Supporting Information

Pd(II)-Catalyzed Atroposelective C−H Olefination: Synthesis of Enantioenriched *N*-Aryl Peptoid Atropisomers

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Table of Contents

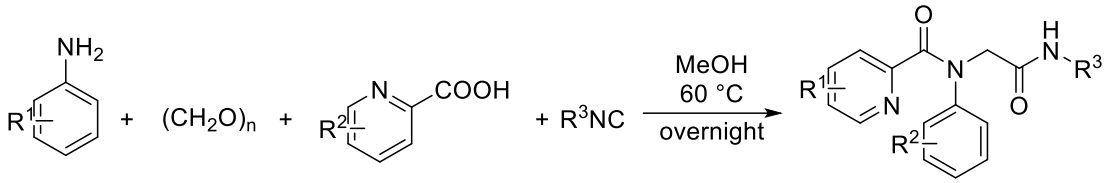
1. General Information

All the materials and solvents were purchased from commercial suppliers and used without additional purification. $Pd(OAc)_2$ was purchased from Laajoo (China). NMR spectra were recorded on a Bruke Avance operating for ^{1}H NMR at 400 MHz, ^{13}C NMR at 101 MHz, ^{19}F NMR at 376 MHz using TMS as internal standard. The peaks were internally referenced to residual undeuterated chloroform in $CDCl_3$ (δ H = 7.26 ppm, δ C = 77.16 ppm). The following abbreviations (or combinations thereof) were used to explain multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet. Melting points were determined using an INESA WRS-1B melting point apparatus. Mass spectroscopy data of the products were collected on an HRMS-TOF instrument. The ee value was determined on Shimadzu HPLC using CHIRALPAK column with hexane and 2-propanol as eluent, Wavelength = 254 nm.

2. Experimental Section and Characterization Date

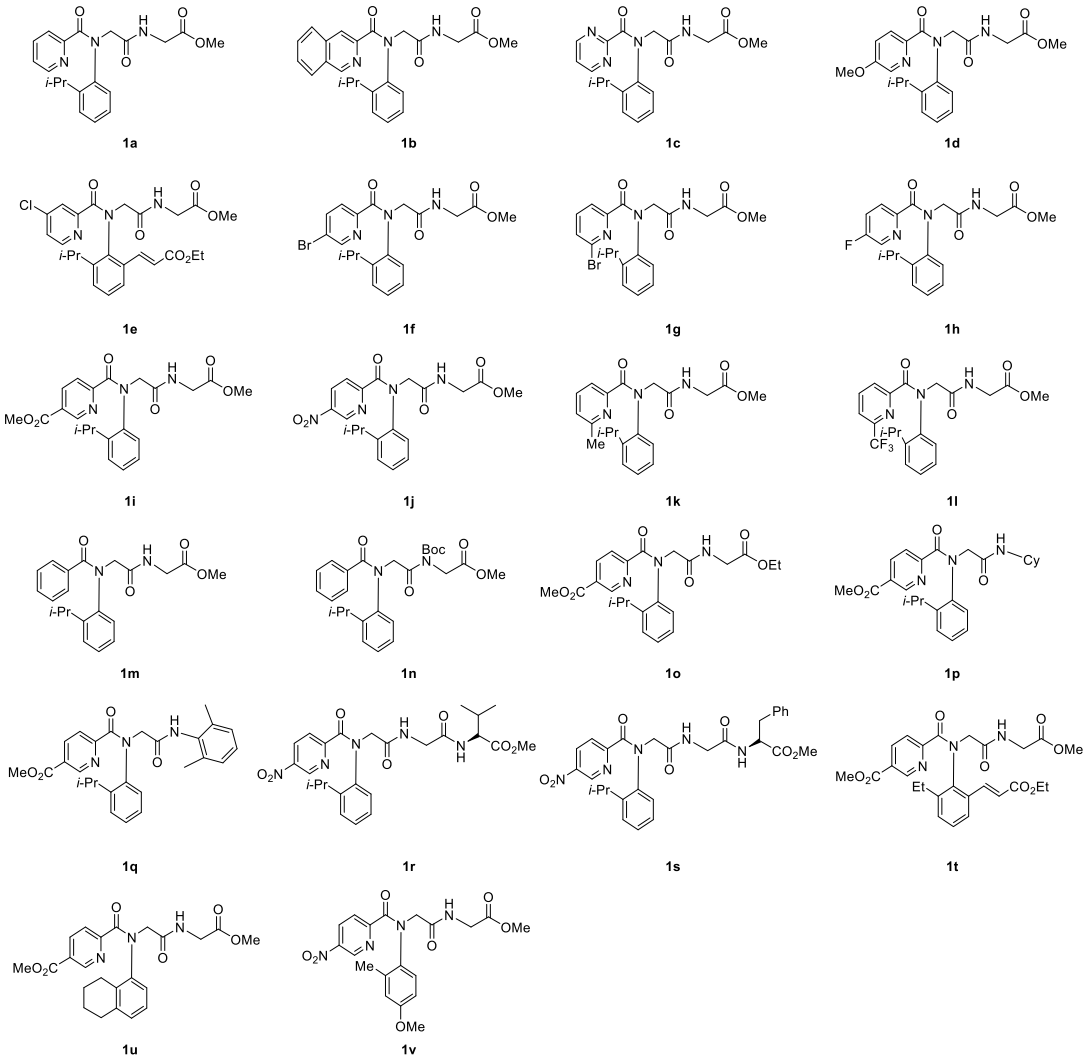
2.1 Preparation of Substrates

General Procedure A (Ugi reaction) for the Preparation of Compound 1a-1v



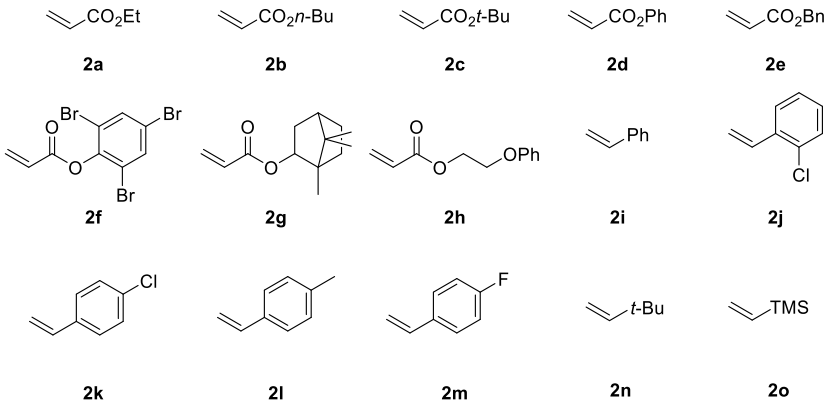
S1 **S2** **S3** **S4** **1a-1v**

To a solution of the amine (**S1**) (5.0 mmol, 1.0 equiv) in methanol (10 mL, 0.5 M) was added paraformaldehyde (**S2**) (1.2 equiv). After being stirred for 1h at room temperature, picolinic acid (**S3**) (1.2 equiv) and isocyanide (**S4**) (1.2 equiv) was added. The mixture was then stirred overnight at 60 °C under air followed by cooling. The resulting mixture was filtered through a celite pad and concentrated in vacuo. The residue was purified by silica gel column chromatography to afford the product.[1]



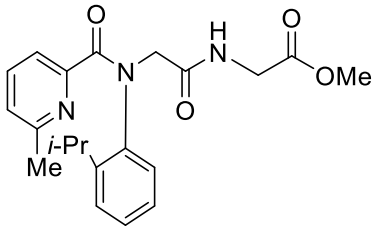
Scheme S1. *N*-aryl Peptoids

Substrates **1a-1j**, **1m-1v** are known compounds.[1]



Scheme S2. Olefins

Olefins **2a-2o** are commercially available.



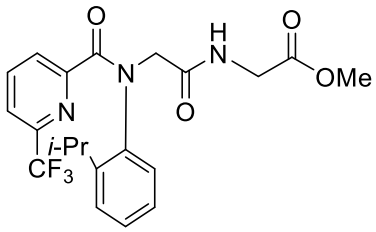
Methyl *N*-(2-isopropylphenyl)-*N*-(6-methylpicolinoyl)glycylglycinate (1k)

The title compound **1k** was prepared according to the general procedure A and was purified by flash chromatography (petroleum ether: ethyl acetate: triethylamine = 1: 1: 1%). **1k** was obtained as a brown solid, *E*: *Z* = 5: 1.

^{1}H NMR (400 MHz, Chloroform-d) δ 7.45 (t, *J* = 7.7 Hz, 1H), 7.36 (t, *J* = 8.0 Hz, 2H), 7.26 – 7.13 (m, 3H), 7.03 (ddd, *J* = 8.5, 5.6, 3.2 Hz, 1H), 6.95 (d, *J* = 7.7 Hz, 1H), 4.95 (d, *J* = 14.9 Hz, 1H), 4.21 (dd, *J* = 18.1, 6.0 Hz, 1H), 4.05 – 3.94 (m, 2H), 3.76 (s, 3H), 3.09 (p, *J* = 6.8 Hz, 1H), 2.24 (s, 3H), 1.15 (d, *J* = 6.8 Hz, 3H), 0.97 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.36, 169.96, 168.94, 157.35, 152.02, 145.47, 140.72, 136.33, 129.14, 128.62, 126.81, 126.39, 124.10, 121.15, 55.38, 52.45, 41.28, 27.95, 24.94, 23.94, 22.91.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{21}H_{25}N_3NaO_4$ 406.1739; found: 406.1737.



Methyl *N*-(2-isopropylphenyl)-*N*-(6-(trifluoromethyl)picolinoyl)glycylglycinate (1l)

The title compound **1l** was prepared according to the general procedure A and was purified by flash chromatography (petroleum ether: ethyl acetate: triethylamine = 1: 1: 1%). **1k** was obtained as a yellow solid, *E*: *Z* = 10: 1.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.93 (d, *J* = 7.9 Hz, 1H), 7.83 (t, *J* = 7.9 Hz, 1H), 7.50 (d, *J* = 7.8 Hz, 1H), 7.22 – 7.15 (m, 3H), 7.12 (t, *J* = 4.9 Hz, 1H), 6.99 (td, *J* = 7.4, 2.2 Hz, 1H), 4.98 (d, *J* = 15.0 Hz, 1H), 4.18 (dd, *J* = 18.3, 5.7 Hz, 1H), 4.04 (dd, *J* = 18.3, 5.1 Hz, 1H), 3.97 (d, *J* = 15.0 Hz, 1H), 3.76 (s, 3H), 3.07 (p, *J* = 6.8 Hz, 1H), 1.18 (d, *J* = 6.8 Hz, 3H), 1.02 (d, *J* = 6.8 Hz, 3H).

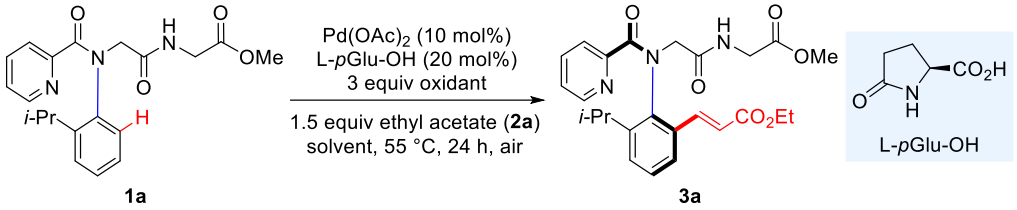
^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.35, 168.33, 168.10, 153.21, 146.58 (q, J_{CF3} = 35.5 Hz), 145.27, 140.18, 138.02, 129.08, 128.85, 127.07, 127.00, 126.45, 121.10 (q, J_{CF} = 8.7 Hz), 55.26, 52.49, 41.30, 28.05, 24.80, 22.70.

^{19}F NMR (376 MHz, Chloroform-*d*) δ -67.92.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{21}H_{22}F_3N_3NaO_4$ 460.1456; found: 460.1455.

2.2 Optimization of Reaction Conditions

Table S1. Optimization of reaction conditions[a]

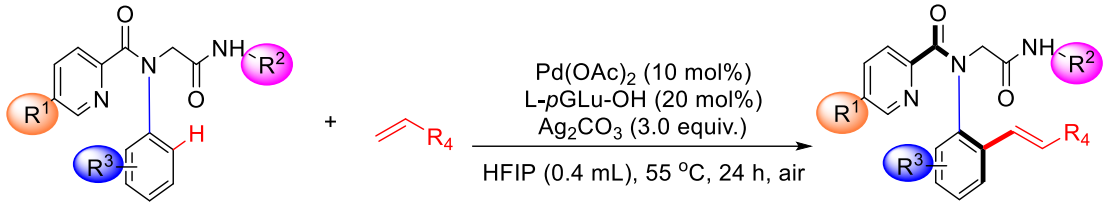


1a **3a**

Entry	Solvent	Sxidant	Yield (%)[b]	*ee* (%)[c]
1	HFIP	Ag_2CO_3	78	94
2	THF	Ag_2CO_3	46	90
3	1,4-dioxane	Ag_2CO_3	39	85
4	MeCN	Ag_2CO_3	82	81
5	trifluoroethanol	Ag_2CO_3	43	81
6	HFIP	AgOAc	49	79
7	HFIP	Ag_2O	22	75
8	HFIP	$AgNO_3$	57	89

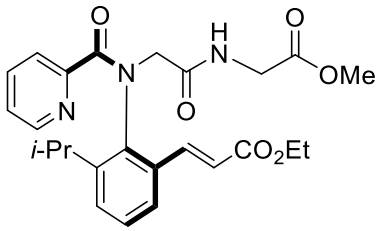
[a]Reaction conditions: **1a** (0.1 mmol, 1.0 equiv.), **2a** (1.5 equiv.), $Pd(OAc)_2$ (10 mol%), L-*p*Glu-OH (20 mol%), oxidant (3.0 equiv.) in solvent (0.4 mL) at 55 °C under air for 24 h.
[b]Isolated yield.
[c]The *ee* values were determined by chiral HPLC.

2.3 General Procedures for Pd(II)-Catalyted Atroposelective C-H Olefination



1 2 3

To a 10 mL Schlenk tube was added **1** (0.1 mmol), **2** (0.15 mmol), $Pd(OAc)_2$ (2.3 mg, 10 mol%), L-*p*Glu-OH (2.6 mg, 20 mol%) and Ag_2CO_3 (82.8 mg, 3.0 equiv.), HFIP (0.4 mL) stirred at 55 °C (aluminum heat transfer block) under air at 24 h. After cooling to room temperature, the mixture was diluted with ethyl acetate, the resulting residue was purified by preparative TLC using Hexane/EtOAc as the eluent to afford the desired product.



Ethyl (*E*)-3-(3-isopropyl-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)phenyl)acrylate (3a)

A purification by flash chromatography in petroleum ether: ethyl acetate= 2 : 1 to give **3a** as yellow oil (36.3 mg, 78%, *E: Z* = 2: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

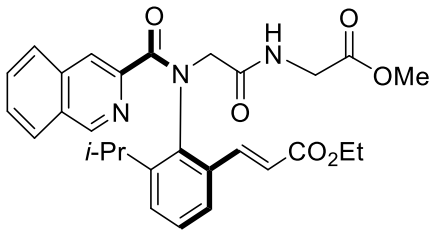
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.13 (d, *J* = 4.7 Hz, 1H), 7.90 (d, *J* = 15.9 Hz, 1H), 7.86 – 7.81 (m, 1H), 7.73 (d, *J* = 7.9 Hz, 1H), 7.62 (td, *J* = 7.8, 1.8 Hz, 1H), 7.35 (dd, *J* = 7.3, 1.9 Hz, 1H), 7.26 – 7.16 (m, 2H), 7.11 (dd, *J* = 7.8, 5.0 Hz, 1H), 6.28 (d, *J* = 15.9 Hz, 1H), 4.37 (dd, *J* = 14.6, 5.5 Hz, 2H), 4.26 – 4.20 (m, 2H), 4.15 (d, *J* = 6.5 Hz, 1H), 4.05 (dd, *J* = 18.3, 4.7 Hz, 1H), 3.77 (s, 3H), 3.05 – 3.00 (m, 1H), 1.31 (t, *J* = 7.1 Hz, 3H), 1.12 (d, *J* = 6.8 Hz, 3H), 0.79 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.08, 169.77, 168.34, 166.56, 151.93, 147.76, 146.53, 141.10, 140.21, 136.26, 132.80, 128.71, 128.68, 124.90, 124.71, 124.41, 121.07, 60.59, 56.64, 52.31, 41.35, 28.19, 24.88, 22.99, 14.32.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{25}H_{29}N_3NaO_6$ 490.1948; found: 490.1949.

HPLC: OD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 9.5 min (minor), 13.7 min (major), 94% ee.

$[\alpha]_D^{20}$ = -117.1 (c = 1.0, $CHCl_3$).



Ethyl (*E*)-3-(3-isopropyl-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)isoquinoline-3-carboxamido)phenyl)acrylate(3b)

A purification by flash chromatography in petroleum ether: ethyl acetate= 2 : 1 to give **3b** as yellow oil (12.8mg, 25%, *E: Z* = 5: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

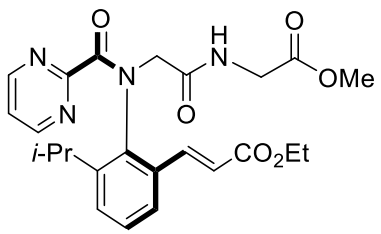
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.12 (d, *J* = 8.5 Hz, 1H), 8.01 (d, *J* = 15.9 Hz, 1H), 7.92 (d, *J* = 8.5 Hz, 1H), 7.84 (d, *J* = 5.3 Hz, 1H), 7.71 (d, *J* = 8.9 Hz, 1H), 7.57 – 7.44 (m, 3H), 7.39 (dd, *J* = 6.8, 1.9 Hz, 1H), 7.21 (d, *J* = 7.4 Hz, 2H), 6.29 (dd, *J* = 15.9, 3.7 Hz, 1H), 4.56 (d, *J* = 14.0 Hz, 1H), 4.37 (d, *J* = 14.2 Hz, 1H), 4.26 – 4.20 (m, 3H), 4.08 (dd, *J* = 18.3, 4.8 Hz, 1H), 3.79 (s, 3H), 3.11 – 3.05 (m, 1H), 1.31 (s, 3H), 1.15 (d, *J* = 6.8 Hz, 3H), 0.77 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.24, 169.59, 168.49, 166.74, 151.09, 146.33, 141.48, 136.55, 133.01, 129.88, 128.83, 128.69, 128.09, 127.48, 124.77, 121.04, 120.99, 60.68, 56.95, 52.45, 41.51, 28.30, 24.89, 23.37, 14.44.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{24}H_{28}N_4NaO_6$ 540.2103; found: 540.2105.

HPLC: AD-H column (hexane/isopropanol = 70/30, rate = 1.0 mL/min, λ = 254 nm) tr = 19.7 min (minor), 29.8 min (major), 43% ee.

$[\alpha]_D^{20}$ =+53.0 (c = 0.2, $CHCl_3$).



Ethyl (*E*)-3-(3-isopropyl-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)pyrimidine-2-carboxamido)phenyl)acrylate(3c)

A purification by flash chromatography in petroleum ether: ethyl acetate= 1: 2 to give **3c** as yellow oil (41.8mg, 89%, *E: Z* = 8: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

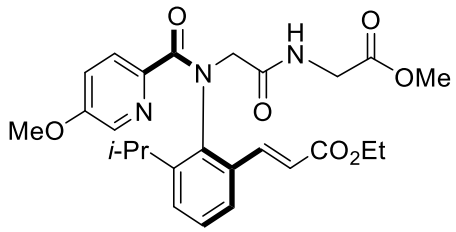
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.53 (d, *J* = 4.9 Hz, 2H), 8.00 (d, *J* = 15.9 Hz, 1H), 7.83 (t, *J* = 5.0 Hz, 1H), 7.34 (d, *J* = 5.9 Hz, 1H), 7.25 – 7.10 (m, 3H), 6.31 (d, *J* = 15.9 Hz, 1H), 4.41 (s, 2H), 4.25 (q, *J* = 7.2 Hz, 2H), 4.13 (t, *J* = 6.1 Hz, 2H), 3.77 (s, 3H), 3.08 (q, *J* = 6.8 Hz, 1H), 1.33 (t, *J* = 7.2 Hz, 3H), 1.11 (d, *J* = 6.8 Hz, 3H), 0.87 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.02, 168.23, 166.59, 160.58, 156.72, 147.24, 141.22, 138.74, 133.88, 129.36, 128.66, 125.07, 121.66, 121.46, 60.78, 56.24, 52.44, 41.52, 28.23, 25.30, 23.25, 14.44.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{24}H_{28}N_4NaO_6$ 491.1901; found: 491.1902.

HPLC: OD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 10.1 min (minor), 21.7 min (major), 96% ee.

$[\alpha]_D^{20}$ = -194.7 (c = 0.5, $CHCl_3$).



Ethyl (*E*)-3-(3-isopropyl-2-(5-methoxy-*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)phenyl)acrylate(3d)

A purification by flash chromatography in petroleum ether: ethyl acetate= 2: 1 to give **3d** as yellow oil (50.7mg, 41%, *E: Z* = 3: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

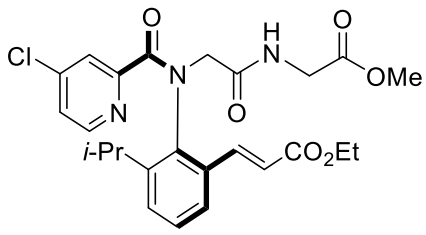
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.91 (t, *J* = 5.4 Hz, 1H), 7.86 (d, *J* = 15.9 Hz, 1H), 7.81 – 7.75 (m, 2H), 7.37 (dd, *J* = 7.1, 2.2 Hz, 1H), 7.25 – 7.18 (m, 2H), 7.08 (dd, *J* = 8.7, 2.9 Hz, 1H), 6.29 (d, *J* = 15.9 Hz, 1H), 4.36 (s, 2H), 4.23 – 4.19 (m, 2H), 4.14 (dd, *J* = 9.1, 5.6 Hz, 1H), 4.04 (dd, *J* = 18.2, 4.8 Hz, 1H), 3.77 (d, *J* = 2.6 Hz, 6H), 2.99 (p, *J* = 6.8 Hz, 1H), 1.31 (t, *J* = 7.2 Hz, 3H), 1.12 (d, *J* = 6.8 Hz, 3H), 0.77 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.22, 169.41, 168.67, 166.73, 156.58, 146.46, 140.91, 135.65, 132.75, 128.82, 128.55, 126.14, 124.84, 120.98, 119.85, 60.67, 56.95, 55.69, 52.40, 41.44, 28.30, 24.86, 23.22, 14.43.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{26}H_{31}N_3NaO_7$ 520.2054; found: 520.2055.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 20.3 min (minor), 11.7 min (major), 95% ee.

$[\alpha]_D^{20}$ = -160.2 (c = 1.0, $CHCl_3$).



Ethyl (*E*)-3-(2-(4-chloro-*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)-3-isopropylphenyl)acrylate(3e)

A purification by flash chromatography in petroleum ether: ethyl acetate= 2: 1 to give **3e** as yellow oil (40.2mg, 80%, *E: Z* = 3: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

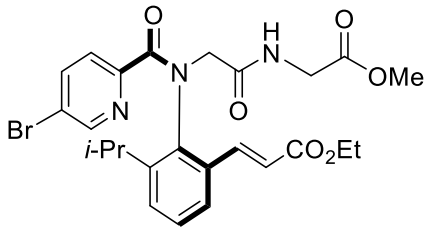
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.98 (d, *J* = 5.1 Hz, 1H), 7.86 (d, *J* = 15.9 Hz, 1H), 7.79 (d, *J* = 2.0 Hz, 1H), 7.70 (t, *J* = 5.4 Hz, 1H), 7.33 (dd, *J* = 6.8, 2.4 Hz, 1H), 7.25 – 7.17 (m, 2H), 7.11 (dd, *J* = 5.3, 2.1 Hz, 1H), 6.24 (d, *J* = 15.9 Hz, 1H), 4.43 (d, *J* = 14.3 Hz, 1H), 4.30 (d, *J* = 14.3 Hz, 1H), 4.25 – 4.20 (m, 2H), 4.17 (dd, *J* = 7.9, 5.1 Hz, 1H), 4.07 – 4.01 (m, 1H), 3.76 (s, 3H), 3.05 – 2.98 (m, 1H), 1.30 (t, *J* = 7.1 Hz, 3H), 1.13 (d, *J* = 6.8 Hz, 3H), 0.85 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.15, 168.60, 168.06, 166.56, 148.64, 146.56, 144.58, 141.04, 139.90, 132.91, 128.95, 128.83, 125.22, 125.10, 124.79, 121.31, 60.70, 56.68, 52.42, 41.43, 28.31, 23.14, 14.40.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{25}H_{28}ClN_3NaO_6$ 524.1559; found: 524.1559.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 10.0 min (minor), 6.7 min (major), 95% ee.

$[\alpha]_D^{20}$ = -137.8 (c = 1.0, $CHCl_3$).



Ethyl (*E*)-3-(2-(5-bromo-*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)-3-isopropylphenyl)acrylate(3f)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **3f** as yellow oil (35.5 mg, 65%, *E: Z* = 5: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

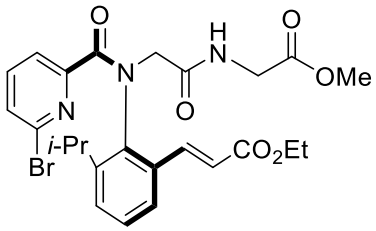
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.14 (d, *J* = 2.2 Hz, 1H), 7.83 (d, *J* = 15.9 Hz, 1H), 7.77 (dd, *J* = 8.3, 2.3 Hz, 1H), 7.73 (t, *J* = 5.3 Hz, 1H), 7.69 (d, *J* = 8.4 Hz, 1H), 7.34 (dd, *J* = 6.9, 2.3 Hz, 1H), 7.24 (q, *J* = 7.5, 6.9 Hz, 2H), 6.26 (d, *J* = 15.9 Hz, 1H), 4.43 (d, *J* = 14.3 Hz, 1H), 4.29 (d, *J* = 14.2 Hz, 1H), 4.22 (td, *J* = 7.1, 1.4 Hz, 2H), 4.17 (d, *J* = 9.5 Hz, 1H), 4.03 (dd, *J* = 18.3, 4.7 Hz, 1H), 3.76 (s, 3H), 3.05 – 2.98 (m, 1H), 1.30 (t, *J* = 7.1 Hz, 3H), 1.13 (d, *J* = 6.8 Hz, 3H), 0.84 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.17, 168.84, 168.10, 166.59, 148.79, 146.58, 140.89, 140.10, 139.18, 128.93, 126.04, 124.80, 122.75, 121.19, 60.68, 56.70, 52.40, 41.41, 28.28, 24.85, 23.25, 14.38.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{25}H_{28}BrN_3NaO_6$ 568.1053; found: 568.1054.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 17.3 min (minor), 9.9 min (major), 97% ee.

$[\alpha]_D^{20}$ = -173.1 (c = 1.0, $CHCl_3$).



Ethyl (*E*)-3-(2-(6-bromo-*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)-3-isopropylphenyl)acrylate(3g)

A purification by flash chromatography in petroleum ether : ethyl acetate= 1: 1 to give **3g** as yellow oil (2.5 mg, 5%, *E: Z* = 10: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

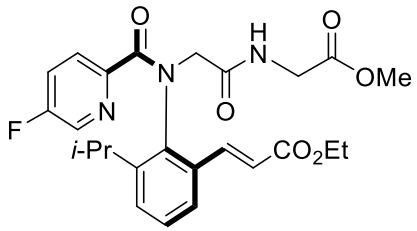
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.86 – 7.78 (m, 2H), 7.68 (d, *J* = 6.5 Hz, 1H), 7.50 (t, *J* = 7.8 Hz, 1H), 7.38 (dd, *J* = 5.9, 3.3 Hz, 1H), 7.33 – 7.27 (m, 3H), 6.26 (d, *J* = 15.8 Hz, 1H), 4.53 (d, *J* = 14.2 Hz, 1H), 4.27 – 4.18 (m, 4H), 4.06 (dd, *J* = 18.4, 4.7 Hz, 1H), 3.78 (s, 3H), 3.00 (p, *J* = 6.8 Hz, 1H), 1.31 (s, 3H), 1.17 (d, *J* = 6.8 Hz, 3H), 0.93 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.24, 168.12, 167.85, 166.70, 152.22, 140.99, 140.00, 139.86, 138.73, 132.79, 129.91, 129.07, 129.05, 124.88, 123.70, 121.17, 60.69, 56.78, 52.47, 41.50, 28.36, 24.96, 23.38, 14.43.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{25}H_{28}N_3NaO_6$ 568.1053; found: 568.1055.

HPLC: OD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 9.9 min (minor), 20.5 min (major), 34% ee.

$[\alpha]_D^{20}$ = -58.0 (c = 0.1, $CHCl_3$).



Ethyl (*E*)-3-(2-(5-fluoro-*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)-3-isopropylphenyl)acrylate(3h)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **3h** as yellow oil (40.7 mg, 84%, *E: Z* = 5:1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.94 (d, *J* = 2.8 Hz, 1H), 7.90 – 7.82 (m, 2H), 7.76 (t, *J* = 5.6 Hz, 1H), 7.34 (ddd, *J* = 13.1, 7.7, 2.6 Hz, 2H), 7.26 – 7.20 (m, 2H), 6.27 (d, *J* = 15.9 Hz, 1H), 4.42 (d, *J* = 14.2 Hz, 1H), 4.32 (d, *J* = 14.2 Hz, 1H), 4.21 (dd, *J* = 13.4, 7.7 Hz, 3H), 4.04 (dd, *J* = 18.3, 4.7 Hz, 1H), 3.78 (s, 3H), 3.01 (q, *J* = 6.7 Hz, 1H), 1.31 (t, *J* = 7.1 Hz, 3H), 1.14 (d, *J* = 6.8 Hz, 3H), 0.82 (d, *J* = 6.8 Hz, 3H).

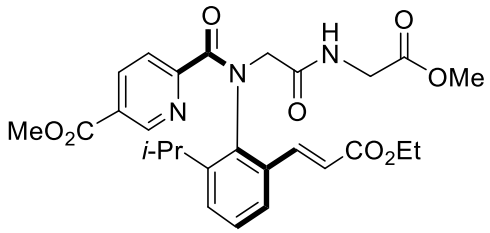
^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.22, 168.67, 168.26, 166.64, 148.15, 146.54, 141.04, 140.31, 136.32, 136.08, 128.90, 126.62, 124.85, 123.28, 123.09, 121.21, 60.72, 56.81, 52.44, 41.45, 28.31, 24.89, 23.22, 14.42.

^{19}F NMR (376 MHz, Chloroform-*d*) δ -122.16.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{25}H_{28}FN_3NaO_6$ 508.1854; found: 508.1855.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 9.6 min (minor), 7.5 min (major), 96% ee.

$[\alpha]_D^{20}$ = -123.8 (c = 1.0, $CHCl_3$).



Methyl (*E*)-6-((2-(3-ethoxy-3-oxoprop-1-en-1-yl)-6-isopropylphenyl)(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)carbamoyl)nicotinate (3i)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **3i** as yellow oil (50.7mg, 97%, *E: Z* = 5: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

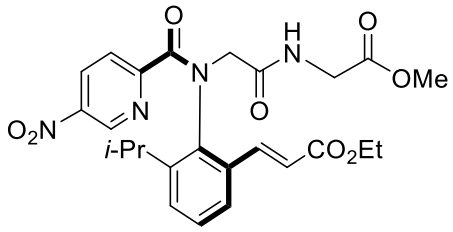
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.69 (d, *J* = 2.1 Hz, 1H), 8.21 (dd, *J* = 8.2, 2.1 Hz, 1H), 7.91 – 7.79 (m, 2H), 7.71 (t, *J* = 5.4 Hz, 1H), 7.32 (dd, *J* = 6.6, 2.6 Hz, 1H), 7.25 – 7.14 (m, 2H), 6.24 (d, *J* = 15.9 Hz, 1H), 4.47 (d, *J* = 14.3 Hz, 1H), 4.29 (d, *J* = 14.3 Hz, 1H), 4.24 – 4.16 (m, 3H), 4.07 – 4.02 (m, 1H), 3.86 (s, 3H), 3.78 – 3.72 (m, 3H), 3.04 (q, *J* = 6.7 Hz, 1H), 1.30 (t, *J* = 7.2 Hz, 3H), 1.13 (d, *J* = 6.7 Hz, 3H), 0.86 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.16, 169.03, 168.02, 166.56, 148.85, 146.76, 140.85, 139.75, 137.55, 132.84, 129.07, 128.94, 126.55, 124.75, 124.06, 121.25, 60.69, 56.56, 52.62, 52.40, 41.42, 28.30, 24.91, 23.21, 14.37.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{27}H_{31}N_3NaO_8$ 548.2003; found: 548.2002.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 10.4 min (minor), 6.5 min (major), 94% ee.

$[\alpha]_D^{20}$ = -126.0 (c = 1.0, $CHCl_3$).



Ethyl (*E*)-3-(3-isopropyl-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)-5-nitropicolinamido)phenyl)acrylate(3j)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **3j** as yellow oil (39.1mg, 76%, *E: Z* = 7: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

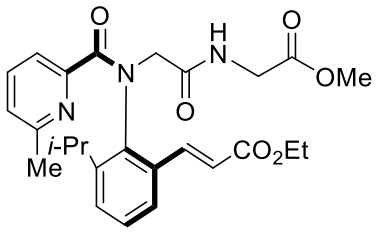
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.91 (d, *J* = 2.5 Hz, 1H), 8.43 (dd, *J* = 8.6, 2.5 Hz, 1H), 7.99 (d, *J* = 8.6 Hz, 1H), 7.87 (d, *J* = 15.8 Hz, 1H), 7.56 (t, *J* = 5.4 Hz, 1H), 7.35 (dd, *J* = 6.0, 3.3 Hz, 1H), 7.29 – 7.26 (m, 2H), 6.26 (d, *J* = 15.9 Hz, 1H), 4.53 (d, *J* = 14.2 Hz, 1H), 4.28 (d, *J* = 14.3 Hz, 1H), 4.21 (dd, *J* = 18.3, 5.9 Hz, 3H), 4.07 (dd, *J* = 18.3, 4.6 Hz, 1H), 3.79 (s, 3H), 3.10 (p, *J* = 6.8 Hz, 1H), 1.32 (t, *J* = 7.1 Hz, 3H), 1.18 (d, *J* = 6.8 Hz, 3H), 0.95 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 167.83, 167.60, 146.91, 144.02, 143.06, 140.49, 139.29, 132.85, 131.75, 129.47, 129.16, 125.09, 124.86, 121.54, 60.82, 56.54, 52.50, 41.48, 28.39, 24.93, 23.35, 14.40.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{25}H_{28}N_4NaO_8$ 535.1799; found: 535.1799.

HPLC: AS-H column (hexane/isopropanol = 60/40, rate = 1.0 mL/min, λ = 254 nm) tr = 25.2 min (minor), 12.1 min (major), 98% ee.

$[\alpha]_D^{20}$ = -136.7 (c = 1.0, $CHCl_3$).



Ethyl (*E*)-3-(3-isopropyl-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)-6-methylpicolinamido)phenyl)acrylate (3k)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **3k** as yellow oil (36.2 mg, 75%, *E: Z* = 5: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

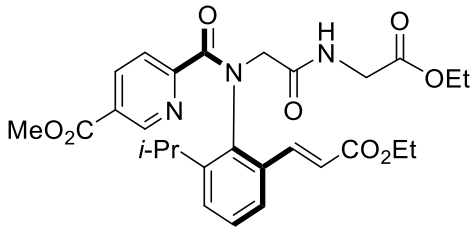
^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.91 (d, *J* = 15.9 Hz, 1H), 7.85 (t, *J* = 5.5 Hz, 1H), 7.58 (d, *J* = 7.7 Hz, 1H), 7.49 (t, *J* = 7.7 Hz, 1H), 7.36 (d, *J* = 7.5 Hz, 1H), 7.22 (t, *J* = 7.6 Hz, 1H), 7.18 (dd, *J* = 7.8, 1.7 Hz, 1H), 6.95 (d, *J* = 7.6 Hz, 1H), 6.27 (d, *J* = 15.9 Hz, 1H), 4.43 (d, *J* = 14.2 Hz, 1H), 4.33 (d, *J* = 14.2 Hz, 1H), 4.21 (d, *J* = 7.6 Hz, 2H), 4.14 (dd, *J* = 16.0, 6.3 Hz, 1H), 4.05 (dd, *J* = 18.3, 4.8 Hz, 1H), 3.76 (s, 3H), 2.96 (hept, *J* = 6.6 Hz, 1H), 2.04 (s, 3H), 1.30 (t, *J* = 7.1 Hz, 3H), 1.10 (d, *J* = 6.8 Hz, 3H), 0.74 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.16, 169.65, 168.57, 166.68, 156.78, 146.25, 141.53, 140.84, 136.50, 133.02, 128.65, 128.49, 124.62, 121.64, 120.81, 60.60, 56.78, 52.36, 41.42, 28.15, 24.91, 23.58, 23.10, 14.39.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{26}H_{31}N_3NaO_6$ 504.2108; found: 504.2105.

HPLC: OD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 15.2 min (minor), 8.0 min (major), 21% ee.

$[\alpha]_D^{20}$ = +33.6 (c = 1.0, $CHCl_3$).



Methyl (*E*)-6-((2-((2-ethoxy-2-oxoethyl)amino)-2-oxoethyl)(2-(3-ethoxy-3-oxoprop-1-en-1-yl)-6-isopropylphenyl)carbamoyl)nicotinate (3o)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **3o** as yellow

oil (52.8 mg, 98%, *E: Z* = 5: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

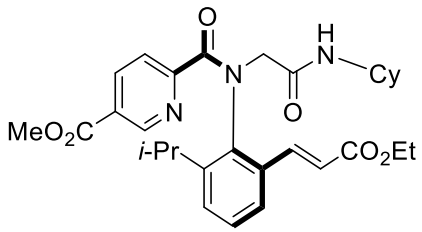
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.70 (d, *J* = 2.1 Hz, 1H), 8.22 (dd, *J* = 8.2, 2.1 Hz, 1H), 7.93 – 7.82 (m, 2H), 7.70 (t, *J* = 5.3 Hz, 1H), 7.33 (dd, *J* = 7.0, 2.2 Hz, 1H), 7.22 (d, *J* = 6.5 Hz, 2H), 6.26 (d, *J* = 15.9 Hz, 1H), 4.46 (d, *J* = 14.3 Hz, 1H), 4.33 (d, *J* = 14.2 Hz, 1H), 4.24 (ddt, *J* = 9.6, 4.1, 2.5 Hz, 4H), 4.16 (d, *J* = 5.9 Hz, 1H), 4.06 (d, *J* = 4.6 Hz, 1H), 3.87 (s, 3H), 3.07 (q, *J* = 6.7 Hz, 1H), 1.30 (d, *J* = 7.5 Hz, 6H), 1.14 (d, *J* = 6.8 Hz, 3H), 0.86 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 169.71, 169.04, 168.02, 165.09, 155.46, 148.88, 146.76, 140.89, 139.78, 137.57, 129.08, 128.95, 126.57, 124.80, 121.30, 61.55, 60.72, 56.63, 52.65, 41.63, 28.32, 24.96, 23.23, 14.42, 14.29.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{28}H_{33}N_3NaO_8$ 562.216; found: 562.216.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 11.0 min (minor), 7.4 min (major), 96% ee.

$[\alpha]_D^{20}$ = -101.4 (c = 1.0, $CHCl_3$).



Methyl (*E*)-6-((2-(cyclohexylamino)-2-oxoethyl)(2-(3-ethoxy-3-oxoprop-1-en-1-yl)-6-isopropylphenyl)carbamoyl)nicotinate (3p)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **3p** as yellow oil (51.6mg, 96%, *E: Z* = 8: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

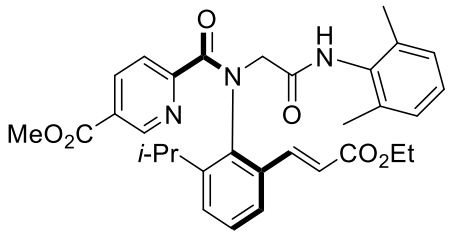
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.71 (d, *J* = 2.1 Hz, 1H), 8.21 (dd, *J* = 8.2, 2.1 Hz, 1H), 7.82 (d, *J* = 15.9 Hz, 1H), 7.76 (d, *J* = 8.1 Hz, 1H), 7.33 (dd, *J* = 6.8, 2.4 Hz, 1H), 7.22 (q, *J* = 6.8, 5.8 Hz, 2H), 7.13 (d, *J* = 8.0 Hz, 1H), 4.47 (d, *J* = 14.2 Hz, 1H), 4.24 (tt, *J* = 7.1, 3.5 Hz, 2H), 4.11 (d, *J* = 14.1 Hz, 1H), 3.87 (s, 3H), 3.82 – 3.70 (m, 1H), 3.06 (p, *J* = 6.7 Hz, 1H), 2.02 – 1.89 (m, 2H), 1.79 – 1.57 (m, 5H), 1.32 (t, *J* = 7.2 Hz, 6H), 1.18 (d, *J* = 6.8 Hz, 3H), 0.86 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 169.11, 166.87, 166.51, 148.94, 146.80, 140.81, 139.91, 137.53, 132.80, 129.02, 128.92, 126.53, 124.89, 123.91, 121.50, 60.73, 57.49, 52.66, 48.53, 32.94, 32.87, 28.40, 25.69, 25.12, 24.82, 24.81, 23.24, 14.44.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{30}H_{37}N_3NaO_6$ 558.2574; found: 558.2575.

HPLC: AD-H column (hexane/isopropanol = 80/20, rate = 1.0 mL/min, λ = 254 nm) tr = 11.6 min (minor), 8.4 min (major), 83% ee.

$[\alpha]_D^{20}$ = -165.0 (c = 1.0, $CHCl_3$).



Methyl (*E*)-6-((2-((2,6-dimethylphenyl)amino)-2-oxoethyl)(2-(3-ethoxy-3-oxoprop-1-en-1-yl)-6-isopropylphenyl)carbamoyl)nicotinate (3q)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **3q** as yellow oil (48.4 mg, 87%, *E: Z* = 10: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

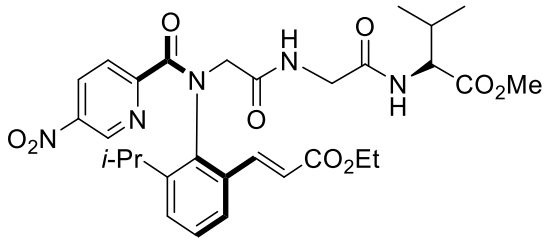
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.72 (d, *J* = 2.1 Hz, 1H), 8.44 (s, 1H), 8.23 (dd, *J* = 8.1, 2.1 Hz, 1H), 7.94 (d, *J* = 15.9 Hz, 1H), 7.80 (d, *J* = 8.1 Hz, 1H), 7.32 (dd, *J* = 5.6, 3.7 Hz, 1H), 7.25 (d, *J* = 5.6 Hz, 2H), 7.07 (s, 3H), 6.22 (d, *J* = 15.9 Hz, 1H), 4.70 (d, *J* = 14.4 Hz, 1H), 4.32 (d, *J* = 14.4 Hz, 1H), 4.18 – 4.10 (m, 2H), 3.88 (s, 3H), 3.26 (p, *J* = 6.8 Hz, 1H), 2.30 (s, 6H), 1.24 (d, *J* = 7.1 Hz, 3H), 1.20 (t, *J* = 6.9 Hz, 3H), 0.94 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 169.52, 166.41, 165.91, 165.06, 148.91, 147.02, 140.92, 140.34, 137.59, 135.08, 133.93, 132.84, 129.08, 129.04, 128.33, 127.23, 126.60, 124.81, 123.91, 121.63, 60.78, 57.54, 52.66, 28.49, 24.98, 23.27, 18.68, 14.28.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{32}H_{35}N_3NaO_6$ 580.2418; found: 580.2418.

HPLC: AD-H column (hexane/isopropanol = 80/20, rate = 0.8 mL/min, λ = 254 nm) tr = 15.1 min (minor), 10.9 min (major), 95% ee.

$[\alpha]_D^{20}$ = -125.8 (c = 1.0, $CHCl_3$).



Methyl (*E*)-*N*-(2-(3-ethoxy-3-oxoprop-1-en-1-yl)-6-isopropylphenyl)-*N*-(5-nitropicolinoyl)glycylglycyl-*D*-valinate (3r)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **3r** as yellow oil (43.5 mg, 71%, *E: Z* = 9: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

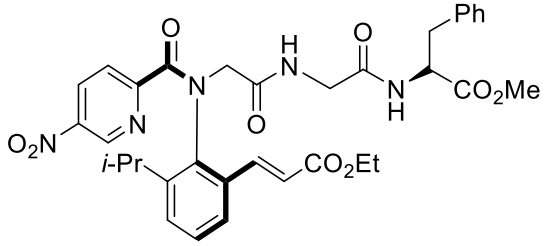
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.87 (d, *J* = 2.5 Hz, 1H), 8.40 (dd, *J* = 8.6, 2.6 Hz, 1H), 7.98 (d, *J* = 8.6 Hz, 1H), 7.92 (d, *J* = 15.9 Hz, 1H), 7.54 (t, *J* = 5.2 Hz, 1H), 7.32 (q, *J* = 4.2, 3.8 Hz, 1H), 7.25 (s, 1H), 6.93 (d, *J* = 8.6 Hz, 1H), 6.23 (d, *J* = 15.9 Hz, 1H), 4.51 (dd, *J* = 8.6, 5.4 Hz, 1H), 4.40 (d, *J* = 14.6 Hz, 1H), 4.28 – 4.16 (m, 4H), 4.10 (d, *J* = 7.1 Hz, 1H), 3.97 (dd, *J* = 16.8, 4.9 Hz, 1H), 3.70 (s, 3H), 3.21 (p, *J* = 6.8 Hz, 1H), 2.18 – 2.12 (m, 1H), 1.30 (t, *J* = 7.1 Hz, 3H), 1.23 (t, *J* = 7.1 Hz, 3H), 1.17 (d, *J* = 6.7 Hz, 3H), 0.94 – 0.91 (m, 6H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 172.47, 168.89, 167.76, 167.64, 166.60, 156.89, 146.95, 143.98, 142.99, 140.70, 139.51, 132.80, 131.73, 129.38, 129.17, 125.13, 124.79, 121.48, 60.90, 57.54, 56.55, 52.26, 43.44, 31.10, 28.23, 24.91, 23.25, 19.05, 18.07, 14.39.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{30}H_{37}N_5NaO_9$ 634.2483; found: 634.2483.

HPLC: IE-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 23.8 min (minor), 36.6 min (major), 91% de.

$[\alpha]_D^{20}$ = -105.2 (c = 1.0, $CHCl_3$).



Ethyl (*R*,*E*)-3-(3-isopropyl-2-(*N*-(2-((2-((1-methoxy-1-oxo-3-phenylpropan-2-yl)amino)-2-oxoethyl)amino)-2-oxoethyl)-5-nitropicolinamido)phenyl)acrylate (3s)

A purification by flash chromatography in petroleum ether: ethyl acetate= 1: 2 to give **3s** as yellow oil (37.1 mg, 56%, *E: Z* = 10: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

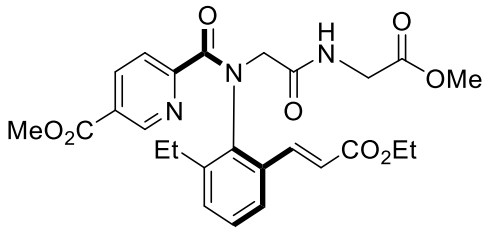
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.88 (d, *J* = 2.5 Hz, 1H), 8.38 (dd, *J* = 8.6, 2.6 Hz, 1H), 7.98 – 7.84 (m, 2H), 7.42 (t, *J* = 5.7 Hz, 1H), 7.37 – 7.31 (m, 1H), 7.27 (s, 1H), 7.22 (dd, *J* = 16.1, 7.1 Hz, 4H), 7.16 – 7.10 (m, 2H), 6.84 (d, *J* = 7.9 Hz, 1H), 6.25 (d, *J* = 15.9 Hz, 1H), 4.86 (q, *J* = 6.6 Hz, 1H), 4.36 (d, *J* = 14.6 Hz, 1H), 4.28 – 4.18 (m, 3H), 4.15 – 4.10 (m, 1H), 3.92 (dd, *J* = 16.8, 4.8 Hz, 1H), 3.68 (s, 3H), 3.21 (p, *J* = 8.1, 7.4 Hz, 1H), 3.12 (t, *J* = 6.3 Hz, 2H), 1.31 (t, *J* = 7.1 Hz, 3H), 1.18 (d, *J* = 6.7 Hz, 3H), 0.93 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 172.00, 168.57, 167.67, 166.56, 142.97, 140.66, 136.04, 132.80, 131.72, 129.38, 129.16, 128.65, 127.17, 125.11, 124.79, 121.49, 60.87, 56.54, 53.56, 52.44, 37.81, 28.22, 24.93, 23.25, 14.39.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{34}H_{37}N_5NaO_9$ 682.2483; found: 648.2485.

HPLC: IE-H column (hexane/isopropanol = 70/30, rate = 1.0 mL/min, λ = 254 nm) tr = 68.7 min (minor), 84.6 min (major), 93% de.

$[\alpha]_D^{20}$ = -86.4(c = 0.5, $CHCl_3$).



Methyl (*E*)-6-((2-(3-ethoxy-3-oxoprop-1-en-1-yl)-6-ethylphenyl)(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)carbamoyl)nicotinate (3t)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **3t** as yellow oil (50.5 mg, 99%, *E: Z* = 5: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

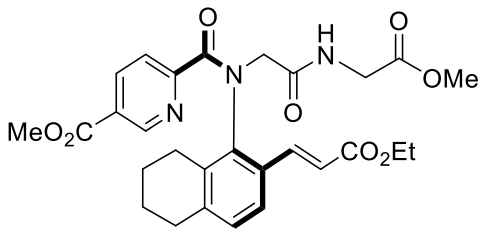
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.71 (d, *J* = 2.0 Hz, 1H), 8.20 (dd, *J* = 8.2, 2.1 Hz, 1H), 7.85 (d, *J* = 15.9 Hz, 1H), 7.75 (d, *J* = 8.2 Hz, 1H), 7.67 (t, *J* = 5.4 Hz, 1H), 7.32 (p, *J* = 4.0 Hz, 1H), 7.20 (d, *J* = 5.3 Hz, 2H), 6.24 (d, *J* = 15.9 Hz, 1H), 4.52 (d, *J* = 14.2 Hz, 1H), 4.27 – 4.17 (m, 4H), 4.09 – 4.02 (m, 1H), 3.87 (s, 3H), 3.77 (s, 3H), 2.63 – 2.55 (m, 2H), 1.31 (t, *J* = 7.1 Hz, 3H), 1.13 (t, *J* = 7.5 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.16, 169.08, 168.05, 166.55, 155.71, 149.00, 142.03, 140.50, 140.45, 137.53, 132.79, 130.54, 128.86, 126.49, 124.71, 123.55, 121.29, 60.73, 55.88, 52.63, 52.43, 41.45, 23.53, 14.39, 13.87.

HRMS (ESI) m/z: $[M + H]^+$ Calcd for $C_{26}H_{30}N_3O_8$ 512.2028; found: 512.2030

HPLC: AS-H column (hexane/isopropanol = 60/40, rate = 1.0 mL/min, λ = 254 nm) tr = 38.4 min (minor), 14.5 min (major), 94% ee.

$[\alpha]_D^{20}$ = -126.0 (c = 1.0, $CHCl_3$).



Methyl *(E)*-6-((2-(3-ethoxy-3-oxoprop-1-en-1-yl)-5,6,7,8-tetrahydronaphthalen-1-yl)(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)carbamoyl)nicotinate (3u)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **3u** as yellow oil (46.1 mg, 86%, *E: Z* = 5: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

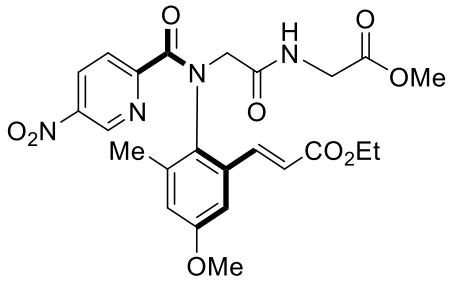
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.73 (d, *J* = 1.2 Hz, 1H), 8.17 (dd, *J* = 8.2, 2.1 Hz, 1H), 7.79 – 7.70 (m, 2H), 7.68 (d, *J* = 8.1 Hz, 1H), 7.19 (d, *J* = 8.0 Hz, 1H), 6.94 (d, *J* = 8.1 Hz, 1H), 6.17 (d, *J* = 15.8 Hz, 1H), 4.60 (d, *J* = 14.1 Hz, 1H), 4.23 – 4.11 (m, 4H), 4.07 – 4.02 (m, 1H), 3.86 (s, 3H), 3.76 (s, 3H), 2.82 – 2.77 (m, 1H), 2.69 (q, *J* = 6.4 Hz, 2H), 2.60 (d, *J* = 7.1 Hz, 1H), 1.83 – 1.65 (m, 4H), 1.30 (t, *J* = 7.1 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.12, 169.11, 168.18, 166.68, 155.94, 149.08, 141.67, 140.01, 137.46, 136.14, 129.93, 129.80, 126.41, 123.65, 123.16, 120.01, 60.59, 55.19, 52.60, 52.37, 41.44, 29.70, 25.67, 22.58, 22.35.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{28}H_{31}N_3NaO_8$ 560.2003; found: 560.2003.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 37.6 min (minor), 15.6 min (major), >99% ee.

$[\alpha]_D^{20}$ = -61.2 (c = 1.0, $CHCl_3$).



Ethyl (*E*)-3-(5-methoxy-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)-5-nitropicolinamido)-3-methylphenyl)acrylate (3v)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **3v** as yellow oil (23.6 mg, 46%, *E: Z* = 11: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

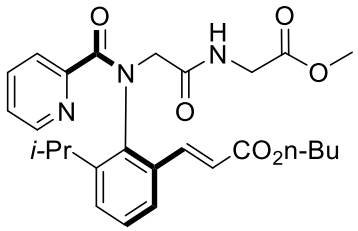
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.98 (d, *J* = 2.5 Hz, 1H), 8.40 (dd, *J* = 8.6, 2.5 Hz, 1H), 7.85 (d, *J* = 8.6 Hz, 1H), 7.78 (d, *J* = 15.8 Hz, 1H), 7.53 (t, *J* = 5.3 Hz, 1H), 6.78 (d, *J* = 2.9 Hz, 1H), 6.68 (d, *J* = 2.8 Hz, 1H), 6.23 (d, *J* = 15.8 Hz, 1H), 4.52 (d, *J* = 14.1 Hz, 1H), 4.26 – 4.20 (m, 3H), 4.17 (d, *J* = 5.8 Hz, 1H), 4.09 – 4.01 (m, 1H), 3.78 (s, 3H), 3.74 (s, 3H), 2.25 (s, 3H), 1.32 (t, *J* = 7.1 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.17, 168.16, 167.79, 166.40, 159.18, 157.76, 143.87, 143.43, 139.86, 138.40, 133.80, 133.70, 131.73, 124.11, 121.62, 118.57, 109.20, 60.87, 55.47, 52.50, 41.45, 18.76, 14.39.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{24}H_{26}N_4NaO_9$ 537.1592; found: 537.1591.

HPLC: OD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 17.9 min (minor), 31.0 min (major), 98% ee.

$[\alpha]_D^{20}$ = -130.2 (c = 1.0, $CHCl_3$).



Butyl (*E*)-3-(3-isopropyl-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)phenyl)acrylate (4b)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **4b** as yellow

oil (36.3 mg, 73%, *E: Z* = 2: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

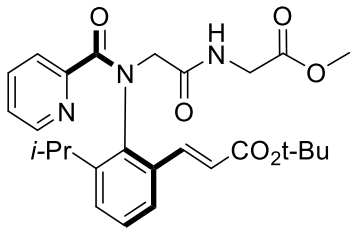
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.13 (d, *J* = 4.6 Hz, 1H), 7.90 (d, *J* = 15.9 Hz, 1H), 7.85 (t, *J* = 5.5 Hz, 1H), 7.73 (d, *J* = 8.0 Hz, 1H), 7.62 (td, *J* = 7.7, 1.7 Hz, 1H), 7.36 (dd, *J* = 7.3, 1.9 Hz, 1H), 7.25 – 7.16 (m, 2H), 7.12 (dd, *J* = 7.6, 4.7 Hz, 1H), 6.29 (d, *J* = 15.9 Hz, 1H), 4.35 (d, *J* = 14.7 Hz, 1H), 4.19 – 4.11 (m, 4H), 4.05 (dd, *J* = 18.3, 4.8 Hz, 1H), 3.77 (s, 3H), 3.01 (q, *J* = 6.8 Hz, 1H), 1.70 – 1.63 (m, 2H), 1.46 – 1.38 (m, 2H), 1.12 (d, *J* = 6.8 Hz, 3H), 0.95 (t, *J* = 7.4 Hz, 3H), 0.78 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.18, 168.46, 166.76, 147.87, 146.60, 141.14, 136.36, 132.82, 128.82, 128.77, 125.02, 124.80, 124.51, 121.13, 64.61, 56.72, 52.43, 41.42, 30.82, 28.28, 24.98, 23.10, 19.28, 13.87.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{27}H_{33}N_3NaO_6$ 518.2261; found: 518.2264.

HPLC: AD-H column (hexane/isopropanol = 80/20, rate = 1.0 mL/min, λ = 254 nm) tr = 42.1 min (minor), 29.0 min (major), 94% ee.

$[\alpha]_D^{20}$ = -110.6 (c = 1.0, $CHCl_3$).



Tert-butyl (*E*)-3-(3-isopropyl-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)phenyl)acrylate (4c)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **4c** as yellow oil (20.8 mg, 42%, *E: Z* = 2: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

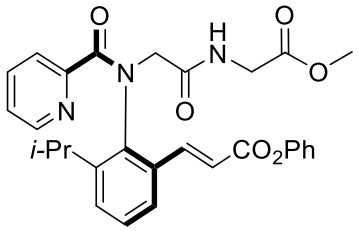
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.14 (d, *J* = 4.3 Hz, 1H), 7.88 – 7.78 (m, 2H), 7.72 (t, *J* = 7.2 Hz, 1H), 7.62 (td, *J* = 7.8, 1.8 Hz, 1H), 7.34 (dd, *J* = 7.3, 1.9 Hz, 1H), 7.21 (t, *J* = 7.6 Hz, 1H), 7.17 (dd, *J* = 7.9, 1.9 Hz, 1H), 7.12 (ddd, *J* = 7.7, 4.7, 1.2 Hz, 1H), 6.22 (d, *J* = 15.8 Hz, 1H), 4.40 – 4.34 (m, 2H), 4.14 (d, *J* = 3.3 Hz, 1H), 4.06 (dd, *J* = 18.3, 4.8 Hz, 1H), 3.78 (s, 3H), 3.04 – 2.99 (m, 1H), 1.51 (s, 9H), 1.12 (d, *J* = 6.8 Hz, 3H), 0.78 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.18, 168.52, 165.94, 147.92, 146.52, 140.12, 139.38, 136.32, 132.99, 128.73, 128.57, 124.99, 124.80, 124.49, 123.08, 80.73, 56.73, 52.42, 41.46, 28.56, 28.28, 25.01, 23.09.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{27}H_{33}N_3NaO_6$ 518.2261; found: 518.2662.

HPLC: AD-H column (hexane/isopropanol = 70/30, rate = 1.0 mL/min, λ = 254 nm) tr = 16.1 min (minor), 8.6 min (major), 96% ee.

$[\alpha]_D^{20}$ = -94.1 (c = 1.0, $CHCl_3$).



Phenyl (*E*)-3-(3-isopropyl-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)phenyl)acrylate (4d)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **4d** as yellow oil (35.9 mg, 70%, *E: Z* = 2: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

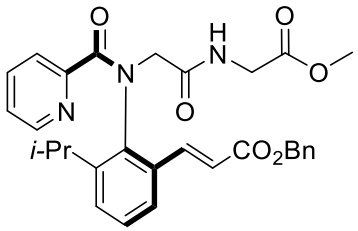
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.13 (d, *J* = 4.7 Hz, 1H), 8.08 (d, *J* = 15.9 Hz, 1H), 7.98 – 7.92 (m, 1H), 7.86 (t, *J* = 5.4 Hz, 1H), 7.80 (d, *J* = 7.9 Hz, 1H), 7.65 (td, *J* = 3.7, 1.4 Hz, 1H), 7.57 – 7.48 (m, 1H), 7.45 – 7.37 (m, 4H), 7.15 (d, *J* = 7.7 Hz, 3H), 6.47 (d, *J* = 15.9 Hz, 1H), 4.57 (d, *J* = 14.1 Hz, 1H), 4.28 (d, *J* = 14.2 Hz, 1H), 4.13 (dd, *J* = 15.2, 6.4 Hz, 1H), 4.00 (dd, *J* = 18.3, 4.7 Hz, 1H), 3.68 (s, 3H), 3.06 – 3.00 (m, 1H), 1.16 (d, *J* = 6.8 Hz, 3H), 0.84 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.08, 169.83, 168.39, 165.09, 151.92, 150.80, 147.81, 146.66, 143.11, 140.60, 136.45, 132.54, 129.53, 129.34, 128.85, 125.93, 125.09, 124.85, 124.64, 121.73, 119.98, 56.80, 52.37, 41.45, 28.34, 24.89, 23.14.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{29}H_{29}N_3NaO_6$ 538.1948; found: 538.1950.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 19.7 min (minor), 9.2 min (major), 95% ee.

$[\alpha]_D^{20}$ = -164.7 (c = 1.0, $CHCl_3$).



Benzyl (*E*)-3-(3-isopropyl-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)phenyl)acrylate (4e)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **4e** as yellow oil (40.2 mg, 76%, *E: Z* = 2: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

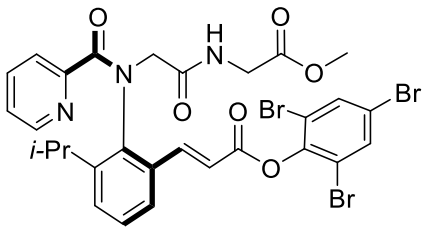
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.11 (d, *J* = 4.6 Hz, 1H), 7.97 (d, *J* = 11.4 Hz, 1H), 7.85 – 7.81 (m, 1H), 7.72 (d, *J* = 7.8 Hz, 1H), 7.63 – 7.50 (m, 2H), 7.41 – 7.38 (m, 3H), 7.34 (d, *J* = 6.3 Hz, 3H), 7.22 (d, *J* = 4.6 Hz, 1H), 7.11 (dd, *J* = 7.4, 4.8 Hz, 1H), 6.32 (d, *J* = 15.9 Hz, 1H), 5.22 (s, 2H), 4.46 (d, *J* = 14.2 Hz, 1H), 4.32 (d, *J* = 14.2 Hz, 1H), 4.13 (dd, *J* = 12.4, 5.7 Hz, 1H), 3.99 (dd, *J* = 18.3, 4.7 Hz, 1H), 3.77 (s, 3H), 3.06 – 3.00 (m, 1H), 1.13 (d, *J* = 6.8 Hz, 3H), 0.81 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.16, 169.86, 168.41, 166.43, 151.95, 147.82, 146.60, 141.78, 140.37, 138.59, 136.38, 136.08, 132.69, 128.99, 128.74, 128.39, 128.23, 125.02, 124.74, 124.53, 120.61, 66.47, 56.73, 52.42, 41.37, 28.30, 24.91, 23.14.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{30}H_{31}N_3NaO_6$ 552.2105; found: 552.2107.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 22.0 min (minor), 11.2 min (major), 95% ee.

$[\alpha]_D^{20}$ = -87.5 (c = 1.0, $CHCl_3$).



2,4,6-tribromophenyl (*E*)-3-(3-isopropyl-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)phenyl)acrylate (4f)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **4f** as yellow oil (39.1 mg, 52%, *E: Z* = 2: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

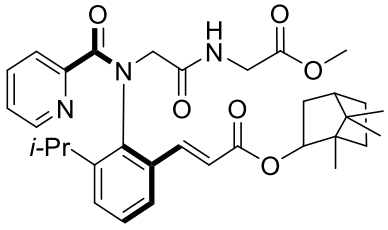
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.16 (d, *J* = 15.9 Hz, 1H), 8.11 (d, *J* = 3.2 Hz, 1H), 7.86 (t, *J* = 5.4 Hz, 1H), 7.82 (d, *J* = 7.8 Hz, 1H), 7.73 (s, 2H), 7.64 (td, *J* = 7.8, 1.8 Hz, 1H), 7.57 – 7.51 (m, 1H), 7.45 (t, *J* = 4.6 Hz, 1H), 7.29 (s, 1H), 7.13 (ddd, *J* = 7.7, 4.8, 1.2 Hz, 1H), 6.46 (d, *J* = 15.9 Hz, 1H), 4.54 (d, *J* = 14.1 Hz, 1H), 4.33 (d, *J* = 14.1 Hz, 1H), 4.20 (dd, *J* = 18.3, 6.1 Hz, 1H), 3.99 (dd, *J* = 18.3, 4.6 Hz, 1H), 3.70 (s, 3H), 3.09 – 3.01 (m, 1H), 1.17 (d, *J* = 6.7 Hz, 3H), 0.87 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.69, 170.09, 168.37, 162.53, 151.86, 147.74, 146.84, 145.08, 140.72, 136.47, 134.92, 132.21, 129.82, 128.88, 125.13, 125.00, 124.78, 119.94, 118.76, 118.17, 56.82, 52.41, 41.44, 28.39, 24.83, 23.21.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{29}H_{26}Br_3N_3NaO_6$ 771.9264; found: 771.9263.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 19.3 min (minor), 26.1 min (major), 97% ee.

$[\alpha]_D^{20}$ = -71.6 (c = 1.0, $CHCl_3$).



1,7,7-trimethylbicyclo[2.2.1]heptan-2-yl (*E*)-3-(3-isopropyl-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)phenyl)acrylate (4g)

A purification by flash chromatography in petroleum ether: ethyl acetate= 2: 1 to give **4g** as yellow

oil (45.5 mg, 79%, *E: Z* = 2: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

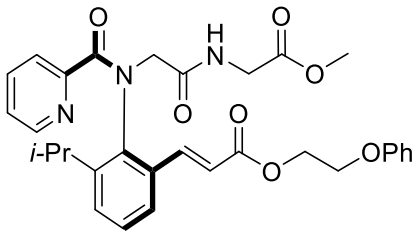
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.13 (d, *J* = 4.7 Hz, 1H), 7.97 (dd, *J* = 6.9, 1.7 Hz, 1H), 7.87 (dd, *J* = 15.9, 2.6 Hz, 1H), 7.72 (d, *J* = 7.2 Hz, 1H), 7.62 (tt, *J* = 7.7, 1.8 Hz, 1H), 7.39 – 7.35 (m, 1H), 7.22 (t, *J* = 7.6 Hz, 1H), 7.18 (dd, *J* = 8.0, 1.8 Hz, 1H), 7.12 (ddd, *J* = 7.7, 4.8, 1.2 Hz, 1H), 6.26 (dd, *J* = 15.9, 5.3 Hz, 1H), 4.76 (dt, *J* = 7.2, 3.4 Hz, 1H), 4.54 (dd, *J* = 14.2, 5.9 Hz, 1H), 4.22 (d, *J* = 3.4 Hz, 1H), 4.16 (d, *J* = 5.8 Hz, 1H), 4.05 (ddd, *J* = 18.0, 4.8, 2.0 Hz, 1H), 3.78 (s, 3H), 3.08 – 3.01 (m, 1H), 1.89 – 1.69 (m, 6H), 1.60 – 1.53 (m, 1H), 1.10 (d, *J* = 6.8 Hz, 3H), 1.01 (d, *J* = 8.8 Hz, 3H), 0.88 (s, 3H), 0.84 (s, 3H), 0.78 (s, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.17, 168.52, 166.14, 147.89, 140.82, 136.35, 132.77, 128.74, 126.32, 125.02, 124.78, 121.69, 121.64, 56.72, 52.45, 48.94, 47.12, 45.11, 41.41, 38.96, 33.80, 28.28, 27.17, 25.03, 23.12, 20.21, 20.10, 11.67.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{33}H_{41}N_3NaO_6$ 598.2887; found: 598.2887.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 13.7 min (minor), 6.3 min (major), 95% ee.

$[\alpha]_D^{20}$ = -118.8 (c = 1.0, $CHCl_3$).



2-phenoxyethyl (*E*)-3-(3-isopropyl-2-(*N*-(2-((2-methoxy-2-oxoethyl)amino)-2-oxoethyl)picolinamido)phenyl)acrylate (4h)

A purification by flash chromatography in petroleum ether : ethyl acetate= 1: 2 to give **4h** as yellow oil (44.3 mg, 79%, *E: Z* = 2: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.11 (d, *J* = 4.6 Hz, 1H), 7.99 – 7.87 (m, 2H), 7.73 (d, *J* = 7.8 Hz, 1H), 7.62 – 7.48 (m, 2H), 7.36 (dd, *J* = 7.0, 2.1 Hz, 1H), 7.25 – 7.17 (m, 2H), 7.11 (ddd, *J* = 7.6, 4.7, 1.2 Hz, 1H), 6.98 (d, *J* = 7.4 Hz, 1H), 6.94 (d, *J* = 7.8 Hz, 2H), 6.89 (d, *J* = 8.1 Hz, 1H), 6.34 (d, *J* = 15.9 Hz, 1H), 4.58 – 4.50 (m, 2H), 4.44 (d, *J* = 14.2 Hz, 1H), 4.32 (d, *J* = 14.2 Hz,

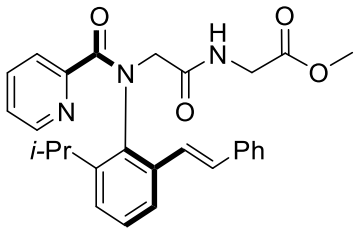
1H), 4.23 (t, *J* = 4.8 Hz, 2H), 4.14 (d, *J* = 5.0 Hz, 1H), 4.06 (dd, *J* = 18.3, 4.7 Hz, 1H), 3.77 (s, 3H), 3.02 (p, *J* = 6.8 Hz, 1H), 1.13 (d, *J* = 6.8 Hz, 3H), 0.80 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.19, 168.42, 166.54, 158.55, 147.83, 146.61, 141.96, 140.40, 136.39, 132.66, 129.67, 129.02, 128.79, 125.02, 124.79, 124.54, 121.29, 120.38, 114.70, 65.96, 63.04, 56.74, 52.43, 41.42, 28.29, 24.94, 23.11.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{31}H_{33}N_3NaO_7$ 582.2211; found: 582.2212.

HPLC: IA column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 21.2 min (minor), 15.8 min (major), 95% ee.

$[\alpha]_D^{20}$ = -92.8 (c = 1.0, $CHCl_3$).



Methyl (*E*)-*N*-(2-isopropyl-6-styrylphenyl)-*N*-picolinoylglycylglycinate (4i)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **4i** as yellow oil (26.0 mg, 55%, *E: Z* = 3: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

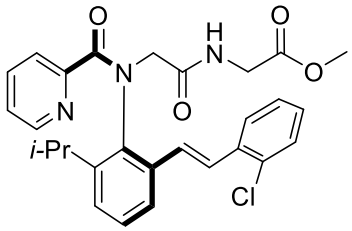
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.24 (d, *J* = 4.7 Hz, 1H), 7.74 (t, *J* = 5.5 Hz, 1H), 7.60 – 7.55 (m, 2H), 7.49 (d, *J* = 7.2 Hz, 2H), 7.44 – 7.39 (m, 2H), 7.35 (s, 2H), 7.29 (s, 1H), 7.21 (d, *J* = 7.9 Hz, 1H), 7.12 (ddd, *J* = 6.9, 4.8, 1.5 Hz, 1H), 7.08 (d, *J* = 8.0 Hz, 1H), 6.94 (d, *J* = 16.2 Hz, 1H), 4.52 (d, *J* = 14.4 Hz, 1H), 4.31 (d, *J* = 14.4 Hz, 1H), 4.11 – 4.05 (m, 1H), 3.98 – 3.92 (m, 1H), 3.74 (s, 3H), 3.08 – 3.03 (m, 1H), 1.12 (d, *J* = 6.7 Hz, 3H), 0.81 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.35, 170.12, 168.65, 152.35, 148.21, 146.33, 138.98, 137.28, 136.15, 132.02, 128.85, 128.77, 126.85, 126.28, 125.27, 124.90, 124.03, 56.41, 52.46, 41.39, 28.32, 25.24, 23.10.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{28}H_{29}N_3NaO_4$ 494.2050; found: 494.2051.

HPLC: AD-H column (hexane/isopropanol = 80/20, rate = 1.0 mL/min, λ = 254 nm) tr = 26.0 min (minor), 19.2 min (major), 98% ee.

$[\alpha]_D^{20}$ = -196.1 (c = 1.0, $CHCl_3$).



Methyl (*E*)-*N*-(2-(2-chlorostyryl)-6-isopropylphenyl)-*N*-picolinoylglycylglycinate (4j)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **4j** as yellow oil (40.6 mg, 80%, *E: Z* = 4: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

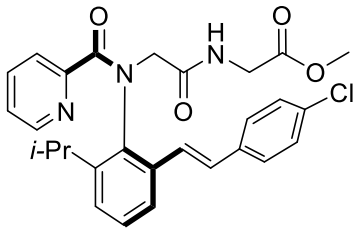
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.23 (d, *J* = 4.5 Hz, 1H), 7.68 (d, *J* = 1.8 Hz, 2H), 7.64 – 7.50 (m, 3H), 7.45 – 7.41 (m, 1H), 7.39 – 7.33 (m, 3H), 7.25 – 7.19 (m, 2H), 7.15 – 7.09 (m, 2H), 4.51 (d, *J* = 14.3 Hz, 1H), 4.33 (d, *J* = 14.3 Hz, 1H), 4.12 (dd, *J* = 18.3, 5.7 Hz, 1H), 3.99 (dd, *J* = 18.3, 5.0 Hz, 1H), 3.73 (s, 3H), 3.11 – 3.04 (m, 1H), 1.13 (d, *J* = 6.7 Hz, 3H), 0.83 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.36, 170.10, 168.57, 148.16, 146.35, 139.17, 136.21, 135.48, 135.40, 133.59, 129.91, 128.99, 128.85, 128.00, 127.93, 127.16, 126.99, 126.68, 124.91, 124.44, 124.02, 56.40, 52.47, 41.38, 28.33, 25.21, 23.12.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{28}H_{28}ClN_3NaO_4$ 528.1660; found: 528.1661.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 11.3 min (minor), 4.9 min (major), 92% ee.

$[\alpha]_D^{20}$ = -158.8 (c = 1.0, $CHCl_3$).



Methyl (*E*)-*N*-(2-(4-chlorostyryl)-6-isopropylphenyl)-*N*-picolinoylglycylglycinate (4k)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **4k** as yellow oil (46.1 mg, 91%, *E: Z* = 2: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

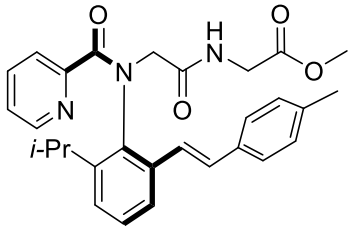
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.22 (d, *J* = 4.8 Hz, 1H), 7.62 – 7.54 (m, 2H), 7.41 (t, *J* = 8.6 Hz, 3H), 7.38 – 7.33 (m, 2H), 7.30 (d, *J* = 8.5 Hz, 2H), 7.23 (d, *J* = 7.7 Hz, 1H), 7.12 (ddd, *J* = 7.5, 4.7, 1.4 Hz, 1H), 7.09 (dd, *J* = 7.8, 1.5 Hz, 1H), 6.87 (d, *J* = 16.2 Hz, 1H), 4.43 (d, *J* = 14.4 Hz, 1H), 4.35 (d, *J* = 14.3 Hz, 1H), 4.09 (dd, *J* = 18.3, 5.6 Hz, 1H), 3.95 (dd, *J* = 18.5, 4.9 Hz, 1H), 3.75 (s, 3H), 3.04 (p, *J* = 6.7 Hz, 1H), 1.12 (d, *J* = 6.8 Hz, 3H), 0.81 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.26, 170.14, 168.54, 148.14, 146.30, 139.14, 136.18, 135.88, 135.42, 133.63, 130.51, 129.00, 128.77, 128.06, 126.47, 126.12, 124.94, 124.11, 123.98, 56.38, 52.49, 41.41, 28.33, 25.21, 23.10.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{28}H_{28}ClN_3NaO_4$ 528.1660; found: 528.1661.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 12.1 min (minor), 5.4 min (major), 92% ee.

$[\alpha]_D^{20}$ = -223.6 (c = 1.0, $CHCl_3$).



Methyl (*E*)-*N*-(2-isopropyl-6-(4-methylstyryl)phenyl)-*N*-picolinoylglycylglycinate (4l)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **4l** as yellow oil (32.3 mg, 67%, *E: Z* = 3: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

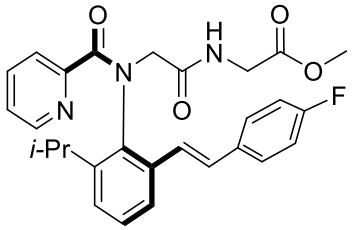
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.25 (d, *J* = 4.6 Hz, 1H), 7.76 (t, *J* = 5.4 Hz, 1H), 7.56 (dt, *J* = 9.8, 2.3 Hz, 2H), 7.39 (dd, *J* = 7.2, 5.4 Hz, 3H), 7.31 (s, 1H), 7.21 (t, *J* = 7.7 Hz, 1H), 7.15 (d, *J* = 7.9 Hz, 2H), 7.11 (d, *J* = 6.5 Hz, 1H), 7.08 – 7.03 (m, 1H), 6.92 (d, *J* = 16.2 Hz, 1H), 4.55 (d, *J* = 14.3 Hz, 1H), 4.28 (d, *J* = 14.4 Hz, 1H), 4.09 (dd, *J* = 18.3, 5.7 Hz, 1H), 3.96 (dd, *J* = 18.3, 5.2 Hz, 1H), 3.75 (s, 3H), 3.06 (d, *J* = 13.5 Hz, 1H), 2.36 (s, 3H), 1.11 (d, *J* = 6.8 Hz, 3H), 0.80 (d, *J* = 6.7 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.40, 170.12, 168.68, 148.25, 146.32, 138.83, 138.12, 136.12, 134.50, 132.02, 129.57, 128.76, 126.77, 126.08, 124.88, 124.14, 124.00, 123.95, 56.40, 52.45, 41.40, 28.32, 25.26, 23.10, 21.42.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{29}H_{31}N_3NaO_4$ 508.2207; found: 508.2205.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 8.5 min (minor), 5.0 min (major), 99% ee.

$[\alpha]_D^{20}$ = -247.2 (c = 1.0, $CHCl_3$).



Methyl (*E*)-*N*-(2-(4-fluorostyryl)-6-isopropylphenyl)-*N*-picolinoylglycylglycinate (4m)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **4m** as yellow oil (27.0 mg, 55%, *E: Z* = 3: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.23 (d, *J* = 4.8 Hz, 1H), 7.68 (t, *J* = 5.4 Hz, 1H), 7.61 – 7.55 (m, 2H), 7.46 (dd, *J* = 8.6, 5.5 Hz, 2H), 7.39 – 7.32 (m, 2H), 7.22 (t, *J* = 7.7 Hz, 1H), 7.14 – 7.01 (m, 4H), 6.89 (d, *J* = 16.2 Hz, 1H), 4.46 (d, *J* = 14.4 Hz, 1H), 4.33 (d, *J* = 14.4 Hz, 1H), 4.08 (dd, *J* = 12.6, 5.8 Hz, 1H), 3.96 (dd, *J* = 18.2, 5.1 Hz, 1H), 3.75 (s, 3H), 3.07 – 3.01 (m, 1H), 1.12 (d, *J* = 6.7 Hz, 3H), 0.80 (d, *J* = 6.7 Hz, 3H).

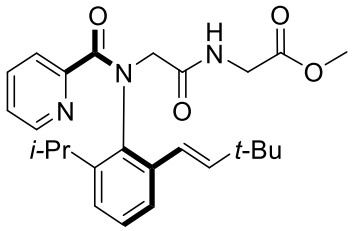
^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.28, 170.12, 168.57, 152.33, 148.17, 146.27, 139.03, 136.14, 133.53, 130.66, 128.76, 128.46, 128.38, 126.27, 125.22, 124.91, 124.06, 123.92, 115.89, 115.68, 56.36, 52.46, 41.38, 28.31, 25.23, 23.08.

^{19}F NMR (376 MHz, Chloroform-*d*) δ -113.62.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{28}H_{28}FN_3NaO_4$ 512.1956; found: 512.1958.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 5.5 min (minor), 11.3 min (major), 97% ee.

$[\alpha]_D^{20}$ = -196.1 (c = 1.0, $CHCl_3$).



Methyl (*E*)-*N*-(2-(3,3-dimethylbut-1-en-1-yl)-6-isopropylphenyl)-*N*-picolinoylglycylglycinate (4n)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **4n** as yellow oil (20.8 mg, 43%, *E: Z* = 5: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

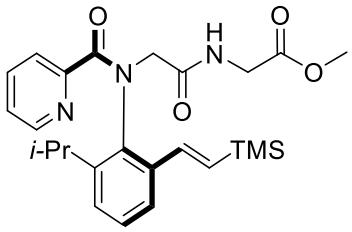
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.27 (d, *J* = 4.8 Hz, 1H), 7.96 – 7.89 (m, 1H), 7.57 – 7.49 (m, 2H), 7.23 – 7.10 (m, 3H), 7.04 – 6.98 (m, 1H), 6.43 (d, *J* = 16.0 Hz, 1H), 6.07 (d, *J* = 16.0 Hz, 1H), 4.69 (d, *J* = 14.3 Hz, 1H), 4.15 (dd, *J* = 18.2, 5.8 Hz, 1H), 4.11 – 4.01 (m, 2H), 3.77 (s, 3H), 3.09 (d, *J* = 7.3 Hz, 1H), 1.09 (s, 9H), 1.04 (s, 3H), 0.79 (d, *J* = 6.8 Hz, 3H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.12, 168.99, 148.31, 146.27, 145.77, 138.38, 136.18, 135.97, 128.68, 125.52, 124.80, 124.30, 123.86, 121.28, 56.35, 52.46, 45.77, 41.46, 33.79, 29.57, 28.32, 25.32, 23.11, 8.74.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{26}H_{33}N_3NaO_4$ 474.2361; found: 474.2363.

HPLC: AD-H column (hexane/isopropanol = 70/30, rate = 1.0 mL/min, λ = 254 nm) tr = 7.0 min (minor), 4.3 min (major), 98% ee.

$[\alpha]_D^{20}$ = -92.4 (c = 1.0, $CHCl_3$).



Methyl (*E*)-*N*-(2-isopropyl-6-(2-(trimethylsilyl)vinyl)phenyl)-*N*-picolinoylglycylglycinate (4o)

A purification by flash chromatography in petroleum ether : ethyl acetate= 2: 1 to give **4o** as yellow oil (17.7 mg, 38%, *E: Z* = 3: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.24 (d, *J* = 4.6 Hz, 1H), 7.86 (t, *J* = 5.1 Hz, 1H), 7.57 – 7.51 (m, 2H), 7.31 – 7.29 (m, 1H), 7.18 (t, *J* = 7.7 Hz, 1H), 7.12 (ddd, *J* = 6.7, 4.9, 2.1 Hz, 1H), 7.08 – 7.05 (m, 1H), 7.02 (d, *J* = 19.0 Hz, 1H), 6.34 (d, *J* = 19.0 Hz, 1H), 4.71 (d, *J* = 14.3 Hz, 1H), 4.16 (dd, *J* = 18.2, 5.8 Hz, 1H), 4.09 – 4.02 (m, 2H), 3.77 (s, 3H), 3.09 (s, 1H), 1.09 (d, *J* = 6.8 Hz, 3H), 0.81 (d, *J* = 6.7 Hz, 3H), 0.13 (s, 9H).

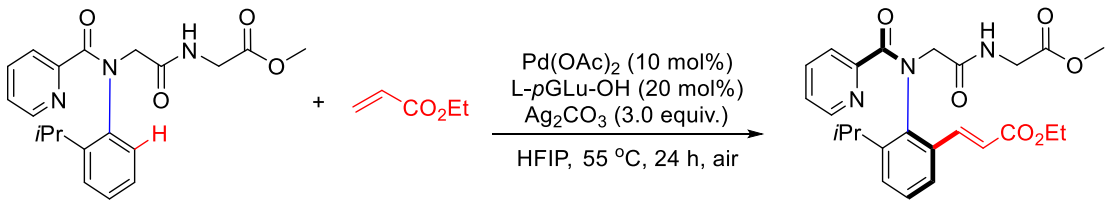
^{13}C NMR (101 MHz, Chloroform-*d*) δ 170.36, 170.12, 168.82, 148.22, 146.32, 139.92, 138.52, 136.58, 136.03, 134.44, 128.68, 126.53, 124.83, 124.22, 124.01, 56.56, 52.47, 45.79, 41.47, 28.29, 25.26, 23.14, 8.82, -1.19.

HRMS (ESI) m/z: $[M + Na]^+$ Calcd for $C_{25}H_{33}N_3NaO_4Si$ 490.2134; found: 490.2133.

HPLC: AD-H column (hexane/isopropanol = 50/50, rate = 1.0 mL/min, λ = 254 nm) tr = 7.0 min (minor), 4.0 min (major), 96% ee.

$[\alpha]_D^{20}$ = -136.2 (c = 0.5, $CHCl_3$).

2.4 Gram-Scale Synthesis



1a (5.0 mmol, 1.8 g) **2a** **3a,** 1.0 g
44%, 95% ee, *E* : *Z* = 2 : 1

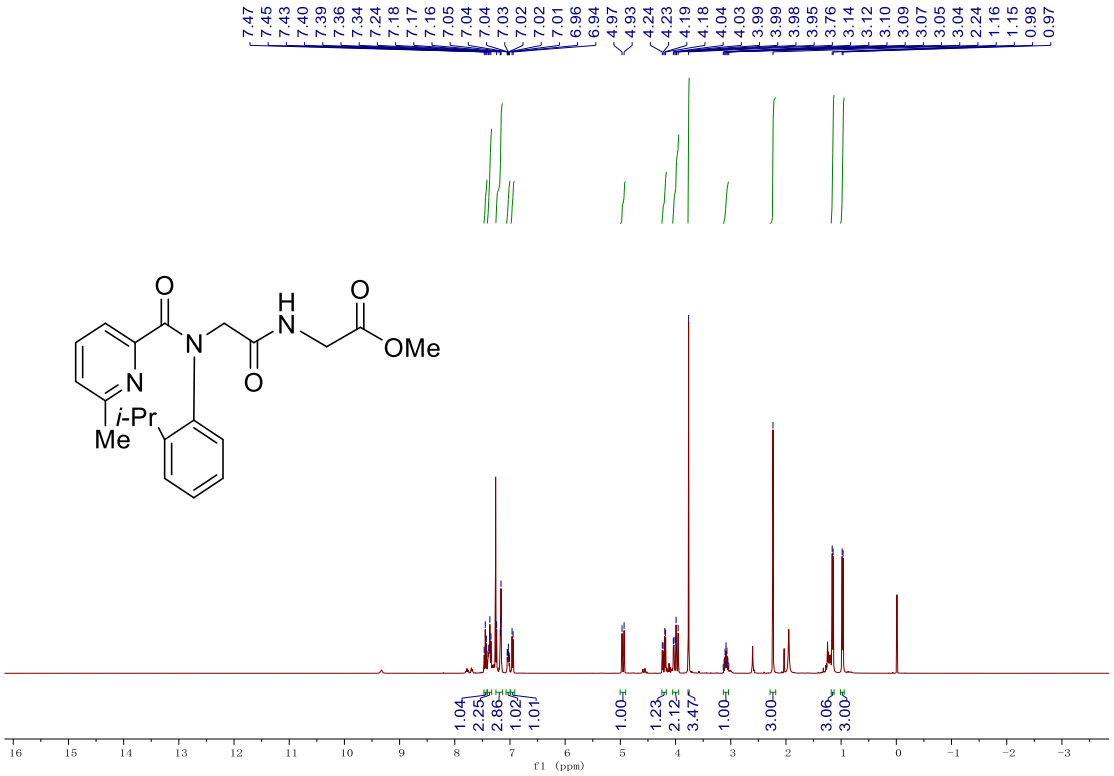
To a 50 mL Schlenk tube was added **1a** (5.0 mmol), **2a** (7.5 mmol), $Pd(OAc)_2$ (112.2 mg, 10 mol%), L-*p*Glu-OH (129.1 mg, 20 mol%) and Ag_2CO_3 (4.1 g, 3.0 equiv.), HFIP (20.0 mL) stirred at 55 ℃ (aluminum heat transfer block) under air for 24 h. After cooling to room temperature, the mixture was diluted with ethyl acetate, the crude mixture was purified by flash column chromatography on silica gel (hexanes/ethyl acetate = 2:1 to 1:1) affording the desired product **3a** as yellow oil (**3a**, 1.0 g, 44% yield, 95% ee, *E: Z* = 2: 1). (Note! The structure and NMR data of major *E*-rotamer were shown.)

3. References

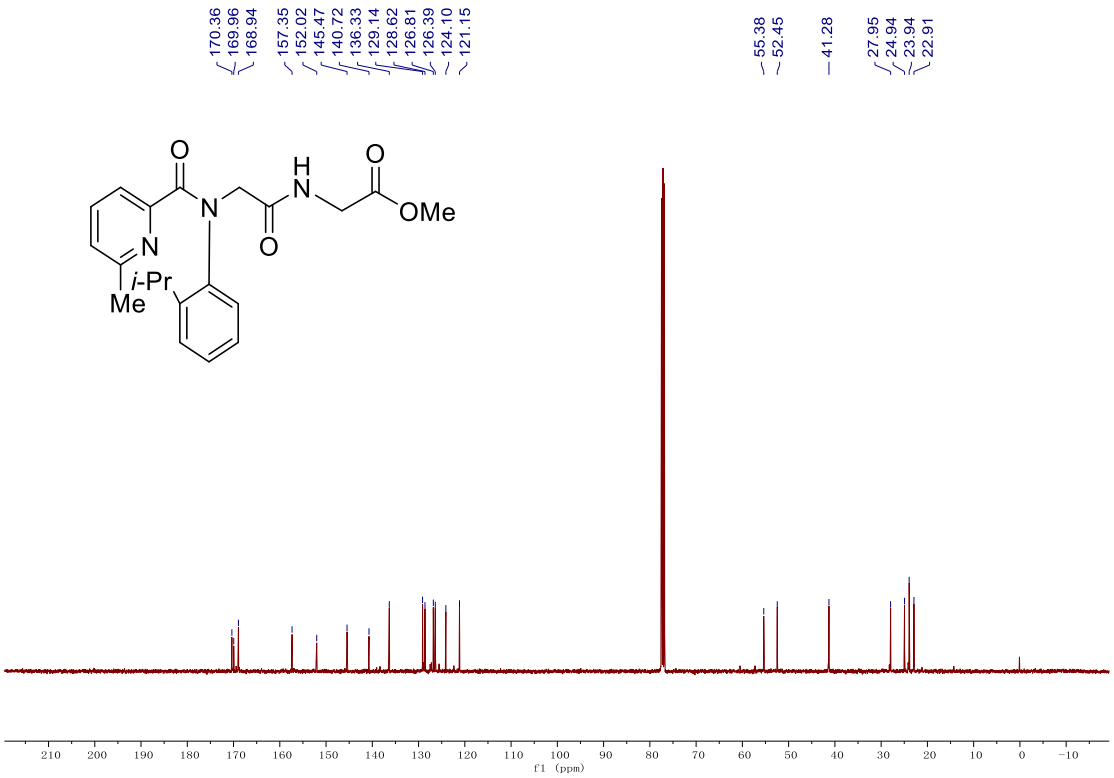
[1] Y.J. Wu, P.P. Xie, G. Zhou, Q.J. Yao, X. Hong, B.F. Shi, Chem. Sci. 12 (2021) 9391-9397.

4. NMR Spectra

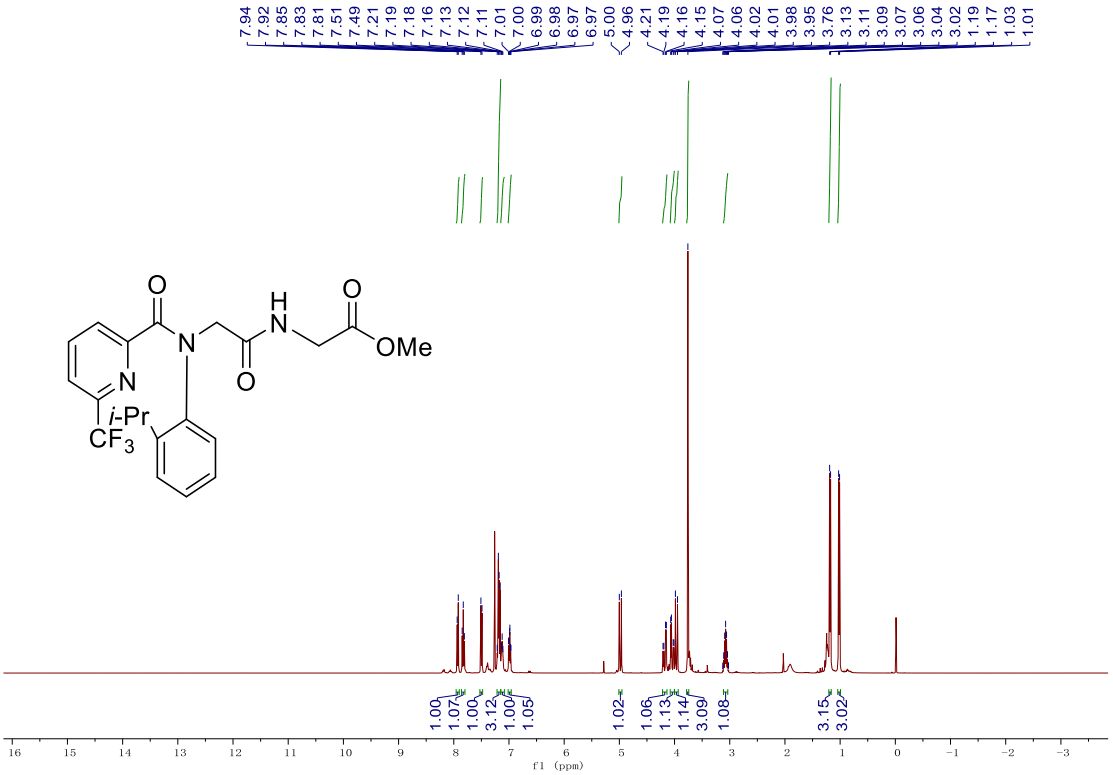
1k-^{1}H NMR



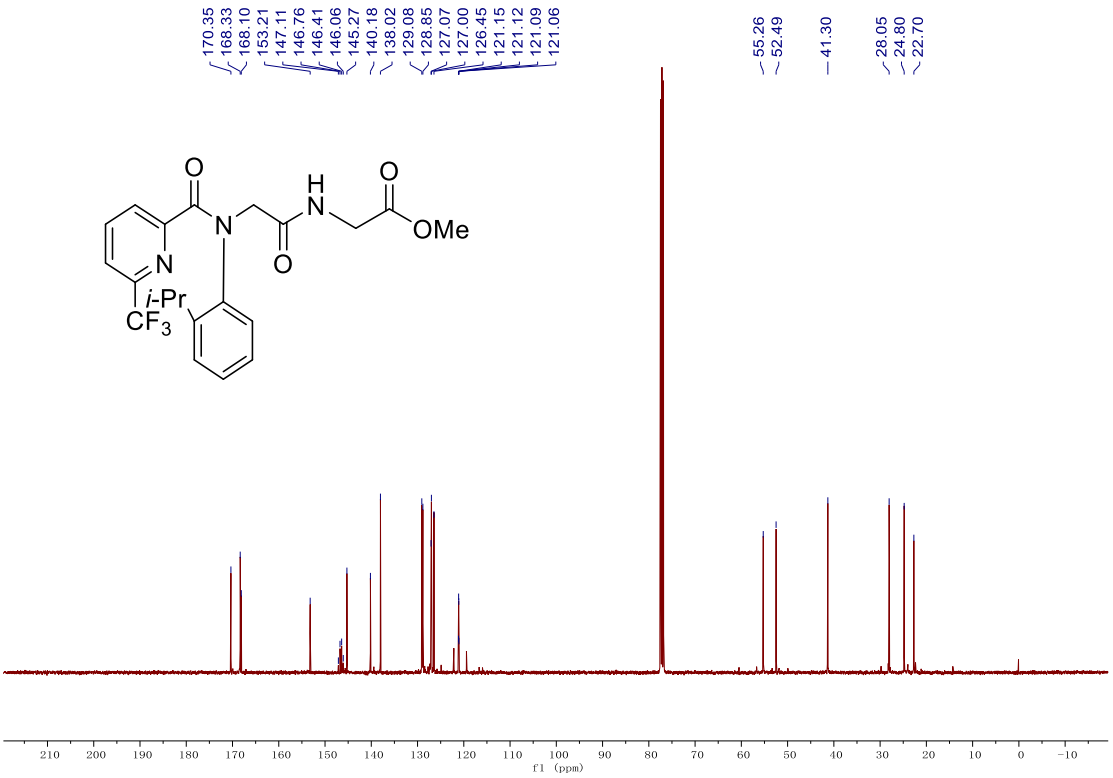
1k-^{13}C NMR



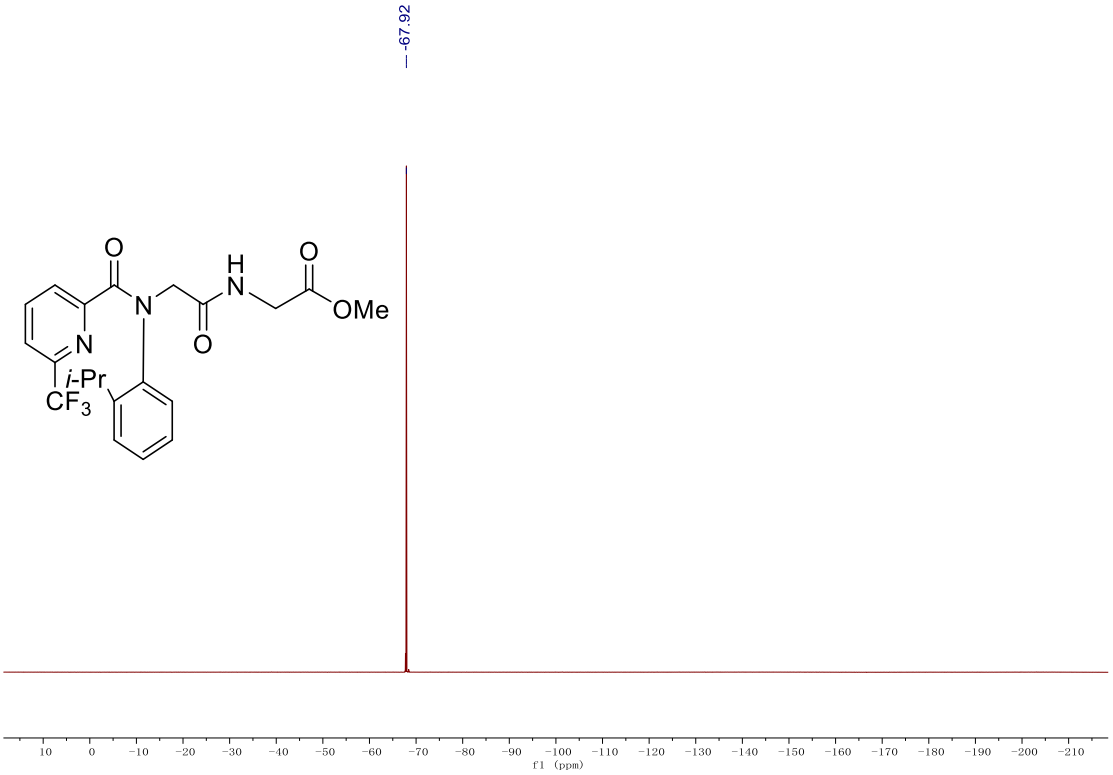
1l-^{1}H NMR



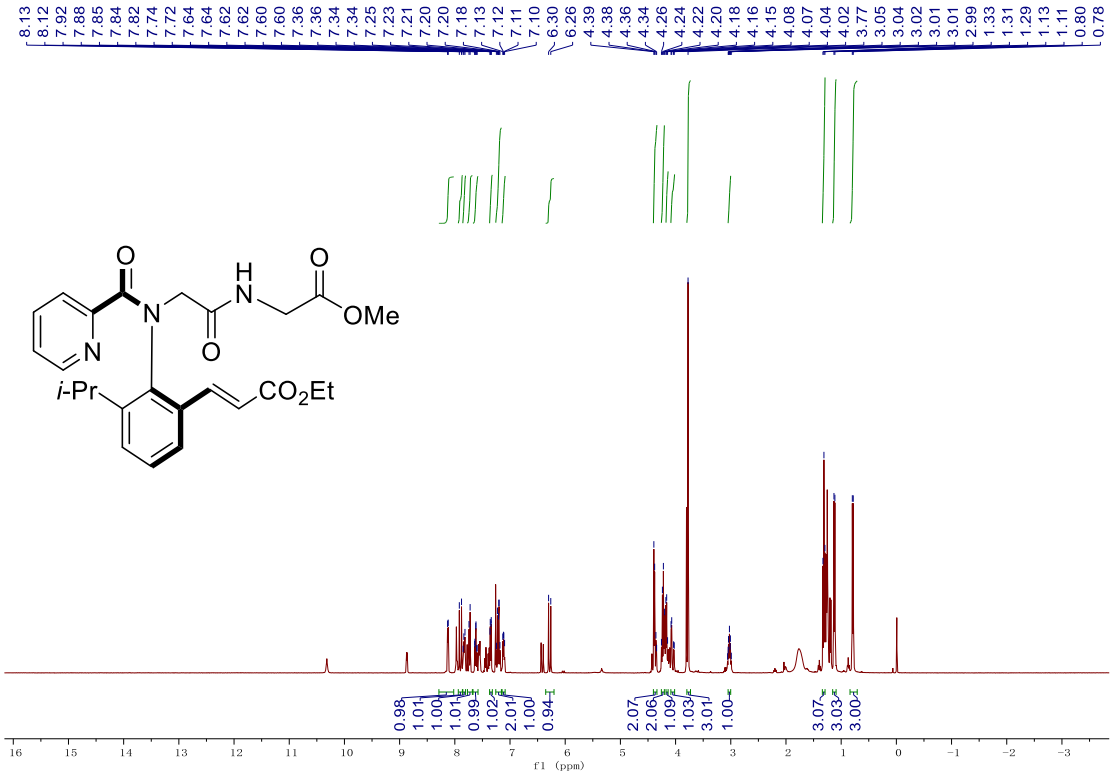
1l-^{13}C NMR



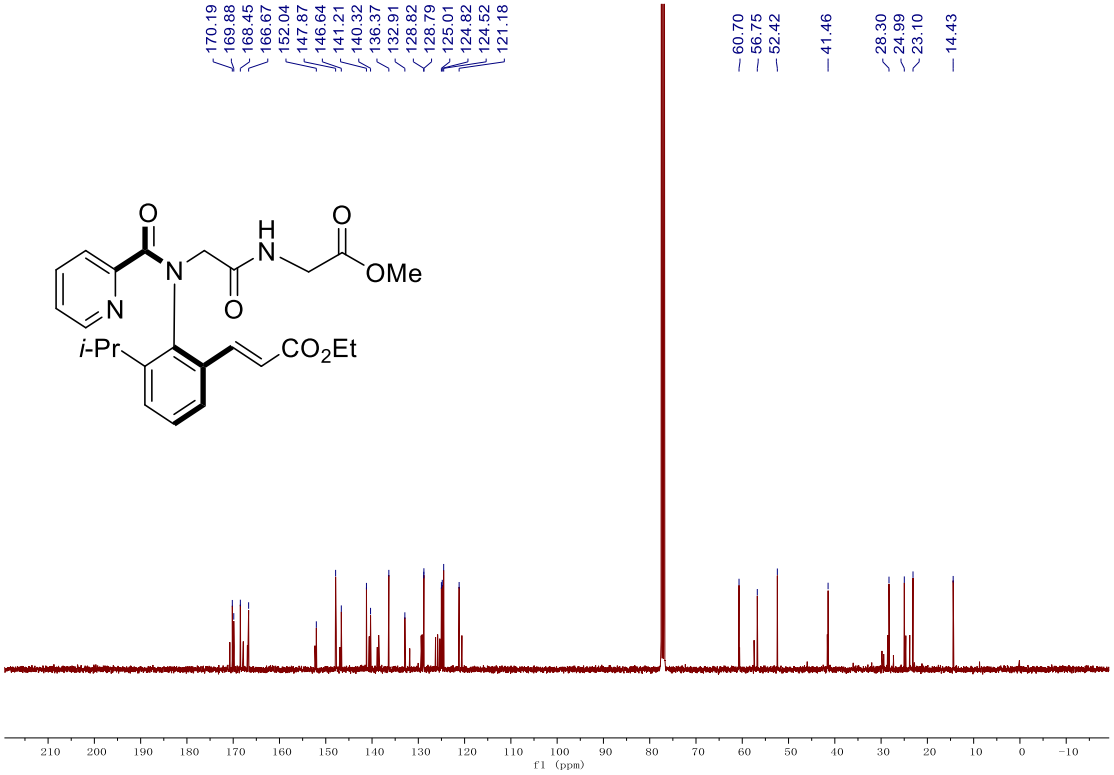
1l-^{19}F


-67.92
O
H
N
O
N
O
OMe
N
i-Pr
CF3
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

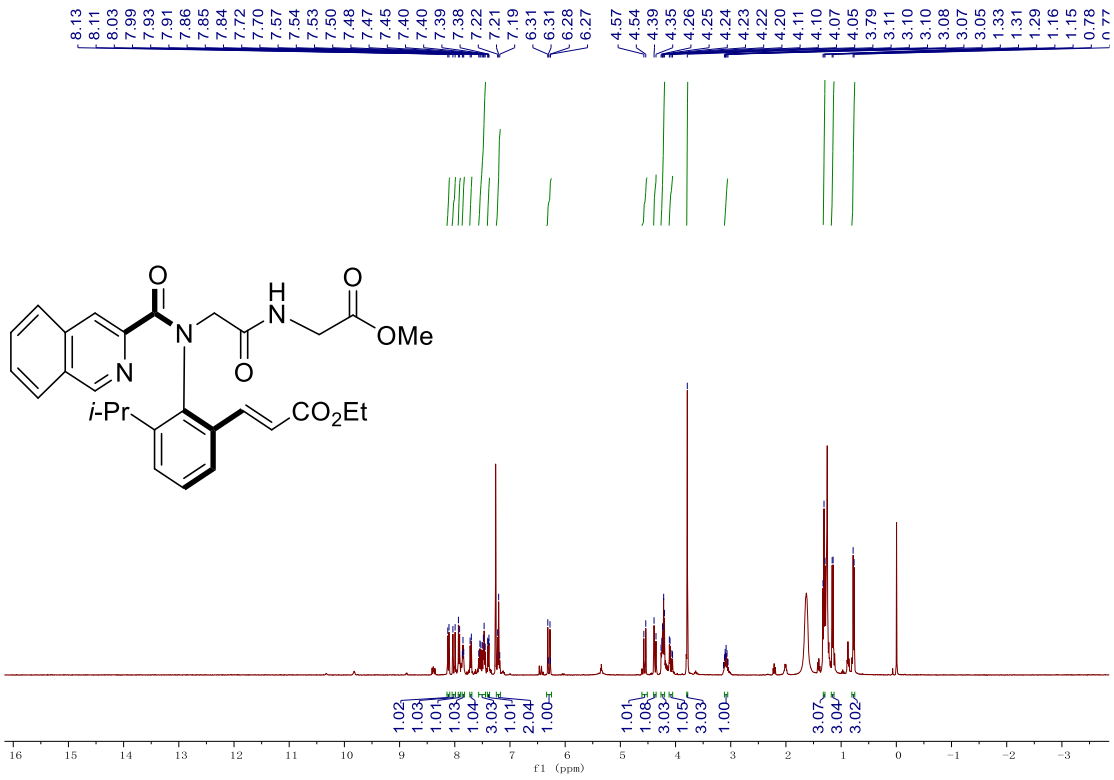
3a-^{1}H NMR



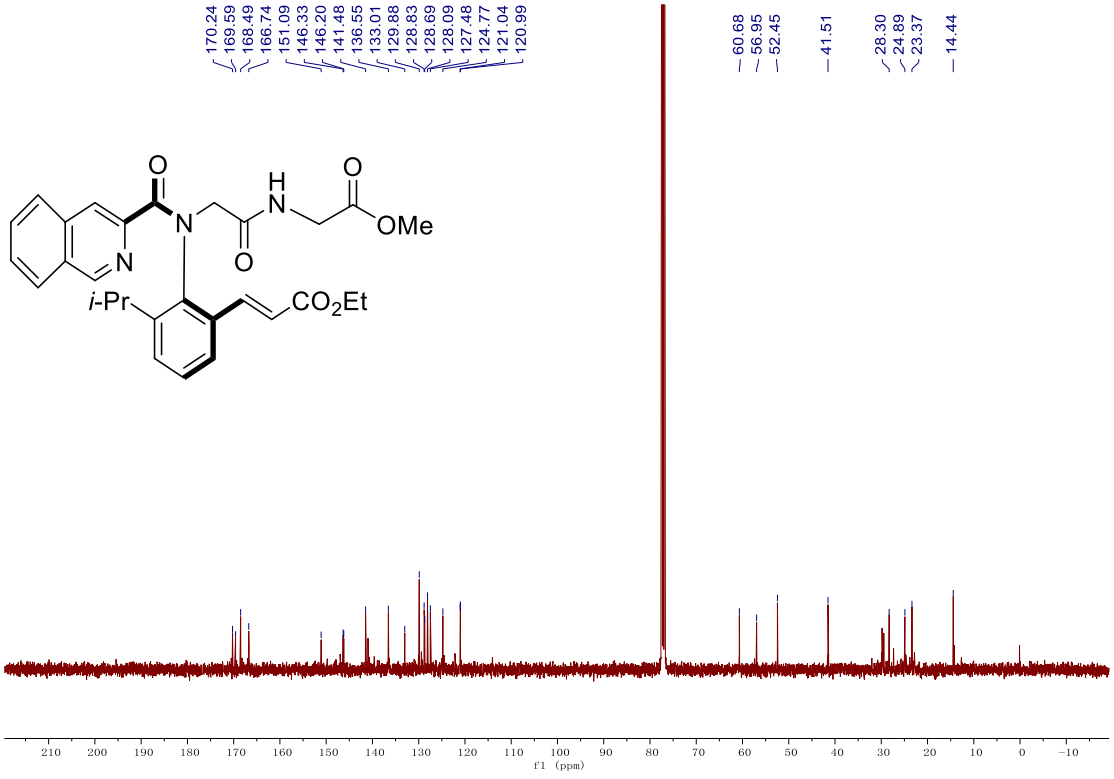
3a-^{13}C NMR



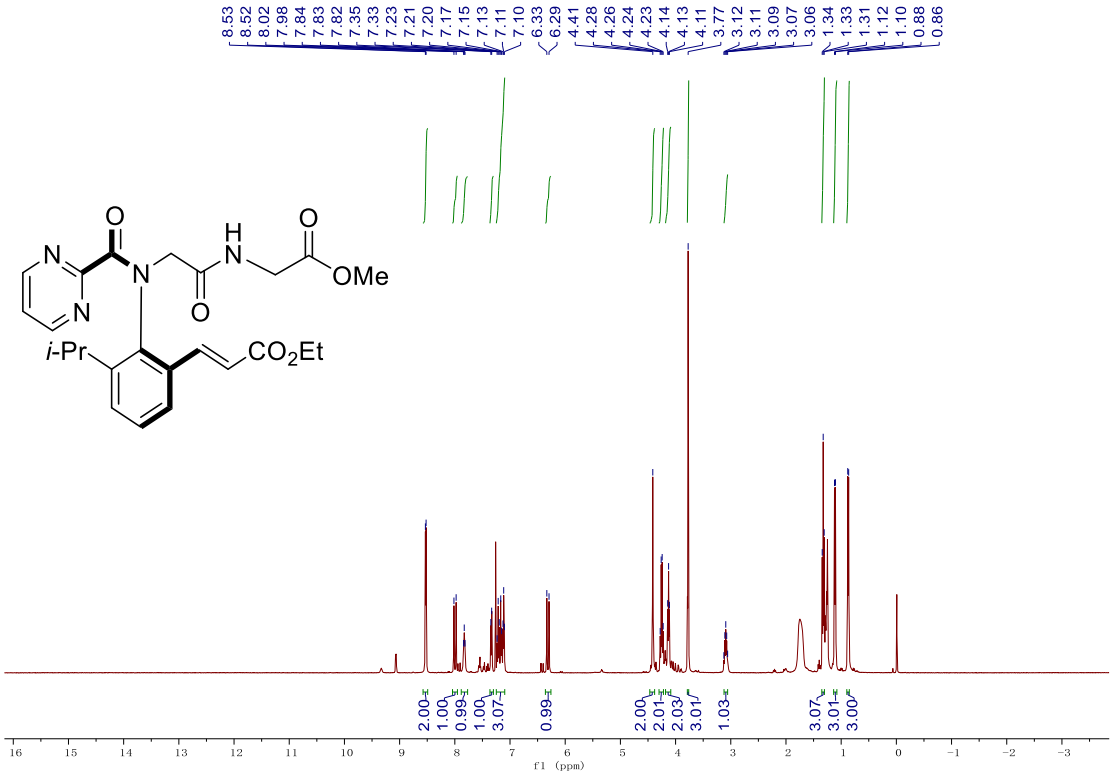
3b-^{1}H NMR


8.13 8.11 8.03 7.99 7.93 7.91 7.86 7.85 7.84 7.72 7.70 7.57 7.54 7.53 7.50 7.48 7.47 7.45 7.40 7.40 7.39 7.38 7.22 7.21 7.19 6.31 6.31 6.28 6.27
4.57 4.54 4.39 4.35 4.26 4.25 4.24 4.23 4.22 4.20 4.11 4.10 4.07 4.05 3.79 3.11 3.10 3.10 3.08 3.07 3.05 1.33 1.31 1.29 1.16 1.15 0.78
O
H
N
O
N
O
OMe
N
i-Pr
CO2Et
1.02 1.03 1.01 1.03 1.04 3.03 1.01 2.04 1.00
1.01 1.08 3.03 1.05 3.03 1.00
3.07 3.04 3.02
f1 (ppm)

3b-^{13}C NMR


170.24 169.59 168.49 166.74 151.09 146.33 146.20 141.48 136.55 133.01 129.88 128.83 128.69 128.09 127.48 124.77 121.04 120.99
60.68 56.95 52.45 41.51 28.30 24.89 23.37 14.44
O
H
N
O
N
O
OMe
N
i-Pr
CO2Et
f1 (ppm)

3c-^{1}H NMR



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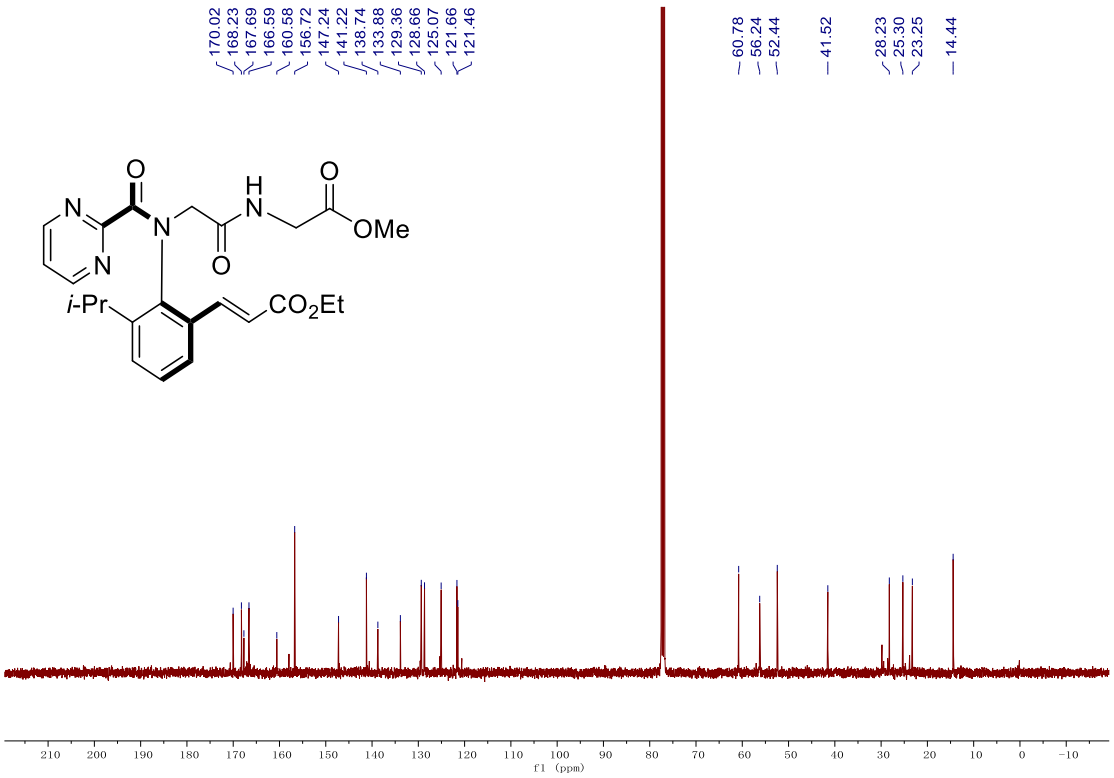

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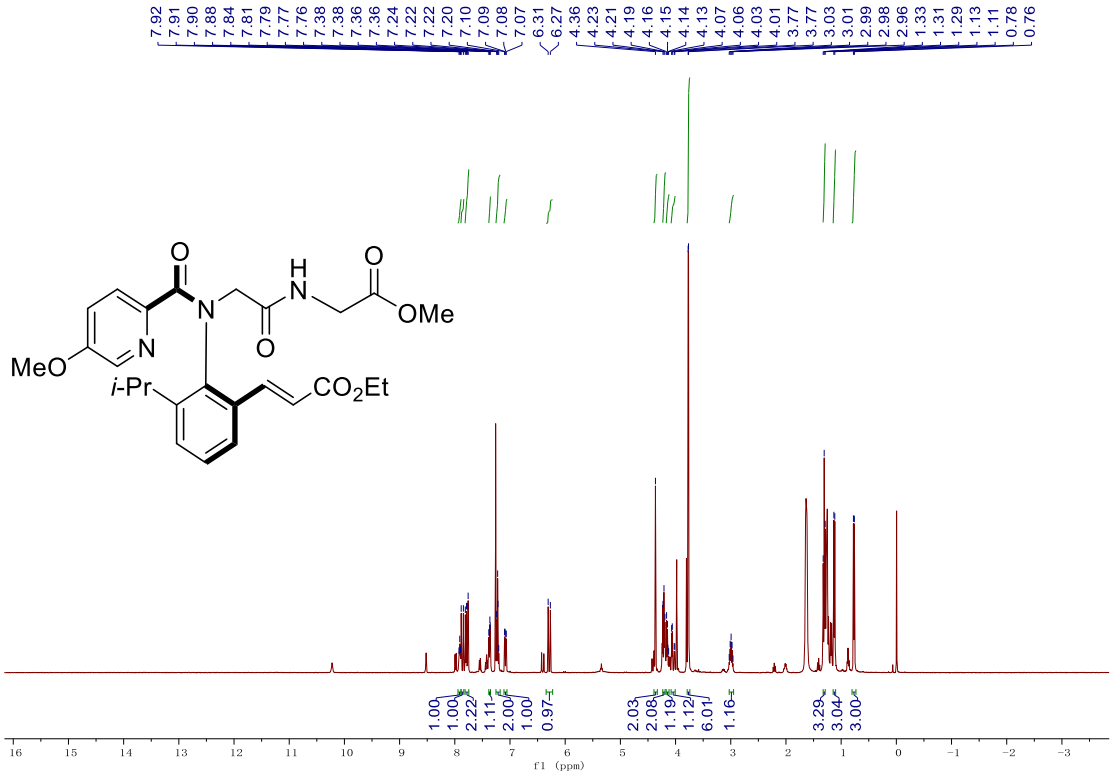
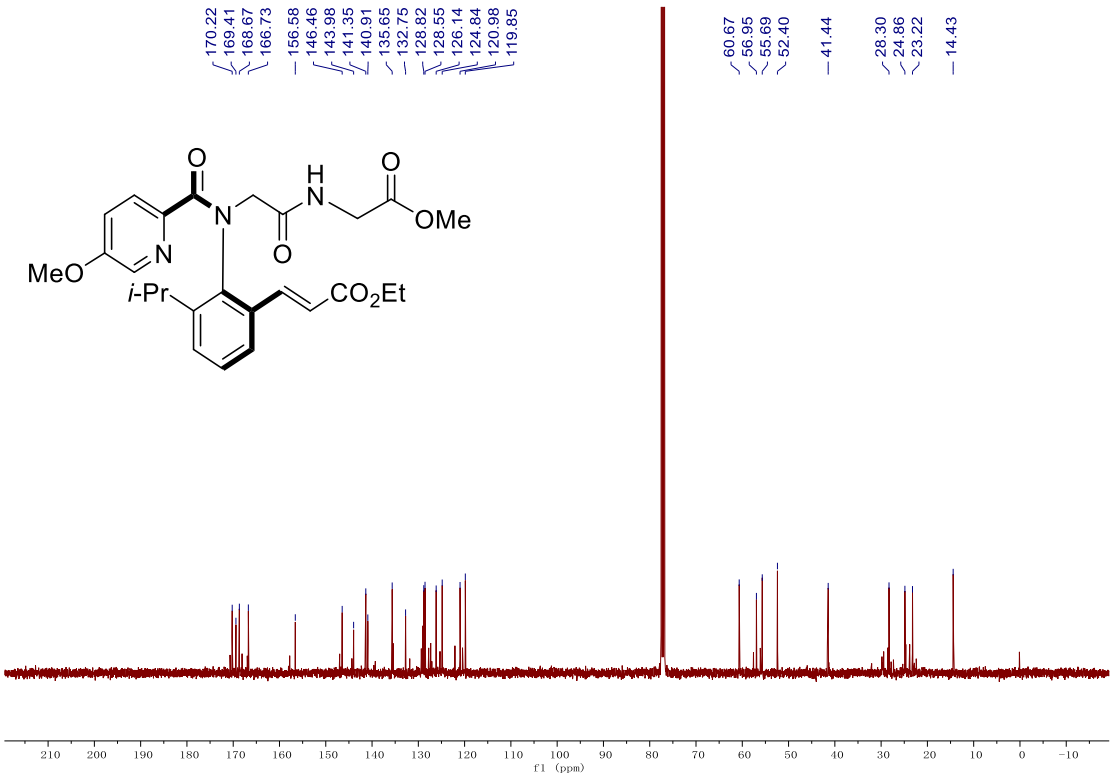
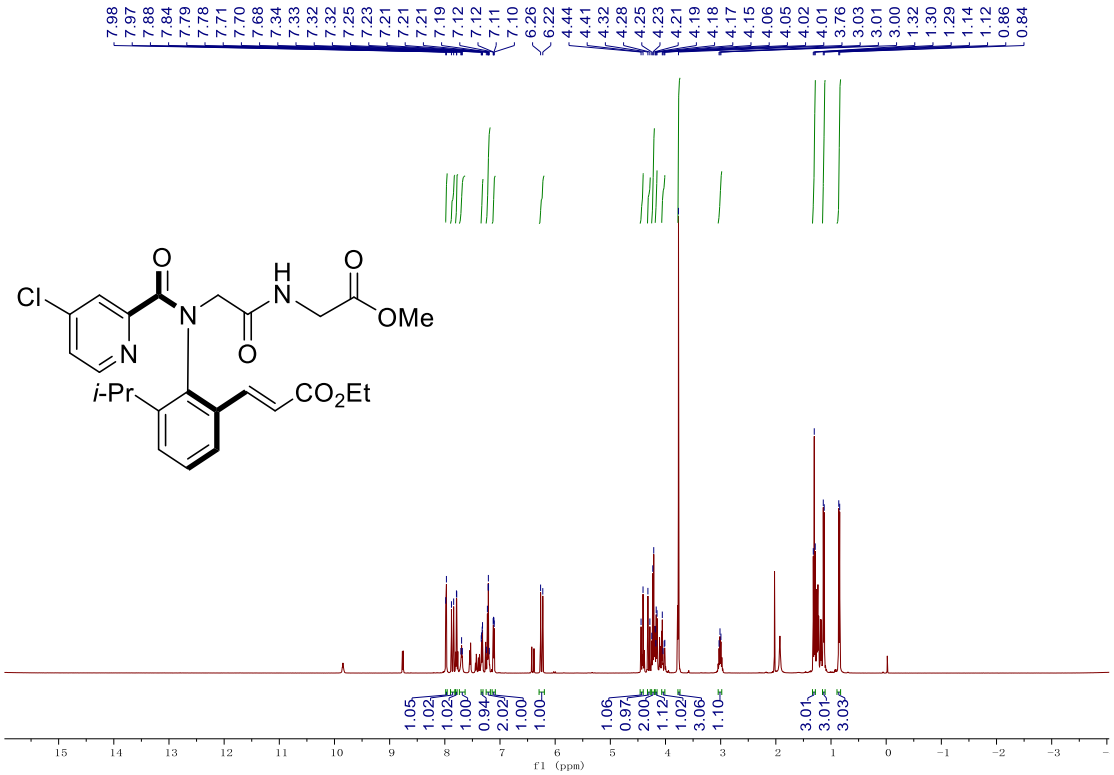


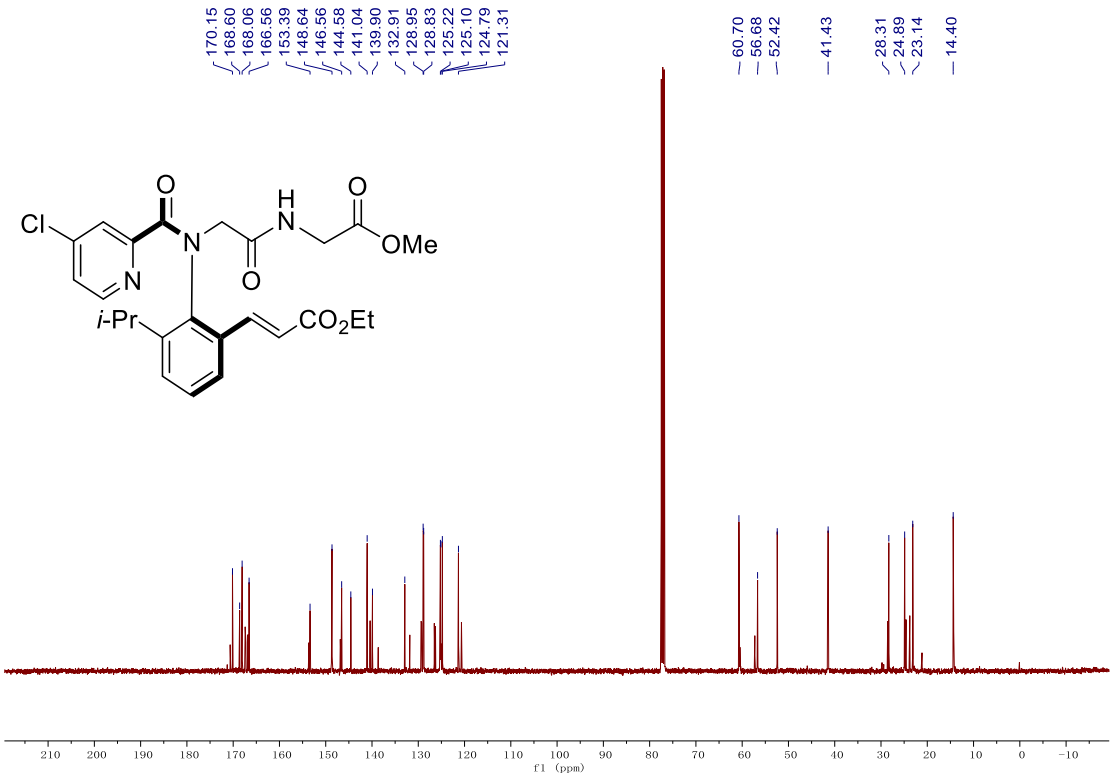
3d-^{13}C NMR



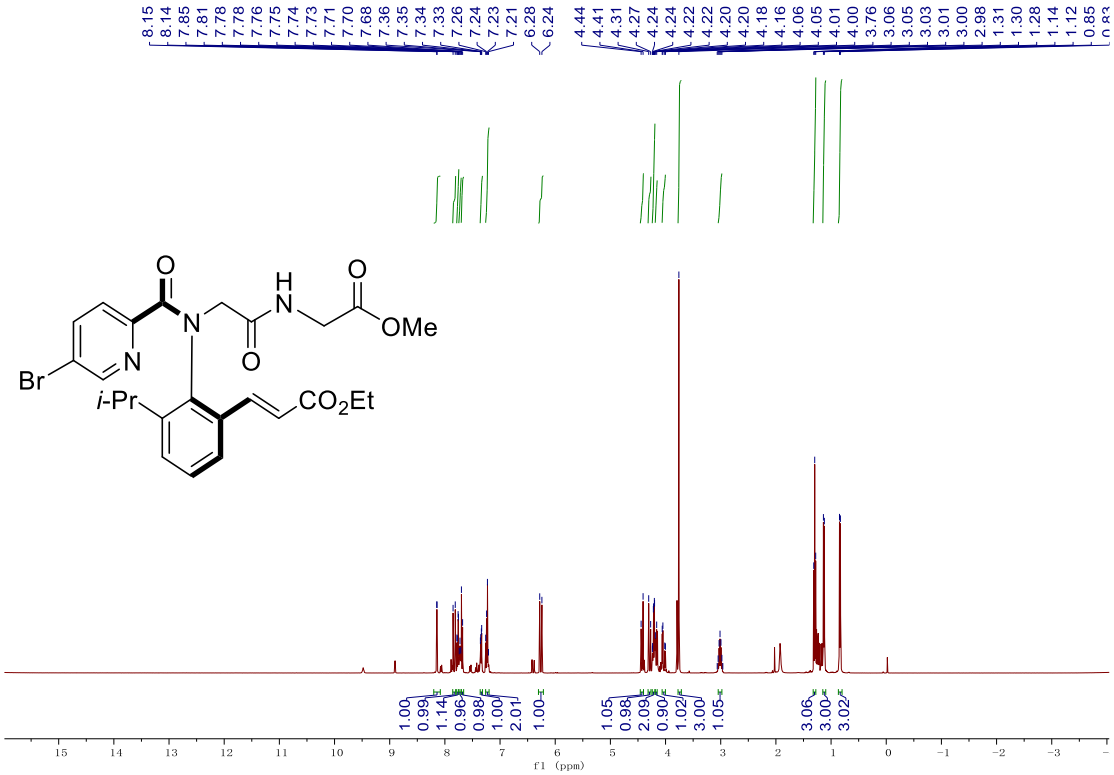
3e-^{1}H NMR



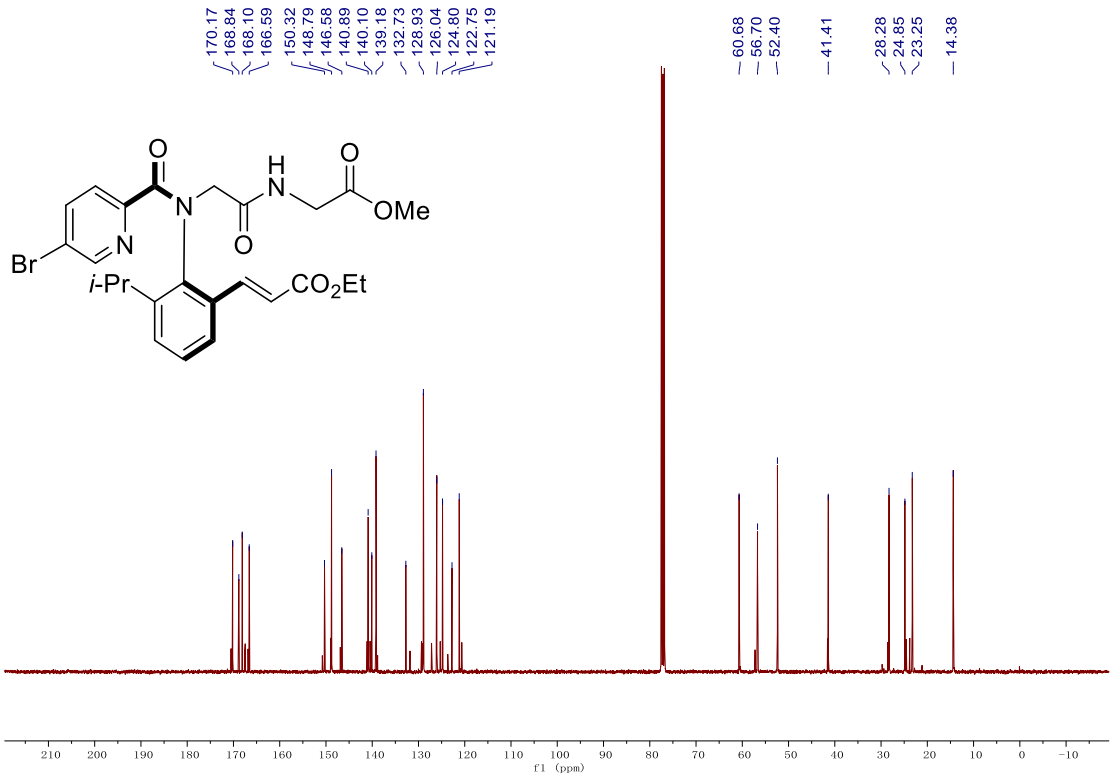
3e-^{13}C NMR



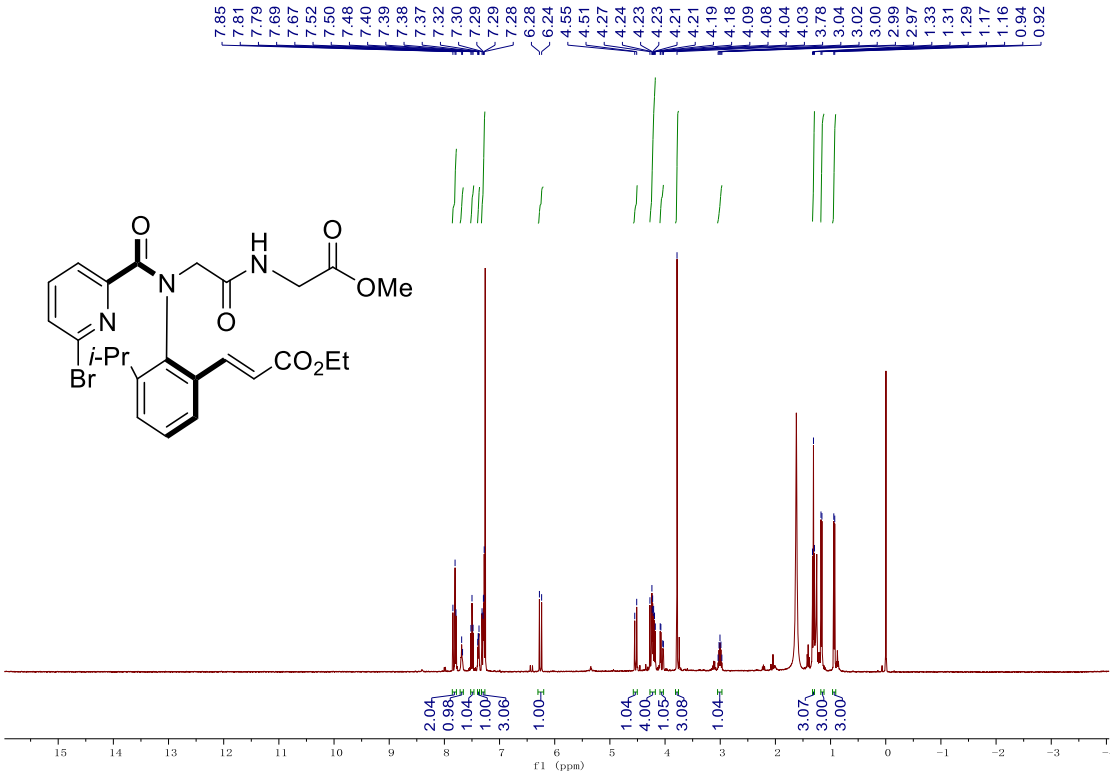
3f-^{1}H NMR



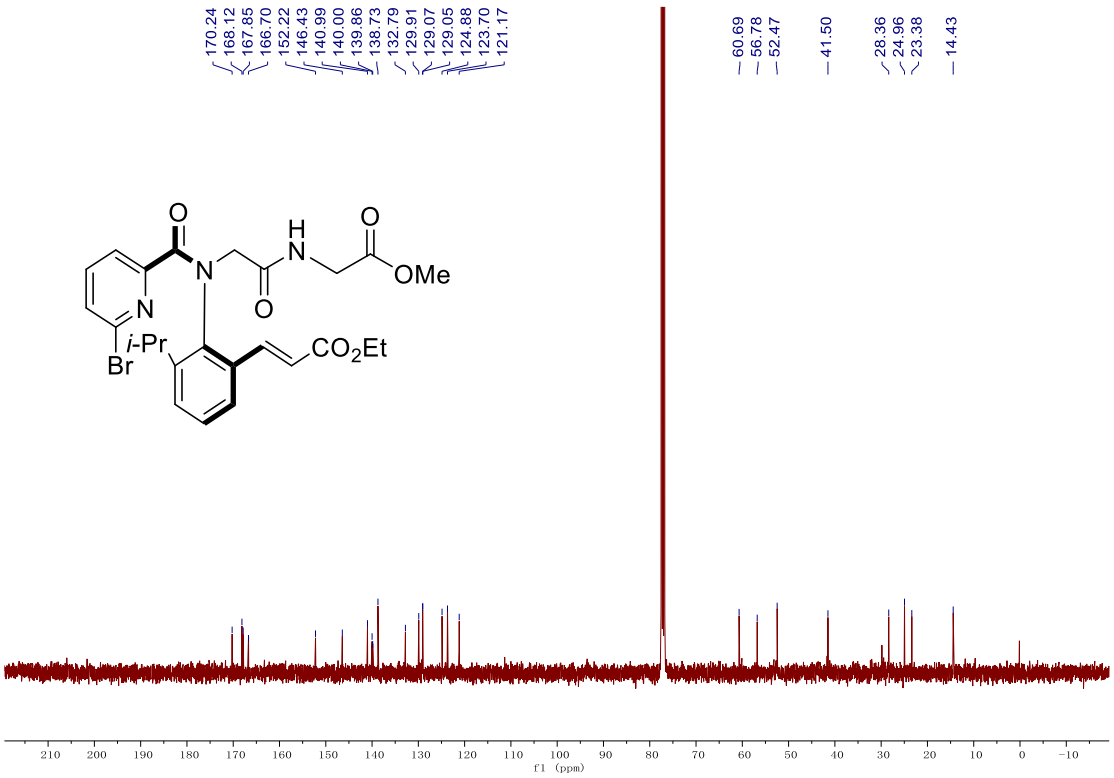
3f-^{13}C NMR



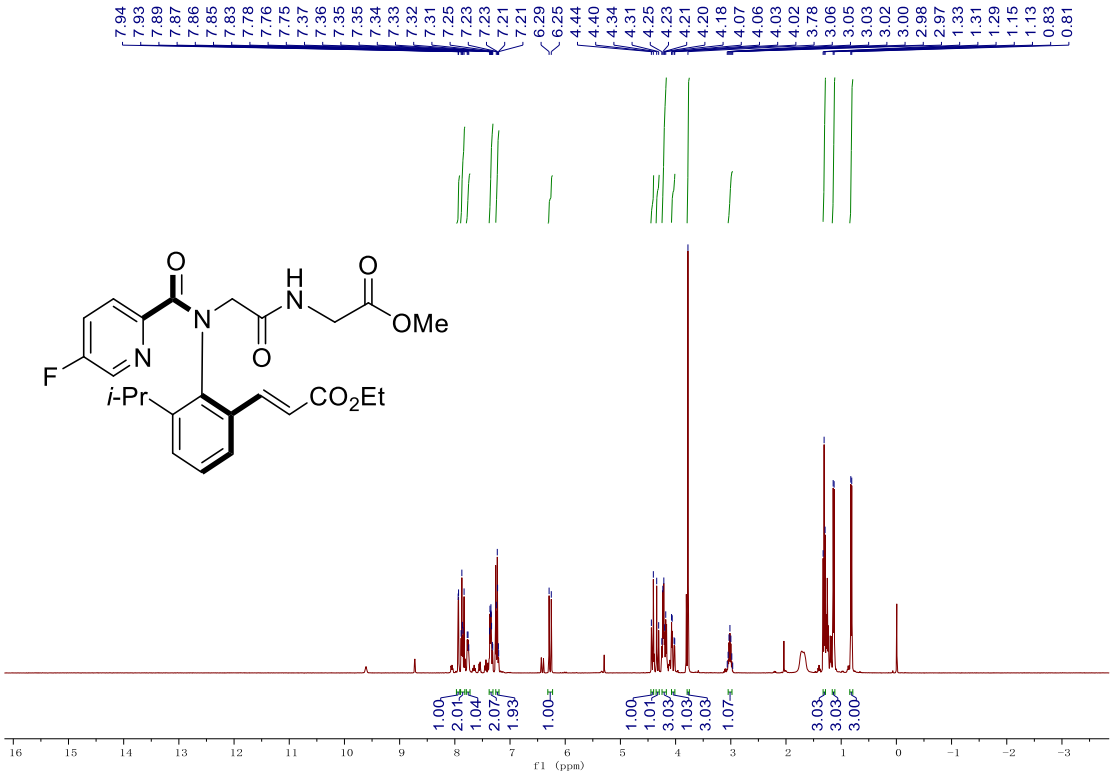
3g-^{1}H NMR



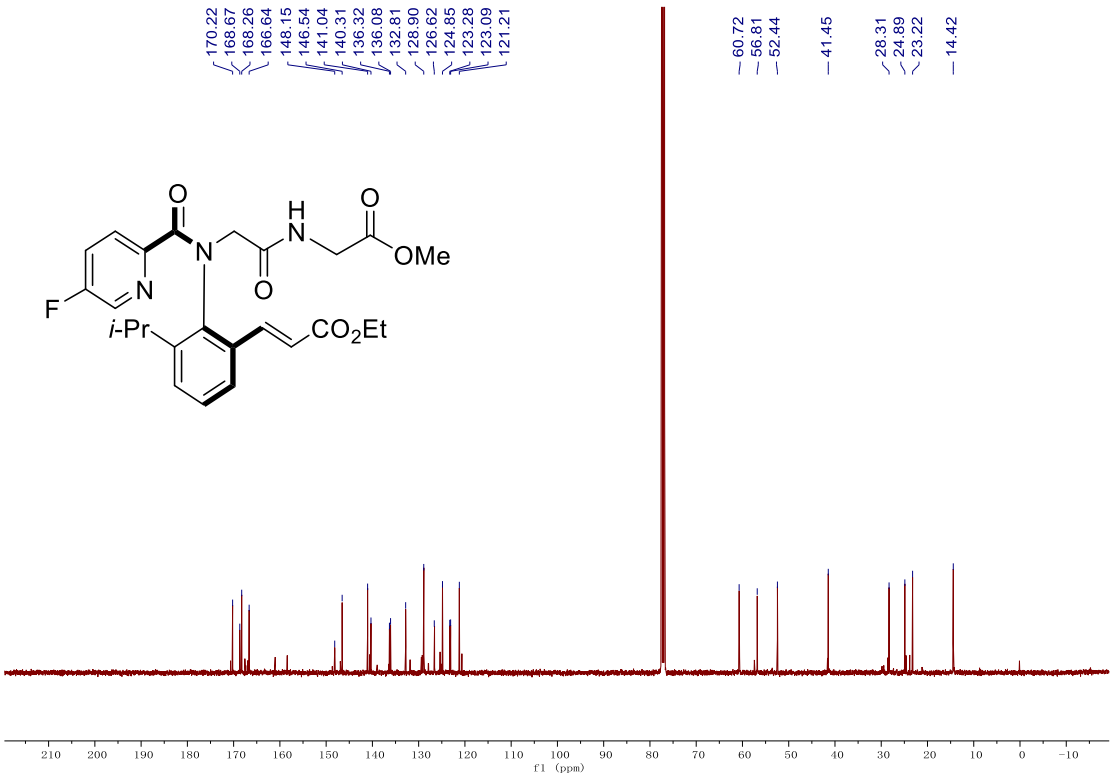
3g-^{13}C NMR



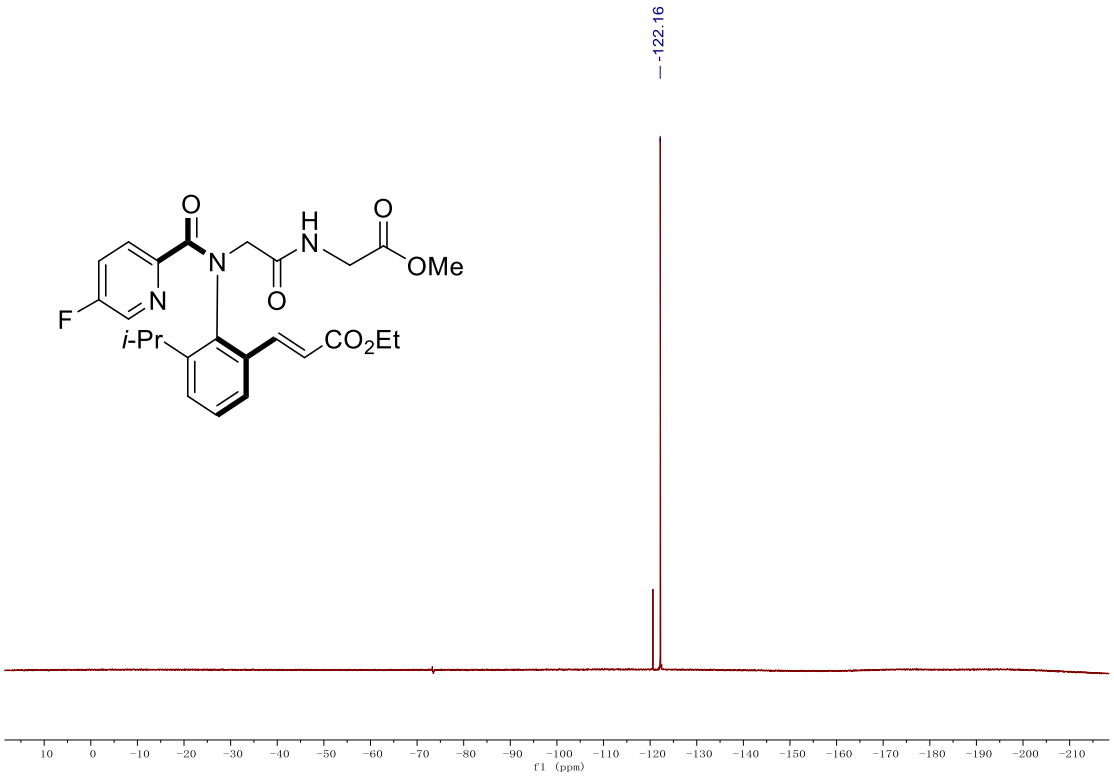
3h-^{1}H NMR



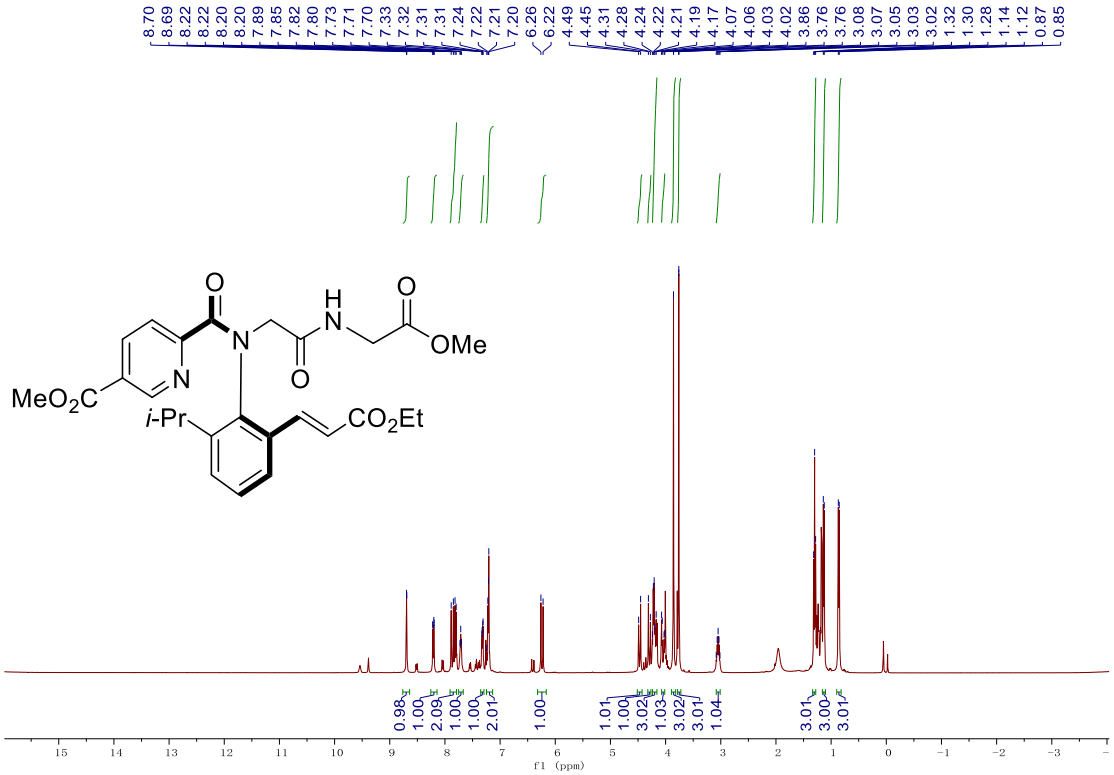
3h-^{13}C NMR



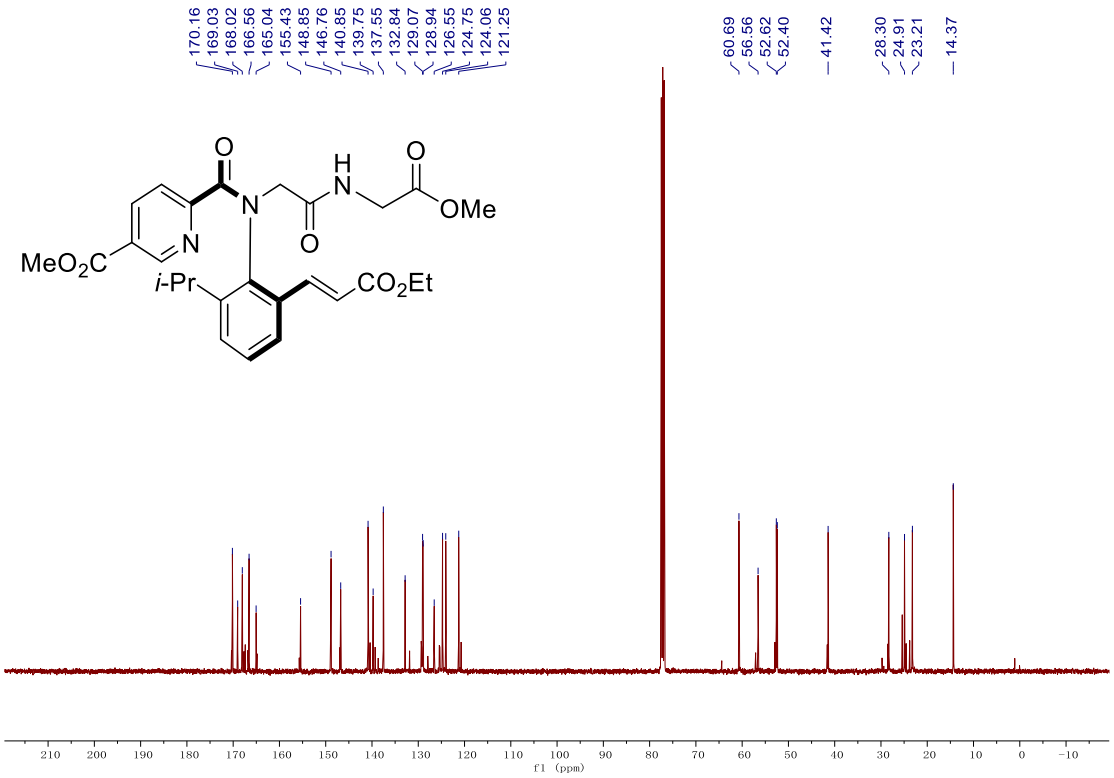
3h-^{19}F


-122.16
O
H
N
O
N
OMe
F
N
O
i-Pr
CO2Et
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

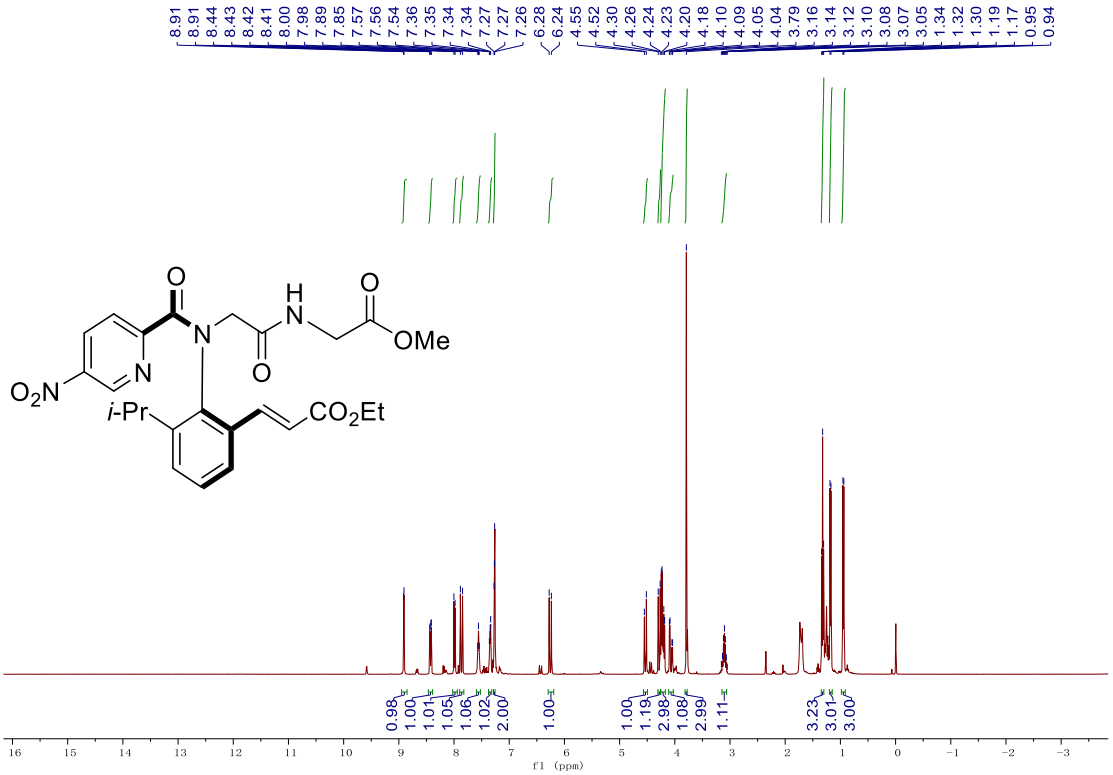
3i-^{1}H NMR



3i-^{13}C NMR



3j-^{1}H NMR



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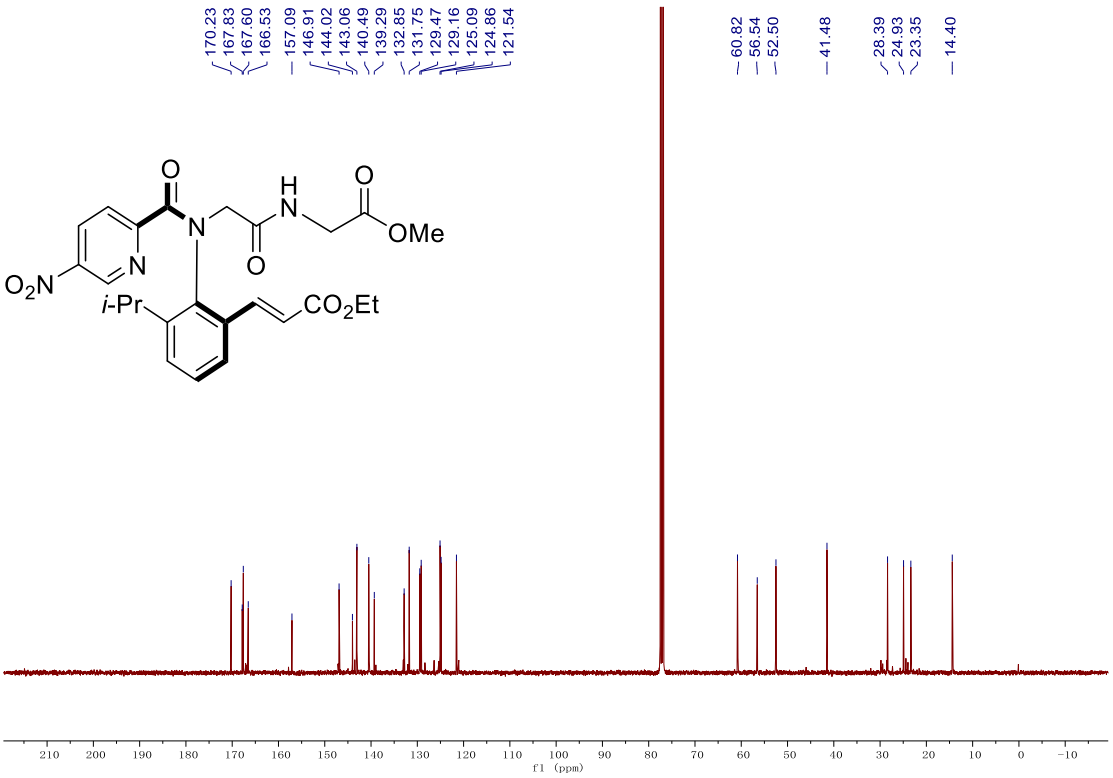
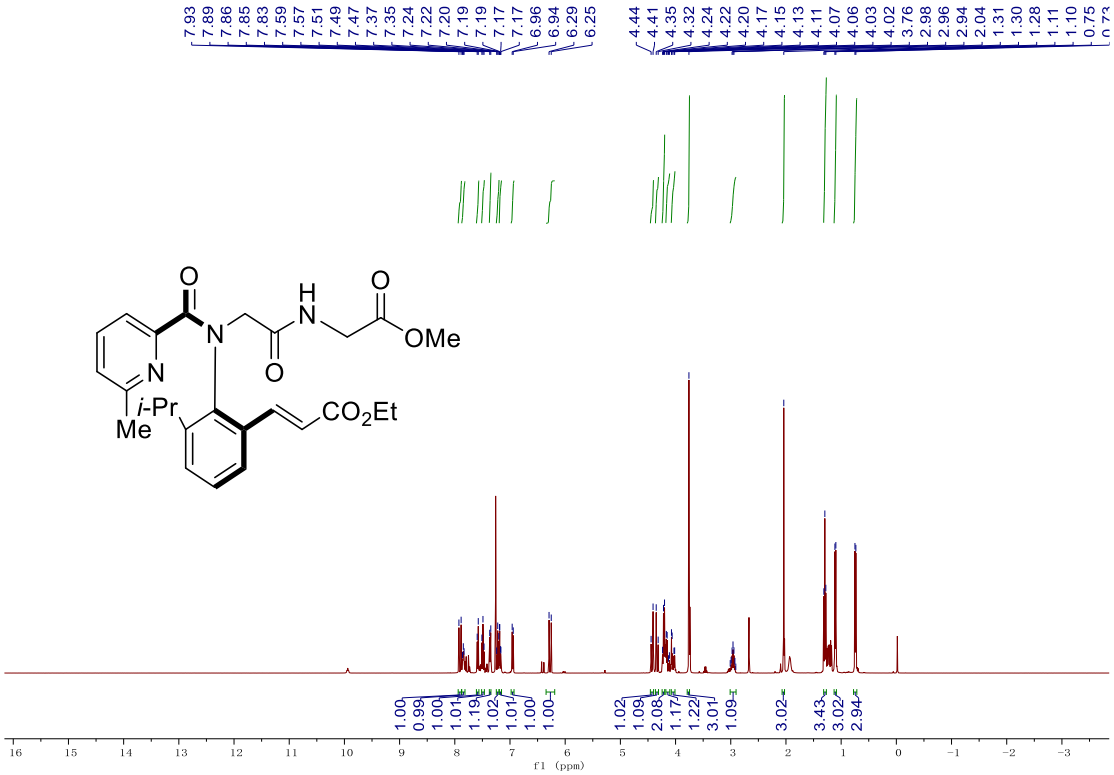
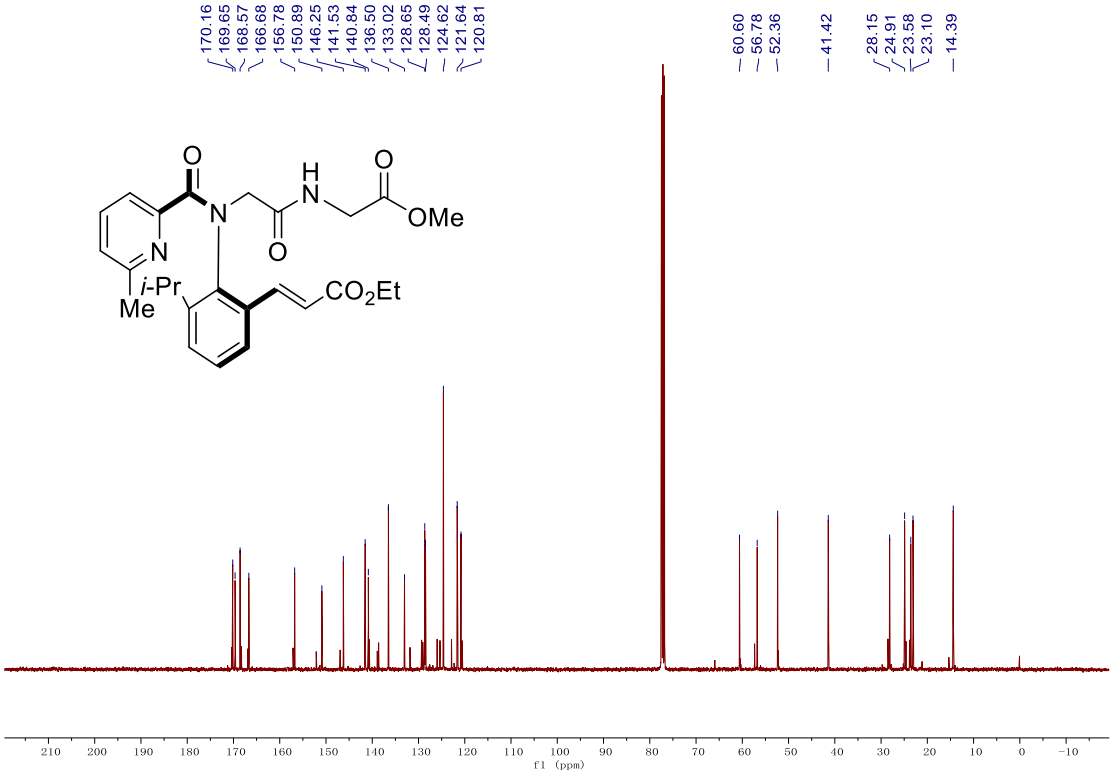


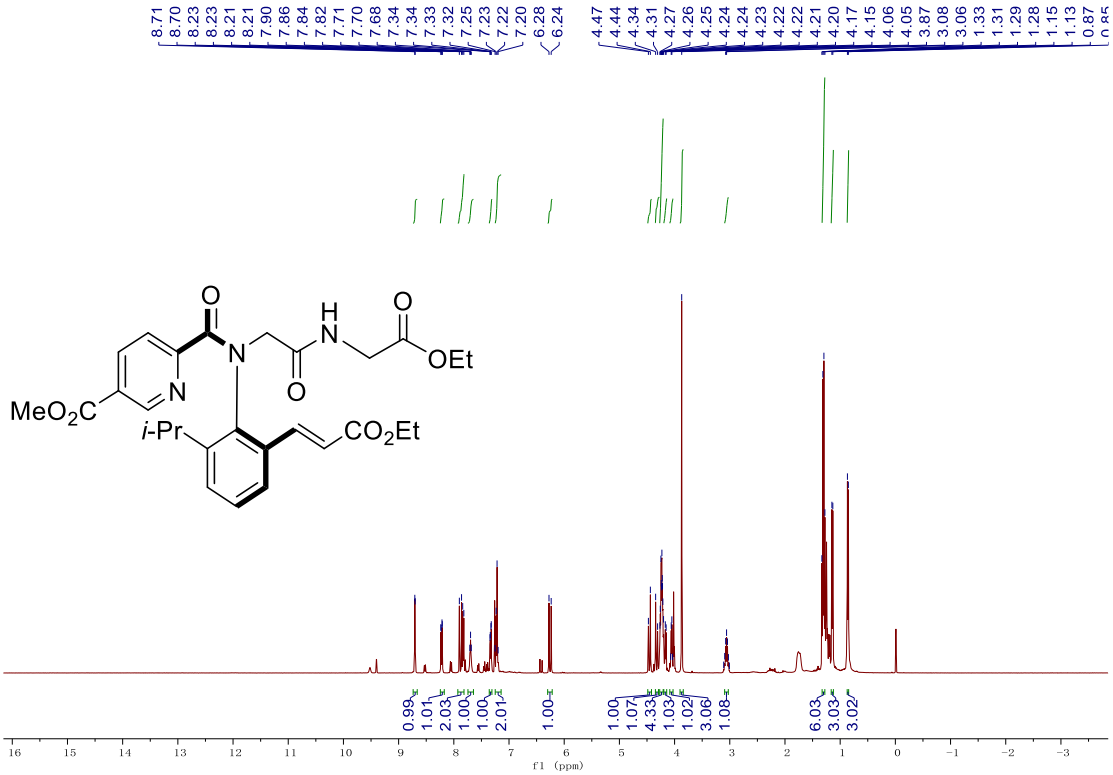
3k-^{1}H NMR



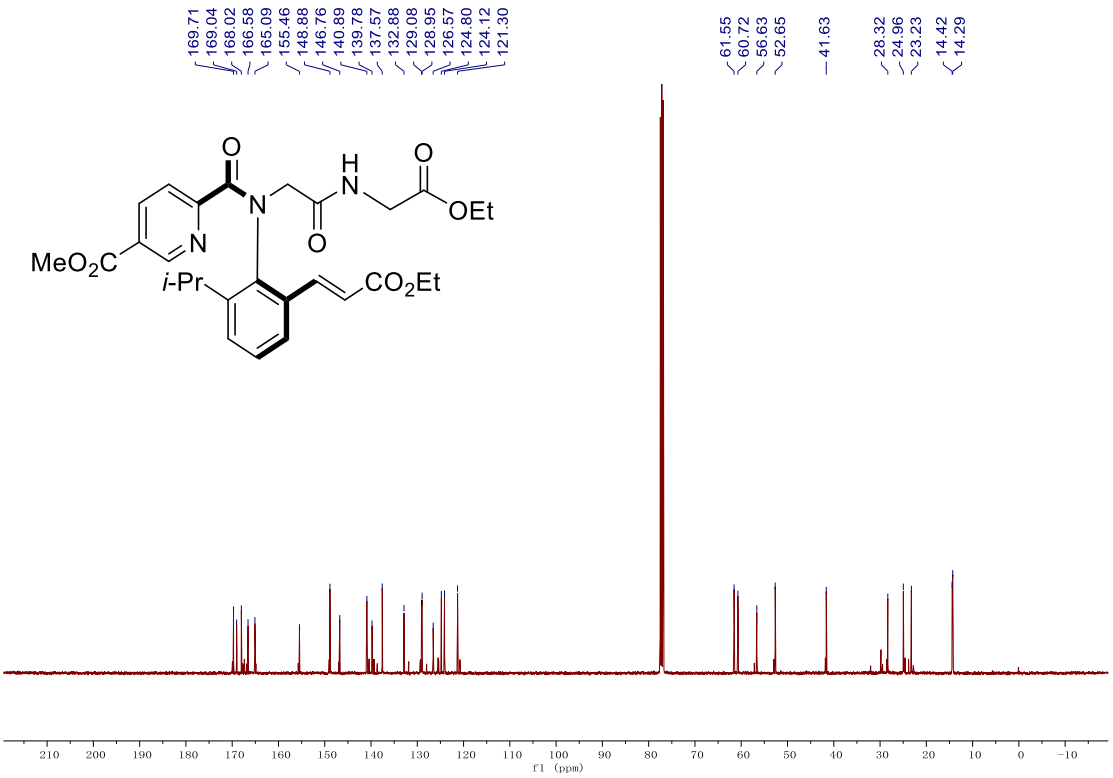
3k-^{13}C NMR



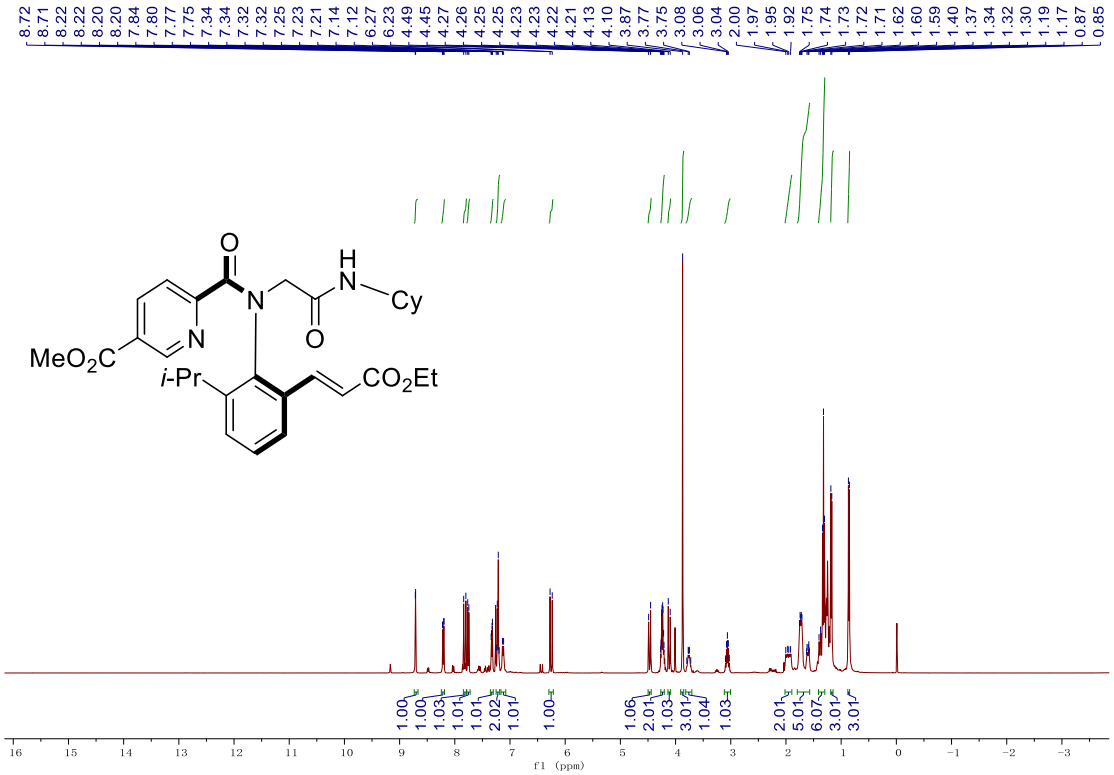
3o-^{1}H NMR



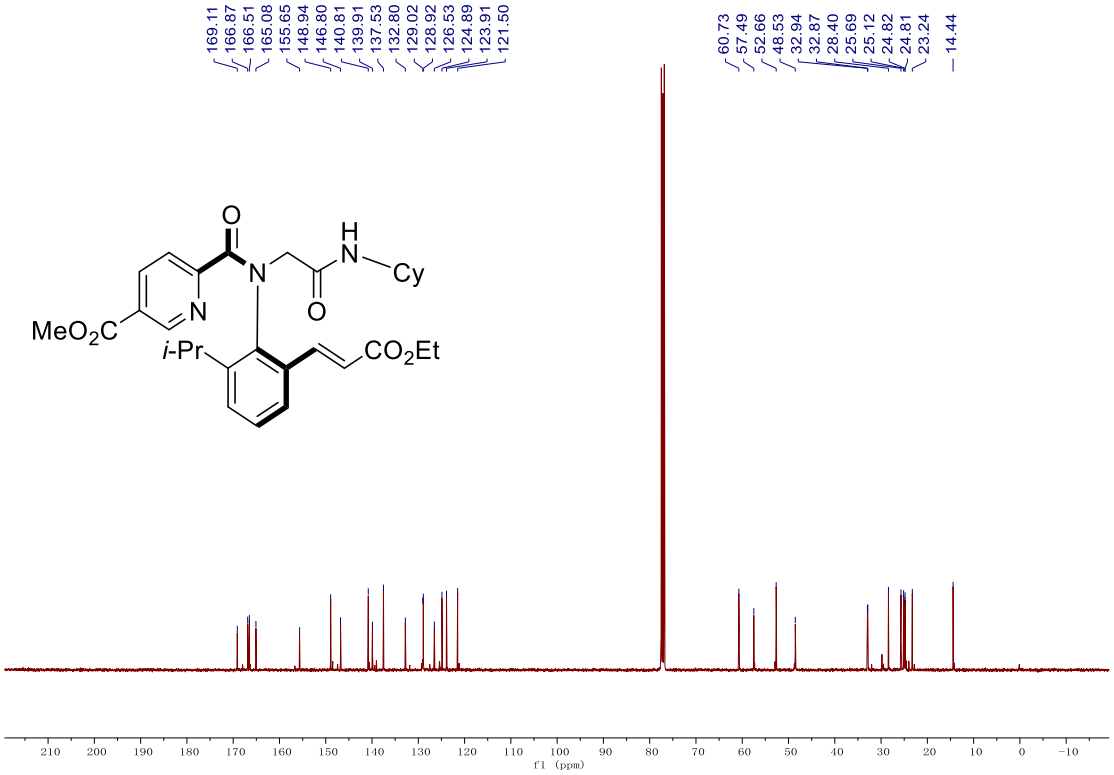
3o-^{13}C NMR



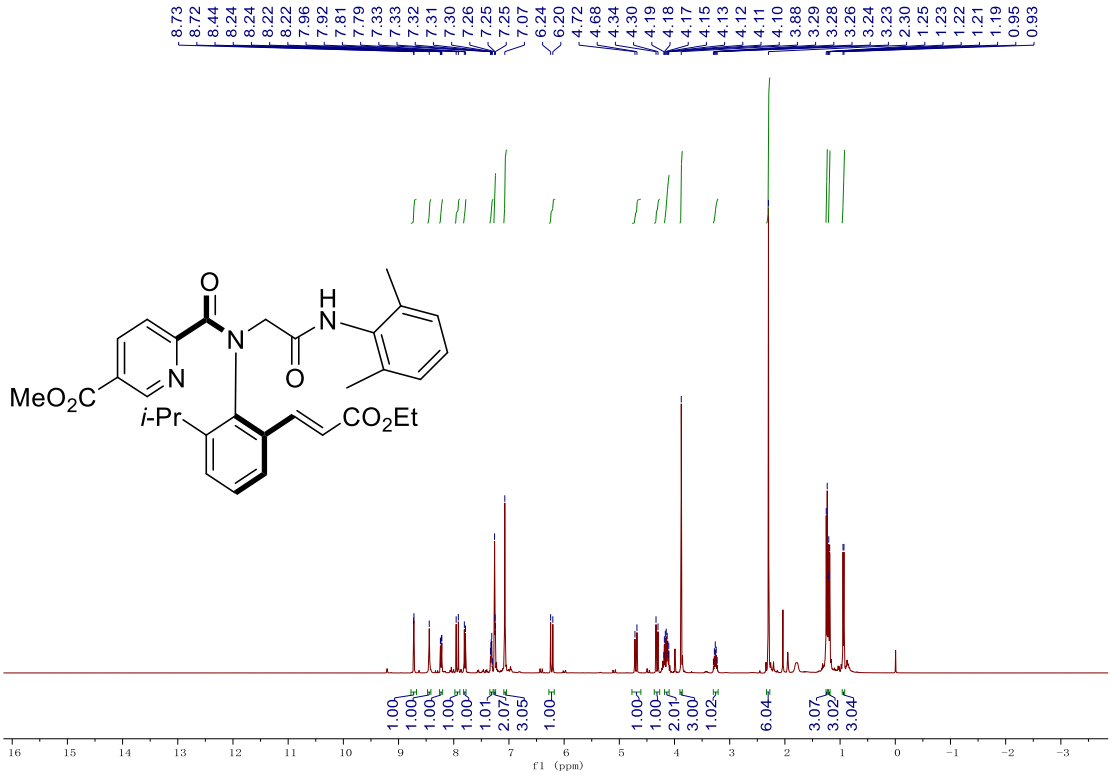
3p-^{1}H NMR



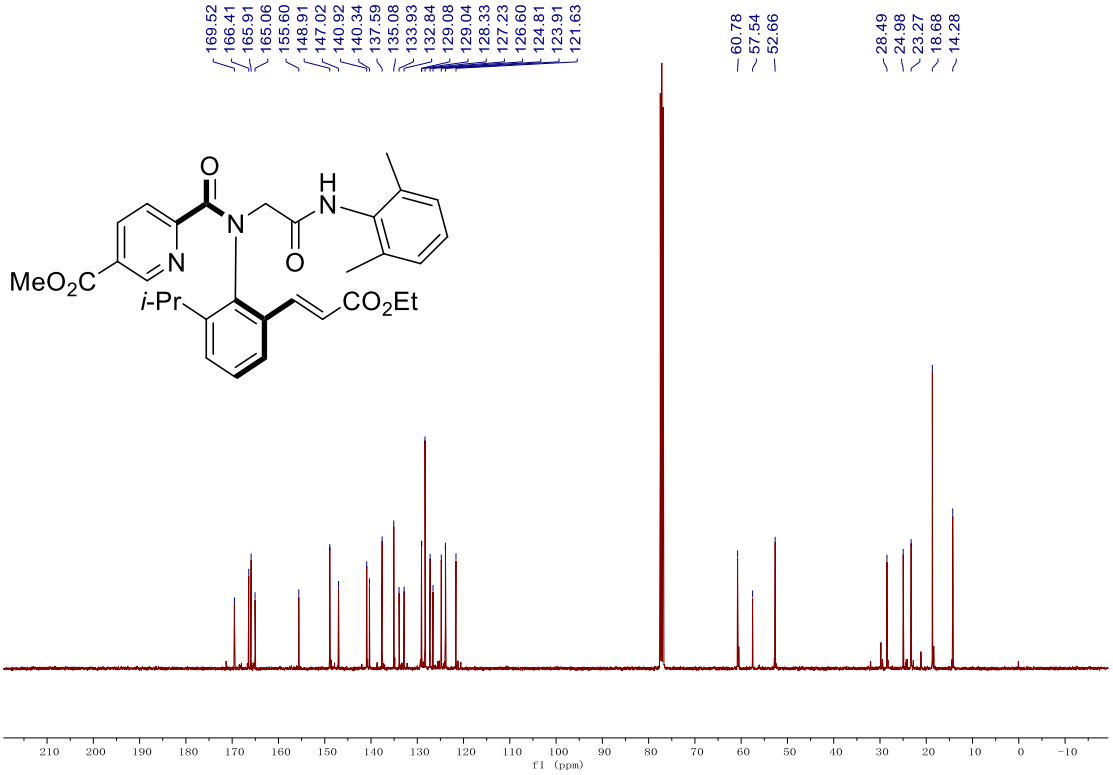
3p-^{13}C NMR



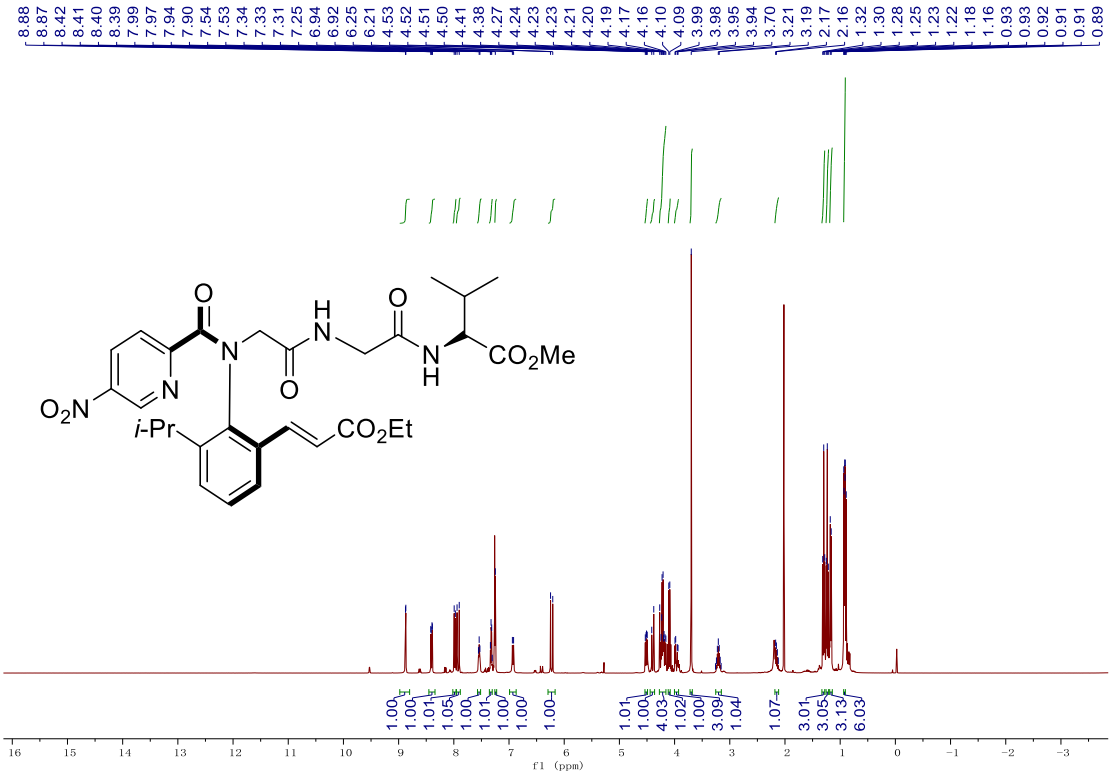
3q-^{1}H NMR



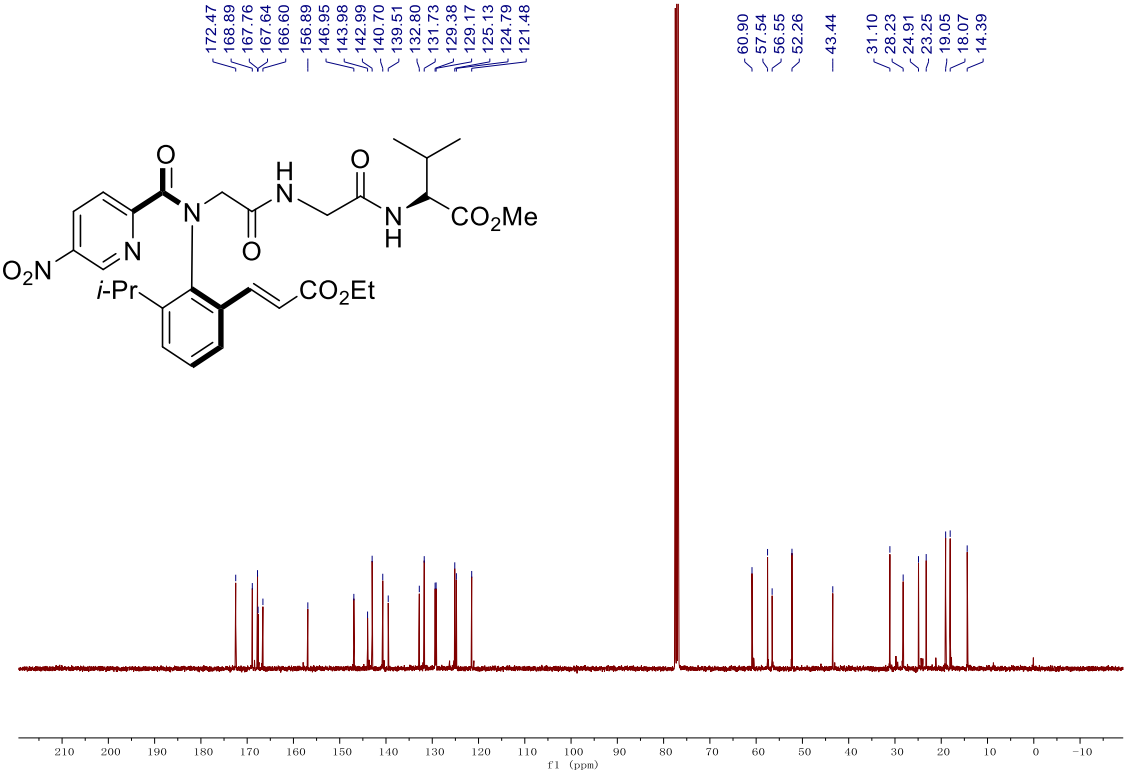
3q-^{13}C NMR



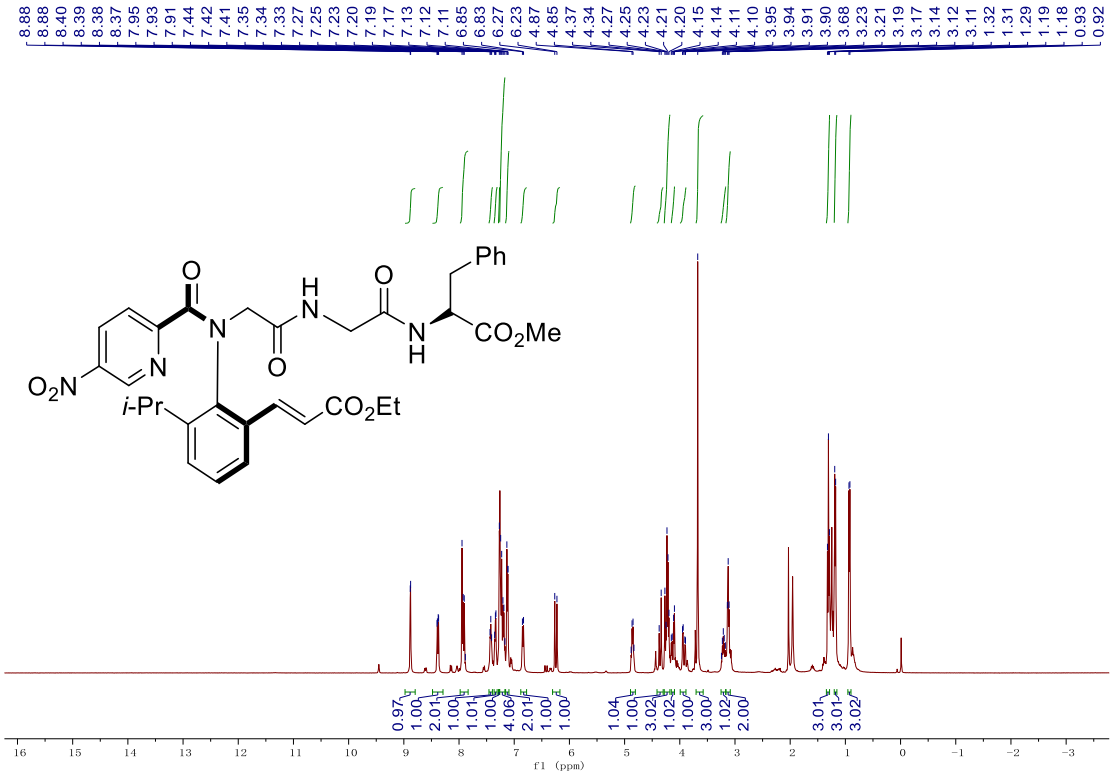
3r-^{1}H NMR



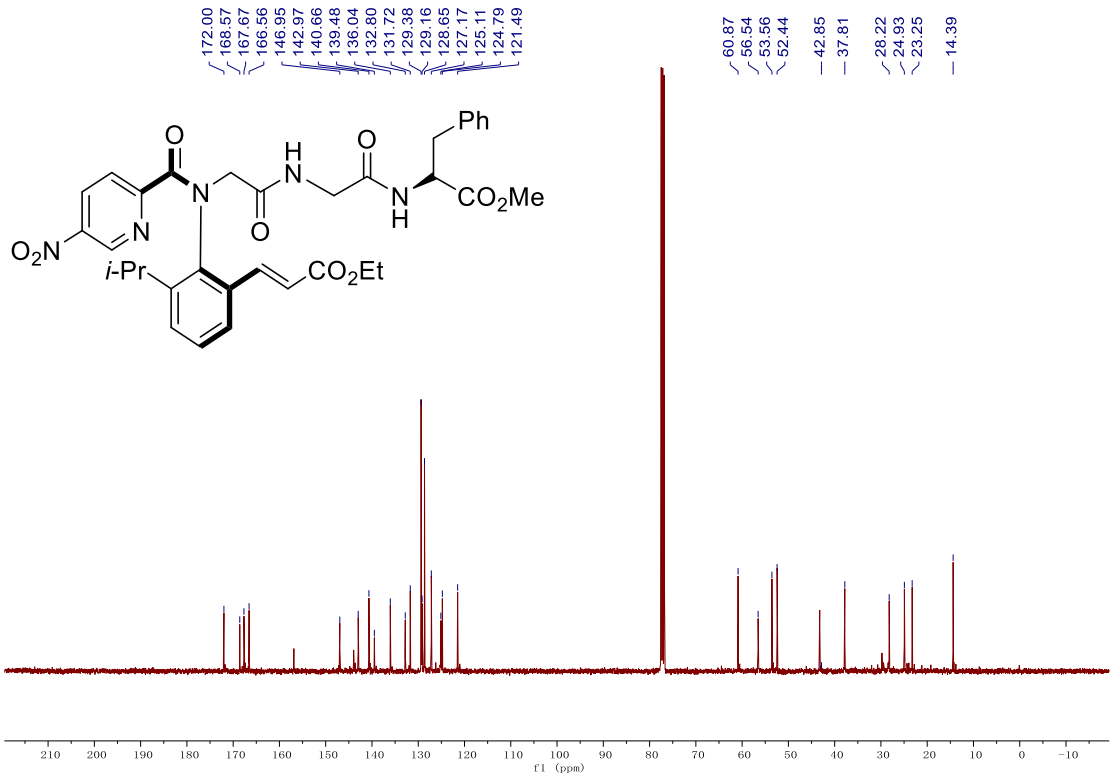
3r-^{13}C NMR



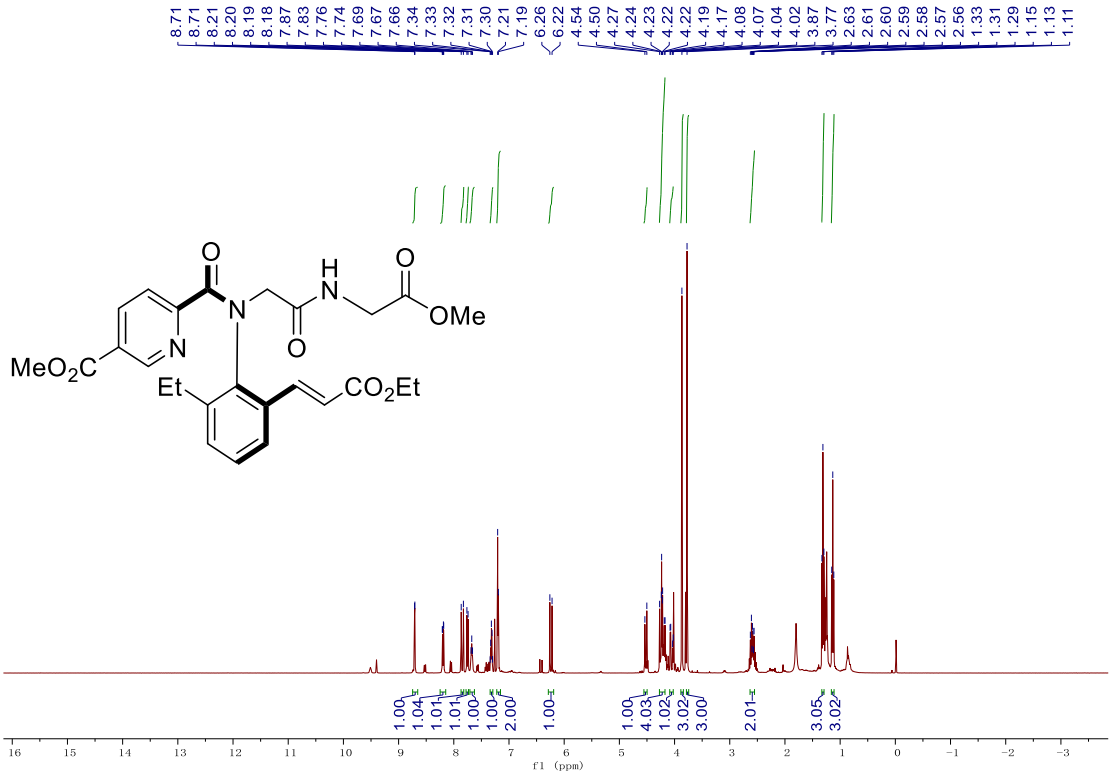
3s-^{1}H NMR



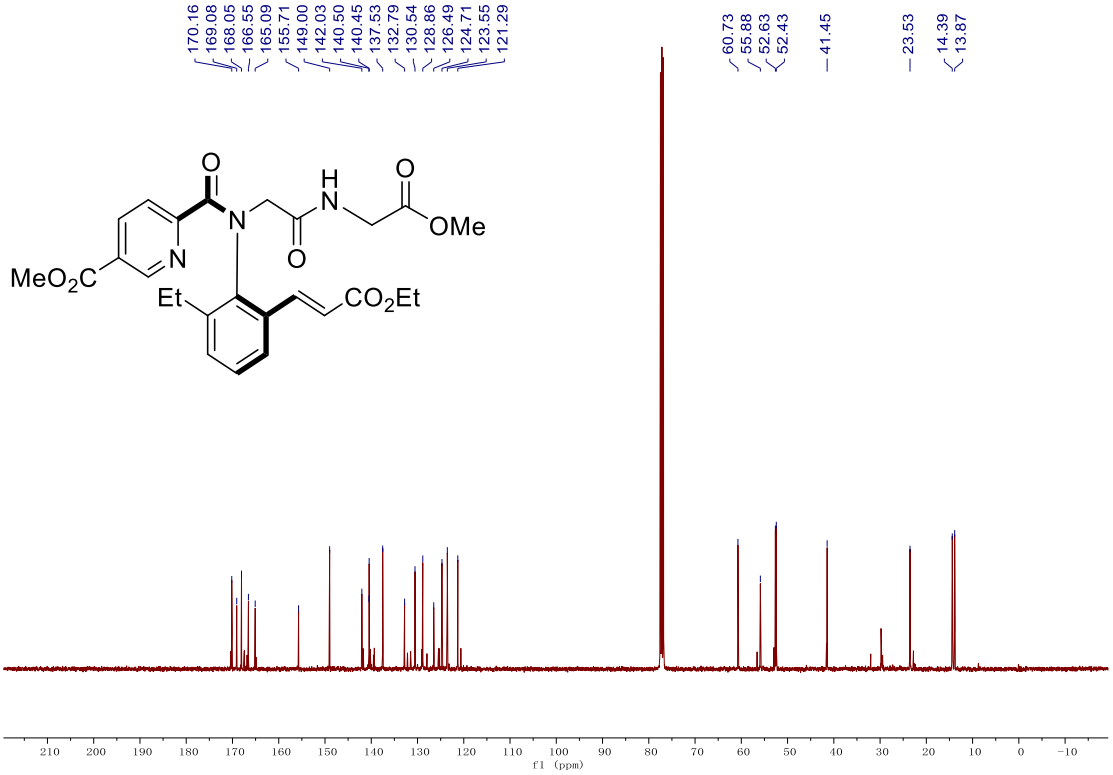
3s-^{13}C NMR



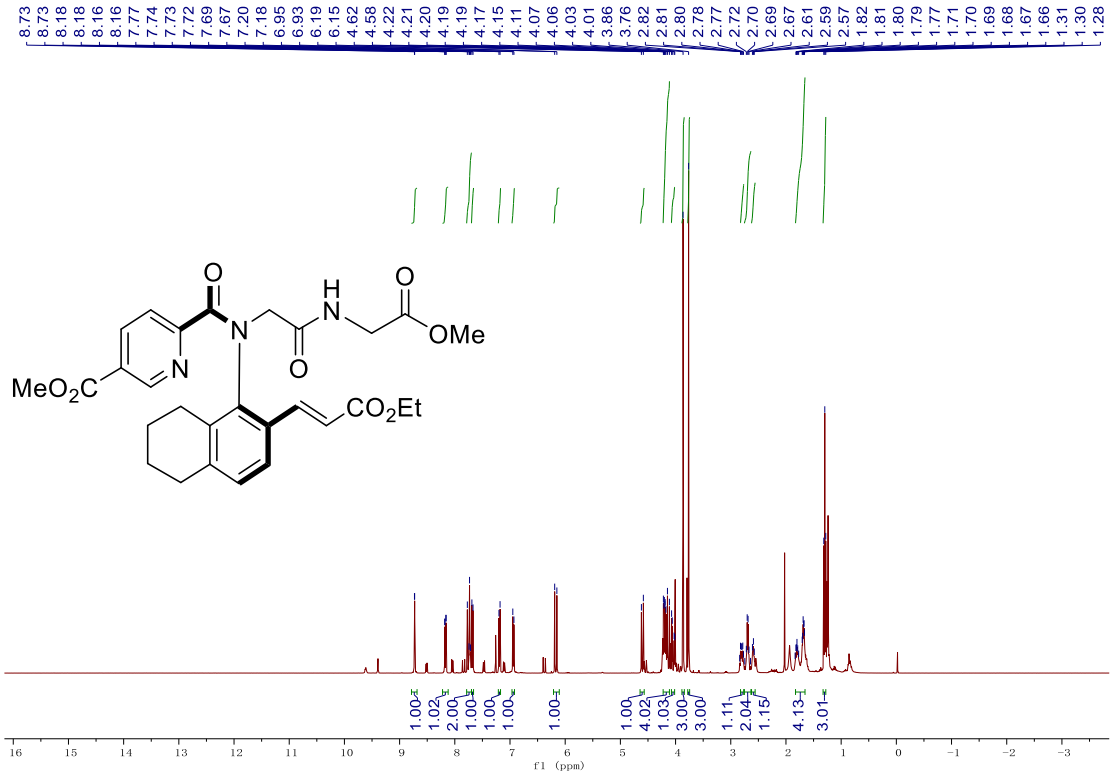
3t-^{1}H NMR



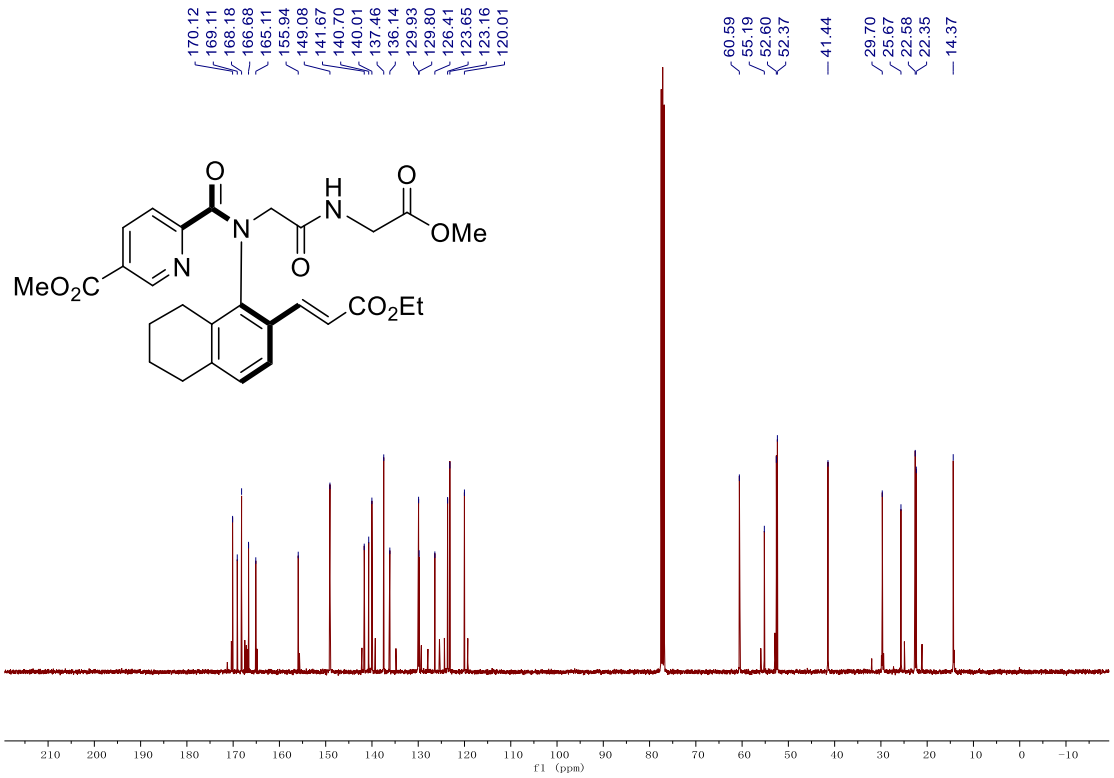
3t-^{13}C NMR



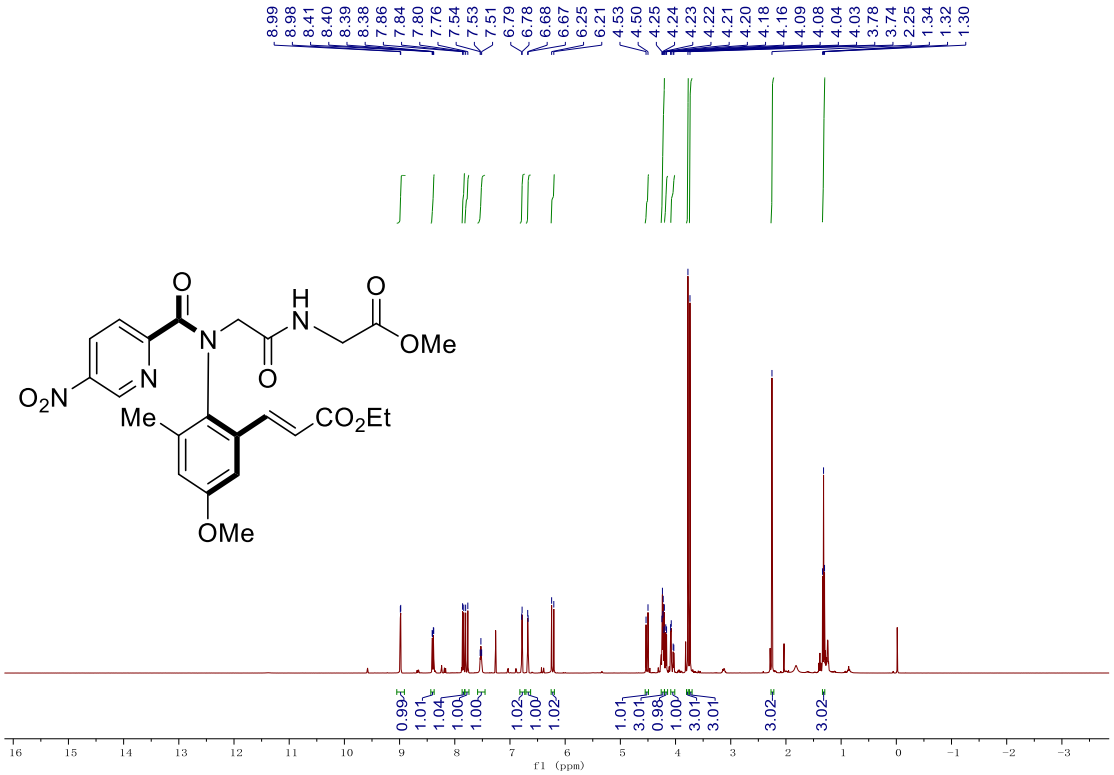
3u-^{1}H NMR



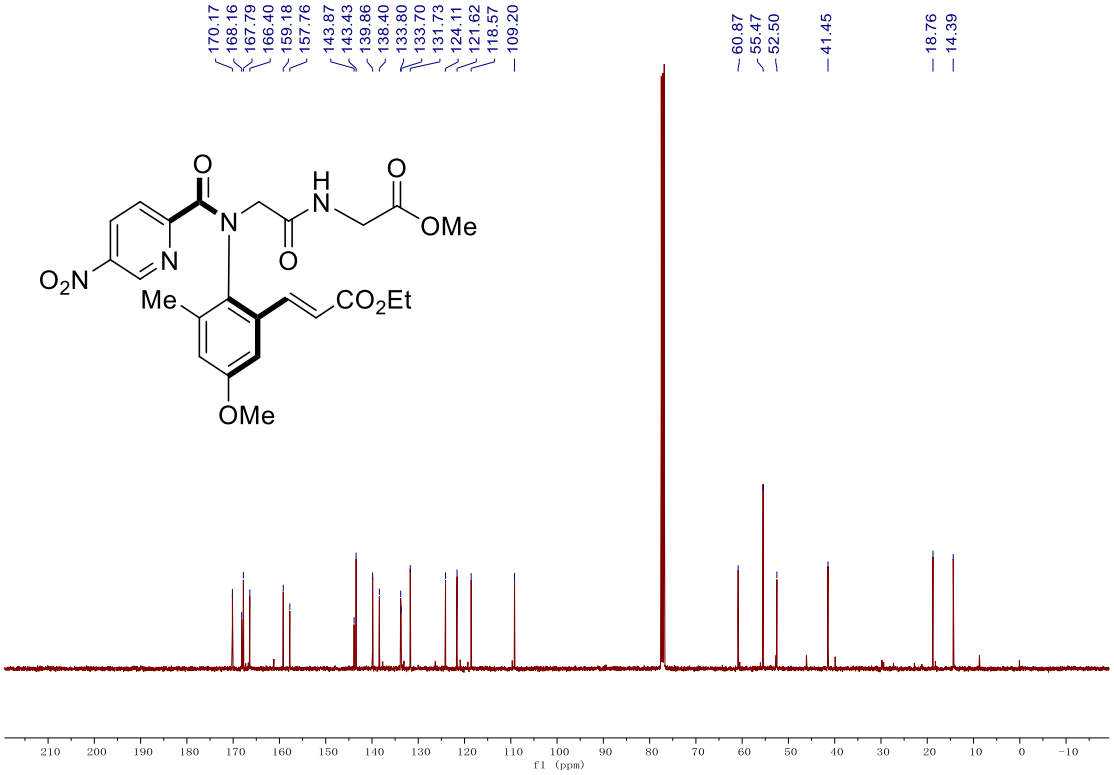
3u-^{13}C NMR



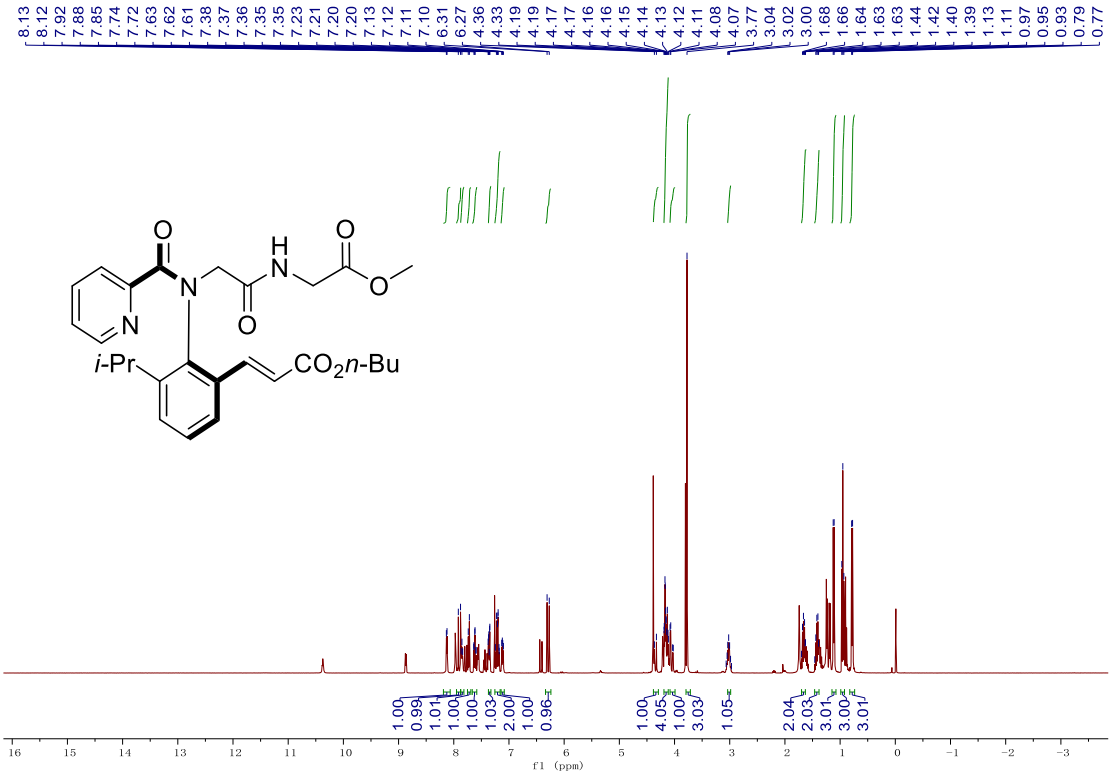
3v-^{1}H NMR



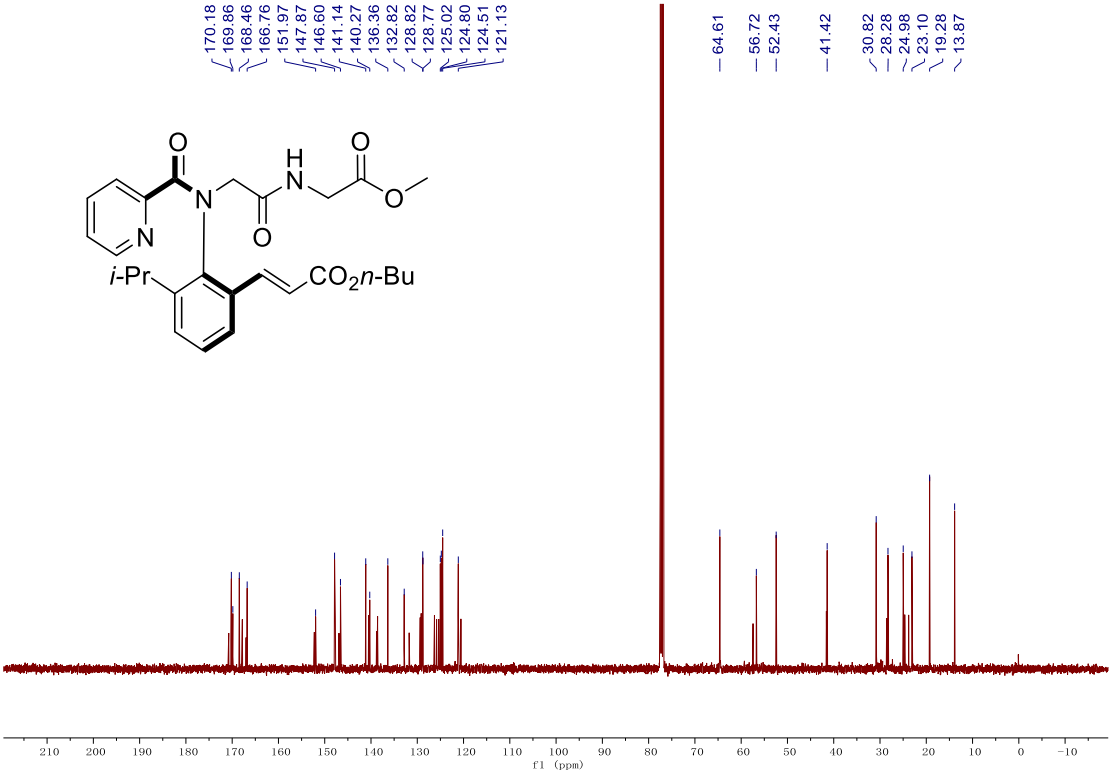
3v-^{13}C NMR



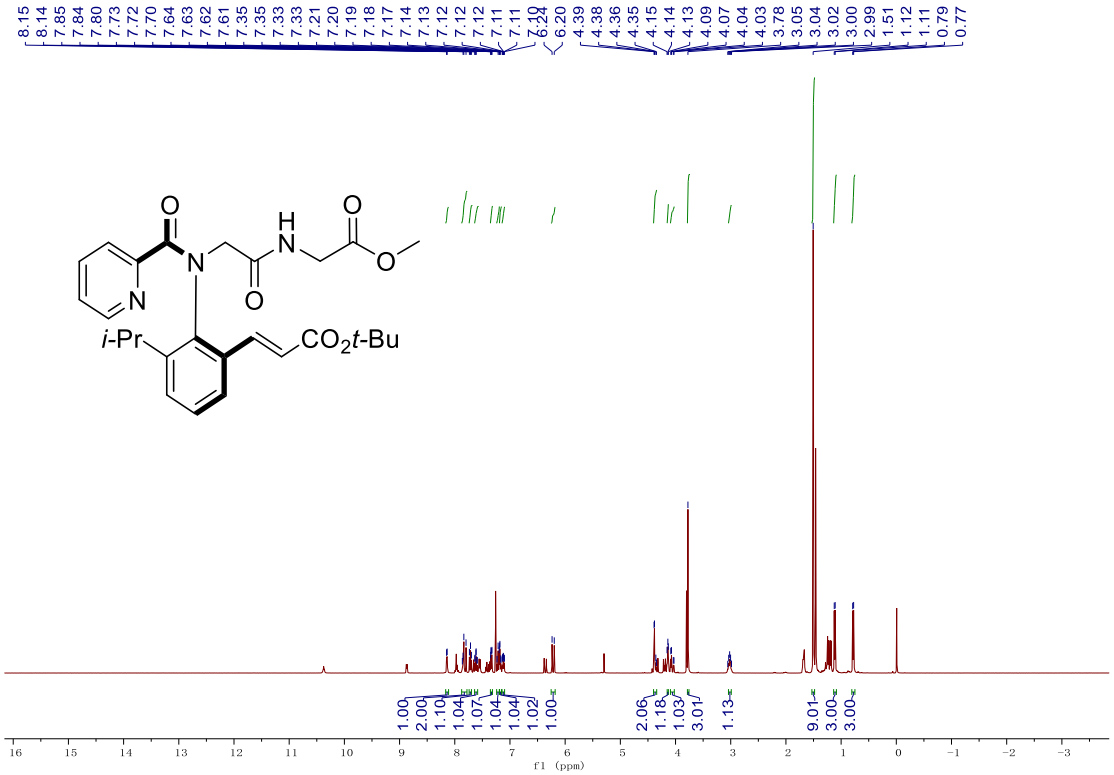
4b-^{1}H NMR



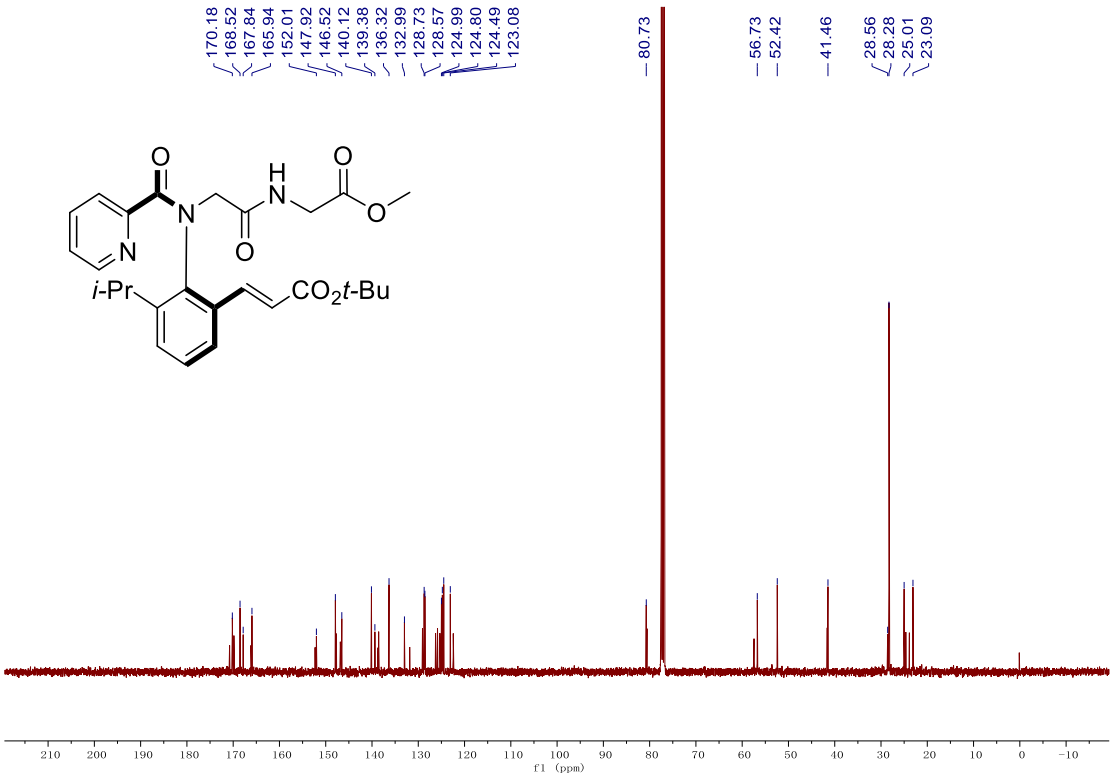
4b-^{13}C NMR



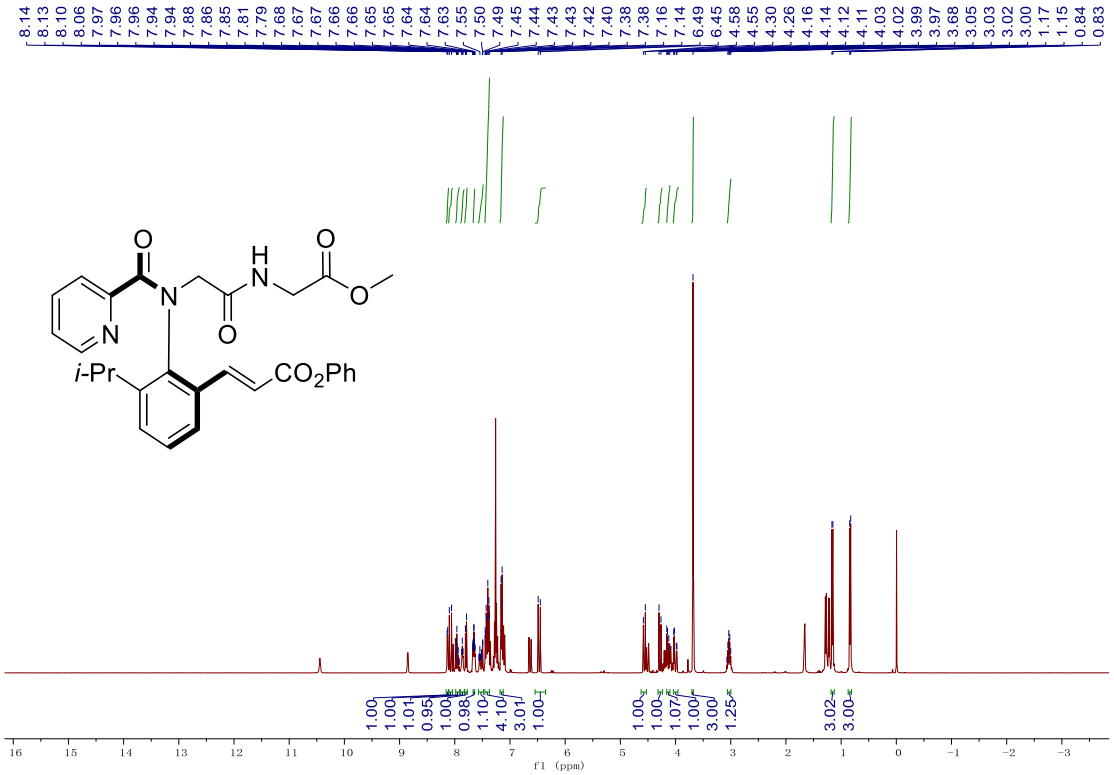
4c-^{1}H NMR



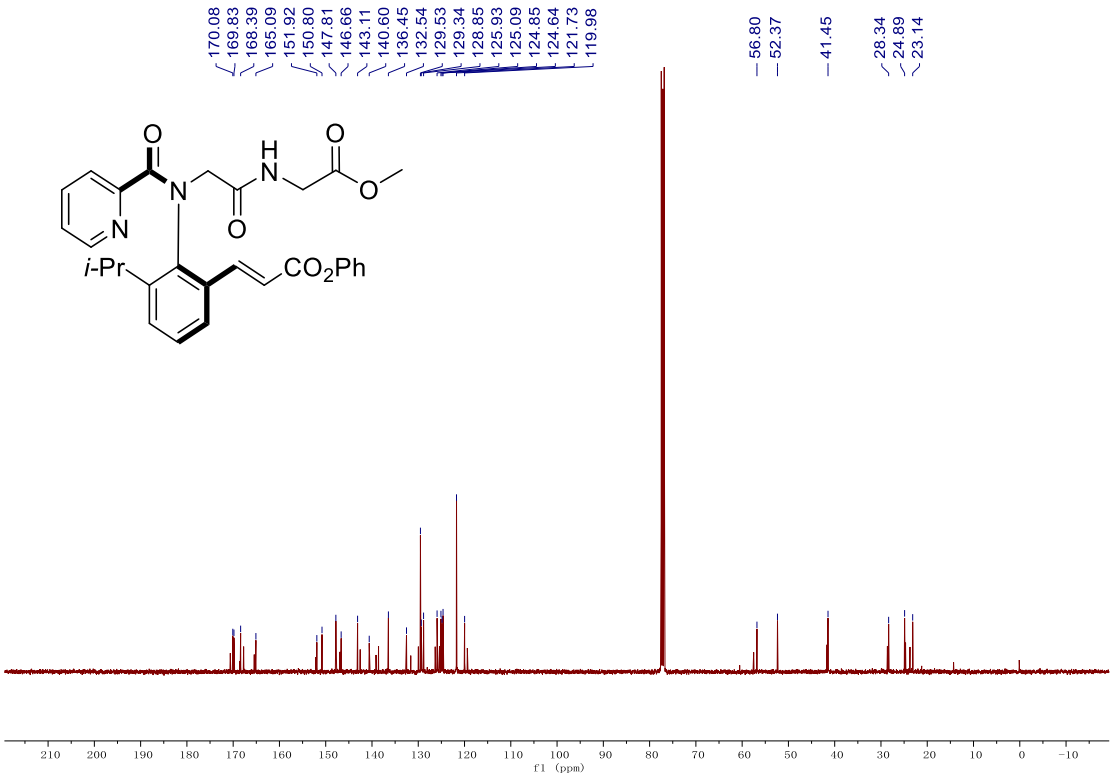
4c-^{13}C NMR



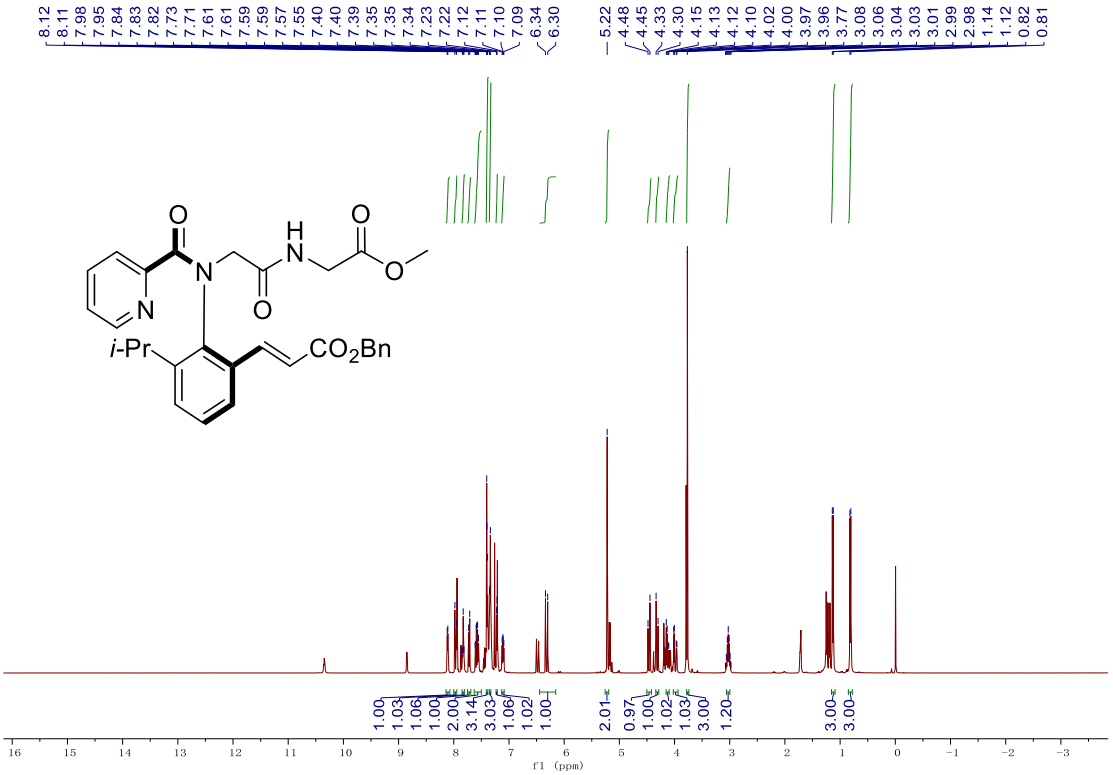
4d-^{1}H NMR



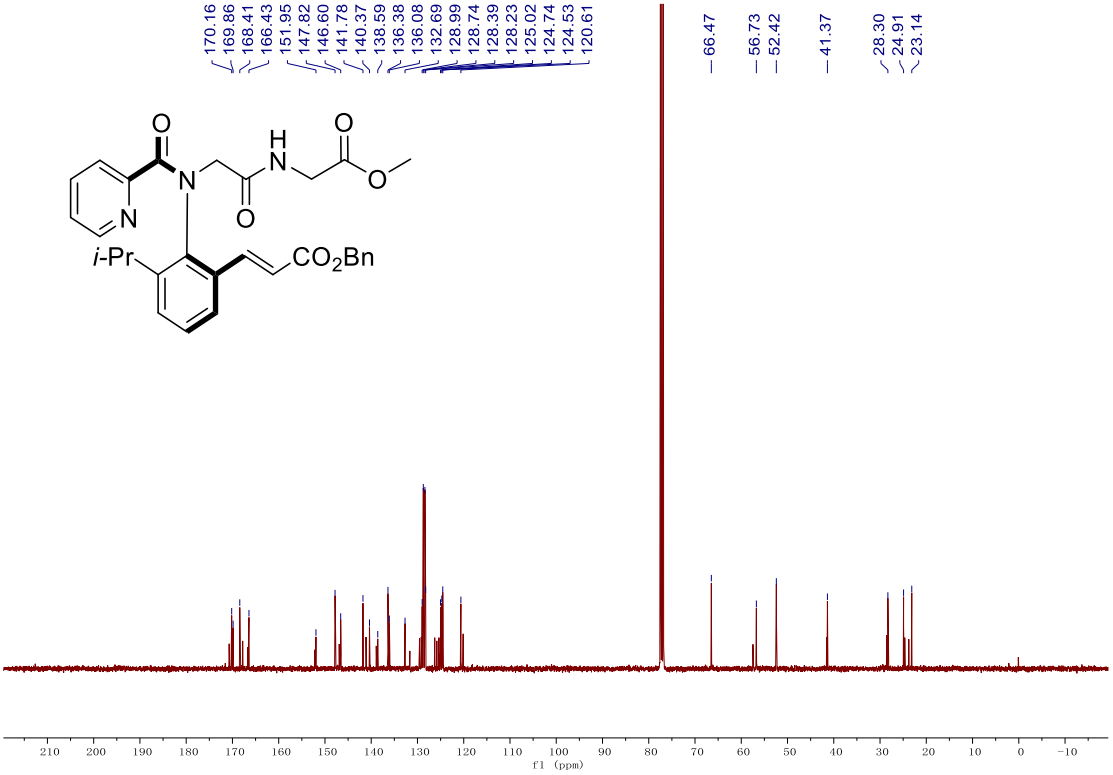
4d-^{13}C NMR



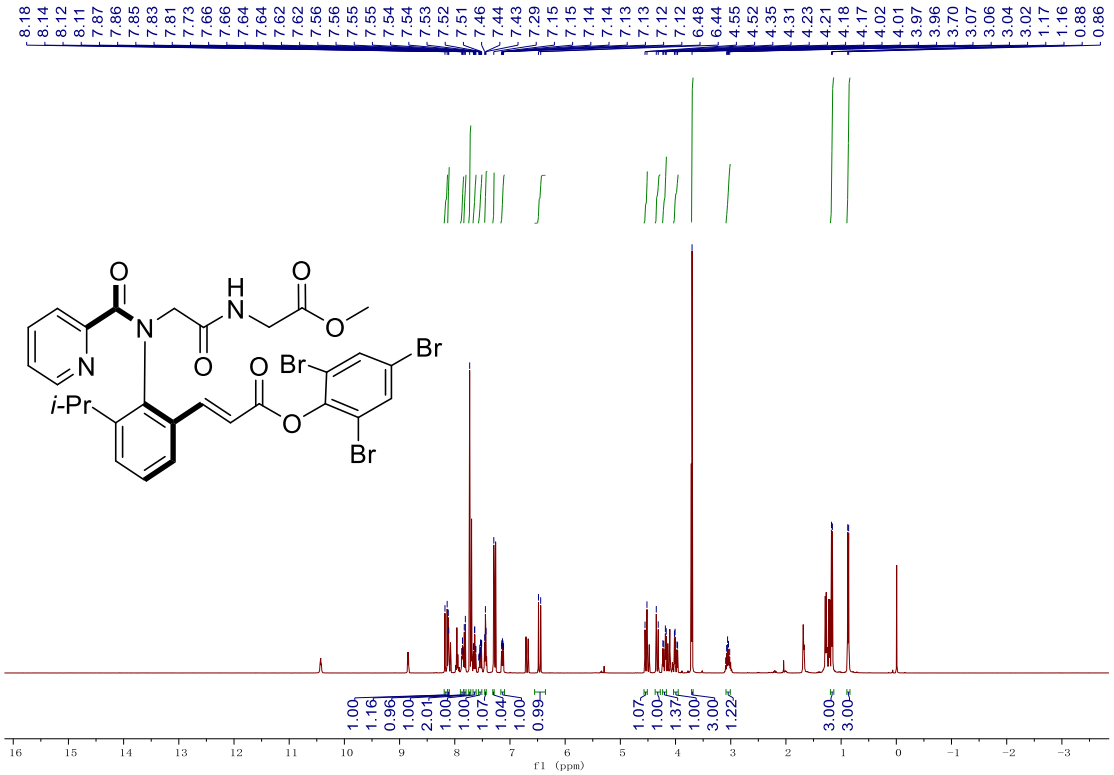
4e-^{1}H NMR



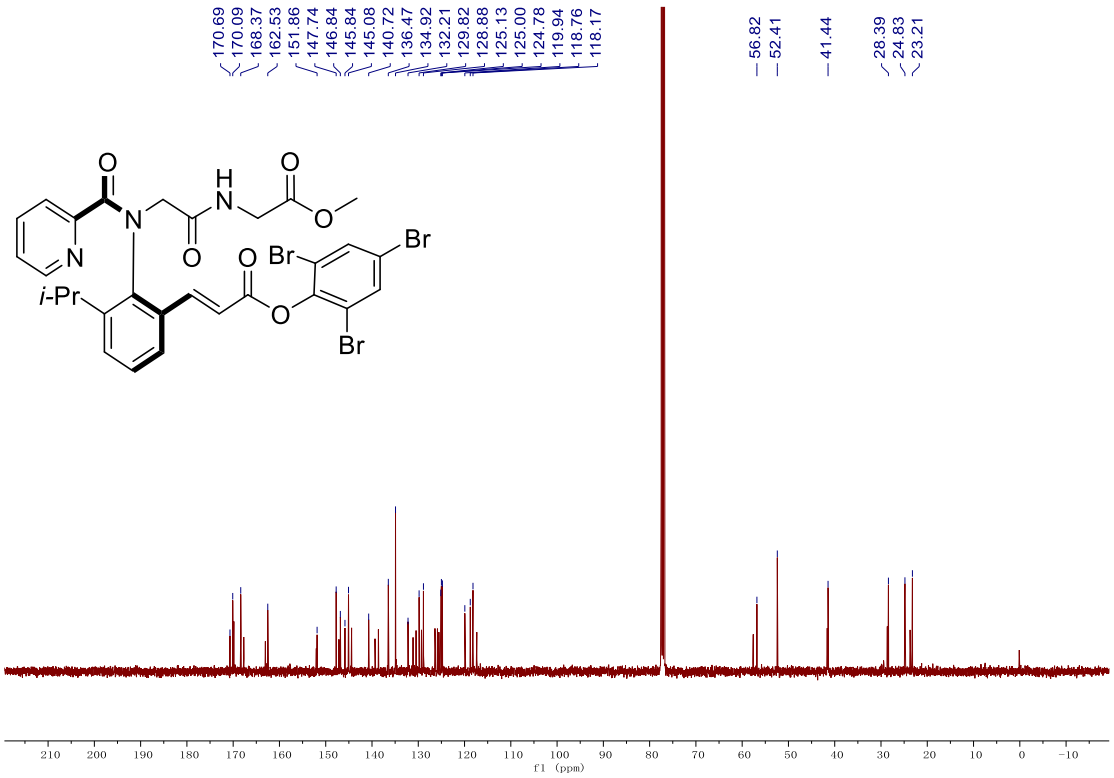
4e-^{13}C NMR



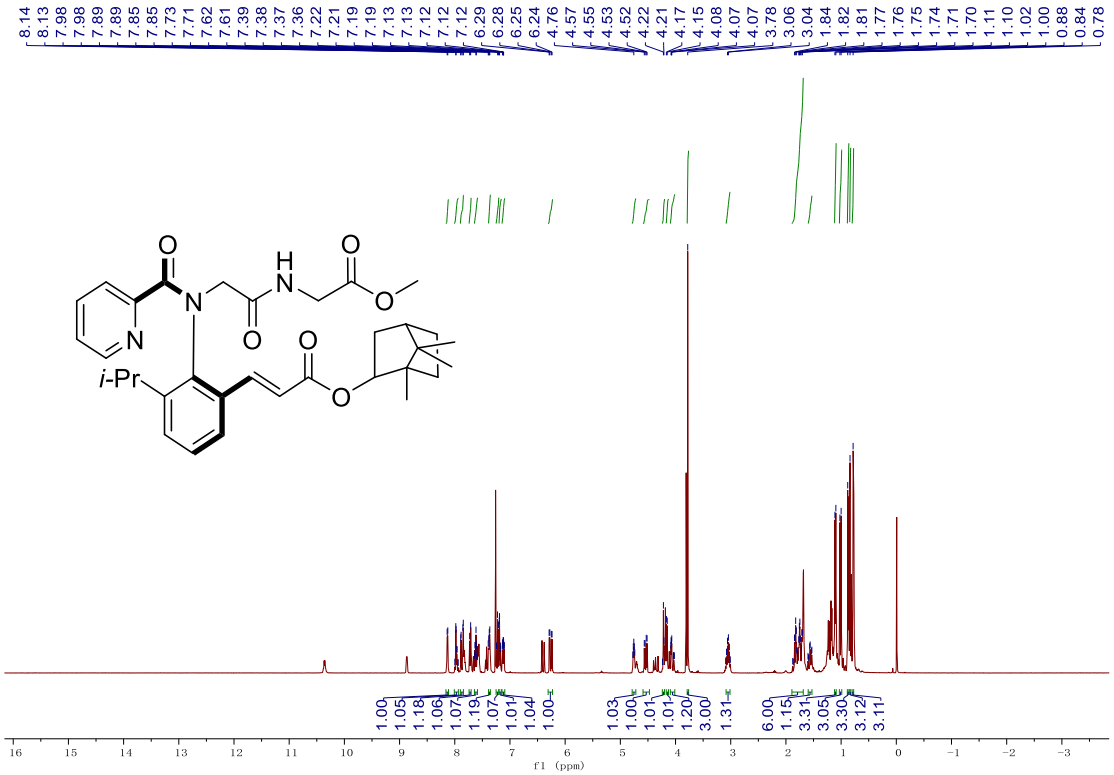
4f-^{1}H NMR



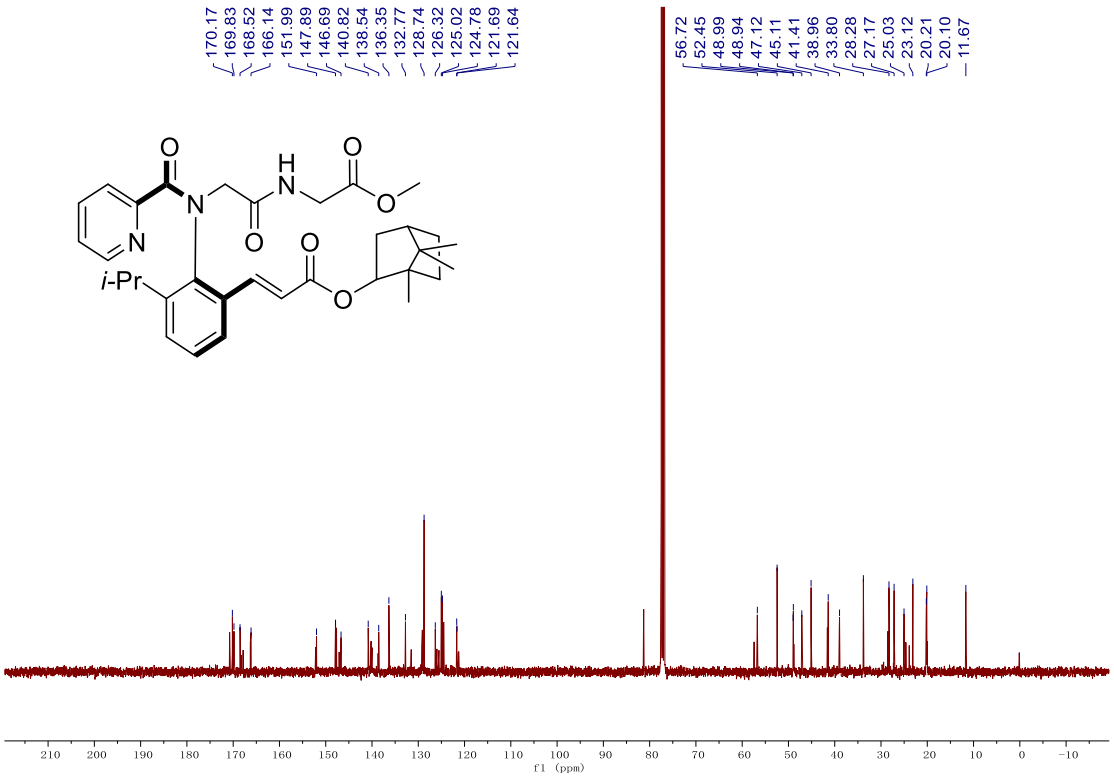
4f-^{13}C NMR



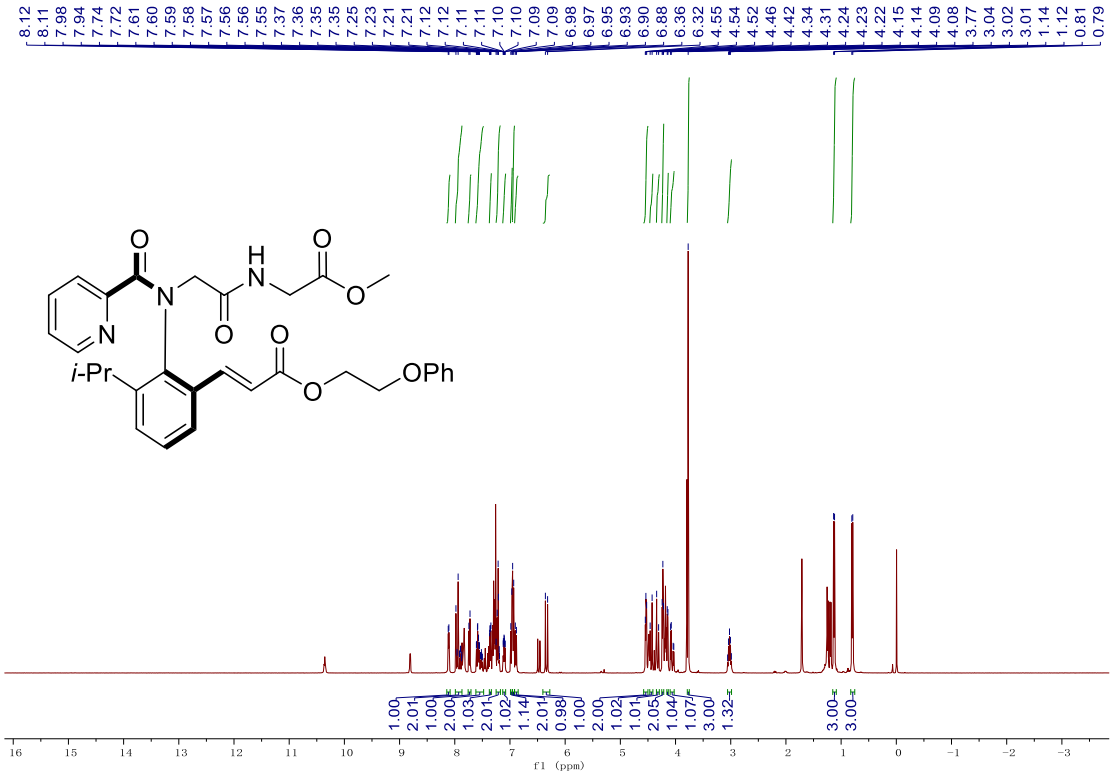
4g-^{1}H NMR



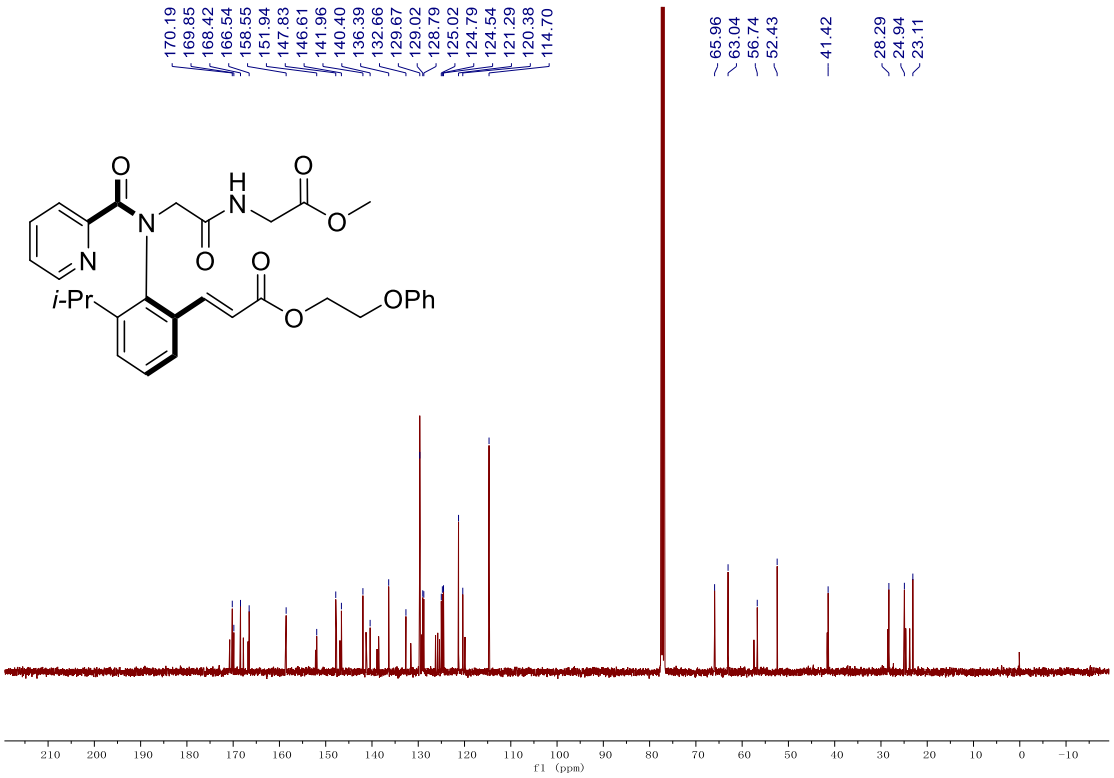
4g-^{13}C NMR



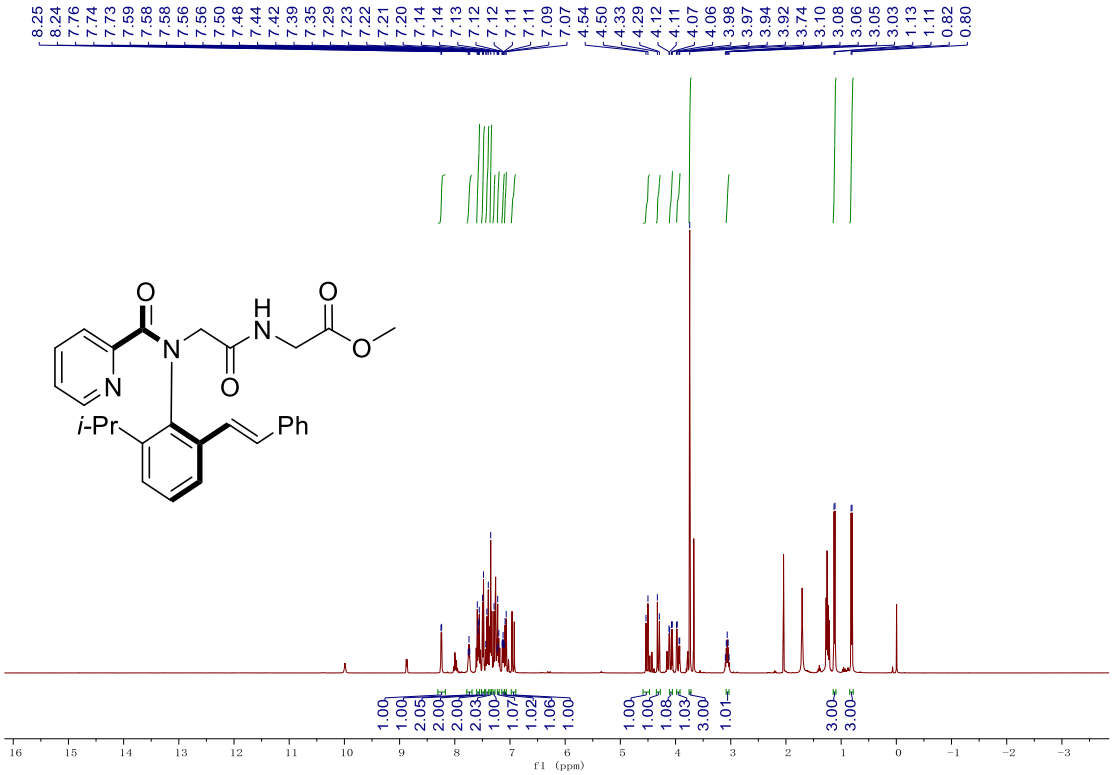
4h-^{1}H NMR



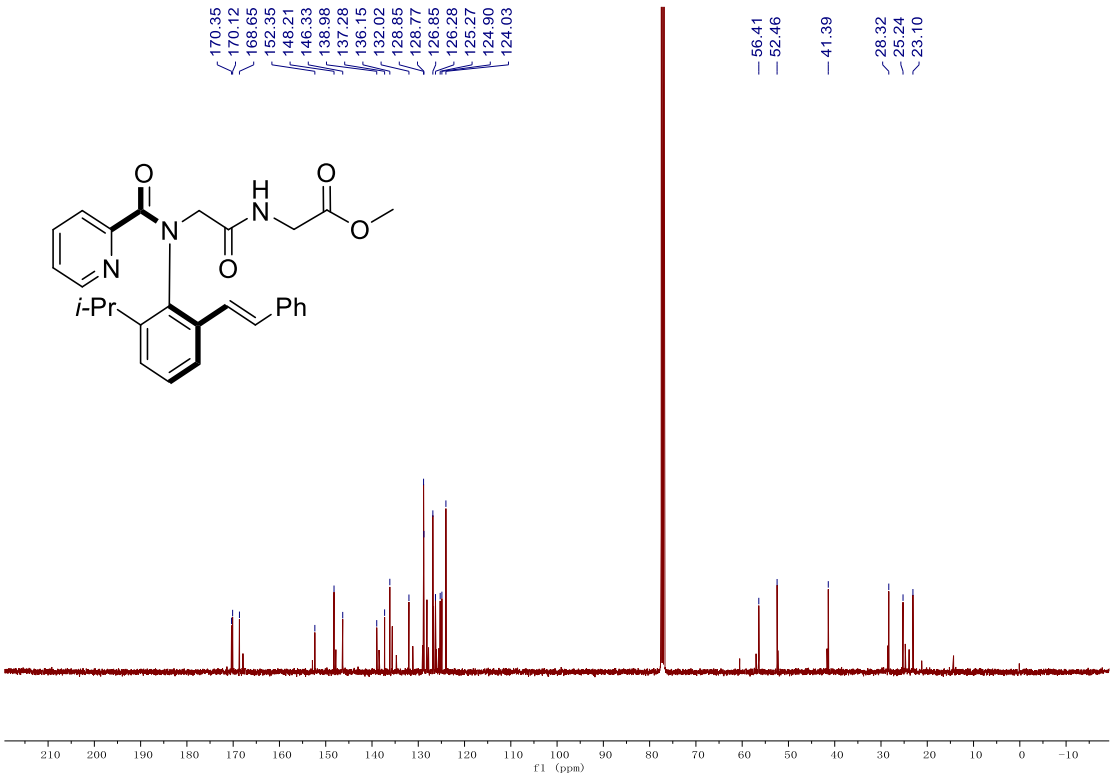
4h-^{13}C NMR



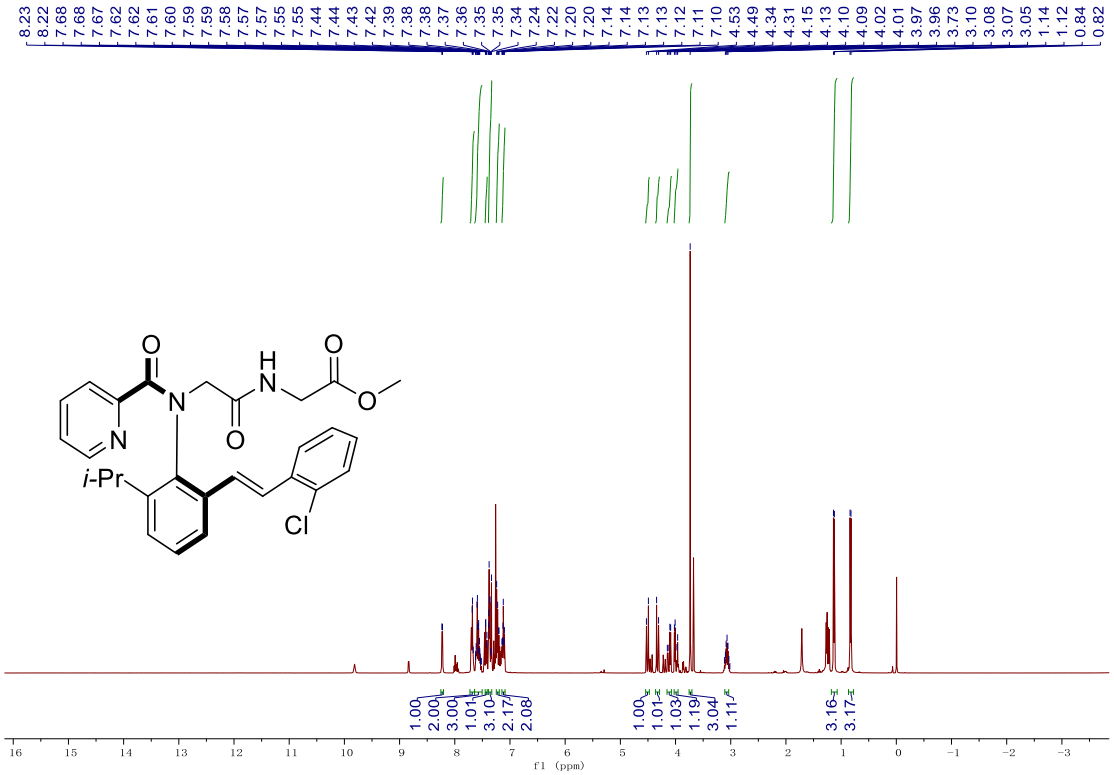
4i-^{1}H NMR



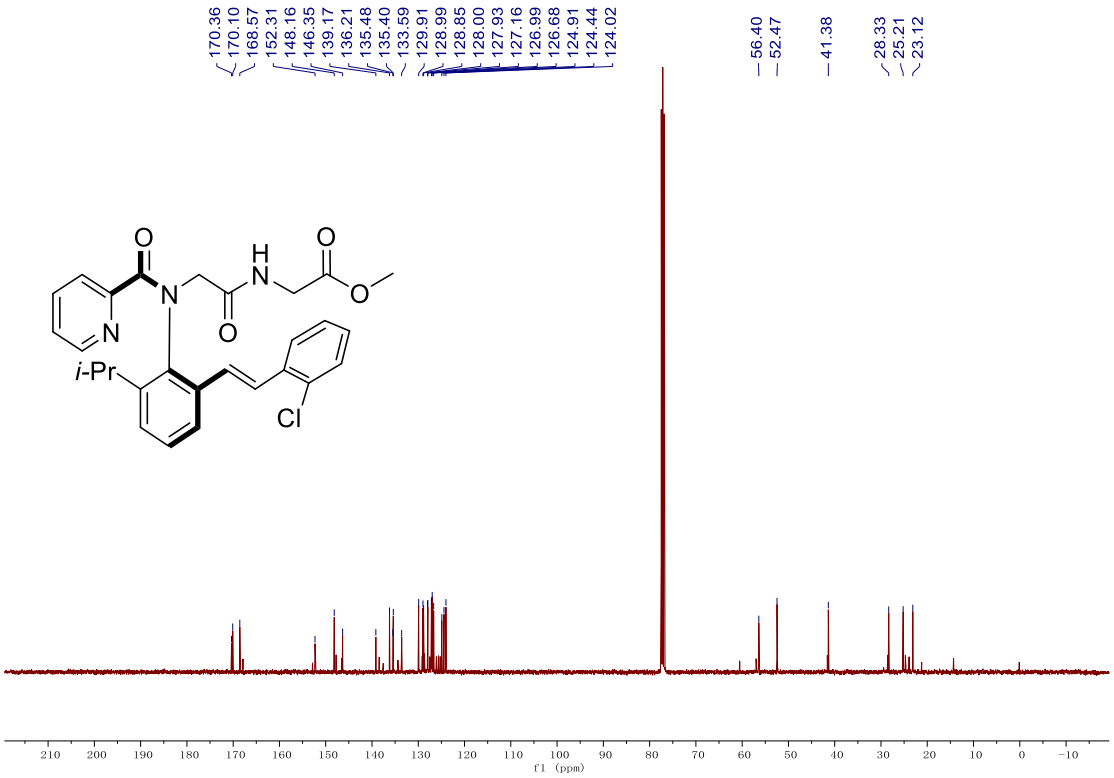
4i-^{13}C NMR



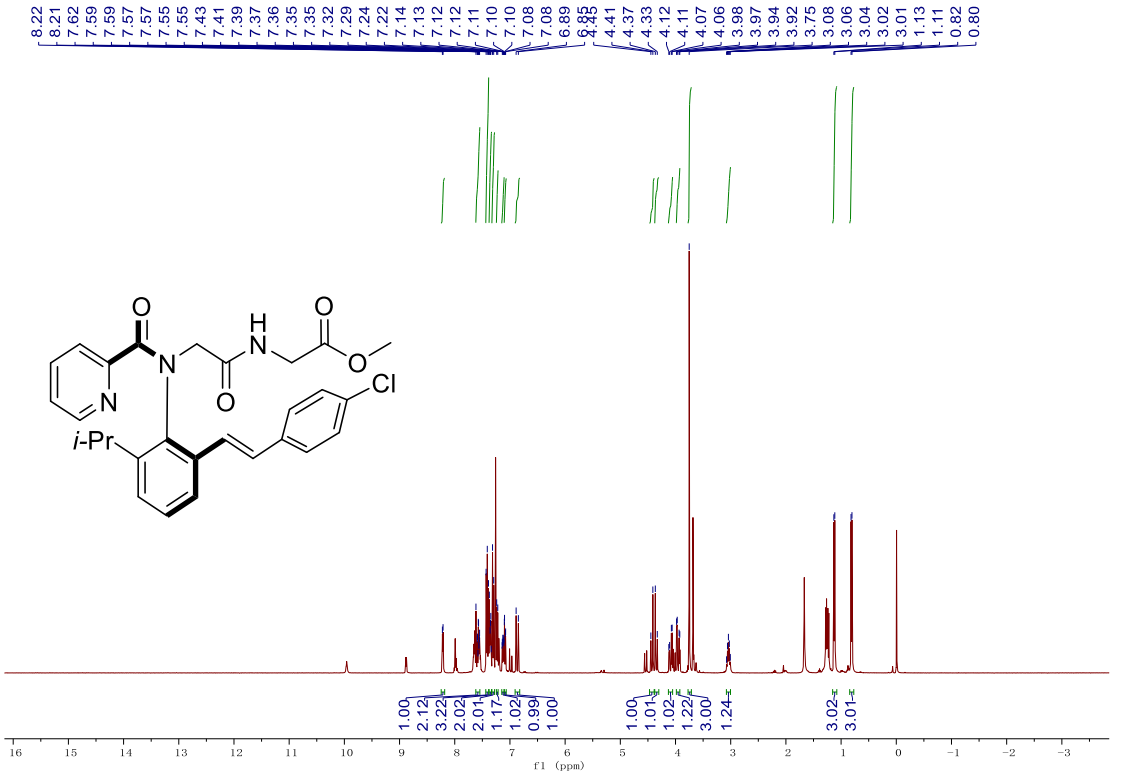
4j-^{1}H NMR



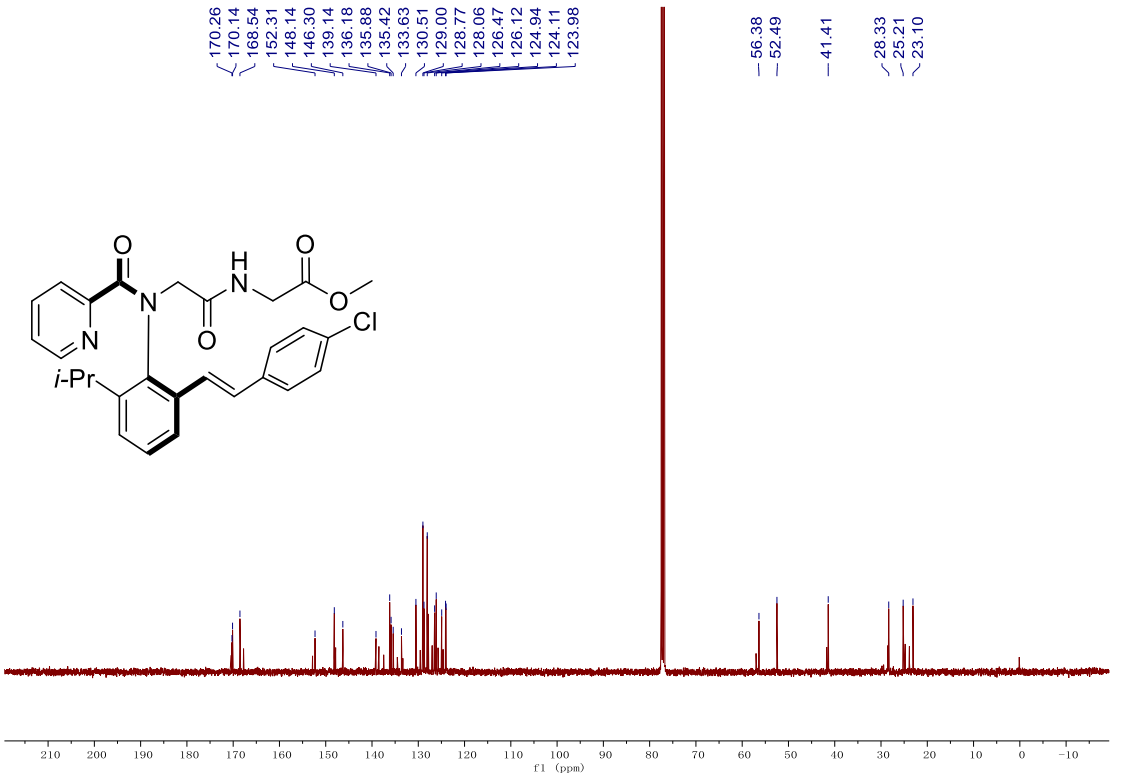
4j-^{13}C NMR



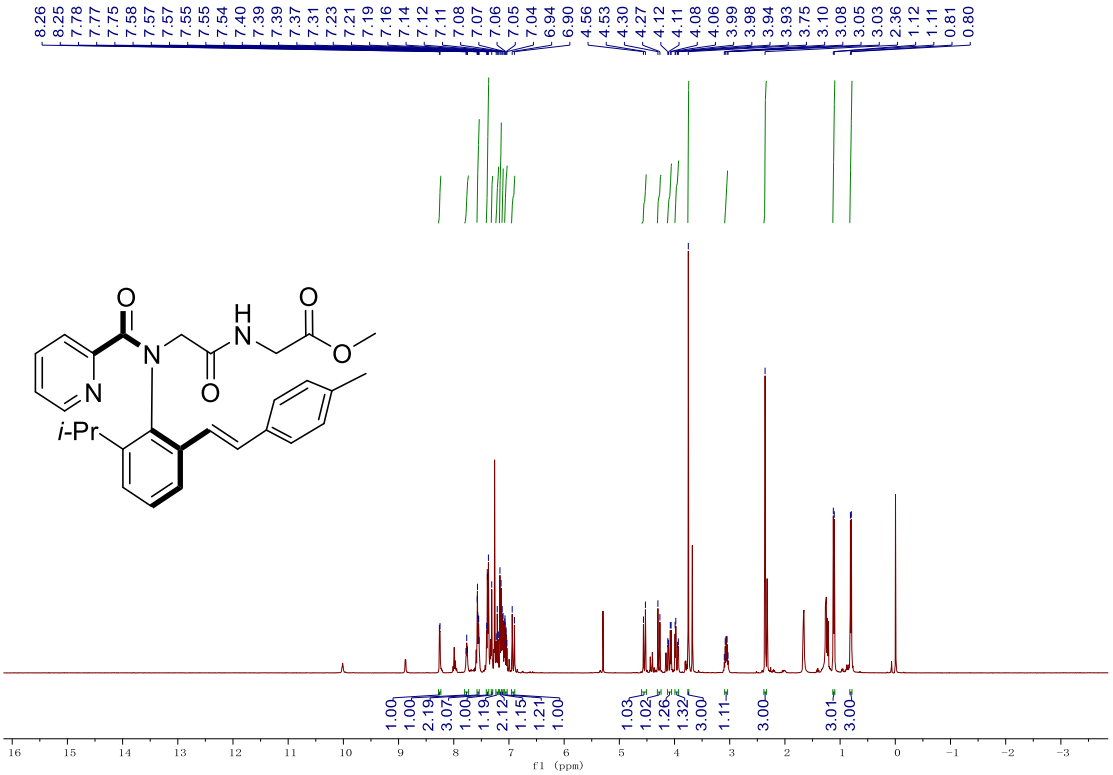
4k-^{1}H NMR



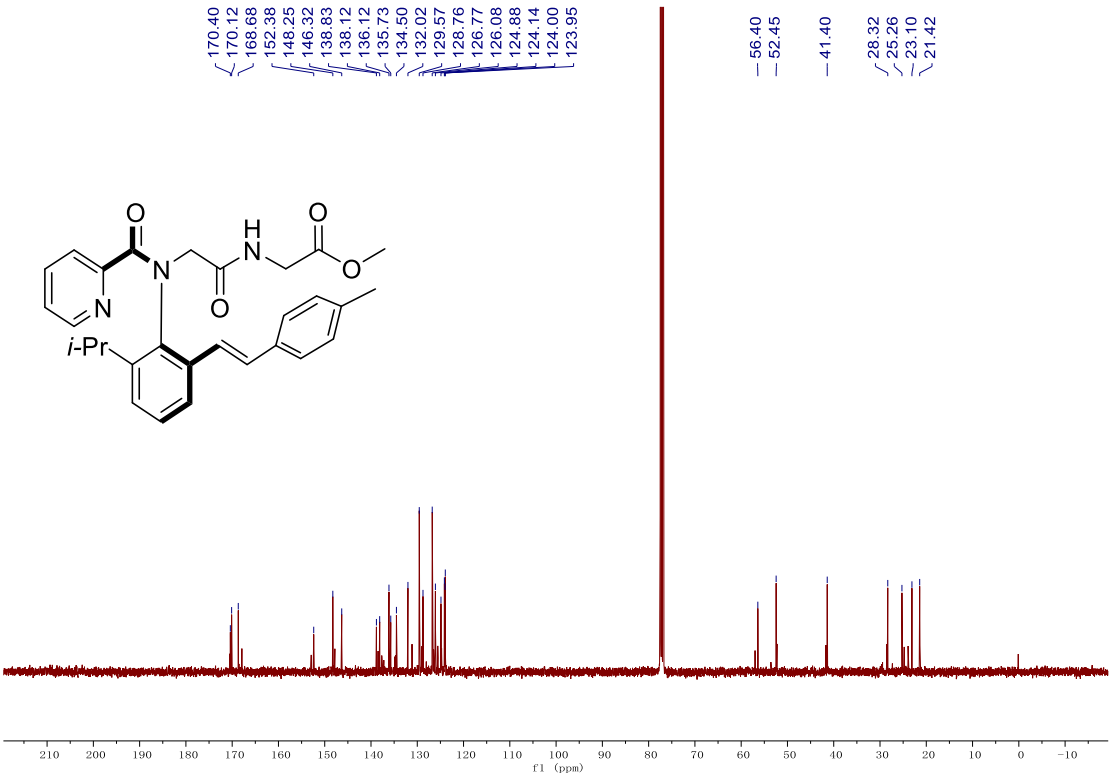
4k-^{13}C NMR



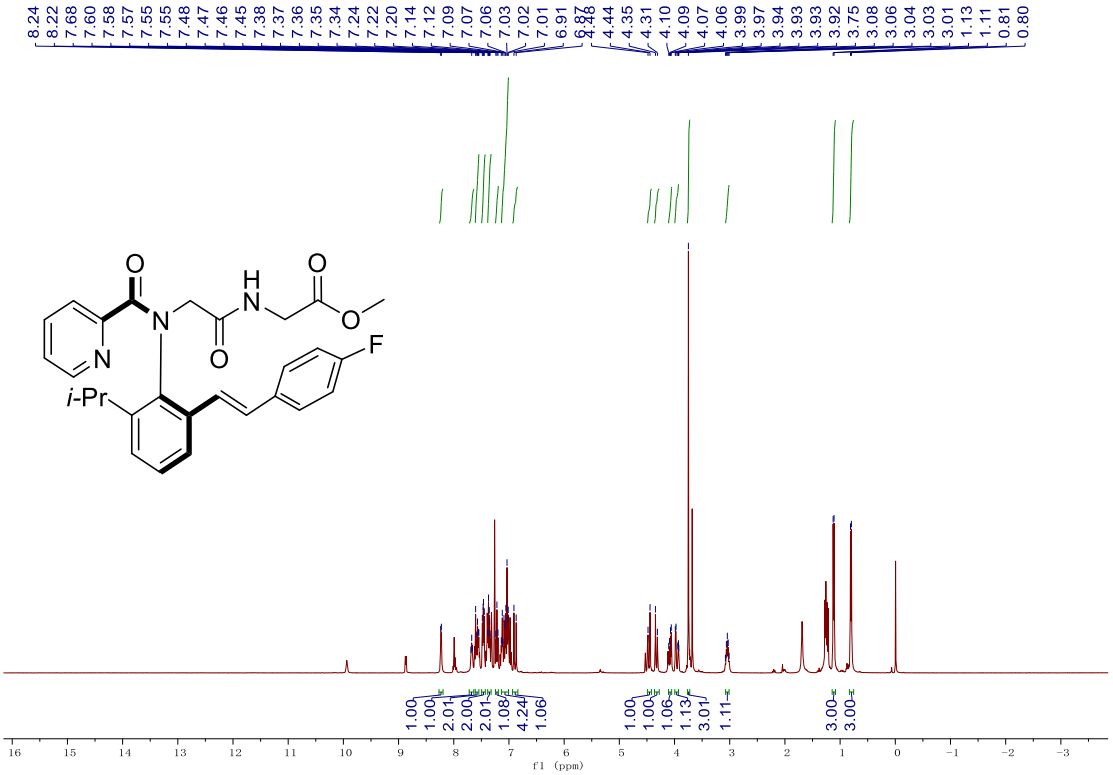
4l-^{1}H NMR



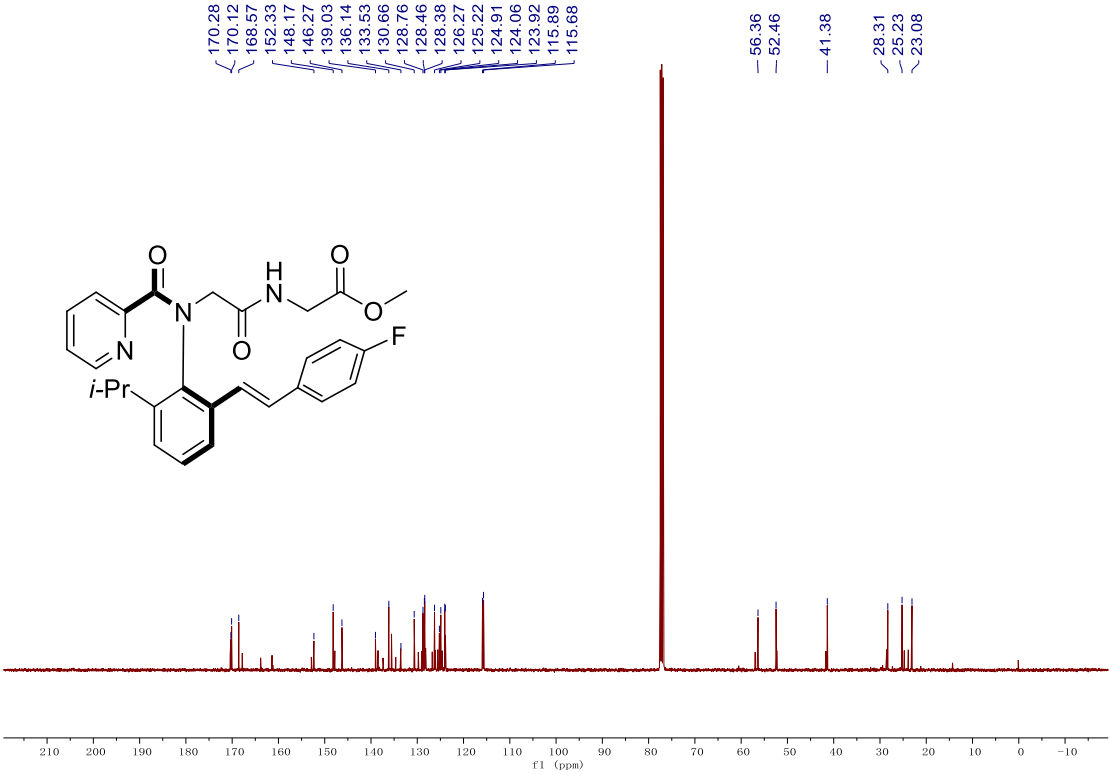
4l-^{13}C NMR



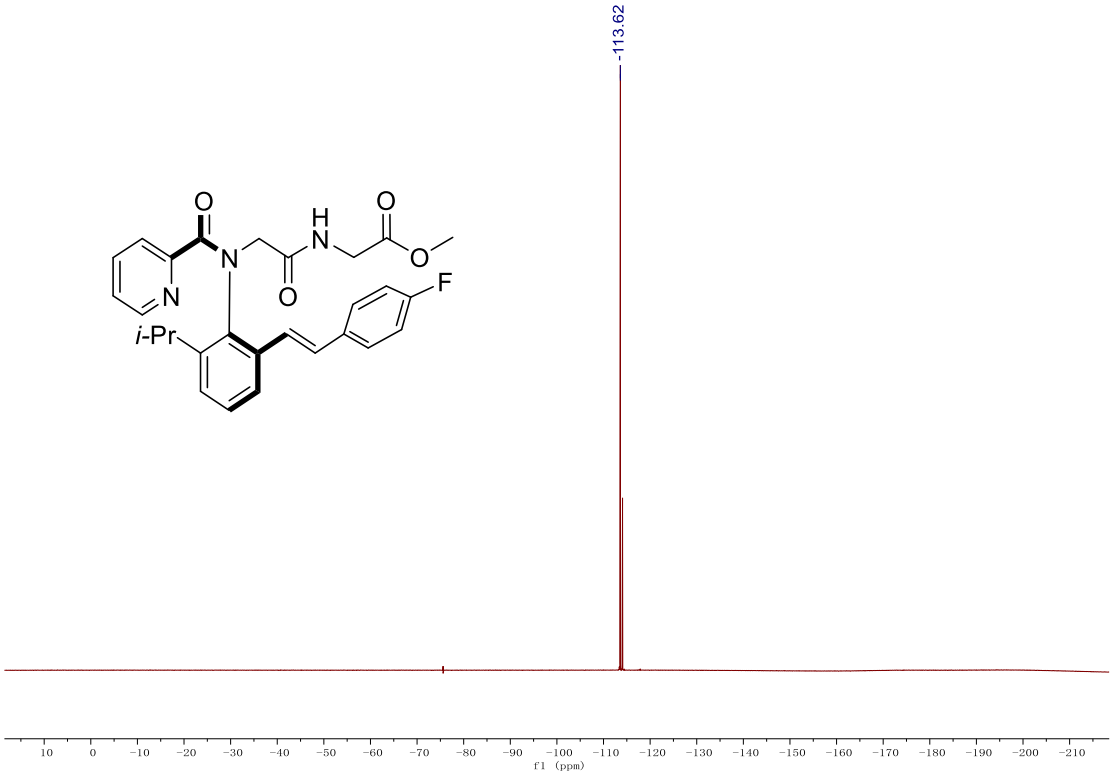
4m-^{1}H NMR



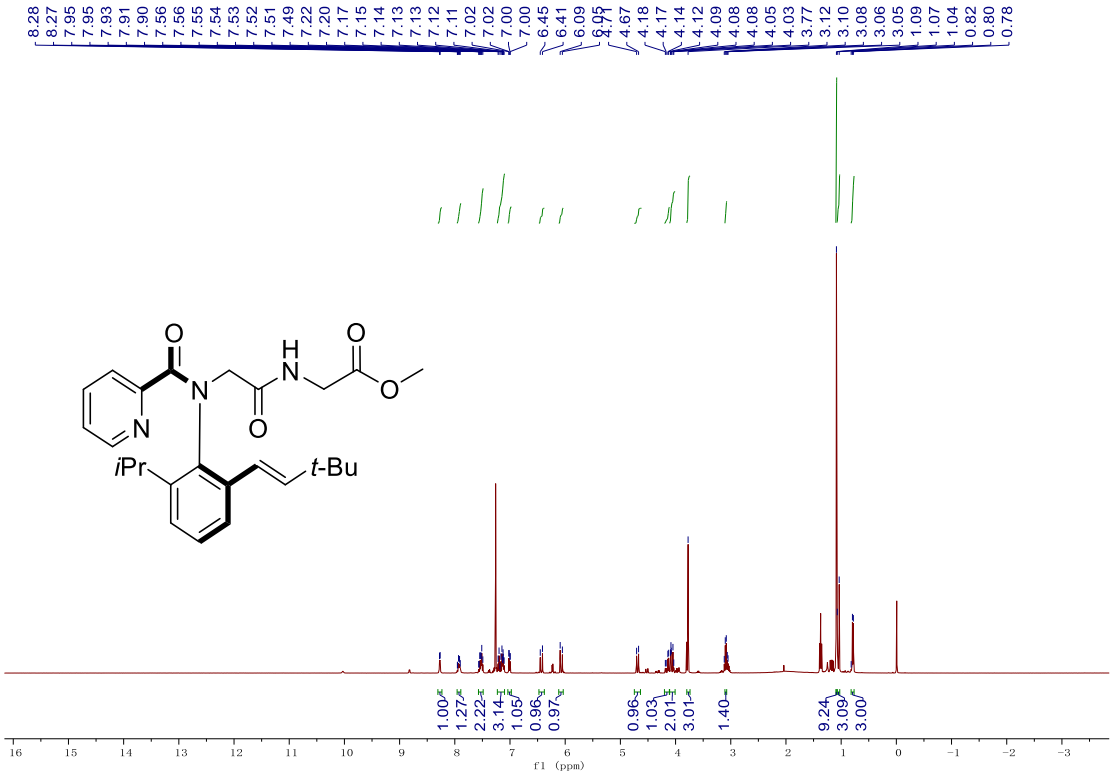
4m-^{13}C NMR



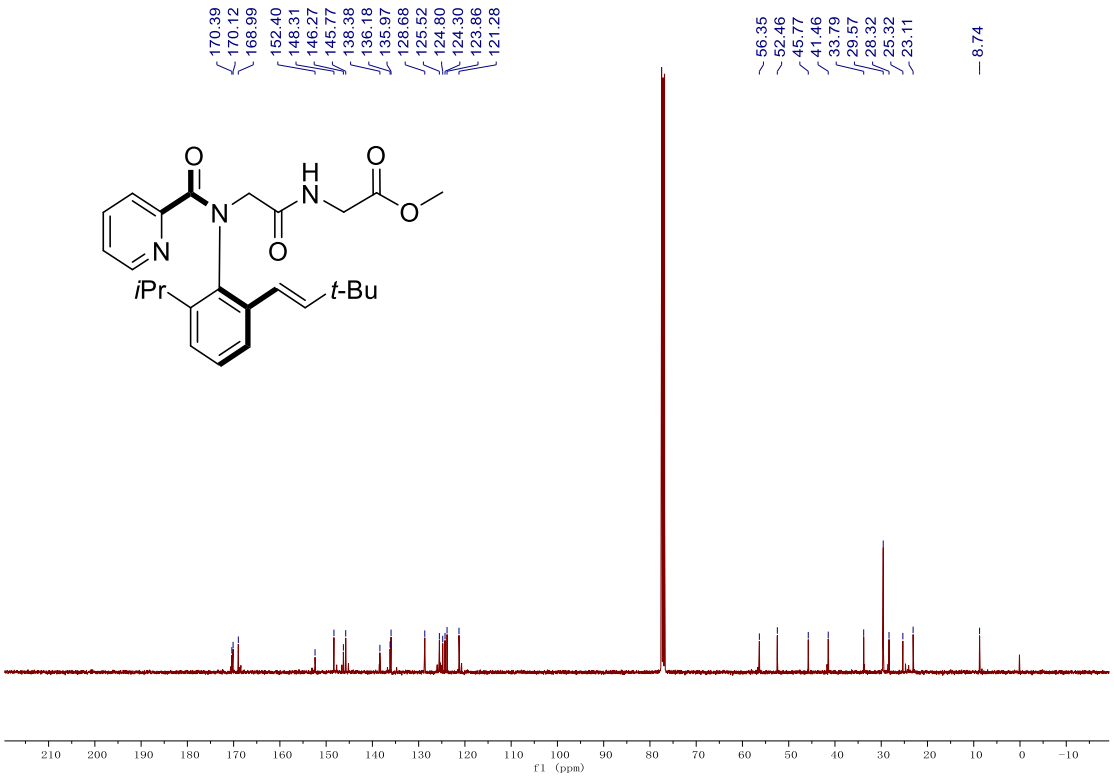
4m-^{19}F


-113.62
O
H
N
O
N
O
O
F
N
i-Pr
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)

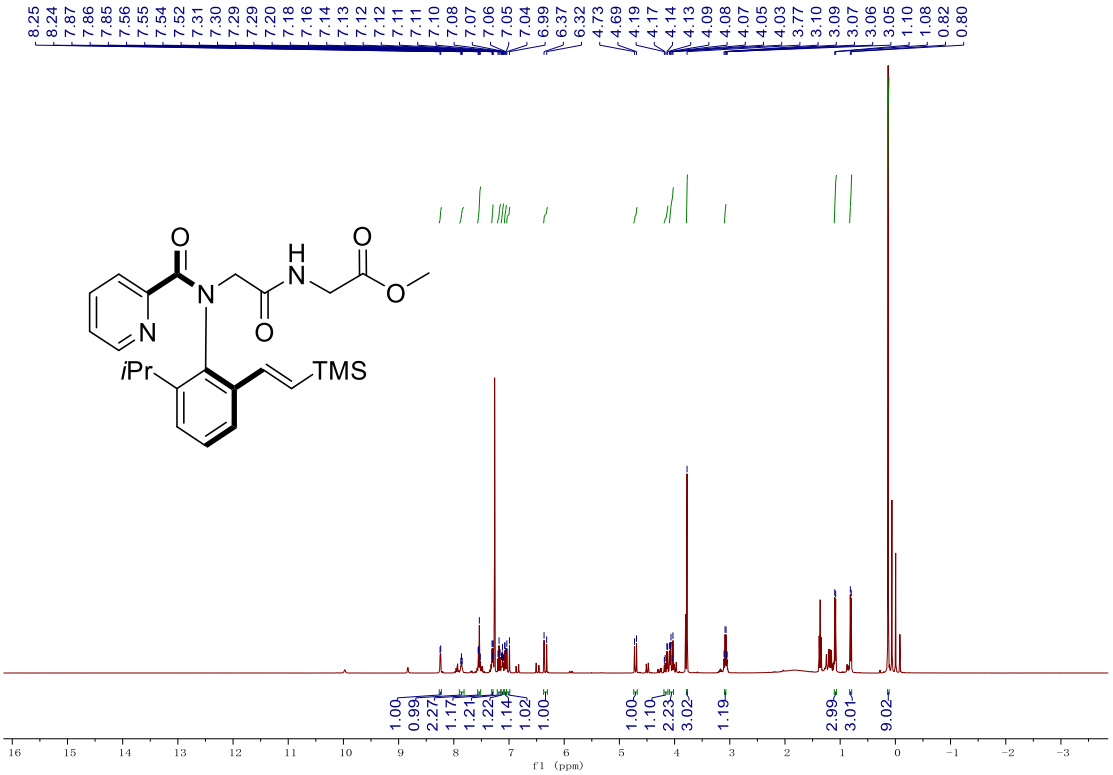
4n-^{1}H NMR



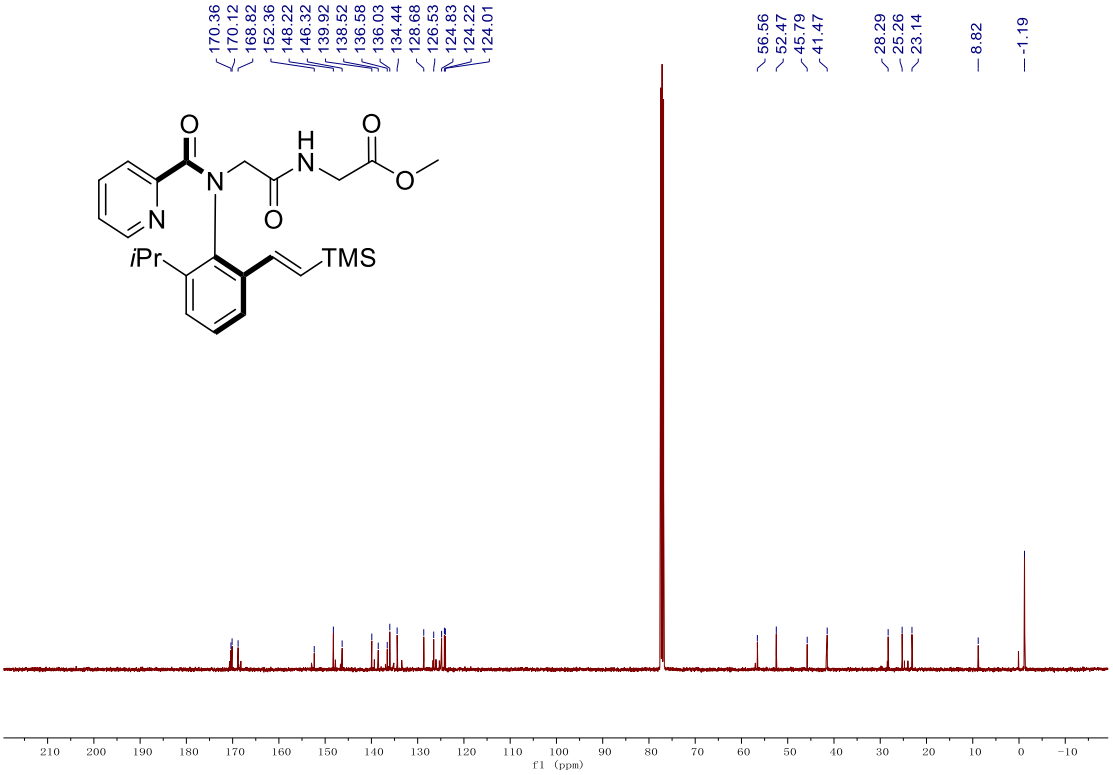
4n-^{13}C NMR



4o-^{1}H NMR



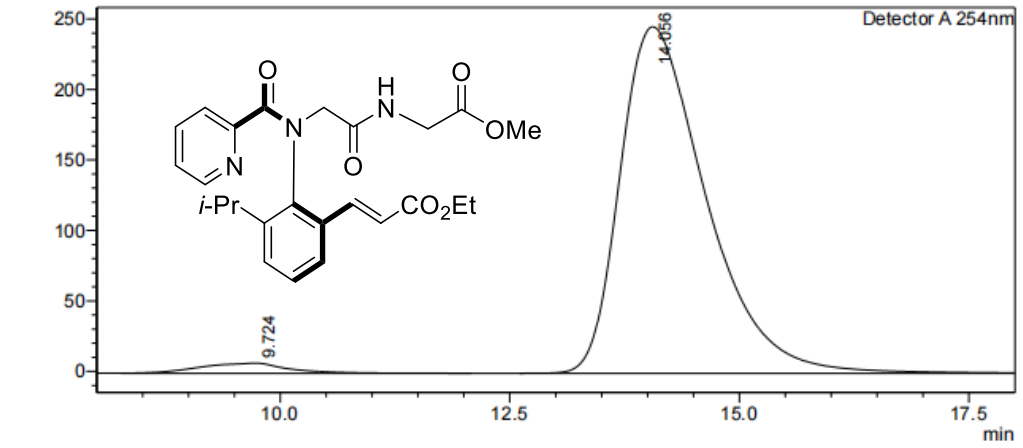
4o-^{13}C NMR



5. Copies of HPLC Analysis

3a: OD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>



<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	9.724	480798	7211	2.910			
2	14.056	16043337	245651	97.090			
Total		16524135	252862				

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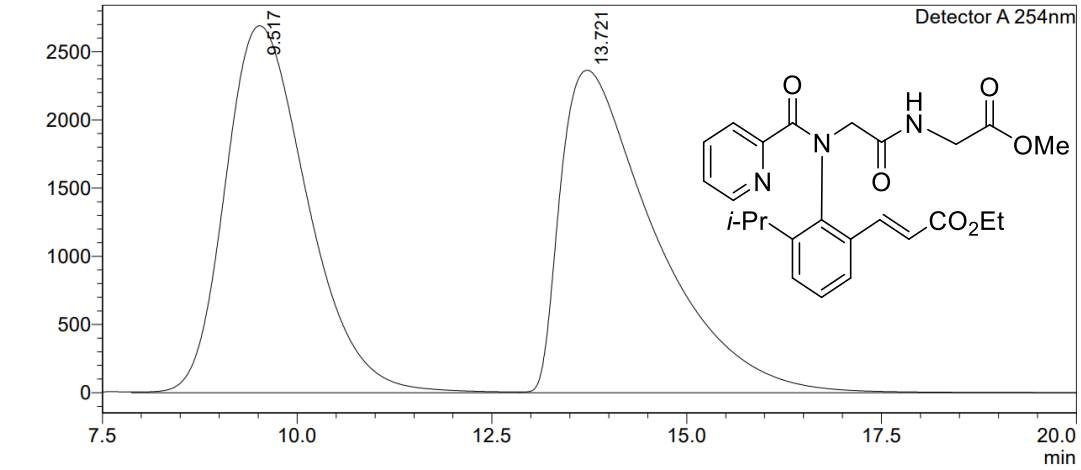


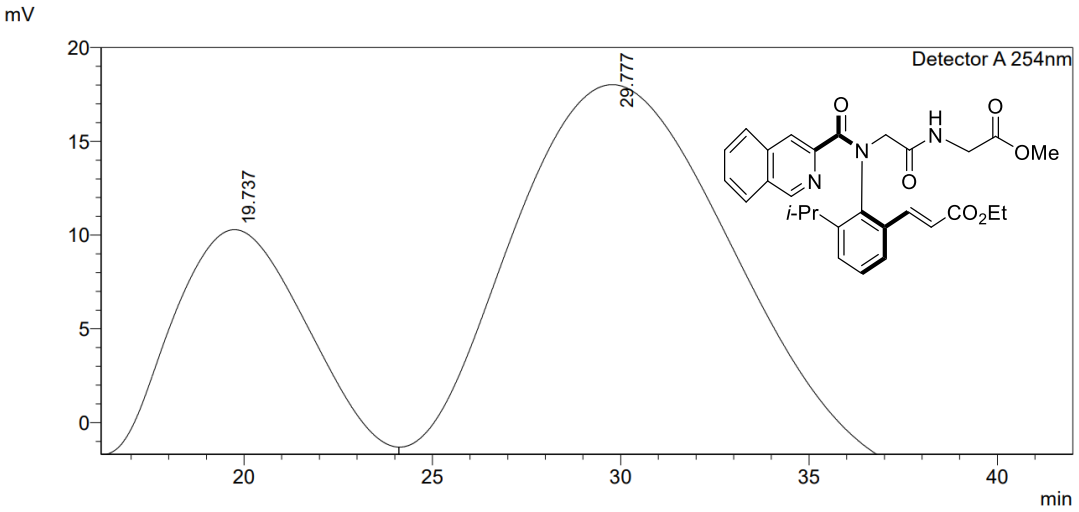
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	9.517	197933119	2691289	49.673			
2	13.721	200538966	2364863	50.327		SV	
Total		398472085	5056151				

3b: AD-H, Hexane/i-PrOH =70/30, rate = 1.0 mL/min, 254 nm

<Chromatogram>



<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	19.737	3609647	13513	28.475			
2	29.777	9066737	21343	71.525		V	
Total		12676384	34855				

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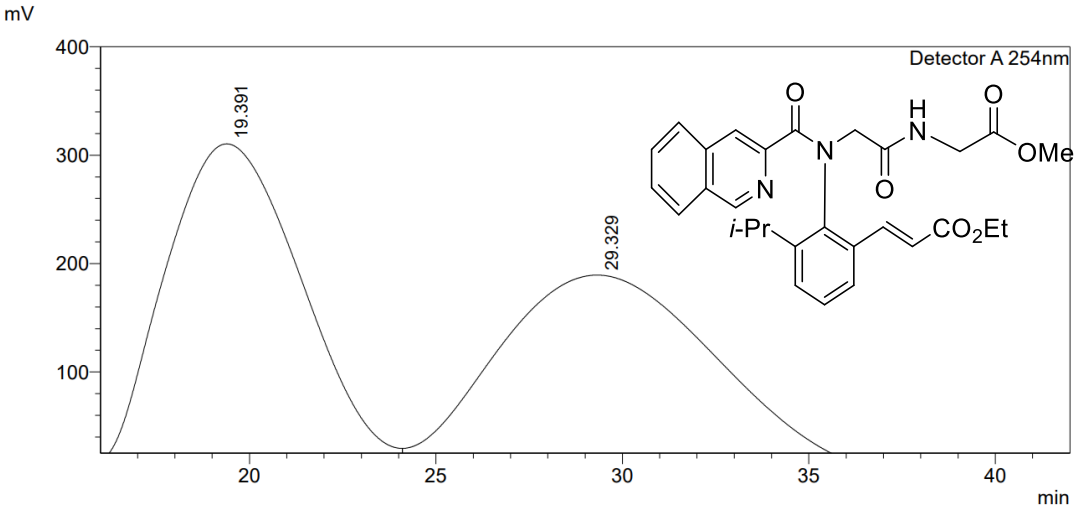

<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	19.391	84906185	312881	50.490			
2	29.329	83259028	192168	49.510		V	
Total		168165213	505049				

3c: OD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

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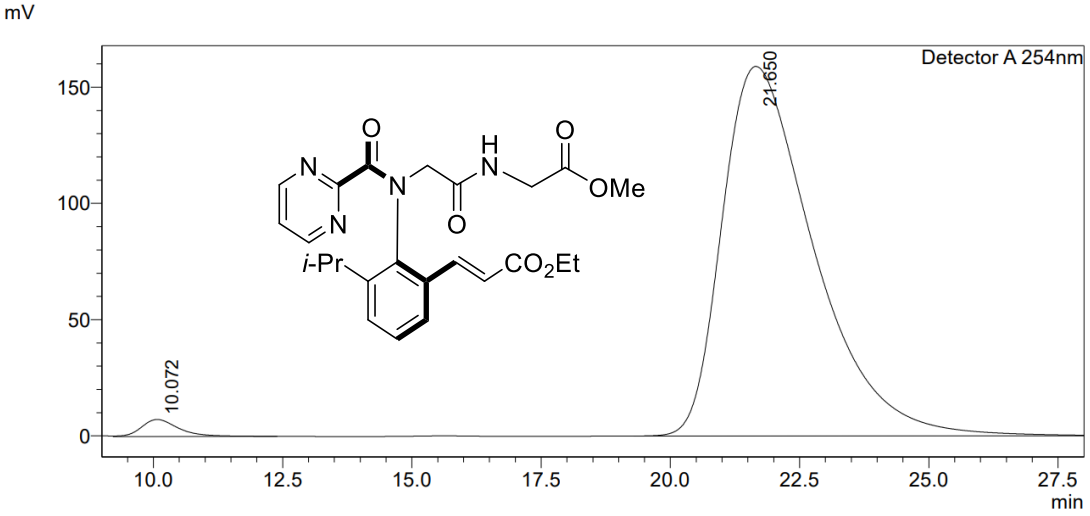
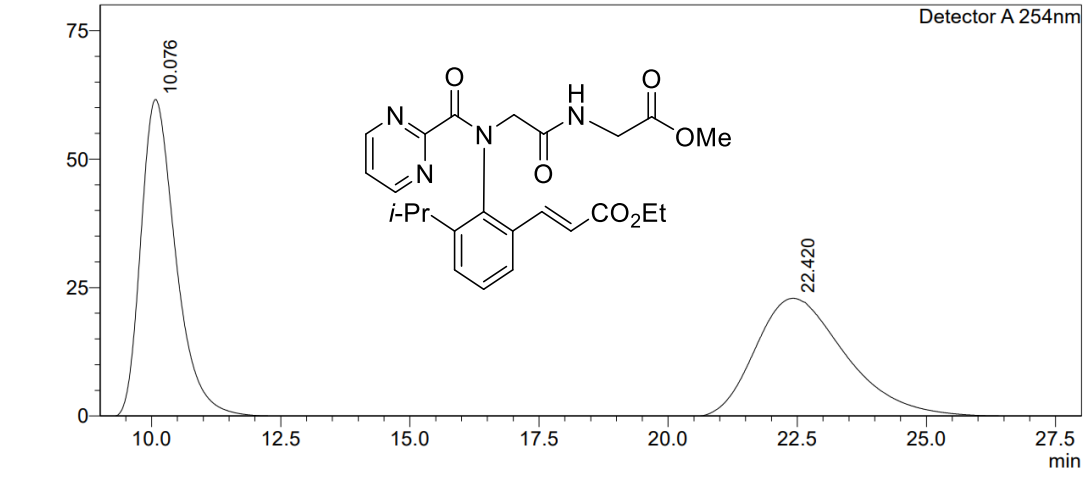


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	10.072	364067	7315	1.815			
2	21.650	19696748	159009	98.185			
Total		20060815	166324				

<Chromatogram>



<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	10.076	2973468	62025	50.530			
2	22.420	2911075	23307	49.470			
Total		5884543	85332				

3d: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

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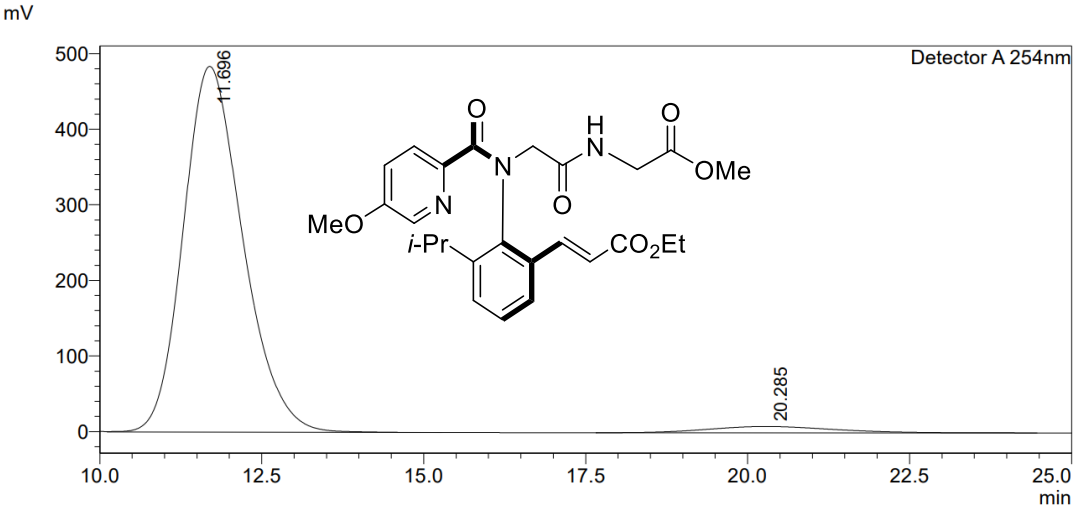

<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	11.696	31023116	483938	96.507			
2	20.285	1123004	8333	3.493			
Total		32146119	492271				

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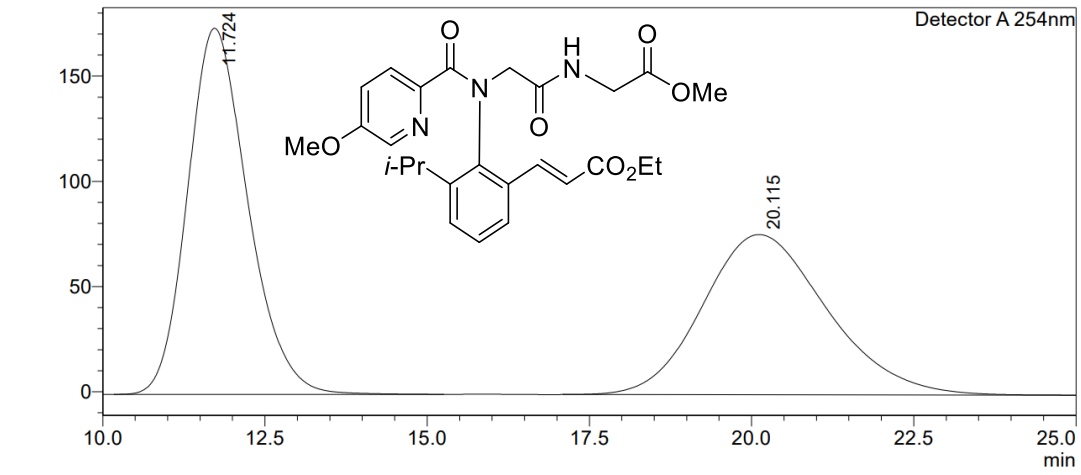

<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	11.724	11249201	173962	52.519			
2	20.115	10170144	76119	47.481			
Total		21419345	250081				

3e: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

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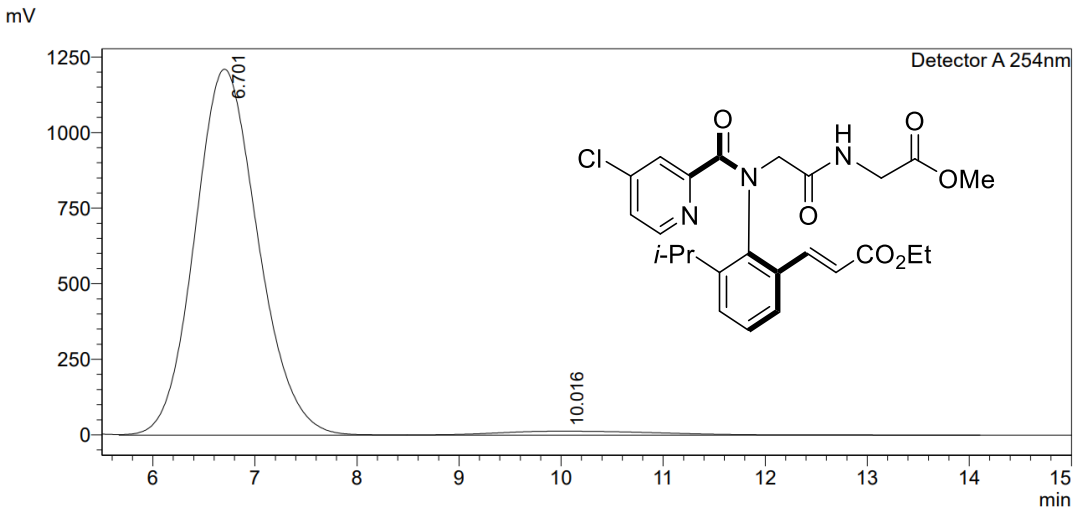

<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	6.701	52205981	1210256	97.348			
2	10.016	1422402	12880	2.652		V	
Total		53628383	1223136				

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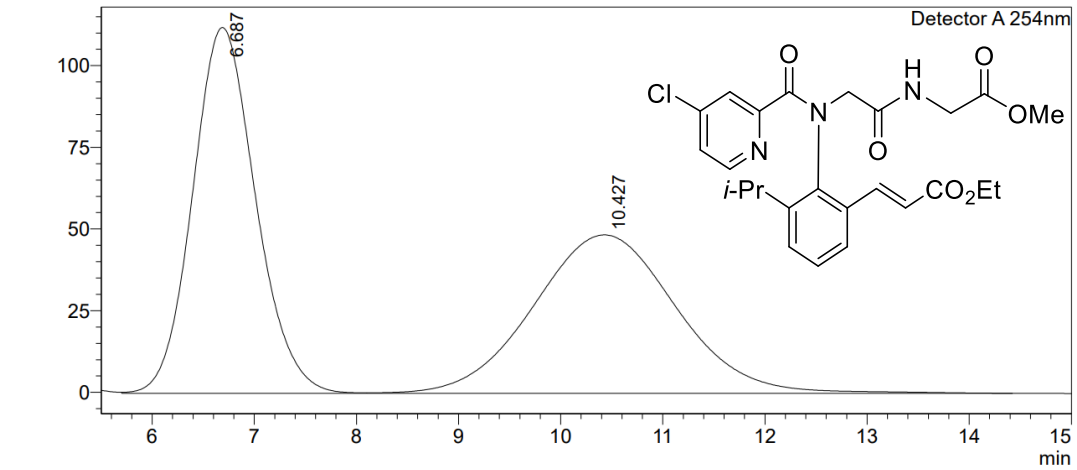


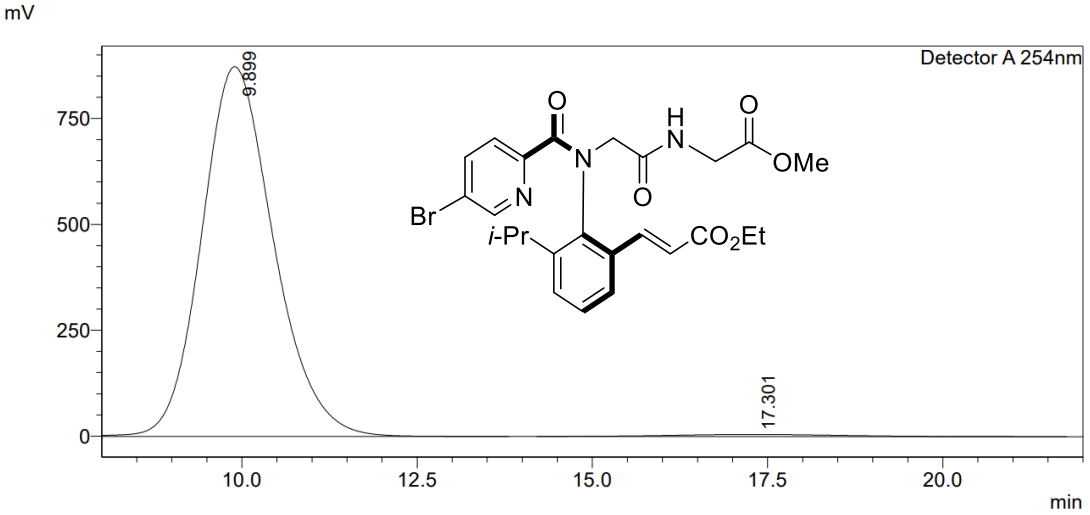
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	6.687	4796728	111928	50.365			
2	10.427	4727147	48478	49.635		V	
Total		9523875	160406				

3f: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>



<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	9.899	62511770	873095	98.700			
2	17.301	823567	4862	1.300			
Total		63335337	877957				

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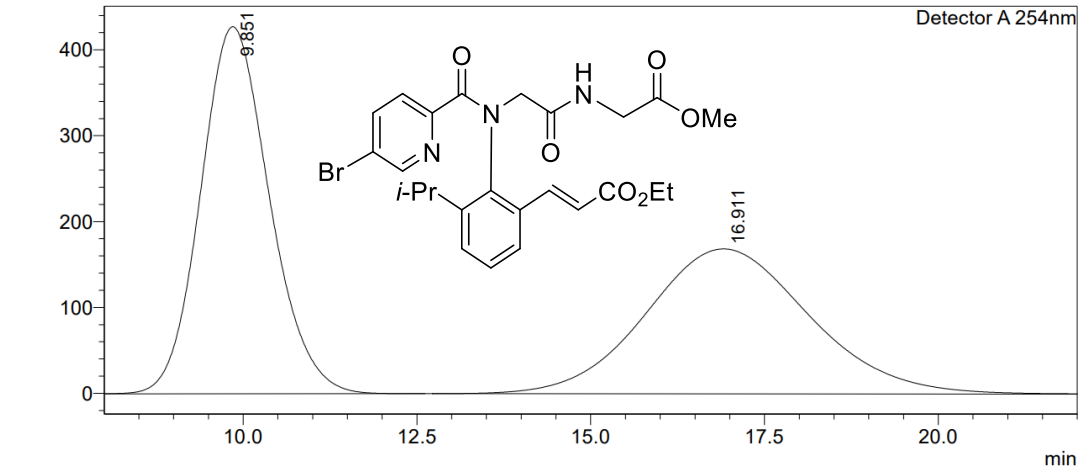

<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	9.851	29475479	427512	51.505			
2	16.911	27753083	168757	48.495			
Total		57228562	596269				

3g: OD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

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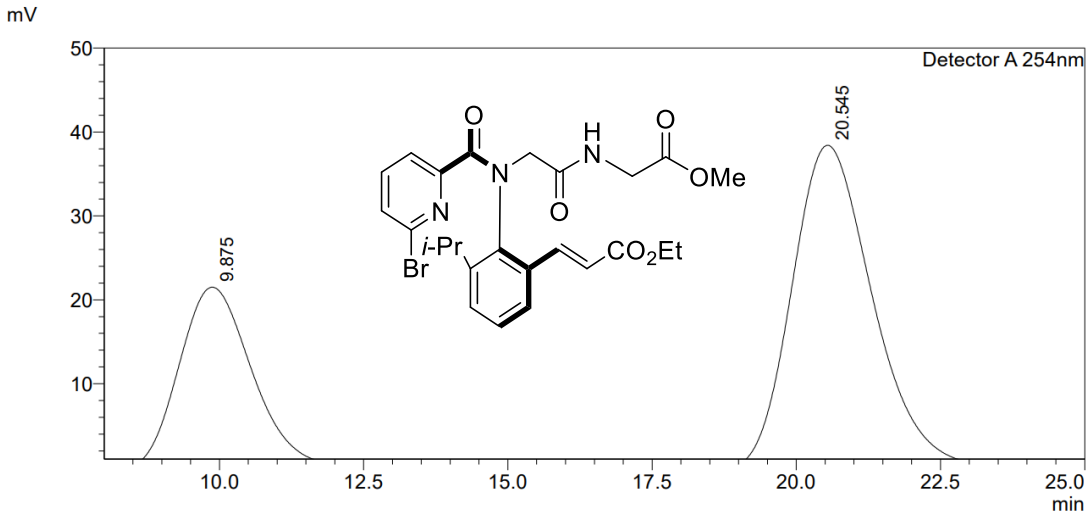
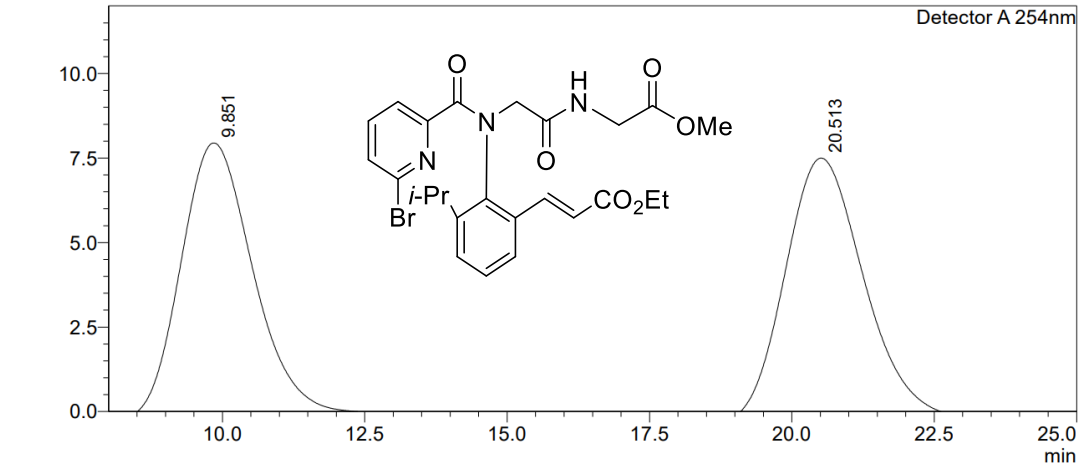


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	9.875	1856641	21440	32.647			
2	20.545	3830452	38760	67.353			
Total		5687093	60200				

<Chromatogram>



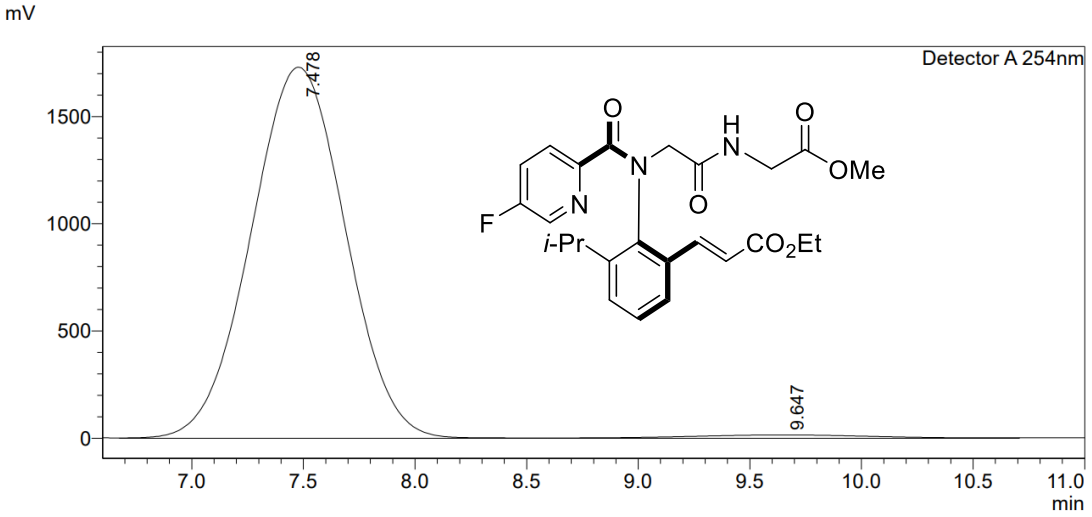
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	9.851	739522	8153	49.109			
2	20.513	766343	7810	50.891			
Total		1505865	15963				

3h: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

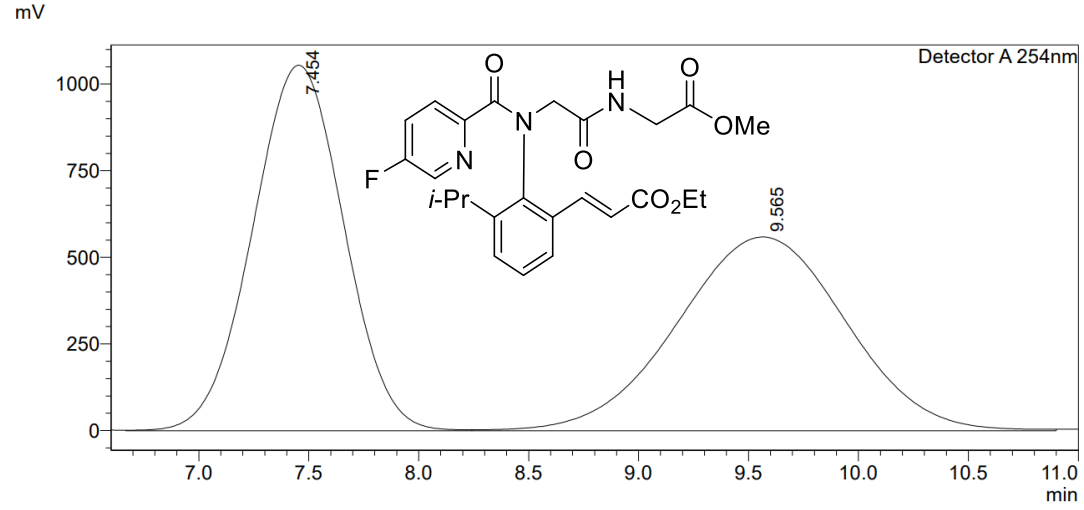


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	7.478	51012590	1730522	98.170			
2	9.647	950867	15661	1.830		V	
Total		51963457	1746183				

<Chromatogram>



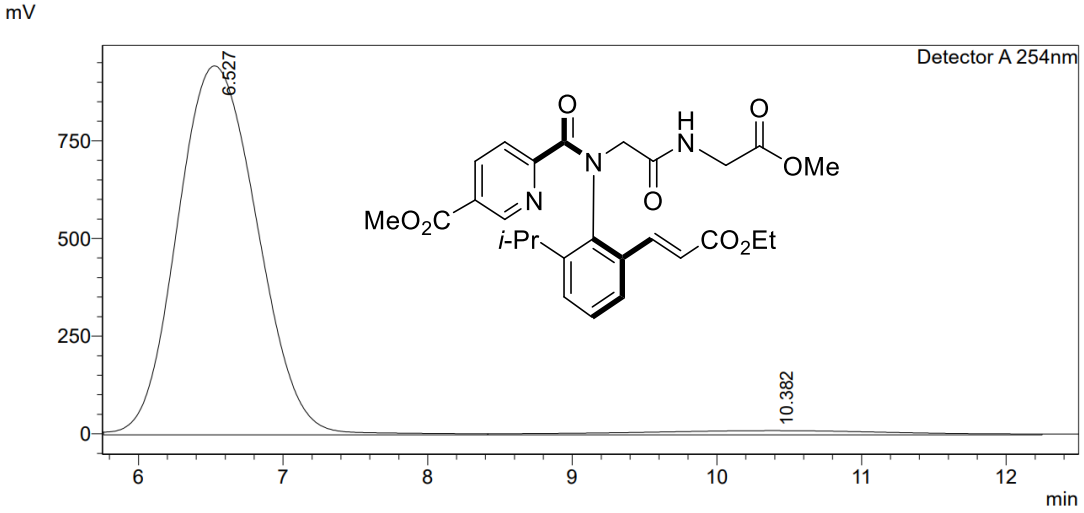
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	7.454	30525005	1054641	50.411			
2	9.565	30027309	559249	49.589		V	
Total		60552313	1613889				

3i: AD-H, Hexane/i-PrOH =50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

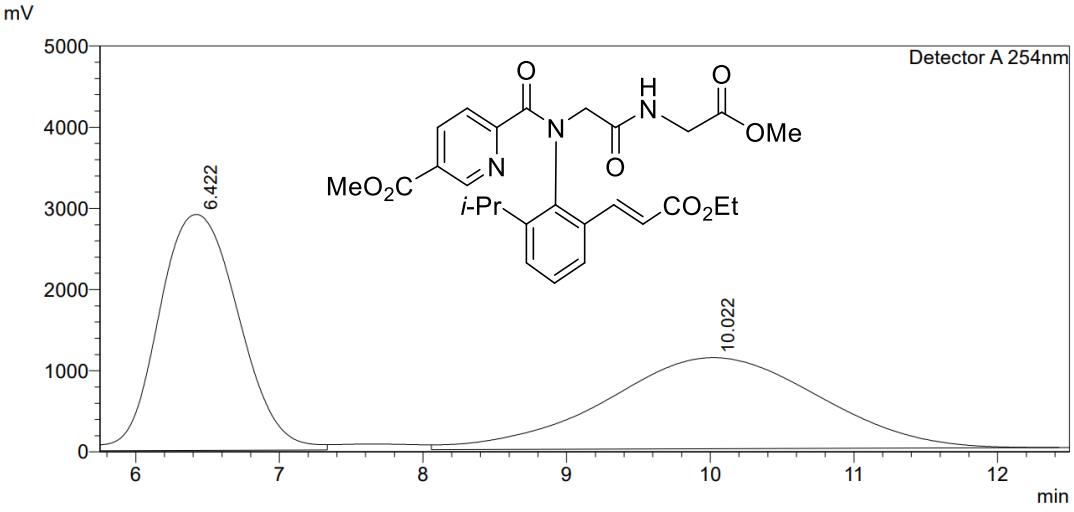


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	6.527	36367106	944064	96.385			
2	10.382	1363974	10455	3.615		V	
Total		37731080	954519				

<Chromatogram>



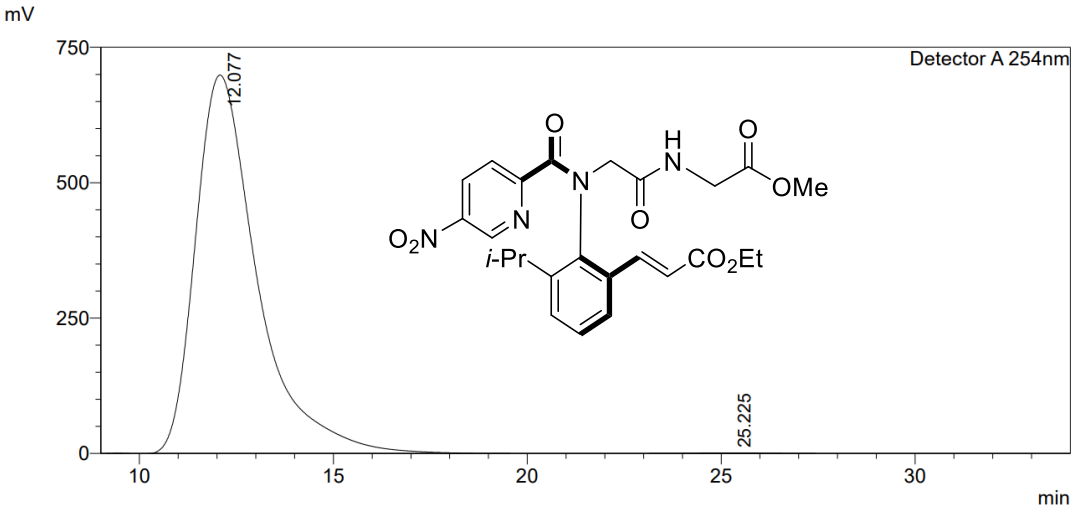
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	6.422	113894715	2906773	49.532			
2	10.022	116047865	1121199	50.468			
Total		229942580	4027972				

3j: AS-H, Hexane/i-PrOH = 60/40, rate = 1.0 mL/min, 254 nm

<Chromatogram>

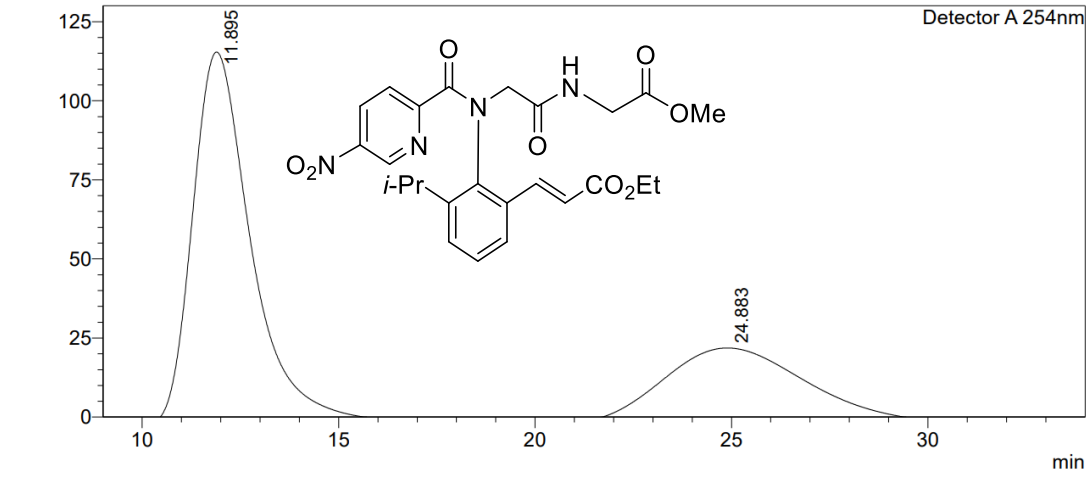


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	12.077	78721814	700921	99.012			
2	25.225	785833	3199	0.988			
Total		79507647	704120				

<Chromatogram>



<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	11.895	12437811	117760	66.126			
2	24.883	6371588	24142	33.874			
Total		18809399	141902				

3k: OD-H, Hexane/i-PrOH =50/50, rate = 1.0 mL/min, 254 nm

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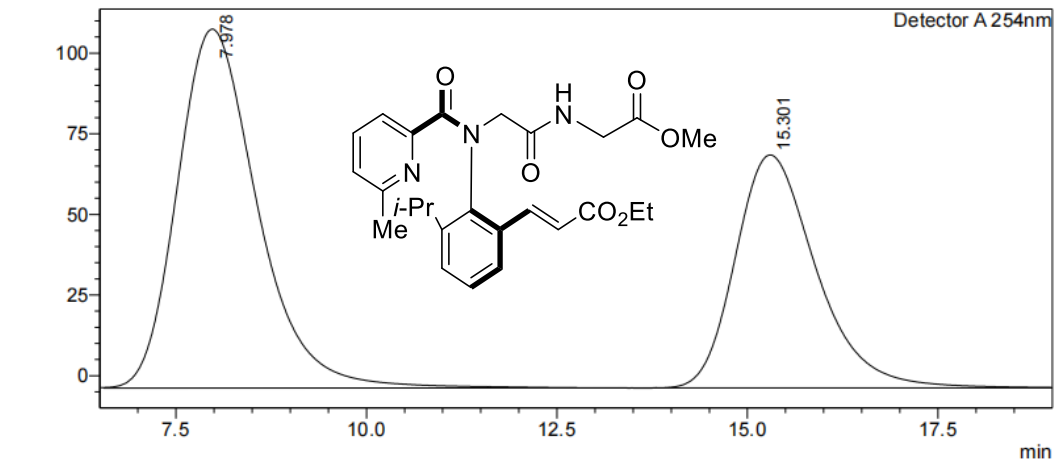
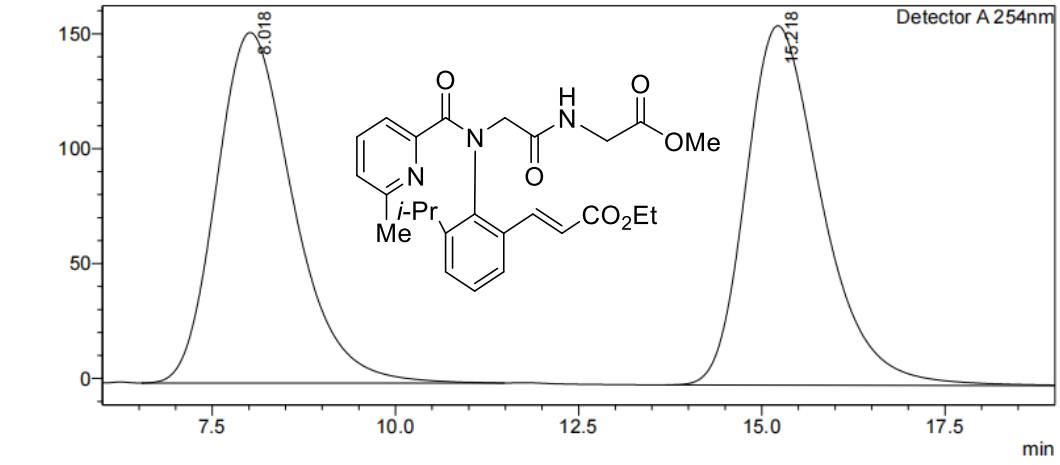


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	7.978	8178884	111277	60.399		S	
2	15.301	5362641	72238	39.601		S	
Total		13541525	183515				

<Chromatogram>



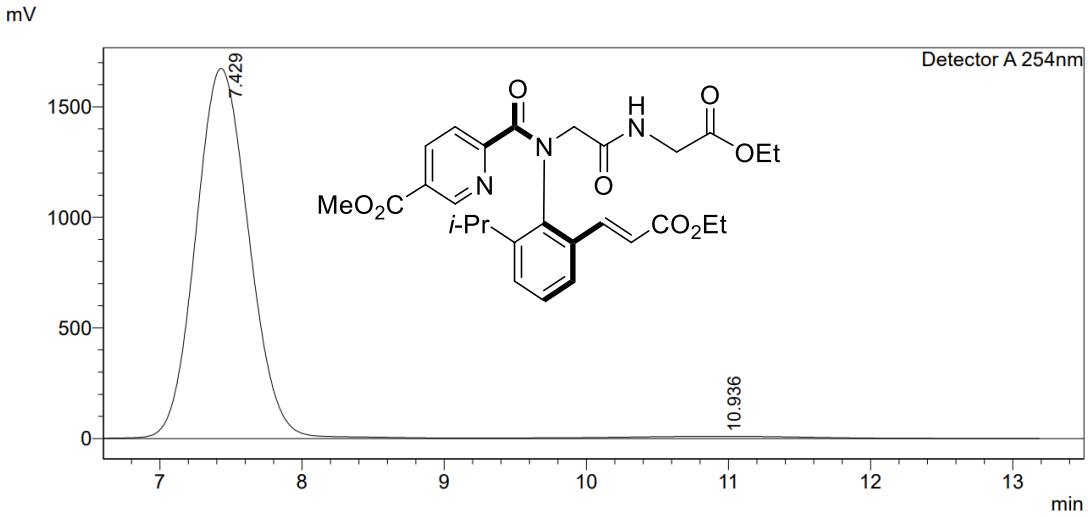
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	8.018	11172428	152560	49.723			
2	15.218	11296749	156385	50.277			
Total		22469178	308945				

3o: AD-H, Hexane/i-PrOH =50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

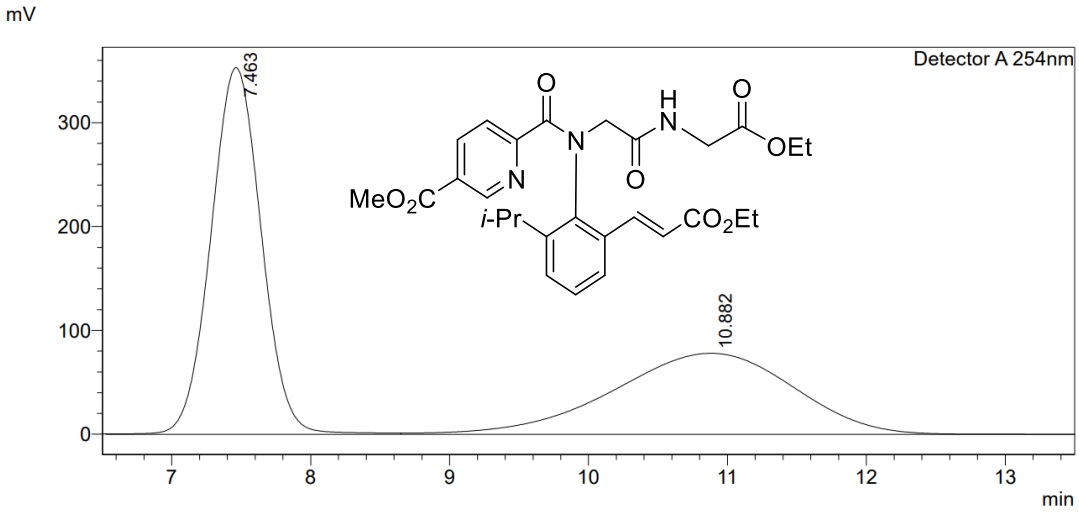


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	7.429	43536005	1673283	97.787			
2	10.936	985367	9981	2.213		V	
Total		44521372	1683264				

<Chromatogram>



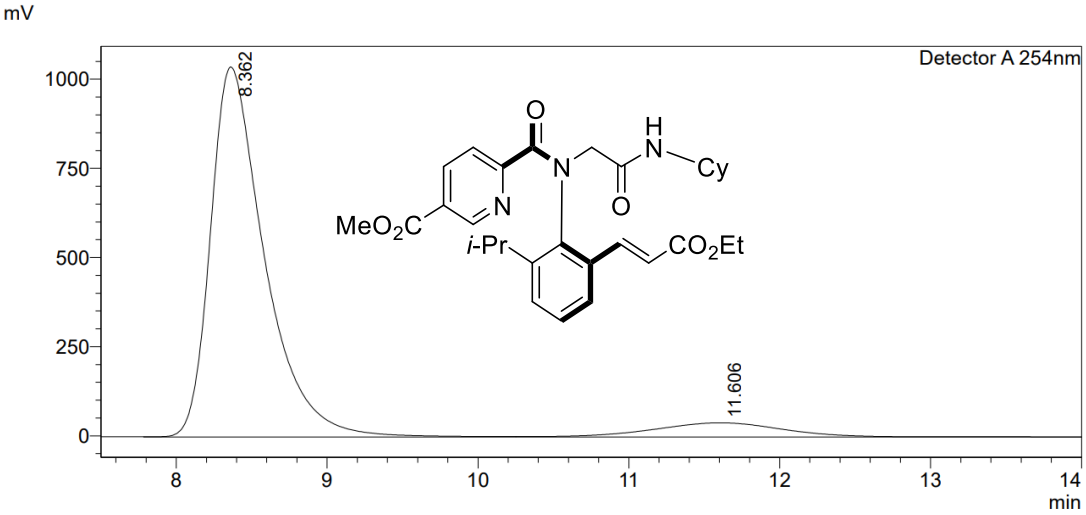
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	7.463	8920890	353079	55.758			
2	10.882	7078421	78036	44.242		V	
Total		15999311	431115				

3p: AD-H, Hexane/i-PrOH =80/20, rate = 1.0 mL/min, 254 nm

<Chromatogram>

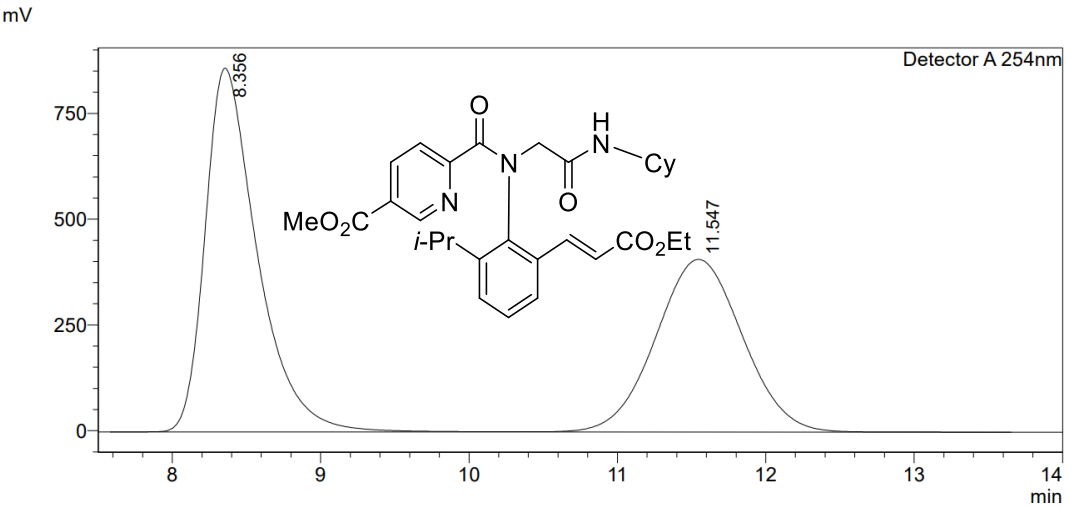


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	8.362	25926268	1037920	91.327			
2	11.606	2462179	39936	8.673		V	
Total		28388447	1077856				

<Chromatogram>



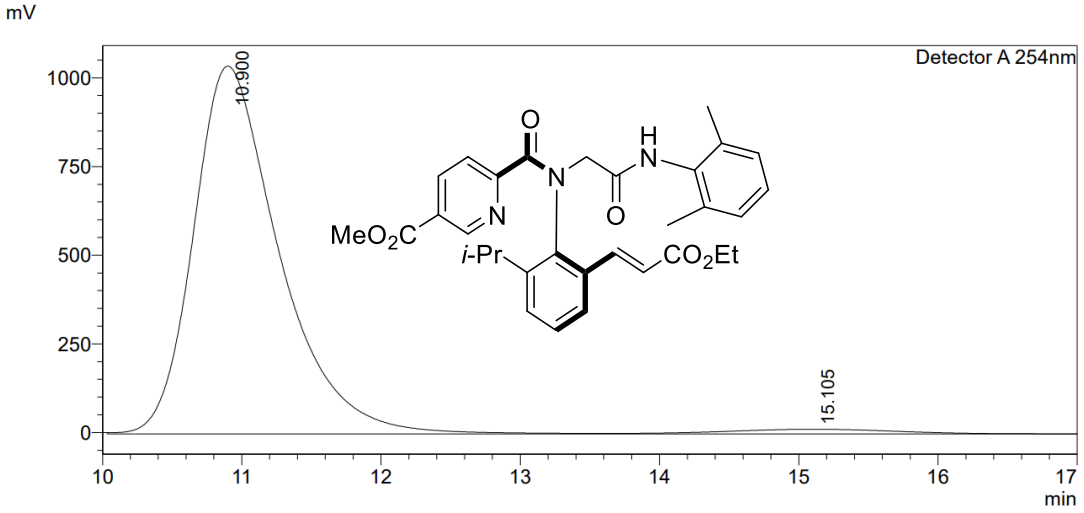
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	8.356	21077246	859986	55.874			
2	11.547	16645603	408171	44.126		V	
Total		37722850	1268157				

3q: AD-H, Hexane/i-PrOH = 80/20, rate =0.8 mL/min, 254 nm

<Chromatogram>

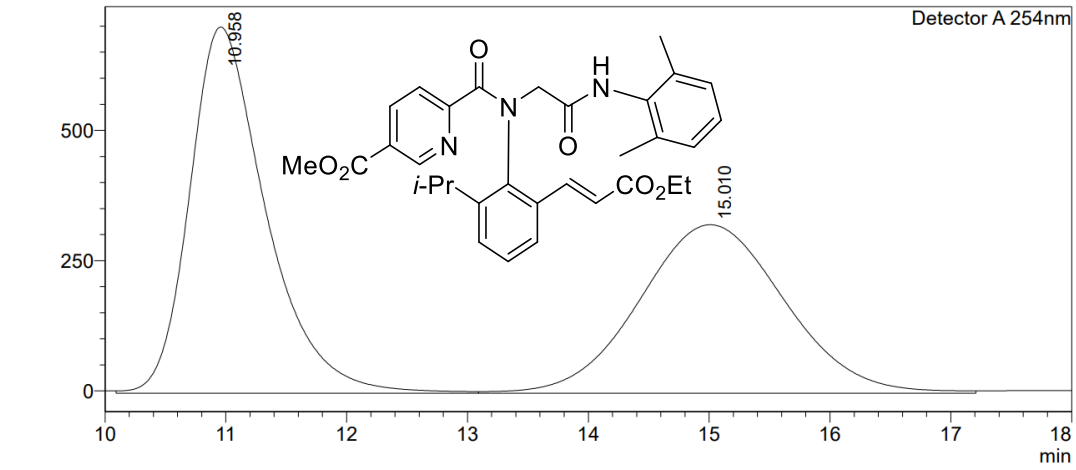


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	10.900	44463553	1036891	97.538			
2	15.105	1122194	13141	2.462		V	
Total		45585747	1050032				

<Chromatogram>



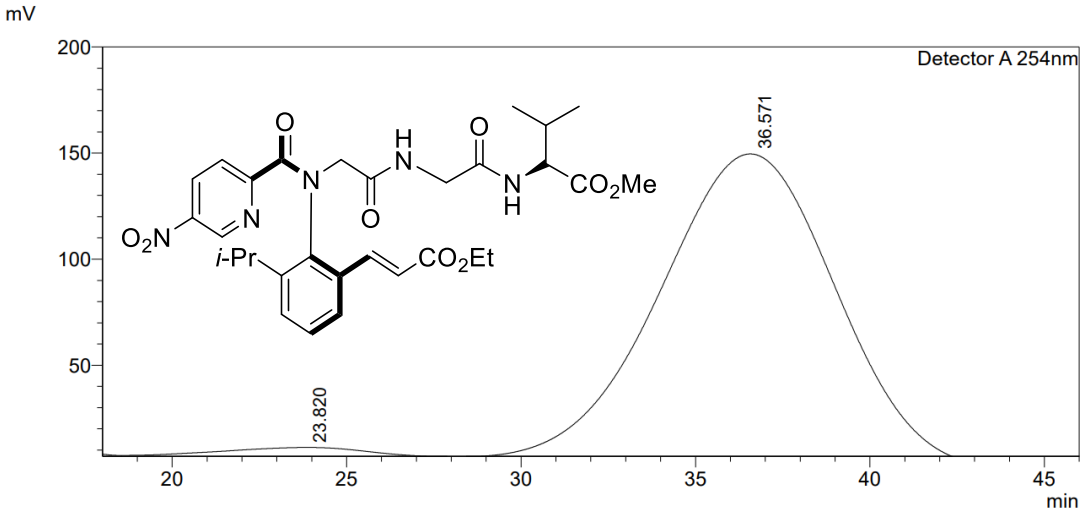
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	10.958	31007674	702700	53.317			
2	15.010	27149199	323363	46.683		V	
Total		58156873	1026063				

3r: IE, Hexane/i-PrOH =50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

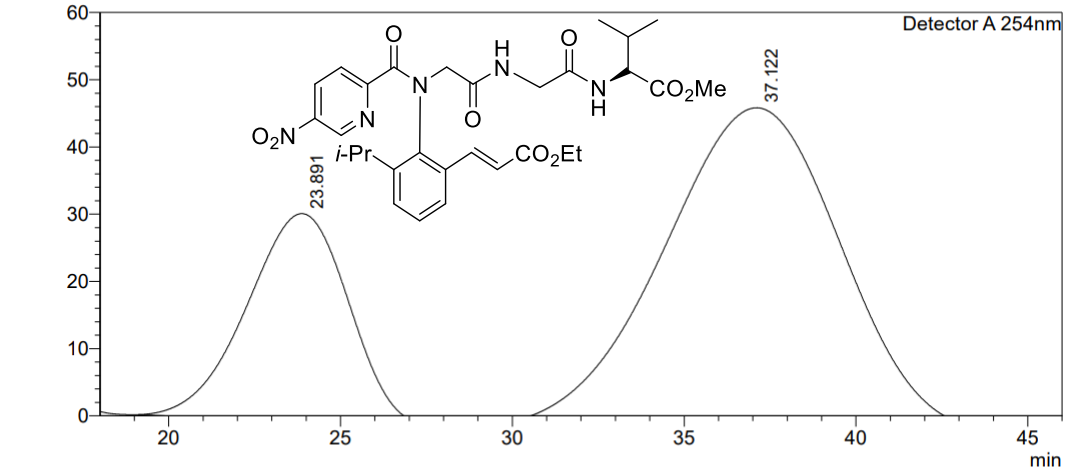


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	23.820	2428993	6171	4.553			
2	36.571	50923729	145463	95.447			
Total		53352722	151634				

<Chromatogram>



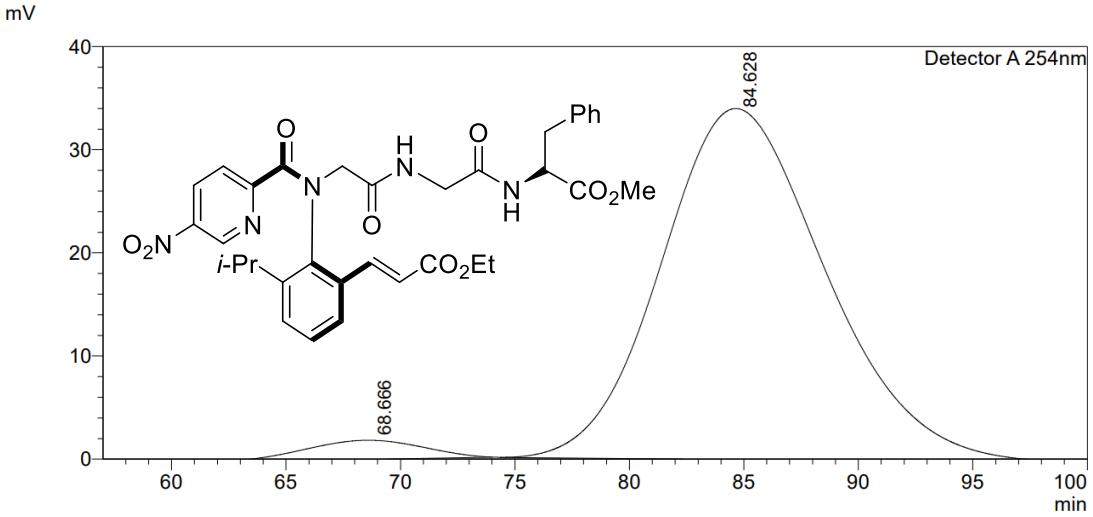
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	23.891	6339477	30890	26.641			
2	37.122	17456044	48033	73.359		M	
Total		23795521	78923				

3s: IE, Hexane/i-PrOH =70/30, rate = 1.0 mL/min, 254 nm

<Chromatogram>

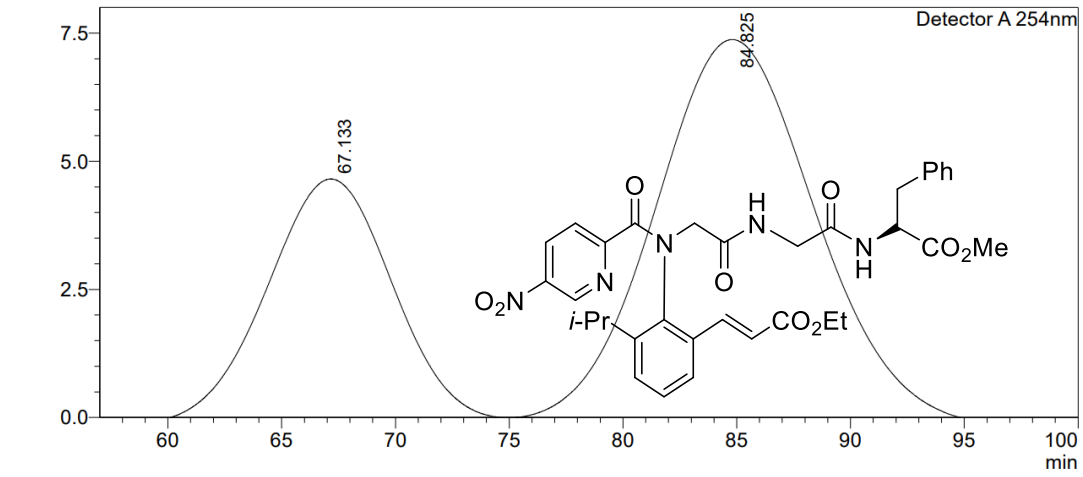


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	68.666	673614	1866	3.802		M	
2	84.628	17041993	34032	96.198		M	
Total		17715607	35898				

<Chromatogram>



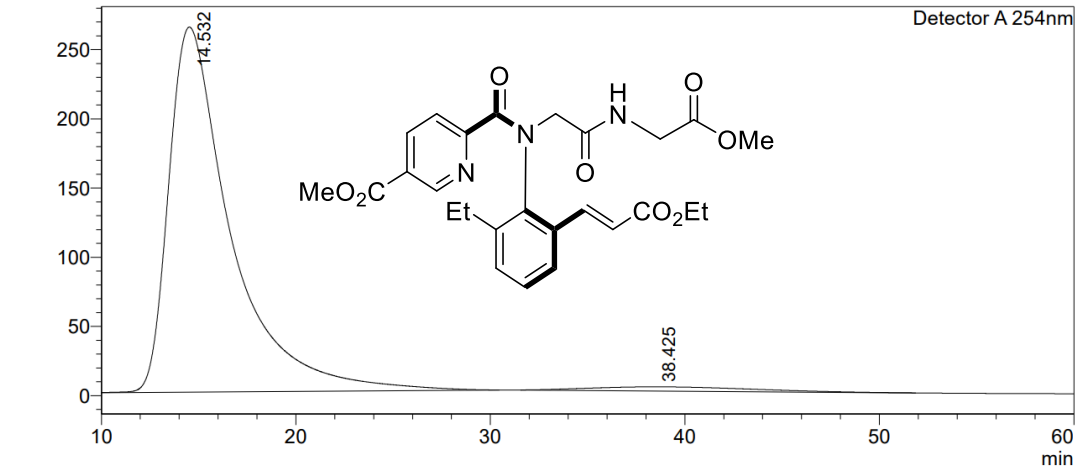
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	67.133	1805781	4723	33.037		M	
2	84.825	3660160	7460	66.963		M	
Total		5465941	12183				

3t: AS-H, Hexane/i-PrOH = 60/40, rate = 1.0 mL/min, 254 nm

<Chromatogram>

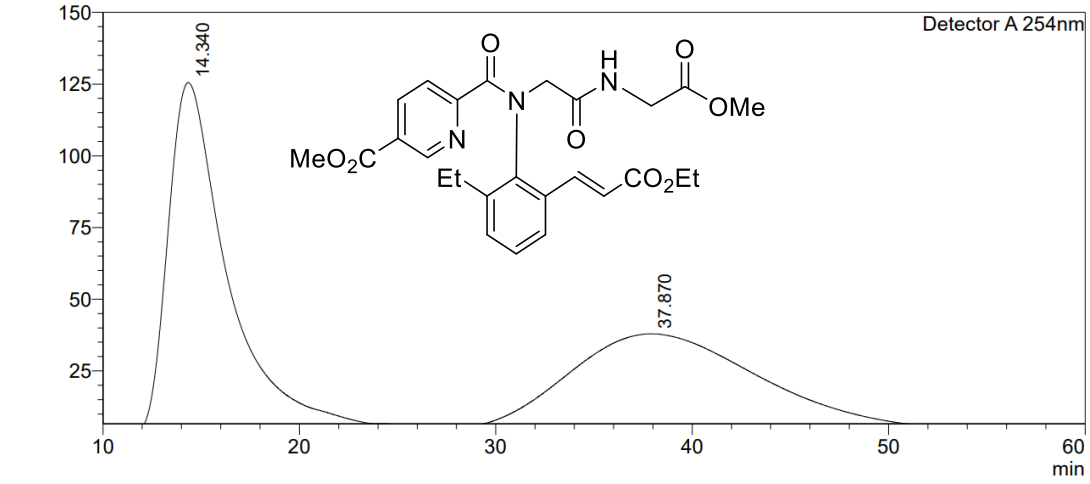


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	14.532	58636607	263763	97.040			
2	38.425	1788729	3013	2.960		M	
Total		60425335	266776				

<Chromatogram>



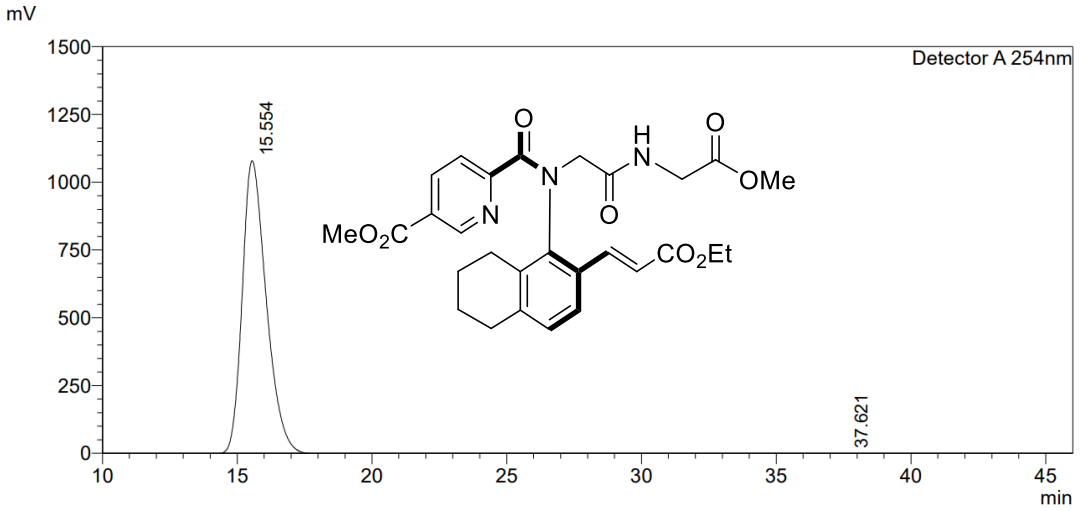
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	14.340	25425353	121959	51.902			
2	37.870	23561661	33679	48.098		M	
Total		48987014	155638				

3u: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

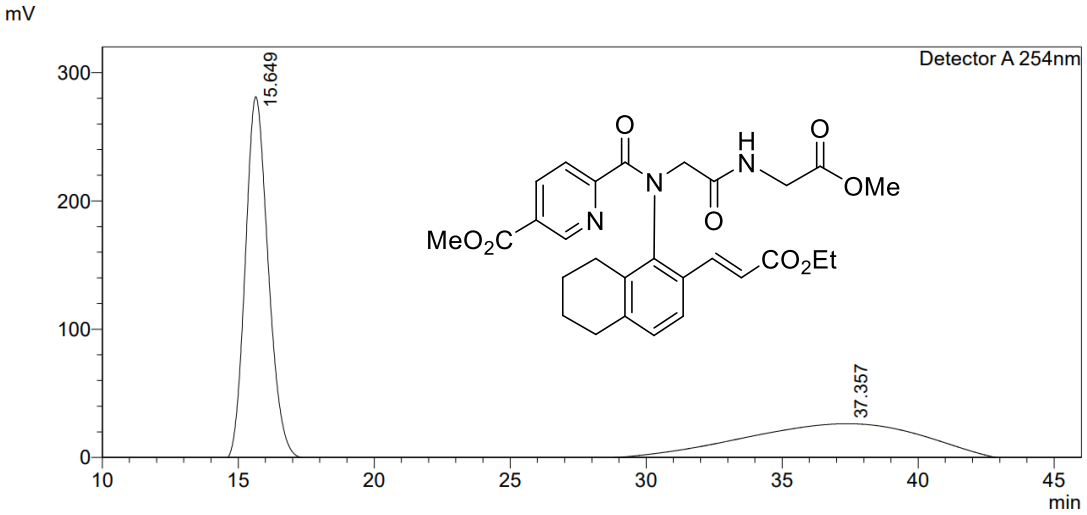


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	15.554	68358932	1085210	99.760			
2	37.621	164646	2431	0.240		M	
Total		68523578	1087641				

<Chromatogram>



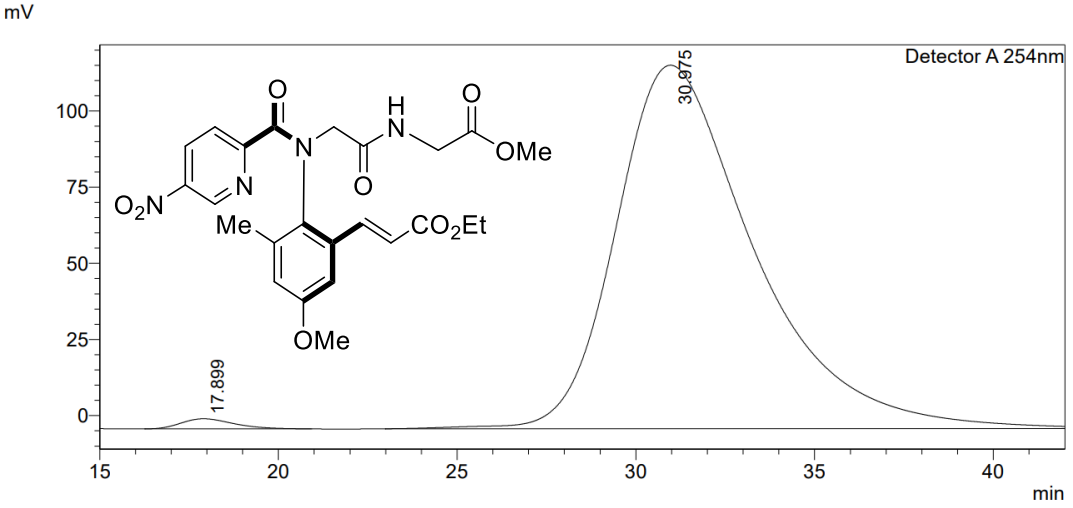
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	15.649	17424163	285751	51.553			
2	37.357	16374404	30921	48.447		M	
Total		33798566	316672				

3v: OD-H, Hexane/i-PrOH =50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

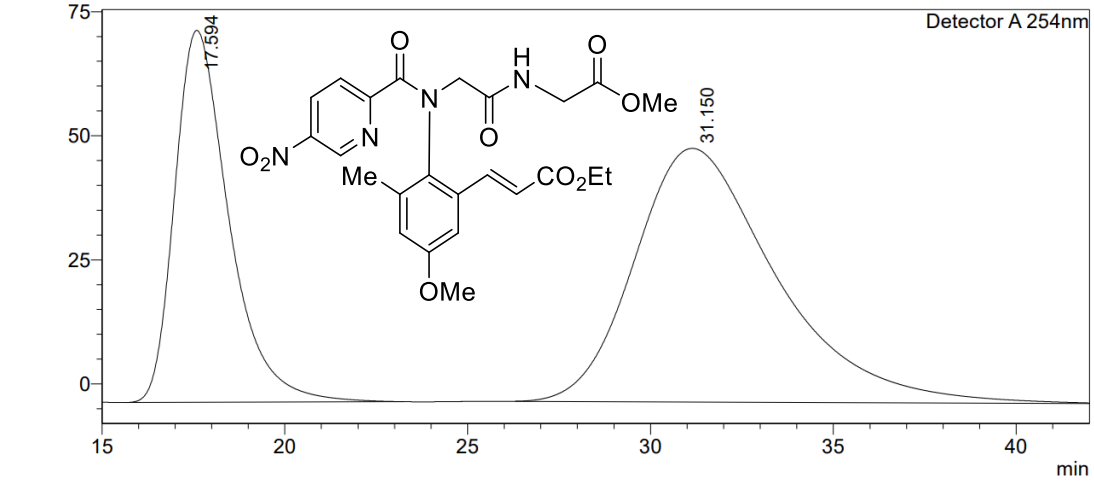


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	17.899	342933	3340	1.048			
2	30.975	32376453	119386	98.952			
Total		32719387	122726				

<Chromatogram>



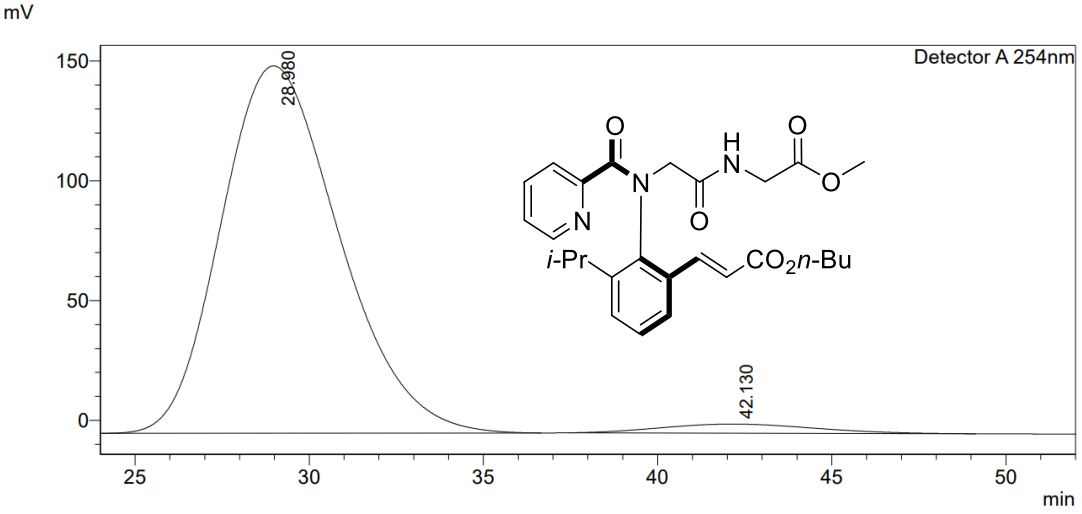
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	17.594	7731401	74917	35.908			
2	31.150	13799745	51087	64.092			
Total		21531146	126004				

4b: AD-H, Hexane/i-PrOH =80/20, rate = 1.0 mL/min, 254 nm

<Chromatogram>

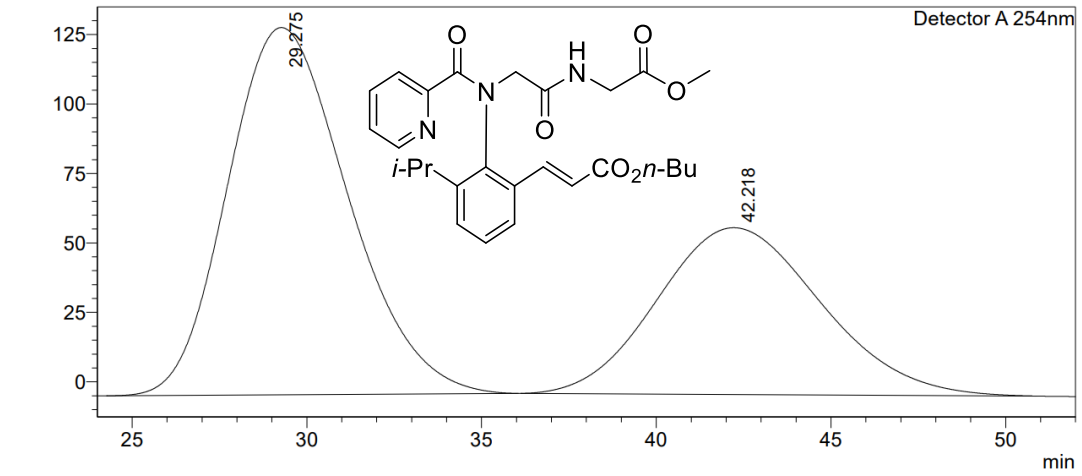


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	28.980	36175558	153306	96.867			
2	42.130	1169965	3817	3.133		M	
Total		37345523	157123				

<Chromatogram>



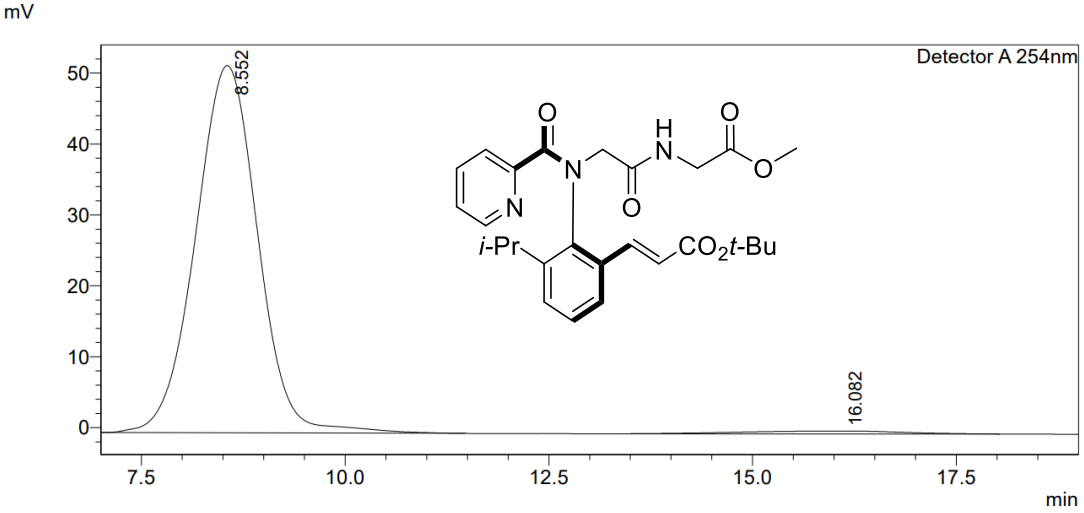
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	29.275	31652165	132206	61.781			
2	42.218	19580700	60029	38.219		M	
Total		51232864	192236				

4c: AD-H, Hexane/i-PrOH = 70/30, rate = 1.0 mL/min, 254 nm

<Chromatogram>

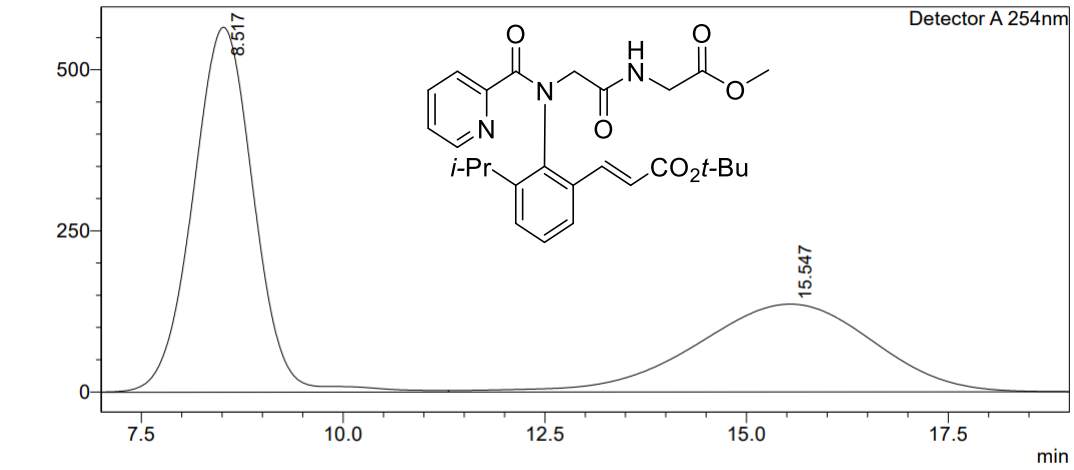


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	8.552	2756081	51787	98.015			
2	16.082	55806	394	1.985		M	
Total		2811887	52181				

<Chromatogram>



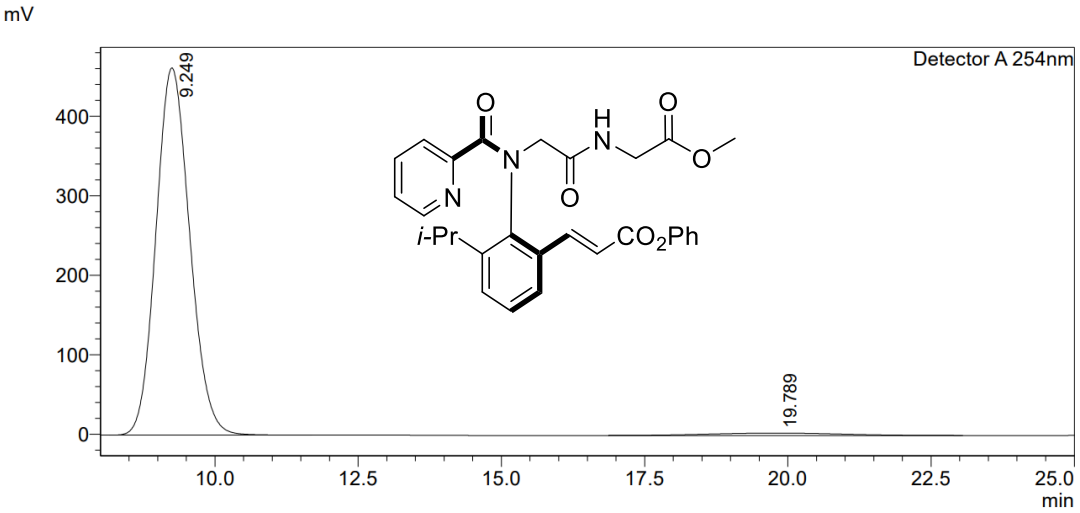
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	8.517	29797794	566287	58.742			
2	15.547	20928339	136212	41.258		V	
Total		50726133	702499				

4d: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

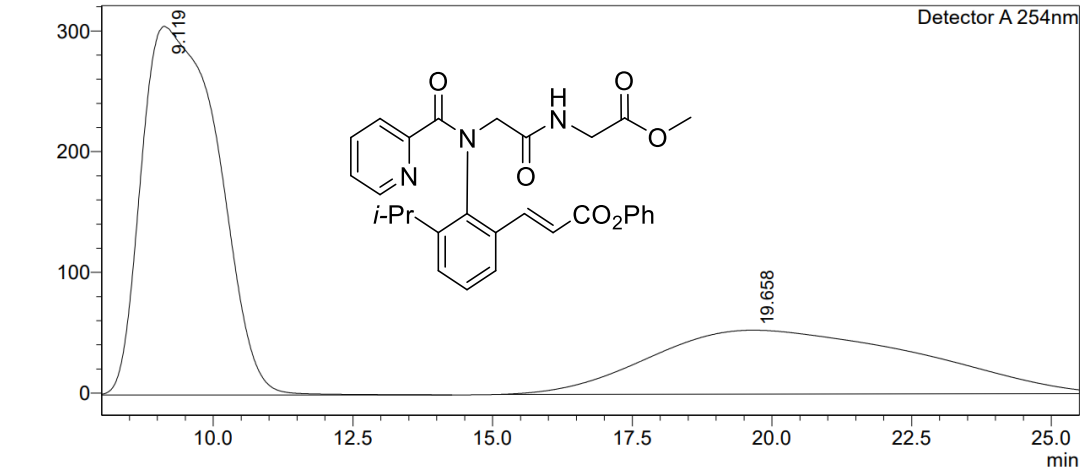


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	9.249	18955857	461931	97.505			
2	19.789	485005	3058	2.495			
Total		19440863	464989				

<Chromatogram>



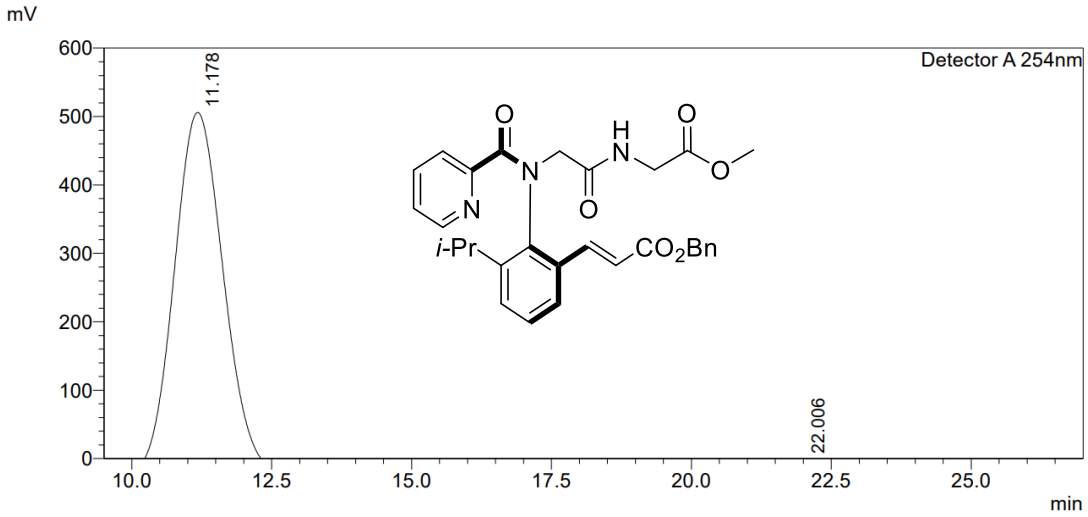
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	9.119	29144161	305332	62.064			
2	19.658	17814174	53111	37.936		M	
Total		46958335	358443				

4e: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

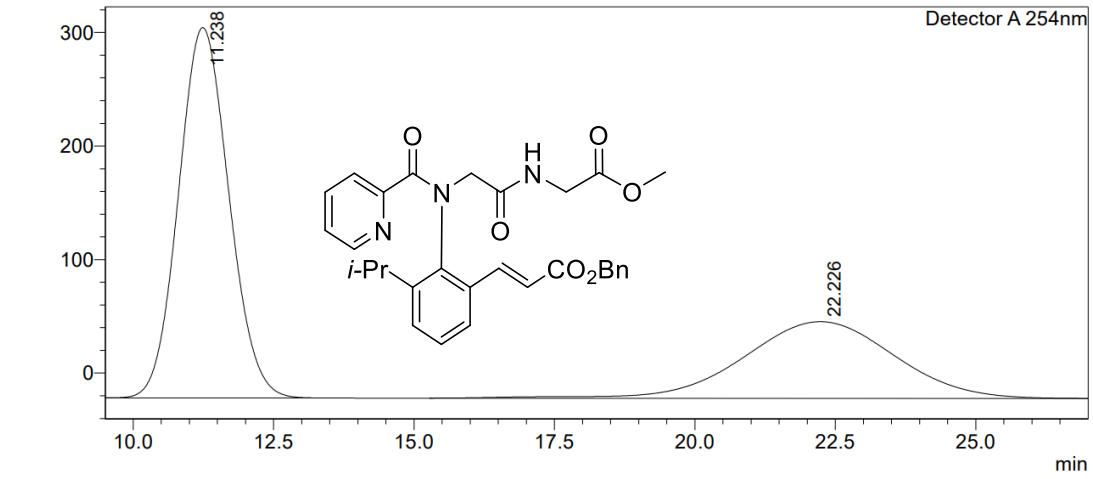


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	11.178	32510275	528491	97.581			
2	22.006	805799	4453	2.419			
Total		33316074	532944				

<Chromatogram>



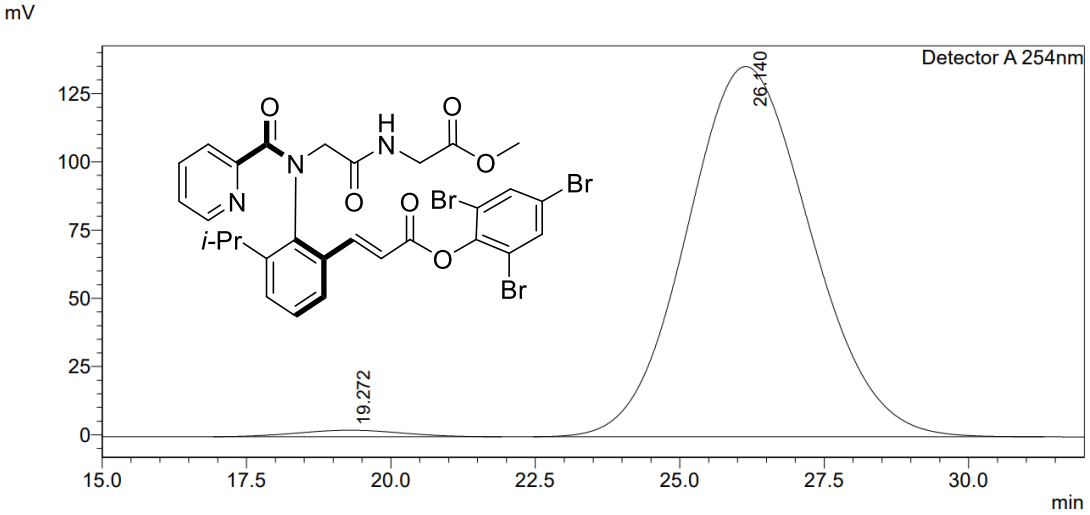
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	11.238	20388644	326291	61.647			
2	22.226	12684556	67541	38.353			
Total		33073200	393832				

4f: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

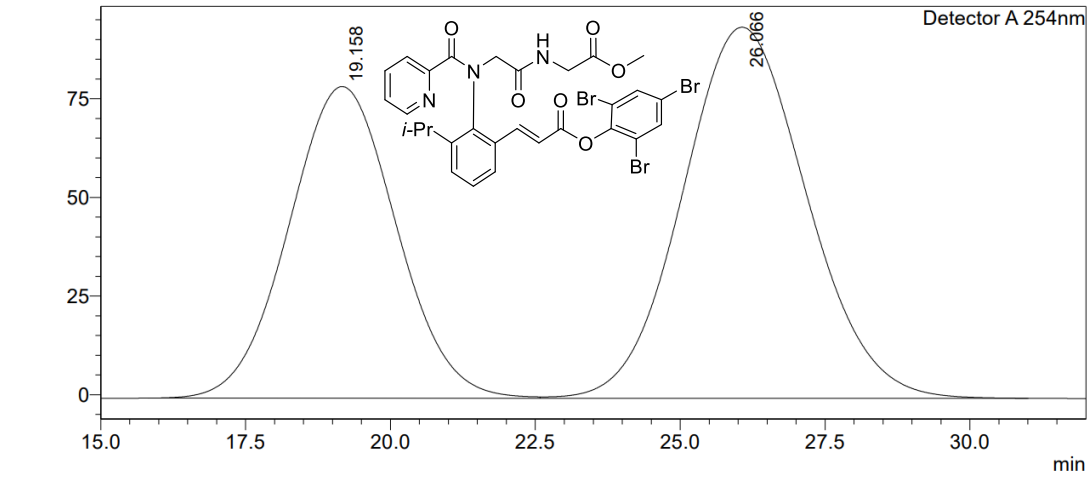


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	19.272	302611	2384	1.469			
2	26.140	20292534	135579	98.531			
Total		20595145	137963				

<Chromatogram>



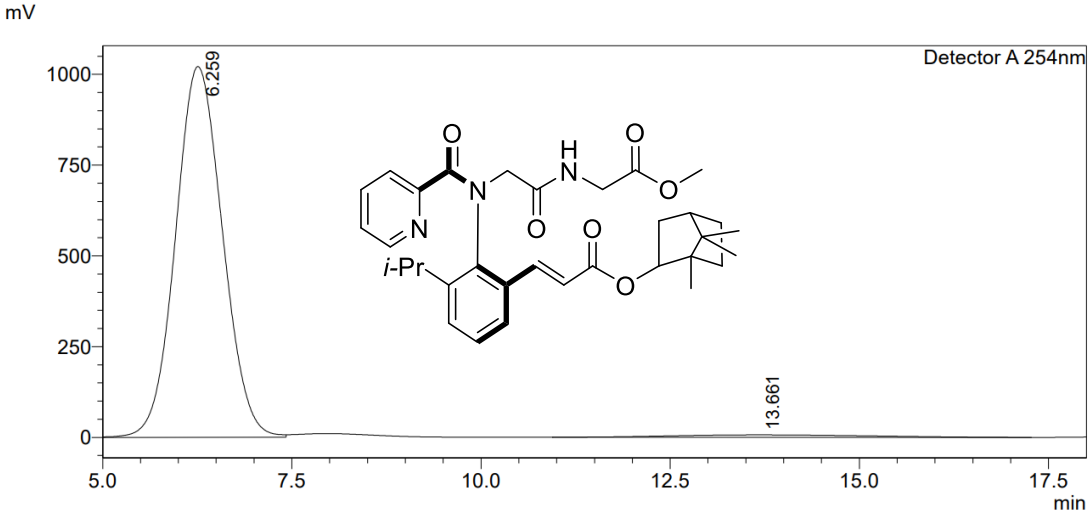
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	19.158	10205942	78931	42.178			
2	26.066	13991287	94021	57.822		V	
Total		24197229	172952				

4g: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

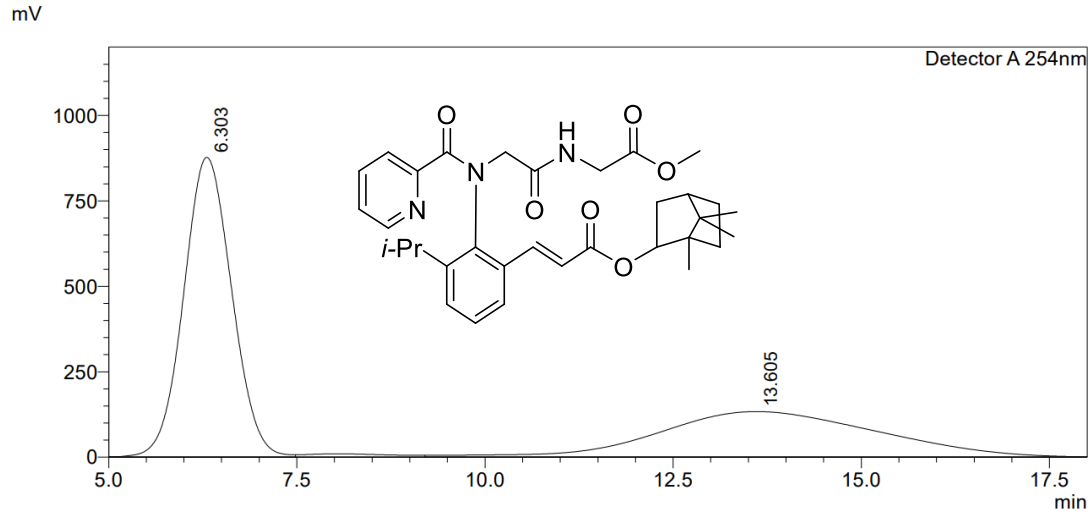


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	6.259	44194073	1021710	97.329			
2	13.661	1212990	6641	2.671			
Total		45407063	1028351				

<Chromatogram>



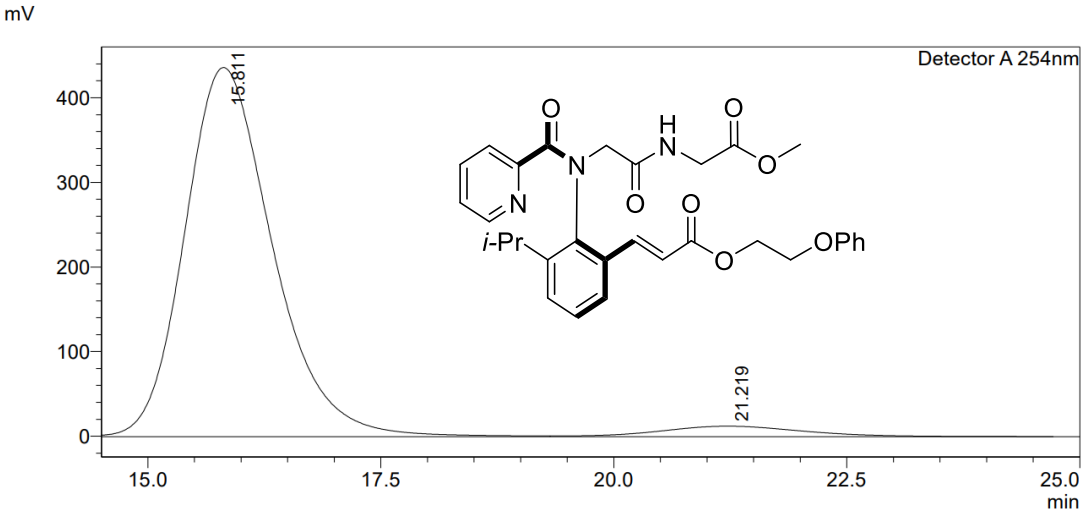
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	6.303	39160841	878044	58.871			
2	13.605	27358993	133750	41.129			
Total		66519834	1011794				

4h: IA, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

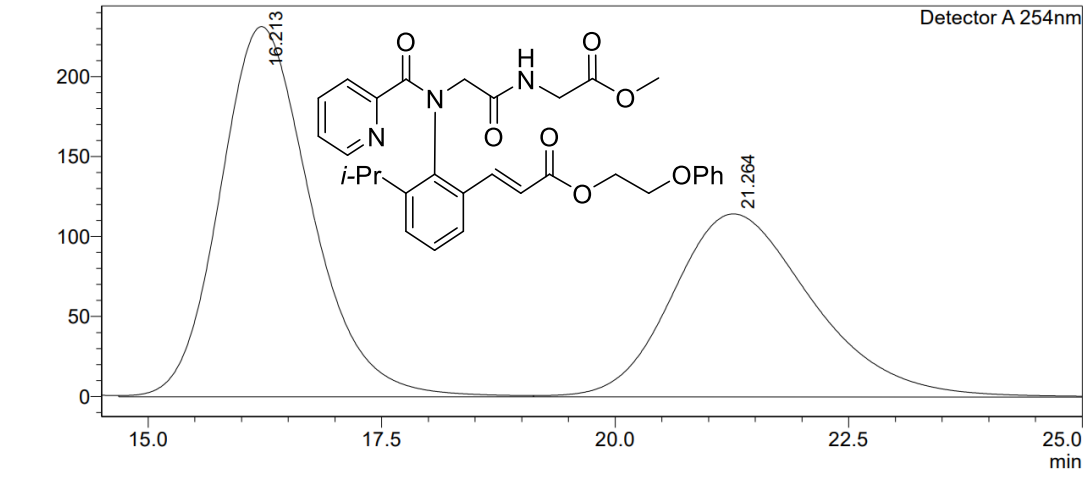


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	15.811	28692014	436205	95.627			
2	21.219	1312129	12320	4.373		V	
Total		30004143	448526				

<Chromatogram>



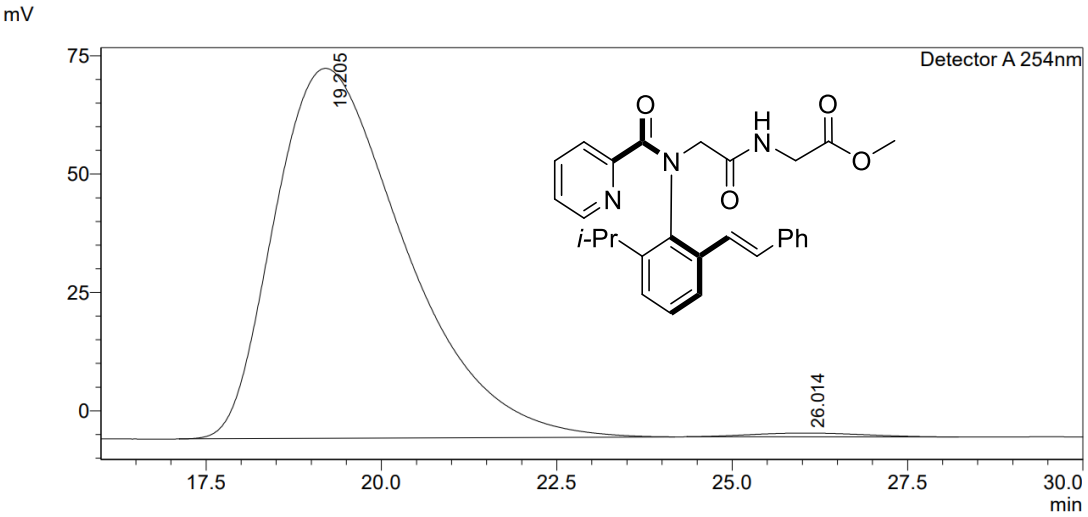
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	16.213	15790268	231494	56.723			
2	21.264	12046993	114419	43.277		V	
Total		27837261	345913				

4i: AD-H, Hexane/i-PrOH =80/20, rate = 1.0 mL/min, 254 nm

<Chromatogram>

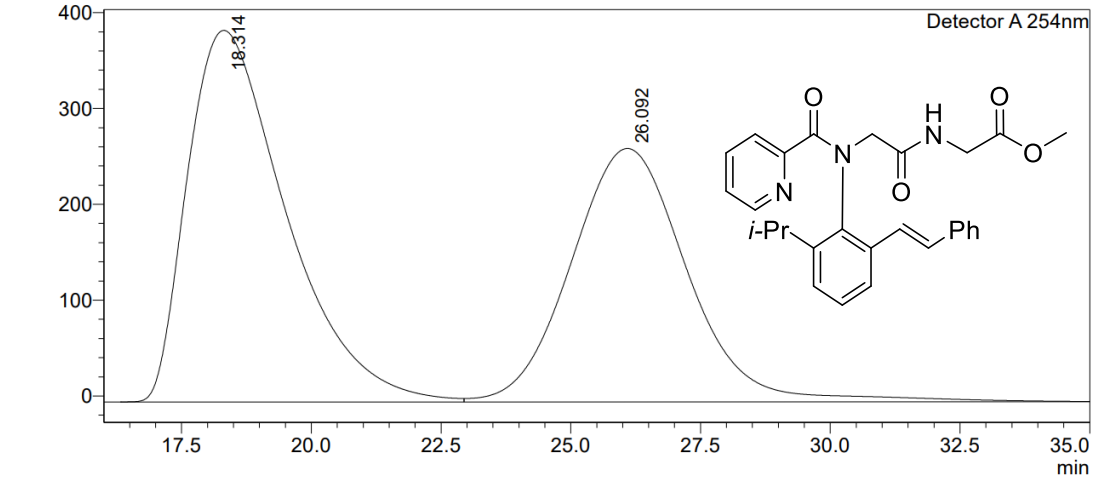


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	19.205	10129060	78159	99.114			
2	26.014	90521	810	0.886			
Total		10219580	78968				

<Chromatogram>



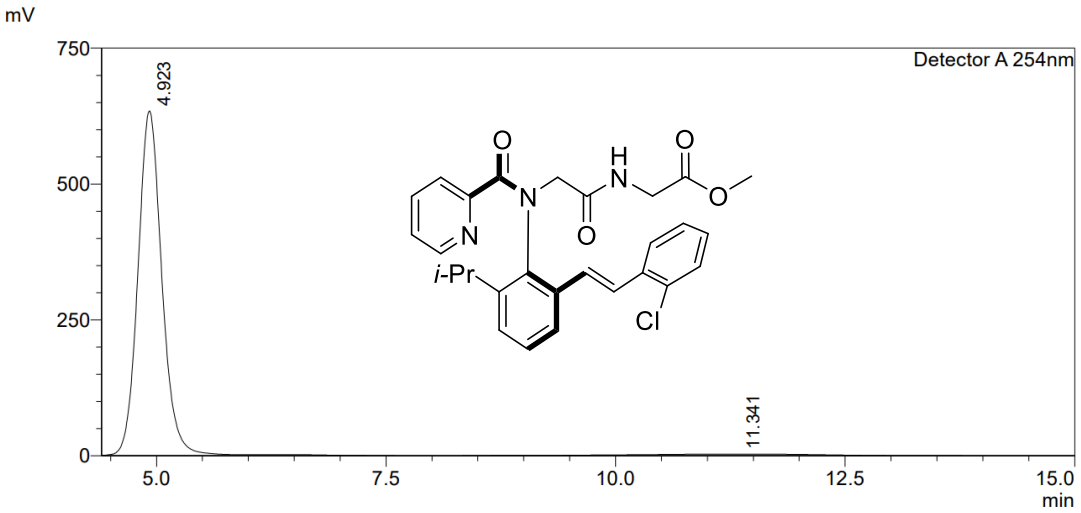
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	18.314	51212867	387625	55.292			
2	26.092	41409974	264365	44.708		V	
Total		92622841	651990				

4j: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

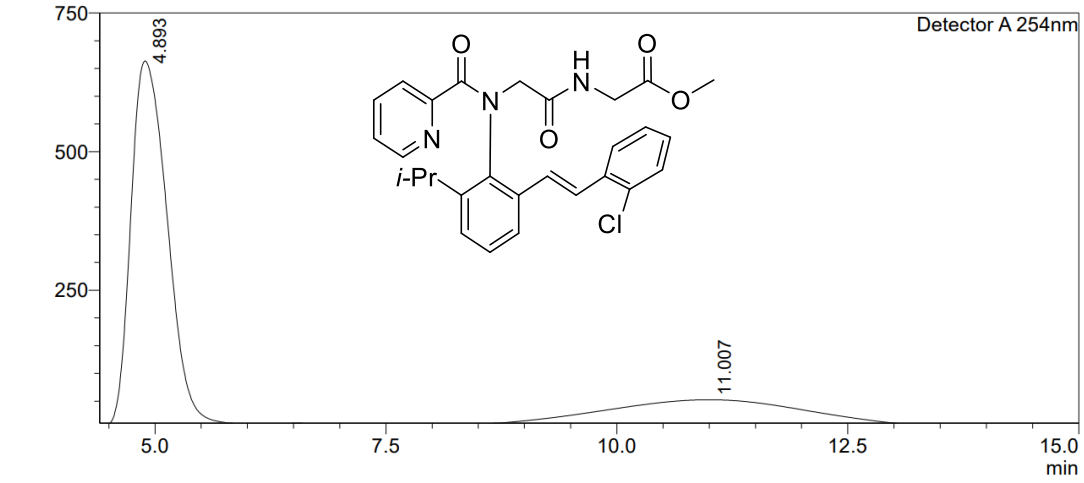


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	4.923	11643967	634197	96.206			
2	11.341	459202	3244	3.794			
Total		12103169	637441				

<Chromatogram>



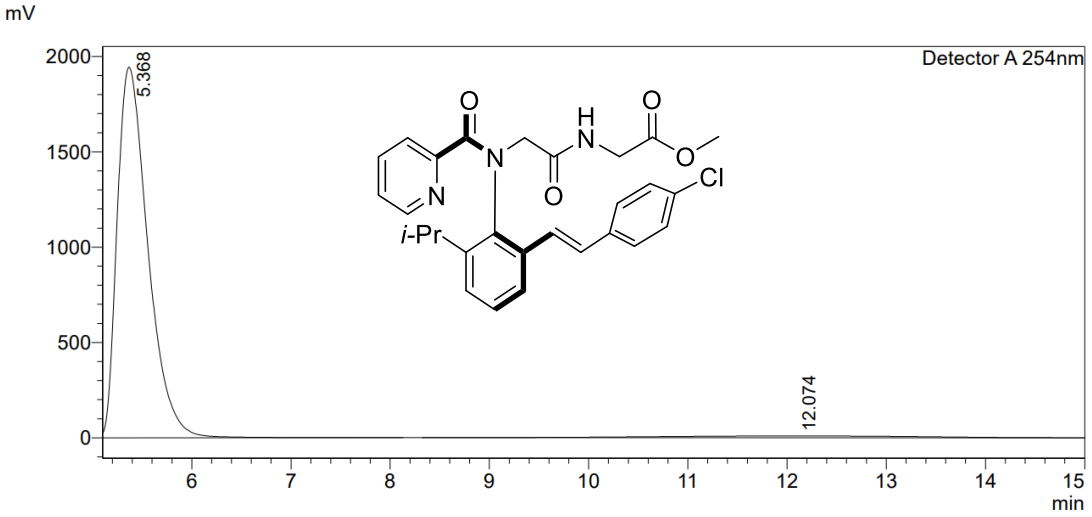
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	4.893	18190732	660194	67.060		M	
2	11.007	8935149	52028	32.940			
Total		27125881	712222				

4k: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

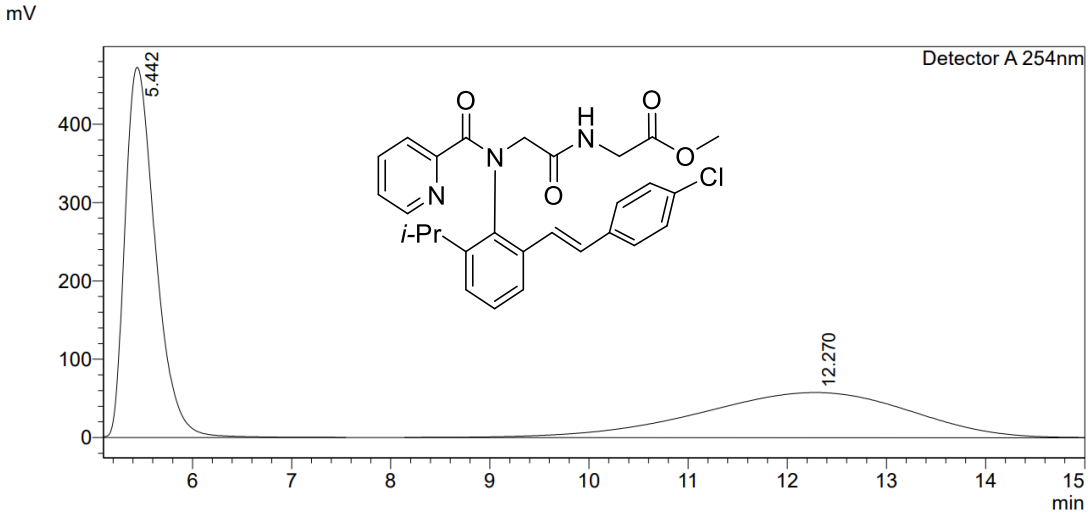


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	5.368	41764813	1943470	96.086			
2	12.074	1701359	9261	3.914			
Total		43466172	1952732				

<Chromatogram>



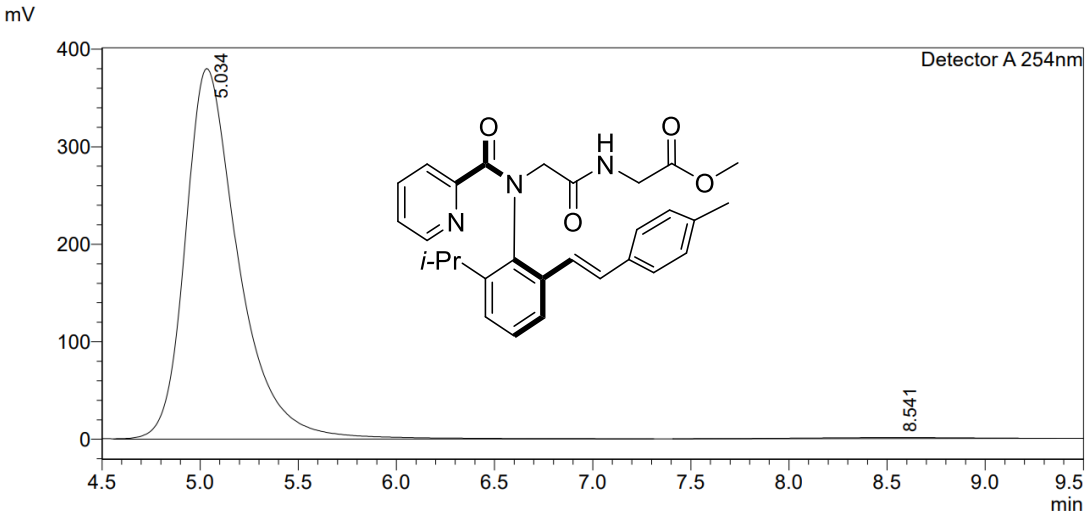
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	5.442	10059379	472539	54.116			
2	12.270	8529197	57447	45.884			
Total		18588576	529986				

4l: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

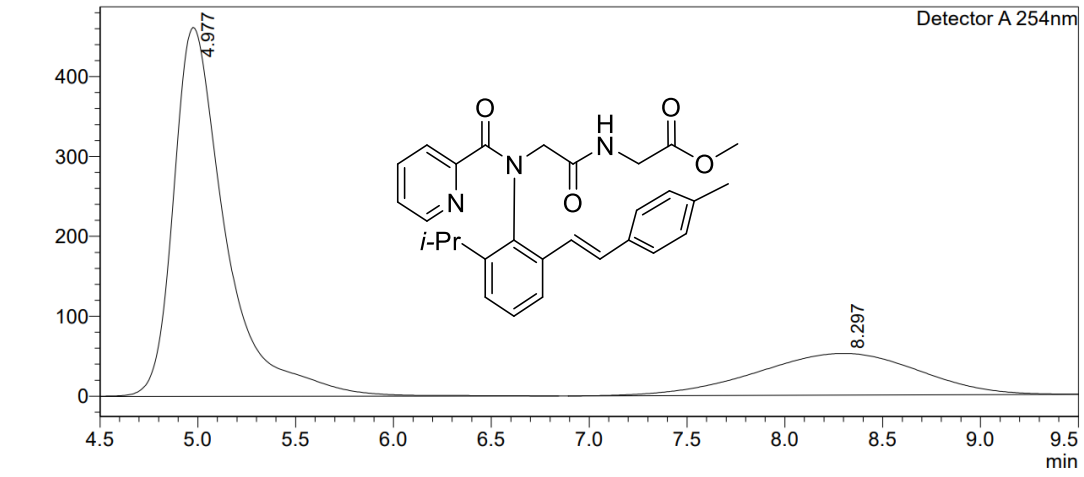


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	5.034	7185118	380067	99.260			
2	8.541	53561	966	0.740			
Total		7238679	381033				

<Chromatogram>



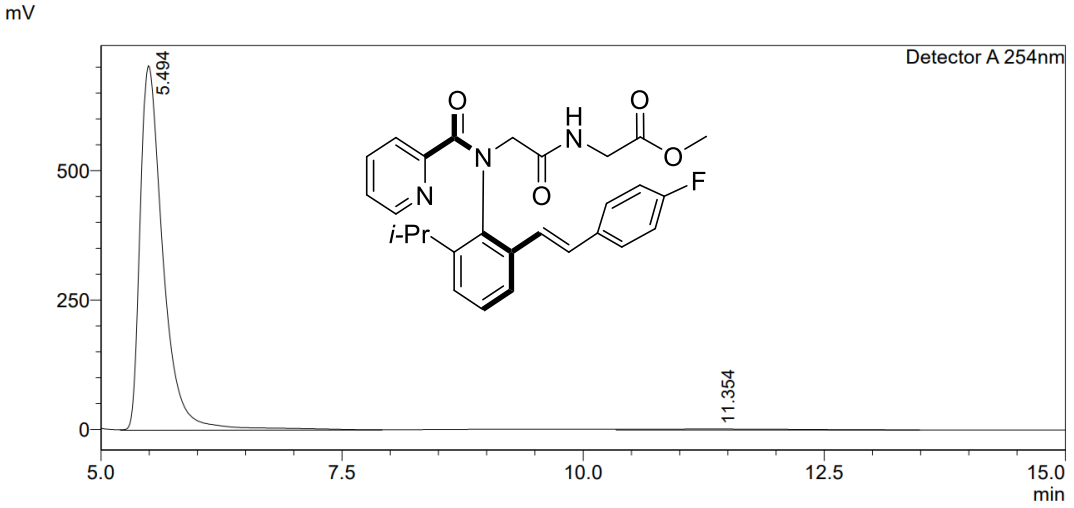
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	4.977	8566129	461898	73.862		S	
2	8.297	3031309	52155	26.138			
Total		11597438	514053				

4m: AD-H, Hexane/i-PrOH = 50/50, rate = 1.0 mL/min, 254 nm

<Chromatogram>

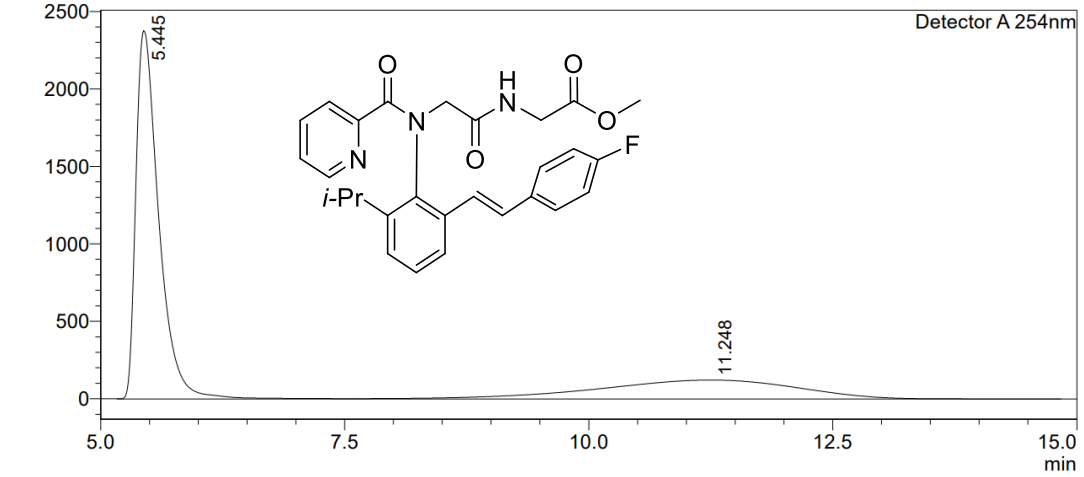


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	5.494	11703248	703457	98.237			
2	11.354	210060	1815	1.763			
Total		11913308	705272				

<Chromatogram>



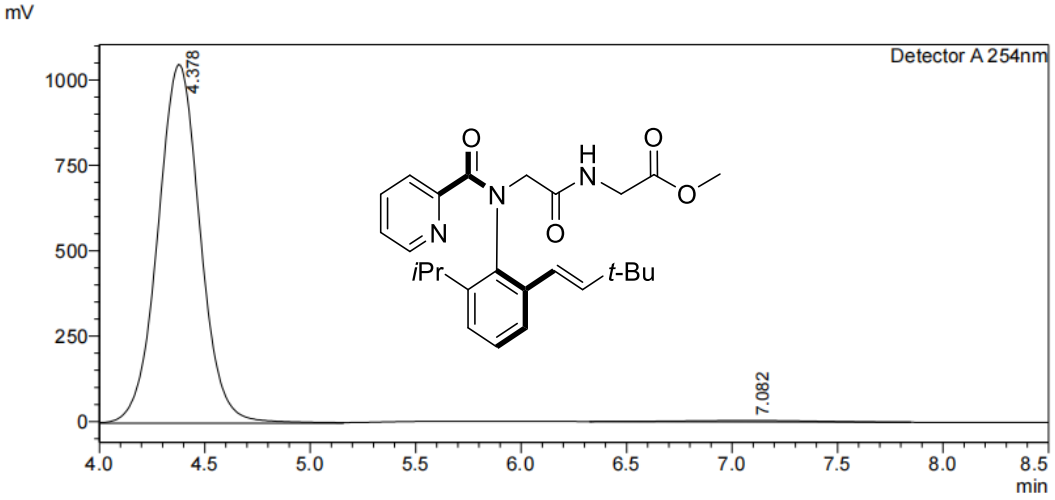
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	5.445	38710158	2375928	69.055			
2	11.248	17346603	121654	30.945		V	
Total		56056760	2497582				

4n: AD-H, Hexane/i-PrOH = 70/30, rate = 1.0 mL/min, 254 nm

<Chromatogram>

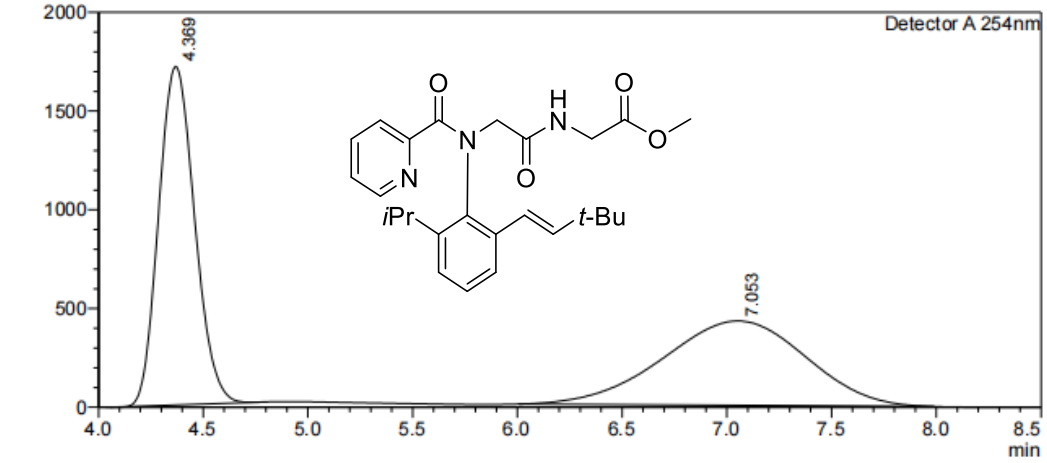


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	4.378	14691527	1049748	98.863			
2	7.082	168943	3792	1.137		M	
Total		14860470	1053540				

<Chromatogram>



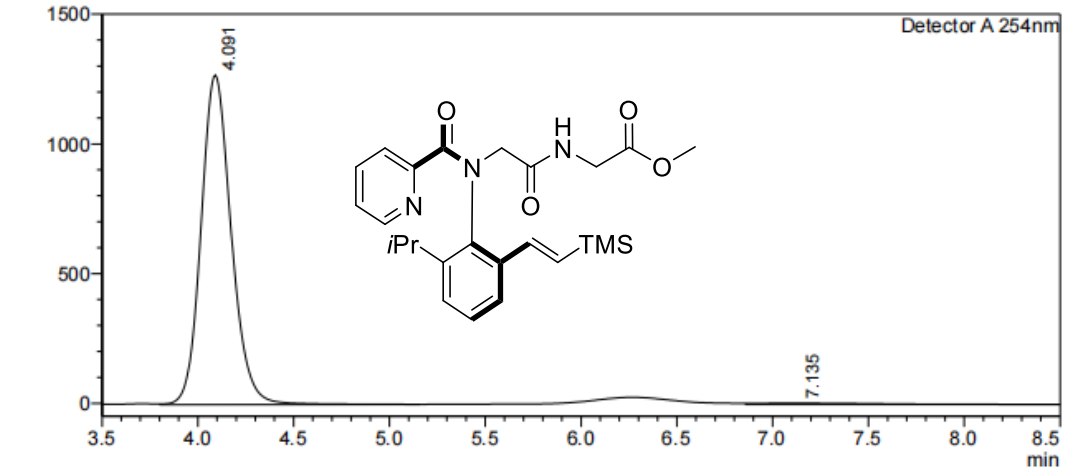
<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	4.369	20512248	1714849	50.210		M	
2	7.053	20340919	427368	49.790		M	
Total		40853167	2142217				

4o: AD-H, Hexane/i-PrOH = 70/30, rate = 1.0 mL/min, 254 nm

<Chromatogram>

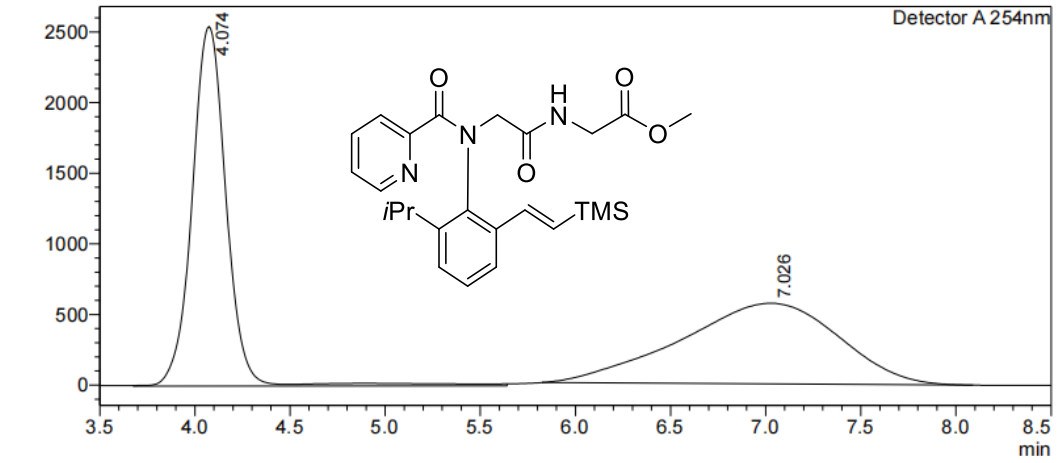


<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	4.091	13970394	1270390	98.127			
2	7.135	266702	5076	1.873			
Total		14237095	1275466				

<Chromatogram>



<Peak Table>

Detector A 254nm

Peak#	Ret. Time	Area	Height	Conc.	Unit	Mark	Name
1	4.074	32257581	2544429	49.442		M	
2	7.026	32986083	571150	50.558		M	
Total		65243664	3115579				