Supporting Information

Palladium-Catalyzed Regioselective C-H Alkenylation of Arylacetamides via Distal Weakly Coordinating Primary Amides as Directing Groups

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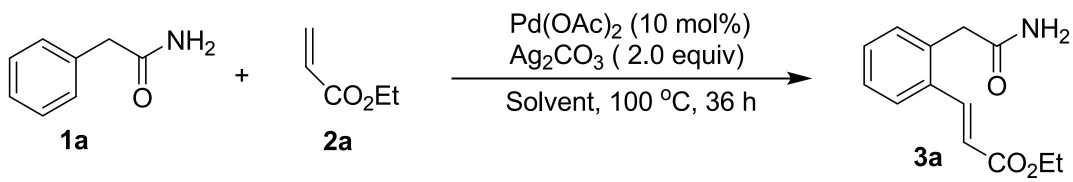
Table of Contents

1. Optimization of reaction conditions.

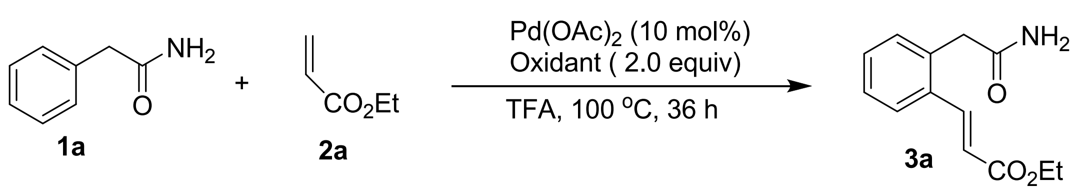
Table S1. Optimization by varying solvents[a]



S. No.	Solvent	Yeild[b] of 3a(%)
1.	DCE	16
2.	ACN	12
3.	AcOH	43
4.	HFIP	36
5.	TFE	40
6.	TFA	50
7.	NMP	16
8.	DMF	18
9.	THF	10

[a]Reaction conditions: **1a** (0.2 mmol), **2a** (0.6 mmol), $Pd(OAc)_2$ (10 mol%), Ag_2CO_3 (2.0 equiv), solvent (2.0 mL), at 100 °C for 36 h. [b]Isolated yield of **3a** through column chromatography.

Table S2. Optimization by varying oxidants[a]

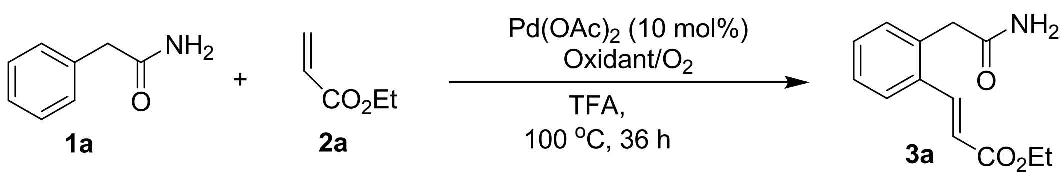


S.No.	Oxidant	Yield[b] of 3a (%)
1.	Ag_2CO_3	50
2.	Ag_2O	45
3.	CH_3CO_2Ag	50
4.	$AgBF_4$	--

5.	CF_3CO_2Ag	53
6.	$AgNO_3$	40
7.	$K_2S_2O_8$	8
8.	BQ/O_2	54
9.	$Cu(OAc)_2/O_2$	51
10.	--	33
11.	BQ	42

[a]Reaction conditions: **1a** (0.2 mmol), **2a** (0.6 mmol), $Pd(OAc)_2$ (10 mol%), Oxidant (2.0 equiv), TFA (2.0 mL), at 100 °C for 36 h. [b]Isolated yield of **3a** through column chromatography.

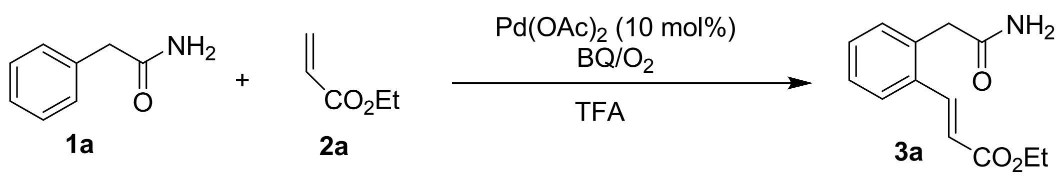
Table S3. Optimization by varying amount of oxidant[a]



S. No.	Oxidant	Amount (equiv.)	Yield[b] of 3a (%)
1.	BQ	2.0	64
2.	BQ	0.5	61
3.	BQ	1.0	72

[a]Reaction conditions: **1a** (0.2 mmol), **2a** (0.6 mmol), $Pd(OAc)_2$ (10 mol%), BQ (X equiv.), TFA (2.0 mL), at 100 °C for 36 h. [b]Isolated yield of **3a** through column chromatography.

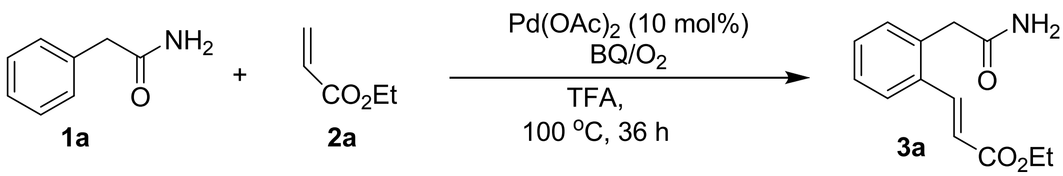
Table S4.Optimization by varying time and temperature[a]



S.No.	Time (h)	Temperature (°C)	Yield[b] of 3a (%)
1	15	100	54
2	24	100	68
3	36	100	72
4	36	120	71
5	36	80	66

[a]Reaction conditions: **1a** (0.2 mmol), **2a** (0.6 mmol), $Pd(OAc)_2$ (10 mol%), BQ/O_2(1.0 equiv), solvent (2.0 mL). [b]Isolated yield of **3a** through column chromatography.

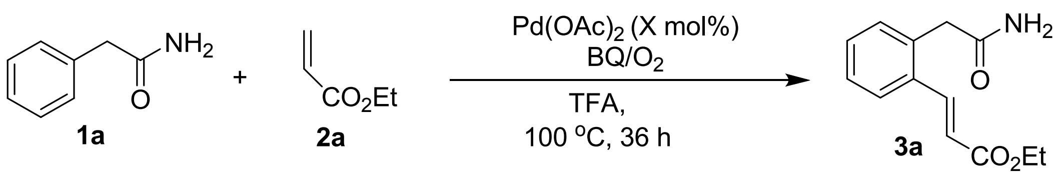
Table S5. Optimization by varying amount of ethyl acrylate[a]



S. No.	Ethyl acrylate (equiv)	Yield[b] of 3a (%)
1	2	65
2	3	72
3	4	73

[a]Reaction conditions: **1a** (0.2 mmol), **2b** (X mmol), $Pd(OAc)_2$ (10 mol%), BQ (1.0 equiv), solvent (2.0 mL). [b]Isolated yield of **3a** through column chromatography.

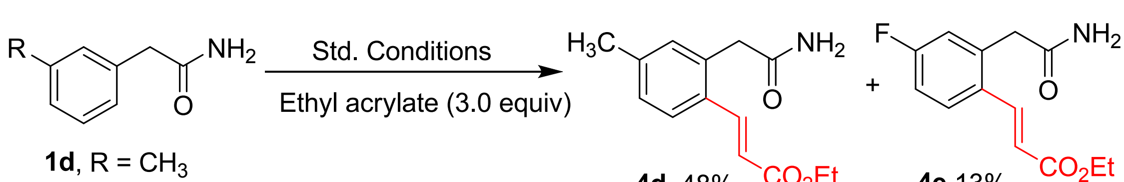
Table S6. Optimization of amount of catalyst[a]



S. No.	$Pd(OAc)_2$ (mol%)	Yield[b] of 3a (%)
1	2	45
2	5	68
3	10	72

[a]Reaction conditions: **1a** (0.2 mmol), **2a** (0.6 mmol), $Pd(OAc)_2$ (Xmol%), BQ(1.0 equiv), solvent (2.0 mL). [b]Isolated yield of **3a** through column chromatography.

2. Intermolecular competition experiment between 1d and 1e:

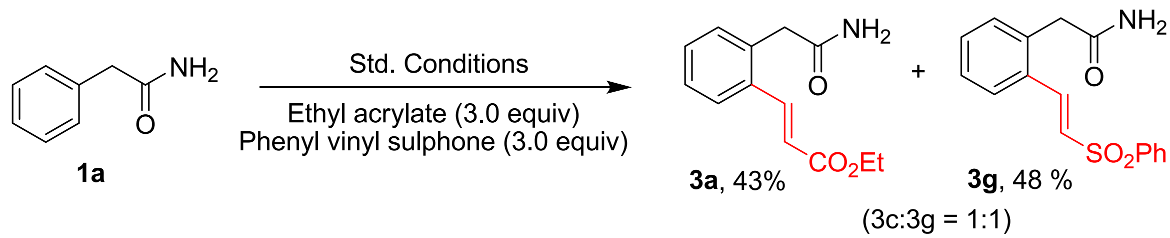


1d, R = CH_3
1e, R = F

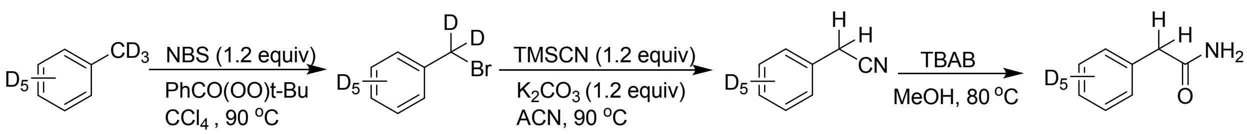
4d, 48% **4e**,13%

(4d:4e = 3.6:1)

Intermolecular competition experiment between 2a and 2g:



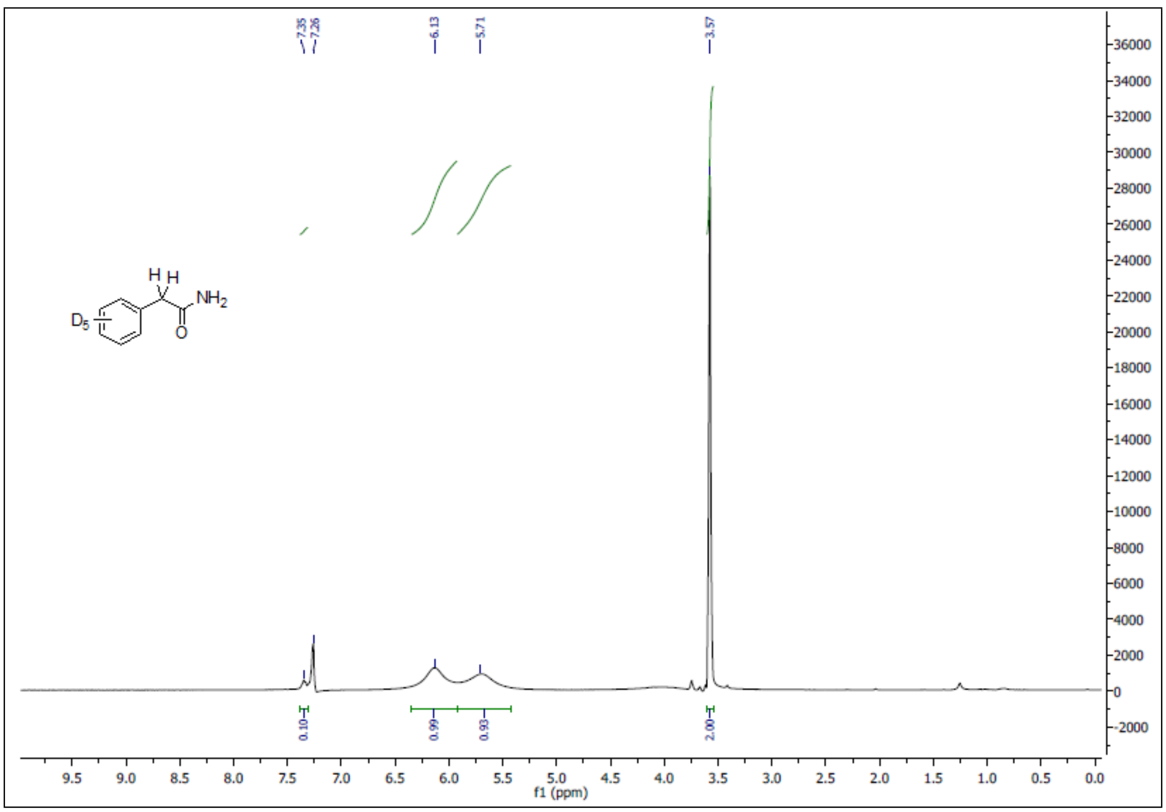
3. Synthesis of Phenylacetamide-*d*$_5$



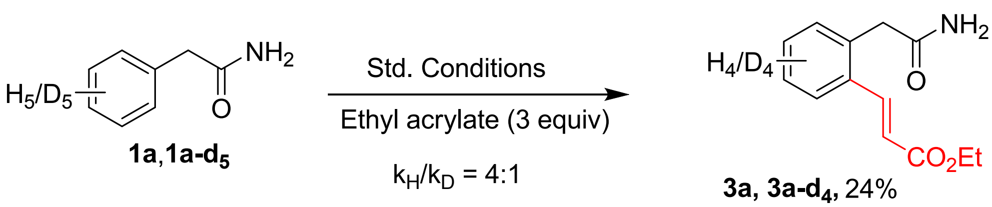
Procedure for synthesis of Benzyl bromide-*d*$_7$: By following the reported literature procedure,[1] to a 50 mL round bottom flask equipped with magnetic stir bar, were added toluene-*d*$_8$(1.0 mL, 10 mmol), NBS (12 mmol, 2.2 g), CCl_4 (30 mL) followed by catalytic amount of tert. butylperoxybenzoate (30 mol%, 580 µL). Reaction was monitored by TLC. After 3h solution was cooled to room temperature. Reaction mixture was filtered to remove the precipitated succinimide. The filtrate was concentrated in vacuumand crude product was purified through column chromatography to give colourless oil.

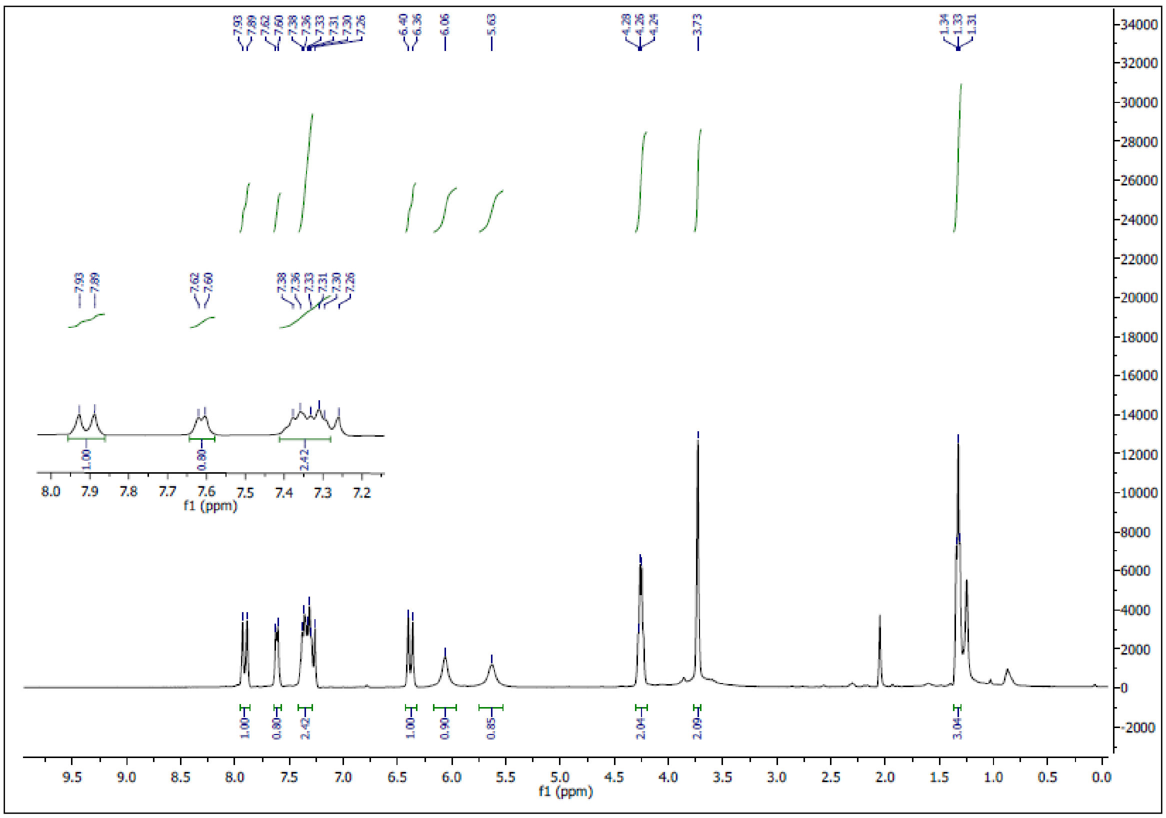
Procedure for synthesis of phenyl acetonitrile-*d*$_5$: By following the reported literature procedure,[2] to a 50 mL round bottom flask equipped with magnetic stir bar, were added benzyl bromide-d$_7$ (6 mmol, 1.06g), TMSCN (7.2 mmol, 0.98 mL), K_2CO_3 (7.2 mmol, 995 mg) and acetonitrile (20 mL). The solution was stir under reflux for 12 h. After cooling to room temperature, solvent was removed and reaction mixture was extracted with ethyl acetate (30 mL x 3). The organic layer was washed with water and brine. The solution was concentrated undervacuum and crude product was purified by column chromatography to give colorless liquid.

Procedure for synthesis of phenyl acetamide-d_5: By following the reported literature procedure,[3] to a 25 mL round bottom flask equipped with magnetic stir bar, were added phenyl acetonitrile-d_5 (1.6 mmol, 195 mg), tetra butyl ammonium hydroxide (4.0 ml, 25% solution), ethanol (10 mL) . The solution was stir under reflux for 12 h. After cooling to room temperature, solvent was evaporated in vacuum. The reaction mixture was extracted with ethyl acetate (30 mL x 3). The organic layer was washed with brine and dried over sodium sulphate. After concentrated in vacuum crude product was purified by column chromatography to give white solid (110 mg, 57%).



4. Intermolecular competition experiment between 1a and 1a-d$_5$ to find KIE:





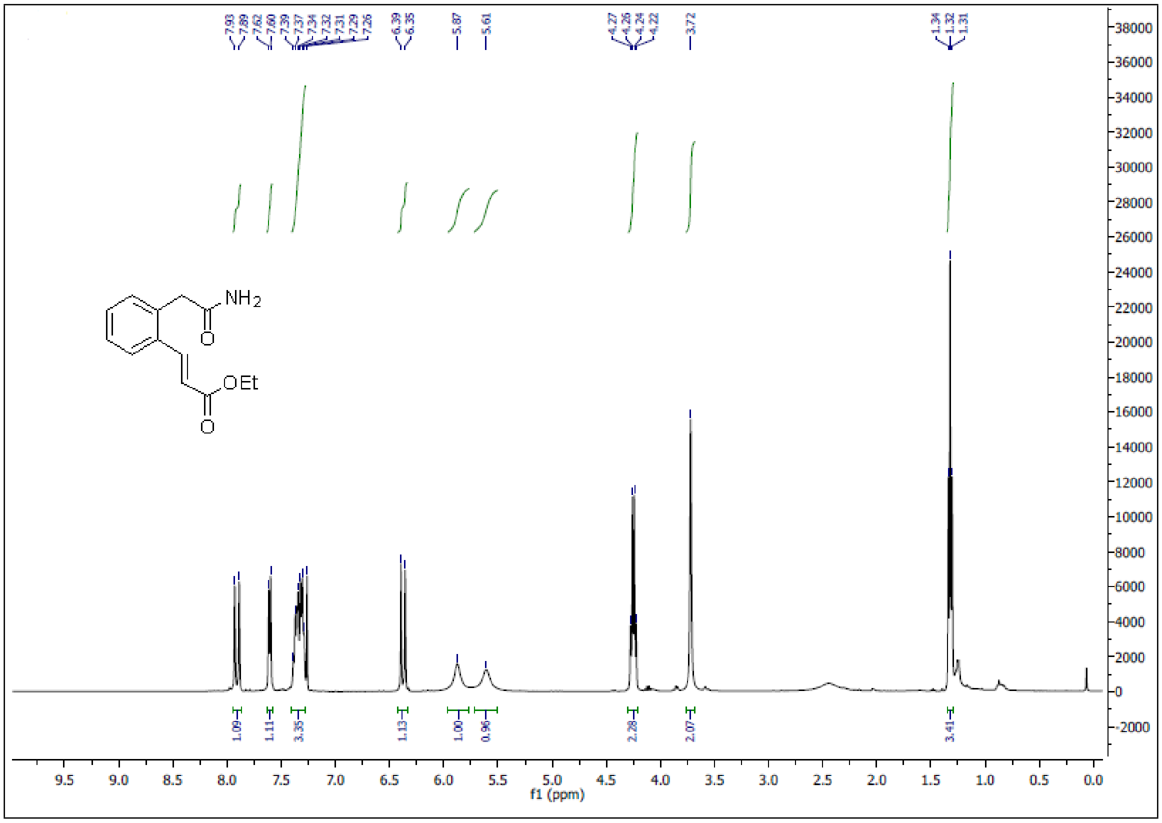
5. References

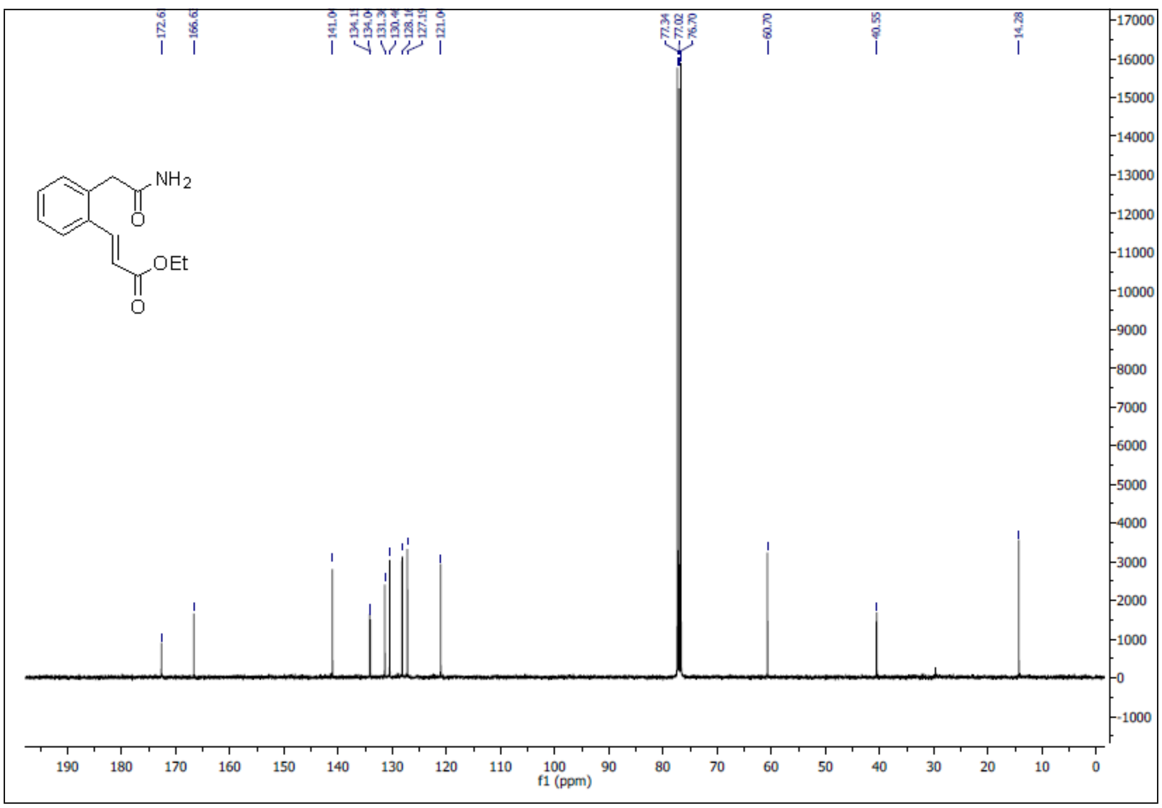
(1) Z, Hong. *J. Label. Compd. Radiopharm*. **2008**, *51*, 293.

(2) Yabe, O.; Mizufune, H.; Ikemoto, T.*Synlett.* **2009**, *8*, 1291.

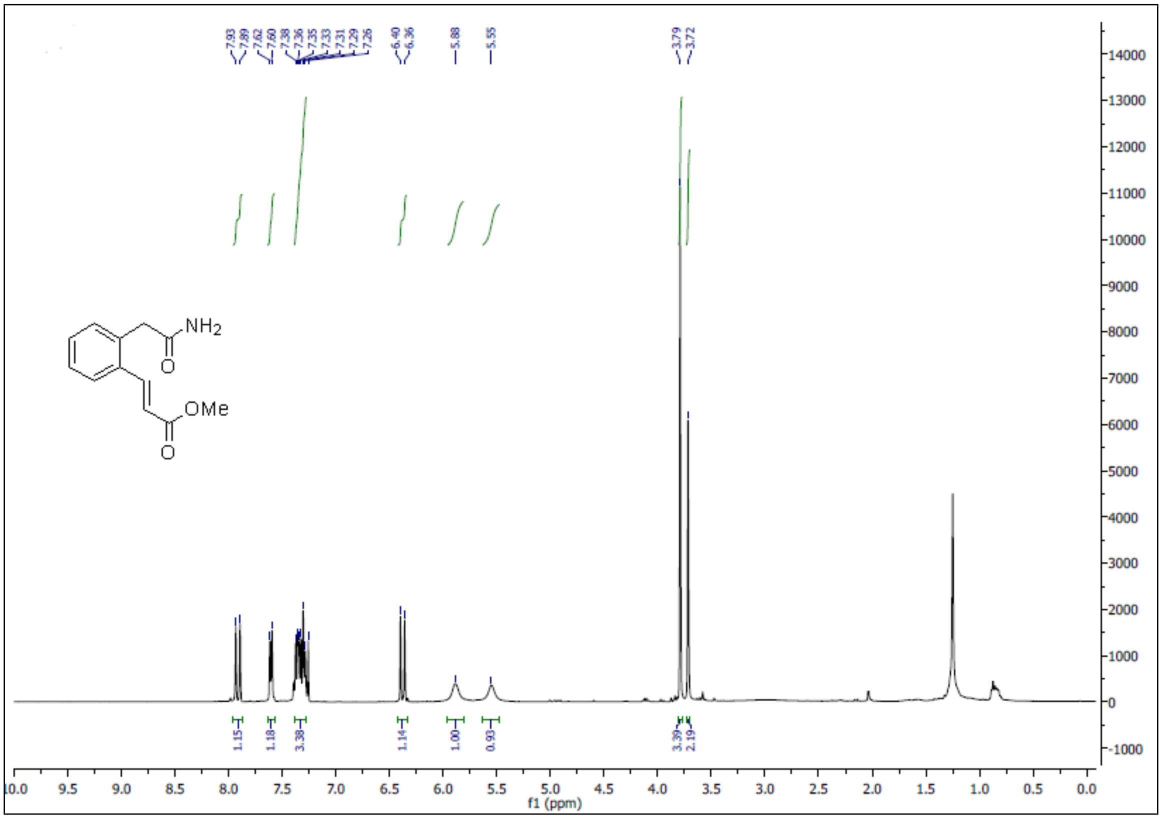
(3) Veisi, H.; Maleki, B.; Hamelian, M.; Ashrafi, S. S. *RSC Adv*. **2015**, *5*, 6365.

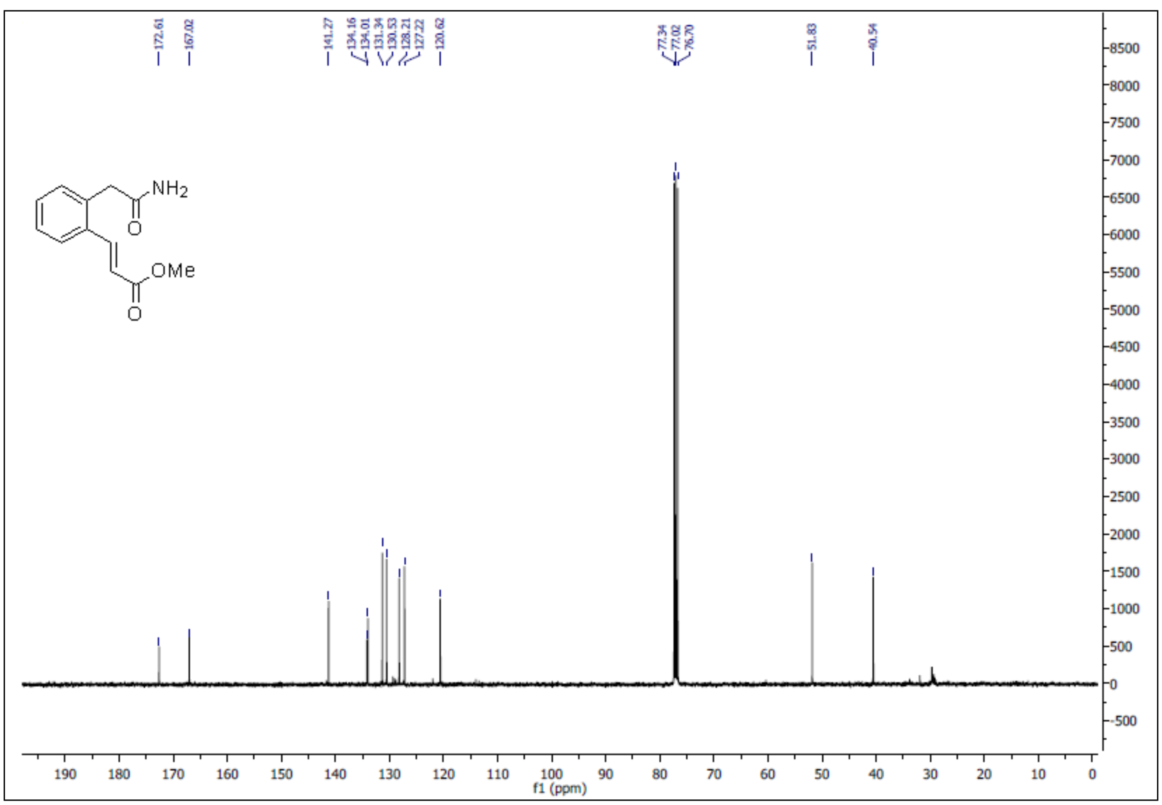
6. ^{1}H and $^{13}C\{^{1}H\}$ Spectra of **3a**



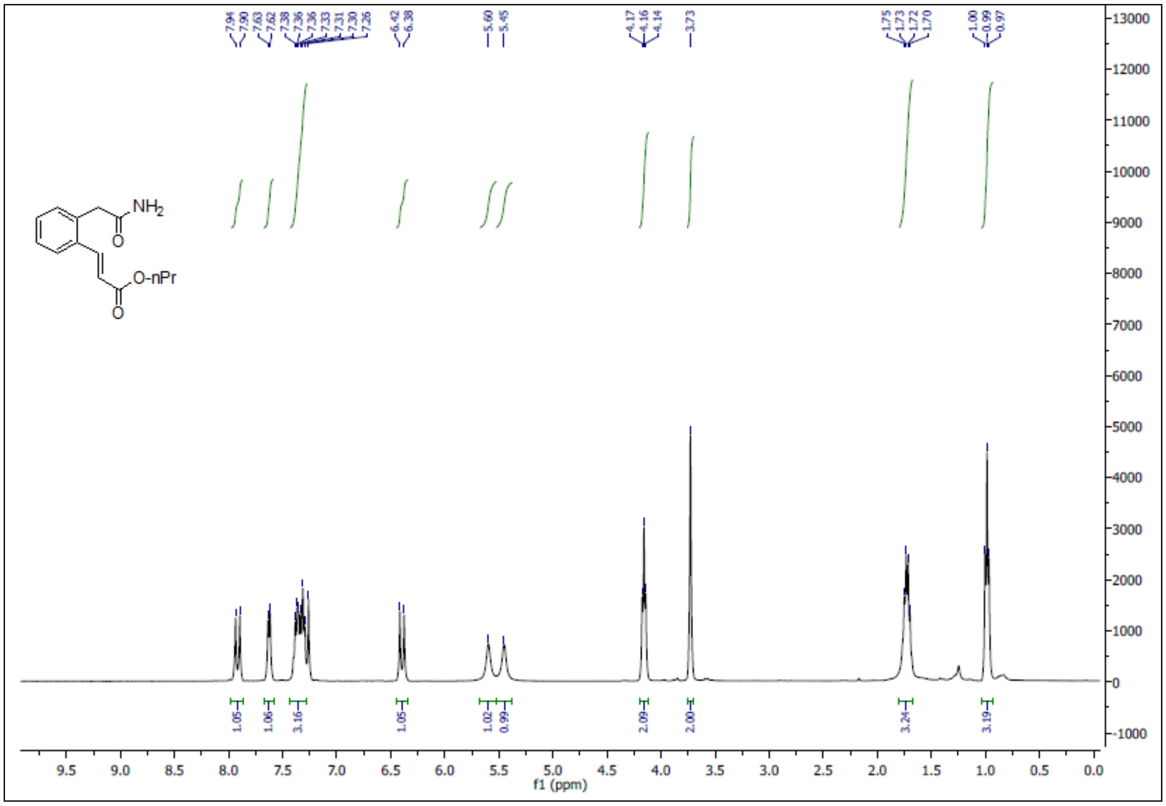


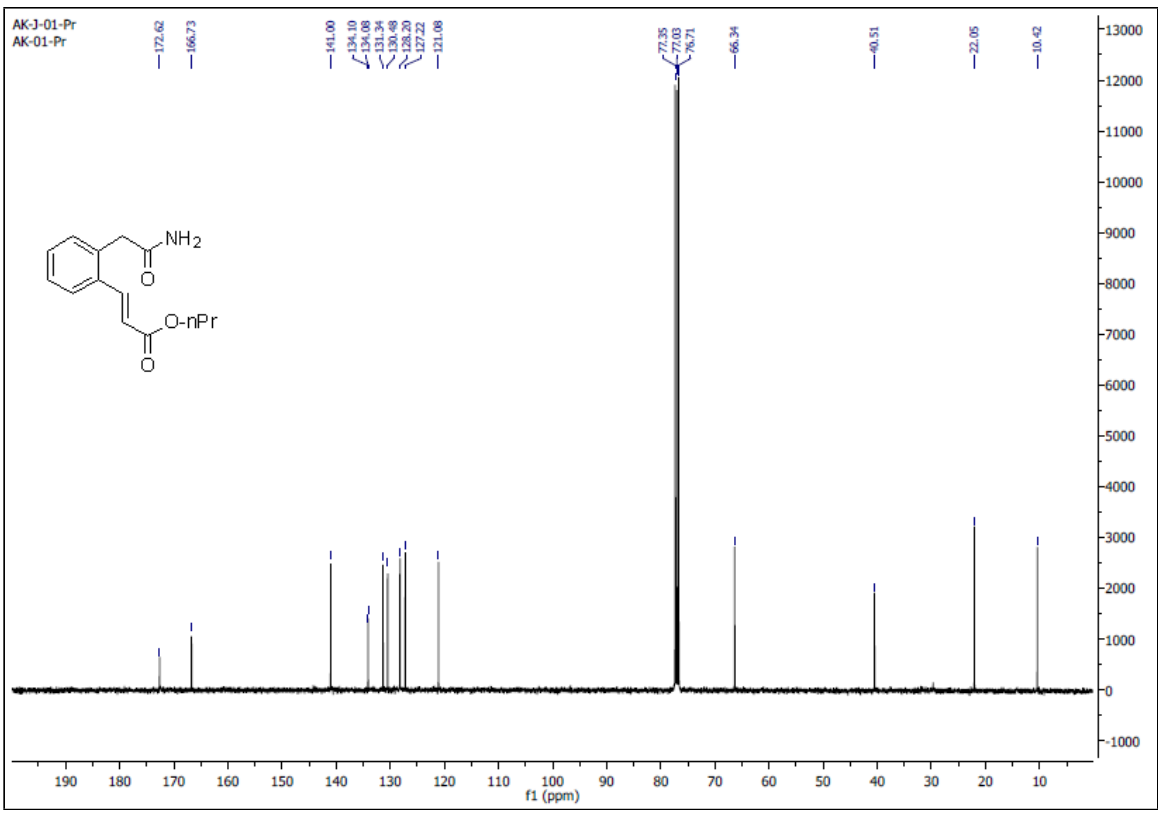
^{1}H and $^{13}C\{^{1}H\}$ Spectra of **3b**



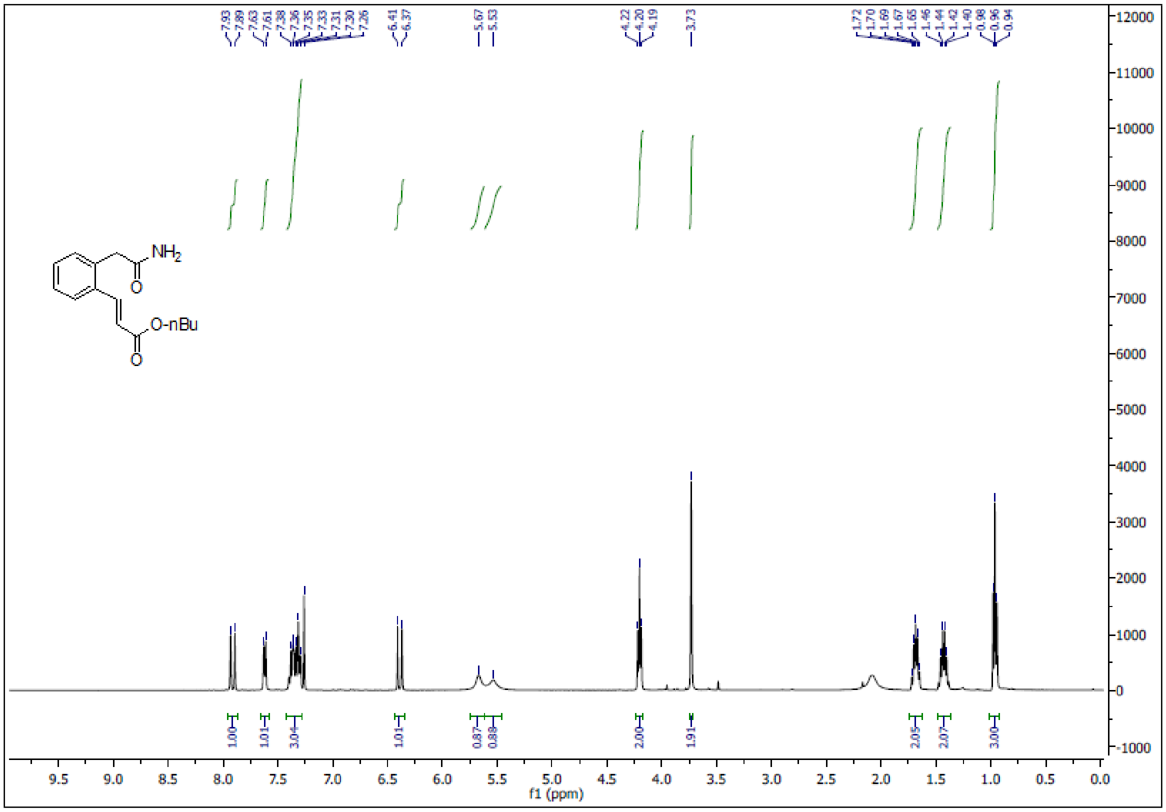


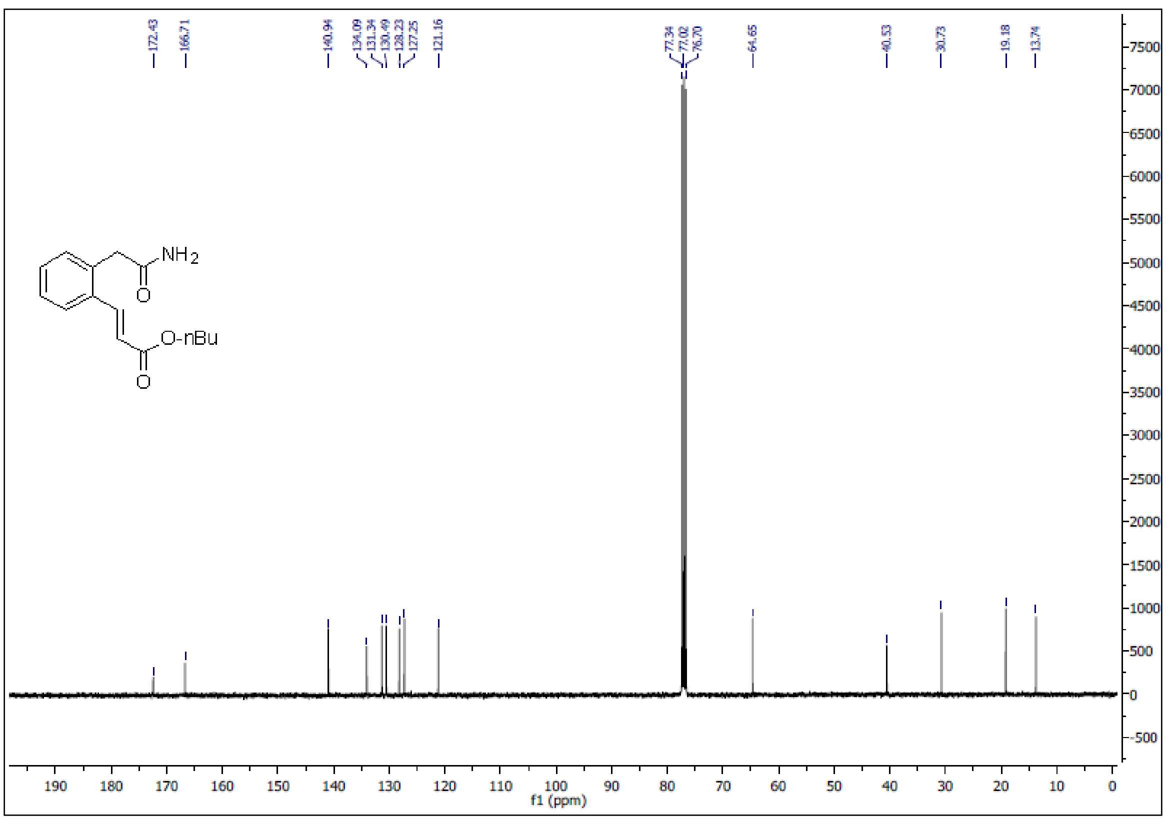
^{1}H and $^{13}C\{^{1}H\}$ Spectra of **3c**



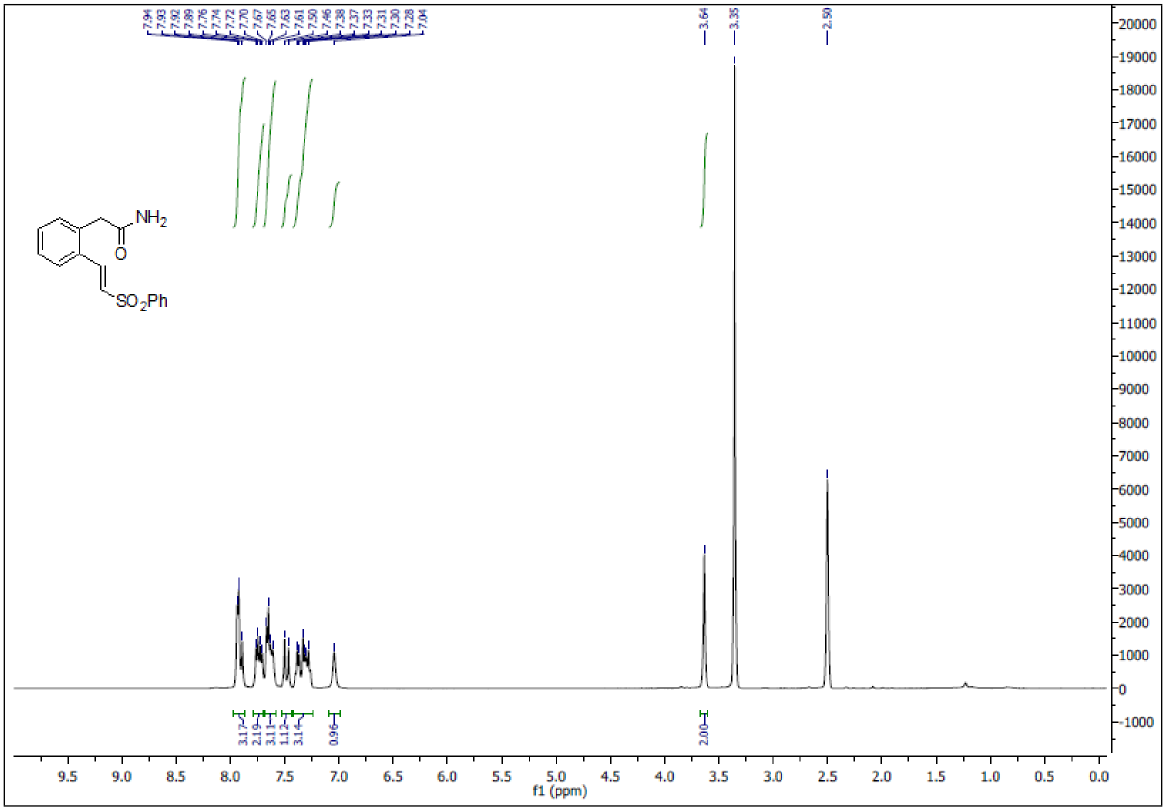


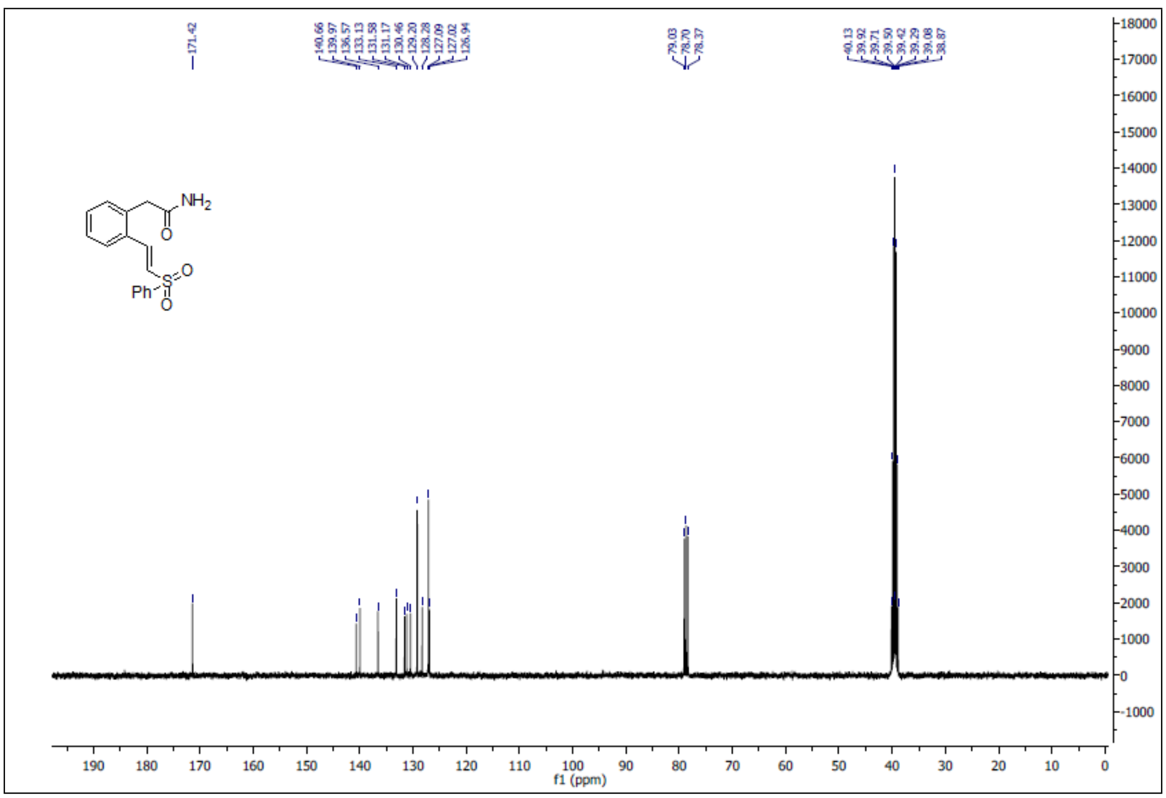
^{1}H and ^{13}C{^{1}H} Spectra of **3d**



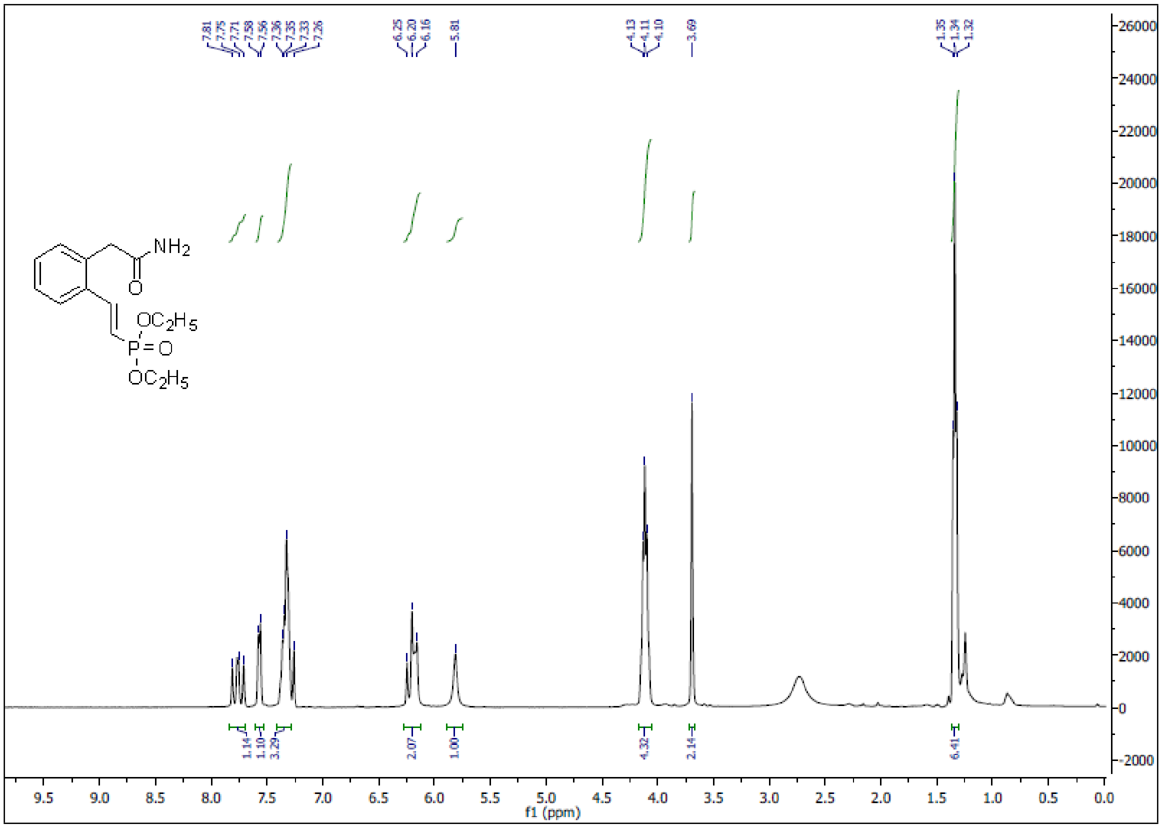


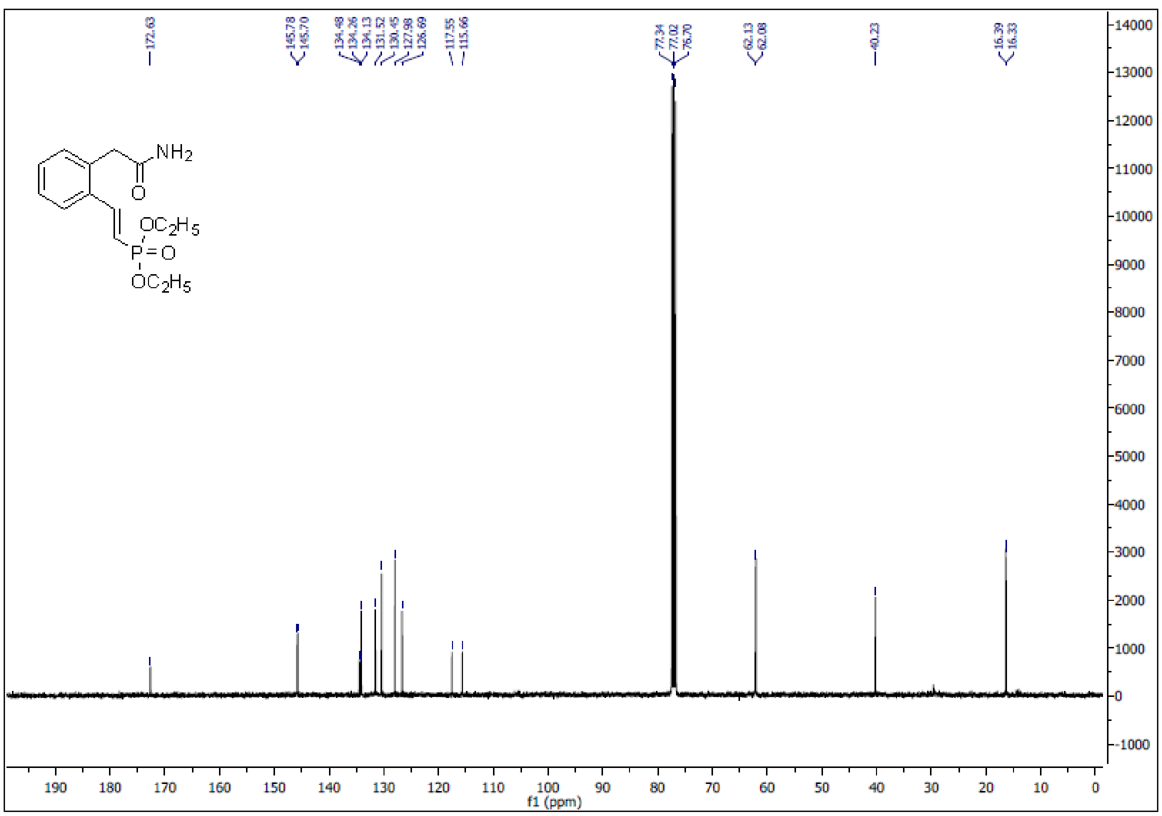
[1]H and [13]C{[1]H} Spectra of **3e**



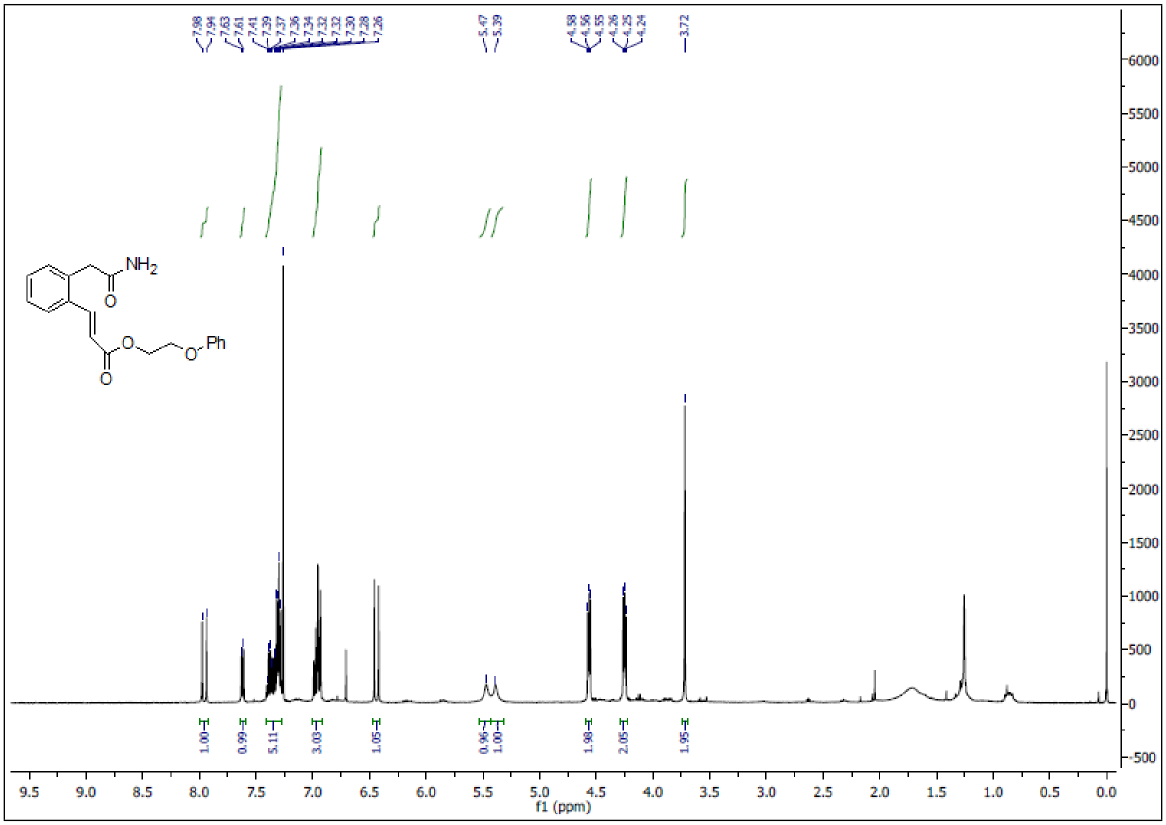


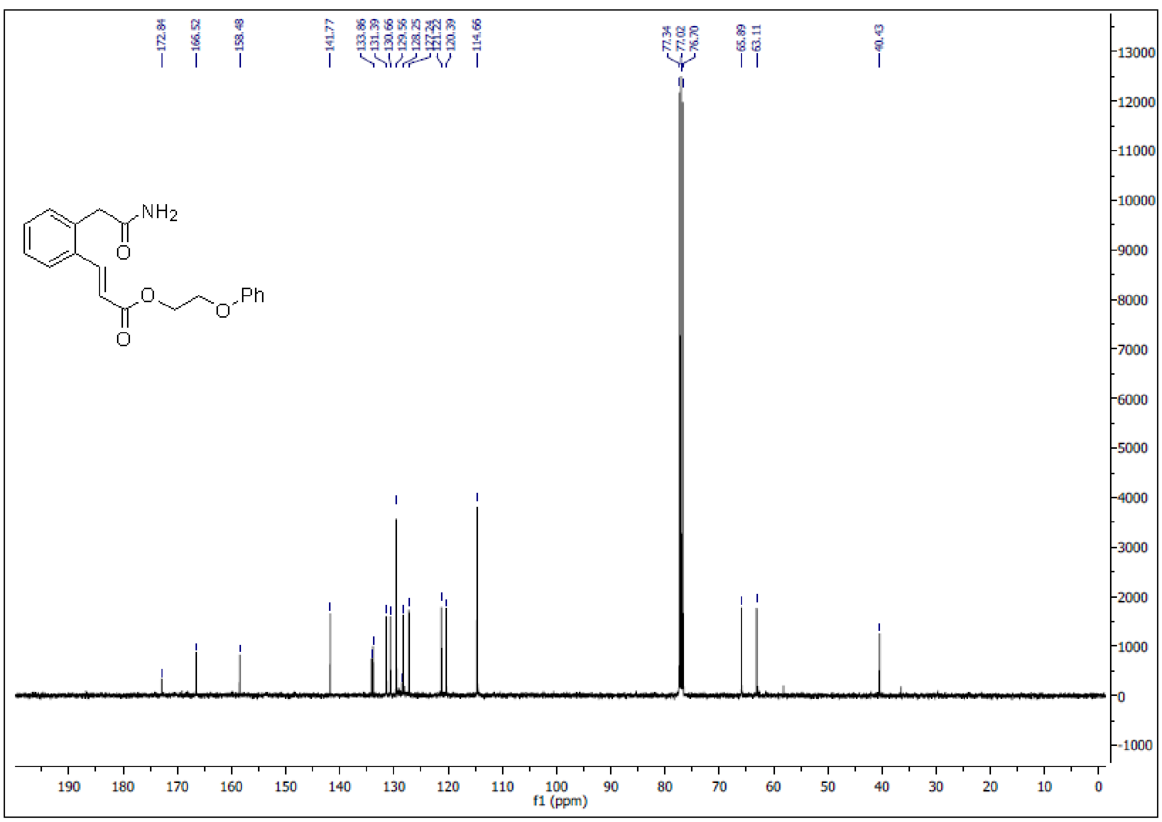
^{1}H and $^{13}C\{^{1}H\}$ Spectra of **3f**



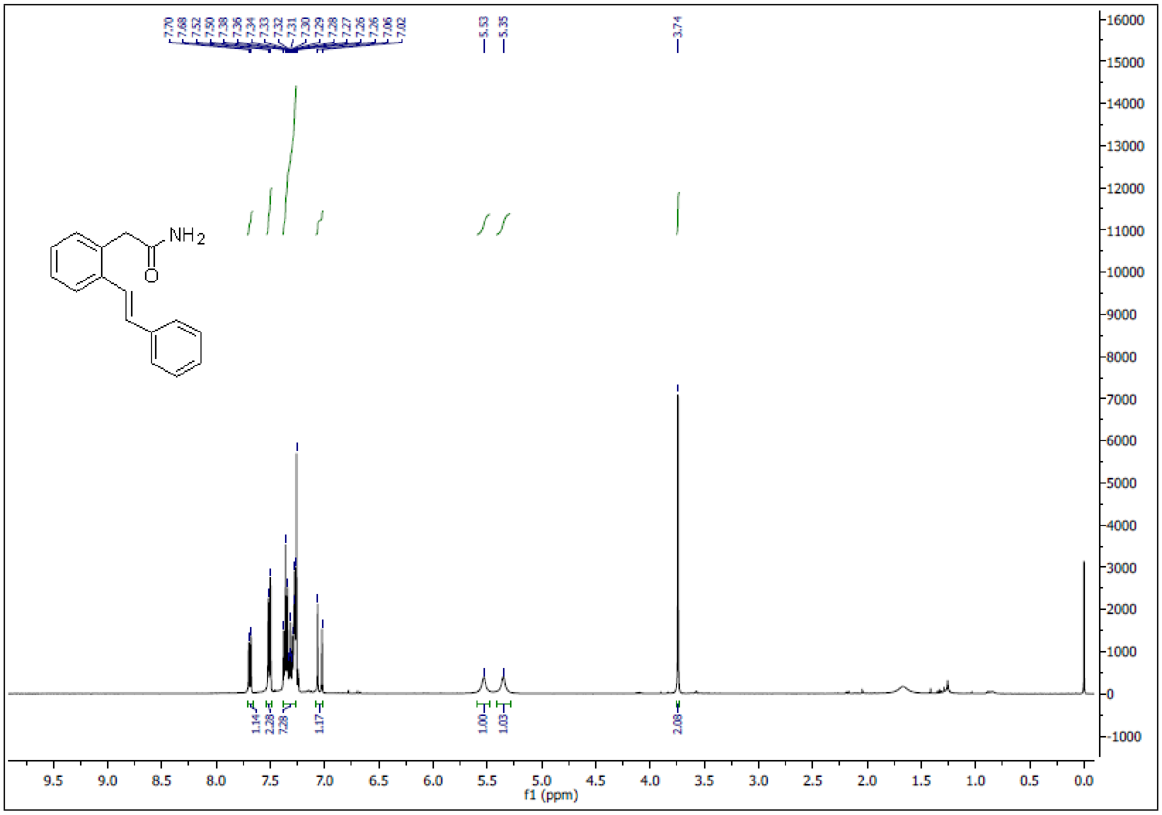


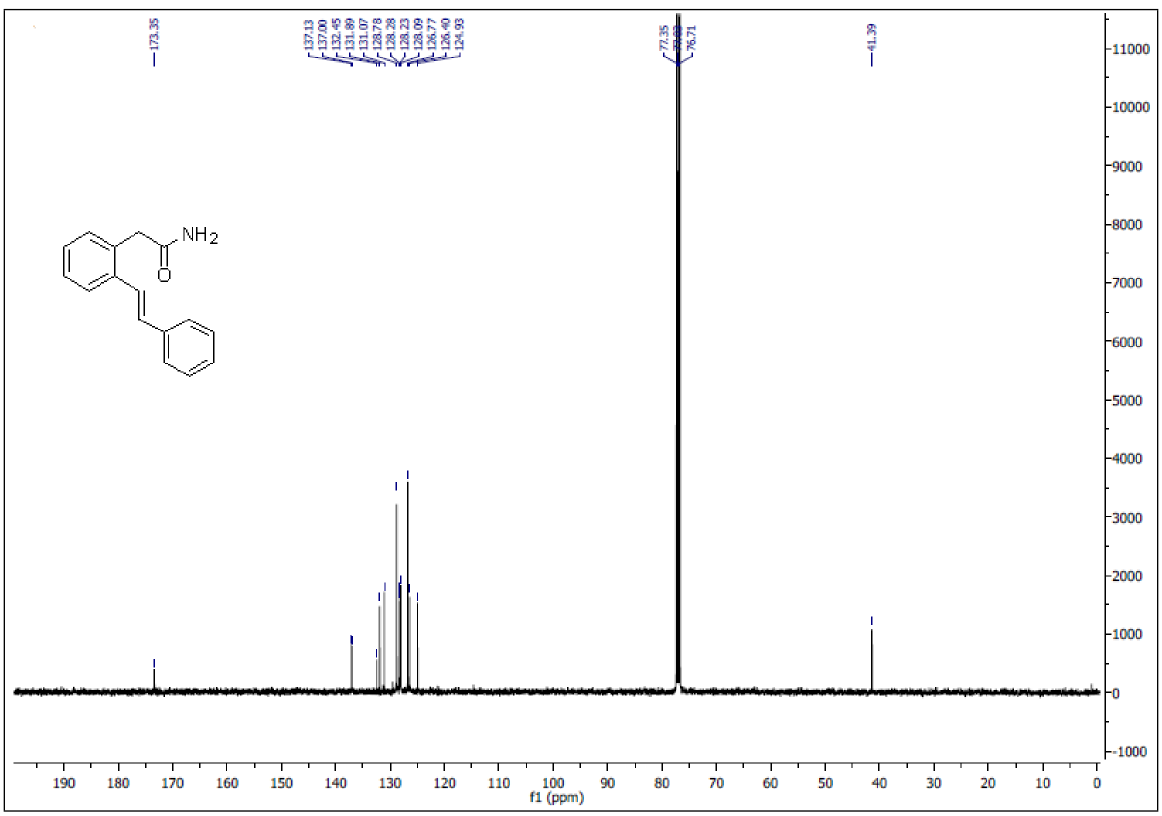
^{1}H and $^{13}C\{^{1}H\}$ Spectra of **3g**



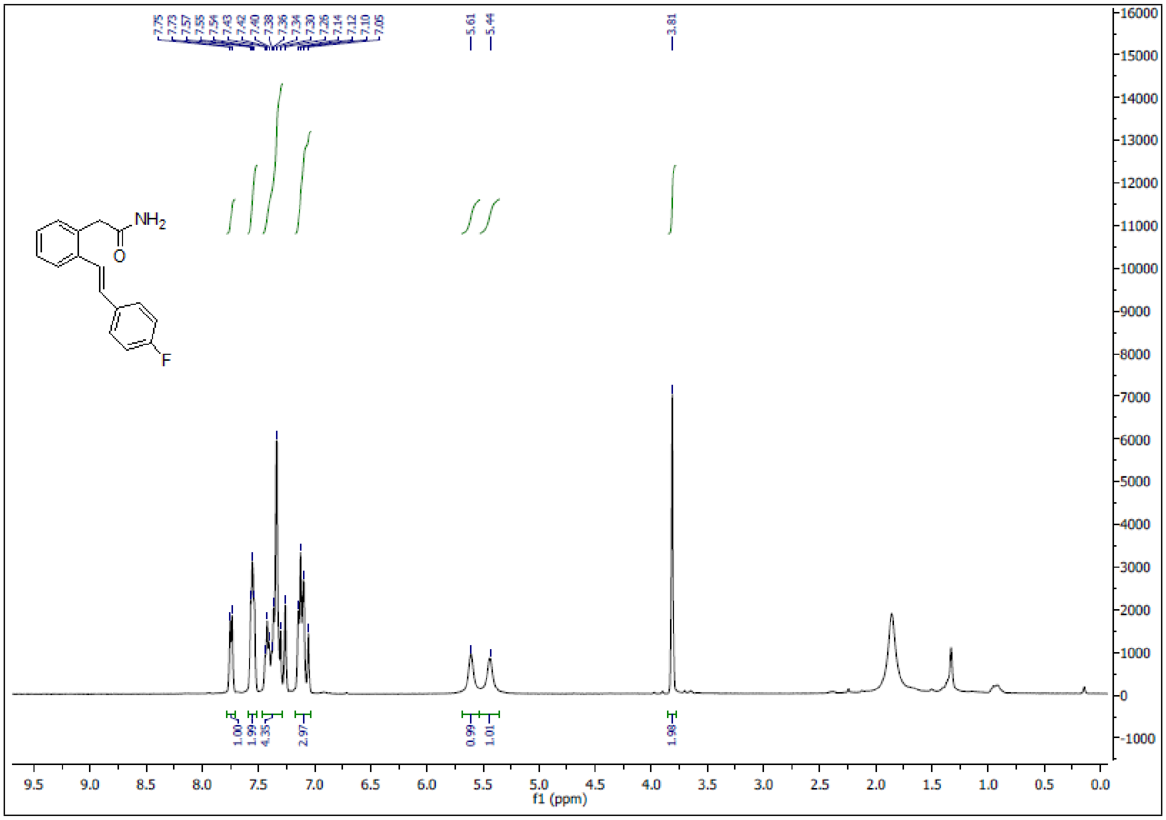


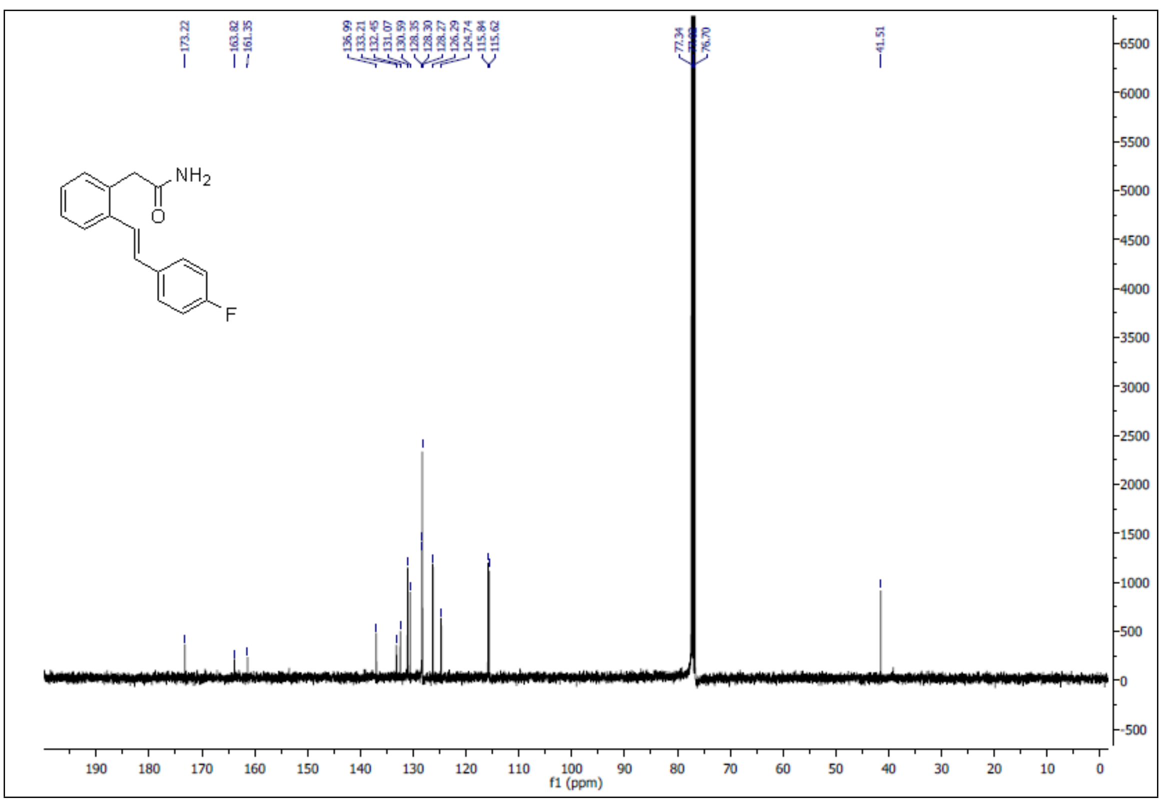
^{1}H and $^{13}C\{^{1}H\}$ Spectra of **3h**



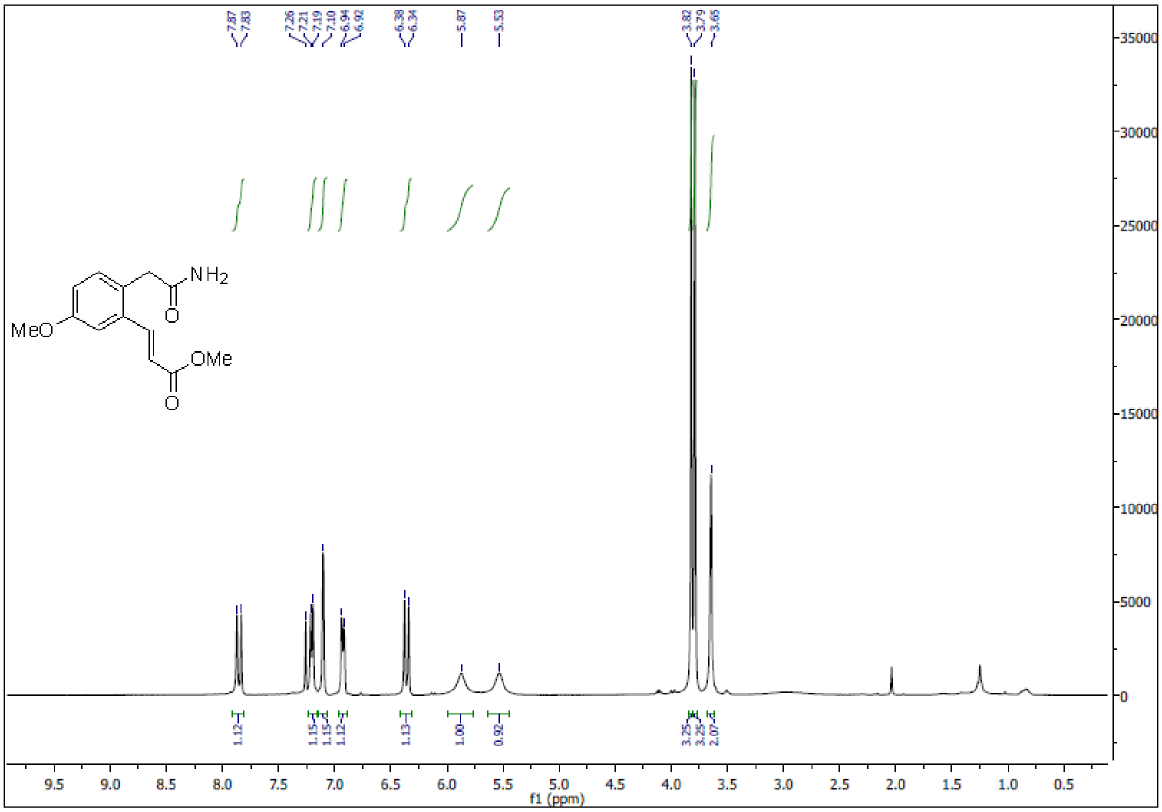


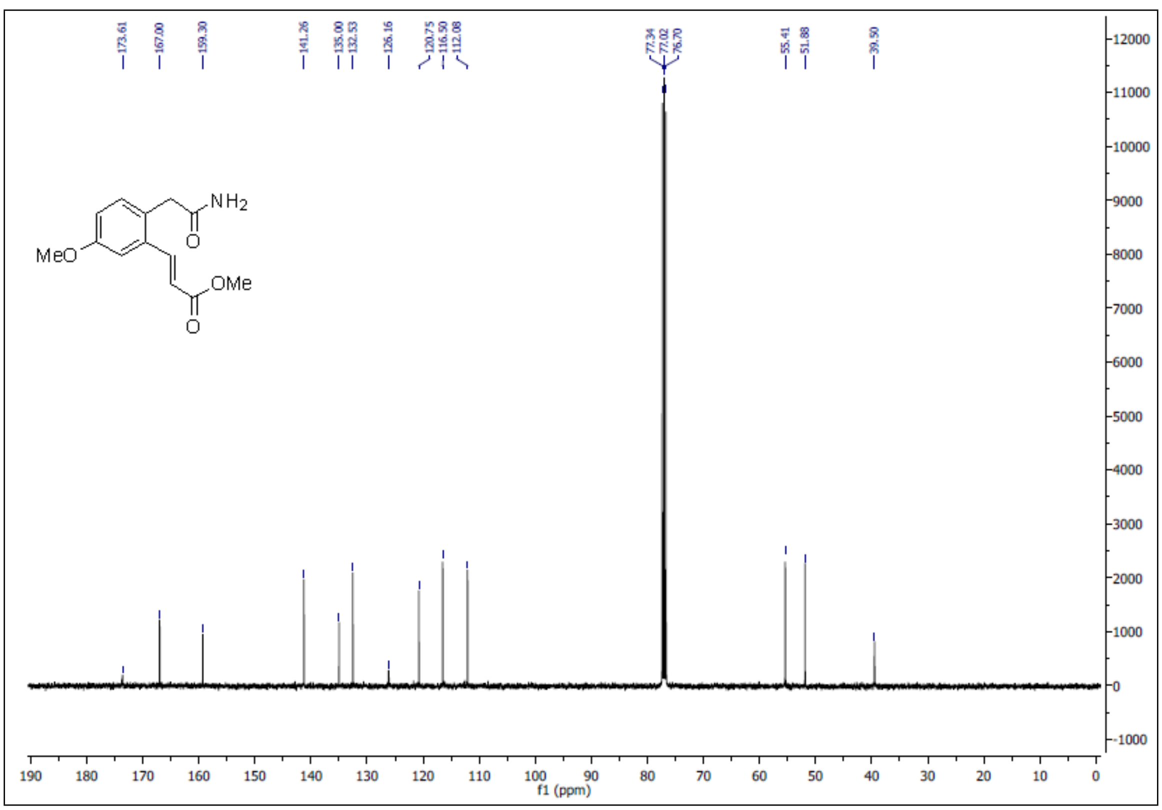
^{1}H and $^{13}C\{^{1}H\}$ Spectra of **3i**





[1]H and [13]C{[1]H} Spectra of **4a**





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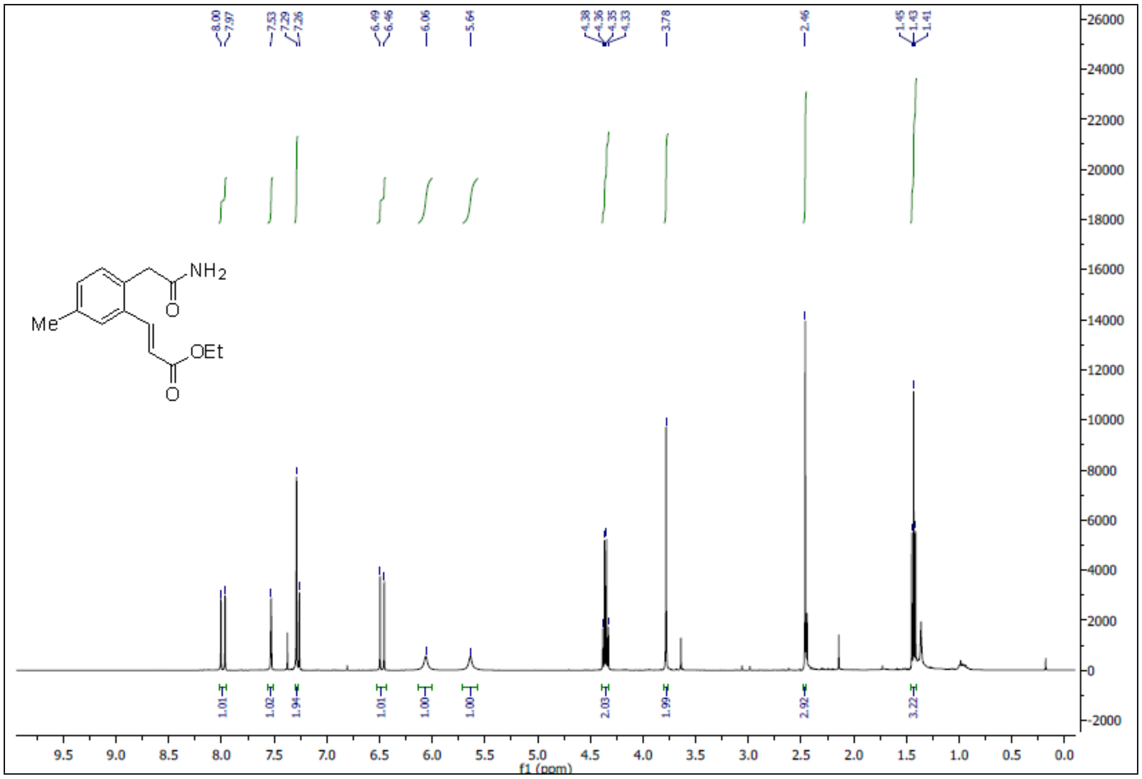

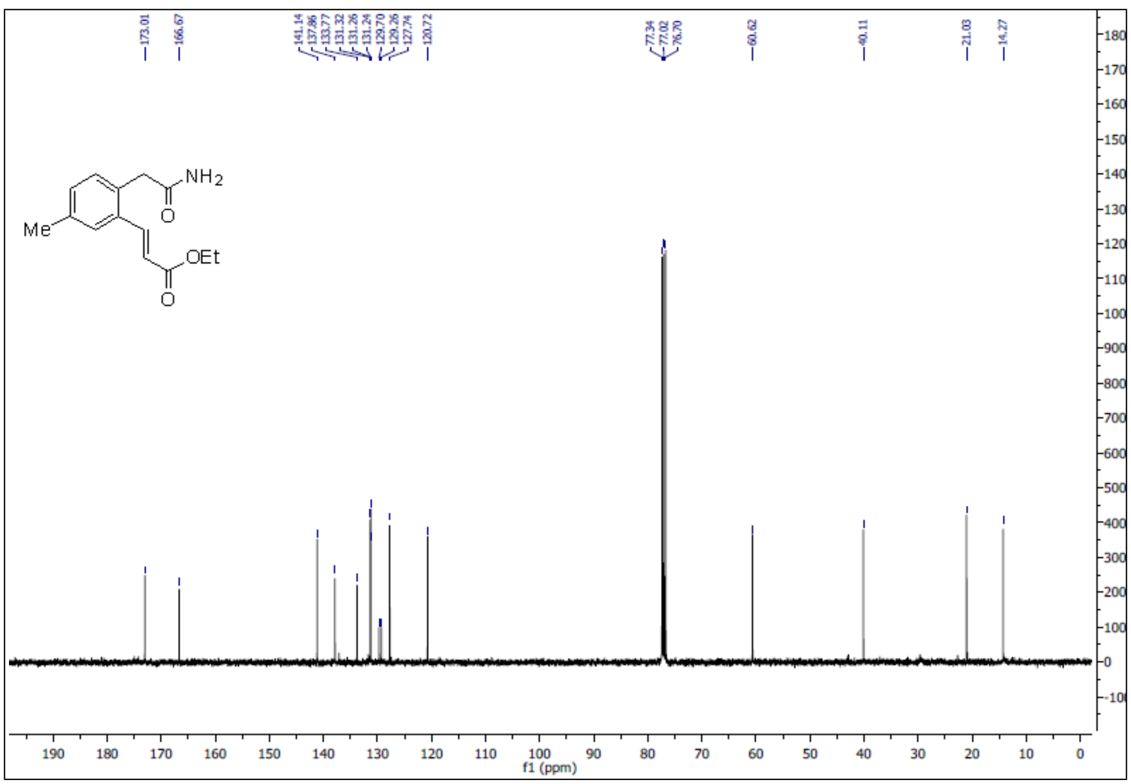

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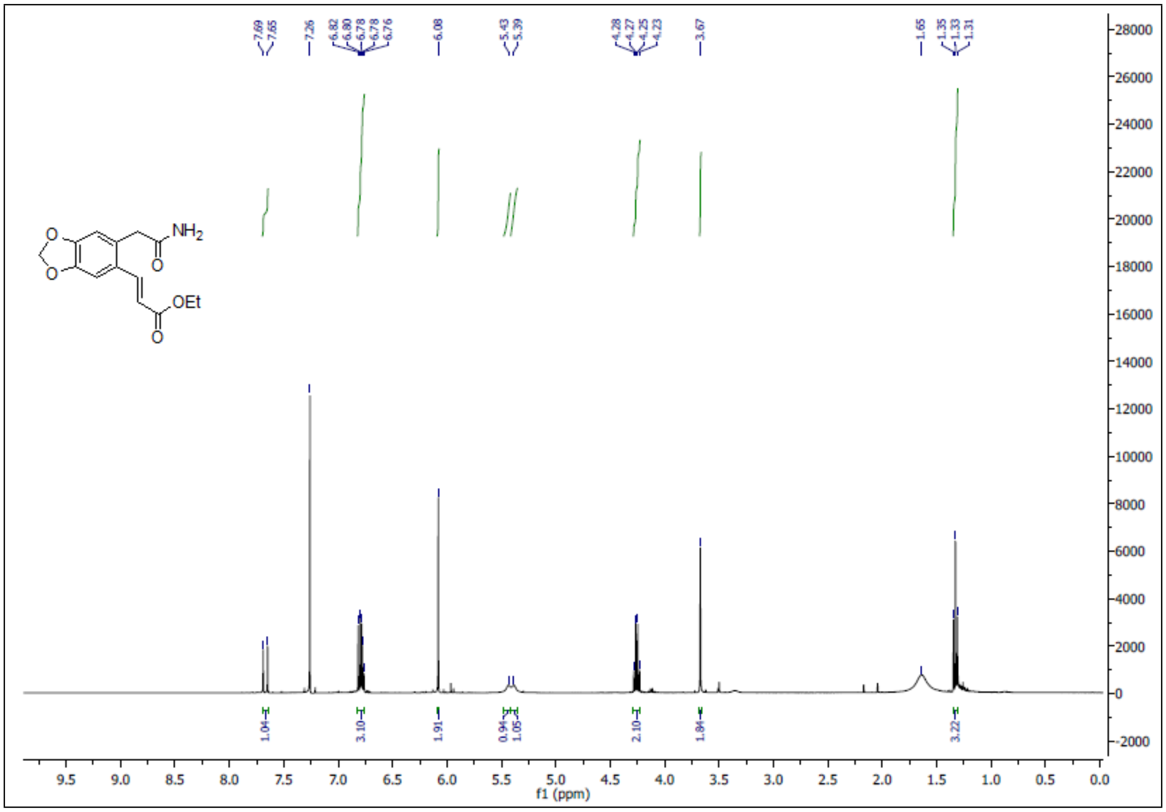

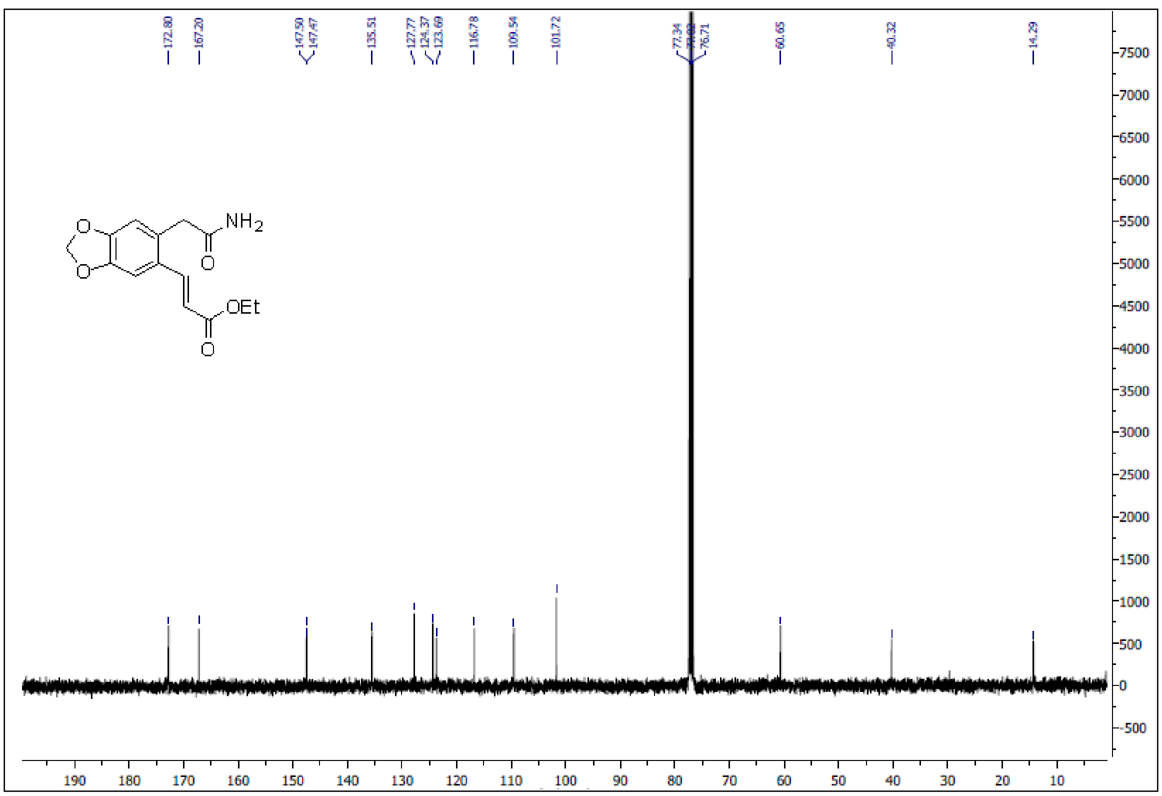

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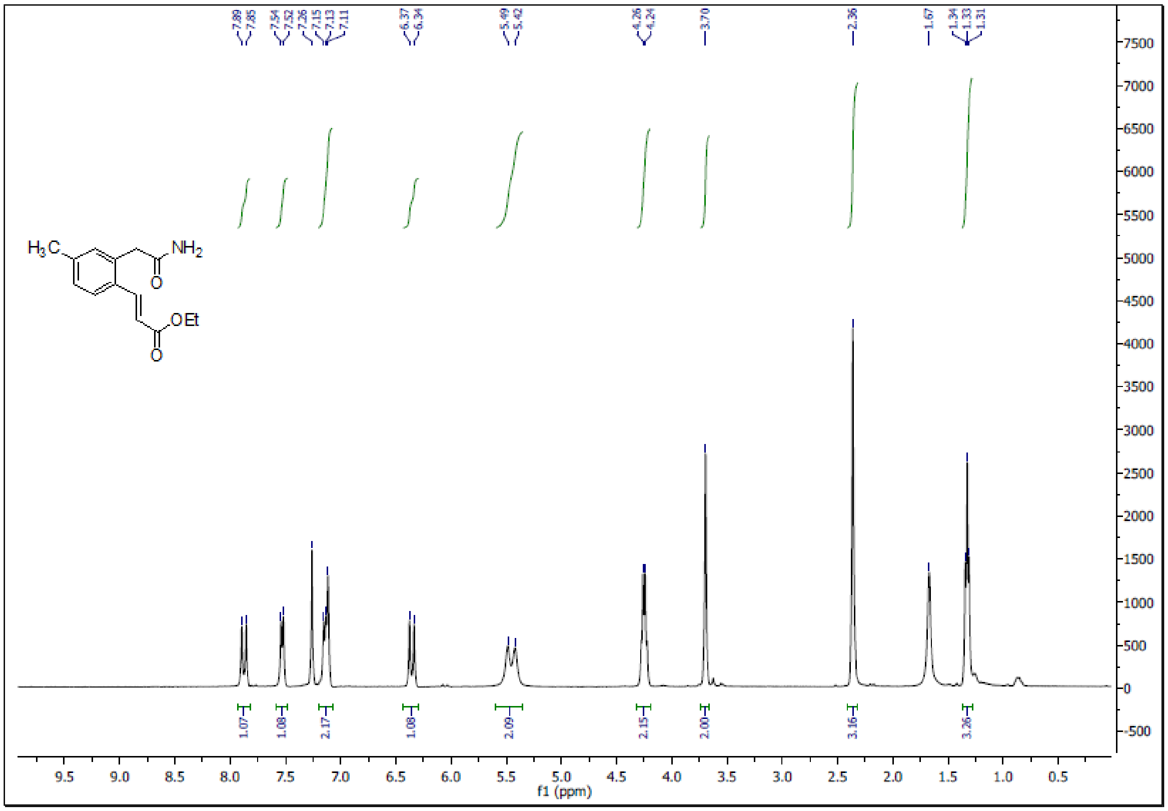

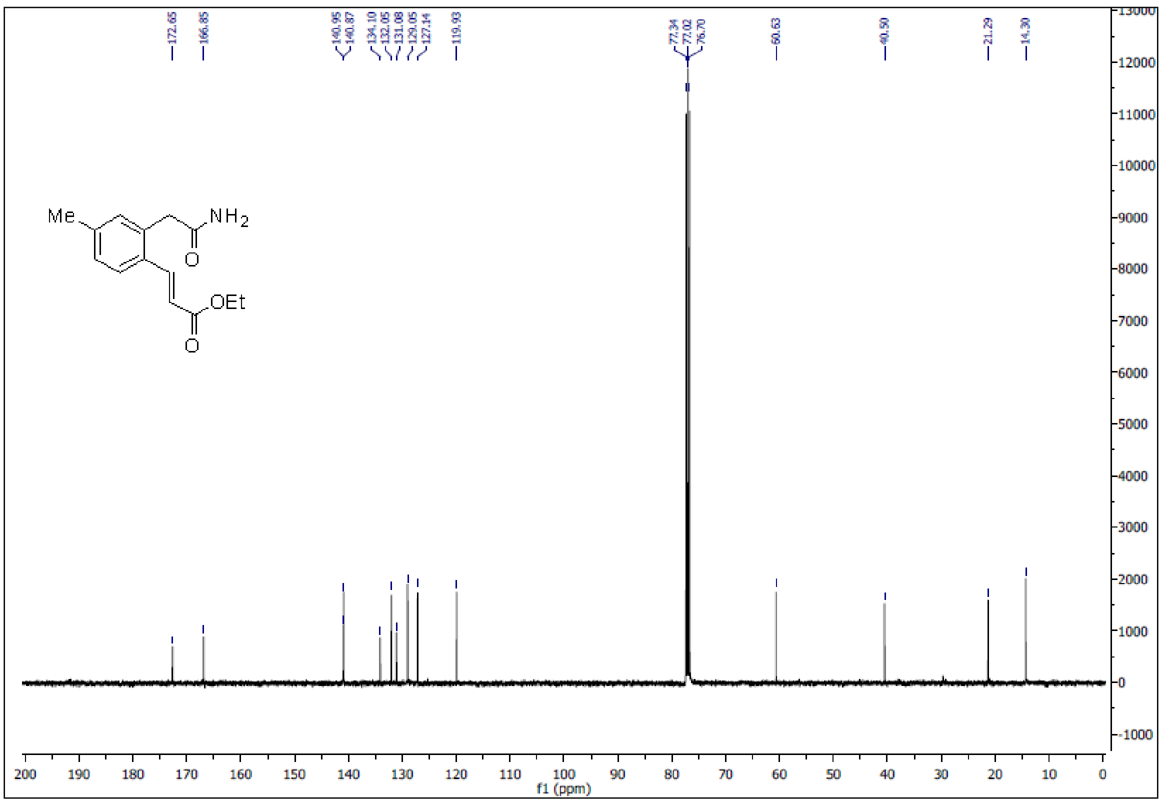

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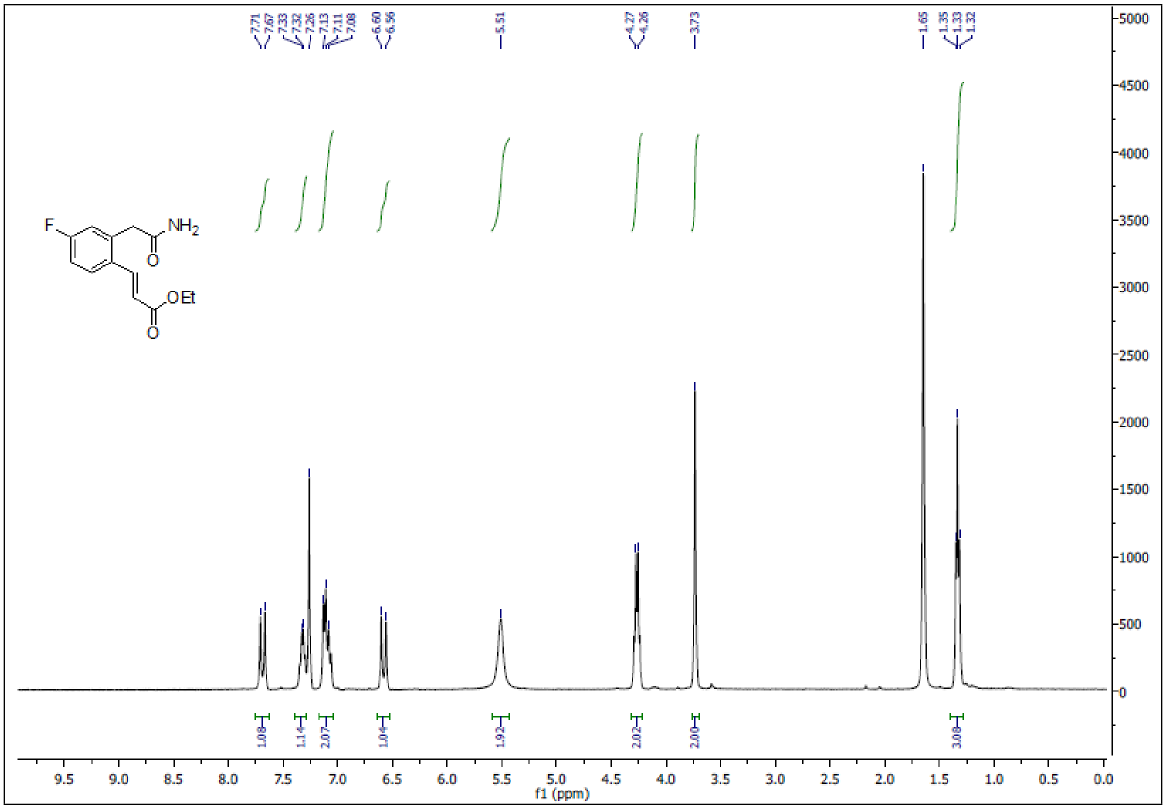
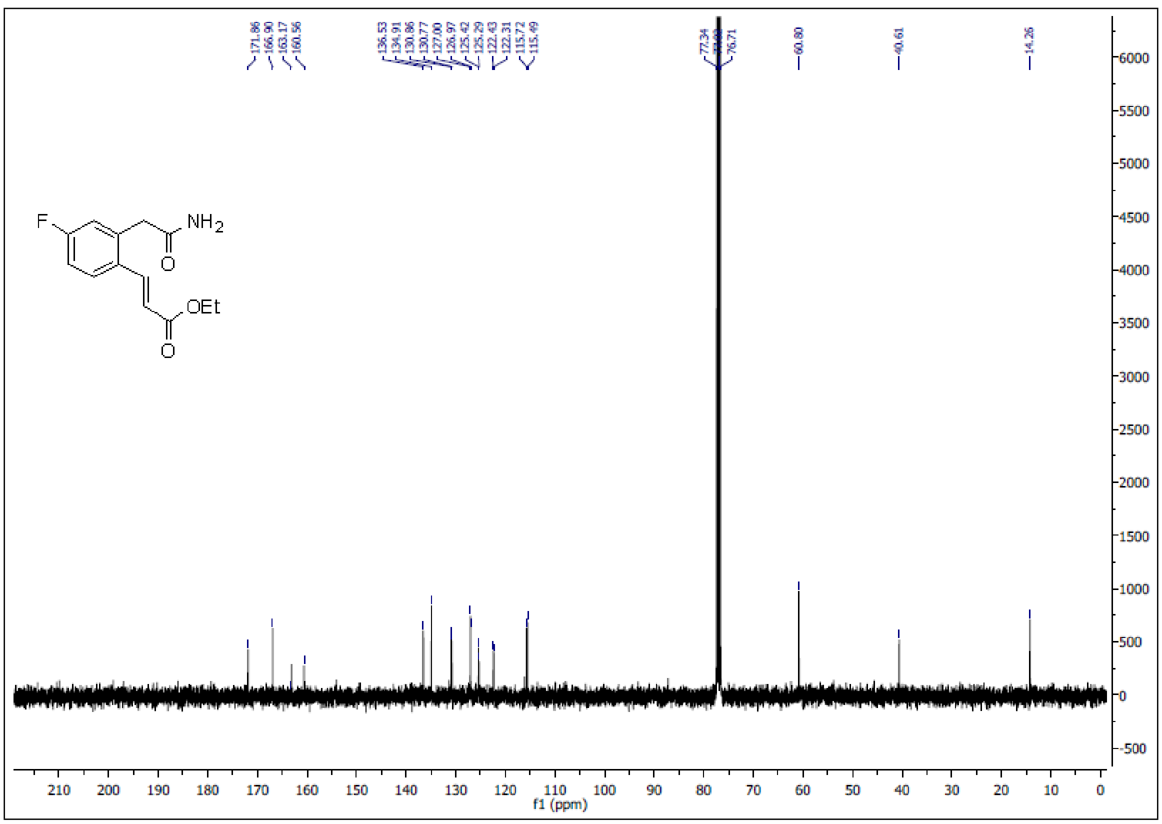
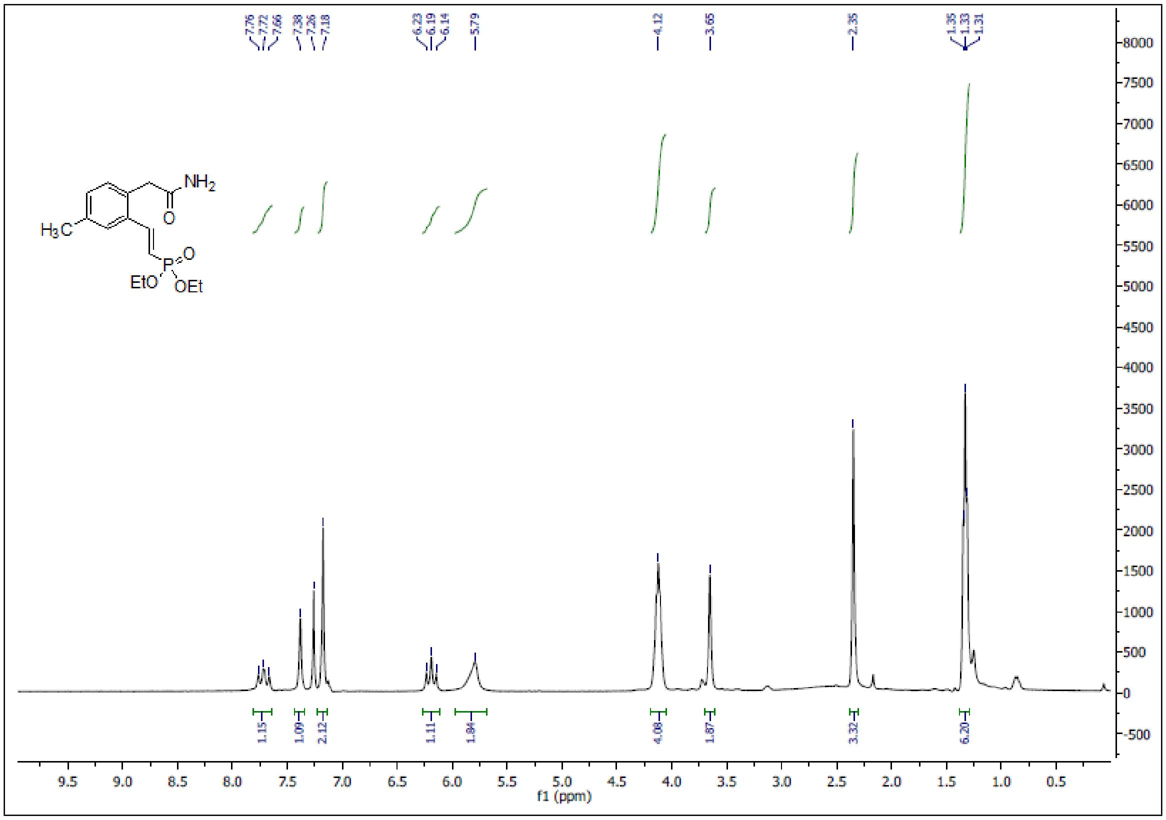
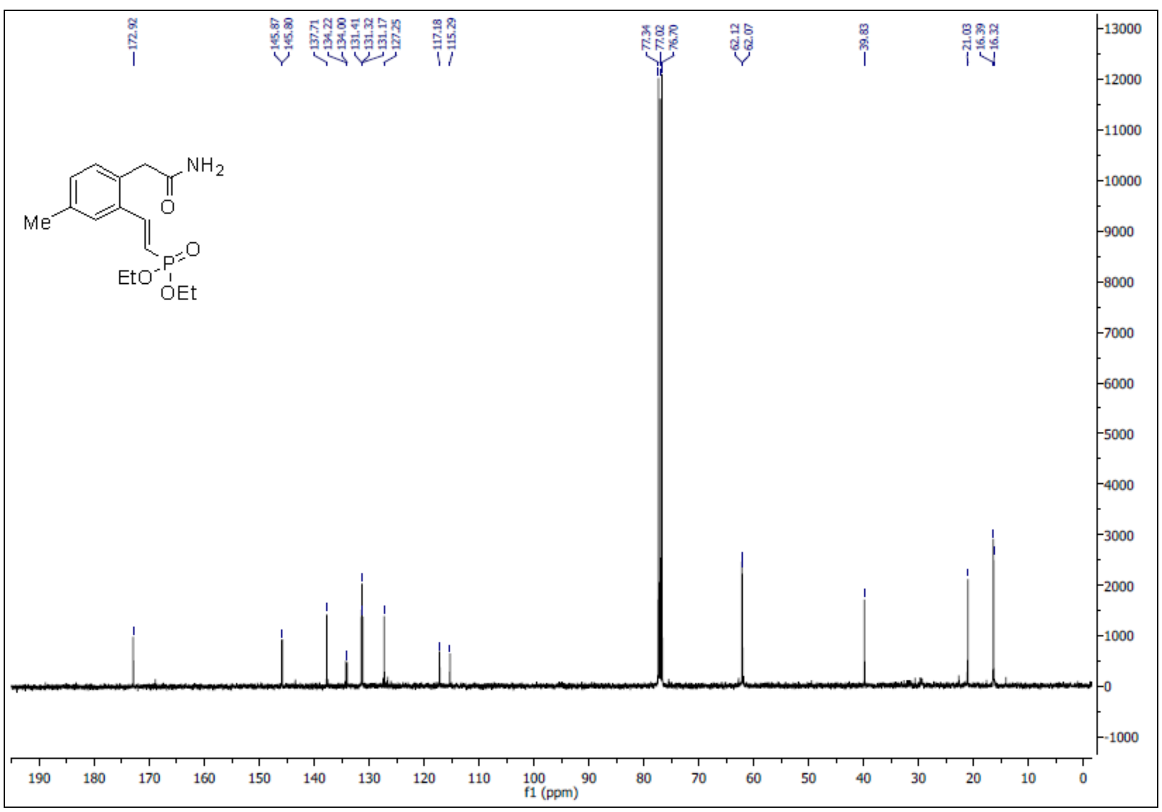




^{1}H and $^{13}C\{^{1}H\}$ Spectra of **4f**





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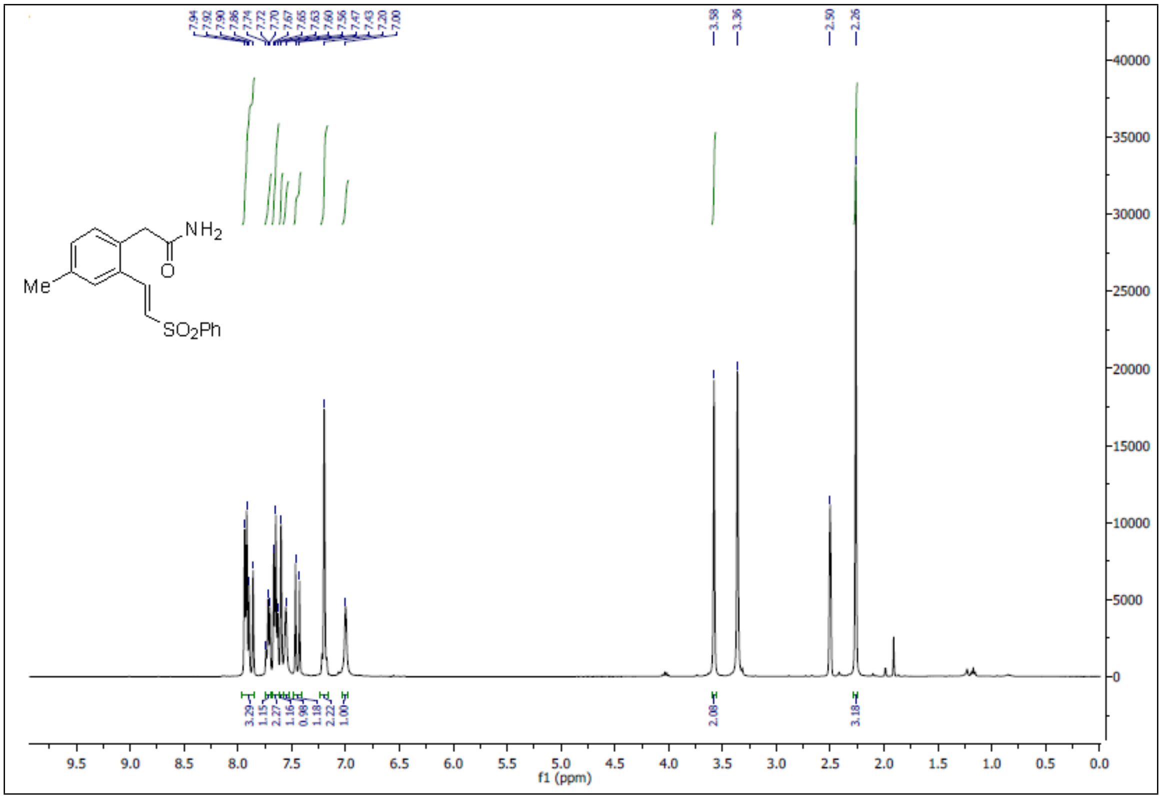

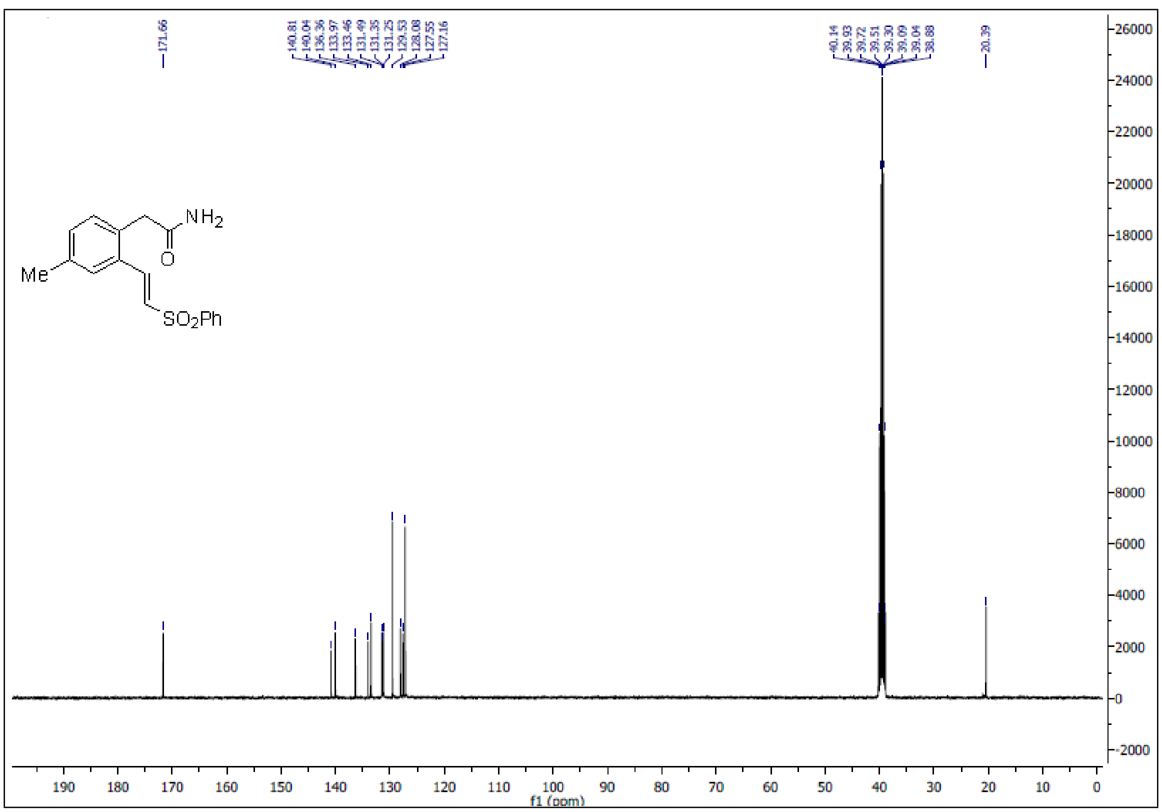

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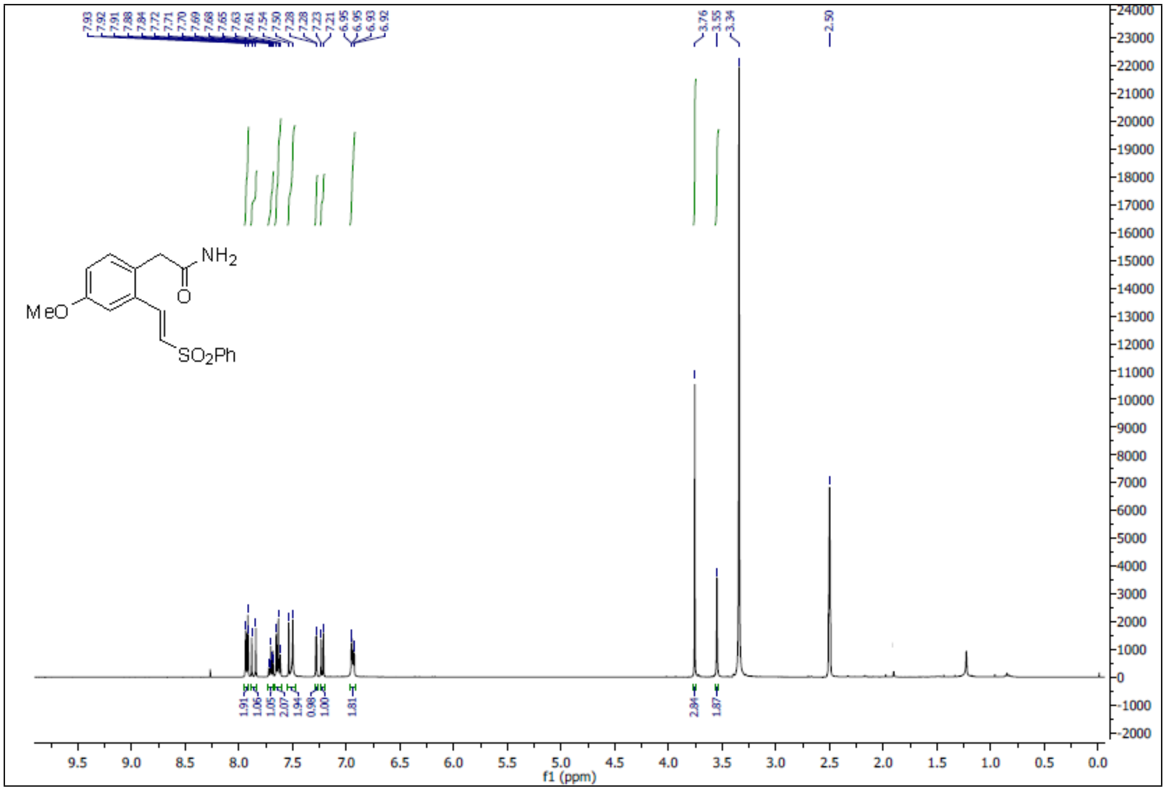

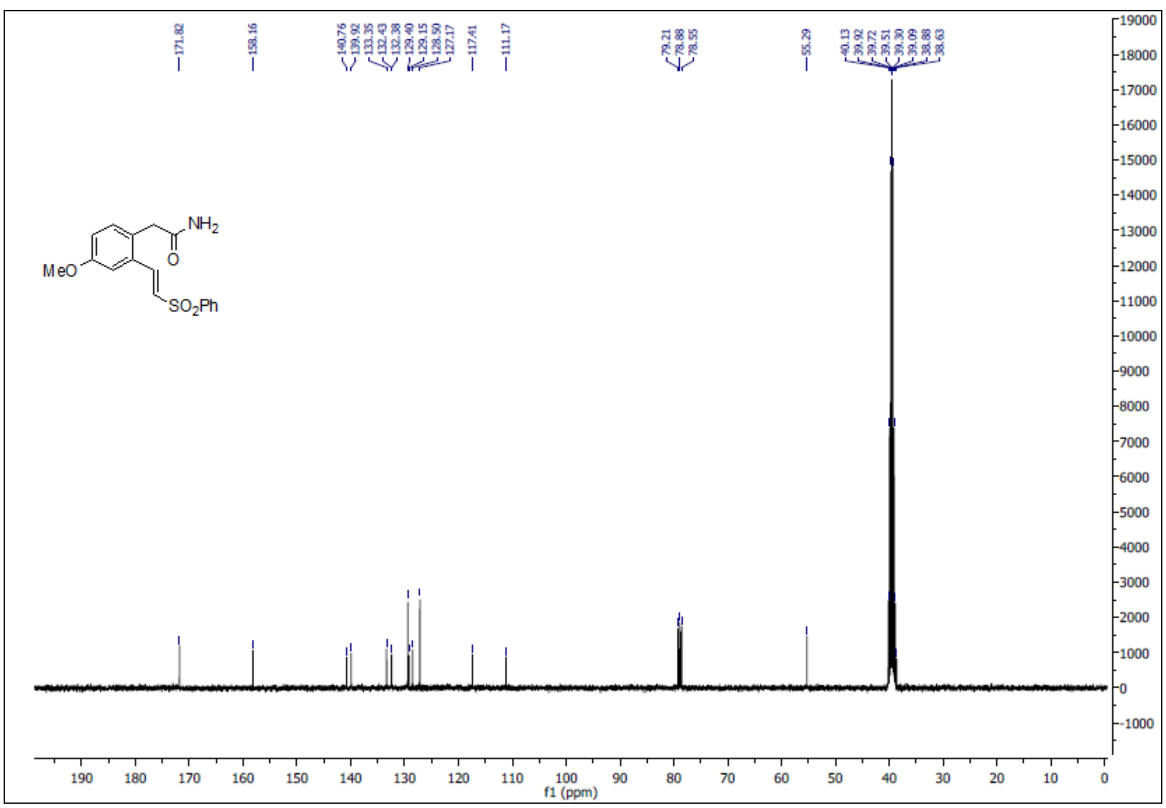

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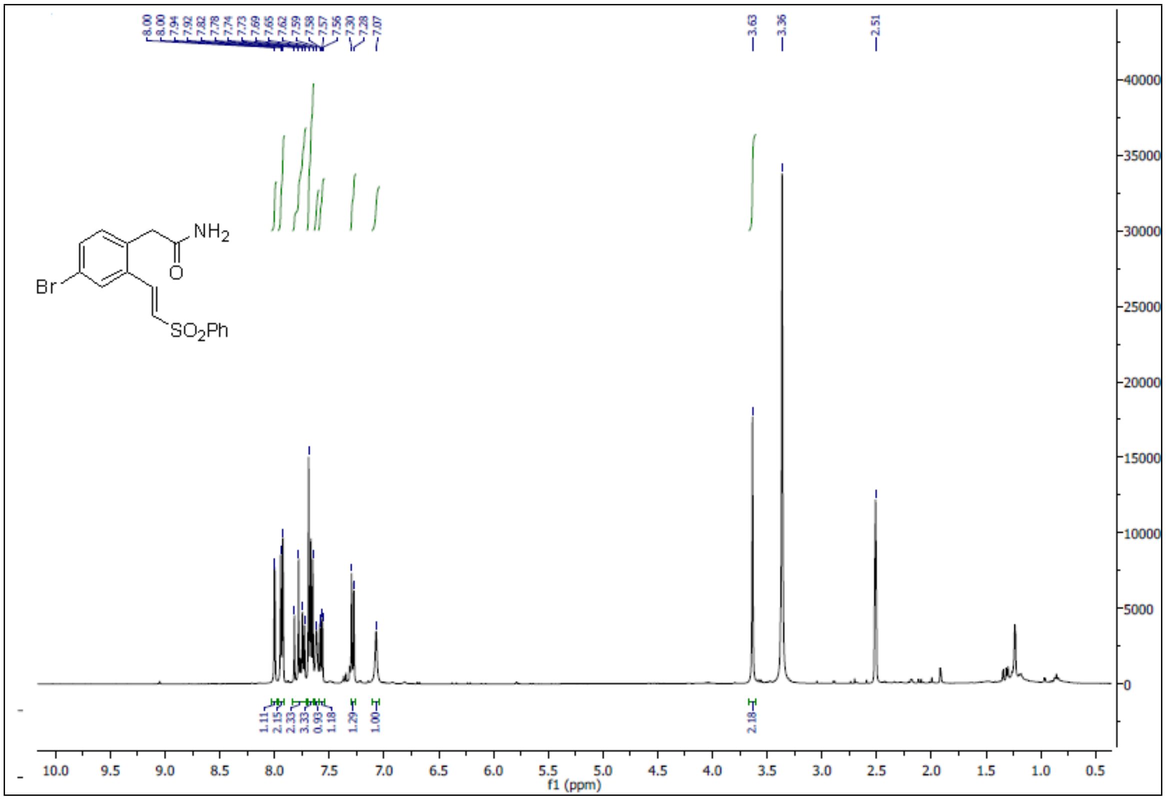

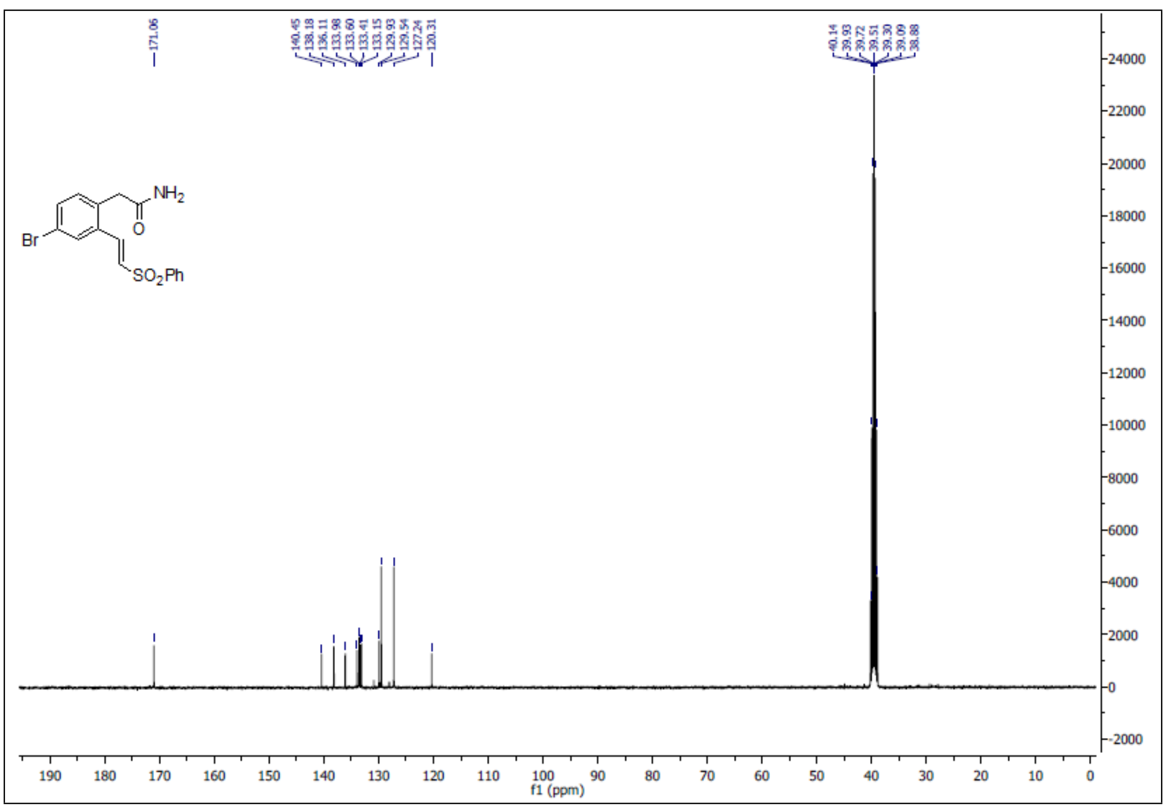

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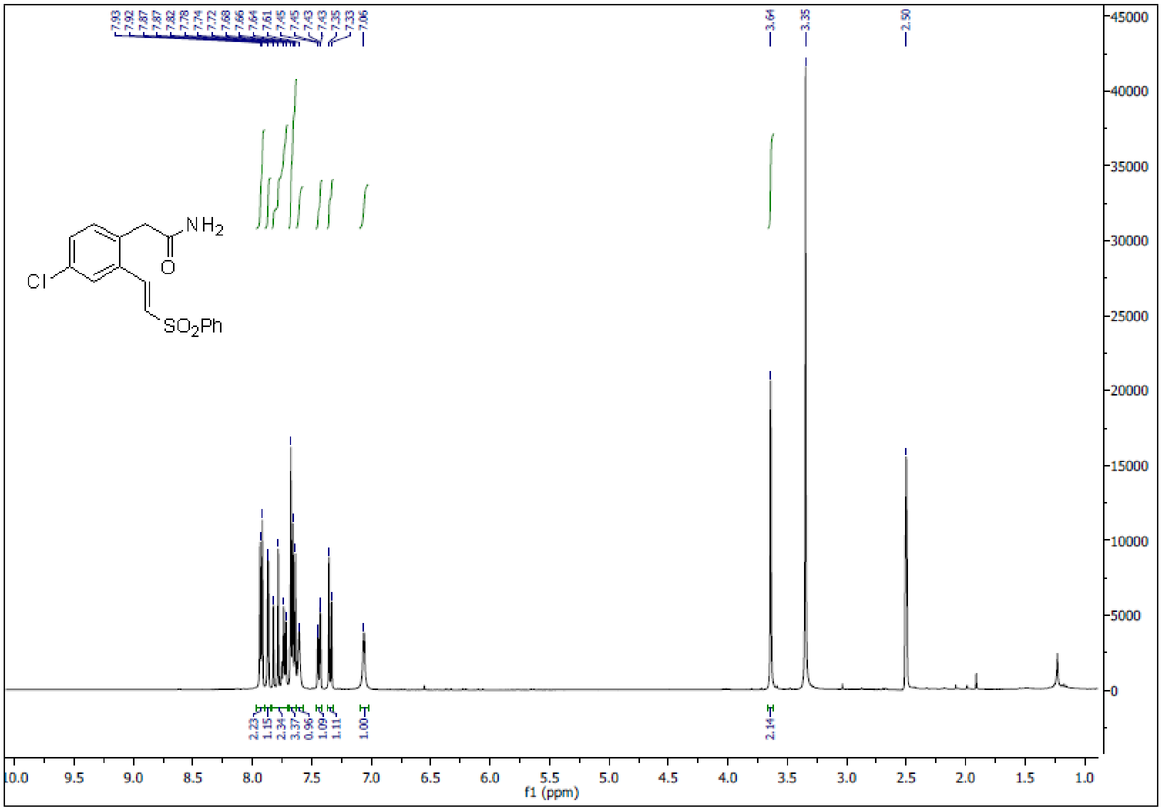

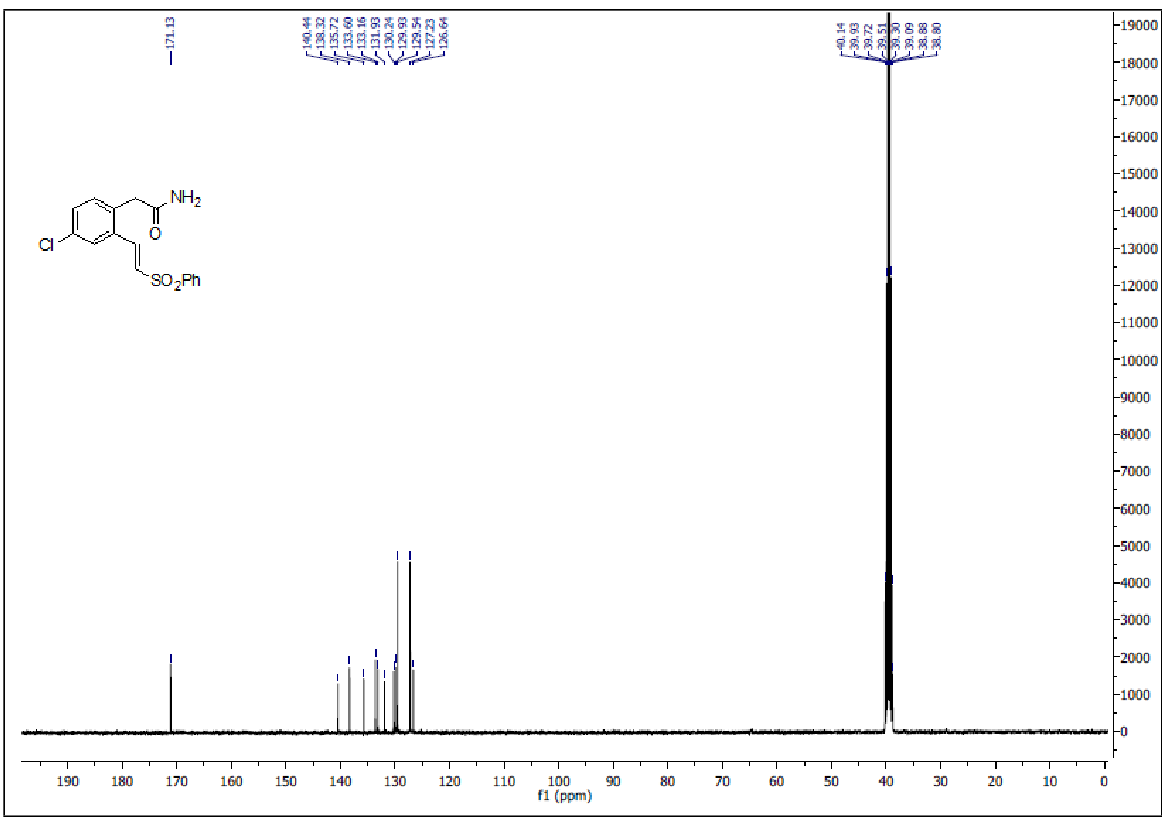

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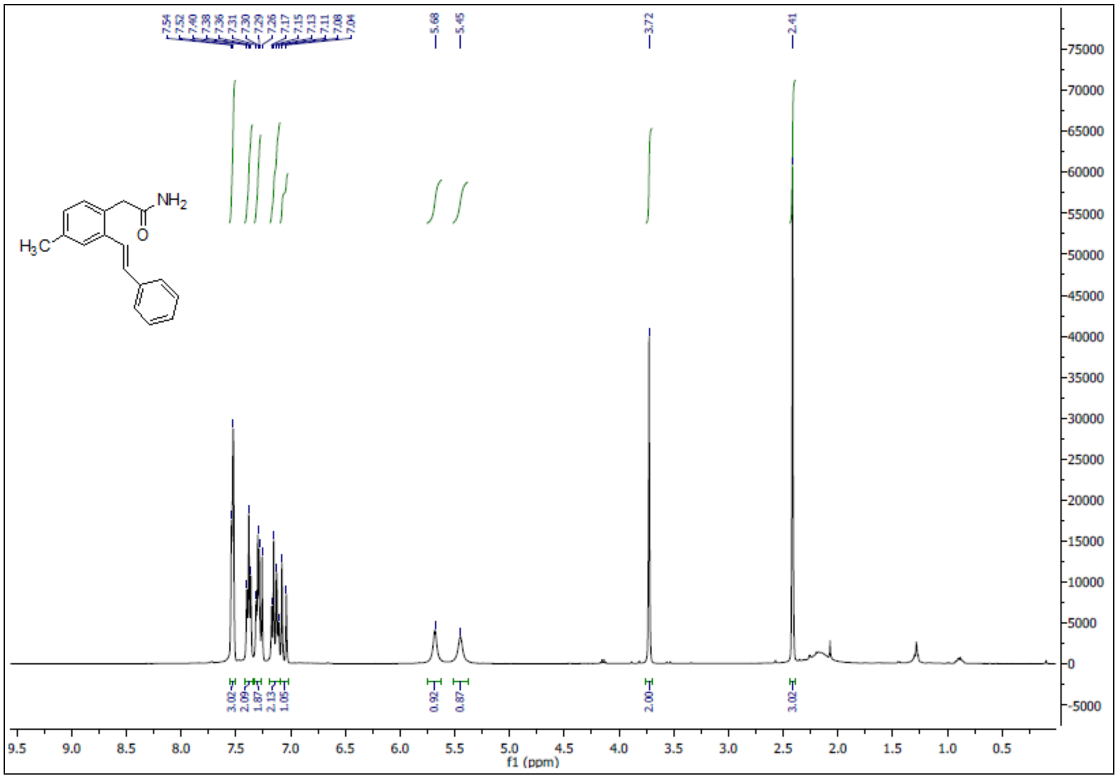

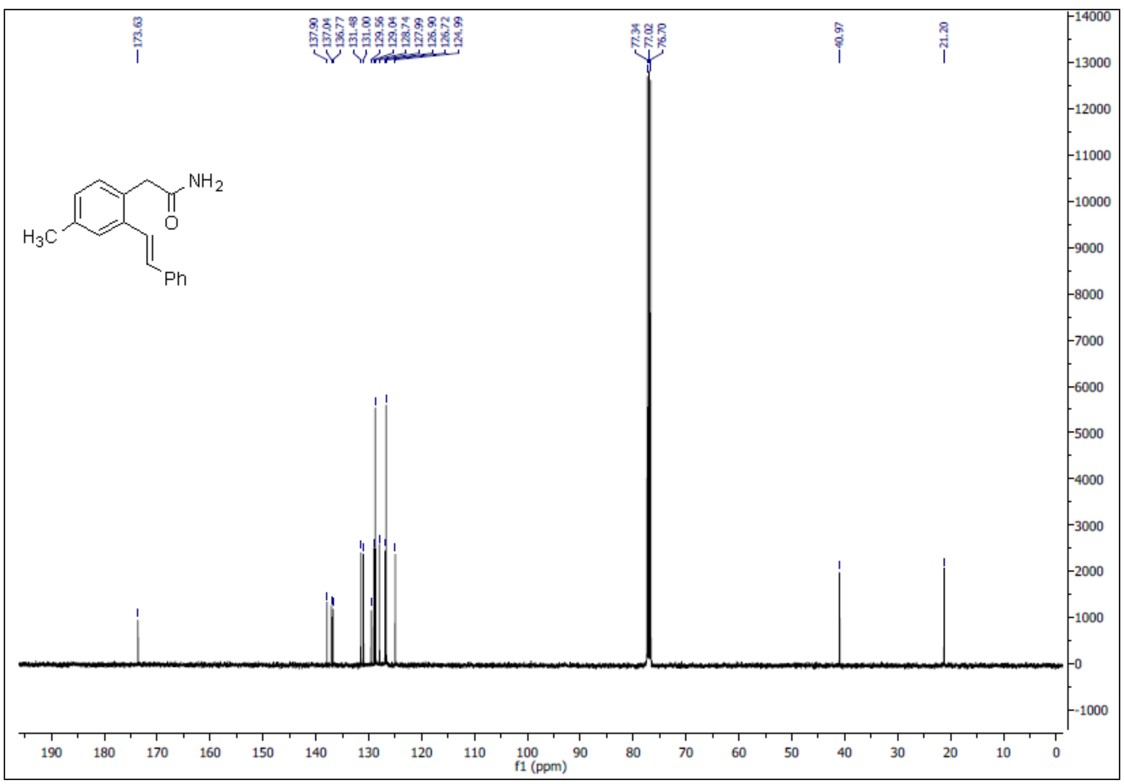

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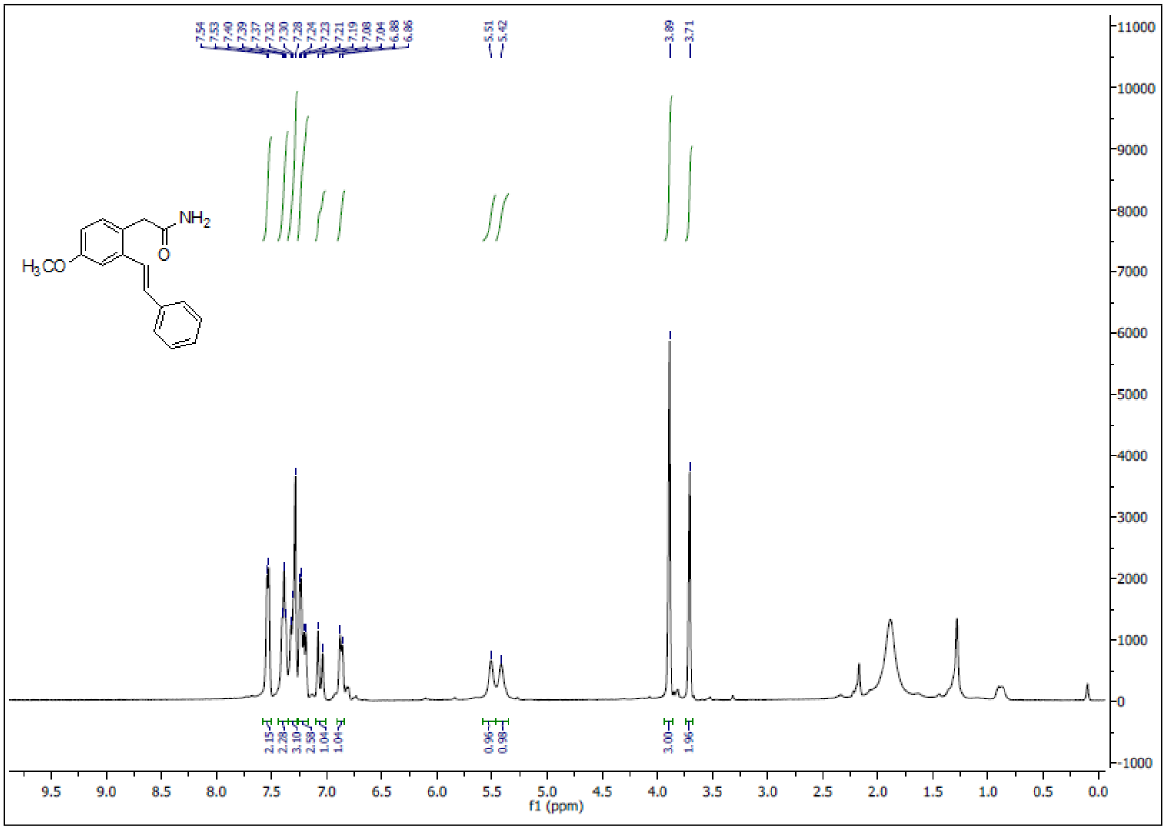

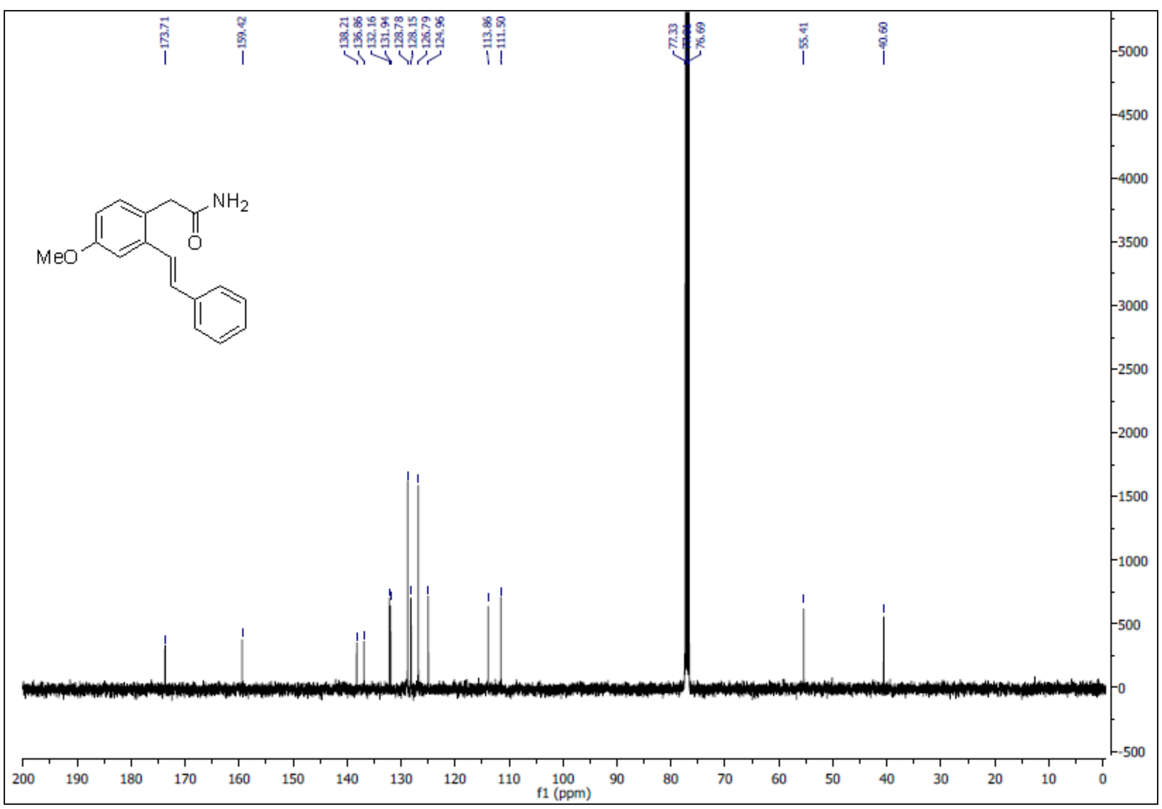

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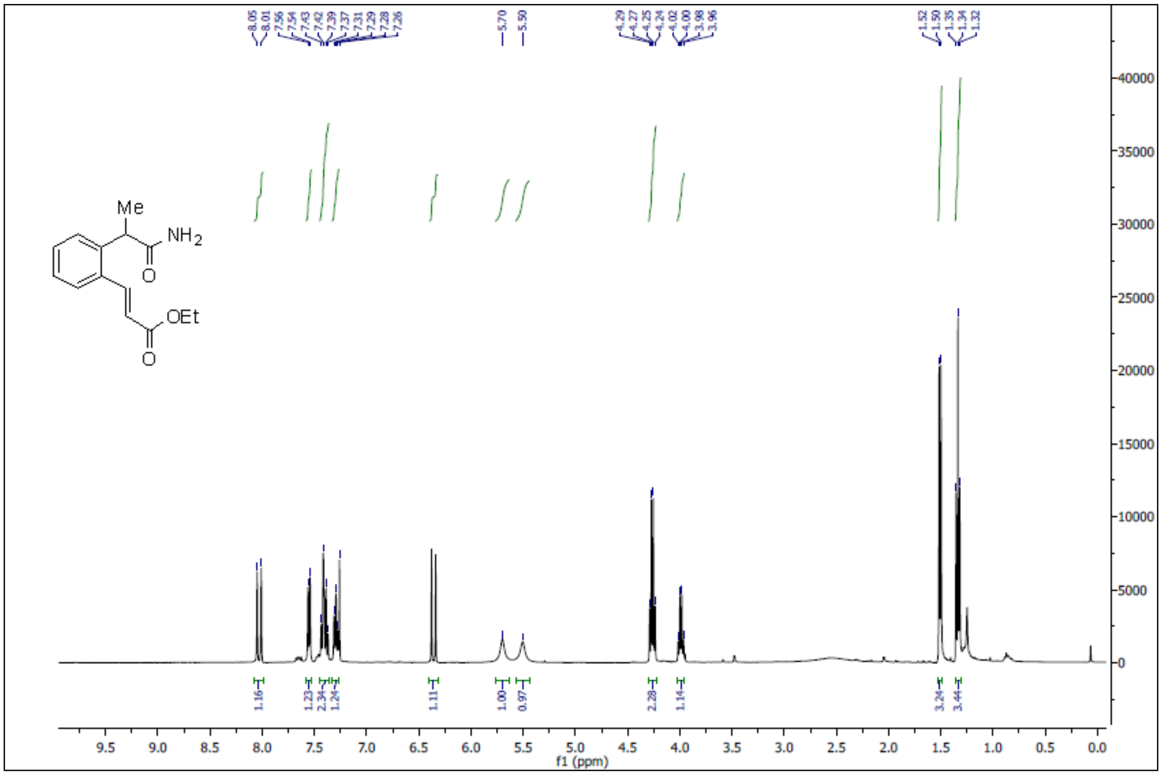
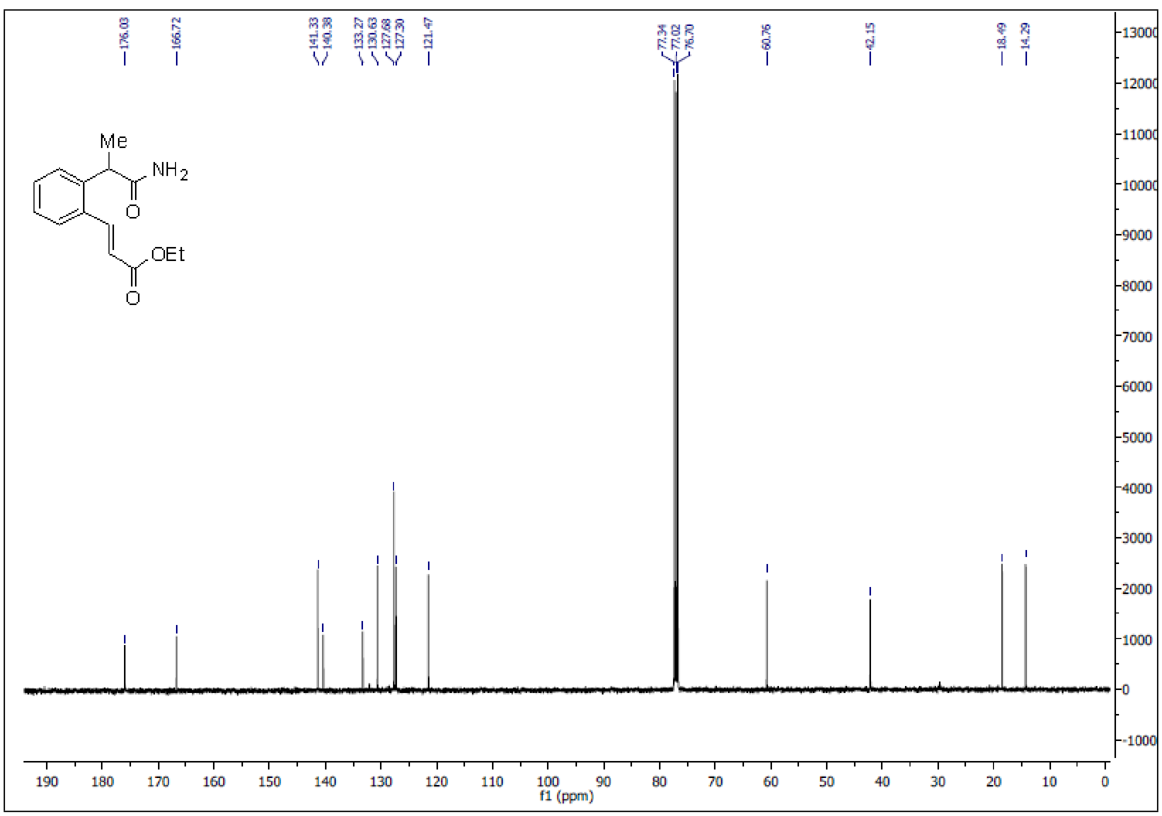
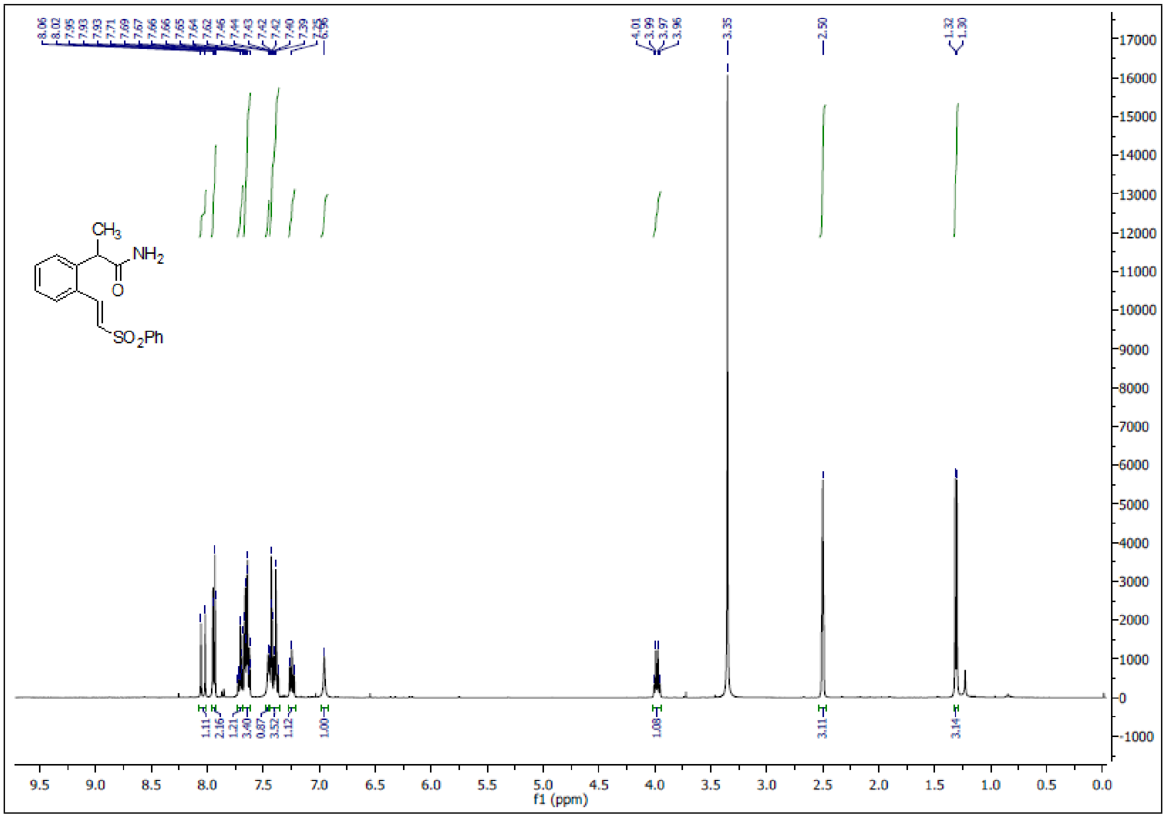
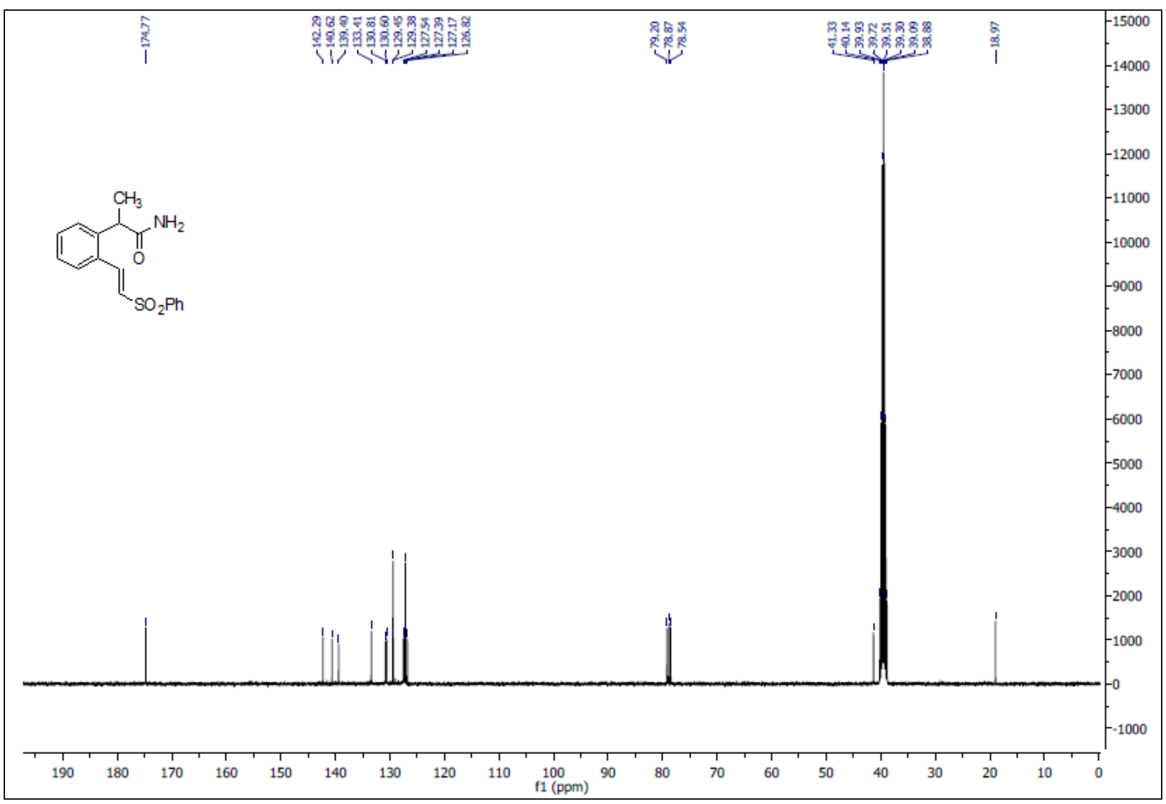


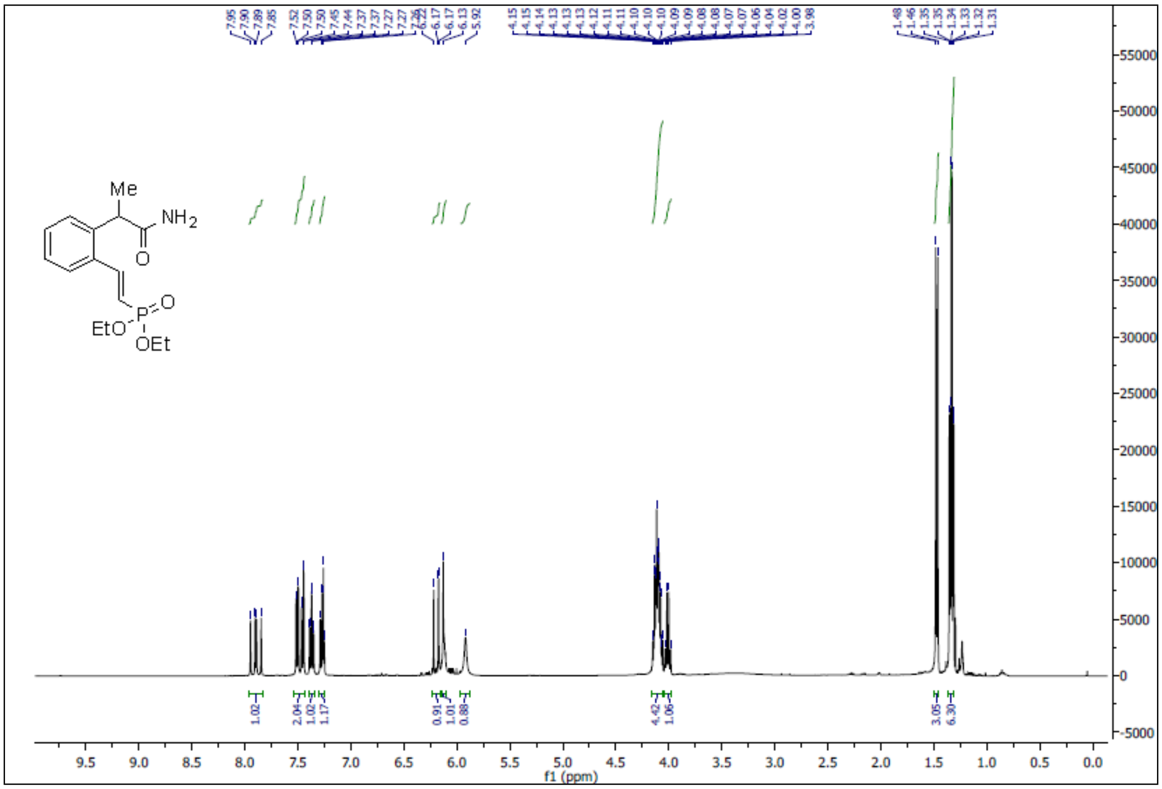


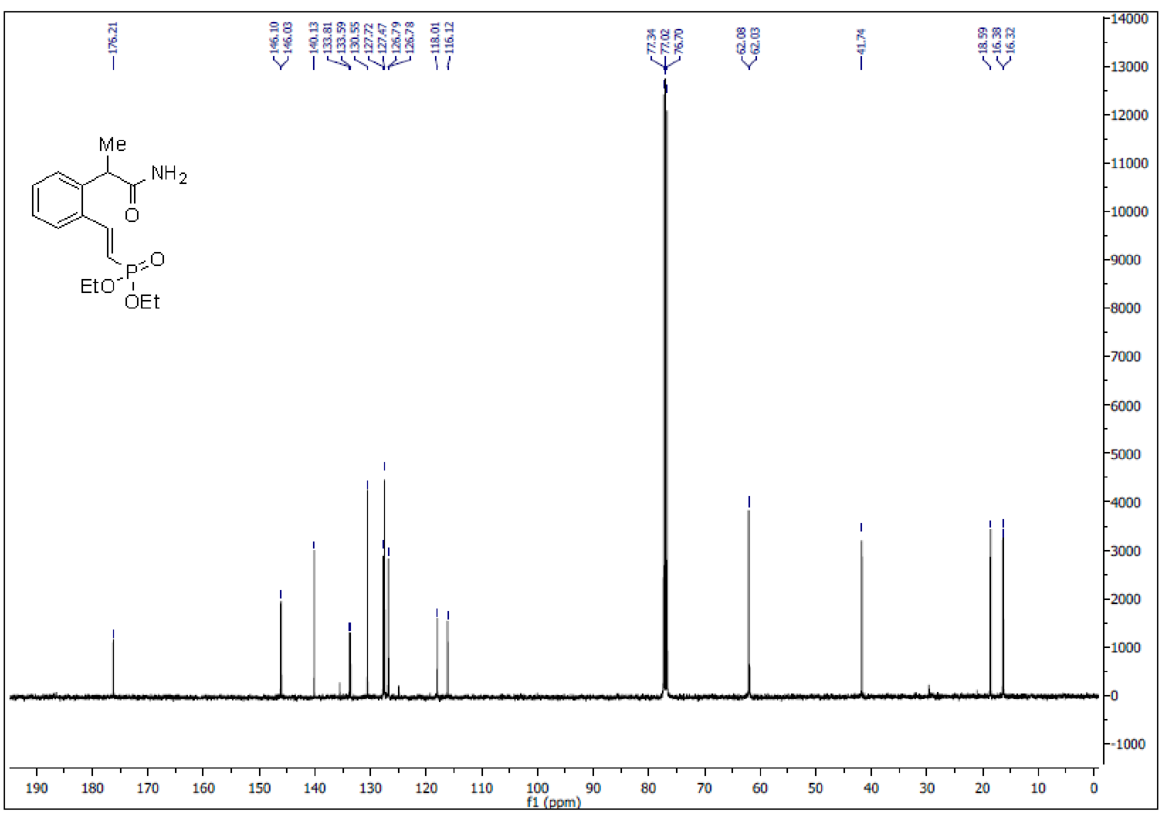
^{1}H and $^{13}C\{^{1}H\}$ Spectra of **6b**



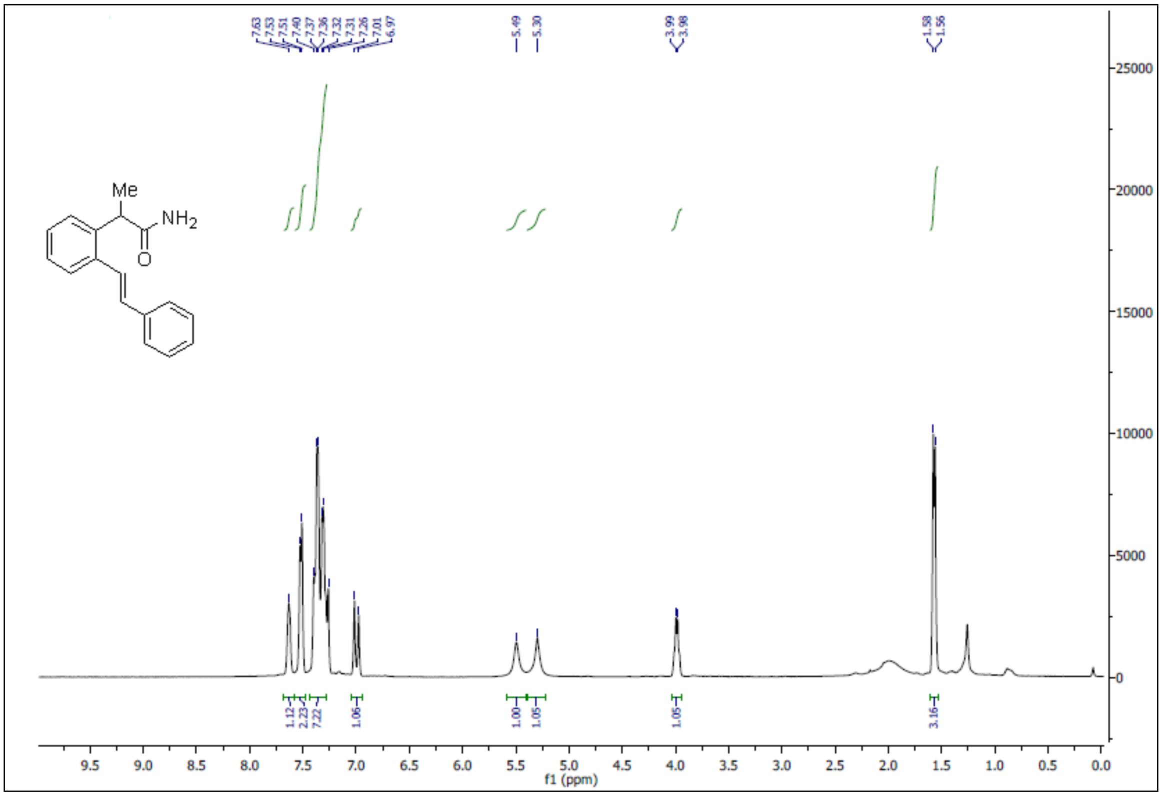


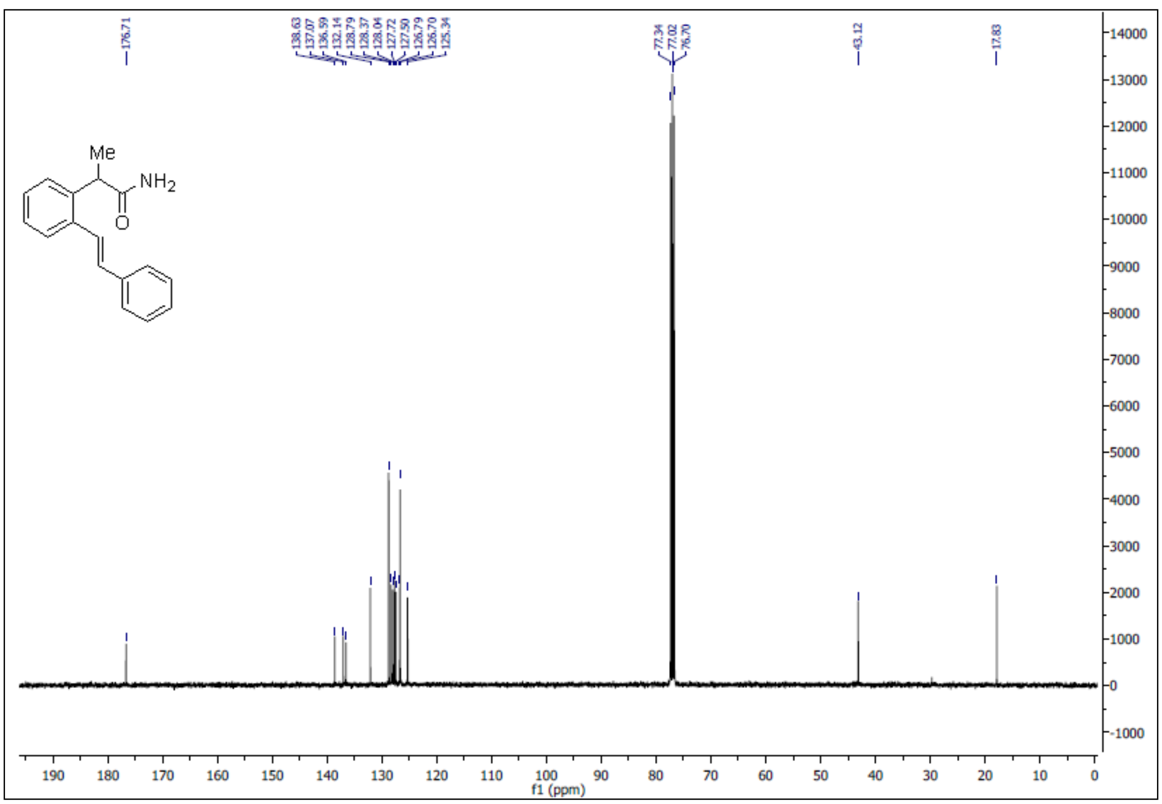
^1H and $^{13}C\{^1H\}$ Spectra of **6c**



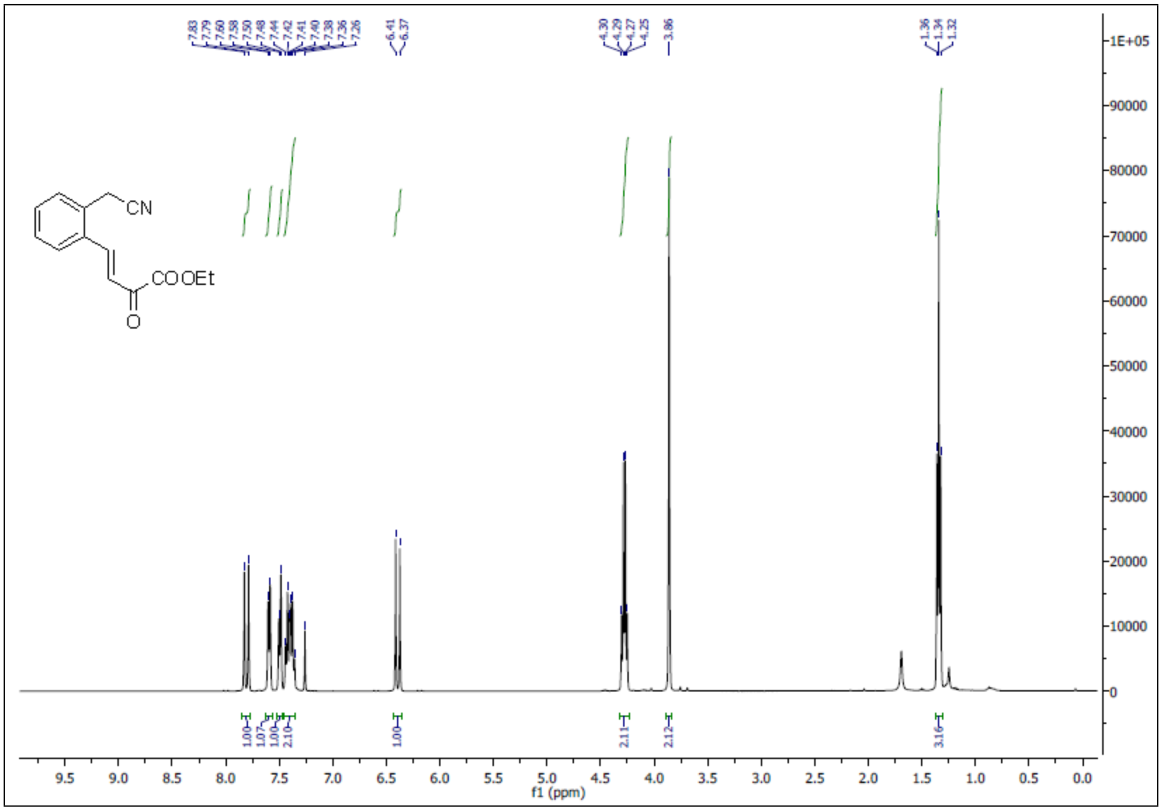


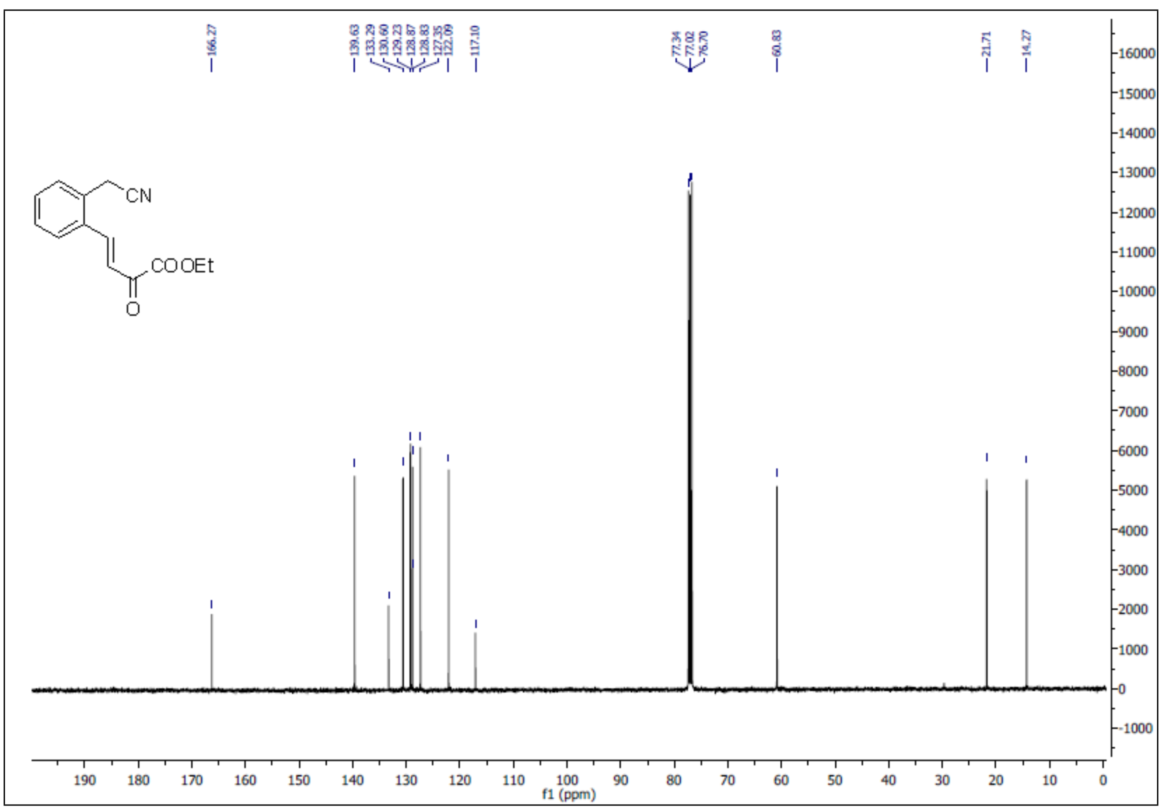
^{1}H and $^{13}C\{^{1}H\}$ Spectra of **6d**



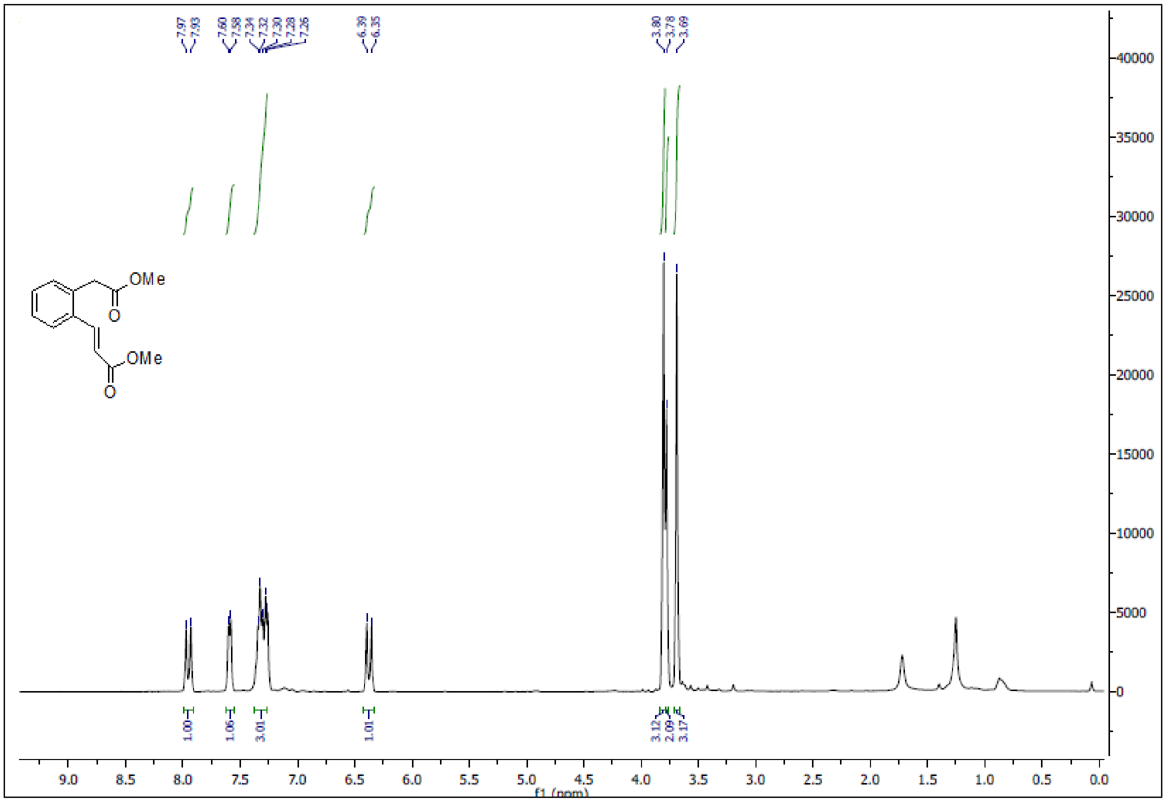


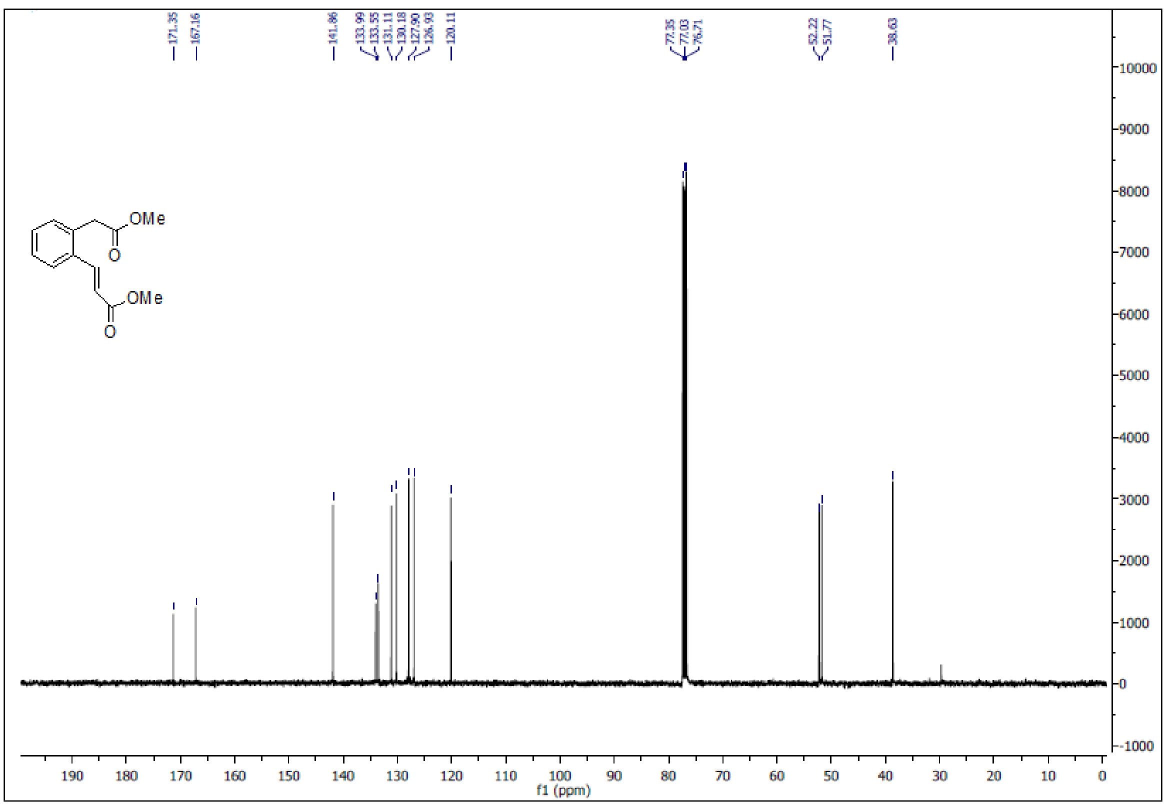
^{1}H and $^{13}C\{^{1}H\}$ Spectra of **7a**



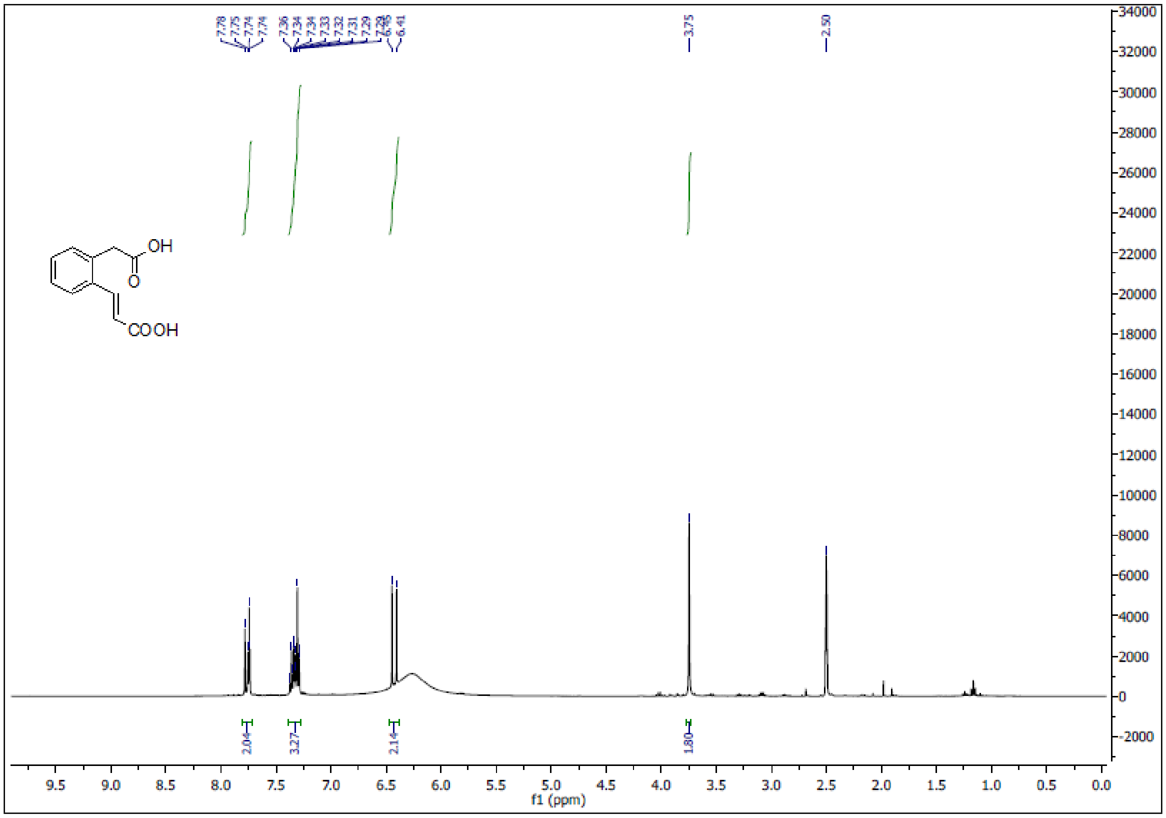


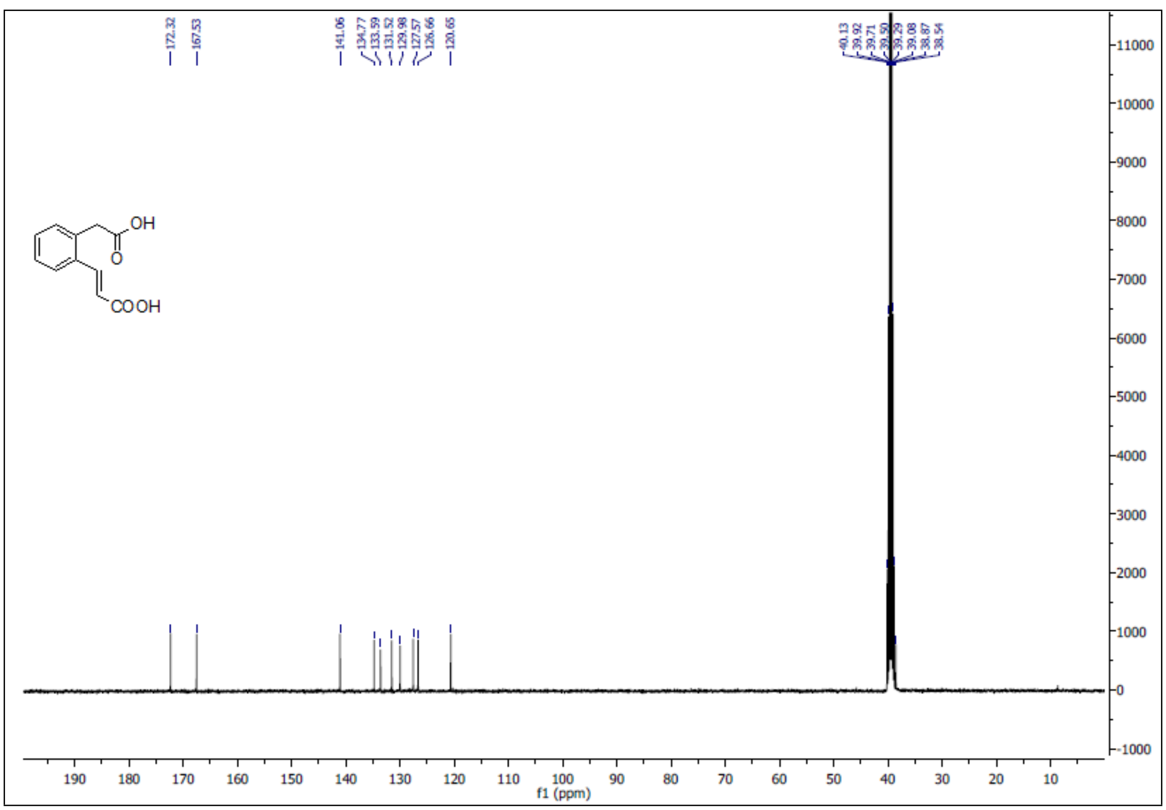
[1]H and [13]C{[1]H} Spectra of **7b**





^{1}H and ^{13}C{^{1}H} Spectra of **7c**





^{1}H and $^{13}C\{^{1}H\}$ Spectra of **9**