Supporting Information

Asymmetric catalytic concise synthesis of 3-(3-indolomethyl)oxindoles for the construction of trigolutes analogs

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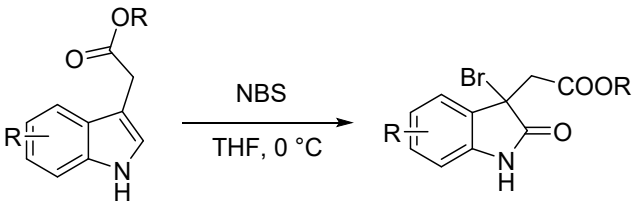
Content

1 General information

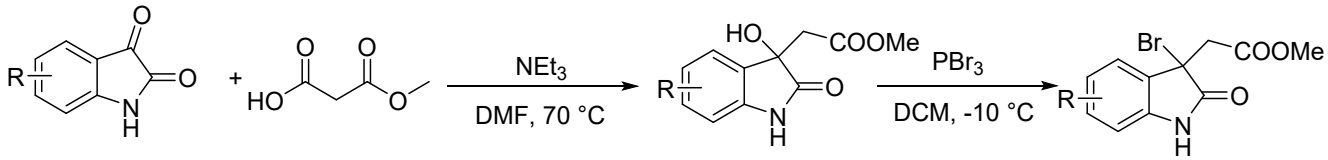
NMR characterization data were collected on Bruker ASCEND™ 400M and 600M. ^{1}H NMR and ^{13}C{^{1}H} NMR: chemical shifts δ were recorded in ppm relative to tetramethylsilane and internally referenced to the residual solvent signal. Data were reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, dd = doublet of doublets, td = triplet of doublets, dt = doublet of triplets, ddd = doublet of doublet of doublets, m = multiplet), coupling constants (Hz), integration.Ultra Performance Convergence Chromatography (UPC^{2}) was performed on using Daicel Chiralcel IA-3, IC-3, ID-3, IE-3, IG-3, IH-3, OD-3, OX-3, OZ-3, AD-3. at 35 °C with UV detector at 211 nm, and enantiomeric excesses were determined in comparison with the authentic racemates. High resolution mass spectra (HRMS) were performed on Thermo Q-Exactive Focus (FTMS+c ESI) and data were reported as (m/z). Infrared spectra (IR) were recorded on Bruker Tensor II spectrometer with Plantium ATR accessory and the peaks are reported as absorption maxima (v, cm-1). Optical rotations were measured on Rudolph Research Analytic Automatic Polarimeter, and reported as follows: $[\alpha]_D^T$ (c: g/100 mL, in CH_2Cl_2, λ = 589 nm). Melting point ranges were determined on OptiMelt. X-ray crystallographic data were collected by a Bruker D8 Venture Photon II. The experiments requiring substrates 3-Bromo-3-substituted oxindoles [1] and chiral *N*,*N*′-dioxide ligands.[2] were synthesized according to known procedures and purified by recrystallization prior to use. All of the starting materials including the metal salts were purchased from TCI, Aladdin, Adamas, Acros, Aldrich and other companies, and used without further purification. The 3Å MS and inorganic base was purchased from Acros and oven-dried by the muffle furnace for 4 h prior to use. All the solvents were pre-dried over appropriate desiccants, and distilled prior to use. other commercial reagents were used without further purification. Reactions were monitored using thin-layer chromatography (TLC) on GF254 silica gel. Visualization of the developed plates was performed under UV light (254 nm) or using iodine, cobalt thiocyanate or $KMnO_4$. The products were purified by flash column chromatography with silicycle 300-400 mesh silica gel.

2 Typical procedure for preparation of substrates and products

2.1 Typical Synthesis Procedure of A and B



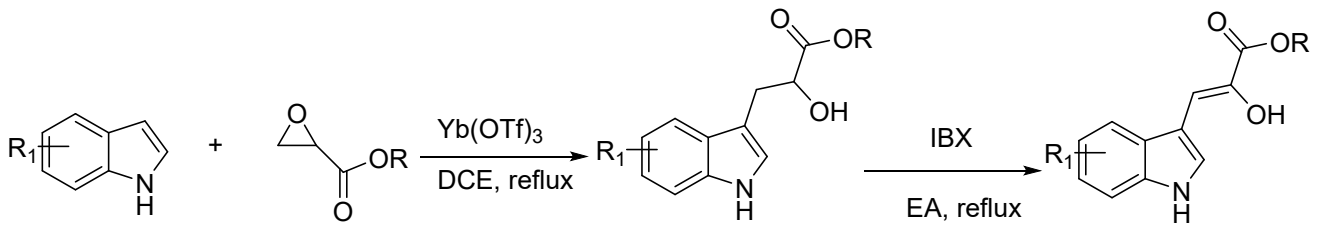
A1-A5, A10



A6-A9, A11-A16

Synthesis Procedure of **A1-A5**, **A10**: *N*-bromosuccinimide (30.0 mmol, 5.34 g) was dissolved in cold THF (100 mL). The resulting THF solution was added dropwise via addition funnel to a stirring solution of 3-substituted indole (15 mmol) in *t*BuOH (100 mL) at room temperature over a period of 1 hour. The mixture was stirred for an additional hour. The solution was concentrated under reduced pressure. The crude material was subjected to column chromatography on silica gel (elute: petroleum ether/ethyl acetate = 10/1, v/v) to obtain the product.

Synthesis Procedure of **A6**-**A9**, **A11**-**A16**: a solution of isatin (30 mmol) was dissolved in DMF and the corresponding acid (33 mmol) was added at room temperature, followed by addition of triethylamine (20 mol%). The mixture was stirred at 70 °C for 12 h and then washed with H_2O. The aqueous layer was extracted with EA in three times, concentrated under reduced pressure, and then washed with DCM to obtain the crude product. The crude product (10 mmol) was dissolved in 10 mL DCM at -10°C, followed by addition of PBr_3 (10mmol), and monitored by TLC. The reaction mixture was quenched by with H_2O, and extracted with DCM. The combined organic extracts were dried over Na_2SO_4, filtered and concentrated under reduce pressure. The residue was subjected to flash chromatograph on silica gel (petroleum ether/ethyl acetate = 10:1, v/v) and then recrystallized from the mixture of petroleum ether and ethyl acetate to afford 3-bromo-3-substituted oxindoles as a yellow solid.

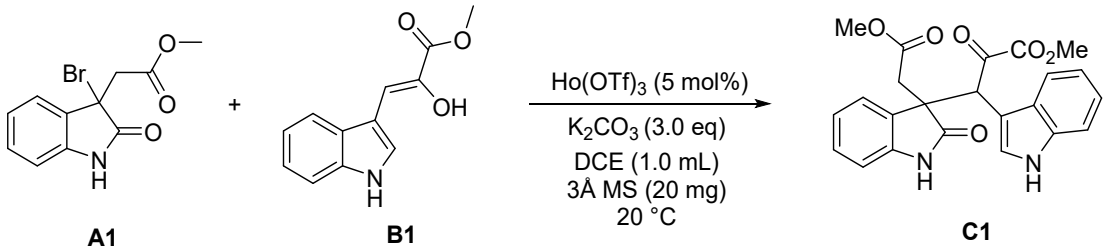


B2-B19

B1 was prepared according to previous literature.[3] Synthesis Procedure of **B2**-**B19**: Glycidic acid ester (4.0 g, 39.2 mmol) was added in one portion by syringe to a mixture of indole (78.4 mmol) and $Yb(OTf)_3$ (7.3 g, 11.7 mmol) in DCE (50 mL) under N_2. The mixture was refluxed for 1.5 h. The reaction was quenched with sat. Na_2CO_3 (50 mL) and the solution was acidified with 2M HCl (150 mL). The solution was extracted with CH_2Cl_2(3 x 50 mL) and the combined organic layers were washed with brine (50 mL), dried (Na_2SO_4), and concentrated under reduced pressure. The residue was subjected to flash chromatograph on silica gel (petroleum ether/ethyl acetate = 8:1, v/v) to give methyl -α-hydroxy-1H-indole-3-propanoate. Methyl -α-hydroxy-1H-indole-3-propanoate (10 mmol) was dissolved in

ethyl acetate (20 mL) in a round-bottomed flask equipped with a reflux condenser. Next, o-iodoxybenzoic acid (IBX) was added and the mixture was heated at reflux temperature (monitored by TLC). Upon completion, the reaction was cooled to room temperature and the crude mixture was passed through a pad of silica gel using ethyl acetate to rinse. Upon concentration, the residue was subjected to flash chromatograph on silica gel (petroleum ether/ethyl acetate = 8:1, v/v) and then recrystallized from the mixture of petroleum ether and ethyl acetate to afford the final product as a white solid.

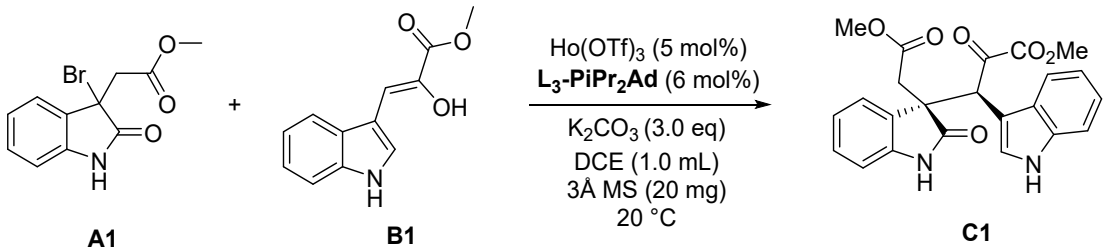
2.3 Typical procedure for preparation of the racemic products



A1 **B1** **C1**

A dry reaction tube was charged with 3-Bromo-3-substituted oxindoles **A1** (42.6 mg, 0.15 mmol), methyl (Z)-2-hydroxy-3-(1H-indol-3-yl)acrylate **B1** (21.7 mg, 0.1 mmol), K_2CO_3 (41.4 mg, 0.3 mmol, 3.0 equiv.), 3Å MS. (20.0 mg), and 1.0 mL DCE in the air. The reaction was performed at 20 °C for 19 hours. The reaction mixture was directly subjected to flash column chromatography on silica gel (eluent: petroleum ether/ethyl acetate = 2:1 to 1:1, v/v) to afford the corresponding products **C1**.

2.4 Typical procedure for preparation of the asymmetric products

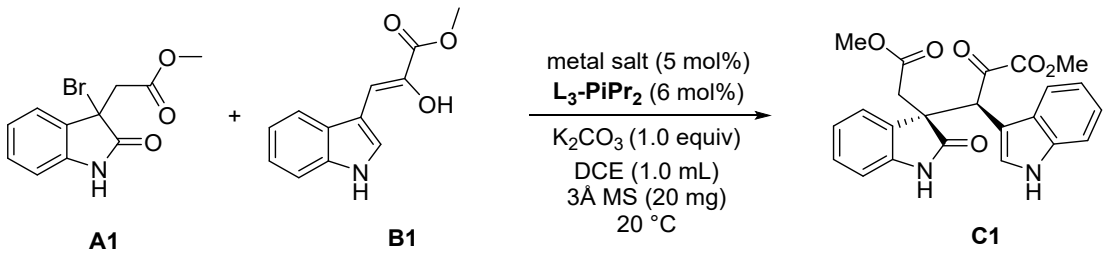


A1 **B1** **C1**

An oven-dried test tube was charged with *N,N'*-dioxide **L_3-$PiPr_2$Ad** (5.5 mg, 0.006 mmol), $Ho(OTf)_3$ (3.1 mg, 0.005 mmol), and 0.5 mL DCM under N_2 atmosphere. After the mixture was stirred at 35 °C for 30 min, the solvent was removed in vacuo. 3-Bromo-3-substituted oxindoles **A1** (42.6 mg, 0.15 mmol), methyl (Z)-2-hydroxy-3-(1H-indol-3-yl)acrylate **B1** (21.7 mg, 0.1 mmol), K_2CO_3 (41.4 mg, 0.3 mmol, 3.0 equiv.), 3Å MS. (20 mg), and 1.0 mL DCE were added in the glovebox. The reaction was performed at 20 °C for 11 hours. The reaction mixture was directly subjected to flash column chromatography on silica gel at -35°C (eluent: petroleum ether/ethyl acetate = 2:1 to 1:1, v/v) to afford the corresponding products **C1**. By the way, the product suffered somewhat epimerization after the chromatography on silica gel at room temperature.

3 Optimization of the reaction conditions

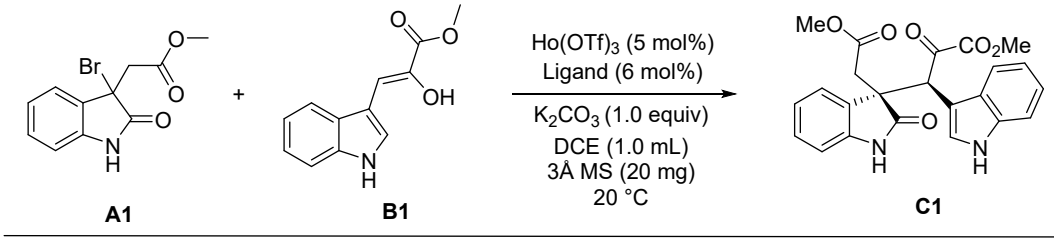
Table S1. Screening of metal salts

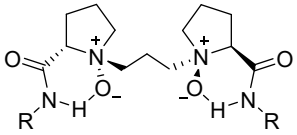


entry[a]	metal salts	yield (%)[b]	dr[c]	ee (%)[c]
1	$Mg(OTf)_2$	Messy	-	-
2	$Sc(OTf)_3$	Messy	-	-
3	$Ni(OTf)_2$	Messy	-	-
4	$La(OTf)_3$	50	69/31	76/70
5	$Ce(OTf)_3$	60	81/19	78/65
6	$Pr(OTf)_3$	62	86/14	78/55
7	$Nd(OTf)_3$	62	89/11	85/50
8	$Sm(OTf)_3$	62	79/21	82/57
9	$Eu(OTf)_3$	64	86/14	88/57
10	$Gd(OTf)_3$	62	80/20	86/51
11	$Tb(OTf)_3$	60	88:12	86/71
12	$Dy(OTf)_3$	62	90:10	85/70
13	$Ho(OTf)_3$	64	90:10	88/70
14	$Er(OTf)_3$	62	91:9	86/68
15	$Tm(OTf)_3$	52	92:8	89/99
16	$Yb(OTf)_3$	42	95:5	87/59
17	$Lu(OTf)_3$	40	95:5	87/40
18[d]	$Ho(OTf)_3$	42	62:38	70/13
19[e]	$Ho(OTf)_3$	50	93:7	84/55
20[f]	$Ho(OTf)_3$	56	95:5	84/61
21[g]	$Ho(OTf)_3$	complex	-	-

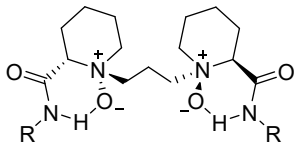
[a] The reactions were performed with **A1** (0.10 mmol), **B1** (0.1 mmol), K_2CO_3 (0.1 mmol), 3 Å molecular sieves (20.0 mg) and metal salt/**L_3-PiPr$_2$** (1:1.2, 5 mol %) in CH_2ClCH_2Cl (1.0 mL) at 20 °C for 19 h. [b] Yield of the NMR product. [c] Determined by UPC^2 analysis on a chiral stationary phase. [d] Without 3 Å molecular sieves. [e] 4 Å molecular sieves (20.0 mg) instead of 3 Å molecular sieves. [f] 5 Å molecular sieves (20.0 mg) instead of 3 Å molecular sieves. [g] 1.8 μL H_2O instead of 3 Å molecular sieves**.**

Table S2. Screening of ligands

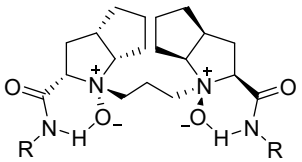




L_3-PrPr$_2$Ad: R = 2,6-^{i}Pr$_2$-4(1-Ad)C$_6$H$_2$



L_3-PiMe$_2$: R = 2,6-Me$_2$C$_6$H$_3$
L_3-PiEt$_2$: R = 2,6-Et$_2$C$_6$H$_3$
L_3-PiPr$_2$: R = 2,6-^{i}Pr$_2$C$_6$H$_3$
L_3-PiPr$_3$: R = 2,4,6-^{i}Pr$_2$C$_6$H$_2$
L_3-PiPr$_2$Ad: R = 2,6-^{i}Pr$_2$-4(1-Ad)C$_6$H$_2$

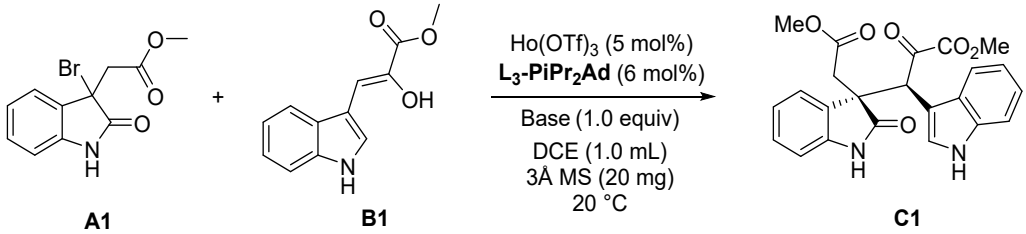


L_3-RaPr$_2$Ad: 2,6-^{i}Pr$_2$-4(1-Ad)C$_6$H$_2$

entry[a]	**Ligand**	yield (%)[b]	dr[c]	ee (%)[c]
1	**L_3-PiMe$_2$**	48	80/20	59/22
2	**L_3-PiEt$_2$**	68	79/21	72/40
3	**L_3-PiPr$_2$**	64	90/10	88/70
4	**L_3-PiPr$_3$**	66	89:11	86/27
5	**L_3-PiPr$_2$Ad**	64	>19:1	92
6	**L_3-PrPr$_2$Ad**	44	>19:1	84
7	**L_3-RaPr$_2$Ad**	34	>19:1	35

[a] The reactions were performed with **A1** (0.10 mmol), **B1** (0.1 mmol), K_2CO_3 (0.1 mmol), 3 Å molecular sieves (20.0 mg) and Ho(OTf)$_3$/**Ligand** (1:1.2, 5 mol %) in CH_2ClCH_2Cl (1.0 mL) at 20 °C for 19 h. [b] Yield of the NMR product. [c] Determined by UPC^2 analysis on a chiral stationary phase.

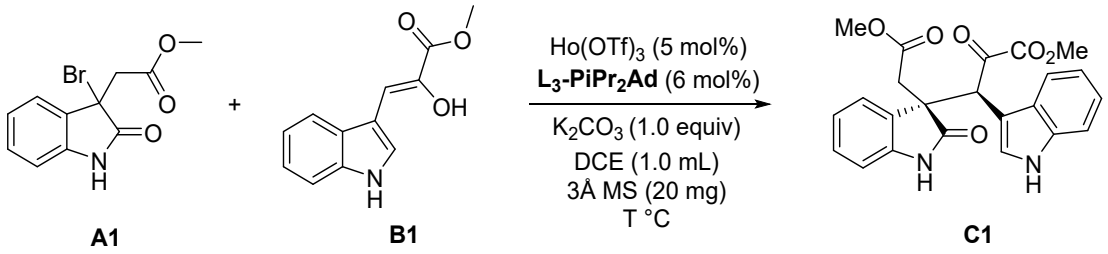
Table S3. Screening of base



entry[a]	base	yield (%)[b]	dr[c]	ee (%)[c]
1	$KHCO_3$	46	>19:1	88
2	Na_2CO_3	48	>19:1	93
3	K_2CO_3	64	>19:1	92
4	K_3PO_4	62	>19:1	90
5	Cs_2CO_3	complex	-	-
6	NEt_3	complex	-	-
7	DBU	complex	-	-

[a] The reactions were performed with **A1** (0.10 mmol), **B1** (0.1 mmol), base (0.1 mmol), 3 Å molecular sieves (20.0 mg) and $Ho(OTf)_3$/ **L_3-PiPr$_2$Ad** (1:1.2, 5 mol %) in CH_2ClCH_2Cl (1.0 mL) at 20 °C for 19 h. [b] Yield of the NMR product. [c] Determined by UPC^2 analysis on a chiral stationary phase.

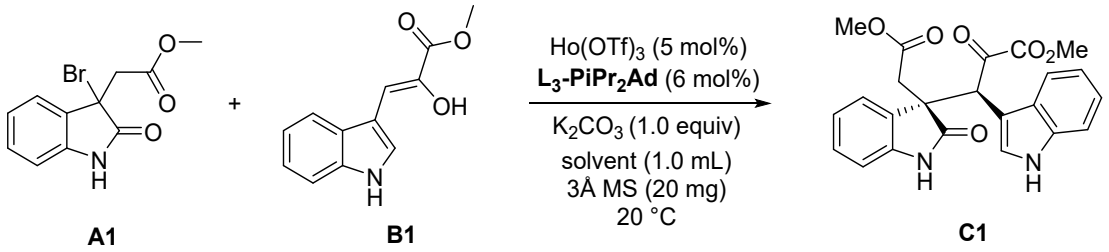
Table S4. Screening of temperature.



entry[a]	T (°C)	yield (%)[b]	dr[c]	ee (%)[c]
1[d]	-20	trace	-	-
2[e]	0	22	>19:1	93
3[f]	20	64	>19:1	92
4[g]	40	56	94:6	87/22

[a] The reactions were performed with **A1** (0.10 mmol), **B1** (0.1 mmol), K_2CO_3 (0.1 mmol), 3 Å molecular sieves (20.0 mg) and $Ho(OTf)_3$/ **L_3-PiPr$_2$Ad** (1:1.2, 5 mol %) in CH_2ClCH_2Cl (1.0 mL) at T °C. [b] Yield of the NMR product. [c] Determined by UPC^2 analysis on a chiral stationary phase. [d] Reaction time 48 h. [e] Reaction time 36 h. [f] Reaction time 19 h. [g] Reaction time 11 h.

Table S5. Screening of solvents.

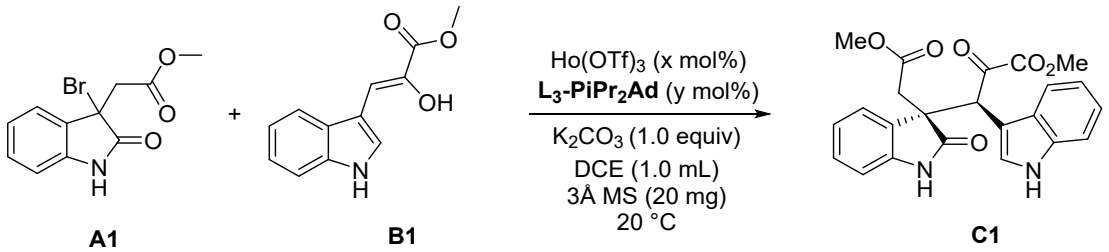


A1 **B1** **C1**

entry[a]	solvent	yield (%)[b]	dr[c]	ee (%)[c]
1	DCM	46	>19:1	88
2	$CHCl_3$	66	>19:1	73
3	DCE	64	>19:1	92
4	EA	complex	-	-
5	Toluene	16	>19:1	84
6	Et_2O	20	>19:1	87
7	THF	14	>19:1	31

[a] The reactions were performed with **A1** (0.10 mmol), **B1** (0.1 mmol), K_2CO_3 (0.1 mmol), 3 Å molecular sieves (20.0 mg) and Ho(OTf)$_3$/ **L_3-PiPr$_2$Ad** (1:1.2, 5 mol %) in solvent (1.0 mL) at 20 °C for 19 h. [b] Yield of the NMR product. [c] Determined by UPC^2 analysis on a chiral stationary phase.

Table S6. Ratio of Ho(OTf)$_3$ and **L_3-PiPr$_2$Ad**.

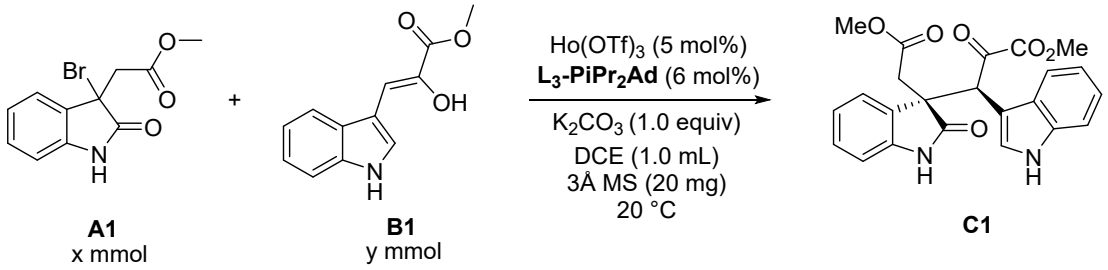


A1 **B1** **C1**

entry[a]	x:y	yield (%)[b]	dr[c]	ee (%)[c]
1	7.5:5	68	>19:1	70
2	6:5	64	>19:1	70
3	5:5	64	>19:1	90
4	5:6	64	>19:1	92
5	5:7.5	64	>19:1	92
6	5:10	69	>19:1	93

[a] The reactions were performed with **A1** (0.10 mmol), **B1** (0.1 mmol), K_2CO_3 (0.1 mmol), 3Å molecular sieves (20.0 mg) and Ho(OTf)$_3$/**L_3-PiPr$_2$Ad** (x:y) in CH_2ClCH_2Cl (1.0 mL) at 20 °C for 19 h. [b] Yield of the NMR product. [c] Determined by UPC^2 analysis on a chiral stationary phase.

Table S7. Screening of ratio of substrate.

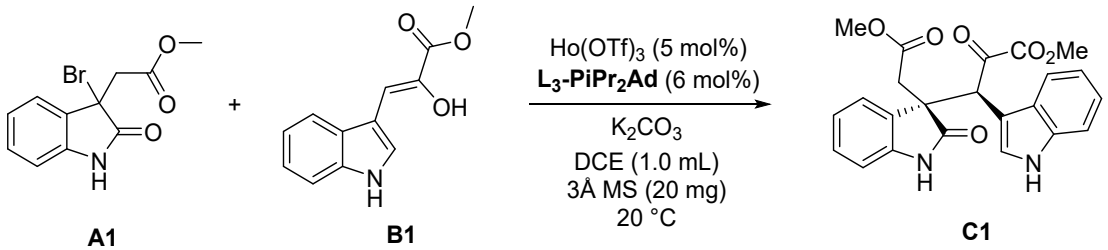


A1 x mmol + **B1** y mmol → **C1**

entry[a]	x:y	yield (%)[b]	dr[c]	ee (%)[c]
1[d]	0.2:0.1	95	>19:1	91
2[d]	0.15:1	95	>19:1	92
3	0.1:0.1	64	>19:1	91
4	0.1:0.15	64	>19:1	90
5	0.1:0.2	62	>19:1	91

[a] The reactions were performed with **A1** (x mmol), **B1** (y mmol), K_2CO_3 (0.1 mmol), 3 Å molecular sieves (20.0 mg) and $Ho(OTf)_3$/ **L_3-$PiPr_2$Ad** (1:1.2, 5 mol %) in DCE (1.0 mL) at 20 °C for 19 h. [b] Yield of the NMR product. [c] Determined by UPC[2] analysis on a chiral stationary phase. [d] Reaction time 11 h.

Table S8. Screening of the amount of base.

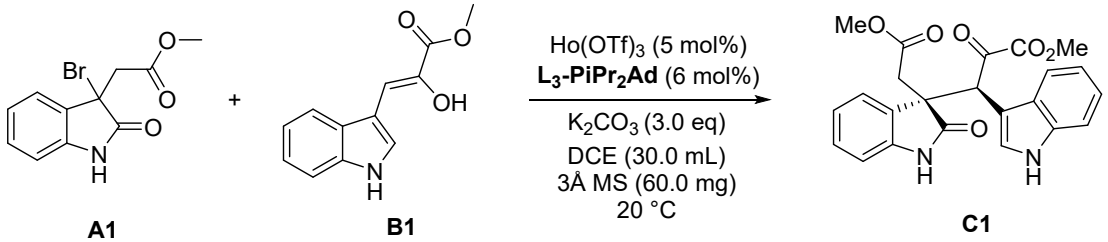


A1 + **B1** → **C1**

entry[a]	the amount of K_2CO_3 (x mmol)	yield (%)[b]	dr[c]	ee (%)[c]
1	0.1	95	>19:1	92
2	0.2	95	>19:1	94
3	0.3	95	>19:1	96

[a] The reactions were performed with **A1** (0.15 mmol), **B1** (0.1 mmol), K_2CO_3 (x mmol), 3 Å molecular sieves (20.0 mg) and $Ho(OTf)_3$/ **L_3-$PiPr_2$Ad** (1:1.2, 5 mol %) in DCE (1.0 mL) at 20 °C for 11 h. [b] Yield of the NMR product. [c] Determined by UPC[2] analysis on a chiral stationary phase.

4 Gram-scale synthesis of C1



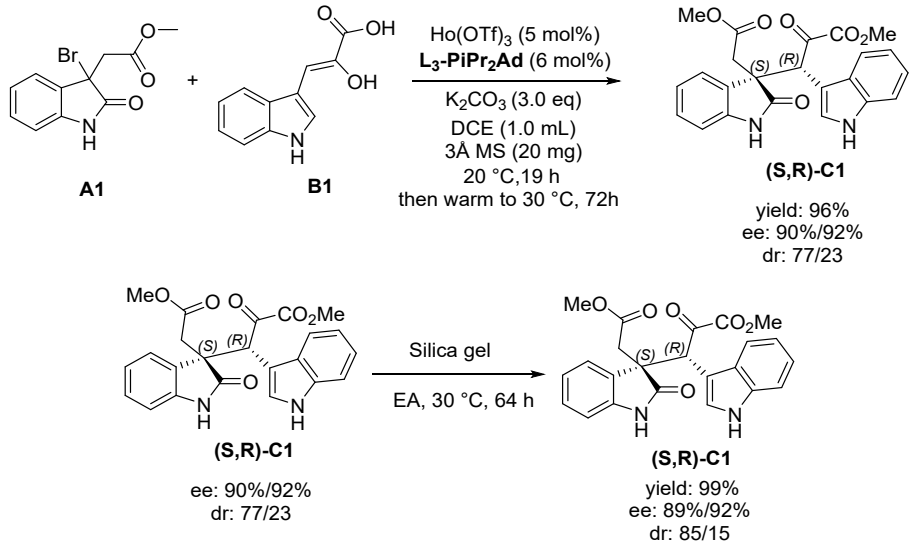
A1
4.5 mmol, 1.28 g

B1
3.0 mmol, 0.65 g

C1
1.11 g
88% yield
95% ee
>19:1 dr

An oven-dried 100 mL flask was charged with *N,N'*-dioxide **L_3-PiPr$_2$Ad** (165.1 mg, 0.18 mmol), $Ho(OTf)_3$ (91.8 mg, 0.15 mmol), and DCM (7.5 mL) under N_2 atmosphere. After the mixture was stirred at 35 °C for 30 min, the solvent was removed in vacuo. 3-Bromo-3-substituted oxindoles **A1** (1.28 g, 4.5 mmol), methyl (Z)-2-hydroxy-3-(1H-indol-3-yl)acrylate **B1** (0.65 g, 3 mmol), K_2CO_3 (1.24 g, 9 mmol, 3.0 equiv.), 3Å MS. (600.0 mg), and 30.0 mL DCE were added subsequently in the glovebox. The reaction was performed at 20 °C for 16 hours. The reaction mixture was directly subjected to flash column chromatography on silica gel at -35°C (eluent: petroleum ether/ethyl acetate = 2:1 to 1:1, v/v) to afford the corresponding products **C1**. By the way, the product suffered from somewhat epimerization after the solvent was removed in vacuo.

5 Synthetic transformations



A1

B1

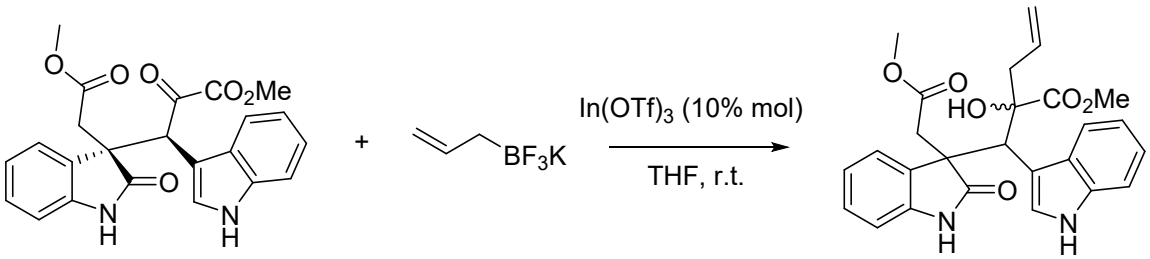
(S,R)-C1
yield: 96%
ee: 90%/92%
dr: 77/23

(S,R)-C1
ee: 90%/92%
dr: 77/23

(S,R)-C1
yield: 99%
ee: 89%/92%
dr: 85/15

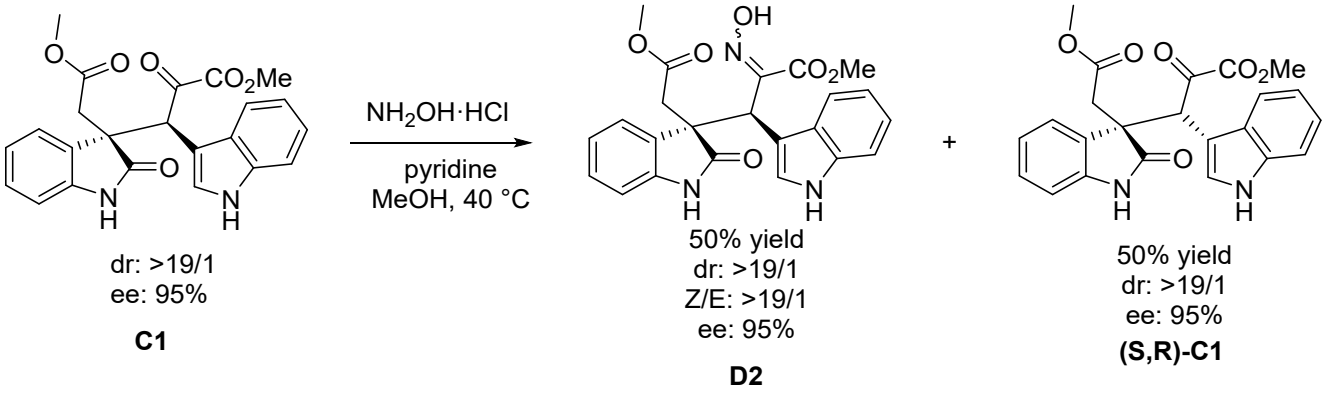
An oven-dried test tube was charged with *N,N'*-dioxide **L_3-PiPr$_2$Ad** (5.5 mg, 0.006 mmol), $Ho(OTf)_3$ (3.1 mg, 0.005 mmol), and 0.5 mL DCM under N_2 atmosphere. After the mixture was stirred at 35 °C for 30 min, the solvent was removed in vacuo. 3-Bromo-3-substituted oxindoles **A1** (42.6 mg, 0.15 mmol), methyl (Z)-2-hydroxy-3-(1H-indol-3-yl)acrylate **B1** (21.7 mg, 0.1 mmol), K_2CO_3 (41.4 mg, 0.3 mmol, 3.0 equiv.), 3Å MS. (20 mg), and 1.0 mL DCE were added in the glovebox. The reaction was performed at 20 °C. After 19 h, the reaction was performed at 30 °C for 72 h. The reaction mixture was directly subjected to flash column chromatography on silica gel at -35°C (eluent: petroleum ether/ethyl acetate = 2:1 to 1:1, v/v) to afford the corresponding products **(S,R)-C1**. An over-dried test tube was charged with **(S,R)-C1** (0.05 mmol, 21.1 mg), 0.3 g Silica gel and 1 mL EA. The reaction was performed at 30 °C for 64 h. The reaction mixture was directly subjected to flash filtration to afford the **(S,R)-C1** in 99% yield. The dr value and ee value were determined by UPC[2] analysis using a chiral stationary phase.

5.1 Procedure for the synthesis of D1

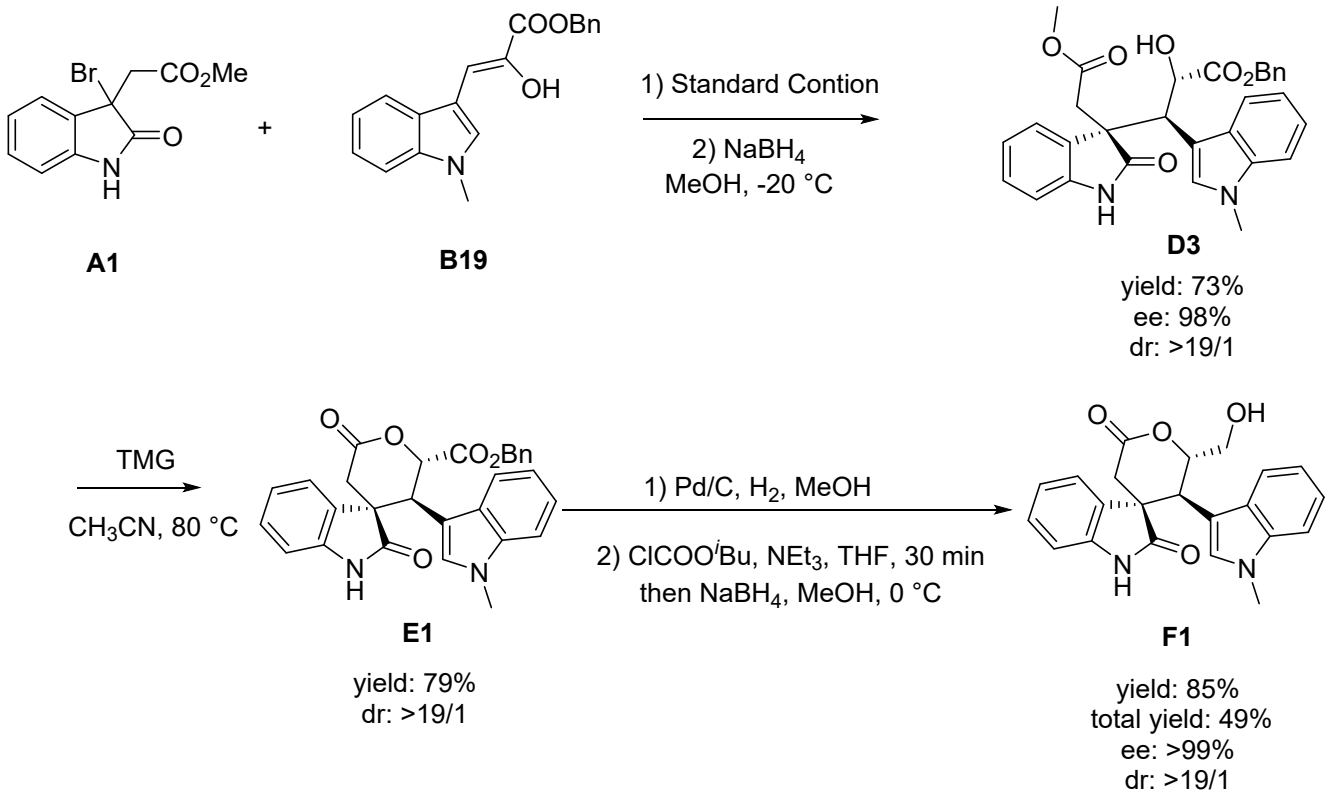


An over-dried test tube was charged with $In(OTf)_3$ (0.01mmol, 5.6 mg), **C1** (0.1 mmol, 42.1 mg) and 1 mL THF in the glovebox. The mixture was stirred at room temperature for 30 min. Potassium allyltrifluoroborate was added (0.2 mmol, 29.6 mg) to the test tube. The reaction was performed at room temperature for 30 min. The reaction mixture was directly subjected to flash column chromatography on silica gel (eluent: petroleum ether/ethyl acetate = 1:1 to 1:2, v/v) to afford the corresponding products **D1** in 87% yield. The dr value was determined by NMR. The ee value was determined by UPC[2] analysis using a chiral stationary phase.

5.2 Procedure for the synthesis of D2

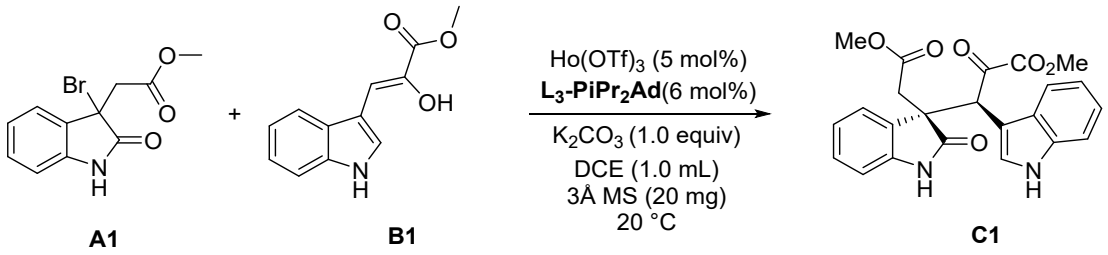


An over-dried test tube was charged with $NH_2OH·HCl$ (0.12mmol, 8.4 mg), pyidine (0.11 mmol, 8.9 μL) and 1.0 mL MeOH. The mixture was stirred at 40 °C for 0.5 h. **C1** (0.1 mmol, 42.1 mg) was added to the test tube. The reaction was performed at the 40 °C for 36 h. The reaction mixture was directly subjected to flash column chromatography on silica gel (eluent: petroleum ether/ethyl acetate = 1:1 to 2:3, v/v) to afford the corresponding products **D1** in 50% yield. The dr value and Z/E value were determined by NMR. The ee value was determined by UPC[2] analysis using a chiral stationary phase.



An oven-dried test tube was charged with *N,N'*-dioxide **L_3-PiPr$_2$Ad** (5.5 mg, 0.006 mmol), Ho(OTf)$_3$ (3.1 mg, 0.005 mmol), and 0.5 mL DCM under N_2 atmosphere. After the mixture was stirred at 35 °C for 30 min, the solvent was removed in vacuo. 3-Bromo-3-substituted oxindoles **A1** (42.6 mg, 0.15 mmol), benzyl (Z)-2-hydroxy-3-(1-methyl-1H-indol-3-yl)acrylate **B19** (21.7 mg, 0.1 mmol), K_2CO_3 (41.4 mg, 0.3 mmol, 3.0 equiv.), 3Å MS. (20 mg), and 1.0 mL DCE were added subsequently in the glovebox. The reaction was performed at 20 °C. Atfer 15 h, The reaction mixture was directly subjected to flash filtration, the solvent was removed in vacuo. The mixture was dissolved in 2.0 mL MeOH at -20°C. $NaBH_4$ (11.4 mg, 0.3 mmol) was added. The reaction was performed at -20 °C for 30 minutes. The reaction mixture was directly subjected to flash column chromatography on silica gel (eluent: petroleum ether/ethyl acetate = 3:2 to 1:1, v/v) to afford the corresponding products **D3** in 73% yield. **D3** (51.2 mg, 0.1 mmol), TMG (12.55 μL, 0.1 mmol), and 1.0 mL CH_3CN were added to a test tube. The reaction was performed at 80 °C for 13 h. The reaction mixture was directly subjected to flash column chromatography on silica gel (eluent: petroleum ether/ethyl acetate = 3:2 to 1:1 v/v,) to afford the corresponding products **E1** in 79% yield. An oven-dried test tube was charged with **E1** (48.1 mg, 0.1 mmol), Pd/C (4.0 mg), and 2 mL MeOH under H_2 atmosphere. After 16h, the product was filtered with coarse silica gel, the solvent was removed in vacuo. the mixture was dissolved in 2.0 mL THF. NEt_3 (15.3 uL, 0.11 mmol) and ClCOO^{i}Bu (16.5 uL, 0.12 mmol) were added under N_2 atmosphere. The reaction was performed at room temperature for 30 minutes, and then 1.0 mL MeOH and $NaBH_4$ (11.4 mg, 0.3 mmol) were added at 0 °C. After for 30 minutes, the reaction mixture was directly subjected to flash column chromatography on silica gel (eluent: petroleum ether/ethyl acetate = 1:1 to 1:2, v/v) to afford the corresponding products **F1** in 85% yield. The dr value was determined by NMR and UPC^2 analysis using a chiral stationary phase. The ee value was determined by UPC^2 analysis using a chiral stationary phase.

6 Control experiments

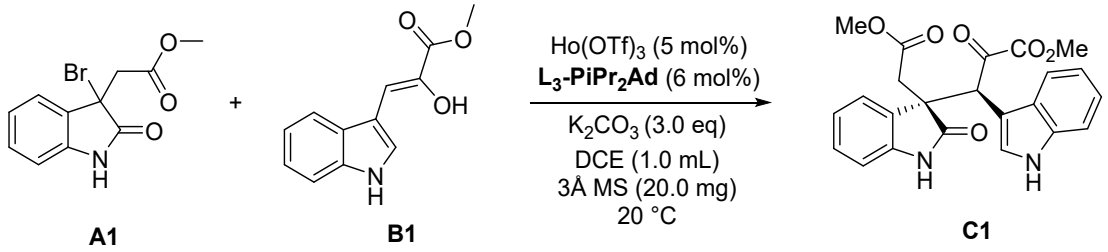


A1 **B1** **C1**

entry[a]	Variations	yield (%)[b]	dr[c]	ee (%)[c]
1	-	64	>19:1	92
2	Without $Ho(OTf)_3$ and **L_3-PiPr$_2$Ad**	trace	-	-
3	Without **L_3-PiPr$_2$Ad**	62	9/1	-

[a] The reactions were performed with **A1** (0.10 mmol), **B1** (0.1 mmol), K_2CO_3 (0.1 mmol), 3Å molecular sieves (20.0 mg) and $Ho(OTf)_3$/**L_3-PiPr$_2$Ad** (1:1.2, 5 mol %) in CH_2ClCH_2Cl (1.0 mL) at 20 °C for 19 h. [b] Yield of the NMR product. [c] Determined by UPC^2 analysis on a chiral stationary phase.

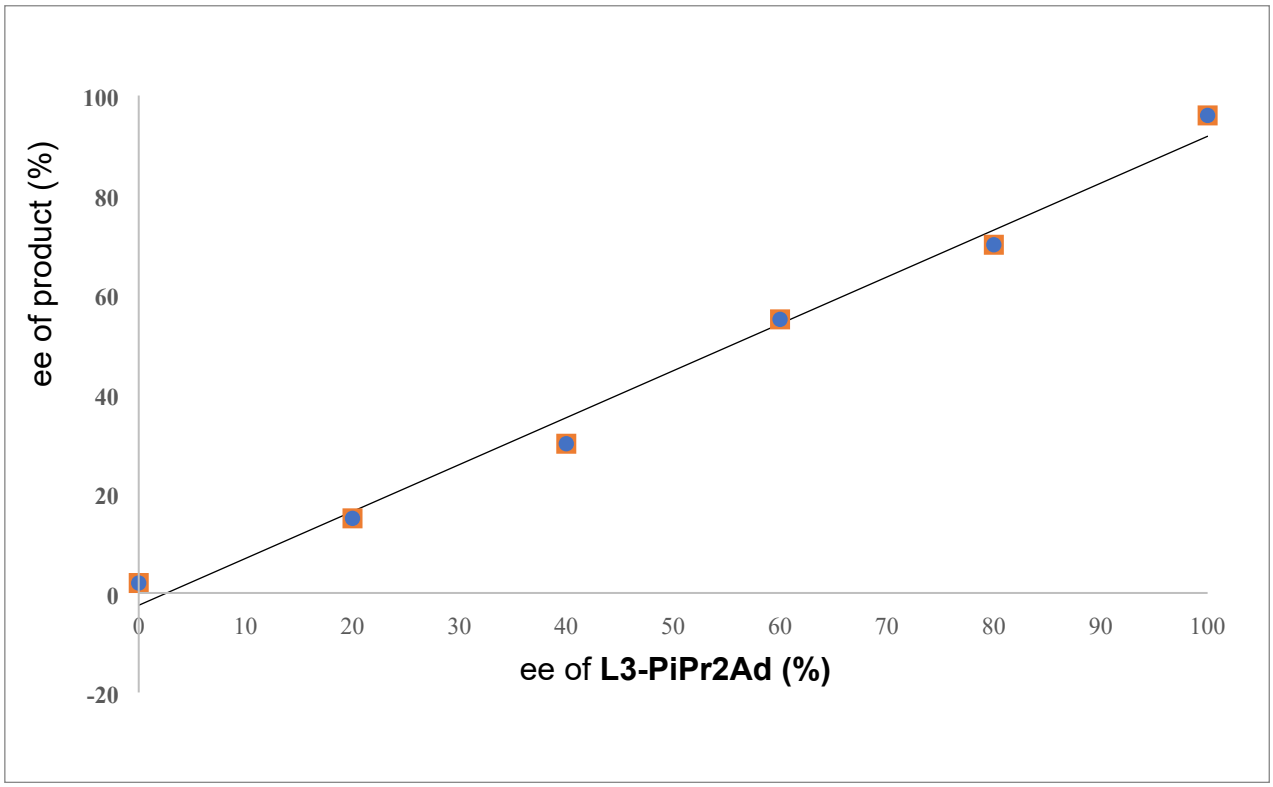
7 The relationship between ee of the ligand and ee of the product C1



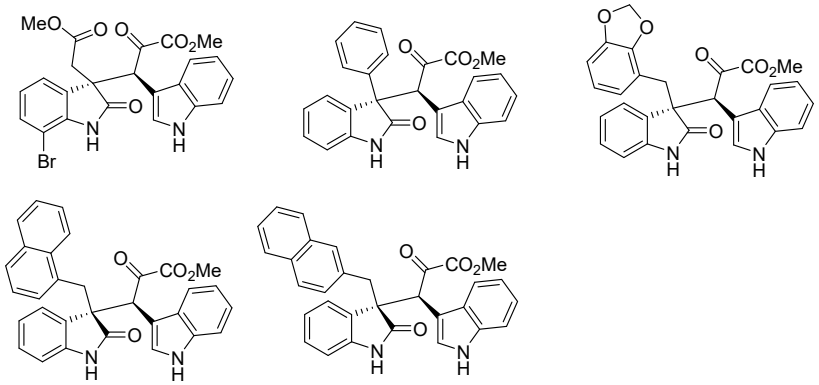
A1 **B1** **C1**

entry[a]	ee of ligand	yield (%)[b]	dr[c]	ee (%)[c]
1	0	94	>19:1	2
2	20	95	>19:1	15
3	40	96	>19:1	30
4	60	94	>19:1	55
5	80	95	>19:1	70
6	100	95	>19:1	96

[a] The reactions were performed with **A1** (0.15 mmol), **B1** (0.1 mmol), K_2CO_3 (0.3 mmol), 3Å molecular sieves (20.0 mg) and $Ho(OTf)_3$/**L_3-PiPr$_2$Ad** (1:1.2, 5 mol %) in CH_2ClCH_2Cl (1.0 mL) at 20 °C for 11 h. [b] Yield of the NMR product. [c] Determined by UPC^2 analysis on a chiral stationary phase.

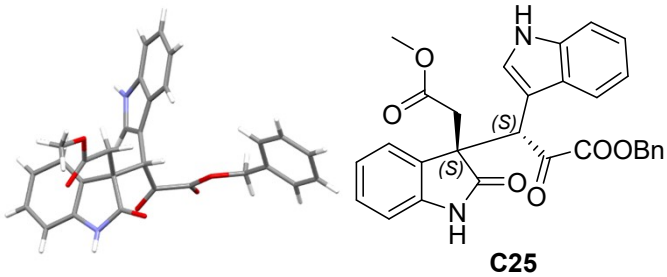


8 Unsuccessful substrate scopes



9 Determination of absolute configuration of compound C25

Crystals suitable for the X-ray crystal structure analysis were obtained from a solution of compound **C25** in $CHCl_3$ (ca. 5 mL) at room temperature. The yellow crystal in rod-shape, with approximate dimensions of 0.194 × 0.244 × 0.577 mm^3, was selected and mounted for the single-crystal X-ray diffraction. The data set was collected by Bruker D8 Venture Photon II diffractometer at 173(2)K equipped with micro-focus Cu radiation source (Kα = 1.54178Å). Applied with face-indexed numerical absorption correction, the structure solution was solved and refinement was processed by SHELXTL (version 6.14) and OLEX 2.3 program package.[4] The structure was analyzed by ADDSYM routine implemented in PLATON suite and no higher symmetry was suggested.[5]



C25

Crystallographic Data for $C_{30}H_{25}Cl_3N_2O_6$

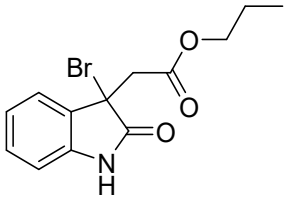
Formula	$C_{30}H_{25}Cl_3N_2O_6$
Formula mass (amu)	615.87
Space group	P 21 21 21
a (Å)	9.4395(2)
b (Å)	17.2117(4)
c (Å)	18.1895(4)
α (deg)	90
β (deg)	90
γ (deg)	90
V (Å^3)	2955.25(11)
Z	4
λ (Å)	1.54178
T (K)	173
ρ_{calcd} (g cm^{-3})	1.384
μ (mm^{-1})	3.195
Transmission factors	0.475-0.944
$2\theta_{max}$ (deg)	68.241
No. of unique data, including $F_o^2 < 0$	5364
No. of unique data, with $F_o^2 > 2\sigma(F_o^2)$	5204
No. of variables	379
$R(F)$ for $F_o^2 > 2\sigma(F_o^2)$ [a]	0.0354
$R_w(F_o^2)$ [b]	0.0916
Goodness of fit	1.040

[a] $R(F) = \sum||F_o| - |F_c|| / \sum|F_o|$.

[b] $R_w(F_o^2) = [\sum[w(F_o^2 - F_c^2)^2] / \sum wF_o^4]^{1/2}$; $w^{-1} = [\sigma^2(F_o^2) + (Ap)^2 + Bp]$, where $p = [\max(F_o^2,0) + 2F_c^2] / 3$.

10 Characterization of the products

Propyl 2-(3-bromo-2-oxoindolin-3-yl)acetate (A3)



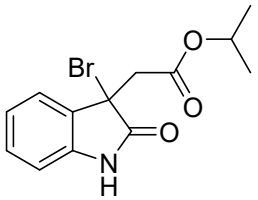
A3

Yellow solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 9.11 (s, 1H), 7.37 (s, 1H), 7.06 (s, 1H), 6.97 – 6.90 (m, 2H), 3.86 (t, *J* = 6.0, 2H), 3.62 (dd, *J* = 48.0, 18.0 Hz, 2H), 1.43 (s, 2H,) 0.77 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 176.4, 168.2, 140.4, 130.6, 129.8, 124.1, 123.3, 111.0, 67.0, 51.4, 43.4, 21.7, 10.3.

Isopropyl 2-(3-bromo-2-oxoindolin-3-yl)acetate (A4)



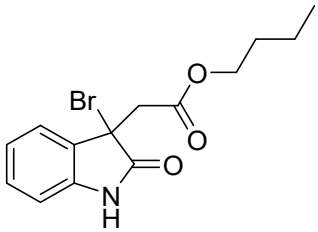
A4

Yellow solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.92 (s, 1H), 7.36 (d, *J* = 7.6 Hz, 1H), 7.27 – 7.25 (m, 1H), 7.05 (t, *J* = 7.5 Hz, 1H), 6.93 (d, *J* = 7.8 Hz, 1H), 4.76 (p, *J* = 6.2 Hz, 1H), 3.56 (dd, *J* = 64.0, 18.0 Hz ,2H), 1.03 (d, *J* = 6.2 Hz, 3H), 0.92 (d, *J* = 6.2 Hz, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 176.4, 167.5, 140.4, 130.6, 129.9, 124.1, 123.3, 110.9, 69.2, 51.4, 43.8, 21.5, 21.3.

Butyl 2-(3-bromo-2-oxoindolin-3-yl)acetate (A5)



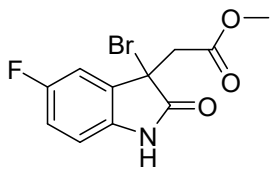
A5

Yellow solid.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.54 (s, 1H), 7.37 (d, *J* = 7.5 Hz, 1H), 7.31 – 7.23 (m, 1H), 7.07 (t, *J* = 7.6 Hz, 1H), 6.92 (d, *J* = 7.8 Hz, 1H), 4.05 – 3.78 (m, 2H), 3.61 (dd, *J* = 48.0, 16.0 Hz, 2H), 1.45 – 1.34 (m, 2H), 1.22 – 1.14 (m, 2H), 0.82 (t, *J* = 7.3 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 175.9, 168.3, 140.3, 130.6, 129.9, 124.1, 123.4, 110.8, 65.3, 51.2, 43.5, 30.4, 19.0, 13.7.

Methyl 2-(3-bromo-5-fluoro-2-oxoindolin-3-yl)acetate (A6)



A6

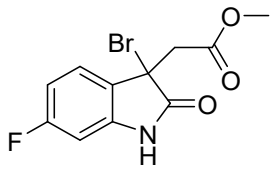
Yellow solid.

^{1}H NMR (400 MHz, Acetonitrile-d_3) δ 8.71 (s, 1H), 7.25 (dd, *J* = 8.2, 2.7 Hz, 1H), 7.05 (td, *J* = 9.1, 2.6 Hz, 1H), 6.92 (dd, *J* = 8.6, 4.3 Hz, 1H), 3.63 (d, *J* = 17.2 Hz, 1H), 3.53 – 3.49 (m, 4H).

^{13}C NMR (101 MHz, Acetonitrile-d_3) δ 175.65 , 169.72 , 159.71 (d, *J* = 239.0 Hz), 138.00 (d, *J* = 2.1 Hz), 132.32 (d, *J* = 9.1 Hz), 117.64 (d, *J* = 23.9 Hz), 112.67 (d, *J* = 25.5 Hz), 112.31 (d, *J* = 8.0 Hz).

^{19}F NMR (377 MHz, CD_3CN) δ -121.8.

Methyl 2-(3-bromo-6-fluoro-2-oxoindolin-3-yl)acetate (A7)



A7

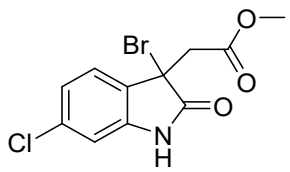
Yellow solid.

^{1}H NMR (400 MHz, Acetonitrile-d_3) δ 8.81 (s, 1H), 7.43 (dd, *J* = 8.4, 5.4 Hz, 1H), 6.84 – 6.68 (m, 2H), 3.65 (d, *J* = 17.1 Hz, 1H), 3.513 -3.49 (m, *J* = 15.9 Hz, 4H).

^{13}C NMR (101 MHz, Acetonitrile-d_3) δ 175.87 , 169.73 , 164.71 (d, *J* = 246.2 Hz), 143.59 (d, *J* = 12.5 Hz), 126.70 (d, *J* = 10.1 Hz), 126.69 , 109.89 (d, *J* = 23.3 Hz), 99.74 (d, *J* = 27.8 Hz), 52.55 , 51.78 , 43.14 .

^{19}F NMR (377 MHz, CD_3CN) δ -110.3.

Methyl 2-(3-bromo-6-chloro-2-oxoindolin-3-yl)acetate (A8)



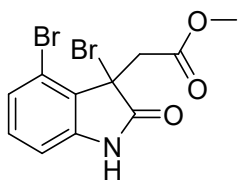
A8

Yellow solid.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.56 (s, 1H), 7.28 (d, *J* = 8.1 Hz, 1H), 7.04 (dd, *J* = 8.1, 1.9 Hz, 1H), 6.94 (d, *J* = 1.9 Hz, 1H), 3.65 (d, *J* = 17.1 Hz, 1H), 3.56 - 3.51 (m, 4H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 175.8, 168.8, 141.4, 136.4, 128.2, 125.1, 123.5, 111.6, 52.4, 50.1, 43.1.

Methyl 2-(3,4-dibromo-2-oxoindolin-3-yl)acetate (A9)



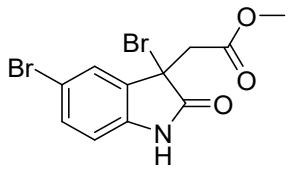
A9

Yellow solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.60 (s, 1H), 7.18 (d, *J* = 8.1 Hz, 1H), 7.14 (t, *J* = 7.9 Hz, 1H), 6.89 (d, *J* = 7.6 Hz, 1H), 3.90 (dd, *J* = 364.9, 17.4 Hz, 2H), 3.56 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 175.2, 169.2, 142.4, 131.7, 127.6, 127.4, 119.9, 109.9, 52.3, 51.8, 41.3.

Methyl 2-(3,5-dibromo-2-oxoindolin-3-yl)acetate (A10)



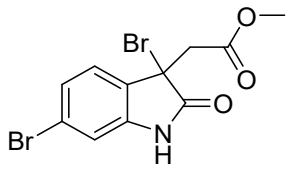
A10

Yellow solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.16 (s, 1H), 7.47 (d, *J* = 2.1 Hz, 1H), 7.40 (dd, *J* = 8.2, 2.0 Hz, 1H), 6.81 (d, *J* = 8.3 Hz, 1H), 3.65 (d, *J* = 17.3 Hz, 1H), 3.57 (s, 3H), 3.51 (d, *J* = 17.3 Hz, 1H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 175.1, 168.8, 139.2, 133.4, 131.9, 127.3, 115.8, 112.3, 52.4, 49.9, 43.0.

Methyl 2-(3,6-dibromo-2-oxoindolin-3-yl)acetate (A11)

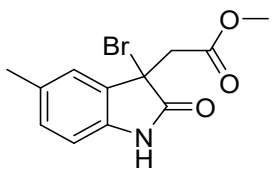


A11

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.90 (s, 1H), 7.25 – 7.17 (m, 2H), 7.11 (d, *J* = 1.7 Hz, 1H), 3.65 (d, *J* = 17.1 Hz, 1H), 3.59 – 3.50 (m, 4H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 175.9, 168.8, 141.6, 128.8, 126.4, 125.3, 124.3, 114.5, 52.4, 50.2, 43.0.

Methyl 2-(3-bromo-5-methyl-2-oxoindolin-3-yl)acetate (A12)



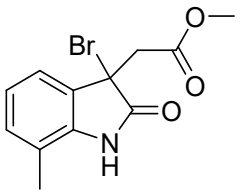
A12

Yellow solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.72 (s, 1H), 7.17 (d, *J* = 1.5 Hz, 1H), 7.06 (dd, *J* = 8.0, 1.6 Hz, 1H), 6.81 (d, *J* = 7.9 Hz, 1H), 3.65 (d, *J* = 17.0 Hz, 1H), 3.56 -3.53 (m, 4H), 2.31 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 176.1, 168.8, 137.9, 133.0, 131.1, 129.7, 124.7, 110.7, 52.3, 51.5, 43.2, 21.2.

Methyl 2-(3-bromo-7-methyl-2-oxoindolin-3-yl)acetate (A13)



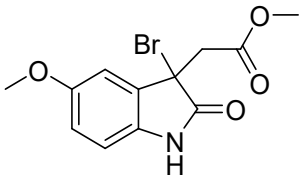
A13

Yellow solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 9.37 (s, 1H), 7.20 (d, *J* = 7.5 Hz, 1H), 7.09 (d, *J* = 7.7 Hz, 1H), 6.97 (t, *J* = 7.6 Hz, 1H), 3.61 (dd, *J* = 60.0, 18.0 Hz 2H), 3.51 (s, 3H), 2.31 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 176.7, 168.8, 139.2, 132.0, 129.3, 123.2, 121.4, 120.5, 52.2, 51.9, 43.1, 16.5.

methyl 2-(3-bromo-5-methoxy-2-oxoindolin-3-yl)acetate (A14)



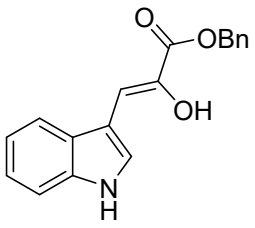
A14

Yellow solid.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 7.98 (s, 1H), 7.02 – 6.91 (m, 1H), 6.81 (t, *J* = 1.6 Hz, 2H), 3.79 (s, 3H), 3.64 (d, *J* = 17.0 Hz, 1H), 3.55 – 3.49 (d, 4H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 175.5, 168.8, 156.3, 133.4, 130.9, 115.4, 111.3, 110.9, 55.9, 52.3, 51.3, 43.2.

Benzyl (Z)-2-hydroxy-3-(1H-indol-3-yl)acrylate (B2)



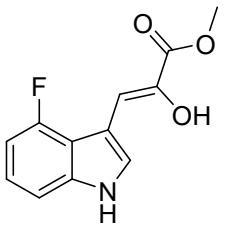
B2

Red solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.41 (s, 1H), 7.98 (d, *J* = 2.6 Hz, 1H), 7.78 (d, *J* = 7.8 Hz, 1H), 7.46 (d, *J* = 7.1 Hz, 2H), 7.44 – 7.37 (m, 4H), 7.27 – 7.23 (m, 1H), 7.20 (t, *J* = 7.5 Hz, 1H), 7.01 (s, 1H), 6.25 (s, 1H), 5.36 (s, 2H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 166.1, 136.7, 135.7, 135.6, 128.8, 128.6, 128.4, 127.6, 126.9, 122.9, 120.6, 118.8, 111.4, 110.8, 104.5, 67.8.

Methyl (Z)-3-(4-fluoro-1H-indol-3-yl)-2-hydroxyacrylate (B3)



B3

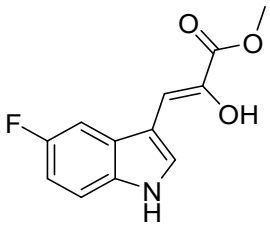
Yellow solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.50 (s, 1H), 7.98 (d, *J* = 2.3 Hz, 1H), 7.21 (s, 1H), 7.18 – 7.11 (m, 2H), 6.84 (dd, *J* = 11.2, 7.6 Hz, 1H), 3.92 (s, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 166.77 , 157.60 (d, *J* = 247.3 Hz), 138.15 (d, *J* = 11.0 Hz), 136.91 , 127.64 , 123.29 (d, *J* = 8.5 Hz), 115.48 (d, *J* = 18.5 Hz), 109.58 (d, *J* = 3.2 Hz), 107.50 (d, *J* = 3.0 Hz), 106.08 (d, *J* = 19.6 Hz), 105.44 (d, *J* = 5.4 Hz), 53.1.

^{19}F NMR (565 MHz, $CDCl_3$) δ -123.4.

Methyl (Z)-3-(5-fluoro-1H-indol-3-yl)-2-hydroxyacrylate (B4)



B4

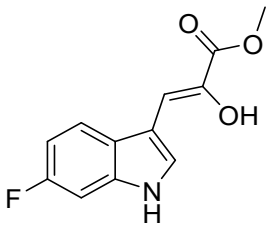
White solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.45 (s, 1H), 7.99 (d, *J* = 2.7 Hz, 1H), 7.43 (dd, *J* = 9.5, 2.5 Hz, 1H), 7.31 (dd, *J* = 8.8, 4.3 Hz, 1H), 6.99 (td, *J* = 8.9, 2.5 Hz, 1H), 6.84 (d, *J* = 1.6 Hz, 1H), 6.28 (d, *J* = 1.7 Hz, 1H), 3.93 (s, 3H).

^{13}C NMR (151 MHz, Chloroform-*d*) δ 166.58, 158.53 (d, *J* = 236.4 Hz), 136.76 , 132.09 , 129.04 , 127.46 (d, *J* = 9.8 Hz), 112.09 (d, *J* = 9.8 Hz), 111.21 (d, *J* = 26.2 Hz), 110.98 (d, *J* = 4.4 Hz), 104.04 (d, *J* = 23.9 Hz), 103.79 , 53.09.

^{19}F NMR (565 MHz, $CDCl_3$) δ -123.2.

Methyl (Z)-3-(6-fluoro-1H-indol-3-yl)-2-hydroxyacrylate (B5)



B5

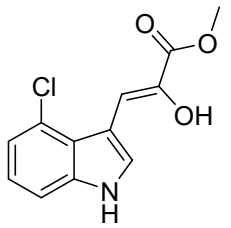
Red solid.

^{1}H NMR (400 MHz, Acetonitrile-d_3) δ 9.64 (s, 1H), 7.88 (d, *J* = 2.7 Hz, 1H), 7.72 (dd, *J* = 8.7, 5.3 Hz, 1H), 7.19 (dd, *J* = 9.9, 2.4 Hz, 1H), 6.94 (ddd, *J* = 9.8, 8.7, 2.4 Hz, 1H), 6.88 – 6.82 (m, 2H), 3.85 (s, 3H).

^{13}C NMR (101 MHz, Acetonitrile-d_3) δ 166.55 , 160.79 (d, *J* = 235.4 Hz), 138.31 , 136.64 (d, *J* = 12.9 Hz), 129.03 (d, *J* = 3.1 Hz), 124.29 , 120.34 (d, *J* = 10.2 Hz), 110.83 , 109.18 (d, *J* = 24.7 Hz), 104.27 , 98.56 (d, *J* = 26.2 Hz), 53.12 .

^{19}F NMR (377 MHz, CD_3CN) δ -122.7.

Methyl (Z)-3-(4-chloro-1H-indol-3-yl)-2-hydroxyacrylate (B6)



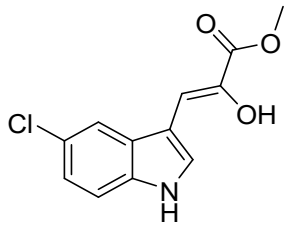
B6

White solid.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.56 (s, 1H), 8.12 (d, *J* = 2.8 Hz, 1H), 7.76 (s, 1H), 7.36 – 7.23 (m, 1H), 7.18 – 7.06 (m, 2H), 6.35 (d, *J* = 1.7 Hz, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 167.0, 137.1, 136.4, 129.2, 126.7, 123.2, 123.1, 122.1, 111.1, 110.3, 105.1, 53.2.

Methyl (Z)-3-(5-chloro-1H-indol-3-yl)-2-hydroxyacrylate (B7)



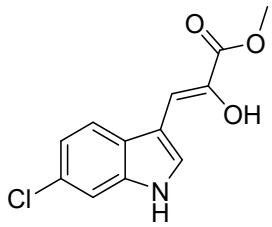
B7

White solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.44 (s, 1H), 7.97 (s, 1H), 7.75 (s, 1H), 7.32 (d, *J* = 8.6 Hz, 1H), 7.20 (d, *J* = 8.5 Hz, 1H), 6.85 (s, 1H), 6.27 (s, 1H), 3.93 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 166.5, 137.0, 134.0, 128.5, 128.0, 126.4, 123.2, 118.5, 112.4, 110.6, 103.4, 53.1.

Methyl (Z)-3-(6-chloro-1H-indol-3-yl)-2-hydroxyacrylate (B8)



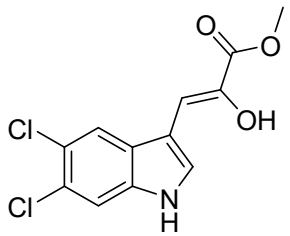
B8

Red solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.41 (s, 1H), 7.94 (d, *J* = 2.7 Hz, 1H), 7.68 (d, *J* = 8.4 Hz, 1H), 7.39 (d, *J* = 1.8 Hz, 1H), 7.17 (dd, *J* = 8.5, 1.8 Hz, 1H), 6.88 (d, *J* = 1.5 Hz, 1H), 6.28 (d, *J* = 1.6 Hz, 1H), 3.93 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 166.5, 137.1, 136.0, 128.7, 127.9, 125.5, 121.3, 119.7, 111.4, 110.9, 103.5, 53.1.

methyl (Z)-3-(5,6-dichloro-1H-indol-3-yl)-2-hydroxyacrylate (B8)



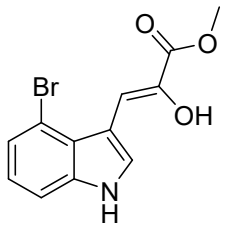
B9

White solid.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.43 (s, 1H), 7.96 (d, *J* = 2.7 Hz, 1H), 7.85 (s, 1H), 7.51 (s, 1H), 6.79 (d, *J* = 1.7 Hz, 1H), 6.31 (d, *J* = 1.8 Hz, 1H), 3.93 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 166.4, 137.4, 134.4, 128.9, 126.6, 124.8, 120.1, 112.9, 111.7, 110.6, 102.9, 53.2.

Methyl (Z)-3-(4-bromo-1H-indol-3-yl)-2-hydroxyacrylate (B10)



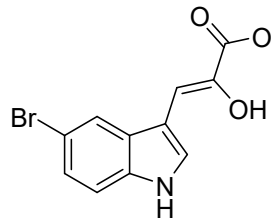
B10

White solid.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.57 (s, 1H), 8.15 (d, *J* = 2.8 Hz, 1H), 7.93 (s, 1H), 7.40 – 7.30 (m, 2H), 7.05 (t, *J* = 7.9 Hz, 1H), 6.35 (d, *J* = 1.6 Hz, 1H), 3.93 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 167.0, 137.0, 136.1, 129.5, 125.6, 124.3, 123.5, 114.5, 111.5, 110.9, 104.7, 53.2.

Methyl (Z)-3-(5-bromo-1H-indol-3-yl)-2-hydroxyacrylate (B11)



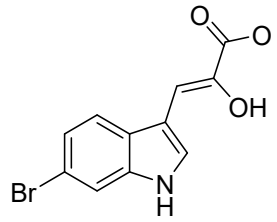
B11

Pink solid.

^{1}H NMR (600 MHz, Acetonitrile-d_3) δ 9.72 (s, 1H), 7.95 (s, 1H), 7.91 (d, *J* = 2.5 Hz, 1H), 7.39 (d, *J* = 8.6 Hz, 1H), 7.29 (dd, *J* = 8.6, 1.5 Hz, 1H), 6.86 (s, 1H), 6.83 (s, 1H), 3.85 (s, 3H).

^{13}C NMR (151 MHz, CD_3CN) δ 166.5, 138.4, 135.5, 129.8, 129.4, 125.8, 122.0, 114.3, 113.7, 110.5, 104.1, 53.1.

Methyl (Z)-3-(6-bromo-1H-indol-3-yl)-2-hydroxyacrylate (B12)



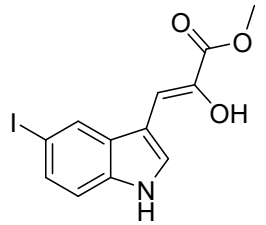
B12

White solid.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.42 (s, 1H), 7.93 (d, *J* = 2.6 Hz, 1H), 7.64 (d, *J* = 8.5 Hz, 1H), 7.55 (s, 1H), 7.30 (dd, *J* = 8.5, 1.7 Hz, 1H), 6.87 (s, 1H), 6.28 (d, *J* = 1.8 Hz, 1H), 3.93 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 166.5, 137.2, 136.4, 127.8, 125.8, 123.9, 120.1, 116.3, 114.3, 111.0, 103.5, 53.1.

Methyl (Z)-2-hydroxy-3-(5-iodo-1H-indol-3-yl)acrylate (B13)



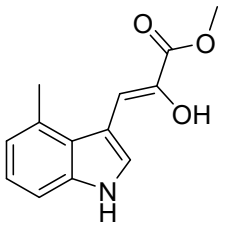
B13

White solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.44 (s, 1H), 8.11 (s, 1H), 7.92 (d, *J* = 2.6 Hz, 1H), 7.49 (dd, *J* = 8.5, 1.6 Hz, 1H), 7.18 (d, *J* = 8.4 Hz, 1H), 6.84 (d, *J* = 1.6 Hz, 1H), 6.28 (d, *J* = 1.7 Hz, 1H), 3.93 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 166.5, 137.1, 134.7, 131.2, 129.4, 128.0, 127.8, 113.3, 110.2, 103.3, 84.1, 53.1.

Methyl (Z)-2-hydroxy-3-(4-methyl-1H-indol-3-yl)acrylate (B14)



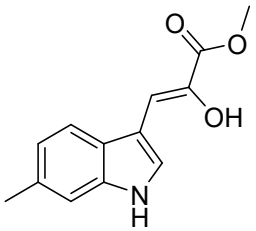
B14

White solid.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.43 (s, 1H), 8.09 (s, 1H), 7.31 (s, 1H), 7.26 – 7.24 (m, 1H), 7.12 (t, *J* = 7.6 Hz, 1H), 6.94 (d, *J* = 7.1 Hz, 1H), 6.29 (s, 1H), 3.93 (s, 3H), 2.80 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 166.9, 136.1, 135.9, 131.2, 128.3, 125.1, 122.7, 111.7, 109.5, 106.4, 53.1, 21.3.

Methyl (Z)-2-hydroxy-3-(6-methyl-1H-indol-3-yl)acrylate (B15)



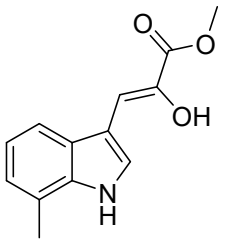
B15

Yellow solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.29 (s, 1H), 7.90 (d, *J* = 2.5 Hz, 1H), 7.67 (d, *J* = 8.1 Hz, 1H), 7.19 (s, 1H), 7.04 (dd, *J* = 8.0, 1.4 Hz, 1H), 6.94 (d, *J* = 1.6 Hz, 1H), 6.22 (d, *J* = 1.8 Hz, 1H), 3.93 (s, 3H), 2.48 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 166.7, 136.6, 136.1, 132.7, 127.0, 124.8, 122.3, 118.4, 111.3, 110.6, 104.4, 53.0, 21.8.

Methyl (Z)-2-hydroxy-3-(7-methyl-1H-indol-3-yl)acrylate (B16)



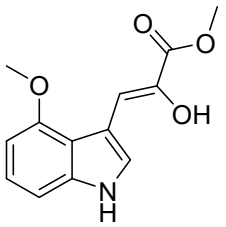
B16

White solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.35 (s, 1H), 7.96 (d, *J* = 2.4 Hz, 1H), 7.65 (d, *J* = 7.9 Hz, 1H), 7.14 (t, *J* = 7.5 Hz, 1H), 7.06 (d, *J* = 7.1 Hz, 1H), 6.97 (s, 1H), 6.27 (s, 1H), 3.93 (s, 3H), 2.51 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 166.7, 136.7, 135.2, 127.2, 126.5, 123.4, 120.7, 120.6, 116.4, 111.2, 104.5, 53.0, 16.7.

Methyl (Z)-2-hydroxy-3-(4-methoxy-1H-indol-3-yl)acrylate (B17)



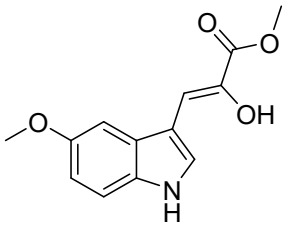
B17

Yellow solid.

^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.41 (s, 1H), 7.95 (s, 1H), 7.56 (s, 1H), 7.14 (t, *J* = 8.0 Hz, 1H), 7.00 (d, *J* = 8.1 Hz, 1H), 6.60 (d, *J* = 7.8 Hz, 1H), 6.26 (s, 1H), 4.00 (s, 42H), 3.92 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 167.0, 155.2, 137.2, 136.1, 126.9, 123.5, 116.3, 111.1, 107.0, 104.7, 100.9, 55.4, 53.0.

Methyl (Z)-2-hydroxy-3-(5-methoxy-1H-indol-3-yl)acrylate (B18)



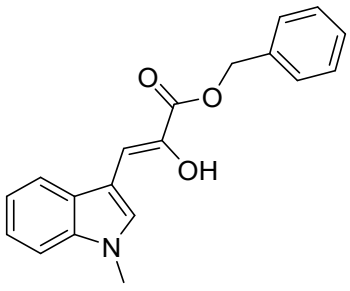
B18

White solid.

^{1}H NMR (600 MHz, Acetonitrile-d_3) δ 9.50 (s, 1H), 7.87 (d, *J* = 2.7 Hz, 1H), 7.34 (d, *J* = 8.8 Hz, 1H), 7.25 (d, *J* = 2.4 Hz, 1H), 6.90 (s, 1H), 6.83 (dd, *J* = 8.7, 2.5 Hz, 1H), 6.77 (s, 1H), 3.86 (s, 3H), 3.84 (s, 3H).

^{13}C NMR (151 MHz, CD_3CN) δ 166.7, 155.6, 137.6, 131.7, 129.2, 128.2, 113.3, 110.6, 105.0, 100.9, 56.2, 53.0.

Benzyl (Z)-2-hydroxy-3-(1-methyl-1H-indol-3-yl)acrylate (B19)

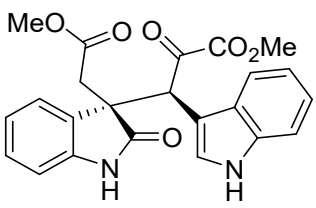


B19

White solid。

^{1}H NMR (400 MHz, DMSO-d_6) δ 9.14 (d, *J* = 1.7 Hz, 1H), 7.90 (s, 1H), 7.72 (d, *J* = 7.9 Hz, 1H), 7.51 – 7.33 (m, 6H), 7.22 (t, *J* = 7.3 Hz, 1H), 7.12 (t, *J* = 7.4 Hz, 1H), 6.87 (d, *J* = 1.6 Hz, 1H), 5.31 (s, 2H), 3.84 (s, 3H).

^{13}C NMR (101 MHz, DMSO) δ 164.6, 137.3, 136.4, 136.2, 131.8, 128.6, 128.1, 128.0, 126.8, 122.0, 119.8, 118.3, 110.1, 108.8, 104.9, 66.1, 32.8.



C1

Methyl (S)-3-(1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C1)

Yellow sold; 38.5 mg, 92% yield, >19:1 dr, 96% ee; melting point: 106 – 110 °C; $[\alpha]_D^{14.6}$ = -255.8 (*c* = 0.81 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 8.20 min, t_R (minor) = 10.68 min.

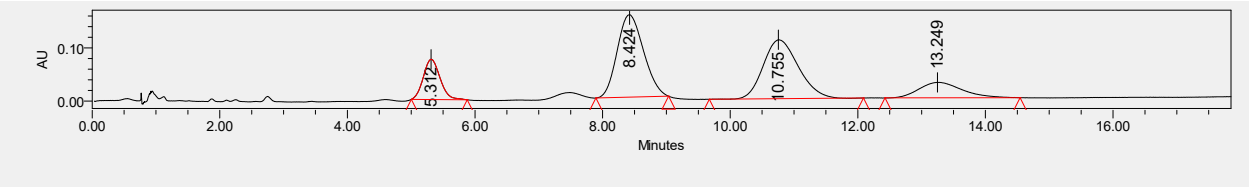
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.76 (s, 1H), 8.46 (s, 1H), 7.66 (d, *J* = 7.6 Hz, 1H), 7.35 (d, *J* = 8.0 Hz, 1H), 7.23 – 7.15 (m, 3H), 6.91 – 6.82 (m, 2H), 6.81 (d, *J* = 2.4 Hz, 1H), 6.72 (d, *J* = 7.2 Hz, 1H), 5.50 (s, 1H), 3.54 (s, 3H), 3.33 (s, 3H), 3.15 (dd, *J* = 52.0, 16.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.8, 180.1, 170.0, 160.9, 142.3, 136.5, 129.3, 128.7, 127.8, 126.9, 125.0, 123.0, 121.7, 120.9, 119.0, 111.9, 110.1, 103.9, 53.2, 51.7, 51.5, 49.9, 40.2.

IR: 3365, 2953, 2349, 1620, 1471, 1533, 1470, 1435, 1340, 747 cm^{-1}.

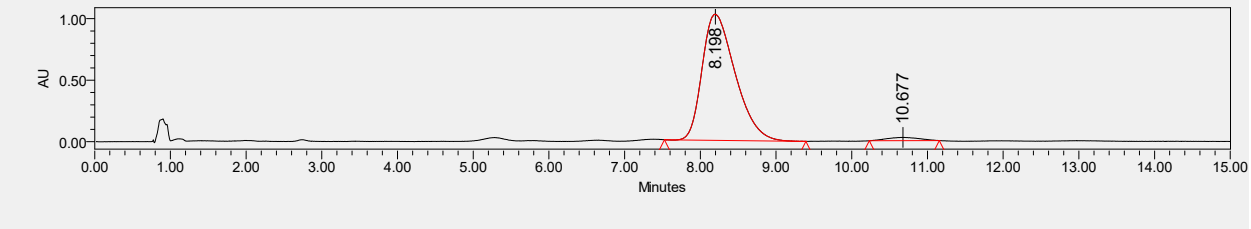
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{20}N_2O_6$ 419.1249; found 419.1248.

The UPCC chromatograms of racemic product **C1**



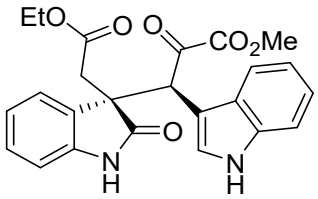
	Retention Time	Area	% Area	Height
1	5.312	1379872	12.09	75677
2	8.424	4442531	38.92	155097
3	10.755	4234268	37.10	110819
4	13.249	1356487	11.89	29024

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	8.198	30985121	97.79	1022971
2	10.677	699846	2.21	24821

Methyl (S)-3-((S)-3-(2-ethoxy-2-oxoethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C2)



C2

Red oil; 38.1 mg, 88% yield, >19:1 dr, 97% ee; $[\alpha]_D^{14.7}$ = -192.38 (*c* = 0.78 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 8.17 min, t_R (minor) = 10.36 min.

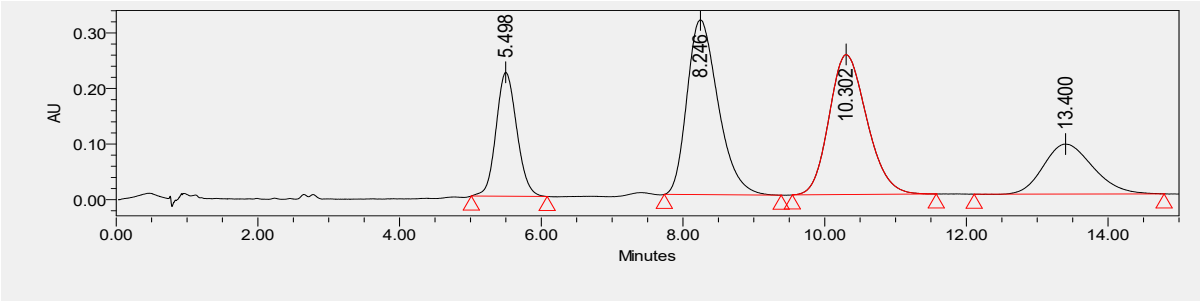
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.76 (m, 1H), 8.51 (s, 1H), 7.66 (d, *J* = 7.6 Hz, 1H), 7.35 (d, *J* = 7.9 Hz, 1H), 7.24 – 7.15 (m, 3H), 6.92 – 6.82 (m, 2H), 6.80 (d, *J* = 4.0 Hz, 1H), 6.73 (d, *J* = 7.2 Hz, 1H), 5.49 (s, 1H), 3.84 – 3.72 (m, 2H), 3.54 (s, 3H), 3.13 (dd, *J* =60.0, 16.0 Hz, 2H), 0.89 (t, *J* = 8.0 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.8, 180.2, 169.4, 160.9, 142.4, 136.5, 129.3, 128.7, 127.8, 126.9, 125.1, 123.0, 121.7, 120.9, 119.0, 111.8, 110.0, 103.9, 60.8, 53.1, 51.6, 50.0, 40.5, 13.8.

IR: 3358, 2910, 2850, 2350, 1728, 1620, 1532, 1470, 1433, 747 cm^{-1}.

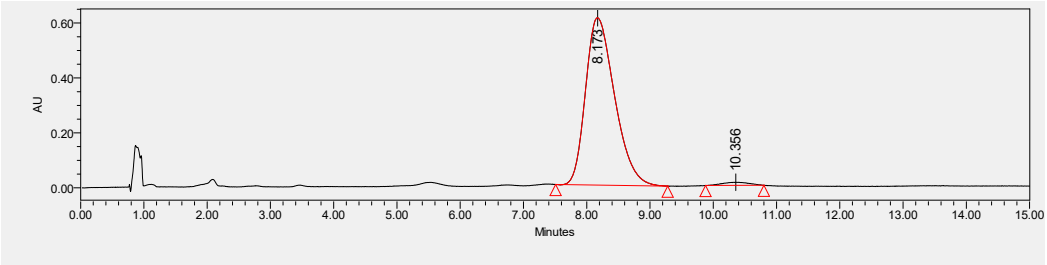
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{24}H_{22}N_2O_6$ 433.1405; found 433.1403.

The UPCC chromatograms of racemic product



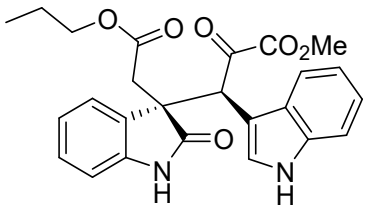
	Retention Time	Area	% Area	Height
1	5.498	4524009	16.28	222931
2	8.246	9574881	34.47	314336
3	10.302	9309435	33.51	252258
4	13.400	4372666	15.74	90073

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	8.173	19440205	98.35	609606
2	10.356	326417	1.65	11402

Methyl (S)-3-(1H-indol-3-yl)-2-oxo-3-((S)-2-oxo-3-(2-oxo-2-propoxyethyl)indolin-3-yl)propanoate (C3)



C3

Yellow solid; 35.8 mg, 80% yield, >19:1 dr, 96% ee; melting point: 139 – 142 °C; $[\alpha]_D^{14.7}$ = -192.82 (*c* = 0.40 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 8.54 min, t_R (minor) = 10.10 min.

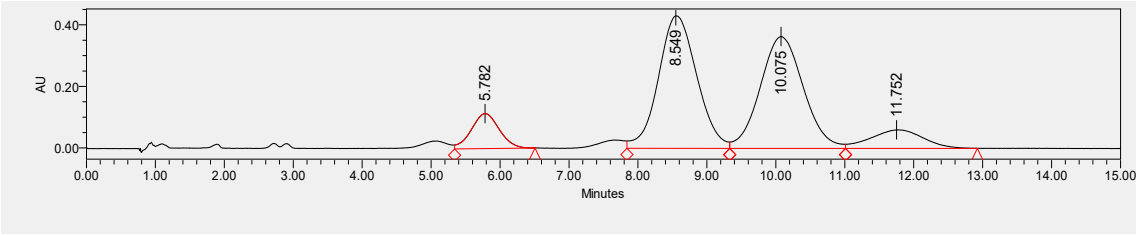
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.64 (s, 1H), 8.21 (s, 1H), 7.67 (d, *J* = 7.7 Hz, 1H), 7.39 (s, 1H), 7.25 – 7.16 (m, 3H), 6.92 – 6.80 (m, 3H), 6.72 (d, *J* = 7.4 Hz, 1H), 5.49 (s, 1H), 3.69 (t, *J* = 6.8 Hz, 2H), 3.55 (s, 3H), 3.26 – 2.98 (dd, *J* = 58.0, 16.0 Hz ,2H), 1.34 – 1.28 (m, 2H), 0.70 (t, *J* = 7.4 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.8, 180.0, 169.5, 160.9, 142.3, 136.5, 129.3, 128.7, 127.9, 126.8, 125.1, 123.1, 121.7, 121.0, 119.1, 111.8, 109.9, 104.1, 66.4, 53.1, 51.5, 50.0, 40.6, 21.7, 10.3.

IR: 3741, 3365, 2960, 2924, 2350, 1728, 1620, 1470, 1433, 748 cm^{-1}.

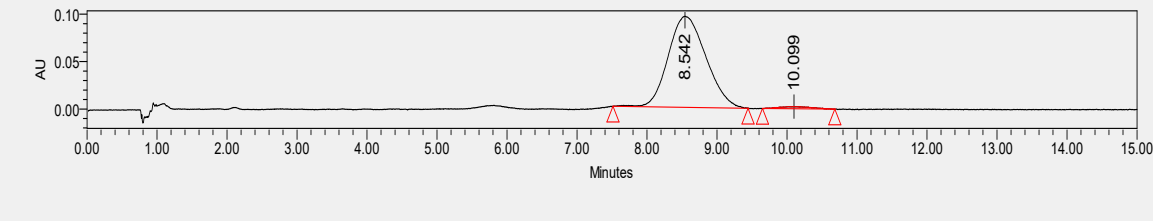
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{25}H_{24}N_2O_6$ 447.1562; found 447.1559.

The UPCC chromatograms of racemic product **C3**

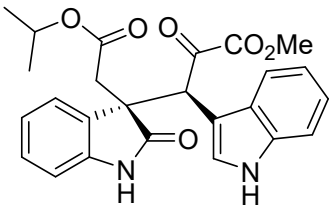


	Retention Time	Area	% Area	Height
1	5.782	3193277	8.22	113770
2	8.549	16638615	42.85	430520
3	10.075	15794829	40.67	363374
4	11.752	3207365	8.26	60405

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	8.542	3595844	98.01	96000
2	10.099	73027	1.99	2392



C4

Methyl (S) -3-(1H-indol-3-yl)-3-((S)-3-(2-isopropoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C4)

Yellow solid; 42.9 mg, 96% yield, >19:1 dr, 93% ee; melting point: 161 – 163 °C; $[\alpha]_D^{14.8}$ = -153.25 (*c* = 0.55 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OD-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 2.76 min, t_R (minor) = 3.83 min.

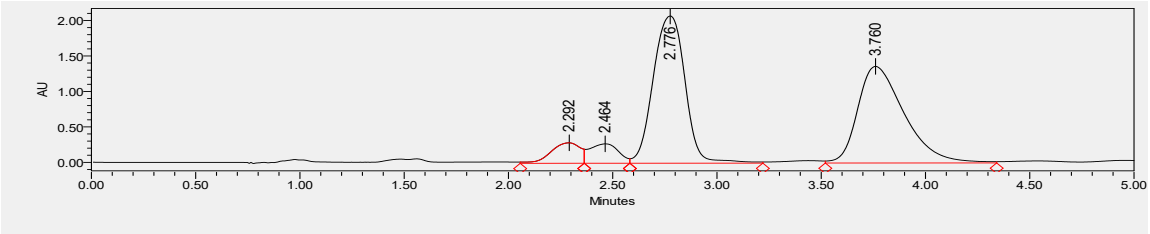
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.85 (s, 1H), 8.60 (s, 1H), 7.65 (d, *J* = 7.6 Hz, 1H), 7.35 (d, *J* = 7.6 Hz, 1H), 7.26 – 7.10 (m, 3H), 6.90 – 6.78 (m, 3H), 6.73 (d, *J* = 7.2 Hz, 1H), 5.47 (s, 1H), 4.63 (hept, *J* = 6.0 Hz, 1H)., 3.53 (s, 3H), 3.09 (dd, *J* = 68.4, 16.0 Hz, 2H), 0.86 (dd, *J* = 8.1, 6.4 Hz, 6H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.8, 180.3, 168.9, 161.0, 142.5, 136.5, 129.2, 128.6, 127.9, 126.9, 125.2, 123.0, 121.6, 120.9, 119.0, 111.9, 110.0, 103.9, 68.4, 53.1, 51.7, 50.1, 40.9, 21.4, 21.2.

IR: 3741, 3610, 3365, 2981, 2350, 1728, 1620, 1470, 1262, 749 cm^{-1}.

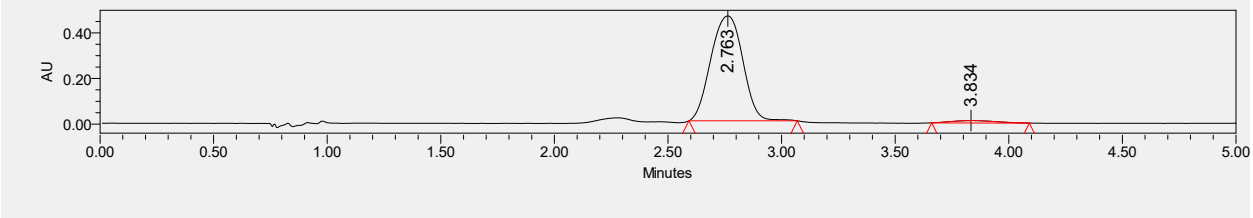
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{25}H_{24}N_2O_6$ 447.1562; found 447.1560.

The UPCC chromatograms of racemic product **C4**

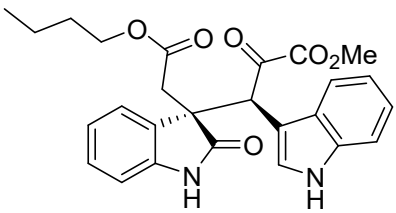


	Retention Time	Area	% Area	Height
1	2.292	2801181	5.76	287965
2	2.464	2658790	5.46	272782
3	2.776	22065947	45.35	2075487
4	3.760	21133562	43.43	1362057

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	2.763	4513624	96.30	461116
2	3.834	173441	3.70	11713



C5

Methyl (S)-3-((S)-3-(2-butoxy-2-oxoethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C5)

Yellow solid; 32.8 mg, 70% yield, >19:1 dr, 95% ee; melting point: 156 – 160 °C; $[\alpha]_D^{14.7}$ = -217.98 (*c* = 0.48 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OX-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 8.67 min, t_R (minor) = 12.56 min.

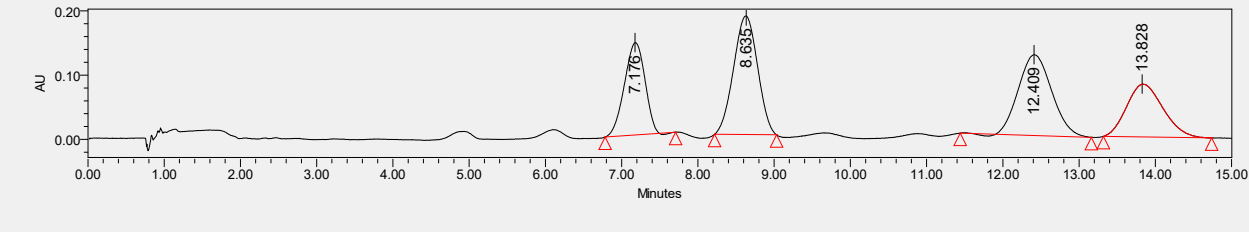
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.70 (s, 1H), 8.31 (s, 1H), 7.67 (d, *J* = 7.6 Hz, 1H), 7.36 (d, *J* = 7.6 Hz, 1H), 7.25 – 7.16 (m, 3H), 6.922 – 6.79 (m, 3H), 6.73 (d, *J* = 7.2 Hz, 1H), 5.49 (s, 1H), 3.74 (t, *J* = 6.8 Hz, 2H), 3.55 (s, 3H), 3.12 (dd, *J* = 48.0, 16.0 Hz, 2H), 1.33 – 1.19 (m, 2H), 1.15 – 1.04 (m, 2H), 0.76 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.8, 180.0, 169.5, 160.9, 142.3, 136.5, 129.3, 128.7, 127.8, 126.8, 125.0, 123.0, 121.7, 120.9, 119.1, 111.8, 110.0, 104.0, 64.7, 53.1, 51.5, 50.0, 40.6, 30.4, 19.0, 13.7.

IR: 3742, 3610, 3360, 2958, 2350, 1729, 1621, 1471, 1262, 749 cm^{-1}.

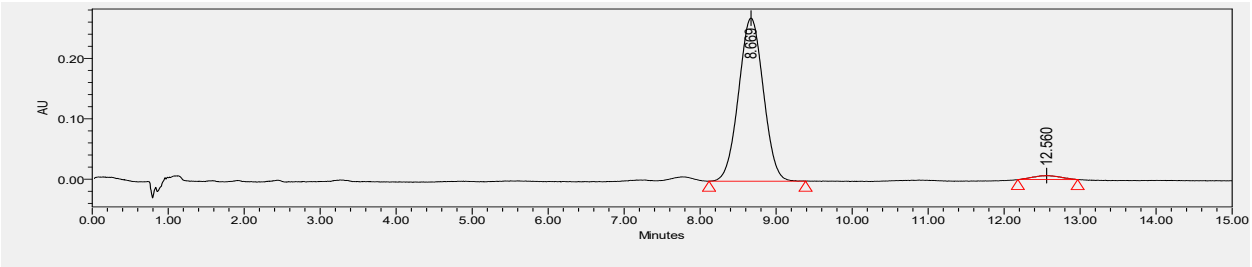
HRMS (FTMS+c ESI) m/z: [M - H]$^-$ calcd for $C_{26}H_{26}N_2O_6$ 461.1718; found 461.1714.

The UPCC chromatograms of racemic product **C5**

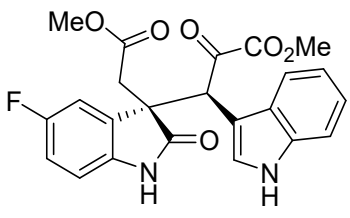


	Retention Time	Area	% Area	Height
1	7.176	2706204	20.30	143735
2	8.635	4029712	30.22	184608
3	12.409	3875042	29.06	125855
4	13.828	2722745	20.42	82346

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	8.669	6095932	97.35	270073
2	12.560	165797	2.65	6495



C6

Methyl 3-(5-fluoro-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C6)

Yellow solid; 38.0 mg, 87% yield, >19:1 dr, 95% ee; melting point: 111 – 116 °C; $[\alpha]_D^{14.6}$ = -242.16 (*c* = 0.68 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 5.06 min, t_R (minor) = 5.72 min.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.81 (s, 1H), 8.59 (s, 1H), 7.67 (d, *J* = 8.0 Hz, 1H), 7.39 – 7.35 (m, 1H), 7.25 – 7.16 (m, 2H), 6.91 (td, *J* = 8.0, 2.4 Hz, 1H), 6.84 – 6.77 (m, 2H), 6.47 (dd, *J* = 8.0, 4.0 Hz, 1H), 5.50 (s, 1H), 3.56 (s, 3H), 3.36 (s, 3H), 3.13 (dd, *J* = 72.0, 16.0 Hz, 2H).

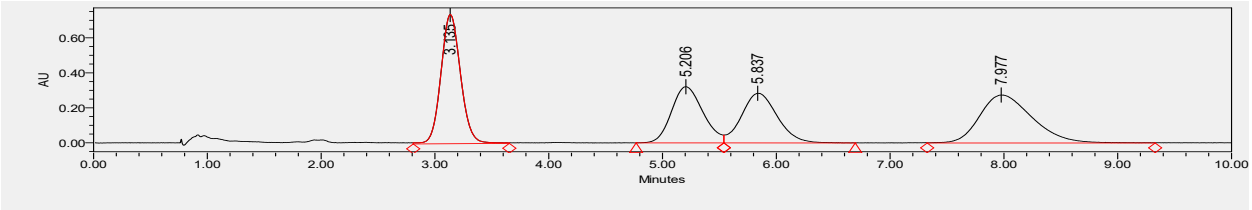
^{13}C NMR (101 MHz, Chloroform-*d*) δ 187.71 , 180.05 , 169.73 , 160.82 , 158.35 (d, *J* = 239.1 Hz), 138.44 , 136.60 , 131.01 (d, *J* = 8.5 Hz), 127.68 , 126.77 , 123.21 , 118.92 , 114.94 (d, *J* = 23.3 Hz), 112.96 (d, *J* = 25.3 Hz), 111.95 , 110.49 (d, *J* = 8.1 Hz), 103.59 , 53.23 ,51.90, 51.86, 50.01 , 40.22 .

^{19}F NMR (377 MHz, $CDCl_3$) δ -121.0.

IR: 3368, 2923, 2350, 1730, 1630, 1486, 1340, 1260, 1198, 747 cm^{-1}.

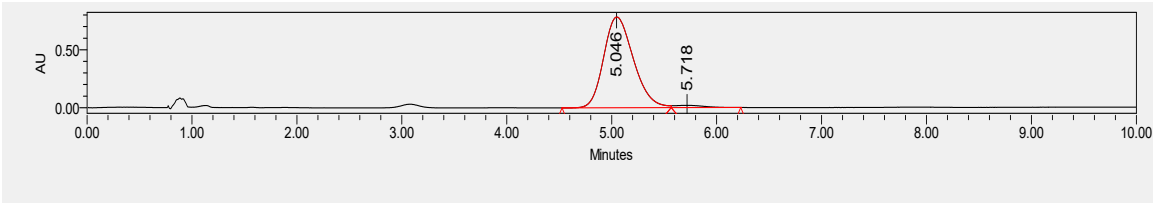
HRMS (FTMS+c ESI) m/z: [M - H]$^{-}$ calcd for $C_{23}H_{19}FN_2O_6$ 437.1154; found 437.1152.

The UPCC chromatograms of racemic product **C6**

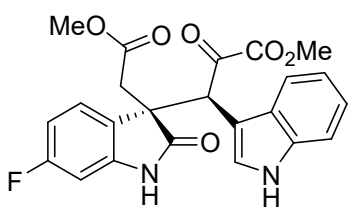


	Retention Time	Area	% Area	Height
1	3.135	8871869	29.48	738485
2	5.206	6187804	20.56	321236
3	5.837	6202977	20.61	284067
4	7.977	8829377	29.34	274286

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	5.046	15404946	97.61	783354
2	5.718	376959	2.39	19508



C7

Methyl 3-(6-fluoro-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C7)

Yellow oil; 42.0 mg, 96% yield, >19:1 dr, 92% ee; $[\alpha]_D^{15.0}$ = -229.77 (*c* = 0.70 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 4.70 min, t_R (minor) = 6.02 min.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.83 (d, *J* = 2.8 Hz, 1H), 8.77 (s, 1H), 7.65 (d, *J* = 7.6 Hz, 1H), 7.36 (d, *J* = 7.6 Hz, 1H), 7.20 (m, 2H), 6.80 (d, *J* = 2.8 Hz, 1H), 6.66 – 6.59 (m, 2H), 6.53 (ddd, *J* = 10.4, 8.4, 2.4 Hz, 1H), 5.47 (s, 1H), 3.55 (s, 3H), 3.35 (s, 3H), 3.15

(dd, *J* = 56.0, 16.0 Hz, 2H).

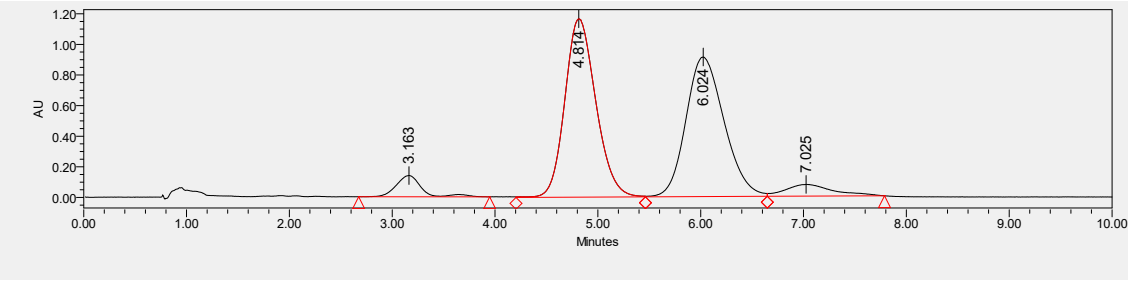
^{13}C NMR (101 MHz, Chloroform-*d*) δ 187.89 , 180.54 , 169.92 , 163.17 (d, *J* = 245.2 Hz), 160.89 , 143.87 (d, *J* = 12.0 Hz), 136.58 , 127.66 , 126.83 , 125.93 (d, *J* = 9.6 Hz), 124.72 (d, *J* = 2.9 Hz), 123.13 , 120.99 , 118.95 , 111.93 , 107.94 (d, *J* = 22.4 Hz), 103.67 , 98.88 (d, *J* = 27.3 Hz), 53.21 , 51.82 , 51.12 , 50.01 .

^{19}F NMR (377 MHz, $CDCl_3$) δ -111.7.

IR: 3364, 2954, 2350, 1730, 1628, 1437, 1339, 1264, 1210, 746 cm^{-1}.

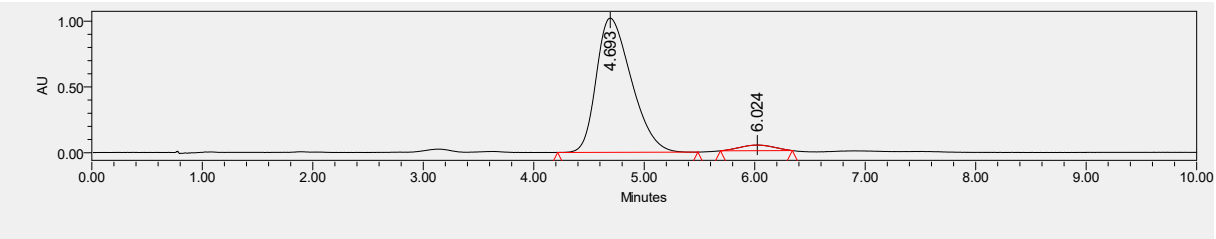
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}FN_2O_6$ 437.1154; found 437.1151.

The UPCC chromatograms of racemic product **C7**

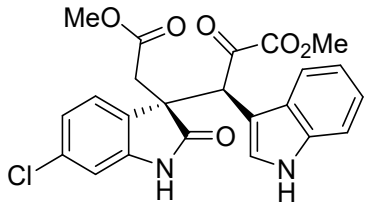


	Retention Time	Area	% Area	Height
1	3.163	2359905	4.48	138839
2	4.814	24366588	46.26	1165845
3	6.024	23495175	44.60	912359
4	7.025	2452565	4.66	76330

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	4.693	22448099	96.09	1020136
2	6.024	914607	3.91	43082



C8

Methyl (S)-3-((S)-6-chloro-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C8)

Yellow solid; 43.9 mg, 97% yield, >19:1 dr, 95% ee; melting point: 106 – 114 °C; $[\alpha]_D^{14.7}$ = -200.28 (*c* = 0.73 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OX-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 6.75 min, t_R (minor) = 10.89 min.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.77 (s, 1H), 8.71 (s, 1H), 7.66 (d, *J* = 7.8 Hz, 1H), 7.36 (d, *J* = 7.8 Hz, 1H), 7.24 – 7.17 (m, 2H),

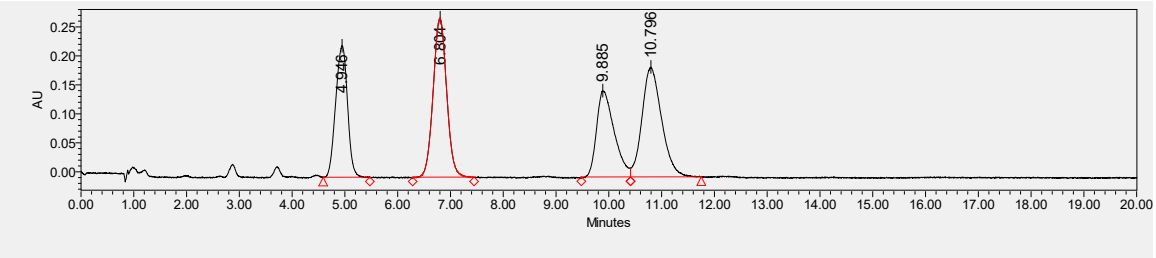
6.90 (d, *J* = 2.0 Hz, 1H), 6.87 – 6.75 (m, 2H), 6.61 (d, *J* = 8.0 Hz, 1H), 5.47 (s, 1H), 3.56 (s, 3H), 3.36 (s, 3H), 3.15 (dd, *J* = 56.0, 16.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.8, 180.2, 169.8, 160.8, 143.6, 136.6, 134.4, 127.8, 127.7, 126.8, 125.8, 123.2, 121.6, 121.1, 118.9, 111.9, 110.8, 103.7, 53.2, 51.9, 51.2, 50.1, 40.2. ^{13}C NMR (101 MHz, $CDCl_3$) δ 187.8, 180.2, 169.8, 160.8, 143.6, 136.6, 134.4, 127.8, 127.7, 126.8, 125.8, 123.2, 121.6, 121.1, 118.9, 111.9, 110.8, 103.7, 53.2, 51.9, 51.2, 50.1, 40.2.

IR: 3365, 2953, 2350, 1730, 1616, 1485, 1337, 1262, 1125, 746 cm^{-1}.

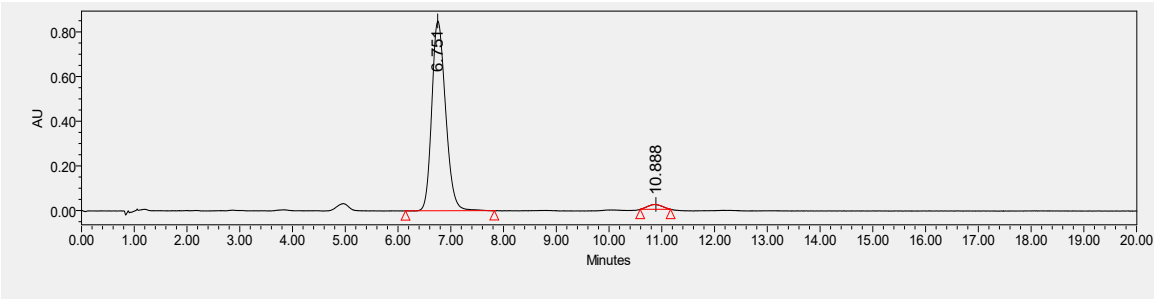
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}ClN_2O_6$ 453.0859, 455.0829; found 453.0860, 455.0833.

The UPCC chromatograms of racemic product **C8**

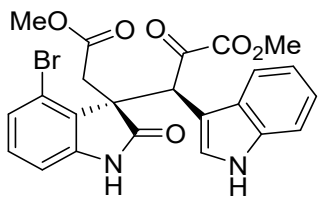


	Retention Time	Area	% Area	Height
1	4.946	3538432	21.17	226907
2	6.804	4857716	29.06	275052
3	9.885	3447818	20.63	148894
4	10.796	4871483	29.14	189760

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	6.751	15438711	97.37	850182
2	10.888	416934	2.63	21835



C9

Methyl (S)-3-((S)-4-bromo-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C9)

Yellow oil; 34.8 mg, 70% yield, >19:1 dr, 89% ee; $[\alpha]_D^{14.8}$ = -217.92 (*c* = 0.42 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL ID-3, CO_2/EtOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 3.84 min, t_R (minor) = 4.29 min.

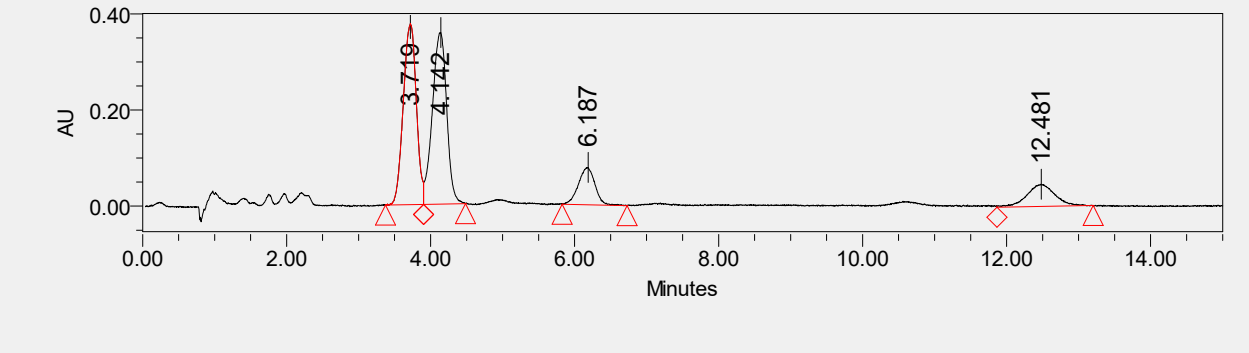
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.95 (s, 1H), 8.84 (s, 1H), 7.39 (d, *J* = 7.8 Hz, 1H), 7.17 (d, *J* = 7.8 Hz, 1H), 7.07 (d, *J* = 2.8 Hz, 1H), 7.02 (t, *J* = 8.0 Hz, 2H), 6.97 – 6.92 (m, 1H), 6.74 (t, *J* = 8.0 Hz, 1H), 6.35 (d, *J* = 7.6 Hz, 1H), 5.93 (s, 1H), 3.78 (dd, *J* = 40.0, 16.0 Hz, 2H), 3.58 (s, 3H), 3.42 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.0, 179.0, 170.5, 162.1, 144.0, 135.9, 130.4, 128.3, 127.5, 126.8, 126.6, 122.3, 120.1, 118.3, 118.2, 111.5, 109.1, 103.4, 55.2, 53.2, 52.0, 46.4, 36.8.

IR: 3362, 2923, 2349, 1736, 1615, 1450, 1348, 1262, 176, 745 cm^{-1}.

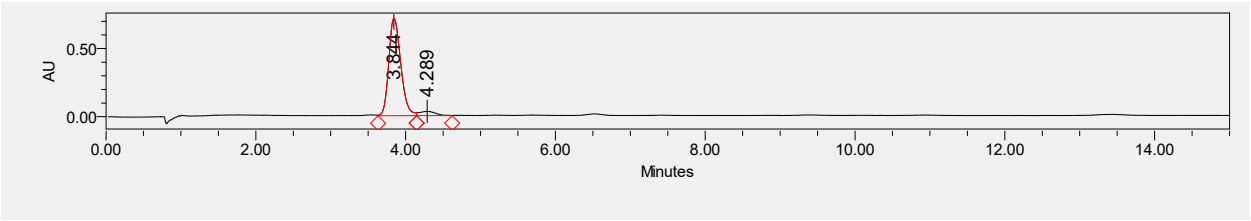
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}BrN_2O_6$ 497.0354, 499.0333; found 497.0355, 499.0334.

The UPCC chromatograms of racemic product **C9**

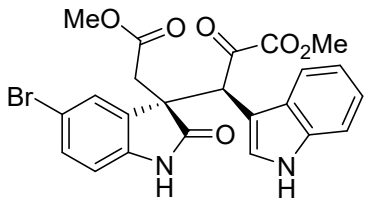


	Retention Time	Area	% Area	Height
1	3.719	4744144	38.95	376583
2	4.142	4943696	40.59	357036
3	6.187	1237132	10.16	77615
4	12.481	1255830	10.31	46322

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	3.844	7948017	94.33	713874
2	4.289	477683	5.67	31426



C10

Methyl (S)-3-((S)-5-bromo-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C10)

Yellow solid; 41.7 mg, 84% yield, >19:1 dr, 96% ee; melting point: 106 – 108 °C; $[\alpha]_D^{14.7}$ = -168.06 (*c* = 0.29 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 7.30 min, t_R (minor) = 8.50 min.

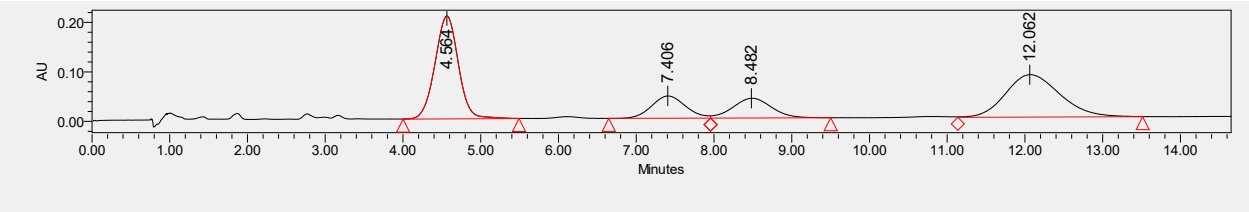
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.64 (s, 1H), 8.27 (s, 1H), 7.67 (d, *J* = 7.6 Hz, 1H), 7.42 (d, *J* = 8.0 Hz, 1H), 7.34 (dd, *J* = 8.0, 2.0 Hz, 1H), 7.29 – 7.20 (m, 2H), 6.85 (d, *J* = 2.8 Hz, 1H), 6.79 (d, *J* = 8.0 Hz, 1H), 6.77 (d, *J* = 2.0 Hz, 1H), 5.48 (s, 1H), 3.57 (s, 3H), 3.39 (s, 3H), 3.10 (dd, *J* = 94.0, 16.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.7, 179.4, 169.6, 160.7, 141.6, 136.6, 131.5, 128.1, 127.6, 126.6, 123.4, 121.2, 119.0, 114.2, 111.9, 111.3, 103.9, 53.2, 51.9, 51.4, 50.2, 40.4.

IR: 3365, 2953, 2350, 1730, 1617, 1457, 1338, 1262, 1176, 745 cm^{-1}.

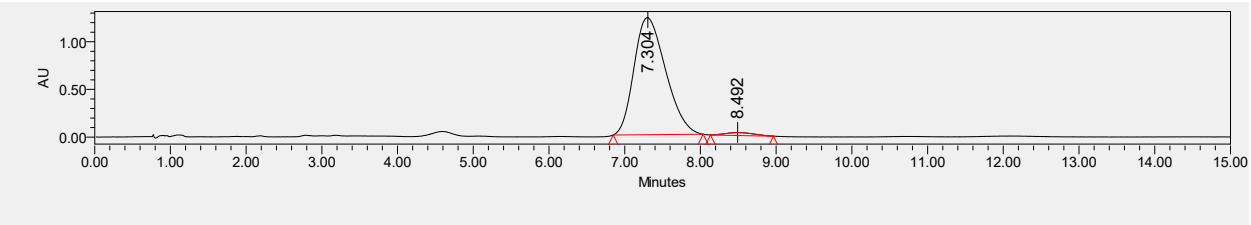
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}BrN_2O_6$ 497.0354, 499.0333; found 497.0354, 499.0334.

The UPCC chromatograms of racemic product **C10**

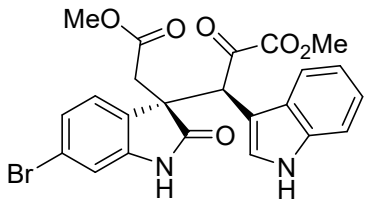


	Retention Time	Area	% Area	Height
1	4.564	4325500	38.52	208072
2	7.406	1368399	12.19	45039
3	8.482	1379286	12.28	39975
4	12.062	4156784	37.02	85663

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	7.304	35592730	97.80	1227024
2	8.492	800185	2.20	31274



C11

Methyl (S)-3-((S)-6-bromo-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C11)

Yellow solid; 43.7 mg, 88% yield, >19:1 dr, 96% ee; melting point: 121 – 124 °C; $[\alpha]_D^{14.6}$ = -167.98 (*c* = 0.51 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IH-3, CO_2/MeOH = 85/15, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 11.35 min, t_R (minor) = 10.55 min.

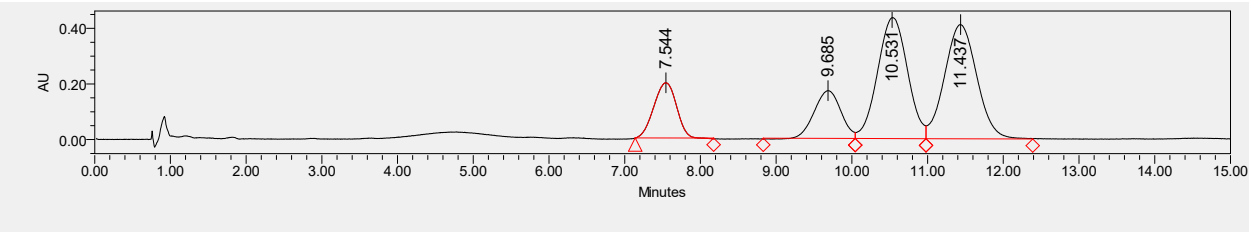
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.75 (s, 1H), 8.72 (s, 1H), 7.64 (d, *J* = 8.0 Hz, 1H), 7.37 (d, *J* = 8.0 Hz, 1H), 7.26 – 7.23 (m, 1H), 7.20 (d, *J* = 7.6 Hz, 1H), 7.06 (d, *J* = 1.6 Hz, 1H), 6.99 (dd, *J* = 8.0, 1.6 Hz, 1H), 6.79 (d, *J* = 2.8 Hz, 1H), 6.55 (d, *J* = 8.0 Hz, 1H), 5.46 (s, 1H), 3.56 (s, 3H), 3.36 (s, 3H), 3.15 (dd, *J* = 52.0, 16.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.8, 180.1, 169.8, 160.8, 143.8, 136.6, 128.4, 127.6, 126.8, 126.2, 124.6, 123.2, 122.4, 121.1, 118.9, 113.6, 111.9, 103.7, 51.9, 51.2, 50.0, 40.1.

IR: 3366, 2953, 2350, 1730, 1611, 1482, 1337, 1208, 1084, 747 cm^{-1}.

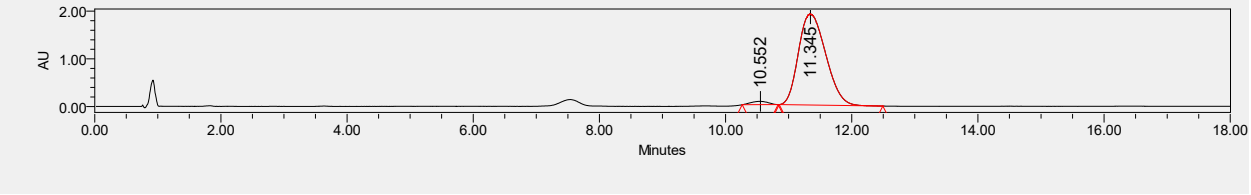
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}BrN_2O_6$ 497.0354, 499.0333; found 497.0352, 499.0332.

The UPCC chromatograms of racemic product **C11**

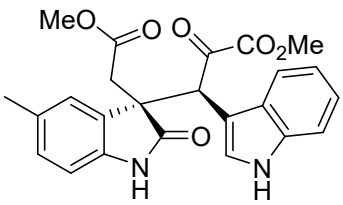


	Retention Time	Area	% Area	Height
1	7.544	4125502	12.71	198542
2	9.685	4236817	13.05	171836
3	10.531	11940642	36.78	435195
4	11.437	12157885	37.45	410810

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	10.552	1320319	2.25	69699
2	11.345	57272650	97.75	1914363



C12

Methyl (S)-3-(1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-5-methyl-2-oxoindolin-3-yl)-2-oxopropanoate (C12)

Yellow oil; 37.2 mg, 86% yield, >19:1 dr, 98% ee; $[\alpha]_D^{15.3}$ = -283.25 (*c* = 0.4 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 9.51 min, t_R (minor) = 10.94 min.

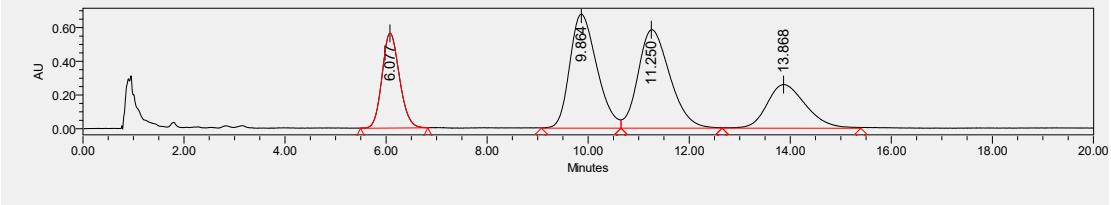
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.76 (s, 1H), 8.33 (s, 1H), 7.61 (d, *J* = 7.6 Hz, 1H), 7.34 (d, *J* = 8.0 Hz, 1H), 7.21 (t, *J* = 7.2 Hz, 1H), 7.15 (t, *J* = 7.2 Hz, 1H), 6.99 (d, *J* = 7.6 Hz, 1H), 6.84 (d, *J* = 2.4 Hz, 1H), 6.76 (d, *J* = 7.6 Hz, 1H), 6.54 (s, 1H), 5.47 (s, 1H), 3.55 (s, 3H), 3.36 (s, 3H), 3.14 (dd, *J* = 40.0, 16.0 Hz, 2H), 2.16 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.9, 180.1, 170.0, 161.0, 139.7, 136.5, 131.0, 129.4, 129.0, 127.8, 126.9, 125.8, 123.0, 120.8, 119.1, 111.8, 109.6, 104.0, 53.1, 51.7, 51.5, 50.0, 40.1, 21.3.

IR: 3367, 2953, 2350, 1730, 1625, 1492, 1339, 1263, 1080, 740 cm^{-1}.

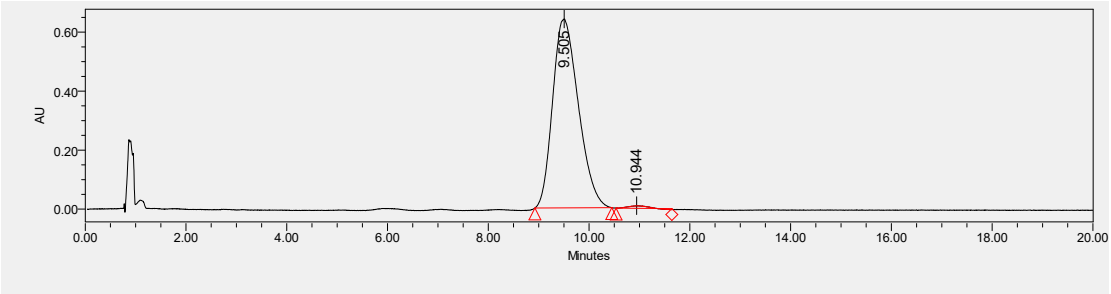
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{24}H_{22}N_2O_6$ 433.1405; found 433.1402.

The UPCC chromatograms of racemic product **C12**

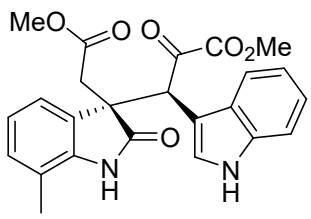


	Retention Time	Area	% Area	Height
1	6.077	13443692	17.24	562213
2	9.864	25161730	32.26	677210
3	11.250	25504279	32.70	585137
4	13.868	13886016	17.80	259412

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	9.505	22717679	98.86	640489
2	10.944	262670	1.14	9033



C13

Methyl (S)-3-(1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-7-methyl-2-oxoindolin-3-yl)-2-oxopropanoate (C13)

Yellow oil; 30.7 mg, 71% yield, >19:1 dr, 92% ee; $[\alpha]_D^{15.5}$ = -122.50 (*c* = 0.4 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 6.96 min, t_R (minor) = 13.62 min.

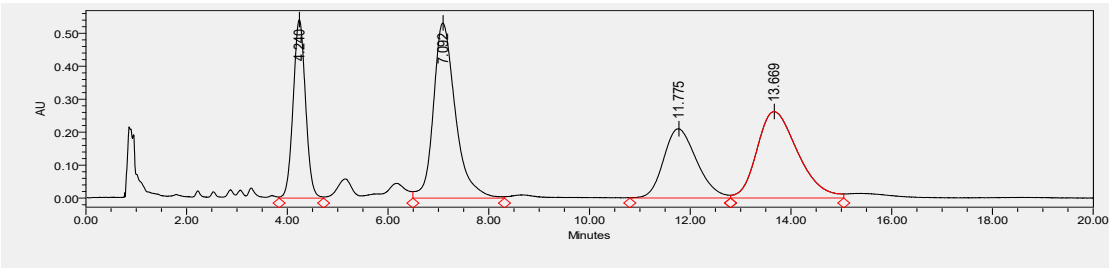
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.59 (s, 1H), 8.49 (s, 1H), 7.68 (d, *J* = 7.6 Hz, 1H), 7.37 (d, *J* = 8.0 Hz, 1H), 7.25 – 7.15 (m, 2H), 7.02 (d, *J* = 7.6 Hz, 1H), 6.85 (s, 1H), 6.78 (t, *J* = 7.6 Hz, 1H), 6.56 (d, *J* = 7.4 Hz, 1H), 3.55 (s, 3H), 3.35 (s, 3H), 3.13 (dd, *J* = 52.0, 16.0 Hz 2H), 2.24 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.9, 180.3, 169.9, 160.9, 140.9, 136.5, 130.1, 128.9, 127.9, 126.8, 123.1, 122.4, 121.6, 120.9, 119.1, 119.0, 111.7, 104.2, 53.1, 51.8, 51.7, 49.9, 40.2, 16.6.

IR: 3366, 2922, 2350, 1730, 1627, 1459, 1437, 1262, 1202, 749 cm^{-1}.

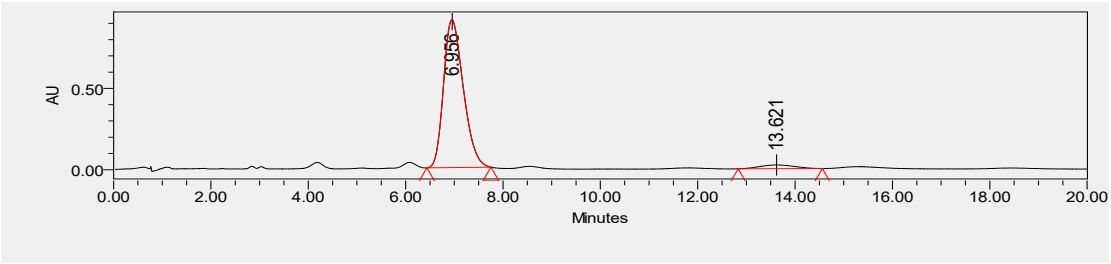
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{24}H_{22}N_2O_6$ 433.1405; found 433.1402.

The UPCC chromatograms of racemic product **C13**

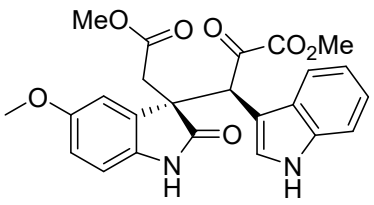


	Retention Time	Area	% Area	Height
1	4.240	9228088	18.60	541312
2	7.092	16046603	32.34	531187
3	11.775	9607553	19.36	210006
4	13.669	14739329	29.70	262460

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	6.956	25577572	95.76	910067
2	13.621	1131928	4.24	23270



C14

Methyl (S)-3-(1H-indol-3-yl)-3-((S)-5-methoxy-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C14)

Yellow oil; 40.9 mg, 91% yield, >19:1 dr, 90% ee; $[\alpha]_D^{15.6}$ = -232.07 (*c* = 0.18 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IE-3, CO_2/*i*-PrOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 12.73 min, t_R (minor) = 11.61 min.

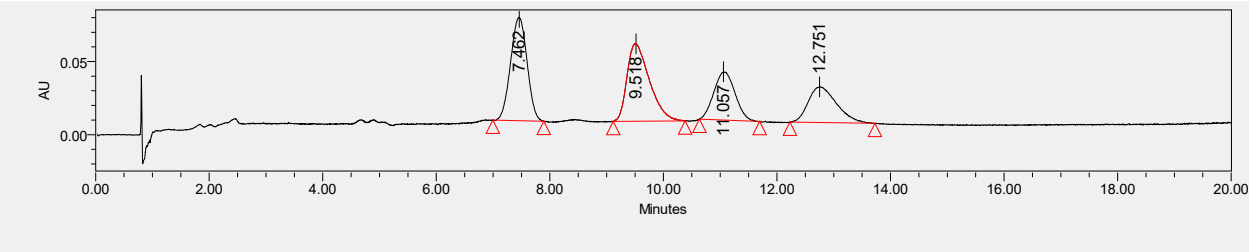
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.90 (s, 1H), 8.36 (s, 1H), 7.67 (d, *J* = 7.6 Hz, 1H), 7.35 (d, *J* = 8.0 Hz, 1H), 7.23 – 7.17 (m, 2H), 6.85 (d, *J* = 2.4 Hz, 1H), 6.77 – 6.69 (m, 2H), 6.33 (d, *J* = 2.0 Hz, 1H), 5.50 (s, 1H), 3.60 (s, 3H), 3.55 (s, 3H), 3.36 (s, 3H), 3.11 (dd, *J* = 72.0, 12.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.9, 180.0, 169.9, 160.9, 154.8, 136.6, 135.9, 130.7, 127.8, 126.9, 123.0, 120.9, 119.0, 112.9, 112.7, 111.9, 110.1, 103.8, 55.7, 53.2, 51.8, 50.1, 40.4.

IR: 3364, 2954, 2350, 1731, 1604, 1489, 1340, 1207, 1030, 744 cm^{-1}.

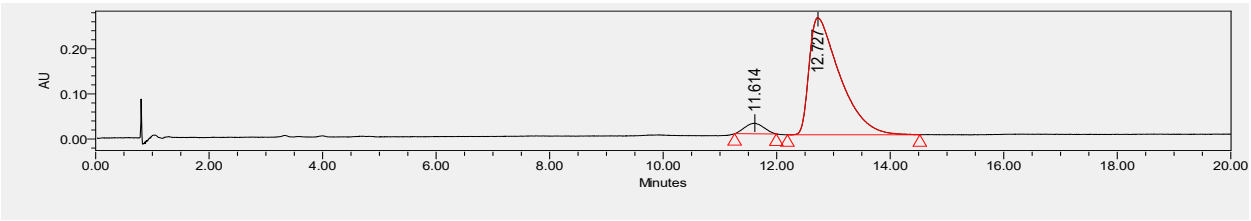
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{24}H_{22}N_2O_7$ 449.1354; found 449.1351.

The UPCC chromatograms of racemic product **C14**

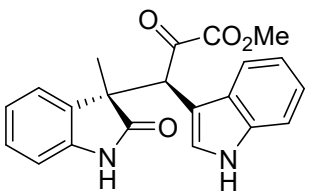


	Retention Time	Area	% Area	Height
1	7.462	1426344	31.21	70679
2	9.518	1447067	31.67	52971
3	11.057	853574	18.68	32952
4	12.751	842593	18.44	24392

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	11.614	540152	5.23	23669
2	12.727	9777976	94.77	260020



C15

Methyl (S)-3-(1H-indol-3-yl)-3-((S)-3-methyl-2-oxoindolin-3-yl)-2-oxopropanoate (C15)

Yellow solid; 28.9 mg, 80% yield, >19:1 dr, 80% ee; melting point: 117 – 120 °C; $[\alpha]_D^{16.2}$ = -294.05 (*c* = 0.37 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 6.09 min, t_R (minor) = 7.52 min.

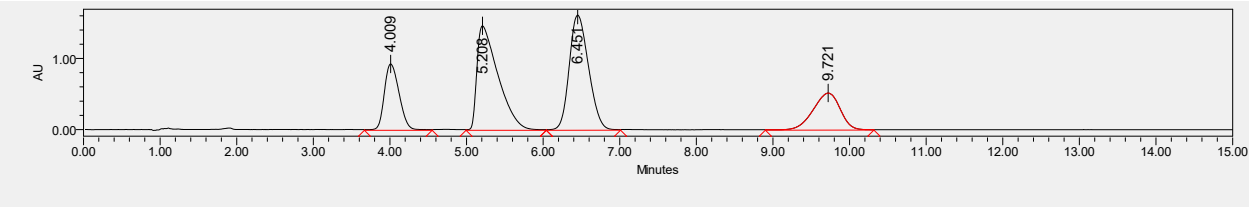
^{1}H NMR (600 MHz, Chloroform-*d*) δ 8.65 (s, 1H), 8.47 (s, 1H), 7.76 (d, *J* = 7.6 Hz, 1H), 7.42 (d, *J* = 8.0 Hz, 1H), 7.27 (m, 1H), 7.23 – 7.17 (m, 2H), 6.94 (d, *J* = 7.6 Hz, 1H), 6.83 (t, *J* = 4.0 Hz, 2H), 6.59 (d, *J* = 7.4 Hz, 1H), 5.51 (s, 1H), 3.54 (s, 3H), 1.46 (s, 3H).

^{13}C NMR (151 MHz, $CDCl_3$) δ 189.6, 182.2, 161.2, 141.1, 136.6, 132.5, 128.1, 127.9, 126.2, 124.8, 123.0, 121.7, 121.7, 120.7, 119.6, 111.7, 110.0, 105.2, 53.0, 51.2, 49.7, 24.3.

IR: 3370, 2919, 2350, 1727, 1705, 1619, 1470, 1337, 1131, 746 cm^{-1}.

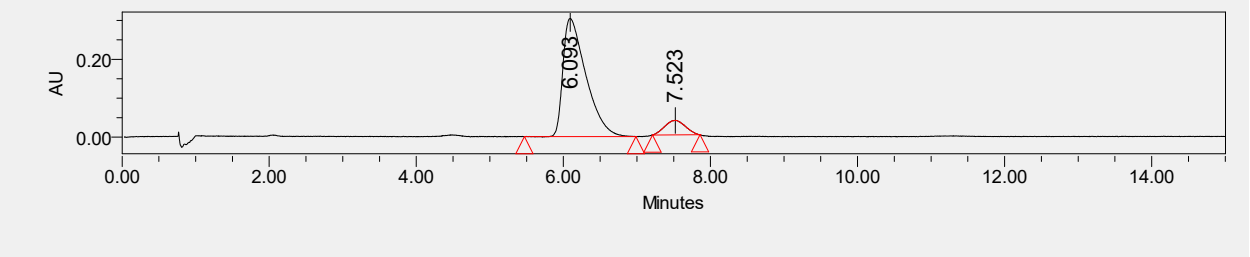
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{21}H_{18}N_2O_4$ 361.1194; found 361.1193.

The UPCC chromatograms of racemic product **C15**

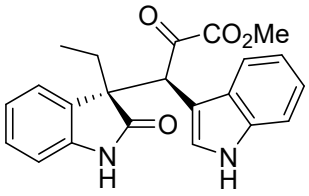


	Retention Time	Area	% Area	Height
1	4.009	12717305	15.44	932956
2	5.208	28208394	34.24	1469184
3	6.451	28474378	34.56	1619319
4	9.721	12992043	15.77	521786

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	6.093	6591748	90.03	303359
2	7.523	729648	9.97	37447



C16

Methyl (S)-3-((S)-3-ethyl-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C16)

Yellow solid; 32.0 mg, 85% yield, >19:1 dr, 91% ee; melting point: 90 – 97 °C; $[\alpha]_D^{16.4}$ = -265.83 (*c* = 0.24 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IH-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 4.15 min, t_R (minor) = 3.86 min.

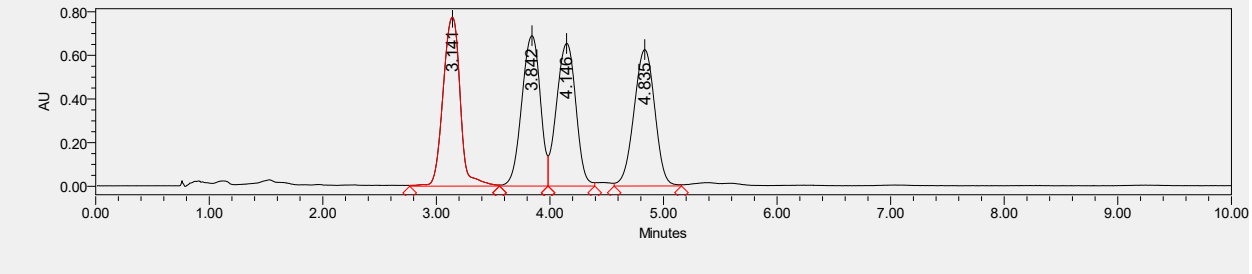
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.53 (s, 1H), 8.15 (s, 1H), 7.76 (d, *J* = 7.6 Hz, 1H), 7.42 (d, *J* = 7.6 Hz, 1H), 7.29 – 7.16 (m, 3H), 6.91 (d, *J* = 7.6 Hz, 1H), 6.85 (t, *J* = 7.6 Hz, 1H), 6.81 (d, *J* = 2.4 Hz, 1H), 6.54 (d, *J* = 7.6 Hz, 1H), 5.51 (s, 1H), 3.54 (s, 3H), 2.11 (td, *J* = 12.4, 4.4 Hz, 1H), 1.81 (td, *J* = 12.8, 4.0 Hz, 1H), 0.67 (t, *J* = 7.2 Hz, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 189.3, 181.3, 161.1, 142.0, 136.6, 130.5, 128.1, 127.9, 126.4, 125.1, 123.0, 121.6, 120.8, 119.7, 111.6, 109.6, 105.4, 54.3, 53.0, 51.6, 39.8, 16.8, 14.1.

IR: 3370, 2957, 2350, 1727, 1704, 1620, 1468, 1340, 1085, 746 cm^{-1}.

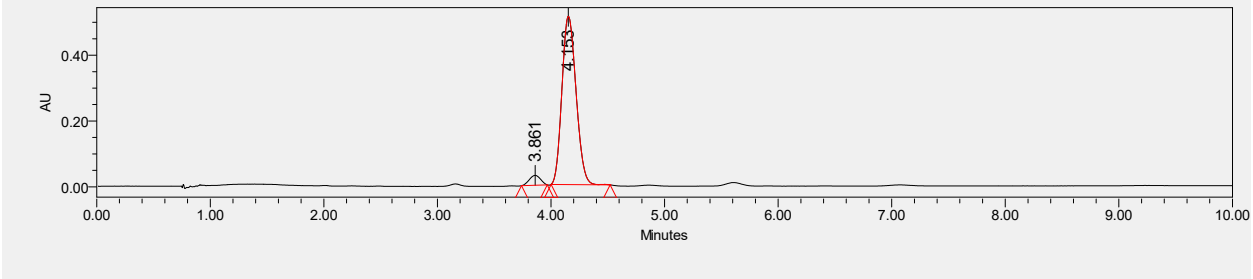
HRMS (FTMS+c ESI) m/z: $[M + H]^+$ calcd for $C_{22}H_{20}N_2O_4$ 377.1496; found 377.1490.

The UPCC chromatograms of racemic product **C16**

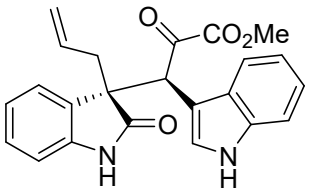


	Retention Time	Area	% Area	Height
1	3.141	8112203	25.66	773922
2	3.842	7806255	24.69	689015
3	4.146	7728095	24.45	653749
4	4.835	7964161	25.19	625196

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	3.861	206471	4.46	30025
2	4.153	4418849	95.54	511447



C17

Methyl (S)-3-((S)-3-allyl-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C17)

Yellow oil; 31.0 mg, 80% yield, >19:1 dr, 75% ee; $[\alpha]_D^{16.7}$ = -277.27 (*c* = 0.09 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IG-3, CO_2/MeOH = 85/15, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 11.90 min, t_R (minor) = 5.05 min.

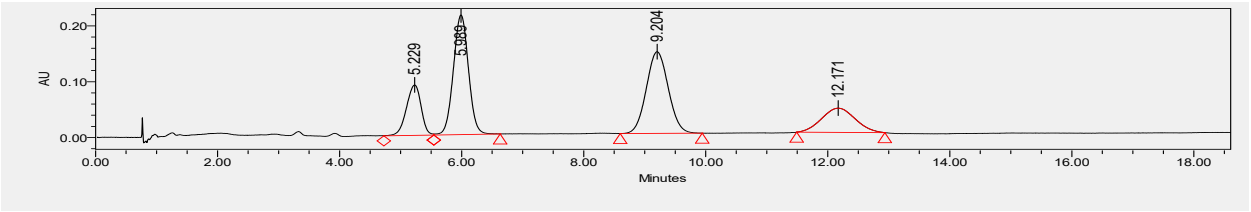
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.60 (s, 1H), 8.14 (s, 1H), 7.77 (d, *J* = 7.6 Hz, 1H), 7.43 (d, *J* = 8.0 Hz, 1H), 7.31 – 7.13 (m, 3H), 6.92 – 6.78 (m, 3H), 6.58 (d, *J* = 7.6 Hz, 1H), 5.54 (s, 1H), 5.17 – 5.04 (m, 1H), 4.94 – 4.73 (m, 2H), 3.54 (s, 3H), 2.72 (ddd, *J* = 98.4, 13.6, 7.2 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 189.2, 180.6, 161.1, 141.9, 136.6, 131.1, 129.8, 128.1, 128.0, 126.4, 125.3, 123.1, 121.6, 120.9, 119.6, 119.5, 111.7, 109.8, 105.0, 54.2, 53.0, 51.1, 41.9.

IR: 3370, 2924, 2406, 1727, 1706, 1620, 1470, 1339, 1261, 747 cm^{-1}.

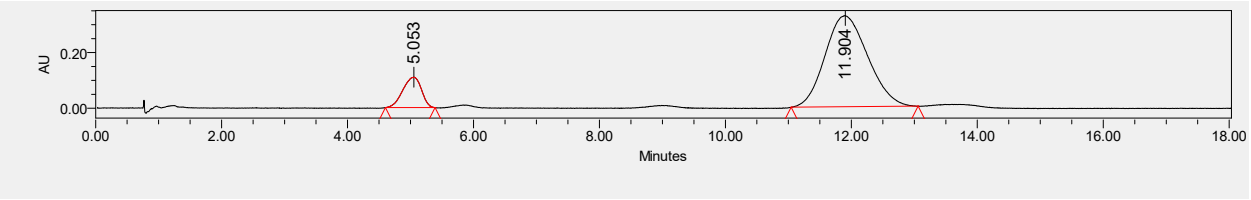
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{20}N_2O_4$ 387.1350; found 387.1349.

The UPCC chromatograms of racemic product **C17**

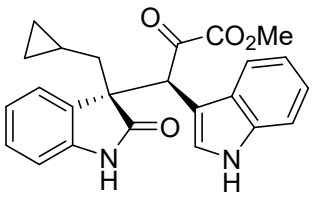


	Retention Time	Area	% Area	Height
1	5.229	1513323	14.39	90399
2	5.989	3679382	35.00	214244
3	9.204	3662722	34.84	146434
4	12.171	1658346	15.77	43533

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	5.053	2237391	12.70	109333
2	11.904	15382448	87.30	327570



C18

Methyl (S)-3-((S)-3-(cyclopropylmethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C18)

Yellow oil; 32.2 mg, 80% yield, >19:1 dr, 87% ee; $[\alpha]_D^{16.6}$ = -199.21 (*c* = 0.38 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IH-3, CO_2/MeOH = 85/15, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 9.85 min, t_R (minor) = 8.22 min.

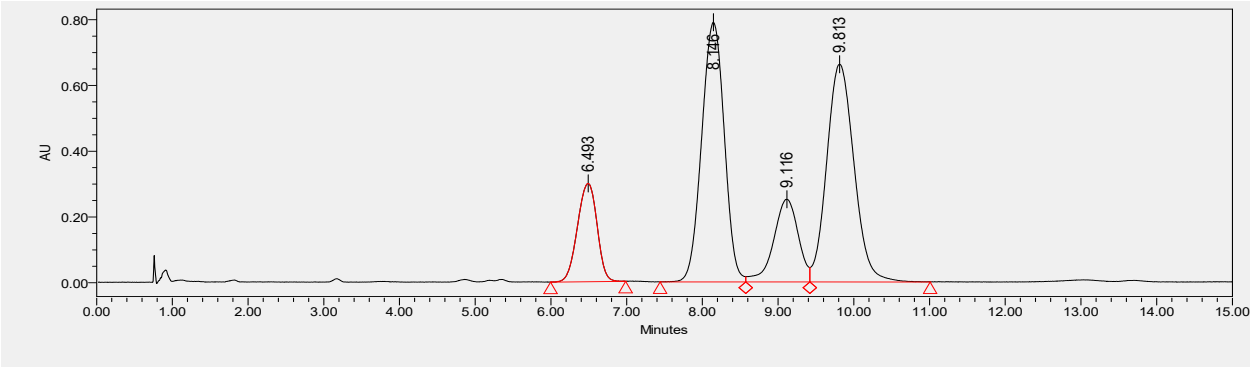
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.58 (s, 1H), 8.37 (s, 1H), 7.73 (d, *J* = 7.6 Hz, 1H), 7.42 (d, *J* = 7.8 Hz, 1H), 7.30 – 7.14 (m, 3H), 6.94 (d, *J* = 7.6 Hz, 1H), 6.89 – 6.78 (m, 2H), 6.58 (d, *J* = 7.2 Hz, 1H), 5.48 (s, 1H), 3.54 (s, 3H), 2.12 (dd, *J* = 13.2, 4.8 Hz, 1H), 1.81 (dd, *J* = 13.2, 8.0 Hz, 2H), 0.15 - 0.09 (m, 2H), 0.07 – -0.04 (m, 2H), -0.29 (dq, *J* = 9.2, 4.0 Hz, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 189.2, 181.8, 161.2, 142.3, 136.6, 130.7, 128.1, 127.9, 126.4, 125.3, 123.0, 121.5, 120.8, 119.6, 111.7, 109.7, 105.2, 54.6, 53.0, 51.4, 42.3, 5.6, 4.1, 3.5.

IR: 3371, 2923, 2357, 1728, 1704, 1620, 1469, 1260, 1114, 747 cm^{-1}.

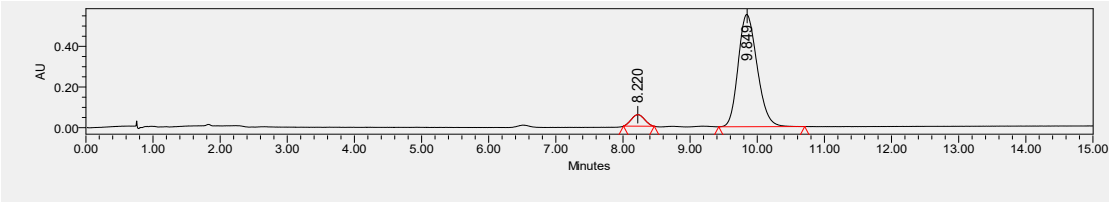
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{24}H_{22}N_2O_4$ 401.1057; found 401.1055.

The UPCC chromatograms of racemic product **C18**

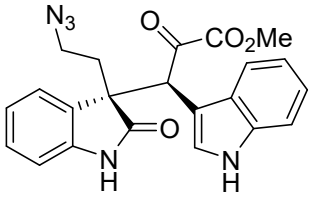


	Retention Time	Area	% Area	Height
1	6.493	5376493	12.20	299213
2	8.146	16389080	37.18	789825
3	9.116	5691430	12.91	251463
4	9.813	16627202	37.72	662338

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	8.220	772600	6.67	56506
2	9.849	10815945	93.33	552316



C19

Methyl (S)-3-((S)-3-(2-azidoethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C19)

Yellow solid; 39.6 mg, 95% yield, >19:1 dr, 87% ee; melting point: 95 – 104 °C; $[\alpha]_D^{16.2}$ = -225.80 (*c*

= 0.75 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OD-3, CO_2/MeOH = 90/10, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 11.91 min, t_R (minor) = 14.57 min.

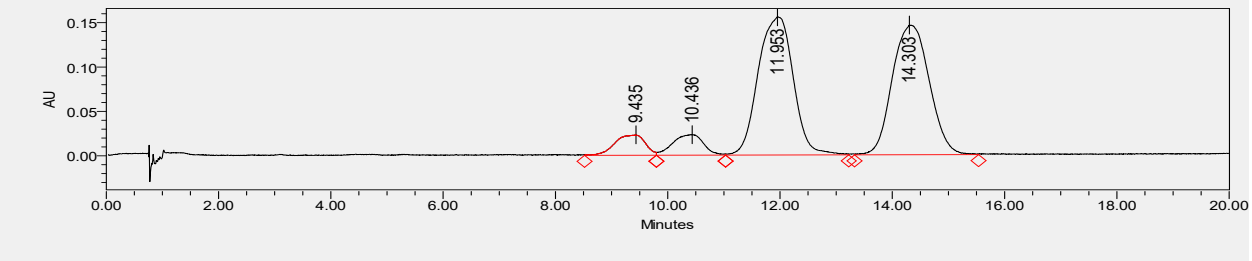
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.61 (s, 1H), 8.46 (s, 1H), 7.73 (d, *J* = 7.6 Hz, 1H), 7.42 (d, *J* = 7.6 Hz, 1H), 7.32 – 7.19 (m, 3H), 6.96 (d, *J* = 7.6 Hz, 1H), 6.88 (t, *J* = 7.6 Hz, 1H), 6.82 (d, *J* = 2.4 Hz, 1H), 6.58 (d, *J* = 7.2 Hz, 1H), 5.51 (s, 1H), 3.55 (s, 3H), 2.90 – 2.74 (m, 2H), 2.47 (dt, *J* = 13.6, 8.0 Hz, 1H), 2.14 (ddd, *J* = 13.2, 8.0, 4.8 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 188.7, 180.5, 161.0, 142.0, 136.6, 128.7, 127.9, 126.5, 125.2, 123.2, 121.9, 121.0, 119.3, 111.8, 110.3, 104.6, 53.1, 52.6, 51.3, 46.9, 36.0.

IR: 3369, 2920, 2350, 2100, 1727, 1707, 1620, 1469, 1261, 747 cm^{-1}.

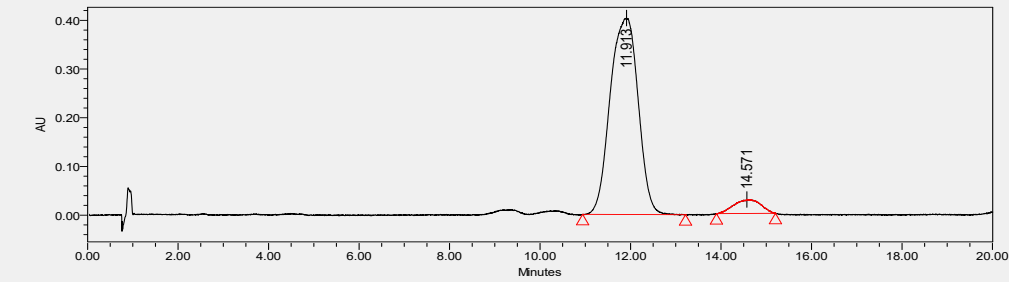
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}N_5O_4$ 416.1364; found 416.1362.

The UPCC chromatograms of racemic product **C19**

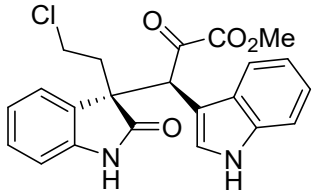


	Retention Time	Area	% Area	Height
1	9.435	863037	5.67	23114
2	10.436	880343	5.79	23168
3	11.953	6765741	44.48	155738
4	14.303	6701973	44.06	146204

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	11.913	17323784	93.64	403347
2	14.571	1176678	6.36	28820



C20

Methyl (S)-3-((S)-3-(2-chloroethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C20)

Yellow solid; 37.3 mg, 91% yield, >19:1 dr, 82% ee; melting point: 152 – 158 °C; $[\alpha]_D^{19.8}$ = -249.66 (*c*

= 0.30 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IE-3, CO_2/MeOH = 85/15, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 6.00 min, t_R (minor) = 8.18 min.

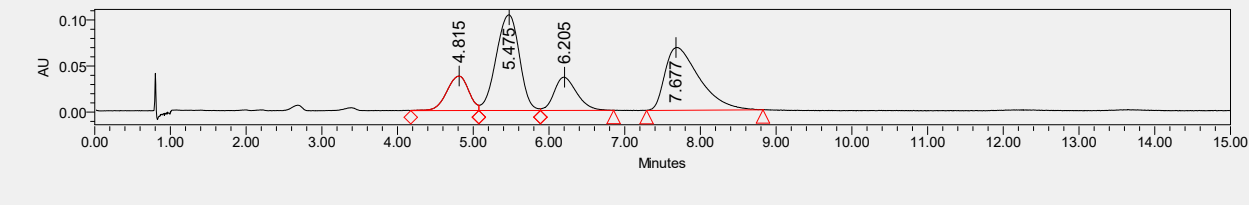
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.67 (s, 1H), 8.62 (s, 1H), 7.72 (d, *J* = 7.6 Hz, 1H), 7.42 (d, *J* = 7.6 Hz, 1H), 7.30 – 7.20 (m, 3H), 6.94 (d, *J* = 7.6 Hz, 1H), 6.88 (t, *J* = 7.6 Hz, 1H), 6.82 (d, *J* = 2.4 Hz, 1H), 6.59 (d, *J* = 7.2 Hz, 1H), 5.52 (s, 1H), 3.54 (s, 3H), 3.14 (td, *J* = 10.8, 6.0 Hz, 1H), 2.82 (td, *J* = 10.8, 4.8 Hz, 1H), 2.66 (ddd, *J* = 13.2, 10.4, 6.0 Hz, 1H), 2.38 (ddd, *J* = 13.2, 10.8, 4.4 Hz, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 188.7, 180.4, 161.0, 142.0, 136.6, 128.7, 128.6, 127.8, 126.6, 125.3, 123.2, 122.0, 121.0, 119.3, 111.8, 110.3, 104.4, 53.3, 53.1, 51.2, 39.7, 39.3.

IR: 3369, 2919, 2357, 1727, 1708, 1620, 1470, 1261, 1084, 748 cm^{-1}.

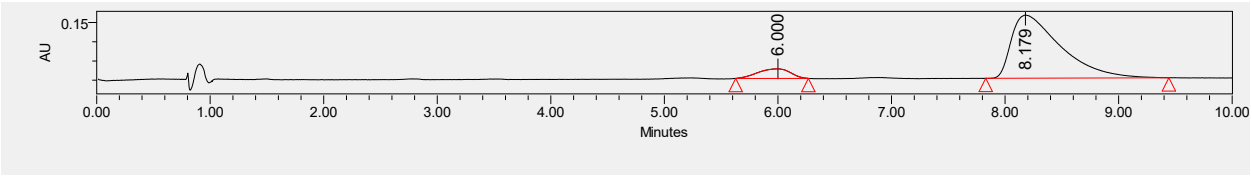
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{22}H_{19}ClN_2O_4$ 409.0961, 411.0931; found 409.0958, 411.0926.

The UPCC chromatograms of racemic product **C20**

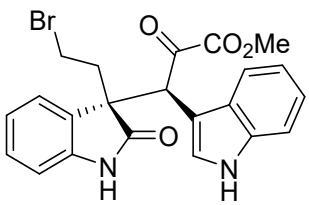


	Retention Time	Area	% Area	Height
1	4.815	750157	12.80	37521
2	5.475	2213905	37.79	103914
3	6.205	746189	12.74	36131
4	7.677	2148637	36.67	68127

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	6.000	496395	9.12	24890
2	8.179	4947310	90.88	163967



C21

Methyl (S)-3-((S)-3-(2-bromoethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C21)

Yellow solid; 40.9 mg, 90% yield, >19:1 dr, 93% ee; melting point: 164 – 166 °C; $[\alpha]_D^{19.8}$ = -190.73 (*c* = 0.25 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IE-3, CO_2/MeOH = 85/15, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 10.37 min, t_R (minor) = 7.73 min.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.67 (s, 1H), 8.64 (s, 1H), 7.71 (d, *J* = 7.6 Hz, 1H), 7.42 (d, *J* = 7.6 Hz, 1H), 7.32 – 7.19 (m, 3H), 6.94 (d, *J* = 7.6 Hz, 1H), 6.88 (t, *J* = 7.6 Hz, 1H), 6.83 (d, *J* = 2.4 Hz, 1H), 6.60 (d, *J* = 7.6 Hz, 1H),

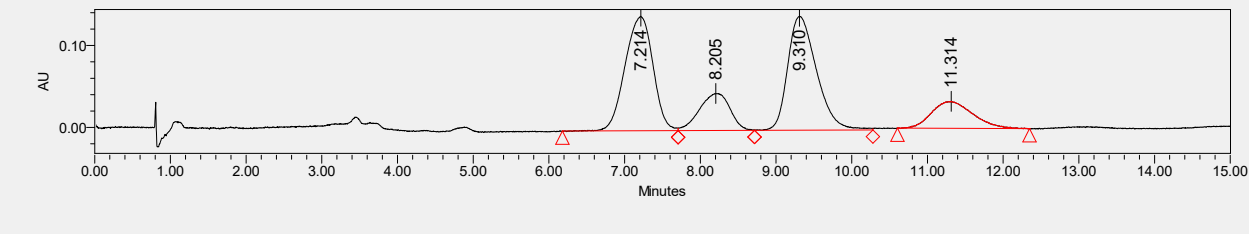
5.51 (s, 1H), 3.54 (s, 2H), 3.00 (ddd, *J* = 12.0, 9.6, 5.2 Hz, 1H), 2.74 (td, *J* = 12.4, 12.0, 5.2 Hz, 1H), 2.61 (td, *J* = 11.2, 10.4, 4.4 Hz, 1H), 2.46 (td, *J* = 12.4, 4.4 Hz, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 188.7, 180.2, 161.0, 142.0, 136.6, 128.7, 128.6, 127.8, 126.6, 125.3, 123.2, 122.1, 121.0, 119.3, 111.8, 110.3, 104.4, 54.3, 53.1, 51.2, 40.1, 26.5.

IR: 3369, 2955, 2349, 1727, 1707, 1620, 1469, 1470, 1261, 746 cm^{-1}.

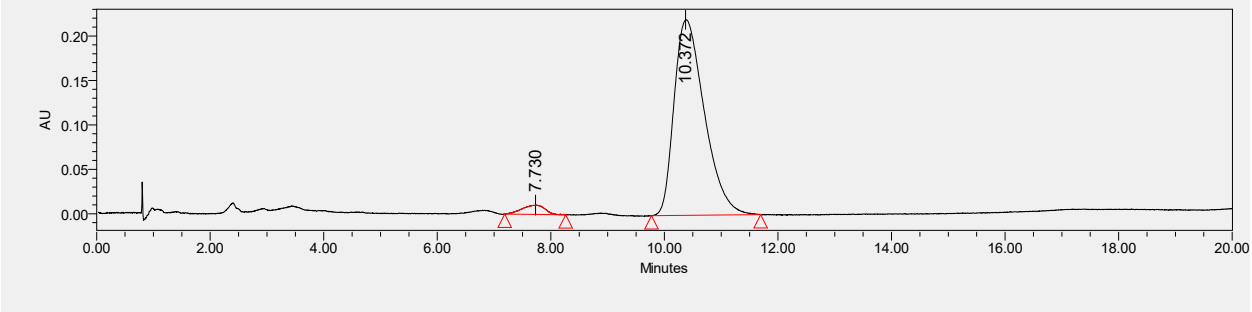
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{22}H_{19}BrN_2O_4$ 453.0455, 455.0435; found 453.0453, 455.0429.

The UPCC chromatograms of racemic product **C21**

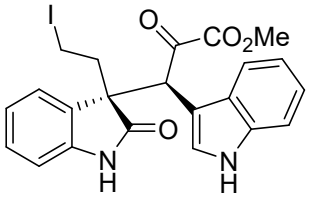


	Retention Time	Area	% Area	Height
1	7.214	3580596	36.66	139929
2	8.205	1266422	12.97	45192
3	9.310	3682189	37.70	139077
4	11.314	1238577	12.68	32901

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	7.730	292043	3.46	10517
2	10.372	8157135	96.54	220500



C22

Methyl (S)-3-(1H-indol-3-yl)-3-((S)-3-(2-iodoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C22)

Yellow solid; 46.7 mg, 93% yield, >19:1 dr, 92% ee; melting point: 143 – 153 °C; $[\alpha]_D^{19.8}$ = -169.91 (*c* = 0.68 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IE-3, CO_2/MeOH = 85/15, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 9.77 min, t_R (minor) = 7.90 min.

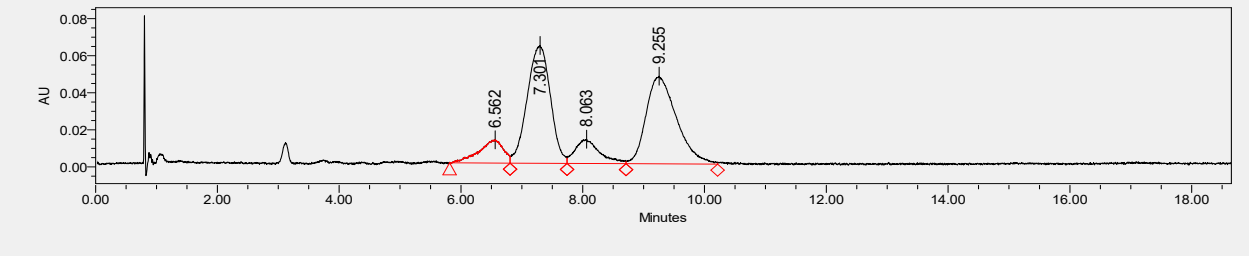
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.63 (s, 1H), 8.59 (s, 1H), 7.70 (d, *J* = 7.6 Hz, 1H), 7.42 (d, *J* = 7.6 Hz, 1H), 7.35 – 7.17 (m, 3H), 6.94 (d, *J* = 7.6 Hz, 1H), 6.87 (t, *J* = 7.6 Hz, 1H), 6.82 (d, *J* = 2.4 Hz, 1H), 6.58 (d, *J* = 7.2 Hz, 1H), 5.50 (s, 1H), 3.54 (s, 3H), 2.88 – 2.70 (m, 2H), 2.48 (td, *J* = 13.2, 12.4, 4.4 Hz, 1H), 2.36 (ddd, *J* = 14.4, 9.2, 4.4 Hz, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 188.7, 180.0, 160.9, 142.0, 136.6, 128.6, 128.5, 127.7, 126.5, 125.3, 123.2, 122.1, 121.1, 119.3, 111.8, 110.3, 104.4, 55.8, 53.1, 51.0, 41.6, -2.9.

IR: 3371, 2952, 2349, 1727, 1707, 1620, 1469, 1261, 1016, 747 cm^{-1}.

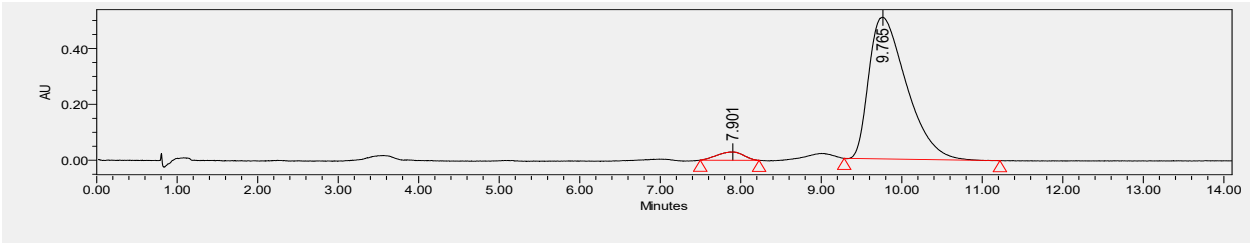
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{22}H_{19}IN_2O_4$ 501.0317; found 501.0311.

The UPCC chromatograms of racemic product **C22**

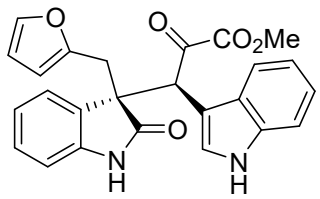


	Retention Time	Area	% Area	Height
1	6.562	346696	8.63	12592
2	7.301	1676971	41.74	63507
3	8.063	359310	8.94	13111
4	9.255	1634867	40.69	47349

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	7.901	677231	3.95	29982
2	9.765	16485416	96.05	506892



C23

Methyl (S)-3-((S)-3-(furan-2-ylmethyl)-2-oxoindolin-3-yl)-3-(1H-indol-3-yl)-2-oxopropanoate (C23)

Yellow solid; 35.1 mg, 82% yield, >19:1 dr, 90% ee; melting point: 110 – 115 °C; $[\alpha]_D^{19.9}$ = -168.60 (*c* = 0.48 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IG-3, CO_2/MeOH = 85/15, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 15.10 min, t_R (minor) = 8.18 min.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.55 (s, 1H), 7.81 – 7.72 (m, 2H), 7.45 (d, *J* = 8.0 Hz, 1H), 7.31 – 7.20 (m, 2H), 7.12 (t, *J* = 7.6 Hz, 1H), 6.99 (d, *J* = 1.2 Hz, 1H), 6.89 (d, *J* = 2.4 Hz, 1H), 6.84 (t, *J* = 7.6 Hz, 1H), 6.75 (d, *J* = 7.6 Hz, 1H), 6.66 (d, *J* = 7.2 Hz, 1H), 5.96 (dd, *J* = 3.2, 1.8 Hz, 1H), 5.61 (s, 1H), 5.52 (d, *J* = 3.2 Hz, 1H), 3.56 (s, 3H), 3.35 (dd, *J* = 128.4, 14.4 Hz, 2H).

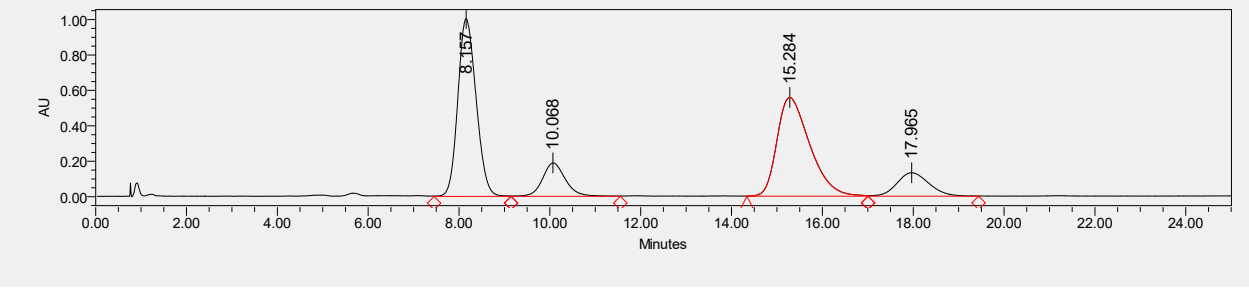
^{13}C NMR (101 MHz, $CDCl_3$) δ 188.8, 180.2, 161.1, 149.7, 141.8, 141.5, 136.6, 129.5, 128.2, 127.9, 126.5, 125.6, 123.2, 121.5, 121.0,

119.5, 111.7, 110.0, 109.6, 107.7, 104.9, 54.2, 53.0, 50.7, 36.0.

IR: 3367, 2918, 2350, 1728, 1708, 1620, 1470, 1261, 1014, 747 cm^{-1}.

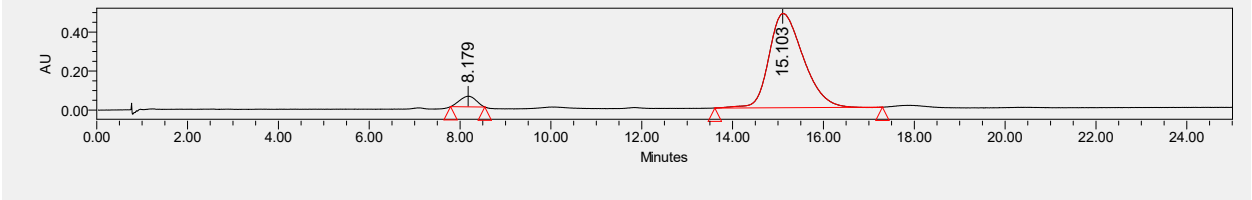
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{25}H_{20}N_2O_5$ 427.1299; found 427.1296.

The UPCC chromatograms of racemic product **C23**

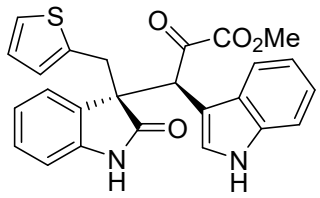


	Retention Time	Area	% Area	Height
1	8.157	28052570	40.60	1003896
2	10.068	6603605	9.56	188719
3	15.284	27882627	40.35	557801
4	17.965	6560226	9.49	132875

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	8.179	1344302	5.04	54279
2	15.103	25341031	94.96	484073



C24

Methyl (S)-3-(1H-indol-3-yl)-2-oxo-3-((S)-2-oxo-3-(thiophen-2-ylmethyl)indolin-3-yl)propanoate (C24)

Yellow oil; 35.1 mg, 78% yield, >19/1 dr, 79% ee; $[\alpha]_D^{20.2}$ = -149.38 (*c* = 0.48 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IG-3, CO_2/MeOH = 87/13, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 34.76 min, t_R (minor) = 13.52 min.

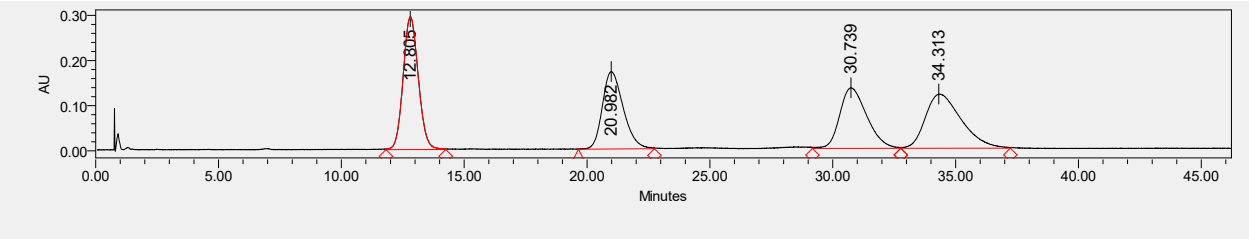
1H NMR (400 MHz, Chloroform-*d*) δ 8.57 (s, 1H), 7.82 (d, *J* = 7.8 Hz, 1H), 7.66 (s, 1H), 7.46 (d, *J* = 8.0 Hz, 1H), 7.32 – 7.27 (m, 1H), 7.25 – 7.22 (m, 1H), 7.17 (td, *J* = 7.6, 1.2 Hz, 1H), 6.92 – 6.87 (m, 2H), 6.85 (dd, *J* = 5.1, 1.2 Hz, 1H), 6.72 (d, *J* = 8.0 Hz, 2H), 6.64 (dd, *J* = 5.2 3.6 Hz, 1H), 6.49 (d, *J* = 3.2 Hz, 1H), 5.66 (s, 1H), 3.71 (d, *J* = 14.0 Hz, 1H), 3.56 (s, 3H), 3.27 (d, *J* = 14.0 Hz, 1H).

13C NMR (101 MHz, CDCl3) δ 188.9, 180.0, 161.1, 142.3, 136.7, 136.0, 129.3, 128.5, 127.9, 127.4, 126.5, 126.2, 125.7, 124.7, 123.2, 121.6, 121.0, 119.6, 111.8, 109.8, 105.0, 55.5, 53.0, 51.2, 38.1.

IR: 3370, 2924, 2406, 1727, 1706, 1620, 1470, 1339, 1261, 746 cm^{-1}.

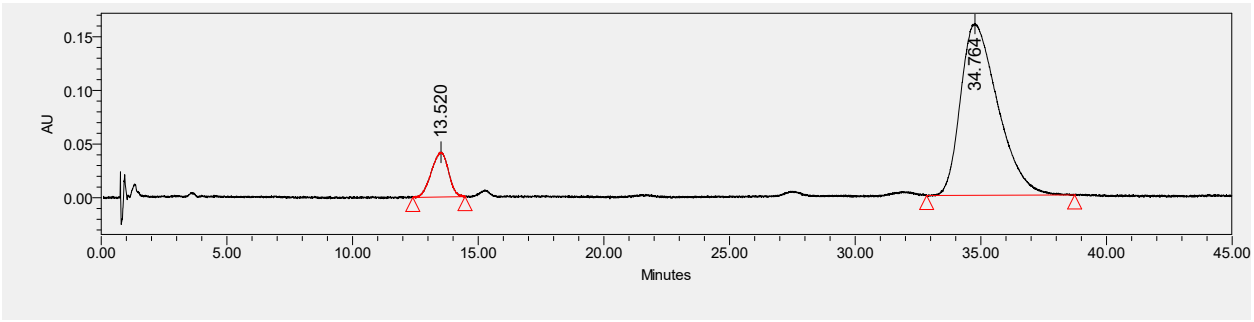
HRMS (FTMS+c ESI) m/z: [M - H]$^-$ calcd for $C_{25}H_{20}N_2O_4S$ 443.1071; found 443.1070.

The UPCC chromatograms of racemic product **C24**

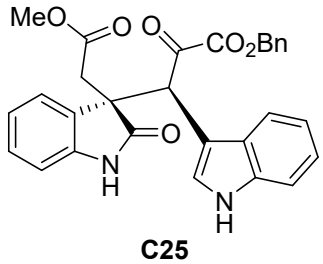


	Retention Time	Area	% Area	Height
1	12.805	12615645	27.92	294282
2	20.982	10123362	22.40	171824
3	30.739	10240063	22.66	134301
4	34.313	12208997	27.02	120089

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	13.520	1965954	10.64	41813
2	34.764	16516533	89.36	160175



C25

Benzyl (S)-3-(1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C25)

Yellow oil; 35.7 mg, 70% yield, >19:1 dr, 95% ee; $[\alpha]_D^{19.3}$ = -224.08 (*c* = 0.71 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IC-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 7.64 min, t_R (minor) = 6.85 min.

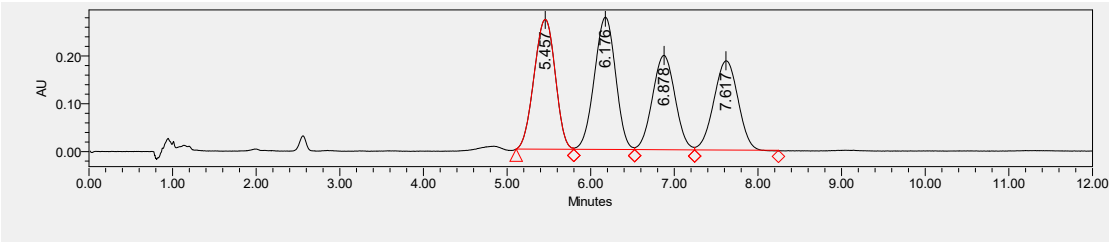
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.73 (s, 1H), 8.48 (s, 1H), 7.61 (d, *J* = 8.0 Hz, 1H), 7.34 (d, *J* = 8.0 Hz, 1H), 7.25 – 7.14 (m, 4H), 7.11 (t, *J* = 7.6 Hz, 2H), 6.87 – 6.81 (m, 4H), 6.71 (d, *J* = 8.0 Hz, 2H), 5.45 (s, 1H), 4.92 (q, *J* = 12.4 Hz, 2H), 3.32 (s, 3H), 3.13 (dd, *J* = 56.0, 16.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.7, 180.1, 169.9, 160.5, 142.4, 136.6, 134.2, 129.2, 128.7, 128.6, 128.5, 128.5, 128.2, 127.8, 126.9, 125.0, 123.0, 121.7, 120.9, 119.1, 111.9, 110.1, 103.8, 68.0, 51.7, 51.3, 50.5, 40.4.

IR: 3367, 2923, 2351, 1728, 1620, 1470, 1340, 1261, 1210, 746 cm^{-1}.

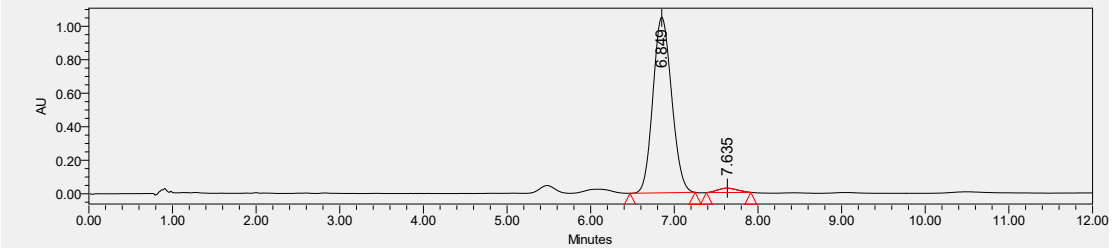
HRMS (FTMS+c ESI) m/z: [M - H]- calcd for C30H26N2O6 509.1718.

The UPCC chromatograms of racemic product **C25**

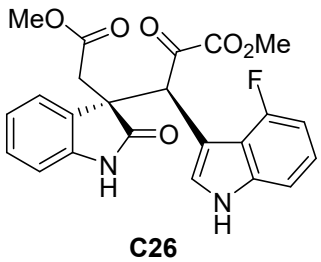


	Retention Time	Area	% Area	Height
1	5.457	4761008	27.88	271524
2	6.176	4873949	28.54	276895
3	6.878	3691720	21.62	197259
4	7.617	3750094	21.96	186672

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	6.849	16278429	97.47	1048542
2	7.635	422978	2.53	26018



C26

Methyl (S)-3-(4-fluoro-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C26)

Yellow oil; 39.0 mg, 89% yield, >19:1 dr, 93% ee; $[\alpha]_D^{19.5}$ = -245.55 (*c* = 0.29 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OD-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 2.49 min, t_R (minor) = 3.10 min.

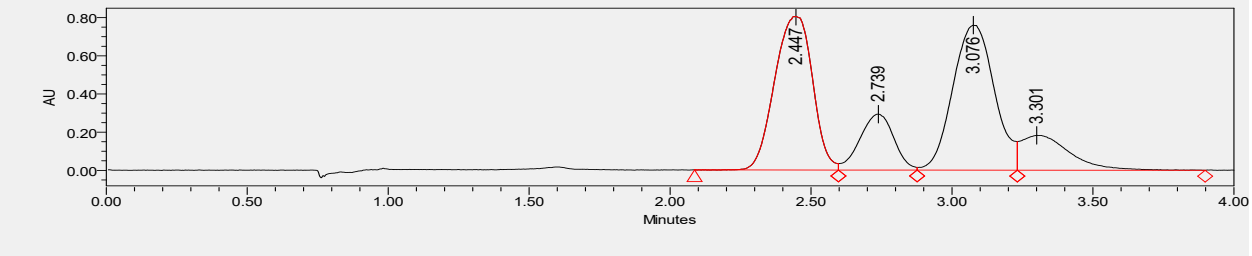
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.99 (s, 1H), 8.31 (s, 1H), 7.20 (td, *J* = 7.6, 1.2 Hz, 1H), 7.15 – 7.06 (m, 2H), 6.96 – 6.78 (m, 3H), 6.78 – 6.69 (m, 1H), 6.66 (d, *J* = 2.8 Hz, 1H), 5.69 (d, *J* = 1.6 Hz, 1H), 3.59 (s, 3H), 3.34 – 3.30 (m, 4H), 3.14 (d, *J* = 15.9 Hz, 1H).

^{13}C NMR (101 MHz, Chloroform-*d*) δ 187.76 , 179.98 , 170.12 , 160.87 , 156.97 (d, *J* = 247.1 Hz), 142.34 , 139.07 (d, *J* = 10.2 Hz), 129.24 , 128.72 , 126.92 , 125.04 , 123.63 (d, *J* = 8.1 Hz), 121.71 , 116.70 (d, *J* = 18.1 Hz), 110.01 , 108.19 (d, *J* = 3.5 Hz), 106.17 (d, *J* = 19.1 Hz), 102.28 , 53.23 , 51.70 , 51.40 , 50.44 , 39.53 .

IR: 3352, 2954, 2350, 1731, 1621, 1470, 1346, 1230, 1034, 742 cm^{-1}.

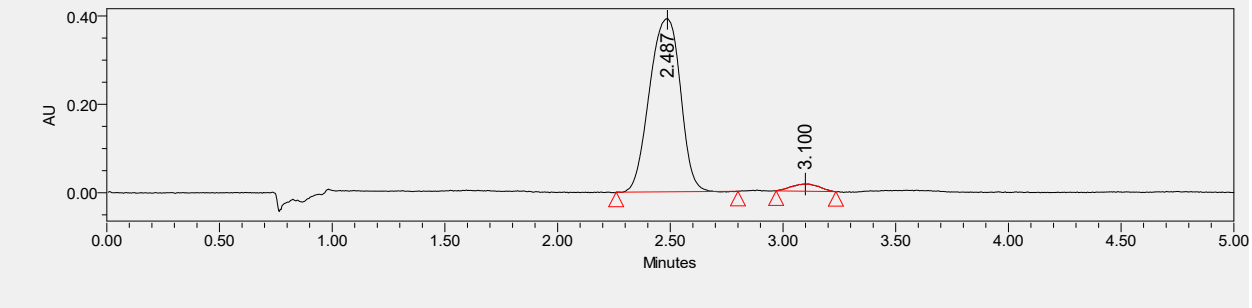
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}FN_2O_6$ 437.1154; found 437.1152.

The UPCC chromatograms of racemic product **C26**

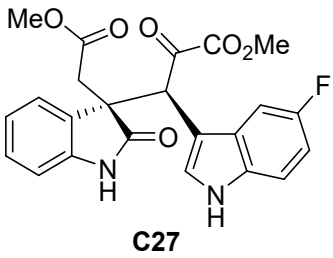


	Retention Time	Area	% Area	Height
1	2.447	7508697	37.60	804623
2	2.739	2451071	12.27	292639
3	3.076	7805039	39.08	759438
4	3.301	2205000	11.04	182583

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	2.487	3742058	96.44	392431
2	3.100	138226	3.56	16253



C27

Methyl (S)-3-(5-fluoro-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C27)

Yellow oil; 38.1 mg, 87% yield, >19:1 dr, 96% ee; $[\alpha]_D^{19.7}$ = -264.28 (*c* = 0.45 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 5.08 min, t_R (minor) = 6.81 min.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.92 (d, *J* = 2.8 Hz, 1H), 8.53 (s, 1H), 7.30 – 7.16 (m, 3H), 6.93 (td, *J* = 9.2, 2.4 Hz, 1H), 6.90 – 6.83 (m, 3H), 6.77 (d, *J* = 7.6 Hz, 1H), 5.39 (s, 1H), 3.57 (s, 3H), 3.36 (s, 3H), 3.15 (*J* = 28.0, 16.0 Hz, 2H).

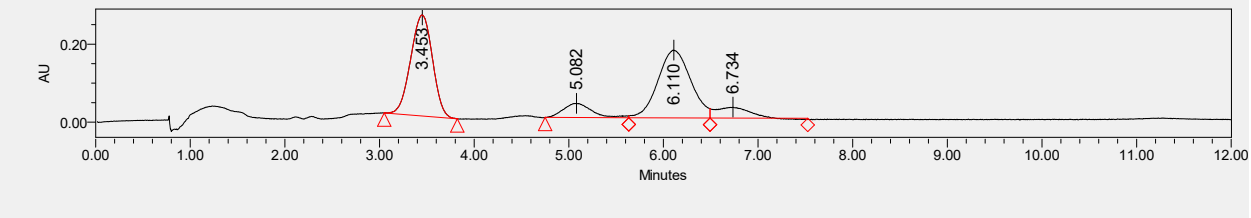
^{13}C NMR (101 MHz, Chloroform-*d*) δ 187.72, 179.97, 170.05, 160.88, 158.51 (d, *J* = 215.2 Hz), 142.15, 132.98, 129.38, 128.86, 128.52, 128.27 (d, *J* = 9.6 Hz), 124.85, 121.89, 112.72 (d, *J* = 9.7 Hz), 111.61 (d, *J* = 26.6 Hz), 110.16, 104.04 (d, *J* = 1.8 Hz), 103.90 (d, *J* = 17.2 Hz), 53.24, 51.83, 51.55, 49.86, 39.83.

^{19}F NMR (377 MHz, $CDCl_3$) δ -122.6.

IR:3353, 2954, 2350, 1728, 1621, 1486, 1344, 1259, 1167, 753 cm^{-1}.

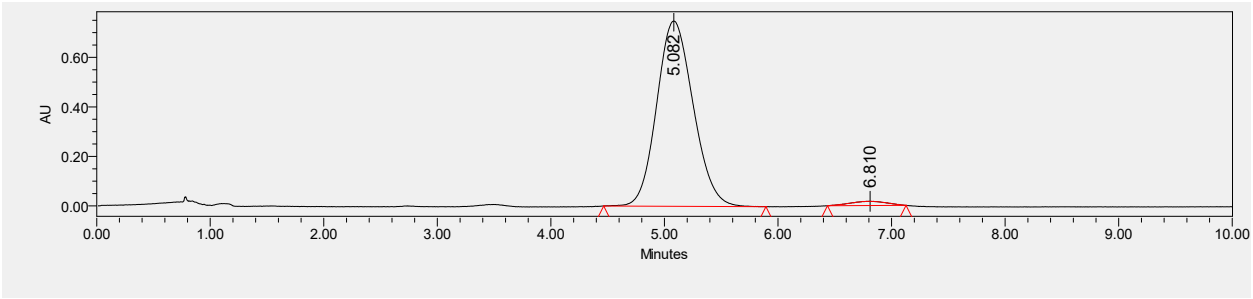
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}FN_2O_6$ 437.1154; found 437.1153.

The UPCC chromatograms of racemic product **C27**

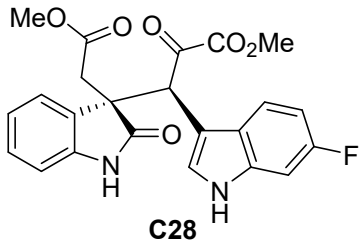


	Retention Time	Area	% Area	Height
1	3.453	4151127	42.22	259100
2	5.082	760341	7.73	36273
3	6.110	4182120	42.54	173986
4	6.734	738110	7.51	27966

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	5.082	16709597	97.79	748047
2	6.810	377912	2.21	17143



C28

Methyl (S)-3-(6-fluoro-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C28)

Yellow solid; 41.6 mg, 95% yield, >19:1 dr, 95% ee; melting point: 108 – 110 °C; $[\alpha]_D^{19.0}$ = -219.23 (*c* = 0.73 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OX-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 5.03 min, t_R (minor) = 8.08 min.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.97 (s, 1H), 8.68 (s, 1H), 7.51 (dd, *J* = 8.8, 5.2 Hz, 1H), 7.19 (t, *J* = 7.6 Hz, 1H), 7.00 (dd, *J* = 9.2, 2.4 Hz, 1H), 6.95 – 6.73 (m, 5H), 5.44 (s, 1H), 3.56 (s, 3H), 3.35 (s, 3H), 3.15 (dd, *J* = 24.0, 16.0 Hz, 2H).

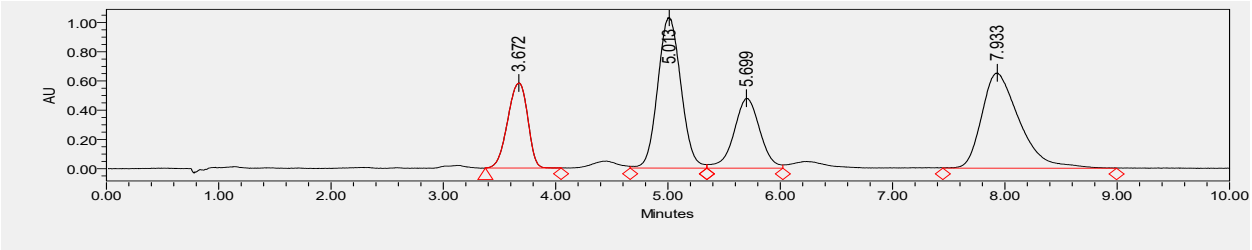
^{13}C NMR (101 MHz, Chloroform-*d*) δ 187.72 , 180.16 , 170.09 , 160.93 , 160.26 (d, *J* = 12.4 Hz) 142.16 , 136.49 (d, *J* = 12.4 Hz), 129.39 , 128.86 , 127.23 , 124.86 , 124.25 , 121.88 , 119.82 (d, *J* = 10.1 Hz), 110.20 , 109.73 (d, *J* = 24.8 Hz), 104.00 , 98.21 (d, *J* = 26.2 Hz), 53.24 , 51.83 , 51.50 , 49.78 , 39.83 .

^{19}F NMR (377 MHz, $CDCl_3$) δ -119.8.

IR:3355, 2954, 2350, 1730, 1623, 1471, 1343, 1261, 1143, 753 cm^{-1}.

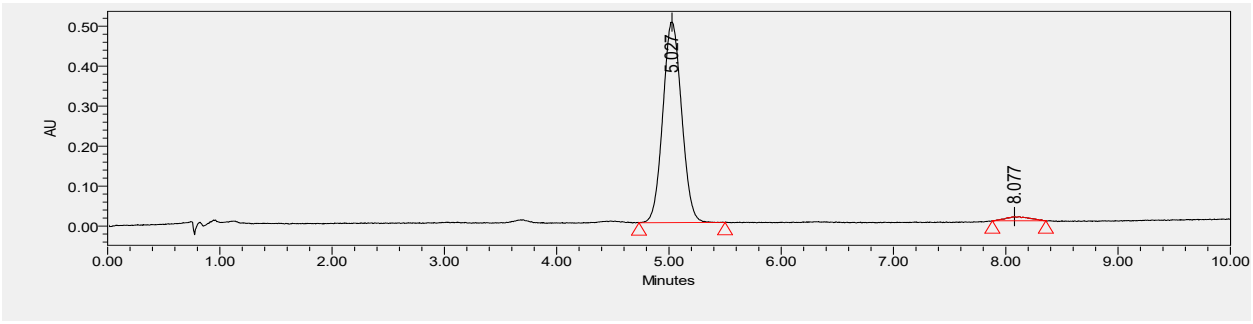
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}FN_2O_6$ 437.1154; found 437.1154.

The UPCC chromatograms of racemic product **C28**

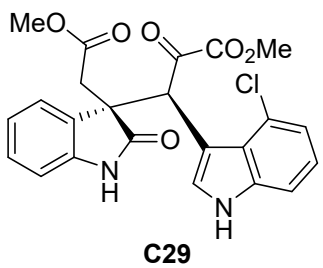


	Retention Time	Area	% Area	Height
1	3.672	7197044	16.09	582300
2	5.013	14769920	33.03	1032307
3	5.699	7631124	17.06	478656
4	7.933	15124150	33.82	652783

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	5.027	5825617	97.43	501866
2	8.077	153513	2.57	10571



C29

Methyl (S)-3-(4-chloro-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (29)

Yellow oil; 37.7 mg, 83% yield, >19:1 dr, 90% ee; $[\alpha]_D^{19.3}$ = -338.38 (*c* = 0.28 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IC-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 4.43 min, t_R (minor) = 6.34 min.

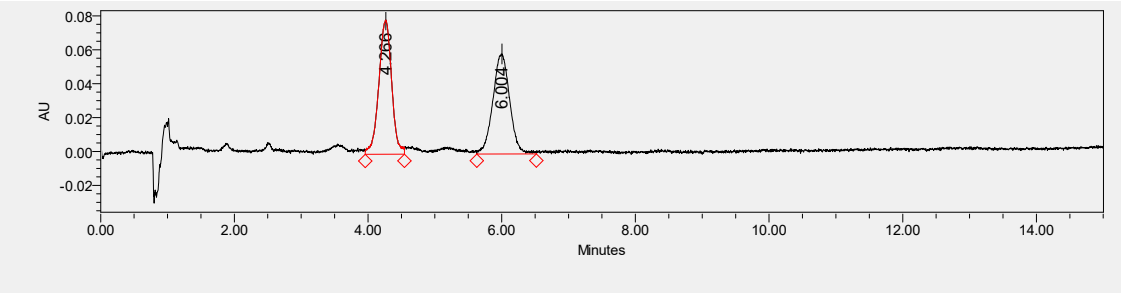
^{1}H NMR (400 MHz, Chloroform-*d*) δ 9.30 (d, *J* = 2.8 Hz, 1H), 8.44 (s, 1H), 7.23-7.13 (m, 3H), 7.06 (t, *J* = 7.6 Hz, 1H), 6.92 – 6.84 (m, 2H), 6.80 – 6.74 (m, 1H), 6.67 (d, *J* = 2.8 Hz, 1H), 6.25 (s, 1H), 3.57 (s, 3H), 3.29 (dd, *J* = 96.0, 16.0 Hz) 3.27 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.6, 180.2, 170.3, 161.0, 142.4, 138.1, 129.5, 128.7, 128.6, 126.0, 125.3, 123.8, 123.5, 122.3, 121.8, 111.2, 110.1, 103.4, 53.2, 51.7, 51.3, 49.3, 39.4.

IR:3349, 2921, 2350, 1730, 1620, 1470, 1340, 1261, 1117, 747 cm^{-1}.

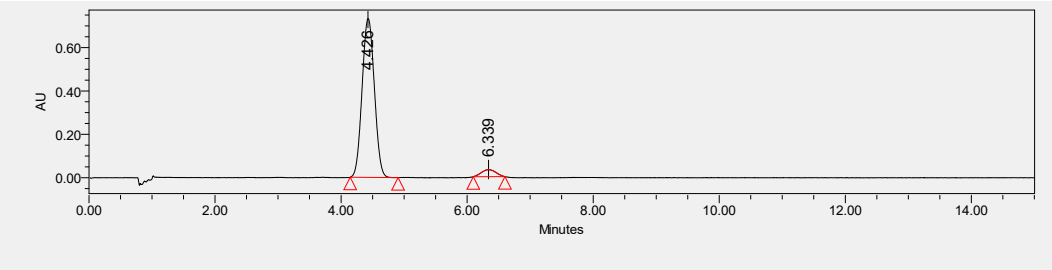
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}ClN_2O_6$ 453.0859, 455.0829; found 453.0858, 455.0828.

The UPCC chromatograms of racemic product **C29**

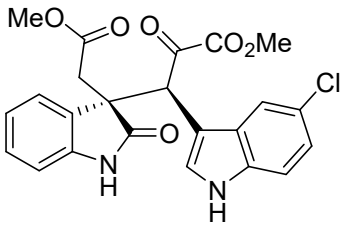


	Retention Time	Area	% Area	Height
1	4.266	1049949	50.38	79208
2	6.004	1034051	49.62	59073

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	4.426	9889274	94.95	732609
2	6.339	525524	5.05	33125



C30

Methyl (S)-3-(5-chloro-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C30)

Yellow oil; 39.1 mg, 86% yield, >19:1 dr, 91% ee; $[\alpha]_D^{19.3}$ = -197.86 (*c* = 0.28 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 6.22 min, t_R (minor) = 8.27 min.

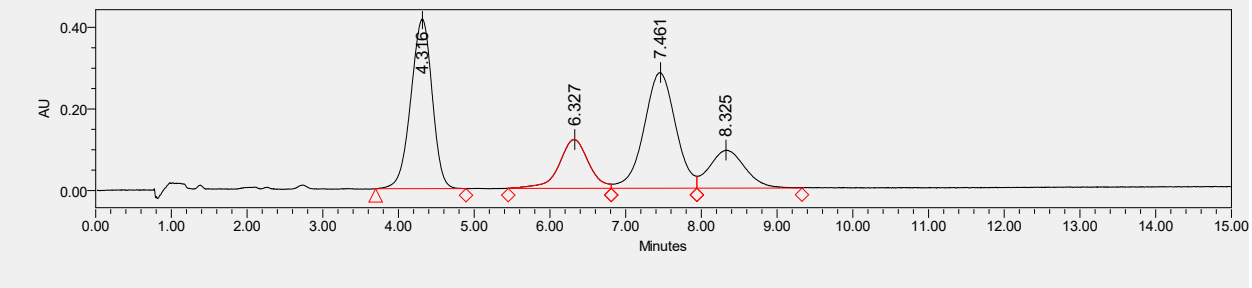
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.95 (s, 1H), 8.55 (s, 1H), 7.59 (d, *J* = 1.9 Hz, 1H), 7.25 – 7.11 (m, 3H), 6.92 – 6.77 (m, 4H), 5.41 (s, 1H), 3.58 (s, 3H), 3.36 (s, 3H), 3.16 (dd, *J* = 24.0, 16.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.7, 180.0, 170.1, 160.9, 142.1, 134.8, 129.4, 128.9, 128.9, 128.1, 126.6, 124.8, 123.5, 121.9, 118.4, 113.0, 110.2, 103.8, 53.3, 51.9, 51.5, 49.6, 39.7.

IR:3352, 2925, 2350, 1730, 1620, 1469, 1342, 1260, 1082, 747 cm^{-1}.

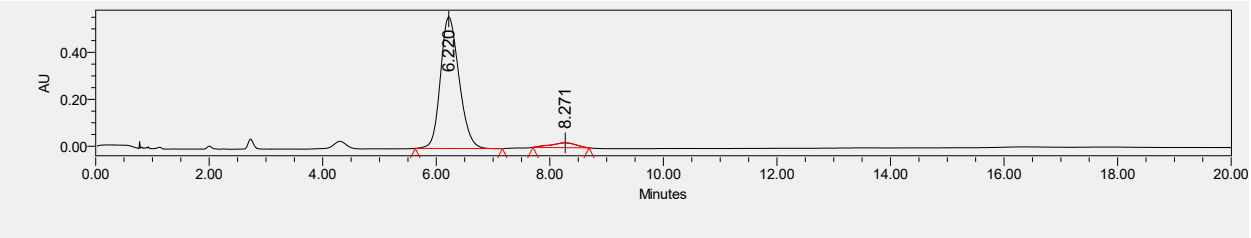
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}ClN_2O_6$ 453.0859, 455.0829; found 453.0858, 455.0830.

The UPCC chromatograms of racemic product **C30**

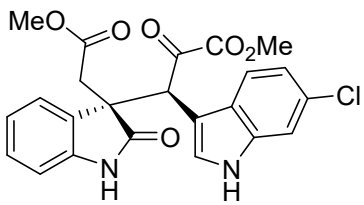


	Retention Time	Area	% Area	Height
1	4.316	8111396	35.94	416322
2	6.327	3232475	14.32	119650
3	7.461	8198600	36.33	283675
4	8.325	3026580	13.41	93076

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	6.220	12741402	95.31	560657
2	8.271	626557	4.69	20544



C31

Methyl (S)-3-(6-chloro-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C31)

Yellow oil; 35.0 mg, 77% yield, >19:1 dr, 94% ee; $[\alpha]_D^{19.3}$ = -197.86 (*c* = 0.17 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OX-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 6.91 min, t_R (minor) = 12.40 min.

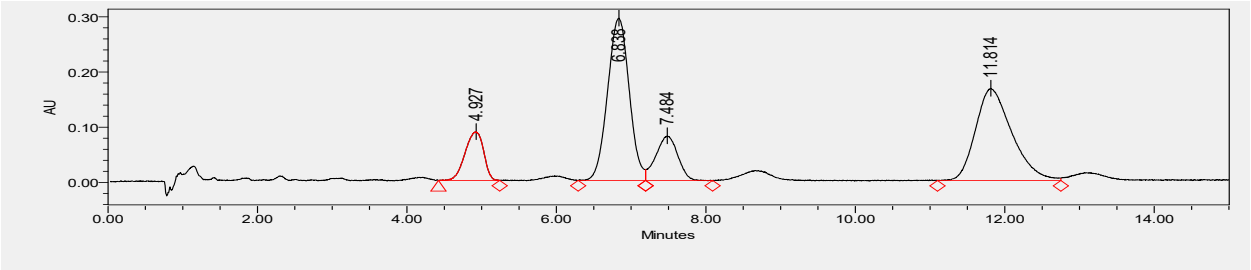
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.85 (s, 1H), 8.49 (s, 1H), 7.50 (d, *J* = 8.6 Hz, 1H), 7.33 (d, *J* = 1.6 Hz, 1H), 7.19 (td, *J* = 7.6, 1.2 Hz, 1H), 7.11 (dd, *J* = 8.8, 1.6 Hz, 1H), 6.91 – 6.82 (m, 3H), 6.76 (d, *J* = 7.6 Hz, 1H), 5.44 (s, 1H), 3.57 (s, 3H), 3.37 (s, 3H), 3.14 (dd, *J* = 24.0, 12.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.8, 180.0, 170.0, 160.9, 142.1, 136.8, 129.4, 128.9, 127.4, 126.3, 124.8, 121.9, 121.7, 119.9, 111.8, 110.2, 104.3, 53.3, 51.9, 51.5, 49.7, 39.8.

IR:3365, 2955, 2350, 1731, 1620, 1471, 1338, 1260, 1116, 753 cm^{-1}.

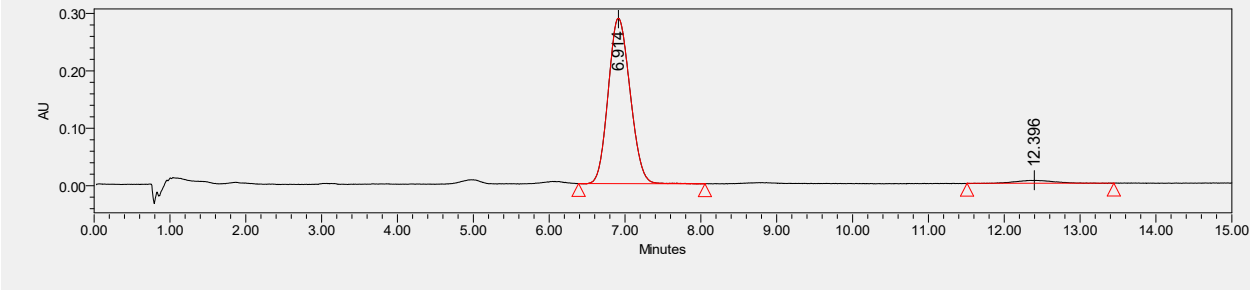
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}ClN_2O_6$ 453.0859, 455.0829; found 453.0856, 455.0829.

The UPCC chromatograms of racemic product **C31**

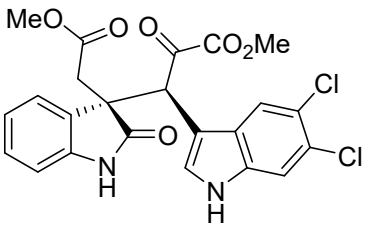


	Retention Time	Area	% Area	Height
1	4.927	1518670	10.34	88574
2	6.838	5901286	40.20	294153
3	7.484	1638382	11.16	81003
4	11.814	5622979	38.30	167003

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	6.914	5764276	97.04	288026
2	12.396	175775	2.96	5231



C32

Methyl (S)-3-(5,6-dichloro-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C32)

Yellow solid; 39.9 mg, 80% yield, >19:1 dr, 97% ee; melting point: 117 – 123 °C; $[\alpha]_D^{20.1}$ = -204.17 (*c* = 0.24 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OD-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 4.37 min, t_R (minor) = 3.96 min.

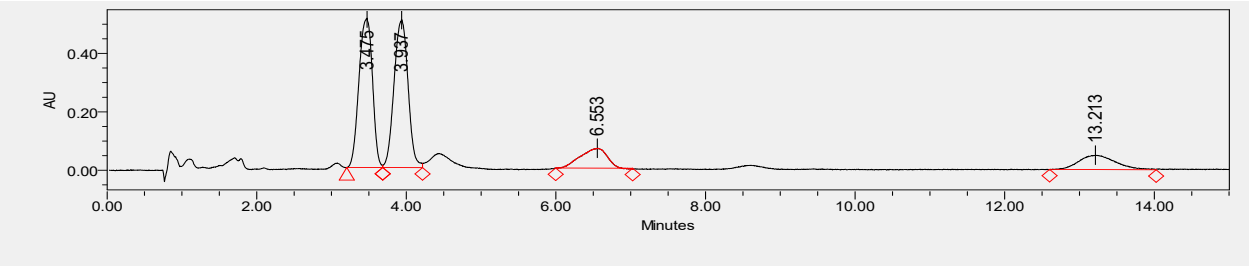
^{1}H NMR (400 MHz, Chloroform-*d*) δ 9.10 (s, 1H), 8.66 (s, 1H), 7.64 (s, 1H), 7.42 (s, 1H), 7.19 (td, *J* = 7.6, 1.4 Hz, 1H), 6.96 – 6.82 (m, 3H), 6.77 (d, *J* = 7.6 Hz, 1H), 5.38 (s, 1H), 3.60 (s, 3H), 3.40 (s, 3H), 3.20 (dd, *J* = 32.0, 12.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.7, 179.9, 170.2, 160.8, 141.9, 135.2, 129.5, 129.1, 128.5, 127.5, 126.9, 125.0, 124.6, 122.1, 119.9, 113.5, 110.3, 103.9, 53.4, 52.0, 51.6, 49.4, 39.0.

IR:3341, 2917, 2350, 1731, 1621, 1471, 1451, 1229, 1082, 753 cm^{-1}.

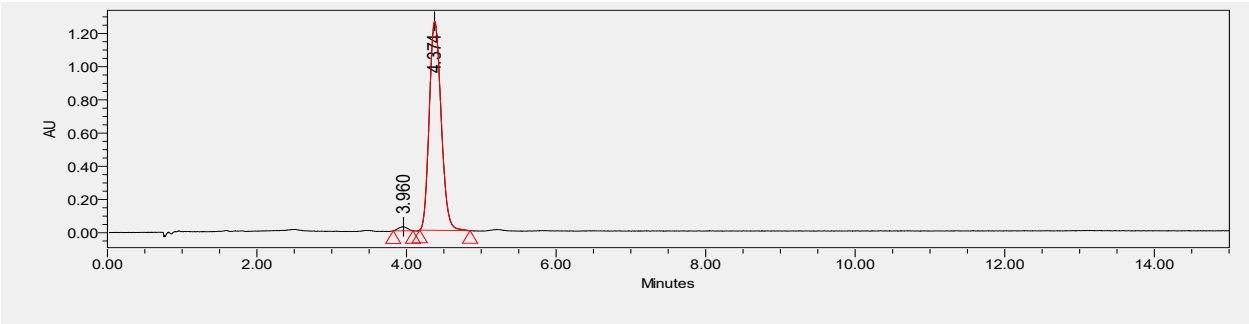
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{18}Cl_2N_2O_6$ 487.0469, 489.0440; found 487.0468, 489.0440.

The UPCC chromatograms of racemic product **C32**

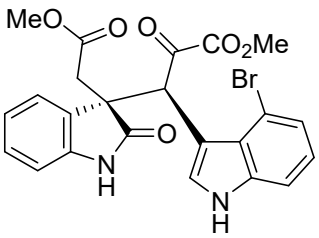


	Retention Time	Area	% Area	Height
1	3.475	6397951	39.19	511796
2	3.937	6581968	40.31	507075
3	6.553	1693434	10.37	67883
4	13.213	1653446	10.13	49396

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	3.960	204646	1.45	24006
2	4.374	13862607	98.55	1258819



C33

Methyl (S)-3-(4-bromo-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C33)

Yellow oil; 47.3 mg, 95% yield, >19:1 dr, 84% ee; $[\alpha]_D^{19.1}$ = -259.91 (*c* = 0.24 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL AD-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 6.61 min, t_R (minor) = 5.47 min.

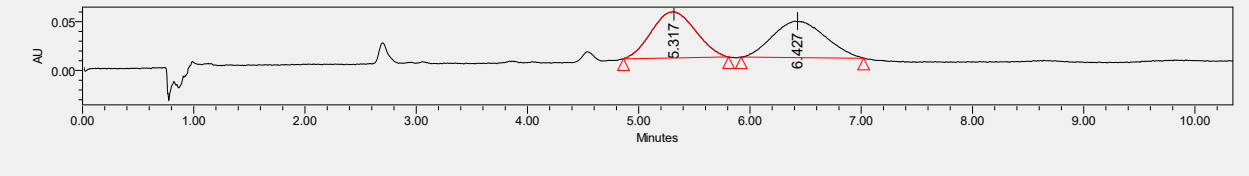
1H NMR (400 MHz, Acetonitrile-*d*3) δ 9.90 (s, 1H), 8.66 (s, 1H), 7.52 (dd, *J* = 8.4, 0.8 Hz, 1H), 7.38 (dd, *J* = 7.6, 0.8 Hz, 1H), 7.24 (td, *J* = 7.6, 1.2 Hz, 1H), 7.11 (t, *J* = 7.8 Hz, 1H), 6.97 – 6.87 (m, 3H), 6.81 (d, *J* = 7.6 Hz, 1H), 6.26 (s, 1H), 3.52 (s, 3H), 3.41 (d, *J* = 15.6 Hz, 1H), 3.24 (s, 3H), 2.92 (d, *J* = 15.6 Hz, 1H).

^{13}C NMR (101 MHz, CD_3CN) δ 188.9, 180.1, 170.6, 162.2, 144.3, 139.2, 130.5, 130.4, 129.3, 126.3, 126.2, 125.6, 124.4, 122.0, 114.1, 113.0, 110.3, 104.5, 53.5, 51.9, 51.7, 49.6, 40.5.

IR:3348, 2921, 2350, 1729, 1620, 1437, 1337, 1176, 1080, 745 cm^{-1}.

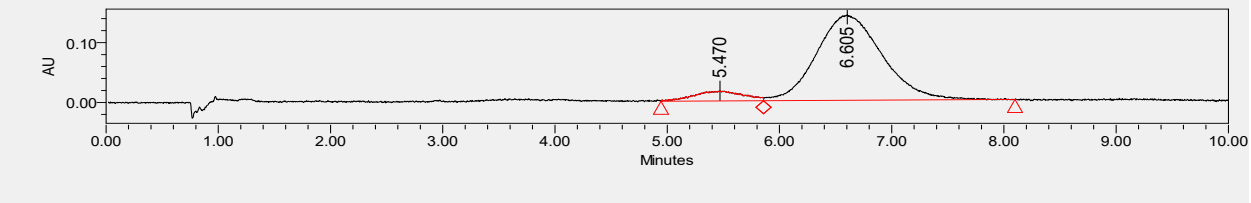
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}BrN_2O_6$ 497.0354, 499.0334; found 497.0352, 499.0333.

The UPCC chromatograms of racemic product **C33**

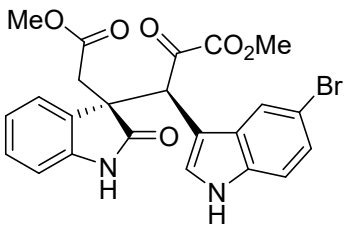


	Retention Time	Area	% Area	Height
1	5.317	1298845	51.42	47429
2	6.427	1226904	48.58	37440

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	5.470	502802	7.99	16907
2	6.605	5790698	92.01	143386



C34

Methyl (S)-3-(5-bromo-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C34)

Yellow solid; 41.0 mg, 84% yield, >19:1 dr, 97% ee; melting point: 127 – 133 °C; $[\alpha]_D^{20.5}$ = -252.35 (*c* = 0.43 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 7.36 min, t_R (minor) = 5.08 min.

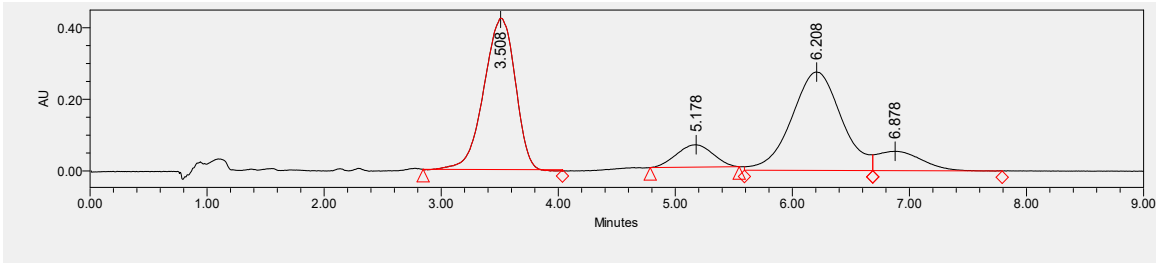
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.96 (s, 1H), 8.54 (s, 1H), 7.74 (s, 1H), 7.28 – 7.24 (m, 1H), 7.23 – 7.16 (m, 2H), 6.89 (t, *J* = 7.3 Hz, 1H), 6.85 – 6.79 (m, 3H), 5.41 (s, 1H), 3.58 (s, 3H), 3.36 (s, 3H), 3.16 (dd, *J* = 20.0, 16.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.7, 179.9, 170.1, 160.9, 142.1, 135.1, 129.5, 129.4, 128.9, 127.9, 126.0, 124.8, 122.0, 121.5, 114.2, 113.4, 110.2, 103.7, 53.3, 51.9, 51.5, 49.6, 39.6.

IR:3363, 2920, 2350, 1730, 1620, 1469, 1259, 1115, 1080, 753 cm^{-1}.

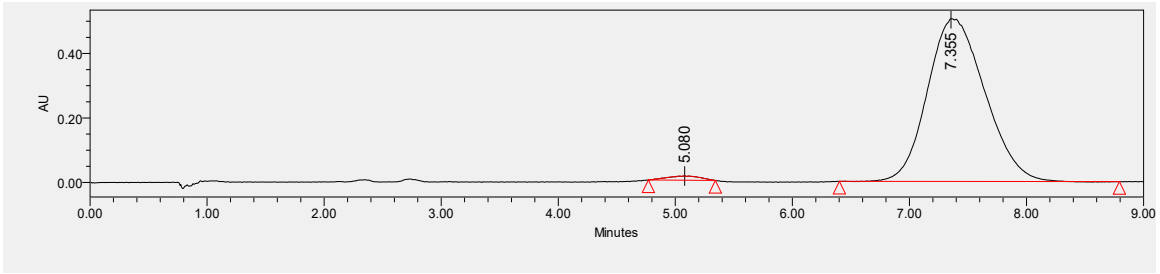
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}BrN_2O_6$ 497.0354, 499.0334; found 497.0344, 499.0332.

The UPCC chromatograms of racemic product **C34**

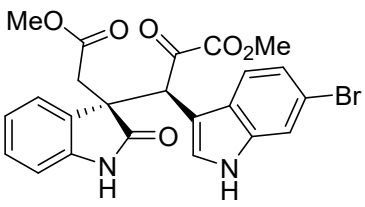


	Retention Time	Area	% Area	Height
1	3.508	7890874	42.00	422518
2	5.178	1347142	7.17	62373
3	6.208	8116195	43.20	274524
4	6.878	1431702	7.62	53885

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	5.080	258606	1.48	13228
2	7.355	17221877	98.52	504941



C35

Methyl (S)-3-(6-bromo-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C35)

Yellow solid; 41.0 mg, 92% yield, 92:8 dr, 95/81% ee; melting point: 135 – 136 °C; $[\alpha]_D^{20.6}$ = -

166.97 (*c* = 0.25 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OX-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, major isomer: t_R (major) = 8.26 min, t_R (minor) = 14.70 min; minor isomer: t_R (major) = 5.82 min, t_R (minor) = 9.12 min.

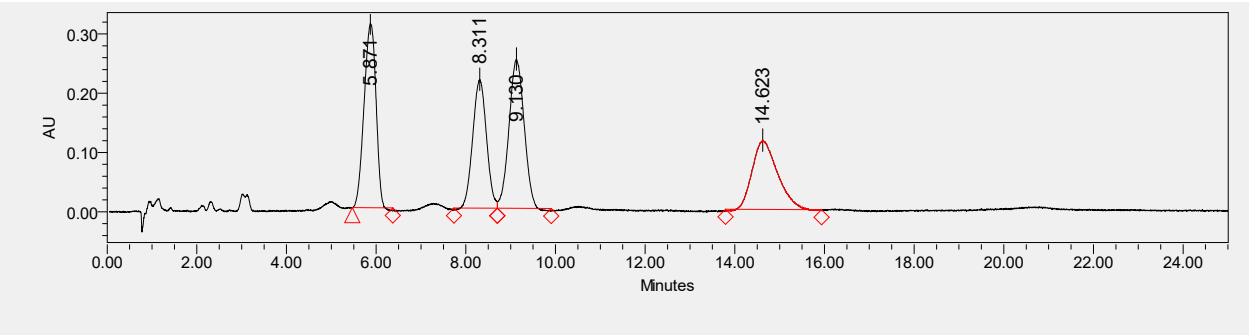
^{1}H NMR (400 MHz, Chloroform-*d*) δ 9.04 (s, 1H), 8.77 (s, 1H), 7.48 (s, 1H), 7.43 (d, *J* = 8.5 Hz, 1H), 7.19 (dd, *J* = 16.4, 8.4 Hz, 2H), 6.89 – 6.77 (m, 4H), 5.43 (s, 1H), 3.55 (s, 3H), 3.36 (s, 3H), 3.16 (t, *J* = 16.0, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.8, 180.1, 170.1, 160.9, 142.1, 137.2, 129.4, 128.9, 127.5, 126.6, 124.8, 124.1, 122.0, 120.2, 116.5, 114.9, 110.3, 104.2, 53.3, 51.9, 51.5, 49.7, 39.6.

IR:3353, 2922, 2350, 1730, 1618, 1470, 1259, 1115, 1052, 754 cm^{-1}.

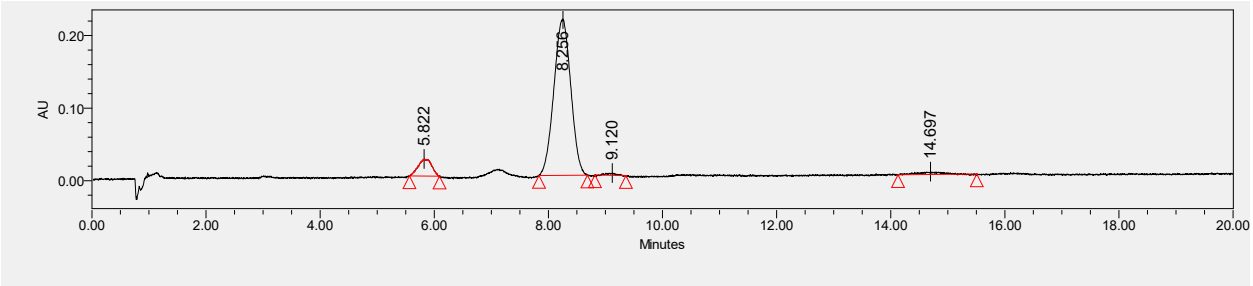
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}BrN_2O_6$ 497.0354, 499.0334; found 497.0353, 499.0334.

The UPCC chromatograms of racemic product **C35**

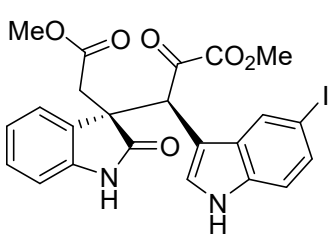


f	Retention Time	Area	% Area	Height
1	5.871	5762791	27.52	311375
2	8.311	4639510	22.16	217601
3	9.130	5959399	28.46	251828
4	14.623	4576815	21.86	116971

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	5.822	383217	7.72	23479
2	8.256	4425303	89.14	215310
3	9.120	40909	0.82	3207
4	14.697	114770	2.31	4025



C36

Methyl (S)-3-(5-iodo-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C36)

Yellow solid; 49.7 mg, 91% yield, 88:12 dr, 94/80% ee; melting point: 153-156 °C; $[\alpha]D^{19.8}$ = -165.01

(c = 0.3 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OX-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, major isomer: t_R (major) = 9.03 min, t_R (minor) = 12.09 min; minor isomer: t_R (major) = 6.29 min, t_R (minor) = 10.11 min.

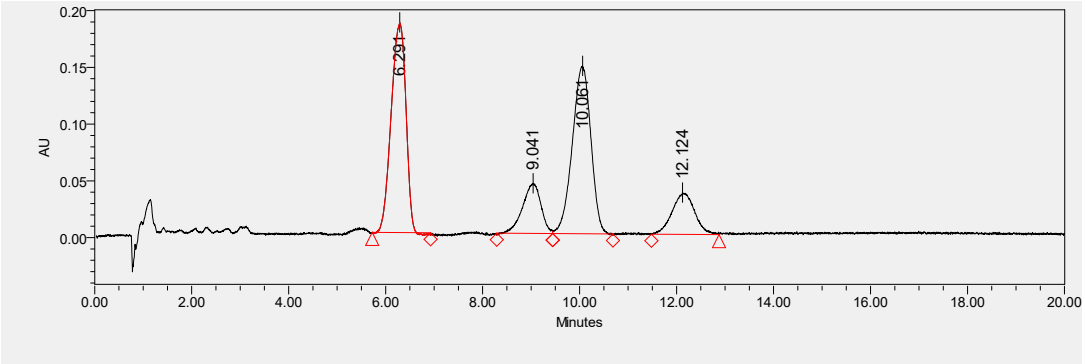
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.94 (s, 1H), 8.54 (s, 1H), 7.93 (d, *J* = 1.6 Hz, 1H), 7.43 (d, *J* = 8.4 Hz, 1H), 7.21 (t, *J* = 7.6 Hz, 1H), 7.10 (d, *J* = 8.4 Hz, 1H), 6.91 (t, *J* = 7.6 Hz, 1H), 6.85 – 6.78 (m, 3H), 5.41 (s, 1H), 3.58 (s, 3H), 3.37 (s, 3H), 3.14 (dd, *J* = 20.0, 16.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.7, 179.9, 170.1, 160.9, 142.1, 135.6, 131.4, 130.2, 129.4, 129.0, 127.7, 127.4, 124.8, 122.0, 113.8, 110.2, 103.4, 84.4, 53.3, 51.9, 51.6, 49.6, 39.6.

IR:3364, 2921, 2350, 1730, 1620, 1470, 1260, 1115, 1081, 755 cm^{-1}.

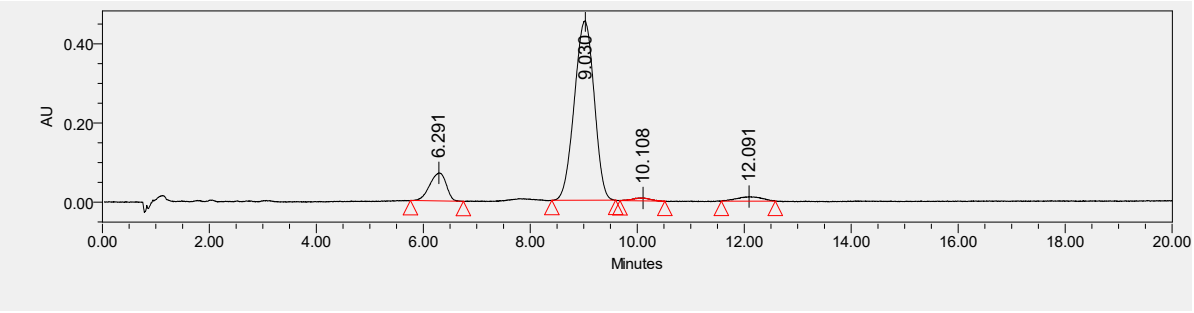
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{23}H_{19}IN_2O_6$ 545.0215; found 545.0214.

The UPCC chromatograms of racemic product **C36**

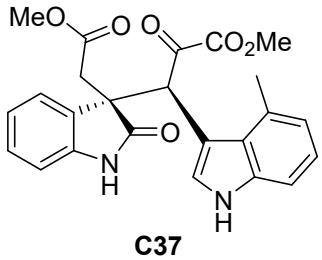


	Retention Time	Area	% Area	Height
1	6.291	3921015	38.46	185241
2	9.041	1160012	11.38	44147
3	10.061	3931082	38.56	147977
4	12.124	1182727	11.60	36986

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	6.291	1503579	10.98	70799
2	9.030	11642446	85.06	453667
3	10.108	169525	1.24	7582
4	12.091	372549	2.72	11596



C37

Methyl (S)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-3-(4-methyl-1H-indol-3-yl)-2-oxopropanoate (C37)

Yellow solid; 42.1 mg, 97% yield, >19:1 dr, 91% ee; melting point: 116-121 °C; $[\alpha]D^{19.5}$ = -295.95 (*c*

= 0.64 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IE-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 8.05 min, t_R (minor) = 7.15 min.

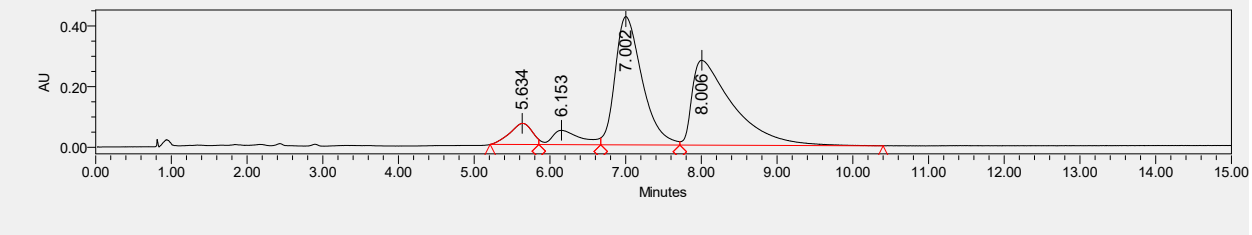
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.86 (d, *J* = 2.9 Hz, 1H), 8.49 (s, 1H), 7.25 – 7.20 (m, 1H), 7.13 (d, *J* = 8.1 Hz, 1H), 7.07 (dd, *J* = 8.4, 7.2 Hz, 1H), 6.93 (d, *J* = 7.2 Hz, 1H), 6.87 (d, *J* = 7.6 Hz, 2H), 6.85 – 6.80 (m, 1H), 6.69 (d, *J* = 2.8 Hz, 1H), 5.74 (s, 1H), 3.57 (s, 3H), 3.34 – 3.14 (m, 5H), 2.87 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 186.7, 180.4, 170.1, 161.2, 142.5, 137.2, 130.7, 129.6, 128.8, 127.8, 126.0, 125.7, 123.2, 123.1, 121.8, 110.3, 110.2, 103.5, 53.2, 51.7, 51.5, 50.4, 39.6, 20.8.

IR:3363, 2953, 2350, 1728, 1619, 1470, 1342, 1260, 1115, 752 cm^{-1}.

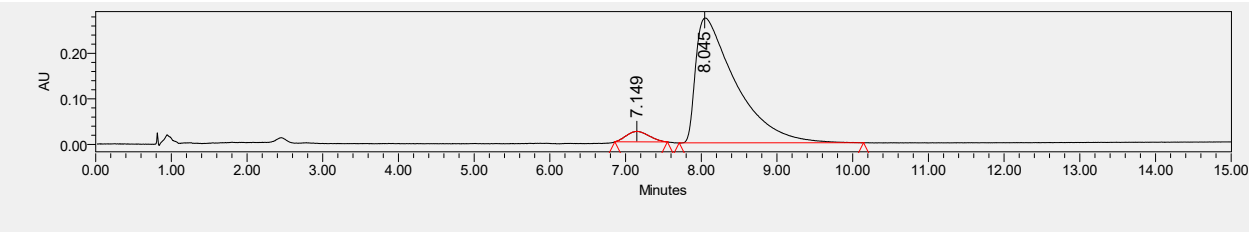
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{24}H_{22}N_2O_6$ 433.1405; found 433.1401.

The UPCC chromatograms of racemic product **C37**

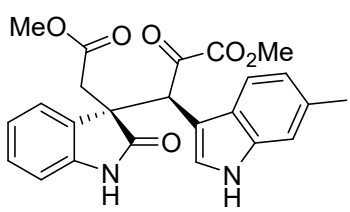


	Retention Time	Area	% Area	Height
1	5.634	1421522	6.00	69616
2	6.153	1276372	5.39	47311
3	7.002	10469368	44.18	422858
4	8.006	10529067	44.43	279540

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	7.149	474045	4.49	23247
2	8.045	10087822	95.51	274123



C38

Methyl (S)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-3-(6-methyl-1H-indol-3-yl)-2-oxopropanoate (C38)

Yellow oil; 39.1 mg, 90% yield, >19:1 dr, 95% ee; $[\alpha]_D^{19.4}$ = -234.48 (*c* = 0.52 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OX-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 9.50 min, t_R (minor) = 14.90 min.

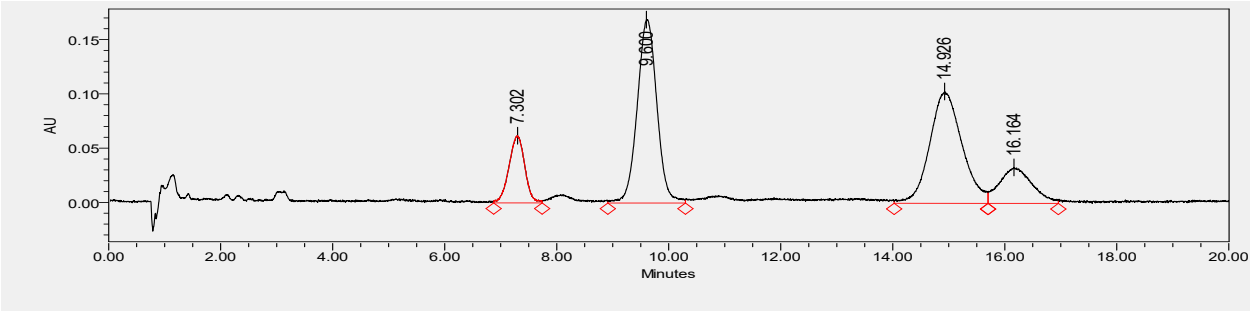
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.62 (s, 1H), 8.49 (s, 1H), 7.54 (d, *J* = 8.0 Hz, 1H), 7.23 – 7.13 (m, 2H), 7.01 (dd, *J* = 8.4, 1.2 Hz, 1H), 6.92 – 6.82 (m, 2H), 6.77 – 6.69 (m, 2H), 5.46 (s, 1H), 3.55 (s, 3H), 3.33 (s, 3H), 3.16 (dd, *J* =44.0, 16.0 Hz, 2H), 2.44 (s, 3H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.7, 180.1, 170.0, 161.0, 142.3, 137.0, 132.9, 129.4, 128.7, 126.3, 125.7, 125.0, 122.7, 121.7, 118.7, 111.7, 110.0, 103.7, 53.1, 51.7, 51.5, 50.1, 40.2, 21.8.

IR: 3365, 2953, 2349, 1729, 1620, 1470, 1342, 1263, 1116, 756 cm^{-1}.

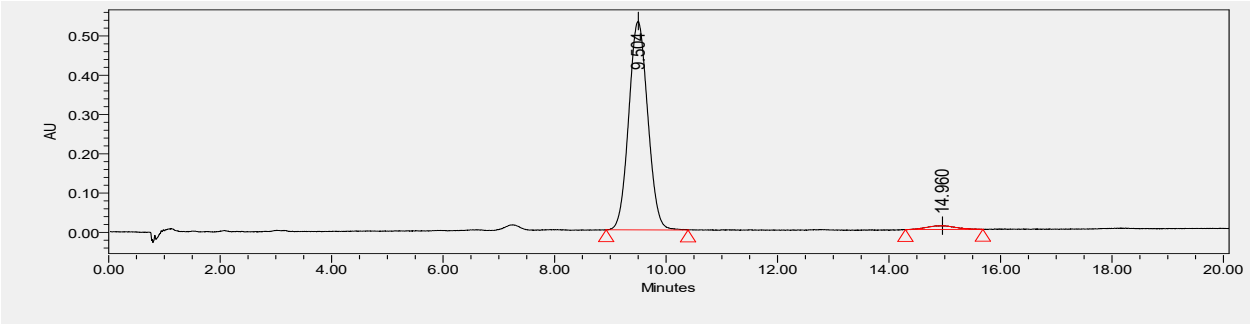
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{24}H_{22}N_2O_6$ 433.1405; found 433.1401.

The UPCC chromatograms of racemic product **C38**

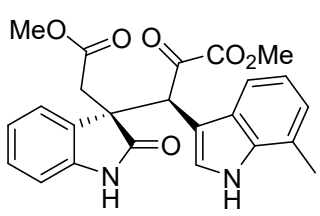


	Retention Time	Area	% Area	Height
1	7.302	1209847	11.21	62003
2	9.600	4126123	38.25	168907
3	14.926	4123306	38.22	103108
4	16.164	1328557	12.32	33166

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	9.504	12569746	97.41	531700
2	14.960	333726	2.59	9749



C39

Methyl (S)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-3-(7-methyl-1H-indol-3-yl)-2-oxopropanoate (C39)

Yellow oil; 33.9 mg, 78% yield, >19:1 dr, 96% ee; $[\alpha]_D^{19.5}$ = -319.57 (*c* = 0.14 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL IE-3, CO_2/*i*-PrOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 13.39 min, t_R (minor) = 12.66 min.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.60 (s, 1H), 8.36 (s, 1H), 7.53 (d, *J* = 7.6 Hz, 1H), 7.19 (t, *J* = 8.0 Hz, 1H), 7.12 (t, *J* = 7.6 Hz, 1H), 7.04 (d, *J* = 7.2 Hz, 1H), 6.89 – 6.84 (m, 3H), 6.72 (d, *J* = 7.2 Hz, 1H), 5.48 (s, 1H), 3.55 (s, 3H), 3.33 (s, 3H), 3.15 (dd, *J* = 56.0, 16.0 Hz, 2H), 2.46 (s, 3H).

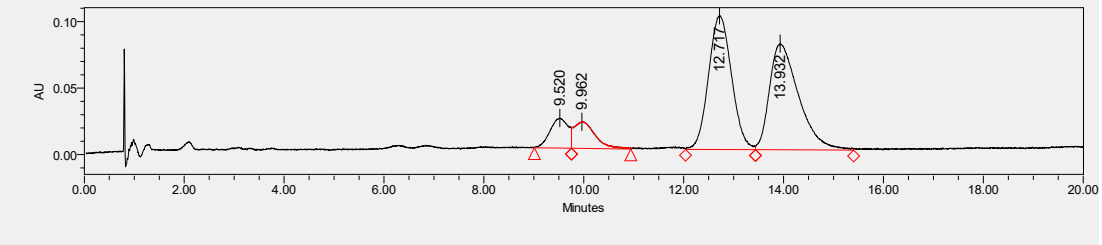
^{13}C NMR (101 MHz, $CDCl_3$) δ 187.9, 180.0, 169.9, 160.9, 142.3, 136.2, 129.3, 128.7, 127.4, 126.5, 125.0, 123.6, 121.6, 121.1, 121.0,

116.8, 110.0, 104.5, 53.1, 51.7, 51.5, 50.2, 40.4, 16.6.

IR: 3365, 2953, 2349, 1729, 1620, 1470, 1342, 1263, 1116, 756 cm^{-1}.

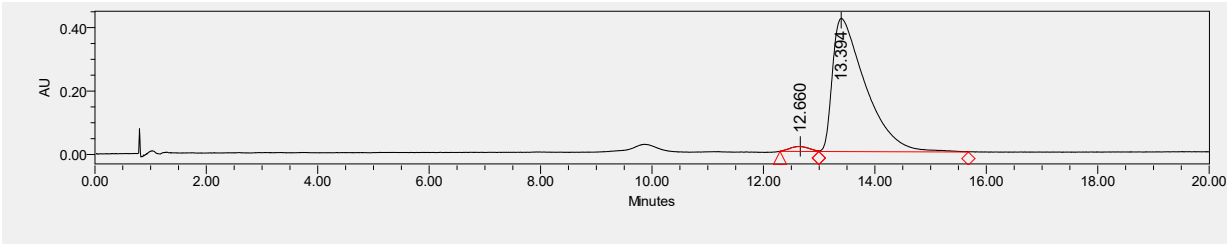
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{24}H_{22}N_2O_6$ 433.1405; found 433.1401.

The UPCC chromatograms of racemic product **C39**

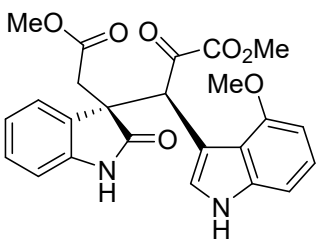


	Retention Time	Area	% Area	Height
1	9.520	569397	7.47	22627
2	9.962	595313	7.81	20096
3	12.717	3224534	42.32	100929
4	13.932	3229761	42.39	79839

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	12.660	381741	2.16	16001
2	13.394	17306741	97.84	420302



C40

Methyl (S)-3-(4-methoxy-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C40)

Yellow oil; 40.1 mg, 91% yield, >19:1 dr, 90% ee; $[\alpha]_D^{19.2}$ = -147.39 (*c* = 0.80 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OD-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 2.89 min, t_R (minor) = 4.89 min.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.78 (s, 1H), 8.32 (s, 1H), 7.18 (td, *J* = 7.6, 1.2 Hz, 1H), 7.13 (t, *J* = 8.0 Hz, 1H), 6.96 (d, *J* = 8.4 Hz, 1H), 6.88 (d, *J* = 7.7 Hz, 1H), 6.83 (t, *J* = 7.6 Hz, 1H), 6.65 (d, *J* = 7.6 Hz, 1H), 6.62 – 6.51 (m, 2H), 6.06 (s, 1H), 4.01 (s, 3H), 3.55 (s, 3H), 3.37 (d, *J* = 15.6 Hz, 1H), 3.27 (s, 3H), 3.02 (d, *J* = 15.6 Hz, 1H).

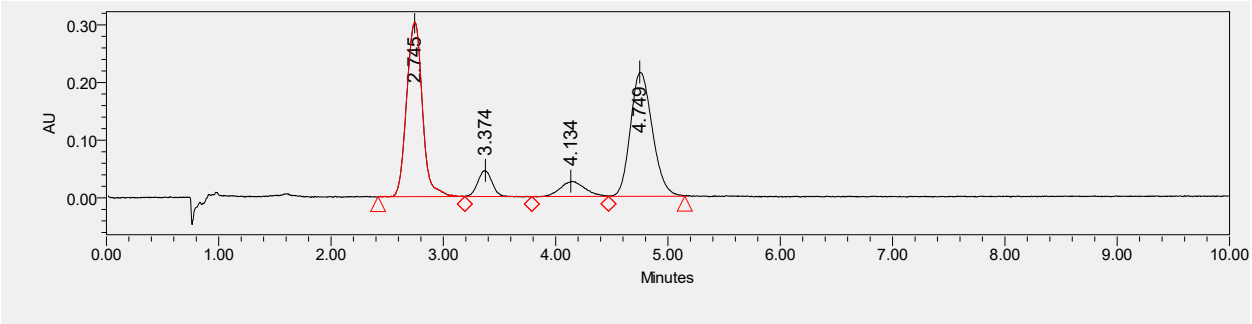
^{13}C NMR (101 MHz, $CDCl_3$) δ 188.2, 180.5, 170.4, 161.2, 154.6, 142.6, 138.2, 129.5, 128.4, 125.7, 125.2, 123.9, 121.4, 117.6, 109.8,

105.1, 103.8, 100.9, 55.3, 53.0, 51.5, 51.4, 50.8, 40.1.

IR: 3364, 2923, 2350, 1729, 1619, 1468, 1352, 1264, 1090, 756 cm^{-1}.

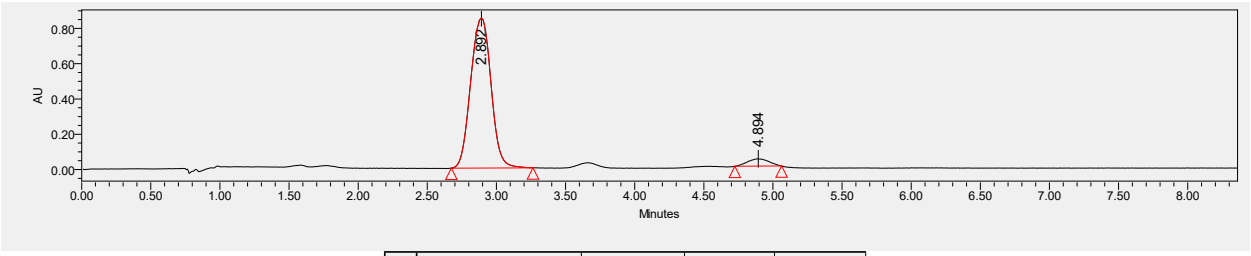
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{24}H_{22}N_2O_7$ 449.1354, found 449.1353.

The UPCC chromatograms of racemic product **C40**

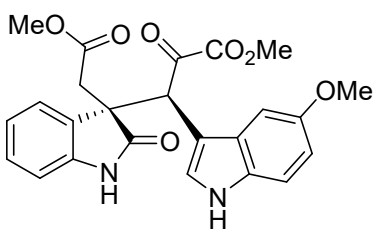


	Retention Time	Area	% Area	Height
1	2.745	2940536	44.20	303058
2	3.374	399988	6.01	45304
3	4.134	395107	5.94	26191
4	4.749	2916474	43.84	215427

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	2.892	8691002	95.13	851843
2	4.894	444798	4.87	41545



C41

Methyl (S)-3-(5-methoxy-1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate (C41)

Yellow oil; 36.9 mg, 80% yield, >19:1 dr, 95% ee; $[\alpha]_D^{19.5}$ = -273.39 (*c* = 0.50 in CH_2Cl_2).

UPCC DAICEL CHIRALCEL OX-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 8.90 min, t_R (minor) = 11.19 min.

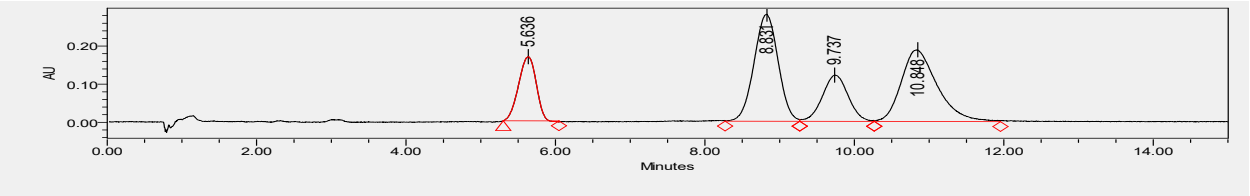
^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.64 (d, *J* = 2.8 Hz, 1H), 8.36 (s, 1H), 7.24 (d, *J* = 8.8 Hz, 1H), 7.19 (td, *J* = 7.6, 1.2 Hz, 1H), 7.04 (d, *J* = 2.4 Hz, 1H), 6.91 – 6.83 (m, 3H), 6.80 (d, *J* = 2.8 Hz, 1H), 6.73 (d, *J* = 7.2 Hz, 1H), 3.83 (s, 3H), 3.56 (s, 3H), 3.35 (s, 3H), 3.12 (dd, *J* = 56.0, 12.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 187.8, 180.0, 169.9, 161.0, 155.0, 142.3, 131.6, 129.4, 128.7, 128.3, 127.4, 125.0, 121.7, 113.5, 112.6, 110.0, 103.6, 100.4, 56.0, 53.2, 51.8, 51.6, 50.1, 40.4.

IR: 3365, 2953, 2350, 1731, 1621, 1487, 1352, 1216, 1164, 752 cm^{-1}.

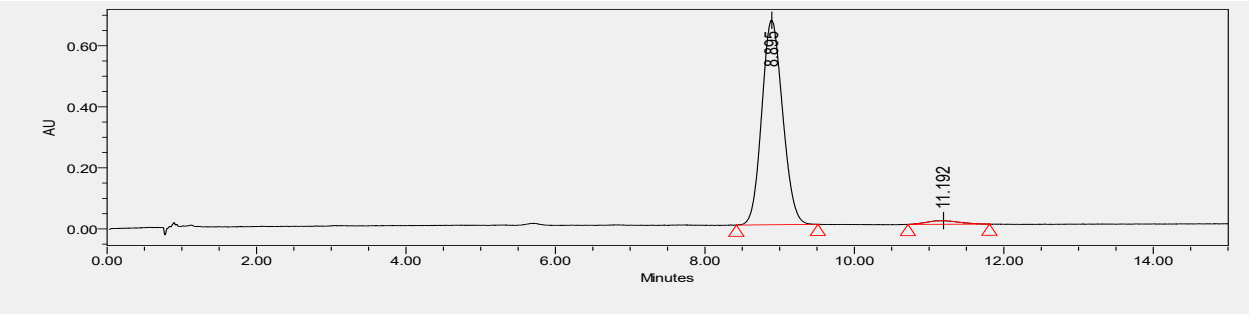
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{24}H_{22}N_2O_7$ 449.1354, found 449.1353.

The UPCC chromatograms of racemic product **C41**

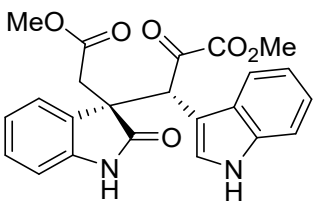


	Retention Time	Area	% Area	Height
1	5.636	2763922	15.15	168553
2	8.831	6283662	34.43	281068
3	9.737	2910284	15.95	121528
4	10.848	6290603	34.47	188066

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	8.895	12972797	97.32	669967
2	11.192	357510	2.68	12049



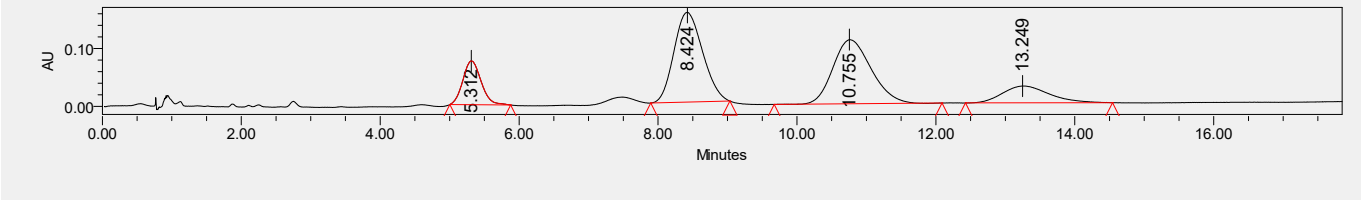
(S,R)-C1

Methyl (R)-3-(1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-2-oxopropanoate ((S,R)-C1)

Yellow oil; 40.0 mg, 95% yield, 85:15 dr, 89%/92% ee; $[\alpha]_D^{21.9}$ = 114.08 (*c* = 0.28 in CH_2Cl_2)

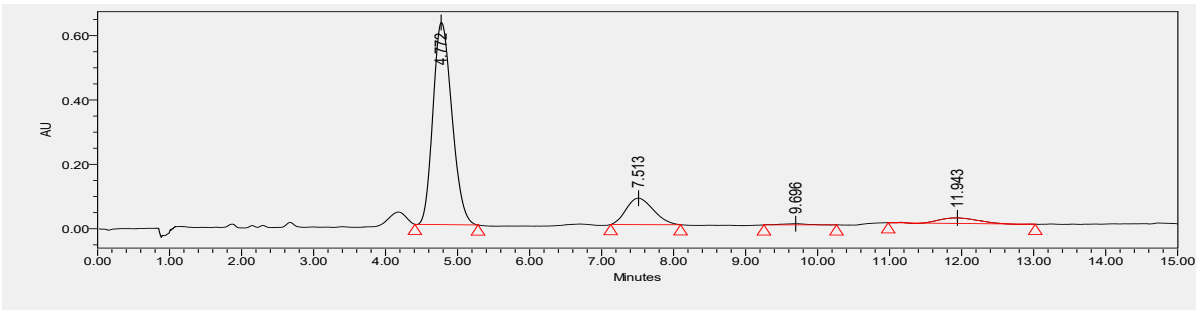
UPCC DAICEL CHIRALCEL OZ-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, major isomer: t_R (major) = 4.77 min, t_R (minor) = 11.94 min; minor isomer : t_R (major) = 7.51 min, t_R (minor) = 9.70 min.

The UPCC chromatograms of racemic product **C1**

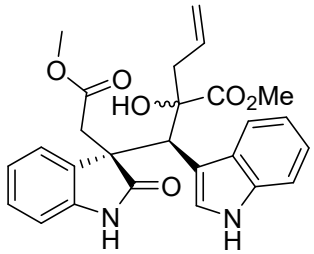


	Retention Time	Area	% Area	Height
1	5.312	1379872	12.09	75677
2	8.424	4442531	38.92	155097
3	10.755	4234268	37.10	110819
4	13.249	1356487	11.89	29024

The UPCC chromatograms of **(S,R)-C1**



	Retention Time	Area	% Area	Height
1	4.772	11493953	79.86	627867
2	7.513	2145997	14.91	82073
3	9.696	85913	0.60	3690
4	11.943	667511	4.64	17122



D1

Methyl 2-((S)-(1H-indol-3-yl)((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)methyl)-2-hydroxypent-4-enoate (D1)

Yellow solid; 36.9 mg, 87% yield, 94:6 dr, 95%/99% ee.

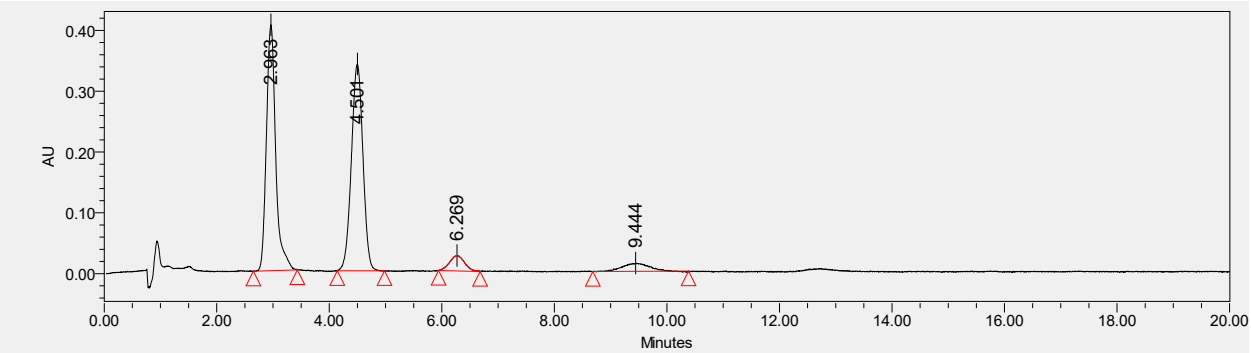
UPCC DAICEL CHIRALCEL IH-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, major isomer: t_R (major) = 2.96 min, t_R (minor) = 4.48 min; minor isomer: t_R (major) = 6.25.

^{1}H NMR (400 MHz, DMSO-d_6) δ 10.91 (s, 1H), 10.79 (s, 1H), 7.40 (d, *J* = 7.8 Hz, 1H), 7.35 (d, *J* = 7.4 Hz, 1H), 7.23 – 7.14 (m, 2H), 6.96 – 6.80 (m, 3H), 6.70 (t, *J* = 7.6 Hz, 1H), 6.45 (d, *J* = 7.6 Hz, 1H), 6.08 – 6.01 (m, 1H), 5.55 – 5.46 (m, 1H), 4.83 (d, *J* = 11.6 Hz, 1H), 4.72 (d, *J* = 17.2 Hz, 1H), 4.17 (s, 1H), 3.69 (s, 3H), 3.20 (s, 3H), 3.05 – 2.88 (m, 2H), 1.80 (ddd, *J* = 76.4, 13.6, 7.6 Hz, 2H).

^{13}C NMR (101 MHz, DMSO) δ 182.1, 176.1, 169.1, 141.7, 134.4, 132.8, 131.6, 128.7, 127.8, 123.4, 121.3, 120.6, 118.5, 117.8, 117.6, 111.1, 109.0, 108.6, 80.7, 55.1, 51.9, 51.3, 46.7, 44.7.

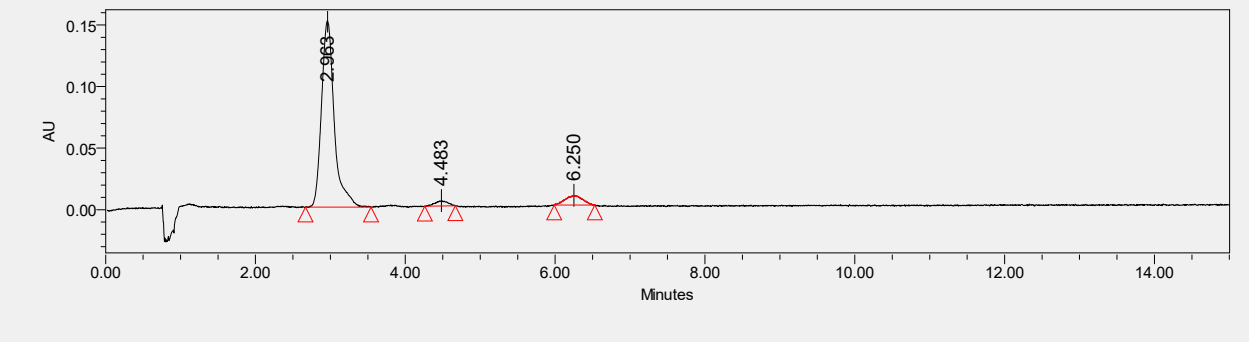
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{26}H_{26}N_2O_6$ 461.1718; found 461.1720.

The UPCC chromatograms of racemic product **D1**

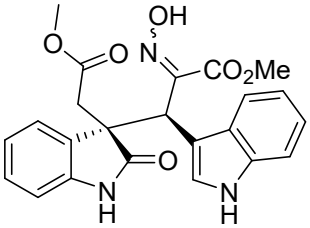


	Retention Time	Area	% Area	Height
1	2.963	4632491	44.52	404326
2	4.501	4841372	46.53	339975
3	6.269	467365	4.49	25437
4	9.444	464386	4.46	13607

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	2.963	1787069	91.12	151218
2	4.483	49827	2.54	4328
3	6.250	124305	6.34	7858



D2

Methyl (S)-2-(hydroxyimino)-3-(1H-indol-3-yl)-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)propanoate (D2)

Yellow oil; 21.8 mg, 50% yield, >19:1 dr, >19/1 Z/E, 95% ee.

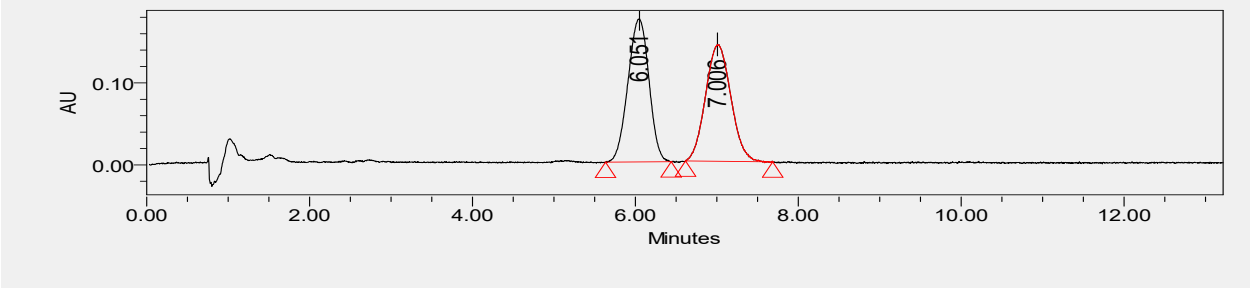
UPCC DAICEL CHIRALCEL IH-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 6.98 min, t_R (minor) = 6.03 min.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 11.13 (s, 1H), 8.61 (s, 1H), 8.47 (s, 1H), 7.64 (d, *J* = 8.0 Hz, 1H), 7.36 (d, *J* = 8.0 Hz, 1H), 7.23 – 7.06 (m, 4H), 6.92 – 6.77 (m, 3H), 4.96 (s, 1H), 3.59 (s, 3H), 3.31 – 3.27 (m, 4H), 2.97 (d, *J* = 16.0 Hz, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 180.8, 170.1, 163.2, 148.2, 142.3, 135.8, 129.9, 128.5, 128.0, 126.5, 124.7, 122.4, 121.7, 120.3, 119.0, 111.6, 110.1, 108.8, 53.5, 52.7, 51.7, 43.3, 41.5.

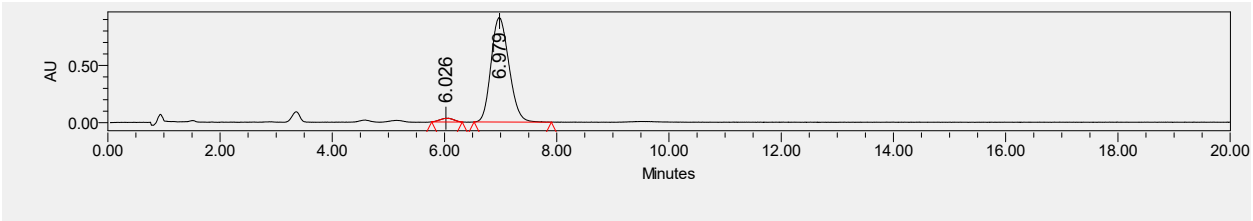
HRMS (FTMS+c ESI) m/z: $[M + Na]^+$ calcd for $C_{23}H_{21}N_3O_6$ 458.1323; found 458.1327.

The UPCC chromatograms of racemic product **D2**

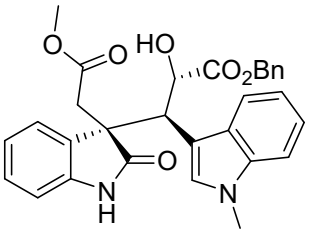


	Retention Time	Area	% Area	Height
1	6.051	3127827	50.48	174597
2	7.006	3068427	49.52	142419

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	6.026	544255	2.62	32628
2	6.979	20199744	97.38	912684



D3

Benzyl (2S,3S)-2-hydroxy-3-((S)-3-(2-methoxy-2-oxoethyl)-2-oxoindolin-3-yl)-3-(1-methyl-1H-indol-3-yl)propanoate (D3)

Yellow oil; 37.4 mg, 73% yield, >19:1 dr, 98% ee.

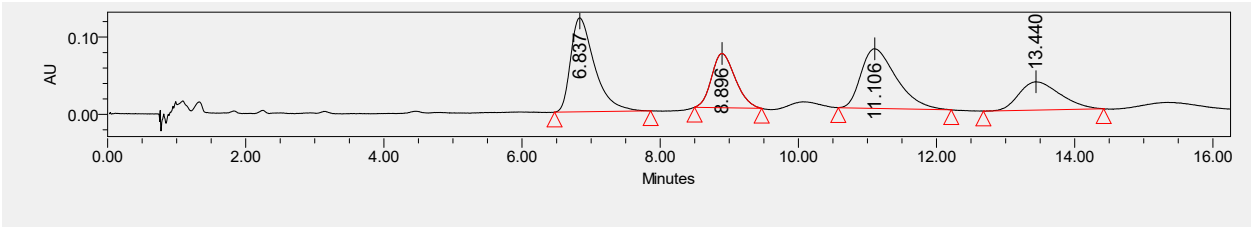
UPCC DAICEL CHIRALCEL IA-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, major isomer: t_R (major) = 6.61 min, t_R (minor) = 11.18 min; minor isomer: t_R (major) = 8.88 min, t_R (minor) = 13.41 min.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.56 (s, 1H), 7.35 (d, *J* = 7.9 Hz, 1H), 7.27 – 7.18 (m, 3H), 7.15 – 7.06 (m, 5H), 7.00 – 6.91 (m, 2H), 6.90 – 6.84 (m, 2H), 6.70 (d, *J* = 7.8 Hz, 1H), 4.88 (t, *J* = 2.4 Hz, 1H), 4.82 (d, *J* = 12.0 Hz, 1H), 4.60 (d, *J* = 12.0 Hz, 1H), 4.33 (d, *J* = 2.4 Hz, 1H), 4.18 (d, *J* = 2.4 Hz, 1H), 3.65 (s, 3H), 3.33 (s, 3H), 3.16 (dd, *J* = 77.6, 16.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 182.0, 172.9, 170.2, 141.5, 135.8, 134.9, 131.0, 129.4, 129.0, 128.5, 128.4, 128.4, 128.2, 124.1, 122.0, 121.4, 119.3, 118.7, 109.9, 109.1, 106.3, 72.0, 67.5, 54.3, 51.7, 44.6, 40.6, 33.0.

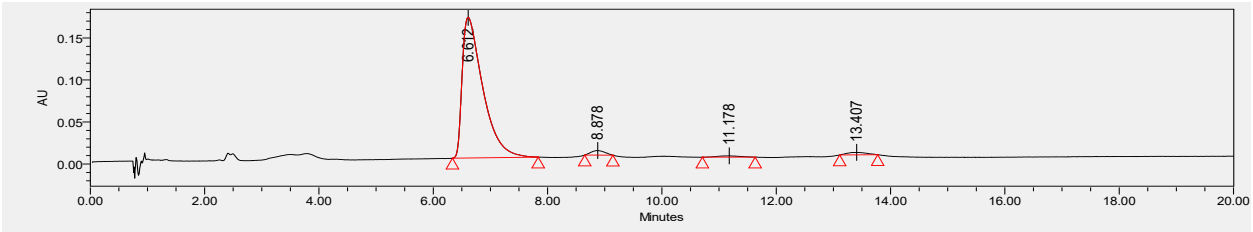
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{30}H_{28}N_2O_6$ 511.1875; found 511.1877.

The UPCC chromatograms of racemic product **D3**

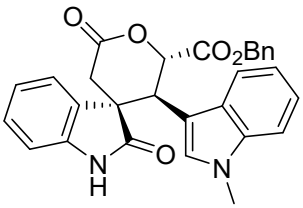


	Retention Time	Area	% Area	Height
1	6.837	2920994	33.01	121506
2	8.896	1672674	18.90	70130
3	11.106	2735874	30.92	77152
4	13.440	1518685	17.16	36676

The UPCC chromatograms of product from asymmetric reaction



	Retention Time	Area	% Area	Height
1	6.612	4173564	95.42	167388
2	8.878	89029	2.04	5374
3	11.178	41839	0.96	1655
4	13.407	69348	1.59	2931



E1

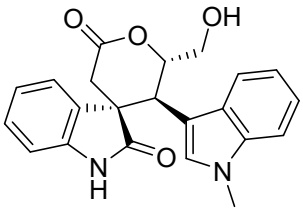
Benzyl (2'S,3S,3'S)-3'-(1-methyl-1H-indol-3-yl)-2,6'-dioxo-2',3',5',6'-tetrahydrospiro[indoline-3,4'-pyran]-2'-carboxylate (E1)

Yellow solid; 37.9 mg, 79% yield, >19:1 dr.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.15 (s, 1H), 7.35 – 7.29 (m, 2H), 7.22 – 7.16 (m, 1H), 7.14 – 7.05 (m, 4H), 7.03 – 6.92 (m, 3H), 6.86 (s, 1H), 6.69 (d, *J* = 7.2 Hz, 2H), 6.59 (d, *J* = 8.0 Hz, 1H), 5.95 (d, *J* = 11.2 Hz, 1H), 4.76 (s, 2H), 4.19 (d, *J* = 11.2 Hz, 1H), 3.35 (s, 3H), 2.99 (dd, *J* = 68.0, 20.0 Hz, 2H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 179.8, 168.6, 167.6, 140.1, 136.2, 134.6, 130.5, 129.1, 128.4, 128.3, 128.1, 127.6, 126.9, 123.4, 123.0, 121.9, 119.5, 118.4, 110.2, 109.2, 105.2, 78.5, 67.5, 51.2, 39.9, 38.1, 32.7.

HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{29}H_{24}N_2O_5$ 479.1612; found 479.1616.



F1

(2'S,3S,3'S)-2'-(hydroxymethyl)-3'-(1-methyl-1H-indol-3-yl)-2',3'-dihydrospiro[indoline-3,4'-pyran]-2,6'(5'H)-dione (F1)

White solid; 31.9 mg, 85% yield, >19:1 dr, >99% ee.

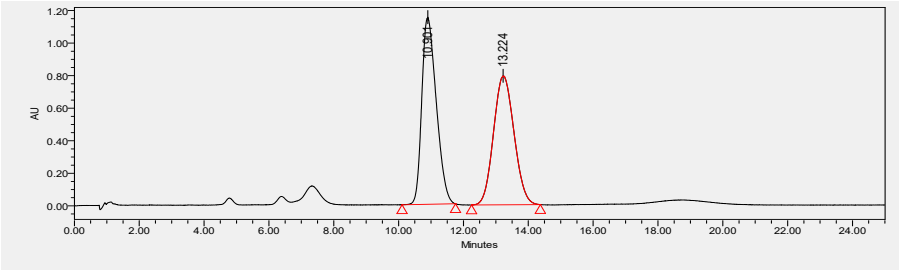
UPCC DAICEL CHIRALCEL IH-3, CO_2/MeOH = 80/20, flow rate = 1.5 mL/min, λ = 211 nm, t_R (major) = 6.61 min, t_R (minor) = 11.18 min.

^{1}H NMR (400 MHz, Chloroform-*d*) δ 8.39 (s, 1H), 7.48 (d, *J* = 8.0 Hz, 1H), 7.33 (d, *J* = 6.8 Hz, 1H), 7.14 – 7.06 (m, 2H), 7.02 – 6.90 (m, 3H), 6.84 (s, 1H), 6.57 (dd, *J* = 6.8, 1.6 Hz, 1H), 5.49 (d, *J* = 11.2 Hz, 1H), 4.06 (d, *J* = 11.3 Hz, 1H), 3.76 (d, *J* = 11.2 Hz, 1H), 3.40 (m, 3H), 2.95 (dd, *J* = 52.0, 16.0 Hz, 2H), 2.69 (s, 1H).

^{13}C NMR (101 MHz, $CDCl_3$) δ 180.5, 169.8, 140.1, 136.3, 131.1, 128.8, 127.7, 126.6, 123.2, 122.9, 121.9, 119.4, 118.6, 110.2, 109.3, 107.5, 81.4, 62.6, 51.3, 38.4, 32.6.

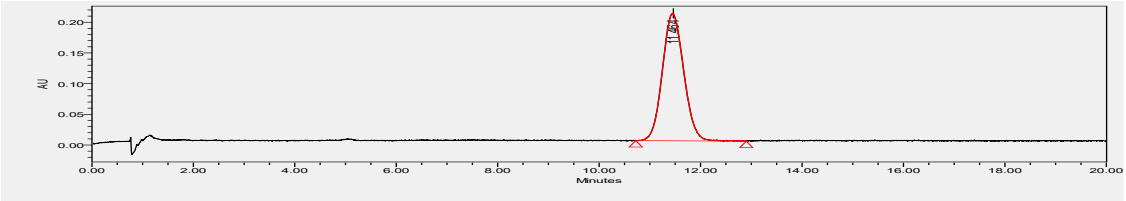
HRMS (FTMS+c ESI) m/z: $[M - H]^-$ calcd for $C_{22}H_{20}N_2O_4$ 375.1350; found 375.1351.

The UPCC chromatograms of racemic product **F1**



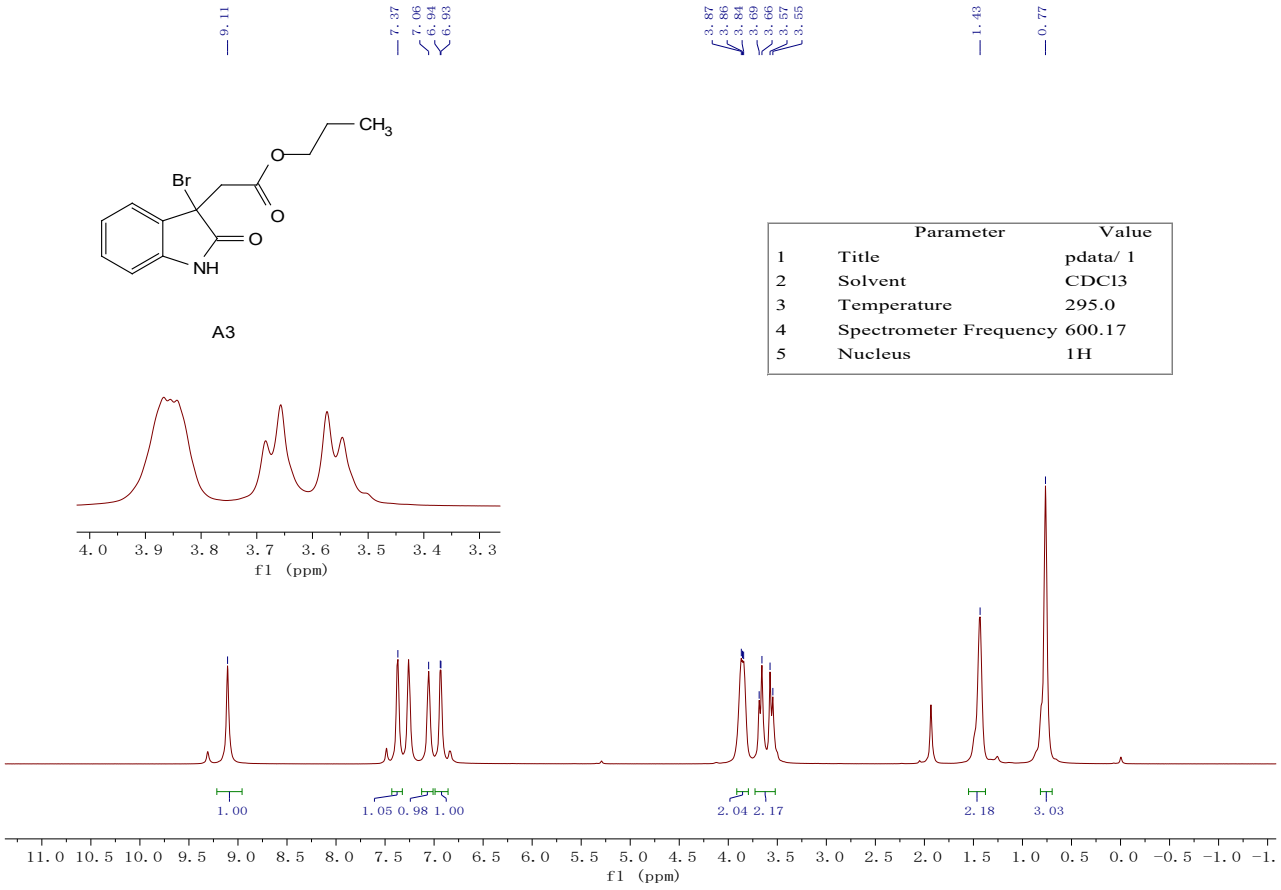
	Retention Time	Area	% Area	Height
1	10.901	35549445	50.56	1150128
2	13.224	34755554	49.44	792611

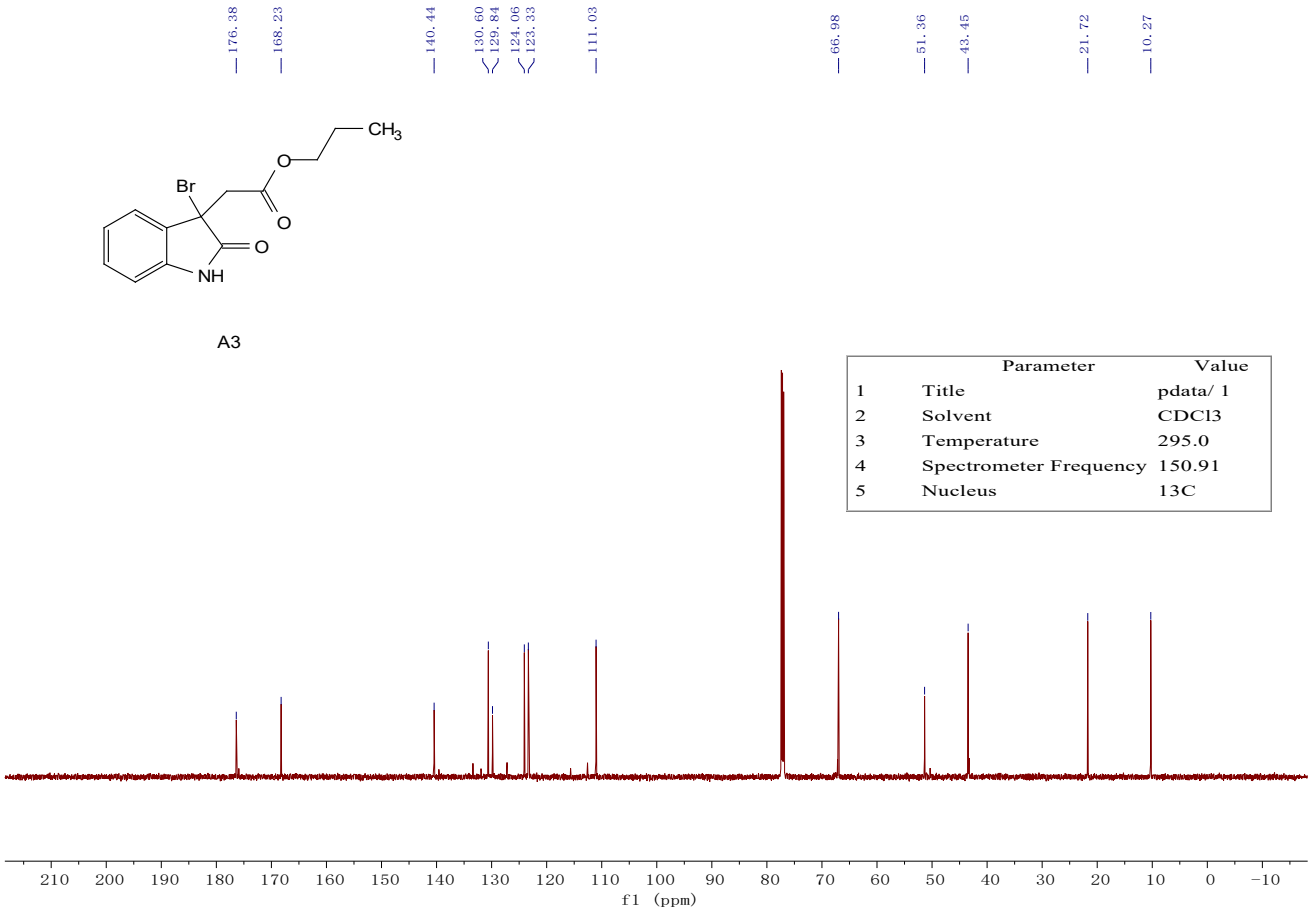
The UPCC chromatograms of product from asymmetric reaction

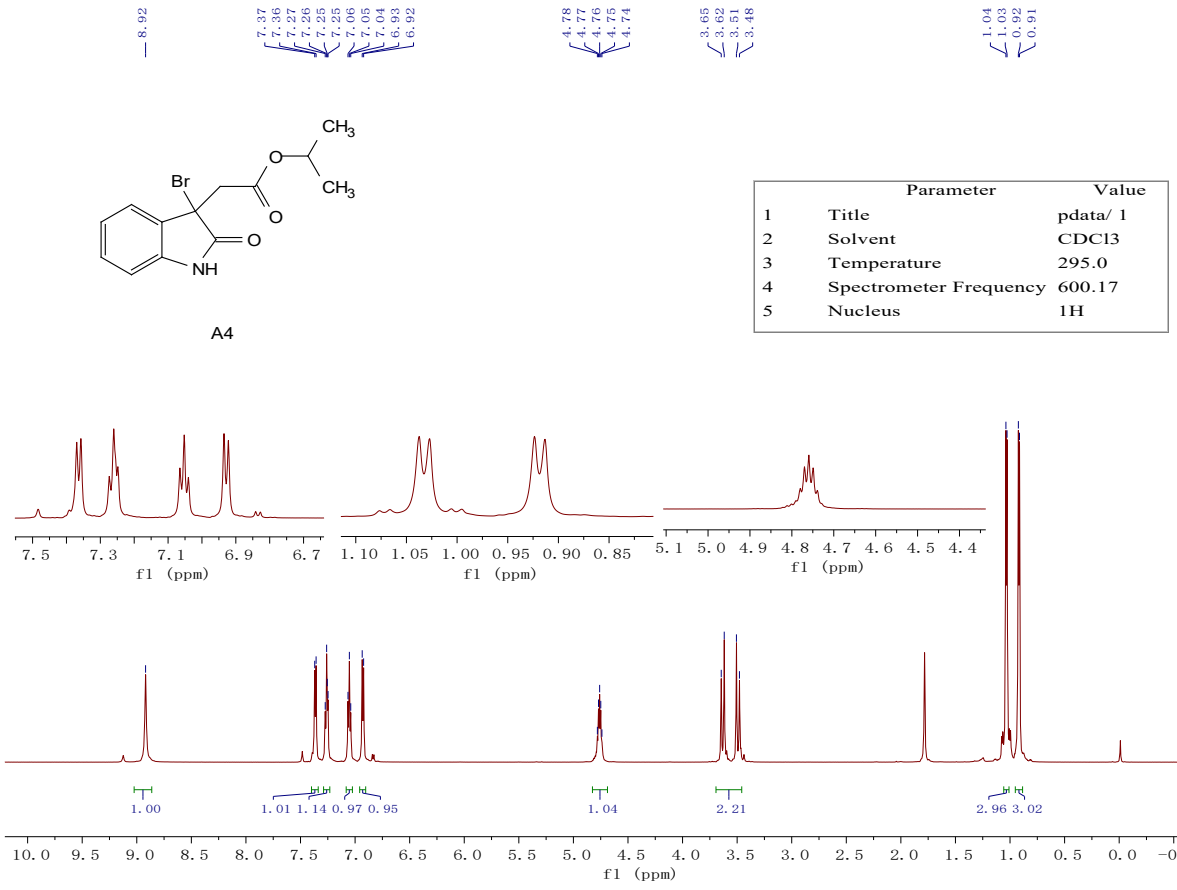


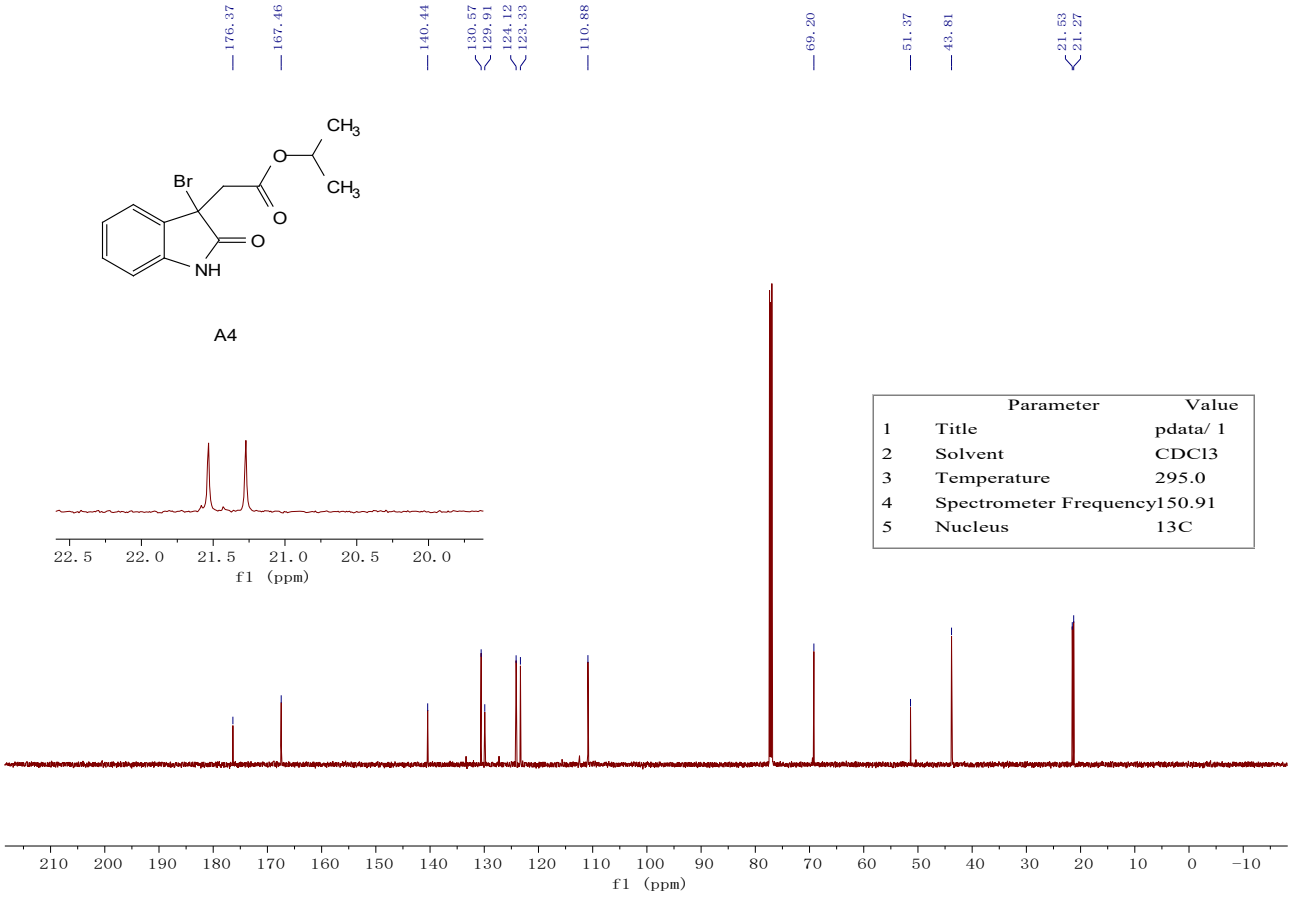
	Retention Time	Area	% Area	Height
1	11.464	6021957	100.00	207437

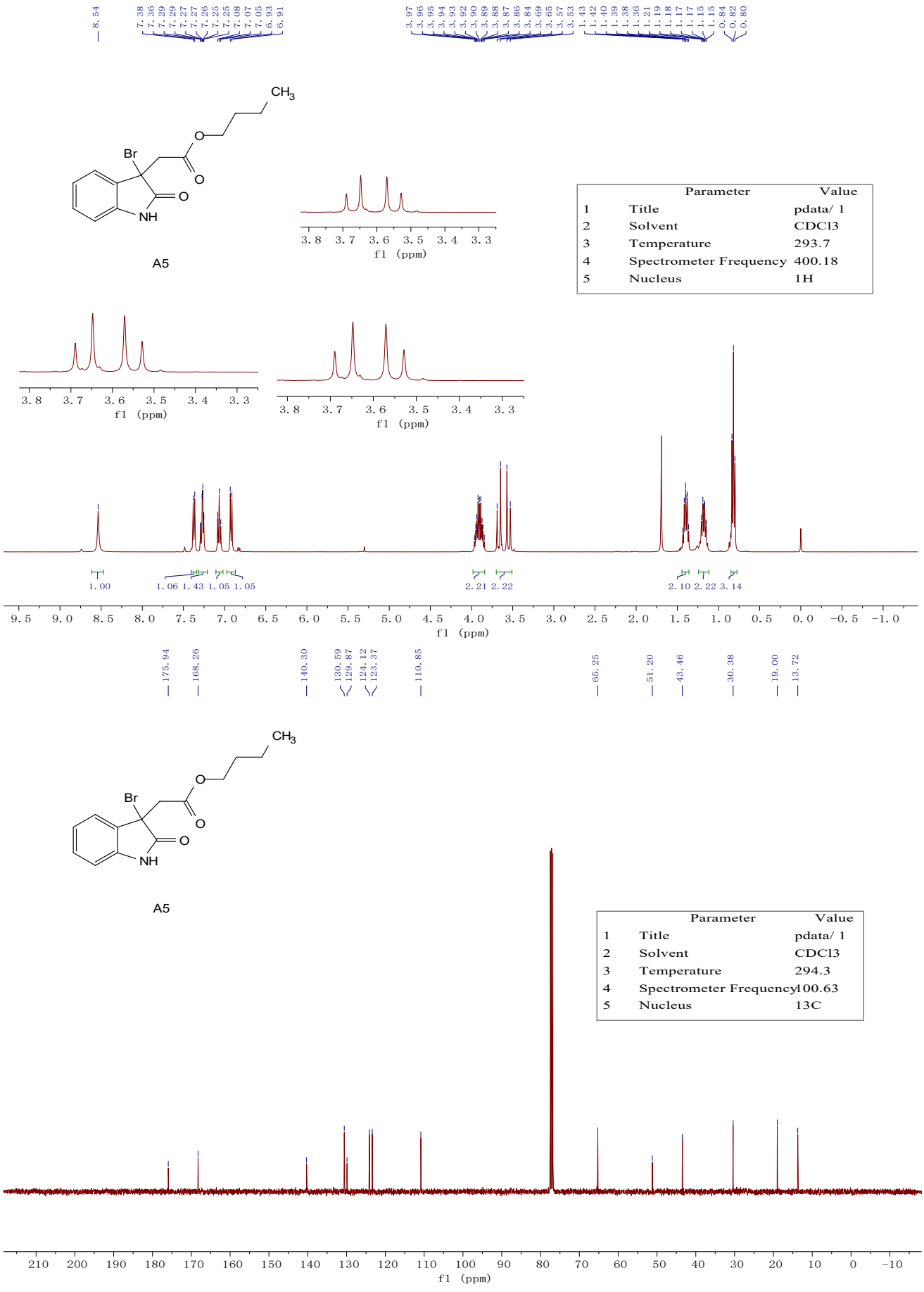
11 Copies of NMR spectra for products

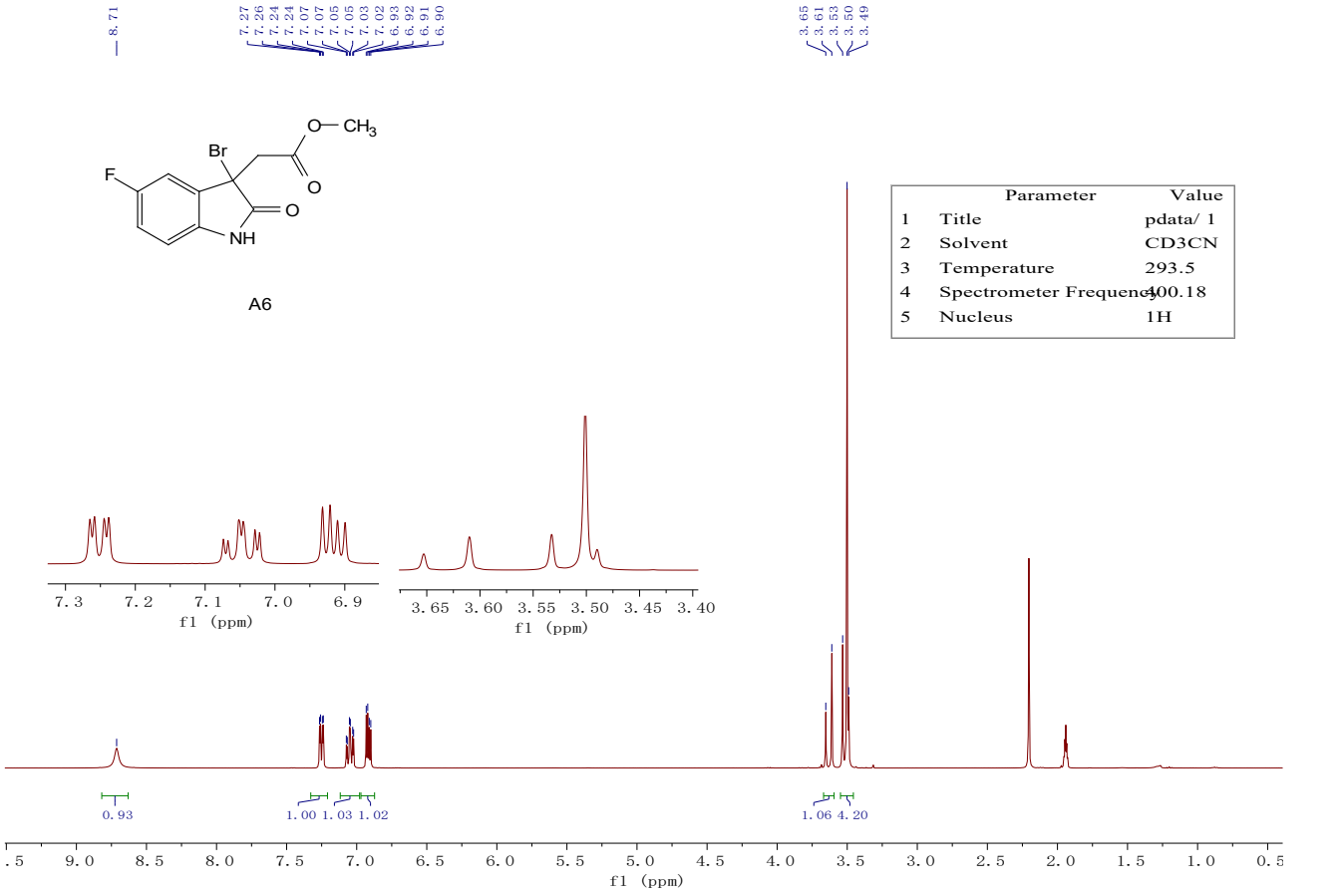

9.11
7.37
7.06
6.94
6.93
3.87
3.86
3.84
3.69
3.66
3.57
3.55
1.43
0.77
CH3
O
Br
O
O
NH
A3
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.0
4 Spectrometer Frequency 600.17
5 Nucleus 1H
4.0 3.9 3.8 3.7 3.6 3.5 3.4 3.3
f1 (ppm)
1.00
1.05 0.98 1.00
2.04 2.17
2.18
3.03
11.0 10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0 −1.
f1 (ppm)

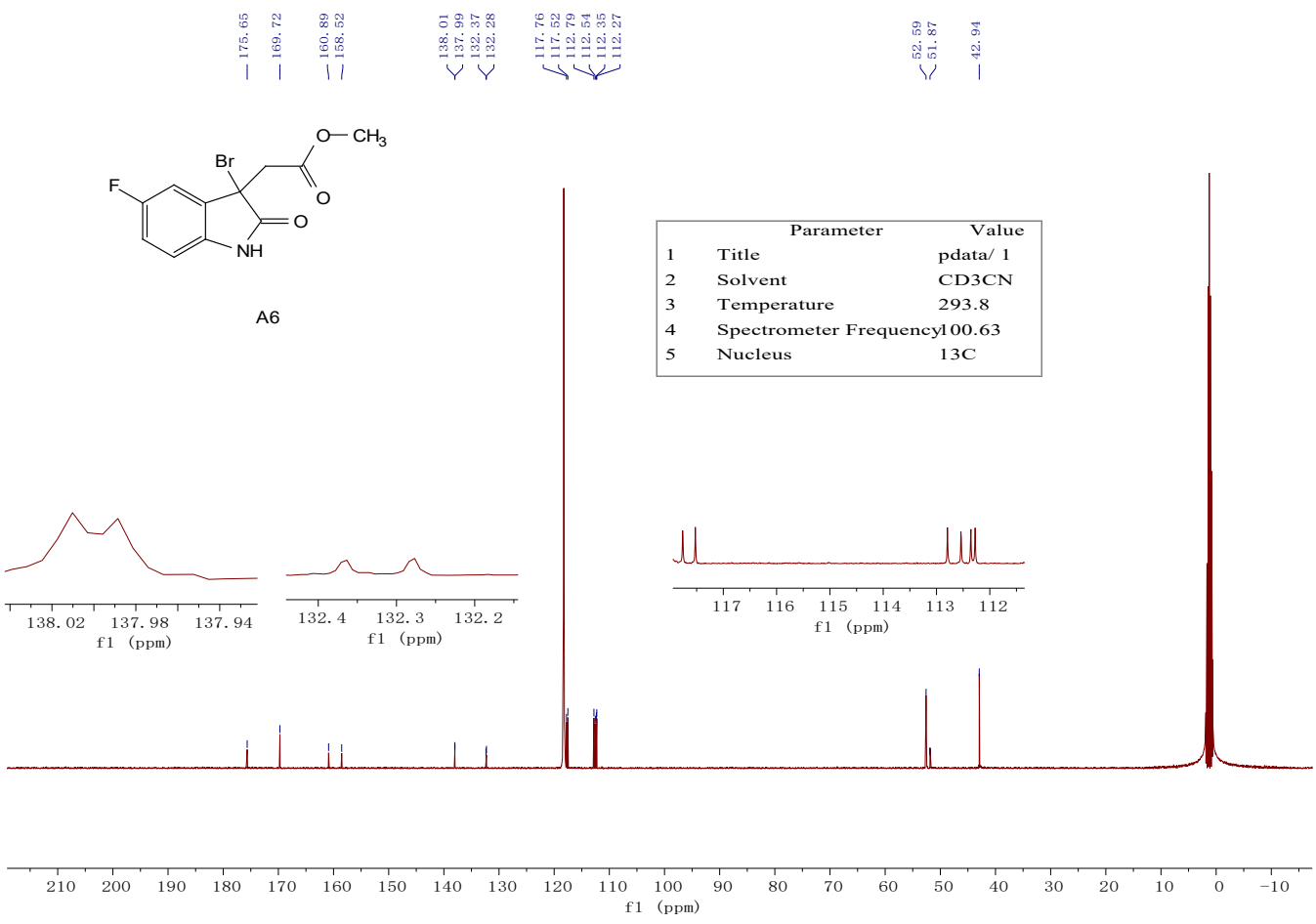

176.38
168.23
140.44
130.60
129.84
124.06
123.33
111.03
66.98
51.36
43.45
21.72
10.27
CH3
O
Br
O
O
NH
A3
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.0
4 Spectrometer Frequency 150.91
5 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

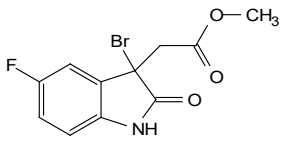

8.92
7.37
7.36
7.27
7.26
7.25
7.25
7.06
7.05
7.04
6.93
6.92
4.78
4.77
4.76
4.75
4.74
3.65
3.62
3.51
3.48
1.04
1.03
0.92
0.91
CH3
O
Br
CH3
O
O
NH
A4
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.0
4 Spectrometer Frequency 600.17
5 Nucleus 1H
f1 (ppm)
1.00
1.01 1.14 0.97 0.95
1.04
2.21
2.96 3.02


176.37
167.46
140.44
130.57
129.91
124.12
123.33
110.88
69.20
51.37
43.81
21.53
21.27
CH3
O
Br
CH3
O
O
NH
A4
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.0
4 Spectrometer Frequency 150.91
5 Nucleus 13C
f1 (ppm)


8.54
7.38 7.36 7.29 7.29 7.27 7.27 7.26 7.25 7.25 7.08 7.07 7.05 6.93 6.91
3.97 3.96 3.95 3.94 3.93 3.92 3.90 3.89 3.88 3.87 3.86 3.84 3.69 3.65 3.57 3.53
1.43 1.42 1.40 1.39 1.38 1.36 1.21 1.19 1.18 1.17 1.17 1.15 1.15 0.84 0.82 0.80
CH3
O
Br
O
O
NH
A5
3.8 3.7 3.6 3.5 3.4 3.3
f1 (ppm)
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.7
4 Spectrometer Frequency 400.18
5 Nucleus 1H
1.00 1.06 1.43 1.05 1.05 2.21 2.22 2.10 2.22 3.14
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0
f1 (ppm)
175.94 168.26 140.30 130.59 129.87 124.12 123.37 110.85 65.25 51.20 43.46 30.38 19.00 13.72
CH3
O
Br
O
O
NH
A5
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.3
4 Spectrometer Frequency 100.63
5 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

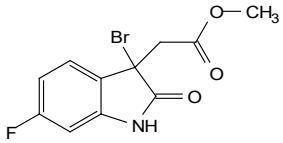

8.71
7.27
7.26
7.24
7.24
7.07
7.07
7.05
7.05
7.03
7.02
6.93
6.92
6.91
6.90
3.65
3.61
3.53
3.50
3.49
O— CH3
Br
F
O
O
NH
A6
Parameter Value
1 Title pdata/ 1
2 Solvent CD3CN
3 Temperature 293.5
4 Spectrometer Frequency 400.18
5 Nucleus 1H
7.3 7.2 7.1 7.0 6.9
f1 (ppm)
3.65 3.60 3.55 3.50 3.45 3.40
f1 (ppm)
0.93
1.00 1.03 1.02
1.06 4.20
f1 (ppm)


175.65
169.72
160.89
158.52
138.01
137.99
132.37
132.28
117.76
117.52
112.79
112.54
112.35
112.27
52.59
51.87
42.94
O— CH3
Br
F
O
O
NH
A6
Parameter Value
1 Title pdata/ 1
2 Solvent CD3CN
3 Temperature 293.8
4 Spectrometer Frequency 100.63
5 Nucleus 13C
138.02 137.98 137.94
f1 (ppm)
132.4 132.3 132.2
f1 (ppm)
117 116 115 114 113 112
f1 (ppm)
f1 (ppm)



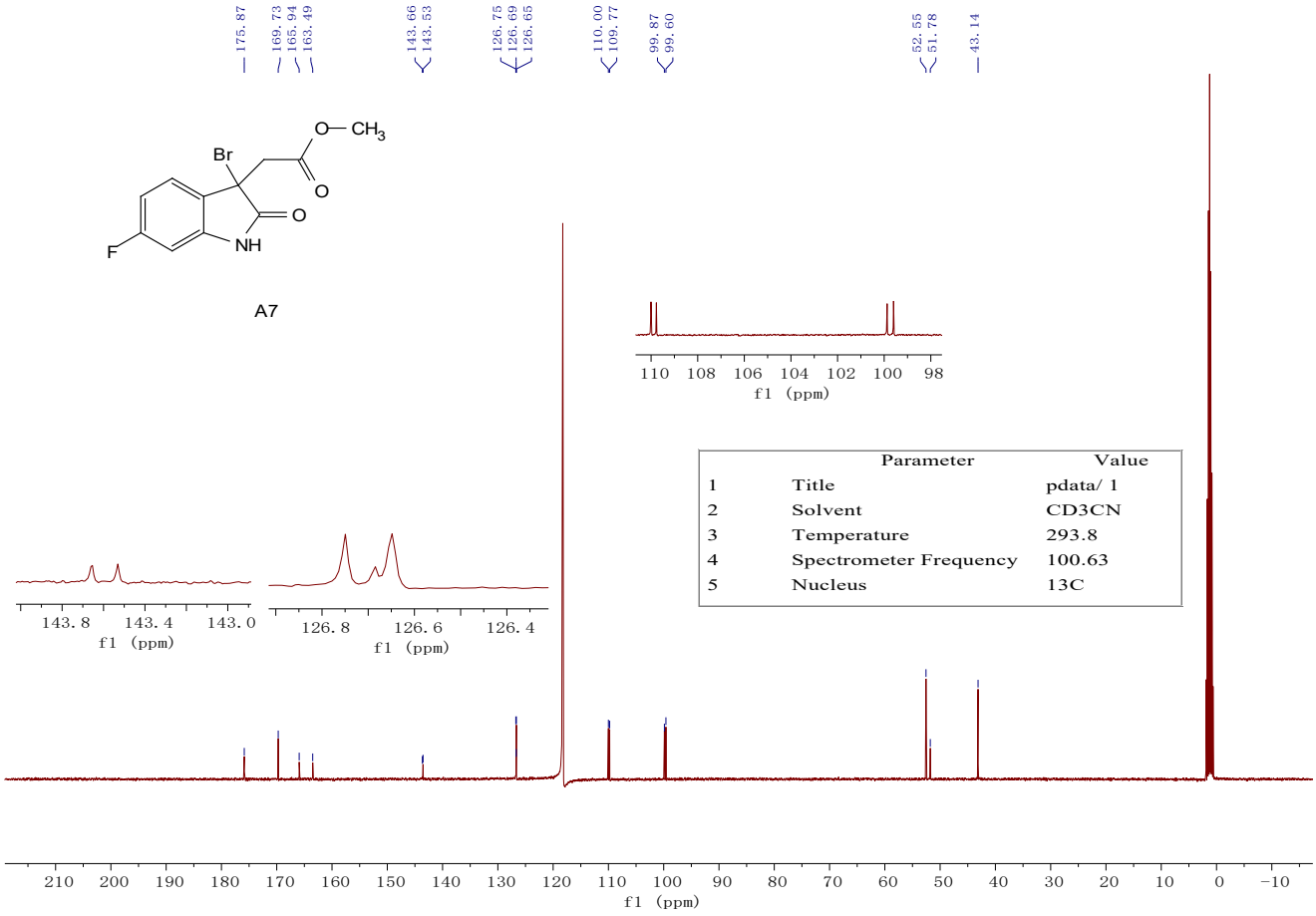
A6

	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CD3CN
3	Temperature	293.6
4	Spectrometer Frequency	376.55
5	Nucleus	19F

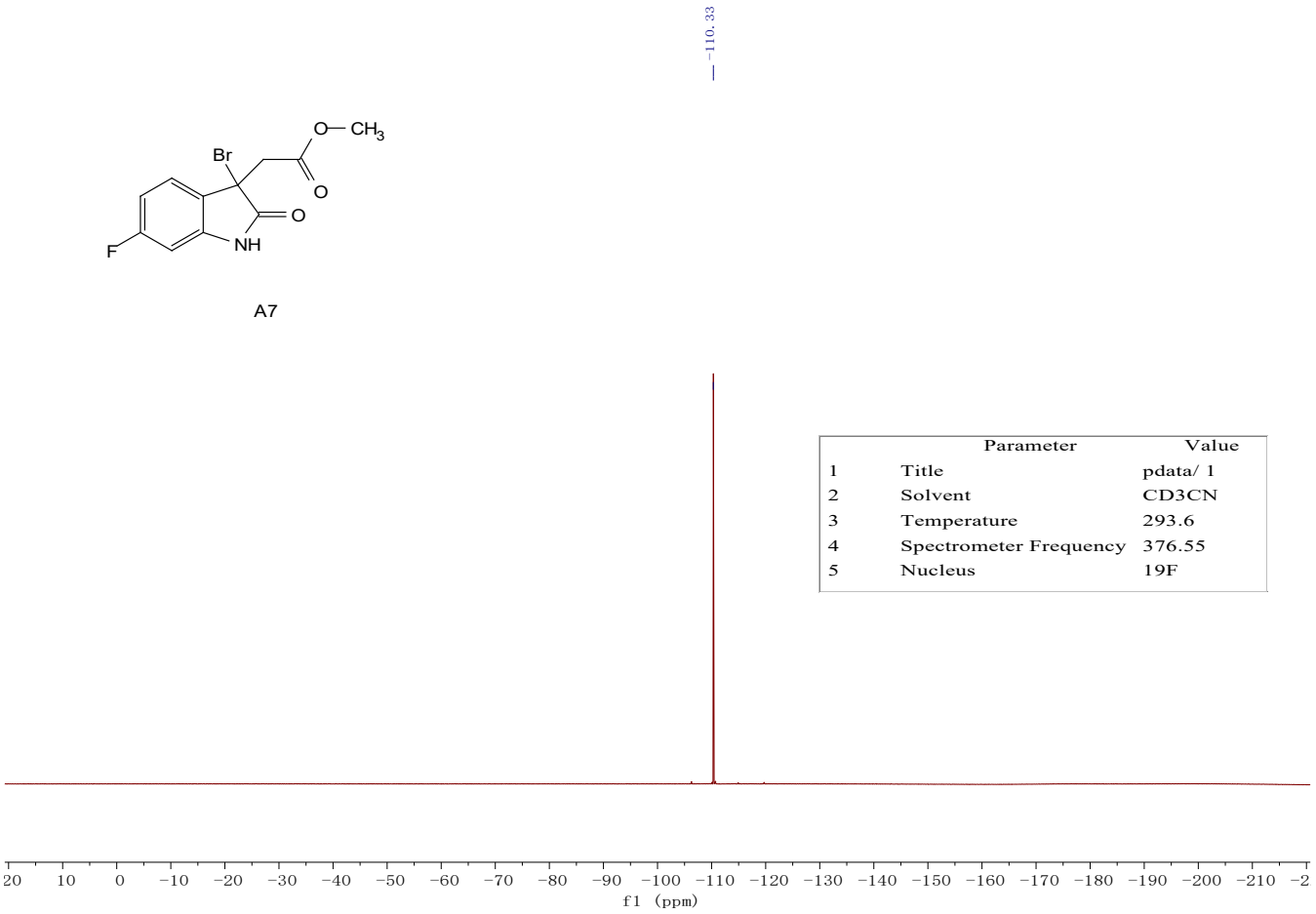


A7

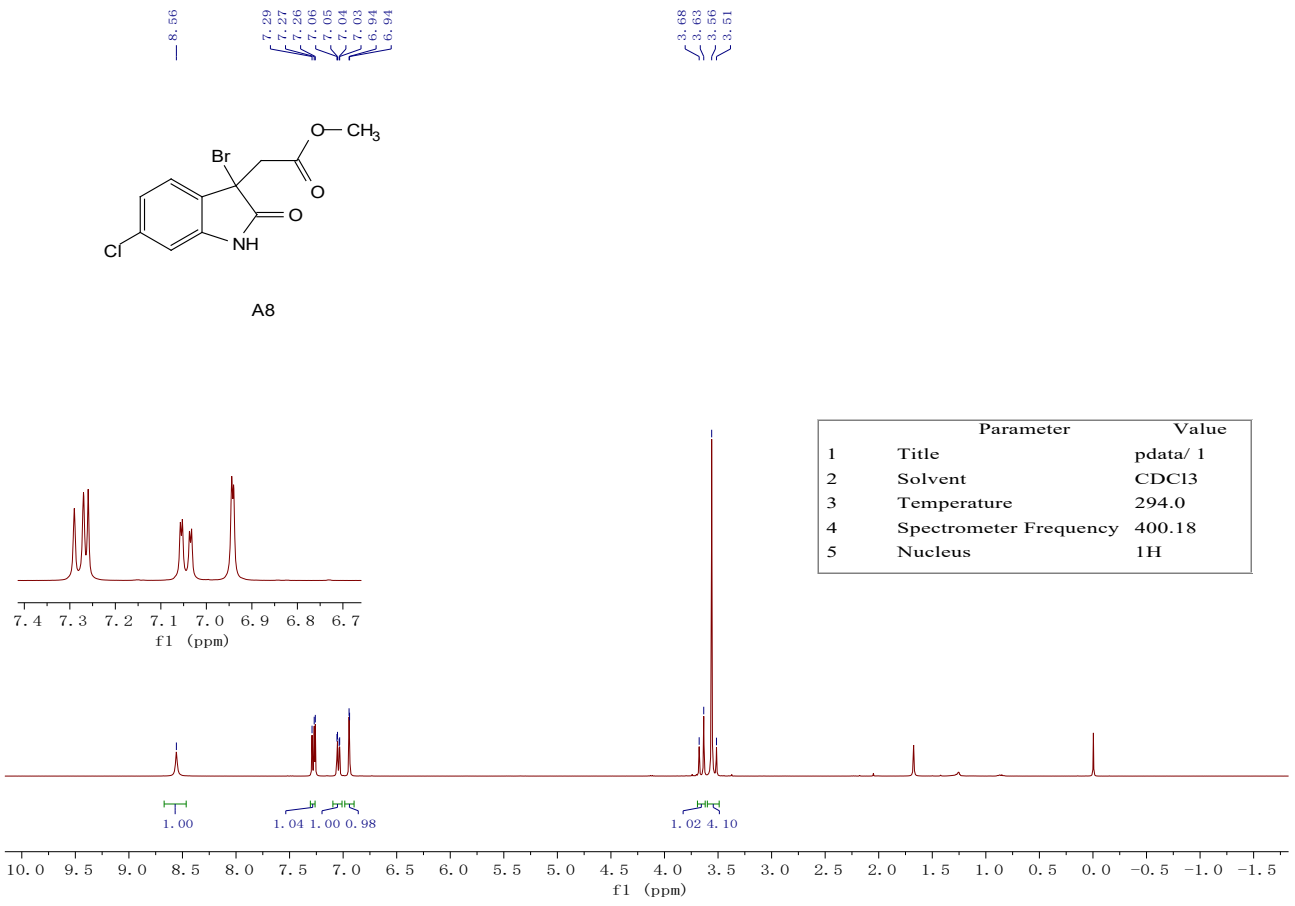
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CD3CN
3	Temperature	293.3
4	Spectrometer Frequency	400.18
5	Nucleus	1H

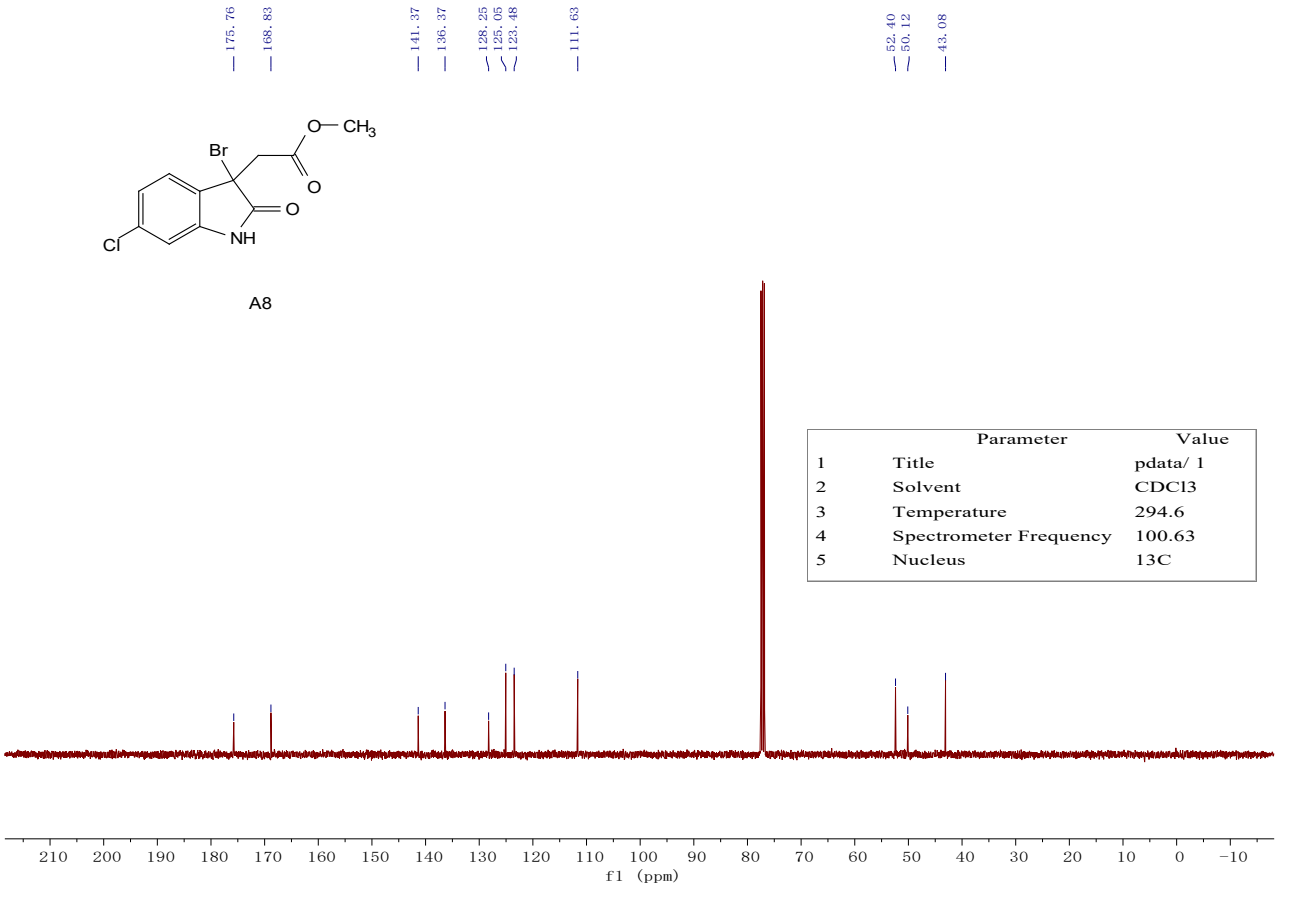


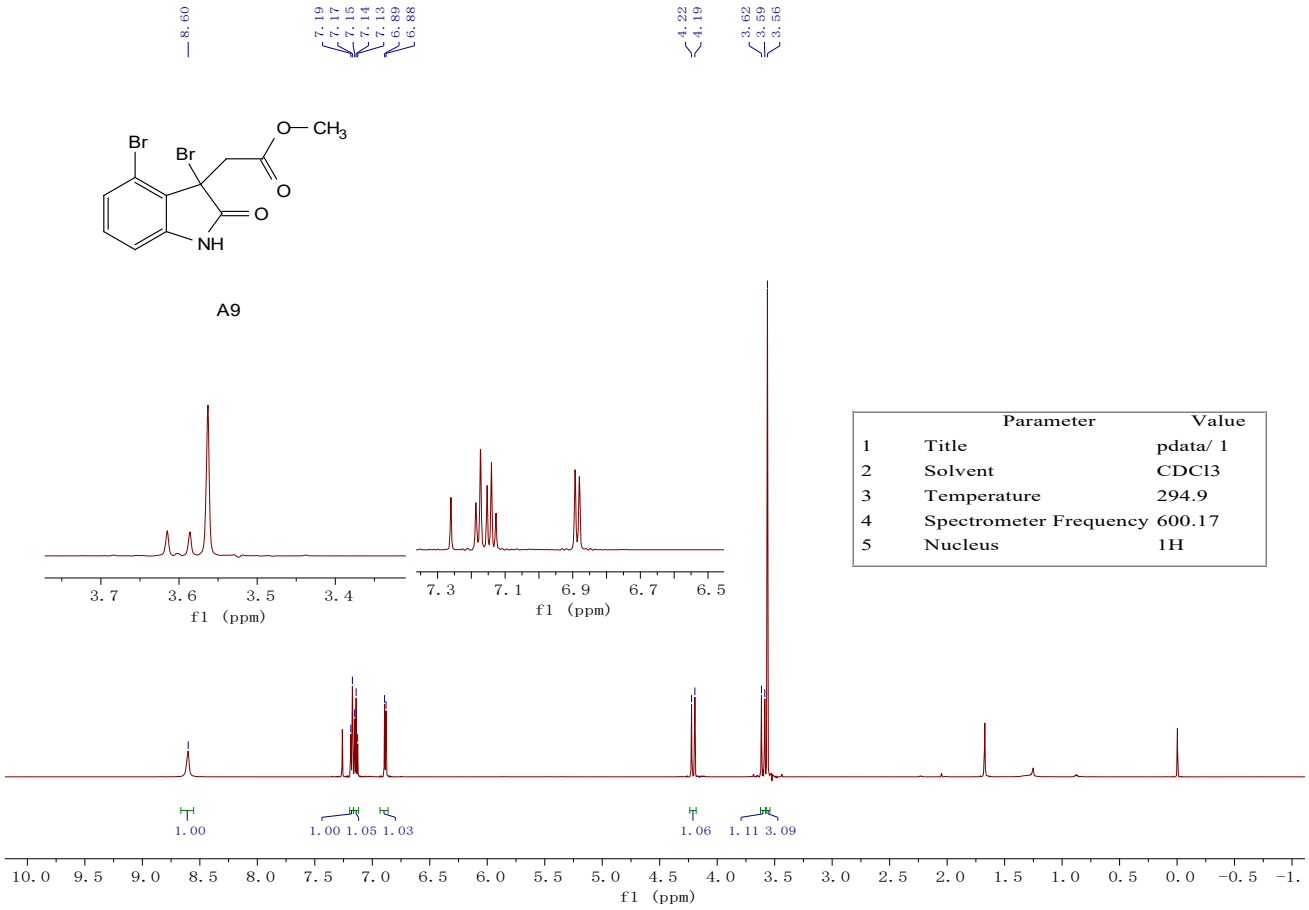
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CD3CN
3	Temperature	293.8
4	Spectrometer Frequency	100.63
5	Nucleus	13C

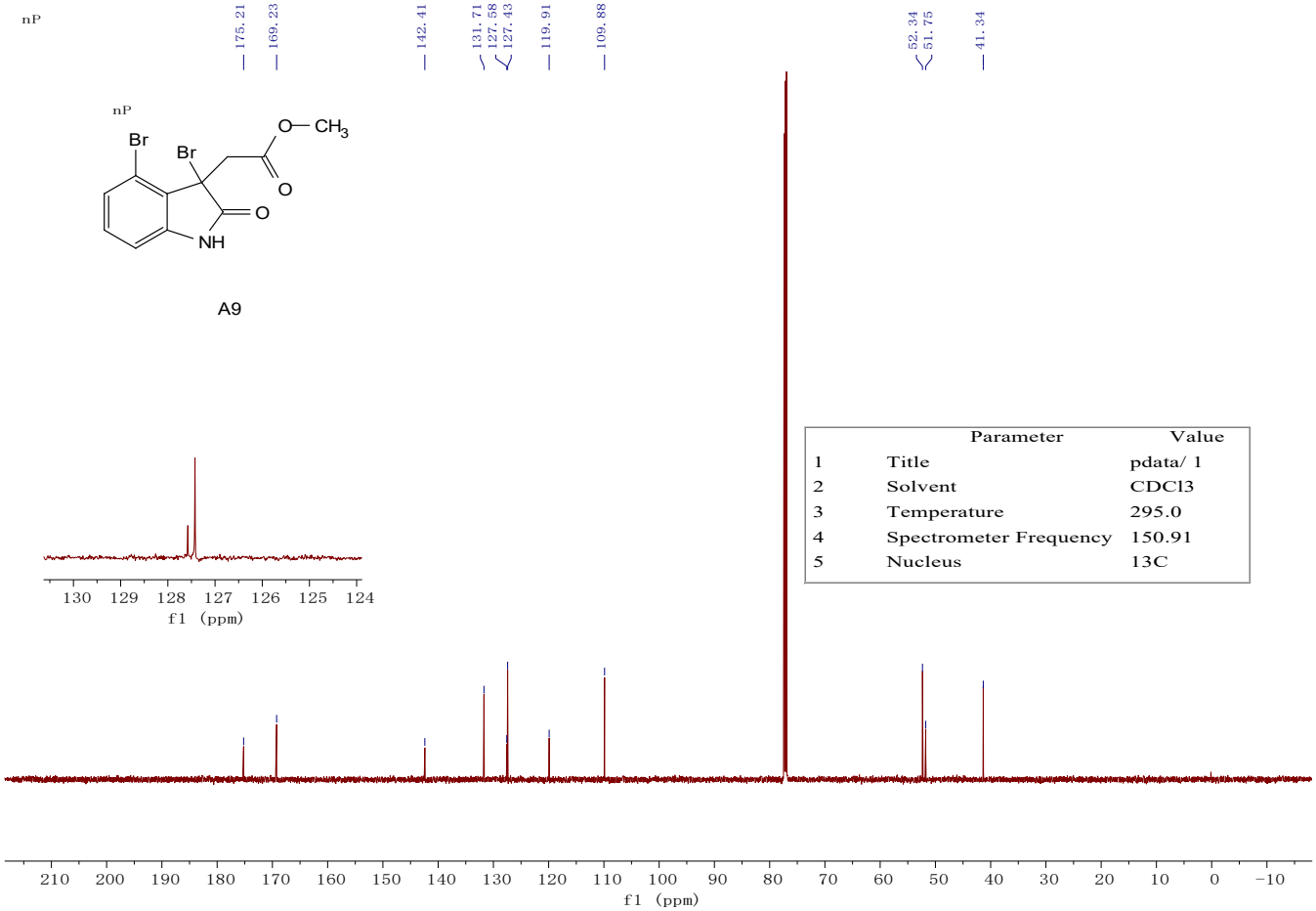


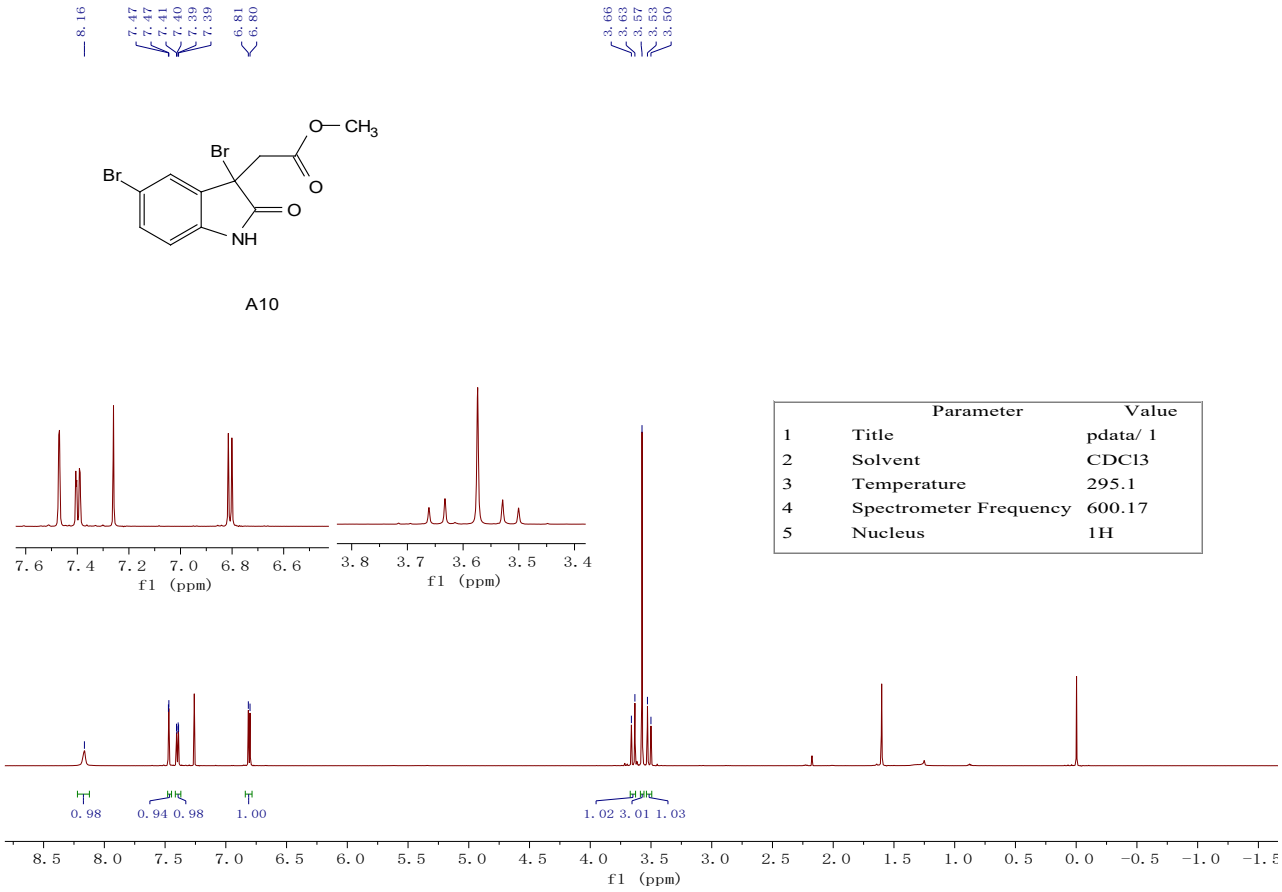
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CD3CN
3	Temperature	293.6
4	Spectrometer Frequency	376.55
5	Nucleus	19F

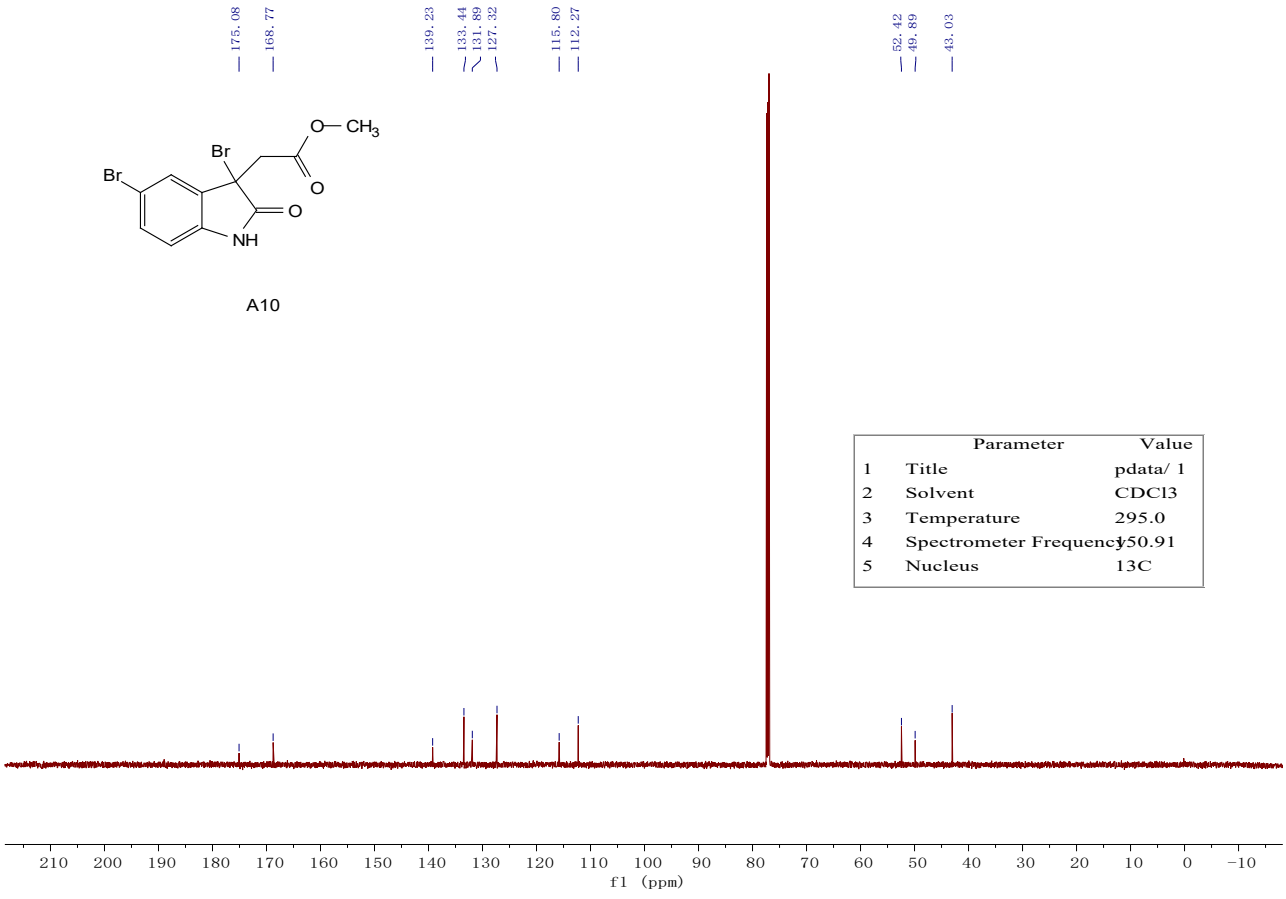

8.56
7.29
7.27
7.26
7.06
7.05
7.04
7.03
6.94
6.94
3.68
3.63
3.56
3.51
O— CH3
Br
O
O
NH
Cl
A8
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.0
4 Spectrometer Frequency 400.18
5 Nucleus 1H
7.4 7.3 7.2 7.1 7.0 6.9 6.8 6.7
f1 (ppm)
1.00
1.04 1.00 0.98
1.02 4.10
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5 -1.0 -1.5
f1 (ppm)

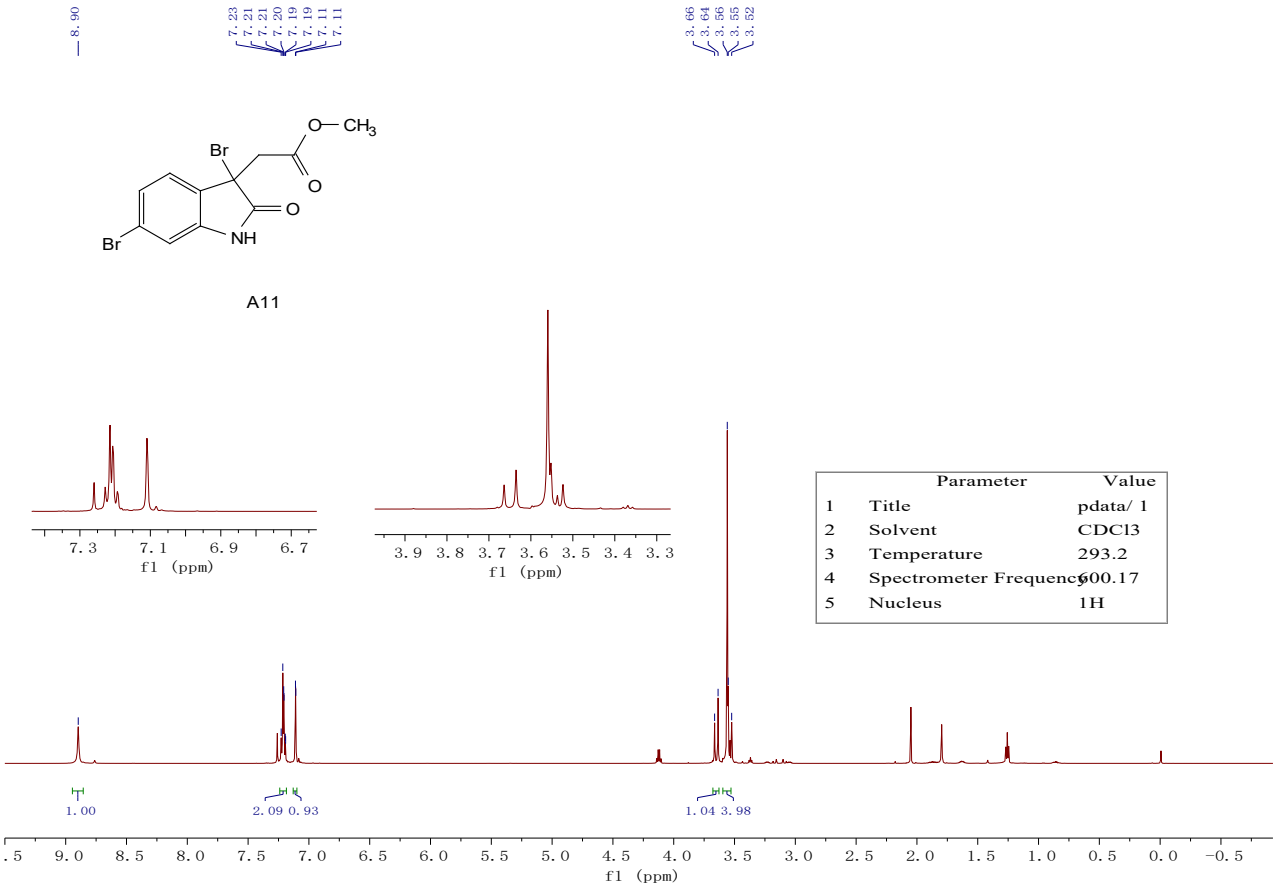

175.76
168.83
141.37
136.37
128.25
125.05
123.48
111.63
52.40
50.12
43.08
O— CH3
Br
O
O
NH
Cl
A8
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.6
4 Spectrometer Frequency 100.63
5 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)

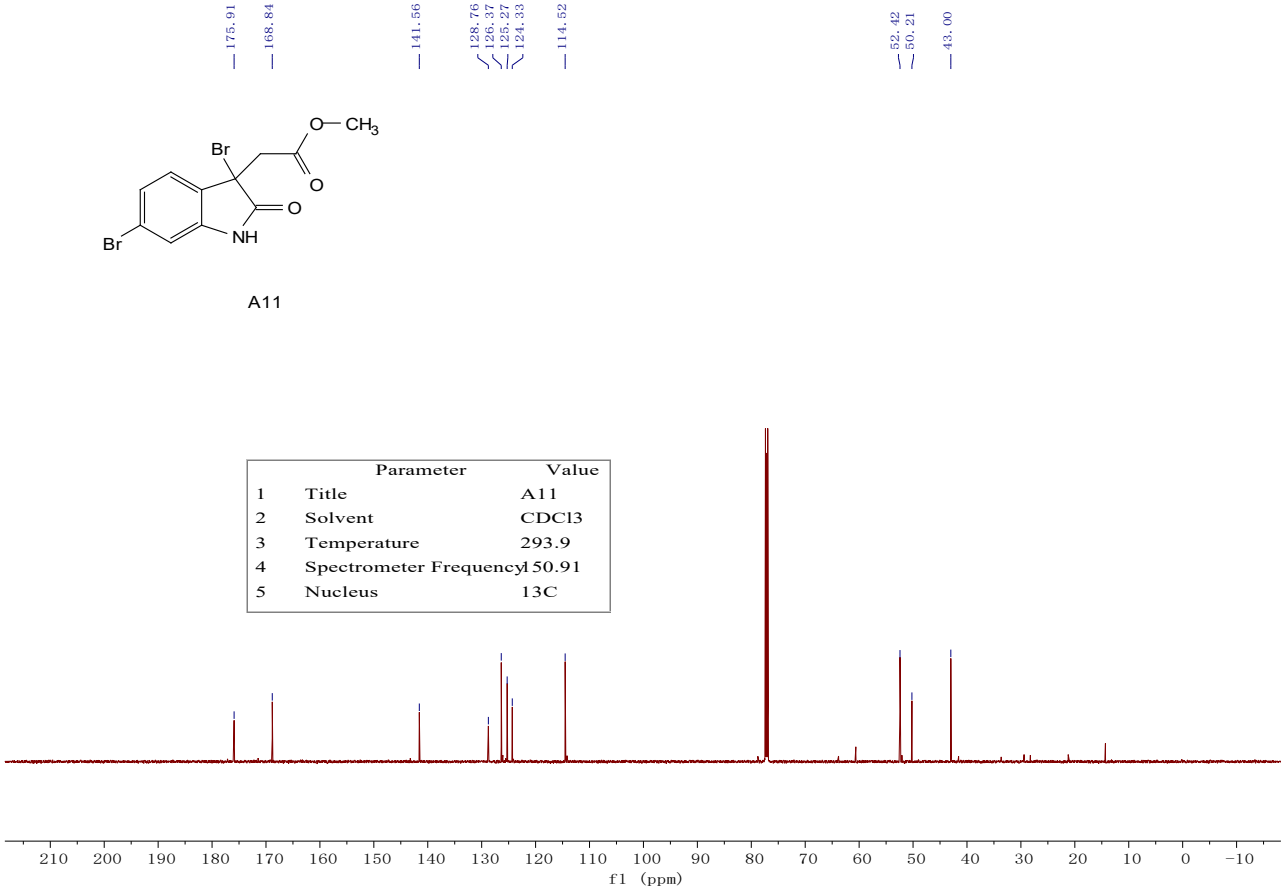

8.60
7.19
7.17
7.15
7.14
7.13
6.89
6.88
4.22
4.19
3.62
3.59
3.56
Br
Br
O
CH3
O
O
NH
A9
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.9
4 Spectrometer Frequency 600.17
5 Nucleus 1H
f1 (ppm)
1.00
1.00 1.05 1.03
1.06
1.11 3.09

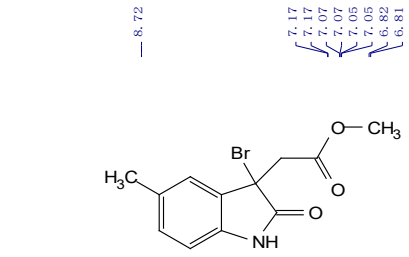

nP
175.21
169.23
142.41
131.71
127.58
127.43
119.91
109.88
52.34
51.75
41.34
Br
Br
O
CH3
O
O
NH
A9
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.0
4 Spectrometer Frequency 150.91
5 Nucleus 13C
f1 (ppm)


8.16
7.47
7.47
7.41
7.40
7.39
7.39
6.81
6.80
3.66
3.63
3.57
3.53
3.50
Br
O—CH3
O
O
NH
A10
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.1
4 Spectrometer Frequency 600.17
5 Nucleus 1H
f1 (ppm)
0.98
0.94 0.98
1.00
1.02 3.01 1.03


175.08
168.77
139.23
133.44
131.89
127.32
115.80
112.27
52.42
49.89
43.03
Br
O—CH3
O
O
NH
A10
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.0
4 Spectrometer Frequency 150.91
5 Nucleus 13C
f1 (ppm)

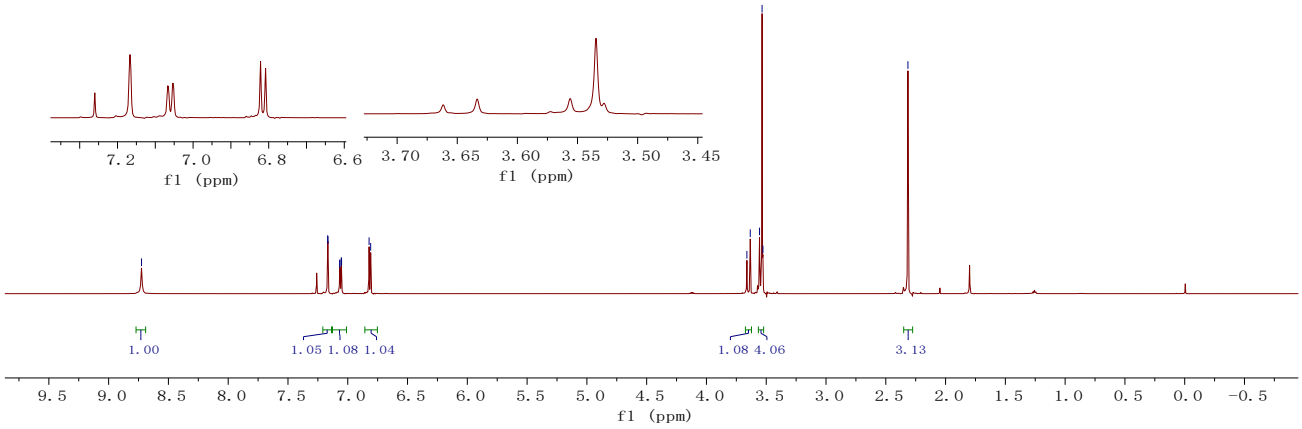

8.90
7.23
7.21
7.21
7.20
7.19
7.19
7.11
7.11
3.66
3.64
3.56
3.55
3.52
O— CH3
Br
O
O
NH
Br
A11
7.3
7.1
6.9
6.7
f1 (ppm)
3.9
3.8
3.7
3.6
3.5
3.4
3.3
f1 (ppm)
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.2
4 Spectrometer Frequency 600.17
5 Nucleus 1H
1.00
2.09
0.93
1.04
3.98
f1 (ppm)

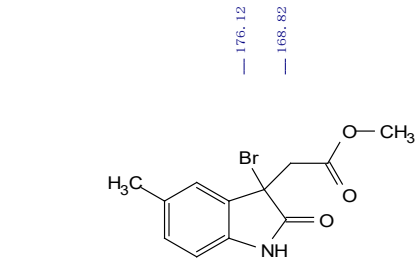

175.91
168.84
141.56
128.76
126.37
125.27
124.33
114.52
52.42
50.21
43.00
O— CH3
Br
O
O
NH
Br
A11
Parameter Value
1 Title A11
2 Solvent CDCl3
3 Temperature 293.9
4 Spectrometer Frequency 150.91
5 Nucleus 13C
f1 (ppm)



A12

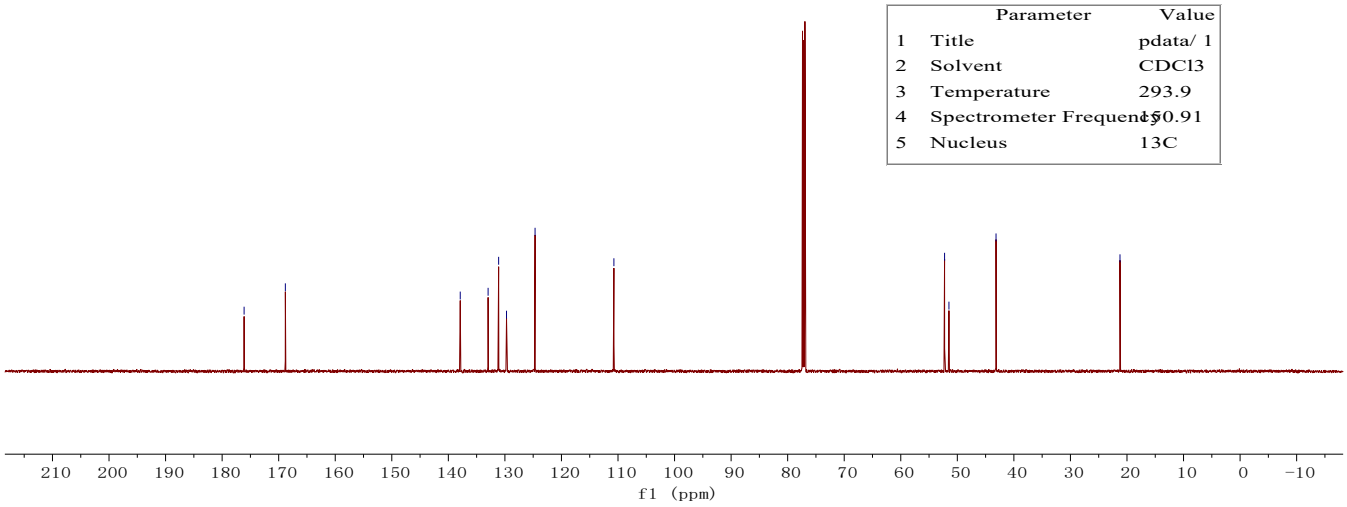
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	293.0
4	Spectrometer Frequency	600.17
5	Nucleus	1H

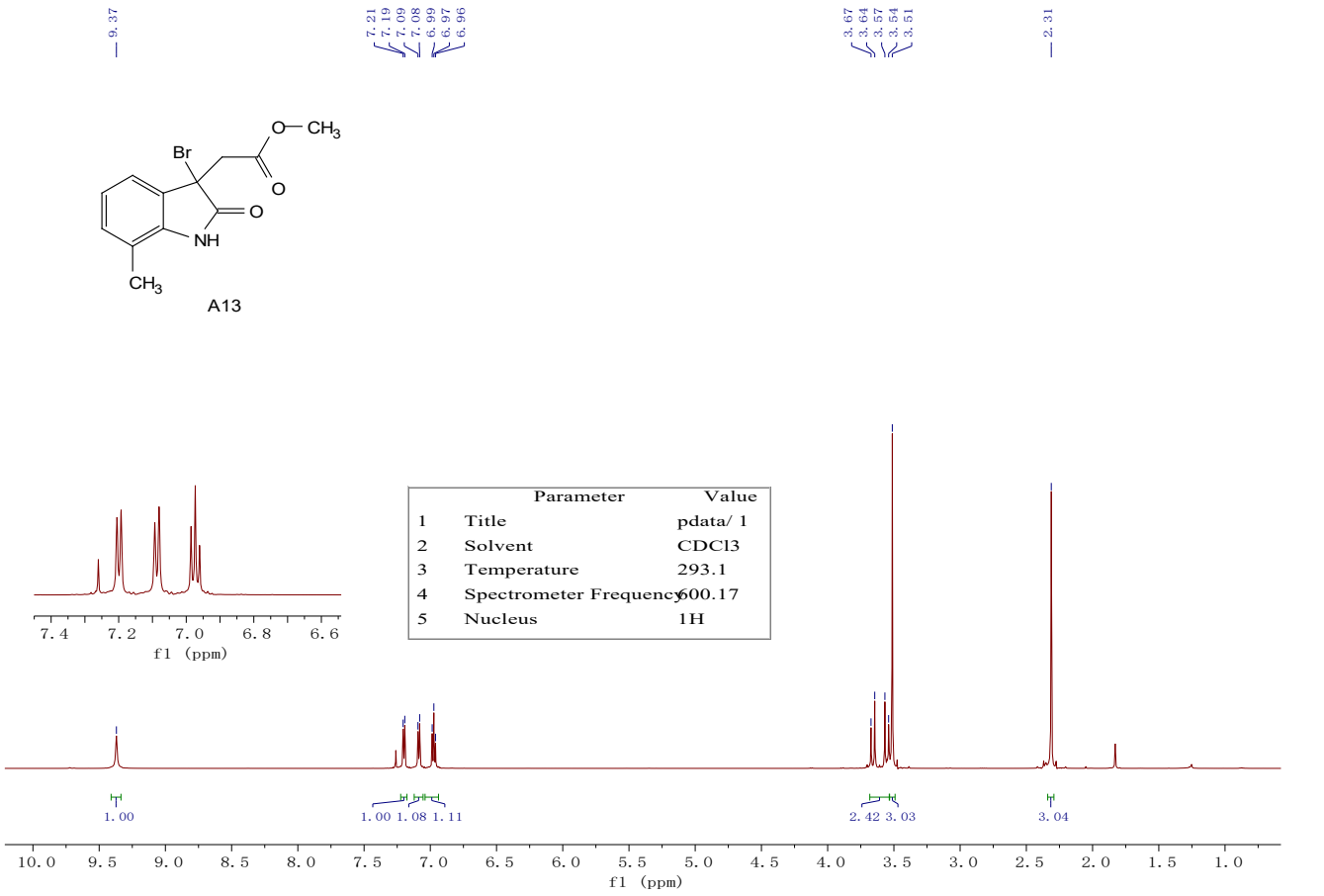


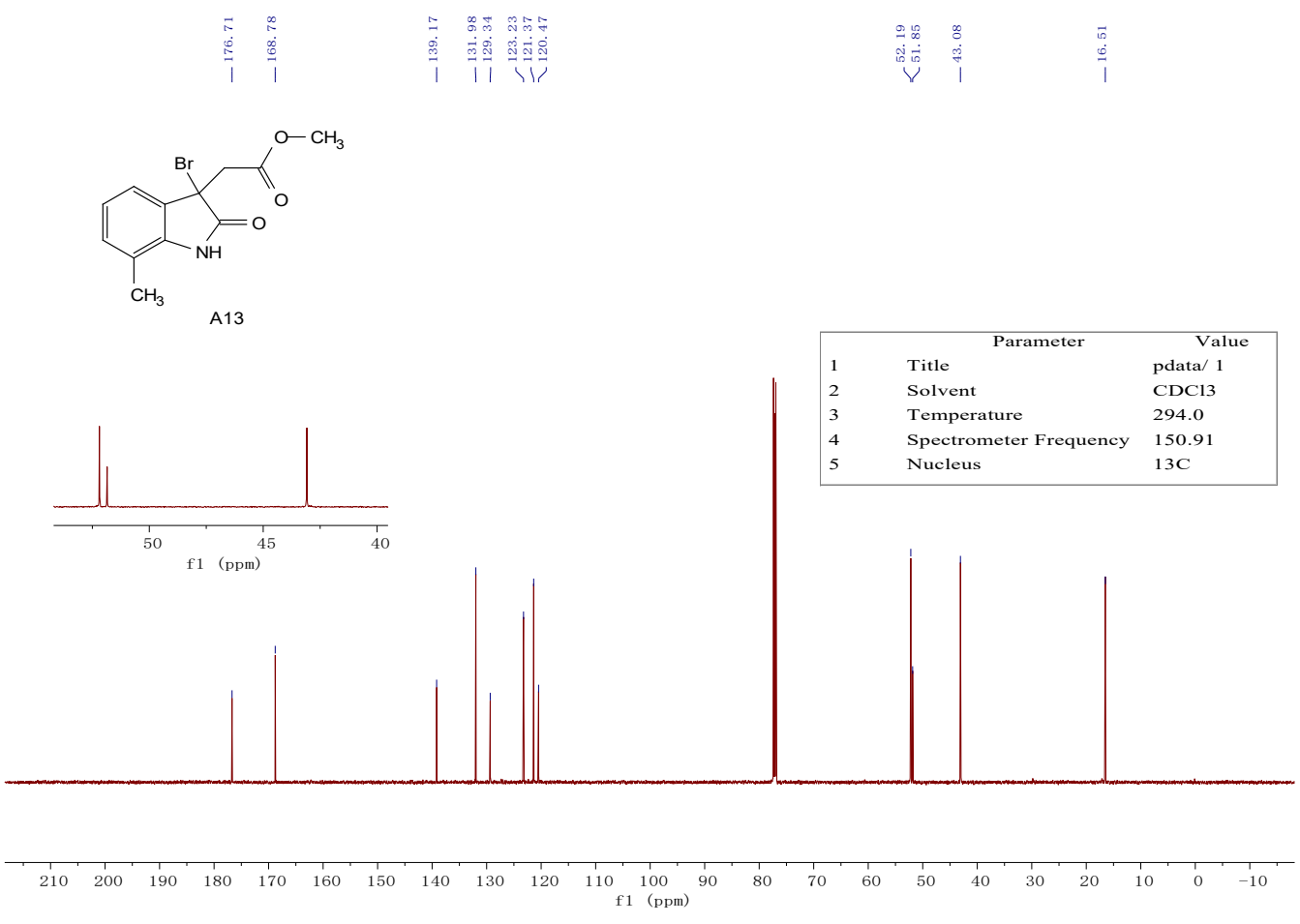


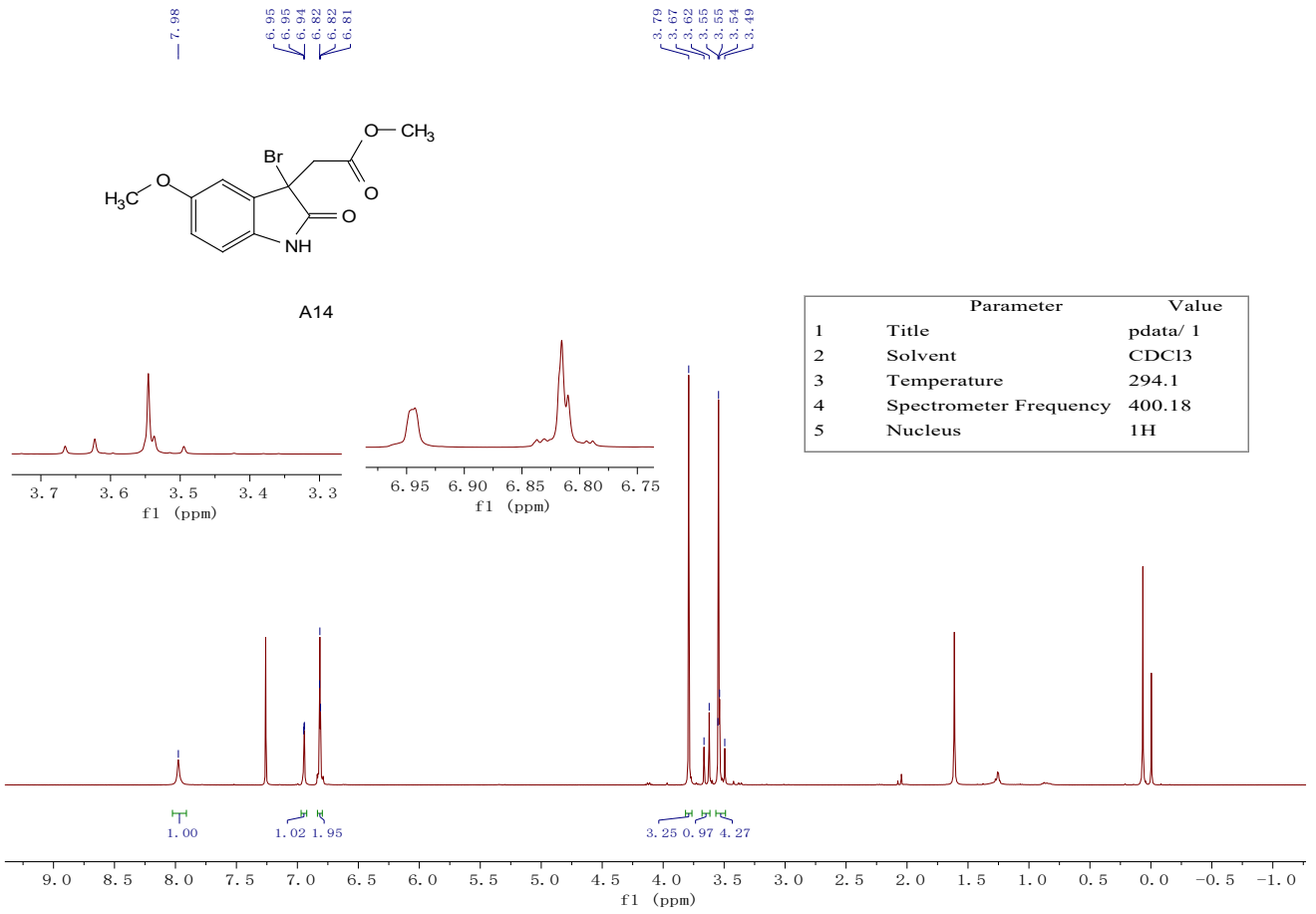
A12

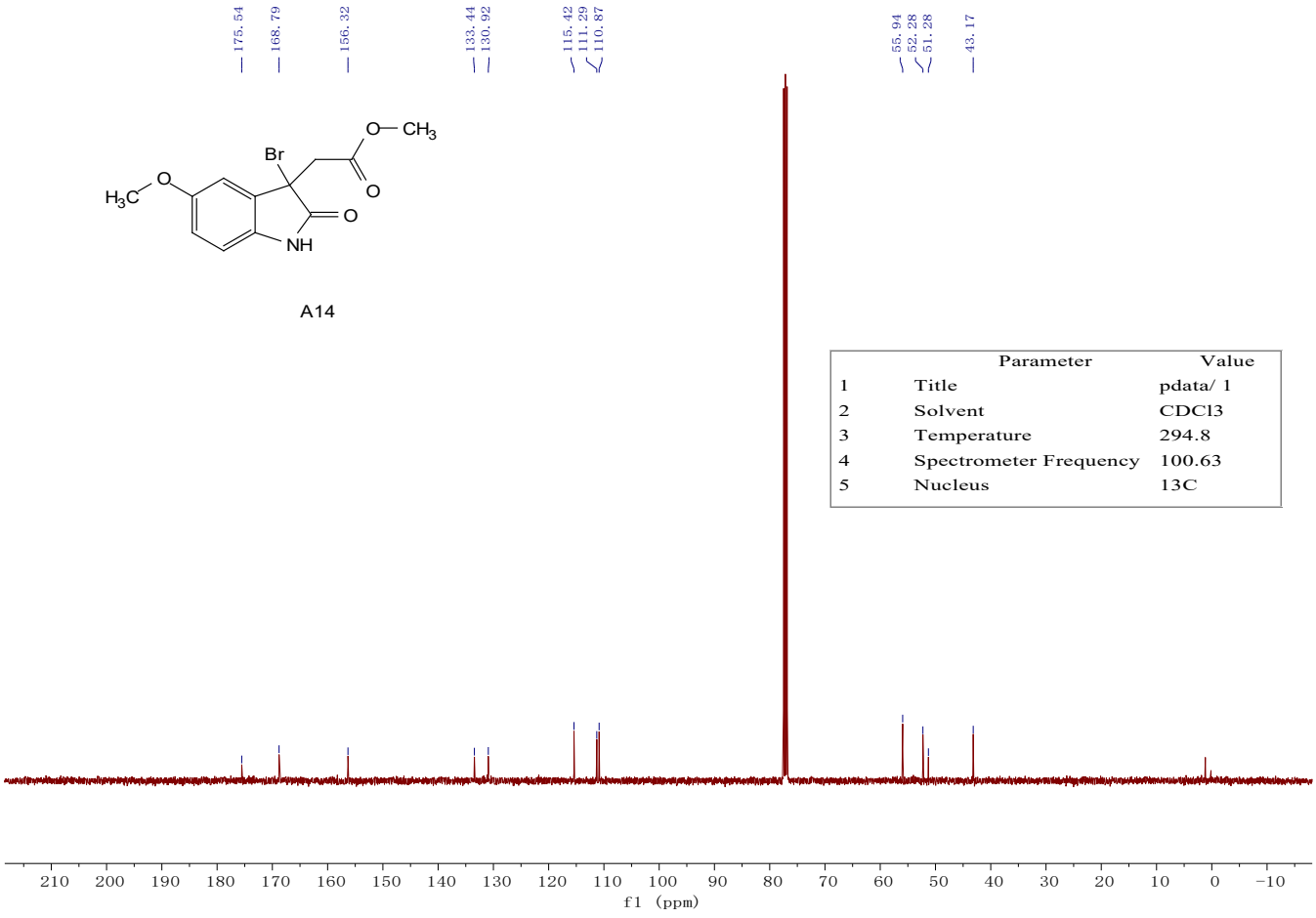
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	293.9
4	Spectrometer Frequency	150.91
5	Nucleus	13C

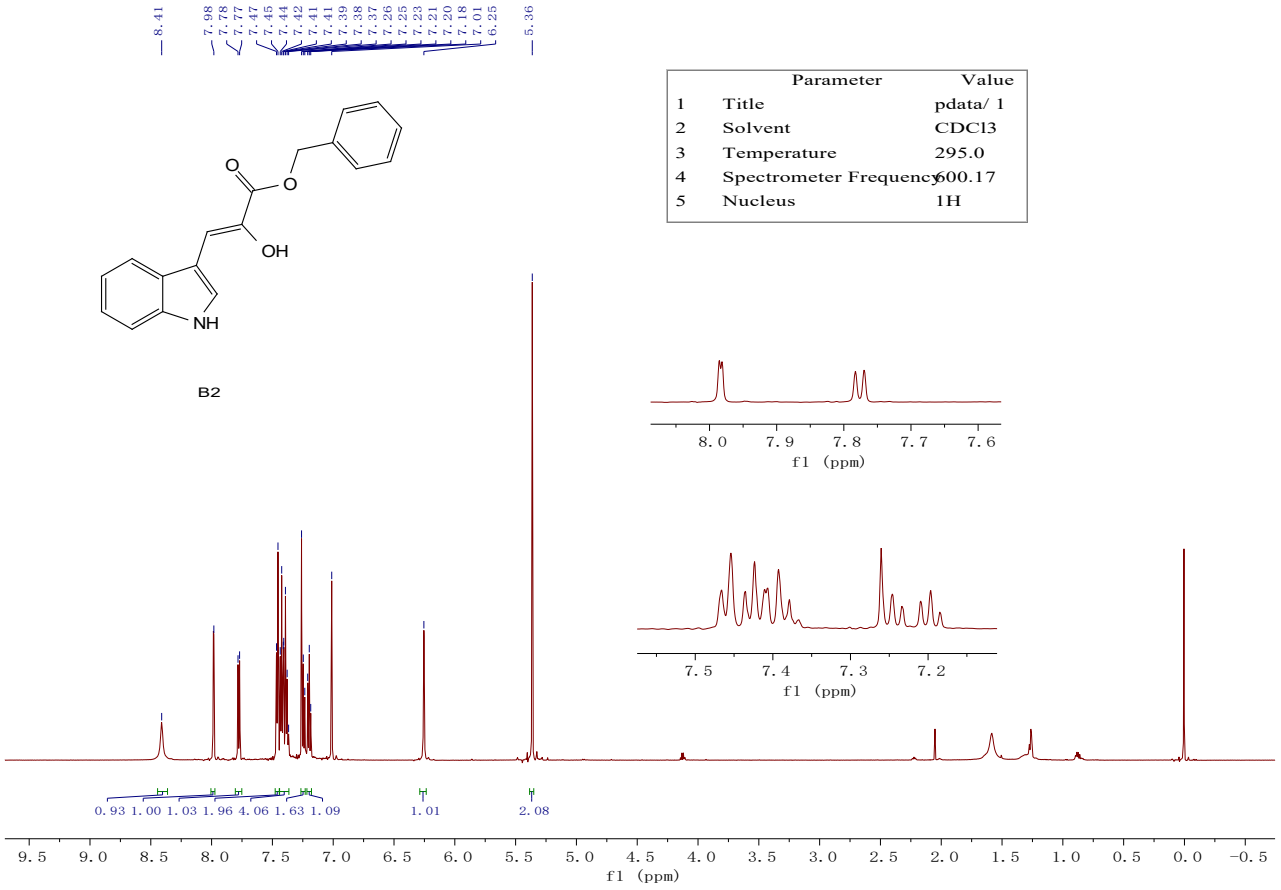


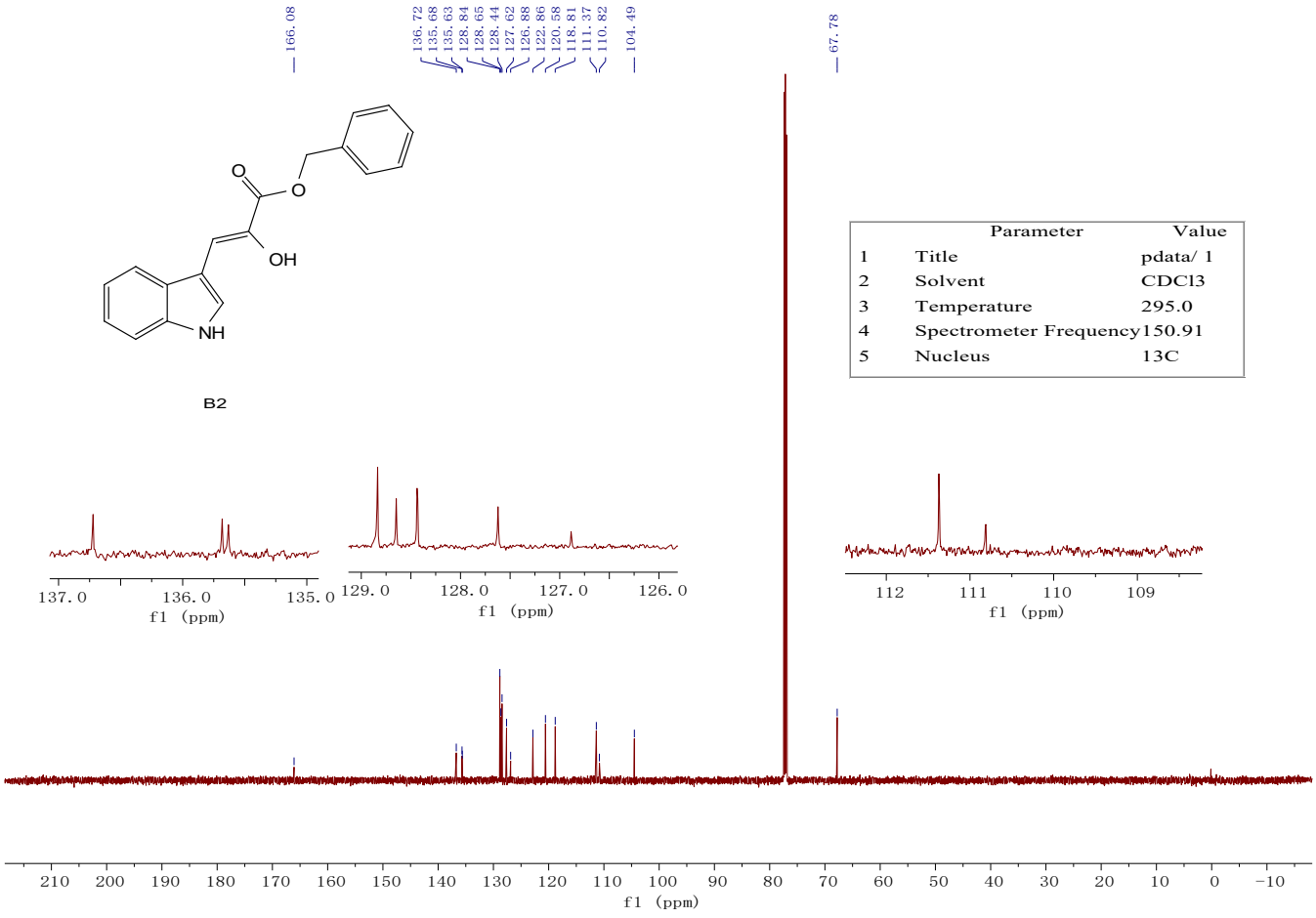

9.37
7.21
7.19
7.09
7.08
6.99
6.97
6.96
3.67
3.64
3.57
3.54
3.51
2.31
Br
O
CH3
O
O
NH
CH3
A13
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.1
4 Spectrometer Frequency 600.17
5 Nucleus 1H
7.4 7.2 7.0 6.8 6.6
f1 (ppm)
1.00
1.00 1.08 1.11
2.42 3.03
3.04
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0
f1 (ppm)

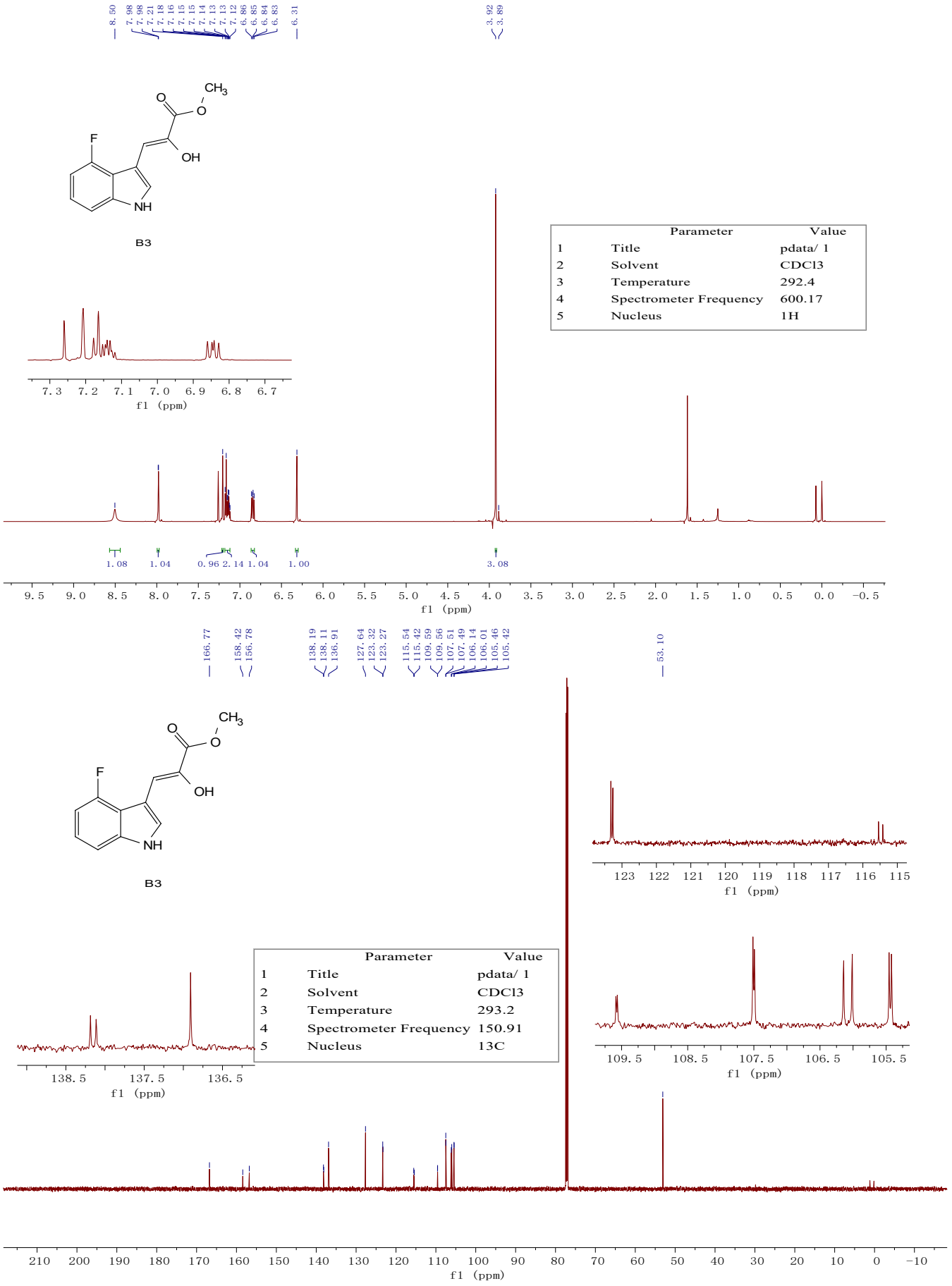

176.71
168.78
139.17
131.98
129.34
123.23
121.37
120.47
52.19
51.85
43.08
16.51
Br
O
CH3
O
O
NH
CH3
A13
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.0
4 Spectrometer Frequency 150.91
5 Nucleus 13C
50 45 40
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

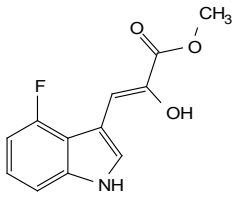

7.98
6.95
6.95
6.94
6.82
6.82
6.81
3.79
3.67
3.62
3.55
3.55
3.54
3.49
O—CH3
Br
H3C
O
O
O
NH
A14
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.1
4 Spectrometer Frequency 400.18
5 Nucleus 1H
3.7 3.6 3.5 3.4 3.3
f1 (ppm)
6.95 6.90 6.85 6.80 6.75
f1 (ppm)
1.00
1.02 1.95
3.25 0.97 4.27
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0
f1 (ppm)


175.54
168.79
156.32
133.44
130.92
115.42
111.29
110.87
55.94
52.28
51.28
43.17
O—CH3
Br
H3C
O
O
O
NH
A14
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.8
4 Spectrometer Frequency 100.63
5 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)


8.41
7.98
7.78
7.77
7.47
7.45
7.44
7.42
7.41
7.41
7.39
7.38
7.37
7.26
7.25
7.23
7.21
7.20
7.18
7.01
6.25
5.36
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.0
4 Spectrometer Frequency 600.17
5 Nucleus 1H
O
O
OH
NH
B2
8.0 7.9 7.8 7.7 7.6
f1 (ppm)
7.5 7.4 7.3 7.2
f1 (ppm)
0.93 1.00 1.03 1.96 4.06 1.63 1.09
1.01
2.08
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5
f1 (ppm)

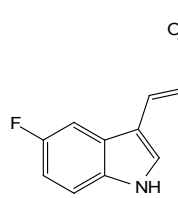

166.08
136.72
135.68
135.63
128.84
128.65
128.44
127.62
126.88
122.86
120.58
118.81
111.37
110.82
104.49
67.78
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.0
4 Spectrometer Frequency 150.91
5 Nucleus 13C
O
O
OH
NH
B2
137.0 136.0 135.0
f1 (ppm)
129.0 128.0 127.0 126.0
f1 (ppm)
112 111 110 109
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)


8.50
7.98
7.98
7.21
7.18
7.16
7.15
7.15
7.14
7.13
7.13
7.12
6.86
6.85
6.84
6.83
6.31
3.92
3.89
CH3
O
O
F
OH
NH
B3
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 292.4
4 Spectrometer Frequency 600.17
5 Nucleus 1H
7.3 7.2 7.1 7.0 6.9 6.8 6.7
f1 (ppm)
1.08 1.04 0.96 2.14 1.04 1.00 3.08
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 -0.5
f1 (ppm)
166.77
158.42
156.78
138.19
138.11
136.91
127.64
123.32
123.27
115.54
115.42
109.59
109.56
107.51
107.49
106.14
106.01
105.46
105.42
53.10
CH3
O
O
F
OH
NH
B3
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.2
4 Spectrometer Frequency 150.91
5 Nucleus 13C
123 122 121 120 119 118 117 116 115
f1 (ppm)
109.5 108.5 107.5 106.5 105.5
f1 (ppm)
138.5 137.5 136.5
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)



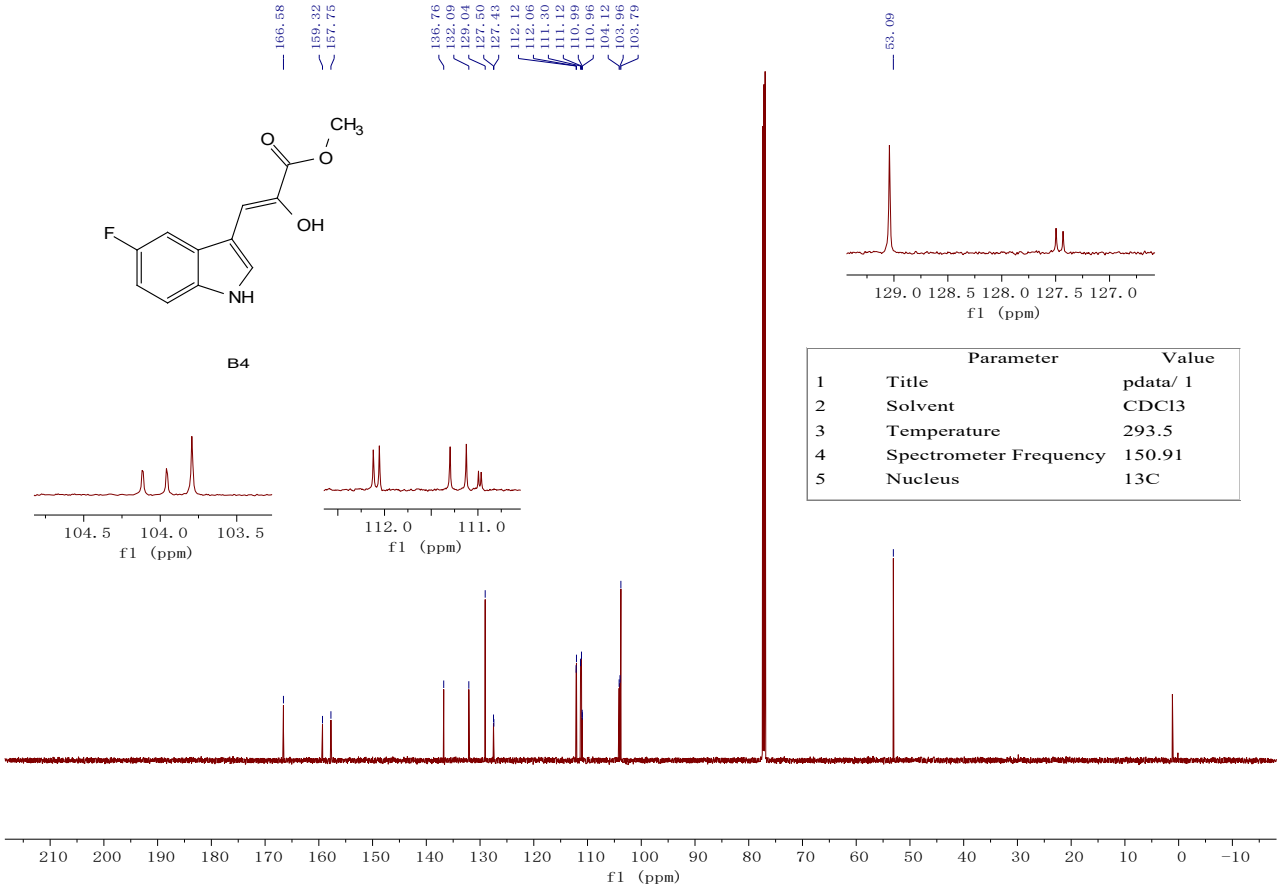
B3

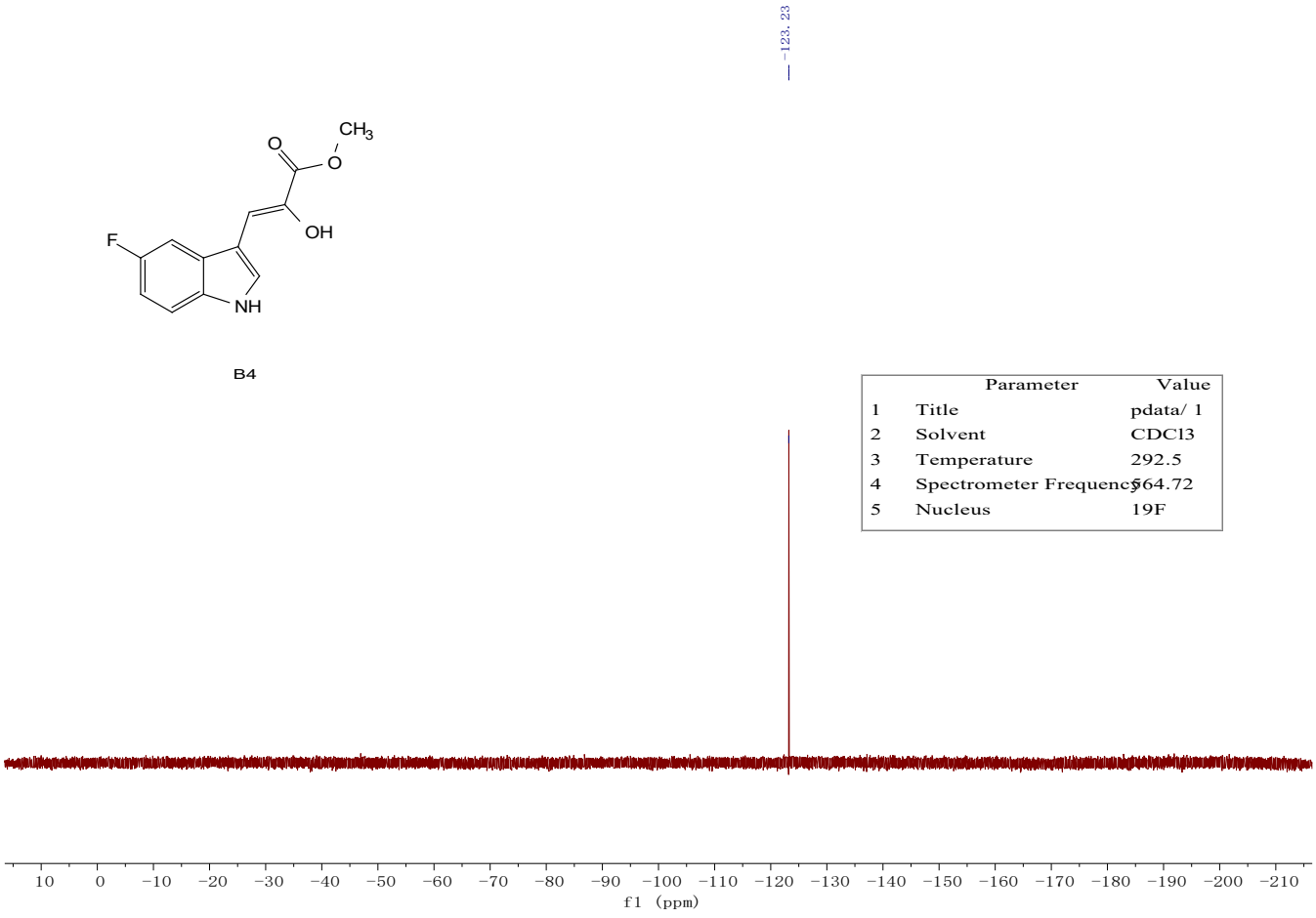
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	293.0
4	Spectrometer Frequency	564.72
5	Nucleus	19F

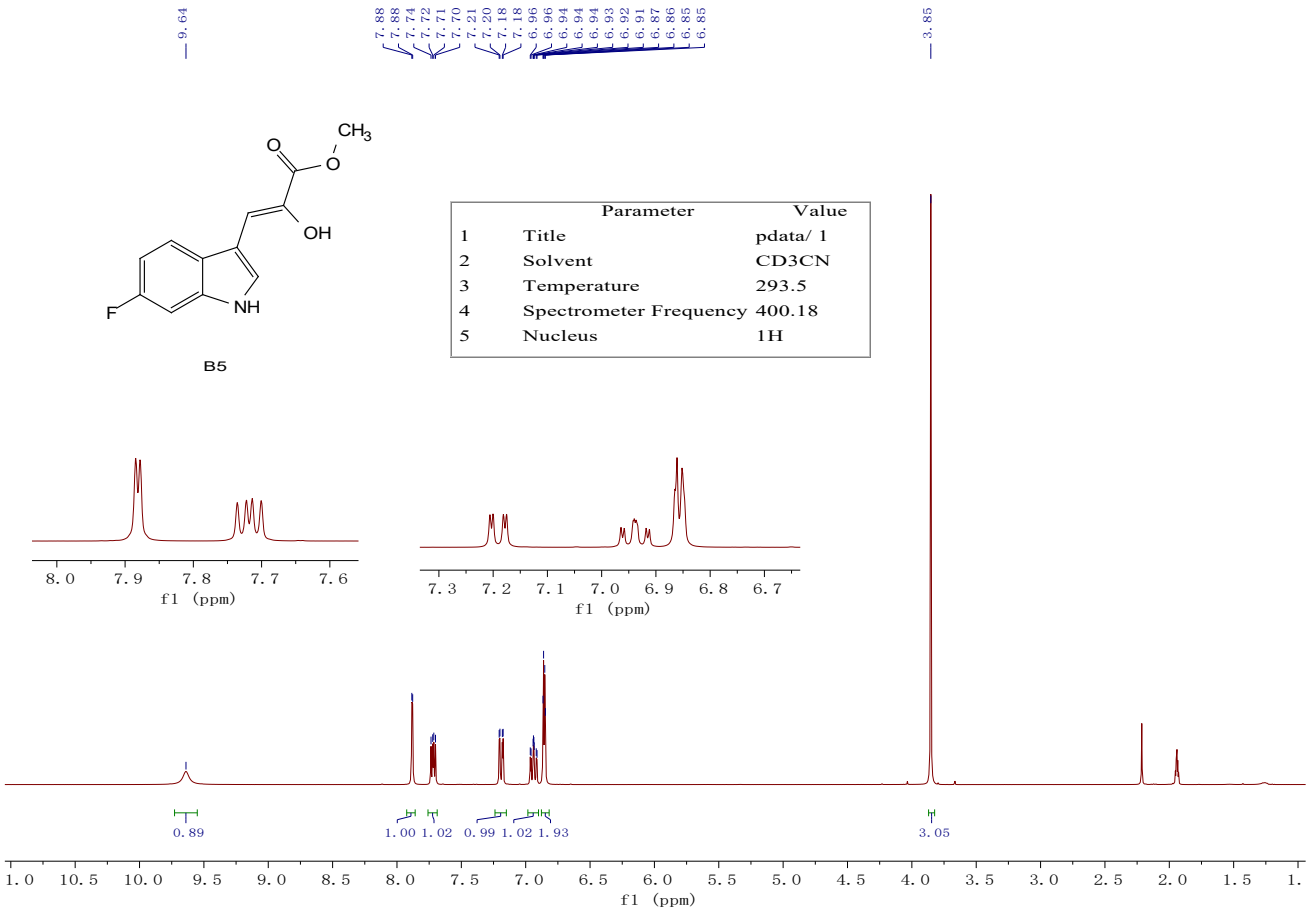


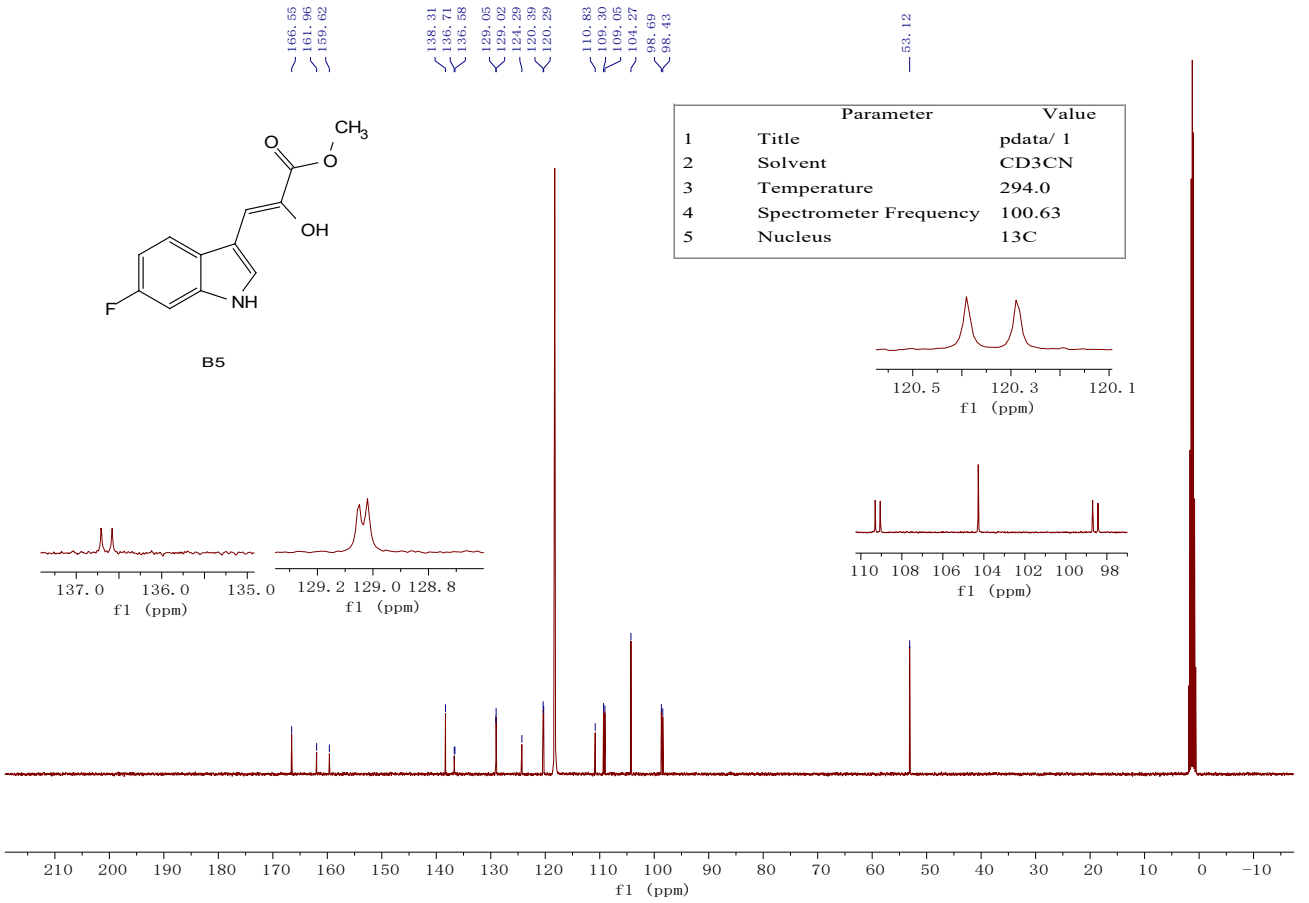
B4

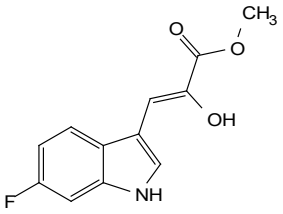
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	292.8
4	Spectrometer Frequency	600.17
5	Nucleus	1H


166.58
159.32
157.75
136.76
132.09
129.04
127.50
127.43
112.12
112.06
111.30
111.12
110.99
110.96
104.12
103.96
103.79
53.09
CH3
O
O
OH
F
NH
B4
129.0 128.5 128.0 127.5 127.0
f1 (ppm)
104.5 104.0 103.5
f1 (ppm)
112.0 111.0
f1 (ppm)
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.5
4 Spectrometer Frequency 150.91
5 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10
f1 (ppm)


-123.23
CH3
O
O
OH
F
NH
B4
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 292.5
4 Spectrometer Frequency 564.72
5 Nucleus 19F
10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210
f1 (ppm)


9.64
7.88
7.88
7.74
7.72
7.71
7.70
7.21
7.20
7.18
6.96
6.96
6.94
6.94
6.94
6.93
6.92
6.91
6.87
6.86
6.85
6.85
3.85
CH3
O
O
OH
F
NH
B5
Parameter Value
1 Title pdata/ 1
2 Solvent CD3CN
3 Temperature 293.5
4 Spectrometer Frequency 400.18
5 Nucleus 1H
f1 (ppm)
0.89
1.00 1.02 0.99 1.02 1.93
3.05

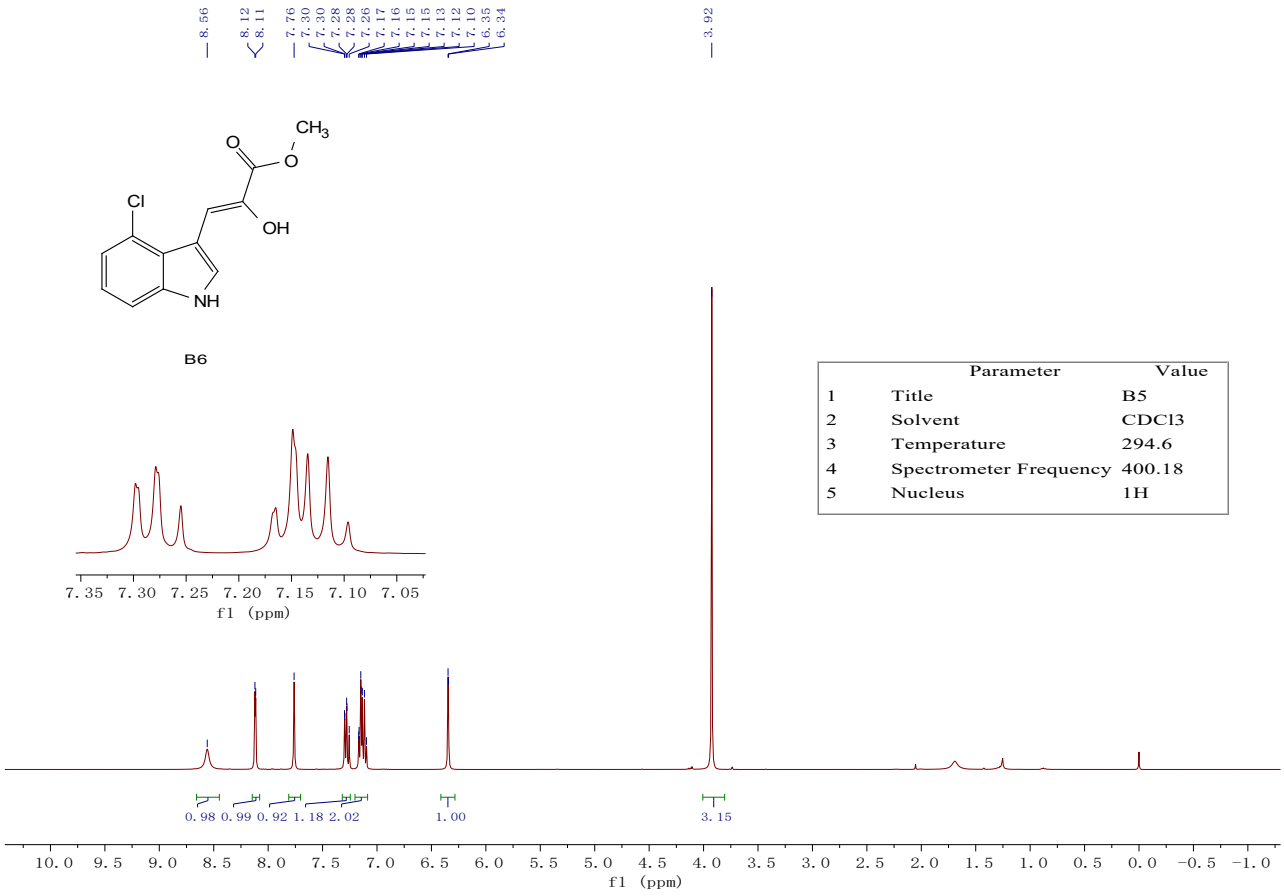

166.55
161.96
159.62
138.31
136.71
136.58
129.05
129.02
124.29
120.39
120.29
110.83
109.30
109.05
104.27
98.69
98.43
53.12
CH3
O
O
OH
F
NH
B5
Parameter Value
1 Title pdata/ 1
2 Solvent CD3CN
3 Temperature 294.0
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)



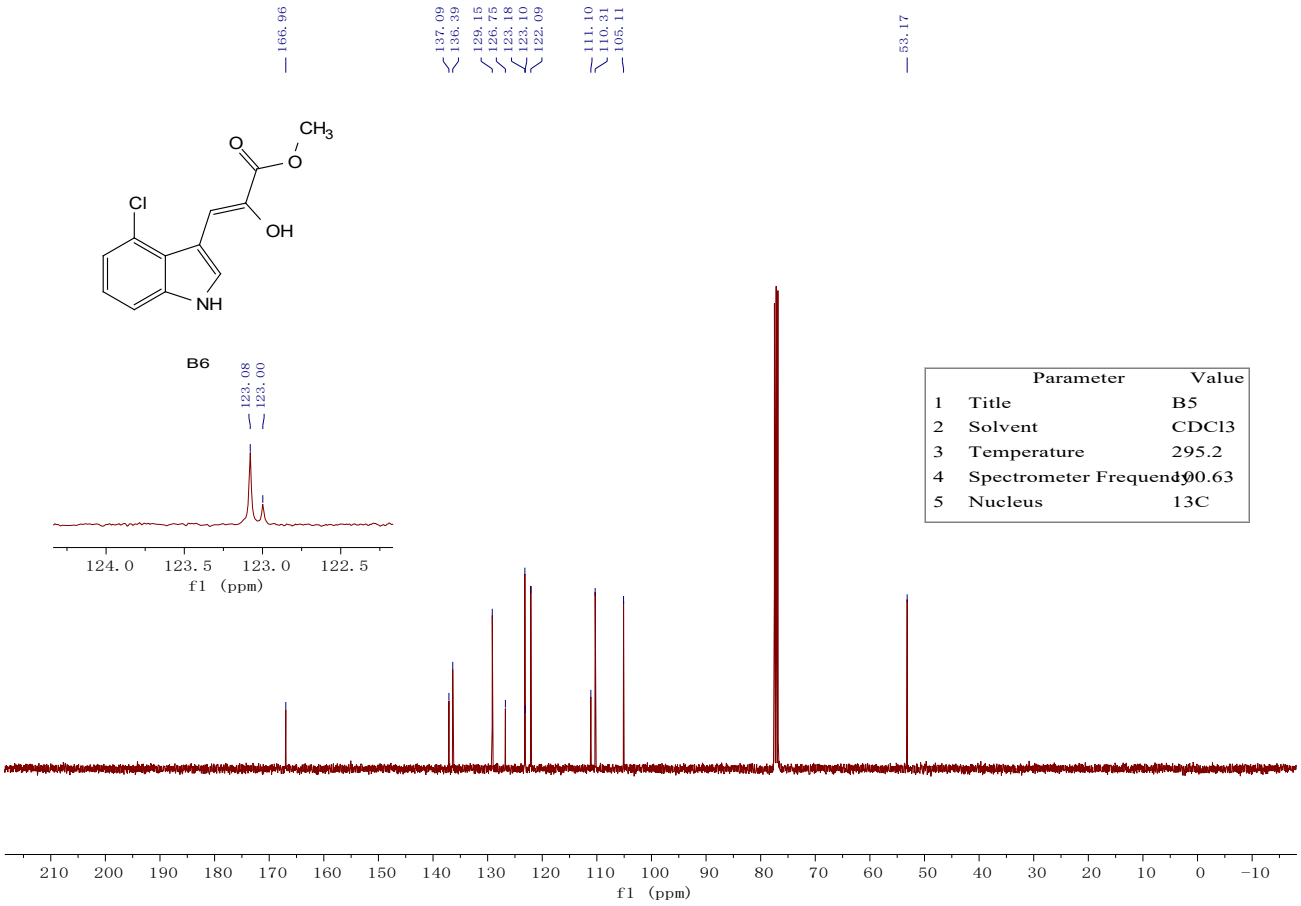
B5

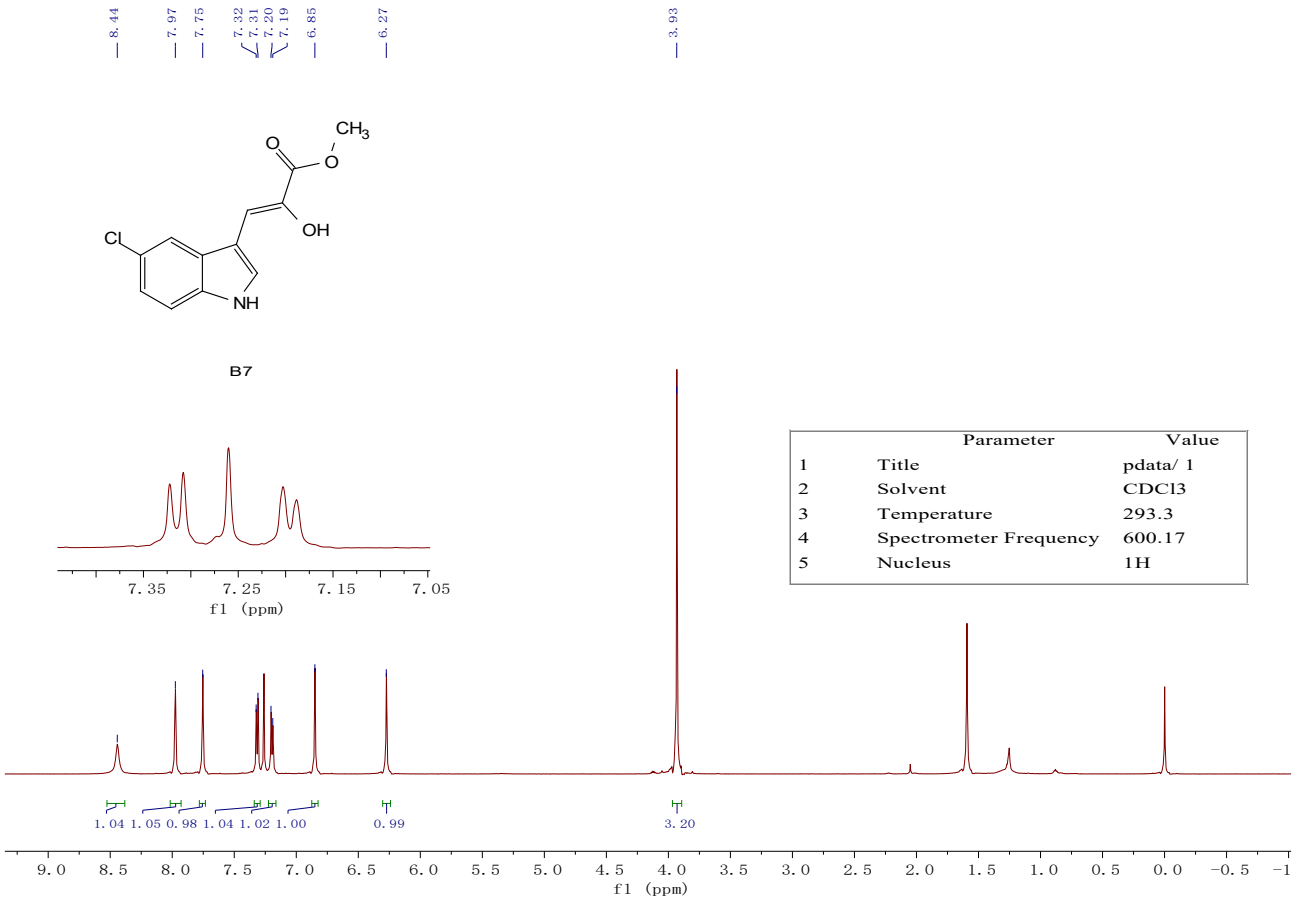
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CD3CN
3	Temperature	293.8
4	Spectrometer Frequency	376.55
5	Nucleus	19F

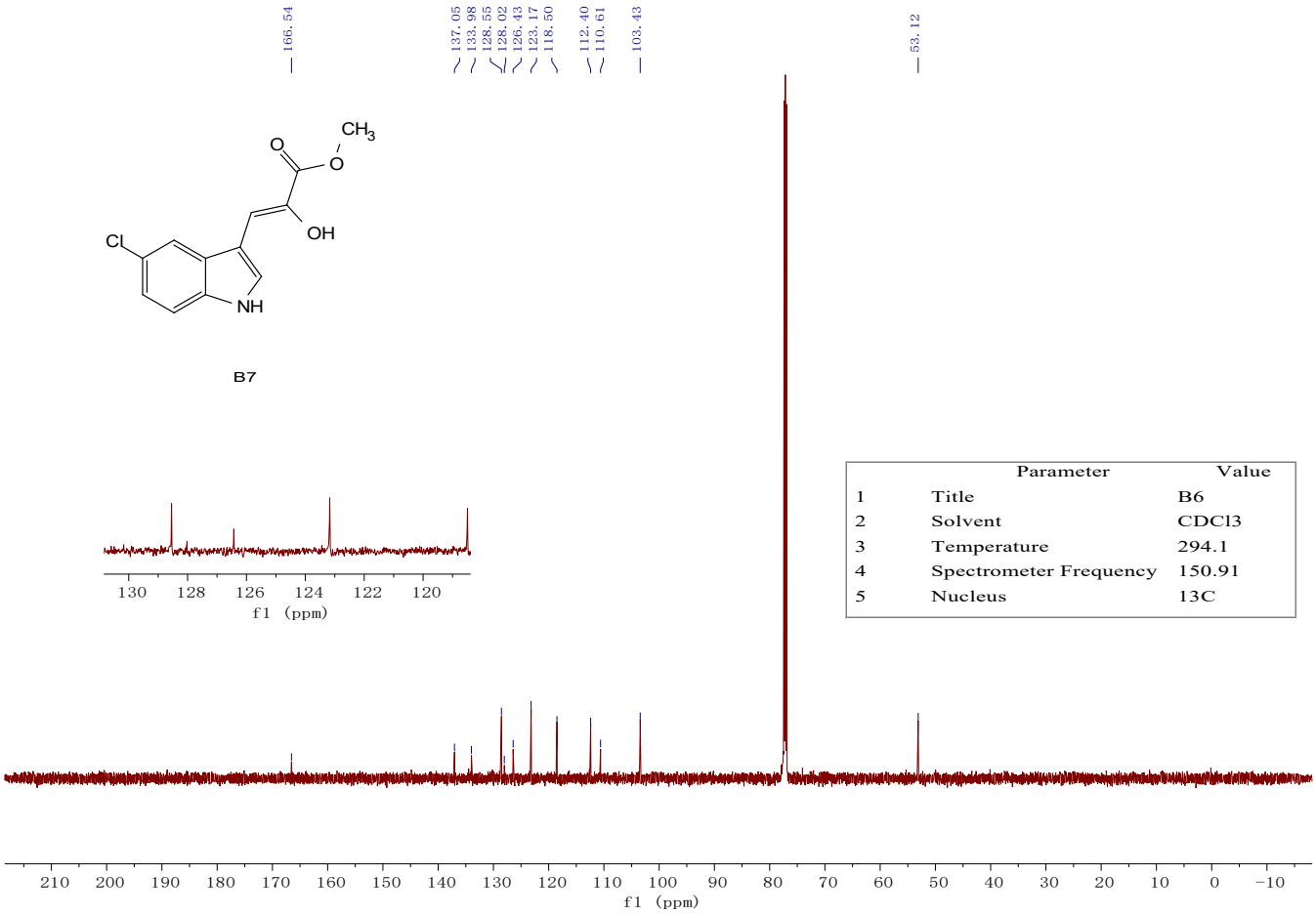
B6



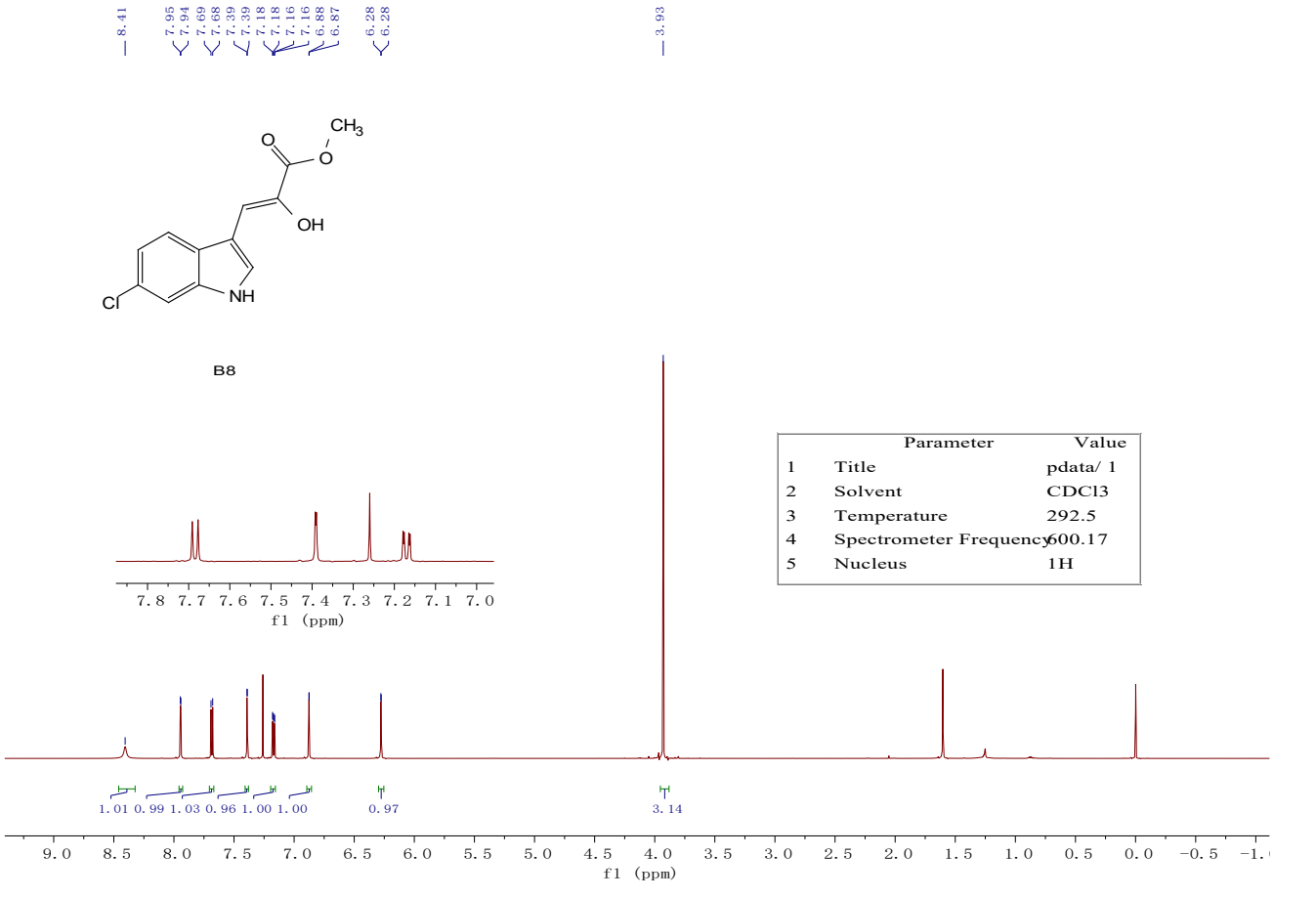
	Parameter	Value
1	Title	B5
2	Solvent	CDCl3
3	Temperature	294.6
4	Spectrometer Frequency	400.18
5	Nucleus	1H


166.96
137.09
136.39
129.15
126.75
123.18
123.10
122.09
111.10
110.31
105.11
53.17
CH3
O
O
Cl
OH
NH
B6
123.08
123.00
124.0
123.5
123.0
122.5
f1 (ppm)
Parameter Value
1 Title B5
2 Solvent CDCl3
3 Temperature 295.2
4 Spectrometer Frequency 100.63
5 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

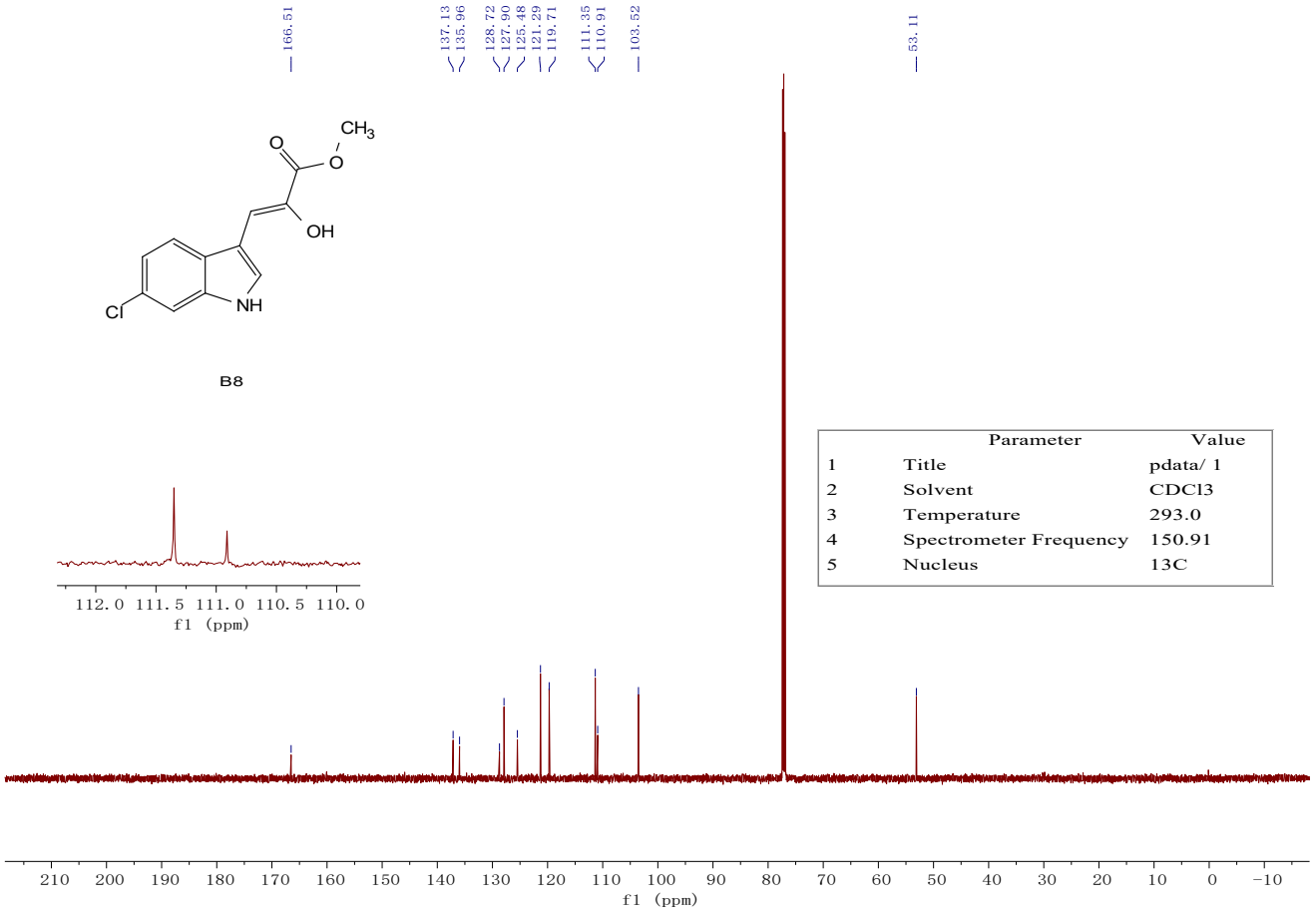

8.44
7.97
7.75
7.32
7.31
7.20
7.19
6.85
6.27
3.93
CH3
O
O
Cl
OH
NH
B7
7.35
7.25
7.15
7.05
f1 (ppm)
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.3
4 Spectrometer Frequency 600.17
5 Nucleus 1H
1.04 1.05 0.98 1.04 1.02 1.00 0.99 3.20
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1
f1 (ppm)

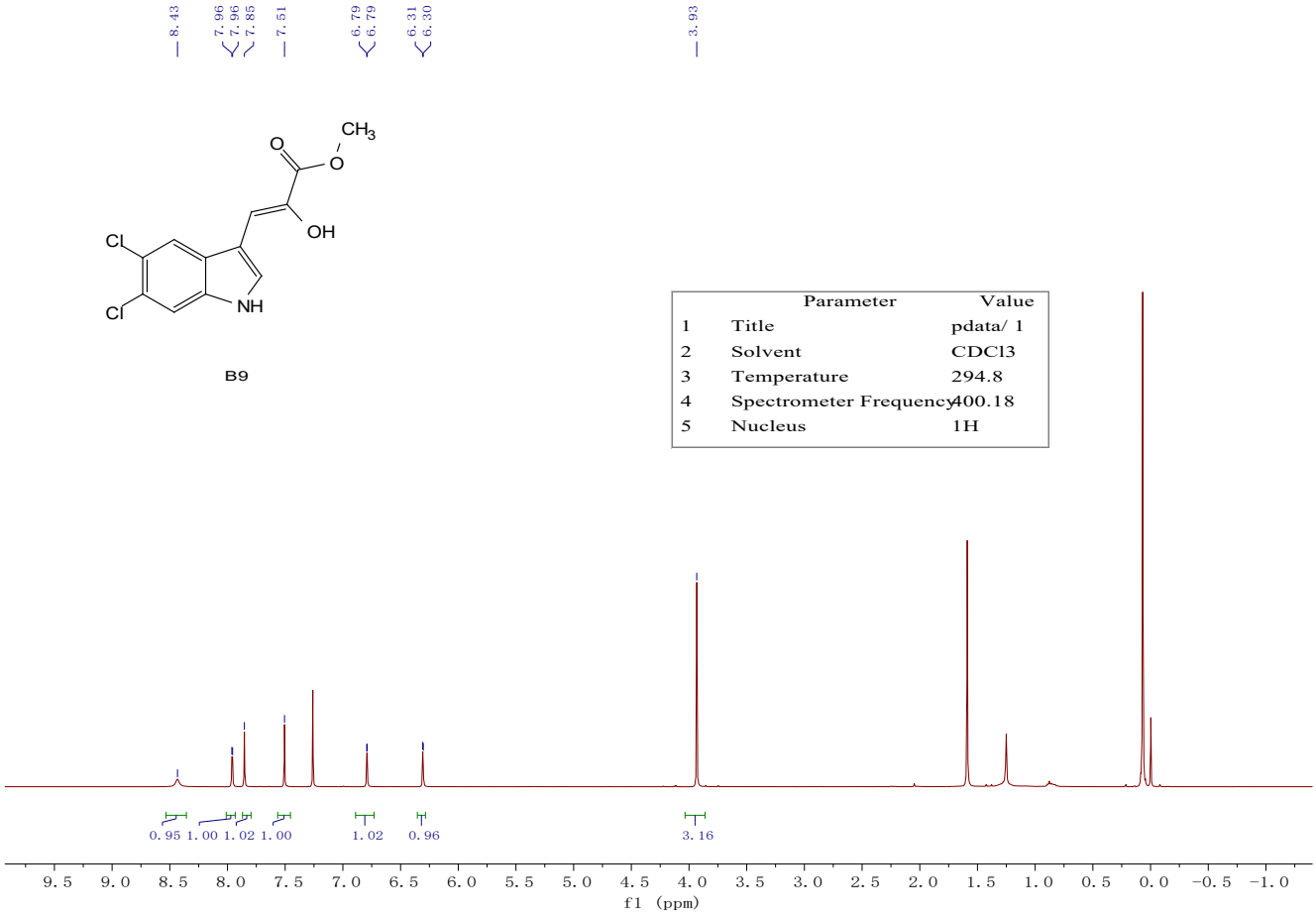


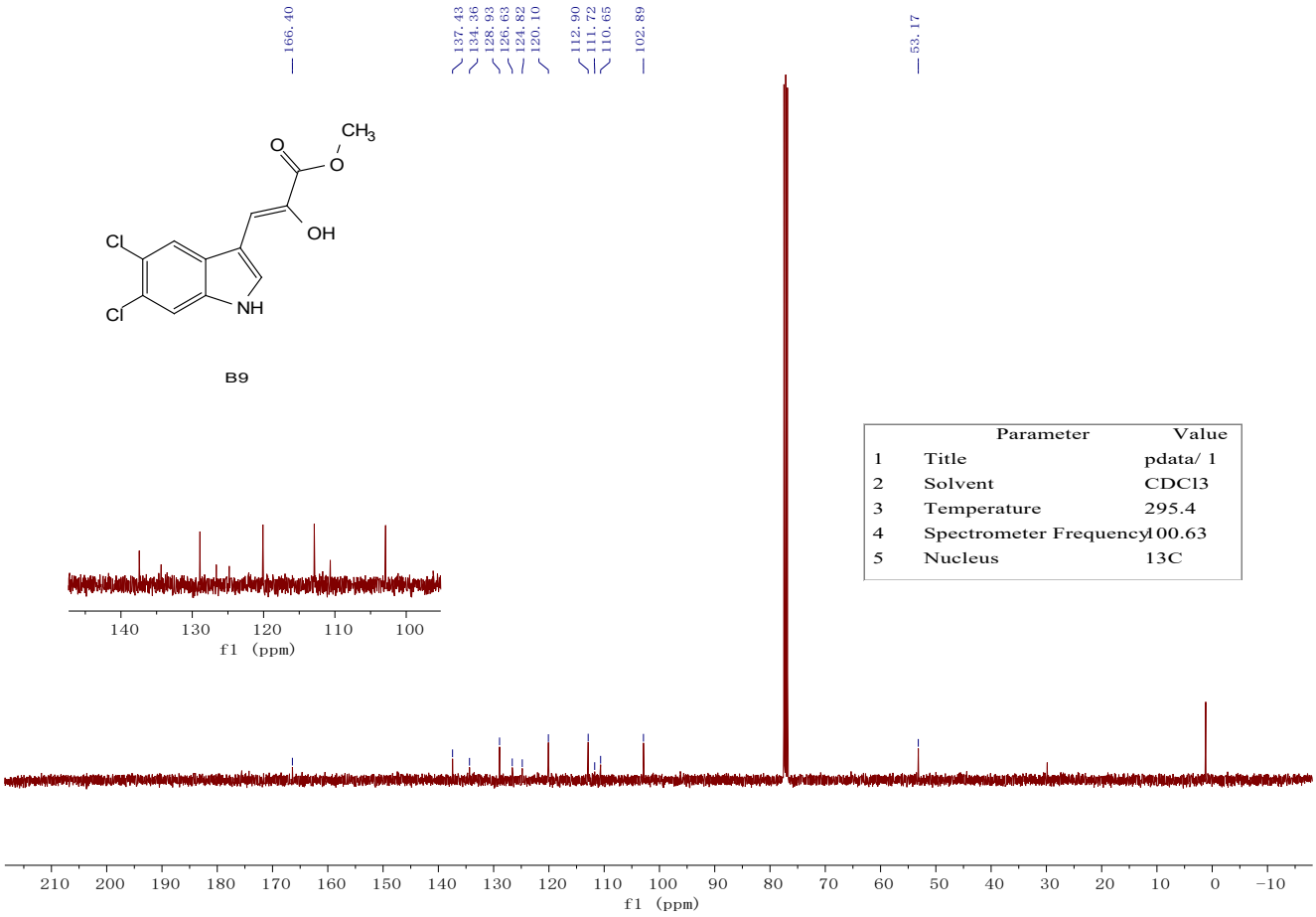
	Parameter	Value
1	Title	B6
2	Solvent	CDCl3
3	Temperature	294.1
4	Spectrometer Frequency	150.91
5	Nucleus	13C

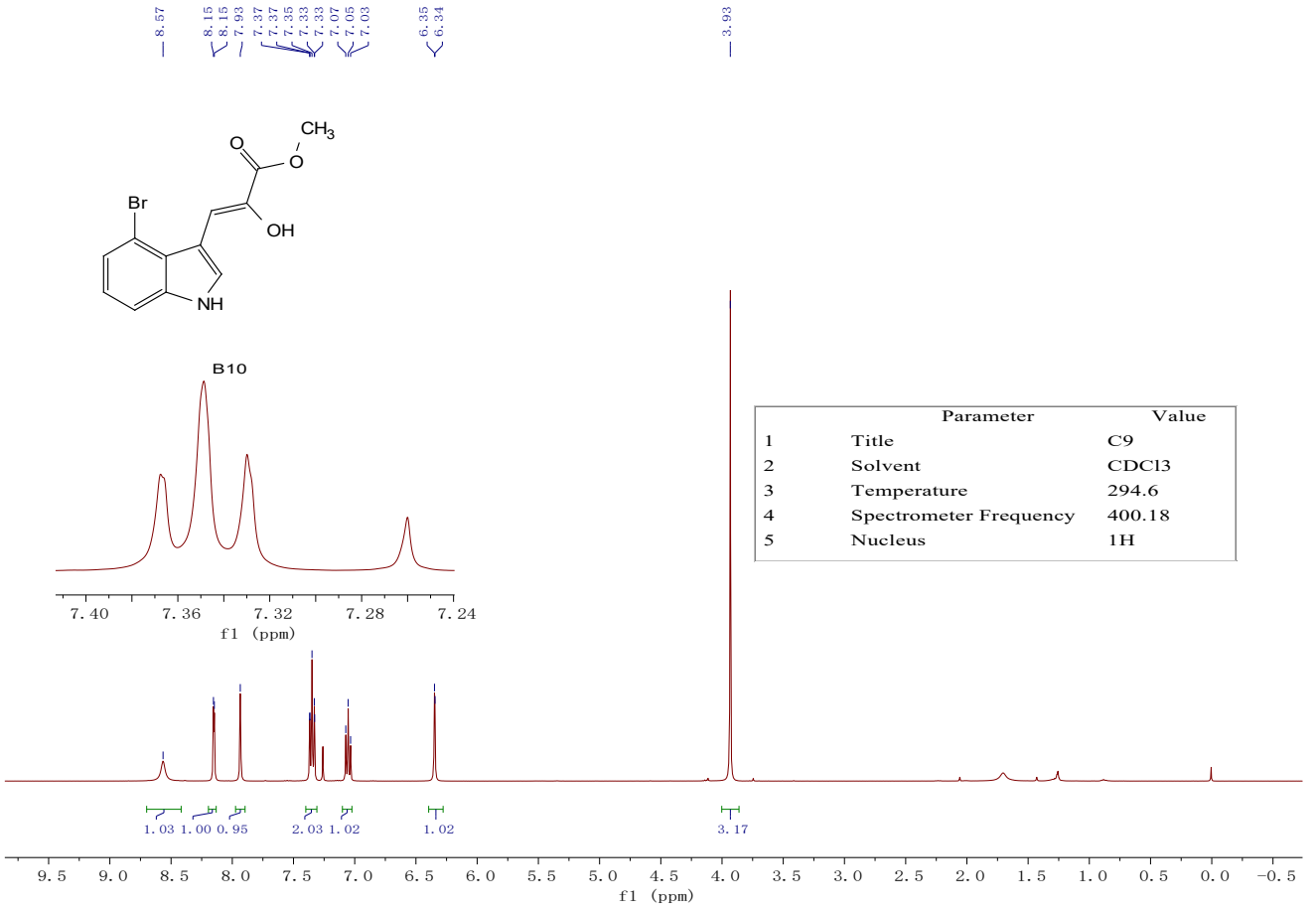


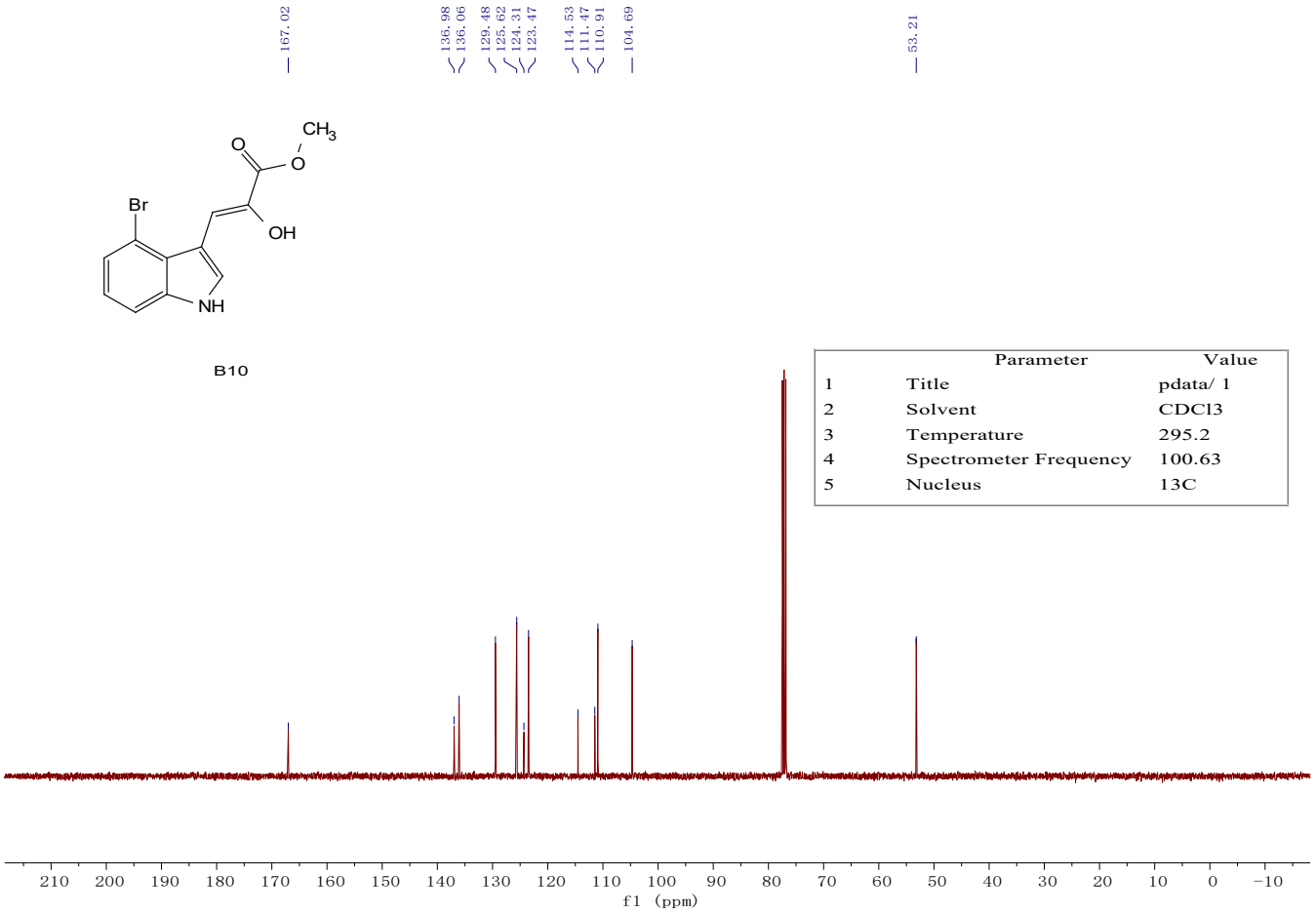
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	292.5
4	Spectrometer Frequency	600.17
5	Nucleus	1H

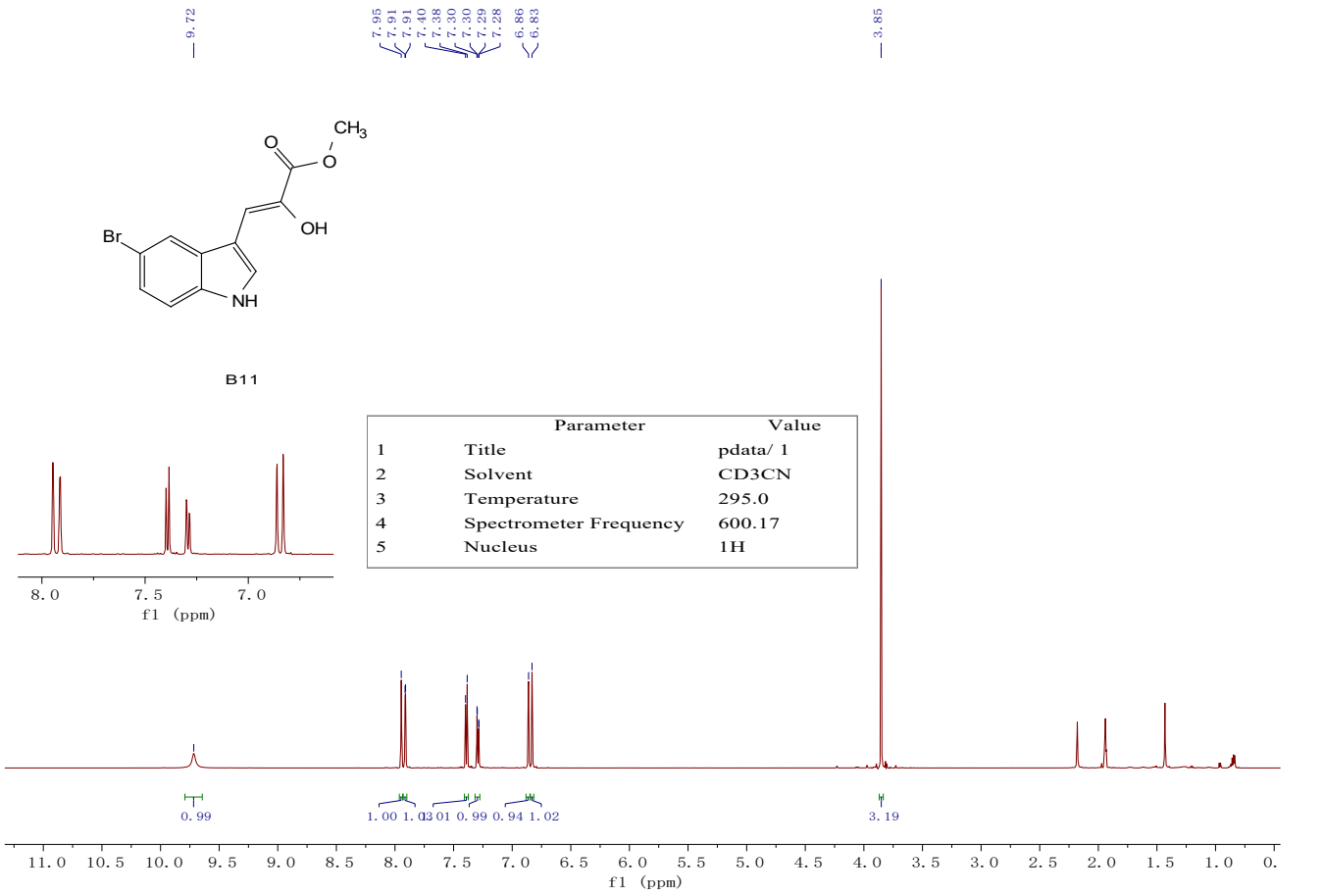

166.51
137.13
135.96
128.72
127.90
125.48
121.29
119.71
111.35
110.91
103.52
53.11
CH3
O
O
OH
Cl
NH
B8
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.0
4 Spectrometer Frequency 150.91
5 Nucleus 13C
112.0 111.5 111.0 110.5 110.0
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

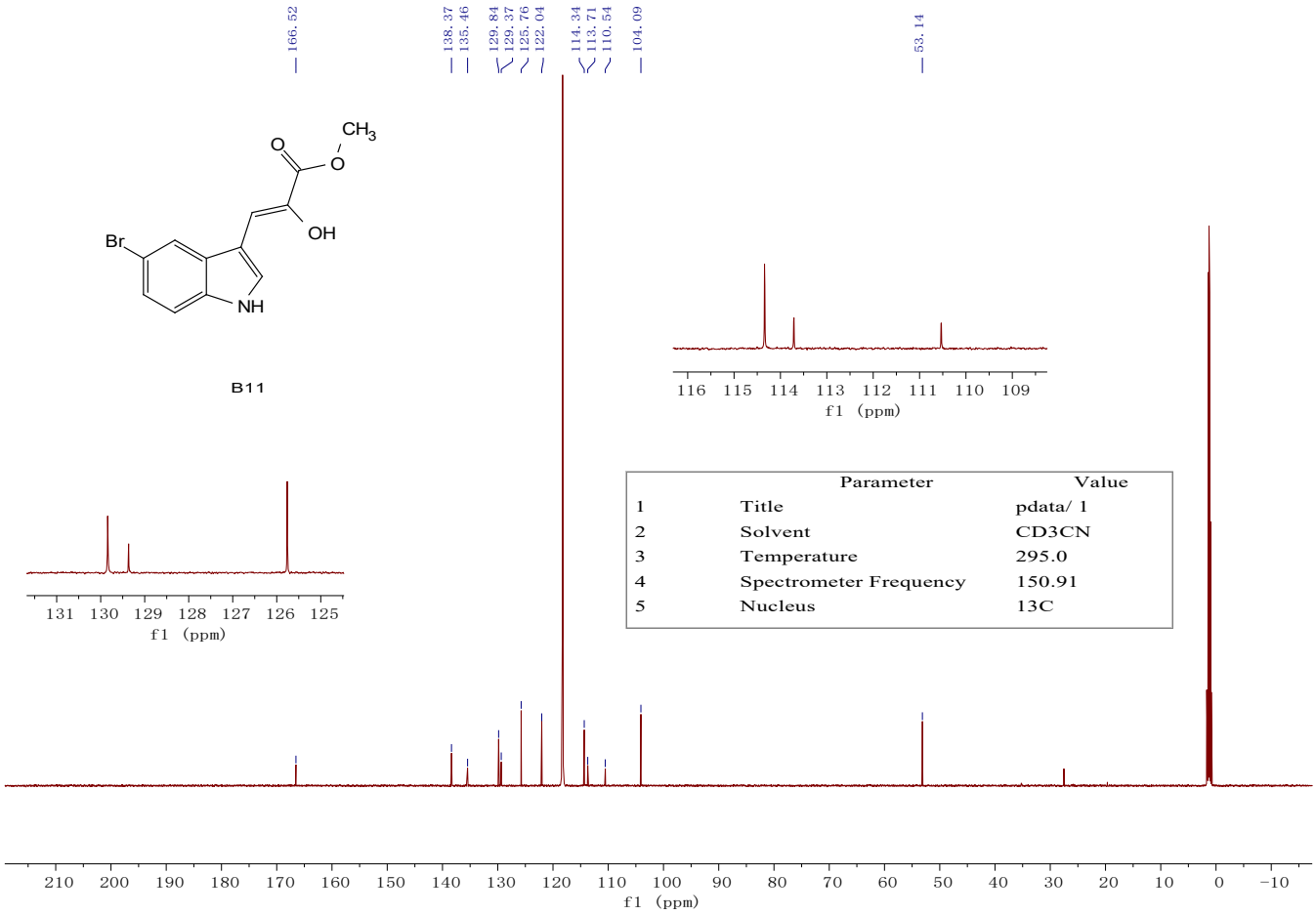

8.43
7.96
7.96
7.85
7.51
6.79
6.79
6.31
6.30
3.93
CH3
O
O
OH
Cl
Cl
NH
B9
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.8
4 Spectrometer Frequency 400.18
5 Nucleus 1H
0.95 1.00 1.02 1.00 1.02 0.96 3.16
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0
f1 (ppm)

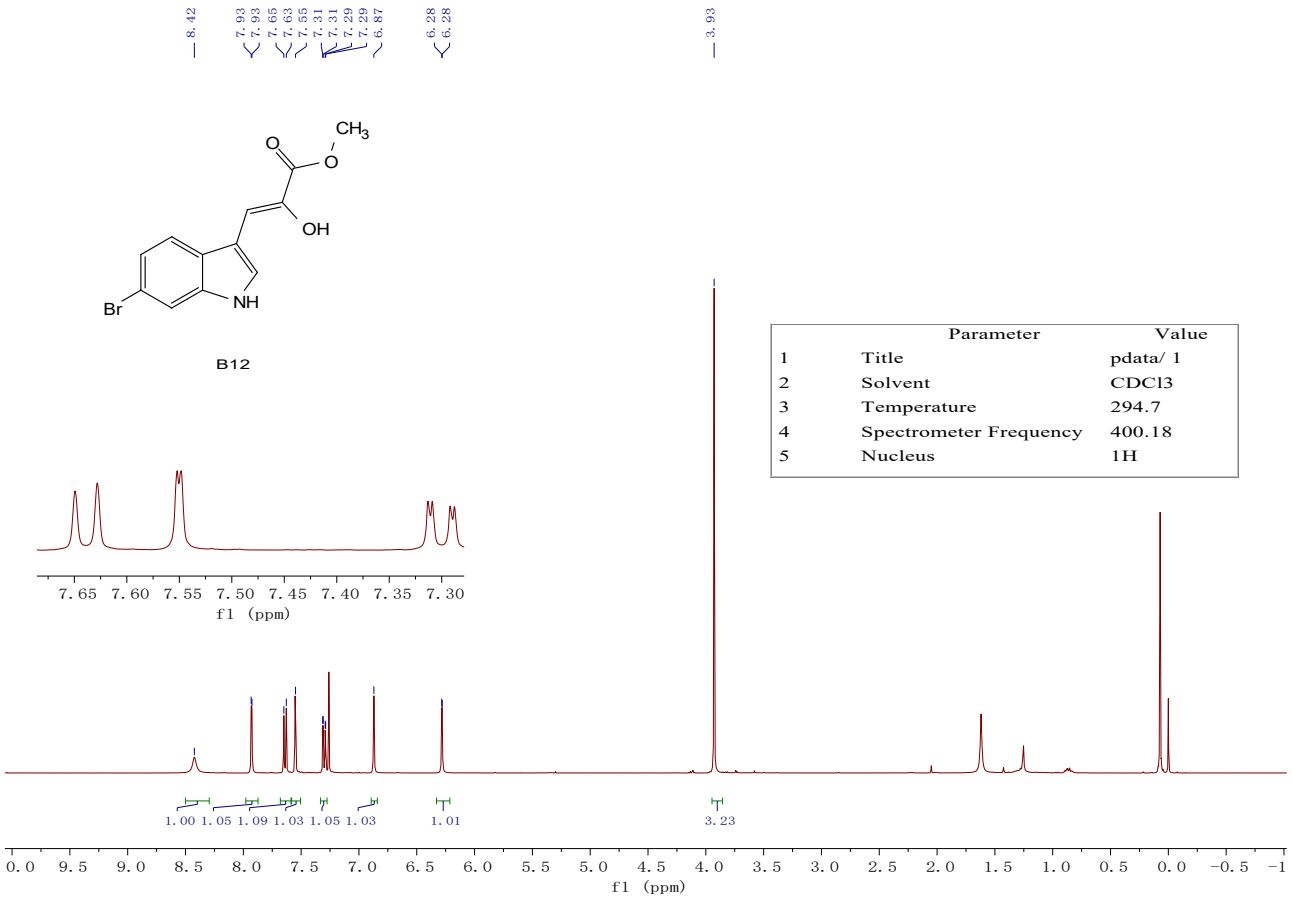

166.40
137.43
134.36
128.93
126.63
124.82
120.10
112.90
111.72
110.65
102.89
53.17
O
O
CH3
OH
Cl
Cl
NH
B9
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.4
4 Spectrometer Frequency 100.63
5 Nucleus 13C
140 130 120 110 100
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

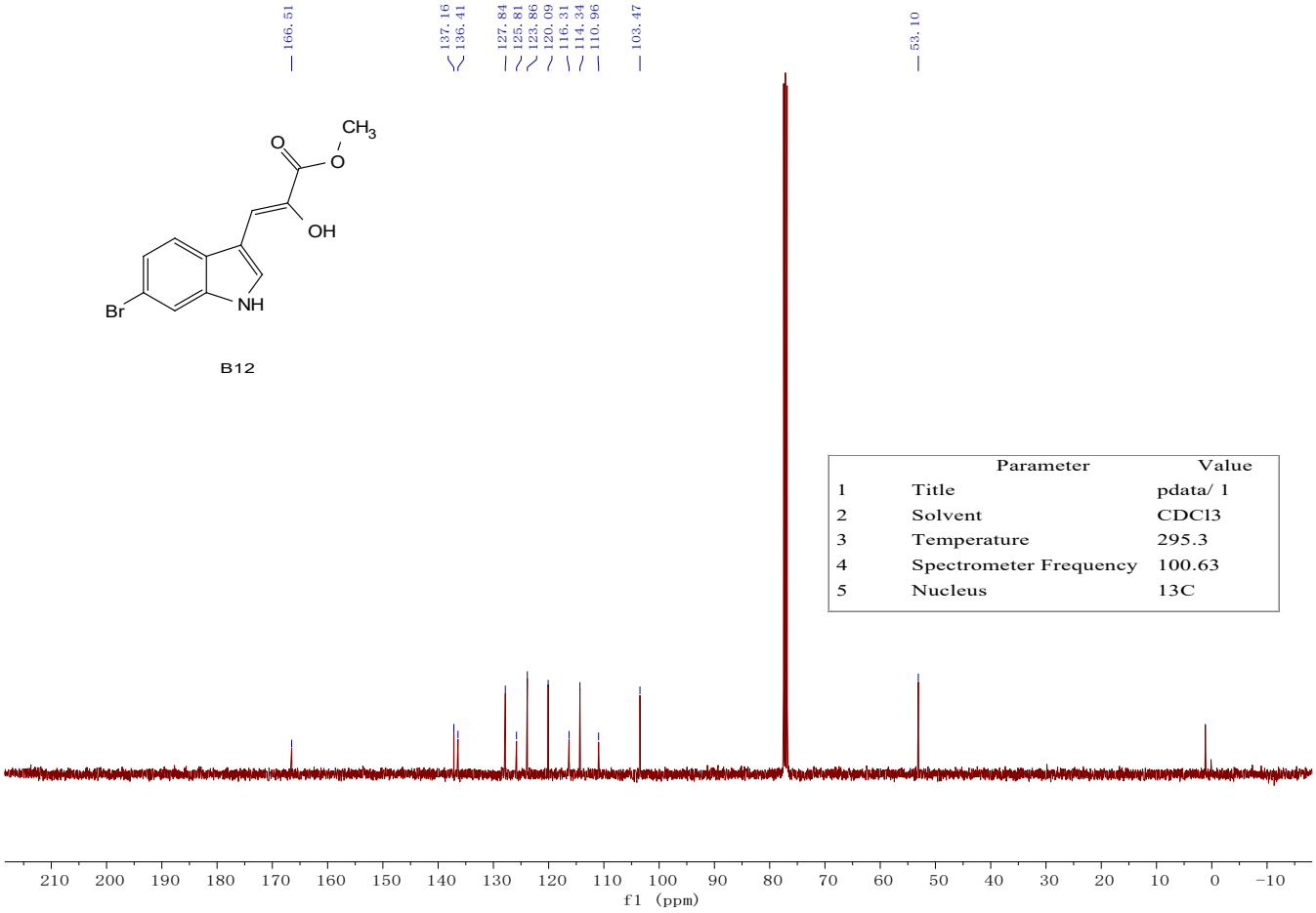

8.57
8.15
8.15
7.93
7.37
7.37
7.35
7.33
7.33
7.07
7.05
7.03
6.35
6.34
3.93
O
O
CH3
OH
Br
NH
B10
Parameter Value
1 Title C9
2 Solvent CDCl3
3 Temperature 294.6
4 Spectrometer Frequency 400.18
5 Nucleus 1H
7.40 7.36 7.32 7.28 7.24
f1 (ppm)
1.03 1.00 0.95 2.03 1.02 1.02 3.17
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5
f1 (ppm)

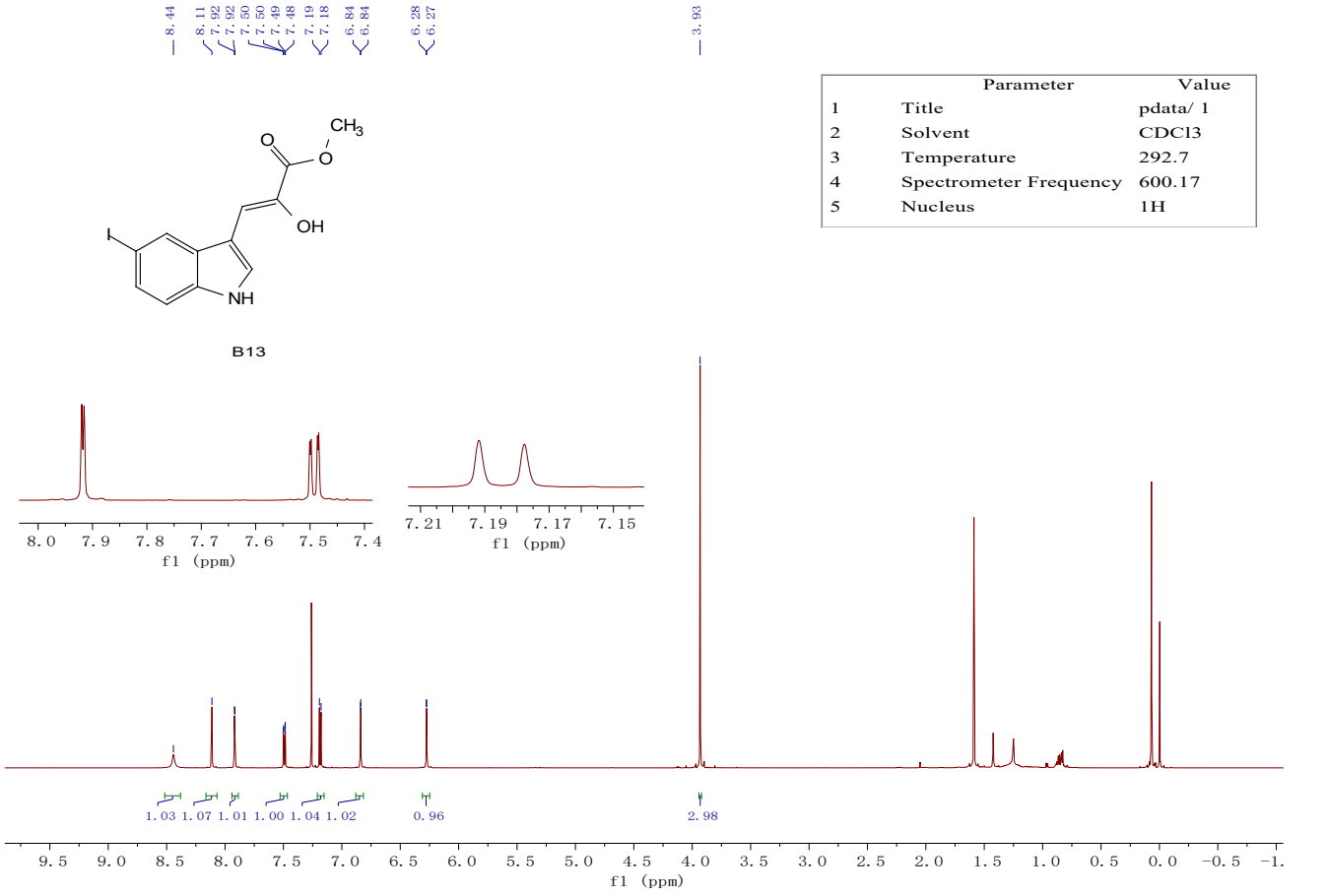

167.02
136.98
136.06
129.48
125.62
124.31
123.47
114.53
111.47
110.91
104.69
53.21
CH3
O
O
Br
OH
NH
B10
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.2
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)

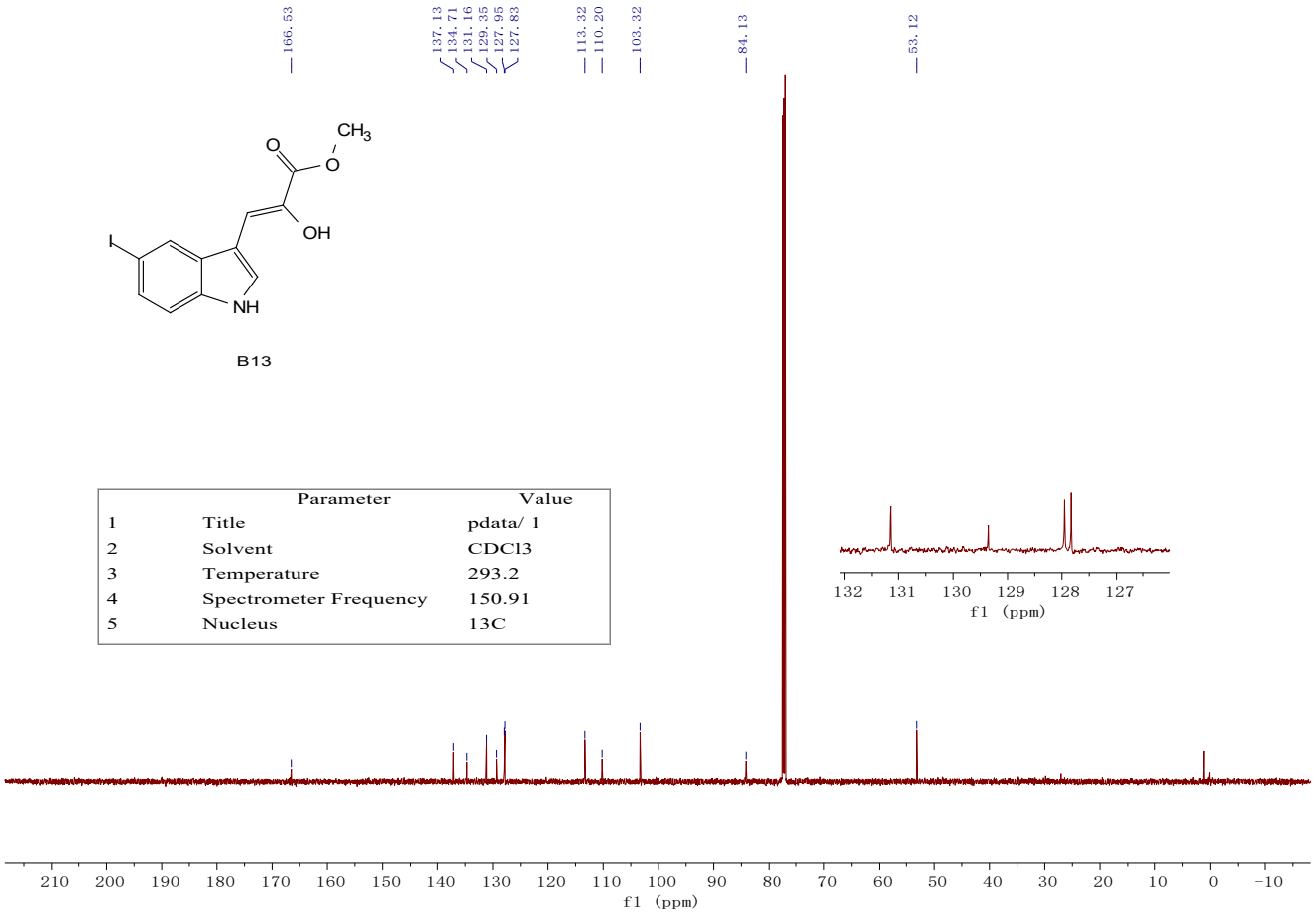

9.72
7.95
7.91
7.91
7.40
7.38
7.30
7.30
7.29
7.28
6.86
6.83
3.85
CH3
O
O
Br
OH
NH
B11
Parameter Value
1 Title pdata/ 1
2 Solvent CD3CN
3 Temperature 295.0
4 Spectrometer Frequency 600.17
5 Nucleus 1H
f1 (ppm)

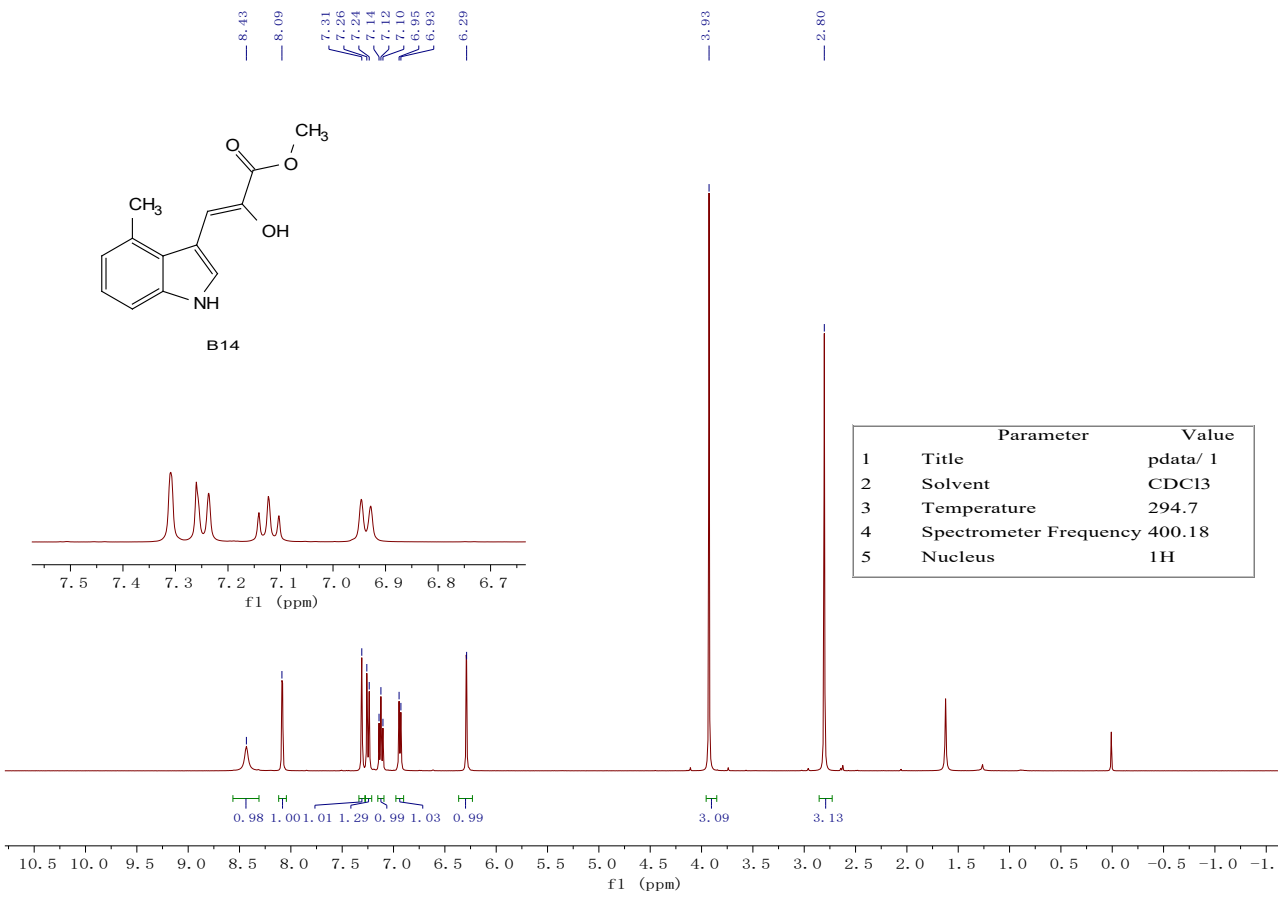

166.52
138.37
135.46
129.84
129.37
125.76
122.04
114.34
113.71
110.54
104.09
53.14
O
O
CH3
OH
Br
NH
B11
116 115 114 113 112 111 110 109
f1 (ppm)
131 130 129 128 127 126 125
f1 (ppm)
Parameter Value
1 Title pdata/ 1
2 Solvent CD3CN
3 Temperature 295.0
4 Spectrometer Frequency 150.91
5 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

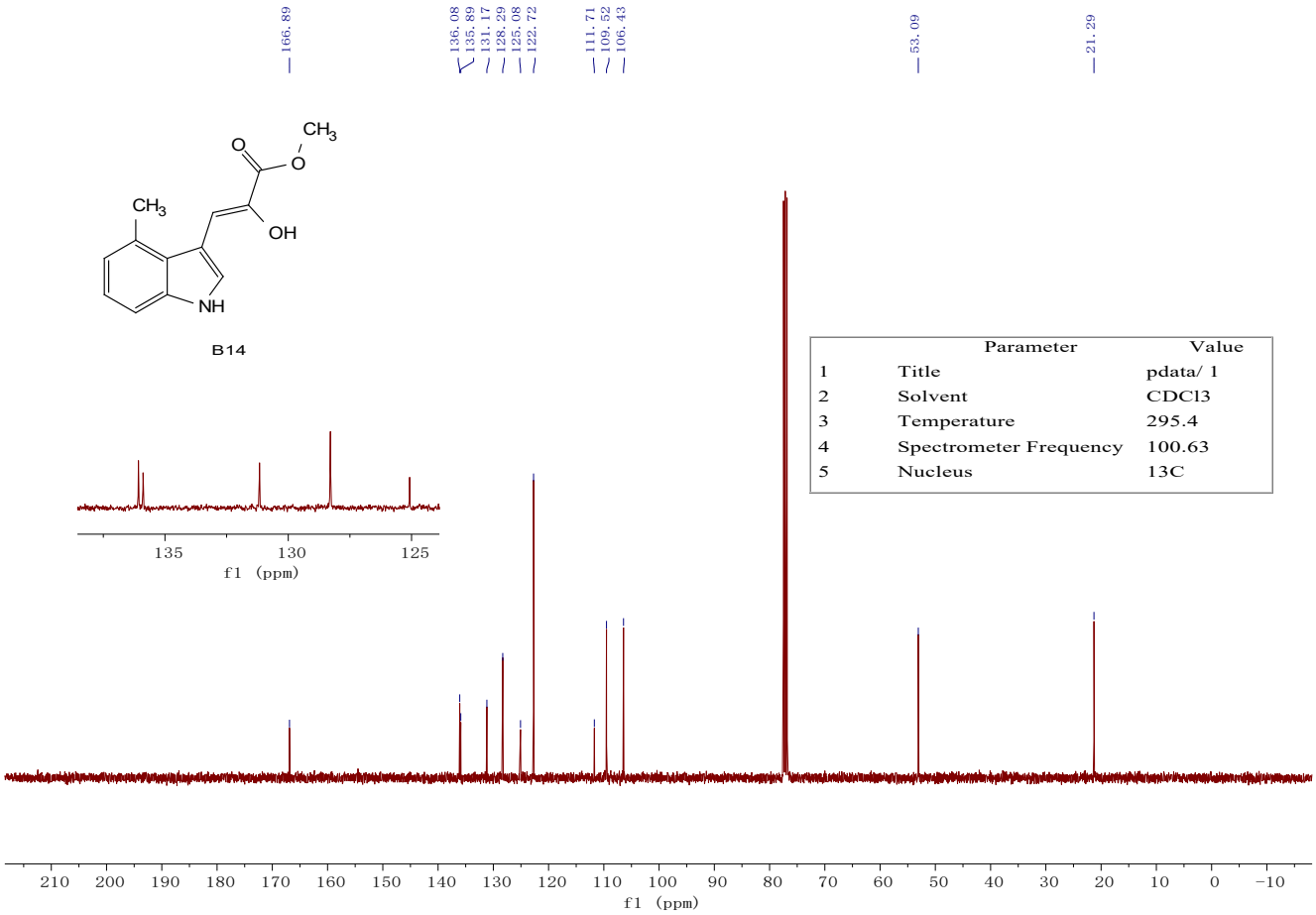

8.42
7.93
7.93
7.65
7.63
7.55
7.31
7.31
7.29
7.29
6.87
6.28
6.28
3.93
O
O
CH3
OH
Br
NH
B12
7.65 7.60 7.55 7.50 7.45 7.40 7.35 7.30
f1 (ppm)
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.7
4 Spectrometer Frequency 400.18
5 Nucleus 1H
1.00 1.05 1.09 1.03 1.05 1.03 1.01 3.23
0.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1
f1 (ppm)

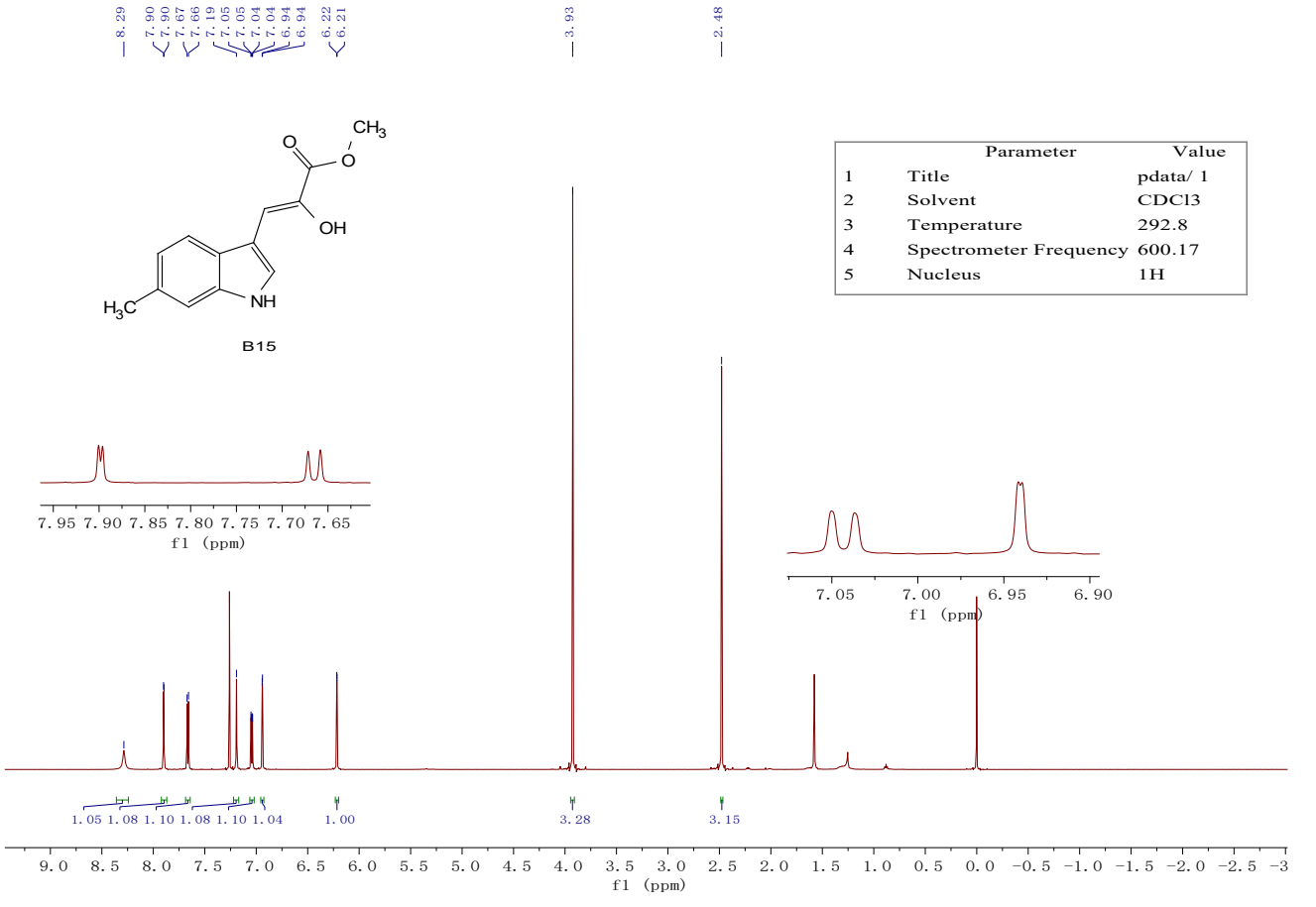

166.51
137.16
136.41
127.84
125.81
123.86
120.09
116.31
114.34
110.96
103.47
53.10
O
O
CH3
OH
Br
NH
B12
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.3
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)

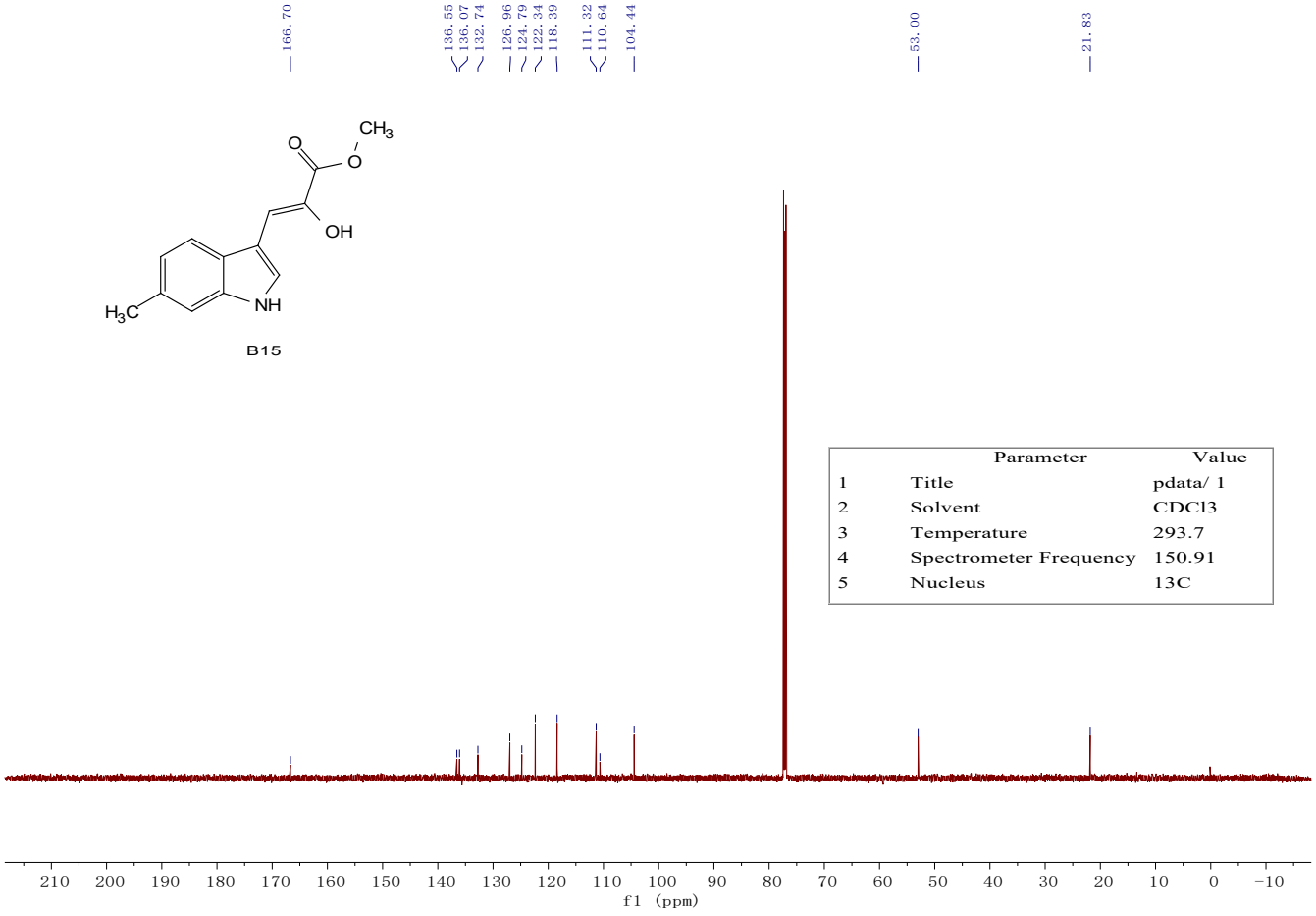

8.44
8.11
7.92
7.92
7.50
7.49
7.48
7.19
7.18
6.84
6.84
6.28
6.27
3.93
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 292.7
4 Spectrometer Frequency 600.17
5 Nucleus 1H
O
O
CH3
OH
I
NH
B13
f1 (ppm)
1.03 1.07 1.01 1.00 1.04 1.02
0.96
2.98
f1 (ppm)

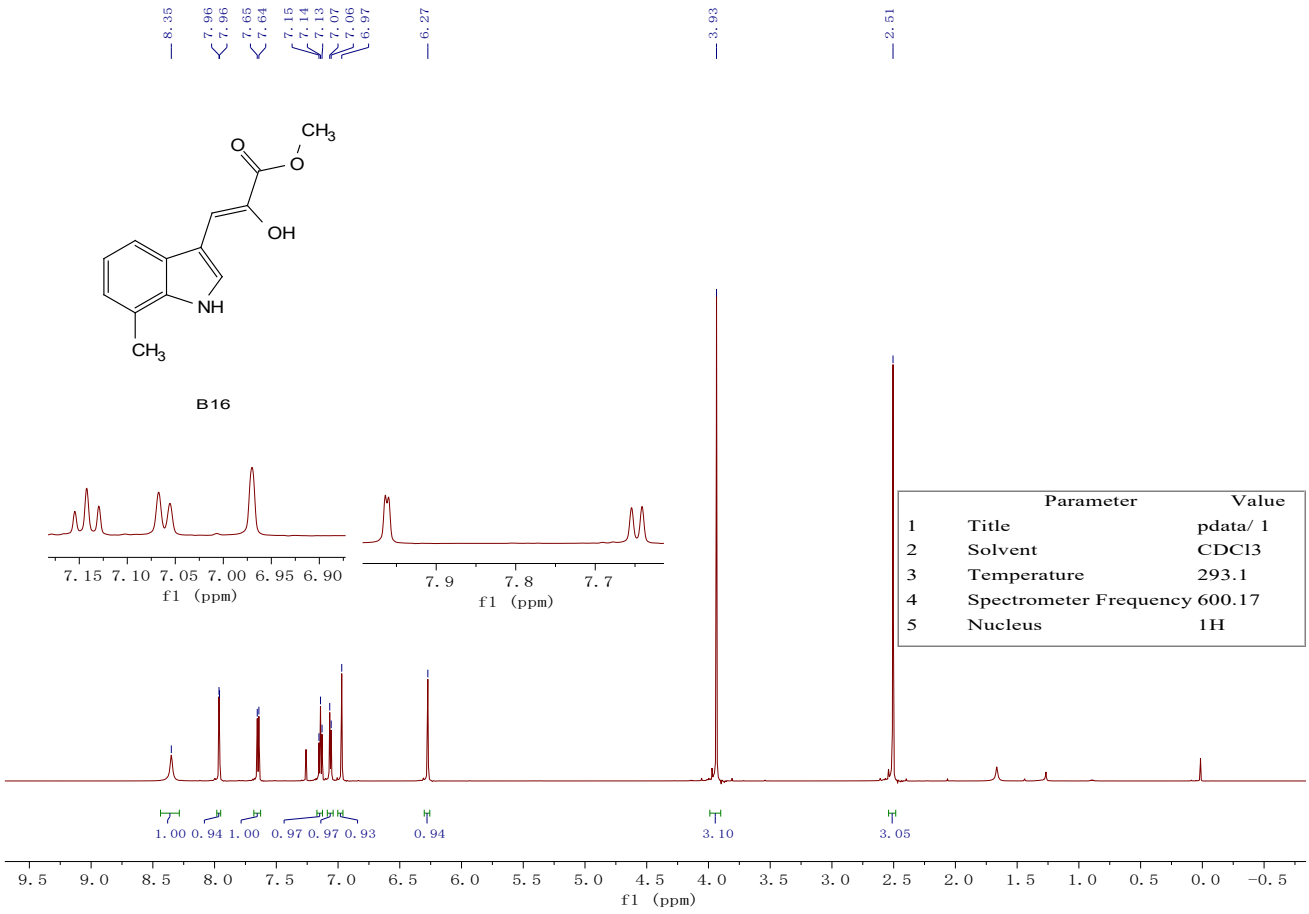

166.53
137.13
134.71
131.16
129.35
127.95
127.83
113.32
110.20
103.32
84.13
53.12
O
O
CH3
OH
I
NH
B13
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.2
4 Spectrometer Frequency 150.91
5 Nucleus 13C
132 131 130 129 128 127
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

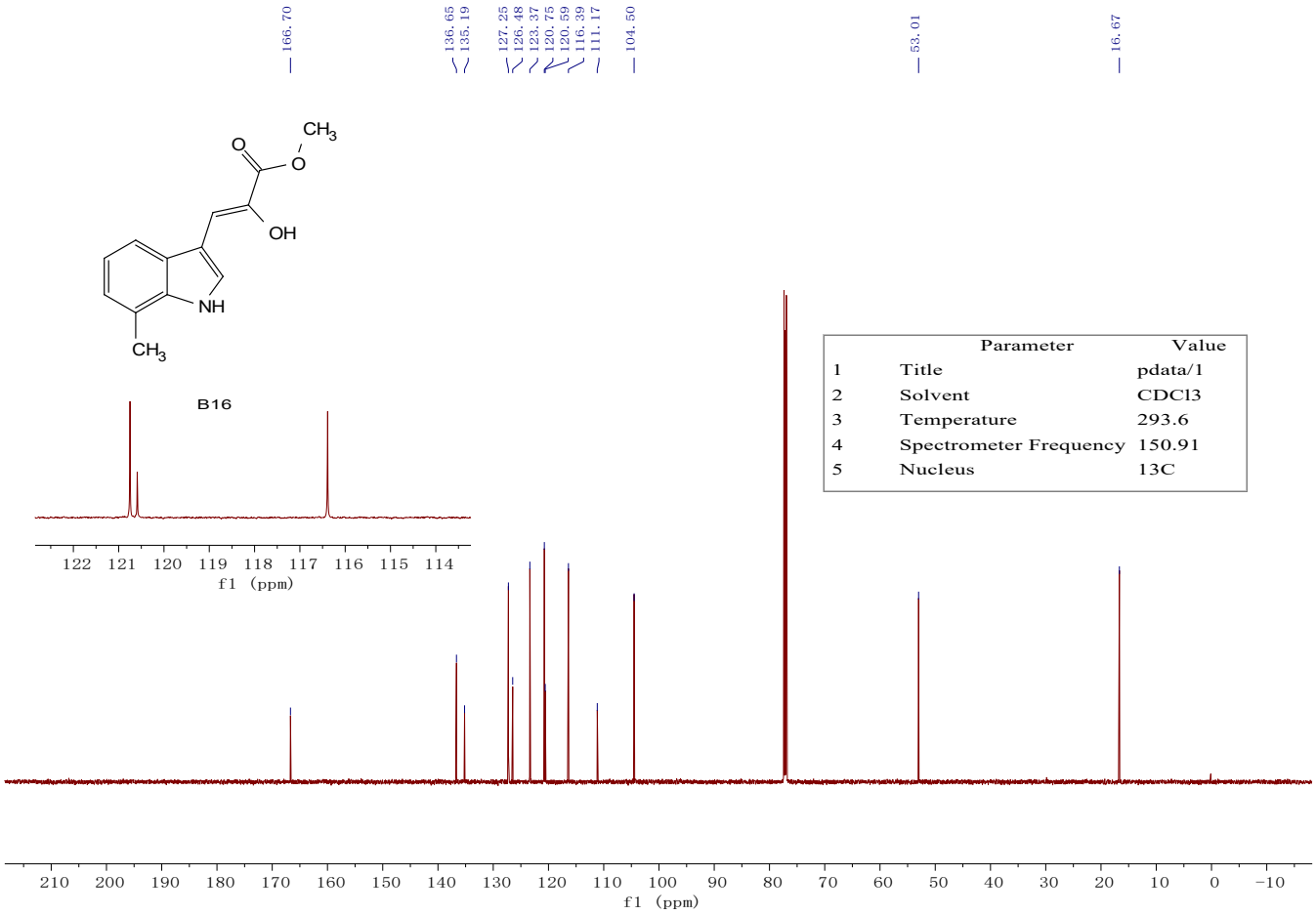

8.43
8.09
7.31
7.26
7.24
7.14
7.12
7.10
6.95
6.93
6.29
3.93
2.80
O
O
CH3
CH3
OH
NH
B14
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.7
4 Spectrometer Frequency 400.18
5 Nucleus 1H
7.5 7.4 7.3 7.2 7.1 7.0 6.9 6.8 6.7
f1 (ppm)
0.98 1.00 1.01 1.29 0.99 1.03 0.99
3.09
3.13
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0 −1.
f1 (ppm)

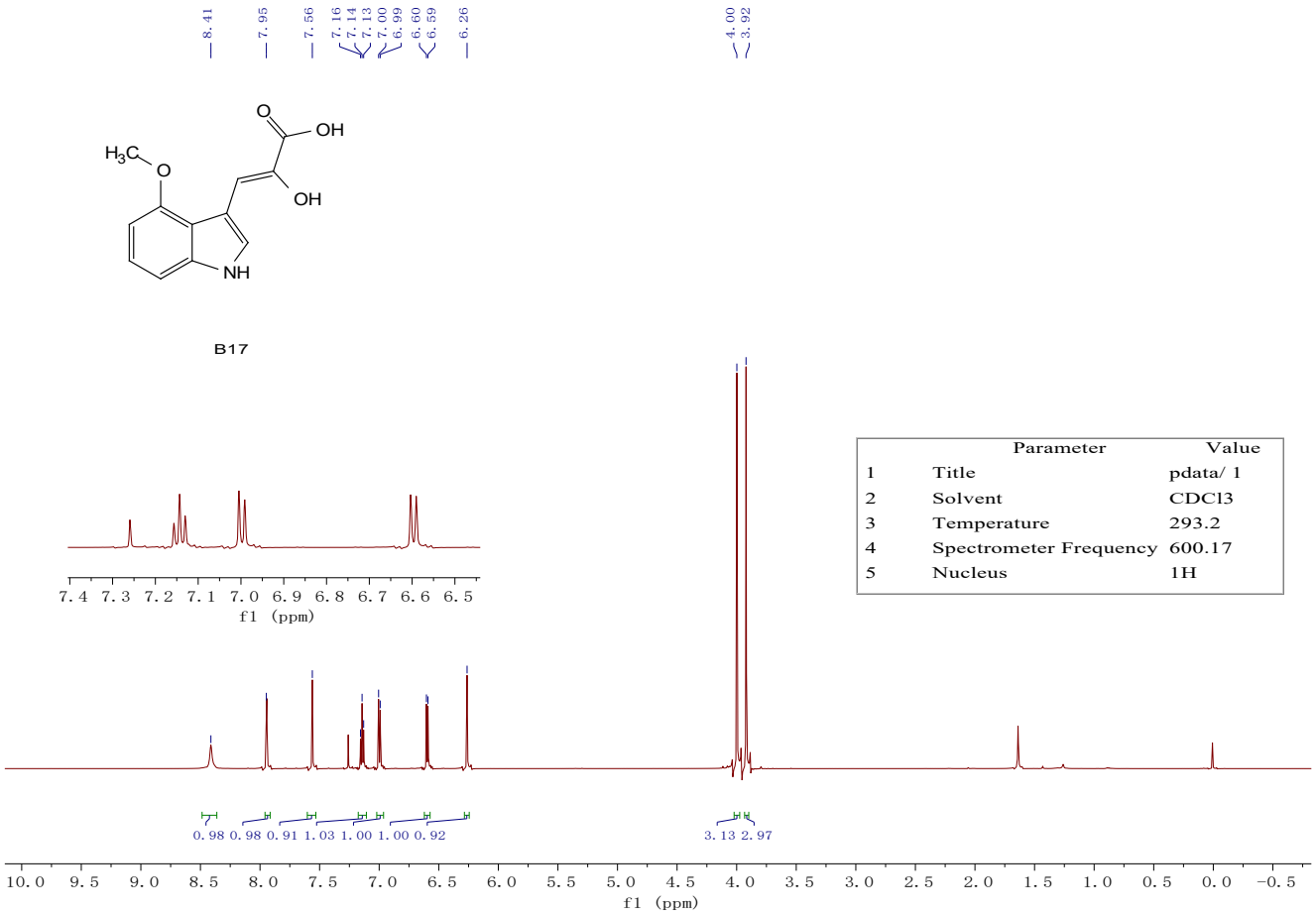

166.89
136.08
135.89
131.17
128.29
125.08
122.72
111.71
109.52
106.43
53.09
21.29
CH3
O
O
CH3
OH
NH
B14
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.4
4 Spectrometer Frequency 100.63
5 Nucleus 13C
135 130 125
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

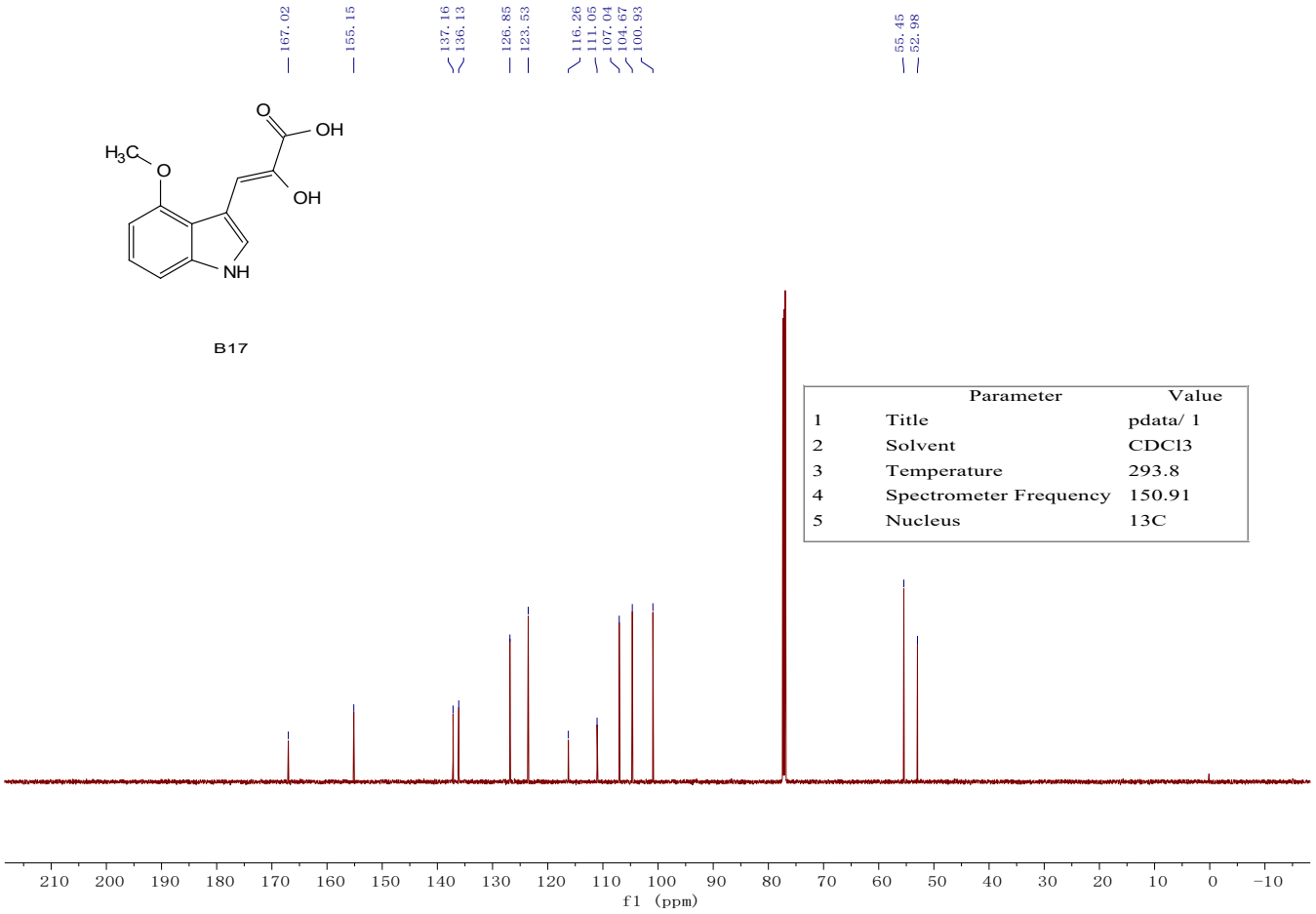

8.29
7.90
7.90
7.67
7.66
7.19
7.05
7.05
7.04
7.04
6.94
6.94
6.22
6.21
3.93
2.48
CH3
O
O
OH
NH
H3C
B15
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 292.8
4 Spectrometer Frequency 600.17
5 Nucleus 1H
7.95 7.90 7.85 7.80 7.75 7.70 7.65
f1 (ppm)
7.05 7.00 6.95 6.90
f1 (ppm)
1.05 1.08 1.10 1.08 1.10 1.04
1.00
3.28
3.15
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0 −1.5 −2.0 −2.5 −3
f1 (ppm)

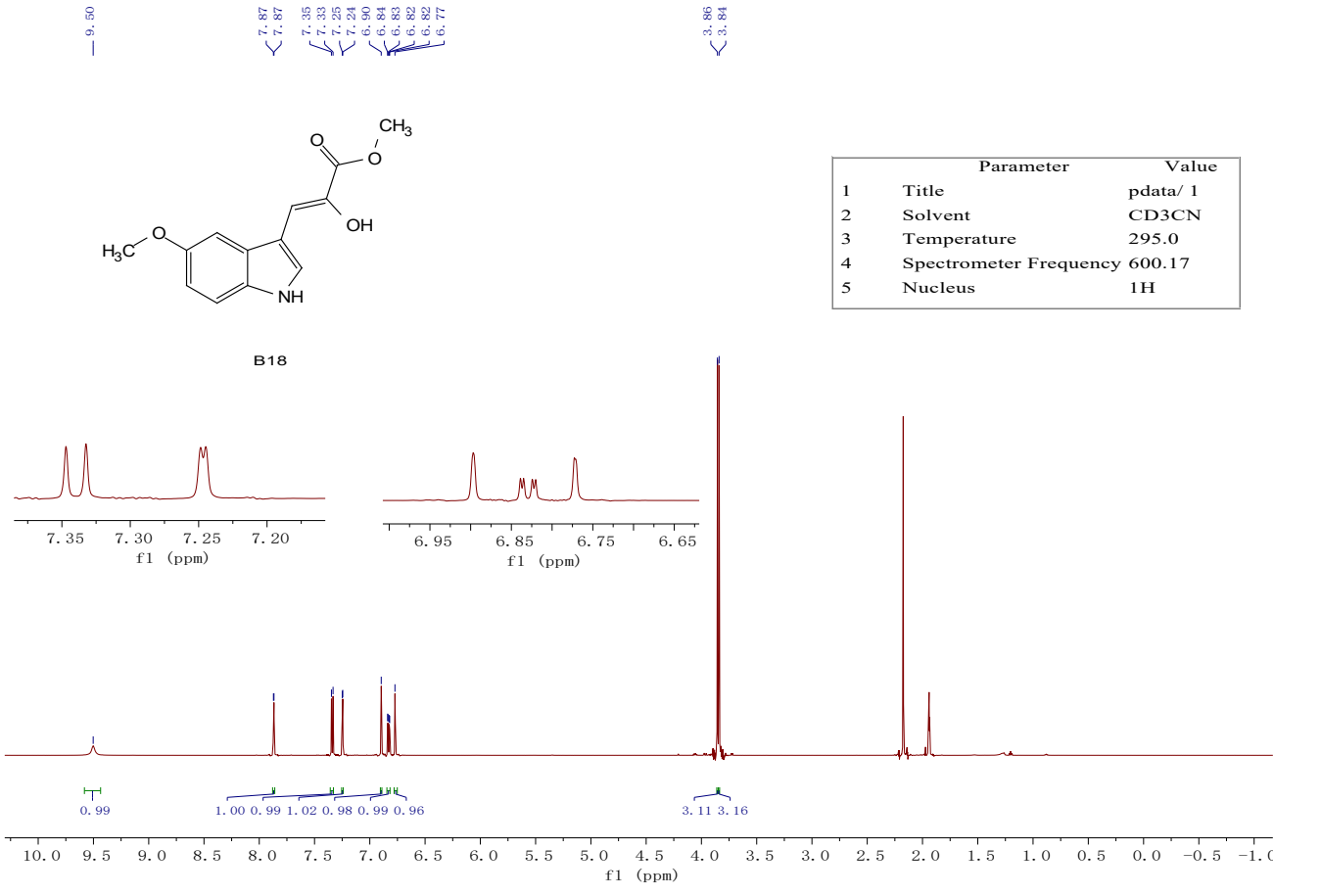

166.70
136.55
136.07
132.74
126.96
124.79
122.34
118.39
111.32
110.64
104.44
53.00
21.83
O
O
CH3
OH
NH
H3C
B15
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.7
4 Spectrometer Frequency 150.91
5 Nucleus 13C
f1 (ppm)

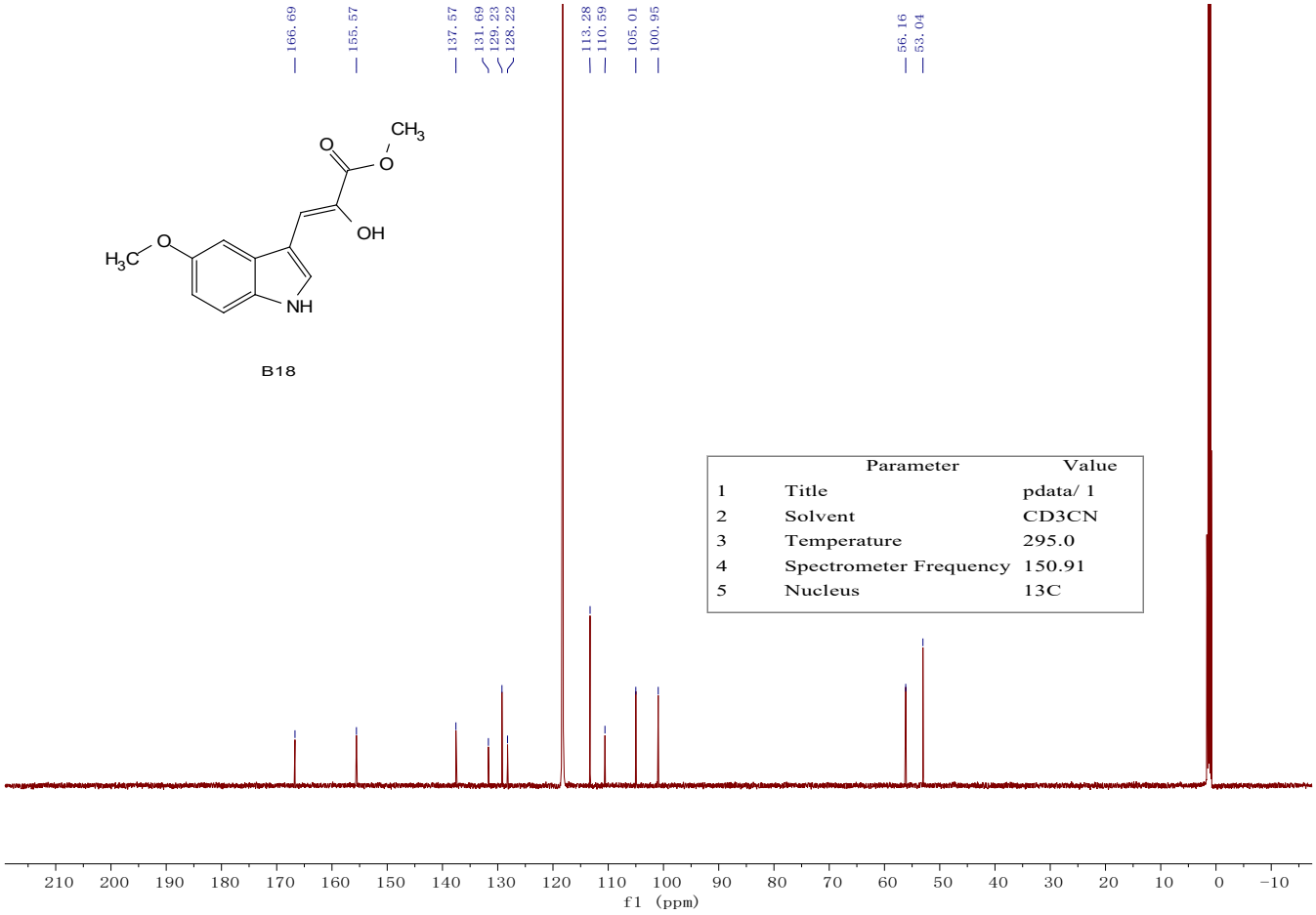

8.35
7.96
7.96
7.65
7.64
7.15
7.14
7.13
7.07
7.06
6.97
6.27
3.93
2.51
O
O
CH3
OH
NH
CH3
B16
7.15 7.10 7.05 7.00 6.95 6.90
7.9 7.8 7.7
f1 (ppm)
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.1
4 Spectrometer Frequency 600.17
5 Nucleus 1H
1.00 0.94 1.00 0.97 0.97 0.93 0.94 3.10 3.05
f1 (ppm)

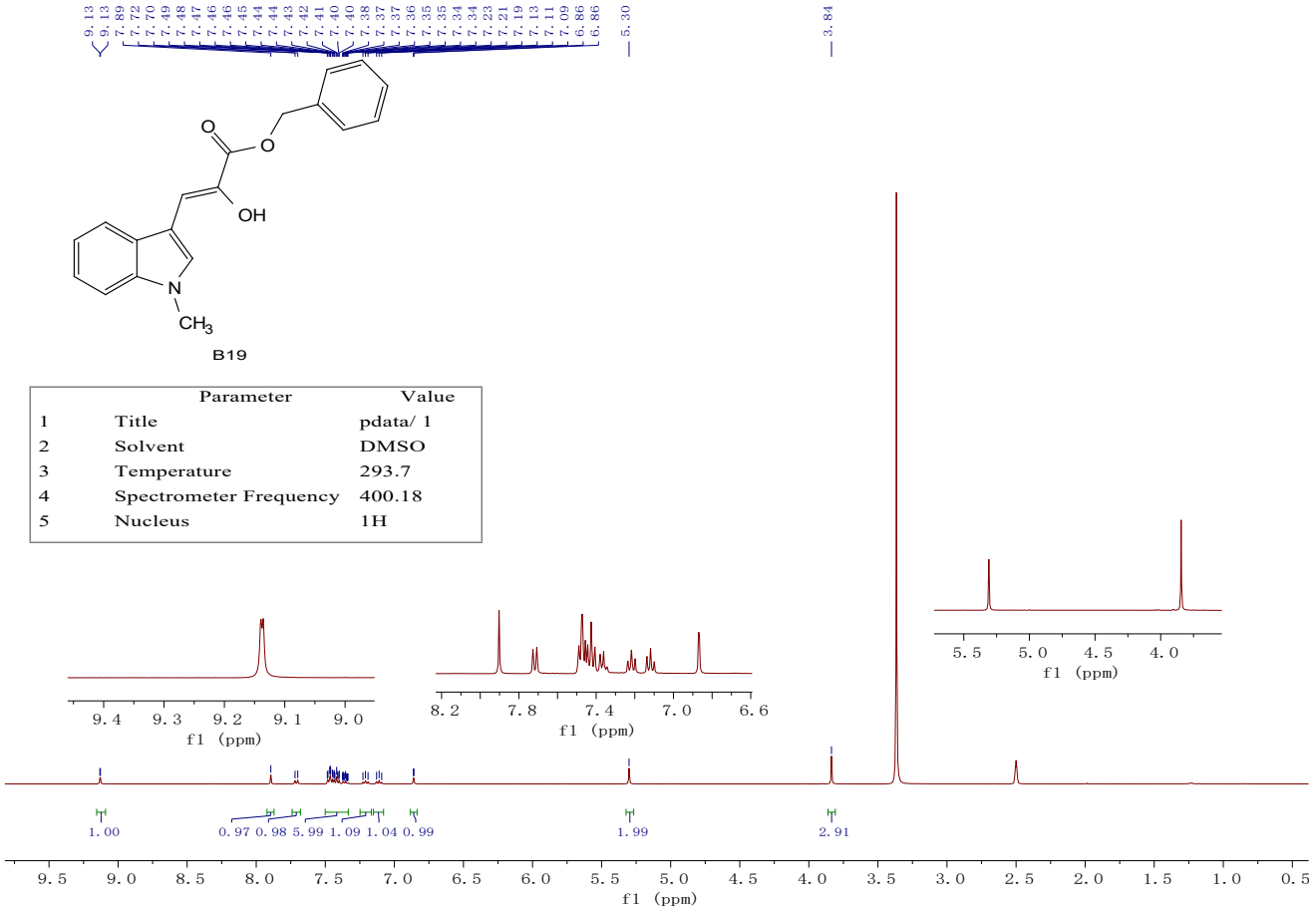

166.70
136.65
135.19
127.25
126.48
123.37
120.75
120.59
116.39
111.17
104.50
53.01
16.67
CH3
O
O
OH
NH
CH3
B16
122 121 120 119 118 117 116 115 114
f1 (ppm)
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.6
4 Spectrometer Frequency 150.91
5 Nucleus 13C
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

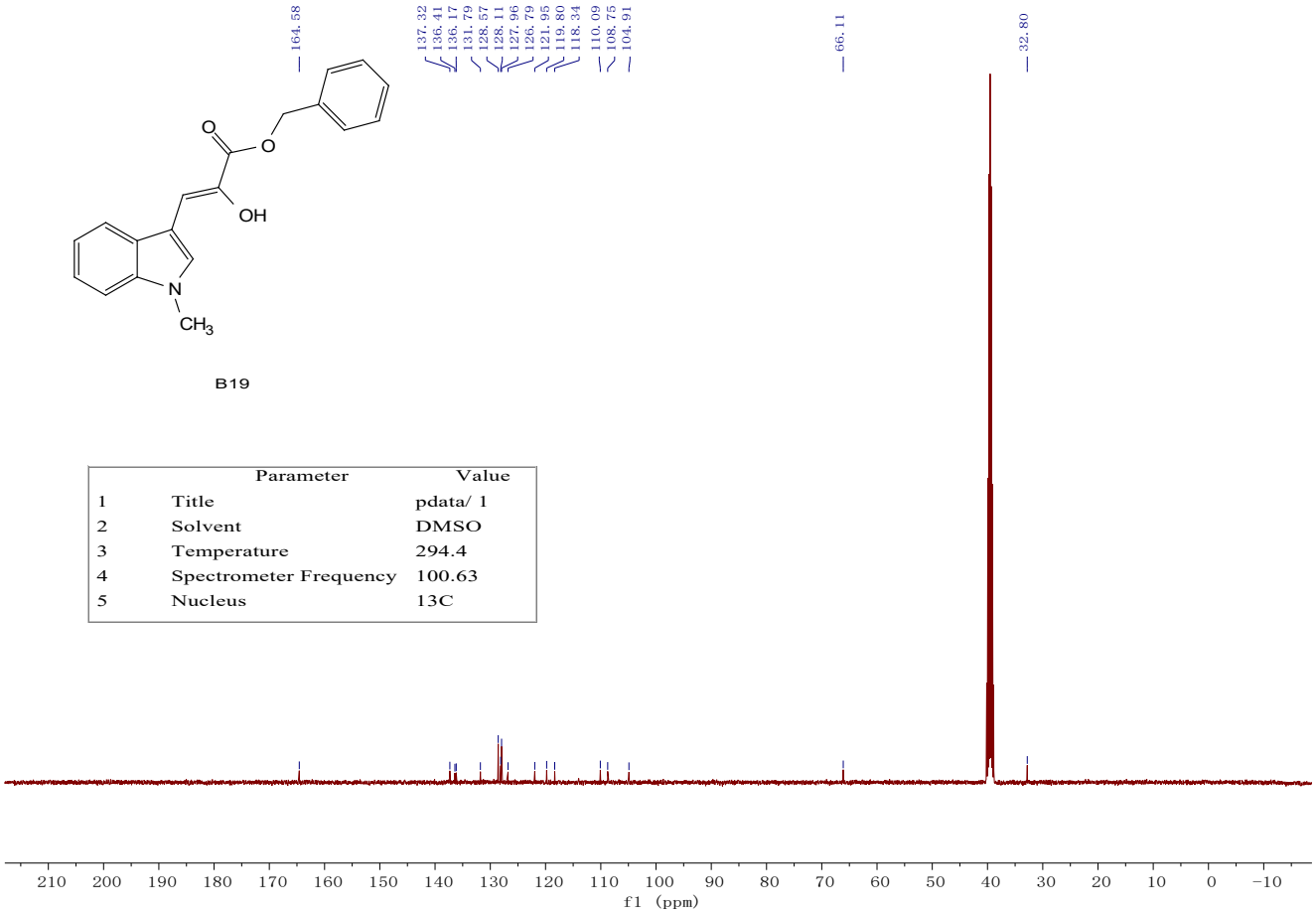

8.41
7.95
7.56
7.16
7.14
7.13
7.00
6.99
6.60
6.59
6.26
4.00
3.92
O
OH
H3C
O
OH
NH
B17
7.4 7.3 7.2 7.1 7.0 6.9 6.8 6.7 6.6 6.5
f1 (ppm)
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.2
4 Spectrometer Frequency 600.17
5 Nucleus 1H
0.98 0.98 0.91 1.03 1.00 1.00 0.92
3.13 2.97
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5
f1 (ppm)


167.02
155.15
137.16
136.13
126.85
123.53
116.26
111.05
107.04
104.67
100.93
55.45
52.98
O
OH
H3C
O
OH
NH
B17
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.8
4 Spectrometer Frequency 150.91
5 Nucleus 13C
f1 (ppm)

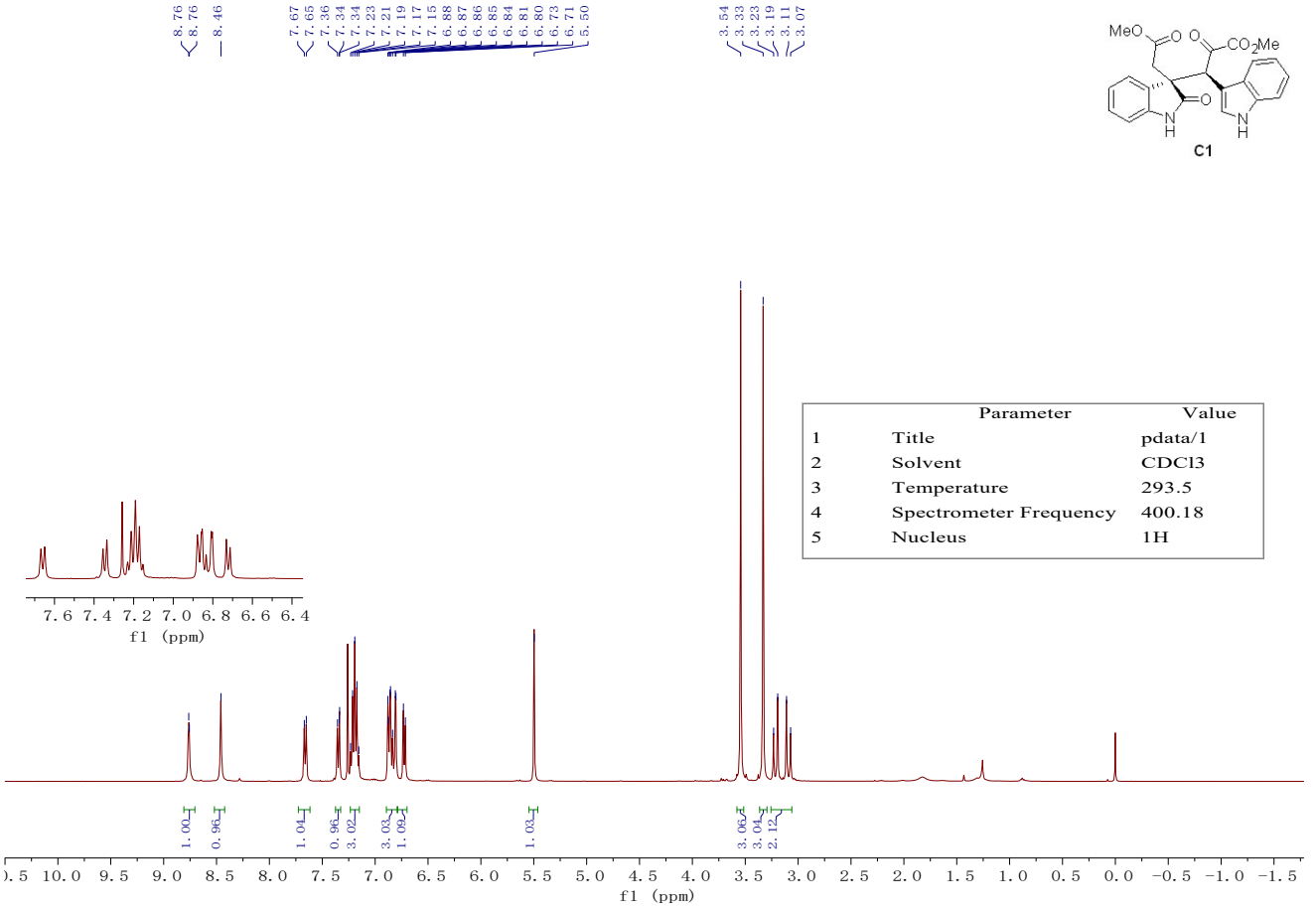

9.50
7.87
7.87
7.35
7.33
7.25
7.24
6.90
6.84
6.83
6.82
6.82
6.77
3.86
3.84
CH3
O
O
OH
H3C
O
NH
B18
Parameter Value
1 Title pdata/ 1
2 Solvent CD3CN
3 Temperature 295.0
4 Spectrometer Frequency 600.17
5 Nucleus 1H
7.35 7.30 7.25 7.20
f1 (ppm)
6.95 6.85 6.75 6.65
f1 (ppm)
0.99
1.00 0.99 1.02 0.98 0.99 0.96
3.11 3.16
f1 (ppm)


166.69
155.57
137.57
131.69
129.23
128.22
113.28
110.59
105.01
100.95
56.16
53.04
CH3
O
O
OH
H3C
O
NH
B18
Parameter Value
1 Title pdata/ 1
2 Solvent CD3CN
3 Temperature 295.0
4 Spectrometer Frequency 150.91
5 Nucleus 13C
f1 (ppm)

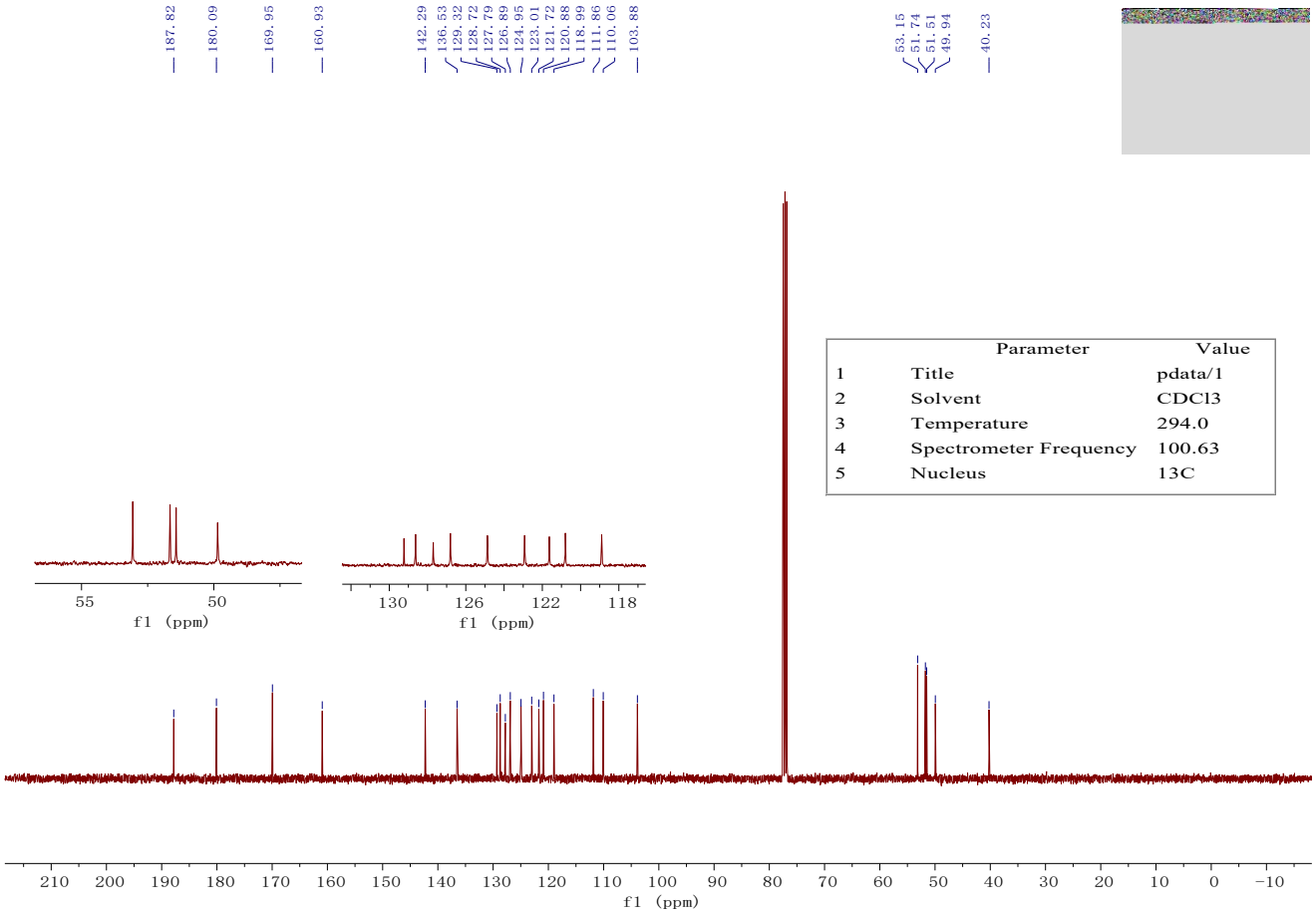

9.13
9.13
7.89
7.72
7.70
7.49
7.48
7.47
7.46
7.46
7.45
7.44
7.44
7.43
7.42
7.41
7.40
7.40
7.38
7.37
7.37
7.36
7.35
7.34
7.34
7.23
7.21
7.19
7.13
7.11
7.09
6.86
6.86
5.30
3.84
O
O
OH
N
CH3
B19
Parameter Value
1 Title pdata/ 1
2 Solvent DMSO
3 Temperature 293.7
4 Spectrometer Frequency 400.18
5 Nucleus 1H
1.00
0.97 0.98 5.99 1.09 1.04 0.99
1.99
2.91
f1 (ppm)

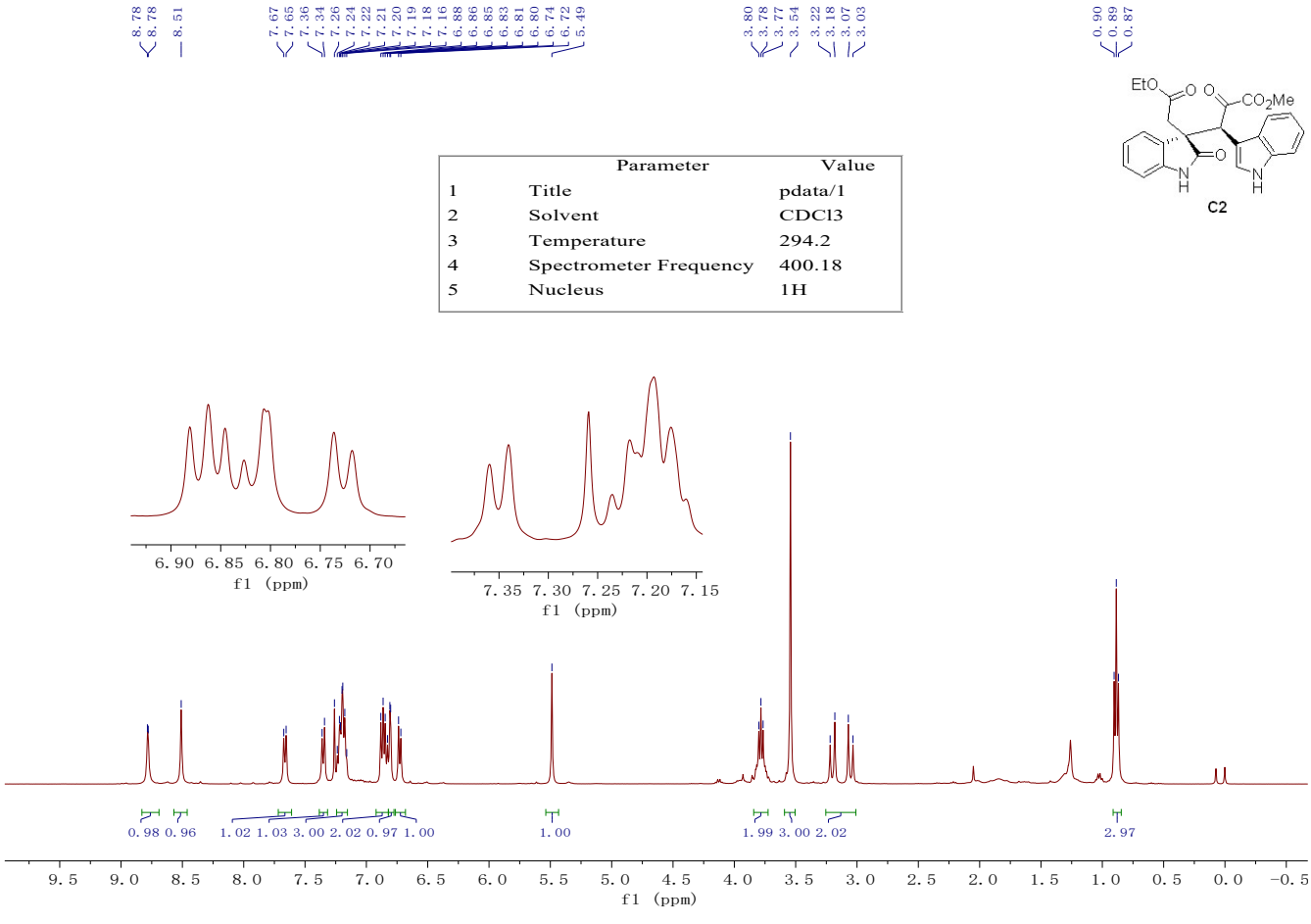


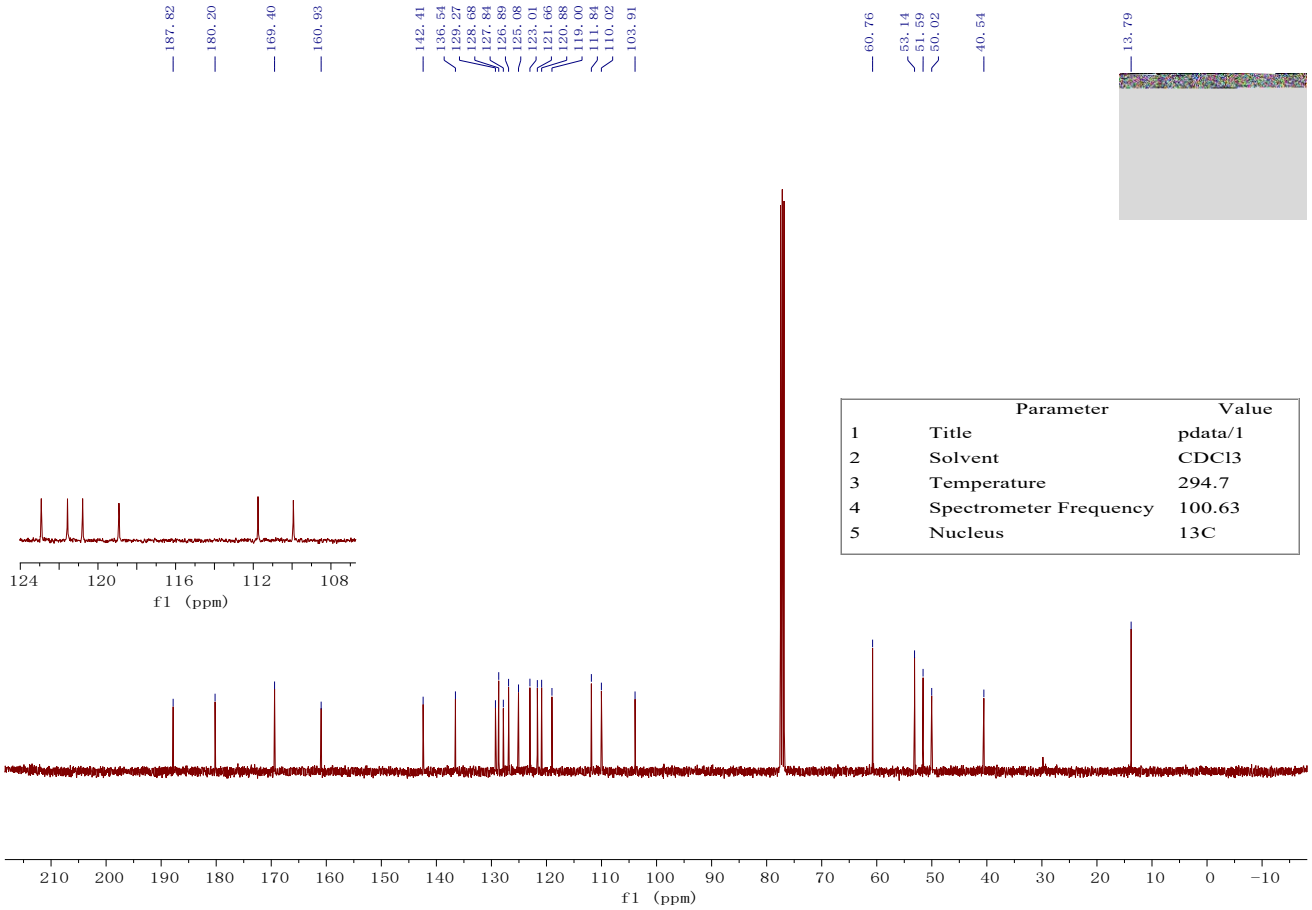
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	DMSO
3	Temperature	294.4
4	Spectrometer Frequency	100.63
5	Nucleus	13C



	Parameter	Value
1	Title	pdata/1
2	Solvent	CDCl3
3	Temperature	293.5
4	Spectrometer Frequency	400.18
5	Nucleus	1H

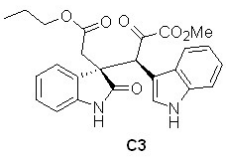

187.82
180.09
169.95
160.93
142.29
136.53
129.32
128.72
127.79
126.89
124.95
123.01
121.72
120.88
118.99
111.86
110.06
103.88
53.15
51.74
51.51
49.94
40.23
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.0
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)
f1 (ppm)
f1 (ppm)


8.78
8.78
8.51
7.67
7.65
7.36
7.34
7.26
7.24
7.22
7.21
7.20
7.19
7.18
7.16
6.88
6.86
6.85
6.83
6.81
6.80
6.74
6.72
5.49
3.80
3.78
3.77
3.54
3.22
3.18
3.07
3.03
0.90
0.89
0.87
EtO
CO2Me
C2
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.2
4 Spectrometer Frequency 400.18
5 Nucleus 1H
f1 (ppm)
f1 (ppm)
0.98 0.96
1.02 1.03 3.00 2.02 0.97 1.00
1.00
1.99 3.00 2.02
2.97
f1 (ppm)

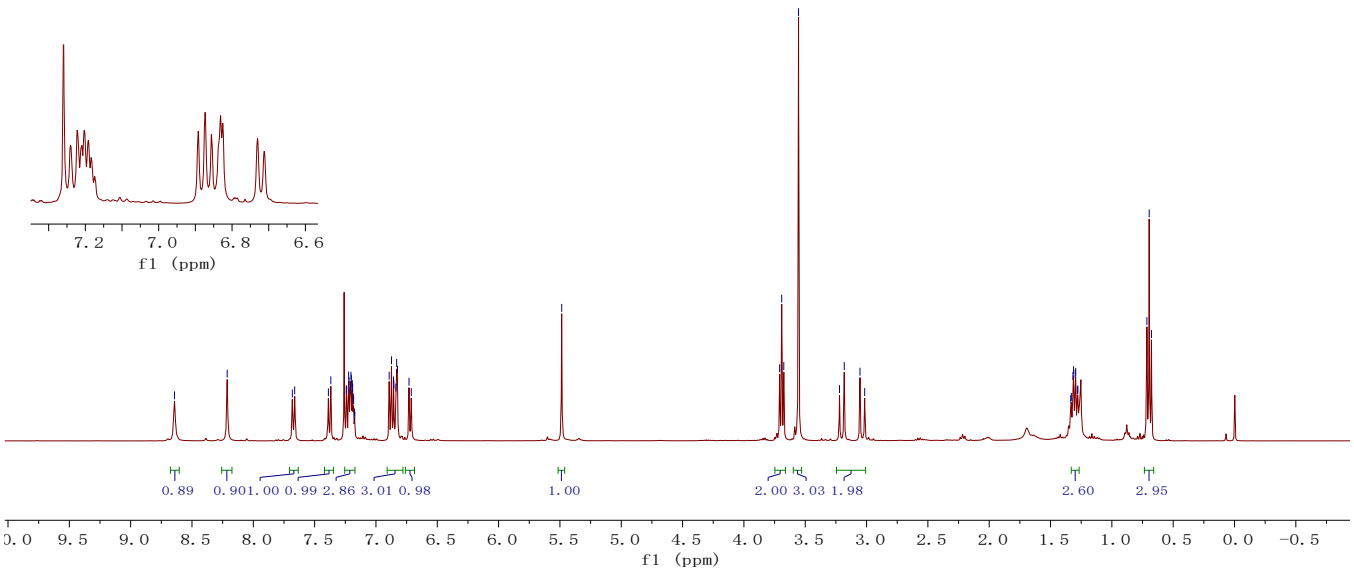


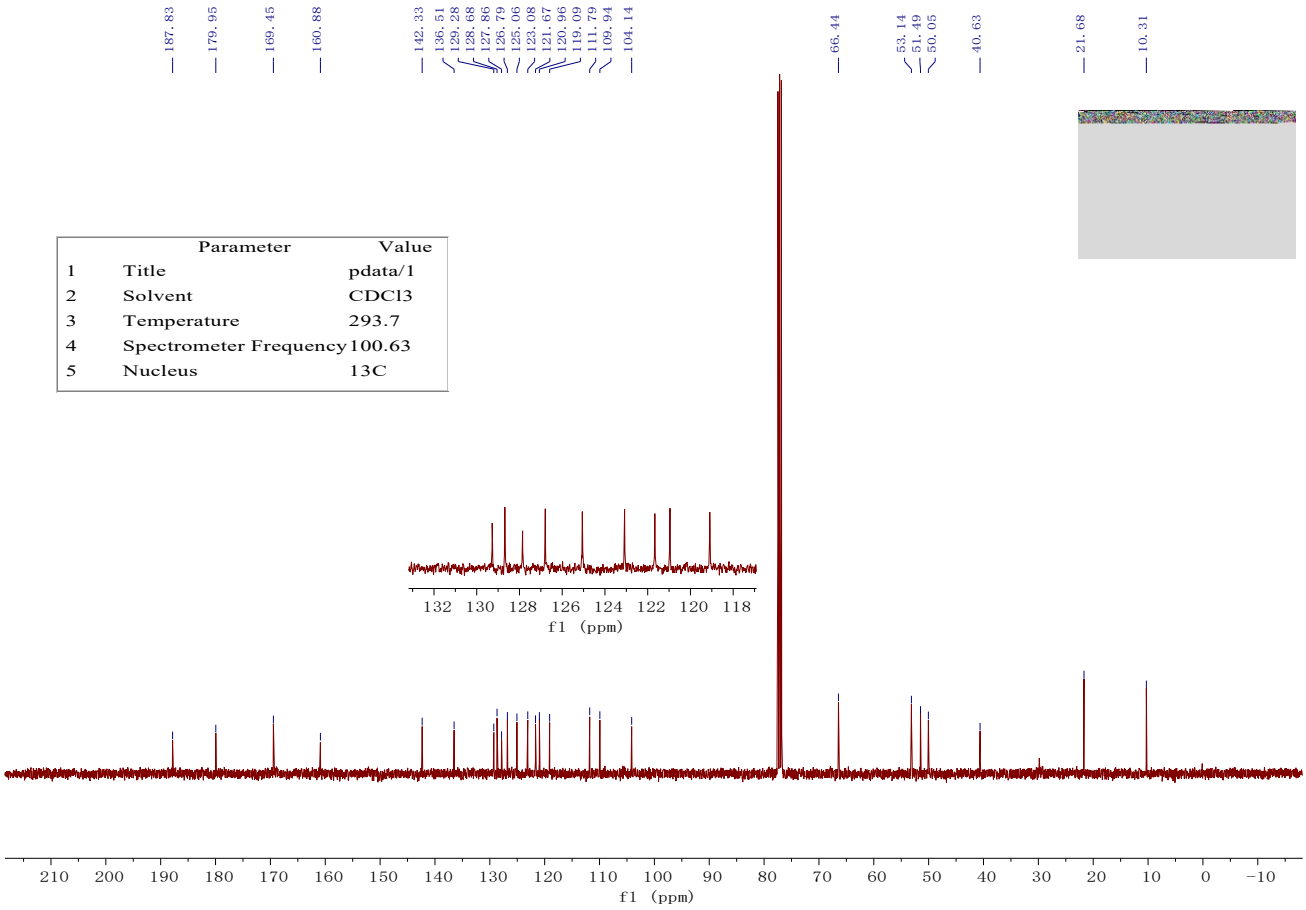
	Parameter	Value
1	Title	pdata/1
2	Solvent	CDCl3
3	Temperature	294.7
4	Spectrometer Frequency	100.63
5	Nucleus	13C

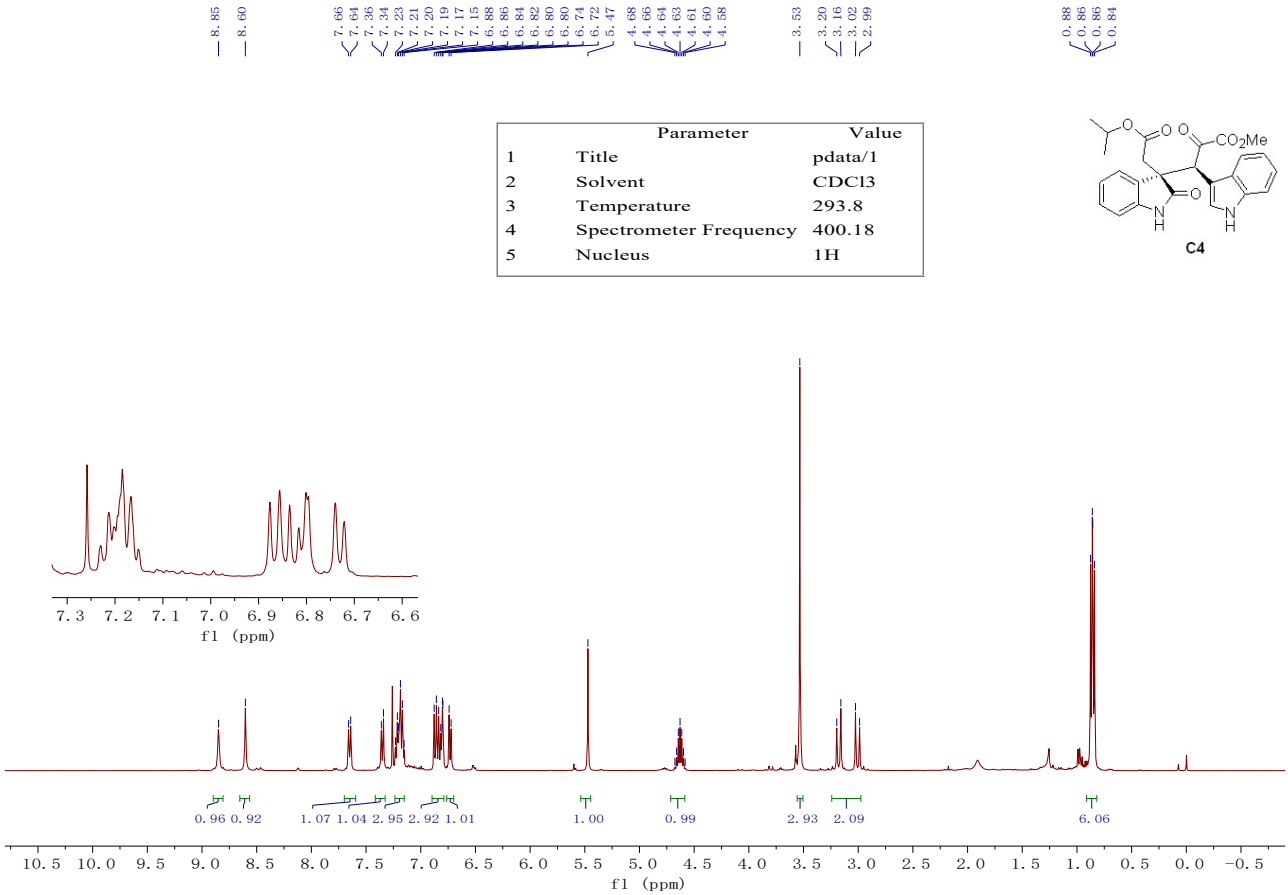
	Parameter	Value
1	Title	pdata/1
2	Solvent	CDCl3
3	Temperature	293.4
4	Spectrometer Frequency	400.18
5	Nucleus	1H

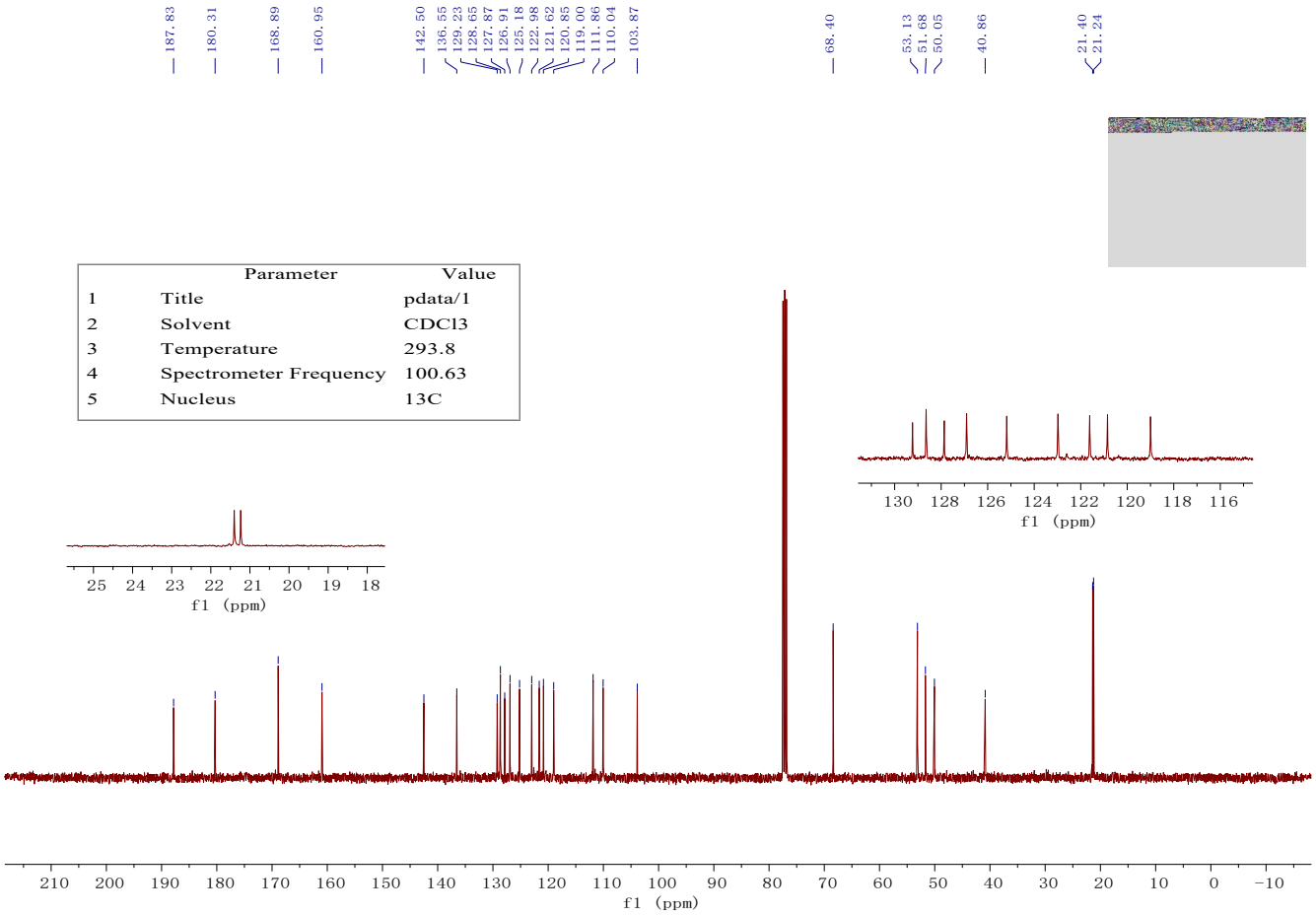


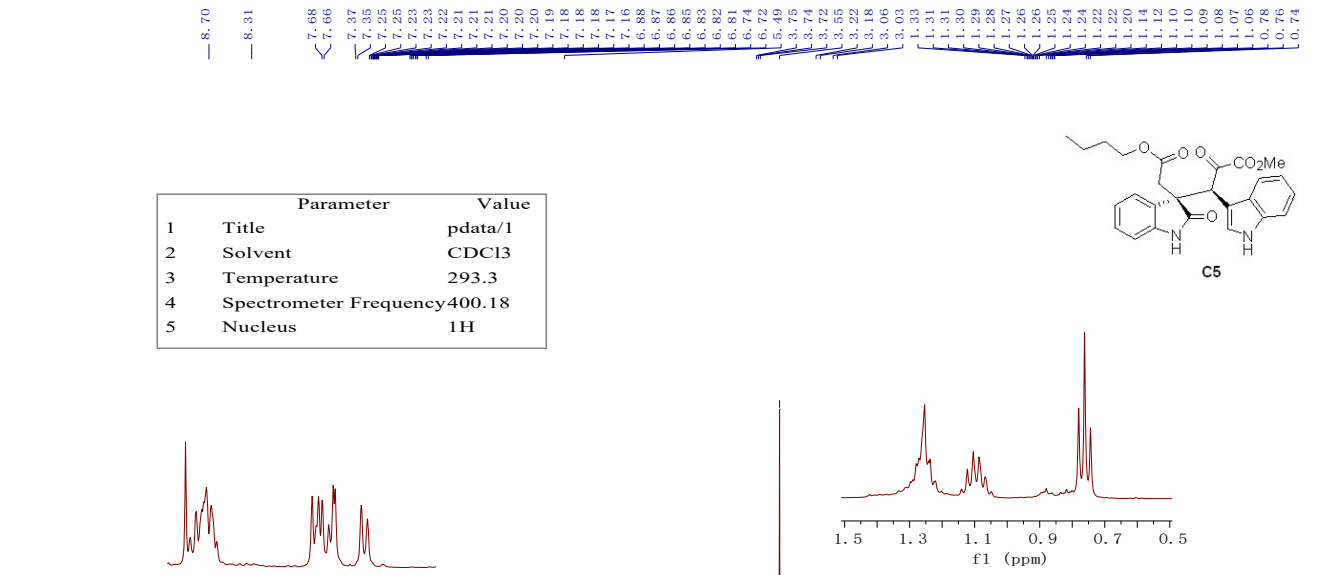
C3




187.83
179.95
169.45
160.88
142.33
136.51
129.28
128.68
127.86
126.79
125.06
123.08
121.67
120.96
119.09
111.79
109.94
104.14
66.44
53.14
51.49
50.05
40.63
21.68
10.31
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.7
4 Spectrometer Frequency 100.63
5 Nucleus 13C
132 130 128 126 124 122 120 118
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

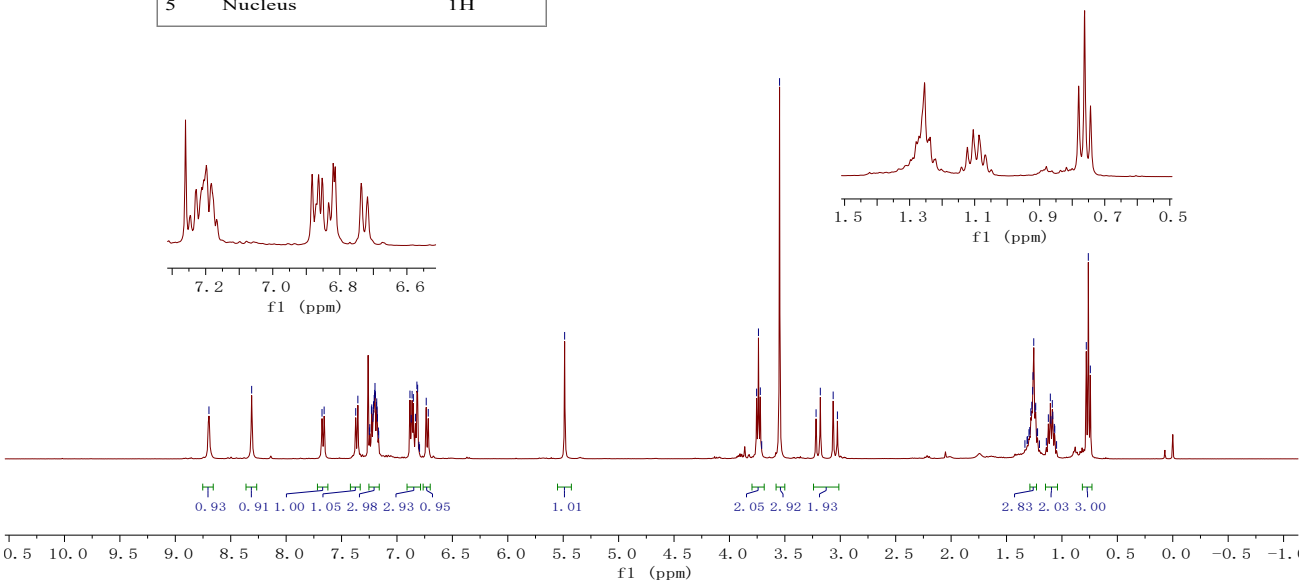

8.85
8.60
7.66
7.64
7.36
7.34
7.23
7.21
7.20
7.19
7.17
7.15
6.88
6.86
6.84
6.82
6.80
6.74
6.72
5.47
4.68
4.66
4.64
4.63
4.61
4.60
4.58
3.53
3.20
3.16
3.02
2.99
0.88
0.86
0.86
0.84
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.8
4 Spectrometer Frequency 400.18
5 Nucleus 1H
CO2Me
C4
7.3 7.2 7.1 7.0 6.9 6.8 6.7 6.6
f1 (ppm)
0.96 0.92 1.07 1.04 2.95 2.92 1.01 1.00 0.99 2.93 2.09 6.06
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5
f1 (ppm)

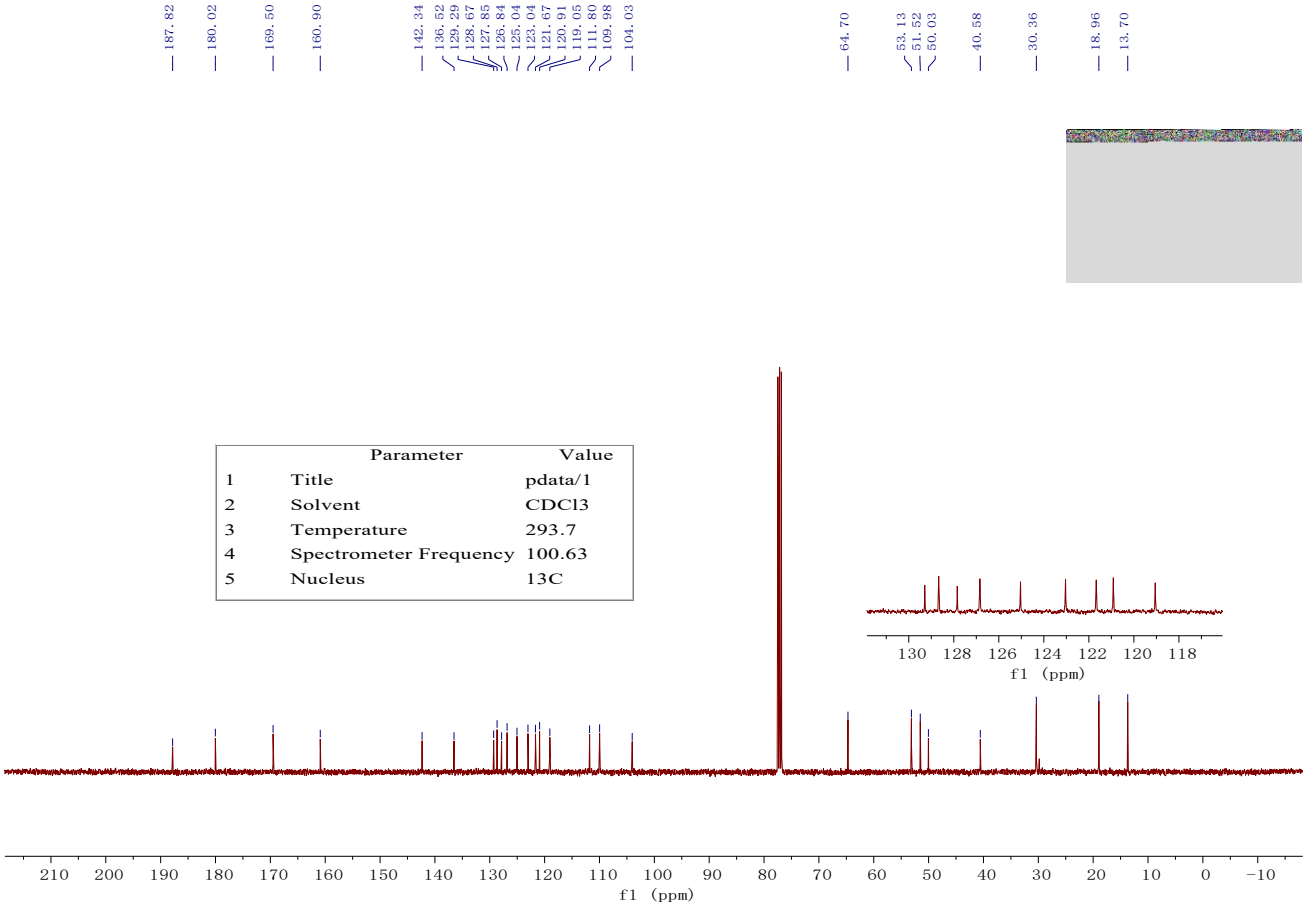

187.83
180.31
168.89
160.95
142.50
136.55
129.23
128.65
127.87
126.91
125.18
122.98
121.62
120.85
119.00
111.86
110.04
103.87
68.40
53.13
51.68
50.05
40.86
21.40
21.24
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.8
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)

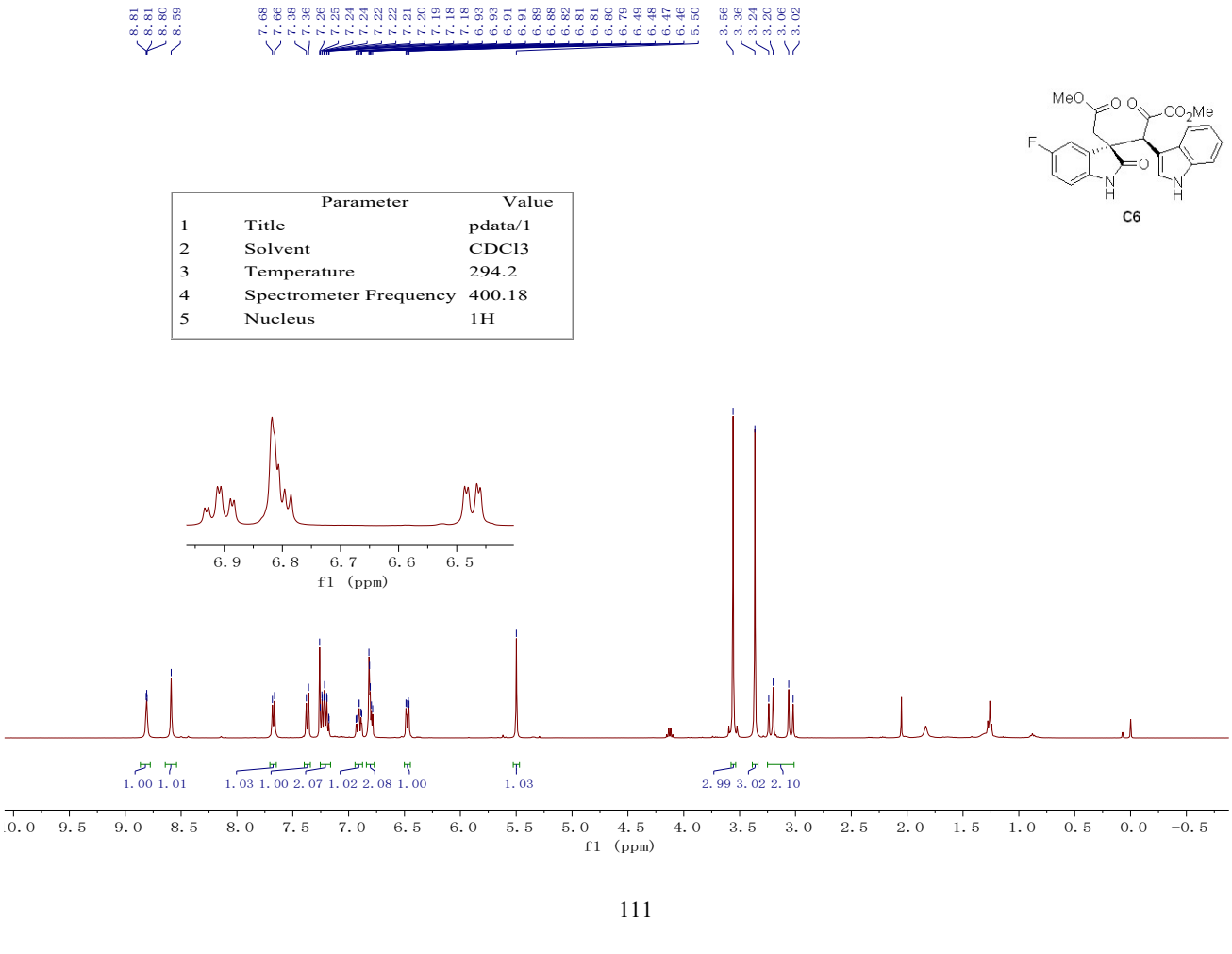

8.70
8.31
7.68
7.66
7.37
7.35
7.25
7.23
7.22
7.21
7.21
7.20
7.20
7.20
7.19
7.18
7.18
7.17
7.16
6.88
6.87
6.86
6.85
6.83
6.82
6.81
6.74
6.72
6.49
3.75
3.74
3.72
3.55
3.22
3.18
3.06
3.03
1.33
1.31
1.31
1.30
1.29
1.28
1.27
1.26
1.26
1.25
1.24
1.24
1.22
1.22
1.20
1.14
1.12
1.10
1.10
1.09
1.08
1.07
1.06
0.78
0.76
0.74
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.3
4 Spectrometer Frequency 400.18
5 Nucleus 1H
f1 (ppm)

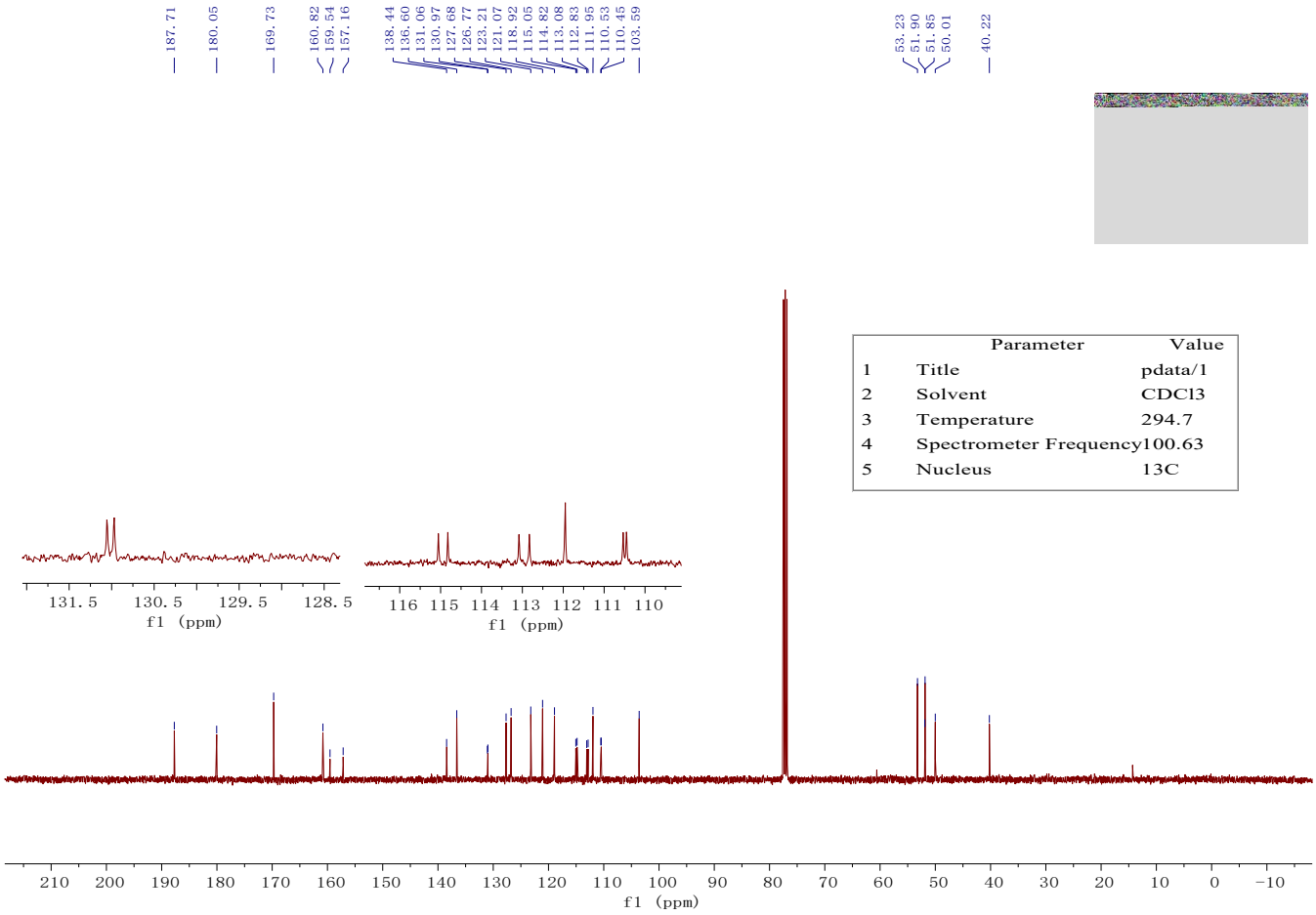
CO2Me
O
O
O
O
N
H
N
H

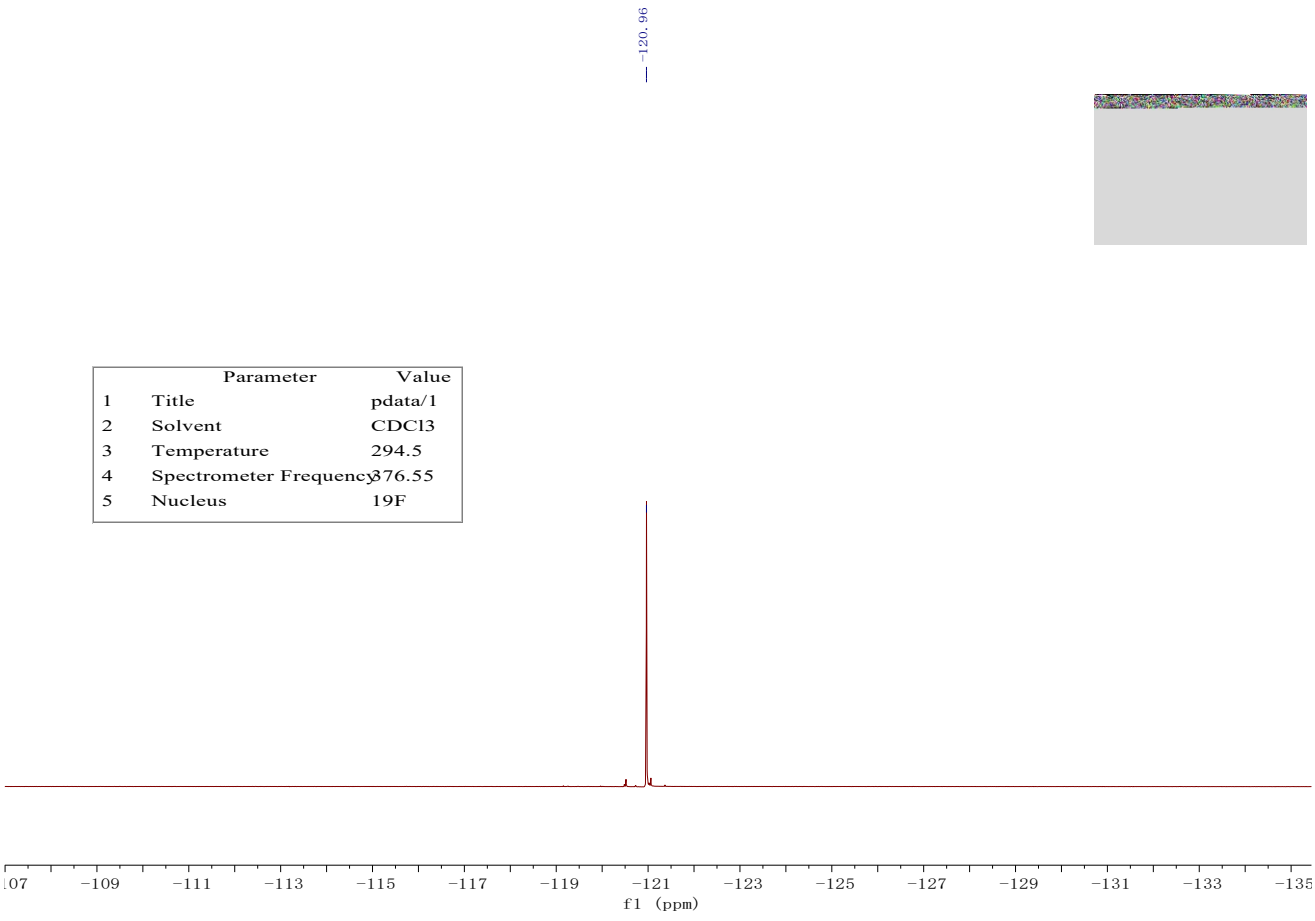
C5

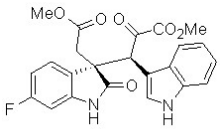

0.93
0.91
1.00
1.05
2.98
2.93
0.95
1.01
2.05
2.92
1.93
2.83
2.03
3.00
f1 (ppm)


187.82
180.02
169.50
160.90
142.34
136.52
129.29
128.67
127.85
126.84
125.04
123.04
121.67
120.91
119.05
111.80
109.98
104.03
64.70
53.13
51.52
50.03
40.68
30.36
18.96
13.70
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.7
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)


8.81
8.81
8.80
8.59
7.68
7.66
7.38
7.36
7.26
7.25
7.24
7.24
7.22
7.22
7.21
7.20
7.19
7.18
7.18
6.93
6.93
6.91
6.91
6.89
6.88
6.82
6.81
6.81
6.80
6.79
6.49
6.48
6.47
6.46
5.50
3.56
3.36
3.24
3.20
3.06
3.02
MeO
O
O
CO2Me
F
O
N
H
N
H
C6
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.2
4 Spectrometer Frequency 400.18
5 Nucleus 1H
f1 (ppm)
1.00 1.01
1.03 1.00 2.07 1.02 2.08 1.00
1.03
2.99 3.02 2.10
f1 (ppm)

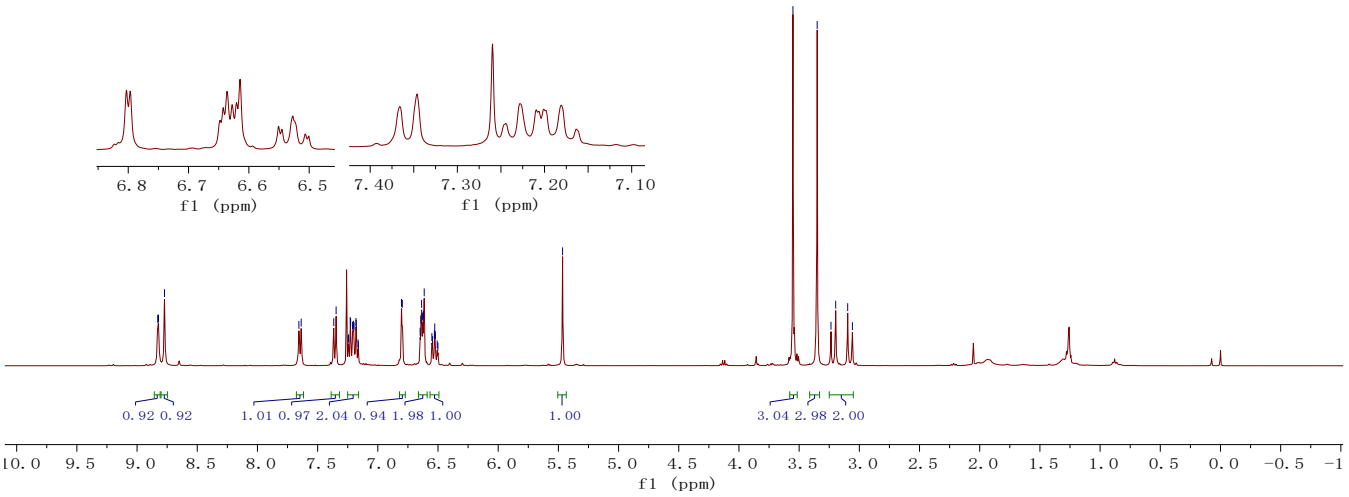

187.71
180.05
169.73
160.82
159.54
157.16
138.44
136.60
131.06
130.97
127.68
126.77
123.21
121.07
118.92
115.05
114.82
113.08
112.83
111.95
110.53
110.45
103.59
53.23
51.90
51.85
50.01
40.22
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.7
4 Spectrometer Frequency 100.63
5 Nucleus 13C
131.5 130.5 129.5 128.5
f1 (ppm)
116 115 114 113 112 111 110
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

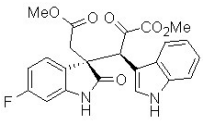

−120.96
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.5
4 Spectrometer Frequency 376.55
5 Nucleus 19F
−107 −109 −111 −113 −115 −117 −119 −121 −123 −125 −127 −129 −131 −133 −135
f1 (ppm)



C7

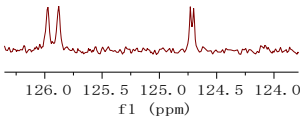
	Parameter	Value
1	Title	pdata/1
2	Solvent	CDCl3
3	Temperature	294.0
4	Spectrometer Frequency	400.18
5	Nucleus	1H

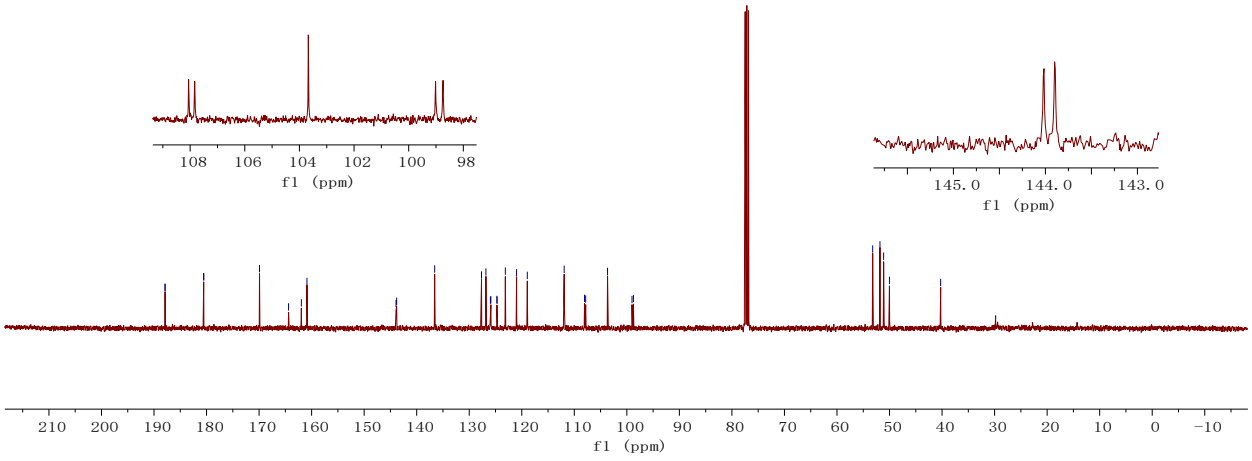


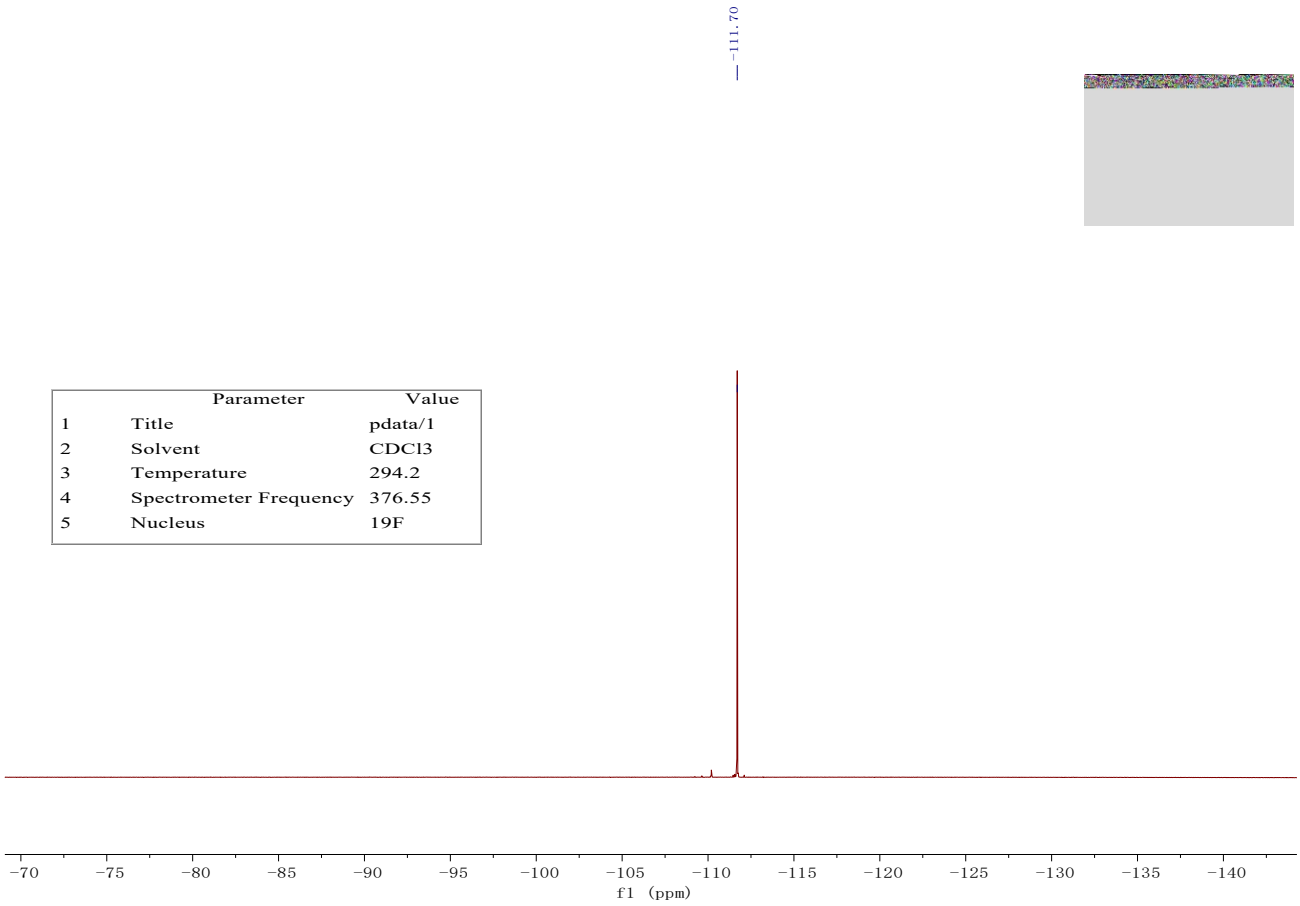


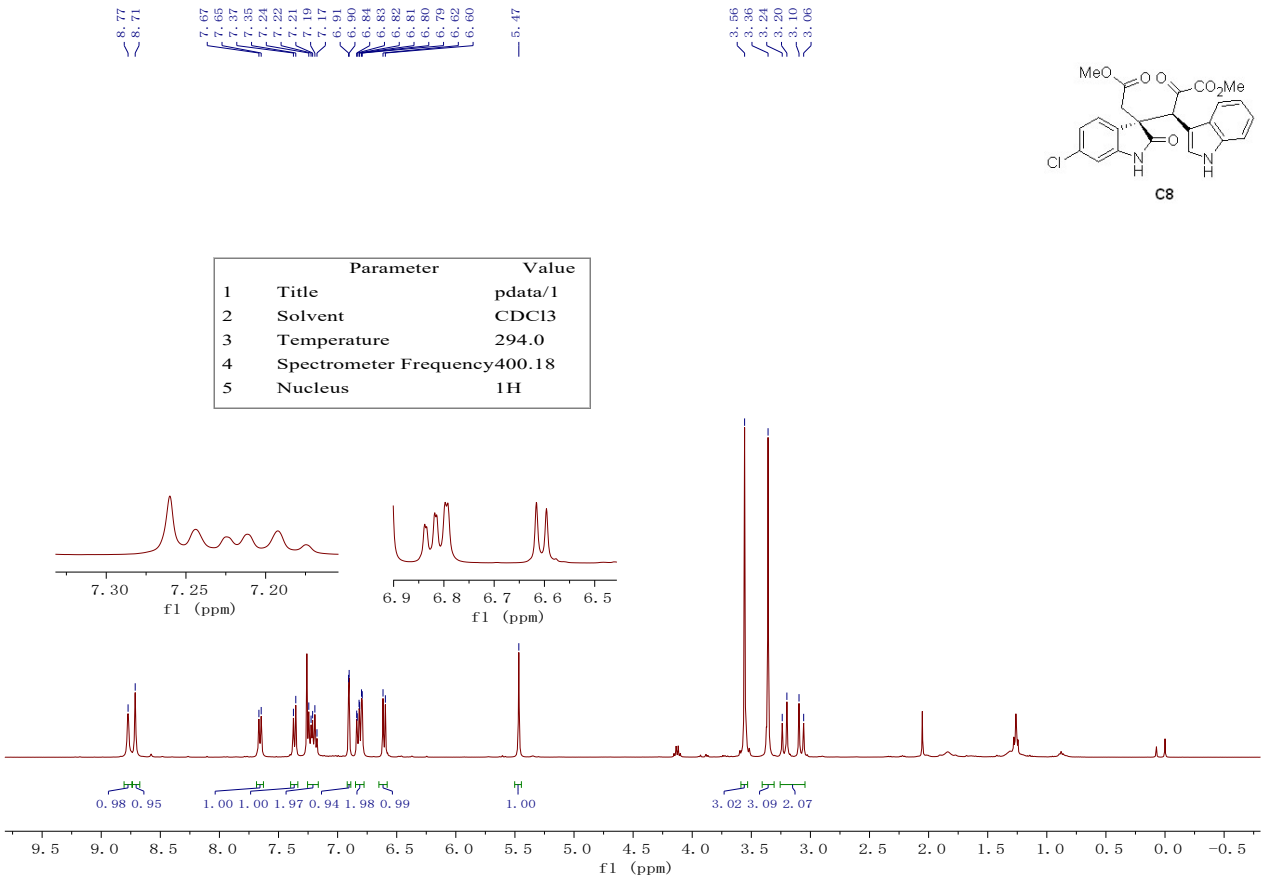
C7

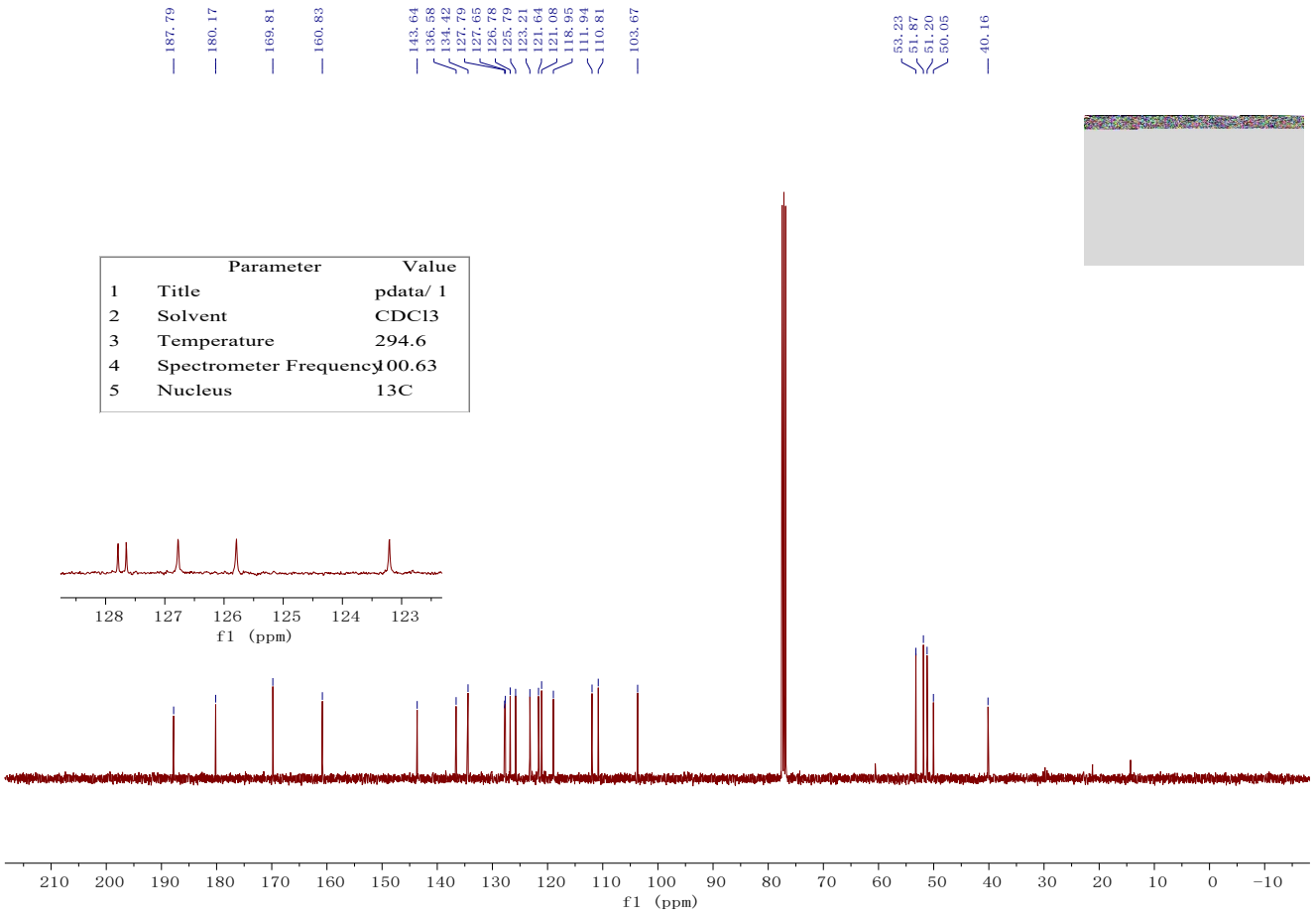
	Parameter	Value
1	Title	pdata/1
2	Solvent	CDCl3
3	Temperature	294.5
4	Spectrometer Frequency	100.63
5	Nucleus	13C

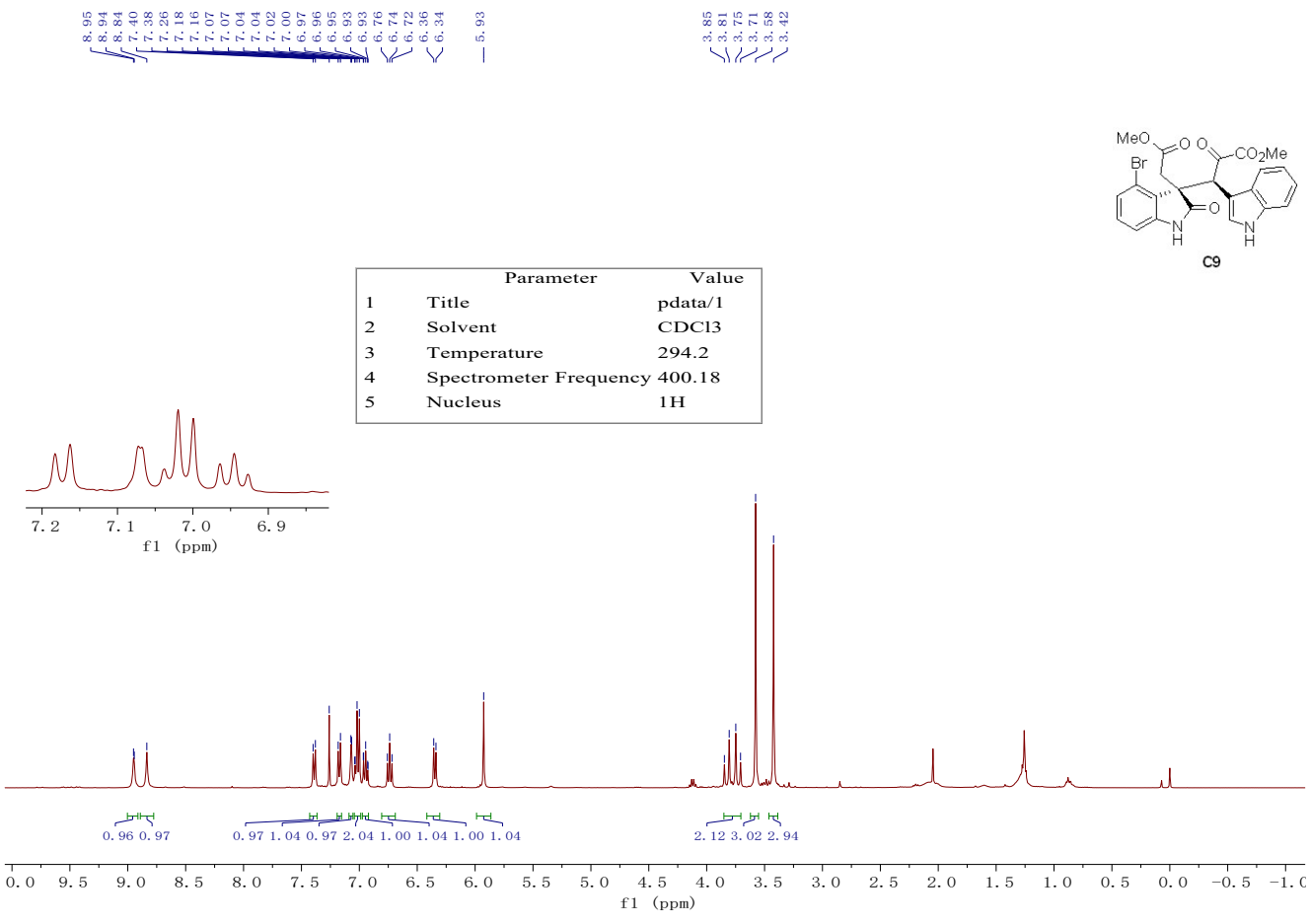


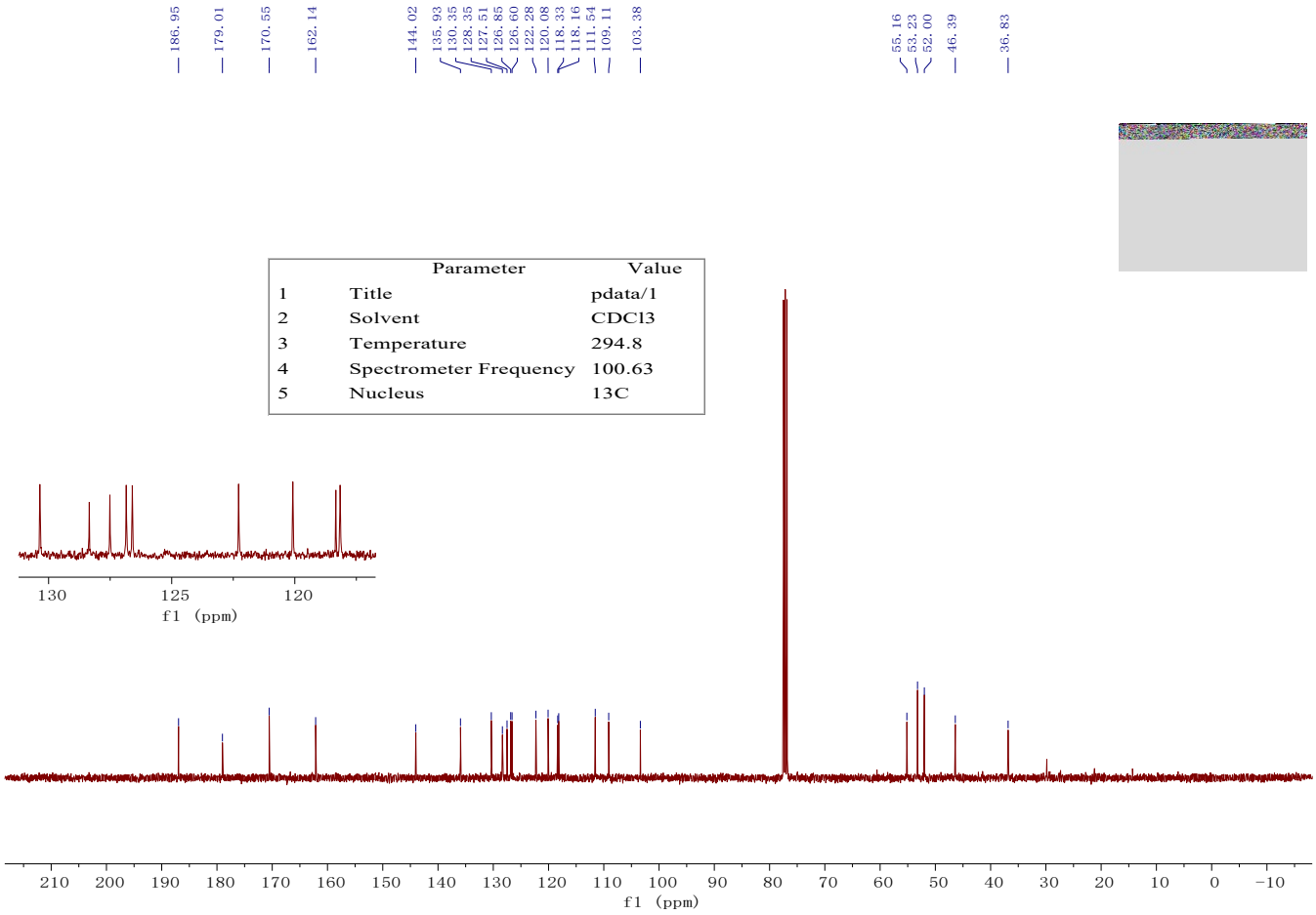



-111.70
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.2
4 Spectrometer Frequency 376.55
5 Nucleus 19F
f1 (ppm)


8.77
8.71
7.67
7.65
7.37
7.35
7.24
7.22
7.21
7.19
7.17
6.91
6.90
6.84
6.83
6.82
6.81
6.80
6.79
6.62
6.60
5.47
3.56
3.36
3.24
3.20
3.10
3.06
MeO
CO2Me
Cl
N
H
C8
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.0
4 Spectrometer Frequency 400.18
5 Nucleus 1H
f1 (ppm)
0.98 0.95
1.00 1.00 1.97 0.94 1.98 0.99
1.00
3.02 3.09 2.07
f1 (ppm)


187.79
180.17
169.81
160.83
143.64
136.58
134.42
127.79
127.65
126.78
125.79
123.21
121.64
121.08
118.95
111.94
110.81
103.67
53.23
51.87
51.20
50.05
40.16
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.6
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)
f1 (ppm)

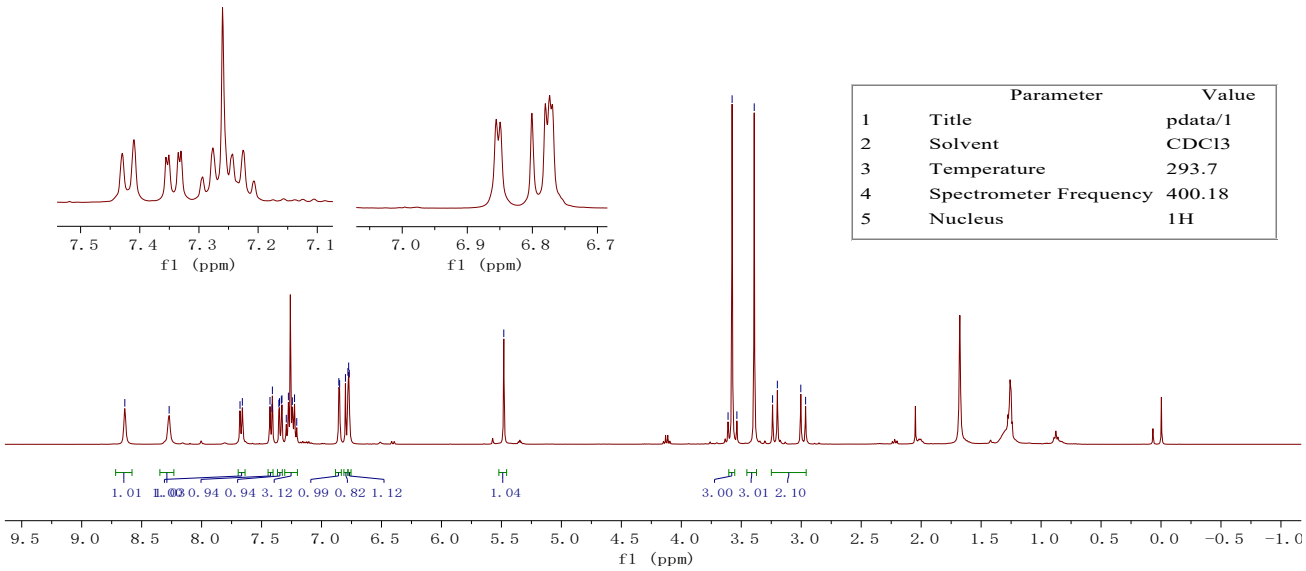

8.95
8.94
8.84
7.40
7.38
7.26
7.18
7.16
7.07
7.07
7.04
7.04
7.02
7.00
6.97
6.96
6.95
6.93
6.93
6.76
6.74
6.72
6.36
6.34
5.93
3.85
3.81
3.75
3.71
3.58
3.42
MeO
Br
CO2Me
C9
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.2
4 Spectrometer Frequency 400.18
5 Nucleus 1H
f1 (ppm)
0.96 0.97
0.97 1.04 0.97 2.04 1.00 1.04 1.00 1.04
2.12 3.02 2.94
f1 (ppm)

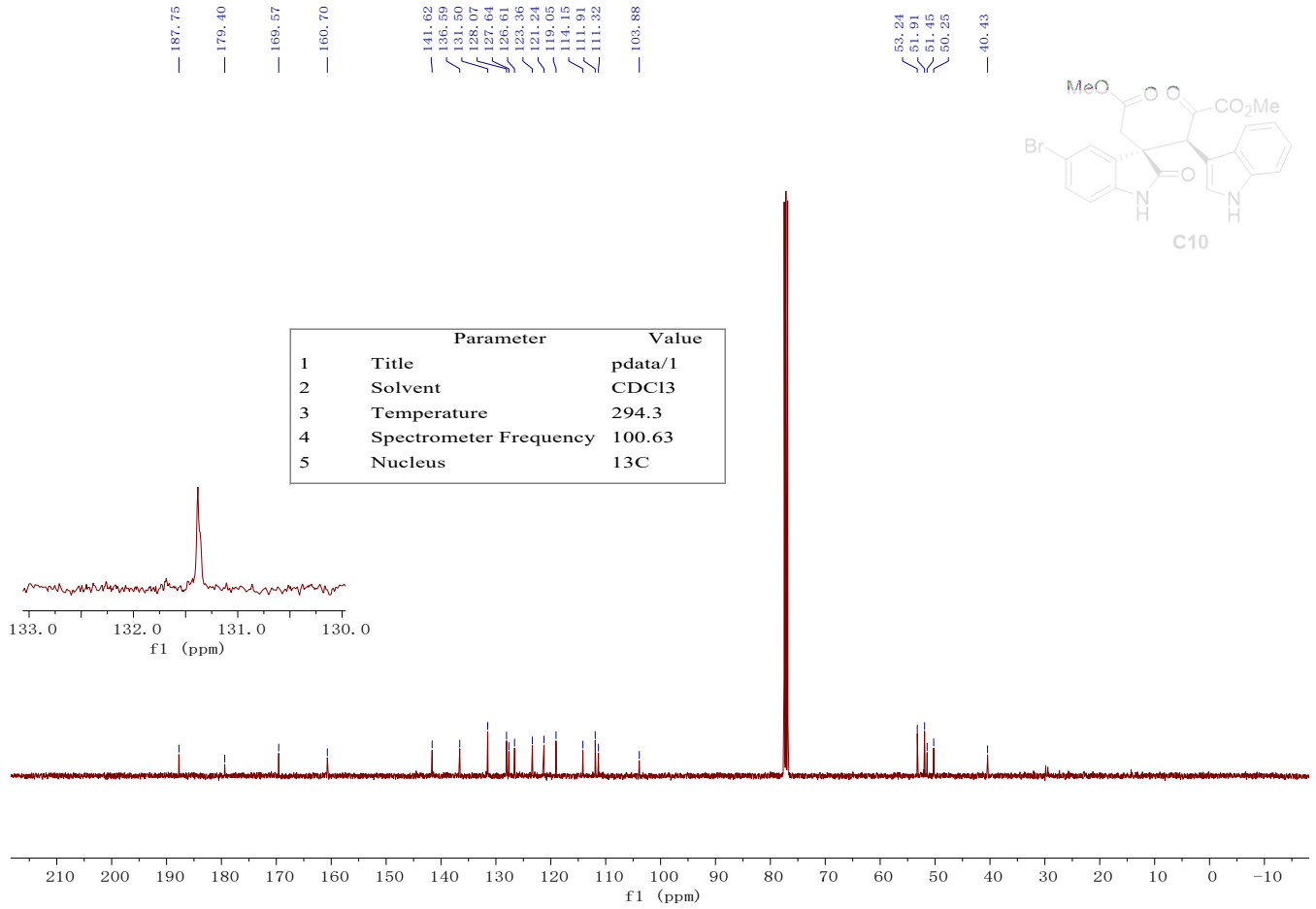

186.95
179.01
170.55
162.14
144.02
135.93
130.35
128.35
127.51
126.85
126.60
122.28
120.08
118.33
118.16
111.54
109.11
103.38
55.16
53.23
52.00
46.39
36.83
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.8
4 Spectrometer Frequency 100.63
5 Nucleus 13C
130 125 120
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

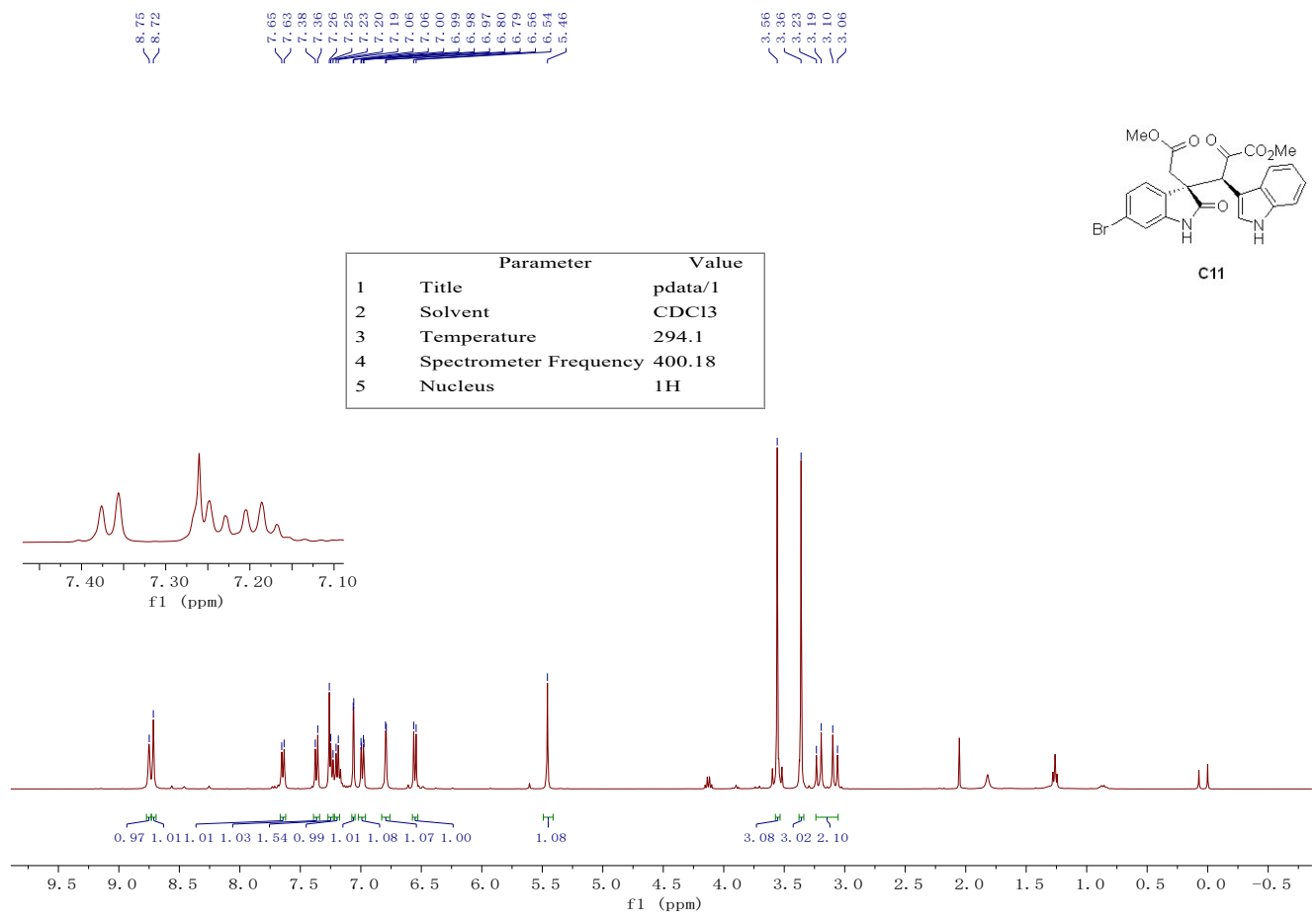

8.64
8.27
7.68
7.66
7.43
7.41
7.41
7.36
7.35
7.34
7.33
7.29
7.28
7.24
7.23
7.21
6.86
6.85
6.80
6.78
6.77
6.77
5.48
3.61
3.58
3.54
3.39
3.24
3.20
3.00
2.96

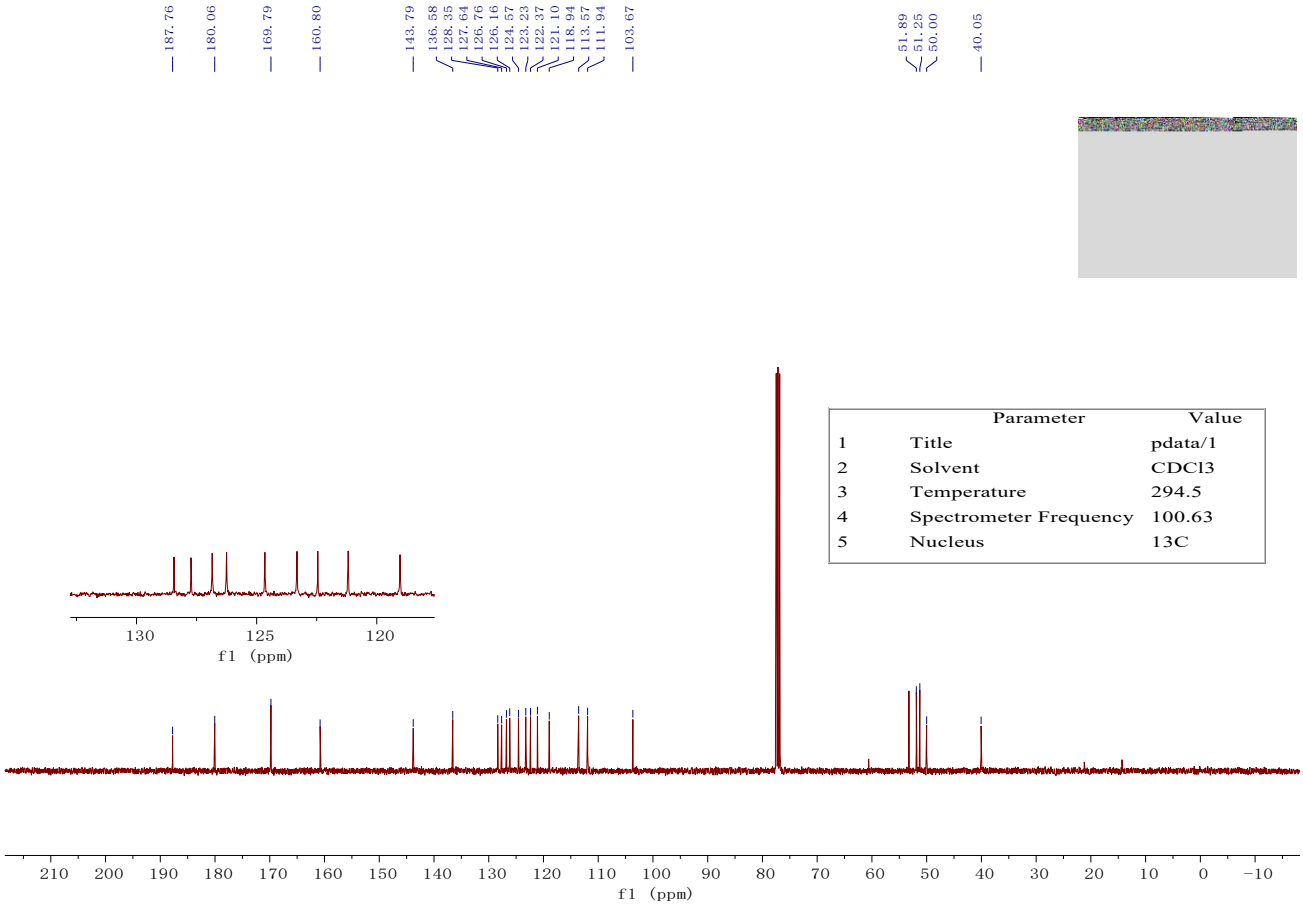
MeO
O
O
CO2Me
Br
O
N
H
N
H

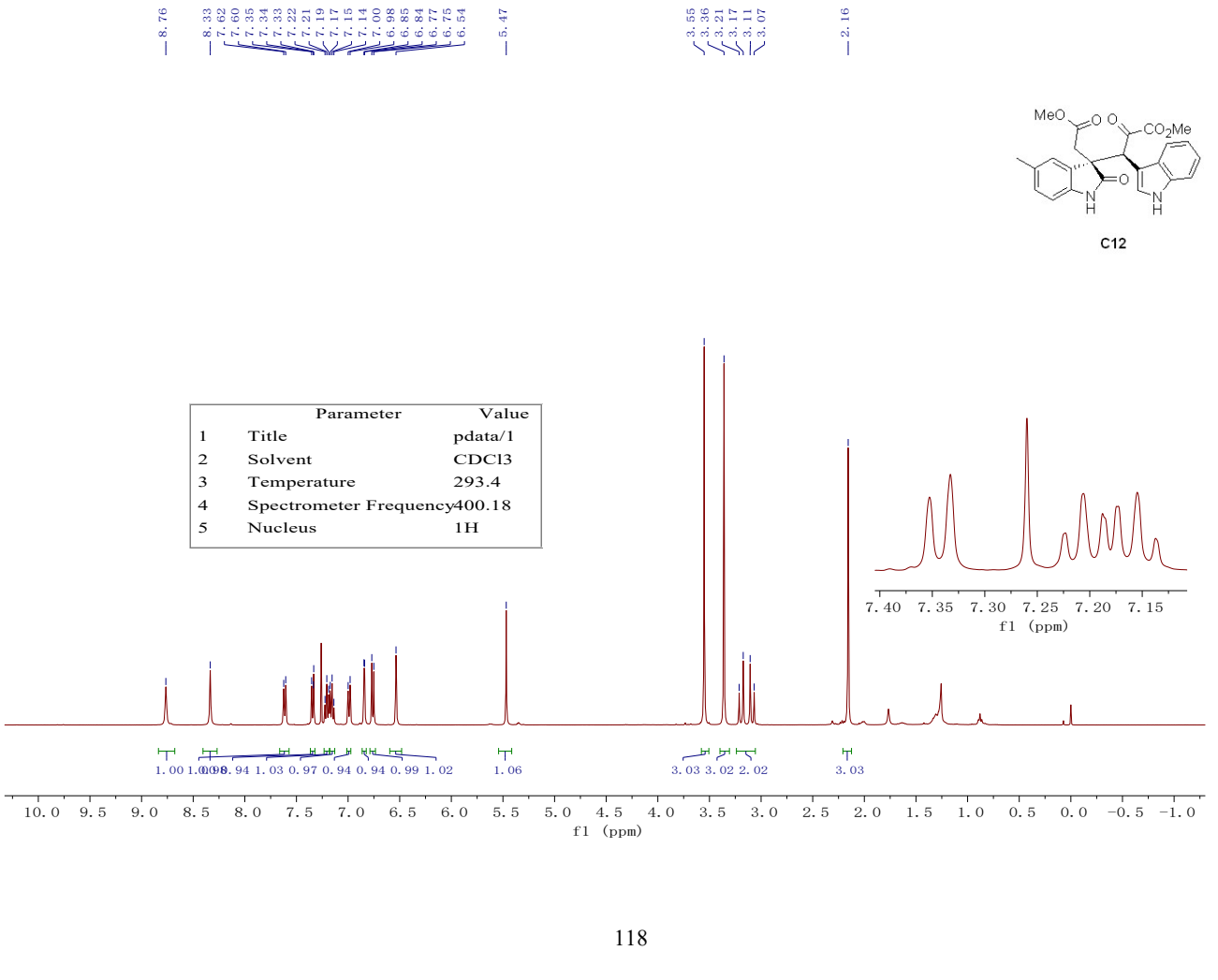
C10

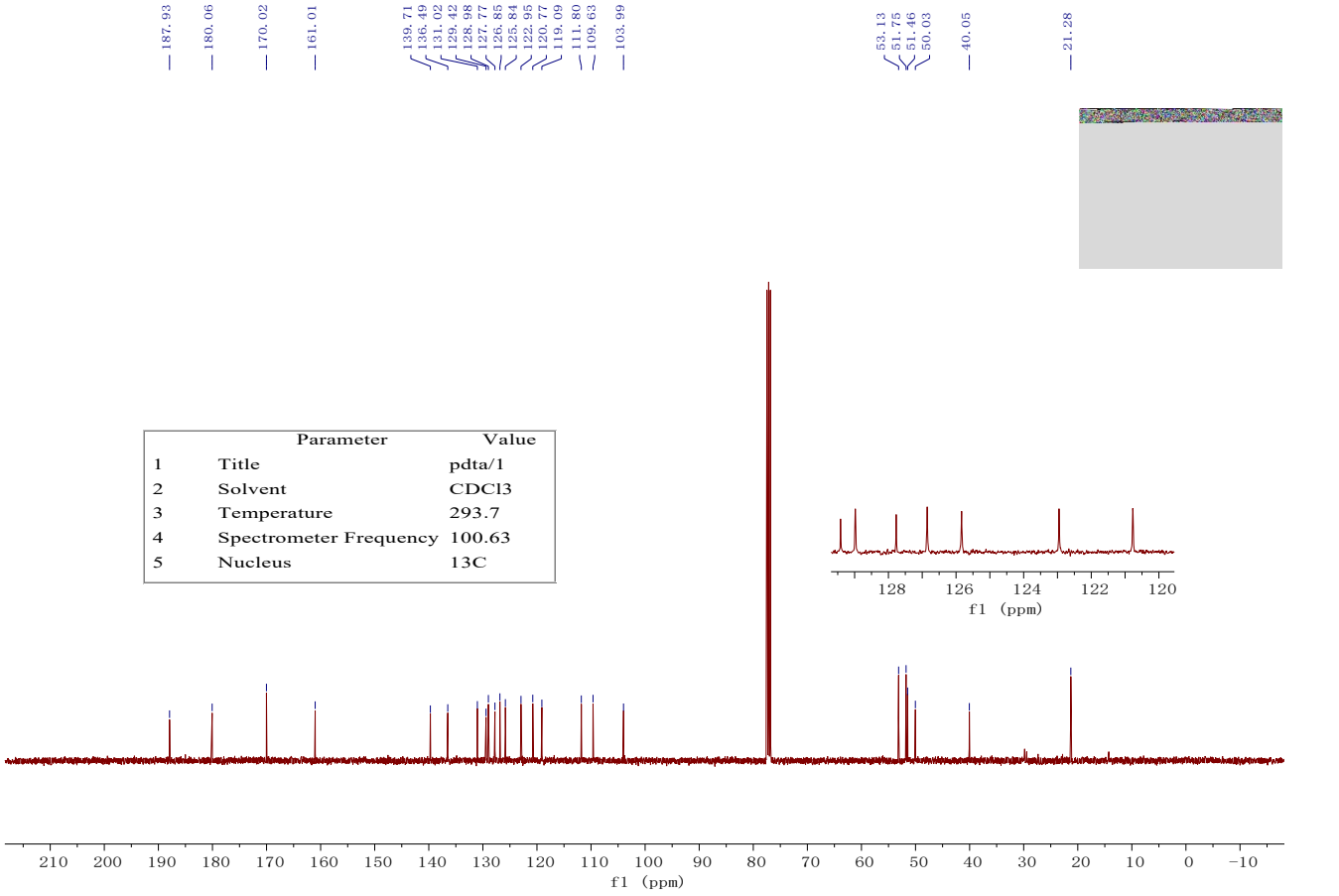

7.5 7.4 7.3 7.2 7.1
f1 (ppm)
7.0 6.9 6.8 6.7
f1 (ppm)
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.7
4 Spectrometer Frequency 400.18
5 Nucleus 1H
1.01
1.04
3.00 3.01 2.10
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0
f1 (ppm)

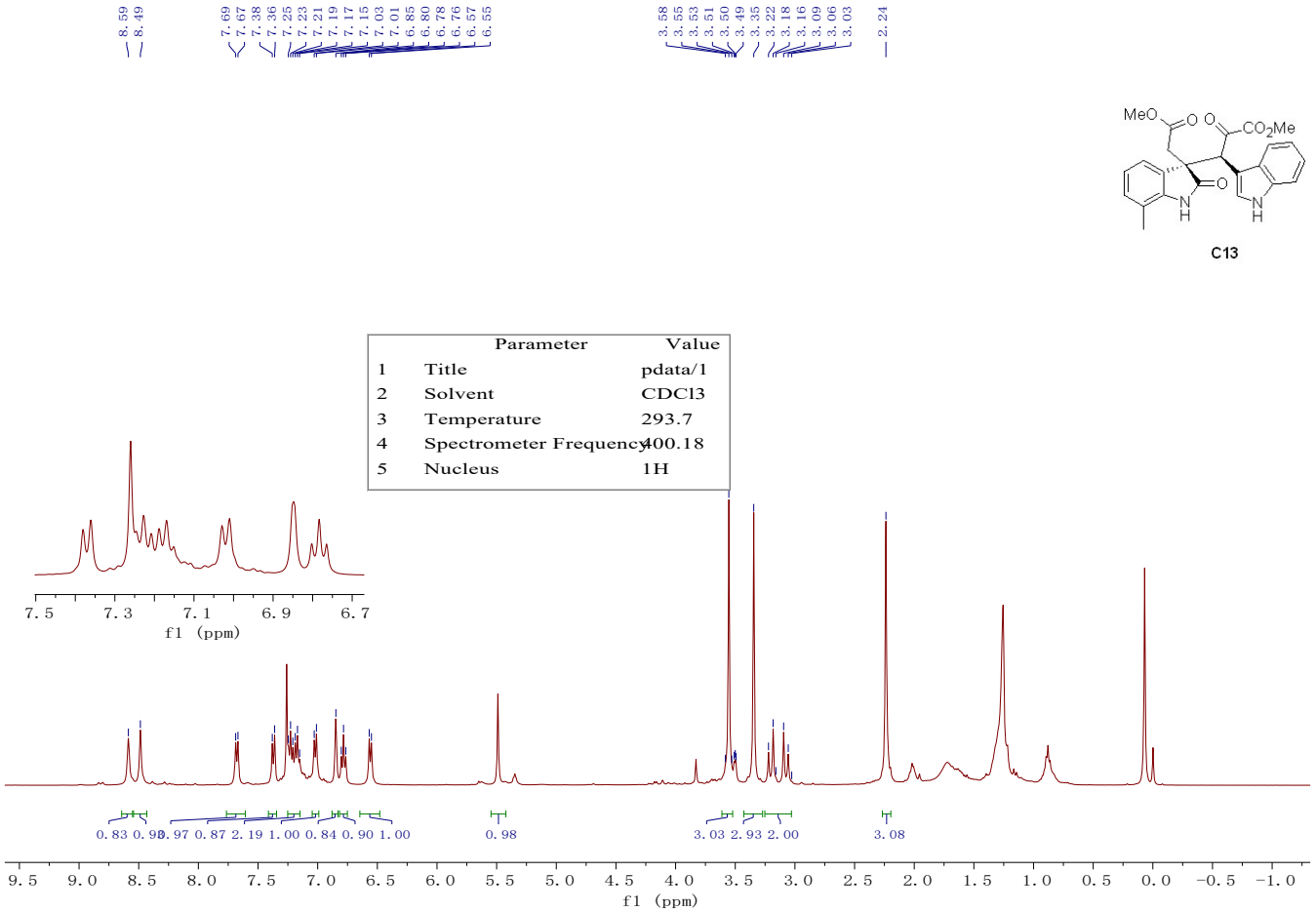

187.75
179.40
169.57
160.70
141.62
136.59
131.50
128.07
127.64
126.61
123.36
121.24
119.05
114.15
111.91
111.32
103.88
53.24
51.91
51.45
50.25
40.43
MeO
CO2Me
Br
N
H
C10
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.3
4 Spectrometer Frequency 100.63
5 Nucleus 13C
133.0
132.0
131.0
130.0
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)


8.75
8.72
7.65
7.63
7.38
7.36
7.26
7.25
7.23
7.20
7.19
7.06
7.06
7.00
6.99
6.98
6.97
6.80
6.79
6.56
6.54
5.46
3.56
3.36
3.23
3.19
3.10
3.06
MeO
CO2Me
Br
N
H
C11
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.1
4 Spectrometer Frequency 400.18
5 Nucleus 1H
7.40
7.30
7.20
7.10
f1 (ppm)
0.97 1.01 1.01 1.03 1.54 0.99 1.01 1.08 1.07 1.00
1.08
3.08 3.02 2.10
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5
f1 (ppm)


187.76
180.06
169.79
160.80
143.79
136.58
128.35
127.64
126.76
126.16
124.57
123.23
122.37
121.10
118.94
113.57
111.94
103.67
51.89
51.25
50.00
40.05
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.5
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)

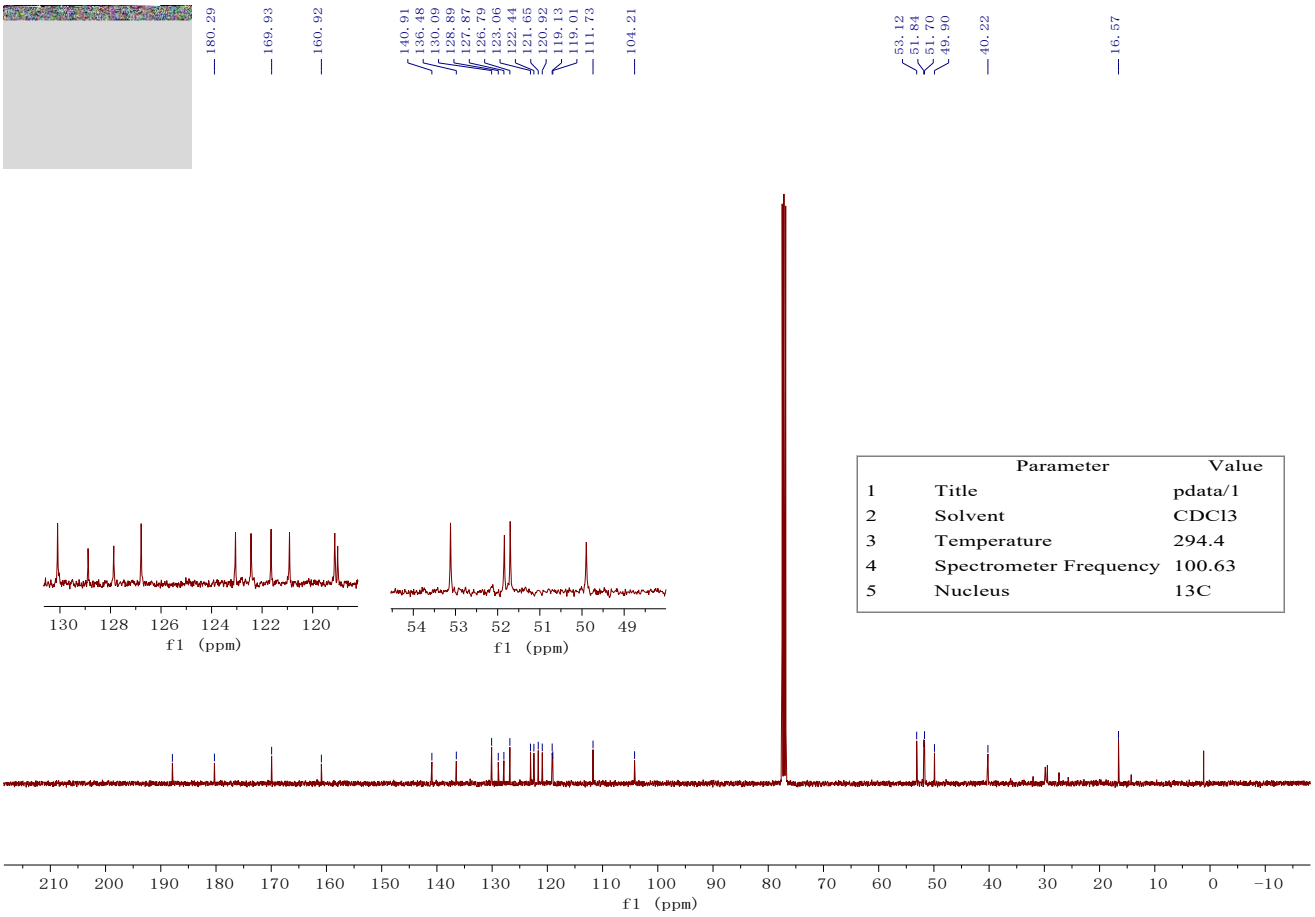

8.76
8.33
7.62
7.60
7.35
7.34
7.33
7.22
7.21
7.19
7.17
7.15
7.14
7.00
6.98
6.85
6.84
6.77
6.75
6.54
5.47
3.55
3.36
3.21
3.17
3.11
3.07
2.16
MeO
O
O
CO2Me
O
N
H
N
H
C12
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.4
4 Spectrometer Frequency 400.18
5 Nucleus 1H
1.00 1.09 0.98 0.94 1.03 0.97 0.94 0.94 0.99 1.02
1.06
3.03 3.02 2.02
3.03
f1 (ppm)

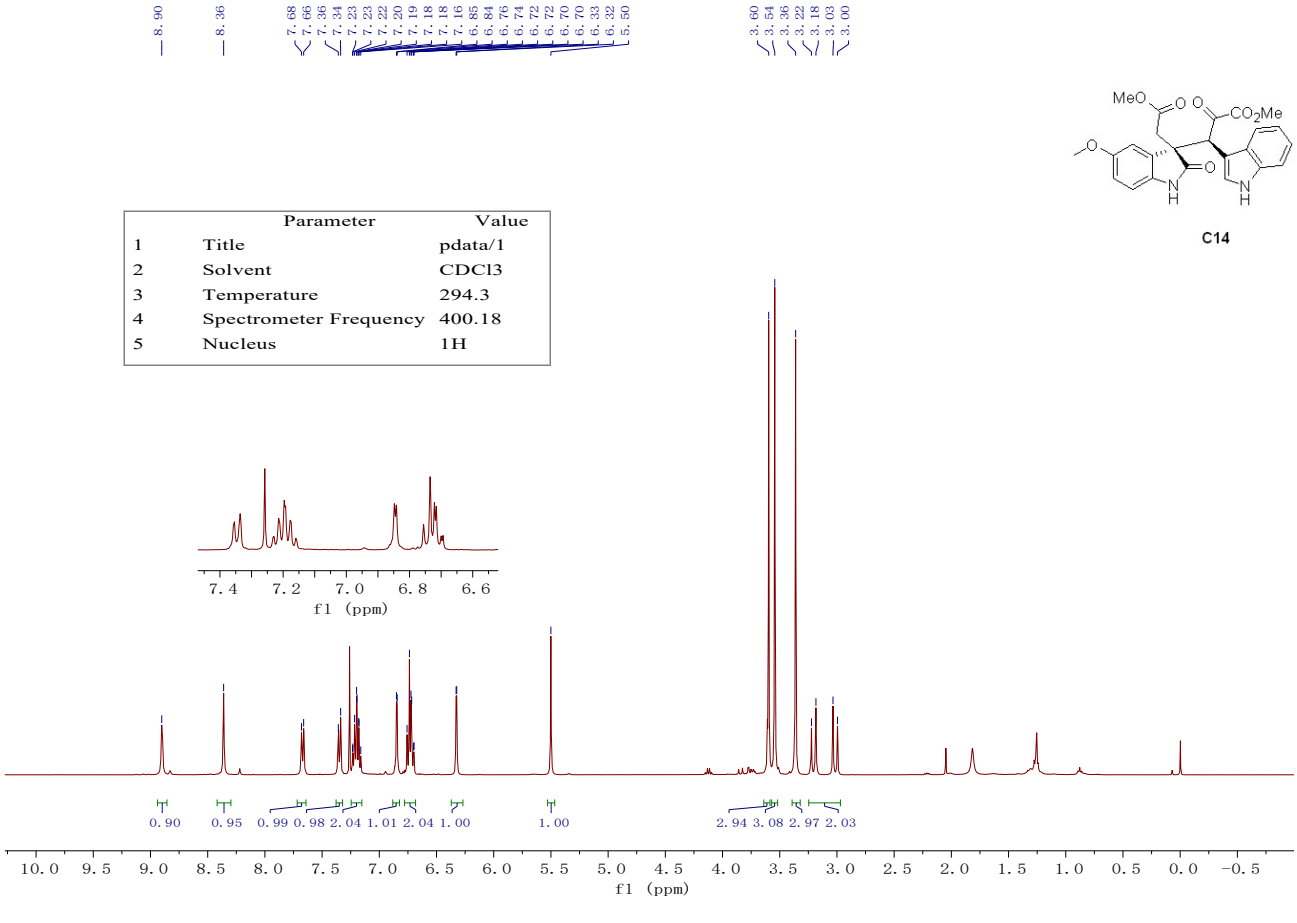

187.93
180.06
170.02
161.01
139.71
136.49
131.02
129.42
128.98
127.77
126.85
125.84
122.95
120.77
119.09
111.80
109.63
103.99
53.13
51.75
51.46
50.03
40.05
21.28
Parameter Value
1 Title pdta/1
2 Solvent CDCl3
3 Temperature 293.7
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)
f1 (ppm)


8.59
8.49
7.69
7.67
7.38
7.36
7.25
7.23
7.21
7.19
7.17
7.15
7.03
7.01
6.85
6.80
6.78
6.76
6.57
6.55
3.58
3.55
3.53
3.51
3.50
3.49
3.35
3.22
3.18
3.16
3.09
3.06
3.03
2.24
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.7
4 Spectrometer Frequency 400.18
5 Nucleus 1H
0.83 0.93 2.97 0.87 2.19 1.00 0.84 0.90 1.00
0.98
3.03 2.93 2.00
3.08
f1 (ppm)
f1 (ppm)

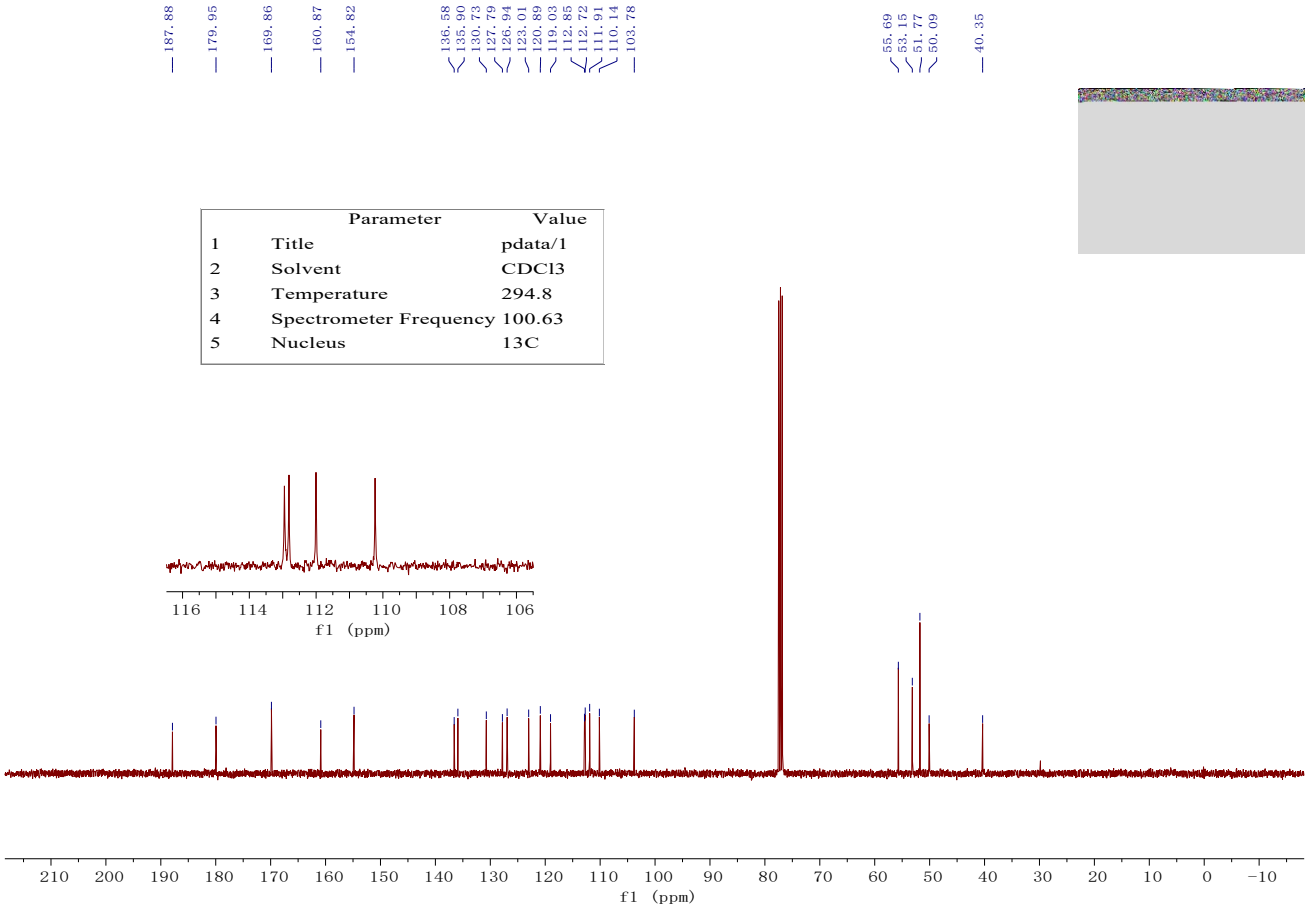
MeO
O
O
CO2Me
O
N
H
N
H

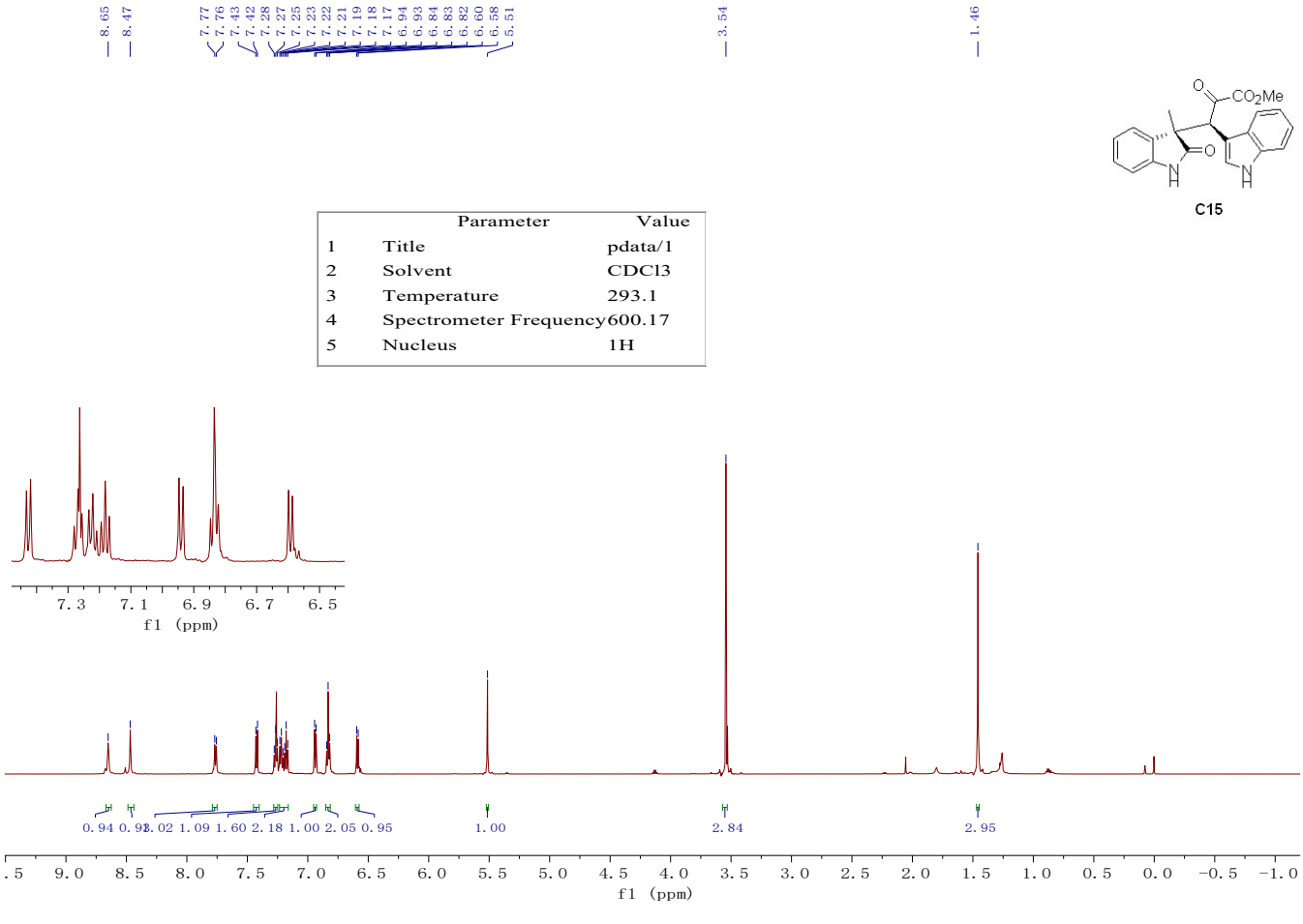
C13


180.29
169.93
160.92
140.91
136.48
130.09
128.89
127.87
126.79
123.06
122.44
121.65
120.92
119.13
119.01
111.73
104.21
53.12
51.84
51.70
49.90
40.22
16.57
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.4
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)


8.90
8.36
7.68
7.66
7.36
7.34
7.23
7.23
7.22
7.20
7.19
7.18
7.18
7.16
6.85
6.84
6.76
6.74
6.72
6.72
6.70
6.70
6.33
6.32
5.50
3.60
3.54
3.36
3.22
3.18
3.03
3.00
MeO
CO2Me
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.3
4 Spectrometer Frequency 400.18
5 Nucleus 1H
0.90
0.95
0.99
0.98
2.04
1.01
2.04
1.00
1.00
2.94
3.08
2.97
2.03
f1 (ppm)

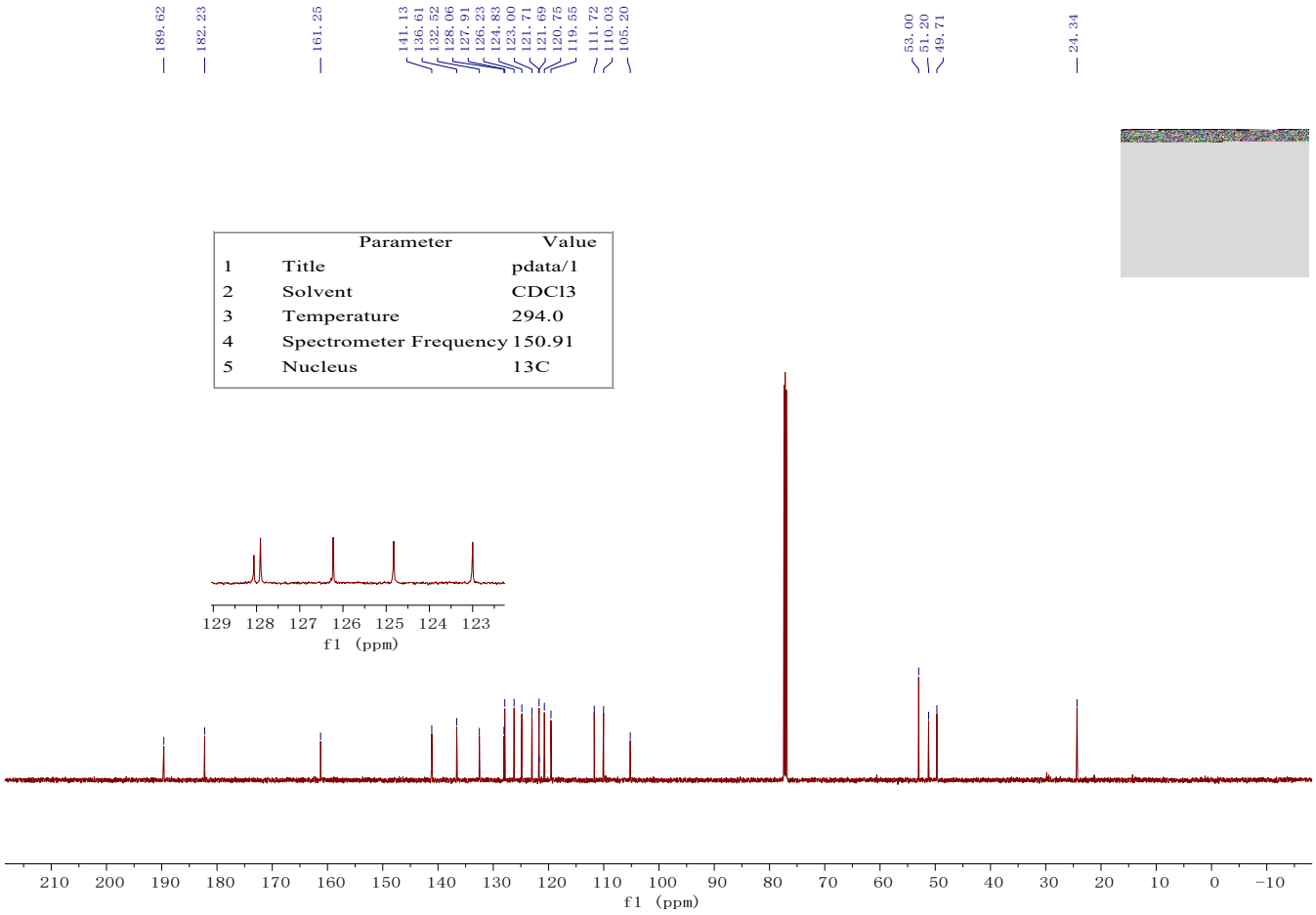
C14


187.88
179.95
169.86
160.87
154.82
136.58
135.90
130.73
127.79
126.94
123.01
120.89
119.03
112.85
112.72
111.91
110.14
103.78
55.69
53.15
51.77
50.09
40.35
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.8
4 Spectrometer Frequency 100.63
5 Nucleus 13C
116 114 112 110 108 106
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)


8.65
8.47
7.77
7.76
7.43
7.42
7.28
7.27
7.25
7.23
7.22
7.21
7.19
7.18
7.17
6.94
6.93
6.84
6.83
6.82
6.60
6.58
5.51
3.54
1.46
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.1
4 Spectrometer Frequency 600.17
5 Nucleus 1H
7.3 7.1 6.9 6.7 6.5
f1 (ppm)
0.94 0.93 3.02 1.09 1.60 2.18 1.00 2.05 0.95
1.00
2.84
2.95
.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0
f1 (ppm)

O
CO2Me
O
N
H
N
H

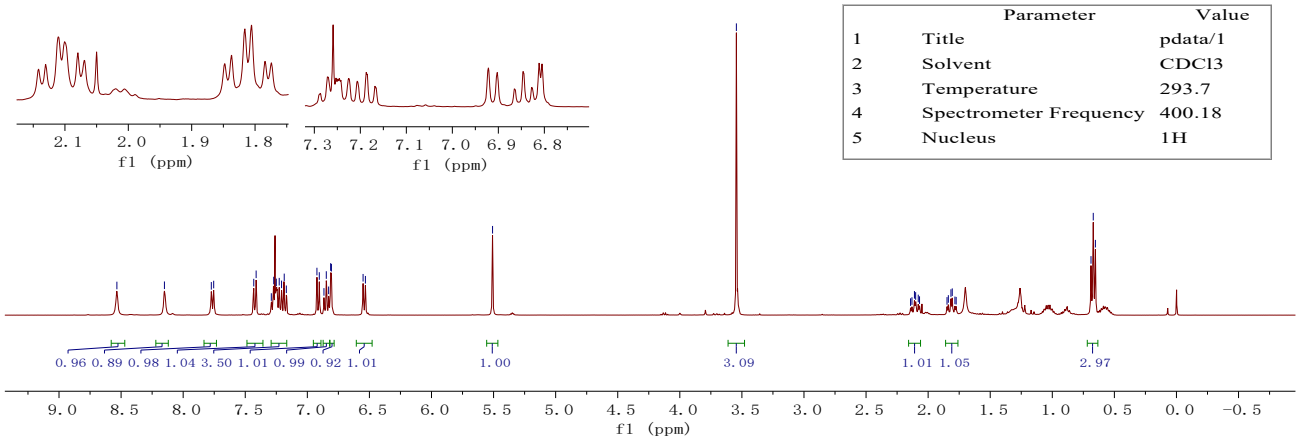
C15

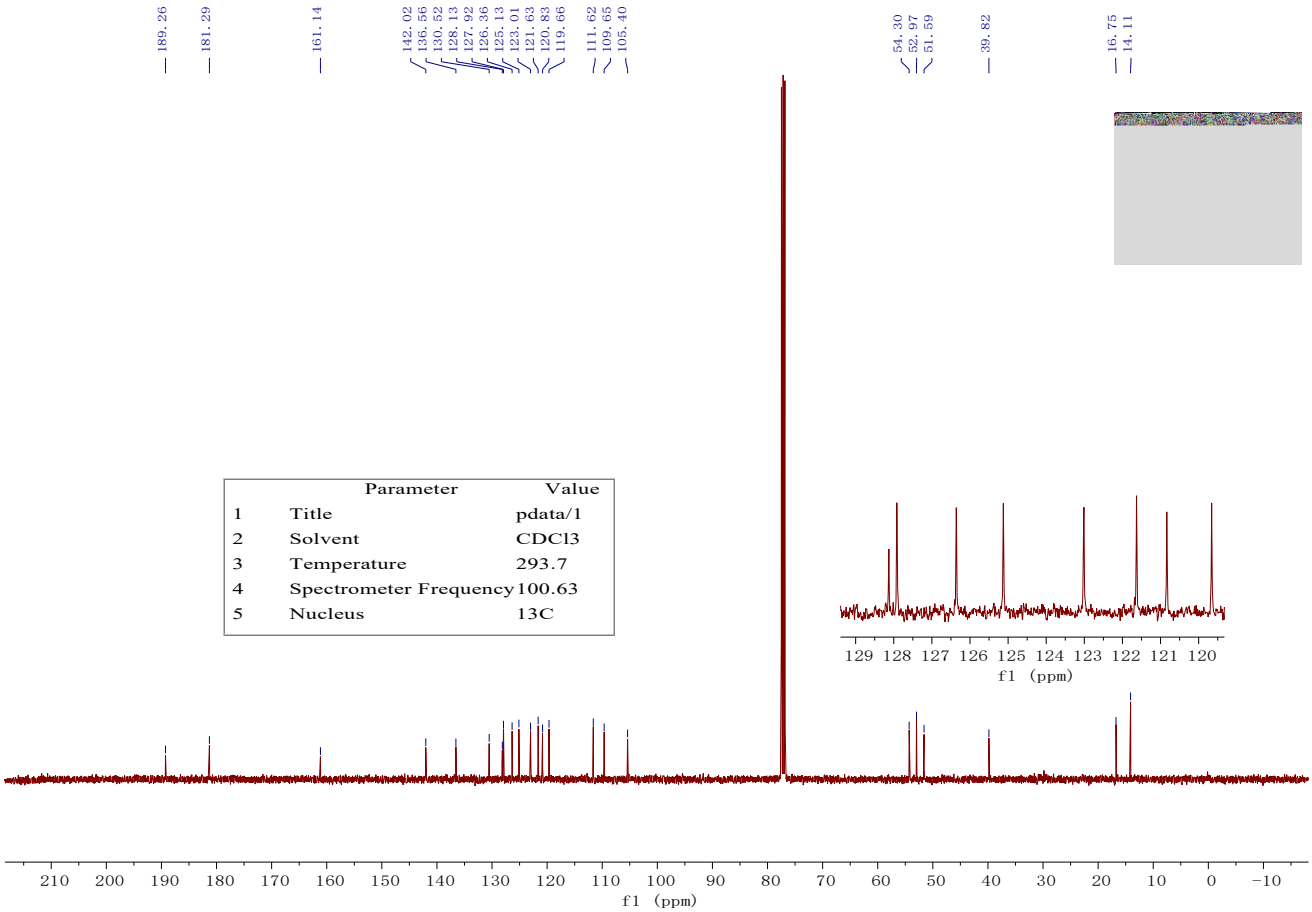

189.62
182.23
161.25
141.13
136.61
132.52
128.06
127.91
126.23
124.83
123.00
121.71
121.69
120.75
119.55
111.72
110.03
105.20
53.00
51.20
49.71
24.34
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.0
4 Spectrometer Frequency 150.91
5 Nucleus 13C
129 128 127 126 125 124 123
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)


8.53
8.15
7.77
7.75
7.43
7.41
7.29
7.27
7.25
7.23
7.21
7.19
7.17
6.92
6.90
6.87
6.85
6.83
6.81
6.81
6.55
6.53
5.51
3.54
2.14
2.13
2.11
2.10
2.08
2.07
1.85
1.84
1.82
1.81
1.78
1.77
0.69
0.67
0.65

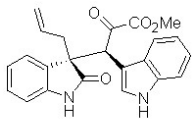
O
CO2Me
O
N
H
N
H

C16

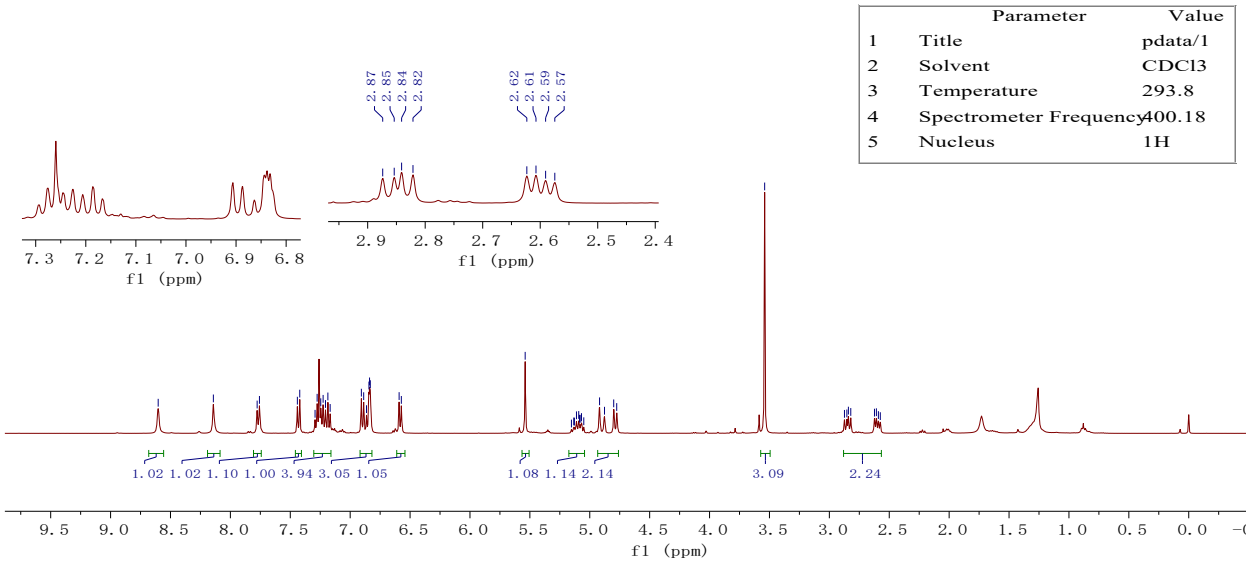

2.1 2.0 1.9 1.8
f1 (ppm)
7.3 7.2 7.1 7.0 6.9 6.8
f1 (ppm)
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.7
4 Spectrometer Frequency 400.18
5 Nucleus 1H
0.96 0.89 0.98 1.04 3.50 1.01 0.99 0.92 1.01
1.00
3.09
1.01 1.05
2.97
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5
f1 (ppm)

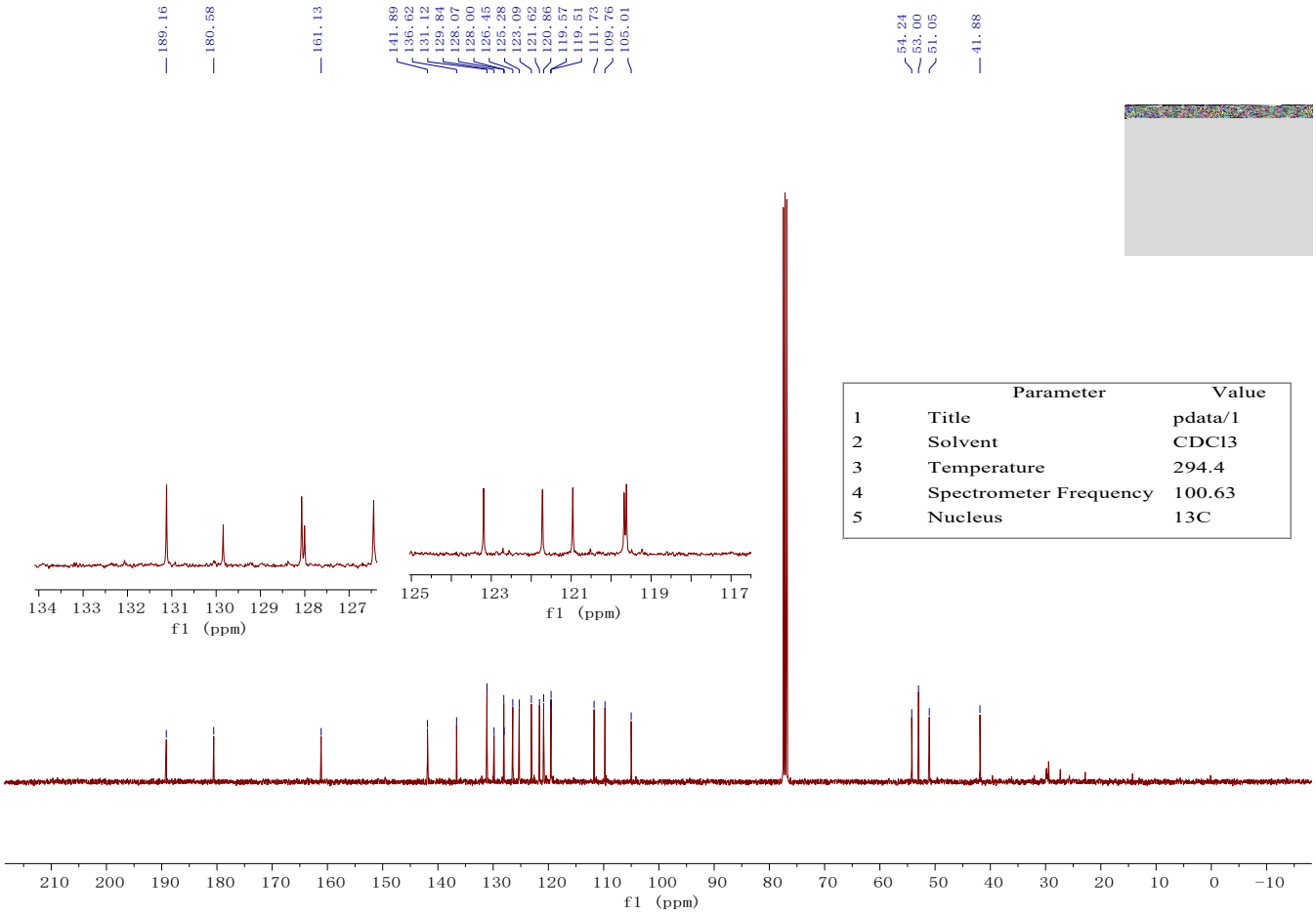

189.26
181.29
161.14
142.02
136.56
130.52
128.13
127.92
126.36
125.13
123.01
121.63
120.83
119.66
111.62
109.65
105.40
54.30
52.97
51.59
39.82
16.75
14.11
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.7
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)
f1 (ppm)

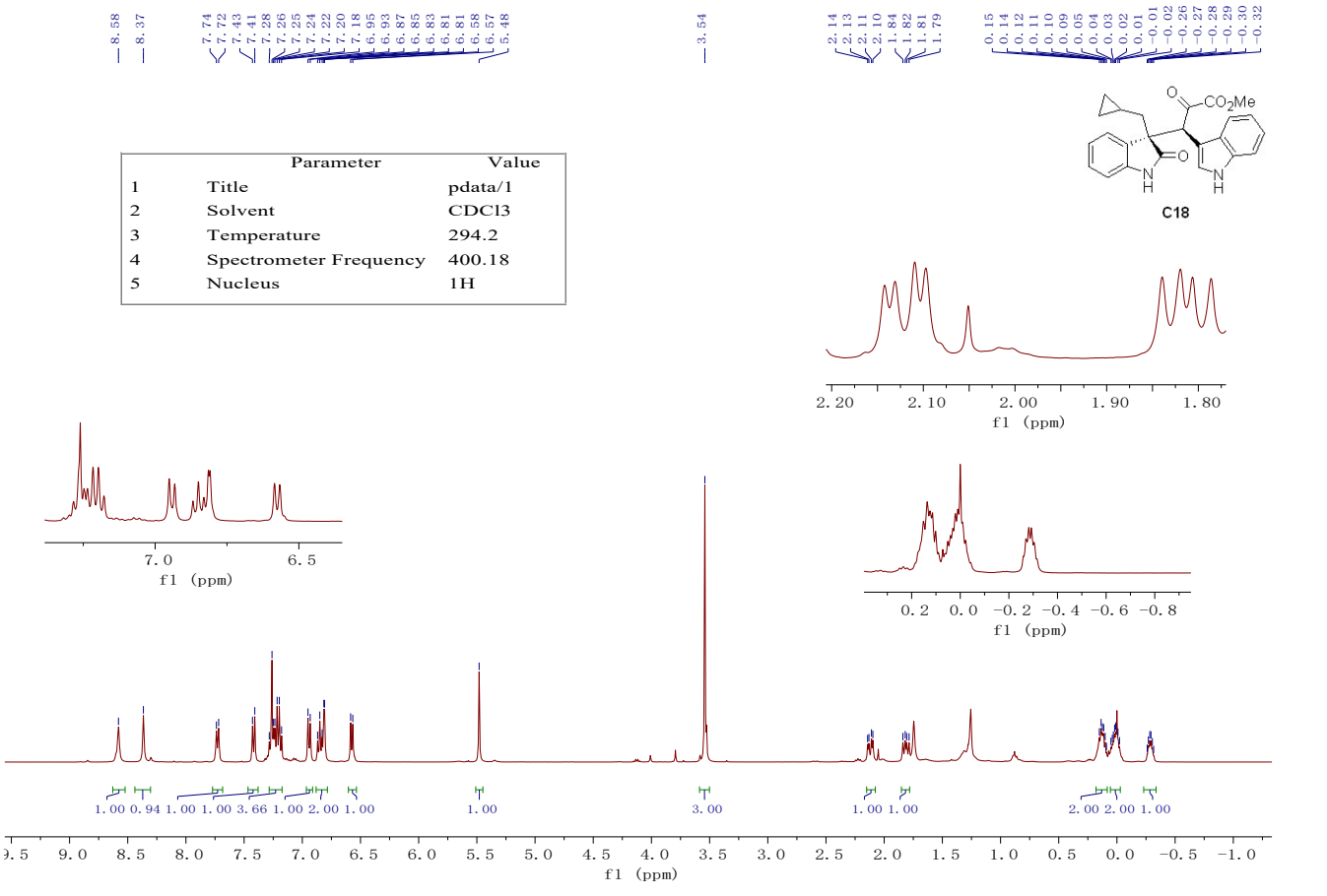

8.60
8.14
7.78
7.76
7.44
7.42
7.29
7.28
7.25
7.23
7.21
7.19
7.17
6.91
6.89
6.86
6.84
6.84
6.83
6.59
6.57
5.54
5.15
5.13
5.11
5.09
5.09
5.07
5.07
5.05
4.92
4.88
4.80
4.78
3.54
2.87
2.85
2.84
2.82
2.62
2.61
2.59
2.57

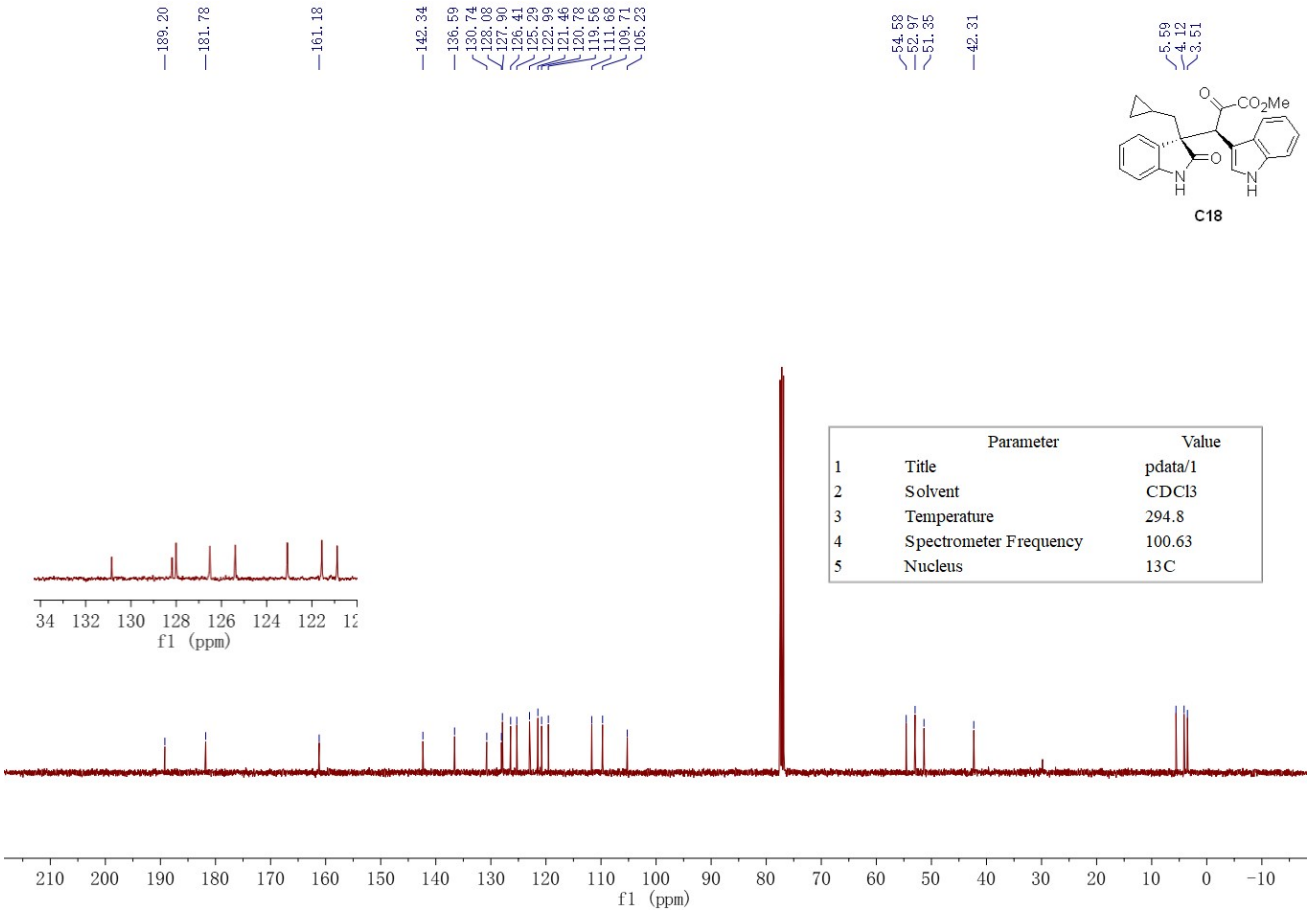

O
CO2Me
O
N
H
N
H

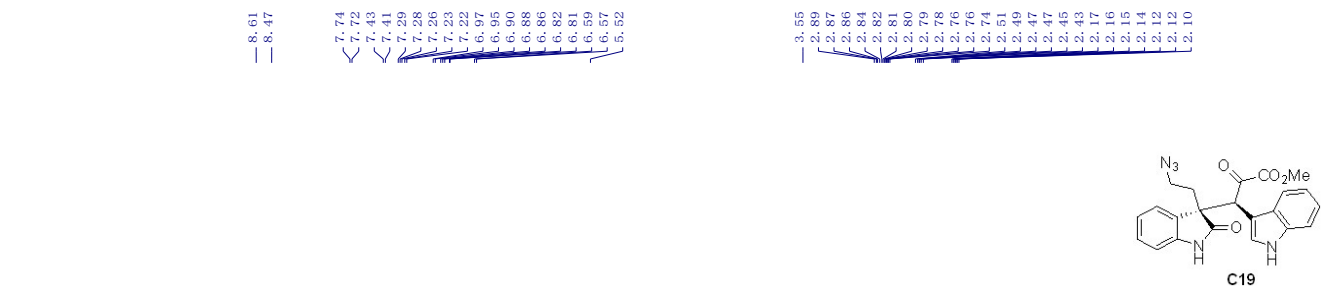
C17

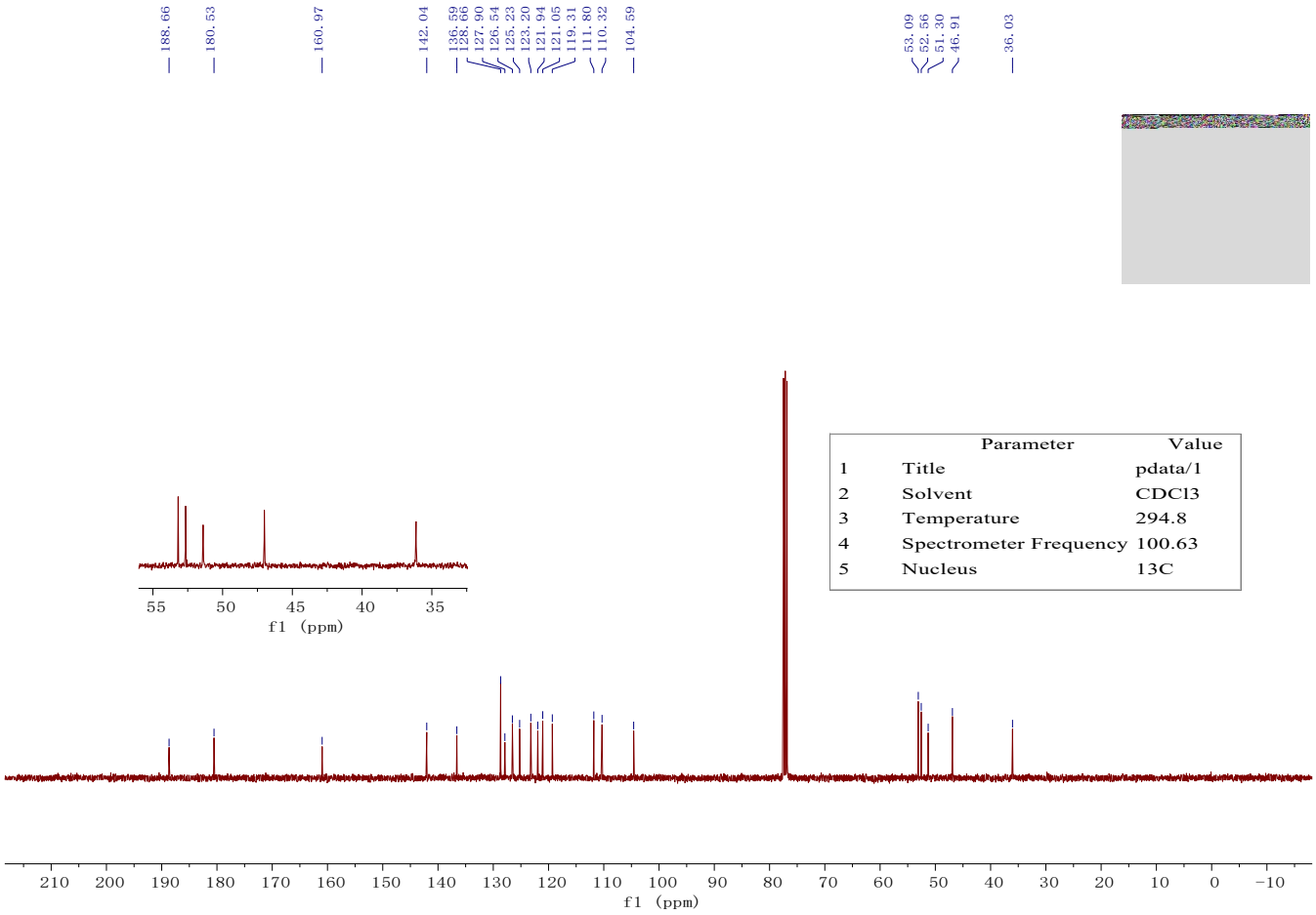

Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.8
4 Spectrometer Frequency 400.18
5 Nucleus 1H
2.87
2.85
2.84
2.82
2.62
2.61
2.59
2.57
f1 (ppm)
f1 (ppm)
1.02 1.02 1.10 1.00 3.94 3.05 1.05
1.08 1.14 2.14
3.09
2.24
f1 (ppm)

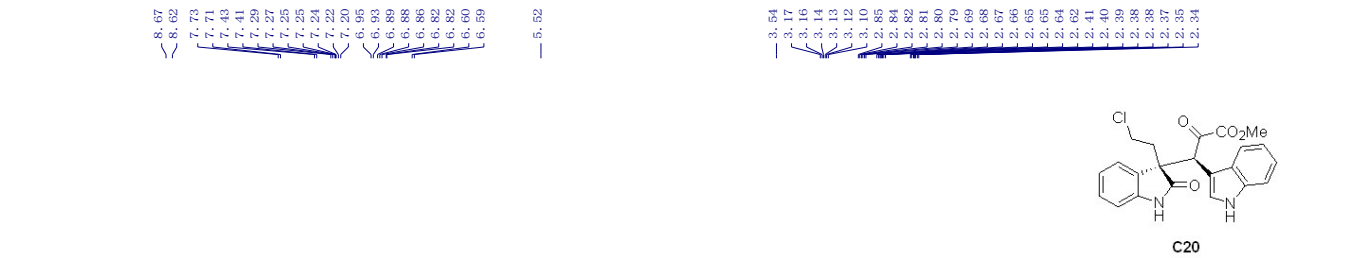

189.16
180.58
161.13
141.89
136.62
131.12
129.84
128.07
128.00
126.45
125.28
123.09
121.62
120.86
119.57
119.51
111.73
109.76
105.01
54.24
53.00
51.05
41.88
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.4
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)


8.58
8.37
7.74
7.72
7.43
7.41
7.28
7.26
7.25
7.24
7.22
7.20
7.18
6.95
6.93
6.87
6.85
6.83
6.81
6.81
6.58
6.57
5.48
3.54
2.14
2.13
2.11
2.10
1.84
1.82
1.81
1.79
0.15
0.14
0.12
0.11
0.10
0.09
0.05
0.04
0.03
0.02
0.01
-0.01
-0.02
-0.26
-0.27
-0.28
-0.29
-0.30
-0.32
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.2
4 Spectrometer Frequency 400.18
5 Nucleus 1H
C18
f1 (ppm)


189.20
181.78
161.18
142.34
136.59
130.74
128.08
127.90
126.41
125.29
122.99
121.46
120.78
119.56
111.68
109.71
105.23
54.58
52.97
51.35
42.31
5.59
4.12
3.51
CO2Me
C18
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.8
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)

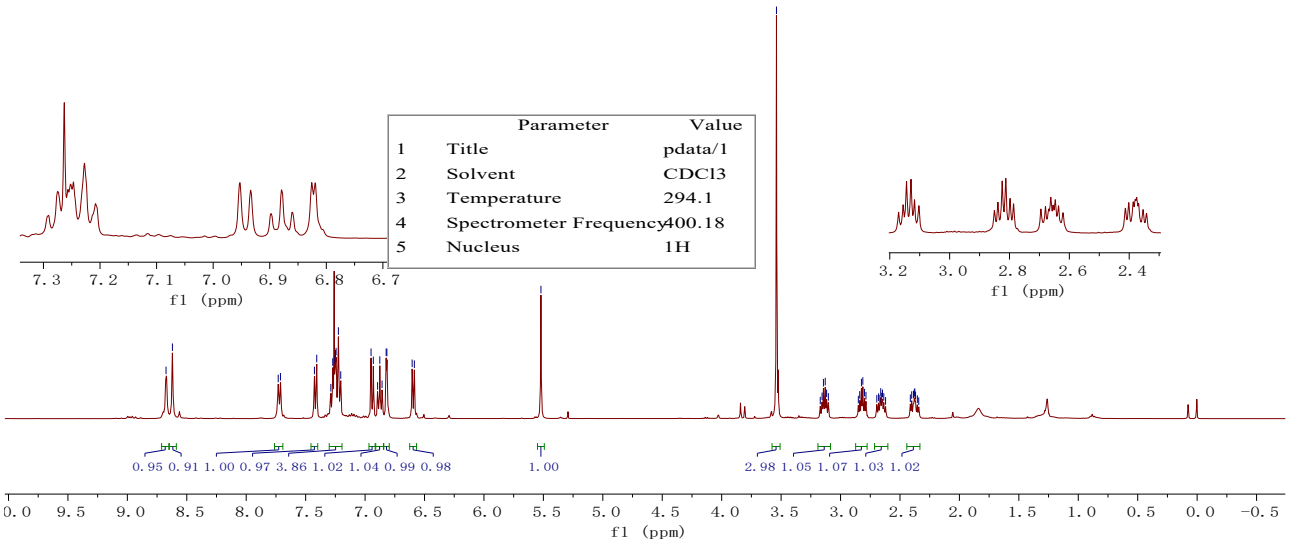

8.61
8.47
7.74
7.72
7.43
7.41
7.29
7.28
7.26
7.23
7.22
6.97
6.95
6.90
6.88
6.86
6.82
6.81
6.59
6.57
5.52
3.55
2.89
2.87
2.86
2.84
2.82
2.81
2.80
2.79
2.78
2.76
2.76
2.74
2.51
2.49
2.47
2.47
2.45
2.43
2.17
2.16
2.15
2.14
2.12
2.12
2.10
N3
CO2Me
C19
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.4
4 Spectrometer Frequency 400.18
5 Nucleus 1H
f1 (ppm)

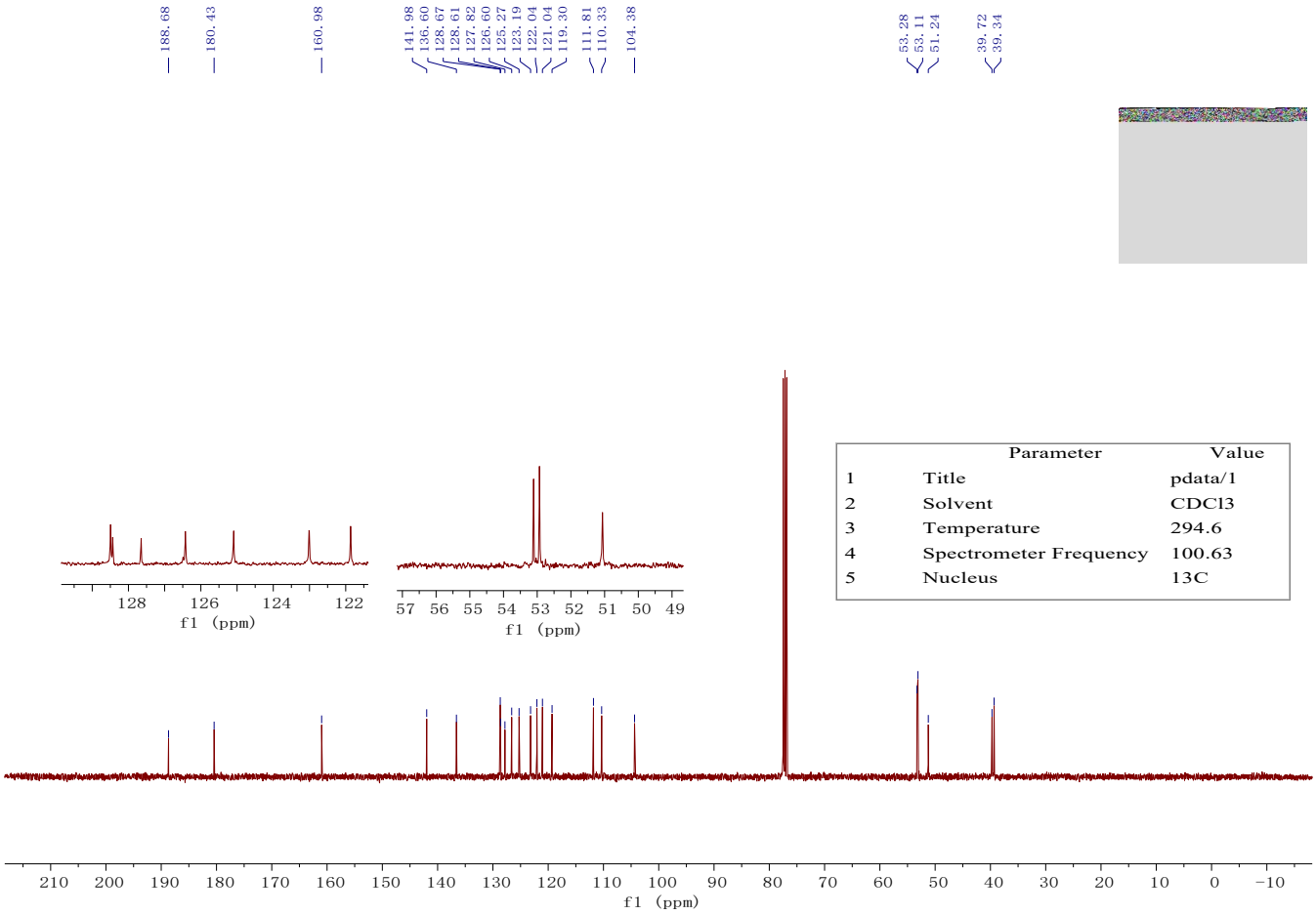

188.66
180.53
160.97
142.04
136.59
128.66
127.90
126.54
125.23
123.20
121.94
121.05
119.31
111.80
110.32
104.59
53.09
52.56
51.30
46.91
36.03
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.8
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)


8.67
8.62
7.73
7.71
7.43
7.41
7.29
7.27
7.25
7.25
7.24
7.22
7.20
6.95
6.93
6.89
6.88
6.86
6.82
6.82
6.60
6.59
5.52
3.54
3.17
3.16
3.14
3.13
3.12
3.10
2.85
2.84
2.82
2.81
2.80
2.79
2.69
2.68
2.67
2.66
2.65
2.65
2.64
2.62
2.41
2.40
2.39
2.38
2.38
2.37
2.35
2.34

Cl
O
CO2Me
O
N
H
N
H

C20

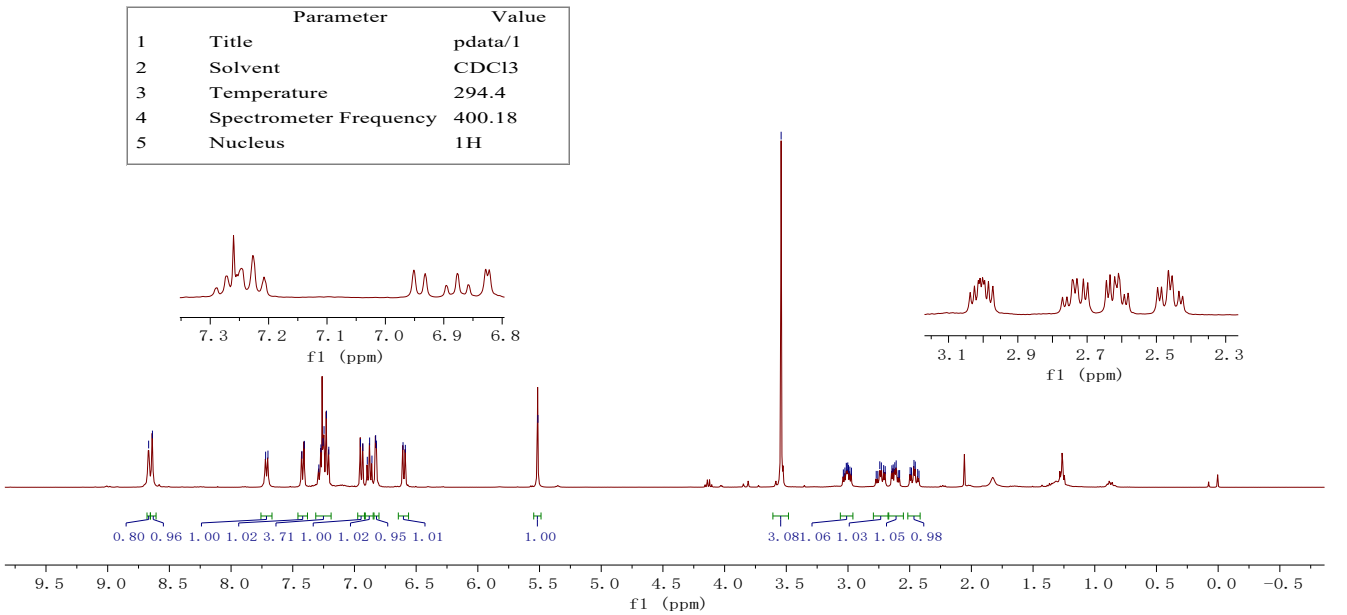

Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.1
4 Spectrometer Frequency 400.18
5 Nucleus 1H
f1 (ppm)
0.95 0.91 1.00 0.97 3.86 1.02 1.04 0.99 0.98
1.00
2.98 1.05 1.07 1.03 1.02
f1 (ppm)

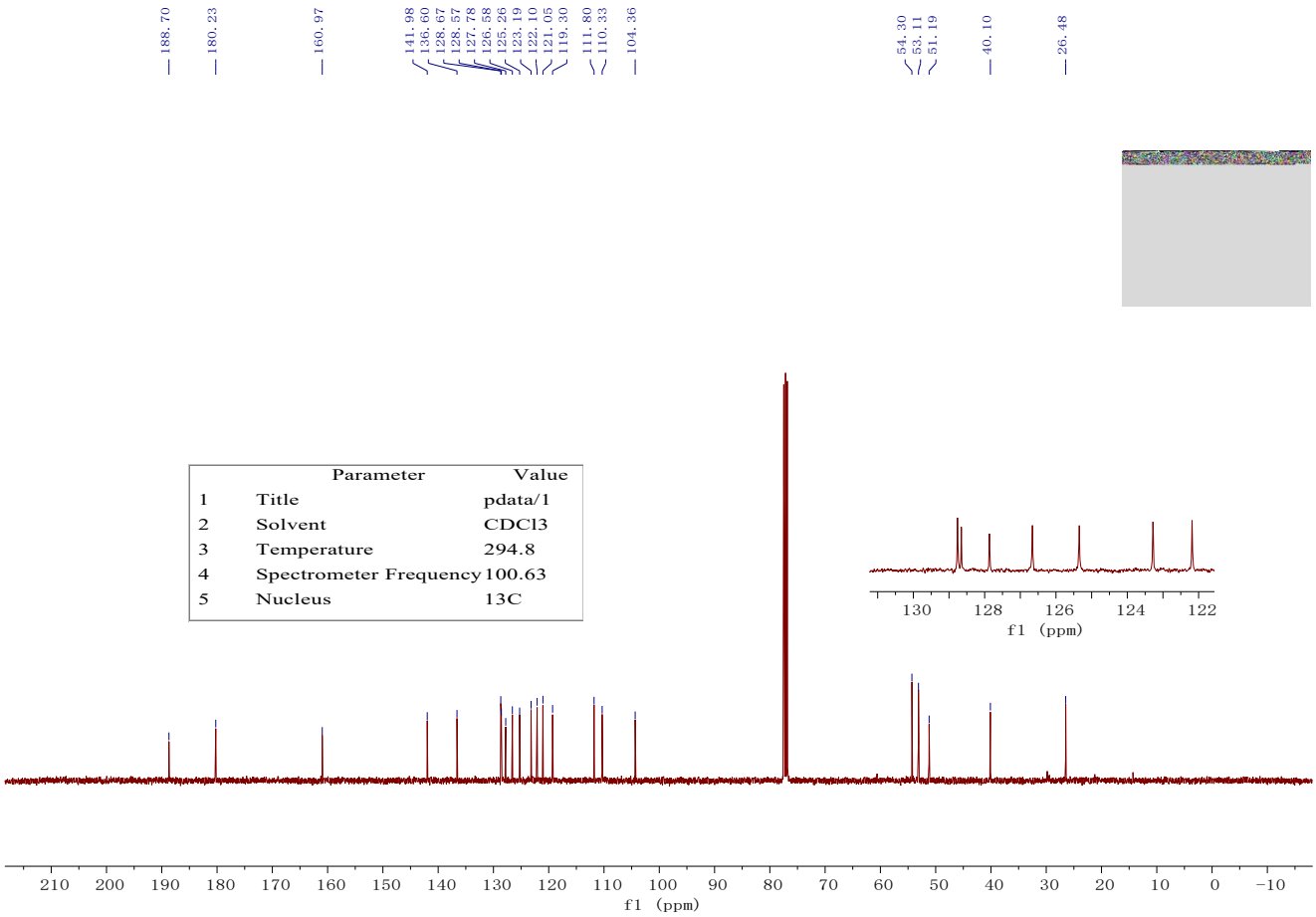

188.68
180.43
160.98
141.98
136.60
128.67
128.61
127.82
126.60
125.27
123.19
122.04
121.04
119.30
111.81
110.33
104.38
53.28
53.11
51.24
39.72
39.34
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.6
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)

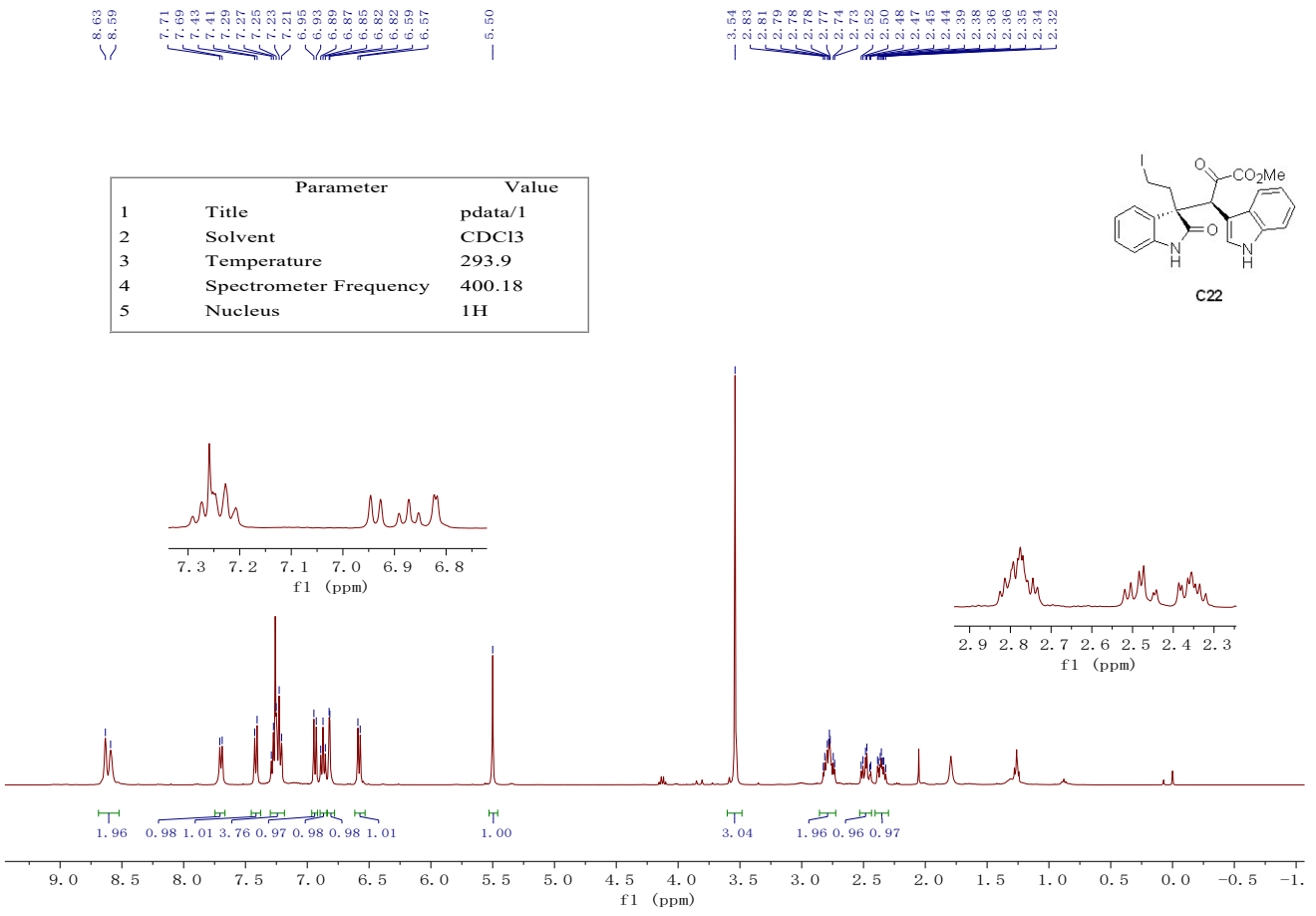

8.67
8.64
7.72
7.70
7.43
7.41
7.29
7.27
7.25
7.25
7.23
7.21
6.95
6.93
6.90
6.88
6.86
6.83
6.82
6.61
6.59
5.51
3.54
3.04
3.03
3.01
3.01
3.00
3.00
2.98
2.97
2.77
2.76
2.74
2.73
2.71
2.70
2.64
2.63
2.62
2.61
2.59
2.58
2.50
2.49
2.47
2.45
2.43
2.42

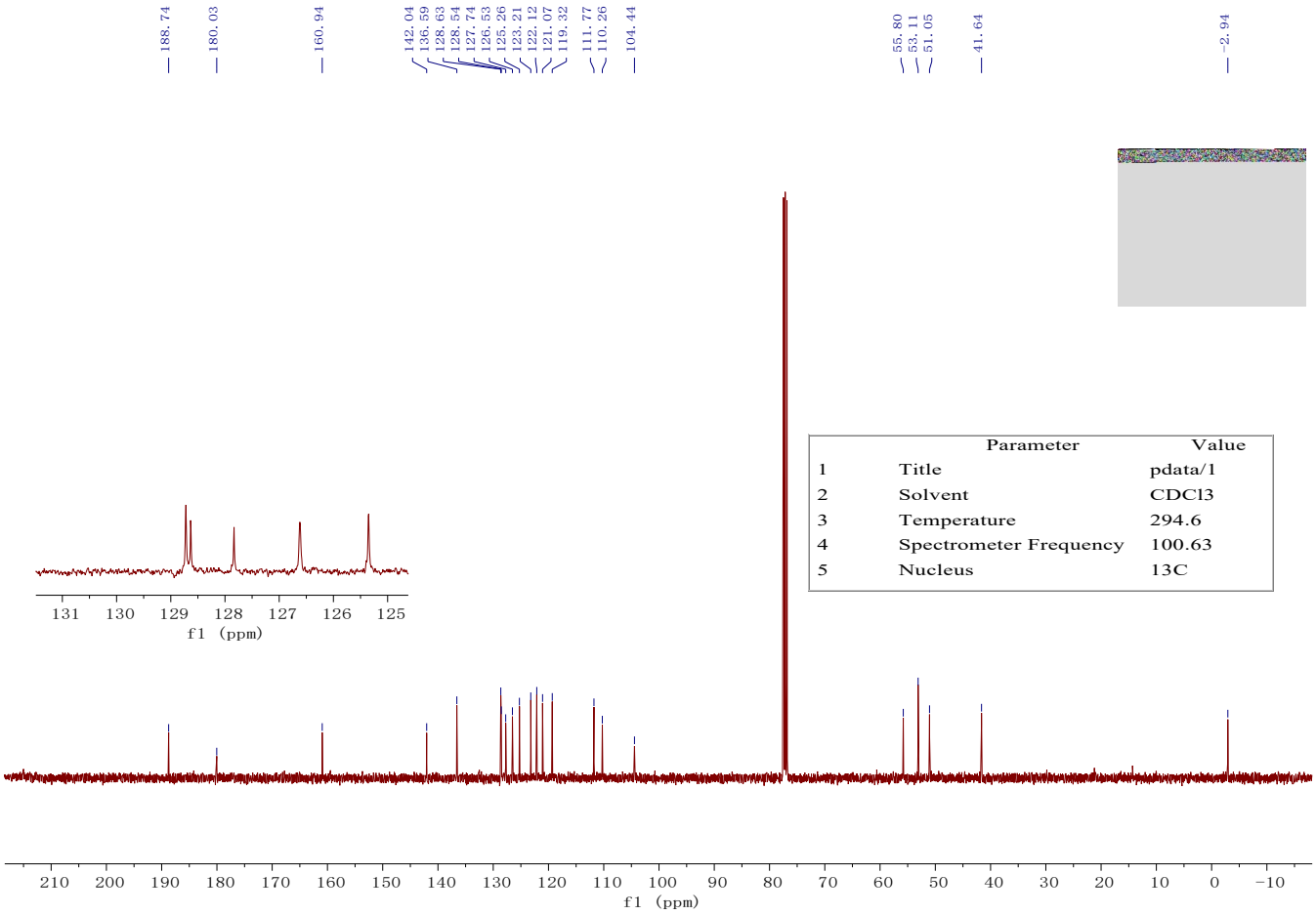
Br
O
CO2Me
O
N
H
N
H

C21

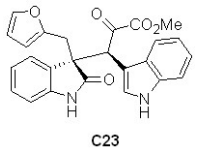

Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.4
4 Spectrometer Frequency 400.18
5 Nucleus 1H
f1 (ppm)
0.80 0.96 1.00 1.02 3.71 1.00 1.02 0.95 1.01
1.00
3.08 1.06 1.03 1.05 0.98


188.70
180.23
160.97
141.98
136.60
128.67
128.57
127.78
126.58
125.26
123.19
122.10
121.05
119.30
111.80
110.33
104.36
54.30
53.11
51.19
40.10
26.48
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.8
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)

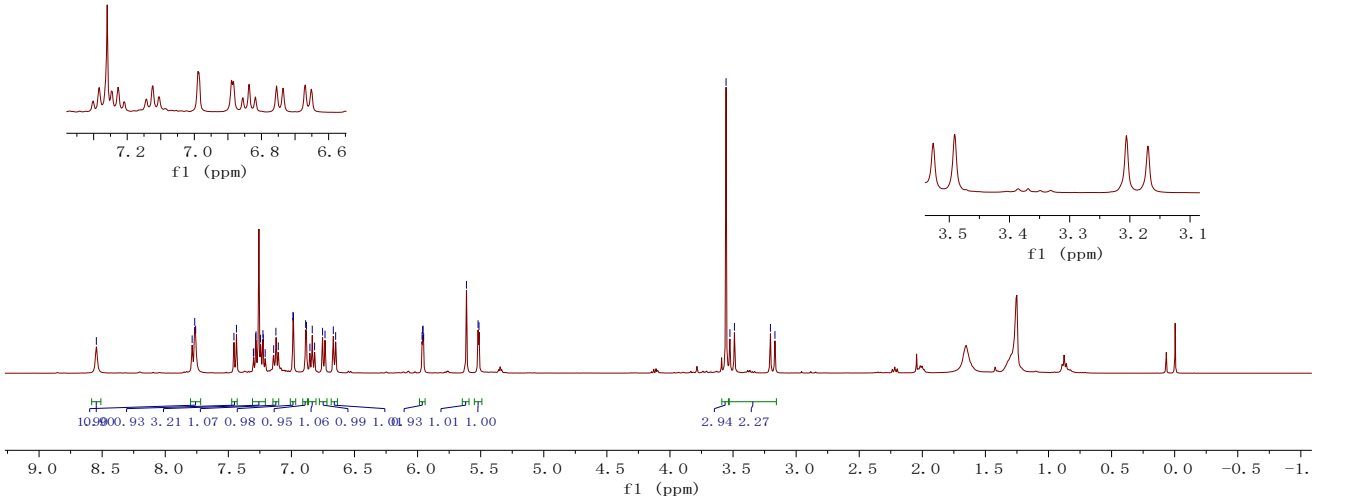

8.63
8.59
7.71
7.69
7.43
7.41
7.29
7.27
7.25
7.23
7.21
6.95
6.93
6.89
6.87
6.85
6.82
6.82
6.59
6.57
5.50
3.54
2.83
2.81
2.79
2.78
2.78
2.77
2.74
2.73
2.52
2.50
2.48
2.47
2.45
2.44
2.39
2.38
2.36
2.36
2.35
2.34
2.32
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.9
4 Spectrometer Frequency 400.18
5 Nucleus 1H
C22
1.96
0.98 1.01 3.76 0.97 0.98 0.98 1.01
1.00
3.04
1.96 0.96 0.97
f1 (ppm)

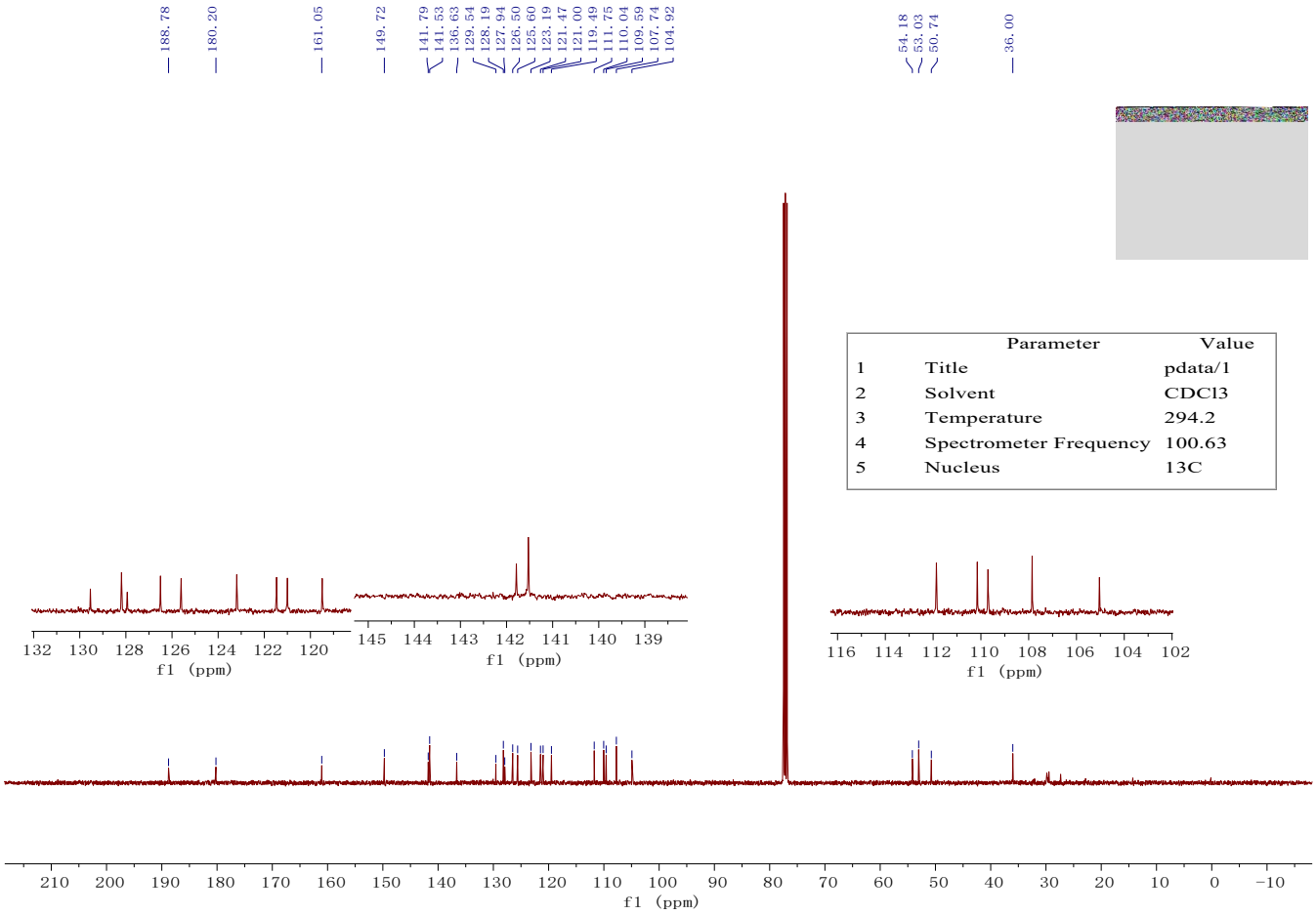


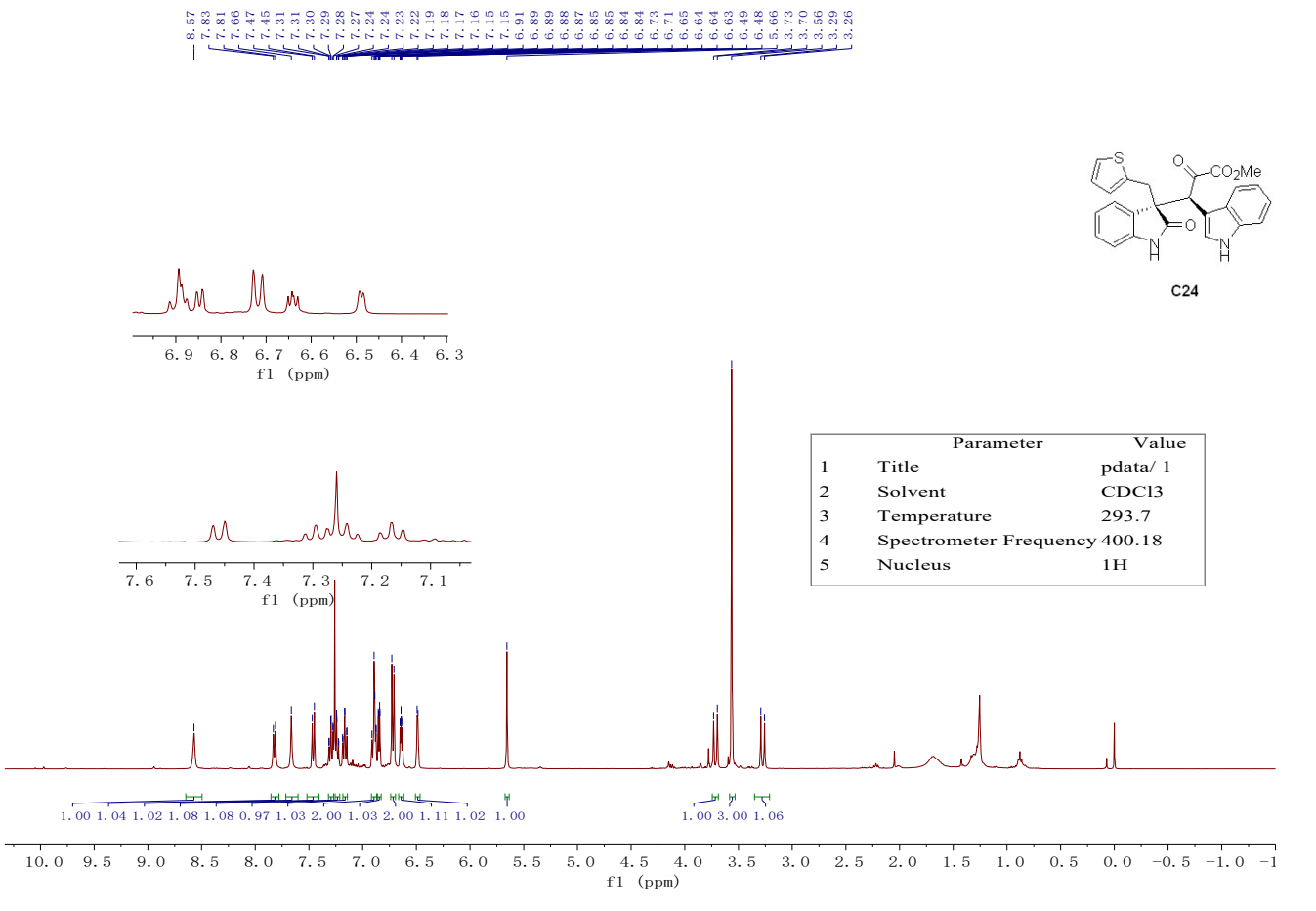
	Parameter	Value
1	Title	pdata/1
2	Solvent	CDCl3
3	Temperature	293.6
4	Spectrometer Frequency	400.18
5	Nucleus	1H

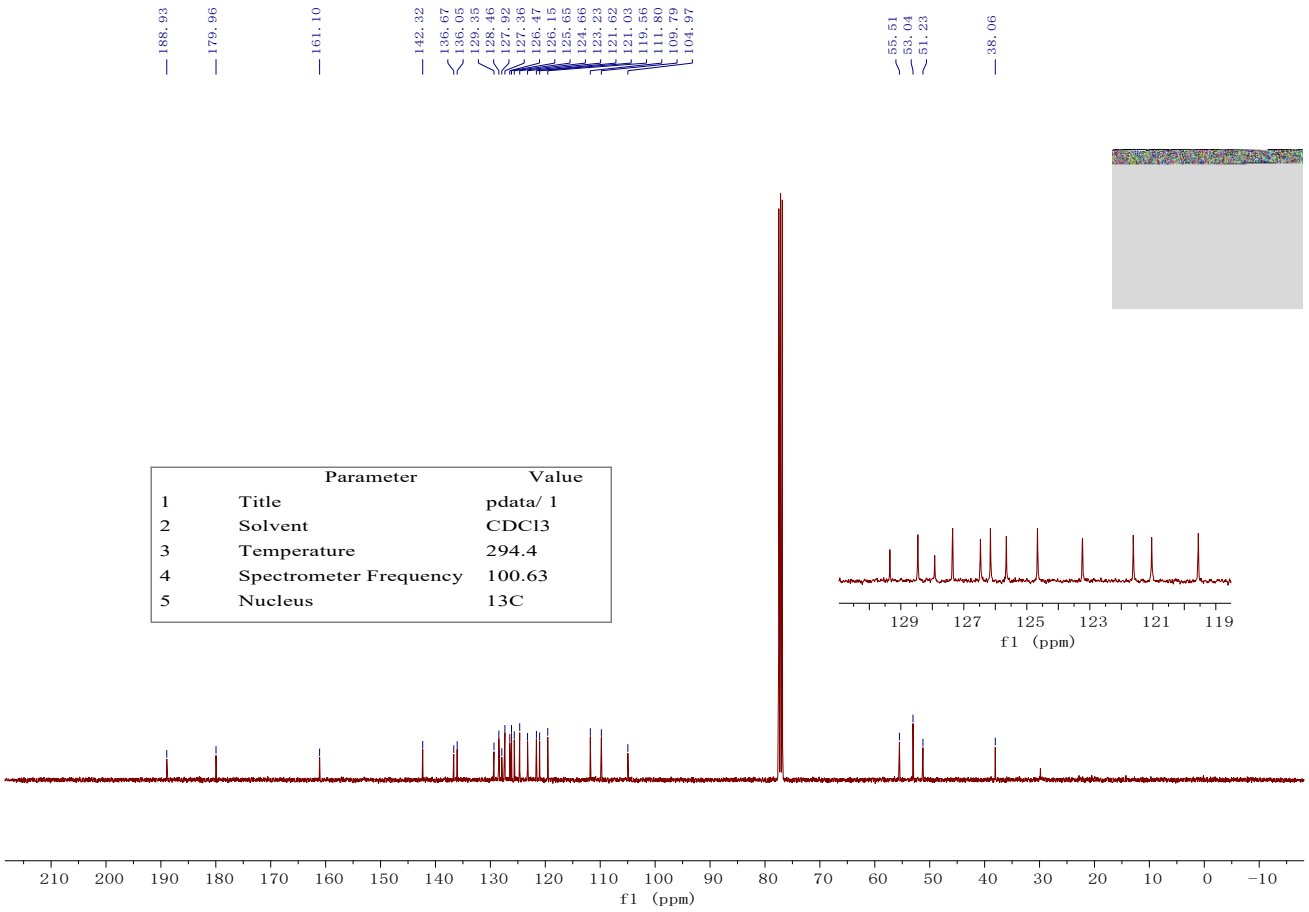


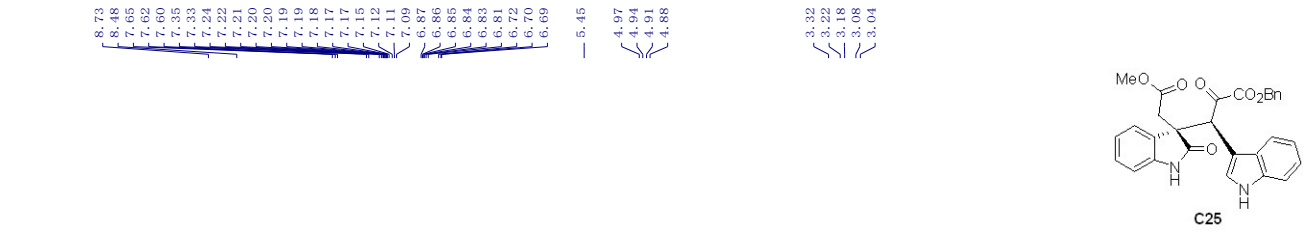
C23



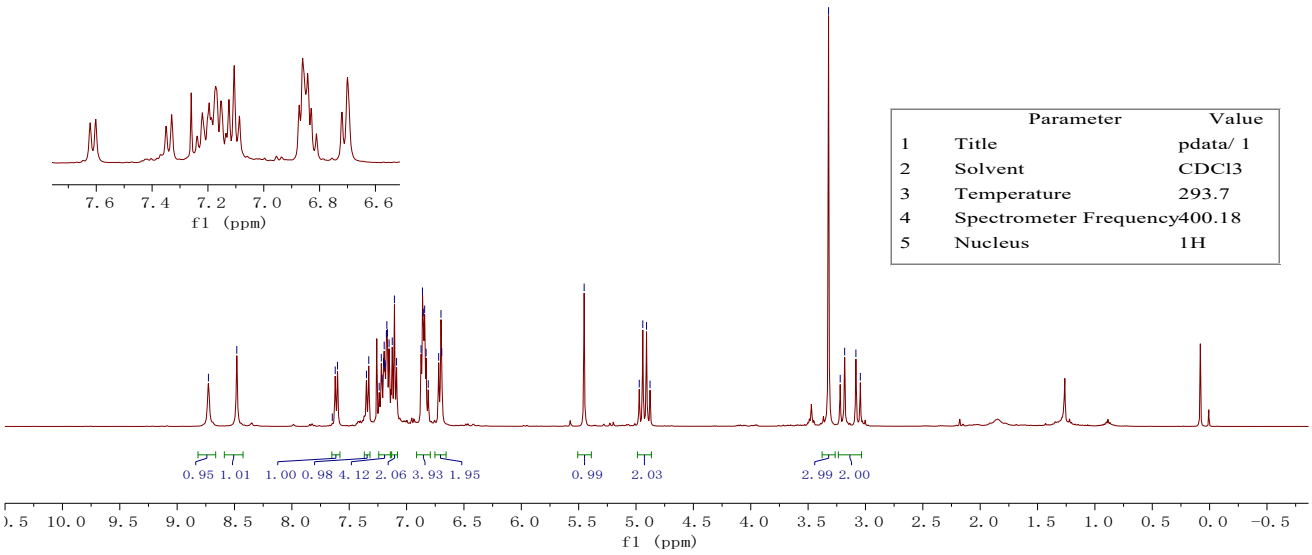

188.78
180.20
161.05
149.72
141.79
141.53
136.63
129.54
128.19
127.94
126.50
125.60
123.19
121.47
121.00
119.49
111.75
110.04
109.59
107.74
104.92
54.18
53.03
50.74
36.00
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.2
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)

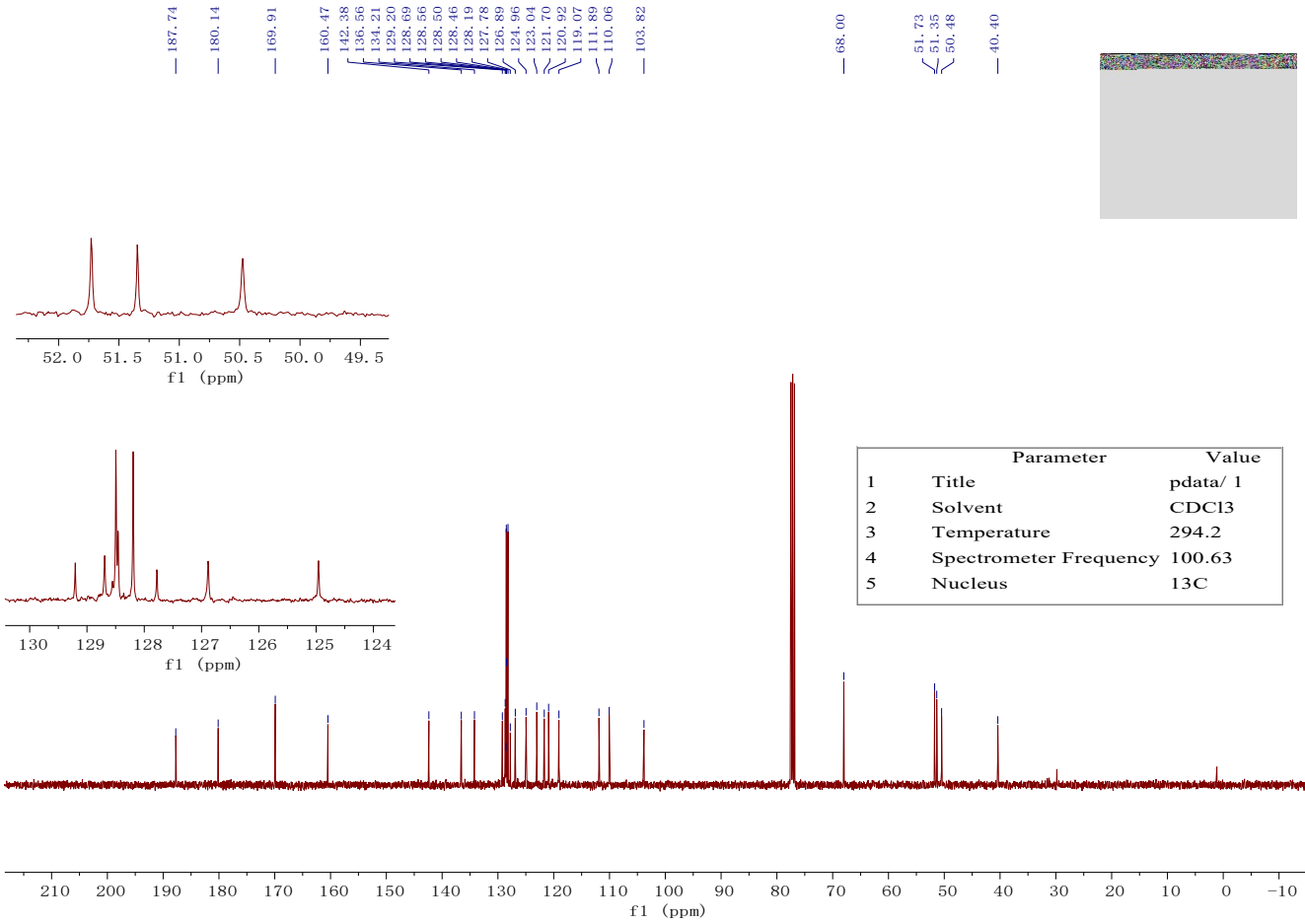

8.57
7.83
7.81
7.66
7.47
7.45
7.31
7.31
7.30
7.29
7.28
7.27
7.24
7.24
7.23
7.22
7.19
7.18
7.17
7.16
7.15
7.15
6.91
6.89
6.89
6.88
6.87
6.85
6.85
6.84
6.84
6.73
6.71
6.65
6.64
6.64
6.63
6.49
6.48
5.66
3.73
3.70
3.56
3.29
3.26
O
CO2Me
S
O
N
H
C24
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.7
4 Spectrometer Frequency 400.18
5 Nucleus 1H
1.00 1.04 1.02 1.08 1.08 0.97 1.03 2.00 1.03 2.00 1.11 1.02 1.00
1.00 3.00 1.06
f1 (ppm)

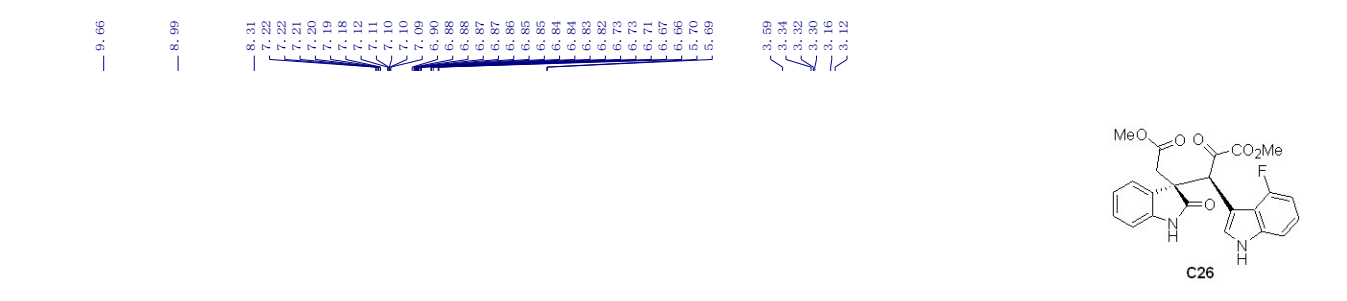

188.93
179.96
161.10
142.32
136.67
136.05
129.35
128.46
127.92
127.36
126.47
126.15
125.65
124.66
123.23
121.62
121.03
119.56
111.80
109.79
104.97
55.51
53.04
51.23
38.06
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.4
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)
f1 (ppm)


8.73
8.48
7.65
7.62
7.60
7.35
7.33
7.24
7.22
7.21
7.20
7.20
7.19
7.19
7.18
7.17
7.17
7.15
7.12
7.11
7.09
6.87
6.86
6.85
6.84
6.83
6.81
6.72
6.70
6.69
5.45
4.97
4.94
4.91
4.88
3.32
3.22
3.18
3.08
3.04
MeO
O
O
O
CO2Bn
O
N
H
N
H

C25

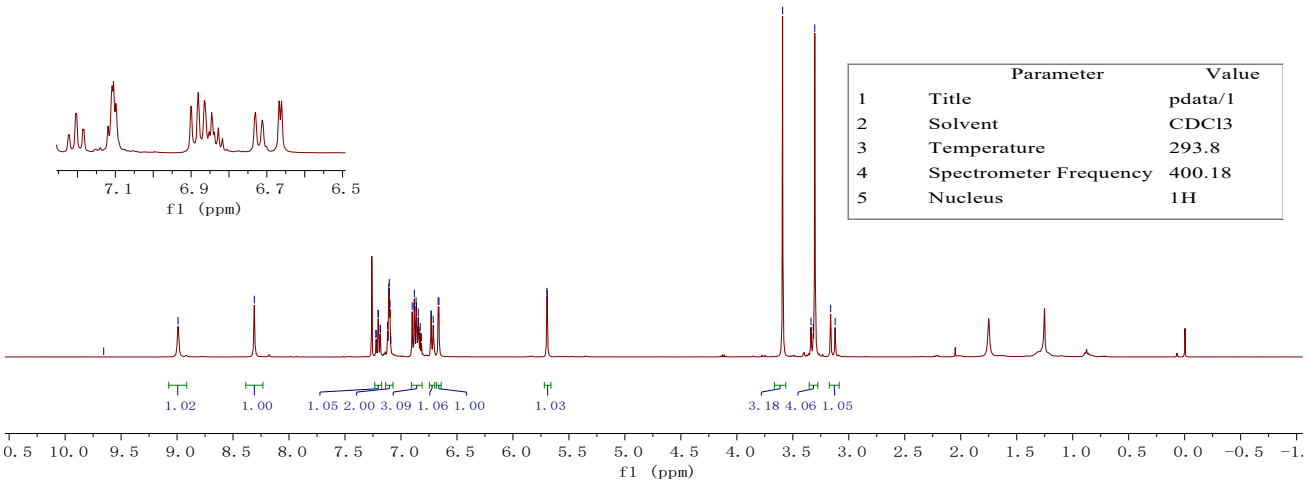

Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.7
4 Spectrometer Frequency 400.18
5 Nucleus 1H
f1 (ppm)
0.95 1.01 1.00 0.98 4.12 2.06 3.93 1.95 0.99 2.03 2.99 2.00
f1 (ppm)

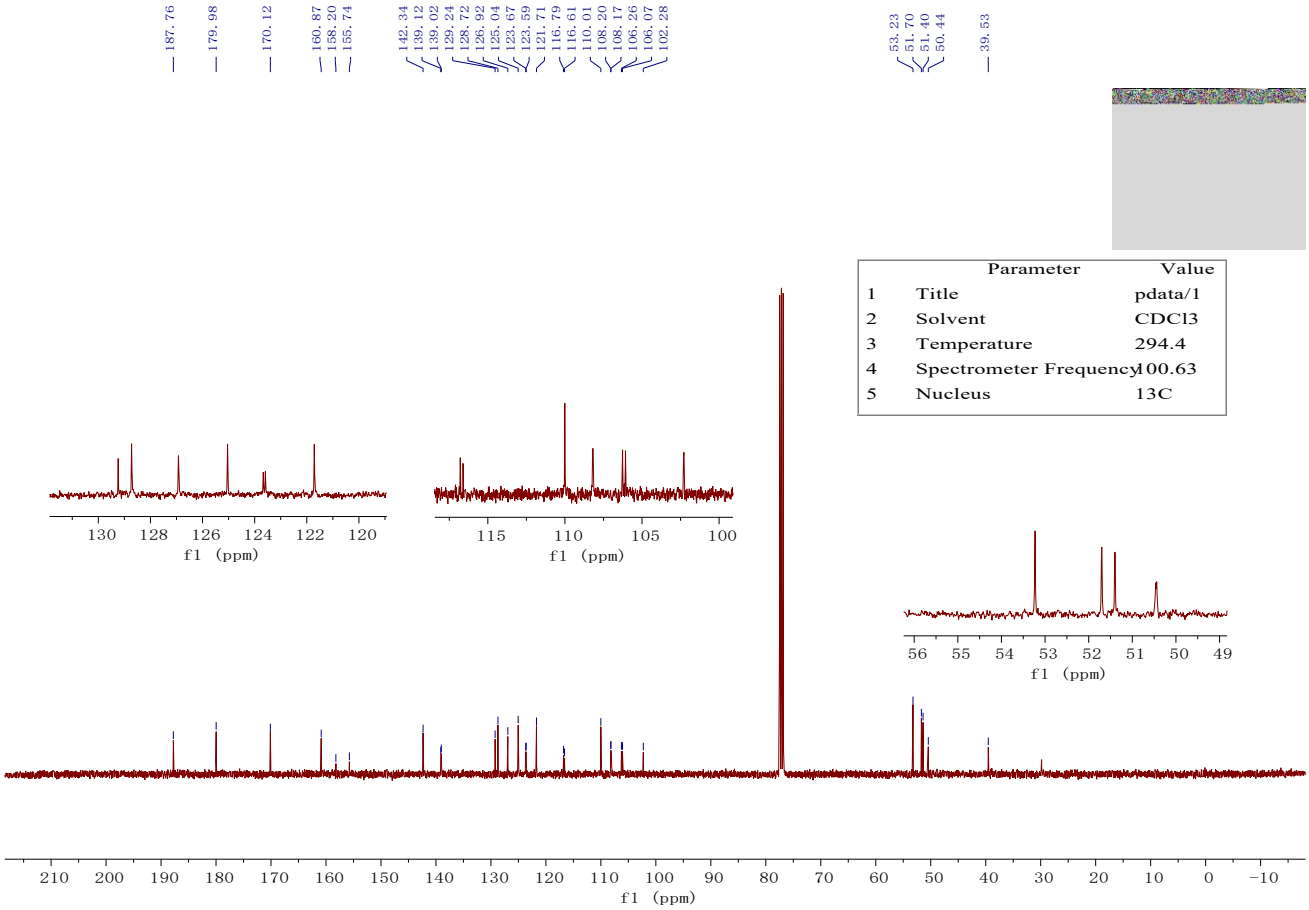

187.74
180.14
169.91
160.47
142.38
136.56
134.21
129.20
128.69
128.56
128.50
128.46
128.19
127.78
126.89
124.96
123.04
121.70
120.92
119.07
111.89
110.06
103.82
68.00
51.73
51.35
50.48
40.40
f1 (ppm)
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.2
4 Spectrometer Frequency 100.63
5 Nucleus 13C

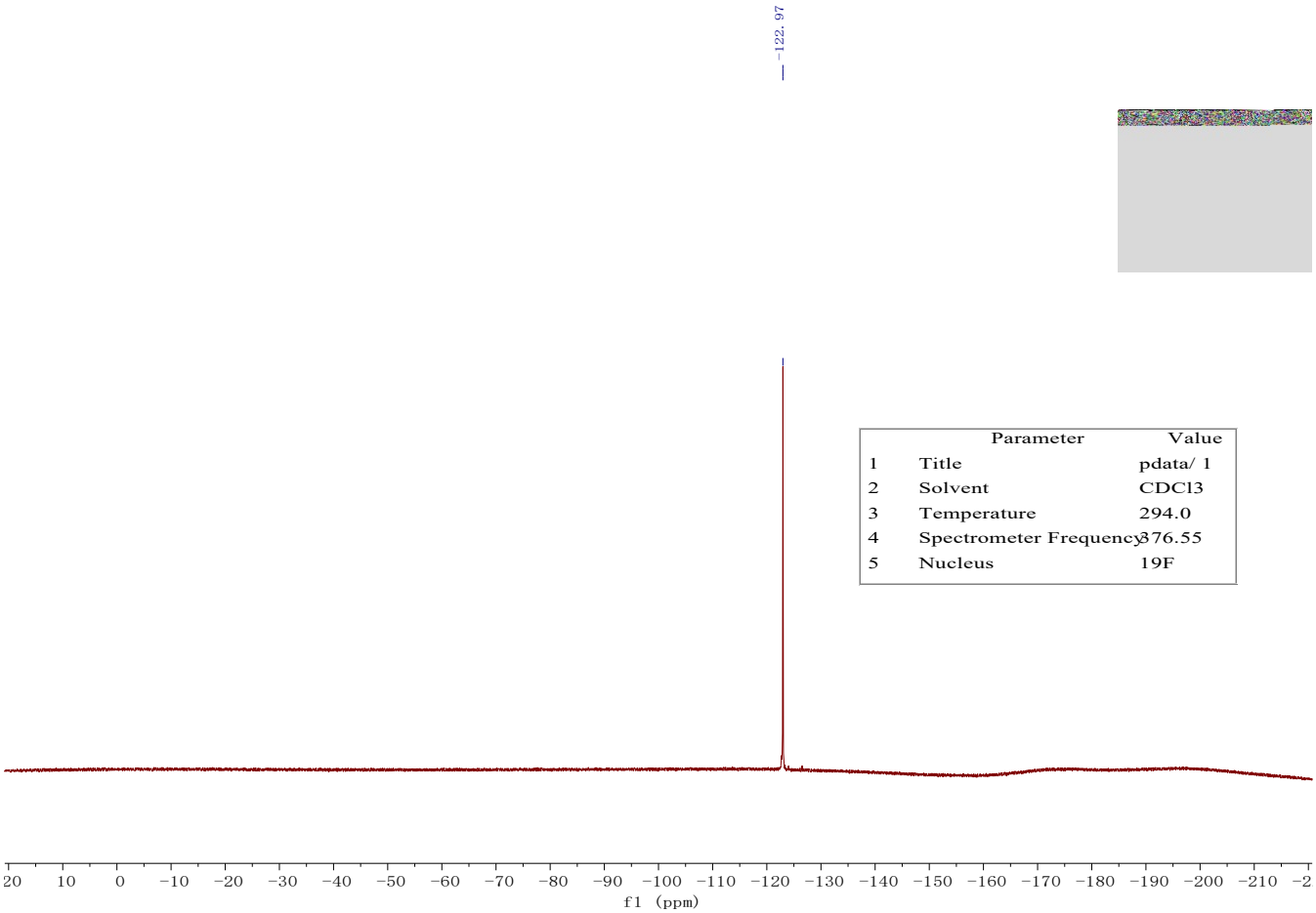

9.66
8.99
8.31
7.22
7.22
7.21
7.20
7.19
7.18
7.12
7.11
7.10
7.10
7.09
6.90
6.88
6.88
6.87
6.87
6.86
6.85
6.85
6.84
6.84
6.83
6.82
6.73
6.73
6.71
6.67
6.66
5.70
5.69
3.59
3.34
3.32
3.30
3.16
3.12
f1 (ppm)

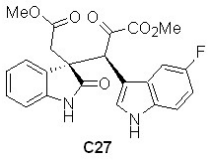
MeO
O
O
CO2Me
F
O
N
H
N
H

C26

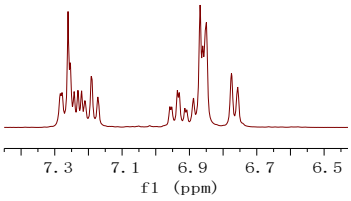

Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 293.8
4 Spectrometer Frequency 400.18
5 Nucleus 1H
1.02
1.00
1.05 2.00 3.09 1.06 1.00
1.03
3.18 4.06 1.05
f1 (ppm)


187.76
179.98
170.12
160.87
158.20
155.74
142.34
139.12
139.02
129.24
128.72
126.92
125.04
123.67
123.59
121.71
116.79
116.61
110.01
108.20
108.17
106.26
106.07
102.28
53.23
51.70
51.40
50.44
39.53
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.4
4 Spectrometer Frequency100.63
5 Nucleus 13C
f1 (ppm)

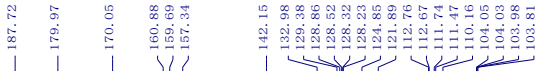

-122.97
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.0
4 Spectrometer Frequency376.55
5 Nucleus 19F
f1 (ppm)

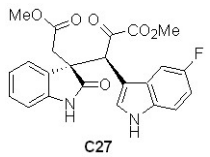


C27

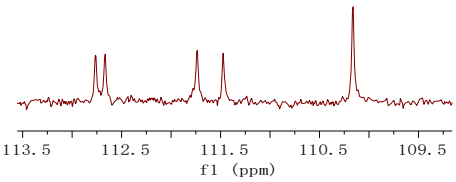


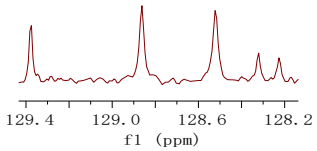
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	294.7
4	Spectrometer Frequency	400.18
5	Nucleus	1H

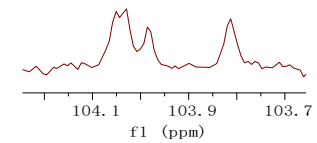


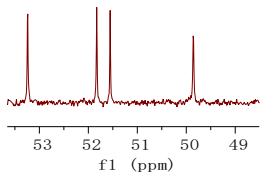


C27



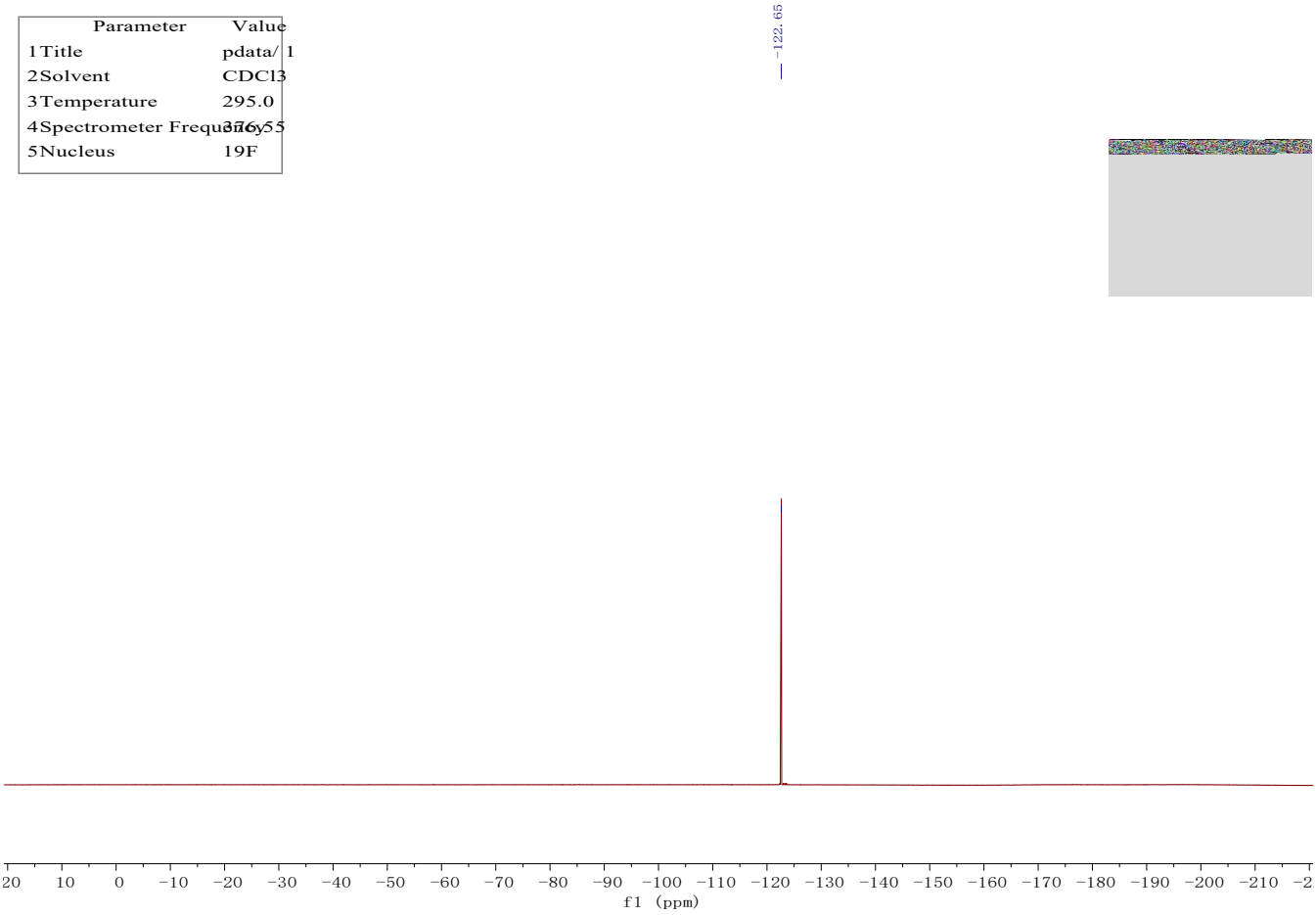


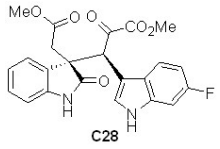




	Parameter	Value
1	Title	pdata/1
2	Solvent	CDCl3
3	Temperature	295.4
4	Spectrometer Frequency	100.63
5	Nucleus	13C

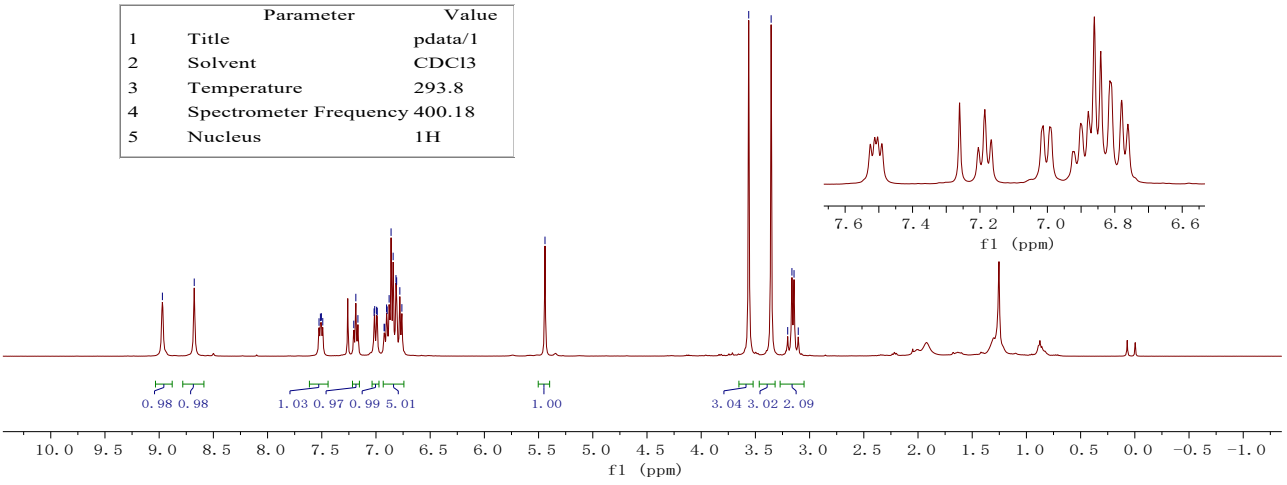
Parameter	Value
1 Title	pdata/ 1
2 Solvent	CDCl3
3 Temperature	295.0
4 Spectrometer Frequency	376.55
5 Nucleus	19F

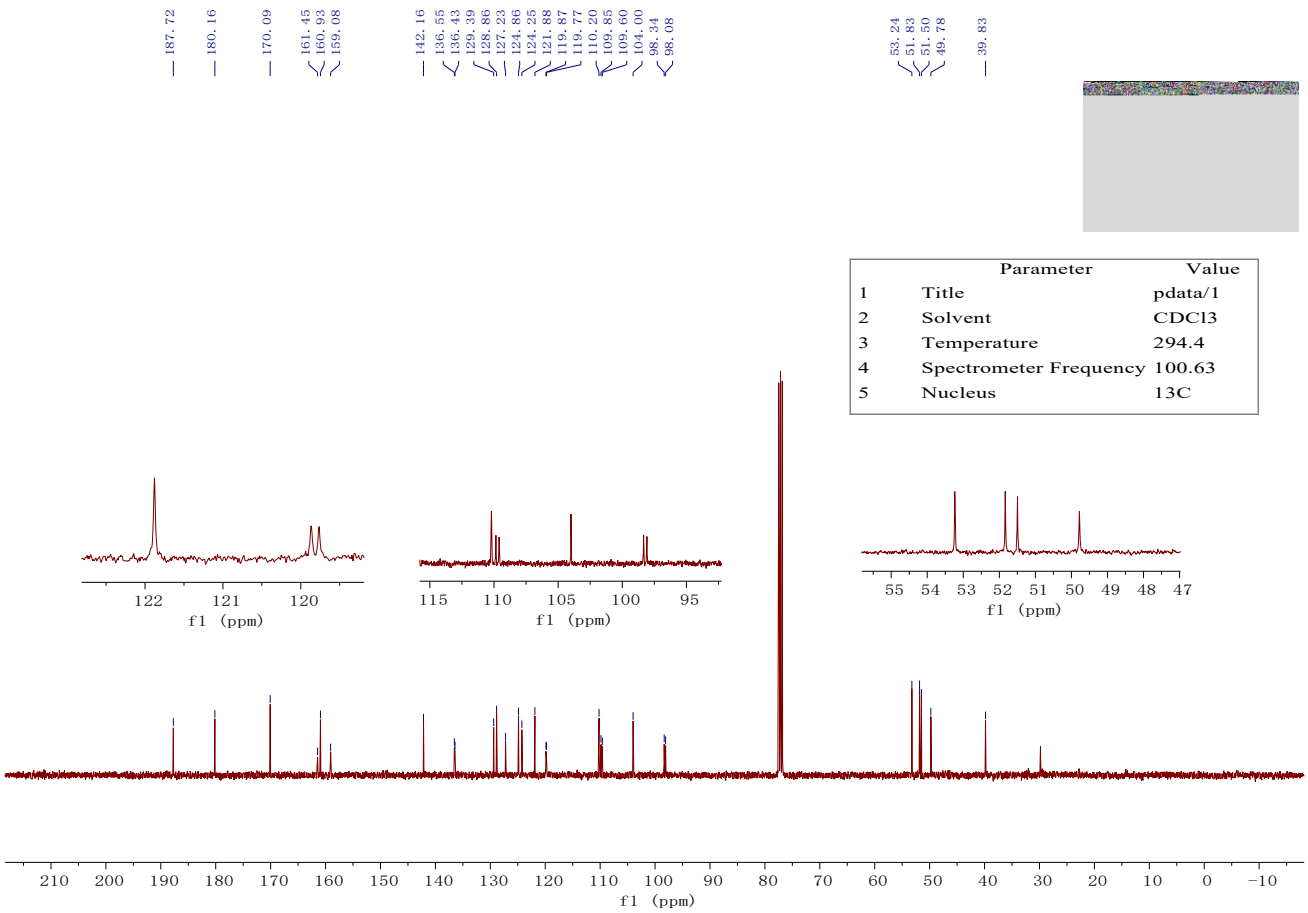


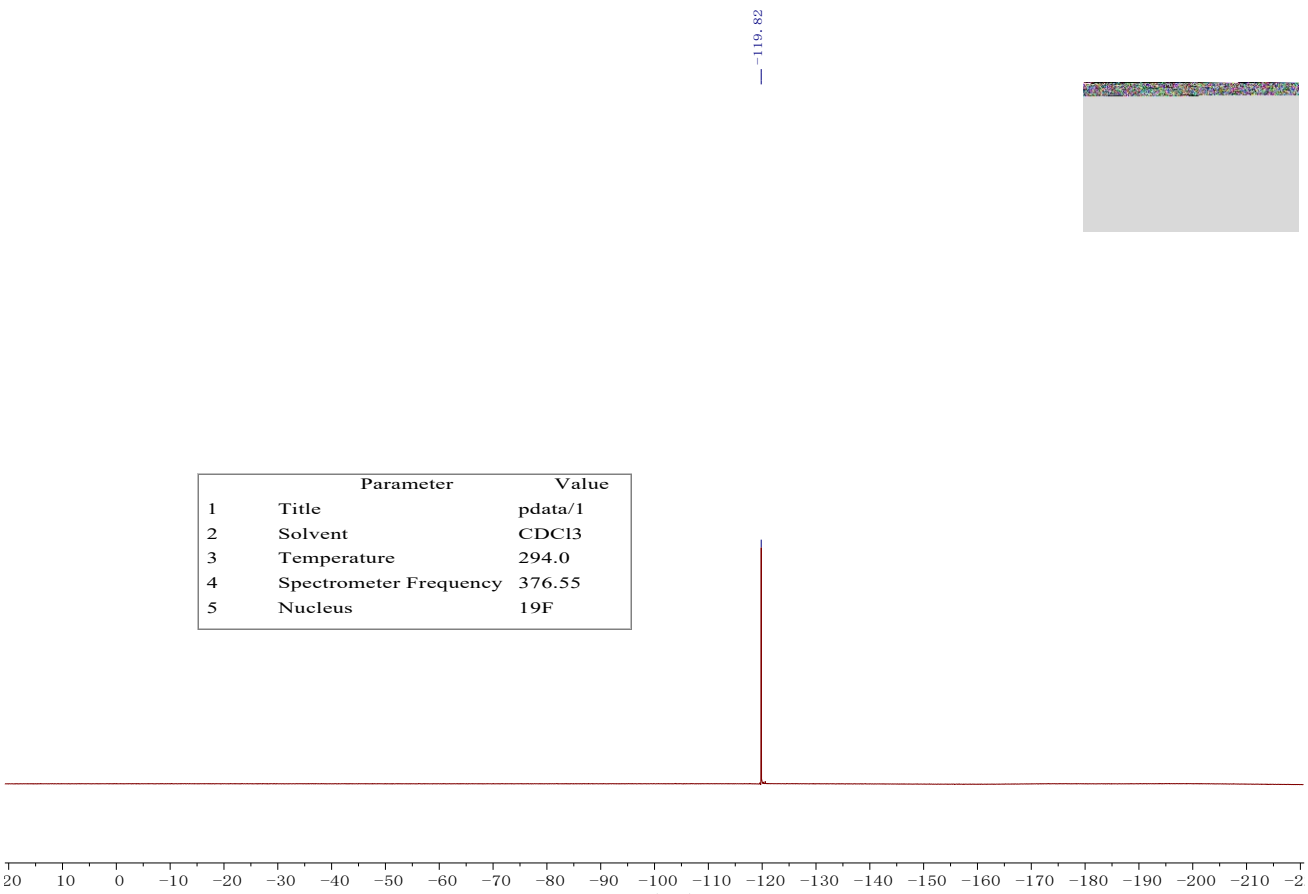


C28

	Parameter	Value
1	Title	pdata/1
2	Solvent	CDCl3
3	Temperature	293.8
4	Spectrometer Frequency	400.18
5	Nucleus	1H




187.72
180.16
170.09
161.45
160.93
159.08
142.16
136.55
136.43
129.39
128.86
127.23
124.86
124.25
121.88
119.87
119.77
110.20
109.85
109.60
104.00
98.34
98.08
53.24
51.83
51.50
49.78
39.83
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.4
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)


-119.82
Parameter Value
1 Title pdata/1
2 Solvent CDCl3
3 Temperature 294.0
4 Spectrometer Frequency 376.55
5 Nucleus 19F
f1 (ppm)


9.30
9.29
8.44
7.23
7.23
7.21
7.21
7.19
7.19
7.17
7.17
7.16
7.15
7.15
7.14
7.14
7.13
7.07
7.06
7.04
6.90
6.88
6.88
6.88
6.86
6.86
6.84
6.84
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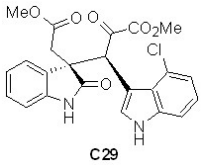
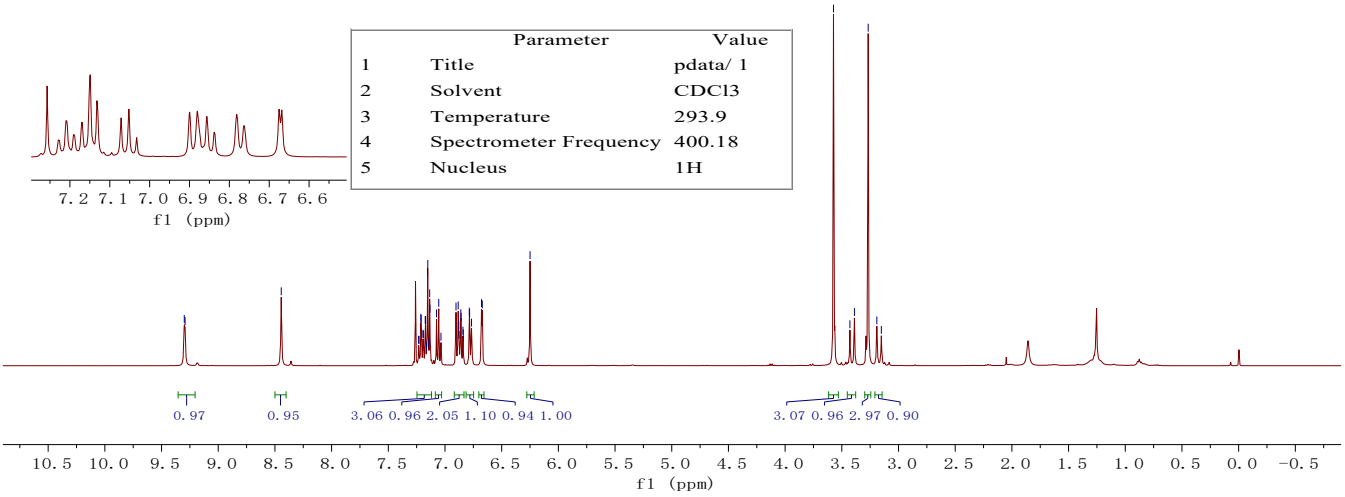
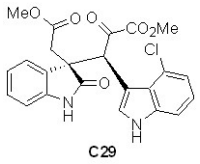
3.57
3.43
3.39
3.27
3.19
3.15


MeO
O
O
O
CO2Me
Cl
N
H
O
N
H

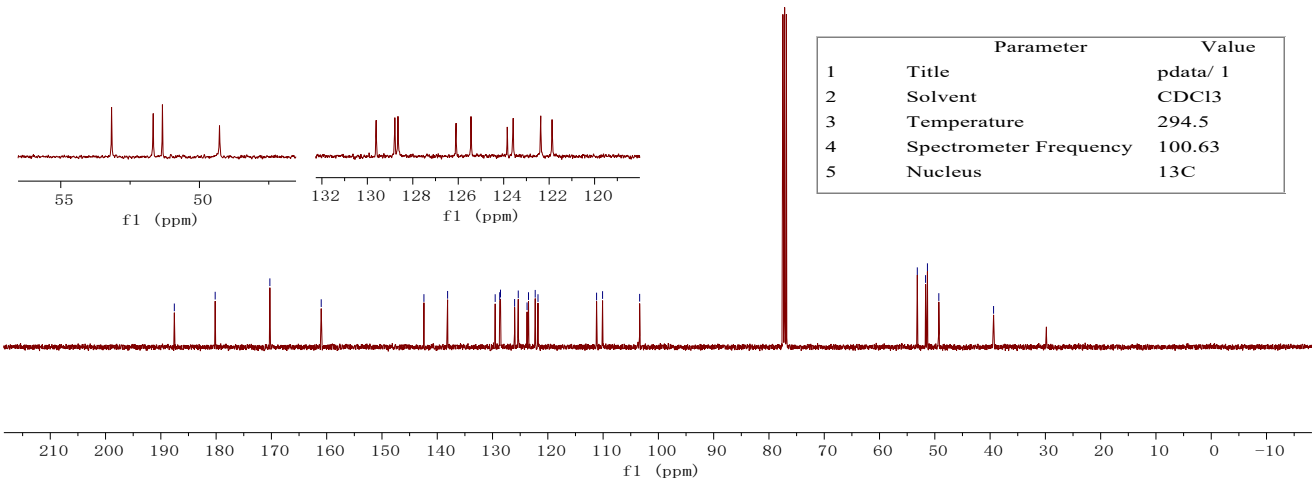
C29

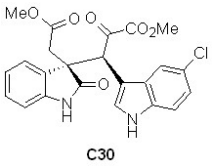

Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.9
4 Spectrometer Frequency 400.18
5 Nucleus 1H
7.2 7.1 7.0 6.9 6.8 6.7 6.6
f1 (ppm)
0.97
0.95
3.06 0.96 2.05 1.10 0.94 1.00
3.07 0.96 2.97 0.90
10.5 10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5
f1 (ppm)


187.56
180.17
170.28
160.99
142.41
138.13
129.52
128.70
128.56
126.01
125.35
123.76
123.50
122.28
121.78
111.18
110.10
103.39
53.17
51.67
51.33
49.28
39.37


MeO
O
O
O
CO2Me
Cl
N
H
O
N
H

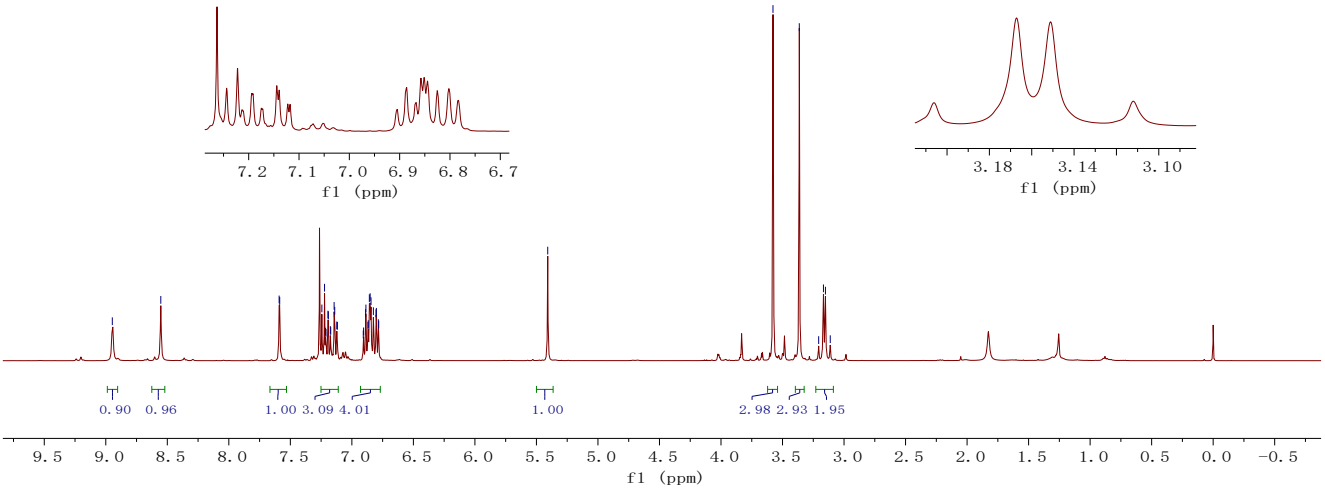
C29

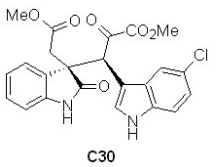

Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.5
4 Spectrometer Frequency 100.63
5 Nucleus 13C
55 50
f1 (ppm)
132 130 128 126 124 122 120
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)



C30

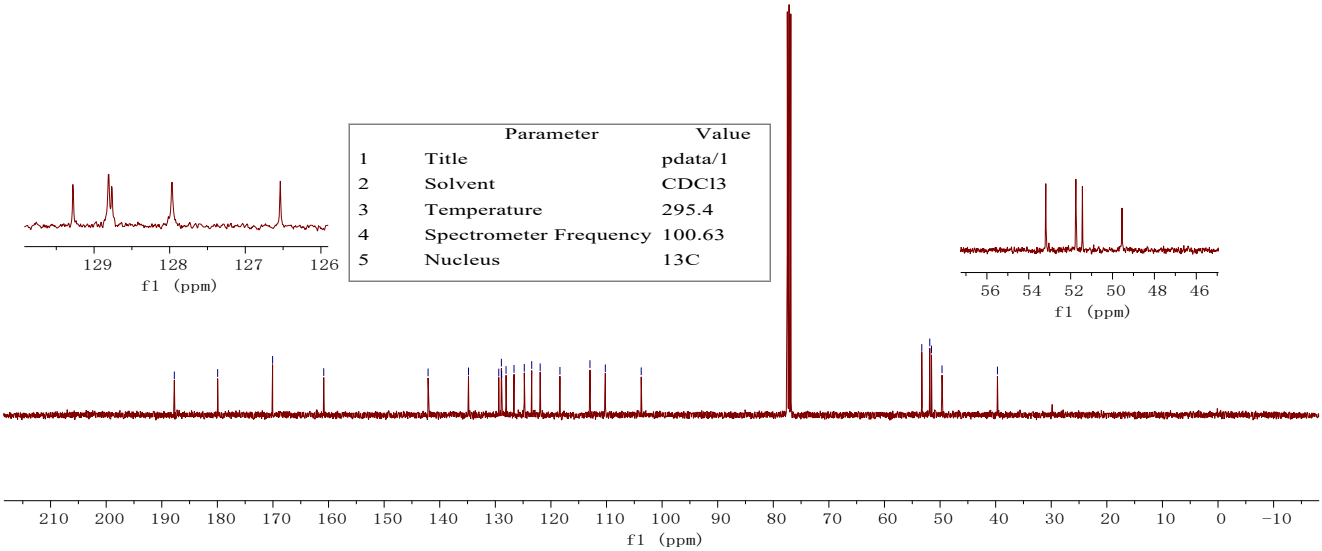
	Parameter	Value
1	Title	pdata/1
2	Solvent	CDCl3
3	Temperature	294.7
4	Spectrometer Frequency	400.18
5	Nucleus	1H



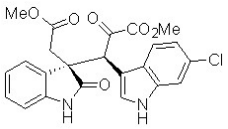


C30

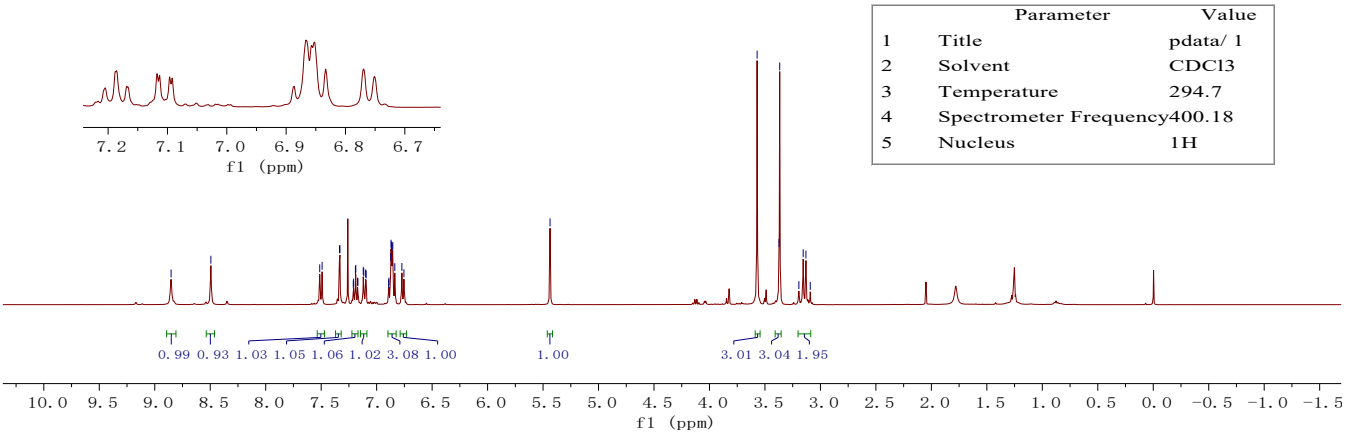
	Parameter	Value
1	Title	pdata/1
2	Solvent	CDCl3
3	Temperature	295.4
4	Spectrometer Frequency	100.63
5	Nucleus	13C



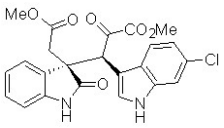

8.85
8.49
7.51
7.49
7.33
7.21
7.19
7.17
7.12
7.10
7.09
6.89
6.87
6.86
6.85
6.84
6.77
6.75
5.44
3.57
3.37
3.19
3.16
3.13
3.09


MeO
O
O
CO2Me
Cl
O
N
H
N
H

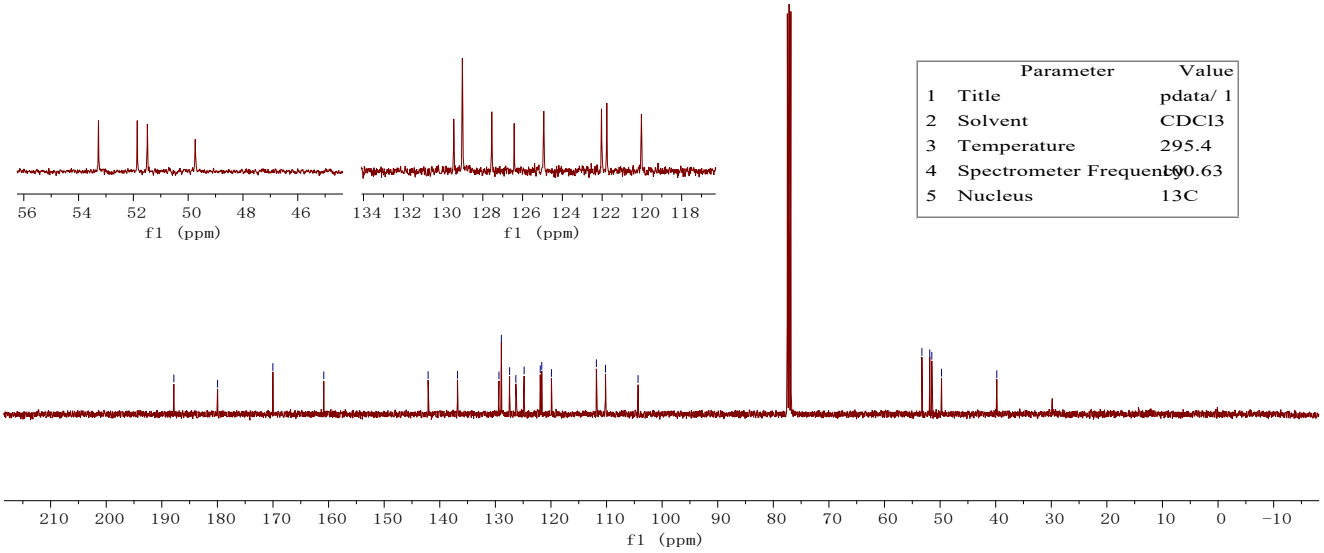
C31

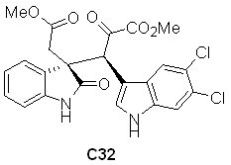

Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.7
4 Spectrometer Frequency 400.18
5 Nucleus 1H
7.2 7.1 7.0 6.9 6.8 6.7
f1 (ppm)
0.99 0.93 1.03 1.05 1.06 1.02 3.08 1.00
1.00
3.01 3.04 1.95
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0 −1.5
f1 (ppm)


187.84
179.97
170.02
160.87
142.10
136.81
129.35
128.92
127.44
126.32
124.83
121.92
121.66
119.92
111.83
110.19
104.33
53.27
51.86
51.49
49.74
39.80

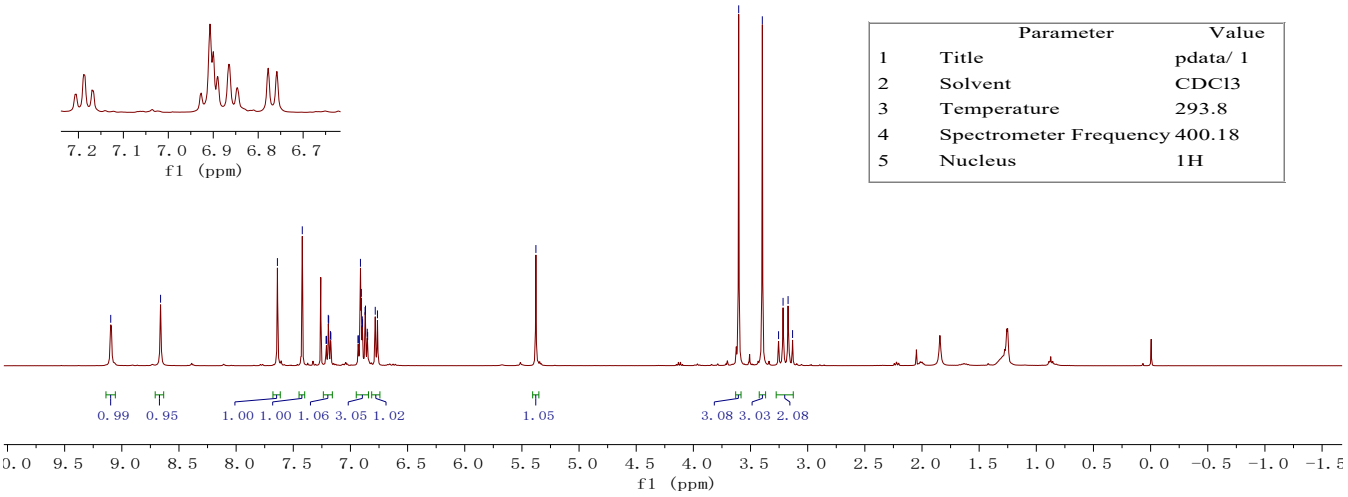

MeO
O
O
CO2Me
Cl
O
N
H
N
H

C31

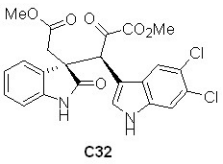

Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.4
4 Spectrometer Frequency 100.63
5 Nucleus 13C
56 54 52 50 48 46
f1 (ppm)
134 132 130 128 126 124 122 120 118
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)



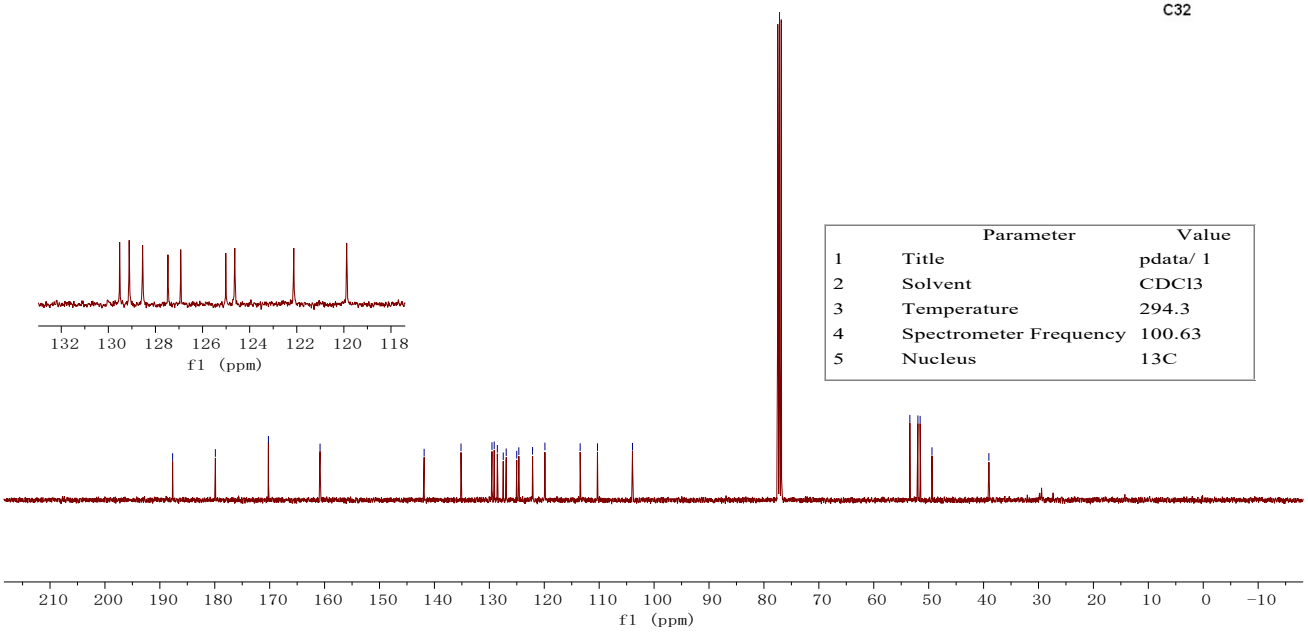
C32



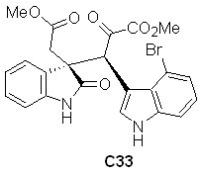
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	293.8
4	Spectrometer Frequency	400.18
5	Nucleus	1H



C32

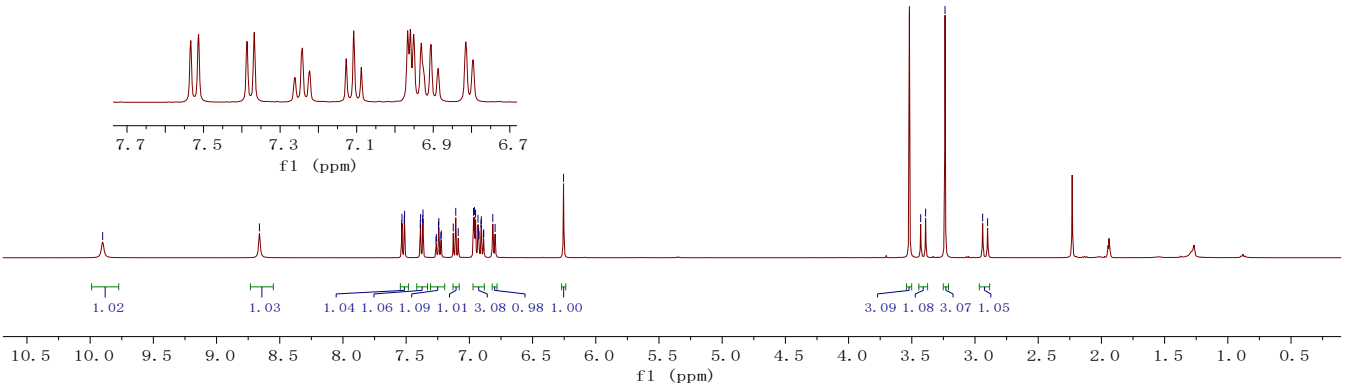


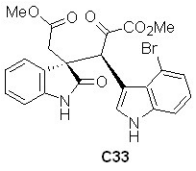
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	294.3
4	Spectrometer Frequency	100.63
5	Nucleus	13C



C33

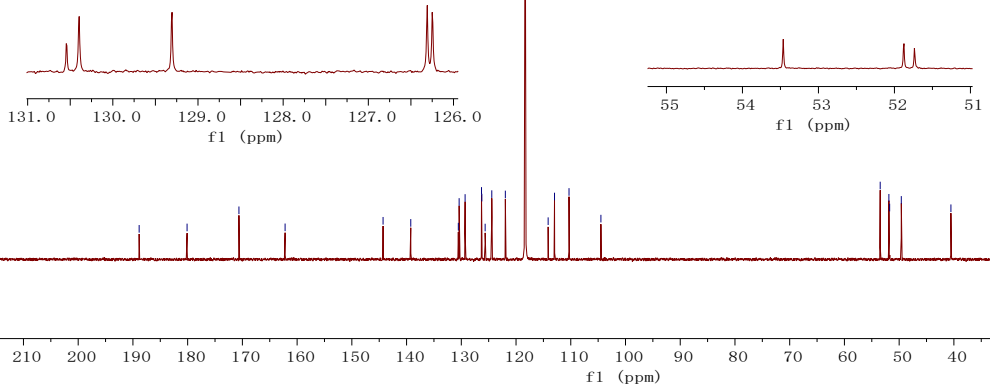
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CD3CN
3	Temperature	293.8
4	Spectrometer Frequency	400.18
5	Nucleus	1H

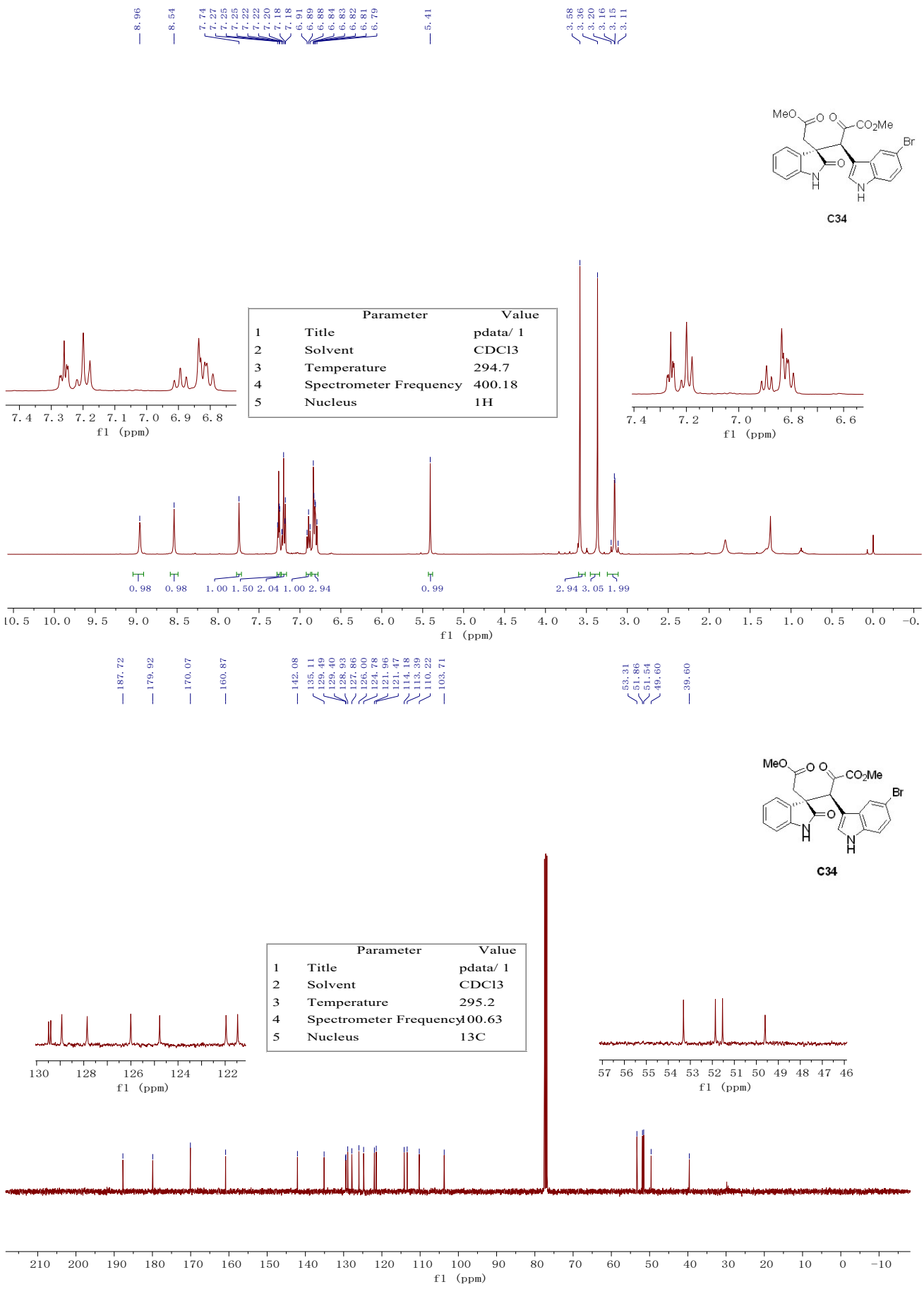


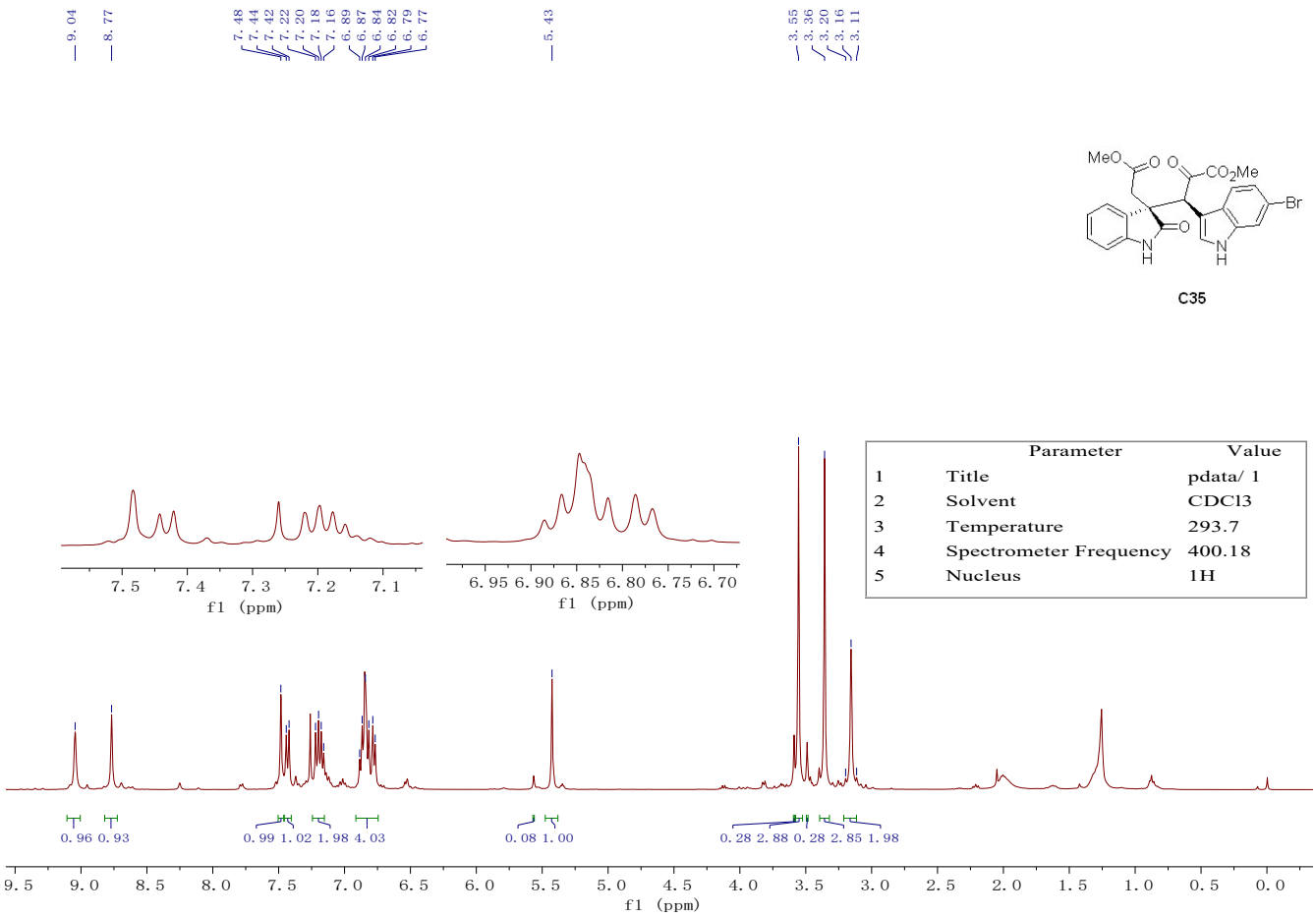


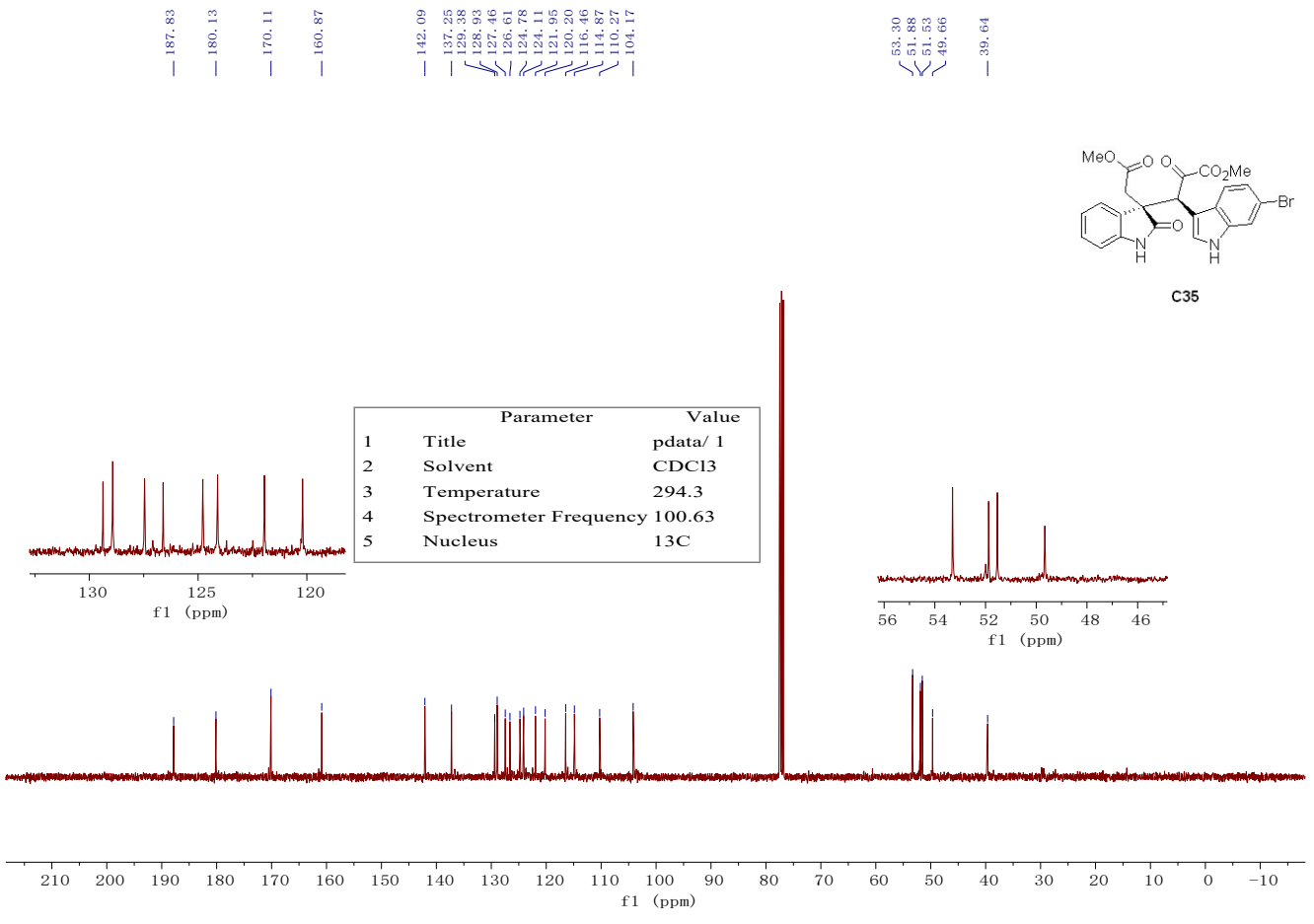
C33

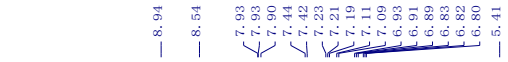
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CD3CN
3	Temperature	294.2
4	Spectrometer Frequency	100.63
5	Nucleus	13C



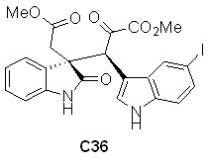

8.96
8.54
7.74
7.27
7.25
7.22
7.20
7.18
6.91
6.89
6.88
6.84
6.83
6.82
6.81
6.79
5.41
3.58
3.36
3.20
3.16
3.15
3.11
MeO
CO2Me
Br
C34
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.7
4 Spectrometer Frequency 400.18
5 Nucleus 1H
0.98 0.98 1.00 1.50 2.04 1.00 2.94 0.99 2.94 3.05 1.99
f1 (ppm)
187.72
179.92
170.07
160.87
142.08
135.11
129.49
129.40
128.93
127.86
126.00
124.78
121.96
121.47
114.18
113.39
110.22
103.71
53.31
51.86
51.54
49.60
39.60
MeO
CO2Me
Br
C34
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.2
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)


9.04
8.77
7.48
7.44
7.42
7.22
7.20
7.18
7.16
6.89
6.87
6.84
6.82
6.79
6.77
5.43
3.55
3.36
3.20
3.16
3.11
MeO
CO2Me
Br
N
H
C35
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.7
4 Spectrometer Frequency 400.18
5 Nucleus 1H
f1 (ppm)
0.96 0.93
0.99 1.02 1.98 4.03
0.08 1.00
0.28 2.88 0.28 2.85 1.98

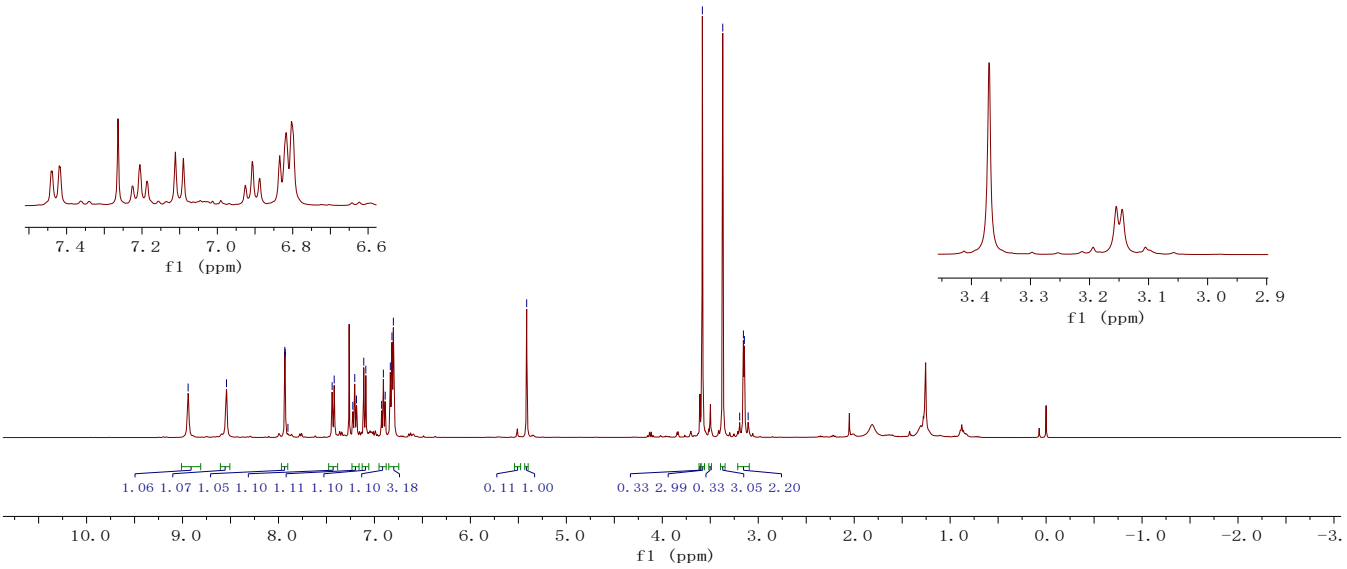

187.83
180.13
170.11
160.87
142.09
137.25
129.38
128.93
127.46
126.61
124.78
124.11
121.95
120.20
116.46
114.87
110.27
104.17
53.30
51.88
51.53
49.66
39.64
MeO
CO2Me
Br
N
H
C35
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.3
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)

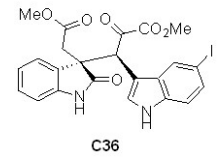


	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	294.7
4	Spectrometer Frequency	400.18
5	Nucleus	1H



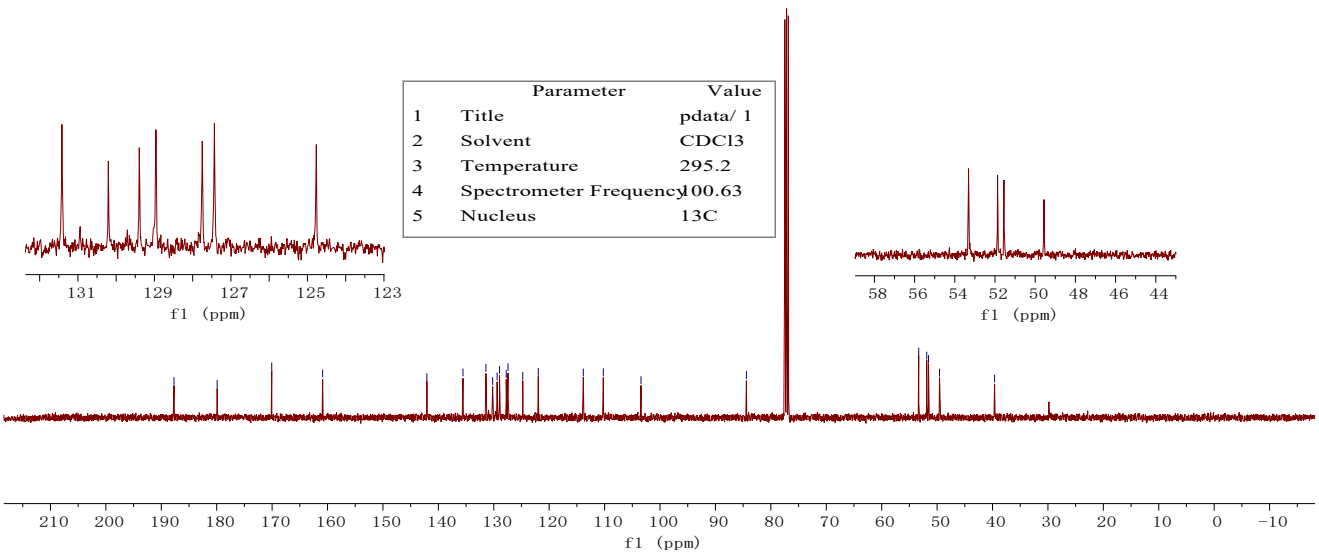
C36

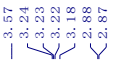


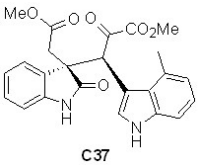


C36

	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	295.2
4	Spectrometer Frequency	100.63
5	Nucleus	13C

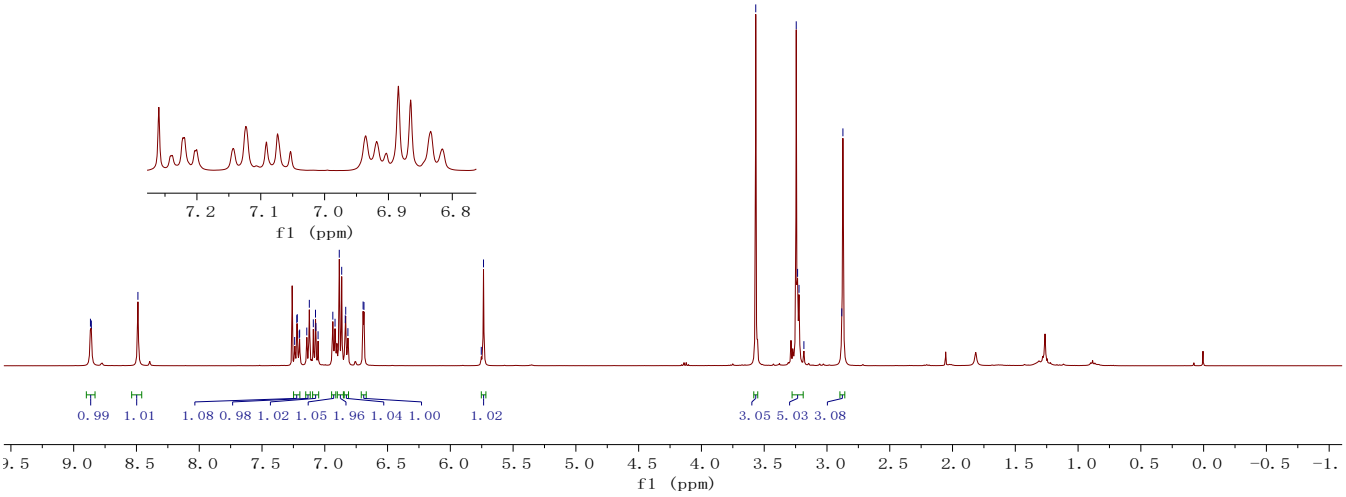


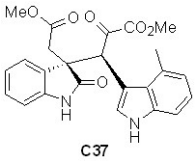




C37

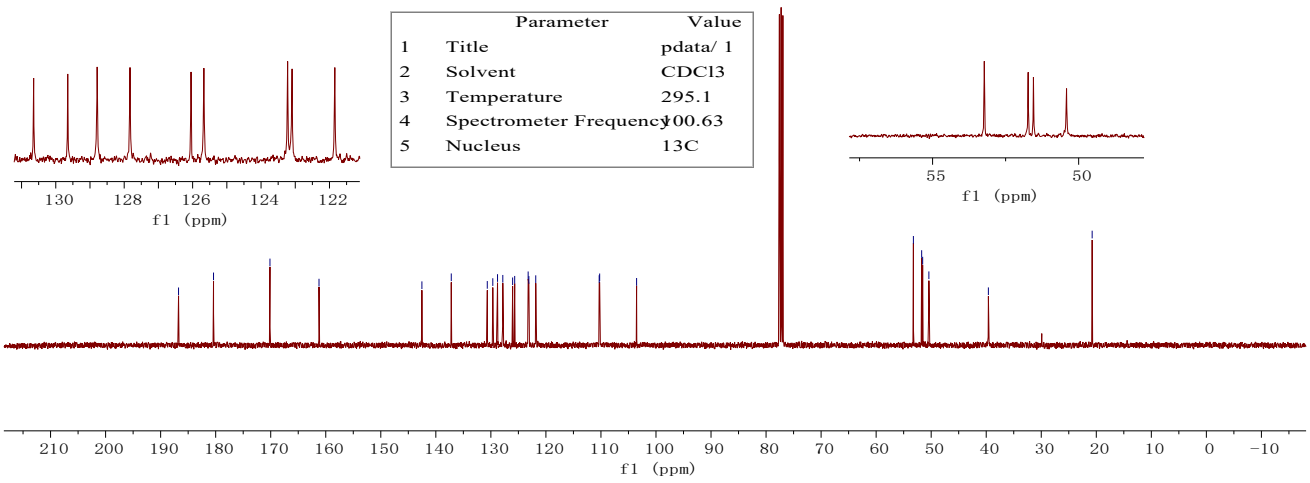
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	294.7
4	Spectrometer Frequency	400.18
5	Nucleus	1H

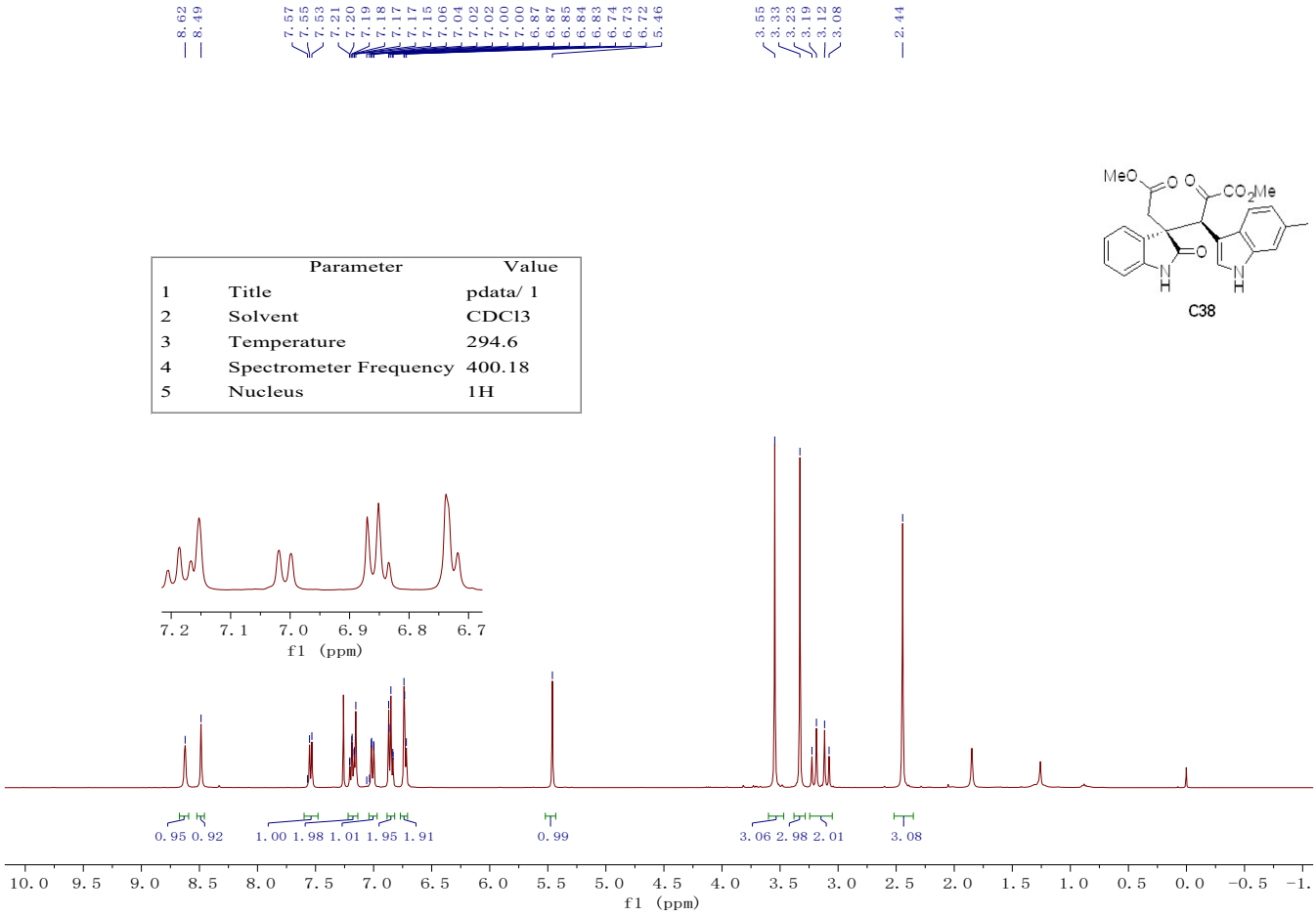


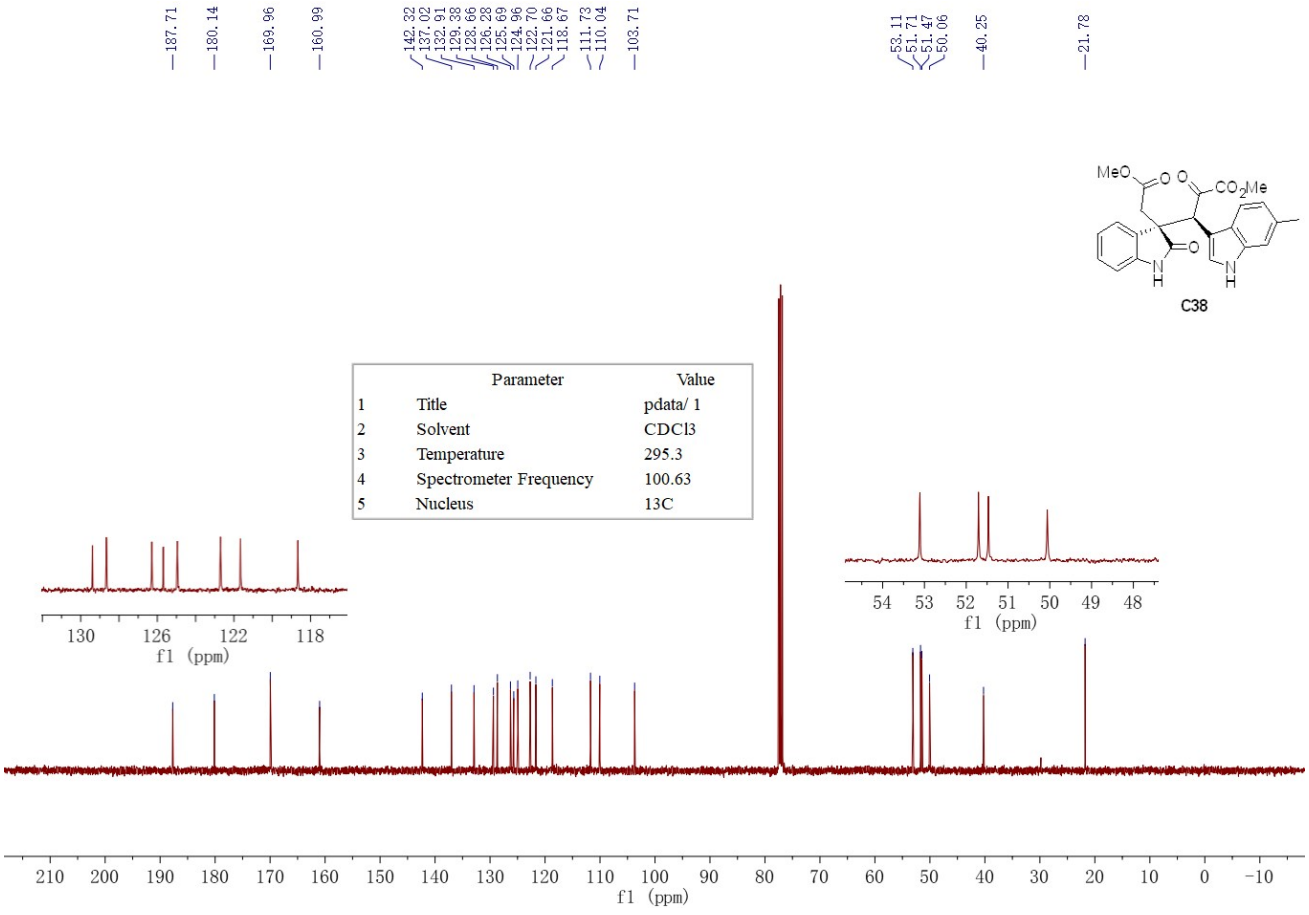


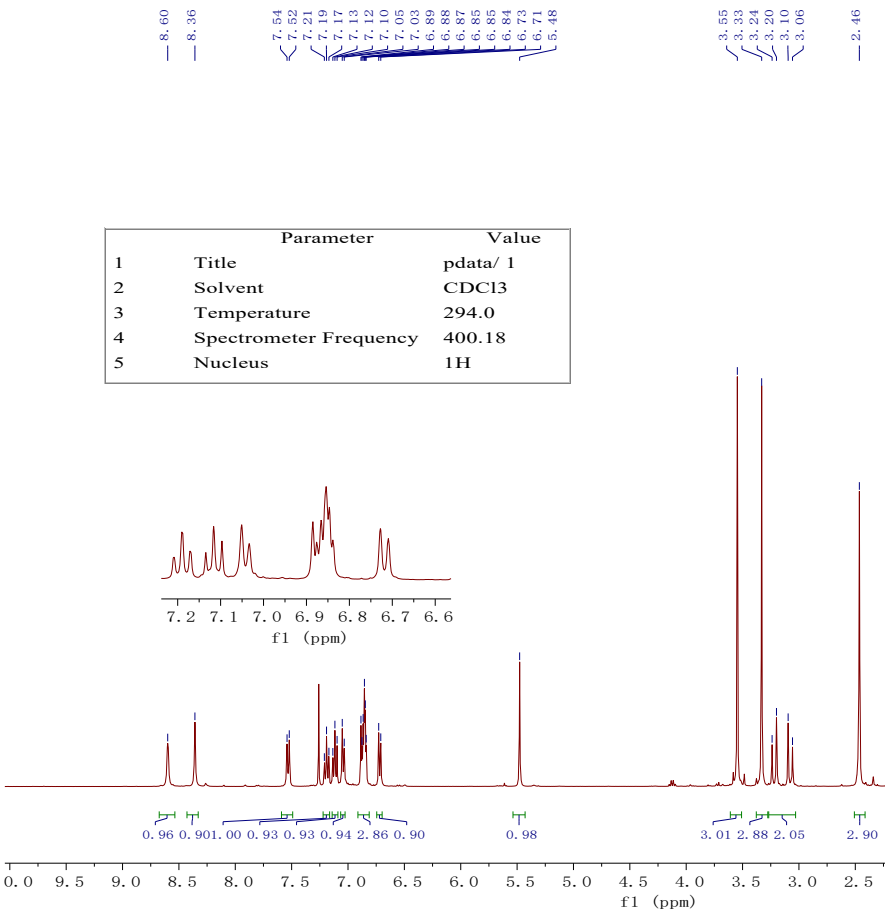
C37

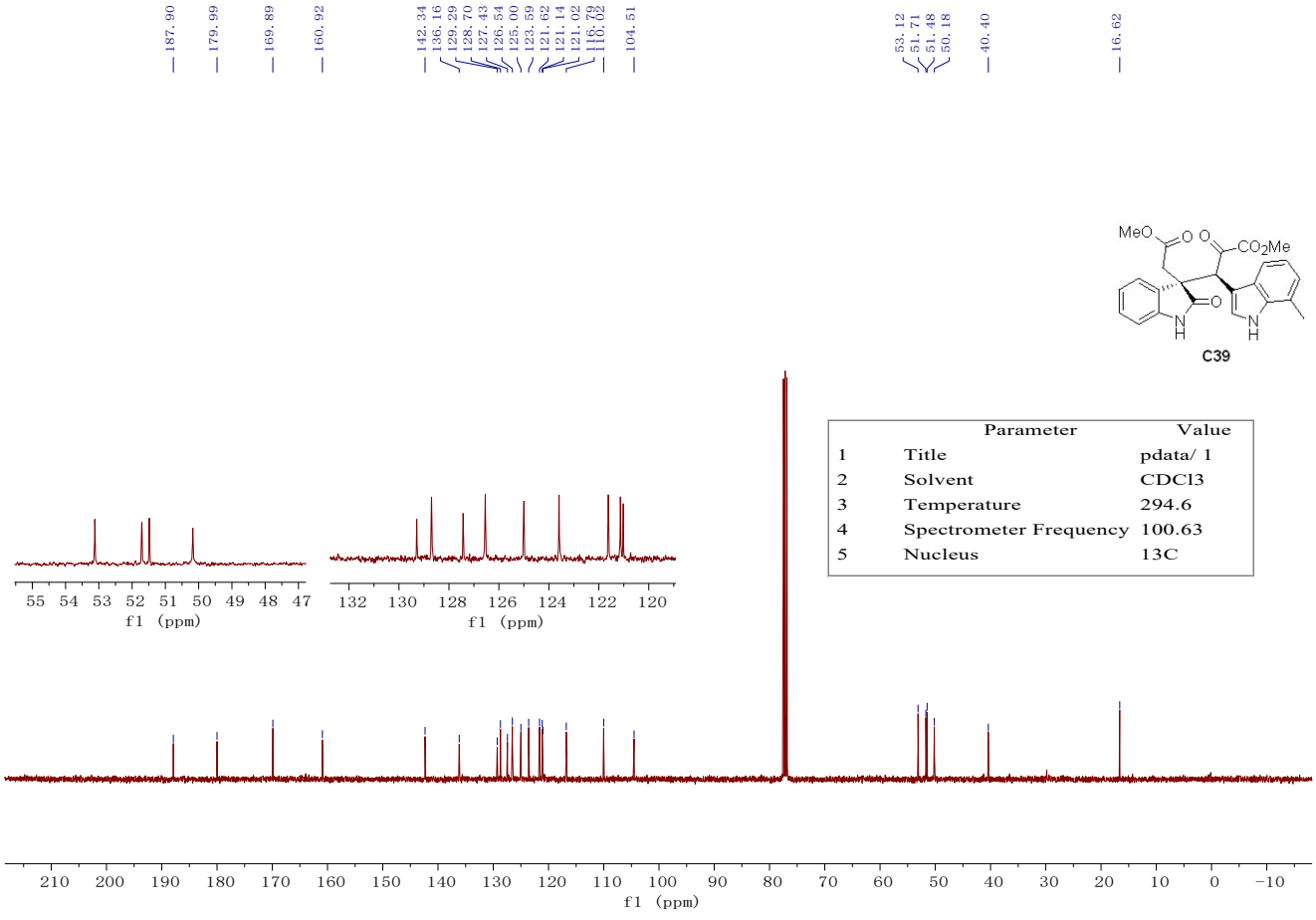
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	295.1
4	Spectrometer Frequency	100.63
5	Nucleus	13C



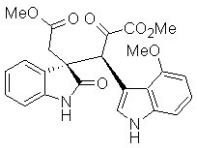

8.62
8.49
7.57
7.55
7.53
7.21
7.20
7.19
7.18
7.17
7.17
7.15
7.06
7.04
7.02
7.02
7.00
7.00
6.87
6.87
6.85
6.84
6.83
6.74
6.73
6.72
5.46
3.55
3.33
3.23
3.19
3.12
3.08
2.44
MeO
CO2Me
C38
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.6
4 Spectrometer Frequency 400.18
5 Nucleus 1H
f1 (ppm)
0.95 0.92
1.00 1.98 1.01 1.95 1.91
0.99
3.06 2.98 2.01
3.08


187.71
180.14
169.96
160.99
142.32
137.02
132.91
129.38
128.66
126.28
125.69
124.96
122.70
121.66
118.67
111.73
110.04
103.71
53.11
51.71
51.47
50.06
40.25
21.78
MeO
CO2Me
C38
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 295.3
4 Spectrometer Frequency 100.63
5 Nucleus 13C
f1 (ppm)
f1 (ppm)
f1 (ppm)

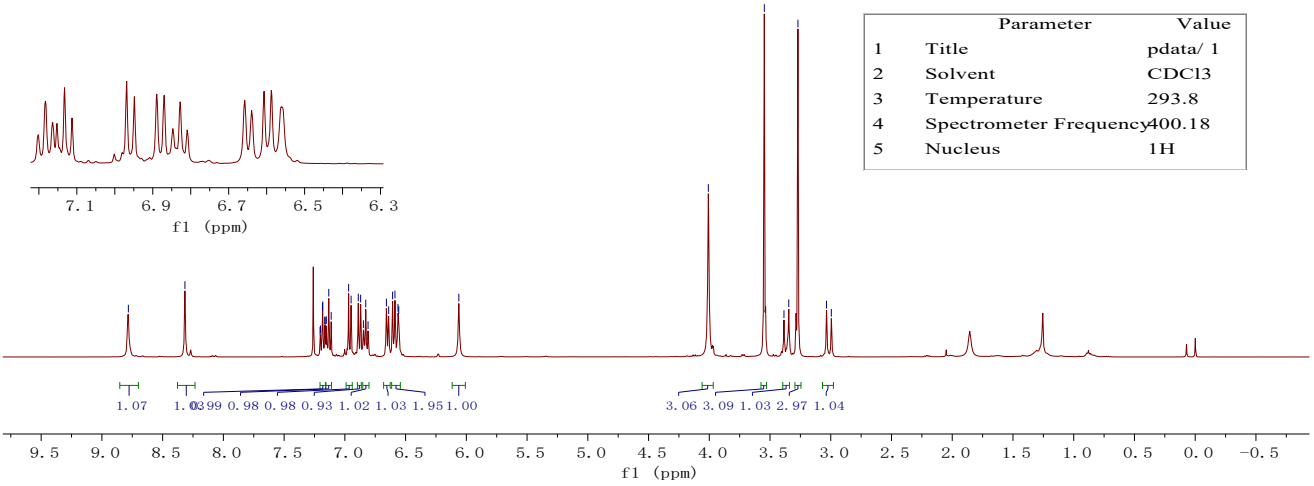

8.60
8.36
7.54
7.52
7.21
7.19
7.17
7.13
7.12
7.10
7.05
7.03
6.89
6.88
6.87
6.85
6.85
6.84
6.73
6.71
5.48
3.55
3.33
3.24
3.20
3.10
3.06
2.46
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.0
4 Spectrometer Frequency 400.18
5 Nucleus 1H
MeO
CO2Me
C39
7.2 7.1 7.0 6.9 6.8 6.7 6.6
f1 (ppm)
0.96 0.90 1.00 0.93 0.93 0.94 2.86 0.90
0.98
3.01 2.88 2.05
2.90
f1 (ppm)

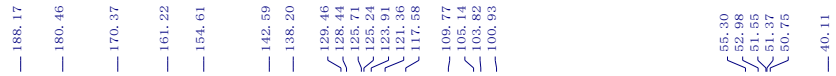

187.90
179.99
169.89
160.92
142.34
136.16
129.29
128.70
127.43
126.54
125.00
123.59
121.62
121.14
121.02
116.72
110.62
104.51
53.12
51.71
51.48
50.18
40.40
16.62
MeO
CO2Me
C39
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.6
4 Spectrometer Frequency 100.63
5 Nucleus 13C
55 54 53 52 51 50 49 48 47
f1 (ppm)
132 130 128 126 124 122 120
f1 (ppm)
f1 (ppm)


8.78
8.32
7.20
7.20
7.18
7.18
7.17
7.16
7.15
7.13
7.11
6.97
6.95
6.89
6.87
6.85
6.83
6.81
6.66
6.64
6.61
6.59
6.56
6.56
6.06
4.01
3.55
3.39
3.35
3.27
3.04
3.00


MeO
CO2Me
MeO
O
O
O
O
N
H
N
H

C40


Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.8
4 Spectrometer Frequency 400.18
5 Nucleus 1H
7.1 6.9 6.7 6.5 6.3
f1 (ppm)
1.07 1.03 0.99 0.98 0.98 0.93 1.02 1.03 1.95 1.00
3.06 3.09 1.03 2.97 1.04
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5
f1 (ppm)


188.17
180.46
170.37
161.22
154.61
142.59
138.20
129.46
128.44
125.71
125.24
123.91
121.36
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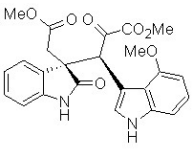
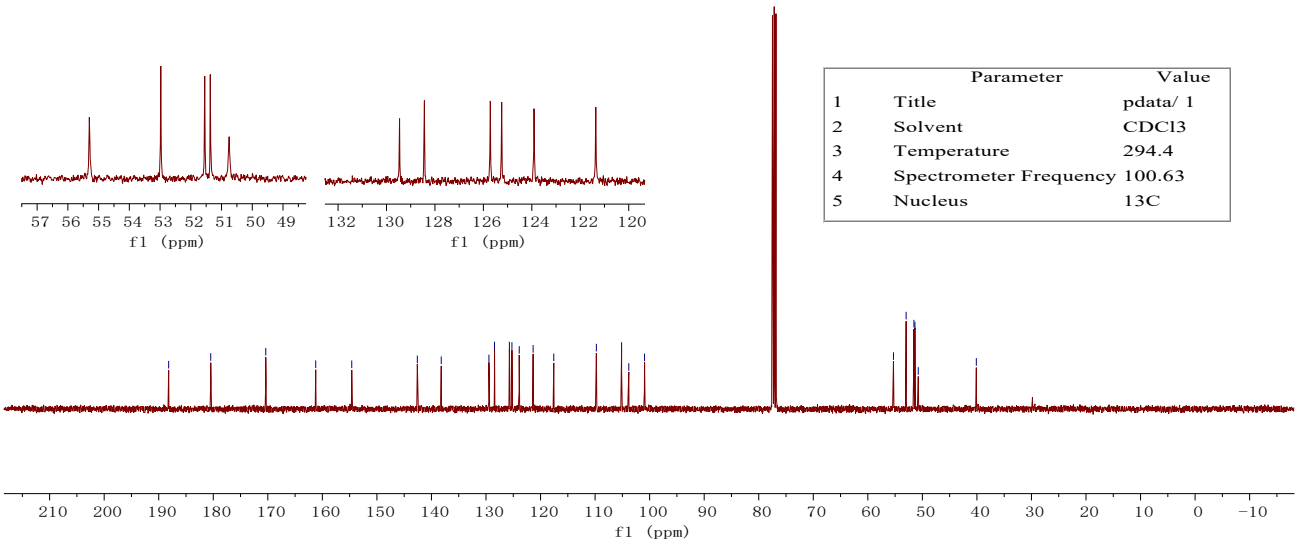
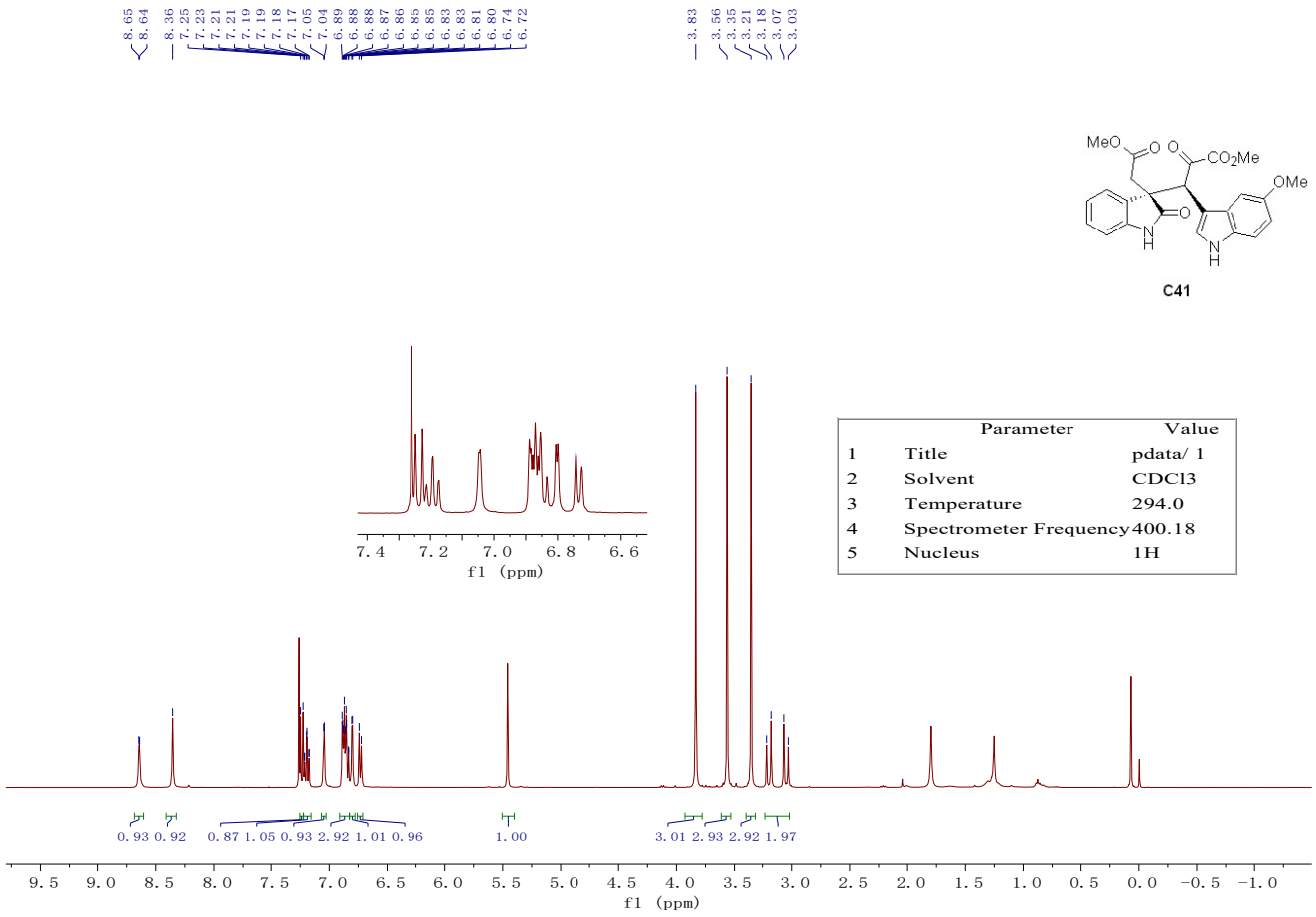
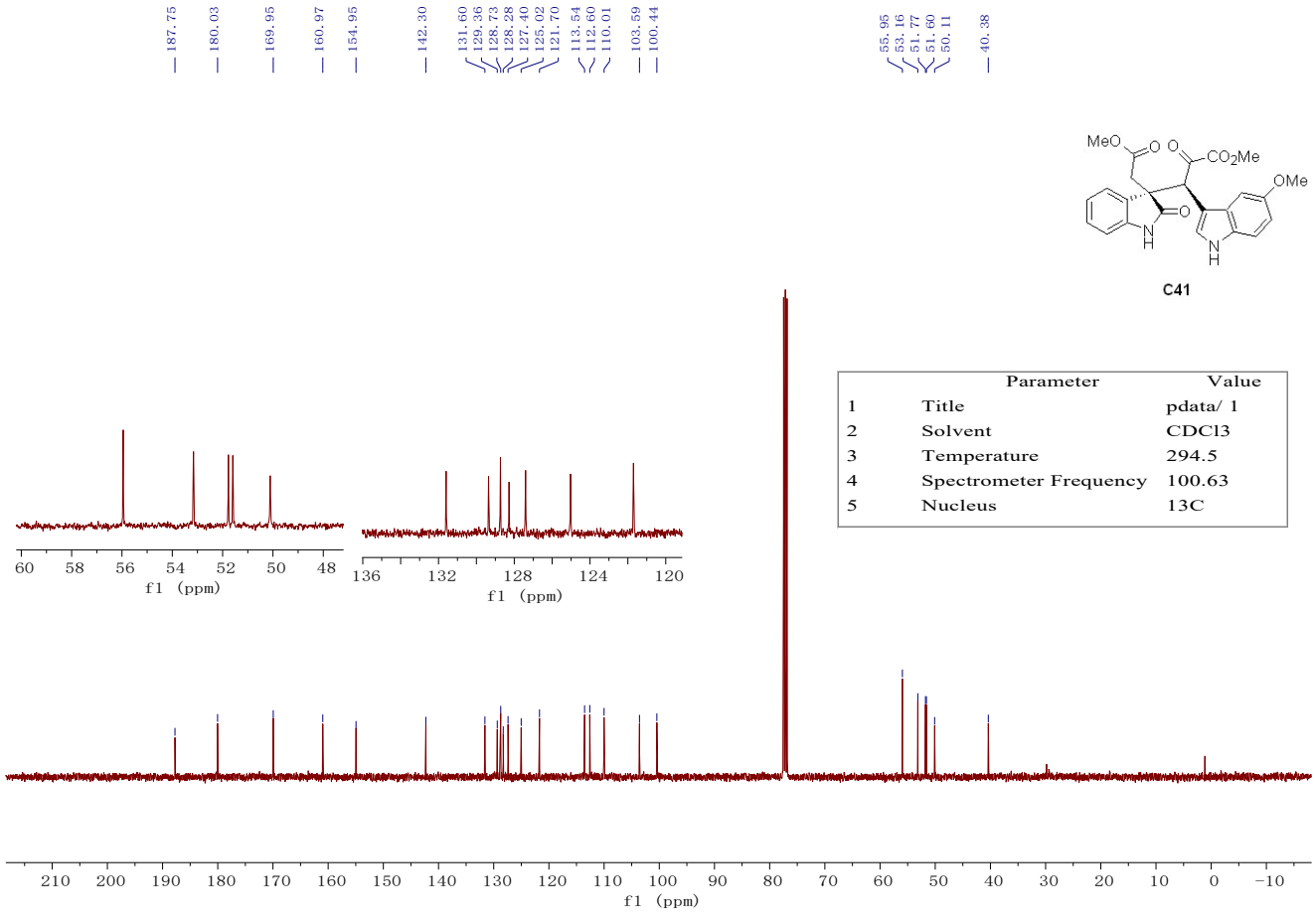
109.77
105.14
103.82
100.93
55.30
52.98
51.55
51.37
50.75
40.11

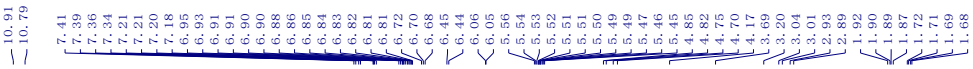

MeO
CO2Me
MeO
O
O
O
O
N
H
N
H

C40

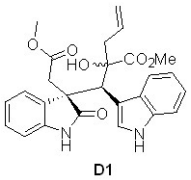

Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.4
4 Spectrometer Frequency 100.63
5 Nucleus 13C
57 56 55 54 53 52 51 50 49
f1 (ppm)
132 130 128 126 124 122 120
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)


8.65
8.64
8.36
7.25
7.23
7.21
7.21
7.19
7.19
7.18
7.17
7.05
7.04
6.89
6.88
6.88
6.87
6.86
6.85
6.85
6.83
6.83
6.81
6.80
6.74
6.72
3.83
3.56
3.35
3.21
3.18
3.07
3.03
MeO
O
O
CO2Me
OMe
N
H
O
N
H
C41
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.0
4 Spectrometer Frequency 400.18
5 Nucleus 1H
7.4 7.2 7.0 6.8 6.6
f1 (ppm)
0.93 0.92 0.87 1.05 0.93 2.92 1.01 0.96 1.00 3.01 2.93 2.92 1.97
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.5 −1.0
f1 (ppm)

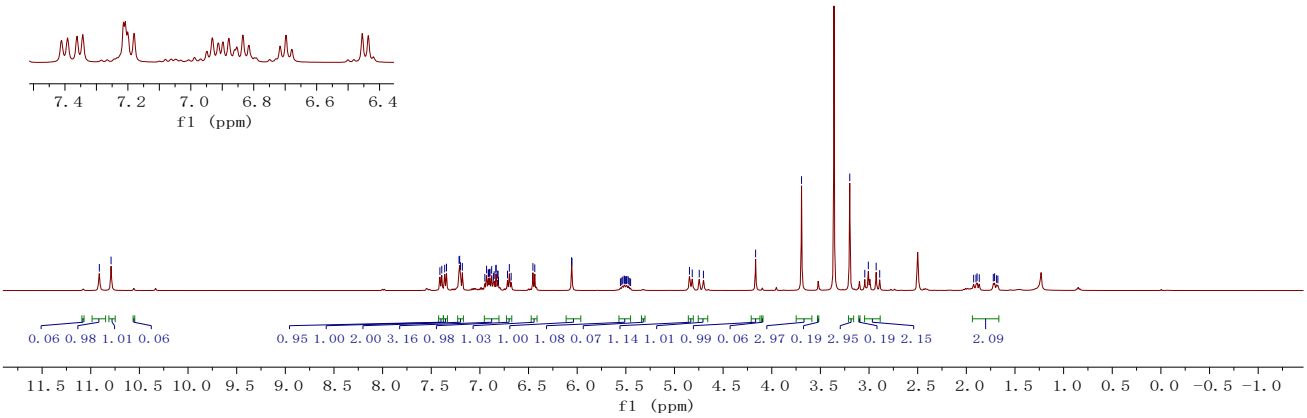

187.75
180.03
169.95
160.97
154.95
142.30
131.60
129.36
128.73
128.28
127.40
125.02
121.70
113.54
112.60
110.01
103.59
100.44
55.95
53.16
51.77
51.60
50.11
40.38
MeO
O
O
CO2Me
OMe
N
H
O
N
H
C41
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 294.5
4 Spectrometer Frequency 100.63
5 Nucleus 13C
60 58 56 54 52 50 48
f1 (ppm)
136 132 128 124 120
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)



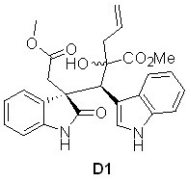
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	DMSO
3	Temperature	293.3
4	Spectrometer Frequency	400.18
5	Nucleus	1H



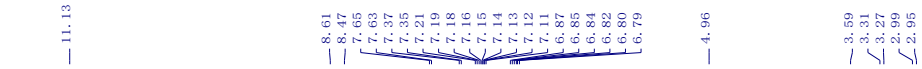
D1



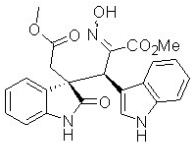
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	DMSO
3	Temperature	293.7
4	Spectrometer Frequency	100.63
5	Nucleus	13C



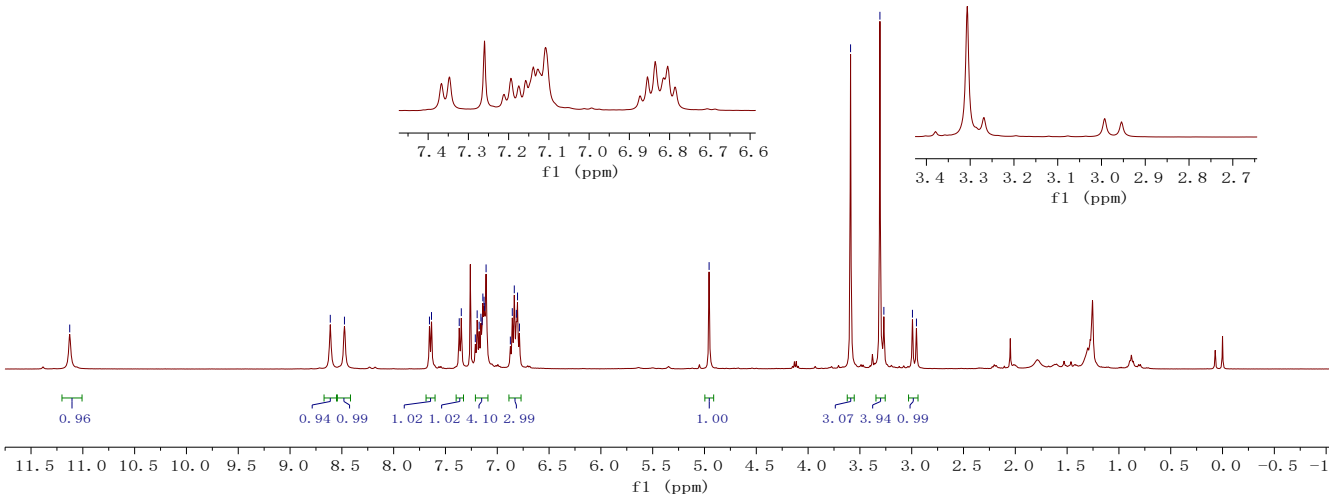
D1

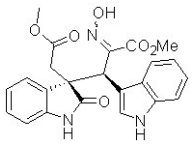


	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	293.6
4	Spectrometer Frequency	400.18
5	Nucleus	1H



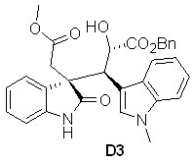
D2



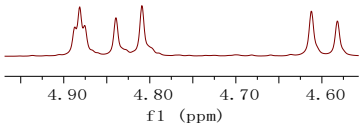


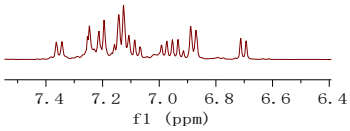
D2

	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	294.0
4	Spectrometer Frequency	100.63
5	Nucleus	13C

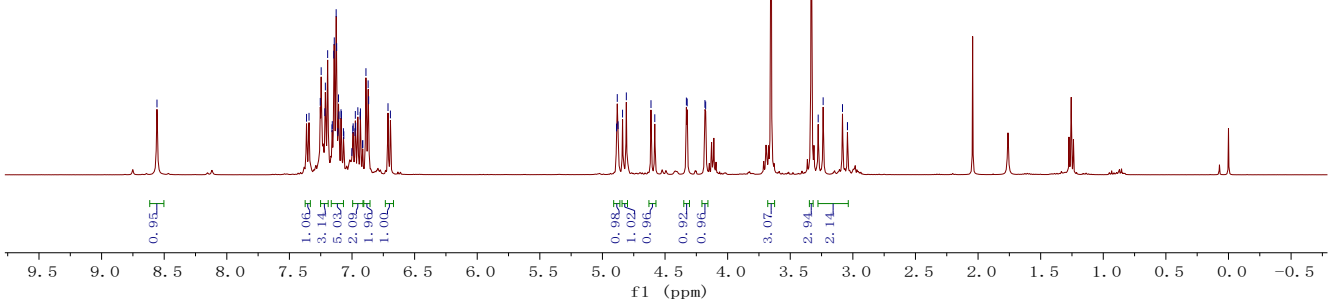


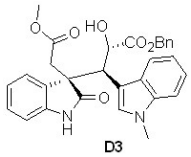
D3



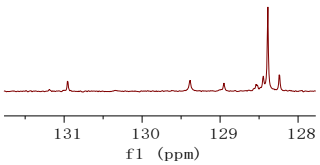


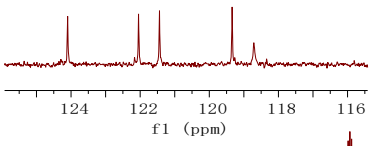
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	293.6
4	Spectrometer Frequency	400.18
5	Nucleus	1H

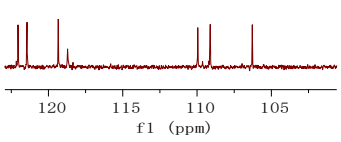




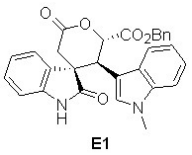
D3



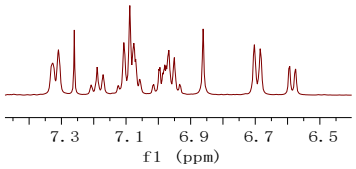




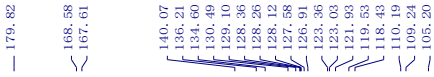
	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	294.0
4	Spectrometer Frequency	100.63
5	Nucleus	13C

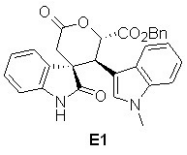


E1

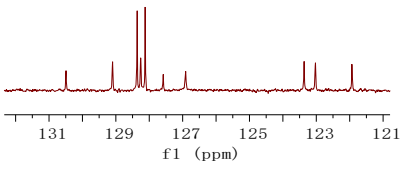


	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	293.5
4	Spectrometer Frequency	400.18
5	Nucleus	1H

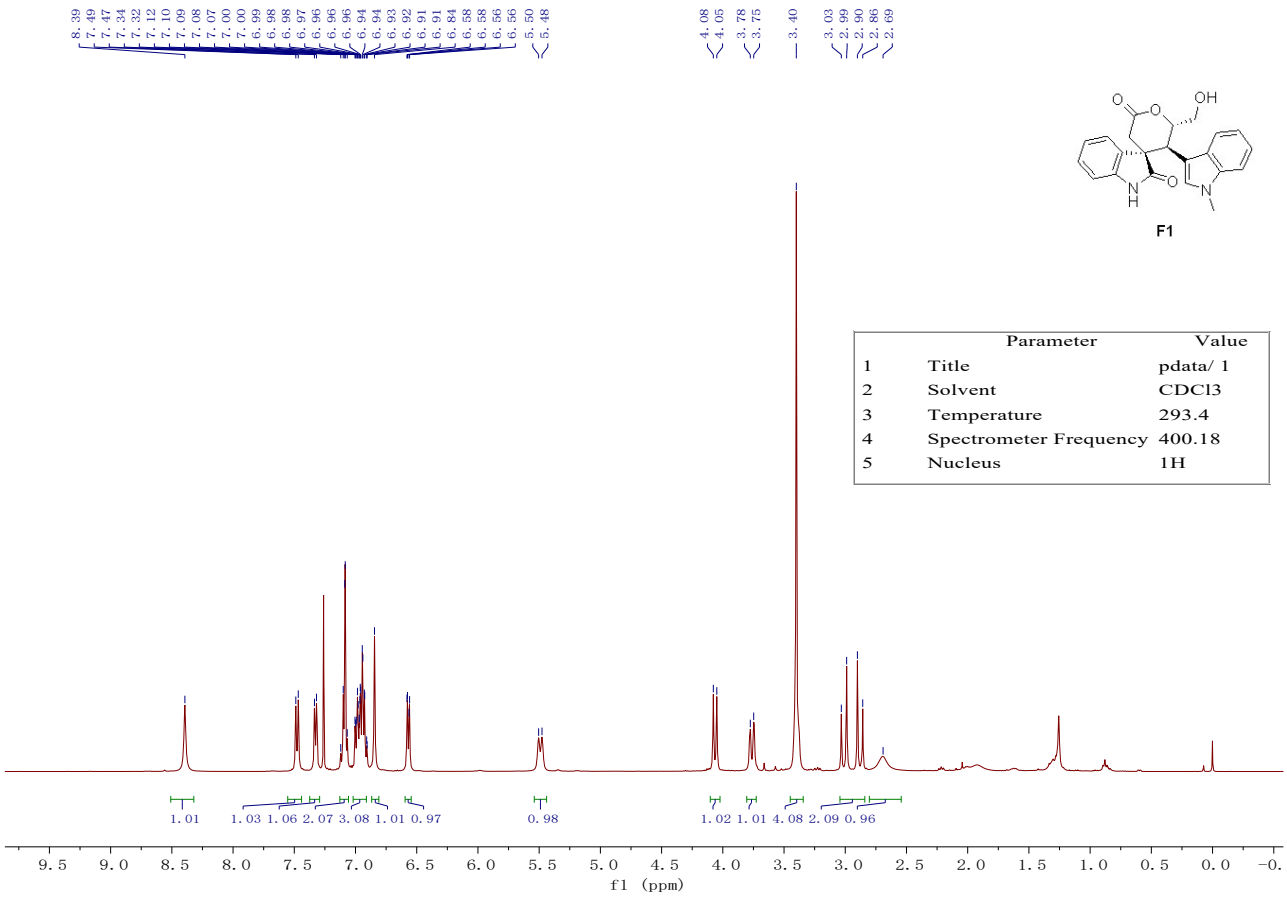


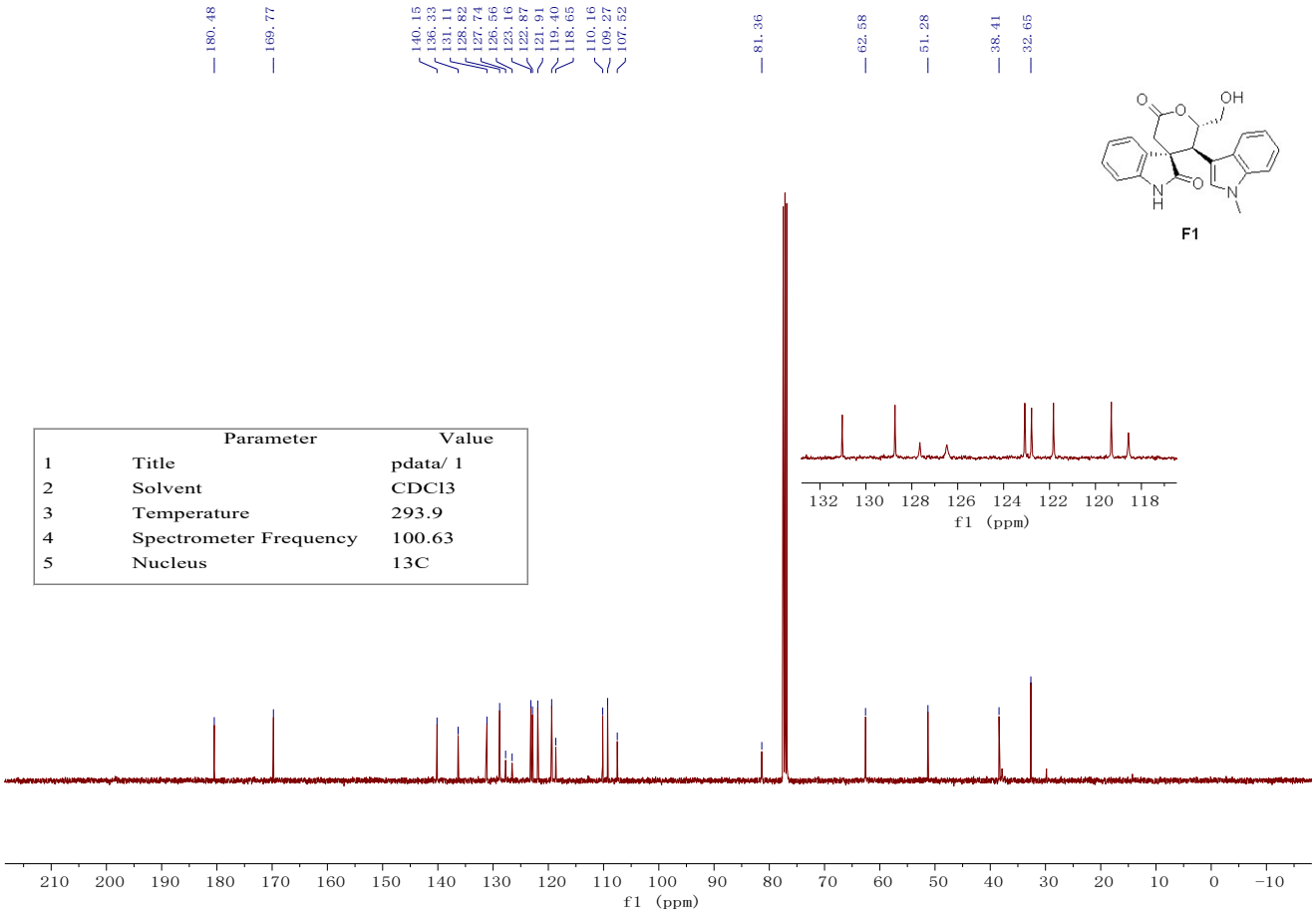


E1

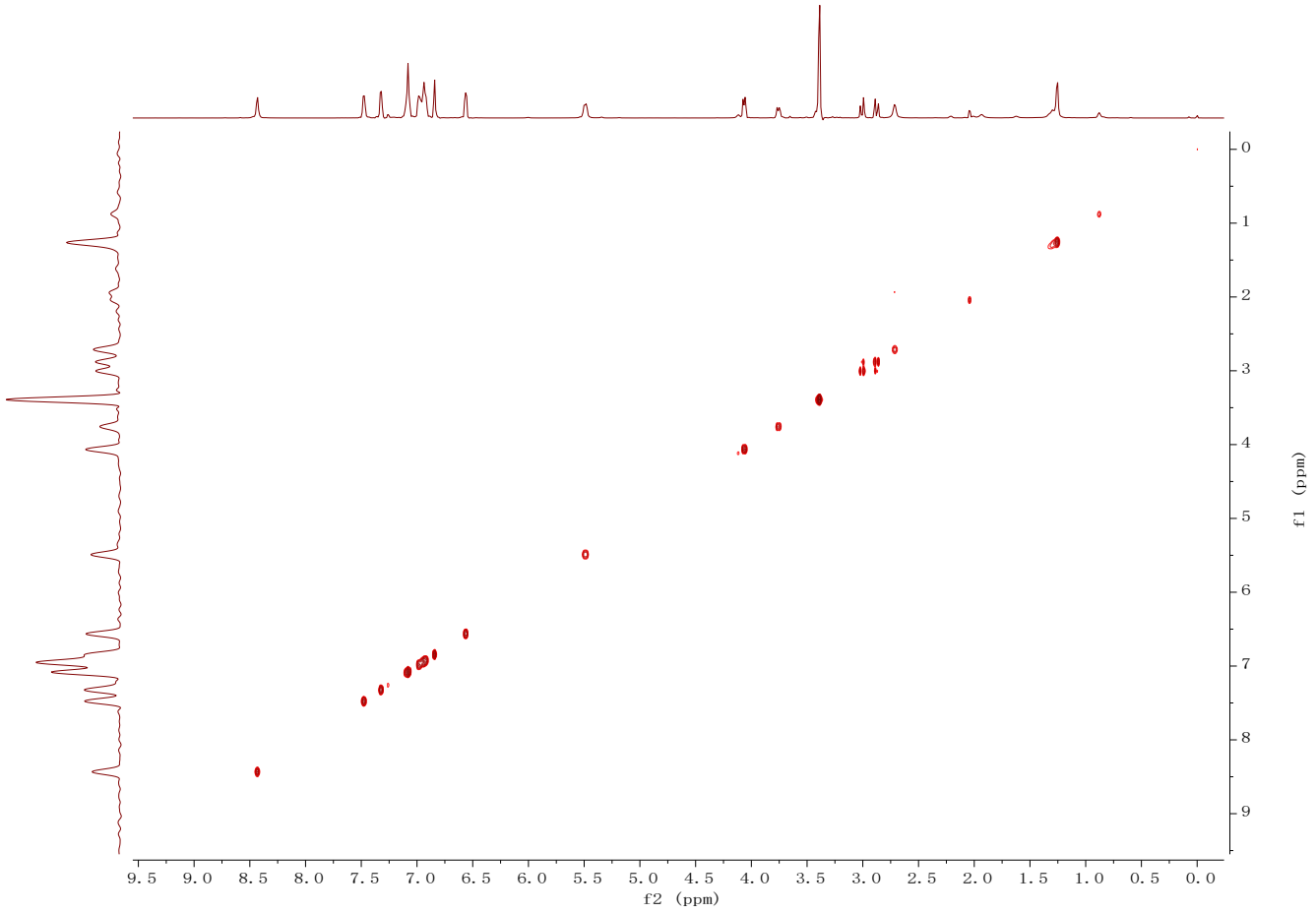


	Parameter	Value
1	Title	pdata/ 1
2	Solvent	CDCl3
3	Temperature	294.0
4	Spectrometer Frequency	100.63
5	Nucleus	13C


8.39 7.49 7.47 7.34 7.32 7.12 7.10 7.09 7.08 7.07 7.00 7.00 6.99 6.98 6.98 6.97 6.96 6.96 6.96 6.94 6.94 6.93 6.92 6.91 6.91 6.84 6.58 6.58 6.56 6.56 5.50 5.48
4.08 4.05 3.78 3.75 3.40 3.03 2.99 2.90 2.86 2.69
OH
O
O
N
H
O
N
F1
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.4
4 Spectrometer Frequency 400.18
5 Nucleus 1H
1.01 1.03 1.06 2.07 3.08 1.01 0.97 0.98 1.02 1.01 4.08 2.09 0.96
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0 −0.
f1 (ppm)


180.48 169.77 140.15 136.33 131.11 128.82 127.74 125.56 123.16 122.87 121.91 119.40 118.65 110.16 109.27 107.52 81.36 62.58 51.28 38.41 32.65
OH
O
O
N
H
O
N
F1
Parameter Value
1 Title pdata/ 1
2 Solvent CDCl3
3 Temperature 293.9
4 Spectrometer Frequency 100.63
5 Nucleus 13C
132 130 128 126 124 122 120 118
f1 (ppm)
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 −10
f1 (ppm)

NOE spectra for F1



12 Reference

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