Supporting Information

Contents

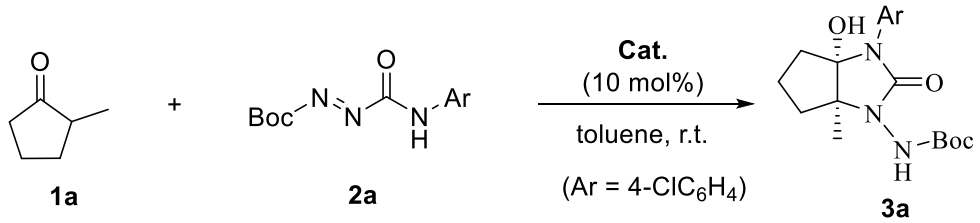
1. General methods

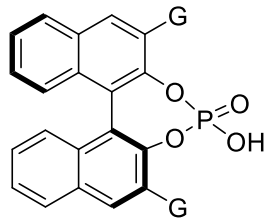
Unless otherwise specified, all reactions were conducted under an inert atmosphere and anhydrous conditions. All the solvents were purified according to the standard procedures. All chemicals which are commercially available were employed without further purification. Thin-layer chromatography (TLC) was performed on silica gel plates (60F-254) using UV-light (254 nm). Flash chromatography was conducted on silica gel (200–300 mesh). ^{1}H and ^{13}C NMR spectra were recorded at ambient temperature in $CDCl_3$ or DMSO on a 400 MHz NMR spectrometer. Chemical shifts were reported in parts per million (ppm). The data are reported as follows: for ^{1}H NMR, chemical shift in ppm from tetramethylsilane with the solvent as internal standard ($CDCl_3$ δ 7.26 ppm), (DMSO δ 2.50 ppm), multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet or overlap of non-equivalent resonances), integration; for ^{13}C NMR, chemical shift in ppm from tetramethylsilane with the solvent as internal indicator ($CDCl_3$ δ 77.1 ppm), (DMSO δ 39.5 ppm), multiplicity with respect to protons. All high-resolution mass spectra were obtained on a Q-TOF Micro LC/MS System ESI spectrometer to be given in m/z. Enantiomeric excesses values were determined with HPLC (chiral column; mobile phase *n*-hexane/*i*-PrOH). ACAs **2** are synthesized according to modified literature-reported procedures[1]; cyclic ketones are either commercially available or prepared according to the literature[2].

2. Representative procedures

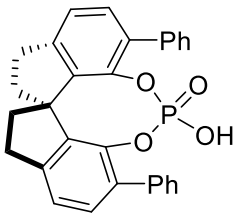
Optimization of the reaction conditions

Table S1 Effect of catalysts.





CPA1, G = 3,5-$(C_6H_5)_2C_6H_3$
CPA2, G = 2,4,6-$(^iPr)_3C_6H_2$
CPA3, G = 4-ClC_6H_4
CPA4, G = 9-anthracenyl
CPA5, G = 1-nathphalenyl
CPA6, G = $SiPh_3$



CPA7

Entry[a]	**Cat.**	Solvent	Yield (%)[b]	dr[c]	*ee* (%)[d]
1	**CPA1**	toluene	76	> 20:1	87
2	**CPA2**	toluene	85	> 20:1	95
3	**CPA3**	toluene	52	> 20:1	61
4	**CPA4**	toluene	64	> 20:1	73
5	**CPA5**	toluene	73	> 20:1	78
6	**CPA6**	toluene	n.r.	-	-
7	**CPA7**	toluene	n.r.	-	-

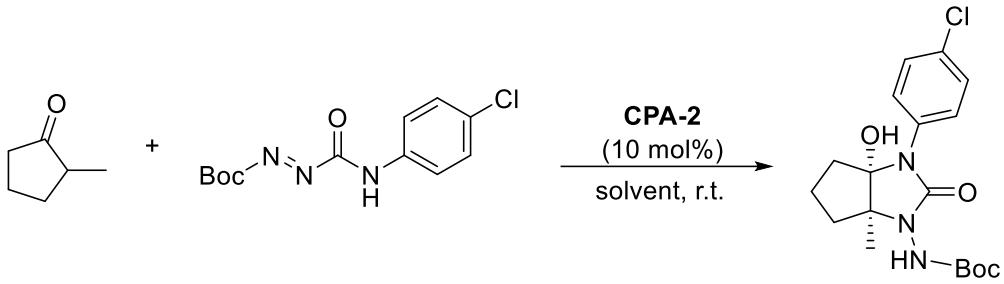
[a]Reaction conditions: **1a** (0.1 mmol), **2a** (0.15 mmol), and **Cat.** (10 mol%) in a specified solvent (1 mL) at room temperature (r.t.) for 120 h.

[b]Isolated yields.

[c]dr values were determined by ^1H NMR.

[d]*ee* values were determined by HPLC analysis on a chiral stationary phase.

Table S2 Effect of solvents.



1a **2a** **3a**

Entry[a]	**Cat.**	Solvent	Yield (%)[b]	dr[c]	*ee* (%)[d]
1	**CPA2**	toluene	85	> 20:1	95
2	**CPA2**	CH_2Cl_2	52	> 20:1	97
3	**CPA2**	CH_3CN	n.r.	-	-
4	**CPA2**	THF	n.r.	-	-
5	**CPA2**	PhCl	44	> 20:1	95
6	**CPA2**	PhBr	31	> 20:1	94

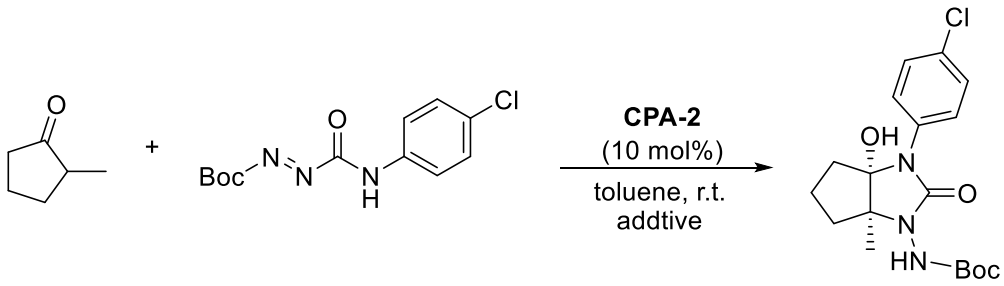
[a]Reaction conditions: **1a** (0.1 mmol), **2a** (0.15 mmol), and **CPA-2** (10 mol%) in solvent specified (1 mL) at r.t. for 120 h.

[b]Isolated yields.

[c]dr values were determined by ^{1}H NMR.

[d]*ee* values were determined by HPLC analysis on a chiral stationary phase.

Table S3 Effect of additives.



1a **2a** **3a**

Entry[a]	Addtive	Solvent	Yield (%)[b]	dr[c]	*ee* (%)[d]
1	3Å	toluene	26	> 20:1	7
2	4Å	toluene	32	> 20:1	3
3	5Å	toluene	37	> 20:1	0

[a]Reaction conditions: **1a** (0.1 mmol), **2a** (0.15 mmol), and **CPA-2** (10 mol%) in toluene (1 mL) at specific temperature. for 120 h.

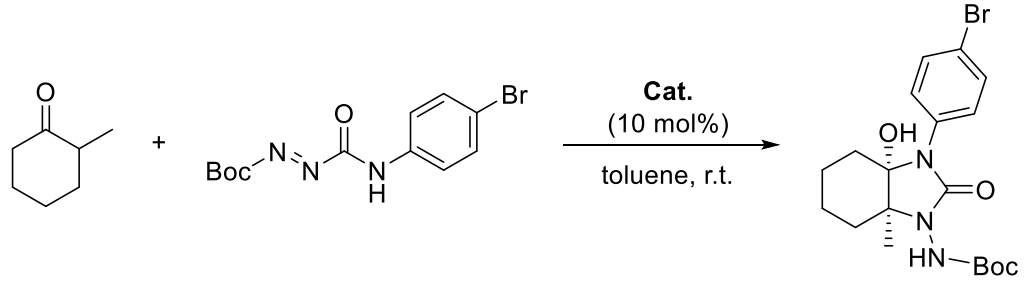
[b]Isolated yields.

[c]dr values were determined by ^{1}H NMR.

[d]*ee* values were determined by HPLC analysis on a chiral stationary phase.

Optimization of the reaction conditions

Table S4 Effect of catalysts.



1x **2d** **3x**

Entry[a]	**Cat.**	Solvent	Yield (%)[b]	dr[c]	*ee* (%)[d]
1	**CPA1**	toluene	82	> 20:1	71
2	**CPA2**	toluene	73	> 20:1	67
3	**CPA3**	toluene	n.r.	-	-
4	**CPA4**	toluene	68	> 20:1	19

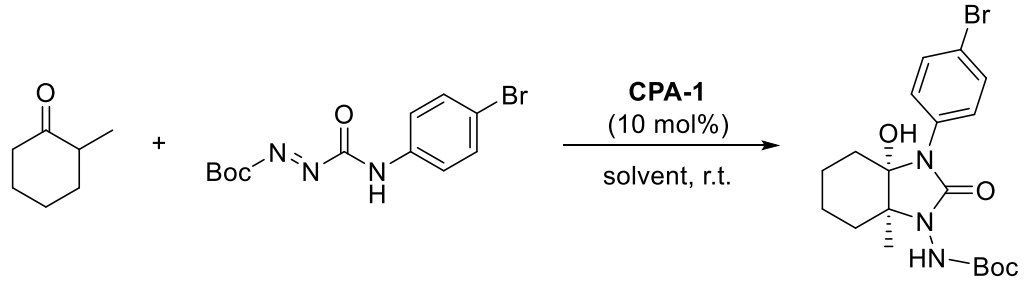
[a]Reaction conditions: **1a** (0.1 mmol), **2a** (0.15 mmol), and **Cat.** (10 mol%) in toluene specified (1 mL) at r.t. for 120 h.

[b]Isolated yields.

[c]dr values were determined by ^{1}H NMR.

[d]*ee* values were determined by HPLC analysis on a chiral stationary phase.

Table S5 Effect of solvents.



1x **2d** **3x**

Entry[a]	**Cat.**	Solvent	Yield (%)[b]	dr[c]	*ee* (%)[d]
1	**CPA1**	toluene	73	> 20:1	67
2	**CPA1**	CH_2Cl_2	41	> 20:1	91
3	**CPA1**	CH_3CN	n.r.	-	-
4	**CPA1**	THF	n.r.	-	-
5	**CPA1**	PhCl	63	> 20:1	83
6	**CPA1**	PhBr	67	> 20:1	80
7	**CPA1**	$PhCF_3$	76	> 20:1	90

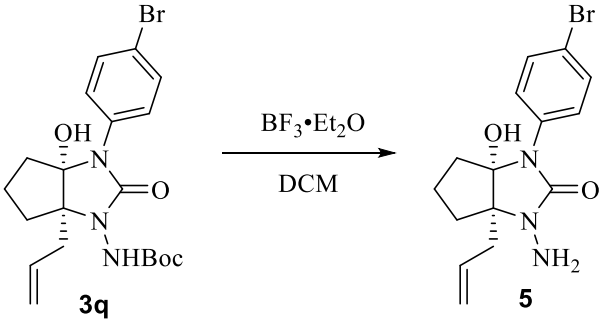
[a]Reaction conditions: **1a** (0.1 mmol), **2a** (0.15 mmol), and **CPA-1** (10 mol%) in solvent specified (1 mL) at r.t. for 120 h.

[b]Isolated yields.

[c]dr values were determined by ^{1}H NMR.

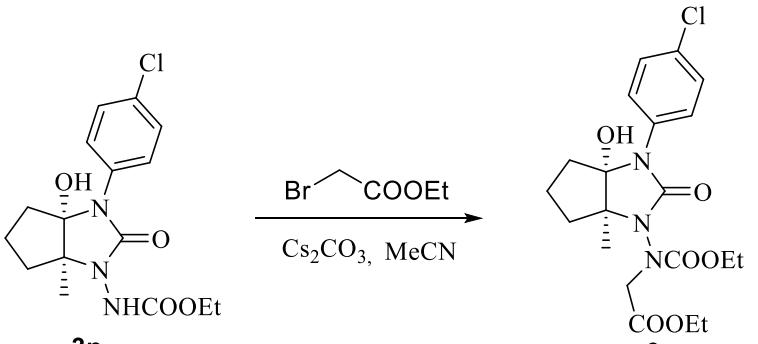
[d]*ee* values were determined by HPLC analysis on a chiral stationary phase.

Experimental procedures for the transformation of the products



Yield: 87%
ee: 92%

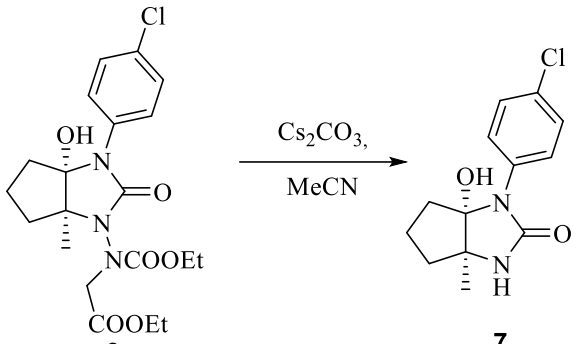
To the solution of compound **3q** (90.2 mg, 0.2 mmol) in CH_2Cl_2 (2 mL) was add boron trifluoride ether (50 μL, 0.4 mmol), the reaction mixture was stirred at room temperature for 2 h. After the completion of the reaction which was indicated by TLC, the reaction mixture was treated with H_2O and extracted with dichloromethane and washed with brine. The combined organic layers were dried with anhydrous Na_2SO_4 and the solvent was removed under reduced pressure. The residue was purified through preparative thin layer chromatography on silica gel (petroleum ether/ethyl acetate = 2:1) to afford pure product **5**.



Yield: 79%
ee: 94%
dr = 1.2:1

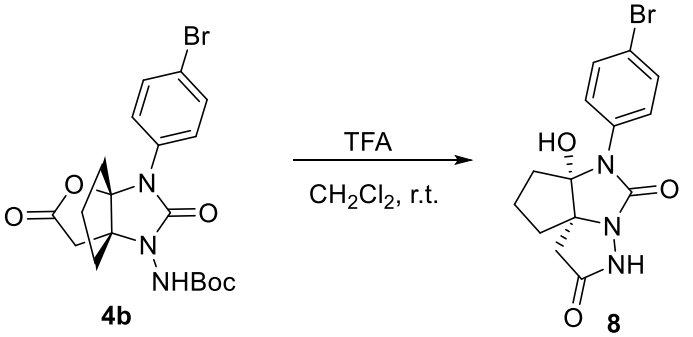
To the solution of compound **3n** (70.6 mg, 0.2 mmol) in CH_3CN (2 mL) was add ethyl 2-bromoacetate (44 μL, 0.4 mmol). Then, Cs_2CO_3 (130 mg , 0.4 mmol) was added to the reaction mixture, which was stirred at 50 ℃ for 2 h. After the completion of the reaction which was indicated by TLC, the reaction mixture was treated with H_2O and extracted with ethyl acetate and washed with brine. The combined organic layers were dried with anhydrous Na_2SO_4 and the solvent was removed under reduced pressure.

The residue was purified through preparative thin layer chromatography on silica gel (petroleum ether/ethyl acetate = 3:1) to afford pure product **6**.



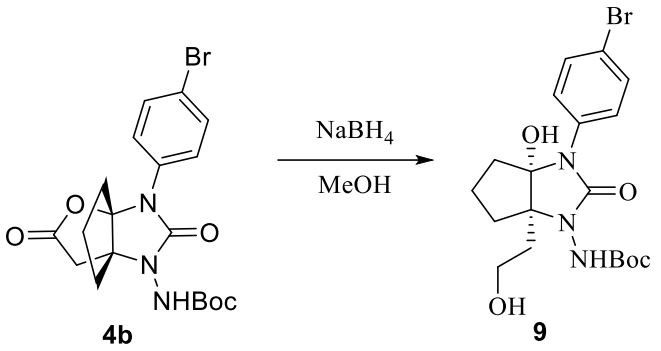
Yield: 67%
ee: 94%

To the solution of compound **6** (82.2mg, 0.2 mmol) in CH_3CN (2 mL) was add Cs_2CO_3 (97.6 mg , 0.3 mmol), the reaction mixture was stirred at 80 ℃ for 6 h. After the completion of the reaction which was indicated by TLC, the reaction mixture was treated with H_2O and extracted with ethyl acetate and washed with brine. The combined organic layers were dried with anhydrous Na_2SO_4 and the solvent was removed under reduced pressure. The residue was purified through preparative thin layer chromatography on silica gel (petroleum ether/ethyl acetate = 1:2) to afford pure product **7.**



Yield: 92%
ee: 93%

To the solution of compound **4b** (90.2 mg, 0.2 mmol) in DCM (1 mL) was add TFA (77 μL , 1 mmol), the reaction mixture was stirred at room temperature for 2 h. After the completion of the reaction which was indicated by TLC, the reaction mixture was treated with saturated $NaHCO_3$ aqueous solution and extracted with dichloromethane and washed with brine. The combined organic layers were dried with anhydrous Na_2SO_4 and the solvent was removed under reduced pressure. The residue was purified through preparative thin layer chromatography on silica gel (petroleum ether/ethyl acetate = 4:1) to afford pure product **8**.



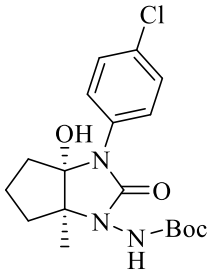
4b **9**

Yield: 87%
ee: 93%

To the solution of compound **4b** (90.2 mg, 0.2 mmol) in MeOH (2 mL) was add sodium borohydride (11.4 mg, 0.3 mmol). the reaction mixture was stirred at room temperature for 5 h. After the completion of the reaction which was indicated by TLC, the reaction mixture was treated with H_2O and extracted with ethyl acetate and washed with brine. The combined organic layers were dried with anhydrous Na_2SO_4 and the solvent was removed under reduced pressure. The residue was purified through preparative thin layer chromatography on silica gel (petroleum ether/ethyl acetate = 4:1) to afford pure product **9**.

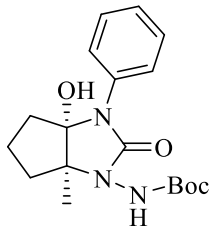
3. Characterization of products

tert-Butyl ((3a*S*,6a*S*)-3-(4-chlorophenyl)-3a-hydroxy-6a-methyl-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3a):



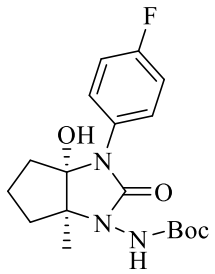
A white solid; 64.8 mg; isolated yield = 85%; m.p. 142.4 – 142.9 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +165.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 5.72 min (minor), t_2 = 6.77 min (major), *ee* = 95%; ^{1}H NMR (400 MHz, DMSO) δ 9.01 – 8.60 (m, 1H), 7.55 (d, *J* = 8.8 Hz, 2H), 7.41 (d, *J* = 8.8 Hz, 2H), 6.50 (s, 1H), 2.03 – 1.97 (m, 1H), 1.93 – 1.85 (m, 1H), 1.73 – 1.61 (m, 1H), 1.49 – 1.34 (m, 12H), 1.20 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 155.7, 154.3, 136.4, 129.0, 128.5, 126.4, 96.1, 79.6, 69.1, 37.0, 28.1, 20.8, 19.9. HRMS (ESI) m/z calcd for $C_{18}H_{24}ClN_3O_4Na^+$ [M + Na]$^+$ = 404.1347, found = 404.1343.

tert-Butyl ((3a*S*,6a*S*)-3a-hydroxy-6a-methyl-2-oxo-3-phenylhexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3b):



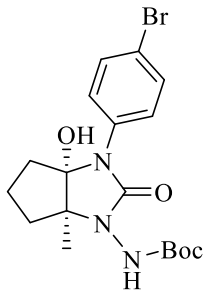
A white solid; 52.1 mg; isolated yield = 75%; m.p. 129.4 – 129.9 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = -79.01 (*c* 0.10, EA); HPLC (IH-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 6.55 min (major), t_2 = 14.59 min (minor), *ee* = 92%; ^{1}H NMR (400 MHz, DMSO) δ 8.95 – 8.56 (m, 1H), 7.56 – 7.44 (m, 2H), 7.41 – 7.31 (m, 2H), 7.24 – 7.16 (m, 1H), 6.41 (s, 1H), 2.09 – 1.98 (m, 1H), 1.91 – 1.83 (m, 1H), 1.72 – 1.57 (m, 1H), 1.50 – 1.40 (m, 12H), 1.22 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 156.2, 155.0, 137.7, 128.9, 126.1, 125.6, 96.4, 79.9, 69.4, 37.4, 37.4, 28.5, 21.2, 20.4. HRMS (ESI) m/z calcd for $C_{18}H_{25}N_3O_4Na^+$ [M + Na]$^+$ = 370.1737, found = 370.1737.

tert-Butyl ((3a*S*,6a*S*)-3-(4-fluorophenyl)-3a-hydroxy-6a-methyl-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3c):



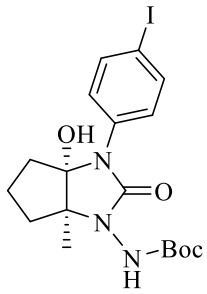
A white solid; 51.8 mg; isolated yield = 71%; m.p. 121.4 – 121.9 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = -90.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 5.71 min (minor), t_2 = 6.20 min (major), *ee* = 94%; ^{1}HNMR (400 MHz, DMSO) δ 9.05 – 8.48 (m, 1H), 7.59 – 7.38 (m, 2H), 7.31 – 7.09 (m, 2H), 6.42 (s, 1H), 2.11 – 1.93 (m, 1H), 1.88 – 1.76 (m, 1H), 1.69 – 1.55 (m, 1H), 1.54 – 1.35 (m, 12H), 1.22 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 161.4, 159.0 (*J* = 240 Hz), 156.2, 155.1, 133.8, 133.7, 128.5, 128.4, 115.8, 115.5 (*J* = 22 Hz), 96.3, 79.9, 69.5, 37.4, 37.4, 28.5, 21.2, 20.3. ^{19}F NMR (376 MHz, DMSO) δ -117.10. HRMS (ESI) m/z calcd for $C_{18}H_{24}FN_3O_4Na^+$ [M + Na]$^+$ = 388.1643, found = 388.1641.

tert-Butyl ((3a*S*,6a*S*)-3-(4-bromophenyl)-3a-hydroxy-6a-methyl-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3d):



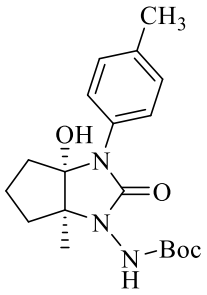
A white solid; 61.2 mg; isolated yield = 72%; m.p. 148.3 – 148.8 °C; dr > 20:1. $[\alpha]^{21.0}_{D}$ = +187.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 6.16 min (minor), t_2 = 7.77 min (major), *ee* = 93%; ^{1}H NMR (400 MHz, DMSO) δ 9.03 – 8.57 (m, 1H), 7.54 (d, *J* = 9.0 Hz, 2H), 7.50 (d, *J* = 9.0 Hz, 2H), 6.51 (s, 1H), 2.06 – 1.97 (m, 1H), 1.95 – 1.85 (m, 1H), 1.75 – 1.60 (m, 1H), 1.52 – 1.37 (m, 12H), 1.20 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 156.1, 154.6, 137.2, 131.8, 127.0, 117.5, 96.5, 80.0, 69.5, 37.4, 37.6, 28.5, 21.2, 20.3. HRMS (ESI) m/z calcd for $C_{18}H_{24}BrN_3O_4Na^+$ $[M + Na]^+$ = 448.0842, found = 448.0841.

<u>*tert*-Butyl ((3a*S*,6a*S*)-3a-hydroxy-3-(4-iodophenyl)-6a-methyl-2-oxohexahydrocyclopenta[d]imidazol-1(2*H*)-yl)carbamate (3e)</u>:



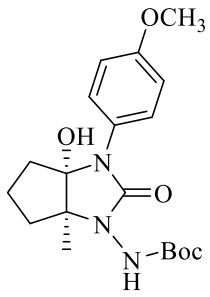
A white solid; 73.8 mg; isolated yield = 78%; m.p. 135.3 – 135.8 °C; dr > 20:1. $[\alpha]^{21.0}_{D}$ = +260.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 6.87 min (minor), t_2 = 9.26 min (major), *ee* = 95%; ^{1}H NMR (400 MHz, DMSO) δ 9.01 – 8.61 (m, 1H), 7.70 (d, *J* = 8.6 Hz, 2H), 7.38 (d, *J* = 8.6 Hz, 2H), 6.50 (s, 1H), 2.15 – 1.82 (m, 2H), 1.76 – 1.62 (m, 1H), 1.49 – 1.29 (m, 12H), 1.21 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 156.1, 154.6, 137.8, 137.6, 127.2, 96.4, 89.8, 80.0, 69.5, 37.4, 37.4, 28.5, 21.2, 20.3. HRMS (ESI) m/z calcd for $C_{18}H_{24}IN_3O_4Na^+$ $[M + Na]^+$ = 496.0703, found = 496.0704.

<u>*tert*-Butyl ((3a*S*,6a*S*)-3a-hydroxy-6a-methyl-2-oxo-3-(*p*-tolyl)hexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3f)</u>:



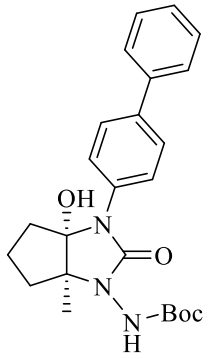
A white solid; 55.6 mg; isolated yield = 77%; m.p. 131.1 – 131.6 °C; dr > 20:1. $[\alpha]^{21.0}_{D}$ = -51.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 7.68 min (major), t_2 = 9.16 min (minor), *ee* = 94%; ^{1}H NMR (400 MHz, DMSO) δ 8.96 – 8.51 (m, 1H), 7.32 (d, *J* = 8.2 Hz, 2H), 7.15 (d, *J* = 8.2 Hz, 2H), 6.31 (s, 1H), 2.28 (s, 3H), 2.08 – 1.99 (m, 1H), 1.85 – 1.77 (m, 1H), 1.68 – 1.53 (m, 1H), 1.48 – 1.33 (m, 12H), 1.20 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 156.2, 155.2, 135.0, 134.9, 129.4, 126.5, 96.3, 79.8, 69.3, 37.5, 37.4, 28.5, 21.2, 21.0, 20.4. HRMS (ESI) m/z calcd for $C_{19}H_{27}N_3O_4Na^+$ $[M + Na]^+$ = 384.1894, found = 384.1890.

<u>*tert*-Butyl ((3a*S*,6a*S*)-3a-hydroxy-3-(4-methoxyphenyl)-6a-methyl-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3g)</u>:



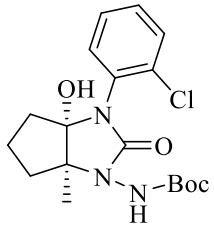
A colorless oil; 57.3 mg; isolated yield = 76%; dr > 20:1. $[\alpha]^{21.0}_D$ = +129.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 12.95 min (minor), t_2 = 13.78 min (major), *ee* = 94%; ^{1}H NMR (400 MHz, DMSO) δ 9.06 – 8.46 (m, 1H), 7.27 (d, *J* = 8.8 Hz, 2H), 6.93 (d, *J* = 8.8 Hz, 2H), 6.25 (s, 1H), 3.75 (s, 3H), 2.07 – 1.97 (m, 1H), 1.82 – 1.73 (m, 1H), 1.62 – 1.50 (m, 1H), 1.49 – 1.33 (m, 12H), 1.20 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 157.8, 156.3, 155.4, 129.9, 129.0, 114.2, 96.2, 80.0, 69.3, 55.7, 40.5, 40.3, 40.1, 39.9, 39.7, 39.5, 39.2, 37.5, 37.3, 28.5, 21.2, 20.4. HRMS (ESI) m/z calcd for $C_{19}H_{27}N_3O_5Na^+$ $[M + Na]^+$ = 400.1843, found = 400.1838.

<u>*tert*-Butyl ((3a*S*,6a*S*)-3-([1,1'-biphenyl]-4-yl)-3a-hydroxy-6a-methyl-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3h)</u>:



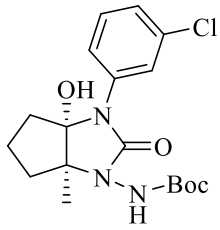
A white solid; 55.0 mg; isolated yield = 65%; m.p. 134.6 – 135.2 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = -49.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 6.63 min (major), t_2 = 9.10 min (minor), *ee* = 93%; ^{1}H NMR (400 MHz, DMSO) δ 9.27 – 8.50 (m, 1H), 7.74 – 7.65 (m, 4H), 7.63 – 7.58 (m, 2H), 7.52 – 7.43 (m, 2H), 7.39 – 7.33 (m, 1H), 6.50 (s, 1H), 2.19 – 1.83 (m, 2H), 1.78 – 1.59 (m, 1H), 1.56 – 1.35 (m, 12H), 1.23 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 156.2, 154.9, 140.1, 137.2, 137.1, 129.4, 127.7, 127.1, 126.9, 126.0, 96.5, 80.0, 69.5, 37.5, 37.4, 28.5, 21.3, 20.4. HRMS (ESI) m/z calcd for $C_{24}H_{29}N_3O_4Na^+$ $[M + Na]^+$ = 446.2050, found = 446.2046.

<u>*tert*-Butyl ((3a*S*,6a*S*)-3-(2-chlorophenyl)-3a-hydroxy-6a-methyl-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3i)</u>:



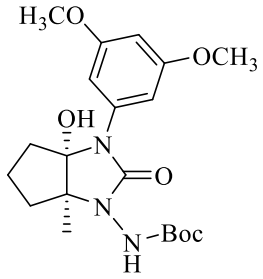
A white solid; 55.6 mg; isolated yield = 73%; m.p. 135.4 – 135.9 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +144.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 7.38 min (minor), t_2 = 10.60 min (major), *ee* = 98%; ^{1}H NMR (400 MHz, DMSO) δ 9.00 – 8.51 (m, 1H), 7.61 – 7.52 (m, 2H), 7.45 – 7.26 (m, 2H), 6.29 (s, 1H), 2.09 – 2.02 (m, 1H), 1.97 – 1.79 (m, 1H), 1.78 – 1.70 (m, 1H), 1.64 – 1.52 (m, 2H), 1.49 – 1.34 (m, 10H), 1.24 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 156.1, 154.2, 134.7, 134.0, 133.7, 130.3, 129.7, 127.7, 96.6, 79.7, 70.6, 38.3, 38.0, 28.5, 21.7, 20.0. HRMS (ESI) m/z calcd for $C_{18}H_{24}ClN_3O_4Na^+$ $[M + Na]^+$ = 404.1348, found = 404.1349.

<u>*tert*-Butyl ((3a*S*,6a*S*)-3-(3-chlorophenyl)-3a-hydroxy-6a-methyl-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3j)</u>:



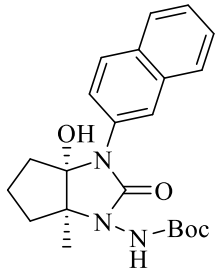
A white solid; 61.7 mg; isolated yield = 81%; m.p. 145.1 – 145.6 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = -79.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 250 nm), product: t_1 = 8.77 min (minor), t_2 = 9.27 min (major), *ee* = 91%; ^{1}H NMR (400 MHz, DMSO) δ 9.07 – 8.64 (m, 1H), 7.66 (s, 1H), 7.54 (d, *J* = 8.1 Hz, 1H), 7.38 (t, *J* = 8.1 Hz, 1H), 7.22 (d, *J* = 7.9 Hz, 1H), 6.57 (s, 1H), 2.04 – 1.90 (m, 2H), 1.77 – 1.65 (m, 1H), 1.53 – 1.34 (m, 12H), 1.21 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 156.1, 154.5, 139.4, 133.1, 130.5, 124.7, 124.1, 123.0, 96.6, 80.0, 69.6, 37.4, 37.3, 28.5, 21.3, 20.2. HRMS (ESI) m/z calcd for $C_{18}H_{24}ClN_3O_4Na^+$ $[M + Na]^+$ = 404.1348, found = 404.1346.

<u>*tert*-Butyl ((3a*S*,6a*S*)-3-(3,5-dimethoxyphenyl)-3a-hydroxy-6a-methyl-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3k)</u>:



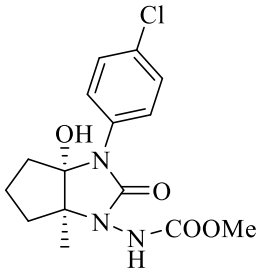
A colorless oil; 70.8 mg; isolated yield = 87%; dr > 20:1. $[\alpha]^{21.0}_D$ = +123.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 7.68 min (minor), t_2 = 10.35 min (major), *ee* = 98%; ^{1}H NMR (400 MHz, DMSO) δ 9.02 – 8.60 (m, 1H), 7.06 – 6.87 (m, 2H), 6.61 (s, 1H), 3.79 (s, 6H), 2.11 – 1.93 (m, 2H), 1.86 – 1.63 (m, 1H), 1.57 – 1.37 (m, 12H), 1.21 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 156.5, 156.2, 154.7, 138.7, 102.2, 96.7, 96.1, 80.0, 69.6, 56.7, 37.6, 37.5, 28.5, 21.4, 20.2. HRMS (ESI) m/z calcd for $C_{20}H_{29}N_3O_6Na^+$ $[M + Na]^+$ = 430.1949, found = 430.1955.

<u>*tert*-Butyl ((3a*S*,6a*S*)-3a-hydroxy-6a-methyl-3-(naphthalen-2-yl)-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3l)</u>:



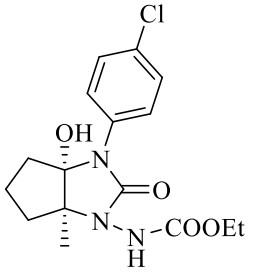
A white solid; 50.0 mg; isolated yield = 63%; m.p. 133.3 – 133.8 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = -84.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 5.36 min (major), t_2 = 6.25 min (minor), *ee* = 91%; ^{1}H NMR (400 MHz, DMSO) δ 9.03 – 8.57 (m, 1H), 8.00 (s, 1H), 7.95 – 7.83 (m, 3H), 7.78 – 7.63 (m, 1H), 7.57 – 7.37 (m, 2H), 6.55 (s, 1H), 2.12 – 2.03 (m, 1H), 1.98 – 1.89 (m, 1H), 1.80 – 1.58 (m, 1H), 1.56 – 1.36 (m, 12H), 1.26 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 156.2, 155.1, 135.5, 133.5, 131.1, 128.3, 128.0, 127.9, 126.7, 125.9, 125.3, 123.1, 96.6, 79.9, 69.6, 37.6, 37.5, 28.5, 21.3, 20.4. HRMS (ESI) m/z calcd for $C_{22}H_{27}N_3O_4Na^+$ $[M + Na]^+$ = 420.1894, found = 420.1896.

<u>Methyl ((3a*S*,6a*S*)-3-(4-chlorophenyl)-3a-hydroxy-6a-methyl-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3m)</u>:



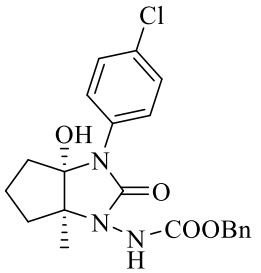
A white solid; 44.1 mg; isolated yield = 65%; m.p. 140.3 – 140.8 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +91.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 250 nm), product: t_1 = 11.94 min (minor), t_2 = 15.07 min (major), *ee* = 92%; ^{1}H NMR (400 MHz, DMSO) δ 9.31 (s, 1H), 7.59 – 7.51 (m, 2H), 7.49 – 7.39 (m, 2H), 6.56 (s, 1H), 3.64 (s, 3H), 2.09 – 1.82 (m, 2H), 1.77 – 1.62 (m, 1H), 1.57 – 1.36 (m, 3H), 1.24 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 157.7, 154.7, 136.6, 129.6, 128.9, 126.9, 96.5, 69.6, 52.6, 37.4, 37.2, 21.2, 20.3. HRMS (ESI) m/z calcd for $C_{15}H_{18}ClN_3O_4Na^+$ $[M + Na]^+$ = 362.0878, found = 362.0873.

Ethyl ((3a*S*,6a*S*)-3-(4-chlorophenyl)-3a-hydroxy-6a-methyl-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3n):



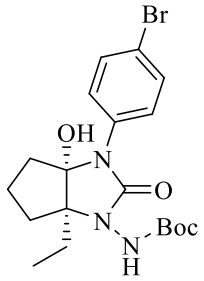
A white solid; 47.3 mg; isolated yield = 67%; m.p. 139.4 – 139.9 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +115.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 10.03 min (minor), t_2 = 12.36 min (major), *ee* = 94%; ^{1}H NMR (400 MHz, DMSO) δ 9.35 – 8.88 (m, 1H), 7.55 (d, *J* = 8.8 Hz, 2H), 7.43 (d, *J* = 8.8 Hz, 2H), 6.55 (s, 1H), 4.08 (q, *J* = 7.0 Hz, 2H), 2.06 – 1.96 (m, 1H), 1.93 – 1.84 (m, 1H), 1.74 – 1.62 (m, 1H), 1.55 – 1.35 (m, 3H), 1.24 – 1.21 (m, 6H). ^{13}C NMR (100 MHz, DMSO) δ 157.2, 154.7, 136.6, 129.5, 128.9, 126.9, 96.5, 69.6, 61.3, 37.4, 37.2, 21.2, 20.3, 14.9. HRMS (ESI) m/z calcd for $C_{16}H_{20}ClN_3O_4Na^+$ $[M + Na]^+$ = 376.1035, found = 376.1037.

Benzyl ((3a*S*,6a*S*)-3-(4-chlorophenyl)-3a-hydroxy-6a-methyl-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3o):



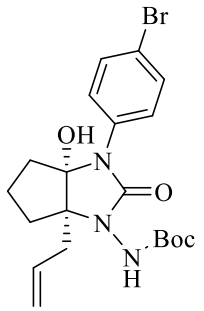
A white solid; 58.9 mg; isolated yield = 71%; m.p. 130.4 – 130.9 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = -42.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 14.78 min (major), t_2 = 18.95 min (minor), *ee* = 93%; ^{1}H NMR (400 MHz, DMSO) δ 9.54 – 9.07 (m, 1H), 7.60 – 7.48 (m, 2H), 7.46 – 7.26 (m, 7H), 6.57 (s, 1H), 5.22 – 5.03 (m, 2H), 2.09 – 1.97 (m, 1H), 1.95 – 1.85 (m, 1H), 1.77 – 1.58 (m, 1H), 1.55 – 1.35 (m, 2H), 1.32 – 1.17 (m, 4H). ^{13}C NMR (100 MHz, DMSO) δ 157.2, 154.7, 139.2, 136.9, 136.6, 129.6, 128.9, 128.5, 128.3, 127.0, 96.6, 69.6, 66.6, 37.4, 37.2, 21.2, 20.3. HRMS (ESI) m/z calcd for $C_{21}H_{22}ClN_3O_4Na^+$ $[M + Na]^+$ = 438.1191, found = 438.1187.

***tert*-Butyl ((3aS,6aS)-3-(4-bromophenyl)-6a-ethyl-3a-hydroxy-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3p):**



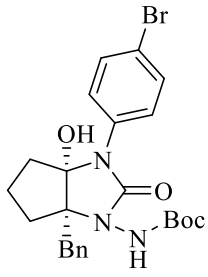
A white solid; 71.1 mg; isolated yield = 81%; m.p. 132.1 – 132.7 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +87.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 5.89 min (minor), t_2 = 8.91 min (major), *ee* = 94%; ^{1}H NMR (400 MHz, DMSO) δ 9.07 – 8.46 (m, 1H), 7.54 (d, *J* = 8.7 Hz, 2H), 7.46 (d, *J* = 8.8 Hz, 2H), 6.51 (s, 1H), 1.97 – 1.84 (m, 2H), 1.76 – 1.45 (m, 6H), 1.41 (s, 9H), 0.95 (t, *J* = 7.2 Hz, 3H). ^{13}C NMR (100 MHz, DMSO) δ 156.3, 155.0, 137.0, 131.8, 127.6, 117.8, 97.0, 80.0, 71.5, 37.9, 33.6, 28.5, 26.9, 21.2, 9.2. HRMS (ESI) m/z calcd for $C_{19}H_{26}BrN_3O_4Na^+$ $[M + Na]^+$ = 462.0999, found = 462.0996.

<u>*tert*-Butyl ((3a*S*,6a*R*)-6a-allyl-3-(4-bromophenyl)-3a-hydroxy-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3q)</u>:



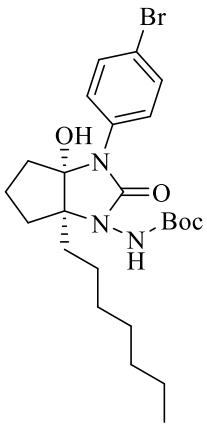
A white solid; 70.3 mg; isolated yield = 78%; m.p. 131.6 – 132.4 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +76.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 5.35 min (minor), t_2 = 7.80 min (major), *ee* = 95%; ^{1}H NMR (400 MHz, DMSO) δ 9.10 – 8.25 (m, 1H), 7.56 (d, *J* = 8.8 Hz, 2H), 7.48 (d, *J* = 8.9 Hz, 2H), 6.69 (s, 1H), 6.05 – 5.84 (m, 1H), 5.25 – 4.96 (m, 2H), 2.48 – 2.32 (m, 2H), 1.94 – 1.82 (m, 2H), 1.72 – 1.53 (m, 2H), 1.52 – 1.32 (m, 11H). ^{13}C NMR (100 MHz, DMSO) δ 156.0, 154.8, 136.9, 135.3, 131.8, 127.4, 118.5, 117.9, 96.9, 80.0, 81.0, 37.5, 33.4, 33.0, 28.5, 21.2. HRMS (ESI) m/z calcd for $C_{20}H_{26}BrN_3O_4Na^+$ $[M + Na]^+$ = 474.0999, found = 474.1009.

<u>*tert*-Butyl ((3a*S*,6a*R*)-6a-benzyl-3-(4-bromophenyl)-3a-hydroxy-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3r)</u>:



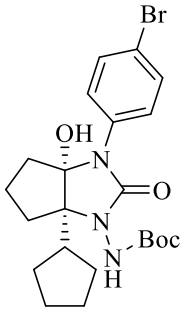
A white solid;77.2 mg; isolated yield = 77%; m.p. 132.8 – 133.4 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +184.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 5.09 min (minor), t_2 = 7.69 min (major), *ee* = 94%; 1H NMR (400 MHz, DMSO) δ 8.94 – 8.57 (m, 1H), 7.60 – 7.54 (m, 2H), 7.53 – 7.48 (m, 2H), 7.42 – 7.35 (m, 2H), 7.32 – 7.22 (m, 2H), 7.21 – 7.15 (m, 1H), 7.05 (s, 1H), 3.31 – 3.14 (m, 1H), 2.96 – 2.78 (m, 1H), 1.89 – 1.69 (m, 2H), 1.65 – 1.51 (m, 1H), 1.44 – 1.28 (m, 12H) 13C NMR (101 MHz, DMSO) δ 156.3, 154.9, 138.1, 136.8, 131.8, 131.7, 128.3, 127.6, 126.6, 118.0, 97.2, 80.0, 72.5, 72.2, 39.2, 37.3, 32.6, 28.5, 21.1. HRMS (ESI) m/z calcd for $C_{24}H_{28}BrN_3O_4Na^+$ $[M + Na]^+$ = 524.1155, found = 524.1152.

<u>*tert*-Butyl ((3a*S*,6a*S*)-3-(4-bromophenyl)-6a-heptyl-3a-hydroxy-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3s)</u>:



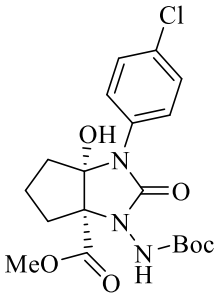
A white solid; 84.5 mg; isolated yield = 83%; m.p. 136.2 – 136.8 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +206.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 4.44 min (minor), t_2 = 6.89 min (major), *ee* = 96%; ^{1}H NMR (400 MHz, DMSO) δ 8.94 – 8.49 (m, 1H), 7.58 – 7.51 (m, 2H), 7.49 – 7.45 (m, 2H), 6.49 (s, 1H), 2.00 – 1.83 (m, 2H), 1.74 – 1.52 (m, 4H), 1.48 – 1.40 (m, 12H), 1.25 (s, 9H), 0.85 (t, *J* = 6.5 Hz, 3H). ^{13}C NMR (100 MHz, DMSO) δ 156.2, 155.0, 137.1, 131.7, 127.5, 117.8, 97.0, 79.8, 71.3, 37.8, 34.6, 34.0, 31.8, 30.6, 29.1, 28.5, 24.0, 22.6, 21.2, 14.4. HRMS (ESI) m/z calcd for $C_{24}H_{36}BrN_3O_4Na^+$ [M + Na]$^+$ = 532.1781, found = 532.1788.

<u>*tert*-Butyl ((3a*S*,6a*R*)-3-(4-bromophenyl)-6a-cyclopentyl-3a-hydroxy-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3t)</u>:



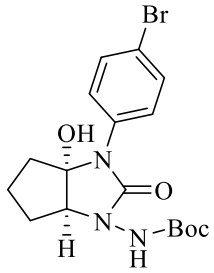
A white solid; 75.7 mg; isolated yield = 79%; m.p. 132.5 – 133.0 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +142.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 5.83 min (minor), t_2 = 19.10 min (major), *ee* = 93%; ^{1}H NMR (400 MHz, DMSO) δ 8.90 – 8.35 (m, 1H), 7.61 – 7.52 (m, 2H), 7.48 – 7.41 (m, 2H), 6.71 – 6.25 (m, 1H), 2.39 – 2.17 (m, 1H), 2.08 – 1.75 (m, 4H), 1.71 – 1.47 (m, 6H), 1.44 – 1.26 (m, 13H). ^{13}C NMR (100 MHz, DMSO) δ 156.3, 155.0, 137.0, 131.7, 127.9, 127.6, 117.9, 97.5, 80.0, 73.7, 44.78, 38.4, 33.0, 31.0, 28.5, 25.7, 21.4. HRMS (ESI) m/z calcd for $C_{22}H_{30}BrN_3O_4Na^+$ [M + Na]$^+$ = 502.1312, found = 502.1309.

<u>Methyl (3a*S*,6a*S*)-3-((*tert*-butoxycarbonyl)amino)-1-(4-chlorophenyl)-6a-hydroxy-2-oxohexahydrocyclopenta[*d*]imidazole-3a(1*H*)-carboxylate (3u):</u>



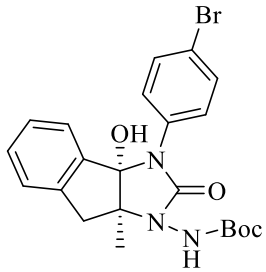
A white solid; 37.4 mg; isolated yield = 44%; m.p. 152.3 – 152.9 °C; dr > 20:1; $[\alpha]^{21.0}_D$ = +121.05 (*c* 0.10, EA); HPLC (IF-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 6.93 min (major), t_2 = 15.50 min (minor), *ee* = 91%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.09 – 7.54 (m, 1H), 7.09 (d, *J* = 8.4 Hz, 2H), 6.96 (d, *J* = 8.4 Hz, 2H), 5.33 (s, 1H), 3.89 (s, 3H), 2.51 – 2.38 (m, 1H), 2.35 – 2.27 (m, 1H), 1.85 – 1.78 (m, 2H), 1.77 – 1.66 (m, 2H), 1.48 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.0, 156.2, 155.6, 133.9, 131.4, 128.3, 126.0, 98.5, 81.2, 78.0, 53.2, 35.3, 33.3, 28.2, 22.2. HRMS (ESI) m/z calcd for $C_{18}H_{24}ClN_3O_6Na^+$ [M + Na]$^+$ = 464.1559, found = 464.1561.

<u>*tert*-Butyl ((3a*S*,6a*S*)-3-(4-bromophenyl)-3a-hydroxy-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (3v)</u>:



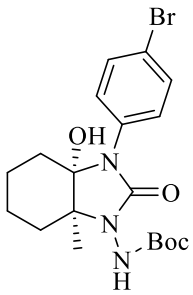
A white solid; 60.8 mg; isolated yield = 74%; m.p. 129.7 – 130.3 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +42.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 12.30 min (minor), t_2 = 87.70 min (major), *ee* = 75%; ^{1}H NMR (400 MHz, DMSO) δ 9.23 – 8.56 (m, 1H), 7.73 – 7.36 (m, 4H), 6.81 (s, 1H), 3.78 (s, 1H), 1.92 – 1.84 (m, 1H), 1.82 – 1.60 (m, 4H), 1.60 – 1.47 (m, 1H), 1.42 (s, 9H). ^{13}C NMR (100 MHz, DMSO) δ 155.4, 137.4, 131.8, 126.3, 117.4, 95.8, 80.3, 68.5, 38.0, 30.2, 28.5, 23.5. HRMS (ESI) m/z calcd for $C_{17}H_{22}BrN_3O_4Na^+$ $[M + Na]^+$ = 434.0686, found = 434.0681.

<u>*tert*-Butyl ((3a*S*,8a*S*)-3-(4-bromophenyl)-3a-hydroxy-8a-methyl-2-oxo-3,3a,8,8a-tetrahydroindeno[1,2-*d*]imidazol-1(2*H*)-yl)carbamate (3w)</u>:



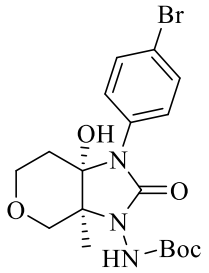
A white solid; 57.7 mg; isolated yield = 61%; m.p. 129.6 – 130.4 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = -88.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 5.83 min (major), t_2 = 6.73 min (minor), *ee* = 92%; ^{1}H NMR (400 MHz, DMSO) δ 9.14 – 8.73 (m, 1H), 7.62 – 7.48 (m, 2H), 7.35 – 7.15 (m, 4H), 7.12 – 7.03 (m, 2H), 6.80 – 6.74 (m, 1H), 3.48 – 3.37 (m, 1H), 2.94 – 2.83 (m, 1H), 1.44 (s, 9H), 1.32 (s, 3H). ^{13}C NMR (100MHz, DMSO) δ 156.1 154.8, 141.0, 140.4 136.4, 131.8 129.8, 129.8 126.8, 125.7, 124.9, 119.2, 96.7 80.1 71.3 43.0, 28.5, 19.2. HRMS (ESI) m/z calcd for $C_{22}H_{24}BrN_3O_4Na^+$ $[M + Na]^+$ = 496.0842, found = 496.0840.

<u>*tert*-Butyl ((3a*S*,7a*S*)-3-(4-bromophenyl)-3a-hydroxy-7a-methyl-2-oxooctahydro-1*H*-benzo[*d*]imidazol-1-yl)carbamate (3x)</u>:



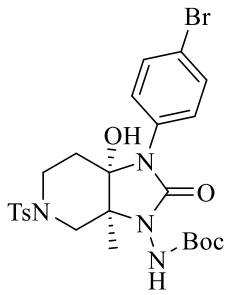
A white solid; 66.7 mg; isolated yield = 76%; m.p. 133.1 – 133.8 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = -76.00 (*c* 0.10, EA); HPLC (IH-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 9.74 min (minor), t_2 = 14.71 min (major), *ee* = 90%; ^{1}H NMR (400 MHz, DMSO) δ 8.90 – 8.25 (m, 1H), 7.62 – 7.47 (m, 2H), 7.38 – 7.20 (m, 2H), 6.24 (s, 1H), 1.82 – 1.46 (m, 5H), 1.45 – 1.34 (m, 10H), 1.27 – 1.13 (m, 5H). ^{13}C NMR (100 MHz, DMSO) δ 156.8, 156.4, 136.3, 131.8, 130.0, 119.3, 88.4, 79.9, 64.8, 34.7, 31.2, 28.5, 21.76, 20.6, 17.7. HRMS (ESI) m/z calcd for $C_{19}H_{26}BrN_3O_4Na^+$ $[M + Na]^+$ = 462.0999, found = 462.0995.

<u>*tert*-Butyl ((3a*S*,7a*S*)-1-(4-bromophenyl)-7a-hydroxy-3a-methyl-2-oxohexahydropyrano[3,4-*d*]imidazol-3(2*H*)-yl)carbamate (3y)</u>:



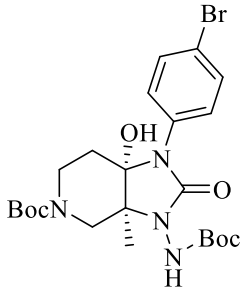
A colorless oil; 68.8 mg; isolated yield = 78%; dr > 20:1. $[\alpha]^{21.0}_D$ = +157.00 (*c* 0.10, EA); HPLC (IE-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 4.18 min (minor), t_2 = 4.67 min (major), *ee* = 90%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.54 – 7.35 (m, 2H), 7.31 – 7.17 (m, 2H), 7.06 (s, 1H), 5.84 (s, 1H), 3.91 – 3.51 (m, 2H), 3.39 – 3.05 (m, 2H), 2.00 – 1.77 (m, 2H), 1.42 (s, 9H), 1.34 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.6, 157.2, 134.2, 132.1, 128.5, 120.7, 88.5, 82.8, 74.8, 64.7, 63.2, 29.1, 28.1, 14.2. HRMS (ESI) m/z calcd for $C_{18}H_{24}BrN_3O_5Na^+$ $[M + Na]^+$ = 464.0791, found = 464.0789.

<u>*tert*-Butyl ((3a*S*,8a*S*)-3-(4-bromophenyl)-3a-hydroxy-8a-methyl-2-oxo-3,3a,8,8a-tetrahydroindeno[1,2-*d*]imidazol-1(2*H*)-yl)carbamate (3z)</u>:



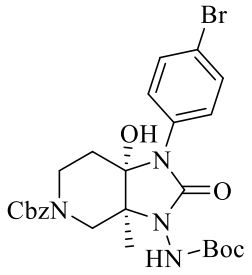
A colorless oil; 84.3 mg; isolated yield = 71%; dr > 20:1. $[\alpha]^{21.0}_D$ = -127.01 (*c* 0.10, EA); HPLC (IF-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 4.44 min (minor), t_2 = 8.27 min (major), *ee* = 92%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.57 – 7.46 (m, 3H), 7.27 – 7.16 (m, 5H), 7.04 (s, 2H), 3.70 – 2.70 (m, 4H), 2.35 (s, 3H), 2.02 – 1.90 (m, 1H), 1.86 – 1.74 (m, 1H), 1.42 (s, 9H), 1.33 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 156.6, 156.5, 144.0, 133.9, 133.6, 131.8, 130.0, 127.5, 127.2, 120.1, 87.7, 82.6, 65.3, 51.3, 42.0, 28.2, 27.7, 21.6, 15.2. HRMS (ESI) m/z calcd for $C_{25}H_{31}BrN_4O_6SNa^+$ $[M + Na]^+$ = 617.1040, found = 617.1035.

<u>*tert*-Butyl (3a*S*,7a*S*)-1-(4-bromophenyl)-3-((*tert*-butoxycarbonyl)amino)-7a-hydroxy-3a-methyl-2-oxooctahydro-5*H*-imidazo[4,5-*c*]pyridine-5-carboxylate (3a')</u>:



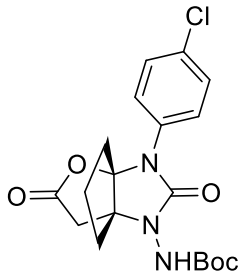
A colorless oil; 79.9 mg; isolated yield = 74%; dr > 20:1. $[\alpha]^{21.0}_D$ = -158.01 (*c* 0.10, EA); HPLC (ID-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 6.89 min (minor), t_2 = 7.44 min (major), *ee* = 96%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.51 – 7.28 (m, 3H), 7.21 – 7.14 (m, 1H), 3.92 – 2.69 (m, 4H), 2.02 – 1.75 (m, 2H), 1.47 (s, 18H), 1.30 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 155.8, 154.0, 154.0, 134.7, 131.5, 126.6, 119.4, 87.7, 82.0, 80.7, 77.3, 65.3, 40.0, 39.6, 28.2, 15.7. HRMS (ESI) m/z calcd for $C_{23}H_{33}BrN_4O_6Na^+$ $[M + Na]^+$ = 563.1475, found = 563.1472.

<u>Benzyl (3a*S*,7a*S*)-1-(4-bromophenyl)-3-((*tert*-butoxycarbonyl)amino)-7a-hydroxy-3a-methyl-2-oxooctahydro-5*H*-imidazo[4,5-*c*]pyridine-5-carboxylate (3b')</u>:



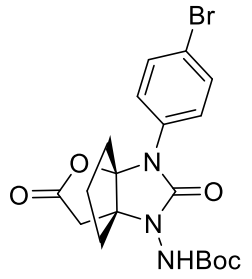
A colorless oil; 99.8 mg; isolated yield = 87%; dr > 20:1. $[\alpha]^{21.0}_D$ = -188.01 (*c* 0.10, EA); HPLC (IK-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 6.03 min (minor), t_2 = 6.59 min (major), *ee* = 95%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.62 – 7.29 (m, 6H), 7.20 – 7.04 (m, 3H), 5.32 – 4.96 (m, 2H), 3.90 – 2.74 (m, 4H), 2.06 – 1.76 (m, 2H), 1.49 (s, 9H), 1.33 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 155.2, 155.1, 153.8, 133.2, 130.7, 130.4, 127.6, 127.23, 127.3, 127.1, 125.4, 118.3 86.5, 80.9, 76.3, 76.0, 75.7, 66.6, 64.4, 63.7, 39.2, 38.8, 27.1, 14.7. HRMS (ESI) m/z calcd for $C_{26}H_{31}BrN_4O_6Na^+$ $[M + Na]^+$ = 597.1319, found = 597.1329.

<u>*tert*-Butyl ((3a*R*,6a*S*)-7-(4-chlorophenyl)-2,8-dioxotetrahydro-4*H*-3a,6a-(epiminomethanoimino)cyclopenta[*b*]furan-9-yl)carbamate (4a)</u>:



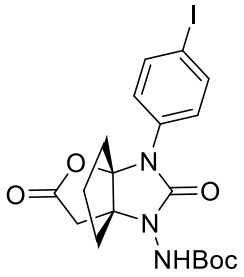
A white solid; 70.0 mg; isolated yield = 86%; m.p. 120.4 – 120.7 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +434.02 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 10.03 min (major), t_2 = 11.08 min (minor), *ee* = 93%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.57 – 7.43 (m, 2H), 7.33 – 7.28 (m, 2H), 7.20 – 6.92 (m, 1H), 3.43 – 3.16 (m, 1H), 2.78 – 2.60 (m, 1H), 2.49 – 2.26 (m, 1H), 2.24 – 2.04 (m, 2H), 1.99 – 1.87 (m, 2H), 1.87 – 1.78 (m, 1H), 1.46 (s, 9H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.7, 155.7, 154.1, 134.2, 131.6, 129.2, 124.7, 105.1, 82.5, 71.4, 39.7, 37.5, 36.6, 28.1, 23.7. HRMS (ESI) m/z calcd for $C_{19}H_{22}ClN_3O_5Na^+$ $[M + Na]^+$ = 430.1140, found = 430.1139.

<u>*tert*-Butyl ((3a*R*,6a*S*)-7-(4-bromophenyl)-2,8-dioxotetrahydro-4*H*-3a,6a-(epiminomethanoimino)cyclopenta[*b*]furan-9-yl)carbamate (4b)</u>:



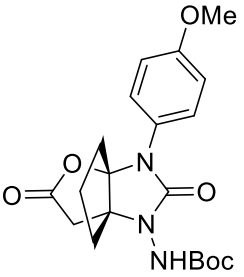
A white solid; 74.9 mg; isolated yield = 83%; m.p. 114.2 – 114.8 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +466.02 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 10.84 min (major), t_2 = 12.65 min (minor), *ee* = 93%; ^{1}H NMR (400 MHz, DMSO) δ 9.56 – 8.60 (m, 1H), 7.75 – 7.58 (m, 2H), 7.50 – 7.37 (m, 2H), 3.22 – 2.97 (m, 2H), 2.35 – 1.90 (m, 4H), 1.89 – 1.64 (m, 2H), 1.49 – 1.34 (m, 9H). ^{13}C NMR (100 MHz, DMSO) δ 174.5, 156.0, 153.5, 135.7, 132.5, 125.0, 118.2, 104.6, 81.0, 71.7, 39.0, 36.5, 36.1, 28.4, 28.1, 23.8. HRMS (ESI) m/z calcd for $C_{19}H_{22}BrN_3O_5Na^+$ $[M + Na]^+$ = 474.0635, found = 474.0631.

<u>*tert*-Butyl ((3a*R*,6a*S*)-7-(4-iodophenyl)-2,8-dioxotetrahydro-4*H*-3a,6a-(epiminomethanoimino)cyclopenta[*b*]furan-9-yl)carbamate (4c)</u>:



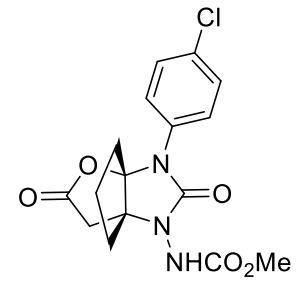
A white solid; 91.8 mg; isolated yield = 92%; m.p. 117.1 – 117.6 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +473.02 (*c* 0.10, EA); HPLC IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 14.52 min (major), t_2 = 15.71 min (minor), *ee* = 96%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74 – 7.59 (m, 2H), 7.38 – 7.28 (m, 2H), 7.14 – 6.89 (m, 1H), 3.44 – 3.23 (m, 1H), 2.72 – 2.62 (m, 1H), 2.47 – 2.26 (m, 1H), 2.23 – 2.05 (m, 2H), 2.01 – 1.88 (m, 1H), 1.86 – 1.78 (m, 2H), 1.46 (s, 9H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.6, 155.7, 153.9, 138.1, 135.5, 125.0, 105.0, 90.3, 82.6, 71.4, 39.7, 37.5, 36.6, 28.1, 23.7. HRMS (ESI) m/z calcd for $C_{19}H_{22}IN_3O_5Na^+$ $[M + Na]^+$ = 522.0496, found = 522.0497.

tert-Butyl ((3a*R*,6a*S*)-7-(4-methoxyphenyl)-2,8-dioxotetrahydro-4*H*-3a,6a-(epiminomethanoimino)cyclopenta[*b*]furan-9-yl)carbamate (4d):



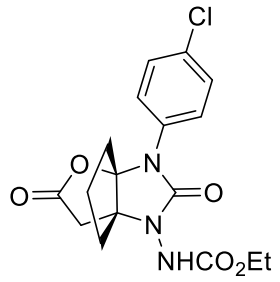
A white solid; 59.6 mg; isolated yield = 74%; m.p. 126.6 – 127.4 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +361.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 17.41 min (major), t_2 = 18.34 min (minor), *ee* = 94%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 – 7.34 (m, 2H), 7.17 – 6.95 (m, 1H), 6.93 – 6.80 (m, 2H), 3.78 (s, 3H), 3.40 – 3.25 (m, 1H), 2.72 – 2.58 (m, 1H), 2.54 – 2.25 (m, 1H), 2.19 – 2.09 (m, 1H), 2.07 – 1.95 (m, 1H), 1.95 – 1.75 (m, 3H), 1.46 (s, 9H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.9, 158.2, 155.8, 154.8, 128.1, 126.4, 114.4, 105.5, 82.3, 71.2, 55.5, 40.0, 37.6, 36.4, 28.1, 23.6. HRMS (ESI) m/z calcd for $C_{20}H_{25}N_3O_6Na^+$ $[M + Na]^+$ = 426.1635, found = 426.1634.

Methyl ((3a*R*,6a*S*)-7-(4-chlorophenyl)-2,8-dioxotetrahydro-4*H*-3a,6a-(epiminomethanoimino)cyclopenta[*b*]furan-9-yl)carbamate (4e):



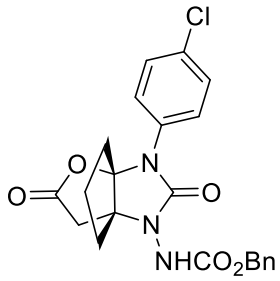
A white solid; 51.1 mg; isolated yield = 70%; m.p. 116.6 – 117.3 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +192.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 19.88 min (major), t_2 = 21.82 min (minor), *ee* = 96%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.50 – 7.44 (m, 2H), 7.37 – 7.30 (m, 3H), 3.77 (s, 3H), 3.36 – 3.18 (m, 1H), 2.75 – 2.61 (m, 1H), 2.51 – 2.27 (m, 1H), 2.20 – 2.05 (m, 2H), 1.99 – 1.77 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.4, 157.4, 154.2, 134.0, 131.8, 129.3, 124.8, 105.1, 71.5, 53.6, 39.5, 37.3, 36.6, 23.7. HRMS (ESI) m/z calcd for $C_{16}H_{16}ClN_3O_5Na^+$ $[M + Na]^+$ = 388.0671, found = 388.0667.

Ethyl ((3a*R*,6a*S*)-7-(4-chlorophenyl)-2,8-dioxotetrahydro-4*H*-3a,6a-(epiminomethanoimino)cyclopenta[*b*]furan-9-yl)carbamate (4f):



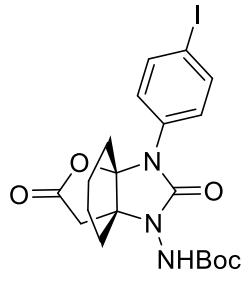
A white solid; 50.8 mg; isolated yield = 67%; m.p. 115.2 – 115.8 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +318.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 12.21 min (major), t_2 = 17.04 min (minor), *ee* = 97%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.50 – 7.45 (m, 2H), 7.35 – 7.29 (m, 2H), 7.27 (s, 1H), 4.26 – 4.17 (m, 2H), 3.40 – 3.19 (m, 1H), 2.75 – 2.59 (m, 1H), 2.51 – 2.30 (m, 1H), 2.24 – 2.03 (m, 2H), 2.00 – 1.76 (m, 3H), 1.27 (t, *J* = 7.1 Hz, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.5, 156.9, 154.1, 134.0, 131.7, 129.3, 124.7, 105.1, 71.5, 62.9, 39.6, 37.3, 36.6, 23.7, 14.3. HRMS (ESI) m/z calcd for $C_{17}H_{18}ClN_3O_5Na^+$ $[M + Na]^+$ = 402.0827, found = 402.0825.

Benzyl ((3a*R*,6a*S*)-7-(4-chlorophenyl)-2,8-dioxotetrahydro-4*H*-3a,6a-(epiminomethanoimino)cyclopenta[*b*]furan-9-yl)carbamate (4g):



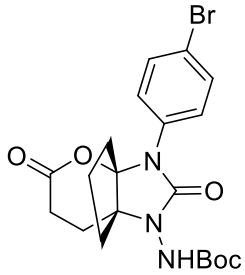
A white solid;67.9 mg; isolated yield = 77%; m.p. 119.1 – 119.8 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +217.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 25.76 min (major), t_2 = 35.17 min (minor), *ee* = 94%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 – 7.40 (m, 3H), 7.36 – 7.28 (m, 7H), 5.26 – 5.10 (m, 2H), 3.42 – 3.11 (m, 1H), 2.71 – 2.52 (m, 1H), 2.45 – 2.20 (m, 1H), 2.20 – 2.02 (m, 2H), 1.93 – 1.77 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.4, 156.8, 154.1, 135.2, 133.9, 131.8, 129.3, 128.7, 128.6, 128.4, 124.9, 105.1, 71.5, 68.4, 39.6, 37.3, 36.6, 23.6. HRMS (ESI) m/z calcd for $C_{22}H_{20}ClN_3O_5Na^+$ $[M + Na]^+$ = 464.0984, found = 464.0983.

***tert*-Butyl ((3a*R*,7a*S*)-8-(4-iodophenyl)-2,9-dioxohexahydro-3a,7a-(epiminomethanoimino)benzofuran-10-yl)carbamate (4h):**



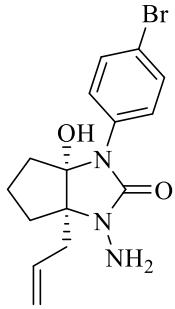
A white solid; 86.2 mg; isolated yield = 84%; m.p. 119.3 – 119.7 °C; dr > 20:1. $[\alpha]^{21.0}_D$ = +382.02 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 18.68 min (major), t_2 = 22.77 min (minor), *ee* = 90%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 – 7.67 (m, 2H), 7.17 – 7.12 (m, 2H), 6.91 (s, 1H), 3.17 – 2.96 (m, 1H), 2.75 – 2.63 (m, 1H), 2.49 – 2.35 (m, 1H), 2.19 – 2.02 (m, 1H), 1.86 – 1.73 (m, 1H), 1.65 – 1.53 (m, 2H), 1.46 (s, 9H), 1.37 – 1.15 (m, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.0, 155.6, 155.5, 154.9, 138.4, 133.9, 128.8, 97.1, 92.7, 65.5, 36.4, 29.7, 29.4, 28.0, 20.0, 19.2. HRMS (ESI) m/z calcd for $C_{20}H_{24}IN_3O_5Na^+$ $[M + Na]^+$ = 536.0653, found = 536.0648.

tert-Butyl ((4aR,7aS)-8-(4-bromophenyl)-2,9-dioxotetrahydro-2*H*,5*H*-4a,7a-(epiminomethanoimino)cyclopenta[b]pyran-10-yl)carbamate (4i):



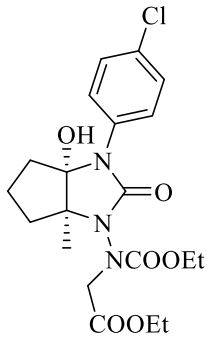
A colorless oil; 39.1 mg; isolated yield = 56%; dr > 20:1. $[\alpha]^{21.0}_D$ = +33.30 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 7.12 min (minor), t_2 = 9.22 min (major), *ee* = 96%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.48 – 7.38 (m, 2H), 7.32 – 7.23 (m, 2H), 6.61 (s, 1H), 2.59 – 2.28 (m, 2H), 2.27 – 2.02 (m, 2H), 2.02 – 1.86 (m, 1H), 1.84 – 1.53 (m, 5H), 1.43 (s, 9H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 171.1, 154.9, 134.1, 132.3, 127.7, 120.7, 101.6, 66.6, 37.9, 29.7, 28.1, 27.8, 26.1, 21.8.HRMS (ESI) m/z calcd for $C_{20}H_{24}BrN_3O_5Na^+$ $[M + Na]^+$ = 488.0784, found = 488.0792.

(3a*R*,6a*S*)-3a-Allyl-3-amino-1-(4-bromophenyl)-6a-hydroxyhexahydrocyclopenta[*d*]imidazol-2(1*H*)-one (5):



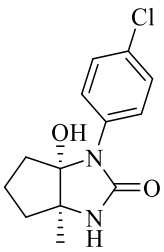
A colorless oil; 61.1 mg; isolated yield = 87%; dr > 20:1. $[\alpha]^{21.0}_D$ = +104.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 10/90, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 15.76 min (minor), t_2 = 18.11 min (major), *ee* = 92%; ^{1}H NMR (400 MHz, DMSO) δ 7.51 (s, 4H), 6.54 (s, 1H), 6.18 – 5.85 (m, 1H), 5.17 – 4.99 (m, 2H), 4.27 (s, 2H), 2.48 – 2.41 (m, 1H), 2.01 – 1.86 (m, 2H), 1.78 – 1.42 (m, 3H), 1.36 – 1.15 (m, 2H). ^{13}C NMR (100 MHz, DMSO) δ 157.0, 137.5, 136.0, 131.7, 126.6, 118.3, 117.0, 96.5, 38.9, 37.7, 33.1, 21.3. HRMS (ESI) m/z calcd for $C_{15}H_{18}BrN_3O_2Na^+$ $[M + Na]^+$ = 374.0474, found = 374.0472.

Ethyl *N*-((3a*S*,6a*S*)-3-(4-chlorophenyl)-3a-hydroxy-6a-methyl-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)-*N*-(ethoxycarbonyl)glycinate (6):



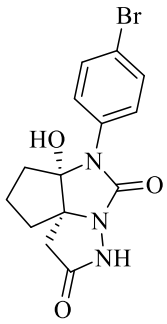
A colorless oil; 69.4 mg; isolated yield = 79%; dr = 1.2:1. $[\alpha]^{21.0}_D$ = +331.01 (*c* 0.10, EA); HPLC (IF-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), major product: t_1 = 5.80 min (minor), t_2 = 7.49 min (major), *ee* = 94%; minor product: t_1 = 4.72 min (major), t_2 = 6.83 min (minor), *ee* = 94%; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.55 – 7.38 (m, 2H), 7.30 – 7.15 (m, 2H), 5.34 – 4.33 (m, 2H), 4.31 – 4.09 (m, 4H), 3.97 – 3.43 (m, 1H), 2.71 – 2.29 (m, 1H), 2.08 – 1.94 (m, 1H), 1.89 – 1.41 (m, 5H), 1.39 – 1.26 (m, 6H), 1.24 – 1.22 (m, 2H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.0, 157.0, 155.0, 134.78, 131.2, 128.8, 126.3, 98.2, 70.1, 63.8, 61.5, 55.1, 40.3, 34.7, 21.1, 17.6, 14.2. HRMS (ESI) m/z calcd for $C_{20}H_{26}ClN_3O_6Na^+$ $[M + Na]^+$ = 462.1402, found = 462.1401.

(3a*S*,6a*S*)-1-(4-Chlorophenyl)-6a-hydroxy-3a-methylhexahydrocyclopenta[*d*]imidazol-2(1*H*)-one (7):



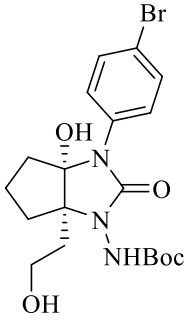
A white solid; 35.6 mg; isolated yield = 67%; m.p. 126.2 – 126.8 °C; dr > 20:1. $[\alpha]^{21.0}_{D}$ = +88.00 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 4.88 min (minor), t_2 = 5.44 min (major), *ee* = 94%; ^{1}H NMR (400 MHz, DMSO) δ 7.64 – 7.53 (m, 2H), 7.42 – 7.34 (m, 2H), 7.20 (s, 1H), 6.32 (s, 1H), 1.92 – 1.80 (m, 1H), 1.80 – 1.71 (m, 1H), 1.69 – 1.58 (m, 2H), 1.56 – 1.45 (m, 1H), 1.40 – 1.28 (m, 1H), 1.23 (s, 3H). ^{13}C NMR (100 MHz, DMSO) δ 156.9, 137.5, 128.6, 128.4, 126.0, 98.7, 63.7, 41.9, 36.6, 23.2, 21.4. HRMS (ESI) m/z calcd for $C_{13}H_{15}ClN_2O_2Na^+$ $[M + Na]^+$ = 289.0714, found = 289.0710.

(6a*S*,9a*R*)-6-(4-Bromophenyl)-6a-hydroxytetrahydro-1*H*-cyclopenta[4,5]imidazo[1,5-*b*]pyrazole-2,5(3*H*,6*H*)-dione (8):



A white solid; 64.6 mg; isolated yield = 92%; m.p. 129.4 – 129.8 °C; dr > 20:1. $[\alpha]^{21.0}_{D}$ = +120.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 4.59 min (major), t_2 = 5.22 min (minor), *ee* = 93%; ^{1}H NMR (400 MHz, DMSO) δ 11.86 (s, 1H), 7.66 (d, *J* = 8.9 Hz, 2H), 7.43 (d, *J* = 8.9 Hz, 2H), 3.21 – 3.07 (m, 2H), 2.35 – 2.01 (m, 4H), 1.94 – 1.70 (m, 2H). ^{13}C NMR (100 MHz, DMSO) δ 174.1, 152.6, 135.2, 132.7, 125.5, 118.9, 105.1, 72.2, 38.9, 36.4, 36.0, 23.9. HRMS (ESI) m/z calcd for $C_{14}H_{14}BrN_3O_3Na^+$ $[M + Na]^+$ = 374.0111, found = 374.0122.

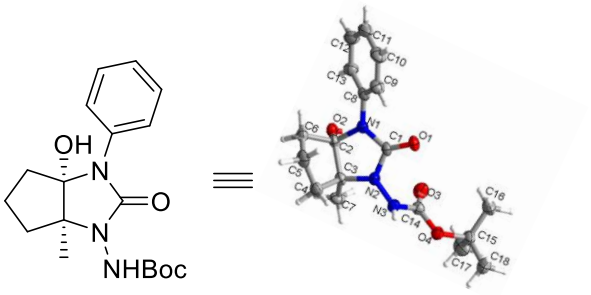
***tert*-Butyl ((3a*S*,6a*R*)-3-(4-bromophenyl)-3a-hydroxy-6a-(2-hydroxyethyl)-2-oxohexahydrocyclopenta[*d*]imidazol-1(2*H*)-yl)carbamate (9):**



A white solid; 79.2 mg; isolated yield = 87%; m.p. 141.4 – 141.8 °C; dr > 20:1. $[\alpha]^{21.0}_{D}$ = +134.01 (*c* 0.10, EA); HPLC (IG-3 column, *i*-propanol/*n*-hexane = 30/70, flow rate 1.0 mL/min, λ = 254 nm), product: t_1 = 4.59 min (major), t_2 = 5.22 min (minor), *ee* = 93%; ^{1}H NMR (400 MHz, DMSO) δ 8.95 – 8.42 (m, 1H), 7.58 – 7.48 (m, 4H), 7.04 (s, 1H), 5.56 (s, 1H), 3.75 – 3.61 (m, 1H), 3.58 – 3.51 (m, 1H), 2.04 – 1.76 (m, 4H), 1.71 – 1.48 (m, 4H), 1.42 (s, 9H) ^{13}C NMR (100 MHz, DMSO) δ 156.3, 154.8, 137.2, 131.7, 127.1, 117.6, 96.8, 80.2, 72.0, 57.0, 38.4, 35.5, 35.5, 28.5, 21.7. HRMS (ESI) m/z calcd for $C_{19}H_{26}BrN_3O_5Na^+$ $[M + Na]^+$ = 478.0948, found = 478.0945.

4. Determination of the absolute configuration

X-ray single crystal data for compound 3b to determine the absolute configuration



CCDC:2408880

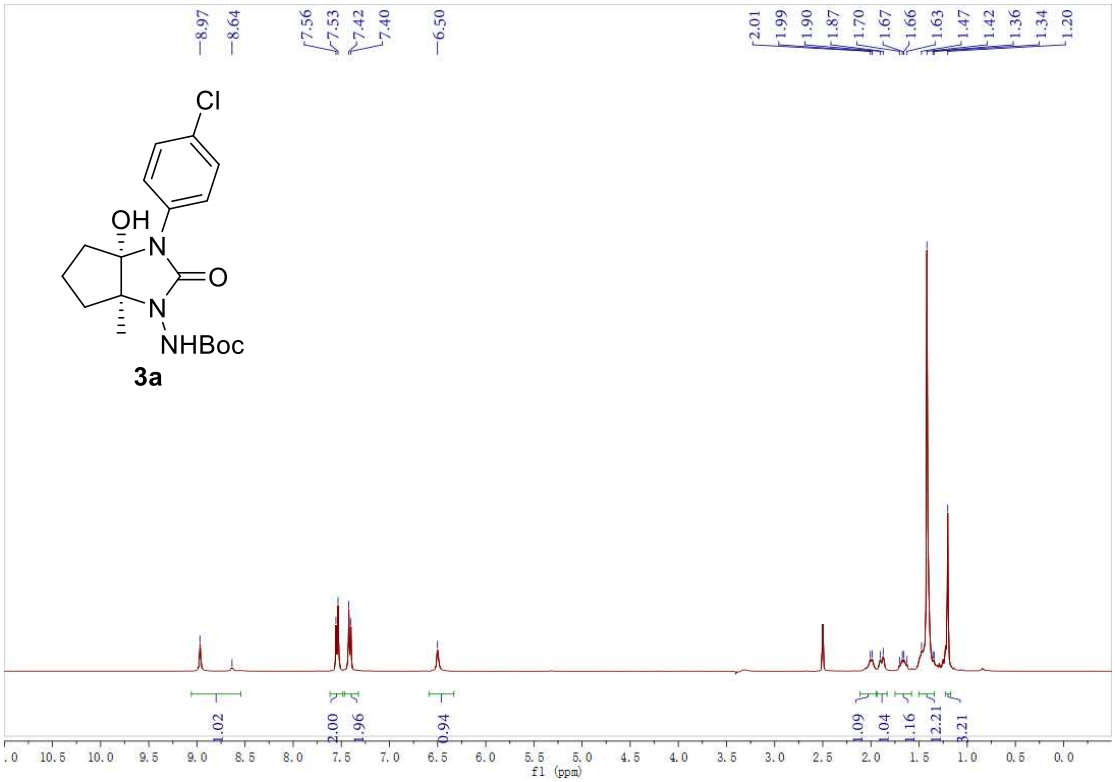
Table 1 Crystal data and structure refinement for 202307171_auto.

Identification code	202307171_auto
Empirical formula	$C_{18}H_{27}N_3O_5$
Formula weight	365.42
Temperature/K	293(2)
Crystal system	monoclinic
Space group	$P2_1$
a/Å	7.5356(3)
b/Å	11.5149(5)
c/Å	11.9517(5)
α/°	90
β/°	105.104(4)
γ/°	90
Volume/Å^3	1001.25(8)
Z	2
ρ_{calc}g/cm^3	1.212
μ/mm^{-1}	0.734
F(000)	392.0
Crystal size/mm^3	0.17 × 0.12 × 0.08
Radiation	CuKα (λ = 1.54184)
2Θrange for data collection/°	7.662 to 141.03
Index ranges	-9 ≤ h ≤ 9, -14 ≤ k ≤ 12, -14 ≤ l ≤ 14
Reflections collected	10486
Independent reflections	3515 [R_{int} = 0.0378, R_{sigma} = 0.0416]
Data/restraints/parameters	3515/1/248
Goodness-of-fit on F^2	1.039
Final R indexes [I>=2σ (I)]	R_1 = 0.0380, wR_2 = 0.0975

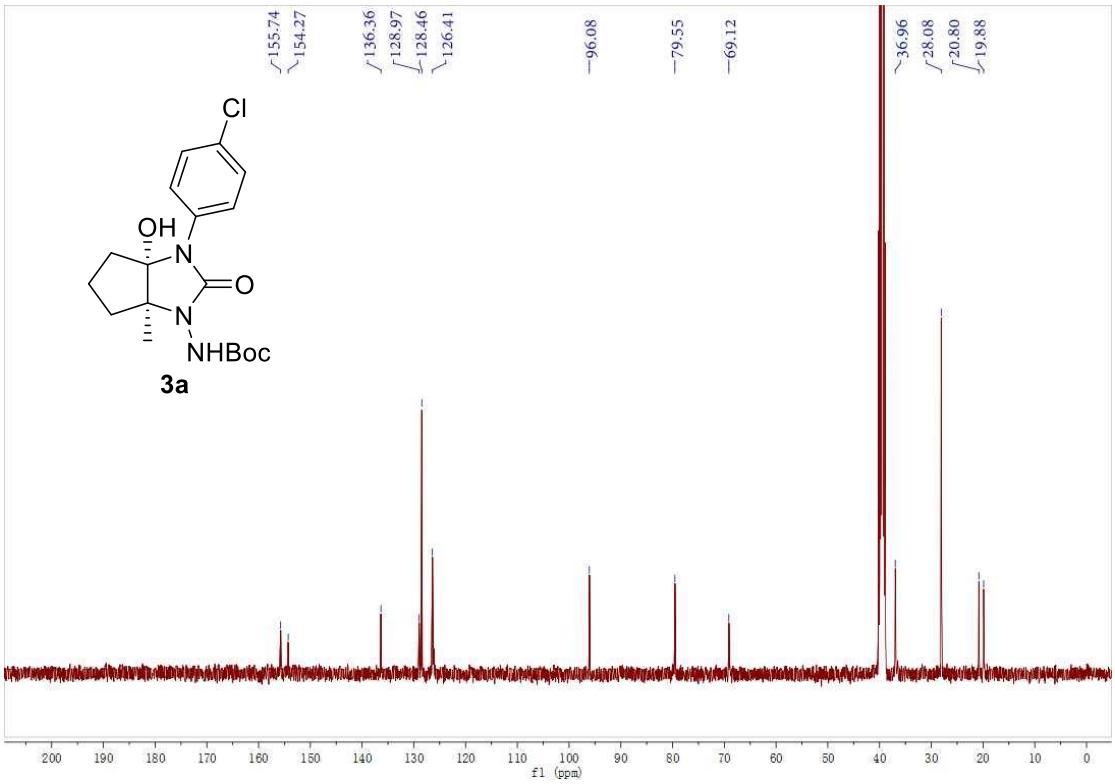
Final R indexes [all data]	R_1 = 0.0414, wR_2 = 0.1013
Largest diff. peak/hole / e Å^{-3}	0.16/-0.14
Flack parameter	0.01(15)

5. NMR spectra

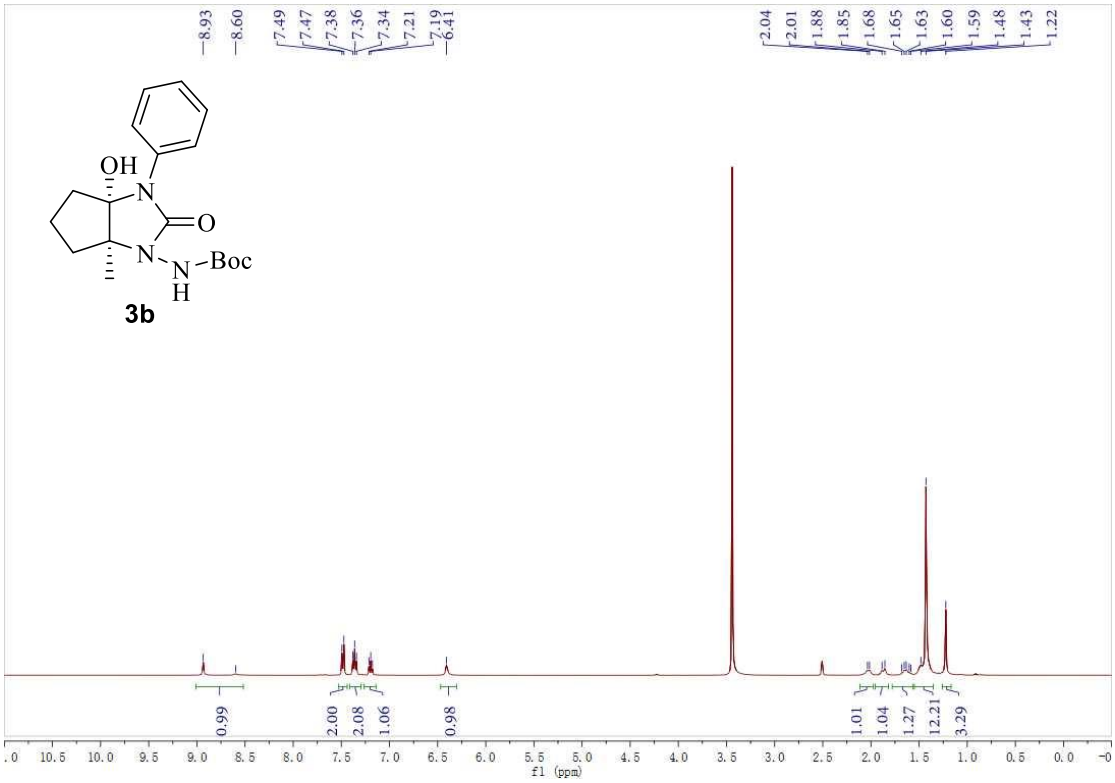
^{1}H NMR (400 MHz, DMSO-d_6)



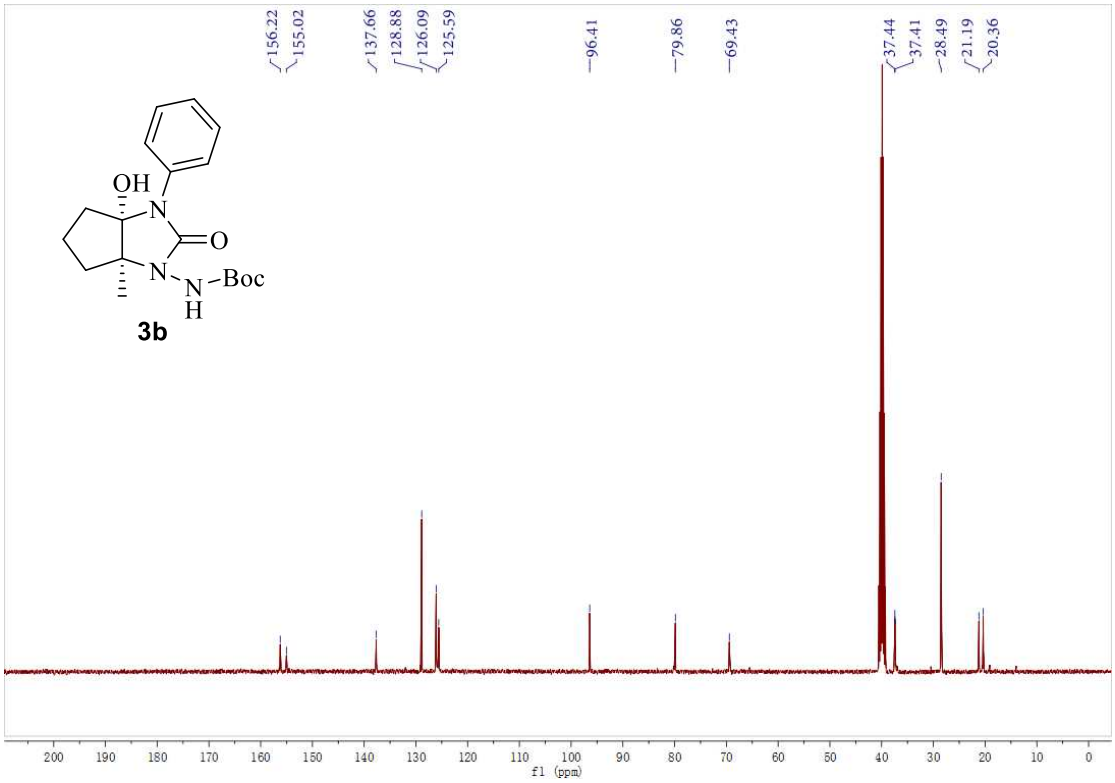
^{13}C NMR (100 MHz, DMSO-d_6)



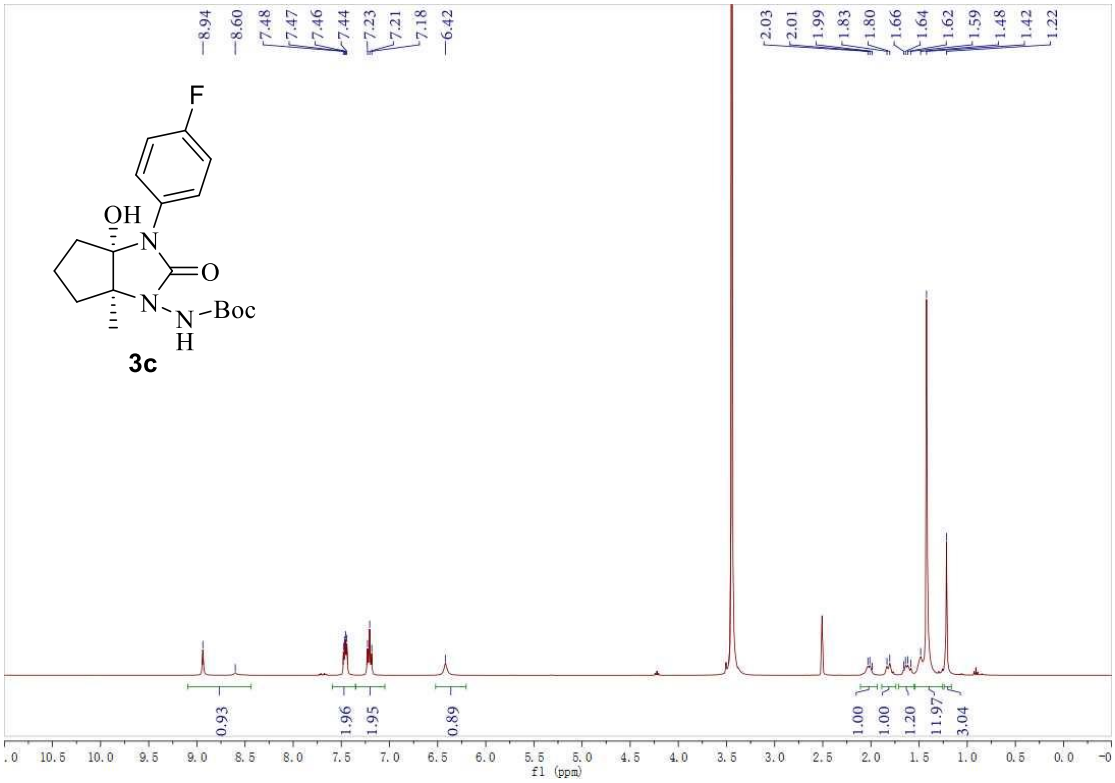
^{1}H NMR (400 MHz, DMSO-d_6)



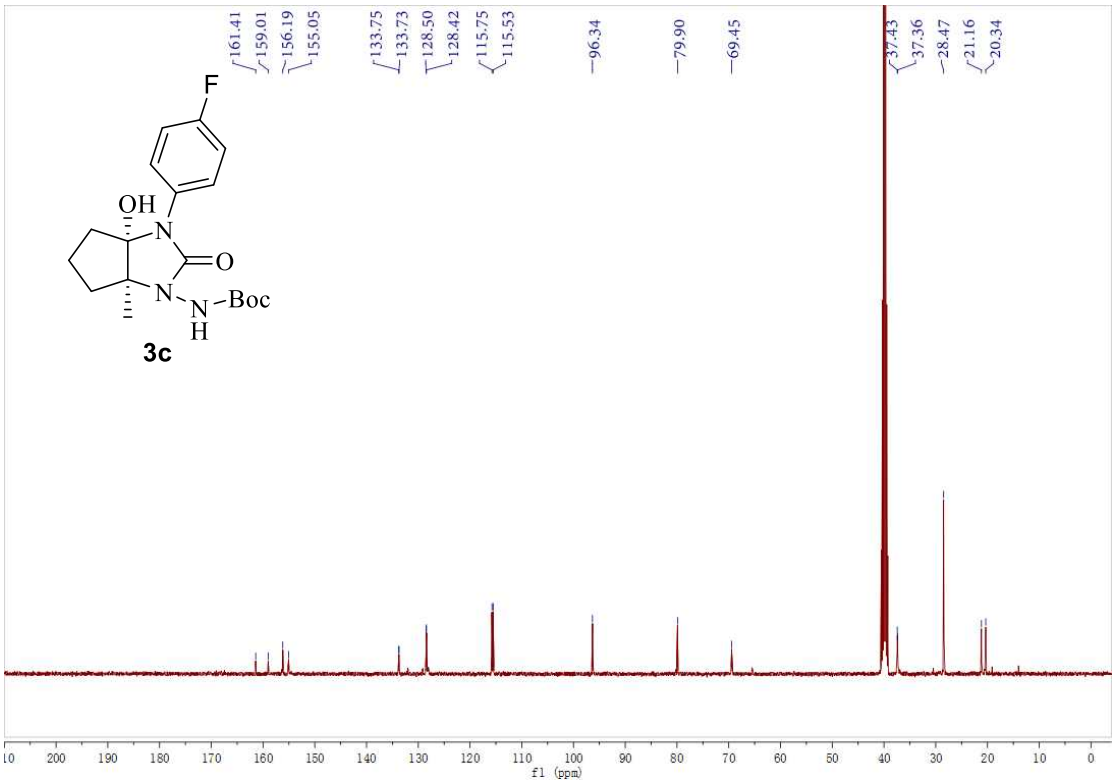
^{13}C NMR (100 MHz, DMSO-d_6)



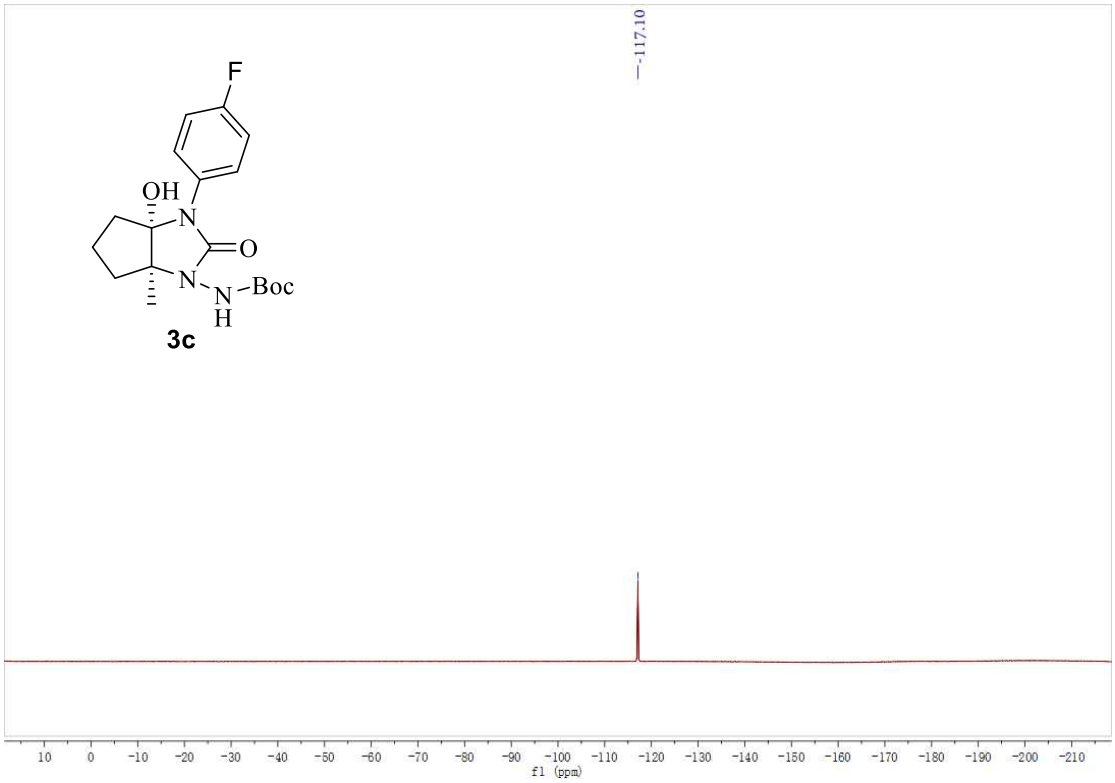
^{1}H NMR (400 MHz, DMSO-d_6)



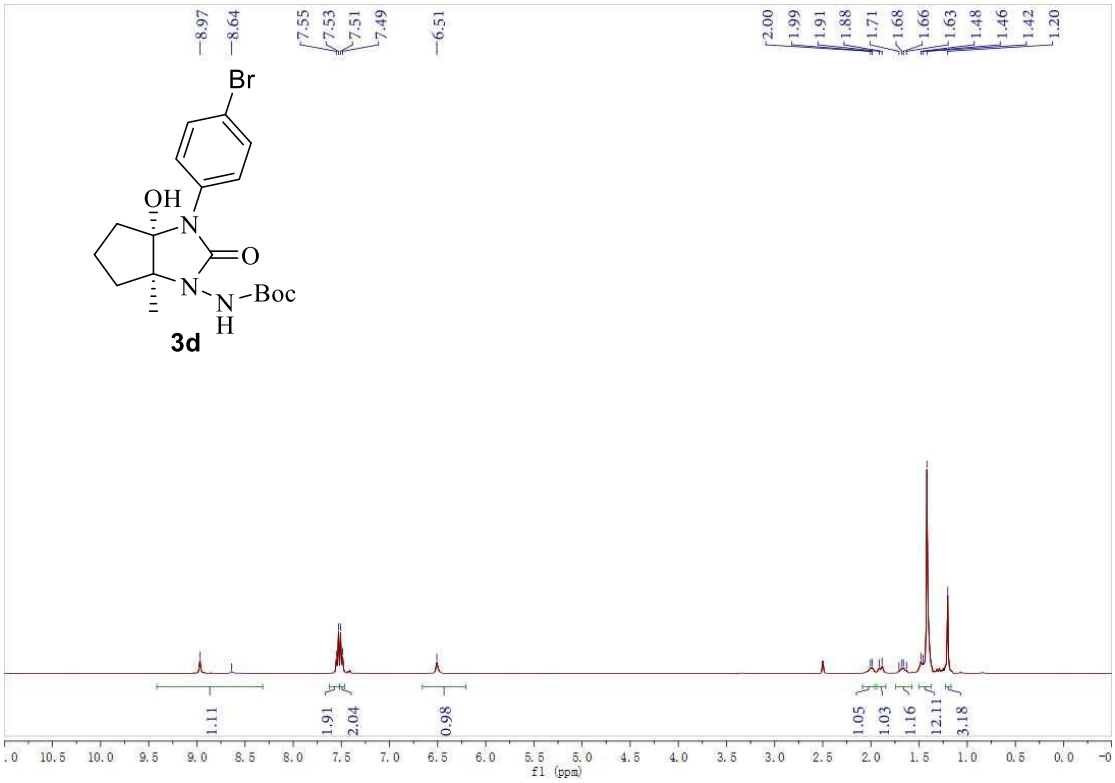
^{13}C NMR (100 MHz, DMSO-d_6)



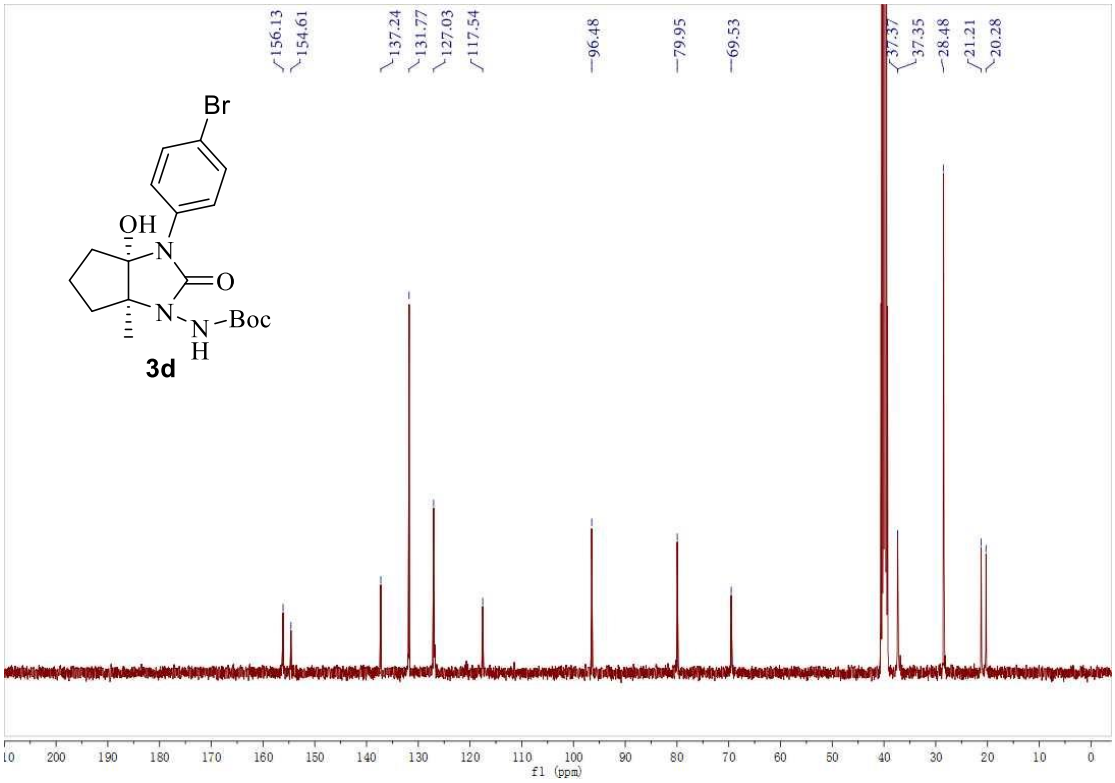
^{19}F NMR (376 MHz, DMSO-d_6)



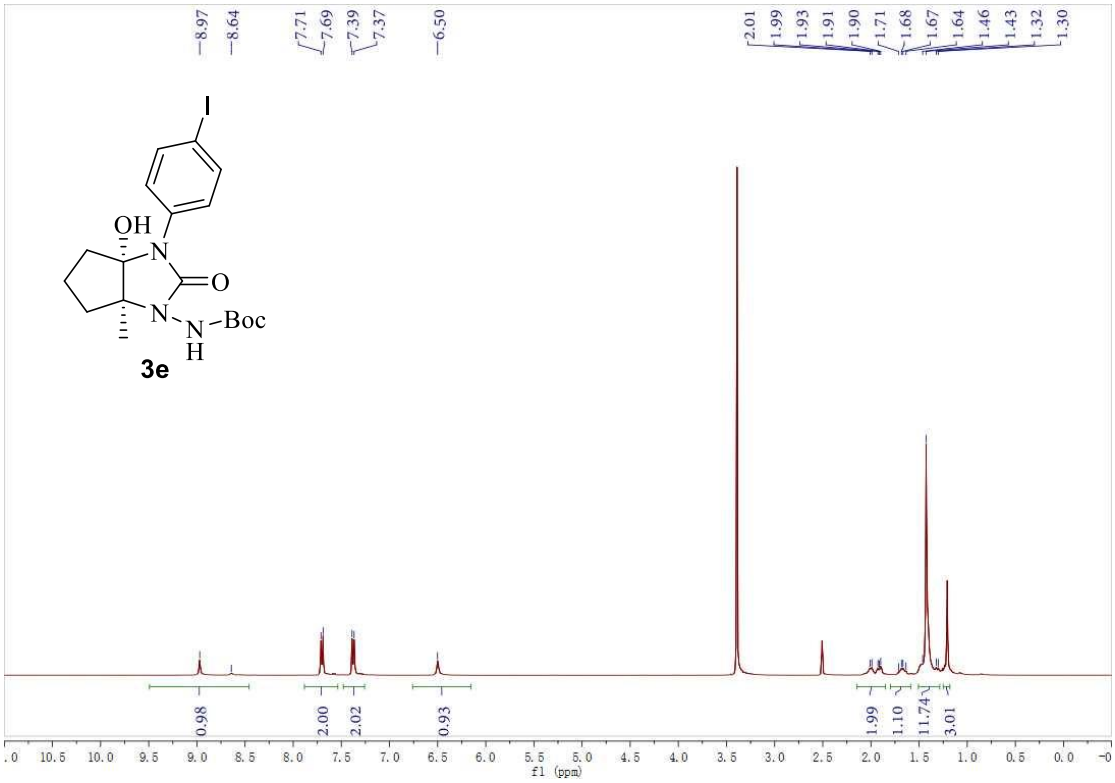
^{1}H NMR (400 MHz, DMSO-d_6)



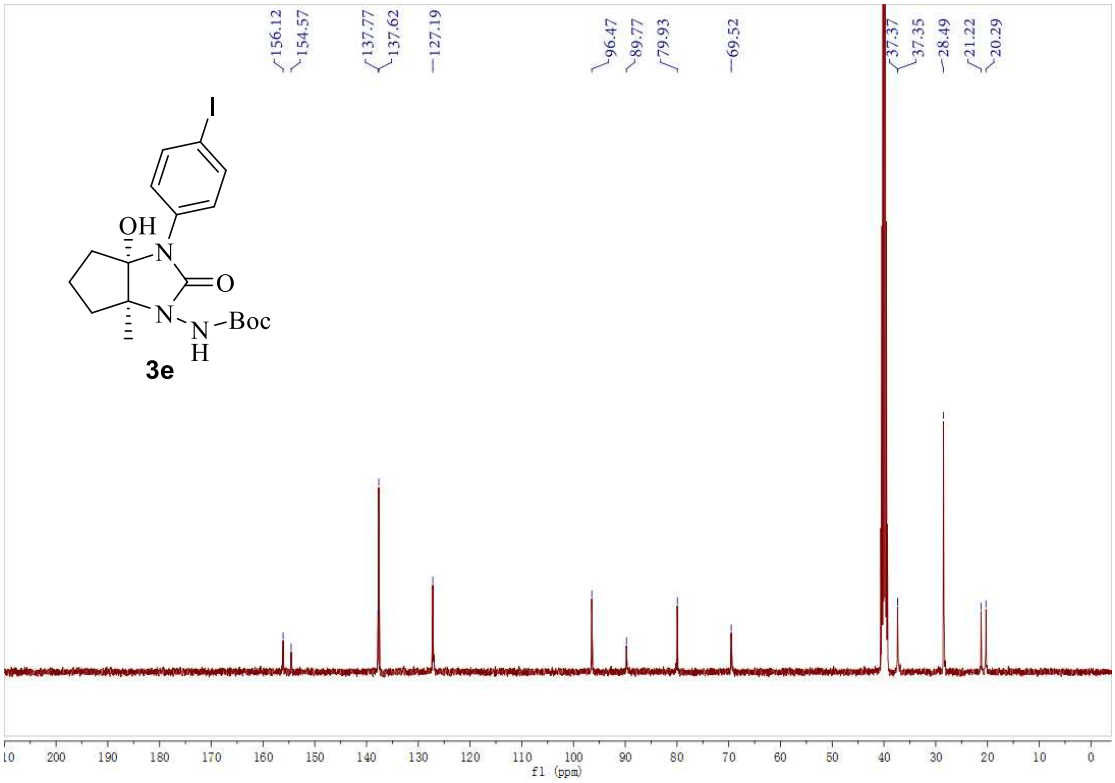
^{13}C NMR (100 MHz, DMSO-d_6)



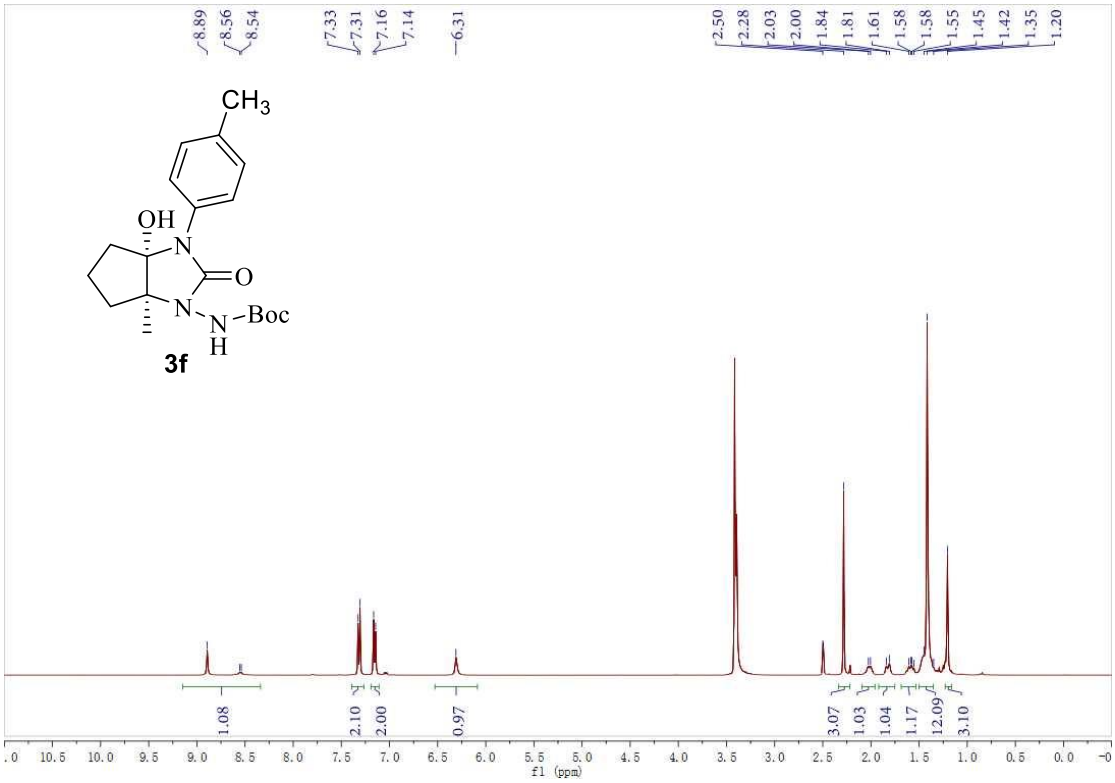
^{1}H NMR (400 MHz, DMSO-d_6)



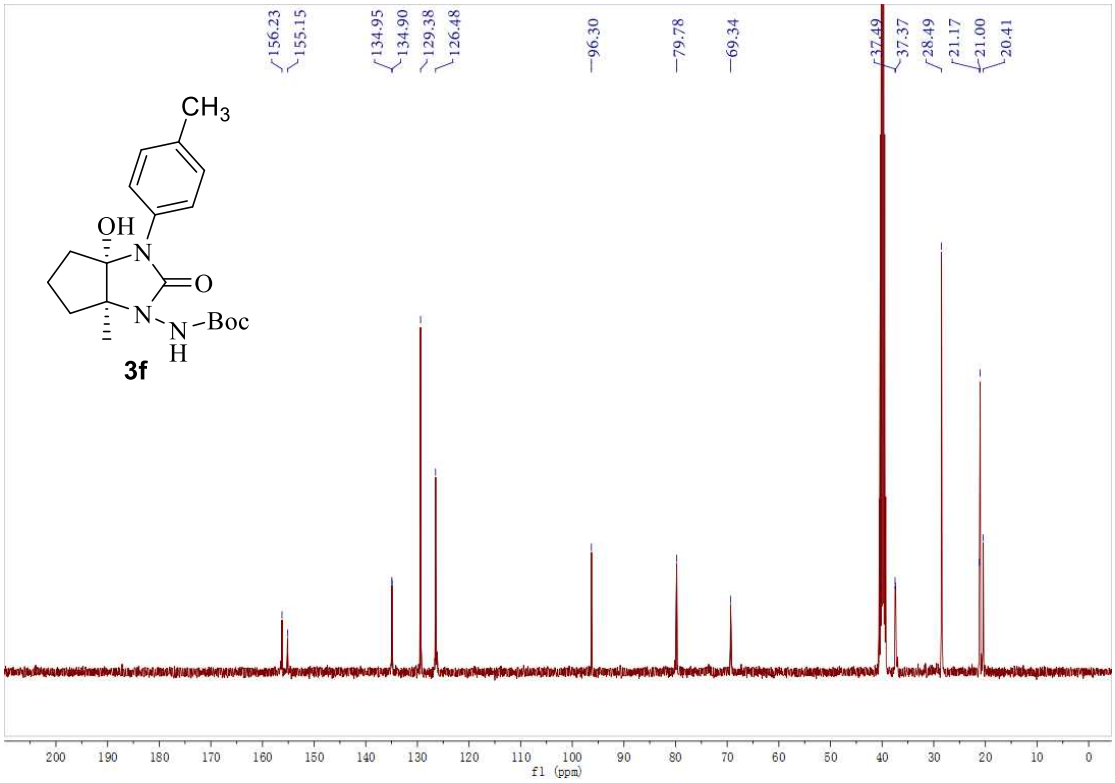
^{13}C NMR (100 MHz, DMSO-d_6)



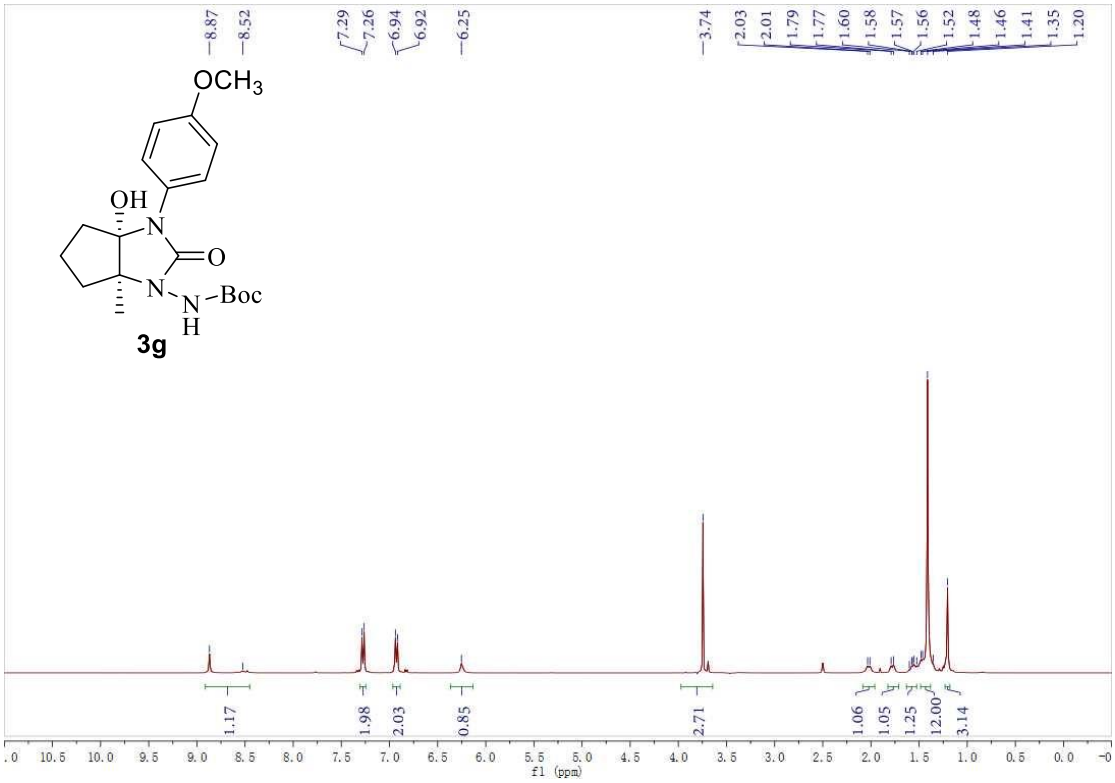
^{1}H NMR (400 MHz, DMSO-d_6)



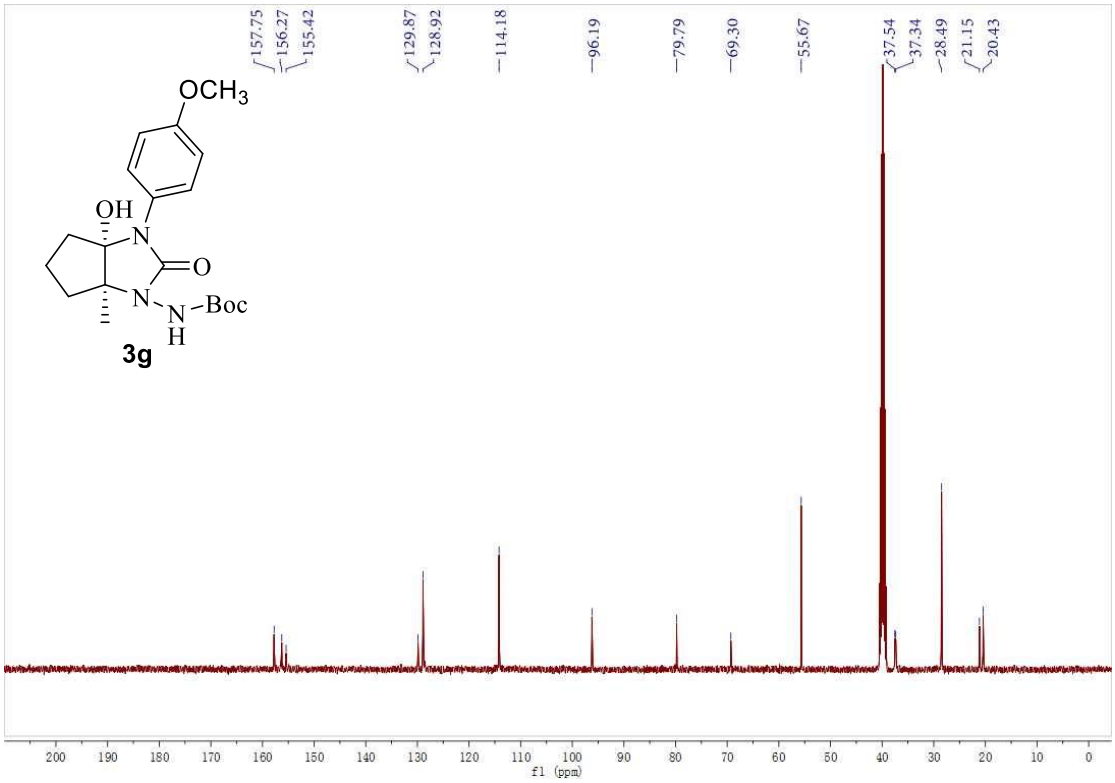
^{13}C NMR (100 MHz, DMSO-d_6)



^{1}H NMR (400 MHz, DMSO-d_6)



^{13}C NMR (100 MHz, DMSO-d_6)



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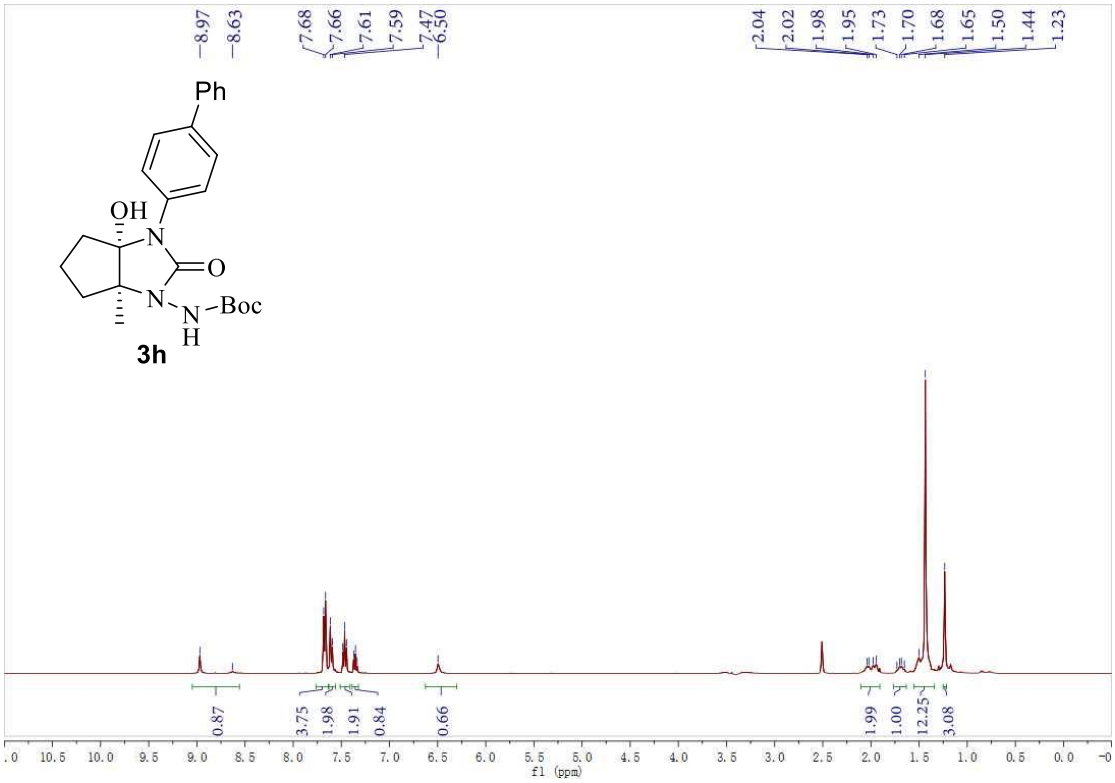

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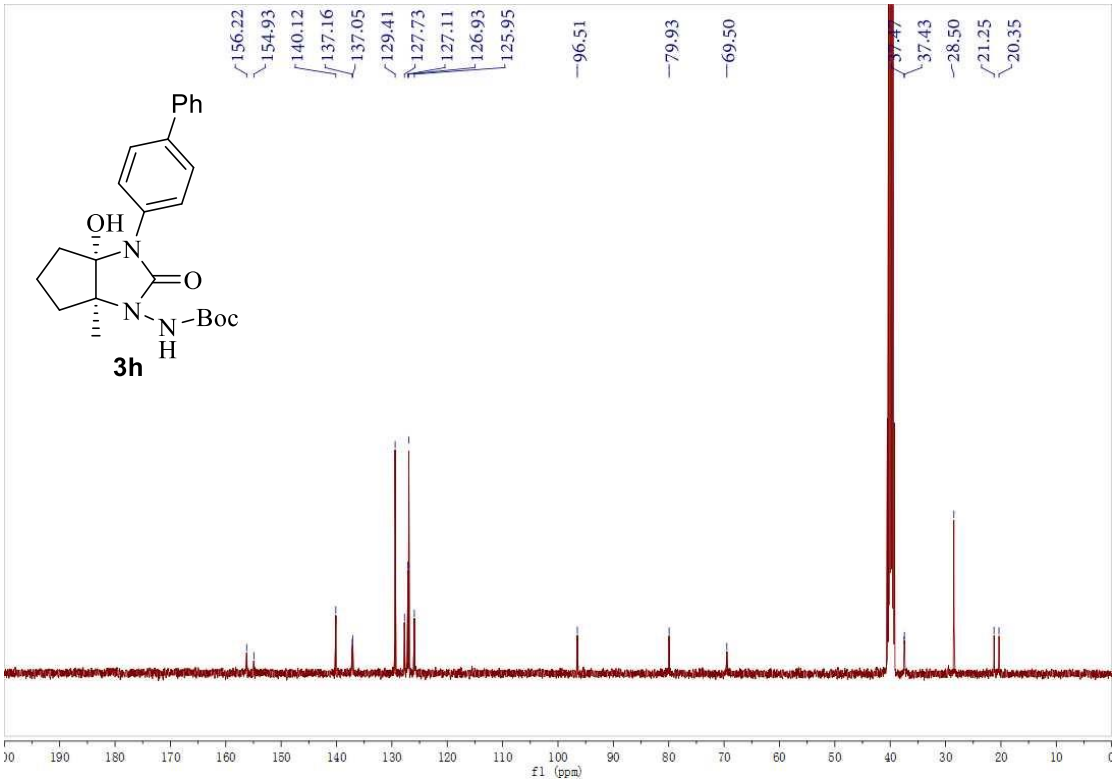

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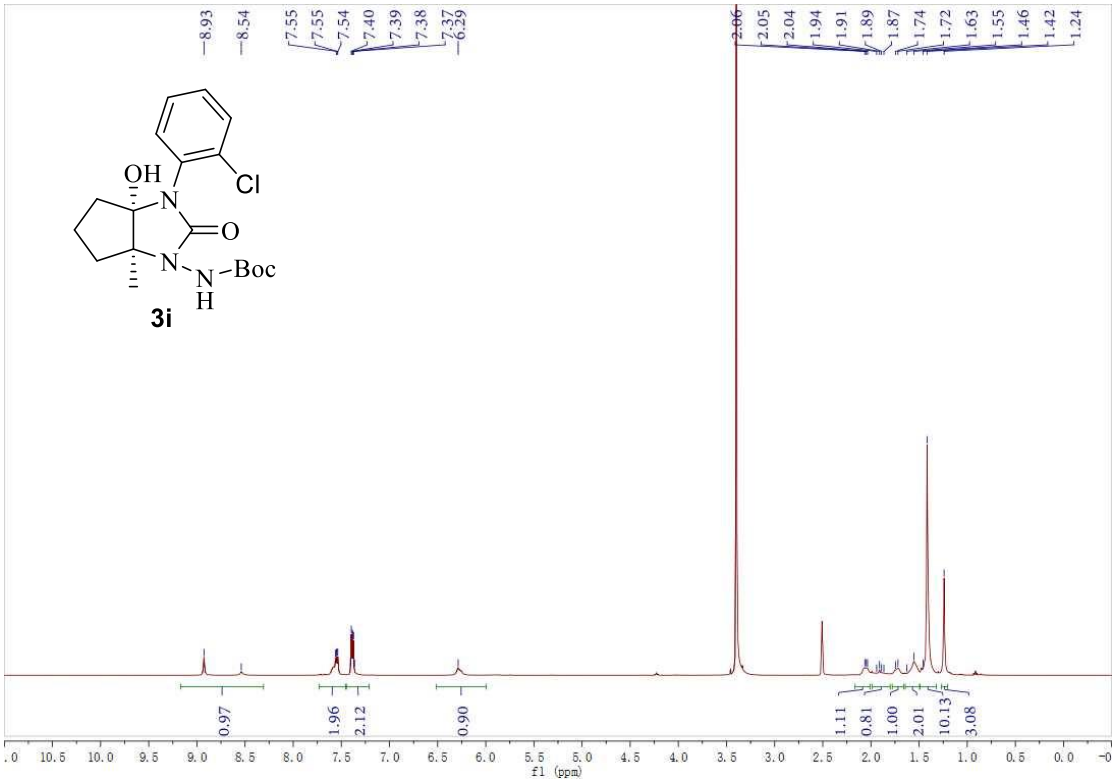

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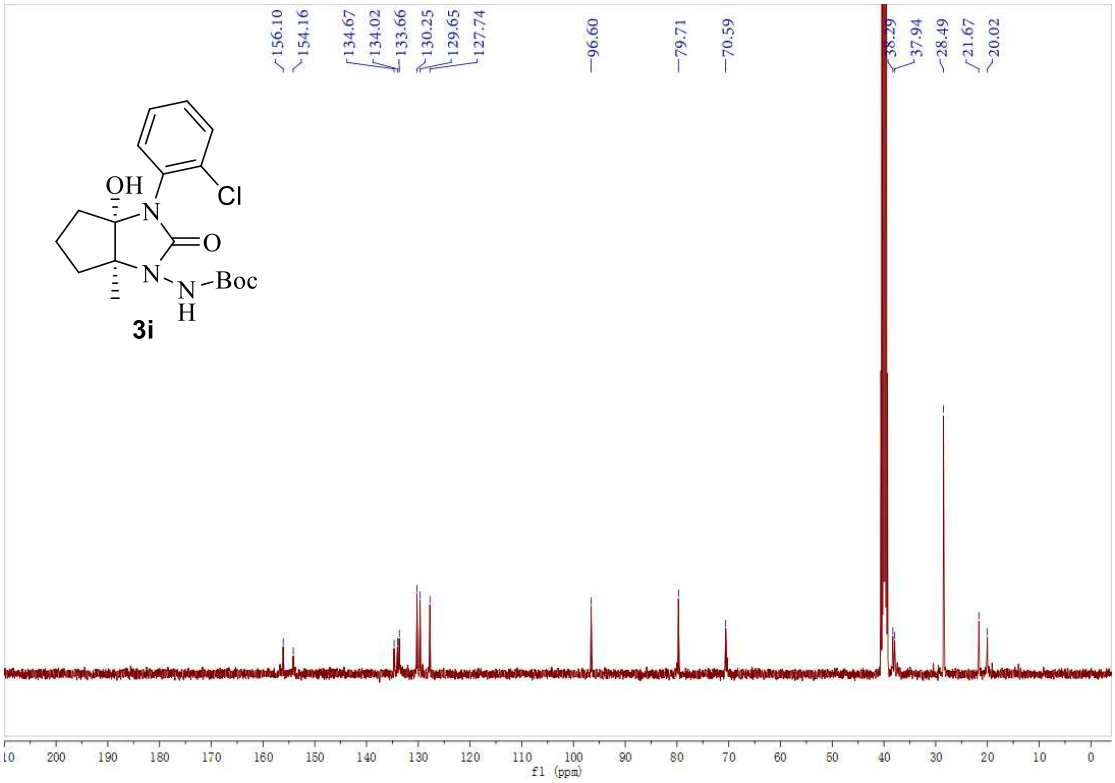

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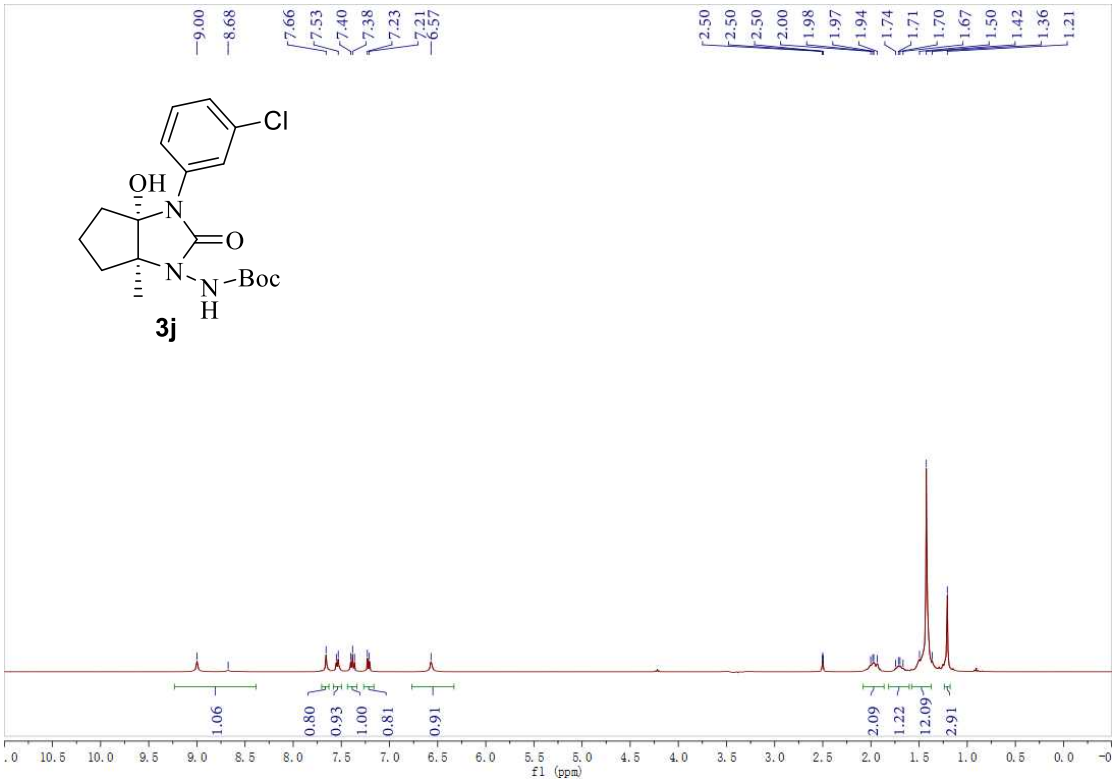

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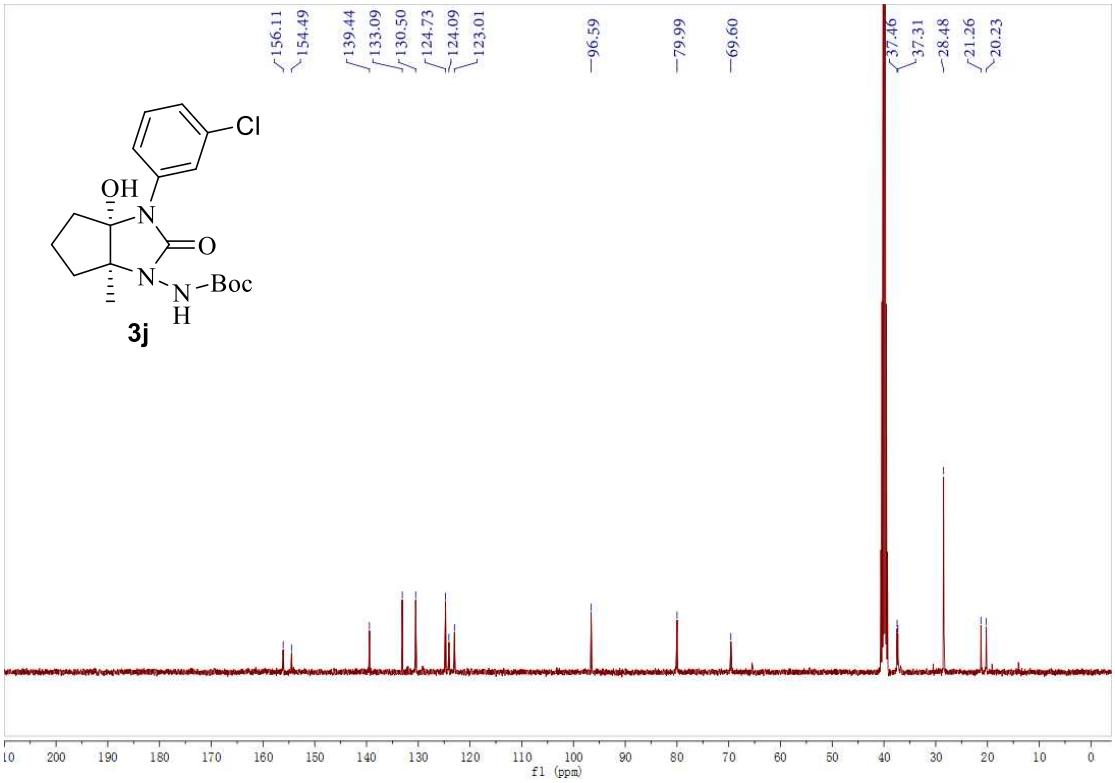

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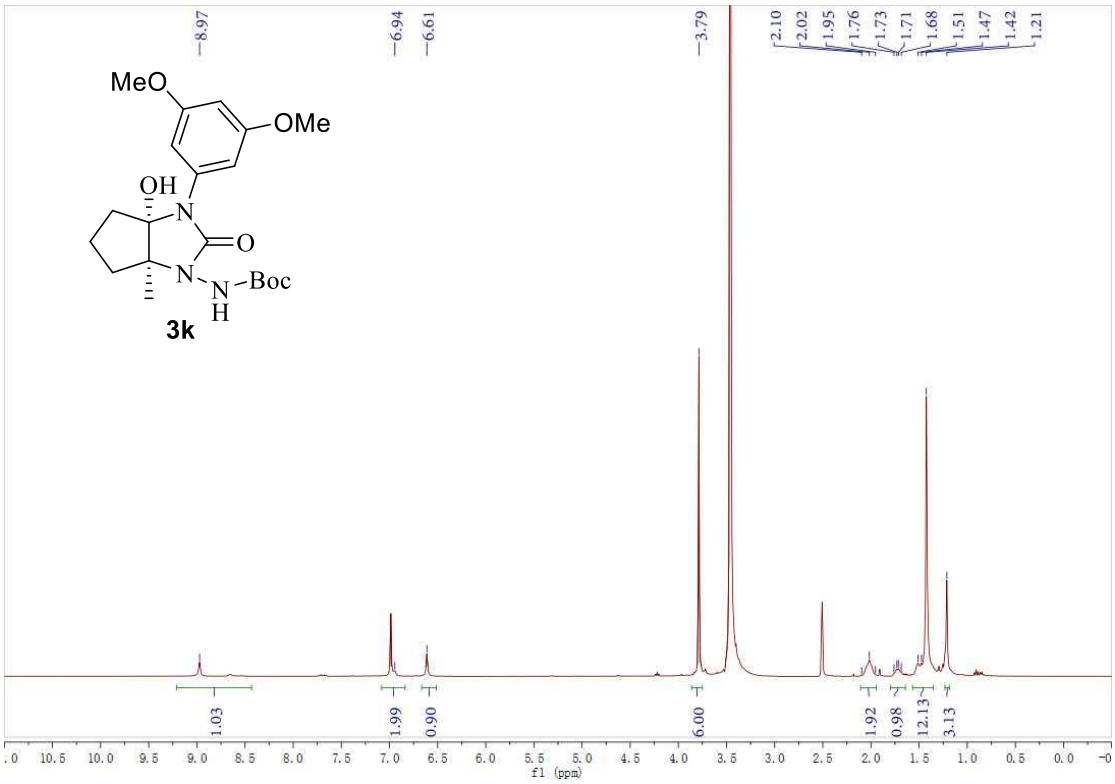

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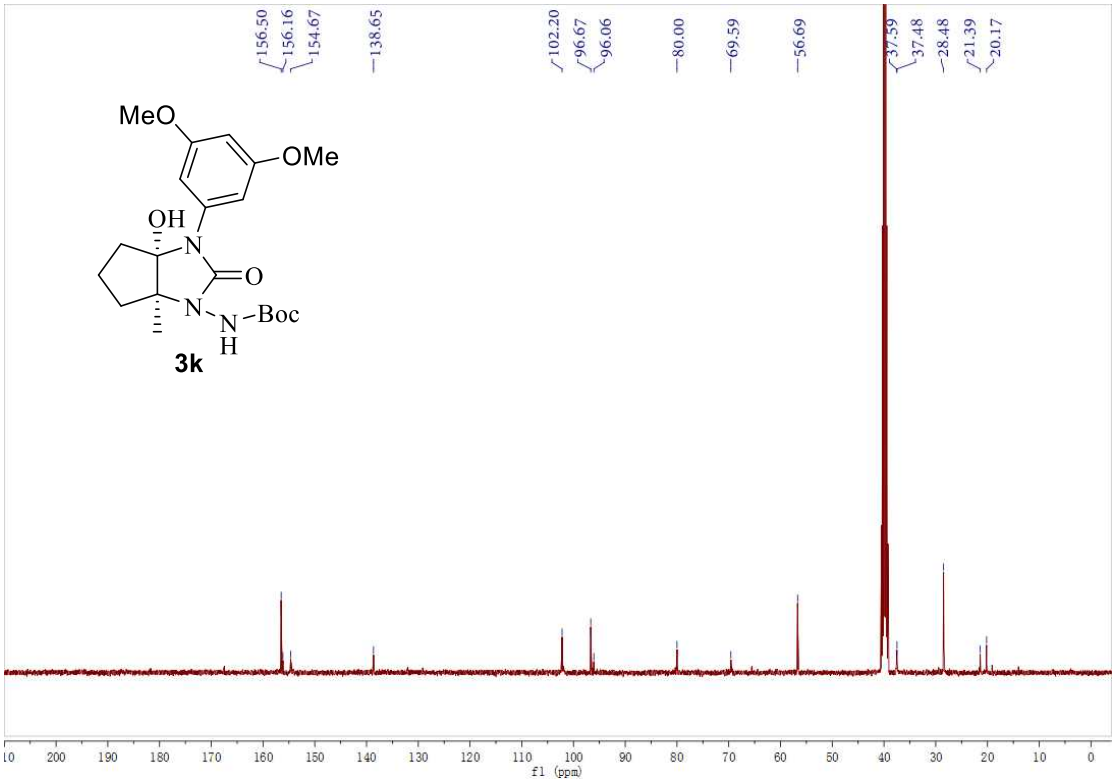

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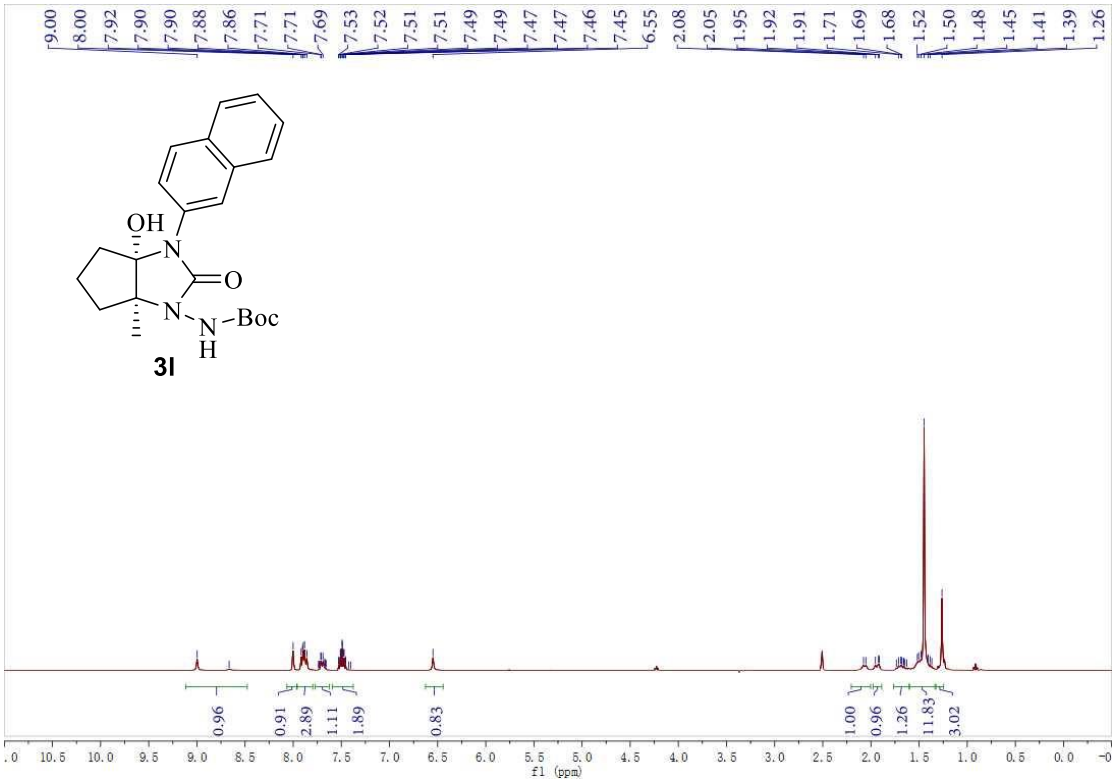

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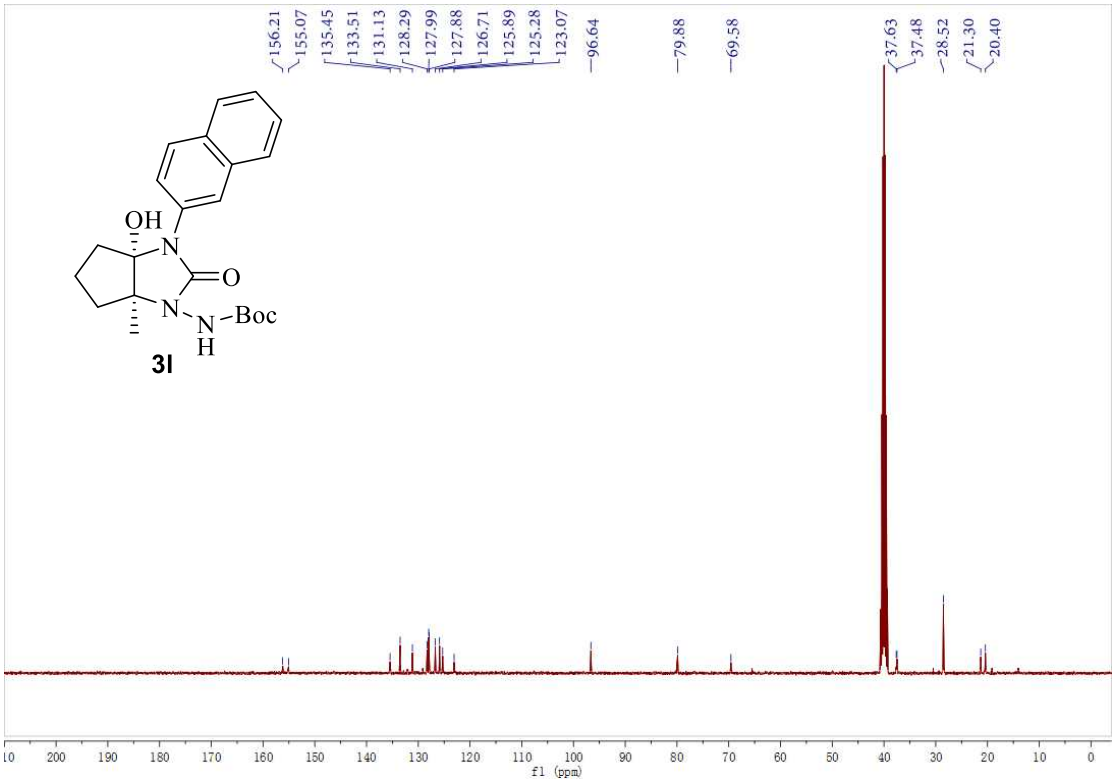

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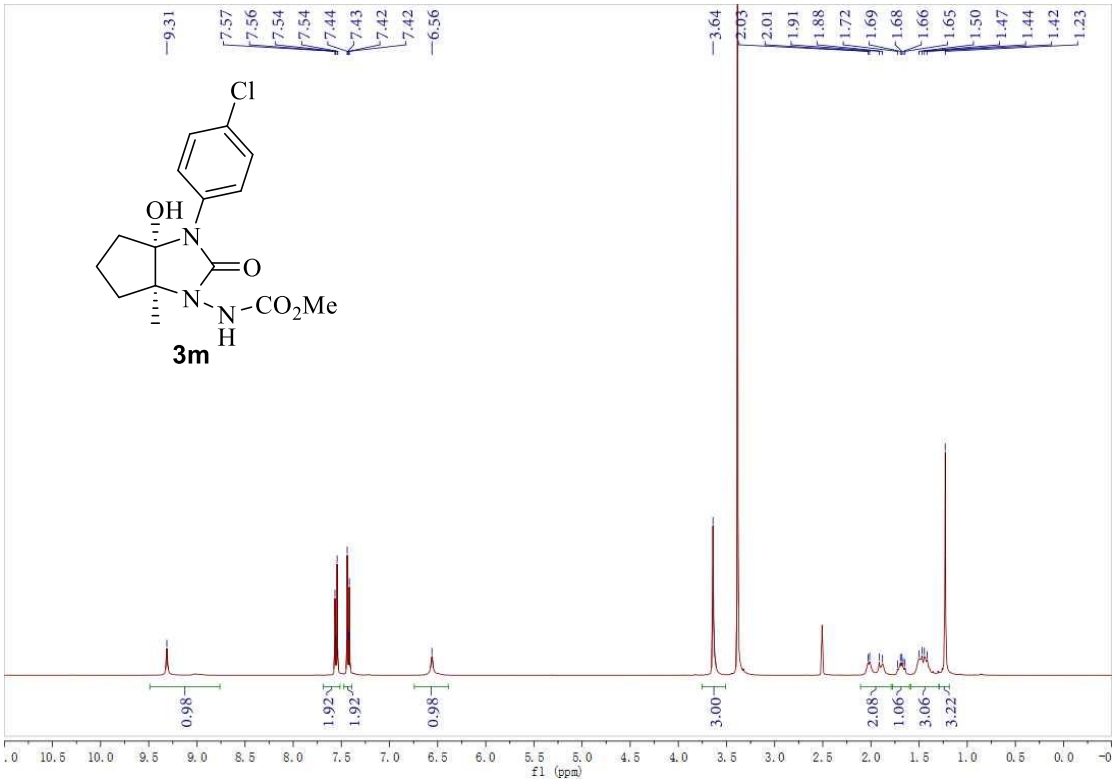

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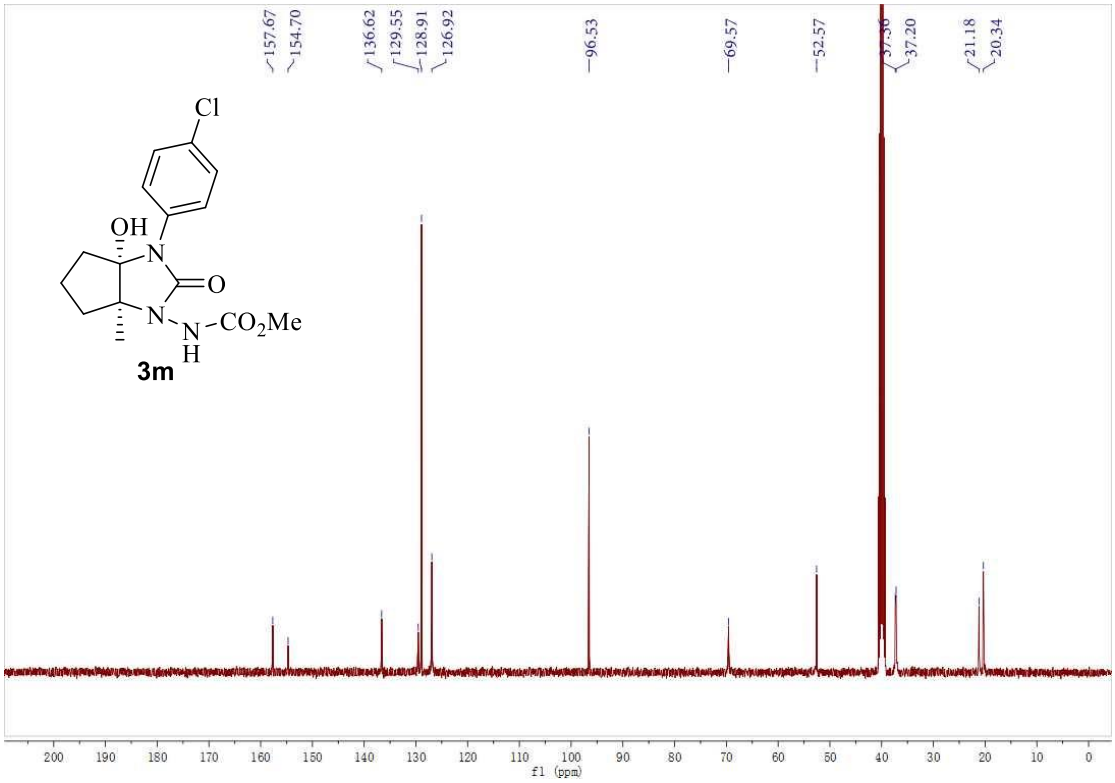

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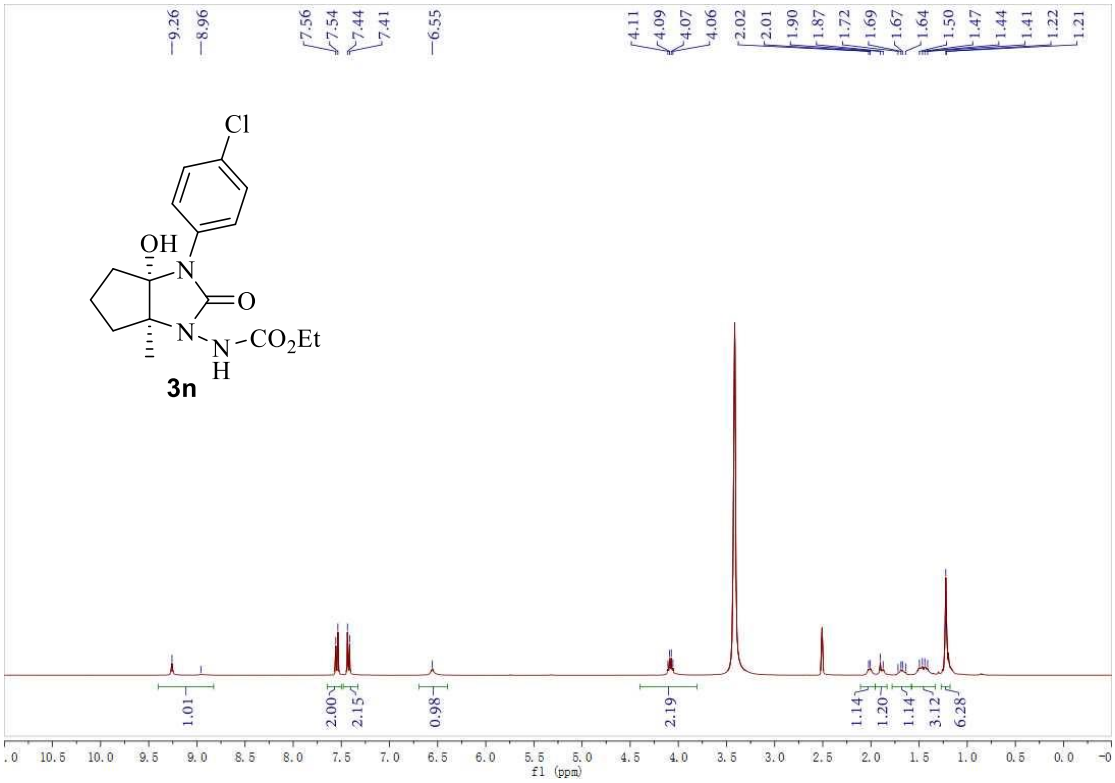

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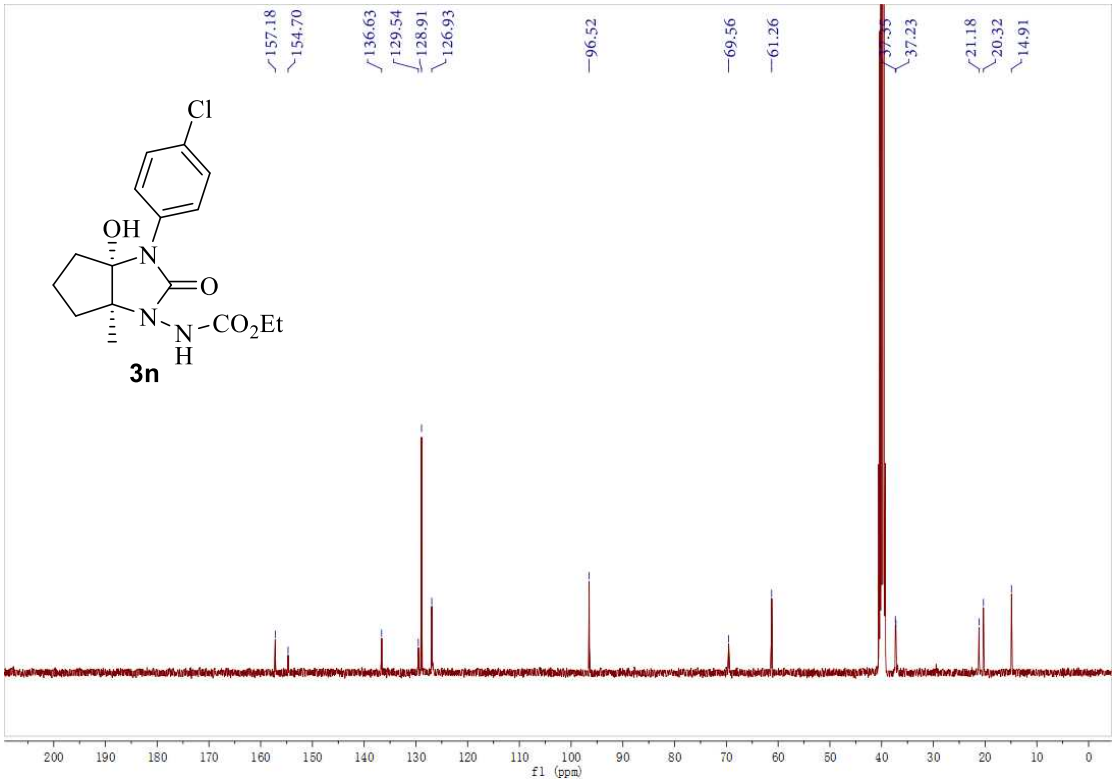

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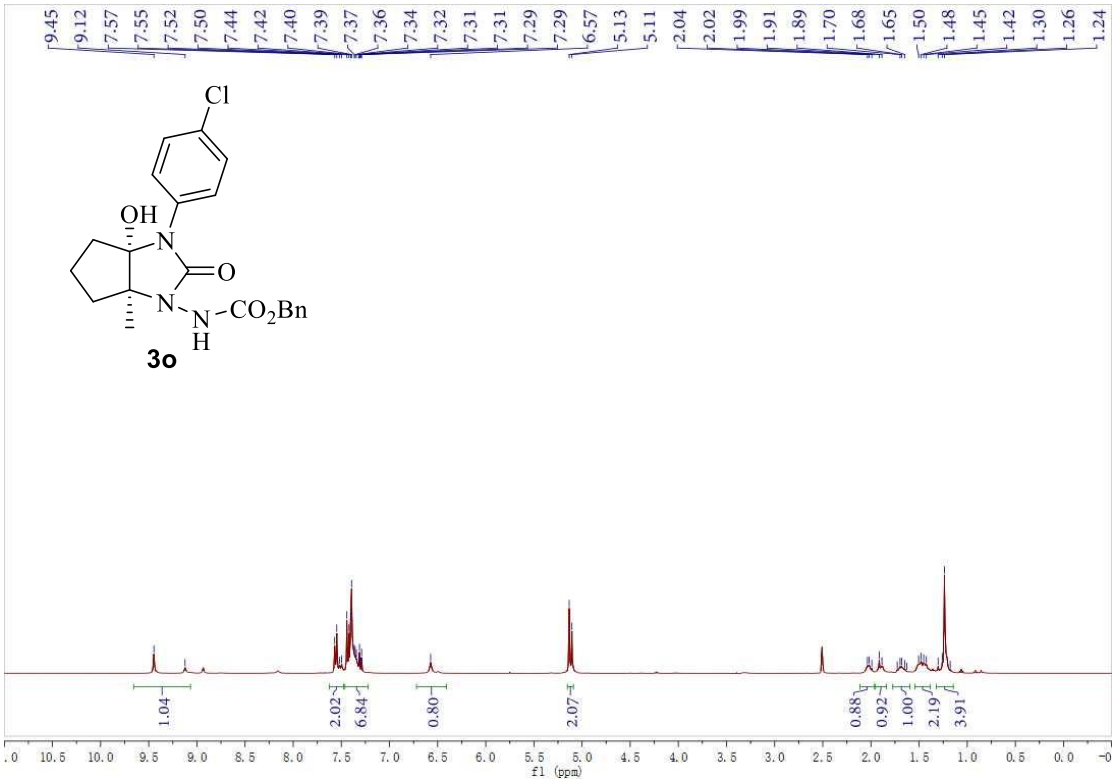

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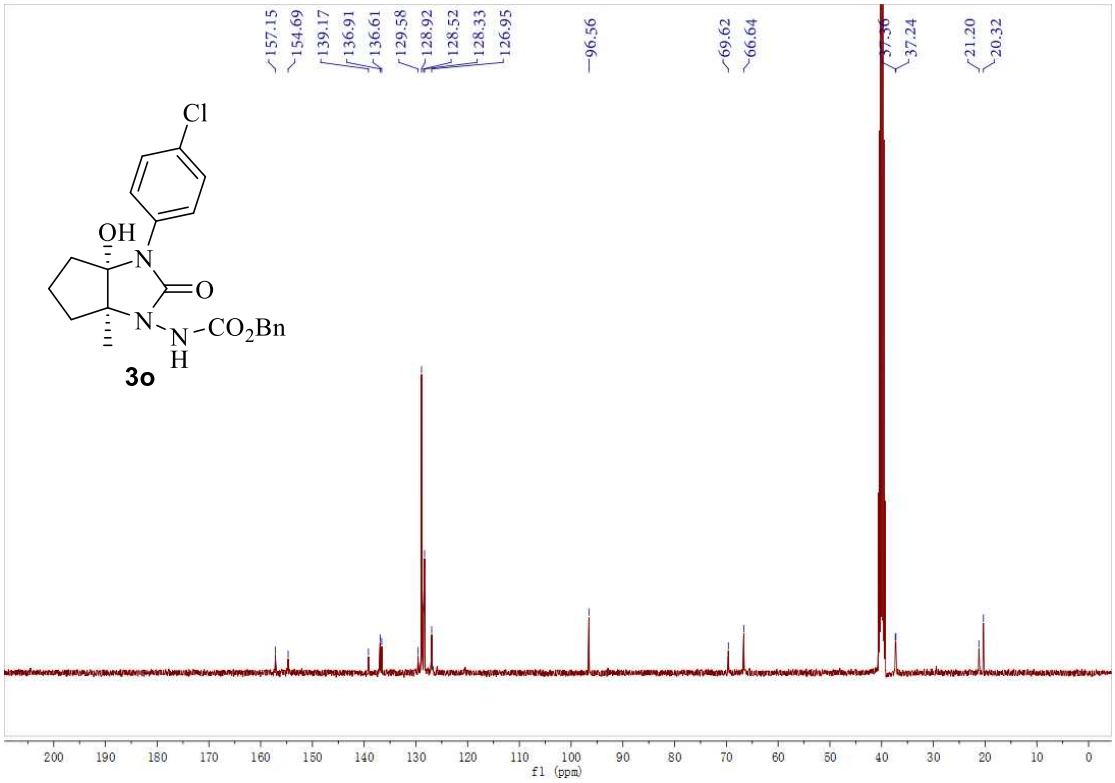

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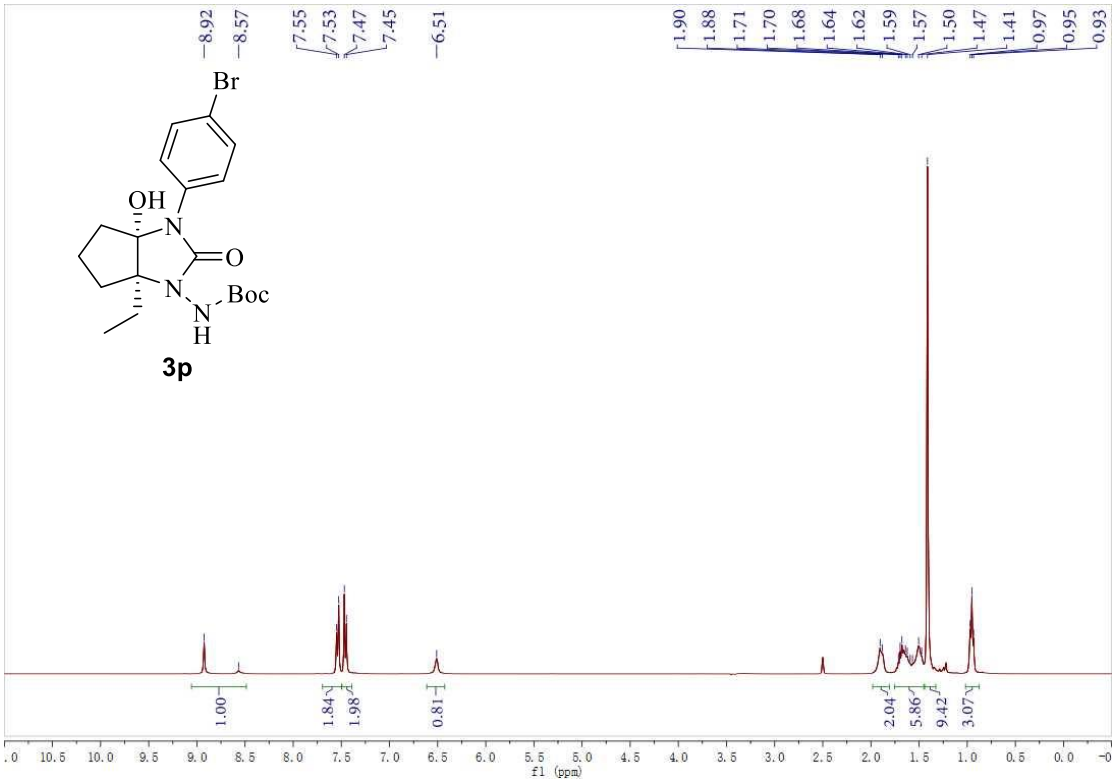

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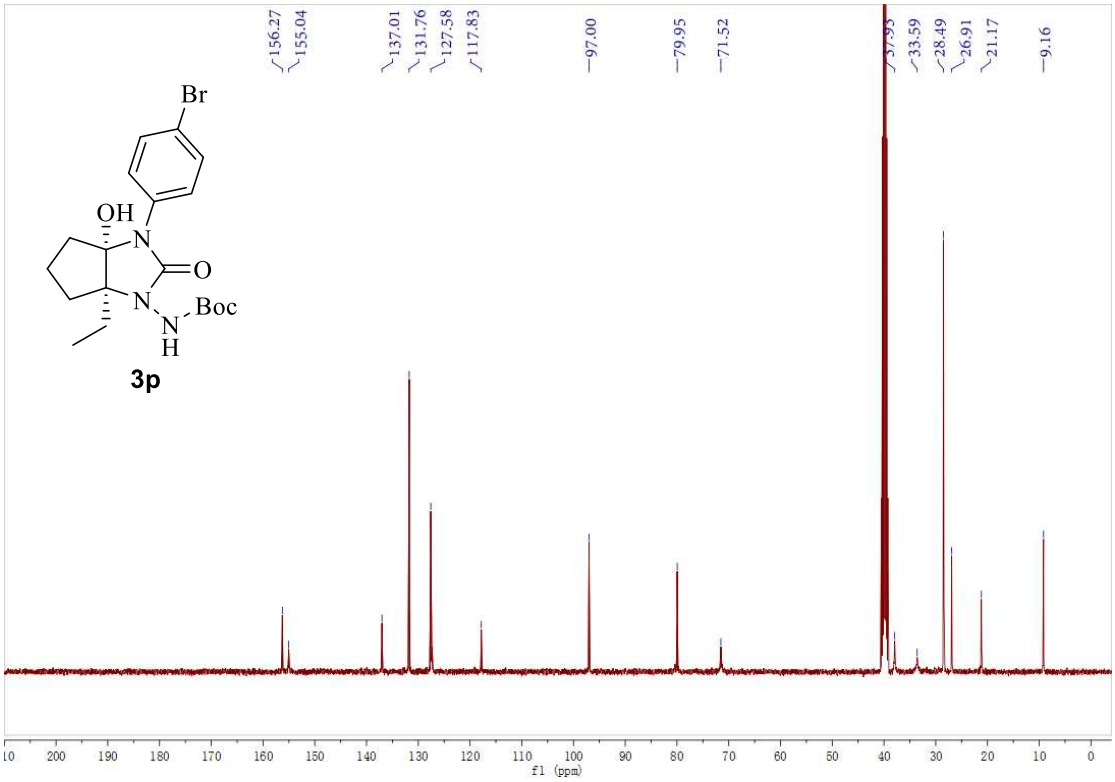

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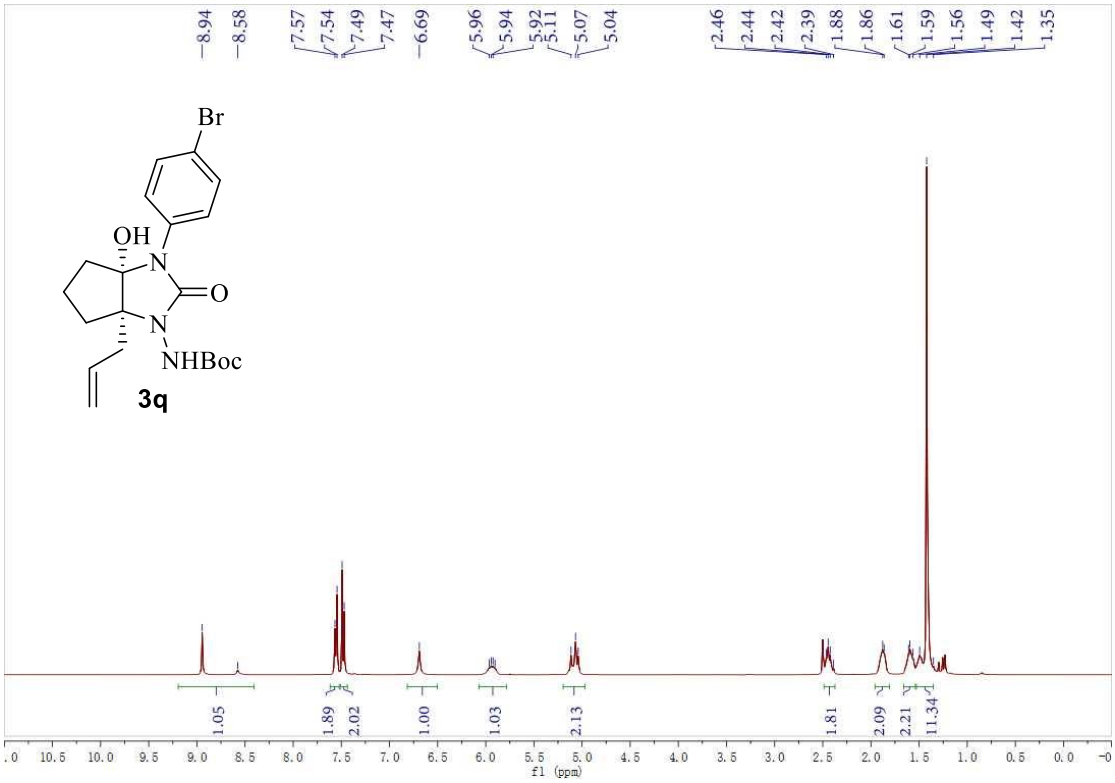

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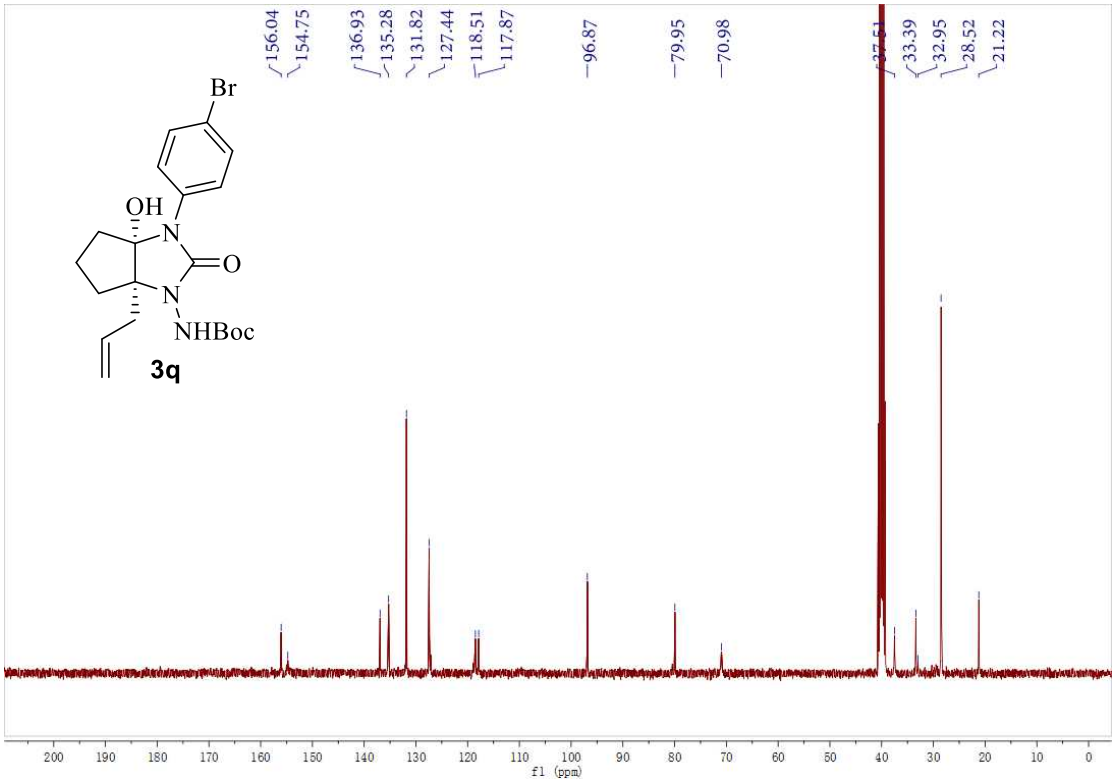

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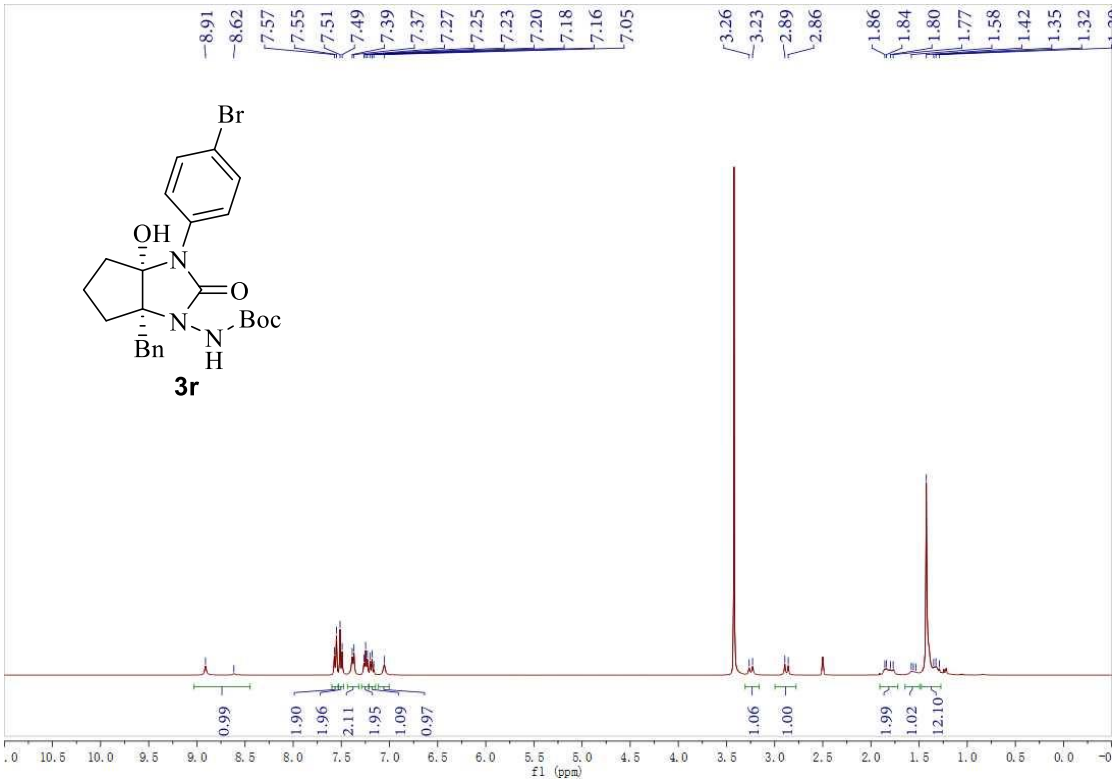

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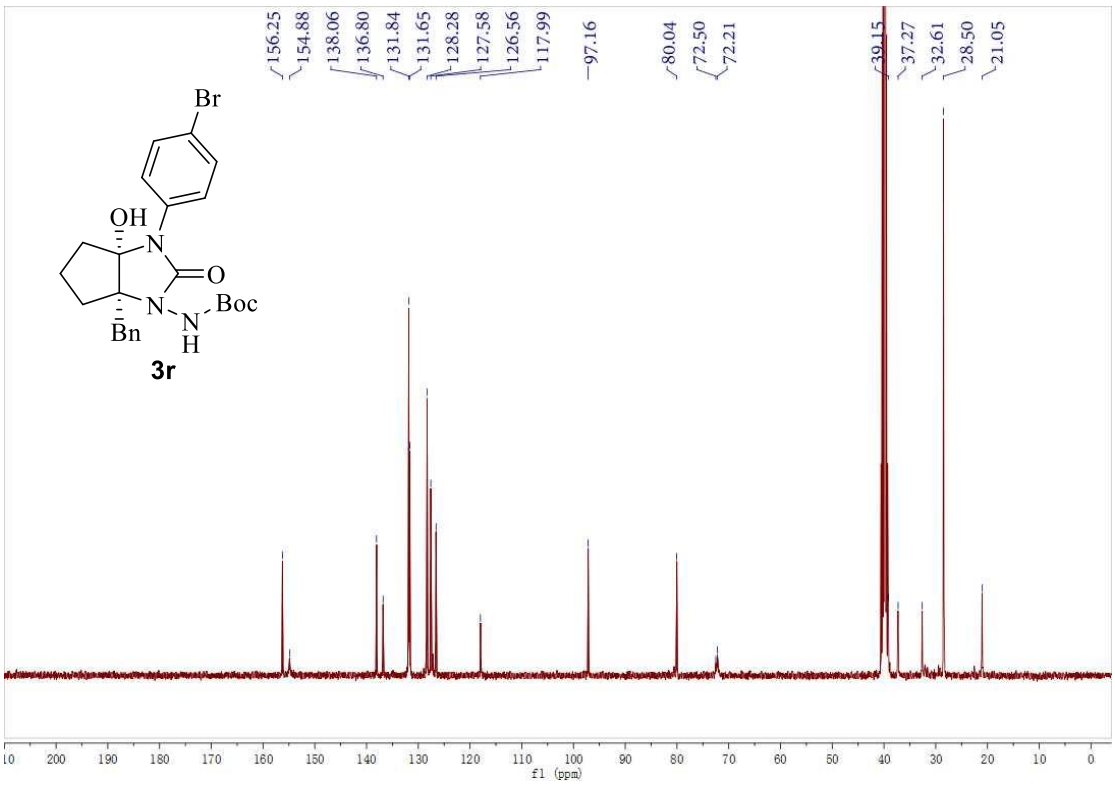

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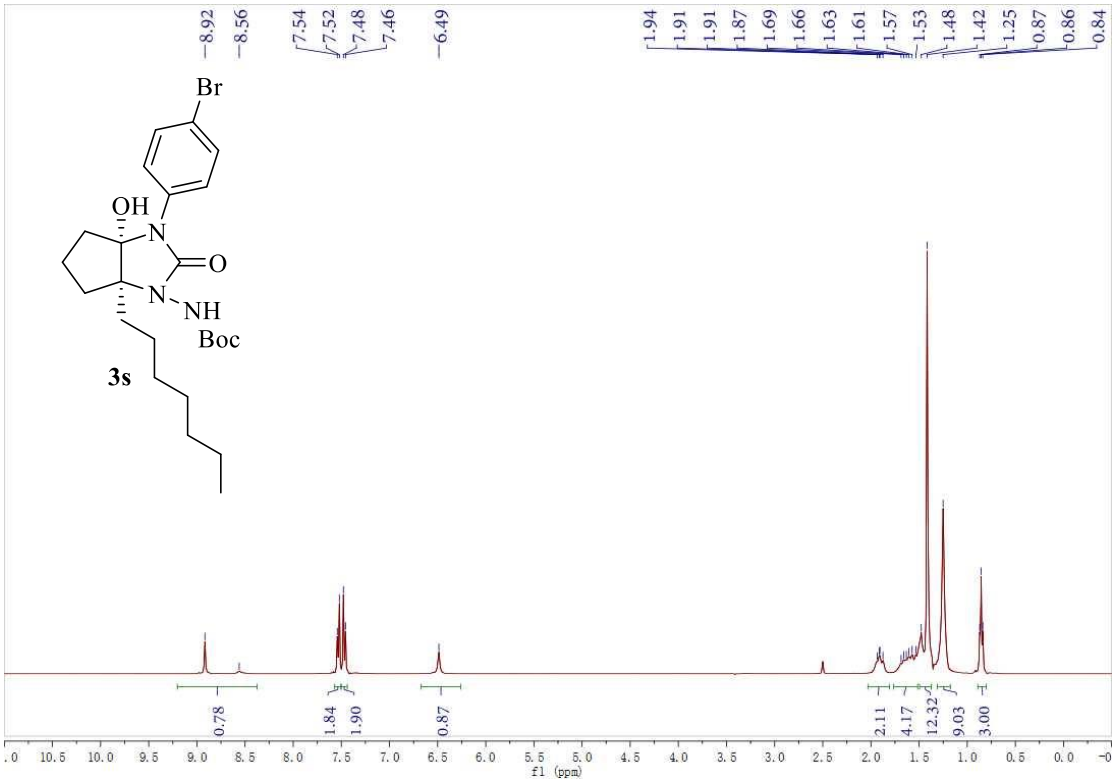

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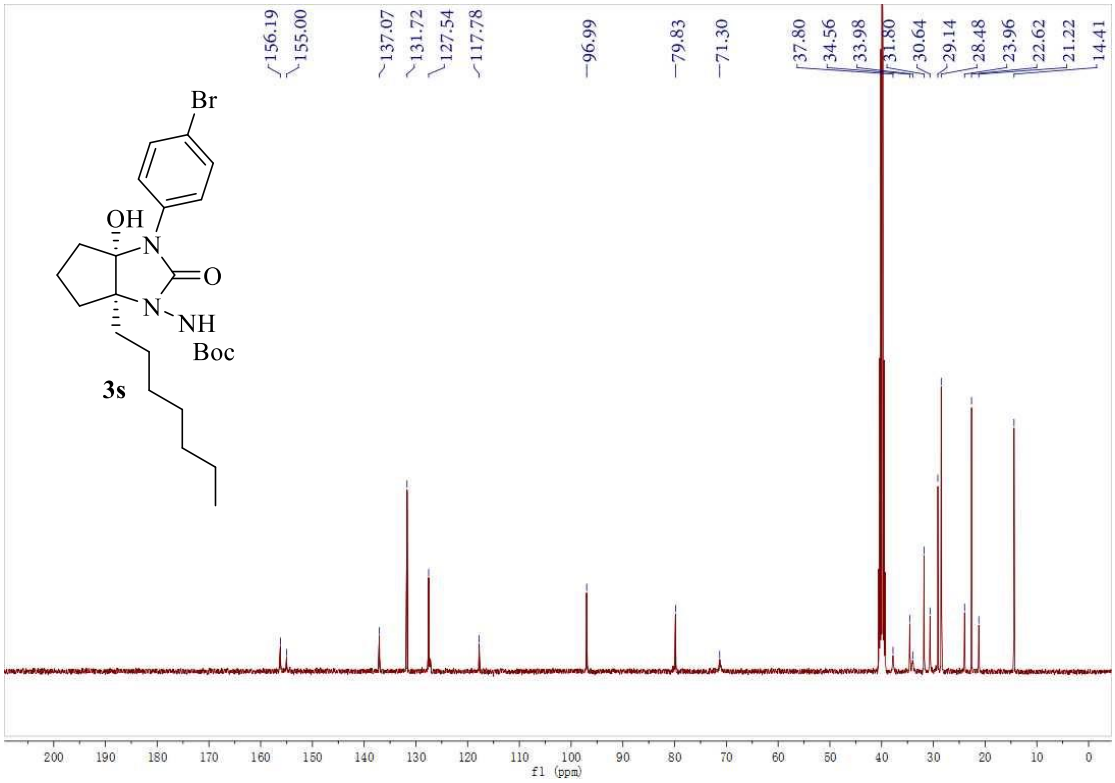

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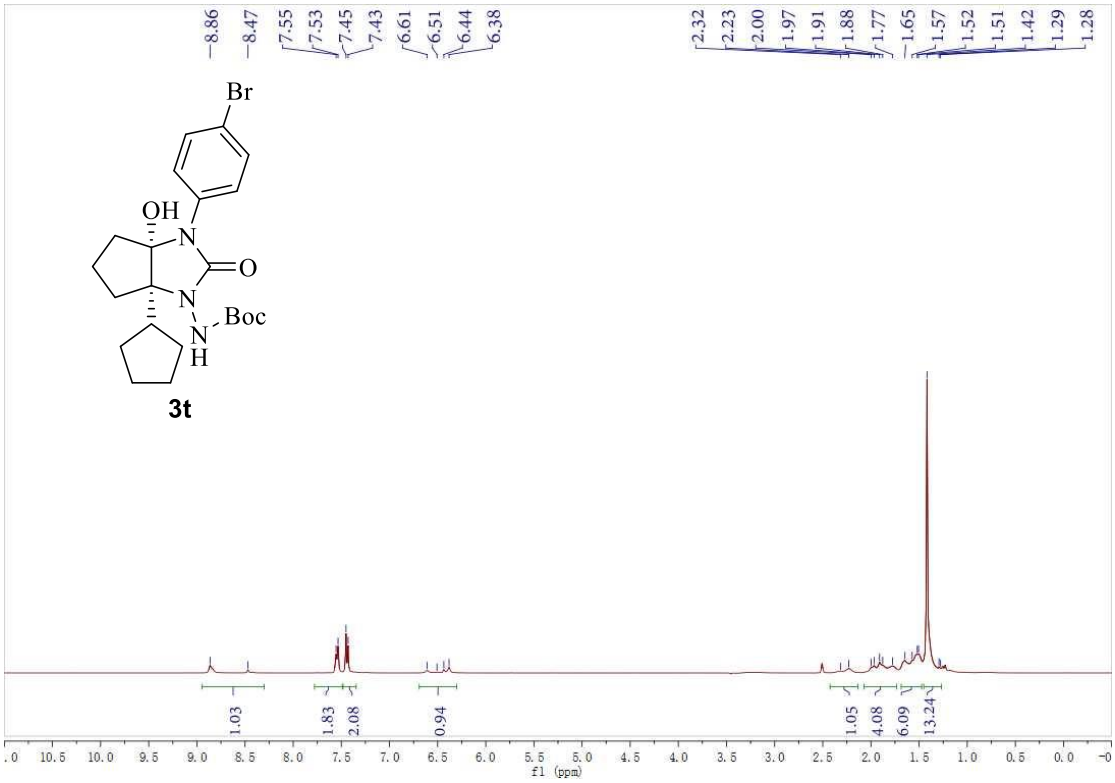

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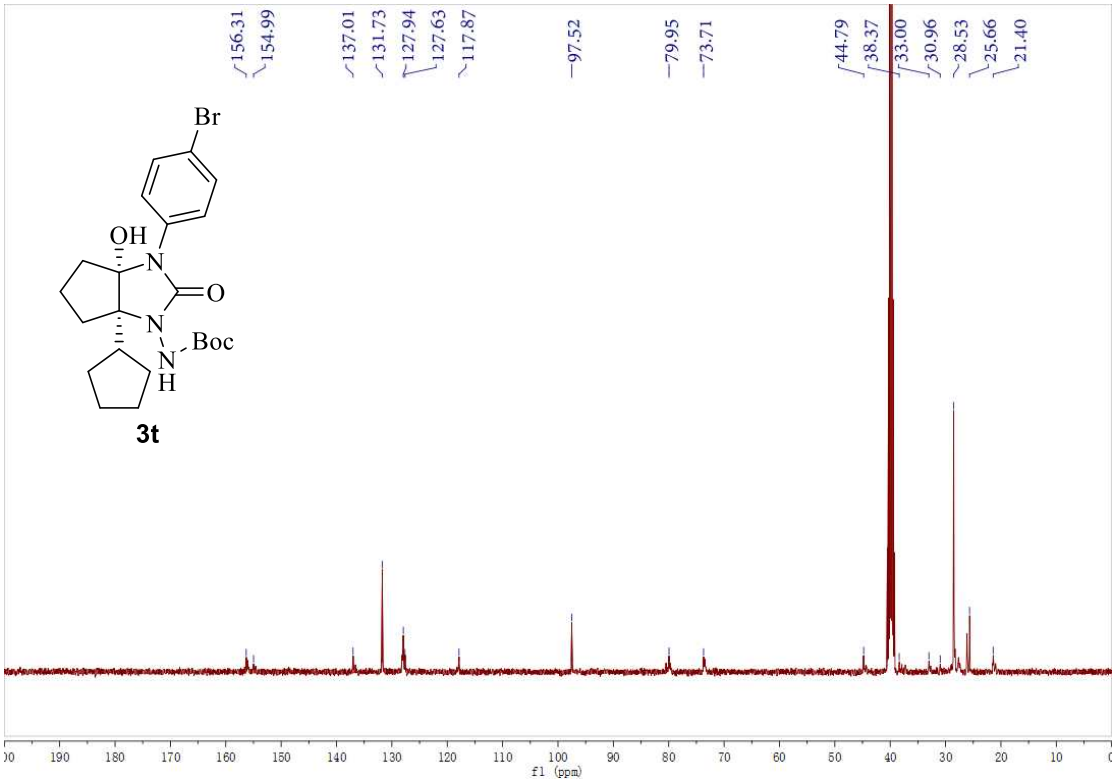

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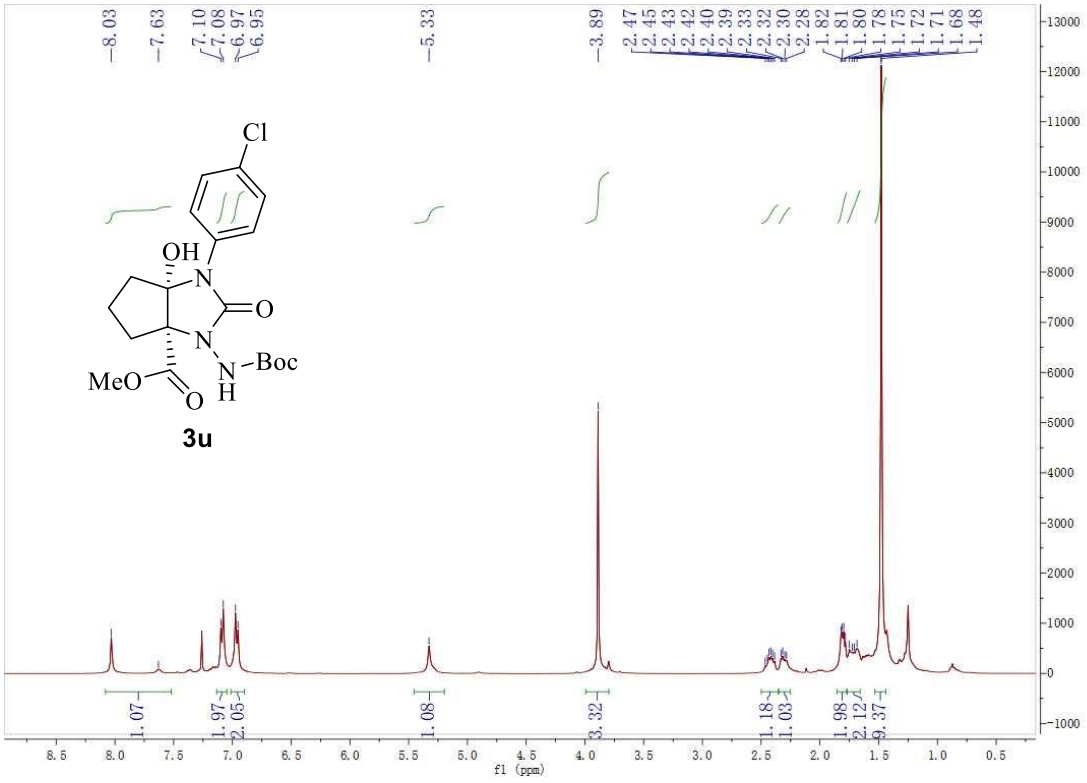

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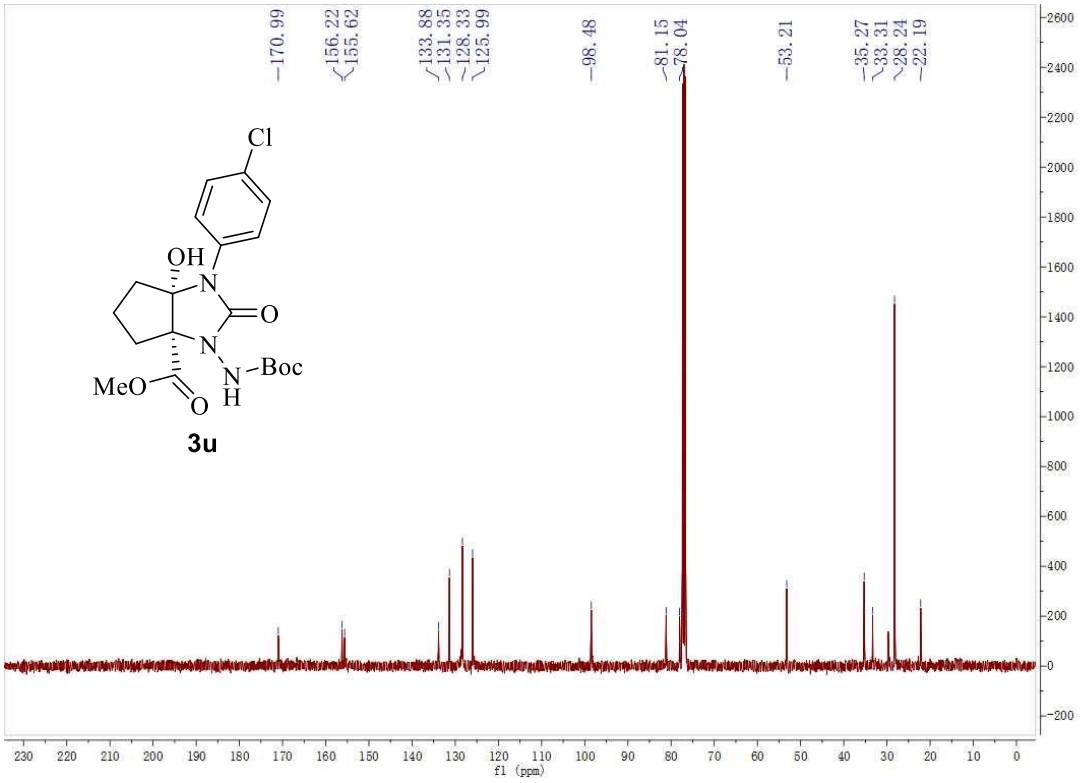

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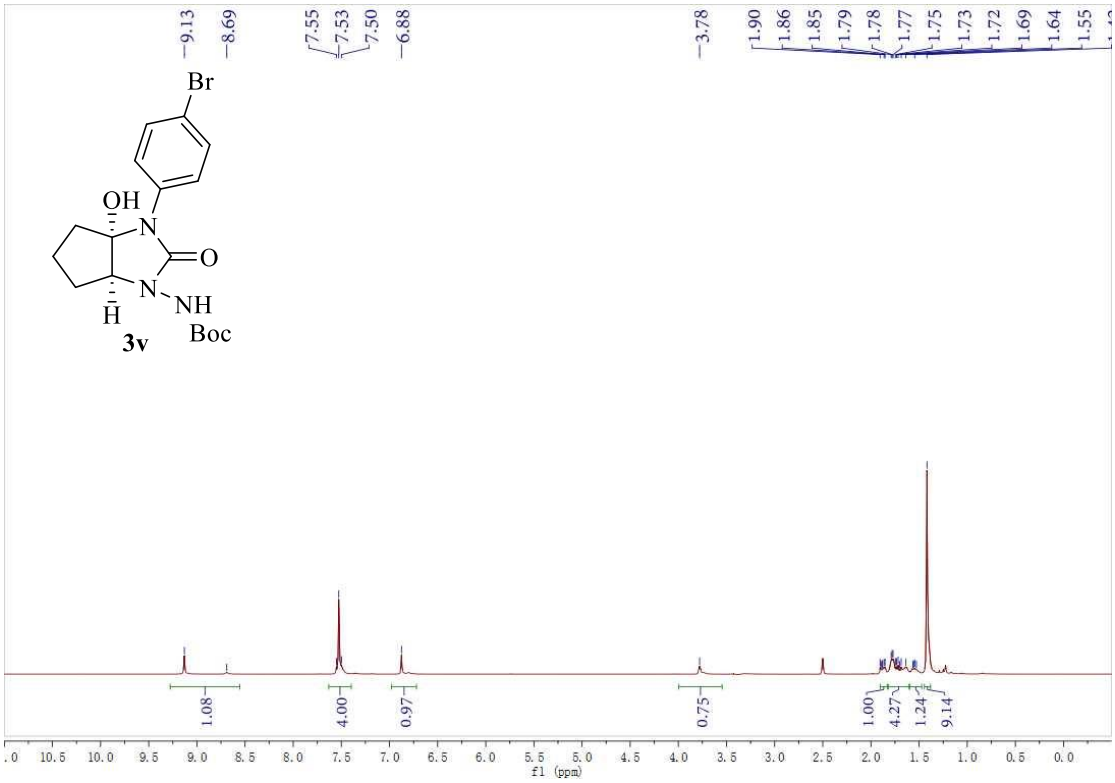

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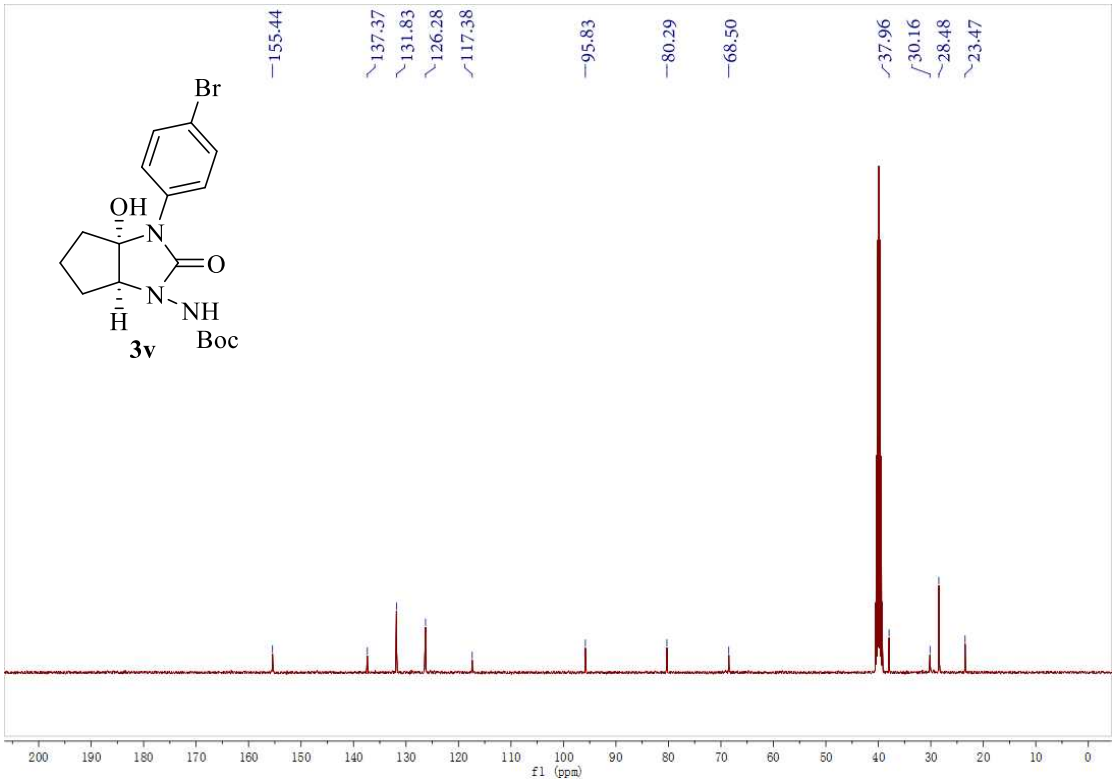

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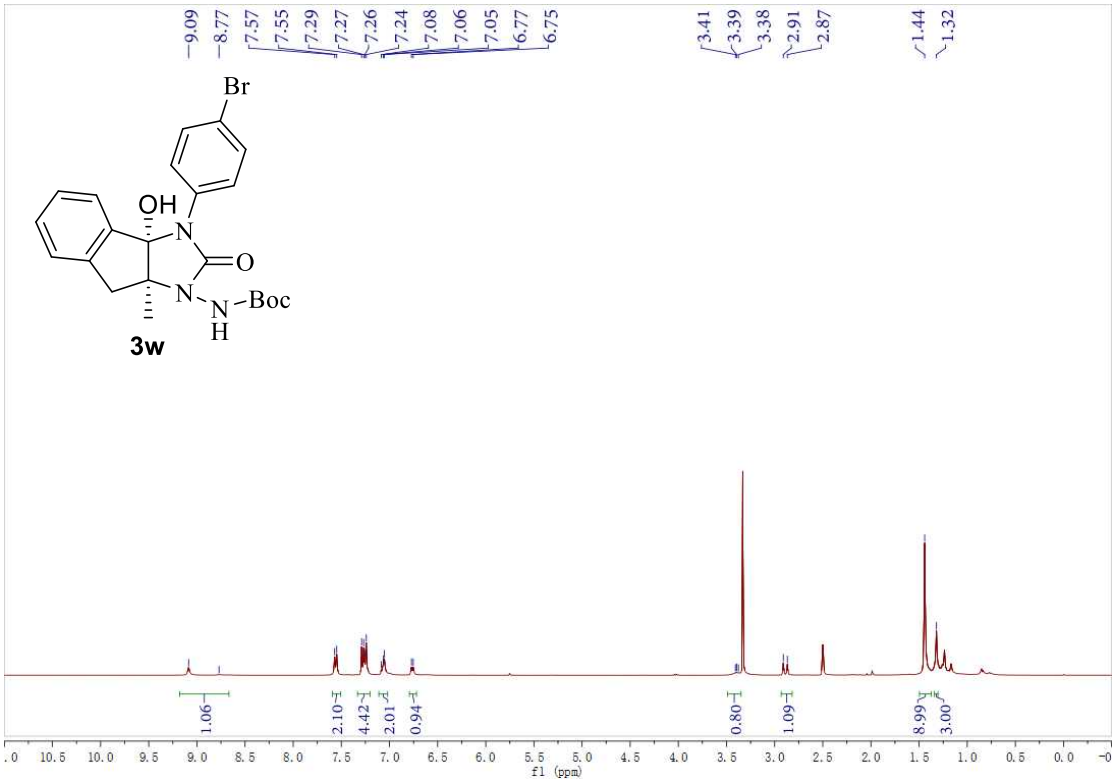

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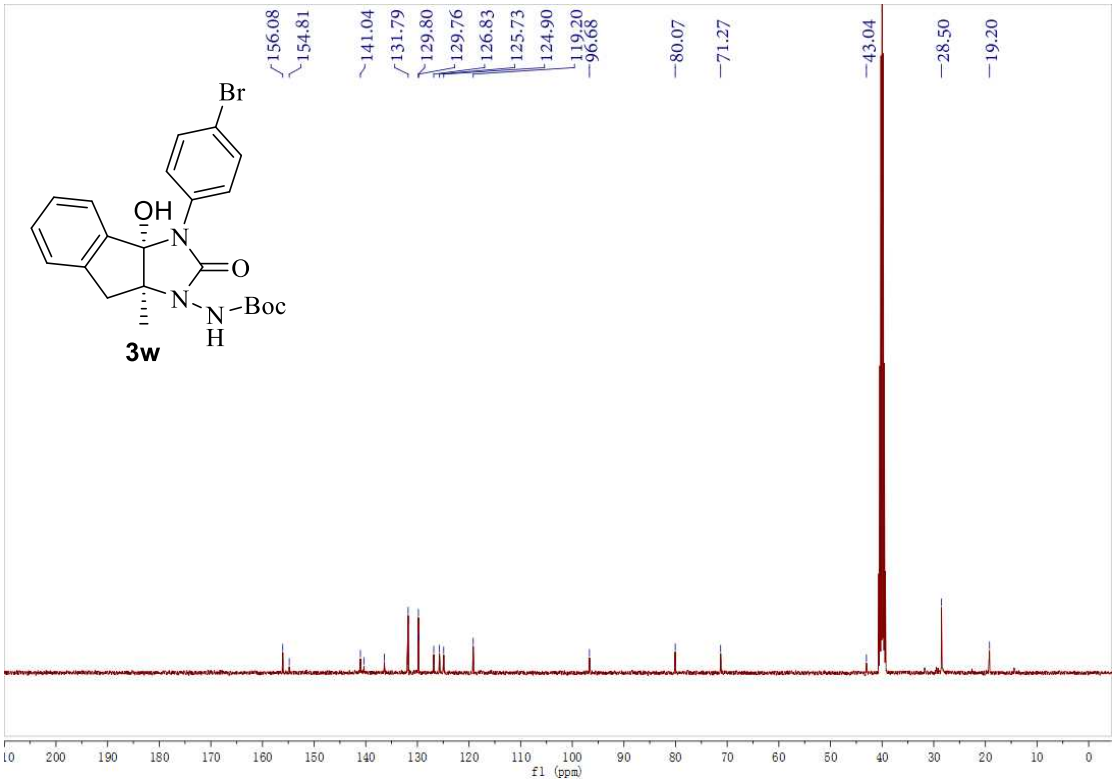

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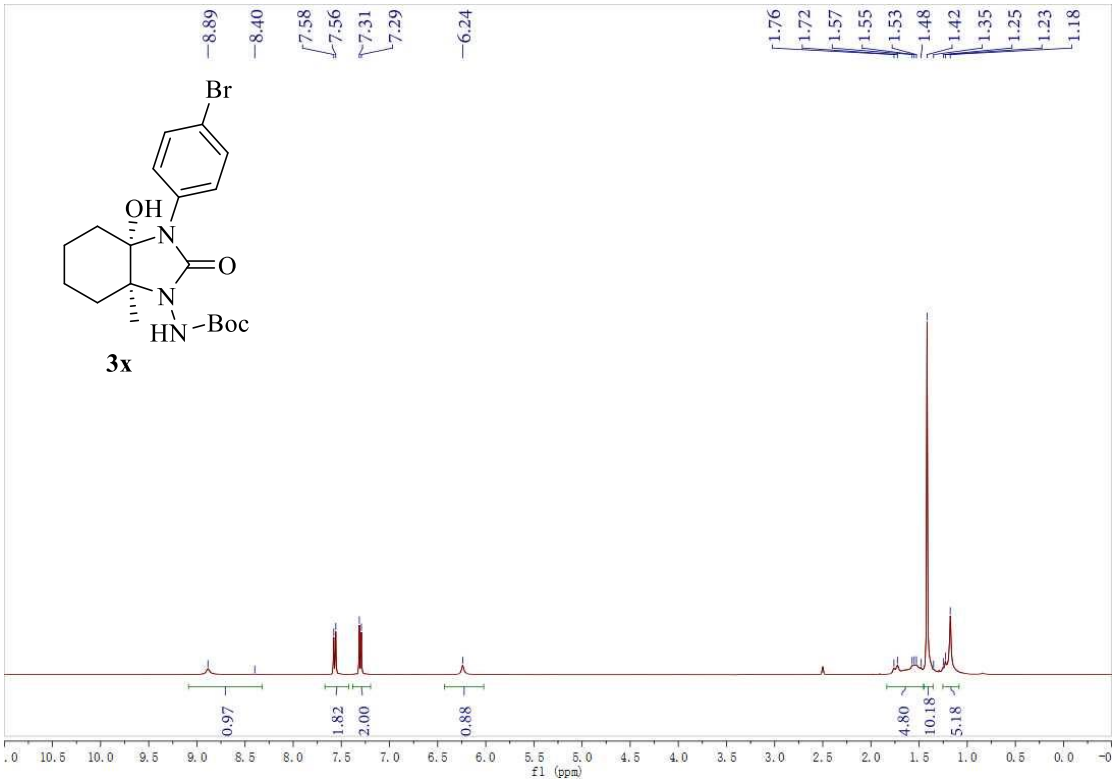

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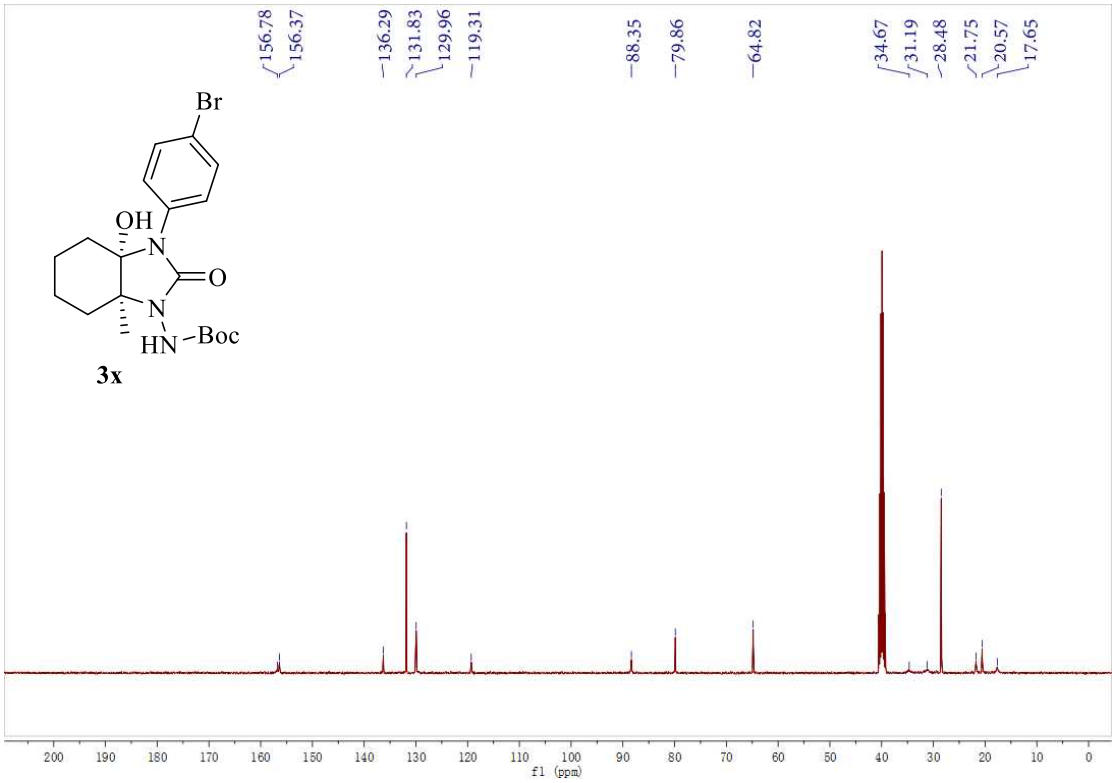

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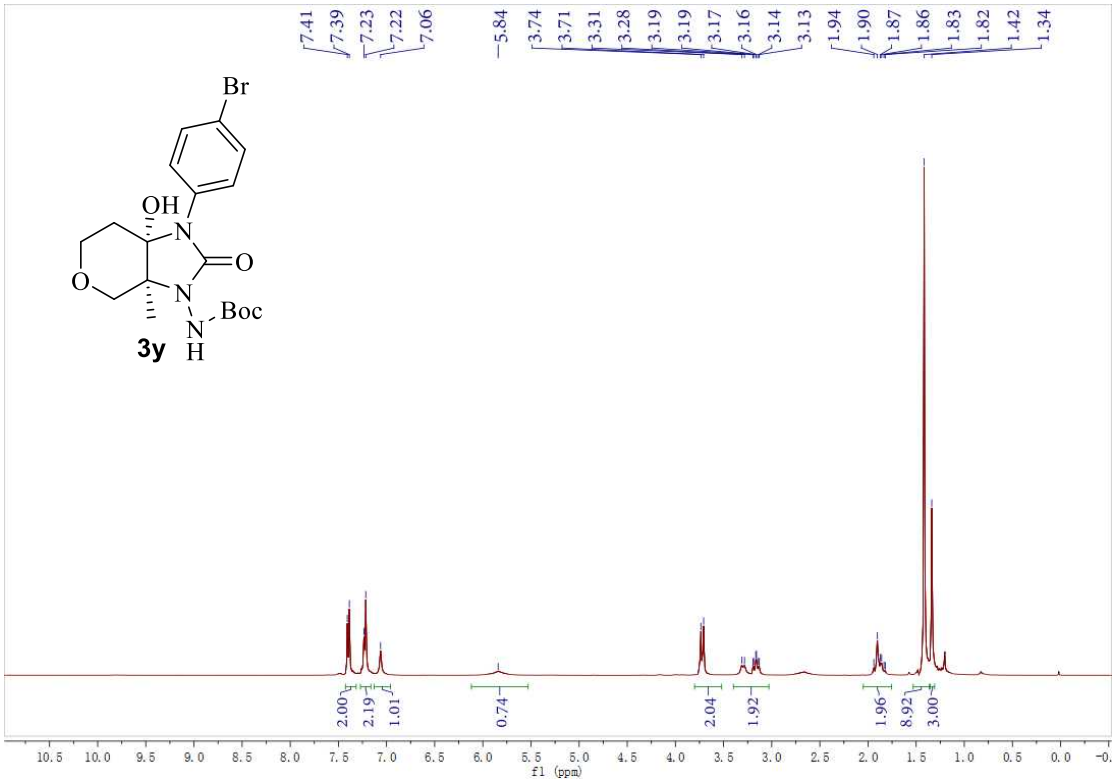

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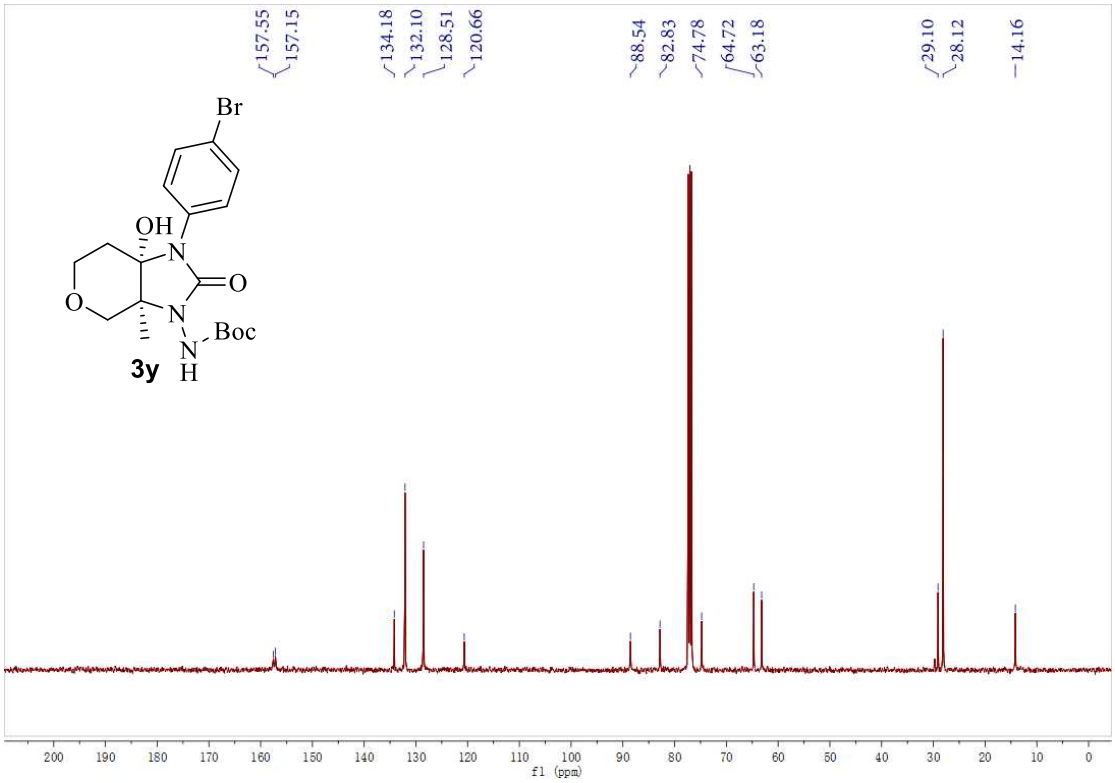

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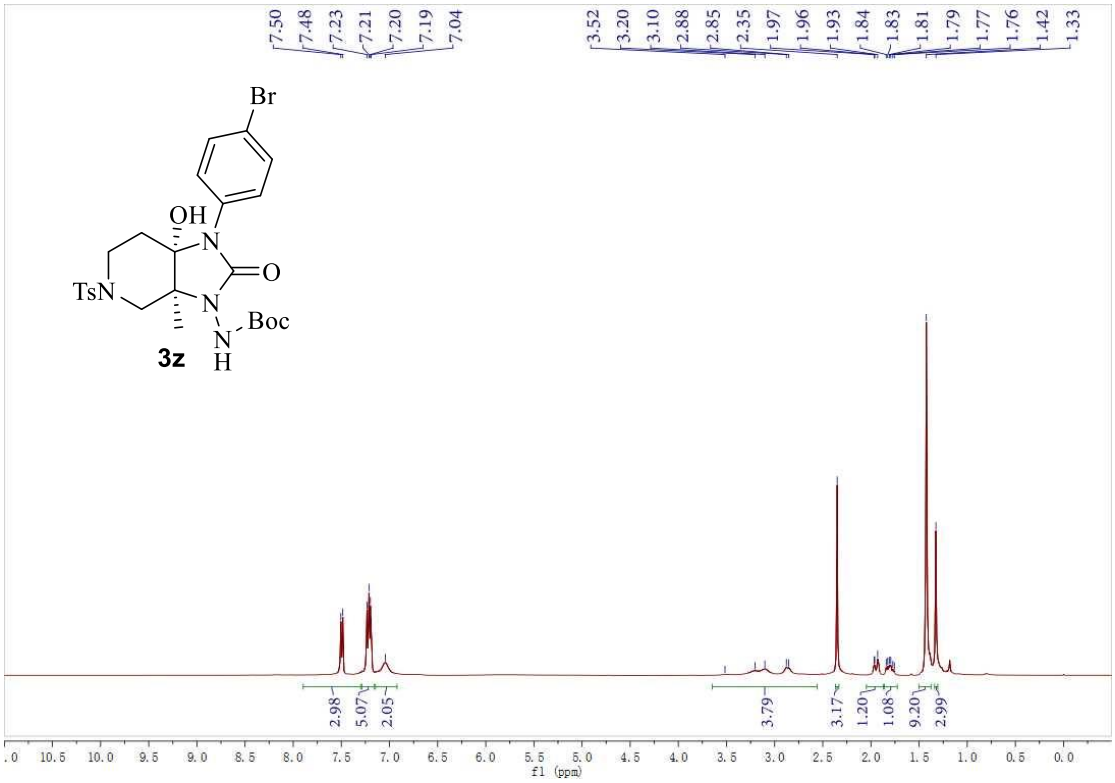

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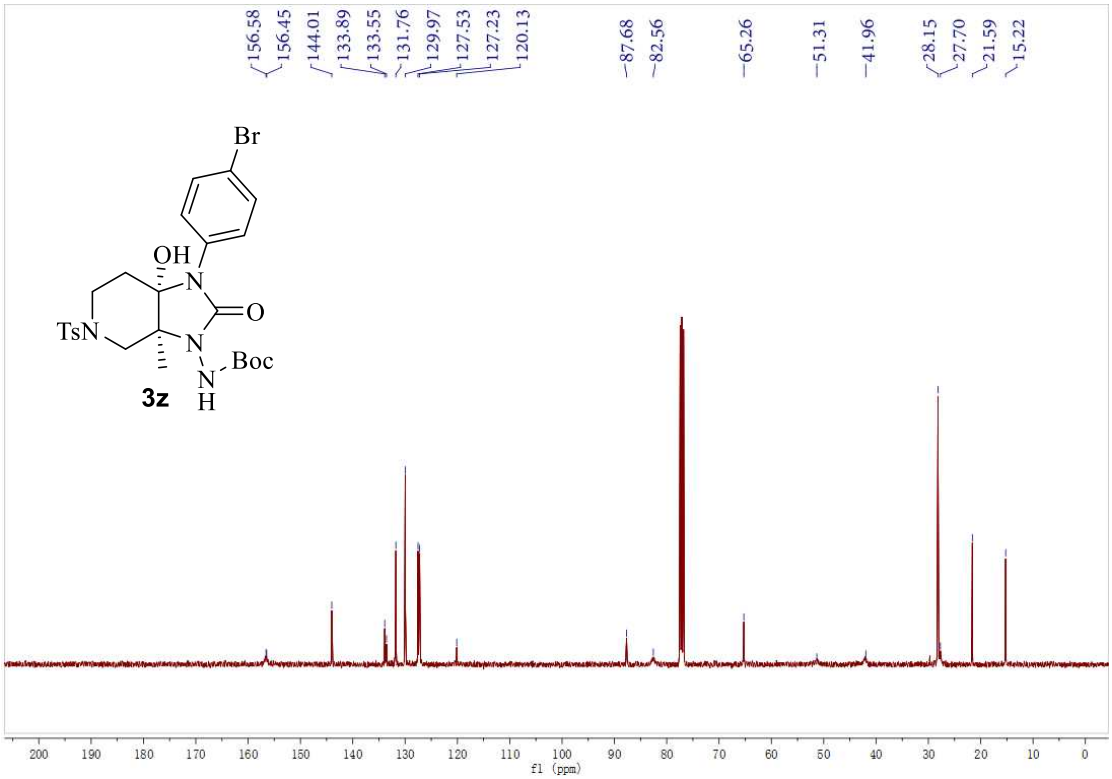

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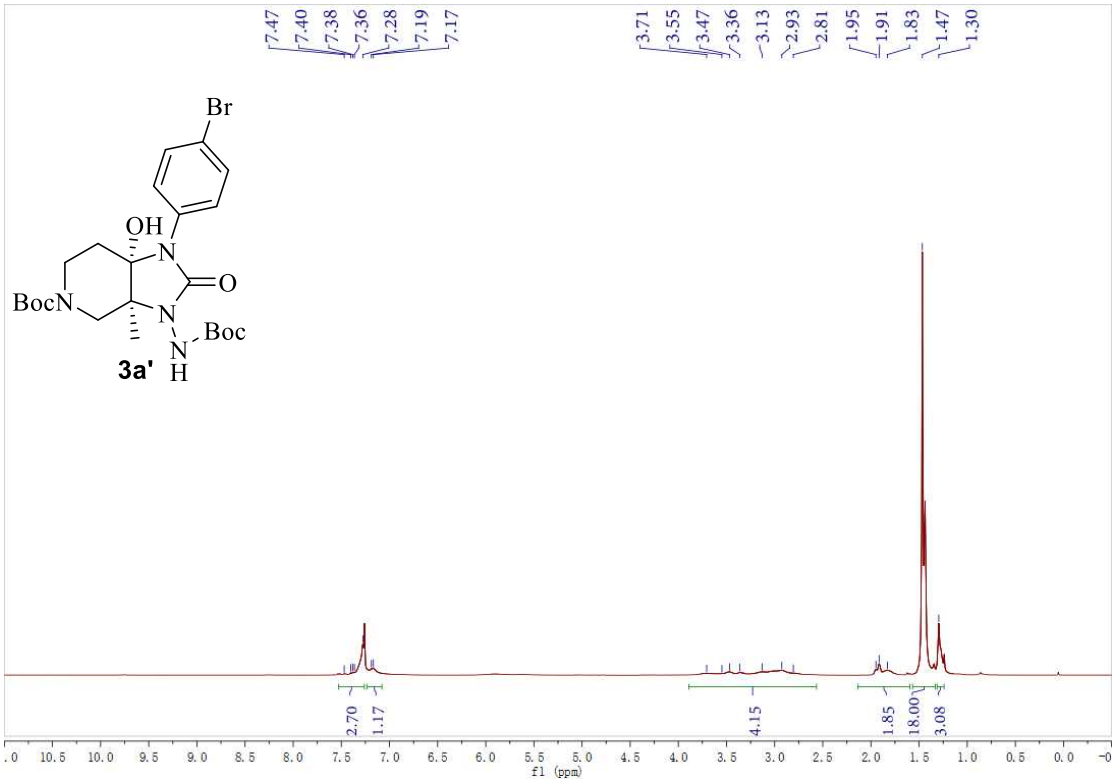

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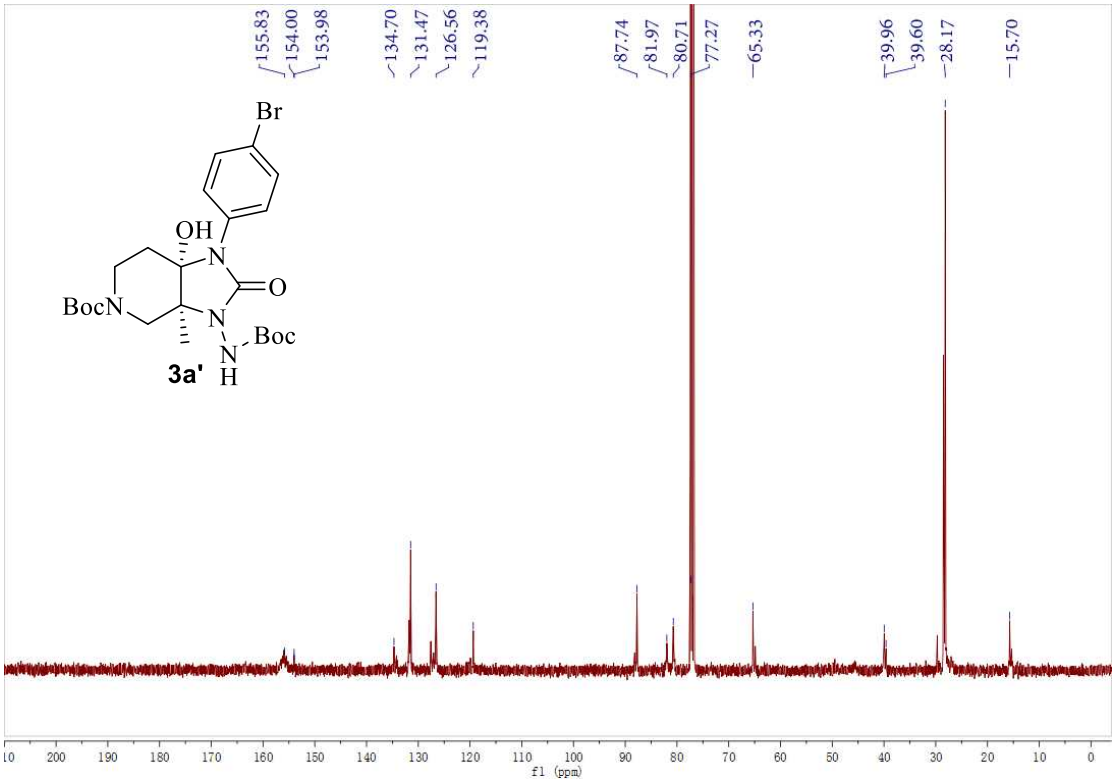

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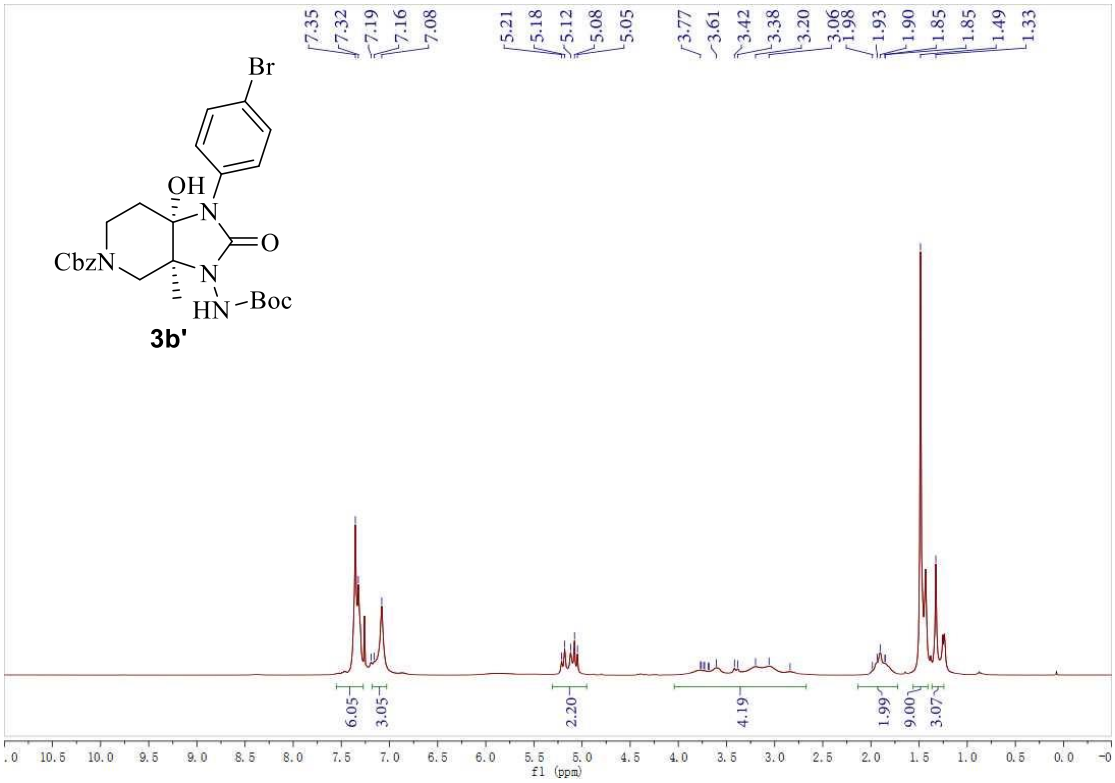

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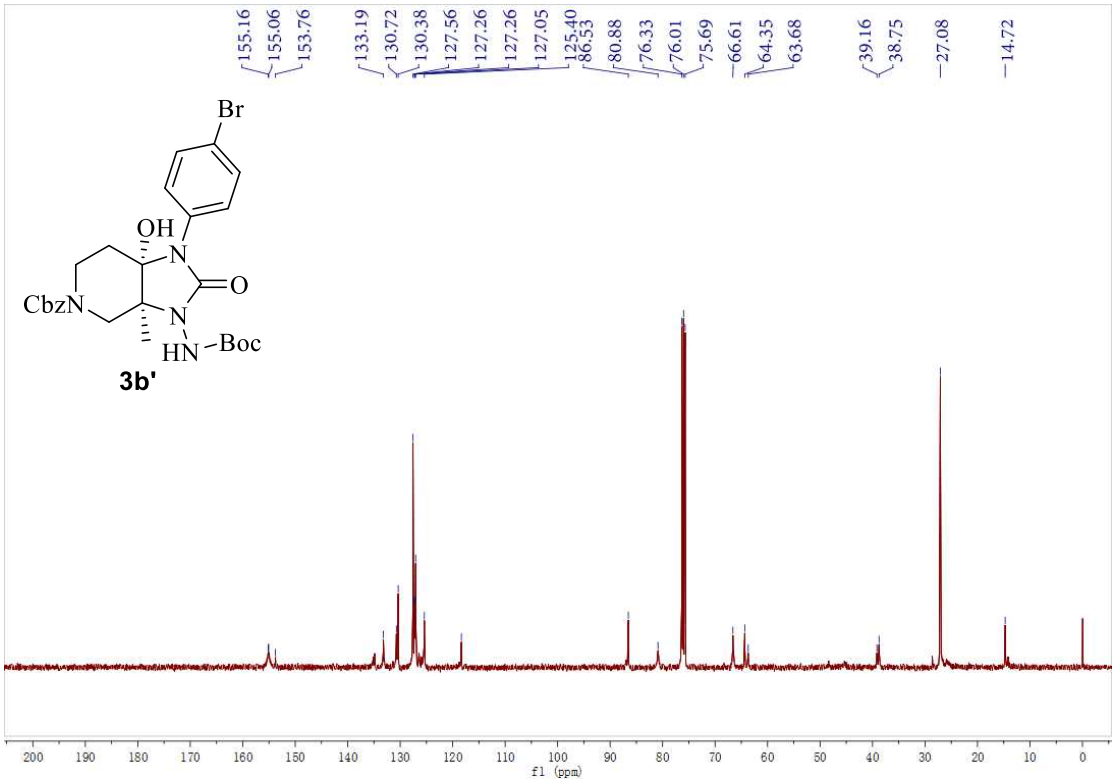

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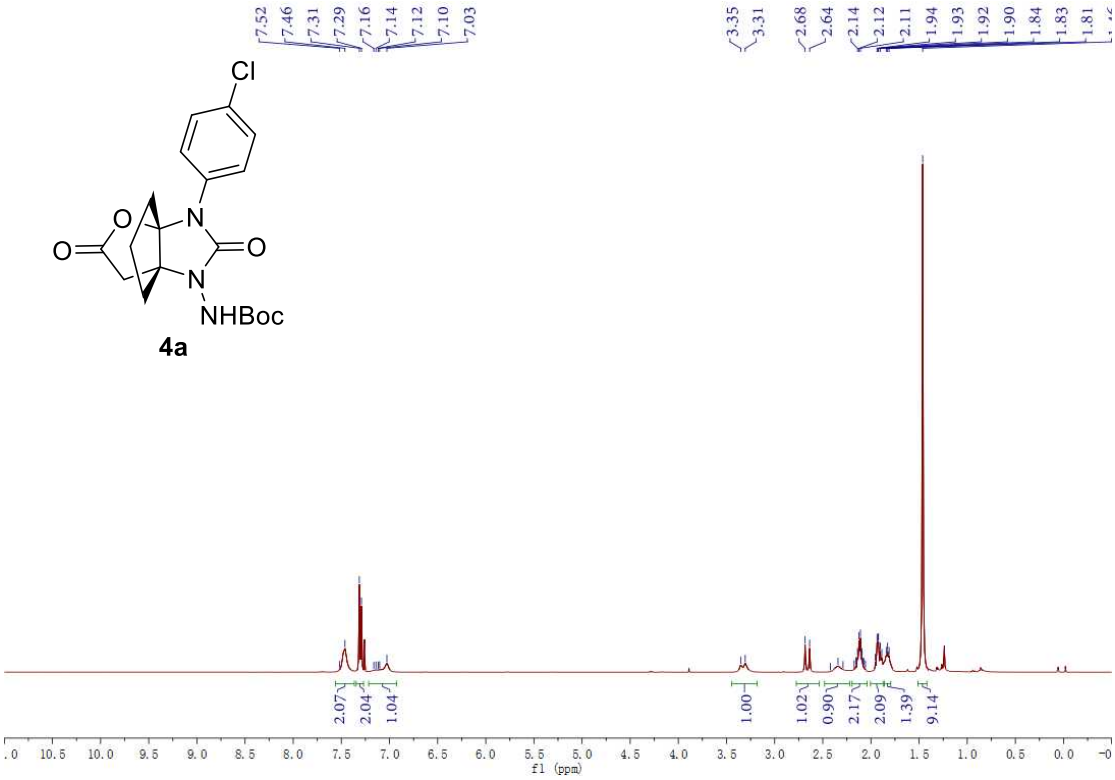

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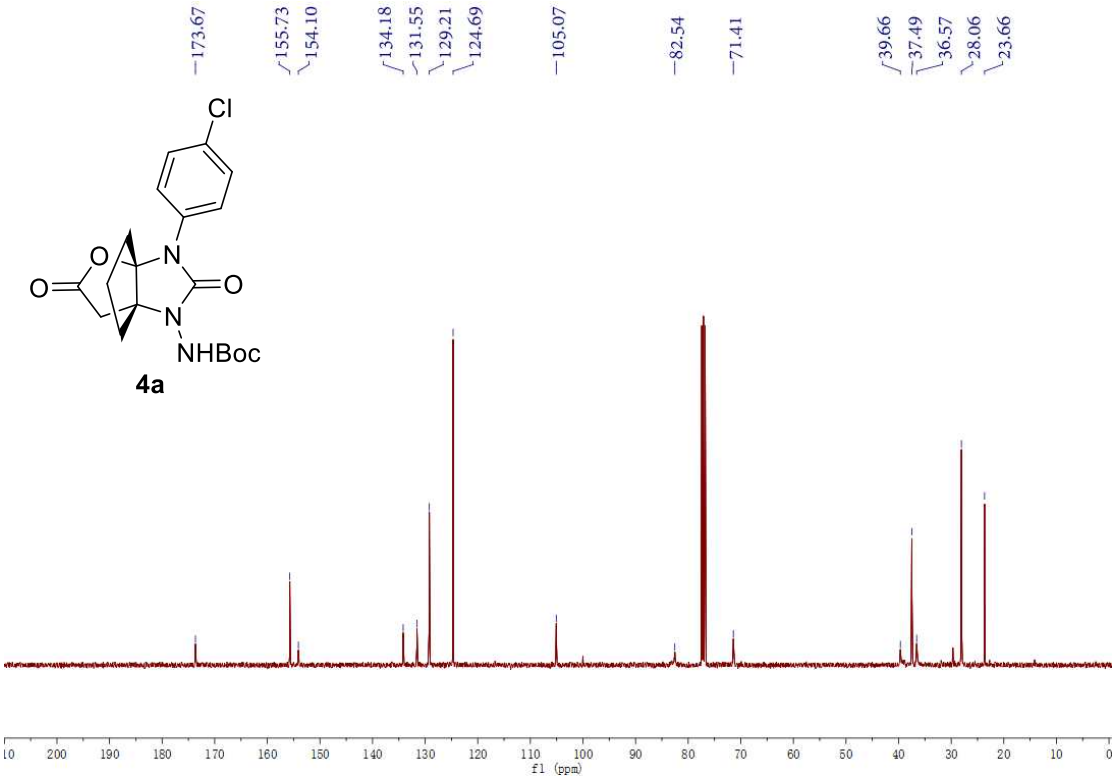

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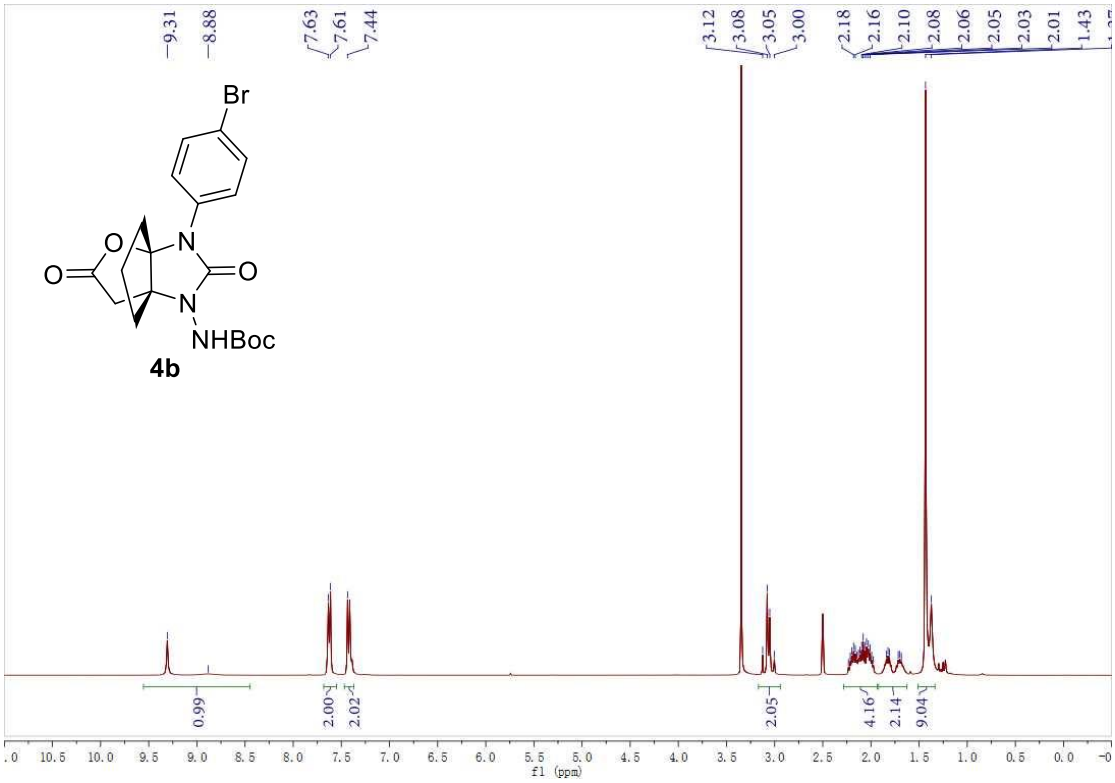

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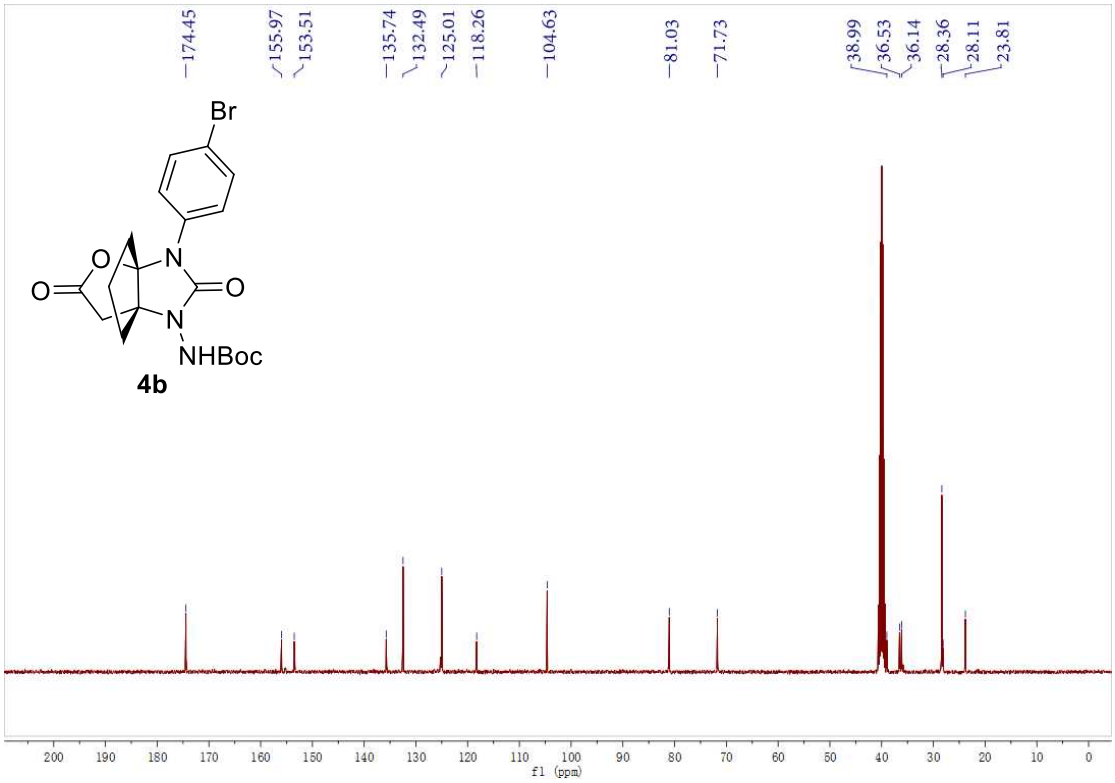

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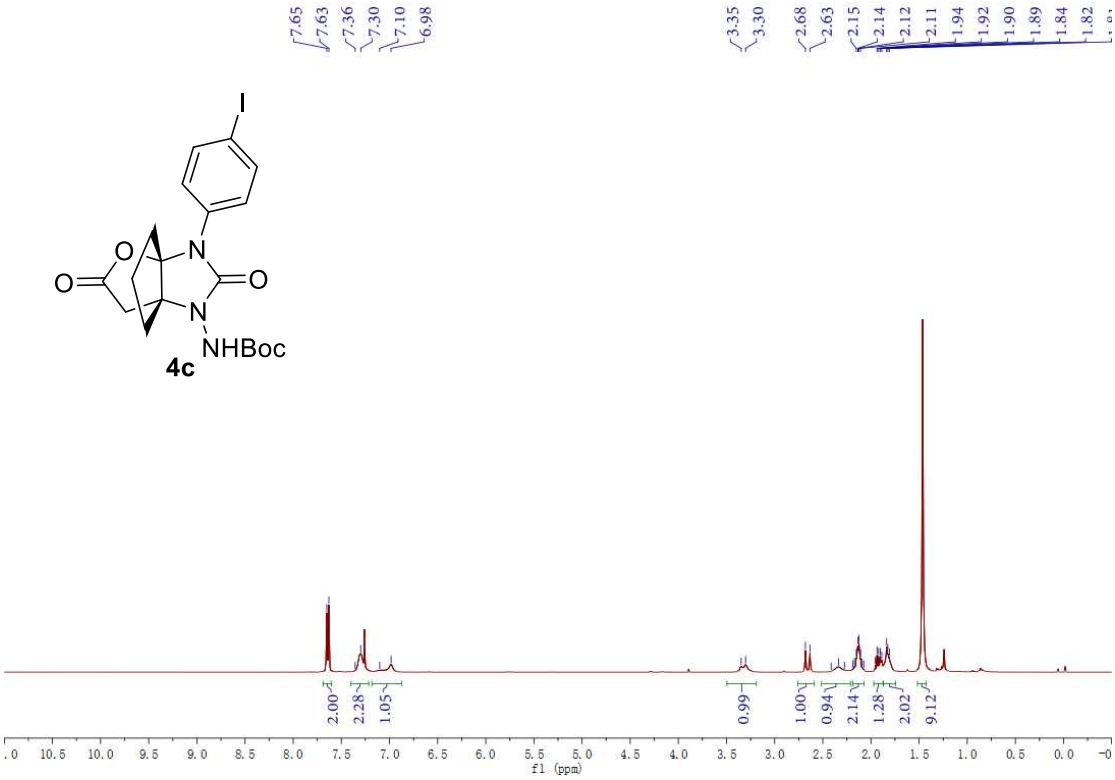

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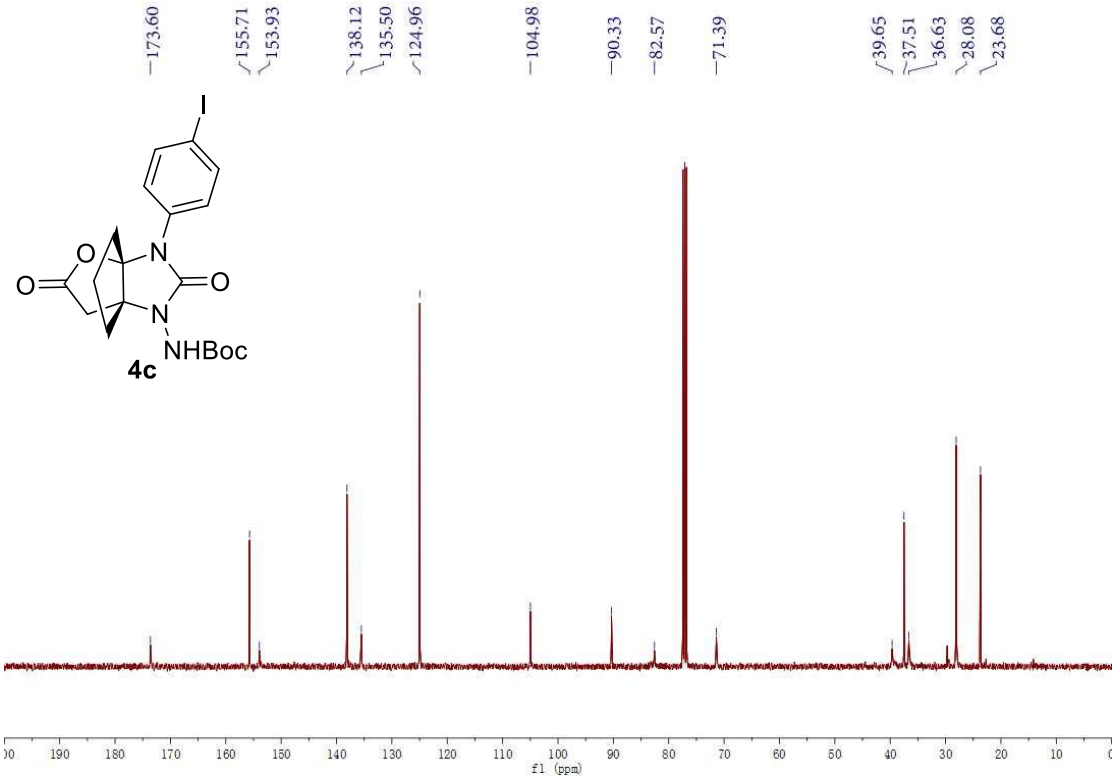

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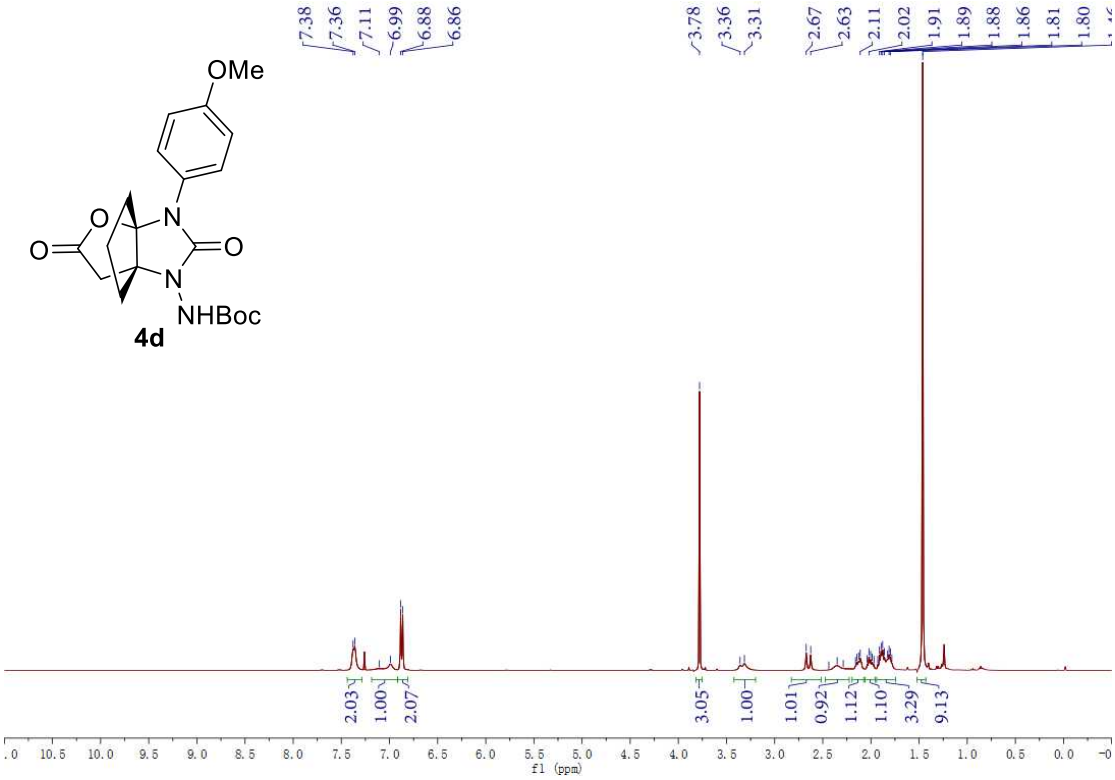

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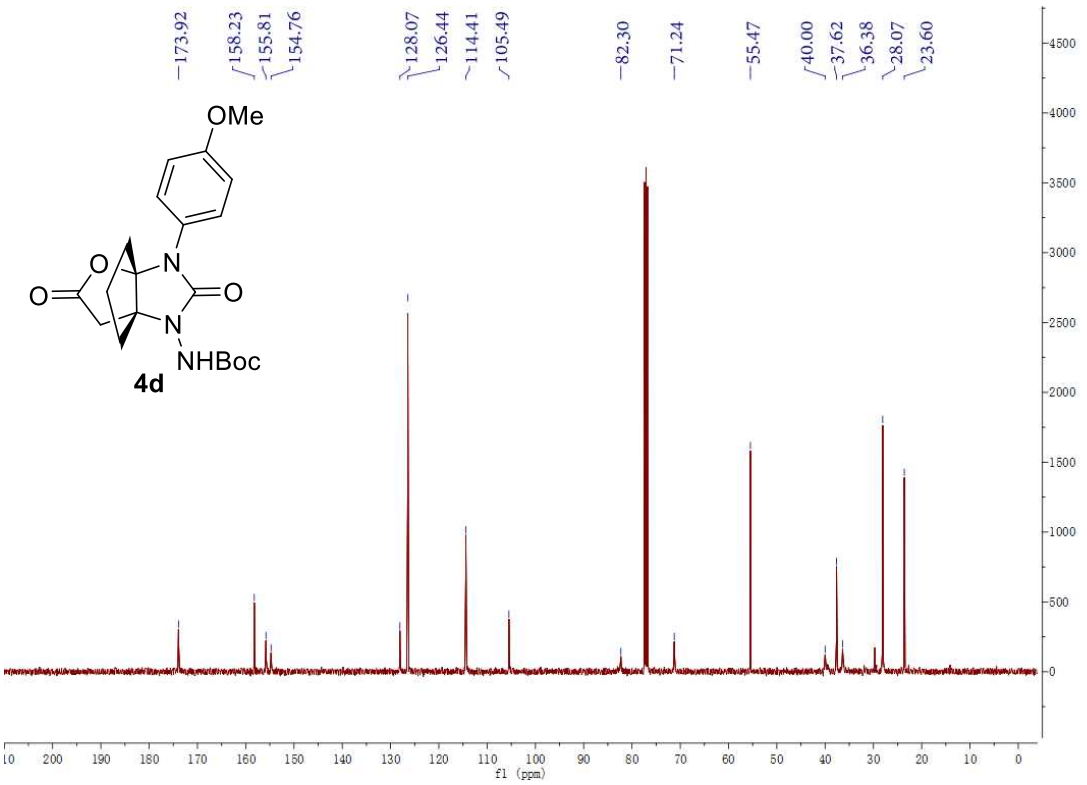

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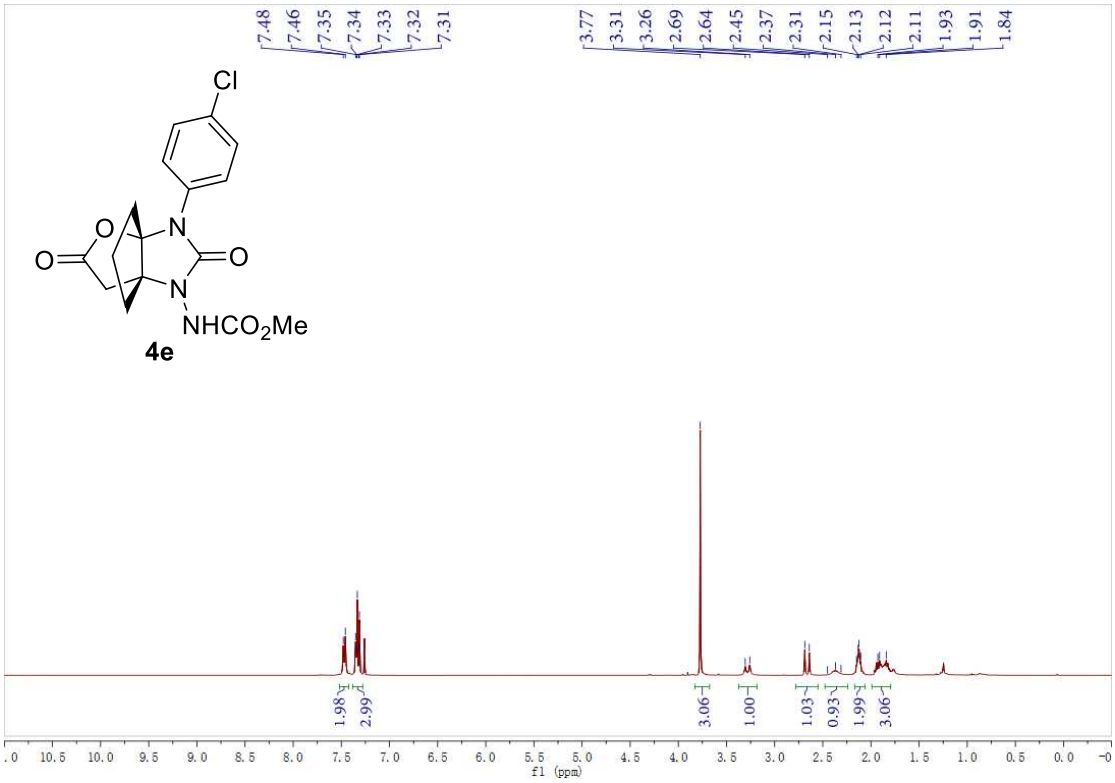

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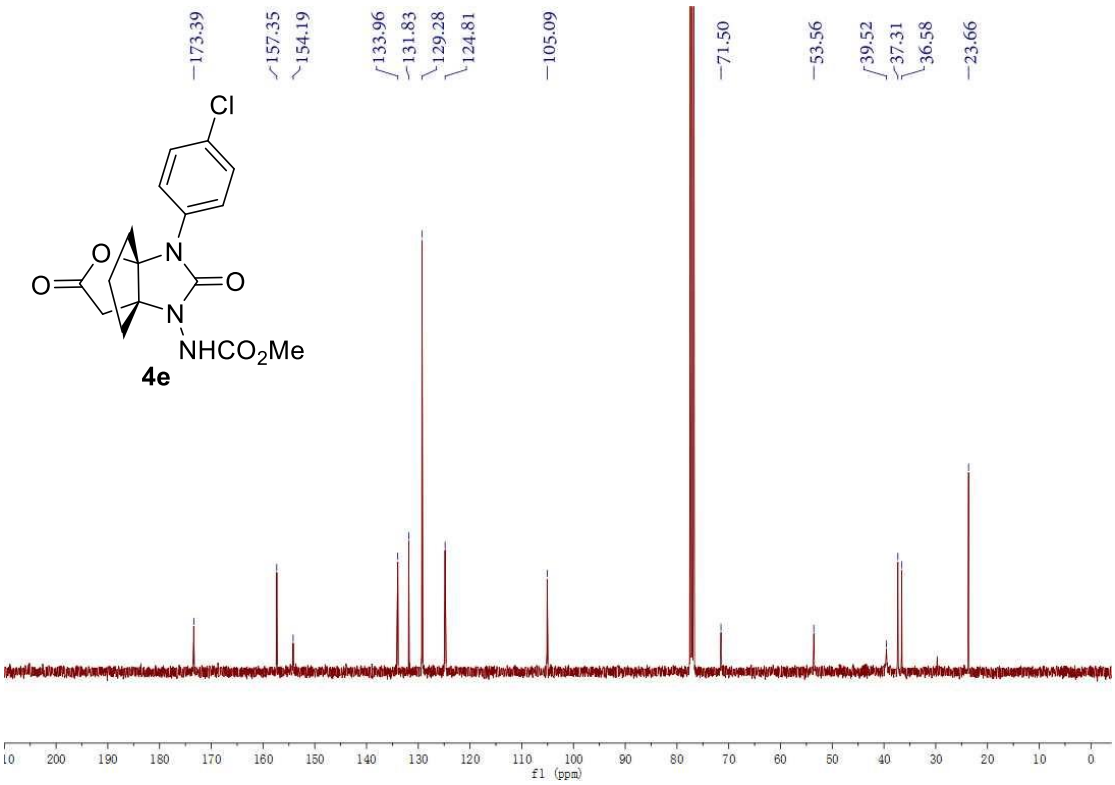

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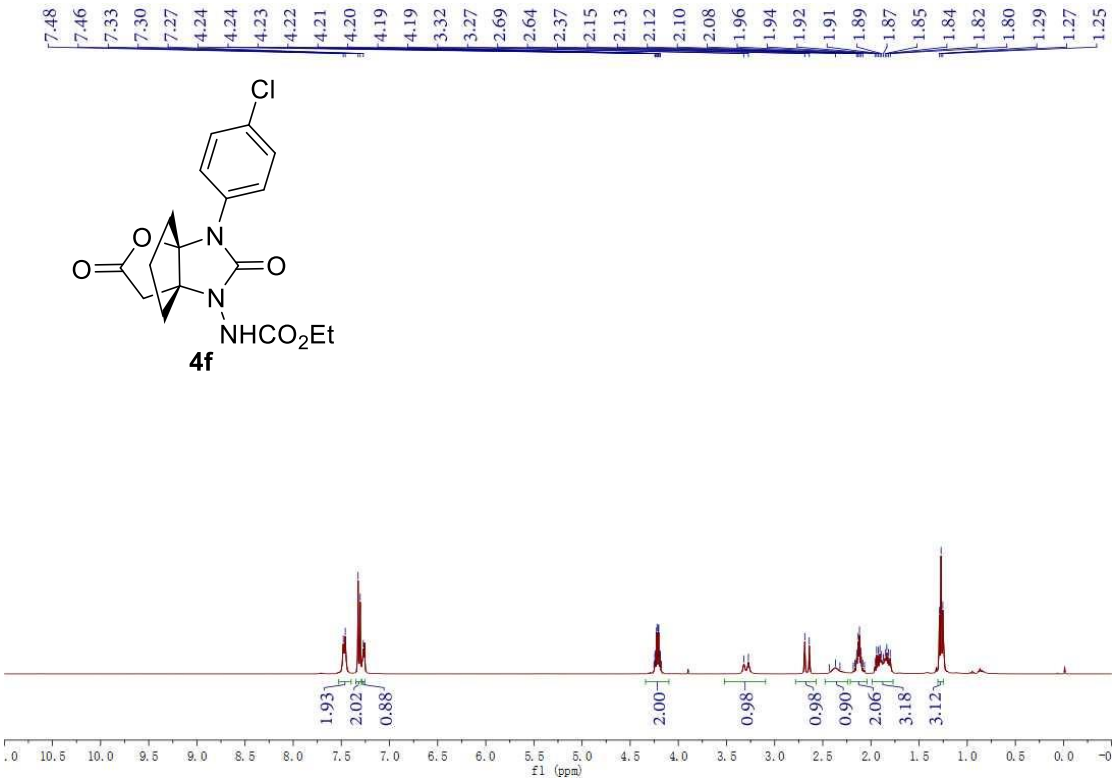

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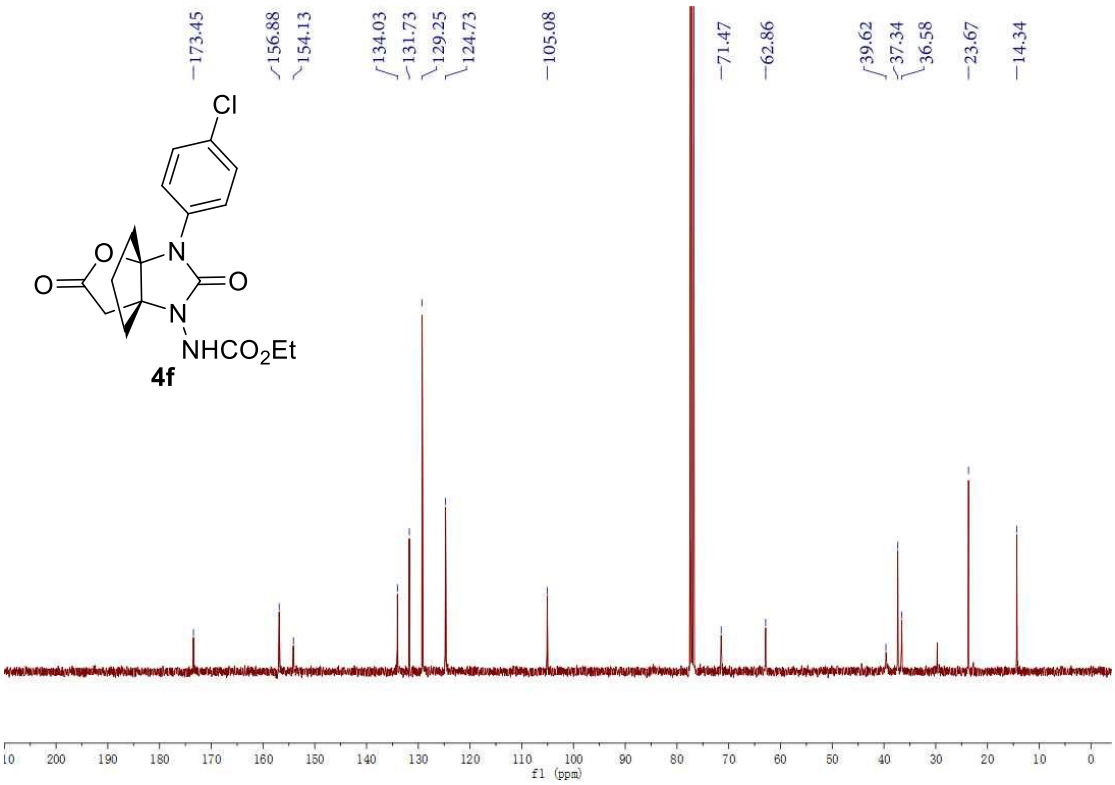

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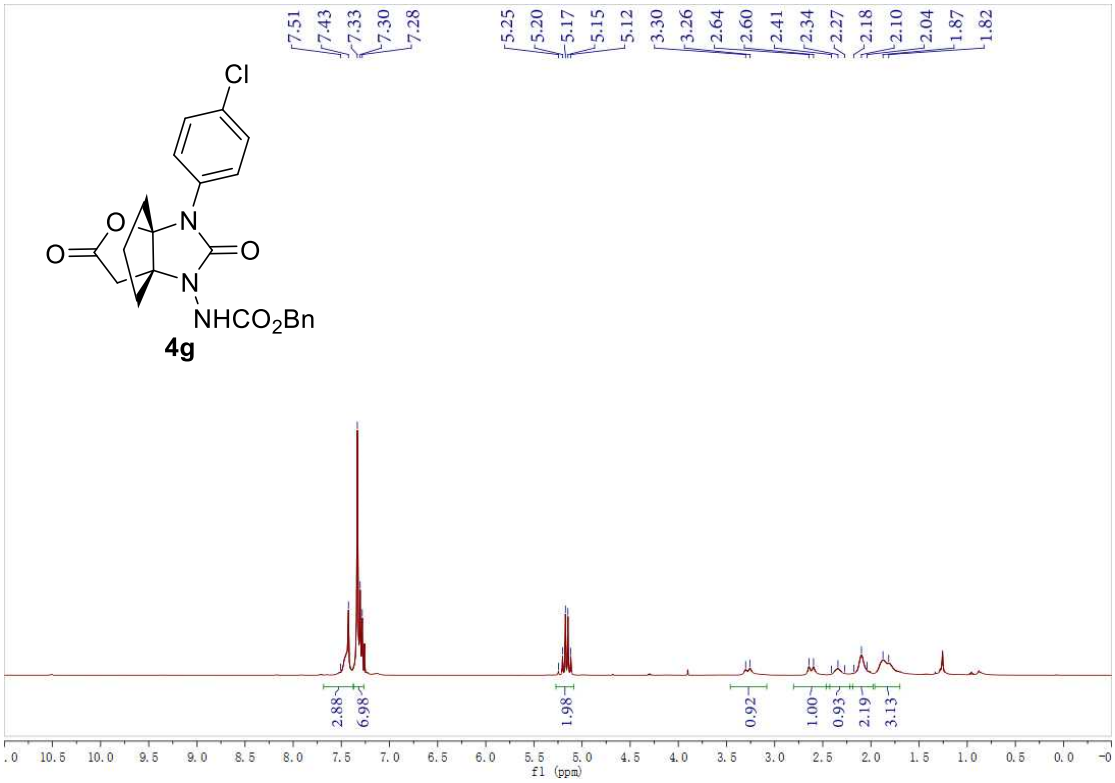
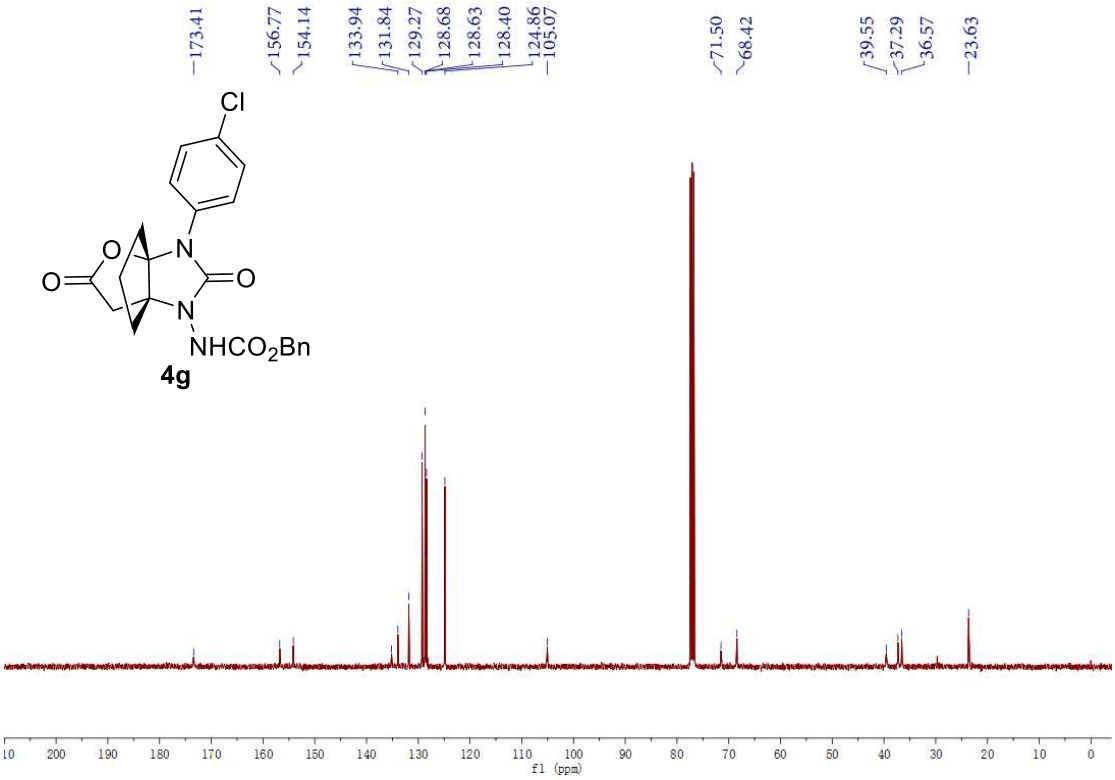
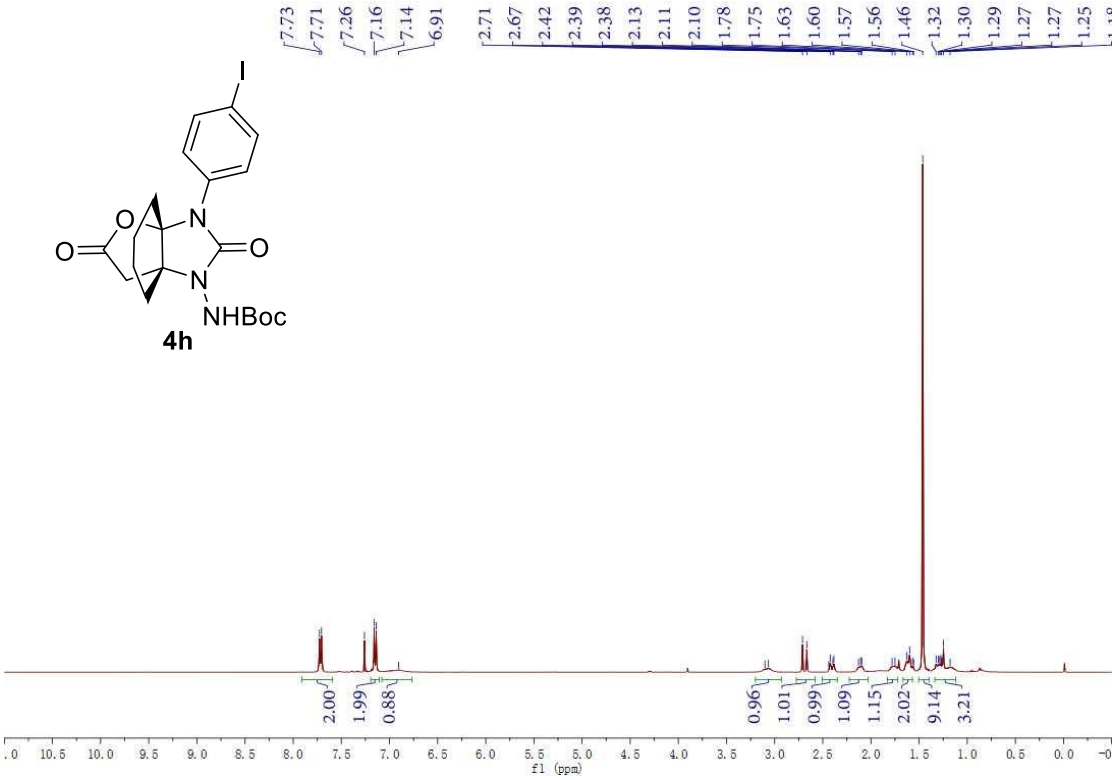


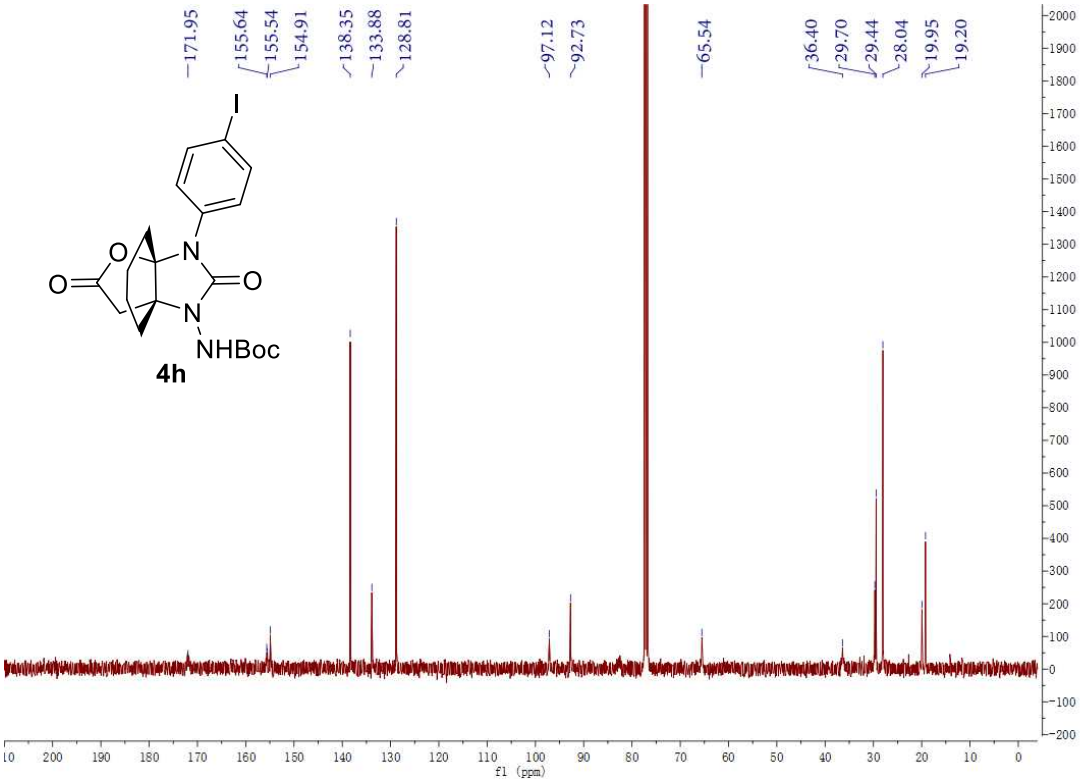
^{13}C NMR (100 MHz, $CDCl_3$)



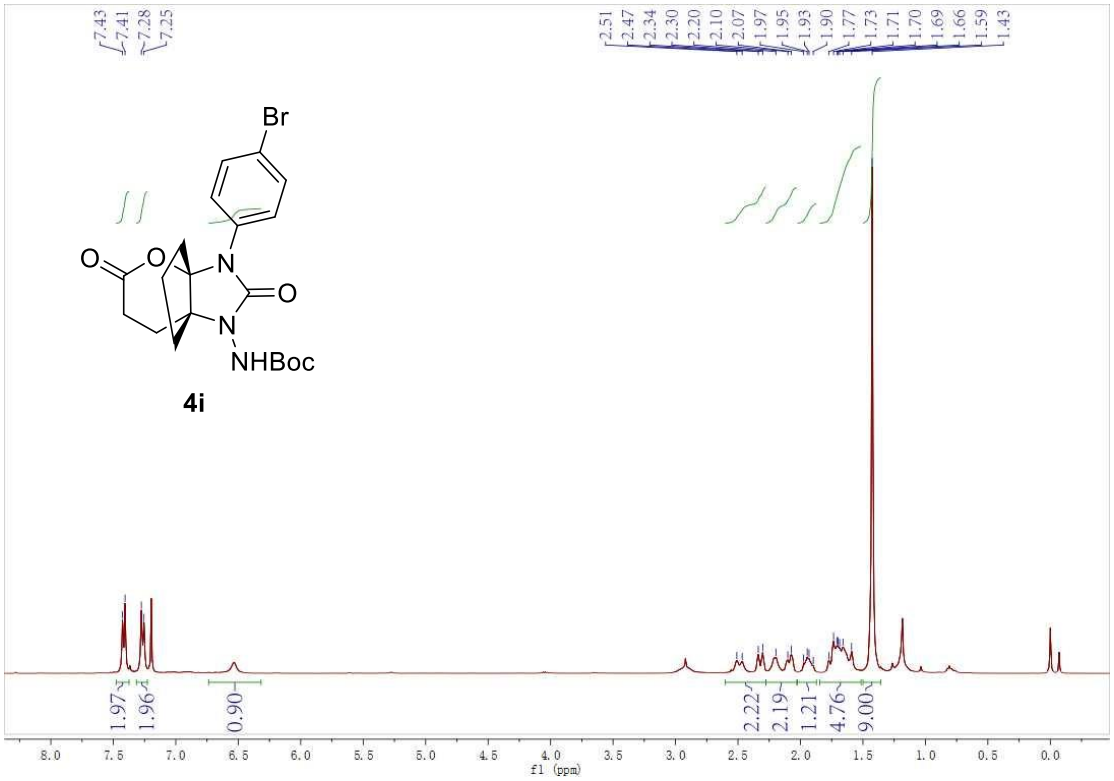
^{1}H NMR (400 MHz, $CDCl_3$)



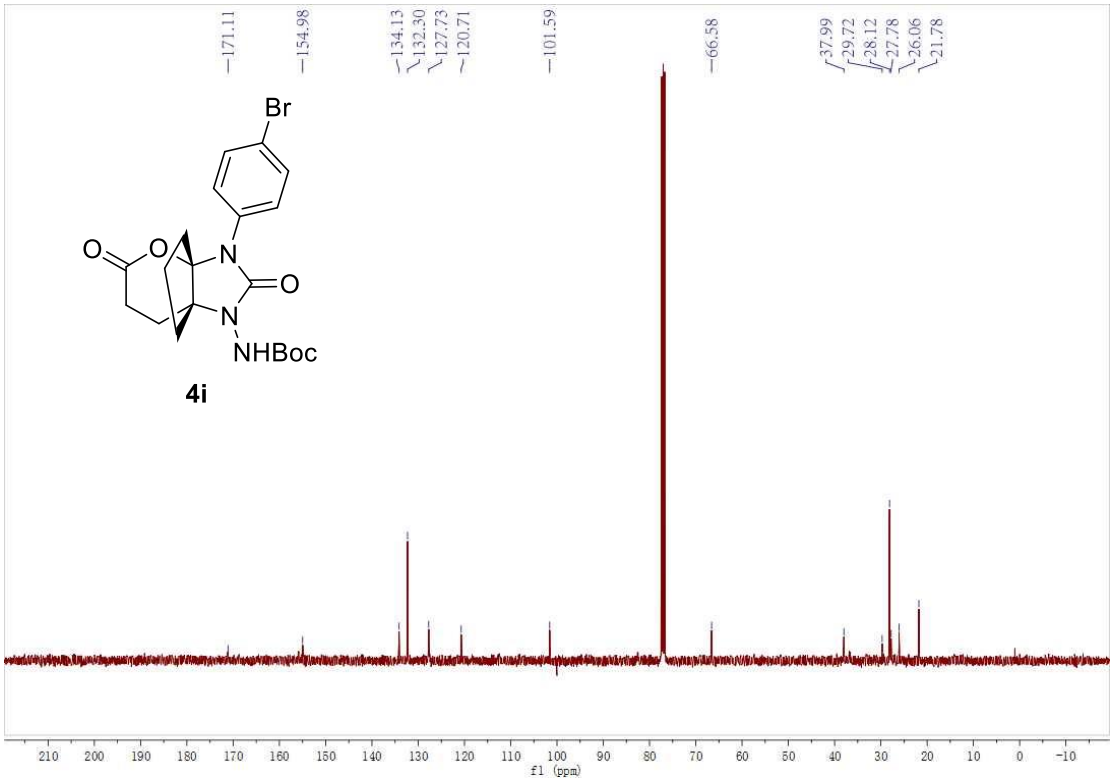
^{13}C NMR (100 MHz, $CDCl_3$)



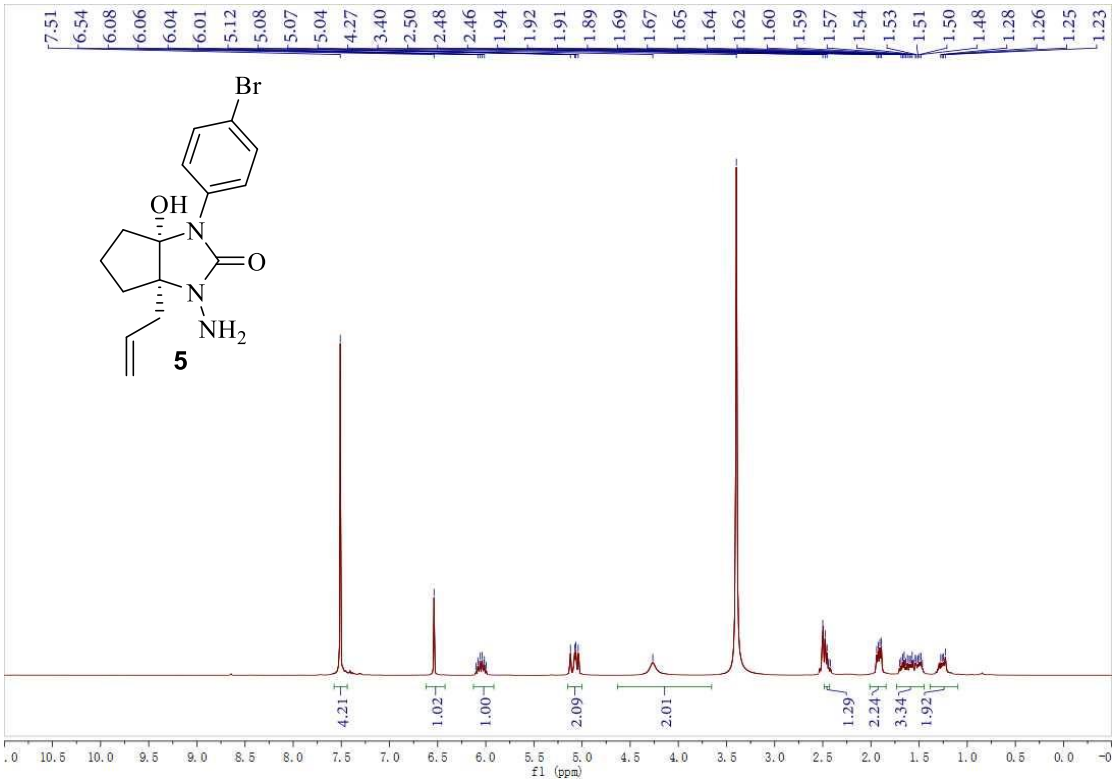
^{1}H NMR (400 MHz, $CDCl_3$)



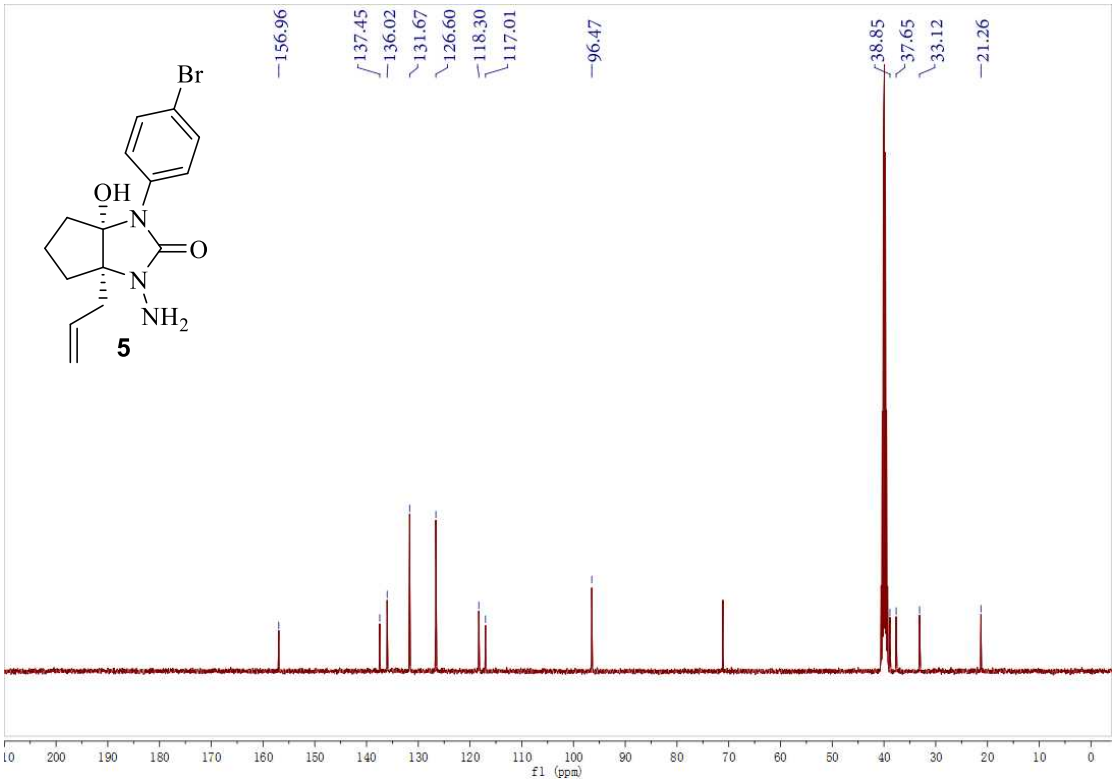
^{13}C NMR (100 MHz, $CDCl_3$)



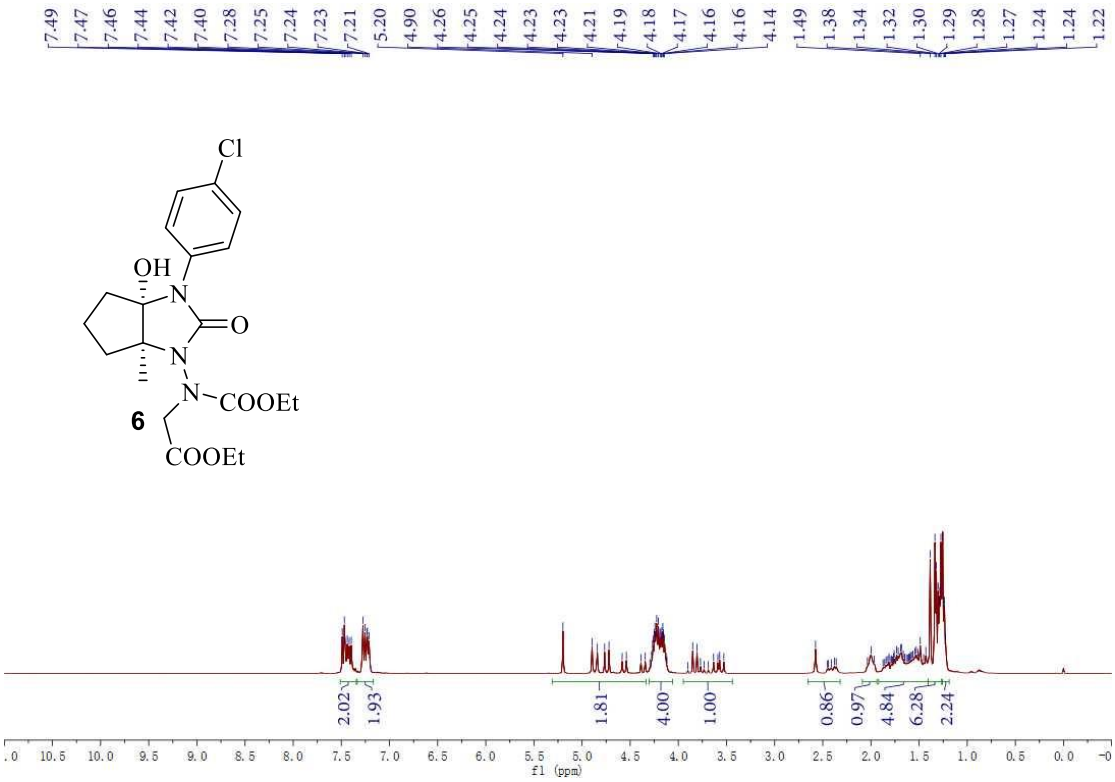
^{1}H NMR (400 MHz, DMSO-d_6)



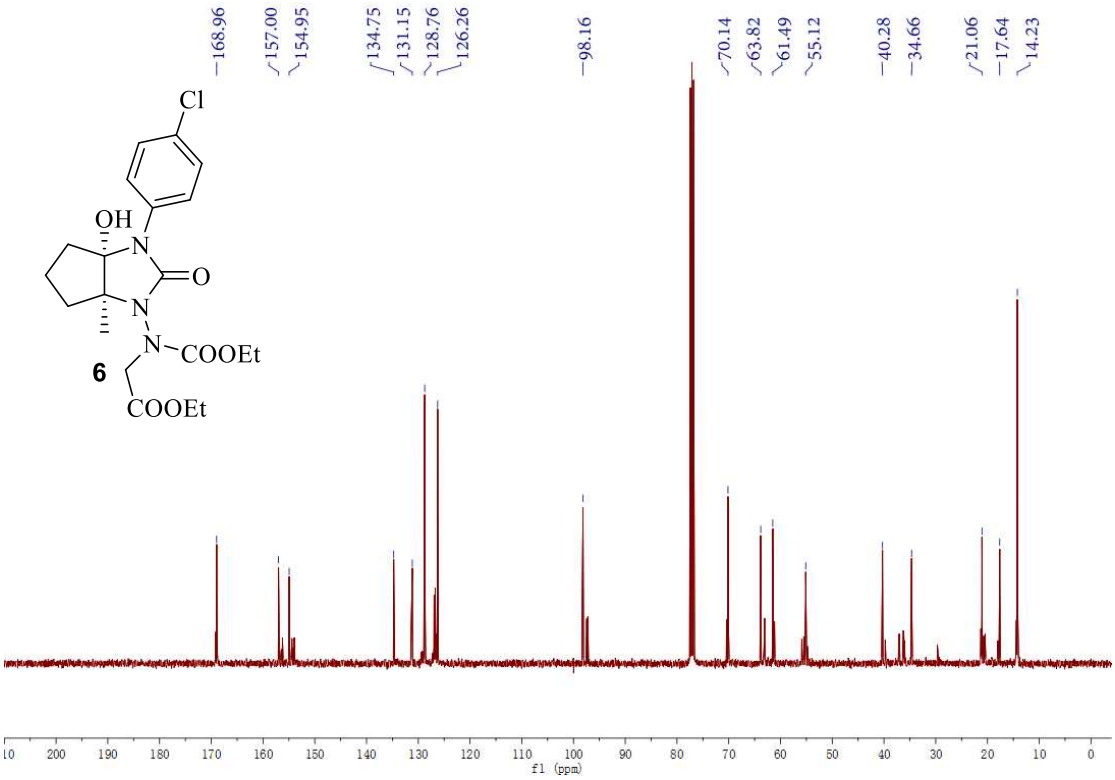
^{13}C NMR (100 MHz, DMSO-d_6)



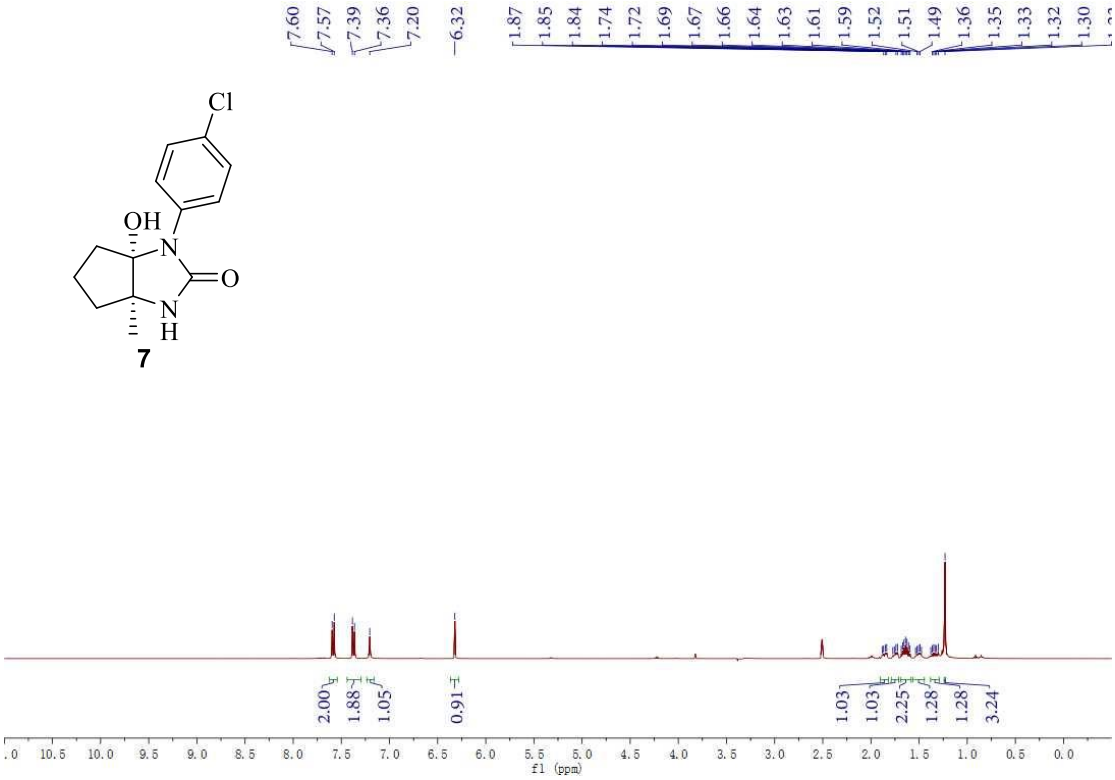
^{1}H NMR (400 MHz, CDCl$_3$)



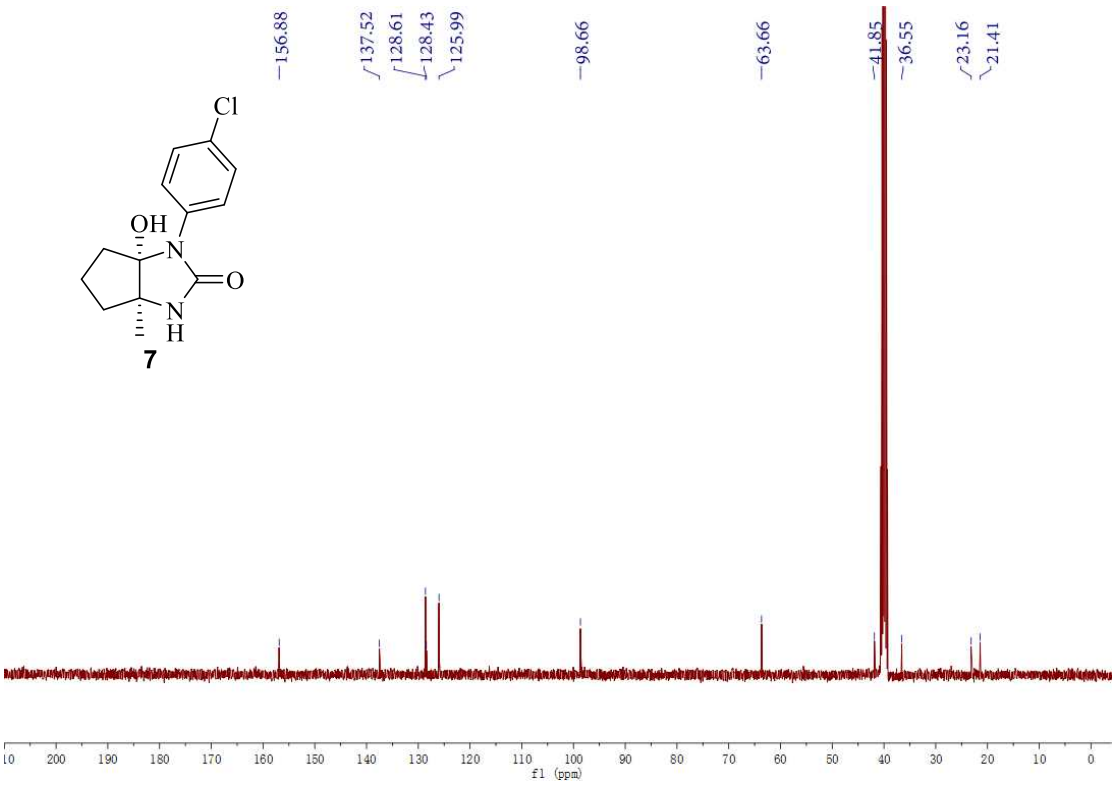
^{13}C NMR (100 MHz, $CDCl_3$)



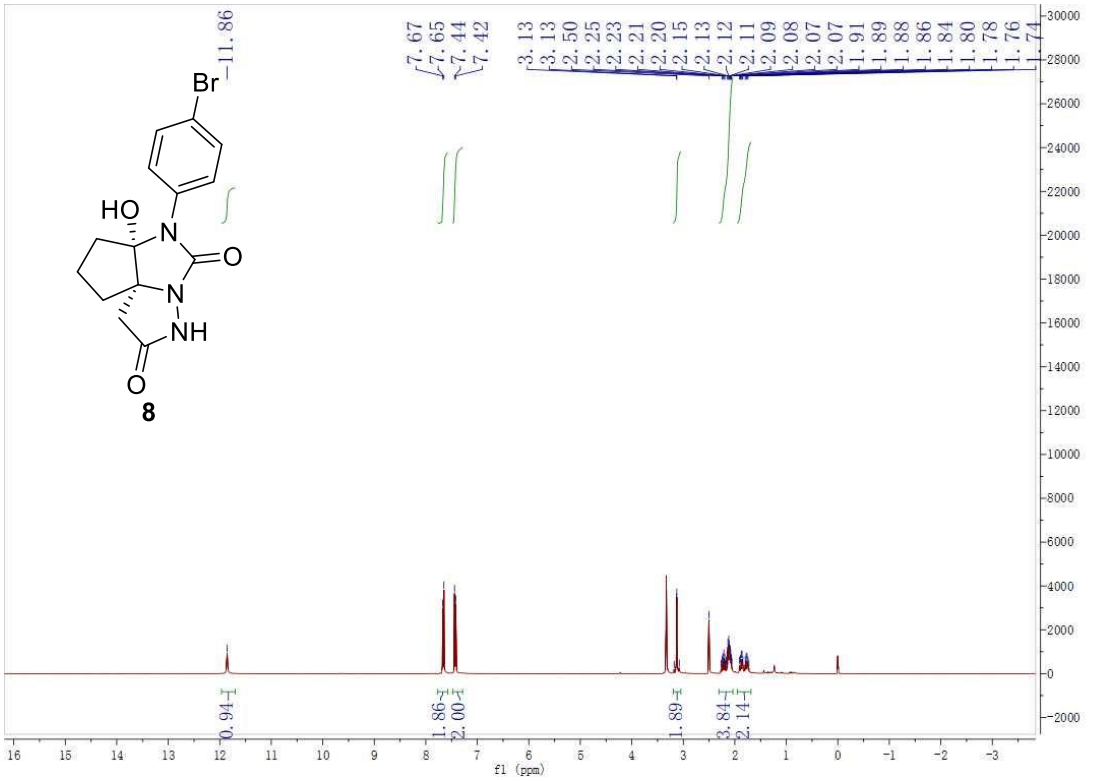
^{1}H NMR (400 MHz, DMSO-d_6)



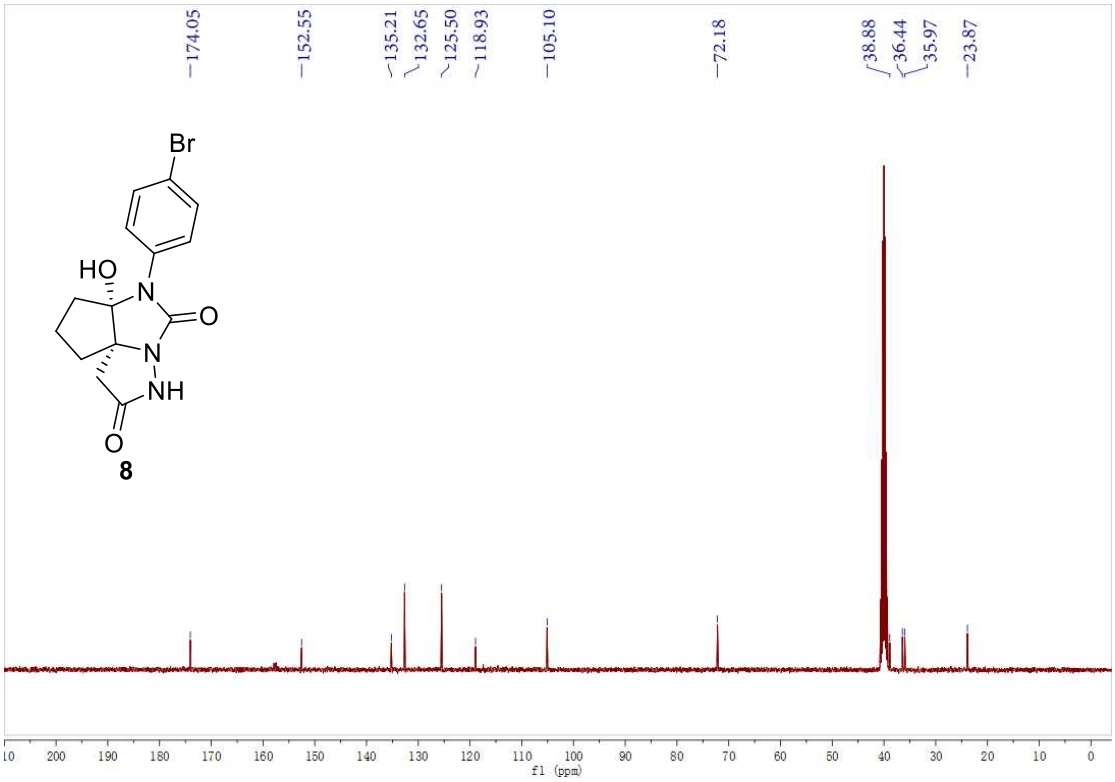
^{13}C NMR (100 MHz, DMSO-d_6)



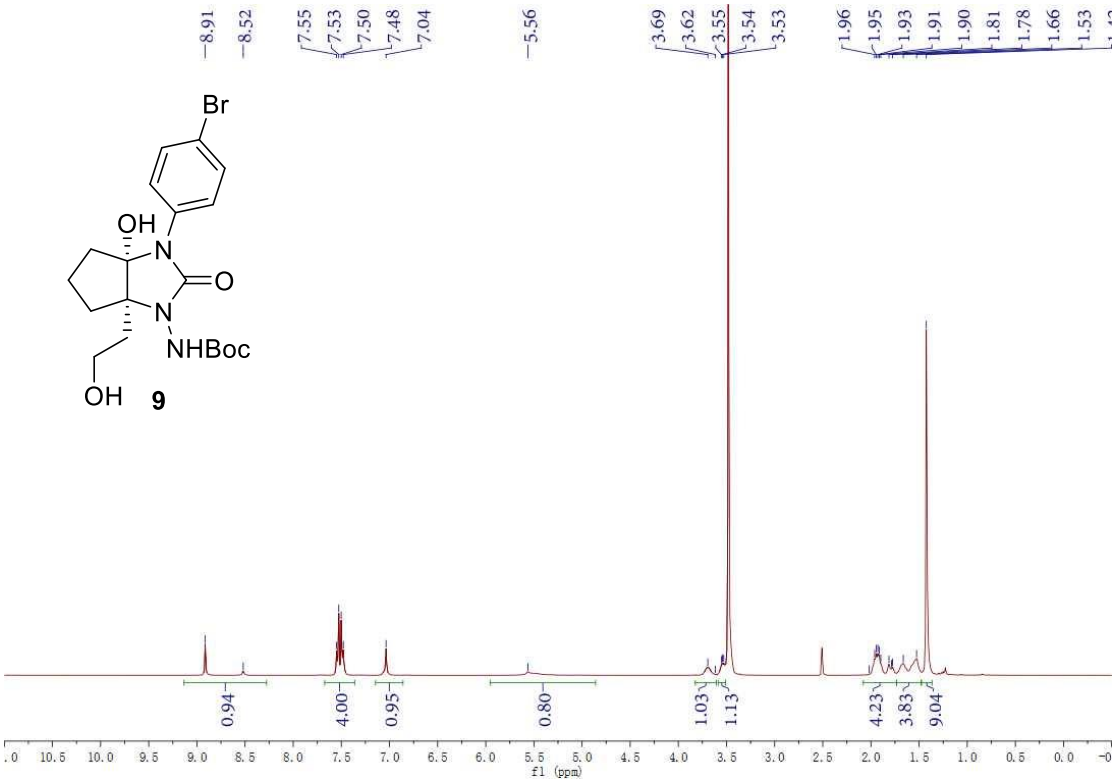
^{1}H NMR (400 MHz, DMSO-d_6)



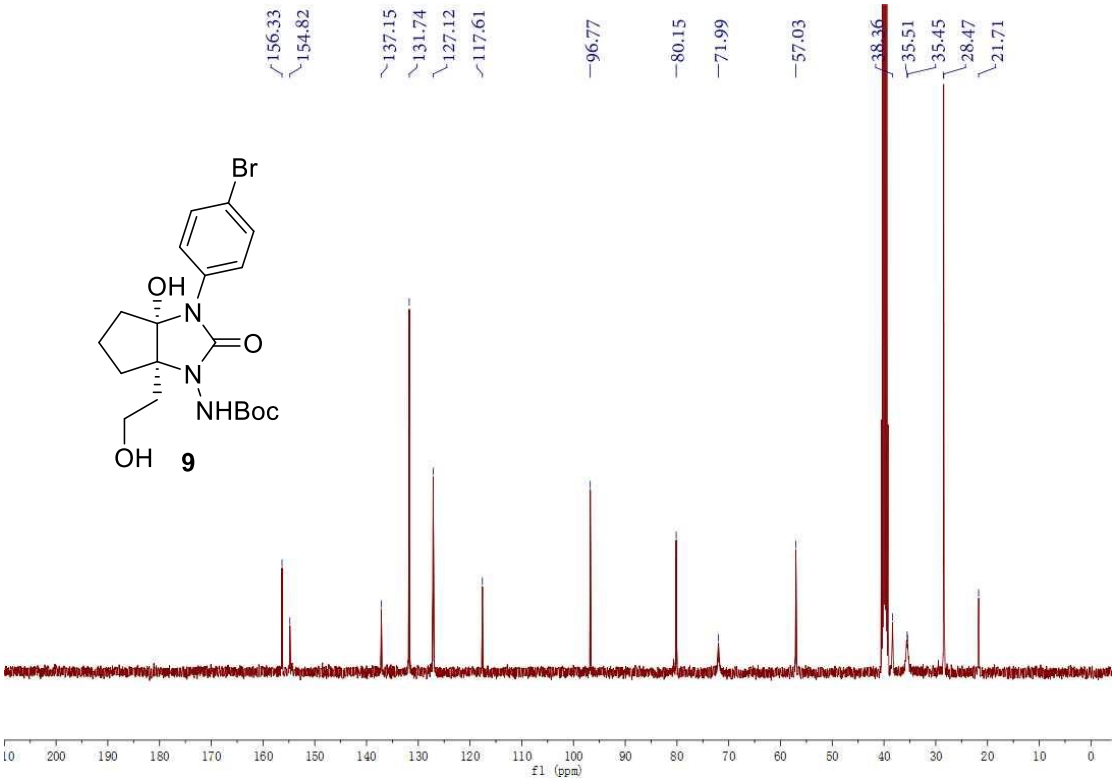
^{13}C NMR (100 MHz, DMSO-d_6)



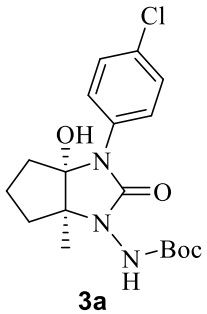
^{1}H NMR (400 MHz, DMSO-d_6)



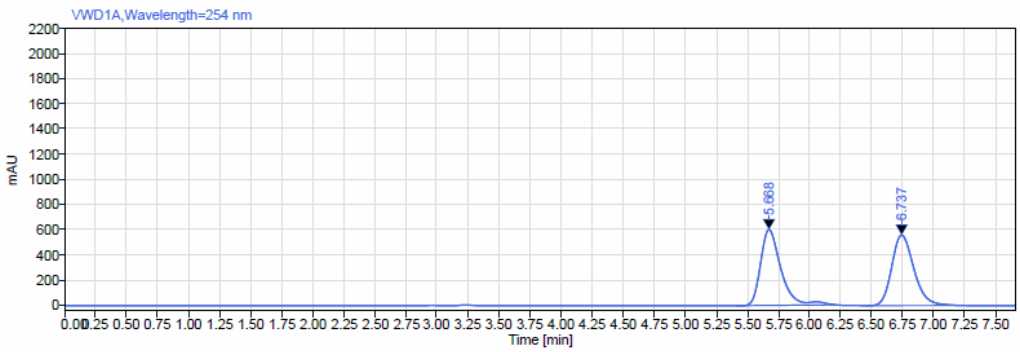
^{13}C NMR (100 MHz, DMSO-d_6)



6. HPLC spectra

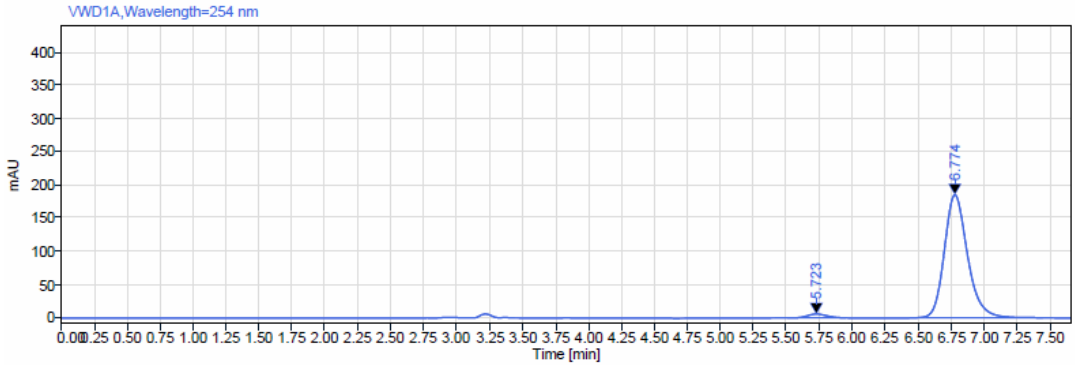


3a



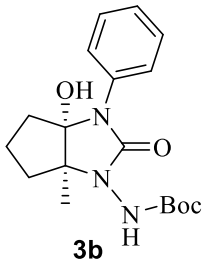
Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.668	MM m	0.80	6856.74	601.47	49.72	
6.737	MM m	0.78	6935.21	560.49	50.28	
		Sum	**13791.95**			



Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.723	MM m	0.44	59.00	5.76	2.53	
6.774	MM m	1.01	2271.96	185.45	97.47	
		Sum	**2330.95**			



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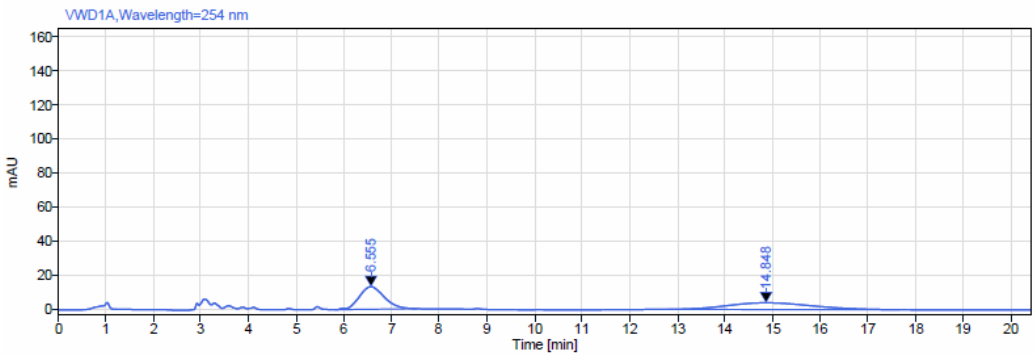
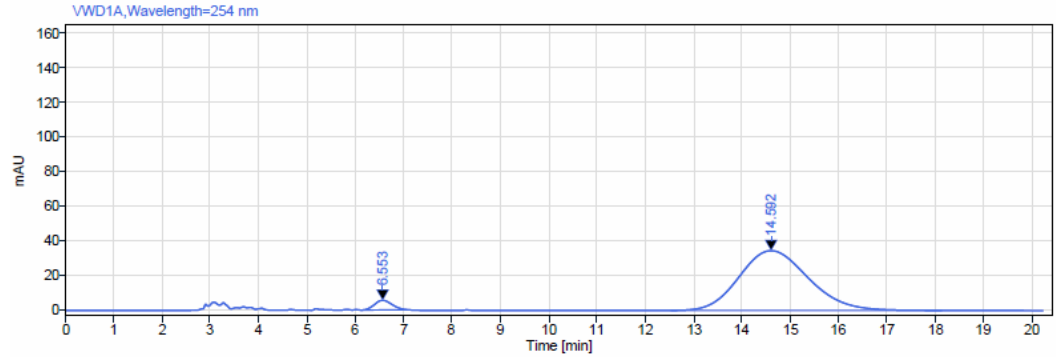


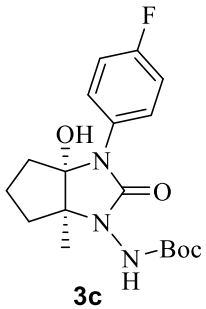
Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
6.555	MM m	1.72	481.16	13.28	49.56	
14.848	MB m	4.86	489.71	3.94	50.44	
		Sum	**970.87**			



Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
6.553	MM m	0.98	140.16	5.55	3.92	
14.592	MM m	5.61	3438.91	34.55	96.08	
		Sum	**3579.07**			



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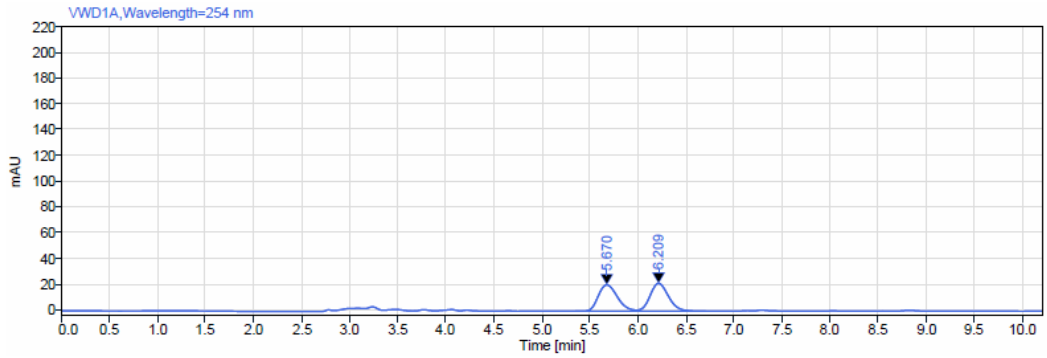
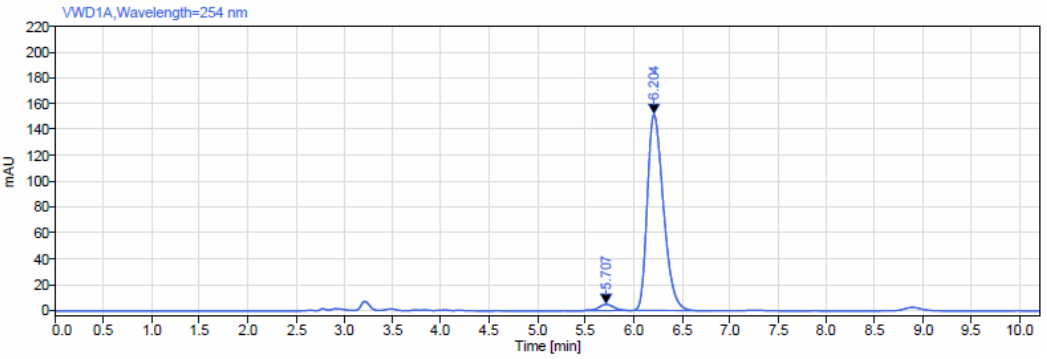


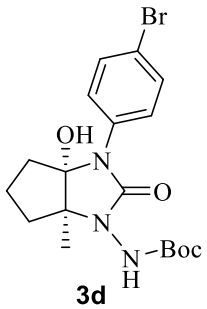
Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.670	MM m	0.64	277.92	20.25	49.31	
6.209	MM m	0.72	285.65	21.50	50.69	
		Sum	**563.56**			



Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.707	MM m	0.45	52.13	4.76	2.88	
6.204	MM m	0.88	1760.03	151.59	97.12	
		Sum	**1812.15**			



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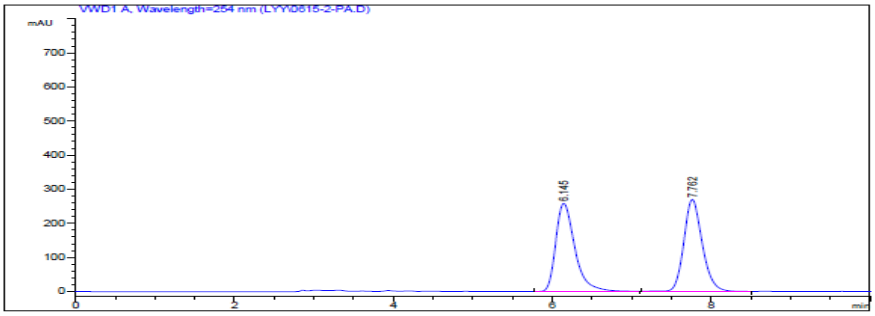


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================================================================================
                          Area Percent Report
================================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min]  mAU   *s    [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   6.145 VB    0.2574 4348.56494  258.56021  49.8473
   2   7.762 BB    0.2459 4375.20215  269.90564  50.1527

Totals :                  8723.76709  528.46585
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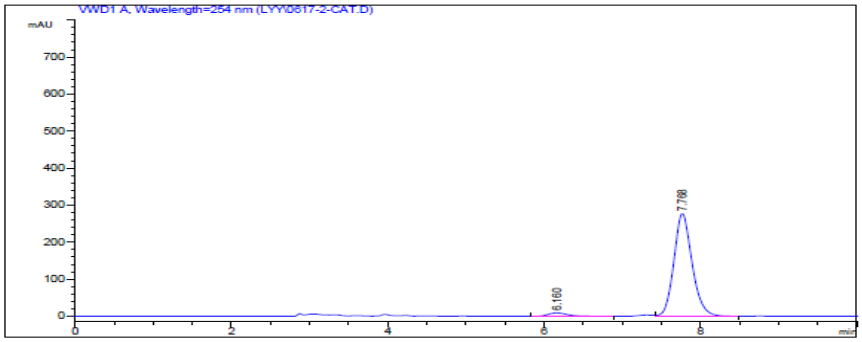


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================================================================================
                          Area Percent Report
================================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]      [min]  mAU   *s    [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   6.160 VB    0.2746  161.96577    9.03867   3.4738
   2   7.768 VB    0.2447 4500.53271  277.29105  96.5262

Totals :                  4662.49849  286.32971
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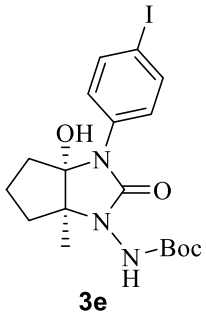
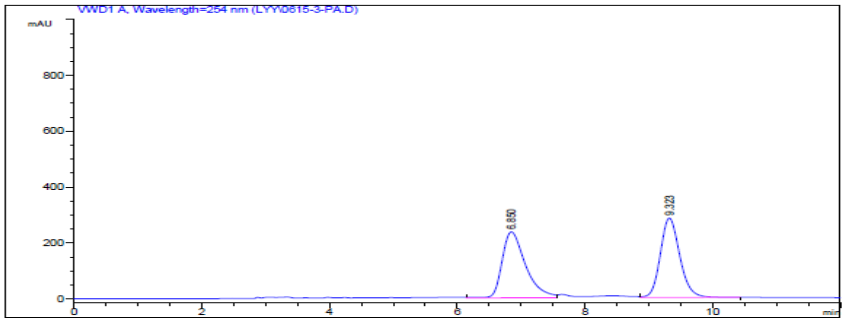


3e

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=====================================================================
                      Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width      Area       Height      Area
   #   [min]        [min]  mAU   *s    [mAU   ]       %
----|-------|----|-------|----------|----------|--------|
   1   6.850 VV     0.3879 6057.75195  236.32777  50.1362
   2   9.323 VB     0.3273 6024.84570  284.27234  49.8638

Totals :                  1.20826e4   520.60011
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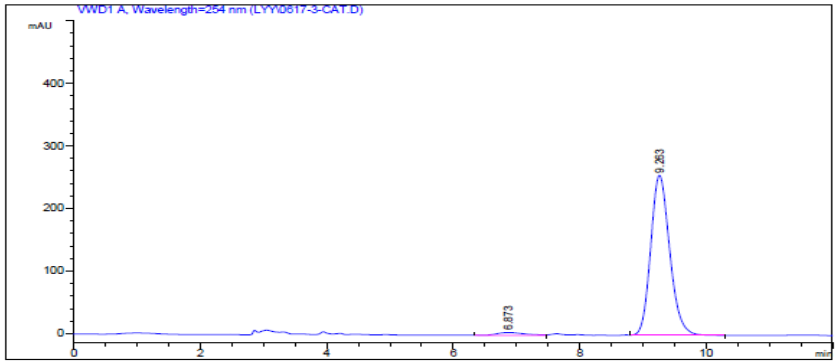


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=====================================================================
                      Area Percent Report
=====================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width      Area       Height      Area
   #   [min]        [min]  mAU   *s    [mAU   ]       %
----|-------|----|-------|----------|----------|--------|
   1   6.873 BV     0.4611  134.71104    4.44722   2.4522
   2   9.263 VB     0.3229 5358.76270  255.91953  97.5478

Totals :                  5493.47374  260.36674
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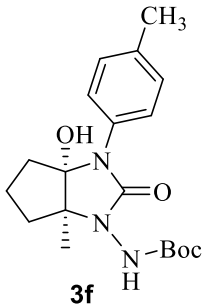

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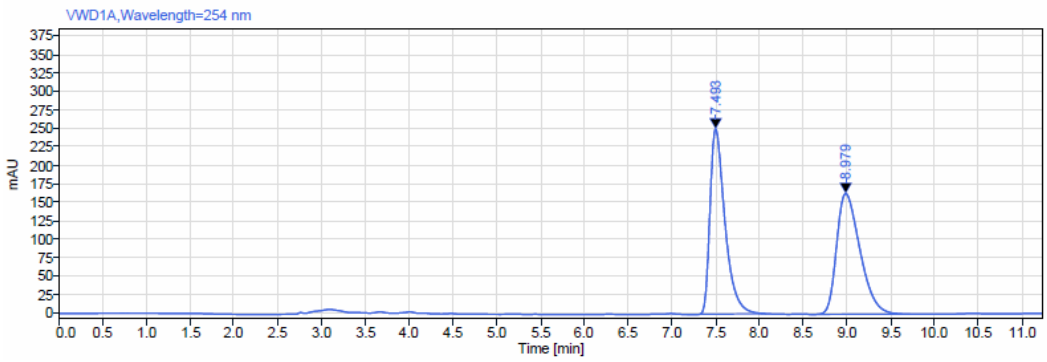
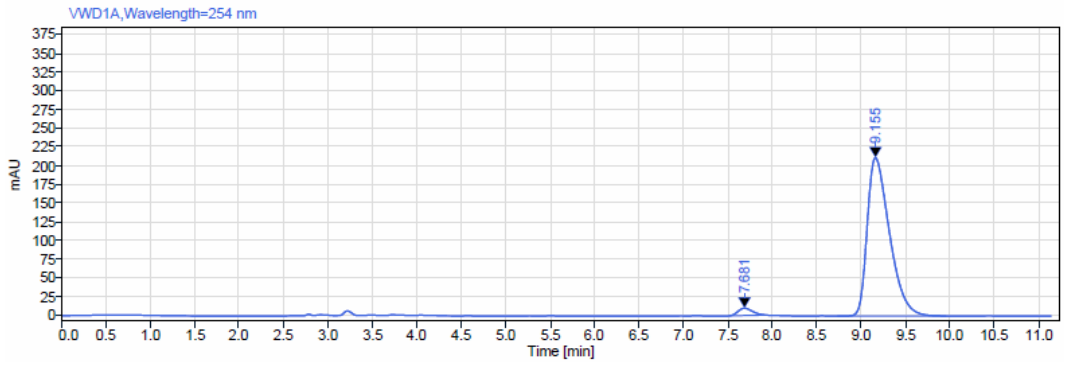


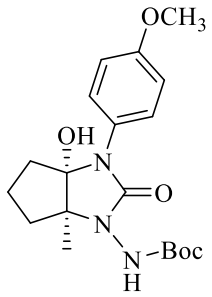
Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
7.493	MM m	0.90	2978.27	250.81	49.54	
8.979	MM m	1.14	3033.66	163.61	50.46	
		Sum	**6011.93**			



Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
7.681	MM m	0.41	110.39	9.80	2.91	
9.155	MM m	1.22	3685.60	211.57	97.09	
		Sum	**3795.99**			



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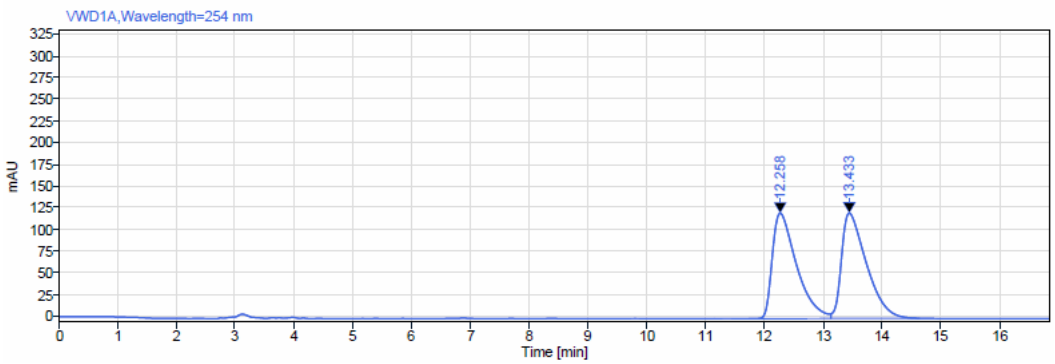
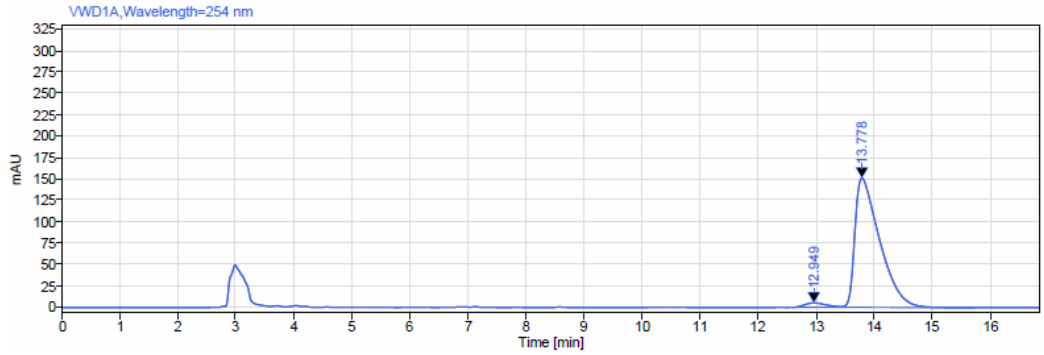


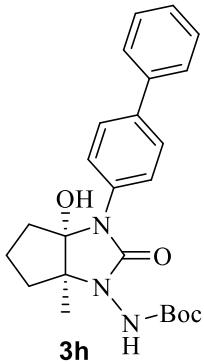
Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
12.258	BM m	1.40	3483.32	121.51	49.38	
13.433	MM m	1.51	3570.85	121.42	50.62	
		Sum	**7054.17**			



Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
12.949	MM m	0.83	137.02	5.20	2.97	
13.778	MB m	2.30	4475.97	151.29	97.03	
		Sum	**4612.99**			



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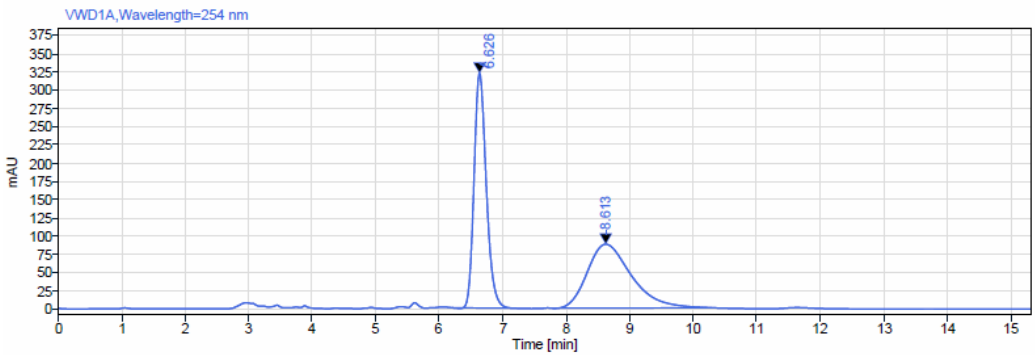
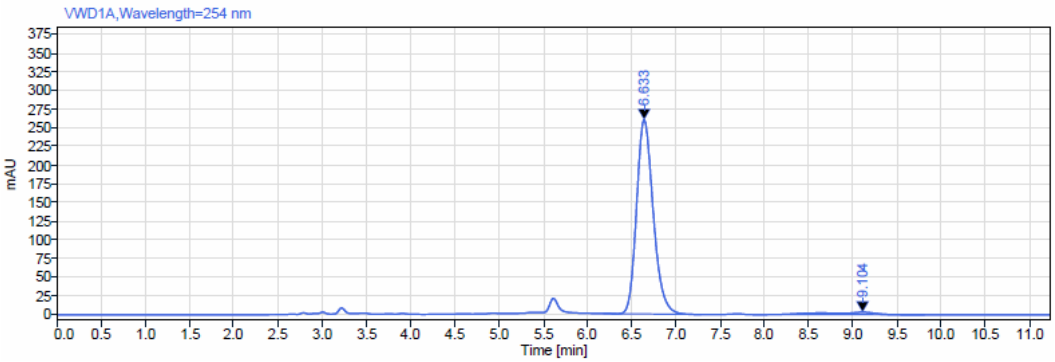


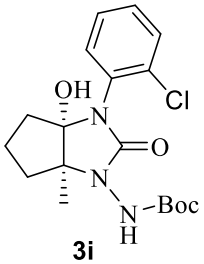
Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
6.626	MM m	1.02	4290.86	321.72	50.49	
8.613	MM m	2.51	4208.17	87.54	49.51	
		Sum	**8499.03**			



Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
6.633	MM m	1.10	3413.22	260.14	96.41	
9.104	MM m	1.62	126.98	3.22	3.59	
		Sum	**3540.20**			



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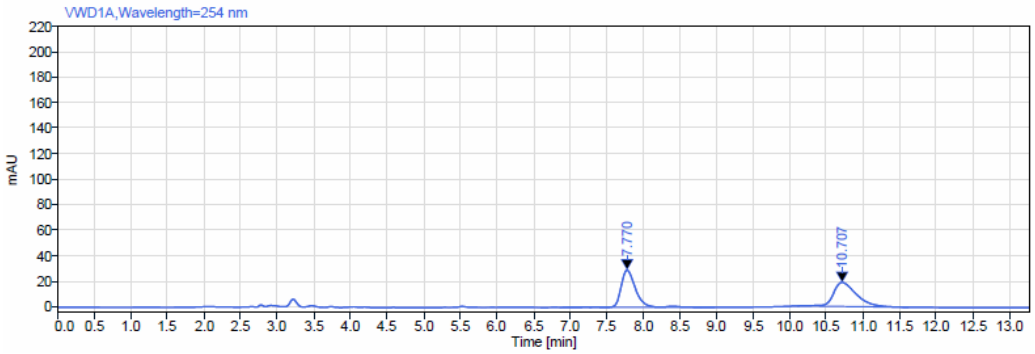
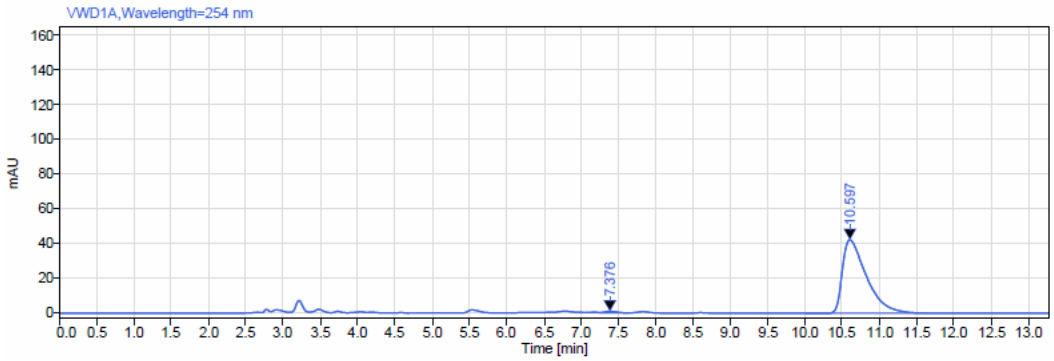


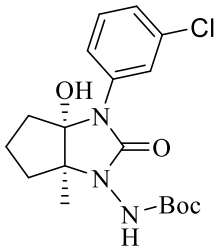
Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
7.770	MM m	2.12	412.95	29.32	50.18	
10.707	MM m	1.52	409.91	18.82	49.82	
		Sum	**822.85**			



Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
7.376	MM m	0.57	10.87	0.92	1.14	
10.597	MM m	1.62	944.96	42.42	98.86	
		Sum	**955.84**			



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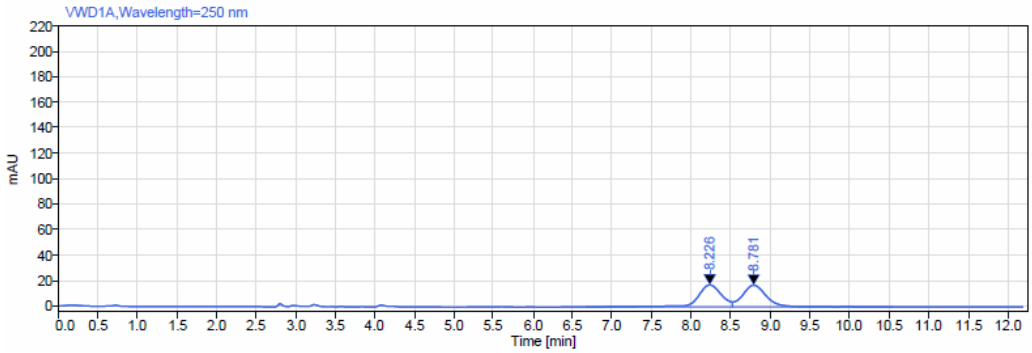
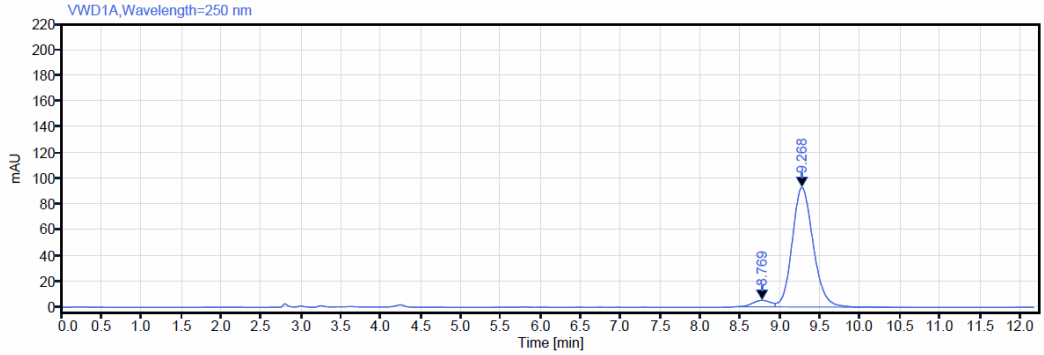


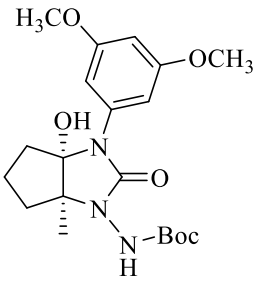
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
8.226	MM m	1.85	362.84	17.26	50.10	
8.781	MM m	2.02	361.38	17.11	49.90	
		Sum	**724.22**			



Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
8.769	MM m	0.49	79.35	5.00	4.46	
9.268	MM m	1.64	1698.95	92.83	95.54	
		Sum	**1778.30**			



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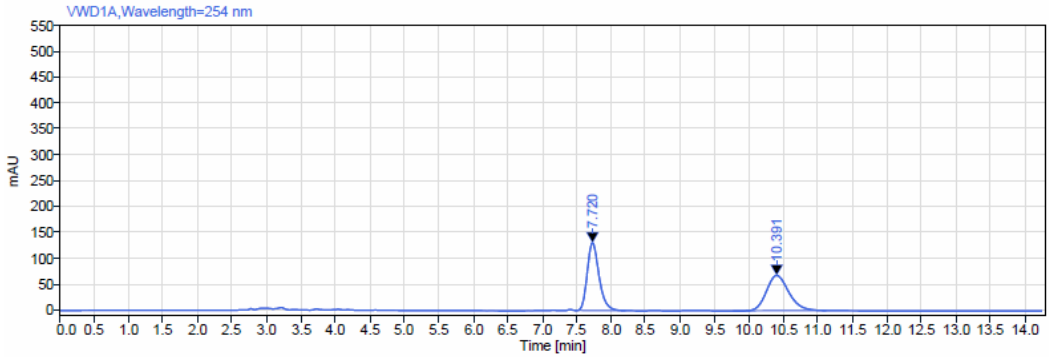
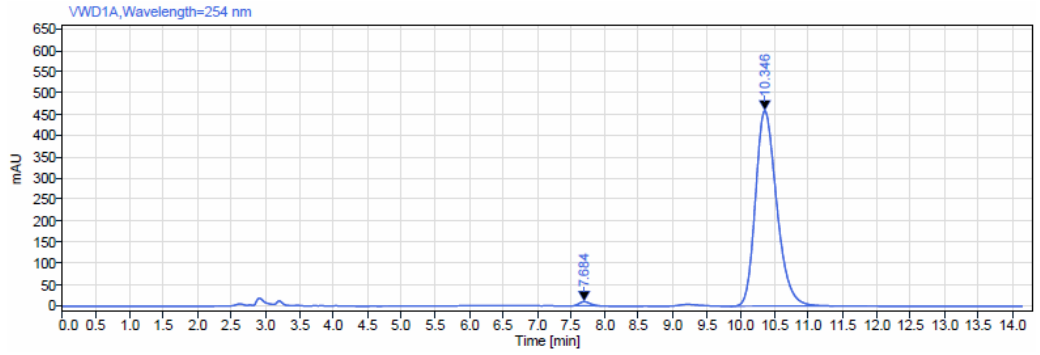


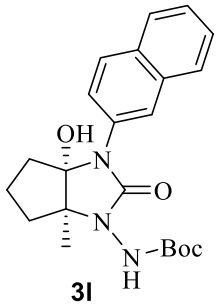
Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
7.720	MM m	0.74	1554.41	130.42	50.44	
10.391	MM m	1.35	1527.53	68.00	49.56	
		Sum	**3081.94**			



Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
7.684	MM m	0.39	105.31	9.66	1.04	
10.346	MM m	1.51	9980.48	459.31	98.96	
		Sum	**10085.79**			



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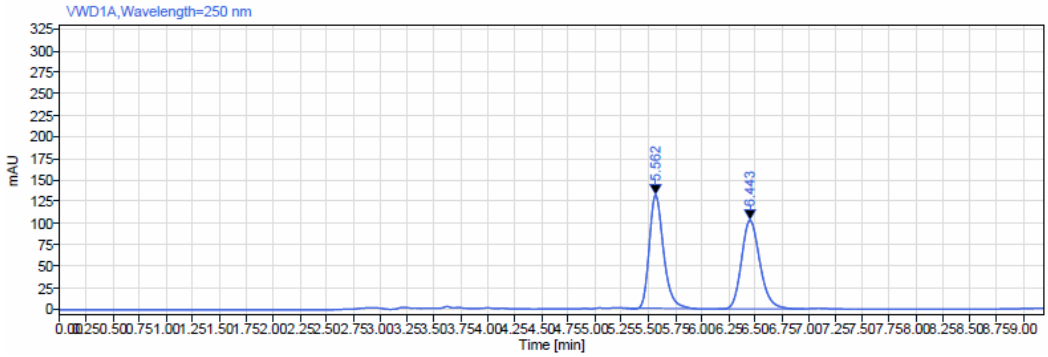
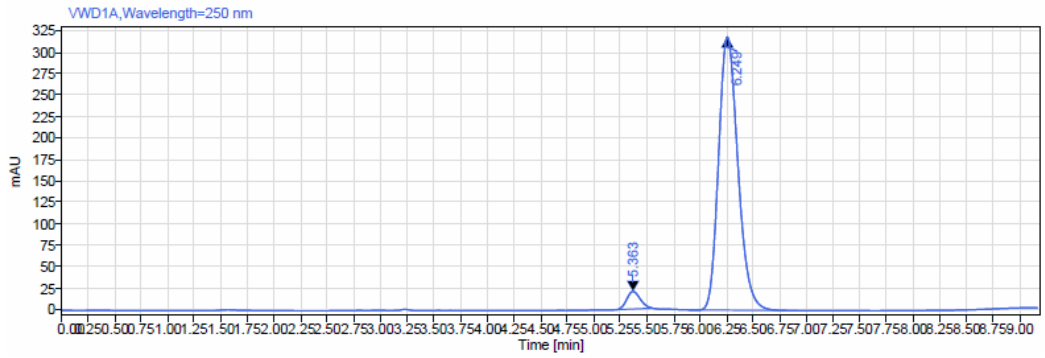


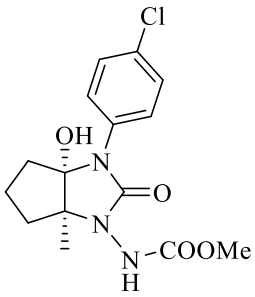
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.562	MM m	0.71	1208.48	131.43	49.58	
6.443	MM m	0.80	1229.10	102.91	50.42	
		Sum	**2437.58**			

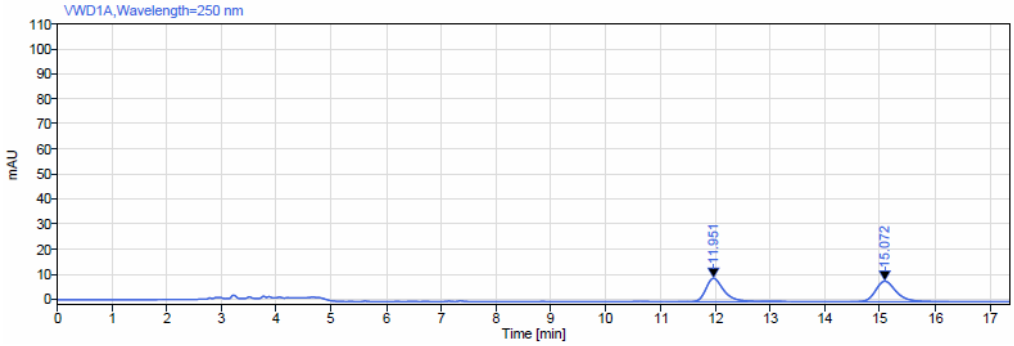


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.363	MM m	0.33	178.55	20.42	4.24	
6.249	MM m	1.02	4028.62	318.85	95.76	
		Sum	**4207.17**			

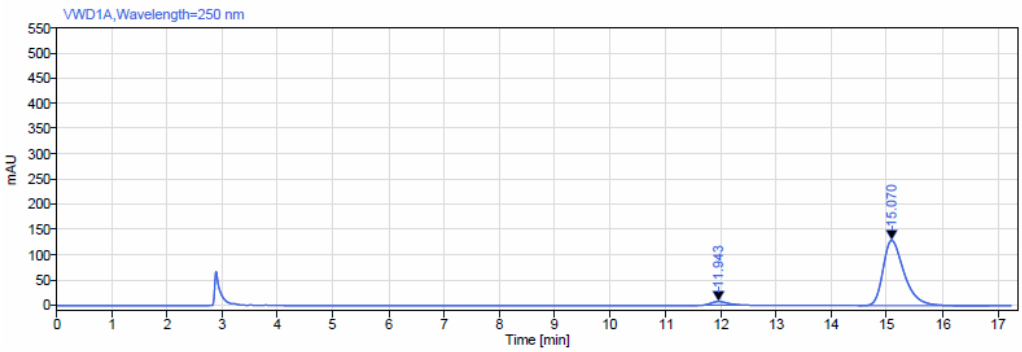


3m



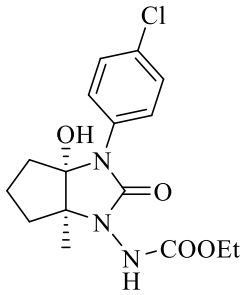
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
11.951	MM m	1.88	209.62	9.30	49.88	
15.072	BB	1.79	210.66	8.16	50.12	
		Sum	**420.29**			



Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
11.943	BM m	0.65	128.48	6.71	3.64	
15.070	BBA	2.33	3405.63	129.23	96.36	
		Sum	**3534.11**			



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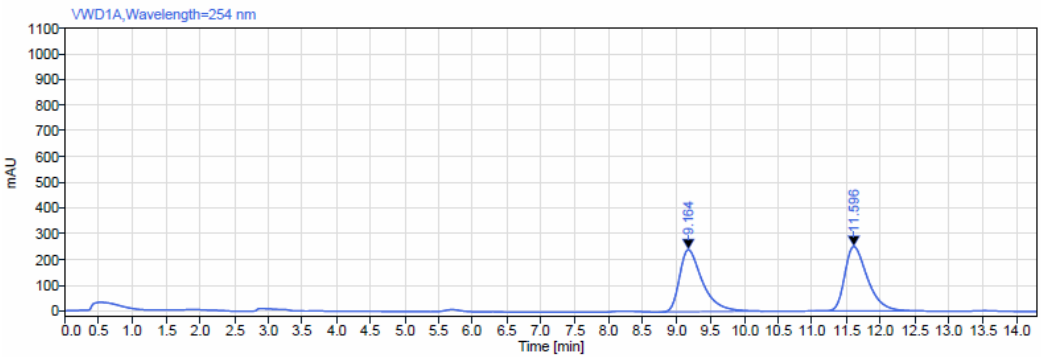
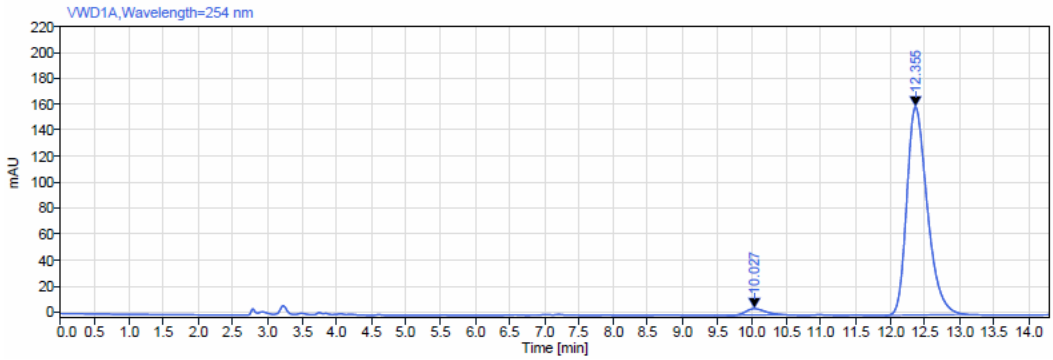


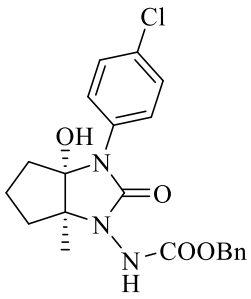
Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
9.164	MM m	1.54	5652.65	241.42	49.32	
11.596	MM m	1.59	5808.45	250.79	50.68	
		Sum	**11461.11**			

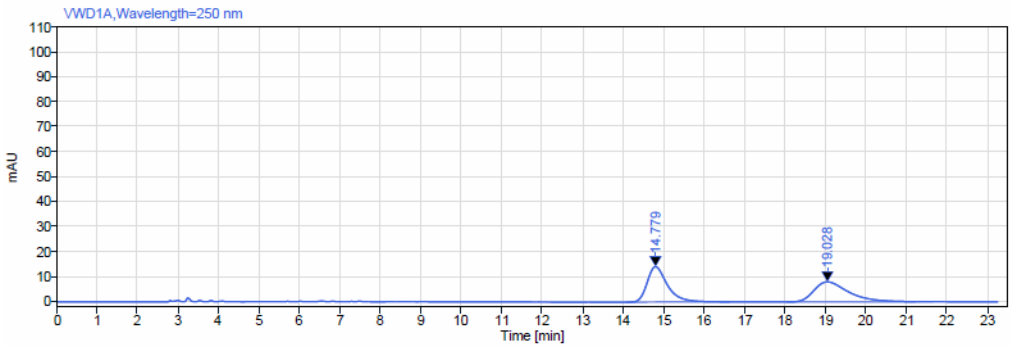


Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
10.027	MM m	0.81	93.16	4.86	2.75	
12.355	MM m	1.18	3296.94	160.08	97.25	
		Sum	**3390.10**			

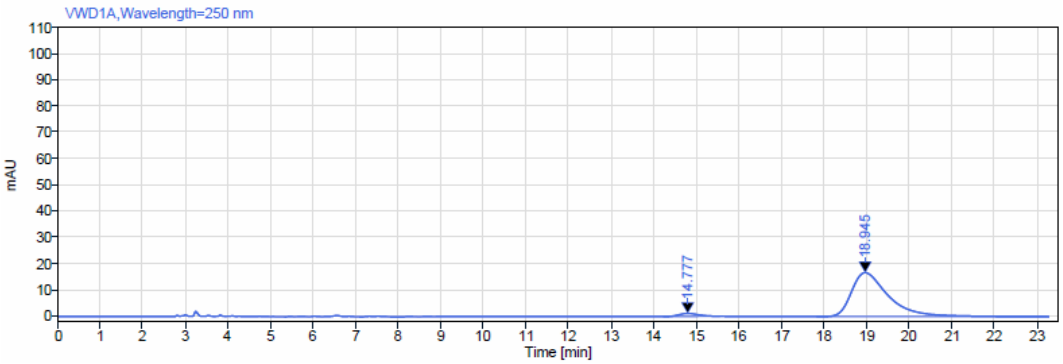


3o



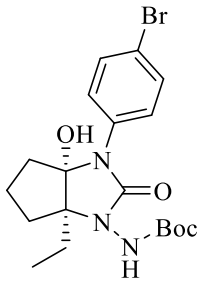
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
14.779	BB	2.55	491.98	14.15	50.57	
19.028	BB	3.61	480.83	8.03	49.43	
		Sum	**972.81**			

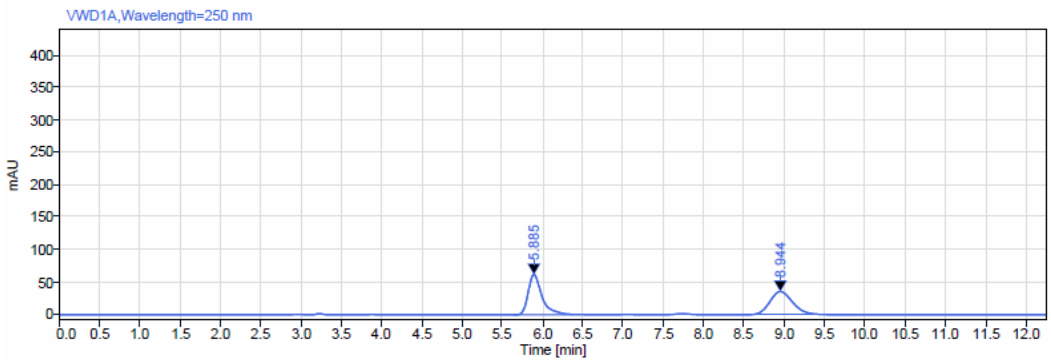


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
14.777	BM m	1.32	36.52	1.14	3.49	
18.945	BBA	5.46	1009.75	16.72	96.51	
		Sum	**1046.27**			

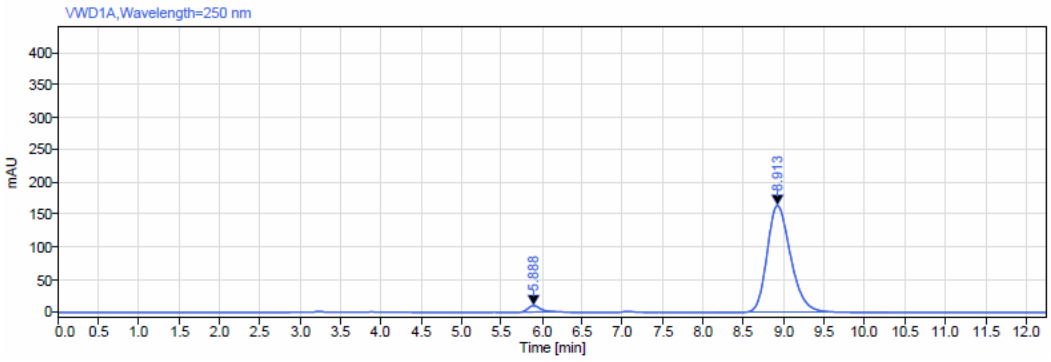


3p



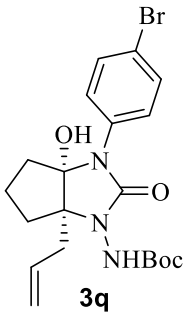
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.885	MM m	0.84	739.60	61.97	50.60	
8.944	MM m	1.52	722.18	35.91	49.40	
		Sum	**1461.78**			

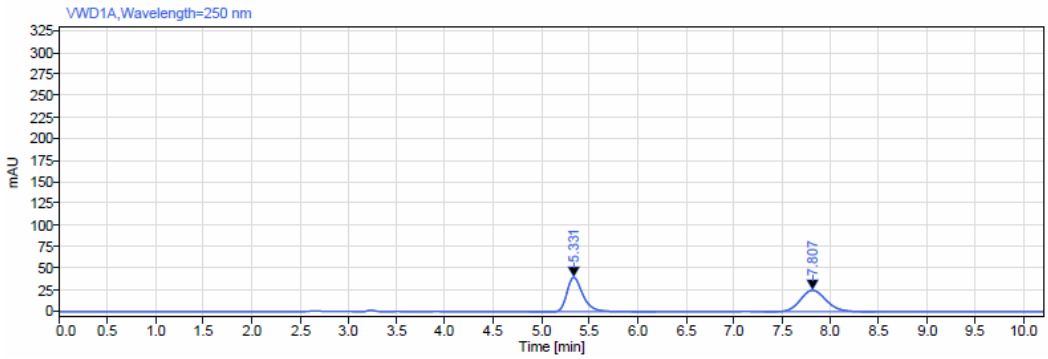


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.888	MM m	0.44	103.31	9.76	2.98	
8.913	MM m	2.10	3361.54	164.88	97.02	
		Sum	**3464.85**			

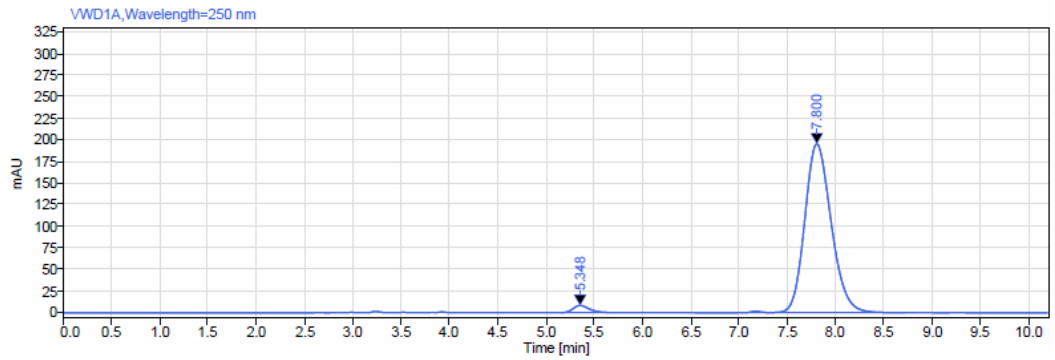


3q



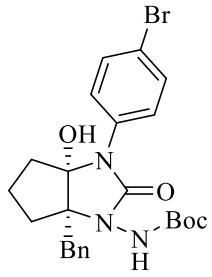
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.331	MM m	1.31	459.74	39.89	49.89	
7.807	MM m	1.15	461.84	24.85	50.11	
		Sum	**921.58**			



Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.348	MM m	0.49	92.02	8.21	2.40	
7.800	MM m	1.70	3740.12	195.76	97.60	
		Sum	**3832.14**			



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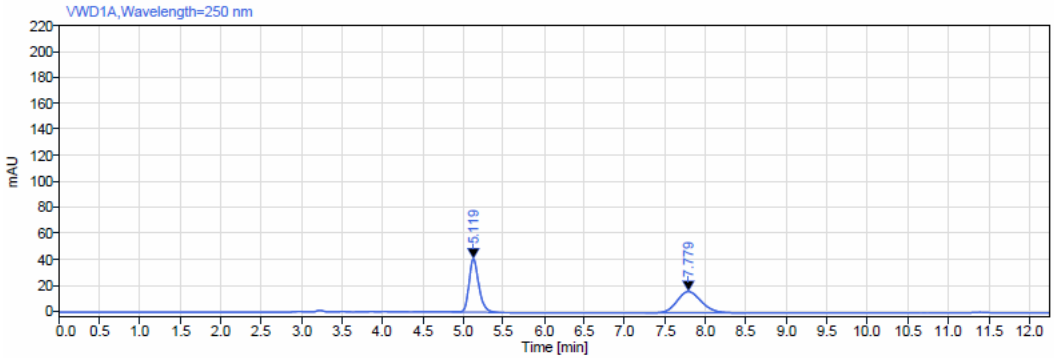
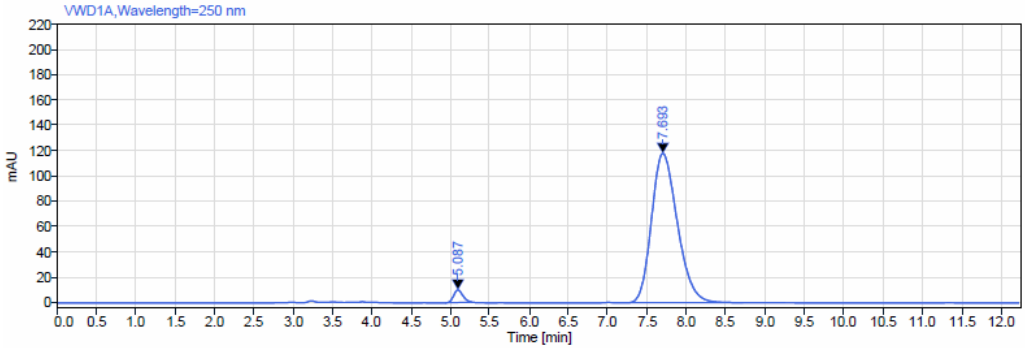


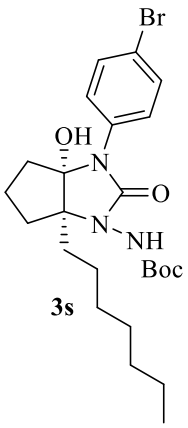
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.119	MM m	0.58	345.18	40.84	50.12	
7.779	MM m	1.24	343.55	16.38	49.88	
		Sum	**688.73**			

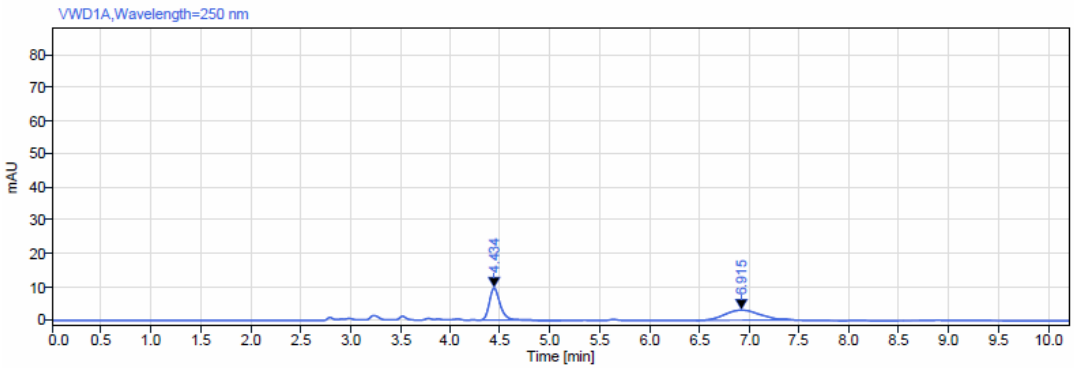


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.087	MM m	0.34	80.38	9.94	2.90	
7.693	MM m	1.65	2689.66	117.85	97.10	
		Sum	**2770.04**			

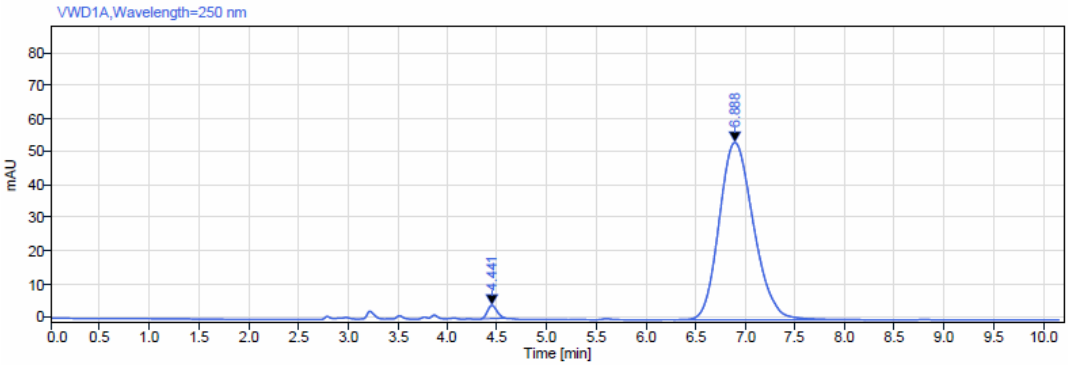


3s



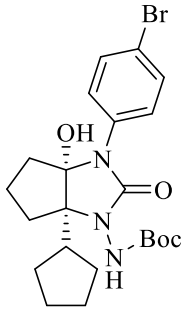
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.434	MM m	0.96	74.26	9.69	49.25	
6.915	MM m	1.02	76.52	3.04	50.75	
		Sum	**150.78**			

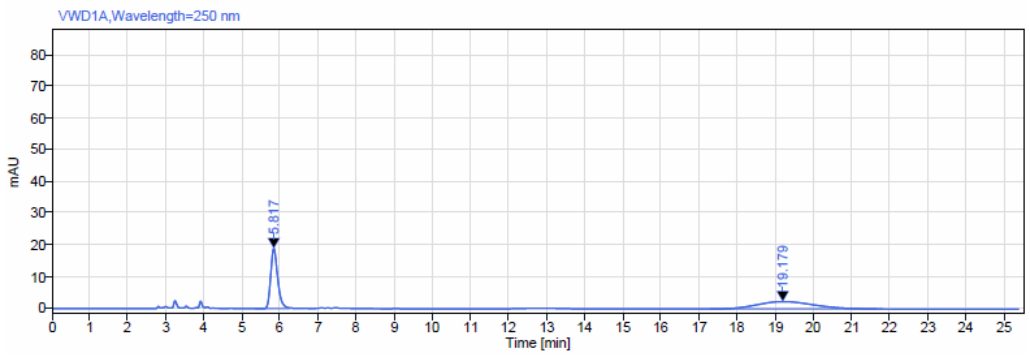


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.441	MM m	0.25	26.54	4.00	2.02	
6.888	MM m	1.96	1289.28	53.62	97.98	
		Sum	**1315.82**			

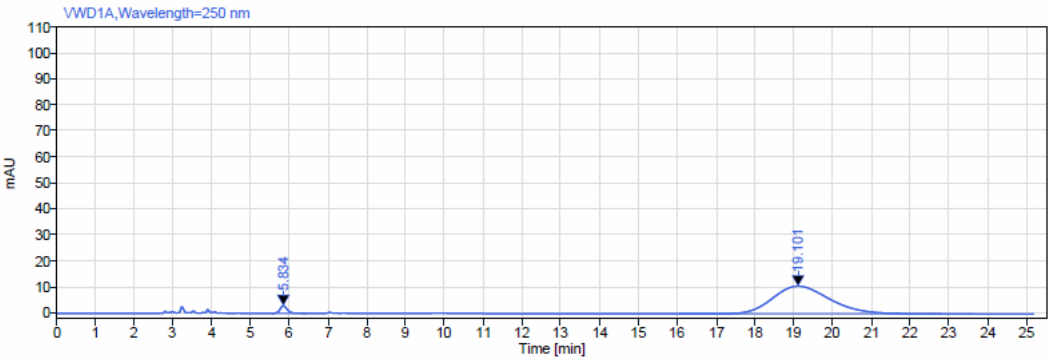


3t



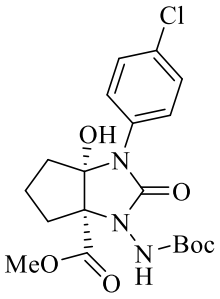
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.817	MM m	1.31	241.95	18.95	49.96	
19.179	BM m	4.36	242.33	2.32	50.04	
		Sum	**484.28**			

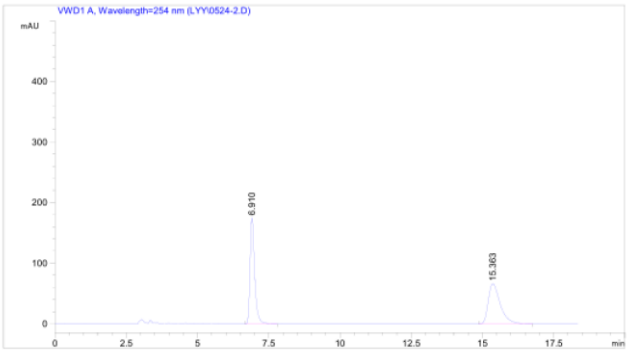


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.834	MM m	0.89	37.76	2.94	3.34	
19.101	MM m	7.58	1094.45	10.66	96.66	
		Sum	**1132.21**			



3u

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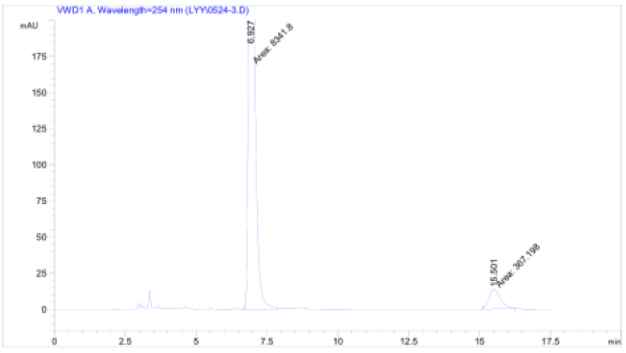
================================================================
                    Area Percent Report
================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   6.910 BB    0.1685 1961.17517  175.15331  50.0061
   2  15.363 BB    0.4429 1960.69702   66.80410  49.9939
```

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================================================================
                    Area Percent Report
================================================================

Sorted By             :      Signal
Multiplier            :      1.0000
Dilution              :      1.0000
Use Multiplier & Dilution Factor with ISTDs


Signal 1: VWD1 A, Wavelength=254 nm

Peak RetTime Type  Width     Area      Height     Area
  #   [min]       [min]  mAU   *s   [mAU   ]      %
----|-------|----|-------|----------|----------|--------|
   1   6.927 MM    0.1885 8341.80273  737.46411  95.7837
   2  15.501 MM    0.4519  367.19839   13.54283   4.2163
```
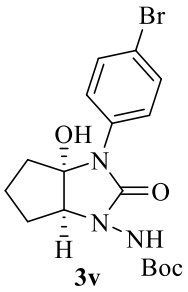
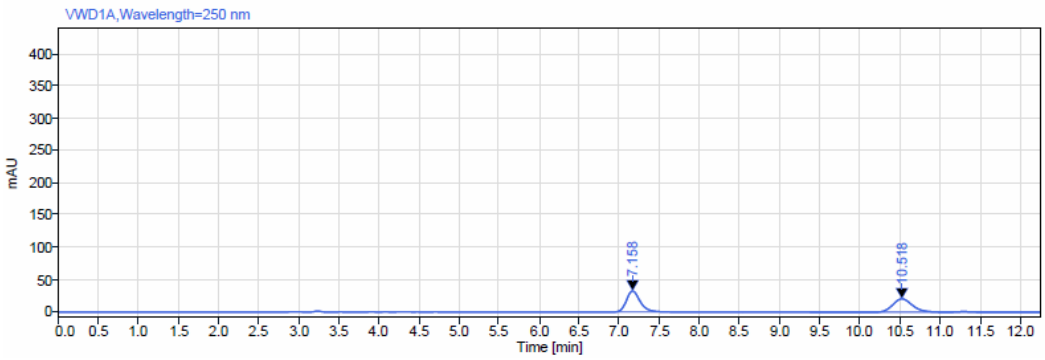
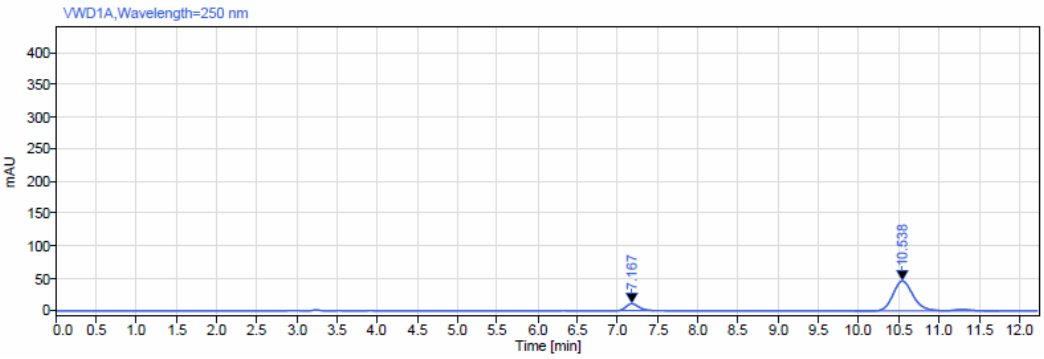



3v



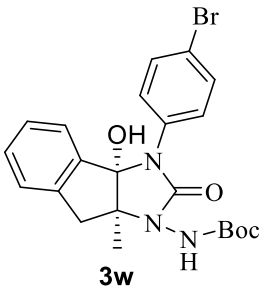
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
7.158	MM m	0.67	387.68	32.60	50.69	
10.518	MM m	3.65	377.09	20.75	49.31	
		Sum	**764.77**			

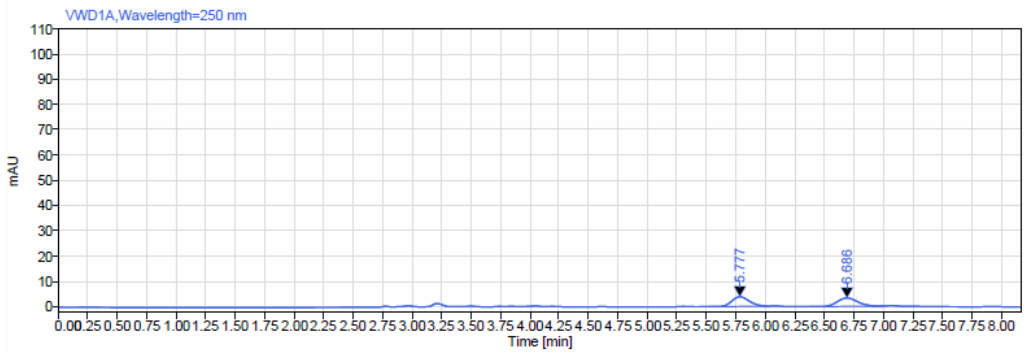


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
7.167	MM m	0.45	118.41	10.72	12.30	
10.538	MM m	1.80	843.95	46.39	87.70	
		Sum	**962.36**			

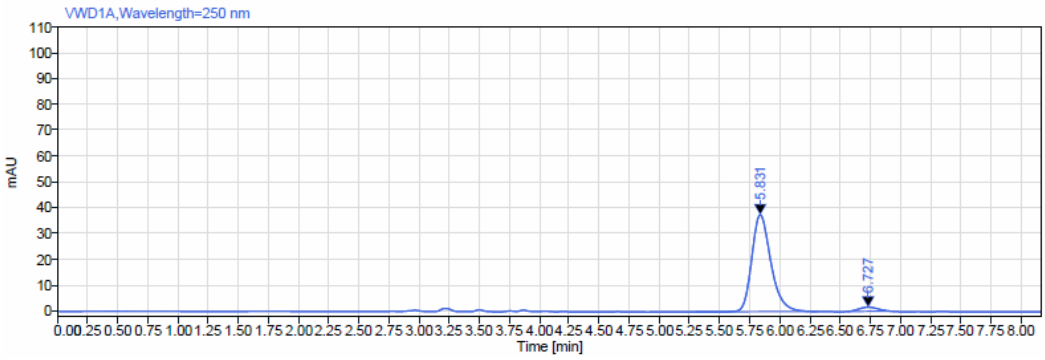


3w



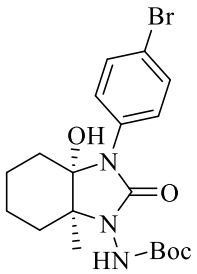
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.777	MM m	0.51	39.08	3.84	49.94	
6.686	MM m	0.63	39.18	3.31	50.06	
		Sum	**78.26**			

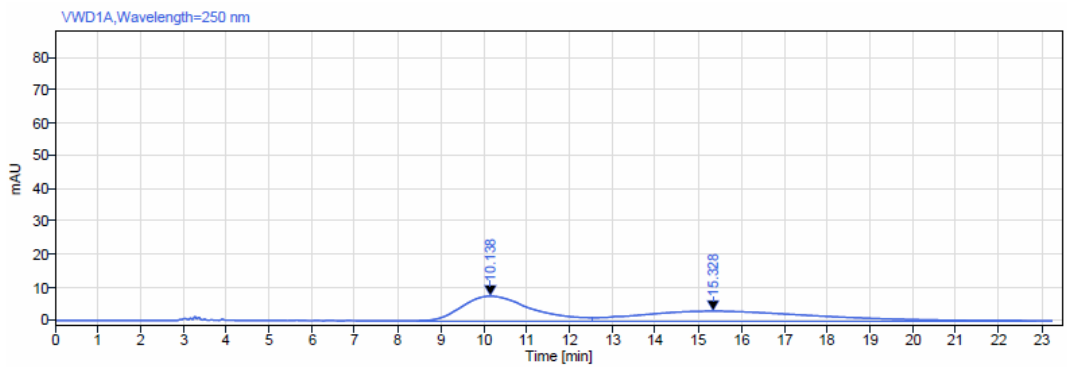


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
5.831	MM m	1.01	413.90	37.51	95.91	
6.727	MM m	0.36	17.65	1.61	4.09	
		Sum	**431.55**			

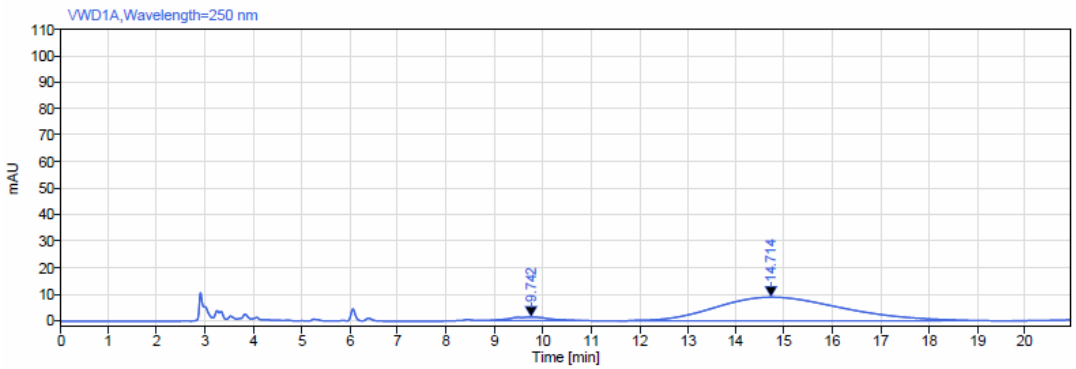


3x



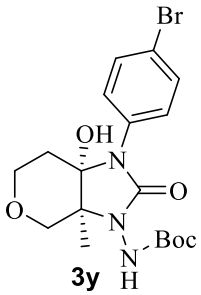
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
10.138	MM m	4.07	826.54	7.48	50.55	
15.328	MM m	10.35	808.50	2.90	49.45	
		Sum	**1635.04**			

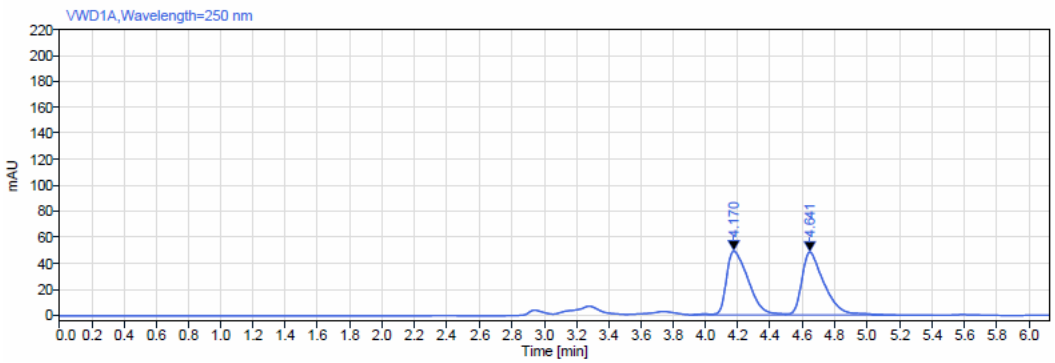


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
9.742	MM m	2.17	71.22	1.23	4.22	
14.714	MM m	8.54	1616.10	8.91	95.78	
		Sum	**1687.33**			

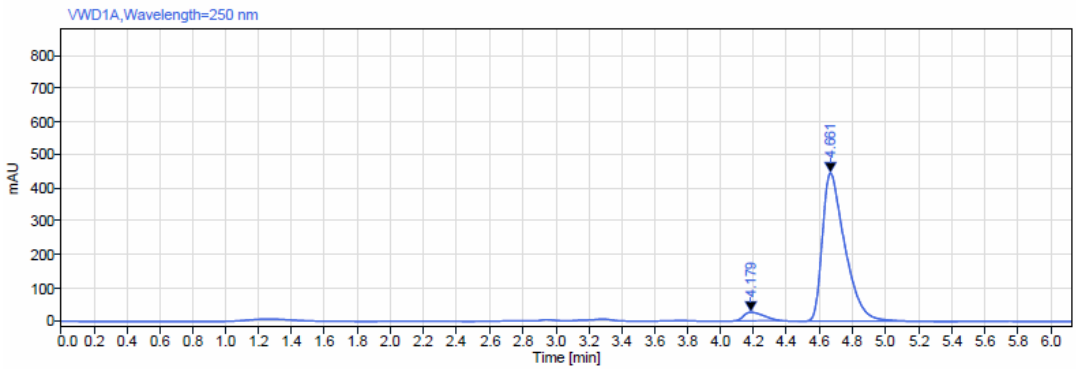


3y



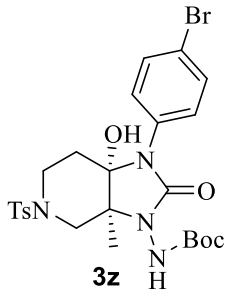
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.170	MM m	0.58	459.76	48.99	49.77	
4.641	MM m	0.91	463.95	48.30	50.23	
		Sum	**923.71**			

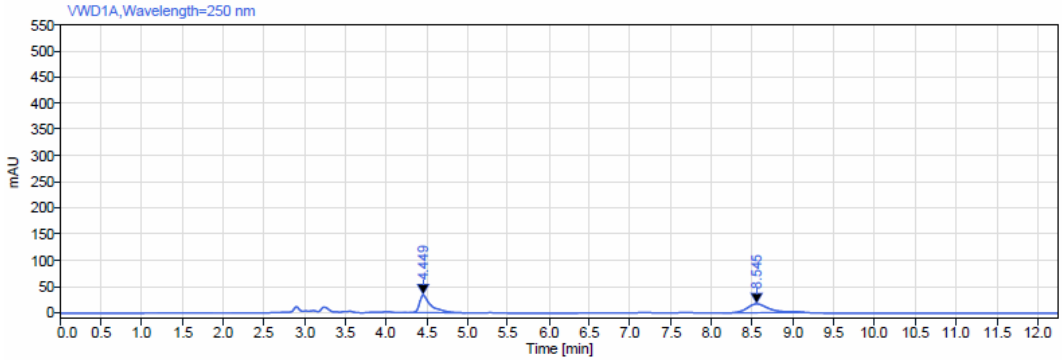


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.179	MM m	0.28	212.20	25.84	4.78	
4.661	MM m	1.27	4223.58	445.91	95.22	
		Sum	**4435.78**			

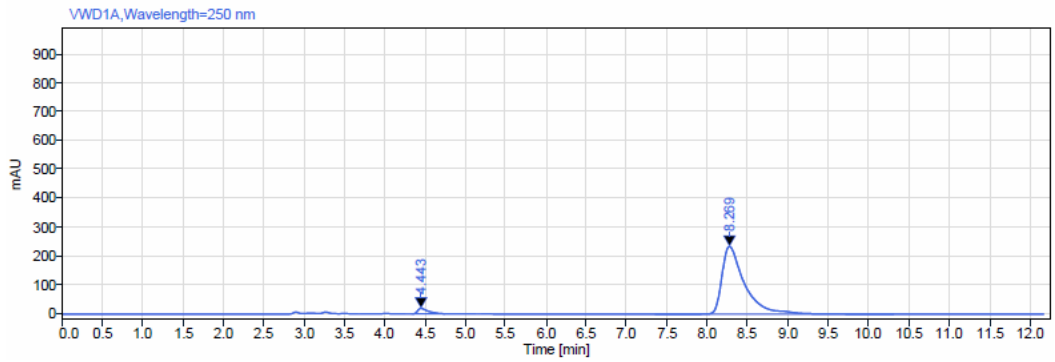


3z



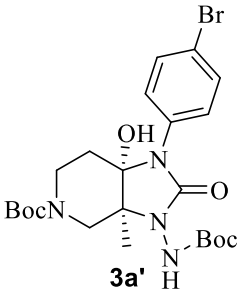
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.449	MM m	0.77	326.40	33.71	50.24	
8.545	MM m	1.00	323.34	16.96	49.76	
		Sum	**649.74**			

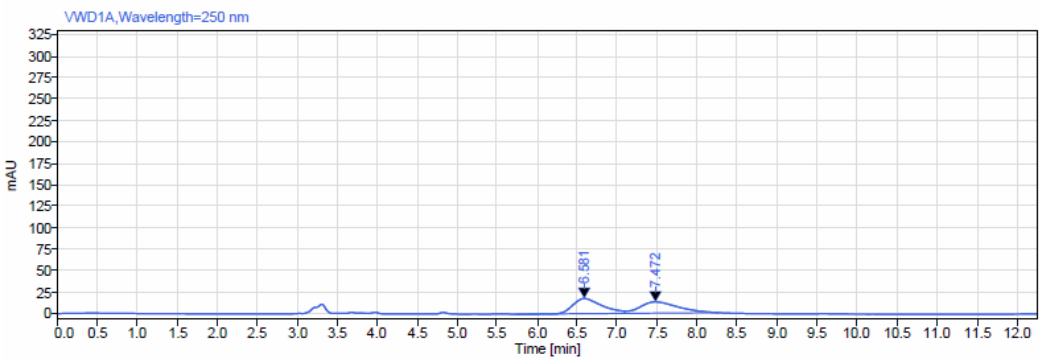


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.443	MM m	0.41	173.19	19.58	3.65	
8.269	MM m	2.96	4572.30	234.58	96.35	
		Sum	**4745.49**			

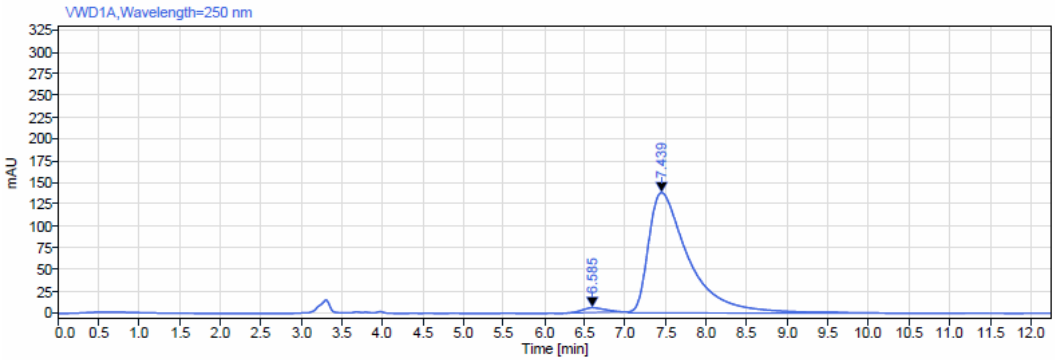


3a'



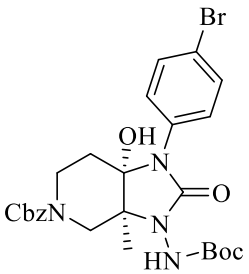
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
6.581	MM m	1.36	444.67	17.83	50.60	
7.472	MM m	1.17	434.18	13.11	49.40	
		Sum	**878.84**			

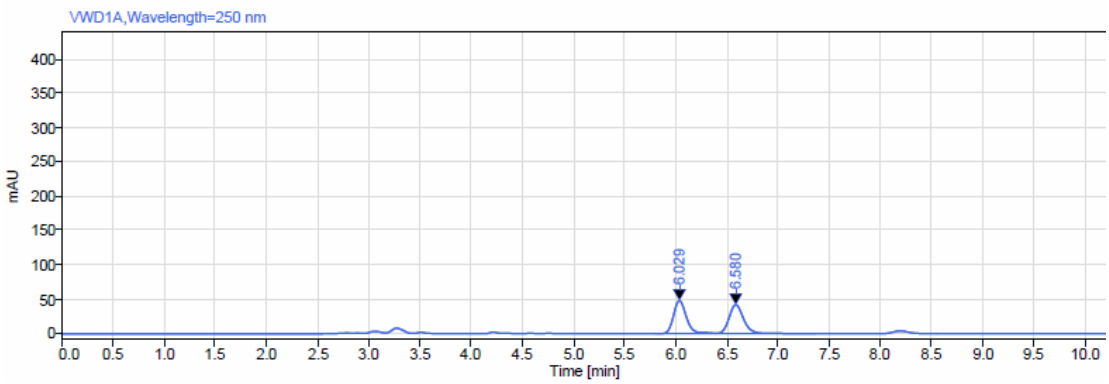


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
6.585	MM m	0.68	103.43	5.53	2.11	
7.439	MM m	4.16	4793.03	138.35	97.89	
		Sum	**4896.46**			

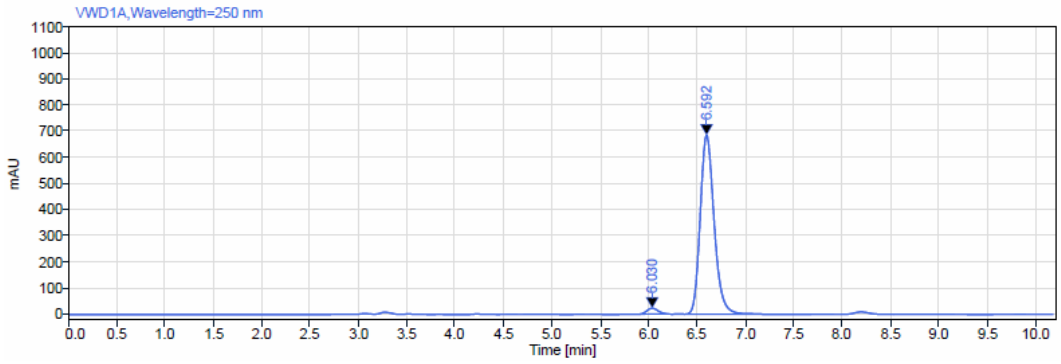


3b'



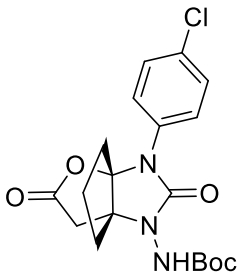
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
6.029	MM m	0.59	414.53	47.95	50.04	
6.580	MM m	0.97	413.83	41.89	49.96	
		Sum	**828.36**			

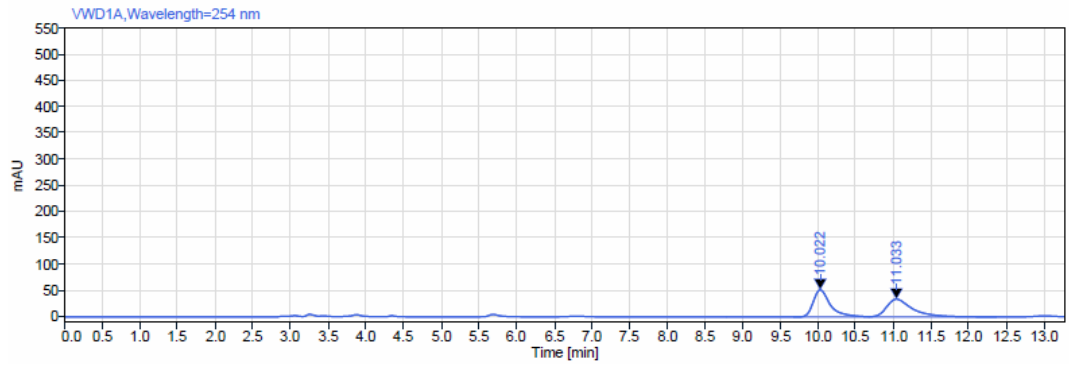


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
6.030	MM m	0.29	176.56	22.39	2.52	
6.592	MM m	1.44	6838.50	684.38	97.48	
		Sum	**7015.06**			

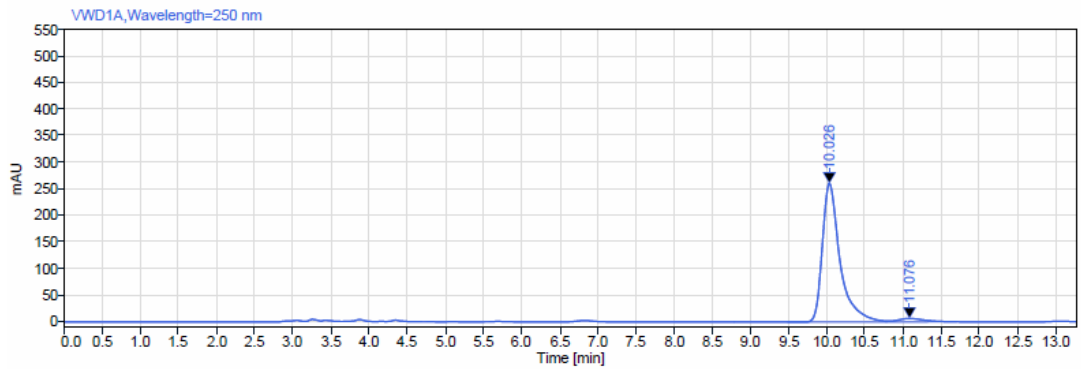


4a



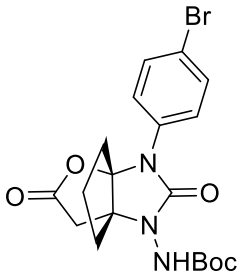
Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
10.022	BV	1.00	825.50	51.94	50.27	
11.033	VB	1.69	816.73	33.81	49.73	
		Sum	**1642.23**			

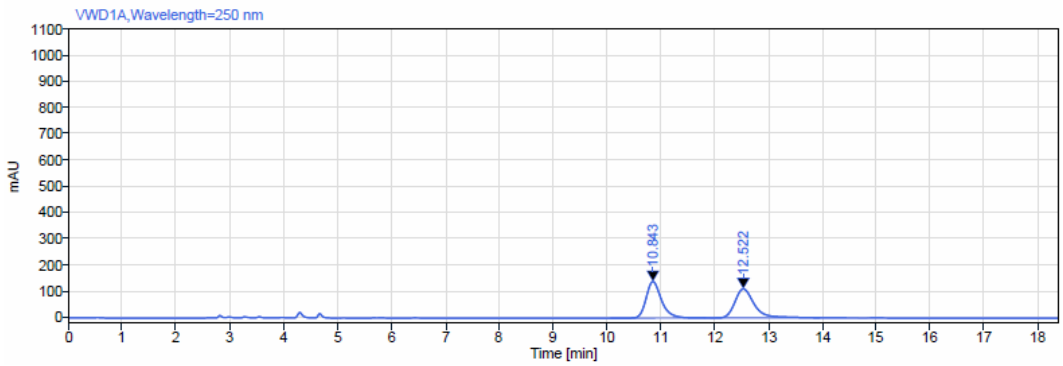


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
10.026	MM m	1.30	4188.05	260.59	96.46	
11.076	MM m	0.92	153.53	6.43	3.54	
		Sum	**4341.58**			

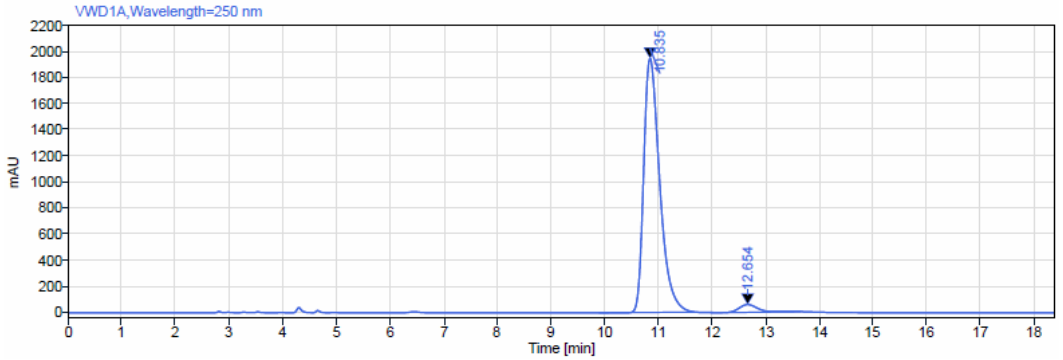


4b



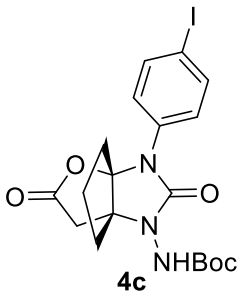
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
10.843	MM m	1.74	2733.25	138.92	49.74	
12.522	MM m	2.15	2761.42	110.40	50.26	
		Sum	**5494.67**			

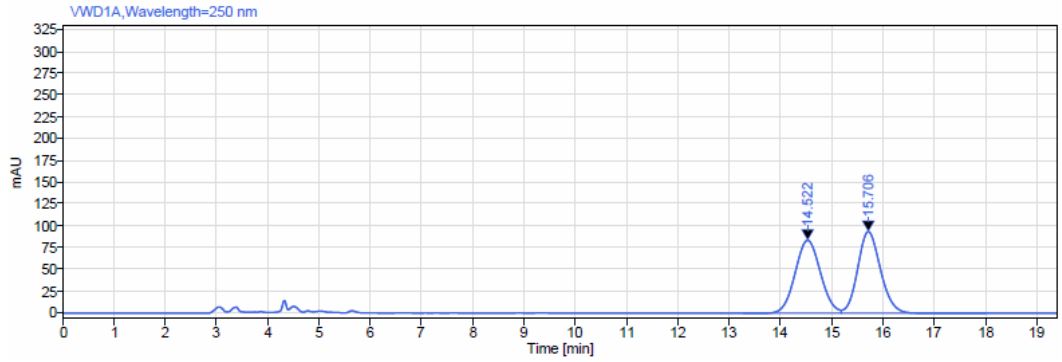


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
10.835	MM m	2.10	40150.59	1944.78	96.51	
12.654	MM m	1.45	1451.79	59.50	3.49	
		Sum	**41602.39**			

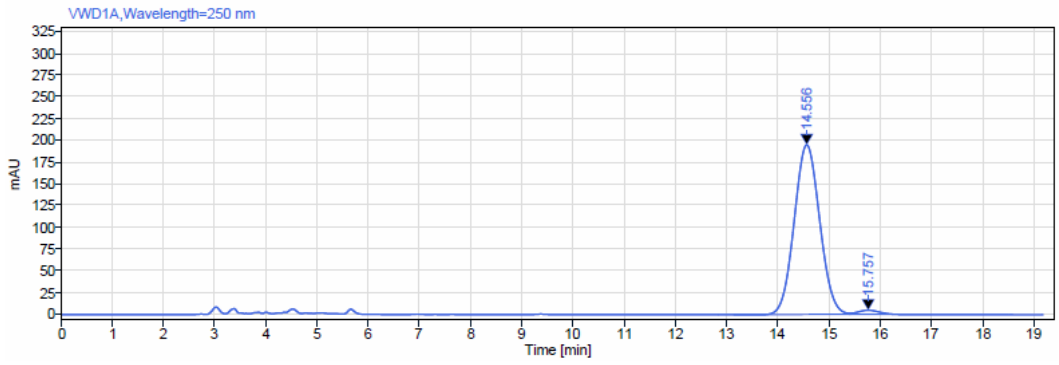


4c



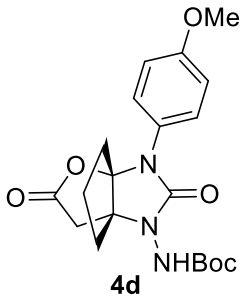
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
14.522	MM m	1.92	2869.93	83.76	49.82	
15.706	MM m	2.82	2890.16	93.78	50.18	
		Sum	**5760.10**			

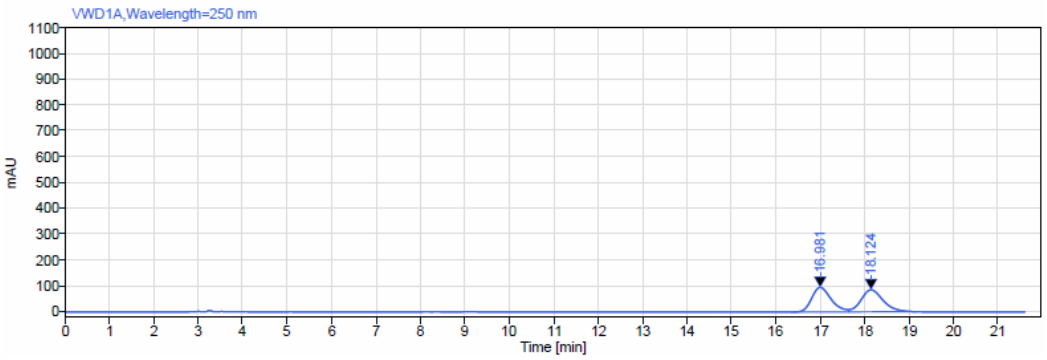


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
14.556	MM m	2.27	6742.03	195.10	98.13	
15.757	MM m	0.83	128.49	4.63	1.87	
		Sum	**6870.52**			

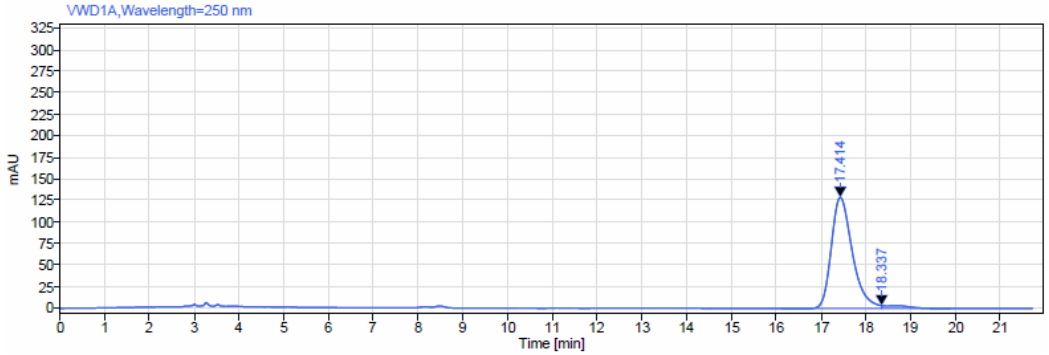


4d



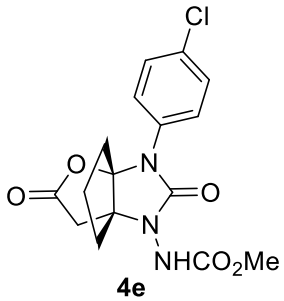
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
16.981	MM m	1.30	2885.21	95.06	49.51	
18.124	MM m	1.53	2942.80	85.36	50.49	
		Sum	**5828.00**			

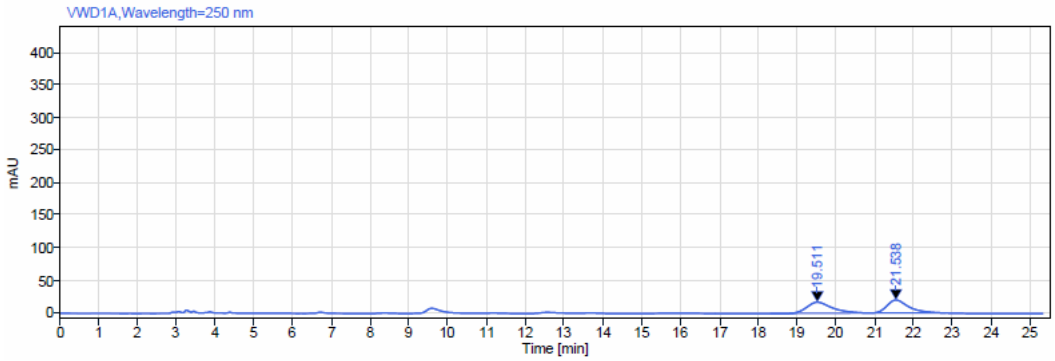


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
17.414	MM m	2.22	4203.36	129.12	96.92	
18.337	MM m	1.54	133.65	3.34	3.08	
		Sum	**4337.00**			

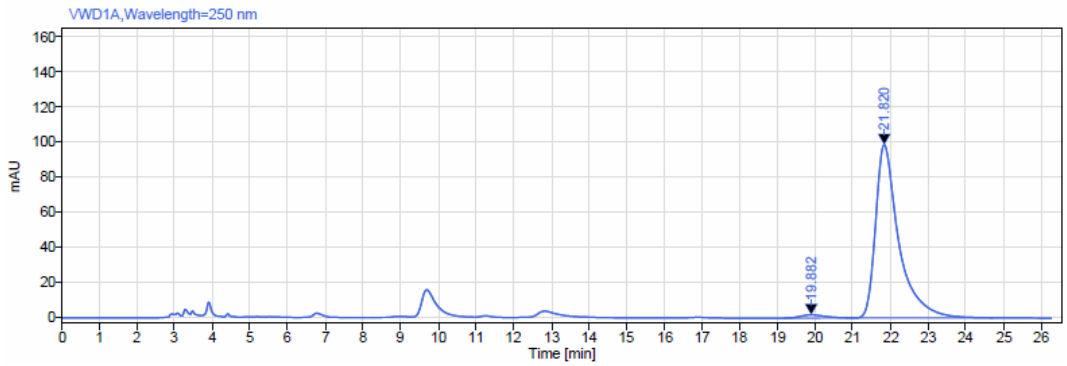


4e



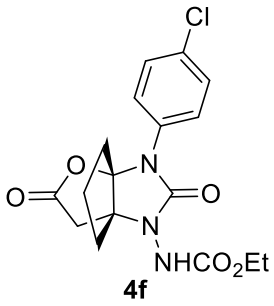
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
19.511	MM m	2.63	770.94	17.05	49.81	
21.538	MM m	1.89	776.75	19.90	50.19	
		Sum	**1547.69**			

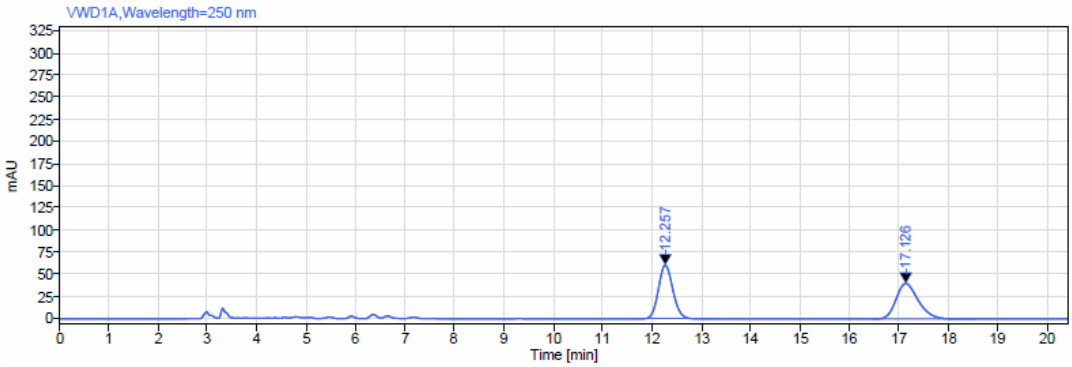


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
19.882	MM m	1.80	84.87	1.83	1.97	
21.820	MM m	3.76	4217.26	98.77	98.03	
		Sum	**4302.13**			

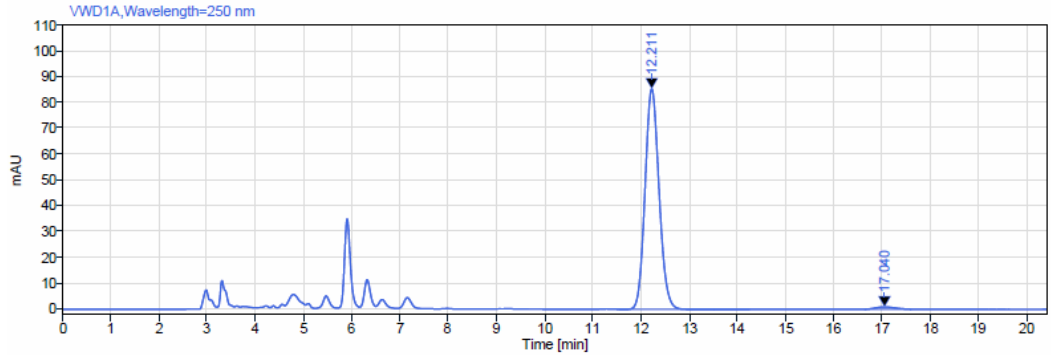


4f



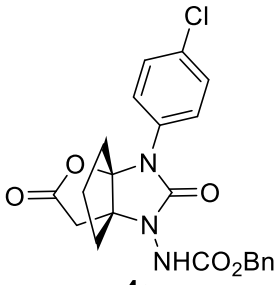
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
12.257	MM m	1.58	1236.29	60.74	49.84	
17.126	MM m	2.07	1244.07	40.04	50.16	
		Sum	**2480.36**			

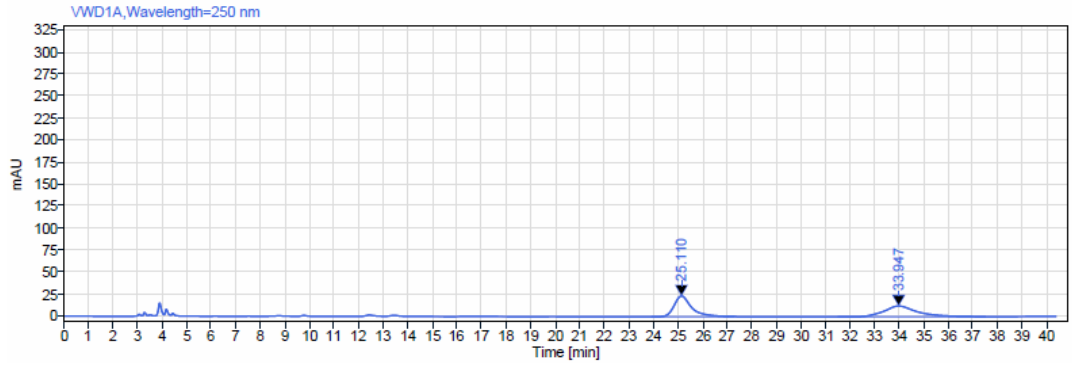


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
12.211	MM m	3.11	1721.35	85.35	98.53	
17.040	MM m	0.97	25.69	0.91	1.47	
		Sum	**1747.04**			

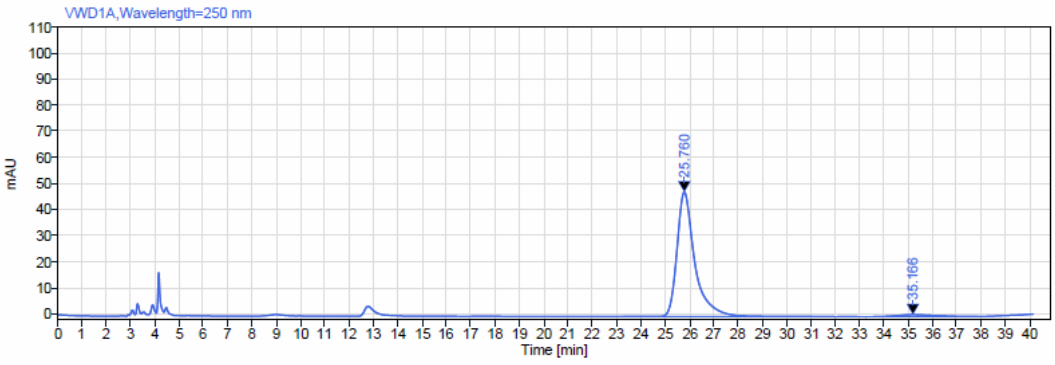


4g



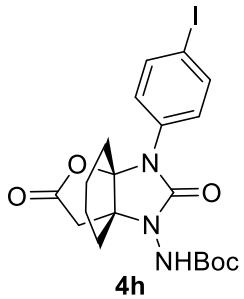
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
25.110	MM m	3.48	1154.98	23.54	50.34	
33.947	MM m	6.03	1139.38	12.21	49.66	
		Sum	**2294.36**			

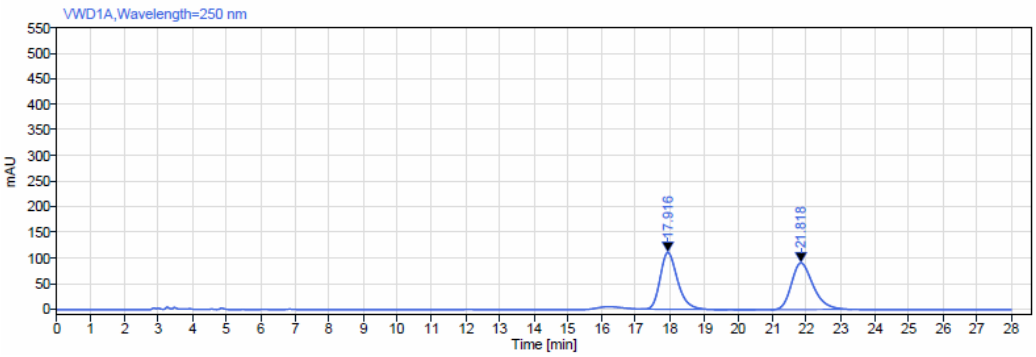


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
25.760	MM m	7.75	2421.64	47.65	96.82	
35.166	MM m	4.41	79.65	0.77	3.18	
		Sum	**2501.29**			

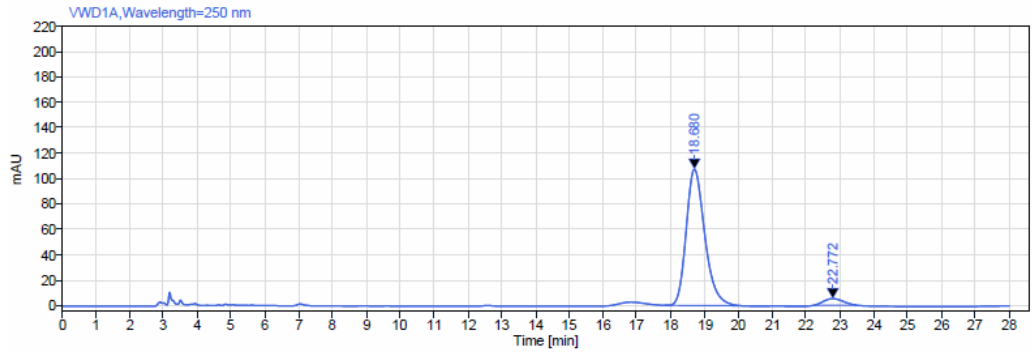


4h



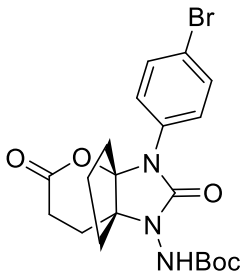
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
17.916	MM m	3.35	3921.34	110.79	49.30	
21.818	MM m	2.38	4032.16	91.00	50.70	
		Sum	**7953.51**			

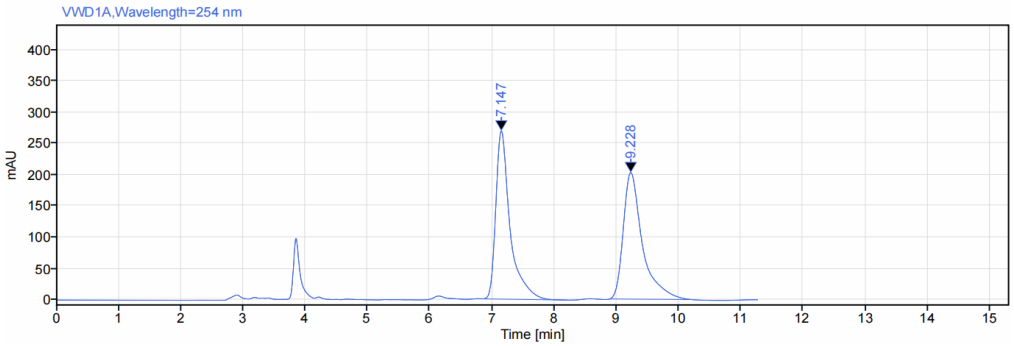


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
18.680	MM m	4.18	4089.32	107.23	95.26	
22.772	MM m	1.26	203.68	5.16	4.74	
		Sum	**4293.00**			

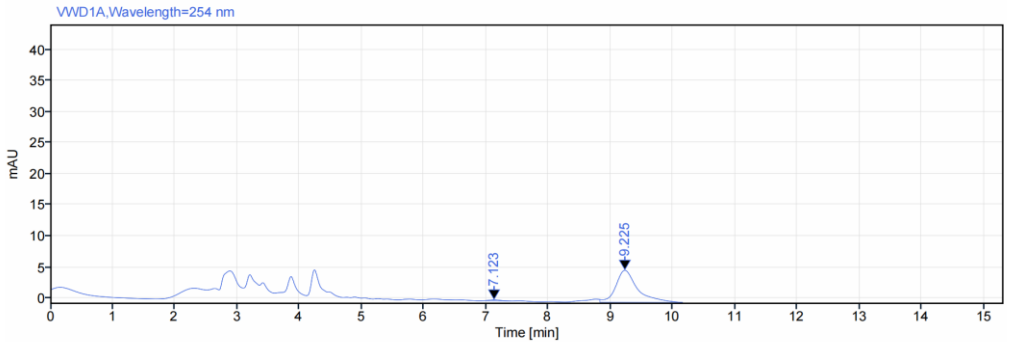


4i



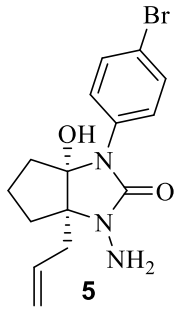
Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
7.147	MM m	1.46	4283.27	269.30	49.76	
9.228	MM m	1.31	4325.40	202.62	50.24	
		Sum	**8608.67**			

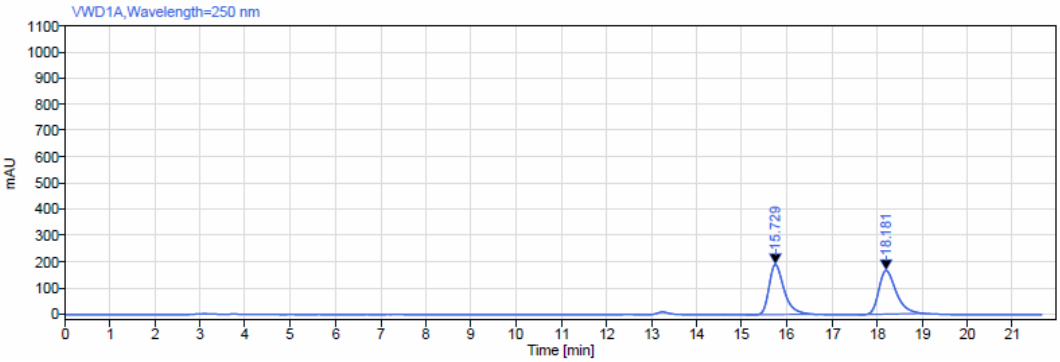


Signal: VWD1A,Wavelength=254 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
7.123	MM m	0.57	2.00	0.15	1.58	
9.225	MM m	1.33	124.59	5.15	98.42	
		Sum	**126.60**			

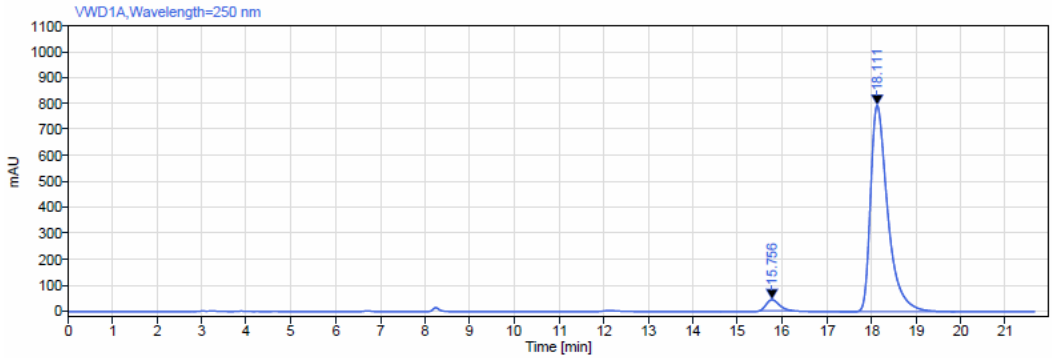


5



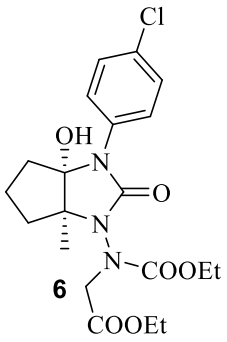
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
15.729	MM m	1.59	4420.64	190.74	50.09	
18.181	MM m	1.44	4404.85	166.30	49.91	
		Sum	**8825.50**			

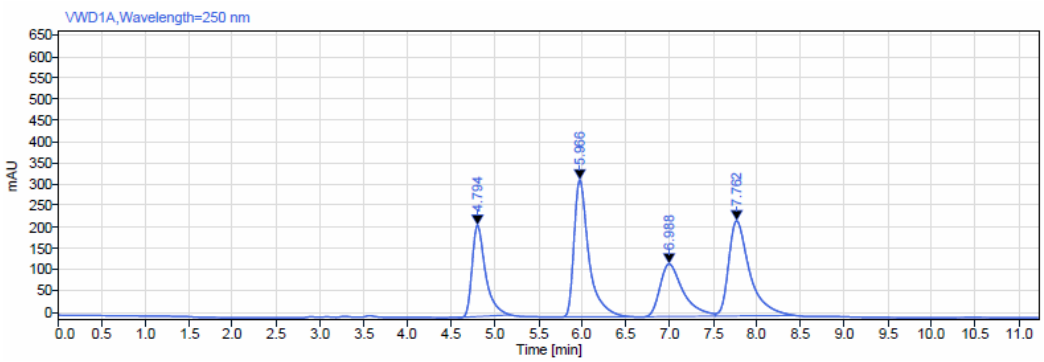


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
15.756	MM m	0.74	843.25	42.28	3.83	
18.111	MM m	2.58	21167.00	794.07	96.17	
		Sum	**22010.25**			

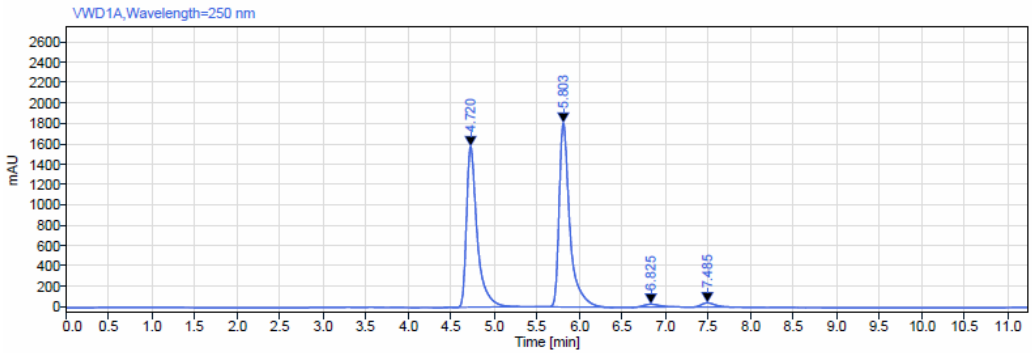


6



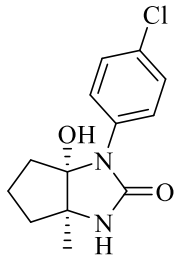
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.794	MM m	0.61	2283.58	213.76	18.96	
5.966	MM m	1.21	3747.56	321.06	31.12	
6.988	MM m	0.96	2266.78	123.18	18.82	
7.762	MM m	0.91	3744.49	223.29	31.09	
		Sum	**12042.42**			

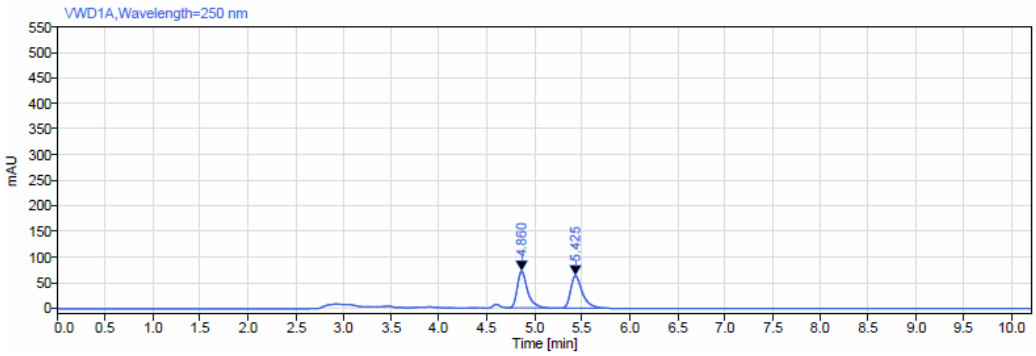


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.720	MM m	0.87	13657.14	1574.89	45.36	
5.803	MM m	0.92	15630.04	1802.94	51.91	
6.825	MM m	0.50	360.19	28.57	1.20	
7.485	MM m	0.59	462.52	41.41	1.54	
		Sum	**30109.88**			

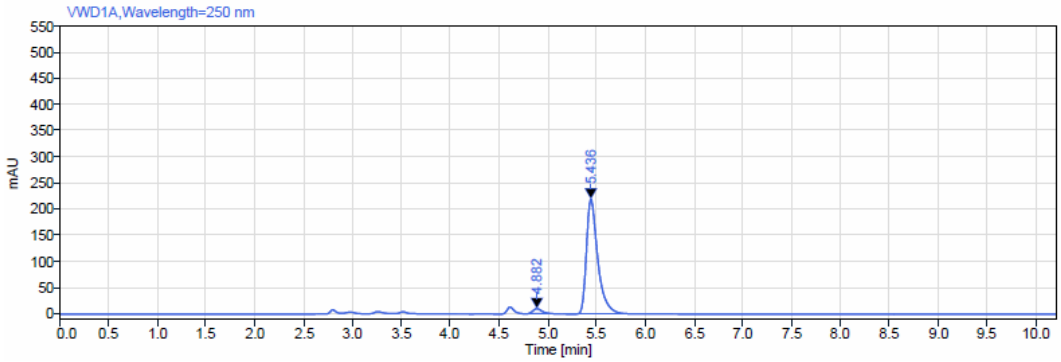


7



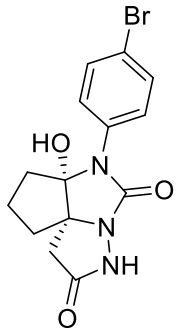
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.860	MM m	0.48	531.54	71.42	49.75	
5.425	MM m	0.57	536.83	63.20	50.25	
		Sum	**1068.37**			



Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.882	MM m	0.22	55.72	9.28	3.04	
5.436	MM m	1.12	1779.54	219.59	96.96	
		Sum	**1835.25**			



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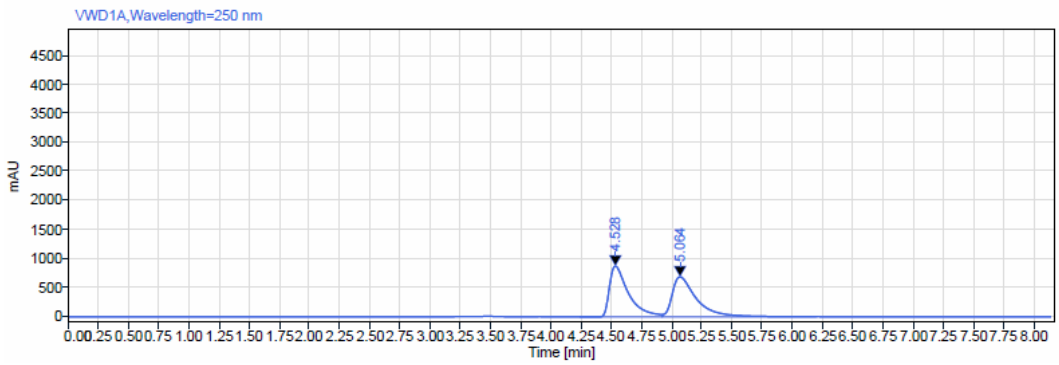
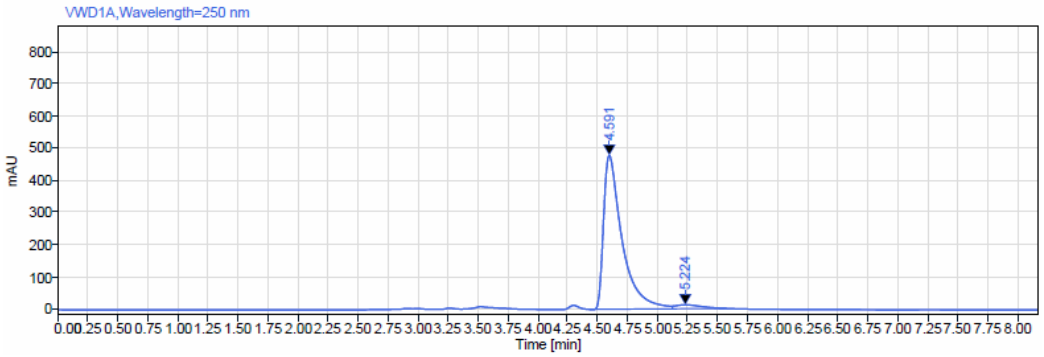


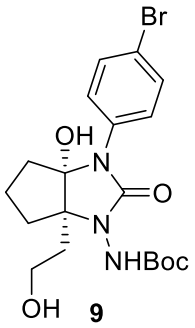
Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.528	MM m	0.69	9572.76	875.28	49.82	
5.064	MM m	1.29	9641.50	690.09	50.18	
		Sum	**19214.26**			

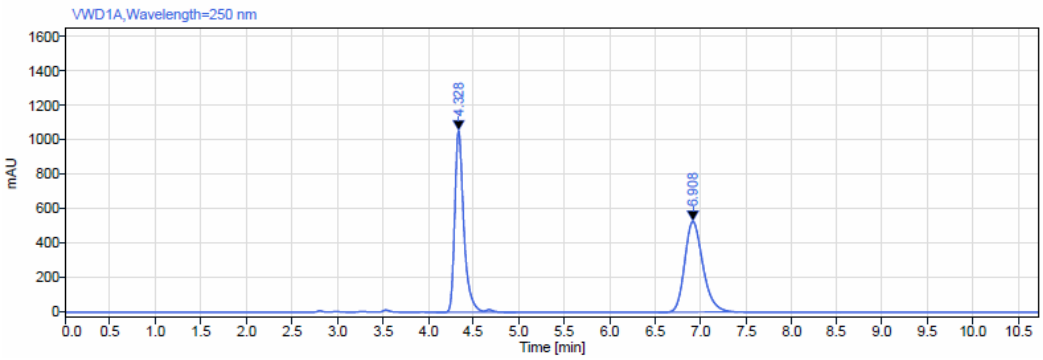


Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.591	MM m	0.69	5120.39	478.33	96.58	
5.224	MM m	0.45	181.45	12.18	3.42	
		Sum	**5301.84**			

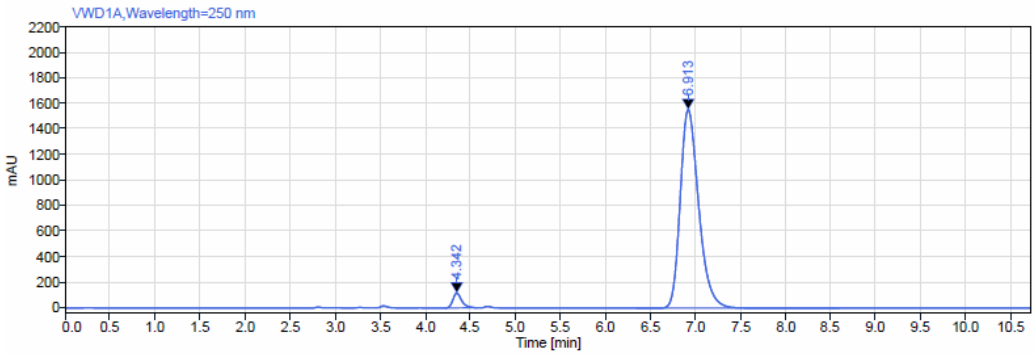


9



Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.328	MM m	0.88	7369.33	1054.17	50.14	
6.908	MM m	0.88	7329.42	527.20	49.86	
		Sum	**14698.75**			



Signal: VWD1A,Wavelength=250 nm

RT [min]	Type	Width [min]	Area	Height	Area%	Name
4.342	MM m	0.36	798.38	116.50	3.49	
6.913	MM m	2.26	22057.49	1553.86	96.51	
		Sum	**22855.87**			

7. References

[1] Liu, B.; Li, K. N.; Luo, S. W.; Huang, J. Z.; Pang, K.; Gong, L. Z. *J. Am. Chem. Soc.* **2013,** 135, 3323–3326.
[2] Rama, H.; Samir Z. Z. *Org. Biomol. Chem*., **2011**, *9*, 3396.