Supporting Information

of

Divergent Synthesis of Chiral Heterocycles via Sequencing of Enantioselective Three-Component Reactions and One-Pot Subsequent Cyclizations

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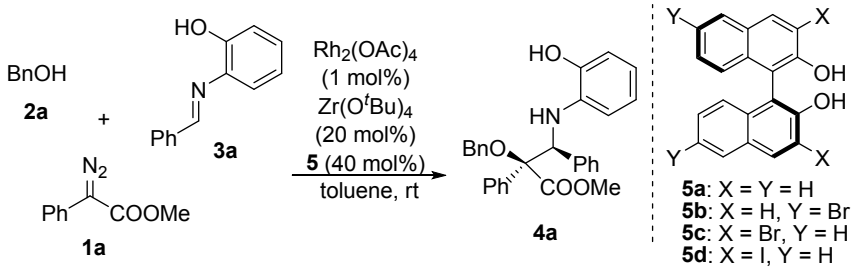
General Information:

Unless otherwise stated, reactions were performed under a nitrogen atmosphere using freshly dried solvents. Toluene, dichloromethane and 1,2-dichloroethane were distilled over calcium hydride. Powdered 3 Å molecular sieves were flame-dried under vacuum immediately prior to use. All other commercially obtained reagents were used as received unless specifically indicated. Substituted BINOLs were prepared according to literature procedures.[1,2] **BINOL-Zr-MS** complex were prepared according to literature procedures.[3-5] All reactions were monitored by thin-layer chromatography. ^{1}H and ^{13}C NMR spectra were recorded on a Bruker Avance 400 (at 400 and 100 MHz, respectively) and reported relative to tetramethylsilane (TMS) as internal standard. Data for ^{1}H NMR spectra are reported as follows: chemical shift (d ppm) (multiplicity, coupling constant (Hz), integration). Multiplicity and qualifier abbreviations are as follows: s = singlet, d = doublet, t = troplet, q = quartet, m = nultiplet, br = broad. HRMS were acquired using either a Bruker MicroTOF with positive electrospray ionization (ESI) or a Waters Micromass Q-TOF micro Synapt High Definition Mass Spectrometer with field ionization (FI) of chemical ionization (CI). HPLC analysis was performed on Waters-Breeze (2487 Dual λ Absorbance Detector and 1525 Binary HPLC Pump) with Chiralcel AD, OD , IA or IC columns.

Condition Optimization and Experimental Procedures:

Reaction Condition Optimizations for Rh(II)/Zr(IV)-BINOL Co-Catalyzed Three-Component Reaction of Methyl Phenyldiazoacetate **1a**, Benzyl Alcohol **2a** and *N*-arylaldimine **3a**.

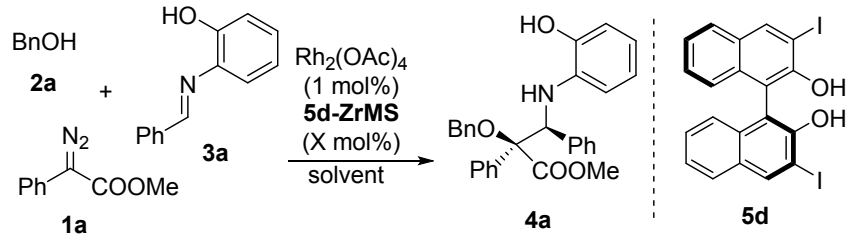
Table S1. Condition Optimization of Rh(II)/Zr(IV)-BINOL (*in situ* prepared) Co-Catalytic System [a]



entry	5	yield (%)[b]	dr[c]	ee (%)[d]
1	**5a**	60	78:22	52
2	**5b**	75	70:30	62
3	**5c**	72	80:20	16
4	**5d**	80	87:13	80

[a] Unless otherwise noted, all reactions were conducted in 0.6 mmol scale of **3a**, **1a**:**2a**:**3a** = 1.1:1.2:1. See the 'General procedure' for experimental details. [b] Isolated yield after column chromatography. [c] Determined by ^{1}H NMR of crude mixture. [d] Determined by chiral HPLC, major diastereomer.

Table S2. Condition Optimization of Rh(II)/**Zr(IV)-5dMS** Co-Catalytic System [a]



entry	Zr(IV):**5d**	X	solvent	T (°C)	yield (%)[b]	dr[c]	ee (%)[d]
1	1:2	20	CH_2Cl_2	rt	82	86:14	70
2	1:2	20	PhMe	rt	90	90:10	86
3	1:2	10	PhMe	rt	81	90:10	60
4[e]	1:2	10	PhMe	rt	77	93:7	86
5[e]	1:1	10	PhMe	rt	70	94:6	94
6[e]	1:1	10	CH_2Cl_2	rt	85	95:5	85
7[e]	1:1	10	DCE	rt	90	95:5	87

[a] Unless other noted, all reactions were conducted on a 0.1 mmol scale of **3a**, **1a**:**2a**:**3a** = 3:3:1. **2a** was mixed with $Rh_2(OAc)_4$, **5d-ZrMS** complex and **3a** before **1a** was added via a syringe pump. See the Supporting Information for experimental details. [b] Isolated yield after column chromatography purification. [c] Determined by ^{1}H NMR of crude mixture. [d] Determined by chiral HPLC, major diastereomer. [e] **2a** was mixed with **1a** and then added to a mixture of $Rh_2(OAc)_4$, **5d-ZrMS** complex and **3a** via a syringe pump. See the 'General procedure' for experimental details.

General procedure for Table S1:

To a suspension of (*S*)-3,3'-diiodo-1,1'-binaphthalene-2,2'-diol (86 mg, 0.16 mmol) in toluene (4.0 mL) was added $Zr(OtBu)_4$ (31 mg, 0.08 mmol) at room temperature, and the resulting solution was stirred for 30 min. Benzyl alcohol (16 *ul*, 0.16 mmol) was added to the above solution, which was stirred for an additional 30 min to form Zr(IV) complex. Then aldimine **3a** (118.2 mg, 0.6 mmol) and $Rh_2(OAc)_4$ (2.7 mg, 1 mol%) were added. The mixture was stirred for 5 min, then a mixture of methyl phenyldiazoacetate **1a** (116.2 mg, 0.66 mmol) and benzyl alcohol **2a** (65 mg, 0.6 mmol) in 2 mL of toluene were added via a syringe pump over 1 h. After completion of the addition, saturated aqueous $NaHCO_3$ (10 mL) was added to quench the reaction. The organic layer was separated, and the aqueous layer was extracted with CH_2Cl_2 (2 x 10 mL). The organic layers were combined and dried over anhydrous Na_2SO_4. After filtration and concentration under reduced pressure, and the crude product was subjected to ^{1}H-NMR analysis to determine the diastereoselectivity. The crude product was purified by flash chromatography on silica gel (eluent: EtOAc/light petroleum ether = 1:9) to give **4a** (217 mg, 80% yield). The optical purity was determined by HPLC analysis using a chiral Daicel Chirapak AD-H column.

General procedure for Table S2:

Entries 1 – 3:

To a suspension of the (*S*)-3-I-ZrMS catalyst (**$(5d)_2$-ZrMS** (60 or 120 mg, containing 0.01 or 0.02 mmol Zr) and $Rh_2(OAc)_4$ (0.4 mg, 1 mol%) in 1 mL of the corresponding solvent was added **2a** (4.3 mg, 0.04 mmol) and stirred for 30 min before aldimine **3a** (19.7 mg, 0.1 mmol) in 0.5 mL of the corresponding solvent was added and stirred for another 5 min. Then a mixture of methyl phenyldiazoacetate **1a** (52.9 mg, 0.3 mmol) and benzyl alcohol **2a** (28.1 mg, 0.26 mmol) in 1 mL of the corresponding solvent was added via a syringe pump over 1 h. After completion of the addition, the reaction mixture was filtered through a cotton plug, concentrated under reduced pressure and subjected to ^{1}H-NMR analysis for the determination of diastereoselectivity. The crude product was purified by flash chromatography on

silica gel to give **4a**. The optical purity was determined by HPLC analysis using a chiral Daicel Chirapak AD-H column.

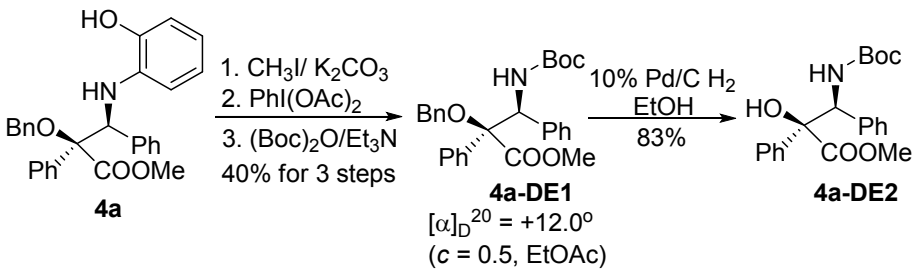
Entries 4 – 7:

To a suspension of the (*S*)-3-I-Zr catalyst **5d-ZrMS** (46 mg, containing 0.01 mmol Zr) and $Rh_2(OAc)_4$ (0.4 mg, 1 mol%) in toluene (1 mL) was added aldimine **3a** (0.1 mmol) in 0.5 mL of toluene at 30 ^oC. After stirring for 5 min, methyl phenyldiazoacetate **1a** (52.9 mg, 0.3 mmol) and benzyl alcohol **2a** (0.3 mmol) in 1 mL of toluene were added via a syringe pump over 1 h. After completion of the addition, the reaction mixture was further stirred for 30 min. The reaction mixture was filtered through a cotton plug, concentrated under reduced pressure and subjected to ^1H-NMR analysis for the determination of diastereoselectivity. The crude product was purified by flash chromatography on silica gel to give **4a**. The optical purities were determined by HPLC analysis using a chiral IA column.

General procedure for Table 1:

To a suspension of **5d-ZrMS** (34.5 mg, containing 0.015 mmol Zr) and $Rh_2(OAc)_4$ (0.4 mg, 1 mol%) in 1 mL of toluene was added aldimine **3a** (0.1 mmol) in 0.5 mL of toluene at 30 ^oC. After stirring for 5 min, methyl phenyldiazoacetate **1a** (52.9 mg, 0.3 mmol) and alcohol **2** (0.3 mmol) in 1 mL of toluene were added via a syringe pump over 1 h. After completion of the addition, the reaction mixture was further stirred for 30 min. The reaction mixture was filtered through a cotton plug, concentrated under reduced pressure and subjected to ^1H-NMR analysis for the determination of diastereoselectivity. The crude product was purified by flash chromatography on silica gel to give **4**. The optical purities were determined by HPLC analysis using a chiral IA column.

Synthesis of α-Hydroxyl-β-Amino Ester and Determination of the Absolute Configuration of 4a:



Scheme S1

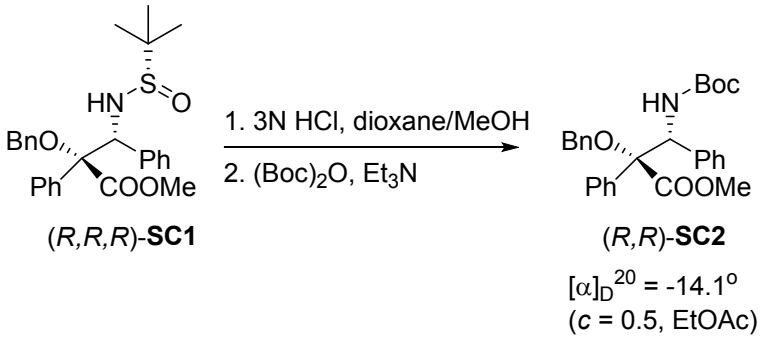
Preparation of Compound 4a-DE1 (Scheme S1):

A mixture of compound **4a** (0.47 g, 1 mmol), CH_3I (5.7 g, 40 mmol) and K_2CO_3 (0.8 g) in acetone (12.5 mL) was stirred at room temperature for 8 h. Aqueous NH_4Cl was added to quench the reaction. After a usual work up, the free amine product was obtained in 90% yield.

To a solution of $PhI(OAc)_2$ (300 mg, 0.9 mmol) in methanol (3 mL) was added a solution of the above free amine product (100 mg, 0.21 mmol) in CH_2Cl_2 (0.5 mL) and methanol (1 mL) over 30 min at room temperature. The reaction mixture was stirred for additional 30 min, and followed by the addition of 1 M HCl (10 mL). A white precipitate was formed immediately and then slowly dissolved to afford a yellow solution in 90 min. The organic layer was separated and the aqueous layer was subsequently extracted with CH_2Cl_2 (2 ×15 mL). The combined organic layer was back extracted with 10 mL of 0.1 M HCl. To the combined aqueous layer was added CH_2Cl_2 (10 mL). To this biphasic mixture was added $(Boc)_2O$ (96 μL, 0.42 mmol) with vigorous stirring, and followed by the addition of solid Na_2CO_3 portion wise until the pH was adjusted to 10–11. This mixture was stirred for 90 min with occasional addition of Na_2CO_3 to maintain the pH = 10–11. The two layers were separated and the aqueous layer was further extracted with CH_2Cl_2 (2 × 15 mL). The combined organic layer was dried over anhydrous $MgSO_4$, filtered and concentrated. The crude product was purified by flash chromatography on silica gel (eluent: EtOAc/light petroleum =1:30) to give **4a-DE1** {42 mg, 40%, $[\alpha]_D^{20} = +12.0^o$ (*c* = 0.5, EtOAc)}.

Preparation of Compound 4a-DE2 (Scheme S1):

To a solution of **4a-DE1** (30 mg, 0.065 mmol) in EtOH (2 ml) was added 10% Pd on carbon (100mg). The reaction mixture was charged with an atmosphere of H2 and stirred at r.t. for 24 h. The catalyst was filtered off, and the solvent was removed under reduced pressure. The crudeproduct was purified by flash chromatography on silica gel eluting with EtOAc:light petroleum =1:12 to give α-hydroxyl-β-amino ester **4a-DE2** (20 mg, 83%).



Scheme S2

Preparation of SC2 from compound SC1 (Scheme S2):

To the solution of compound **SC1** (0.1 mmol) in 2.0 mL of methanol was added 0.6 mL of 3 N HCl in 2.0 mL of 1,4-dioxane. The mixture was stirred at room temperature for 2 h, and was then concentrated. To the resulting residue was added 10 mL of saturated aqueous $NaHCO_3$. The aqueous phase was extracted with EtOAc (3 × 10 mL), and the combined organic phase was dried over anhydrous $MgSO_4$. After filtration, EtOAc was removed to give free amine as colorless oil. The free amine was dissolved in 3.0 mL of menthol containing 10% Et_3N at 50 ℃, and 2 equiv. $(Boc)_2O$ was added to the solution with stirring. The crude product was purified by flash chromatography on silica gel (eluent: EtOAc/light petroleum=1:30) to give **SC2** (31 mg, 68% yield in two steps). [6]

Determination of the absolute configuration of 4a

The absolute configuration of the three-component product **4a** was assigned as (*2S*, *3S*)

by comparison of the optical rotation of **4a-DE1** {$[\alpha]_D^{20}$ = + 12.0° (*c* = 0.5, EtOAc)} (Scheme S1) and compound **SC2** {$[\alpha]_D^{20}$ = –14.1° (*c* = 0.5, EtOAc)}, which was synthesized from known compound **SC1** as previously reported (Scheme S2).[6] The absolute configuration of **SC1** has been determined to be (*R,R,R*) by single crystal X-ray analysis.

General procedure for the sequencing of three-component reaction and subsequent cyclization for the synthesis of chiral morpholines (Table 2):

To a suspension of **5d-ZrMS** (34.5 mg, containing 0.015 mmol Zr) and $Rh_2(OAc)_4$ (0.4 mg, 1 mol%) in CH_2Cl_2 (1 mL) was added aldimine **3a** (0.1 mmol) in 0.5 mL of CH_2Cl_2 at 30 °C. After stirring for 5 min, methyl phenyldiazoacetate **1a** (52.9 mg, 0.3 mmol) and bromoethanol **2h** (21.6 μL, 0.3 mmol) in 1 mL of CH_2Cl_2 were added via a syringe pump over 1 h. After completion of the addition, the reaction mixture was further stirred for 30 min. Triethylamine (0.5 mmol) was added in one portion, and the reaction mixture was further stirred at 30 to 40 °C for about 5 hours, when the reaction was finished as monitored by TLC. The reaction mixture was filtered through a cotton plug, concentrated under reduced pressure and subjected to ^{1}H-NMR analysis for the determination of diastereoselectivity. The crude product was purified by flash chromatography on silica gel to give **6**. The optical purities were determined by HPLC analysis using a chiral IA column.

Sequencing transformation for the preparation of morpholin-3-one 7.

To a suspension of the air-stable **5d-ZrMS** (20 mol%) in 1 mL of $CHCl_3$ was added $Rh_2(OAc)_4$ (1 mol%) and *N*-aryl aldimine (**3e**) (0.1 mmol) at 0 °C. The mixture was stirred for 5 min before a mixture of methyl phenyl diazoacetate (**1a**) (0.3 mmol) and 2-phthalimidoethanol (**2i**) (0.3 mmol) in 1 mL of $CHCl_3$ were added at 0 °C via a syringe pump within 1 h. After completion of the addition, the reaction mixture was further stirred for 3 h at 0 °C. EtOH (2 mL) and hydrazine hydrate (6.8 eq) were sequentially added. The reaction mixture was then heated to 50 °C and reacted

overnight. When the reaction was finished as monitored by TLC, the reaction mixture was filtered through a cotton plug, concentrated under reduced pressure and subjected to ^{1}H NMR analysis to determine the diastereoselectivity. The crude product was purified by flash chromatography on silica gel to give morpholin-3-one **7** (62% yield, >95:5 dr, 97% ee). The enantiomeric excess was determined by chiral HPLC analysis.

Sequencing transformation for the preparation of 2,2-disubstituted morpholine 8.

To a suspension of the air-stable **5d-ZrMS** (20 mol%) in 1 mL of $CHCl_3$ was added $Rh_2(OAc)_4$ (1 mol%) and *N*-arylaldimine **3a** (0.1 mmol) at 0 ^oC. The mixture was stirred for 5 min before a mixture of methyl phenyl diazoacetate (**1a**) (0.3 mmol) and (*E*)-ethyl 4-hydroxybut-2-enoate (**2j**) (0.3 mmol) in 1 mL of $CHCl_3$ were added at 0 ^oC via a syringe pump within 1 h. After completion of the addition, the reaction mixture was further stirred for 3 h at 0 ^oC. $AlCl_3$ (0.2 mmol) was added in one portion, and the reaction mixture was further stirred at room temperature overnight. When the reaction was finished as monitored by TLC, the reaction mixture was filtered through a cotton plug, concentrated under reduced pressure and subjected to ^{1}H NMR analysis to determine the diastereoselectivity. The crude product was purified by flash chromatography on silica gel to give compound **8** (51% yield, 95:5 dr, 94% ee). The enantiomeric excess was determined by chiral HPLC analysis.

Sequencing transformation for the preparation of γ-lactam 10.

To a suspension of (*R*)-**5d-ZrMS** (20 mol%) in 1 mL of $CHCl_3$ was added $Rh_2(OAc)_4$ (2–3mol%) and *N*-aryl aldimine (**3e**) (0.1 mmol) at 0 ^oC. The mixture was stirred for 5 min before a mixture of dimethyl 2-diazosuccinate (**1e**) (0.3 mmol) and benzyl alcohol (**2a**) (0.3 mmol) in 1 mL of $CHCl_3$ were added at 0 ^oC via a syringe pump within 1 h. After completion of the addition, the reaction mixture was further stirred for 3 h at 0 ^oC. The reaction mixture was then warmed to room temperature and TFA (5 mol%) was added and reacted for 5 h. The reaction mixture was filtered through a cotton plug, concentrated under reduced pressure and subjected to ^{1}H NMR

analysis to determine the diastereoselectivity. The crude product was purified by flash chromatography on silica gel to give γ-Lactam **10** (65% yield, >95:5 dr, 90% ee). The enantiomeric excess was determined by chiral HPLC analysis.

Sequencing transformation for the preparation of 1,4-dioxine compound 12.

To a suspension of (*R*)-**5d-ZrMS** (6 mol%) in 1 mL of CH_2Cl_2 was added $Rh_2(OAc)_4$ (1 mol%) and 4-bromobenzaldehyde (**11**) (0.1 mmol) at room temperature. The mixture was stirred for 3 min before a mixture of methyl phenyl diazoacetate (**1a**) (0.2 mmol) and propargyl alcohol (**2k**) (0.2 mmol) in 1 mL of CH_2Cl_2 were added at 0 ^oC via a syringe pump within 1 h. After completion of the addition, the reaction mixture was further stirred for 3 h at 0 ^oC. Then 20 mol% $PtCl_2$ was added to the reaction mixture and stirred for 48h at room temperature. When the reaction was finished as monitored by TLC, the reaction mixture was filtered through a cotton plug, concentrated under reduced pressure and subjected to ^1H NMR analysis to determine the diastereoselectivity. The crude product was purified by flash chromatography on silica gel to give product **12** (56% yield, 94:6 dr, 97% ee). The enantiomeric excess was determined by chiral HPLC analysis.

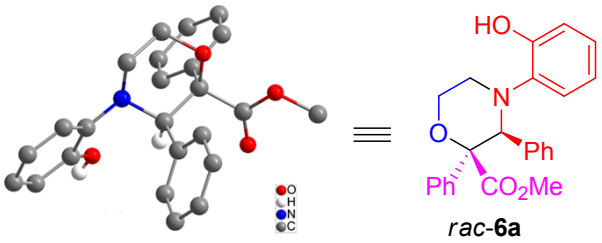
Sequencing transformation for the preparation of 2*H*-pyran compound 14.

To a suspension of (*R*)-**5d-ZrMS** (6 mol%) in 1 mL of CH_2Cl_2 was added $Rh_2(OAc)_4$ (1 mol%) and cinnamaldehyde (**13**) (0.1 mmol) at room temperature. The mixture was stirred for 3 min before a mixture of methyl phenyl diazoacetate (**1a**) (0.2 mmol) and allylic alcohol (**2d**) (0.2 mmol) in 1 mL of CH_2Cl_2 were added at 0 ^oC via a syringe pump within 1 h. After completion of the addition, the reaction mixture was further stirred for 3 h at 0 ^oC. Then 8 mol% Grubbs II reagent was added to the reaction mixture and stirred for 48 h at 40 ^oC. When the reaction was finished as monitored by TLC, the reaction mixture was filtered through a cotton plug, concentrated under reduced pressure and subjected to ^1H NMR analysis to determine the diastereoselectivity. The crude product was purified by flash chromatography on silica gel to give product **14** (70% yield, 95:5 dr, 99% ee). The enantiomeric excess

was determined by chiral HPLC analysis.

X-Ray Crystal Analysis Data

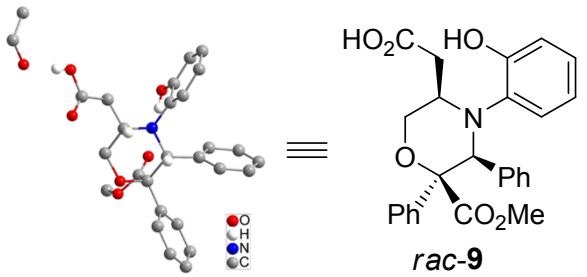
X-ray diffraction parameters and data for *rac*-**6a** (CCDC: 975762)



rac-**6a**

```
Bond precision:        C-C = 0.0035 A                  Wavelength=0.71073
Cell:          a=9.9379(6)       b=10.0008(6)      c=10.8276(6)
               alpha=96.918(2)   beta=104.753(2)   gamma=99.920(2)
Temperature: 296 K
                      Calculated                          Reported
Volume                1009.72(10)                         1009.72(10)
Space group           P -1                                P-1
Hall group            -P 1                                ?
Moiety formula        C24 H23 N O4                        ?
Sum formula           C24 H23 N O4                        C24 H23 N O4
Mr                    389.43                              389.43
Dx,g cm-3             1.281                               1.281
Z                     2                                   2
Mu (mm-1)             0.087                               0.087
F000                  412.0                               412.0
F000'                 412.20
h,k,lmax              11,11,12                            11,11,12
Nref                  3551                                3528
Tmin,Tmax             0.973,0.981                         0.964,0.981
Tmin'                 0.964
Correction method= MULTI-SCAN
Data completeness= 0.994          Theta(max)= 25.000
R(reflections)= 0.0450( 2240)         wR2(reflections)= 0.1226( 3528)
S = 1.008               Npar= 262
```

X-ray diffraction parameters and data for *rac*-**9** (CCDC: 975764)



rac-**9**

Bond precision: C-C = 0.0036 A Wavelength=0.71073

Cell: a=9.1316(14) b=11.5658(17) c=12.884(2)
alpha=87.471(5) beta=84.937(5) gamma=78.960(5)

Temperature: 296 K

	Calculated	Reported
Volume	1329.8(4)	1329.9(3)
Space group	P -1	P-1
Hall group	-P 1	?
Moiety formula	C26 H25 N O6, C2 O	?
Sum formula	C28 H25 N O7	C28 H25 N O7
Mr	487.49	487.49
Dx,g cm-3	1.217	1.217
Z	2	2
Mu (mm-1)	0.088	0.088
F000	512.0	512.0
F000'	512.28	
h,k,lmax	10,13,15	10,13,15
Nref	4696	4654
Tmin,Tmax	0.975,0.990	0.961,0.990
Tmin'	0.960	

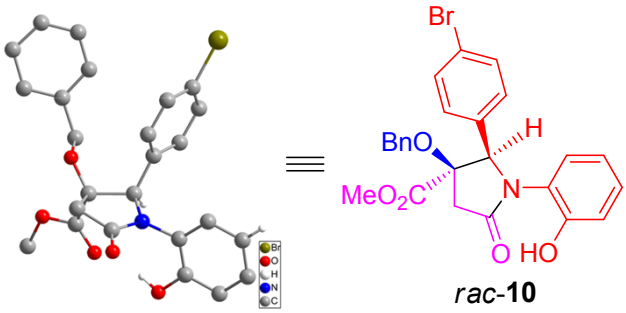
Correction method= MULTI-SCAN

Data completeness= 0.991 Theta(max)= 25.010

R(reflections)= 0.0476(3204) wR2(reflections)= 0.1464(4654)

S = 1.020 Npar= 325

X-ray diffraction parameters and data for *rac*-**10** (CCDC: 975763)



rac-**10**

Bond precision: C-C = 0.0048 A Wavelength=0.71073

Cell: a=9.6542(8) b=10.7705(9) c=12.1323(9)
alpha=87.694(2) beta=71.902(2) gamma=69.127(2)

Temperature: 296 K

	Calculated	Reported
Volume	1116.89(16)	1116.89(16)
Space group	P -1	P-1
Hall group	-P 1	?
Moiety formula	C25 H22 Br N O5	?
Sum formula	C25 H22 Br N O5	C25 H22 Br N O5
Mr	496.34	496.35
Dx,g cm-3	1.476	1.476
Z	2	2
Mu (mm-1)	1.877	1.877
F000	508.0	508.0
F000'	507.66	
h,k,lmax	11,12,14	11,12,14
Nref	3942	3902
Tmin,Tmax	0.459,0.713	0.506,0.729
Tmin'	0.450	

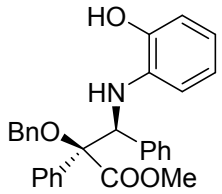
Correction method= MULTI-SCAN

Data completeness= 0.990 Theta(max)= 25.010

R(reflections)= 0.0318(3380) wR2(reflections)= 0.0887(3902)

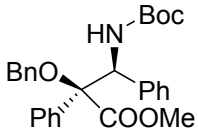
S = 1.081 Npar= 289

Characterization Data of Products:



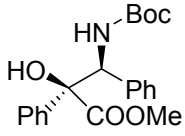
Chemical Formula: $C_{29}H_{27}NO_4$

Compound **4a**: yield 70%; 94% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / isopropanol = 10 : 1; 254 nm, Retention time: t_{major} = 13.56 min, t_{minor} = 32.54 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.54 (m, 2H), 7.27–7.53 (m, 8H), 7.18 (m, 3H), 7.08 (m, 2H), 6.63–6.81 (m, 4H), 5.93 (br, 1H), 5.20 (s, 1H), 4.71(br, 1H), 4.58 (d, J = 11.8 Hz, 1H), 4.54 (d, J = 11.8 Hz, 1H), 4.52 (d, J = 11.8 Hz, 1H), 3.74 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.6, 145.7, 138.1, 137.8, 134.7, 134.4, 129.1, 128.6, 128.4, 128.2, 127.7, 127.4, 127.3, 127.2, 127.0, 120.7, 119.6, 116.4, 114.5, 87.7, 67.8, 65.3, 52.2; HRMS: calcd for $C_{29}H_{27}NO_4$ $(M+Na)^+$ 454.2013; found: 454.2013.



Chemical Formula: $C_{28}H_{31}NO_5$

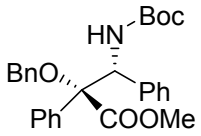
Compound **4a-DE1**: yield 40% (3 steps), ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.33–7.57 (m, 10H), 7.22 (m, 5H), 5.54 (d, J = 10.4 Hz, 1H), 5.35 (d, J = 10.4 Hz, 1H), 4.73 (d, J = 11.5 Hz, 1H), 4.41 (d, J = 11.5 Hz, 1H), 3.63 (s, 3H), 1.31 (s, 9H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.0, 154.6, 138.4, 135.5, 128.9, 128.3(overlap), 128.0(overlap), 127.6, 127.4, 127.2, 87.5, 79.5, 68.1, 61.5, 51.9, 28.3; HRMS: calcd for $C_{28}H_{31}NO_5$ $(M+Na)^+$ 484.2094; found: 484.2083. $[\alpha]_D^{20}$ = + 12.0^o (c = 0.5, EtOAc).



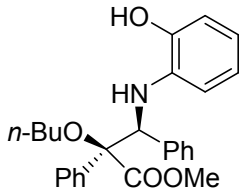
Chemical Formula: $C_{21}H_{25}NO_5$

Compound **4a-DE2**, yield 83% from **9**; ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.78 (m, 2H), 7.29–7.41 (m, 8H), 5.64 (d, J = 9.8Hz, 1H), 5.46 (d, J = 9.8Hz, 1H), 3.86 (s, 3H), 3.61 (s, 3H), 1.22 (s, 9H); ^{13}C NMR (75MHz, $CDCl_3$) δ 173.3, 155.0, 138.3(overlap),

138.0, 128.2, 128.0, 126.6, 81.1, 79.5, 59.2, 53.3, 28.1; HRMS: calcd for $C_{21}H_{25}NO_5$ $(M+Na)^+$ 394.1625; found: 394.1638. $[\alpha]_D^{20} = -42.1°$(c = 0.5, EtOAc).

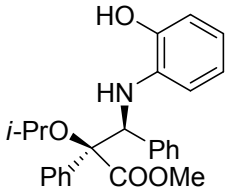


Compound **SC2**: $[\alpha]_D^{20} = -14.1°$(c = 0.5, EtOAc).



Chemical Formula: $C_{26}H_{27}NO_4$

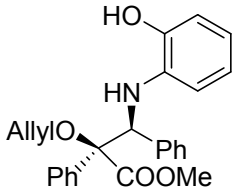
Compound **4b**: yield 66%; 96% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / isopropanol = 10 : 1; 254 nm; Retention time: t_{major} = 19.82 min, t_{minor} = 9.62 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 6.92–7.38 (m, 10H), 6.46–6.71 (m, 4H), 5.81 (s, 1H), 4.99 (br, 1H), 4.41 (br, 1H), 3.76 (s, 3H), 3.33–3.76 (m, 2H), 1.61 (m, 2H), 1.39 (m, 2H), 0.91(m, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.8, 146.5, 137.9, 135.3, 134.3, 129.5, 129.0, 128.6, 128.2, 128.0, 127.6, 127.3, 127.2, 120.7, 120.3, 117.7, 114.7, 87.3, 65.6, 65.4, 52.1, 32.0, 19.2, 13.9; HRMS: calcd for $C_{26}H_{29}NO_4$ $(M+Na)^+$ 442.1989; found: 442.1982.



Chemical Formula: $C_{25}H_{27}NO_4$

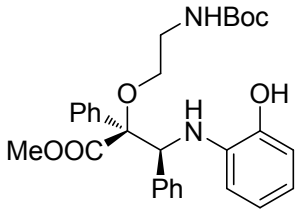
Compound **4c**: yield 52%; 95% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / isopropanol = 10 : 1; 254 nm; Retention time: t_{major} = 20.75 min, t_{minor} = 8.38 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 7.27–7.38 (m, 5H), 7.14 (m, 3H), 6.99 (m, 2H), 6.43–6.61 (m, 4H), 5.88 (br, 1H), 5.12 (s, 1H), 4.69(br, 1H), 3.93 (m, 1H), 3.71 (s, 3H), 1.22 (d, J = 6.1 Hz, 3H), 1.02 (d, J = 6.1 Hz, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 172.6, 145.7, 138.1, 136.4, 134.5, 129.2, 128.9, 128.2,

127.4, 127.2, 127.1, 120.9, 119.4, 116.4, 114.6, 86.9, 68.8, 64.5, 51.9, 23.8, 23.1; HRMS: calcd for $C_{25}H_{27}NO_4$ $(M+Na)^+$ 428.1832; found: 428.1821.



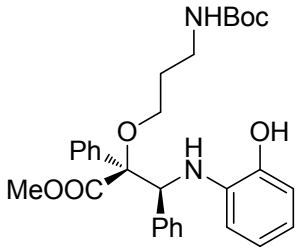
Chemical Formula: $C_{25}H_{25}NO_4$

Compound **4d**, yield 82%, 94% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / isopropanol = 10 : 1; 254 nm; Retention time: t_{major} = 21.91 min, t_{minor} = 10.18 min); ^{1}H NMR (300 MHz, $CDCl_3$) δ 6.97–7.42 (m, 10H), 6.48-6.89 (m, 4H), 5.89 (m, 1H), 5.70 (s, 1H), 5.36 (m, 1H), 5.19 (m, 1H), 5.02(br, 1H), 4.52 (br, 1H), 3.95–4.03 (m, 2H), 3.75 (s, 3H); ^{13}C NMR (75 MHz, $CDCl_3$) δ 171.6, 146.3, 137.6, 134.9, 134.2, 129.1, 128.4, 128.3, 127.7, 127.4, 127.2, 120.8, 120.3, 117.57, 115.9, 114.6, 87.6, 66.9, 65.5, 52.2; HRMS: calcd for $C_{25}H_{25}NO_4$ $(M+Na)^+$ 426.1676; found: 426.1685.



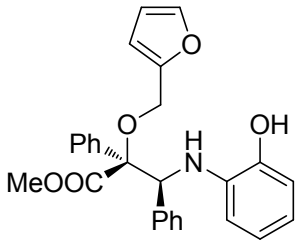
Chemical Formula: $C_{29}H_{34}N_2O_6$

Compound **4e**: yield 89%, 93% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.5 mL/min; hexane / EtOH = 20 : 1; 254 nm; Retention time: t_{major} = 40.35 min, and t_{minor} = 27.67 min); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.44 (dd, J = 7.7, 1.7 Hz, 2H), 7.33 – 7.24 (m, 3H), 7.15 (m, 3H), 7.08 (s, 2H), 6.71 (d, J = 6.7 Hz, 1H), 6.62 – 6.51 (m, 2H), 6.42 (d, J = 6.8 Hz, 1H), 5.13 (s, 1H), 4.99 (s, 1H), 3.66 (s, 3H), 3.56 – 3.24 (m, 4H), 1.46 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.39, 156.37, 145.55, 138.28, 135.05, 134.87, 128.96, 128.61, 128.50, 127.91, 127.59, 127.46, 120.70, 119.07, 115.34, 114.69, 87.54, 79.55, 65.16, 65.02, 52.17, 40.91, 28.52. HRMS: calcd for $C_{29}H_{34}N_2O_6$ $(M+Na)^+$ 529.2315; found: 529.2341.



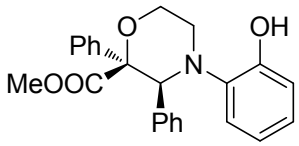
Chemical Formula: $C_{30}H_{36}N_2O_6$

Compound **4f**: yield 83%, 92% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / EtOH = 30 : 1; 254 nm; Retention time: t_{major} = 45.77 min, t_{minor} = 26.14 min); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.47 (d, J = 6.4 Hz, 2H), 7.34 – 7.26 (m, 3H), 7.17 – 7.10 (m, 3H), 7.06 (s, 2H), 6.73 (dd, J = 7.4, 1.2 Hz, 1H), 6.62 – 6.49 (m, 2H), 6.41 (d, J = 7.1 Hz, 1H), 5.04 (s, 1H), 5.00 (s, 1H), 3.68 (s, 3H), 3.49 – 3.26 (m, 4H), 1.74 (m, 2H), 1.45 (s, 9H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.47, 156.40, 145.29, 138.29, 135.49, 128.92, 128.72, 128.42, 127.87, 127.54, 127.44, 120.78, 118.73, 114.91, 87.44, 79.45, 65.36, 63.21, 52.07, 37.73, 29.94, 28.50. HRMS: calcd for $C_{30}H_{36}N_2O_6$ $(M+Na)^+$ 543.2471; found: 543.2499.



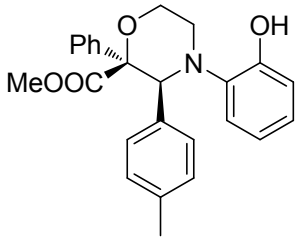
Chemical Formula: $C_{27}H_{25}NO_5$

Compound **4g**: yield 83%, 95% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / EtOH = 20 : 1; 254 nm; Retention time: t_{major} = 33.60 min, t_{minor} = 20.20 min); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.52 (dd, J = 7.1, 2.1 Hz, 2H), 7.42 (s, 1H), 7.33 (m, 3H), 7.19 – 7.07 (m, 3H), 7.02 (d, J = 6.6 Hz, 2H), 6.67 (d, J = 7.4 Hz, 1H), 6.58 (m, 2H), 6.41 (d, J = 7.5 Hz, 1H), 6.38 – 6.32 (m, 1H), 6.29 (d, J = 3.0 Hz, 1H), 5.58 (s, 1H), 4.94 (s, 1H), 4.60 (d, J = 12.3 Hz, 1H), 4.45 (s, 1H), 4.42 (d, J = 12.3 Hz, 1H), 3.71 (s, 3H). ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.36, 151.60, 146.48, 142.60, 137.91, 134.90, 134.23, 129.11, 128.63, 128.53, 127.92, 127.47, 127.35, 120.75, 120.43, 117.65, 114.65, 110.31, 108.70, 87.92, 65.96, 60.95, 52.24. HRMS: calcd for $C_{27}H_{25}NO_5$ $(M+Na)^+$ 466.1630; found: 466.1615 .



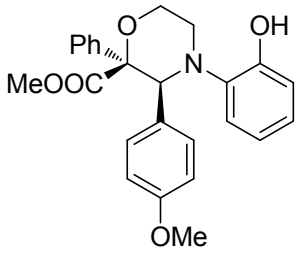
Chemical Formula: $C_{24}H_{23}NO_4$

Compound **6a**: yield 63%; 94% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.6 mL/min; hexane / isopropanol = 18 : 1; 254 nm, Retention time: t_{major} = 17.26 min, and t_{minor} = 15.64 min); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.84 (d, *J* = 7.5 Hz, 2H), 7.56 (t, *J* = 7.7 Hz, 2H), 7.42 (m, 3H), 7.33 – 7.22 (m, 3H), 7.03 (td, *J* = 7.8, 1.4 Hz, 1H), 6.96 (dd, *J* = 8.1, 1.4 Hz, 1H), 6.61 – 6.49 (m, 2H), 6.06 (dd, *J* = 7.9, 1.2 Hz, 1H), 4.85 (s, 1H), 4.29 – 4.16 (m, 2H), 3.70 – 3.61 (m, 1H), 3.27 (s, 3H), 2.41 (d, *J* = 11.7 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.64, 151.86, 137.17, 135.44, 133.93, 130.97, 129.32, 128.64, 127.99, 127.55, 126.90, 126.66, 125.04, 119.29, 114.33, 83.02, 65.01, 62.86, 52.24, 44.79; HRMS (ESI) calcd for $C_{24}H_{23}NO_4$ $(M+Na)^+$412.1519, found 412.1563.



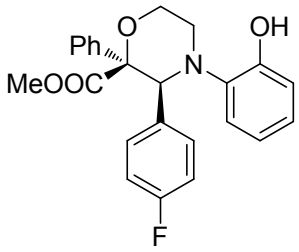
Chemical Formula: $C_{25}H_{25}NO_4$

Compound **6b**: yield 69%; 93% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.5 mL/min; hexane / isopropanol = 10 : 1; 254 nm, Retention time: t_{major} = 22.49 min, and t_{minor} = 20.69 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.73 (d, *J* = 7.8 Hz, 2H), 7.44 (t, *J* = 7.6 Hz, 2H), 7.32 (t, *J* = 6.9 Hz, 1H), 7.18 (s, 2H), 6.94 (m, 3H), 6.84 (d, *J* = 8.0 Hz, 1H), 6.54 – 6.40 (m, 2H), 5.99 (d, *J* = 7.8 Hz, 1H), 4.71 (s, 1H), 4.20 – 4.05 (m, 2H), 3.55 (m, 1H), 3.17 (s, 3H), 2.30 – 2.27 (d, *J* = ? Hz, 1H), 2.23 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.7, 151.89, 137.57, 137.27, 135.54, 130.91, 130.82, 129.30, 128.59, 128.26, 126.83, 126.68, 125.17, 119.26, 114.24, 83.11, 64.68, 62.86, 52.24, 44.77, 21.15;HRMS (ESI) calcd for $C_{25}H_{25}NO_4$ $(M+Na)^+$ 426.1676, found 426.1657.



Chemical Formula: $C_{25}H_{25}NO_5$

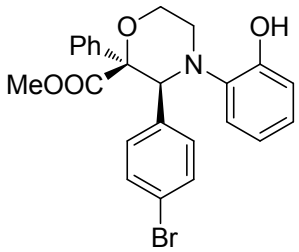
Compound **6c**: yield 71%; 85% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / isopropanol = 10 : 1; 254 nm, Retention time: t_{major} = 26.96 min, and t_{minor} = 14.79 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80 (d, *J* = 7.8 Hz, 2H), 7.53 (t, *J* = 7.7 Hz, 2H), 7.41 (t, *J* = 7.3 Hz, 1H), 7.30 (s, 1H), 7.02 (t, *J* = 7.7 Hz, 1H), 6.93 (d, *J* = 8.0 Hz, 1H), 6.77 (d, *J* = 8.6 Hz, 2H), 6.55 (dd, *J* = 15.8, 8.1 Hz, 2H), 6.08 (d, *J* = 7.8 Hz, 1H), 4.77 (s, 1H), 4.24 – 4.14 (m, 2H), 3.80 (s, 3H), 3.74 (m, 1/2H), 3.62 (td, *J* = 11.4, 4.4 Hz, 1H), 3.27 (s, 3H), 2.37 (d, *J* = 11.8 Hz, 1H), 1.85 (m, 1/2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.64, 159.11, 151.85, 137.15, 135.42, 132.14, 129.24, 128.53, 126.82, 126.60, 126.01, 125.15, 119.22, 114.17, 112.76, 83.11, 67.92, 64.29, 62.79, 55.05, 52.23, 44.70, 25.56; HRMS (ESI) calcd for $C_{25}H_{25}NO_5$ $(M+Na)^+$442.1625, found 442.1652.



Chemical Formula: $C_{24}H_{22}FNO_4$

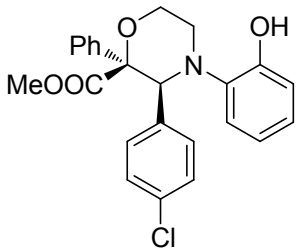
Compound **6d**: yield 83%; 92% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / isopropanol = 10 : 1; 254 nm, Retention time: t_{major} = 15.55 min, and t_{minor} = 12.37 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.81 (d, *J* = 7.6 Hz, 2H), 7.55 (t, *J* = 7.7 Hz, 2H), 7.44 (t, *J* = 7.3 Hz, 1H), 7.37 (s, 2H), 7.08 – 7.01 (m, 1H), 6.96 (dd, *J* = 11.5, 4.9 Hz, 3H), 6.57 (td, *J* = 7.8, 1.5 Hz, 1H), 6.53 (s, 1H), 6.09 (dd, *J* = 7.9, 1.1 Hz, 1H), 4.83 (s, 1H), 4.26 – 4.17 (m, 2H), 3.58 (ddd, *J* = 12.0, 9.6, 5.5 Hz, 1H), 3.31 (s, 3H), 2.44 (d, *J* = 11.9 Hz, 1H); ^{13}CNMR (100 MHz, $CDCl_3$) δ 170.54, 163.71, 161.25, 151.83, 136.95, 135.26, 132.63, 132.56, 129.86, 129.82,

129.33, 128.72, 127.03, 126.58, 124.81, 119.40, 114.56, 114.47, 114.35, 83.04, 64.47, 62.85, 52.33, 44.86; HRMS (ESI) calcd for $C_{24}H_{22}FNO_4$ $(M+Na)^+$430.1425, found 430.1462.



Chemical Formula: $C_{24}H_{22}BrNO_4$

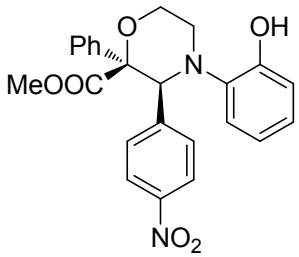
Compound **6e**: yield 63%; 94% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / isopropanol = 10 : 1; 254 nm, Retention time: t_{major} = 18.08 min, and t_{minor} = 12.50 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.78 (d, *J* = 7.8 Hz, 2H), 7.53 (t, *J* = 7.6 Hz, 2H), 7.42 (t, *J* = 7.3 Hz, 1H), 7.37 (d, *J* = 8.2 Hz, 2H), 7.24 (s, 1H), 7.03 (t, *J* = 7.7 Hz, 1H), 6.94 (d, *J* = 8.0 Hz, 1H), 6.57 (t, *J* = 7.6 Hz, 1H), 6.45 (s, 1H), 6.09 (d, *J* = 7.8 Hz, 1H), 4.79 (s, 1H), 4.25 – 4.15 (m, 2H), 3.74 (t, *J* = 6.2 Hz, 1/2H), 3.58 – 3.49 (m, 1H), 3.30 (s, 3H), 2.42 (d, *J* = 11.9 Hz, 1H), 1.85 (t, *J* = 6.3 Hz, 1/2H); ^{13}C NMR (126 MHz, DMSO) δ 170.43, 151.67, 136.75, 135.10, 132.84, 132.45, 130.67, 129.32, 128.73, 127.02, 126.50, 124.69, 122.32, 119.47, 114.49, 82.85, 67.93, 62.79, 52.40, 44.81, 25.57; HRMS (ESI) calcd for $C_{24}H_{22}BrNO_4$ $(M+Na)^+$ 490.0624, found 490.0612.



Chemical Formula: $C_{24}H_{22}ClNO_4$

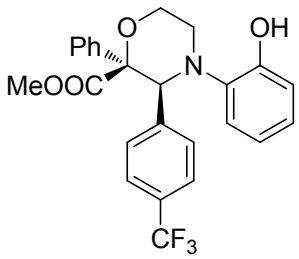
Compound **6f**: yield 80%; 93% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / isopropanol = 10 : 1; 254 nm, Retention time: t_{major} = 16.60 min, and t_{minor} = 12.43 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80 (d, *J* = 7.8 Hz, 2H), 7.56 (t, *J* = 7.7 Hz, 2H), 7.44 (t, *J* = 7.3 Hz, 1H), 7.32 (s, 2H), 7.24 (d, *J* = 8.7 Hz, 2H),

7.08 – 7.01 (m, 1H), 6.96 (dd, J = 8.0, 1.3 Hz, 1H), 6.59 (td, J = 7.7, 1.3 Hz, 1H), 6.48 (s, 1H), 6.11 (d, J = 7.9 Hz, 1H), 4.82 (s, 1H), 4.28 – 4.16 (m, 2H), 3.56 (ddd, J = 12.1, 9.2, 5.9 Hz, 1H), 3.33 (s, 3H), 2.45 (d, J = 11.9 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.48, 151.76, 136.85, 135.19, 134.04, 132.45, 132.20, 129.35, 128.76, 127.75, 127.07, 126.56, 124.75, 119.49, 114.53, 82.97, 62.85, 52.40; HRMS (ESI) calcd for $C_{24}H_{23}NO_4$ $(M+Na)^+$ 446.1130, found 446.1137.



Chemical Formula: $C_{24}H_{22}N_2O_6$

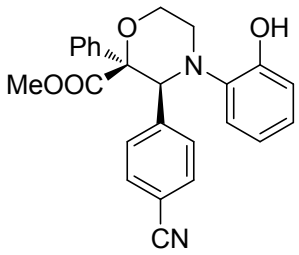
Compound **6g**: yield 65%; 92% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / isopropanol = 10 : 1; 254 nm, Retention time: t_{major} = 37.63 min, and t_{minor} = 18.42 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.07 (d, J = 8.4 Hz, 2H), 7.75 (d, J = 7.4 Hz, 2H), 7.53 (t, J = 7.6 Hz, 3H), 7.43 (t, J = 7.3 Hz, 1H), 7.03 (t, J = 7.7 Hz, 1H), 6.96 (d, J = 8.1 Hz, 1H), 6.55 (t, J = 7.6 Hz, 1H), 6.40 (s, 1H), 6.07 (d, J = 7.7 Hz, 1H), 4.94 (s, 1H), 4.28 – 4.20 (m, 2H), 3.74 (t, J = 6.2 Hz, 1/2H), 3.53 – 3.42 (m, 1H), 3.34 (s, 3H), 2.54 (d, J = 11.9 Hz, 1H), 1.85 (t, J = 6.4 Hz, 1/2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.25, 151.53, 147.42, 141.41, 136.38, 134.82, 131.54, 129.36, 128.96, 127.26, 126.40, 123.98, 122.47, 119.72, 114.90, 82.80, 67.93, 62.88, 52.53, 25.57; HRMS (ESI) calcd for $C_{24}H_{22}N_2O_6$ $(M+Na)^+$ 457.1370, found 457.1391.



Chemical Formula: $C_{25}H_{22}F_3NO_4$

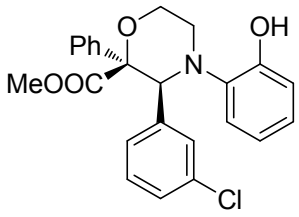
Compound **6h**: yield 58%; 90% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / Ethanol = 10 : 1; 254 nm, Retention time: t_{major} = 10.31

min, and t_{minor} = 8.84 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.81 (d, *J* = 7.6 Hz, 2H), 7.51 (m, 7H), 7.10 – 7.02 (m, 1H), 6.97 (dd, *J* = 8.1, 1.4 Hz, 1H), 6.57 (td, *J* = 7.7, 1.5 Hz, 1H), 6.44 (s, 1H), 6.06 (dd, *J* = 7.9, 1.0 Hz, 1H), 4.92 (s, 1H), 4.29 – 4.22 (m, 2H), 3.55 (ddd, *J* = 12.1, 8.6, 6.3 Hz, 1H), 3.32 (s, 3H), 2.49 (d, *J* = 12.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.43, 151.70, 137.94, 136.69, 135.05, 131.13, 129.40, 128.86, 127.15, 126.53, 124.51 , 124.42, 124.38, 119.58, 114.69, 82.87, 62.88, 52.44; HRMS (ESI) calcd for $C_{25}H_{22}F_3NO_4$ $(M+Na)^+$480.1393, found 480.1415.



Chemical Formula: $C_{25}H_{22}N_2O_4$

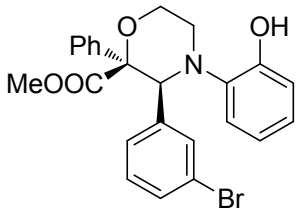
Compound **6i**: yield 70%; 90% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / isopropanol = 10 : 1; 254 nm, Retention time: t_{major} = 29.65 min, and t_{minor} = 23.45 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.76 (d, *J* = 7.7 Hz, 2H), 7.54 (dd, *J* = 12.4, 4.5 Hz, 4H), 7.45 (t, *J* = 7.3 Hz, 3H), 7.09 – 7.02 (m, 1H), 6.97 (dd, *J* = 8.1, 1.4 Hz, 1H), 6.58 (td, *J* = 7.7, 1.4 Hz, 1H), 6.42 (s, 1H), 6.08 (d, *J* = 7.7 Hz, 1H), 4.88 (s, 1H), 4.24 (dd, *J* = 7.2, 2.8 Hz, 2H), 3.54 – 3.44 (m, 1H), 3.35 (d, *J* = 8.0 Hz, 3H), 2.54 (d, *J* = 12.1 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.31, 151.63, 139.39, 136.50, 134.91, 131.42, 131.20, 129.39, 128.96, 127.29, 126.46, 124.15, 119.68, 118.58, 114.87, 111.91, 82.87, 62.92, 52.51; HRMS (ESI) calcd for $C_{25}H_{22}N_2O_4$ $(M+Na)^+$437.1472, found 1501.



Chemical Formula: $C_{24}H_{22}ClNO_4$

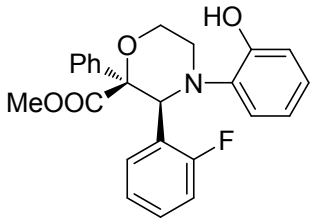
Compound **6j**: yield 67%; 90% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.7 mL/min; hexane / ethanol = 80 : 1; 254 nm, Retention time: t_{major} = 28.55

min, and t_{minor} = 32.45 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.81 (d, *J* = 7.8 Hz, 2H), 7.56 (t, *J* = 7.7 Hz, 2H), 7.45 (t, *J* = 7.3 Hz, 2H), 7.30 (d, *J* = 7.7 Hz, 2H), 7.19 (t, *J* = 7.6 Hz, 1H), 7.06 (dd, *J* = 10.7, 4.6 Hz, 1H), 6.99 – 6.91 (m, 1H), 6.59 (dd, *J* = 10.7, 4.5 Hz, 1H), 6.46 (s, 1H), 6.11 (d, *J* = 7.8 Hz, 1H), 4.82 (s, 1H), 4.28 – 4.16 (m, 2H), 3.64 – 3.53 (m, 1H), 3.34 (d, *J* = 2.4 Hz, 3H), 2.45 (d, *J* = 10.4 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.45, 151.71, 136.81, 135.93, 135.08, 133.55, 130.76, 129.39, 129.12, 128.79, 128.75, 128.20, 127.15, 126.54, 124.75, 119.45, 114.59, 82.86, 64.73, 62.80, 52.43, 44.82; HRMS (ESI) calcd for $C_{24}H_{22}ClNO_4$ $(M+Na)^+$446.1130, found 446.1151.



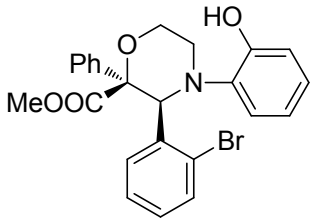
Chemical Formula: $C_{24}H_{22}BrNO_4$

Compound **6k**: yield 56%; 91% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.35 mL/min; hexane / isopropanol = 10 : 1; 254 nm, Retention time: t_{major} = 30.60 min, and t_{minor} = 27.74 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.78 (d, *J* = 7.9 Hz, 2H), 7.54 (t, *J* = 7.6 Hz, 2H), 7.42 (t, *J* = 6.7 Hz, 2H), 7.27 (d, *J* = 13.4 Hz, 1H), 7.11 (t, *J* = 7.8 Hz, 1H), 7.04 (t, *J* = 7.7 Hz, 1H), 6.95 (d, *J* = 8.0 Hz, 1H), 6.57 (t, *J* = 7.6 Hz, 1H), 6.43 (s, 1H), 6.08 (d, *J* = 7.9 Hz, 1H), 4.78 (s, 1H), 4.26 – 4.15 (m, 2H), 3.74 (t, *J* = 6.2 Hz, 1/2H), 3.55 (td, *J* = 11.4, 4.2 Hz, 1H), 3.32 (s, 3H), 2.42 (d, *J* = 11.9 Hz, 1H), 1.85 (t, *J* = 6.3 Hz, 1/2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.41, 151.62, 136.72, 136.10, 134.98, 133.58, 131.07, 129.35, 129.01, 128.76, 127.12, 126.48, 124.71, 121.70, 119.40, 114.55, 82.78, 67.93, 64.64, 62.74, 52.42, 44.69, 25.57; HRMS (ESI) calcd for $C_{24}H_{22}BrNO_4$ $(M+Na)^+$ 490.0624, found 490.0625.



Chemical Formula: $C_{24}H_{22}FNO_4$

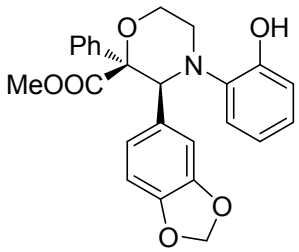
Compound **6l**: yield 64%; 92% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.35 mL/min; hexane / isopropanol = 10 : 1; 254 nm, Retention time: t_{major} = 28.64 min, and t_{minor} = 26.20 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.31 (t, *J* = 7.4 Hz, 1H), 7.84 (d, *J* = 7.9 Hz, 2H), 7.56 (t, *J* = 7.5 Hz, 2H), 7.45 (t, *J* = 7.3 Hz, 1H), 7.35 – 7.29 (m, 1H), 7.21 (t, *J* = 7.5 Hz, 1H), 7.06 (t, *J* = 7.7 Hz, 1H), 6.96 (d, *J* = 8.1 Hz, 1H), 6.88 (t, *J* = 9.1 Hz, 1H), 6.56 (t, *J* = 7.5 Hz, 2H), 6.17 (d, *J* = 7.9 Hz, 1H), 5.44 (s, 1H), 4.29 – 4.16 (m, 2H), 3.66 (td, *J* = 11.3, 4.4 Hz, 1H), 3.30 (s, 3H), 2.45 (d, *J* = 12.0 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.39, 152.19, 136.80, 135.39, 130.94, 129.83,129.74, 129.37, 128.75, 127.20, 126.60, 123.55,123.41,123.38, 122.06, 121.93, 119.44, 115.11, 114.87, 114.37, 82.96, 77.25, 62.86 (s), 52.32; HRMS (ESI) calcd for $C_{24}H_{22}FNO_4$ $(M+Na)^+$430.1425, found 430.1404.



Chemical Formula: $C_{24}H_{22}BrNO_4$

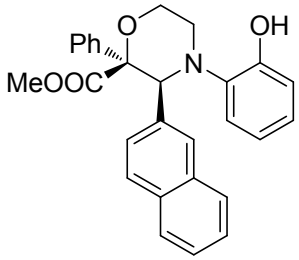
Compound **6m**: yield51%; 89% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.5 mL/min; hexane / ethanol = 20 : 1; 254 nm, Retention time: t_{major} = 19.09 min, and t_{minor} = 17.53 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.43 (d, *J* = 7.8 Hz, 1H), 7.84 (d, *J* = 7.7 Hz, 2H), 7.56 (t, *J* = 7.5 Hz, 2H), 7.43 (t, *J* = 6.9 Hz, 2H), 7.38 (t, *J* = 7.6 Hz, 1H), 7.16 (t, *J* = 7.6 Hz, 1H), 7.05 (t, *J* = 7.7 Hz, 1H), 6.91 (d, *J* = 8.0 Hz, 1H), 6.57 (s, 1H), 6.52 (t, *J* = 7.6 Hz, 1H), 6.05 (d, *J* = 7.8 Hz, 1H), 5.69 (s, 1H), 4.22 (dt, *J* = 23.1, 9.9 Hz, 2H), 3.75 (td, *J* = 11.7, 3.4 Hz, 1H), 3.23 (s, 3H), 2.39 (d, *J* = 11.9 Hz, 1H); ^{13}C NMR (100 MHz,) δ 170.27, 152.62, 136.73, 134.62, 133.73, 132.89, 130.96, 129.47, 128.79, 128.69, 127.38, 126.88, 126.66, 124.45, 119.41, 114.28, 82.91, 62.74,

60.77, 52.18, 44.40; HRMS (ESI) calcd for $C_{24}H_{22}BrNO_4$ $(M+Na)^+$ 490.0624, found 490.0612.



Chemical Formula: $C_{25}H_{23}NO_6$

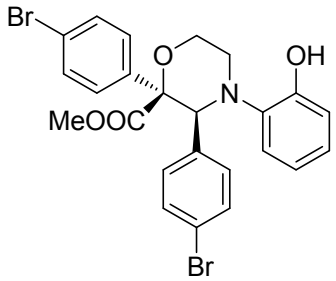
Compound **6n**: yield 59%; 76% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / ethanol = 10 : 1; 254 nm, Retention time: t_{major} = 24.09 min, and t_{minor} = 16.84 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.87 – 7.77 (m, 2H), 7.55 (m, 2H), 7.42 (t, *J* = 6.9 Hz, 1H), 7.04 (m, 2H), 6.94 (dd, *J* = 8.1, 1.4 Hz, 1H), 6.74 (s, 1H), 6.68 (d, *J* = 7.8 Hz, 1H), 6.64 – 6.56 (m, 1H), 6.53 (s, 1H), 6.19 (d, *J* = 7.9 Hz, 1H), 5.96 (s, 2H), 4.76 (s, 1H), 4.19 (m, 2H), 3.74 – 3.60 (m, 1H), 3.34 (s, 3H), 2.40 (d, *J* = 12.3 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.61, 151.83, 147.19, 146.93, 137.13, 135.38, 129.32, 128.64, 127.68, 126.96, 126.61, 125.12, 125.01, 119.35, 114.34, 111.13, 107.34, 101.01, 83.12, 64.59, 62.77, 52.36, 44.71; HRMS (ESI) calcd for $C_{25}H_{23}NO_6$ $(M+Na)^+$ 456.1418, found 456.1430.



Chemical Formula: $C_{28}H_{25}NO_4$

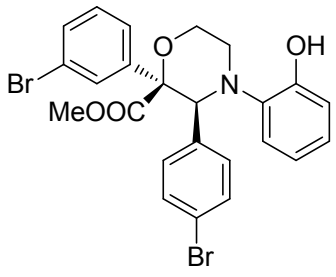
Compound **6o**: yield 77%; 91% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / isopropanol = 10 : 1; 254 nm, Retention time: t_{major} = 20.69 min, and t_{minor} = 14.16 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.10 (s, 1H), 7.89 (d, *J* = 7.6 Hz, 2H), 7.84 (dd, *J* = 8.9, 4.8 Hz, 2H), 7.70 (d, *J* = 8.5 Hz, 1H), 7.59 (t, *J* = 7.7 Hz, 2H), 7.54 – 7.43 (m, 3H), 7.31 (s, 1H), 7.02 (ddd, *J* = 15.5, 8.1, 3.9 Hz, 2H), 6.58 (s, 1H), 6.49 – 6.43 (m, 1H), 6.01 (d, *J* = 7.9 Hz, 1H), 5.04 (s, 1H), 4.30 (dtd, *J* = 22.7,

11.5, 2.9 Hz, 2H), 3.73 (td, J = 11.5, 4.1 Hz, 1H), 3.22 (s, 3H), 2.45 (d, J = 11.7 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.66, 151.84, 137.17, 135.42, 132.84, 132.65, 131.62, 129.38, 128.71, 128.56, 127.45, 127.45, 126.96, 126.83, 126.65, 126.18, 125.94, 125.09, 119.36, 114.37, 83.22, 65.04, 62.98, 52.33; HRMS (ESI) calcd for $C_{28}H_{25}NO_4$ $(M+Na)^+$462.1676, found 430.1679.



Chemical Formula: $C_{24}H_{21}Br_2NO_4$

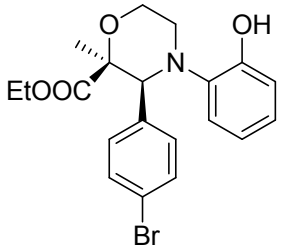
Compound **6p**: yield 59%; 75% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / ethanol = 10 : 1; 254 nm, Retention time: t_{major} = 10.96 min, and t_{minor} = 19.83 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.57 (s, 4H), 7.29 (d, J = 8.4 Hz, 2H), 7.13 (s, 2H), 6.96 (t, J = 7.7 Hz, 1H), 6.86 (d, J = 8.0 Hz, 1H), 6.50 (t, J = 7.6 Hz, 1H), 6.33 (s, 1H), 6.02 (d, J = 7.8 Hz, 1H), 4.65 (s, 1H), 4.08 (m, 2H), 3.45 (td, J = 11.6, 3.4 Hz, 1H), 3.24 (s, 3H), 2.38 (d, J = 11.9 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 170.03, 151.58, 136.03, 135.05, 132.59, 130.50, 130.45, 130.78, 128.44, 127.16, 124.62, 123.10, 122.52, 119.66, 114.61, 82.66, 77.26, 64.66, 62.94, 52.58, 44.97; HRMS (ESI) calcd for $C_{28}H_{25}NO_4$ $(M+Na)^+$567.9730, found 567.9736.



Chemical Formula: $C_{24}H_{21}Br_2NO_4$

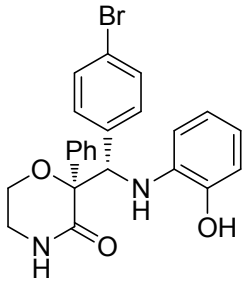
Compound **6q**: yield 57%; 70% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / ethanol = 10 : 1; 254 nm, Retention time: t_{major} = 24.91 min, and t_{minor} = 10.22 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.96 (s, 1H), 7.67 (d, J = 7.6 Hz, 1H), 7.56 (d, J = 7.8 Hz, 1H), 7.38 (m, 3H), 7.20 (s, 2H), 7.03 (t, J = 7.6 Hz,

1H), 6.95 (d, J = 7.9 Hz, 1H), 6.57 (t, J = 7.5 Hz, 1H), 6.40 (s, 1H), 6.10 (d, J = 7.8 Hz, 1H), 4.73 (s, 1H), 4.27 – 4.09 (m, 2H), 3.52 (td, J = 11.6, 3.2 Hz, 1H), 3.33 (s, 3H), 2.47 (d, J = 11.9 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 169.95, 151.58, 139.36, 135.06, 132.53, 132.43, 131.96, 130.81, 130.77, 129.91, 127.10, 125.22, 124.52, 123.69, 122.52, 119.66, 114.72, 82.51, 64.71, 63.00, 52.63, 44.98. HRMS (ESI) calcd for $C_{28}H_{25}NO_4$ $(M+Na)^+$ 567.9730, found 567.9714.



Chemical Formula: $C_{20}H_{22}BrNO_4$

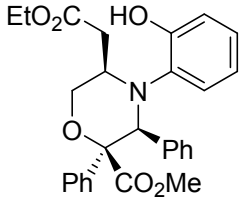
Compound **6r**: yield 58%; 87% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.6 mL/min; hexane / ethanol = 40 : 1; 254 nm, Retention time: t_{major} = 21.68 min, and t_{minor} = 16.15 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.25 (d, J = 9.3 Hz, 2H), 7.10 (s, 1H), 6.99 (dd, J = 22.5, 7.7 Hz, 3H), 6.90 (d, J = 7.9 Hz, 1H), 6.59 (t, J = 7.5 Hz, 1H), 6.44 (d, J = 7.7 Hz, 1H), 4.47 (m, 1H), 4.15 – 3.91 (m, 4H), 3.22 (m, 1H), 2.88 – 2.71 (m, 1H), 1.69 (s, 3H), 1.00 (t, J = 7.0 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.37, 151.65, 135.83, 133.92, 131.43, 130.67, 126.74, 123.38, 122.02, 119.84, 114.40, 78.64, 69.36, 62.89, 60.98, 49.79, 22.51, 13.76. HRMS: calcd for $C_{19}H_{20}BrNO_4$ $(M+Na)^+$ 442.0630; found: 442.0652.



Chemical Formula: $C_{23}H_{21}BrN_2O_3$

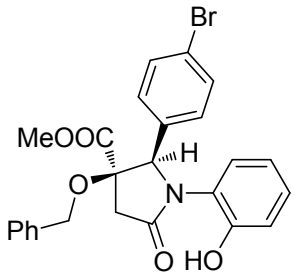
Compound 7: yield 62%; 97% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / isopropanol = 5 : 1; 254 nm, Retention time: t_{major} = 25.46 min, and t_{minor} = 19.33 min.);^{1}H NMR (400 MHz, DMSO) δ 9.25 (s, 1H), 8.00 – 7.82

(m, 3H), 7.55 – 7.41 (m, 4H), 7.36 (t, J = 7.6 Hz, 2H), 7.27 (t, J = 7.2 Hz, 1H), 6.49 (t, J = 11.6 Hz, 1H), 6.37 (t, J = 7.3 Hz, 1H), 6.26 (t, J = 7.1 Hz, 1H), 6.17 (d, J = 7.6 Hz, 1H), 5.10 – 4.97 (m, 2H), 3.90 (d, J = 11.4 Hz, 1H), 3.71 (t, J = 9.2 Hz, 1H), 3.02 – 2.92 (m, 1H), 2.86 (t, J = 9.3 Hz, 1H); ^{13}C NMR (100 MHz, Acetone) δ 169.36, 145.04, 140.30, 139.84, 136.70, 132.86, 131.16, 128.77, 128.35, 127.51, 120.82, 117.17, 114.25, 112.00, 65.19, 62.02, 42.17. HRMS: calcd for $C_{25}H_{22}BrNO_5$ $(M+Na)^+$ 475.0633; found: 475.0626.



Chemical Formula: $C_{28}H_{29}NO_6$

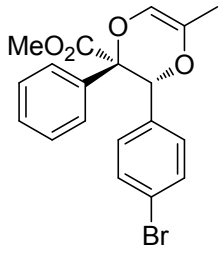
Compound **8**: yield 51%; 94% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / ethanol = 50 : 1; 254 nm, Retention time: t_{major} = 13.14 min, and t_{minor} = 15.19 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.80 (s, 1H), 7.15 – 7.07 (m, 1H), 7.04 (t, J = 7.4 Hz, 2H), 6.95 – 6.87 (m, 2H), 6.86 – 6.65 (m, 7H), 6.46 (td, J = 7.7, 1.3 Hz, 1H), 4.29 (d, J = 8.5 Hz, 1H), 4.23 (s, 1H), 3.89 (dd, J = 16.3, 7.2 Hz, 2H), 3.78 – 3.68 (m, 5H), 2.23 (dd, J = 16.2, 3.9 Hz, 1H), 2.17 – 2.06 (m, 1H), 1.08 (t, J = 7.1 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 170.74, 170.70 , 154.57, 138.12, 134.47, 132.72, 130.88, 128.06, 127.72, 127.56, 127.35, 126.85, 126.12, 124.49, 119.80, 113.93, 85.37, 78.70, 69.14, 60.74, 60.18, 52.39, 34.54, 14.04. HRMS: calcd for $C_{28}H_{29}NO_6$ $(M+Na)^+$ 498.1893; found: 498.1897.



Chemical Formula: $C_{25}H_{22}BrNO_5$

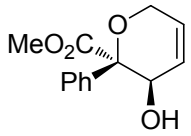
Compound 10 [prepared with (*R*)-**5d-ZrMS** derived from (*R*)-BINOL]: yield 65%; 90% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / ethanol = 5 : 1; 254 nm, Retention time: t_{major} = 17.41 min, and t_{minor} = 22.94 min.);

^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 (s, 1H), 7.40 (d, J = 8.3 Hz, 2H), 7.26 – 7.19 (m, 3H), 7.10 (dd, J = 15.5, 7.8 Hz, 3H), 7.00 (d, J = 8.1 Hz, 1H), 6.92 – 6.81 (m, 3H), 6.74 (t, J = 7.6 Hz, 1H), 5.65 (s, 1H), 4.38 (d, J = 2.4 Hz, 2H), 3.87 (s, 3H), 3.34 (d, J = 17.2 Hz, 1H), 3.09 (d, J = 17.2 Hz, 1H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 172.04, 172.01, 151.33, 136.87, 132.53, 131.51, 130.24, 128.80, 128.32, 127.76, 126.58, 125.27, 124.09, 122.87, 120.87, 120.21, 82.21, 70.82, 68.50, 53.45, 39.15. HRMS: calcd for $C_{25}H_{22}BrNO_5$ $(M+Na)^+$ 518.0579; found: 518.0585.



Chemical Formula: $C_{19}H_{17}BrO_4$

Compound **12** [prepared with (*R*)-**5d**-**ZrMS** derived from (*R*)-BINOL]: yield 56%; 97% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.5 mL/min; hexane / ethanol = 15 : 1; 220 nm, Retention time: t_{major} = 12.6 min, and t_{minor} = 19.6 min.); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 (ddd, J = 11.4, 9.2, 2.3 Hz, 7H), 7.16 (d, J = 8.2 Hz, 2H), 6.07 (s, 1H), 5.40 (s, 1H), 3.60 (s, 3H), 1.66 (s, 3H)；13C NMR (100 MHz, CDCl3) δ 169.04, 136.40, 135.39, 134.20, 130.86, 130.21, 128.84, 128.50, 126.46, 122.54, 120.19, 80.76, 78.56, 52.62, 15.44. HRMS: calcd for $C_{19}H_{17}BrO_4$ $(M+Na)^+$ 411.0208; found: 411.0190.



Chemical Formula: $C_{13}H_{14}O_4$

Compound **14** [prepared with (*R*)-**5d**-**ZrMS** derived from (*R*)-BINOL]: yield 70%; 99% ee, determined by HPLC (Daicel Chirapak IA, flow rate: 0.8 mL/min; hexane / ethanol = 10 : 1; 220 nm, Retention time: t_{major} = 14.2 min, and t_{minor} = 19.3 min.); ^{1}H NMR (400 MHz, $CDCl_3$+D_2O 1d) δ 7.68 – 7.59 (m, 2H), 7.40 (dd, J = 11.6, 4.5 Hz, 2H), 7.36 – 7.29 (m, 1H), 6.25 – 6.15 (m, 1H), 6.01 – 5.92 (m, 1H), 4.81 (d, J = 5.5

Hz, 1H), 4.76 (s, 1H), 4.68 – 4.42 (m, 2H), 3.71 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 171.22, 137.54, 129.39, 128.55, 128.24, 125.77, 125.56, 82.28, 65.02, 63.89, 52.61; HRMS: calcd for $C_{13}H_{14}NO_4$ $(M+Na)^+$ 257.0790; found: 257.0779.

References:

1. Kuwajima, I.; Minami, N.; Sato, T., *Tetrahedron Lett.* **1976,** *17*, 2253-2256.
2. Sogah, G. D. Y.; Cram, D. J., *J. Am. Chem. Soc.* **1979,** *101*, 3035-3042.
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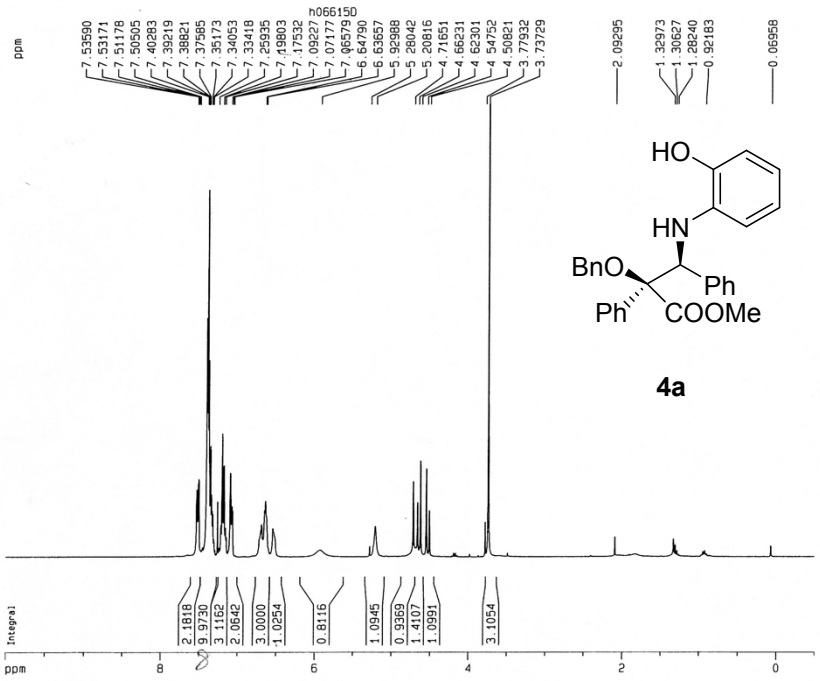
5. Yamashita, Y.; Ishitani, H.; Shimizu, H.; Kobayashi, S., *J. Am. Chem. Soc.* **2002,** *124*, 3292-3302.
6. Huang, H. X.; Guo, X.; Hu, W. H., *Angew. Chem. Int. Ed.* **2007,** *46*, 1337-1339.

NMR Spectra



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PROCNO 1

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SOLVENT CDCl3
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SWH 5995.204 Hz
FIDRES 0.182959 Hz
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DE 6.00 usec
TE 300.0 K
D1 1.00000000 sec

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PL1 -2.00 dB
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F2 - Processing parameters
SI 32768
SF 300.1300124 MHz
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SSB 0
LB 0.10 Hz
GB 0
PC 1.00

1D NMR plot parameters
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CY 15.00 cm
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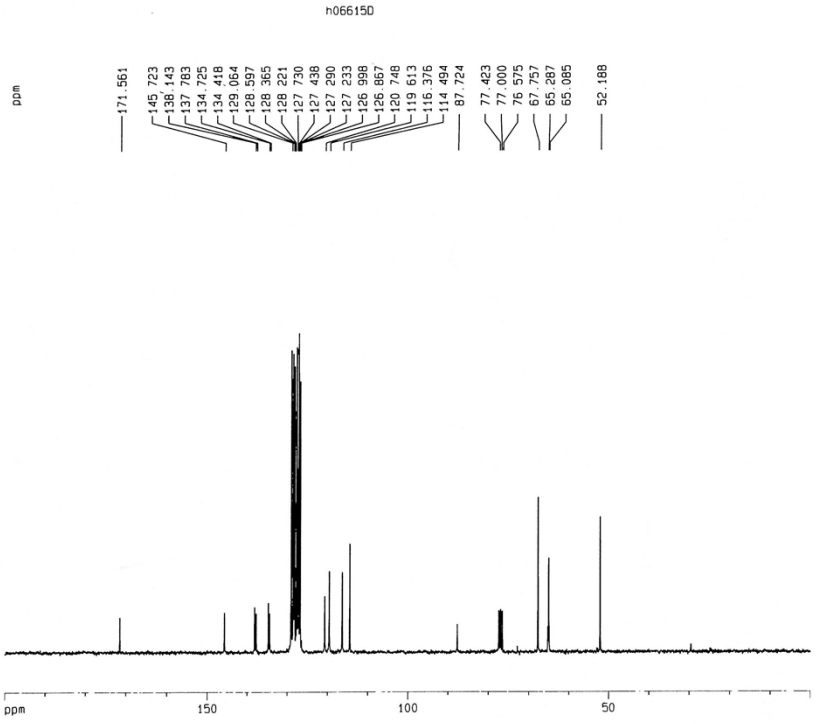
F2P -0.500 ppm
F2 -150.06 Hz
PPMCM 0.52500 ppm/cm
HZCM 157.56825 Hz/cm



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PROCNO 1

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SOLVENT CDCl3
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SWH 22675.736 Hz
FIDRES 0.346004 Hz
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RG 8192
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DE 6.00 usec
TE 300.0 K
D1 2.00000000 sec
d11 0.03000000 sec
d12 0.00002000 sec

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PL1 -6.00 dB
SFO1 75.4775598 MHz

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PCPD2 80.00 usec
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PL12 17.70 dB
PL13 17.71 dB
SFO2 300.1312005 MHz

F2 - Processing parameters
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SSB 0
LB 3.00 Hz
GB 0
PC 1.40

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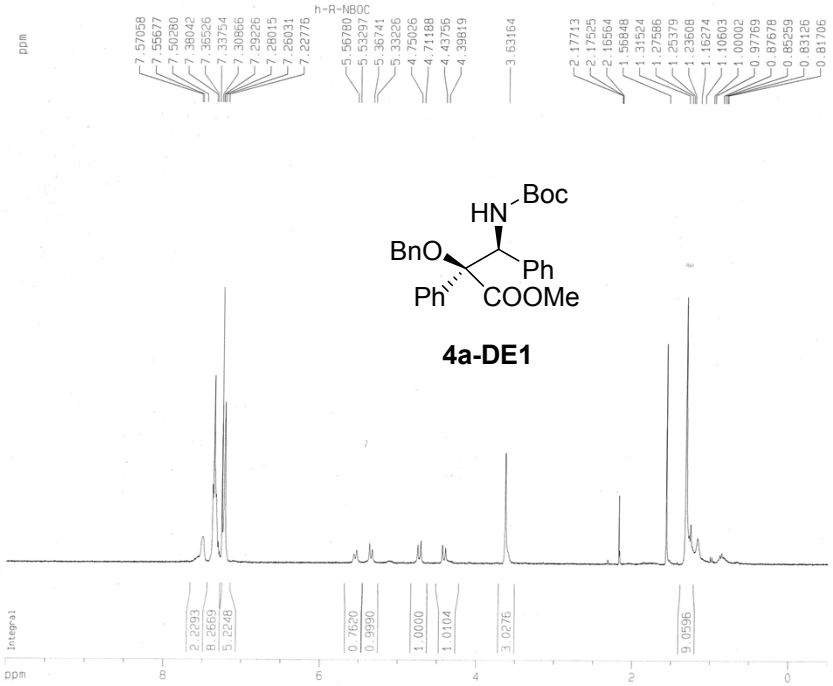
HZCM 754.71533 Hz/cm



4a-DE1

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EXPNO                           1
PROCNO                          1

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TD                      32768
SOLVENT                  CDCl3
NS                          32
DS                           0
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FIDRES              0.182959 Hz
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RG                         128
DW                    83.400 usec
DE                     6.00 usec
TE                     300.0 K
D1                  1.00000000 sec

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PL1                     -2.00 dB
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F2 - Processing parameters
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WDW                            EM
SSB                             0
LB                       0.10 Hz
GB                              0
PC                           1.00

1D NMR plot parameters
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CY                       7.00 cm
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F1                   3001.30 Hz
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F2                   -150.06 Hz
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HZCM               157.56825 Hz/cm
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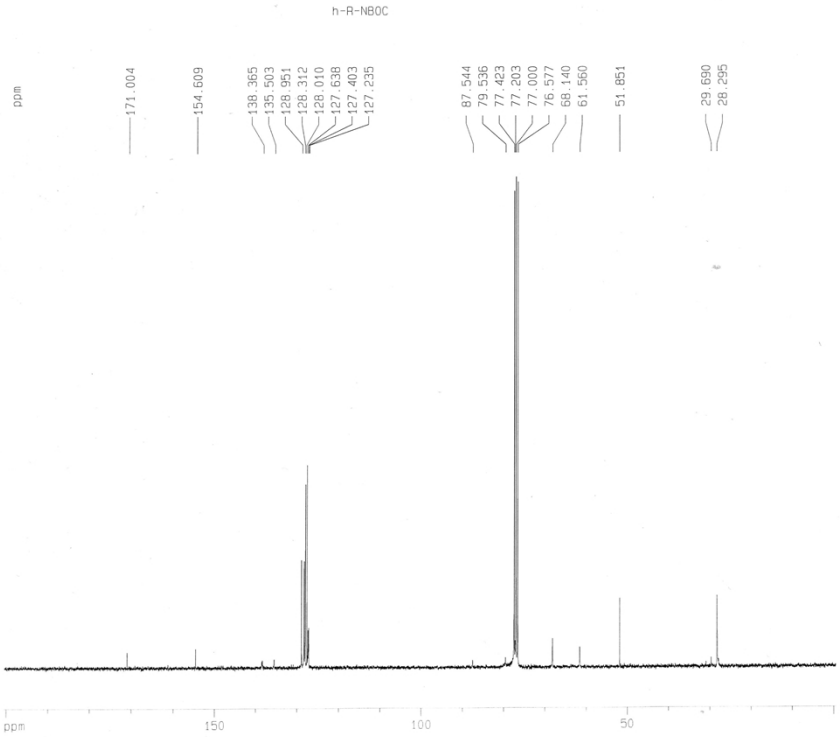


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PROCNO                          1

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PULPROG                  zgpg
TD                      65536
SOLVENT                  CDCl3
NS                       10240
DS                           4
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FIDRES              0.346004 Hz
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RG                        8192
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DE                     6.00 usec
TE                     300.0 K
D1                  2.00000000 sec
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PL1                     -6.00 dB
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NUC2                        1H
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PL2                     -2.00 dB
PL12                    17.70 dB
PL13                    17.71 dB
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F2 - Processing parameters
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SF                 75.4677519 MHz
WDW                            EM
SSB                             0
LB                       1.00 Hz
GB                              0
PC                           1.40

1D NMR plot parameters
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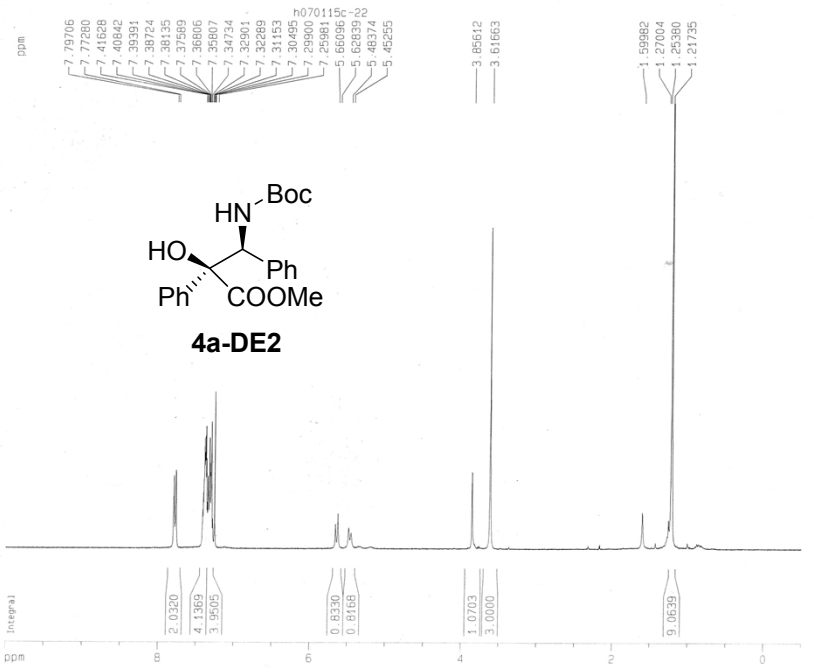

4a-DE2

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EXPNO                    1
PROCNO                   1

F2 - Acquisition Parameters
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Time             12.14
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PULPROG          zg30
TD               32768
SOLVENT          Acetone
NS                  16
DS                   0
SWH           5995.204 Hz
FIDRES        0.182959 Hz
AQ            2.7329011 sec
RG                1024
DW              83.400 usec
DE               6.00 usec
TE              300.0 K
D1           1.00000000 sec

======== CHANNEL f1 ========
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PL1              -2.00 dB
SFO1        300.1320882 MHz

F2 - Processing parameters
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SF          300.1300124 MHz
WDW                 EM
SSB                  0
LB                0.10 Hz
GB                   0
PC                1.00

1D NMR plot parameters
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CY                35.00 cm
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F2P           -0.500 ppm
F2            -150.06 Hz
PPMCM         0.52500 ppm/cm
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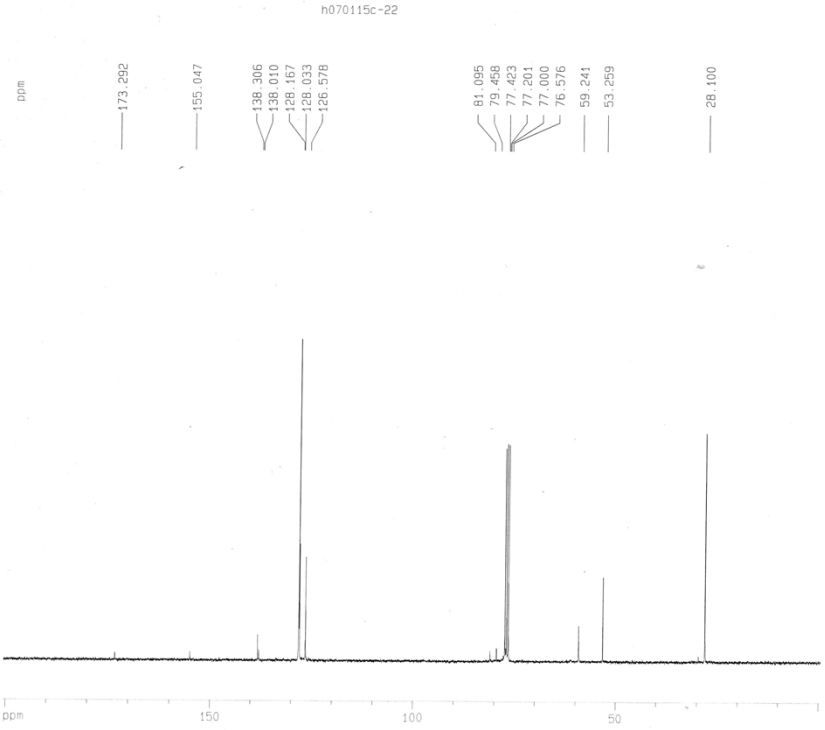


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Current Data Parameters
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EXPNO                    2
PROCNO                   1

F2 - Acquisition Parameters
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PULPROG          zgpg
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DS                    4
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FIDRES        0.346004 Hz
AQ            1.4451188 sec
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DE               6.00 usec
TE              300.0 K
D1           2.00000000 sec
d11          0.03000000 sec
d12          0.00002000 sec

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PL1             -6.00 dB
SFO1        75.4775598 MHz

======== CHANNEL f2 ========
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PCPD2            80.00 usec
PL2              -2.00 dB
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PL13             17.71 dB
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F2 - Processing parameters
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SF          75.4677519 MHz
WDW                 EM
SSB                  0
LB                1.00 Hz
GB                   0
PC                1.40

1D NMR plot parameters
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CY                 8.00 cm
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HZCM          758.45087 Hz/cm
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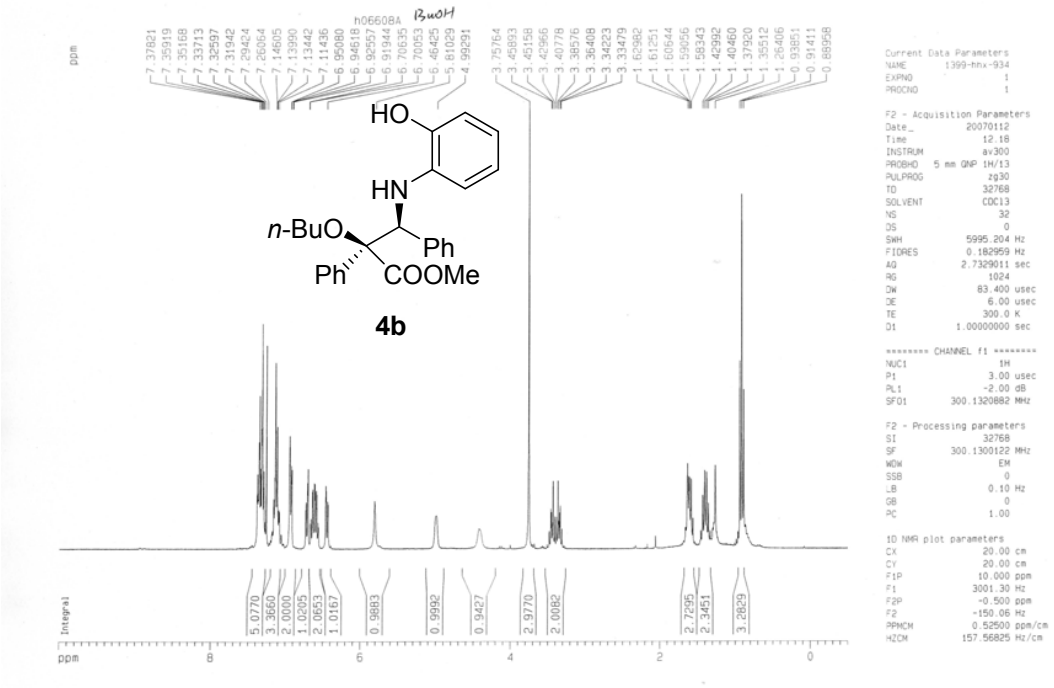
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Ph
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ppm
Integral
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1.0205
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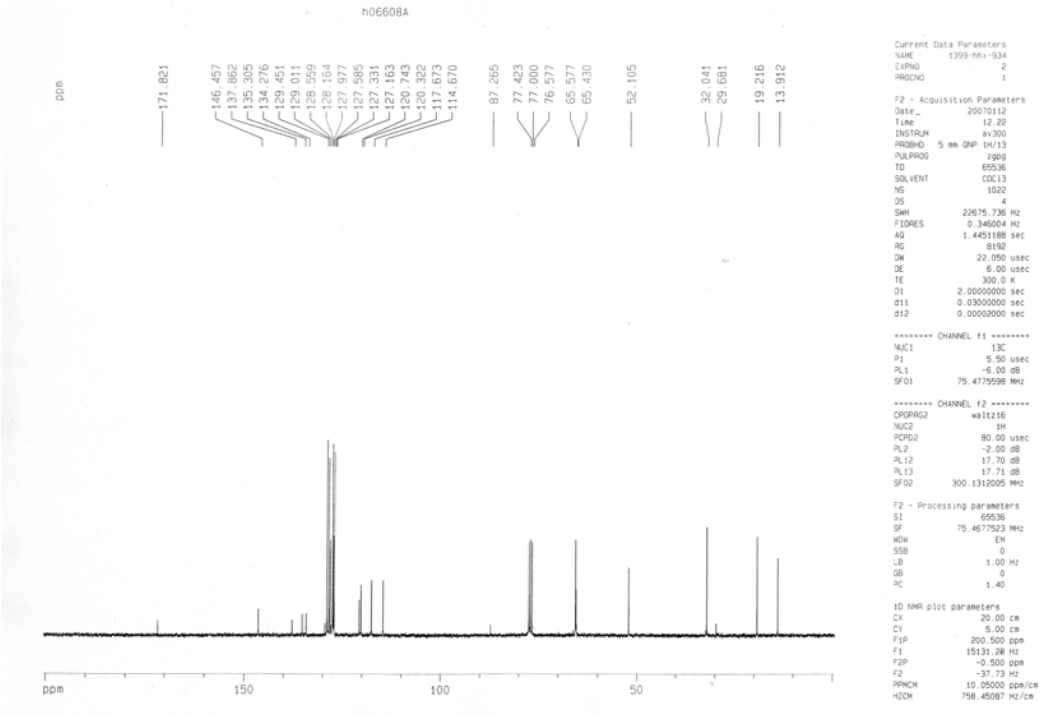
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127.163
120.743
120.322
117.673
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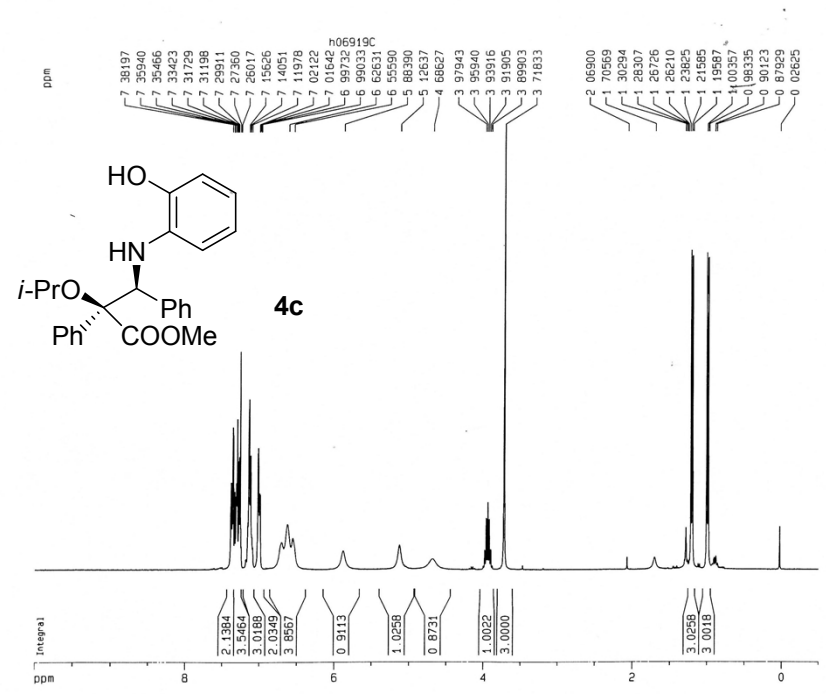


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PROCNO                   1

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TD                   32768
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DS                       0
SWH              5995.204 Hz
FIDRES           0 182959 Hz
AQ               2 7329011 sec
RG                     512
DW                83 400 usec
DE                 6 00 usec
TE                 300 0 K
D1              1 00000000 sec

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PL1                -2 00 dB
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F2 - Processing parameters
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SF            300 1300124 MHz
WDW                     EM
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LB                 0 10 Hz
GB                       0
PC                  1 00

1D NMR plot parameters
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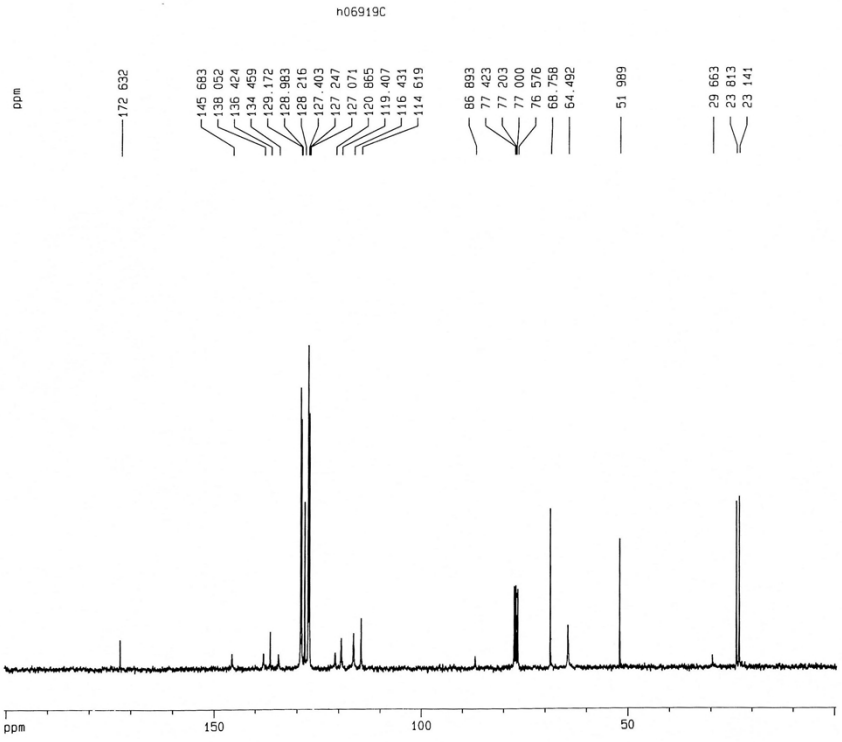


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Current Data Parameters
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EXPNO                    2
PROCNO                   1

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TD                   65536
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FIDRES           0 346004 Hz
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RG                    8192
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d11             0.03000000 sec
d12             0 00002000 sec

======== CHANNEL f1 ========
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P1                 5 50 usec
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SFO1          75 4775598 MHz

======== CHANNEL f2 ========
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NUC2                   1H
PCPD2             80.00 usec
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PL12               17.70 dB
PL13               17 71 dB
SFO2         300.1312005 MHz

F2 - Processing parameters
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WDW                     EM
SSB                      0
LB                 3 00 Hz
GB                       0
PC                  1 40

1D NMR plot parameters
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CY                  8 00 cm
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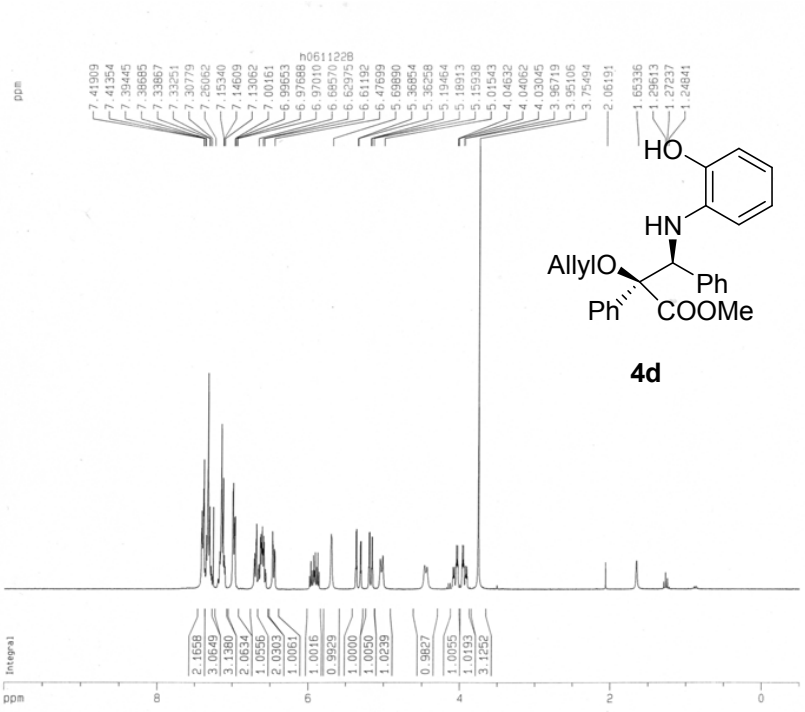


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PROCNO                   1

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SOLVENT          CDCl3
NS                  16
DS                   0
SWH           7485.030 Hz
FIDRES        0.228425 Hz
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RG                1024
DW              66.800 usec
DE               6.00 usec
TE              300.0 K
D1            1.00000000 sec

======== CHANNEL f1 ========
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P1                 3.00 usec
PL1               -2.00 dB
SFO1         300.1320882 MHz

F2 - Processing parameters
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SF          300.1300123 MHz
WDW                 EM
SSB                  0
LB                0.10 Hz
GB                   0
PC                1.00

1D NMR plot parameters
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CY               20.00 cm
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HZCM         157.56825 Hz/cm
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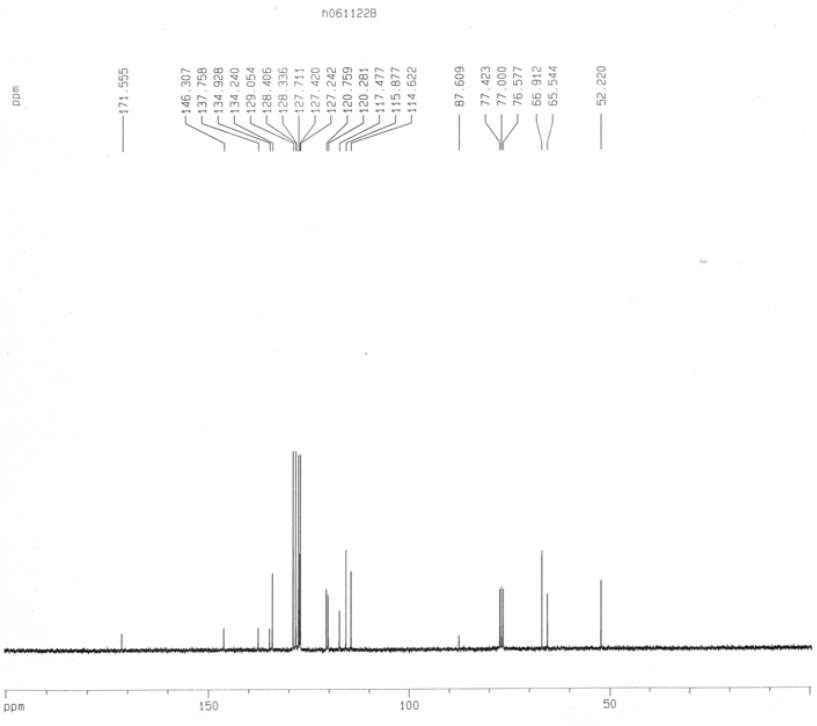


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PROCNO                   1

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DS                   4
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FIDRES        0.346004 Hz
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DE               6.00 usec
TE              300.0 K
D1            2.00000000 sec
d11           0.03000000 sec
d12           0.00002000 sec

======== CHANNEL f1 ========
NUC1                13C
P1                 5.50 usec
PL1               -6.00 dB
SFO1         75.4775598 MHz

======== CHANNEL f2 ========
CPDPRG2         waltz16
NUC2                1H
PCPD2            80.00 usec
PL2               -2.00 dB
PL12              17.70 dB
PL13              17.71 dB
SFO2         300.1312005 MHz

F2 - Processing parameters
SI               65536
SF          75.4677540 MHz
WDW                 EM
SSB                  0
LB                1.00 Hz
GB                   0
PC                1.40

1D NMR plot parameters
CX               20.00 cm
CY                5.00 cm
F1P             200.500 ppm
F1            15131.28 Hz
F2P             -0.500 ppm
F2             -37.73 Hz
PPMCM         10.05000 ppm/cm
HZCM         758.45087 Hz/cm
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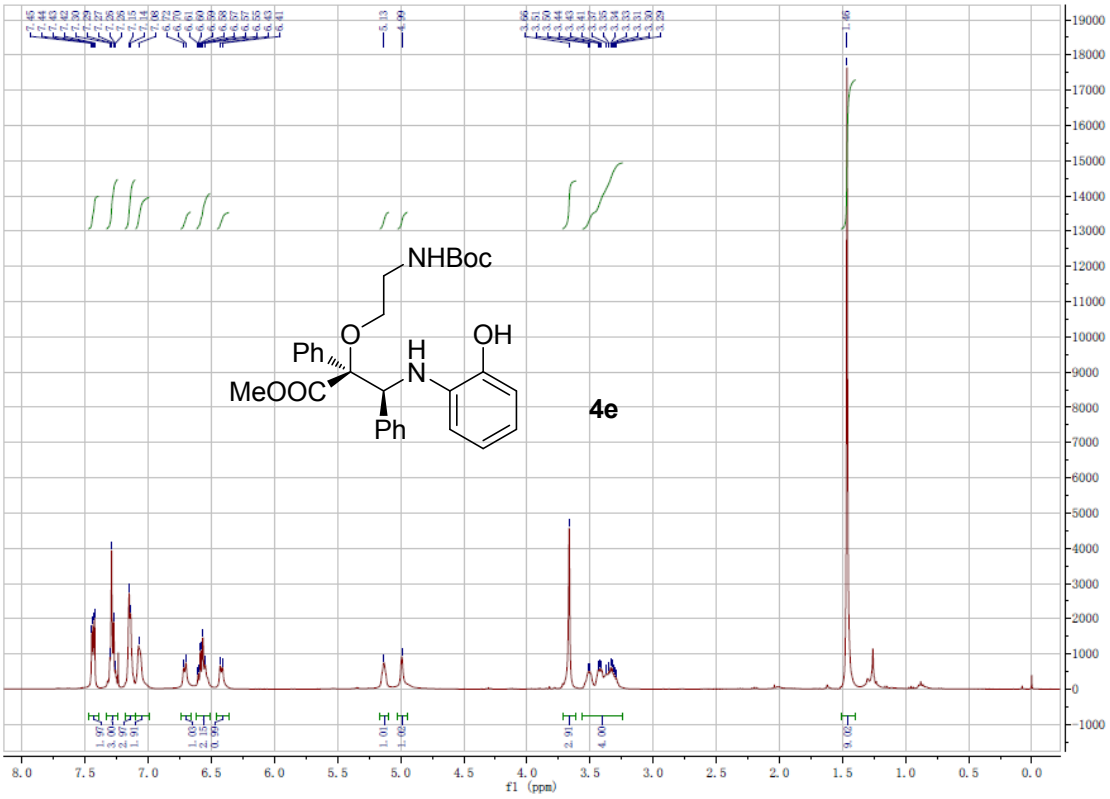
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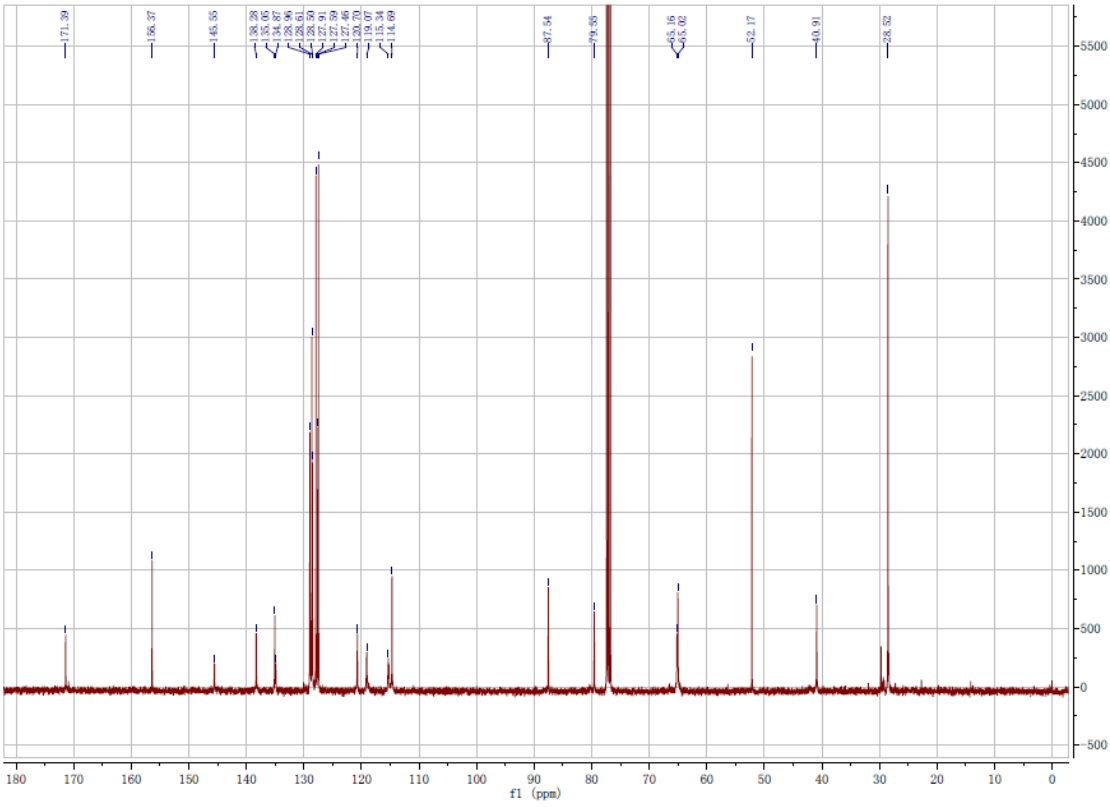
Ph
H
N
OH
MeOOC
Ph
4e
f1 (ppm)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79.55
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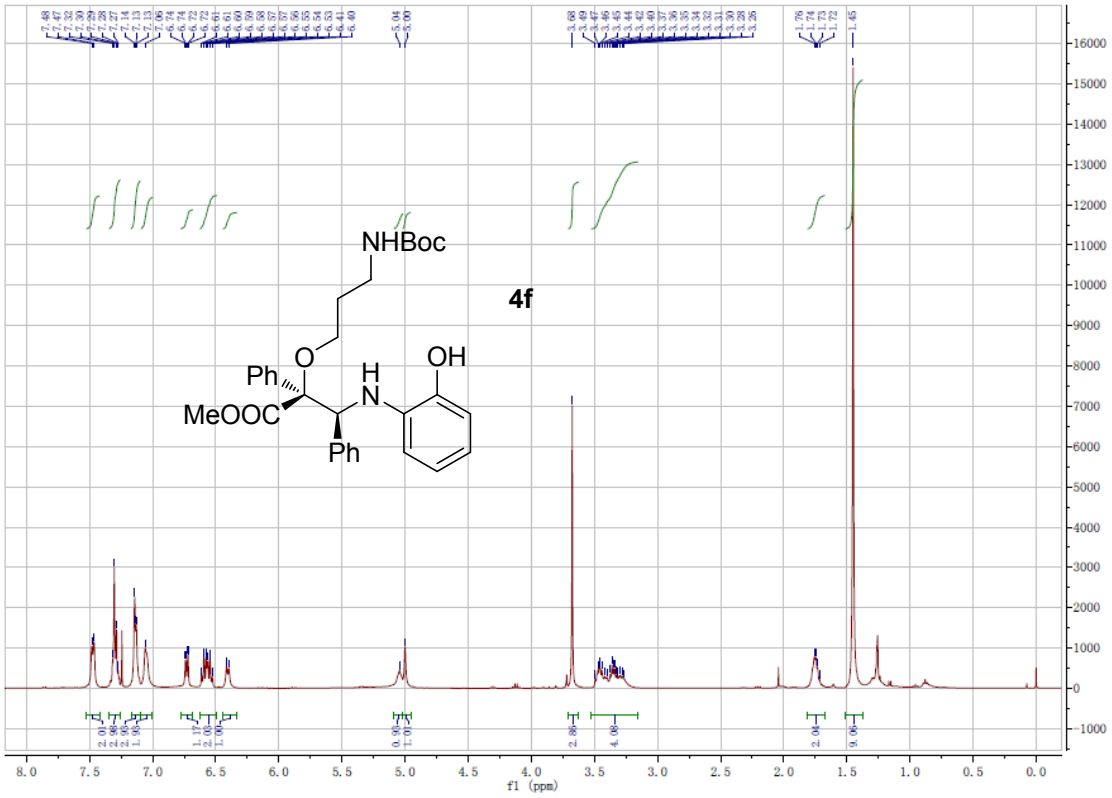
f1 (ppm)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Ph
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OH
Ph
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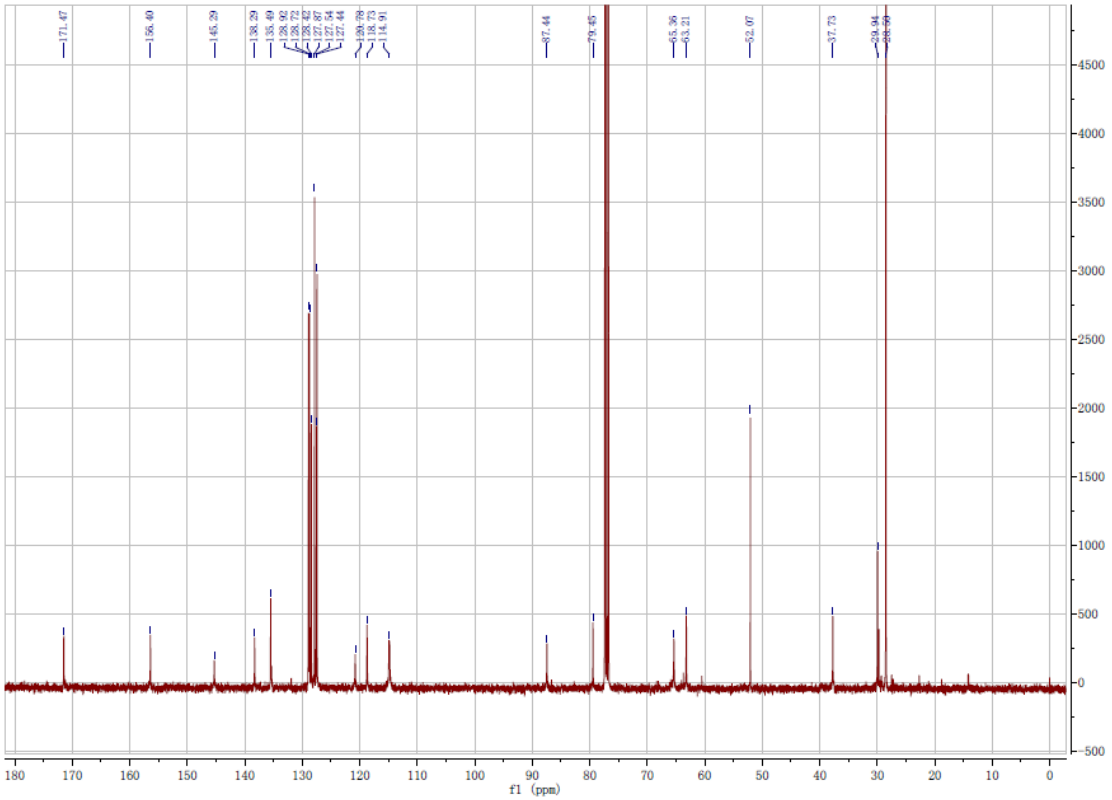
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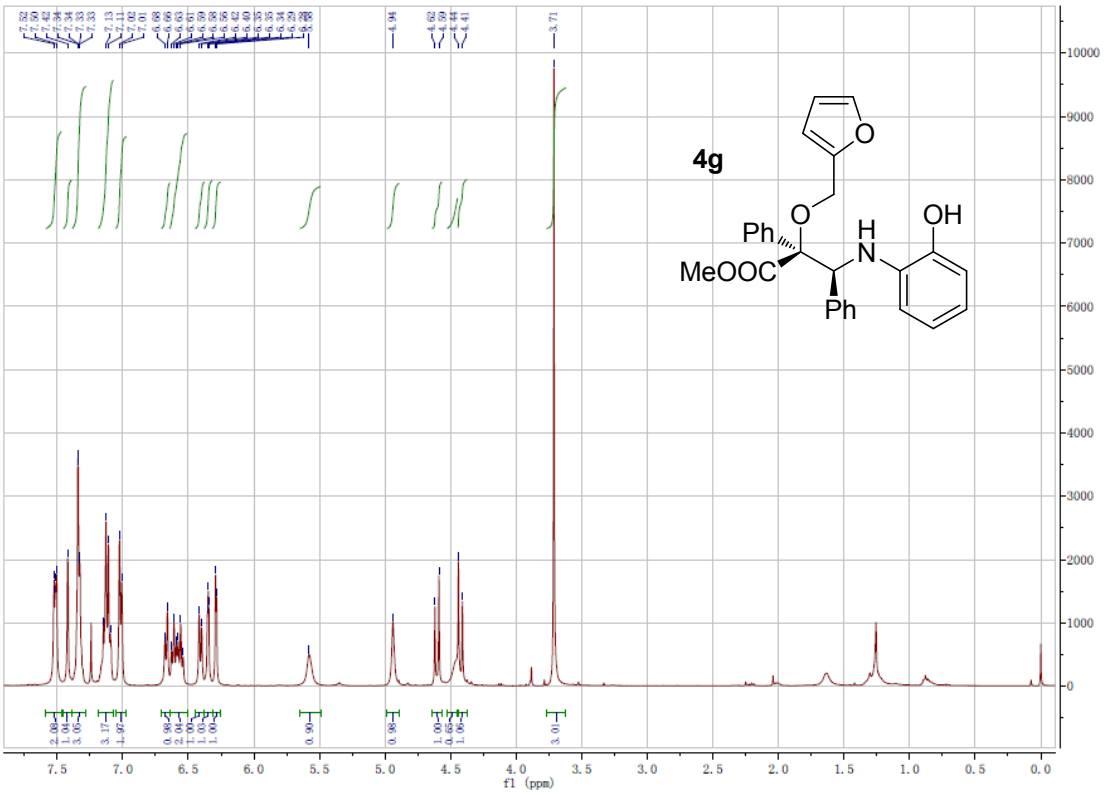
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O
Ph
O
H
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OH
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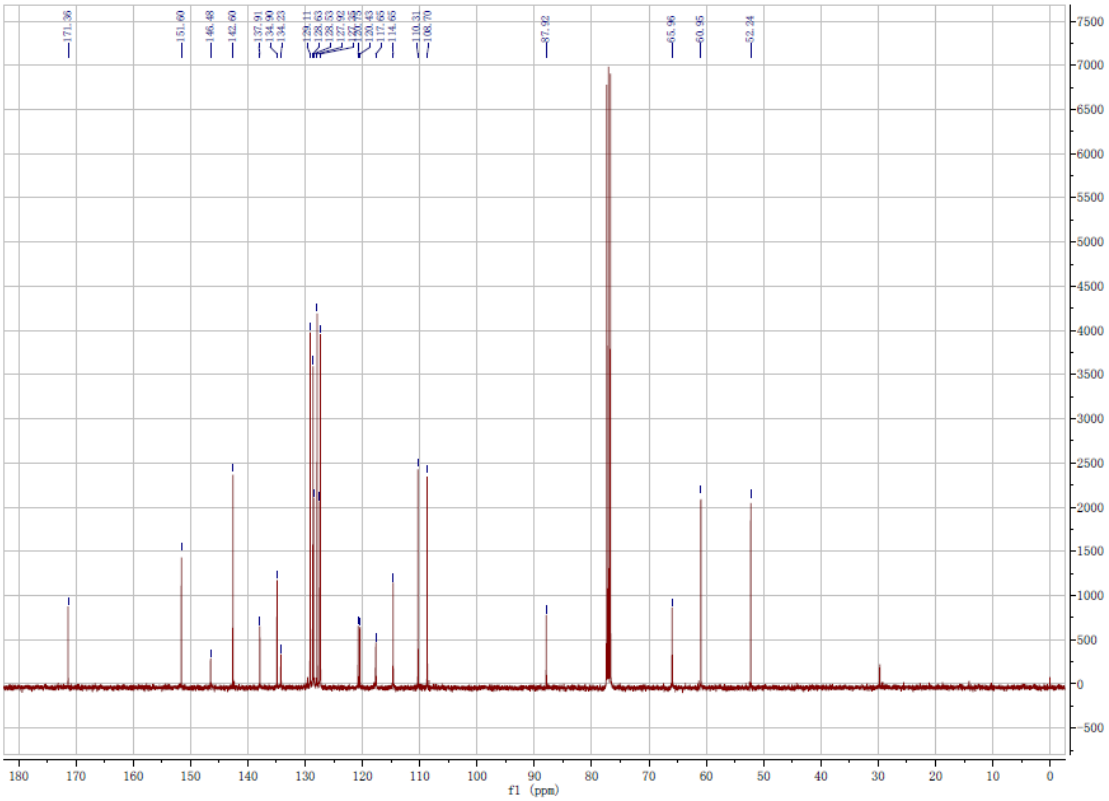
Ph
f1 (ppm)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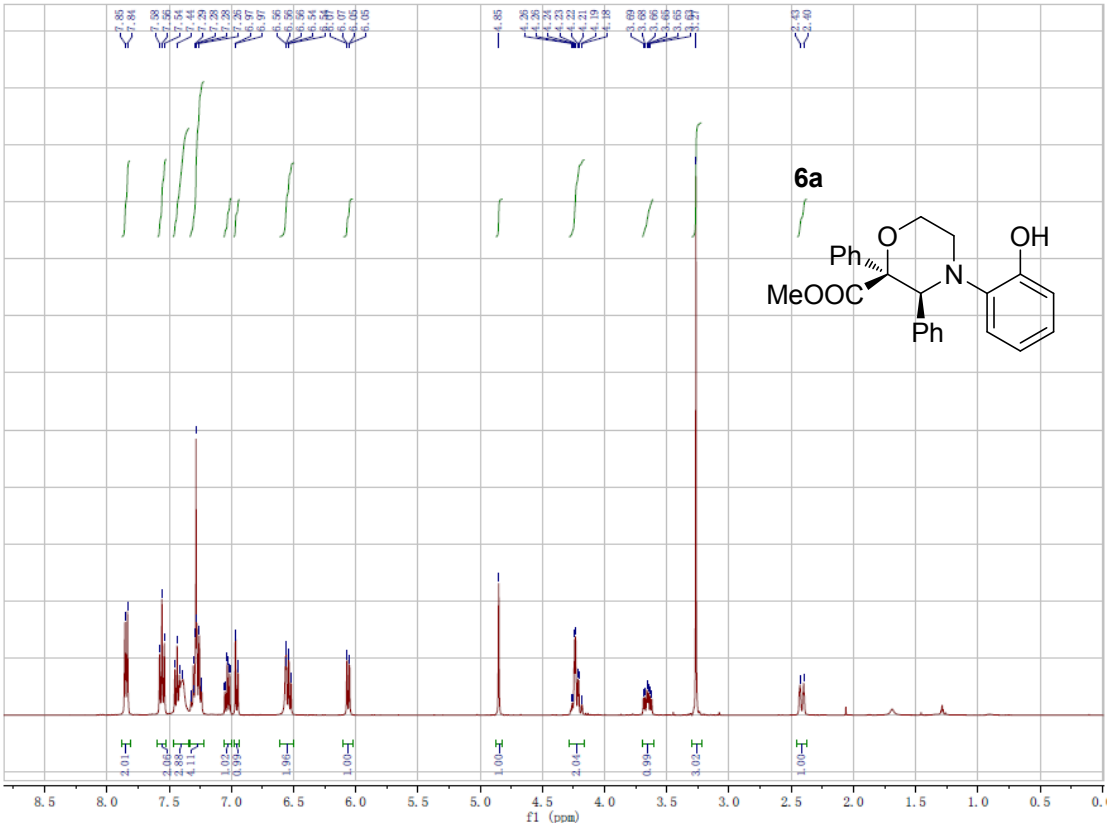
6a
O
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Ph
N
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Ph
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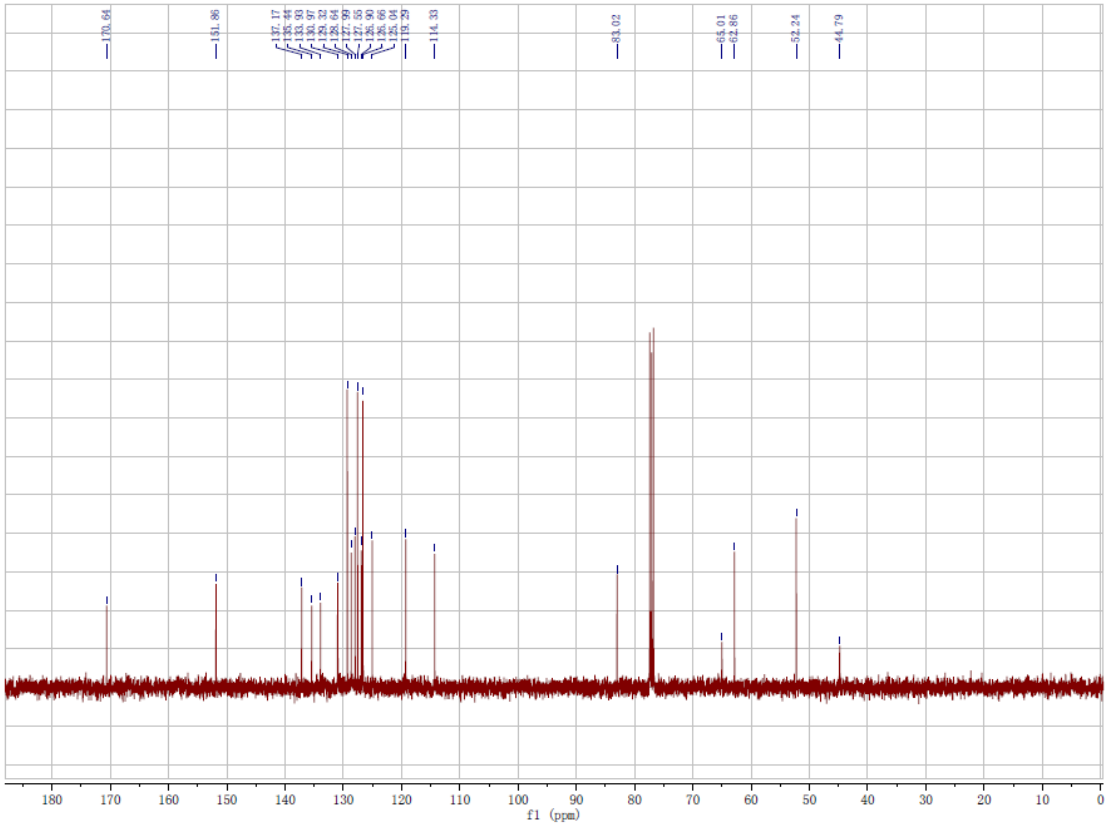
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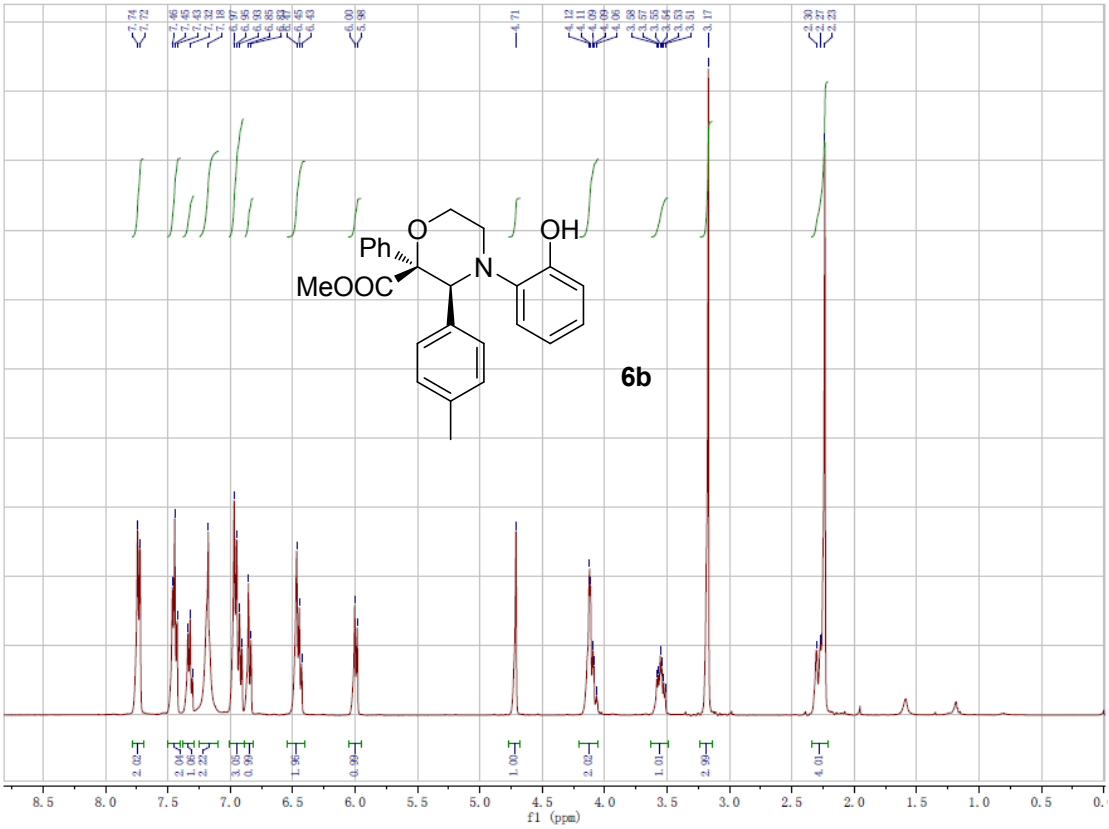
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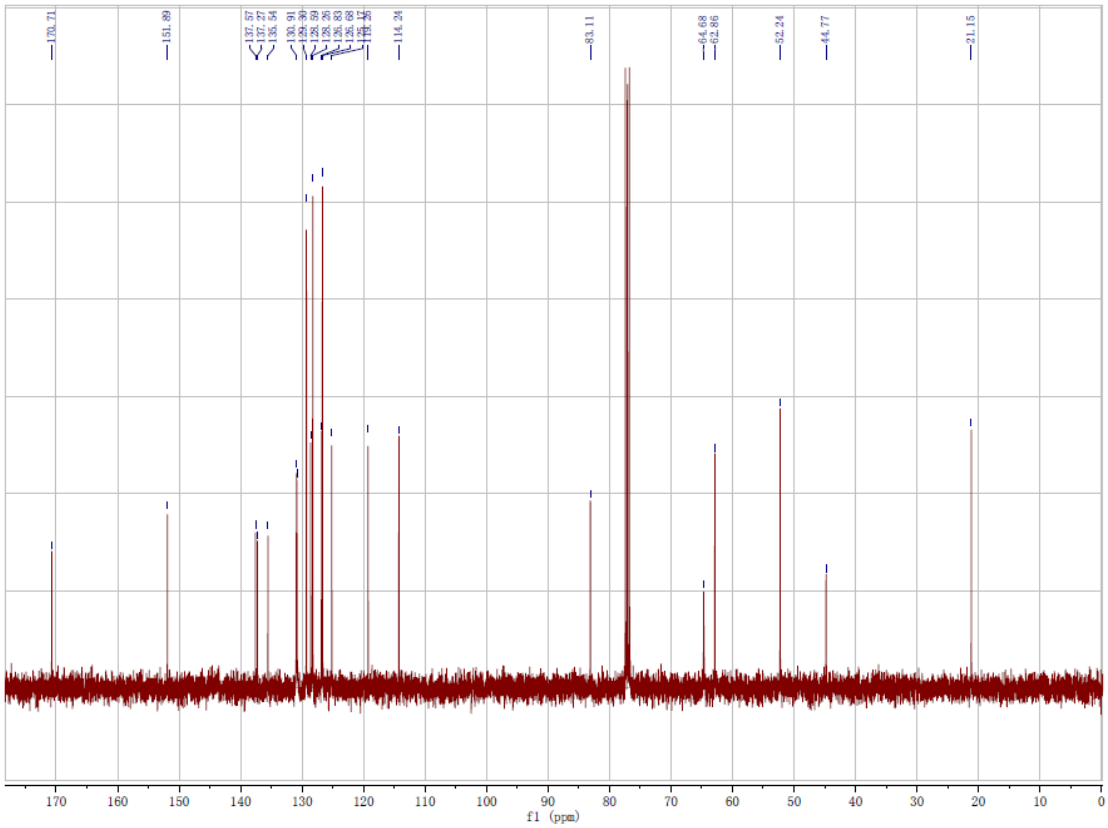
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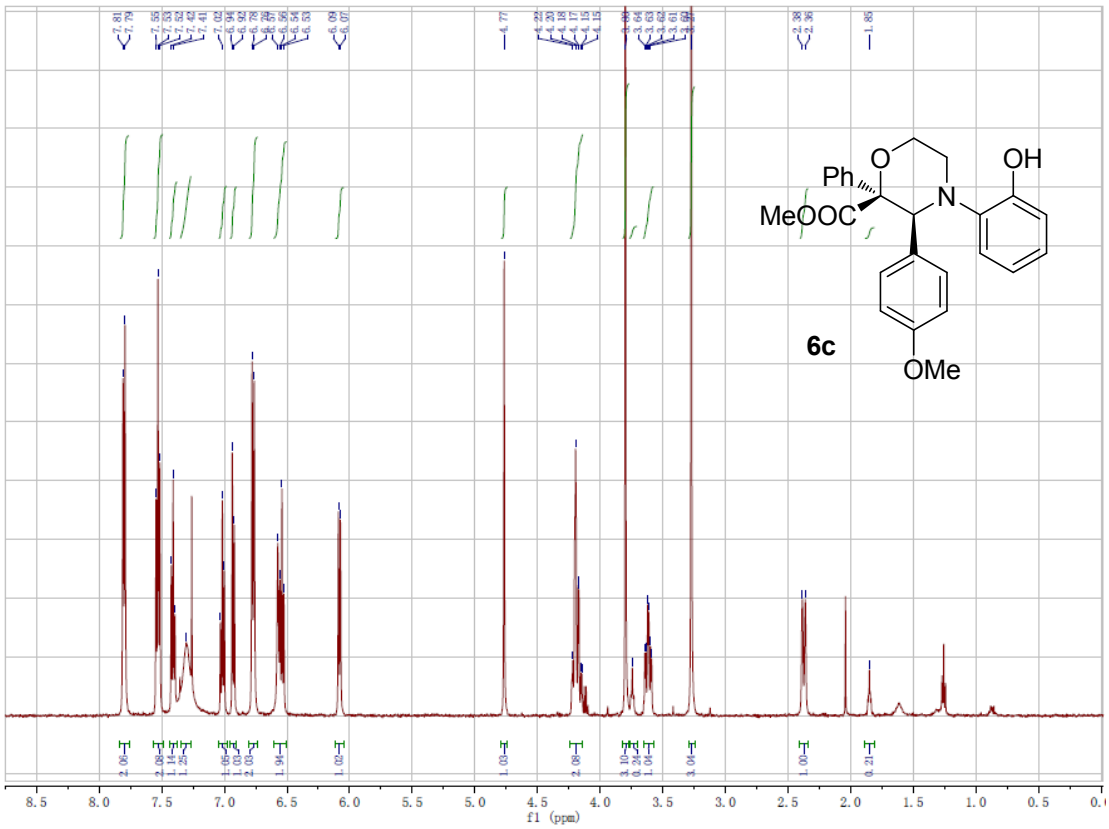
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6c
OMe
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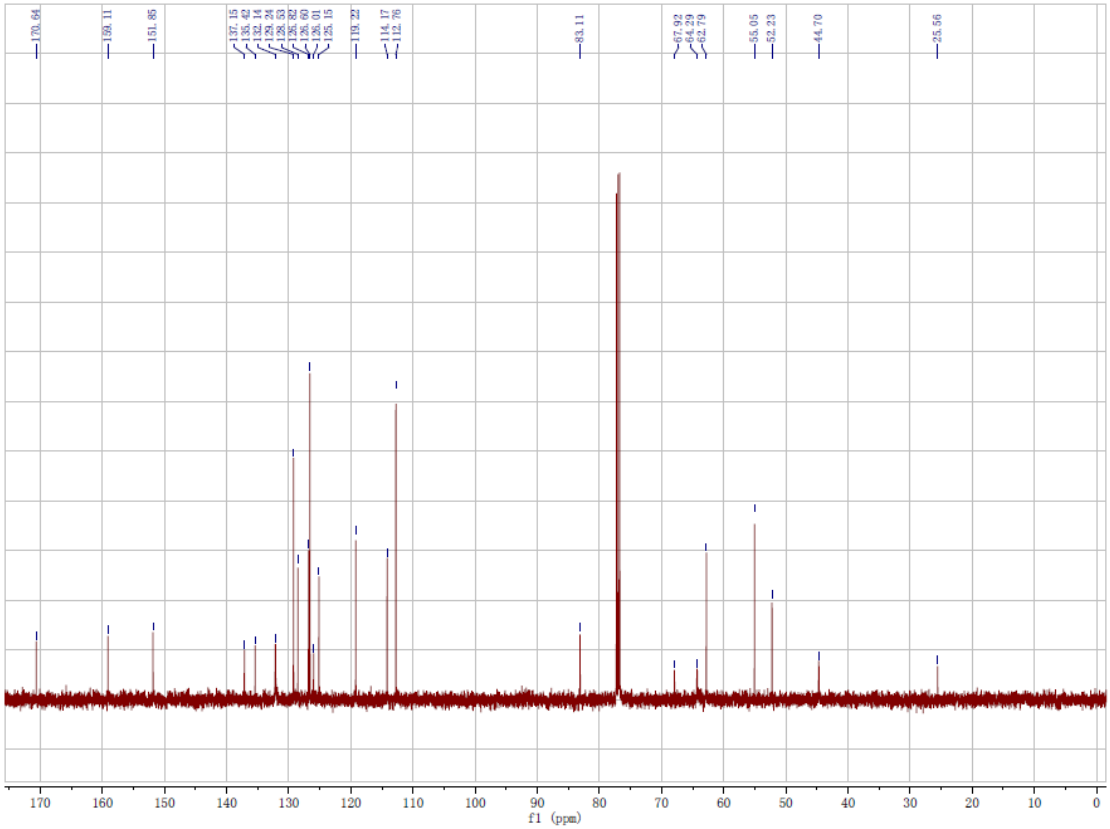
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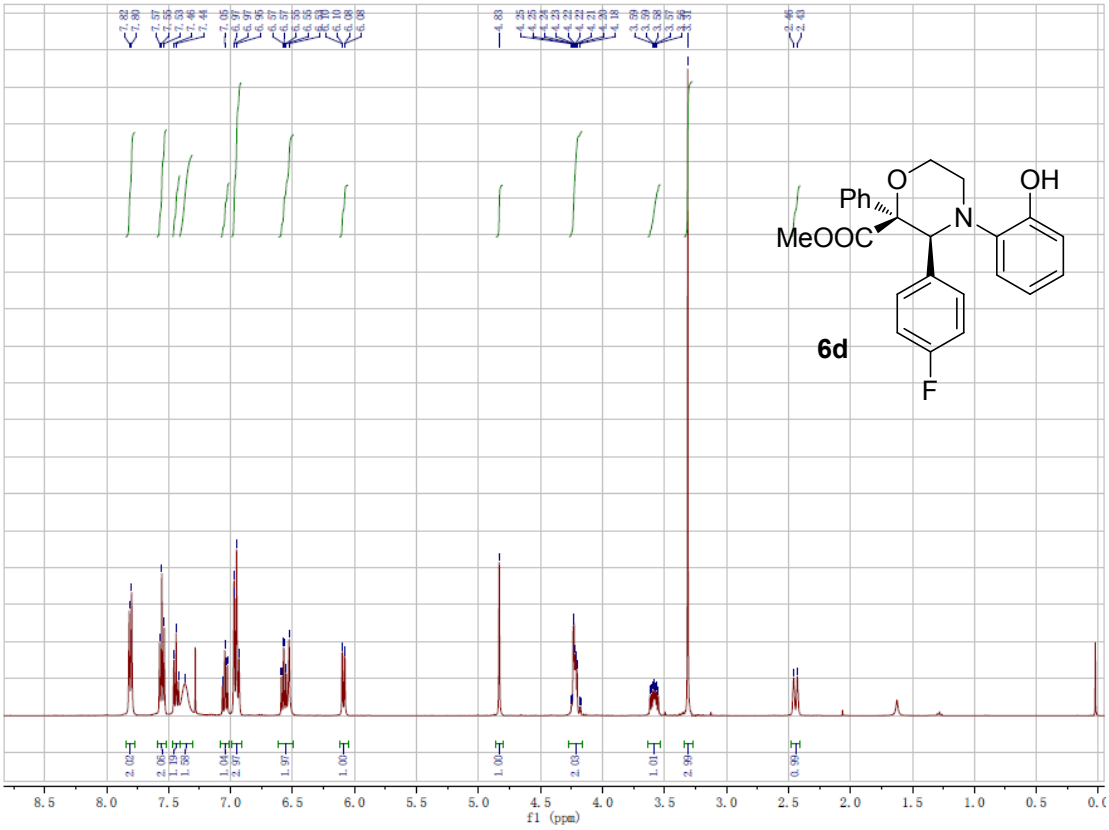
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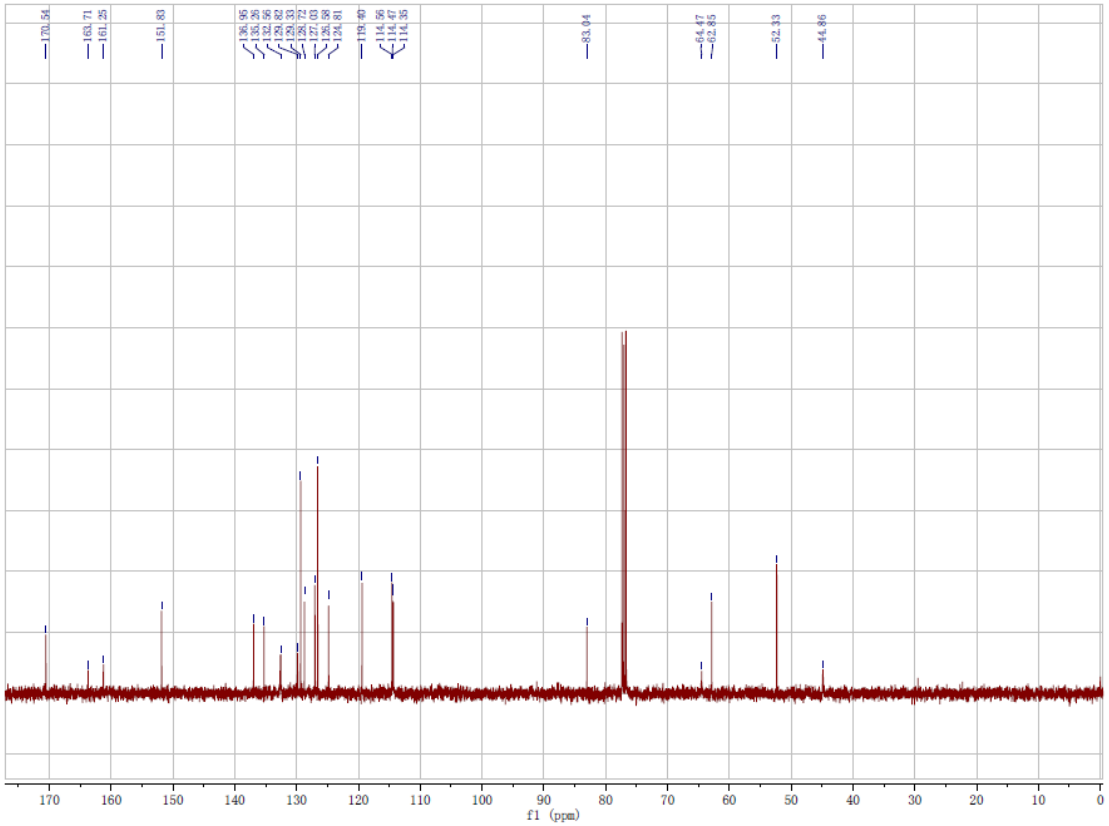
6d
F
f1 (ppm)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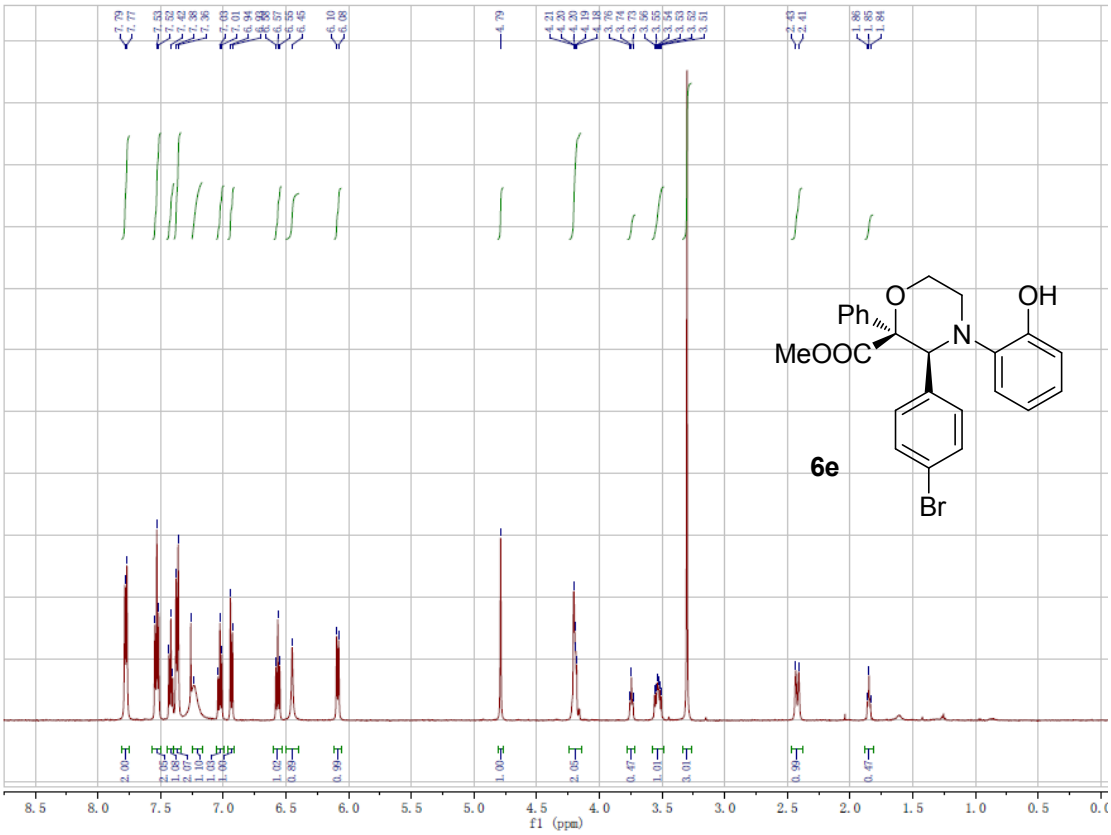
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OH
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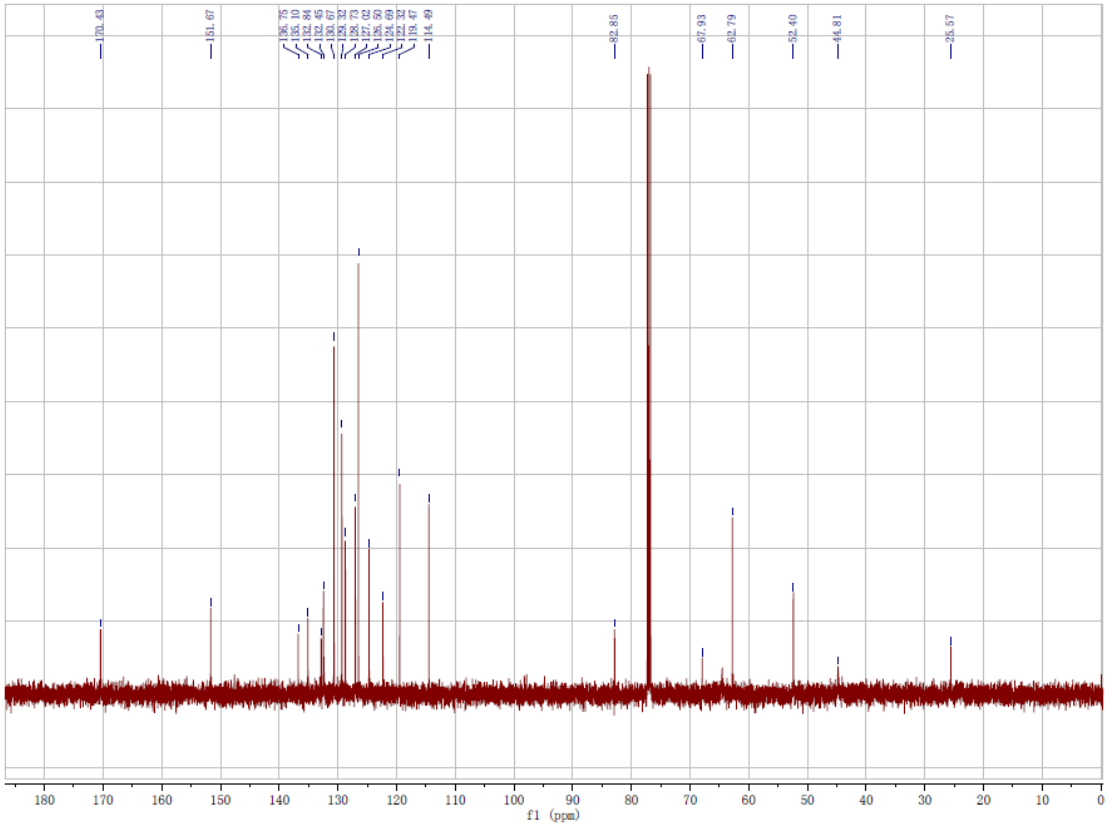
MeOOC
Br
6e
f1 (ppm)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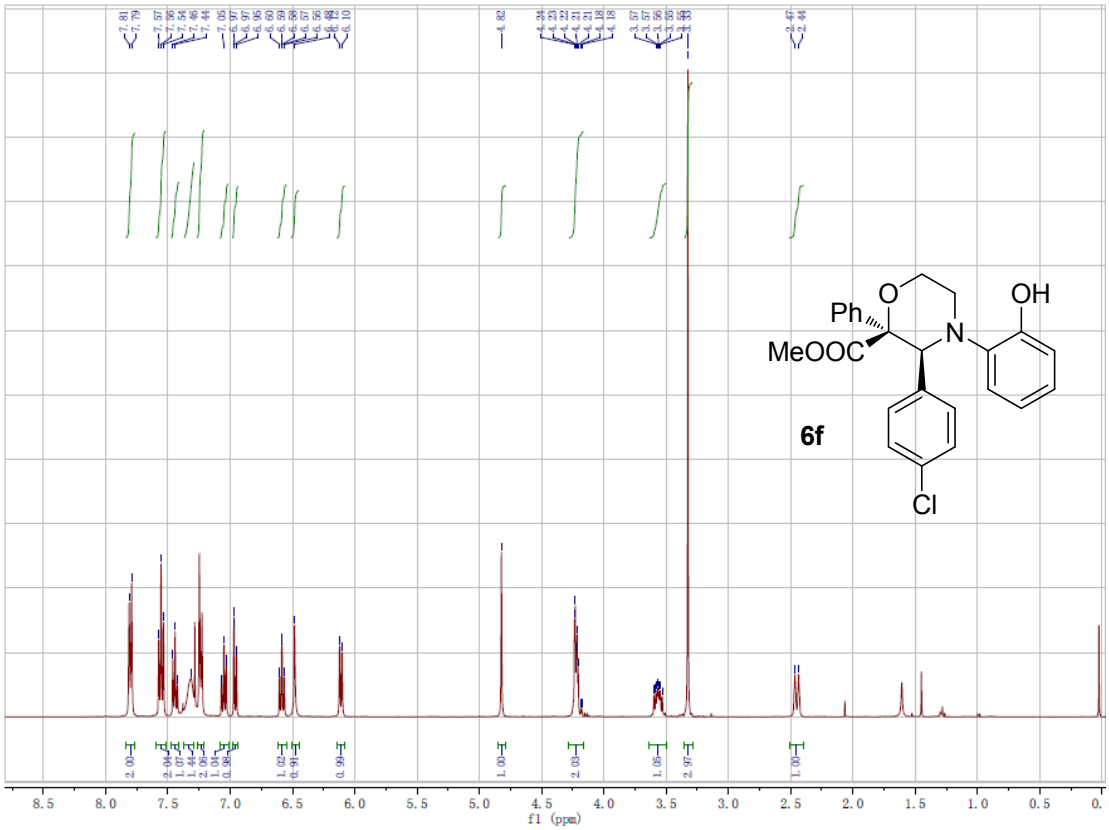
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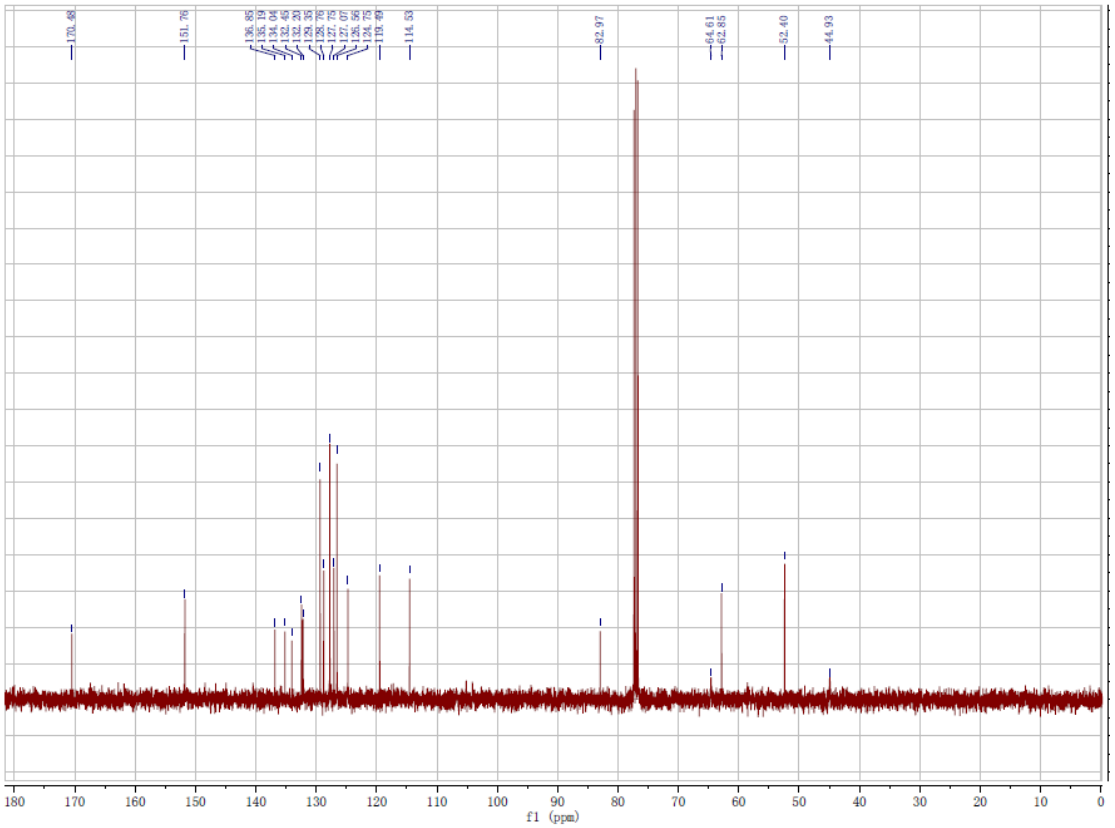
N
OH
Cl
6f
f1 (ppm)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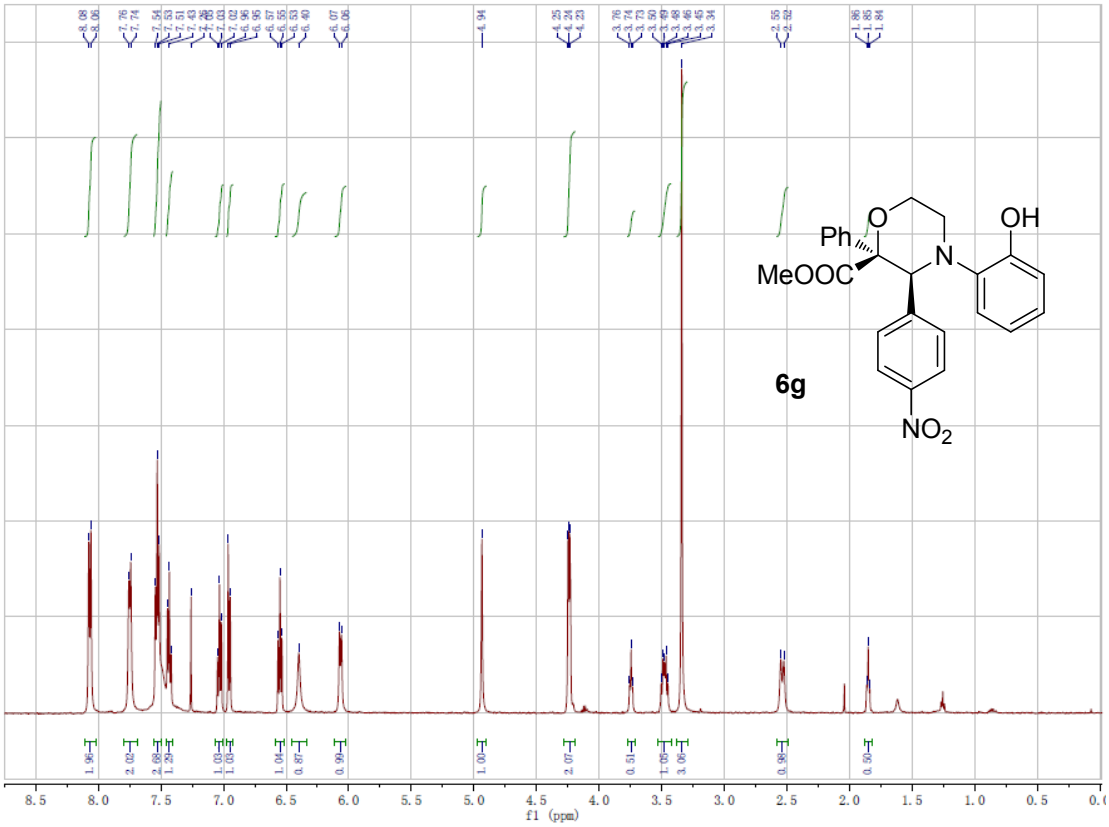
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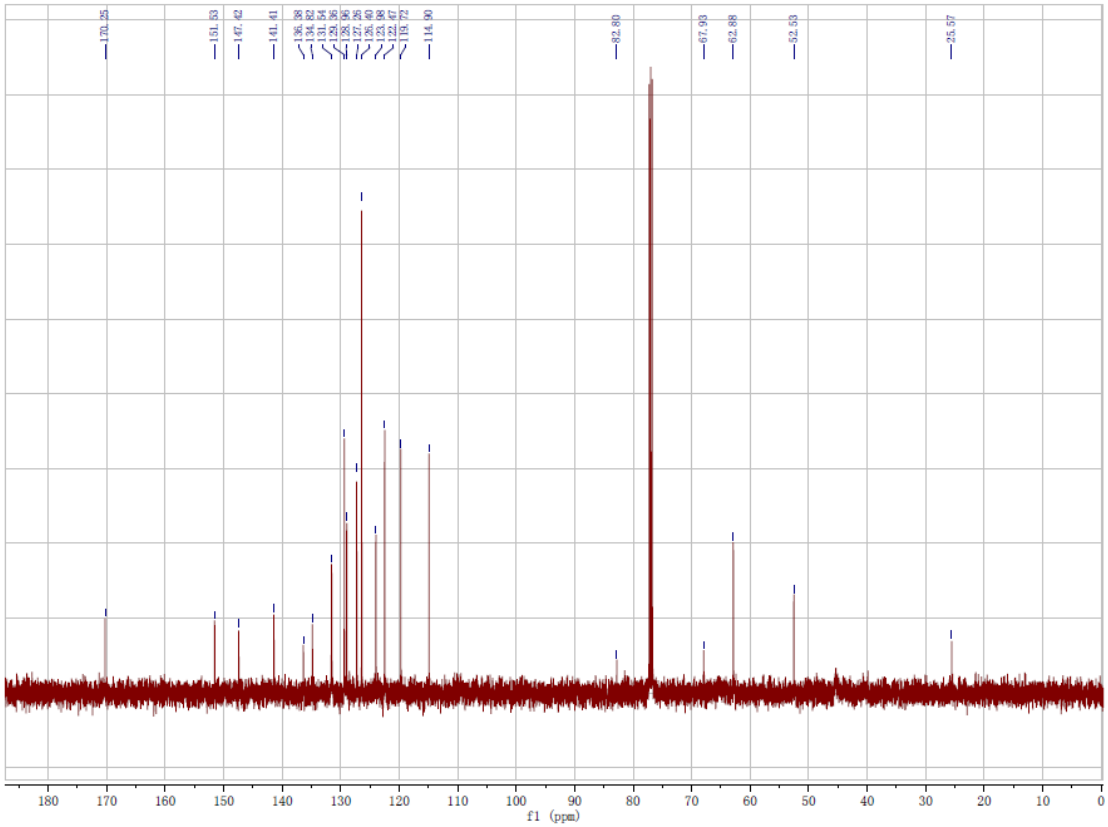
6g
f1 (ppm)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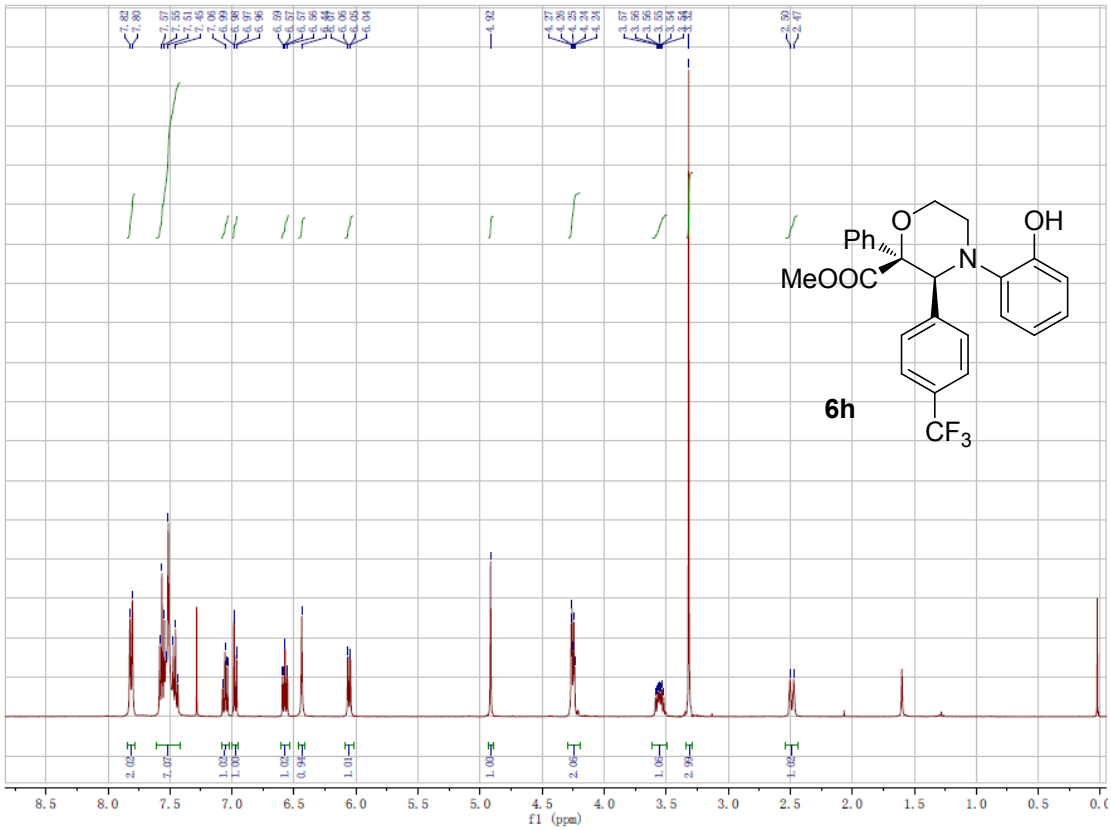
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6h
CF3
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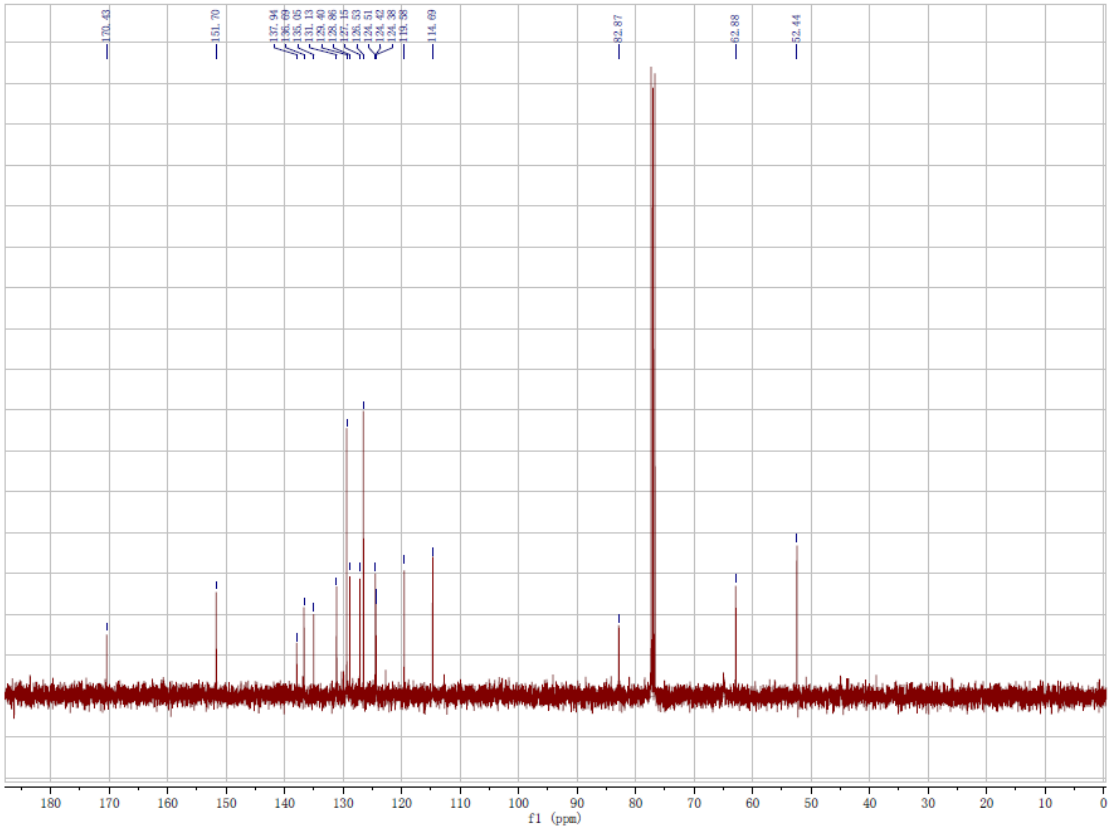
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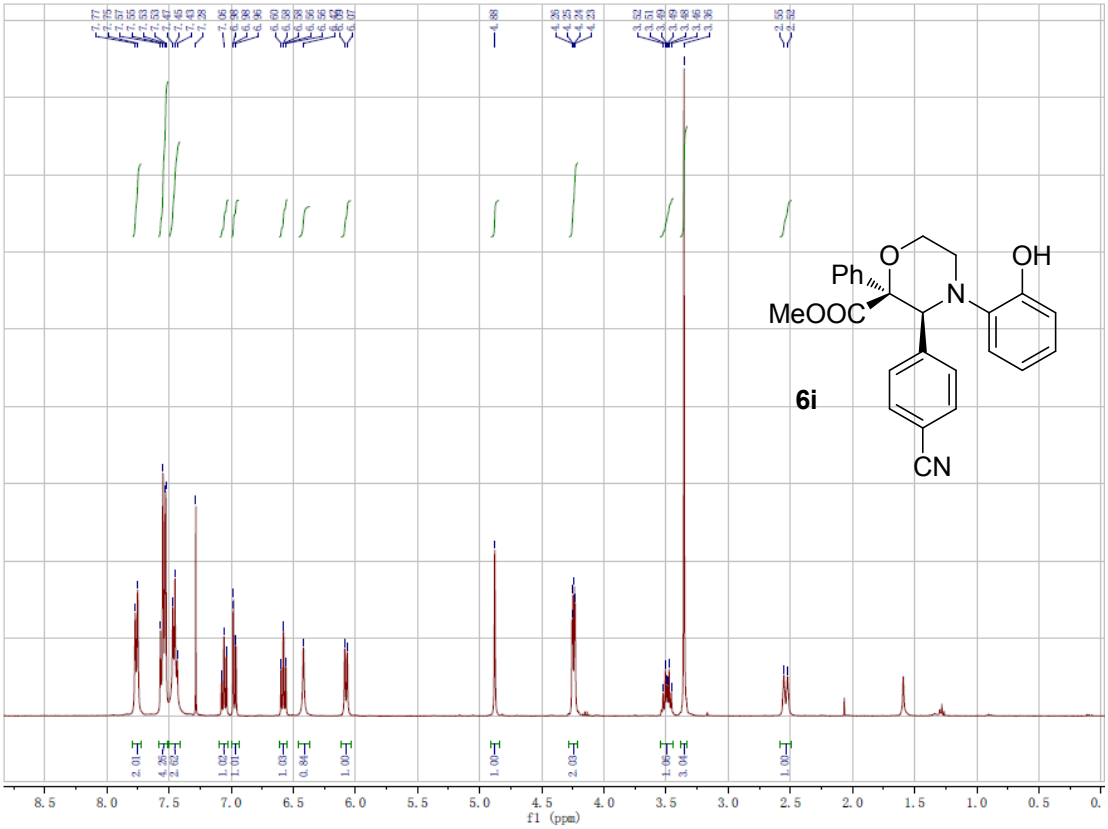
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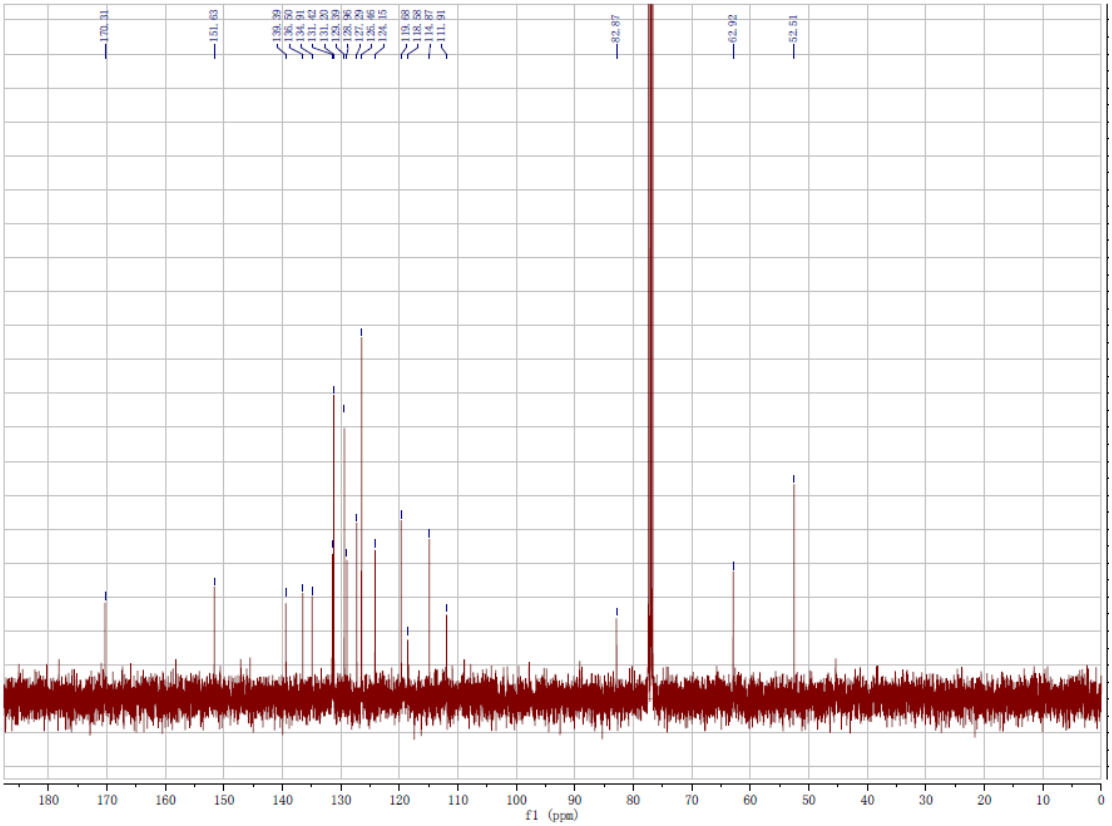
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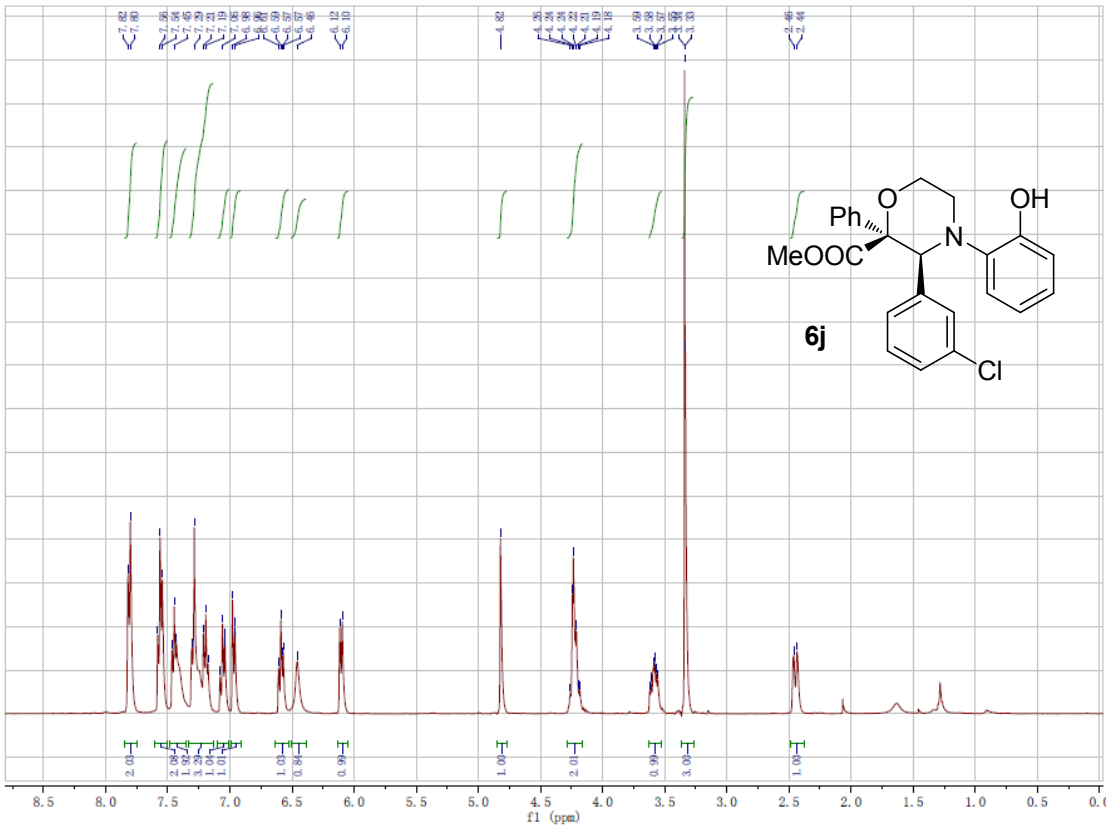
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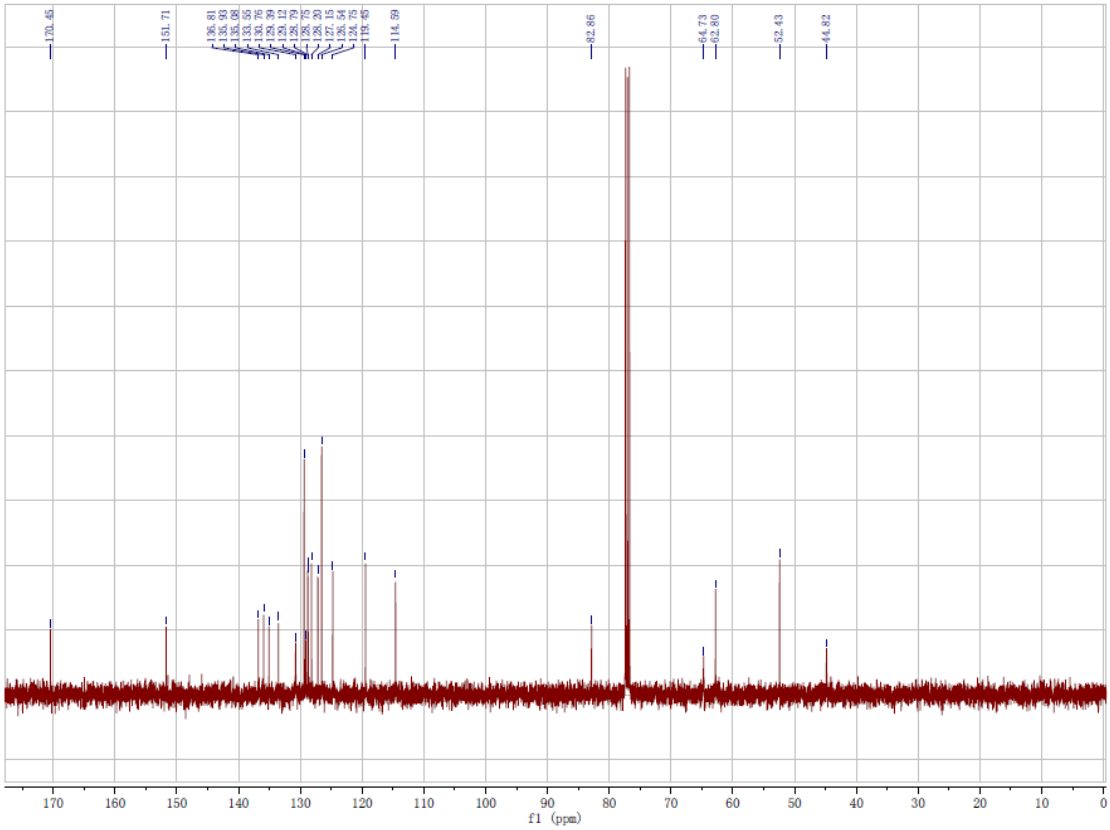
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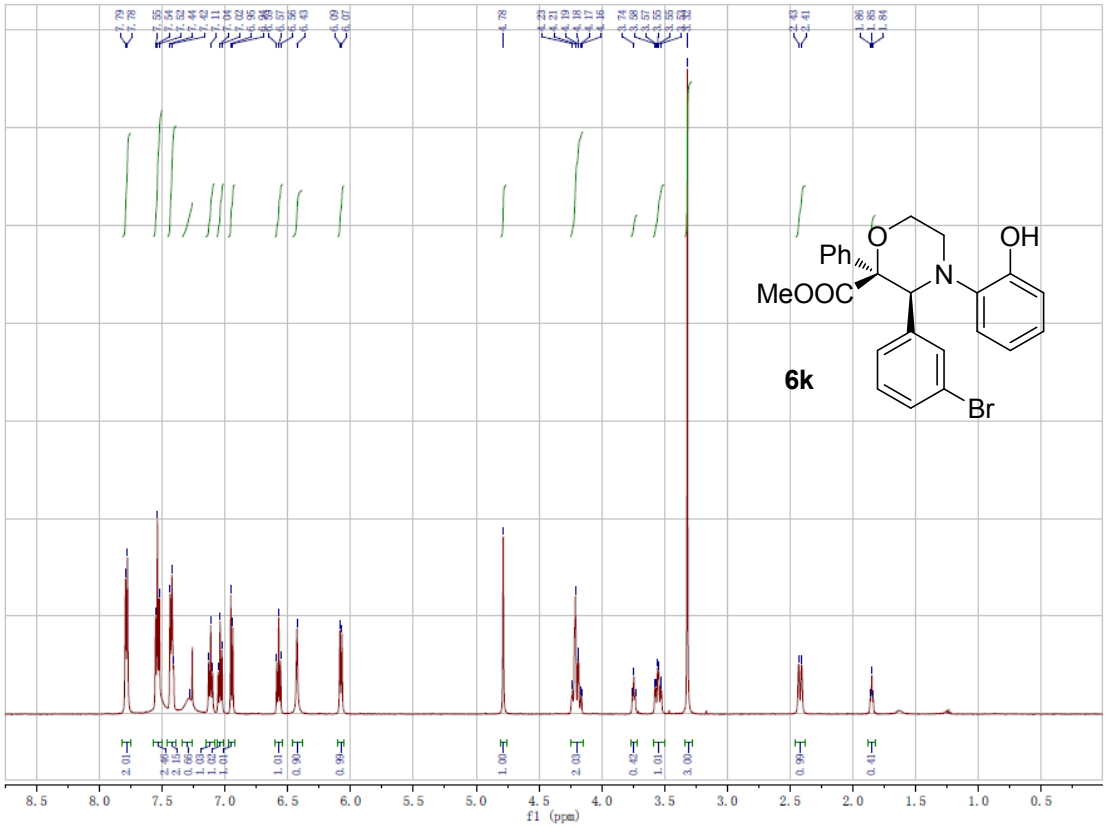
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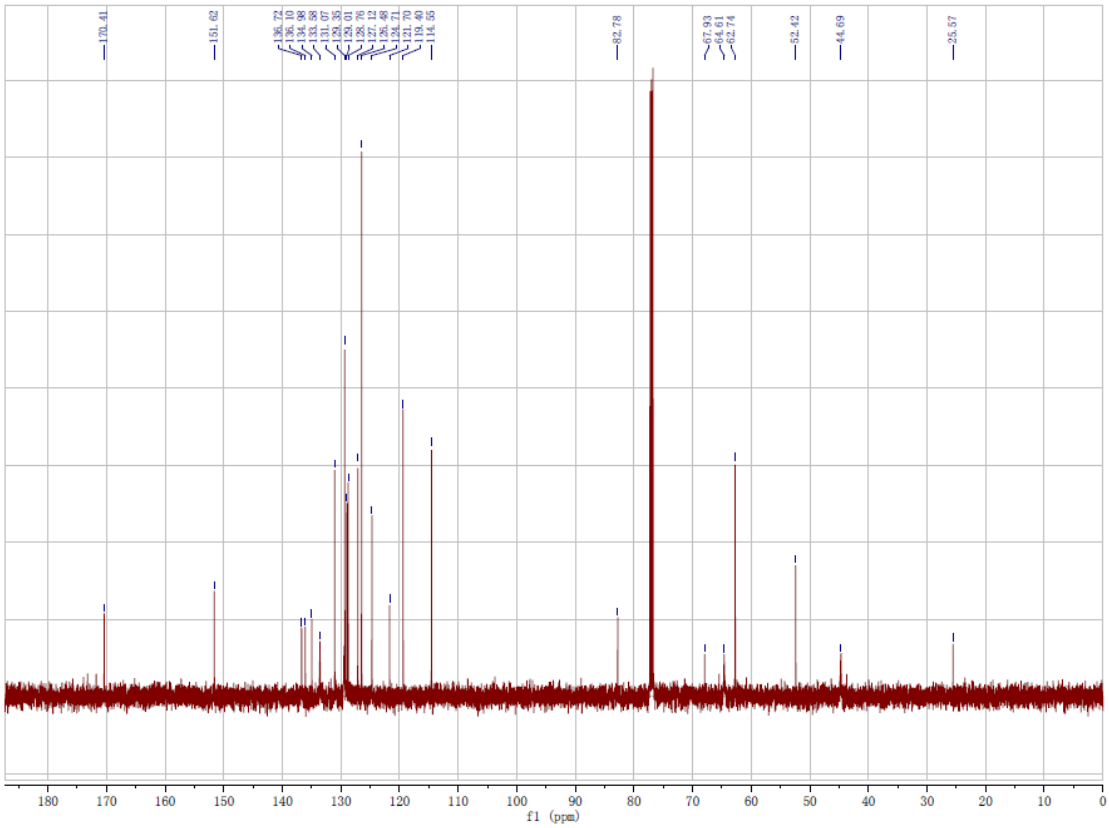
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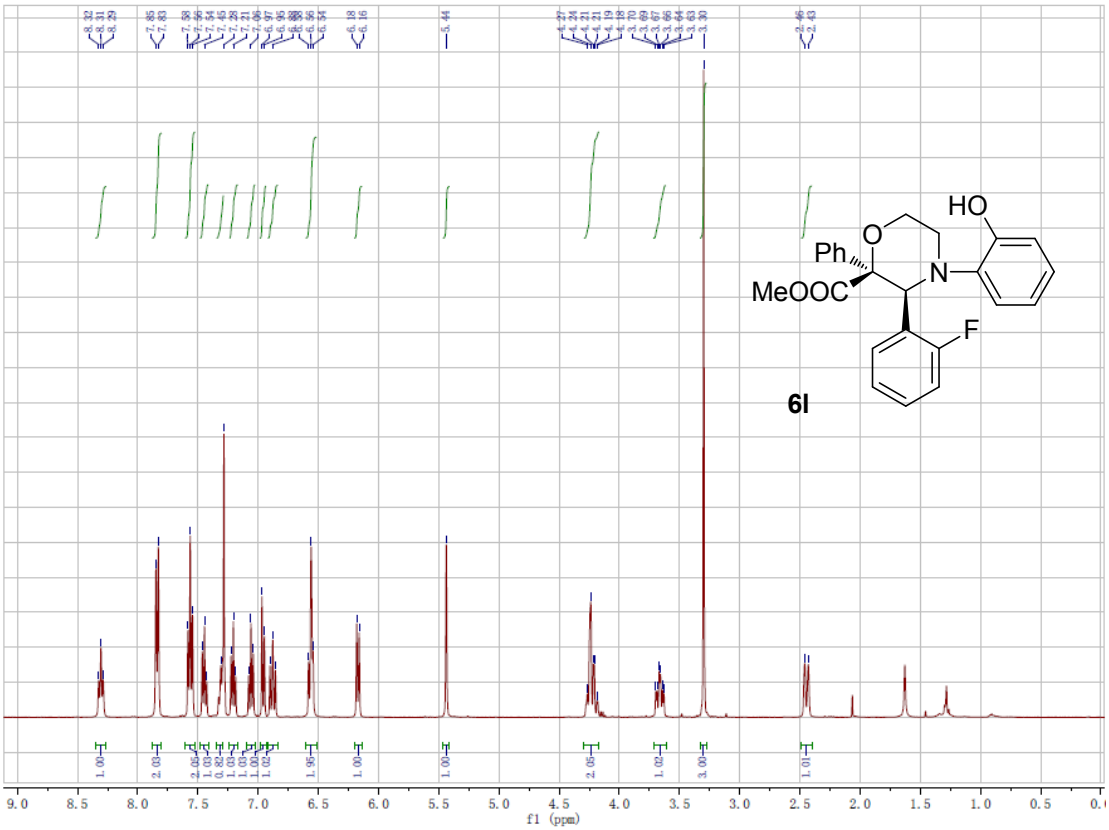
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Ph
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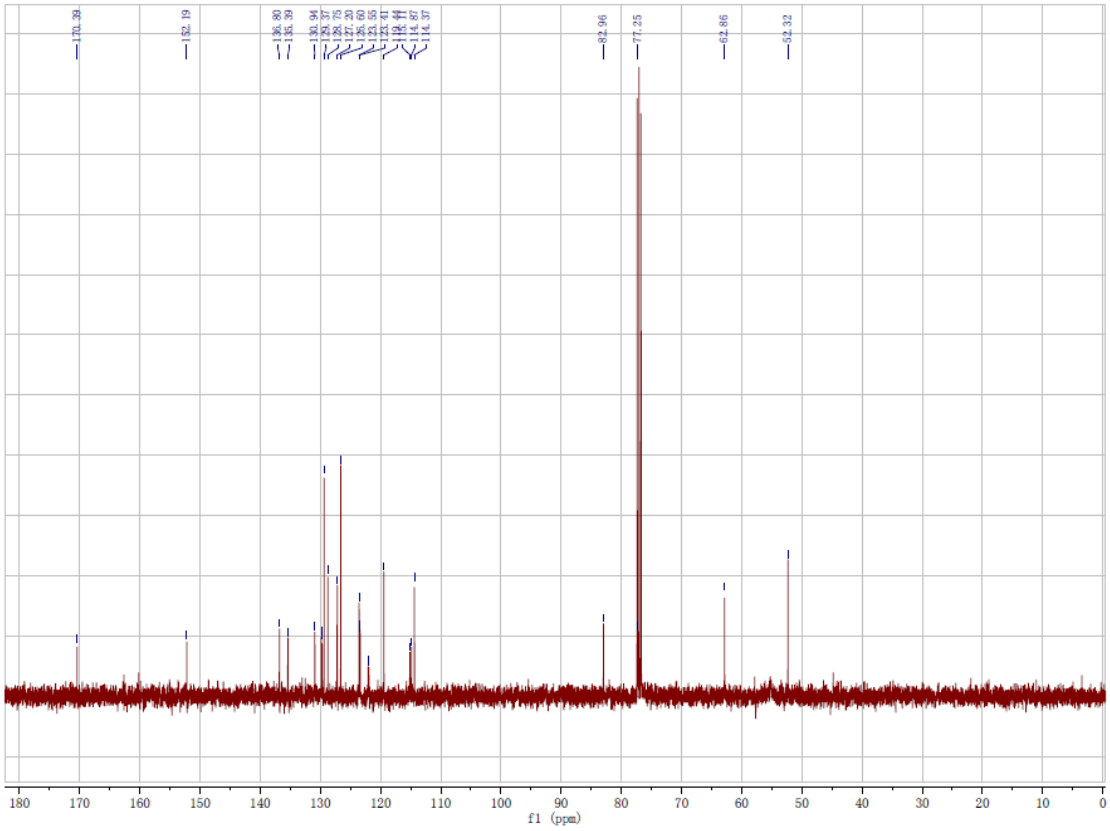
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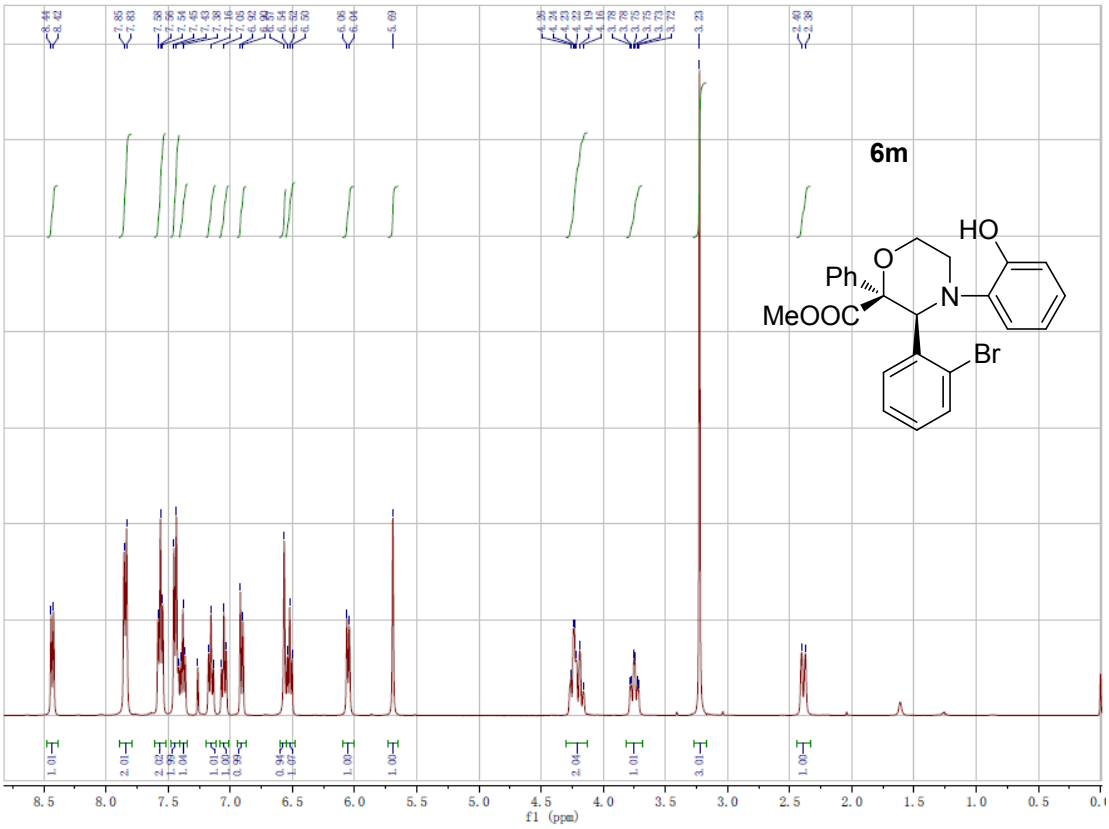
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N
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Br
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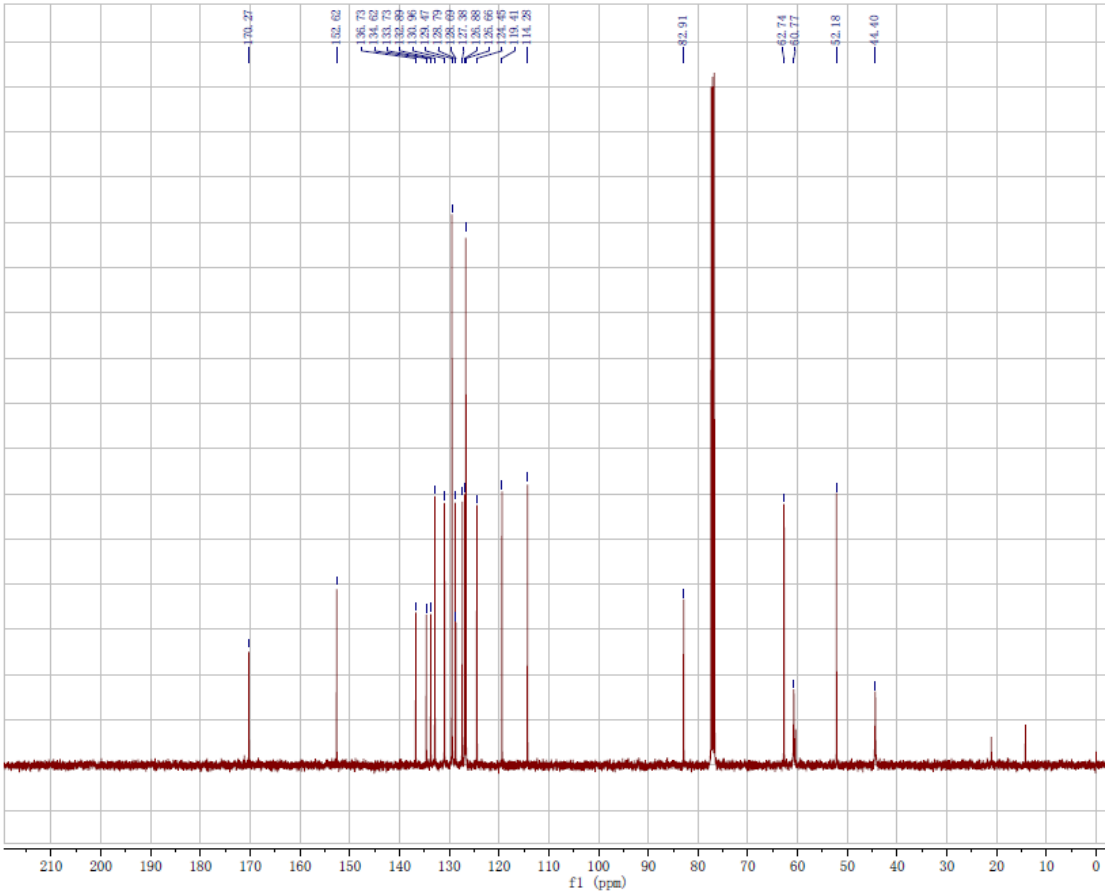
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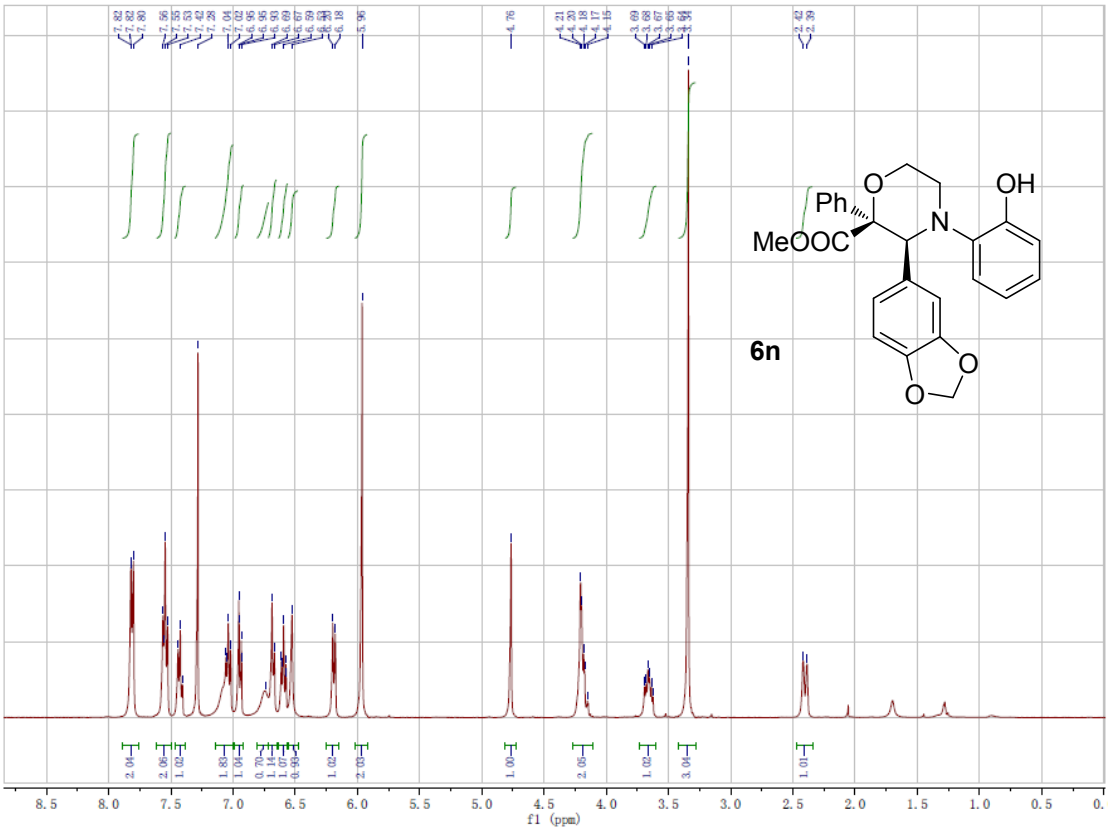
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O
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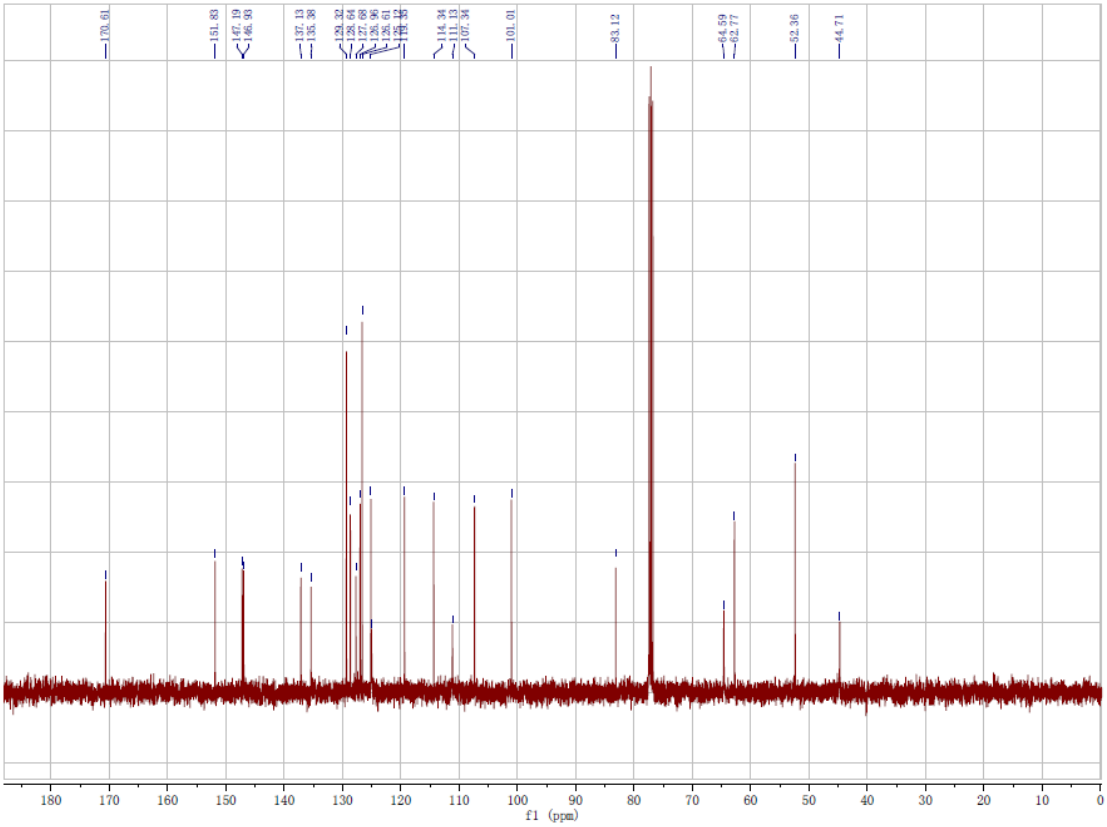
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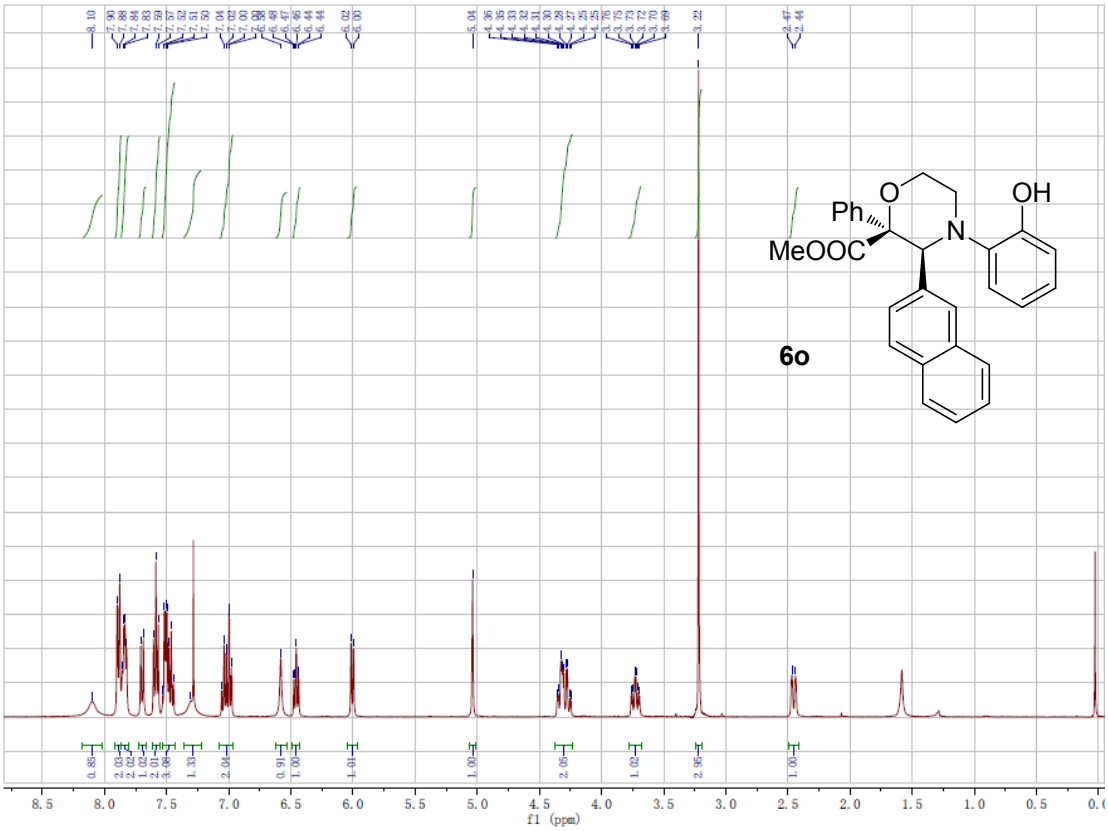
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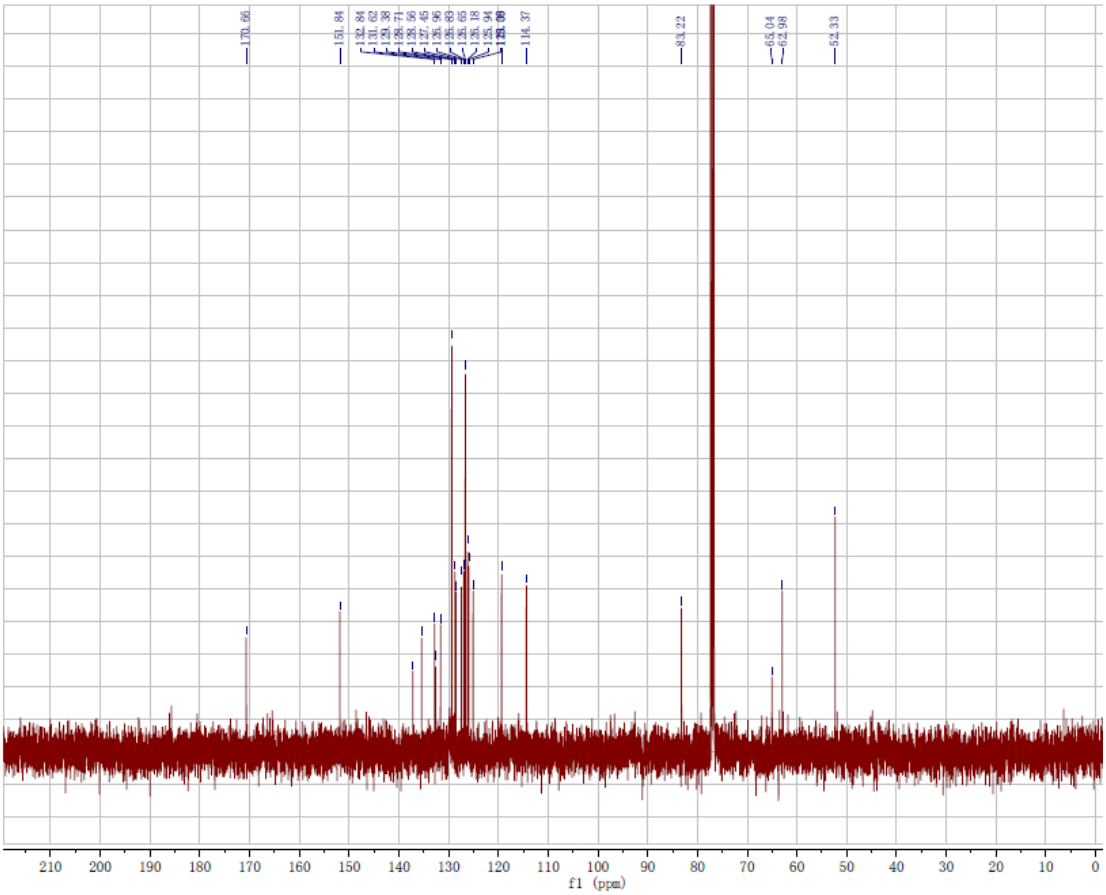
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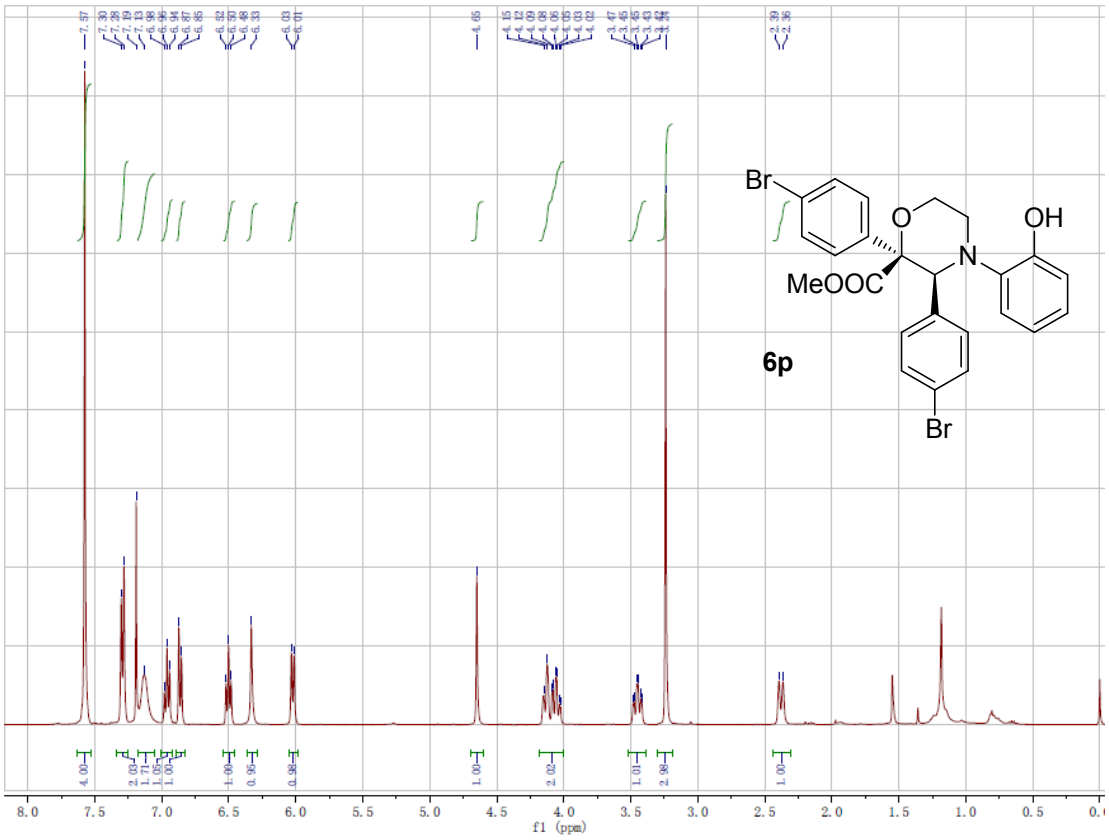
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6p
Br
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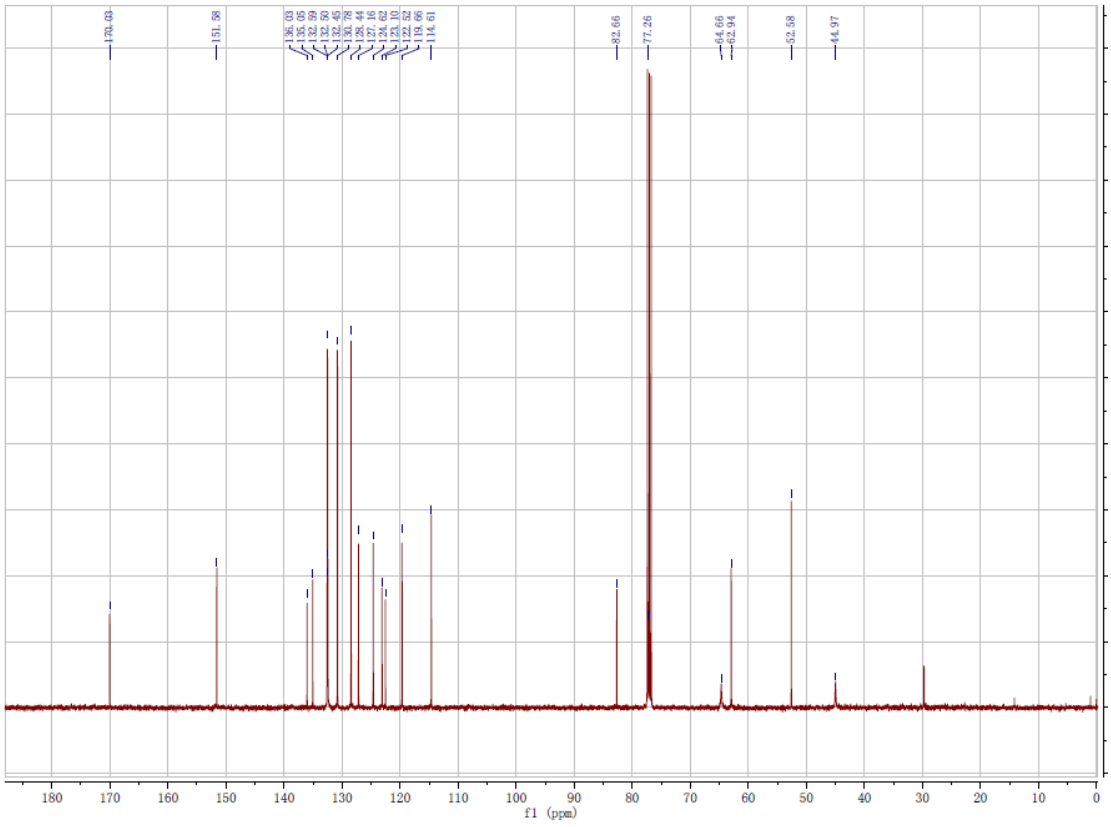
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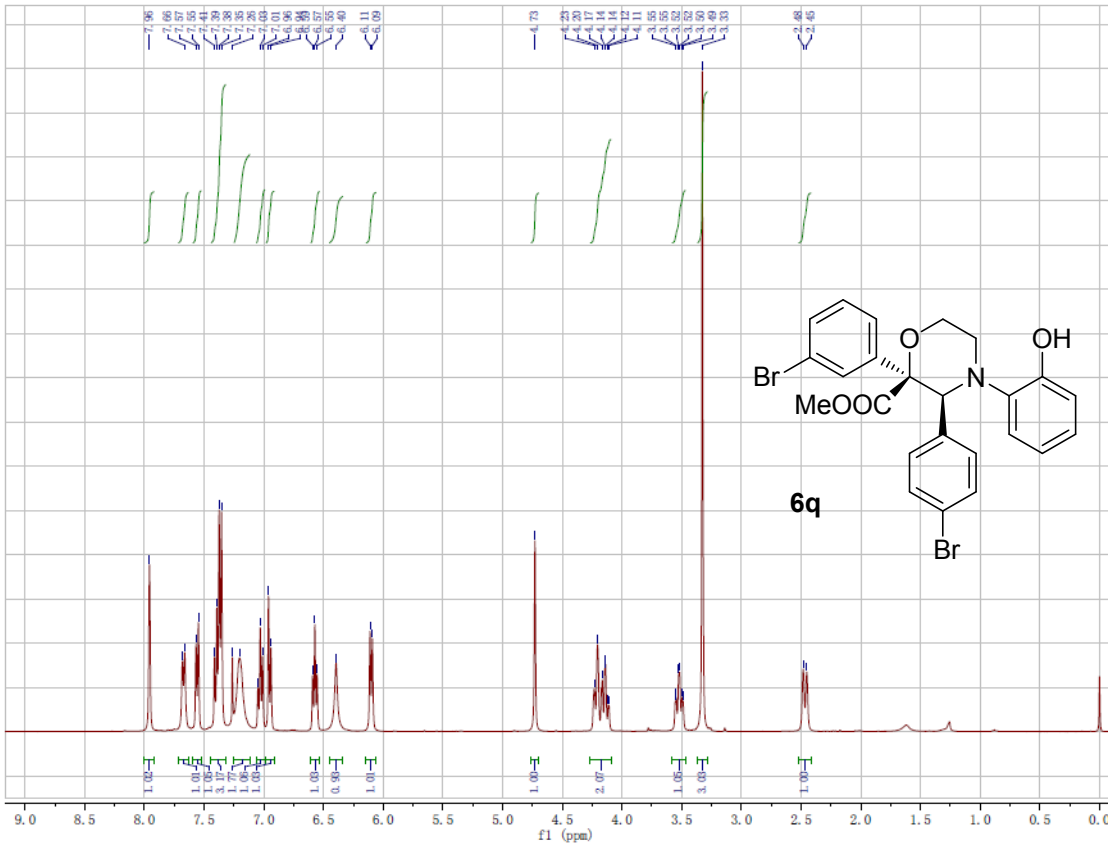
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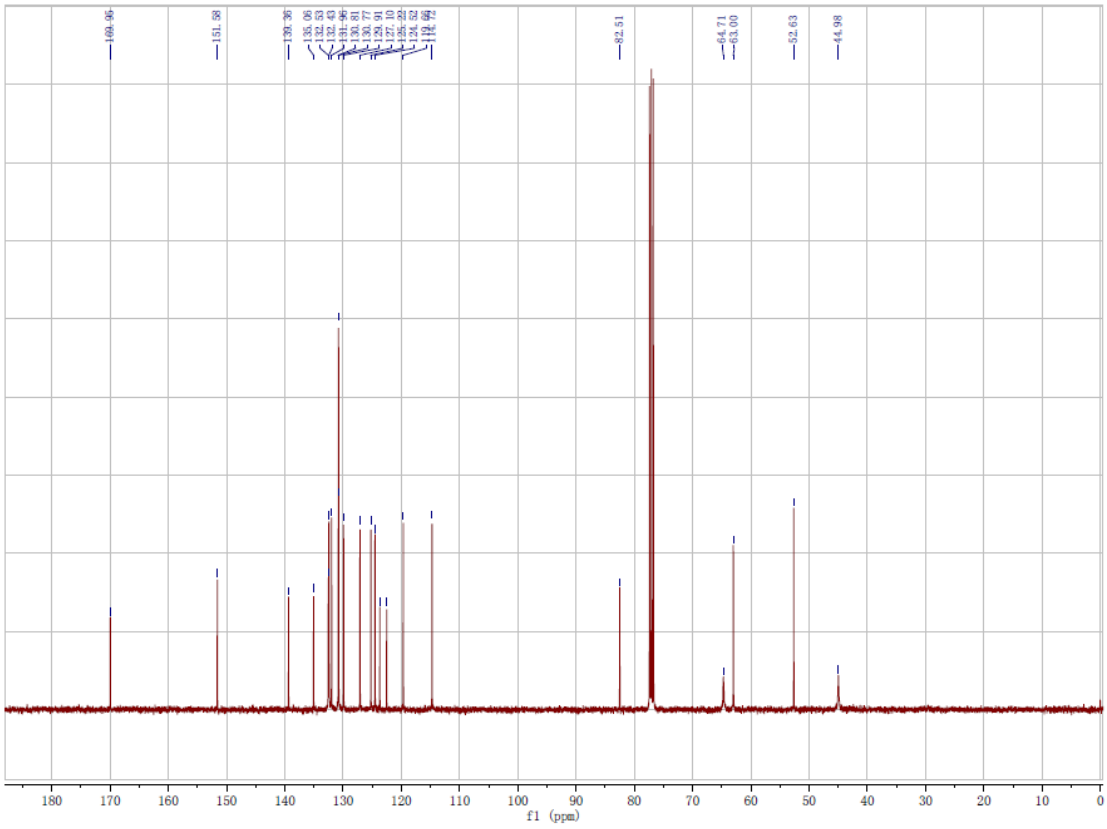
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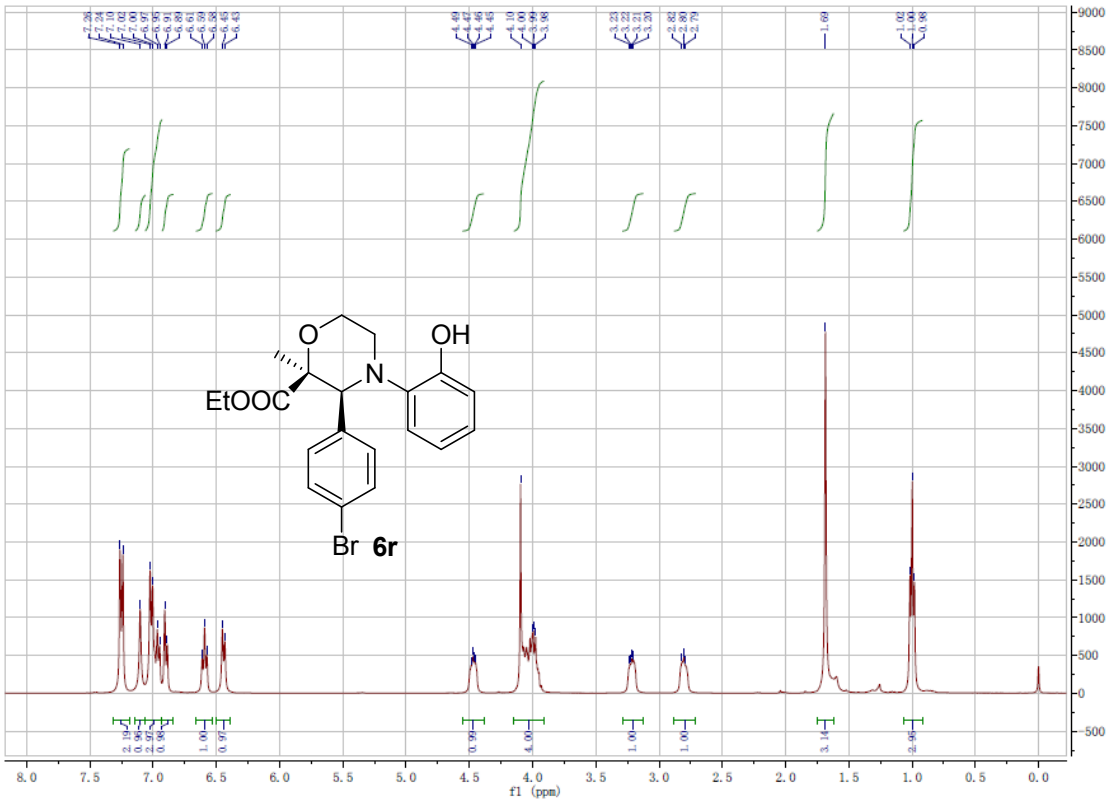
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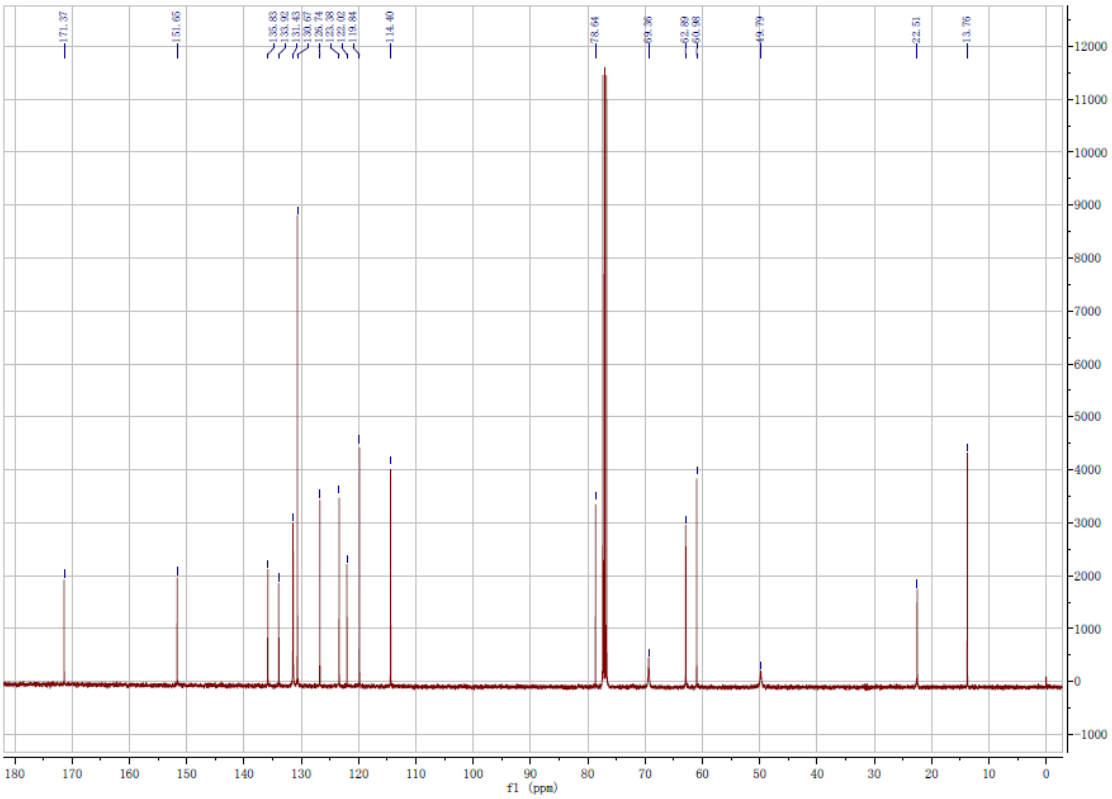
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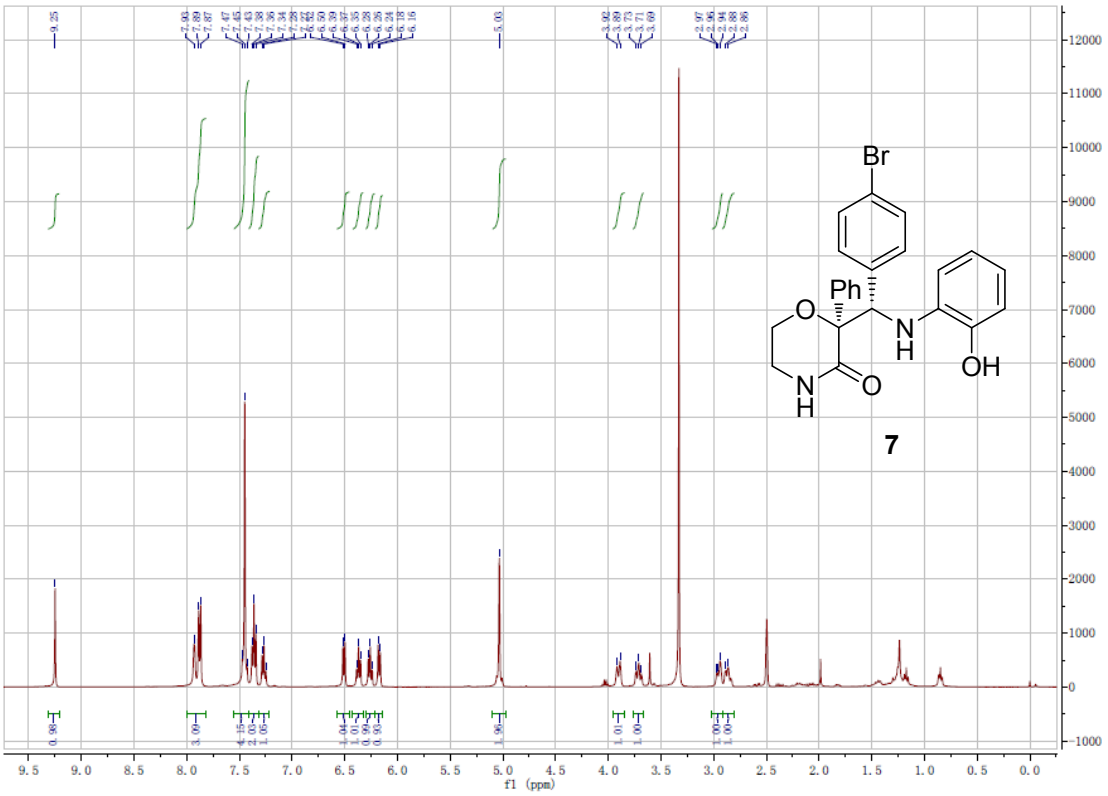
f1 (ppm)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Ph
O
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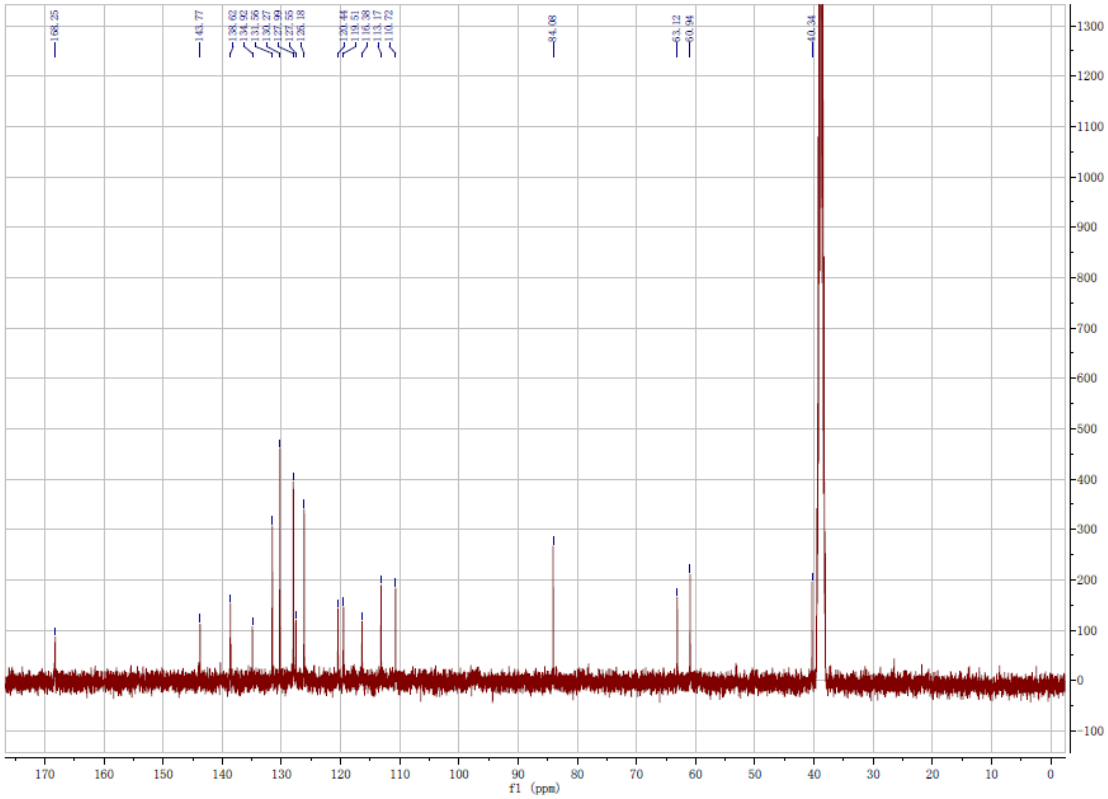
H
N
H
O
OH
7
f1 (ppm)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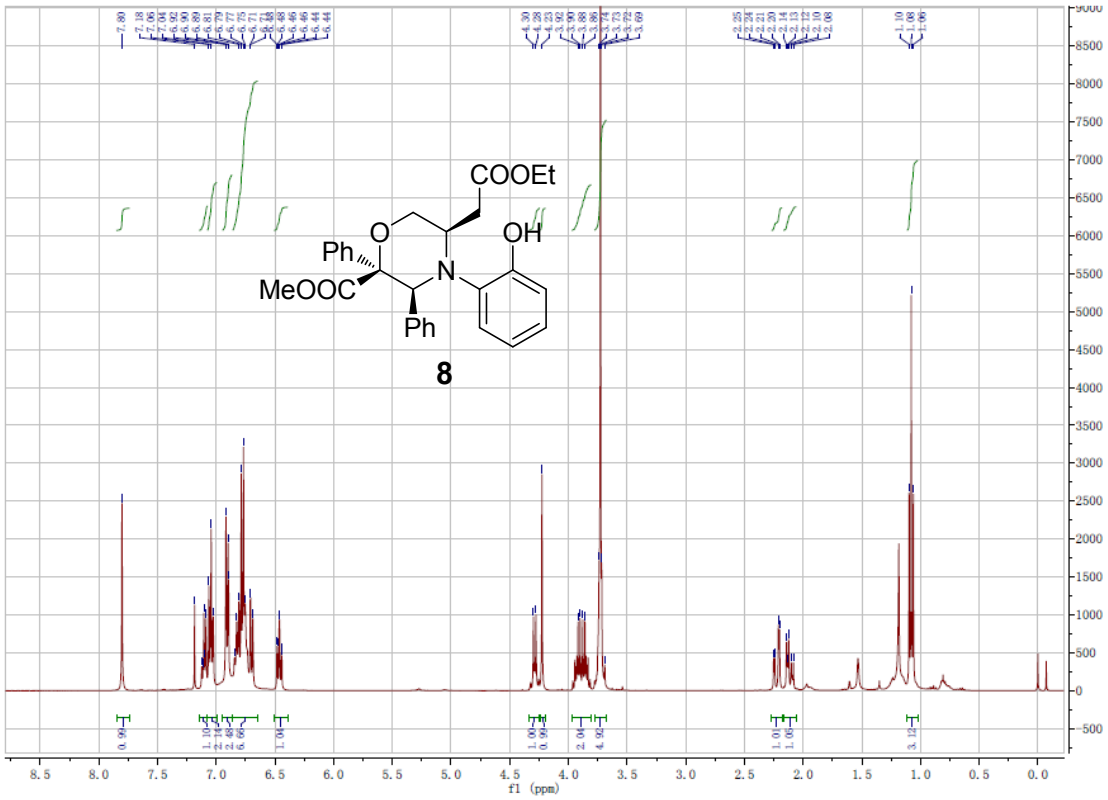
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OH
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Ph
N
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Ph
8
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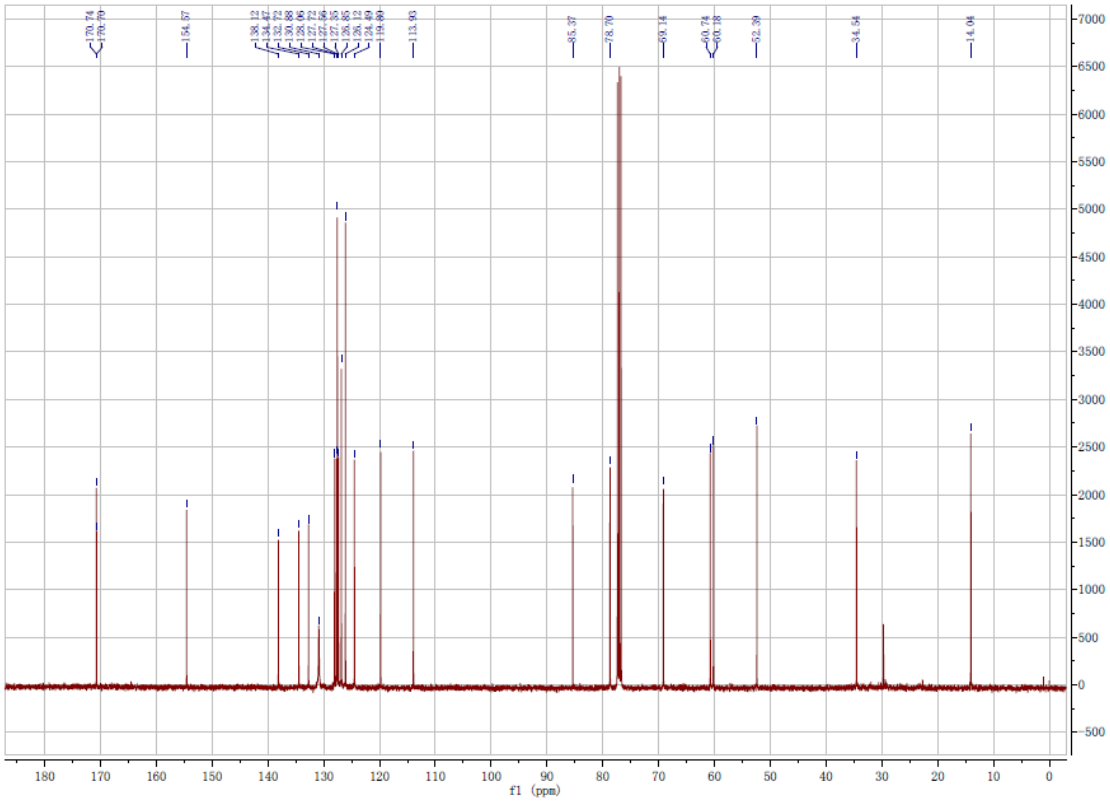
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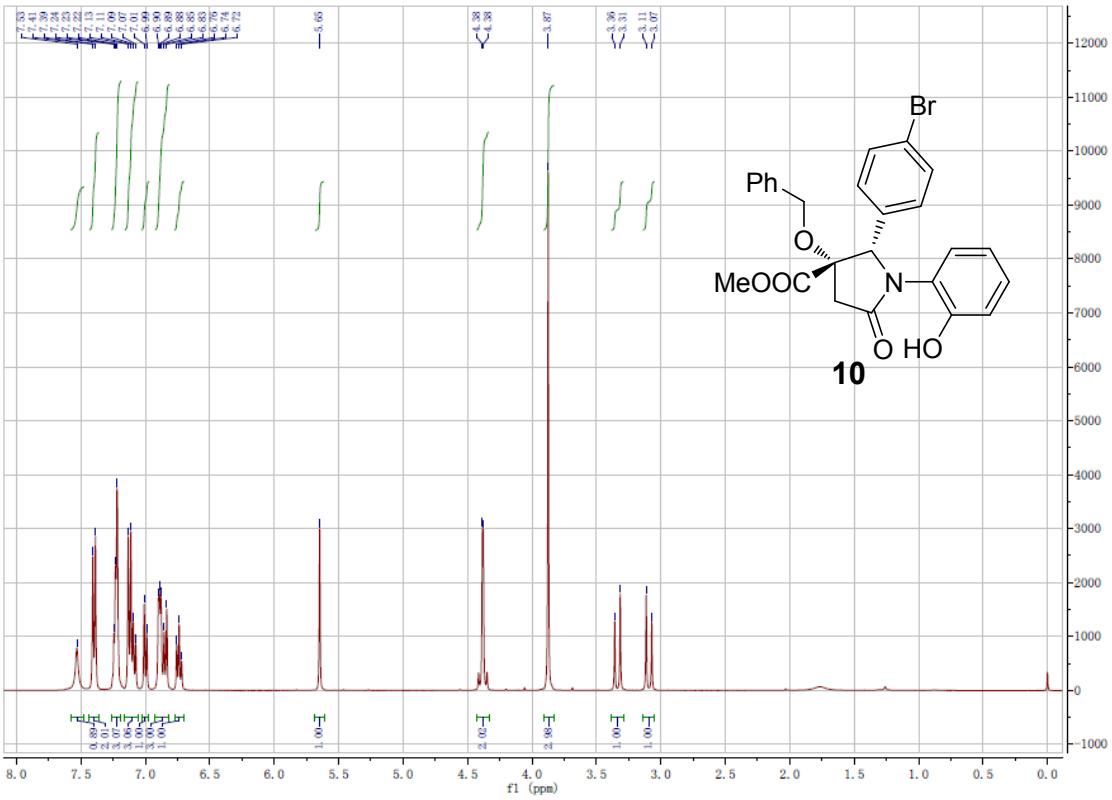
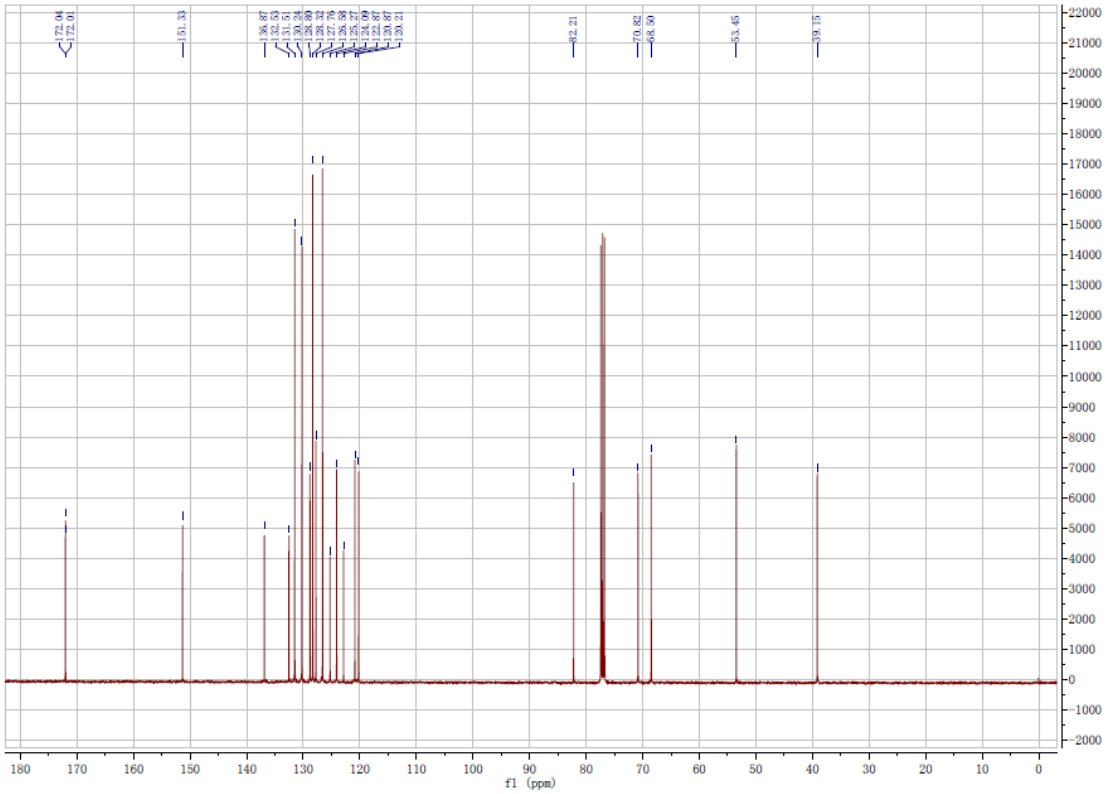

Br
Ph
O
MeOOC
N
O HO
10
f1 (ppm)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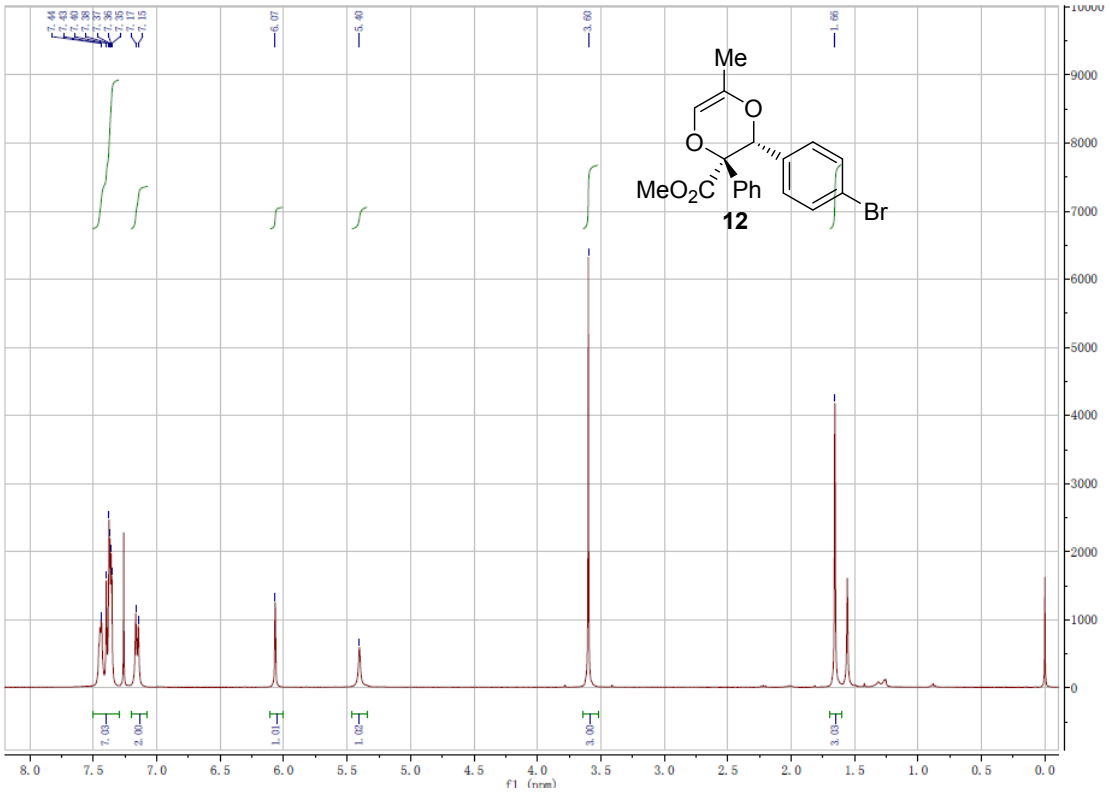
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O
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Ph
Br
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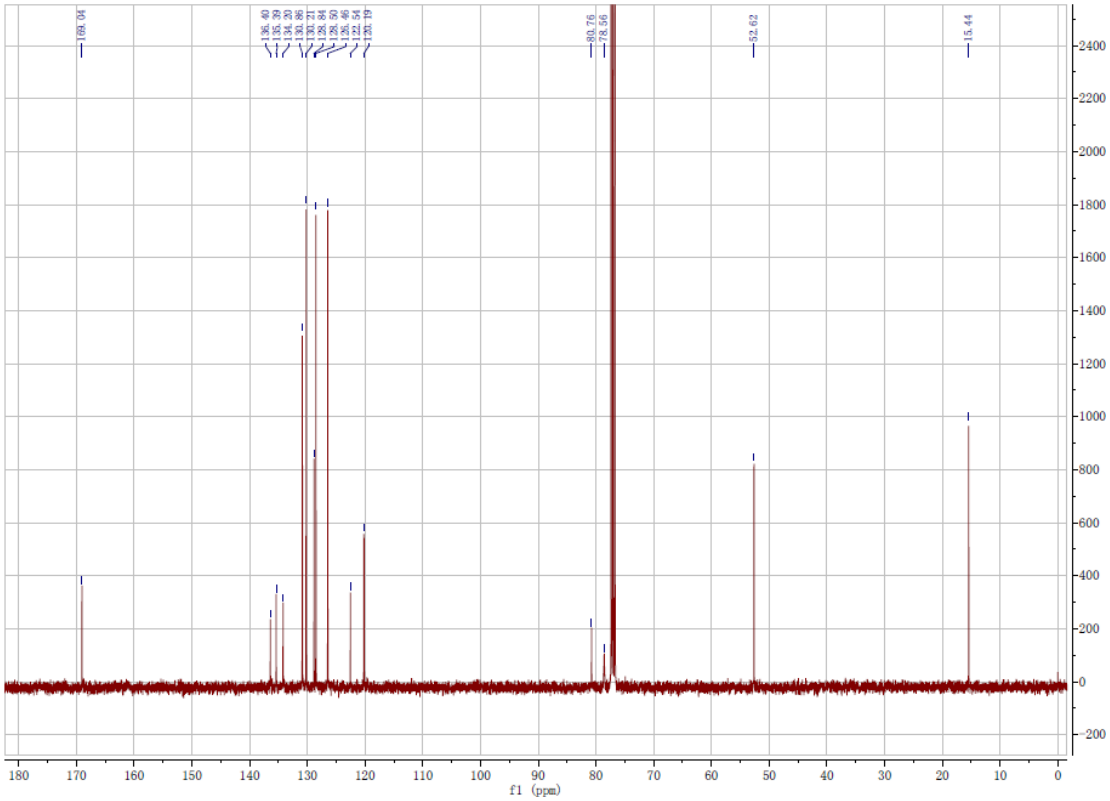
f1 (ppm)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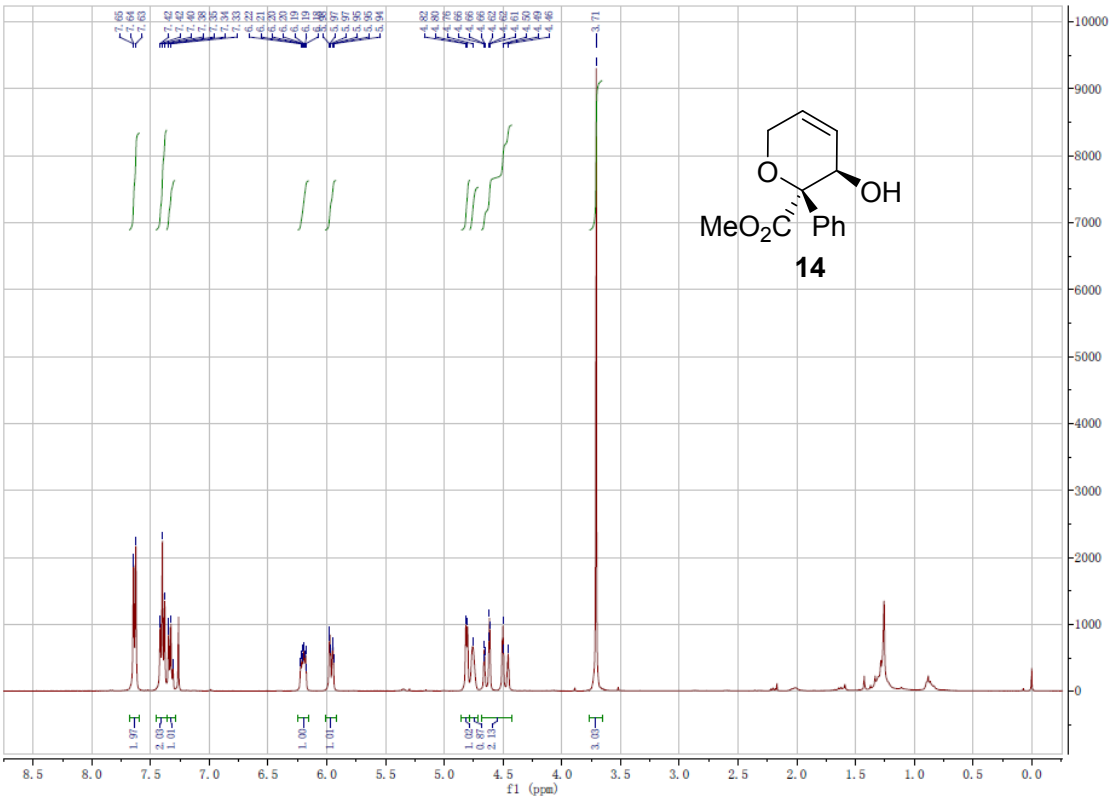
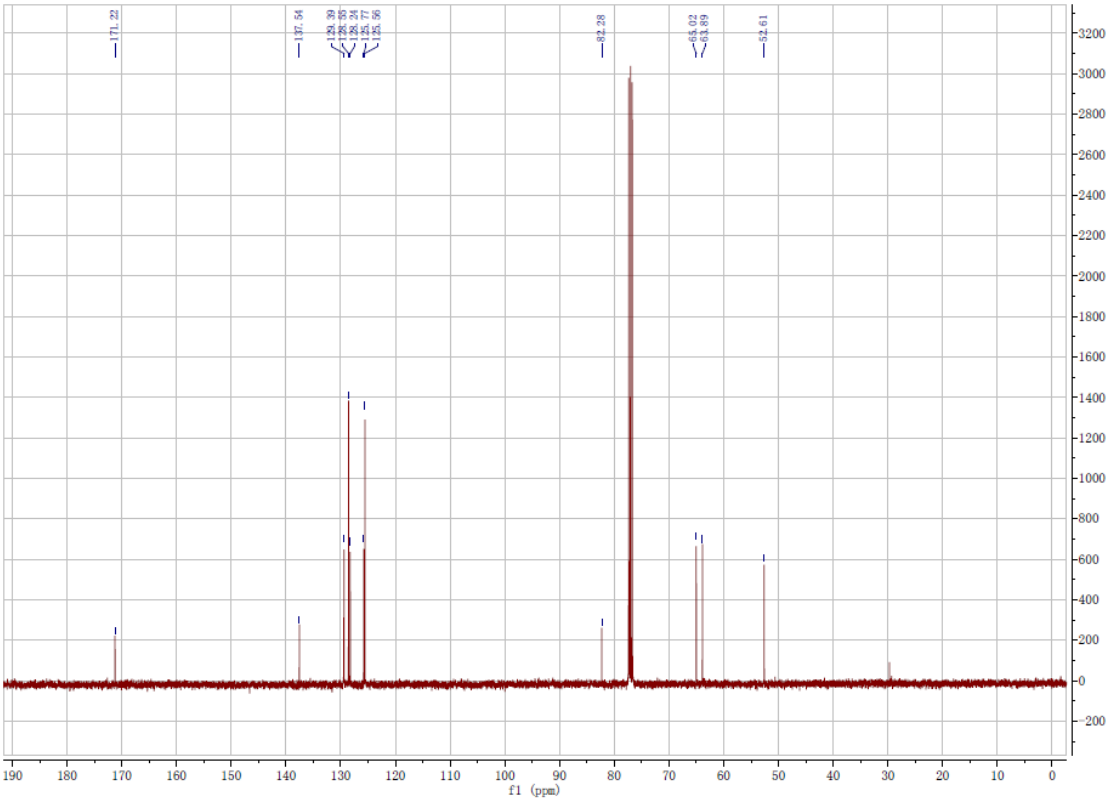

O
OH
MeO2C
Ph
14
f1 (ppm)

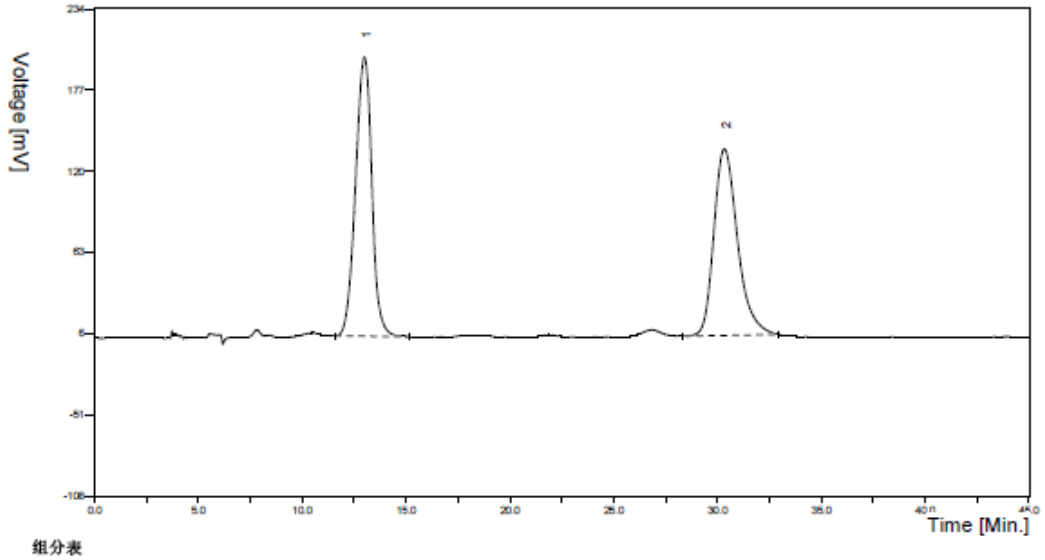

171.22
137.54
129.39
128.55
128.24
125.77
125.56
82.28
65.02
63.89
52.61
f1 (ppm)

HPLC Spectra

Compound *rac*-4a:

Sample Name: TM298 (1-6)-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

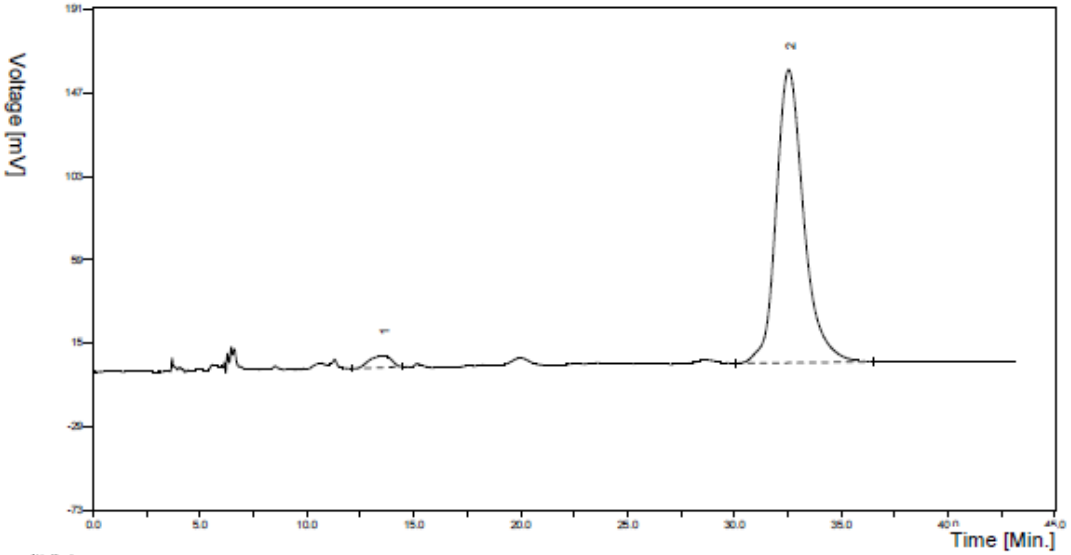


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	12.99	195.77	10740.47	50.8931
2	Unknown	30.33	130.88	10363.52	49.1069
合计			326.65	21103.99	100

Compound 4a:

Sample Name: TM298-5



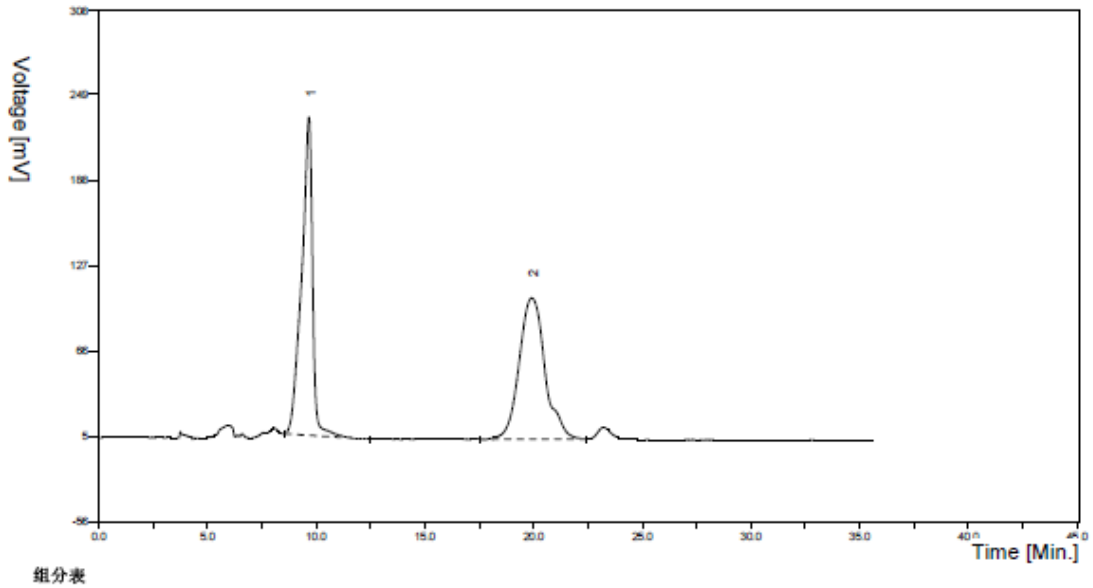
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	13.56	6.35	441.70	3.0900
2	Unknown	32.54	154.29	13852.51	96.9100
合计			160.63	14294.20	100

Compound *rac*-4b:

Sample Name: TM298-13-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.8 mL/min; 254 nm

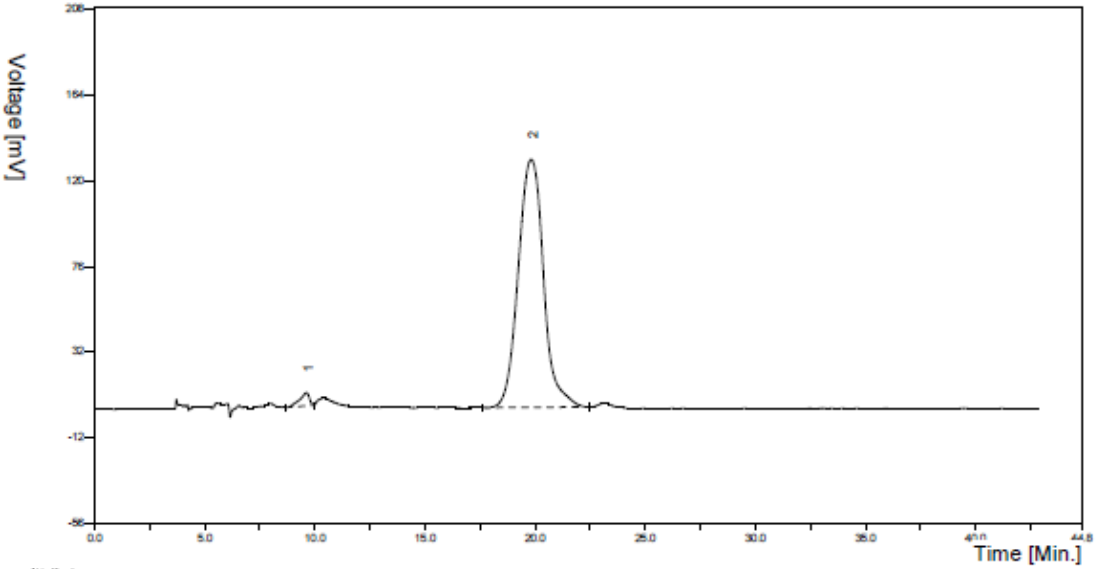


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	9.67	226.99	7931.26	48.7026
2	Unknown	19.92	100.78	8353.82	51.2974
合计			327.77	16285.08	100

Compound 4b:

Sample Name: TM298-13



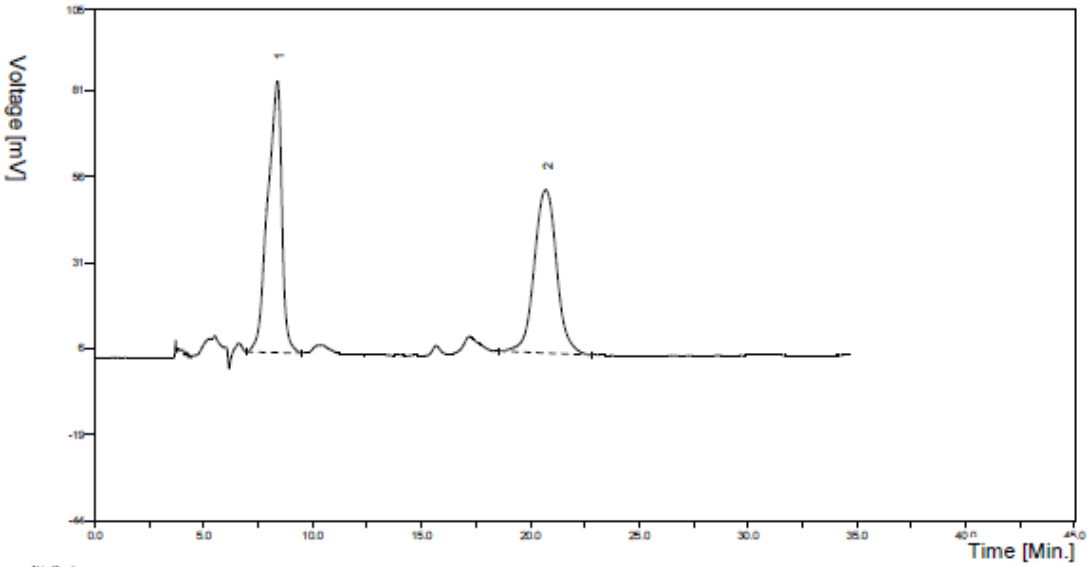
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	9.62	6.70	204.97	1.9722
2	Unknown	19.82	127.46	10187.90	98.0278
合计			134.16	10392.87	100

Compound *rac*-4c:

Sample Name: TM298-12-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.8mL/min; 254 nm; chiral IA

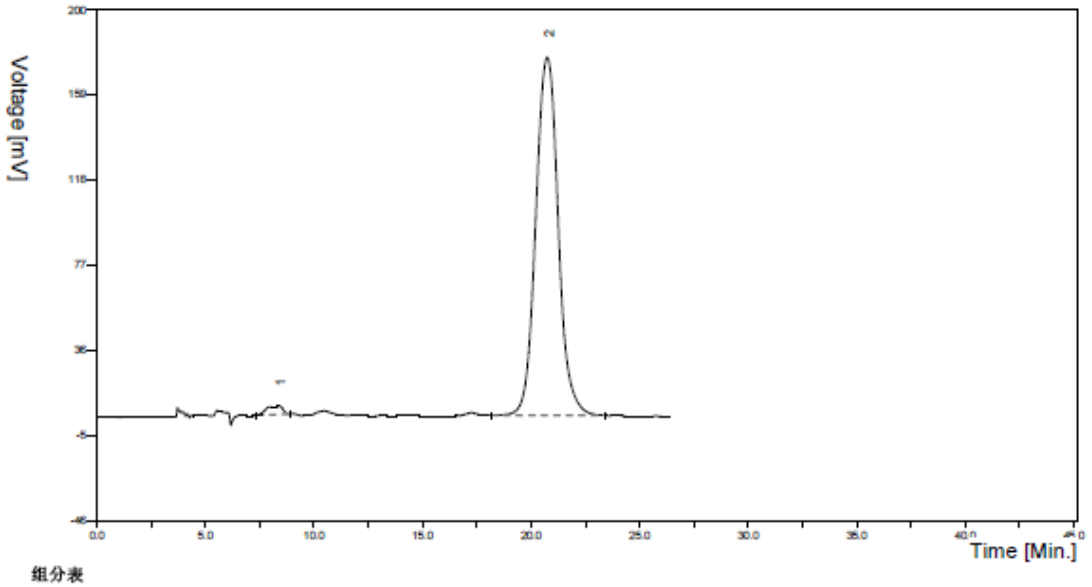


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	8.38	78.83	3565.09	51.3172
2	Unknown	20.71	47.34	3382.07	48.6828
合计			126.17	6947.17	100

Compound 4c:

Sample Name: TM298-12



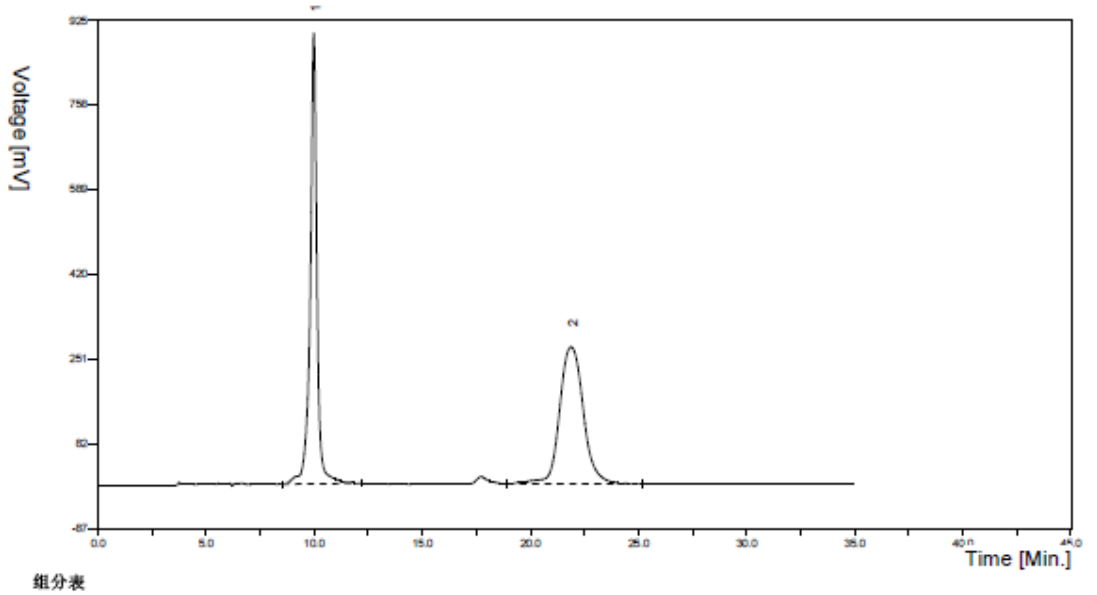
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	8.38	4.03	205.98	1.6338
2	Unknown	20.75	172.18	12401.60	98.3662
合计			176.21	12607.58	100

Compound *rac*-4d:

Sample Name: TM298-11-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

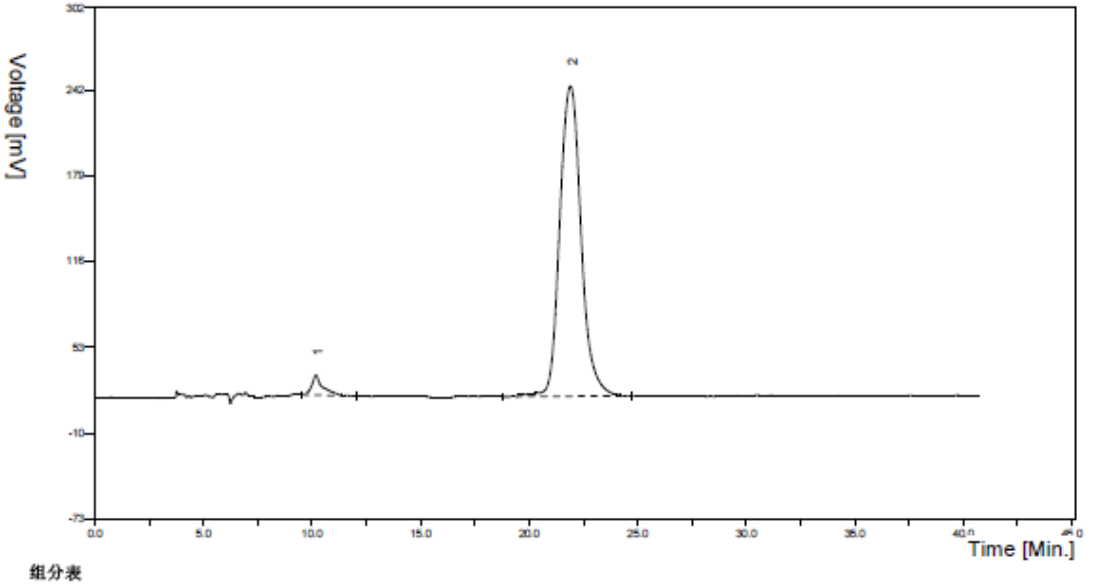


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	9.98	898.20	19729.08	48.6263
2	Unknown	21.88	272.47	20843.80	51.3737
合计			1170.67	40572.88	100

Compound 4d:

Sample Name: TM298-11



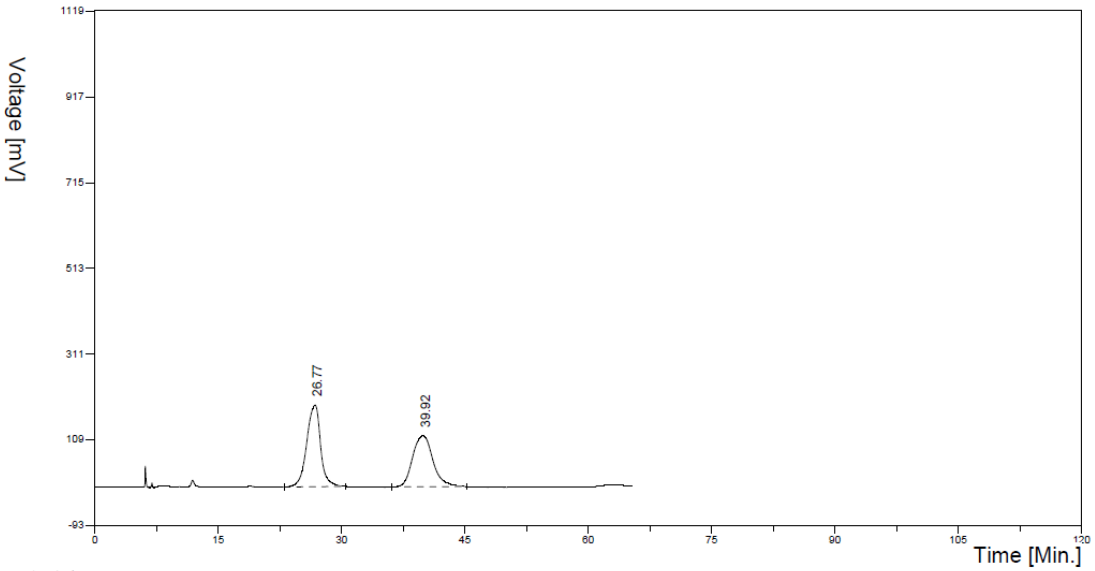
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	10.18	14.47	516.90	3.1949
2	Unknown	21.91	227.82	15662.00	96.8051
合计			242.29	16178.89	100

Compound *rac*-4e:

Sample Name: TM1000-89-2

Condition: Hexane/ EtOH = 20/ 1; 0.5 mL/min; 254 nm; chiral IA

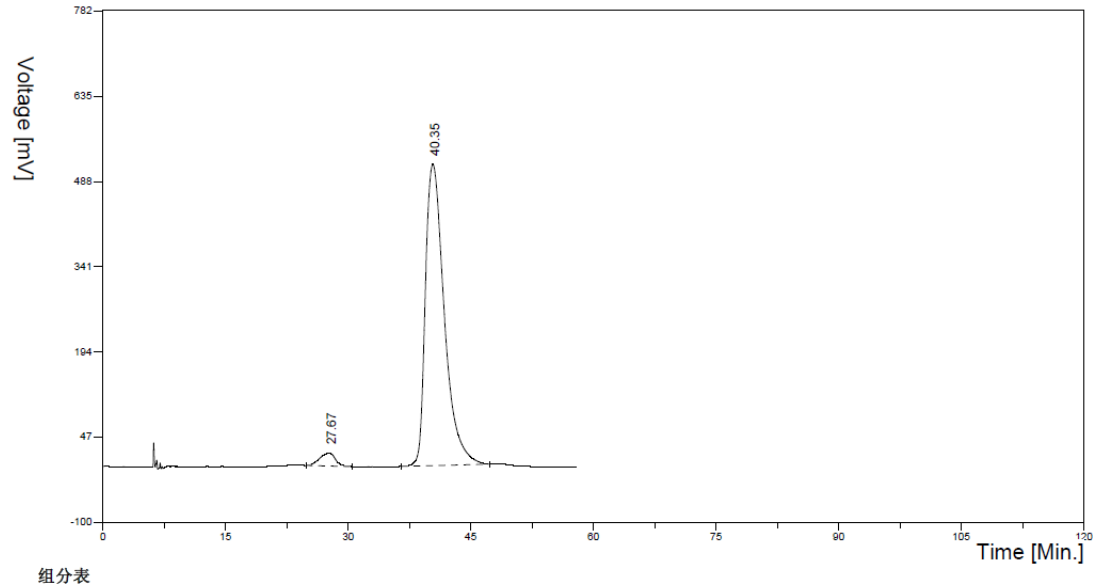


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	26.77	192.26	22560.23	52.1333
2	Unknown	39.92	120.44	20713.89	47.8667
合计			312.70	43274.12	100

Compound 4e:

Sample Name: TM1000-84-2



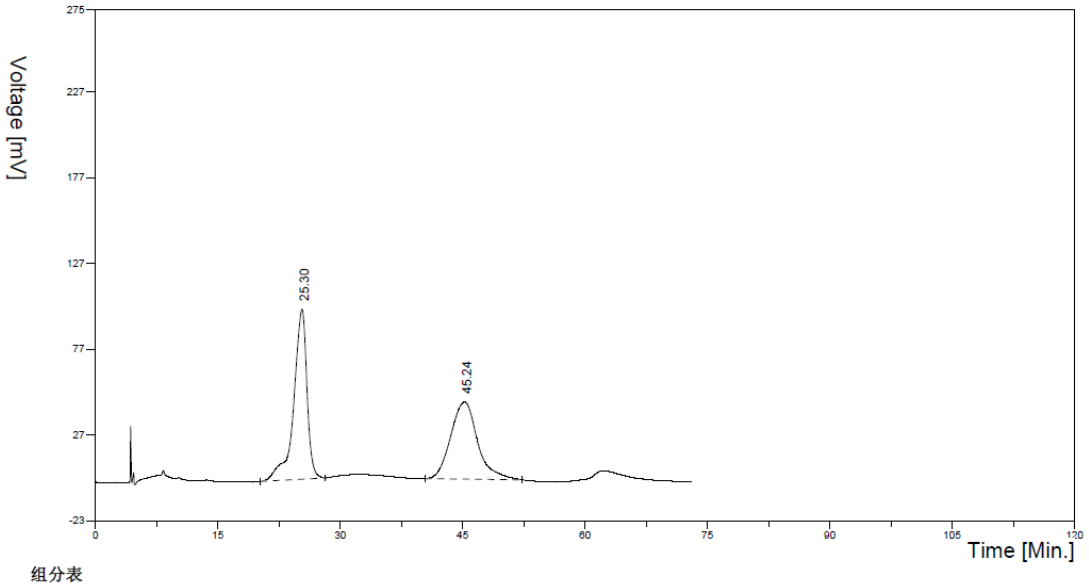
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	27.67	22.31	2951.15	3.4115
2	Unknown	40.35	519.62	83555.78	96.5885
合计			541.93	86506.93	100

Compound *rac*-4f:

Sample Name: TM1000-89-1-1

Condition: Hexane/ EtOH = 30/ 1; 0.8 mL/min; 254 nm; chiral IA

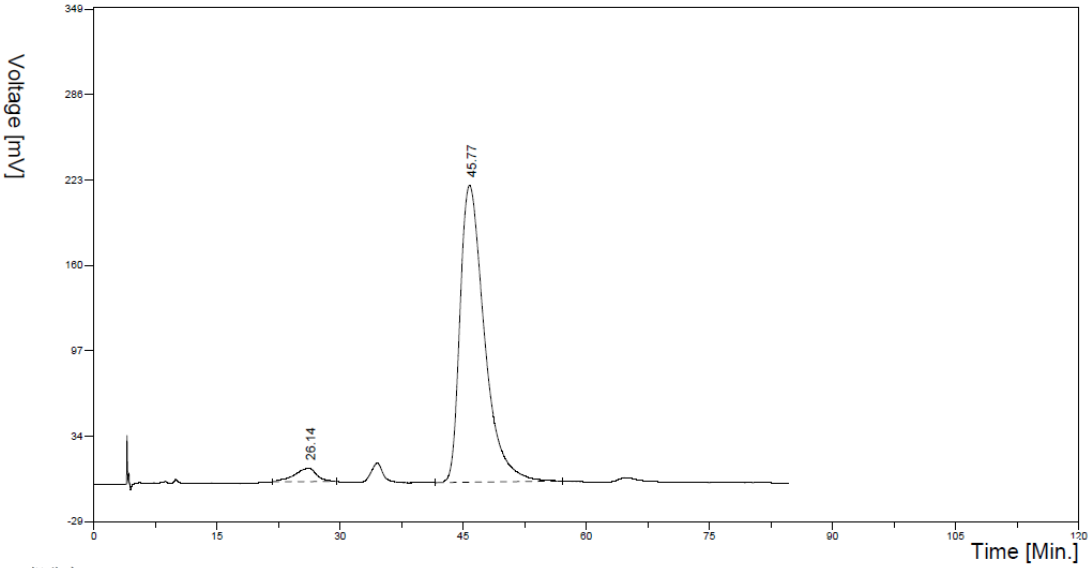


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	25.30	98.98	11230.46	52.0820
2	Unknown	45.24	45.00	10332.57	47.9180
合计			143.98	21563.03	100

Compound 4f:

Sample Name: TM1000-83-2-1



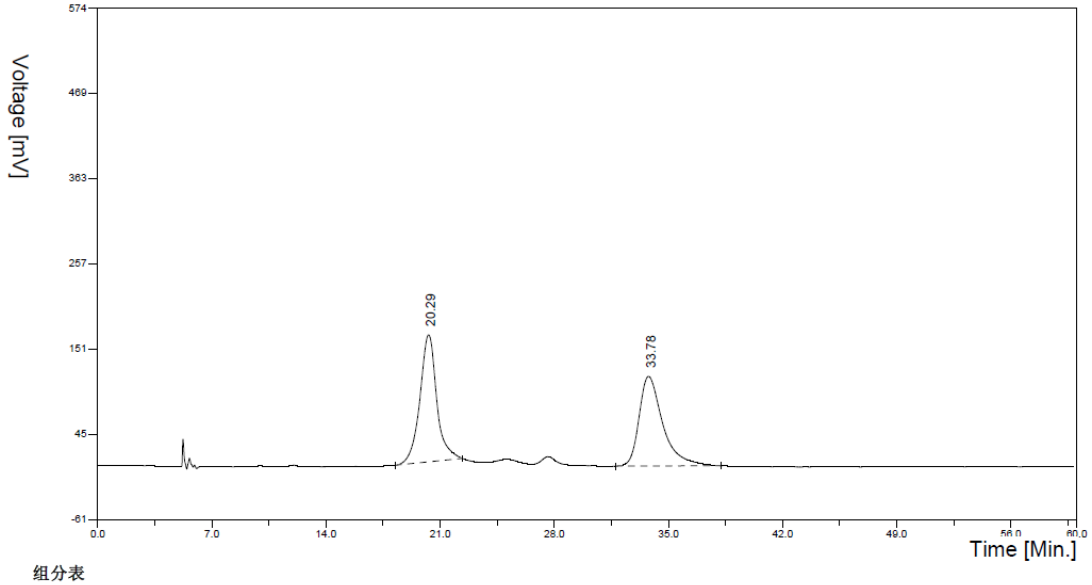
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	26.14	9.55	1814.89	3.8636
2	Unknown	45.77	218.90	45159.71	96.1364
合计			228.45	46974.60	100

Compound *rac*-4g:

Sample Name: TM1000-88-1-meso-1

Condition: Hexane/ EtOH = 20/ 1; 0.8 mL/min; 254 nm; chiral IA

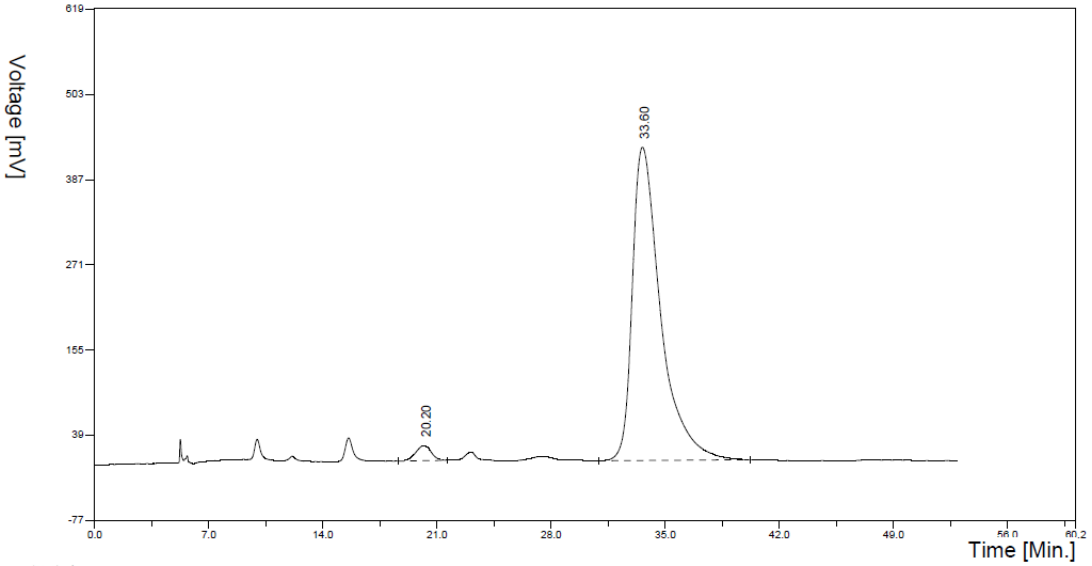


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	20.29	157.82	11327.53	50.1559
2	Unknown	33.78	111.50	11257.12	49.8441
合计			269.32	22584.65	100

Compound 4g:

Sample Name: TM1000-88-1



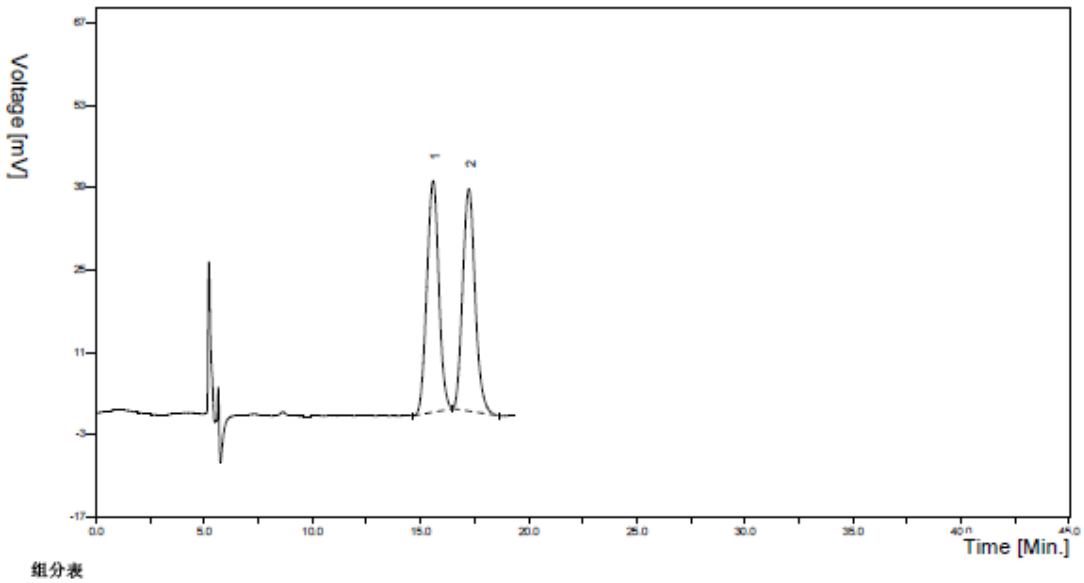
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	20.20	20.66	1372.68	2.5924
2	Unknown	33.60	426.55	51576.95	97.4076
合计			447.21	52949.63	100

Compound *rac*-6a:

Sample Name: TM298-18-meso

Condition: Hexane/ EtOH = 18/ 1; 0.6 mL/min; 254 nm; chiral IA

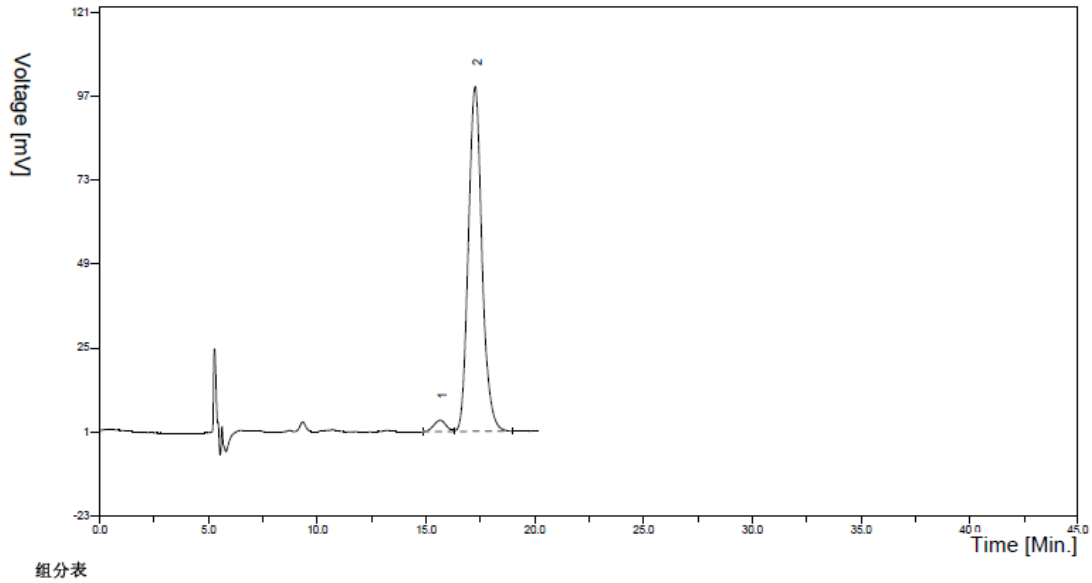


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	15.58	39.35	1506.81	49.9527
2	Unknown	17.24	37.77	1509.66	50.0473
合计			77.12	3016.47	100

Compound 6a:

Sample Name: TM298-20



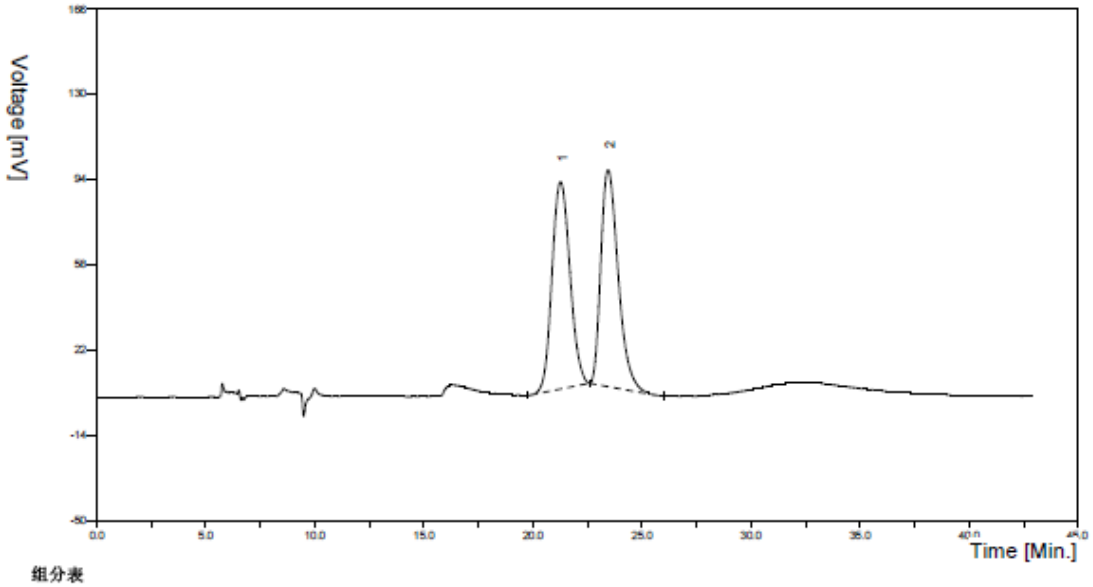
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	15.64	3.25	128.63	2.9104
2	Unknown	17.26	98.59	4291.10	97.0896
合计			101.84	4419.73	100

Compound *rac*-6b:

Sample Name: TM298-30-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.5 mL/min; 254 nm; chiral IA

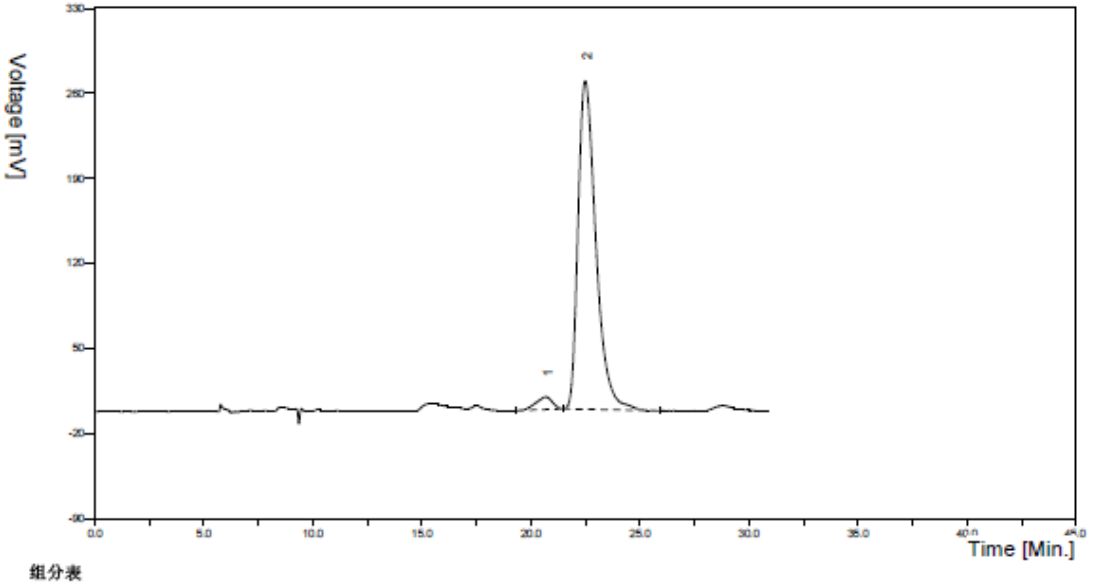


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	21.27	87.46	5001.77	49.7865
2	Unknown	23.45	91.51	5044.67	50.2135
合计			178.98	10046.44	100

Compound 6b:

Sample Name: TM298-42



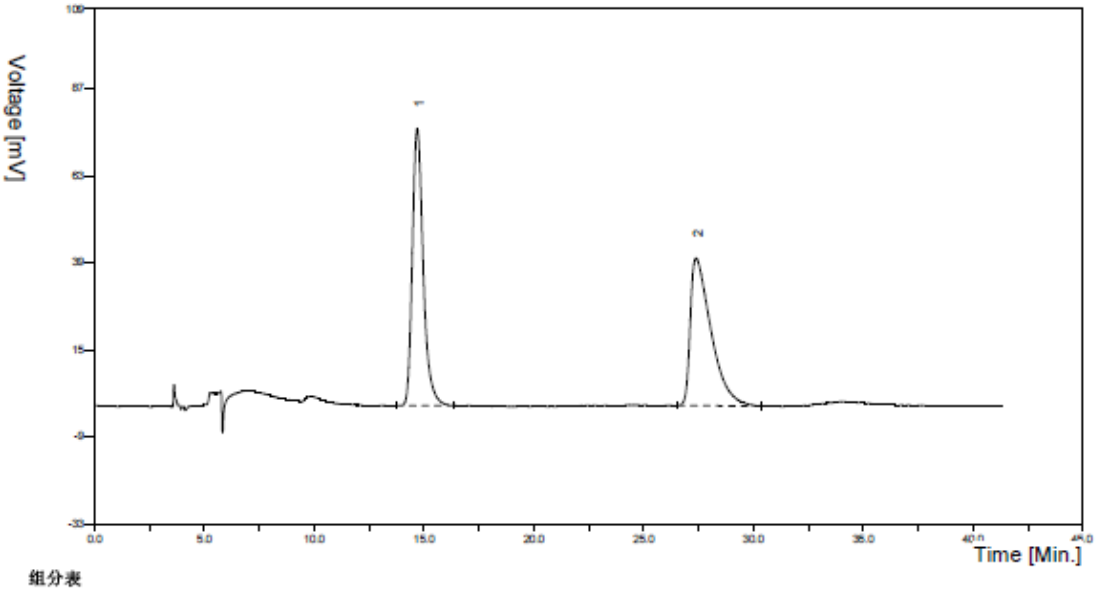
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	20.69	10.27	536.38	3.3677
2	Unknown	22.49	270.09	15391.15	96.6323
合计			280.36	15927.54	100

Compound *rac*-6c:

Sample Name: TM298-43-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

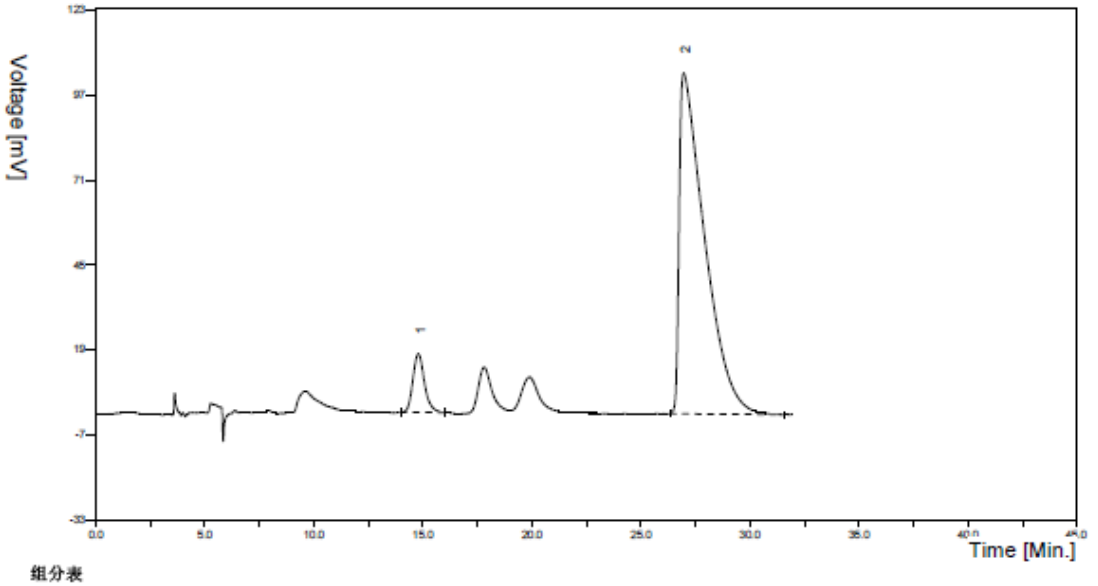


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	14.69	76.35	2634.06	49.7861
2	Unknown	27.39	40.62	2656.69	50.2139
合计			116.98	5290.75	100

Compound 6c:

Sample Name: TM298-43



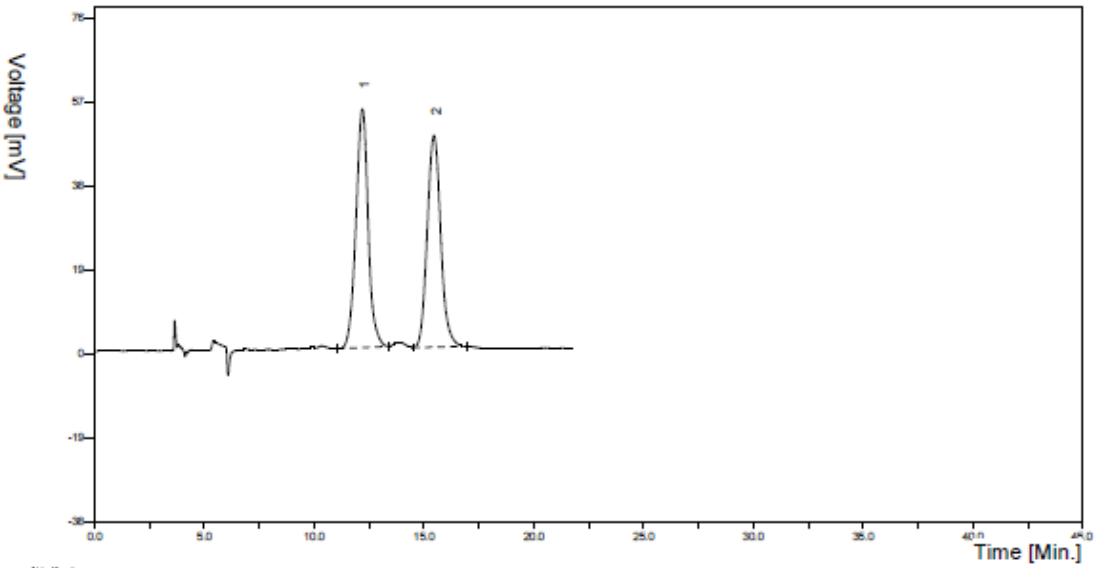
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	14.79	17.92	664.77	7.2948
2	Unknown	26.96	104.17	8448.15	92.7052
合计			122.09	9112.92	100

Compound *rac*-6d:

Sample Name: TM298-52-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

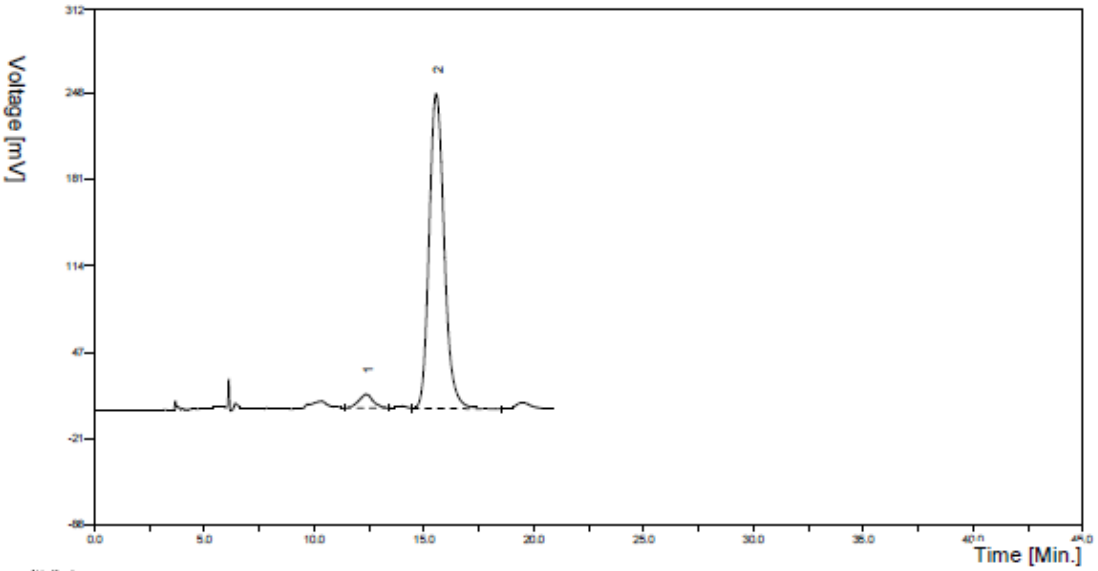


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	12.20	53.99	2090.94	50.5470
2	Unknown	15.46	47.87	2045.68	49.4530
合计			101.85	4136.62	100

Compound 6d:

Sample Name: TM298-52



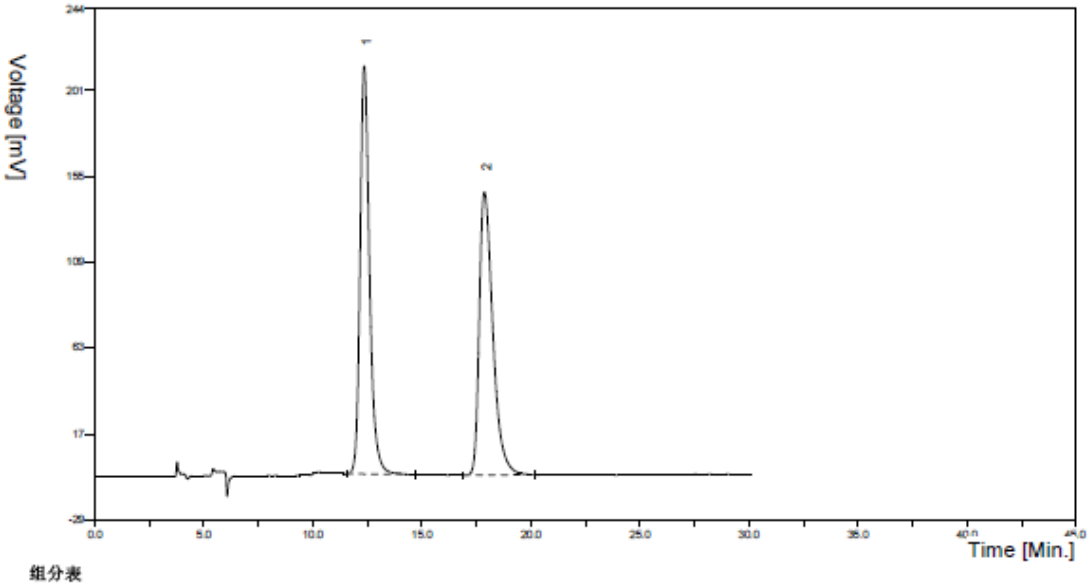
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	12.37	10.60	483.51	3.9935
2	Unknown	15.55	244.43	11623.97	96.0065
合计			255.03	12107.48	100

Compound *rac*-6e:

Sample Name: TM298-11-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

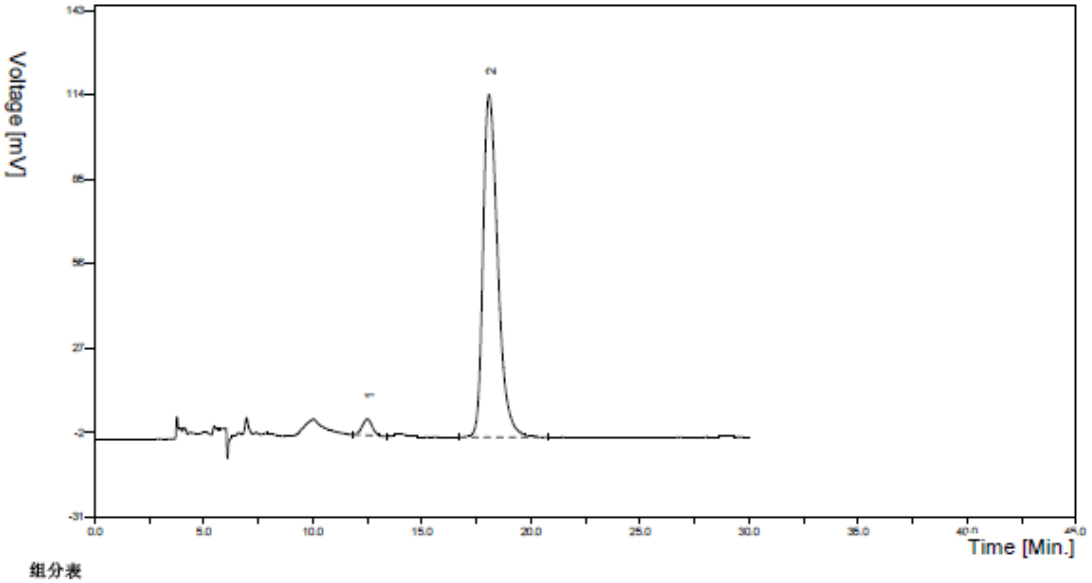


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	12.35	218.31	6601.27	50.1921
2	Unknown	17.87	151.55	6550.73	49.8079
合计			369.86	13151.99	100

Compound 6e:

Sample Name: TM298-21



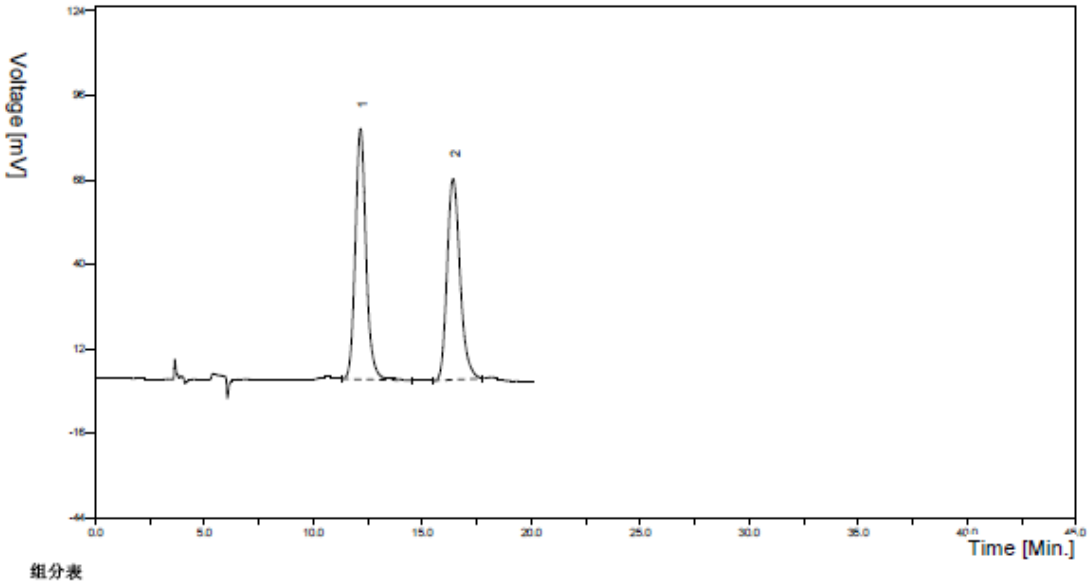
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	12.50	5.53	179.35	3.1439
2	Unknown	18.08	117.56	5525.44	96.8561
合计			123.08	5704.79	100

Compound *rac*-6f:

Sample Name: TM298-53-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

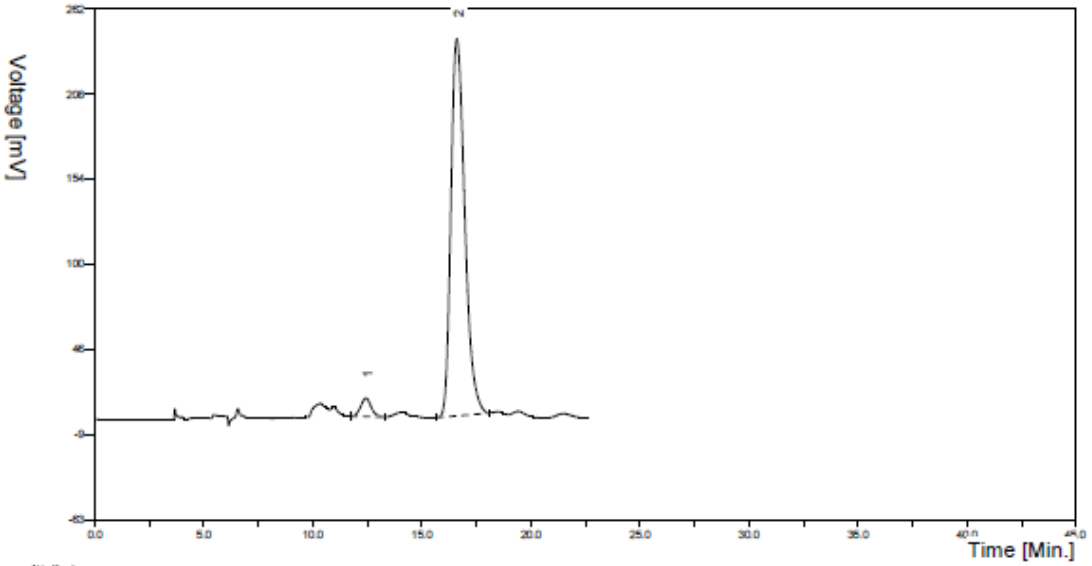


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	12.16	82.93	2860.59	50.9484
2	Unknown	16.41	66.60	2754.10	49.0516
合计			149.53	5614.69	100

Compound 6f:

Sample Name: TM298-53



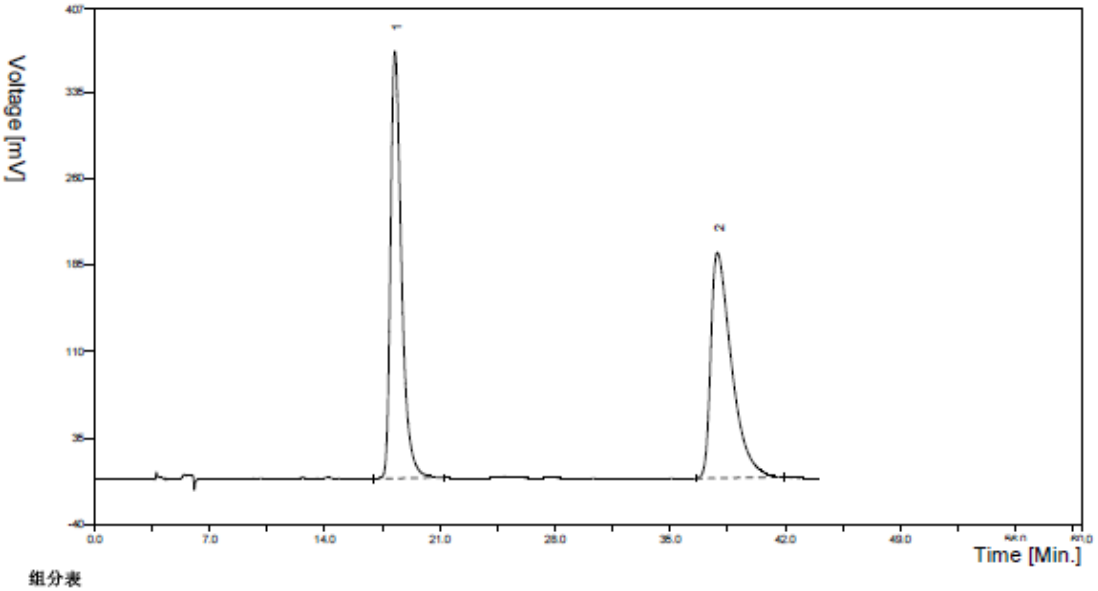
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	12.43	11.69	389.37	3.5505
2	Unknown	16.60	239.09	10577.32	96.4495
合计			250.78	10966.69	100

Compound *rac*-6g:

Sample Name: TM298-26-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

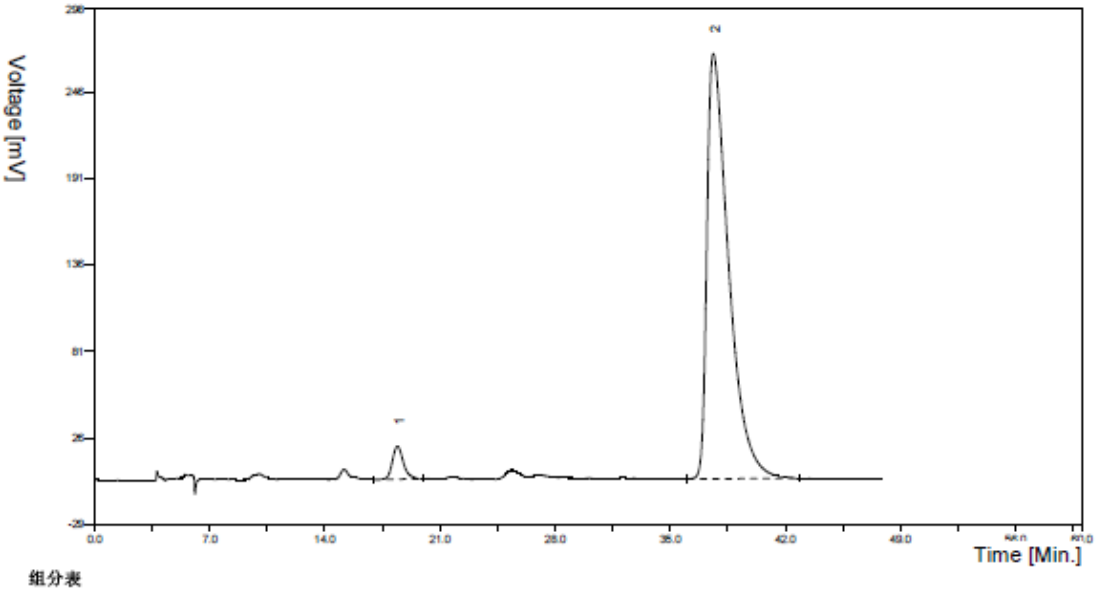


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	18.27	370.69	17175.57	50.0007
2	Unknown	37.88	195.75	17175.07	49.9993
合计			566.44	34350.64	100

Compound 6g:

Sample Name: TM298-26



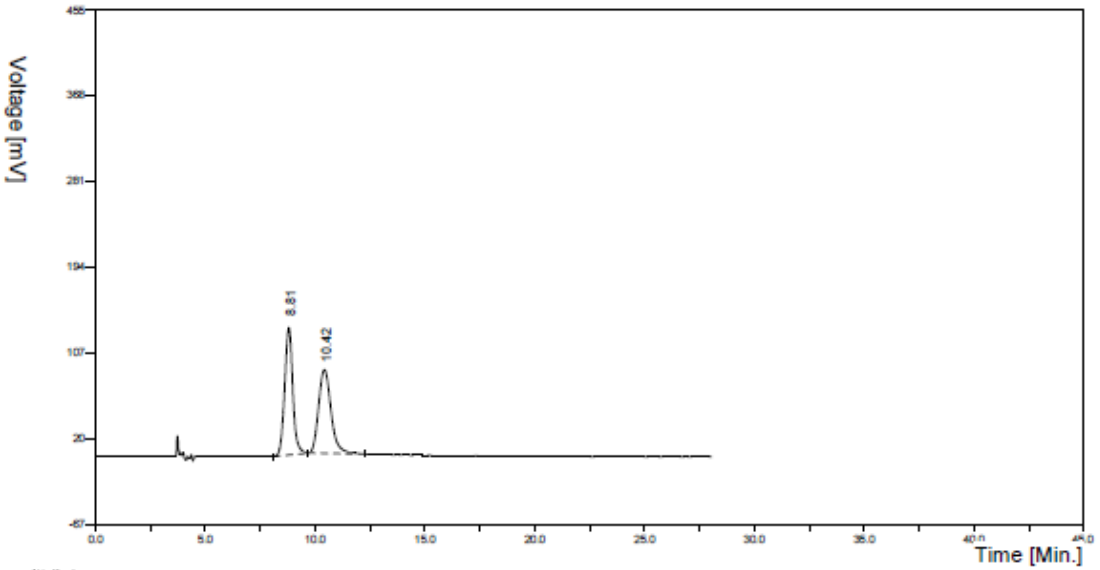
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	18.42	20.88	978.72	3.8011
2	Unknown	37.63	270.22	24769.33	96.1989
合计			291.10	25748.05	100

Compound *rac*-6h:

Sample Name: TM298-56-meso

Condition: Hexane/ EtOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

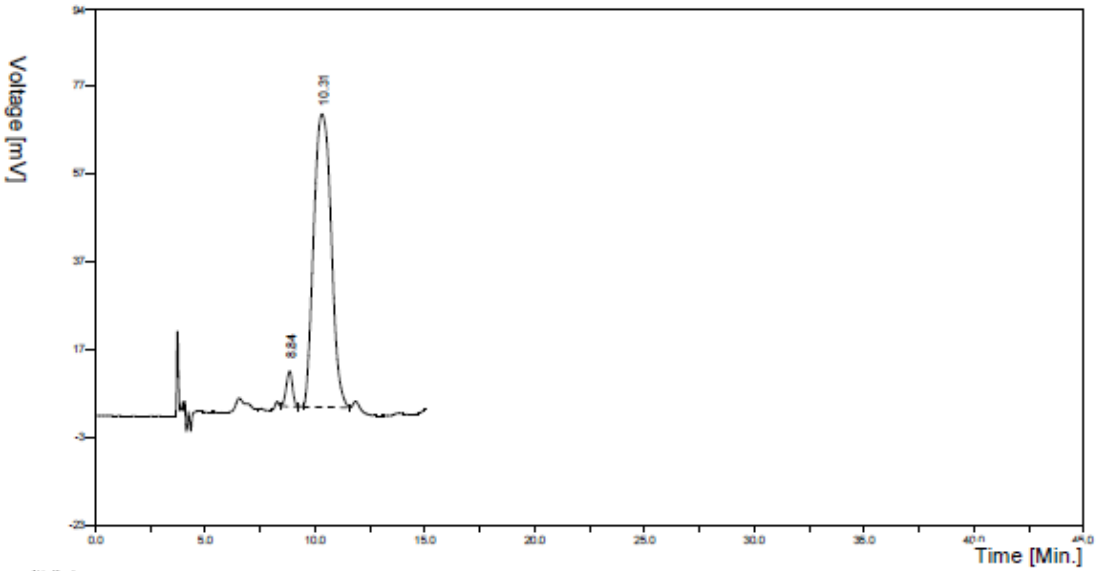


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	8.81	129.08	3321.91	49.8293
2	Unknown	10.42	84.81	3344.67	50.1707
合计			213.90	6666.58	100

Compound 6h:

Sample Name: TM298-56



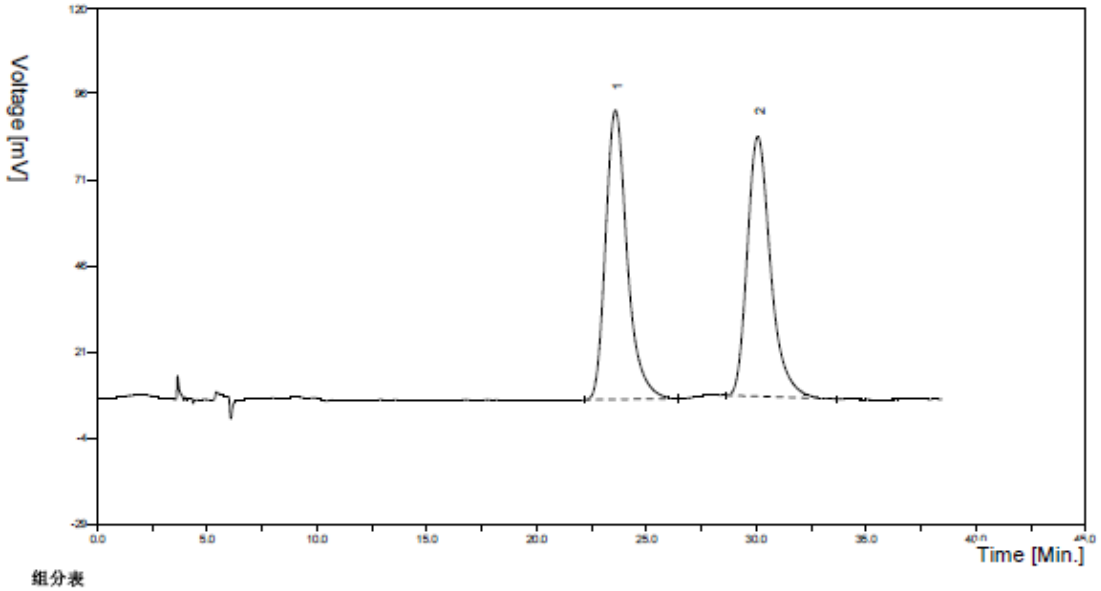
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	8.84	8.07	158.23	4.1143
2	Unknown	10.31	66.62	3687.60	95.8857
合计			74.69	3845.83	100

Compound *rac*-6i:

Sample Name: TM298-57-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

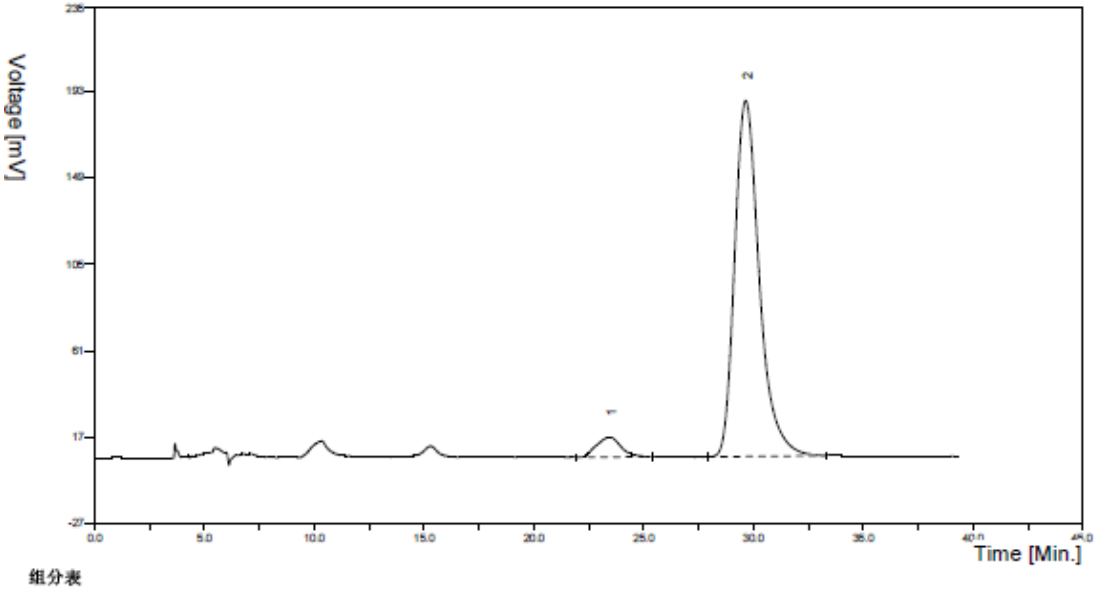


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	23.59	83.88	5724.66	50.7005
2	Unknown	30.07	75.40	5566.47	49.2995
合计			159.28	11291.13	100

Compound 6i:

Sample Name: TM298-57



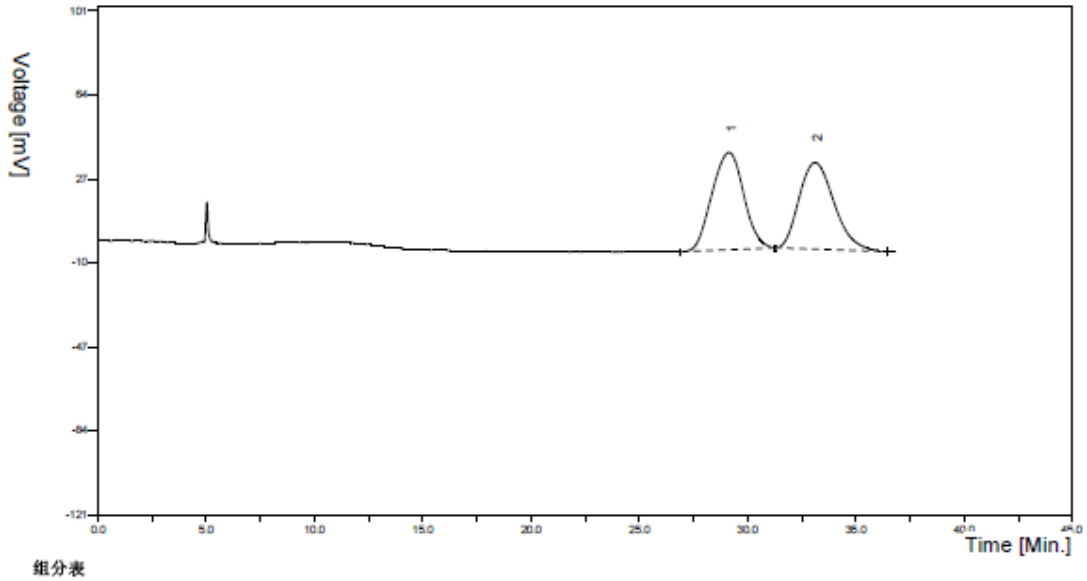
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	23.45	10.12	782.37	5.2284
2	Unknown	29.65	181.30	14181.62	94.7716
合计			191.42	14963.99	100

Compound *rac*-6j:

Sample Name: TM298-55-meso

Condition: Hexane/ EtOH = 80/ 1; 0.7 mL/min; 254 nm; chiral IA

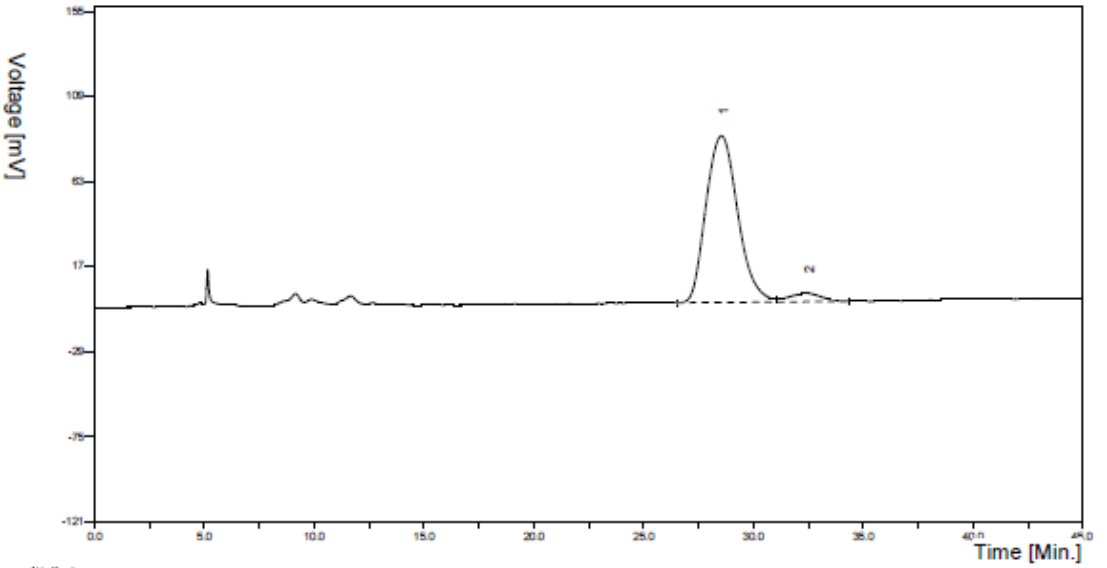


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	29.15	42.82	4365.71	50.4514
2	Unknown	33.11	38.10	4287.59	49.5486
合计			80.92	8653.30	100

Compound 6j:

Sample Name: TM298-55



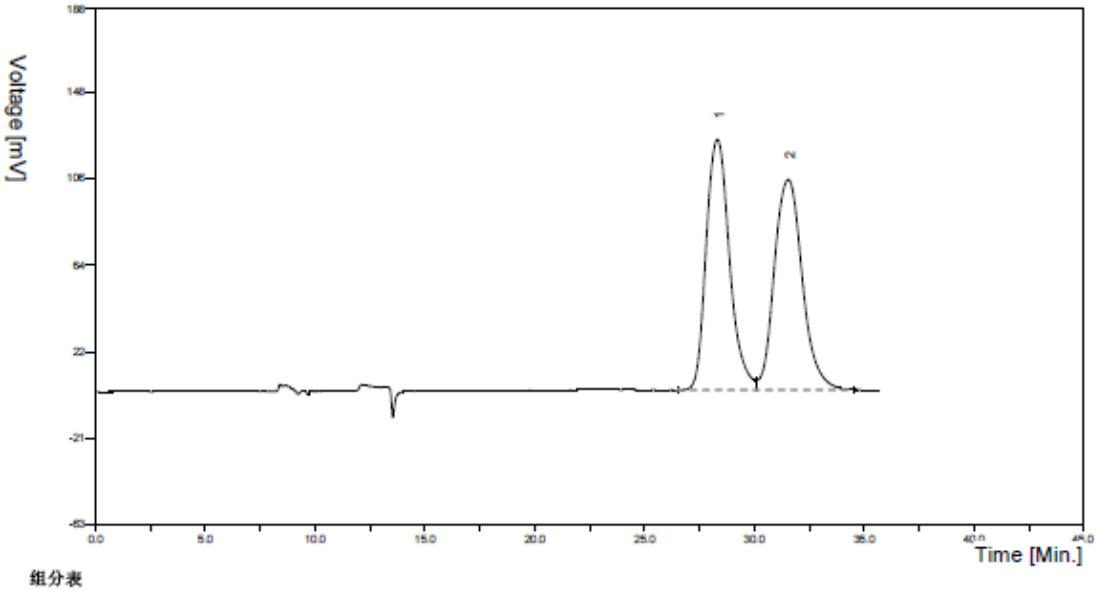
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	28.55	90.05	9053.05	95.1825
2	Unknown	32.45	4.44	458.21	4.8175
合计			94.49	9511.26	100

Compound *rac*-6k:

Sample Name: TM298-24-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.35 mL/min; 254 nm; chiral IA

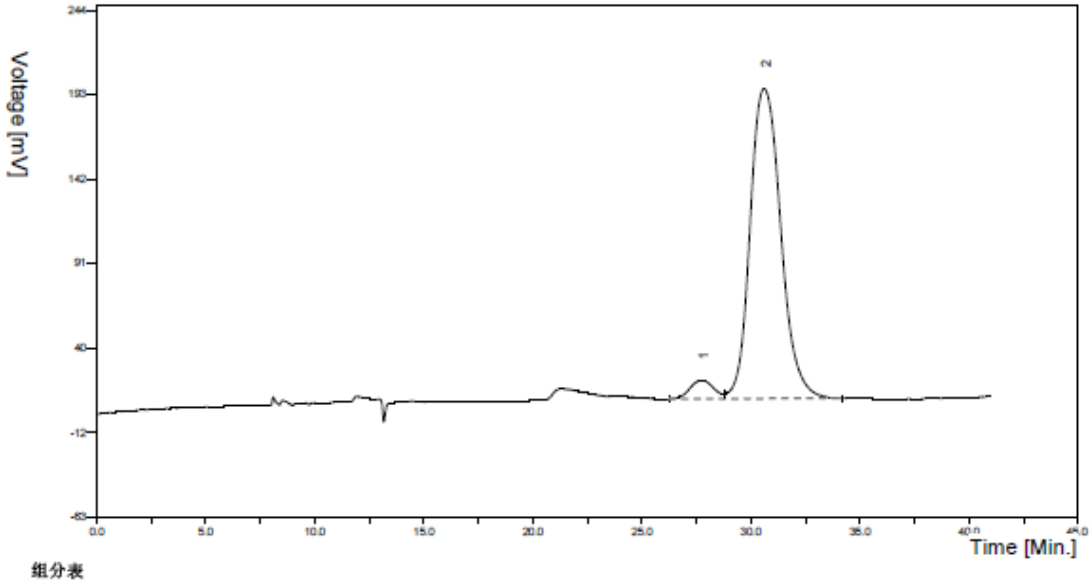


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	28.32	121.93	9020.08	49.8348
2	Unknown	31.55	102.31	9079.90	50.1652
合计			224.24	18099.98	100

Compound 6k:

Sample Name: TM298-44



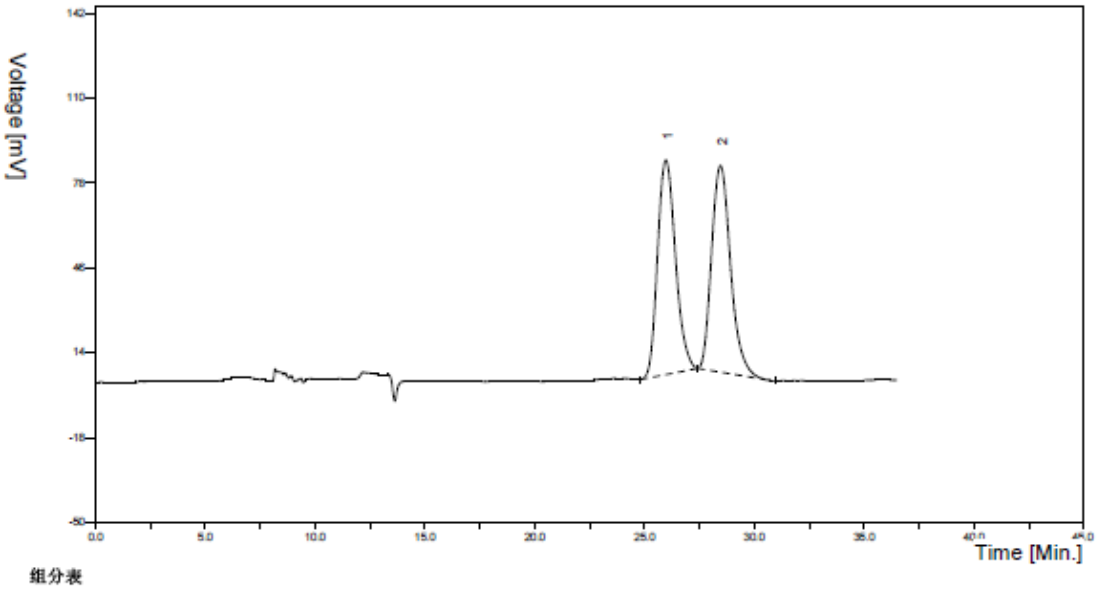
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	27.74	11.10	840.03	4.3802
2	Unknown	30.60	187.11	18337.78	95.6198
合计			198.22	19177.81	100

Compound *rac*-6l:

Sample Name: TM298-54-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.35 mL/min; 254 nm; chiral IA

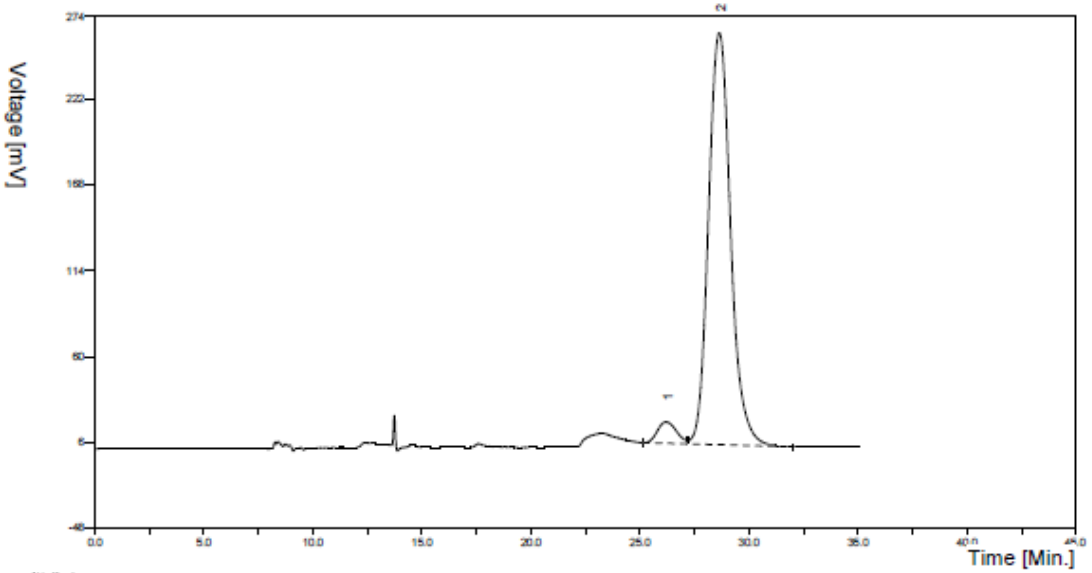


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	25.97	80.84	4587.05	49.5835
2	Unknown	28.46	77.81	4664.12	50.4165
合计			158.64	9251.17	100

Compound 6l:

Sample Name: TM298-54



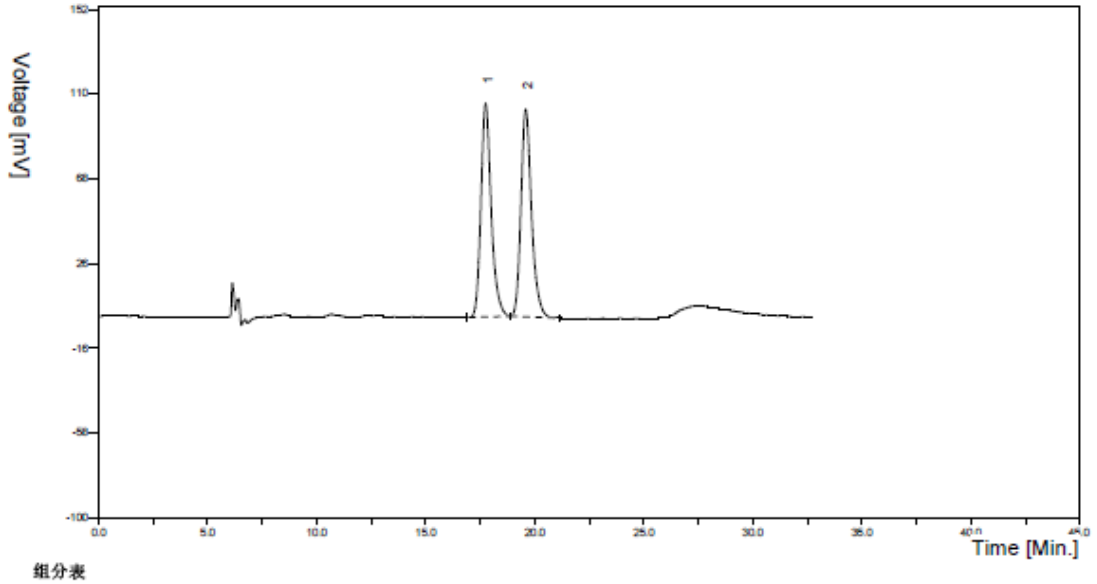
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	26.20	13.40	817.89	4.2750
2	Unknown	28.64	259.78	18313.90	95.7250
合计			273.18	19131.79	100

Compound *rac*-6m:

Sample Name: TM298-27-meso

Condition: Hexane/ EtOH = 20/ 1; 0.5 mL/min; 254 nm; chiral IA

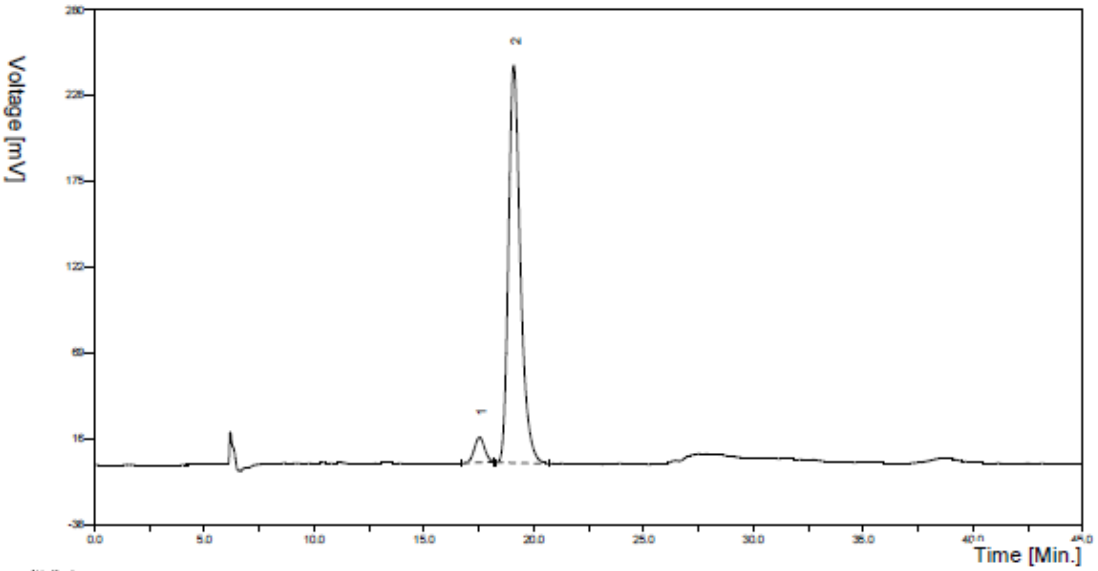


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	17.75	105.69	3460.03	50.0440
2	Unknown	19.59	102.78	3453.94	49.9560
合计			208.46	6913.97	100

Compound 6m:

Sample Name: TM298-45



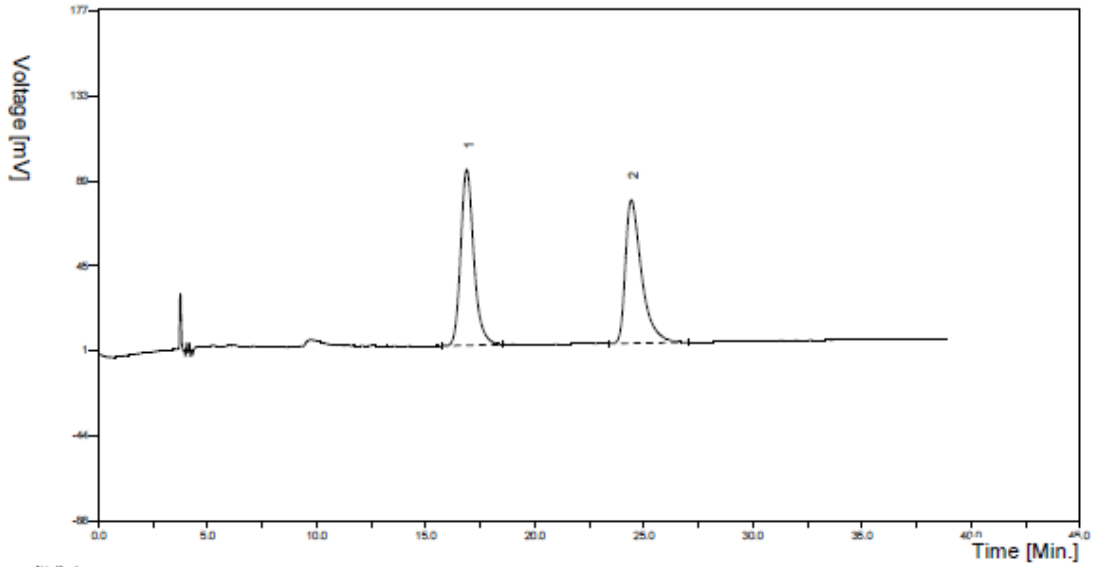
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	17.53	15.55	503.37	5.1721
2	Unknown	19.09	244.89	9228.99	94.8279
合计			260.44	9732.36	100

Compound *rac*-6n:

Sample Name: TM298-32-meso

Condition: Hexane/ EtOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

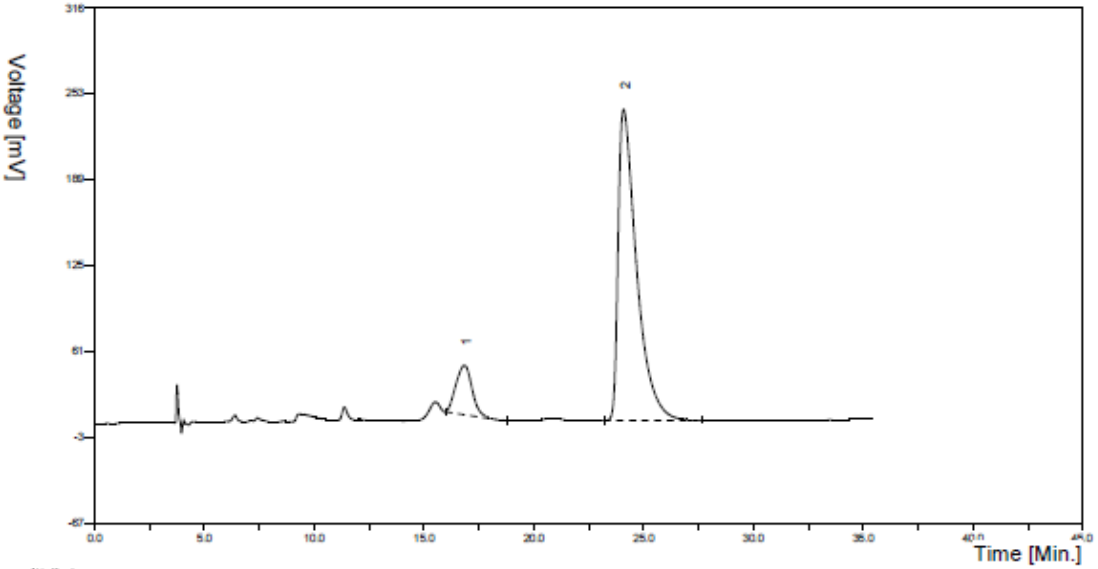


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	16.88	91.15	3810.23	49.9515
2	Unknown	24.43	74.16	3817.63	50.0485
合计			165.31	7627.86	100

Compound 6n:

Sample Name: TM298-32



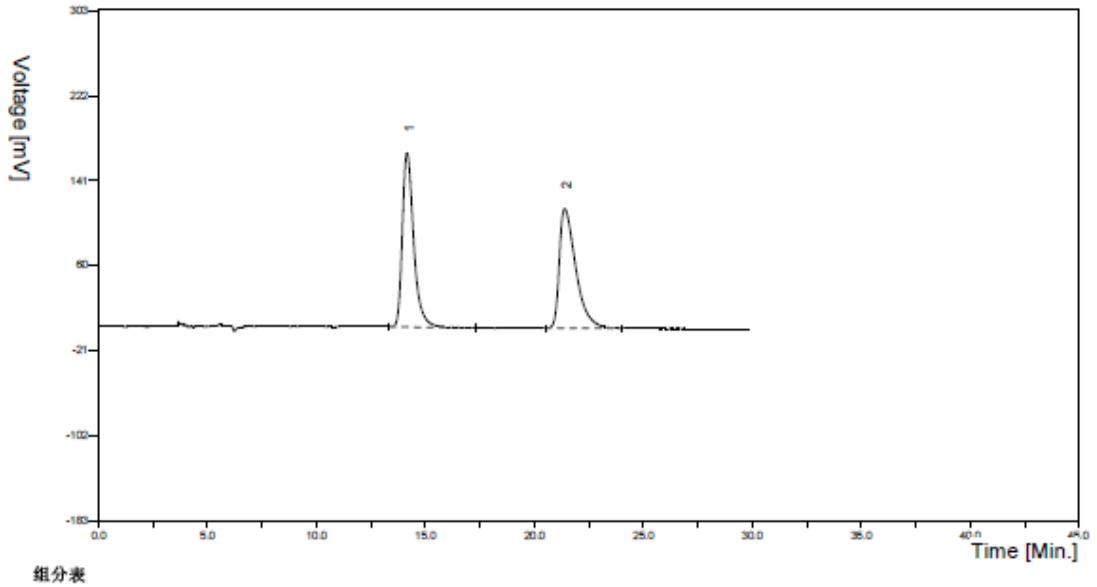
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	16.84	36.52	1831.18	11.9525
2	Unknown	24.09	231.22	13489.34	88.0475
合计			267.74	15320.52	100

Compound *rac*-6o:

Sample Name: TM298-61-meso

Condition: Hexane/ *i*-PrOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

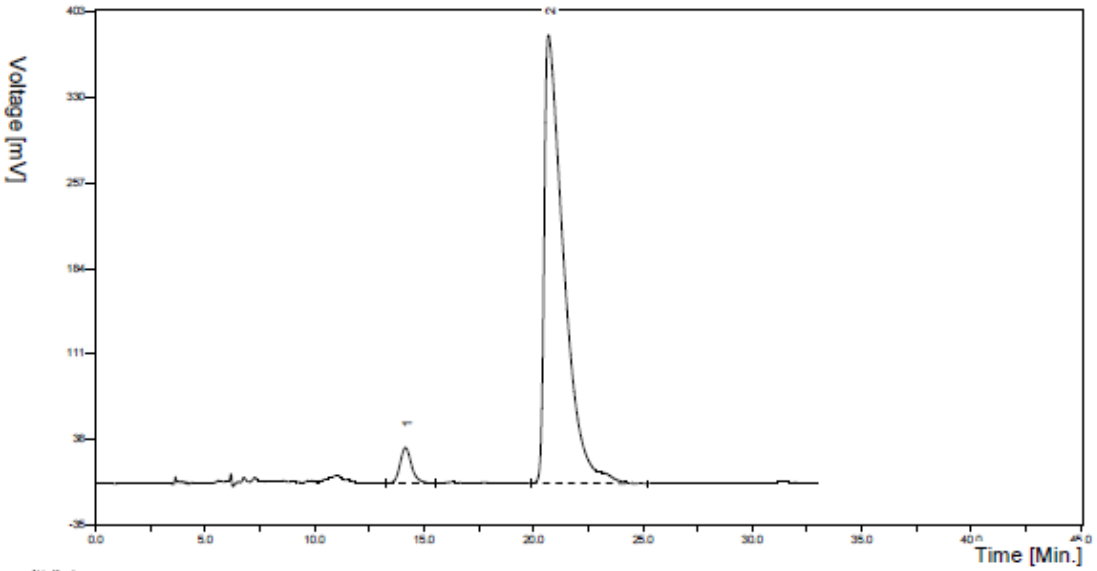


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	14.16	165.62	6010.36	50.1457
2	Unknown	21.39	113.71	5975.43	49.8543
合计			279.33	11985.78	100

Compound 6o:

Sample Name: TM298-61



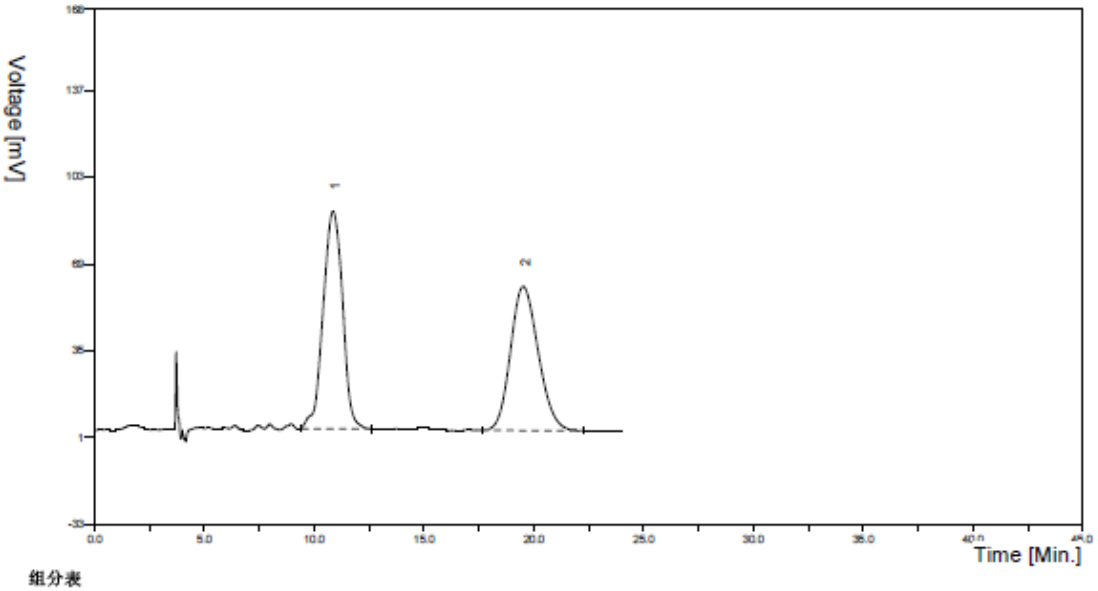
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	14.16	30.09	1100.15	4.4594
2	Unknown	20.69	382.60	23569.99	95.5406
合计			412.70	24670.14	100

Compound *rac*-6p:

Sample Name: TM298-34-meso

Condition: Hexane/ EtOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

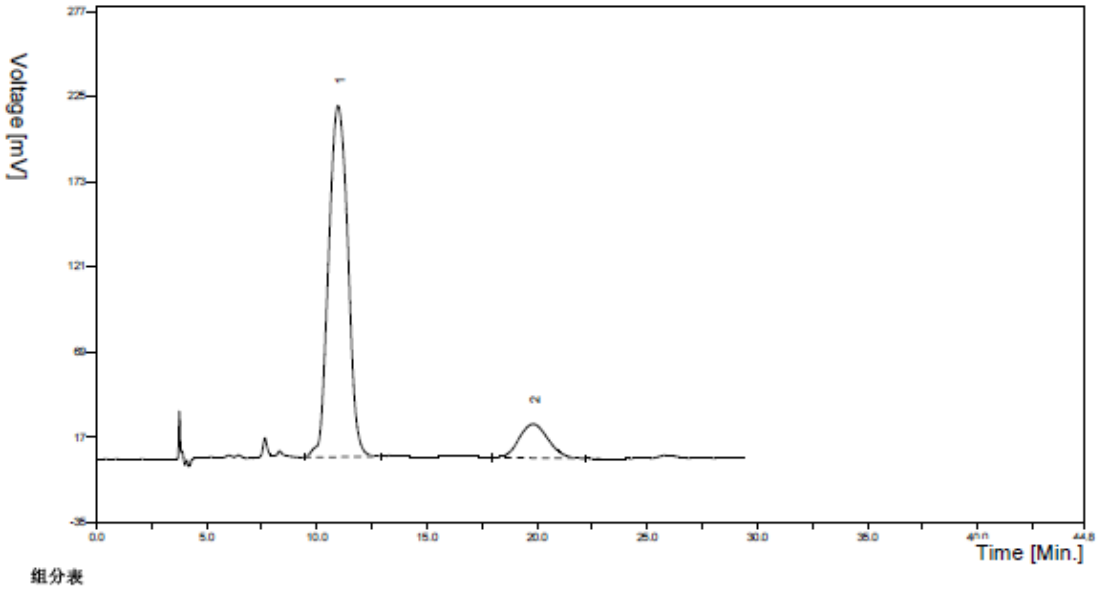


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	10.85	85.20	5248.86	51.4776
2	Unknown	19.52	56.33	4947.54	48.5224
合计			141.53	10196.40	100

Compound 6p:

Sample Name: TM298-34



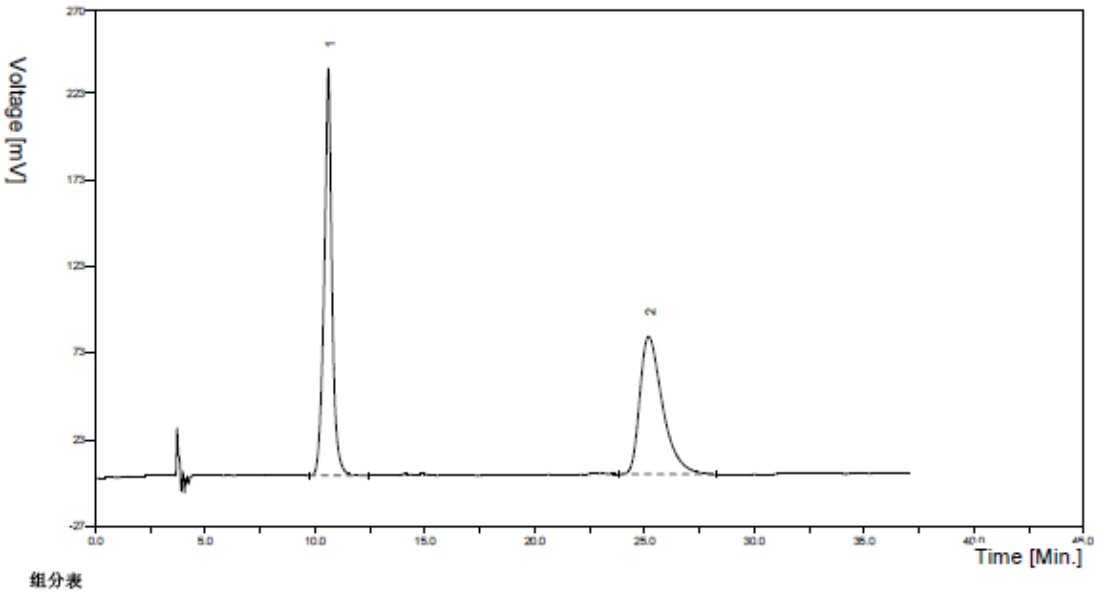
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	10.96	214.64	13017.07	87.2544
2	Unknown	19.83	20.73	1901.46	12.7456
合计			235.37	14918.53	100

Compound *rac*-6q:

Sample Name: TM298-36-meso

Condition: Hexane/ EtOH = 10/ 1; 0.8 mL/min; 254 nm; chiral IA

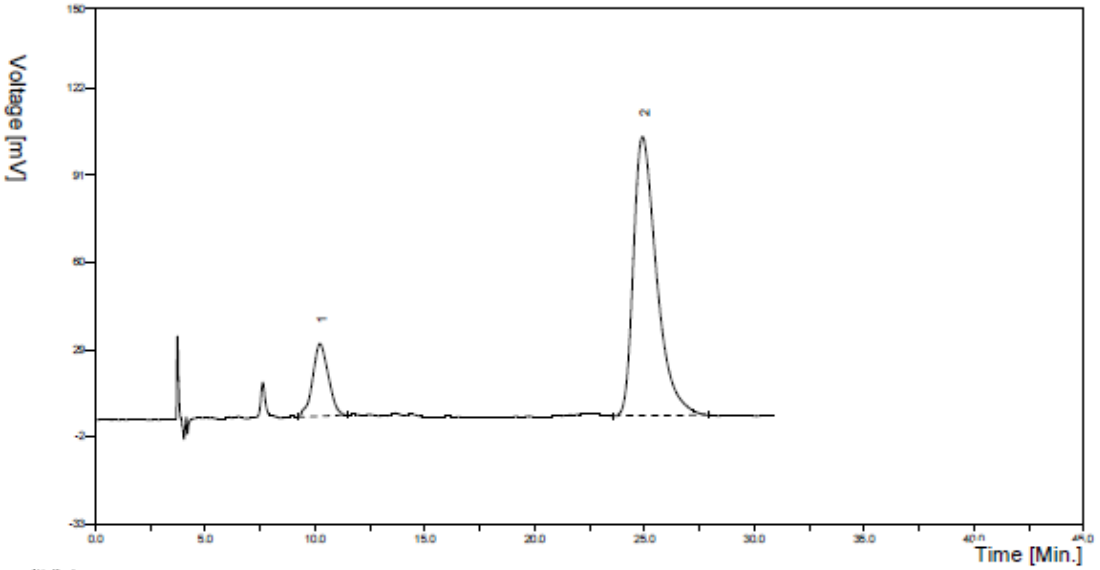


组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	10.61	234.92	5789.49	50.2433
2	Unknown	25.19	79.50	5733.43	49.7567
合计			314.43	11522.91	100

Compound 6q:

Sample Name: TM298-36



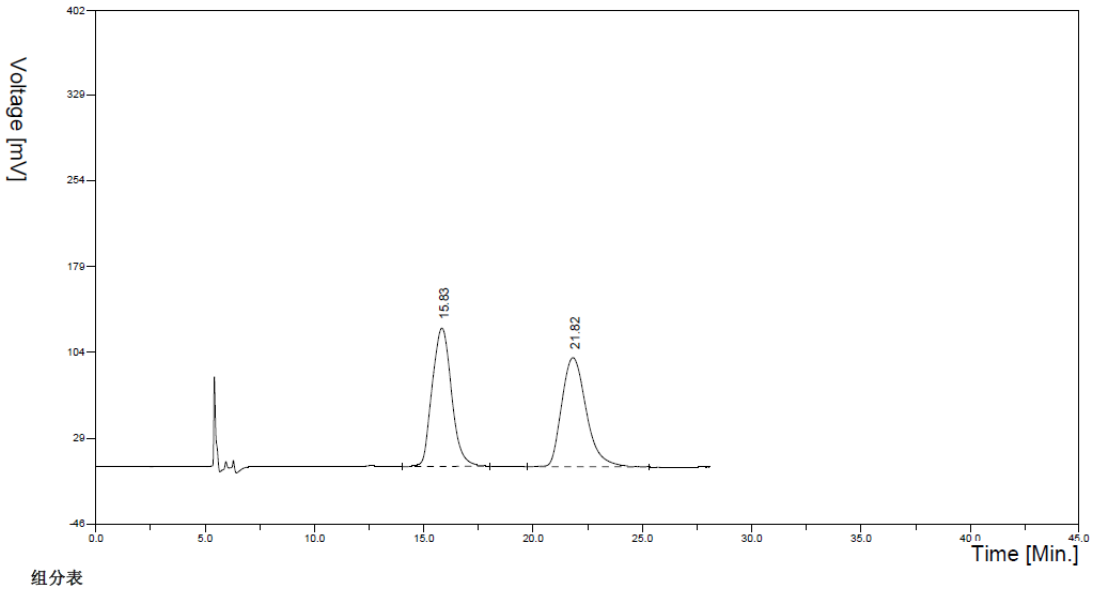
组分表

#	组分名	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	Unknown	10.22	25.71	1277.77	14.9369
2	Unknown	24.91	99.07	7276.70	85.0631
合计			124.78	8554.47	100

Compound *rac*-6r:

Sample Name: TM1000-94-7-meso-130527

Condition: Hexane/ EtOH = 40/ 1; 0.6 mL/min; 254 nm; chiral IA

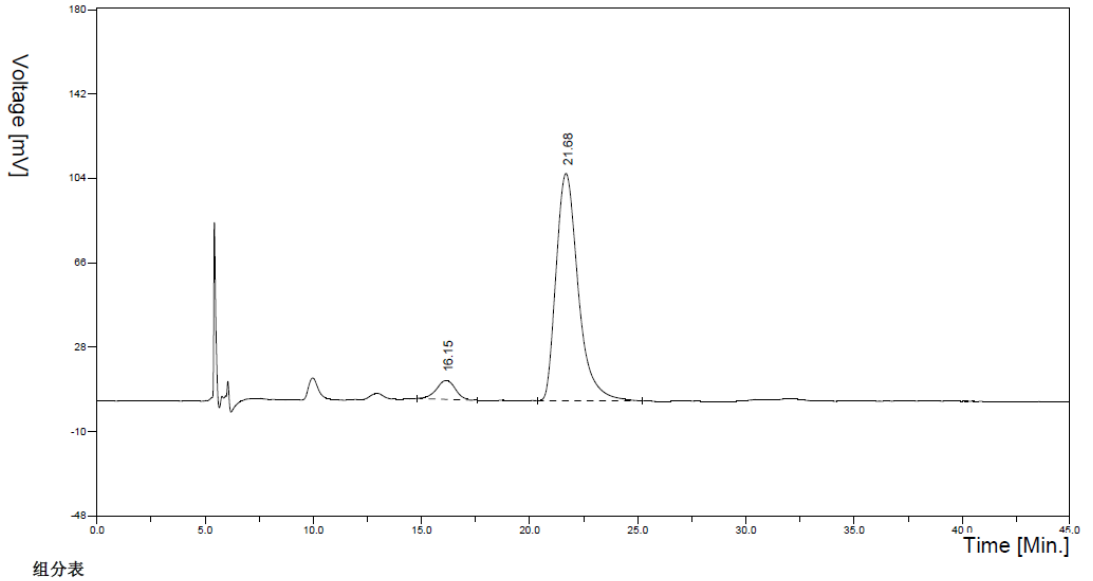


组分表

#	保留时间(min)	峰面积(mv.sec)	面积百分比(%)
1	15.83	7442.85	50.0096
2	21.82	7439.99	49.9904
合计		14882.84	100

Compound 6r:

Sample Name: TM1000-94-7-130527



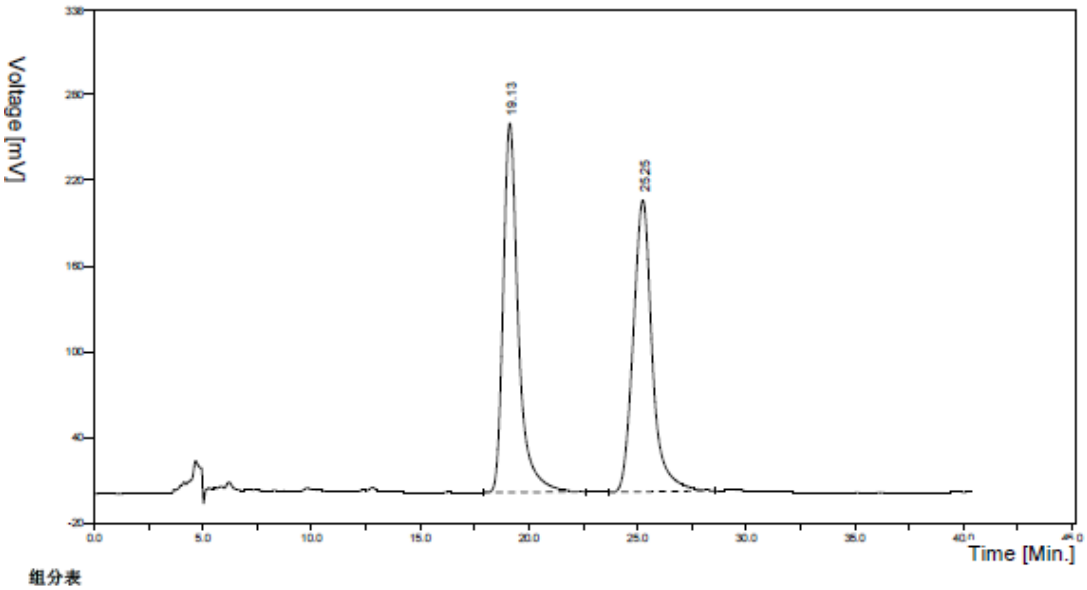
组分表

#	保留时间(min)	峰面积(mv.sec)	面积百分比(%)
1	16.15	515.45	6.6190
2	21.68	7272.01	93.3810
合计		7787.47	100

Compound *rac*-7:

Sample Name: cmq-51031A-130725 Br-IA(xiaoxuan)

Condition: Hexane/ *i*-PrOH = 5/ 1; 0.8 mL/min; 254 nm; chiral IA

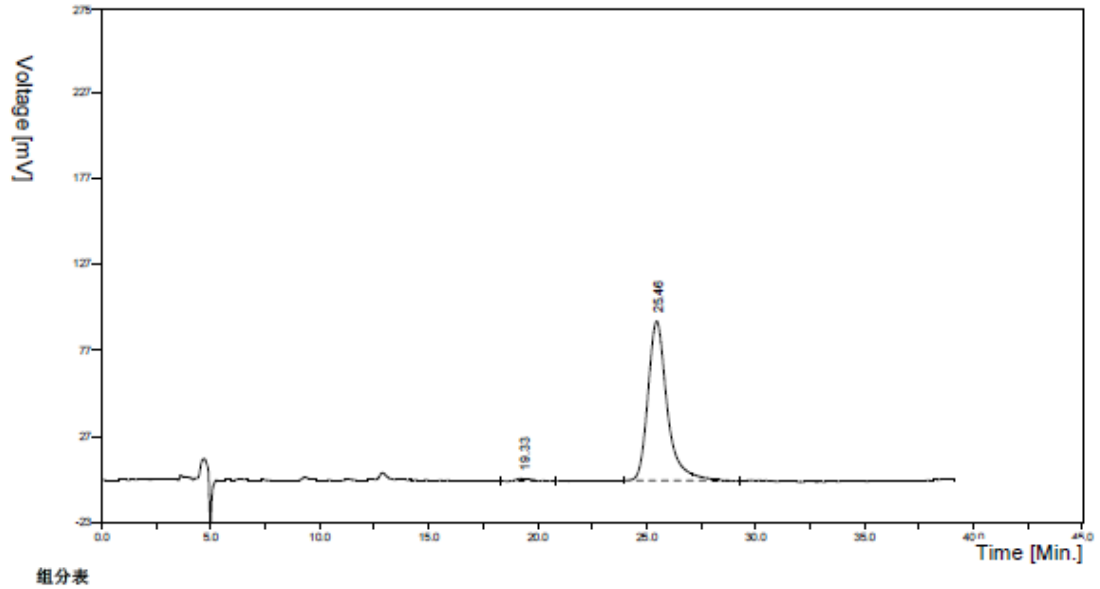


组分表

#	保留时间(min)	峰面积(mv.sec)	面积百分比(%)
1	19.13	12457.20	50.1647
2	25.25	12375.40	49.8353
合计		24832.60	100

Compound 7:

Sample Name: cmq-51272-130725 Br-IA(cat)



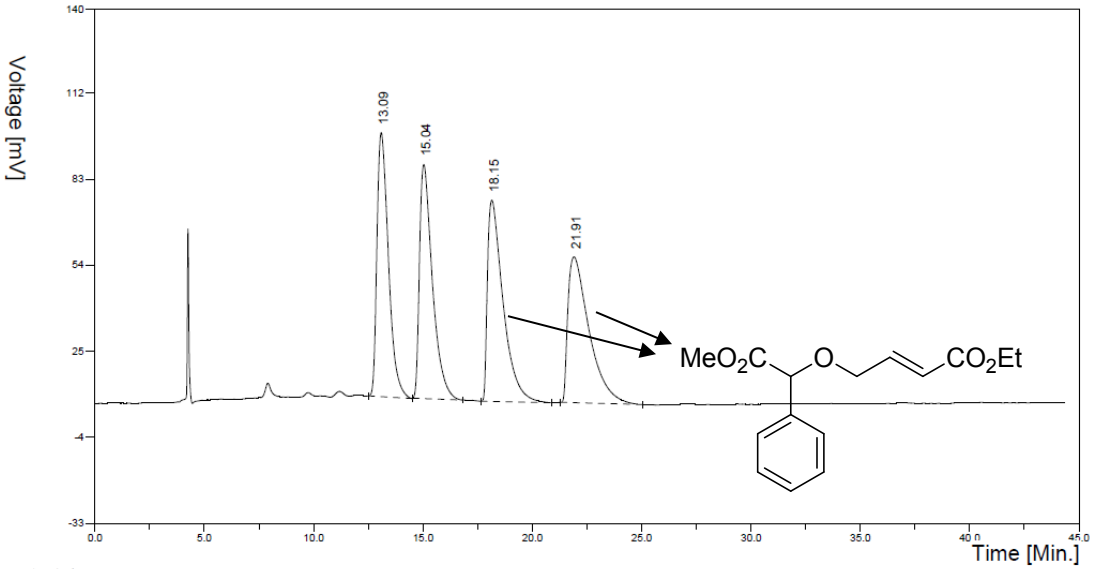
组分表

#	保留时间(min)	峰面积(mv.sec)	面积百分比(%)
1	19.33	76.61	1.3250
2	25.46	5705.23	98.6750
合计		5781.84	100

Compound *rac*-8:

Sample Name: TM1000-85-5-zhong-jiuzhi-131021

Condition: Hexane/ EtOH = 50/ 1; 0.8 mL/min; 254 nm; chiral IA

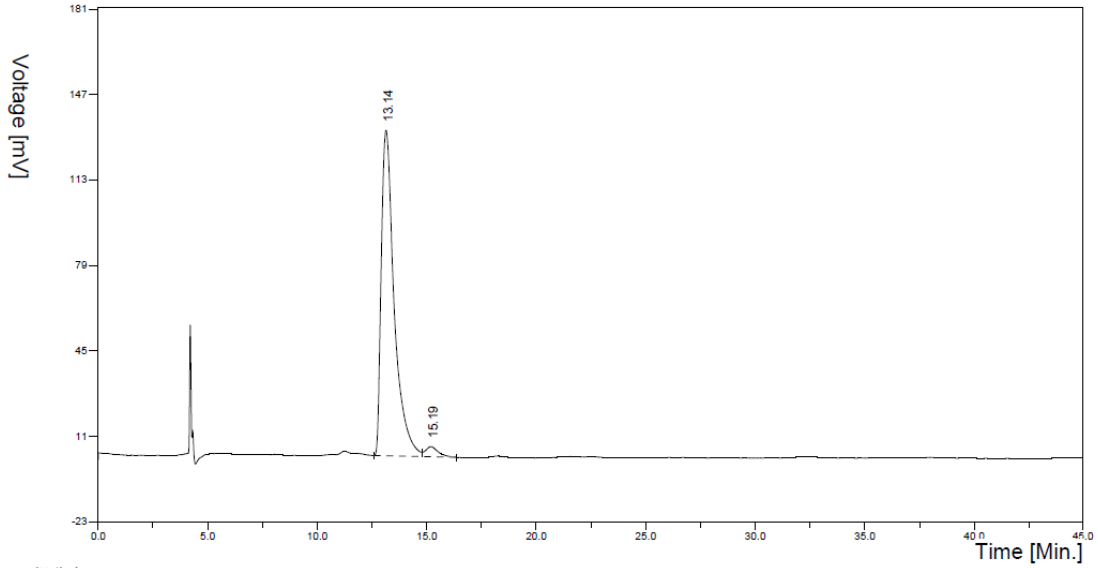


组分表

#	保留时间(min)	峰面积(mv.sec)	面积百分比(%)
1	13.09	3235.93	24.6092
2	15.04	3233.15	24.5880
3	18.15	3366.96	25.6057
4	21.91	3313.24	25.1971
合计		13149.28	100

Compound 8:

Sample Name: TM1000-93-3



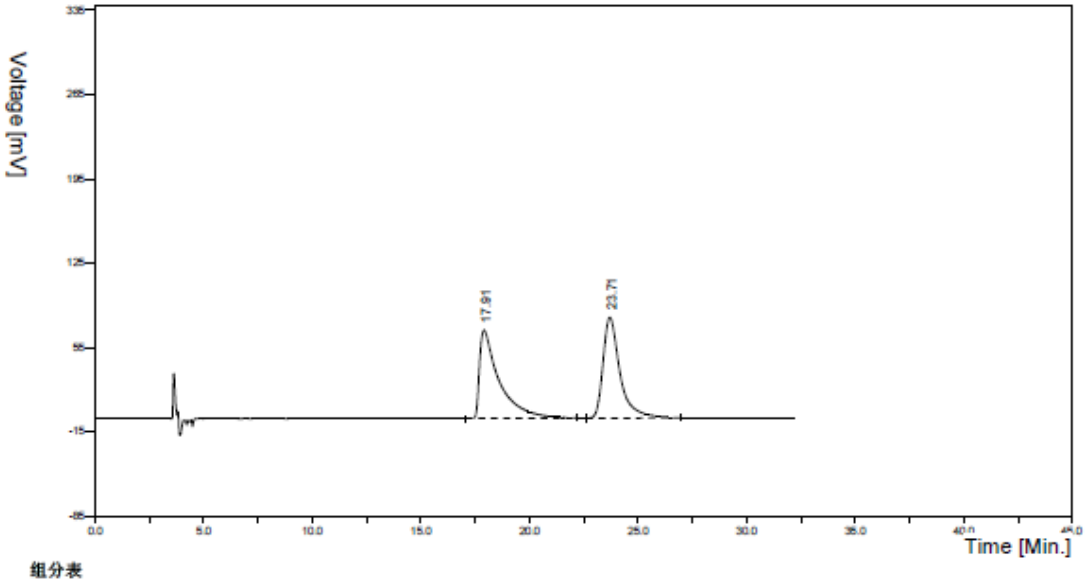
组分表

#	保留时间(min)	峰面积(mv.sec)	面积百分比(%)
1	13.14	5305.75	97.0146
2	15.19	163.27	2.9854
合计		5469.02	100

Compound *rac*-10:

Sample Name: TM1000-120-4-6B-131021

Condition: Hexane/ EtOH = 5/ 1; 0.8 mL/min; 254 nm; chiral IA

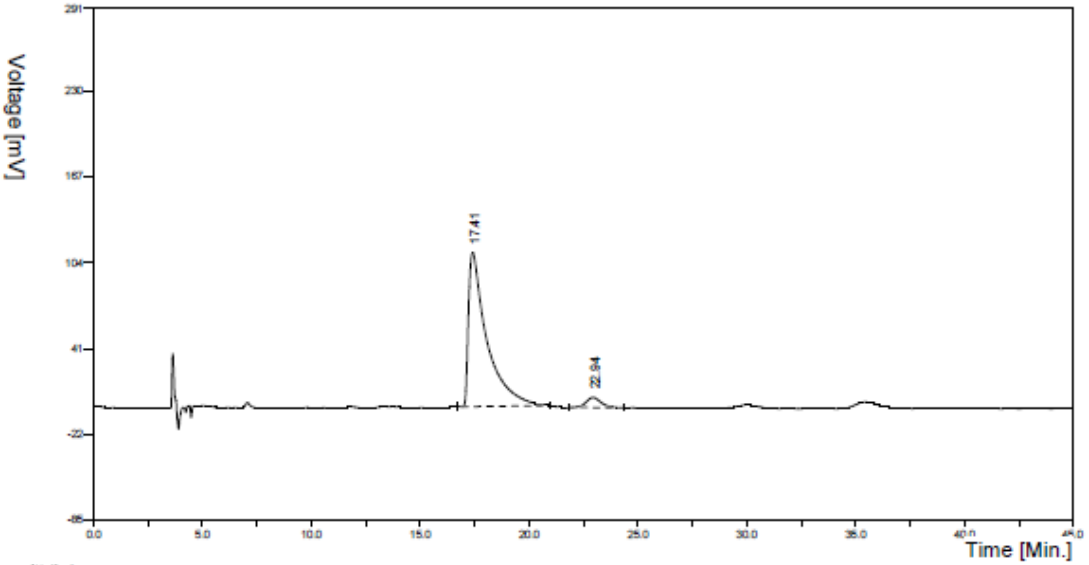


组分表

#	保留时间(min)	峰面积(mv.sec)	面积百分比(%)
1	17.91	4581.41	50.2512
2	23.71	4535.61	49.7488
合计		9117.02	100

Compound 10:

Sample Name: TM1000-120-37B-131021



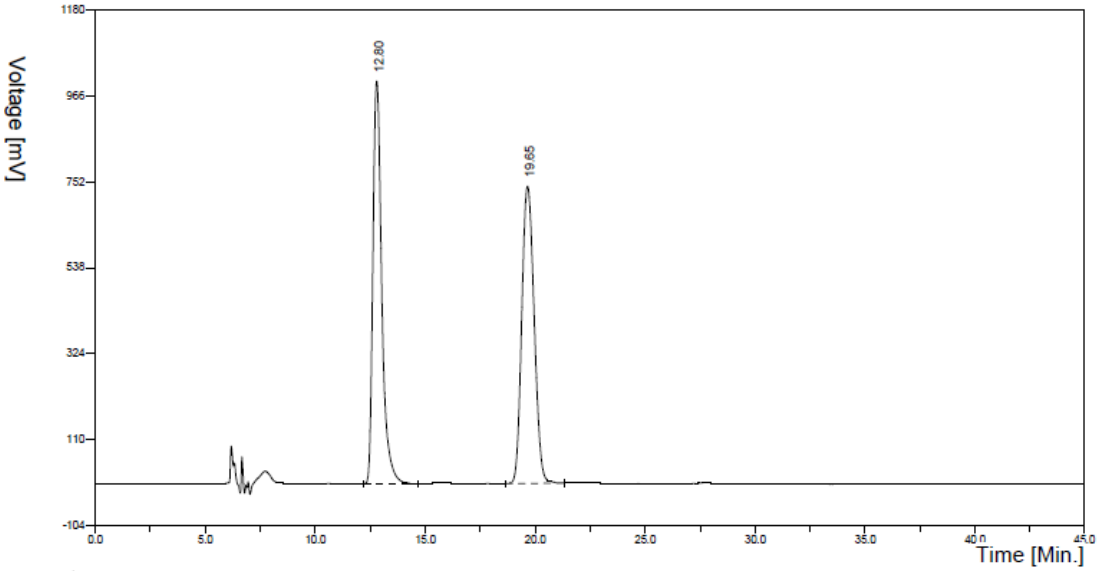
组分表

#	保留时间(min)	峰面积(mv.sec)	面积百分比(%)
1	17.41	6619.39	95.0267
2	22.94	346.43	4.9733
合计		6965.82	100

Compound *rac*-12:

Sample Name: TM1000-226-7-B

Condition: Hexane/ EtOH = 15/1; 0.5 mL/min; 220 nm; chiral IA

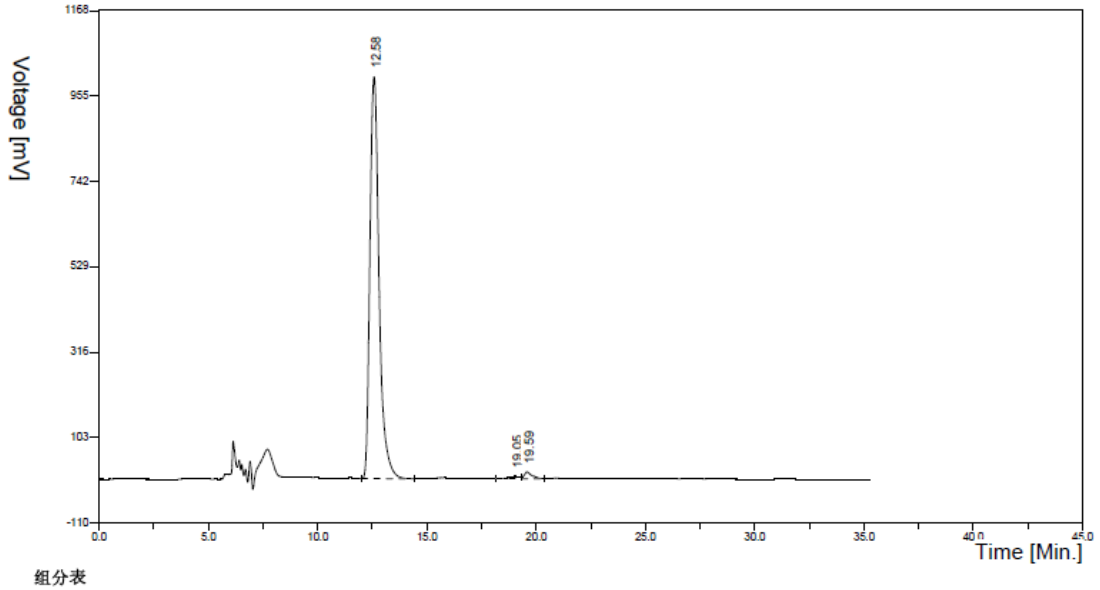


组分表

#	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	12.80	1002.97	28079.87	49.2586
2	19.65	740.69	28925.18	50.7414
合计		1743.67	57005.05	100

Compound 12:

Sample Name: TM1000-226-8



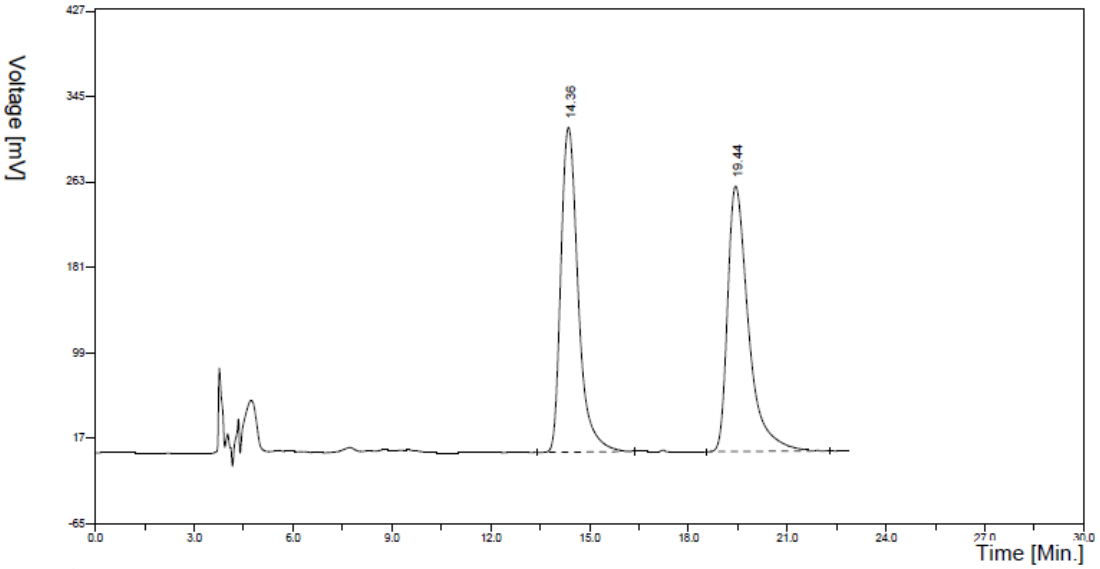
组分表

#	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	12.58	1002.68	29255.55	98.0045
2	19.05	5.77	189.68	0.6354
3	19.59	16.74	405.99	1.3600
合计		1025.18	29851.22	100

Compound *rac*-14:

Sample Name: TM3000-50-0-A-1

Condition: Hexane/ EtOH = 10/ 1; 0.8 mL/min; 220 nm; chiral IA

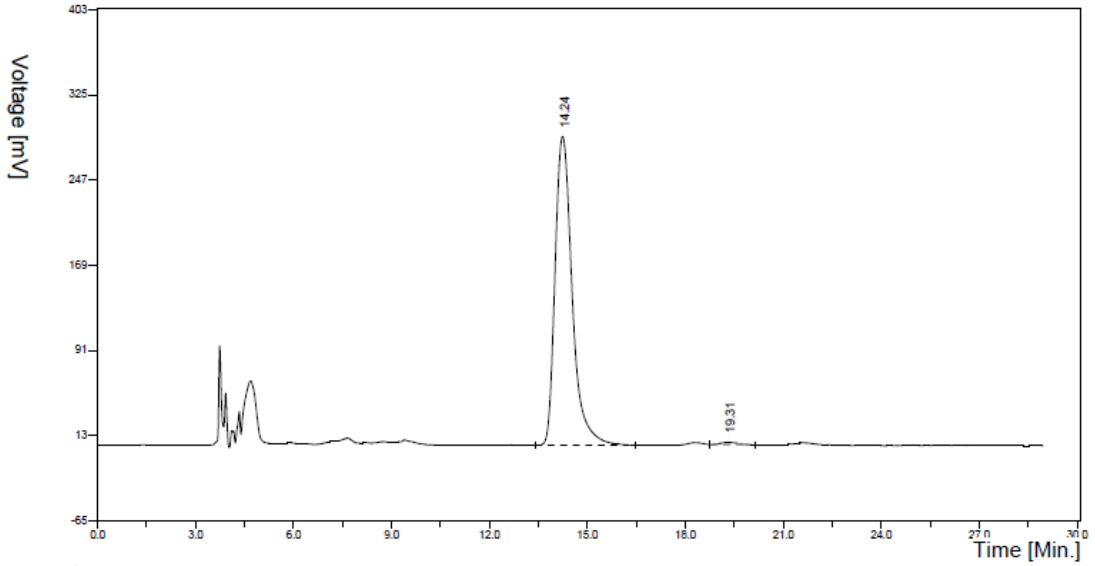


组分表

#	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	14.36	311.72	11363.20	50.3762
2	19.44	254.62	11193.51	49.6238
合计		566.33	22556.71	100

Compound 14:

Sample Name: TM3000-50-3



组分表

#	保留时间(min)	峰高(mv)	峰面积(mv.sec)	面积百分比(%)
1	14.24	282.85	10303.93	99.3735
2	19.31	2.04	64.96	0.6265
合计		284.89	10368.89	100