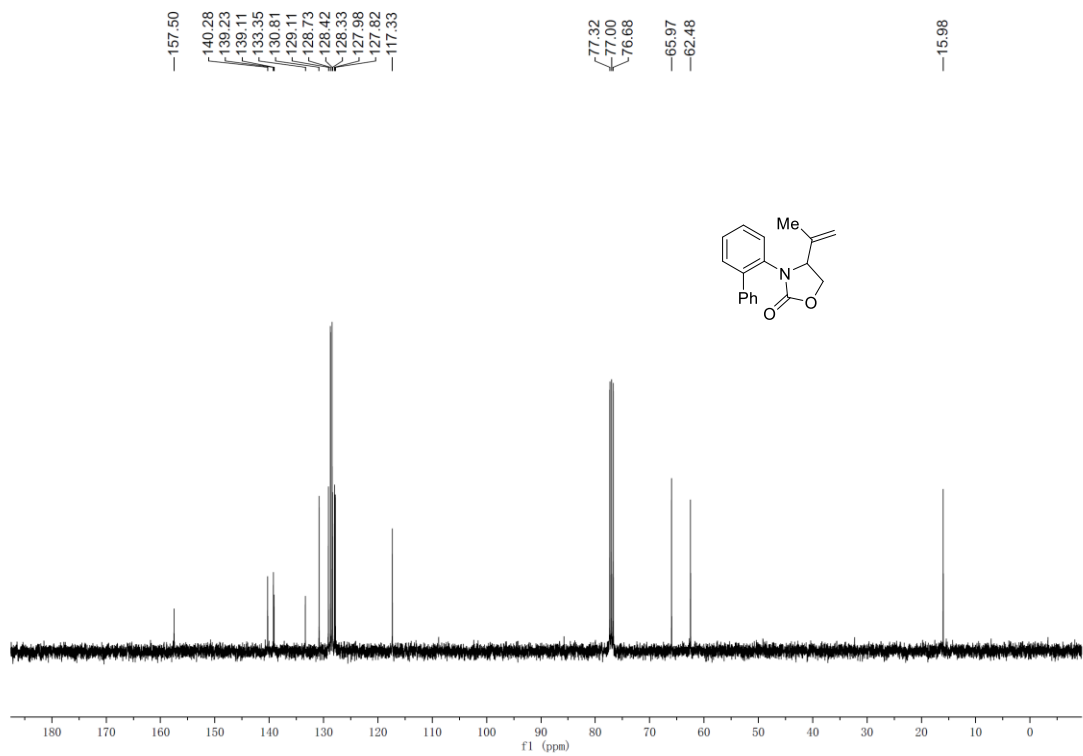
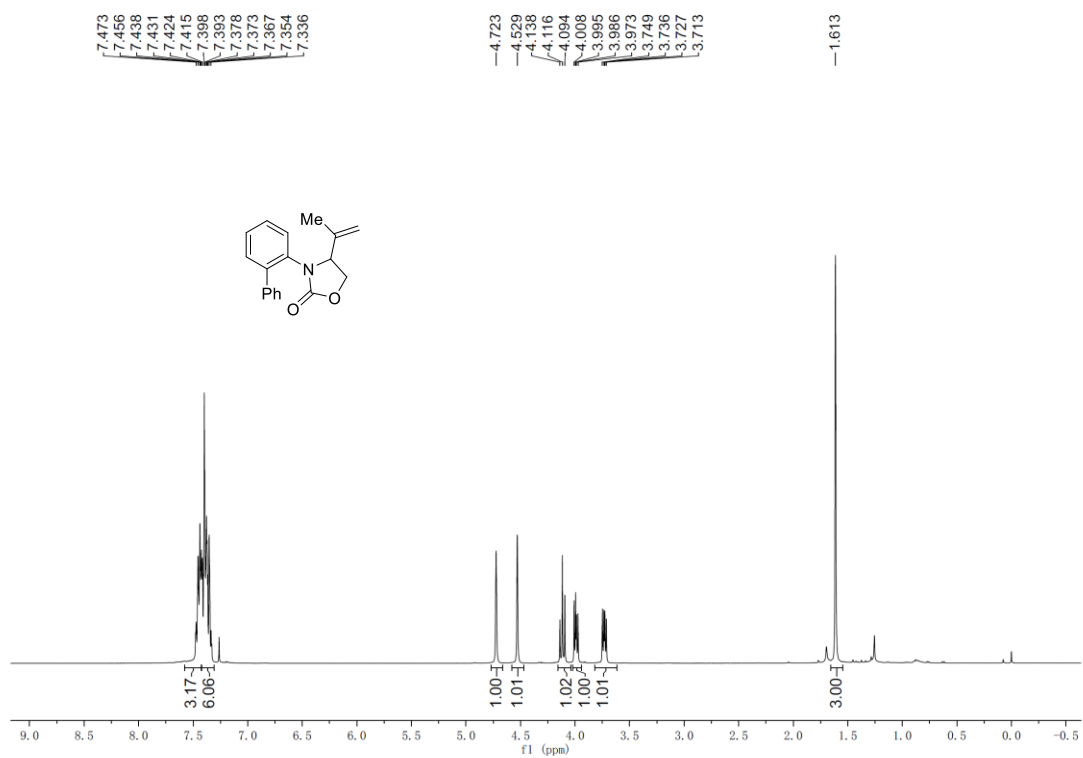


**3-(2-(tert-butyl)phenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2m)**

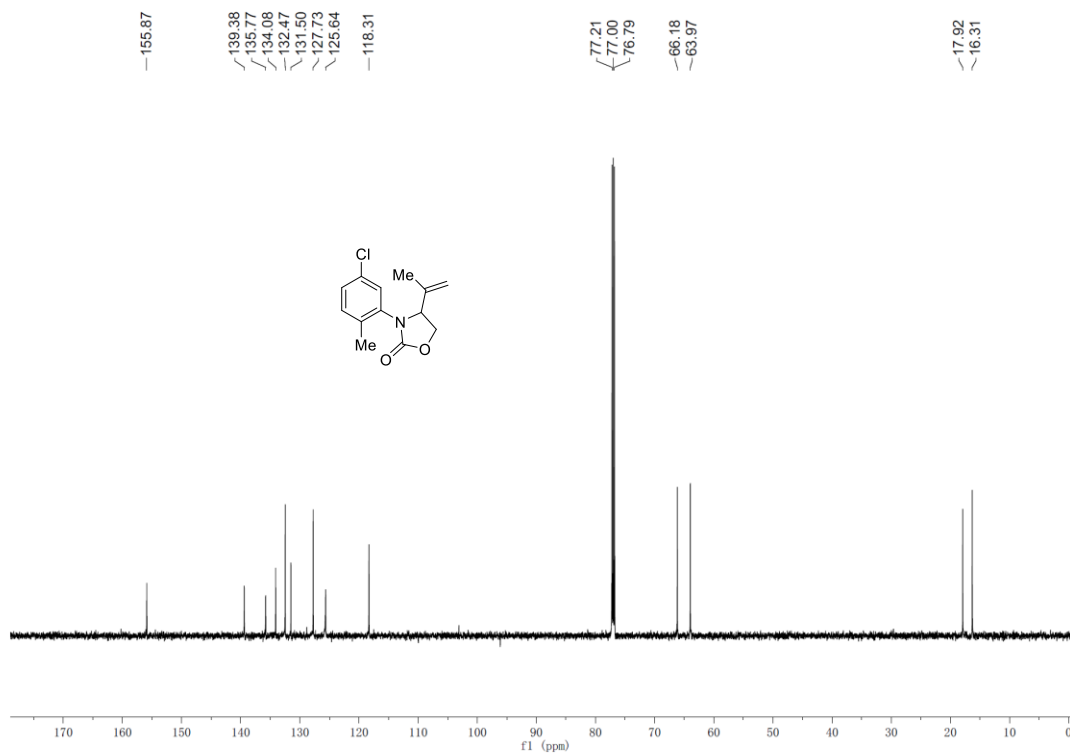
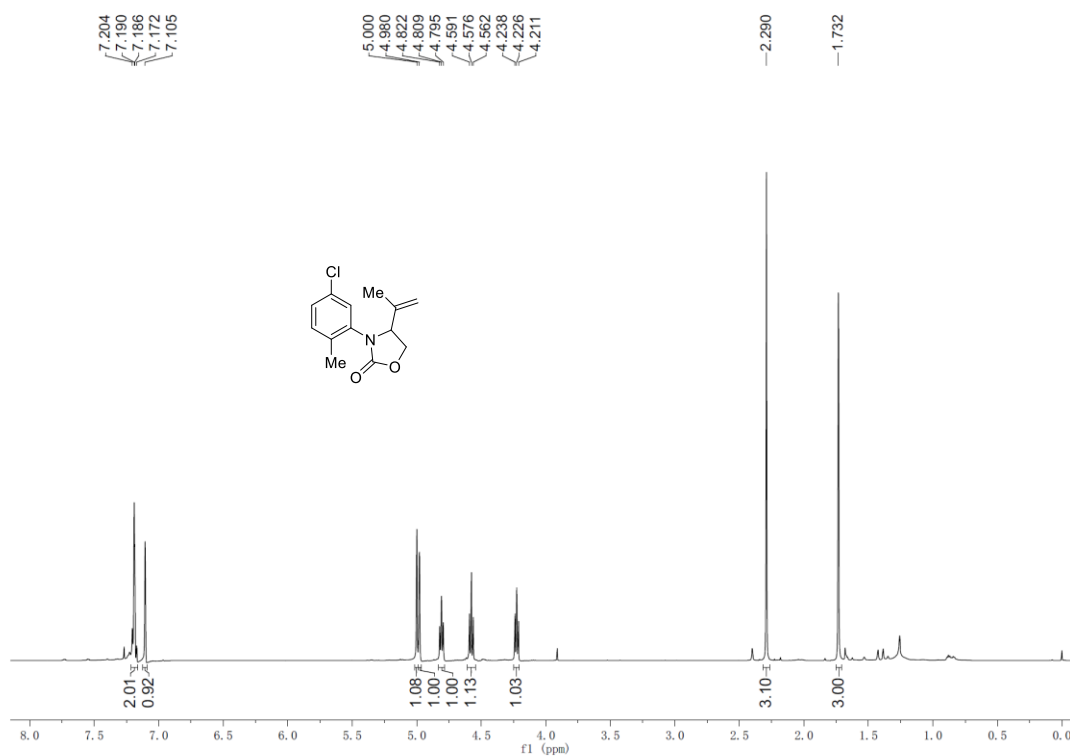




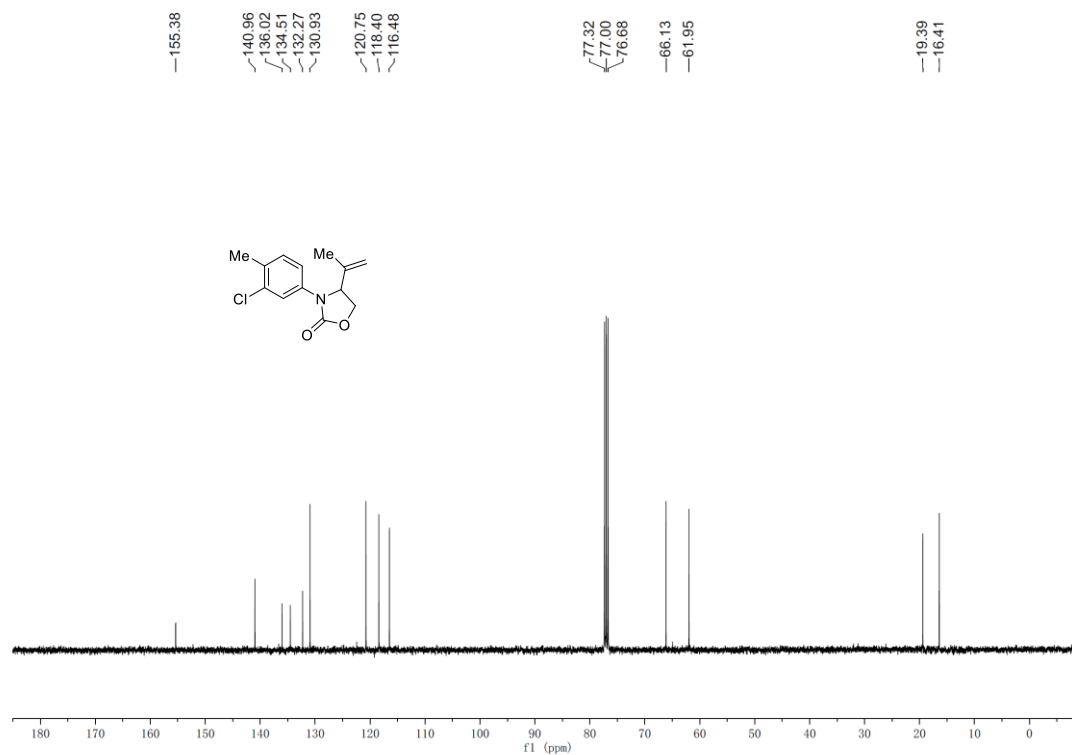
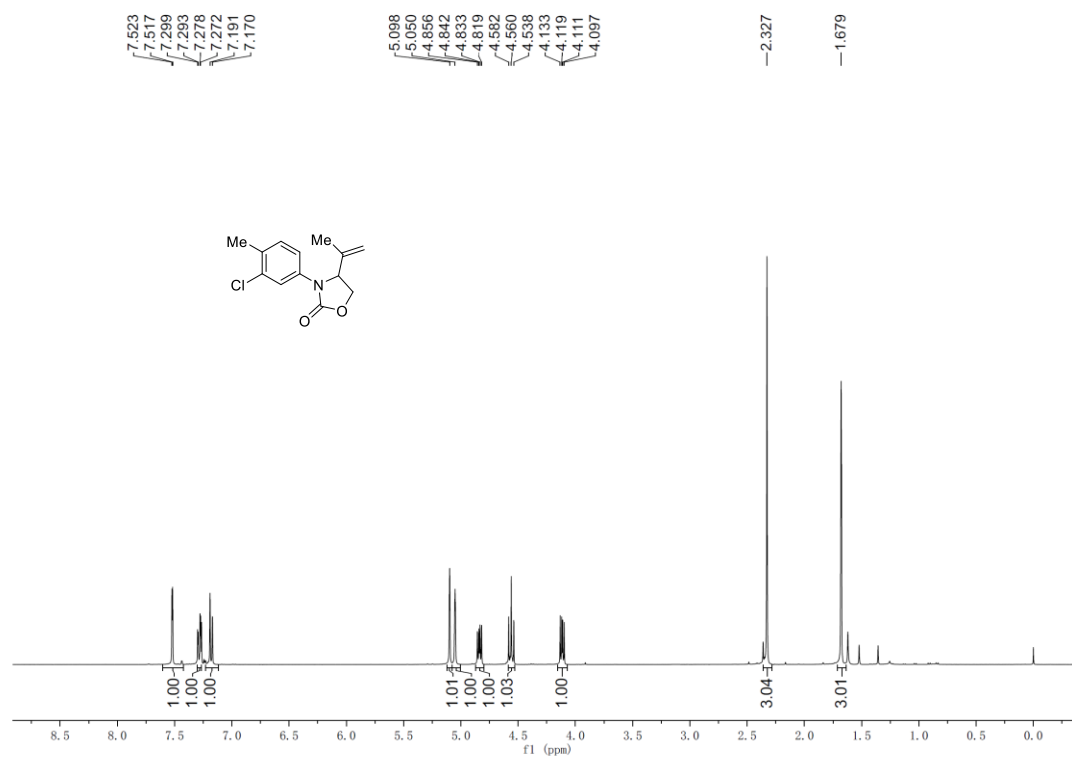
### 3-([1,1'-biphenyl]-2-yl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2n)



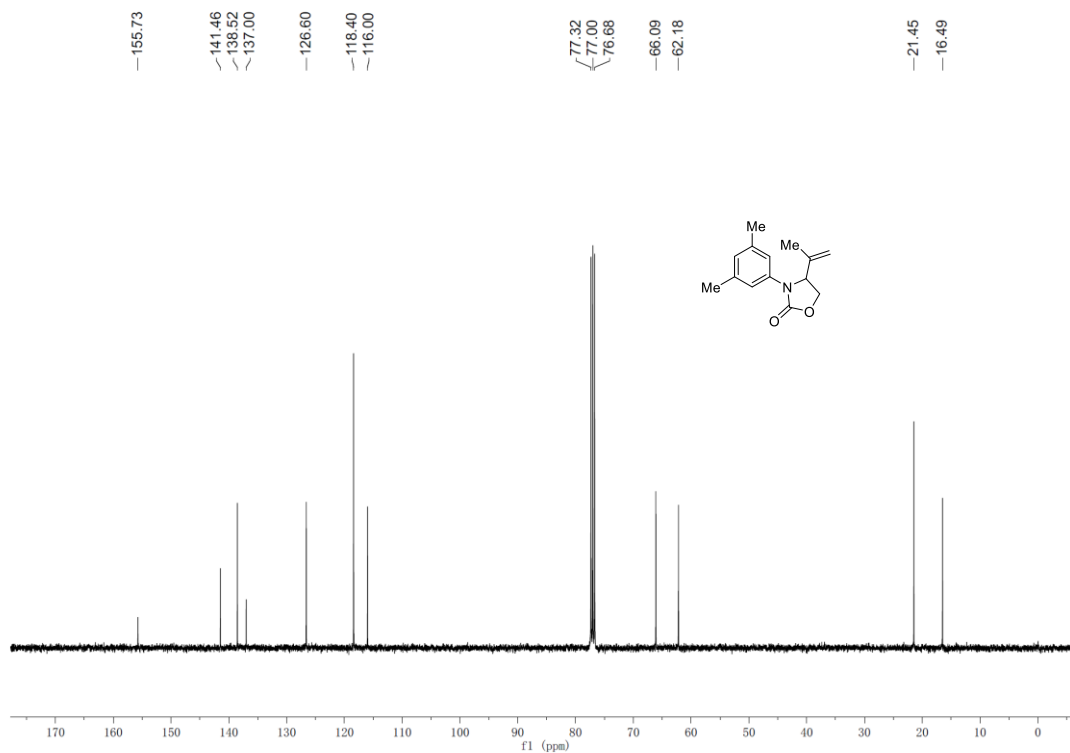
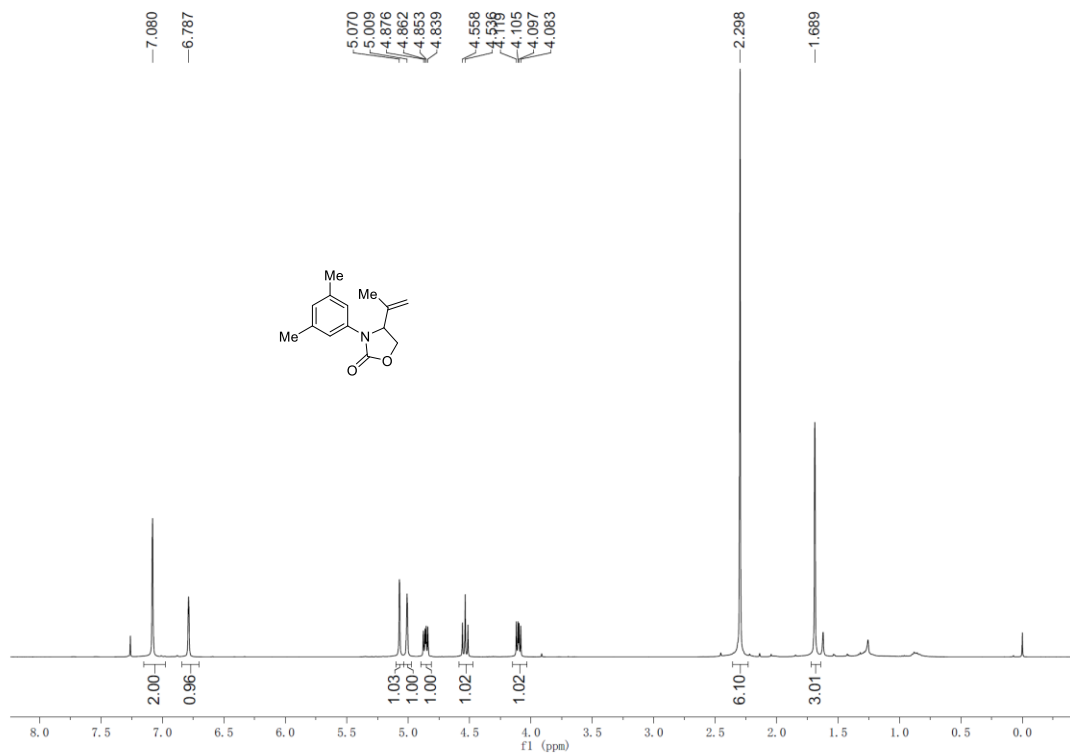
### 3-(5-chloro-2-methylphenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2o)



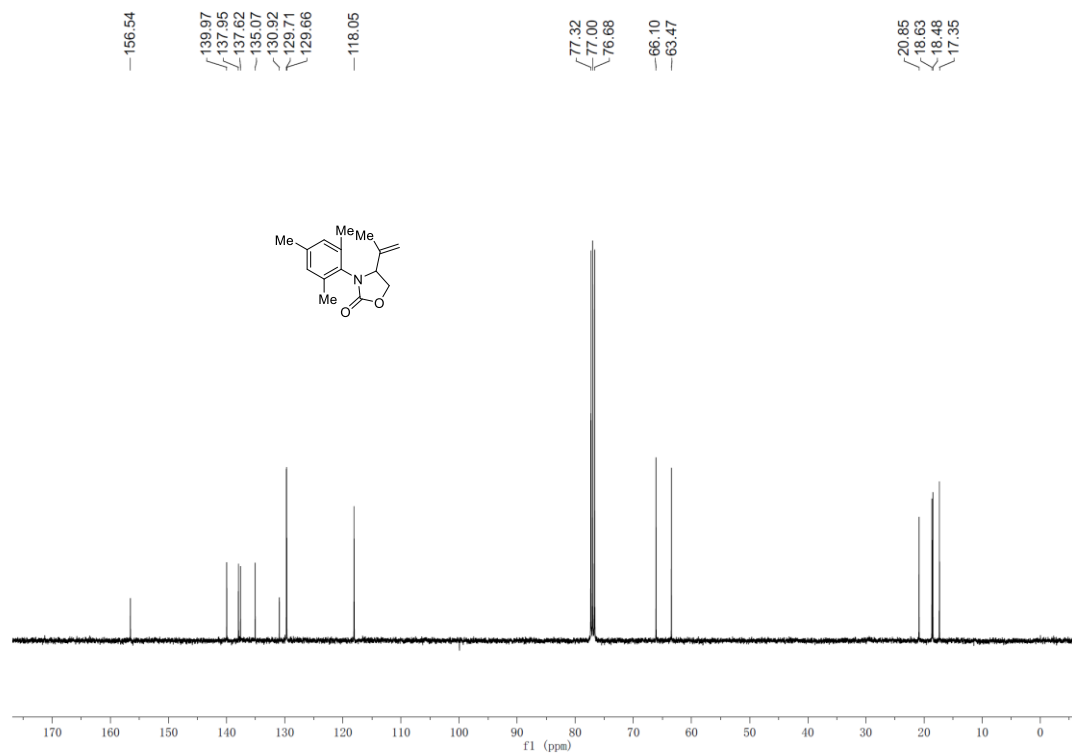
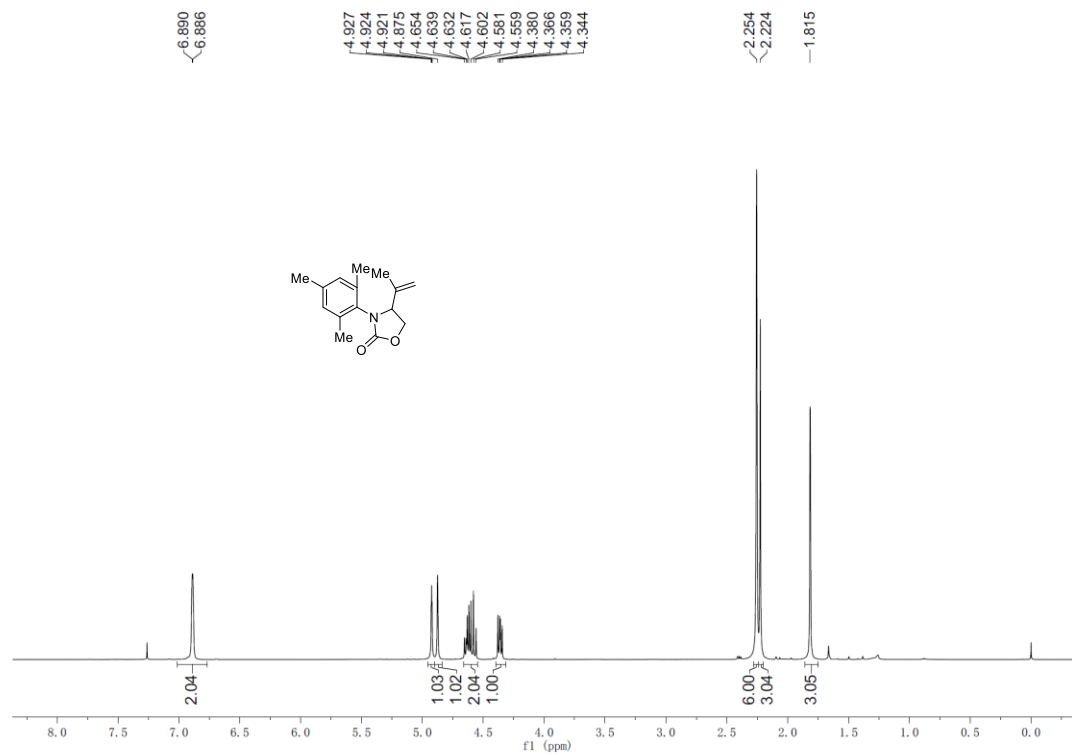
**3-(3-chloro-4-methylphenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2p)**



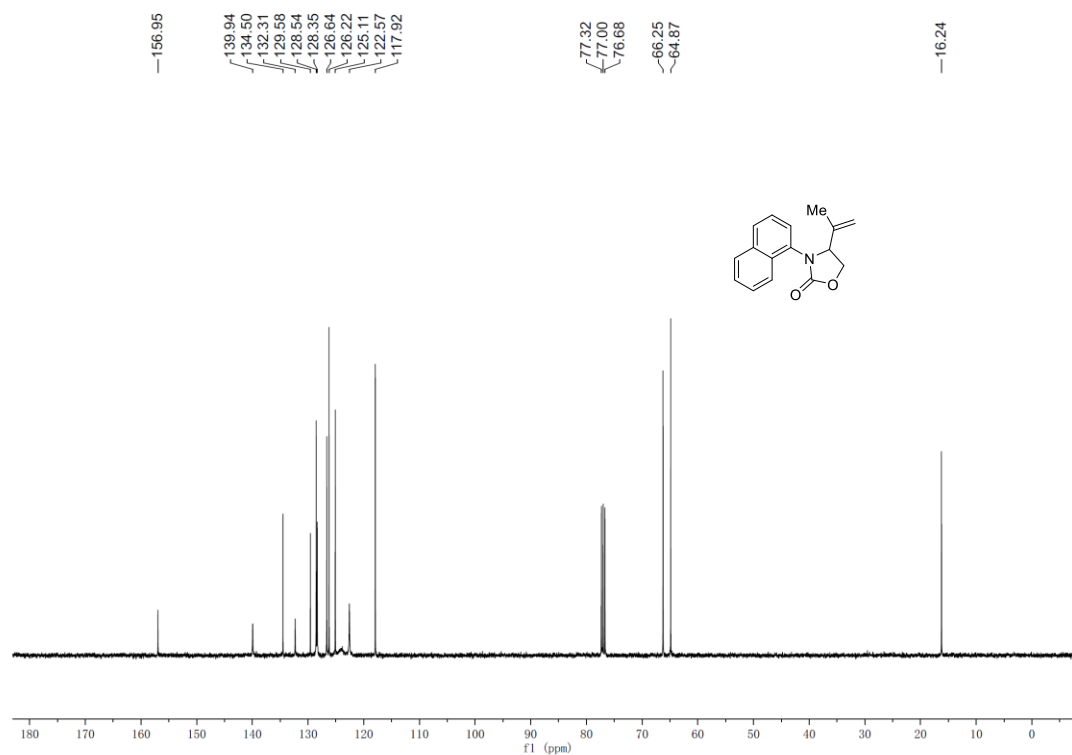
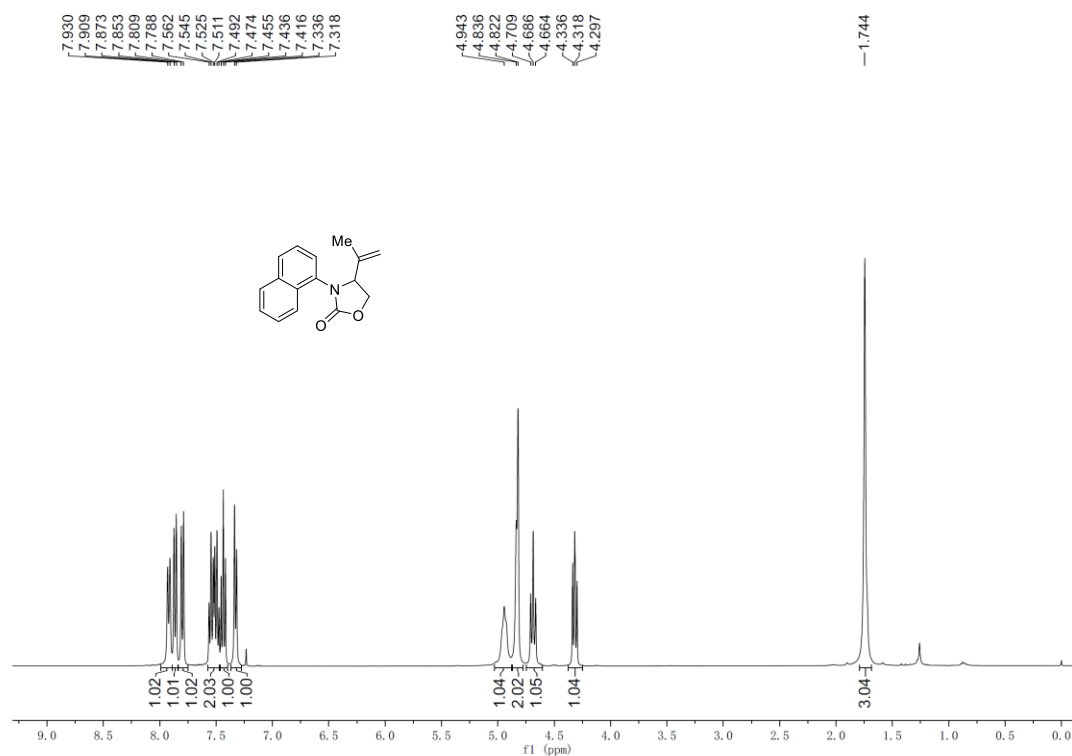
### 3-(3,5-dimethylphenyl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2q)



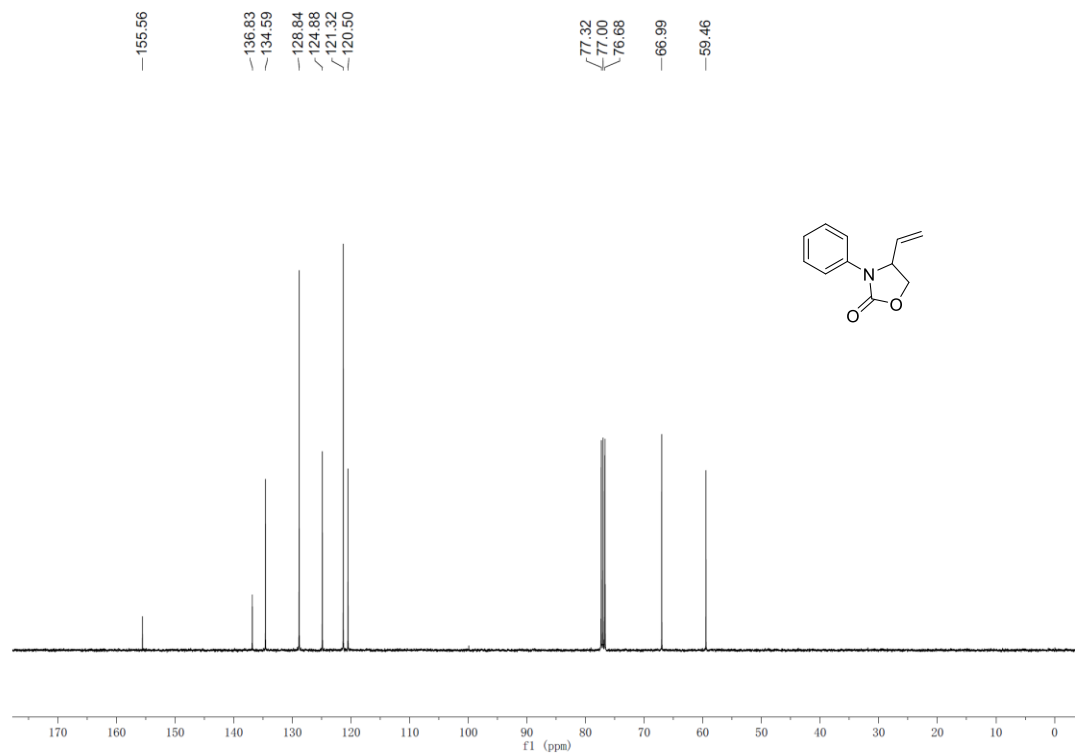
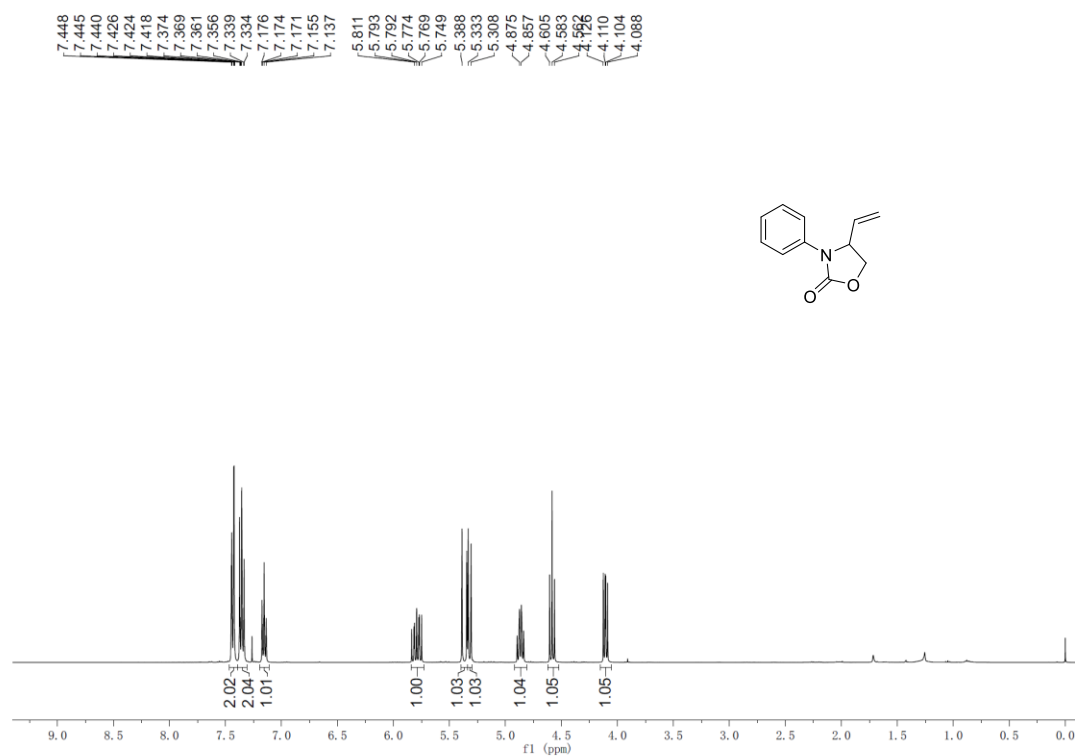
### 3-mesityl-4-(prop-1-en-2-yl)oxazolidin-2-one (2r)



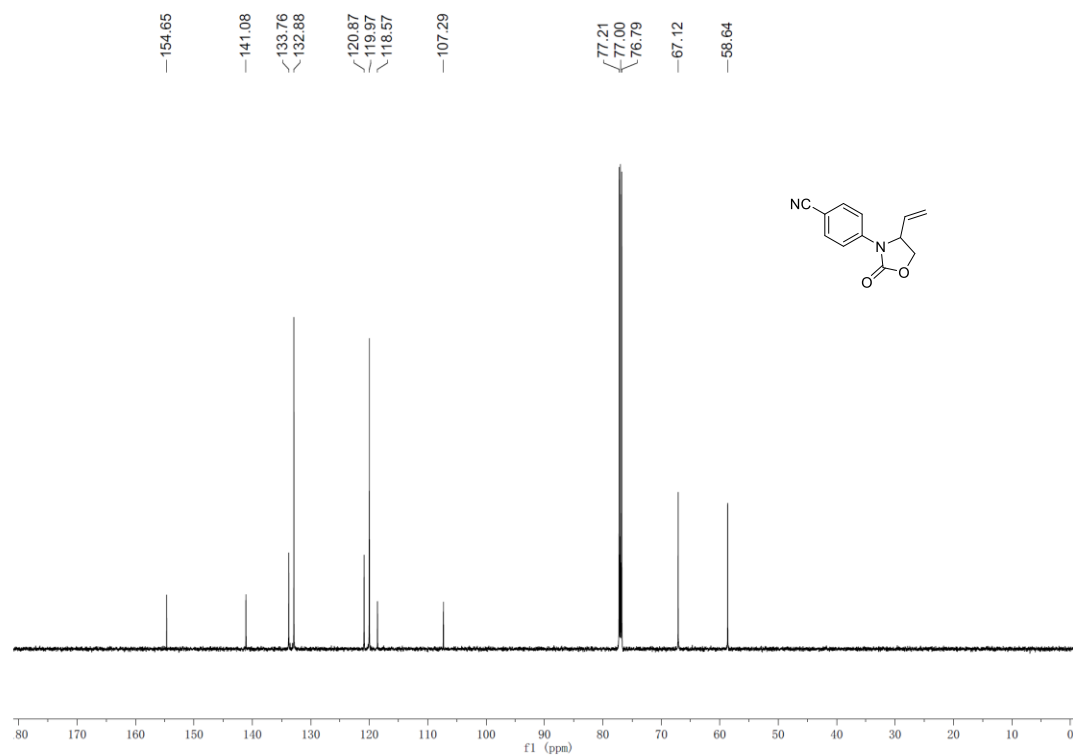
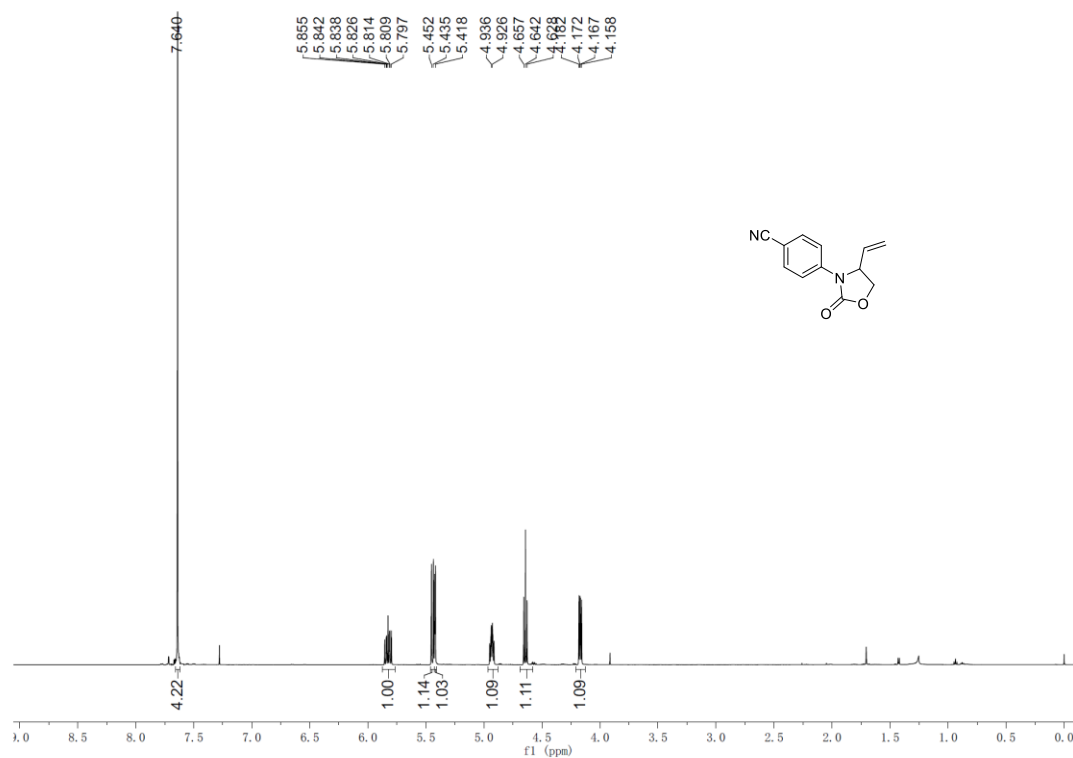
### 3-(naphthalen-1-yl)-4-(prop-1-en-2-yl)oxazolidin-2-one (2s)



### 3-phenyl-4-vinylloxazolidin-2-one (2t)

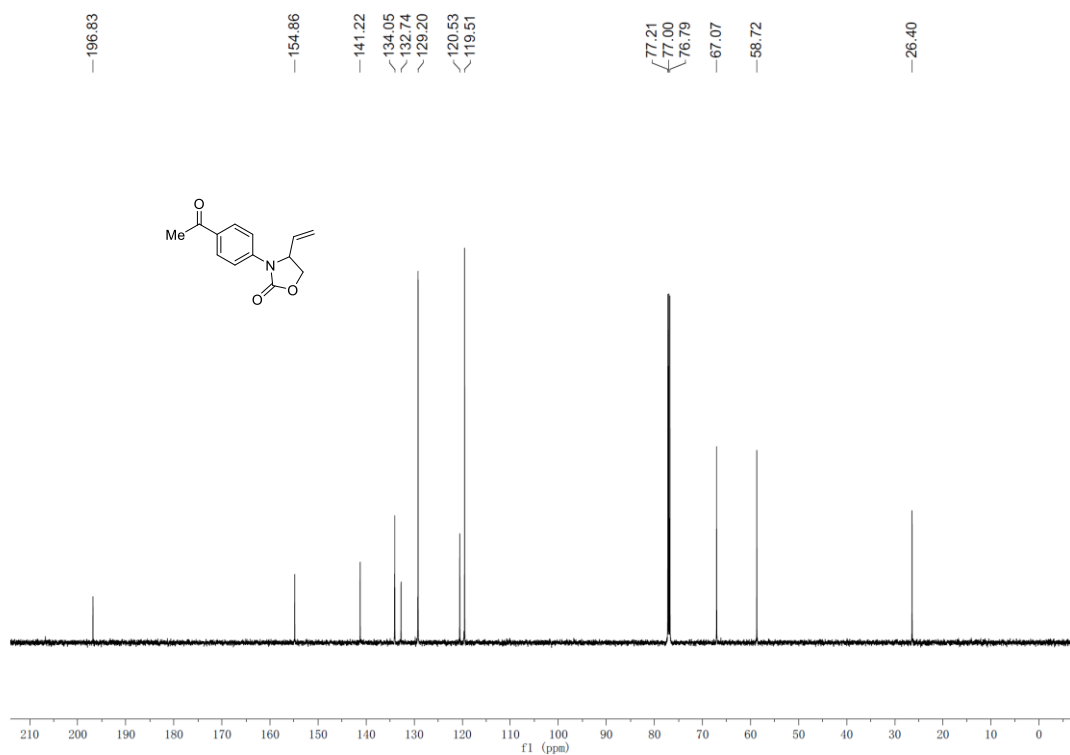
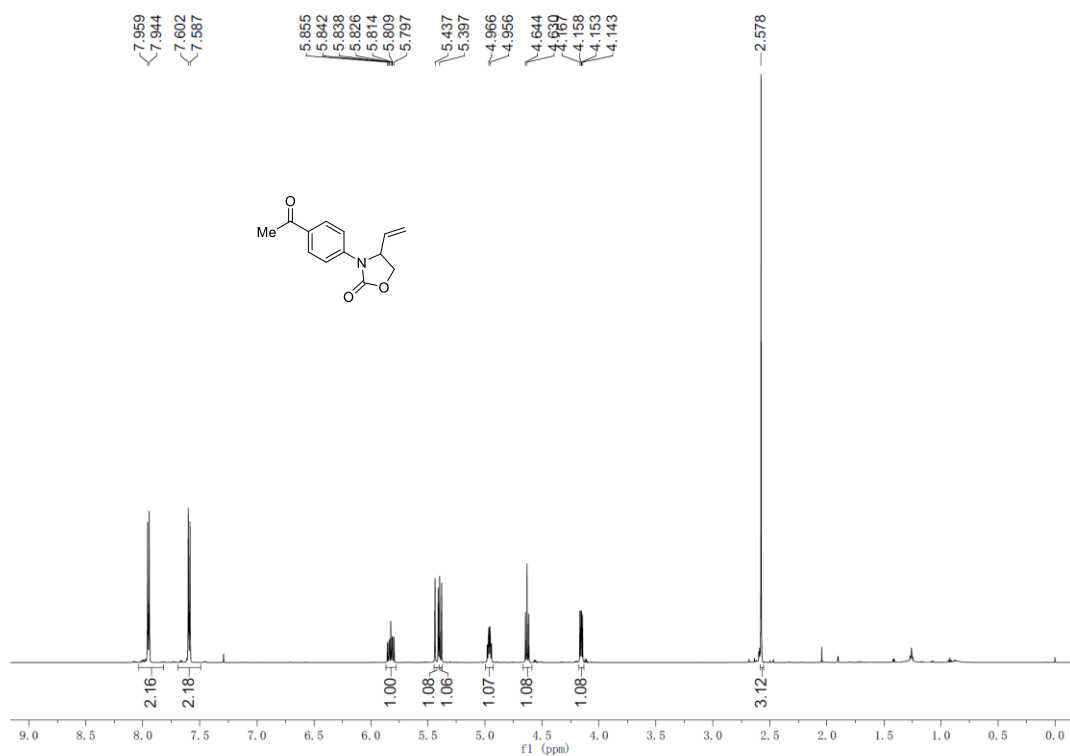


# 4-(2-oxo-4-vinylloxazolidin-3-yl)benzonitrile (2u)

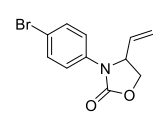
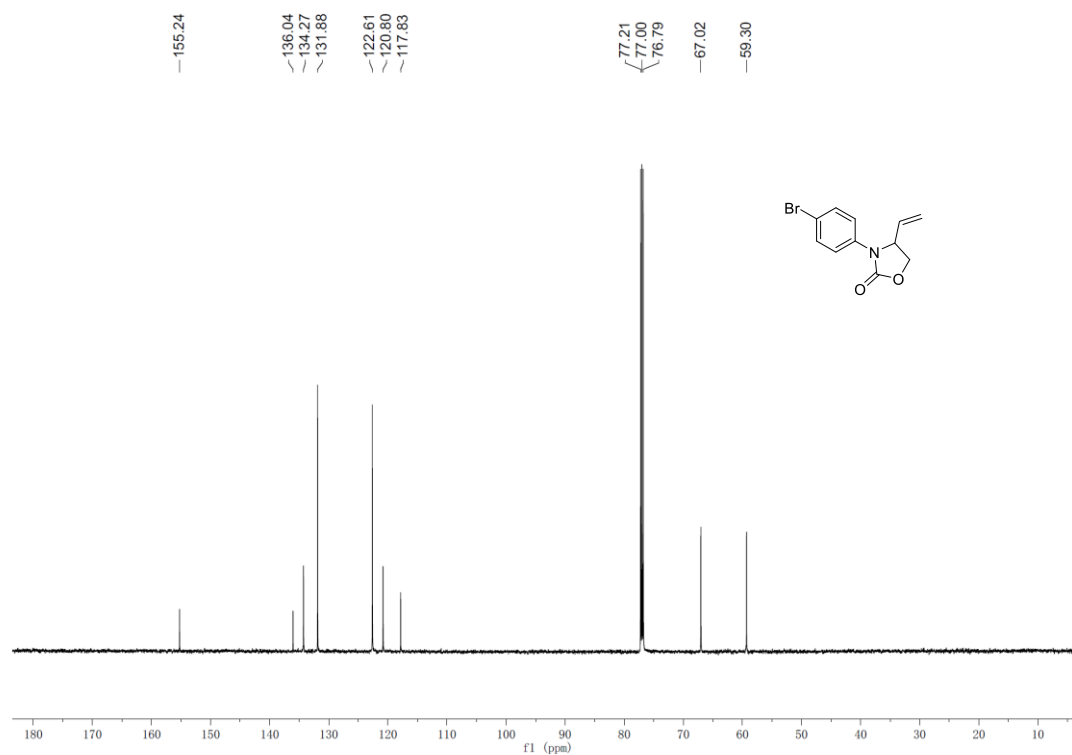
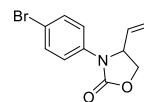
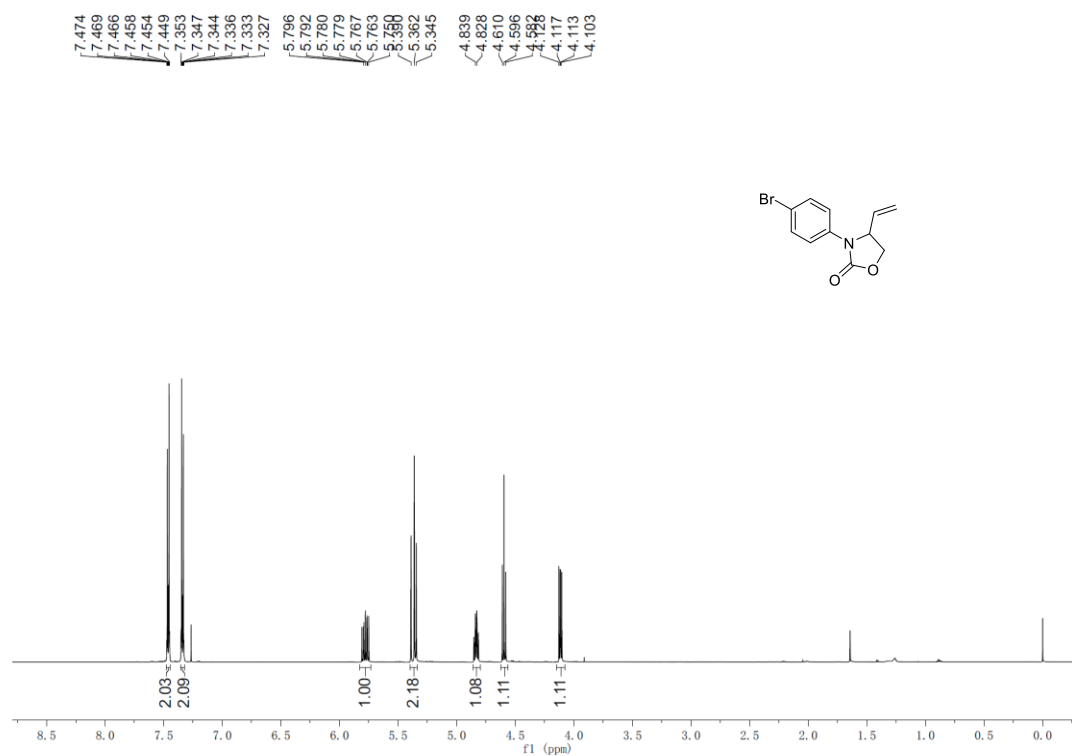




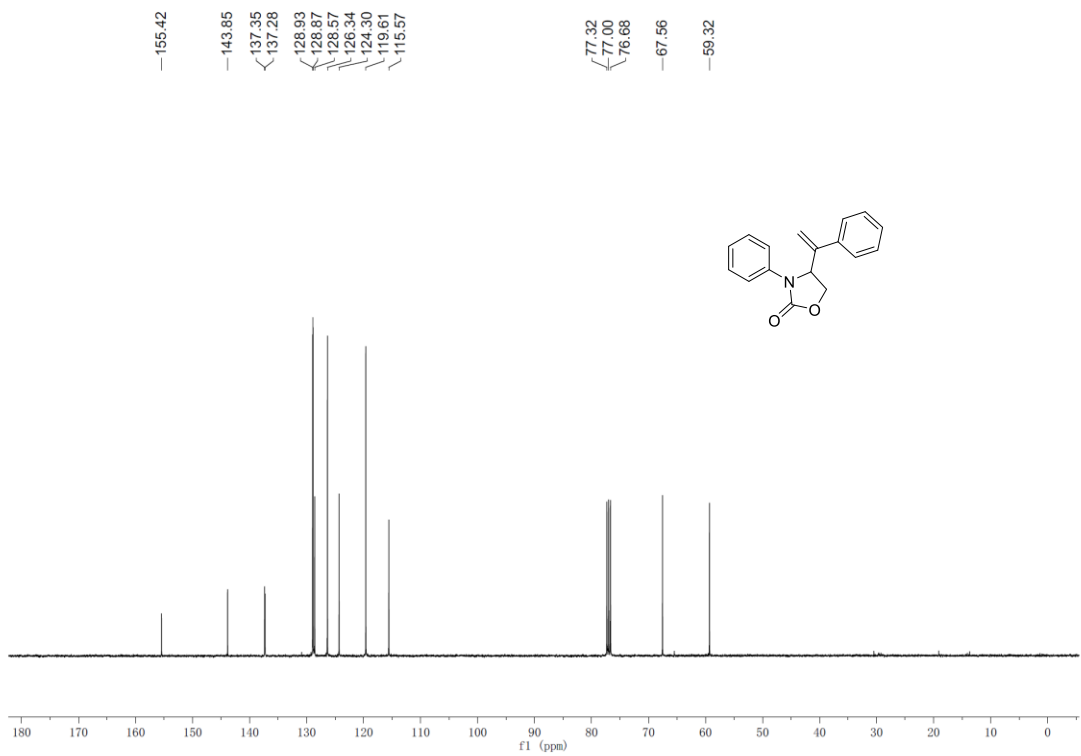
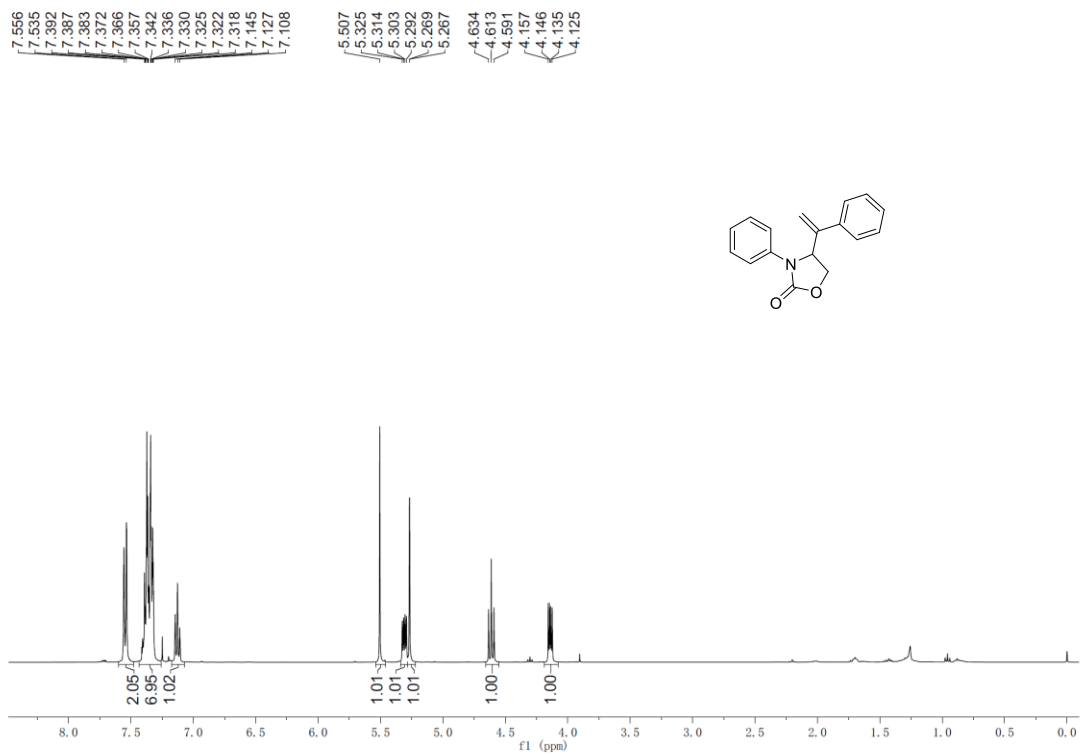
### 3-(4-acetylphenyl)-4-vinloxazolidin-2-one (2v)



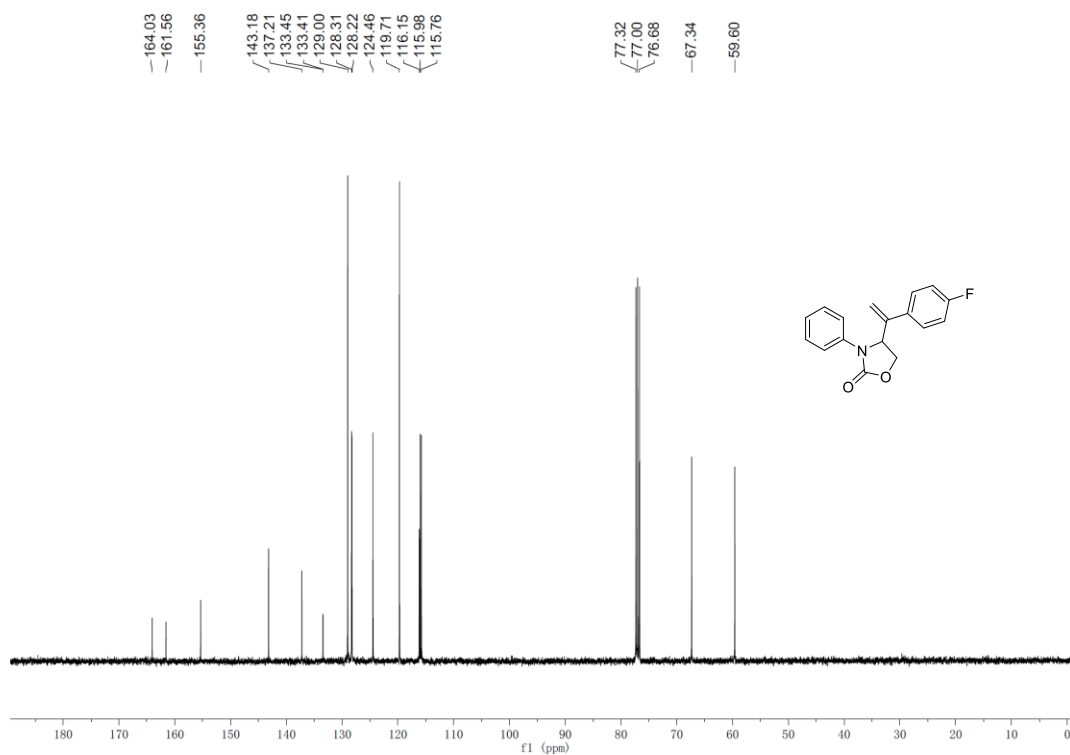
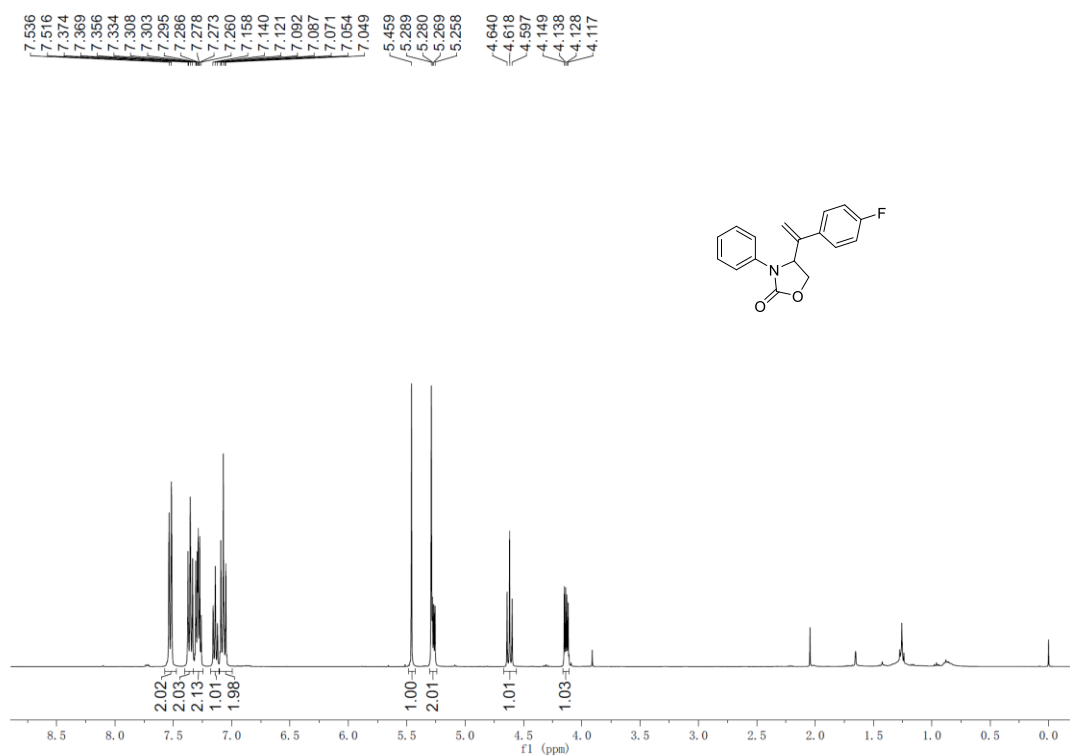
**3-(4-bromophenyl)-4-vinylloxazolidin-2-one (2w)**

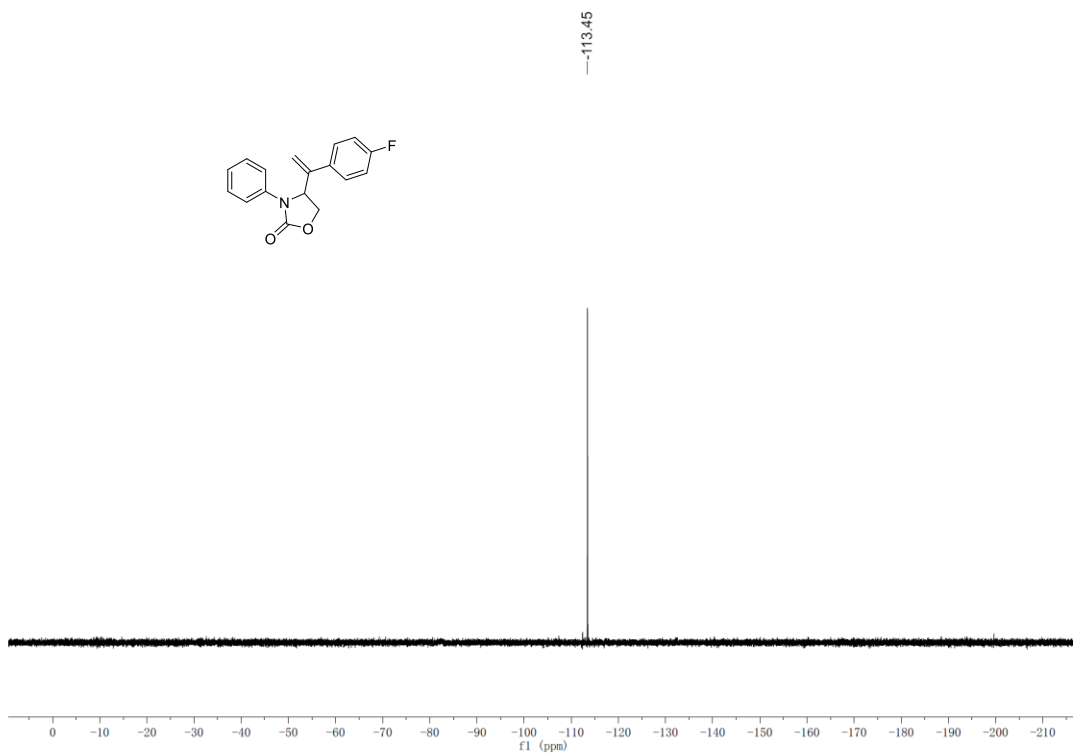


**3-phenyl-4-(1-phenylvinyl)oxazolidin-2-one (2x)**

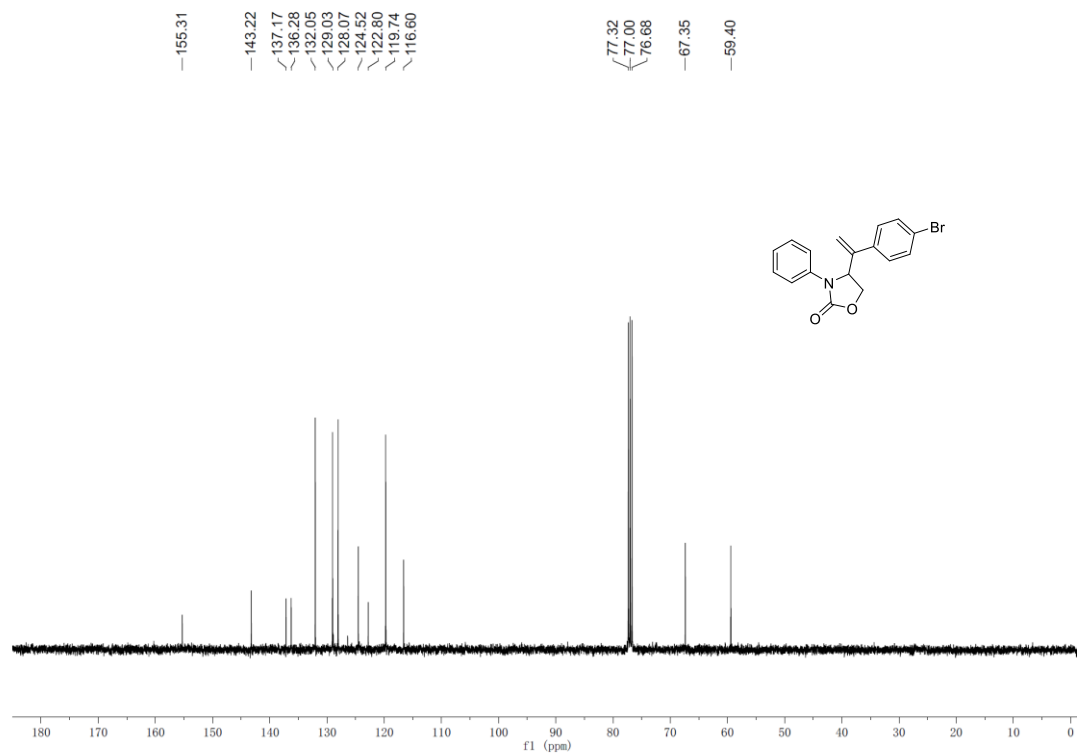
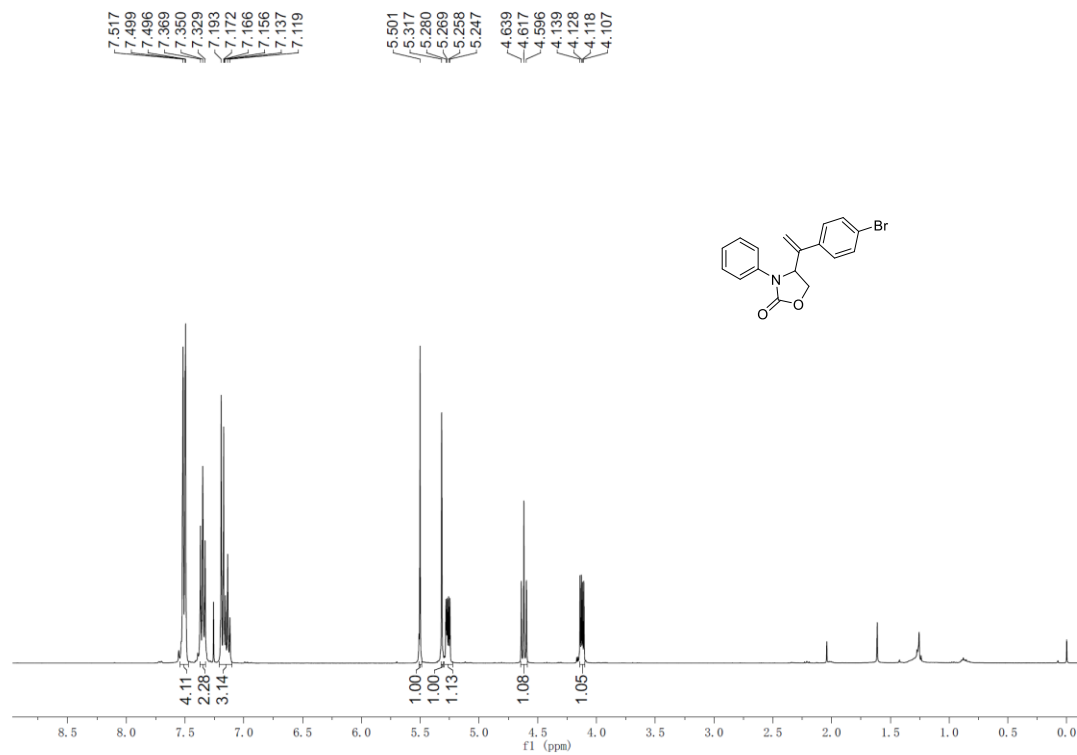


### 4-(1-(4-fluorophenyl)vinyl)-3-phenyloxazolidin-2-one (2y)

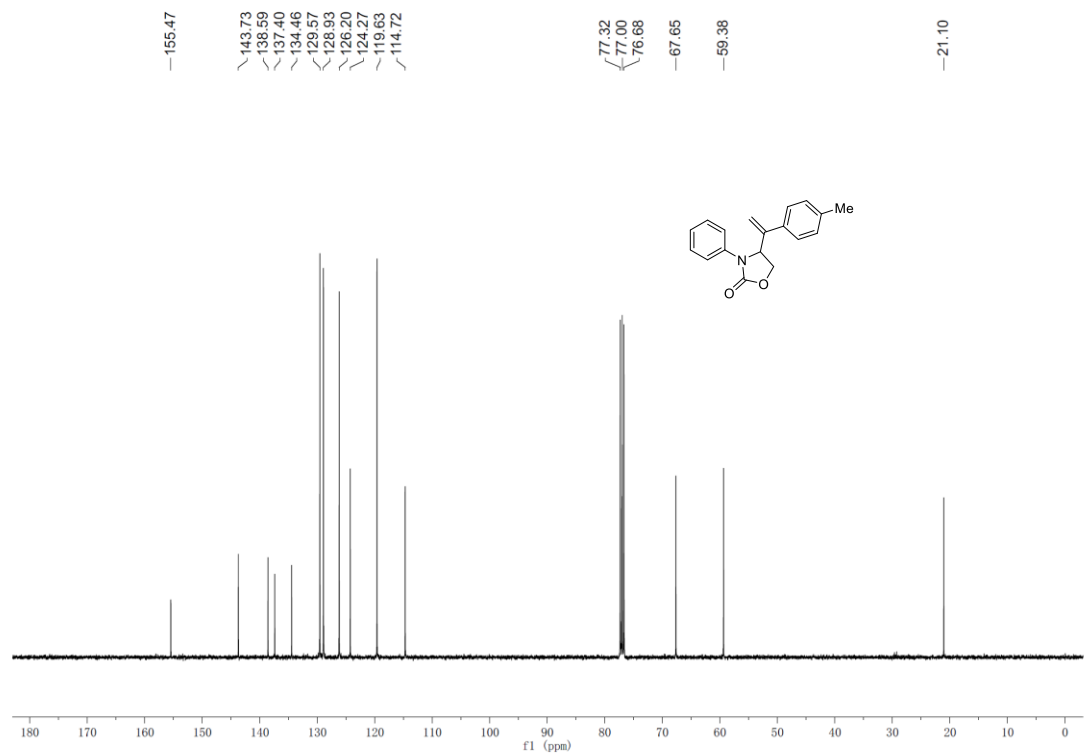
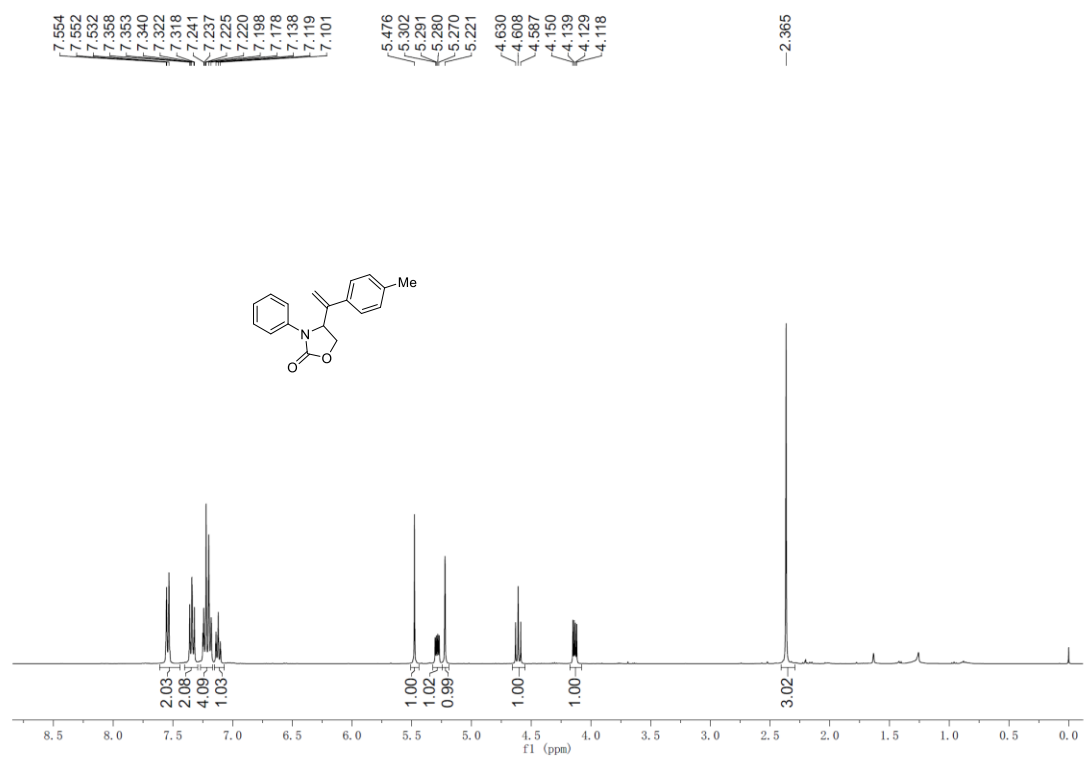




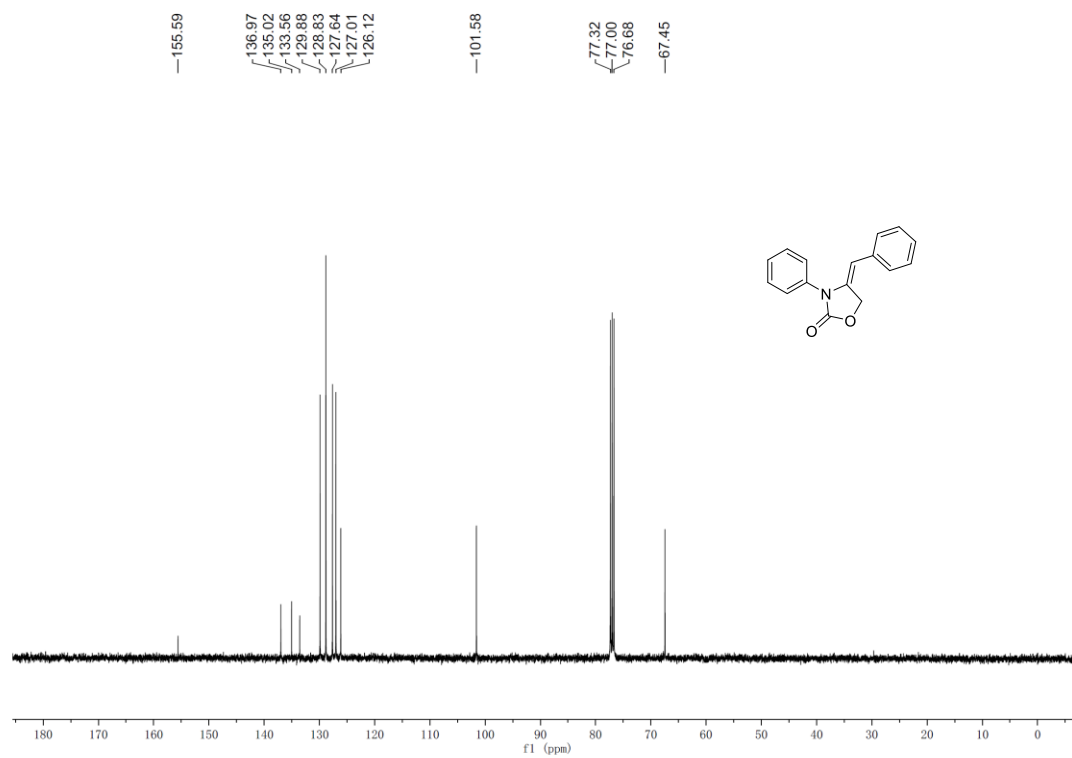
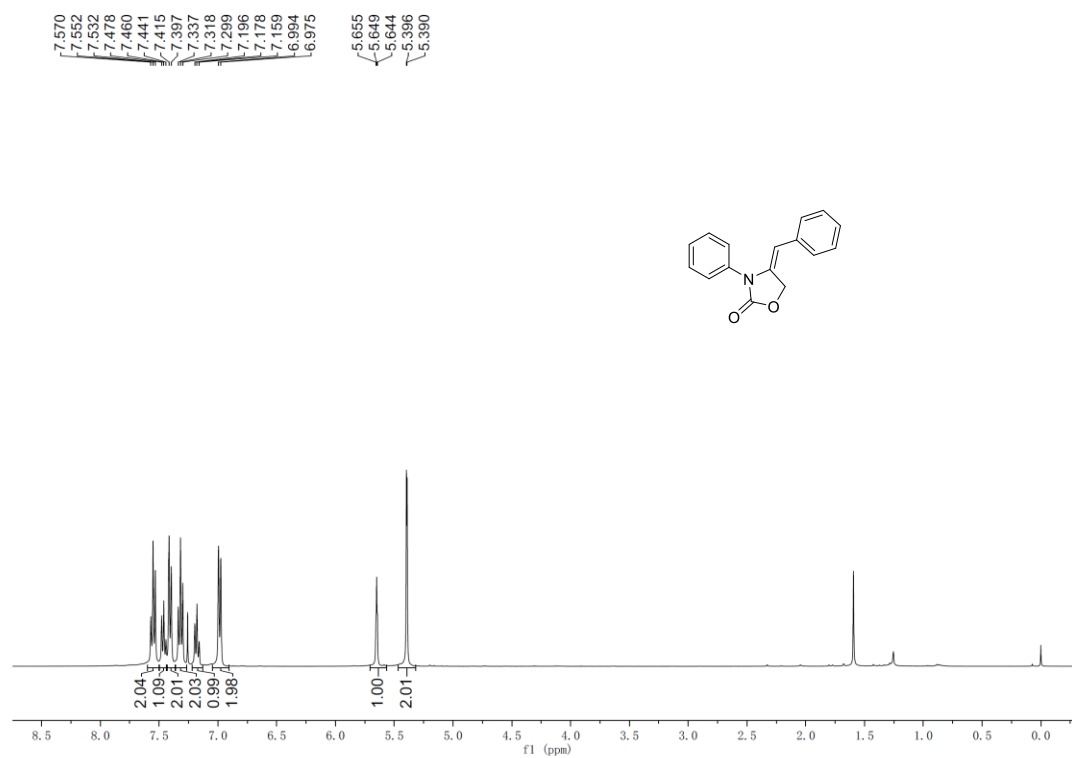
# 4-(1-(4-bromophenyl)vinyl)-3-phenyloxazolidin-2-one (2z)



**3-phenyl-4-(1-(p-tolyl)vinyl)oxazolidin-2-one (2aa)**

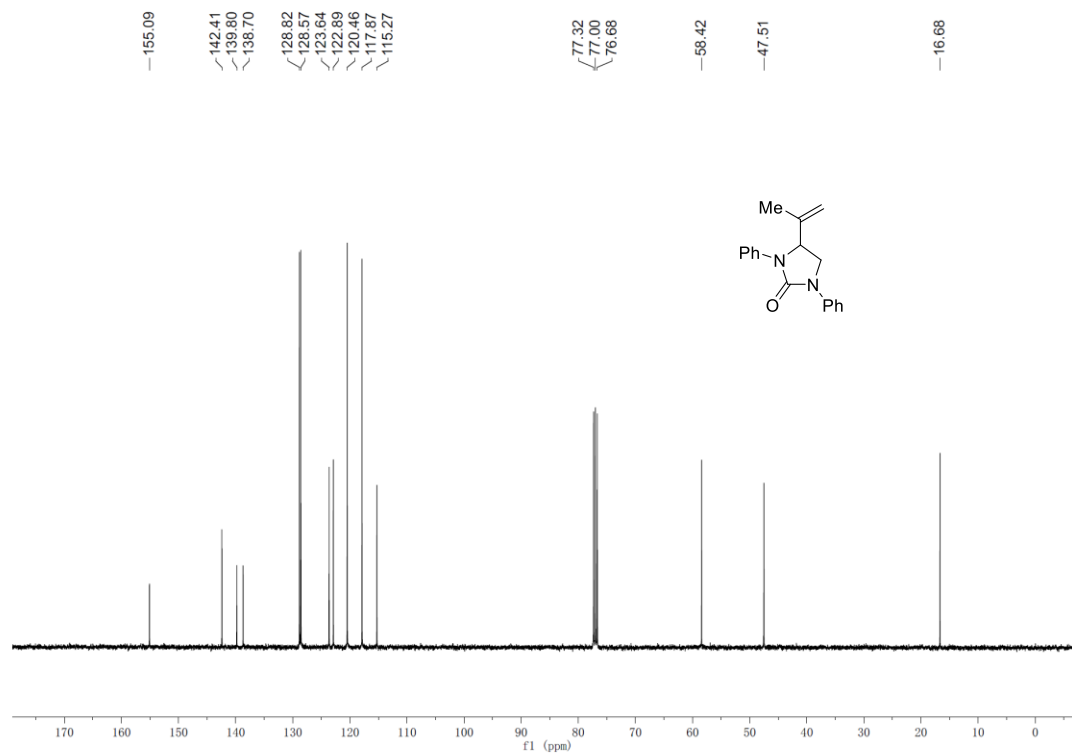
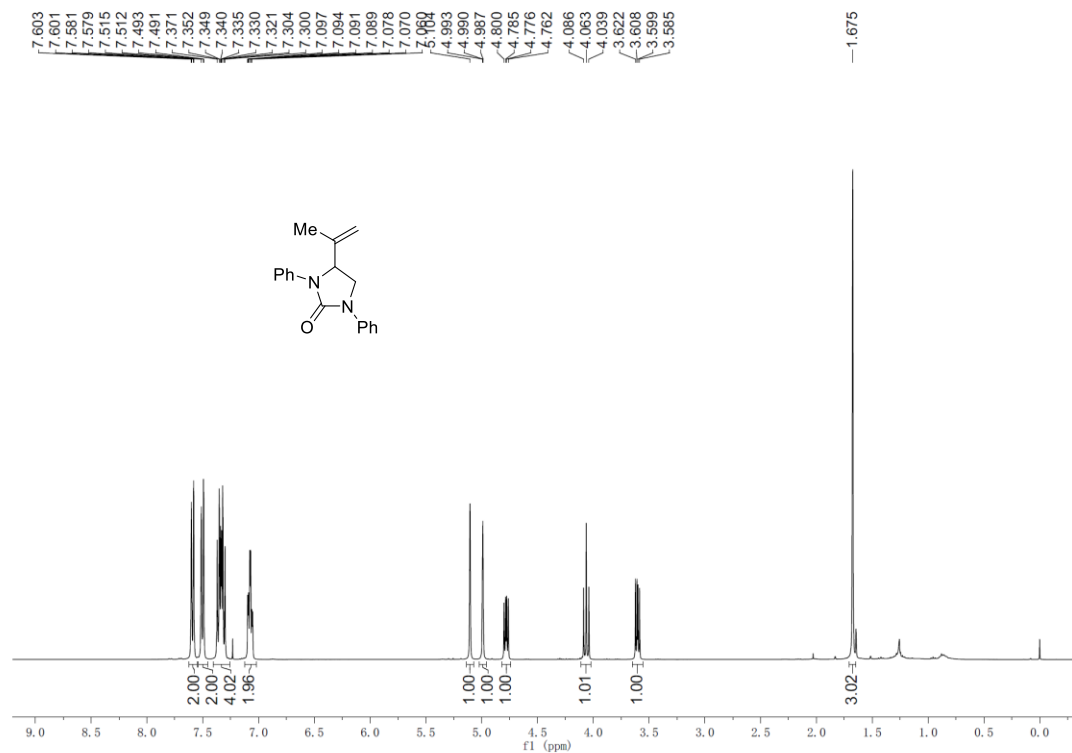


**(E)-4-benzylidene-3-phenyloxazolidin-2-one (2ab)**

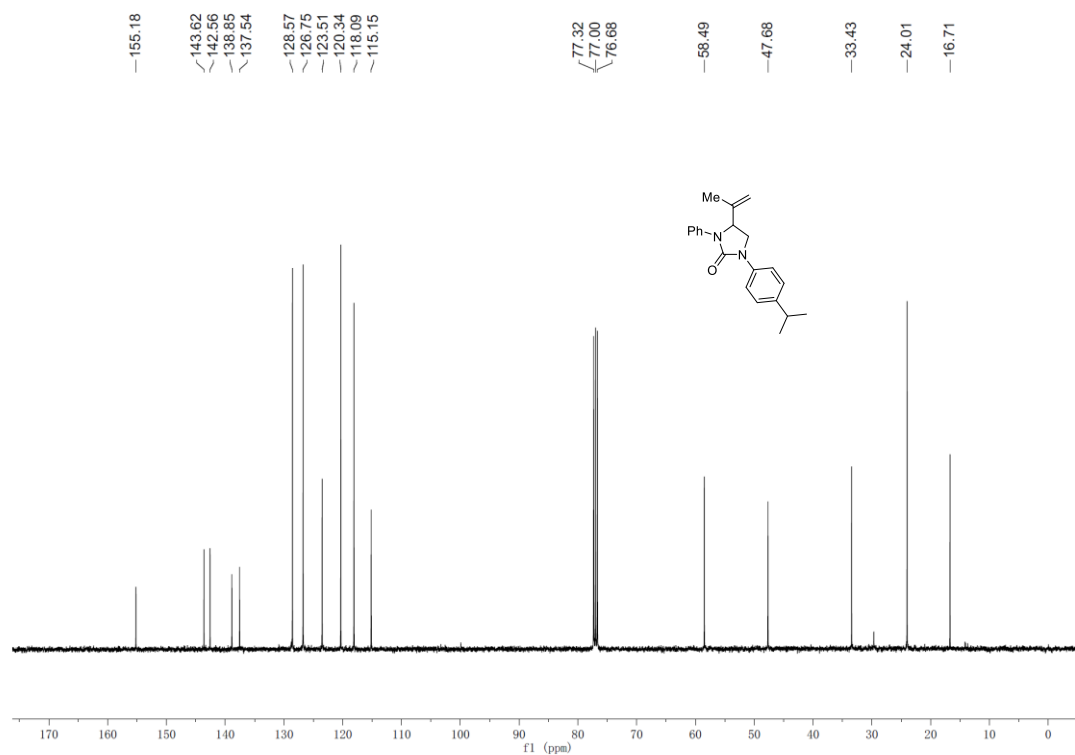
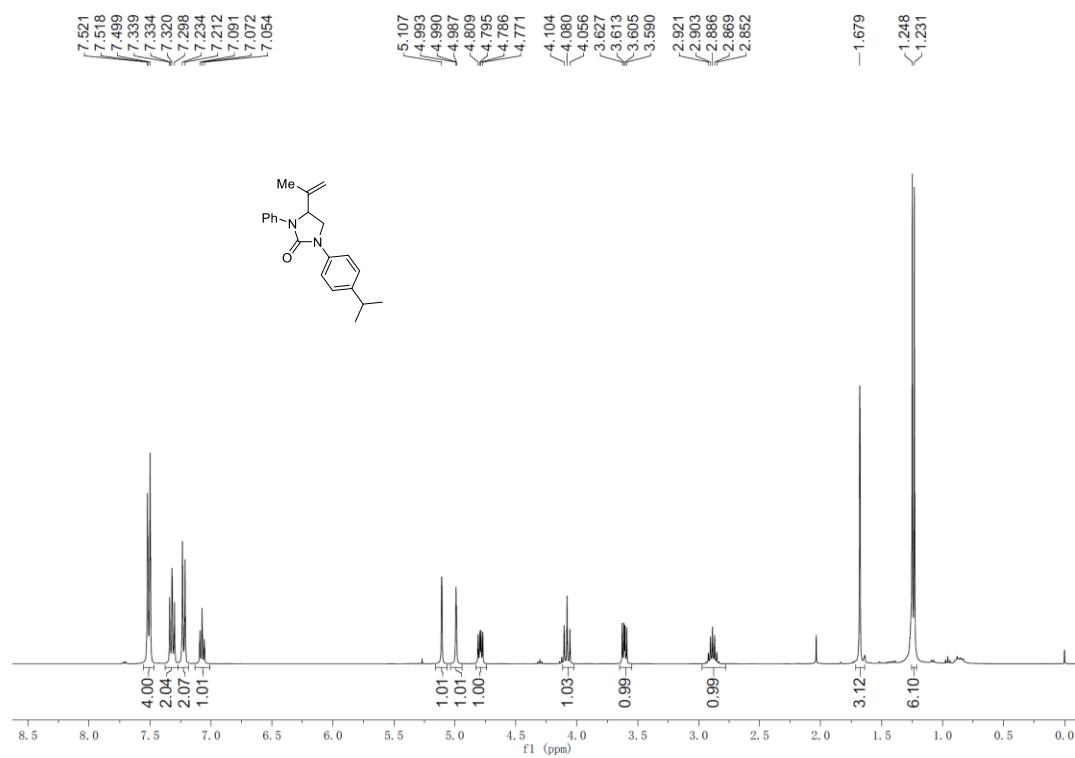




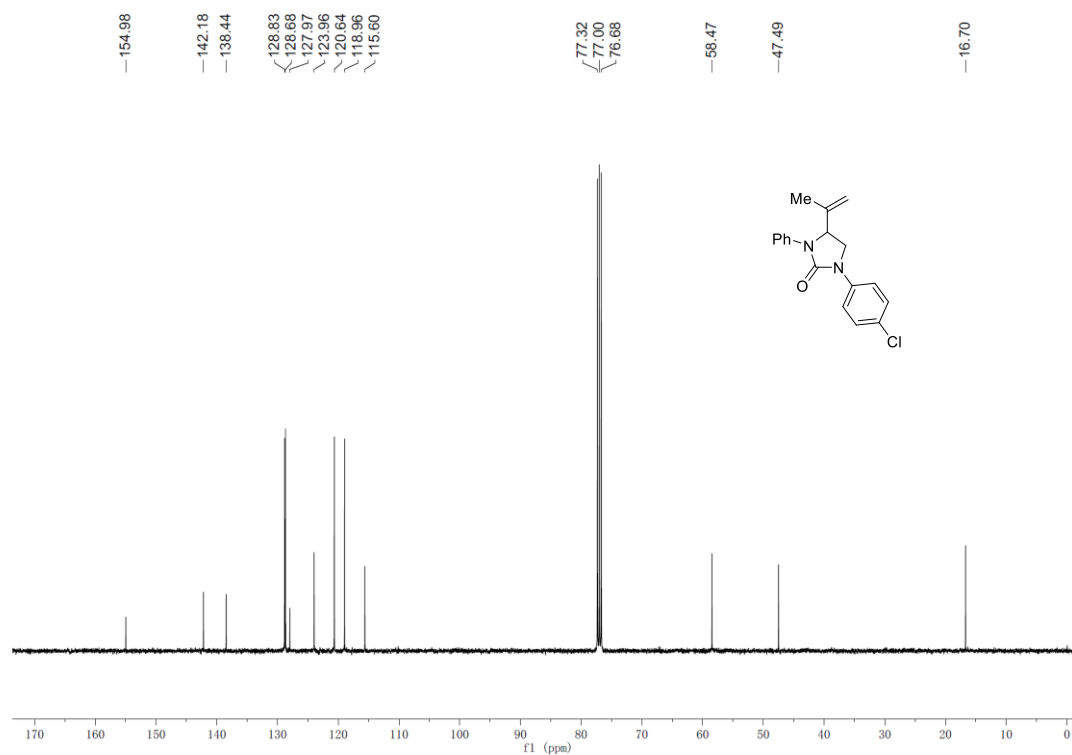
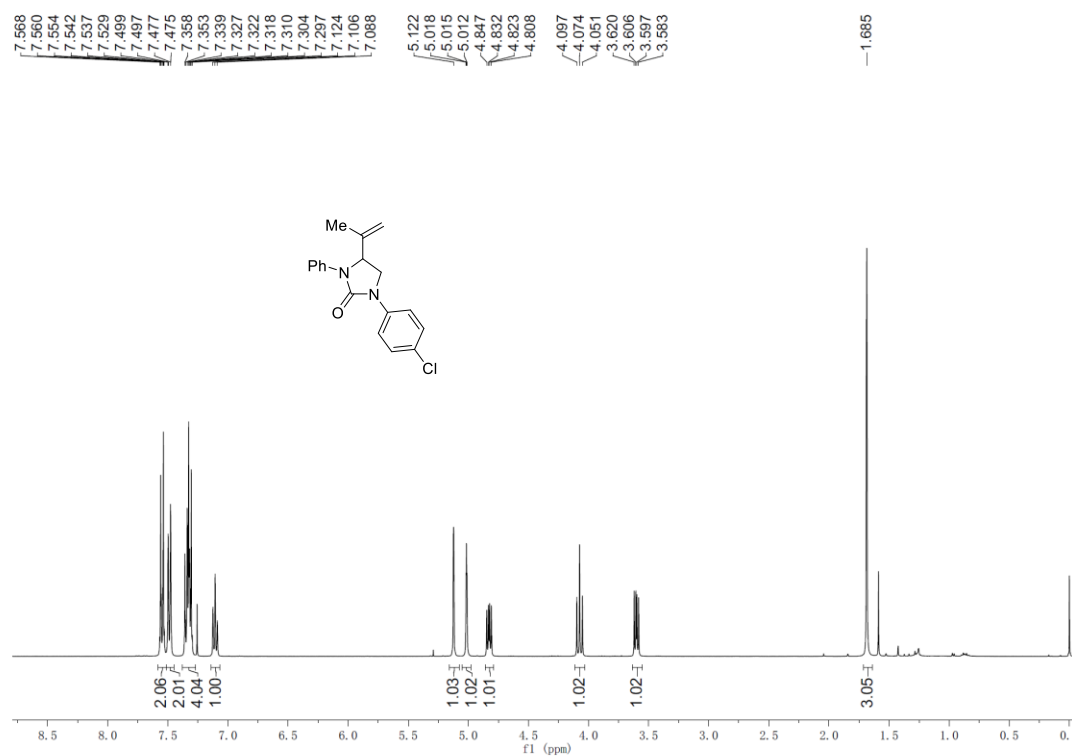
1,3-diphenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ac)



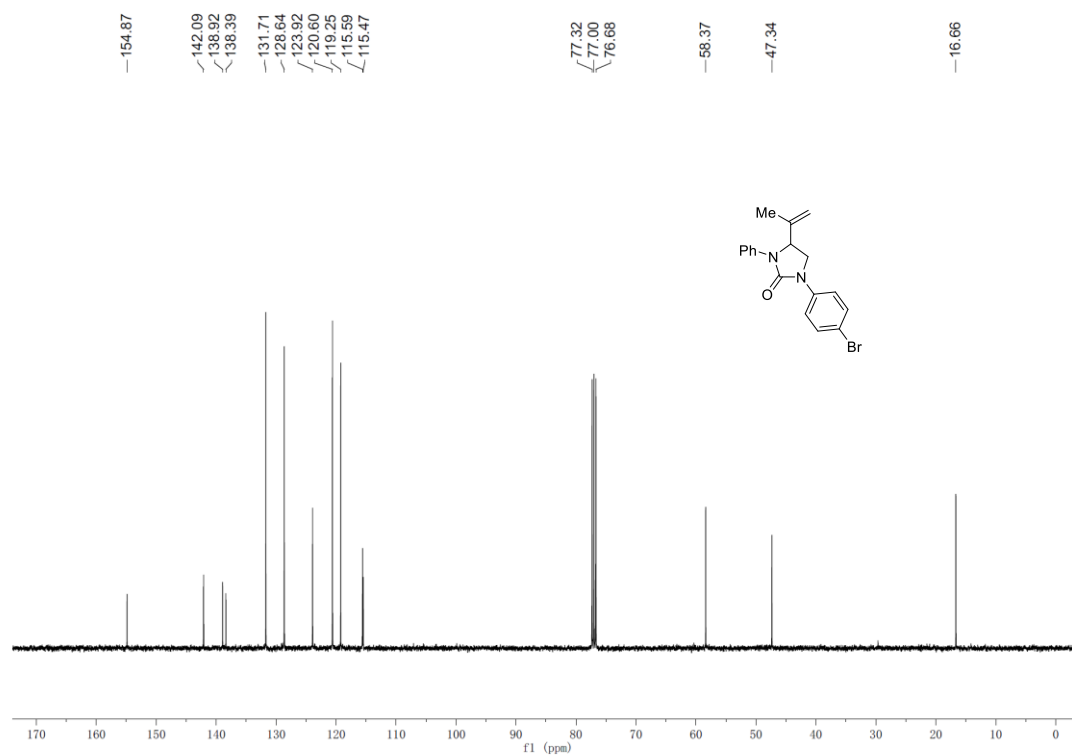
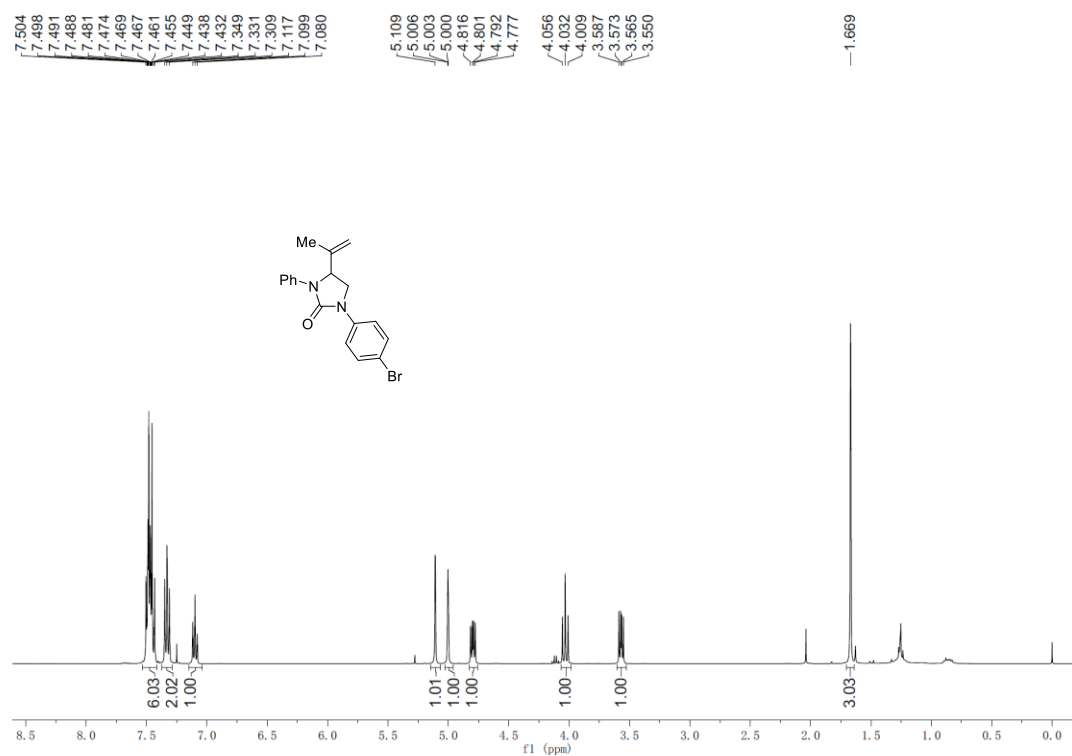
# 1-(4-isopropylphenyl)-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ad)



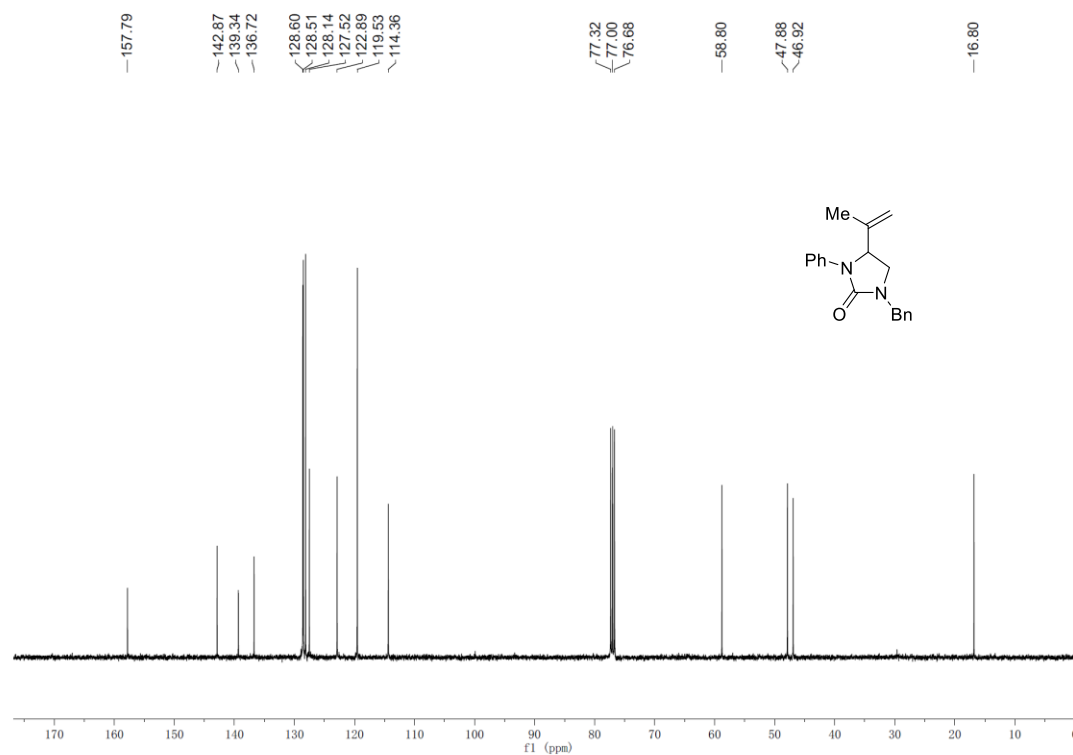
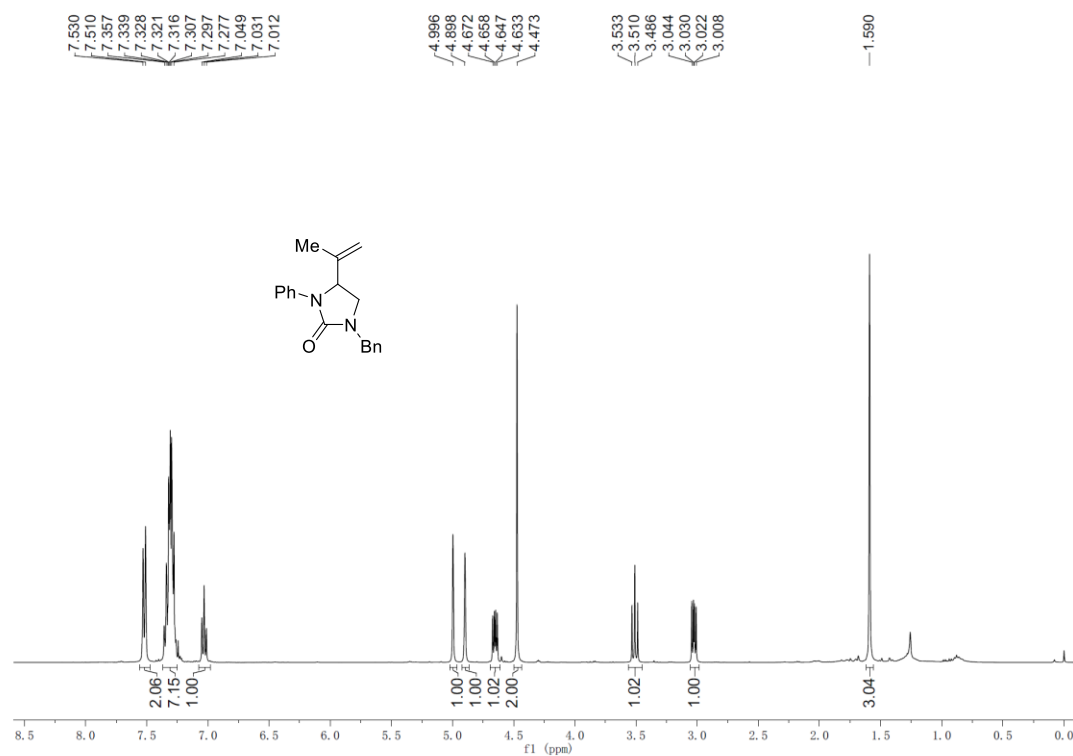
**1-(4-chlorophenyl)-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ae)**



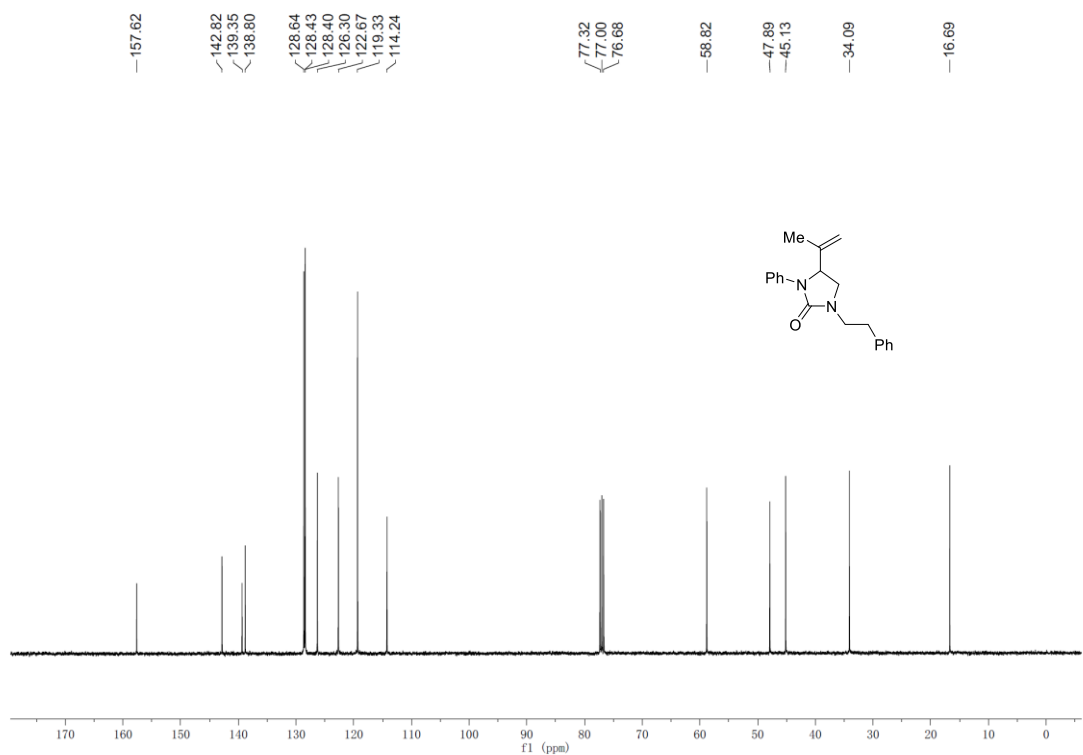
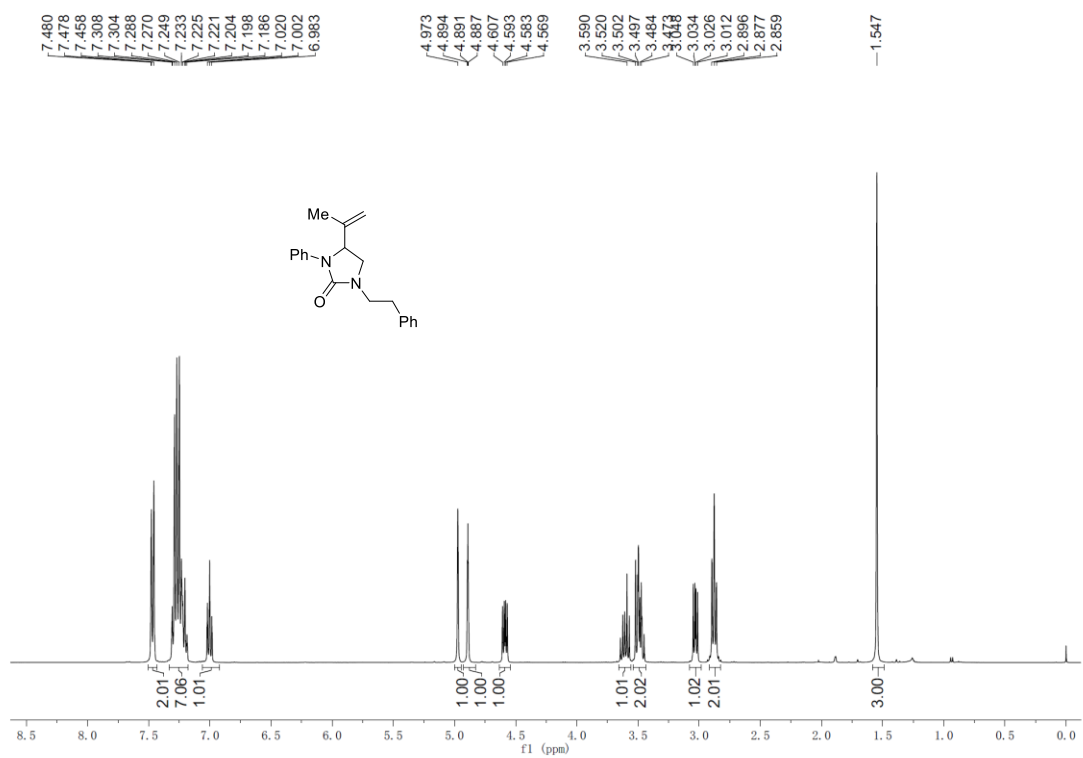
**1-(4-bromophenyl)-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2af)**



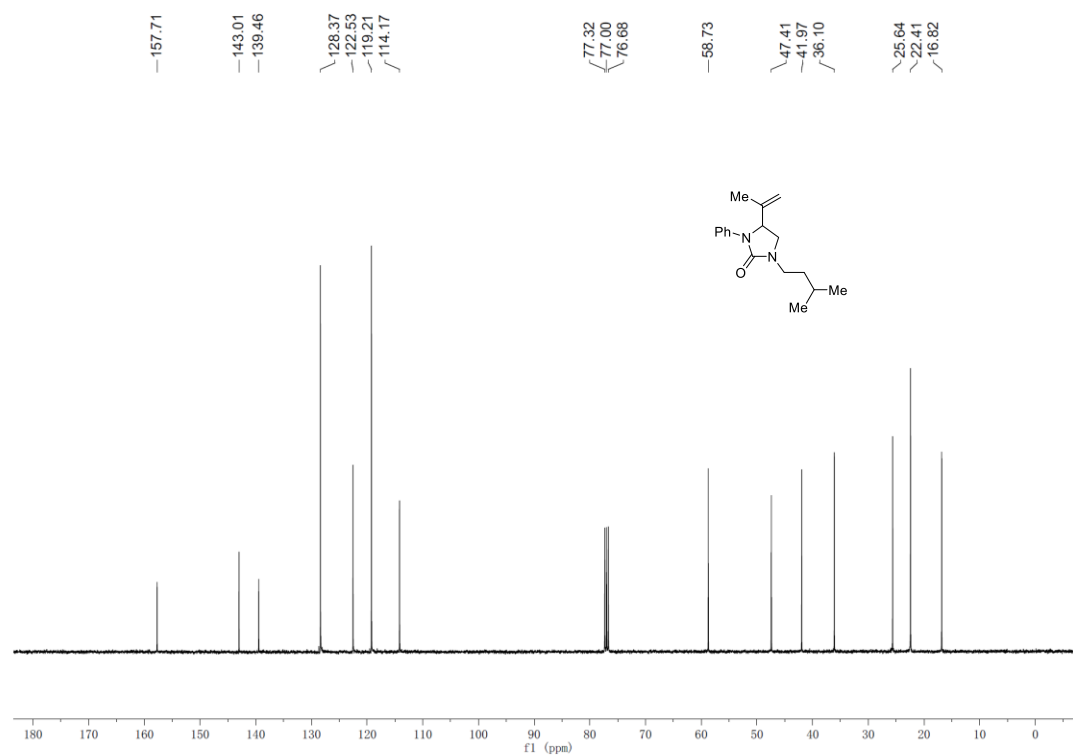
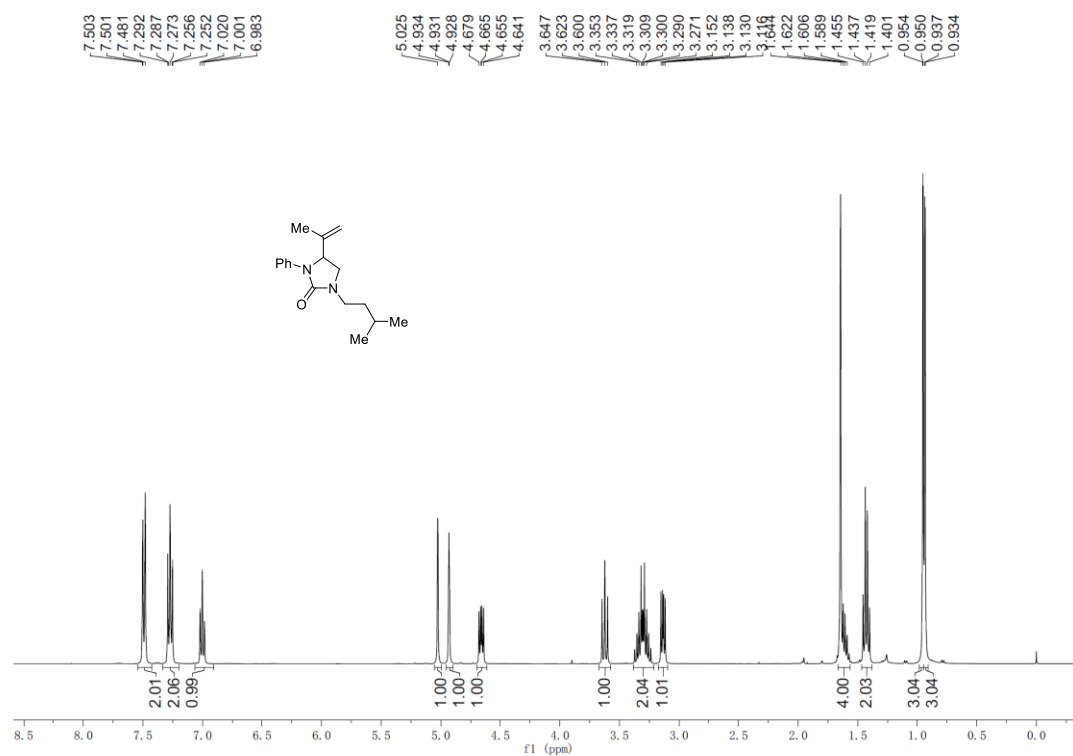
# 1-benzyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ag)



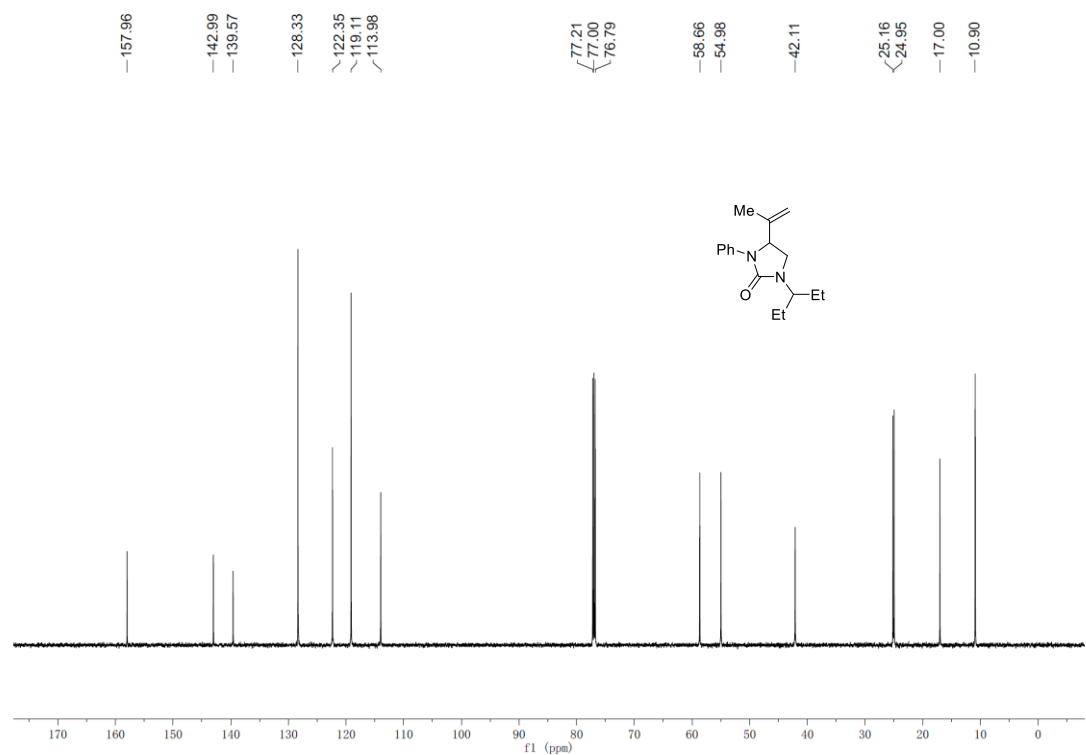
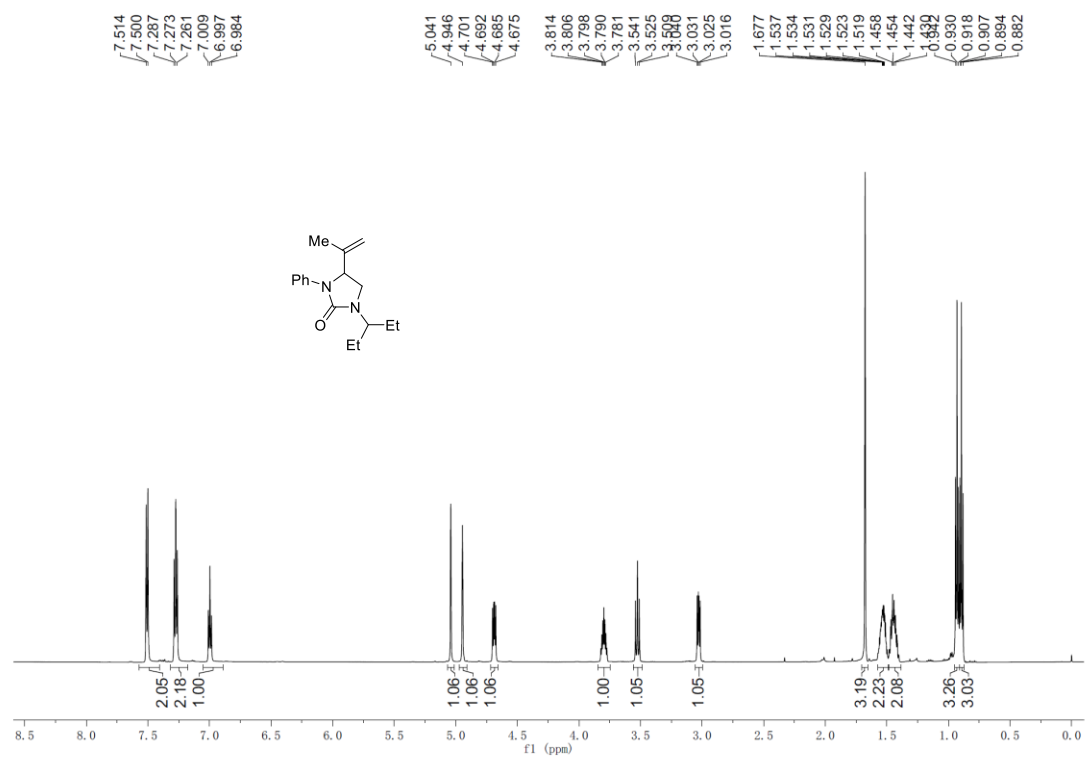
**1-phenethyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ah)**



# 1-isopentyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ai)

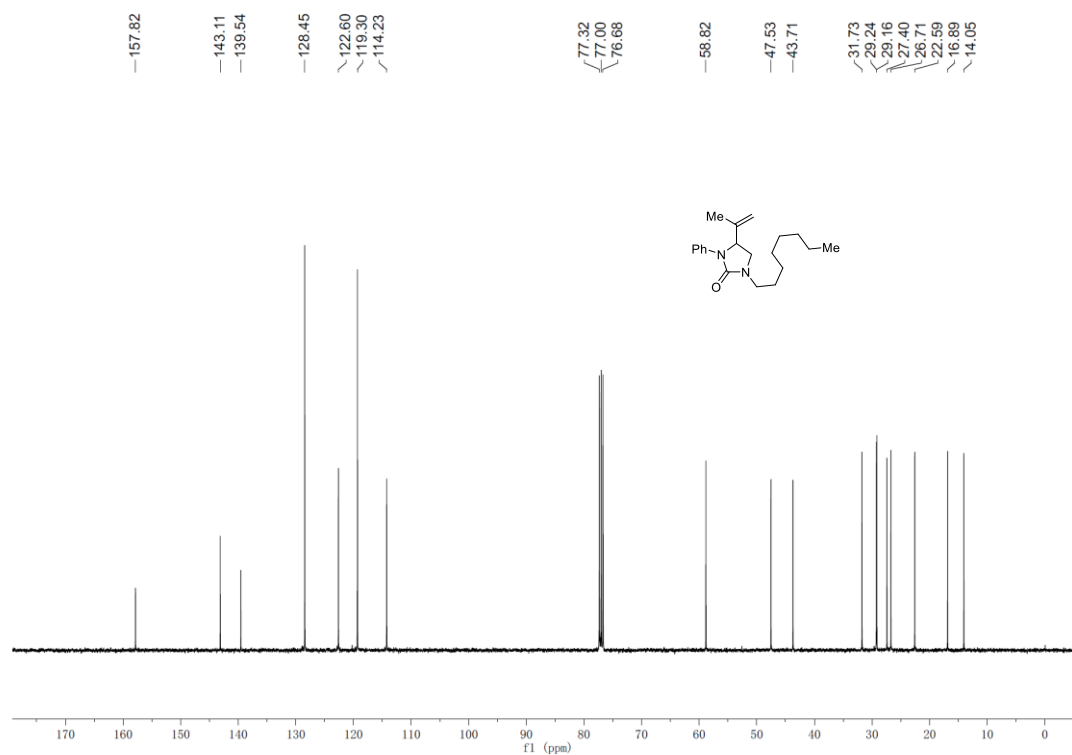
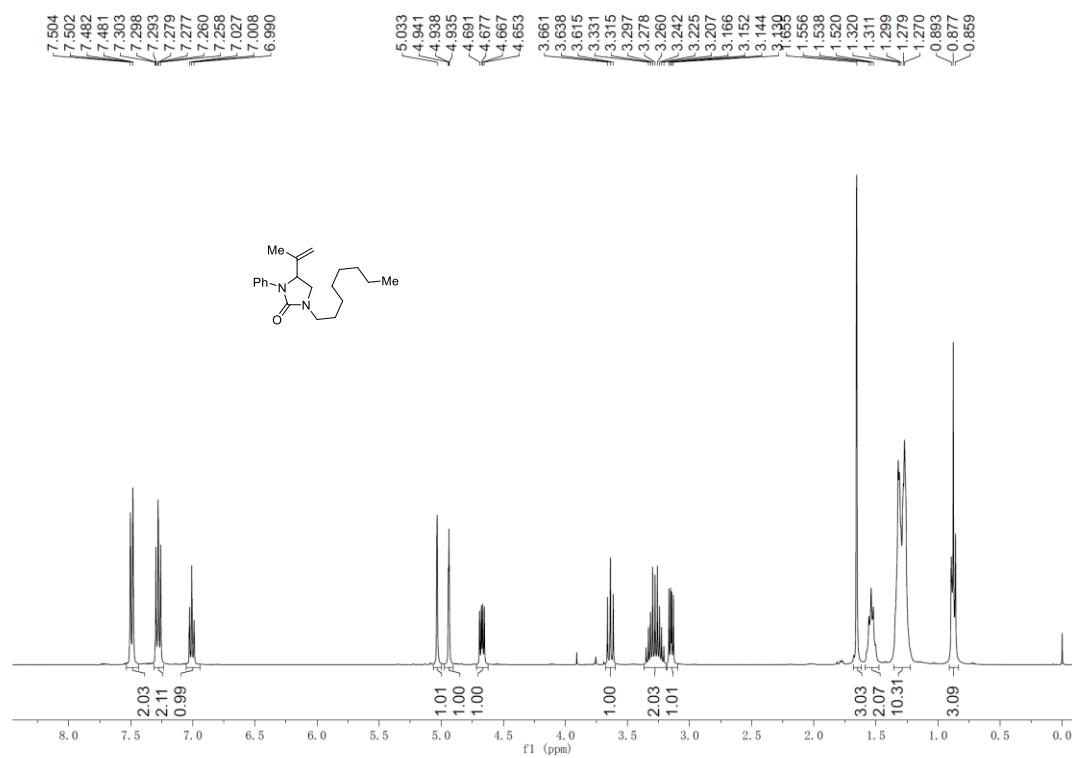


**1-(pentan-3-yl)-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2aj)**

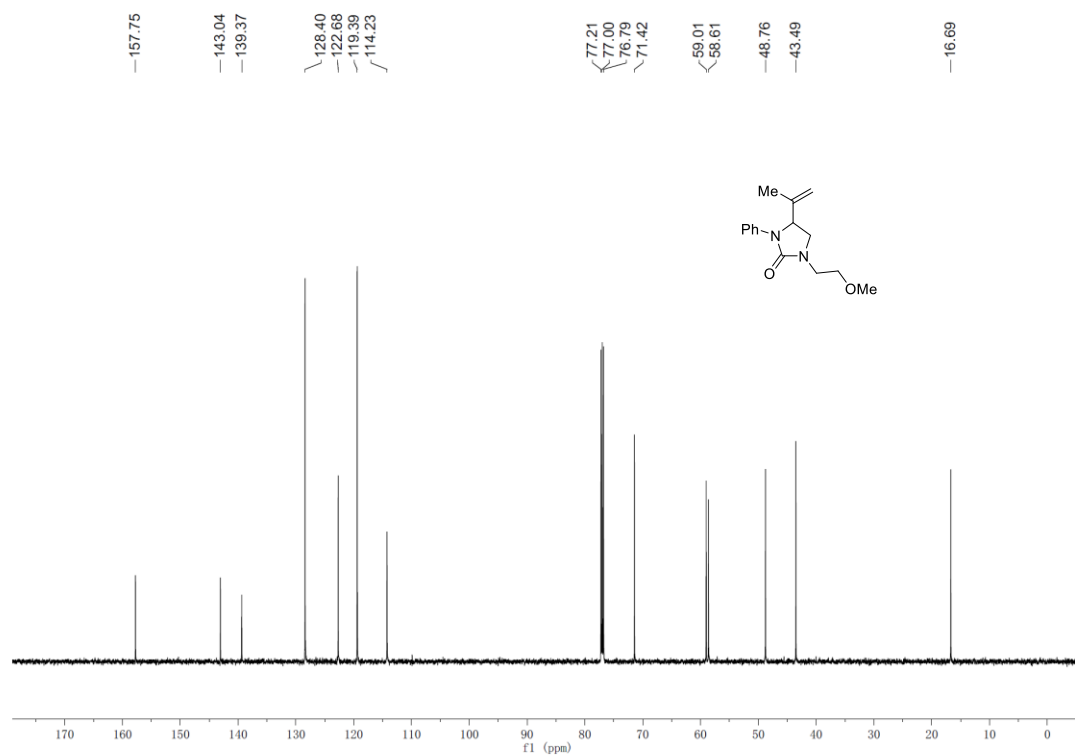
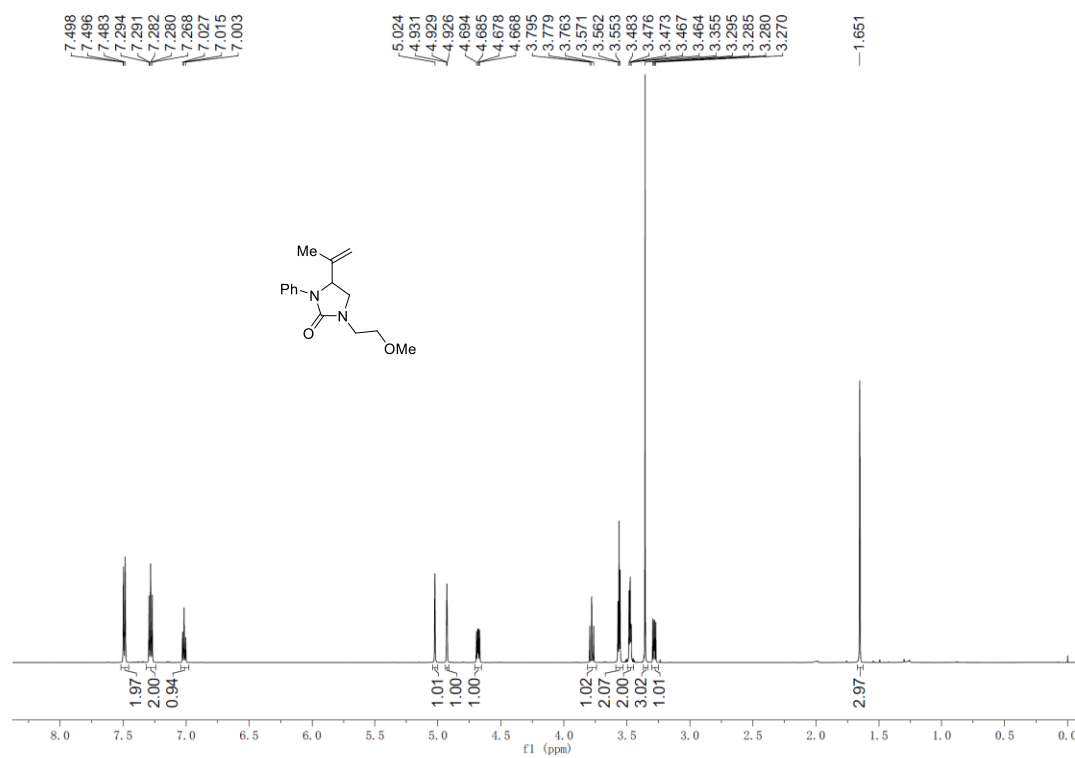




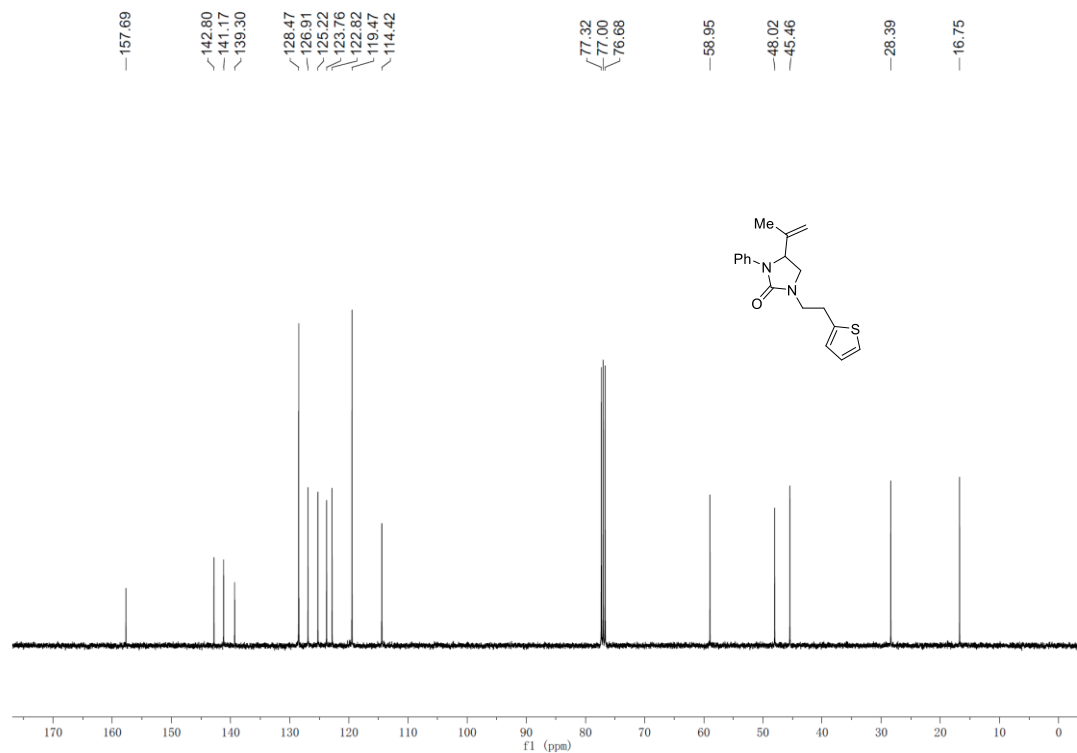
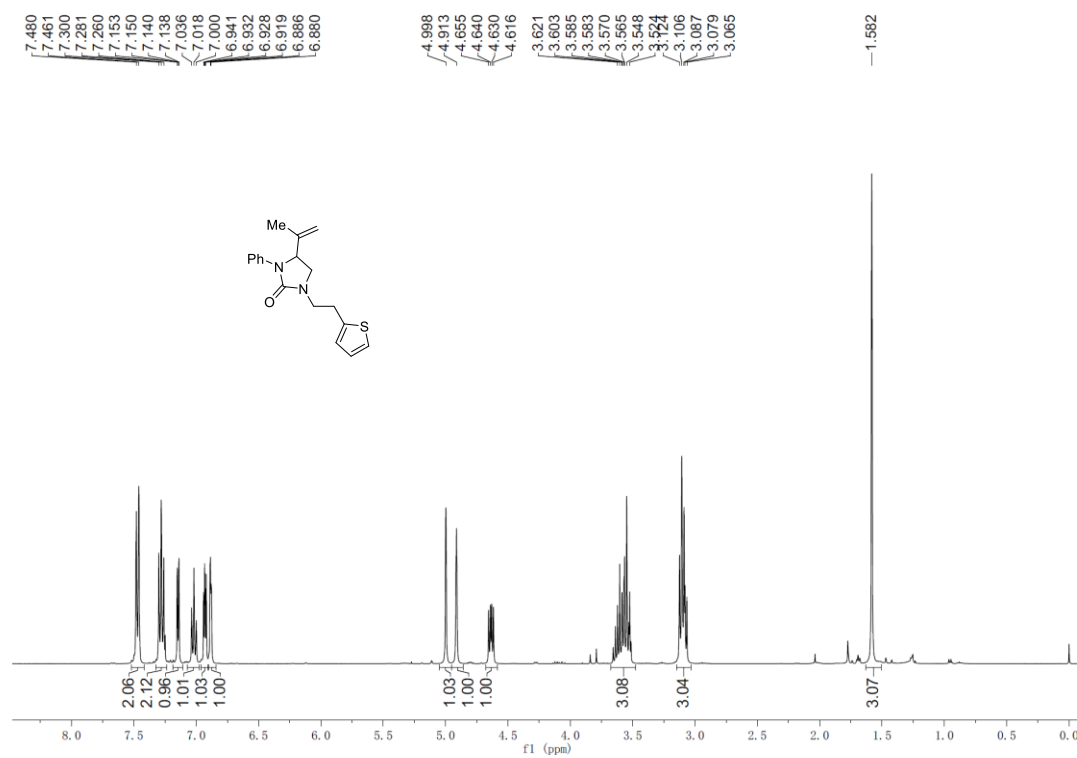
# 1-octyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ak)



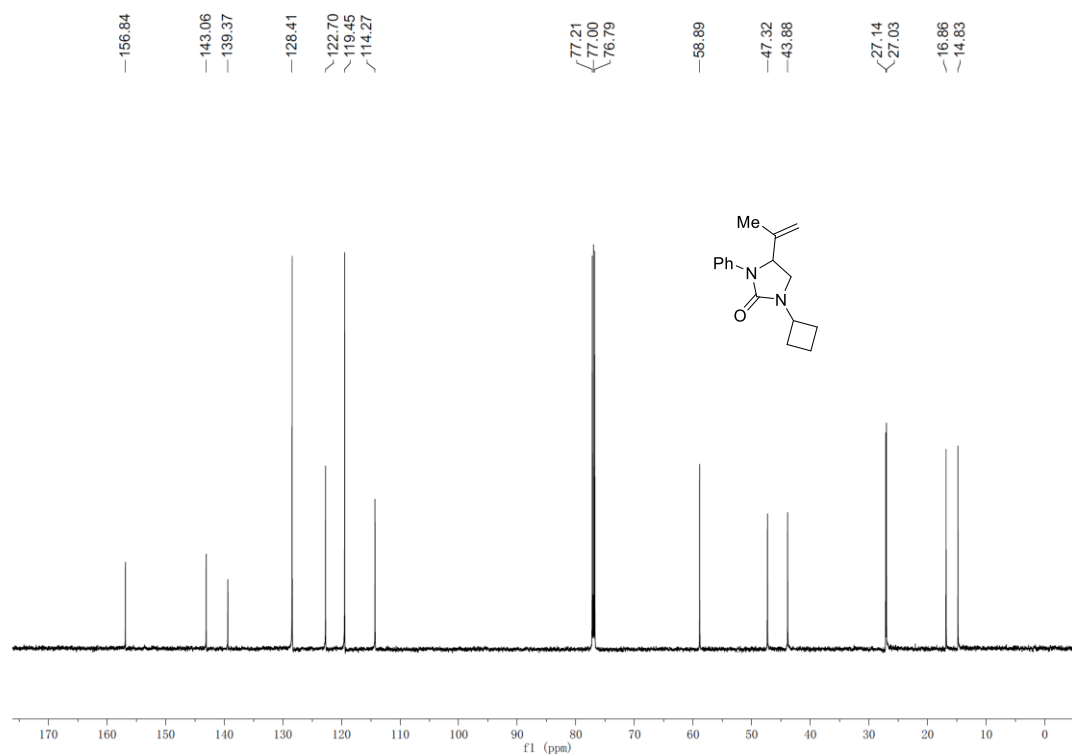
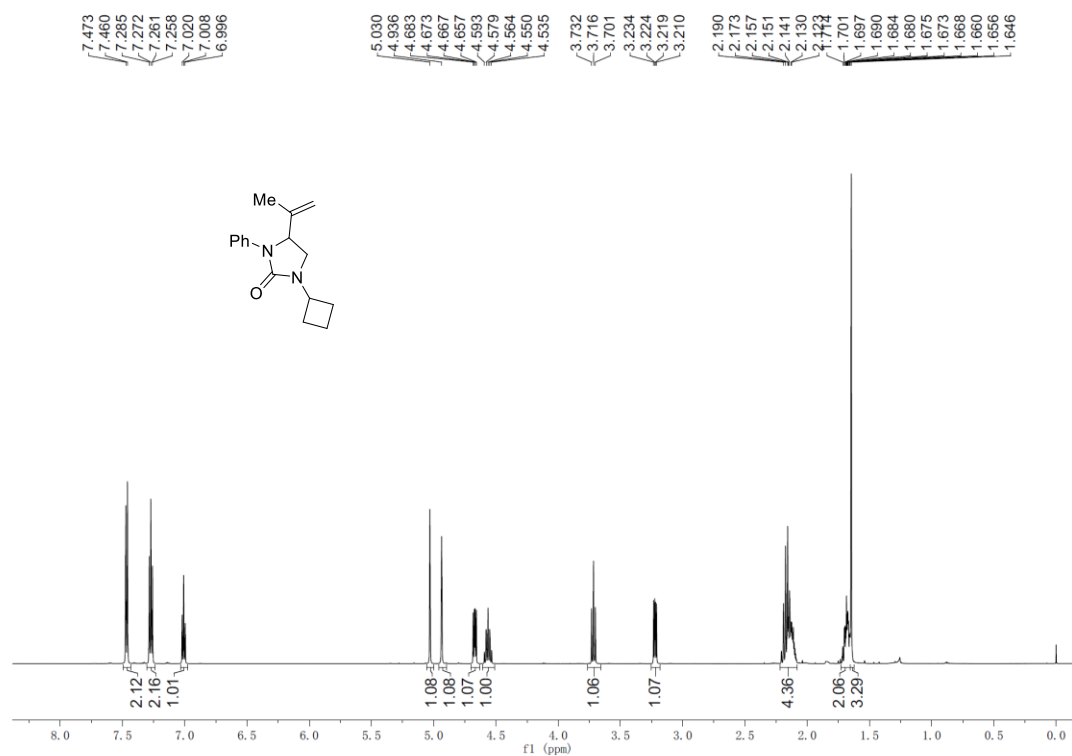
**1-(2-methoxyethyl)-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2a)**



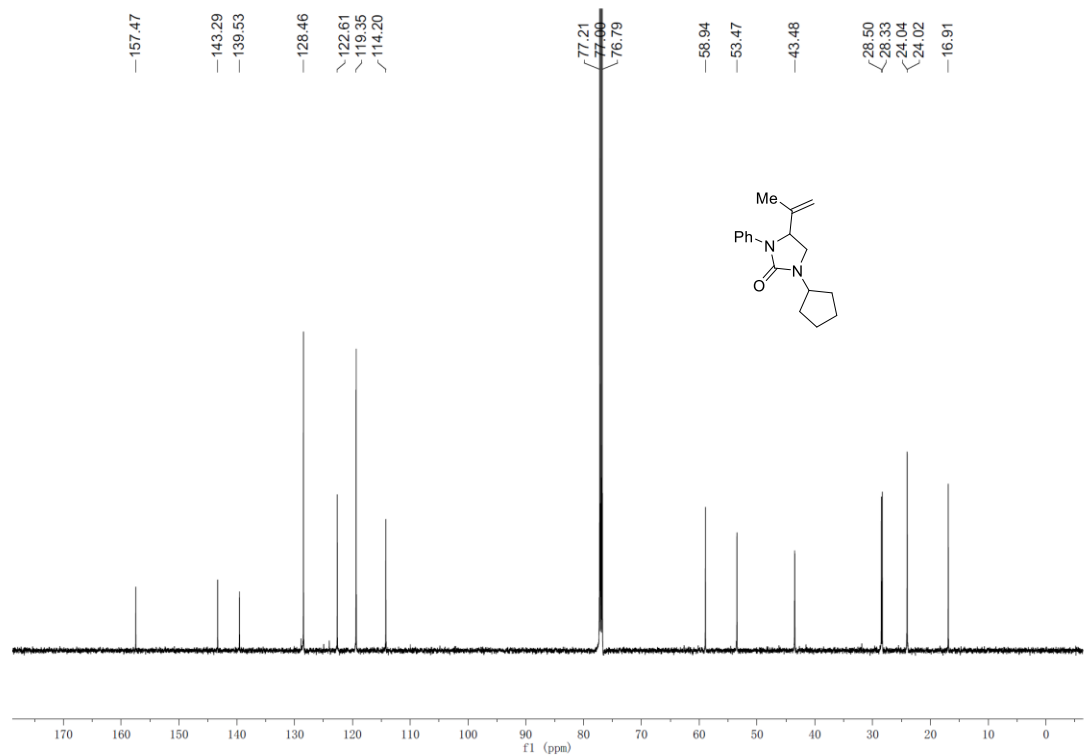
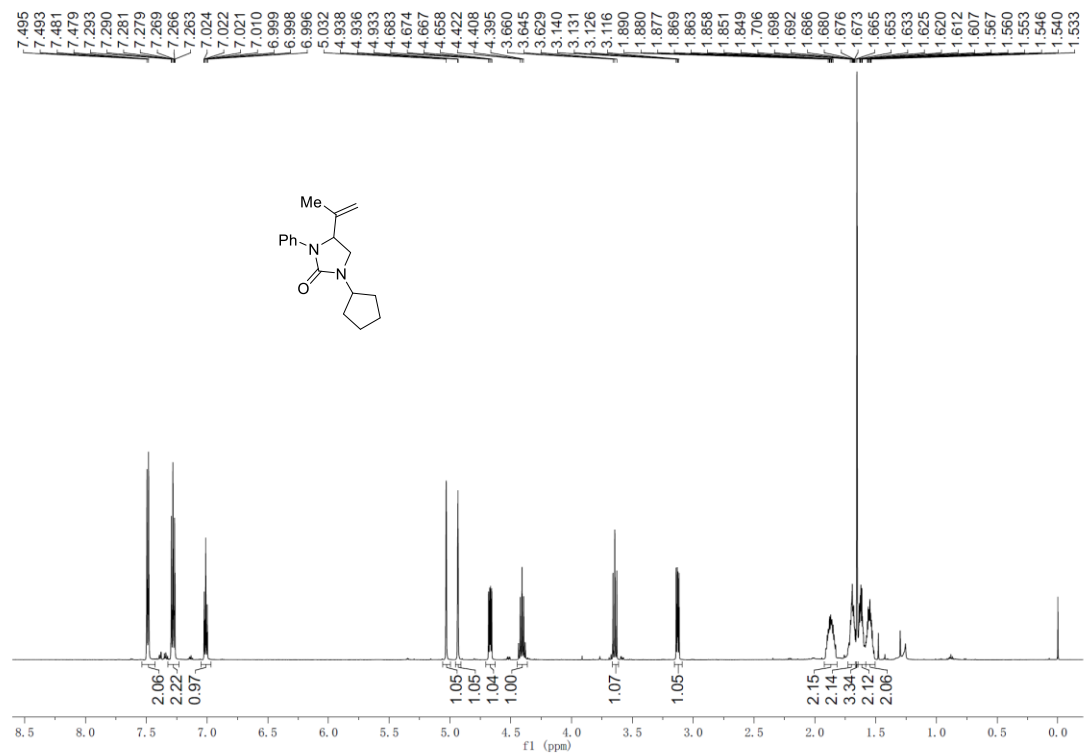
**3-phenyl-4-(prop-1-en-2-yl)-1-(2-(thiophen-2-yl)ethyl)imidazolidin-2-one (2am)**



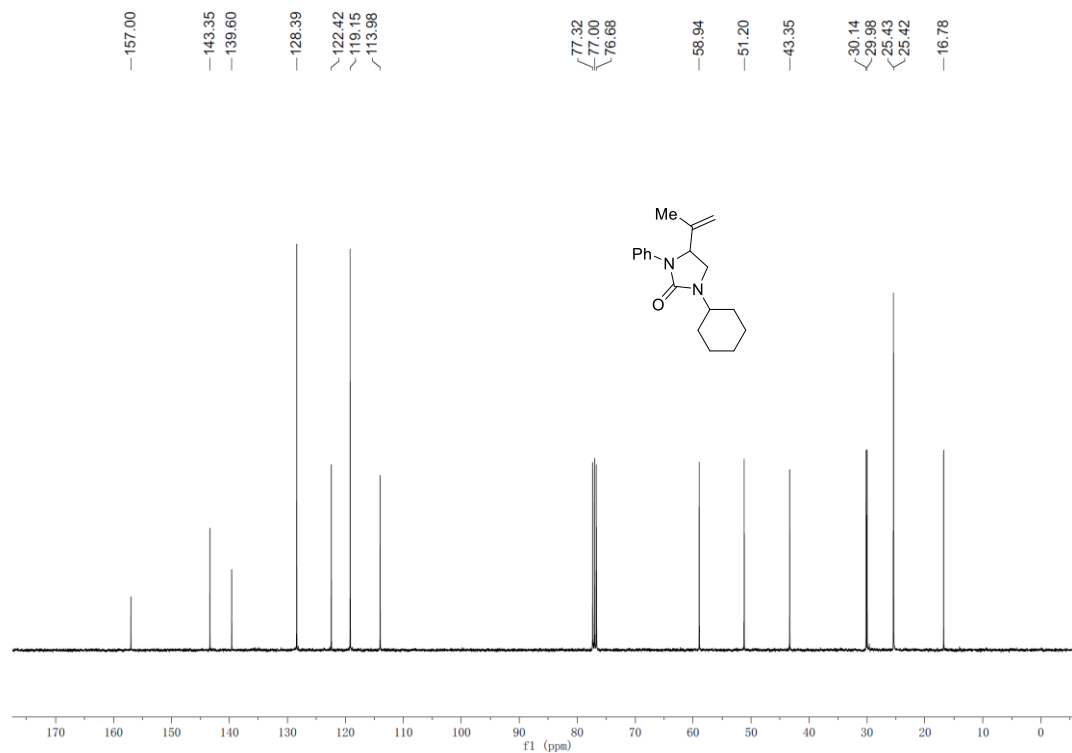
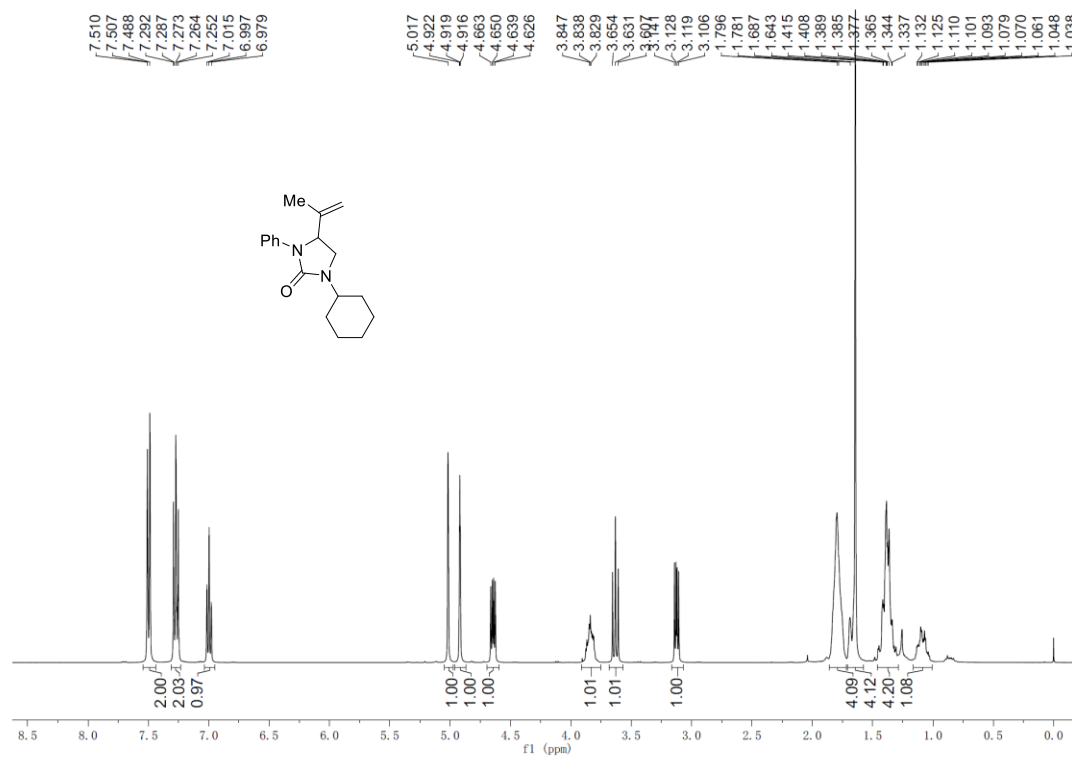
**1-cyclobutyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2a)**



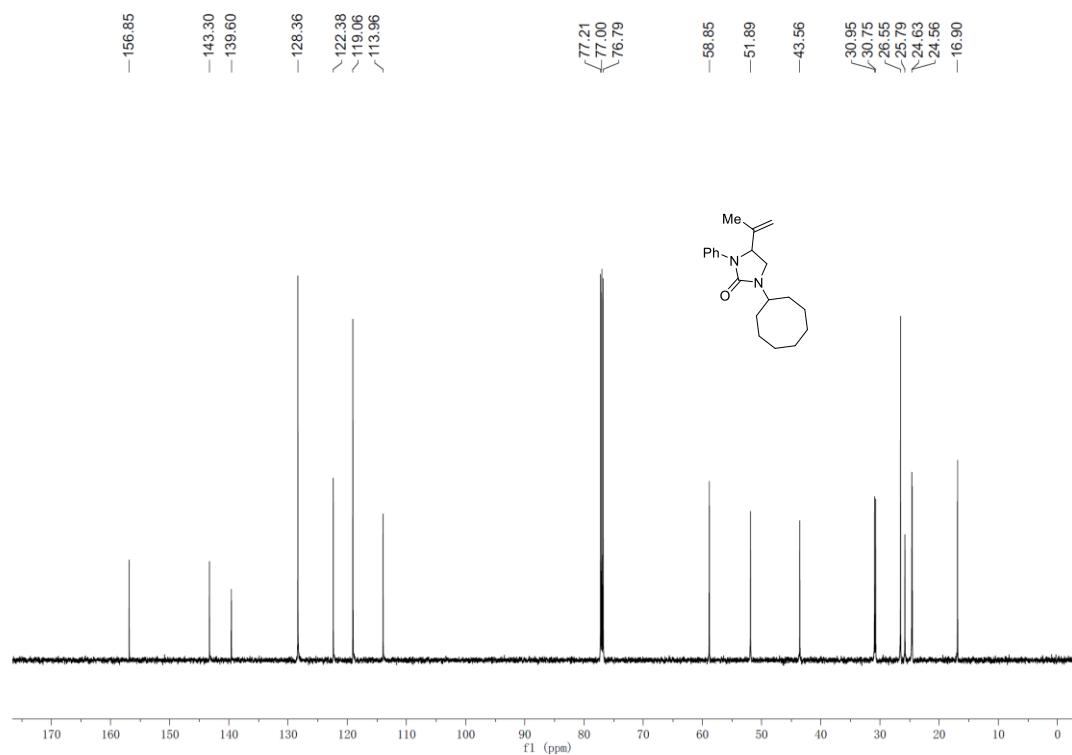
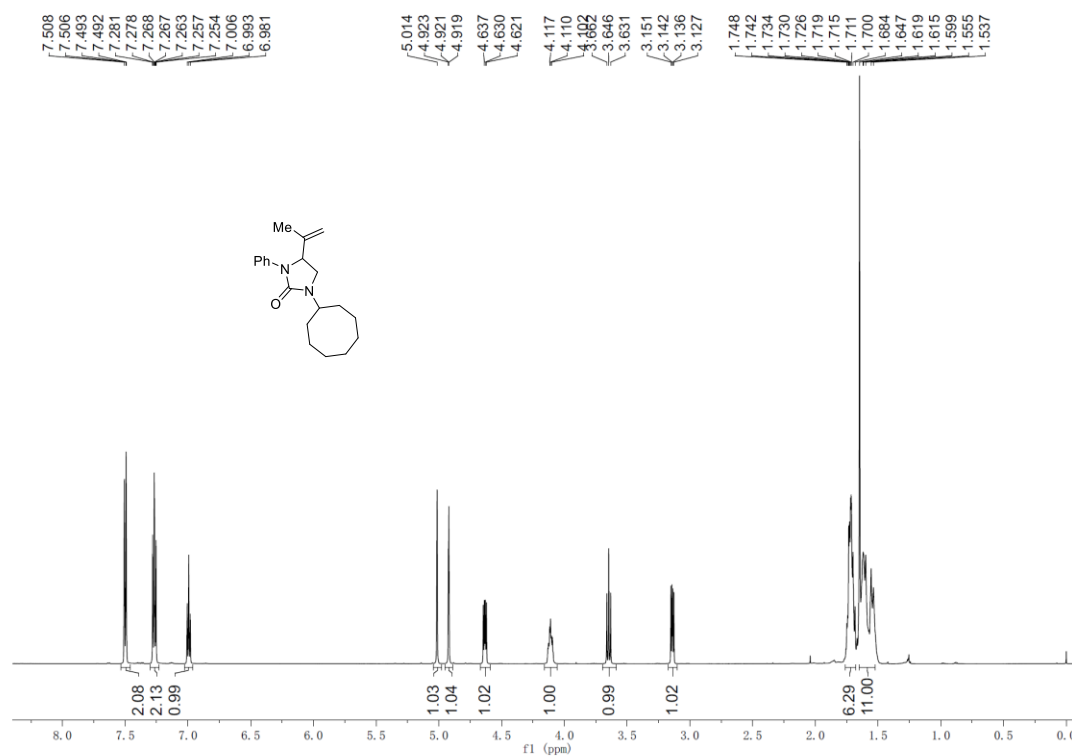
1-cyclopentyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ao)



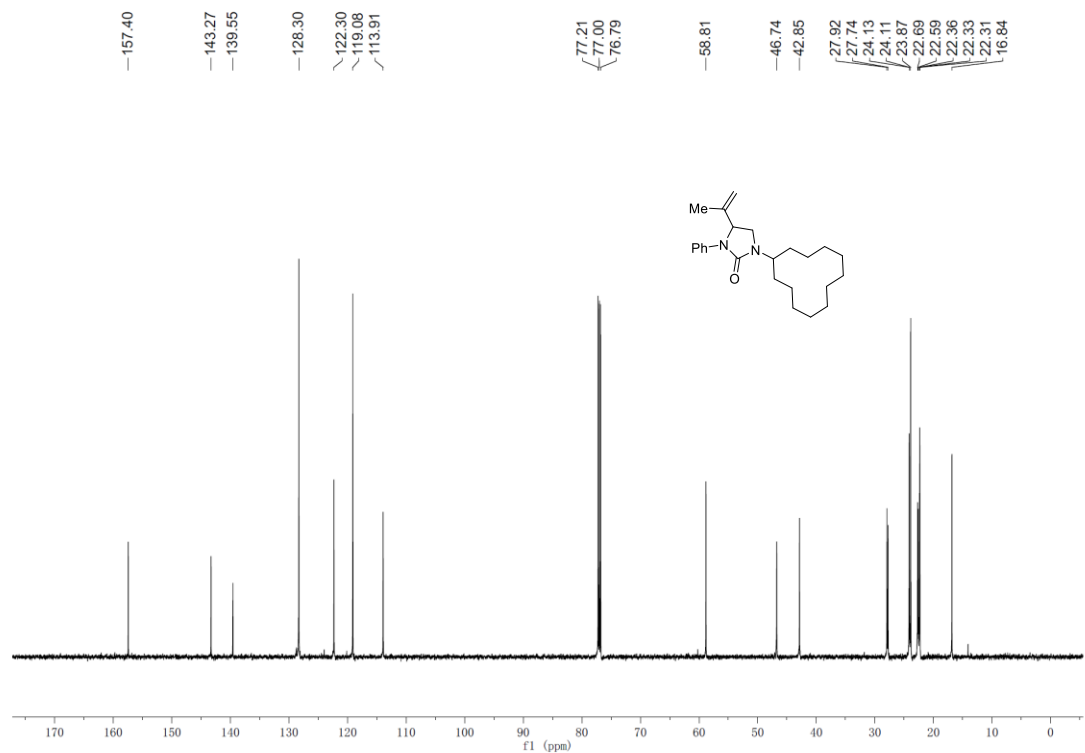
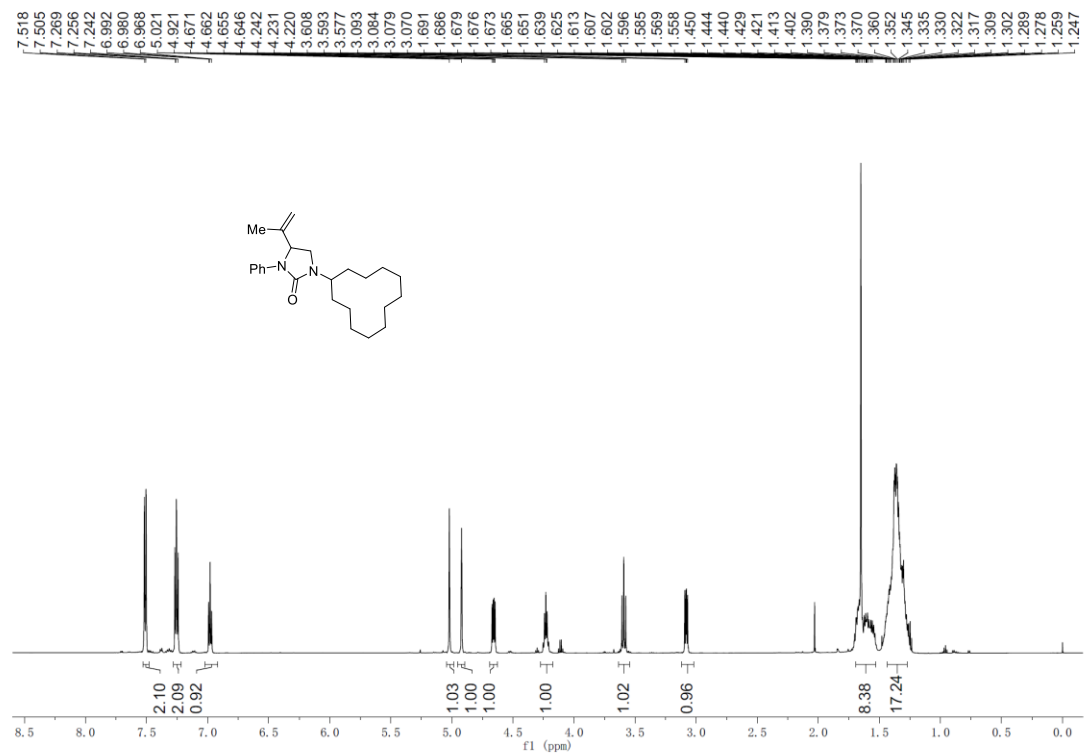
1-cyclohexyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ap)



1-cyclooctyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2aq)

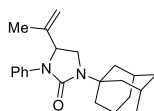
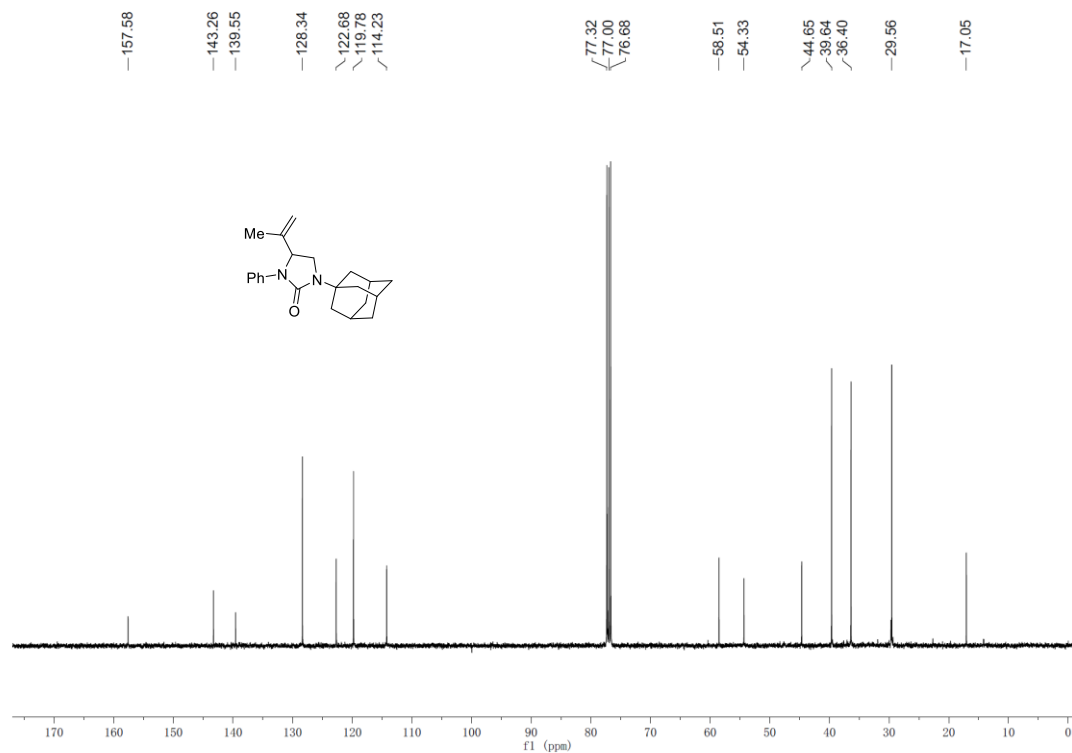
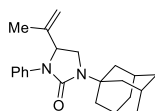
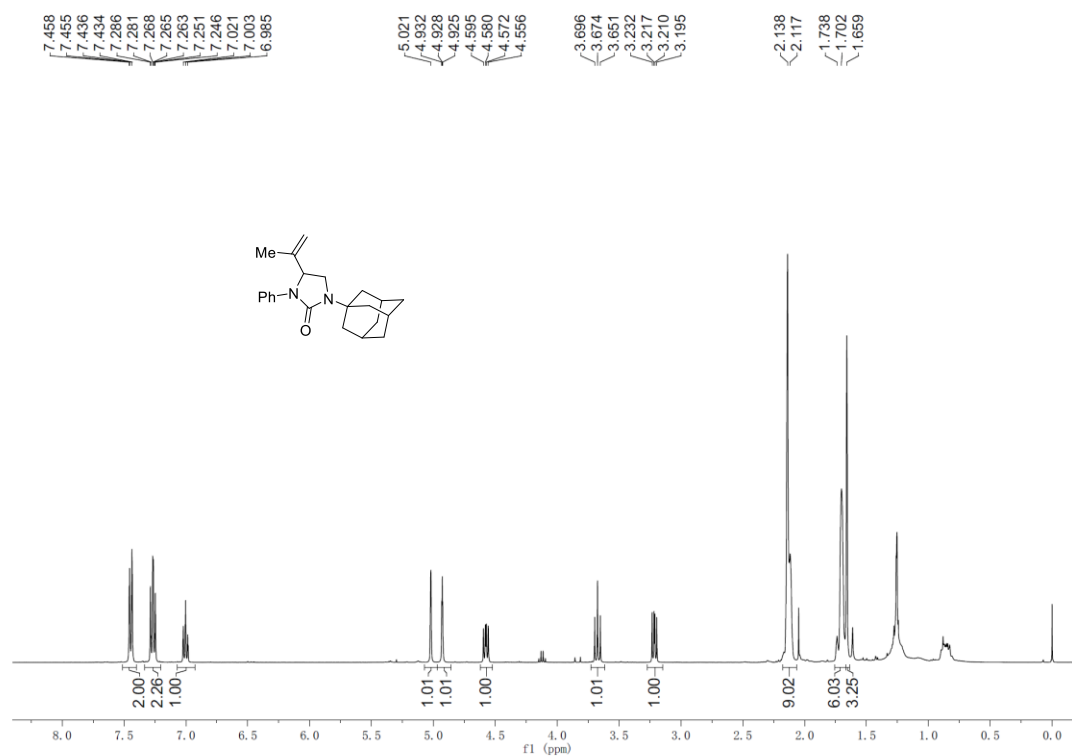


1-cyclododecyl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2ar)

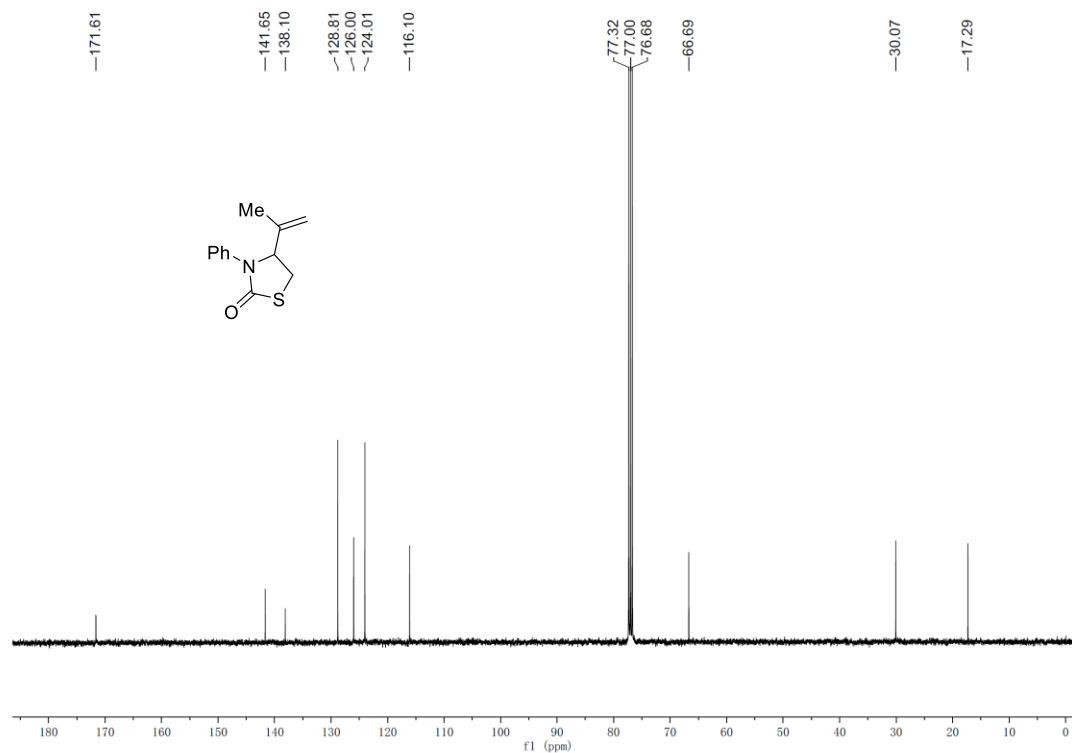
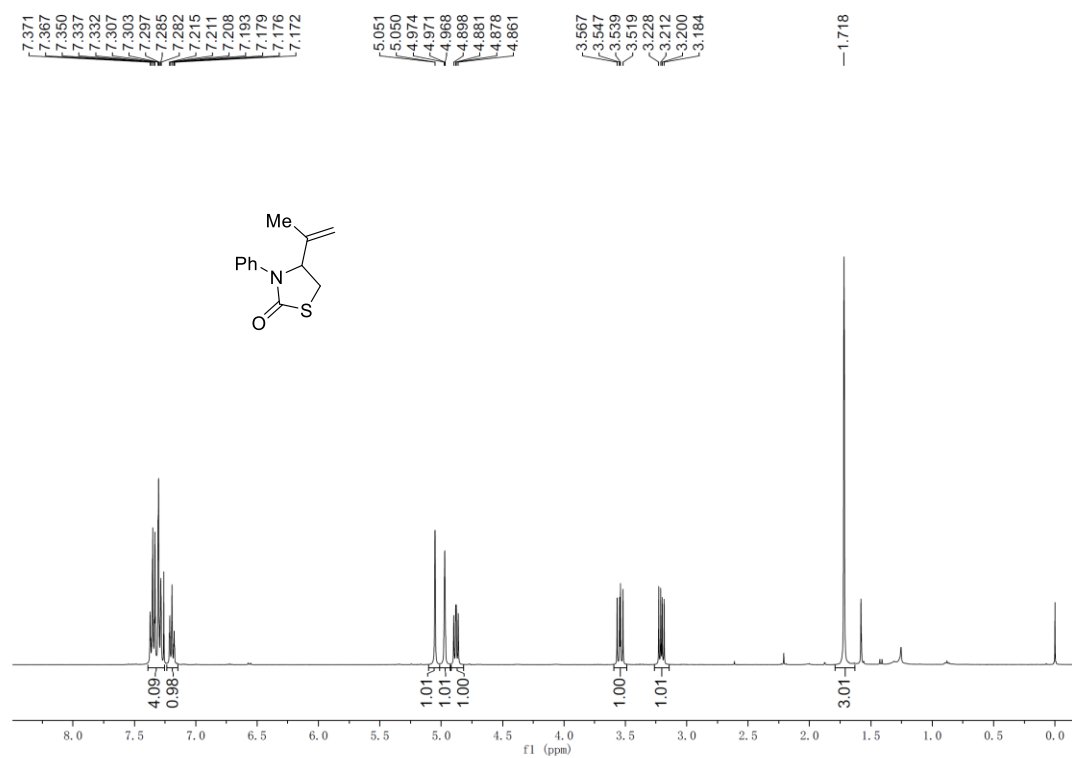




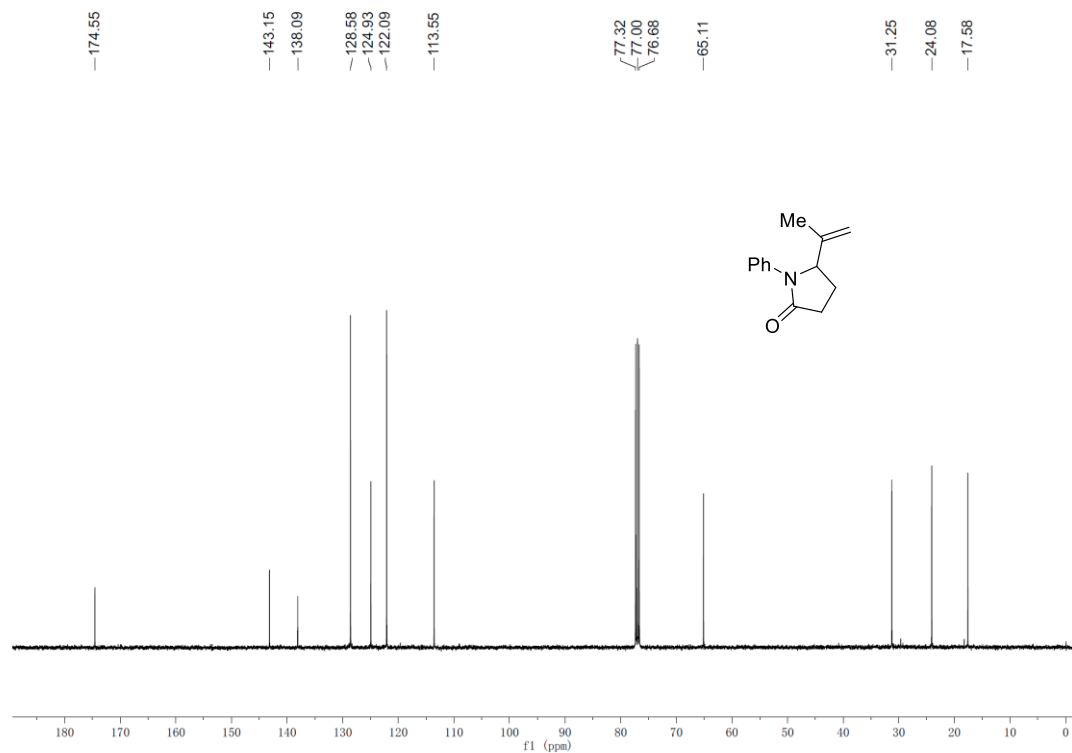
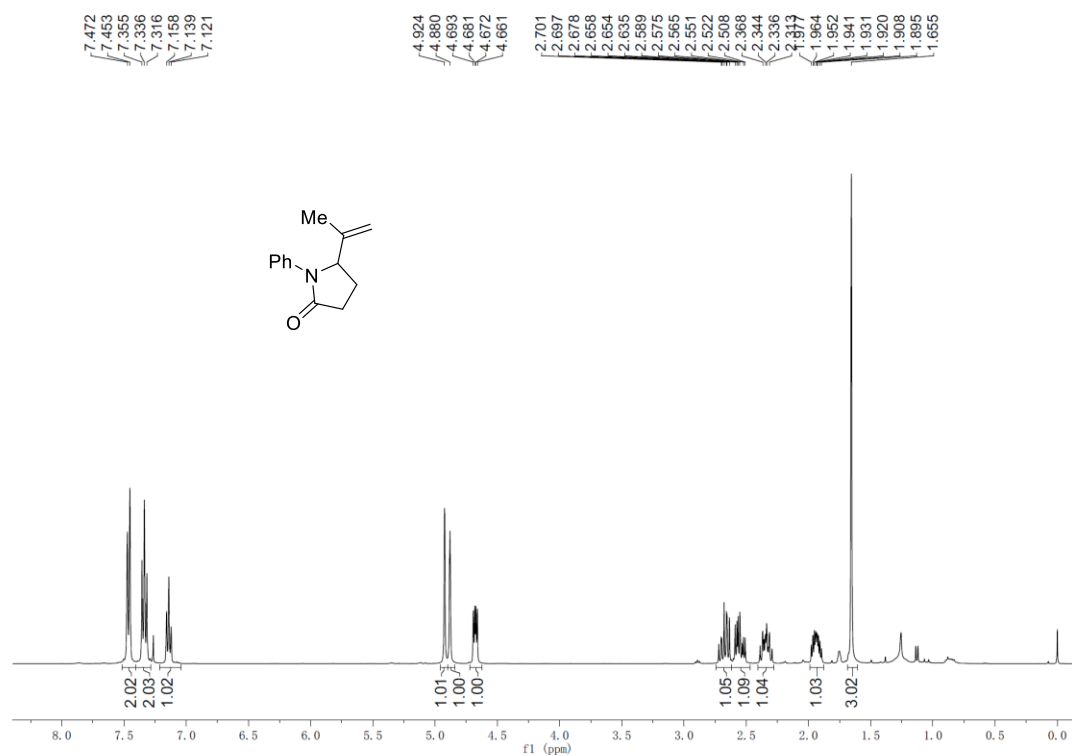
**1-adamantan-1-yl-3-phenyl-4-(prop-1-en-2-yl)imidazolidin-2-one (2as)**



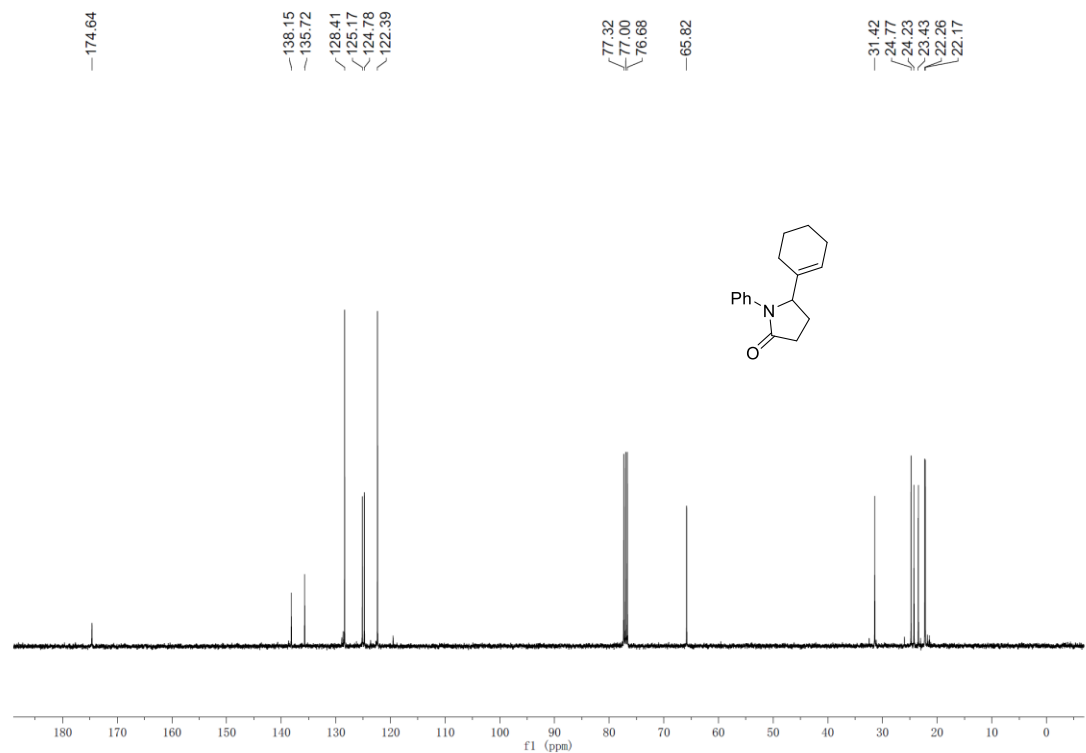
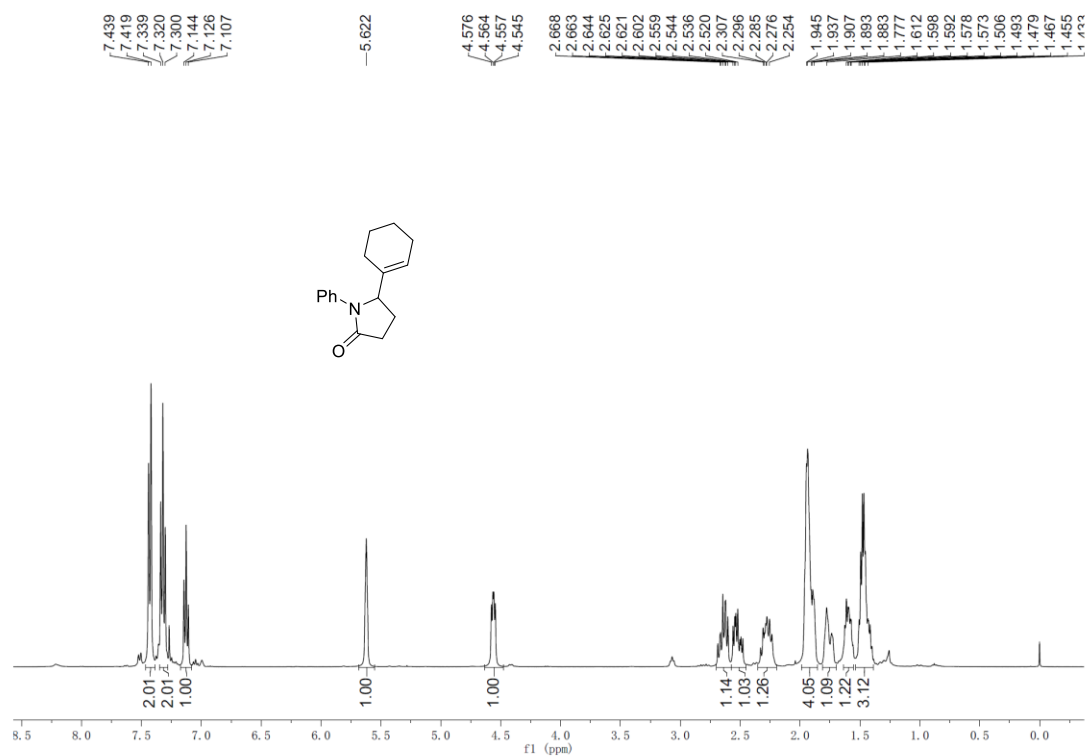
### 3-phenyl-4-(prop-1-en-2-yl)thiazolidin-2-one (2at)



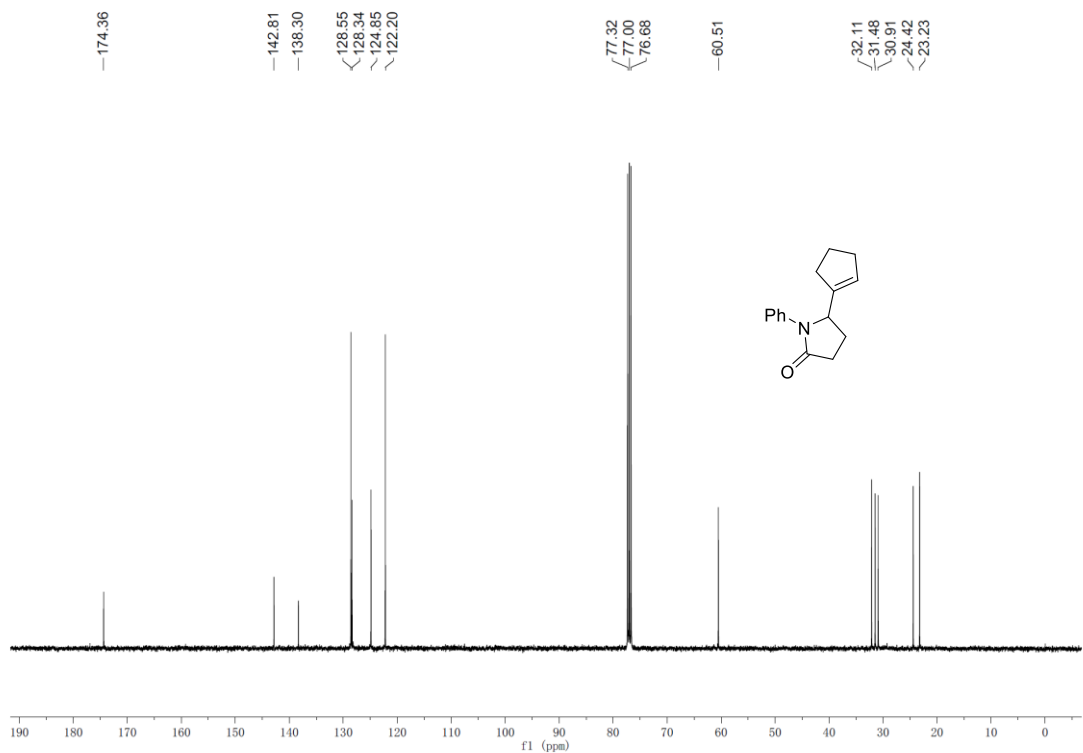
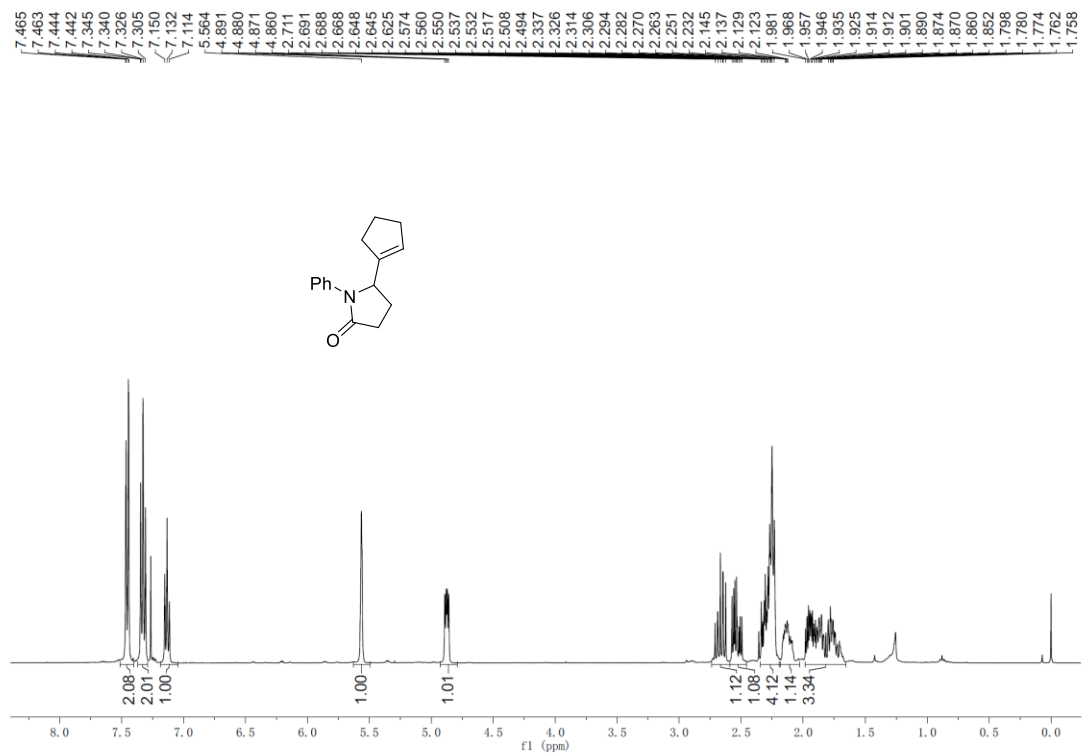
1-phenyl-5-(prop-1-en-2-yl)pyrrolidin-2-one (2au)



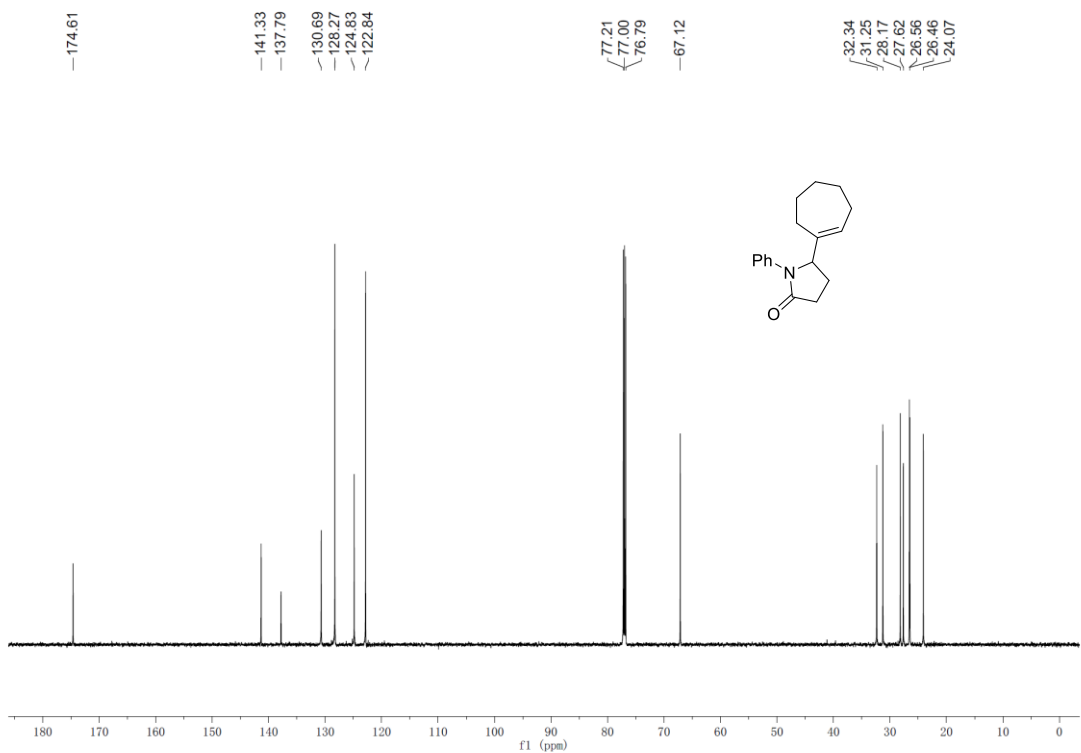
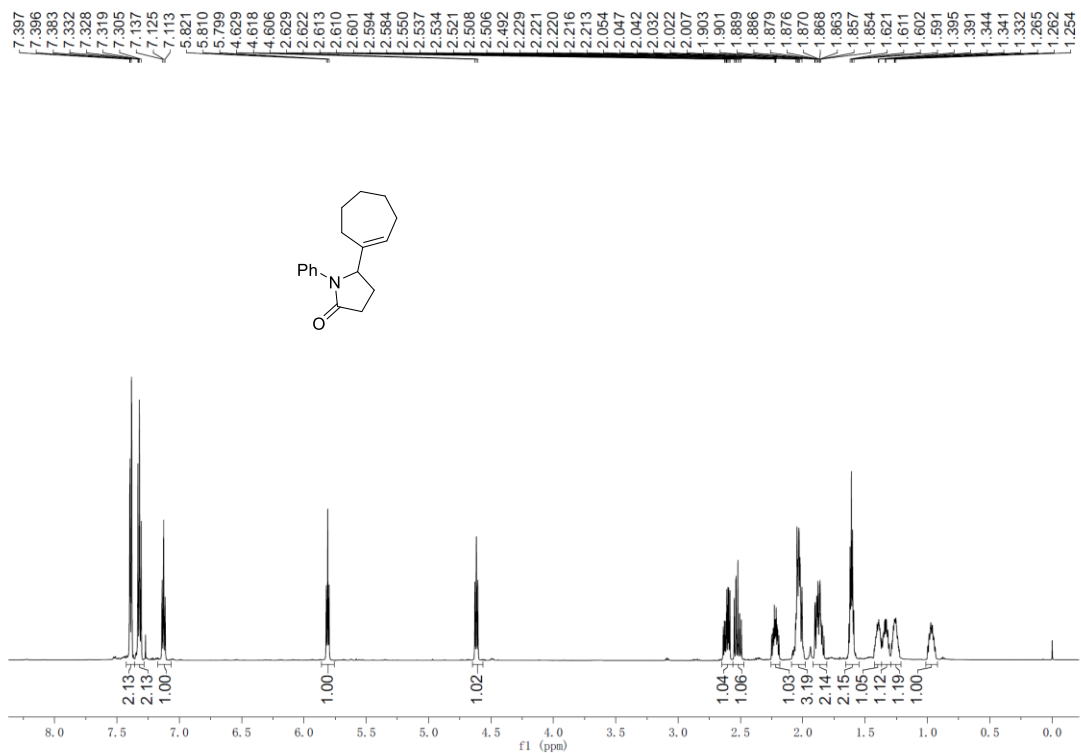
5-(cyclohex-1-en-1-yl)-1-phenylpyrrolidin-2-one (2av)



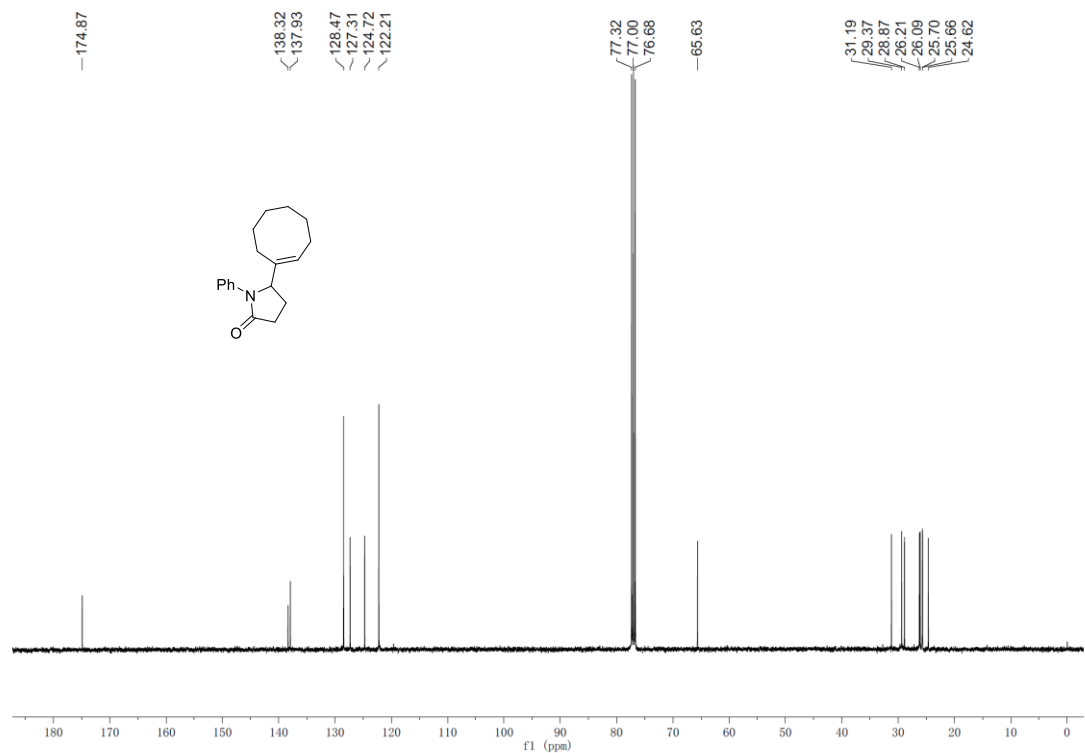
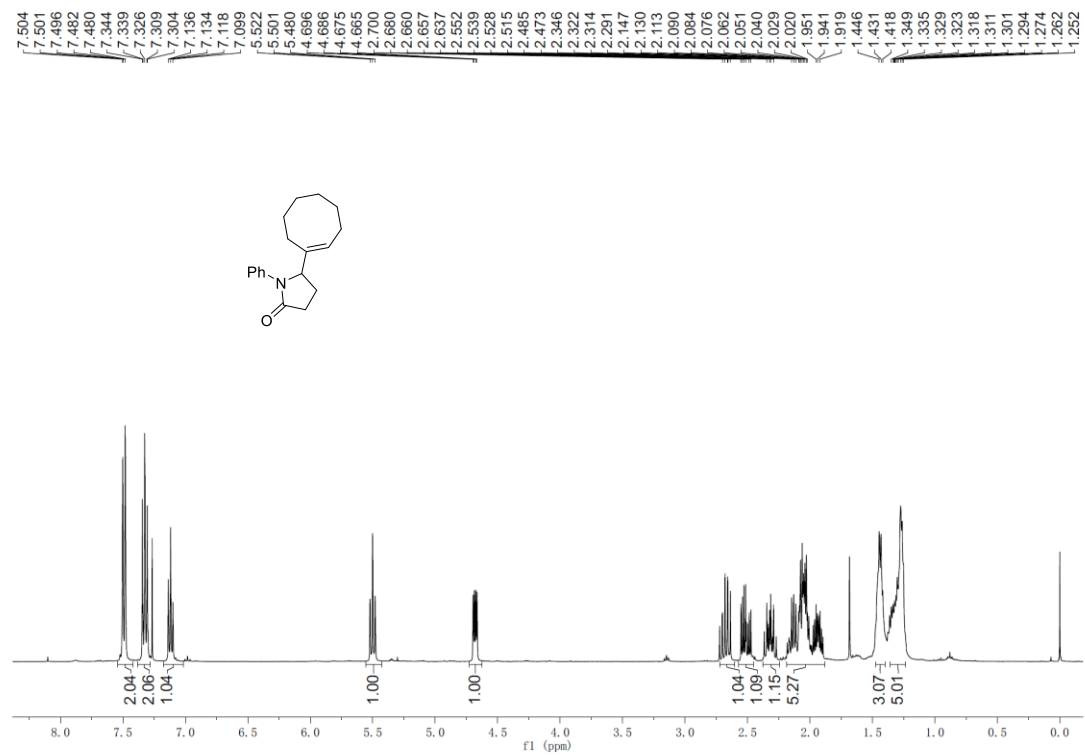
**5-(cyclopent-1-en-1-yl)-1-phenylpyrrolidin-2-one (2aw)**



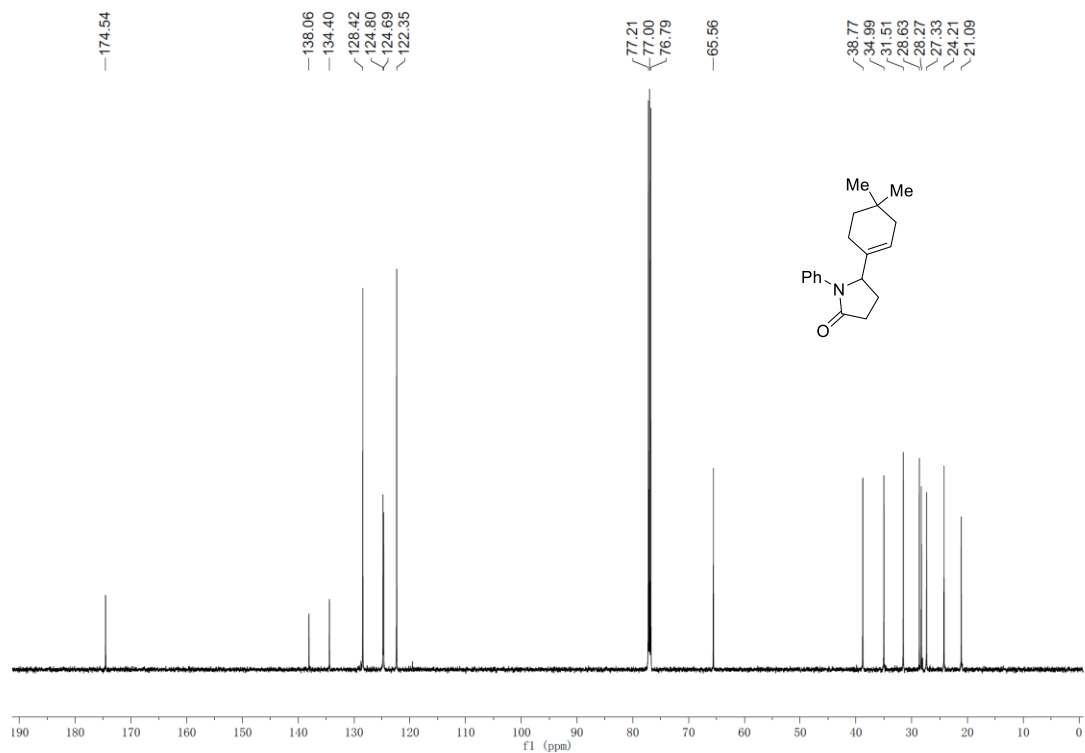
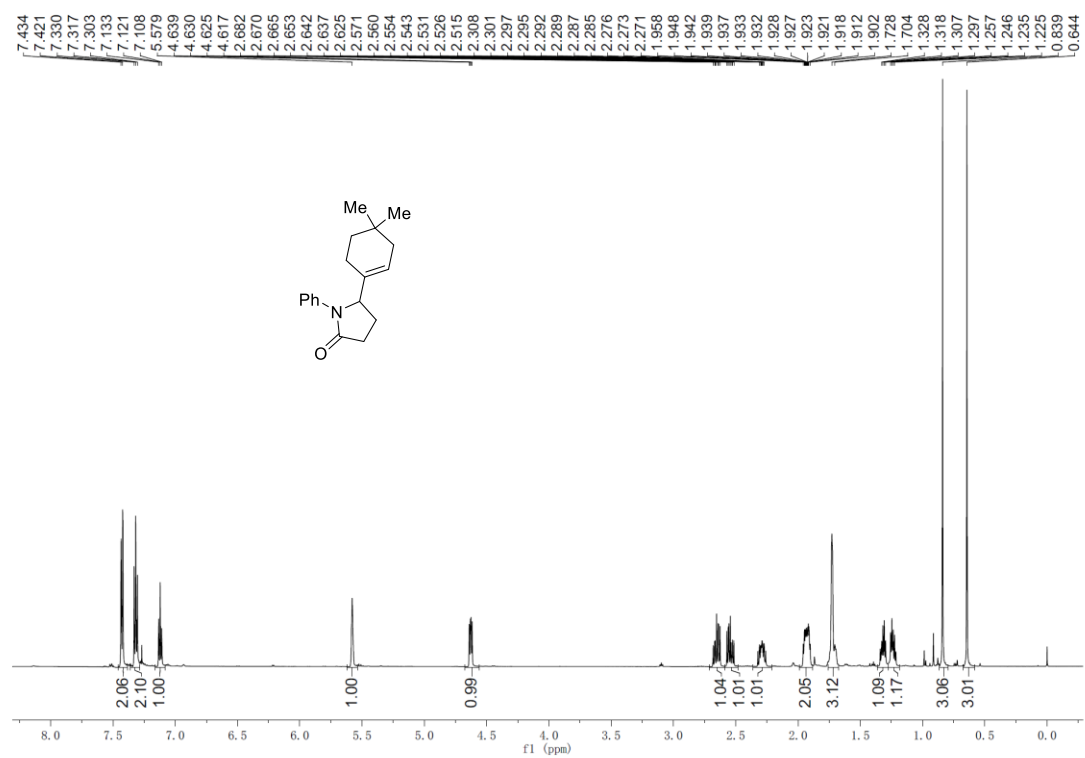
**5-(cyclohept-1-en-1-yl)-1-phenylpyrrolidin-2-one (2ax)**



**(E)-5-(cyclooct-1-en-1-yl)-1-phenylpyrrolidin-2-one (2ay)**

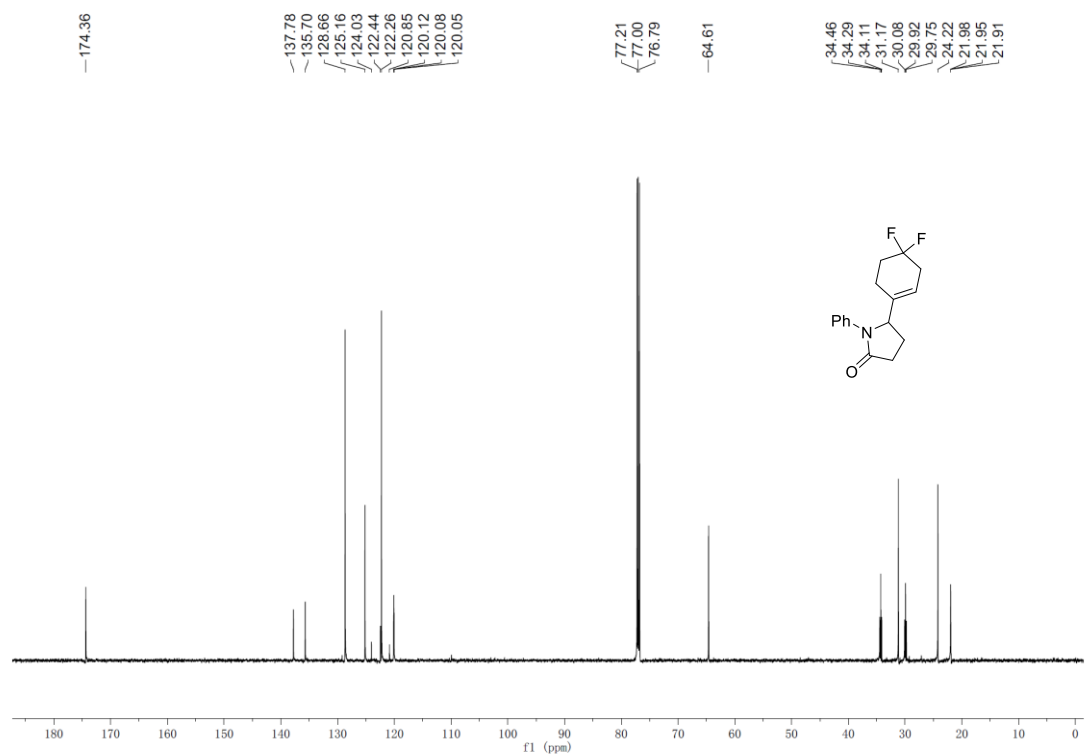
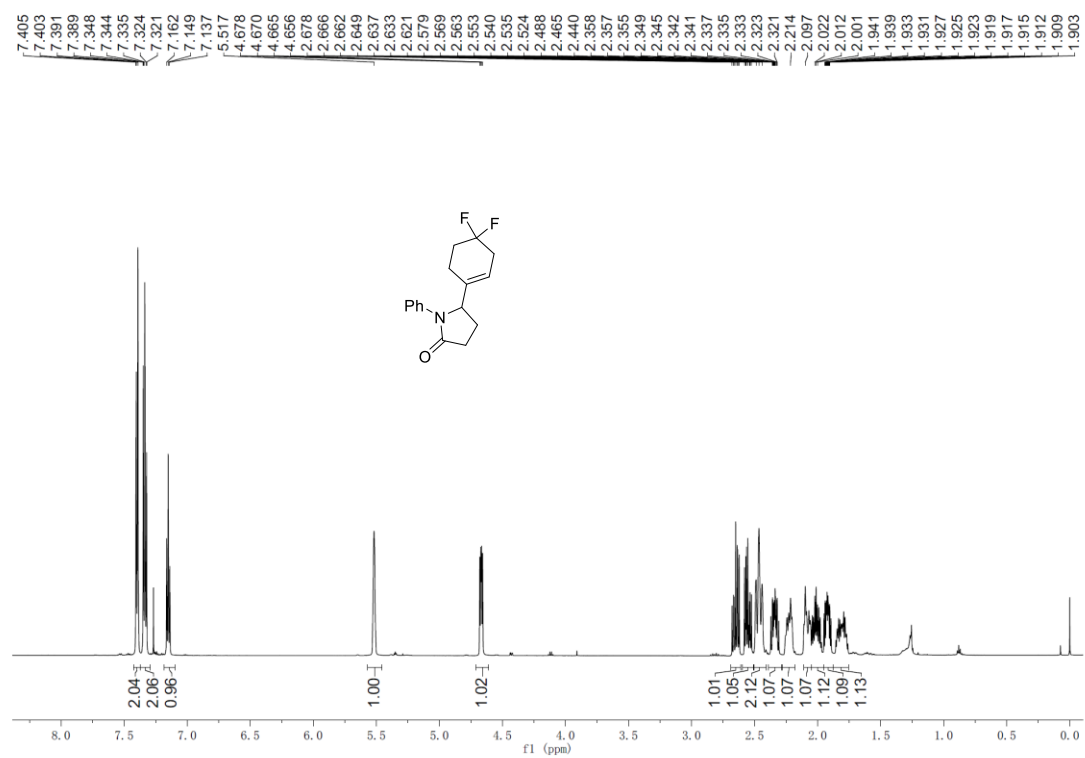


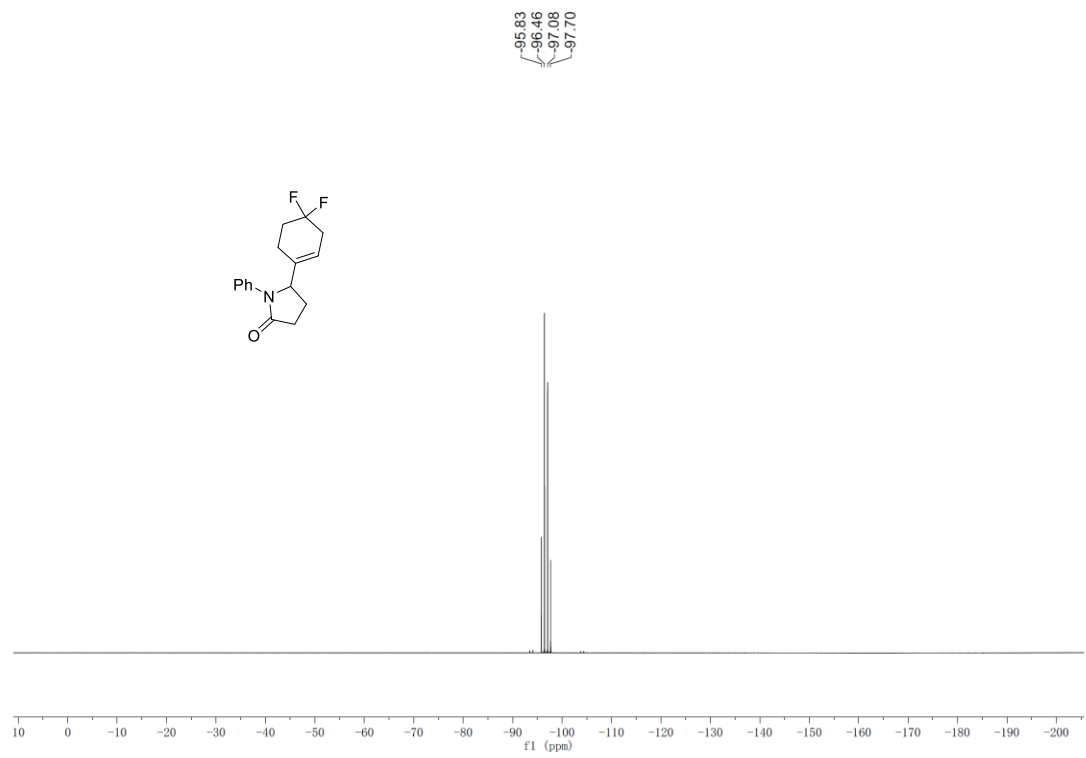
**5-(4,4-dimethylcyclohex-1-en-1-yl)-1-phenylpyrrolidin-2-one (2az)**



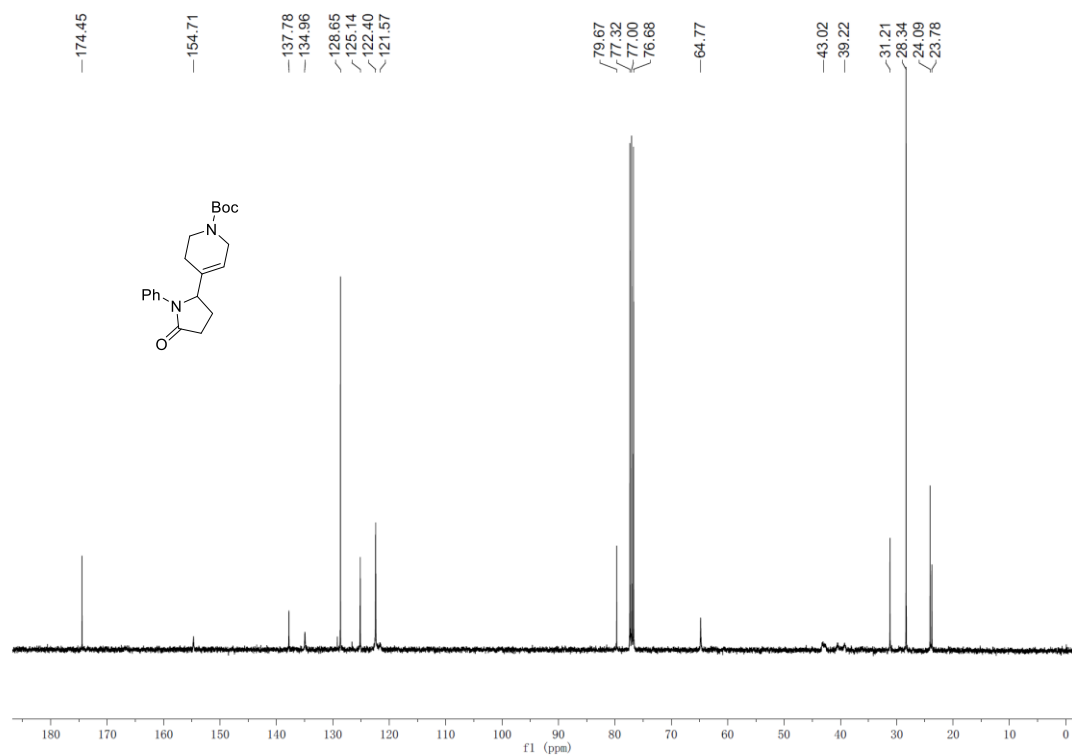
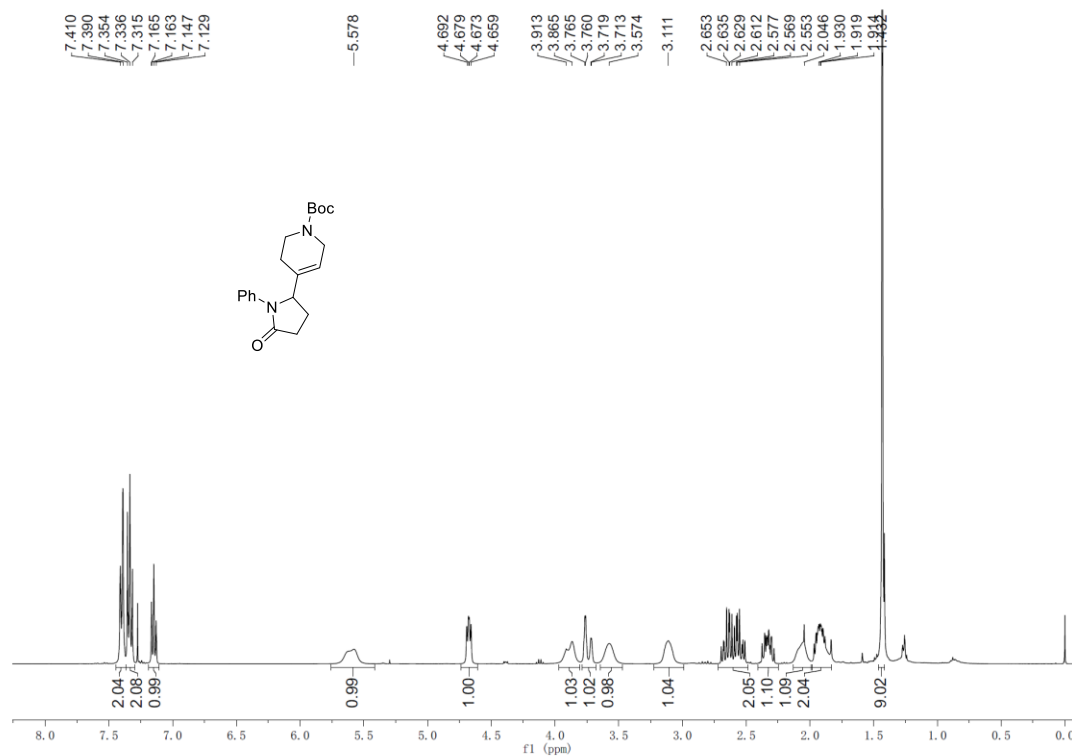


**5-(4,4-difluorocyclohex-1-en-1-yl)-1-phenylpyrrolidin-2-one (2ba)**

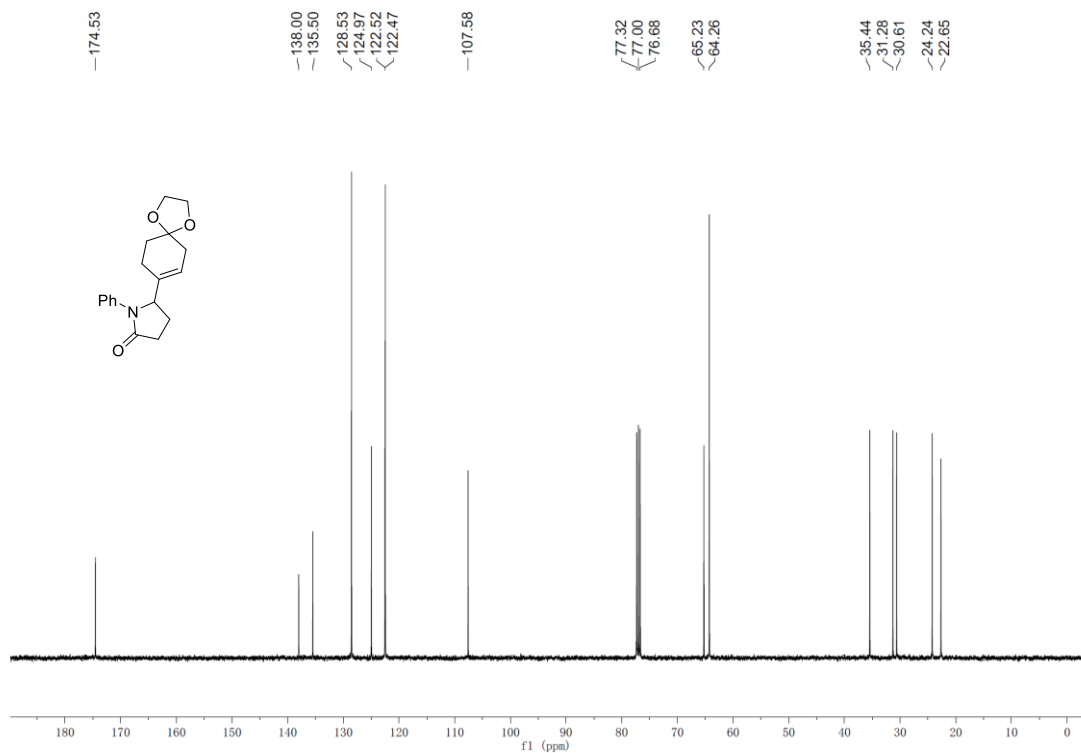
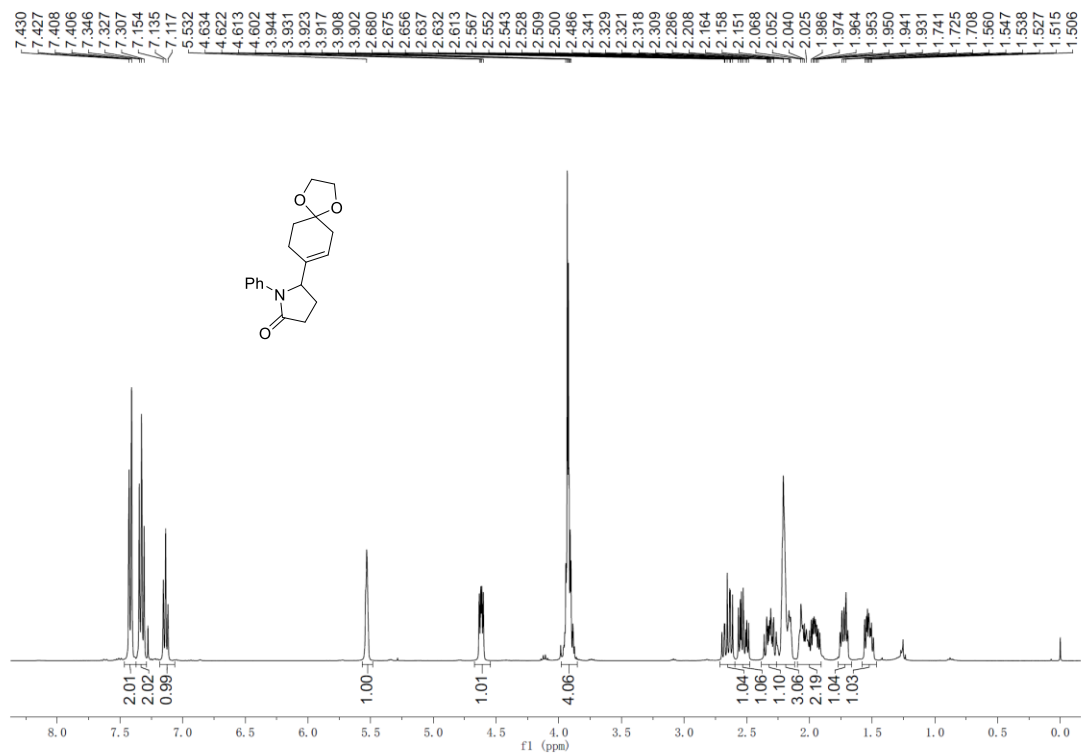




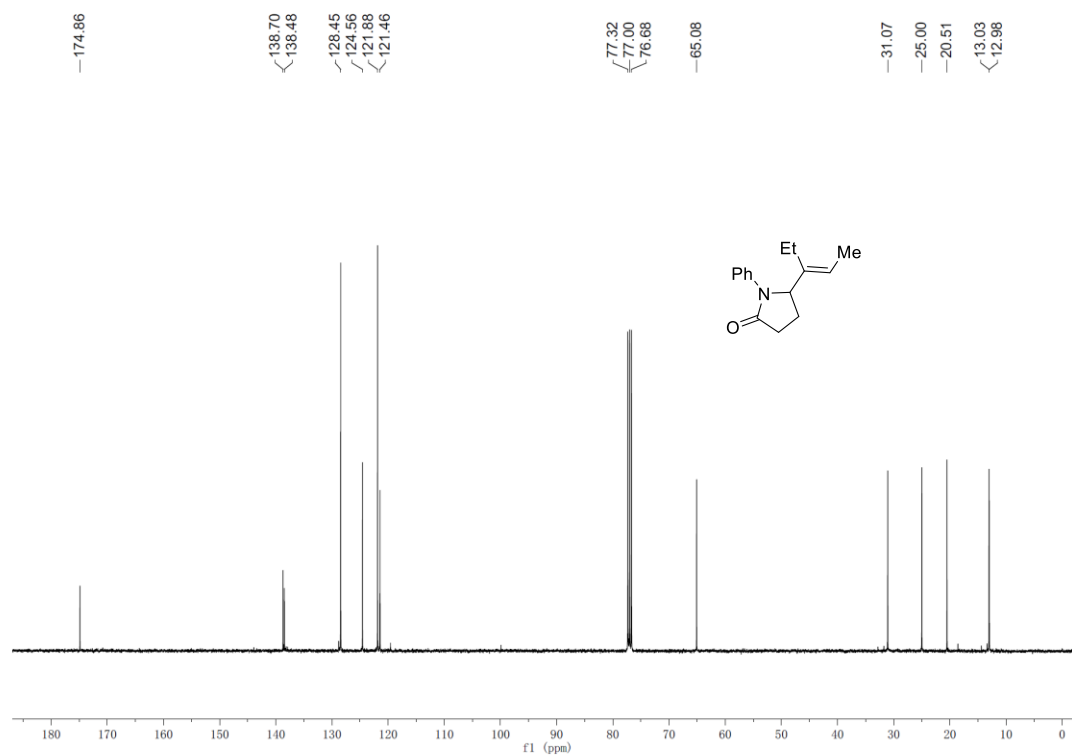
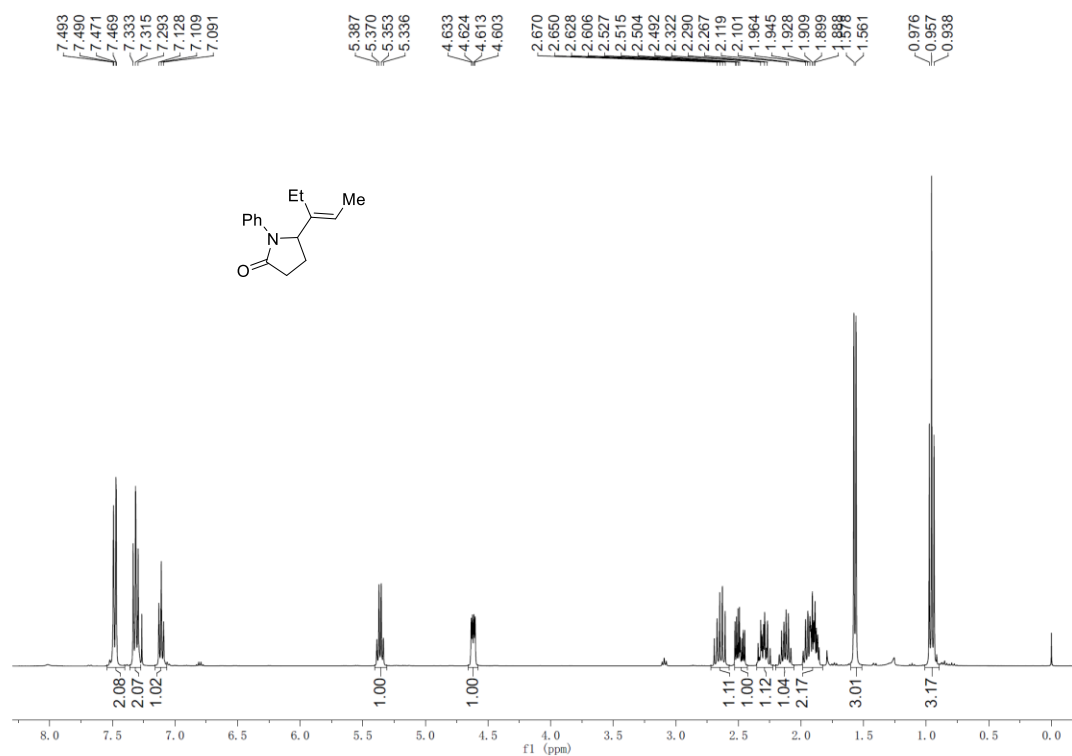
**tert-butyl 4-(5-oxo-1-phenylpyrrolidin-2-yl)-3,6-dihydropyridine-1(2H)-carboxylate (2bb)**



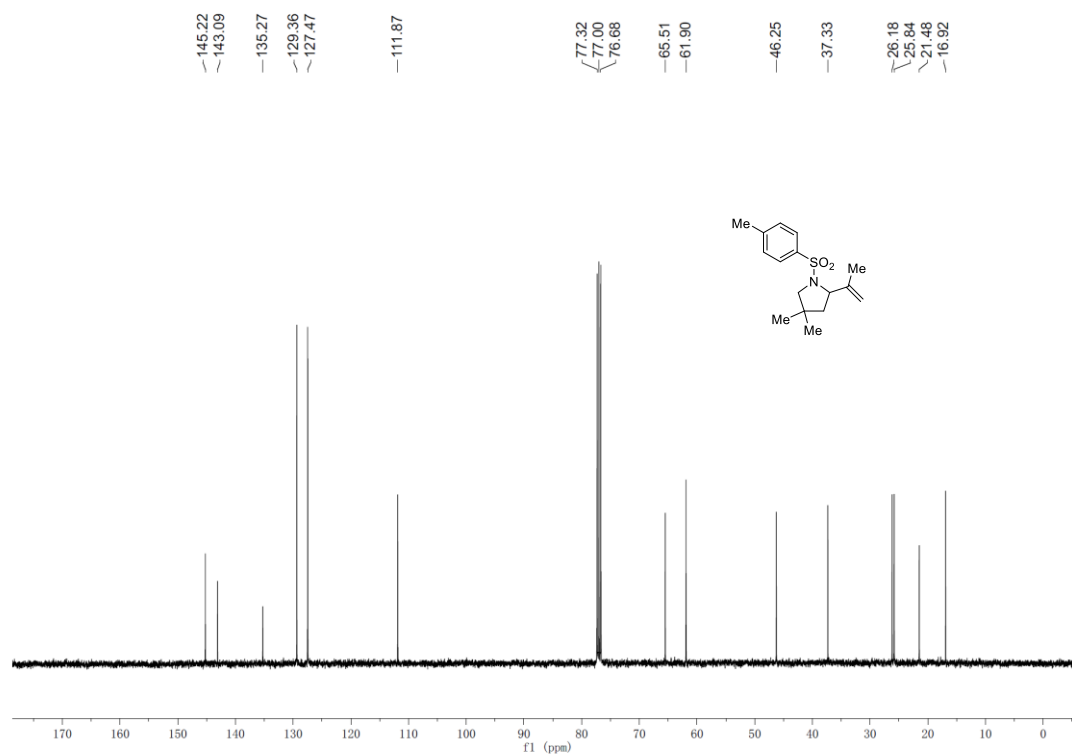
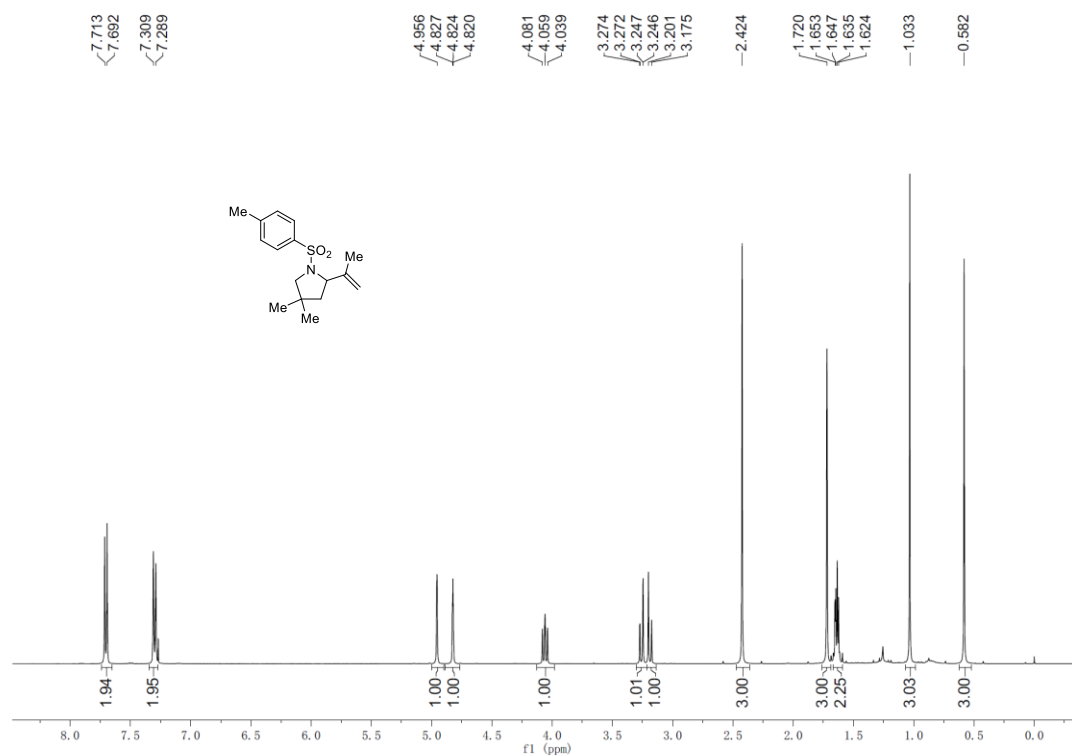
**1-phenyl-5-(1,4-dioxaspiro[4.5]dec-7-en-8-yl)pyrrolidin-2-one (2bc)**



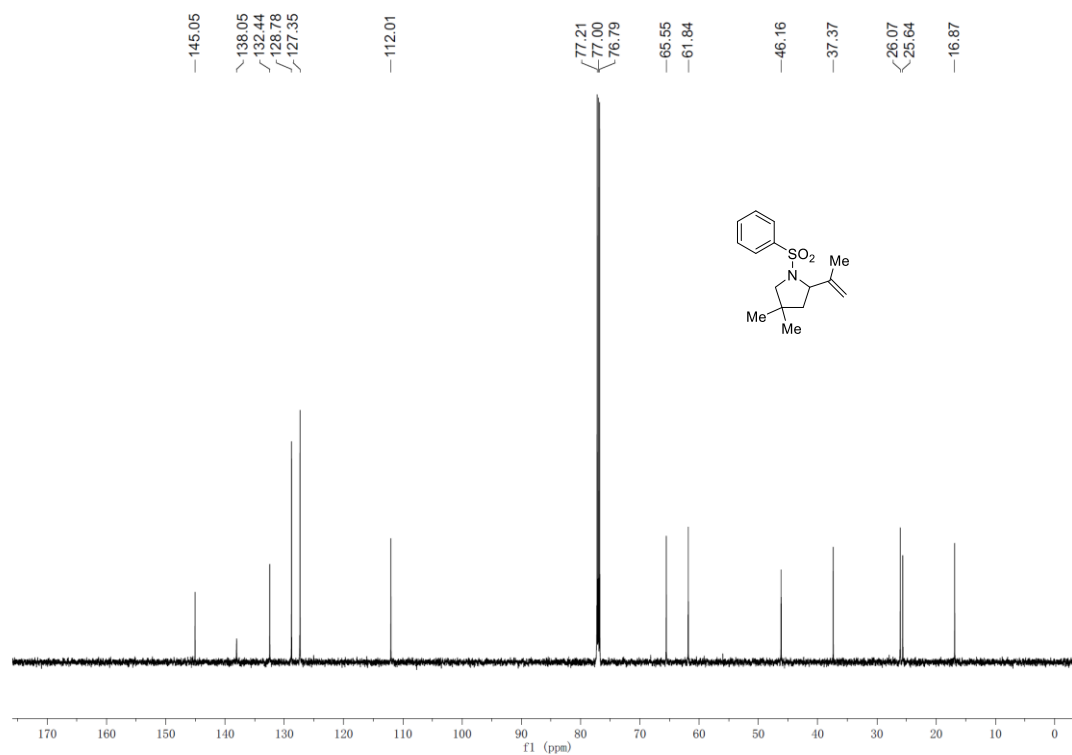
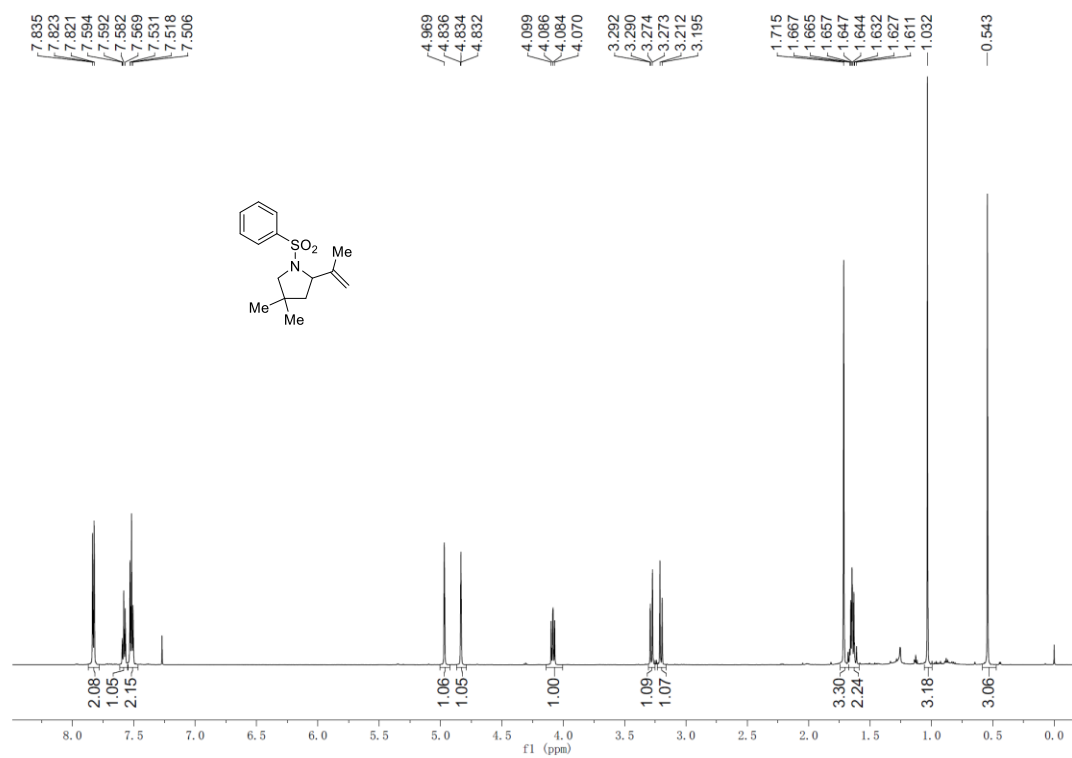
**(E)-5-(pent-2-en-3-yl)-1-phenylpyrrolidin-2-one (2bd)**



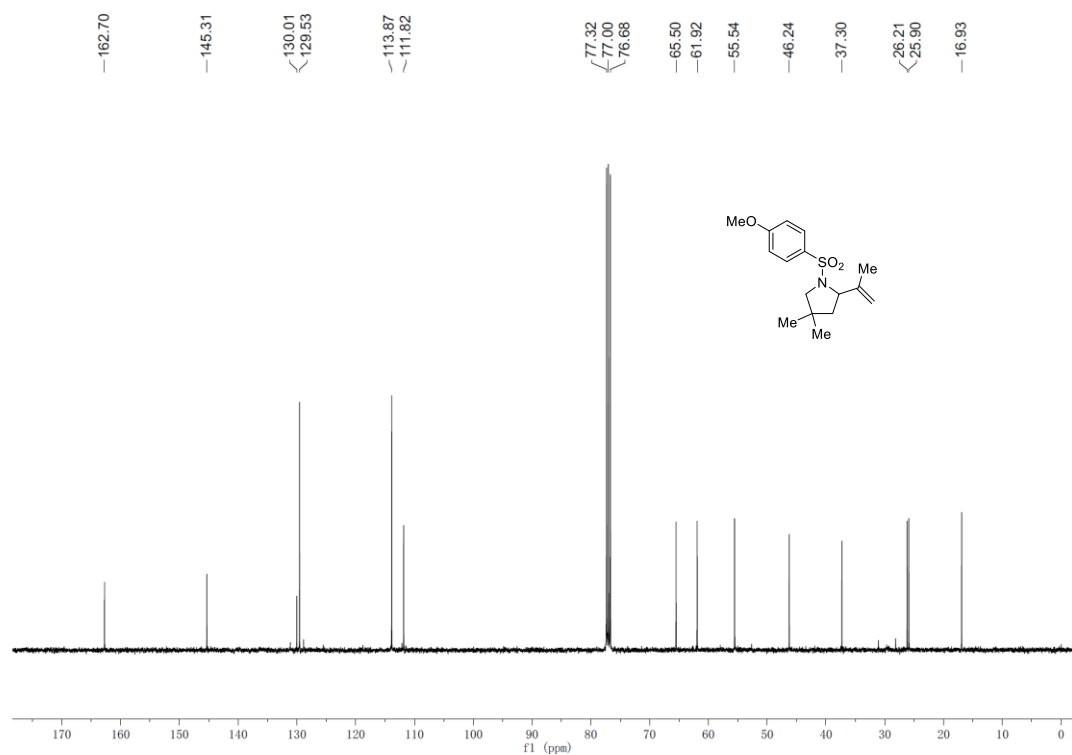
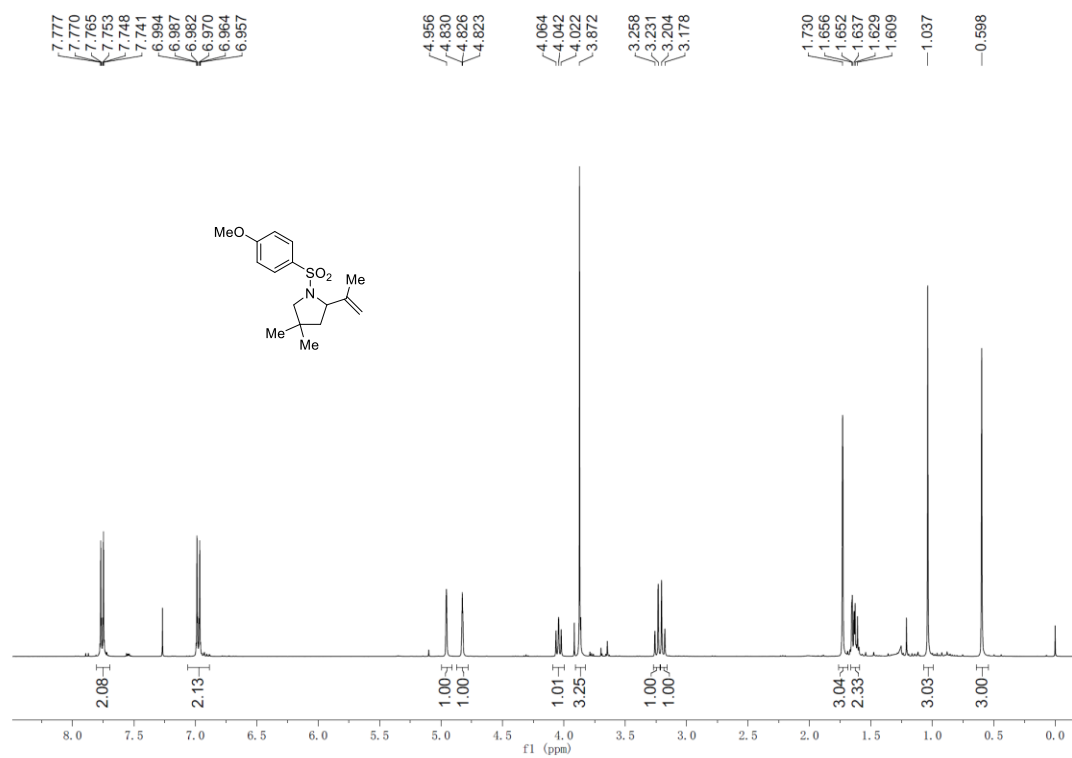
### 4,4-dimethyl-2-(prop-1-en-2-yl)-1-tosylpyrrolidine (4a)



### 4,4-dimethyl-1-(phenylsulfonyl)-2-(prop-1-en-2-yl)pyrrolidine (4b)

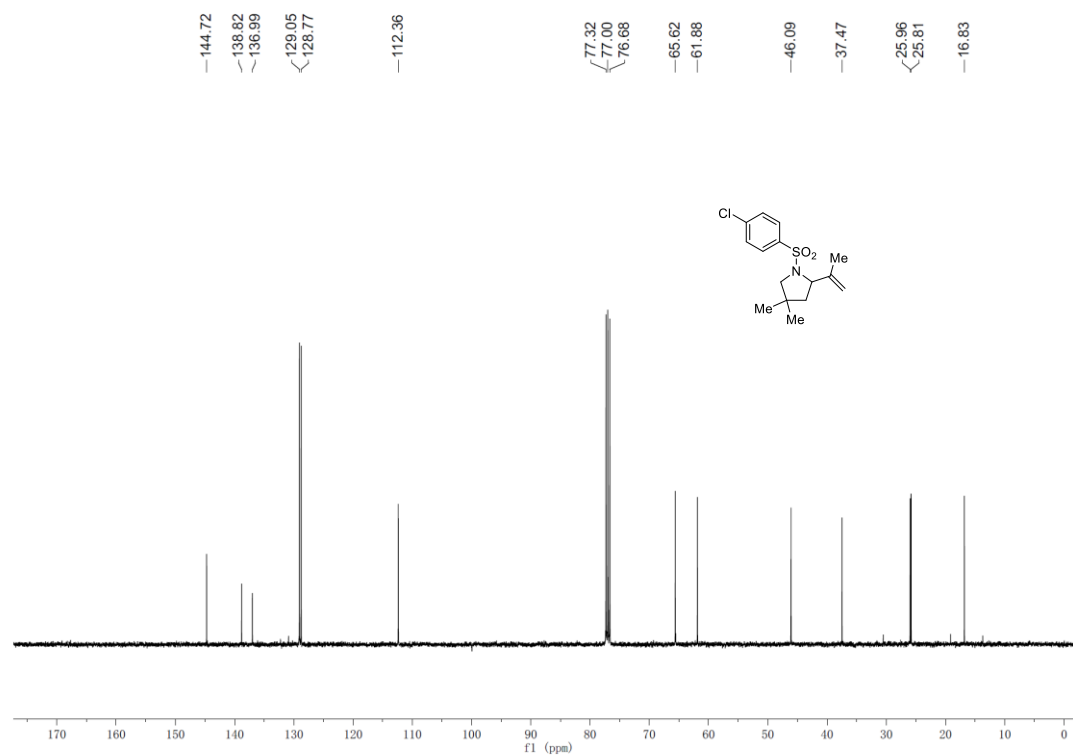
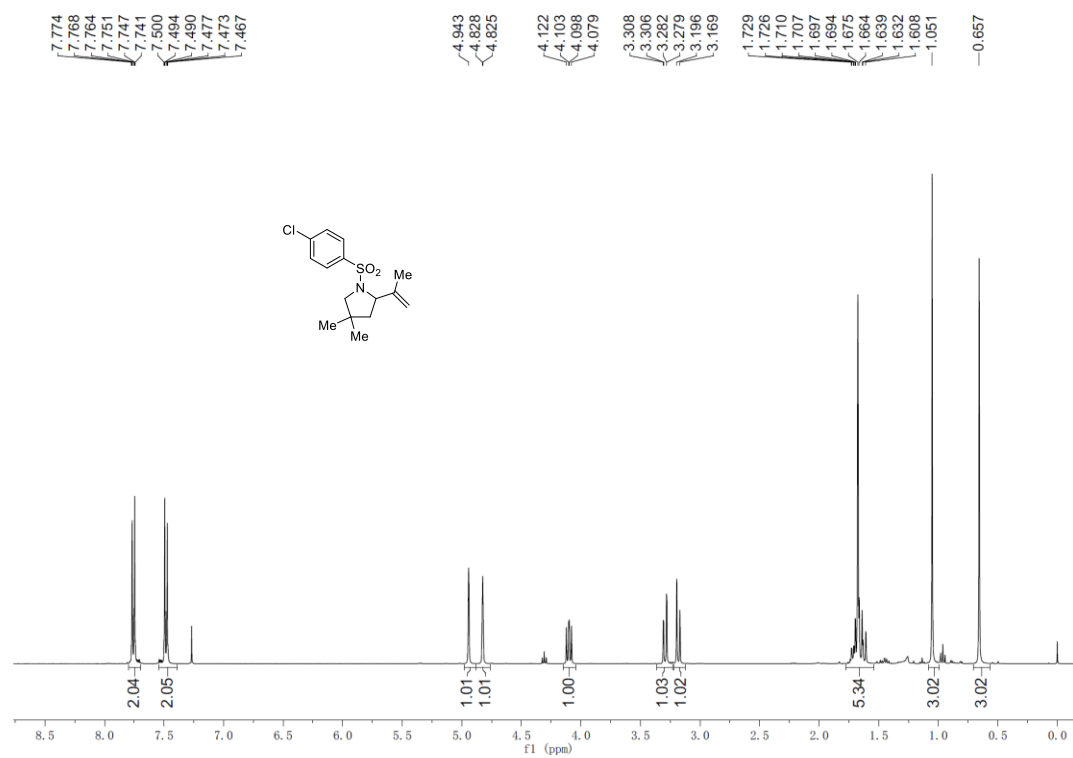


**1-((4-methoxyphenyl)sulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4c)**

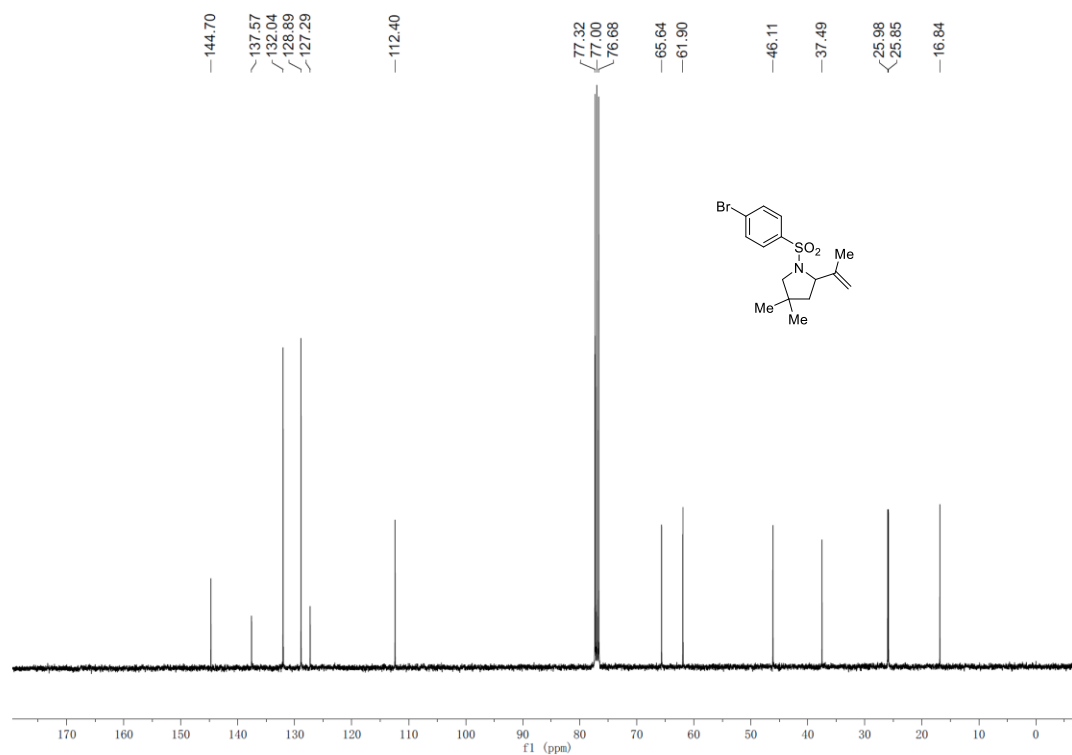
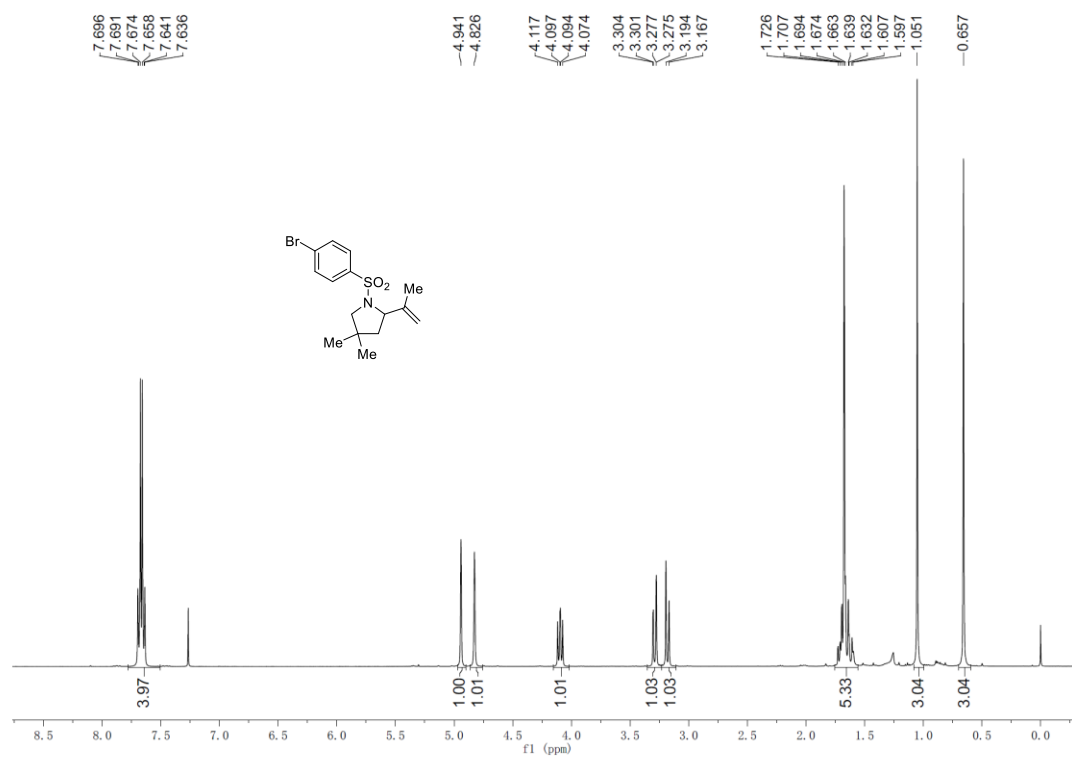




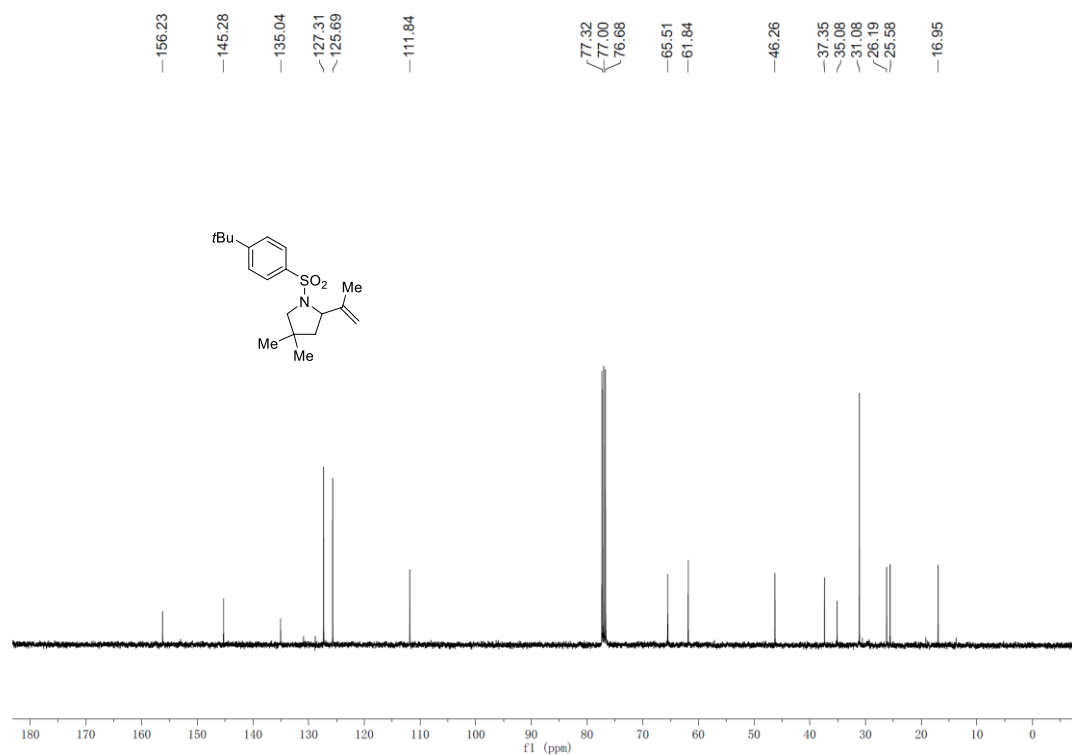
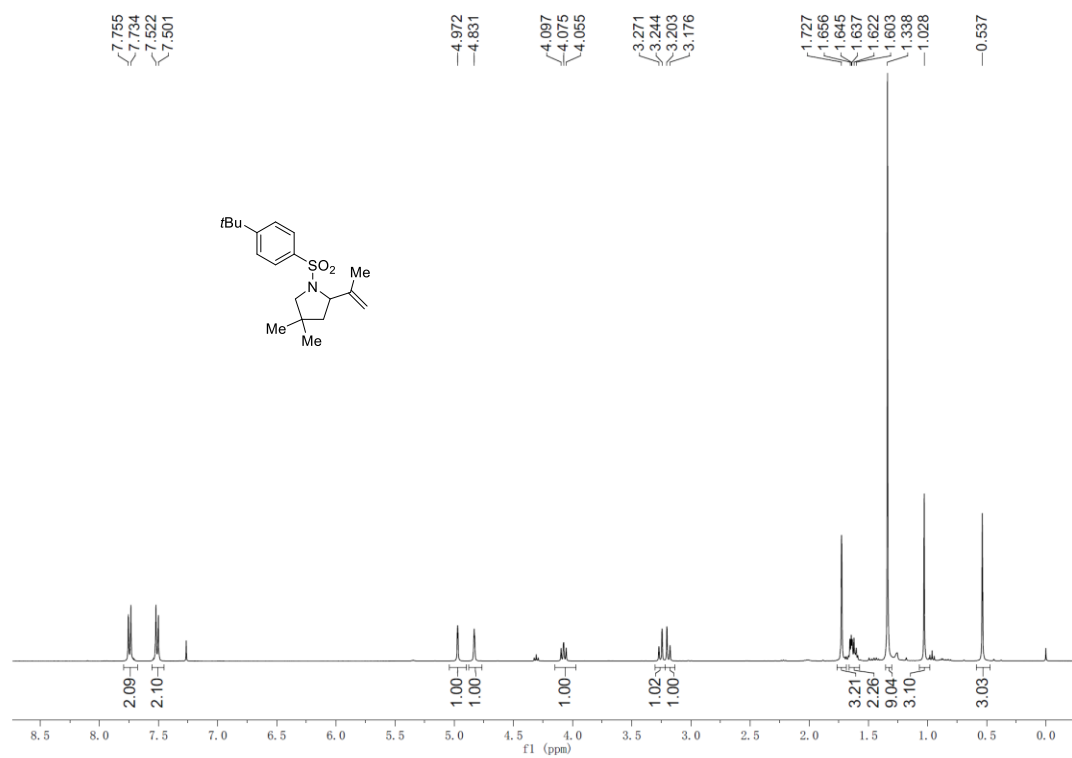
1-((4-chlorophenyl)sulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4d)



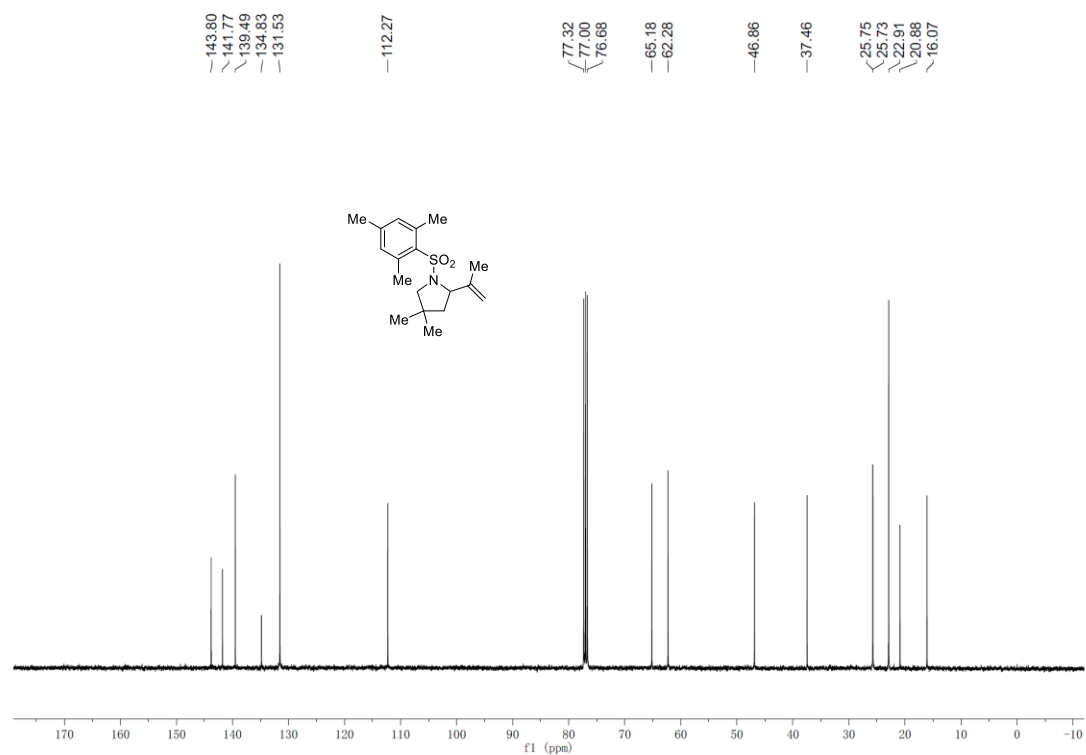
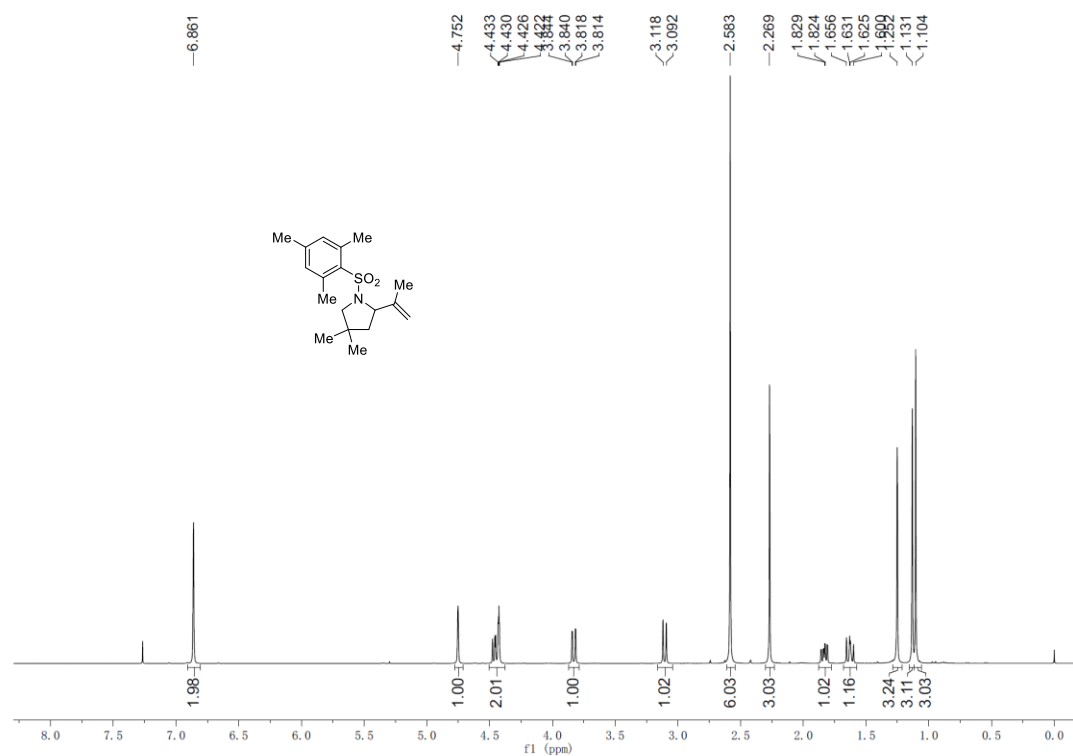
# 1-((4-bromophenyl)sulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4e)



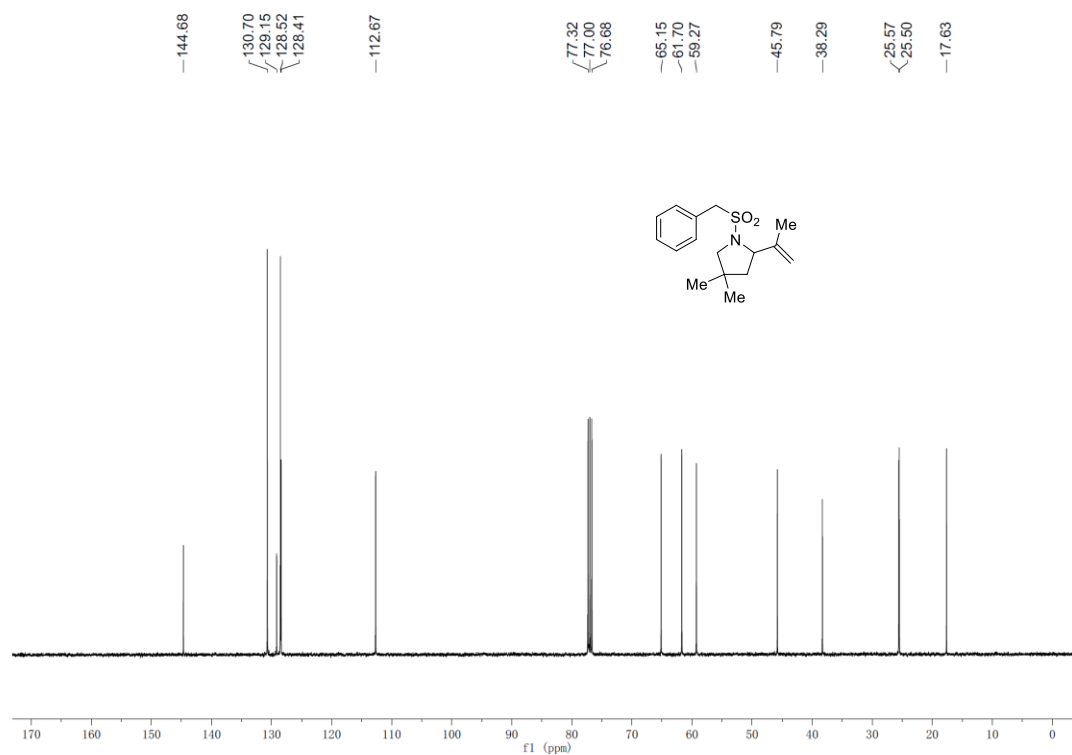
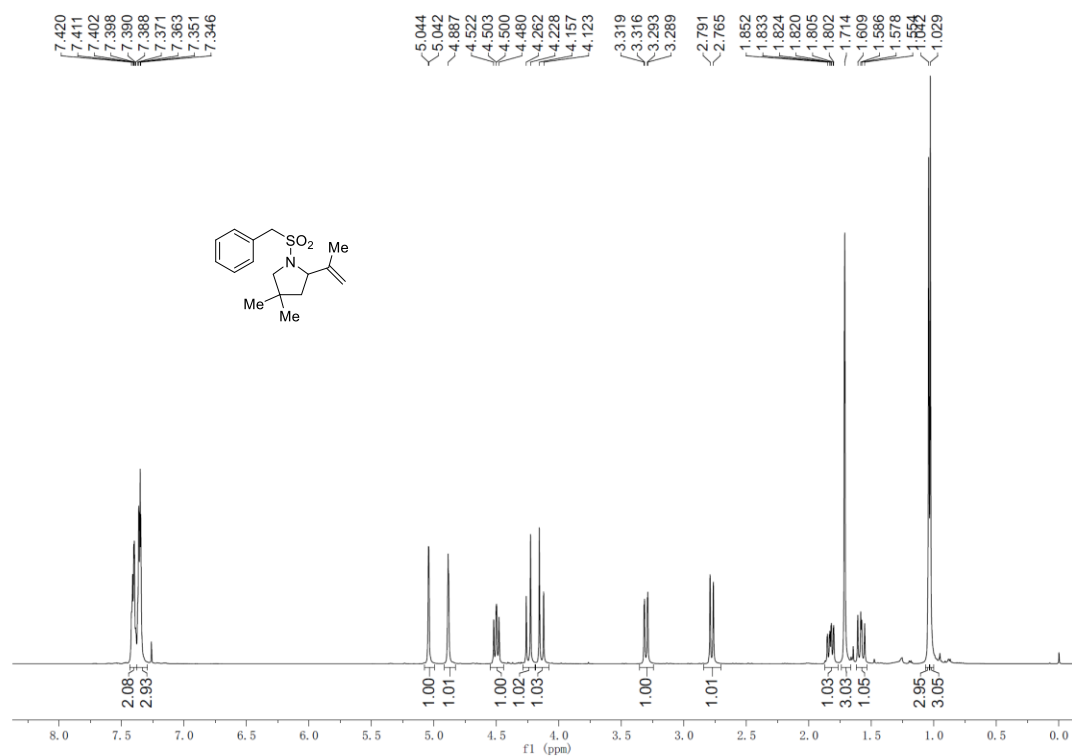
1-((4-(tert-butyl)phenyl)sulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4f)



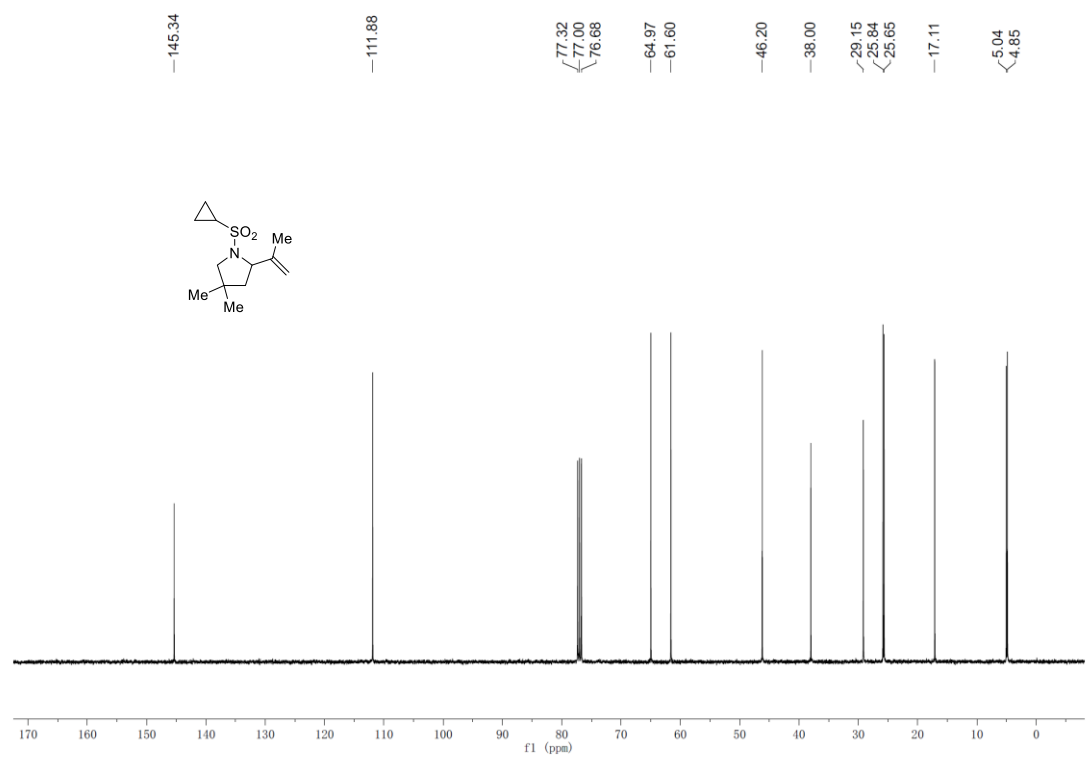
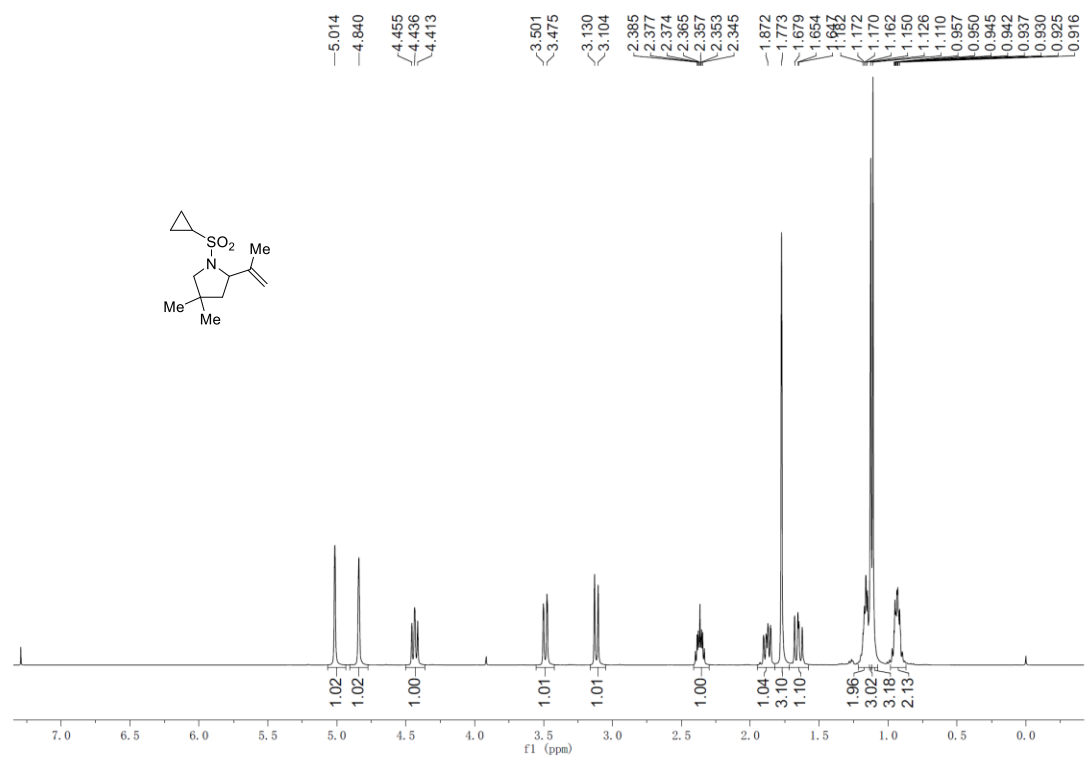
# 1-(mesitylsulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4g)



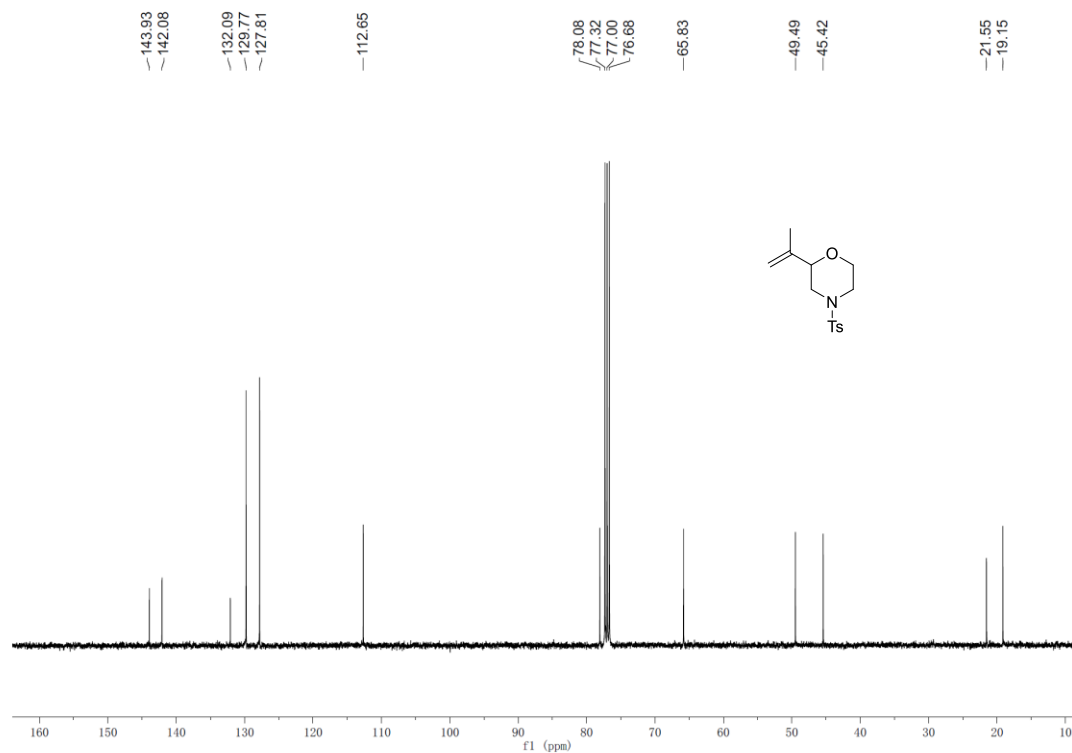
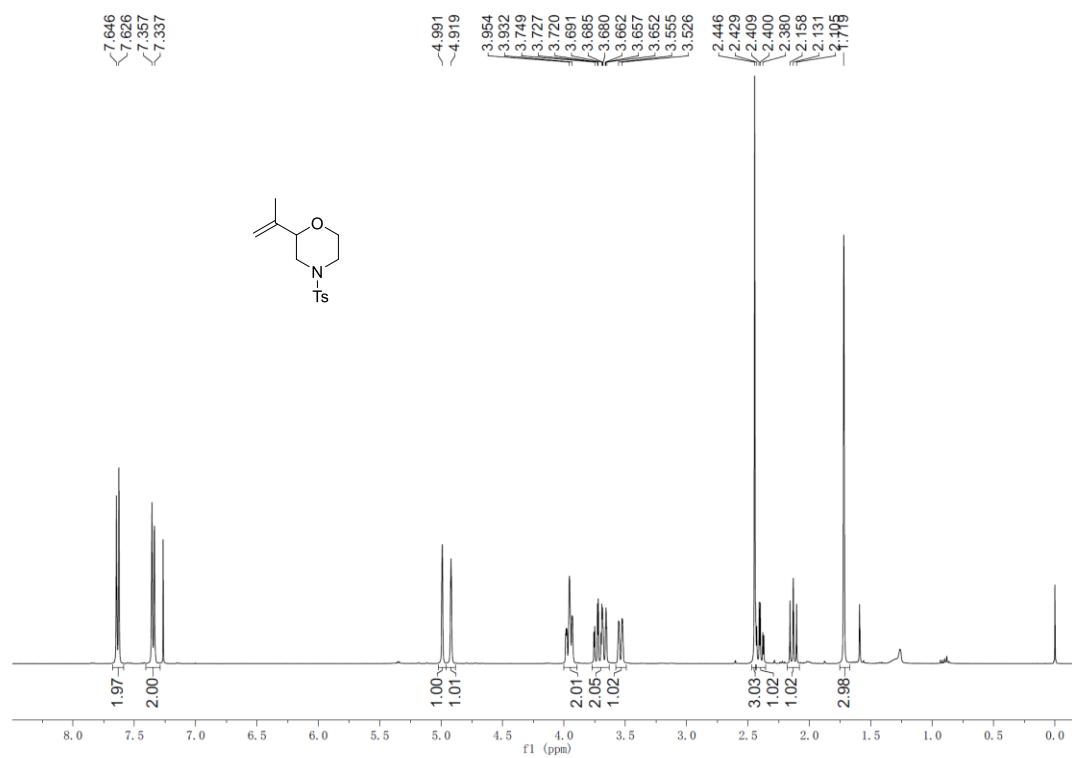
# 1-(benzylsulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4h)



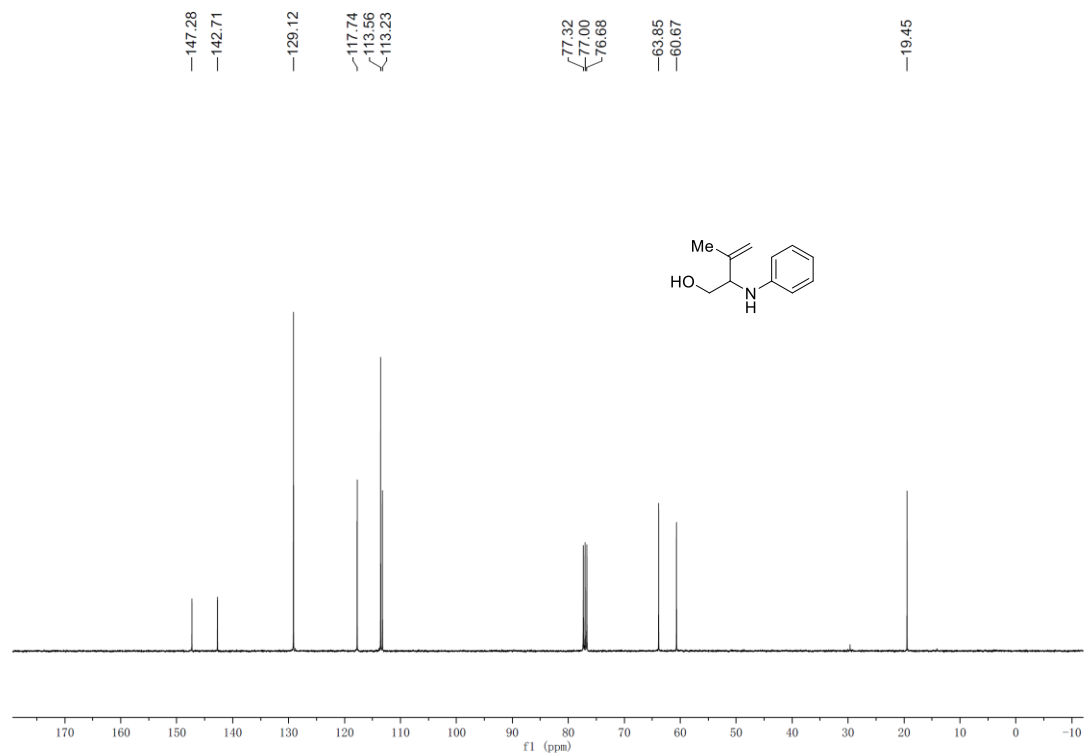
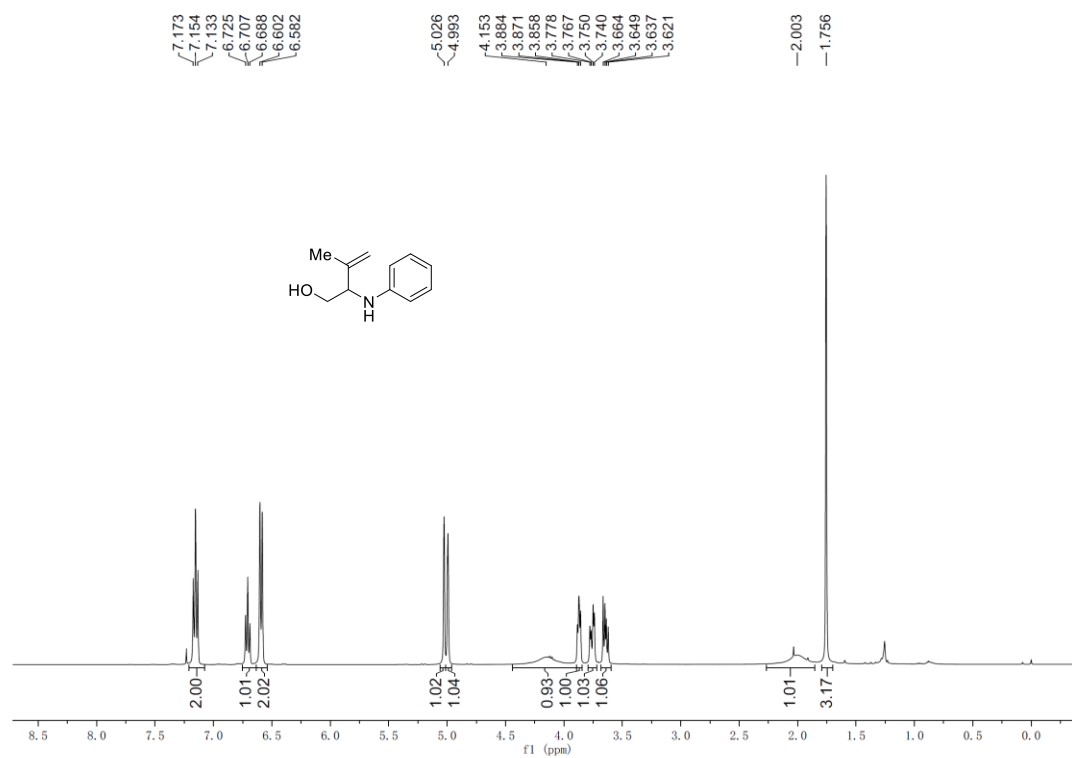
**1-(cyclopropylsulfonyl)-4,4-dimethyl-2-(prop-1-en-2-yl)pyrrolidine (4i)**



**2-(prop-1-en-2-yl)-4-tosylmorpholine (4j)**



### 3-methyl-2-(phenylamino)but-3-en-1-ol (2a-I)





### 3-phenyl-4-(prop-1-en-2-yl-d5)oxazolidin-2-one (D<sub>5</sub>-2a)

