

Highly Enantioselective Access to Chiral Chromanes and Thiochromanes via Cu-Catalyzed Hydroamination with Anthranils

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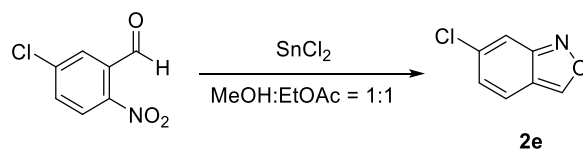
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1. General Information

NMR Spectra were recorded on a Bruker DPX-500 (400) spectrometer at 500 MHz or 400 MHz for ^1H NMR, 376 MHz for ^{19}F NMR and 100 MHz or 125 MHz for ^{13}C NMR in CDCl_3 with tetramethylsilane (TMS) or the residual deuterated solvent peaks as internal standard. Chemical shifts (δ) are reported in ppm, and coupling constants (J) are in Hertz (Hz). The following abbreviations were used to explain the multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet, br = broad. Flash column chromatograph was carried out using 200-300 mesh silica gel at medium pressure. High resolution mass spectra (HRMS) were recorded on a LC-TOF spectrometer. ESI-HRMS data were acquired using a Thermo LTQ Orbitrap XL Instrument equipped with an ESI source. Optical rotation was obtained on a Rudolph Research Analytical (Atopol I). HPLC analysis was performed on Agilent 1260 series, UV detection monitored at 254 nm, using a Chiralcel OD-H or AD-H column with hexane and *i*-PrOH as the eluent. Unless otherwise noted, all reagents were purchased from commercial suppliers and used without purification. All air- and moisture-sensitive manipulations were carried out with standard Schlenk techniques under nitrogen or in a glove box under argon. Anhydrous toluene, THF (Tetrahydrofuran) and dioxane were distilled from sodium benzophenone prior to use. Anhydrous DCE and CH_3CN were distilled from calcium hydride and stored under argon. Anhydrous DMF was distilled from calcium hydride under reduced pressure and stored under argon.

2. Procedure for Preparation Chromene and Anthranil derivatives

General procedure for the synthesis of Anthranil derivatives¹⁻⁴



To a solution of 5-chloro-2-nitrobenzaldehyde (10 mmol) in MeOH/EtOAc (20/20 mL) was added SnCl_2 (5.69 g, 30 mmol) at room temperature. The mixture was stirred for 6-24 hours at room temperature before diluting with DCM (100 mL) followed by quenching with saturated aqueous solution of NaHCO_3 . The mixture was passed through short celite bed. The organic phase was separated, washed with brine, dried with Na_2SO_4 and concentrated. The residue was

subjected to silica gel column chromatography using PE/EA (silica gel, 50:1) as eluent to give 6-chlorobenzo[c]isoxazole (**2e**) as white solid.

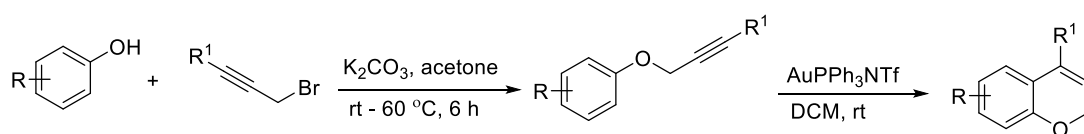
Other anthranils **2d-2j**, **2l** were synthesized following similar synthetic procedure. By the way, the method could not give pure **2a-2c,2k** due to acetal which is hard to isolate from anthranils. The pure anthranils were obtained by following method (Sn/AcOH) although in moderate yield.

General procedure for the synthesis of substrates **2a-2c,2k**^{5,6}



Tin foil (1.30 g, 11 mmol) was added in small pieces to a stirred solution of 4,5-dimethoxy-2-nitrobenzaldehyde (500 mg, 2.39 mmol) in glacial acetic acid (15 mL), and the mixture was stirred at room temperature for 20 h and then worked up with ether and water. The organic layer was dried over anhydrous Na_2SO_4 , solvent was removed under reduced pressure, and the residue was purified by column chromatography (silica gel, PE/EA (8:2)), affording anthranil **2k** (230 mg, 54 %) in the form of white needles.

A general procedure for the synthesis of *2H*-chromene **1b-c**, **1f-1g**, **1i**.⁷



A solution of phenol (5 mmol) was added K_2CO_3 (2 equiv) in acetone. The reaction mixture was stirred at room temperature. After 15 mins, 1.5 equiv of propargyl bromide or 1-bromo-2-butyne were added. The resulting mixture was stirred at $60\text{ }^\circ\text{C}$ overnight, and the reaction was stopped by filtration and evaporation under vacuum. The crude product was extracted with ethyl acetate, washed by saturated brine. It was dried over anhydrous Na_2SO_4 and then solvent was removed. The crude product was purified by silica gel chromatography.

To a solution of aryl propargyl ethers (2.5 mmol) in dry CH₂Cl₂ (10 mL) was added Ph₃PAuNTf₂ (19 mg, 1 mol %) at room temperature. After disappearance of the starting material (TLC and/or GC analysis), the reaction was concentrated under vacuum, and the residue was purified by chromatography (hexane/ethyl acetate, 50:1) through a short pad of silica gel to obtain 2*H*-chronenes.

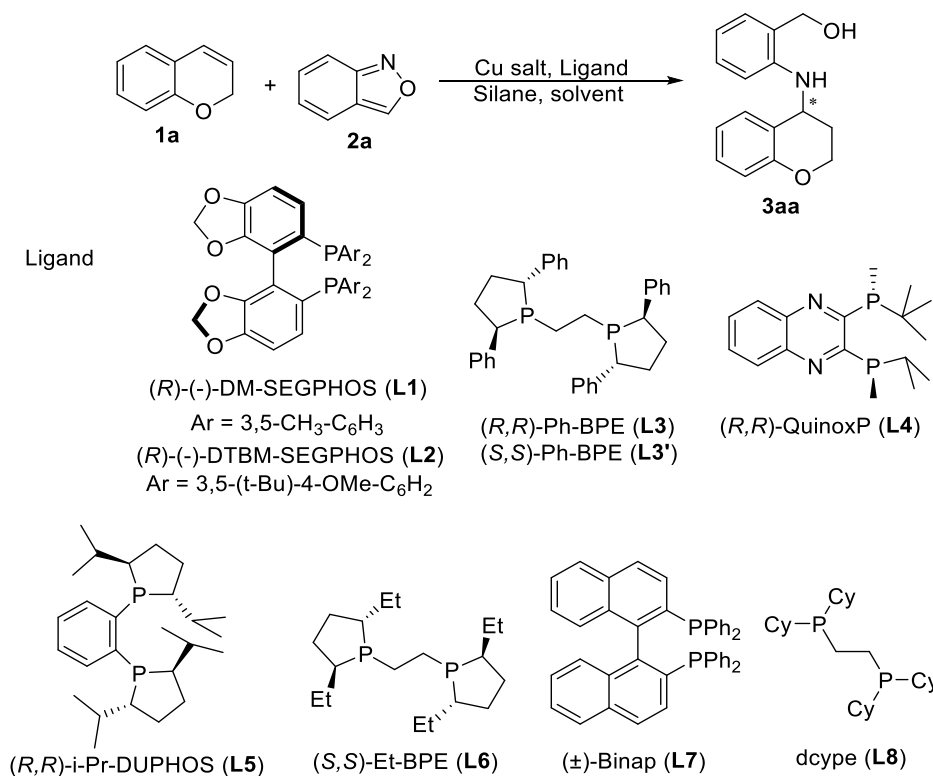
Synthesis of 1a, 1d-e, 1h, 1j-1o. They were prepared according to the reported procedure.⁸

3. General Procedural Information and Optimization of Hydroamination

Typical Reaction Conditions for Synthesis of Chiral Amine.

A flame-dried pressure tube (15 mL) equipped with a magnetic stir barr (10 mm × 5 mm, egg shaped) was evacuated and filled Ar for three times before being transferred into a glovebox. CuOAc (0.01 mmol, 5 mol %), (*S,S*)-(Ph-BPE) (0.011 mmol, 5.5 mol %) and dry toluene (1 mL) was added to the tube stirring for 10 min. PhSiH₃ (50 μL, 0.4 mmol, 2 equiv) was then added. This mixture was stirred for 30 min as a homogenous solution formed. At this time, chromene substrate (0.2 mmol, 1 equiv), fresh anthranil substrate (0.3 mmol, 1.5 equiv) and *t*-BuOH (0.4 mmol, 2 equiv) were added in succession. The reaction tube was capped and taken out of the glovebox. The reaction was stirred at room temperature for 3-12 h. After completion by TLC, a saturated solution of NH₄F in MeOH (ca. 3 mL) was carefully added to quench the reaction (Caution: gas evolution was observed). The reaction mixture was allowed to stir at room temperature for 15 min before diluted with DCM (ca. 10 mL) and water (5mL). The organic phase was separated and the aqueous layer was extracted with DCM (10mL*2). The combined organic phase was concentrated in *vacuo* and the residue was purified by silica gel chromatography using PE/EA (silica gel, 10:1 to 5:1) with 1% Et₃N to afford the product.

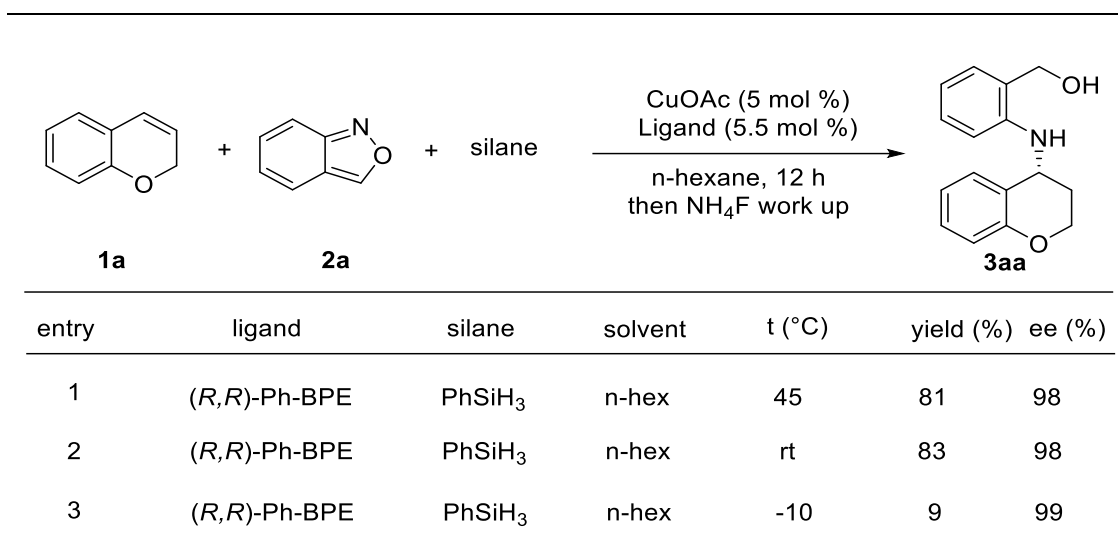
Optimization of Asymmetric Hydroamination Conditions



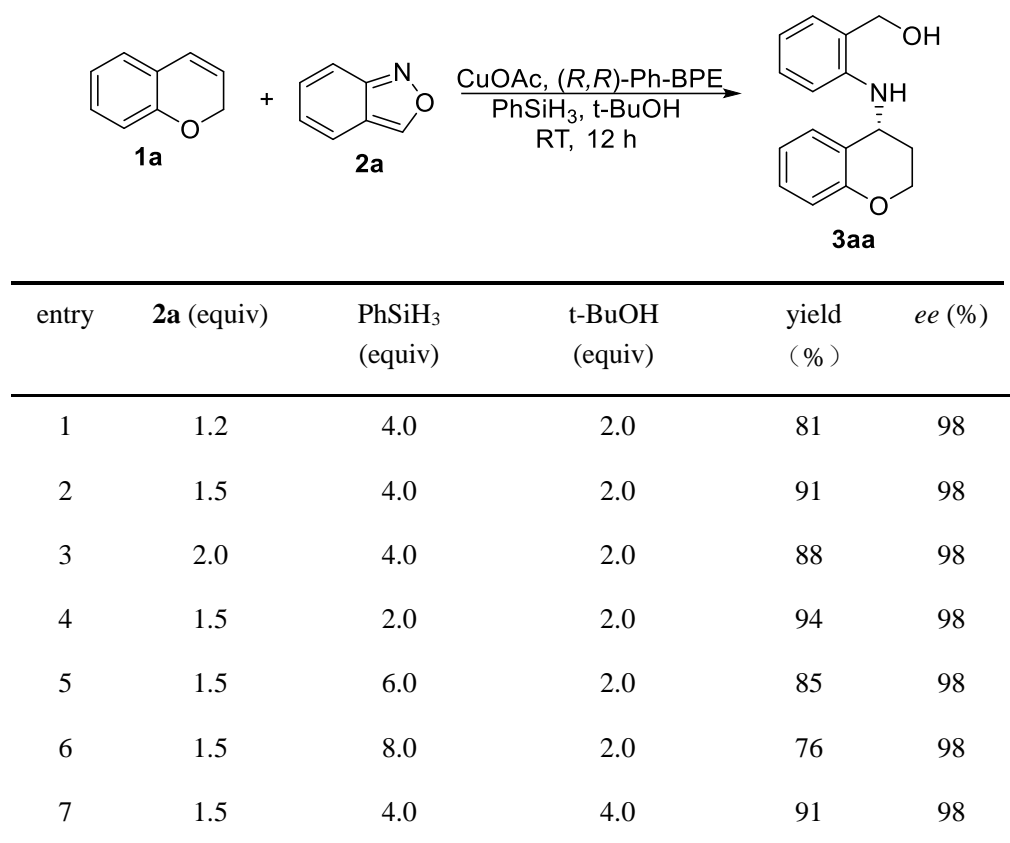
entry	Cu salt	Ligand	solvent	Silane	additive	yield (%)	ee (%)
1	CuOAc	L3	n-hexane	PhSiH ₃	-	81	98
2	CuOAc	L3'	n-hexane	PhSiH ₃	-	78	-98
3	CuOAc	L1	n-hexane	PhSiH ₃	-	NR	-
4	CuOAc	L2	n-hexane	PhSiH ₃	-	17	90
5	CuOAc	L13	n-hexane	PhSiH ₃	-	84	-93
6	CuOAc	L14	n-hexane	PhSiH ₃	-	70	88
7	CuOAc	L15	n-hexane	PhSiH ₃	-	58	82
8	CuOAc	L4	n-hexane	PhSiH ₃	-	trace	-
9	CuOAc	L12	n-hexane	PhSiH ₃	-	33	-
10	Cu(OAc) ₂	L3	n-hexane	PhSiH ₃	-	29	97
11	CuTc	L3	n-hexane	PhSiH ₃	-	30	96
12	CuCl	L3	n-hexane	PhSiH ₃	-	NR	-
13	CuBr	L3	n-hexane	PhSiH ₃	-	NR	-
14	CuOTf	L3	n-hexane	PhSiH ₃	-	NR	-
15	Cu(TFA) ₂	L3	n-hexane	PhSiH ₃	-	NR	-

16	Cu(ClO ₄) ₂	L3	n-hexane	PhSiH ₃	-	NR	-
17	CuOAc	L3	n-hexane	Ph ₂ MeSiH	-	NR	-
18	CuOAc	L3	n-hexane	Ph ₂ SiH ₂	-	15	98
19	CuOAc	L3	n-hexane	(MeO) ₃ SiH	-	52	98
20	CuOAc	L3	n-hexane	(EtO) ₃ SiH	-	73	98
21	CuOAc	L3	n-hexane	DEMS	-	75	98
22	CuOAc	L3	n-hexane	PMHS	-	32	98
23	CuOAc	L3	n-hexane	DMMS	-	50	98
24	CuOAc	L3	n-hexane	(Me ₂ SiH) ₂ O	-	22	98
25	CuOAc	L3	n-hexane	(Me ₃ SiO) ₃ SiH	-	41	98
26	CuOAc	L3	n-hexane	(Me ₂ SiHO) ₄ Si	-	34	98
27	CuOAc	L3	n-hexane	PhSiH ₃	-	83	98
28	CuOAc	L3	n-hexane	PhSiH ₃	-	9 e	99
29	CuOAc	L3	Cyclo hexane	PhSiH ₃	-	78	97
30	CuOAc	L3	Toluene	PhSiH ₃	-	91	98
31	CuOAc	L3	P-xylene	PhSiH ₃	-	88	98
32	CuOAc	L3	THF	PhSiH ₃	-	71	98
33	CuOAc	L3	dioxane	PhSiH ₃	-	69	98
34	CuOAc	L3	EA	PhSiH ₃	-	82	98
35	CuOAc	L3	DCE	PhSiH ₃	-	48	91
36	CuOAc	L3	DMF	PhSiH ₃	-	57	98
37	CuOAc	L3	n-hexane	PhSiH ₃	PPh ₃	69	98
38	CuOAc	L3	n-hexane	PhSiH ₃	t-BuONa	77	98
39	CuOAc	L3	n-hexane	PhSiH ₃	Cs ₂ CO ₃	65	98

The effect of temperature

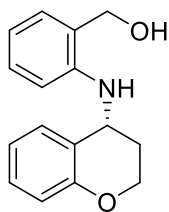


The effect of the ratio between the reagents



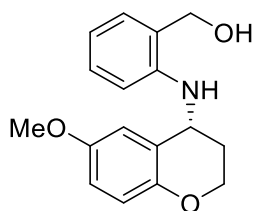
4. Analytic Data for the Products

(*R*)-(2-(chroman-4-ylamino)phenyl)methanol (3aa)



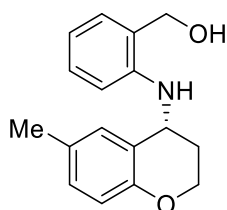
Yellow oil (47.9 mg, 94% yield, 98% *ee*). $^1\text{H NMR}$ (500 MHz, CDCl_3): δ 7.33 – 7.22 (m, 2H), 7.22 – 7.15 (m, 1H), 7.08 (m, 1H), 6.86 (m, 3H), 6.70 (t, $J = 7.3$ Hz, 1H), 5.03 (br s, 1H), 4.66 (t, $J = 4.2$ Hz, 1H), 4.63 – 4.53 (m, 2H), 4.22 (t, $J = 5.2$ Hz, 2H), 2.19 – 2.08 (m, 2H), 1.63 (br s, 1H). $^{13}\text{C NMR}$: (125 MHz, CDCl_3) δ 155.1, 145.9, 130.2, 129.7, 129.6, 129.1, 124.5, 123.2, 120.7, 117.0, 116.8, 110.6, 64.6, 62.8, 46.4, 27.8. $[\alpha]_D^{27} = 580.3$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 75 / 25, 1.0 mL/min, $\lambda = 254$ nm, t_r (major) = 15.3 min, t_r (minor) = 21.6 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{16}\text{H}_{18}\text{NO}_2$, 256.1338; found 256.1331.

(R)-2-((6-methoxychroman-4-yl)amino)phenylmethanol (3ba)



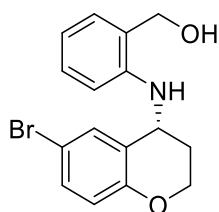
Yellow oil (48.5 mg, 85% yield, 98% *ee*). $^1\text{H NMR}$ (500 MHz, CDCl_3): δ 7.27 – 7.22 (m, 1H), 7.18 – 7.03 (m, 1H), 6.84 – 6.79 (m, 2H), 6.79 – 6.73 (m, 2H), 6.71 – 6.66 (m, 1H), 4.64 – 4.58 (m, 1H), 4.61 – 4.51 (m, 2H), 4.19 – 4.12 (m, 2H), 3.68 (s, 3H), 2.14 – 2.04 (m, 2H). $^{13}\text{C NMR}$: (125 MHz, CDCl_3) δ 153.6, 149.1, 145.9, 129.7, 129.6, 124.5, 123.5, 117.8, 116.8, 116.0, 113.8, 110.6, 64.7, 62.8, 55.8, 46.7, 28.0. $[\alpha]_D^{28} = 274.5$ (c 2.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 75 / 25, 1.0 mL/min, $\lambda = 254$ nm, t_r (minor) = 10.1 min, t_r (major) = 13.5 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{17}\text{H}_{20}\text{NO}_3$, 286.1443; found 286.1436.

(R)-2-((6-methylchroman-4-yl)amino)phenylmethanol (3ca)



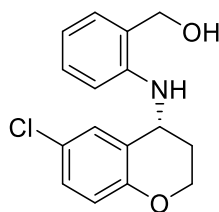
Yellow oil (49.0 mg, 91% yield, 98% *ee*). ¹H NMR (500 MHz, CHCl₃): δ 7.28 – 7.23 (m, 1H), 7.12 – 7.06 (m, 2H), 7.00 – 6.96 (m, 1H), 6.84 – 6.80 (m, 1H), 6.77 – 6.73 (m, 1H), 6.72 – 6.67 (m, 1H), 5.02 (br s, 1H), 4.64 – 4.53 (m, 3H), 4.22 – 4.14 (m, 2H), 2.24 (s, 3H), 2.15 – 2.08 (m, 2H). ¹³C NMR: (125 MHz, CDCl₃) δ 152.9, 145.8, 130.4, 129.9, 129.9, 129.7, 129.6, 124.5, 122.8, 116.8, 116.8, 110.6, 64.6, 62.7, 46.4, 27.9, 20.6. [α]²⁶_D = 602.8 (c 1.0, CHCl₃). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 85 / 15, 1.0 mL/min, λ = 254 nm, t_r (minor) = 10.6 min, t_r (major) = 13.1 min. HRMS (ESI) m/z: [M+H]⁺ calcd for C₁₇H₂₀NO₂, 270.1494; found 270.1489.

(R)-2-((6-bromochroman-4-yl)amino)phenylmethanol (3da)



Yellow oil (64.6 mg, 97% yield, 96% *ee*). ¹H NMR (500 MHz, CHCl₃): δ 7.44 – 7.39 (m, 1H), 7.27 – 7.22 (m, 2H), 7.10 – 7.05 (m, 1H), 6.82 – 6.77 (m, 1H), 6.76 – 6.67 (m, 2H), 5.05 (br s, 1H), 4.65 – 4.52 (m, 3H), 4.25 – 4.15 (m, 2H), 2.15 – 2.05 (m, 2H). ¹³C NMR (125 MHz, CDCl₃): δ 154.2, 145.7, 132.6, 132.0, 129.7, 129.6, 125.3, 124.6, 119.0, 117.1, 112.6, 110.6, 64.7, 63.0, 46.3, 27.6. [α]²⁷_D = 596.7 (c 1.0, CHCl₃). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 90 / 10, 1.0 mL/min, λ = 254 nm, t_r (minor) = 18.4 min, t_r (major) = 21.5 min. HRMS (ESI) m/z: [M+H]⁺ calcd for C₁₆H₁₇BrNO₂, 334.0443; found 334.0436.

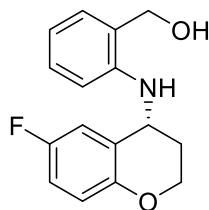
(R)-2-((6-chlorochroman-4-yl)amino)phenylmethanol (3ea)



Yellow oil (52.0 mg, 90% yield, 97% *ee*). ¹H NMR: (500 MHz, CHCl₃) δ 7.31 – 7.22 (m, 2H), 7.14 – 7.10 (m, 1H), 7.10 – 7.05 (m, 1H), 6.83 – 6.75 (m, 2H), 6.74 – 6.67 (m, 1H), 5.06 (br s, 1H), 4.67 – 4.53 (m, 3H), 4.26 – 4.16 (m, 2H), 2.17 – 2.06 (m, 2H). ¹³C NMR (125 MHz, CDCl₃): δ 153.7, 145.7, 129.7,

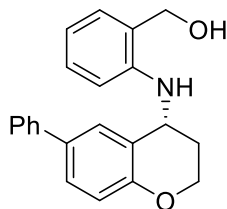
129.6, 129.6, 129.2, 125.4, 124.8, 124.6, 118.5, 117.1, 110.6, 64.7, 63.1, 46.3, 27.6. $[\alpha]_D^{28} = 269.3$ (c 2.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 85 / 15, 1.0 mL/min, $\lambda = 254$ nm, t_r (minor) = 11.9 min, t_r (major) = 13.8 min. HRMS (ESI) m/z: $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{16}\text{H}_{17}\text{ClNO}_2$, 290.0948; found 290.0938.

(R)-(2-((6-fluorochroman-4-yl)amino)phenyl)methanol (3fa)



Yellow oil (44.2 mg, 81% yield, 97% *ee*). ^1H NMR (500 MHz, CDCl_3): δ 7.30 - 7.22(m, 1H), 7.12 - 7.07 (m, 1H), 7.05 - 6.99 (m, 1H), 6.92 - 6.85 (m, 1H), 6.84 - 6.76 (m, 2H), 6.75 - 6.68 (m, 1H), 5.12 (br s, 1H), 4.67 - 4.57 (m, 3H), 4.25 - 4.18 (m, 2H), 2.17 - 2.08 (m, 2H). ^{13}C NMR (125 MHz, CDCl_3): δ 156.9 (d, $J_{\text{C-F}} = 238.5$ Hz), 151.1 (d, $J_{\text{C-F}} = 1.9$ Hz), 145.8, 129.7, 129.6, 124.6, 124.3 (d, $J_{\text{C-F}} = 6.9$ Hz), 118.0 (d, $J_{\text{C-F}} = 8.0$ Hz), 117.1, 116.1 (d, $J_{\text{C-F}} = 23.3$ Hz), 115.5 (d, $J_{\text{C-F}} = 23.0$ Hz), 110.6, 64.8, 63.1, 46.6, 27.9. ^{19}F NMR: (376 MHz, CDCl_3) δ -123.40. $[\alpha]_D = 578.2$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel IC (0.46 cm x 25 cm), Hexanes / IPA = 90 / 10, 1.0 mL/min, $\lambda = 254$ nm, t_r (major) = 5.6 min, t_r (minor) = 6.7 min. HRMS (ESI) m/z: $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{16}\text{H}_{17}\text{FNO}_2$, 274.1243; found 274.1233.

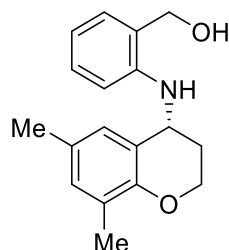
(R)-(2-((6-phenylchroman-4-yl)amino)phenyl)methanol (3ga)



Colorless oil (60.9 mg, 92% yield, 97% *ee*). ^1H NMR (500 MHz, CHCl_3): δ 7.53 - 7.51 (m, 1H), 7.49 - 7.45 (m, 2H), 7.41 - 7.38 (m, 1H), 7.34 - 7.31 (m, 2H), 7.25 - 7.21 (m, 2H), 7.02 - 6.99 (m, 1H), 6.93 - 6.87 (m, 1H), 6.84 - 6.78 (m, 1H), 6.70 - 6.63 (m, 1H), 5.07 (d, $J = 6.5$ Hz, 1H), 4.69 - 4.63 (m, 1H), 4.54 - 4.45 (m, 2H), 4.23 - 4.17 (m, 2H), 2.15 - 2.08 (m, 2H). ^{13}C NMR (125 MHz, CDCl_3): δ 154.8,

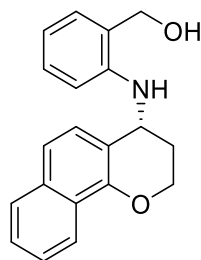
145.9, 140.7, 133.9, 129.8, 129.7, 128.8, 128.8, 127.9, 126.8, 126.7, 124.6, 123.6, 117.6, 117.0, 110.7, 64.6, 63.0, 46.6, 27.9. $[\alpha]_{\text{D}}^{28} = 217.7$ (c 2.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel IC (0.46 cm x 25 cm), Hexanes / IPA = 90 / 10, 1.0 mL/min, $\lambda = 254$ nm, t_{r} (major) = 6.7 min, t_{r} (minor) = 7.3 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{22}\text{H}_{22}\text{NO}_2$, 332.1651; found 332.1638.

(R)-2-(((6,8-dimethylchroman-4-yl)amino)phenyl)methanol (3ha)



Yellow oil (50.4 mg, 89% yield, 95% *ee*). ^1H NMR: (500 MHz, CDCl_3) δ 7.30 – 7.24 (m, 1H), 7.11 – 7.06 (m, 1H), 6.87 – 6.82 (m, 1H), 6.72 – 6.66 (m, 1H), 6.62 – 6.53 (m, 2H), 4.89 (br s, 1H), 4.61 – 4.51 (m, 3H), 4.25 – 4.12 (m, 2H), 2.26 (s, 3H), 2.22 – 2.14 (m, 4H), 2.01 – 1.92 (m, 1H). ^{13}C NMR: (125 MHz, CDCl_3) δ 155.0, 145.5, 138.9, 138.8, 129.7, 129.6, 124.2, 123.6, 117.9, 116.5, 115.1, 110.0, 64.6, 61.5, 43.5, 27.3, 21.1, 18.1. $[\alpha]_{\text{D}}^{27} = 601.6$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 90 / 10, 1.0 mL/min, $\lambda = 254$ nm, t_{r} (minor) = 11.9 min, t_{r} (major) = 13.6 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{18}\text{H}_{22}\text{NO}_2$, 284.1651; found 284.1643.

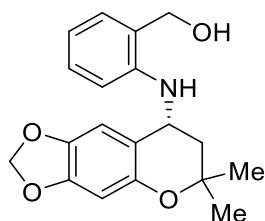
(R)-2-(((3,4-dihydro-2H-benzo[*h*]chromen-4-yl)amino)phenyl)methanol (3ia)



Yellow oil (52.5 mg, 86% yield, 96% *ee*). ^1H NMR (500 MHz, CHCl_3): δ 8.25 – 8.18 (m, 1H), 7.74 – 7.71 (m, 1H), 7.49 – 7.44 (m, 2H), 7.35 – 7.29 (m, 2H), 7.28 – 7.24 (m, 1H), 7.07 – 7.02 (m, 1H), 6.88 – 6.82 (m, 1H), 6.72 – 6.66 (m, 1H), 5.11 ((br s, 1H)), 4.69 (s, 1H), 4.56 – 4.48 (m, 2H), 4.46 – 4.41 (m, 1H), 4.35 – 4.29 (m, 1H), 2.25 – 2.14 (m, 2H). ^{13}C NMR (125 MHz, CDCl_3): δ 150.6, 145.8, 134.1,

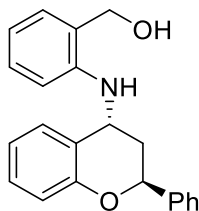
129.7, 129.6, 127.6, 127.5, 126.6, 125.5, 125.2, 124.5, 122.0, 120.2, 116.8, 116.4, 110.6, 64.6, 63.0, 46.3, 27.8. $[\alpha]_D^{27} = 680.6$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel IA (0.46 cm x 25 cm), Hexanes / IPA = 90 / 10, 1.0 mL/min, $\lambda = 254$ nm, t_r (major) = 9.1 min, t_r (minor) = 10.1 min. HRMS (ESI) m/z: $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{20}\text{H}_{20}\text{NO}_2$, 306.1494; found 306.1491.

(R)-(2-(((6,6-dimethyl-7,8-dihydro-6H-[1,3]dioxolo[4,5-g]chromen-8-yl)amino)phenyl)methanol (3ja)



White solid (43.8 mg, 67% yield, 87% *ee*). M.p. 99-102°C. ^1H NMR: (500 MHz, CDCl_3) δ 7.26 – 7.21 (m, 1H), 7.11 – 7.07 (m, 1H), 6.89 (s, 1H), 6.81 – 6.76 (m, 1H), 6.70 – 6.65 (m, 1H), 6.36 (s, 1H), 5.89 – 5.83 (m, 2H), 4.94 (br s, 1H), 4.71 – 4.59 (m, 3H), 2.23 (dd, $J = 13.5, 5.9$ Hz, 1H), 1.79 (dd, $J = 13.5, 9.5$ Hz, 1H), 1.40 (s, 3H), 1.35 (s, 3H). ^{13}C NMR: (125 MHz, CDCl_3) δ 148.7, 147.7, 146.8, 141.6, 129.8, 129.6, 124.4, 116.5, 115.0, 110.5, 106.5, 100.9, 98.9, 75.2, 64.9, 46.1, 39.9, 29.0, 25.5. $[\alpha]_D^{27} = 581.2$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 75 / 25, 1.0 mL/min, $\lambda = 254$ nm, t_r (minor) = 6.2 min, t_r (major) = 7.3 min. HRMS (ESI) m/z: $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{19}\text{H}_{22}\text{NO}_4$, 328.1549; found 328.1541.

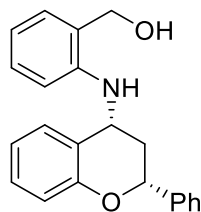
(2-(((2S,4R)-2-phenylchroman-4-yl)amino)phenyl)methanol (3ka)



Yellow oil (32.5 mg, 49% yield, 95% *ee*). ^1H NMR: (500 MHz, CHCl_3) δ 7.46 – 7.30 (m, 6H), 7.29 – 7.22 (m, 2H), 7.15 – 7.11 (m, 1H), 7.02 – 6.94 (m, 2H), 6.87 – 6.81 (m, 1H), 6.76 – 6.70 (m, 1H), 5.33 – 5.05 (m, 2H), 4.74 – 4.60 (m, 3H), 2.47 – 2.41 (m, 1H), 2.22 – 2.14 (m, 1H). ^{13}C NMR: (125 MHz, CDCl_3) δ 155.3, 145.7, 140.9, 130.5, 129.7, 129.6, 129.4, 128.6, 128.0, 126.4, 124.6, 122.4, 121.0, 117.4,

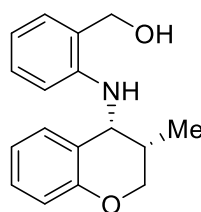
117.0, 110.6, 73.9, 64.7, 47.0, 35.3. $[\alpha]_D^{26} = 602.8$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel IC (0.46 cm x 25 cm), Hexanes / IPA = 90 / 10, 1.0 mL/min, $\lambda = 254$ nm, t_r (major) = 4.9 min, t_r (minor) = 6.1 min.. HRMS (ESI) m/z: $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{22}\text{H}_{22}\text{NO}_2$, 332.1651; found 332.1641.

(2-(((2R,4R)-2-phenylchroman-4-yl)amino)phenyl)methanol (3ka')



Yellow oil (17.9 mg, 27% yield, 99% *ee*). ^1H NMR: (500 MHz, CHCl_3) δ 7.54 – 7.50 (m, 1H), 7.48 – 7.43 (m, 2H), 7.41 – 7.32 (m, 3H), 7.25 – 7.18 (m, 2H), 7.12 – 7.08 (m, 1H), 6.97 – 6.91 (m, 2H), 6.87 – 6.83 (m, 1H), 6.72 – 6.66 (m, 1H), 5.31 – 5.25 (m, 1H), 5.12 – 4.93 (m, 2H), 4.71 – 4.57 (m, 2H), 2.71 – 2.62 (m, 1H), 2.14 – 2.05 (m, 1H). ^{13}C NMR: (125 MHz, CDCl_3) δ 155.1, 146.9, 140.8, 129.8, 129.5, 128.8, 128.6, 128.2, 127.3, 126.1, 124.7, 124.4, 121.0, 117.0, 116.7, 110.8, 77.6, 64.8, 48.8, 37.3. $[\alpha]_D^{27} = 501.1$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel IC (0.46 cm x 25 cm), Hexanes / IPA = 95 / 5, 1.0 mL/min, $\lambda = 254$ nm, t_r (major) = 8,6 min, t_r (minor) = 10.0 min.. HRMS (ESI) m/z: $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{22}\text{H}_{22}\text{NO}_2$, 332.1651; found 332.1641.

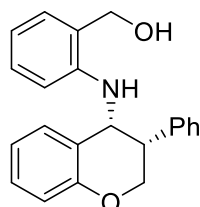
(2-(((3S,4R)-3-methylchroman-4-yl)amino)phenyl)methanol (3la)



Yellow oil (10.2 mg, 19% yield, 99% *ee*, > 20:1 dr). ^1H NMR (500 MHz, CDCl_3): δ 7.29 – 7.22 (m, 2H), 7.21 – 7.15 (m, 1H), 7.11 – 7.06 (m, 1H), 6.91 – 6.83 (m, 2H), 6.77 – 6.72 (m, 1H), 6.72 – 6.66 (m, 1H),, 5.10 (br s, 1H), 4.63 – 4.57 (m, 2H), 4.27 – 4.20 (m, 2H), 3.99 – 3.93 (m, 1H), 2.27 – 2.19 (m, 1H), 1.09 (d, J = 7.2 Hz, 3H). ^{13}C NMR: (125 MHz, CDCl_3) δ 155.0, 151.6, 139.8, 130.1, 129.0, 126.5, 123.5, 120.6, 117.0, 116.0, 114.2, 112.4, 64.4, 62.7, 55.9, 47.1, 27.8. $[\alpha]_D^{27} = 661.7$ (c 1.0, CHCl_3). The

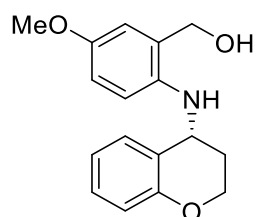
enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 80 / 20, 1.0 mL/min, $\lambda = 254$ nm, t_r (major) = 14.8 min, t_r (minor) = 35.7 min. HRMS (ESI) m/z : $[M+H]^+$ calcd for $C_{17}H_{20}NO_2$, 270.1494; found 270.1488.

(2-(((3*S*,4*R*)-3-phenylchroman-4-yl)amino)phenyl)methanol (3ma)



Yellow oil (32.1 mg, 48% yield, 98% *ee*, > 20:1 *dr*). 1H NMR (500 MHz, $CDCl_3$): δ 7.35 – 7.31 (m, 1H), 7.29 – 7.15 (m, 7H), 7.05 – 7.01 (m, 1H), 6.94 – 6.88 (m, 2H), 6.72 – 6.69 (m, 1H), 6.69 – 6.64 (m, 1H), 5.20 (br s, 1H), 4.78 – 4.71 (m, 1H), 4.55 – 4.46 (m, 2H), 4.45 – 4.40 (m, 1H), 4.32 – 4.27 (m, 1H), 3.37 – 3.30 (m, 1H). ^{13}C NMR: (125 MHz, $CDCl_3$) δ 154.8, 146.2, 139.9, 134.2, 130.0, 129.7, 129.5, 129.1, 128.8, 128.0, 127.2, 124.3, 123.5, 121.2, 116.9, 111.1, 68.1, 64.7, 52.6, 43.5. $[\alpha]_D^{27} = 700.0$ (c 1.0, $CHCl_3$). The enantiomeric excess was determined by Daicel Chiralcel IB (0.46 cm x 25 cm), Hexanes / IPA = 95 / 5, 1.0 mL/min, $\lambda = 254$ nm, t_r (minor) = 11.3 min, t_r (major) = 15.0 min. HRMS (ESI) m/z : $[M+H]^+$ calcd for $C_{22}H_{22}NO_2$, 332.1651; found 332.1641.

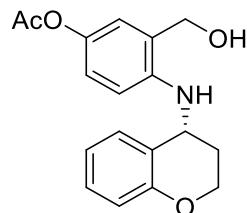
(*R*)-(2-(chroman-4-ylamino)-5-methoxyphenyl)methanol (3ab)



Light yellow solid (34.2 mg, 60% yield, 97% *ee*). M.p. 84-86 °C. 1H NMR: (500 MHz, $CDCl_3$) δ 7.32 – 7.26 (m, 1H), 7.22 – 7.15 (m, 1H), 6.94 – 6.71 (m, 5H), 4.62 – 4.53 (m, 3H), 4.27 – 4.20 (m, 2H), 3.77 (s, 3H), 2.16 – 2.09 (m, 2H). ^{13}C NMR: (125 MHz, $CDCl_3$) δ 154.5, 146.3, 130.7, 129.7, 129.6, 129.0, 124.2, 122.4, 120.9, 116.8, 116.7, 110.5, 67.9, 64.7, 53.2, 31.6, 14.5. $[\alpha]_D^{27} = 594.8$ (c 1.0, $CHCl_3$). The enantiomeric excess was determined by Daicel Chiralcel OD-H (0.46 cm x 25 cm), Hexanes / IPA = 95 / 5, 1.0 mL/min, $\lambda = 254$ nm, t_r (minor) = 21.1 min, t_r (major) = 24.4 min. HRMS (ESI) m/z : $[M+H]^+$

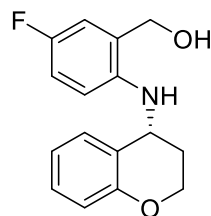
calcd for C₁₇H₂₀NO₃, 286.1443; found 286.1436.

(R)-4-(chroman-4-ylamino)-3-(hydroxymethyl)phenyl acetate (3ac)



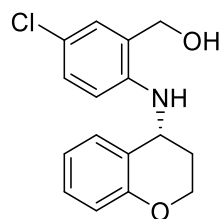
Light yellow solid (37.6 mg, 60% yield, 95% *ee*). M.p. 137-139 °C. ¹H NMR (500 MHz, CDCl₃): δ 7.30 – 7.26 (m, 1H), 7.22 – 7.16 (m, 1H), 6.99 – 6.94 (m, 1H), 6.94 – 6.77 (m, 4H), 4.99 (br s, 1H), 4.66 – 4.54 (m, 3H), 4.29 – 4.19 (m, 2H), 2.28 (s, 3H), 2.17 – 2.11 (m, 2H). ¹³C NMR (125 MHz, CDCl₃): δ 170.4, 155.0, 143.7, 141.2, 130.0, 129.2, 125.2, 123.1, 122.5, 122.0, 120.7, 117.1, 110.9, 64.2, 62.7, 46.7, 27.8, 21.0. [α]_D²⁶ = 532.9 (c 1.0, CHCl₃). The enantiomeric excess was determined by Daicel Chiralcel IA (0.46 cm x 25 cm), Hexanes / IPA = 90 / 10, 1.0 mL/min, λ = 254 nm, t_r (minor) = 13.6 min, t_r (major) = 18.6 min. HRMS (ESI) m/z: [M+H]⁺ calcd for C₁₈H₂₀NO₄, 314.1392; found 314.1381.

(R)-2-(chroman-4-ylamino)-5-fluorophenylmethanol (3ad)



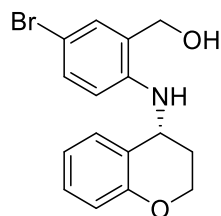
Colorless oil (47.5 mg, 87% yield, 97% *ee*). ¹H NMR (500 MHz, CDCl₃): δ 7.32 – 7.25 (m, 1H), 7.22 – 7.15 (m, 1H), 6.98 – 6.93 (m, 1H), 6.93 – 6.82 (m, 3H), 6.78 – 6.71 (m, 1H), 4.61 – 4.51 (m, 3H), 4.27 – 4.19 (m, 2H), 2.12 (m, 2H). ¹³C NMR (125 MHz, CDCl₃): δ 155.3 (d, J_{C-F} = 190.0 Hz), 155.0, 142.0 (d, J_{C-F} = 2.1 Hz), 130.1, 129.2, 126.0 (d, J_{C-F} = 6.0 Hz), 123.1, 120.7, 117.1, 116.2 (d, J_{C-F} = 22.7 Hz), 115.3 (d, J_{C-F} = 21.7 Hz), 111.6 (d, J_{C-F} = 7.3 Hz), 63.9 (d, J_{C-F} = 1.6 Hz), 62.7, 46.9, 27.7. ¹⁹F NMR: (376 MHz, CDCl₃) δ -128.25. [α]_D²⁷ = 583.6 (c 1.0, CHCl₃). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 75 / 25, 1.0 mL/min, λ = 254 nm, t_r (major) = 16.5 min, t_r (minor) = 30.5 min. HRMS (ESI) m/z: [M+H]⁺ calcd for C₁₆H₁₇FNO₂, 274.1243; found 274.1237.

(R)-(5-chloro-2-(chroman-4-ylamino)phenyl)methanol (3ae)



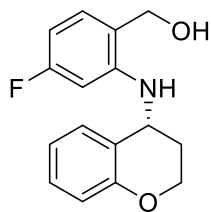
Yellow oil (55.5 mg, 96% yield, 98% *ee*). ¹H NMR: (500 MHz, CDCl₃) δ 7.30 – 7.26 (m, 1H), 7.23 – 7.17 (m, 2H), 7.10 – 7.05 (m, 1H), 6.94 – 6.84 (m, 2H), 6.77 – 6.73 (m, 1H), 5.03 (d, *J* = 6.4 Hz, 1H), 4.65 – 4.59 (m, 2H), 4.58 – 4.50 (m, 1H), 4.28 – 4.18 (m, 2H), 2.17 – 2.08 (m, 2H). ¹³C NMR: (125 MHz, CDCl₃) δ 155.0, 144.4, 130.0, 129.3, 129.2, 129.1, 126.0, 122.9, 121.3, 120.8, 117.1, 111.8, 64.0, 62.7, 46.6, 27.7. [α]_D²⁶ = 576.8 (c 1.0, CHCl₃). The enantiomeric excess was determined by Daicel Chiralcel IC (0.46 cm x 25 cm), Hexanes / IPA = 95 / 5, 1.0 mL/min, λ = 254 nm, *t*_r (major) = 10.0 min, *t*_r (minor) = 12.0 min. HRMS (ESI) *m/z*: [M+H]⁺ calcd for C₁₆H₁₇ClNO₂, 290.0948; found 290.0938.

(R)-(5-bromo-2-(chroman-4-ylamino)phenyl)methanol (3af)



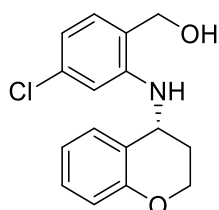
Yellow oil (57.3 mg, 86% yield, 99% *ee*). ¹H NMR: (500 MHz, CDCl₃) δ 7.30 – 7.26 (m, 1H), 7.23 – 7.17 (m, 1H), 7.11 – 7.05 (m, 1H), 6.97 – 6.85 (m, 3H), 6.80 – 6.75 (m, 1H), 5.27 (br s, 1H), 4.94 – 4.79 (m, 2H), 4.67 – 4.60 (m, 1H), 4.29 – 4.18 (m, 2H), 2.20 – 2.09 (m, 2H). ¹³C NMR: (125 MHz, CDCl₃) δ 155.0, 147.5, 130.4, 130.0, 129.3, 125.1, 123.1, 122.8, 121.2, 120.8, 117.2, 110.0, 62.8, 62.7, 46.6, 27.7. [α]_D²⁷ = 571.3 (c 1.0, CHCl₃). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 75 / 25, 1.0 mL/min, λ = 254 nm, *t*_r (minor) = 11.0 min, *t*_r (major) = 13.4 min. HRMS (ESI) *m/z*: [M+H]⁺ calcd for C₁₆H₁₇BrNO₂, 334.0443; found 334.0436.

(R)-(2-(chroman-4-ylamino)-4-fluorophenyl)methanol (3ag)



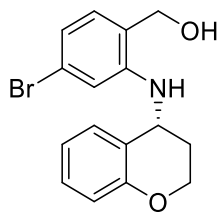
Yellow oil (50.2 mg, 92% yield, 98% *ee*). ^1H NMR: (500 MHz, CDCl_3) δ 7.31 – 7.27 (m, 1H), 7.23 – 7.17 (m, 1H), 7.05 – 6.99 (m, 1H), 6.94 – 6.85 (m, 2H), 6.55 – 6.49 (m, 1H), 6.41 – 6.34 (m, 1H), 5.23 (br s, 1H), 4.61 – 4.52 (m, 3H), 4.29 – 4.19 (m, 2H), 2.20 – 2.10 (m, 2H). ^{13}C NMR: (125 MHz, CDCl_3) δ 164.4 (d, $J = 243.5$ Hz), 155.1, 147.6 (d, $J = 10.9$ Hz), 130.7 (d, $J = 10.5$ Hz), 123.0, 129.3, 122.7, 120.8, 120.2, 120.2, 117.2, 102.6 (d, $J = 21.6$ Hz), 98.0 (d, $J = 26.3$ Hz), 64.0, 62.7, 46.6, 27.7. $[\alpha]_D^{27} = 584.2$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 75 / 25, 1.0 mL/min, $\lambda = 254$ nm, t_r (major) = 10.1 min, t_r (minor) = 13.1 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{16}\text{H}_{17}\text{FNO}_2$, 274.1243; found 274.1237.

(R)-2-(4-chlorophenyl)-N-(chroman-4-yl)ethan-1-amine (3ah)



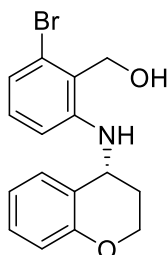
Yellow oil (45.1 mg, 78% yield, 99% *ee*). ^1H NMR: (500 MHz, CDCl_3) δ 7.29 – 7.26 (m, 1H), 7.23 – 7.17 (m, 1H), 7.02 – 6.97 (m, 1H), 6.94 – 6.85 (m, 2H), 6.81 – 6.77 (m, 1H), 6.69 – 6.63 (m, 1H), 5.19 (d, $J = 6.5$ Hz, 1H), 4.64 – 4.53 (m, 3H), 4.30 – 4.18 (m, 2H), 2.20 – 2.09 (m, 2H). ^{13}C NMR: (125 MHz, CDCl_3) δ 155.0, 146.9, 135.4, 130.4, 130.0, 129.3, 122.7, 122.6, 120.8, 117.2, 116.4, 110.5, 64.1, 62.7, 46.4, 27.7. $[\alpha]_D^{27} = 289.6$ (c 2.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 75 / 25, 1.0 mL/min, $\lambda = 254$ nm, t_r (major) = 10.6 min, t_r (minor) = 13.1 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{16}\text{H}_{17}\text{ClNO}_2$, 290.0948; found 290.0938.

(R)-2-(4-bromophenyl)-N-(chroman-4-yl)ethan-1-amine (3ai)



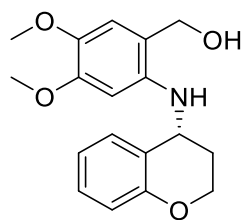
Light red oil (51.4 mg, 77% yield, 97% *ee*). $^1\text{H NMR}$ (500 MHz, CDCl_3): δ 7.29–7.22 (m, 1H), 7.21–7.14 (m, 1H), 7.06 (t, $J = 8.1$ Hz, 1H), 6.96–6.82 (m, 3H), 6.77 (d, $J = 8.1$ Hz, 1H), 5.25 (br s, 1H), 4.93–4.78 (m, 2H), 4.63 (t, $J = 4.2$ Hz, 1H), 4.27–4.16 (m, 2H), 2.19–2.06 (m, 2H). $^{13}\text{C NMR}$: (125 MHz, CDCl_3) δ 155.0, 147.5, 130.4, 130.0, 129.3, 125.1, 123.1, 122.7, 121.2, 120.8, 117.2, 110.0, 62.8, 62.7, 46.6, 27.7. $[\alpha]_D^{27} = 601.3$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 75 / 25, 1.0 mL/min, $\lambda = 254$ nm, t_r (minor) = 11.0 min, t_r (major) = 13.4 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{16}\text{H}_{17}\text{BrNO}_2$, 334.0443; found 334.0436.

(*R*)-2-bromo-6-(chroman-4-ylamino)phenylmethanol (3aj)



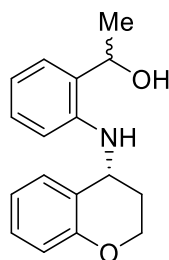
Yellow needle crystal (49.3 mg, 74% yield, 97% *ee*). M.p. 111–113 °C. $^1\text{H NMR}$ (500 MHz, CDCl_3): δ 7.29–7.26 (m, 1H), 7.23–7.17 (m, 1H), 7.10–7.05 (m, 1H), 6.97–6.85 (m, 3H), 6.80–6.75 (m, 1H), 5.27 (br s, 1H), 4.95–4.79 (m, 2H), 4.69–4.60 (m, 1H), 4.29–4.19 (m, 2H), 2.18–2.09 (m, 2H). $^{13}\text{C NMR}$: (125 MHz, CDCl_3) δ 155.0, 147.5, 130.4, 130.0, 129.3, 125.1, 123.1, 122.8, 121.2, 120.8, 117.2, 110.0, 62.8, 62.7, 46.6, 27.7. $[\alpha]_D^{28} = 573.0$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 75 / 25, 1.0 mL/min, $\lambda = 254$ nm, t_r (minor) = 11.5 min, t_r (major) = 13.8 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{16}\text{H}_{17}\text{BrNO}_2$, 334.0443; found 334.0430.

(*R*)-2-(chroman-4-ylamino)-4,5-dimethoxyphenylmethanol (3ak)



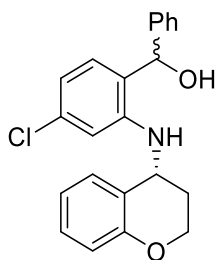
Yellow oil (45.3 mg, 72% yield, 97% *ee*). $^1\text{H NMR}$ (500 MHz, CDCl_3): δ 7.31 – 7.27 (m, 1H), 7.18 – 7.13 (m, 1H), 6.91 – 6.81 (m, 2H), 6.68 (s, 1H), 6.45 (s, 1H), 4.62 (t, $J = 4.3$ Hz, 1H), 4.49 (s, 2H), 4.25 – 4.19 (m, 2H), 3.86 (s, 3H), 3.78 (s, 3H), 2.16 – 2.08 (m, 2H). $^{13}\text{C NMR}$: (125 MHz, CDCl_3) δ 155.0, 150.1, 140.6, 140.5, 130.1, 129.1, 123.4, 120.7, 117.0, 116.9, 115.1, 97.7, 63.8, 62.8, 57.0, 56.2, 47.3, 28.0. $[\alpha]_{\text{D}}^{28} = 224.8$ (c 3.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OD-H (0.46 cm x 25 cm), Hexanes / IPA = 90 / 10, 1.0 mL/min, $\lambda = 254$ nm, t_{r} (major) = 16.8 min, t_{r} (minor) = 19.1 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{18}\text{H}_{22}\text{NO}_4$, 316.1549; found 316.1542.

(*R*)-2-(2-(4-bromo-2-(chroman-4-ylamino)phenyl)methanol (3a))



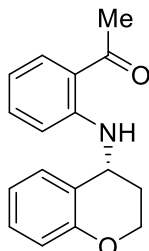
Yellow oil (23.1 mg, 43% yield, dr: 7:1, 99.8% *ee* (major), 87% *ee* (minor)). $^1\text{H NMR}$ (500 MHz, CDCl_3): δ 7.34 – 7.12 (m, 4H), 6.95 – 6.81 (m, 3H), 6.76 – 6.70 (m, 1H), 5.37 (br s, 1H), 4.95 – 4.83 (m, 1H), 4.73 – 4.61 (m, 1H), 4.33 – 4.18 (m, 2H), 2.23 – 2.09 (m, 2H), 1.59 – 1.54 (m, 3H). $^{13}\text{C NMR}$: (125 MHz, CDCl_3) δ 155.1, 145.0, 130.1, 129.0, 129.0, 127.7, 126.8, 123.4, 120.7, 117.0, 116.7, 110.8, 69.6, 62.9, 46.3, 27.8, 21.6. $[\alpha]_{\text{D}}^{26} = 220.9$ (c 2.0, CHCl_3) The enantiomeric excess was determined by Daicel Chiralcel OD-H (0.46 cm x 25 cm), Hexanes / IPA = 98 / 2, 1.0 mL/min, $\lambda = 254$ nm, $t_{\text{r-major}}$ (minor) = 18.0 min, $t_{\text{r-major}}$ (major) = 21.5 min. $T_{\text{r-minor}}$ (minor) = 12.0 min, $t_{\text{r-minor}}$ (major) = 22.8 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{17}\text{H}_{20}\text{NO}_2$, 270.1494; found 270.1483.

(4-chloro-2-((*R*-chroman-4-yl)amino)phenyl)(phenyl)methanol (3am)



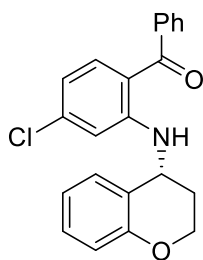
Yellow oil (65.6 mg, 90% yield, dr: 7:1, 99.5% *ee* (major), 84% *ee* (minor)). ¹H NMR (500 MHz, CDCl₃): δ 7.34 – 7.22 (m, 5H), 7.20 – 7.12 (m, 2H), 7.04 – 6.99 (m, 1H), 6.85 – 6.66 (m, 4H), 5.69 (s, 1H), 4.86 – 4.73 (m, 1H), 4.50 – 4.42 (m, 1H), 4.18 – 3.92 (m, 2H), 2.40 (s, 1H), 2.13 – 1.92 (m, 2H). ¹³C NMR (125 MHz, CDCl₃): δ 154.8, 143.3, 141.0, 129.9, 129.0, 128.8, 128.8, 128.7, 128.3, 128.0, 126.4, 122.8, 121.4, 120.7, 116.9, 112.0, 74.7, 62.7, 46.6, 27.8. [α]²⁵_D = 187.2 (c 2.0, CHCl₃). The enantiomeric excess was determined by Daicel Chiralcel IB (0.46 cm x 25 cm), Hexanes / IPA = 95 / 5, 1.0 mL/min, λ = 254 nm, t_{r-major} (minor) = 11.9 min, t_{r-major} (major) = 18.5 min. T_{r-minor} (minor) = 13.0 min, t_{r-minor} (major) = 14.6 min. HRMS (ESI) m/z: [M+H]⁺ calcd for C₂₂H₂₁ClNO₂, 366.1261; found 366.1256.

(R)-1-(2-(chroman-4-ylamino)phenyl)ethan-1-one (3al')



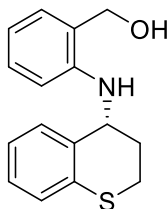
Yellow oil (48.6 mg, 91% yield, 97% *ee*). ¹H NMR (500 MHz, CDCl₃): δ 9.32 - 9.16 (m, 1H), 7.86 – 7.78 (m, 1H), 7.44 – 7.40 (m, 1H), 7.30 – 7.25 (m, 1H), 7.22 – 7.17 (m, 1H), 6.93 – 6.86 (m, 3H), 6.69 – 6.65 (m, 1H), 4.82 – 4.73 (m, 1H), 4.29 – 4.21 (m, 2H), 2.58 (s, 3H), 2.25 – 2.11 (m, 2H). ¹³C NMR: (125 MHz, CDCl₃) δ 200.8, 154.9, 149.4, 135.2, 133.1, 129.8, 129.2, 122.6, 120.8, 118.0, 117.1, 114.6, 111.6, 63.0, 46.0, 28.2, 28.1. [α]²⁵_D = 78.4 (c 2.0, CHCl₃). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 70 / 30, 1.0 mL/min, λ = 254 nm, t_r (minor) = 16.2 min, t_r (major) = 20.2 min. HRMS (ESI) m/z: [M+H]⁺ calcd for C₁₇H₁₈NO₂, 268.1338; found 268.1332.

(R)-(4-chloro-2-(chroman-4-ylamino)phenyl)(phenyl)methanone (3am')



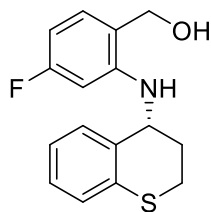
Yellow oil (69.0 mg, 95% yield, 96% *ee*). ^1H NMR (400 MHz, CDCl_3): δ 8.82 (d, $J = 7.1$ Hz, 1H), 7.67 – 7.60 (m, 2H), 7.60 – 7.46 (m, 4H), 7.43 – 7.37 (m, 1H), 7.35 – 7.30 (m, 1H), 7.26 – 7.19 (m, 1H), 6.99 – 6.88 (m, 3H), 4.85 – 4.77 (m, 1H), 4.34 – 4.25 (m, 2H), 2.32 – 2.15 (m, 2H). ^{13}C NMR: (100 MHz, CDCl_3) δ 198.1, 154.9, 148.6, 139.5, 134.9, 134.5, 131.5, 129.8, 129.4, 129.1, 128.3, 122.1, 120.9, 118.9, 118.5, 117.2, 113.2, 62.9, 46.4, 28.0. $[\alpha]_{\text{D}}^{25} = 23.6$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 80 / 20, 1.0 mL/min, $\lambda = 254$ nm, t_{r} (minor) = 13.8 min, t_{r} (major) = 15.8 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{22}\text{H}_{19}\text{ClNO}_2$, 364.1104; found 364.1095.

(R)-2-(2-(thiochroman-4-ylamino)phenyl)methanol (3na)



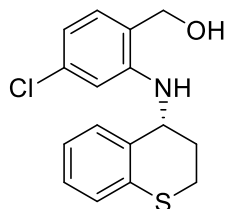
Yellow oil (47.7 mg, 88% yield, 94% *ee*). ^1H NMR (500 MHz, CDCl_3): δ 7.33 – 7.29 (m, 1H), 7.29 – 7.23 (m, 1H), 7.20 – 7.12 (m, 2H), 7.11 – 7.07 (m, 1H), 7.06 – 7.00 (m, 1H), 6.84 – 6.77 (m, 1H), 6.74 – 6.66 (m, 1H), 5.01 (br s, 1H), 4.74 – 4.67 (m, 1H), 4.65 – 4.57 (m, 2H), 3.24 – 3.15 (m, 1H), 2.94 – 2.86 (m, 1H), 2.49 – 2.40 (m, 1H), 2.18 – 2.09 (m, 1H). ^{13}C NMR (125 MHz, CDCl_3): δ 145.9, 134.6, 133.5, 130.3, 129.7, 129.6, 127.9, 126.9, 124.5, 124.4, 116.8, 110.9, 64.7, 50.1, 27.5, 22.9. $[\alpha]_{\text{D}}^{25} = 32.0$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel IC (0.46 cm x 25 cm), Hexanes / IPA = 97 / 3, 1.0 mL/min, $\lambda = 254$ nm, t_{r} (major) = 14.2 min, t_{r} (minor) = 15.7 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{16}\text{H}_{18}\text{NOS}$, 272.1109; found 272.1098.

(R)-2-(4-fluoro-2-(thiochroman-4-ylamino)phenyl)methanol (3ng)



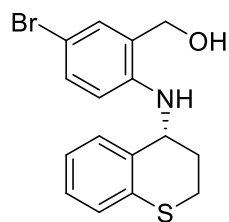
Light yellow oil (43.4 mg, 75% yield, 95% *ee*). $^1\text{H NMR}$ (500 MHz, CDCl_3): δ 7.29 – 7.27 (m, 1H), 7.18 – 7.13 (m, 2H), 7.07 – 6.99 (m, 2H), 6.53 – 6.45 (m, 1H), 6.40 – 6.31 (m, 1H), 5.18 (br s, 1H), 4.66 – 4.50 (m, 3H), 3.21 – 3.12 (m, 1H), 2.97 – 2.86 (m, 1H), 2.48 – 2.36 (m, 1H), 2.18 – 2.08 (m, 1H); $^{13}\text{C NMR}$ (125 MHz, CDCl_3): δ 164.4 (d, $J = 243.5$ Hz), 147.6 (d, $J = 10.9$ Hz), 134.0, 133.5, 130.7 (d, $J = 10.5$ Hz), 130.3, 128.0, 127.0, 124.5, 120.1 (d, $J = 2.3$ Hz), 102.6 (d, $J = 21.7$ Hz), 98.2 (d, $J = 26.3$ Hz), 64.0, 50.3, 27.4, 22.7. $^{19}\text{F NMR}$ (376 MHz, CDCl_3): δ -111.86. $[\alpha]_{\text{D}}^{26} = 34.9$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 90 / 10, 1.0 mL/min, $\lambda = 254$ nm, t_{r} (major) = 9.6 min, t_{r} (minor) = 13.6 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{16}\text{H}_{17}\text{FNOS}$, 290.1015; found 290.1005.

(*R*)-(4-chloro-2-(thiochroman-4-ylamino)phenyl)methanol (3nh)



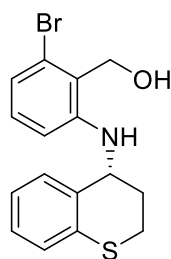
Yellow oil (45.1 mg, 74% yield, 92% *ee*). $^1\text{H NMR}$ (500 MHz, CDCl_3): δ 7.29 – 7.24 (m, 1H), 7.18 – 7.13 (m, 2H), 7.07 – 7.01 (m, 1H), 7.00 – 6.96 (m, 1H), 6.78 – 6.74 (m, 1H), 6.68 – 6.62 (m, 1H), 5.12 (br s, 1H), 4.65 (br s, 1H), 4.59 – 4.52 (m, 2H), 3.20 – 3.13 (m, 1H), 2.94 – 2.87 (m, 1H), 2.47 – 2.40 (m, 1H), 2.16 – 2.09 (m, 1H). $^{13}\text{C NMR}$ (125 MHz, CDCl_3): δ 146.9, 135.4, 133.9, 133.5, 130.4, 130.4, 128.0, 127.0, 124.5, 122.7, 116.4, 110.7, 64.1, 50.1, 27.3, 22.7. $[\alpha]_{\text{D}}^{27} = 46.9$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel IC (0.46 cm x 25 cm), Hexanes / IPA = 97 / 3, 1.0 mL/min, $\lambda = 254$ nm, t_{r} (major) = 7.7 min, t_{r} (minor) = 8.5 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{16}\text{H}_{17}\text{ClNOS}$, 306.0719; found 306.0709.

(*R*)-(5-bromo-2-(thiochroman-4-ylamino)phenyl)methanol (3nf)



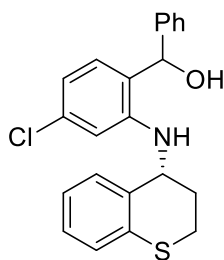
Light yellow oil (56.5 mg, 81% yield, 93% *ee*). $^1\text{H NMR}$ (500 MHz, CDCl_3): δ 7.33 – 7.30 (m, 1H), 7.27 – 7.24 (m, 1H), 7.21 – 7.12 (m, 3H), 7.06 – 7.01 (m, 1H), 6.73 – 6.61 (m, 1H), 5.00 (br s, 1H), 4.67 – 4.60 (m, 1H), 4.60 – 4.49 (m, 2H), 3.20 – 3.10 (m, 1H), 2.98 – 2.85 (m, 1H), 2.44 – 2.34 (m, 1H), 2.18 – 2.07 (m, 1H). $^{13}\text{C NMR}$ (125 MHz, CDCl_3): δ 144.9, 134.2, 133.5, 132.0, 131.9, 130.2, 128.0, 127.0, 126.3, 124.6, 112.6, 108.3, 63.9, 50.3, 27.4, 22.8. $[\alpha]_{\text{D}}^{27} = 52.6$ (c 2.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel IC (0.46 cm x 25 cm), Hexanes / IPA = 90 / 10, 1.0 mL/min, $\lambda = 254$ nm, t_{r} (major) = 6.2 min, t_{r} (minor) = 7.1 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{16}\text{H}_{17}\text{BrNOS}$, 350.0214; found 350.0205.

(*R*)-2-bromo-6-((thiochroman-4-ylamino)phenyl)methanol (3nj)



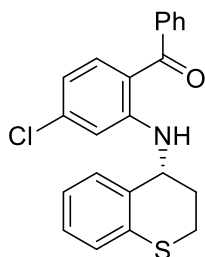
White solid (39.8 mg, 57% yield, 78% *ee*). M.p. 99-101 °C $^1\text{H NMR}$ (400 MHz, CDCl_3): δ 7.31 – 7.24 (m, 1H), 7.22 – 7.11 (m, 2H), 7.11 – 7.00 (m, 2H), 6.98 – 6.88 (m, 1H), 6.79 – 6.69 (m, 1H), 5.21 (br s, 1H), 4.94 – 4.81 (m, 2H), 4.71 – 4.61 (m, 1H), 3.23 – 3.10 (m, 1H), 2.99 – 2.83 (m, 1H), 2.48 – 2.35 (m, 1H), 2.20 – 2.06 (m, 1H). $^{13}\text{C NMR}$ (100 MHz, CDCl_3): δ 147.6, 134.2, 133.6, 130.4, 130.2, 128.0, 127.0, 125.0, 124.6, 123.0, 121.2, 110.3, 62.8, 50.5, 27.6, 22.9. $[\alpha]_{\text{D}}^{25} = 46.2$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel IB (0.46 cm x 25 cm), Hexanes / IPA = 80 / 20, 1.0 mL/min, $\lambda = 254$ nm, t_{r} (major) = 7.2 min, t_{r} (minor) = 8.5 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{16}\text{H}_{17}\text{BrNOS}$, 350.0214; found 350.0204.

(4-chloro-2-(((*R*)-thiochroman-4-yl)amino)phenyl)(phenyl)methanol (3nm)



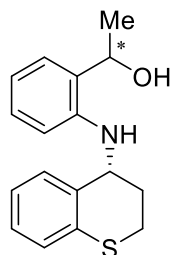
Yellow oil (57.2 mg, 75% yield, dr: 5:1, 99.5% *ee*(major), 69% *ee*(minor)). ^1H NMR (500 MHz, CDCl_3): δ 7.33 – 7.27 (m, 5H), 7.18 – 7.15 (m, 1H), 7.13 – 7.07 (m, 3H), 7.01 – 6.86 (m, 2H), 6.70 – 6.63 (m, 1H), 5.74 – 5.67 (m, 1H), 4.74 (br s, 1H), 4.54 – 4.47 (m, 1H), 2.92 – 2.64 (m, 2H), 2.41 (br s, 1H), 2.28 – 2.01 (m, 2H). ^{13}C NMR (125 MHz, CDCl_3): δ 143.2, 141.0, 134.2, 133.2, 129.9, 128.8, 128.7, 128.6, 128.3, 128.0, 127.8, 126.8, 126.5, 124.5, 121.4, 112.2, 74.6, 50.4, 27.5, 22.8. $[\alpha]^{25}_{\text{D}} = 13.5$ (c 2.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel IB (0.46 cm x 25 cm), Hexanes / IPA = 95 / 5, 1.0 mL/min, $\lambda = 254$ nm, $t_{\text{r-major}}$ (major) = 13.0 min, $t_{\text{r-major}}$ (minor) = 21.9 min. $T_{\text{r-minor}}$ (minor) = 14.5 min, $t_{\text{r-minor}}$ (major) = 17.2 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{22}\text{H}_{21}\text{ClNOS}$, 382.1032; found 382.1022.

(*R*)-4-chloro-2-(thiochroman-4-ylamino)phenyl(phenyl)methanone (3nm')



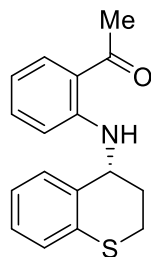
Yellow oil (53.8 mg, 71% yield, 92% *ee*). ^1H NMR (500 MHz, CDCl_3): δ 8.83 (d, $J = 7.5$ Hz, 1H), 7.65 – 7.60 (m, 2H), 7.57 – 7.51 (m, 2H), 7.50 – 7.45 (m, 2H), 7.37 – 7.32 (m, 1H), 7.32 – 7.27 (m, 1H), 7.21 – 7.14 (m, 2H), 7.08 – 7.03 (m, 1H), 6.87 – 6.83 (m, 1H), 4.78 – 4.73 (m, 1H), 3.19 – 3.11 (m, 1H), 3.03 – 2.96 (m, 1H), 2.41 – 2.25 (m, 2H). ^{13}C NMR (125 MHz, CDCl_3): δ 198.2, 148.7, 139.5, 134.9, 134.4, 134.0, 133.6, 131.5, 129.4, 129.2, 129.2, 128.3, 128.3, 128.0, 127.2, 124.7, 118.9, 118.4, 113.5, 50.4, 28.3, 23.4. $[\alpha]^{28}_{\text{D}} = 9.9$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 80 / 20, 1.0 mL/min, $\lambda = 254$ nm, t_{r} (minor) = 13.4 min, t_{r} (major) = 22.0 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{22}\text{H}_{19}\text{ClNOS}$, 380.0876; found 380.0865.

1-(2-(((*R*)-thiochroman-4-yl)amino)phenyl)ethan-1-ol (**3nl**)



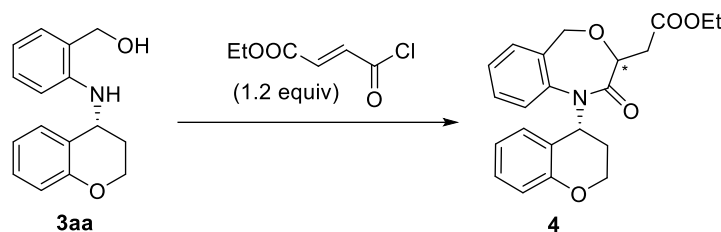
Light yellow oil (46.5 mg, 82% yield, dr: 6:1, 99 % *ee*(major), 72% *ee*(minor)). $^1\text{H NMR}$ (500 MHz, CDCl_3): δ 7.34 – 7.30 (m, 1H), 7.24 – 7.20 (m, 1H), 7.19 – 7.11 (m, 3H), 7.08 – 7.02 (m, 1H), 6.84 – 6.79 (m, 1H), 6.76 – 6.70 (m, 1H), 4.93 – 4.85 (m, 1H), 4.72 – 4.67 (m, 1H), 3.25 – 3.14 (m, 1H), 2.96 – 2.87 (m, 1H), 2.50 – 2.39 (m, 1H), 2.18 – 2.12 (m, 1H), 1.59 – 1.54 (m, 3H) $^{13}\text{C NMR}$: (125 MHz, CDCl_3) δ 145.2, 134.8, 133.4, 130.2, 128.9, 127.8, 127.7, 126.9, 126.8, 124.5, 116.7, 111.2, 69.8, 50.2, 27.7, 23.0, 21.8. $[\alpha]_D^{25} = 63.9$ (c 2.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel IB (0.46 cm x 25 cm), Hexanes / IPA = 95 / 5, 1.0 mL/min, $\lambda = 254$ nm, $t_{r\text{-major}}$ (major) = 13.8 min, $t_{r\text{-major}}$ (minor) = 9.9 min. $T_{r\text{-minor}}$ (minor) = 14.5 min, $t_{r\text{-minor}}$ (major) = 17.2 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{17}\text{H}_{20}\text{NOS}$, 286.1266; found 286.1261.

(*R*)-1-(2-(thiochroman-4-ylamino)phenyl)ethan-1-one (**3nl'**)



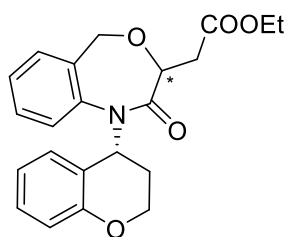
Yellow oil (32.8 mg, 58% yield, 93% *ee*). $^1\text{H NMR}$ (500 MHz, CDCl_3): δ 9.36 - 9.15 (m, 1H), 7.82 – 7.77 (m, 1H), 7.40 – 7.35 (m, 1H), 7.28 – 7.24 (m, 1H), 7.20 – 7.12 (m, 2H), 7.05 – 7.00 (m, 1H), 6.85 – 6.80 (m, 1H), 6.67 – 6.62 (m, 1H), 4.78 – 4.71 (m, 1H), 3.16 – 3.09 (m, 1H), 3.00 – 2.94 (m, 1H), 2.59 (s, 3H), 2.38 – 2.30 (m, 1H), 2.29 – 2.21 (m, 1H). $^{13}\text{C NMR}$: (125 MHz, CDCl_3) δ 200.9, 149.6, 135.2, 134.4, 133.5, 133.1, 129.4, 127.8, 127.1, 124.6, 117.8, 114.5, 111.9, 45.0, 28.4, 28.1, 23.5. $[\alpha]_D^{25} = 18.6$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 70 / 30, 1.0 mL/min, $\lambda = 254$ nm, t_r (major) = 12.6 min, t_r (minor) = 13.8 min. HRMS (ESI) m/z : $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{17}\text{H}_{18}\text{NOS}$, 284.1109; found 284.1104.

ethyl 2-(1-((*R*)-chroman-4-yl)-2-oxo-1,2,3,5-tetrahydrobenzo[*e*][1,4]oxazepin-3-yl)acetate (4)⁸



The solution of fumaric acid chloride monoethyl ester (38.9 mg, 0.24 mmol) in CH₂Cl₂ (0.5 mL) was added dropwise to a solution of **3aa** (51.0 mg, 0.2 mmol) and NaHCO₃ (41.7 mg, 0.5 mmol) in CH₂Cl₂ (1.5 mL). The reaction mixture was stirred for 2 h at room temperature and filtered. The filtrate was washed with water, dried over Na₂SO₄, and then concentrated under reduced pressure to give the mixture without further purify. The mixture, K₂CO₃ (45.5 mg, 0.33 mmol), MeOH (1 mL) and water (150 μ L) was stirred overnight at room temperature. The reaction mixture was diluted with water, acidified, extracted with AcOEt. The extract was washed with water, dried over Na₂SO₄, and then concentrated under reduced pressure. The residue was purified by column chromatography to give the **4** as a solid in 65% yield (silica gel, PE/EA).

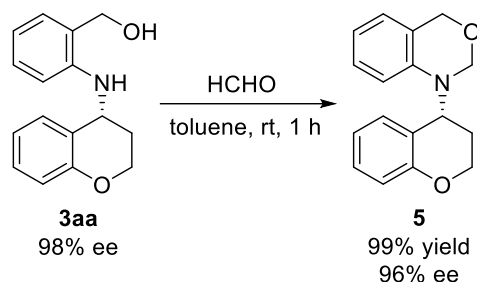
Ethyl (R)-2-(1-(chroman-4-yl)-2-oxo-1,5-dihydro-3H-benzo[*e*][1,4]oxazepin-3(2H)-yl)acetate (4)



White solid (49.6 mg, 65% yield, dr: 4:1, 98% *ee*(major), 97% *ee*(minor)). M.p. 111-113 °C. ¹H NMR (500 MHz, CDCl₃): δ 7.36 – 7.34 (m, 1H), 7.31 – 7.28 (m, 1H), 7.27 – 7.23 (m, 1H), 7.22 – 7.17 (m, 2H), 7.00 – 6.95 (m, 1H), 6.88 – 6.84 (m, 1H), 6.70 – 6.66 (m, 1H), 6.50 – 6.44 (m, 1H), 4.75 – 4.58 (m, 2H), 4.43 – 4.37 (m, 1H), 4.26 – 4.20 (m, 2H), 4.19 – 4.11 (m, 2H), 3.23 – 3.15 (m, 1H), 2.72 – 2.64 (m, 1H), 2.14 – 2.05 (m, 1H), 1.83 – 1.78 (m, 1H), 1.25 (t, *J* = 7.1 Hz, 3H). ¹³C NMR (125 MHz, CDCl₃): δ 170.9, 169.4, 155.0, 139.8, 130.4, 130.1, 130.0, 128.8, 127.8, 127.4, 122.9, 122.7, 121.4, 117.2, 70.2, 67.7, 65.3,

60.7, 49.7, 35.7, 26.3, 14.2. $[\alpha]_D^{25} = -62.8$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OD-H (0.46 cm x 25 cm), Hexanes / IPA = 80 / 20, 1.0 mL/min, $\lambda = 254$ nm, $t_{r\text{-major}}$ (major) = 8.5 min, $t_{r\text{-major}}$ (minor) = 19.0 min. $T_{r\text{-minor}}$ (minor) = 12.9 min, $t_{r\text{-minor}}$ (major) = 42.4 min. HRMS (ESI) m/z: $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{22}\text{H}_{23}\text{NO}_5$, 382.1654; found 382.1644.

(R)-1-(chroman-4-yl)-1,4-dihydro-2H-benzo[d][1,3]oxazine (5)



To the suspension of **3aa** (51.0 mg, 0.2 mmol) in 1 ml of toluene, a 0.1 mL of 37% formaldehyde solution was added. The mixture was then stirred vigorously at room temperature for 2h (The process of the reaction could be monitored by TLC analysis). The organic phase was separated and the aqueous layer was extracted with DCM (10 mL*2). The combined organic solution was dried over Na_2SO_4 , filtered, and concentrated in vacuo. The residue was purified by flash column chromatography using PE/EA to afford **5**. Light yellow oil (52.9 mg, 99% yield, 96% ee). ^1H NMR (400 MHz, CDCl_3): δ 7.49 – 7.44 (m, 1H), 7.22 – 7.15 (m, 2H), 7.04 – 7.00 (m, 1H), 6.99 – 6.89 (m, 3H), 6.88 – 6.83 (m, 1H), 5.00 – 4.95 (m, 1H), 4.94 – 4.86 (m, 2H), 4.67 – 4.45 (m, 2H), 4.36 – 4.29 (m, 1H), 4.21 – 4.14 (m, 1H), 2.35 – 2.25 (m, 1H), 2.14 – 2.07 (m, 1H). ^{13}C NMR: (100 MHz, CDCl_3) δ 156.0, 143.6, 128.9, 128.7, 127.4, 125.2, 122.7, 120.7, 120.2, 117.5, 117.1, 117.1, 77.1, 67.8, 65.1, 56.3, 27.2. $[\alpha]_D^{28} = 693.4$ (c 1.0, CHCl_3). The enantiomeric excess was determined by Daicel Chiralcel OJ-3 (0.46 cm x 25 cm), Hexanes / IPA = 95 / 5, 1.0 mL/min, $\lambda = 254$ nm, t_r (minor) = 16.9 min, t_r (major) = 29.7 min. HRMS (ESI) m/z: $[\text{M}+\text{H}]^+$ calcd for $\text{C}_{17}\text{H}_{18}\text{NO}_2$, 268.1338; found 268.1334.

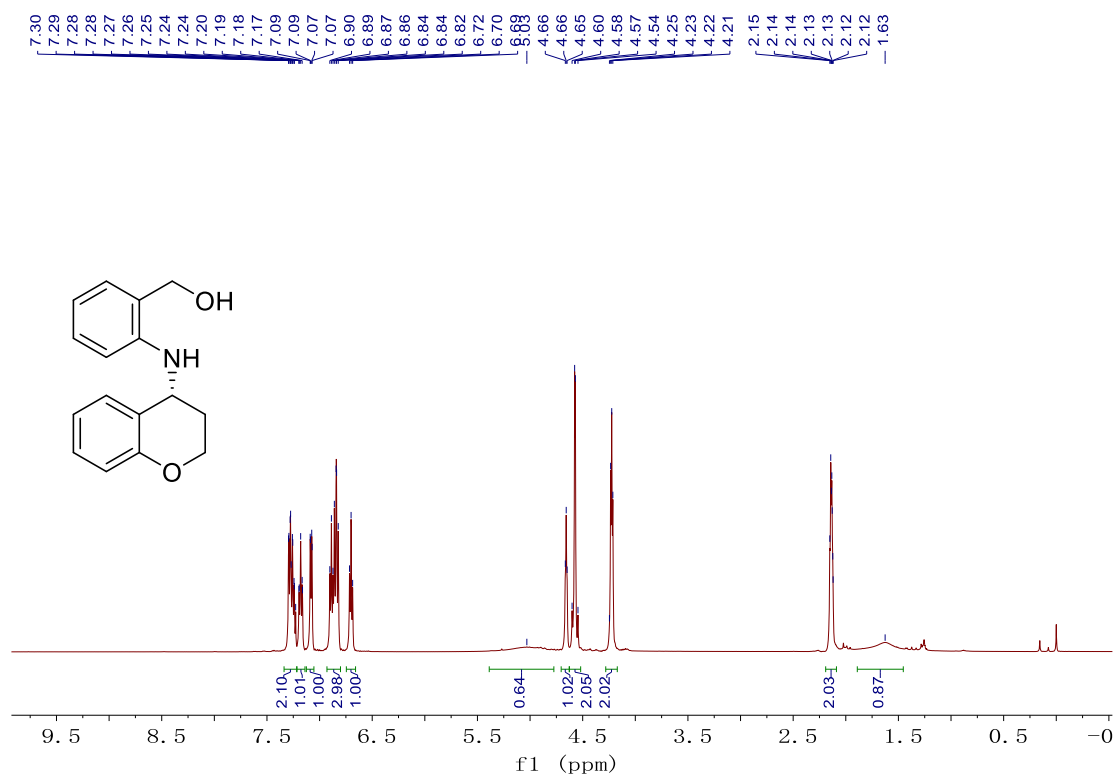
5. Reference

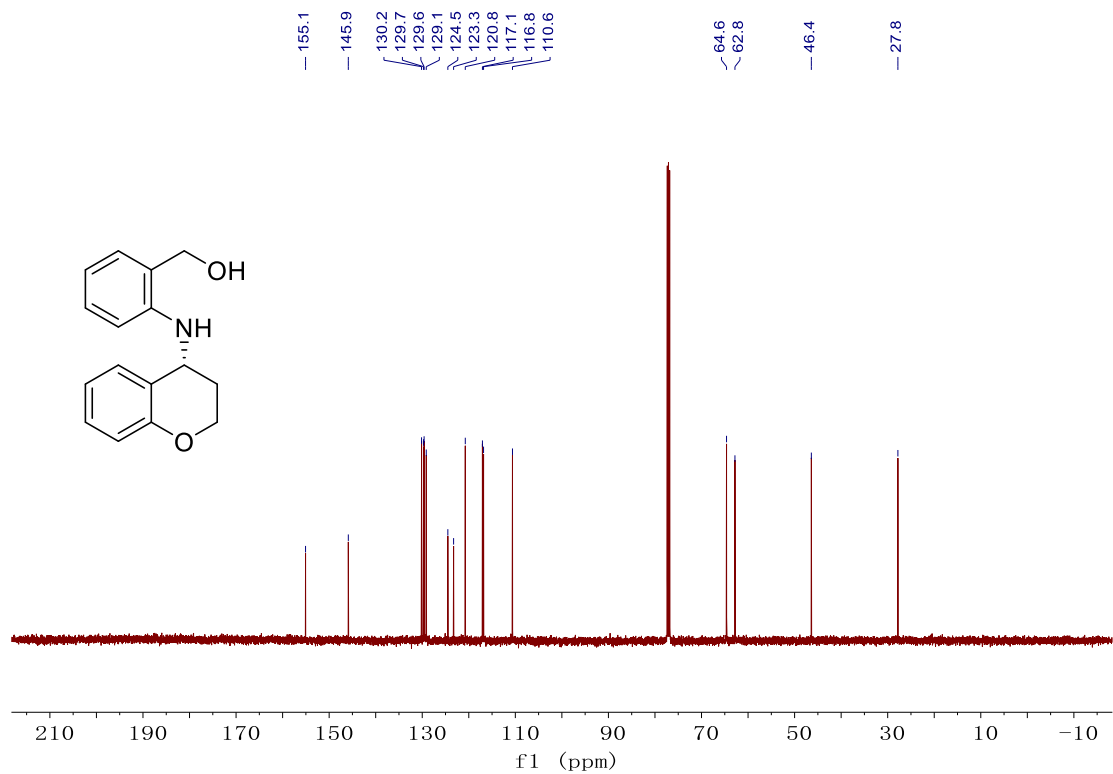
1. J. Chauhan, S. Fletcher, *Tetrahedron Lett.* 2012, **53**, 4951-4954.
2. H. Jin, L. Huang, J. Xie, M. Rudolph, F. Rominger, A. S. K. Hashmi, *Angew. Chem. Int. Ed.* 2016, **55**, 794-797.
3. H. Jin, B. Tian, X. Song, J. Xie, M. Rudolph, F. Rominger, A. S. K. Hashmi, *Angew. Chem. Int. Ed.* 2016, **55**, 12688-12692.

4. B. O. Ashburn, R. G. Carter, *Angew. Chem. Int. Ed.* 2006, **45**, 6737-6741.
5. S. Kumar, E. J. Wachtel, E. Keinan, *J. Org. Chem.* 1993, **58**, 3821-3827.
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7. C. Efe, I. N. Lykakis, M. Stratakis, *Chem. Commun.* 2011, **47**, 803-805.
8. T. Miki, M. Kori, H. Mabuchi, H. Banno, R. Tozawa, M. Nakamura, S. Itokawa, Y. Sugiyama, H. Yukimasa, *Biorg. Med. Chem.* 2002, **10**, 401-414.

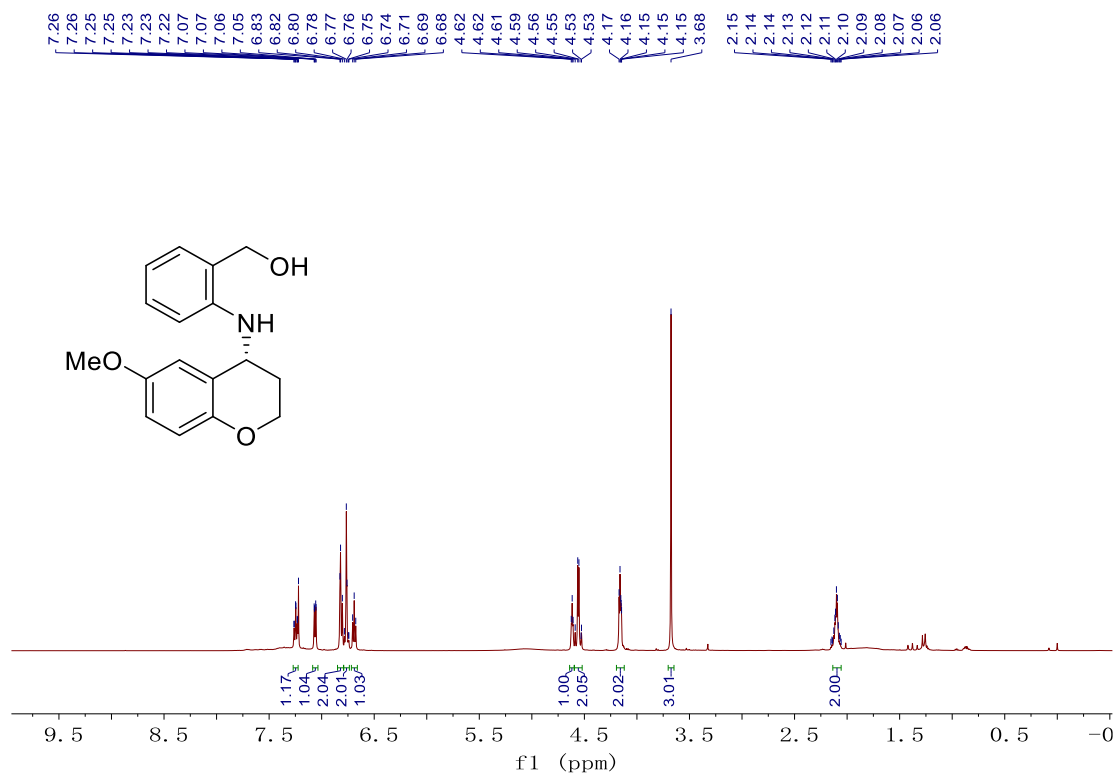
6. NMR Spectrum

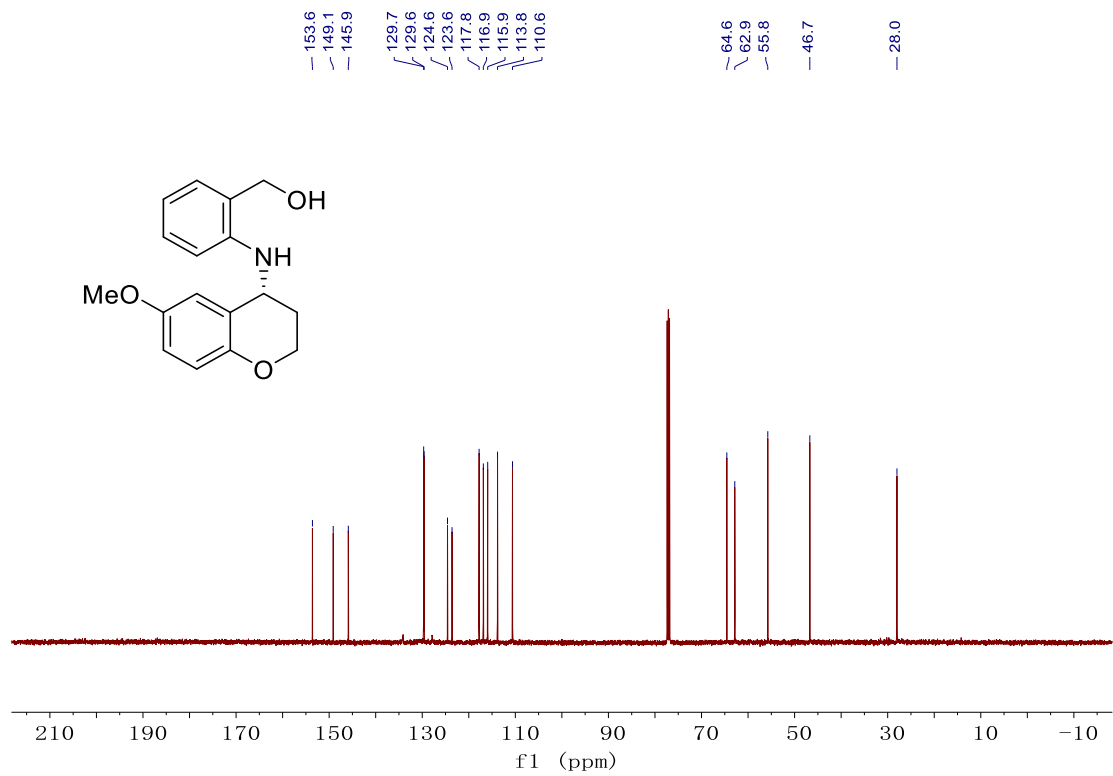
(*R*)-(2-(chroman-4-ylamino)phenyl)methanol (3aa)



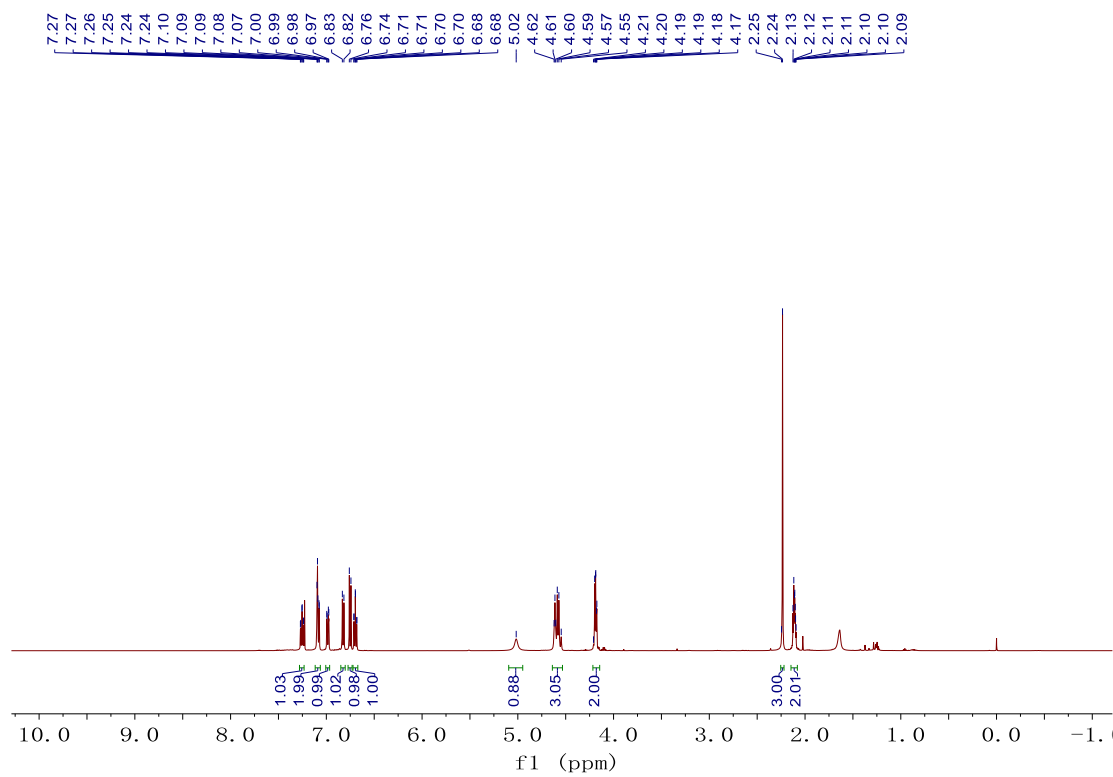


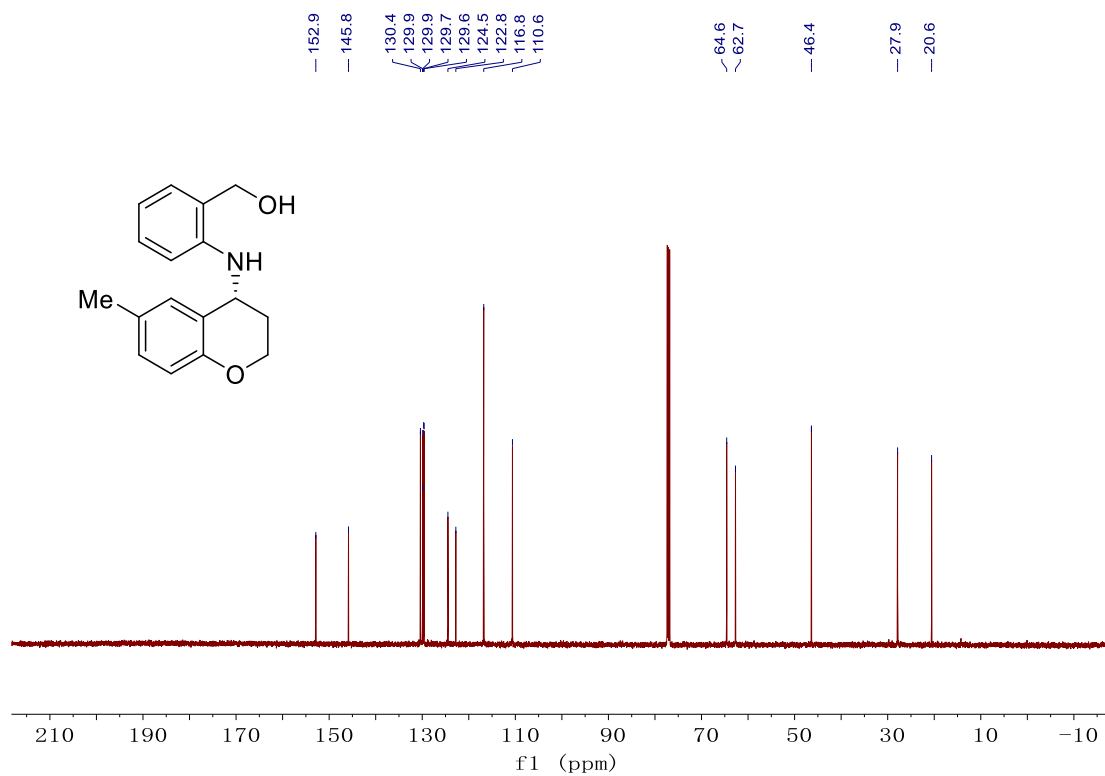
(R)-2-((6-methoxychroman-4-yl)amino)phenyl)methanol (3ba)



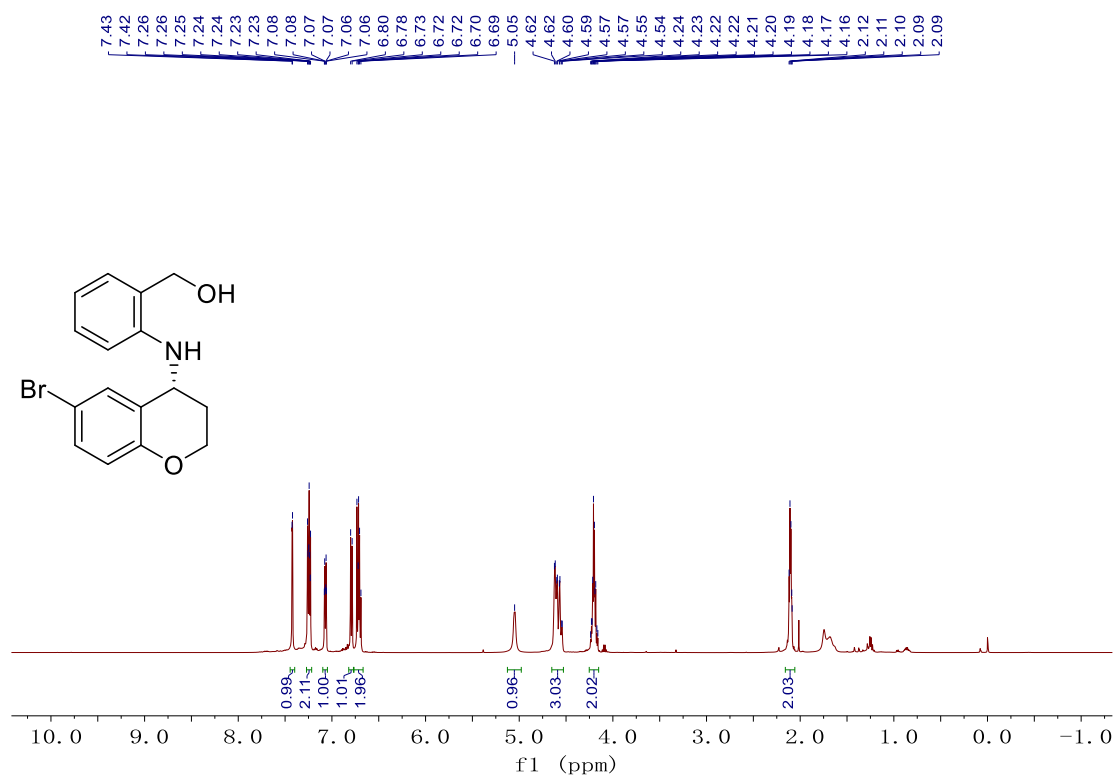


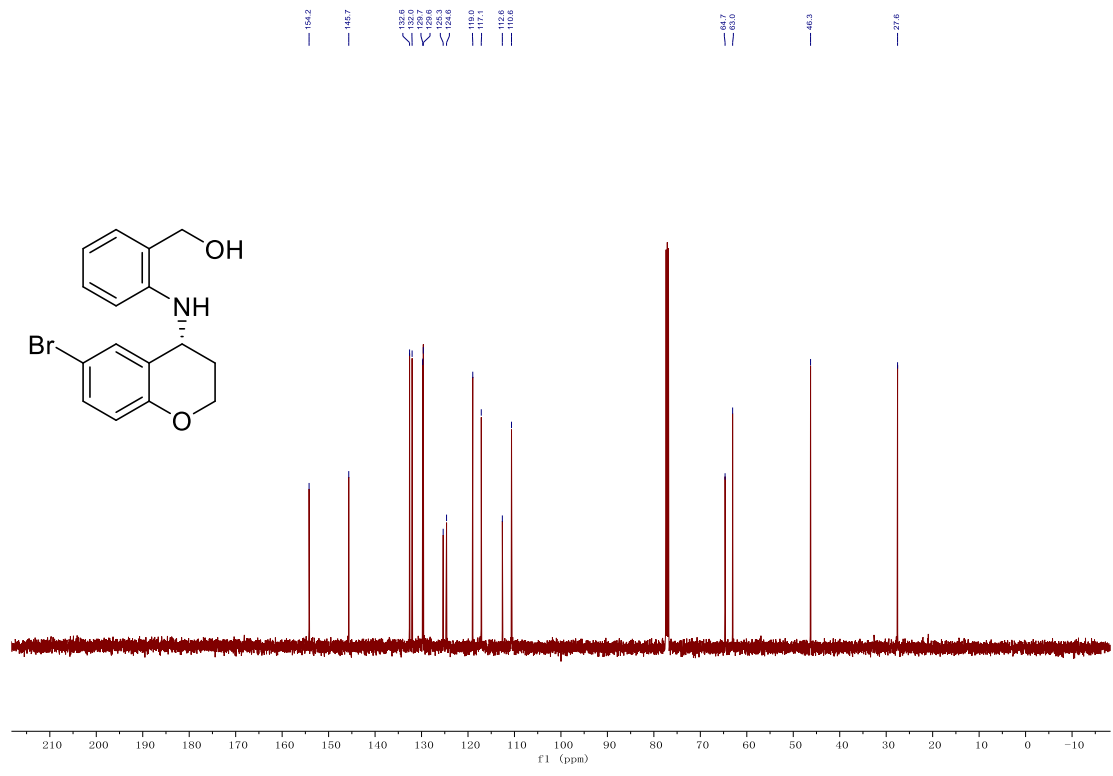
(R)-2-((6-methylchroman-4-yl)amino)phenylmethanol (3ca)



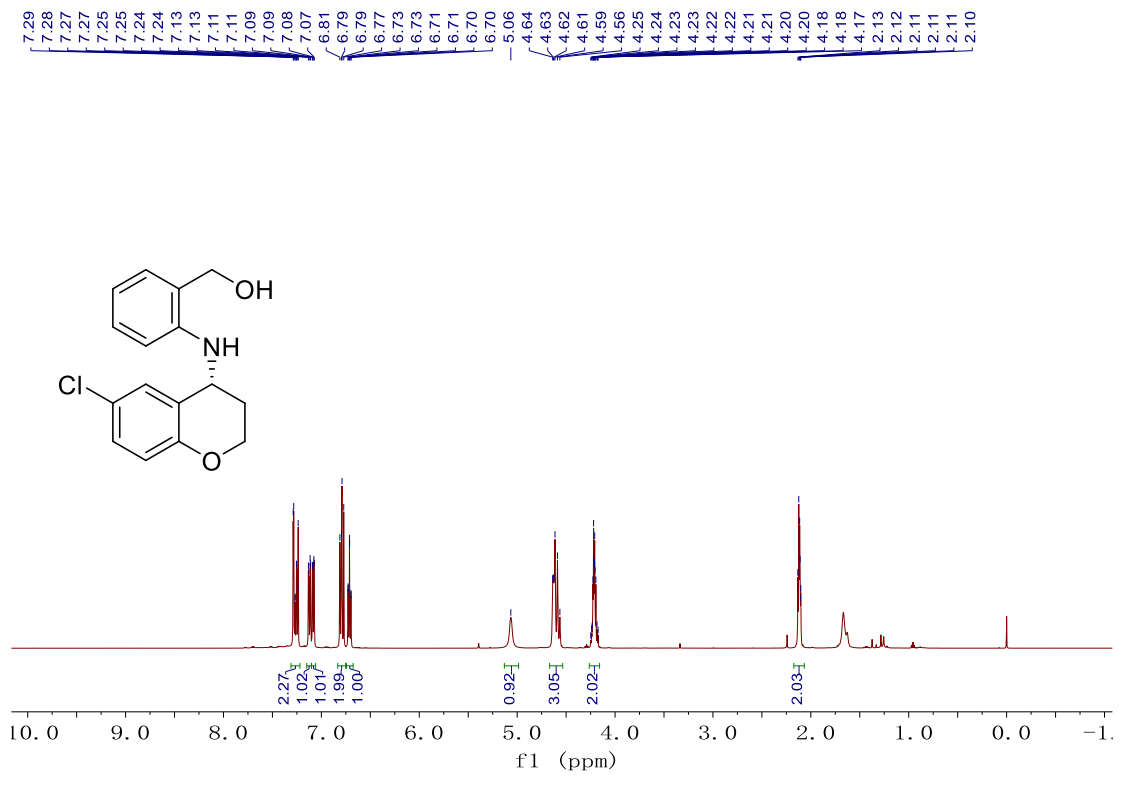


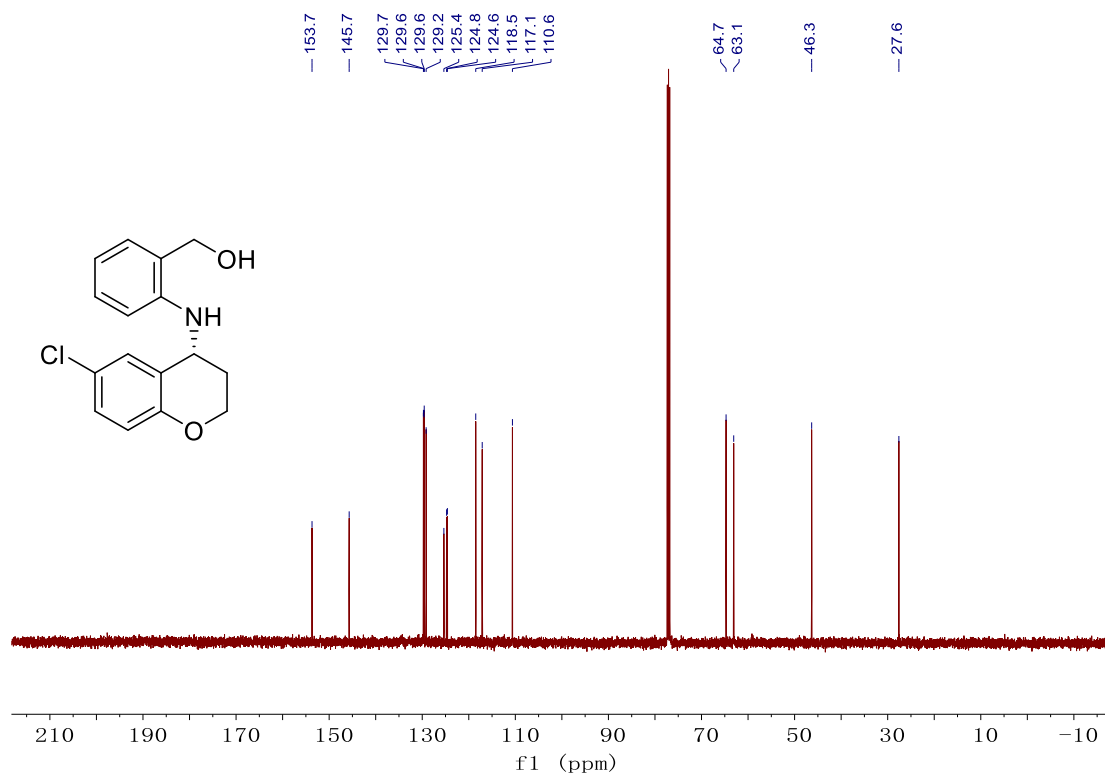
(R)-2-((6-bromochroman-4-yl)amino)phenylmethanol (3da)



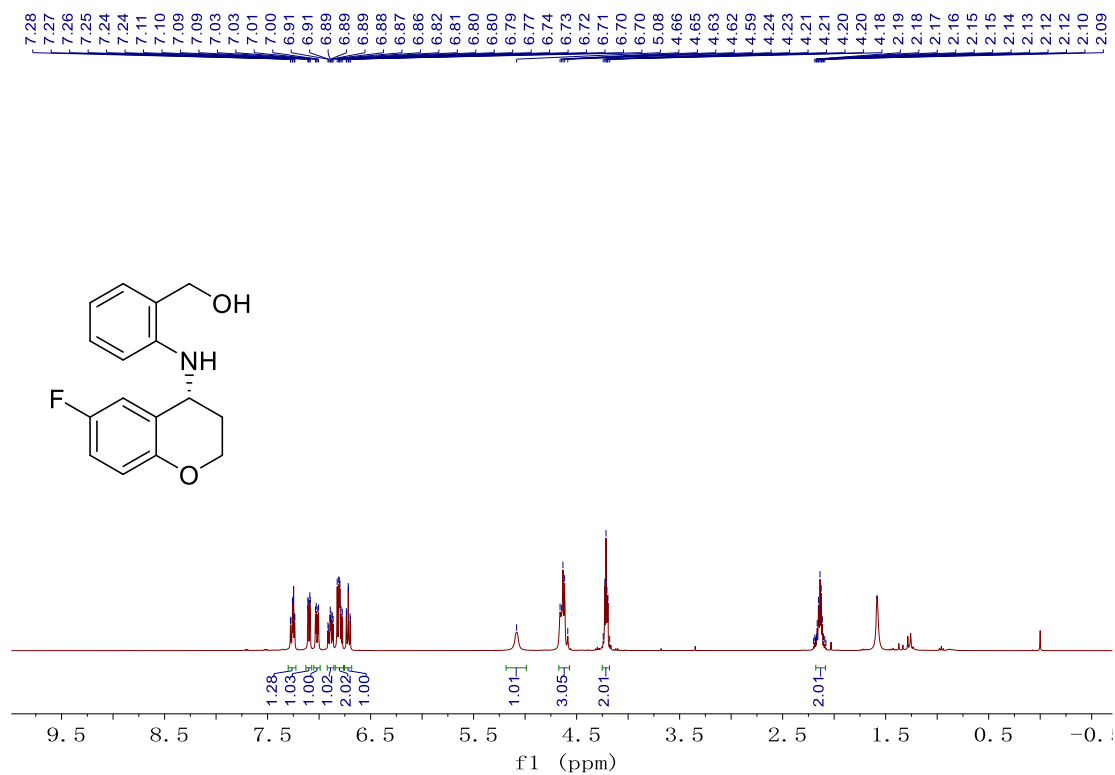


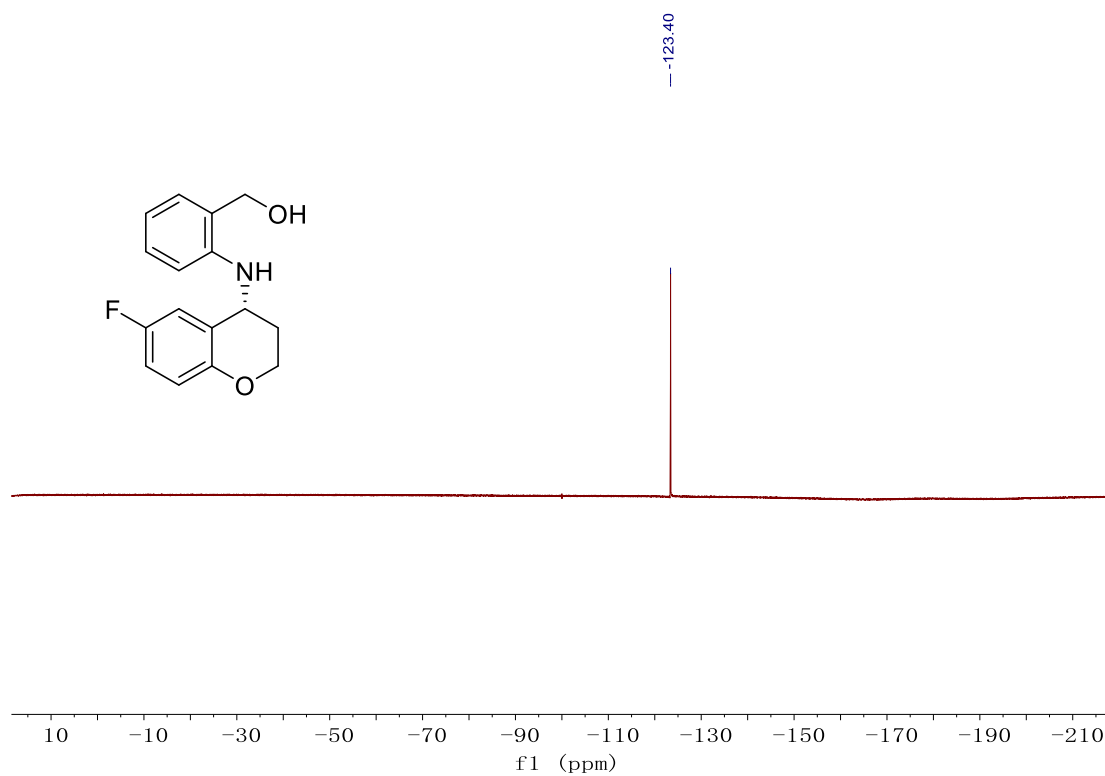
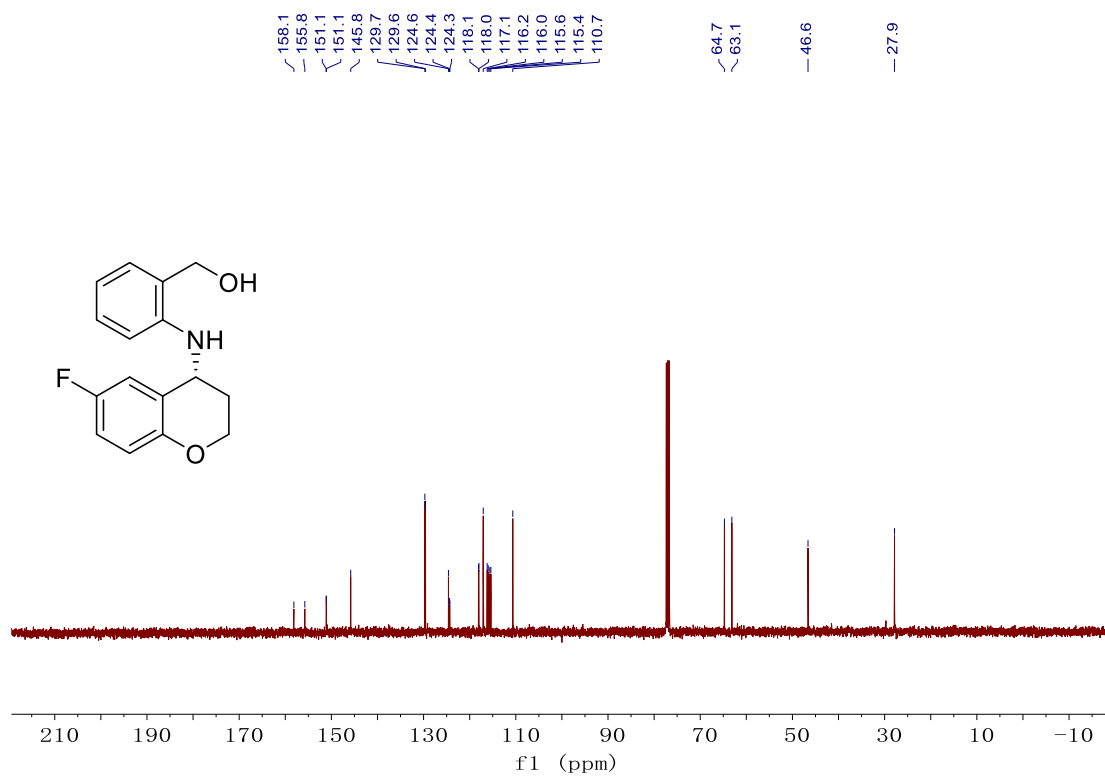
(R)-2-((6-chlorochroman-4-yl)amino)phenylmethanol (3ea)



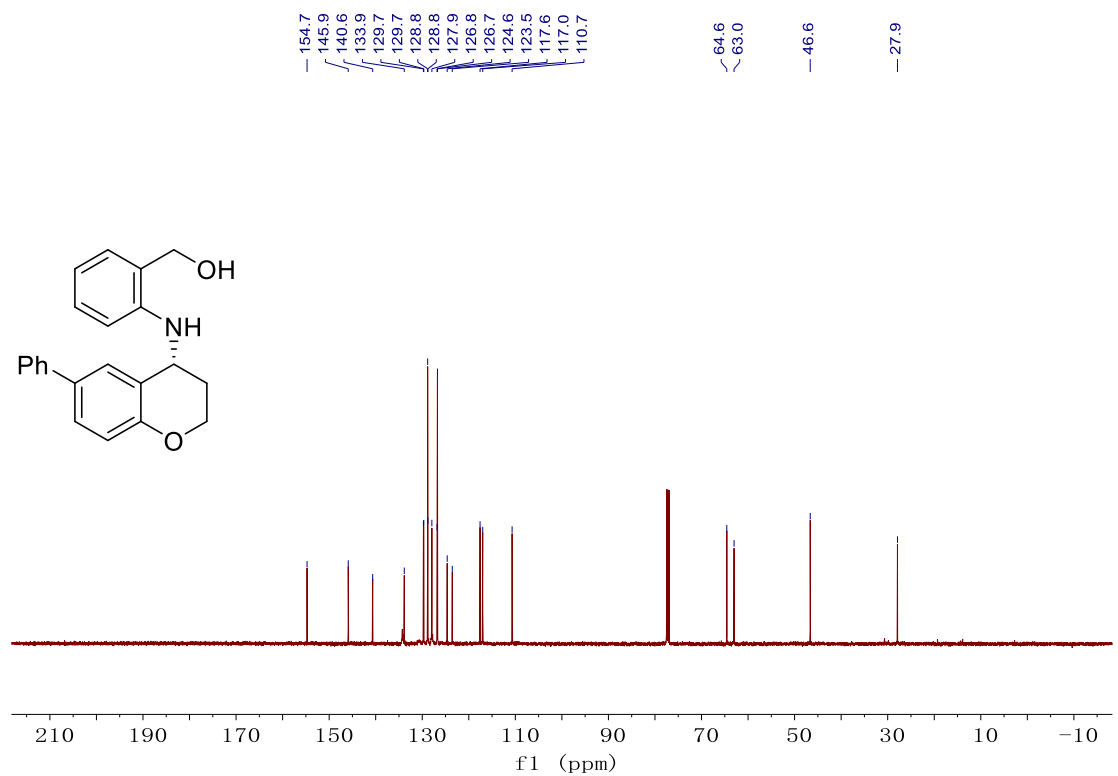
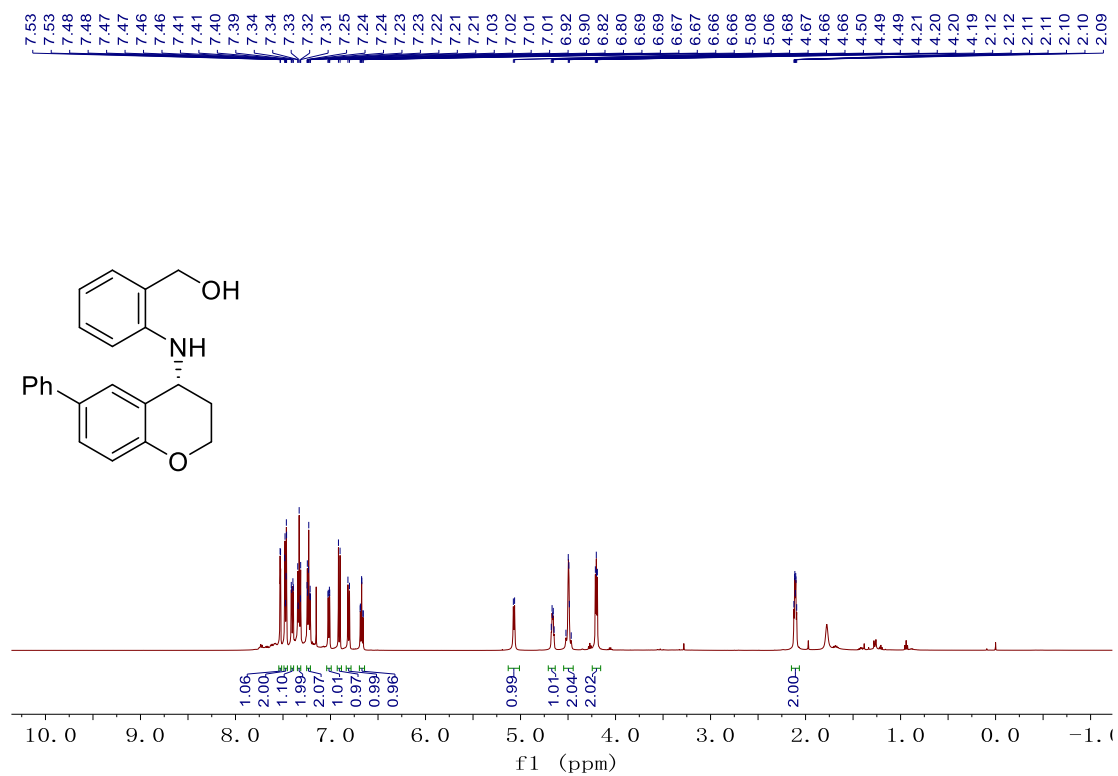


(R)-2-((6-fluorochroman-4-yl)amino)phenylmethanol (3fa)

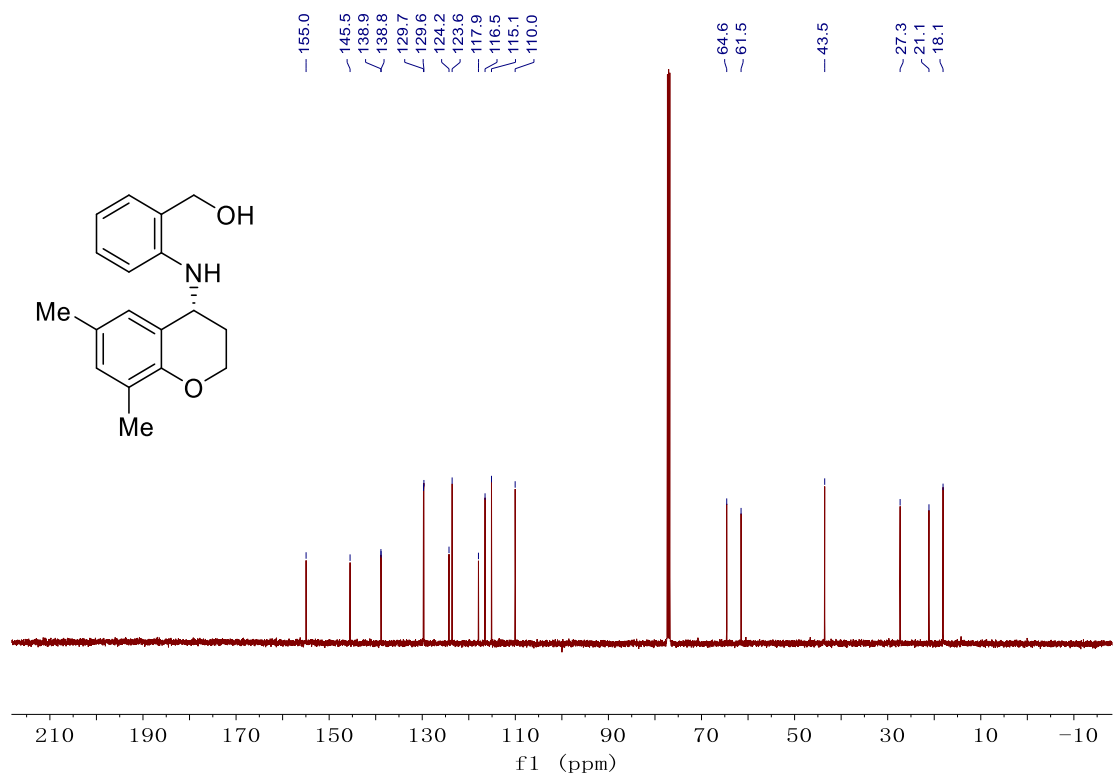
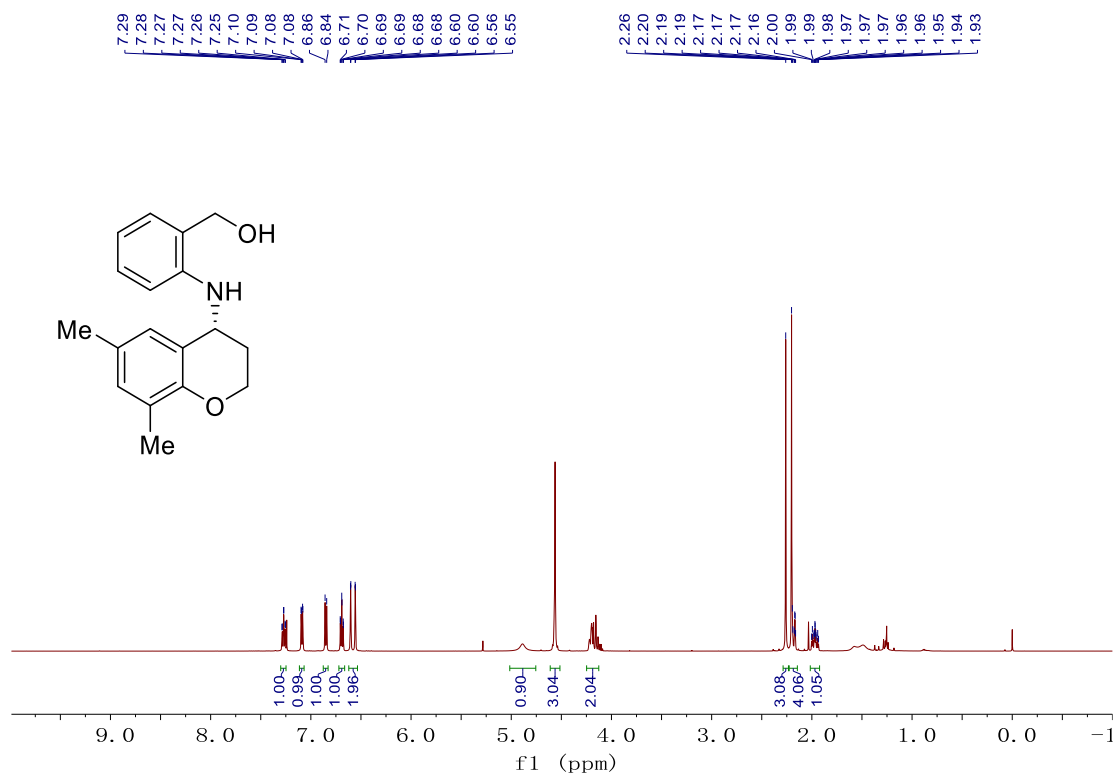




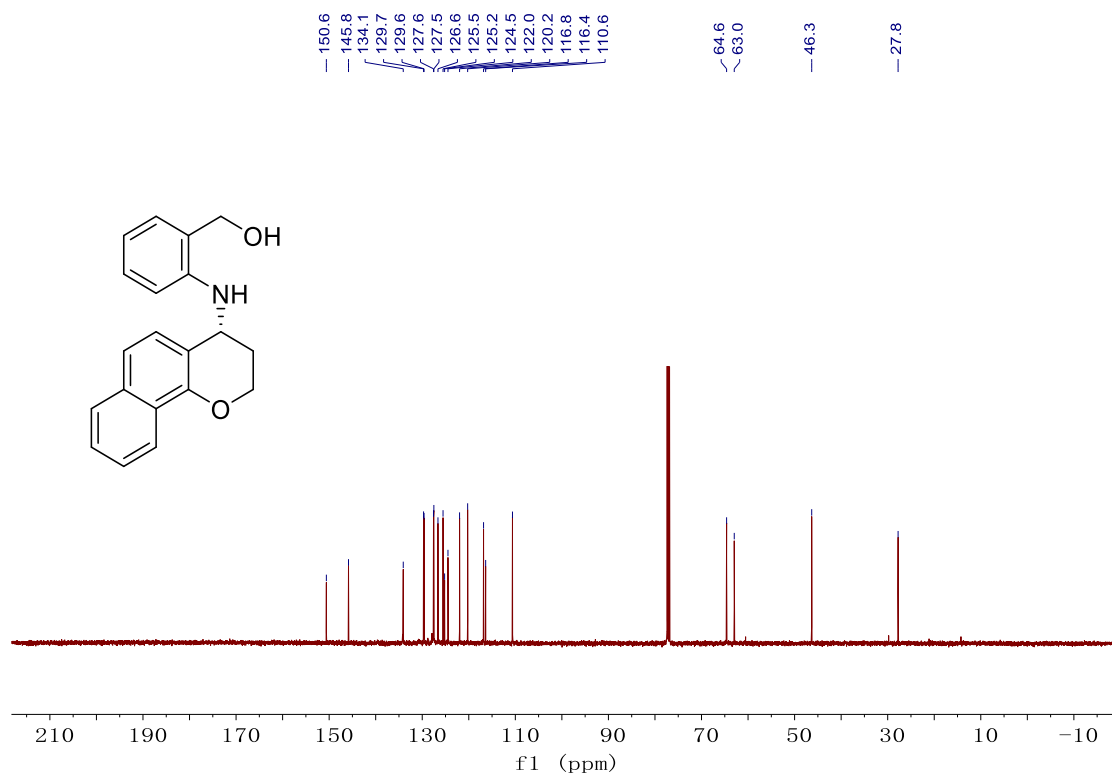
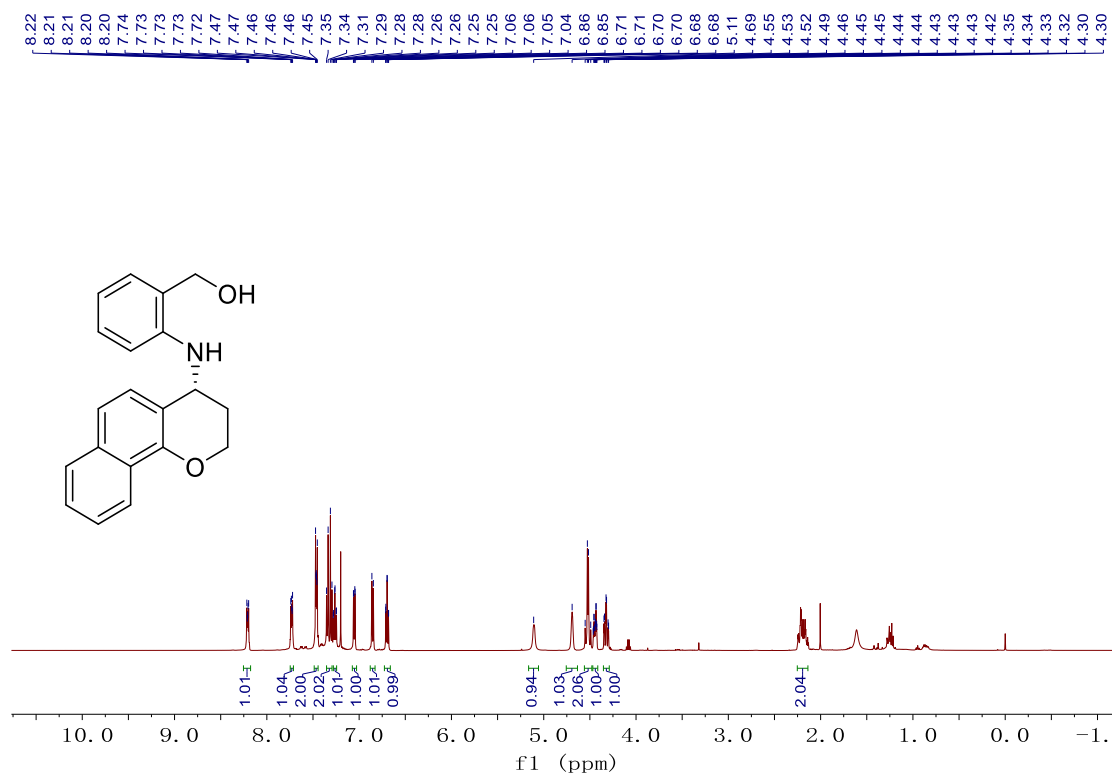
(R)-2-((6-phenylchroman-4-yl)amino)phenylmethanol (3ga)



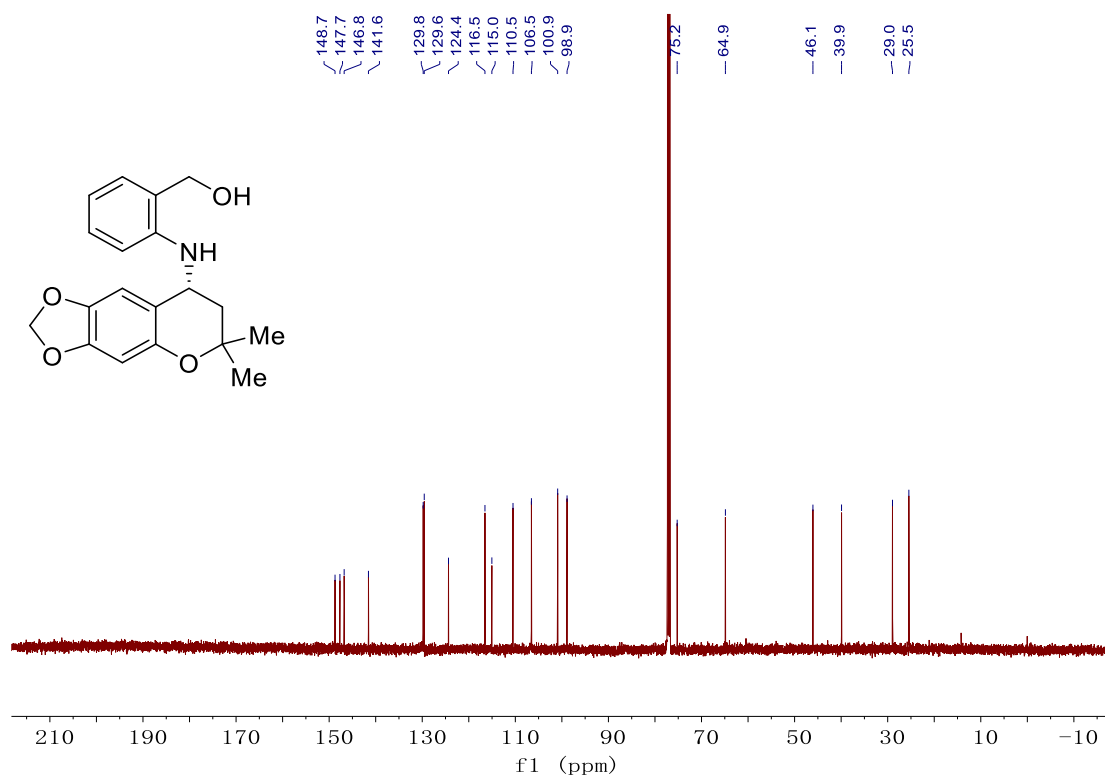
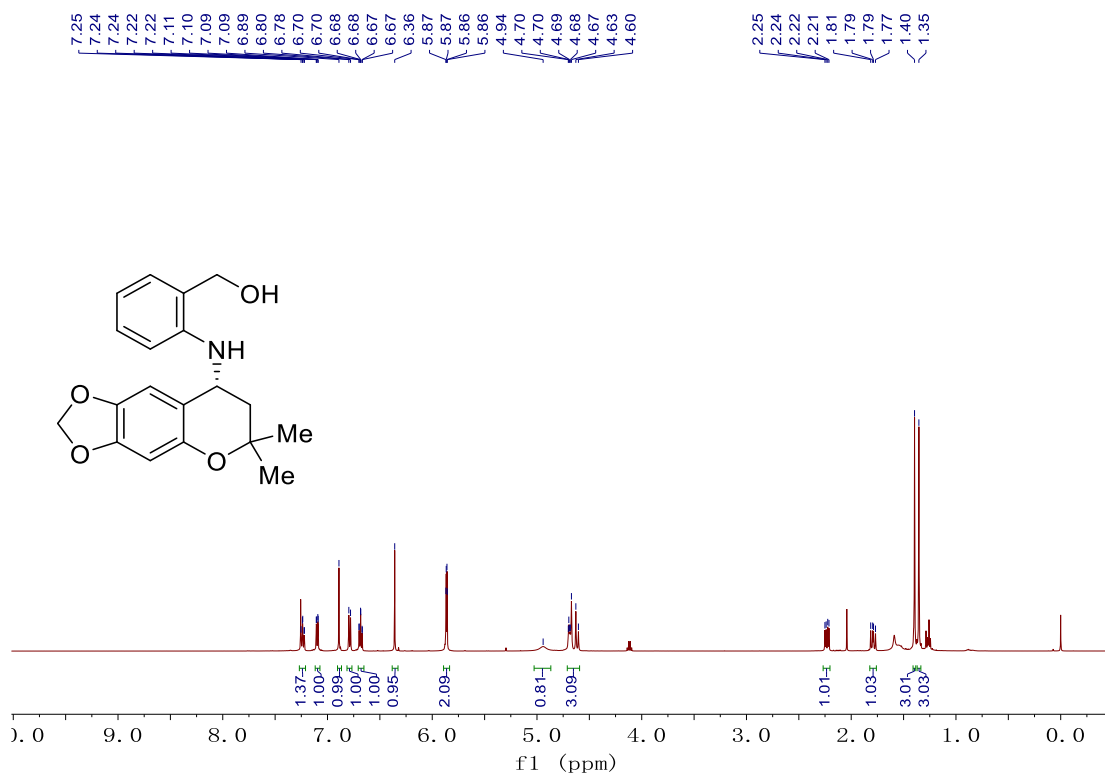
(R)-2-((6,8-dimethylchroman-4-yl)amino)phenylmethanol (3ha)



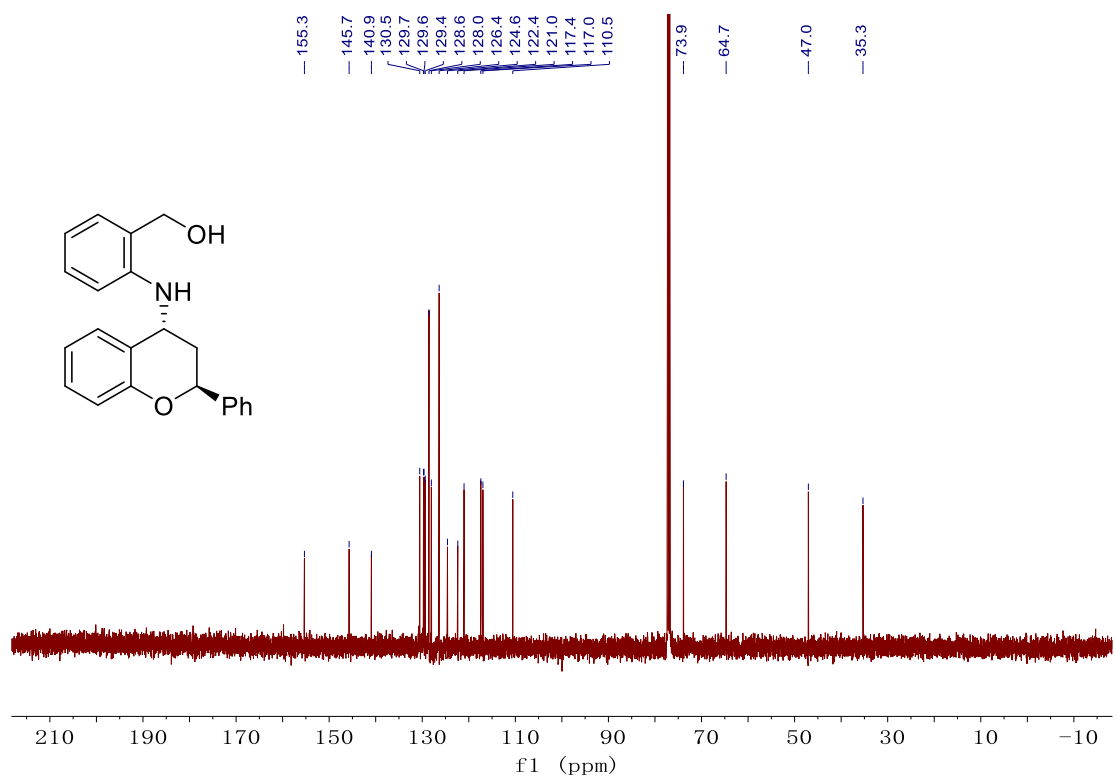
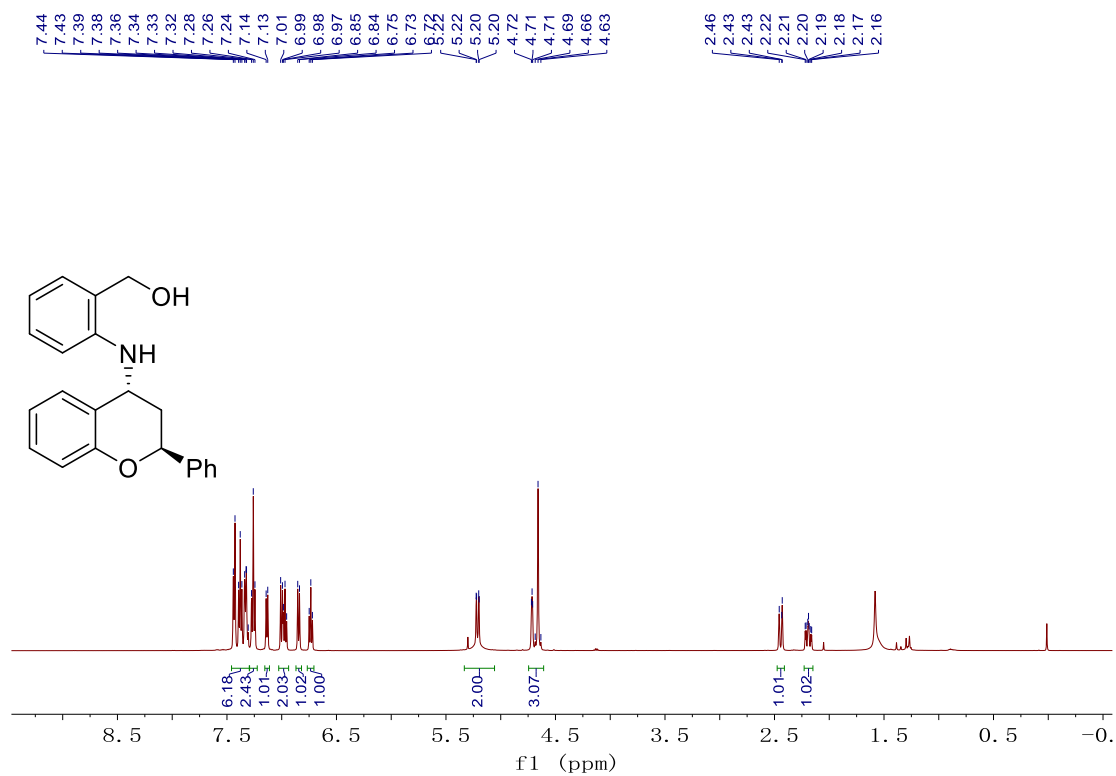
(R)-2-((3,4-dihydro-2H-benzo[h]chromen-4-yl)amino)phenyl)methanol (3ia)



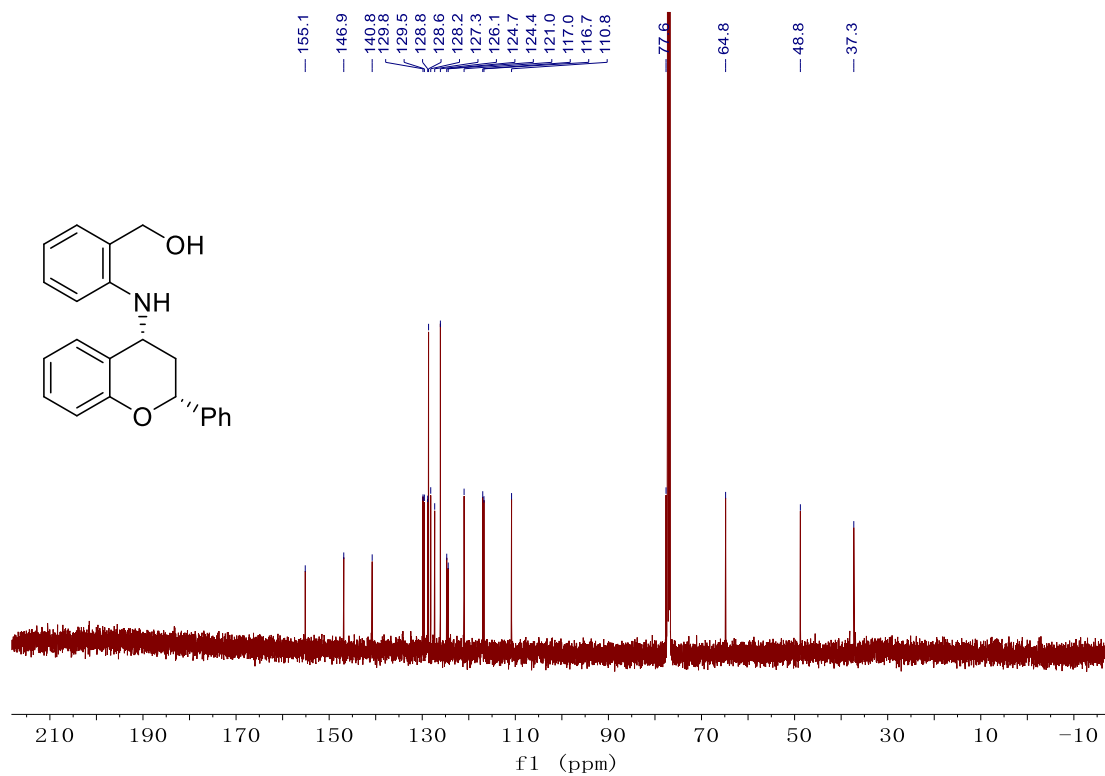
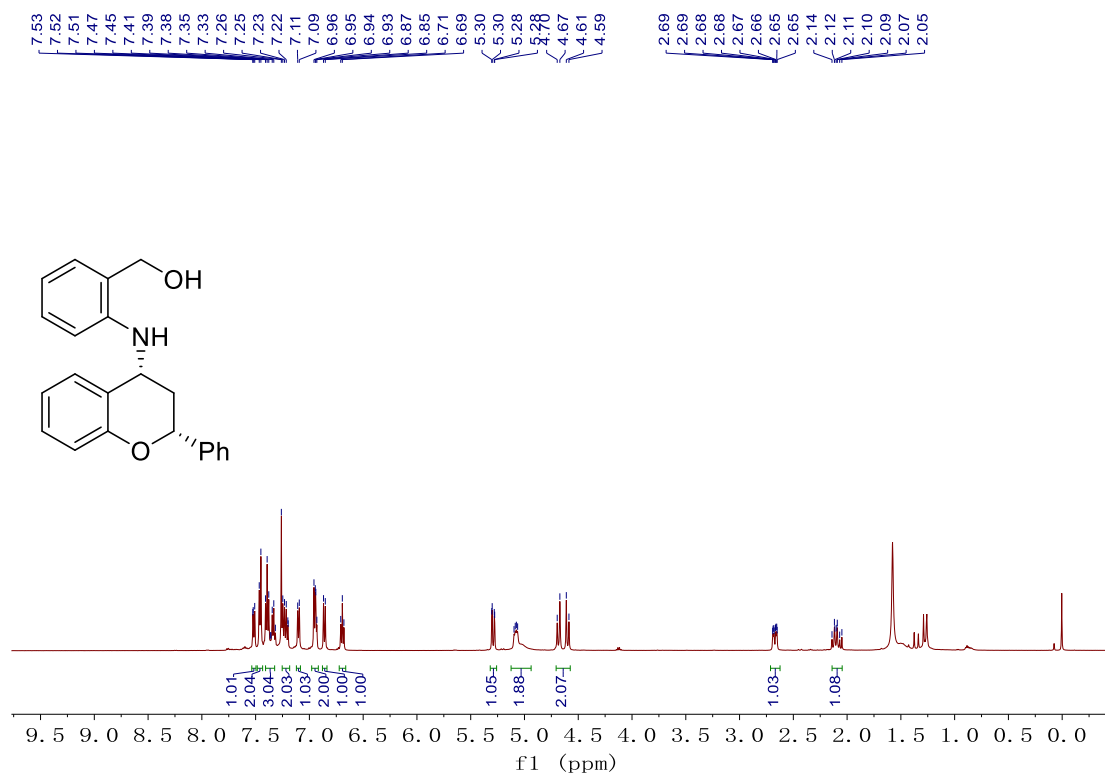
(R)-2-((6,6-dimethyl-7,8-dihydro-6H-[1,3]dioxolo[4,5-g]chromen-8-yl)amino)phenylmethanol (3ja)



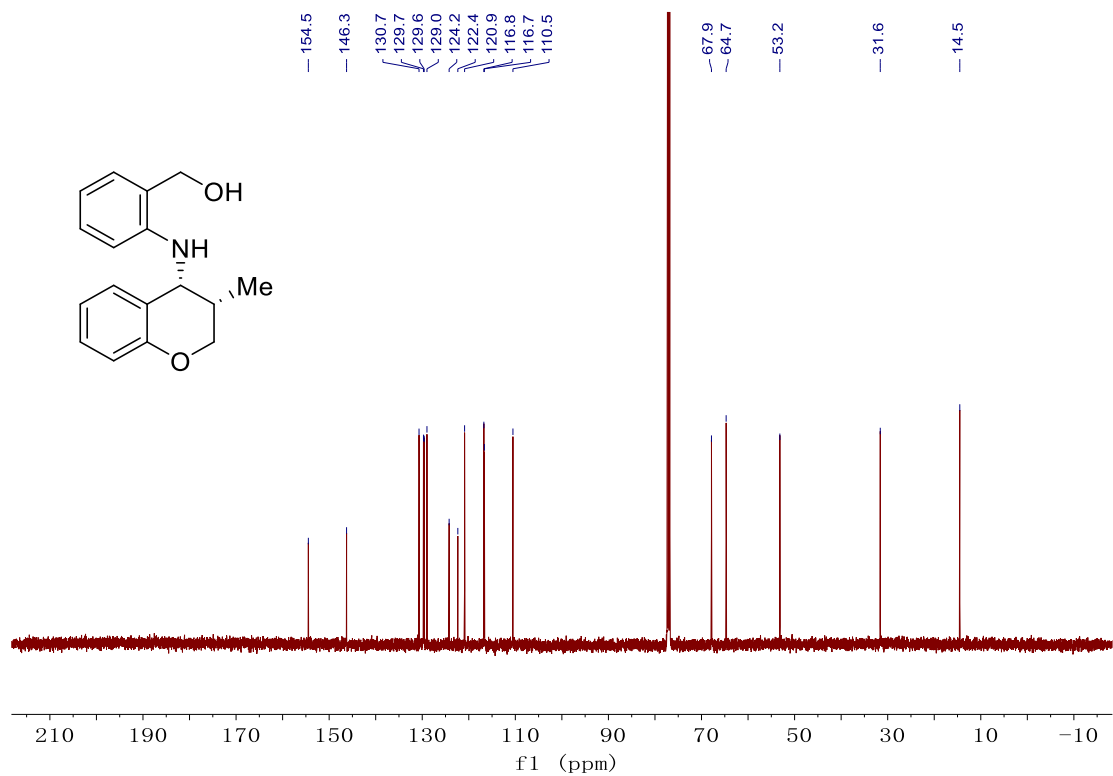
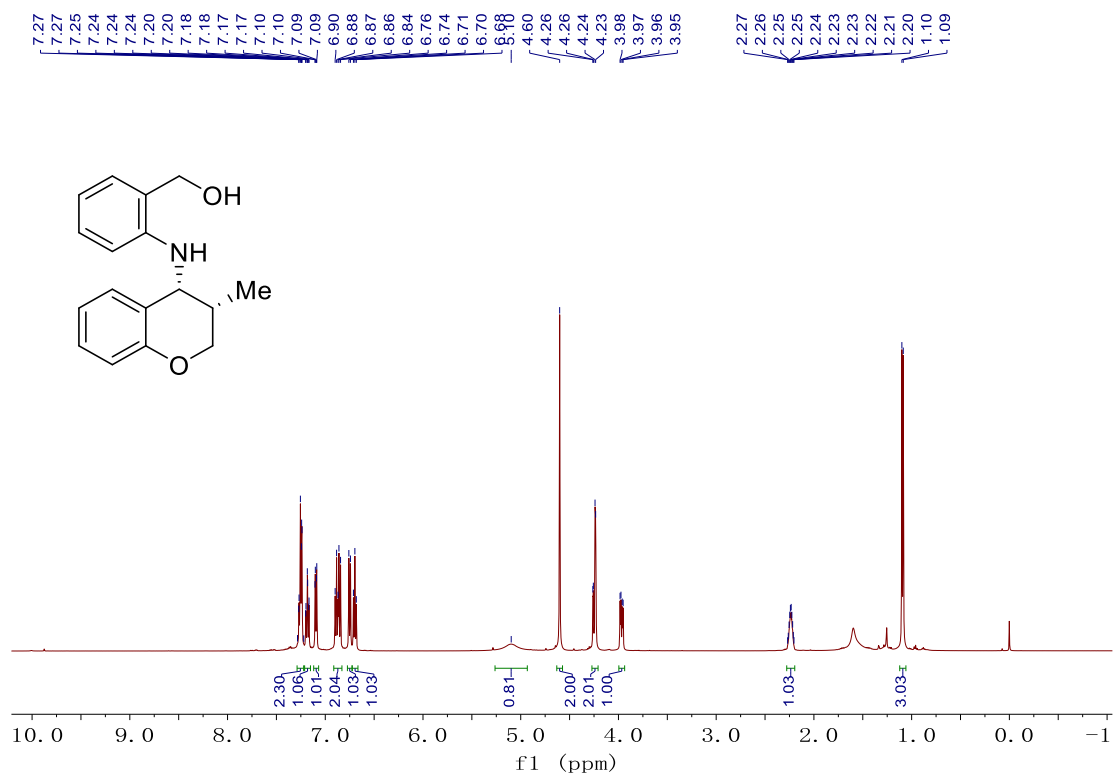
(2-(((2S,4R)-2-phenylchroman-4-yl)amino)phenyl)methanol (3ka)



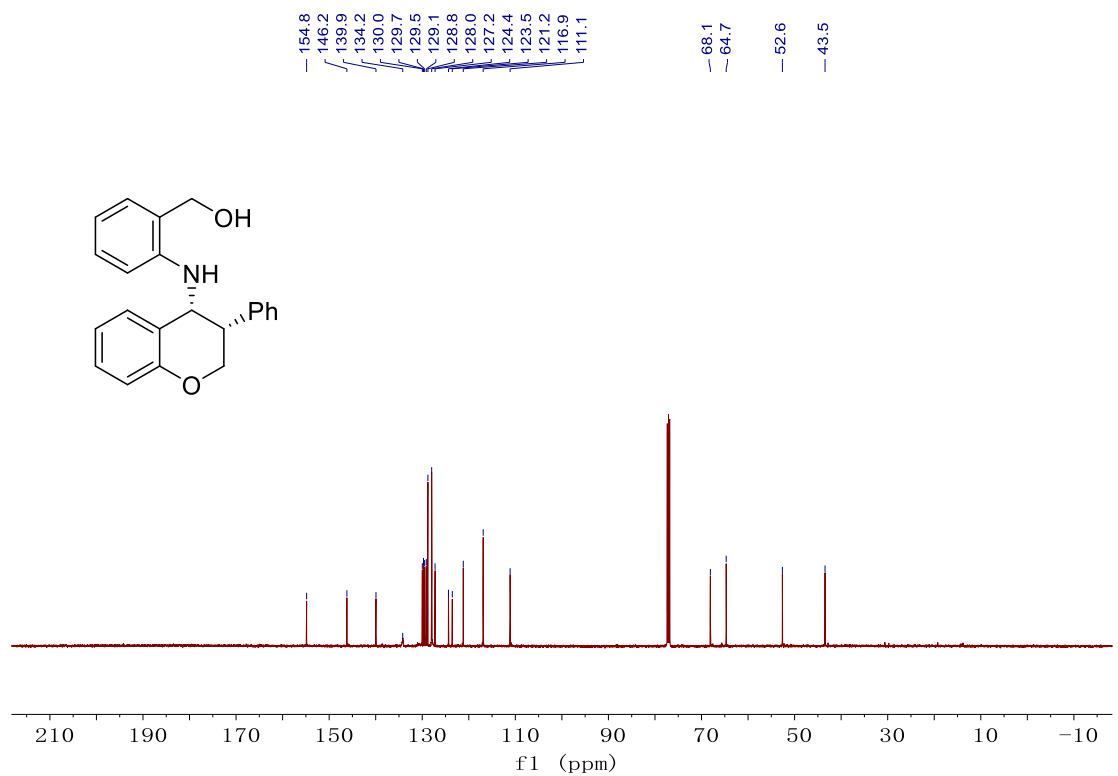
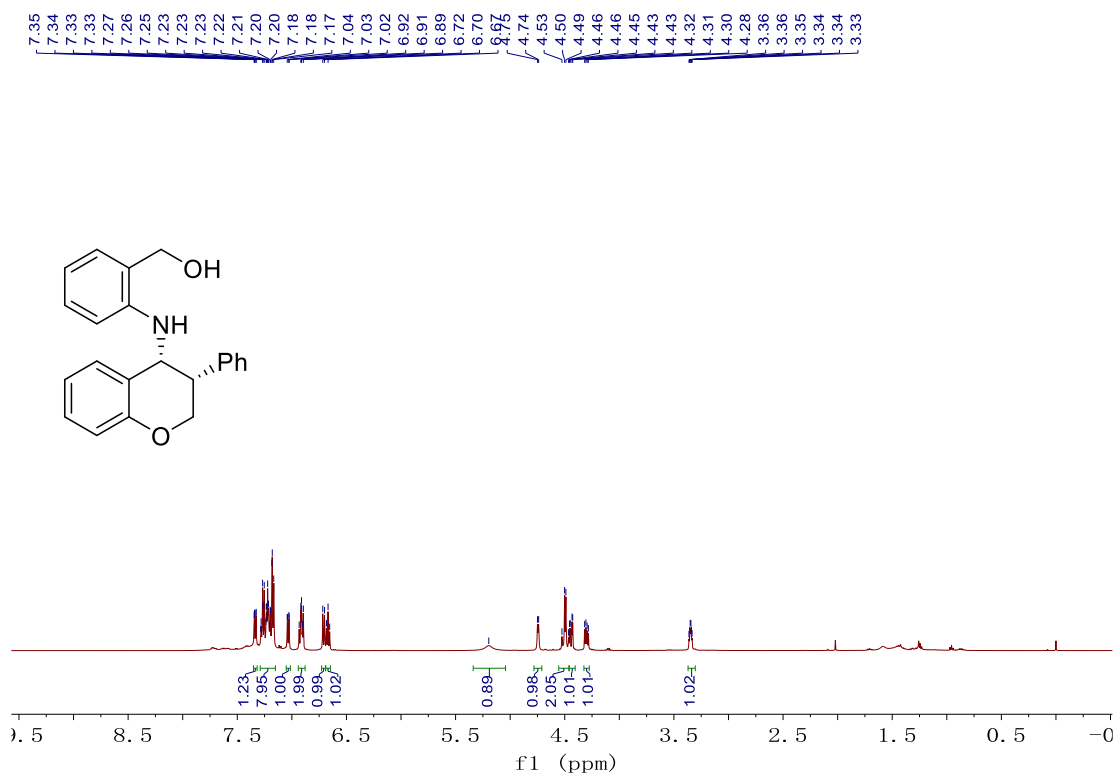
(2-(((2R,4R)-2-phenylchroman-4-yl)amino)phenyl)methanol (3ka')



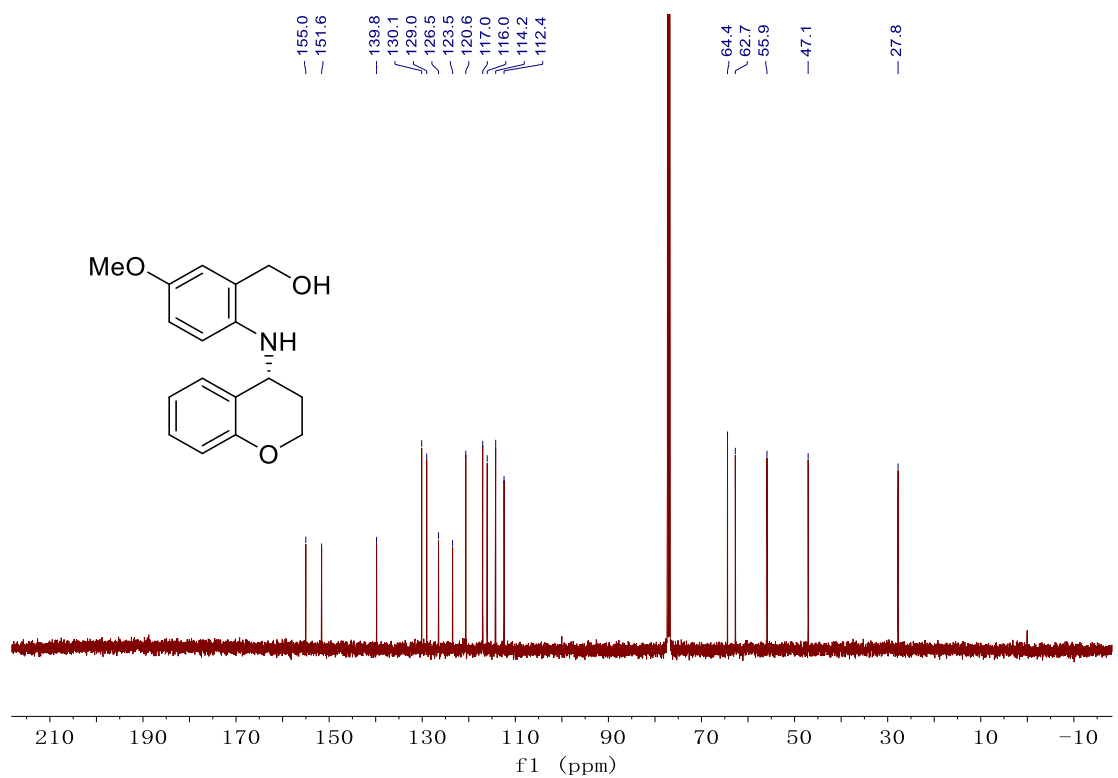
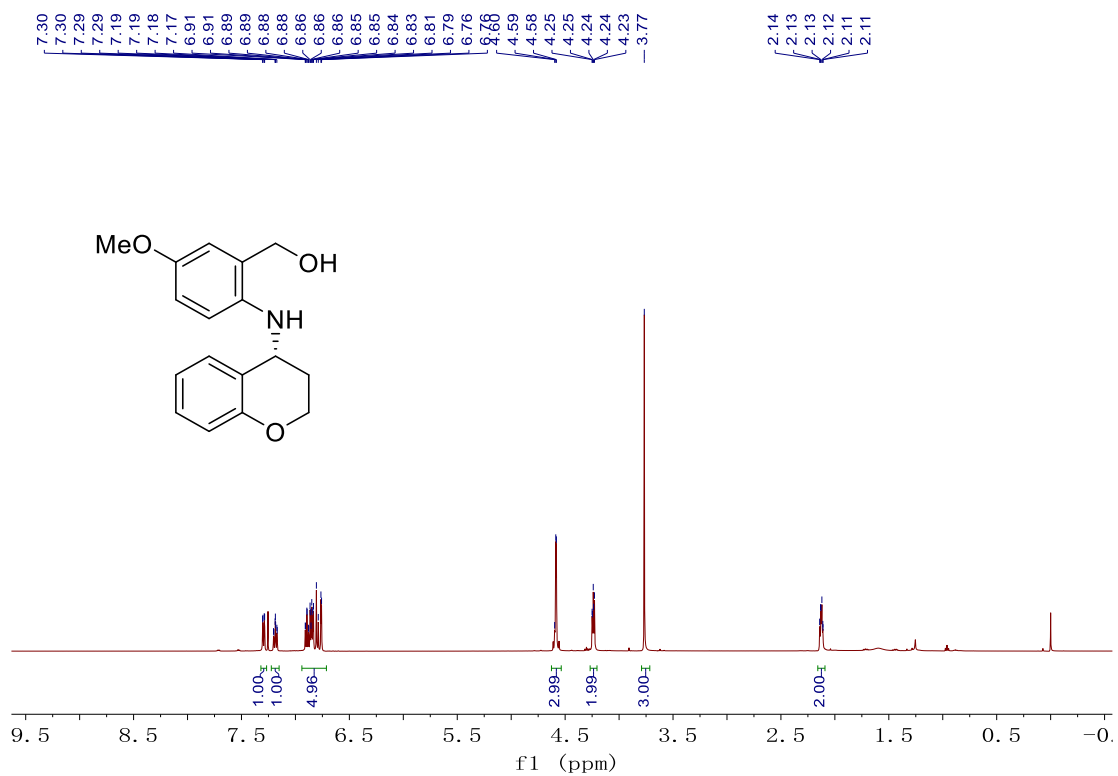
(2-(((3S,4R)-3-methylchroman-4-yl)amino)phenyl)methanol (31a)



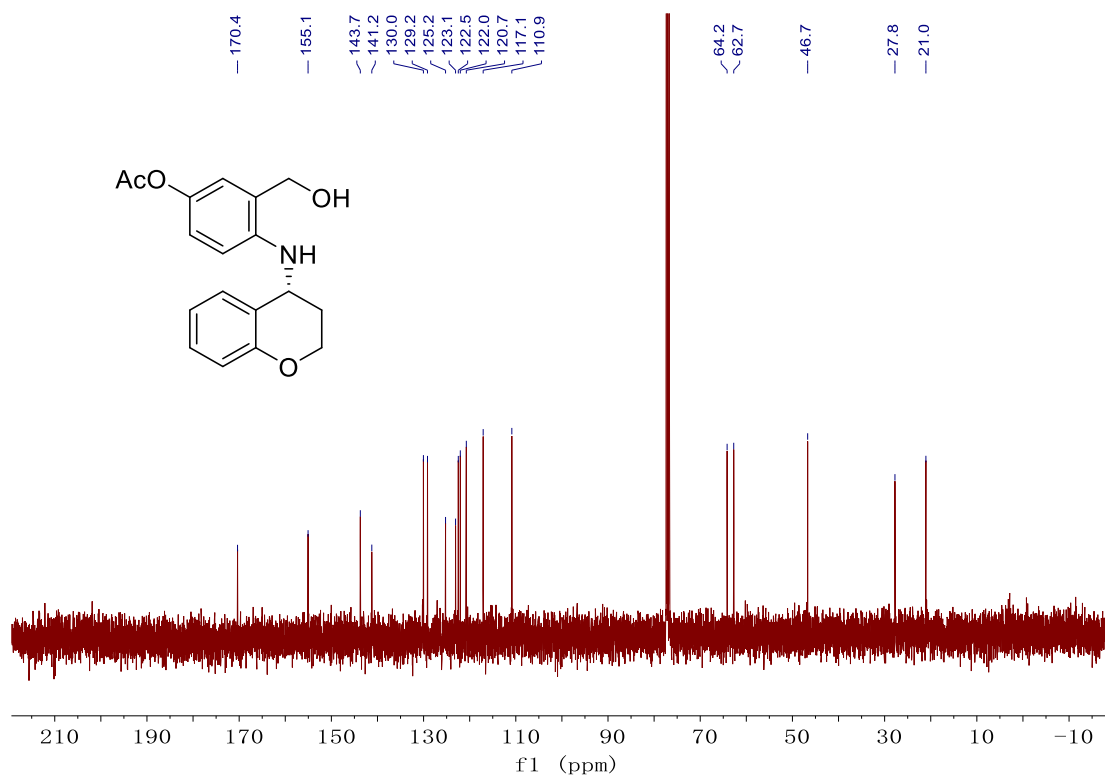
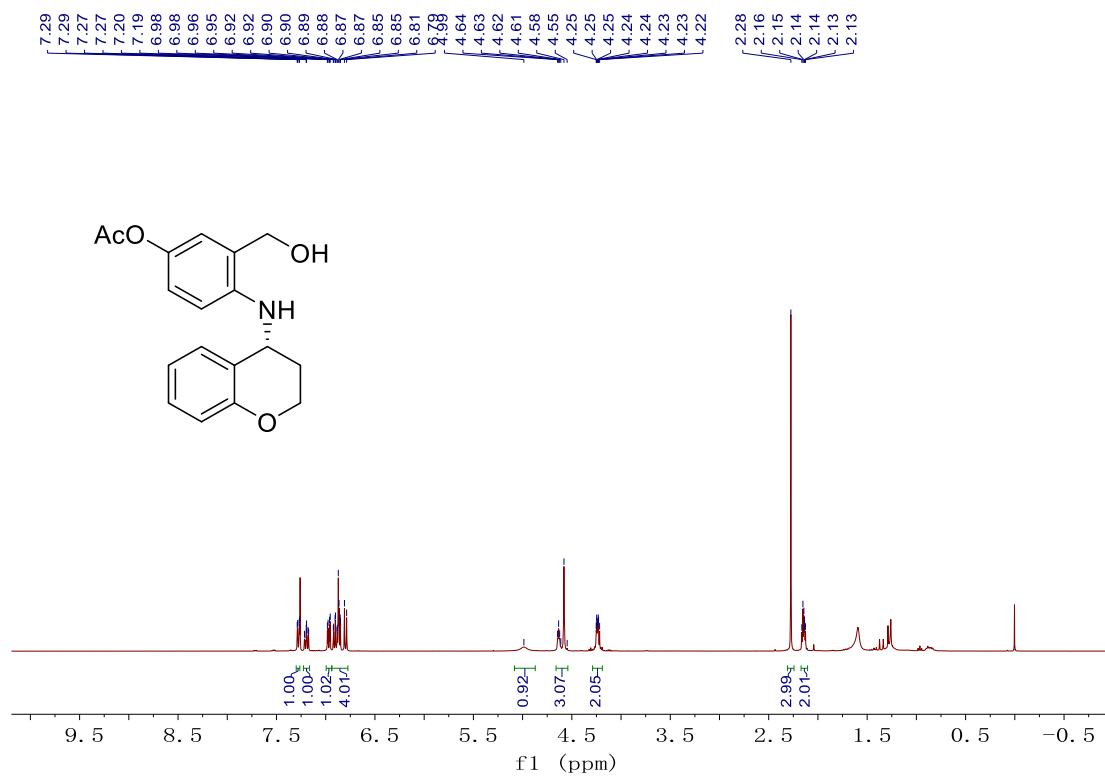
(2-(((3S,4R)-3-phenylchroman-4-yl)amino)phenyl)methanol (3ma)



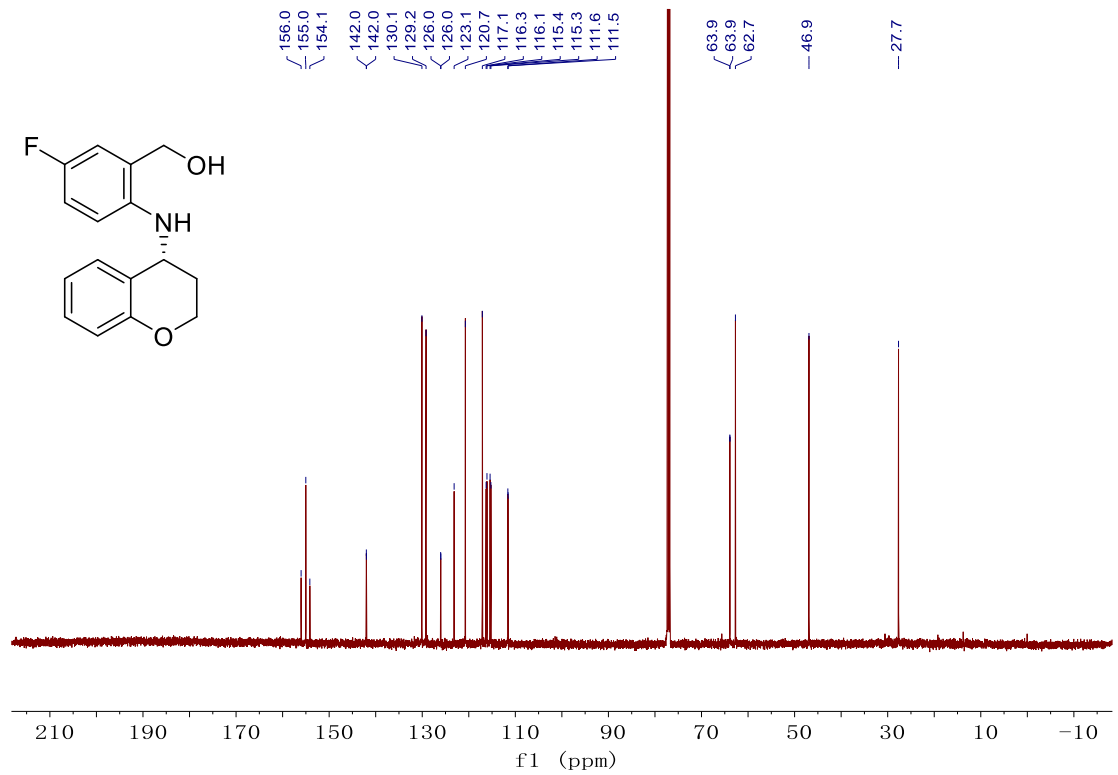
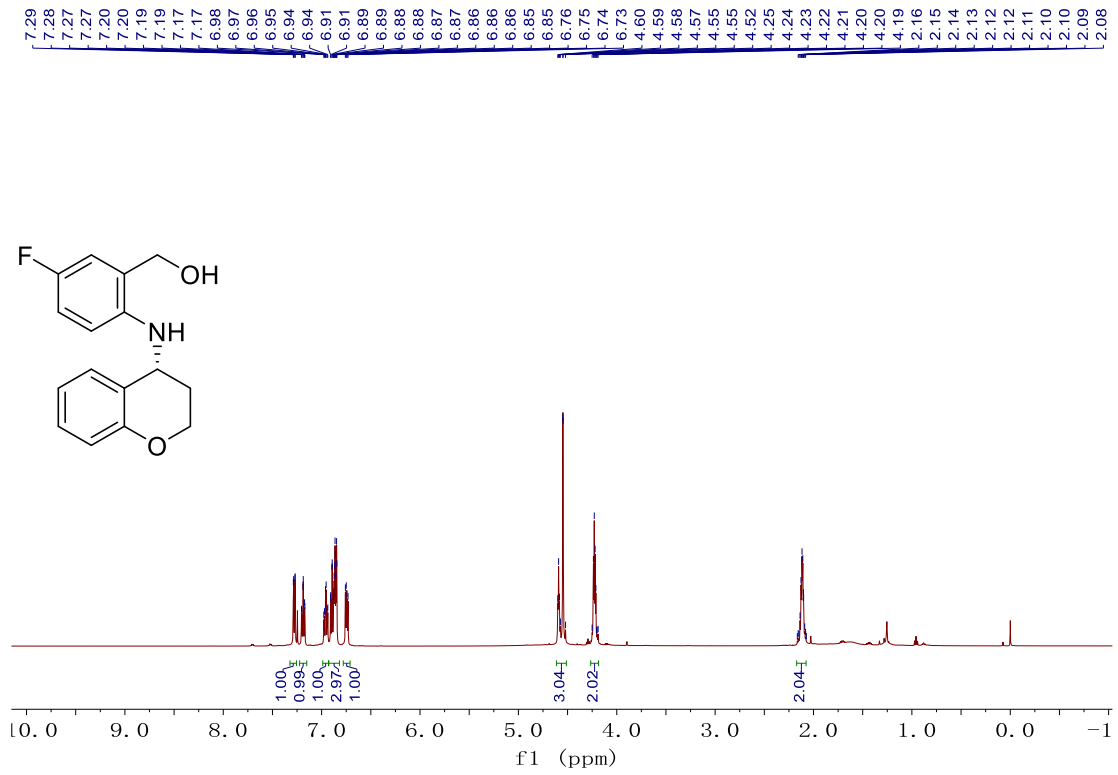
(R)-2-(chroman-4-ylamino)-5-methoxyphenylmethanol (3ab)

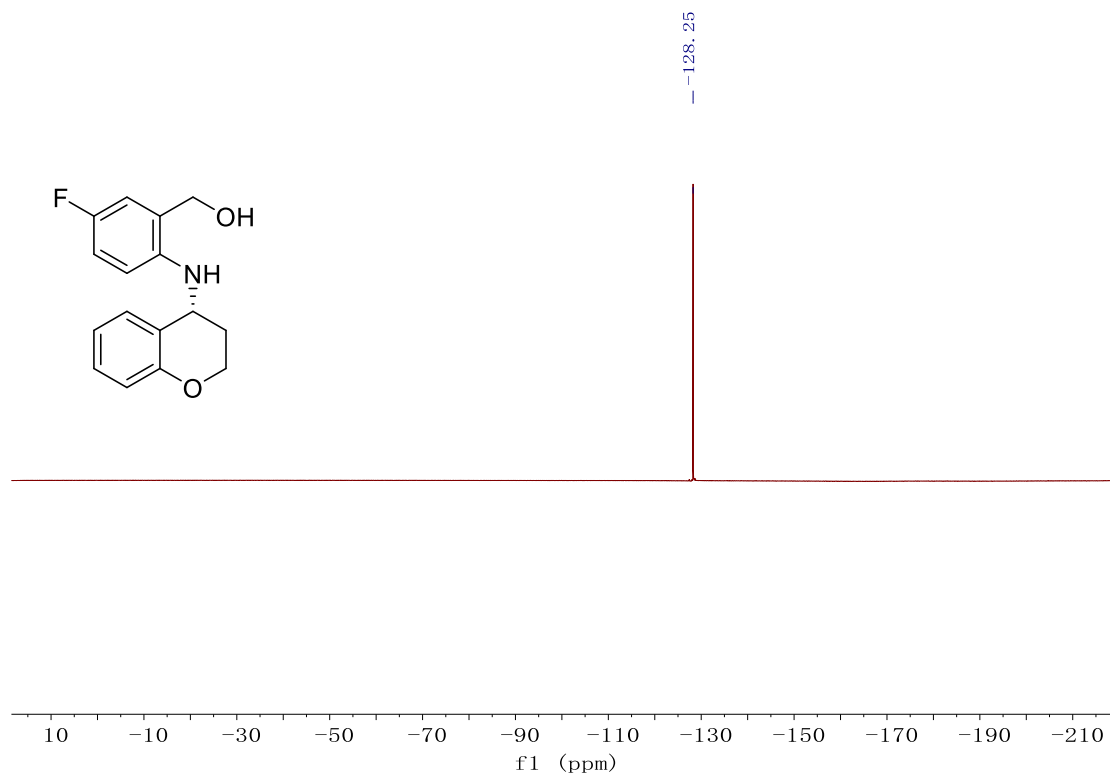


(R)-4-(chroman-4-ylamino)-3-(hydroxymethyl)phenyl acetate (3ac)

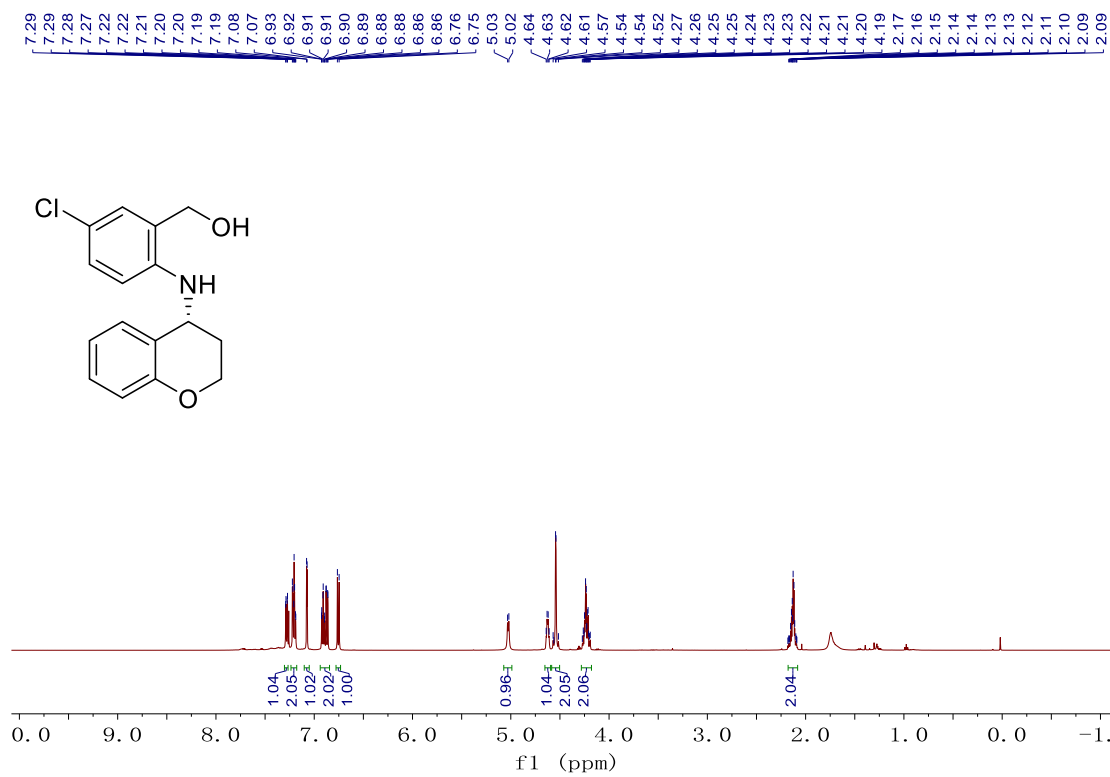


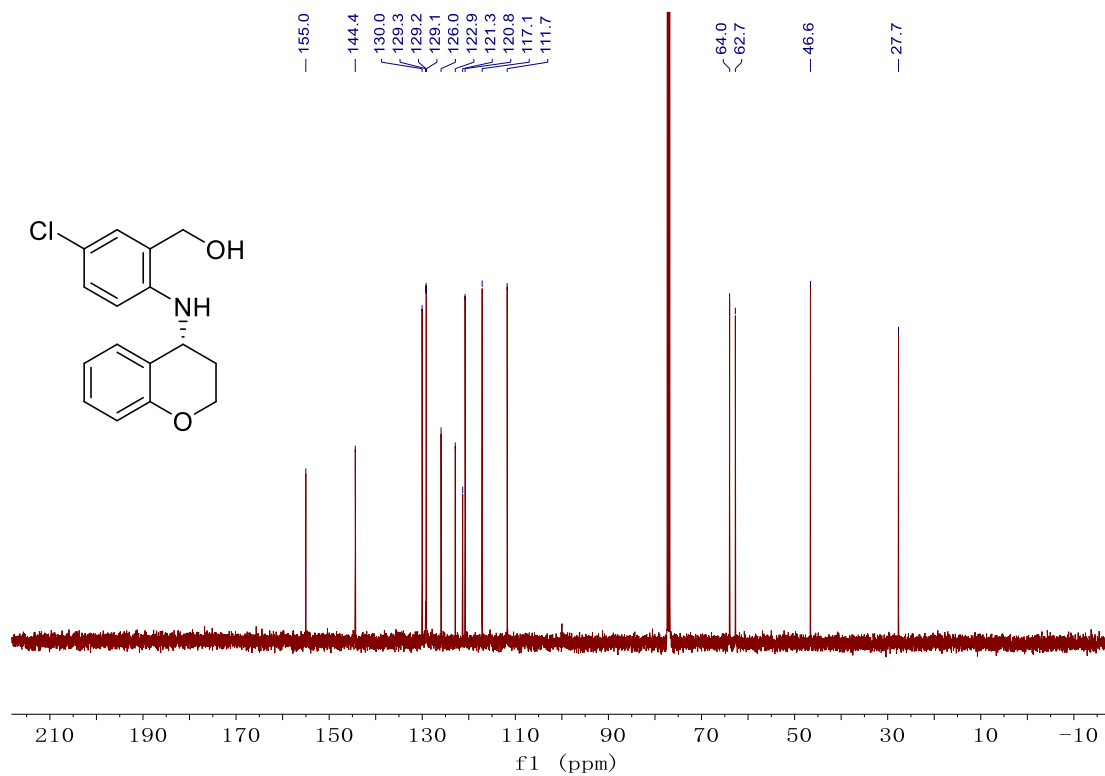
(R)-2-(chroman-4-ylamino)-5-fluorophenylmethanol (3ad)



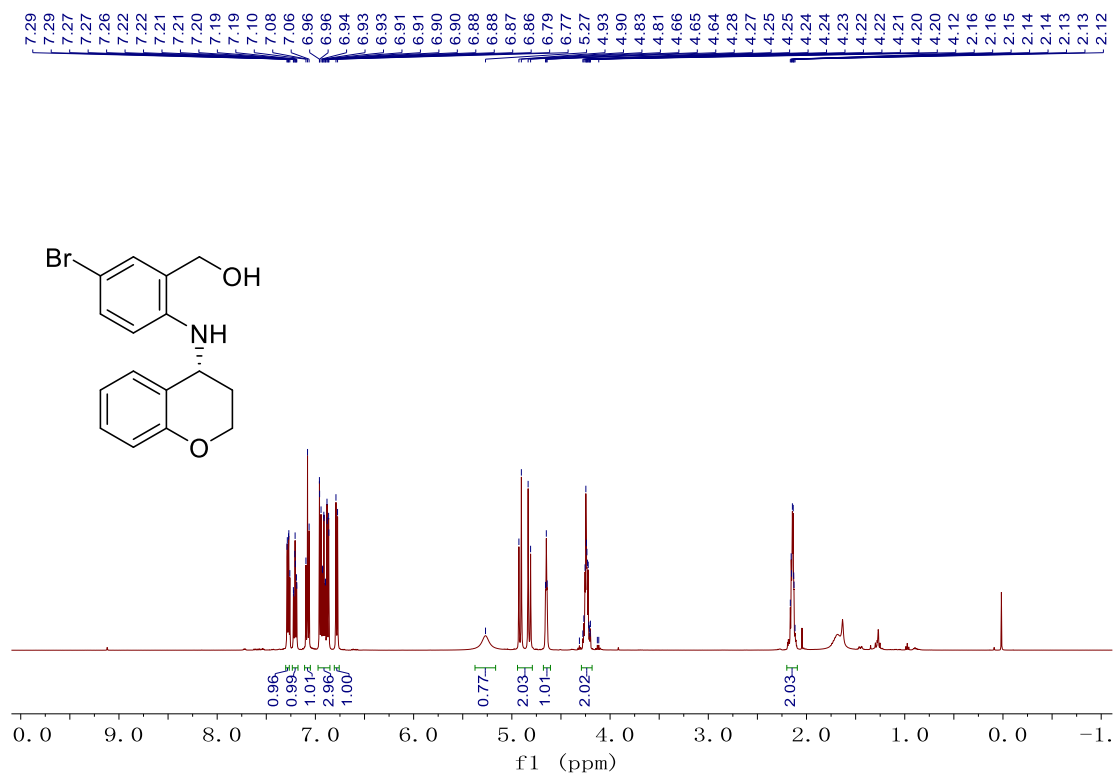


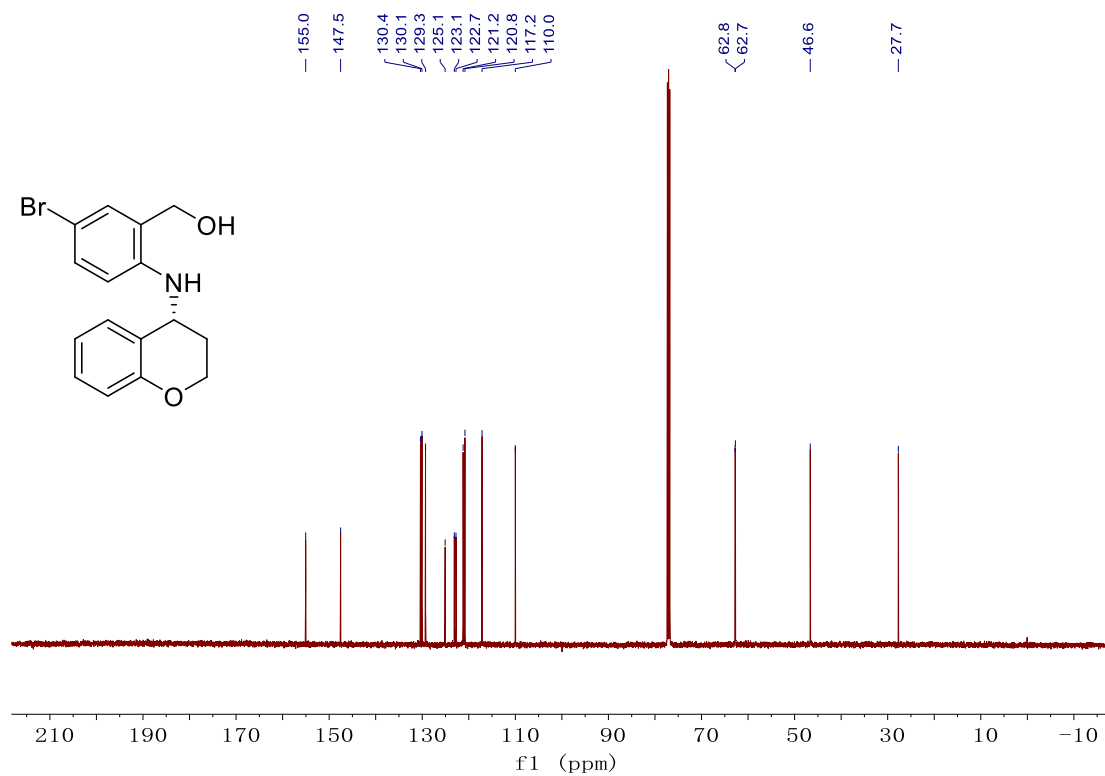
(R)-5-chloro-2-(chroman-4-ylamino)phenylmethanol (3ae)



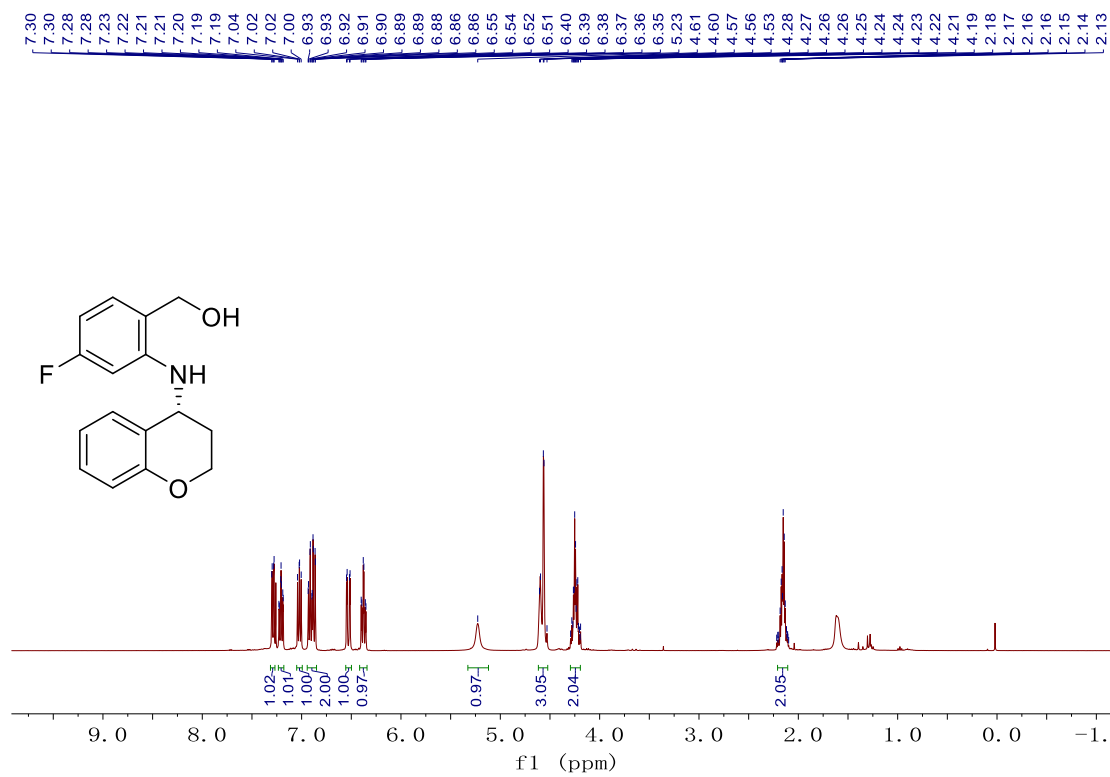


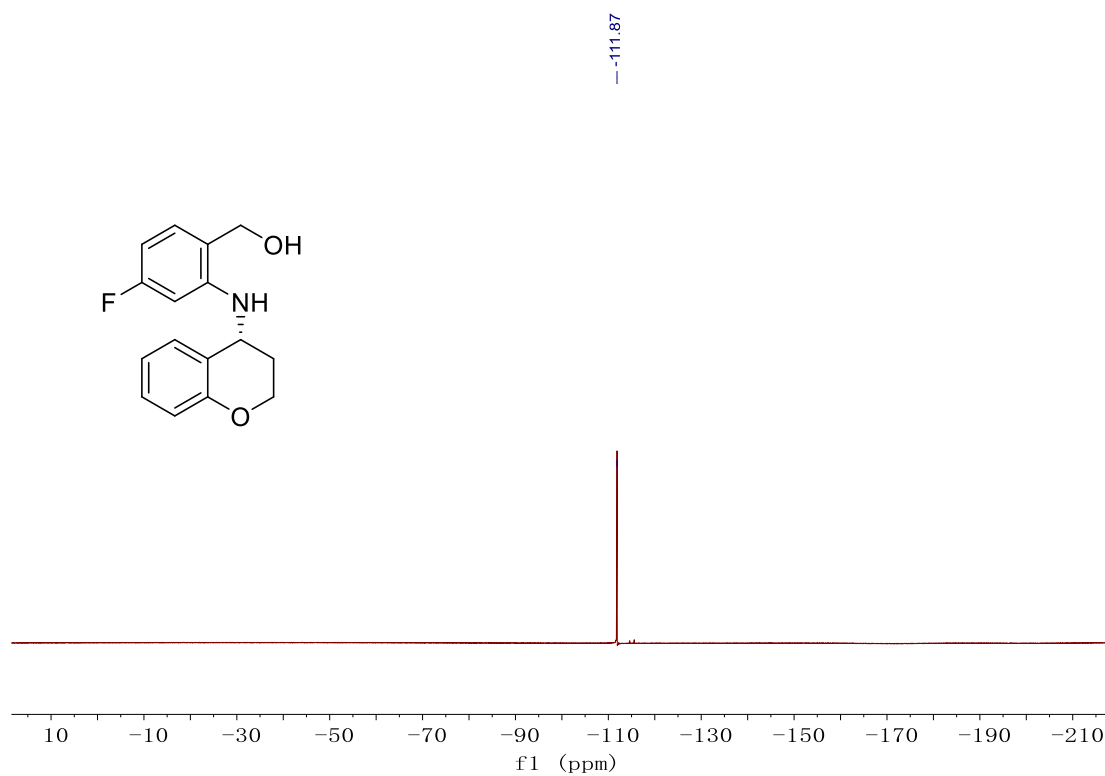
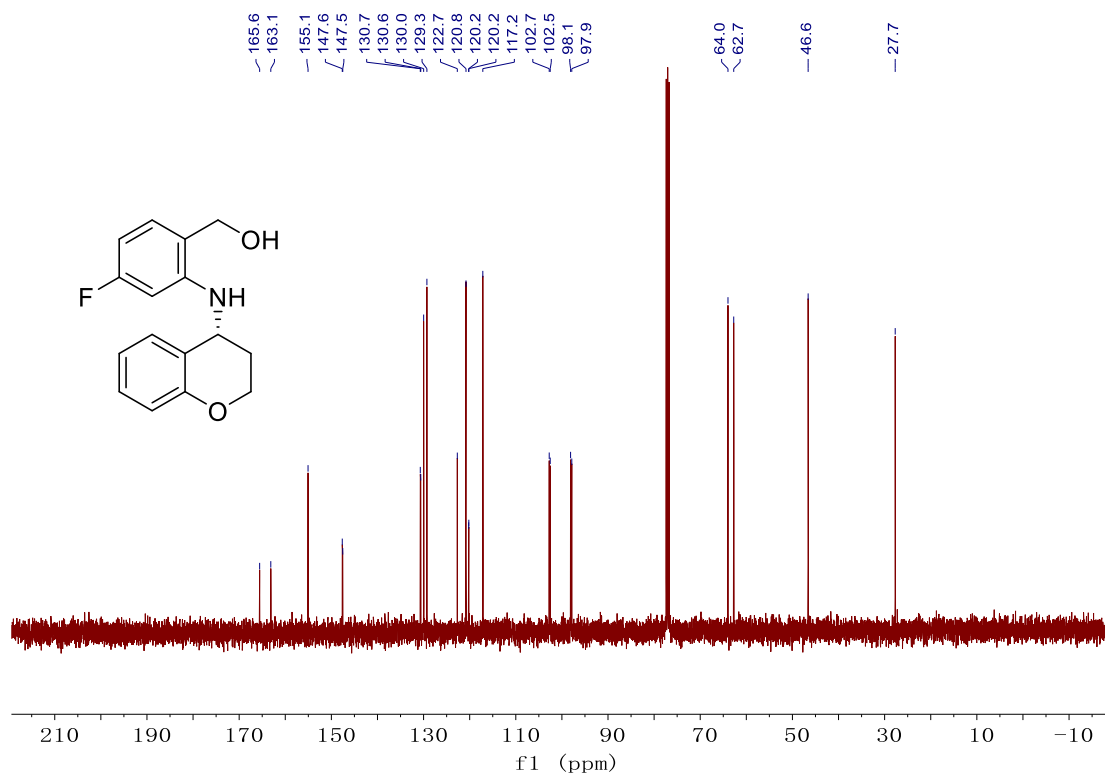
(R)-5-(5-bromo-2-(chroman-4-ylamino)phenyl)methanol (3af)



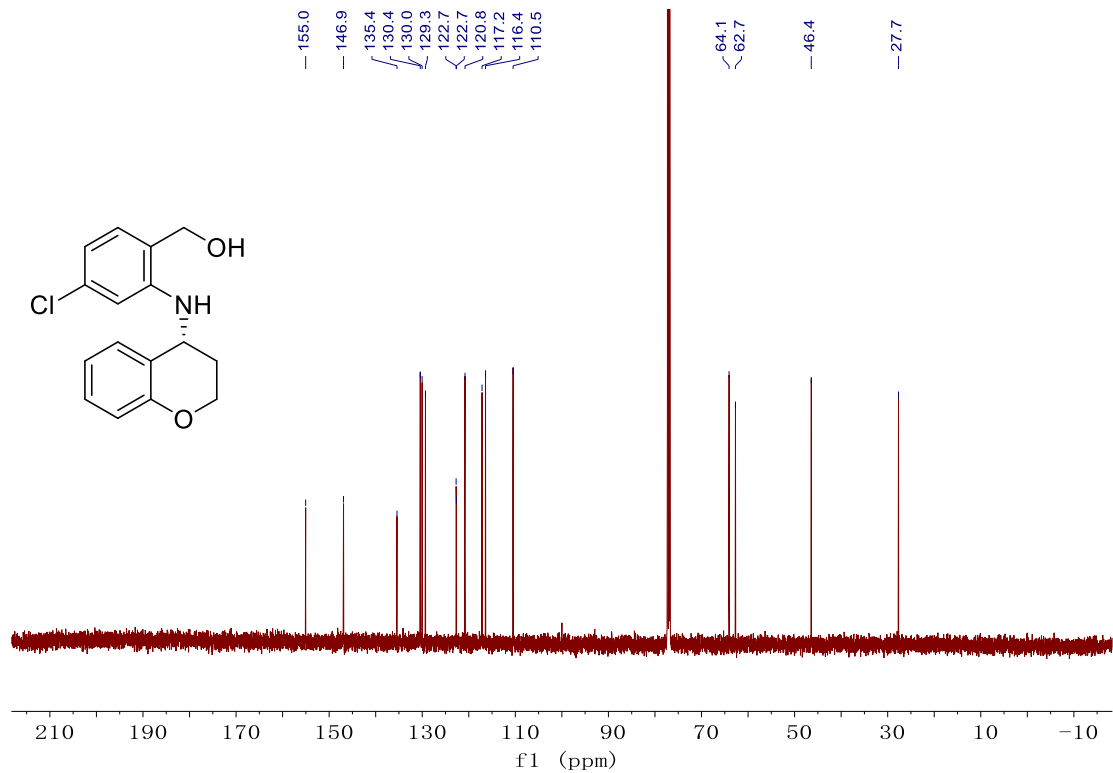
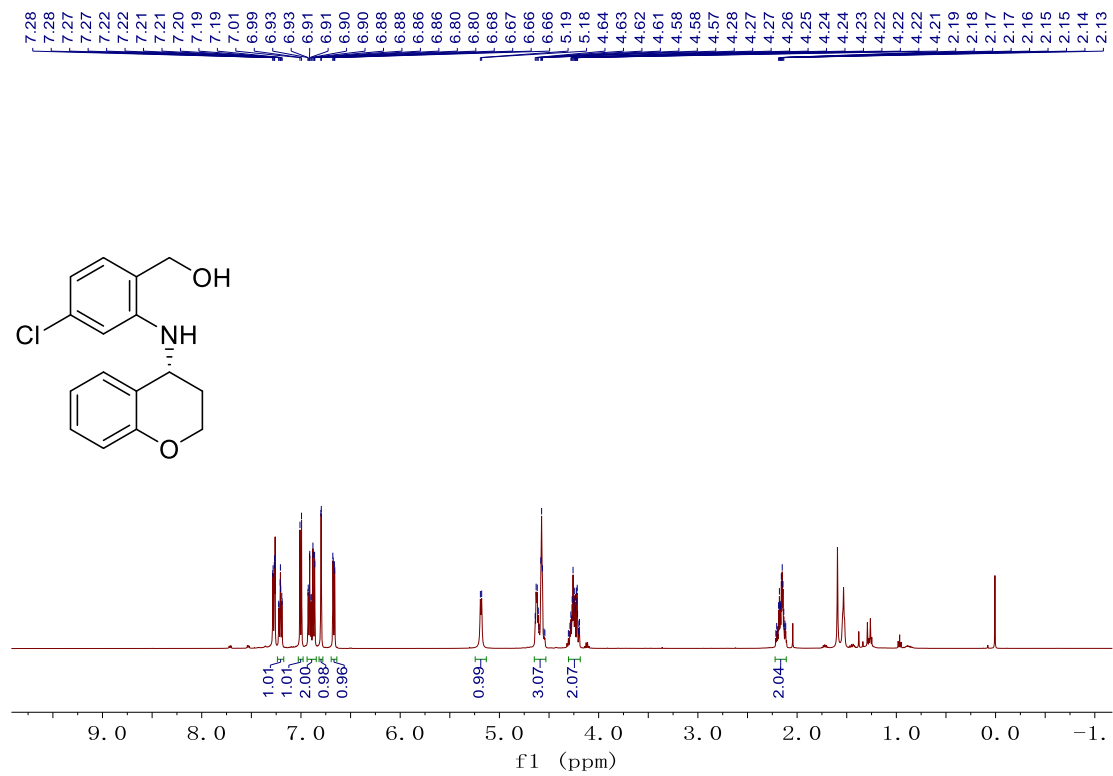


(R)-2-(chroman-4-ylamino)-4-fluorophenyl)methanol (3ag)

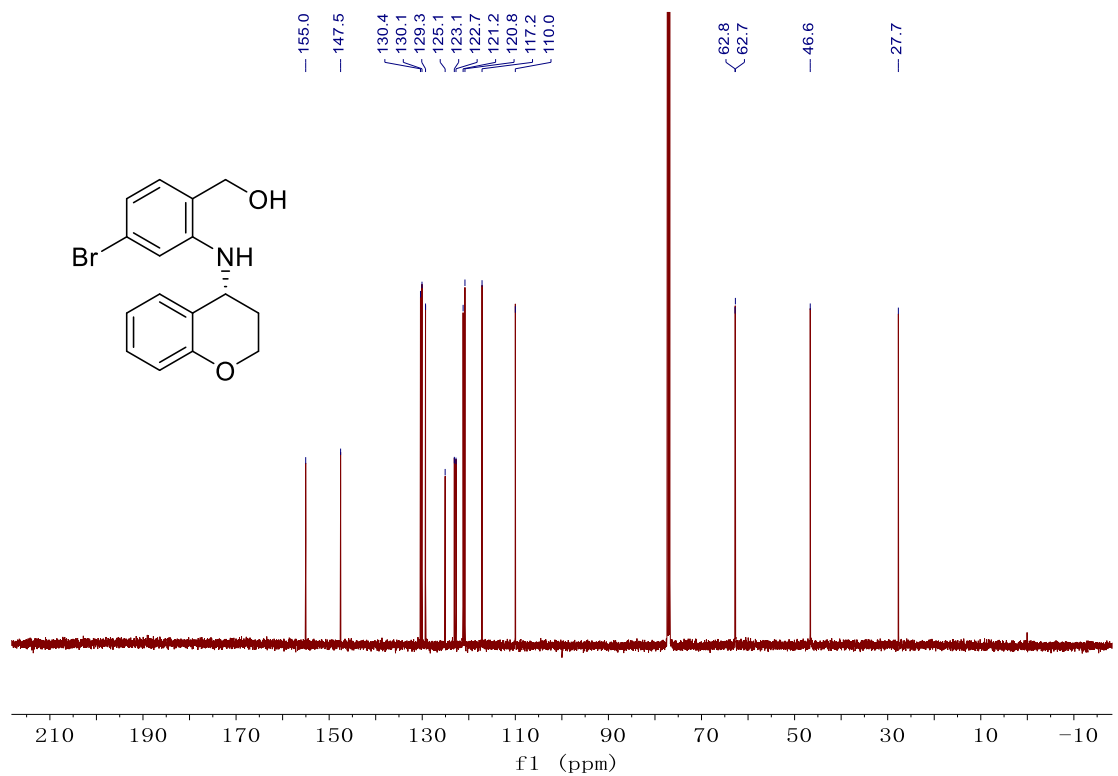
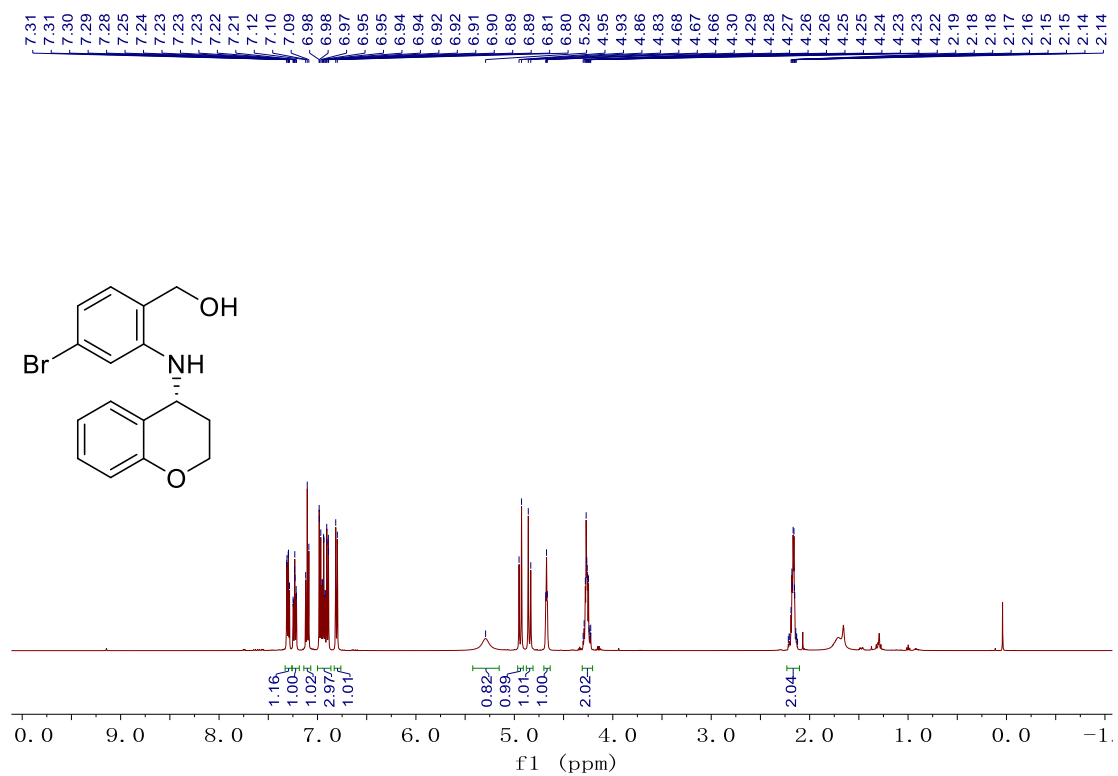




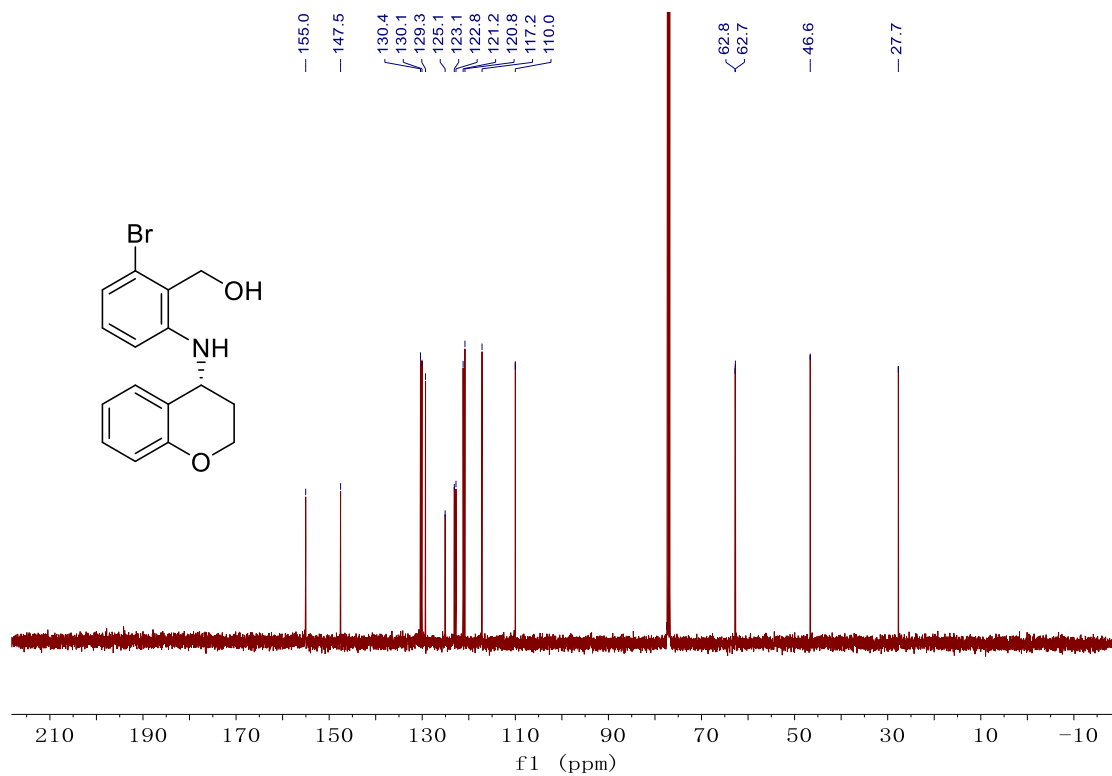
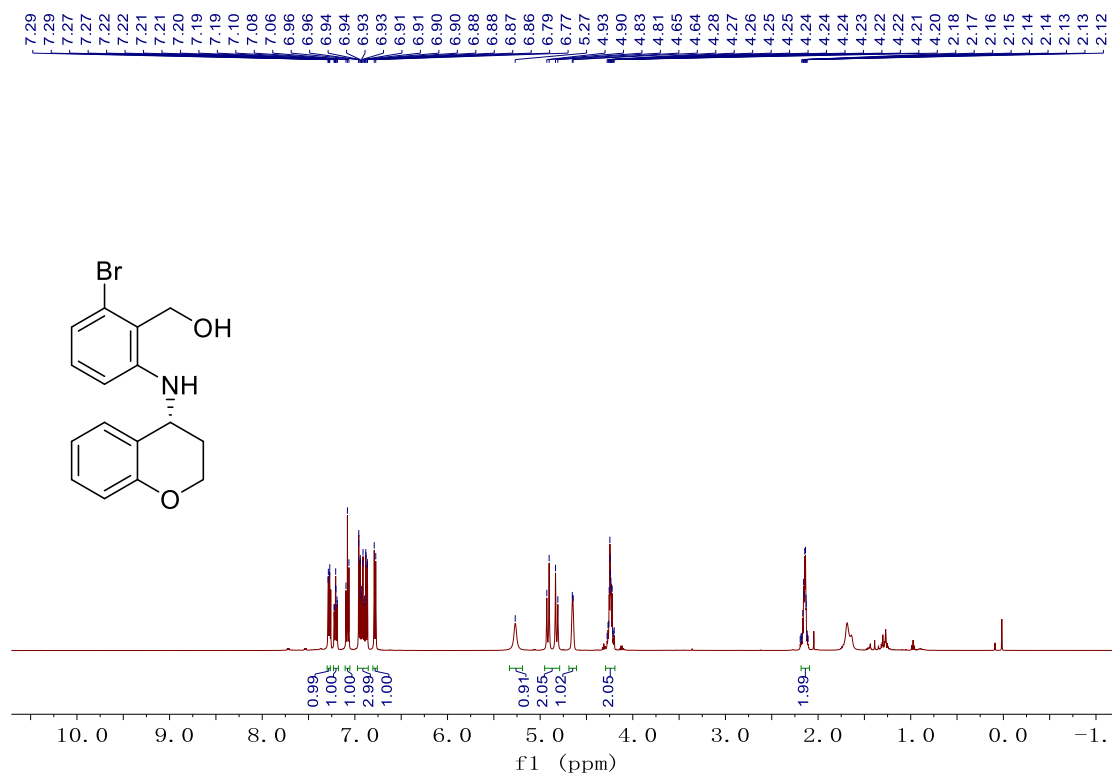
(R)-4-(4-chloro-2-(chroman-4-ylamino)phenyl)methanol (3ah)



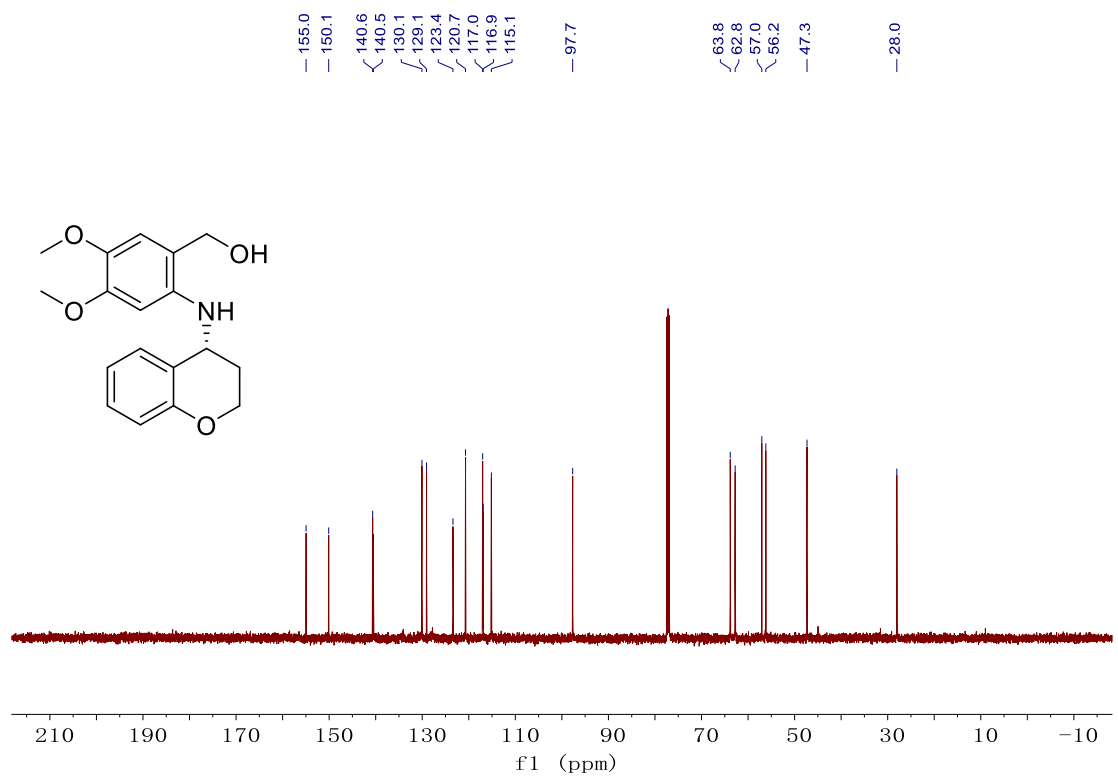
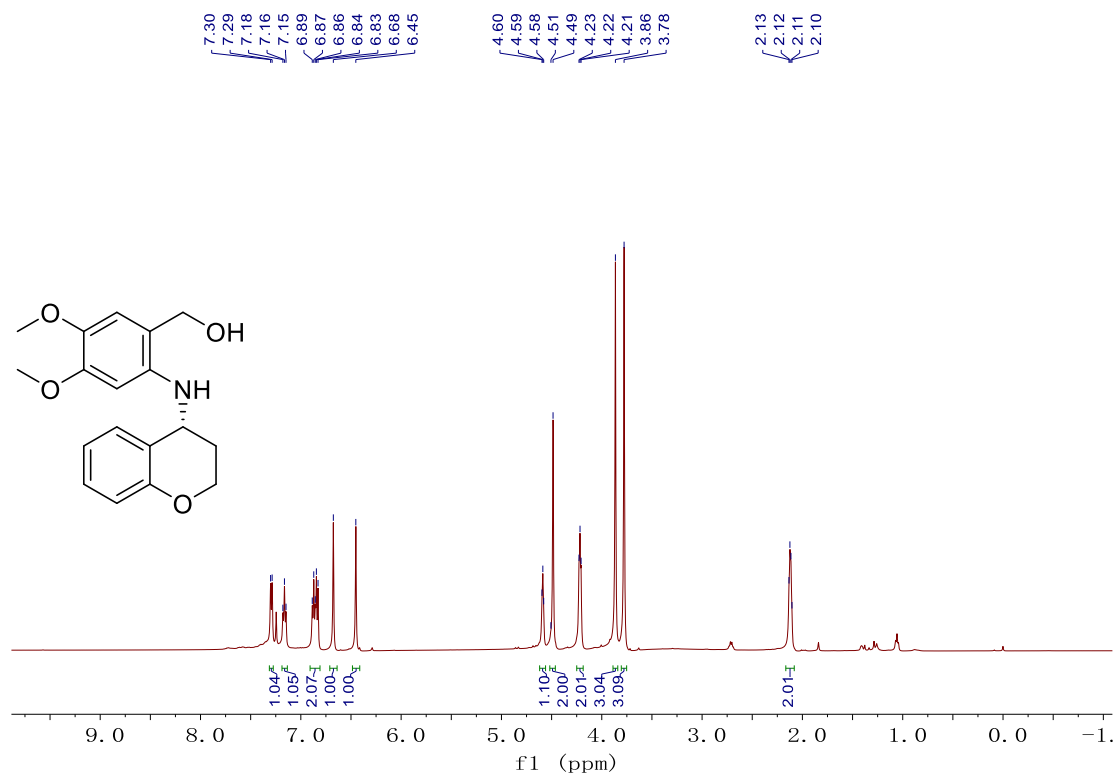
(R)-4-bromo-2-(chroman-4-ylamino)phenylmethanol (3ai)



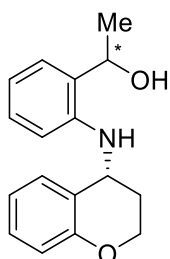
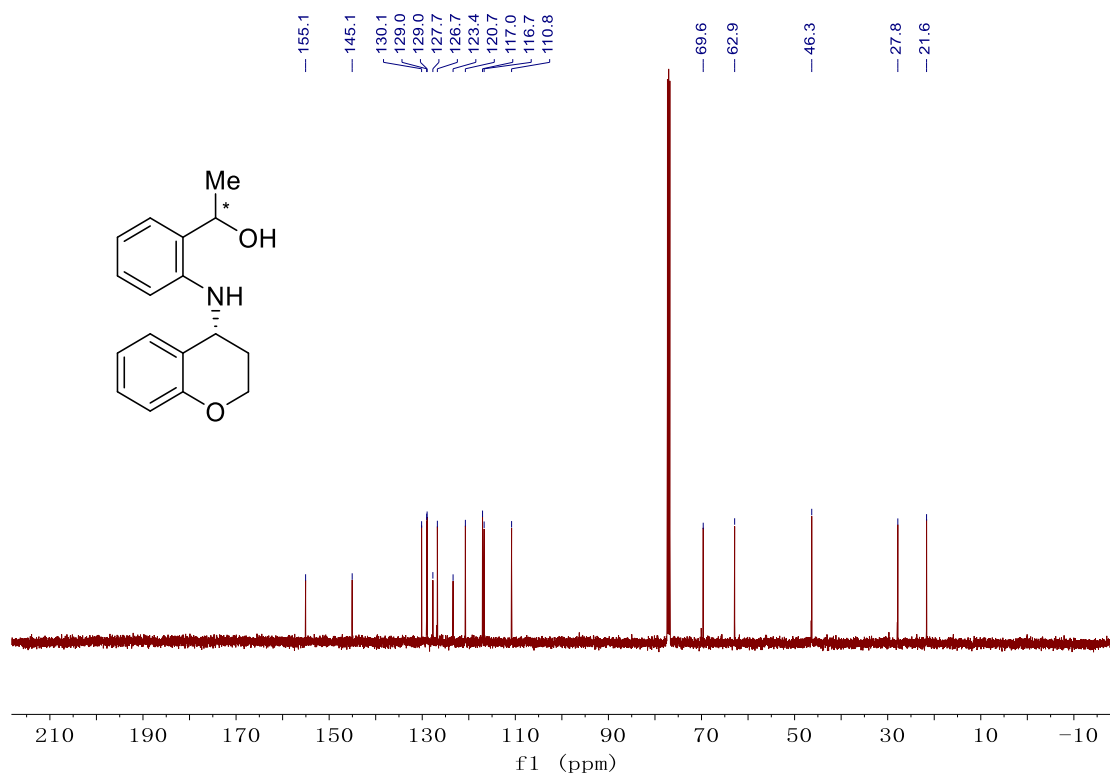
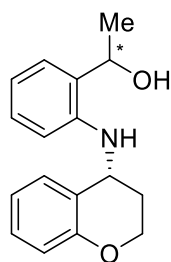
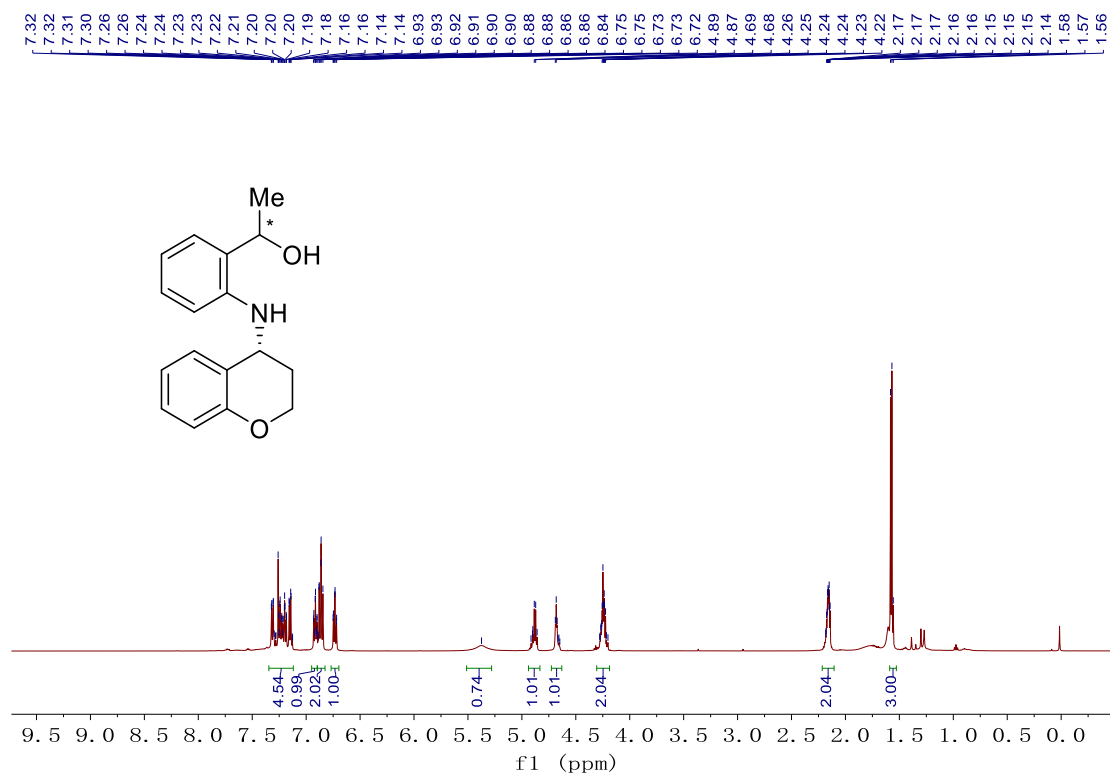
(R)-2-bromo-6-(chroman-4-ylamino)phenylmethanol (3aj)



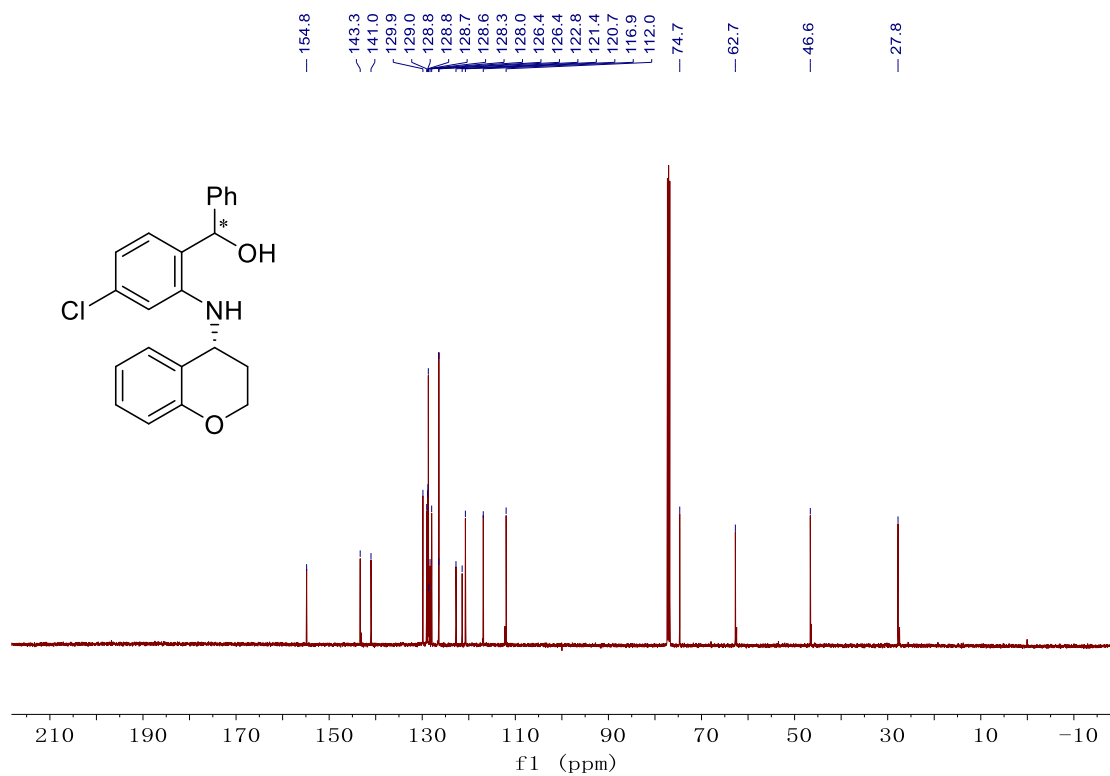
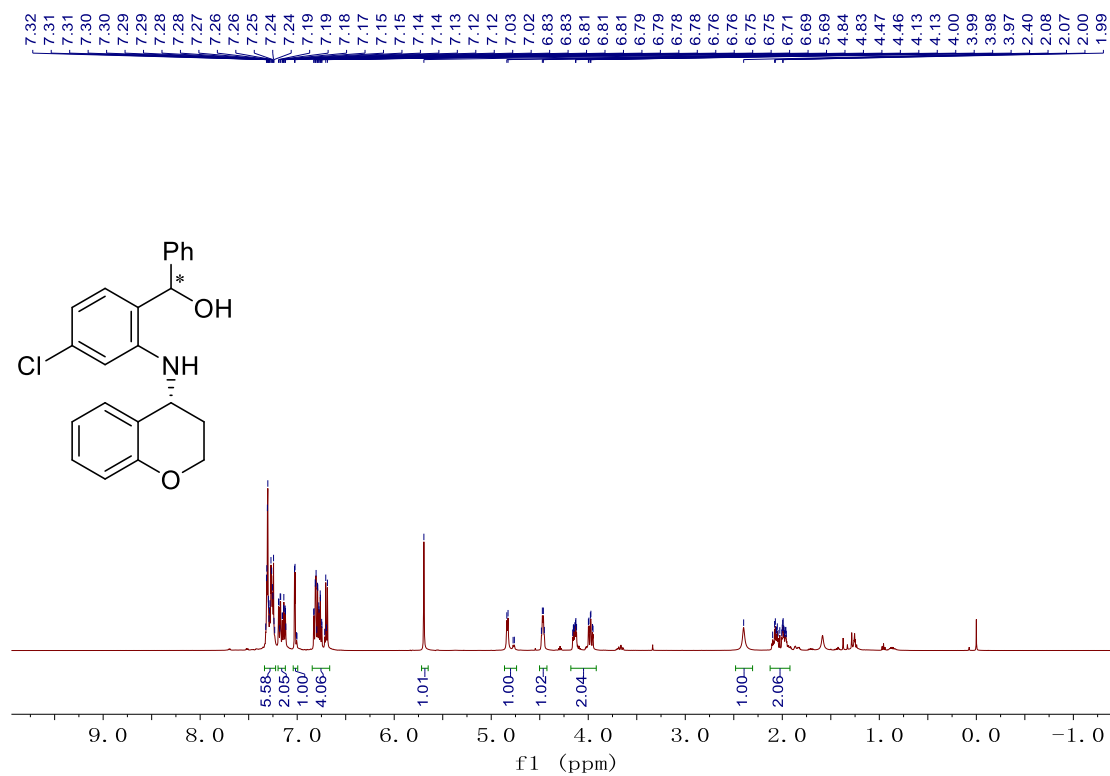
(R)-(2-(chroman-4-ylamino)-4,5-dimethoxyphenyl)methanol (3ak)



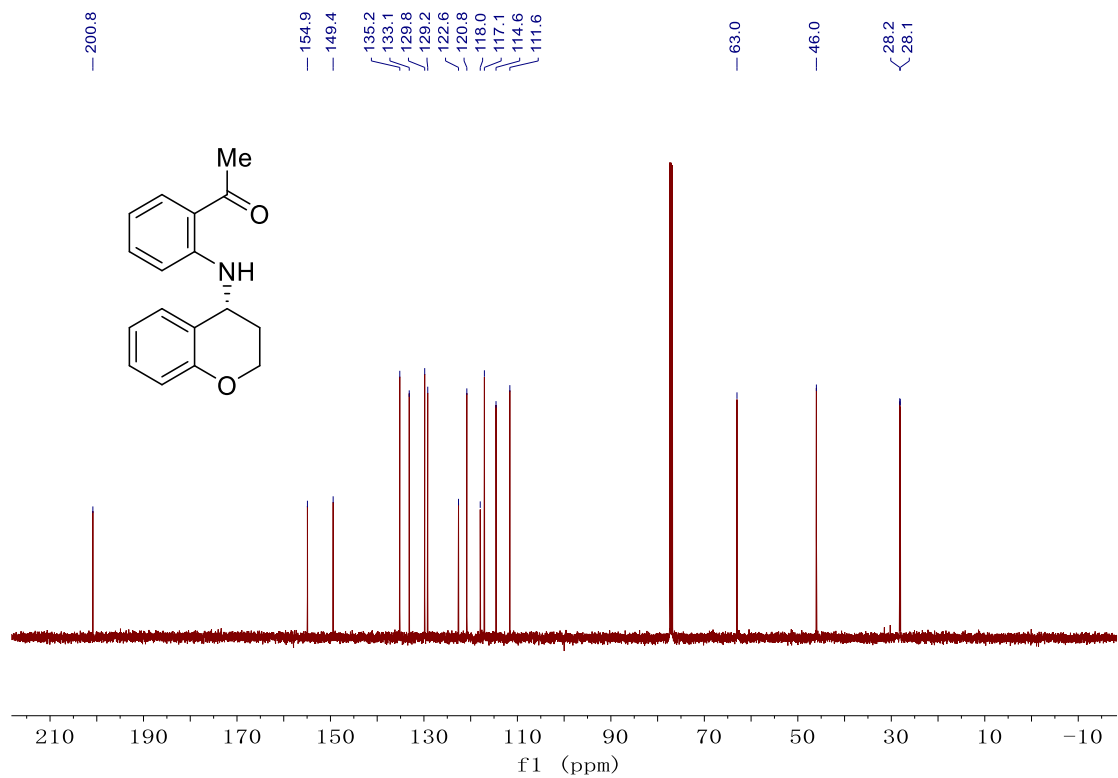
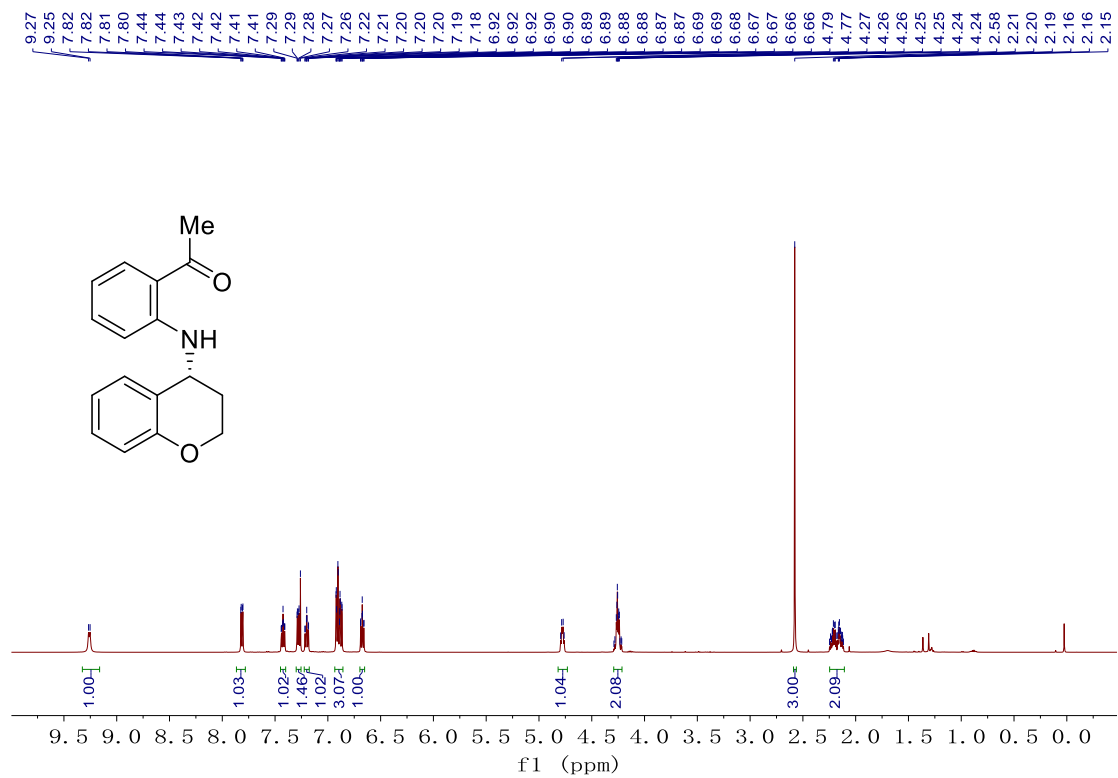
(R)-4-bromo-2-(chroman-4-ylamino)phenylmethanol (3al)



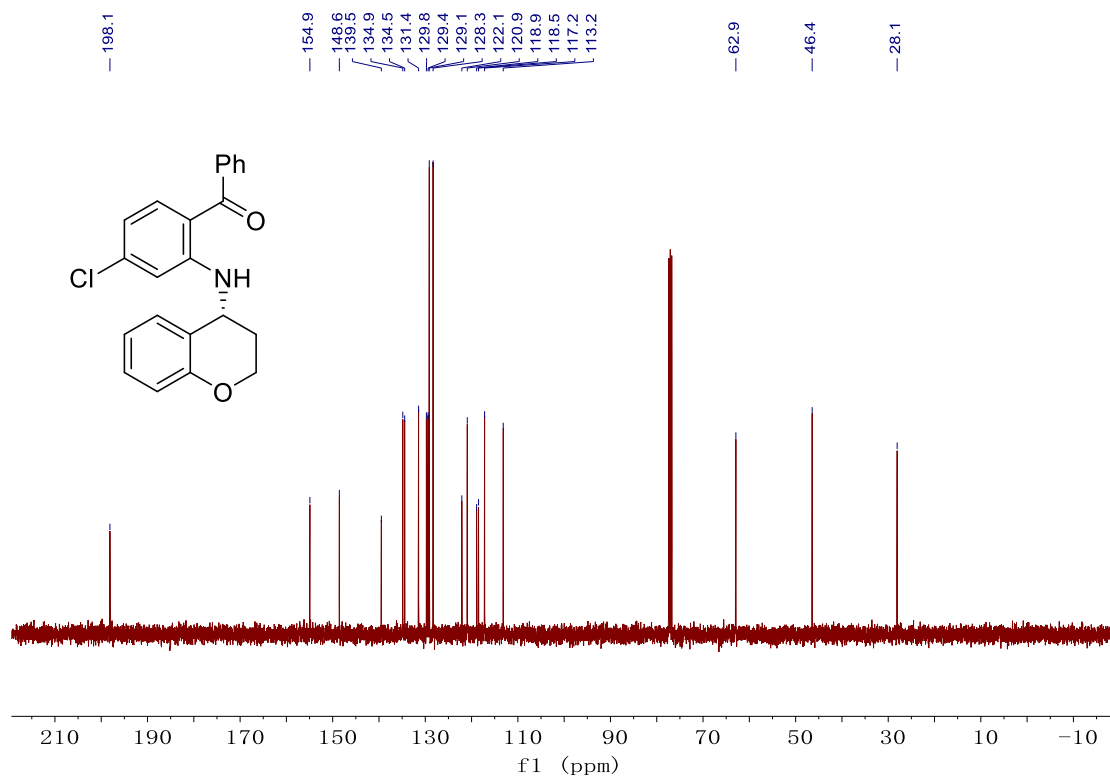
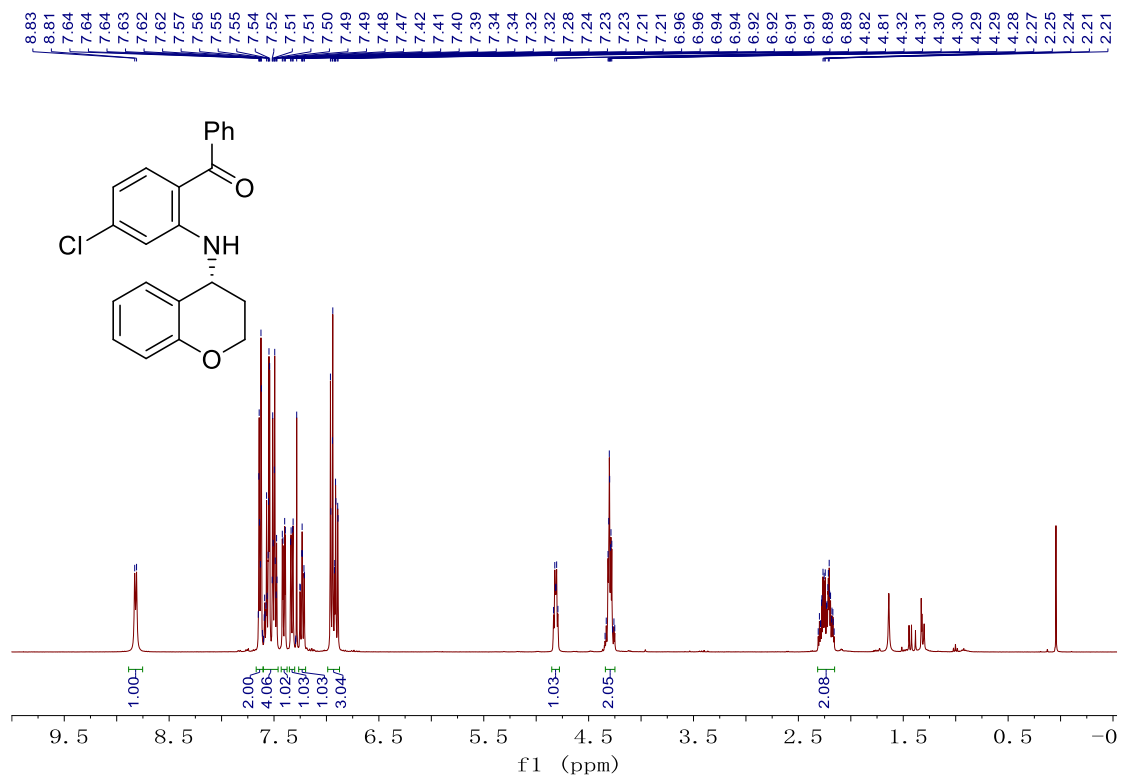
(4-chloro-2-(((*R*)-chroman-4-yl)amino)phenyl)(phenyl)methanol (3am)



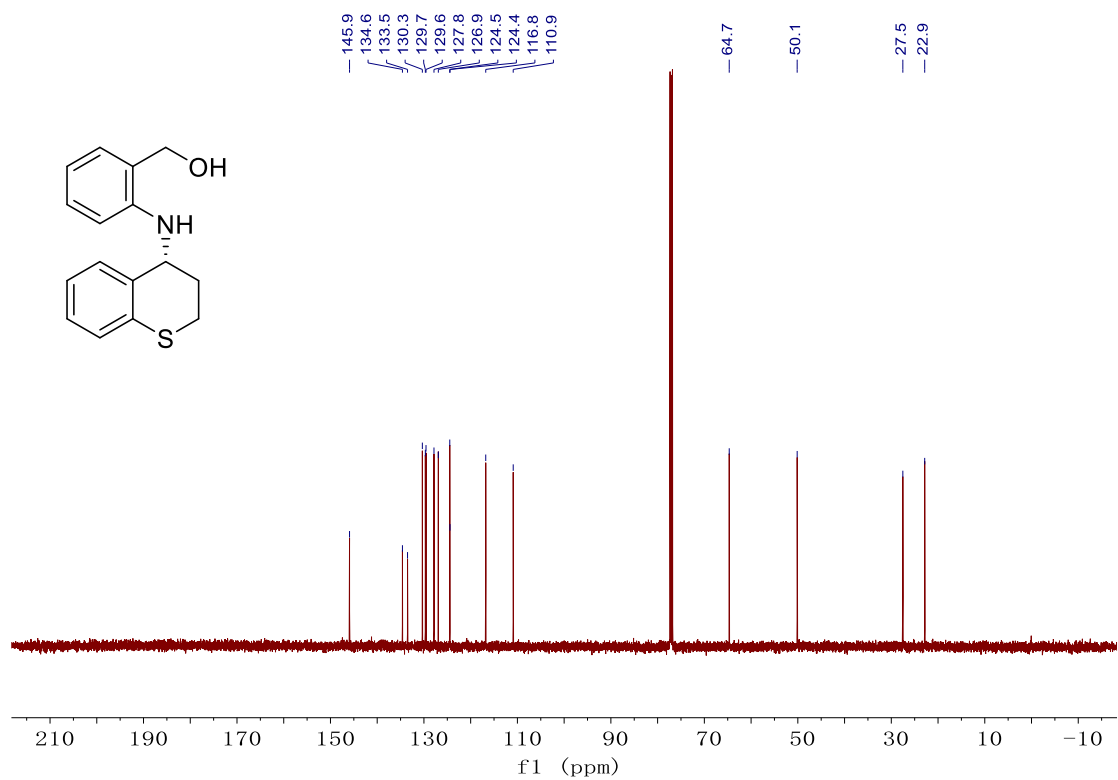
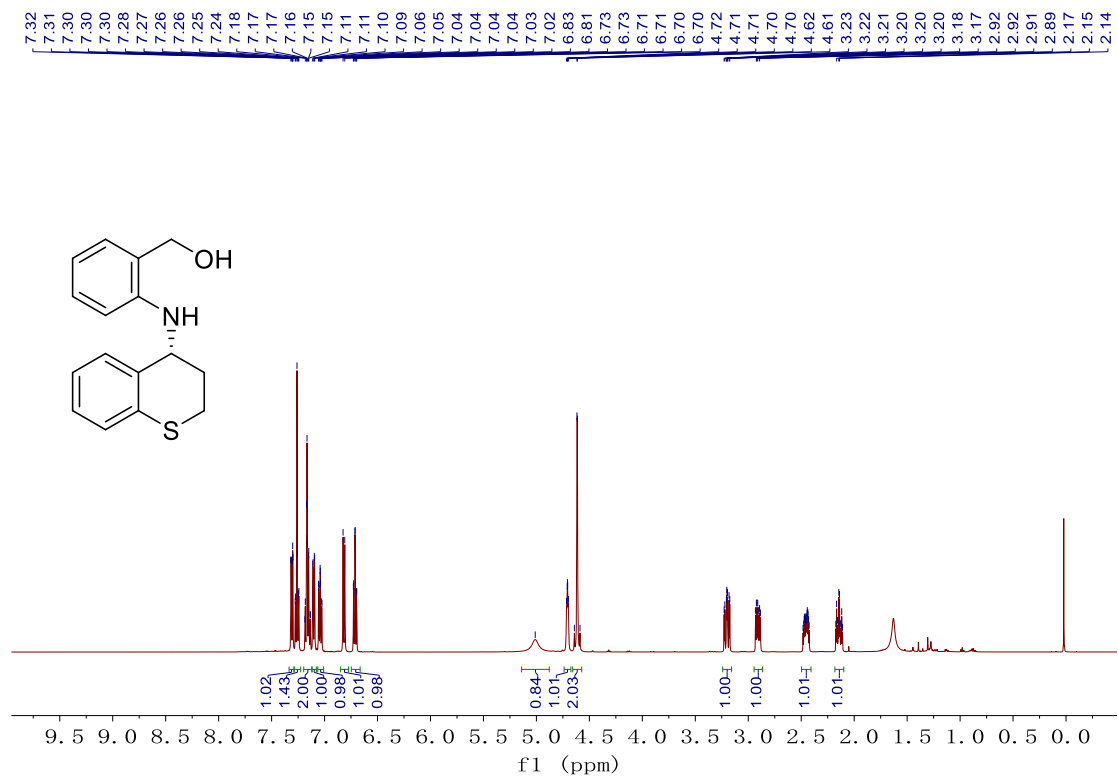
(R)-1-(2-(chroman-4-ylamino)phenyl)ethan-1-one (3al')



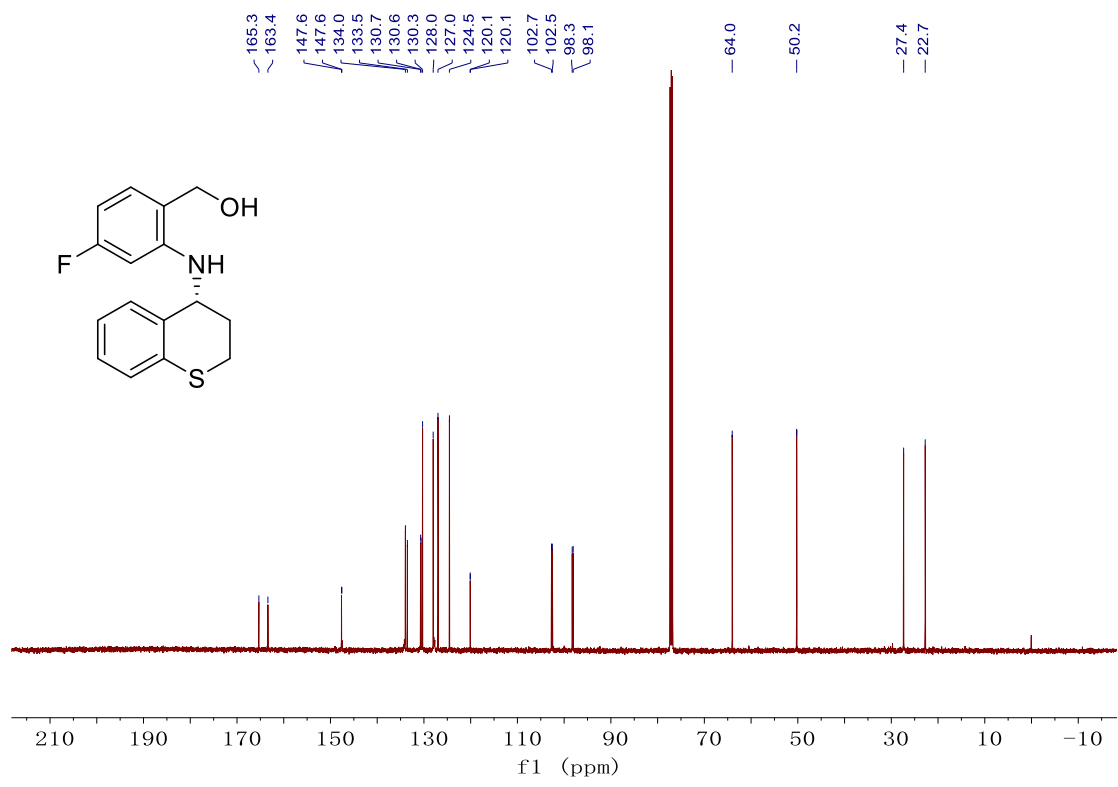
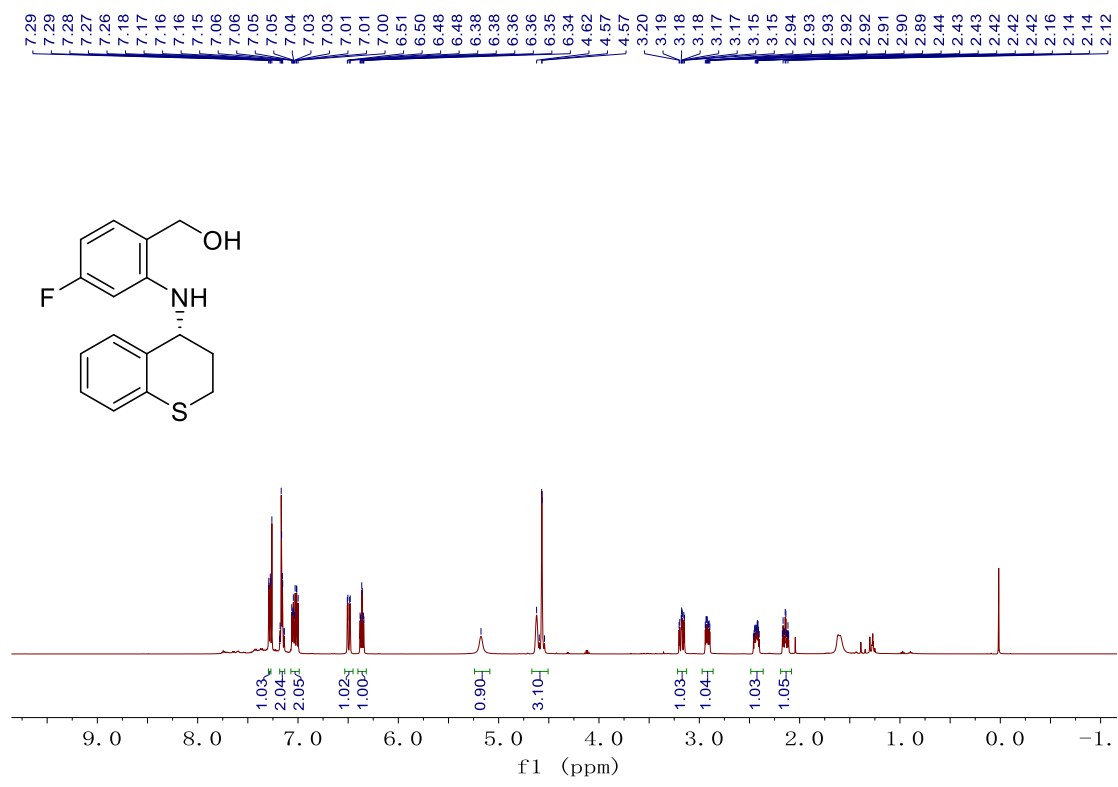
(R)-4-chloro-2-(chroman-4-ylamino)phenyl(methyl)ketone (3am')

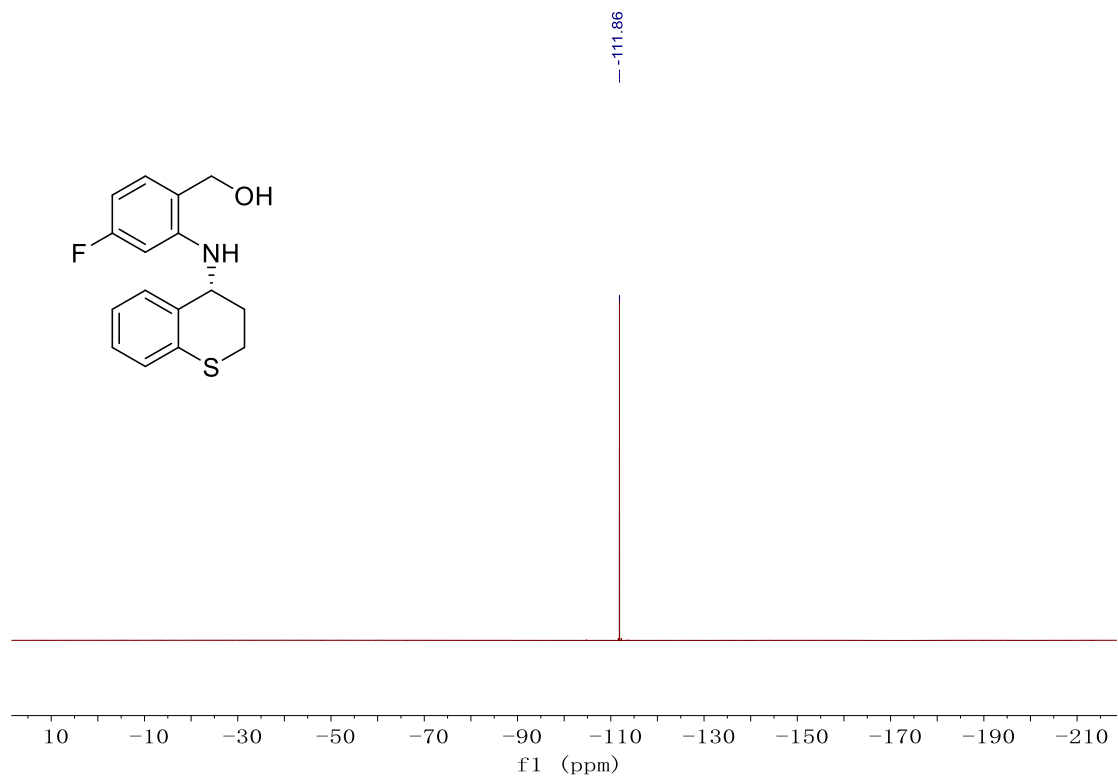


(R)-2-(2-(thiochroman-4-ylamino)phenyl)methanol (3na)

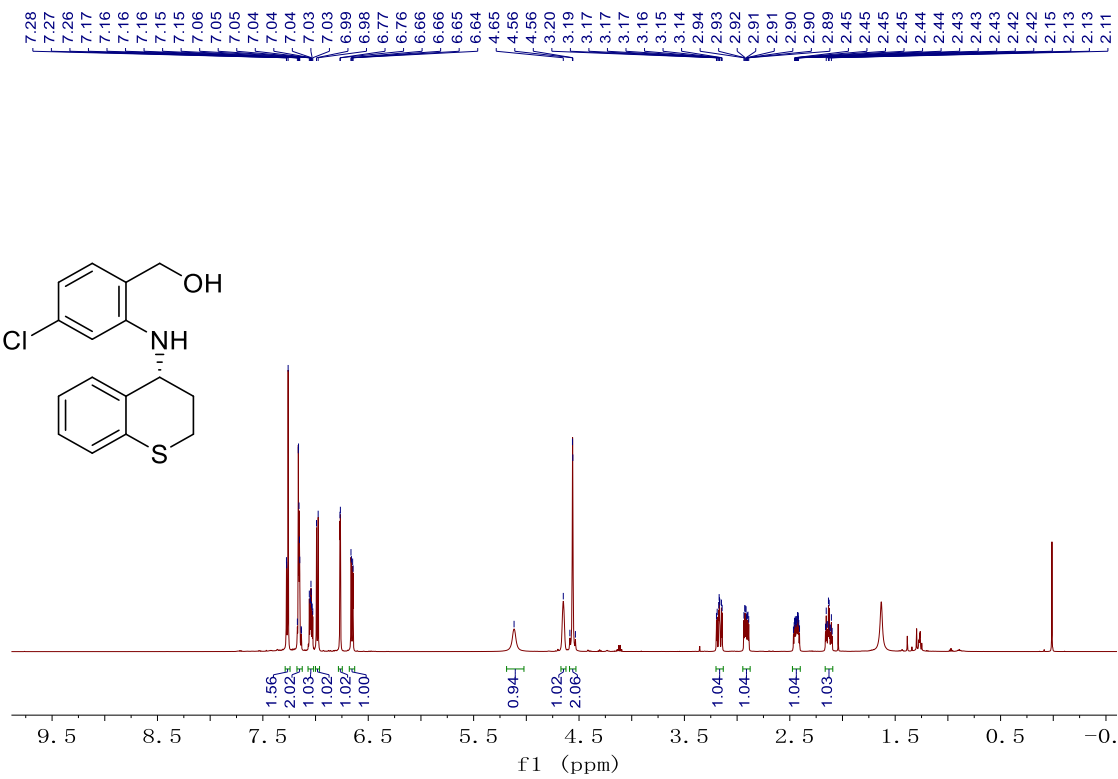


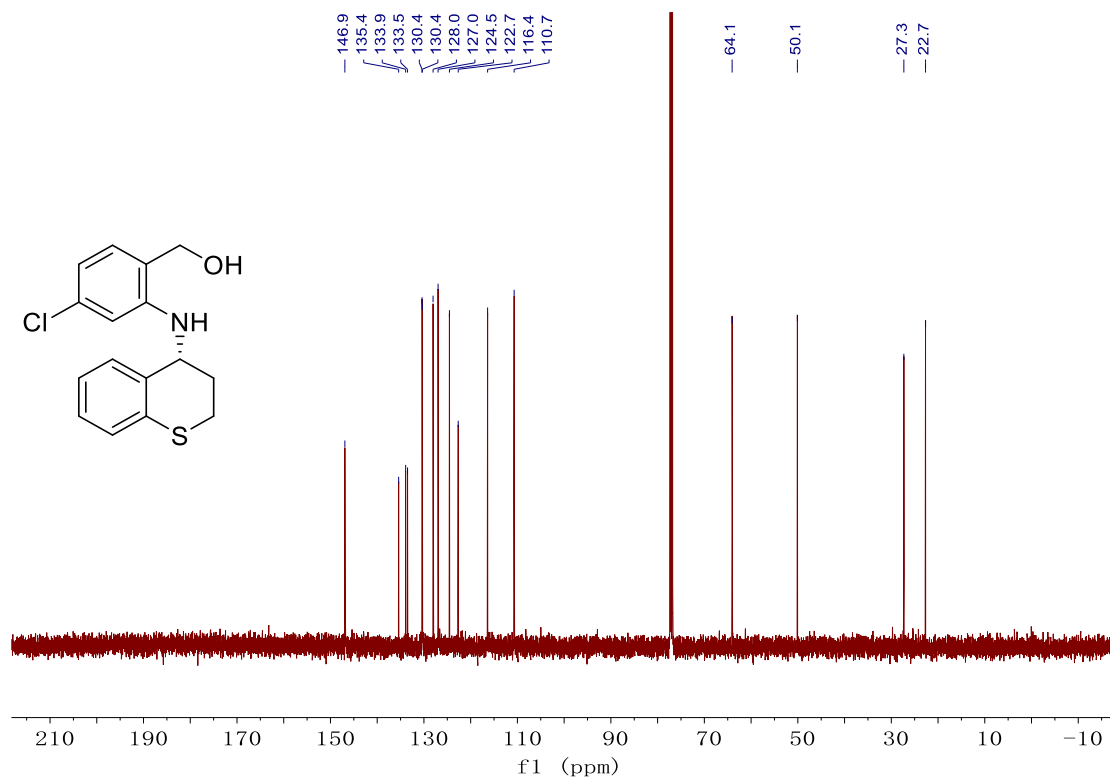
(R)-(4-fluoro-2-(thiochroman-4-ylamino)phenyl)methanol (3ng)



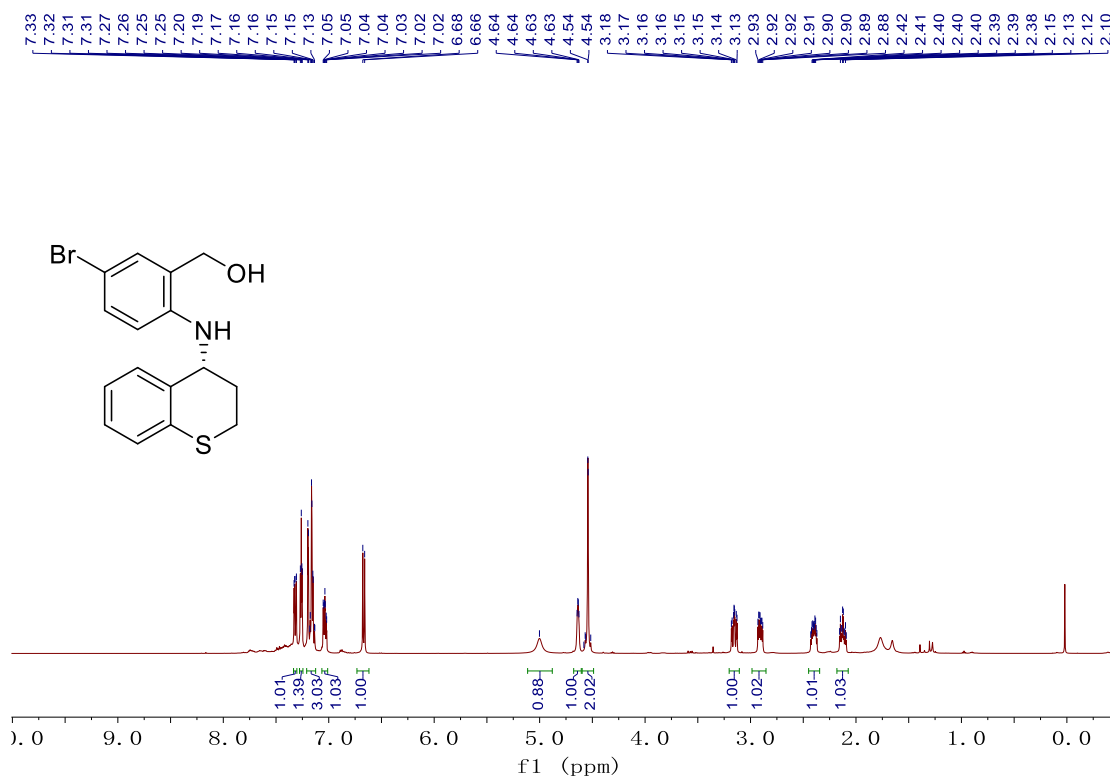


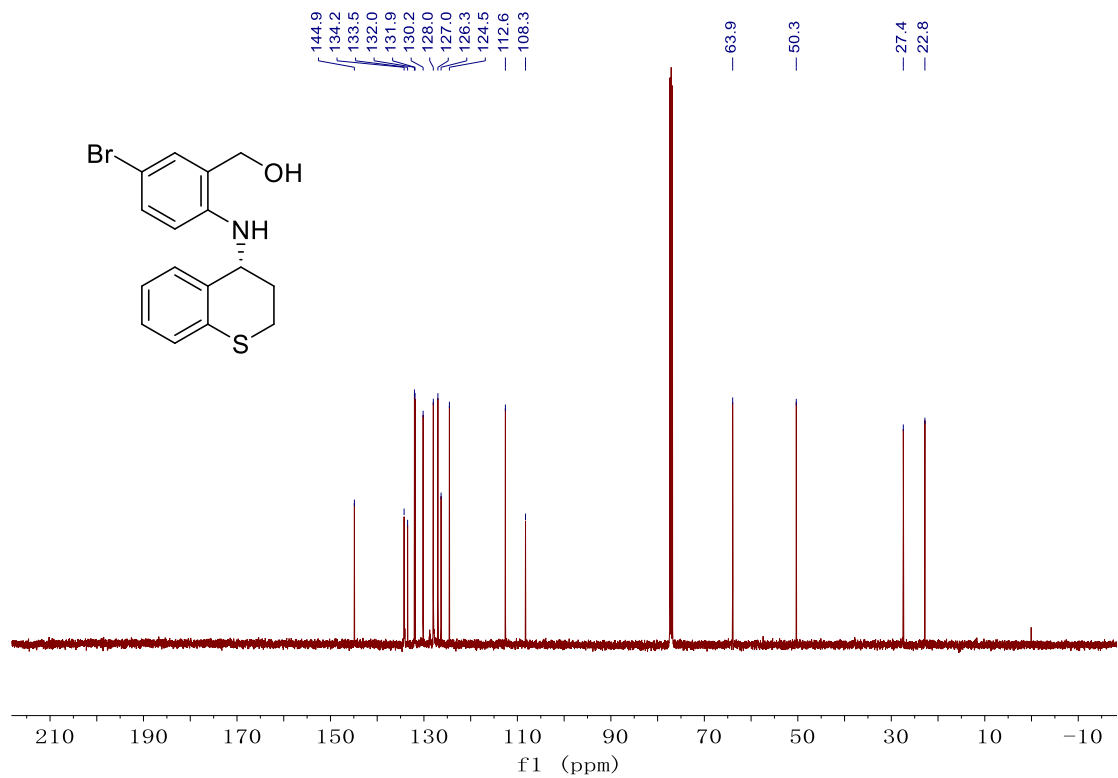
(R)-4-chloro-2-(thiochroman-4-ylamino)phenylmethanol (3nh)



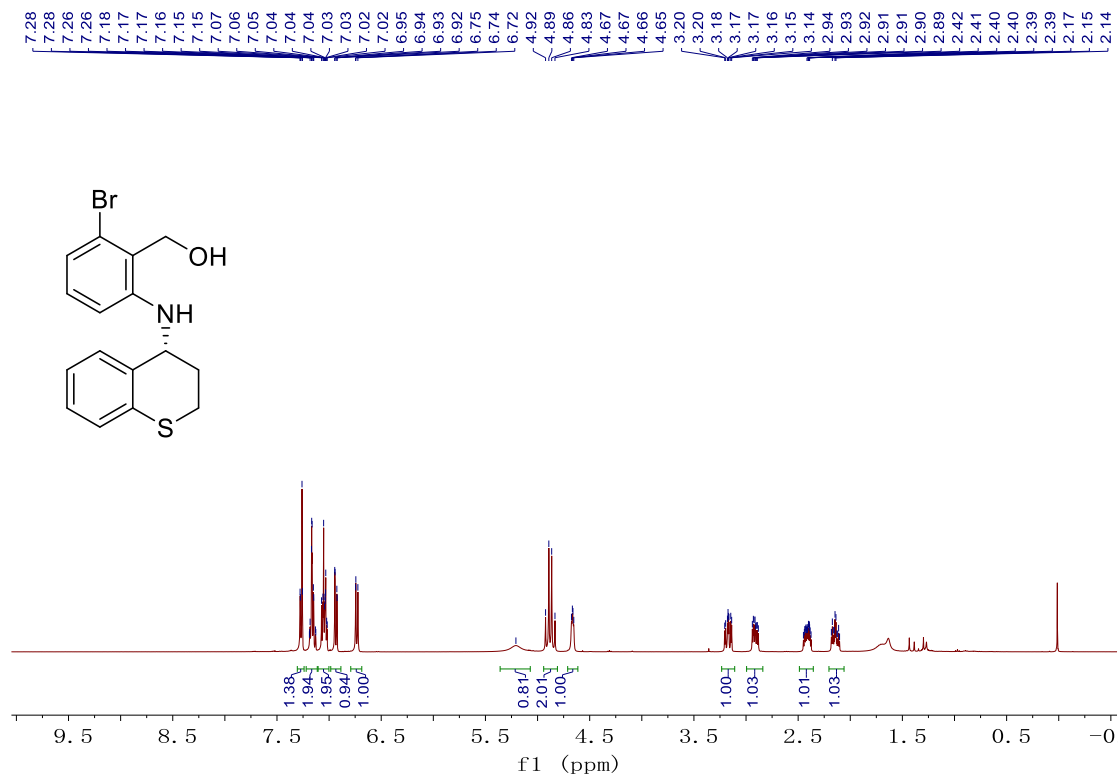


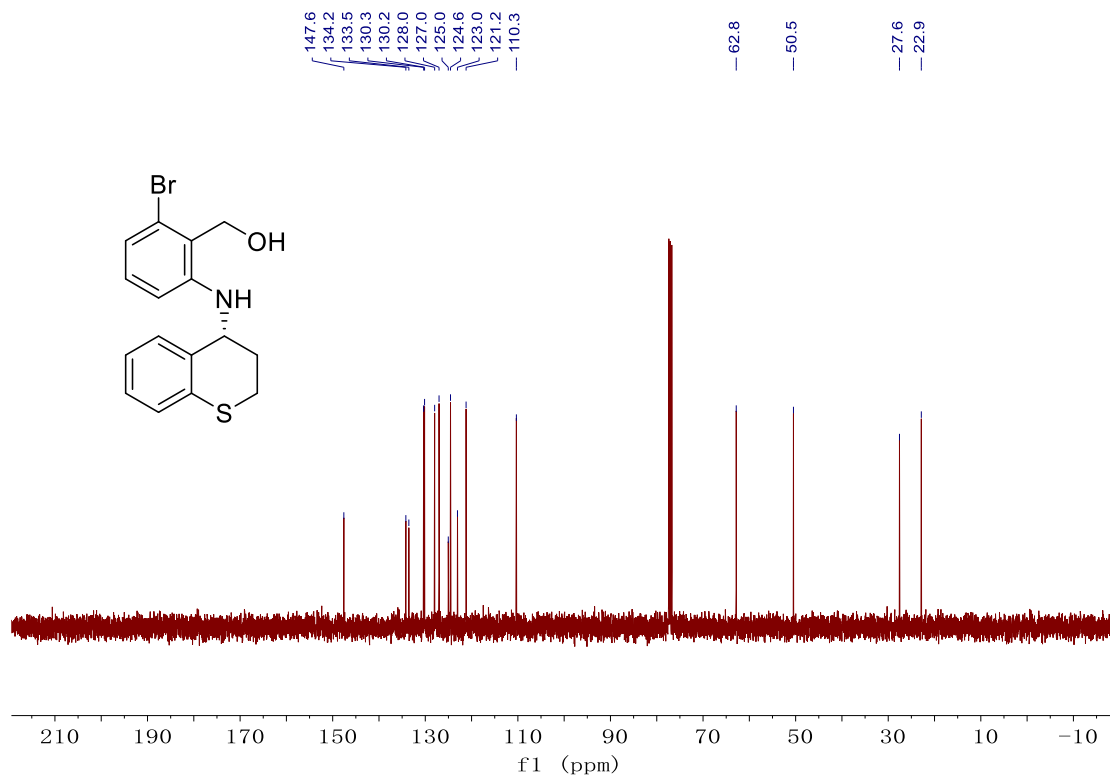
(R)-5-(5-bromo-2-(thiochroman-4-ylamino)phenyl)methanol (3nf)



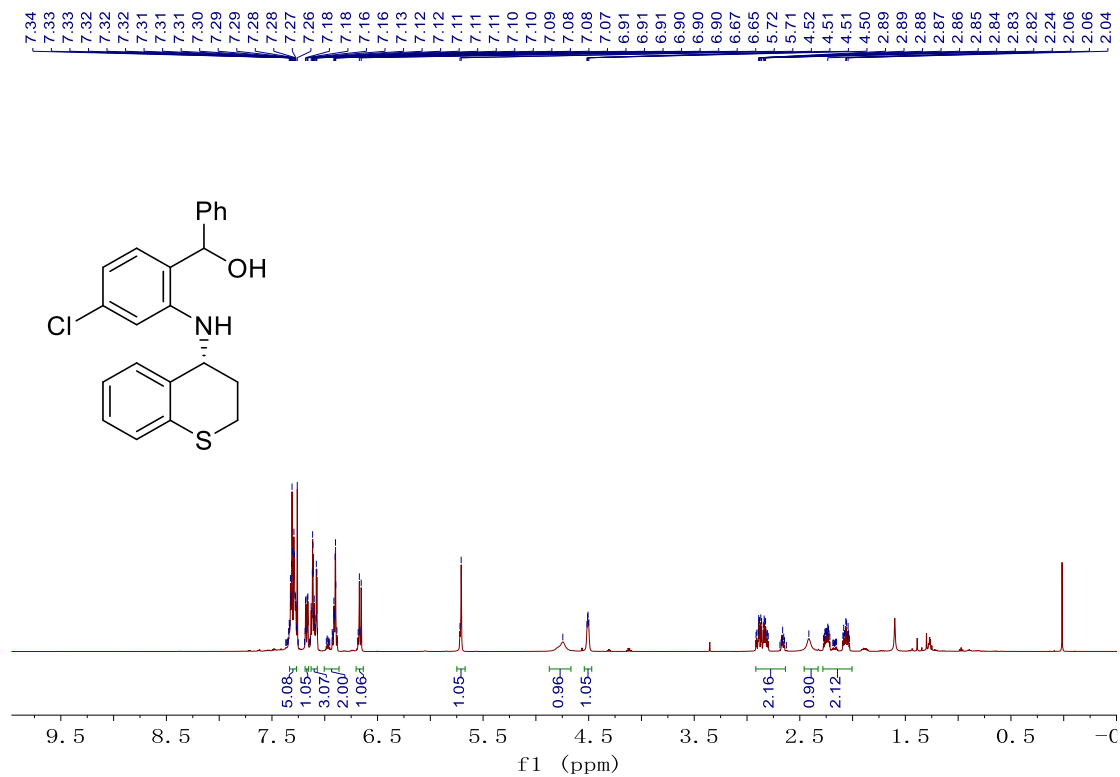


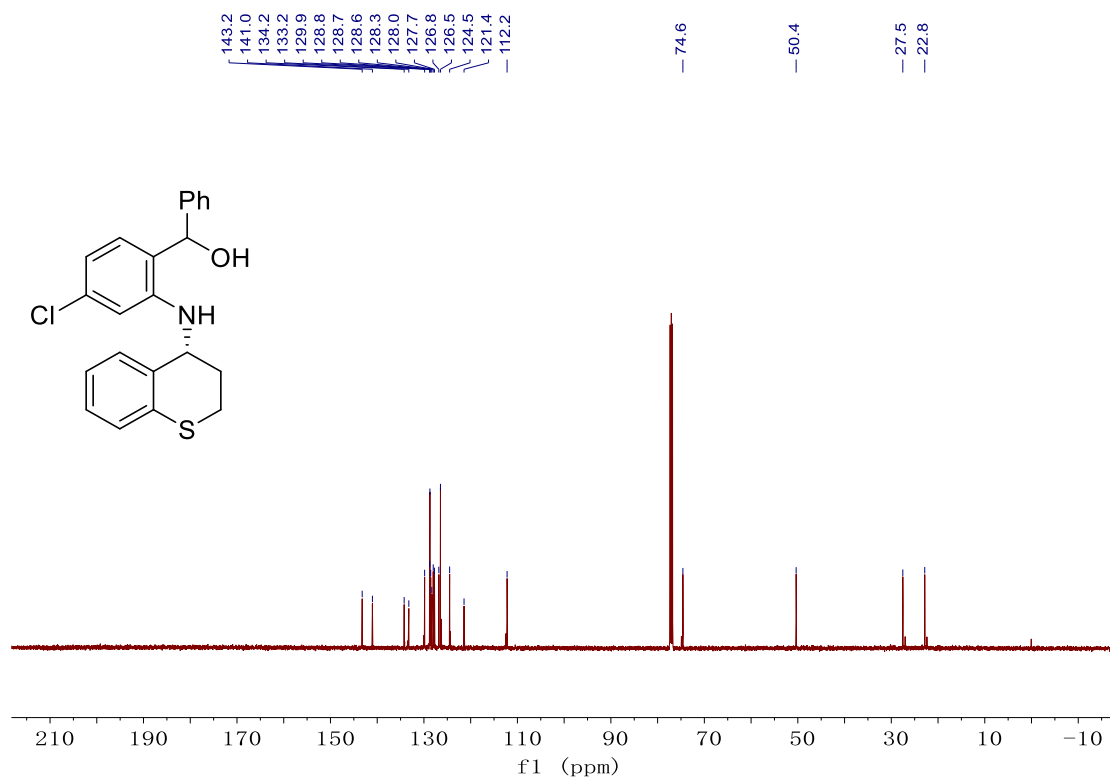
(R)-2-bromo-6-(thiochroman-4-ylamino)phenylmethanol (3nj)



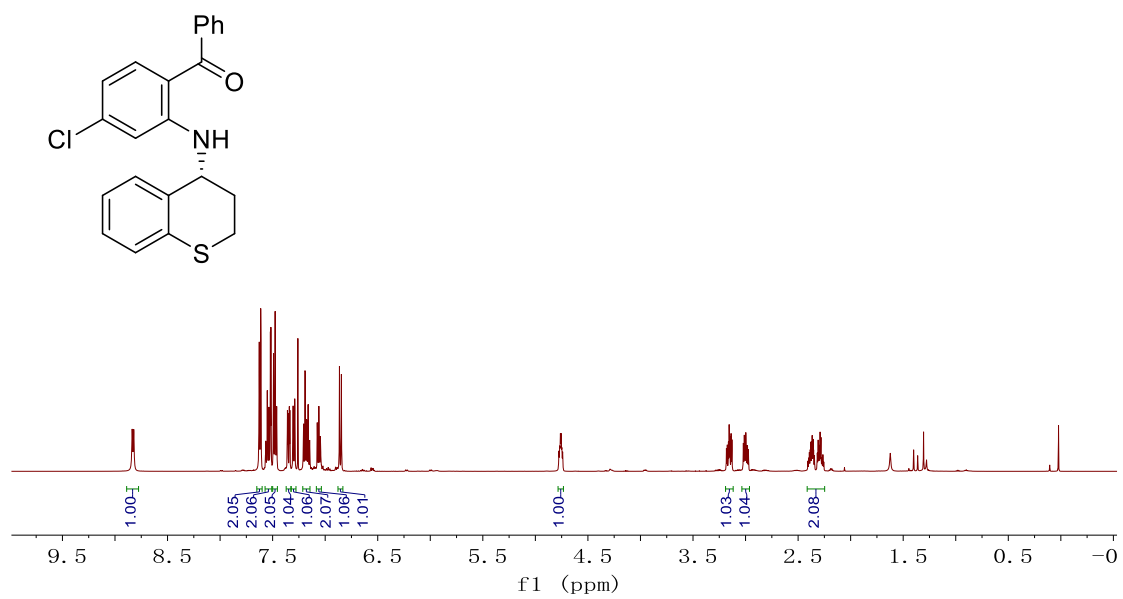


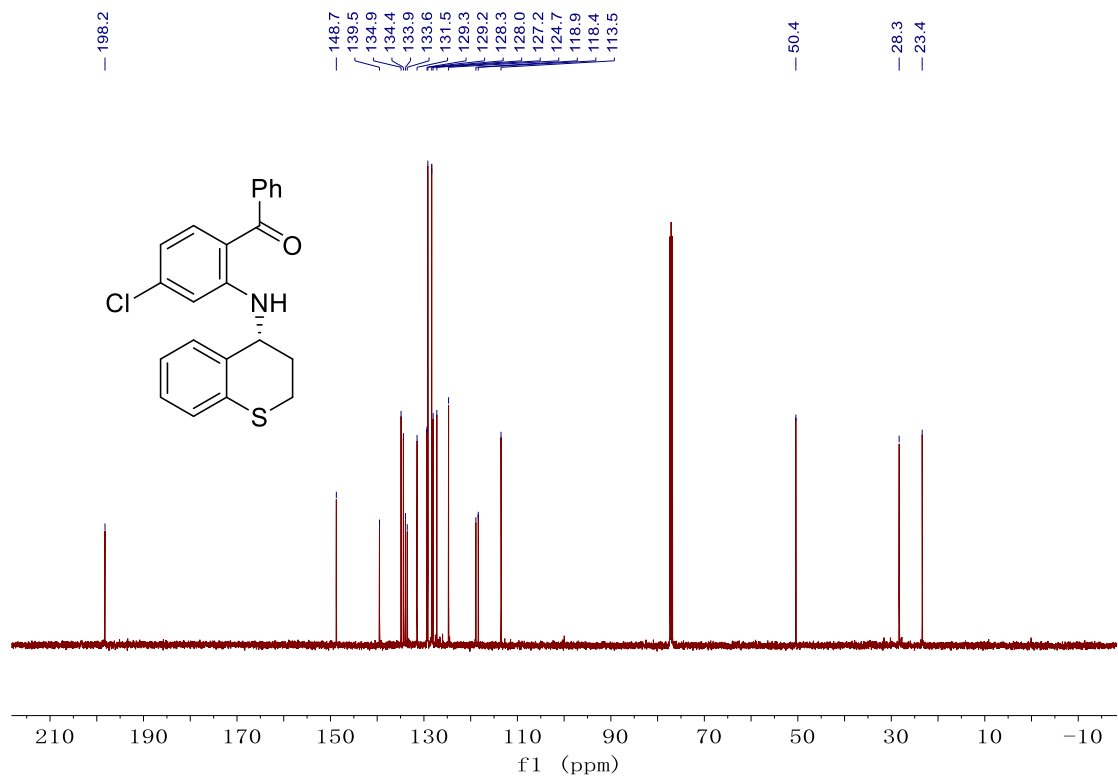
(4-chloro-2-(((R)-thiochroman-4-yl)amino)phenyl)(phenyl)methanol (3nm)



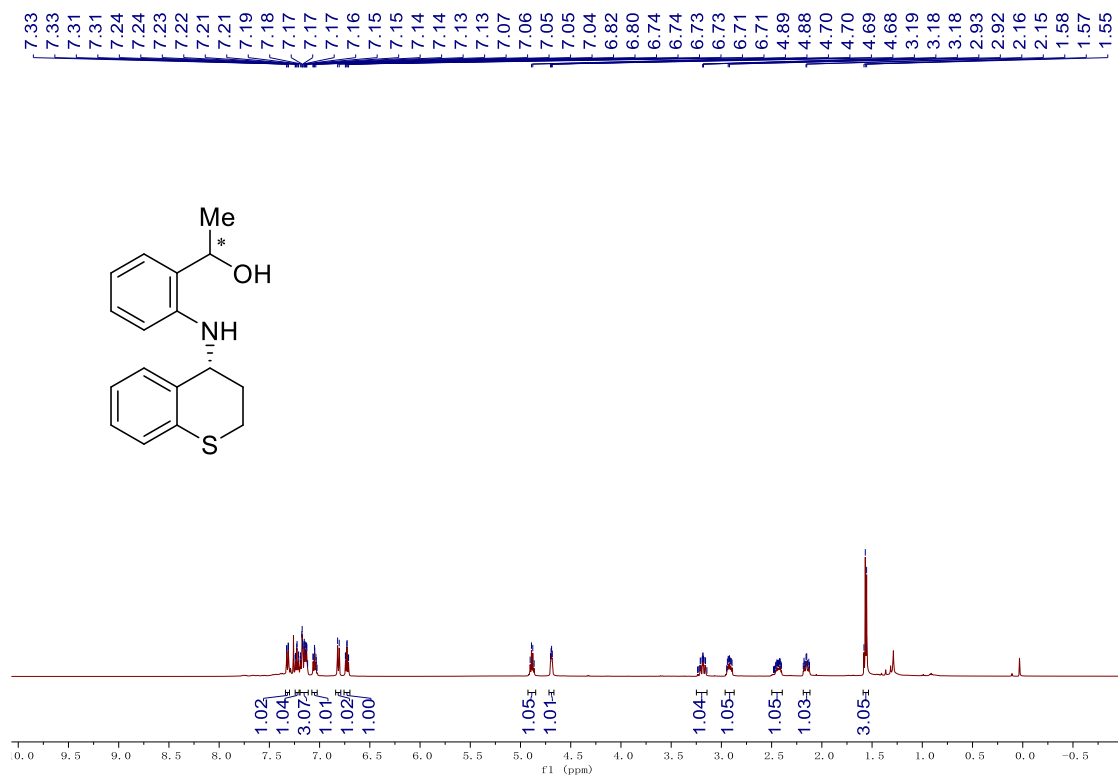


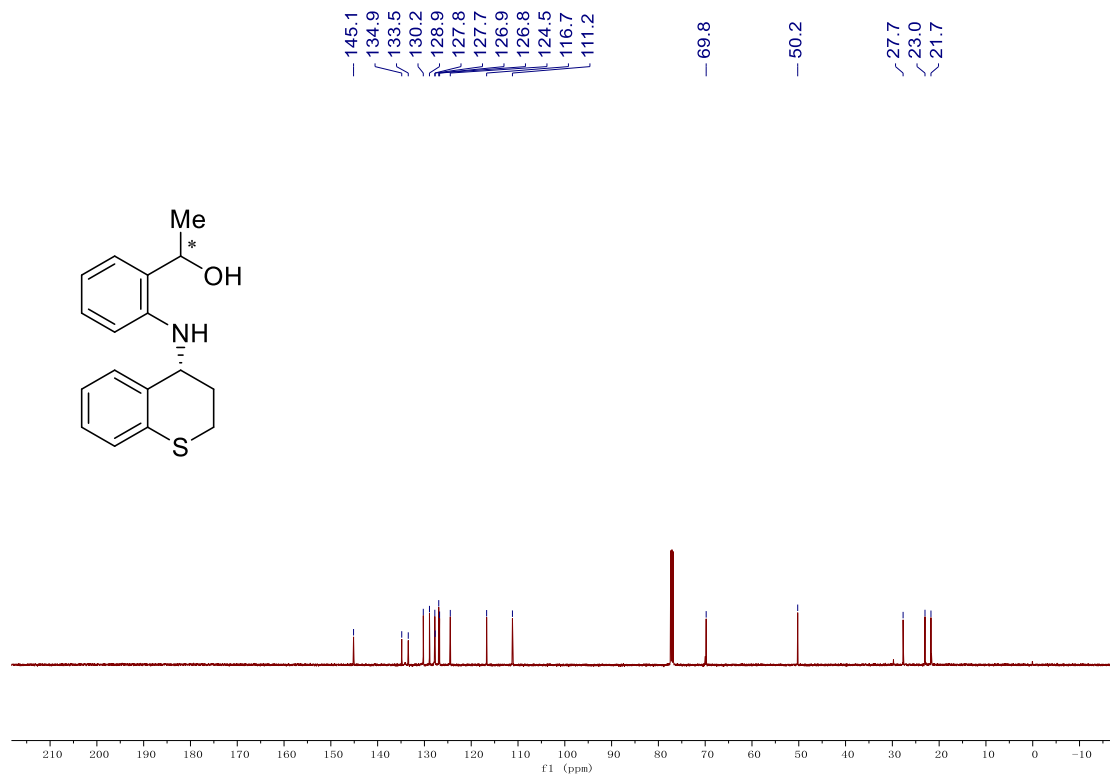
(R)-4-chloro-2-(thiochroman-4-ylamino)phenyl(phenyl)methanone (3nm')



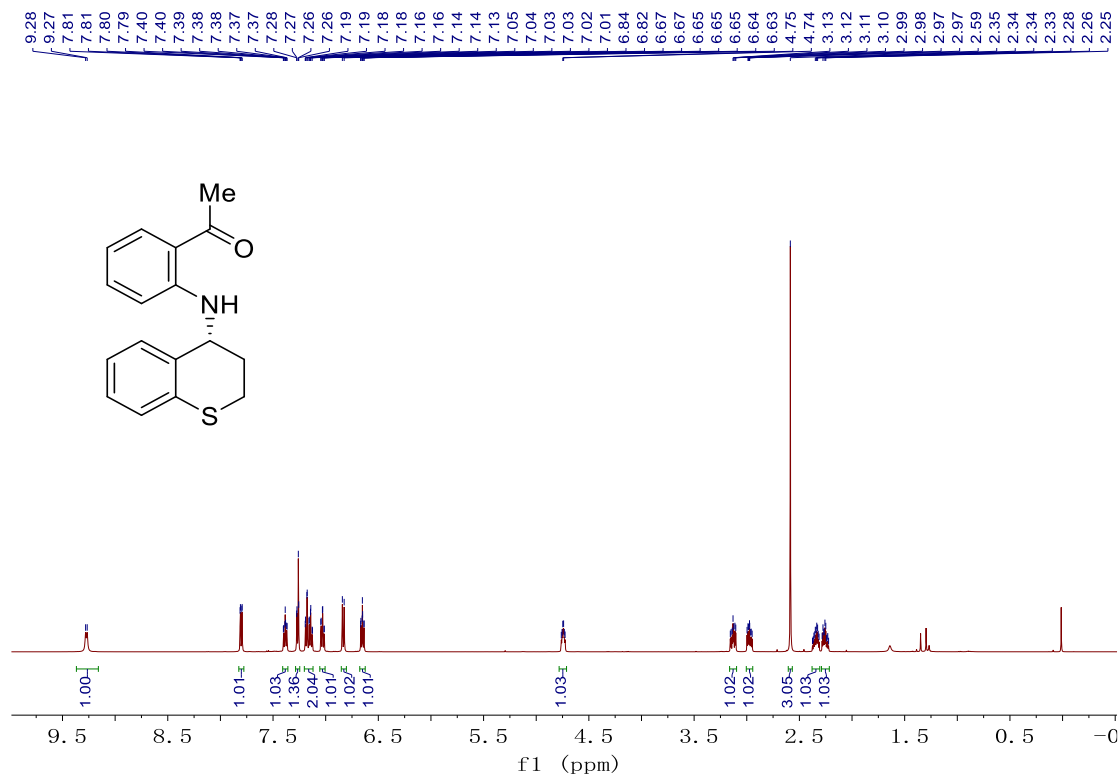


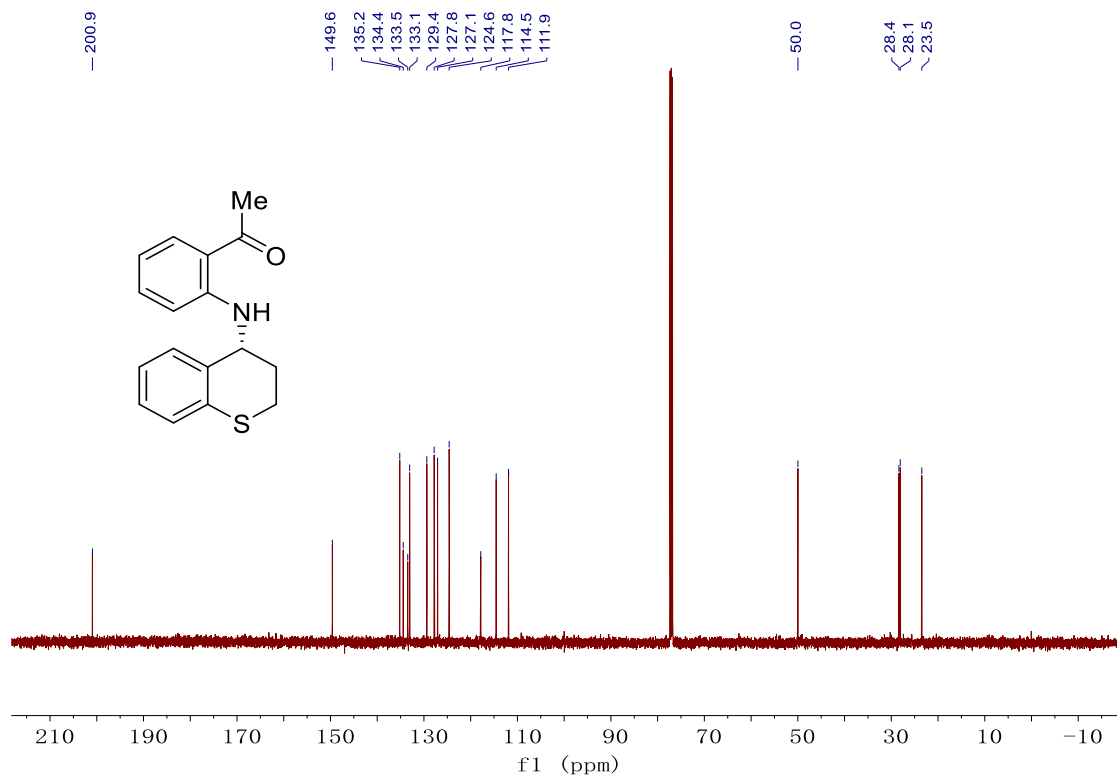
1-(2-(((R)-thiochroman-4-yl)amino)phenyl)ethan-1-ol (3nl)



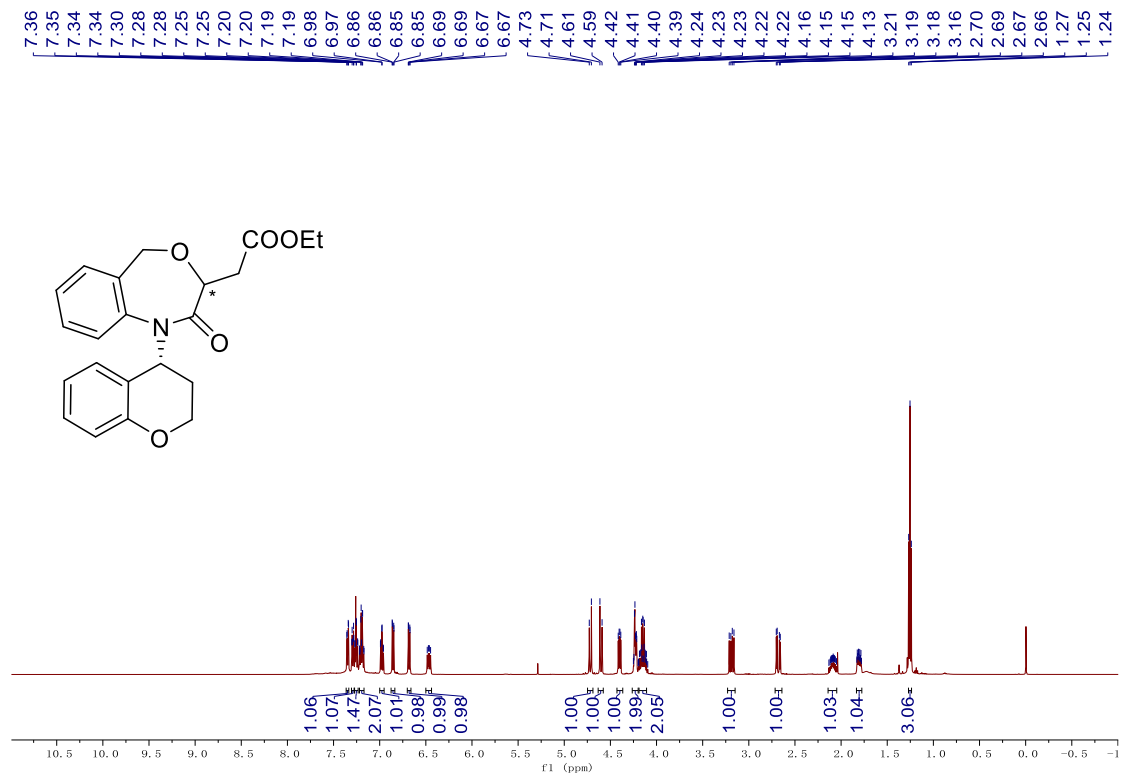


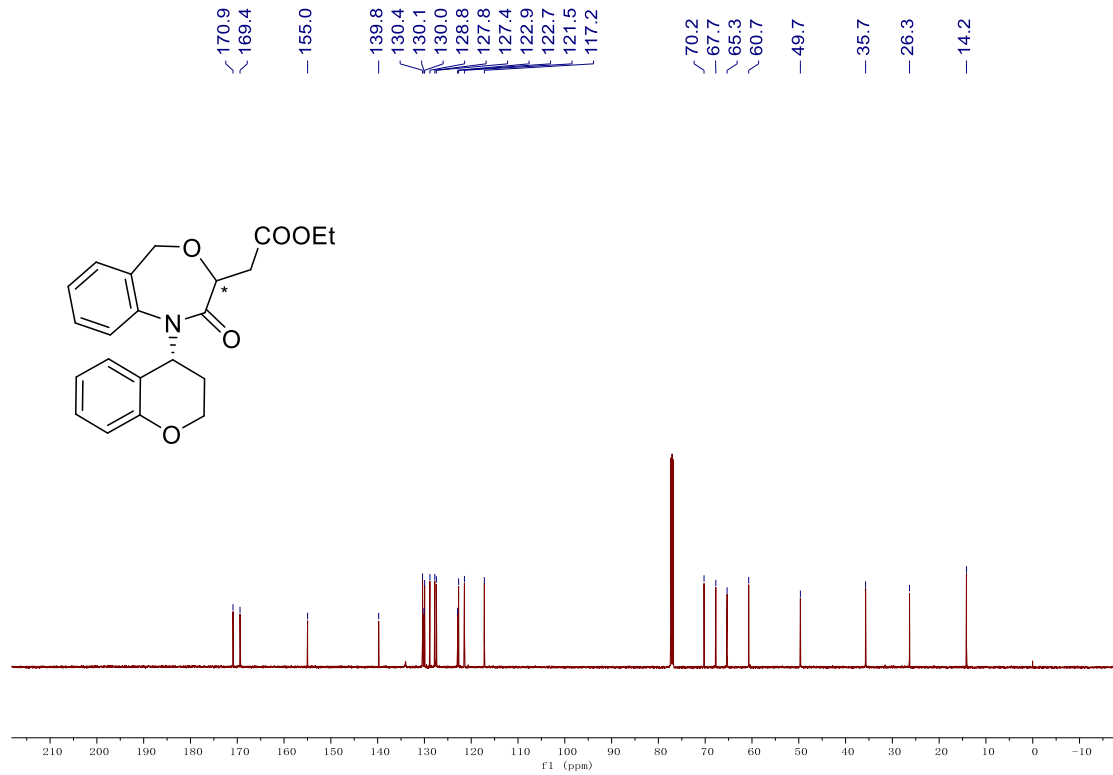
(R)-1-(2-(thiochroman-4-ylamino)phenyl)ethan-1-one (3nl')



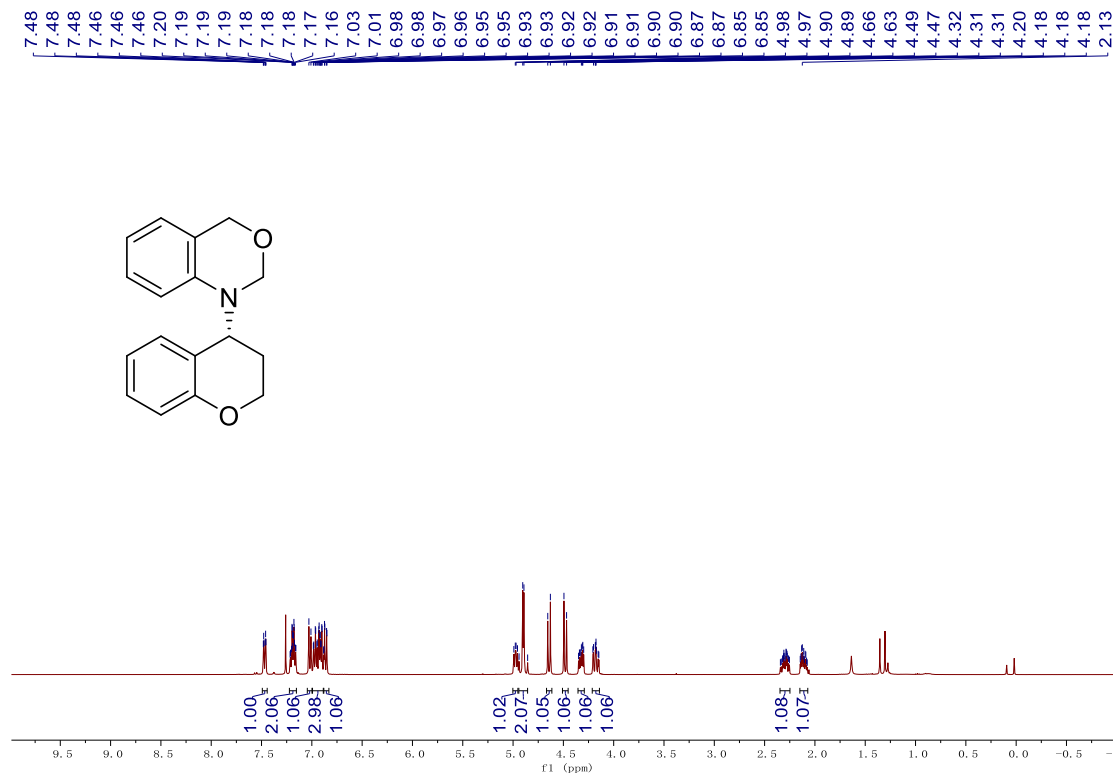


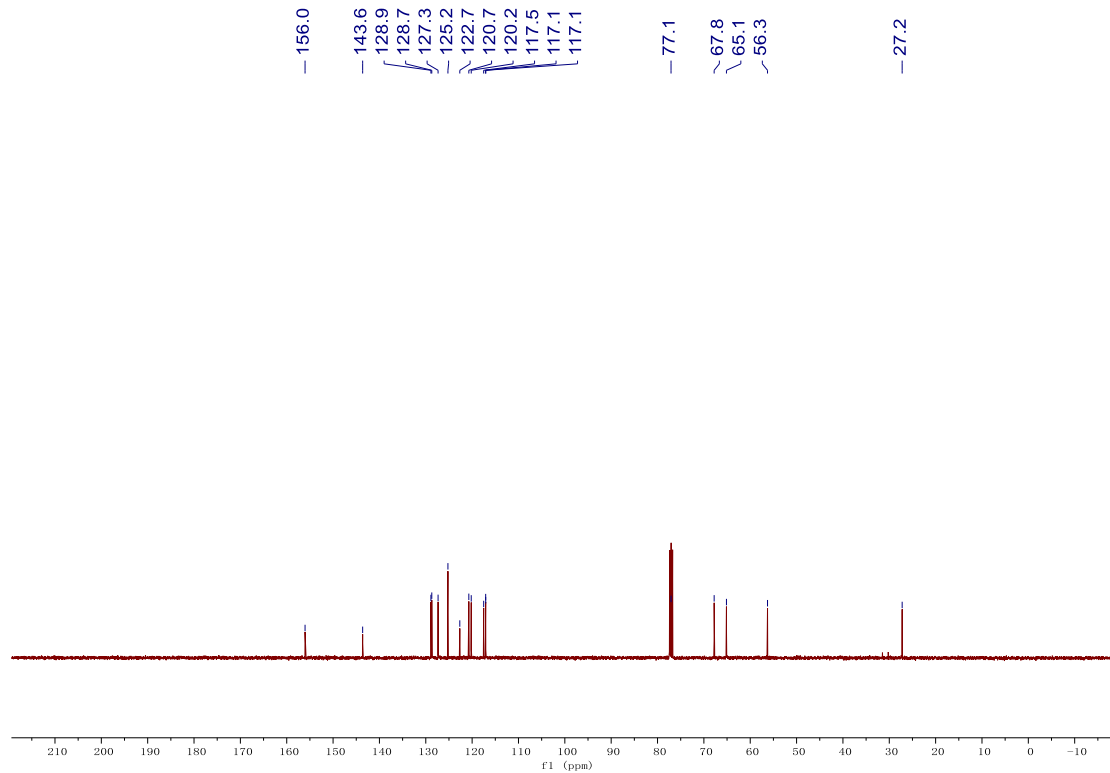
ethyl 2-(1-((*R*)-chroman-4-yl)-2-oxo-1,2,3,5-tetrahydrobenzo[*e*][1,4]oxazepin-3-yl)acetate (4)





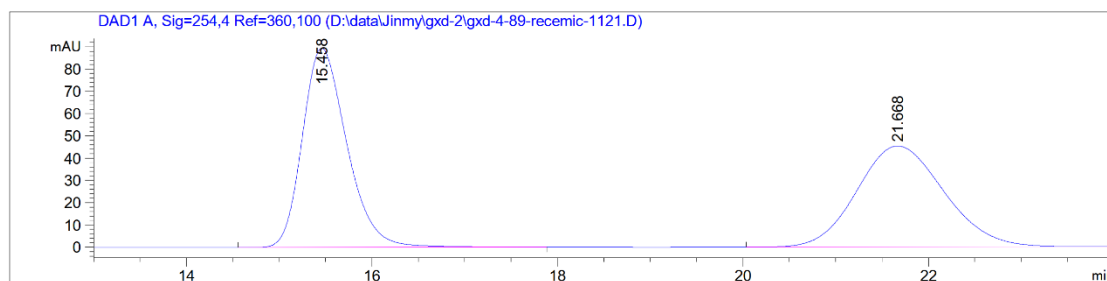
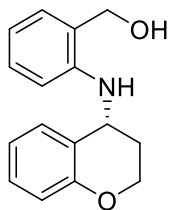
(R)-1-(chroman-4-yl)-1,4-dihydro-2H-benzo[d][1,3]oxazine (5)





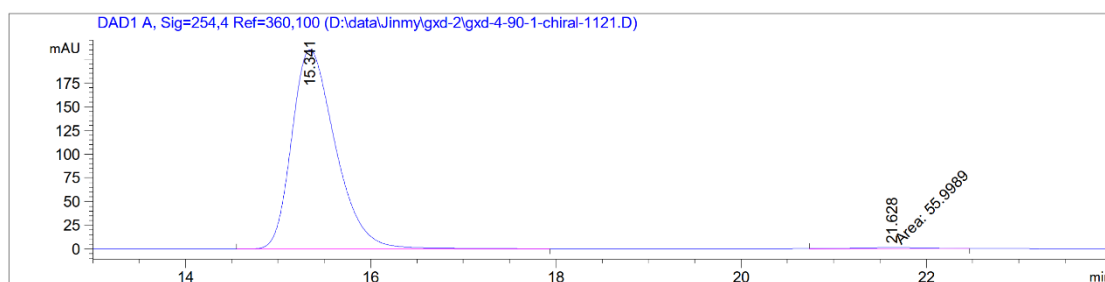
7. HPLC Spectrum

(R)-(2-(chroman-4-ylamino)phenyl)methanol (3aa)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.458	BB	0.5120	2976.71094	89.50433	50.0890
2	21.668	BBA	1.0166	2966.12695	45.37621	49.9110

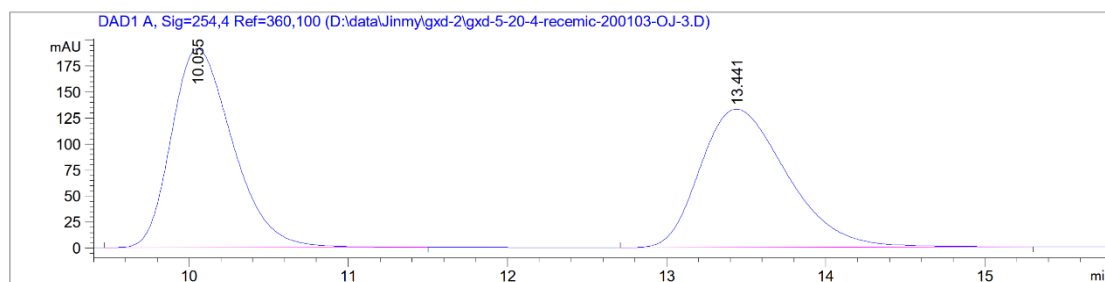
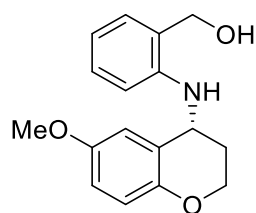


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.341	BB	0.5039	6867.77393	209.77849	99.1912
2	21.628	MM	0.8806	55.99893	1.05987	0.8088

Totals : 6923.77285 210.83836

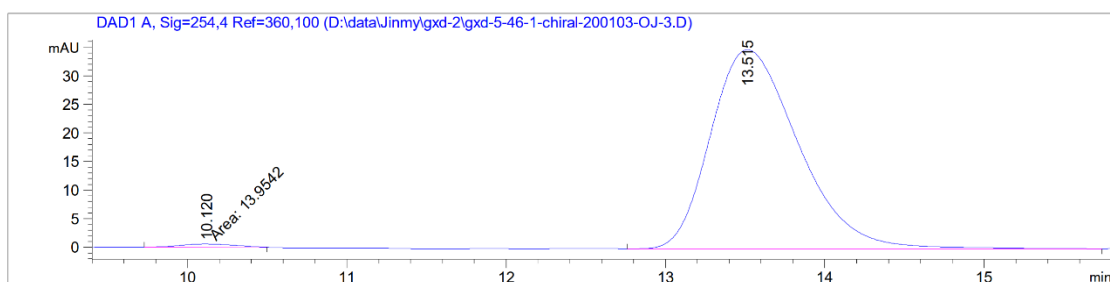
(R)-2-((6-methoxychroman-4-yl)amino)phenylmethanol (3ba)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.055	BB	0.4153	5102.24561	191.20593	50.3364
2	13.441	BB	0.5918	5034.04297	132.93022	49.6636

Totals : 1.01363e4 324.13615

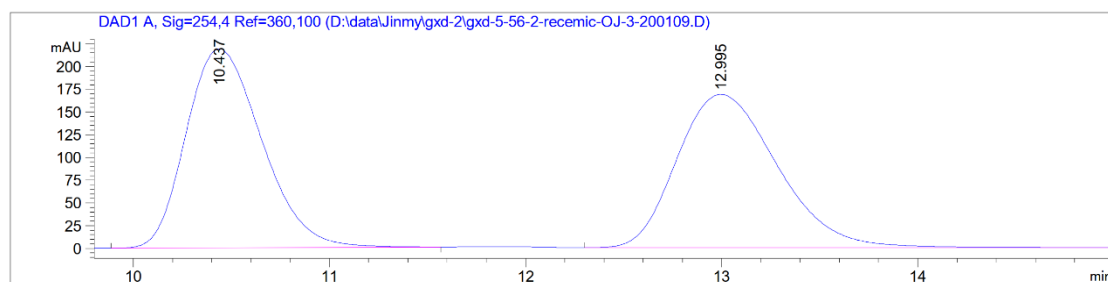
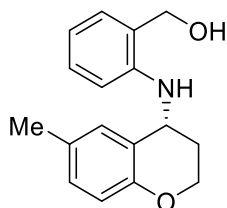


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.120	MM	0.4070	13.95423	5.71487e-1	1.0345
2	13.515	BB	0.5955	1334.96936	34.80577	98.9655

Totals : 1348.92359 35.37726

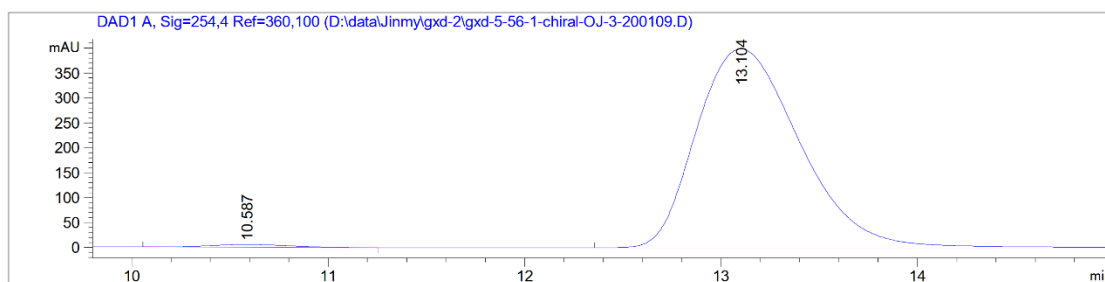
(R)-2-(((6-methylchroman-4-yl)amino)phenyl)methanol (3ca)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.437	BB	0.4205	5859.16064	218.71104	49.4025
2	12.995	BBA	0.5595	6000.89697	168.51047	50.5975

Totals : 1.18601e4 387.22151

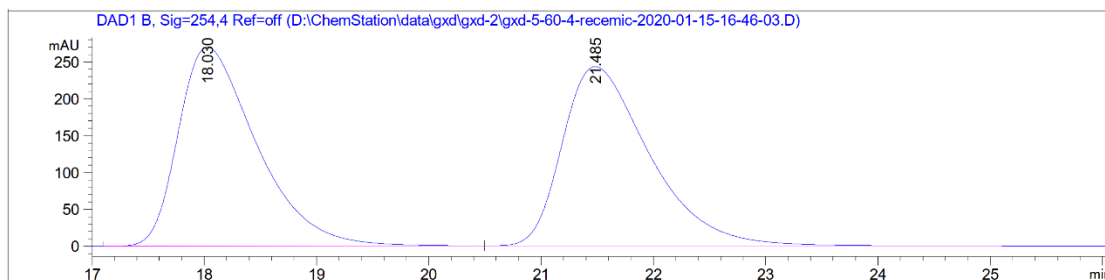
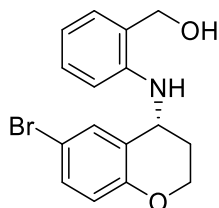


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.587	BB	0.3944	148.62700	5.41217	1.0118
2	13.104	BB	0.5774	1.45412e4	398.82242	98.9882

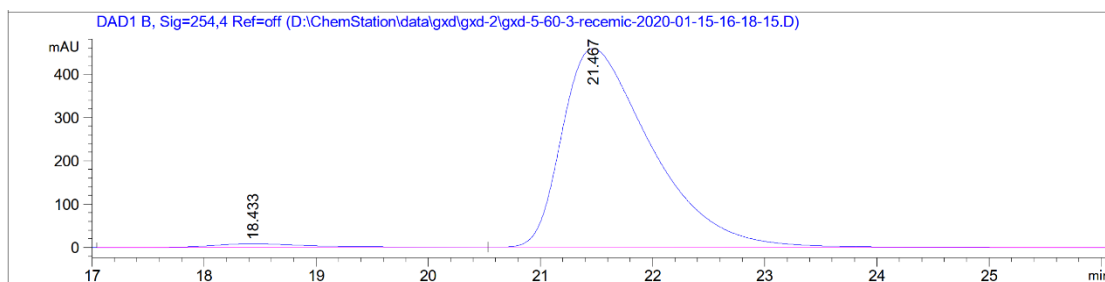
Totals : 1.46898e4 404.23459

(R)-2-(((6-bromochroman-4-yl)amino)phenyl)methanol (3da)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.030	BB	0.7376	1.30836e4	269.87268	49.8064
2	21.485	BB	0.8267	1.31854e4	243.11670	50.1936

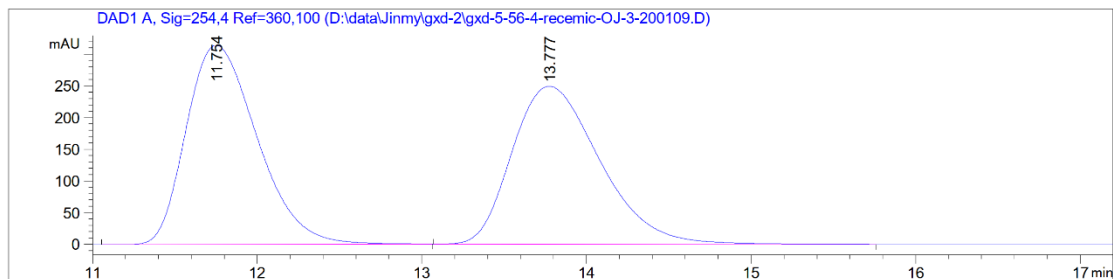
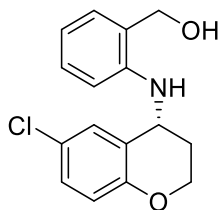


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.433	BB	0.8715	519.79315	8.45166	2.0099
2	21.467	BBA	0.8370	2.53421e4	458.40262	97.9901

Totals : 2.58619e4 466.85428

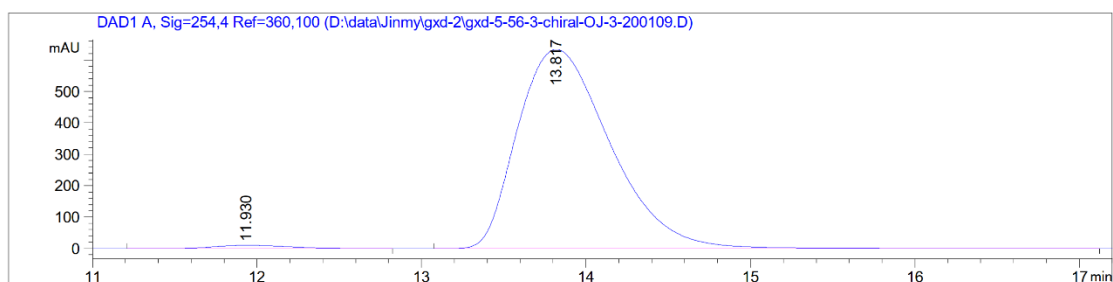
(R)-(2-((6-chlorochroman-4-yl)amino)phenyl)methanol (3ea)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.754	BB	0.4691	9404.85156	314.29456	50.4391
2	13.777	BB	0.5825	9241.09180	249.26575	49.5609

Totals : 1.86459e4 563.56030

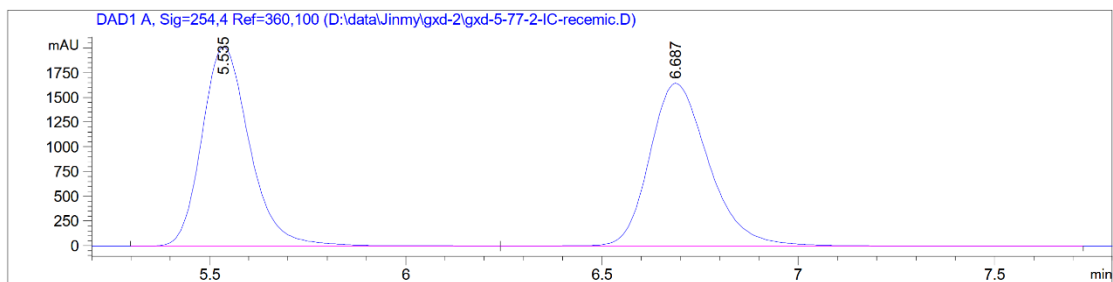
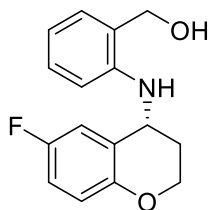


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.930	BB	0.5060	337.40213	10.46941	1.3427
2	13.817	BB	0.6179	2.47919e4	634.39648	98.6573

Totals : 2.51293e4 644.86590

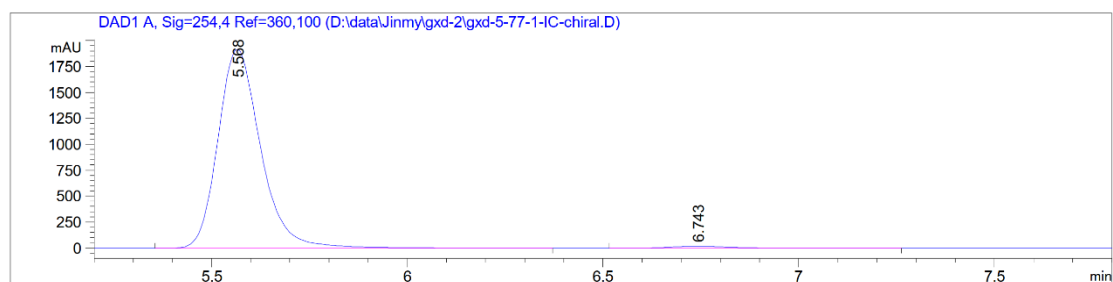
(R)-(2-((6-fluorochroman-4-yl)amino)phenyl)methanol (3fa)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.535	BV R	0.1302	1.70161e4	2018.80334	49.6591
2	6.687	VB	0.1623	1.72497e4	1645.98511	50.3409

Totals : 3.42658e4 3664.78845

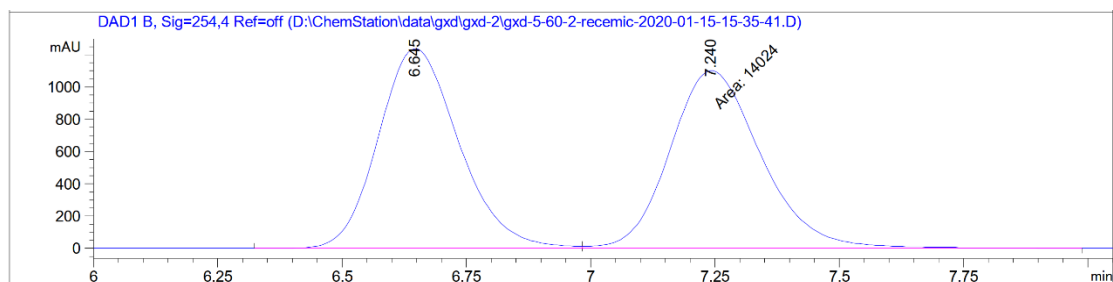
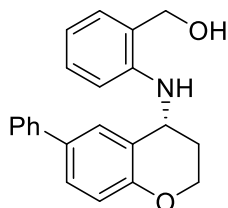


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	5.568	BB	0.1164	1.45478e4	1919.49829	98.6866
2	6.743	BB	0.1488	193.60770	19.68316	1.3134

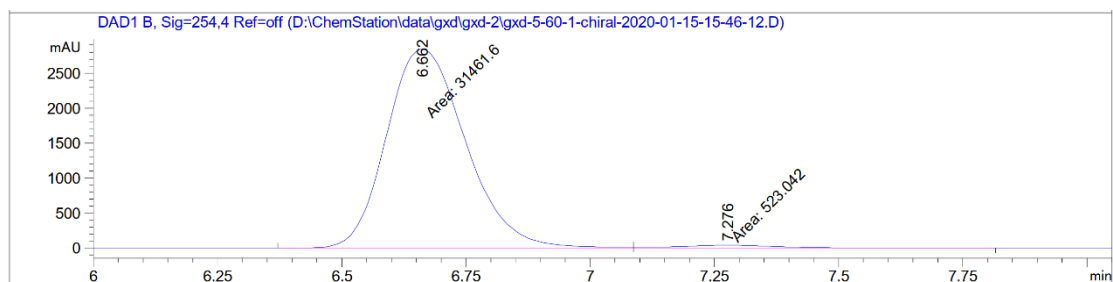
Totals : 1.47414e4 1939.18145

(R)-(2-((6-phenylchroman-4-yl)amino)phenyl)methanol (3ga)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.645	BV	0.1734	1.39226e4	1236.04980	49.8186
2	7.240	MF	0.2124	1.40240e4	1100.20471	50.1814

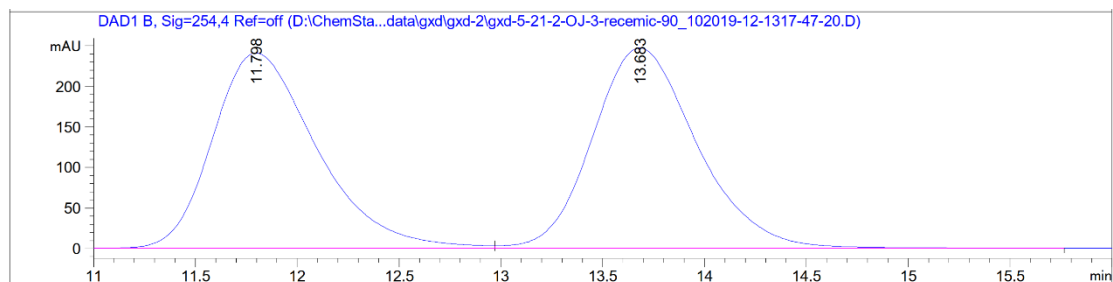
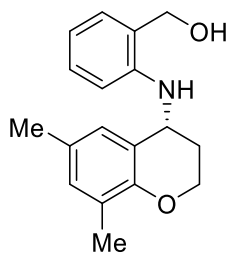


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.662	MF	0.1843	3.14616e4	2844.64404	98.3647
2	7.276	FM	0.2224	523.04156	39.20096	1.6353

Totals : 3.19847e4 2883.84501

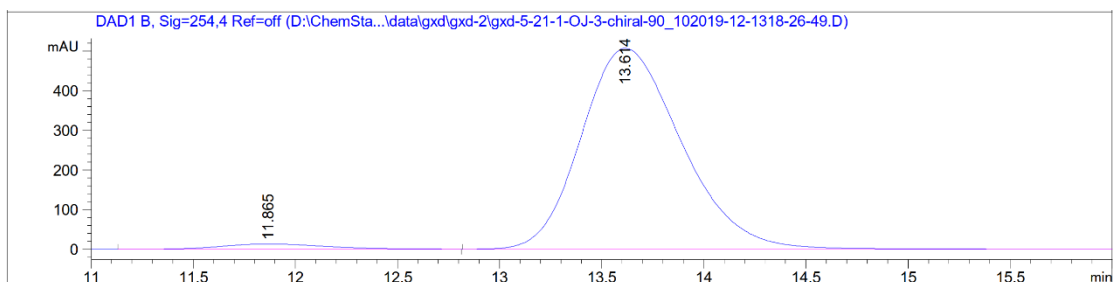
(R)-2-(((6,8-dimethylchroman-4-yl)amino)phenyl)methanol (3ha)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.798	BV	0.5443	8537.05273	240.38194	49.3159
2	13.683	VB	0.5491	8773.88672	246.61345	50.6841

Totals : 1.73109e4 486.99539

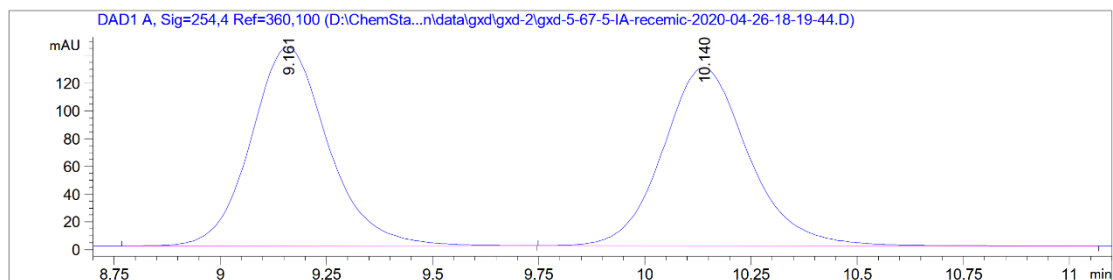
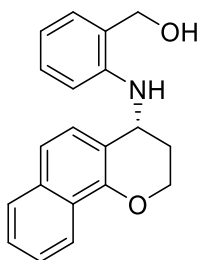


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.865	BB	0.5310	463.17526	13.21232	2.6045
2	13.614	BB	0.5285	1.73206e4	507.05347	97.3955

Totals : 1.77838e4 520.26579

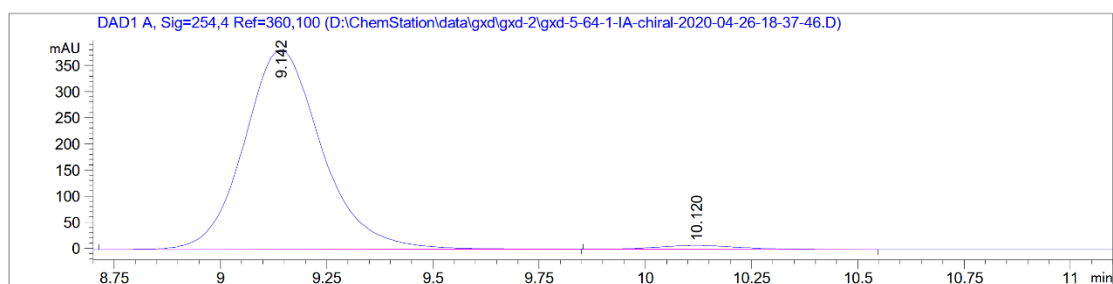
(R)-2-((3,4-dihydro-2H-benzo[h]chromen-4-yl)amino)phenyl)methanol (3ia)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.161	BB	0.1914	1811.32349	143.40982	50.0904
2	10.140	BB	0.2138	1804.78467	128.52042	49.9096

Totals : 3616.10815 271.93024

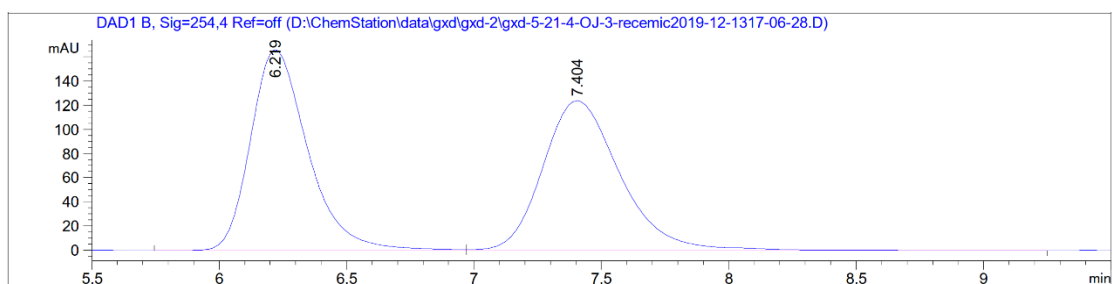
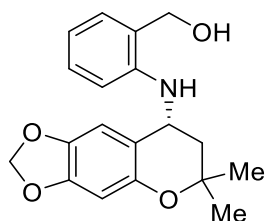


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.142	BB	0.1942	4851.01465	381.84607	98.0100
2	10.120	BB	0.2073	98.49758	7.30544	1.9900

Totals : 4949.51223 389.15151

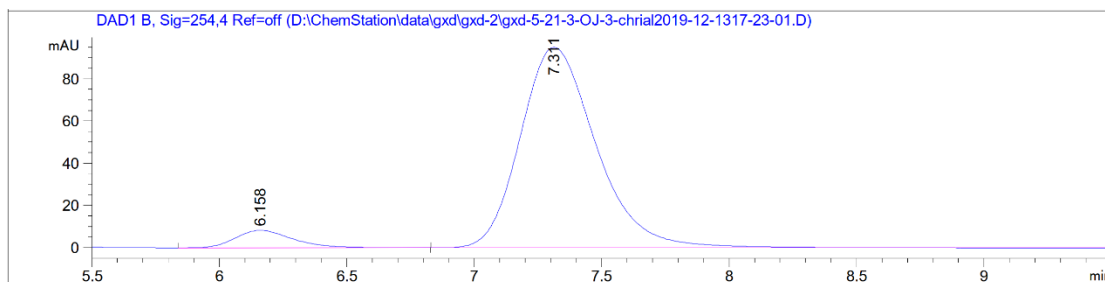
(R)-(2-((6,6-dimethyl-7,8-dihydro-6H-[1,3]dioxolo[4,5-g]chromen-8-yl)amino)phenyl)methanol (3ja)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.219	BV	0.2406	2604.79468	166.40924	49.7679
2	7.404	VB	0.3230	2629.09253	124.18684	50.2321

Totals : 5233.88721 290.59608

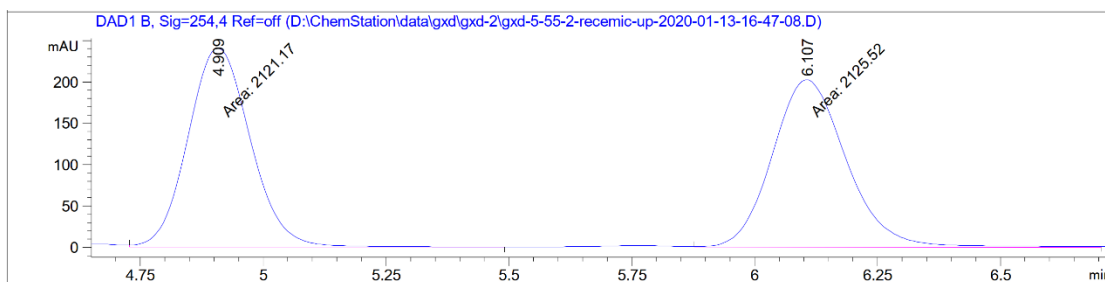
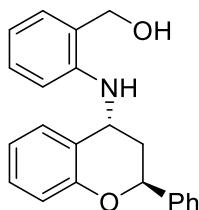


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.158	BB	0.2365	129.38199	8.27130	6.1634
2	7.311	BB	0.3178	1969.82446	95.03085	93.8366

Totals : 2099.20645 103.30215

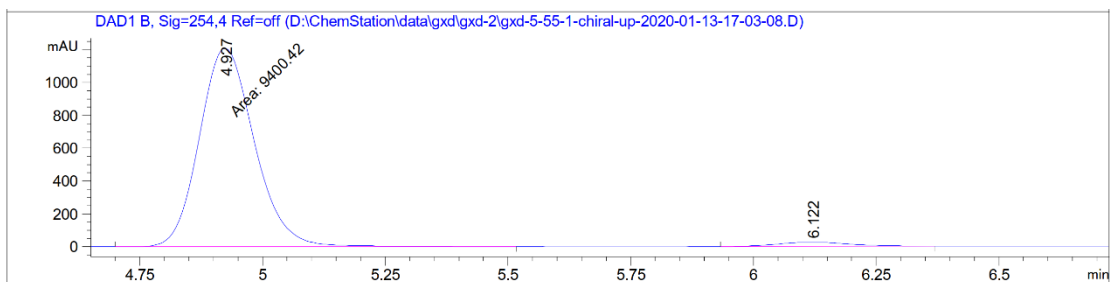
(2-(((2S,4R)-2-phenylchroman-4-yl)amino)phenyl)methanol (3ka)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	4.909	FM	0.1468	2121.17163	240.75459	49.9489
2	6.107	FM	0.1750	2125.51538	202.44238	50.0511

Totals : 4246.68701 443.19698

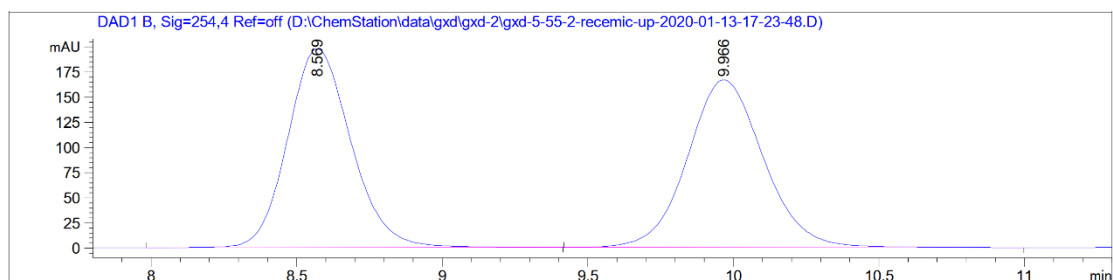
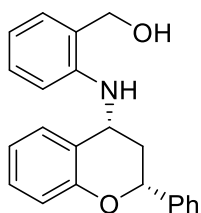


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	4.927	MF	0.1293	9400.41504	1211.73926	97.4946
2	6.122	BB	0.1517	241.56691	24.79122	2.5054

Totals : 9641.98195 1236.53048

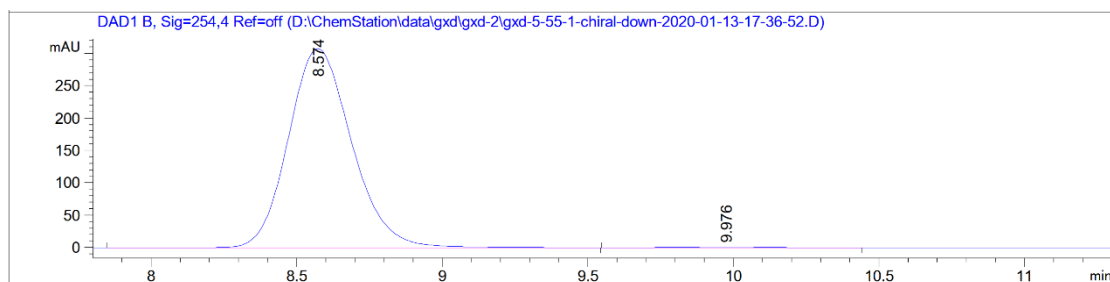
(2-(((2R,4R)-2-phenylchroman-4-yl)amino)phenyl)methanol (3ka')



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.569	BB	0.2330	2998.84106	197.68797	49.7428
2	9.966	BB	0.2803	3029.84912	166.51379	50.2572

Totals : 6028.69019 364.20177

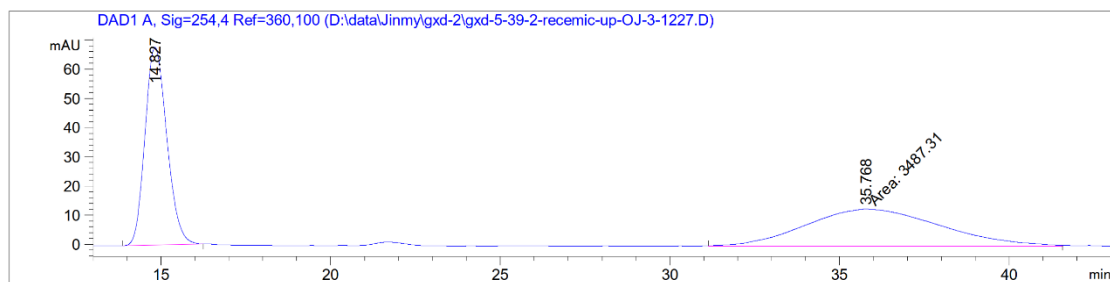
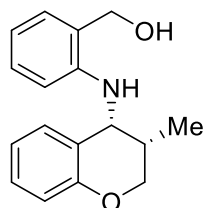


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.574	BB	0.2345	4660.77490	308.00891	99.4447
2	9.976	BB	0.2748	26.02396	1.38784	0.5553

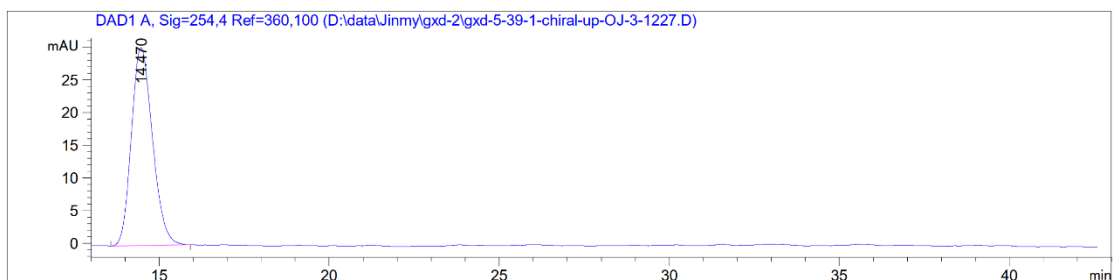
Totals : 4686.79886 309.39675

(2-(((3S,4R)-3-methylchroman-4-yl)amino)phenyl)methanol (3la)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.827	BB	0.6961	3033.13452	67.77893	46.5173
2	35.768	MM	4.5900	3487.31006	12.66272	53.4827

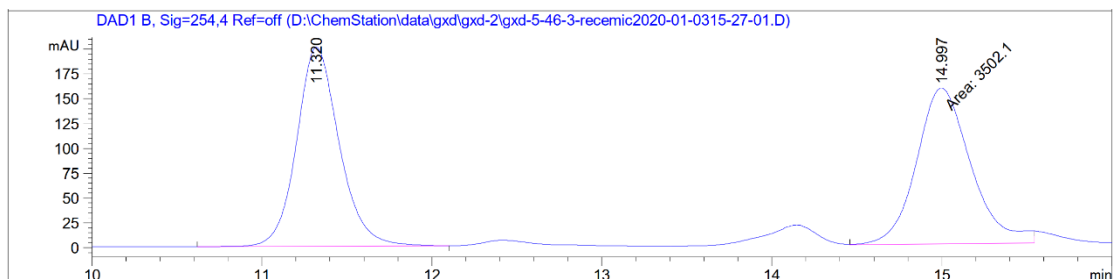
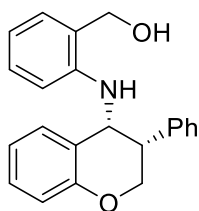


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.470	BB	0.6707	1305.15381	30.28721	100.0000

Totals : 1305.15381 30.28721

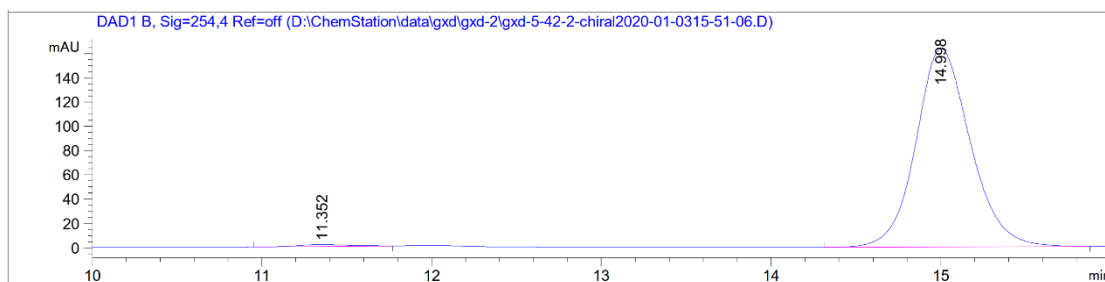
(2-(((3R,4R)-3-phenylchroman-4-yl)amino)phenyl)methanol (3ma)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.320	BB	0.2636	3502.53931	200.74316	50.0031
2	14.997	MF	0.3713	3502.10303	157.17912	49.9969

Totals : 7004.64233 357.92229

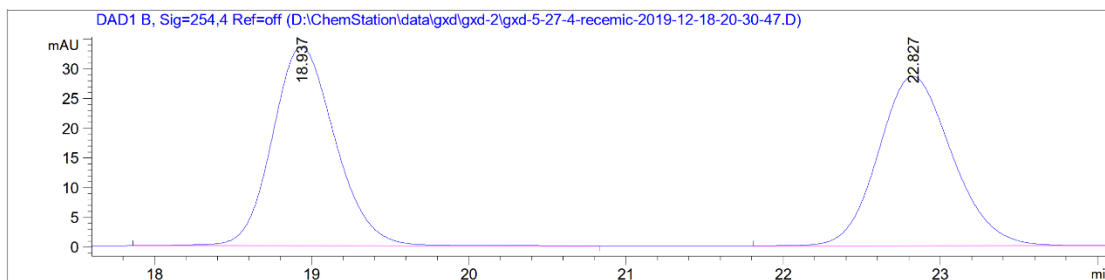
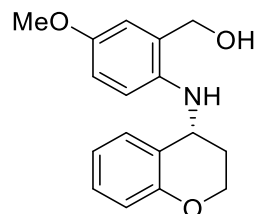


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.352	BB	0.2940	31.04382	1.56096	0.8395
2	14.998	BB	0.3392	3666.71924	163.79053	99.1605

Totals : 3697.76305 165.35149

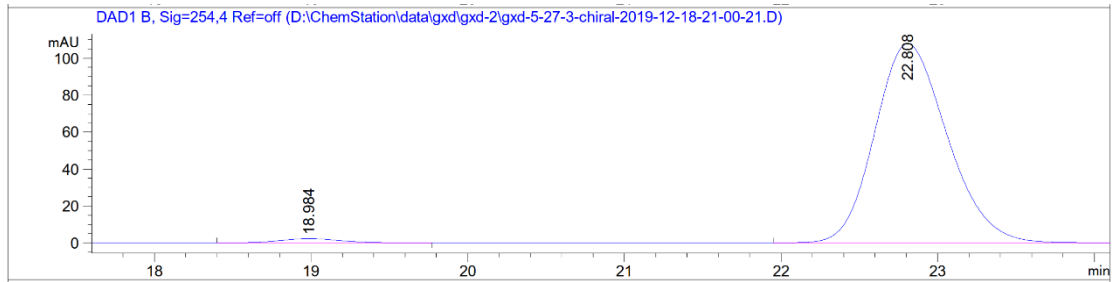
(R)-(2-(chroman-4-ylamino)-5-methoxyphenyl)methanol (3ab)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.937	BB	0.4287	933.20599	33.52590	50.0872
2	22.827	BB	0.5061	929.95575	28.54382	49.9128

Totals : 1863.16174 62.06971

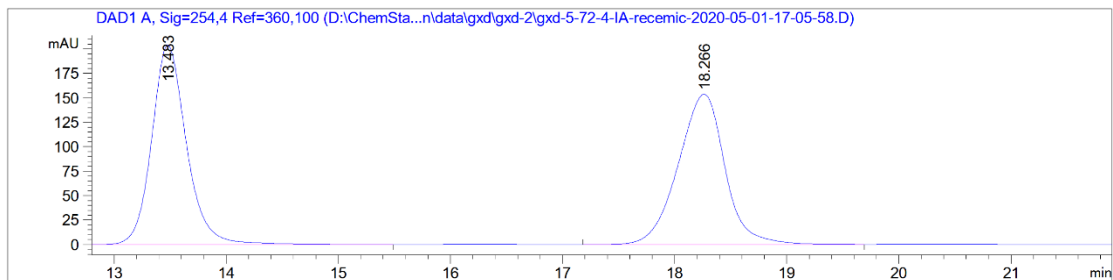
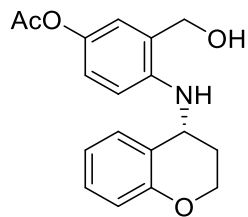


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	18.984	BB	0.4022	59.94406	2.25434	1.7055
2	22.808	BB	0.4984	3454.88818	107.65407	98.2945

Totals : 3514.83224 109.90841

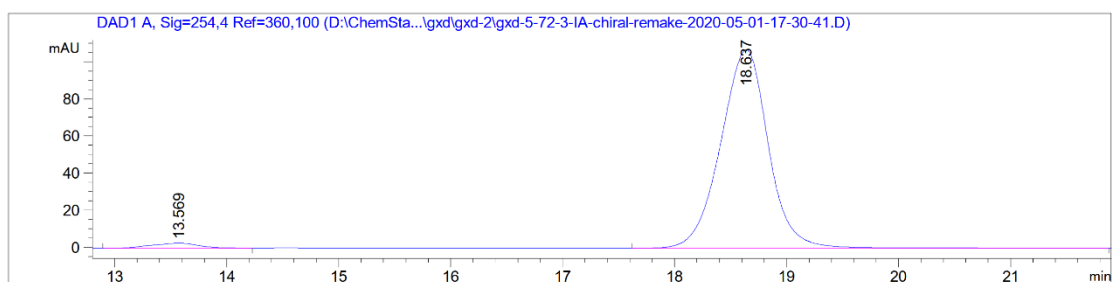
(R)-4-(chroman-4-ylamino)-3-(hydroxymethyl)phenyl acetate (3ac)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.483	BB	0.3259	4405.81934	204.02747	49.7587
2	18.266	BB	0.4436	4448.55127	153.71765	50.2413

Totals : 8854.37061 357.74512

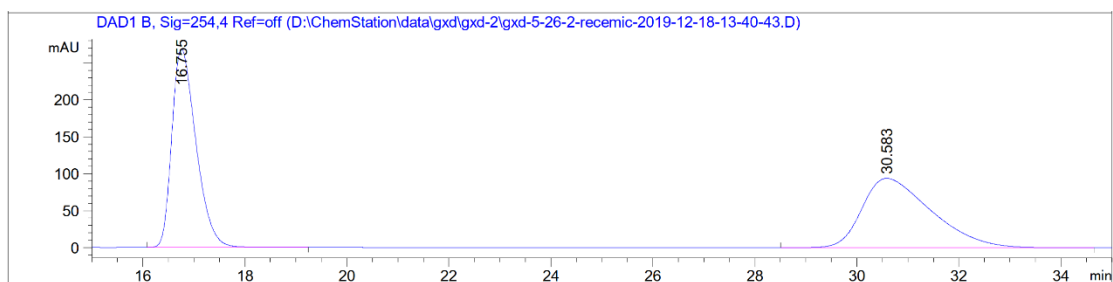
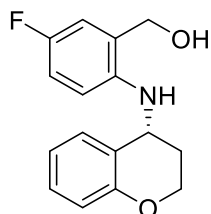


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.569	BB	0.4056	77.30832	2.70368	2.3821
2	18.637	BB	0.4536	3168.10620	106.95918	97.6179

Totals : 3245.41452 109.66285

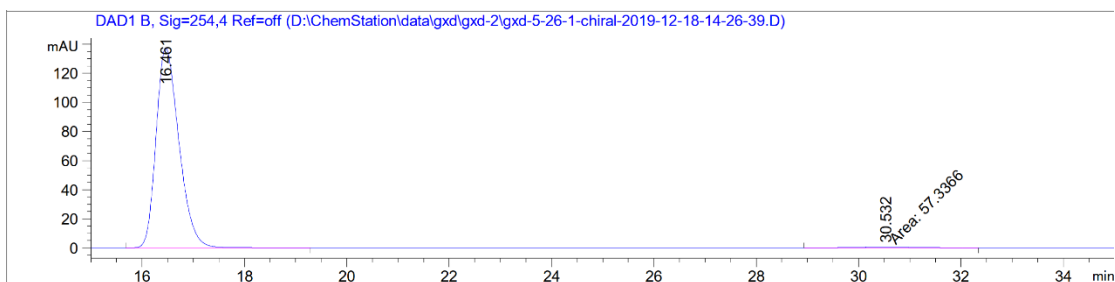
(R)-(2-(chroman-4-ylamino)-5-fluorophenyl)methanol (3ad)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.755	BB	0.5048	8811.22852	268.55930	49.9336
2	30.583	BB	1.4182	8834.64746	93.85553	50.0664

Totals : 1.76459e4 362.41483

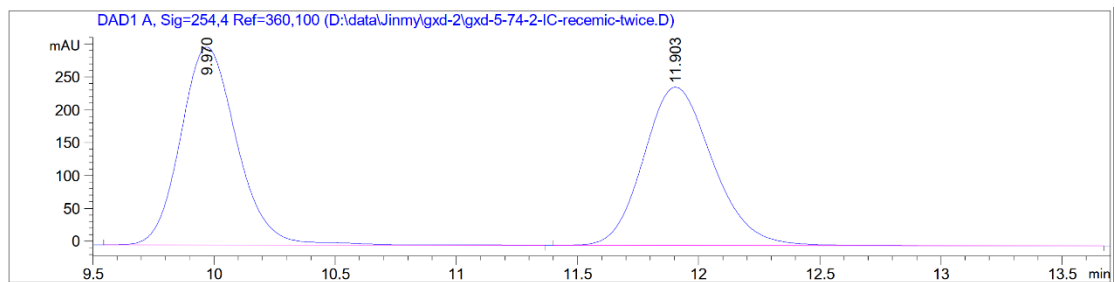
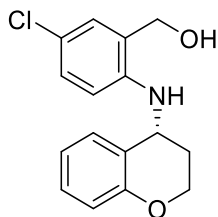


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.461	BB	0.4784	4277.69043	137.69296	98.6774
2	30.532	MM	1.5101	57.33657	6.32825e-1	1.3226

Totals : 4335.02700 138.32579

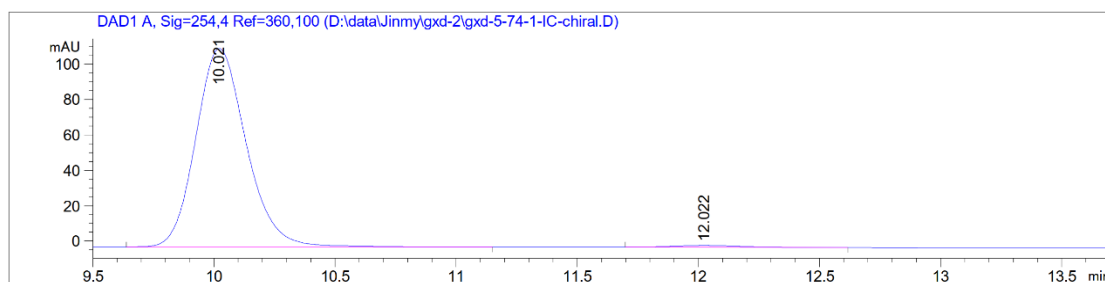
(R)-(5-chloro-2-(chroman-4-ylamino)phenyl)methanol (3ae)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.970	BB	0.2478	4842.10791	300.84753	50.3759
2	11.903	BB	0.3071	4769.85107	240.76421	49.6241

Totals : 9611.95898 541.61174

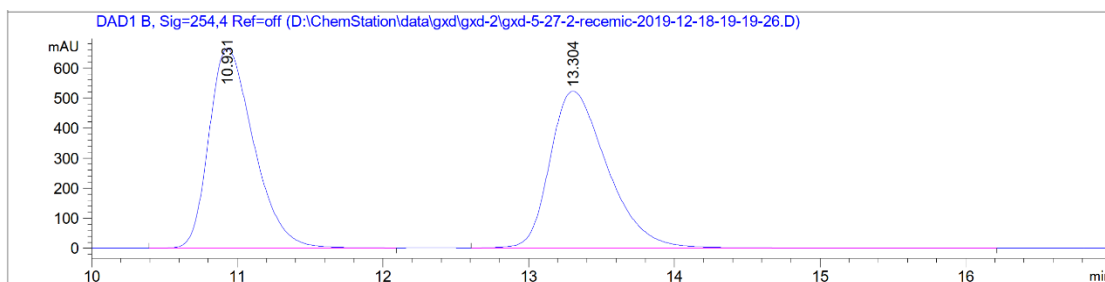
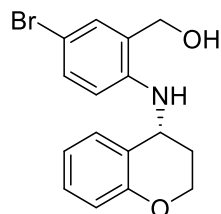


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.021	BB	0.2227	1622.10889	112.17372	98.7646
2	12.022	BB	0.2881	20.28997	1.08531	1.2354

Totals : 1642.39886 113.25903

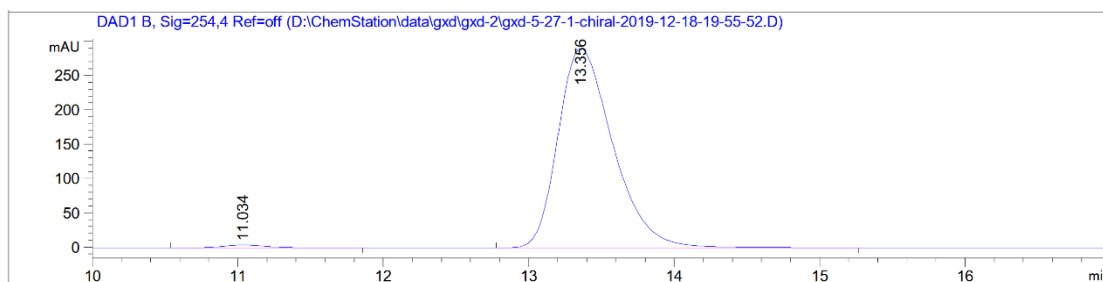
(R)-(5-bromo-2-(chroman-4-ylamino)phenyl)methanol (3af)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.931	BB	0.3282	1.41281e4	664.18909	49.8324
2	13.304	BB	0.4182	1.42232e4	521.45111	50.1676

Totals : 2.83513e4 1185.64020

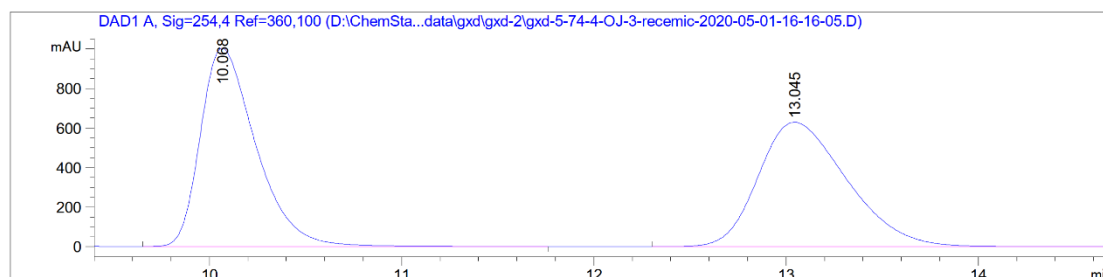
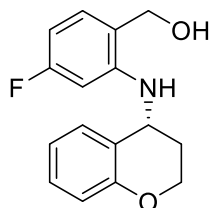


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.034	BB	0.3195	84.88226	4.10124	1.1038
2	13.356	BB	0.4018	7604.99365	290.14716	98.8962

Totals : 7689.87591 294.24840

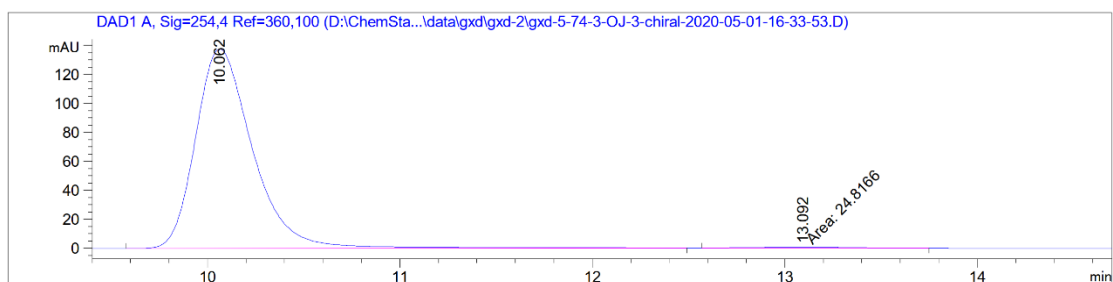
(R)-(2-(chroman-4-ylamino)-4-fluorophenyl)methanol (3ag)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.068	BB	0.3058	2.00757e4	1001.88452	49.9133
2	13.045	BB	0.4959	2.01454e4	628.66577	50.0867

Totals : 4.02211e4 1630.55029

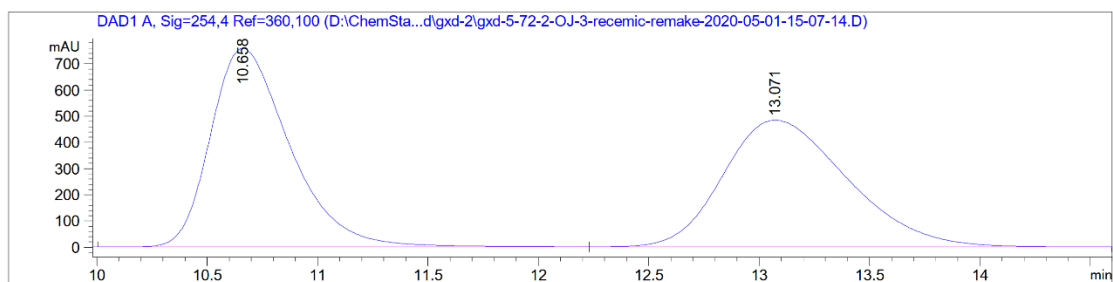
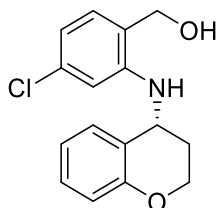


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.062	BB	0.3128	2845.87183	137.89563	99.1355
2	13.092	MM	0.5337	24.81657	7.75027e-1	0.8645

Totals : 2870.68839 138.67066

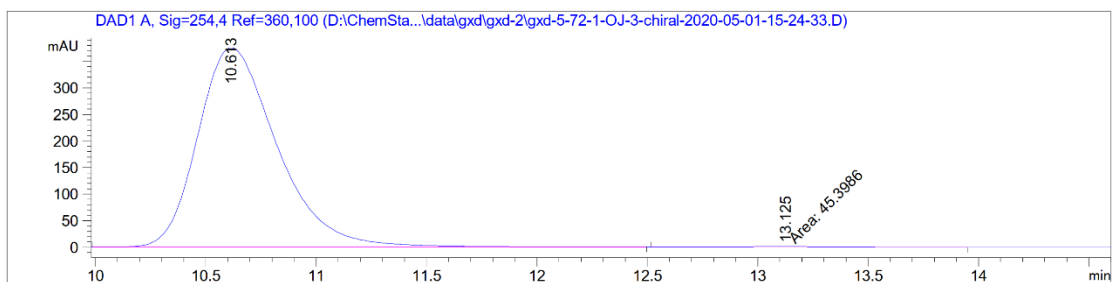
(R)-(4-chloro-2-(chroman-4-ylamino)phenyl)methanol (3ah)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.658	BB	0.3806	1.88868e4	758.30756	49.9520
2	13.071	BB	0.6061	1.89231e4	484.03149	50.0480

Totals : 3.78099e4 1242.33905

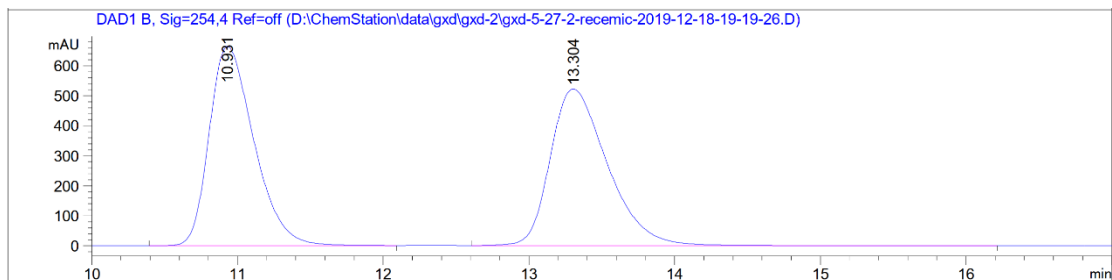
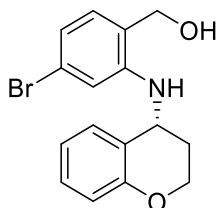


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.613	BB	0.3835	9380.04297	375.46530	99.5183
2	13.125	MM	0.6191	45.39859	1.22210	0.4817

Totals : 9425.44156 376.68740

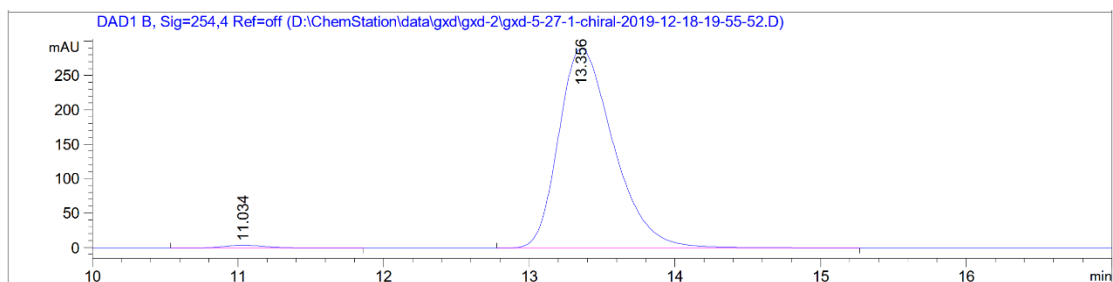
(R)-(4-bromo-2-(chroman-4-ylamino)phenyl)methanol (3ai)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.931	BB	0.3282	1.41281e4	664.18909	49.8324
2	13.304	BB	0.4182	1.42232e4	521.45111	50.1676

Totals : 2.83513e4 1185.64020

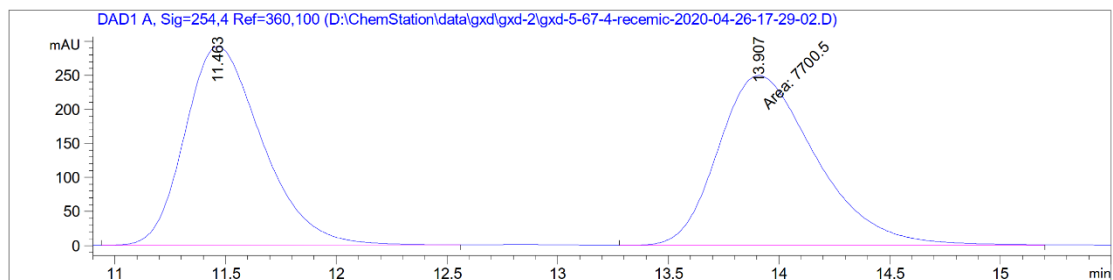
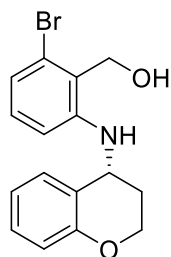


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.034	BB	0.3195	84.88226	4.10124	1.1038
2	13.356	BB	0.4018	7604.99365	290.14716	98.8962

Totals : 7689.87591 294.24840

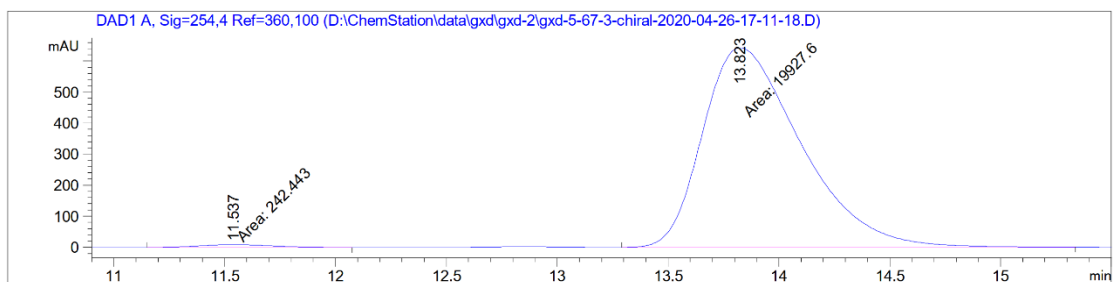
(R)-(2-bromo-6-(chroman-4-ylamino)phenyl)methanol (3aj)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.463	BB	0.3732	7082.60791	291.73959	47.9101
2	13.907	MF	0.5145	7700.49902	249.46124	52.0899

Totals : 1.47831e4 541.20084

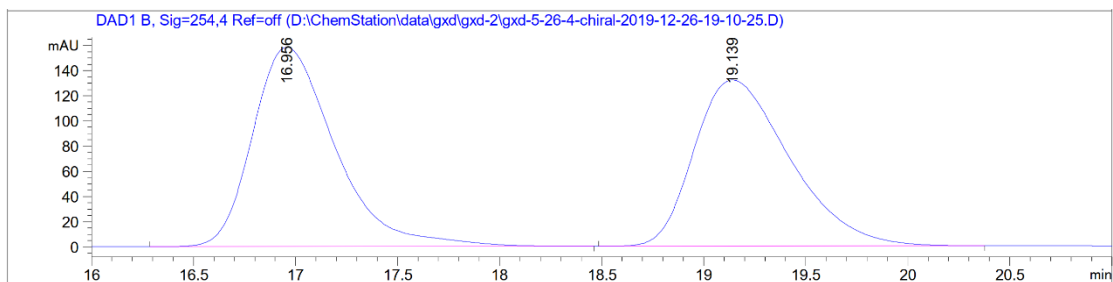
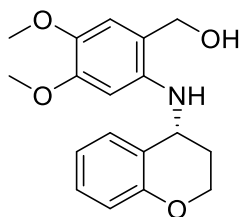


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.537	MM	0.4205	242.44342	9.60848	1.2020
2	13.823	MM	0.5154	1.99276e4	644.36890	98.7980

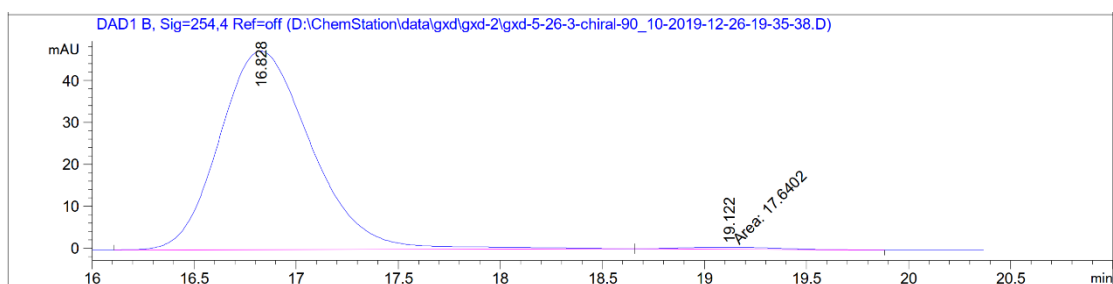
Totals : 2.01701e4 653.97738

(R)-(2-(chroman-4-ylamino)-4,5-dimethoxyphenyl)methanol (3ak)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.956	BB	0.4299	4452.34424	158.39125	50.8828
2	19.139	BB	0.5017	4297.84570	132.04735	49.1172

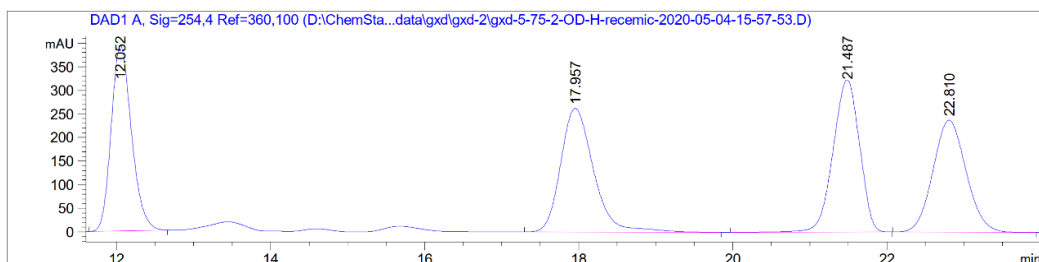
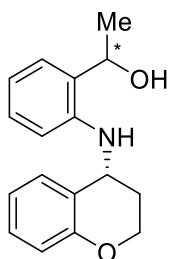


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.828	BB	0.4830	1483.79126	47.42852	98.8251
2	19.122	MM	0.5437	17.64017	5.40724e-1	1.1749

Totals : 1501.43143 47.96924

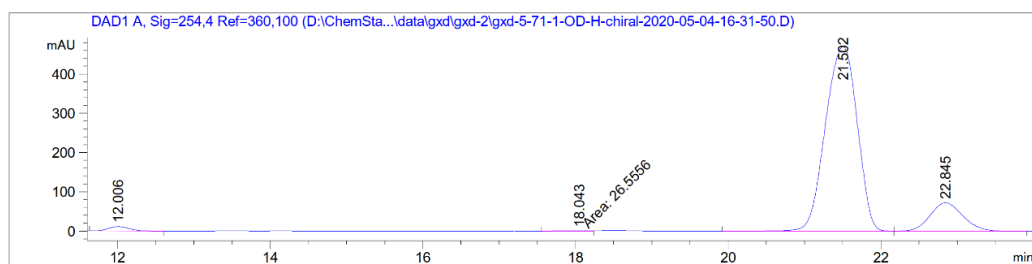
(R)-(4-bromo-2-(chroman-4-ylamino)phenyl)methanol (3a)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.052	BB	0.2817	7206.12744	393.37830	24.2169
2	17.957	BB	0.4563	7775.44043	261.95740	26.1302
3	21.487	BB	0.3642	7695.20117	322.75977	25.8605
4	22.810	BB	0.4621	7079.80176	237.26437	23.7924

Totals : 2.97566e4 1215.35983

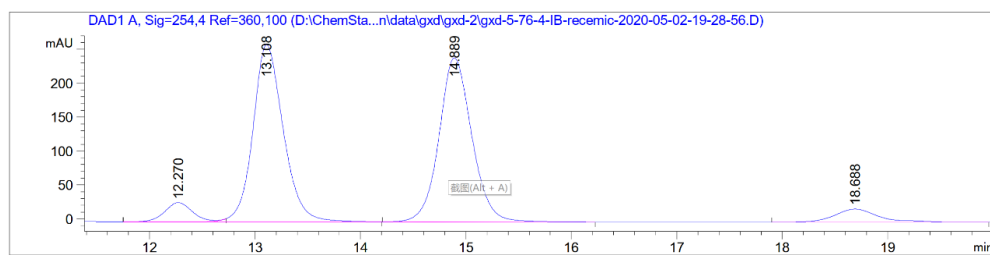
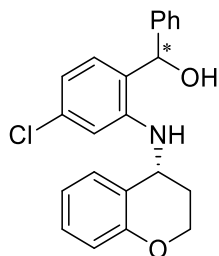


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.006	BB	0.3030	216.34616	11.21551	1.3546
2	18.043	MM	0.4099	26.55558	1.07970	0.1663
3	21.502	BB	0.4648	1.35828e4	470.44107	85.0457
4	22.845	BB	0.4611	2145.47900	72.11691	13.4334

Totals : 1.59712e4 554.85319

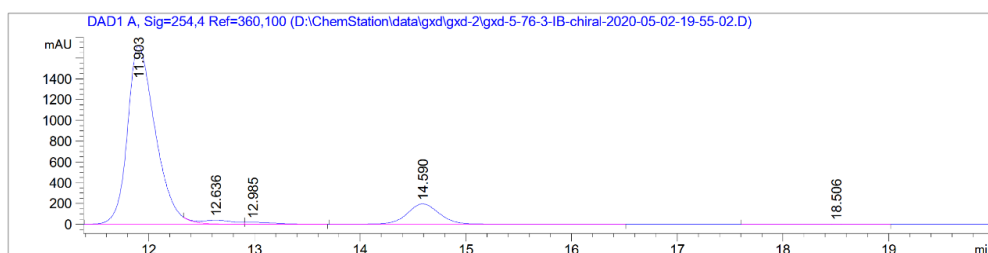
(4-chloro-2-(((R)-chroman-4-yl)amino)phenyl)(phenyl)methanol (3am)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.270	BV E	0.2765	516.12323	28.33297	4.4736
2	13.108	VB R	0.3034	5229.89404	261.38773	45.3315
3	14.889	BB	0.3282	5226.50049	241.81271	45.3021
4	18.688	BB	0.4349	564.48114	19.43325	4.8928

Totals : 1.15370e4 550.96666

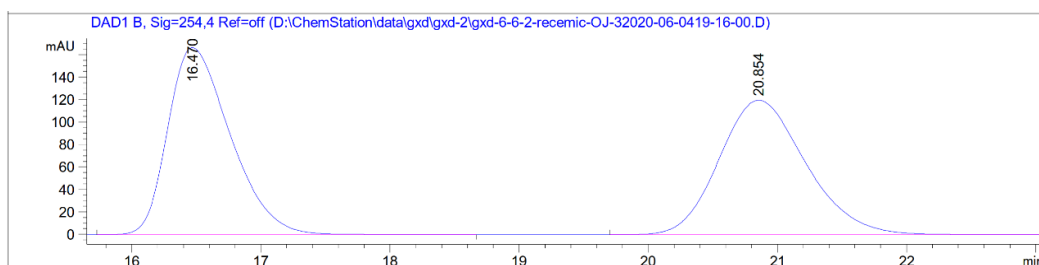
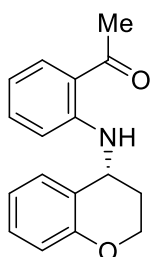


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.903	BV R	0.2757	3.14211e4	1715.56531	85.4114
2	12.636	VV E	0.2950	748.07092	36.51688	2.0335
3	12.985	VB E	0.2932	357.08893	18.50089	0.9707
4	14.590	BB	0.3256	4196.40918	196.17961	11.4070
5	18.506	BB	0.3976	65.28155	2.41355	0.1775

Totals : 3.67880e4 1969.17623

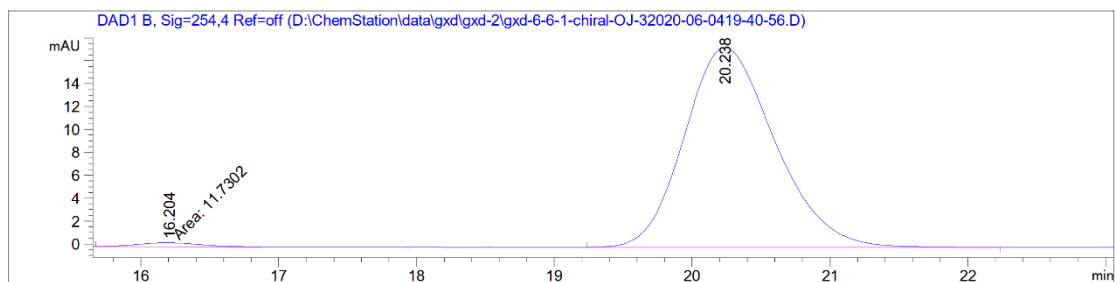
(R)-1-(2-(chroman-4-ylamino)phenyl)ethan-1-one (3al')



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.470	BB	0.5177	5590.75049	166.50044	49.9907
2	20.854	BBA	0.7192	5592.82520	119.69013	50.0093

Totals : 1.11836e4 286.19057

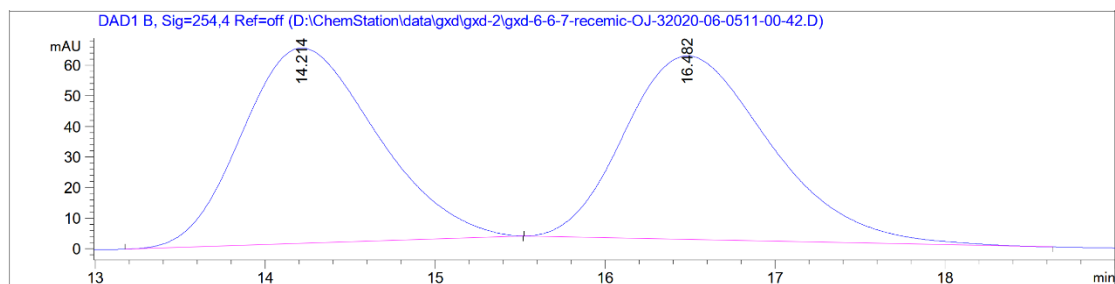
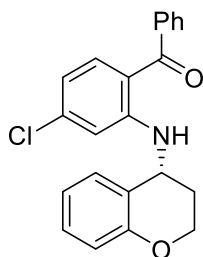


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.204	MM	0.5541	11.73015	3.52807e-1	1.4533
2	20.238	BB	0.6937	795.39874	17.45280	98.5467

Totals : 807.12890 17.80561

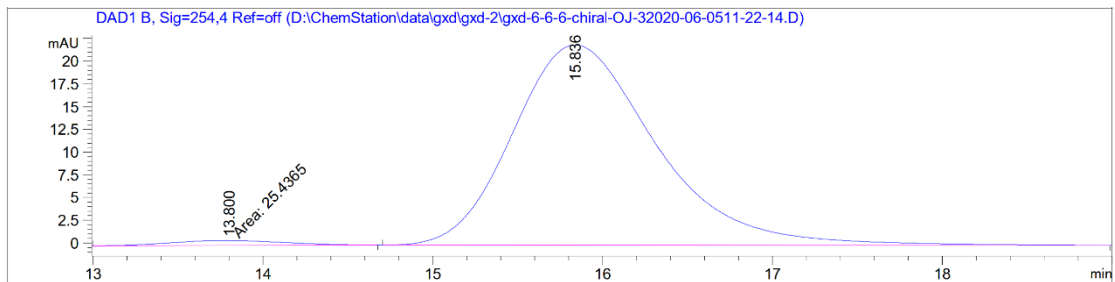
(R)-(4-chloro-2-(chroman-4-ylamino)phenyl)(phenyl)methanone (3am')



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.214	BB	0.8488	3521.58472	63.91703	49.6062
2	16.482	BB	0.9172	3577.49658	60.03707	50.3938

Totals : 7099.08130 123.95410

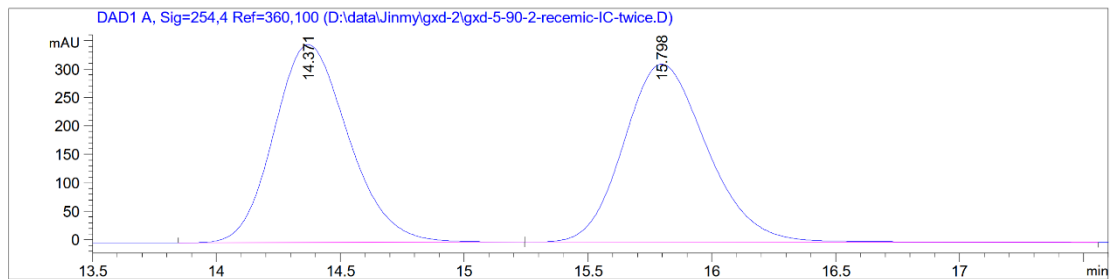
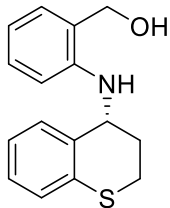


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.800	MM	0.7791	25.43647	5.44153e-1	1.9319
2	15.836	BB	0.8836	1291.20459	22.03764	98.0681

Totals : 1316.64106 22.58179

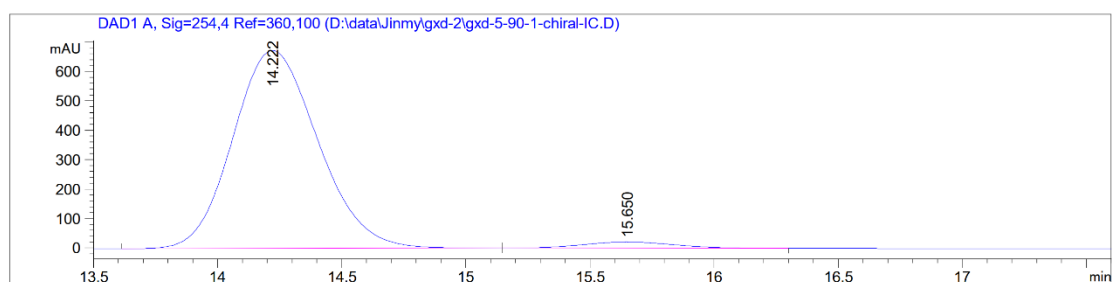
(R)-(2-(thiochroman-4-ylamino)phenyl)methanol (3na)



Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.371	BB	0.3243	7286.68066	348.02106	49.9075
2	15.798	BB	0.3608	7313.68164	312.83505	50.0925

Totals : 1.46004e4 660.85611

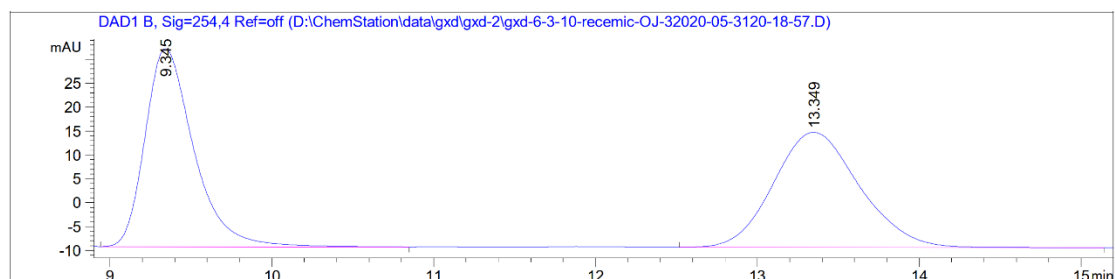
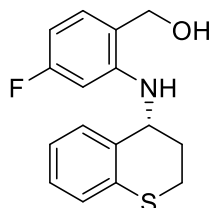


Signal 1: DAD1 A, Sig=254,4 Ref=360,100

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.222	BB	0.3699	1.60285e4	672.98535	96.7826
2	15.650	BB	0.3964	532.83881	20.97133	3.2174

Totals : 1.65613e4 693.95668

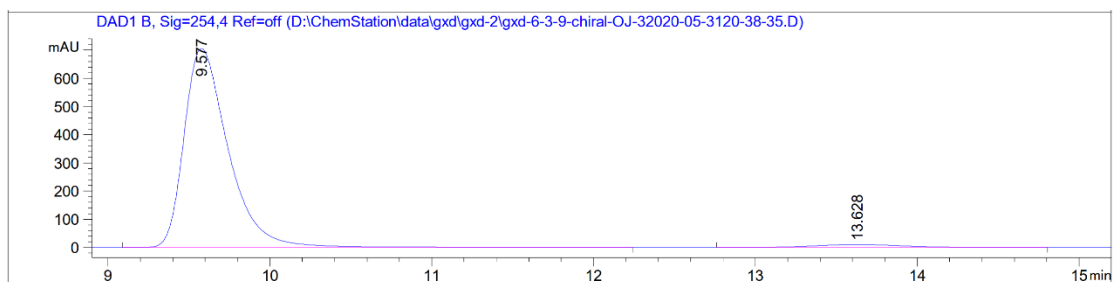
(R)-(4-fluoro-2-(thiochroman-4-ylamino)phenyl)methanol (3ng)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.345	BB	0.3181	867.02393	41.44741	49.3346
2	13.349	BB	0.5628	890.41193	24.11416	50.6654

Totals : 1757.43585 65.56157

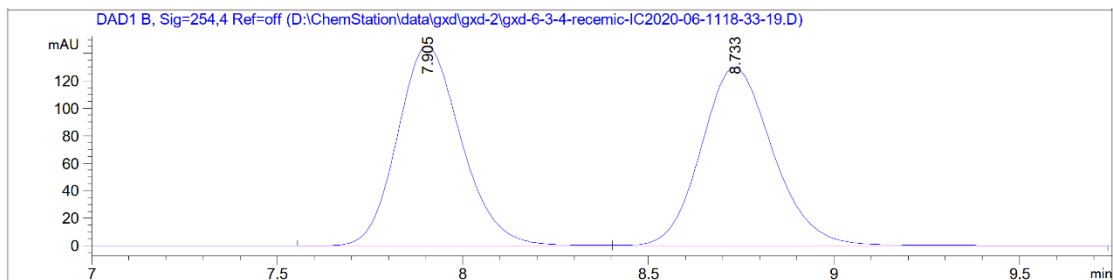
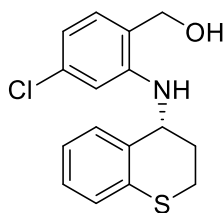


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.577	BB	0.2870	1.33771e4	706.02710	97.2703
2	13.628	BB	0.5619	375.40225	10.23566	2.7297

Totals : 1.37525e4 716.26276

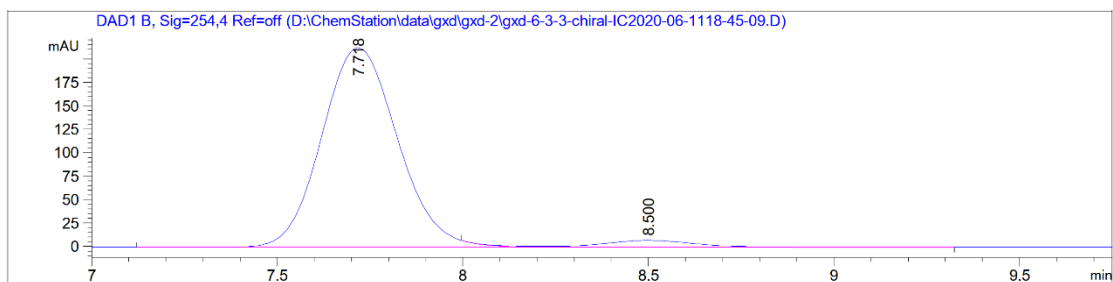
(R)-(4-chloro-2-(thiochroman-4-ylamino)phenyl)methanol (3nh)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.905	BV	0.1833	1734.38635	145.21967	49.8484
2	8.733	VB	0.2071	1744.93274	129.59984	50.1516

Totals : 3479.31909 274.81950

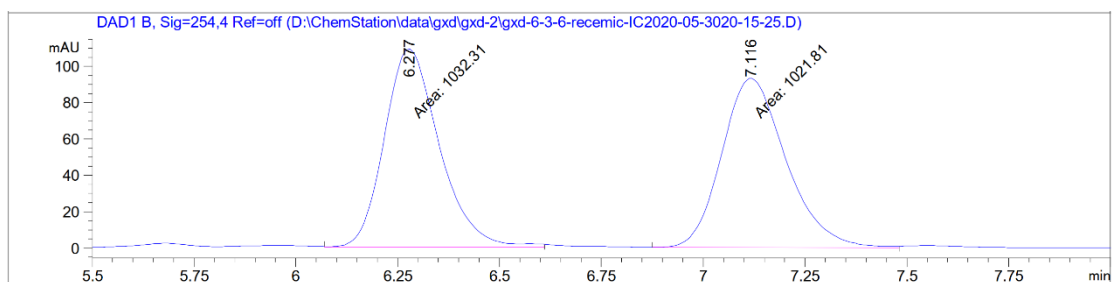
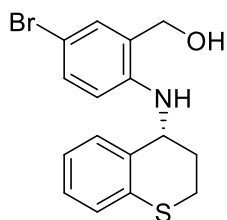


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.718	BV R	0.2217	3019.64307	212.62964	95.7573
2	8.500	VB E	0.2761	133.79126	7.29035	4.2427

Totals : 3153.43433 219.91999

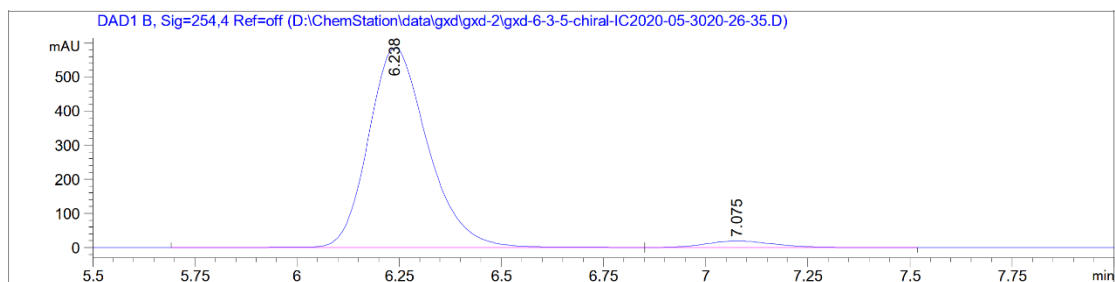
(R)-(5-bromo-2-(thiochroman-4-ylamino)phenyl)methanol (3nf)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.277	MF	0.1572	1032.31177	109.41663	50.2556
2	7.116	MF	0.1828	1021.81226	93.15769	49.7444

Totals : 2054.12402 202.57432

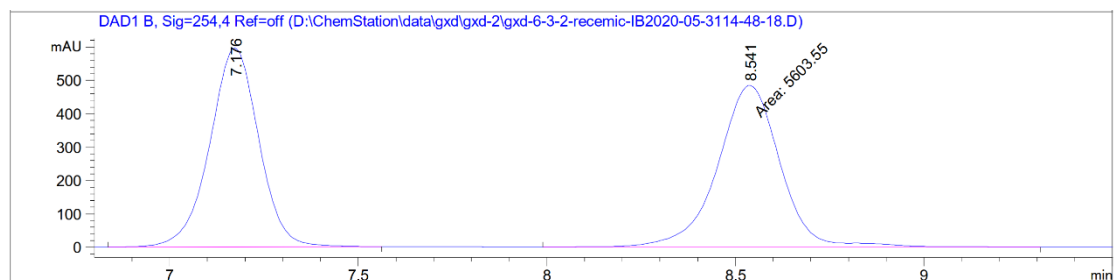
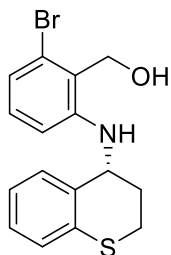


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	6.238	BV	0.1536	5906.92236	586.04376	96.2941
2	7.075	VB	0.1806	227.32938	19.40930	3.7059

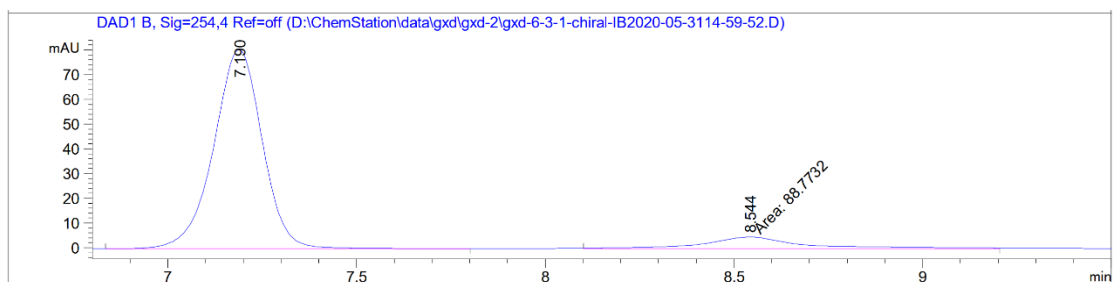
Totals : 6134.25174 605.45306

(R)-(2-bromo-6-(thiochroman-4-ylamino)phenyl)methanol (3nj)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.176	BB	0.1394	5376.48730	595.25037	48.9660
2	8.541	MF	0.1927	5603.55176	484.58673	51.0340

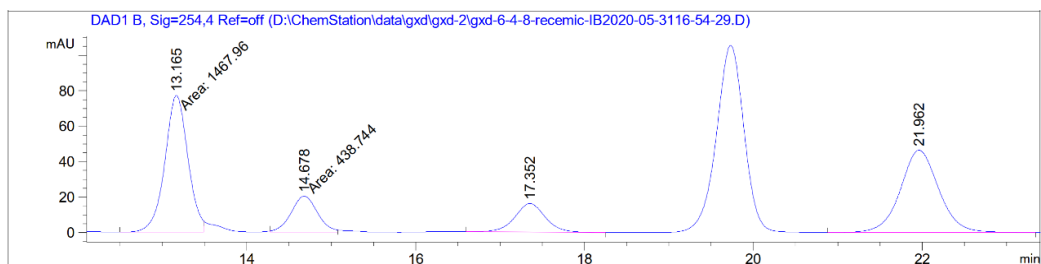
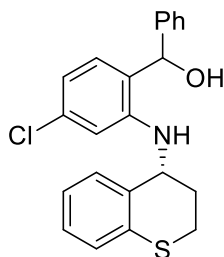


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.190	BB	0.1364	721.74207	80.68765	89.0473
2	8.544	MF	0.3148	88.77319	4.70005	10.9527

Totals : 810.51526 85.38771

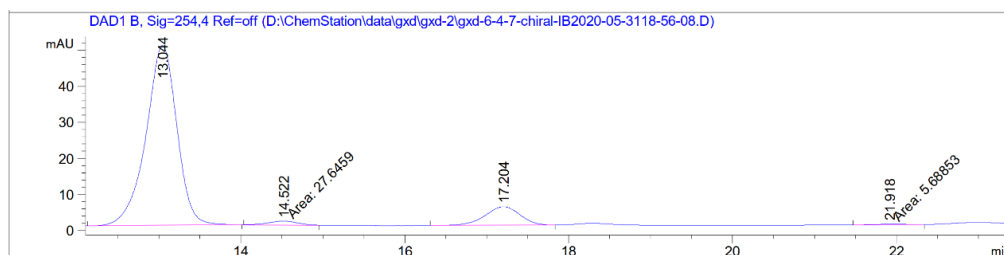
(4-chloro-2-(((R)-thiochroman-4-yl)amino)phenyl)(phenyl)methanol (3nm)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.165	MF	0.3171	1467.96484	77.14549	38.8365
2	14.678	FM	0.3601	438.74365	20.30690	11.6074
3	17.352	BB	0.3821	406.78787	16.13917	10.7620
4	21.962	BB	0.4788	1466.36462	46.39190	38.7941

Totals : 3779.86099 159.98346

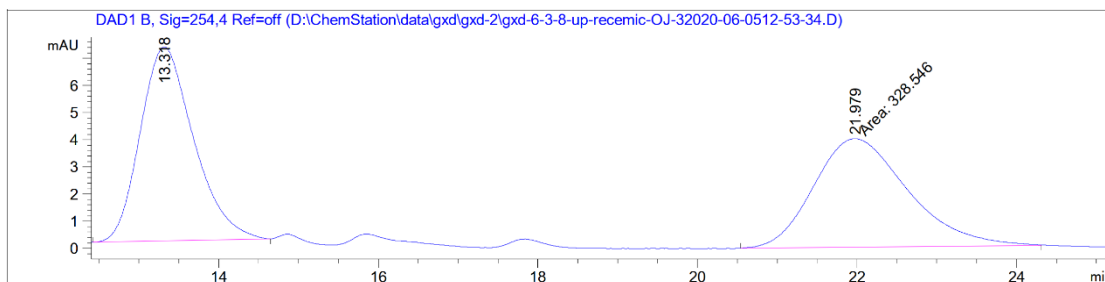
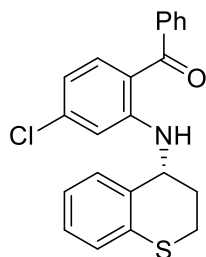


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.044	BB	0.3987	1310.67456	49.86439	87.6326
2	14.522	MM	0.4177	27.64594	1.10318	1.8484
3	17.204	BB	0.4482	151.63867	5.14004	10.1387
4	21.918	MM	0.5140	5.68853	1.84449e-1	0.3803

Totals : 1495.64770 56.29207

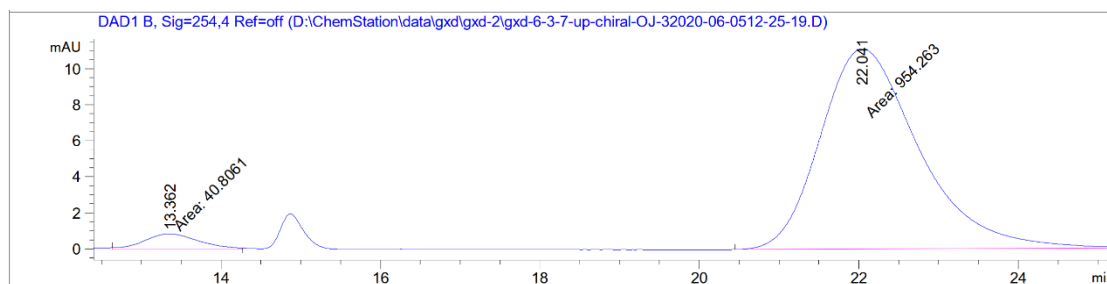
(R)-(4-chloro-2-(thiochroman-4-ylamino)phenyl)(phenyl)methanone (3nm')



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.318	BB	0.6869	332.51227	7.14550	50.3000
2	21.979	MM	1.3691	328.54565	3.99968	49.7000

Totals : 661.05792 11.14518

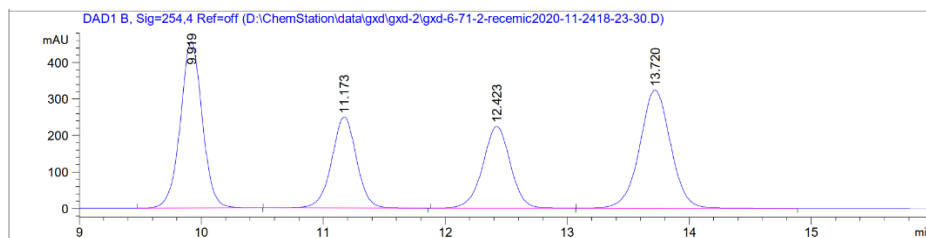
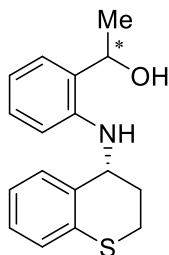


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.362	MM	0.7951	40.80608	8.55317e-1	4.1008
2	22.041	MF	1.4322	954.26312	11.10505	95.8992

Totals : 995.06920 11.96036

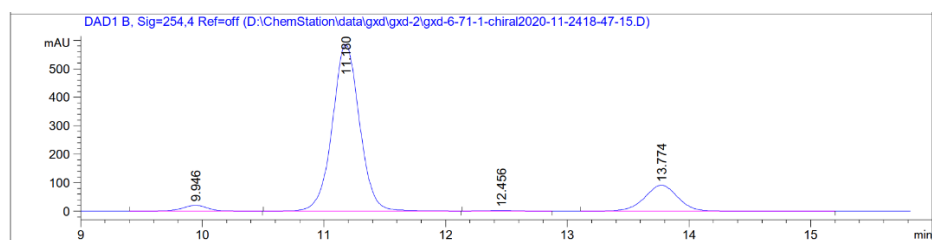
1-(2-(((R)-thiochroman-4-yl)amino)phenyl)ethan-1-ol (3nl)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.919	BB	0.1918	5709.18799	456.83337	30.8331
2	11.173	BB	0.2159	3556.79150	250.09726	19.2089
3	12.423	BB	0.2419	3530.35742	223.93298	19.0661
4	13.720	BB	0.2700	5720.07617	323.88736	30.8919

Totals : 1.85164e4 1254.75098

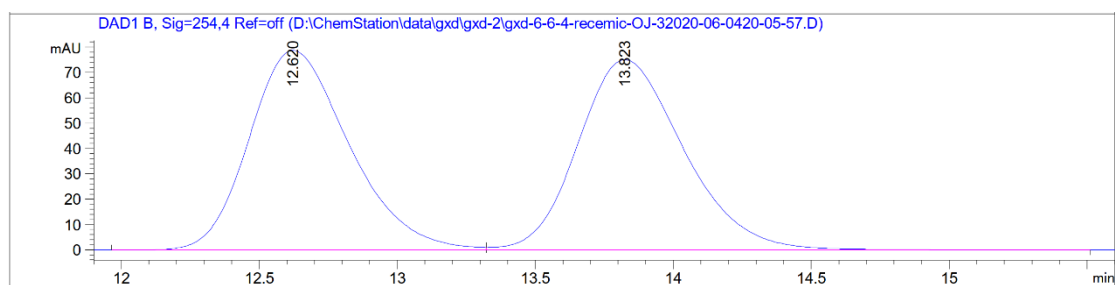
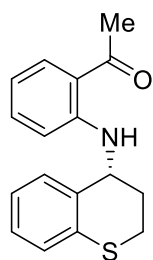


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.946	BB	0.2156	285.08511	20.08410	2.5683
2	11.180	BB	0.2364	9051.78027	585.49432	81.5469
3	12.456	BB	0.2434	36.40385	2.29055	0.3280
4	13.774	BB	0.2917	1726.82666	90.88046	15.5569

Totals : 1.11001e4 698.74944

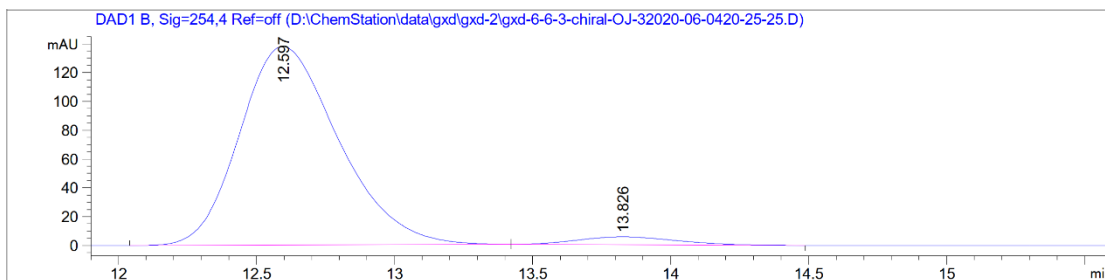
(R)-1-(2-(thiochroman-4-ylamino)phenyl)ethan-1-one (3nl')



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.620	BV	0.3855	1983.91479	78.85223	49.7518
2	13.823	VB	0.4113	2003.70911	75.09126	50.2482

Totals : 3987.62390 153.94349

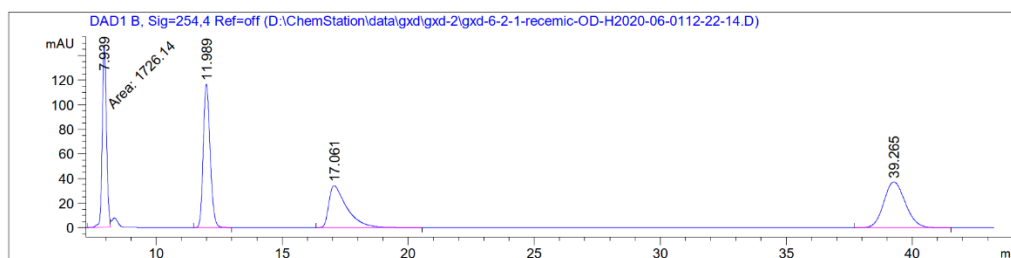
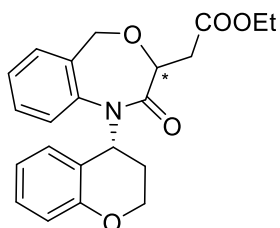


Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.597	BB	0.3823	3433.37622	137.98973	96.2273
2	13.826	BB	0.3842	134.60760	5.44973	3.7727

Totals : 3567.98383 143.43946

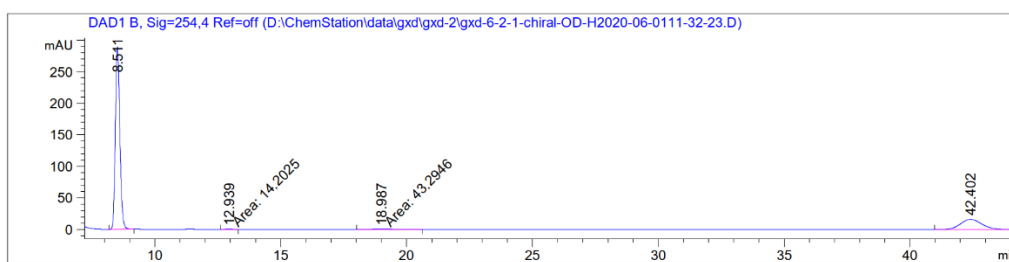
ethyl 2-(1-((R)-chroman-4-yl)-2-oxo-1,2,3,5-tetrahydrobenzo[e][1,4]oxazepin-3-yl)acetate (4)



Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.939	MF	0.1943	1726.13623	148.06203	22.0325
2	11.989	BB	0.2929	2203.70654	116.36733	28.1283
3	17.061	BB	0.7132	1694.15002	34.12495	21.6243
4	39.265	BB	0.9157	2210.49512	37.17818	28.2149

Totals : 7834.48792 335.73249

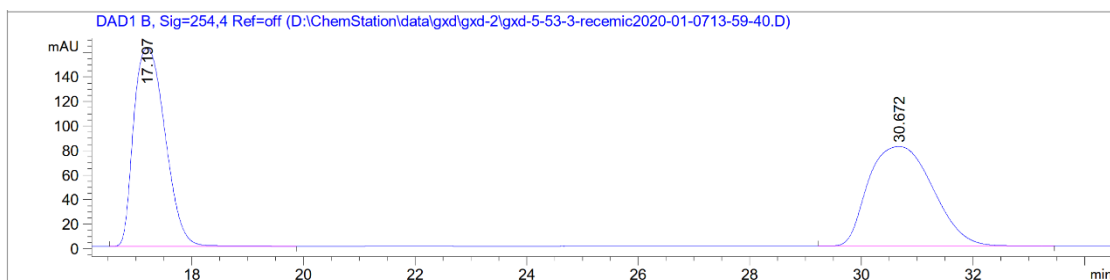
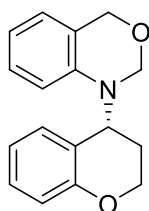


Signal 1: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.511	BB	0.1912	3595.29175	288.85440	78.2157
2	12.939	MM	0.3325	14.20251	7.11811e-1	0.3090
3	18.987	MM	1.0218	43.29458	7.06166e-1	0.9419
4	42.402	BB	0.8791	943.84888	16.07265	20.5335

Totals : 4596.63771 306.34502

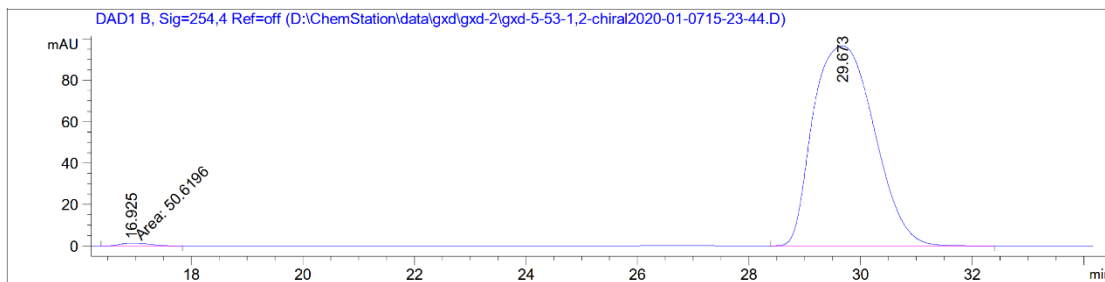
(R)-1-(chroman-4-yl)-1,4-dihydro-2H-benzo[d][1,3]oxazine (5)



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	17.197	BB	0.6351	6313.16064	161.85327	49.2516
2	30.672	BB	1.3026	6505.01367	81.20108	50.7484

Totals : 1.28182e4 243.05435



Signal 2: DAD1 B, Sig=254,4 Ref=off

Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.925	MM	0.6228	50.61965	1.35468	0.6814
2	29.673	BB	1.2486	7378.16650	96.65584	99.3186

Totals : 7428.78615 98.01051