Supporting Information

N-Heterocyclic Carbene Promoted Enantioselective Desymmetrization Reaction of Diarylalkane-bisphenols

Shoulei Li, Bin Liu, Li Chen, Xin Li* and Jin-Pei Cheng

State Key Laboratory of Elemento-organic Chemistry, College of Chemistry, Collaborative Innovation Center of Chemical Science and Engineering, Nankai University, Tianjin 300071, China.

xin_li@nankai.edu.cn (X. Li)

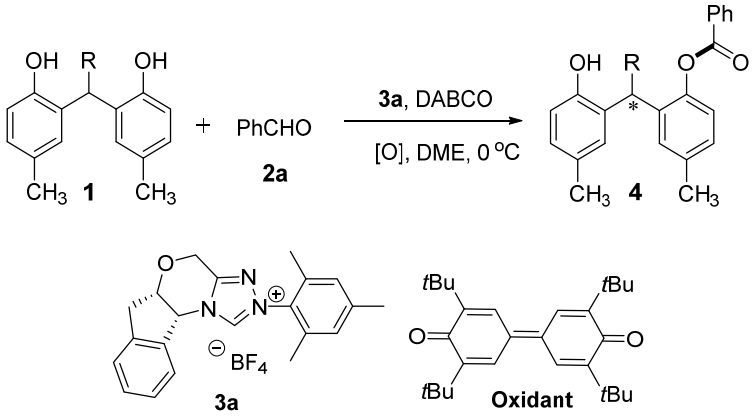
Contents

General Information.

Commercial reagents were used as received, unless otherwise stated. ^{1}H and ^{13}C NMR were recorded in $CDCl_3$ on 400 MHz spectrometer. Chemical shifts are reported in ppm from tetramethylsilane with the solvent resonance as the internal standard. The following abbreviations were used to designate chemical shift mutiplicities: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet. All first-order splitting patterns were assigned on the basis of the appearance of the multiplet. Splitting patterns that could not be easily interpreted are designated as multiplet (m). Mass spectra were obtained using electrospray ionization (ESI). Fourier transform infrared (FT-IR) spectra were tested on Bruker Tensor 27 spectrophotometer. Substrates **1** were synthesized according to the reported literatures.[1]

Evaluation of steric parameters

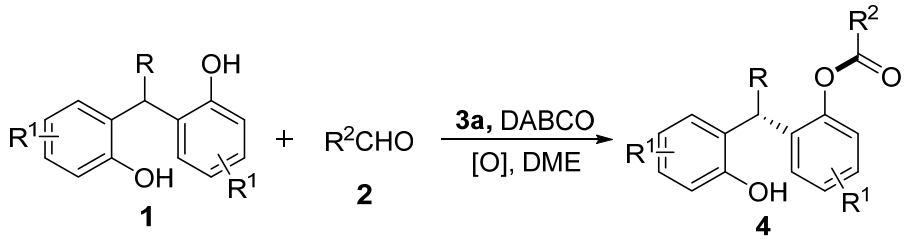
Table S1. Evaluation of steric parameters.[a]



Entry	R	Yield (%)[b]	Run 1 er	Run 2 er	er[c]	Charton vaule	$\Delta\Delta G^{\neq}$(er) (kcal/mol)[d]
1	**1a:** Ph	**4a:** 73	60.3:39.7	60.1:39.8	60.3:39.7	0.57	0.25
2	**1b:** Et	**4b:** 78	62.3:37.7	62.7:37.3	62.5:37.5	0.56	0.30
3	**1c:** Me	**4c:** 70	58.3:41.7	58.5:41.5	58.5:41.5	0.52	0.20
4	**1d:** *c*-C_6H_{11}	**4d:** 70	83.5:16.5	82.3:17.7	82.9:17.1	0.87	0.94
5	**1e:** *i*-Pr	**4e:** 96	81.6:18.4	81.2:18.8	81.4:18.6	0.76	0.87
6	**1f:** 1-Ad[e]	**4f:** 84	97.6:2.4	97.0:3.0	97.3:2.7	1.33	2.13
7	**1g:** *t*-Bu	**4g:** 98	97.2:2.8	96.6:3.4	96.9:3.1	1.24	2.04

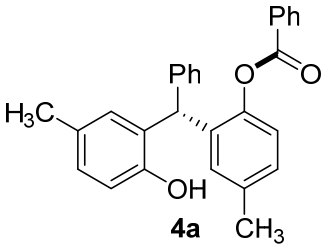
[a] The reactions were conducted with **1** (0.1 mmol), **2a** (0.1 mmol), **3a** (5 mol%), DABCO (0.1 mmol), oxidant (0.1 mmol) in DME (1.0 mL) at 0 °C for 17 h under Ar. [b] Yield of isolated product as the average of two runs. [c] Determined by HPLC analysis, averaged over two runs. [d] $\Delta\Delta G^{\neq} = RT\ln(er)$, R = 0.001986 kcal K^{-1} mol^{-1}, T = 298.15 K. [e]1-Ad = 1-adamantyl. DABCO = 1,4-diazobicyclo(2.2.2)octane, DME = 1,2-dimethoxyethane.

General procedure for synthesis of products 4.



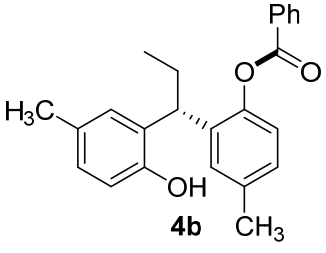
To a dry Schlenk tube equipped with a magnetic stir bar, was added bisphenols **1** (0.1 mmol), triazolium salt **3a** (0.005 mmol), DABCO (0.1 mmol) quinone oxidant (0.1 mmol). The tube was closed with a septum, evacuated, and refilled with argon. Freshly distilled DME (1.0 mL) was added and the reaction mixture was then stirred at 0 ºC for 5 minutes, followed by aldehyde **2** (0.1 mmol). Upon the reaction completed, the mixture was concentrated under reduced pressure. The resulting crude residue was purified *via* column chromatography on silica gel to afford the desired products.

(S)-2-((2-hydroxy-5-methylphenyl)(phenyl)methyl)-5-methylphenyl benzoate (4a).



Yellow solid, mp 129-130 ºC, 30 mg, 73% yield, 17h, 0 ºC; $[\alpha]_D^{25}$ -12.9 (*c* = 0.7, $CHCl_3$); IR *υ* 3418, 3058, 3026, 2918, 2848, 1711, 1601, 1584, 1491, 1450, 808, 738, 700; ^1H NMR (400 MHz, $CDCl_3$) δ 8.01 (d, *J* = 7.7 Hz, 2H), 7.62 (t, *J* = 7.5 Hz, 1H), 7.45 (t, *J* = 7.7 Hz, 2H), 7.32-7.24 (m, 3H), 7.17 (d, *J* = 8.3 Hz, 1H), 7.09 (d, *J* = 7.6 Hz, 3H), 6.94 (d, *J* = 8.2 Hz, 1H), 6.85 (s, 1H), 6.71 (d, *J* = 8.0 Hz, 1H), 6.56 (s, 1H), 5.66 (s, 1H), 5.19 (s, 1H), 2.32 (s, 3H), 2.17 (s, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.8, 151.5, 147.0, 141.2, 136.0, 134.4, 133.6, 130.6, 130.3, 129.5, 129.2, 128.9, 128.5, 128.4, 126.6, 122.3, 116.1, 45.5, 21.2, 20.7; HRMS (ESI): m/z calcd for $[C_{28}H_{28}NO_3]^+$ 426.2064, found 426.2064; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 14.6 min (minor) and t_R = 17.9 min (major).

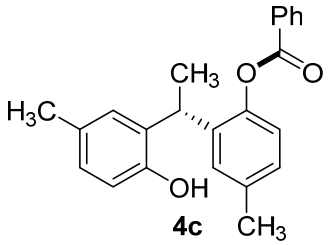
(S)-2-(1-(2-hydroxy-5-methylphenyl)propyl)-5-methylphenyl benzoate (4b).



Yellow solid, mp 124-125 ºC, 28 mg, 78% yield, 17 h, 0 ºC; $[\alpha]_D^{25}$ -17.3 (*c* = 0.8, $CHCl_3$); IR *υ* 3473, 3013, 2919, 2849, 1715, 1646, 1601, 1496, 1451, 801, 706; ^1H NMR (400 MHz, $CDCl_3$) δ 8.24 (d, *J* = 7.7 Hz, 2H), 7.68 (t, *J* = 7.5 Hz, 1H), 7.55 (t, *J* = 7.6 Hz, 2H), 7.08-7.00 (m, 4H), 6.92 (d, *J* = 8.2 Hz, 1H), 6.68 (d, *J* = 8.1 Hz, 1H), 5.35 (s, 1H), 4.06 (t, *J* = 7.5 Hz, 1H), 2.32 (s, 3H), 2.27 (s, 3H), 2.05 (ddq, *J* = 35.1, 14.0, 7.1 Hz, 2H), 0.96 (t, *J* = 7.3 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.0, 151.9, 146.9, 136.3, 135.9, 133.7, 130.3, 129.3, 129.2, 128.7, 128.6, 128.4, 128.3, 128.0, 122.1, 116.2, 39.8, 27.8, 21.1, 20.8, 12.6; HRMS (ESI): m/z calcd for $[C_{24}H_{28}NO_3]^+$ 378.2064, found

378.2064; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 13.5 min (minor) and t_R = 19.2 min (major).

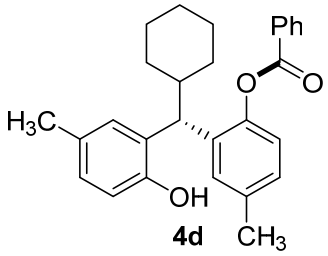
(S)-2-(1-(2-hydroxy-5-methylphenyl)ethyl)-5-methylphenyl benzoate (4c).



4c

Yellow solid, mp 119-120 ºC, 24 mg, 70% yield, 17 h, 0 ºC; $[\alpha]_D^{25}$ -8.2 (*c* = 1.0, $CHCl_3$); IR *υ* 3465, 3033, 2961, 2919, 2849, 1716, 1646, 1601, 1584, 1496, 1451, 872, 815, 708; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.21 (d, *J* = 7.4 Hz, 2H), 7.67 (t, *J* = 7.5 Hz, 1H), 7.54 (t, *J* = 7.6 Hz, 2H), 7.12-7.02 (m, 3H), 6.96-6.94 (m, 2H), 6.70 (d, *J* = 8.1 Hz, 1H), 5.36 (s, 1H), 4.29 (q, *J* = 7.1 Hz, 1H), 2.32 (s, 3H), 2.28 (s, 3H), 1.59 (d, *J* = 7.4 Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.2, 151.7, 146.5, 137.2, 136.5, 133.8, 130.4, 129.3, 129.3, 129.2, 128.7, 128.6, 128.5, 128.1, 128.1, 122.1, 116.1, 33.1, 21.1, 20.7, 20.4; HRMS (ESI): m/z calcd for $[C_{23}H_{26}NO_3]^+$ 364.1907, found 364.1906; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 15.1 min (minor) and t_R = 18.7 min (major).

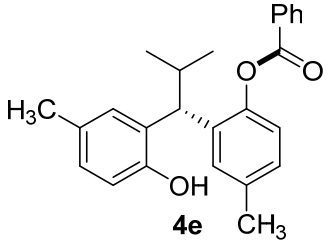
(S)-2-(cyclohexyl(2-hydroxy-5-methylphenyl)methyl)-5-methylphenyl benzoate (4d).



4d

Yellow oil, 29 mg, 70% yield, 17 h, 0 ºC; $[\alpha]_D^{25}$ -28.4 (*c* = 1.0, $CHCl_3$); IR *υ* 3335, 3018, 2917, 2849, 1697, 1604, 1508, 1457, 1264, 1100, 814, 741, 704; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.27 (d, *J* = 7.6 Hz, 2H), 7.69 (t, *J* = 7.4 Hz, 1H), 7.57 (t, *J* = 7.6 Hz, 2H), 7.20 (s, 1H), 7.11 (s, 1H), 7.05 (d, *J* = 7.9 Hz, 1H), 6.99 (d, *J* = 8.2 Hz, 1H), 6.86 (d, *J* = 8.1 Hz, 1H), 6.62 (d, *J* = 8.1 Hz, 1H), 5.07 (s, 1H), 4.04 (d, *J* = 10.6 Hz, 1H), 2.35 (s, 3H), 2.26 (s, 3H), 2.19-2.10 (m, 1H), 1.77-1.66 (m, 5H), 1.31-1.11 (m, 3H), 1.02-0.83 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.7, 151.8, 147.0, 135.9, 134.9, 133.6, 130.3, 129.6, 129.6, 129.5, 128.9, 128.7, 127.8, 127.6, 122.2, 116.2, 43.7, 40.7, 32.1, 31.6, 26.5, 26.5, 21.2, 20.8; HRMS (ESI): m/z calcd for $[C_{28}H_{34}NO_3]^+$ 432.2533, found 432.2535; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 7.1 min (minor) and t_R = 9.1 min (major).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2-methylpropyl)-5-methylphenyl benzoate (4e).

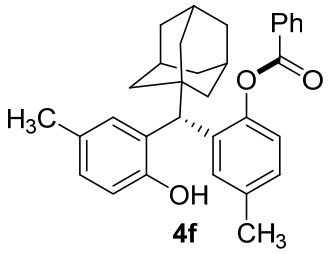


4e

Yellow solid, mp 107-108 ºC, 36 mg, 96% yield, 17 h, 0 ºC; $[\alpha]_D^{25}$ -48.7 (*c* = 0.6, $CHCl_3$); IR *υ* 3440, 3023, 2956, 2919, 2850, 1714, 1602, 1496,1451, 1267, 1086, 809, 754, 704; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.27 (d, *J* = 7.7 Hz, 2H), 7.68 (t, *J* = 7.4 Hz, 1H), 7.56 (t, *J* = 7.6 Hz, 2H), 7.18 (s, 1H), 7.13 (s, 1H), 7.06 (d, *J* = 7.5 Hz, 1H), 7.00 (d, *J* = 8.2 Hz, 1H), 6.86 (d, *J* = 8.2 Hz, 1H),

6.62 (d, J = 8.1 Hz, 1H), 5.12 (s, 1H), 3.95 (d, J = 10.5 Hz, 1H), 2.57-2.48 (m, 1H), 2.34 (s, 3H), 2.26 (s, 3H), 0.95 (t, J = 6.0 Hz, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.7, 151.7, 146.9, 135.9, 135.3, 133.6, 130.3, 129.6, 129.5, 129.0, 128.9, 128.6, 127.9, 127.6, 122.2, 116.3, 45.1, 31.2, 21.9, 21.4, 21.2, 20.8; HRMS (ESI): m/z calcd for $[C_{25}H_{30}NO_3]^+$ 392.2220, found 392.2218; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 8.6 min (minor) and t_R = 11.0 min (major).

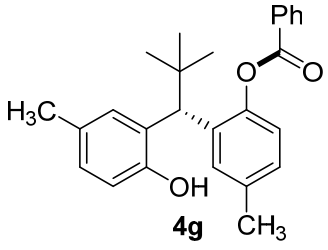
2-((S)-((3S,5S,7S)-adamantan-1-yl)(2-hydroxy-5-methylphenyl)methyl)-5-methylphenyl benzoate (4f).



4f

Yellow solid, mp 73-74 ºC, 39 mg, 84% yield, 17 h, 0 ºC; $[\alpha]_D^{25}$ -27.8 (c = 0.8, $CHCl_3$); IR υ 3468, 3027, 2900, 2846, 1712, 1602, 1505, 1494, 1450, 1264, 1063, 810, 751, 704; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.29 (d, J = 7.7 Hz, 2H), 7.67 (t, J = 7.4 Hz, 1H), 7.56 (t, J = 7.6 Hz, 2H), 7.51 (s, 1H), 7.44 (s, 1H), 7.10 – 6.96 (m, 2H), 6.82 (d, J = 8.1 Hz, 1H), 6.56 (d, J = 8.2 Hz, 1H), 4.75 (s, 1H), 4.54 (s, 1H), 2.40 (s, 3H), 2.30 (s, 3H), 1.97 (s, 3H), 1.64 (d, J = 12.3 Hz, 12H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.7, 151.8, 147.5, 134.7, 133.5, 133.4, 131.7, 131.0, 130.2, 130.0, 129.1, 128.6, 128.3, 127.6, 127.4, 122.3, 116.1, 45.3, 41.2, 37.7, 37.0, 28.9, 21.4, 21.0; HRMS (ESI): m/z calcd for $[C_{32}H_{38}NO_3]^+$ 484.2846, found 484.2848; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 5.8 min (minor) and t_R = 8.9 min (major).

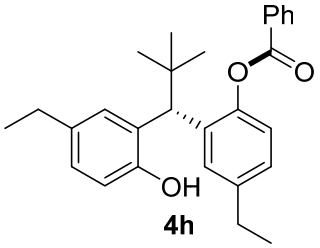
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-5-methylphenyl benzoate (4g).



4g

Yellow solid, mp 54-55 ºC, 38 mg, 98% yield, 17 h, 0 ºC; $[\alpha]_D^{25}$ -62.4 (c = 1.0, $CHCl_3$); IR υ 3455, 3031, 2950, 2922, 2865, 1716, 1602, 1507, 1454, 1271, 1098, 812, 753, 704; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.27 (d, J = 7.2 Hz, 2H), 7.67 (t, J = 7.5 Hz, 1H), 7.55 (t, J = 7.6 Hz, 2H), 7.43 (d, J = 5.9 Hz, 2H), 7.08-7.02 (m, 2H), 6.83 (d, J = 8.1 Hz, 1H), 6.55 (d, J = 8.1 Hz, 1H), 4.83 (s, 1H), 4.65 (s, 1H), 2.38 (s, 3H), 2.29 (s, 3H), 1.13 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.8, 151.7, 147.3, 134.9, 134.3, 133.5, 131.5, 130.5, 130.3, 129.9, 129.2, 129.1, 128.6, 127.7, 127.5, 122.3, 116.2, 44.4, 35.6, 29.5, 21.4, 21.0; HRMS (ESI): m/z calcd for $[C_{26}H_{32}NO_3]^+$ 406.2377, found 406.2375; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 6.1 min (minor) and t_R = 9.1 min (major).

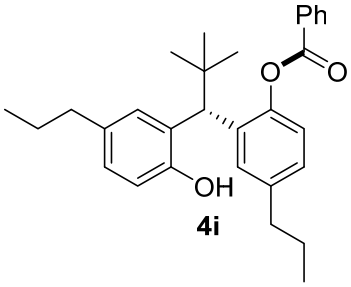
(S)-5-ethyl-2-(1-(5-ethyl-2-hydroxyphenyl)-2,2-dimethylpropyl)phenyl benzoate (4h).



4h

Yellow solid, mp 95-96 ºC, 41 mg, 99% yield, 17 h, 0 ºC; $[\alpha]_D^{25}$ -65.0 (*c* = 1.0, $CHCl_3$); IR *υ* 3471, 3036, 2959, 2919, 2864, 2849, 1718, 1601, 1585, 1508, 1272, 1104, 818, 702; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.24 (d, *J* = 7.3 Hz, 2H), 7.63 (t, *J* = 7.3 Hz, 1H), 7.51 (t, *J* = 7.1 Hz, 2H), 7.44 (s, 2H), 7.04 (q, *J* = 8.1 Hz, 2H), 6.79 (d, *J* = 7.9 Hz, 1H), 6.51 (d, *J* = 8.0 Hz, 1H), 4.92 (s, 1H), 4.65 (s, 1H), 2.63 (q, *J* = 7.6 Hz, 2H), 2.55 (q, *J* = 7.0 Hz, 2H), 1.24-1.17 (m, 6H), 1.09 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.9, 151.9, 147.3, 141.1, 135.6, 134.3, 133.5, 130.4, 130.3, 129.9, 129.3, 128.6, 126.4, 126.2, 122.3, 116.2, 44.2, 35.7, 29.5, 28.6, 28.4, 16.0, 15.5; HRMS (ESI): m/z calcd for $[C_{28}H_{36}NO_3]^+$ 434.2690, found 434.2686; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 6.1 min (minor) and t_R = 7.7 min (major).

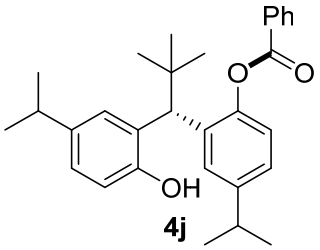
(S)-2-(1-(2-hydroxy-5-propylphenyl)-2,2-dimethylpropyl)-5-propylphenyl benzoate (4i).



4i

Yellow oil, 44 mg, 99% yield, 17 h, 0 ºC; $[\alpha]_D^{25}$ -58.0 (*c* = 1.0, $CHCl_3$); IR *υ* 3467, 3029, 2956, 2925, 2868, 1722, 1603, 1507, 1452, 1262, 1063, 812, 702; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.25 (d, *J* = 7.7 Hz, 2H), 7.64 (t, *J* = 7.4 Hz, 1H), 7.52 (t, *J* = 6.9 Hz, 2H), 7.41 (s, 2H), 7.04 (d, *J* = 10.9 Hz, 2H), 6.80 (d, *J* = 8.1 Hz, 1H), 6.56 (d, *J* = 8.1 Hz, 1H), 4.83 (s, 1H), 4.62 (s, 1H), 2.56 (t, *J* = 7.7 Hz, 2H), 2.49 (t, *J* = 7.7 Hz, 2H), 1.65-1.61 (m, 4H), 1.09 (s, 9H), 0.95-0.89 (m, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.8, 151.8, 147.3, 139.6, 134.1, 134.1, 133.5, 131.1, 130.3, 130.0, 129.8, 129.2, 127.0, 126.8, 122.2, 116.2, 44.2, 37.8, 37.5, 35.7, 29.5, 24.9, 24.5, 13.8, 13.7; HRMS (ESI): m/z calcd for $[C_{30}H_{40}NO_3]^+$ 462.3003, found 462.3008; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 5.2 min (minor) and t_R = 5.7 min (major).

(S)-2-(1-(2-hydroxy-5-isopropylphenyl)-2,2-dimethylpropyl)-5-isopropylphenyl benzoate (4j).

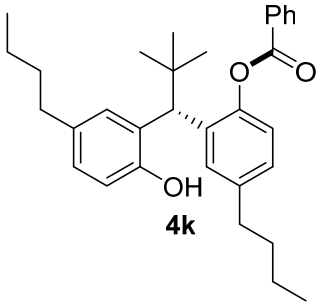


4j

Yellow solid, mp 52-53 ºC, 36 mg, 81% yield, 17 h, 0 ºC; $[\alpha]_D^{25}$ -61.2 (*c* = 1.0, $CHCl_3$); IR *υ* 3474, 3013, 2954, 2866, 1715, 1603, 1505, 1477, 1452, 1269, 1061, 815, 705; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.26 (d, *J* = 7.3 Hz, 2H), 7.63 (t, *J* = 7.3 Hz, 1H), 7.51 (s, 4H), 7.09-7.01 (m, 2H), 6.83 (d, *J* = 8.1 Hz, 1H), 6.55 (d, *J* = 8.0 Hz, 1H), 4.88 (s, 1H), 4.67 (s, 1H), 2.92-2.79 (m, 2H), 1.25-1.21 (m, 12H), 1.08 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.9, 151.8, 147.3, 145.6, 140.3, 134.2, 133.5, 130.3, 129.8, 129.3, 129.0, 128.6, 127.8, 125.1, 124.8, 122.1, 116.1, 44.0, 35.8, 33.7, 33.5, 29.5, 24.4, 24.3, 24.1, 24.0;

HRMS (ESI): m/z calcd for $[C_{30}H_{40}NO_3]^+$ 462.3003, found 462.3009; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 4.4 min (minor) and t_R = 4.8 min (major).

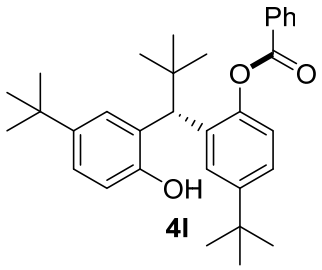
(S)-5-butyl-2-(1-(5-butyl-2-hydroxyphenyl)-2,2-dimethylpropyl)phenyl benzoate (4k).



4k

Yellow solid, mp 64-65 ºC, 42 mg, 90% yield, 17 h, 0 ºC; $[\alpha]_D^{25}$ -55.6 (*c* = 1.0, $CHCl_3$); IR *υ* 3466, 3035, 2954, 2926, 2857, 1717, 1603, 1506, 1458, 1271, 1063, 816, 704; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.24 (d, *J* = 10.6 Hz, 2H), 7.62 (t, *J* = 7.4 Hz, 1H), 7.50 (t, *J* = 6.6 Hz, 2H), 7.41 (s, 2H), 7.02 (t, *J* = 10.7 Hz, 2H), 6.76 (d, *J* = 7.9 Hz, 1H), 6.49 (d, *J* = 7.8 Hz, 1H), 5.01 (s, 1H), 4.64 (s, 1H), 2.58 (t, *J* = 7.9 Hz, 2H), 2.51 (t, *J* = 6.5 Hz, 2H), 1.6-1.52 (m, 4H), 1.37-1.30 (m, 4H), 1.09 (s, 9H), 0.94-0.90 (m, 6H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.9, 151.8, 147.3, 139.8, 134.2, 134.1, 133.5, 131.1, 130.3, 129.8, 129.2, 128.6, 127.0, 126.8, 122.2, 116.1, 44.1, 35.7, 35.3, 35.1, 34.0, 33.6, 29.5, 22.3, 22.2, 14.0, 13.9; HRMS (ESI): m/z calcd for $[C_{32}H_{44}NO_3]^+$ 490.3316, found 490.3322; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 6.9 min (minor) and t_R = 7.7 min (major).

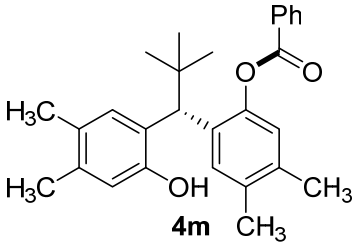
(S)-5-(tert-butyl)-2-(1-(5-(tert-butyl)-2-hydroxyphenyl)-2,2-dimethylpropyl)-phenyl benzoate (4l).



4l

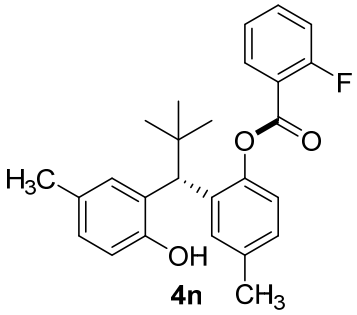
Yellow solid, mp 62-63 ºC, 40 mg, 85% yield, 17 h, 0 ºC; $[\alpha]_D^{25}$ -59.0 (*c* = 1.0, $CHCl_3$); IR *υ* 3466, 3033, 2956, 2904, 2867, 1715, 1602, 1504, 1452, 1268, 1063, 820, 755, 707; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.27 (d, *J* = 7.4 Hz, 2H), 7.70 (d, *J* = 7.3 Hz, 2H), 7.62 (d, *J* = 7.1 Hz, 1H), 7.51 (t, *J* = 7.2 Hz, 2H), 7.23 (d, *J* = 8.5 Hz, 1H), 7.01 (dd, *J* = 18.1, 8.3 Hz, 2H), 6.56 (d, *J* = 8.1 Hz, 1H), 4.95 (s, 1H), 4.69 (s, 1H), 1.29 (s, 18H), 1.07 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.0, 151.5, 147.9, 147.0, 142.5, 133.7, 133.5, 130.3, 129.8, 128.9, 128.6, 128.3, 127.0, 123.9, 123.5, 121.7, 115.7, 43.9, 35.9, 34.5, 34.1, 31.7, 31.4, 29.5; HRMS (ESI): m/z calcd for $[C_{32}H_{44}NO_3]^+$ 490.3316, found 490.3323; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 3.8 min (minor) and t_R = 4.2 min (major).

(S)-2-(1-(2-hydroxy-4,5-dimethylphenyl)-2,2-dimethylpropyl)-4,5-dimethyl-phenyl benzoate (4m).



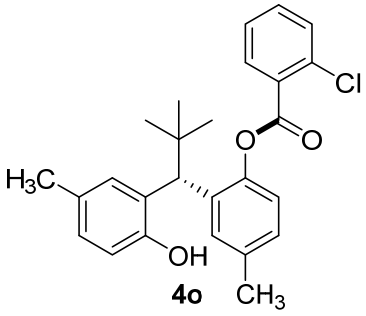
Yellow solid, mp 59-60 °C, 38 mg, 92% yield, 17 h, 0 °C; $[\alpha]_D^{25}$ -67.4 (*c* = 1.0, $CHCl_3$); IR *υ* 3455, 3027, 2959, 2918, 2851, 1713, 1601, 1504, 1451, 1259, 1068, 800, 754, 704; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.25 (d, *J* = 7.3 Hz, 2H), 7.64 (t, *J* = 7.4 Hz, 1H), 7.52 (t, *J* = 7.7 Hz, 2H), 7.36 (s, 2H), 6.89 (s, 1H), 6.47 (s, 1H), 4.90 (s, 1H), 4.49 (s, 1H), 2.25 (s, 3H), 2.21 (s, 3H), 2.18 (s, 3H), 2.12 (s, 3H), 1.10 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.0, 151.8, 147.2, 135.5, 135.1, 133.8, 133.5, 131.9, 131.8, 130.9, 130.3, 129.9, 128.6, 127.7, 126.7, 123.3, 117.8, 44.1, 35.6, 29.5, 19.8, 19.5, 19.4, 19.3; HRMS (ESI): m/z calcd for $[C_{28}H_{36}NO_3]^+$ 434.2690, found 434.2692; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 6.7 min (minor) and t_R = 10.1 min (major).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 2-fluorobenzoate (4n).



Yellow solid, mp 90-91 °C, 37 mg, 91% yield, 12 h, 0 °C; $[\alpha]_D^{25}$ -72.6 (*c* = 1.2, $CHCl_3$); IR *υ* 3488, 3034, 2949, 2919, 2859, 1712, 1612, 1508, 1488, 1456, 1296, 1097, 788, 750; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.14 (t, *J* = 7.4 Hz, 1H), 7.60-7.56 (m, 1H), 7.41 (d, *J* = 5.4 Hz, 2H), 7.28-7.19 (m, 2H), 7.03 (s, 2H), 6.78 (d, *J* = 8.0 Hz, 1H), 6.49 (d, *J* = 7.9 Hz, 1H), 4.83 (s, 1H), 4.68 (s, 1H), 2.34 (s, 3H), 2.26 (s, 3H), 1.09 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.6, 163.3, 161.0, 151.7, 146.9, 135.1, 135.0, 134.1, 131.5 ($^1J_{CF}$ = 251.7 Hz), 131.4, 129.1 ($^3J_{CF}$ = 6.3 Hz), 127.6 ($^2J_{CF}$ = 17.9 Hz), 124,2 ($^4J_{CF}$ = 3.7 Hz), 122.3, 118.4 ($^3J_{CF}$ = 9.0 Hz), 117.2 ($^2J_{CF}$ = 22.9 Hz), 116.1, 43.8, 35.6, 29.4, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{26}H_{31}FNO_3]^+$ 424.2282, found 424.2288; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 10.4 min (minor) and t_R = 12.8 min (major).

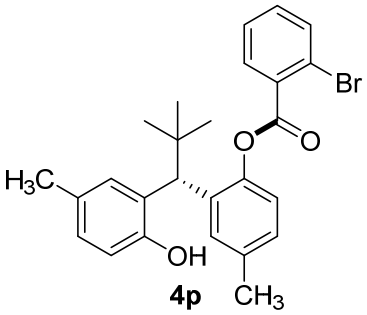
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 2-chlorobenzoate (4o).



Yellow solid, mp 160-161 °C, 30 mg, 71% yield, 72 h, 0 °C; $[\alpha]_D^{25}$ -49.2 (*c* = 1.0, $CHCl_3$); IR *υ* 3419, 3048, 2951, 2919, 2850, 1724, 1609, 1509, 1472, 1503, 1251, 1109, 818, 743; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.14 (d, *J* = 7.6 Hz, 1H), 7.51-7.38 (m, 5H), 7.03 (s, 2H), 6.72 (d, *J* = 6.1 Hz, 1H), 6.40 (t, *J* = 7.8 Hz, 1H), 4.86 (s, 1H), 4.69 (s, 1H), 2.35 (s, 3H), 2.25 (s, 3H), 1.08 (s, 9H); ^{13}C NMR

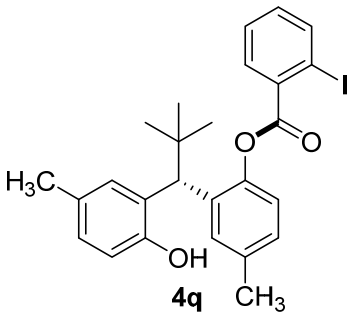
(100 MHz, $CDCl_3$) δ 164.5, 151.6, 147.0, 135.1, 134.4, 134.3, 133.0, 131.9, 131.4, 131.3, 130.3, 129.7, 129.0, 127.7, 127.4, 126.7, 122.2, 115.9, 43.7, 35.6, 29.4, 21.4,21.1; HRMS (ESI): m/z calcd for $[C_{26}H_{31}ClNO_3]^+$ 440.1987, found 440.1984; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 13.4 min (major) and t_R = 15.1 min (minor).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 2-bromobenzoate (4p).



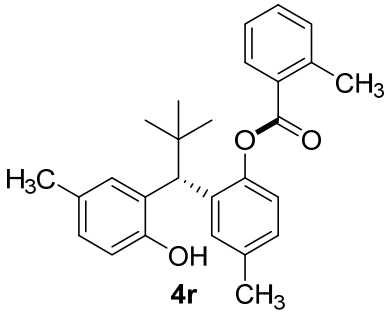
Yellow solid, mp 149-150 °C, 30 mg, 64% yield, 70 h, 0 °C; $[\alpha]_D^{25}$ -33.6 (*c* = 1.0, $CHCl_3$); IR *υ* 3406, 3024, 2951, 2920, 2852, 1724, 1591, 1508, 1468, 1429, 1251, 1103, 816, 740; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.14 (d, *J* = 7.4 Hz, 1H), 7.73 (d, *J* = 7.5 Hz, 1H), 7.41 (d, *J* = 18.0 Hz, 4H), 7.05 (s, 2H), 6.76 (d, *J* = 7.8 Hz, 1H), 6.45 (d, *J* = 8.0 Hz, 1H), 4.77 (s, 1H), 4.68 (s, 1H), 2.36 (s, 3H), 2.26 (s, 3H), 1.09 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.9, 151.5, 147.0, 135.1, 134.6, 134.4, 133.0, 131.8, 131.6, 131.4, 130.3, 129.1, 129.0, 127.7, 127.4, 127.3, 122.4, 122.2, 115.9, 43.8, 35.6, 29.4, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{26}H_{31}BrNO_3]^+$ 484.1482, found 484.1472; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 16.5 min (major) and t_R = 21.6 min (minor).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 2-iodobenzoate (4q).



Yellow solid, mp 159-160 °C, 26 mg, 51% yield, 48 h, 25 °C; $[\alpha]_D^{25}$ -20.8 (*c* = 1.0, $CHCl_3$); IR *υ* 3413, 3030, 2949, 2918, 2849, 1721, 1645, 1609, 1583, 1465, 1102, 799, 755; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.16 (d, *J* = 7.9 Hz, 1H), 8.07 (d, *J* = 5.9 Hz, 1H), 7.47 (t, *J* = 8.5 Hz, 1H), 7.43 (s, 1H), 7.37 (s, 1H), 7.26-7.20 (m, 1H), 7.05 (s, 2H), 6.78 (d, *J* = 8.1 Hz, 1H), 6.48 (d, *J* = 10.5 Hz, 1H), 4.70 (s, 1H), 4.66 (s, 1H), 2.35 (s, 3H), 2.25 (s, 3H), 1.08 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.2, 151.5, 147.0, 141.7, 135.1, 134.4, 134.3, 133.1, 131.5, 131.4, 130.4, 129.1, 129.0, 128.1, 127.6, 127.4, 122.2, 115.9, 94.9, 43.8, 35.6, 29.4, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{26}H_{31}INO_3]^+$ 532.1343, found 532.1342; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 10.9 min (major) and t_R = 13.4 min (minor).

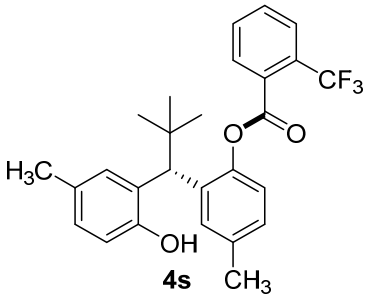
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 2-methylbenzoate (4r).



4r

Yellow solid, mp 92-93 °C, 36 mg, 90% yield, 29 h, 25 °C; $[\alpha]_D^{25}$ -53.4 (*c* = 1.0, $CHCl_3$); IR *υ* 3461, 3034, 2950, 2918, 2849, 1717, 1603, 1507, 1443, 1249, 1186, 807, 732; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.08 (d, *J* = 7.7 Hz, 1H), 7.31 (t, *J* = 7.3 Hz, 1H), 7.24 (s, 1H), 7.20-7.13 (m, 3H), 6.87 (d, *J* = 8.1 Hz, 1H), 6.80 (d, *J* = 8.1 Hz, 1H), 6.60 (d, *J* = 8.0 Hz, 1H), 6.31 (d, *J* = 8.0 Hz, 1H), 4.64 (s, 1H), 4.40 (s, 1H), 2.46 (s, 3H), 2.18 (s, 3H), 2.07 (s, 3H), 0.92 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.4, 151,7, 147.3, 141.6, 134.9, 134.4, 132.6, 132.0, 131.5, 131.2, 130.5, 129.1, 129.0, 128.7, 127.7, 127.5, 125.9, 122.5, 116.3, 44.5, 35.6, 29.5, 22.0, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{27}H_{34}NO_3]^+$ 420.2533, found 420.2535; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 7.4 min (minor) and t_R = 11.2 min (major).

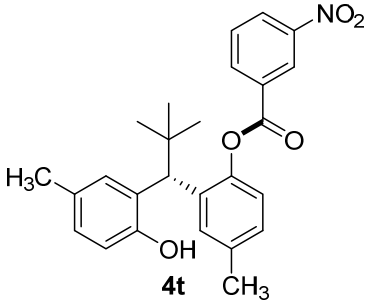
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 2-(trifluoromethyl)benzoate (4s).



4s

Yellow solid, mp 151-152 °C, 35 mg, 77% yield, 24 h, 25 °C; $[\alpha]_D^{25}$ -55.0 (*c* = 1.0, $CHCl_3$); IR *υ* 3439, 3013, 2950, 2918, 1731, 1607, 1587, 1508, 1315, 1260, 1134, 817, 774; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.13-8.10 (m, 1H), 7.8-7.78 (m, 1H), 7.66-7.61 (m, 2H), 7.39 (d, *J* = 11.3 Hz, 2H), 7.05 (s, 2H), 6.66-6.62 (m, 1H), 6.25-6.20 (m, 1H), 5.01 (s, 1H), 4.68 (s, 1H), 2.35 (s, 3H), 2.25 (s, 3H), 1.05 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.9, 151.6, 146.9, 135.2, 134.3, 131.9, 131.5, 131.4, 130.9, 130.6, 130.5, 130.0, 128.9, 127.7, 127.4, 126.7 ($^3J_{CF}$ = 5.3 Hz), 126.1 ($^1J_{CF}$ = 274.4 Hz), 122.1, 115.7, 43.5, 35.6, 29.7, 29.3, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{27}H_{31}F_3NO_3]^+$ 474.2251, found 474.2253; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 14.5 min (major) and t_R = 20.2 min (minor).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 3-nitrobenzoate (4t).

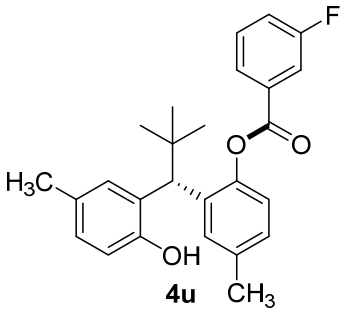


4t

Yellow solid, mp 119-120 °C, 36 mg, 83% yield, 24 h, 0 °C; $[\alpha]_D^{25}$ -16.5 (*c* = 0.4, $CHCl_3$); IR *υ* 3460, 3024, 2953, 2917, 2849, 1727, 1647, 1615, 1531, 1464, 1349, 1256, 1188, 812, 715; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.18 (s, 1H), 8.52 (dd, *J* = 20.3, 7.8 Hz, 2H), 7.73 (t, *J* = 7.9 Hz, 1H), 7.54 (s, 1H), 7.33 (s, 1H), 7.04 (q, *J* = 8.3 Hz, 2H), 6.83 (d, *J* = 7.9 Hz, 1H), 6.57 (d, *J* = 7.8 Hz, 1H), 4.76

(s, 1H), 4.67 (s, 1H), 2.39 (s, 3H), 2.25 (s, 3H), 1.07 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.3, 151.3, 148.4, 146.8, 135.9, 135.3, 134.6, 131.8, 131.2, 130.8, 129.7, 129.4, 128.8, 127.8, 127.6, 127.5, 125.4, 122.0, 115.6, 43.6, 35.6, 29.3, 21.5, 21.0; HRMS (ESI): m/z calcd for $[C_{26}H_{31}N_2O_5]^+$ 451.2227, found 451.2224; HPLC: Daicel Chiralpak OD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 7.2 min (major) and t_R = 9.9 min (minor).

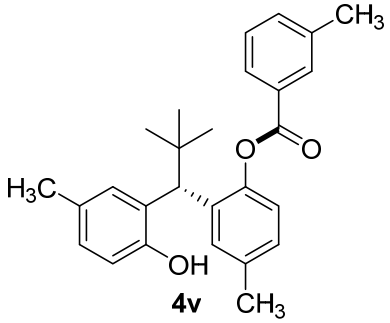
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 3-fluorobenzoate (4u).



4u

Yellow oil, 35 mg, 86% yield, 12 h, 0 °C; $[\alpha]_D^{25}$ -48.2 (*c* = 1.0, $CHCl_3$); IR *υ* 3467, 3023, 2949, 2921, 2866, 1720, 1592, 1507, 1445, 1269, 1186, 811, 746; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.02 (d, *J* = 7.5 Hz, 1H), 7.92 (d, *J* = 9.2 Hz, 1H), 7.48 (q, *J* = 7.4 Hz, 1H), 7.43 (s, 1H), 7.36-7.31 (m, 2H), 7.05-6.97 (m, 2H), 6.78 (d, *J* = 8.0 Hz, 1H), 6.49 (d, *J* = 8.0 Hz, 1H), 4.69 (s, 1H), 4.63 (s, 1H), 2.35 (s, 3H), 2.25 (s, 3H), 1.08 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.6, 162.6 ($^1J_{CF}$ = 246.4 Hz), 151.5, 147.0, 135.1, 134.3, 132.1 ($^3J_{CF}$ = 7.6 Hz), 131.5, 130.5, 130.2 ($^3J_{CF}$ = 7.7 Hz), 129.2, 129.0, 127.7, 127.5, 126.0 ($^4J_{CF}$ = 3.3 Hz), 122.2, 120.5 ($^2J_{CF}$ = 21.8 Hz), 117.1 ($^2J_{CF}$ = 21.8 Hz), 115.9, 44.1, 35.6, 29.4, 21.4, 21.0; HRMS (ESI): m/z calcd for $[C_{26}H_{31}FNO_3]^+$ 424.2282, found 424.2282; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 7.1 min (minor) and t_R = 9.8 min (major).

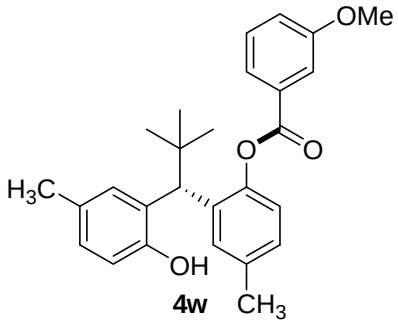
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 3-methylbenzoate (4v).



4v

Yellow solid, mp 62-63 °C, 30 mg, 75% yield, 15 h, 0 °C; $[\alpha]_D^{25}$ -55.8 (*c* = 1.0, $CHCl_3$); IR *υ* 3449, 3029, 2950, 2921, 2865, 1712, 1608, 1507, 1459, 1275, 1182, 810, 738; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.06 (s, 2H), 7.47-7.41 (m, 4H), 7.06-6.98 (m, 2H), 6.81 (d, *J* = 8.0 Hz, 1H), 6.55 (d, *J* = 8.0 Hz, 1H), 4.92 (s, 1H), 4.60 (s, 1H), 2.45 (s, 3H), 2.35 (s, 3H), 2.27 (s, 3H), 1.11 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.1, 151.7, 147.3, 138.4, 134.9, 134.3, 134.2, 131.6, 130.9, 130.4, 129.7, 129.3, 129.1, 128.5, 127.8, 127.5, 127.4, 122.3, 116.3, 44.4, 35.6, 29.5, 21.4, 21.3, 21.1; HRMS (ESI): m/z calcd for $[C_{27}H_{34}NO_3]^+$ 420.2533, found 420.2537; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 8.1 min (minor) and t_R = 11.8 min (major).

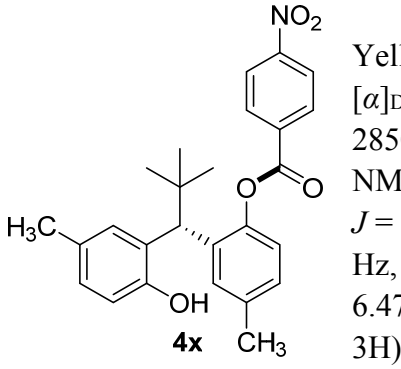
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 3-methoxybenzoate (4w).



4w

Yellow solid, mp 137-138 ºC, 37 mg, 89% yield, 27 h, 0 ºC; $[\alpha]_D^{25}$ -51.2 (*c* = 1.0, $CHCl_3$); IR *υ* 3400, 3033, 2961, 2919, 2866, 1736, 1593, 1492, 1470, 1296, 1174, 849, 809, 749; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.85 (d, *J* = 7.5 Hz, 1H), 7.76 (s, 1H), 7.42 (s, 3H), 7.18 (d, *J* = 8.1 Hz, 1H), 7.02 (q, *J* = 8.1 Hz, 2H), 6.80 (d, *J* = 7.9 Hz, 1H), 6.53 (d, *J* = 8.0 Hz, 1H), 4.95 (s, 1H), 4.64 (s, 1H), 3.87 (s, 3H), 2.35 (s, 3H), 2.27 (s, 3H), 1.10 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.7, 159.7, 151.7, 147.2, 134.9, 134.2, 131.5, 131.1, 130.4, 129.6, 129.2, 129.1, 127.7, 127.5, 122.7, 122.3, 120.2, 116.1, 114.5, 55.5, 44.2, 35.6, 29.5, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{27}H_{34}NO_4]^+$ 436.2482, found 436.2481; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 7.0 min (minor) and t_R = 8.5 min (major).

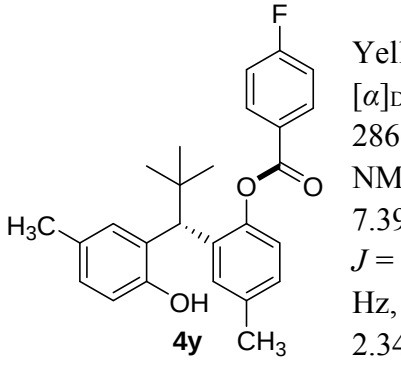
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 4-nitrobenzoate (4x).



4x

Yellow solid, mp 190-191 ºC, 33 mg, 77% yield, 23 h, 0 ºC; $[\alpha]_D^{25}$ -42.4 (*c* = 1.0, $CHCl_3$); IR *υ* 3440, 3013, 2952, 2919, 2850, 1743, 1708, 1604, 1523, 1260, 1071, 815, 714; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.39 (d, *J* = 8.7 Hz, 2H), 8.33 (d, *J* = 8.8 Hz, 2H), 7.50 (s, 1H), 7.33 (s, 1H), 7.06 (d, *J* = 8.2 Hz, 1H), 6.99 (d, *J* = 8.2 Hz, 1H), 6.78 (d, *J* = 7.7 Hz, 1H), 6.47 (d, *J* = 8.0 Hz, 1H), 4.67 (s, 1H), 4.65 (s, 1H), 2.38 (s, 3H), 2.24 (s, 3H), 1.08 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.7, 151.3, 150.7, 146.9, 135.5, 135.4, 134.5, 131.4, 131.3, 130.7, 129.4, 128.8, 127.7, 127.5, 123.7, 122.0, 115.6, 43.8, 35.6, 29.4, 21.5, 21.0; HRMS (ESI): m/z calcd for $[C_{26}H_{31}N_2O_5]^+$ 451.2227, found 451.2224; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 6.0 min (minor) and t_R = 8.3 min (major).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 4-fluorobenzoate (4y).

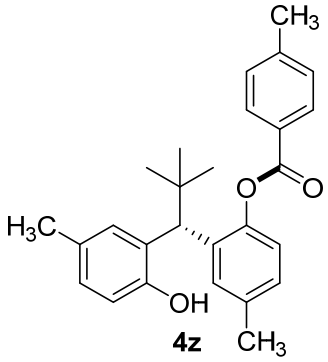


4y

Yellow solid, mp 127-128 ºC, 40 mg, 99% yield, 23 h, 0 ºC; $[\alpha]_D^{25}$ -60.6 (*c* = 1.0, $CHCl_3$); IR *υ* 3385, 3018, 2949, 2921, 2866, 1741, 1706, 1603, 1505, 1273, 1105, 858, 711; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.24 (dd, *J* = 8.2, 5.7 Hz, 2H), 7.39 (d, *J* = 12.2 Hz, 2H), 7.16 (t, *J* = 8.5 Hz, 2H), 7.03 (d, *J* = 8.2 Hz, 1H), 6.97 (d, *J* = 8.2 Hz, 1H), 6.77 (d, *J* = 8.0 Hz, 1H), 6.47 (d, *J* = 8.0 Hz, 1H), 4.85 (s, 1H), 4.60 (s, 1H), 2.34 (s, 3H), 2.25 (s, 3H), 1.08 (s, 9H); ^{13}C NMR (100 MHz,

$CDCl_3$) δ 167.4, 164.9, 164.8, 151.6, 147.1, 135.1, 134.3, 132.9, 132.8, 131.5, 130.4, 129.1, 129.0, 127.7, 127.5, 126.0 ($^4J_{CF}$ = 3.1 Hz), 122.3, 116.0, 115.9, 115.7, 44.1, 35.6, 29.5, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{26}H_{31}FNO_3]^+$ 424.2282, found 424.2280; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 6.4 min (minor) and t_R = 10.0 min (major).

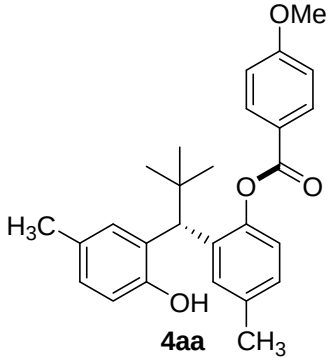
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 4-methylbenzoate (4z).



4z

Yellow solid, mp 125-126 ºC, 30 mg, 75% yield, 30 h, 0 ºC; $[\alpha]_D^{25}$ -77.4 (*c* = 1.0, $CHCl_3$); IR *υ* 3487, 2982, 2952, 2918, 2850, 1715, 1610, 1508, 1459, 1275, 1103, 811, 746; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.14 (d, *J* = 7.4 Hz, 2H), 7.39 (d, *J* = 12.8 Hz, 2H), 7.32 (d, *J* = 7.6 Hz, 2H), 7.01 (q, *J* = 8.1 Hz, 2H), 6.81 (d, *J* = 8.0 Hz, 1H), 6.54 (d, *J* = 8.0 Hz, 1H), 4.92 (s, 1H), 4.57 (s, 1H), 2.46 (s, 3H), 2.34 (s, 3H), 2.27 (s, 3H), 1.09 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.0, 151.7, 147.2, 144.4, 134.9, 134.2, 131.6, 130.4, 130.3, 129.3, 129.2, 129.1, 127.8, 127.5, 127.0, 122.3, 116.3, 44.4, 35.6, 29.5, 21.8, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{27}H_{34}NO_3]^+$ 420.2533, found 420.2527; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 8.6 min (minor) and t_R = 20.7 min (major).

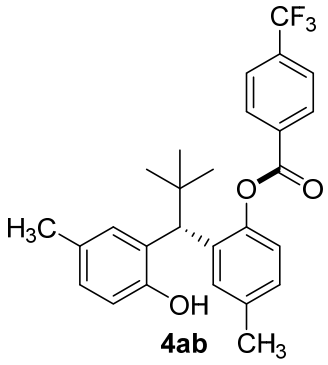
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 4-methoxybenzoate (4aa).



4aa

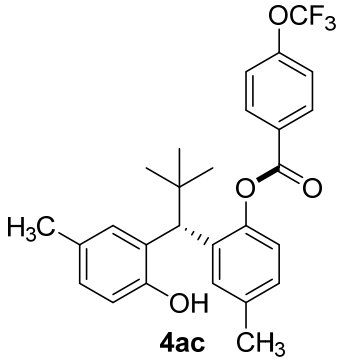
Yellow solid, mp 60-61 ºC, 41 mg, 99% yield, 24 h, 25 ºC; $[\alpha]_D^{25}$ -109.8 (*c* = 1.0, $CHCl_3$); IR *υ* 3445, 2953, 2918, 2850, 1708, 1604, 1581, 1509, 1461, 1254, 1164, 1098, 810, 751; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.20 (d, *J* = 7.9 Hz, 2H), 7.42 (s, 1H), 7.38 (s, 1H), 7.05-6.98 (m, 4H), 6.81 (d, *J* = 7.9 Hz, 1H), 6.55 (d, *J* = 7.9 Hz, 1H), 5.07 (s, 1H), 4.57 (s, 1H), 3.89 (s, 3H), 2.34 (s, 3H), 2.28 (s, 3H), 1.10 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.7, 163.9, 151.8, 147.3, 134.8, 134.2, 132.4, 131.6, 130.3, 129.3, 129.0, 127.8, 127.5, 122.4, 122.0, 116.4, 113.9, 55.5, 44.4, 35.6, 29.5, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{27}H_{34}NO_4]^+$ 436.2482, found 436.2475; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 6.8 min (minor) and t_R = 14.5 min (major).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 4-(trifluoromethyl)benzoate (4ab).



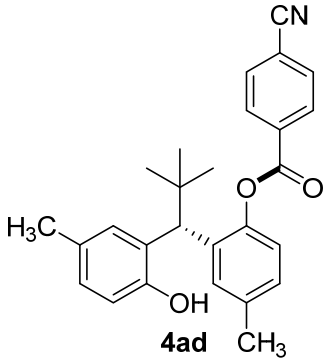
Yellow solid, mp 155-156 ºC, 28 mg, 61% yield, 8 h, 0 ºC; $[\alpha]_D^{25}$ -37.6 (*c* = 1.0, $CHCl_3$); IR *υ* 3432, 2959, 2919, 2869, 2850, 1743, 1707, 1600, 1509, 1410, 1276, 1096, 817, 770; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.35 (d, *J* = 8.2 Hz, 2H), 7.78 (d, *J* = 8.3 Hz, 2H), 7.47 (s, 1H), 7.36 (s, 1H), 7.06-6.99 (m, 2H), 6.79 (d, *J* = 8.0 Hz, 1H), 6.48 (d, *J* = 8.1 Hz, 1H), 4.70 (s, 1H), 4.66 (s, 1H), 2.37 (s, 3H), 2.25 (s, 3H), 1.09 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.5, 151.5, 147.0, 135.3, 135.0, 134.7, 134.4, 133.2, 131.5, 130.6, 135.5, 129.3, 129.0, 127.7, 127.5, 125.5 ($^3J_{CF}$ = 3.8 Hz), 125.0, 122.3, 122.2, 115.8, 44.0, 35.6, 29.4, 21.4, 21.0; HRMS (ESI): m/z calcd for $[C_{27}H_{31}F_3NO_3]^+$ 474.2251, found 474.2255; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 5.8 min (minor) and t_R = 10.3 min (major).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 4-(trifluoromethoxy)benzoate (4ac).



Yellow solid, mp 117-118 ºC, 35 mg, 74% yield, 8 h, 0 ºC; $[\alpha]_D^{25}$ -49.2 (*c* = 1.0, $CHCl_3$); IR *υ* 3445, 3012, 2993, 2919, 2850, 1721, 1606, 1507, 1098, 815, 763; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.28 (d, *J* = 7.8 Hz, 2H), 7.44 (s, 1H), 7.38-7.33 (m, 3H), 7.05 (d, *J* = 8.3 Hz, 1H), 6.98 (d, *J* = 8.2 Hz, 1H), 6.78 (d, *J* = 8.2 Hz, 1H), 6.49 (d, *J* = 8.0 Hz, 1H), 4.80 (s, 1H), 4.63 (s, 1H), 2.36 (s, 3H), 2.25 (s, 3H), 1.10 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 164.6, 153.0, 151.5, 147.0, 135.1, 134.3, 132.3, 131.5, 130.5, 129.2, 129.0, 128.2, 127.7, 127.5, 122.2, 121.6, 120.3, 119.0, 115.9, 44.2, 35.6, 29.4, 21.4, 21.0; HRMS (ESI): m/z calcd for $[C_{27}H_{31}F_3NO_4]^+$ 490.2200, found 490.2206; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 4.2 min (minor) and t_R = 6.3 min (major).

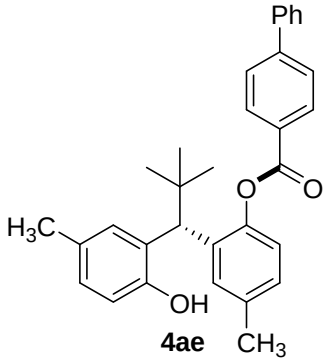
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 4-cyanobenzoate (4ad).



Yellow solid, mp 146-147 ºC, 27 mg, 66% yield, 16 h, 0 ºC; $[\alpha]_D^{25}$ -55.0 (*c* = 1.0, $CHCl_3$); IR *υ* 3455, 2952, 2919, 2850, 2241, 1733, 1609, 1507, 1491, 1476, 1272, 1072, 812, 760; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.33 (d, *J* = 8.2 Hz, 2H), 7.80 (d, *J* = 8.3 Hz, 2H), 7.49 (s, 1H), 7.33 (s, 1H), 7.05 (d, *J* = 8.2 Hz, 1H), 6.98 (d, *J* = 8.2 Hz, 1H), 6.79 (d, *J* = 7.9 Hz, 1H), 6.49 (d, *J* = 8.1 Hz, 1H), 4.74 (s, 1H), 4.65 (s, 1H), 2.37 (s, 3H), 2.24 (s, 3H), 1.08 (s, 9H); ^{13}C NMR (100 MHz,

$CDCl_3$) δ 164.0, 151,4, 146.9, 135.4, 134.5, 133.9, 132.4, 131.4, 130.7, 130.6, 129.3, 128.8, 127.7, 127.5, 122.1, 118.0, 116.6, 115.6, 43.8, 35.6, 29.4, 26.9, 21.5, 21.0; HRMS (ESI): m/z calcd for $[C_{27}H_{31}N_2O_3]^+$ 431.2329, found 431.2332; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 6.2 min (minor) and t_R = 10.0 min (major).

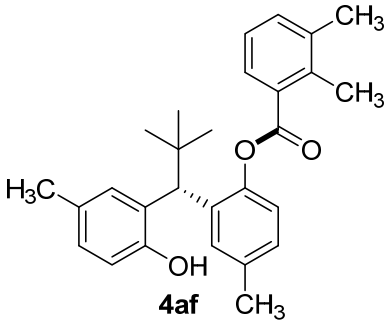
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl [1,1'-biphenyl]-4-carboxylate (4ae).



4ae

Yellow solid, mp 124-125 °C, 36 mg, 78% yield, 42 h, 0 °C; $[\alpha]_D^{25}$ -91.8 (*c* = 1.0, $CHCl_3$); IR *υ* 3484, 3034, 2953, 2918, 2850, 1713, 1697, 1607, 1509, 1275, 1073, 819, 748; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.32 (d, *J* = 8.2 Hz, 2H), 7.74 (d, *J* = 8.2 Hz, 2H), 7.66 (d, *J* = 7.7 Hz, 2H), 7.50 (t, *J* = 7.5 Hz, 2H), 7.43 (d, *J* = 12.1 Hz, 3H), 7.04 (q, *J* = 8.3 Hz, 2H), 6.80 (d, *J* = 8.0 Hz, 1H), 6.53 (d, *J* = 8.1 Hz, 1H), 4.96 (s, 1H), 4.65 (s, 1H), 2.36 (s, 3H), 2.27 (s, 3H), 1.12 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.8, 151.7, 147.2, 146.2, 139.9, 135.0, 134.3, 131.6, 130.8, 130.4, 129.2, 129.1, 129.0, 128.5, 128.3, 127.8, 127.5, 127.4, 127.3, 122.3, 116.2, 44.3, 35.6, 29.5, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{32}H_{36}NO_3]^+$ 482.2690, found 482.2686; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 13.1 min (minor) and t_R = 25.3 min (major).

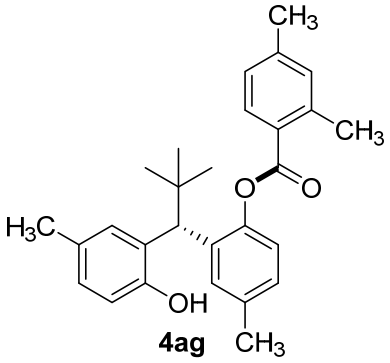
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 2,3-dimethylbenzoate (4af).



4af

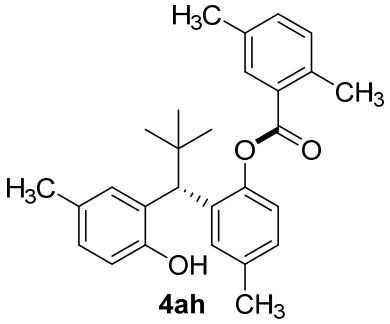
Yellow solid, mp 50-51 °C, 34 mg, 82% yield, 14 h, 25 °C; $[\alpha]_D^{25}$ -57.0 (*c* = 1.2, $CHCl_3$); IR *υ* 3468, 3029, 2950, 2921, 2866, 1716, 1608, 1507, 1459, 1094, 808, 746; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.09 (d, *J* = 7.8 Hz, 1H), 7.46-7.42 (m, 3H), 7.31-7.26 (m, 1H), 7.12-7.05 (m, 2H), 6.85 (d, *J* = 9.2 Hz, 1H), 6.56 (d, *J* = 8.1 Hz, 1H), 4.94 (s, 1H), 4.66 (s, 1H), 2.58 (s, 3H), 2.43 (s, 3H), 2.41 (s, 3H), 2.32 (s, 3H), 1.15 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 167.3, 151.7, 147.3, 139.1, 138.2, 134.9, 134.3, 133.9, 131.5, 130.4, 129.9, 129.2, 129.1, 128.5, 127.7, 127.5, 125.3, 122.4, 116.3, 44.3, 35.7, 29.5, 21.4, 21.1, 20.7, 16.8; HRMS (ESI): m/z calcd for $[C_{28}H_{36}NO_3]^+$ 434.2690, found 434.2696; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 11.7 min (minor) and t_R = 14.0 min (major).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 2,4-dimethylbenzoate (4ag).



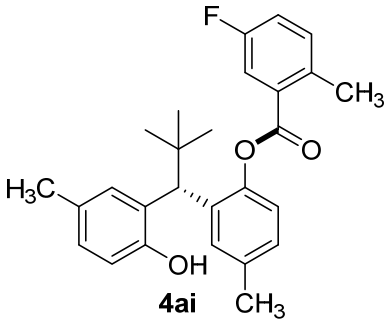
Yellow solid, mp 124-125 °C, 36 mg, 87% yield, 24 h, 25 °C; $[\alpha]_D^{25}$ -60.8 (*c* = 1.0, $CHCl_3$); IR *υ* 3475, 3014, 2951, 2918, 2849, 1716, 1610, 1508, 1456, 1257, 1096, 811, 765; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.16 (d, *J* = 7.3 Hz, 1H), 7.38 (s, 2H), 7.12 (s, 2H), 7.08-6.99 (m, 1H), 6.96 (t, *J* = 5.8 Hz, 1H), 6.77 (d, *J* = 6.7 Hz, 1H), 6.50 (t, *J* = 7.8 Hz, 1H), 4.99 (s, 1H), 4.54 (s, 1H), 2.60 (s, 3H), 2.39 (s, 3H), 2.33 (s, 3H), 2.24 (s, 3H), 1.08 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.4, 151.8, 147.3, 143.4, 141.9, 134.8, 134.3, 132.8, 131.6, 131.5, 130.4, 129.2, 129.0, 127.8, 127.5, 126.7, 125.7, 122.5, 116.4, 44.5, 35.7, 29.5, 22.1, 21.6, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{28}H_{36}NO_3]^+$ 434.2690, found 434.2697; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 5.8 min (minor) and t_R = 13.6 min (major).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 2,5-dimethylbenzoate (4ah).



Yellow solid, mp 105-106 °C, 33 mg, 80% yield, 14 h, 25 °C; $[\alpha]_D^{25}$ -51.8 (*c* = 1.0, $CHCl_3$); IR *υ* 3489, 3019, 2950, 2919, 2850, 1721, 1610, 1569, 1508, 1457; 1098, 809, 773; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.07 (s, 1H), 7.41 (d, *J* = 11.6 Hz, 2H), 7.31 (d, *J* = 7.7 Hz, 1H), 7.20 (d, *J* = 7.7 Hz, 1H), 7.05 (d, *J* = 8.2 Hz, 1H), 6.98 (d, *J* = 8.2 Hz, 1H), 6.79 (d, *J* = 7.9 Hz, 1H), 6.53-6.50 (m, 1H), 4.96 (s, 1H), 4.59 (s, 1H), 2.59 (s, 3H), 2.41 (s, 3H), 2.36 (s, 3H), 2.26 (s, 3H), 1.11 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.6, 151.8, 147.3, 138.5, 135.4, 134.9, 134.4, 133.5, 131.9, 131.8, 131.5, 130.5, 129.1, 129.0, 128.4, 127.7, 127.5, 122.4, 116.3, 44.4, 35.7, 29.5, 21.6, 21.4, 21.1, 21.0; HRMS (ESI): m/z calcd for $[C_{28}H_{36}NO_3]^+$ 434.2690, found 434.2691; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 7.4 min (minor) and t_R = 9.7 min (major).

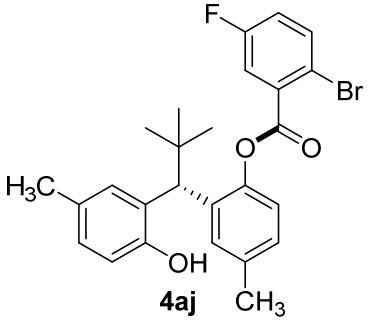
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 5-fluoro-2-methylbenzoate (4ai).



Yellow solid, mp 157-58 °C, 25 mg, 60% yield, 48 h, 0 °C; $[\alpha]_D^{25}$ -38.6 (*c* = 1.0, $CHCl_3$); IR *υ* 3480, 3032, 2984, 2950, 2925, 2864, 1722, 1608, 1586, 1495, 1452, 1175, 1096, 812, 753; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.95 (dd, *J* = 9.6, 2.6 Hz, 1H), 7.43 (s, 1H), 7.32 (s, 1H), 7.25-7.23 (m, 1H), 7.16 (td, *J* = 8.2, 2.7 Hz, 1H), 7.02 (d, *J* = 8.2 Hz, 1H), 6.94 (d, *J* = 8.2 Hz, 1H), 6.77

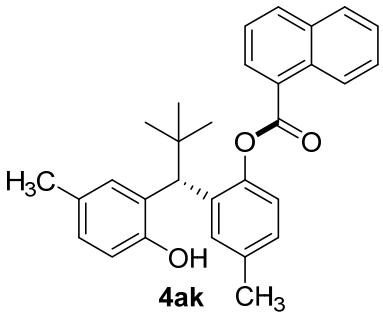
(d, J = 8.1 Hz, 1H), 6.49 (d, J = 8.1 Hz, 1H), 4.70 (s, 1H), 4.58 (s, 1H), 2.56 (s, 3H), 2.33 (s, 3H), 2.21 (s, 3H), 1.05 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.1, 160.6 ($^1J_{CF}$ = 244.4 Hz), 151.6, 137.3 ($^4J_{CF}$ = 3.3 Hz), 135.0, 134.5, 133.3 ($^3J_{CF}$ = 7.7 Hz), 131.4, 130.7, 130.1 ($^3J_{CF}$ = 7.7 Hz), 129.2, 128.9, 127.7, 127.5, 122.4, 119.6 ($^2J_{CF}$ = 21.1 Hz), 117.8 ($^2J_{CF}$ = 21.4 Hz), 115.9, 44.2, 35.6, 29.4, 21.4, 21.2, 21.0; HRMS (ESI): m/z calcd for $[C_{27}H_{33}FNO_3]^+$ 438.2439, found 438.2437; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 7.9 min (minor) and t_R = 10.8 min (major).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 2-bromo-5-fluorobenzoate (4aj).



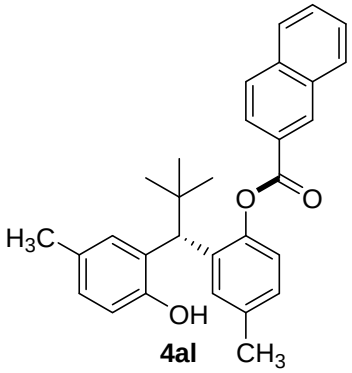
Yellow solid, mp 50-51 °C, 25 mg, 52% yield, 48 h, 0 °C; $[\alpha]_D^{25}$ -25.8 (c = 1.2, $CHCl_3$); IR υ 3485, 3027, 2951, 2918, 2865, 2851, 1738, 1606, 1579, 1507, 1468, 1181, 1097, 810, 752; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.92 (d, J = 8.8 Hz, 1H), 7.70-7.67 (m, 1H), 7.48 (s, 1H), 7.37 (s, 1H), 7.14 (t, J = 8.1 Hz, 1H), 7.05 (s, 2H), 6.78 (d, J = 7.9 Hz, 1H), 6.47 (d, J = 8.0 Hz, 1H), 4.74 (s, 1H), 4.70 (s, 1H), 2.37 (s, 3H), 2.26 (s, 3H), 1.08 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.6, 161.4 ($^1J_{CF}$ = 248.2 Hz), 151.4, 146.8, 136.0 ($^3J_{CF}$ = 7.7 Hz), 135.3, 134.5, 133.0 ($^3J_{CF}$ = 7.4Hz), 131.3, 130.5, 129.2, 128.8, 127.6, 127.5, 122.1, 120.3 ($^2J_{CF}$ = 21.8 Hz), 119.1 ($^2J_{CF}$ = 24.7 Hz), 116.8 ($^4J_{CF}$ = 3.3 Hz), 115.7, 43.6, 35.7, 29.4, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{26}H_{30}BrFNO_3]^+$ 502.1388, found 502.1388; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 16.3 min (major) and t_R = 21.7 min (minor).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 1-naphthoate (4ak).



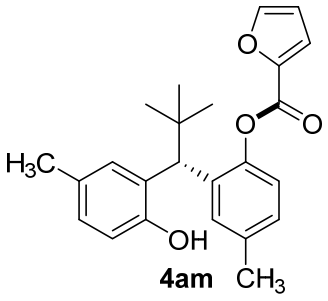
Yellow solid, mp 93-94 °C, 36 mg, 82% yield, 96 h, 0 °C; $[\alpha]_D^{25}$ -25.6 (c = 1.0, $CHCl_3$); IR υ 3471, 3033, 2949, 2918, 2864, 1737, 1606, 1574, 1507, 1182, 810, 776; ^{1}H NMR (400 MHz, $CDCl_3$) δ 9.00 (d, J = 8.6 Hz, 1H), 8.57 (d, J = 7.3 Hz, 1H), 8.07 (d, J = 8.2 Hz, 1H), 7.90 (d, J = 8.1 Hz, 1H), 7.62-7.54 (m, 3H), 7.47 (s, 1H), 7.38 (s, 1H), 7.06 (s, 2H), 6.76 (d, J = 8.0 Hz, 1H), 6.46 (d, J = 8.1 Hz, 1H), 4.80 (s, 1H), 4.71 (s, 1H), 2.37 (s, 3H), 2.21 (s, 3H), 1.10 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.2, 151.7, 147.3, 135.0, 134.7, 134.2, 133.9, 131.8, 131.5, 131.3, 130.6, 129.1, 129.0, 128.7, 128.1, 127.8, 127.5, 126.4, 126.1, 125.9, 124.7, 122.6, 116.0, 44.2, 35.7, 29.5, 21.5, 21.1; HRMS (ESI): m/z calcd for $[C_{30}H_{34}NO_3]^+$ 456.2533, found 456.2531; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 17.0 min (major) and t_R = 29.8 min (minor).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl 2-naphthoate (4al).



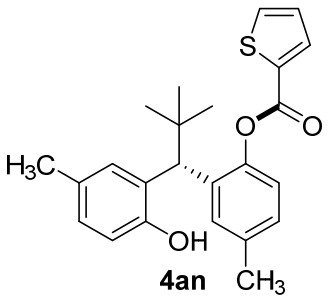
Yellow solid, mp 74-75 ºC, 31 mg, 71% yield, 96 h, 0 ºC; $[\alpha]_D^{25}$ -72.2 (*c* = 1.0, $CHCl_3$); IR *υ* 3451, 3027, 2950, 2921, 2865, 1710, 1630, 1600, 1507, 1464, 1184, 1098, 811, 757; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.82 (s, 1H), 8.22 (d, *J* = 8.5 Hz, 1H), 7.98 (d, *J* = 8.0 Hz, 1H), 7.91 (t, *J* = 8.6 Hz, 2H), 7.62 (t, *J* = 7.4 Hz, 1H), 7.56 (t, *J* = 7.4 Hz, 1H), 7.43 (s, 1H), 7.39 (s, 1H), 7.04 (s, 2H), 6.79 (d, *J* = 8.0 Hz, 1H), 6.52 (d, *J* = 8.1 Hz, 1H), 4.85 (s, 1H), 4.67 (s, 1H), 2.36 (s, 3H), 2.24 (s, 3H), 1.10 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.0, 151.7, 147.3, 135.8, 135.0, 134.4, 132.5, 132.1, 131.5, 130.5, 129.6, 129.2, 129.1, 128.6, 128.4, 127.9, 127.8, 127.5, 127.0, 126.8, 125.6, 122.4, 116.1, 44.3, 35.6, 29.5, 21.5, 21.1; HRMS (ESI): m/z calcd for $[C_{30}H_{34}NO_3]^+$ 456.2533, found 456.2537; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 7.5 min (minor) and t_R = 12.9 min (major).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl furan-2-carboxylate (4am).



Yellow solid, mp 103-104 ºC, 37 mg, 99% yield, 42 h, 0 ºC; $[\alpha]_D^{25}$ -63.2 (*c* = 1.0, $CHCl_3$); IR *υ* 3414, 3143, 3125, 2949, 2920, 2866, 1718, 1609, 1566, 1509, 1463, 1108, 818, 768; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 (s, 1H), 7.41 (s, 3H), 7.03 (s, 2H), 6.80 (d, *J* = 7.8 Hz, 1H), 6.59 (s, 1H), 6.54 (d, *J* = 7.9 Hz, 1H), 4.94 (s, 1H), 4.63 (s, 1H), 2.35 (s, 3H), 2.27 (s, 3H), 1.10 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 157.4, 151.6, 147.1, 146.4, 144.4, 135.1, 134.3, 131.5, 130.3, 129.2, 129.1, 127.7, 127.5, 122.2, 119.3, 116.1, 112.2, 44.1, 35.6, 29.4, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{24}H_{30}NO_4]^+$ 396.2169, found 396.2170; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 8.5 min (major) and t_R = 11.8 min (minor).

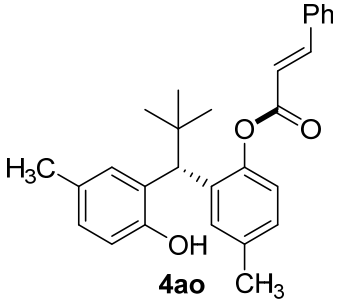
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl thiophene-2-carboxylate (4an).



Yellow solid, mp 126-127 ºC, 37 mg, 94% yield, 42 h, 0 ºC; $[\alpha]_D^{25}$ -90.3 (*c* = 0.8, $CHCl_3$); IR *υ* 3333, 3027, 2950, 2918, 2865, 1696, 1609, 1509, 1451, 1261, 1098, 815, 740; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.01 (d, *J* = 3.6 Hz, 1H), 7.66 (d, *J* = 4.9 Hz, 1H), 7.43 (s, 1H), 7.36 (s, 1H), 7.18 (t, *J* = 4.3 Hz, 1H), 7.03 (s, 2H), 6.80 (d, *J* = 8.0 Hz, 1H), 6.52 (d, *J* = 8.1 Hz, 1H), 4.93 (s, 1H), 4.64 (s, 1H), 2.34 (s, 3H), 2.27 (s,

3H), 1.11 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 161.2, 151.7, 146.8, 135.1, 134.7, 134.1, 133.4, 133.2, 131.6, 130.2, 129.3, 129.1, 128.1, 127.7, 127.5, 122.2, 116.2, 44.2, 29.4, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{24}H_{30}NO_3S]^+$ 412.1941, found 412.1934; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 14.7 min (minor) and t_R = 17.4 min (major).

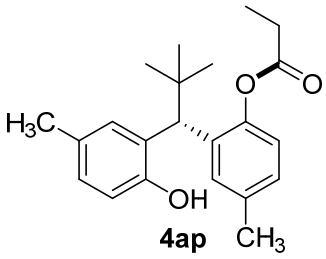
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl cinnamate (4ao).



4ao

Yellow solid, mp 137-138 °C, 39 mg, 94% yield, 42 h, 0 °C; $[\alpha]_D^{25}$ -91.6 (*c* = 1.0, $CHCl_3$); IR *υ* 3469, 3062, 3028, 2952, 2919, 2851, 1711, 1635, 1494, 1448, 1141, 820, 760; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.91 (d, *J* = 15.9 Hz, 1H), 7.59 (s, 2H), 7.443-7.39 (m, 5H), 7.03 (d, *J* = 7.9 Hz, 1H), 6.96 (d, *J* = 7.9 Hz, 1H), 6.81 (d, *J* = 7.9 Hz, 1H), 6.69 (d, *J* = 16.0 Hz, 1H), 6.57 (d, *J* = 8.0 Hz, 1H), 5.11 (s, 1H), 4.56 (s, 1H), 2.35 (s, 3H), 2.28 (s, 3H), 1.11 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 166.2, 151.7, 147.1, 146.6, 134.9, 134.3, 134.2, 131.4, 130.7, 130.5, 129.1, 129.0, 128.4, 127.7, 127.5, 122.2, 117.4, 116.3, 44.3, 35.7, 29.5, 21.4, 21.1; HRMS (ESI): m/z calcd for $[C_{28}H_{34}NO_3]^+$ 432.2533, found 432.2531; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 13.9 min (minor) and t_R = 16.8 min (major).

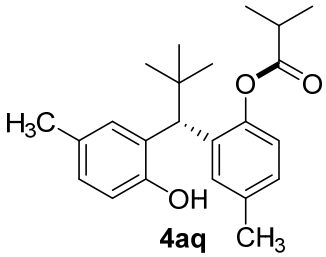
(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl propionate (4ap).



4ap

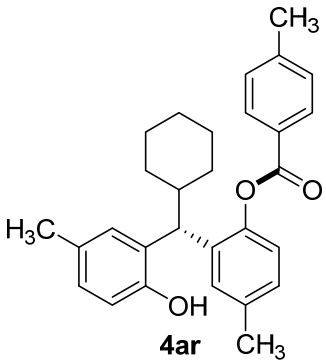
Yellow solid, mp 52-53 °C, 20 mg, 60% yield, 42 h, 25 °C; $[\alpha]_D^{25}$ -15.8 (*c* = 1.0, $CHCl_3$); IR *υ* 3467, 3027, 2948, 2922, 2866, 1738, 1608, 1508, 1457, 1097, 810; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.39 (d, *J* = 11.0 Hz, 2H), 7.01 (d, *J* = 8.1 Hz, 1H), 6.90 (d, *J* = 8.2 Hz, 1H), 6.75 (d, *J* = 8.0 Hz, 1H), 6.45 (d, *J* = 8.1 Hz, 1H), 5.02 (s, 1H), 4.54 (s, 1H), 2.68 (q, *J* = 7.5 Hz, 2H), 2.35 (s, 3H), 2.29 (s, 3H), 1.33 (t, *J* = 7.5 Hz, 3H), 1.10 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 173.8, 151.6, 147.0, 134.8, 134.3, 131.3, 130.3, 129.0, 128.9, 127.5, 127.4, 122.2, 43.6, 35.6, 29.4, 27.9, 21.4, 21.1, 9.2; HRMS (ESI): m/z calcd for $[C_{22}H_{32}NO_3]^+$ 358.2377, found 358.2376; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 5.6 min (major) and t_R = 6.4 min (minor).

(S)-2-(1-(2-hydroxy-5-methylphenyl)-2,2-dimethylpropyl)-4-methylphenyl isobutyrate (4aq).



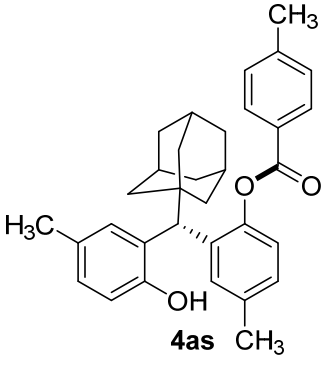
Yellow solid, mp 102-103 °C, 23 mg, 65% yield, 42 h, 25 °C; $[\alpha]_D^{25}$ -43.8 (*c* = 1.0, $CHCl_3$); IR *υ* 3493, 2953, 2920, 2852, 1739, 1646, 1607, 1508, 1467, 1098, 812, 756; ^1H NMR (400 MHz, $CDCl_3$) δ 7.42 (s, 1H), 7.33 (s, 1H), 6.99 (d, *J* = 8.1 Hz, 1H), 6.85 (d, *J* = 8.0 Hz, 1H), 6.71 (d, *J* = 7.7 Hz, 1H), 6.39 (d, *J* = 7.2 Hz, 1H), 5.06 (s, 1H), 4.52 (s, 1H), 2.90 (hept, *J* = 5.9 Hz, 1H), 2.32 (s, 3H), 2.28 (s, 3H), 1.43-1.33 (m, 6H), 1.07 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 176.5, 151.7, 147.1, 134.7, 134.0, 131.5, 130.0, 129.2, 129.0, 127.6, 127.4, 122.0, 116.2, 43.5, 35.7, 34.5, 29.4, 21.4, 21.1, 19.1, 19.0; HRMS (ESI): m/z calcd for $[C_{23}H_{34}NO_3]^+$ 372.2533, found 372.2530; HPLC: Daicel Chiralpak OD-H, *i*-PrOH /*n*-hexane =1/19, Flow rate = 1 mL/min, UV = 210 nm, t_R = 4.1 min (major) and t_R = 4.9 min (minor).

(S)-2-(cyclohexyl(2-hydroxy-5-methylphenyl)methyl)-4-methylphenyl 4-methylbenzoate (4ar).



Colorless oil, 29 mg, 69% yield, 48 h, 25 °C; $[\alpha]_D^{25}$ -29.6 (*c* = 1.0, $CHCl_3$); IR *υ* 3464, 3027, 2919, 2849, 1712, 1610, 1508, 1069, 811, 746; ^1H NMR (400 MHz, $CDCl_3$) δ 8.13 (d, *J* = 8.2 Hz, 2H), 7.34 (d, *J* = 8.0 Hz, 2H), 7.11 (d, *J* = 13.3 Hz, 2H), 7.01 (d, *J* = 10.3 Hz, 1H), 6.95 (d, *J* = 8.2 Hz, 1H), 6.84 (d, *J* = 10.1 Hz, 1H), 6.62 (d, *J* = 8.1 Hz, 1H), 5.15 (s, 1H), 3.95 (d, *J* = 10.5 Hz, 1H), 2.47 (s, 3H), 2.31 (s, 3H), 2.25 (s, 3H), 2.12-2.08 (m, 1H), 1.72-1.62 (m, 5H), 1.23-1.09 (m, 3H), 0.97-0.80 (m, 2H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.8, 151.9, 147.0, 144.6, 135.9, 134.9, 130.3, 129.8, 129.7, 129.5, 129.4, 128.8, 128.6, 127.8, 127.6, 126.7, 122.2, 116.3, 43.6, 40.7, 32.1, 31.5, 26.5, 26.4, 21.8, 21.2, 20.9; HRMS (ESI): m/z calcd for $[C_{29}H_{32}NaO_3]^+$ 451.2244, found 451.2248; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 6.8 min (minor) and t_R = 12.0 min (major).

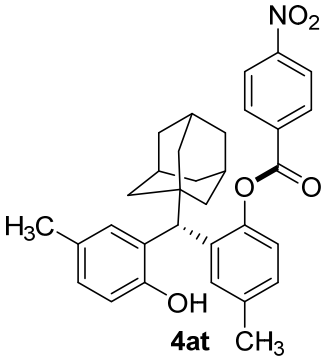
2-((S)-((3S,5S,7S)-adamantan-1-yl)(2-hydroxy-5-methylphenyl)methyl)-4-methylphenyl 4-methylbenzoate (4as).



Yellow solid, mp 164-165 °C, 36 mg, 76% yield, 96 h, 0 °C; $[\alpha]_D^{25}$ -30.8 (*c* = 1.0, $CHCl_3$); IR *υ* 3444, 3026, 2905, 2847, 1724, 1611, 1497, 1447, 1097, 814, 747; ^1H NMR (400 MHz, $CDCl_3$) δ 8.14 (d, *J* = 8.1 Hz, 2H), 7.44 (d, *J* = 15.1 Hz, 2H), 7.32 (d, *J* = 8.0 Hz, 2H), 7.03-6.97 (m, 2H), 6.78 (d, *J* = 8.0 Hz, 1H), 6.53 (d, *J* = 8.1 Hz, 1H), 4.82 (s, 1H), 4.48 (s, 1H), 2.45 (s, 3H), 2.36 (s, 3H), 2.27 (s, 3H), 1.94 (s, 3H), 1.76-1.56 (m, 12H); ^{13}C NMR (100 MHz, $CDCl_3$) δ

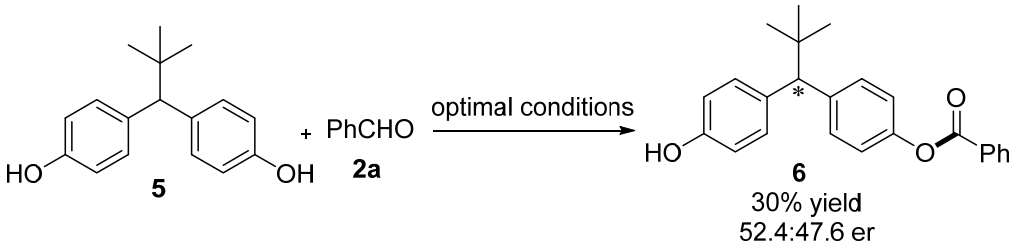
165.9, 151.8, 147.5, 144.2, 134.7, 133.4, 131.7, 130.9, 130.3, 129.3, 129.1, 128.4, 127.6, 127.4, 127.2, 122.3, 116.2, 45.2, 41.1, 37.6, 37.0, 28.9, 21.8, 21.5, 21.1; HRMS (ESI): m/z calcd for $[C_{33}H_{36}NaO_3]^+$ 503.2557, found 503.2560; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 5.5 min (minor) and t_R = 12.8 min (major).

2-((S)-((3S,5S,7S)-adamantan-1-yl)(2-hydroxy-5-methylphenyl)methyl)-4-methylphenyl 4-nitrobenzoate (4at).



Yellow solid, mp 182-183 °C, 30 mg, 59% yield, 17 h, 0 °C; $[\alpha]_D^{25}$ -15.6 (*c* = 1.0, $CHCl_3$); IR *υ* 3443, 3018, 2097, 2844, 1734, 1602, 1525, 1501, 1187, 849; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.46 (d, *J* = 8.9 Hz, 2H), 8.39 (d, *J* = 8.9 Hz, 2H), 7.59 (s, 1H), 7.39 (s, 1H), 7.10-7.01 (m, 2H), 6.83 (d, *J* = 10.2 Hz, 1H), 6.54 (d, *J* = 8.1 Hz, 1H), 4.59 (s, 1H), 4.55 (s, 1H), 2.42 (s, 3H), 2.28 (s, 3H), 1.97 (s, 3H), 1.78-1.59 (m, 12H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.7, 151.5, 150.8, 147.1, 135.6, 135.3, 133.6, 131.6, 131.3, 131.1, 129.3, 127.8, 127.6, 127.5, 123.7, 122.0, 115.5, 44.8, 41.1, 37.6, 36.9, 28.8, 21.5, 21.0; HRMS (ESI): m/z calcd for $[C_{32}H_{33}NNaO_5]^+$ 534.2251, found 534.2257; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 5.3 min (minor) and t_R = 13.1 min (major).

General procedure for synthesis of product 6.

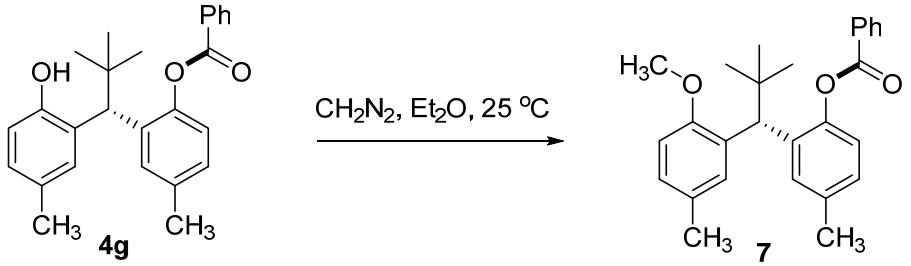


To a dry Schlenk tube equipped with a magnetic stir bar, was added bisphenols **5** (0.1 mmol), triazolium salt **3a** (0.005 mmol), DABCO (0.1 mmol) quinone oxidant (0.1 mmol). The tube was closed with a septum, evacuated, and refilled with argon. Freshly distilled DME (1.0 mL) was added and the reaction mixture was then stirred at 0 °C for 5 minutes, followed by aldehyde **2a** (0.1 mmol). The reaction was stirred for 20 h at 0°C. Upon the reaction completed, the mixture was concentrated under reduced pressure. The resulting crude residue was purified *via* column chromatography on silica gel to afford the desired product **6**.

Yellow solid, mp 140-141 °C, 11 mg, 30% yield; $[\alpha]_D^{25}$ +3.0 (*c* = 0.4, $CHCl_3$); IR *υ* 3448, 3017, 2953, 2918, 2849, 1705, 1590, 1513, 1452, 1086, 815, 779; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.18 (d, J = 7.3 Hz, 2H), 7.63 (t, J = 7.4 Hz, 1H), 7.50 (t, J = 7.7 Hz, 2H), 7.45 (d, J = 8.6 Hz, 2H), 7.28 (d, J = 8.5 Hz, 2H), 7.12 (d, J = 8.5 Hz, 2H), 6.75

(d, J = 8.5 Hz, 2H), 4.78 (brs, 1H) 3.69 (s, 1H), 1.01 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.2, 153.8, 149.1, 141.1, 135.2, 133.5, 130.9, 130.6, 130.2, 129.6, 128.6, 121.0, 114.8, 62.9, 35.1, 29.2; HRMS (ESI): m/z calcd for $[C_{24}H_{28}NO_3]^+$ 378.2064, found 378.2062; HPLC: Daicel Chiralpak OD-H, *i*-PrOH /*n*-hexane =1/9, Flow rate = 1 mL/min, UV = 210 nm, t_R = 11.2 min (major) and t_R = 13.2 min (minor).

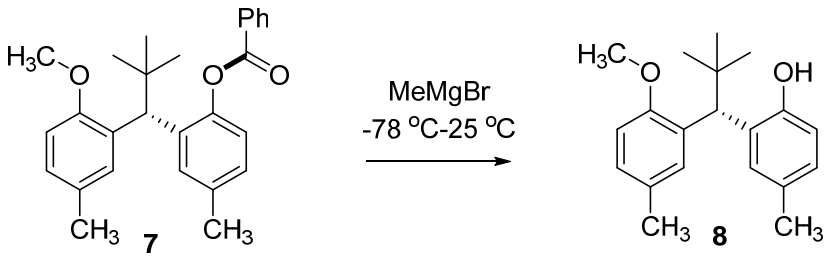
General procedure for synthesis of product 7.



To a 100 ml flask equipped with a magnetic stir bar, was added **4g** (0.5 mmol) and fresh prepared CH_2N_2 ether solution[2] (30 mL). The reaction was stirred for 3 days at 25 °C. After the reaction completed, the mixture was concentrated and purified via column chromatography on silica gel to afford **7**.

White solid, mp 116-117 °C, 101 mg, 50% yield; $[\alpha]_D^{25}$ -13.3 (*c* = 0.3, $CHCl_3$); IR *υ* 3382, 3012, 2956, 2919, 2851, 1738, 1598, 1584, 1497, 1449, 1056, 809, 770; ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.25 (d, J = 7.4 Hz, 2H), 7.64 (t, J = 7.4 Hz, 1H), 7.58-7.50 (m, 3H), 7.33 (s, 1H), 7.03-6.97 (m, 2H), 6.90 (d, J = 8.4 Hz, 1H), 6.58 (d, J = 8.3 Hz, 1H), 4.94 (s, 1H), 3.26 (s, 3H), 2.37 (s, 3H), 2.27 (s, 3H), 1.05 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 165.0, 155.3, 147.3, 135.3, 134.6, 133.1, 131.0, 130.6, 130.3, 130.2, 128.5, 128.4, 127.2, 127.1, 122.3, 110.0, 54.7, 42.2, 35.5, 29.3, 21.5, 21.0; HRMS (ESI): m/z calcd for $[C_{27}H_{34}NO_3]^+$ 420.2533, found 420.2526; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/99, Flow rate = 1 mL/min, UV = 210 nm, t_R = 7.5 min (minor) and t_R = 8.6 min (major).

General procedure for synthesis of product 8.

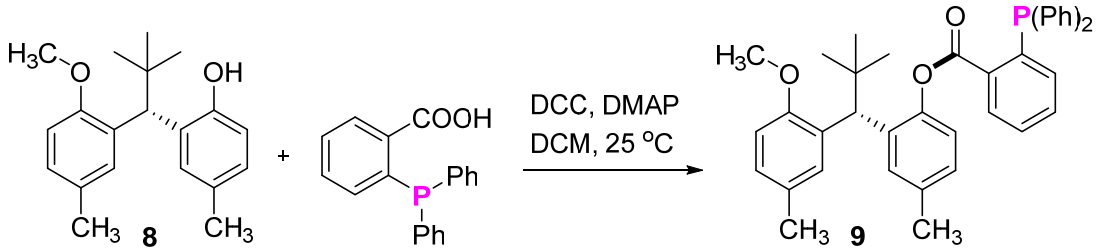


To a dry Schlenk tube equipped with a magnetic stir bar, was added **7** (0.2 mmol). The tube was closed with a septum, evacuated, and refilled with Ar. Freshly distilled THF (2 mL) was added and the reaction mixture was then stirred at -78°C for 5 minutes, followed by MeMgBr ether solution (1.0 mmol) dropwise. The reaction was allowed to warm up to room temperature. Upon the reaction completed, the mixture was quenched with sat. NH_4Cl, extracted by EA, dried with $MgSO_4$. The organic solvent was

concentrated under reduced pressure, and the resulting crude residue was purified *via* column chromatography on silica gel to afford the desired product **8**.

White solid, mp 89-90 °C, 50 mg, 84% yield; $[\alpha]_D^{25}$ +58.0 (*c* = 0.4, $CHCl_3$); IR *υ* 3466, 3023, 2949, 2921, 2854, 1605, 1496, 1463, 1228, 881, 807; ^1H NMR (400 MHz, $CDCl_3$) δ 7.37 (s, 1H), 7.21 (s, 1H), 6.94 (d, J = 8.3 Hz, 1H), 6.85 (d, J = 8.0 Hz, 1H), 6.76 (d, J = 8.3 Hz, 1H), 6.71 (d, J = 8.1 Hz, 1H), 5.76 (s, 1H), 4.53 (s, 1H), 3.85 (s, 3H), 2.29 (s, 3H), 2.25 (s, 3H), 1.12 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 154.3, 152.2, 130.7, 130.4, 129.8, 129.5, 129.0, 128.9, 127.5, 127.4, 116.0, 110.4, 55.9, 42.7, 35.5, 29.6, 21.1, 20.9; HRMS (ESI): m/z calcd for $[C_{20}H_{27}O_2]^+$ 299.2006, found 299.1997; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/99, Flow rate = 1 mL/min, UV = 210 nm, t_R = 20.8 min (major) and t_R = 40.8 min (minor).

General procedure for synthesis of product 9.



To a dry Schlenk tube equipped with a magnetic stir bar, was added 2-(diphenylphosphino)benzoic acid (0.1 mmol), DCC (0.1 mmol), DMAP (0.01 mmol). The tube was closed with a septum, evacuated, and refilled with Ar. Freshly distilled DCM (2 mL) was added and the reaction mixture was then stirred at 25°C for 30 minutes, followed by **8** (0.1 mmol). The reaction was stirred for 24 h at 25°C. Upon the reaction completed, the organic solvent was concentrated under reduced pressure, and the resulting crude residue was purified *via* column chromatography on silica gel to afford the desired product **9**.

White solid, mp 64-65 °C, 44 mg, 75% yield; $[\alpha]_D^{25}$ +13.0 (*c* = 1.0, $CHCl_3$); IR *υ* 3439, 3025, 2954, 2917, 2849, 1728, 1949, 1461, 1434, 1243, 1187, 1097, 1037, 802, 742, 694; ^1H NMR (400 MHz, $CDCl_3$) δ 8.43-8.39 (m, 1H), 7.51-7.43 (m, 3H), 7.32-7.26 (m, 11H), 7.03-6.99 (m, 1H), 6.89 (d, *J* = 8.1 Hz, 2H), 6.58 (t, *J* = 9.2 Hz 2H), 4.89 (s, 1H), 3.32 (s, 3H), 2.31 (s, 3H), 2.26 (s, 3H), 0.99 (s, 9H); ^{13}C NMR (100 MHz, $CDCl_3$) δ 163.8, 154.3, 146.0, 141.2, 140.9, 137.1, 137.0, 136.9, 134.1, 133.4, 133.3, 133.2, 133.1, 133.0, 132.8, 131.1, 130.2, 129.7, 129.6, 127.6, 127.5, 127.4, 127.3, 127.0, 126.1, 126.0, 121.3, 109.1, 53.9, 41.3, 34.4, 28.3, 20.4, 20.0; ^{31}P NMR (162 MHz, $CDCl_3$) δ -4.3; HRMS (ESI): m/z calcd for $[C_{39}H_{40}O_3P]^+$ 587.2710, found 587.2715; HPLC: Daicel Chiralpak AD-H, *i*-PrOH /*n*-hexane =1/99, Flow rate = 1 mL/min, UV = 210 nm, t_R = 6.6 min (minor) and t_R = 8.6 min (major).

References.

(1) C. Gruttner, V. Bohmer, R. Assmus and S. Scherf, *J. Chem. Soc., Perkin Trans. 1*, 1995, 93.
(2) Z.-J. Huang, X. Huang, B.-S. Li, C.-L. Mou, S. Yang, B.-A. Song and Y.-G. Chi, *J. Am. Chem. Soc.*, 2016, **138**, 7524.

X-ray crystallography data of 4p.

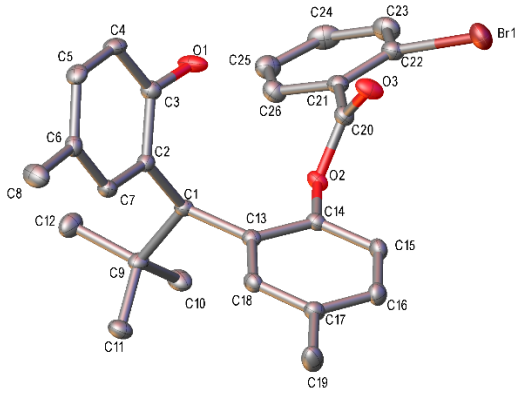
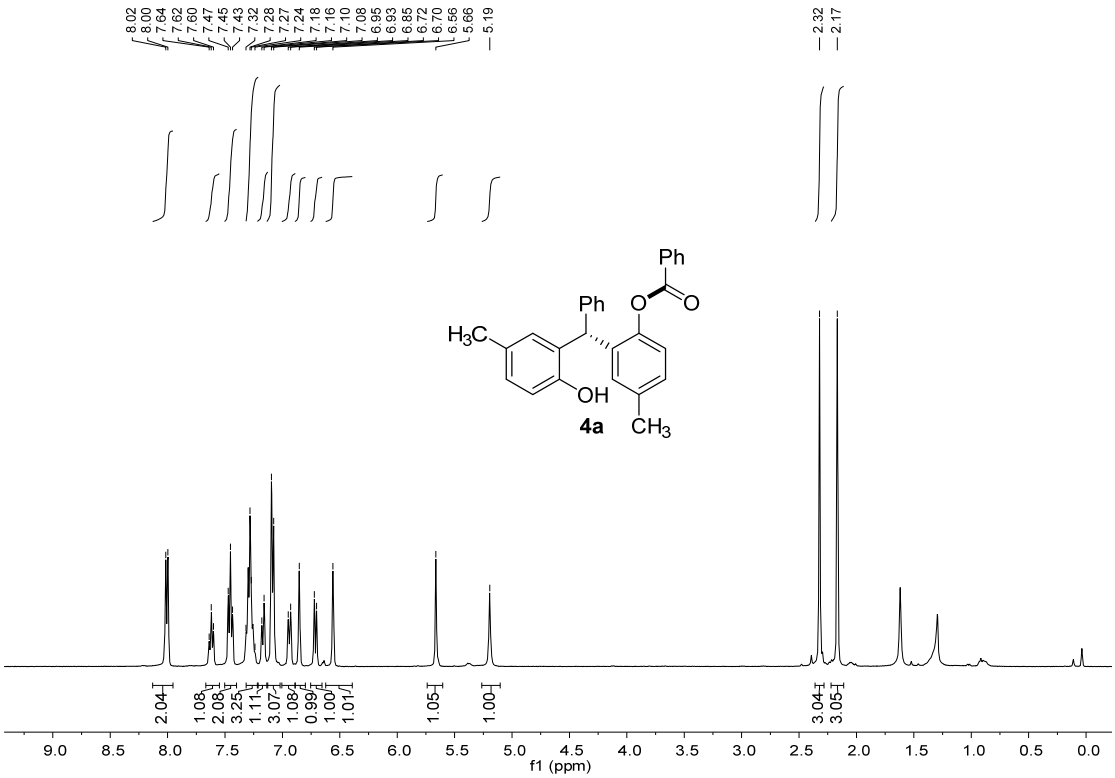


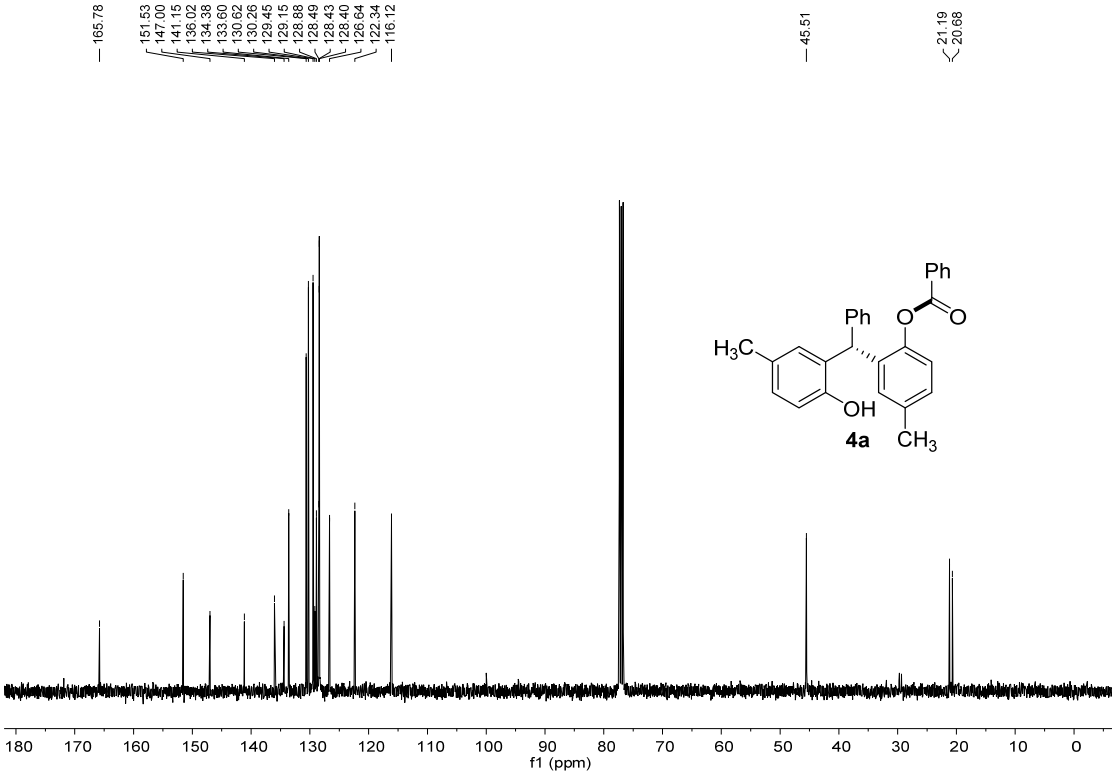
Figure S1. The x-ray single crystal structure of **4p**.

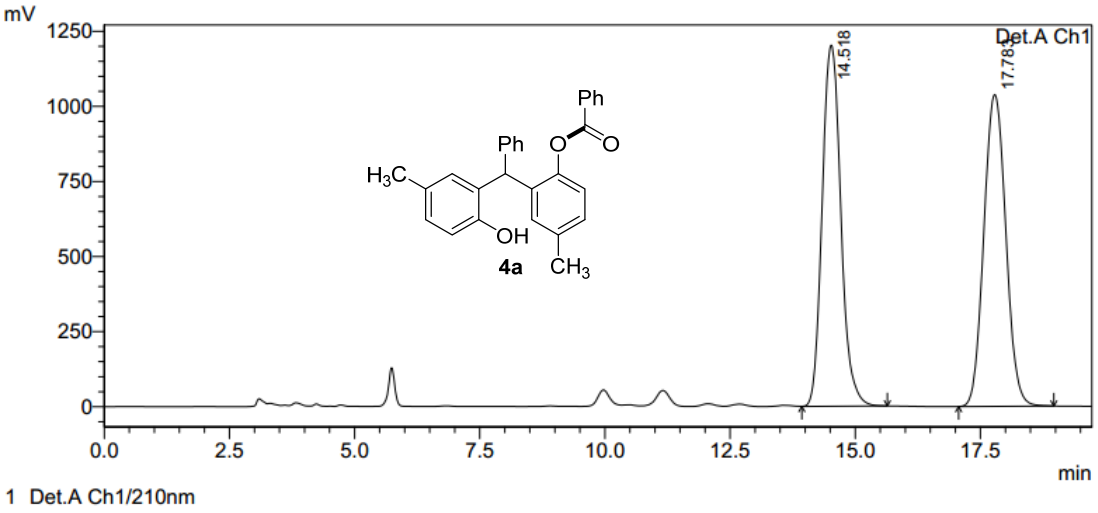
Table S2. Crystal data and structure refinement for A.

Identification code	a	
Empirical formula	C26 H27 Br O3	
Formula weight	467.38	
Temperature	173.15 K	
Wavelength	0.71073 Å	
Crystal system	Orthorhombic	
Space group	$P2_12_12$	
Unit cell dimensions	a = 14.839(4) Å	a= 90°.
	b = 17.596(4) Å	b= 90°.
	c = 8.652(2) Å	g = 90°.
Volume	2259.2(9) $Å^3$	
Z Density (calculated)	4, 1.374 Mg/m^3	
Absorption coefficient	1.844 mm^{-1}	
F(000)	968	
Crystal size	0.323 x 0.261 x 0.112 mm^3	
Theta range for data collection	2.745 to 27.458°.	
Index ranges	-19<=h<=19, -22<=k<=22, -10<=l<=11	
Reflections collected	15380	
Independent reflections	5155 [R(int) = 0.0589]	
Completeness to theta = 25.242°	99.7 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	1.0000 and 0.72002	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	5155 / 0 / 277	
Goodness-of-fit on F^2	1.101	
Final R indices [I>2sigma(I)]	R1 = 0.0480, wR2 = 0.0846	
R indices (all data)	R1 = 0.0550, wR2 = 0.0877	
Absolute structure parameter	0.005(7)	
Extinction coefficient	n/a	
Largest diff. peak and hole	0.368 and -0.293 e.$Å^{-3}$	

NMR Spectra and HPLC Spectra.





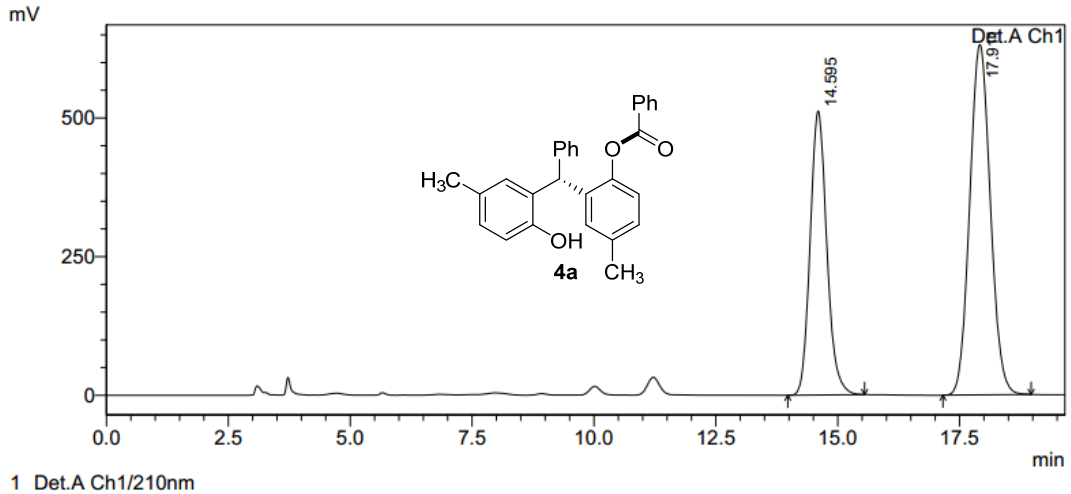


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	14.518	31269860	1202411	49.707	53.664
2	17.783	31638447	1038201	50.293	46.336
Total		62908307	2240612	100.000	100.000

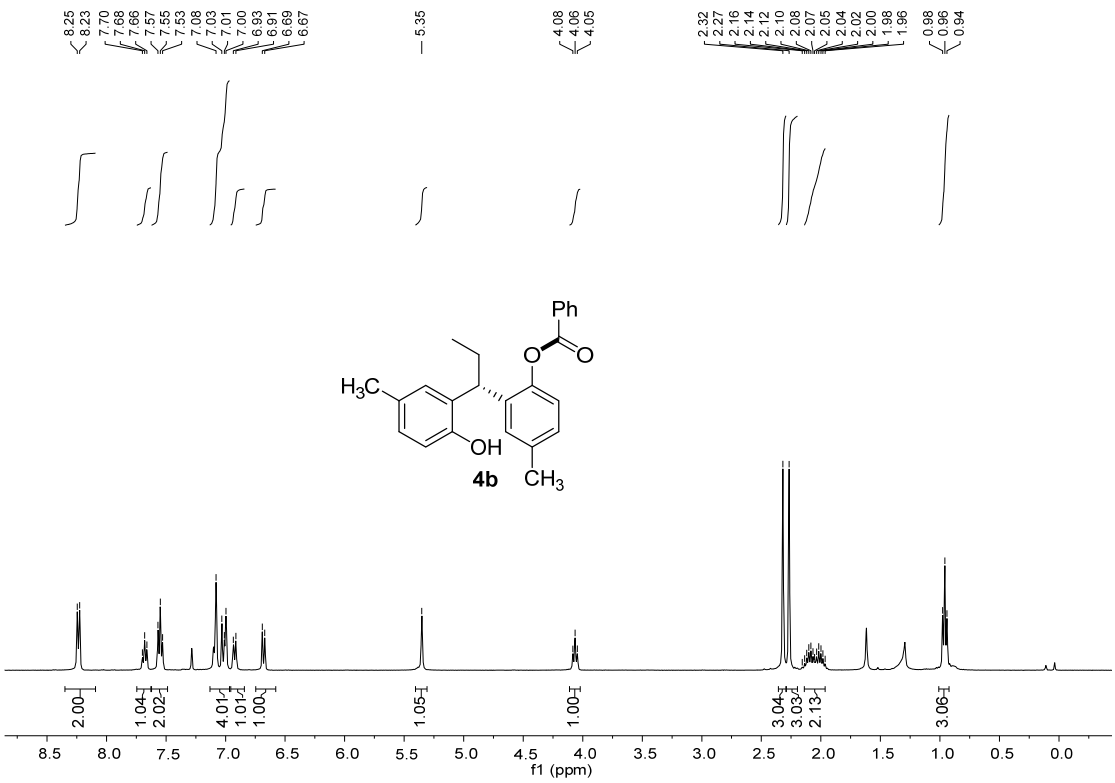


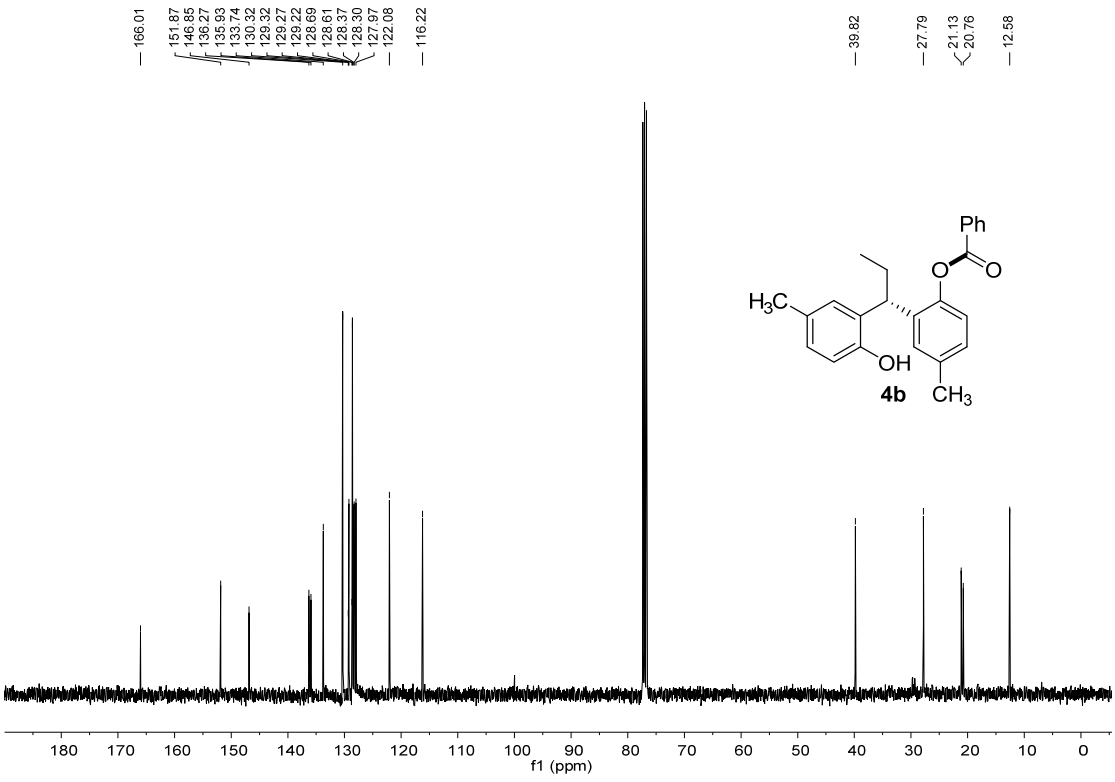
1 Det.A Ch1/210nm

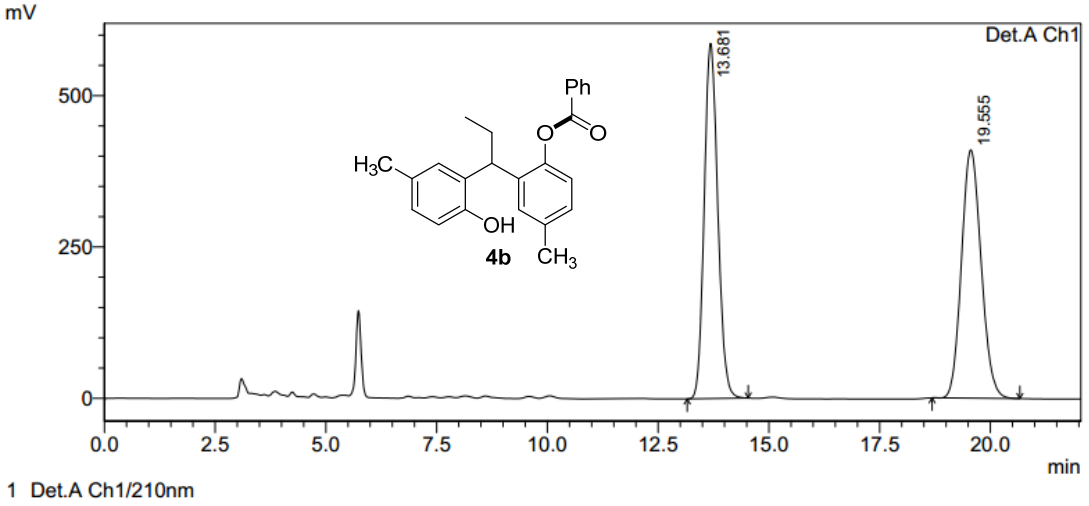
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	14.595	12219790	512323	39.678	44.779
2	17.911	18577470	631796	60.322	55.221
Total		30797260	1144119	100.000	100.000


8.25
8.23
7.70
7.68
7.66
7.57
7.55
7.53
7.08
7.03
7.01
7.00
6.93
6.91
6.69
6.67
5.35
4.08
4.06
4.05
2.32
2.27
2.16
2.14
2.12
2.10
2.08
2.07
2.05
2.04
2.02
2.00
1.98
1.96
0.98
0.96
0.94
Ph
O
O
H3C
OH
4b
CH3
2.00
1.04
2.02
4.01
1.01
1.00
1.05
1.00
3.04
3.03
2.13
3.06
f1 (ppm)


166.01
151.87
146.85
136.27
135.93
133.74
130.32
129.32
129.27
129.22
128.69
128.61
128.37
128.30
127.97
122.08
116.22
39.82
27.79
21.13
20.76
12.58
Ph
O
O
H3C
OH
4b
CH3
f1 (ppm)



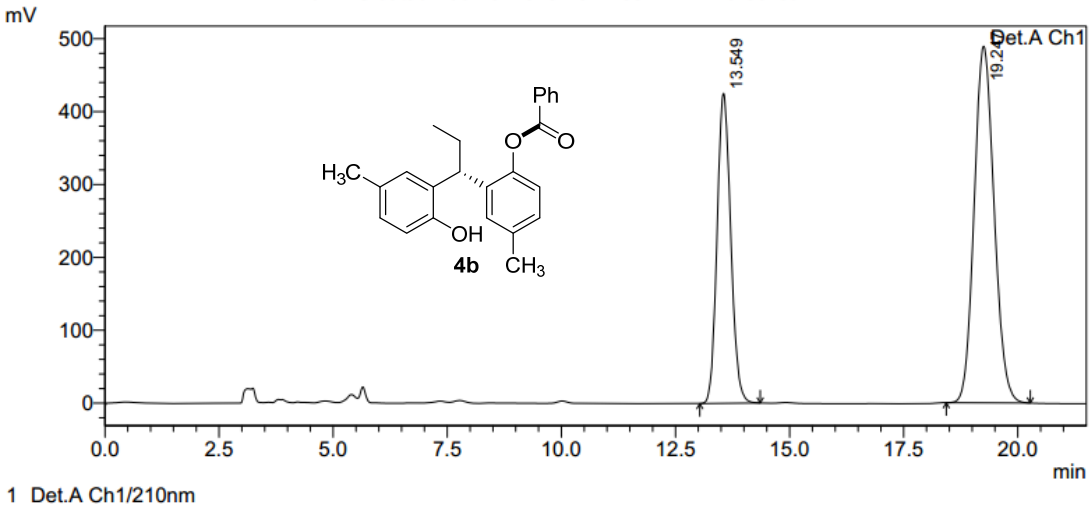
1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.681	12509311	586922	49.747	58.861
2	19.555	12636697	410203	50.253	41.139
Total		25146008	997125	100.000	100.000

F:\HPLC data\LB\lb-20170701-01-P89-B-AD-1-9-ee.lcd

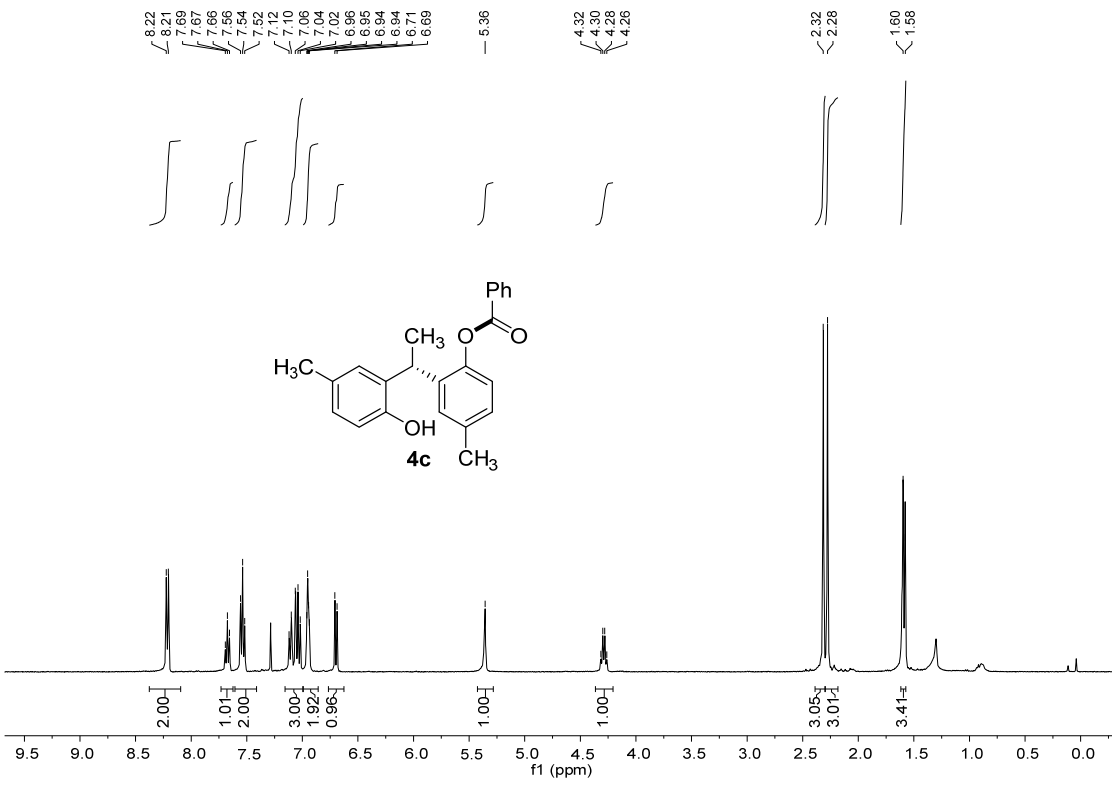


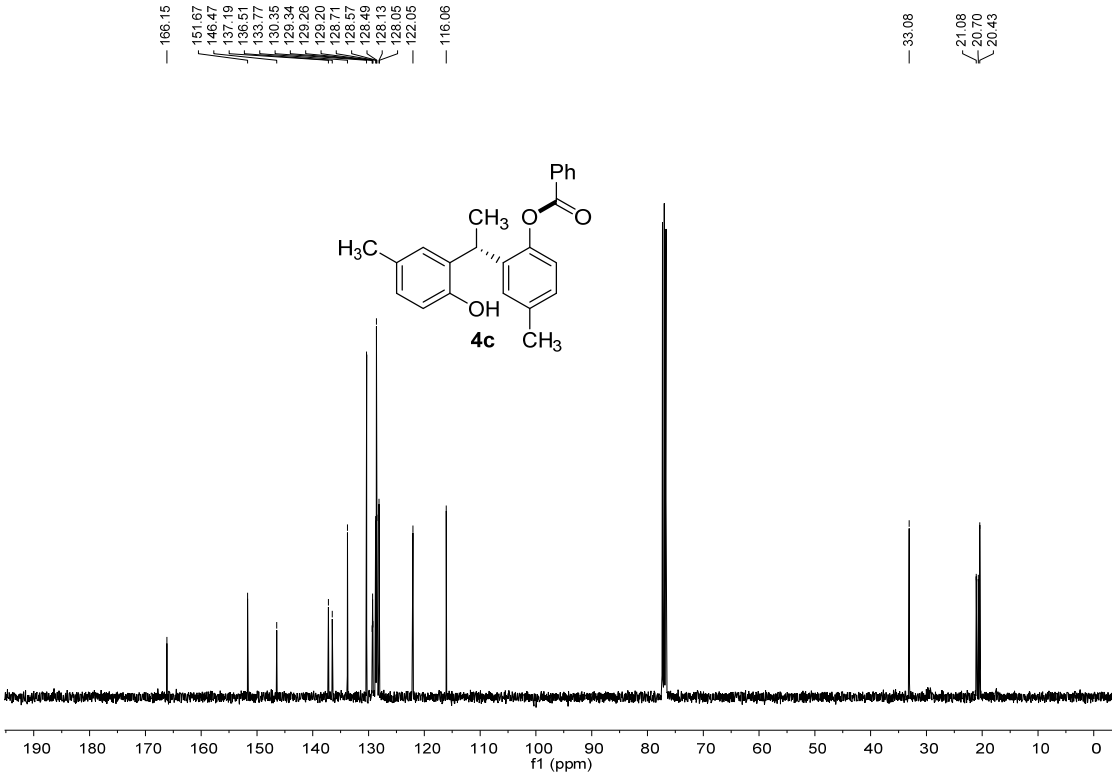
1 Det.A Ch1/210nm

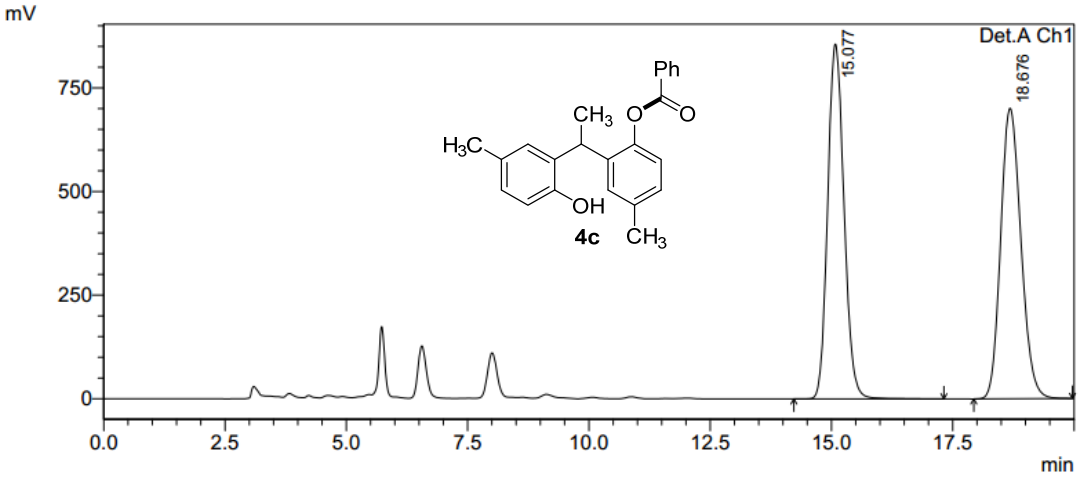
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.549	8866458	425300	37.336	46.502
2	19.247	14881404	489290	62.664	53.498
Total		23747863	914590	100.000	100.000


8.22
8.21
7.69
7.67
7.66
7.56
7.54
7.52
7.12
7.10
7.06
7.04
7.02
6.96
6.95
6.94
6.94
6.71
6.69
5.36
4.32
4.30
4.28
4.26
2.32
2.28
1.60
1.58
Ph
CH3
O
O
H3C
OH
4c
CH3
2.00
1.01
2.00
3.00
1.92
0.96
1.00
1.00
3.05
3.01
3.41
f1 (ppm)


166.15
151.67
146.47
137.19
136.51
133.77
130.35
129.34
129.26
129.20
128.71
128.57
128.49
128.13
128.05
122.05
116.06
33.08
21.08
20.70
20.43
Ph
CH3
O
O
H3C
OH
4c
CH3
f1 (ppm)

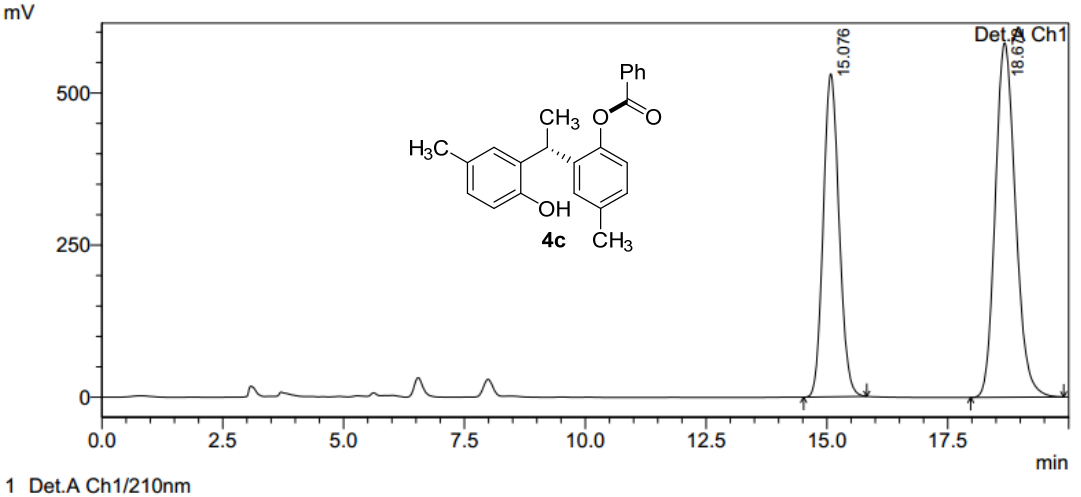


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	15.077	20081649	856238	49.639	54.986
2	18.676	20373389	700959	50.361	45.014
Total		40455039	1557197	100.000	100.000

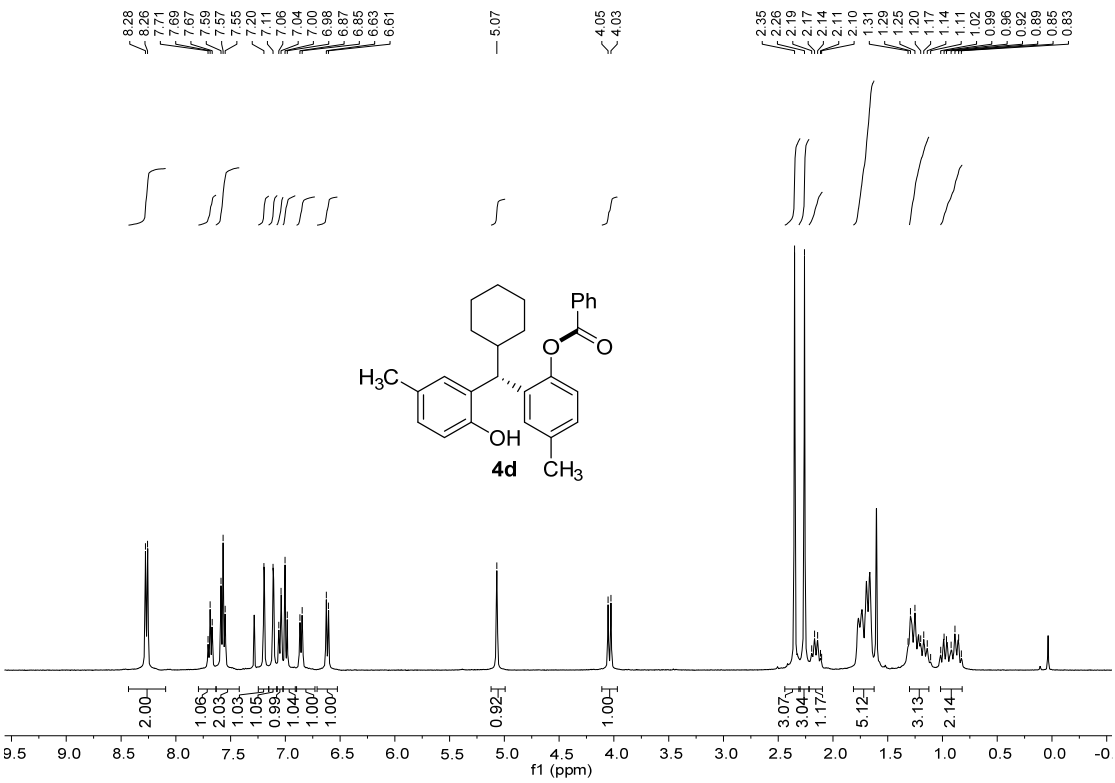


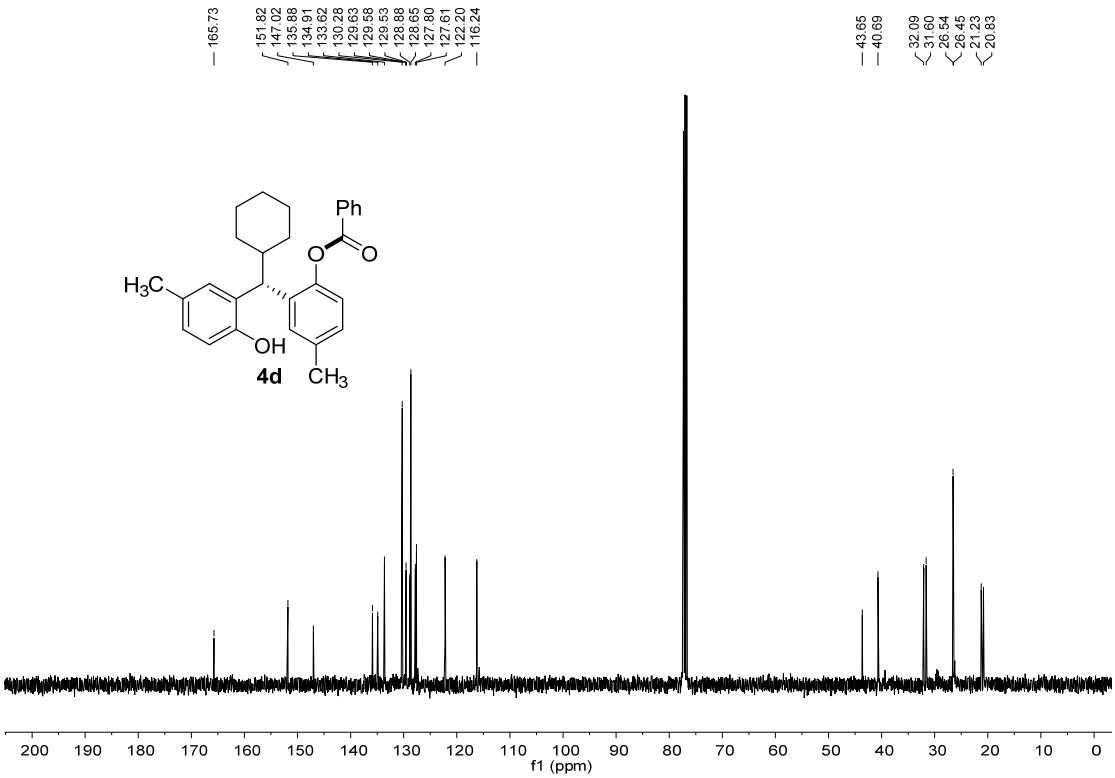
1 Det.A Ch1/210nm

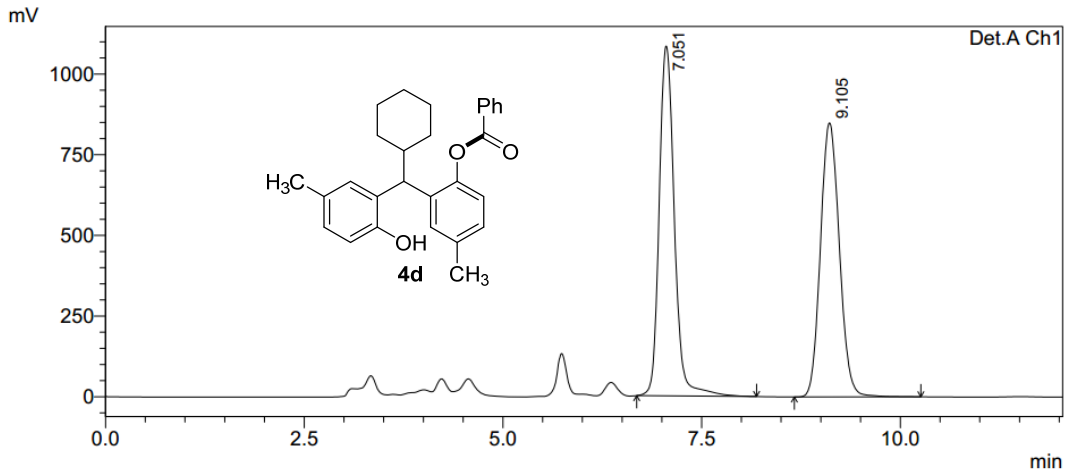
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	15.076	12097061	530659	41.667	47.683
2	18.672	16935636	582223	58.333	52.317
Total		29032697	1112882	100.000	100.000


8.28
8.26
7.71
7.69
7.67
7.59
7.57
7.55
7.20
7.11
7.06
7.04
7.00
6.98
6.87
6.85
6.63
6.61
5.07
4.05
4.03
2.35
2.26
2.19
2.17
2.14
2.11
2.10
1.31
1.29
1.25
1.20
1.17
1.14
1.11
1.02
0.99
0.96
0.92
0.89
0.85
0.83
Ph
O
O
H3C
OH
4d
CH3
2.00
1.06
2.03
1.03
1.05
0.99
1.04
1.00
1.00
0.92
1.00
3.07
3.04
1.17
5.12
3.13
2.14
f1 (ppm)


165.73
151.82
147.02
135.88
134.91
133.62
130.28
129.63
129.58
129.53
128.88
128.65
127.80
127.61
122.20
116.24
43.65
40.69
32.09
31.60
26.54
26.45
21.23
20.83
Ph
O
O
H3C
OH
4d
CH3
f1 (ppm)

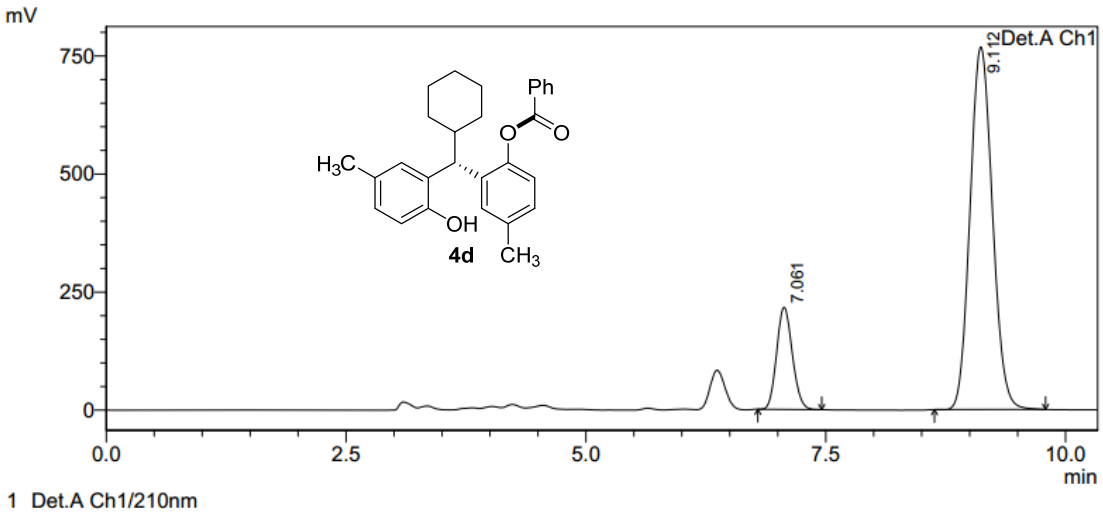


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.051	14399220	1083964	50.588	56.067
2	9.105	14064732	849366	49.412	43.933
Total		28463951	1933330	100.000	100.000

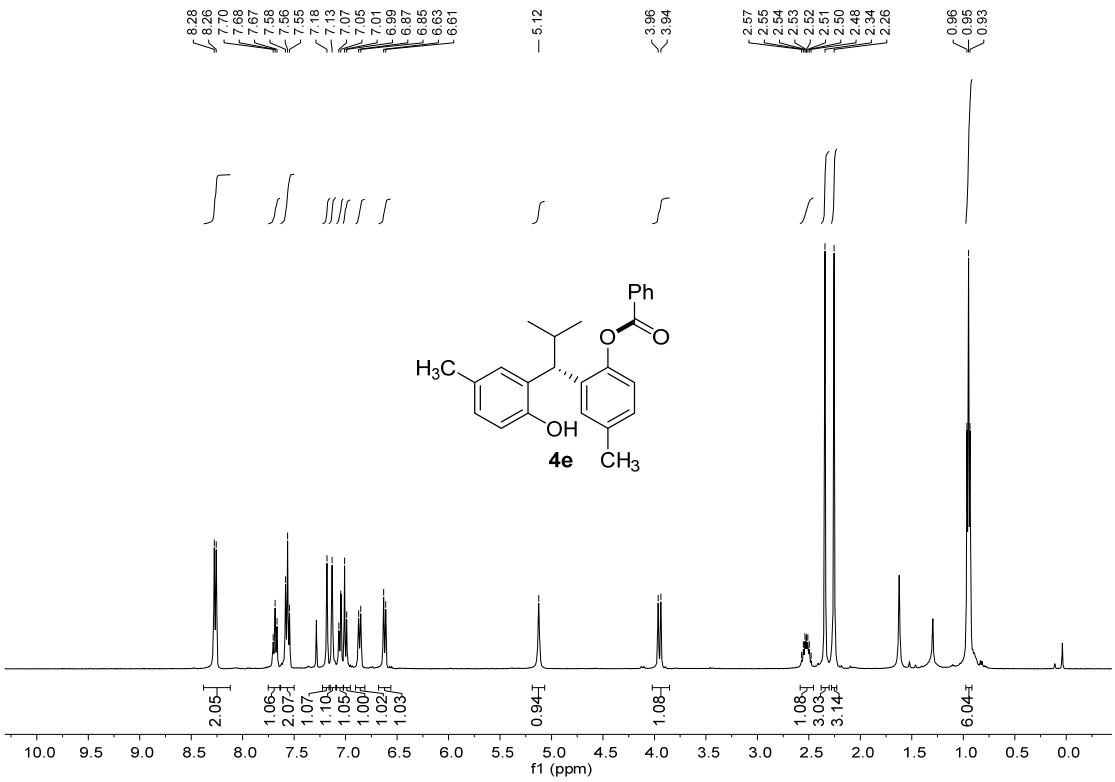


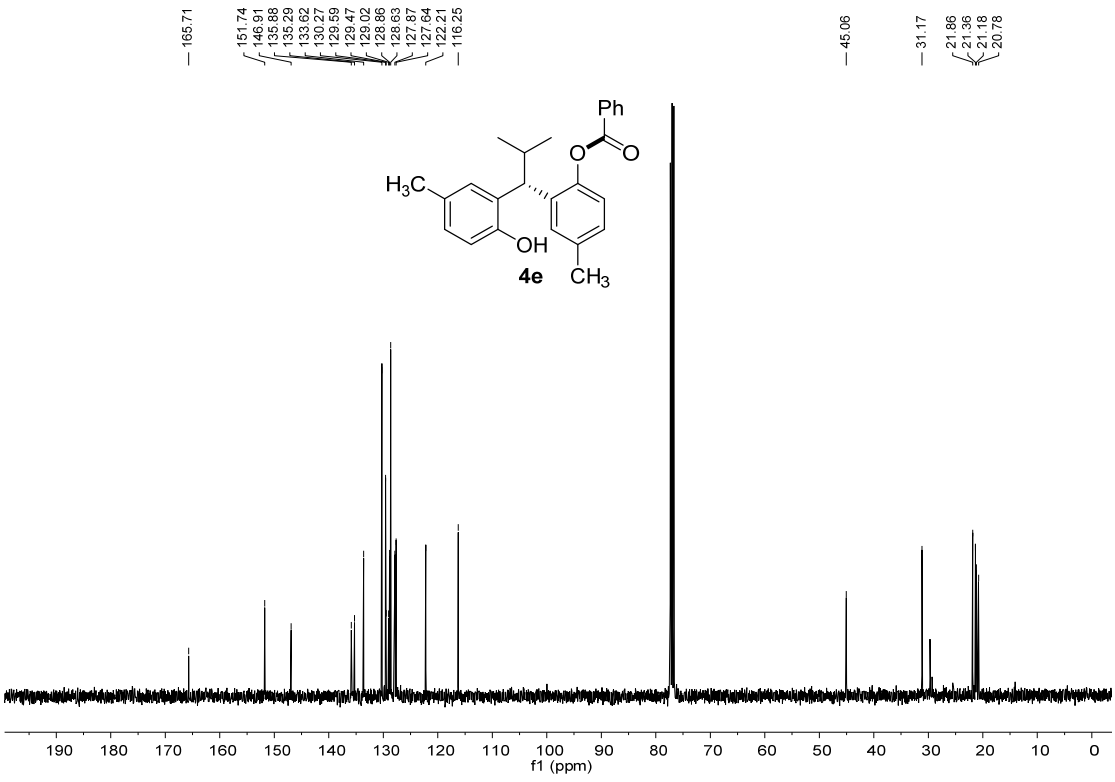
1 Det.A Ch1/210nm

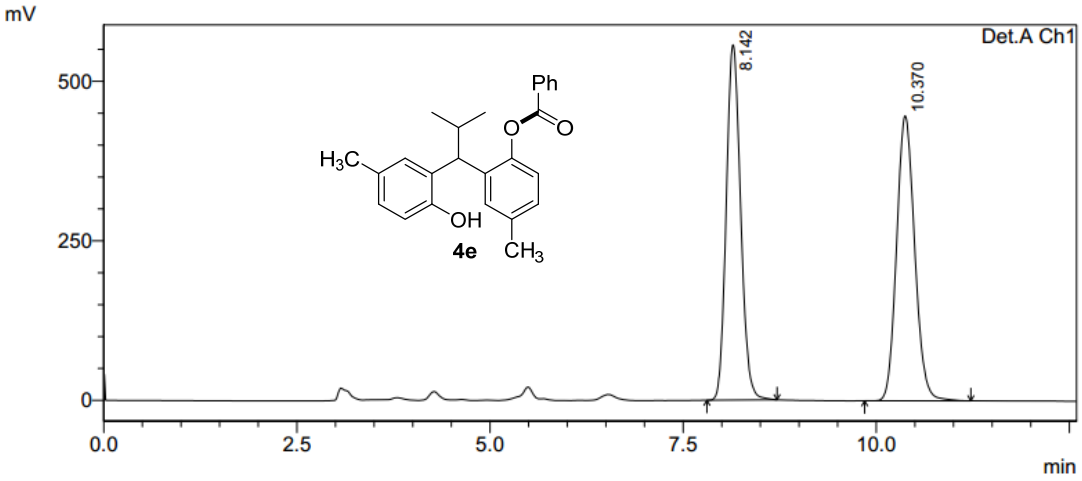
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.061	2465268	216363	16.538	21.981
2	9.112	12441051	767953	83.462	78.019
Total		14906320	984316	100.000	100.000


8.28
8.26
7.70
7.68
7.67
7.58
7.56
7.55
7.18
7.13
7.07
7.05
7.01
6.99
6.87
6.85
6.63
6.61
5.12
3.96
3.94
2.57
2.55
2.54
2.53
2.52
2.51
2.50
2.48
2.34
2.26
0.96
0.95
0.93
Ph
O
O
H3C
OH
4e
CH3
2.05
1.06
2.07
1.07
1.10
1.05
1.00
1.02
1.03
0.94
1.08
1.08
3.03
3.14
6.04
10.0 9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


165.71
151.74
146.91
135.88
135.29
133.62
130.27
129.59
129.47
129.02
128.86
128.63
127.87
127.64
122.21
116.25
45.06
31.17
21.86
21.36
21.18
20.78
Ph
O
O
H3C
OH
4e
CH3
190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

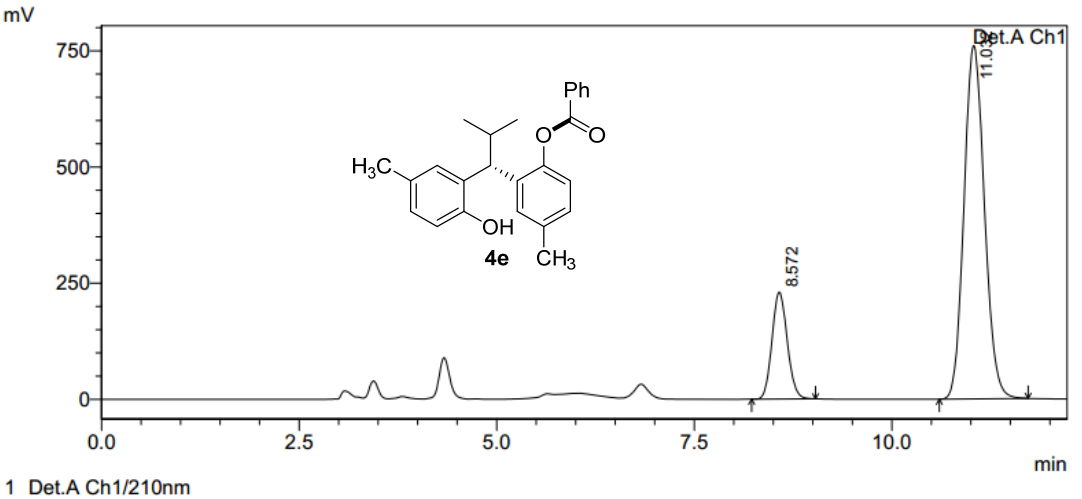


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.142	7207168	556824	49.739	55.491
2	10.370	7282816	446620	50.261	44.509
Total		14489984	1003444	100.000	100.000

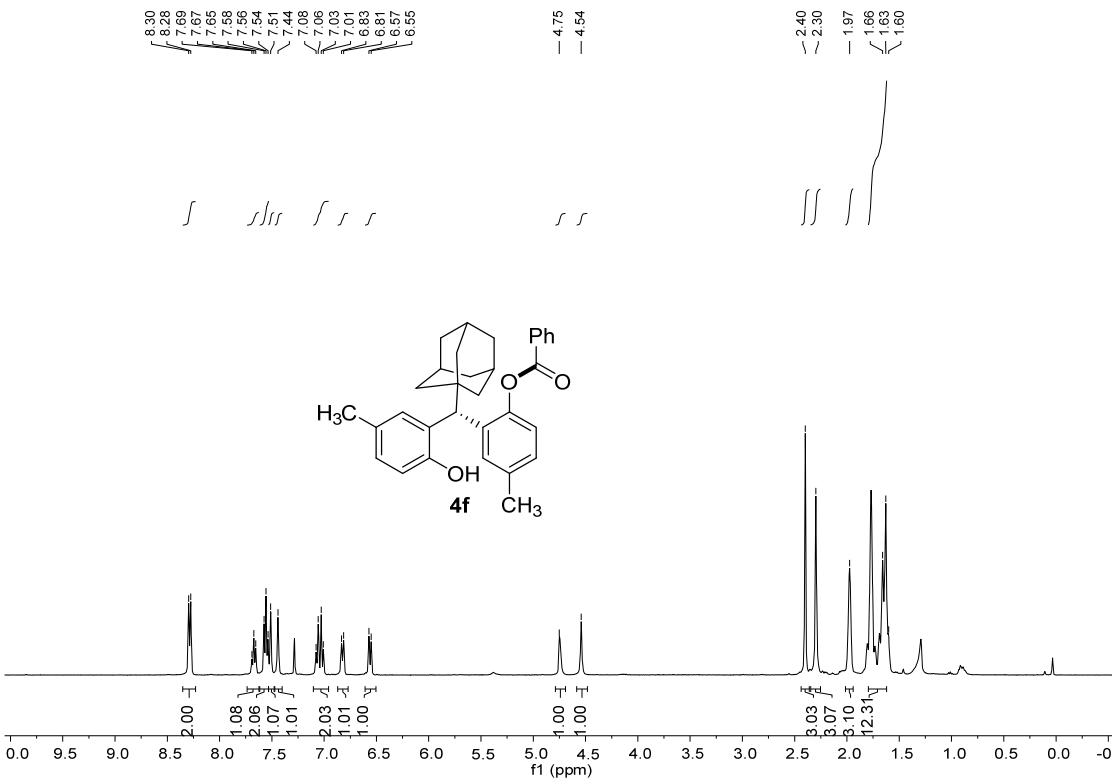


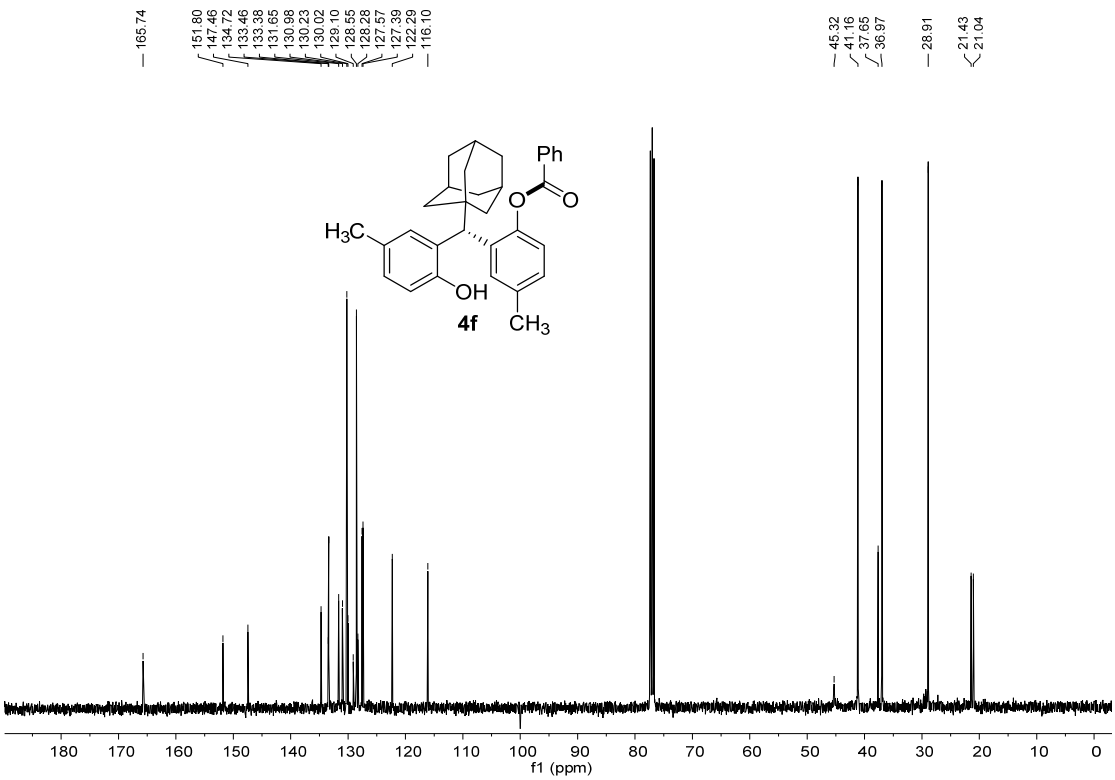
1 Det.A Ch1/210nm

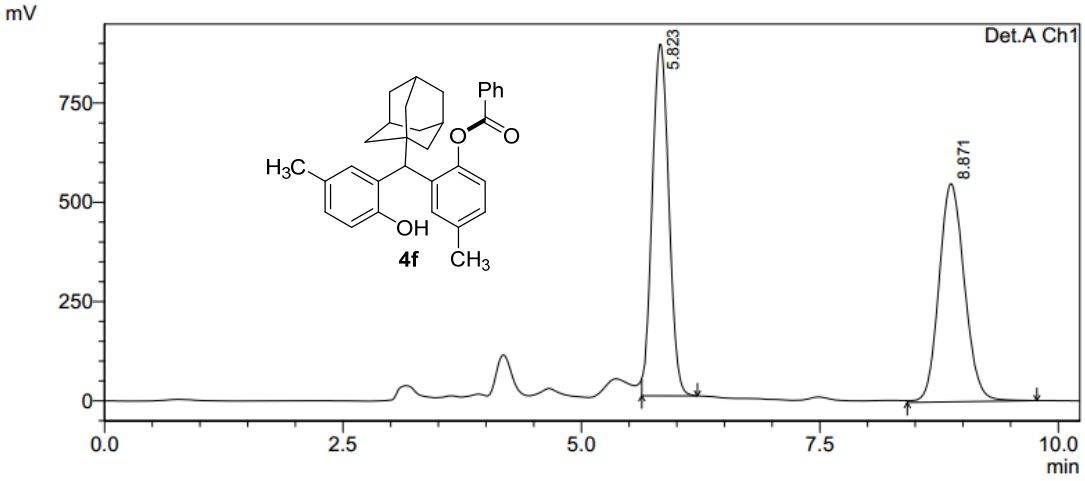
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.572	3098541	230322	18.429	23.243
2	11.032	13714515	760594	81.571	76.757
Total		16813056	990916	100.000	100.000


8.30
8.28
7.69
7.67
7.65
7.58
7.56
7.54
7.51
7.44
7.08
7.06
7.03
7.01
6.83
6.81
6.57
6.55
4.75
4.54
2.40
2.30
1.97
1.66
1.63
1.60
Ph
O
O
H3C
OH
4f
CH3
2.00
1.08
2.06
1.07
1.01
2.03
1.01
1.00
1.00
1.00
3.03
3.07
3.10
12.31
f1 (ppm)


165.74
151.80
147.46
134.72
133.46
133.38
131.65
130.98
130.23
130.02
129.10
128.55
128.28
127.57
127.39
122.29
116.10
45.32
41.16
37.65
36.97
28.91
21.43
21.04
Ph
O
O
H3C
OH
4f
CH3
f1 (ppm)

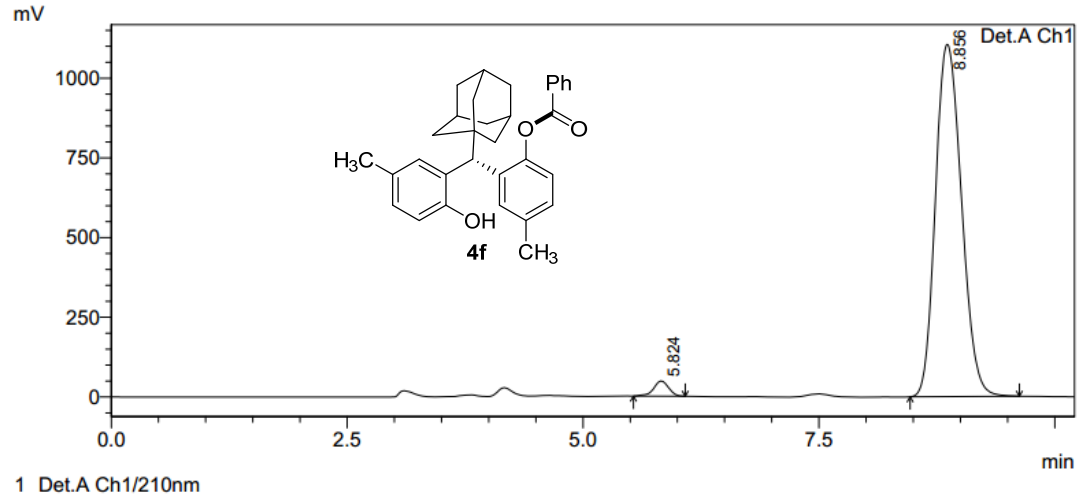


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.823	10757640	886028	51.220	61.707
2	8.871	10245135	549834	48.780	38.293
Total		21002776	1435863	100.000	100.000

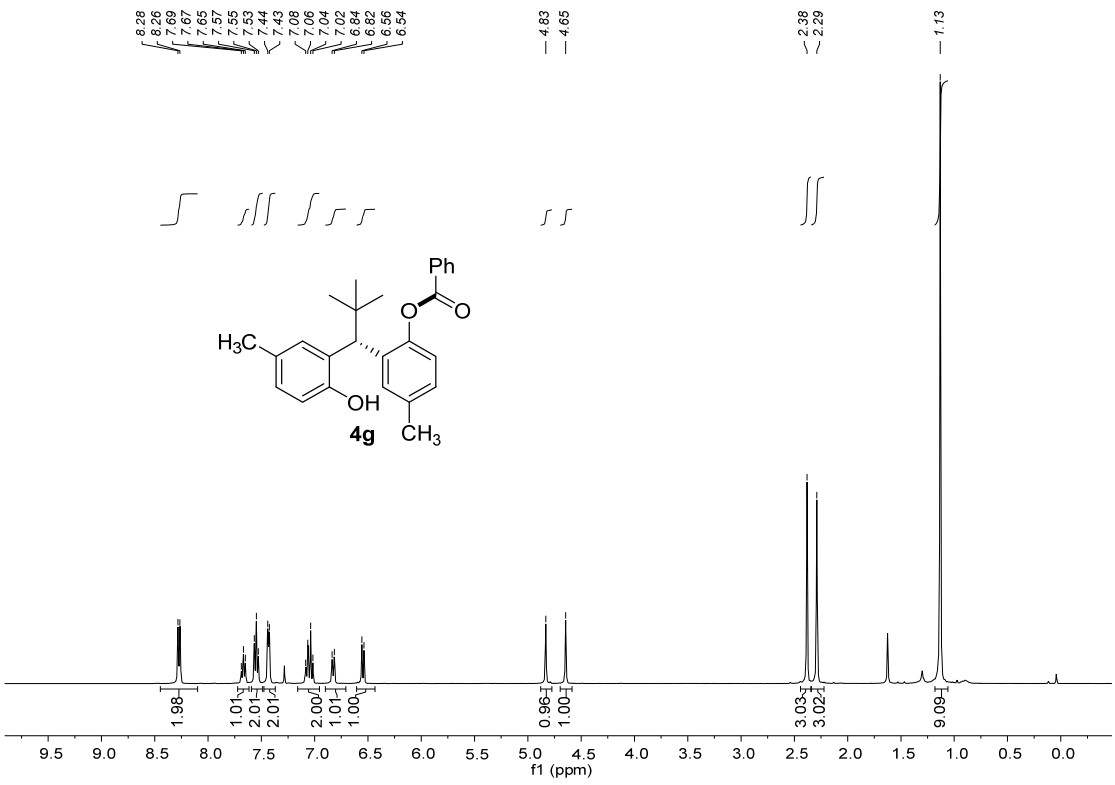


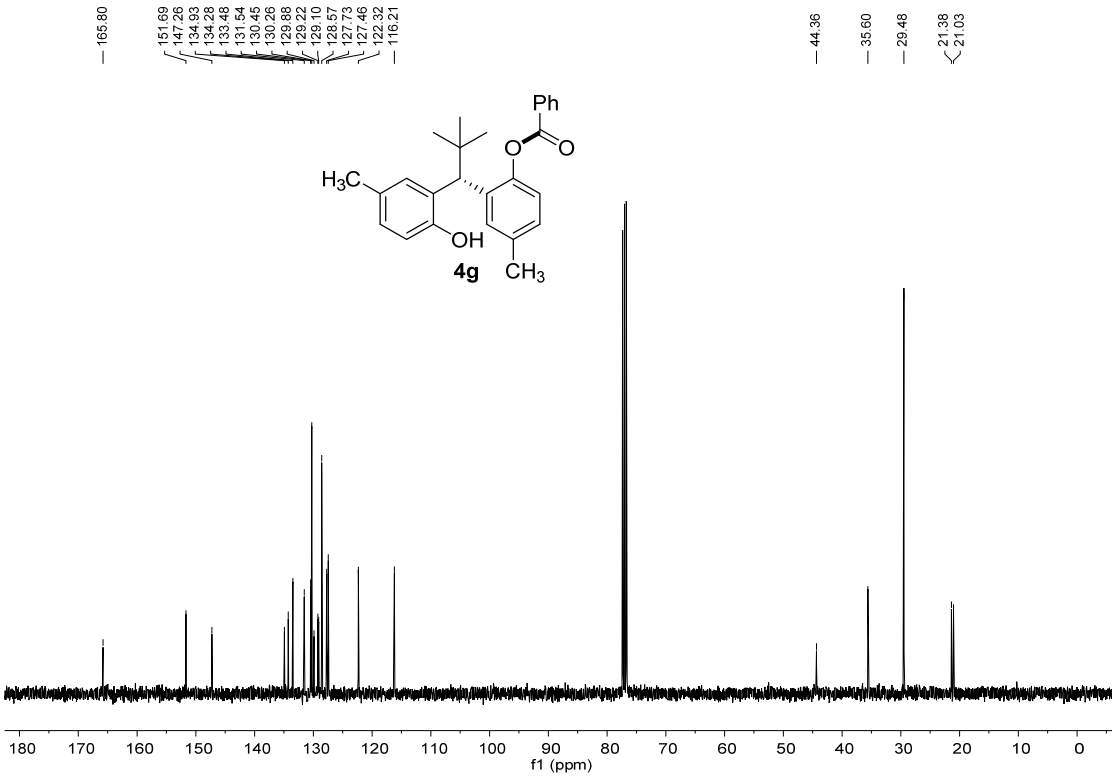
1 Det.A Ch1/210nm

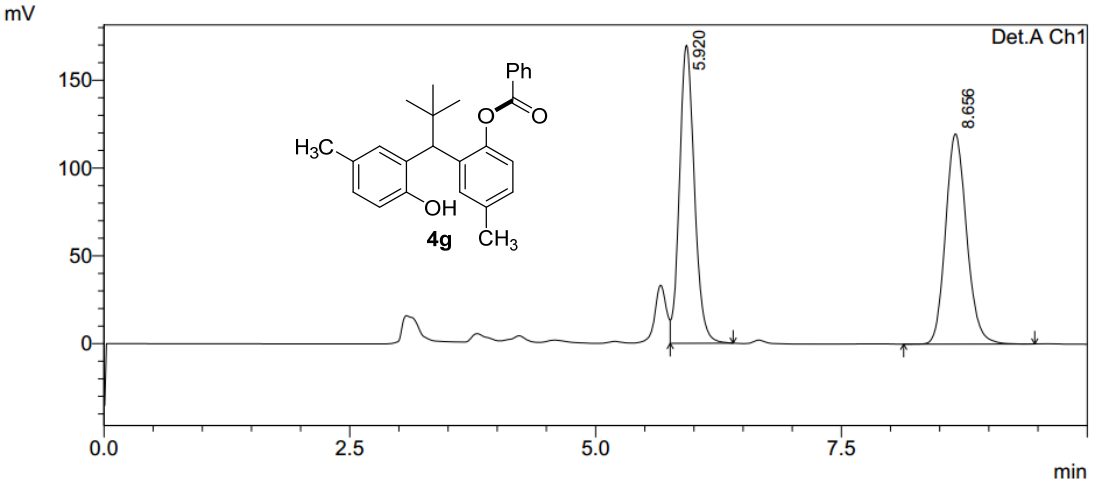
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.824	528602	47631	2.426	4.132
2	8.856	21263450	1105188	97.574	95.868
Total		21792052	1152819	100.000	100.000


8.28
8.26
7.69
7.67
7.65
7.57
7.55
7.53
7.44
7.43
7.08
7.06
7.04
7.02
6.84
6.82
6.56
6.54
4.83
4.65
2.38
2.29
1.13
Ph
O
O
H3C
OH
4g
CH3
1.98
1.01
2.01
2.01
2.00
1.01
1.00
0.96
1.00
3.03
3.02
9.09
f1 (ppm)


165.80
151.69
147.26
134.93
134.28
133.48
131.54
130.45
130.26
129.88
129.22
129.10
128.57
127.73
127.46
122.32
116.21
44.36
35.60
29.48
21.38
21.03
Ph
O
O
H3C
OH
4g
CH3
f1 (ppm)

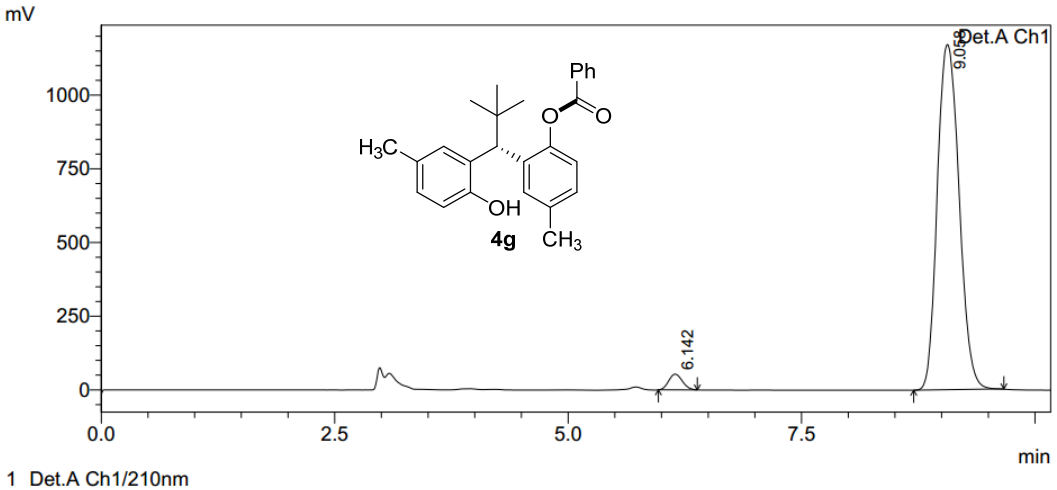


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.920	1793339	169855	50.104	58.648
2	8.656	1785898	119761	49.896	41.352
Total		3579237	289616	100.000	100.000

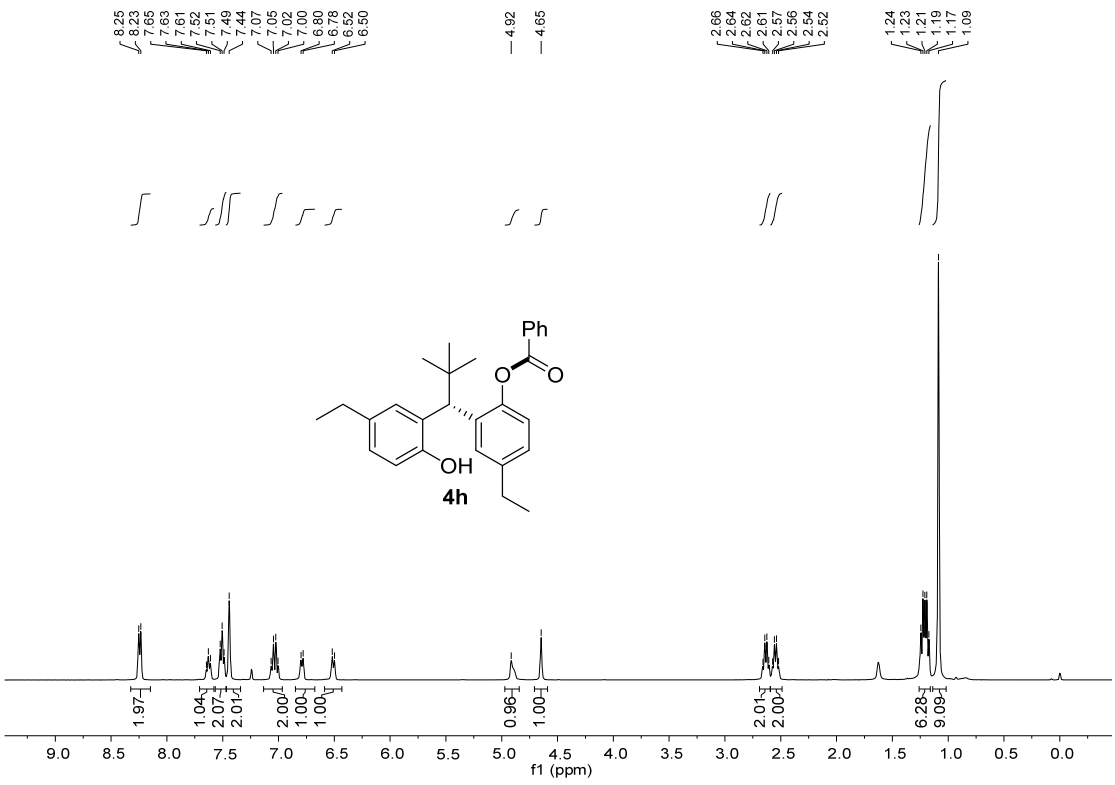


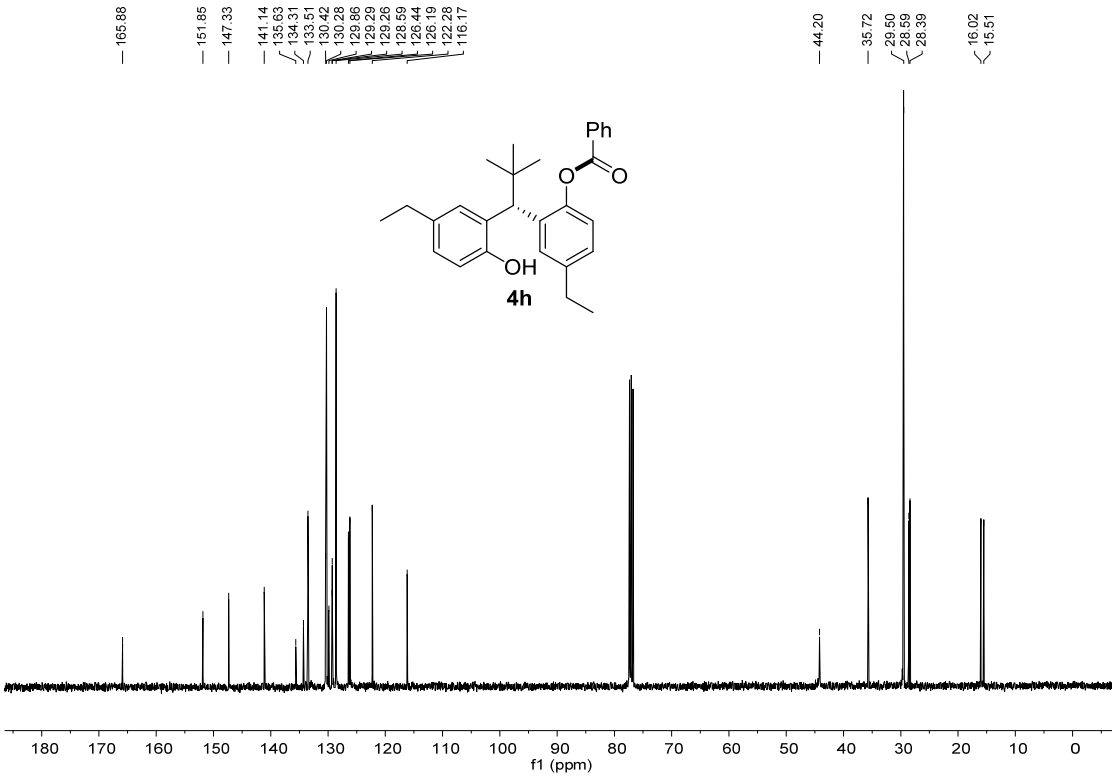
1 Det.A Ch1/210nm

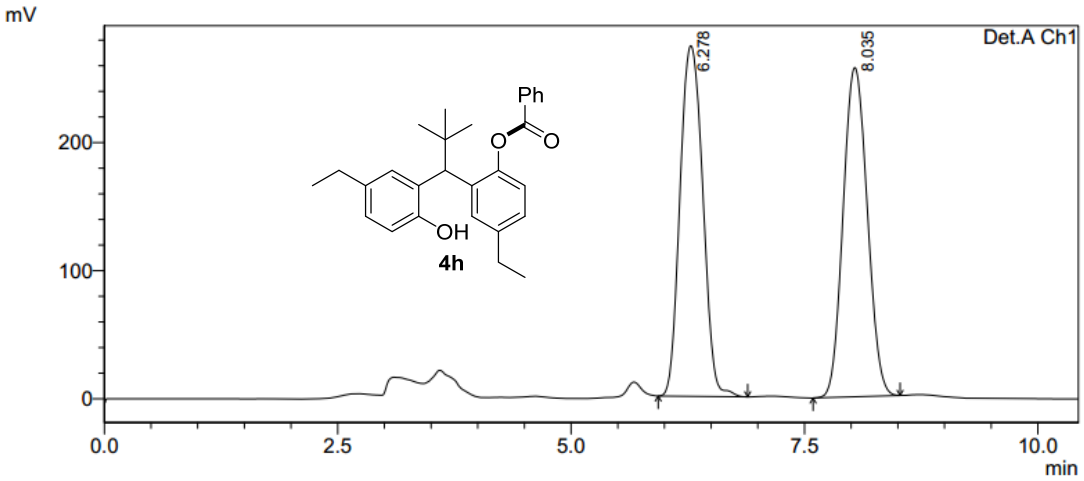
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.142	540889	53224	2.763	4.348
2	9.058	19036167	1171007	97.237	95.652
Total		19577057	1224230	100.000	100.000


8.25
8.23
7.65
7.63
7.61
7.52
7.51
7.49
7.44
7.07
7.05
7.02
7.00
6.80
6.78
6.52
6.50
4.92
4.65
2.66
2.64
2.62
2.61
2.57
2.56
2.54
2.52
1.24
1.23
1.21
1.19
1.17
1.09
Ph
O
O
OH
4h
1.97
1.04
2.07
2.01
2.00
1.00
1.00
0.96
1.00
2.01
2.00
6.28
9.09
f1 (ppm)


165.88
151.85
147.33
141.14
135.63
134.31
133.51
130.42
130.28
129.86
129.29
129.26
128.59
126.44
126.19
122.28
116.17
44.20
35.72
29.50
28.59
28.39
16.02
15.51
Ph
O
O
OH
4h
f1 (ppm)

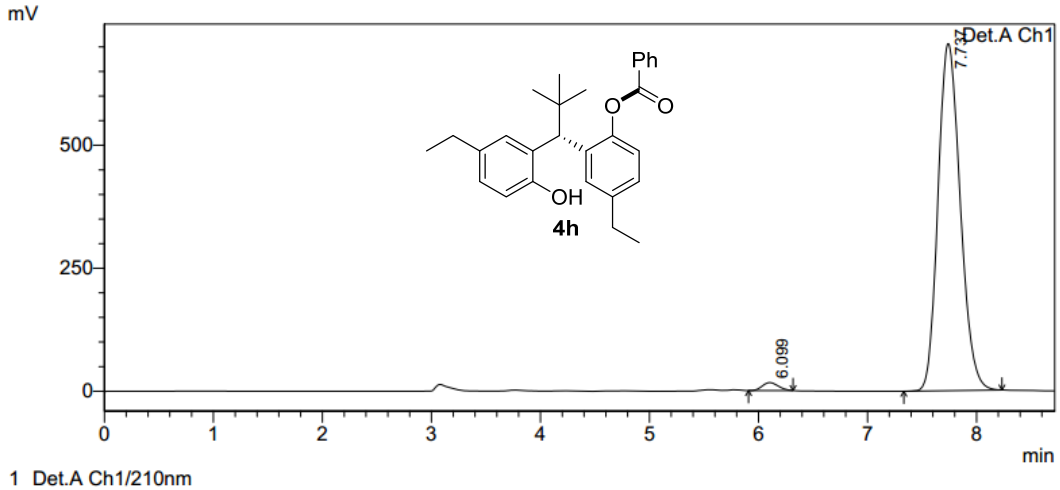


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.278	4653240	273825	50.129	51.573
2	8.035	4629334	257116	49.871	48.427
Total		9282574	530941	100.000	100.000

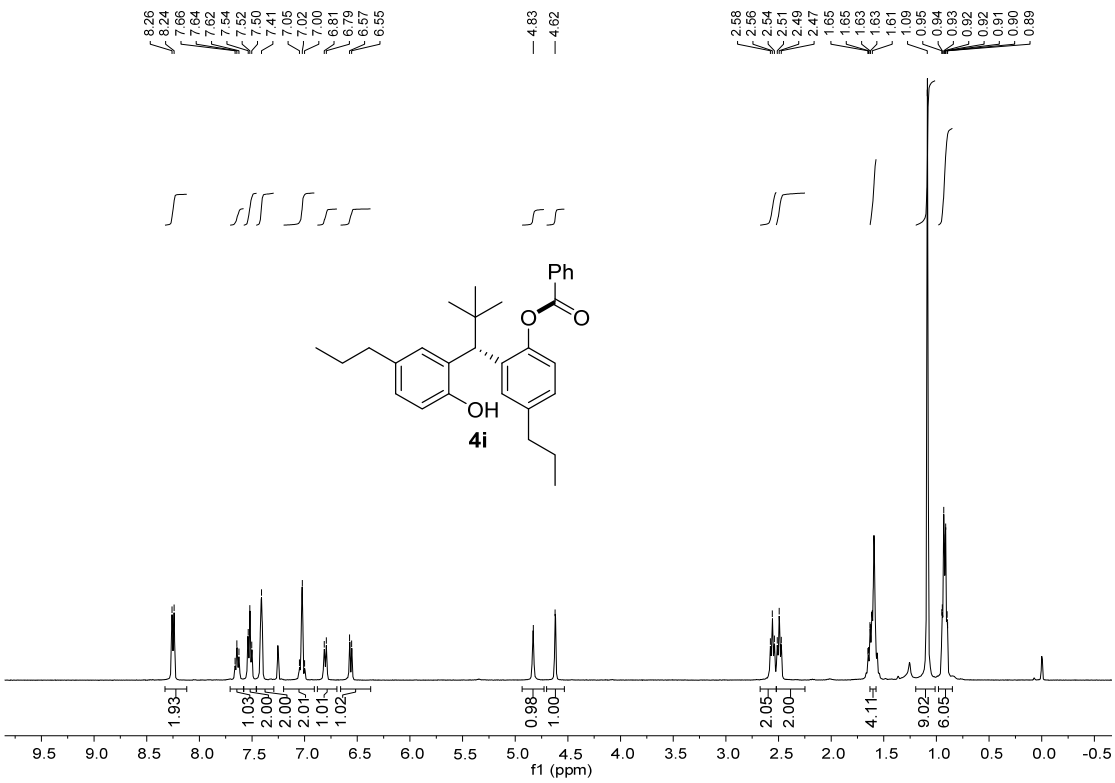


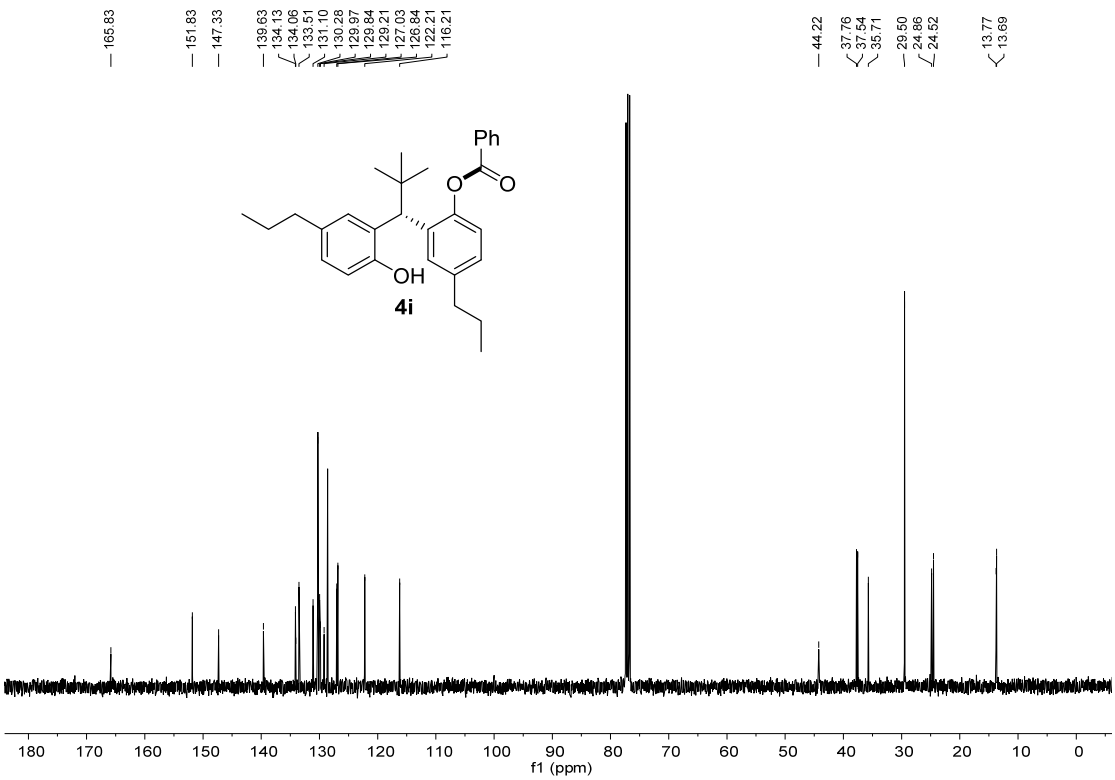
1 Det.A Ch1/210nm

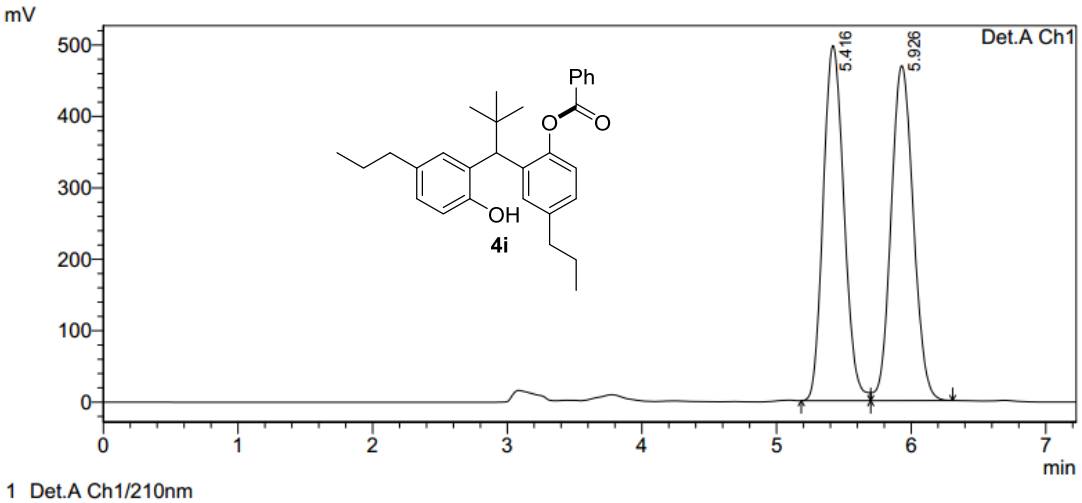
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.099	166837	16326	1.639	2.261
2	7.737	10014858	705855	98.361	97.739
Total		10181694	722181	100.000	100.000


8.26
8.24
7.66
7.64
7.62
7.54
7.52
7.50
7.41
7.05
7.02
7.00
6.81
6.79
6.57
6.55
4.83
4.62
2.58
2.56
2.54
2.51
2.49
2.47
1.65
1.65
1.63
1.63
1.61
1.09
0.95
0.94
0.93
0.92
0.92
0.91
0.90
0.89
Ph
O
O
OH
4i
1.93
1.03
2.00
2.00
2.01
1.01
1.02
0.98
1.00
2.05
2.00
4.11
9.02
6.05
f1 (ppm)


165.83
151.83
147.33
139.63
134.13
134.06
133.51
131.10
130.28
129.97
129.84
129.21
127.03
126.84
122.21
116.21
44.22
37.76
37.54
35.71
29.50
24.86
24.52
13.77
13.69
Ph
O
O
OH
4i
f1 (ppm)

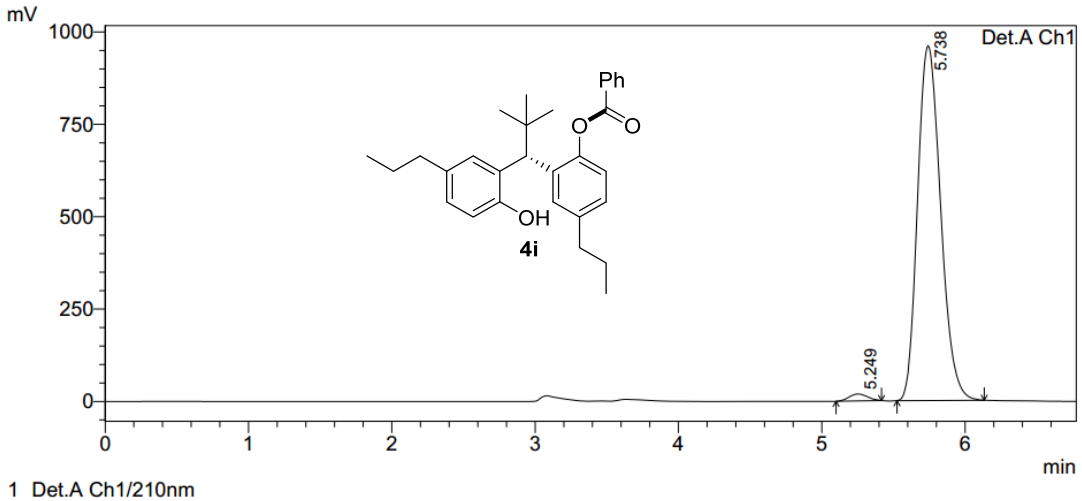


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.416	5338327	497196	49.781	51.472
2	5.926	5385228	468756	50.219	48.528
Total		10723555	965952	100.000	100.000

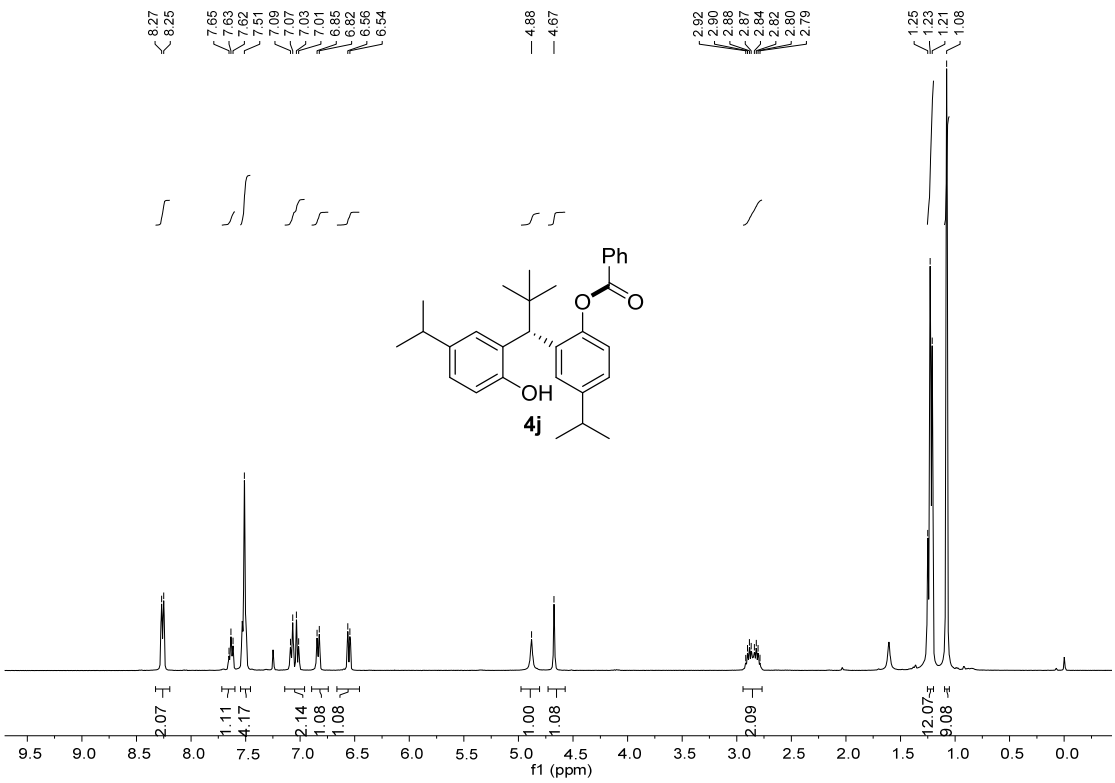


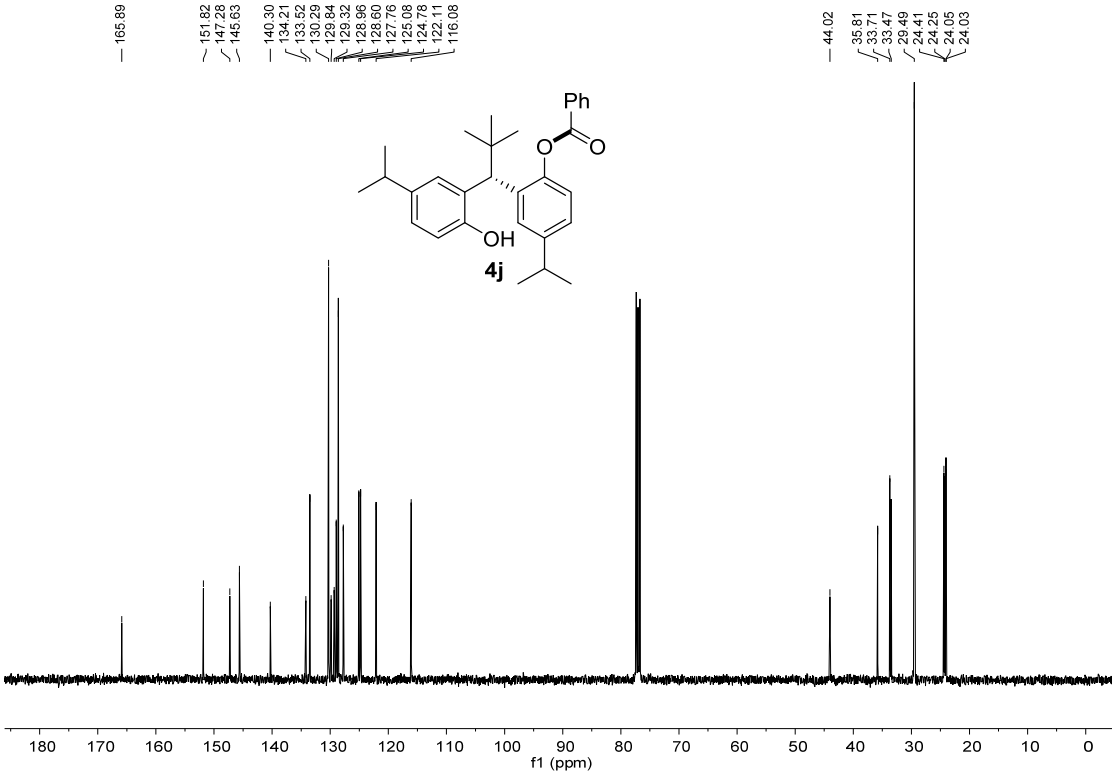
1 Det.A Ch1/210nm

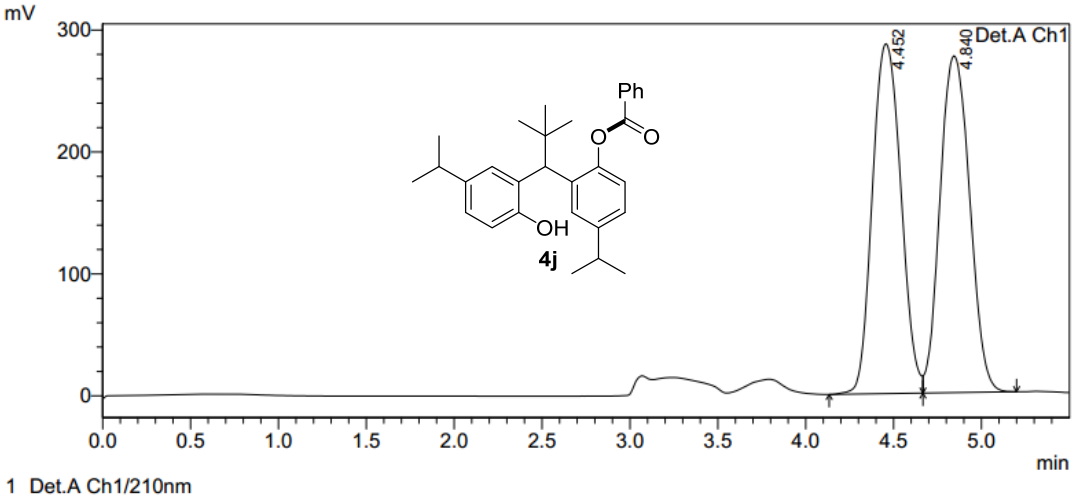
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.249	168082	18936	1.540	1.932
2	5.738	10748031	961052	98.460	98.068
Total		10916114	979987	100.000	100.000


8.27
8.25
7.65
7.63
7.62
7.51
7.09
7.07
7.03
7.01
6.85
6.82
6.56
6.54
4.88
4.67
2.92
2.90
2.88
2.87
2.84
2.82
2.80
2.79
1.25
1.23
1.21
1.08
Ph
O
O
OH
4j
2.07
1.11
4.17
2.14
1.08
1.08
1.00
1.08
2.09
12.07
9.08
f1 (ppm)


165.89
151.82
147.28
145.63
140.30
134.21
133.52
130.29
129.84
129.32
128.96
128.60
127.76
125.08
124.78
122.11
116.08
44.02
35.81
33.71
33.47
29.49
24.41
24.25
24.05
24.03
Ph
O
O
OH
4j
f1 (ppm)

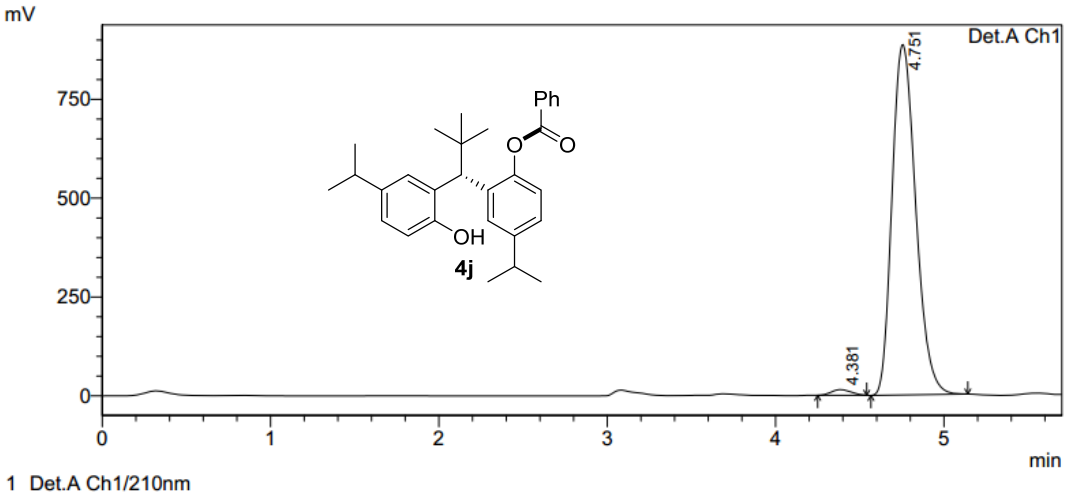


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.452	3251076	287020	50.039	50.958
2	4.840	3246071	276228	49.961	49.042
Total		6497147	563248	100.000	100.000

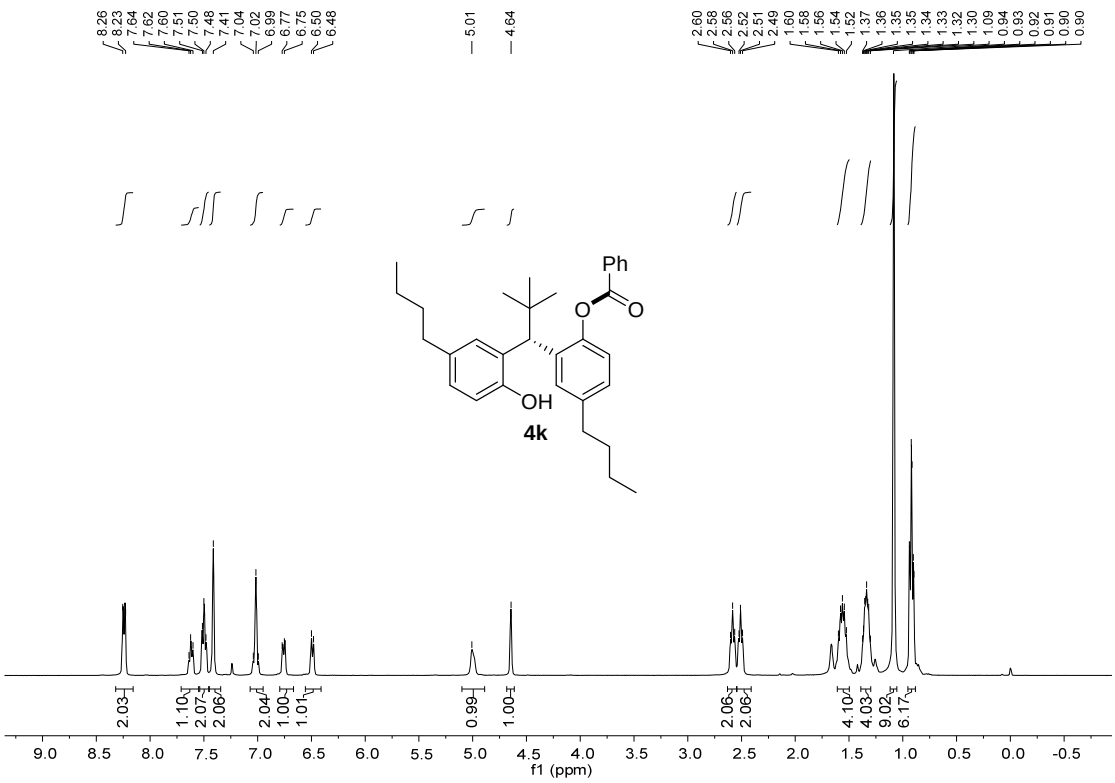


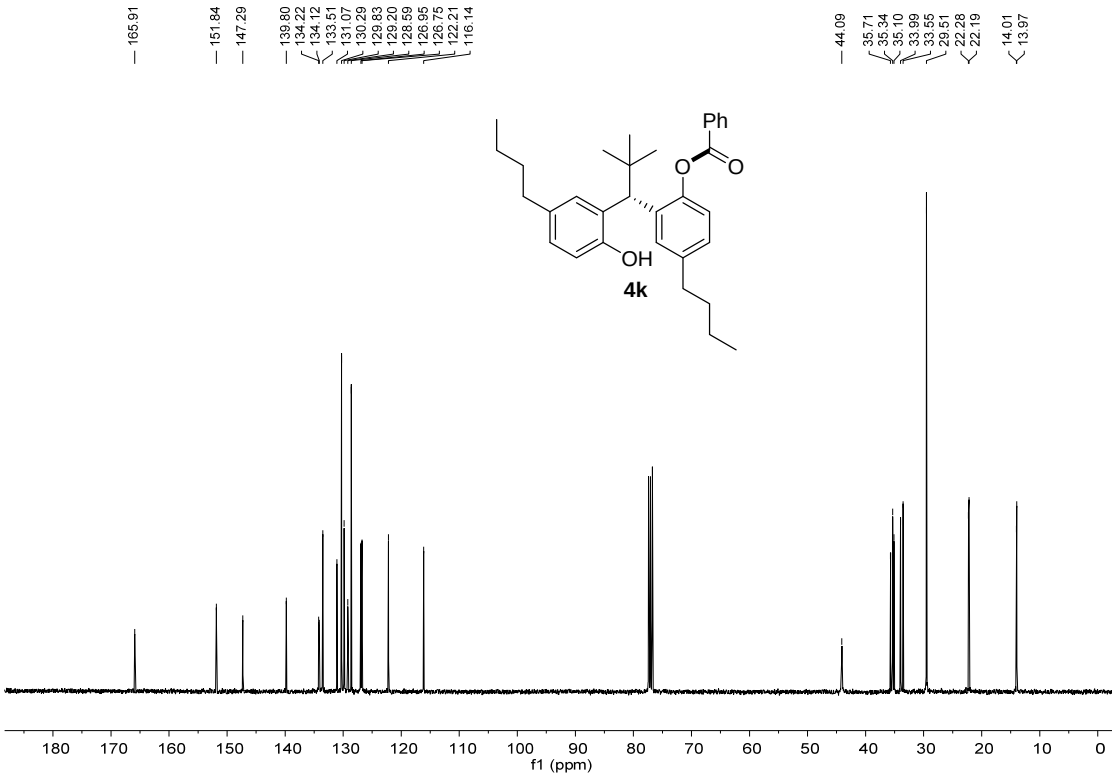
1 Det.A Ch1/210nm

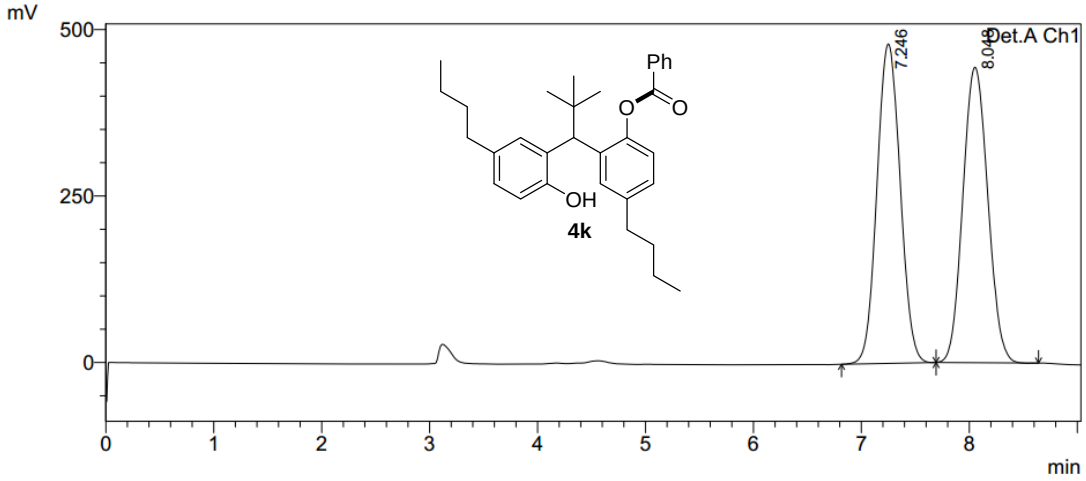
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.381	115784	14334	1.319	1.592
2	4.751	8665593	886228	98.681	98.408
Total		8781378	900562	100.000	100.000


8.26
8.23
7.64
7.62
7.60
7.51
7.50
7.48
7.41
7.04
7.02
6.99
6.77
6.75
6.50
6.48
5.01
4.64
2.60
2.58
2.56
2.52
2.51
2.49
1.60
1.58
1.56
1.54
1.52
1.37
1.36
1.35
1.35
1.34
1.33
1.32
1.30
1.09
0.94
0.93
0.92
0.91
0.90
0.90
Ph
O
O
OH
4k
2.03
1.10
2.07
2.06
2.04
1.00
1.01
0.99
1.00
2.06
2.08
4.10
4.03
9.02
6.17
f1 (ppm)


165.91
151.84
147.29
139.80
134.22
134.12
133.51
131.07
130.29
129.83
129.20
128.59
126.95
126.75
122.21
116.14
44.09
35.71
35.34
35.10
33.99
33.55
29.51
22.28
22.19
14.01
13.97
Ph
O
O
OH
4k
f1 (ppm)

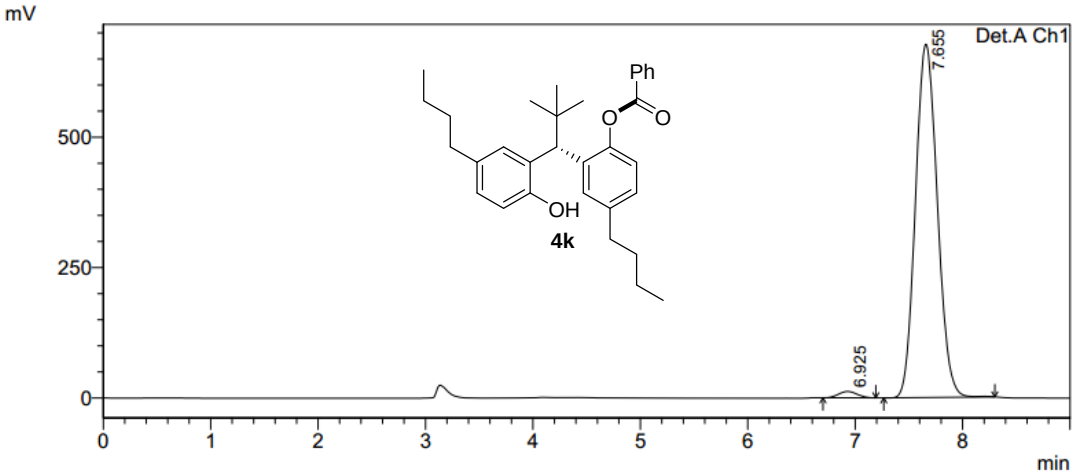


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.246	7174209	479899	50.177	51.954
2	8.048	7123543	443802	49.823	48.046
Total		14297752	923702	100.000	100.000

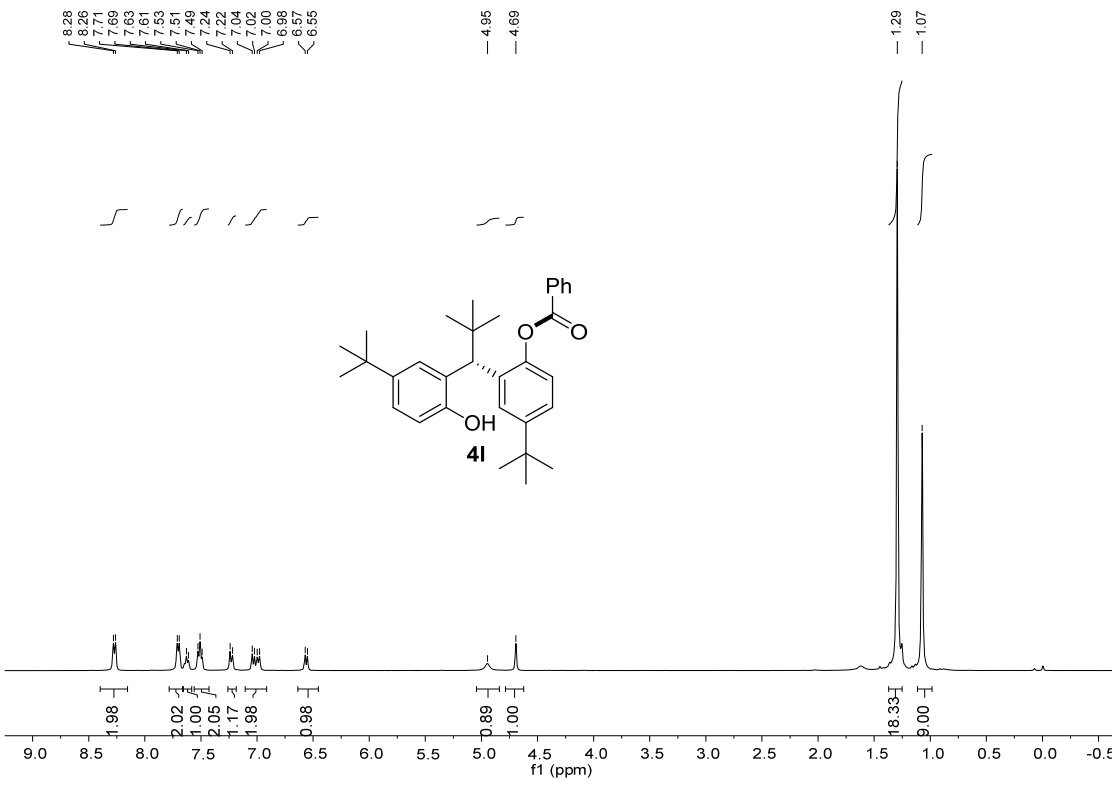


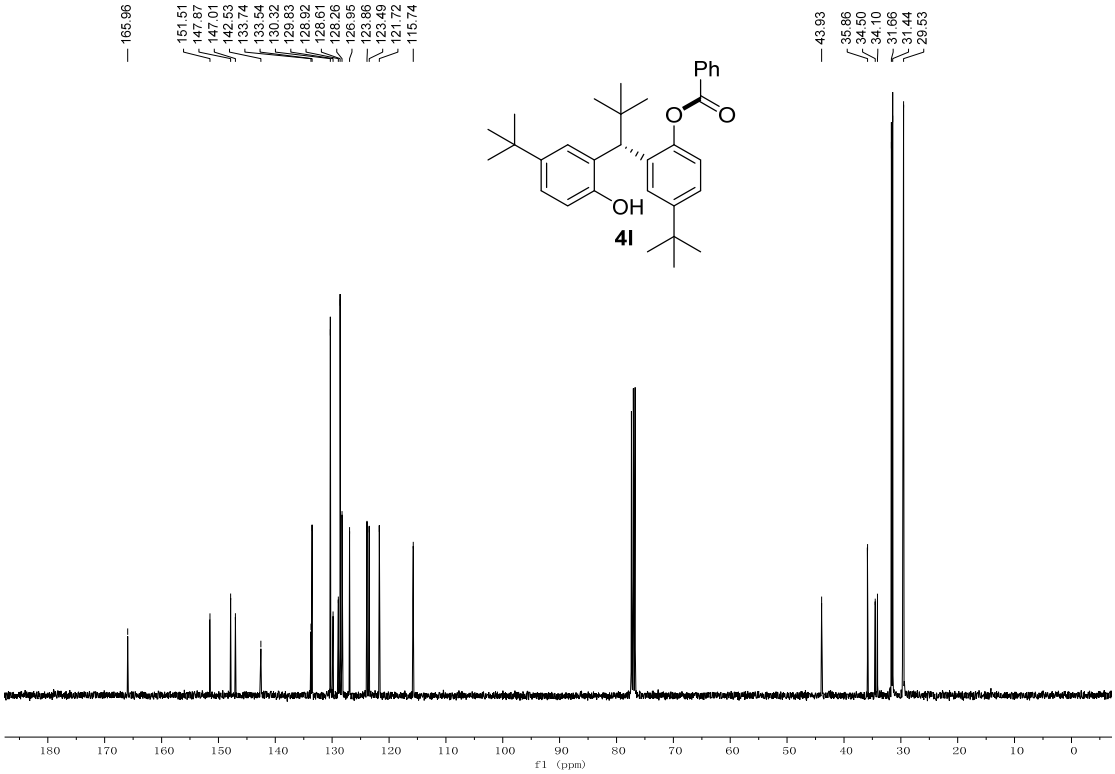
1 Det.A Ch1/210nm

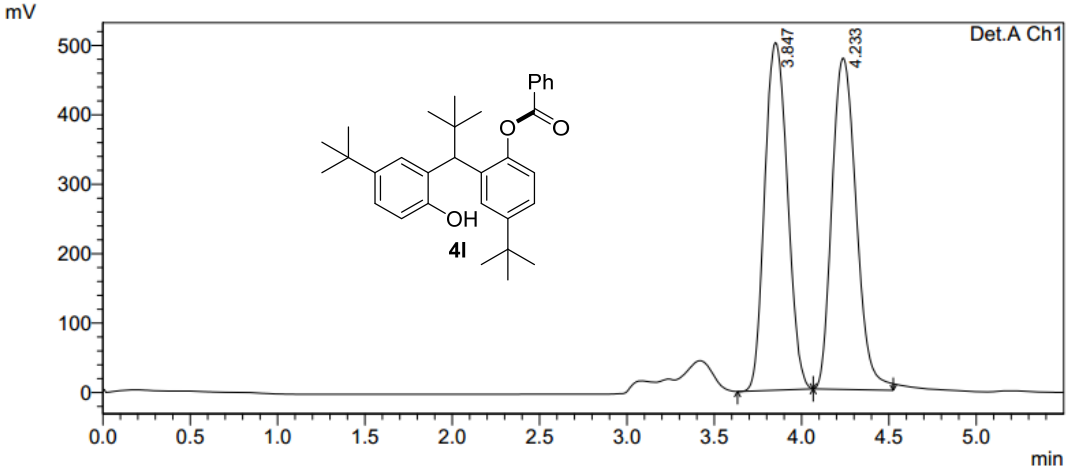
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.925	147085	12213	1.511	1.771
2	7.655	9588991	677442	98.489	98.229
Total		9736076	689655	100.000	100.000


8.28
8.26
7.71
7.69
7.63
7.61
7.53
7.51
7.49
7.24
7.22
7.04
7.02
7.00
6.98
6.57
6.55
4.95
4.69
1.29
1.07
Ph
O
O
OH
4l
1.98
2.02
1.00
2.05
1.17
1.98
0.98
0.89
1.00
18.33
9.00
f1 (ppm)


165.96
151.51
147.87
147.01
142.53
133.74
133.54
130.32
129.83
128.92
128.61
128.26
126.95
123.86
123.49
121.72
115.74
43.93
35.86
34.50
34.10
31.66
31.44
29.53
Ph
O
O
OH
4l
f1 (ppm)

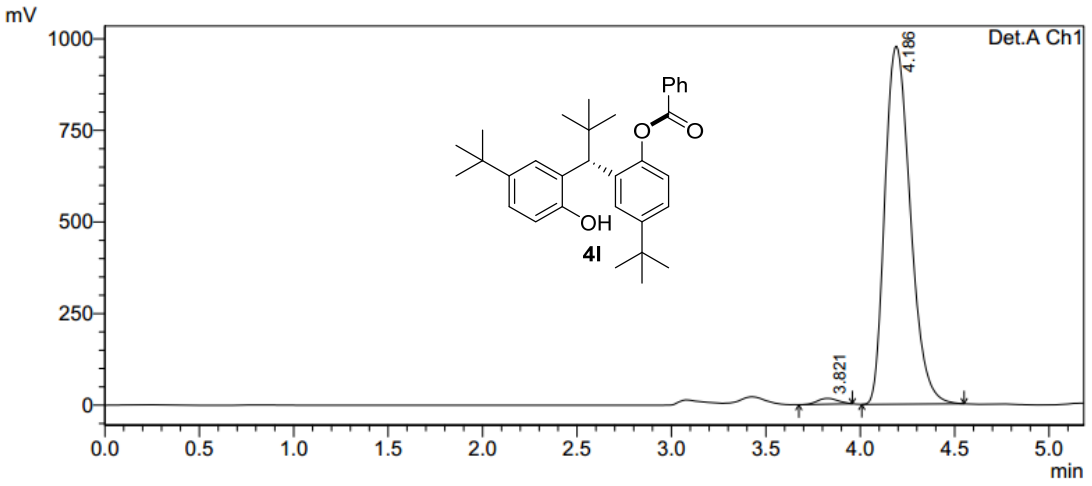


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	3.847	4556882	501155	49.612	51.238
2	4.233	4628128	476932	50.388	48.762
Total		9185010	978087	100.000	100.000

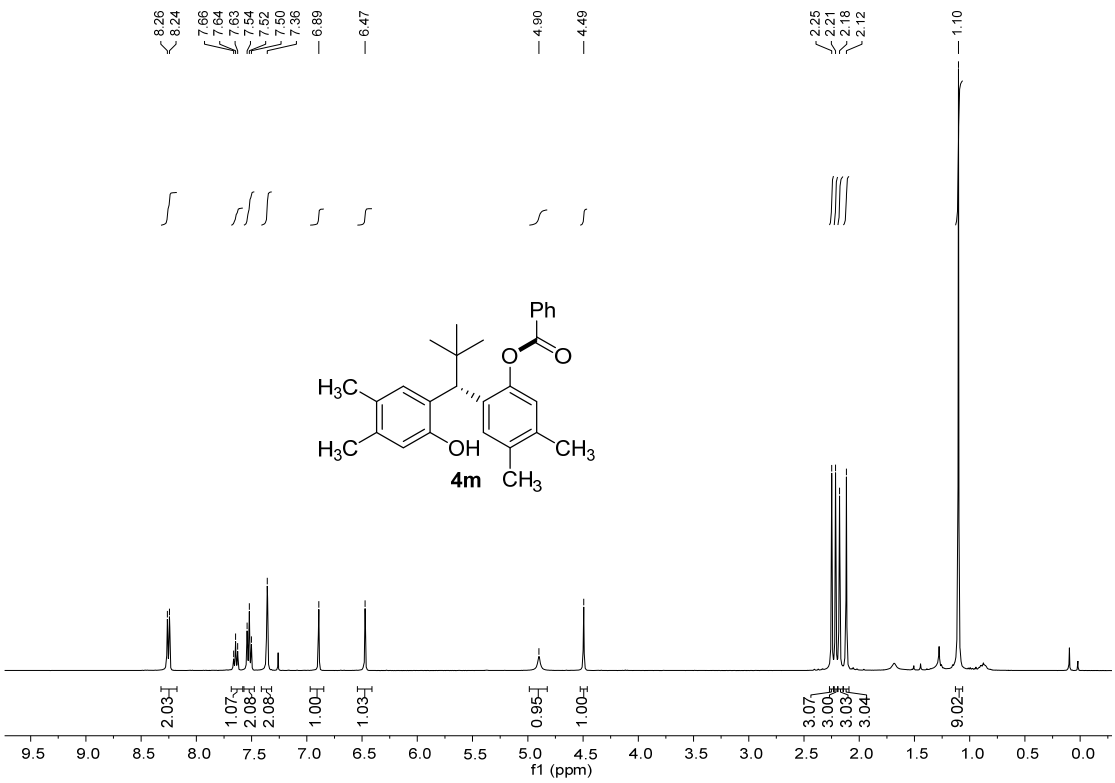


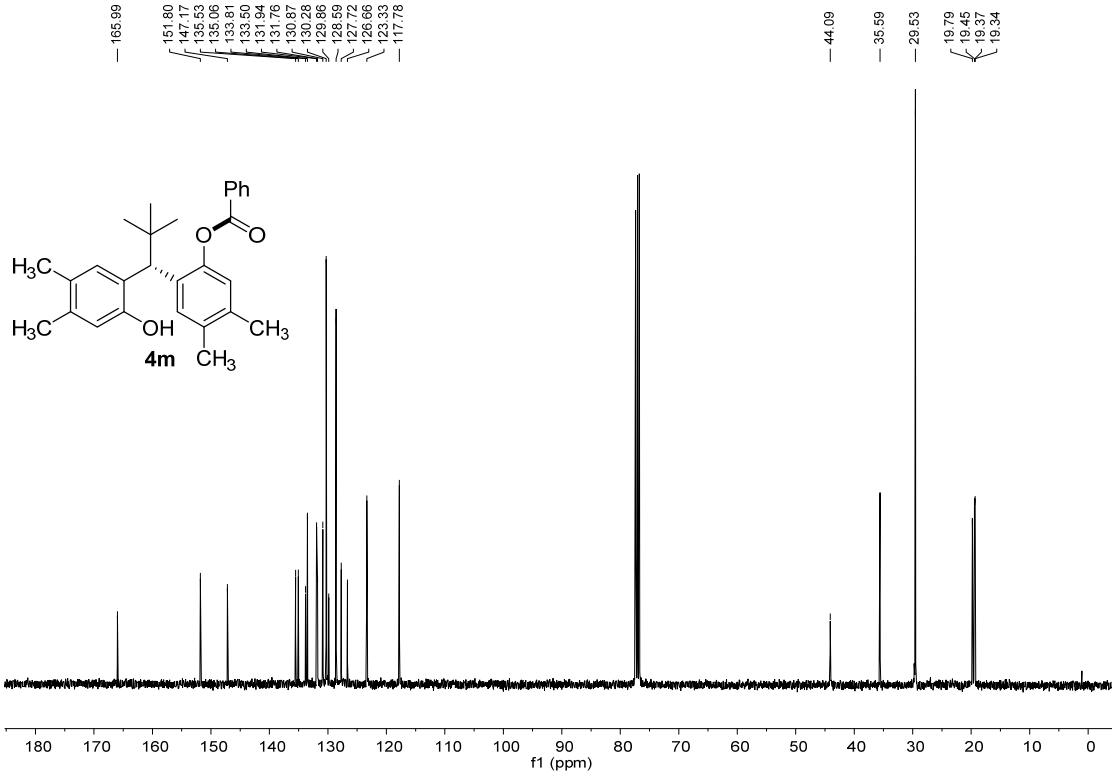
1 Det.A Ch1/210nm

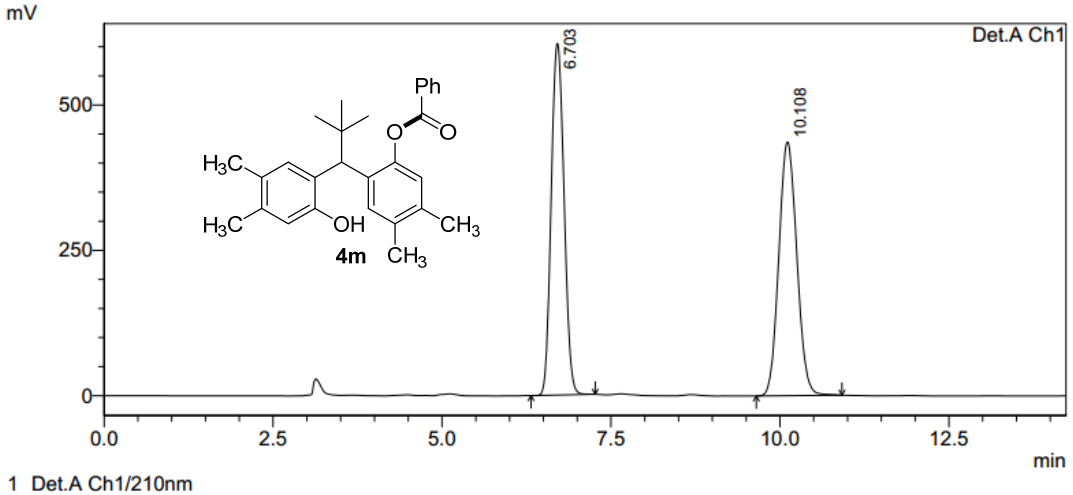
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	3.821	120738	15881	1.300	1.599
2	4.186	9169063	977568	98.700	98.401
Total		9289801	993449	100.000	100.000


8.26
8.24
7.66
7.64
7.63
7.54
7.52
7.50
7.36
6.89
6.47
4.90
4.49
2.25
2.21
2.18
2.12
1.10
Ph
O
O
H3C
H3C
OH
CH3
CH3
4m
2.03
1.07
2.08
2.08
1.00
1.03
0.95
1.00
3.07
3.00
3.03
3.04
9.02
f1 (ppm)


165.99
151.80
147.17
135.53
135.06
133.81
133.50
131.94
131.76
130.87
130.28
129.86
128.59
127.72
126.86
123.33
117.78
44.09
35.59
29.53
19.79
19.45
19.37
19.34
Ph
O
O
H3C
H3C
OH
CH3
CH3
4m
f1 (ppm)

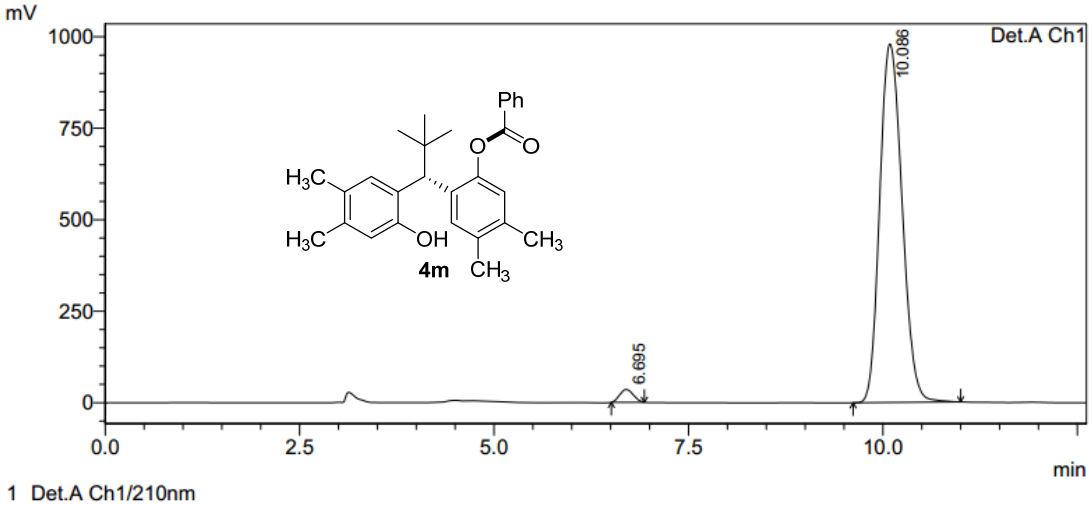


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.703	7978614	604968	49.694	58.098
2	10.108	8076813	436322	50.306	41.902
Total		16055427	1041291	100.000	100.000

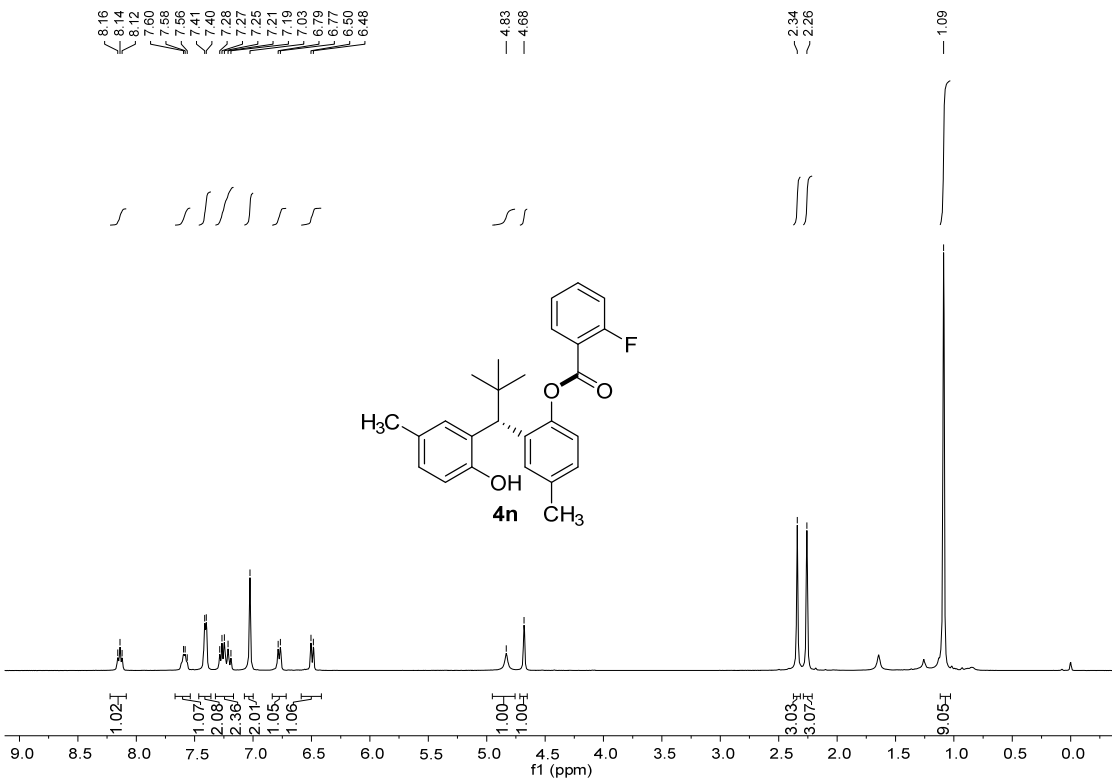


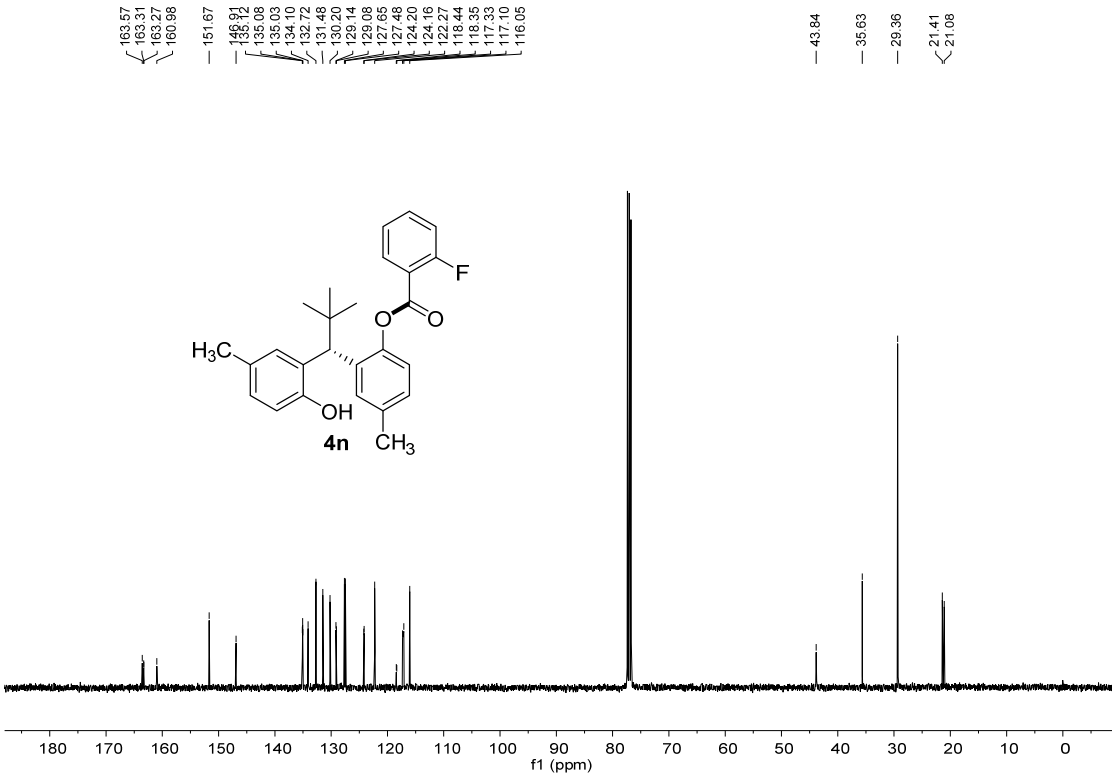
1 Det.A Ch1/210nm

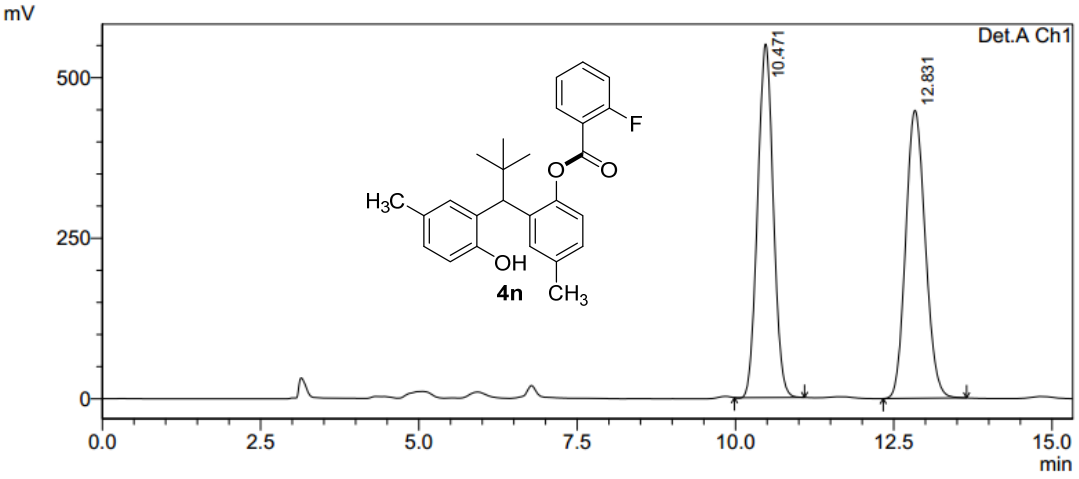
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.695	425053	35022	2.122	3.451
2	10.086	19602580	979964	97.878	96.549
Total		20027633	1014986	100.000	100.000


8.16
8.14
8.12
7.60
7.58
7.56
7.41
7.40
7.28
7.27
7.25
7.21
7.19
7.03
6.79
6.77
6.50
6.48
4.83
4.68
2.34
2.26
1.09
F
O
O
H3C
OH
4n
CH3
1.02
1.07
2.08
2.36
2.01
1.05
1.06
1.00
1.00
3.03
3.07
9.05
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


163.57
163.31
163.27
160.98
151.67
146.91
135.12
135.08
135.03
134.10
132.72
131.48
130.20
129.14
129.08
127.65
127.48
124.20
124.16
122.27
118.44
118.35
117.33
117.10
116.05
43.84
35.63
29.36
21.41
21.08
F
O
O
H3C
OH
4n
CH3
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

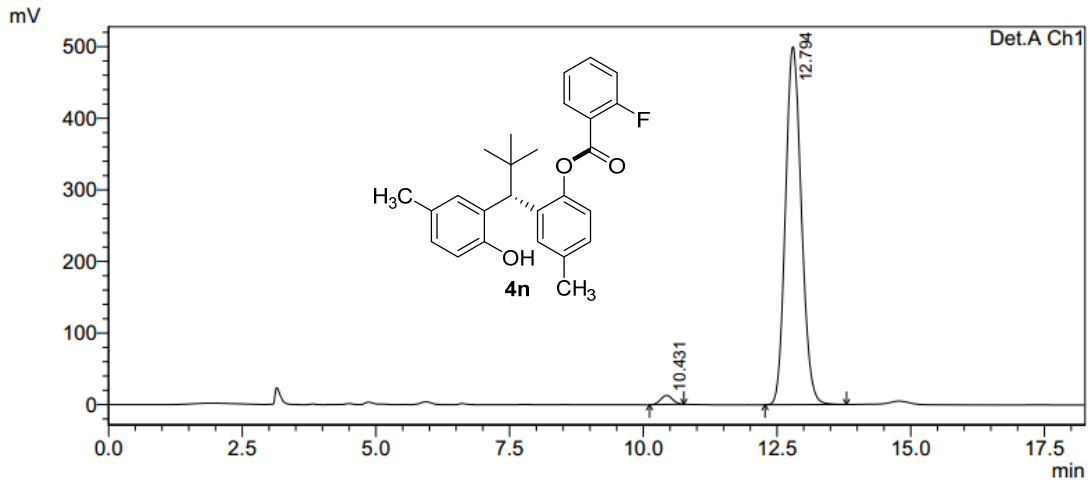


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.471	9497561	550680	49.595	55.105
2	12.831	9652516	448657	50.405	44.895
Total		19150077	999337	100.000	100.000

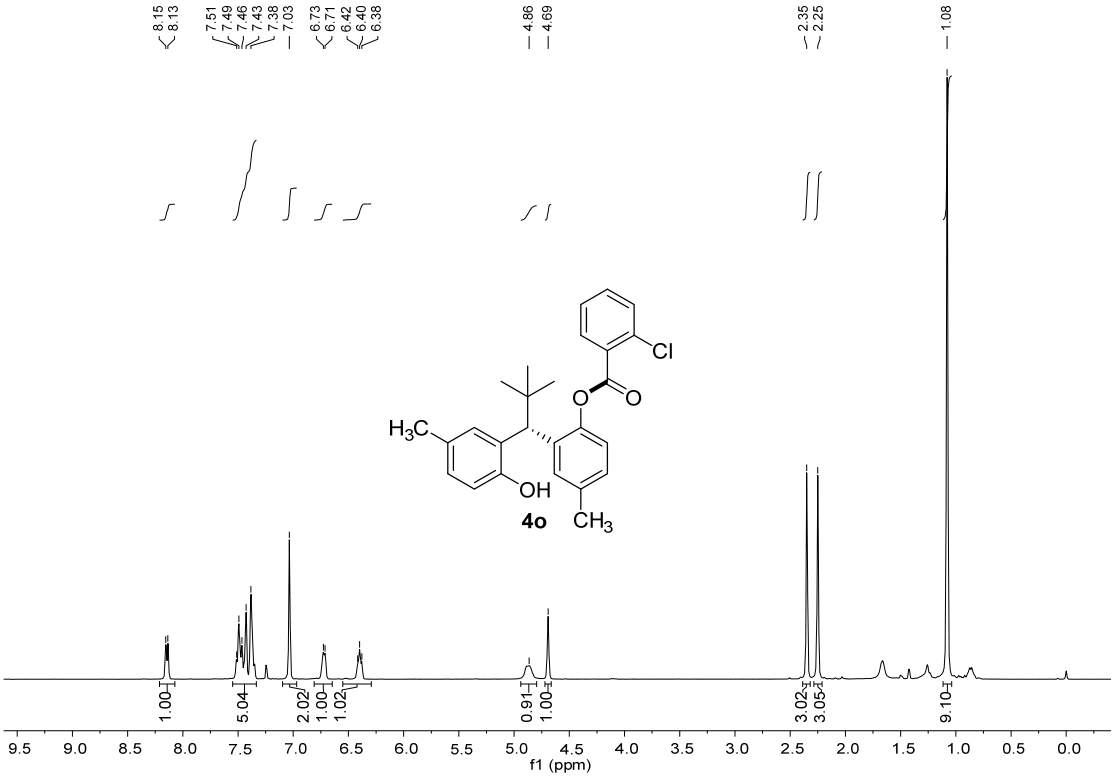


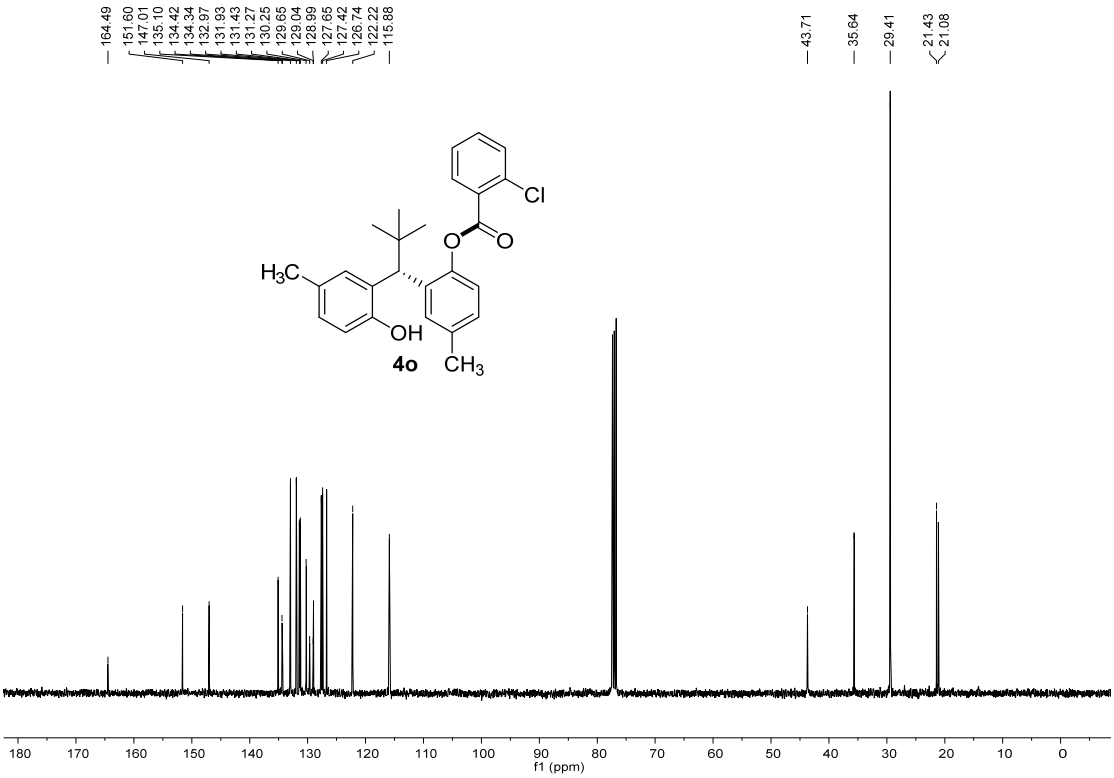
1 Det.A Ch1/210nm

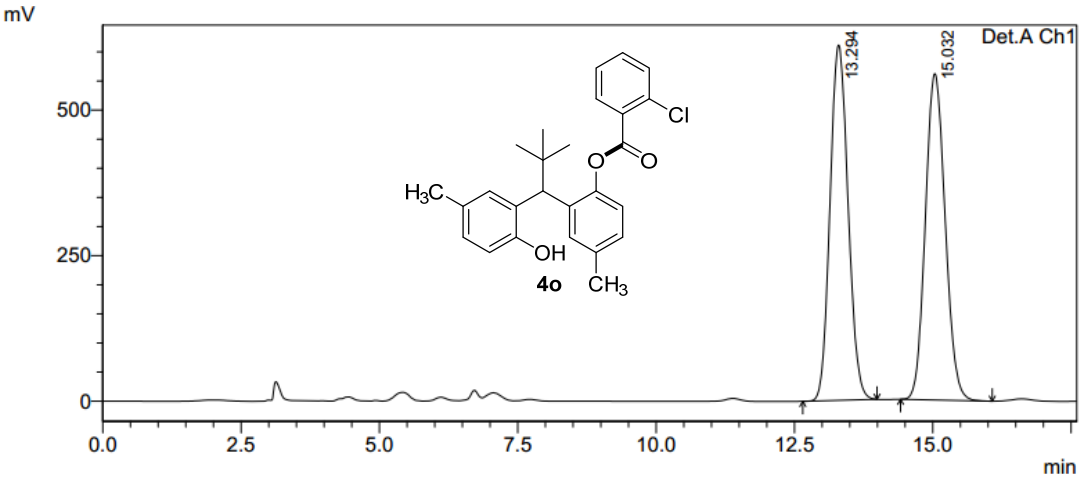
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.431	198083	12719	1.875	2.481
2	12.794	10364442	499983	98.125	97.519
Total		10562526	512702	100.000	100.000


8.15
8.13
7.51
7.49
7.46
7.43
7.38
7.03
6.73
6.71
6.42
6.40
6.38
4.86
4.69
2.35
2.25
1.08
Cl
O
O
H3C
OH
4o
CH3
1.00
5.04
2.02
1.00
1.02
0.91
1.00
3.02
3.05
9.10
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


164.49
151.60
147.01
135.10
134.42
134.34
132.97
131.93
131.43
131.27
130.25
129.65
129.04
128.99
127.65
127.42
126.74
122.22
115.88
43.71
35.64
29.41
21.43
21.08
Cl
O
O
H3C
OH
4o
CH3
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

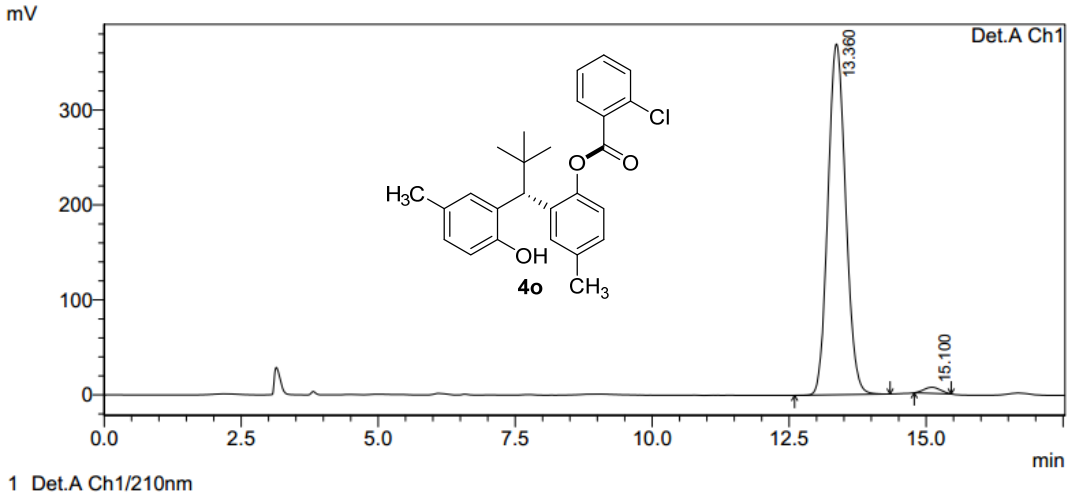


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.294	13864290	610262	49.810	52.133
2	15.032	13970108	560314	50.190	47.867
Total		27834398	1170575	100.000	100.000

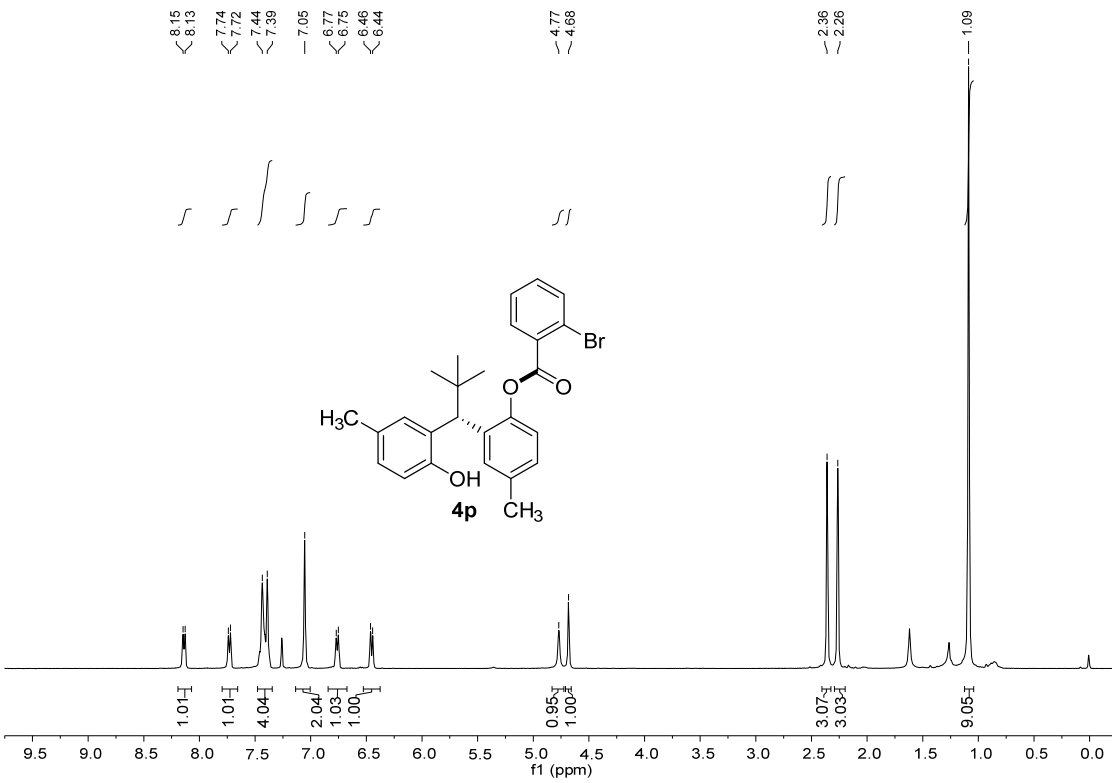


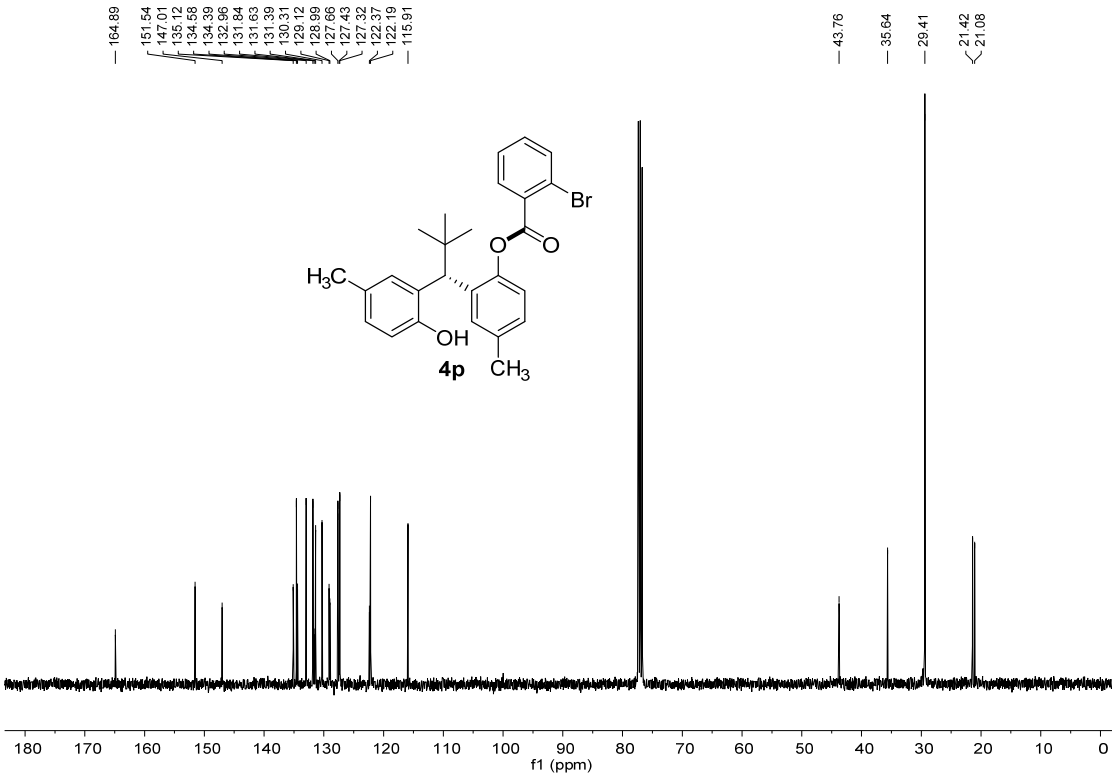
1 Det.A Ch1/210nm

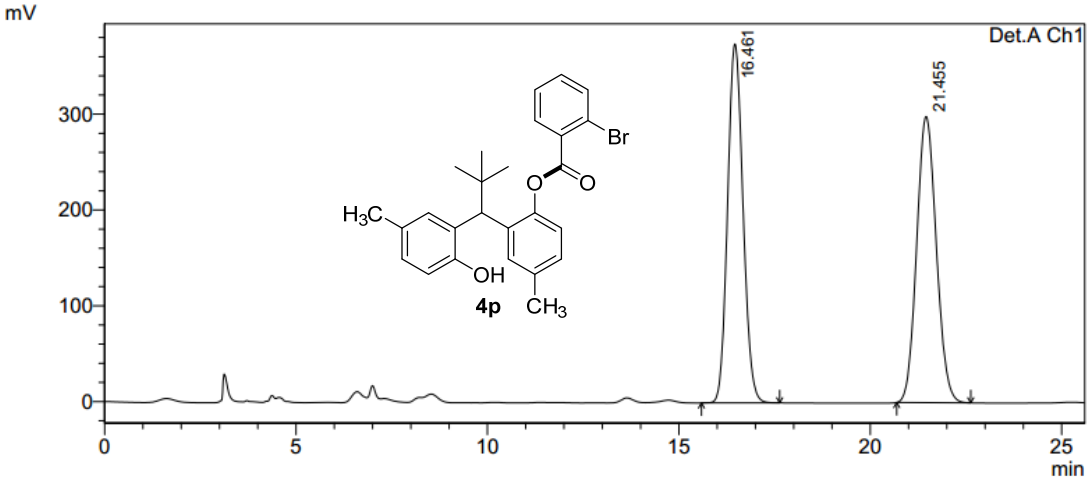
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.360	8299577	369410	98.405	98.299
2	15.100	134561	6394	1.595	1.701
Total		8434138	375804	100.000	100.000


8.15
8.13
7.74
7.72
7.44
7.39
7.05
6.77
6.75
6.46
6.44
4.77
4.68
2.36
2.26
1.09
Br
O
O
H3C
OH
4p
CH3
1.01
1.01
4.04
2.04
1.03
1.00
0.95
1.00
3.07
3.03
9.05
f1 (ppm)


164.89
151.54
147.01
135.12
134.58
134.39
132.96
131.84
131.63
131.39
130.31
129.12
128.99
127.66
127.43
127.32
122.37
122.19
115.91
43.76
35.64
29.41
21.42
21.08
Br
O
O
H3C
OH
4p
CH3
f1 (ppm)

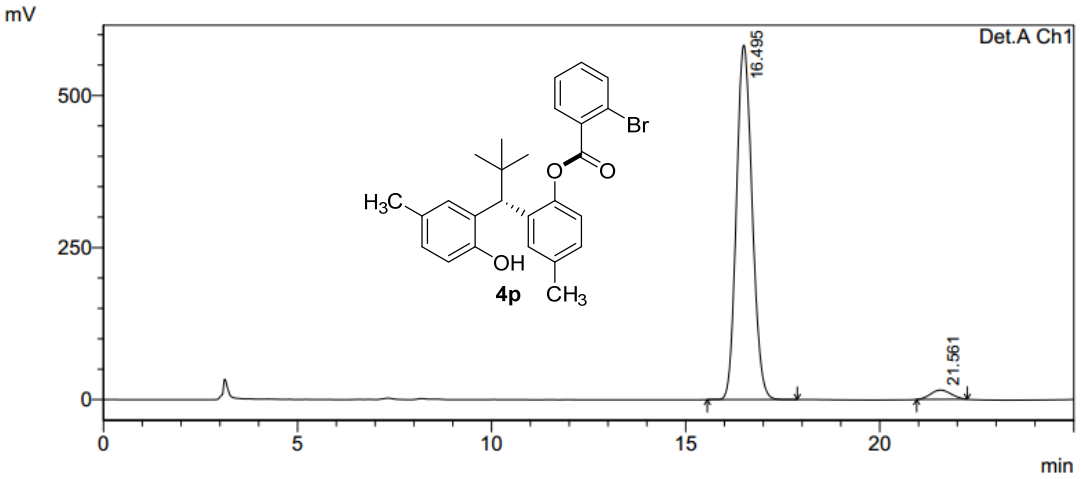


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	16.461	10495896	374710	49.679	55.651
2	21.455	10631521	298614	50.321	44.349
Total		21127418	673324	100.000	100.000

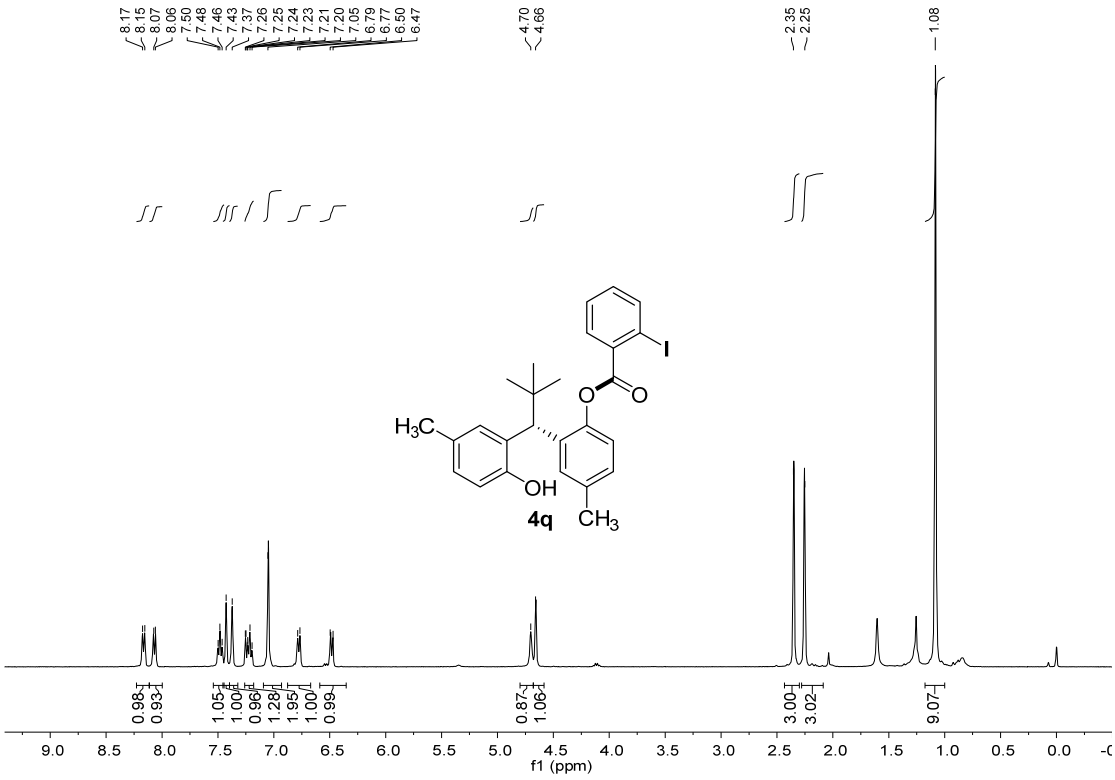


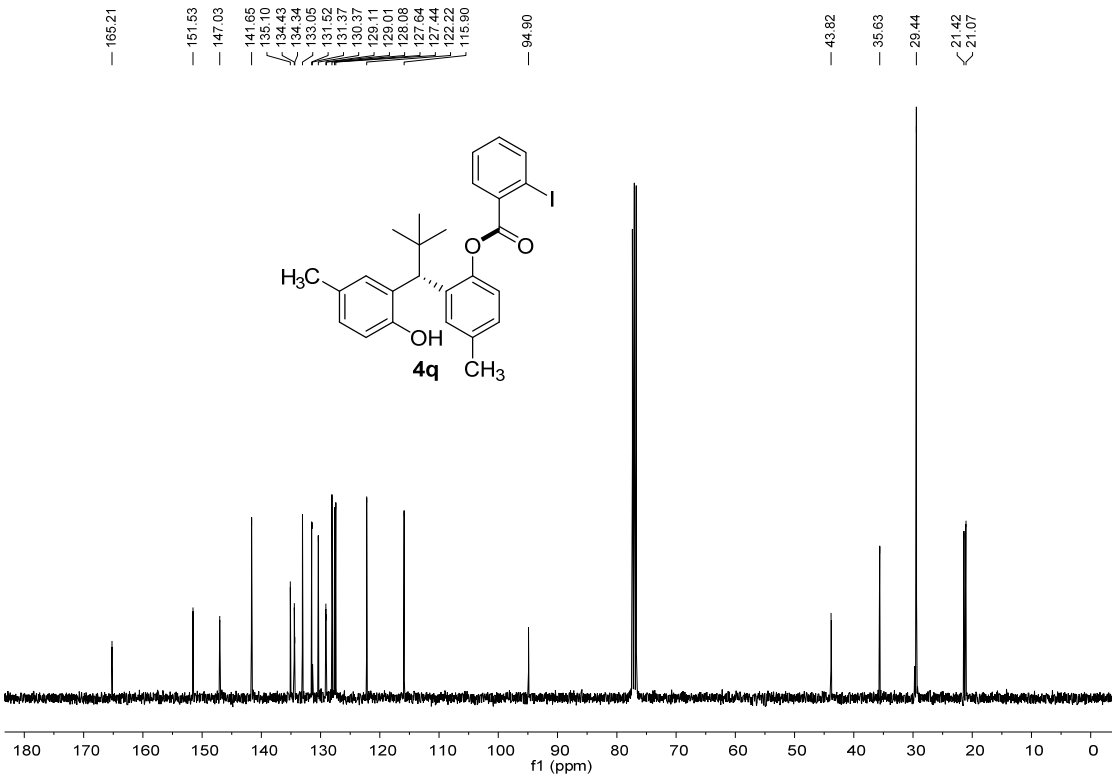
1 Det.A Ch1/210nm

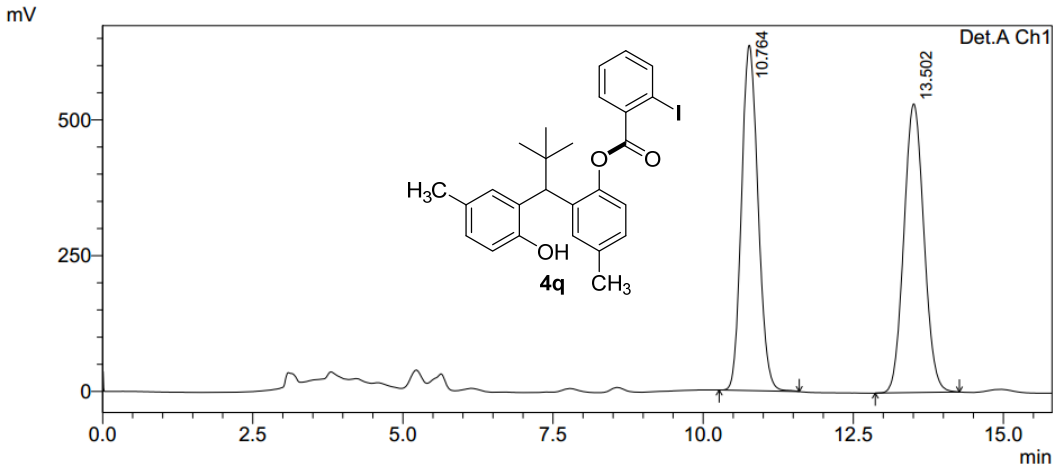
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	16.495	16443652	582930	96.695	97.446
2	21.561	561971	15280	3.305	2.554
Total		17005623	598211	100.000	100.000


8.17
8.15
8.07
8.06
7.50
7.48
7.46
7.43
7.37
7.26
7.25
7.24
7.23
7.21
7.20
7.05
6.79
6.77
6.50
6.47
4.70
4.66
2.35
2.25
1.08
I
O
O
H3C
OH
4q
CH3
0.98
0.93
1.05
1.00
0.96
1.28
1.95
1.00
0.99
0.87
1.06
3.00
3.02
9.07
f1 (ppm)


165.21
151.53
147.03
141.65
135.10
134.43
134.34
133.05
131.52
131.37
130.37
129.11
129.01
128.08
127.64
127.44
122.22
115.90
94.90
43.82
35.63
29.44
21.42
21.07
I
O
O
H3C
OH
4q
CH3
f1 (ppm)

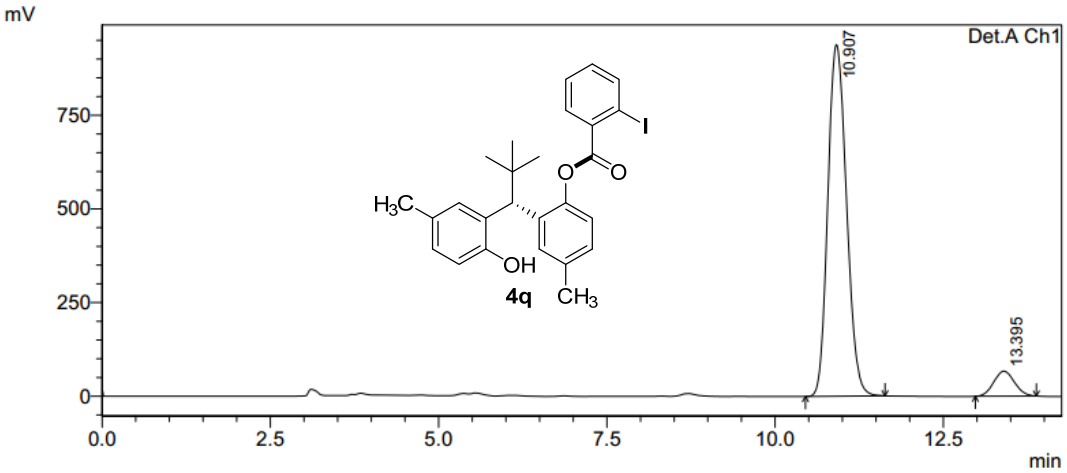


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.764	12198508	636053	49.703	54.474
2	13.502	12344356	531564	50.297	45.526
Total		24542864	1167617	100.000	100.000

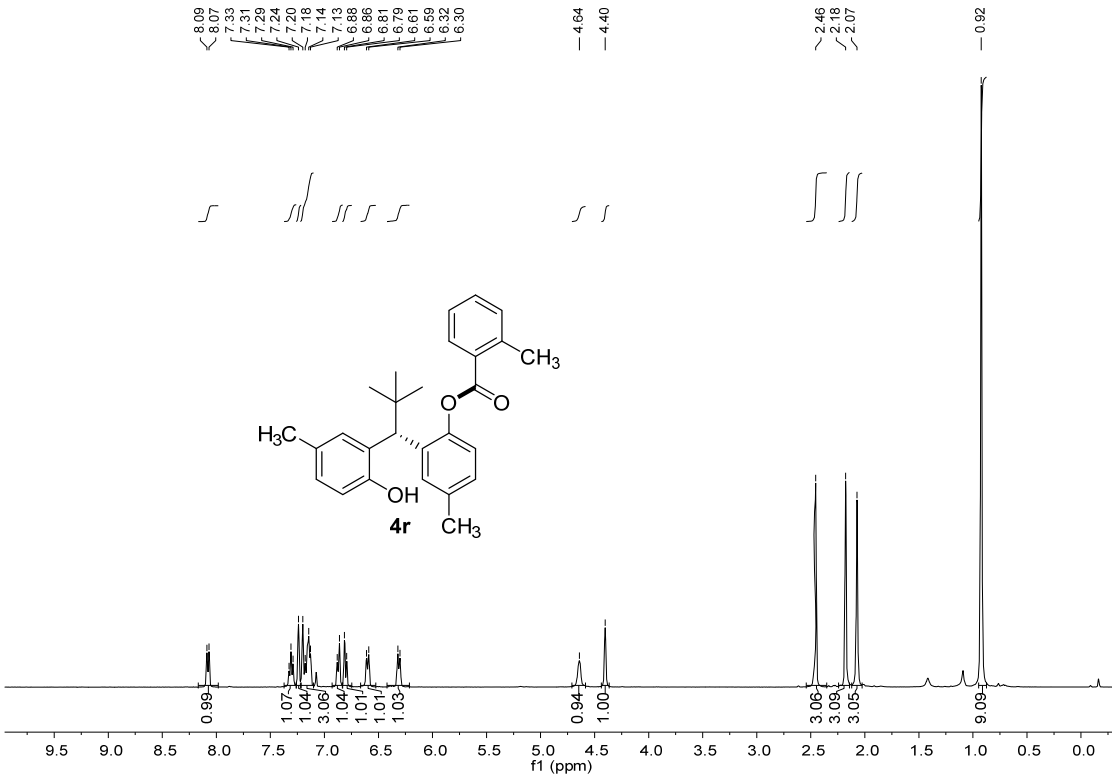


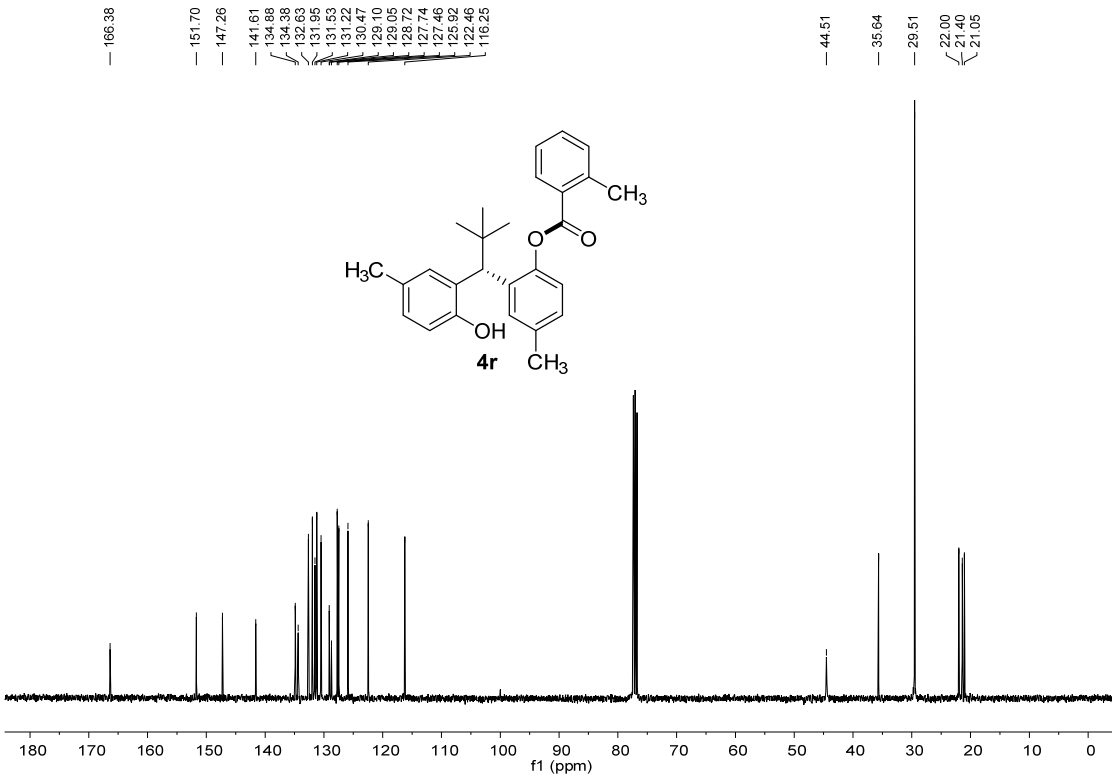
1 Det.A Ch1/210nm

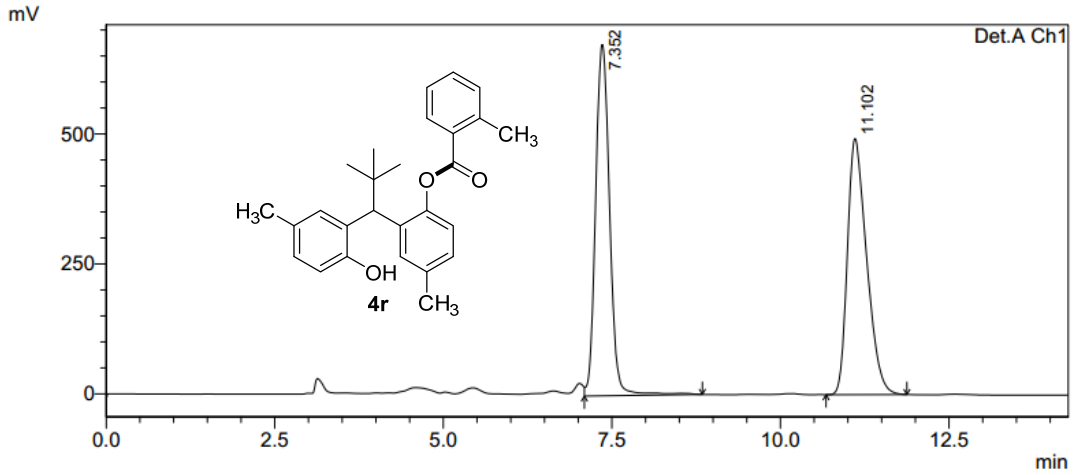
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	10.907	18120151	938790	92.683	93.352
2	13.395	1430559	66854	7.317	6.648
Total		19550710	1005644	100.000	100.000


8.09
8.07
7.33
7.31
7.29
7.24
7.20
7.18
7.14
7.13
6.88
6.86
6.81
6.79
6.61
6.59
6.32
6.30
4.64
4.40
2.46
2.18
2.07
0.92
CH3
O
O
H3C
OH
4r
CH3
0.99
1.07
1.04
3.06
1.04
1.01
1.01
1.03
0.94
1.00
3.06
3.09
3.05
9.09
f1 (ppm)


166.38
151.70
147.26
141.61
134.88
134.38
132.63
131.95
131.53
131.22
130.47
129.10
129.05
128.72
127.74
127.46
125.92
122.46
116.25
44.51
35.64
29.51
22.00
21.40
21.05
CH3
O
O
H3C
OH
4r
CH3
f1 (ppm)

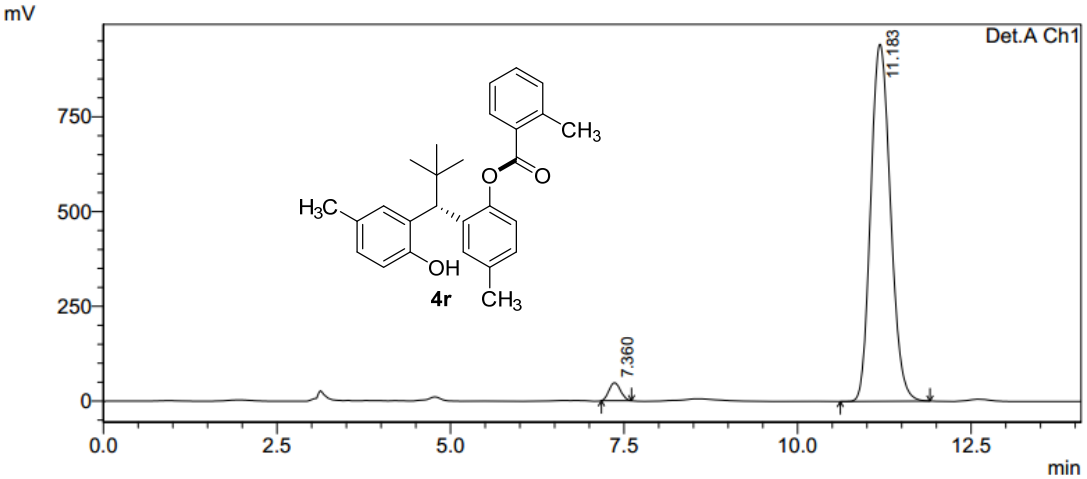


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.352	9803942	675973	50.079	57.848
2	11.102	9772996	492565	49.921	42.152
Total		19576938	1168539	100.000	100.000

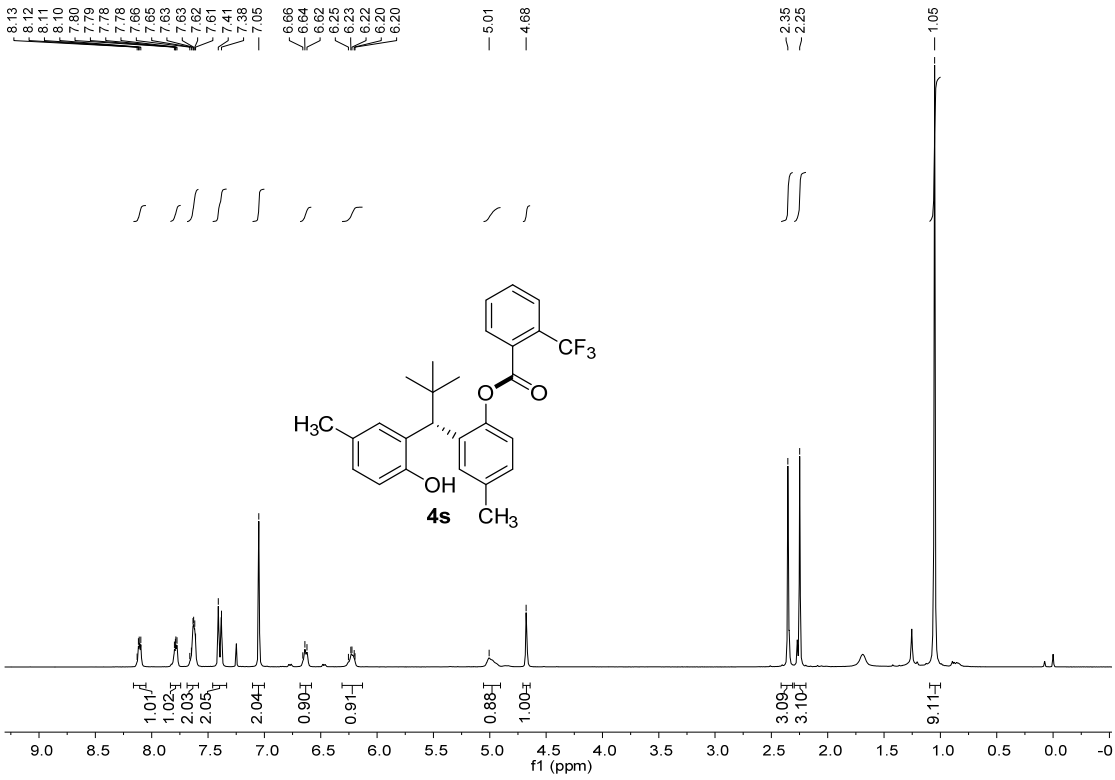


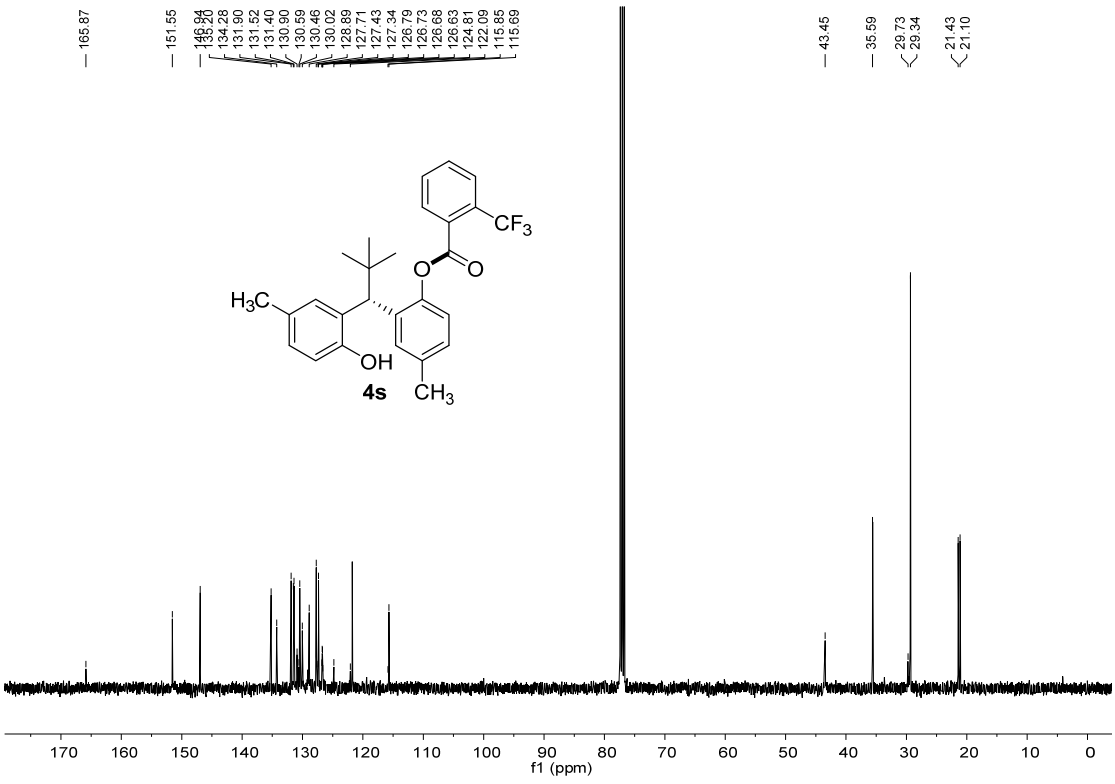
1 Det.A Ch1/210nm

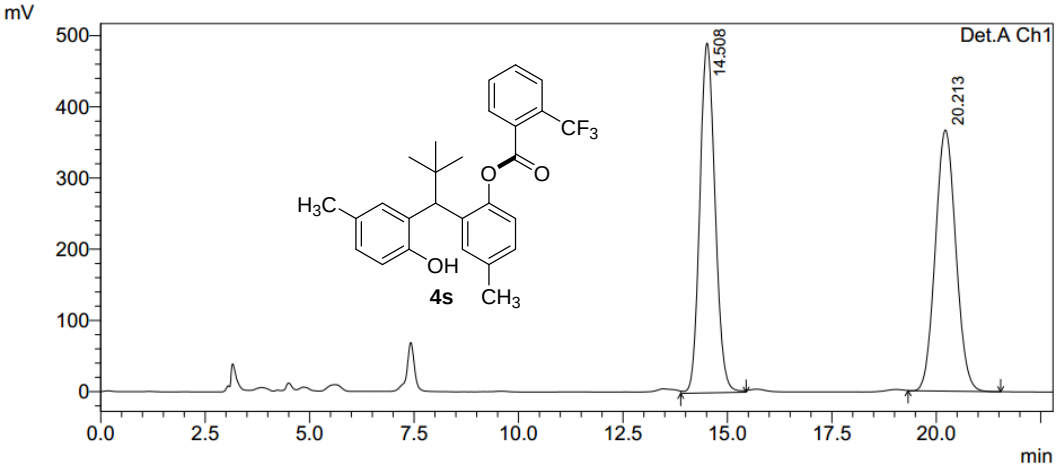
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.360	544110	47376	2.834	4.791
2	11.183	18656419	941546	97.166	95.209
Total		19200528	988923	100.000	100.000


8.13
8.12
8.11
8.10
7.80
7.79
7.78
7.78
7.66
7.65
7.63
7.63
7.62
7.61
7.41
7.38
7.05
6.66
6.64
6.62
6.25
6.23
6.22
6.20
6.20
5.01
4.68
2.35
2.25
1.05
CF3
O
O
H3C
OH
4s
CH3
1.01
1.02
2.03
2.05
2.04
0.90
0.91
0.88
1.00
3.09
3.10
9.11
f1 (ppm)


165.87
151.55
146.94
135.20
134.28
131.90
131.52
131.40
130.90
130.59
130.46
130.02
128.89
127.71
127.43
127.34
126.79
126.73
126.68
126.63
124.81
122.09
115.85
115.69
43.45
35.59
29.73
29.34
21.43
21.10
CF3
O
O
H3C
OH
4s
CH3
f1 (ppm)

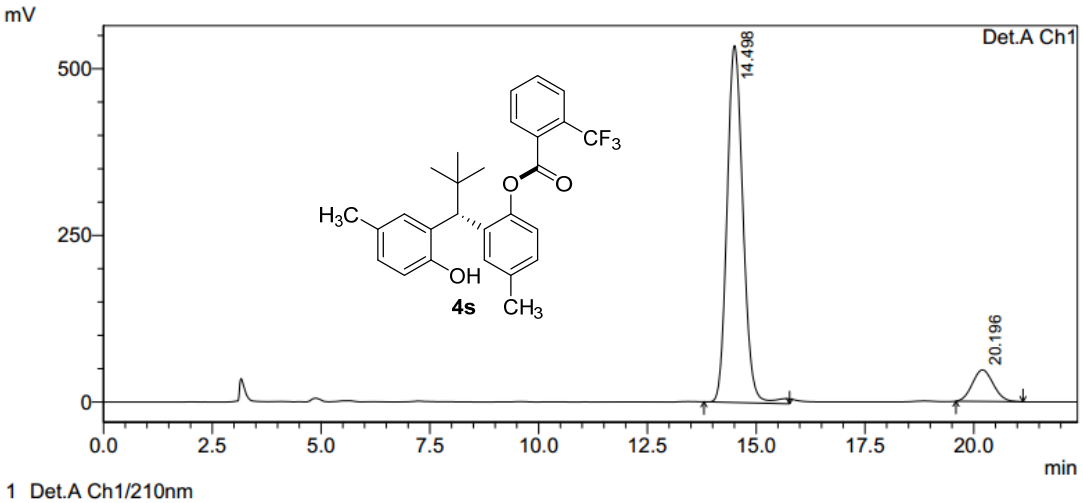


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	14.508	12524460	491500	50.033	57.260
2	20.213	12507850	366865	49.967	42.740
Total		25032310	858365	100.000	100.000

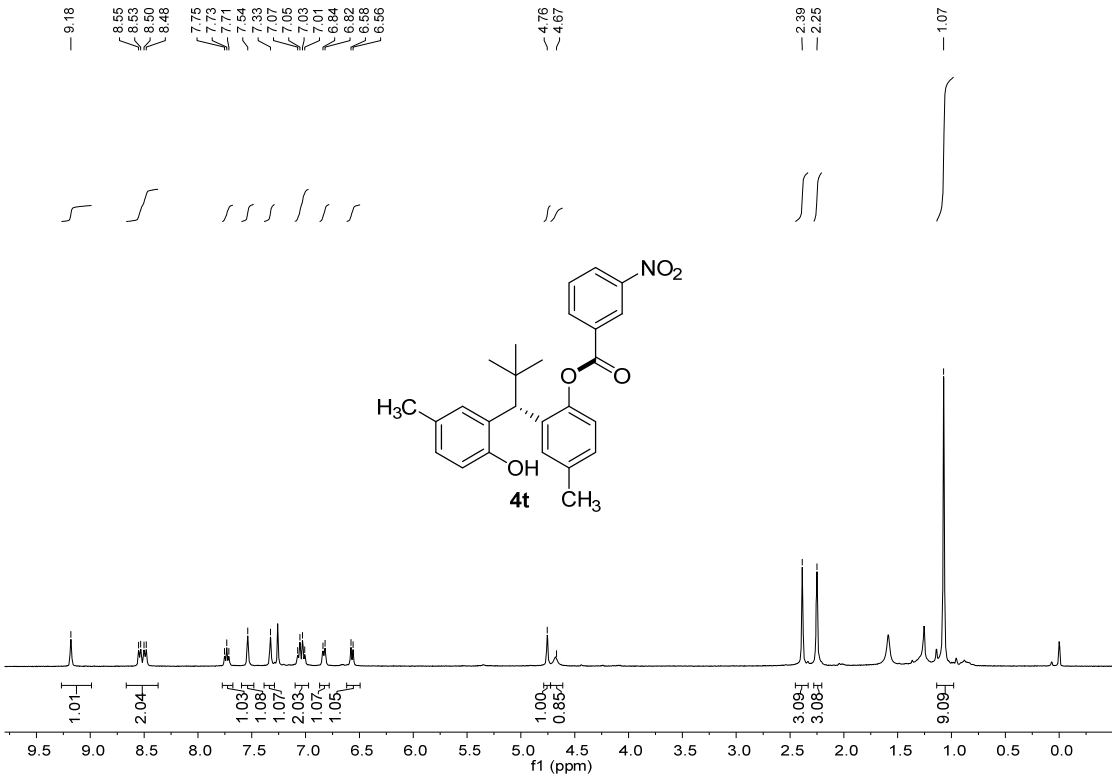


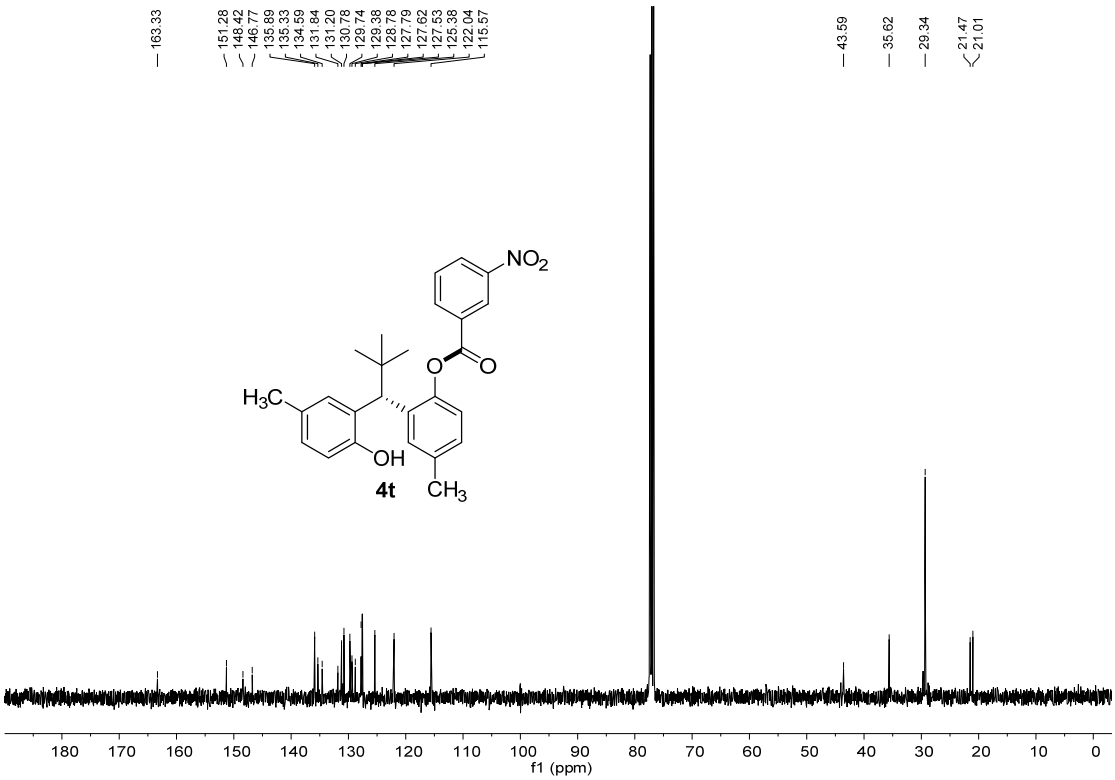
1 Det.A Ch1/210nm

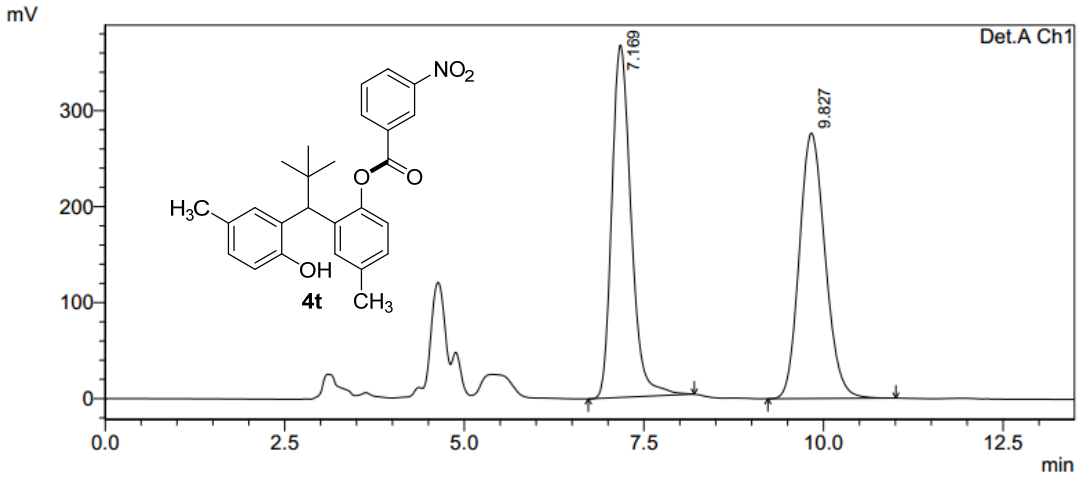
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	14.498	13669935	535623	89.635	91.888
2	20.196	1580668	47287	10.365	8.112
Total		15250603	582909	100.000	100.000


9.18
8.55
8.53
8.50
8.48
7.75
7.73
7.71
7.54
7.33
7.07
7.05
7.03
7.01
6.84
6.82
6.58
6.56
4.76
4.67
2.39
2.25
1.07
NO2
O
O
H3C
OH
4t
CH3
1.01
2.04
1.03
1.08
1.07
2.03
1.07
1.05
1.00
0.85
3.09
3.08
9.09
f1 (ppm)


163.33
151.28
148.42
146.77
135.89
135.33
134.59
131.84
131.20
130.78
129.74
129.38
128.78
127.79
127.62
127.53
125.38
122.04
115.57
43.59
35.62
29.34
21.47
21.01
NO2
O
O
H3C
OH
4t
CH3
f1 (ppm)

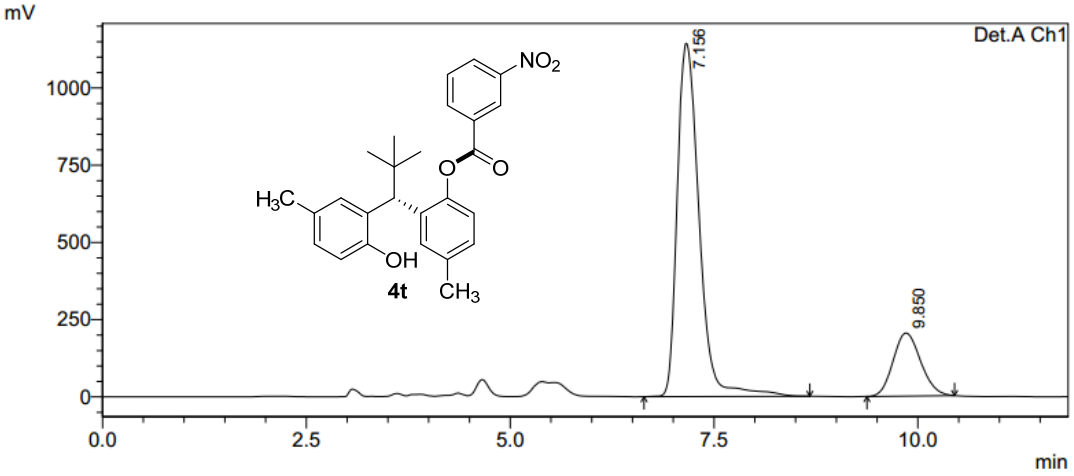


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.169	6844541	367156	49.773	57.044
2	9.827	6906931	276476	50.227	42.956
Total		13751472	643632	100.000	100.000

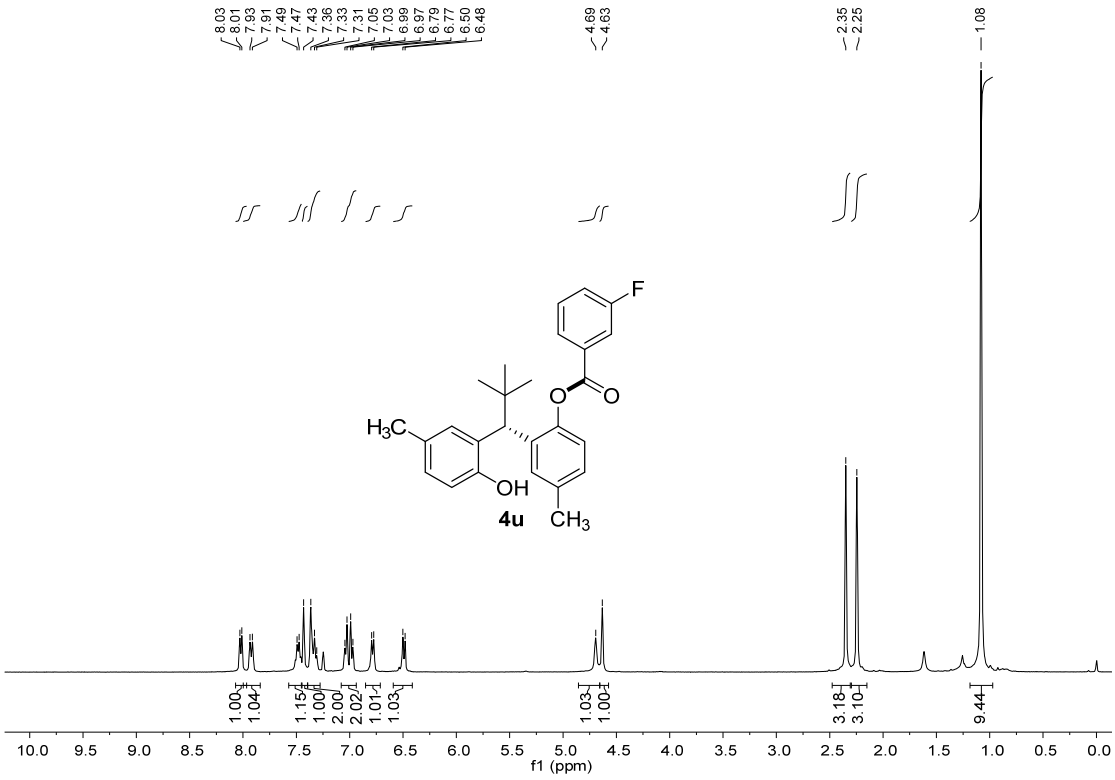


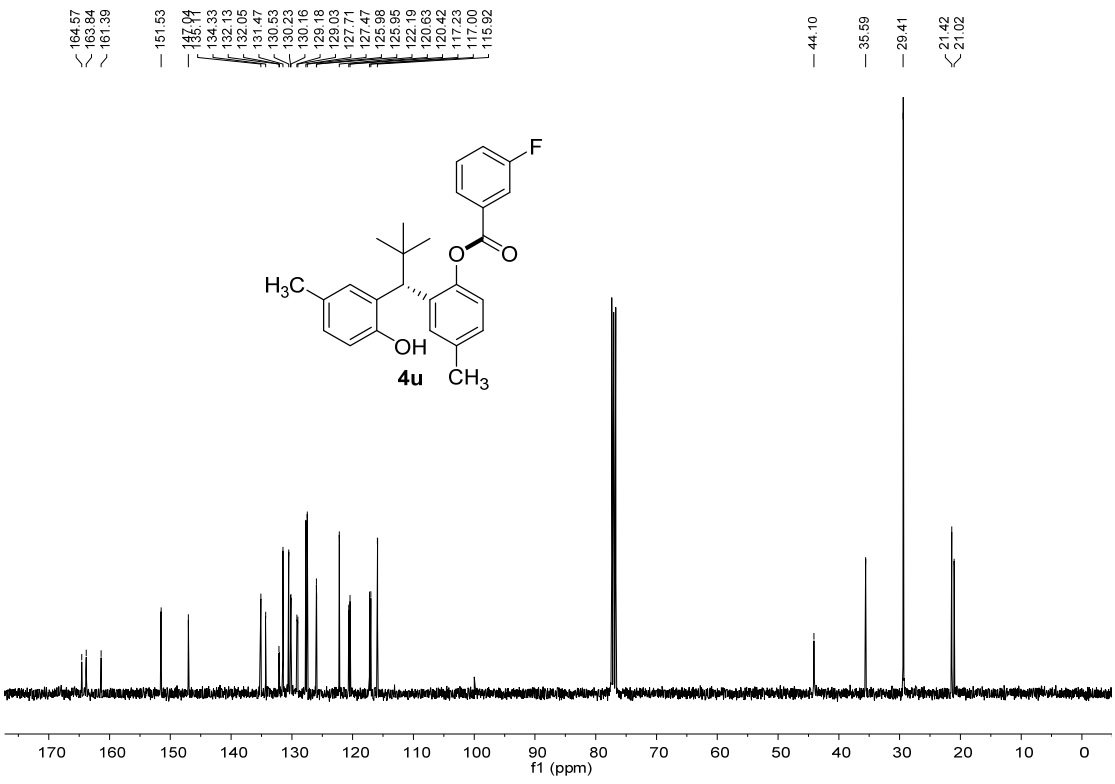
1 Det.A Ch1/210nm

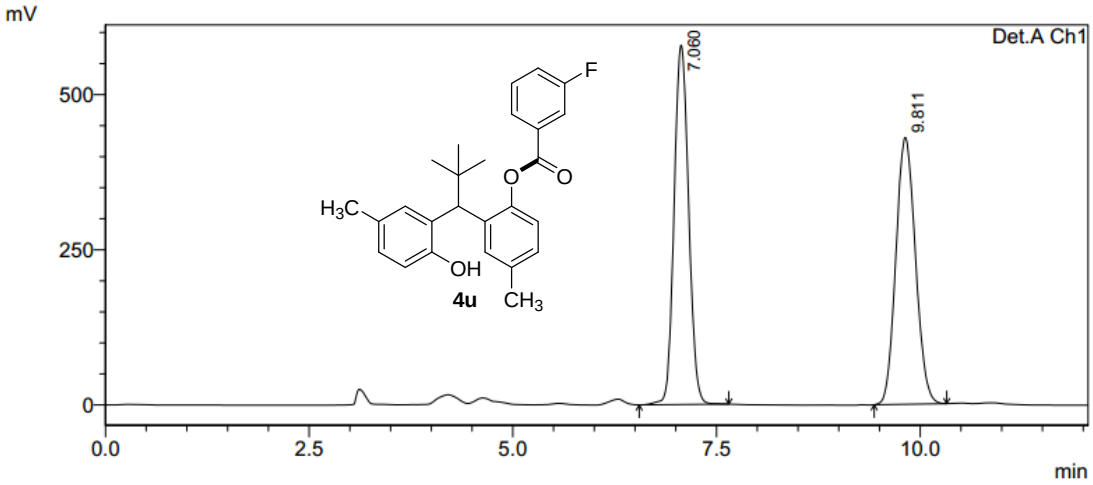
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.156	21457807	1144164	81.657	84.845
2	9.850	4820190	204376	18.343	15.155
Total		26277997	1348541	100.000	100.000


8.03
8.01
7.93
7.91
7.49
7.47
7.43
7.36
7.33
7.31
7.05
7.03
6.99
6.97
6.79
6.77
6.50
6.48
4.69
4.63
2.35
2.25
1.08
F
O
O
H3C
OH
4u
CH3
1.00
1.04
1.15
1.00
2.00
2.02
1.01
1.03
1.03
1.00
3.18
3.10
9.44
f1 (ppm)


164.57
163.84
161.39
151.53
147.04
145.11
134.33
132.13
132.05
131.47
130.53
130.23
130.16
129.18
129.03
127.71
127.47
125.98
125.95
122.19
120.63
120.42
117.23
117.00
115.92
44.10
35.59
29.41
21.42
21.02
F
O
O
H3C
OH
4u
CH3
f1 (ppm)

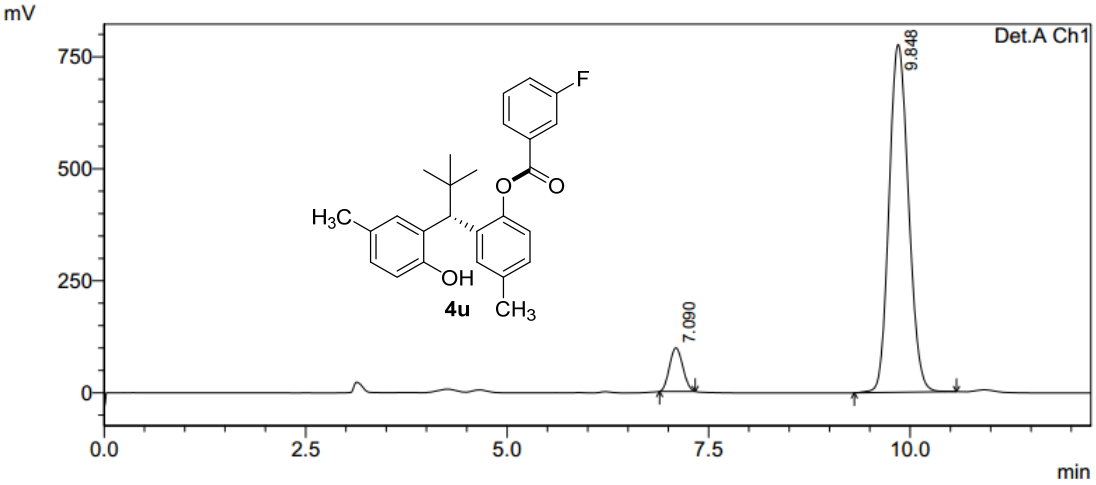


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.060	7192840	579126	50.046	57.391
2	9.811	7179662	429962	49.954	42.609
Total		14372502	1009089	100.000	100.000

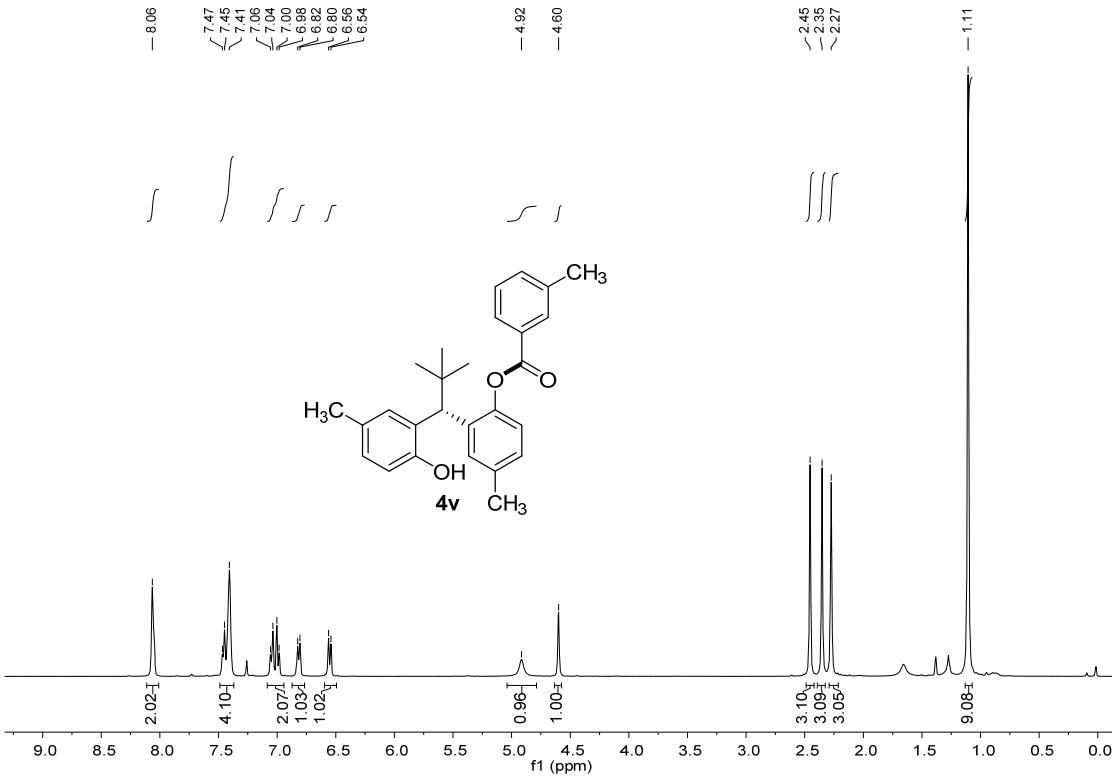


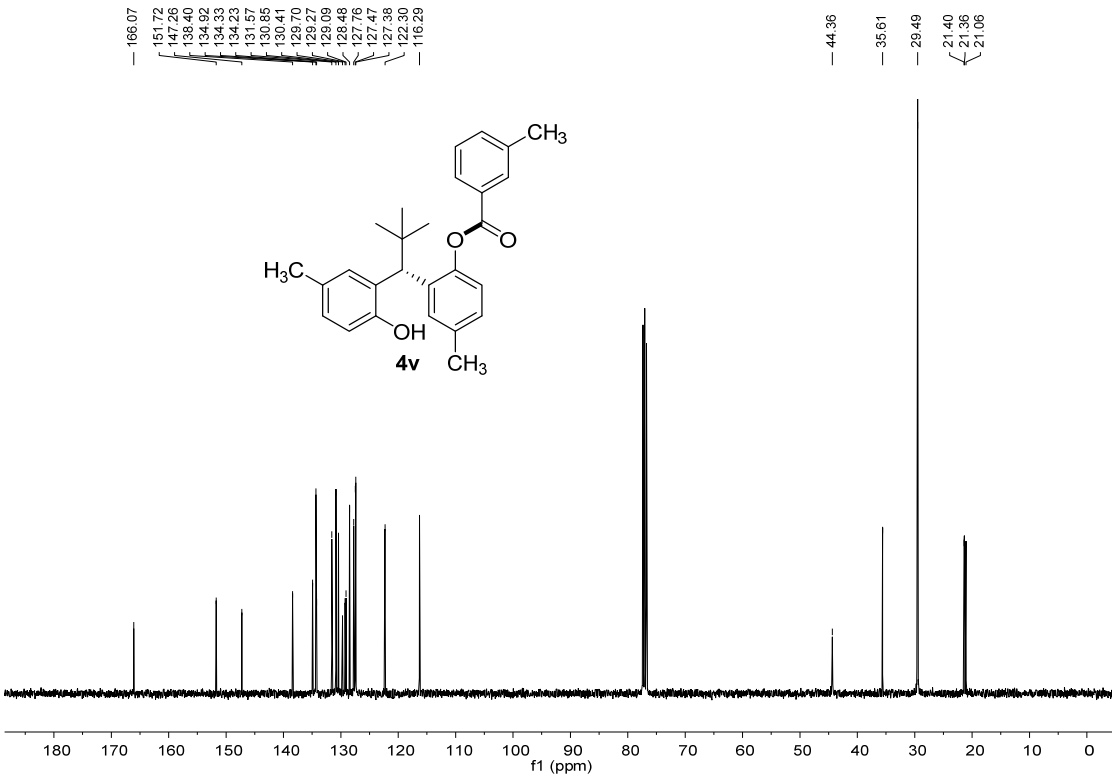
1 Det.A Ch1/210nm

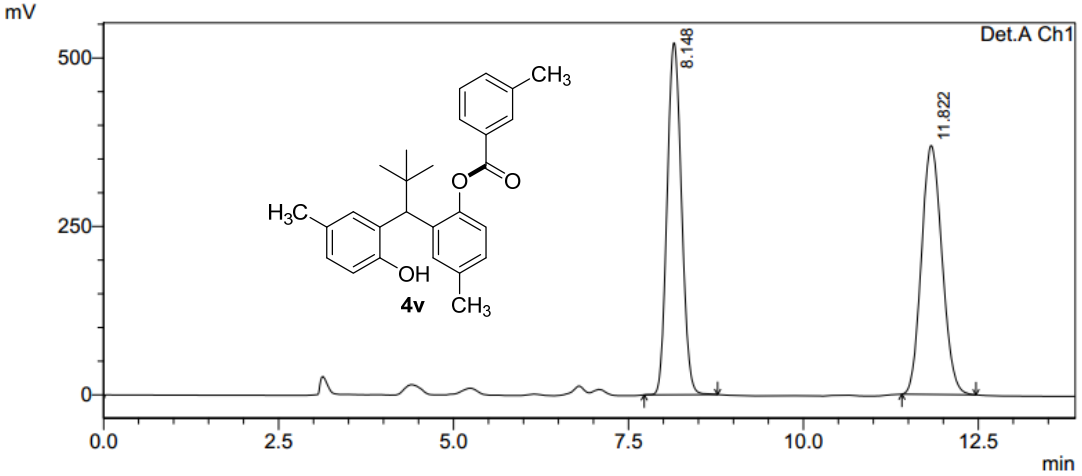
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.090	1113583	97104	7.857	11.111
2	9.848	13060117	776829	92.143	88.889
Total		14173700	873933	100.000	100.000


8.06
7.47
7.45
7.41
7.06
7.04
7.00
6.98
6.82
6.80
6.56
6.54
4.92
4.60
2.45
2.35
2.27
1.11
CH3
O
O
H3C
OH
4v
CH3
2.02
4.10
2.07
1.03
1.02
0.96
1.00
3.10
3.09
3.05
9.08
f1 (ppm)


166.07
151.72
147.26
138.40
134.92
134.33
134.23
131.57
130.85
130.41
129.70
129.27
129.09
128.48
127.76
127.47
127.38
122.30
116.29
44.36
35.61
29.49
21.40
21.36
21.06
CH3
O
O
H3C
OH
4v
CH3
f1 (ppm)

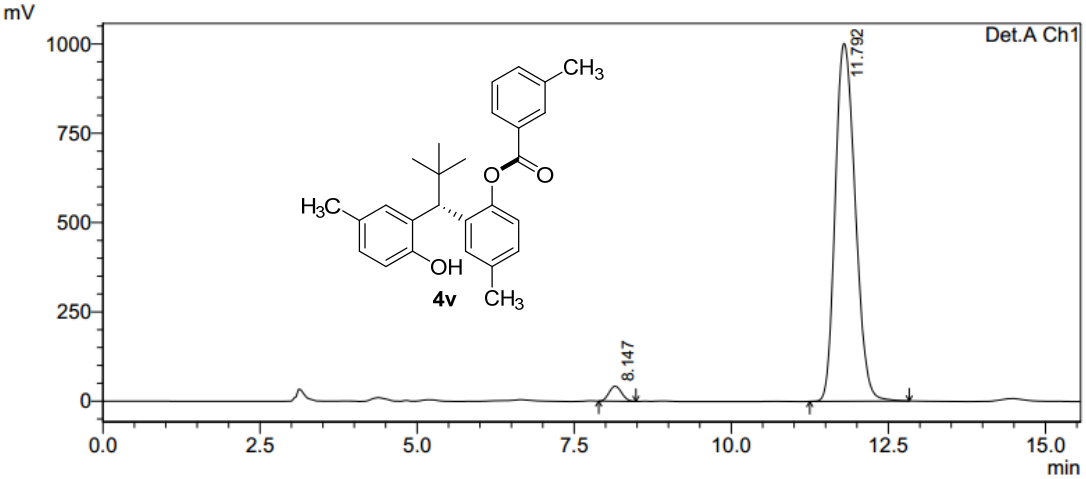


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.148	7460540	522449	49.653	58.583
2	11.822	7564683	369357	50.347	41.417
Total		15025222	891806	100.000	100.000

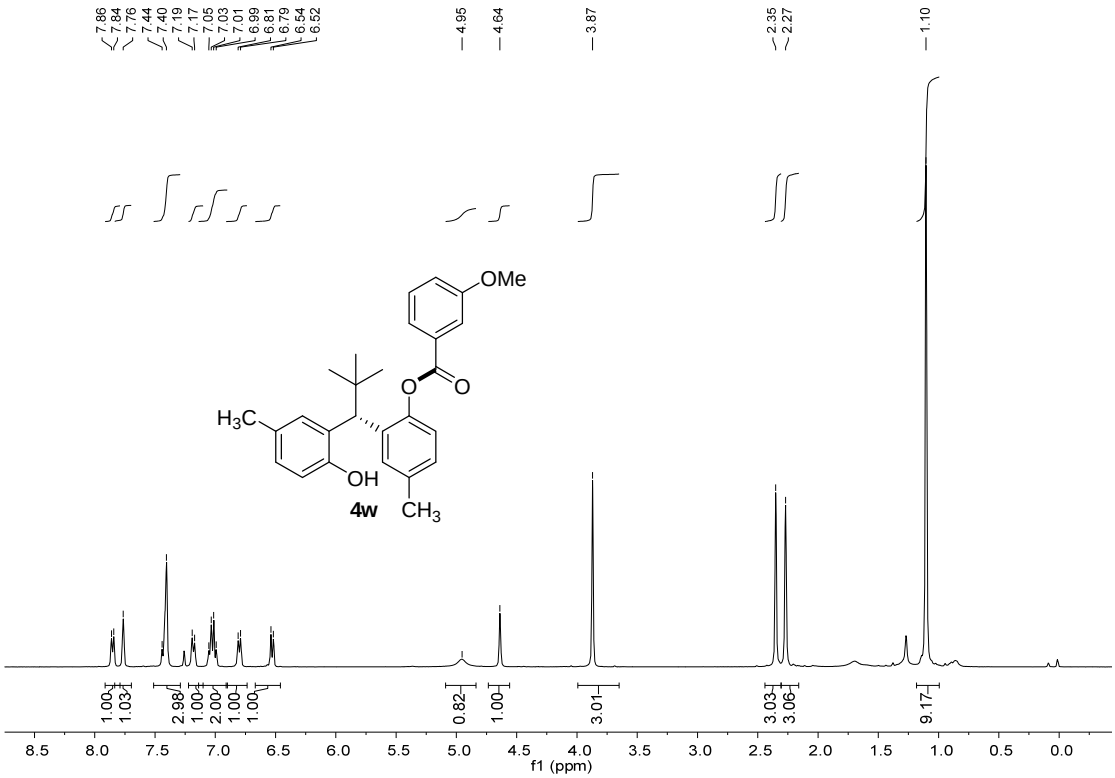


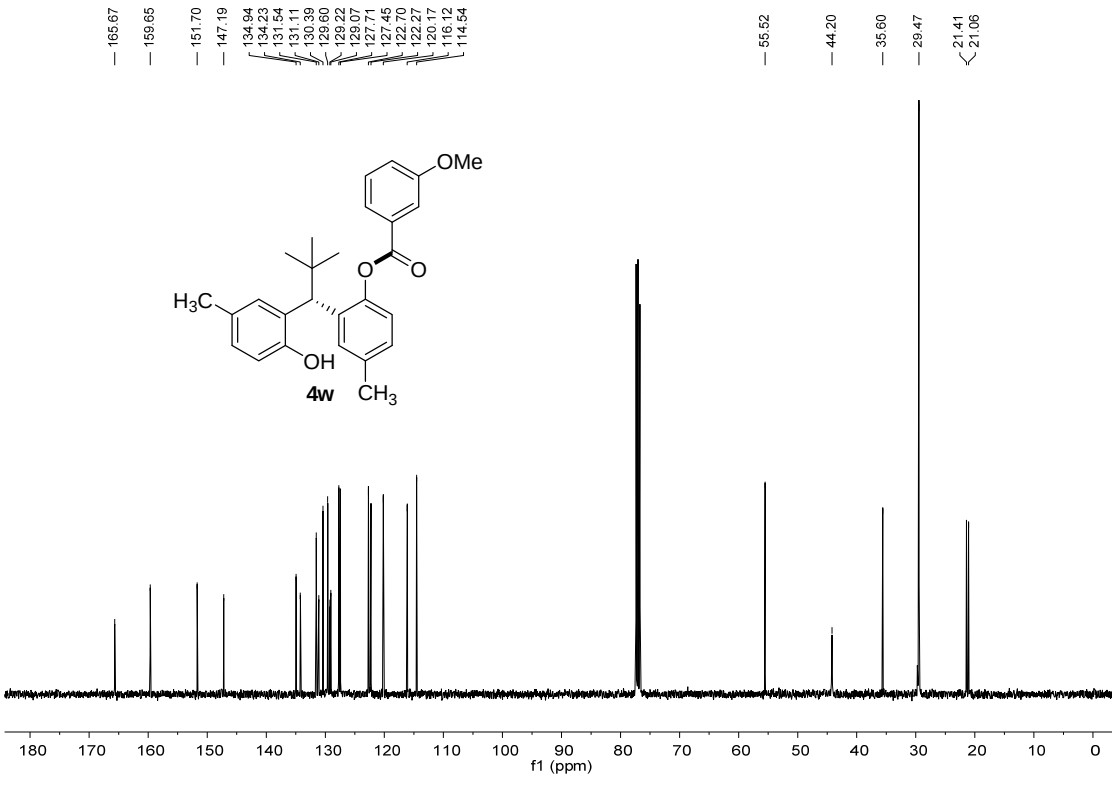
1 Det.A Ch1/210nm

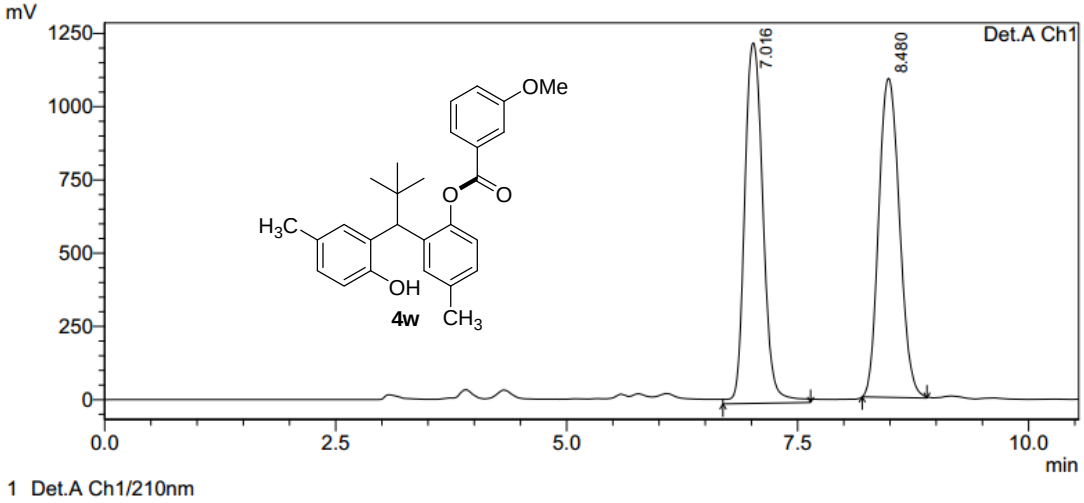
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.147	585681	42124	2.576	4.035
2	11.792	22146852	1001951	97.424	95.965
Total		22732533	1044075	100.000	100.000


7.86
7.84
7.76
7.44
7.40
7.19
7.17
7.05
7.03
7.01
6.99
6.81
6.79
6.54
6.52
4.95
4.64
3.87
2.35
2.27
1.10
OMe
O
O
H3C
OH
4w
CH3
1.00
1.03
2.98
1.00
2.00
1.00
1.00
0.82
1.00
3.01
3.03
3.06
9.17
f1 (ppm)


165.67
159.65
151.70
147.19
134.94
134.23
131.54
131.11
130.39
129.60
129.22
129.07
127.71
127.45
122.70
122.27
120.17
116.12
114.54
55.52
44.20
35.60
29.47
21.41
21.06
OMe
O
O
H3C
OH
4w
CH3
f1 (ppm)

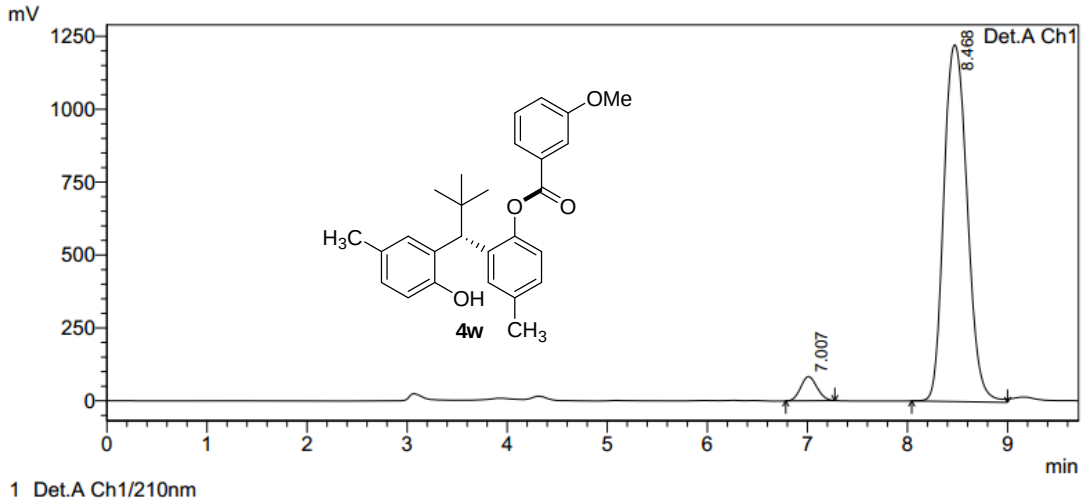


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.016	17021907	1230971	49.975	53.056
2	8.480	17038826	1089145	50.025	46.944
Total		34060733	2320116	100.000	100.000

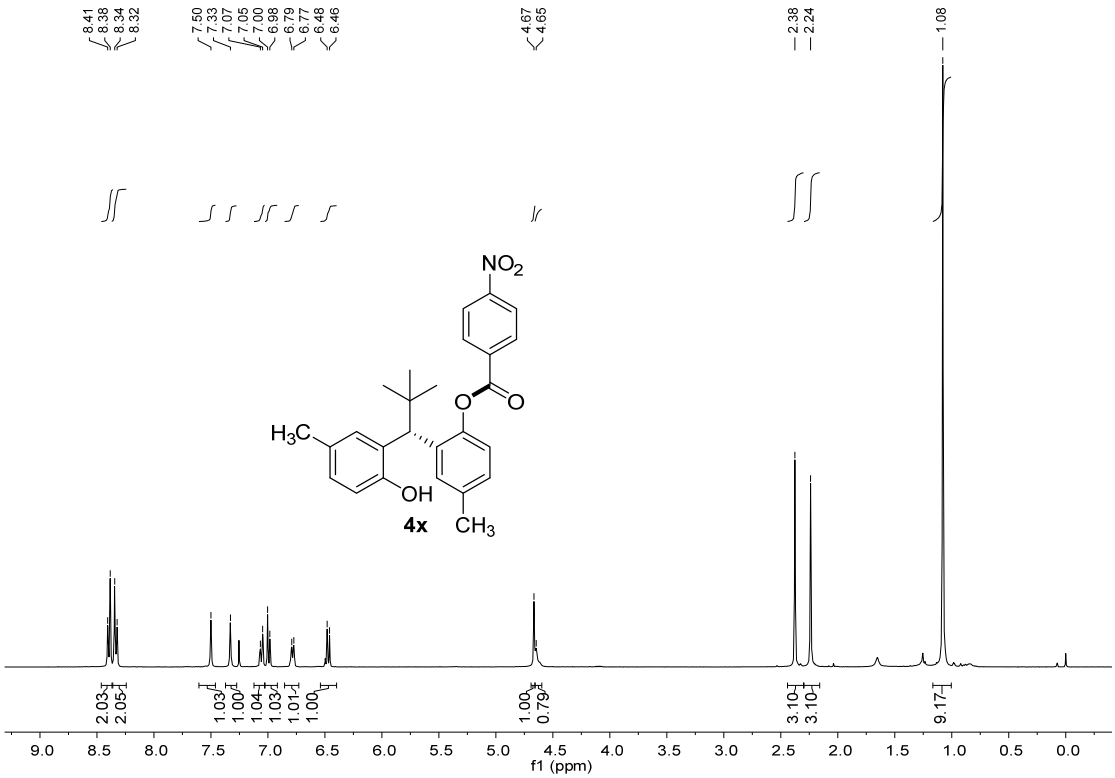


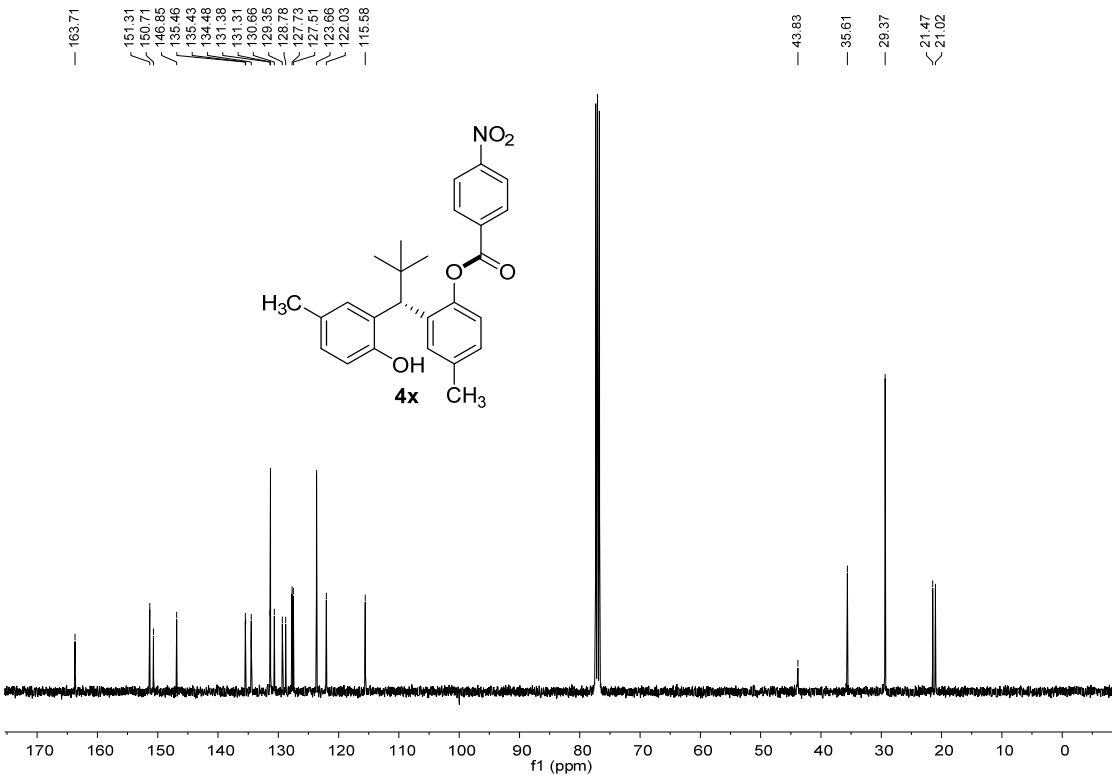
1 Det.A Ch1/210nm

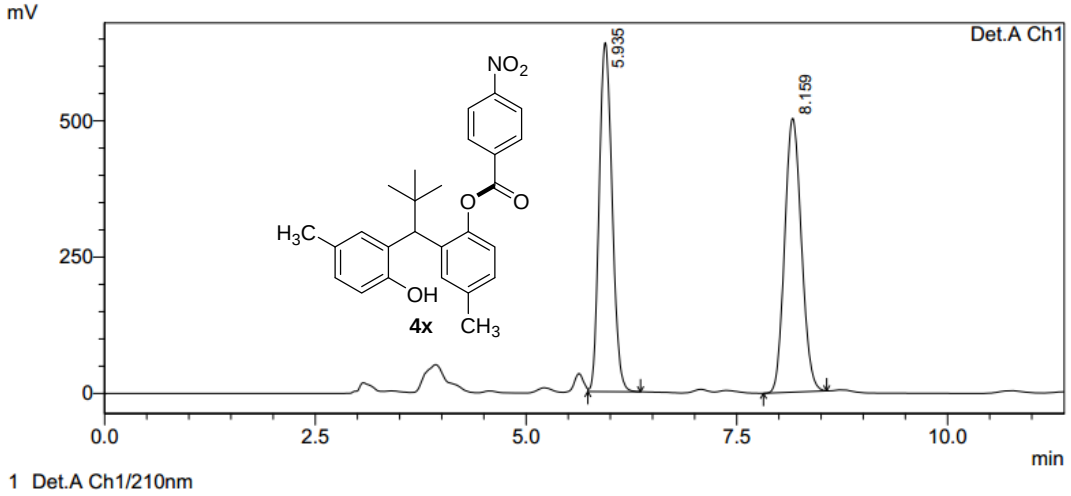
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.007	942815	83009	4.524	6.352
2	8.468	19897498	1223827	95.476	93.648
Total		20840313	1306836	100.000	100.000


8.41
8.38
8.34
8.32
7.50
7.33
7.07
7.05
7.00
6.98
6.79
6.77
6.48
6.46
4.67
4.65
2.38
2.24
1.08
NO2
O
O
H3C
OH
4x
CH3
2.03
2.05
1.03
1.00
1.04
1.03
1.01
1.00
1.00
0.79
3.10
3.10
9.17
f1 (ppm)


163.71
151.31
150.71
146.85
135.46
135.43
134.48
131.38
131.31
130.66
129.35
128.78
127.73
127.51
123.66
122.03
115.58
43.83
35.61
29.37
21.47
21.02
NO2
O
O
H3C
OH
4x
CH3
f1 (ppm)

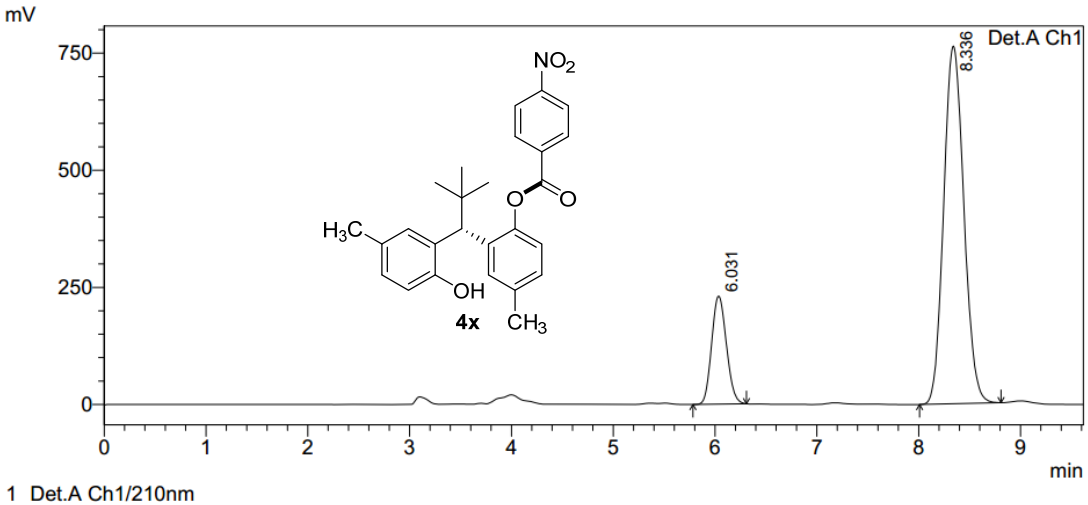


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.935	6849008	640243	49.690	56.049
2	8.159	6934470	502056	50.310	43.951
Total		13783478	1142300	100.000	100.000

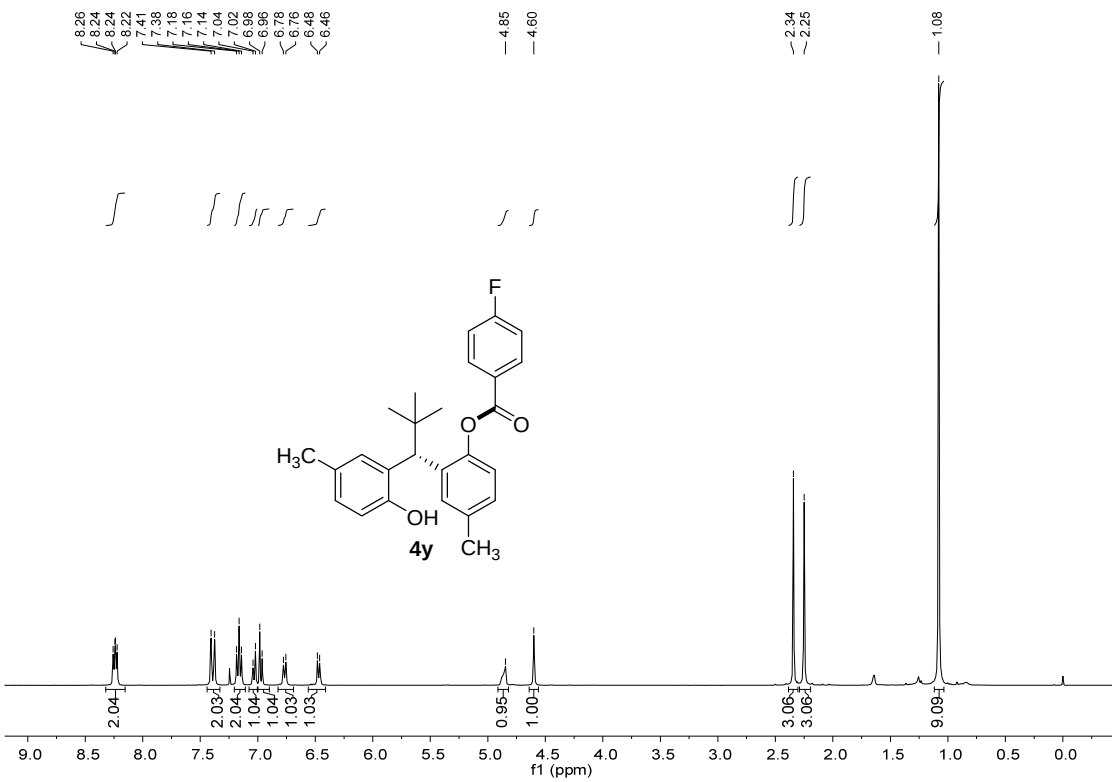


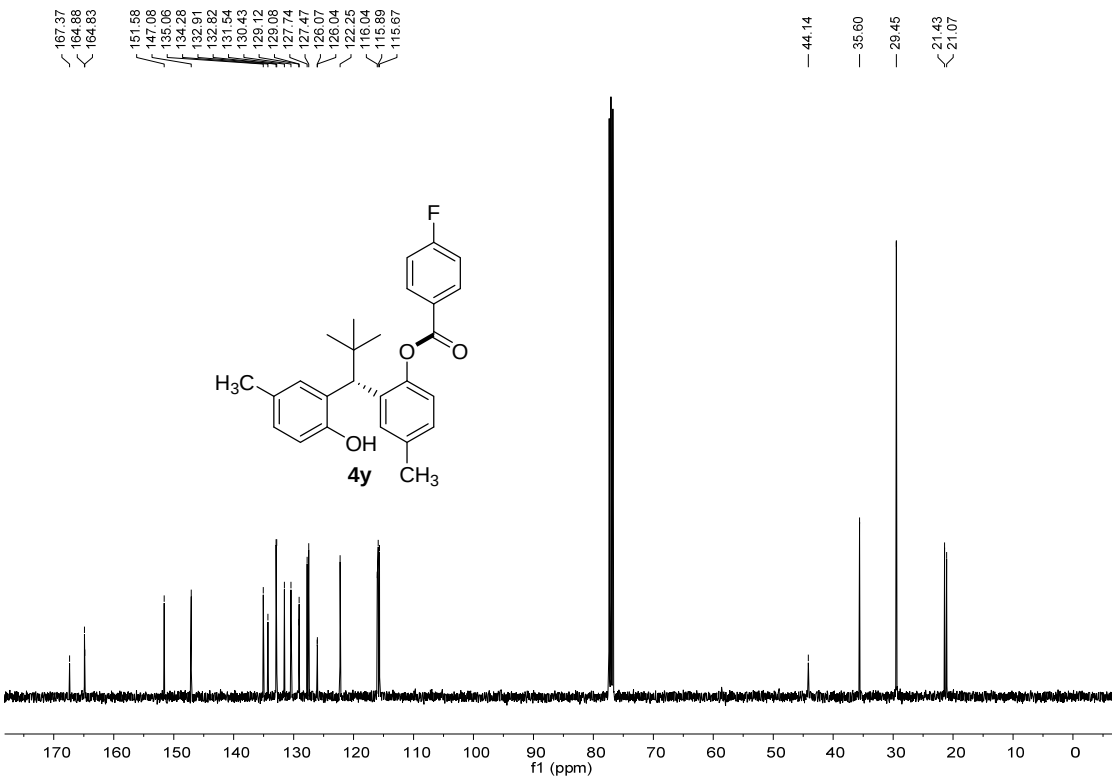
1 Det.A Ch1/210nm

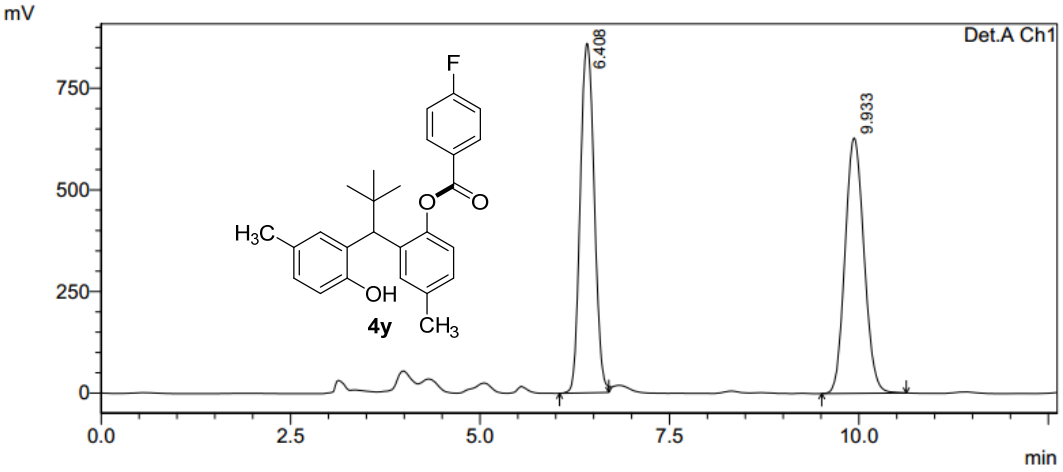
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.031	2324153	230684	18.089	23.197
2	8.336	10524385	763753	81.911	76.803
Total		12848538	994438	100.000	100.000


8.26
8.24
8.24
8.22
7.41
7.38
7.18
7.16
7.14
7.04
7.02
6.98
6.96
6.78
6.76
6.48
6.46
4.85
4.60
2.34
2.25
1.08
F
O
O
H3C
OH
4y
CH3
2.04
2.03
2.04
1.04
1.04
1.03
1.03
0.95
1.00
3.06
3.06
9.09
9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


167.37
164.88
164.83
151.58
147.08
135.06
134.28
132.91
132.82
131.54
130.43
129.12
129.08
127.74
127.47
126.07
126.04
122.25
116.04
115.89
115.67
44.14
35.60
29.45
21.43
21.07
F
O
O
H3C
OH
4y
CH3
170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

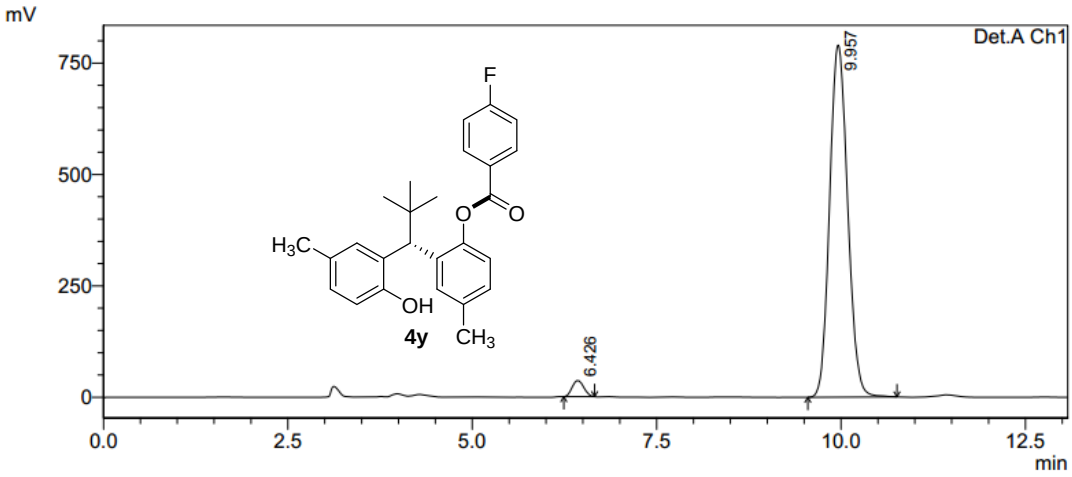


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.408	11043810	859693	50.227	57.782
2	9.933	10943914	628134	49.773	42.218
Total		21987724	1487828	100.000	100.000

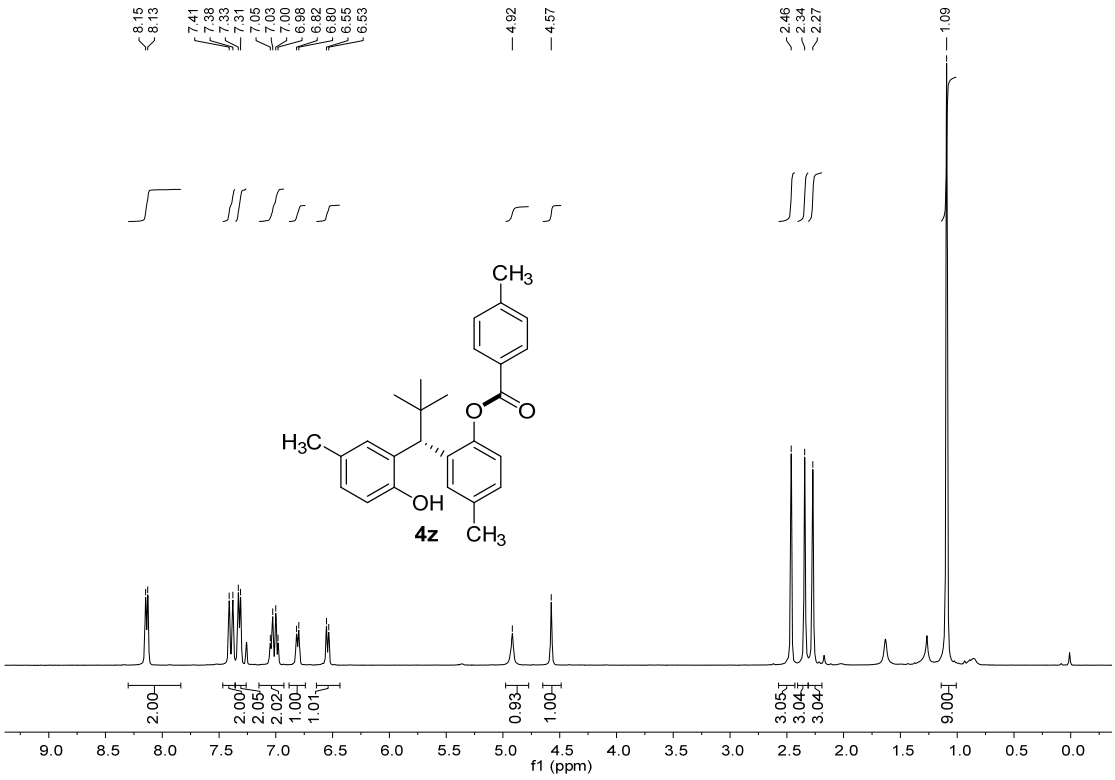


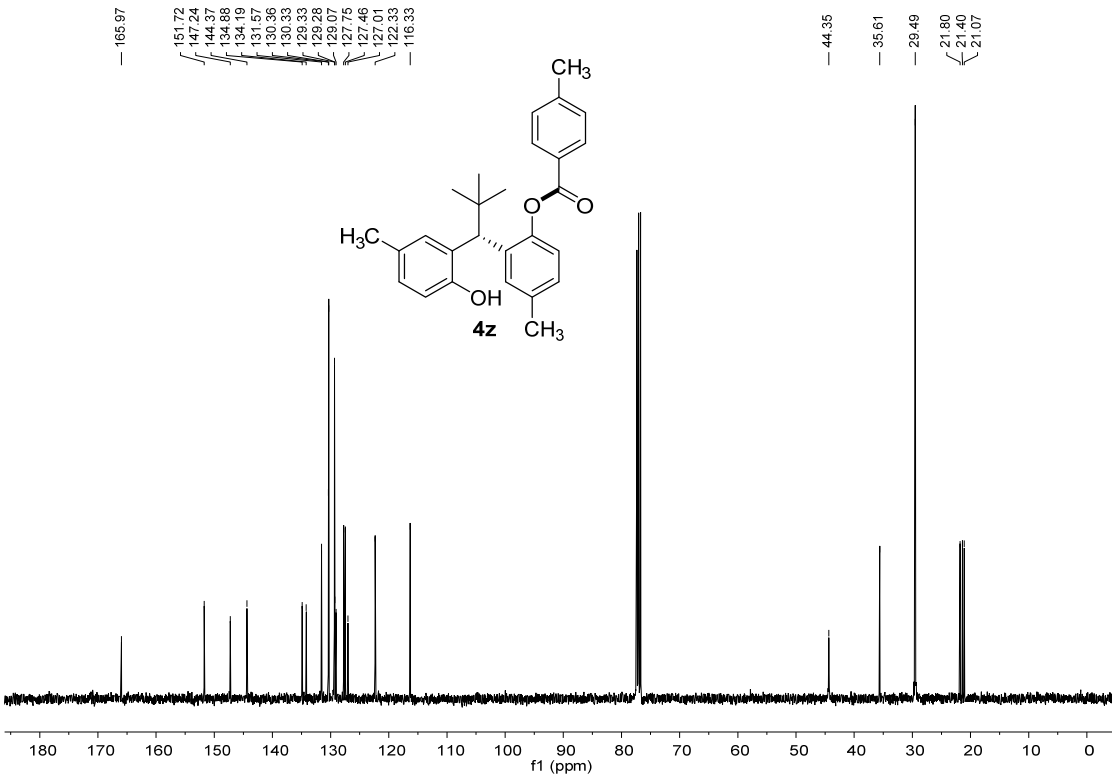
1 Det.A Ch1/210nm

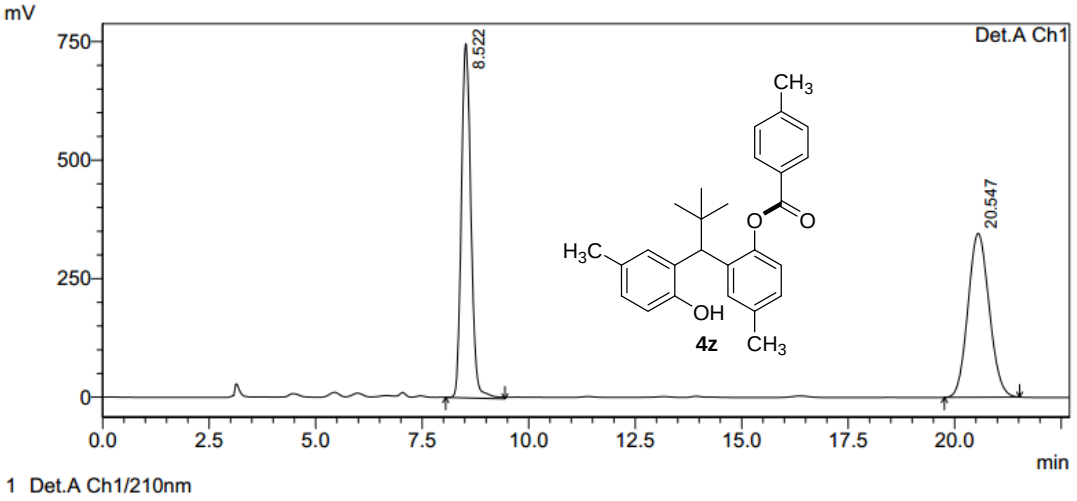
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.426	396227	36127	2.857	4.372
2	9.957	13470177	790213	97.143	95.628
Total		13866404	826340	100.000	100.000


8.15
8.13
7.41
7.38
7.33
7.31
7.05
7.03
7.00
6.98
6.82
6.80
6.55
6.53
4.92
4.57
2.46
2.34
2.27
1.09
CH3
O
O
H3C
OH
4z
CH3
2.00
2.00
2.05
2.02
1.00
1.01
0.93
1.00
3.05
3.04
3.04
9.00
f1 (ppm)


165.97
151.72
147.24
144.37
134.88
134.19
131.57
130.36
130.33
129.33
129.28
129.07
127.75
127.46
127.01
122.33
116.33
44.35
35.61
29.49
21.80
21.40
21.07
CH3
O
O
H3C
OH
4z
CH3
f1 (ppm)

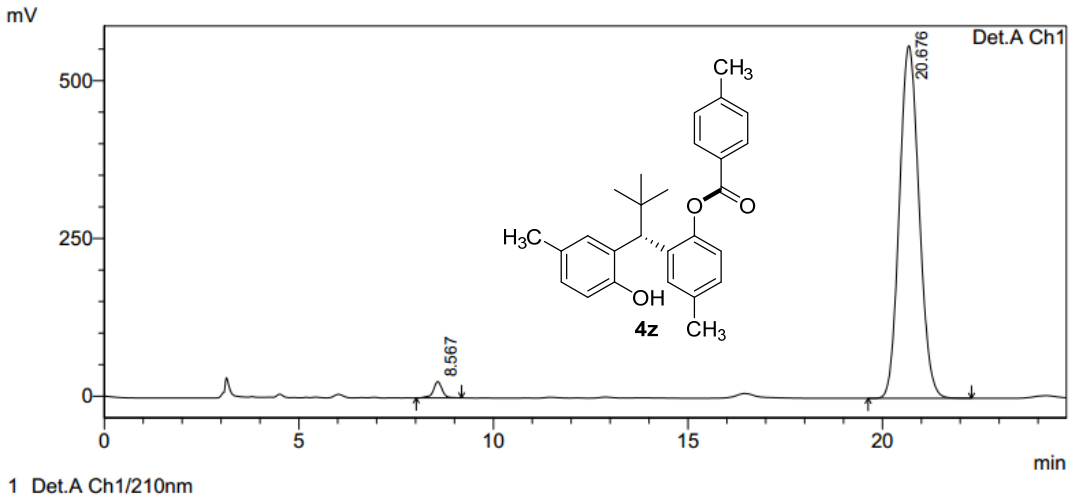


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.522	11715943	747665	49.478	68.379
2	20.547	11963335	345756	50.522	31.621
Total		23679278	1093420	100.000	100.000

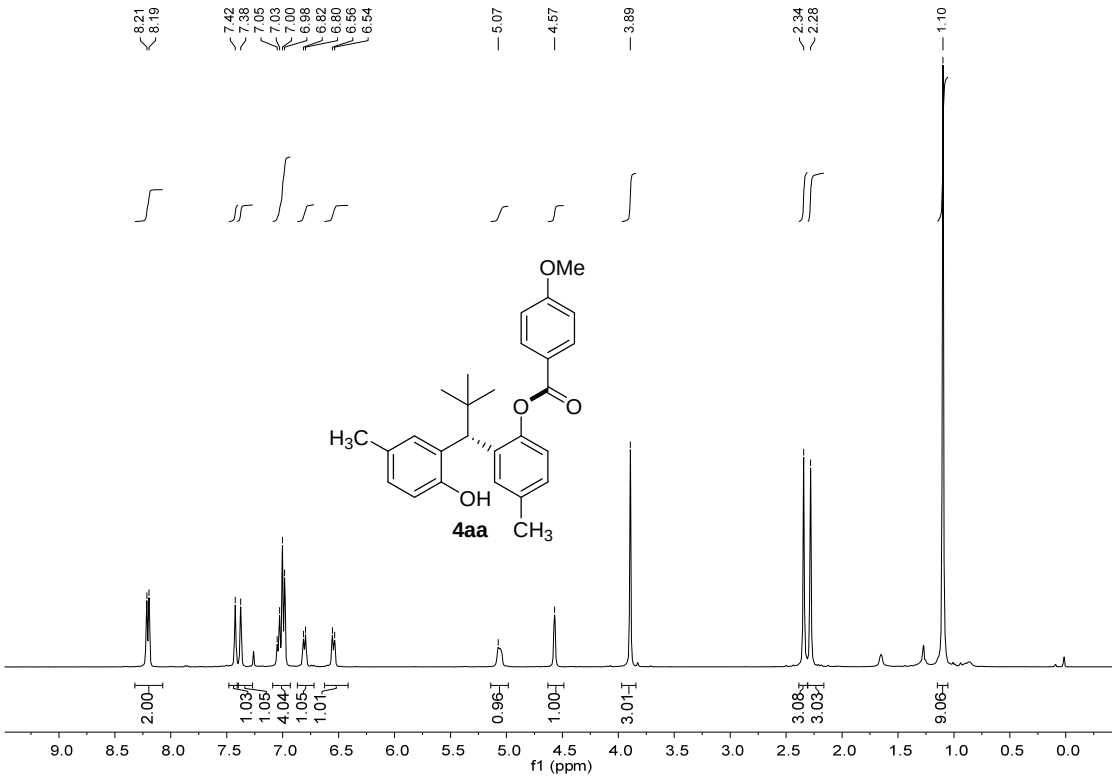


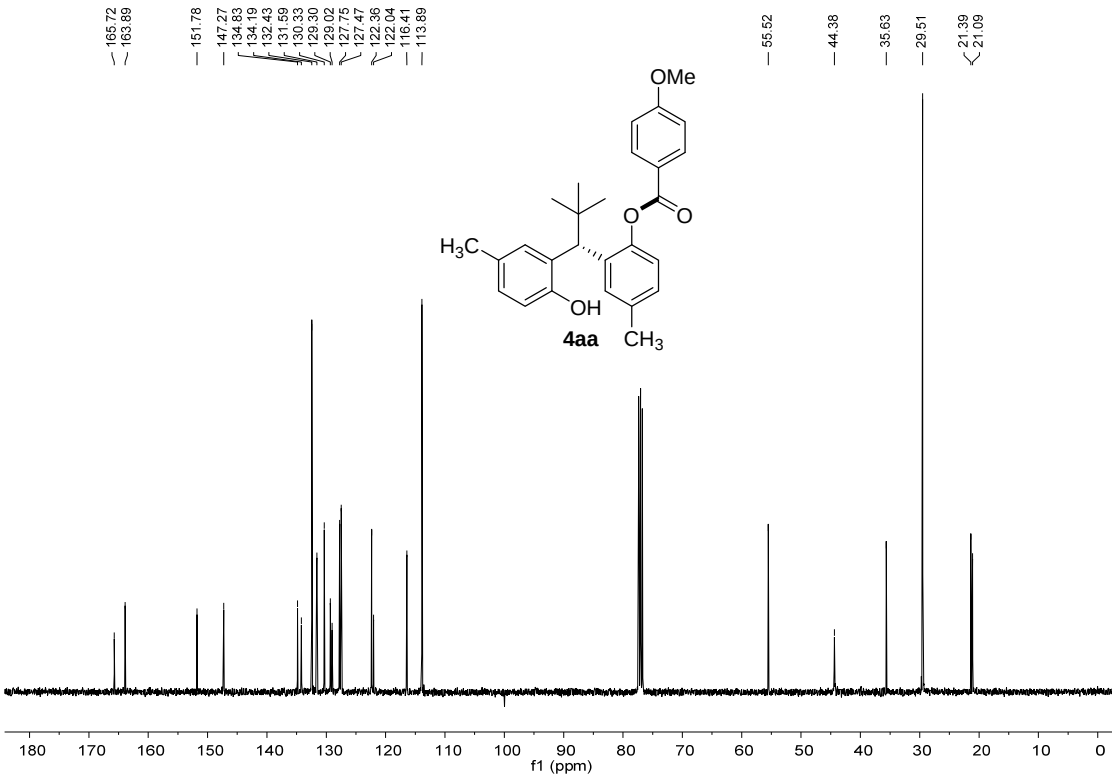
1 Det.A Ch1/210nm

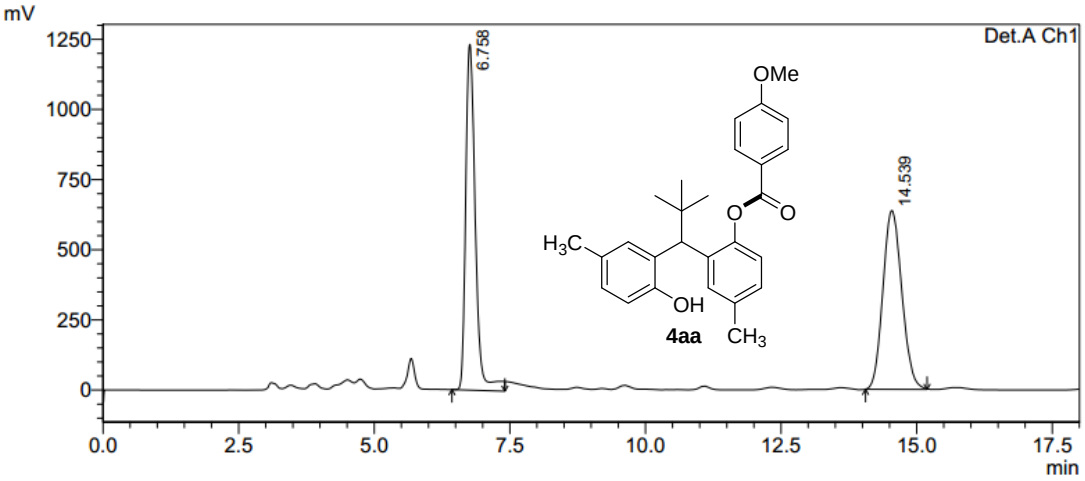
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.567	402502	25680	2.007	4.395
2	20.676	19656983	558643	97.993	95.605
Total		20059484	584323	100.000	100.000


8.21
8.19
7.42
7.38
7.05
7.03
7.00
6.98
6.82
6.80
6.56
6.54
5.07
4.57
3.89
2.34
2.28
1.10
OMe
O
O
H3C
OH
4aa
CH3
2.00
1.03
1.05
4.04
1.05
1.01
0.96
1.00
3.01
3.08
3.03
9.06
f1 (ppm)


165.72
163.89
151.78
147.27
134.83
134.19
132.43
131.59
130.33
129.30
129.02
127.75
127.47
122.36
122.04
116.41
113.89
55.52
44.38
35.63
29.51
21.39
21.09
OMe
O
O
H3C
OH
4aa
CH3
f1 (ppm)

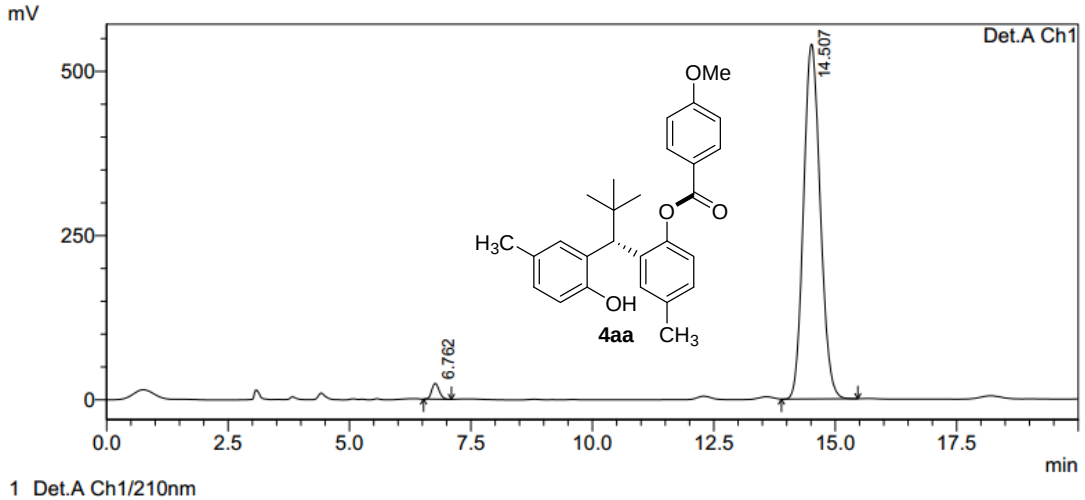


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.758	15222197	1232368	49.564	65.908
2	14.539	15489857	637449	50.436	34.092
Total		30712054	1869817	100.000	100.000

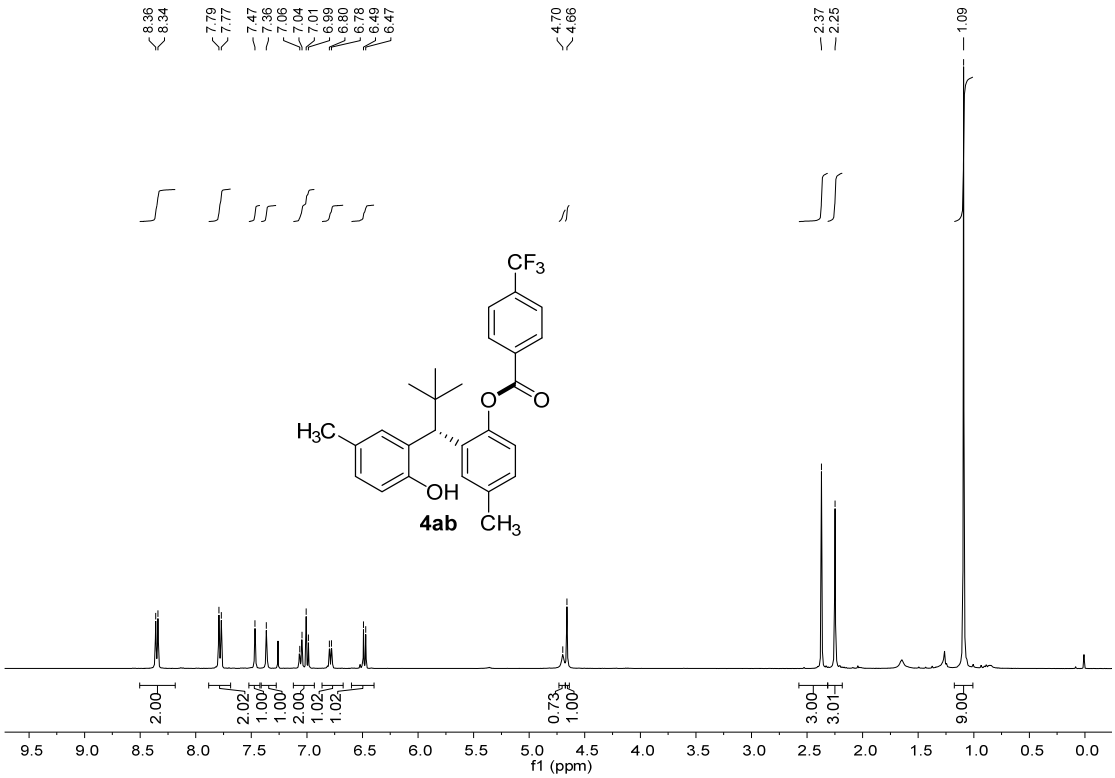


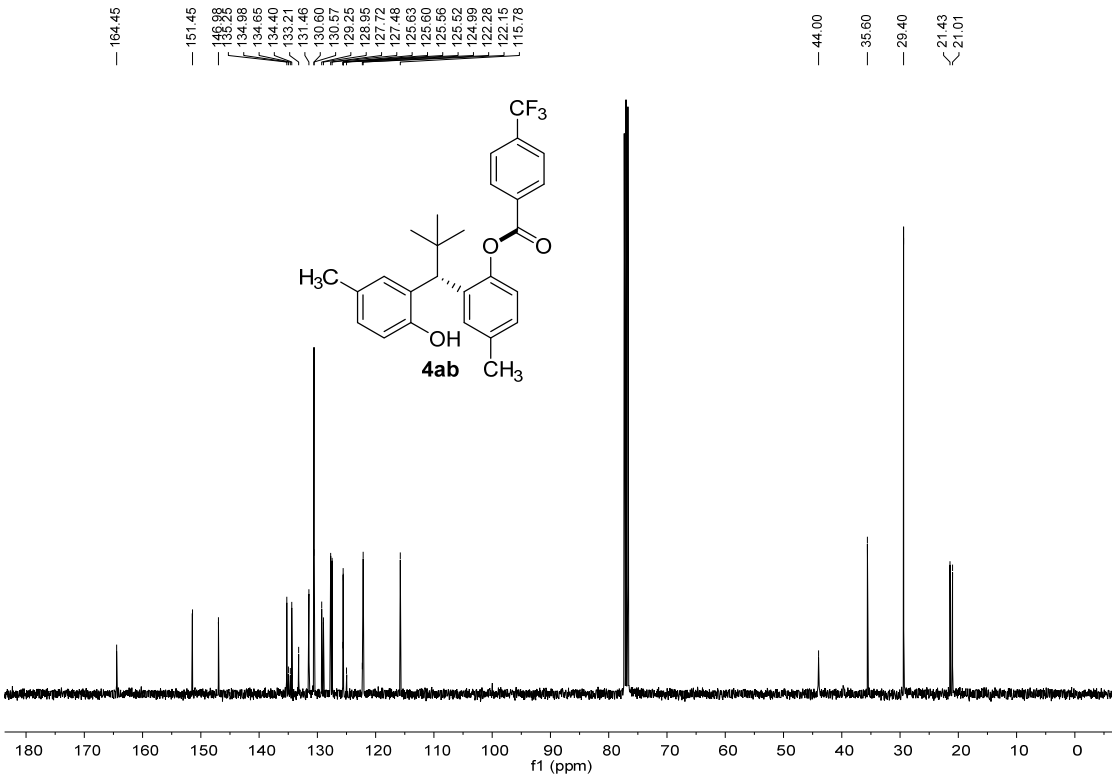
1 Det.A Ch1/210nm

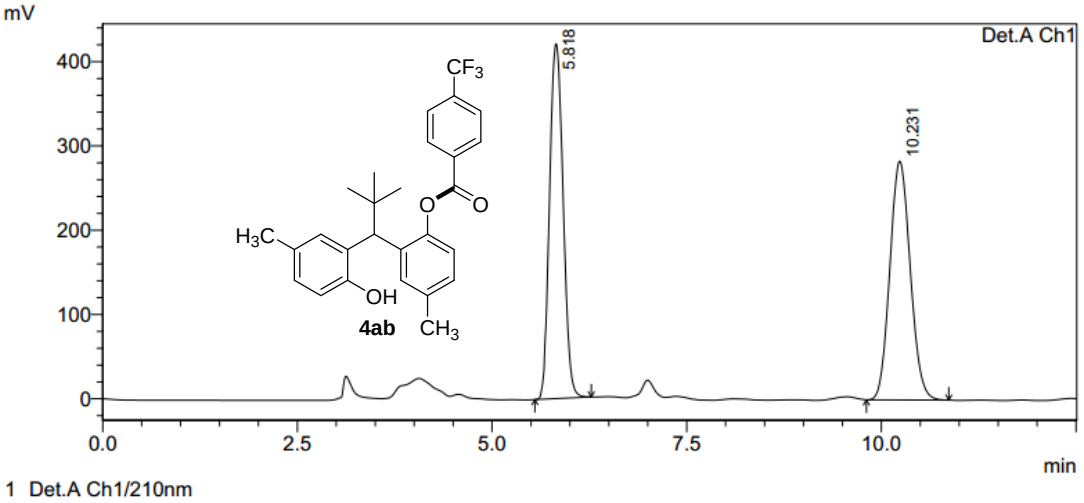
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.762	254033	24023	1.929	4.257
2	14.507	12917947	540320	98.071	95.743
Total		13171979	564343	100.000	100.000


8.36
8.34
7.79
7.77
7.47
7.36
7.06
7.04
7.01
6.99
6.80
6.78
6.49
6.47
4.70
4.66
2.37
2.25
1.09
CF3
O
O
H3C
OH
4ab
CH3
2.00
2.02
1.00
1.00
2.00
1.02
1.02
0.73
1.00
3.00
3.01
9.00
f1 (ppm)


164.45
151.45
146.88
135.25
134.98
134.65
134.40
133.21
131.46
130.60
130.57
129.25
128.95
127.72
127.48
125.63
125.60
125.56
125.52
124.99
122.28
122.15
115.78
44.00
35.60
29.40
21.43
21.01
CF3
O
O
H3C
OH
4ab
CH3
f1 (ppm)

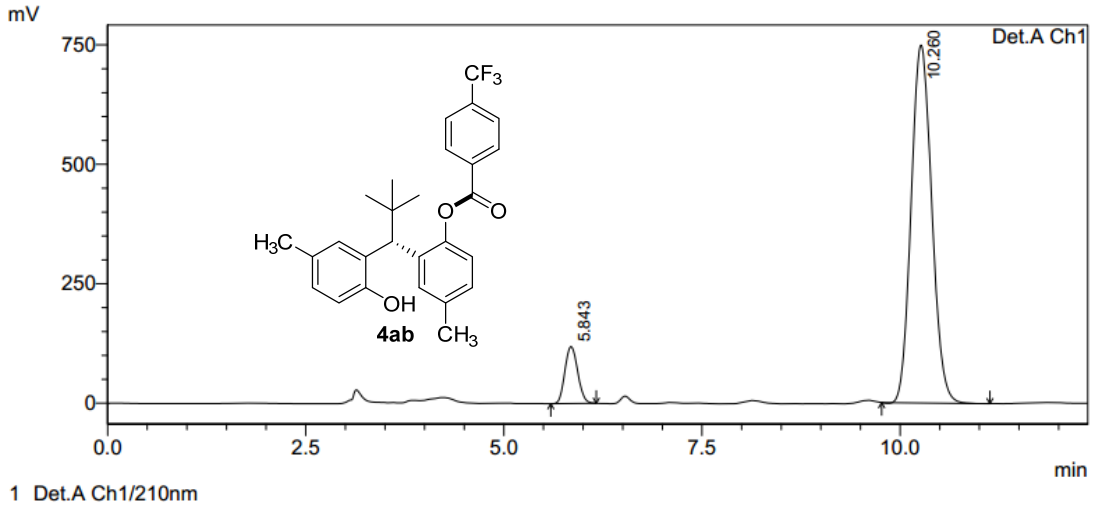


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.818	5097335	420935	49.676	59.772
2	10.231	5163804	283296	50.324	40.228
Total		10261139	704231	100.000	100.000

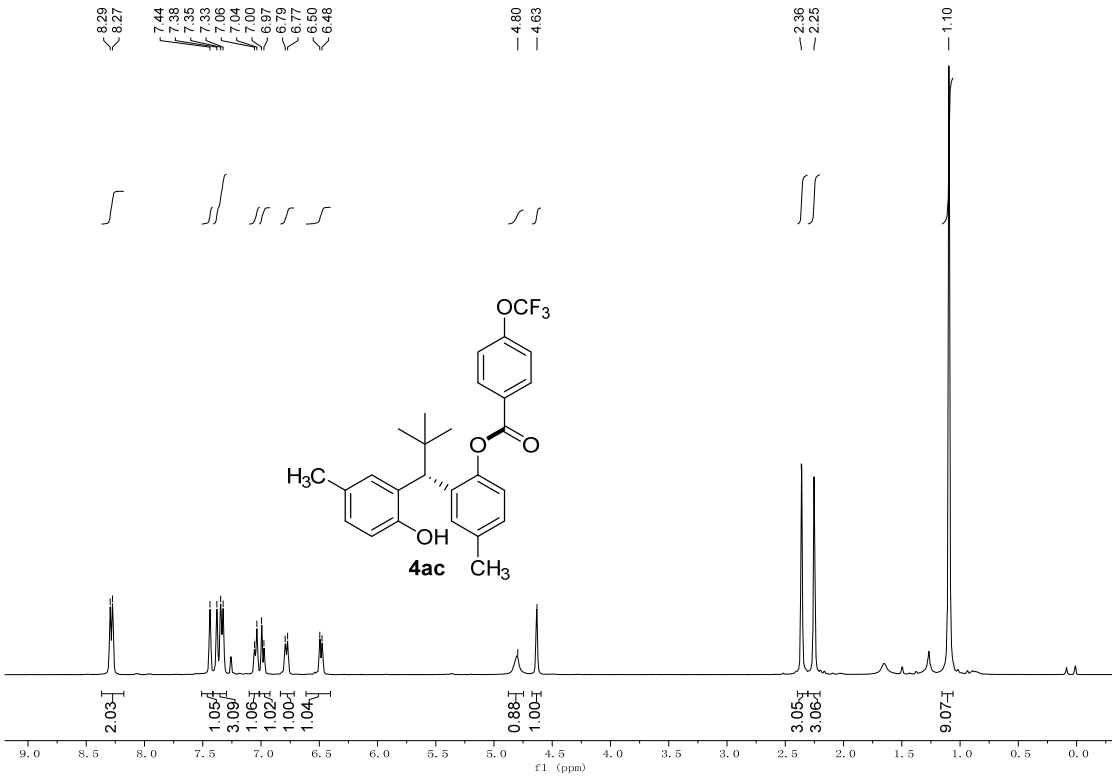


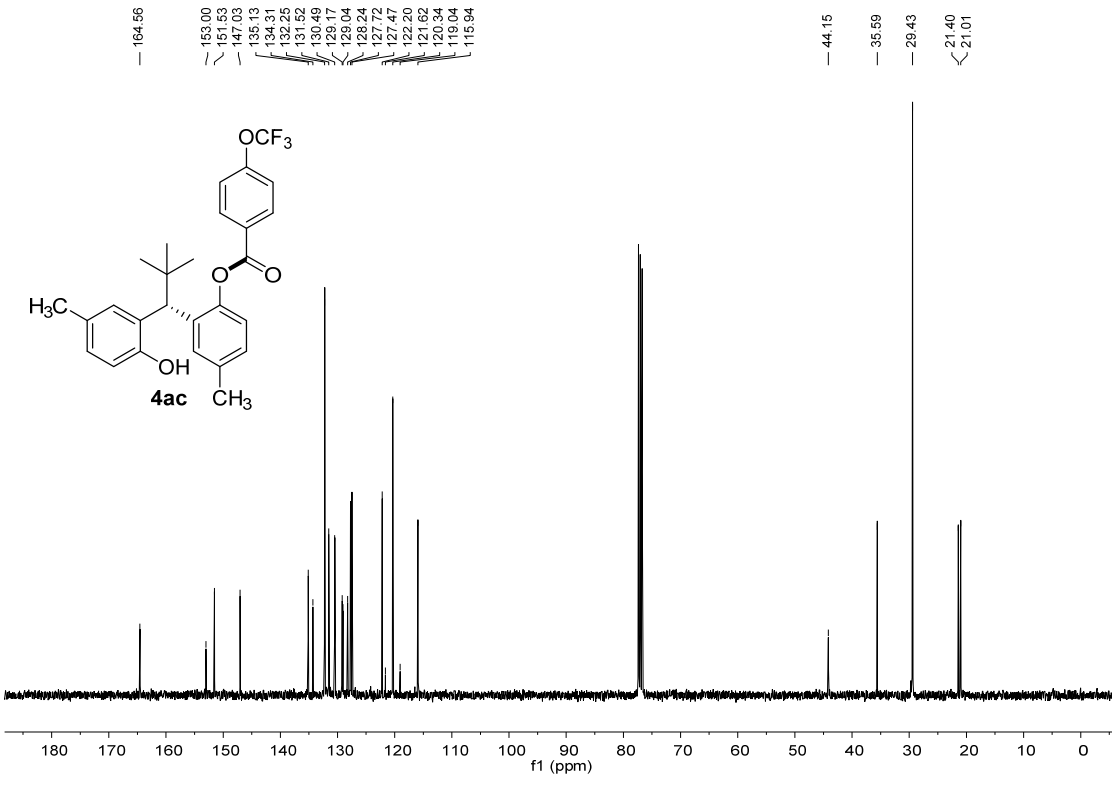
1 Det.A Ch1/210nm

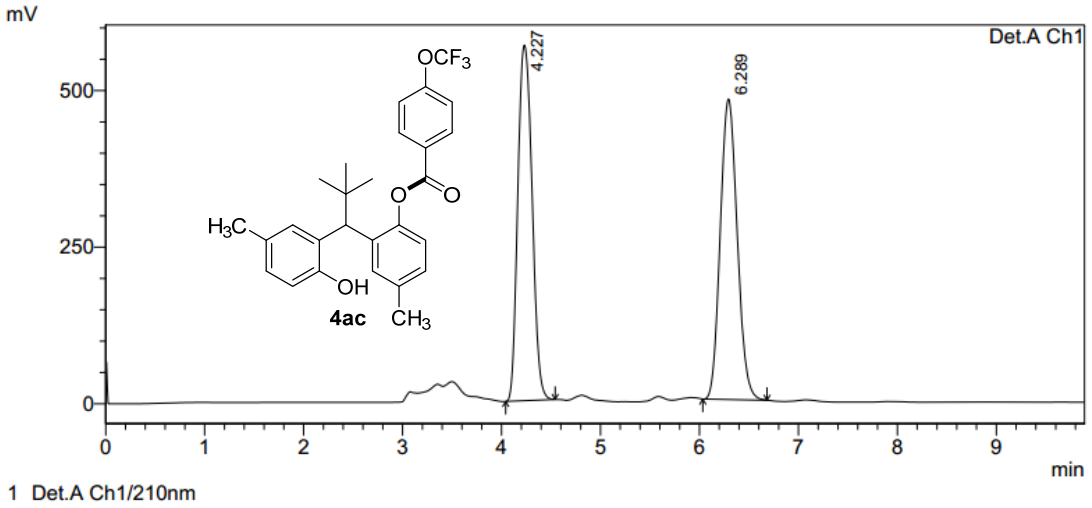
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.843	1338934	118975	8.981	13.704
2	10.260	13569702	749209	91.019	86.296
Total		14908635	868184	100.000	100.000


8.29
8.27
7.44
7.38
7.35
7.33
7.06
7.04
7.00
6.97
6.79
6.77
6.50
6.48
4.80
4.63
2.36
2.25
1.10
OCF3
O
O
H3C
OH
4ac
CH3
2.03
1.05
3.09
1.06
1.02
1.00
1.04
0.88
1.00
3.05
3.06
9.07
f1 (ppm)


164.56
153.00
151.53
147.03
135.13
134.31
132.25
131.52
130.49
129.17
129.04
128.24
127.72
127.47
122.20
121.62
120.34
119.04
115.94
44.15
35.59
29.43
21.40
21.01
OCF3
O
O
H3C
OH
4ac
CH3
f1 (ppm)

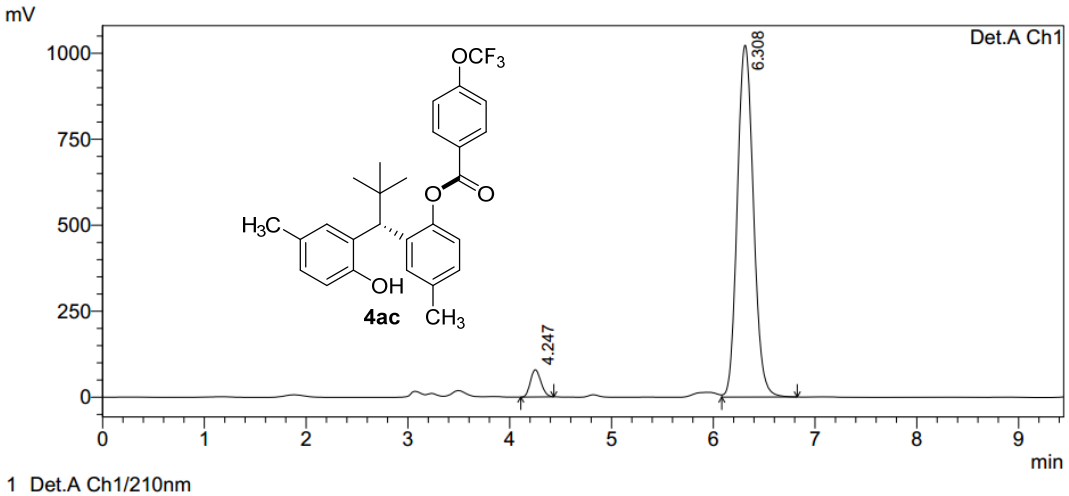


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.227	5687375	567870	49.901	54.190
2	6.289	5709830	480046	50.099	45.810
Total		11397205	1047916	100.000	100.000

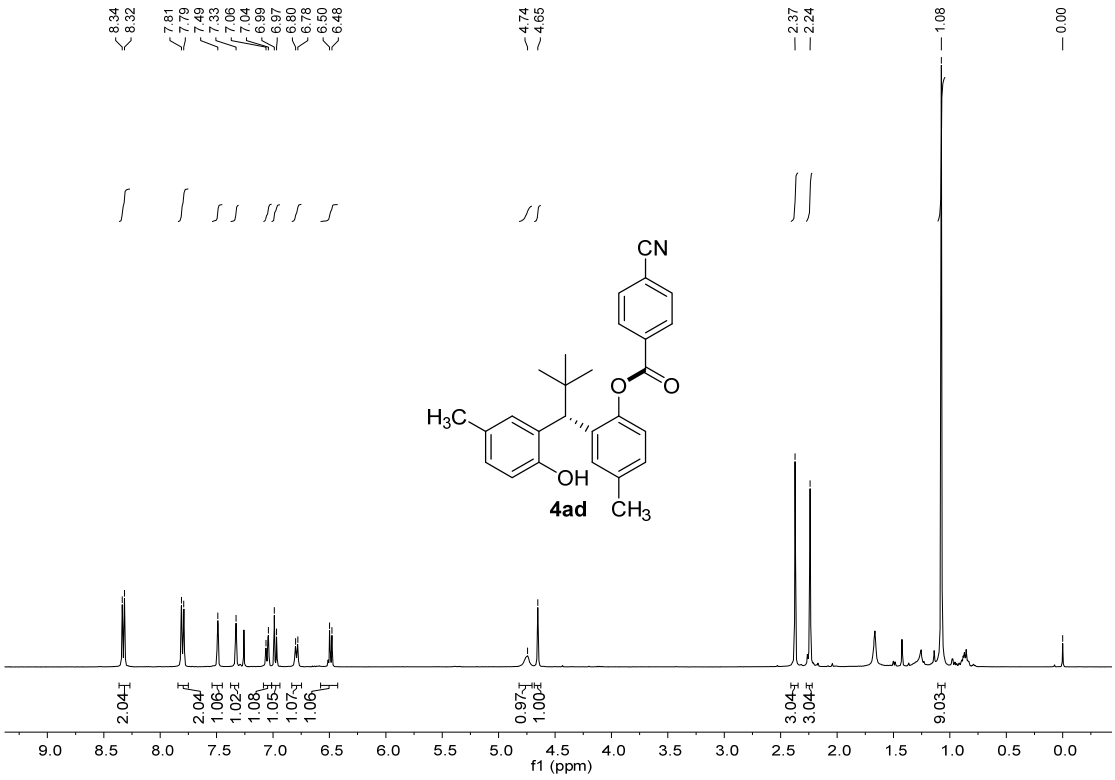


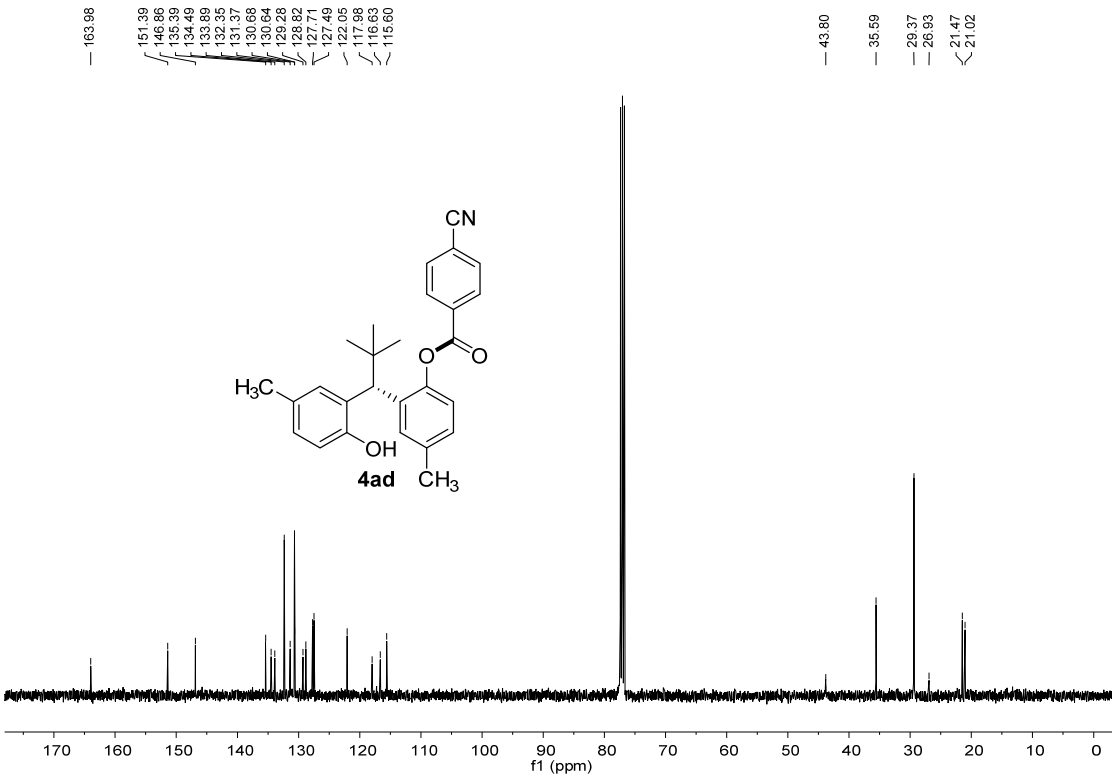
1 Det.A Ch1/210nm

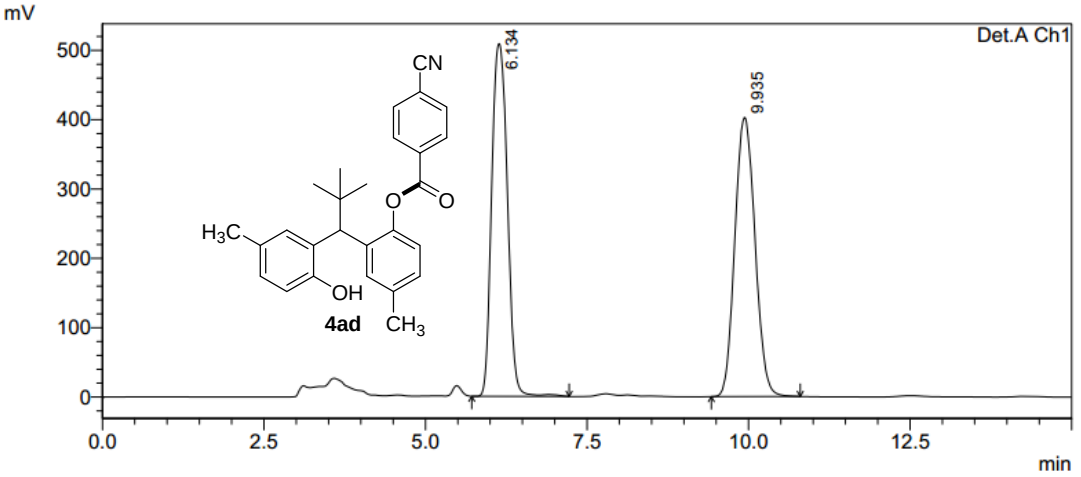
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.247	570163	79149	4.813	7.184
2	6.308	11275316	1022660	95.187	92.816
Total		11845479	1101809	100.000	100.000


8.34
8.32
7.81
7.79
7.49
7.33
7.06
7.04
6.99
6.97
6.80
6.78
6.50
6.48
4.74
4.65
2.37
2.24
1.08
0.00
CN
O
O
H3C
OH
4ad
CH3
2.04
2.04
1.06
1.02
1.08
1.05
1.07
1.06
0.97
1.00
3.04
3.04
9.03
f1 (ppm)


163.98
151.39
146.86
135.39
134.49
133.89
132.35
131.37
130.68
130.64
129.28
128.82
127.71
127.49
122.05
117.98
116.63
115.60
43.80
35.59
29.37
26.93
21.47
21.02
CN
O
O
H3C
OH
4ad
CH3
f1 (ppm)

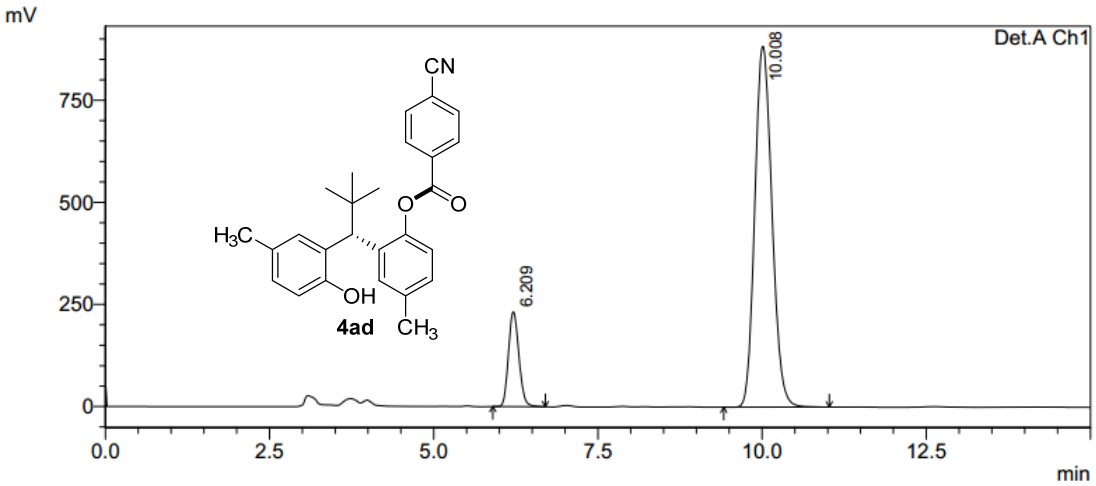


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.134	8594549	508889	49.594	55.822
2	9.935	8735348	402736	50.406	44.178
Total		17329896	911625	100.000	100.000

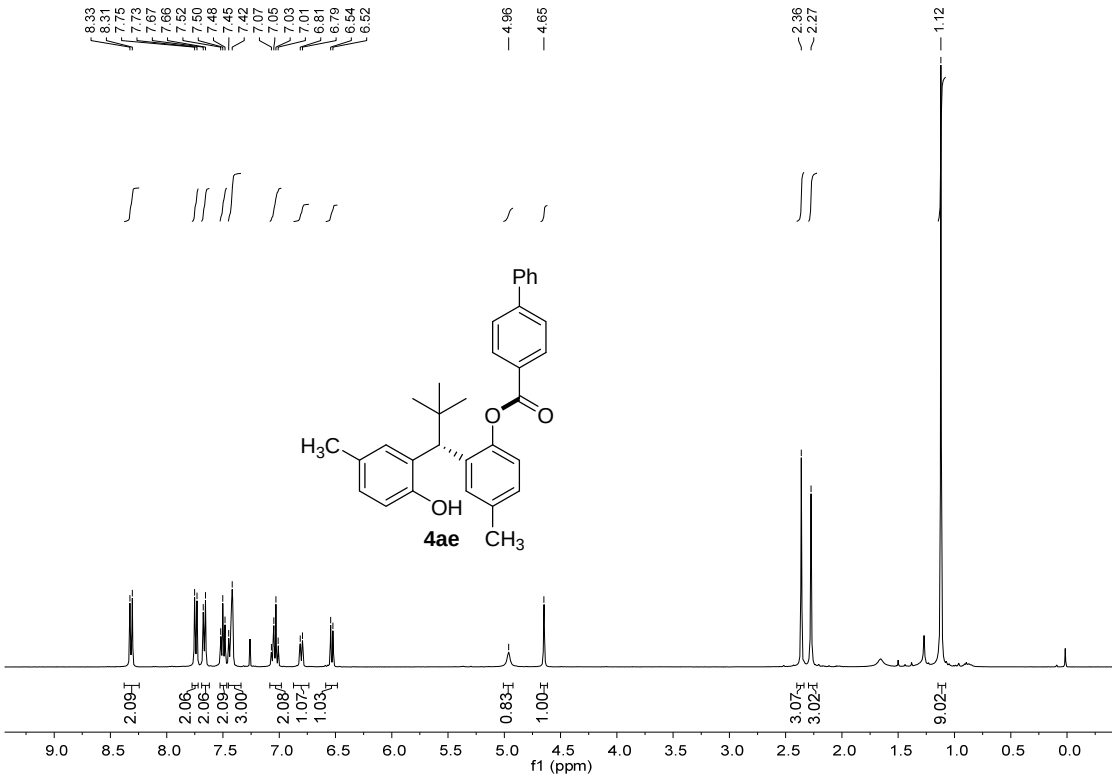


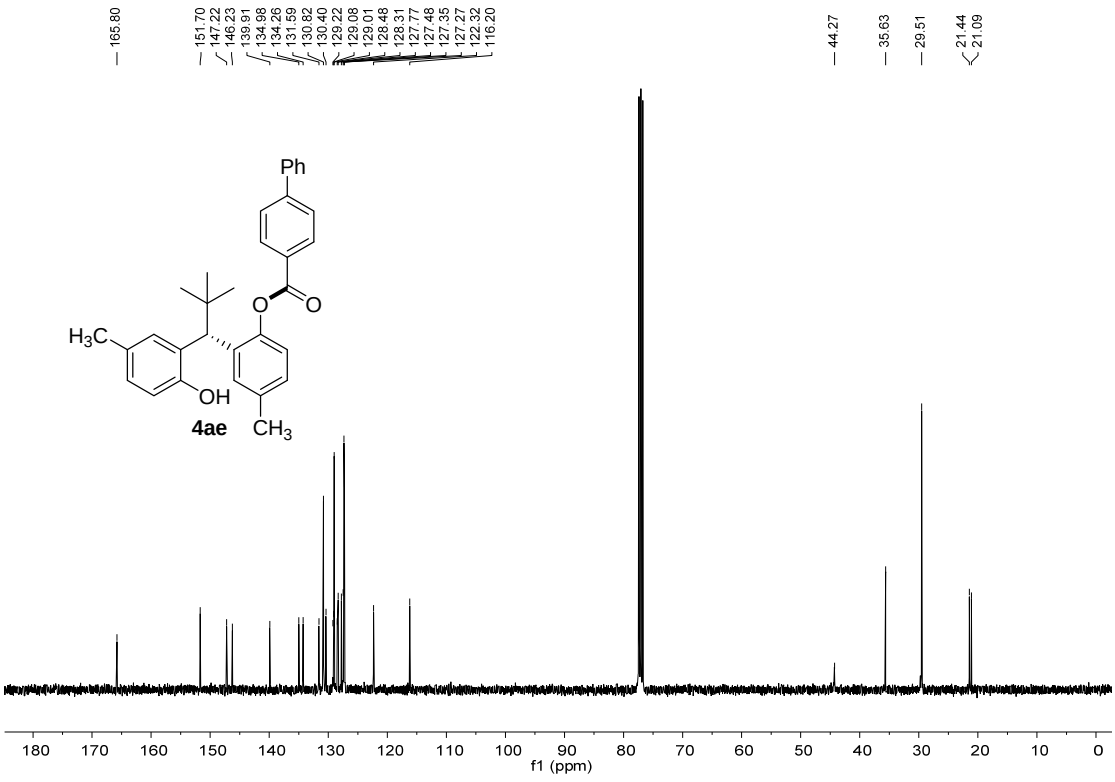
1 Det.A Ch1/210nm

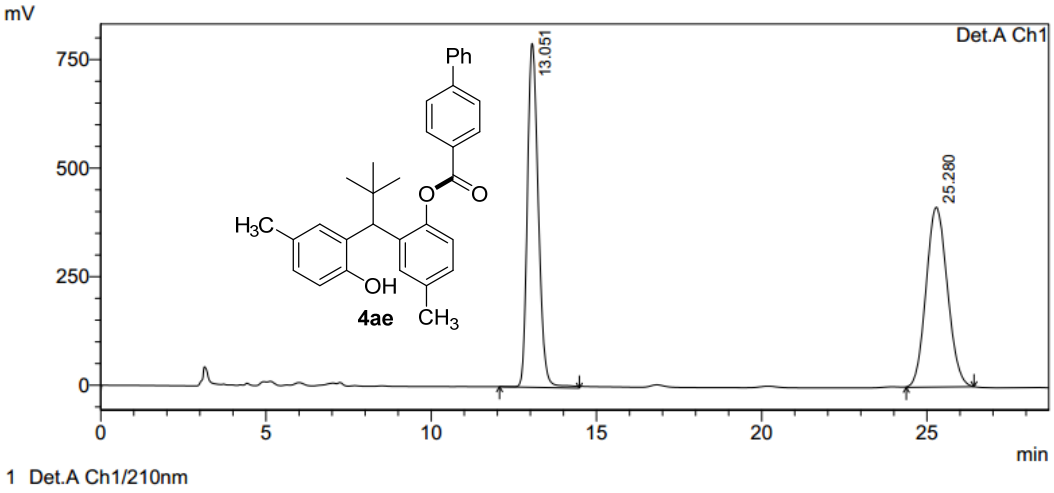
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.209	2565918	231843	13.760	20.786
2	10.008	16081818	883559	86.240	79.214
Total		18647736	1115402	100.000	100.000


8.33
8.31
7.75
7.73
7.67
7.66
7.52
7.50
7.48
7.45
7.42
7.07
7.05
7.03
7.01
6.81
6.79
6.54
6.52
4.96
4.65
2.36
2.27
1.12
Ph
O
O
H3C
OH
4ae
CH3
2.09
2.06
2.06
2.09
3.00
2.08
1.07
1.03
0.83
1.00
3.07
3.02
9.02
f1 (ppm)


165.80
151.70
147.22
146.23
139.91
134.98
134.26
131.59
130.82
130.40
129.22
129.08
129.01
128.48
128.31
127.77
127.48
127.35
127.27
122.32
116.20
44.27
35.63
29.51
21.44
21.09
Ph
O
O
H3C
OH
4ae
CH3
f1 (ppm)

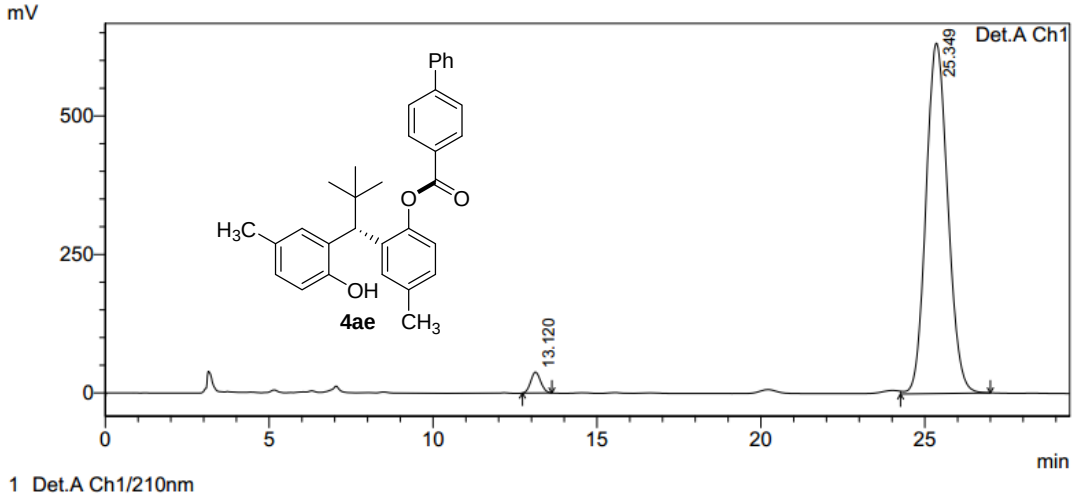


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.051	18281942	792041	49.618	65.663
2	25.280	18563579	414177	50.382	34.337
Total		36845521	1206218	100.000	100.000

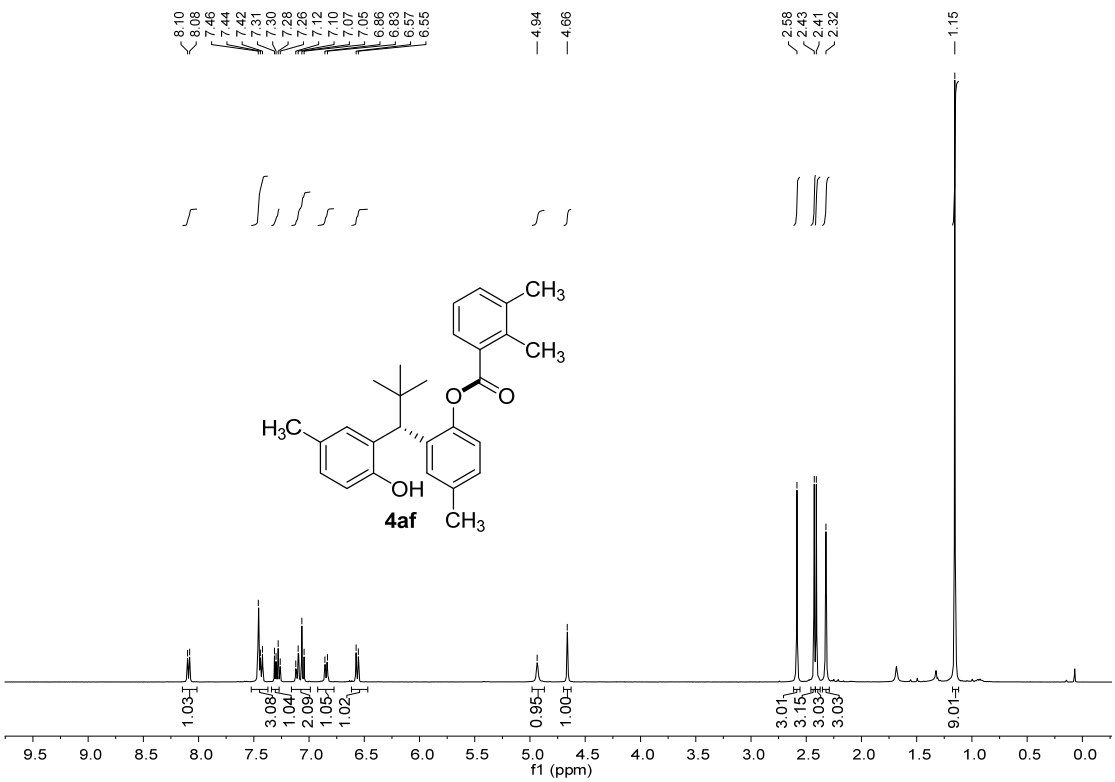


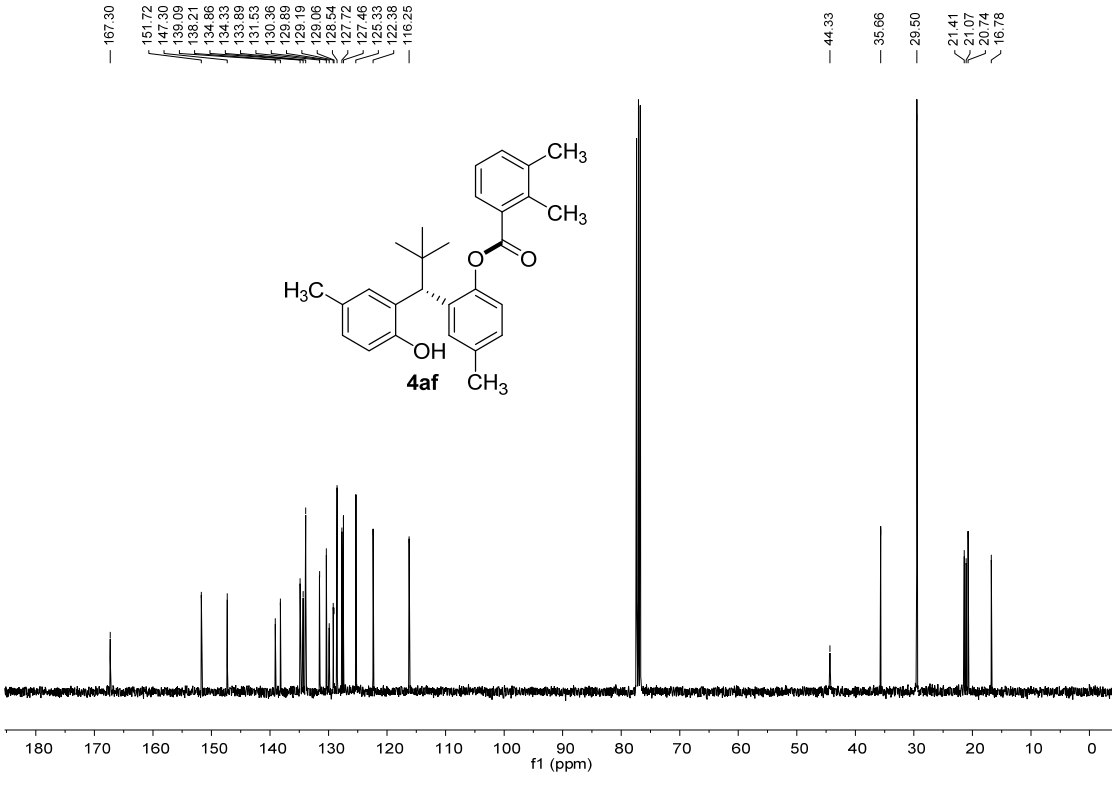
1 Det.A Ch1/210nm

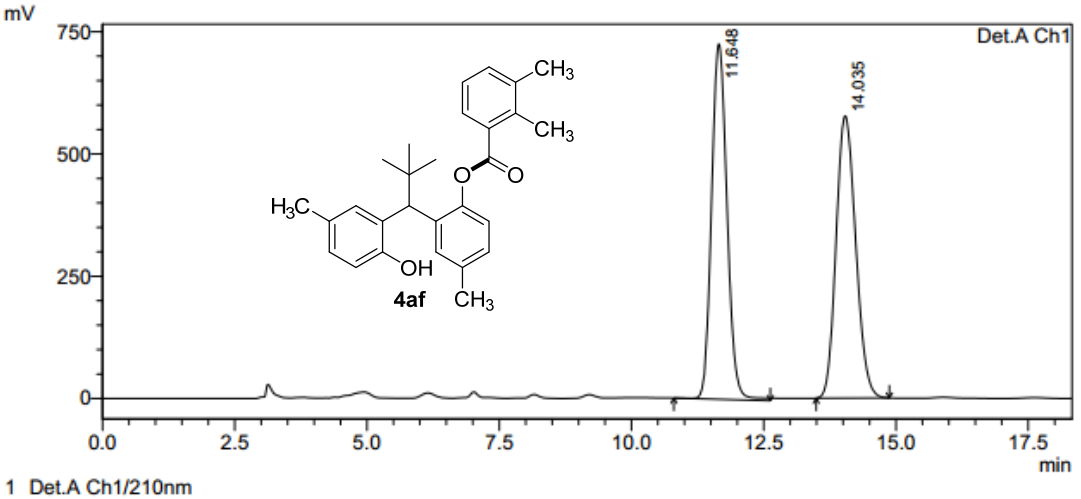
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.120	803183	37611	2.679	5.614
2	25.349	29182261	632382	97.321	94.386
Total		29985444	669993	100.000	100.000


8.10
8.08
7.46
7.44
7.42
7.31
7.30
7.28
7.26
7.12
7.10
7.07
7.05
6.86
6.83
6.57
6.55
4.94
4.66
2.58
2.43
2.41
2.32
1.15
CH3
CH3
O
O
H3C
OH
4af
CH3
1.03
3.08
1.04
2.09
1.05
1.02
0.95
1.00
3.01
3.15
3.03
3.03
9.01
9.5 9.0 8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


167.30
151.72
147.30
139.09
138.21
134.86
134.33
133.89
131.53
130.36
129.89
129.19
129.06
128.54
127.72
127.46
125.33
122.38
116.25
44.33
35.66
29.50
21.41
21.07
20.74
16.78
CH3
CH3
O
O
H3C
OH
4af
CH3
180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

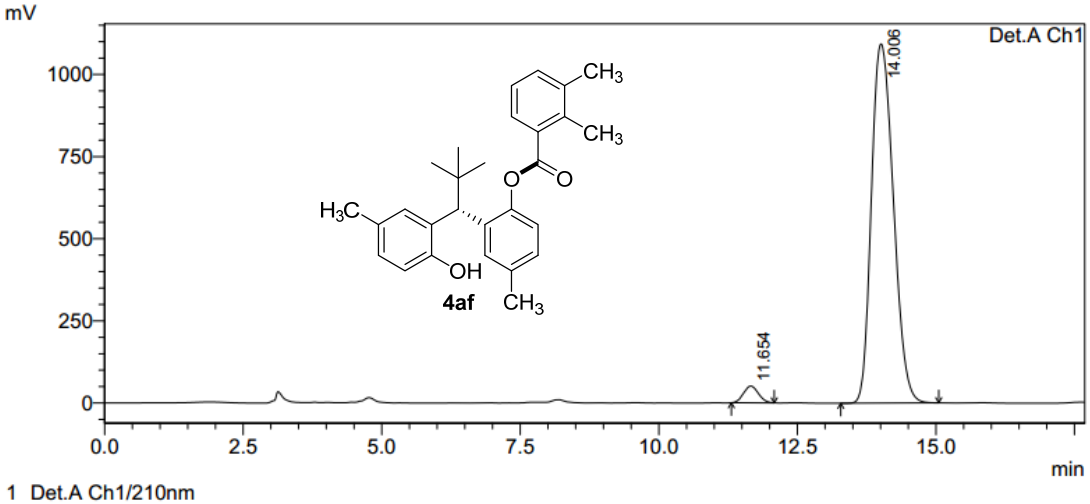


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	11.648	14810628	726477	49.896	55.736
2	14.035	14872660	576959	50.104	44.264
Total		29683287	1303436	100.000	100.000

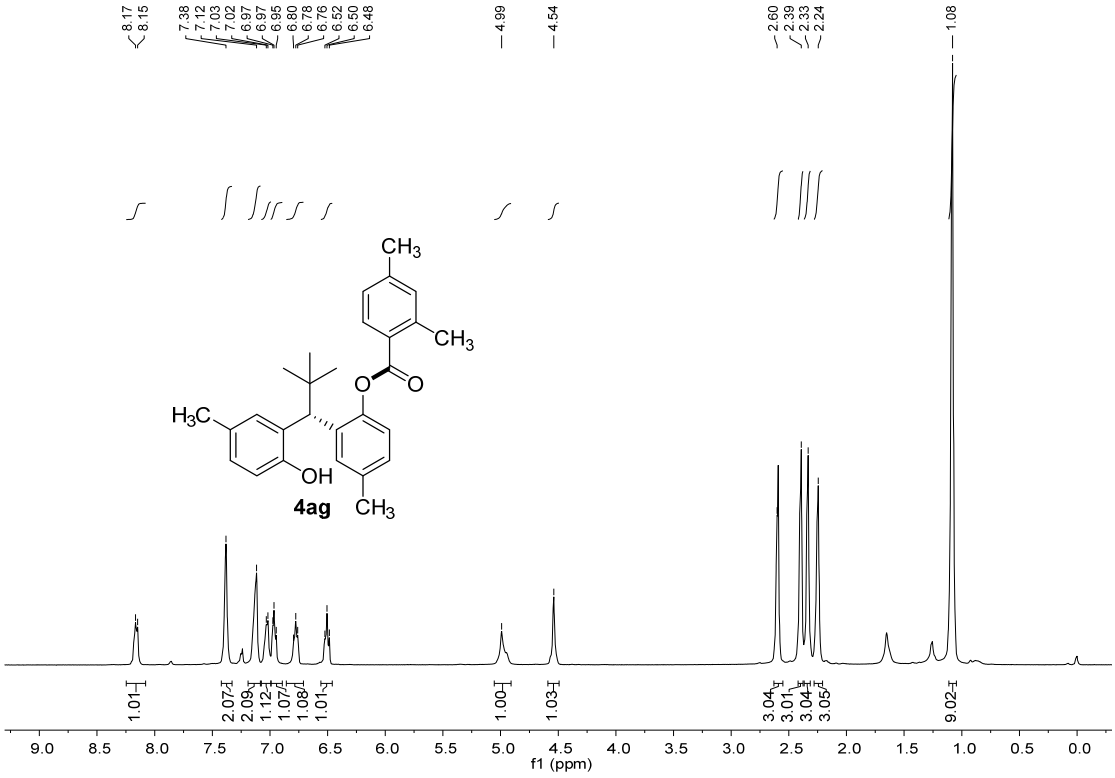


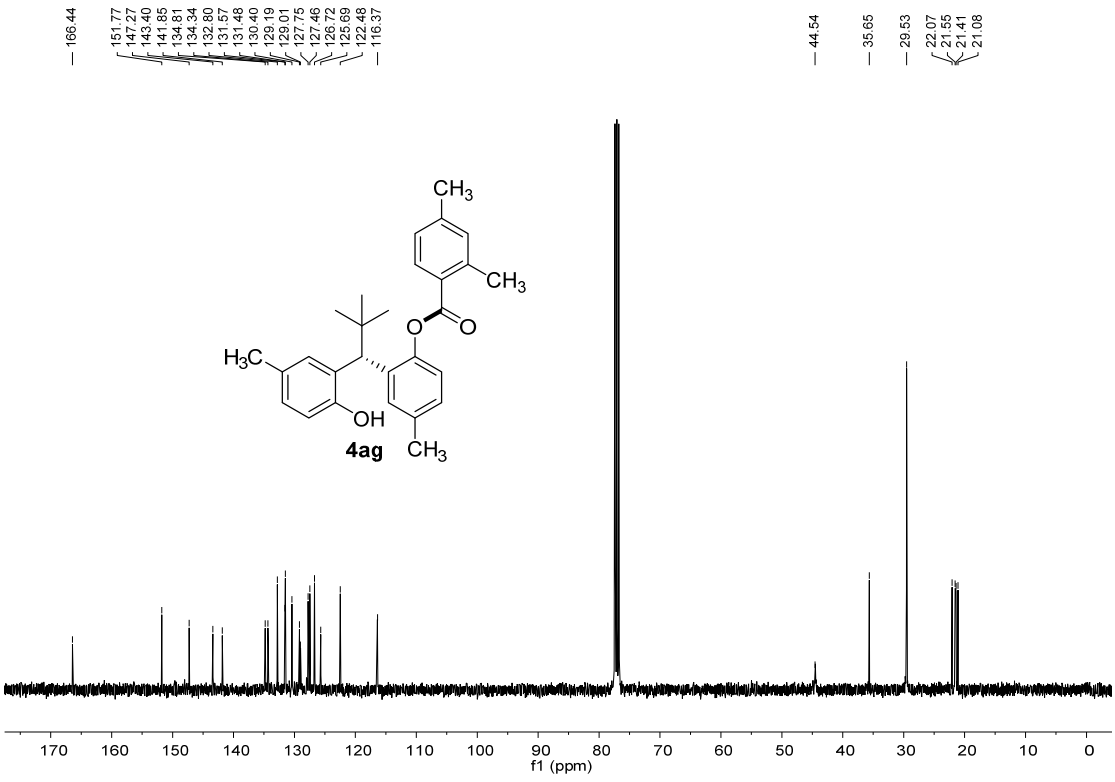
1 Det.A Ch1/210nm

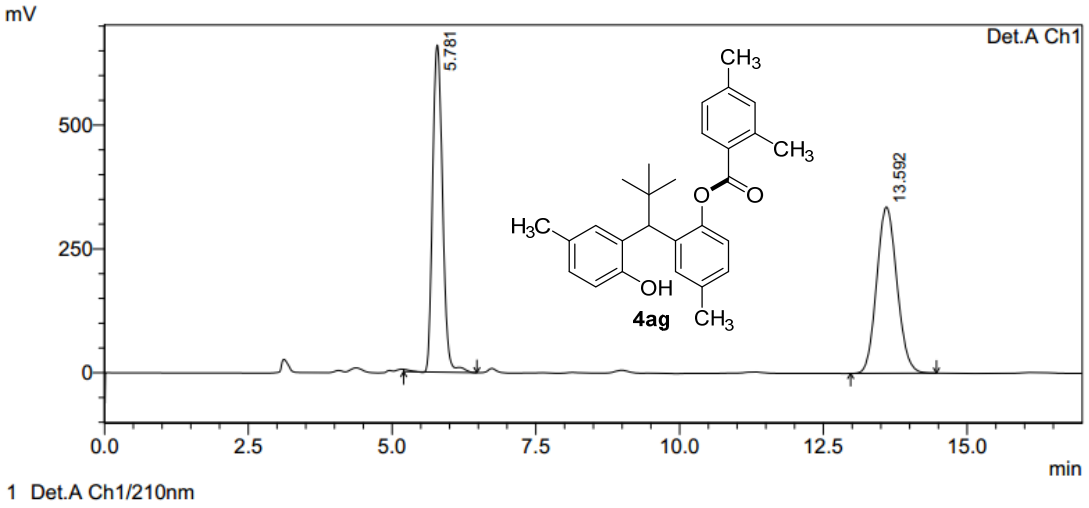
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	11.654	950522	50956	3.051	4.453
2	14.006	30203868	1093466	96.949	95.547
Total		31154390	1144422	100.000	100.000


8.17
8.15
7.38
7.12
7.03
7.02
6.97
6.97
6.95
6.80
6.78
6.76
6.52
6.50
6.48
4.99
4.54
2.60
2.39
2.33
2.24
1.08
CH3
CH3
O
O
H3C
OH
4ag
CH3
1.01
2.07
2.09
1.12
1.07
1.08
1.01
1.00
1.03
3.04
3.01
3.04
3.05
9.02
f1 (ppm)


166.44
151.77
147.27
143.40
141.85
134.81
134.34
132.80
131.57
131.48
130.40
129.19
129.01
127.75
127.46
126.72
125.69
122.48
116.37
44.54
35.65
28.53
22.07
21.55
21.41
21.08
CH3
CH3
O
O
H3C
OH
4ag
CH3
f1 (ppm)

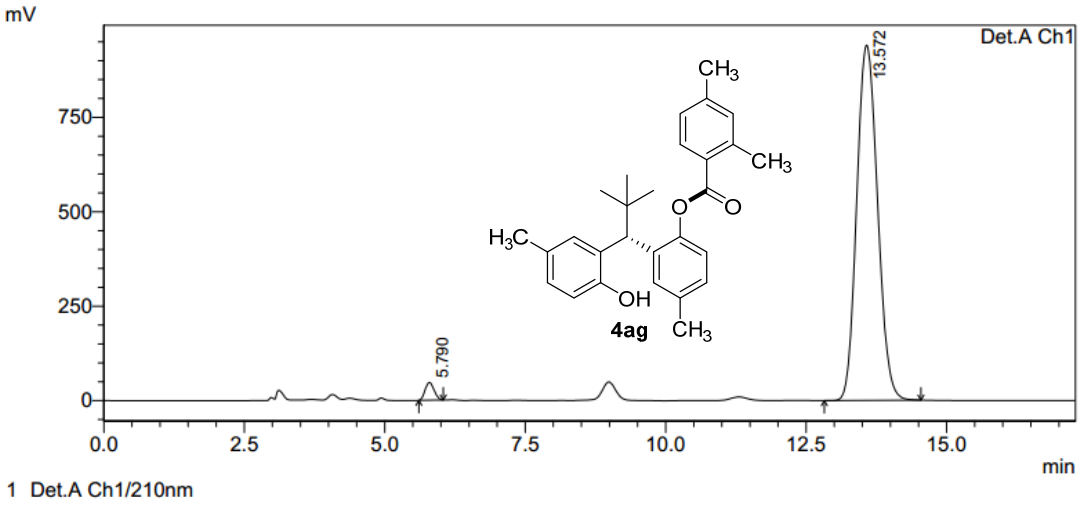


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.781	7973439	660540	49.183	66.293
2	13.592	8238278	335852	50.817	33.707
Total		16211717	996392	100.000	100.000

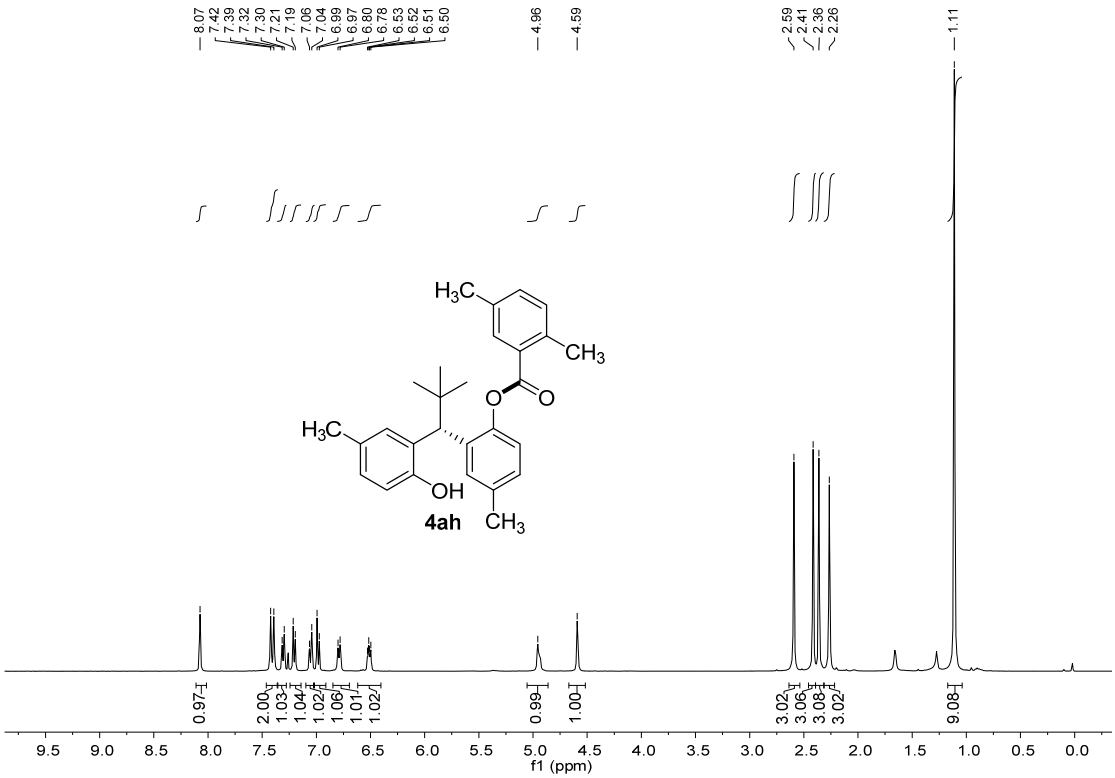


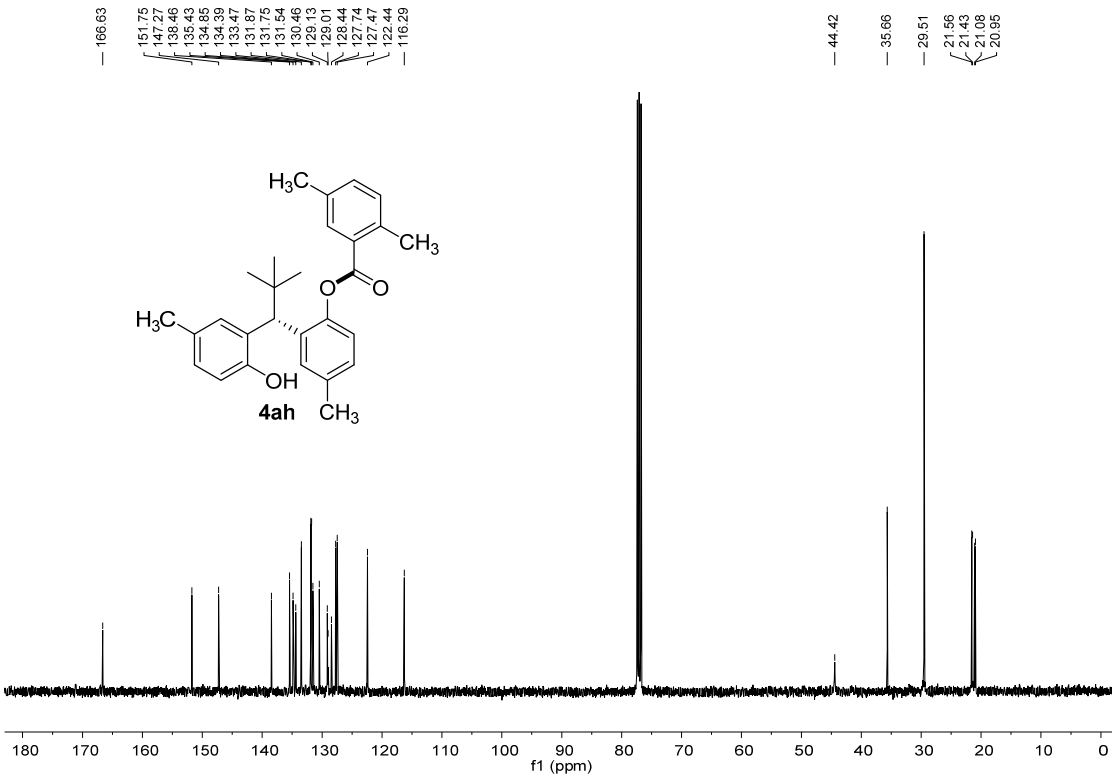
1 Det.A Ch1/210nm

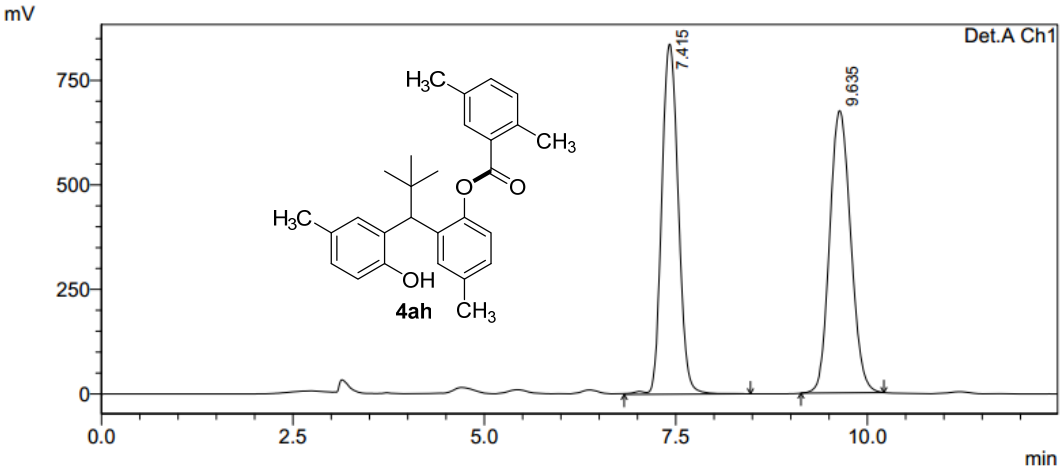
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.790	520704	46808	2.104	4.740
2	13.572	24232644	940648	97.896	95.260
Total		24753347	987456	100.000	100.000


8.07
7.42
7.39
7.32
7.30
7.21
7.19
7.06
7.04
6.99
6.97
6.80
6.78
6.53
6.52
6.51
6.50
4.96
4.59
2.59
2.41
2.36
2.26
1.11
H3C
CH3
O
O
H3C
OH
4ah
CH3
0.97
2.00
1.03
1.04
1.02
1.06
1.01
1.02
0.99
1.00
3.02
3.06
3.08
3.02
9.08
f1 (ppm)


166.63
151.75
147.27
138.46
135.43
134.85
134.39
133.47
131.87
131.75
131.54
130.46
129.13
129.01
128.44
127.74
127.47
122.44
116.29
44.42
35.66
29.51
21.56
21.43
21.08
20.95
H3C
CH3
O
O
H3C
OH
4ah
CH3
f1 (ppm)

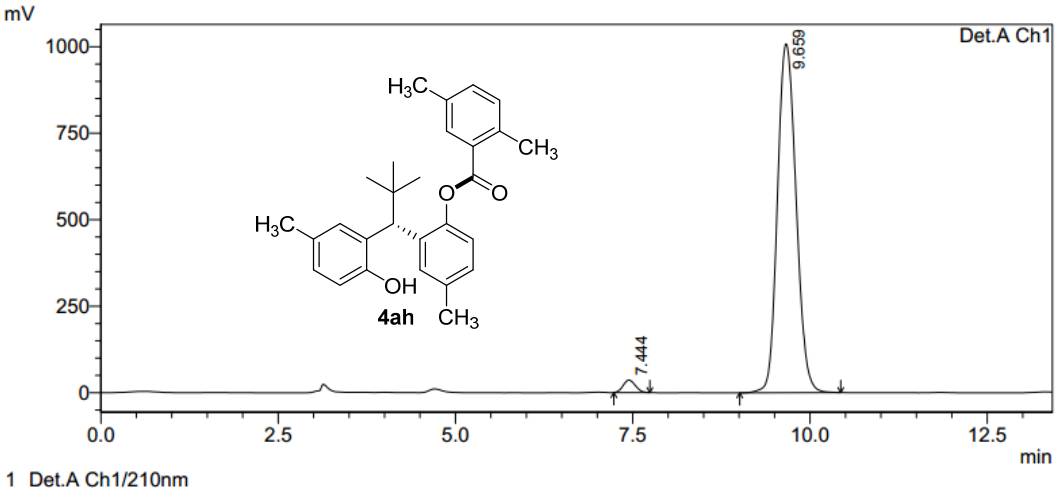


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.415	12587413	837743	49.315	55.365
2	9.635	12937357	675376	50.685	44.635
Total		25524770	1513118	100.000	100.000

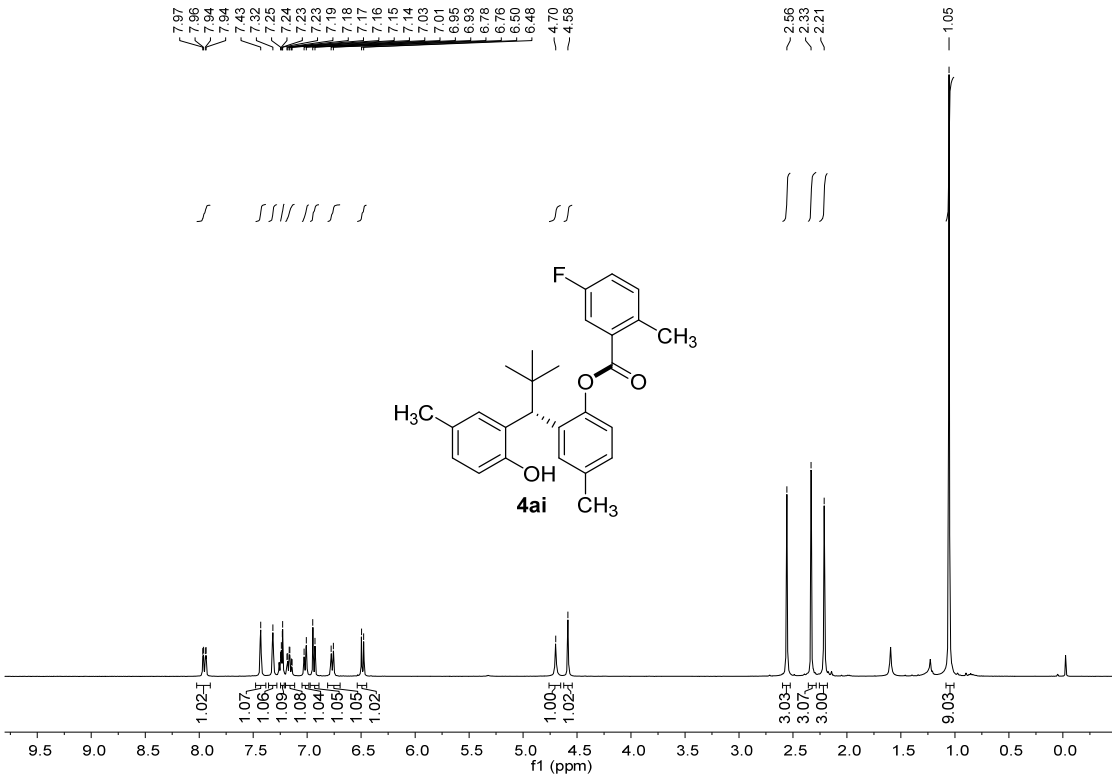


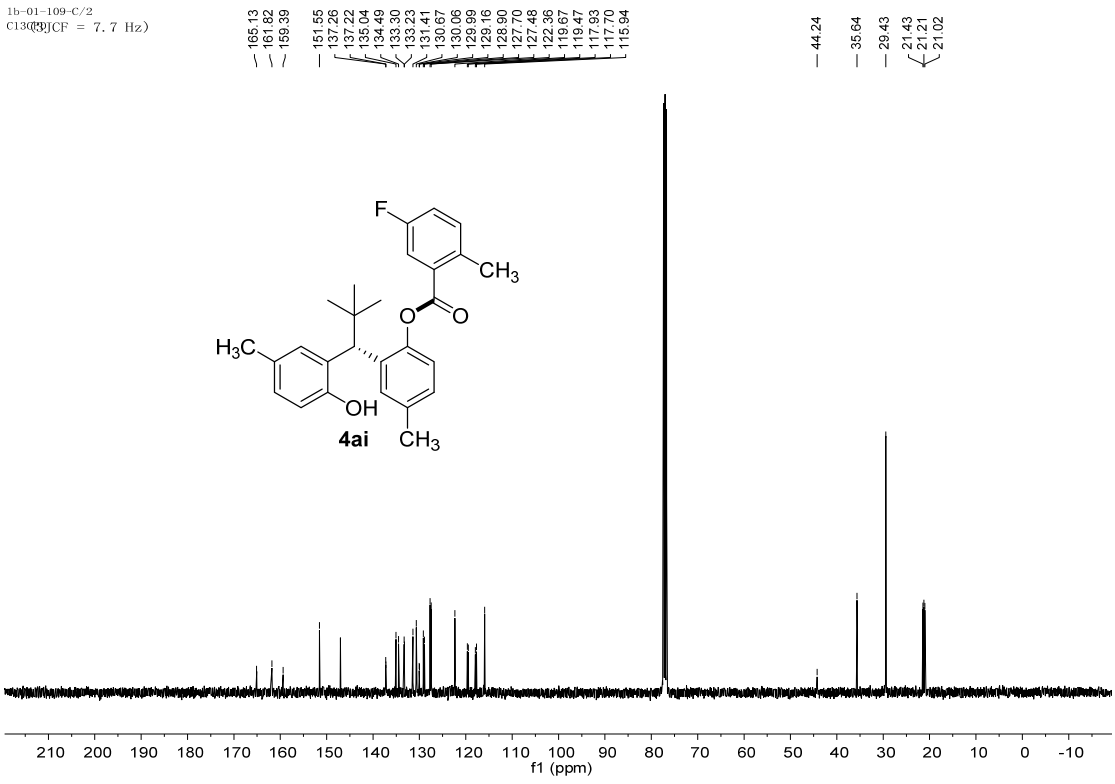
1 Det.A Ch1/210nm

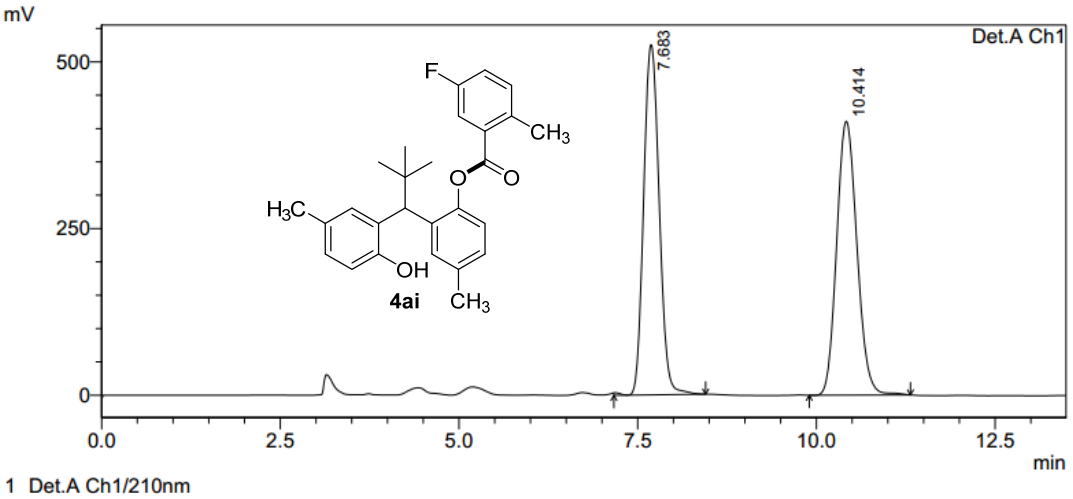
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.444	435161	36132	2.303	3.460
2	9.659	18460841	1008150	97.697	96.540
Total		18896001	1044281	100.000	100.000


7.97
7.96
7.94
7.94
7.43
7.32
7.25
7.24
7.23
7.23
7.19
7.18
7.17
7.16
7.15
7.14
7.03
7.01
6.95
6.93
6.78
6.76
6.50
6.48
4.70
4.58
2.56
2.33
2.21
1.05
F
CH3
O
O
H3C
OH
4ai
CH3
1.02
1.07
1.06
1.09
1.08
1.04
1.05
1.02
1.00
1.02
3.03
3.07
3.00
9.03
f1 (ppm)


1b-01-109-C/2
C13(CDCl3, JCF = 7.7 Hz)
165.13
161.82
159.39
151.55
137.26
137.22
135.04
134.49
133.30
133.23
131.41
130.67
130.06
129.99
129.16
128.90
127.70
127.48
122.36
119.67
119.47
117.93
117.70
115.94
44.24
35.64
29.43
21.43
21.21
21.02
F
CH3
O
O
H3C
OH
4ai
CH3
f1 (ppm)

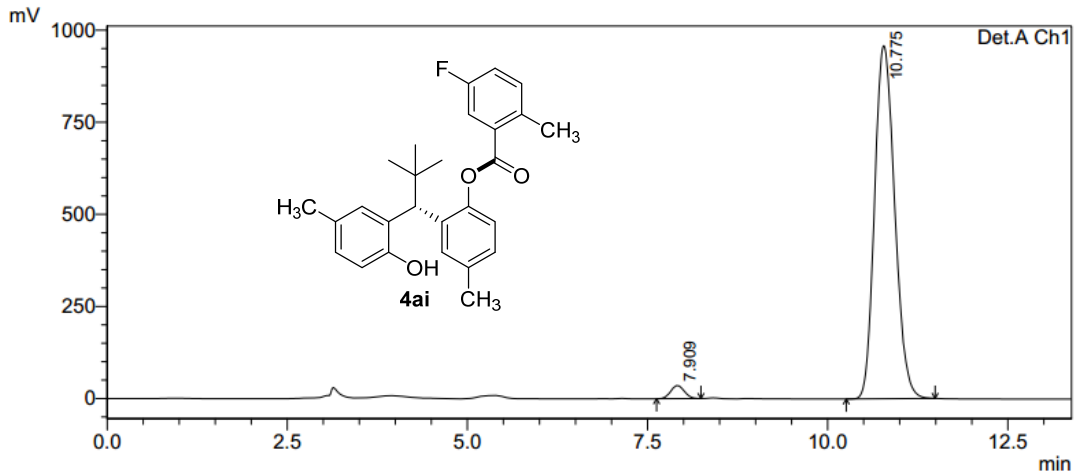


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.683	7969292	525115	49.580	56.103
2	10.414	8104290	410870	50.420	43.897
Total		16073583	935985	100.000	100.000

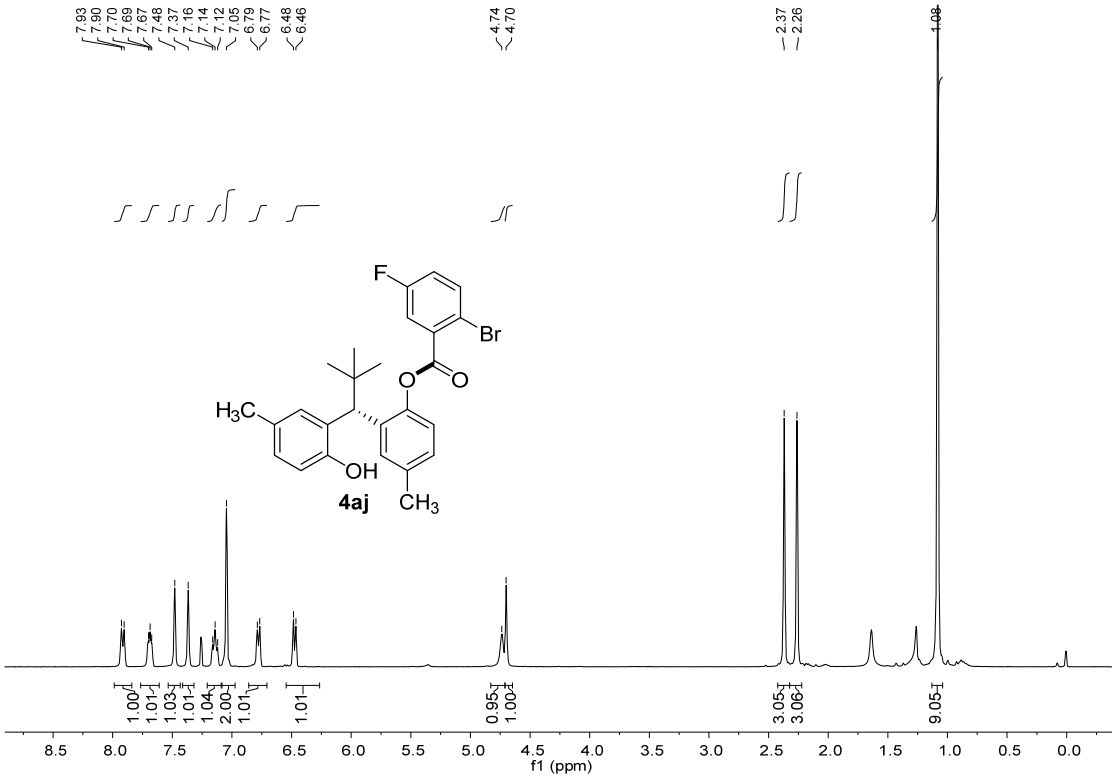


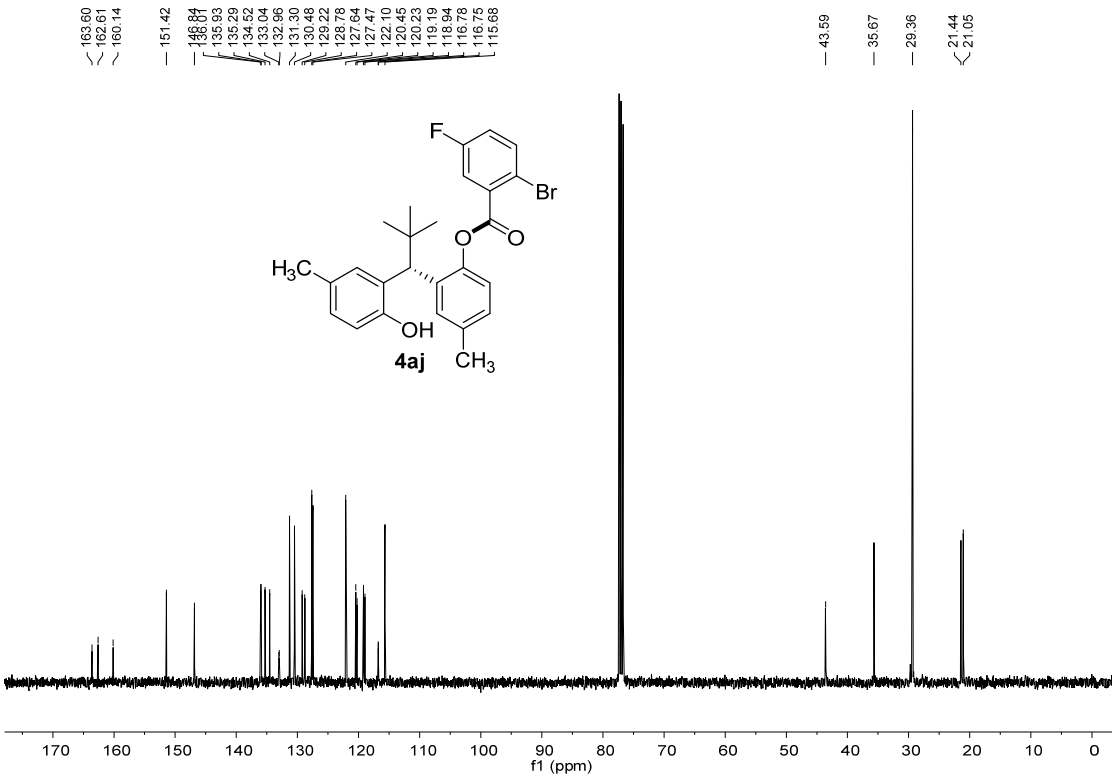
1 Det.A Ch1/210nm

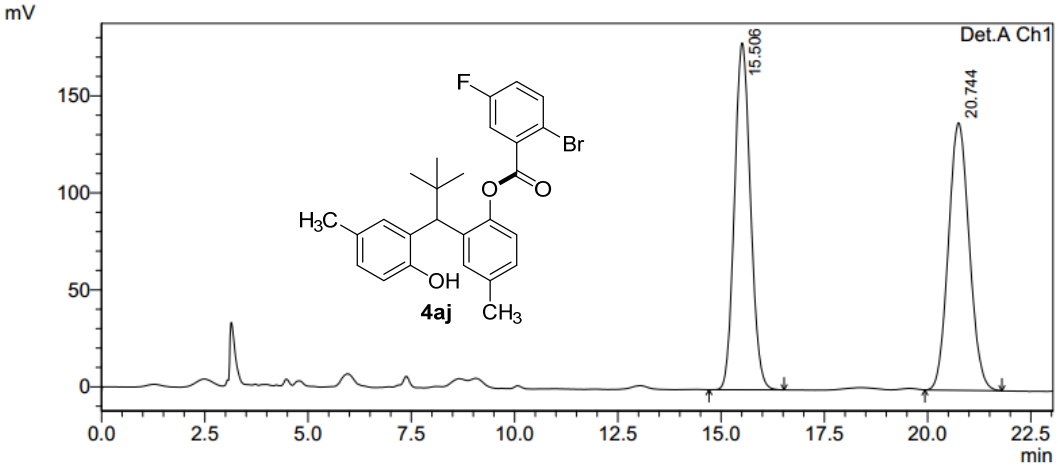
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.909	473074	35714	2.477	3.593
2	10.775	18625360	958270	97.523	96.407
Total		19098434	993984	100.000	100.000


7.93
7.90
7.70
7.69
7.67
7.48
7.37
7.16
7.14
7.12
7.05
6.79
6.77
6.48
6.46
4.74
4.70
2.37
2.26
1.08
F
Br
O
O
H3C
OH
4aj
CH3
1.00
1.01
1.03
1.01
1.04
2.00
1.01
1.01
0.95
1.00
3.05
3.06
9.05
f1 (ppm)


163.60
162.61
160.14
151.42
146.84
136.01
135.93
135.29
134.52
133.04
132.96
131.30
130.48
129.22
128.78
127.64
127.47
122.10
120.45
120.23
119.19
118.94
116.78
116.75
115.68
43.59
35.67
29.36
21.44
21.05
F
Br
O
O
H3C
OH
4aj
CH3
f1 (ppm)

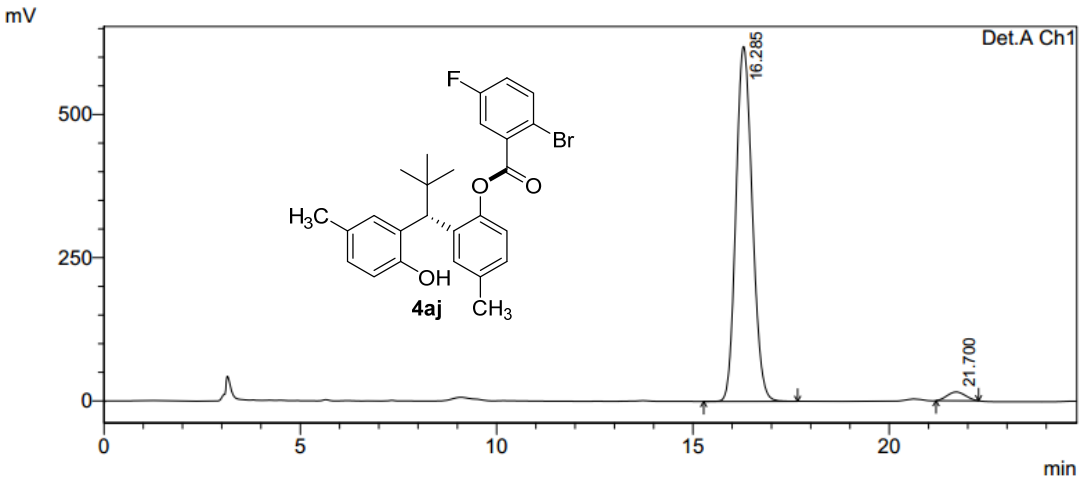


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	15.506	4827788	178855	49.963	56.464
2	20.744	4834974	137902	50.037	43.536
Total		9662762	316756	100.000	100.000

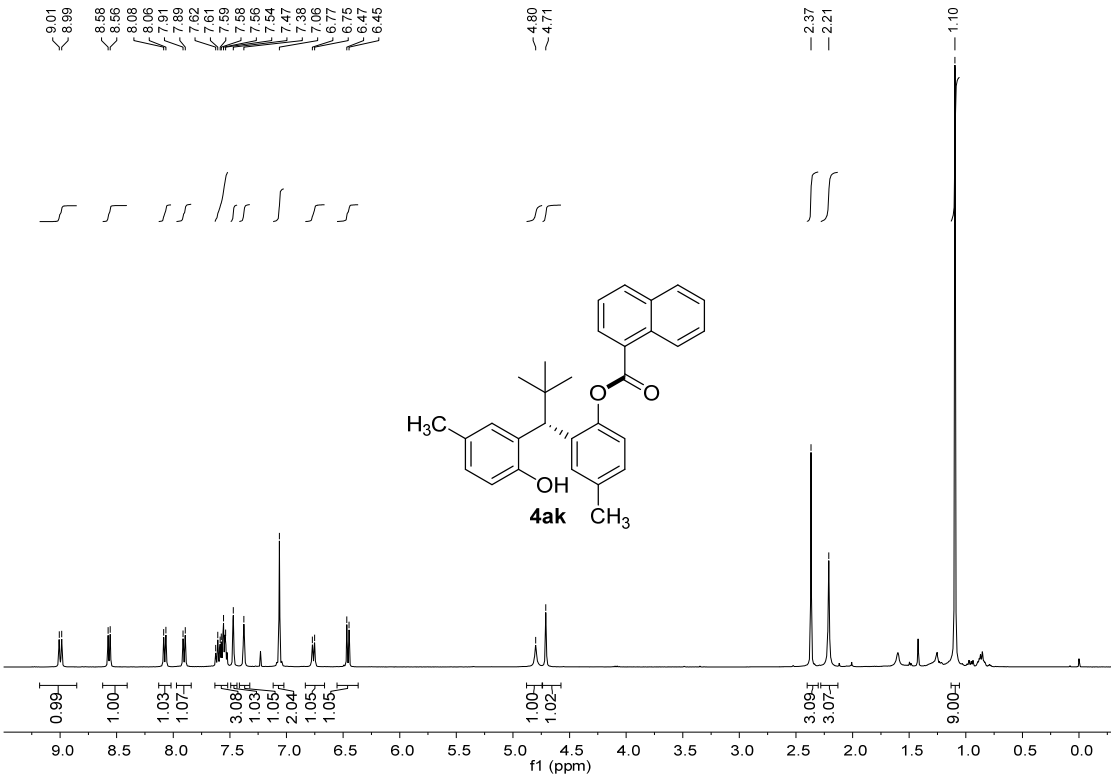


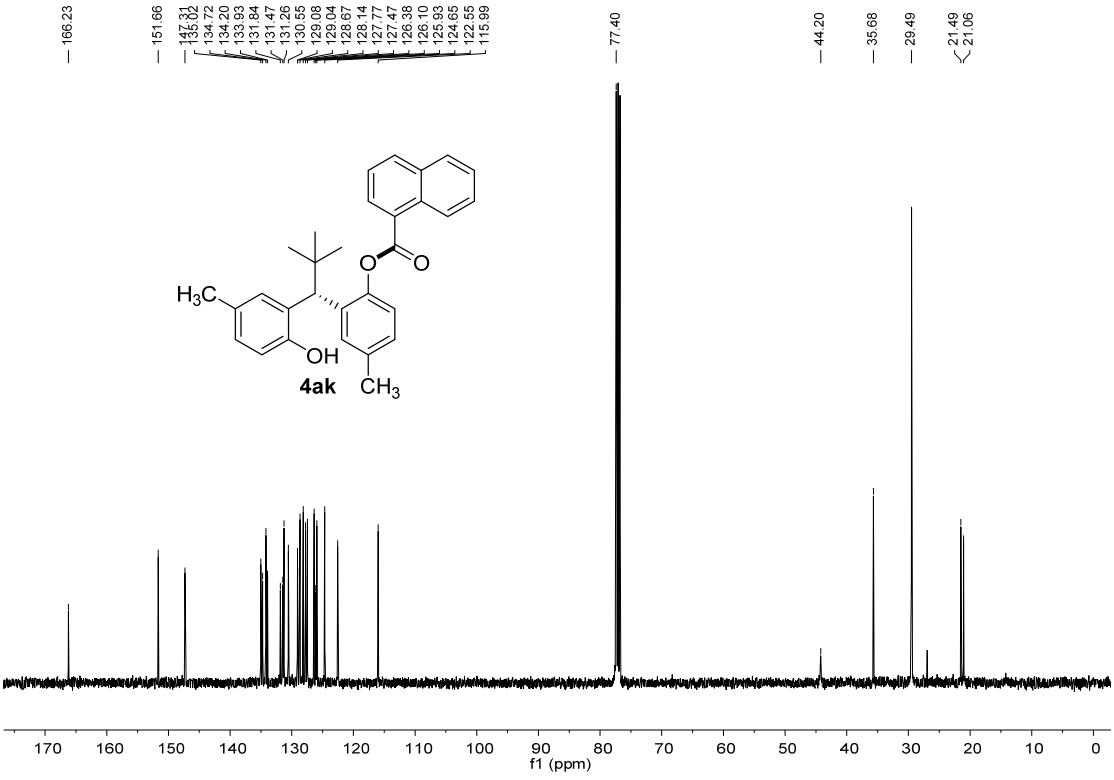
1 Det.A Ch1/210nm

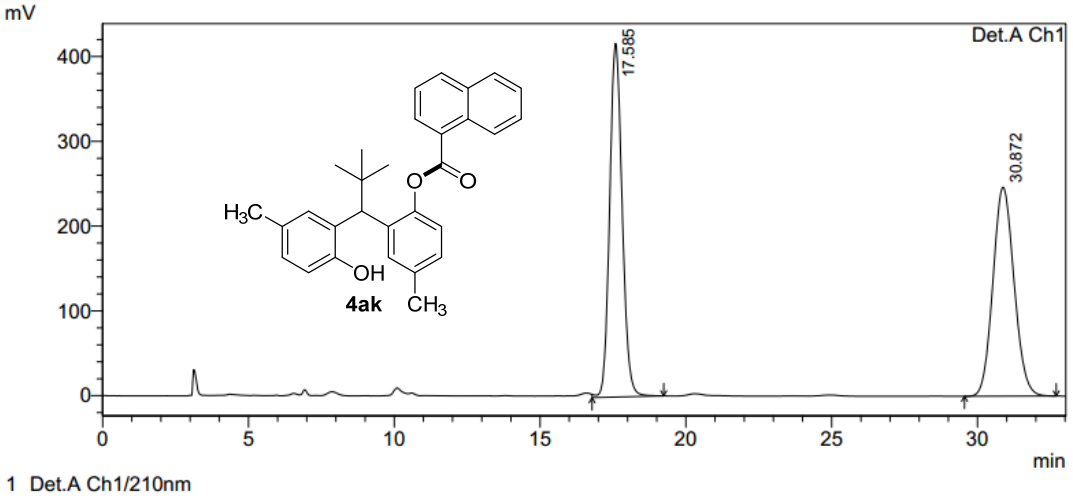
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	16.285	17905507	619634	97.327	97.605
2	21.700	491843	15203	2.673	2.395
Total		18397350	634836	100.000	100.000


9.01
8.99
8.58
8.56
8.08
8.06
7.91
7.89
7.62
7.61
7.59
7.58
7.56
7.54
7.47
7.38
7.06
6.77
6.75
6.47
6.45
4.80
4.71
2.37
2.21
1.10
H3C
O
O
OH
4ak
CH3
0.99
1.00
1.03
1.07
3.08
1.03
1.05
2.04
1.05
1.05
1.00
1.02
3.09
3.07
9.00
f1 (ppm)


166.23
151.66
147.31
135.02
134.72
134.20
133.93
131.84
131.47
131.26
130.55
129.08
129.04
128.67
128.14
127.77
127.47
126.38
126.10
125.93
124.65
122.55
115.99
77.40
44.20
35.68
29.49
21.49
21.06
H3C
O
O
OH
4ak
CH3
f1 (ppm)

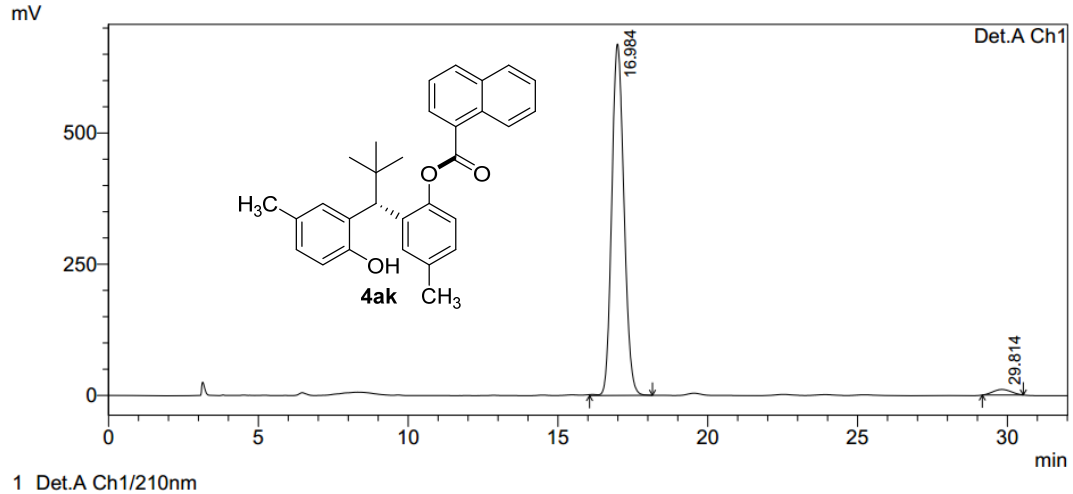


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	17.585	12467026	417243	50.076	62.875
2	30.872	12429428	246369	49.924	37.125
Total		24896454	663612	100.000	100.000

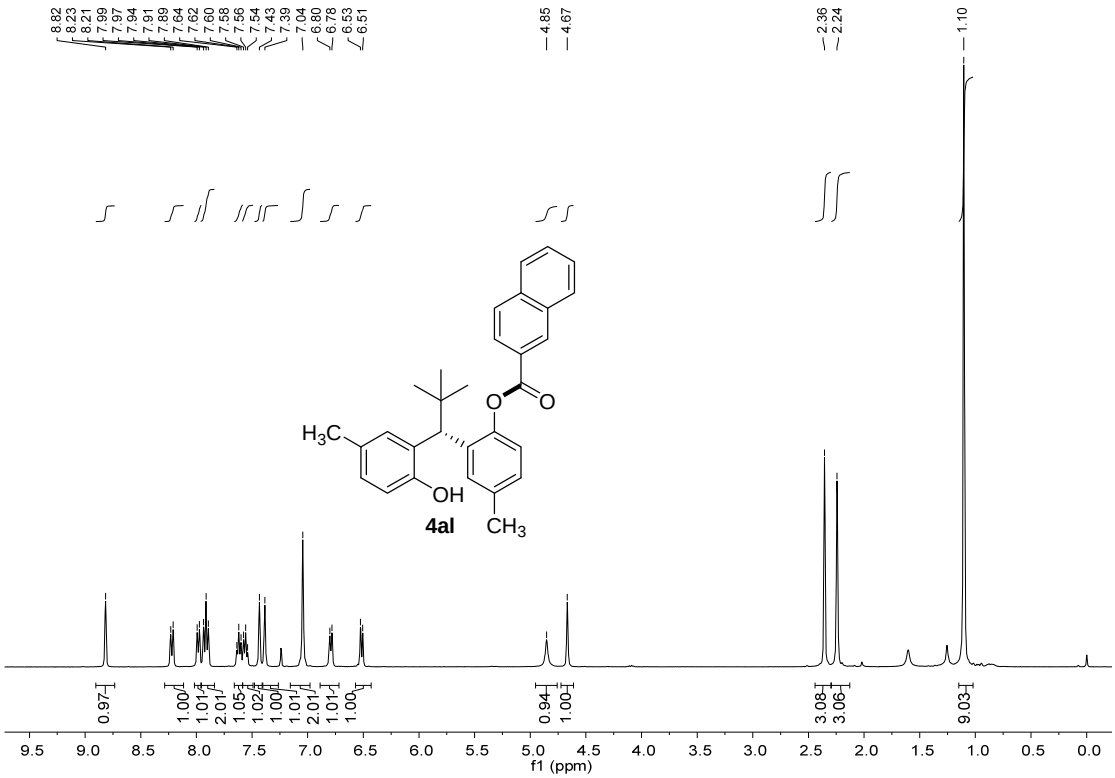


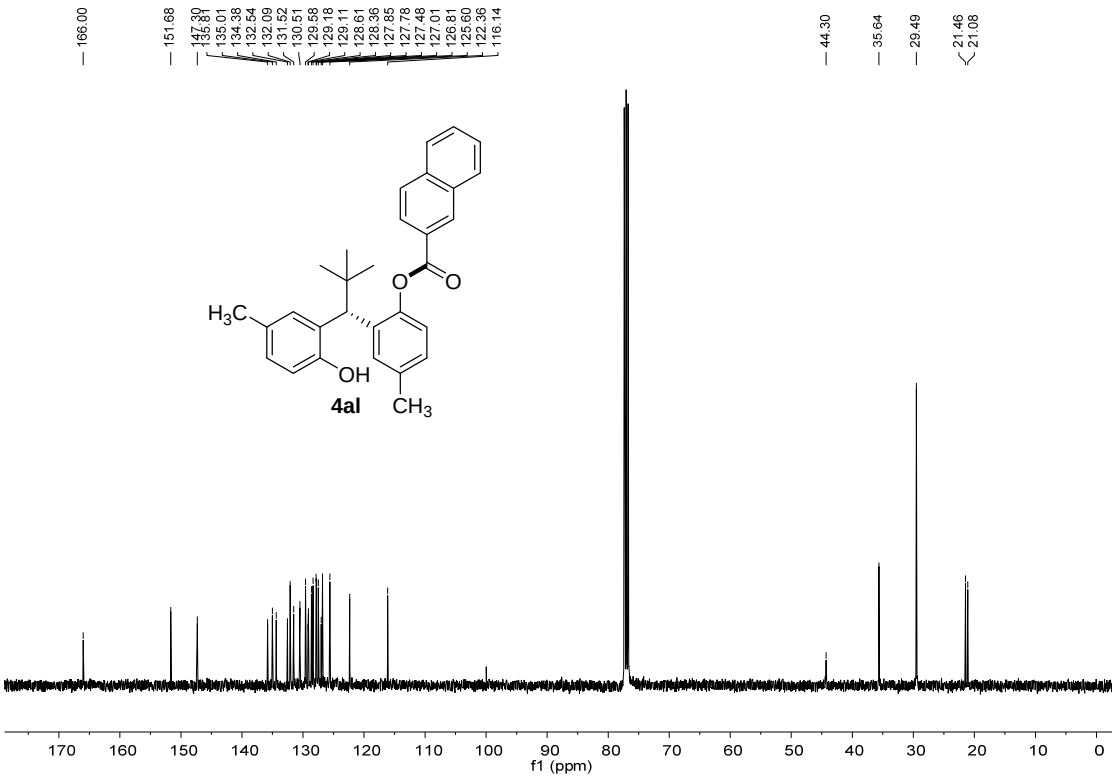
1 Det.A Ch1/210nm

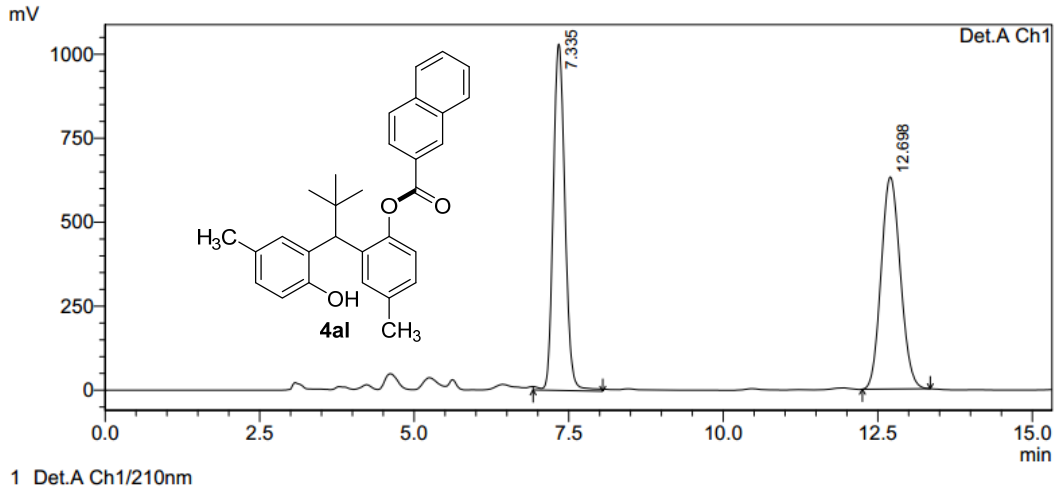
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	16.984	18982089	669521	97.690	98.440
2	29.814	448776	10609	2.310	1.560
Total		19430865	680131	100.000	100.000


8.82
8.23
8.21
7.99
7.97
7.94
7.91
7.89
7.64
7.62
7.60
7.58
7.56
7.54
7.43
7.39
7.04
6.80
6.78
6.53
6.51
4.85
4.67
2.36
2.24
1.10
H3C
OH
O
O
CH3
4al
0.97
1.00
1.01
2.01
1.05
1.02
1.00
1.01
2.01
1.01
1.00
0.94
1.00
3.08
3.06
9.03
f1 (ppm)


166.00
151.68
147.30
135.81
135.01
134.38
132.54
132.09
131.52
130.51
129.58
129.18
129.11
128.61
128.36
127.85
127.78
127.48
127.01
126.81
125.60
122.36
116.14
44.30
35.64
29.49
21.46
21.08
H3C
OH
O
O
CH3
4al
f1 (ppm)

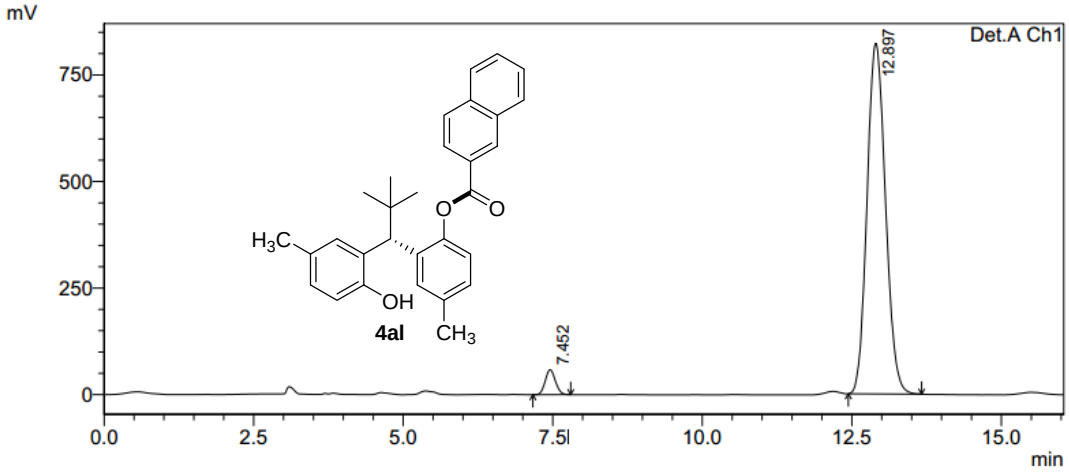


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.335	13569808	1030958	49.841	62.021
2	12.698	13656129	631324	50.159	37.979
Total		27225937	1662282	100.000	100.000

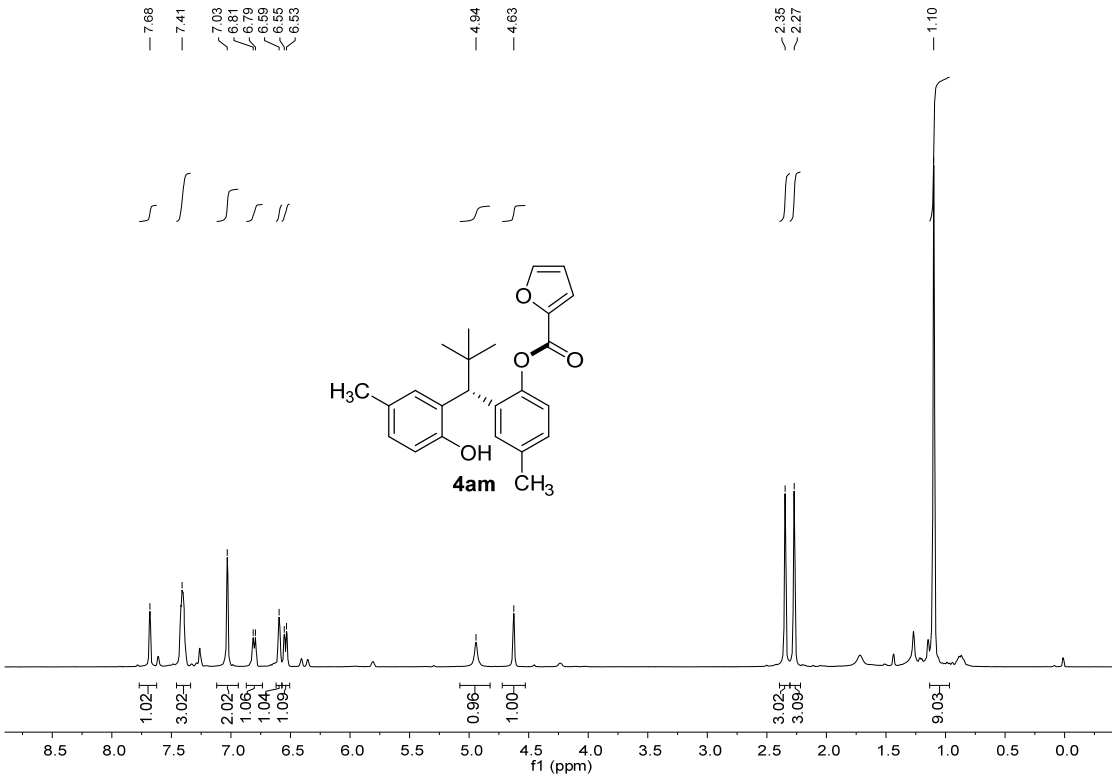


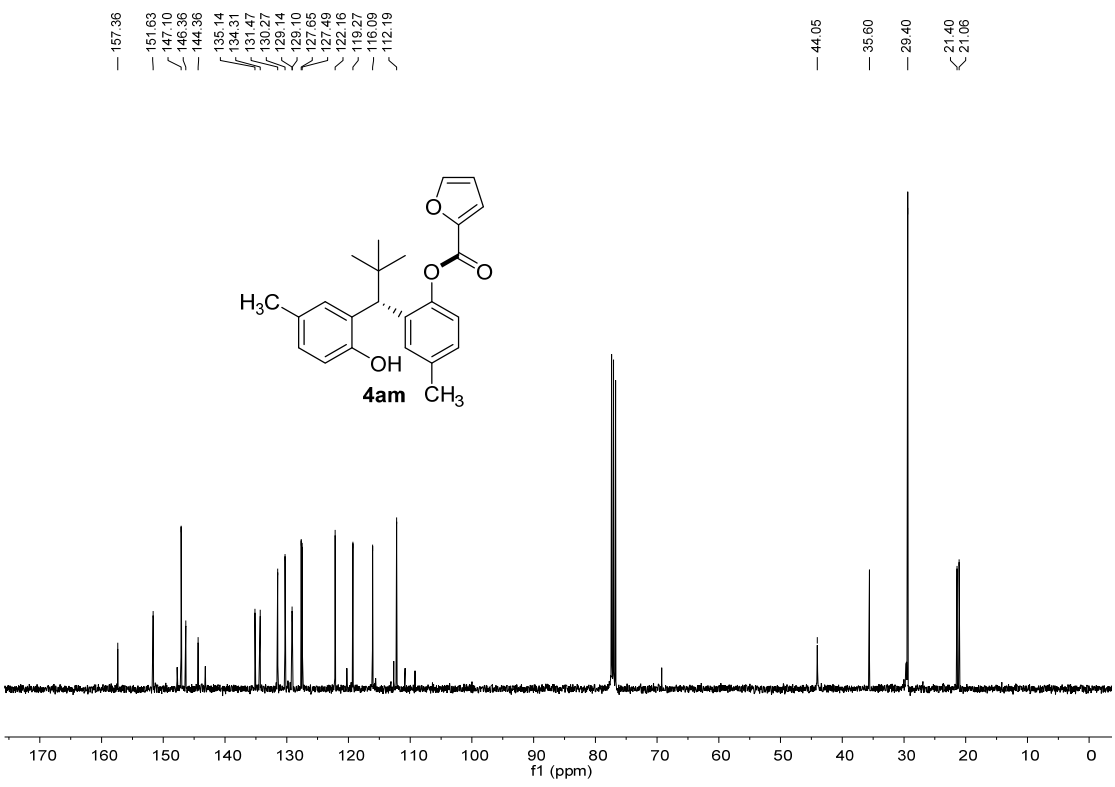
1 Det.A Ch1/210nm

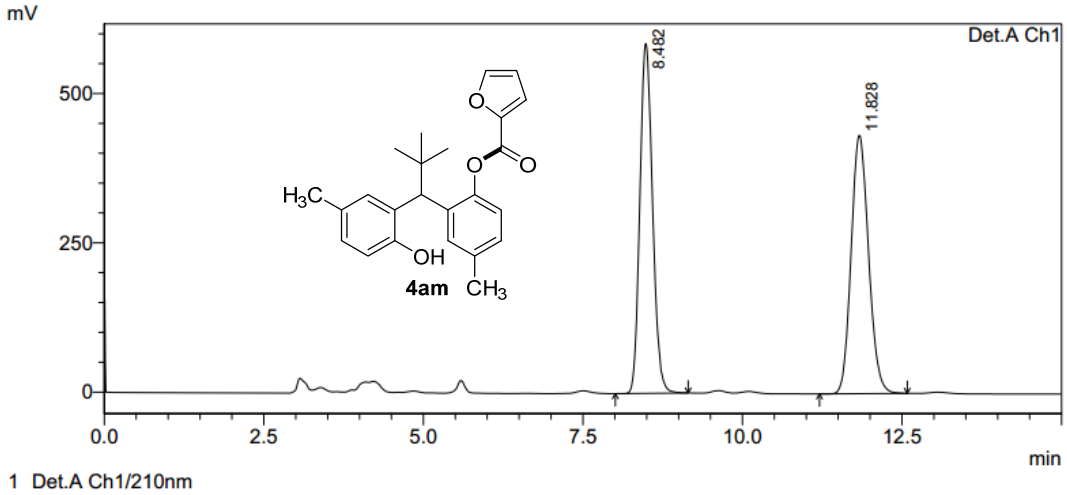
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.452	692997	58504	3.775	6.637
2	12.897	17665040	822934	96.225	93.363
Total		18358037	881438	100.000	100.000


7.68
7.41
7.03
6.81
6.79
6.59
6.55
6.53
4.94
4.63
2.35
2.27
1.10
1.02
3.02
2.02
1.06
1.04
1.09
0.96
1.00
3.02
3.09
9.03
4am
f1 (ppm)


157.36
151.63
147.10
146.36
144.36
135.14
134.31
131.47
130.27
129.14
129.10
127.85
127.49
122.16
119.27
116.09
112.19
44.05
35.60
29.40
21.40
21.06
4am
f1 (ppm)

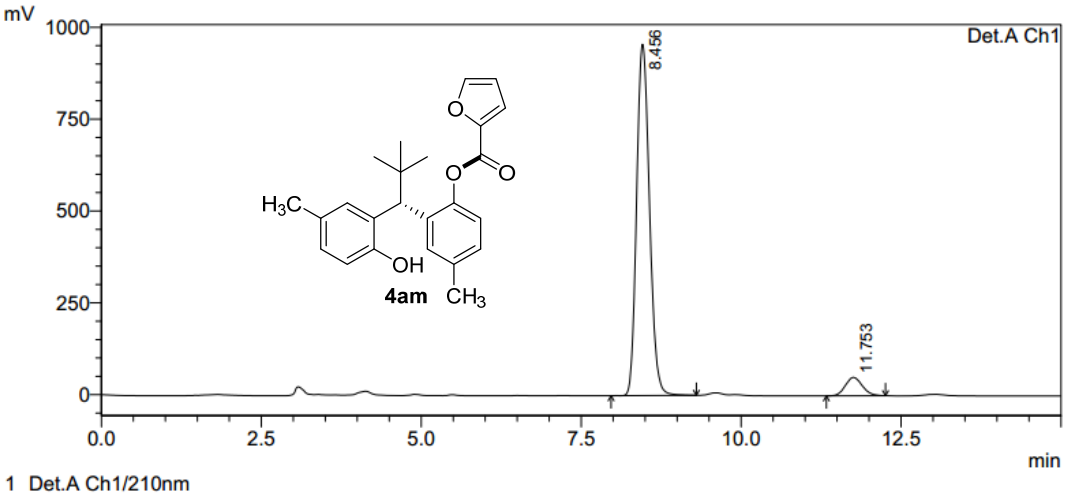


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.482	8094396	585994	49.652	57.517
2	11.828	8207705	432816	50.348	42.483
Total		16302102	1018810	100.000	100.000

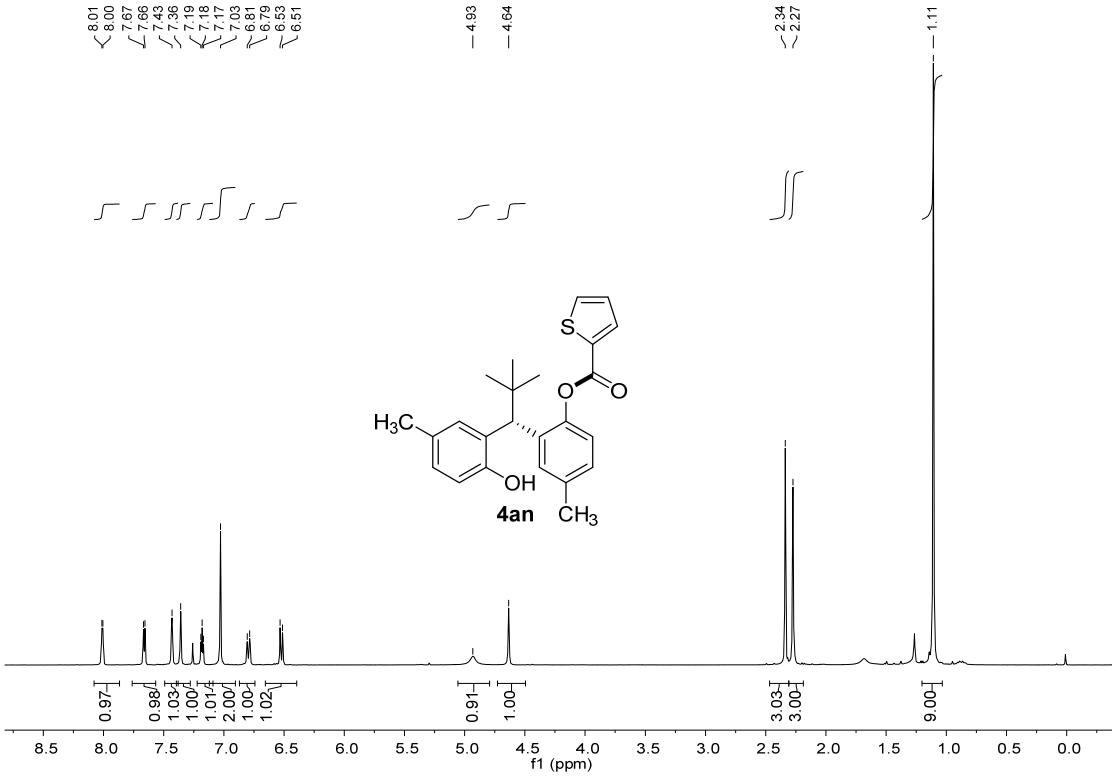


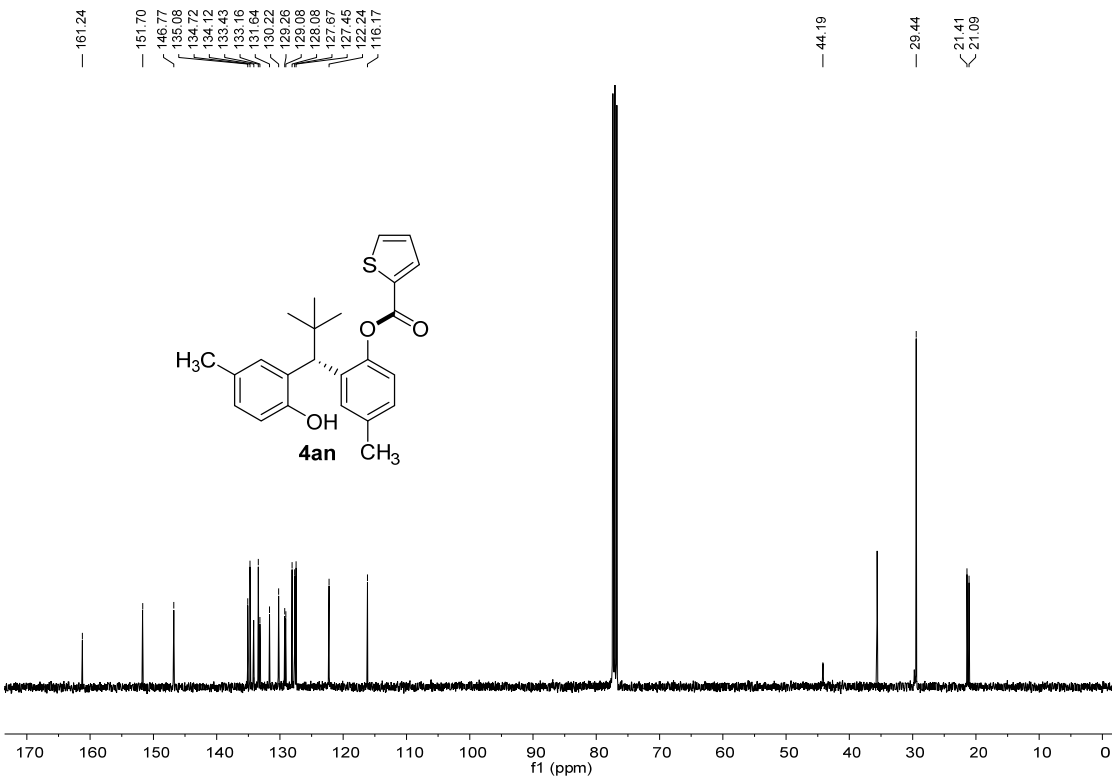
1 Det.A Ch1/210nm

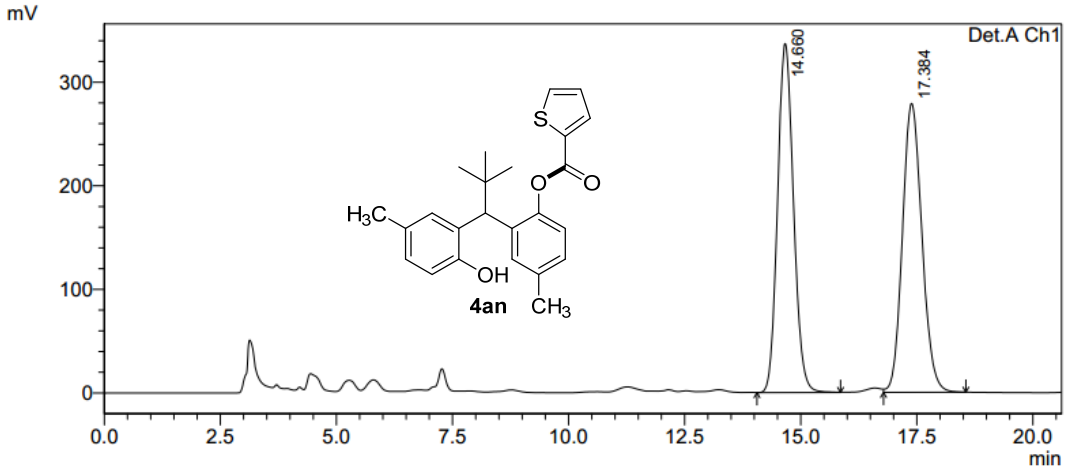
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	8.456	13345881	956191	93.542	95.019
2	11.753	921321	50127	6.458	4.981
Total		14267202	1006318	100.000	100.000


8.01
8.00
7.67
7.66
7.43
7.36
7.19
7.18
7.17
7.03
6.81
6.79
6.53
6.51
4.93
4.64
2.34
2.27
1.11
S
O
O
H3C
OH
4an
CH3
0.97
0.98
1.03
1.00
1.01
2.00
1.00
1.02
0.91
1.00
3.03
3.00
9.00
f1 (ppm)


161.24
151.70
146.77
135.08
134.72
134.12
133.43
133.16
131.64
130.22
129.26
129.08
128.08
127.67
127.45
122.24
116.17
44.19
29.44
21.41
21.09
S
O
O
H3C
OH
4an
CH3
f1 (ppm)

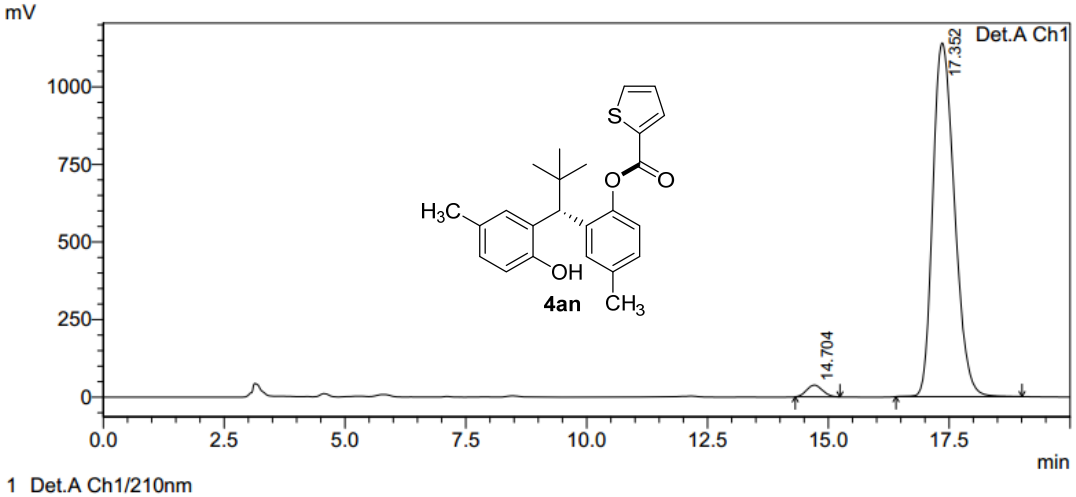


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	14.660	8067706	337027	49.763	54.726
2	17.384	8144403	278820	50.237	45.274
Total		16212109	615847	100.000	100.000

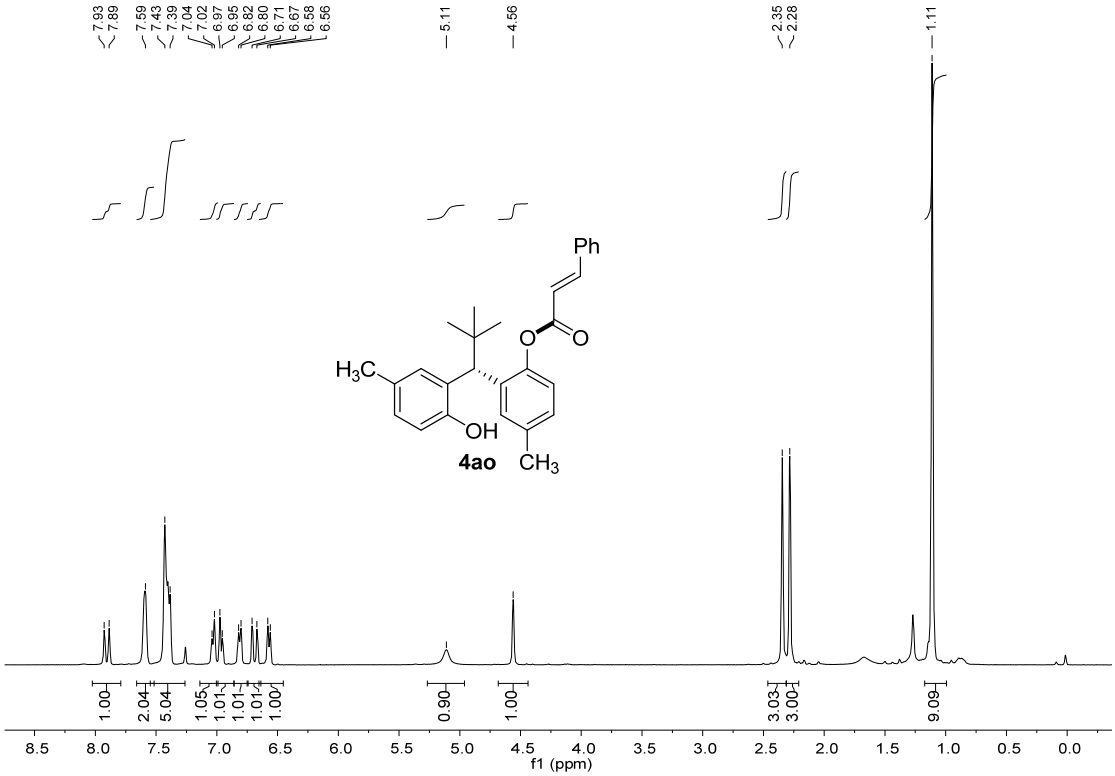


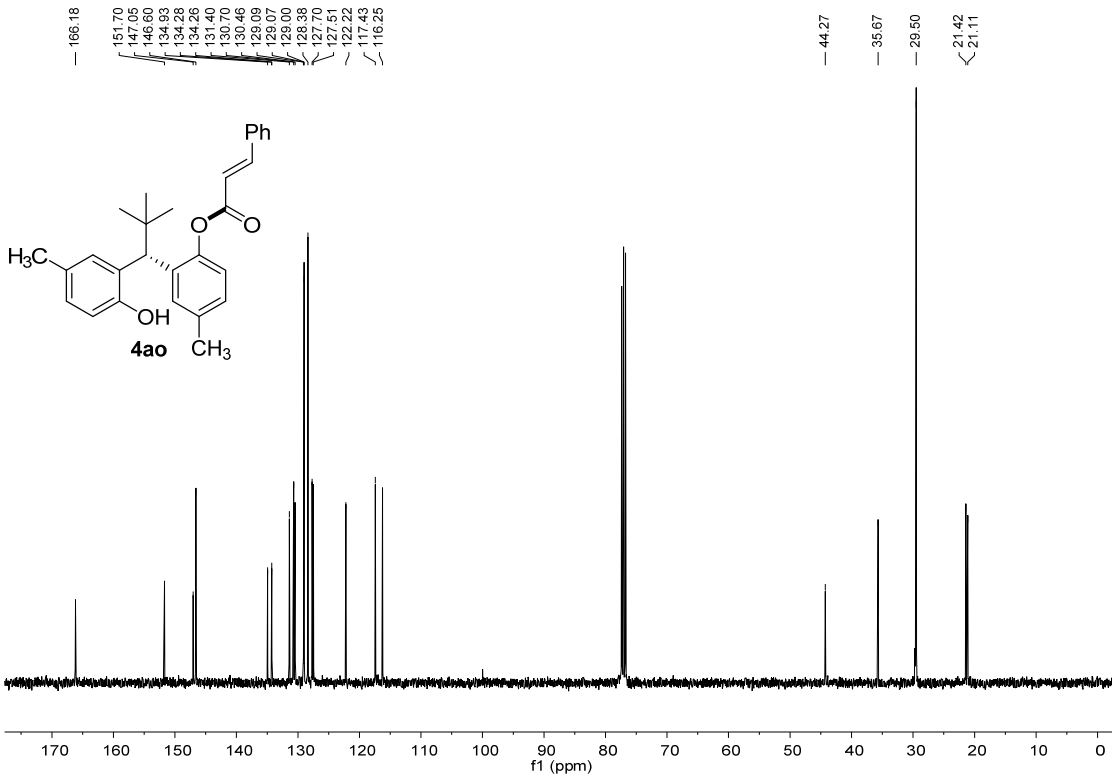
1 Det.A Ch1/210nm

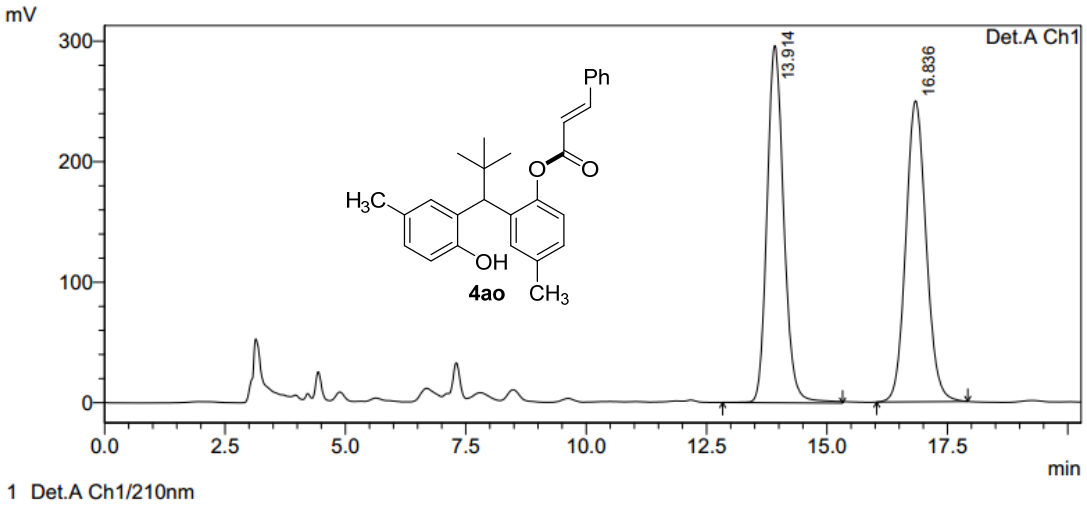
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	14.704	867267	37968	2.386	3.223
2	17.352	35474859	1139989	97.614	96.777
Total		36342125	1177957	100.000	100.000


7.93
7.89
7.59
7.43
7.39
7.04
7.02
6.97
6.95
6.82
6.80
6.71
6.67
6.58
6.56
5.11
4.56
2.35
2.28
1.11
Ph
O
O
H3C
OH
4ao
CH3
1.00
2.04
5.04
1.05
1.01
1.01
1.01
1.00
0.90
1.00
3.03
3.00
9.09
f1 (ppm)


166.18
151.70
147.05
146.60
134.93
134.28
134.26
131.40
130.70
130.46
129.09
129.07
129.00
128.38
127.70
127.51
122.22
117.43
116.25
44.27
35.67
29.50
21.42
21.11
Ph
O
O
H3C
OH
4ao
CH3
f1 (ppm)

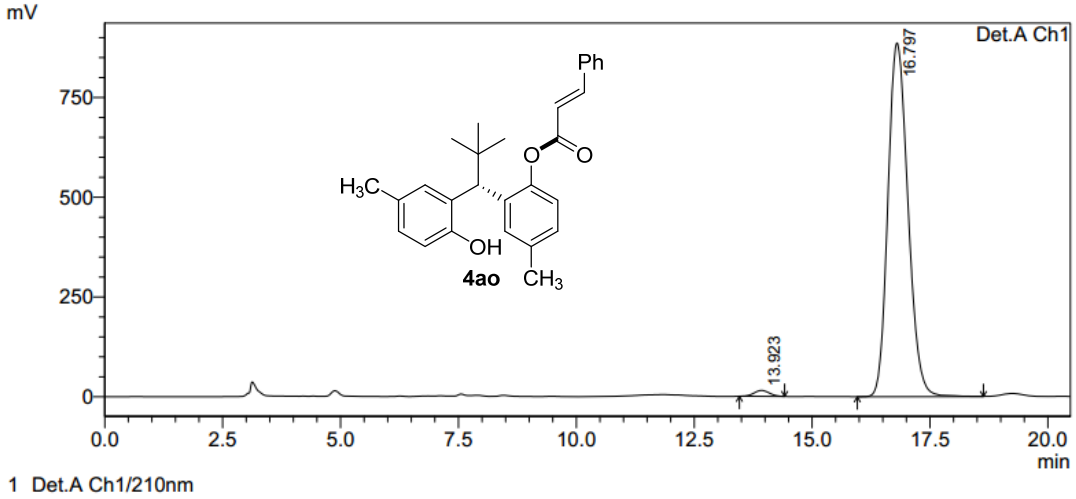


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.914	7181260	296498	49.432	54.276
2	16.836	7346419	249780	50.568	45.724
Total		14527679	546278	100.000	100.000

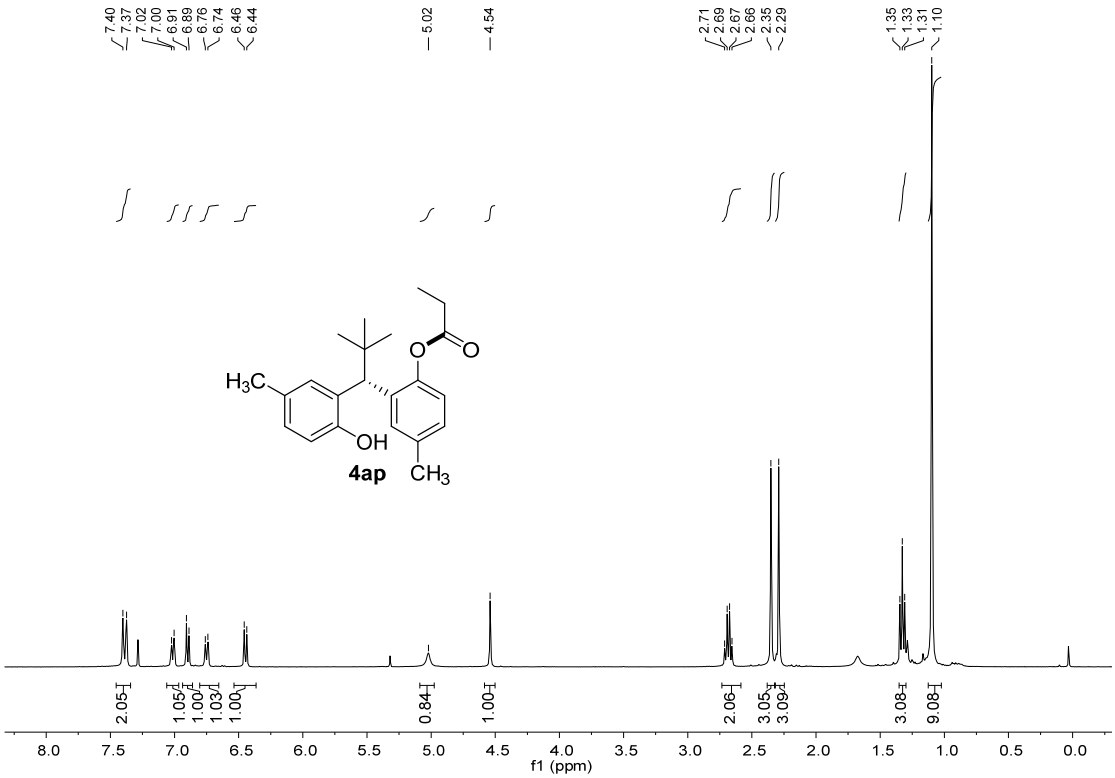


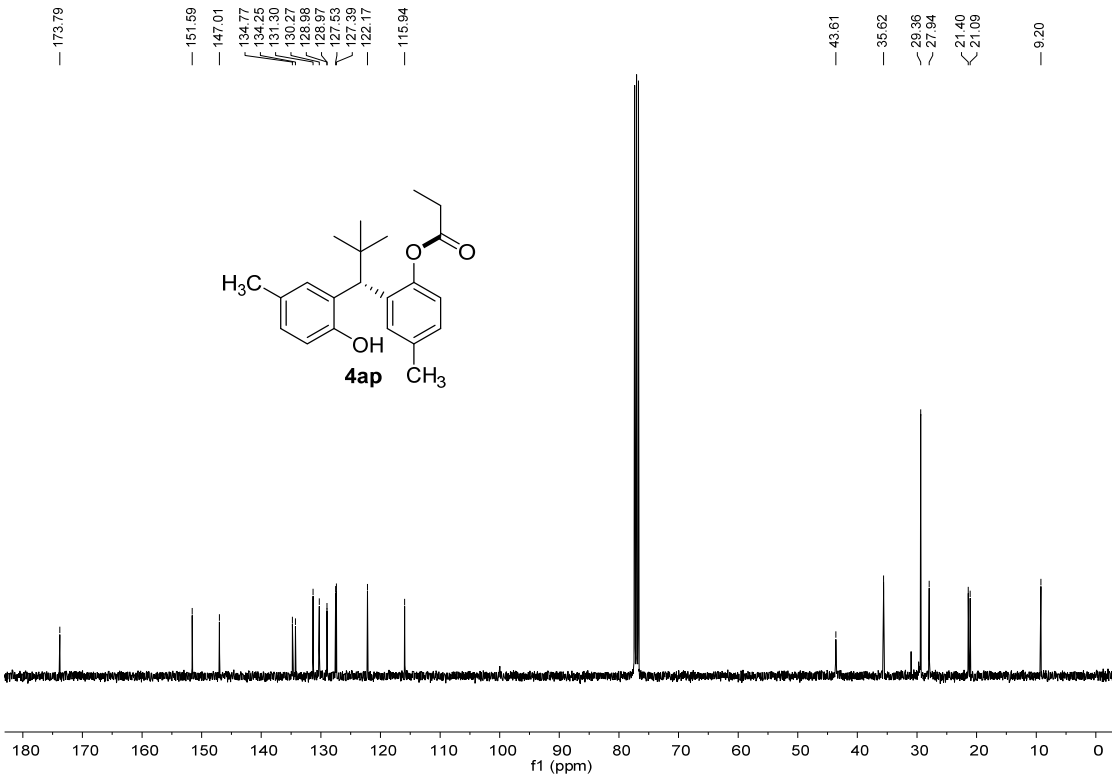
1 Det.A Ch1/210nm

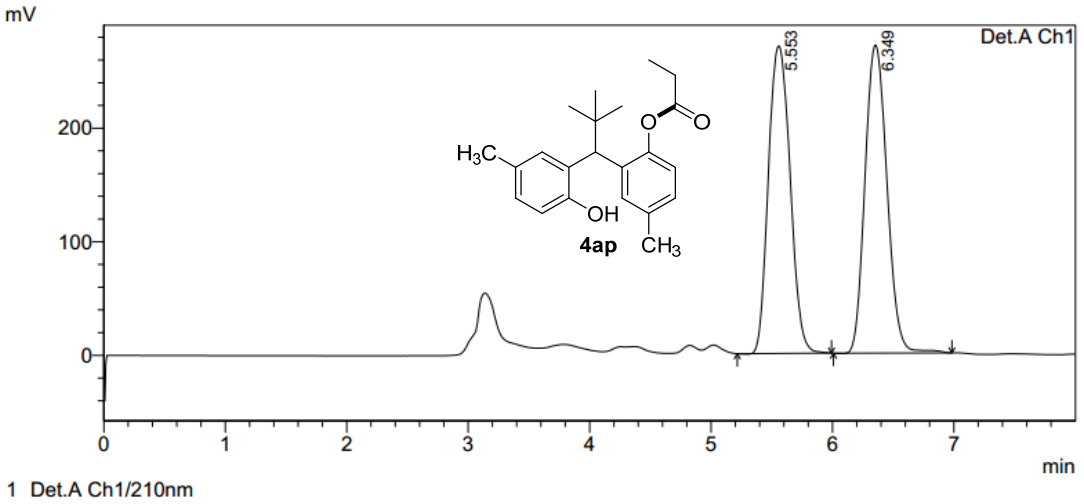
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	13.923	337977	14930	1.273	1.656
2	16.797	26208539	886681	98.727	98.344
Total		26546516	901611	100.000	100.000


7.40
7.37
7.02
7.00
6.91
6.89
6.76
6.74
6.46
6.44
5.02
4.54
2.71
2.69
2.67
2.66
2.35
2.29
1.35
1.33
1.31
1.10
H3C
O
O
OH
4ap
CH3
2.05
1.05
1.00
1.03
1.00
0.84
1.00
2.06
3.05
3.09
3.08
9.08
f1 (ppm)

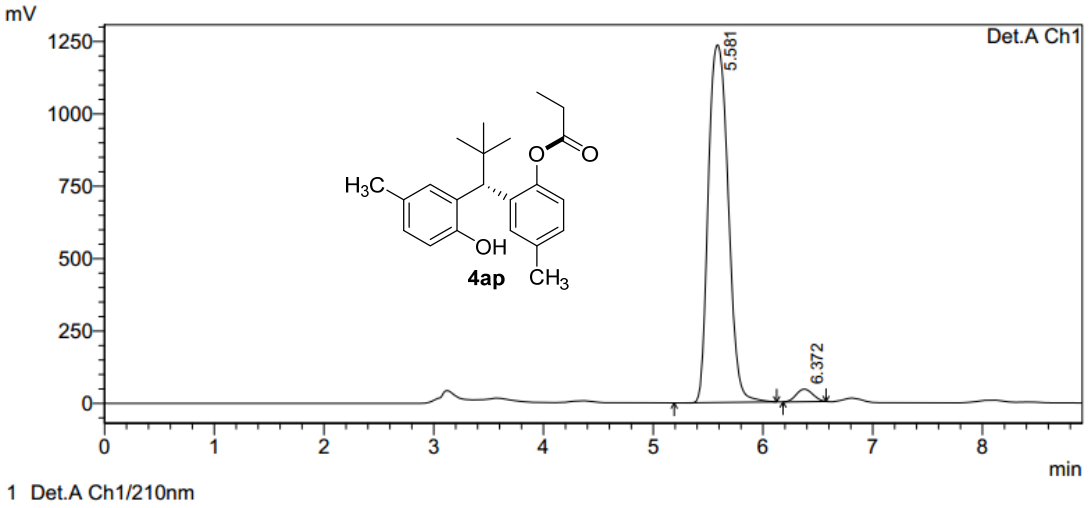

173.79
151.59
147.01
134.77
134.25
131.30
130.27
128.98
128.97
127.53
127.39
122.17
115.94
43.61
35.62
29.36
27.94
21.40
21.09
9.20
H3C
O
O
OH
4ap
CH3
f1 (ppm)



PeakTable

Detector A Ch1 210nm

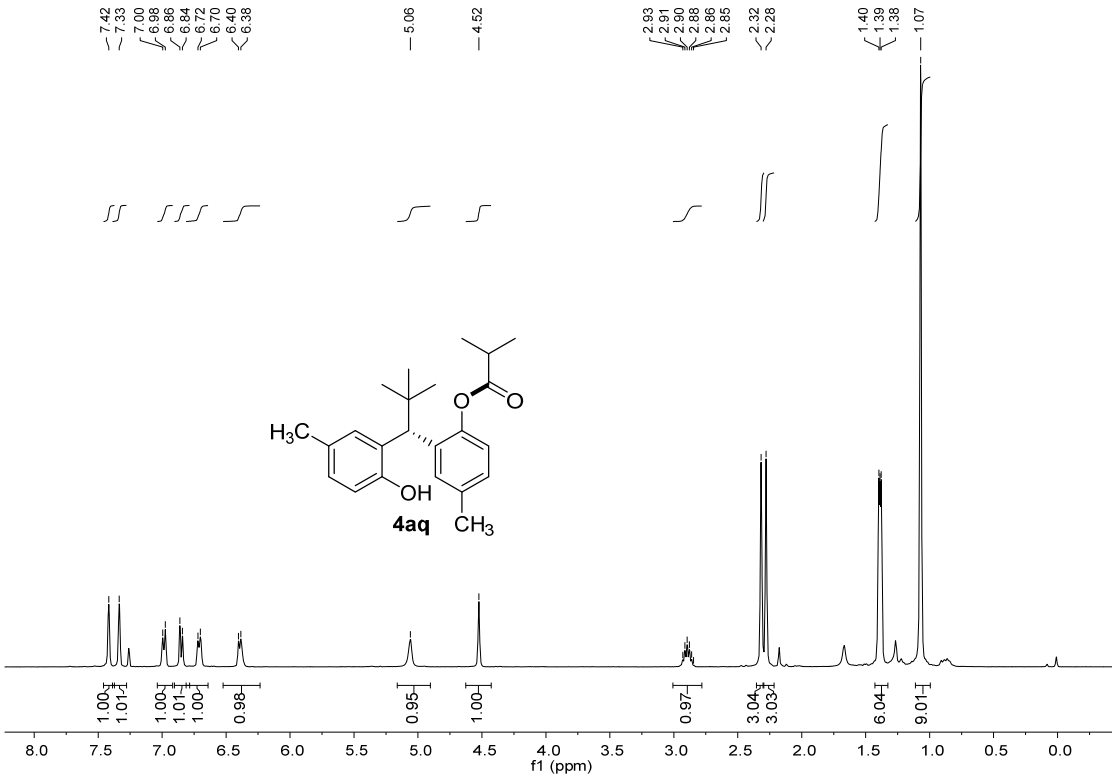
Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.553	3372713	270786	49.696	49.968
2	6.349	3414041	271133	50.304	50.032
Total		6786754	541920	100.000	100.000

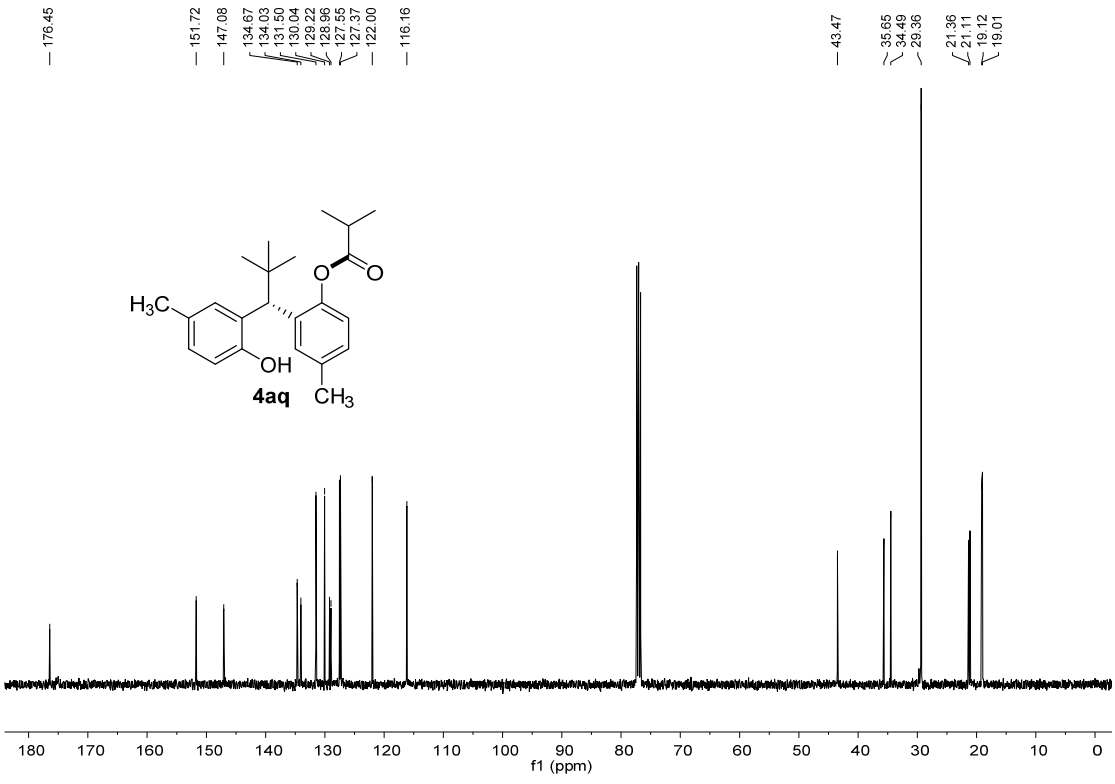


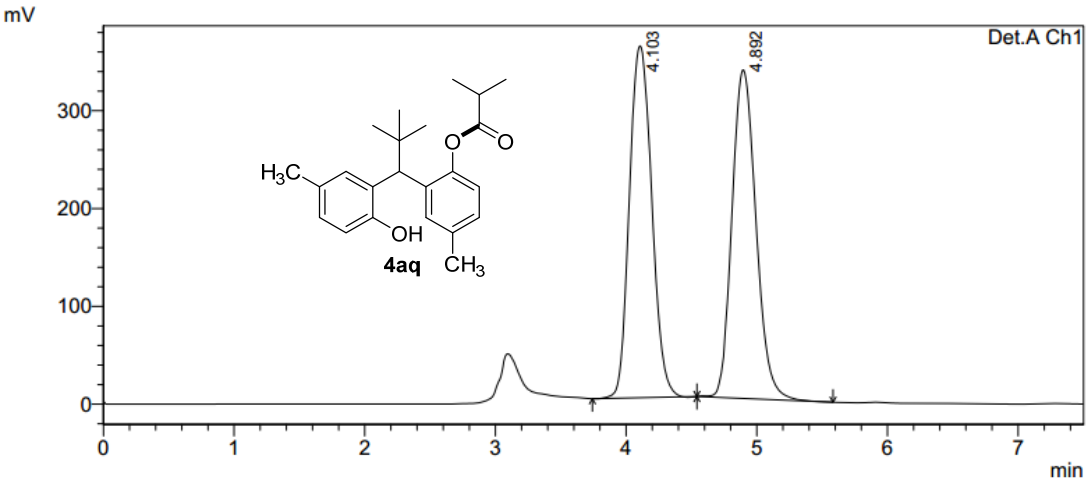
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.581	15501021	1235517	97.125	96.600
2	6.372	458840	43489	2.875	3.400
Total		15959862	1279006	100.000	100.000


7.42
7.33
7.00
6.98
6.86
6.84
6.72
6.70
6.40
6.38
5.06
4.52
2.93
2.91
2.90
2.88
2.86
2.85
2.32
2.28
1.40
1.39
1.38
1.07
H3C
OH
O
O
4aq
CH3
1.00
1.01
1.00
1.01
1.00
0.98
0.95
1.00
0.97
3.04
3.03
6.04
9.01
f1 (ppm)


176.45
151.72
147.08
134.67
134.03
131.50
130.04
129.22
128.98
127.55
127.37
122.00
116.16
43.47
35.65
34.49
29.36
21.36
21.11
19.12
19.01
H3C
OH
O
O
4aq
CH3
f1 (ppm)

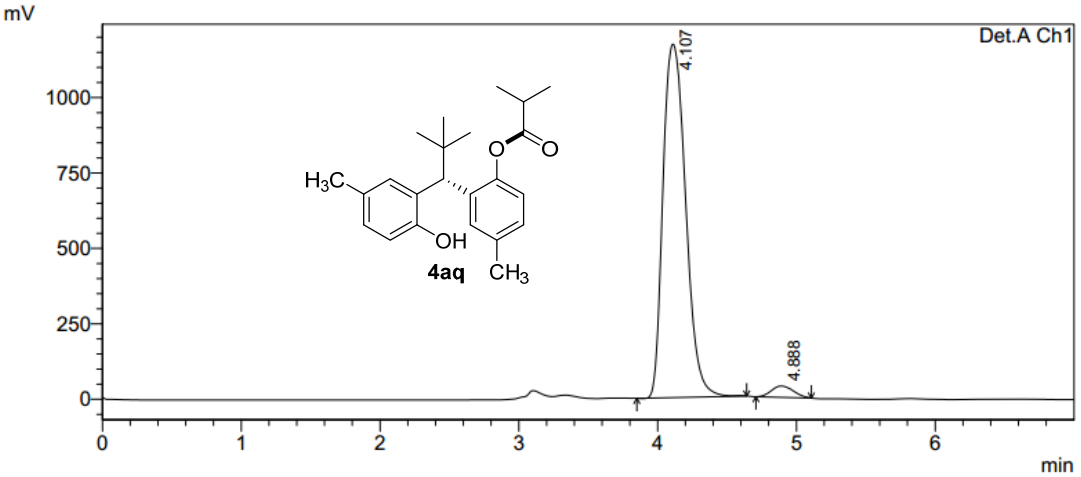


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.103	4281269	359640	49.958	51.731
2	4.892	4288505	335573	50.042	48.269
Total		8569775	695213	100.000	100.000

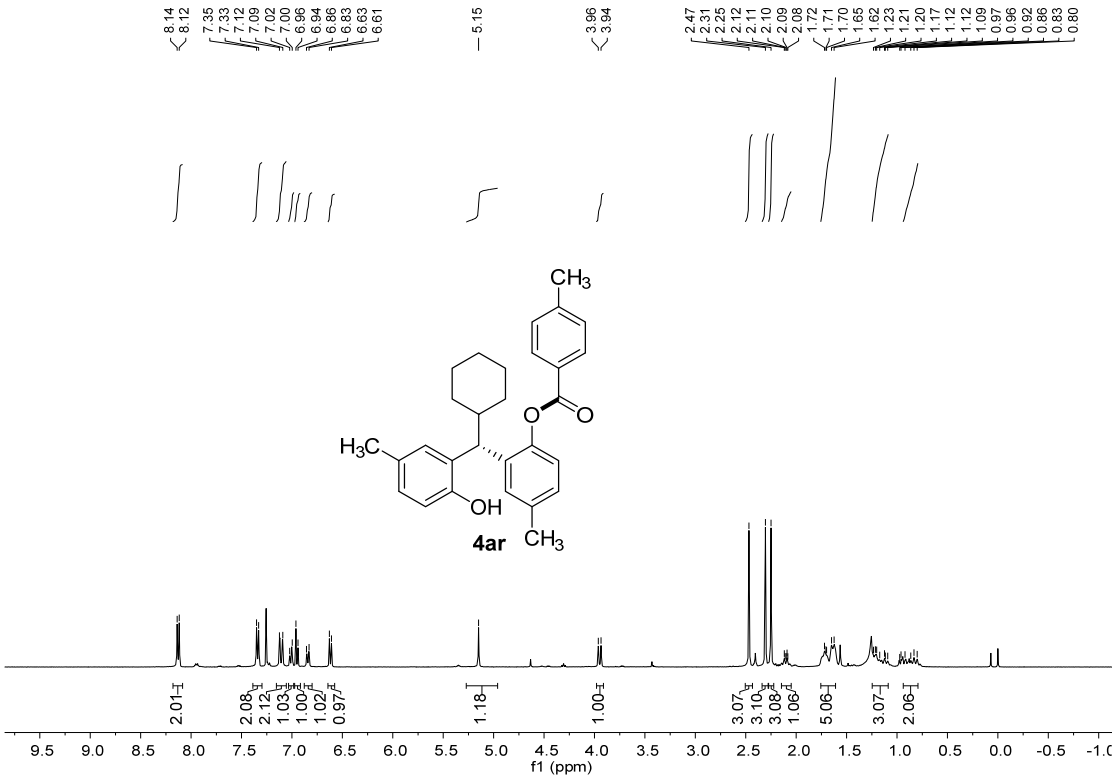


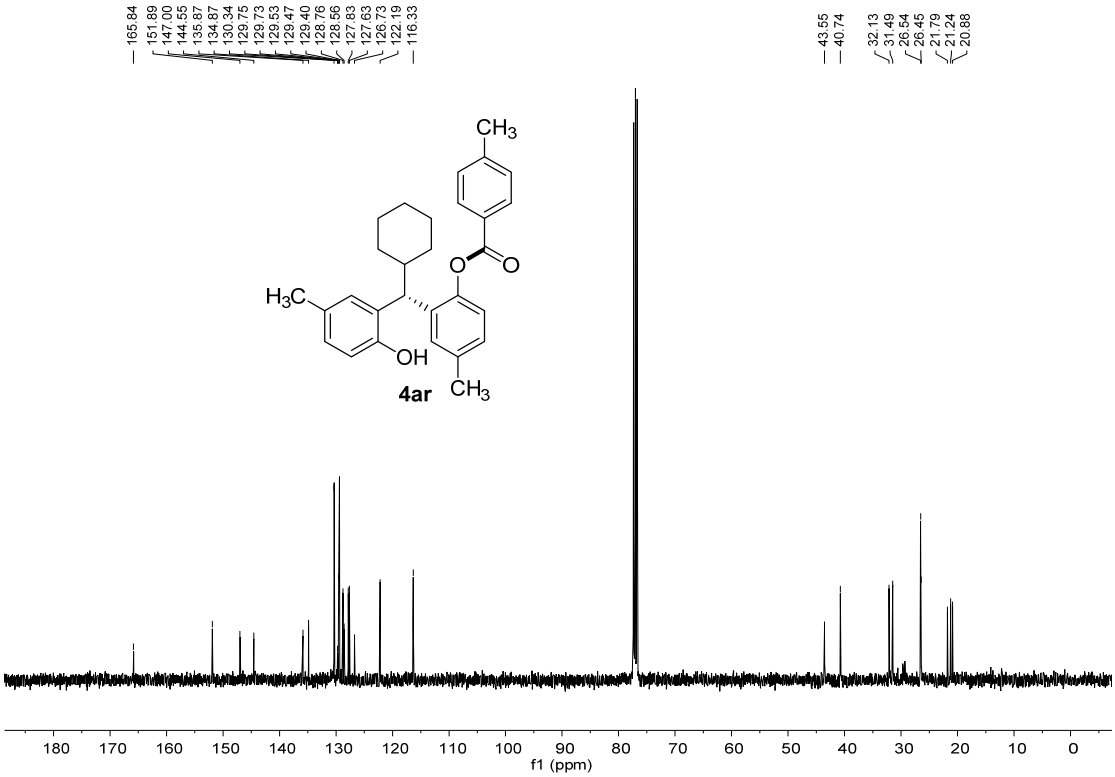
1 Det.A Ch1/210nm

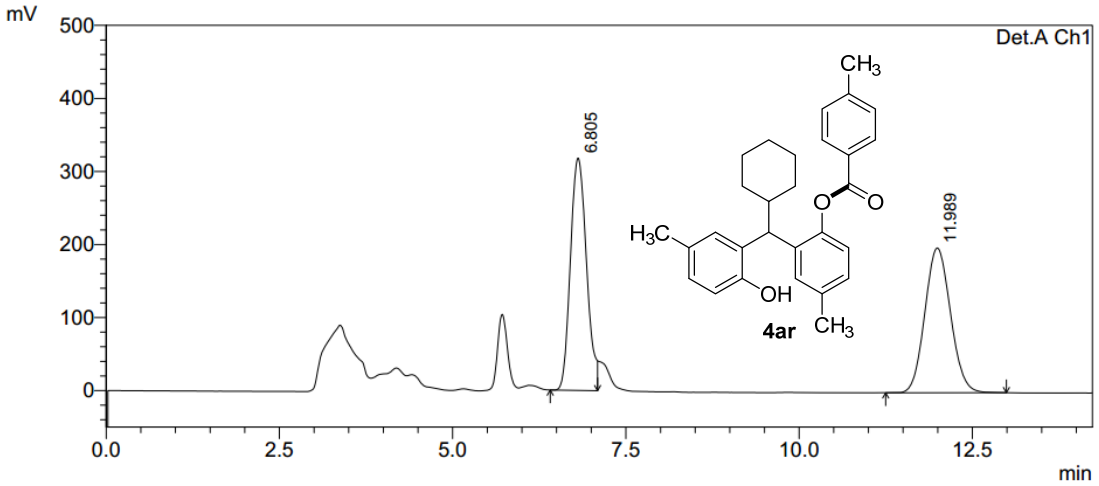
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	4.107	13303550	1171772	96.986	96.878
2	4.888	413497	37762	3.014	3.122
Total		13717047	1209534	100.000	100.000


8.14
8.12
7.35
7.33
7.12
7.09
7.02
7.00
6.96
6.94
6.86
6.83
6.63
6.61
5.15
3.96
3.94
2.47
2.31
2.25
2.12
2.11
2.10
2.09
2.08
1.72
1.71
1.70
1.65
1.62
1.23
1.21
1.20
1.17
1.12
1.12
1.09
0.97
0.96
0.92
0.86
0.83
0.80
CH3
O
O
H3C
OH
CH3
4ar
2.01
2.08
2.12
1.03
1.00
1.02
0.97
1.18
1.00
3.07
3.10
3.08
1.06
5.06
3.07
2.06
f1 (ppm)


165.84
151.89
147.00
144.55
135.87
134.87
130.34
129.75
129.73
129.53
129.47
129.40
128.76
128.56
127.83
127.63
126.73
122.19
116.33
43.55
40.74
32.13
31.49
28.54
28.45
21.79
21.24
20.88
CH3
O
O
H3C
OH
CH3
4ar
f1 (ppm)

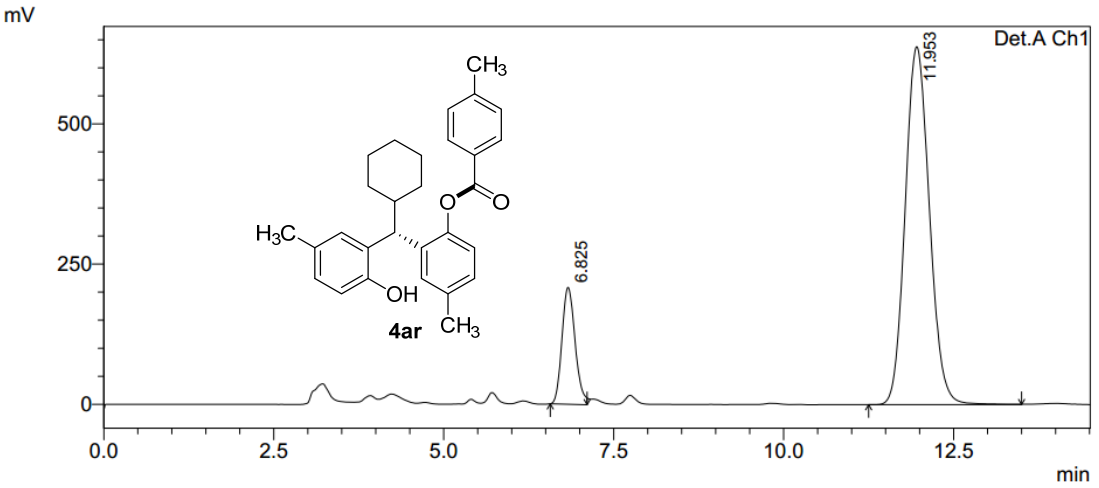


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.805	5134543	318098	50.200	61.622
2	11.989	5093532	198114	49.800	38.378
Total		10228075	516212	100.000	100.000

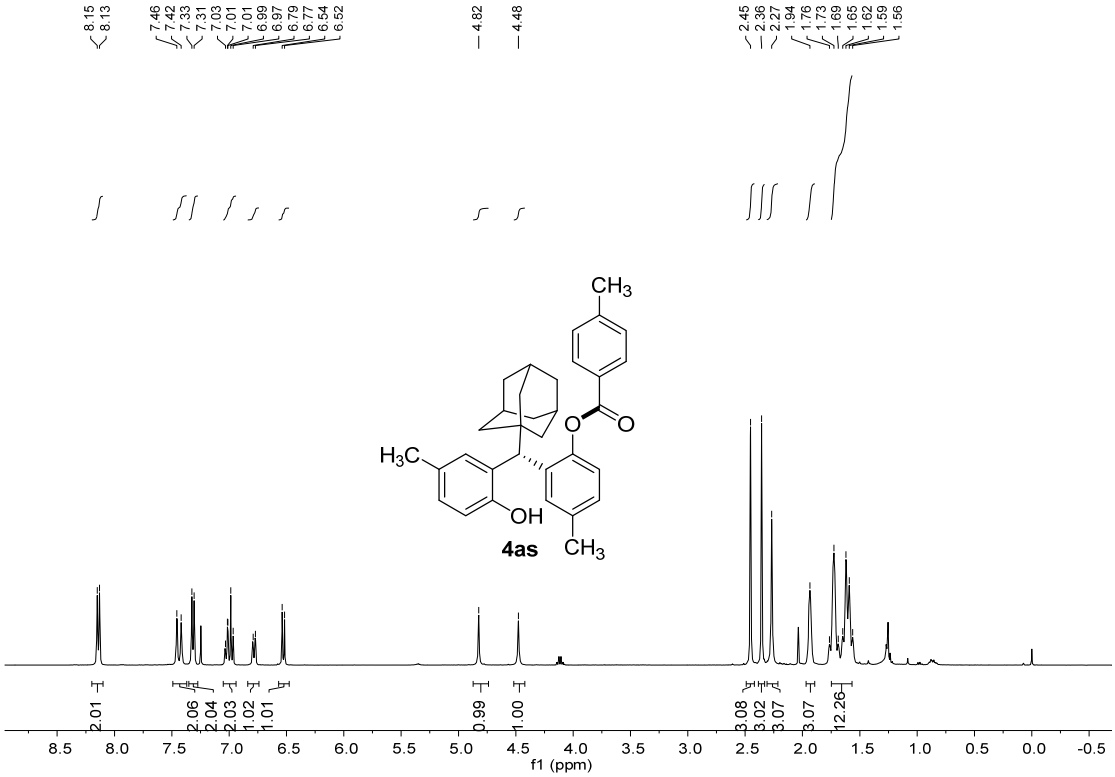


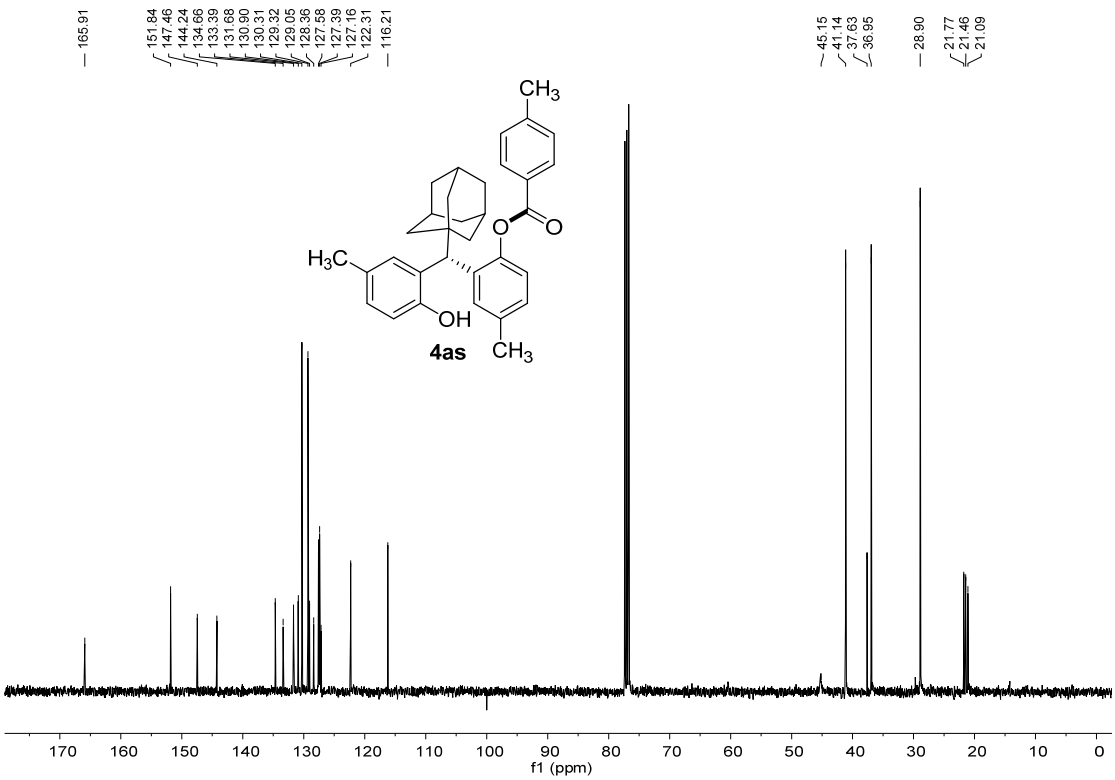
1 Det.A Ch1/210nm

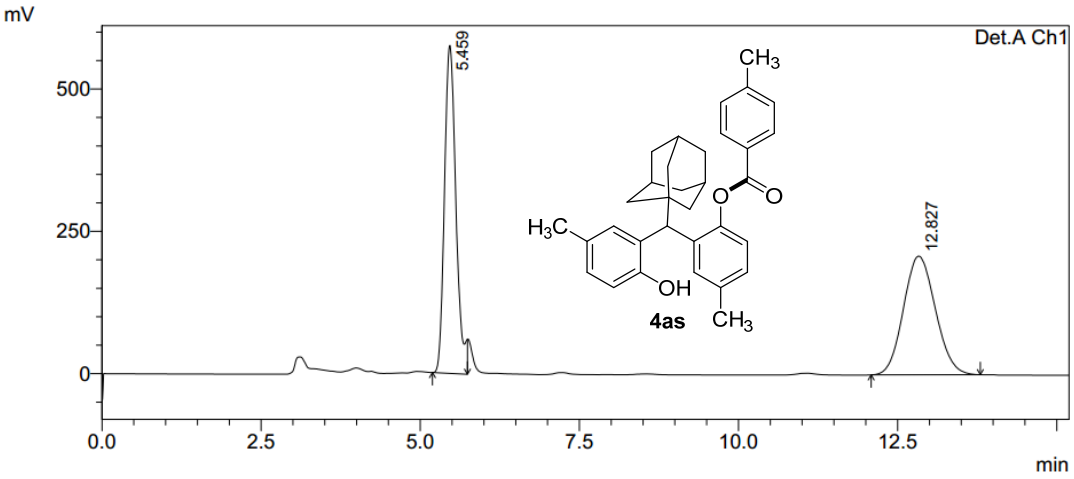
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.825	2801424	208296	15.056	24.603
2	11.953	15804929	638330	84.944	75.397
Total		18606353	846626	100.000	100.000


8.15
8.13
7.46
7.42
7.33
7.31
7.03
7.01
7.01
6.99
6.97
6.79
6.77
6.54
6.52
4.82
4.48
2.45
2.36
2.27
1.94
1.76
1.73
1.69
1.65
1.62
1.59
1.56
CH3
O
O
H3C
OH
4as
CH3
2.01
2.06
2.04
2.03
1.02
1.01
0.99
1.00
3.08
3.02
3.07
3.07
12.26
f1 (ppm)


165.91
151.84
147.46
144.24
134.66
133.39
131.68
130.90
130.31
129.32
129.05
128.36
127.58
127.39
127.16
122.31
116.21
45.15
41.14
37.63
36.95
28.90
21.77
21.46
21.09
CH3
O
O
H3C
OH
4as
CH3
f1 (ppm)

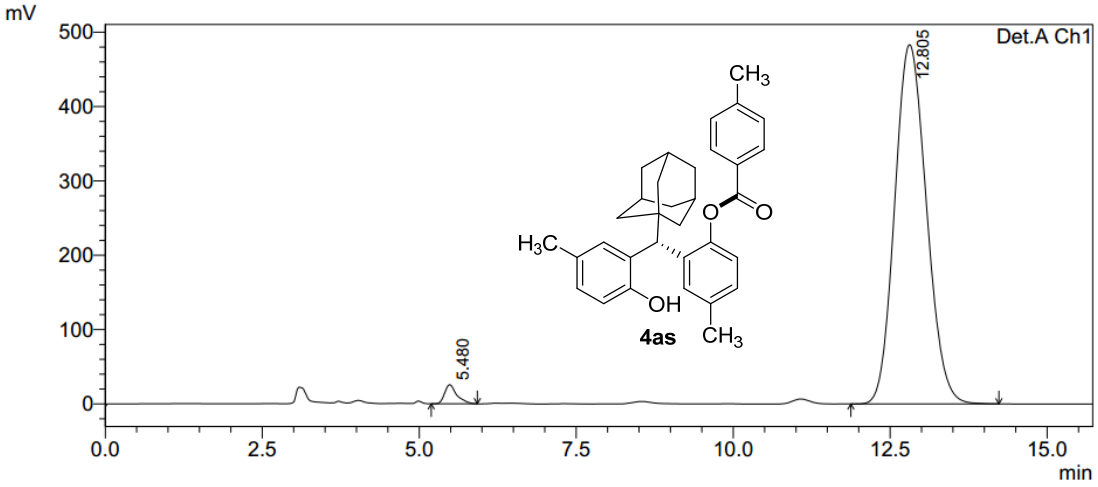


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.459	7193546	576078	49.693	73.423
2	12.827	7282501	208526	50.307	26.577
Total		14476047	784604	100.000	100.000

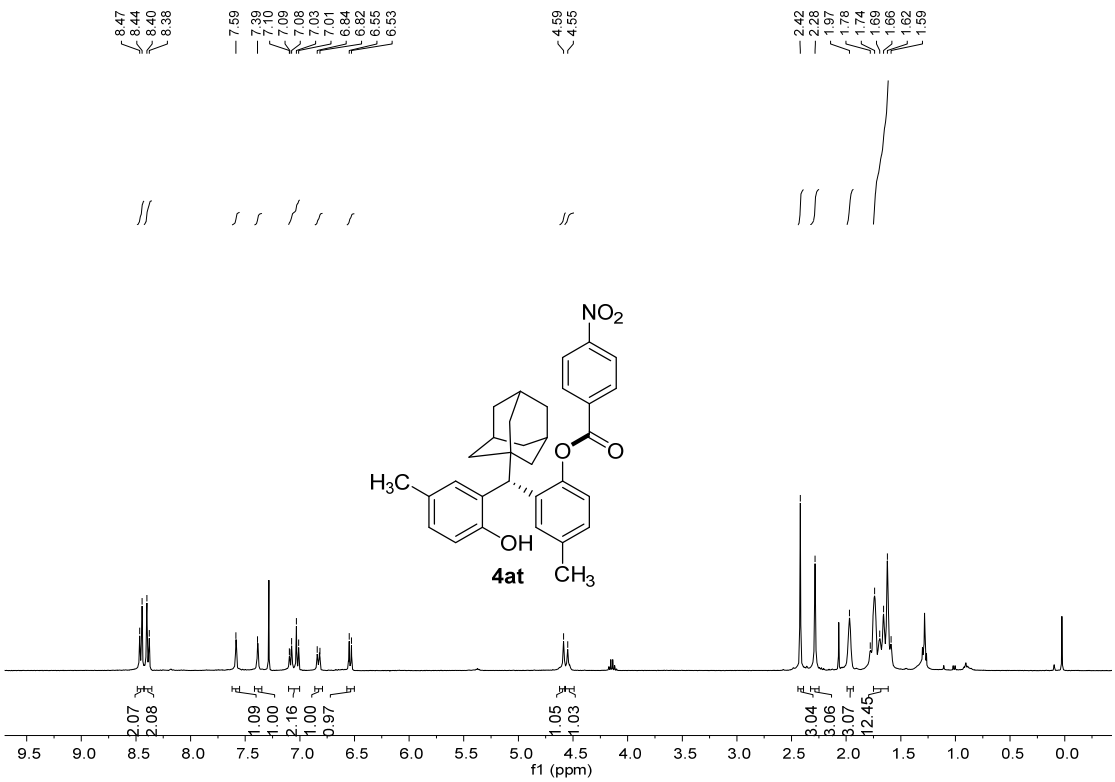


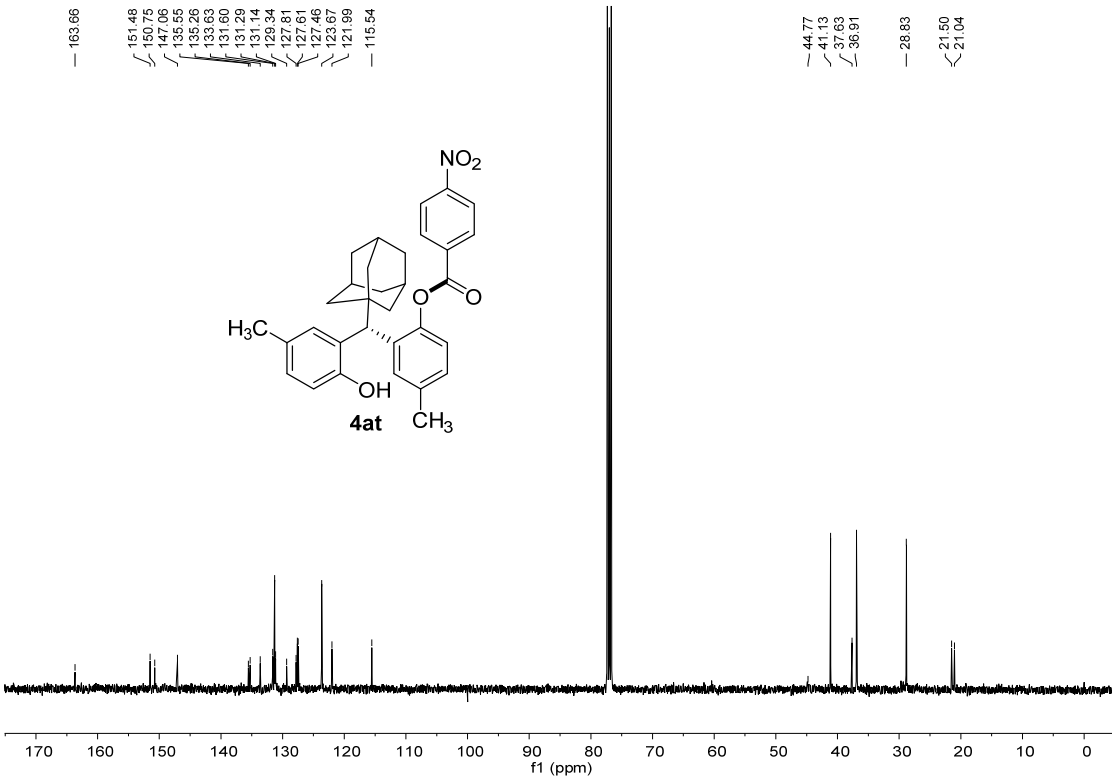
1 Det.A Ch1/210nm

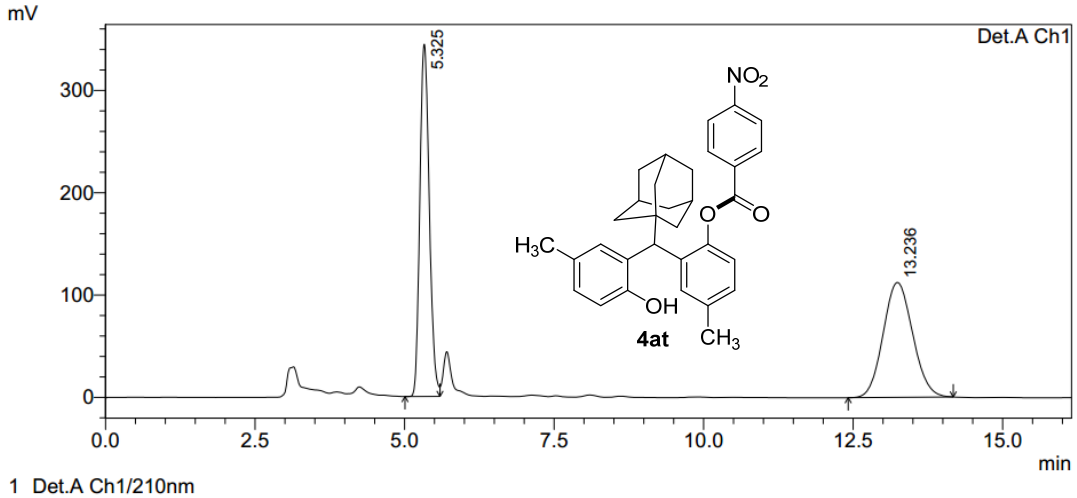
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.480	345963	25694	1.994	5.048
2	12.805	17000968	483282	98.006	94.952
Total		17346931	508976	100.000	100.000


8.47
8.44
8.40
8.38
7.59
7.39
7.10
7.09
7.08
7.03
7.01
6.84
6.82
6.55
6.53
4.59
4.55
2.42
2.28
1.97
1.78
1.74
1.69
1.66
1.62
1.59
NO2
O
O
H3C
OH
4at
CH3
2.07
2.08
1.09
1.00
2.16
1.00
0.97
1.05
1.03
3.04
3.06
3.07
12.45
f1 (ppm)


163.66
151.48
150.75
147.06
135.55
135.26
133.63
131.60
131.29
131.14
129.34
127.81
127.61
127.46
123.67
121.99
115.54
44.77
41.13
37.63
36.91
28.83
21.50
21.04
NO2
O
O
H3C
OH
4at
CH3
f1 (ppm)

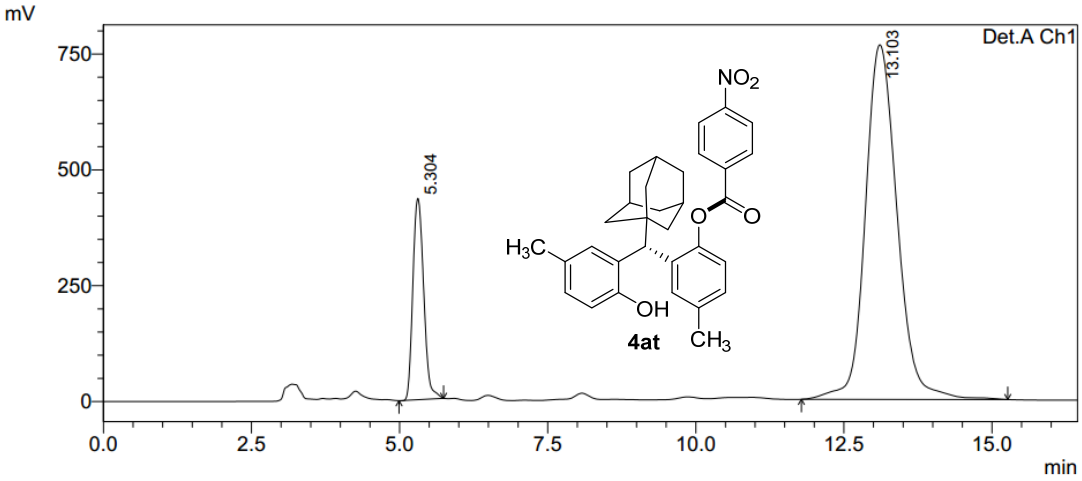


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.325	3785965	343940	49.542	75.378
2	13.236	3855998	112345	50.458	24.622
Total		7641963	456284	100.000	100.000

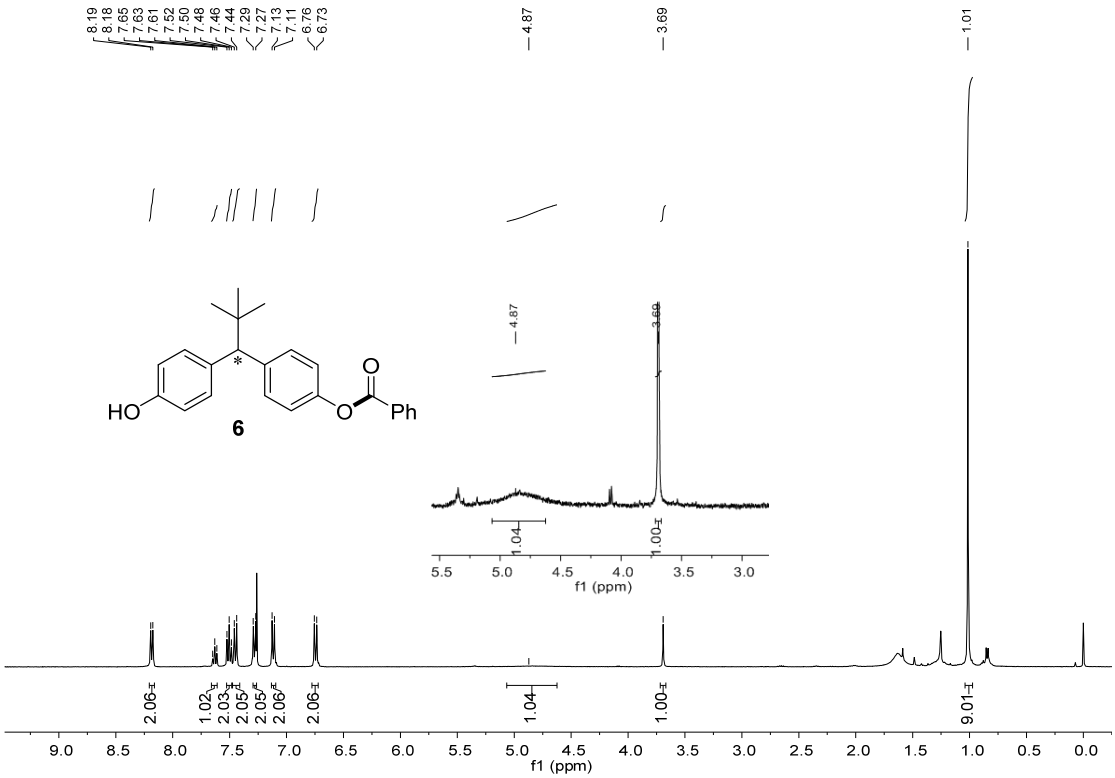


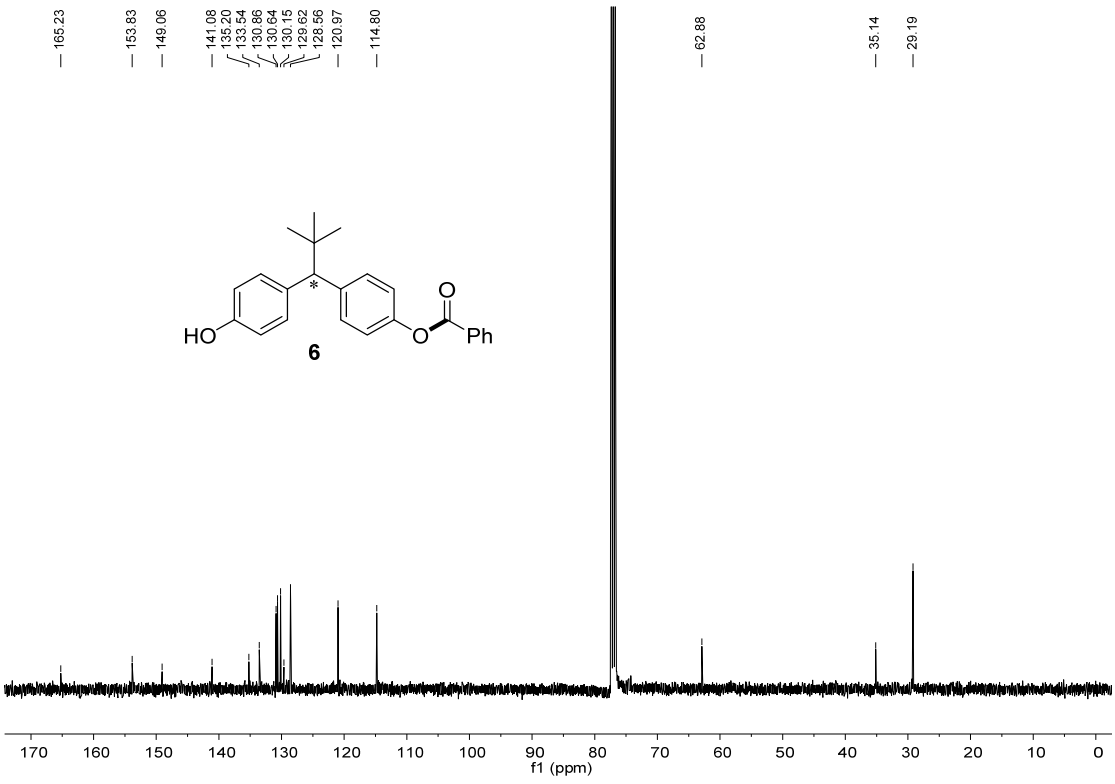
1 Det.A Ch1/210nm

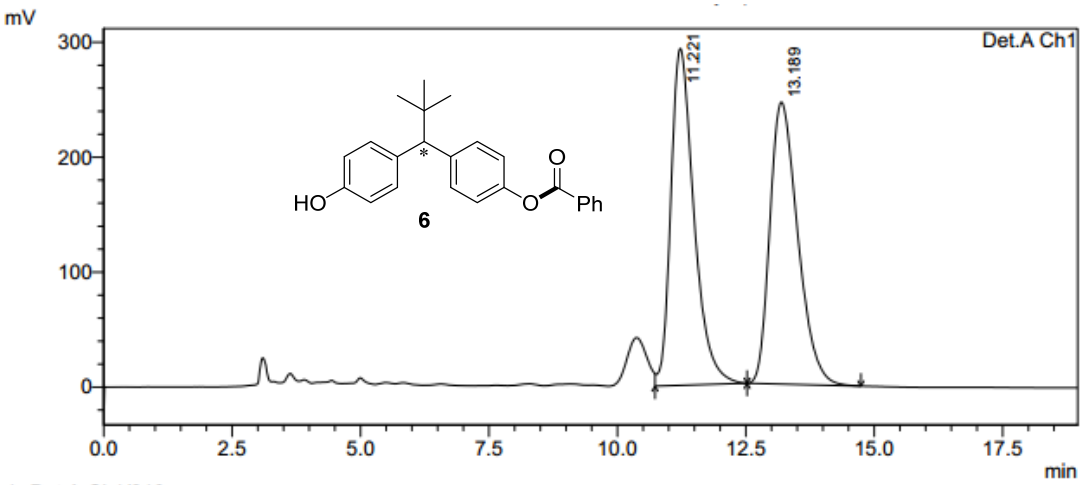
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	5.304	5523163	434648	16.158	36.218
2	13.103	28658725	765448	83.842	63.782
Total		34181887	1200096	100.000	100.000


8.19
8.18
7.65
7.63
7.61
7.52
7.50
7.48
7.46
7.44
7.29
7.27
7.13
7.11
6.76
6.73
4.87
3.69
1.01
HO
O
O
Ph
6
2.06
1.02
2.03
2.05
2.05
2.06
2.06
1.04
1.00
9.01
f1 (ppm)


165.23
153.83
149.06
141.08
135.20
133.54
130.86
130.64
130.15
129.62
128.56
120.97
114.80
62.88
35.14
29.19
HO
O
O
Ph
6
f1 (ppm)

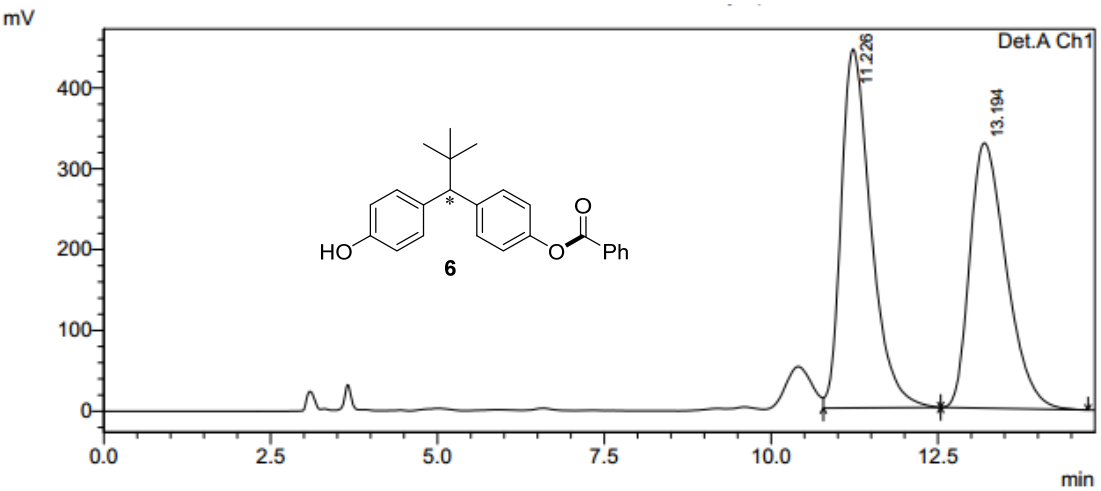


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	11.221	9187595	293064	49.789	54.448
2	13.189	9265461	245183	50.211	45.552
Total		18453056	538247	100.000	100.000

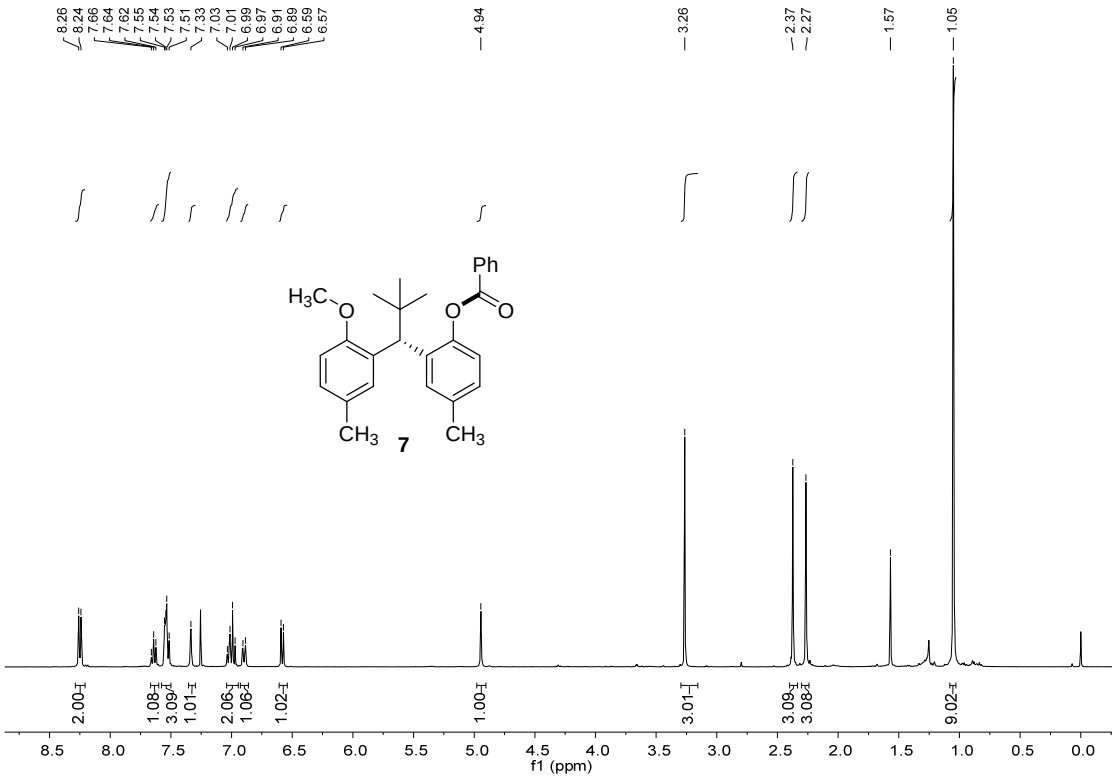


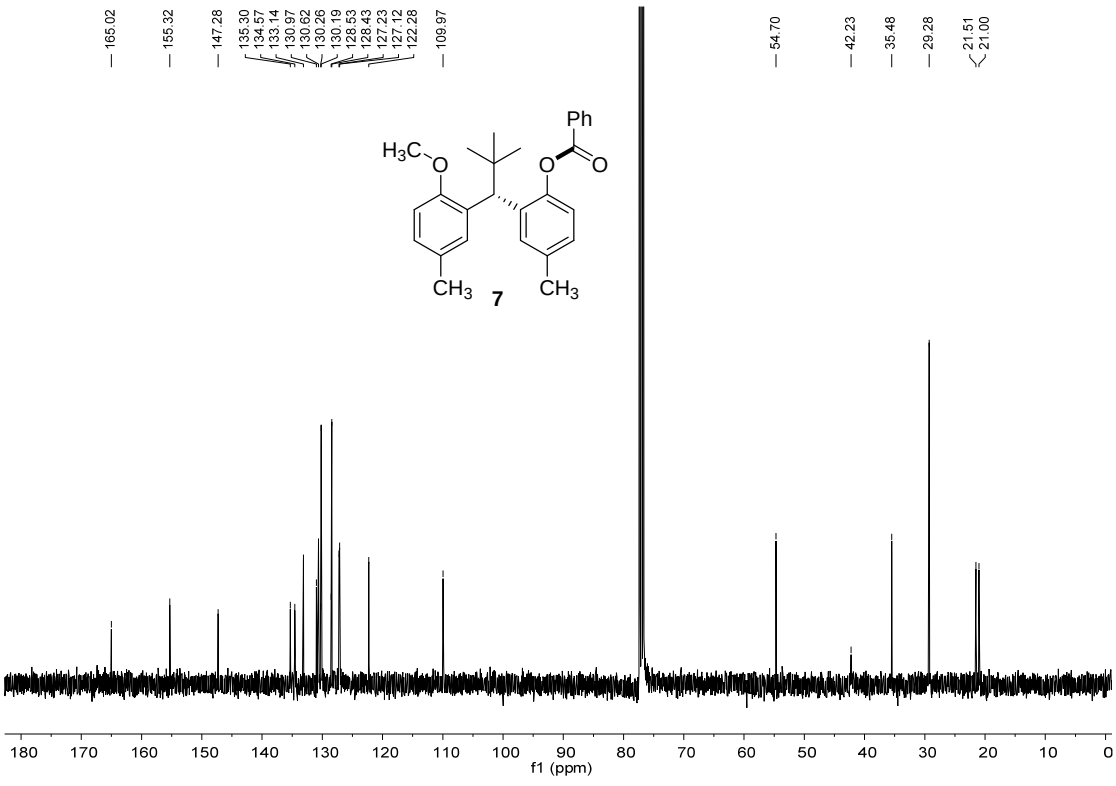
1 Det.A Ch1/210nm

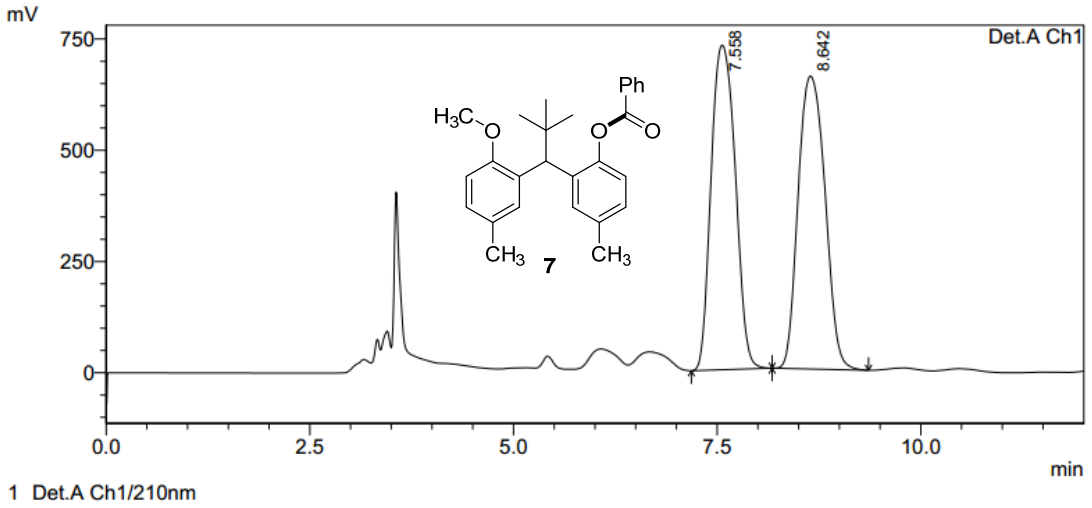
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	11.226	13770519	443933	52.421	57.500
2	13.194	12498402	328120	47.579	42.500
Total		26268921	772053	100.000	100.000


8.26
8.24
7.66
7.64
7.62
7.55
7.54
7.53
7.51
7.33
7.03
7.01
6.99
6.97
6.91
6.89
6.59
6.57
4.94
3.26
2.37
2.27
1.57
1.05
Ph
H3C
O
O
O
CH3
CH3
7
2.00
1.08
3.09
1.01
2.06
1.06
1.02
1.00
3.01
3.09
3.08
9.02
f1 (ppm)


165.02
155.32
147.28
135.30
134.57
133.14
130.97
130.62
130.26
130.19
128.53
128.43
127.23
127.12
122.28
109.97
54.70
42.23
35.48
29.28
21.51
21.00
Ph
H3C
O
O
O
CH3
CH3
7
f1 (ppm)

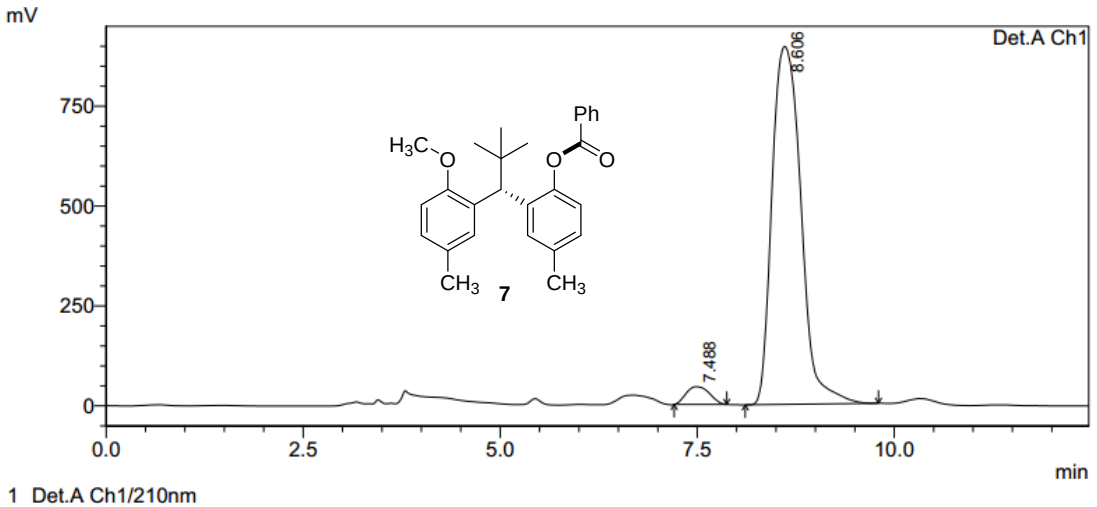


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.558	15075584	729337	49.903	52.557
2	8.642	15134065	658361	50.097	47.443
Total		30209650	1387699	100.000	100.000

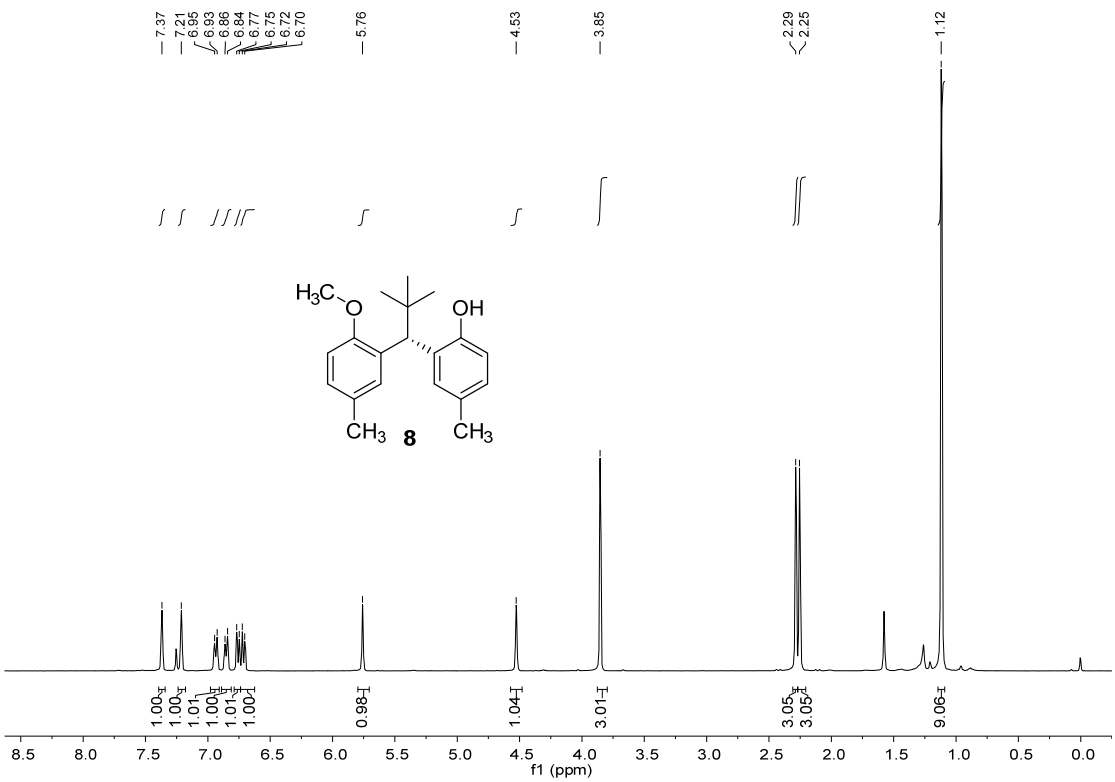


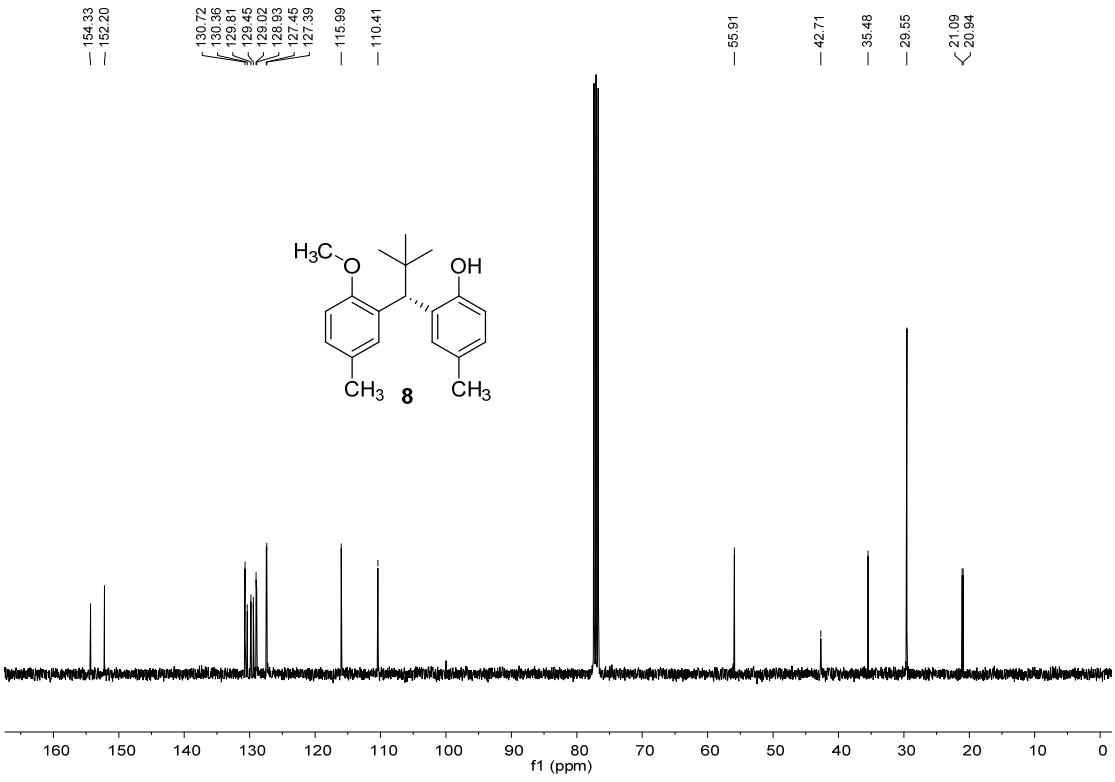
1 Det.A Ch1/210nm

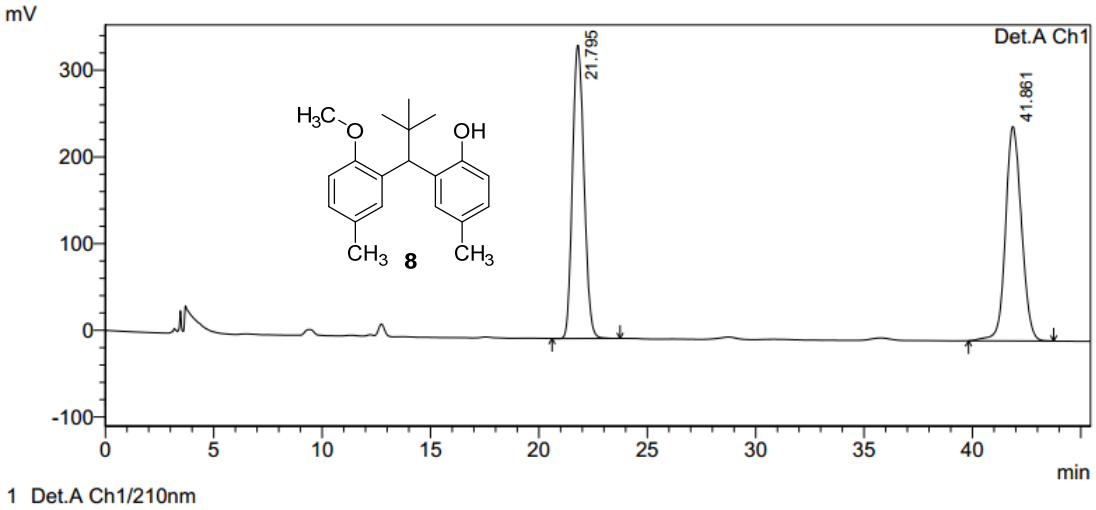
PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	7.488	916936	44628	3.853	4.744
2	8.606	22882717	896054	96.147	95.256
Total		23799653	940682	100.000	100.000


7.37
7.21
6.95
6.93
6.86
6.84
6.77
6.75
6.72
6.70
5.76
4.53
3.85
2.29
2.25
1.12
H3C
O
OH
CH3
8
CH3
1.00
1.00
1.01
1.00
1.01
1.00
0.98
1.04
3.01
3.05
3.05
9.06
f1 (ppm)


154.33
152.20
130.72
130.36
129.81
129.45
129.02
128.93
127.45
127.39
115.99
110.41
55.91
42.71
35.48
29.55
21.09
20.94
H3C
O
OH
CH3
8
CH3
f1 (ppm)

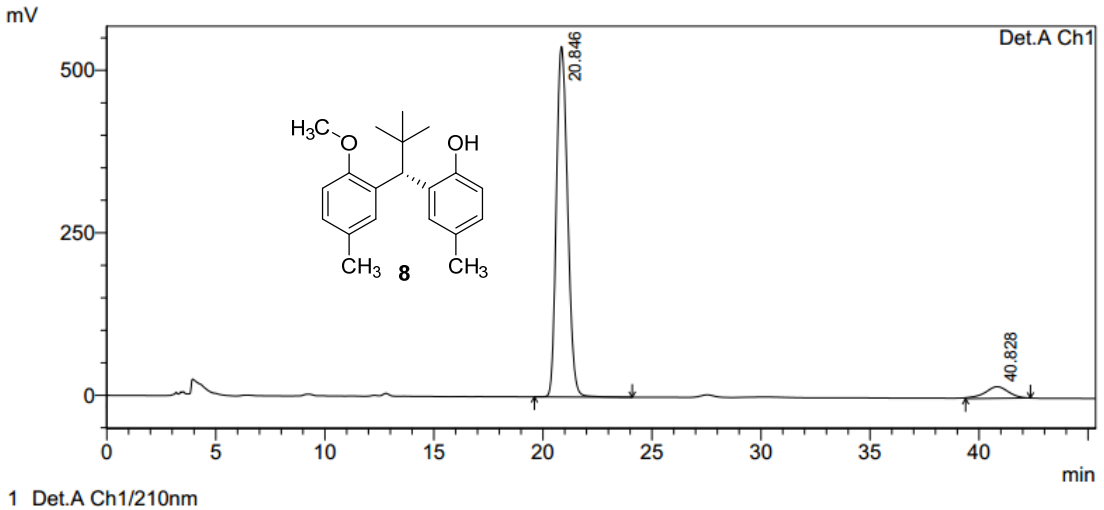


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	21.795	12511772	338437	49.621	57.767
2	41.861	12702887	247430	50.379	42.233
Total		25214659	585866	100.000	100.000

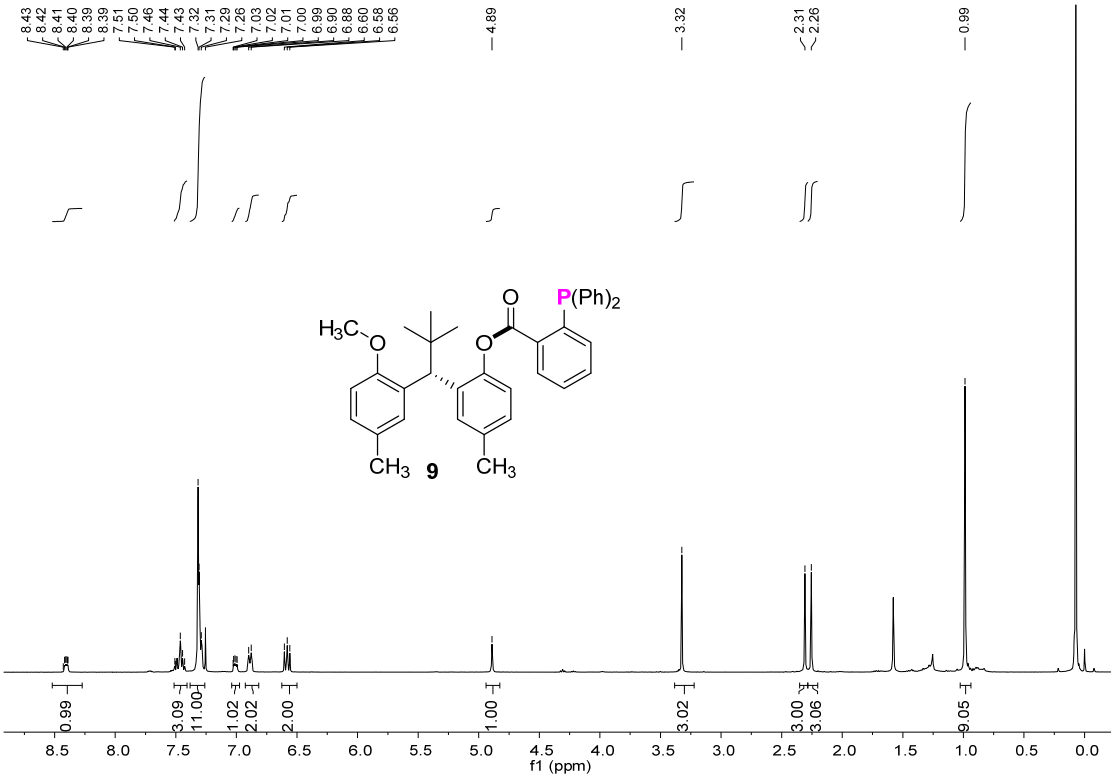


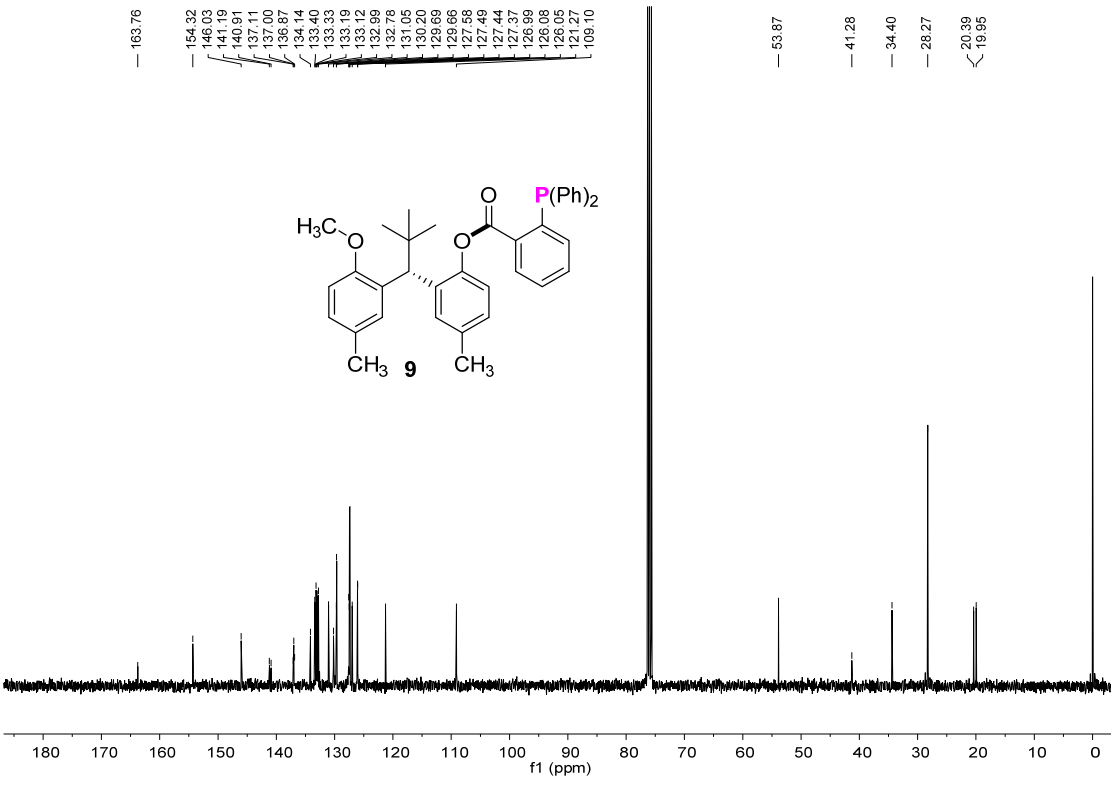
1 Det.A Ch1/210nm

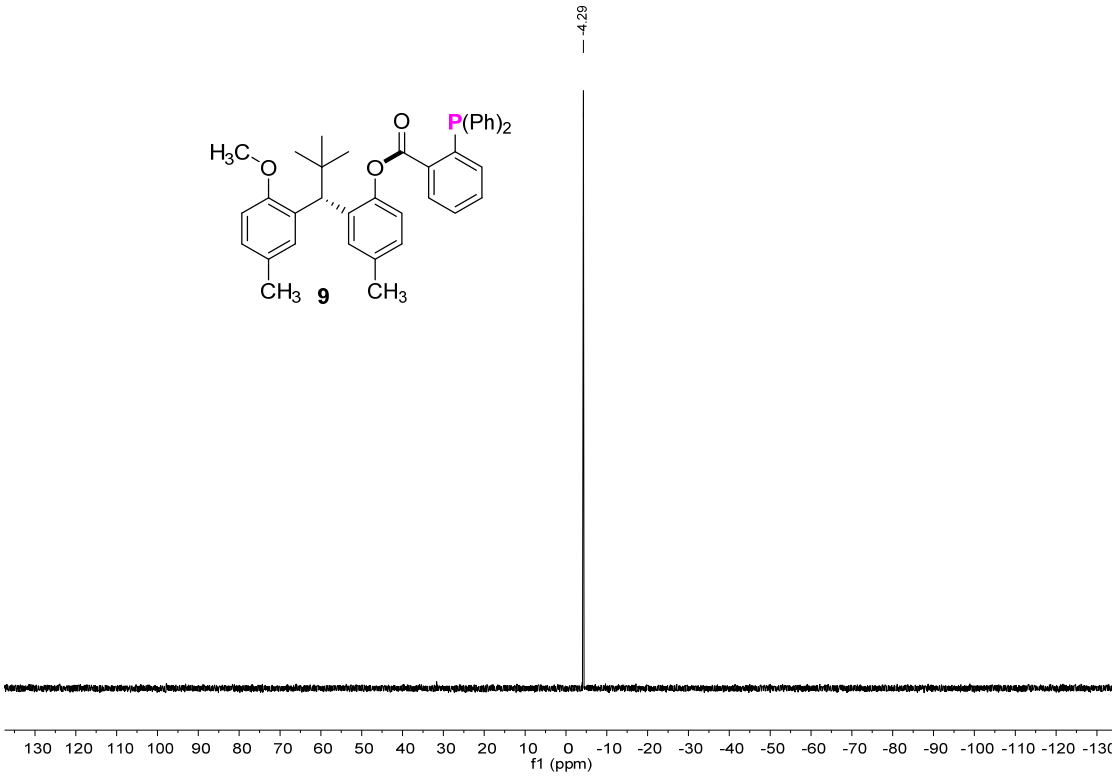
PeakTable

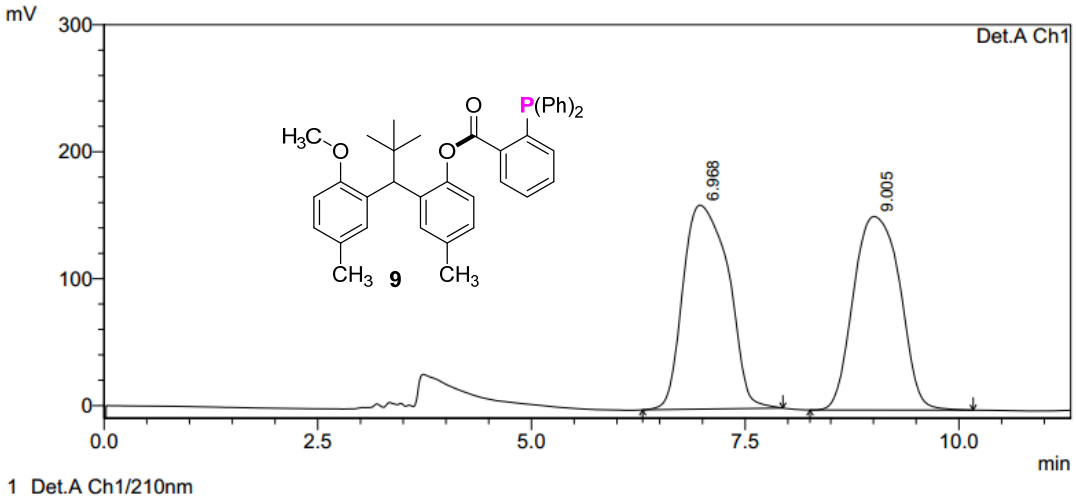
Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	20.846	19341264	539288	93.418	96.769
2	40.828	1362773	18008	6.582	3.231
Total		20704037	557296	100.000	100.000


8.43
8.42
8.41
8.40
8.39
7.51
7.50
7.46
7.44
7.43
7.32
7.31
7.29
7.26
7.03
7.02
7.01
7.00
6.99
6.90
6.88
6.60
6.58
6.56
4.89
3.32
2.31
2.26
0.99
O
P(Ph)2
H3C
O
O
CH3
9
CH3
0.99
3.09
11.00
1.02
2.02
2.00
1.00
3.02
3.00
3.06
9.05
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


163.76
154.32
146.03
141.19
140.91
137.11
137.00
136.87
134.14
133.40
133.33
133.19
133.12
132.99
132.78
131.05
130.20
129.69
129.66
127.58
127.49
127.44
127.37
126.99
126.08
126.05
121.27
109.10
53.87
41.28
34.40
28.27
20.39
19.95
O
P(Ph)2
H3C
O
O
CH3
9
CH3
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)



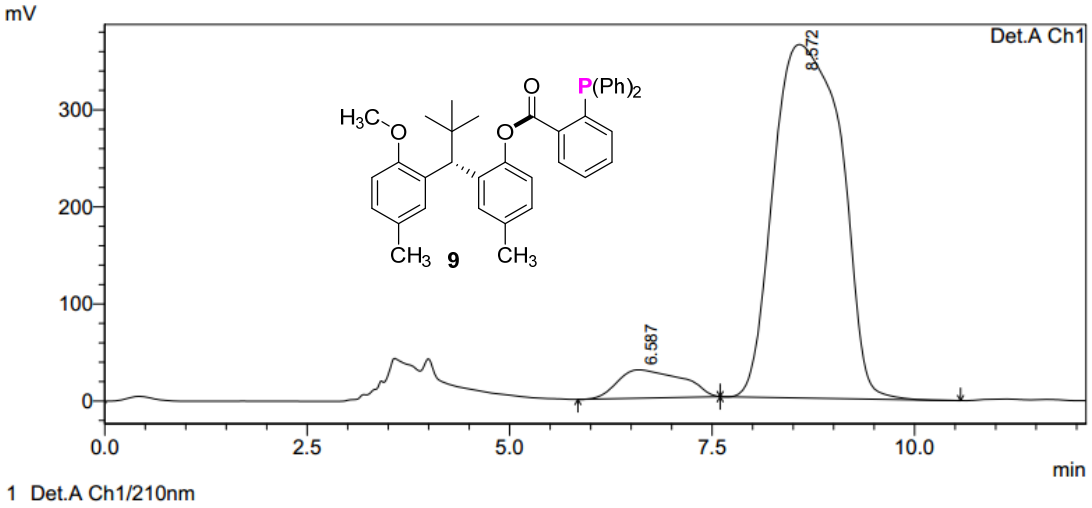


1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.968	5944431	160645	50.661	51.302
2	9.005	5789389	152489	49.339	48.698
Total		11733820	313134	100.000	100.000



1 Det.A Ch1/210nm

PeakTable

Detector A Ch1 210nm

Peak#	Ret. Time	Area	Height	Area %	Height %
1	6.587	1611368	29296	7.054	7.446
2	8.572	21232063	364132	92.946	92.554
Total		22843431	393428	100.000	100.000