SUPPORTING INFORMATION

Chiral *N*-Heterocyclic-Carbene-Catalyzed Cascade Asymmetric Desymmetrization of Cyclopentenediones with Enals: Access to Optically Active 1,3-Indandione Derivatives

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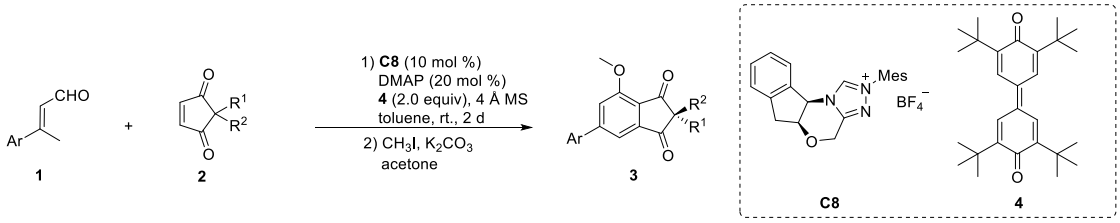
I: General methods

Unless otherwise noted, all reactions were carried out under an atmosphere of nitrogen in oven-dried Schlenk tube with magnetic stirring, all reagents obtained from commercial suppliers were used without further purification. Reactions were monitored by thin-layer chromatography (TLC) on silica gel precoated glass plates (0.2 ± 0.03 mm thickness, GF-254, particle size 0.01–0.04 mm) from Yantai Chemical Industry Research Institute. TLC were visualized by UV fluorescence (254 nm). Flash column chromatography was performed with silica gel (particle size 0.04–0.05 mm). ^{1}H NMR, ^{13}C NMR and ^{19}F NMR spectroscopic data were recorded using Bruker AMX-400 instrument and calibrated by using the residual solvent peaks as an internal reference *($CDCl_3$ [^{1}H: 7.26, ^{13}C: 77.23]*. Coupling constants (*J*) are given in Hz. High-resolution mass spectra (HRMS) for all the compounds were determined on a Micromass GCT-TOF mass spectrometer with ESI or CI resource. High performance liquid chromatography (HPLC) was performed on Agilent 1200 Series chromatographs using a Daicel Chiralpak AD-H, IG-H, IA-H, AS-H (0.46 cm × 25 cm). X-ray data were recorded on a Rigaku Mercury CCD/AFC diffractomrter. Optical rotations are reported as follows: $[\alpha]_D^{20}$ (*c* in g per 100 mL, solvent).

II: General and Typical experimental procedures

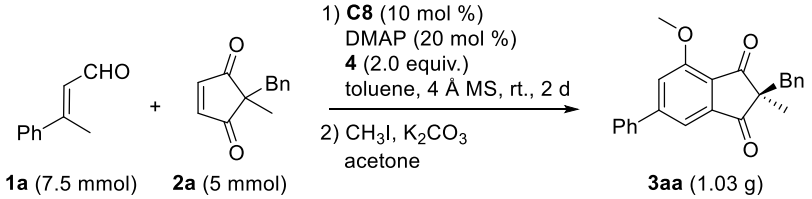
General procedure for the catalytic synthesis of products 3:



To a 25 mL pre-dried round-bottom Schlenk tube with a magnetic stir bar, were added 4 Å MS (160 mg), oxidant **4** (164 mg, 2.0 equiv), 2,2-disubstituted cyclopentenediones **2** (0.2 mmol, 1.0 equiv), triazolium salt **C8** (8.4 mg, 0.02 mmol, 0.1 equiv), DMAP (5.2 mg, 0.04 mmol, 0.2 equiv) and *β*,*β*-disubstituted enals **1** (0.3 mmol, 1.5 equiv), followed by an addition of anhydrous toluene (2 mL). Then the Schlenk tube was closed with septum and the reaction mixture was stirred at room temperature for two days. After completion of the reaction monitored by TLC, the reaction mixture went through fast flash column chromatography to yield the crude products. Next, to the solution of crude products (calculated as 1.0 equiv) in anhydrous acetone (2 mL), was included K_2CO_3 (2.0 equiv) and CH_3I (2.0 equiv), and the reaction mixture was stirred at room temperature about 2 hours. After the completion of the reaction monitored by TLC, solvent was removed under vacuum. The crude products were purified by flash column chromatography (PE/EA = 6/1) to provide **3**.

Note: The racemic samples described in this work were synthesized according above procedure, which were catalyzed by mixed **C8** and ***ent*-C8** as ligands in a 1:1 ratio.

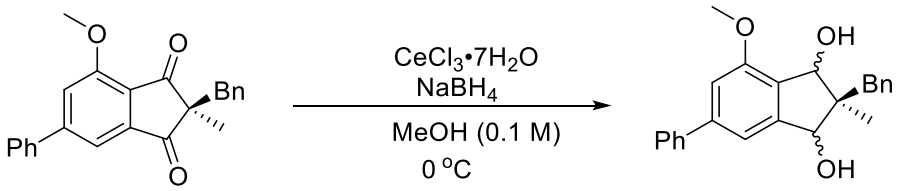
Typical procedure for the scale up synthesis of products 3aa:



To a 100 mL pre-dried round-bottom Schlenk tube with a magnetic stir bar, were added 4 Å MS (2.0 g), oxidant **4** (4.0 g, 2.0 equiv), 2,2-disubstituted

cyclopentenediones **2a** (1.0 g, 5.0 mmol, 1.0 equiv), triazolium salt **C8** (0.21 g, 0.5 mmol, 0.1 equiv), DMAP (0.13 g, 1.0 mmol, 0.2 equiv) and *β*,*β*-disubstituted enals **1a** (1.10 g, 7.5 mmol, 1.5 equiv), followed by an addition of 50 mL anhydrous toluene. Then the Schlenk tube was closed with septum and the reaction mixture was stirred at room temperature for two days. After completion of the reaction monitored by TLC, the reaction mixture went through fast flash column chromatography to yield the crude products. Next, to the solution of crude products (1.06 g) in anhydrous acetone (30 mL), was added K_2CO_3 (0.84 g, 2.0 equiv) and CH_3I (0.86 g, 0.38 mL, 2.0 equiv) and the reaction mixture was stirred at room temperature. When the reaction was complete monitored by TLC, the solvent was removed under vacuum. The mixtures were purified by flash column chromatography (PE/EA = 6/1) to furnished the desired products **3a** in overall 58% yield (1.03 g) with 87% ee.

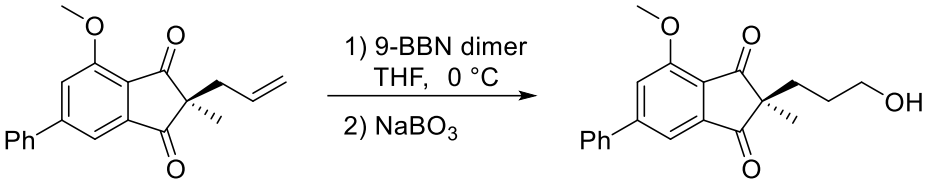
Transformation of 3aa to 4



3aa **4**

To a dry 25 mL Schlenk tube, equipped with a magnetic stir bar, was added **3aa** (36 mg, 0.1 mmol, 1.0 equiv) and $CeCl_3 \cdot 7H_2O$ (75 mg, 0.2 mmol, 2.0 equiv), followed by an addition of 1 mL absolute methanol under Argon and the reaction mixture was cooled to 0 ℃. Then $NaBH_4$ was added (8 mg, 0.2 mmol, 2.0 equiv) at once and the reaction mixture stirred at 0 ℃. After 30 min, the reaction mixture solution was quenched with 2 mL saturated NH_4Cl solution and diluted with CH_2Cl_2. Organic phase was separated from aqueous phase, the aqueous layer was extracted twice with CH_2Cl_2. Combined organic phase was dried over anhydrous Na_2SO_4, concentrated under vacuum and purified by flash column chromatography (PE/EA = 5/1) to give a white solid product **4**.

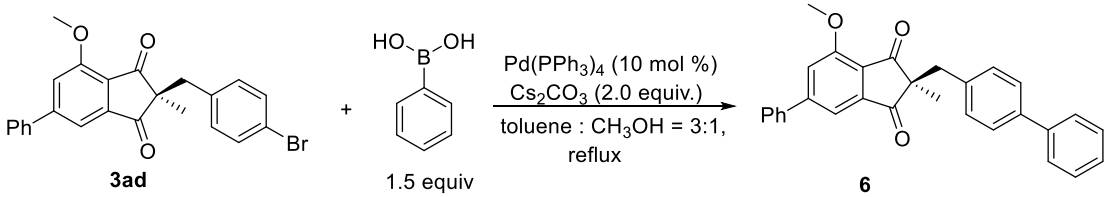
Transformation of 3at to 5



3at **5**

In a 25 mL of Schlenk tube equipped with a magnetic stirring bar, 9-BBN dimer (72.6 mg, 0.3 mmol) was dissolved in anhydrous THF (2 mL), and the resulting solution was cooled to 0 ℃. After the mixture was stirred for 5 min, a solution of **3at** (61.3 mg, 0.20 mmol) in THF (1 mL) was added to the reaction flask at 0 ℃ and stirred for about 12 h until the substrate was consumed. Then $NaBO_3$ (400 mg) in water (6 mL) was added to the reaction flask, and the resulting mixture was stirred at room temperature for 6 h. The organic layer was separated, and the aqueous layer was extracted with EtOAc (3 × 10 mL). The combined organic layers were washed with the saturated aqueous NaCl solution, dried over Na_2SO_4, and finally evaporated under reduced pressure. Purification of the crude product was performed with flash chromatography (PE/EA = 2/1) to give the pure product **5** as a white solid.

Transformation of 3ad to 6

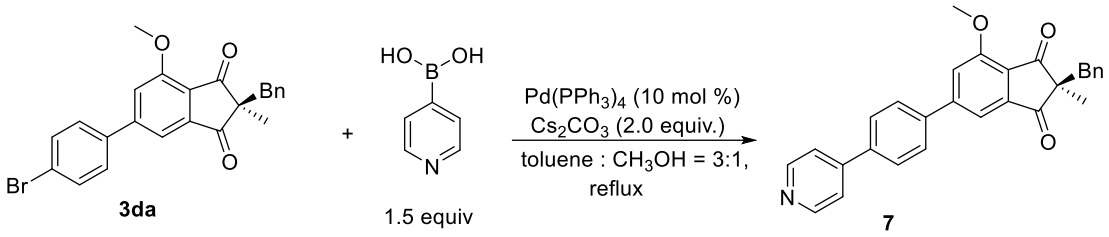


3ad 1.5 equiv **6**

In a 25 mL of Schlenk tube, equipped with a magnetic stirring bar, was added **3ad** (79 mg, 0.18 mmol), phenylboronic acid (32.9 mg, 0.27 mmol, 1.5 equiv), $Pd(PPh_3)_4$ (20.8 mg, 0.018 mmol, 0.1 equiv) and Cs_2CO_3 (117.3 mg, 0.36 mmol, 2.0 equiv) in toluene/CH_3OH (3/1, 4 mL) solution. Then, the mixture was degassed under N_2 for 30 min at −78 ℃. Subsequently, the resulting mixture was stirred and heated to reflux for overnight. After complete consumption of starting material, the mixture was cooled to room temperature, passed through a pad of celite and extracted with ethyl acetate. Combined organic layer was washed with water and brine, dried over Na_2SO_4 and concentrated to give a crude product. Finally, it was purified by column

chromatography on silica gel with PE/EA (4/1) to give the pure product **6** as a white solid.

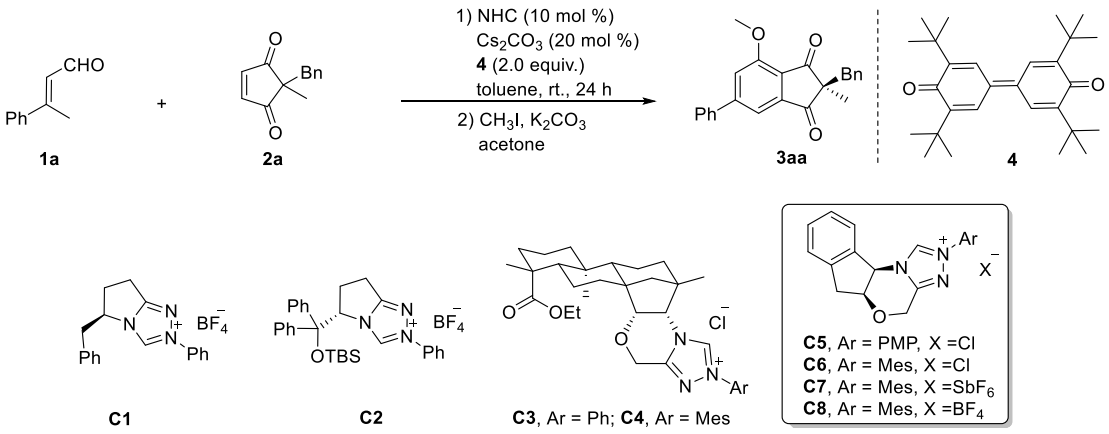
Transformation of 3da to 7



In a 25 mL of Schlenk tube, equipped with a magnetic stirring bar, was added **3da** (79 mg, 0.18 mmol), pyridine-4-boronic acid (33.2 mg, 0.27 mmol, 1.5 equiv), $Pd(PPh_3)_4$ (20.8 mg, 0.018 mmol, 0.1 equiv) and Cs_2CO_3 (117.3 mg, 0.36 mmol, 2.0 equiv) in toluene/CH_3OH (3/1, 4 mL) solution. Then, the mixture was degassed under N_2 for 30 min at −78 °C. Subsequently, the resulting mixture was stirred and heated to reflux for overnight. After complete consumption of starting material, the mixture was cooled to room temperature, passed through a pad of celite and extracted with ethyl acetate. Combined organic layer was washed with water and brine, dried over Na_2SO_4 and concentrated to give a crude product. Finally, it was purified by column chromatography on silica gel with PE/EA (1/1) to give the pure product **7** as a white solid.

III: Experimental screening details

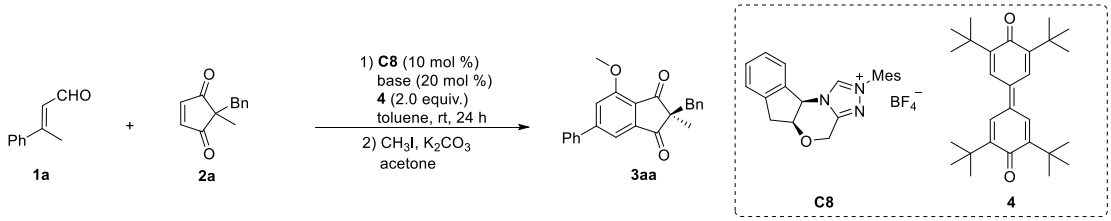
Table S1. Screening of NHC precatalysts.



entry[a]	cat.	yield[b] (%)	ee[c] (%)
1	**C1**	nr	--
2	**C2**	nr	--
3	**C3**	nr	--
4	**C4**	nr	--
5	**C5**	nr	--
6	**C6**	52	74
7	**C7**	48	74
8	**C8**	54	80

[a] Reaction conditions: **1a** (0.075 mmol, 1.5 equiv), **2a** (0.05 mmol, 1.0 equiv), NHC (10 mol %), Cs_2CO_3 (20 mol %), **4** (0.1 mmol, 2.0 equiv), toluene (1 mL), rt, 24 hours. [b] Isolated yield. [c] Determined by HPLC.

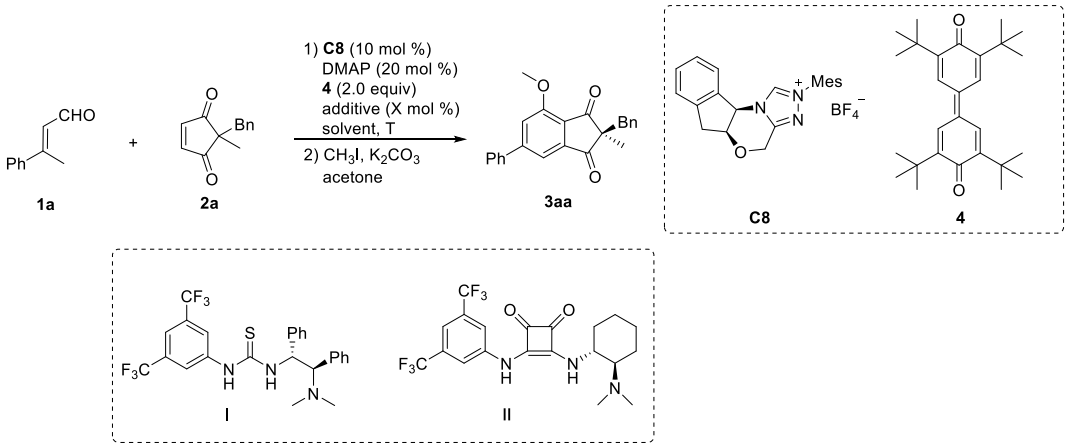
Table S2. Screening of bases.



entry[a]	base	yield[b] (%)	ee[c] (%)
1	Li_2CO_3	nr	--
2	Na_2CO_3	47	75
3	K_2CO_3	50	76
4	$CaCO_3$	nr	--
5	$BaCO_3$	nr	--
6	NaOAc	nr	--
7	KOAc	48	78
8	Na_3PO_4	50	80
9	K_3PO_4	52	83
10	Na_2HPO_4	nr	--
11	$NaOCH_3$	nr	--
12	NaO^tBu	nr	--
13	KO^tBu	nr	--
14	Et_3N	trace	n.d.
15	DBACO	52	82
16	DBU	54	83
17	TMEDA	trace	n.d.
18	DMAP	53	86

[a] Reaction conditions: **1a** (0.075 mmol, 1.5 equiv), **2a** (0.05 mmol, 1.0 equiv), **C8** (10 mol %), base (20 mol %), **4** (0.1 mmol, 2.0 equiv), toluene (1 mL), rt, 24 hours. [b] Isolated yield. [c] Determined by HPLC.

Table S3. Screening of solvents, reaction temperature and additives.



entry[a]	solvent	additive	X (mol %)	T (°C)	yield[b] (%)	ee[c] (%)
1	*p*-xylene	--	--	rt	49	85
2	*m*-xylene	--	--	rt	51	85
3	mesitylene	--	--	rt	54	83
4	ethylbenzene	--	--	rt	46	86
5	fluorobenzene	--	--	rt	23	81
6	pentafluorobenzene	--	--	rt	22	76
7	DCM	--	--	rt	46	40
8	DCE	--	--	rt	45	45
9	1,4-dioxane	--	--	rt	52	82
10	Et_2O	--	--	rt	45	87
11	MTBE	--	--	rt	38	89
12	toluene	--	--	0	< 5%	--
13	toluene	--	--	40	56	84
14	toluene	$Sc(OTf)_3$	20	rt	nr	--
15	toluene	$Mg(OTf)_2$	20	rt	nr	--
16	toluene	LiCl	20	rt	trace	n.d.
17	toluene	I	20	rt	33	82
18	toluene	II	20	rt	31	84
19	toluene	Na_2SO_4	20 mg	rt	46	88
20	toluene	$MgSO_4$	20 mg	rt	43	86
21	toluene	3 Å MS	20 mg	rt	55	85
22	toluene	4 Å MS	20 mg	rt	54	90
23	toluene	5 Å MS	20 mg	rt	35	88
24	toluene	4 Å MS	40 mg	rt	55	90
25	toluene	4 Å MS	60 mg	rt	50	90
26[d]	toluene	4 Å MS	40 mg	rt	60	90

[a] Reaction conditions: **1a** (0.075 mmol, 1.5 equiv), **2a** (0.05 mmol, 1.0 equiv), **C8** (10 mol %), DMAP (20 mol %), **4** (0.1 mmol, 2.0 equiv), solvent (1 mL), rt., 24 hours. [b] Isolated yield. [c] Determined by HPLC. [d] reaction time 2 days.

IV: Crystal data and ORTEP diagram for compound 3ad

X-ray data of **3ad**

Identification code	mo_20190418f_0ma_a
Empirical formula	$C_{24}H_{19}BrO_3$
Formula weight	435.30
Temperature	149.99 K
Wavelength	0.71073 Å
Crystal system	orthorhombic
Space group	P 21 21 21
Unit cell dimensions	a = 6.9776 (2) Å α = 90 º
	b = 14.8155 (5) Å β = 90 º
	c = 19.0346 (7) Å γ = 90º
Volume	1967.73 (11) $Å^3$
Z	4
Density (calculated)	1.469 mg/m^3
Absorption coefficient	2.111 mm^{-1}
F(000)	888.0
Crystal size	0.35 × 0.3 × 0.2 mm^3
Theta range for data collection	2.544 º to 27.502 º
Index ranges	-9⩽h⩽9, -19⩽k⩽19, -24⩽l⩽24
Reflections collected	50231
Independent reflections	4510 [R_{int} = 0.0562]
Completeness to theta = 25.00°	99.5%
Absorption correction	Semi-empirical from equivalents
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	4510 / 0 / 256
Goodness-of-fit on F^2	1.035
Final R indices [I>2sigma(I)]	R_1 = 0.0237, wR_2 = 0.0551

R indices (all data)	$R_1 = 0.0277$, $wR_2 = 0.0567$
Absolute structure parameter	0.015(8)
Largest diff. peak and hole	0.265 and -0.413 e. Å^{-3}

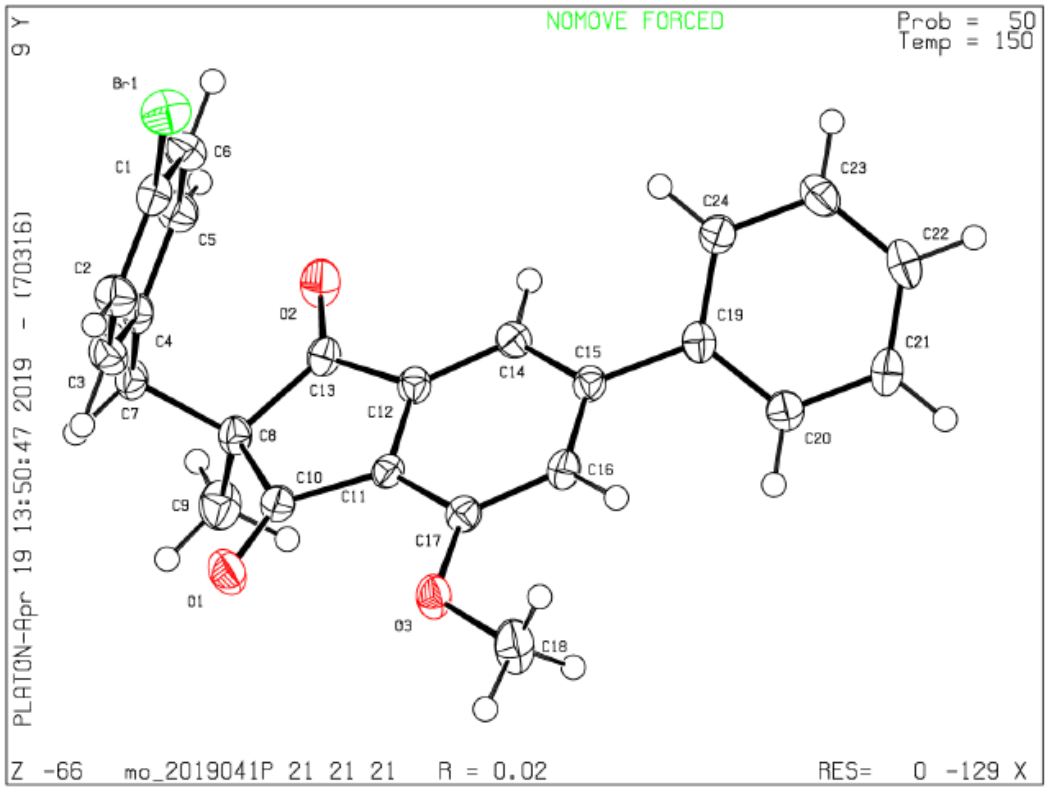


Figure S1. ORTEP drawing of **3ad**

The crystal was prepared from the solution of **3ad** in petroleum n-hexane/dichloromethane. CCDC 1911223 contains the supplementary crystallographic data for this paper. These data can be obtained free of charge from The Cambridge Crystallographic Data Centre via www.ccdc.cam.ac.uk/data request/cif.

V: Characterization of products

(*S*)-2-Benzyl-4-methoxy-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (3aa).

39.8 mg, overall 60% yield, white solid, m. p. 90 – 91 ºC; 90% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 10.82, t

(minor) = 14.64; $[\alpha]_D^{20}$ = −10.0 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.65 – 7.51 (m, 3H), 7.49 – 7.36 (m, 3H), 7.29 (d, *J* = 1.2 Hz, 1H), 7.15 – 6.90 (m, 5H), 4.01 (s, 3H), 3.30 – 2.98 (m, 2H), 1.38 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.4, 201.2, 157.5, 150.9, 143.9, 139.1, 136.2, 129.9, 129.2, 129.1, 128.1, 127.4, 127.3, 126.6, 116.3, 113.2, 56.5, 56.4, 41.2, 20.8. IR (neat, cm^{-1}): 1733, 1699, 1600, 1494, 1173, 1103, 1054, 996, 872, 801, 760, 701, 635. HRMS (ESI): calcd. for $C_{24}H_{20}O_3Na^+$ [M + Na] $^+$ 379.1305; found: 379.1305.

(*S*)-2-(4-Fluorobenzyl)-4-methoxy-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (3ab). 38.2 mg, overall 51% yield, white solid, m. p. 73 – 74 ºC; 90% ee . The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL·min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 11.93, t (minor) = 13.71; $[\alpha]_D^{20}$ = −12.9 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.58 (td, *J* = 4.0, 1.6 Hz, 3H), 7.52 – 7.38 (m, 3H), 7.32 (d, *J* = 1.2 Hz, 1H), 7.11 – 6.89 (m, 2H), 6.74 (t, *J* = 8.8 Hz, 2H), 4.03 (s, 3H), 3.25 – 2.97 (m, 2H), 1.37 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.3, 201.1, 162.9, 160.4, 157.5, 151.1, 143.8, 139.0, 131.4 (d, J_{C-F} = 8.0 Hz) 129.2, 129.1, 127.5, 127.3, 116.4, 114.9 (d, J_{C-F} = 21.0 Hz), 113.3, 56.5, 56.4, 40.1, 20.9. ^{19}F NMR (376 MHz, $CDCl_3$) δ −116.2 (Ar−F). IR (neat, cm^{-1}): 1737, 1700, 1601, 1570, 1509, 1333, 1220, 997, 872, 820, 764, 751, 696. HRMS (ESI): calcd. for $C_{24}H_{19}FO_3Na^+$ [M + Na] $^+$ 397.1210; found: 397.1208.

(*S*)-2-(4-Chlorobenzyl)-4-methoxy-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (3ac). 43.0 mg, overall 55% yield, white solid, m. p. 145 – 146 ºC; 89% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL·min^{-1}, λ= 254 nm]: major diastereoisomer t (major) = 13.23, t (minor) = 15.42; $[\alpha]_D^{20}$ = −28.7 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 – 7.53 (m, 3H), 7.54 – 7.40 (m, 3H), 7.35 (d, *J* = 1.2 Hz, 1H), 7.12 – 6.93 (m, 4H), 4.06 (s, 3H), 3.23 – 3.03 (m, 2H), 1.39 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.1, 201.0, 157.6, 151.2, 143.7, 139.0, 134.7, 132.5, 131.3, 129.2, 129.2, 128.3, 127.5, 127.2, 116.5, 113.3, 56.4, 56.3, 40.1, 21.1. IR (neat, cm^{-1}): 1735, 1700, 1604, 1568, 1449, 1407, 1368,

1337, 1255, 1236, 1171, 1100, 995, 871, 816, 772, 762, 698. HRMS (ESI): calcd. for $C_{24}H_{20}ClO_3^+$ $[M + H]^+$ 391.1095; found: 391.1095.

(*S*)-2-(4-Bromobenzyl)-4-methoxy-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (3ad). 51.2 mg, overall 59% yield, white solid, m. p. 156 – 157 °C; 87% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 13.93, t (minor) = 15.98; $[\alpha]_D^{20}$ = −38.6 (*c* 1, $CHCl_3$); ^1H NMR (400 MHz, $CDCl_3$) δ 7.67 – 7.53 (m, 3H), 7.52 – 7.39 (m, 3H), 7.34 (d, *J* = 1.2 Hz, 1H), 7.23 – 7.12 (m, 2H), 7.00 – 6.87 (m, 2H), 4.04 (s, 3H), 3.18 – 2.99 (m, 2H), 1.37 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.1, 200.9, 157.6, 151.2, 143.6, 139.0, 135.3, 131.7, 131.2, 129.2, 129.1, 127.5, 127.1, 120.7, 116.5, 113.4, 56.4, 56.3, 40.1, 21.2. IR (neat, cm^{-1}): 1734, 1698, 1602, 1407, 1233, 1180, 1154, 1099, 1072, 1040, 922, 871, 803, 768, 712, 632. HRMS (ESI): calcd. for $C_{24}H_{20}BrO_3^+$ $[M + H]^+$ 435.0590; found: 435.0590.

(*S*)-4-Methoxy-2-methyl-2-(4-methylbenzyl)-6-phenyl-1H-indene-1,3(2H)-dione (3ae). 41.5 mg, overall 56% yield, white solid, m. p. 101 – 102 °C; 91% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 10.63, t (minor) = 16.29; $[\alpha]_D^{20}$ = −6.0 (*c* 1, $CHCl_3$); ^1H NMR (400 MHz, $CDCl_3$) δ 7.57 (dd, *J* = 8.4, 1.6 Hz, 3H), 7.50 – 7.38 (m, 3H), 7.31 (d, *J* = 1.2 Hz, 1H), 6.94 (d, *J* = 8.0 Hz, 2H), 6.87 (d, *J* = 8.0 Hz, 2H), 4.03 (s, 3H), 3.20 – 3.02 (m, 2H), 2.14 (s, 3H), 1.36 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.4, 201.4, 157.5, 150.8, 143.9, 139.1, 136.0, 133.1, 129.8, 129.2, 129.1, 128.8, 127.4, 127.3, 116.3, 113.3, 56.5, 56.4, 40.7, 21.0, 20.9. IR (neat, cm^{-1}): 1736, 1702, 1600, 1568, 1368, 1337, 1254, 1233, 1171, 1101, 1056, 996, 943, 869, 765, 699. HRMS (ESI): calcd. For $C_{25}H_{23}O_3^+$ $[M + H]^+$ 371.1642; found: 371.1628.

(*S*)-4-Methoxy-2-methyl-6-phenyl-2-(4-(trifluoromethyl)benzyl)-1H-indene-1,3(2H)-dione (3af). 48.4 mg, overall 57% yield, white solid, m. p. 140 – 141 °C; 86% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t

(major) = 10.41, t (minor) = 12.95; $[\alpha]_D^{20}$ = −7.9 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 – 7.53 (m, 3H), 7.51 – 7.38 (m, 3H), 7.37 – 7.29 (m, 3H), 7.19 (d, *J* = 8.0 Hz, 2H), 4.03 (s, 3H), 3.26 – 3.12 (m, 2H), 1.40 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 203.8, 200.6, 157.6, 151.3, 143.5, 140.4, 139.0, 130.3, 129.3, 129.2, 128.7, 127.5, 127.0, 125.1 (q, $J_{C\text{-}F}$ = 3.8 Hz), 116.5, 113.4, 56.4, 56.3, 40.3, 21.3. ^{19}F NMR (376 MHz, $CDCl_3$) δ −62.5 (Ar−F). IR (neat, cm^{-1}): 1738, 1703, 1602, 1570, 1325, 1254, 1235, 1159, 1121, 1099, 1066, 997, 703, 633. HRMS (ESI): calcd. For $C_{25}H_{19}F_3O_3Na^+$ [M + Na] $^+$ 447.1179; found: 447.1183.

(*S*)-4-Methoxy-2-methyl-2-(4-nitrobenzyl)-6-phenyl-1H-indene-1,3(2H)-dione (3ag). 69.8 mg, overall 87% yield, white solid, m. p. 175 – 176 °C; 89% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 28.11, t (minor) = 31.53; $[\alpha]_D^{20}$ = −30.9 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.01 – 7.84 (m, 2H), 7.65 – 7.50 (m, 3H), 7.50 – 7.38 (m, 3H), 7.34 (d, *J* = 1.2 Hz, 1H), 7.27 – 7.18 (m, 2H), 4.04 (s, 3H), 3.30 – 3.14 (m, 2H), 1.41 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 203.5, 200.3, 157.7, 151.5, 146.8, 144.0, 143.3, 138.8, 130.9, 129.4, 129.2, 127.5, 126.8, 123.4, 116.7, 113.4, 56.4, 56.3, 40.0, 21.4. IR (neat, cm^{-1}): 1735, 1699, 1600, 1568, 1517, 1452, 1099, 998, 830, 775, 766, 720, 698. HRMS (ESI): calcd. for $C_{24}H_{19}NO_5Na^+$ [M + Na] $^+$ 424.1155; found: 424.1154.

(*S*)-2-(3-Chlorobenzyl)-4-methoxy-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (3ah). 31.2 mg, overall 40% yield, white solid, m. p. 46 – 47 °C; 87% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 10.89, t (minor) = 13.79; $[\alpha]_D^{20}$ = +4.3 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 – 7.54 (m, 3H), 7.51 – 7.40 (m, 3H), 7.33 (d, *J* = 1.2 Hz, 1H), 7.06 (s, 1H), 7.03 – 6.98 (m, 2H), 6.98 – 6.90 (m, 1H), 4.04 (s, 3H), 3.17 – 3.03 (m, 2H), 1.38 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 203.9, 200.7, 157.6, 151.1, 143.7, 139.0, 138.2, 133.8, 129.9, 129.4, 129.2, 129.2, 128.2, 127.5, 127.2, 126.9, 116.5, 113.4, 56.4, 56.3, 40.5, 20.9. IR (neat, cm^{-1}): 1737, 1699, 1600, 1449, 1371, 1332, 1207, 1079, 997, 924, 869, 787, 758,

697, 564, 469. HRMS (ESI): calcd. for $C_{24}H_{20}ClO_3^+$ [M + H] $^+$ 391.1095; found: 391.1096.

(*S*)-2-(3-Bromobenzyl)-4-methoxy-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (3ai). 36.6 mg, overall 42% yield, white solid, m. p. 49 – 50 ^{o}C; 86% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL·min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 11.17, t (minor) = 14.06; $[\alpha]_D^{20}$ = +12.0 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 – 7.54 (m, 3H), 7.52 – 7.39 (m, 3H), 7.33 (d, *J* = 1.2 Hz, 1H), 7.24 – 7.18 (m, 1H), 7.15 (dt, *J* = 8.0, 1.6 Hz, 1H), 7.03 – 6.88 (m, 2H), 4.04 (s, 3H), 3.17 – 3.02 (m, 2H), 1.38 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 203.9, 200.7, 157.6, 151.1, 143.7, 139.1, 138.5, 132.8, 129.9, 129.7, 129.3, 129.2, 128.7, 127.5, 127.2, 122.1, 116.5, 113.4, 56.4, 56.3, 40.5, 20.9. IR (neat, cm^{-1}): 1737, 1670, 1602, 1567, 1127, 1333, 1234, 1208, 1073, 997, 869, 758, 695, 668. HRMS (ESI): calcd. for $C_{24}H_{19}BrO_3Na^+$ [M + Na] $^+$ 457.0410; found: 457.0413.

(*S*)-4-Methoxy-2-(3-methoxybenzyl)-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (3aj). 33.2 mg, overall 43% yield, colorless oily liquid; 87% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL·min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 12.65, t (minor) = 17.05; $[\alpha]_D^{20}$ = +12.0 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.63 – 7.53 (m, 3H), 7.52 – 7.39 (m, 3H), 7.30 (d, *J* = 1.2 Hz, 1H), 6.95 (t, *J* = 7.6 Hz, 1H), 6.64 (dt, *J* = 7.6, 1.2 Hz, 1H), 6.59 (t, *J* = 2.4 Hz, 1H), 6.55 (ddd, *J* = 3.6, 2.8, 1.2 Hz, 1H), 4.03 (s, 3H), 3.67 (s, 3H), 3.19 – 3.07 (m, 2H), 1.38 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.4, 201.2, 159.1, 157.5, 150.8, 143.9, 139.1, 137.7, 129.2, 129.2, 129.1, 127.4, 122.4, 116.3, 114.9, 113.2, 112.8, 56.4, 56.3, 55.1, 41.4, 20.8. IR (neat, cm^{-1}): 2921, 1737, 1699, 1600, 1449, 1332, 1231, 1048, 995, 868, 760, 695, 476. HRMS (ESI): calcd. for $C_{25}H_{22}O_4Na^+$ [M + Na] $^+$ 409.1410; found: 409.1400.

(*S*)-4-Methoxy-2-methyl-2-(3-methylbenzyl)-6-phenyl-1H-indene-1,3(2H)-dione (3ak). 25.9 mg, overall 35% yield, colorless oily liquid; 88% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the

eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 8.90, t (minor) = 12.12; $[\alpha]_D^{20}$ = +6.4 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 – 7.52 (m, 3H), 7.51 – 7.38 (m, 3H), 7.30 (d, *J* = 1.2 Hz, 1H), 6.95 (t, *J* = 7.6 Hz, 1H), 6.90 – 6.73 (m, 3H), 4.02 (s, 3H), 3.20 – 3.00 (m, 2H), 2.16 (s, 3H), 1.38 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.4, 201.3, 157.5, 150.8, 143.9, 139.1, 137.6, 136.1, 130.7, 129.2, 129.1, 128.0, 127.4, 127.3, 127.0, 116.3, 113.2, 56.5, 56.4, 41.2, 21.3, 20.8. IR (neat, cm^{-1}): 2919, 1737, 1700, 1601, 1448, 1332, 1230, 995, 866, 790, 759, 696, 564, 468. HRMS (ESI): calcd. for $C_{25}H_{23}O_3^+$ [M + H] $^+$ 371.1642; found: 371.1642.

(*S*)-2-(2-Fluorobenzyl)-4-methoxy-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (3al). 35.2 mg, overall 47% yield, white solid, m. p. 101 – 102 °C; 66% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 13.53, t (minor) = 18.84; $[\alpha]_D^{20}$ = +26.0 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 (d, *J* = 1.2 Hz, 1H), 7.64 – 7.56 (m, 2H), 7.52 – 7.39 (m, 3H), 7.36 (d, *J* = 1.2 Hz, 1H), 7.13 – 7.02 (m, 2H), 6.95 – 6.82 (m, 2H), 4.05 (s, 3H), 3.15 (d, *J* = 1.6 Hz, 2H), 1.38 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 203.5, 200.6, 162.1, 159.7, 157.7, 151.0, 143.5, 139.1, 132.3, 132.2, 129.2, 129.1, 128.7 (d, $J_{C\text{-}F}$ = 8.0 Hz), 127.5, 127.0, 123.7 (d, $J_{C\text{-}F}$ = 4.0 Hz), 116.4, 115.3 (d, $J_{C\text{-}F}$ = 22.0 Hz), 113.4, 56.4, 55.2, 33.9, 33.9, 19.6. ^{19}F NMR (376 MHz, $CDCl_3$) δ −114.8 (Ar−F). IR (neat, cm^{-1}): 1740, 1703, 1601, 1585, 1493, 1450, 1334, 1210, 1182, 1077, 1028, 997, 869, 756, 699. HRMS (ESI): calcd. for $C_{24}H_{19}FO_3Na^+$ [M + Na] $^+$ 397.1210; found: 397.1208.

(*S*)-2-(2-Chlorobenzyl)-4-methoxy-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (3am). 39.0 mg, overall 50% yield, white solid, m. p. 91 – 92 °C; 52% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ= 254 nm]: major diastereoisomer t (major) = 13.66, t (minor) = 16.34; $[\alpha]_D^{20}$ = +38.2; ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 – 7.58 (m, 1H), 7.52 – 7.41 (m, 2H), 7.38 (d, *J* = 1.2 Hz, 3H), 7.25 – 7.19 (m, 1H), 7.18 – 7.12 (m, 1H), 7.09 – 7.01 (m, 1H), 4.06 (s, 3H), 3.28 (s, 2H), 1.38 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 203.3, 200.5, 157.7, 151.0, 143.6, 139.1, 134.8, 133.9, 132.0, 129.7, 129.2,

129.1, 128.2, 127.5, 127.0, 126.4, 116.4, 113.5, 56.4, 55.2, 37.9, 19.3. IR (neat, cm^{-1}): 1740, 1704, 1603, 1572, 1450, 1332, 1209, 1079, 1052, 1036, 996, 864, 767, 751, 719, 701, 690. HRMS (ESI): calcd. for $C_{24}H_{19}ClO_3Na^+$ [M + Na] $^+$ 413.0915; found: 413.0930.

(*S*)-2-(2-Bromobenzyl)-4-methoxy-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (3an). 45.1 mg, overall 52% yield, white solid, m. p. 130 – 131 ^{o}C; 46% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) =15.04, t (minor) = 17.46; $[\alpha]_D^{20}$ = +44.4 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 (d, *J* = 1.2 Hz, 1H), 7.65 – 7.56 (m, 2H), 7.54 – 7.40 (m, 4H), 7.38 (d, *J* = 1.2 Hz, 1H), 7.16 (dd, *J* = 7.6, 2.0 Hz, 1H), 7.09 (td, *J* = 7.6, 2.0 Hz, 1H), 6.96 (td, *J* = 8.0, 2.0 Hz, 1H), 4.07 (s, 3H), 3.31 (s, 2H), 1.38 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 203.2, 200.5, 157.8, 151.1, 143.6, 139.1, 135.8, 133.1, 131.7, 129.3, 129.2, 128.4, 127.5, 127.0, 126.9, 125.6, 116.4, 113.5, 56.4, 55.2, 40.3, 19.3. IR (neat, cm^{-1}): 1738, 1701, 1603, 1567, 1469, 1451, 1335, 1232, 1024, 995, 874, 765, 755, 703, 658. HRMS (ESI): calcd. for $C_{24}H_{19}BrO_3Na^+$ [M + Na] $^+$ 457.0410; found: 457.0416.

(*S*)-4-Methoxy-2-methyl-2-(2-methylbenzyl)-6-phenyl-1H-indene-1,3(2H)-dione (3ao). 31.1 mg, overall 42% yield, white solid, m. p. 79 – 80 ^{o}C; 85% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 9.12, t (minor) = 11.83; $[\alpha]_D^{20}$ = +52.0 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.64 – 7.54 (m, 3H), 7.52 – 7.39 (m, 3H), 7.32 (d, *J* = 1.2 Hz, 1H), 7.03 – 6.94 (m, 2H), 6.92 (td, *J* = 7.2, 1.6 Hz, 1H), 6.87 (td, *J* = 7.2, 1.6 Hz, 1H), 4.03 (s, 3H), 3.20 (d, *J* = 2.4 Hz, 2H), 2.32 (s, 3H), 1.40 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.5, 201.4, 157.5, 150.8, 143.9, 139.1, 136.8, 134.7, 130.6, 130.2, 129.2, 129.1, 127.5, 126.7, 125.5, 116.3, 113.2, 56.4, 56.3, 37.7, 20.7, 19.9. IR (neat, cm^{-1}): 1739, 1704, 1601, 1449, 1323, 1206, 1074, 1050, 993, 865, 766, 746, 689, 565, 456. HRMS (ESI): calcd. for $C_{25}H_{22}O_3Na^+$ [M + Na] $^+$ 393.1461; found: 393.1457.

(*S*)-4-Methoxy-2-methyl-2-(naphthalen-2-ylmethyl)-6-phenyl-1H-indene-1,3(2H)-dione (3ap). 56.0 mg, overall 69% yield, white solid, m. p. 120 – 121 °C; 91% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 15.44, t (minor) = 18.27; $[\alpha]_D^{20}$ = −54.8 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.74 – 7.67 (m, 1H), 7.66 – 7.60 (m, 1H), 7.59 – 7.53 (m, 3H), 7.53 – 7.46 (m, 2H), 7.46 – 7.38 (m, 3H), 7.38 – 7.29 (m, 2H), 7.25 – 7.16 (m, 2H), 3.96 (s, 3H), 3.51 – 3.16 (m, 2H), 1.45 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.4, 201.2, 157.5, 150.9, 143.8, 139.1, 134.0, 133.2, 132.2, 129.1, 129.1, 128.8, 128.4, 127.9, 127.7, 127.5, 127.4, 127.3, 125.7, 125.5, 116.4, 113.3, 56.7, 56.3, 41.1, 21.3. IR (neat, cm^{-1}): 1736, 1699, 1602, 1568, 1449, 1335, 1233, 1173, 997, 854, 815, 762, 744, 703. HRMS (ESI): calcd. for $C_{28}H_{22}O_3Na^+$ [M + Na] $^+$ 429.1461; found: 429.1461.

(*S*)-4-Methoxy-2-methyl-2-(naphthalen-1-ylmethyl)-6-phenyl-1H-indene-1,3(2H)-dione (3aq). 43.9 mg, overall 54% yield, white solid, m. p. 56 – 57 °C; 85% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 12.14, t (minor) = 14.95; $[\alpha]_D^{20}$ = +95.5 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.15 (d, *J* = 8.4 Hz, 1H), 7.62 (d, *J* = 8.0 Hz, 1H), 7.56 – 7.29 (m, 9H), 7.26 (d, *J* = 6.8 Hz, 1H), 7.23 – 7.11 (m, 2H), 3.90 (s, 3H), 3.64 (s, 2H), 1.48 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.4, 201.2, 157.3, 150.6, 143.7, 139.1, 133.7, 132.6, 132.0, 129.1, 128.7, 128.3, 127.5, 127.4, 125.8, 125.4, 125.0, 124.9, 116.2, 113.1, 56.6, 56.3, 37.7, 20.4. IR (neat, cm^{-1}): 1737, 1700, 1601, 1570, 1450, 1333, 1231, 1213, 994, 868, 781, 759, 696. HRMS (ESI): calcd. for $C_{28}H_{22}O_3Na^+$ [M + Na] $^+$ 429.1461; found: 429.1459.

(*S*)-2-Benzyl-2-ethyl-4-methoxy-6-phenyl-1H-indene-1,3(2H)-dione (3ar). 34.8 mg, overall 47% yield, white solid, m. p. 107 – 108 °C; 46% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 9.97, t (minor) = 12.46; $[\alpha]_D^{20}$ = +14.4 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.67 – 7.53 (m, 3H), 7.52 – 7.35 (m, 3H), 7.28 (d, *J* = 1.6 Hz, 1H), 7.13 – 6.88 (m, 5H), 4.02 (s,

3H), 3.22 – 3.00 (m, 2H), 2.06 – 1.88 (m, 2H), 0.78 (t, *J* = 7.6 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.8, 201.5, 157.1, 150.7, 145.1, 139.1, 136.0, 130.0, 129.2, 129.1, 128.7, 128.1, 127.5, 126.5, 116.2, 112.8, 61.4, 56.4, 40.8, 29.1, 9.3. IR (neat, cm^{-1}): 1738, 1701, 1602, 1584, 1452, 1330, 1230, 1206, 870, 763, 741, 699. HRMS (ESI): calcd. for $C_{25}H_{22}O_3Na^+$ $[M + Na]^+$ 393.1461; found: 393.1458.

(*S*)-2-(4-Bromobenzyl)-2-ethyl-4-methoxy-6-phenyl-1H-indene-1,3(2H)-dione (3as). 45.7 mg, overall 51% yield, white solid, m. p. 129 – 130 ºC; 44% ee. The *ee* value was determined by HPLC [Daicel Chiralpak IA-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 10.28, t (minor) = 8.81; $[\alpha]_D^{20}$ = +5.2 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.66 – 7.55 (m, 3H), 7.53 – 7.39 (m, 3H), 7.33 (s, 1H), 7.24 – 7.07 (m, 2H), 6.92 (d, *J* = 8.4 Hz, 2H), 4.04 (s, 3H), 3.16 – 2.99 (m, 2H), 1.95 (qd, *J* = 7.6, 2.8 Hz, 2H), 0.78 (t, *J* = 7.6 Hz, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.5, 201.1, 157.2, 151.0, 144.9, 139.0, 135.1, 131.8, 131.2, 129.2, 129.1, 128.5, 127.5, 120.7, 116.4, 112.9, 61.2, 56.4, 39.6, 29.4, 9.3. IR (neat, cm^{-1}): 1734, 1698, 1602, 1583, 1407, 1333, 1233, 872, 803, 768, 696, 632. HRMS (ESI): calcd. for $C_{25}H_{21}BrO_3Na^+$ $[M + Na]^+$ 471.0566; found: 471.0565.

(*S*)-2-Allyl-4-methoxy-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (3at). 33.1 mg, overall 54% yield, white solid, m. p. 159 – 160 ºC; 60% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 10.49, t (minor) = 12.06; $[\alpha]_D^{20}$ = −15.0 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.71 (d, J = 1.6 Hz, 1H), 7.68 – 7.61 (m, 2H), 7.56 – 7.39 (m, 4H), 5.57 (m, 1H), 5.13 – 4.86 (m, 2H), 4.09 (s, 3H), 2.54 (m, 2H), 1.28 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.3, 201.3, 157.8, 151.2, 143.7, 139.2, 132.0, 129.2, 129.1, 127.5, 127.1, 119.3, 116.5, 113.5, 56.4, 54.5, 39.6, 19.5. IR (neat, cm^{-1}): 2358, 2151, 1948, 1740, 1702, 1601, 1333, 1233, 1004, 775, 702, 588. HRMS (ESI): calcd. for $C_{20}H_{19}O_3^+$ $[M + H]^+$ 307.1329; found: 307.1328.

Methyl (*S*)-2-(4-methoxy-2-methyl-1,3-dioxo-6-phenyl-2,3-dihydro-1H-inden-2-yl) acetate (3au). 40.6 mg, overall 60% yield, white solid, m. p. 151 – 152 ºC; 57% ee.

The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL·min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 19.26, t (minor) = 23.32; $[\alpha]_D^{20}$ = −18.0 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.75 (d, J = 1.2 Hz, 1H), 7.69 – 7.60 (m, 2H), 7.56 – 7.39 (m, 4H), 4.08 (s, 3H), 3.52 (s, 3H), 3.18 – 2.92 (m, 2H), 1.27 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 203.0, 200.2, 171.3, 157.9, 151.0, 143.4, 139.4, 129.2, 129.1, 127.5, 126.7, 116.4, 113.8, 56.3, 52.0, 51.8, 38.4, 21.1. IR (neat, cm^{-1}): 2920, 2357, 2217, 2194, 2162, 2015, 1947, 1731, 1702, 1603, 1334, 1208, 796, 623. HRMS (ESI): calcd. for $C_{20}H_{19}O_5^+$ $[M + H]^+$ 339.1227; found: 339.1222.

(*S*)-4-Methoxy-2-methyl-6-phenyl-2-(thiophen-2-ylmethyl)-1H-indene-1,3(2H)-dione (3av). 41.3 mg, overall 57% yield, colorless oily liquid; 84% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL·min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 14.03, t (minor) = 18.26; $[\alpha]_D^{20}$ = −6.5 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.68 – 7.55 (m, 3H), 7.52 – 7.40 (m, 3H), 7.35 (d, *J* = 1.2 Hz, 1H), 6.91 (dd, *J* = 4.8, 2.0 Hz, 1H), 6.70 (m, 2H), 4.05 (s, 3H), 3.48 – 3.30 (m, 2H), 1.37 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.1, 200.8, 157.7, 151.0, 144.0, 139.1, 137.6, 129.2, 129.1, 127.5, 127.4, 126.6, 124.3, 116.4, 113.4, 56.4, 56.3, 34.8, 20.7. IR (neat, cm^{-1}): 2924, 1737, 1699, 1600, 1449, 1332, 1209, 1078, 996, 758, 693, 552. HRMS (ESI): calcd. for $C_{22}H_{19}O_3S^+$ $[M + H]^+$ 363.1049 found: 363.1043.

(*S*)-2-Benzyl-6-(4-fluorophenyl)-4-methoxy-2-methyl-1H-indene-1,3(2H)-dione (3ba). 33.7 mg, overall 45% yield, white solid, m. p. 108 – 109 °C; 90% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL·min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 13.96, t (minor) = 18.04; $[\alpha]_D^{20}$ = +14.4 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.62 – 7.43 (m, 3H), 7.23 (d, *J* = 1.6 Hz, 1H), 7.20 – 7.10 (m, 2H), 7.11 – 6.92 (m, 5H), 4.01 (s, 3H), 3.22 – 3.06 (m, 2H), 1.38 (s, 3H). ^{13}C NMR (101 MHz, CDCl3) δ 204.3, 201.2, 163.5 (d, J_{CF} = 248.0 Hz), 157.5, 149.7, 143.9, 136.1, 135.3, 135.2, 129.9, 129.2 (d, J_{CF} = 8.0 Hz), 128.1, 127.4, 126.6, 116.3, 116.1, 113.0, 56.5, 56.4, 41.2, 20.8. ^{19}F NMR

(564 MHz, $CDCl_3$) δ −112.2 (Ar−F). IR (neat, cm^{-1}): 1732, 1700, 1599, 1573, 1516, 1332, 1242, 1210, 1161, 998, 832, 771, 748, 703. HRMS (ESI): calcd. for $C_{24}H_{19}FO_3Na^+$ $[M + Na]^+$ 397.1210; found: 397.1211.

(*S*)-2-Benzyl-6-(4-chlorophenyl)-4-methoxy-2-methyl-1H-indene-1,3(2H)-dione (3ca). 46.8 mg, overall 60% yield, white solid, m. p. 91 – 92 °C; 89% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 15.77, t (minor) = 19.26; $[\alpha]_D^{20}$ = −11.4 (*c* 1, $CHCl_3$); ^1H NMR (400 MHz, $CDCl_3$) δ 7.52 (d, *J* = 1.2 Hz, 1H), 7.51 – 7.47 (m, 2H), 7.45 – 7.39 (m, 2H), 7.24 (d, *J* = 1.2 Hz, 1H), 7.10 – 6.96 (m, 5H), 4.01 (s, 3H), 3.20 – 3.07 (m, 2H), 1.37 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.2, 201.1, 157.6, 149.5, 143.9, 137.5, 136.1, 135.5, 129.9, 129.4, 128.7, 128.1, 127.6, 126.6, 116.0, 113.0, 56.5, 56.4, 41.2, 20.8. IR (neat, cm^{-1}): 1734, 1702, 1600, 1497, 1452, 1395, 1333, 1237, 1093, 998, 924, 825, 769, 749, 702, 556, 512, 489. HRMS (ESI): calcd. for $C_{24}H_{19}ClO_3Na^+$ $[M + Na]^+$ 413.0915; found: 413.0915.

(*S*)-2-Benzyl-6-(4-bromophenyl)-4-methoxy-2-methyl-1H-indene-1,3(2H)-dione (3da). 42.5 mg, overall 49% yield, white solid, m. p. 57 – 58 °C; 89% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 16.80, t (minor) = 19.97; $[\alpha]_D^{20}$ = −16.2 (*c* 1, $CHCl_3$); ^1H NMR (400 MHz, $CDCl_3$) δ 7.62 – 7.54 (m, 2H), 7.52 (d, *J* = 1.2 Hz, 1H), 7.46 – 7.37 (m, 2H), 7.23 (d, *J* = 1.6 Hz, 1H), 7.11 – 6.93 (m, 5H), 4.01 (s, 3H), 3.21 – 3.07 (m, 2H), 1.37 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.2, 201.1, 157.6, 149.5, 144.0, 138.0, 136.1, 132.3, 129.9, 129.0, 128.1, 127.6, 126.6, 123.7, 116.0, 113.0, 56.5, 56.4, 41.2, 20.8. IR (neat, cm^{-1}): 1737, 1699, 1494, 1451, 1391, 1331, 1234, 1073, 998, 922, 821, 745, 699, 556, 510. HRMS (ESI): calcd. for $C_{24}H_{19}BrO_3Na^+$ $[M + Na]^+$ 457.0410; found: 457.0417.

(*S*)-2-Benzyl-6-(4-iodophenyl)-4-methoxy-2-methyl-1H-indene-1,3(2H)-dione (3ea). 48.2 mg, overall 50% yield, white solid, m. p. 170 – 171 °C; 90% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 16.93,

t (minor) = 19.87; $[\alpha]_D^{20}$ = −22.5 (*c* 1, $CHCl_3$); ^1H NMR (400 MHz, $CDCl_3$) δ 7.84 – 7.72 (m, 2H), 7.52 (d, *J* = 1.2 Hz, 1H), 7.32 – 7.24 (m, 2H), 7.23 (d, *J* = 1.2 Hz, 1H), 7.11 – 6.93 (m, 5H), 4.00 (s, 3H), 3.20 – 3.05 (m, 2H), 1.37 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.2, 201.1, 157.6, 149.6, 144.0, 138.5, 138.3, 136.1, 129.9, 129.1, 128.1, 127.7, 126.7, 116.0, 113.0, 95.5, 56.5, 56.4, 41.2, 20.8. IR (neat, cm^{-1}): 1699, 1601, 1333, 1244, 1003, 818, 701, 508, 422. HRMS (ESI): calcd. for $C_{24}H_{20}IO_3^+$ [M + H] $^+$ 483.0452; found: 483.0440.

(*S*)-2-Benzyl-4-methoxy-2-methyl-6-(p-tolyl)-1H-indene-1,3(2H)-dione (3fa). 36.3 mg, overall 49% yield, white solid, m. p. 121 – 122 °C; 89% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL·min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 10.55, t (minor) = 14.51; $[\alpha]_D^{20}$ = −2.7 (*c* 1, $CHCl_3$); ^1H NMR (400 MHz, $CDCl_3$) δ 7.56 (d, *J* = 1.6 Hz, 1H), 7.53 – 7.40 (m, 2H), 7.34 – 7.25 (m, 2H), 7.25 (d, *J* = 3.2 Hz, 1H), 7.16 – 6.84 (m, 5H), 4.01 (s, 3H), 3.32 – 2.96 (m, 2H), 2.40 (s, 3H), 1.38 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.5, 201.2, 157.5, 150.8, 143.8, 139.4, 136.2, 136.1, 129.9, 129.9, 128.1, 127.3, 127.1, 126.6, 116.0, 113.0, 56.5, 56.3, 41.1, 21.2, 20.9. IR (neat, cm^{-1}): 2365, 1733, 1699, 1598, 1451, 1332, 1241, 1205, 999, 817, 746, 700, 553, 491. HRMS (ESI): calcd. for $C_{25}H_{22}O_3Na^+$ [M + Na] $^+$ 393.1461; found: 393.1456.

(*S*)-2-Benzyl-4-methoxy-2-methyl-6-(3-nitrophenyl)-1H-indene-1,3(2H)-dione (3ga). 40.9 mg, overall 51% yield, white solid, m. p. 58 – 59 °C; 92% ee. The *ee* value was determined by HPLC [Daicel Chiralpak IG-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL·min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 40.59, t (minor) = 64.39; $[\alpha]_D^{20}$ = +35.0 (*c* 1, $CHCl_3$); ^1H NMR (400 MHz, $CDCl_3$) δ 8.43 (t, *J* = 2.0 Hz, 1H), 8.29 (dd, *J* = 8.0, 2.0 Hz, 1H), 7.91 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.67 (t, *J* = 8.0 Hz, 1H), 7.60 (d, *J* = 1.2 Hz, 1H), 7.31 (d, *J* = 1.6 Hz, 1H), 7.17 – 6.87 (m, 5H), 4.07 (s, 3H), 3.25 – 3.08 (m, 2H), 1.40 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.0, 201.1, 157.8, 148.8, 147.9, 144.1, 140.8, 136.0, 133.3, 130.3, 129.9, 128.3, 128.2, 126.7, 123.7, 122.3, 116.3, 113.3, 56.6, 56.6, 41.3, 20.7. IR (neat, cm^{-1}): 2359, 1738, 1702,

1602, 1527, 1450, 1331, 1235, 998, 808, 737, 698, 555, 507. HRMS (ESI): calcd. for $C_{24}H_{19}NO_5Na^+$ $[M + Na]^+$ 424.1155; found: 424.1155.

(*S*)-2-Benzyl-6-(2-fluorophenyl)-4-methoxy-2-methyl-1H-indene-1,3(2H)-dione (3ha). 33.7 mg, overall 45% yield, colorless oily liquid; 89% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 10.18, t (minor) = 13.43; $[\alpha]_D^{20}$ = +10.0 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.53 (s, 1H), 7.47 – 7.35 (m, 2H), 7.31 (s, 1H), 7.26 – 7.13 (m, 2H), 7.13 – 6.91 (m, 5H), 4.00 (s, 3H), 3.26 – 3.01 (m, 2H), 1.39 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.1, 201.2, 157.1, 145.3, 143.5, 136.1, 130.8 (d, J_{C-F} = 8.0 Hz), 130.6, 130.5, 130.0, 128.1, 127.6, 126.6, 124.7 (d, J_{C-F} = 4.0 Hz), 118.4, 118.3, 116.5 (d, J_{C-F} = 22.0 Hz), 115.2, 56.4, 56.3, 41.2, 20.8. ^{19}F NMR (564 MHz, $CDCl_3$) δ −116.9 (Ar−F). IR (neat, cm^{-1}): 2921, 1738, 1701, 1602, 1496, 1450, 1334, 1232, 1078, 998, 874, 801, 757, 699, 556, 505. HRMS (ESI): calcd. for $C_{24}H_{19}FO_3Na^+$ $[M + Na]^+$ 397.1210; found: 397.1202.0

(*S*)-2-Benzyl-4-methoxy-2-methyl-6-(o-tolyl)-1H-indene-1,3(2H)-dione (3ia). 27.4 mg, overall 37% yield, colorless oily liquid; 89% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 7.78, t (minor) = 10.01; $[\alpha]_D^{20}$ = +60.0 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.35 – 7.24 (m, 3H), 7.24 (dd, *J* = 7.2, 2.0 Hz, 1H), 7.15 (dd, *J* = 7.6, 1.2 Hz, 1H), 7.11 – 6.95 (m, 6H), 3.95 (s, 3H), 3.28 – 3.03 (m, 2H), 2.19 (s, 3H), 1.39 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.4, 201.3, 156.9, 151.9, 143.3, 139.9, 136.1, 135.0, 130.7, 129.9, 129.2, 128.6, 128.1, 127.3, 126.6, 126.1, 118.6, 115.4, 56.4, 56.3, 41.6, 20.4, 20.3. IR (neat, cm^{-1}): 2925, 1738, 1701, 1600, 1452, 1331, 1229, 1081, 998, 872, 759, 699, 557, 504. HRMS (ESI): calcd. for $C_{25}H_{22}O_3Na^+$ $[M + Na]^+$ 393.1461; found: 393.1459.

(*S*)-2-Benzyl-4-methoxy-2-methyl-6-(naphthalen-2-yl)-1H-indene-1,3(2H)-dione (3ja). 49.6 mg, overall 61% yield, white solid, m. p. 132 – 133 °C; 89% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 15.02, t

(minor) = 19.65; $[\alpha]_D^{20}$ = +28.7 (*c* 1, $CHCl_3$); ^1H NMR (400 MHz, $CDCl_3$) δ 8.03 (d, *J* = 2.0 Hz, 1H), 7.95 – 7.82 (m, 3H), 7.70 (d, *J* = 1.6 Hz, 1H), 7.66 (dd, *J* = 8.4, 2.0 Hz, 1H), 7.58 – 7.48 (m, 2H), 7.41 (d, *J* = 1.6 Hz, 1H), 7.16 – 6.96 (m, 5H), 4.05 (s, 3H), 3.27 – 3.05 (m, 2H), 1.41 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.5, 201.3, 157.6, 150.8, 143.9, 136.3, 136.2, 133.4, 130.0, 129.0, 128.5, 128.2, 127.8, 127.4, 127.1, 127.0, 126.9, 126.7, 124.9, 116.4, 113.5, 56.6, 56.4, 41.2, 20.9. IR (neat, cm^{-1}): 1735, 1698, 1602, 1571, 1448, 1332, 1315, 1247, 1176, 1003, 879, 857, 820, 745, 698, 563, 553, 505, 476, 447, 408. HRMS (ESI): calcd. for $C_{28}H_{22}O_3Na^+$ $[M + Na]^+$ 429.1461; found: 429.1441.

(*S*)-2-Benzyl-6-(furan-2-yl)-4-methoxy-2-methyl-1H-indene-1,3(2H)-dione (3ka). 34.6 mg, overall 50% yield, white solid, m. p. 82 – 83 °C; 84% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL·min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 12.20, t (minor) = 13.54; $[\alpha]_D^{20}$ = +20.0 (*c* 1, $CHCl_3$); ^1H NMR (400 MHz, $CDCl_3$) δ 7.59 (d, *J* = 1.2 Hz, 1H), 7.52 (d, *J* = 1.6 Hz, 1H), 7.40 (d, *J* = 1.2 Hz, 1H), 7.09 – 6.94 (m, 5H), 6.86 (dd, *J* = 3.6, 0.8 Hz, 1H), 6.52 (dd, *J* = 3.6, 2.0 Hz, 1H), 4.01 (s, 3H), 3.20 – 3.05 (m, 2H), 1.36 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.4, 200.9, 157.8, 151.8, 144.1, 143.9, 139.2, 136.1, 129.8, 128.1, 127.0, 126.6, 112.5, 111.9, 109.6, 109.5, 56.4, 56.3, 41.3, 20.7. IR (neat, cm^{-1}): 1735, 1697, 1603, 1450, 1328, 1240, 1179, 1056, 1023, 1004, 864, 810, 747, 704, 593, 561, 511. HRMS (ESI): calcd. for $C_{22}H_{18}O_4Na^+$ $[M + Na]^+$ 369.1097; found: 369.1097.

(*S*)-2-Benzyl-4-methoxy-2-methyl-6-(thiophen-2-yl)-1H-indene-1,3(2H)-dione (3la). 37.7 mg, overall 52% yield, white solid, m. p. 113 – 114 °C; 86% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (90:10) as the eluent, flow: 1.0 mL·min^{-1}, λ = 254 nm]: major diastereoisomer t (major) = 12.16, t (minor) = 14.59; $[\alpha]_D^{20}$ = −14.0 (*c* 1, $CHCl_3$); ^1H NMR (400 MHz, $CDCl_3$) δ 7.58 (d, *J* = 1.2 Hz, 1H), 7.44 (dd, *J* = 3.6, 1.2 Hz, 1H), 7.40 (dd, *J* = 5.2, 1.2 Hz, 1H), 7.27 (d, *J* = 1.2 Hz, 1H), 7.15 – 6.95 (m, 6H), 4.01 (s, 3H), 3.22 – 3.04 (m, 2H), 1.37 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.3, 200.8, 157.7, 144.0, 143.4, 141.9, 136.1, 129.9, 128.6,

128.1, 127.8, 127.3, 126.7, 126.0, 114.3, 111.5, 56.5, 56.4, 41.2, 20.8. IR (neat, cm^{-1}): 1734, 1697, 1601, 1570, 1451, 1412, 1374, 1311, 1240, 1179, 1076, 1031, 993, 856, 834, 749, 701, 558, 507. HRMS (ESI): calcd. for $C_{22}H_{18}O_3SNa^+$ $[M + Na]^+$ 385.0869; found: 385.0868.

(2*S*)-2-Benzyl-4-methoxy-2-methyl-6-phenyl-2,3-dihydro-1H-indene-1,3-diol (4). 24.0 mg, 67% yield, white solid, m. p. 87 – 88 °C; >20:1 dr, 91% ee. The *dr* and *ee* value were determined by HPLC [Daicel Chiralpak IA-H with hexane/*i*-PrOH (75:25) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: t (major) = 19.27, t (minor) = +8.21; $[\alpha]_D^{20}$ = 51.4 (*c* 1, $CHCl_3$); ^1H NMR (400 MHz, $CDCl_3$) δ 7.64 – 7.54 (m, 2H), 7.53 – 7.46 (m, 2H), 7.49 – 7.40 (m, 2H), 7.41 – 7.27 (m, 4H), 7.28 – 7.20 (m, 1H), 7.03 (d, *J* = 1.2 Hz, 1H), 4.74 (s, 1H), 4.47 (s, 1H), 3.93 (s, 3H), 3.25 – 3.06 (m, 2H), 2.40 (s, 2H), 0.70 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 156.8, 147.9, 144.7, 141.2, 139.2, 131.5, 130.7, 128.8, 128.1, 127.6, 127.3, 125.9, 117.1, 110.0, 82.3, 78.2, 55.4, 50.7, 36.6, 22.7. IR (neat, cm^{-1}): 3551, 1592, 1574, 1461, 1399, 1329, 1195, 1164, 1036, 1023, 853, 806, 762, 749, 705, 693. HRMS (ESI): calcd. for $C_{24}H_{24}O_3Na^+$ $[M + Na]^+$ 383.1618; found: 383.1598.

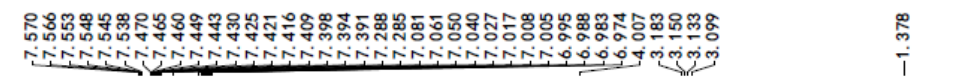
(*S*)-2-(3-hydroxypropyl)-4-methoxy-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (5). 53.8 mg, 83% yield, colorless oily liquid; 60% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AS-H with hexane/*i*-PrOH (85:15) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: t (major) = 20.02, t (minor) = 16.95; $[\alpha]_D^{20}$ = −6.0 (*c* 1, $CHCl_3$); ^1H NMR (400 MHz, $CDCl_3$) δ 7.74 – 7.68 (m, 1H), 7.68 – 7.60 (m, 2H), 7.48 (m, 3H), 7.43 (m, 1H), 4.08 (m, 3H), 3.50 (m, 2H), 1.88 (m, 2H), 1.40 (m, 2H), 1.27 (m, 3H), 1.24 (s, 1H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 205.0, 202.0, 157.8, 151.4, 143.6, 139.1, 129.3, 129.2, 127.5, 127.0, 116.6, 113.5, 62.6, 56.4, 54.2, 31.6, 28.2, 20.1. IR (neat, cm^{-1}): 2923, 1737, 1695, 1602, 1449, 1332, 1214, 1057, 989, 868, 757, 693, 561. HRMS (ESI): calcd. for $C_{20}H_{21}O_4^+$ $[M + H]^+$ 325.1434; found: 325.1430.

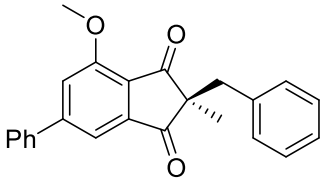
(*S*)-2-([1,1'-biphenyl]-4-ylmethyl)-4-methoxy-2-methyl-6-phenyl-1H-indene-1,3(2H)-dione (6). 71.6 mg, 92% yield, colorless oily liquid; 87% ee. The *ee* value were determined by HPLC [Daicel Chiralpak IA-H with hexane/*i*-PrOH (90:10) as the

eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: t (major) = 12.41, t (minor) = 13.75; $[\alpha]_D^{20}$ = −60.0 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.61 (d, J = 1.2 Hz, 1H), 7.59 – 7.54 (m, 2H), 7.50 – 7.39 (m, 5H), 7.38 – 7.28 (m, 5H), 7.26 (m, 1H), 7.14 (d, J = 8.0 Hz, 2H), 4.02 (s, 3H), 3.31 – 3.09 (m, 2H), 1.42 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.4, 201.3, 157.6, 151.0, 143.8, 140.6, 139.2, 139.1, 135.4, 130.4, 129.2, 129.1, 128.7, 127.5, 127.3, 127.1, 126.8, 126.7, 116.4, 113.3, 56.6, 56.4, 40.7, 21.0. IR (neat, cm^{-1}): 2359, 2182, 2149, 1702, 1601, 1332, 999, 760, 513, 466. HRMS (ESI): calcd. for $C_{30}H_{25}O_3^+$ [M + H]$^+$ 433.1798; found: 433.1798.

(*S*)-2-benzyl-4-methoxy-2-methyl-6-(4-(pyridin-4-yl)phenyl)-1H-indene-1,3(2H)-dione (7). 74.1 mg, 95% yield, white solid, m. p. 59 – 60 ºC; 87% ee. The *ee* value was determined by HPLC [Daicel Chiralpak AD-H with hexane/*i*-PrOH (80:20) as the eluent, flow: 1.0 mL min^{-1}, λ = 254 nm]: t (major) = 22.52, t (minor) = 34.77; $[\alpha]_D^{20}$ = −3.8 (*c* 1, $CHCl_3$); ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.75 – 8.60 (m, 2H), 7.70 (m, 4H), 7.60 (d, *J* = 1.6 Hz, 1H), 7.55 – 7.46 (m, 2H), 7.32 (d, *J* = 1.2 Hz, 1H), 7.11 – 6.93 (m, 5H), 4.02 (s, 3H), 3.27 – 2.99 (m, 2H), 1.37 (s, 3H). ^{13}C NMR (101 MHz, $CDCl_3$) δ 204.3, 201.1, 157.6, 150.4, 149.7, 147.2, 143.9, 139.7, 138.9, 136.1, 129.9, 128.2, 128.1, 127.7, 127.6, 126.6, 121.5, 116.2, 113.2, 56.5, 56.4, 41.2, 20.8. IR (neat, cm^{-1}): 2225, 2149, 2093, 1983, 1700, 1598, 1333, 1233, 1002, 812, 700. HRMS (ESI): calcd. for $C_{29}H_{24}NO_3^+$ [M + H]$^+$ 434.1751; found: 434.1766.

VI: NMR spectra of new compounds





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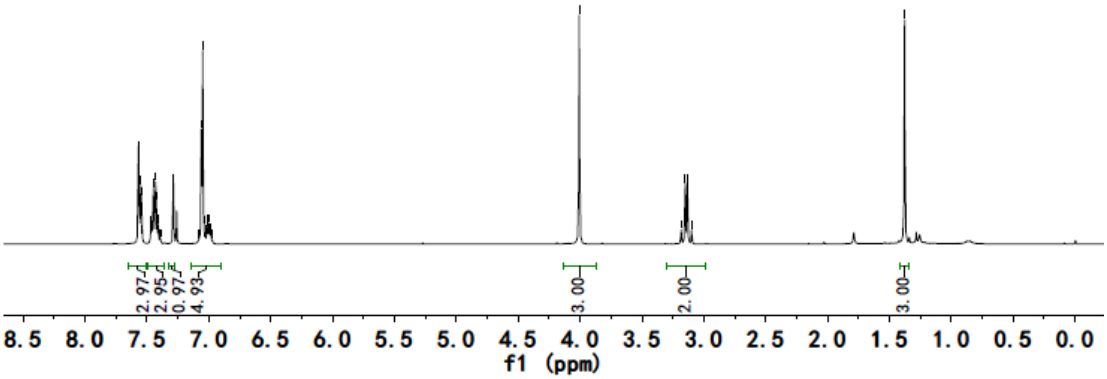

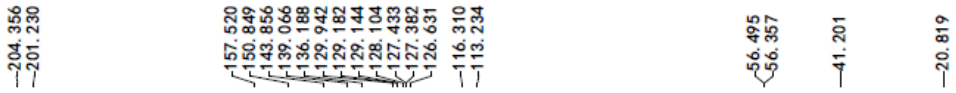

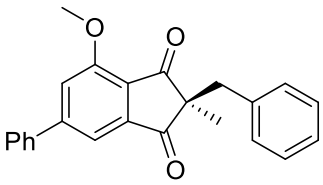

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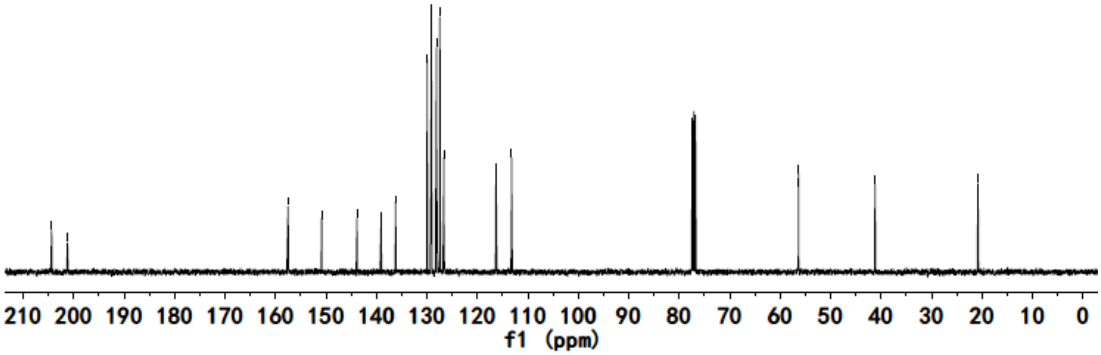

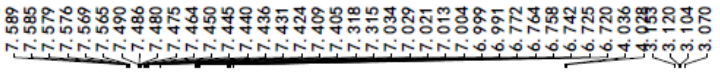
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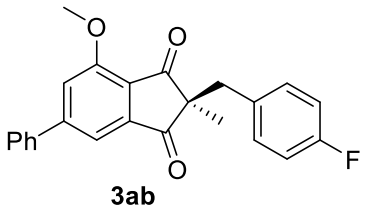
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F

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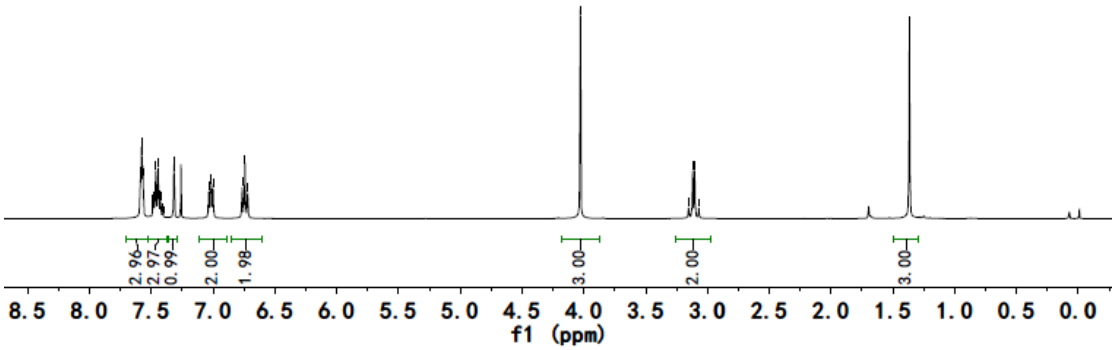
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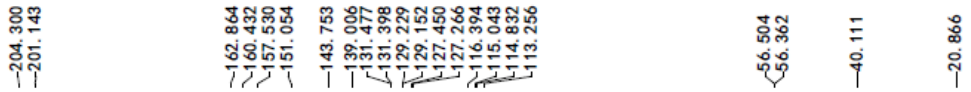
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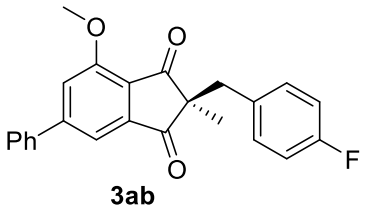
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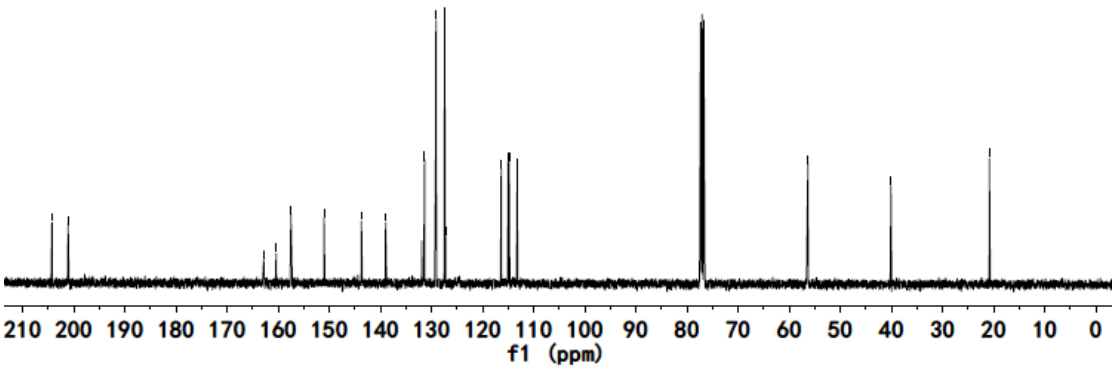
3ab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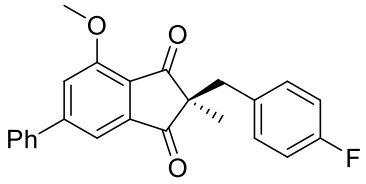
O
O
Ph
O
F

3ab

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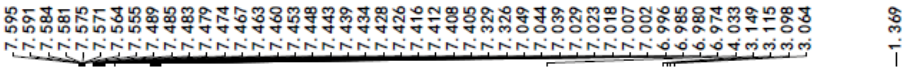
f1 (ppm)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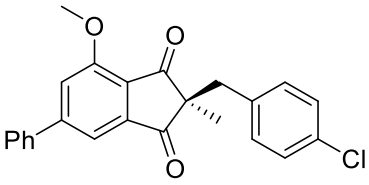
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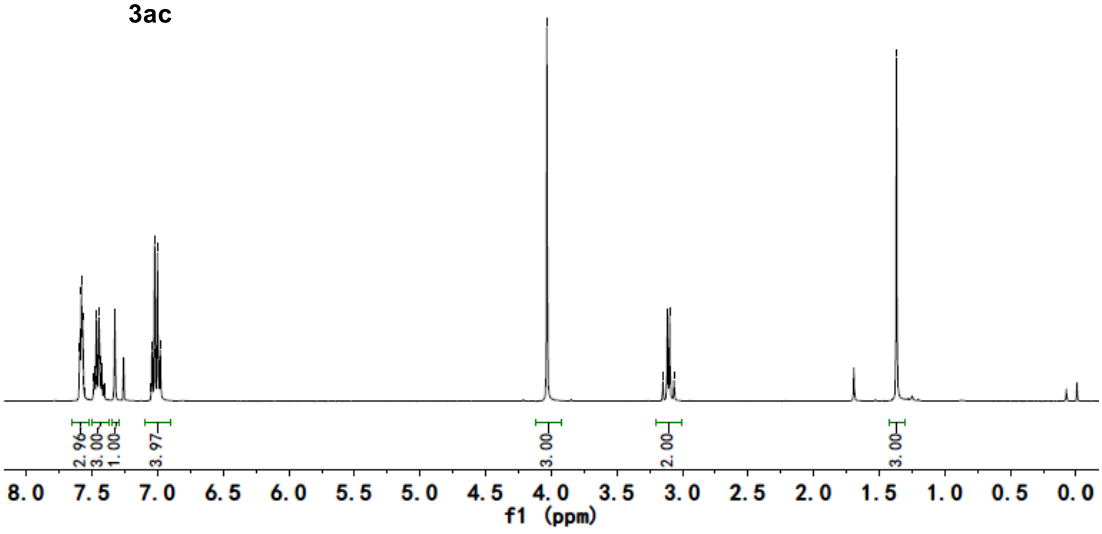
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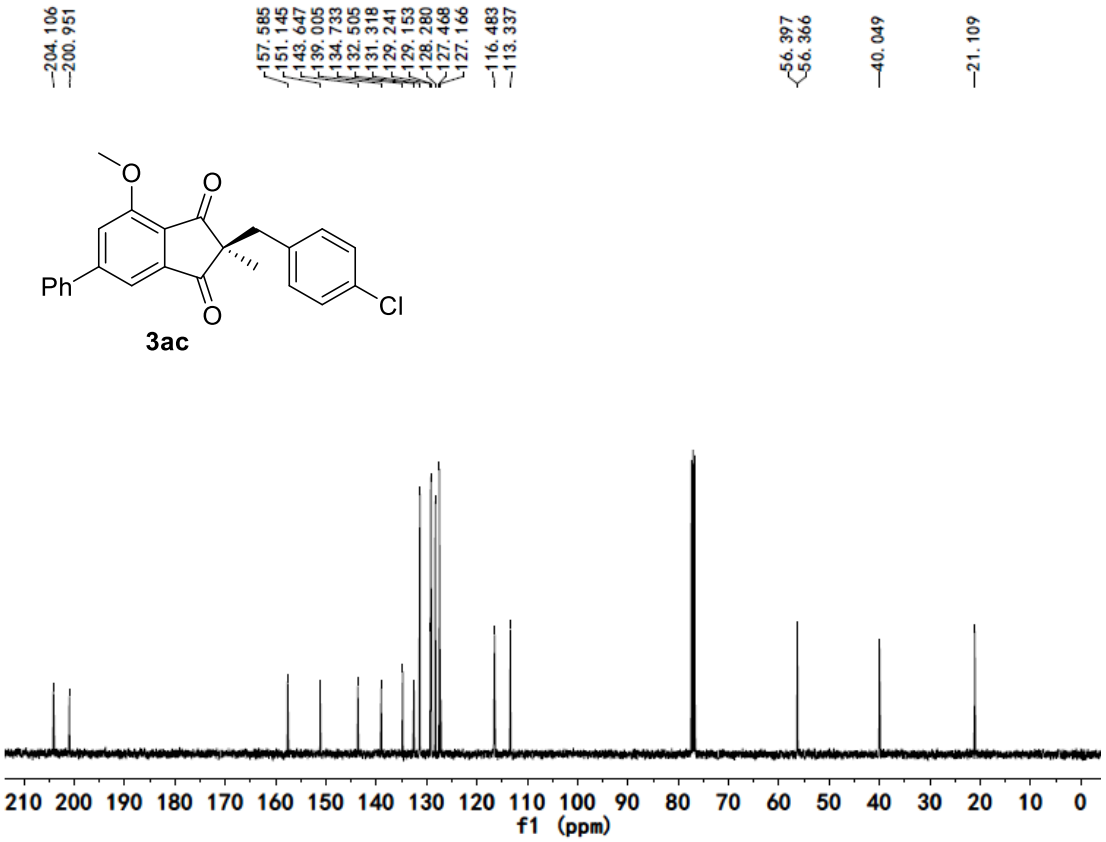
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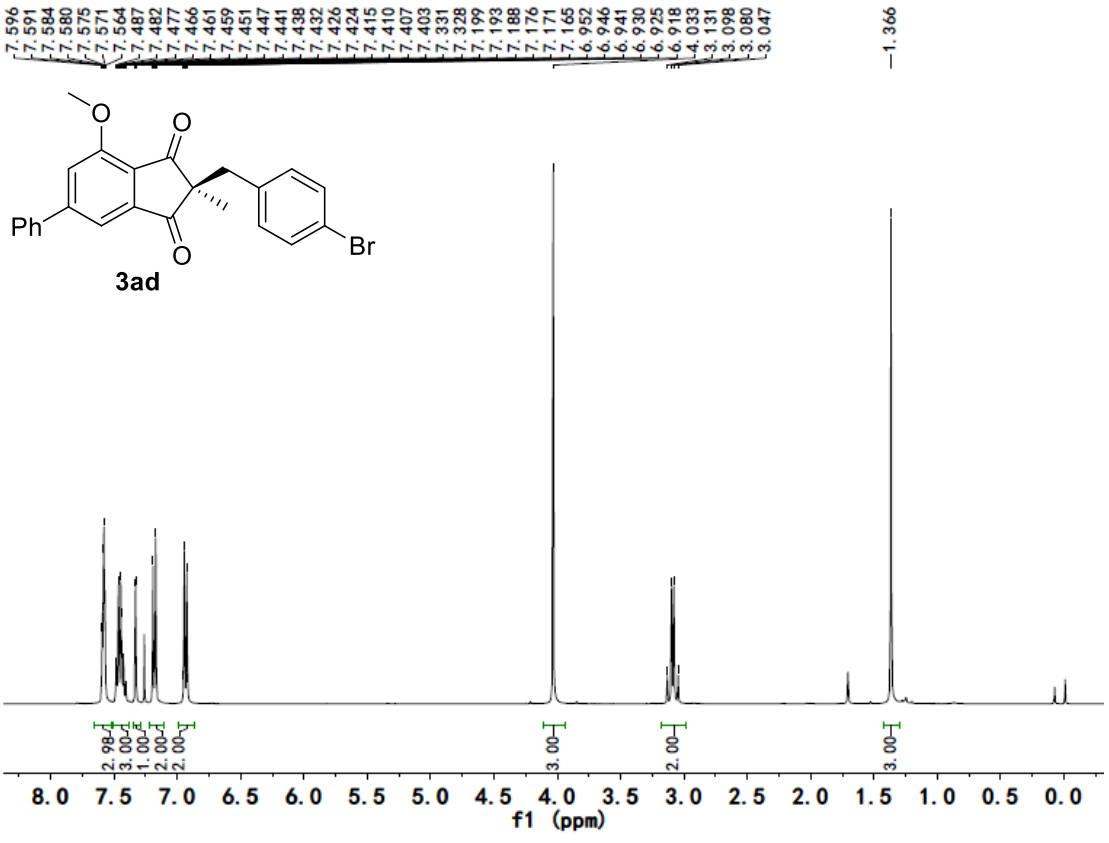
f1 (ppm)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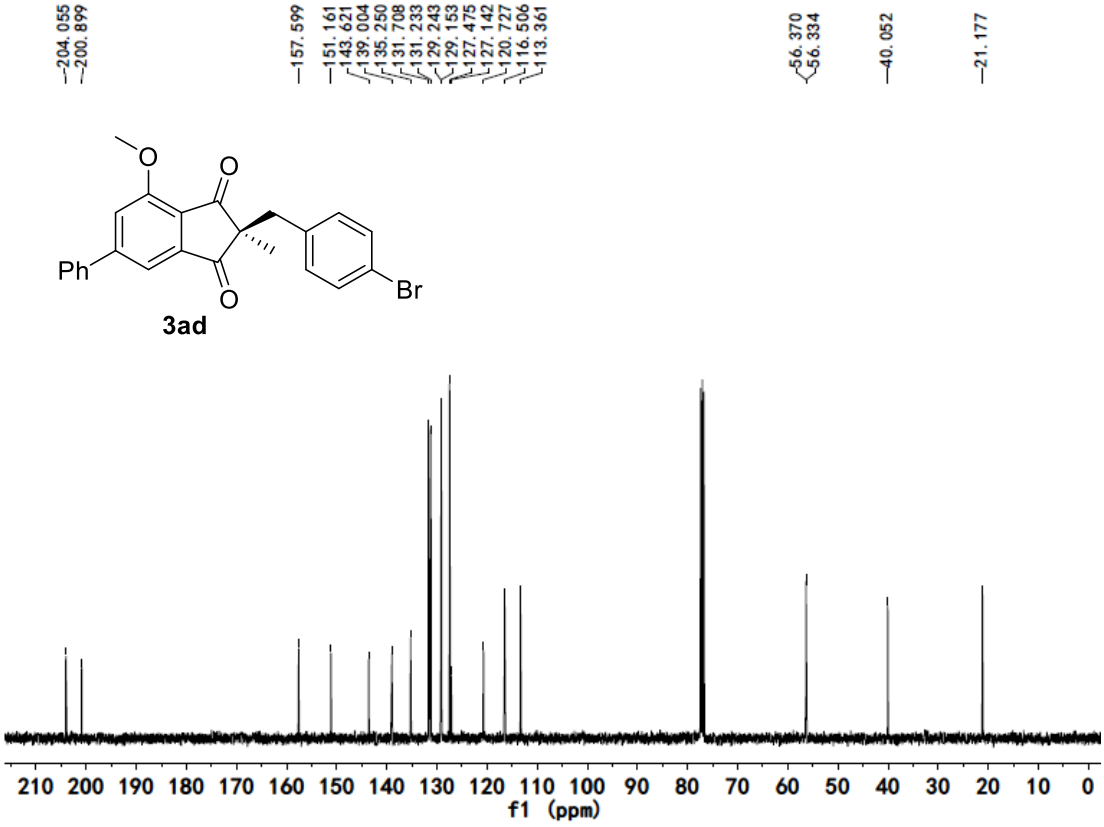
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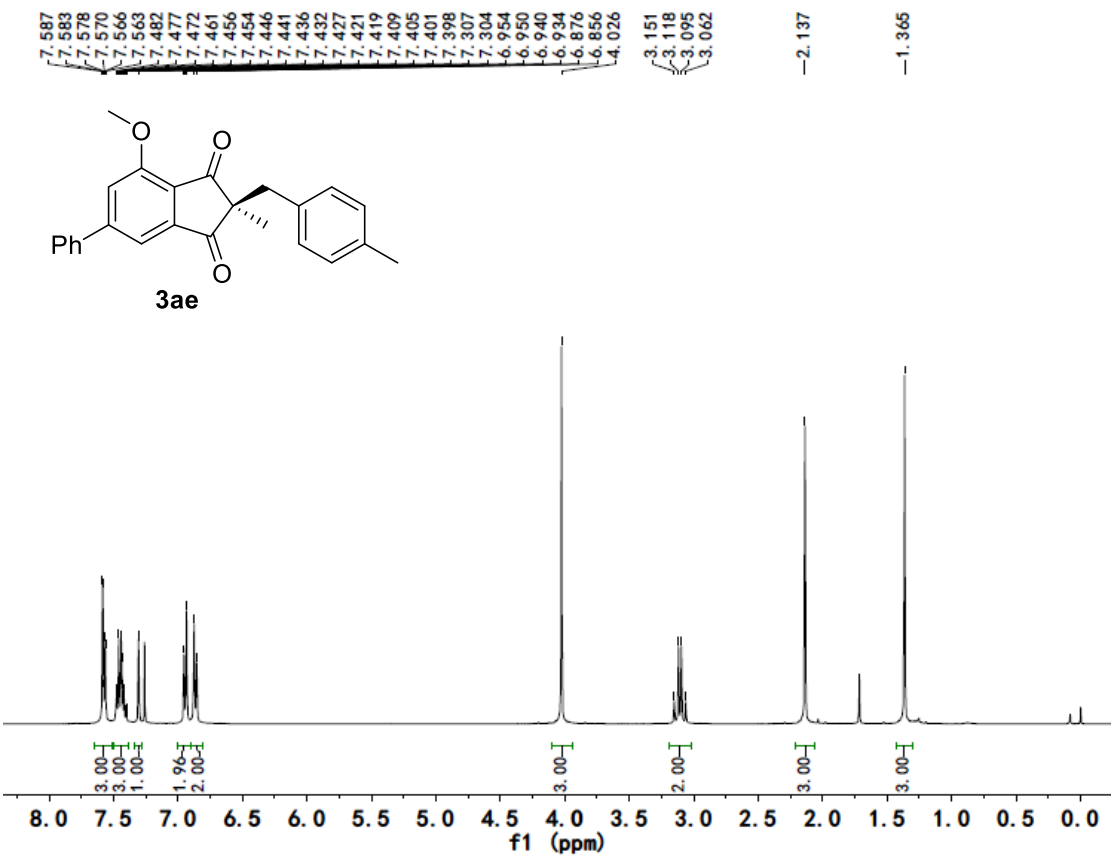
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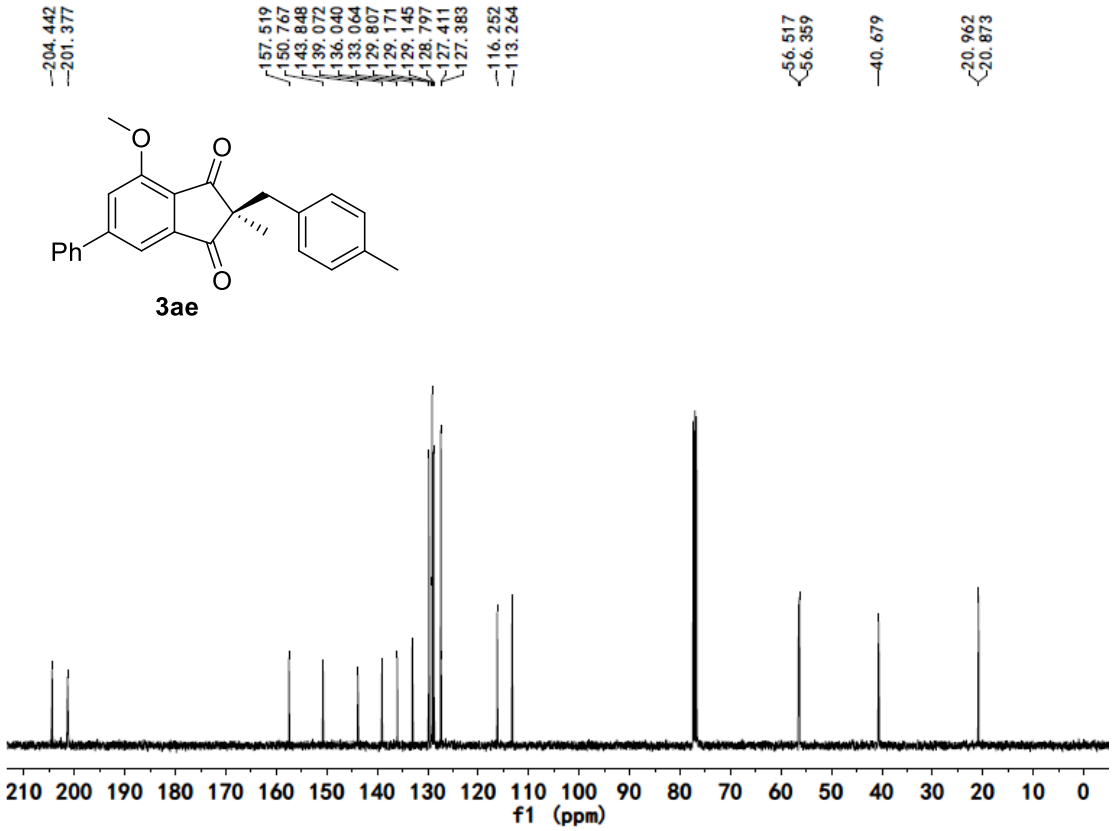
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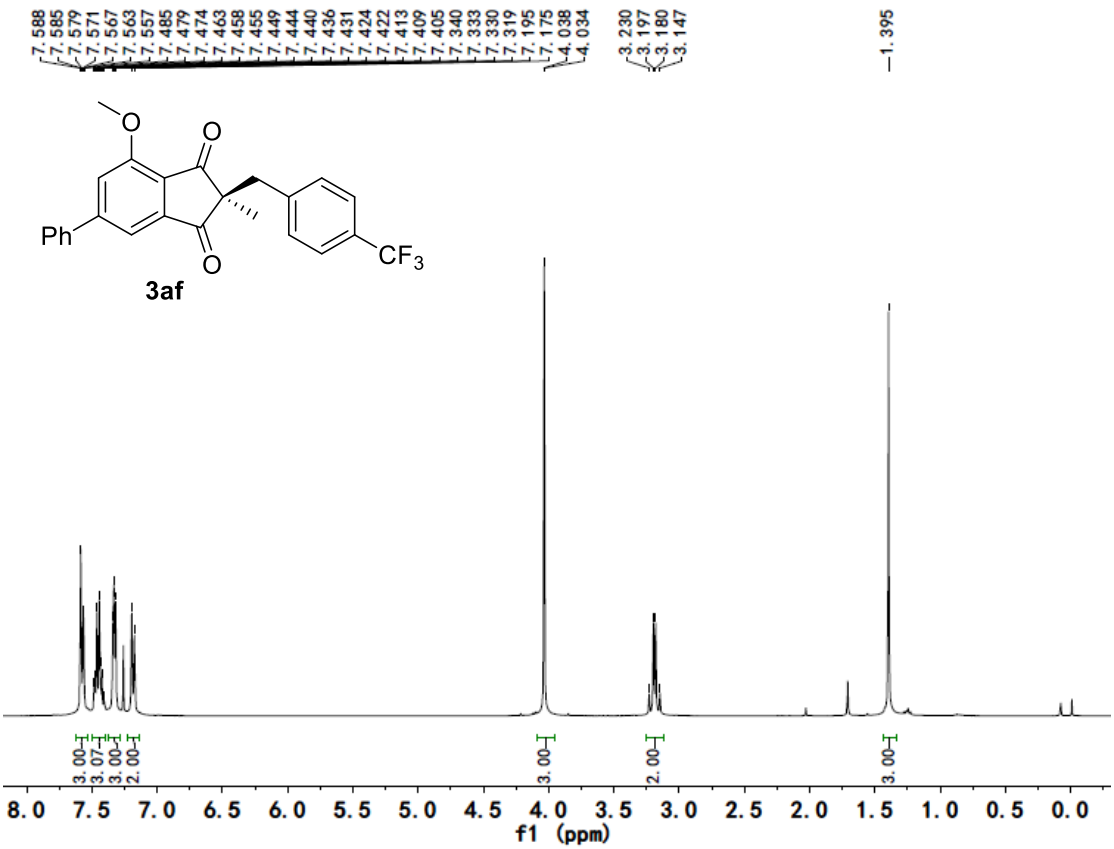
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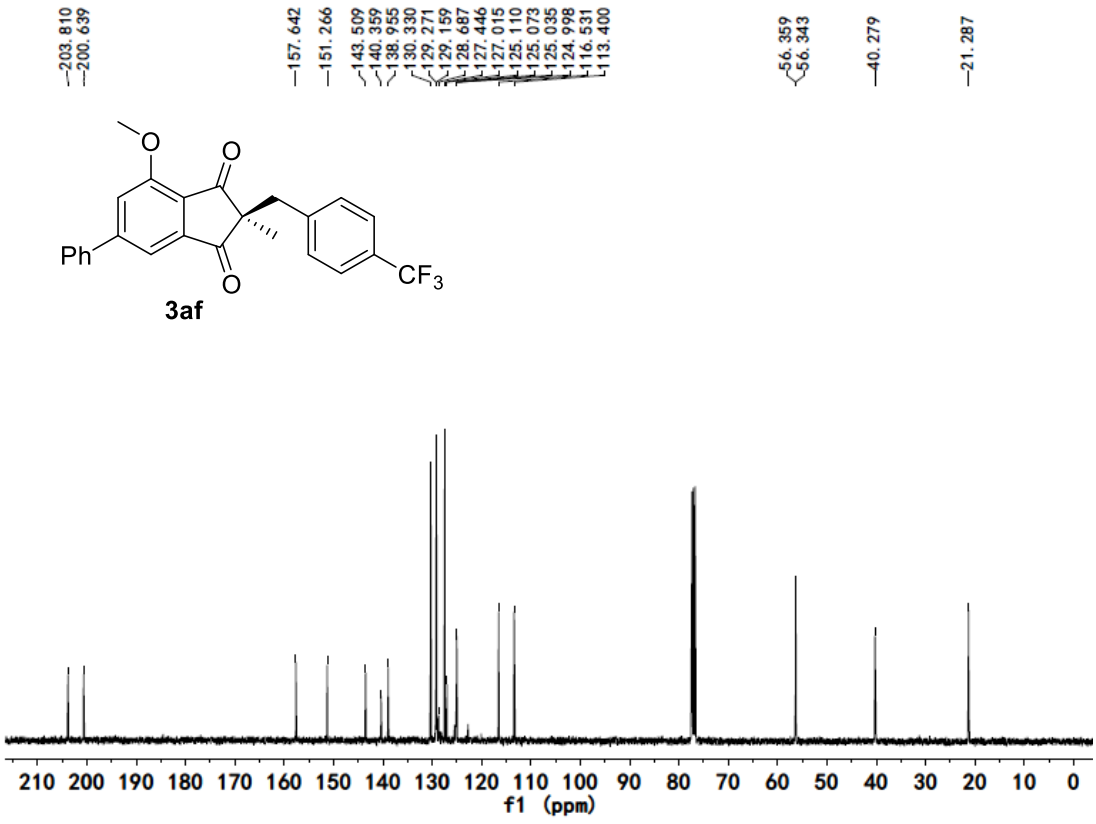
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113.400
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56.343
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Ph
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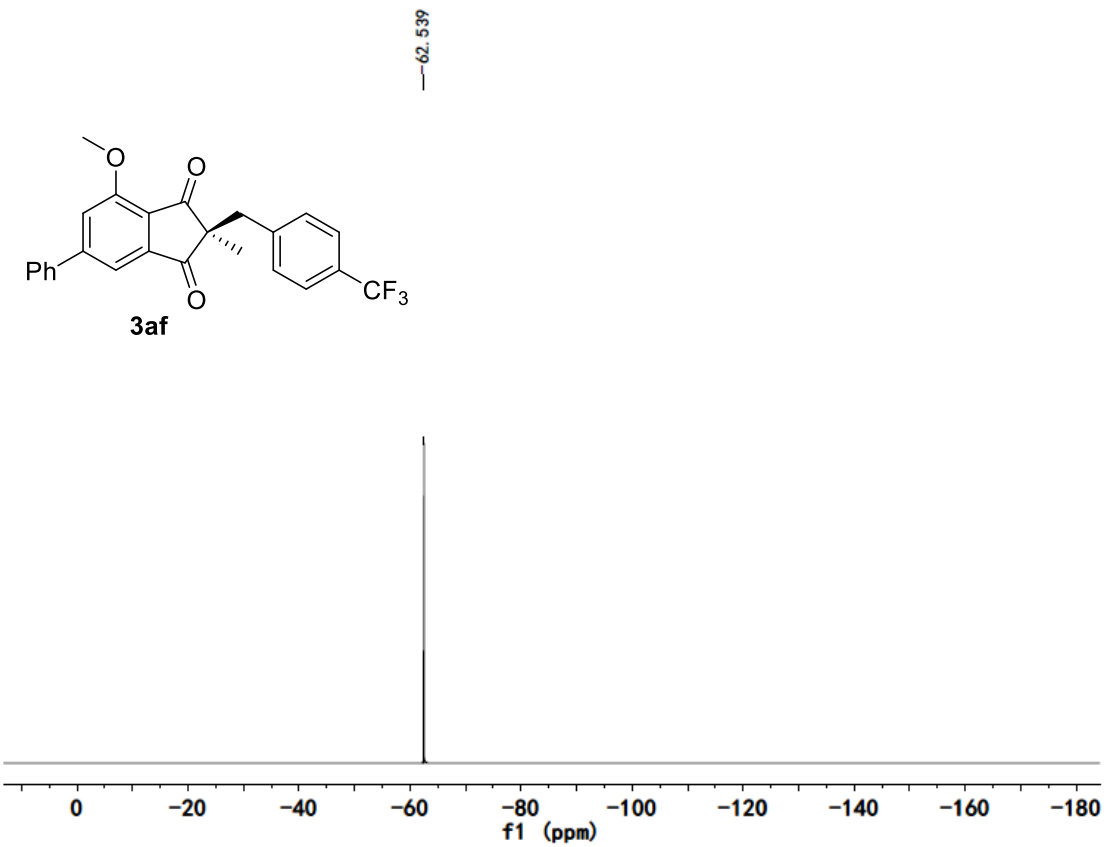
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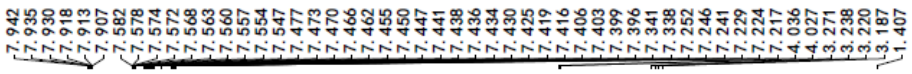
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7.918
7.913
7.907
7.582
7.578
7.574
7.572
7.568
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7.560
7.557
7.554
7.547
7.477
7.473
7.470
7.466
7.462
7.455
7.450
7.447
7.441
7.438
7.436
7.434
7.430
7.425
7.419
7.416
7.406
7.403
7.399
7.396
7.341
7.338
7.252
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7.217
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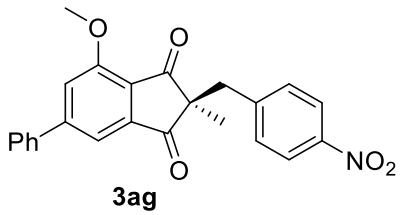
4.027
3.271
3.238
3.220
3.187
1.407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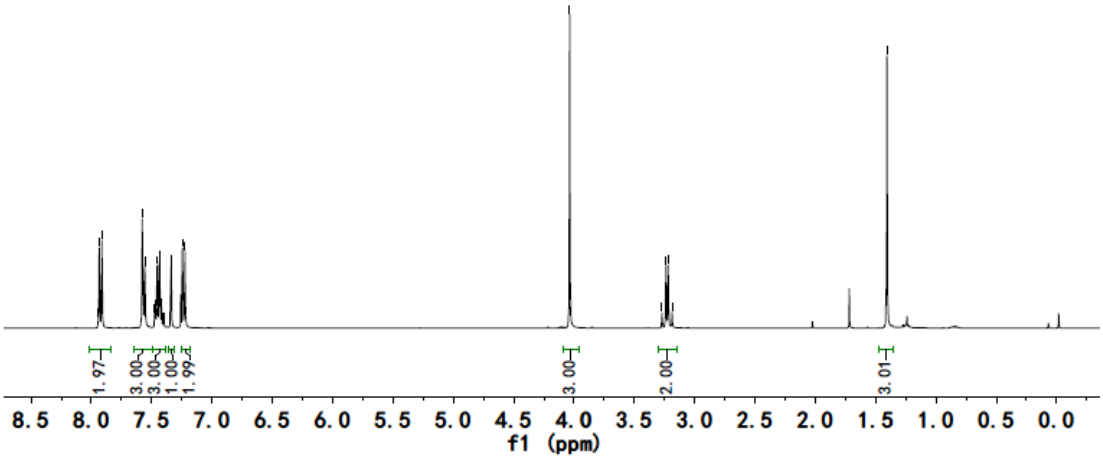
O
Ph
O
NO2

3ag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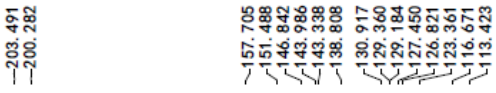
3.00
3.00
1.00
1.99
3.00
2.00
3.01
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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157.705
151.488
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143.986
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127.450
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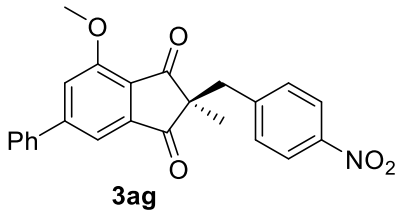
123.361
116.671
113.423
56.402
56.301
40.041
21.438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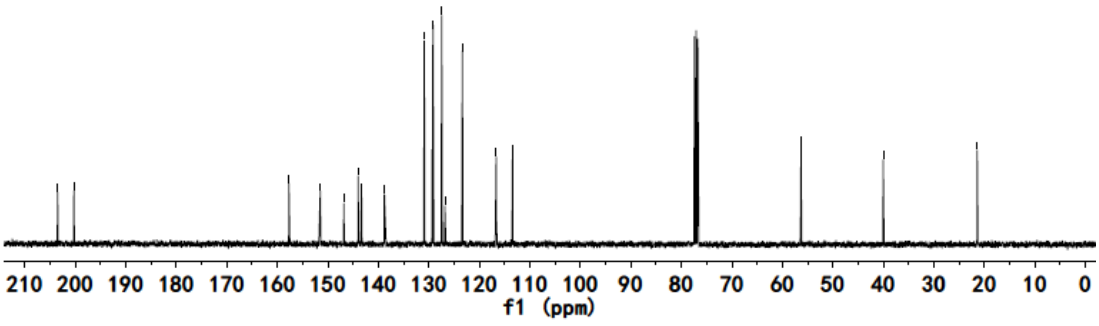
O
Ph
O
NO2

3ag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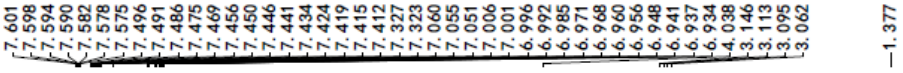
f1 (ppm)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7.594
7.590
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7.578
7.575
7.496
7.491
7.486
7.475
7.469
7.456
7.450
7.446
7.441
7.434
7.424
7.419
7.415
7.412
7.327
7.323
7.060
7.055
7.051
7.006
7.001
6.996
6.992
6.985
6.971
6.968
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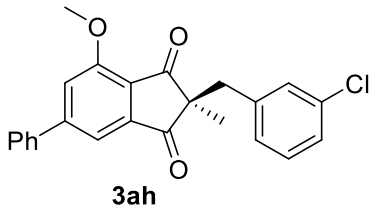
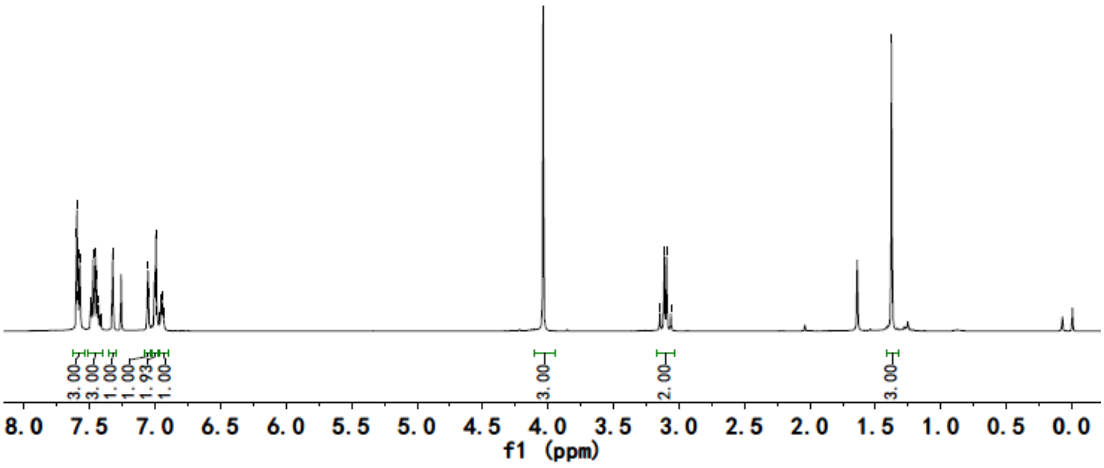
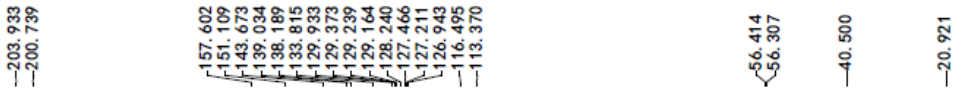
3.146
3.113
3.095
3.062
1.377


O
O
Cl
Ph
O

3ah


3.00
3.00
1.00
1.93
1.00
3.00
2.00
3.00
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)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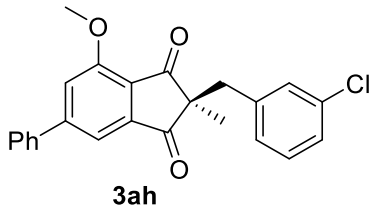
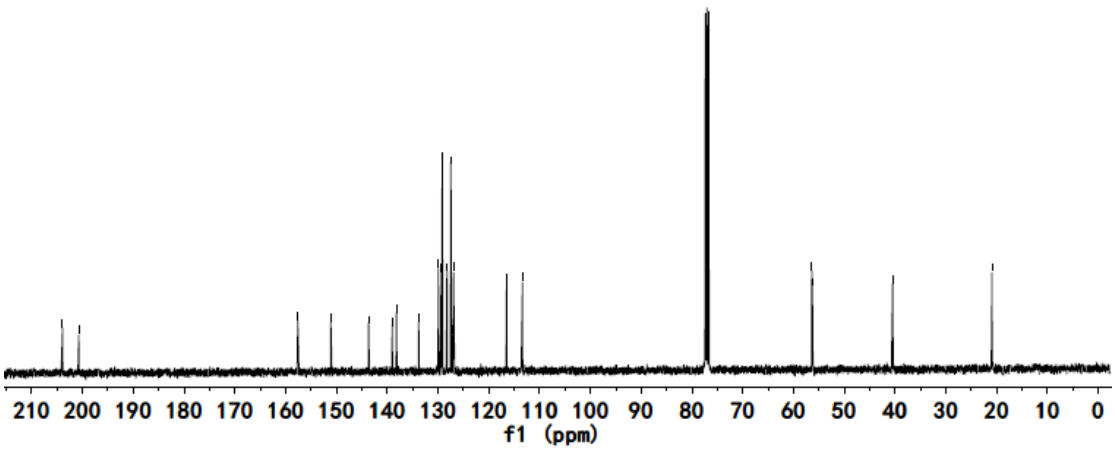
143.673
139.034
138.189
133.815
129.933
129.373
129.239
129.164
128.240
127.466
127.211
126.943
116.495
113.370
56.414
56.307
40.500
20.921


O
O
Cl
Ph
O

3ah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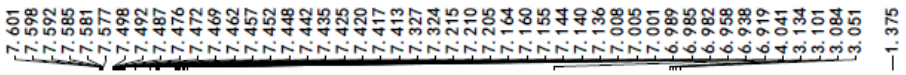
f1 (ppm)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7.492
7.487
7.476
7.472
7.469
7.462
7.457
7.452
7.448
7.442
7.435
7.425
7.420
7.417
7.413
7.327
7.324
7.215
7.210
7.205
7.164
7.160
7.155
7.144
7.140
7.136
7.008
7.005
7.001
6.989
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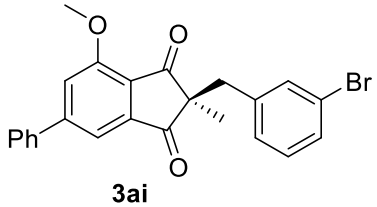
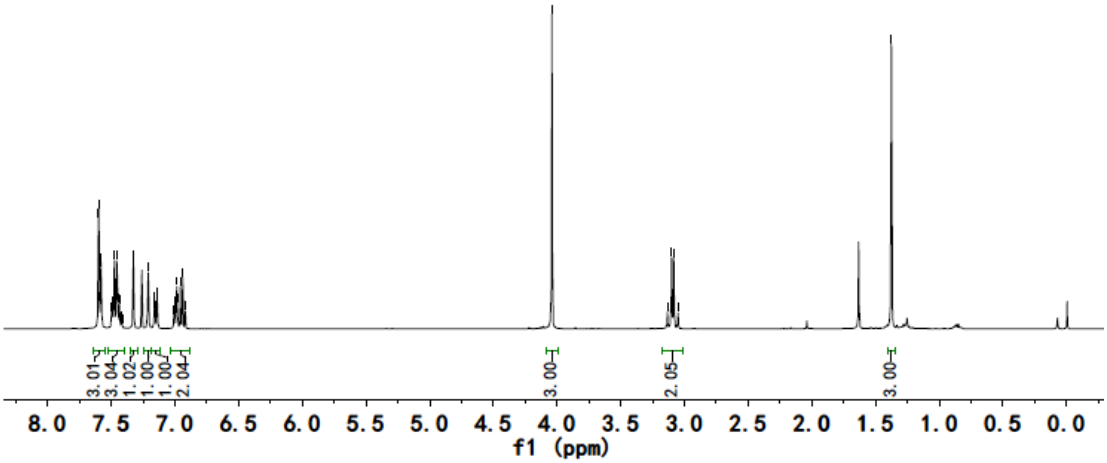
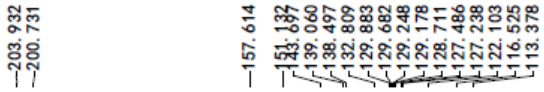
4.041
3.134
3.101
3.084
3.051
1.375


O
O
Br
Ph
O

3ai


3.01
3.04
1.02
1.00
1.00
2.04
3.00
2.05
3.00
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)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139.060
138.497
132.809
129.883
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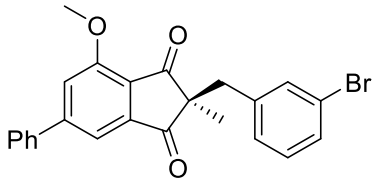
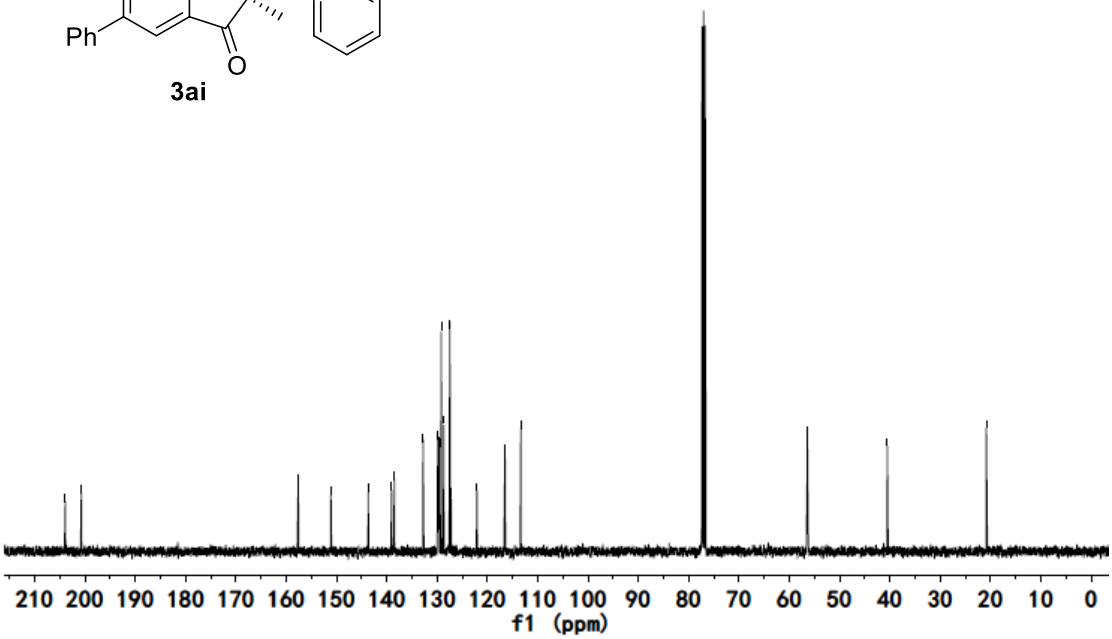
128.711
127.486
127.238
122.103
116.525
113.378
56.432
56.325
40.521
20.847


O
O
Br
Ph
O

3ai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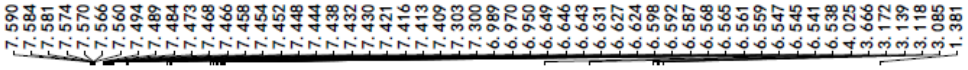
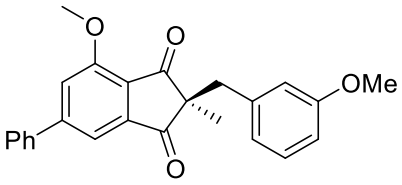
f1 (ppm)





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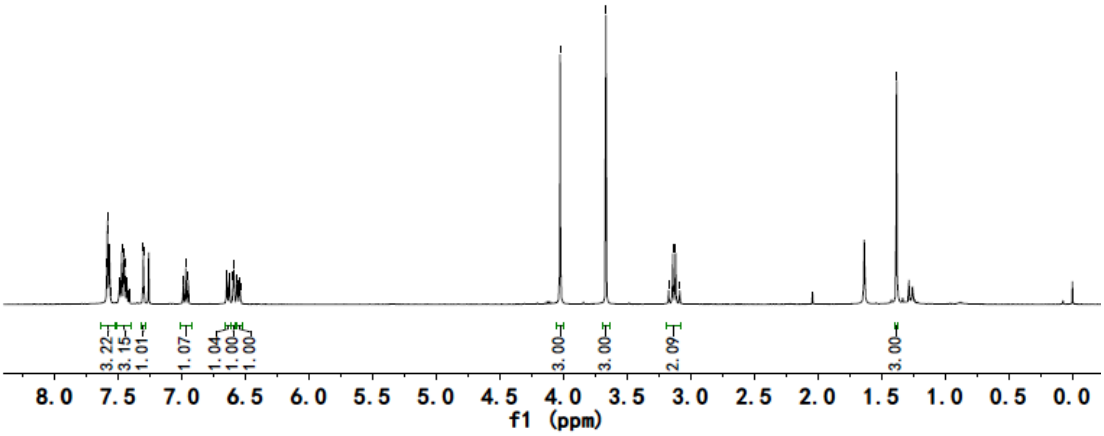

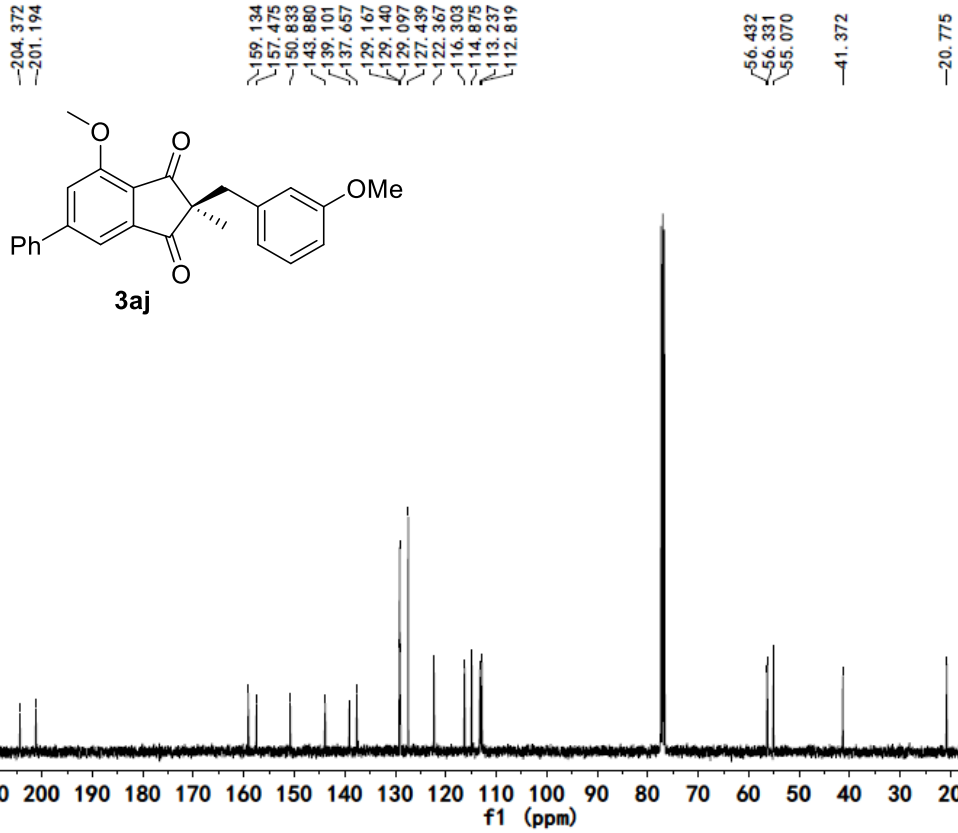

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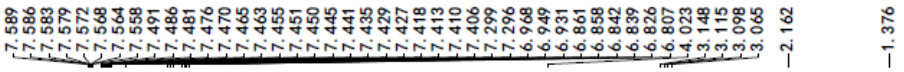
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7.476
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7.465
7.463
7.455
7.451
7.450
7.445
7.441
7.435
7.429
7.427
7.418
7.413
7.410
7.406
7.299
7.296
6.968
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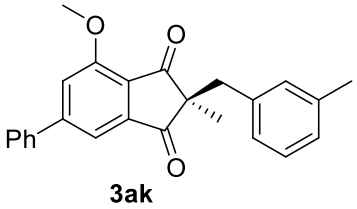
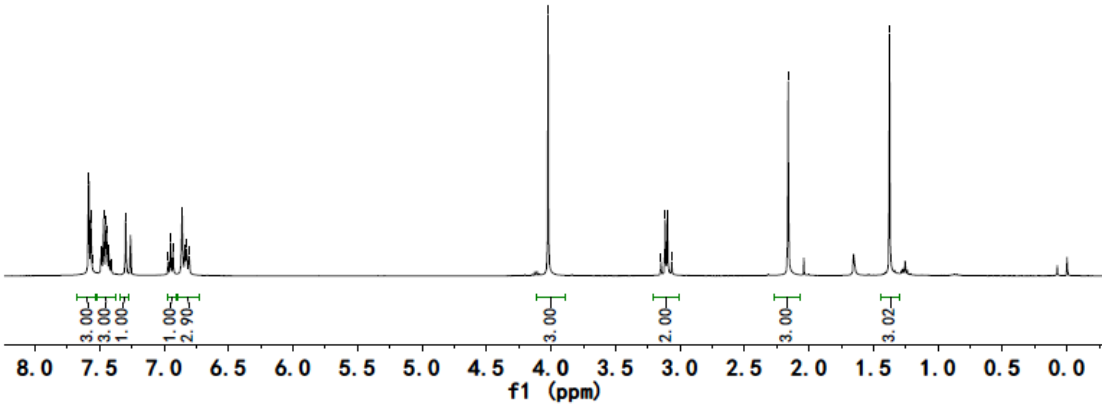
3.115
3.098
3.065
2.162
1.376


O
O
Ph
O

3ak


3.00
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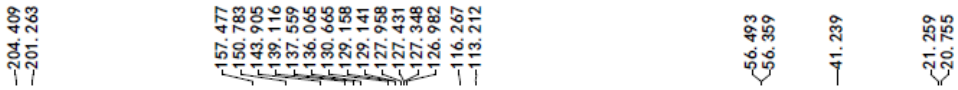
1.00
1.00
2.90
3.00
2.00
3.00
3.02
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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143.905
139.116
137.559
136.065
130.665
129.158
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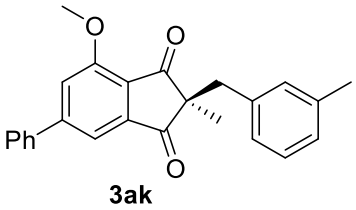
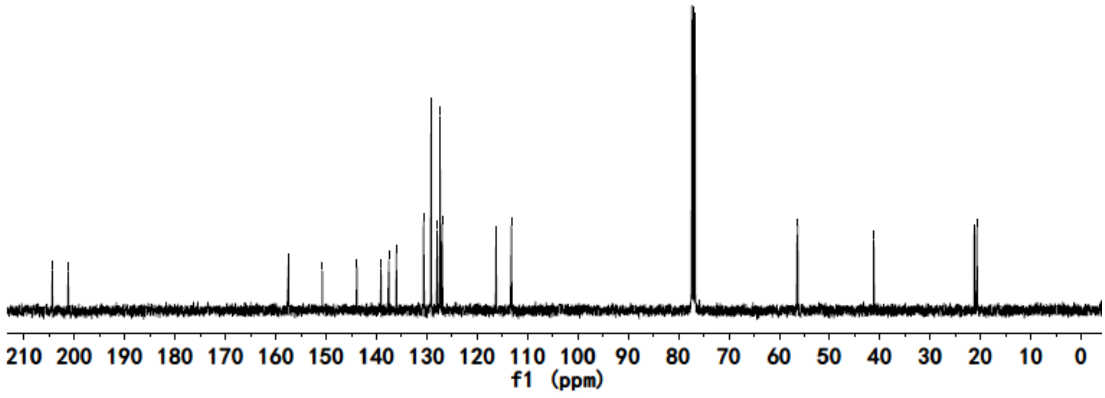
127.958
127.431
127.348
126.982
116.267
113.212
56.493
56.359
41.239
21.259
20.755


O
O
Ph
O

3ak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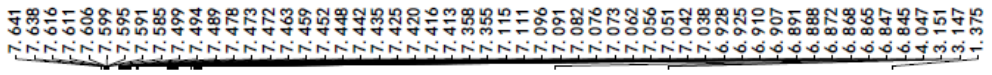
f1 (ppm)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7.494
7.489
7.478
7.473
7.472
7.463
7.459
7.452
7.448
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7.425
7.420
7.416
7.413
7.358
7.355
7.115
7.111
7.096
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7.082
7.076
7.073
7.062
7.056
7.051
7.042
7.038
6.928
6.925
6.910
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6.847
6.845
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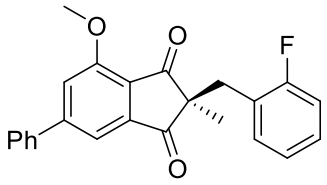
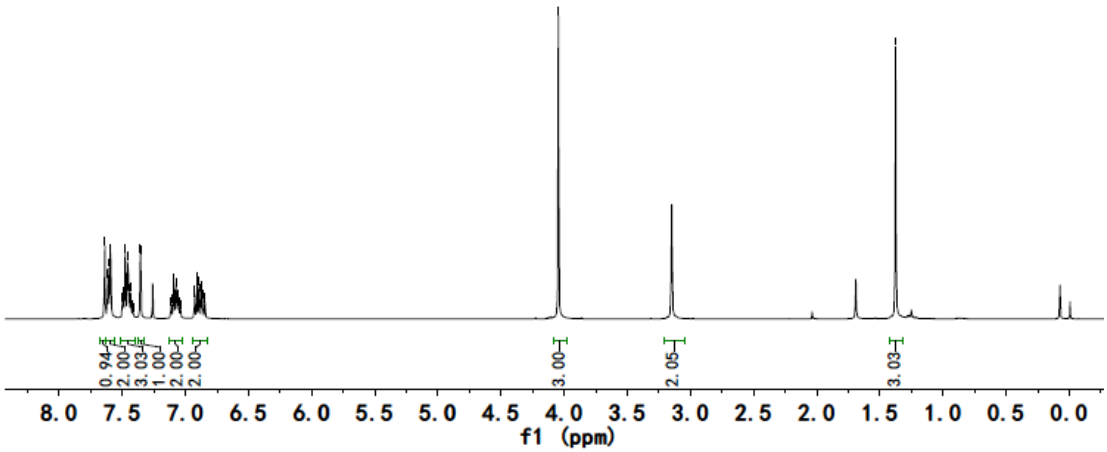
3.147
1.375


O
O
F
Ph
O

3al


0.94
2.00
3.03
1.00
2.00
2.00
3.00
2.05
3.03
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)


203.519
200.610
162.133
159.680
157.701
151.008
143.522
139.075
132.291
132.251
129.213
129.168
128.732
128.651
127.449
126.965
123.716
123.679
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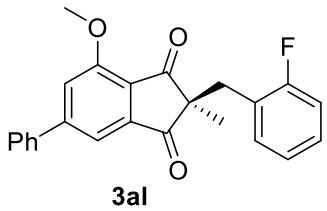
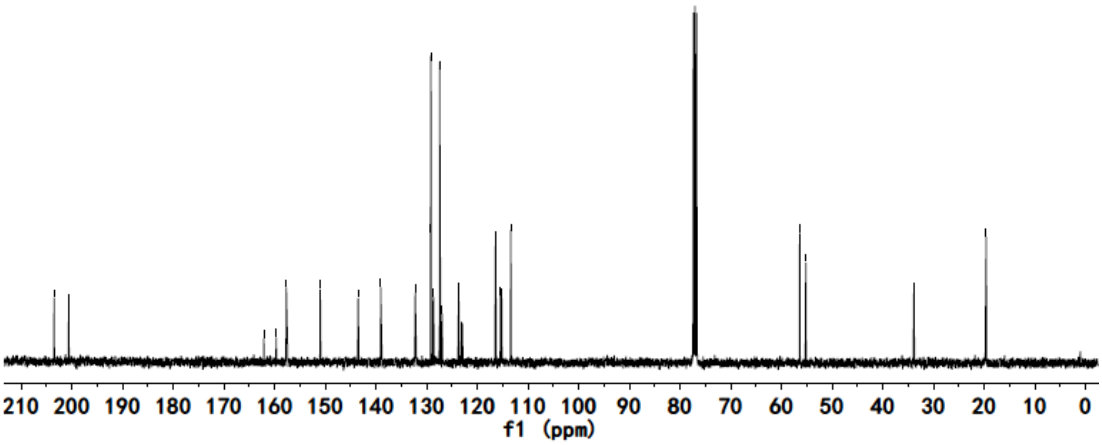
115.442
115.218
113.405
56.402
55.188
33.893
33.870
19.615


O
O
F
Ph
O

3al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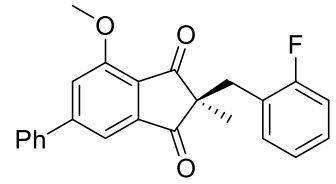
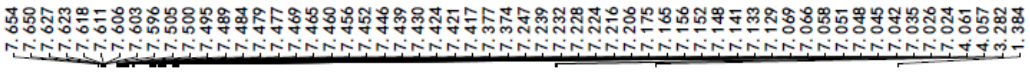
f1 (ppm)


O
O
F
Ph
O

3al

-114.839
-10 -30 -50 -70 -90 -110 -130 -150 -170 -190 -210 -230 -250 -270
f1 (ppm)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7.495
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7.484
7.479
7.477
7.469
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7.460
7.456
7.452
7.446
7.439
7.430
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7.421
7.417
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7.374
7.247
7.239
7.232
7.228
7.224
7.216
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7.152
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7.141
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7.069
7.066
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7.048
7.045
7.042
7.035
7.026
7.024
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4.057
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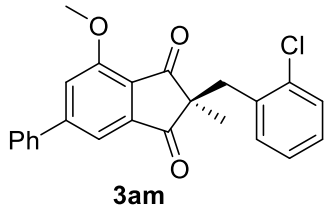
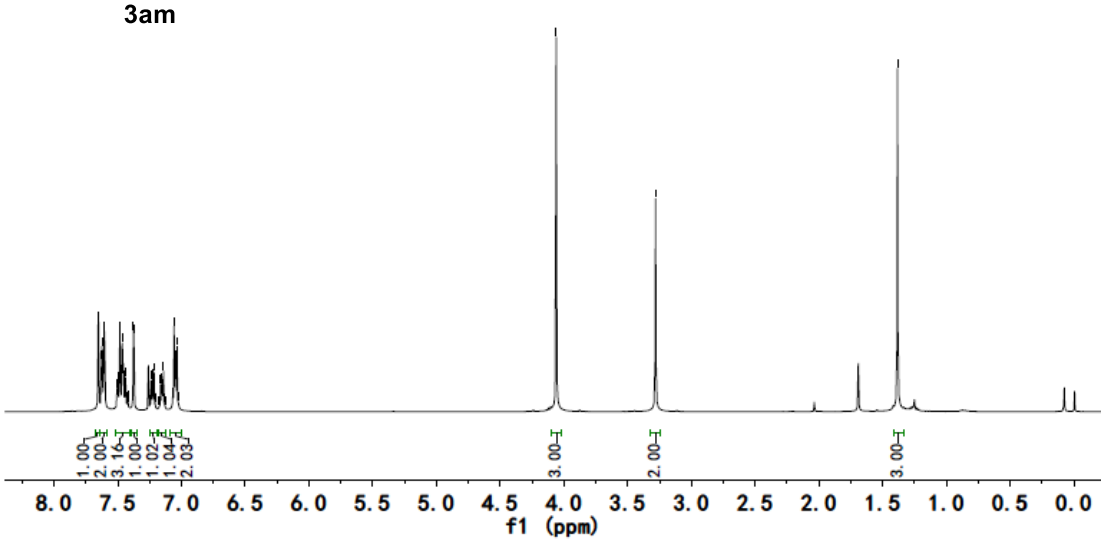
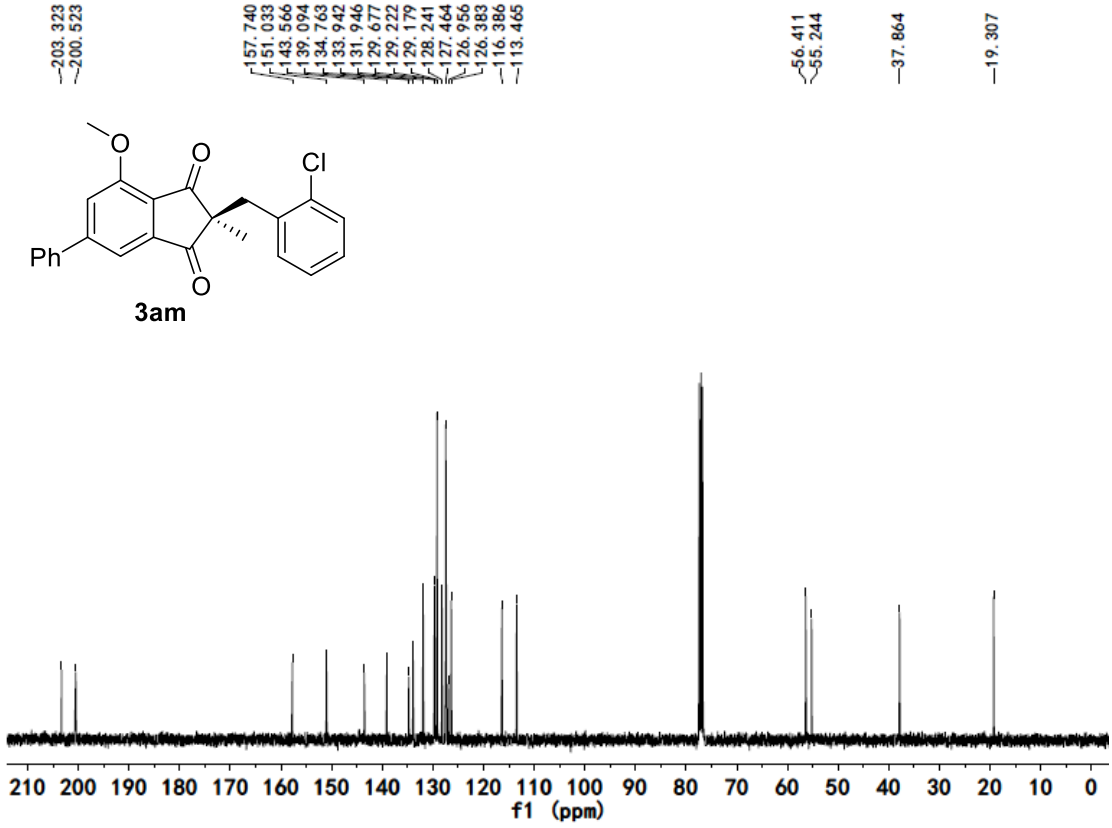
1.384


O
O
Cl
Ph
O

3am


1.00
2.00
3.16
1.00
1.02
1.04
2.03
3.00
2.00
3.00
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)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200.523
157.740
151.033
143.566
139.094
134.763
133.942
131.946
129.677
129.222
129.179
128.241
127.464
126.956
126.383
116.386
113.465
56.411
55.244
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Cl
Ph
O
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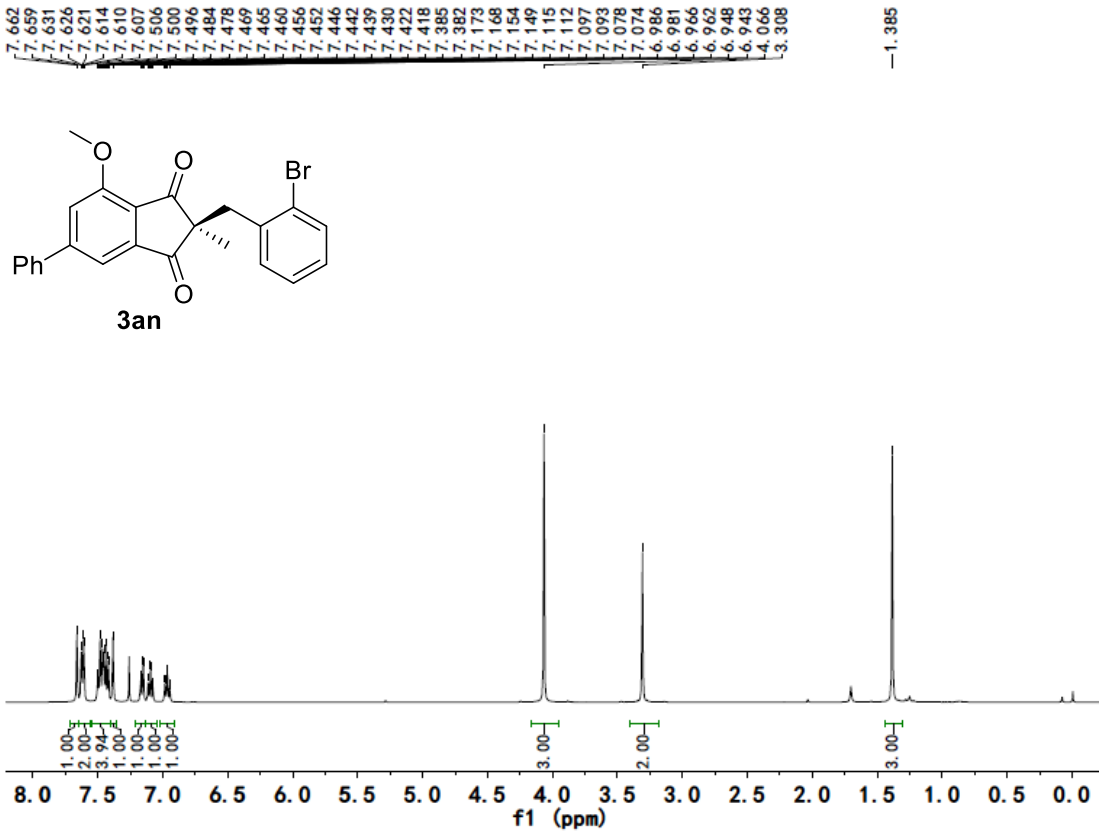
f1 (ppm)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7.078
7.074
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6.981
6.966
6.962
6.948
6.943
4.066
3.308
1.385
O
O
Br
Ph
O
3an
1.00
2.00
3.94
1.00
1.00
1.00
1.00
3.00
2.00
3.00
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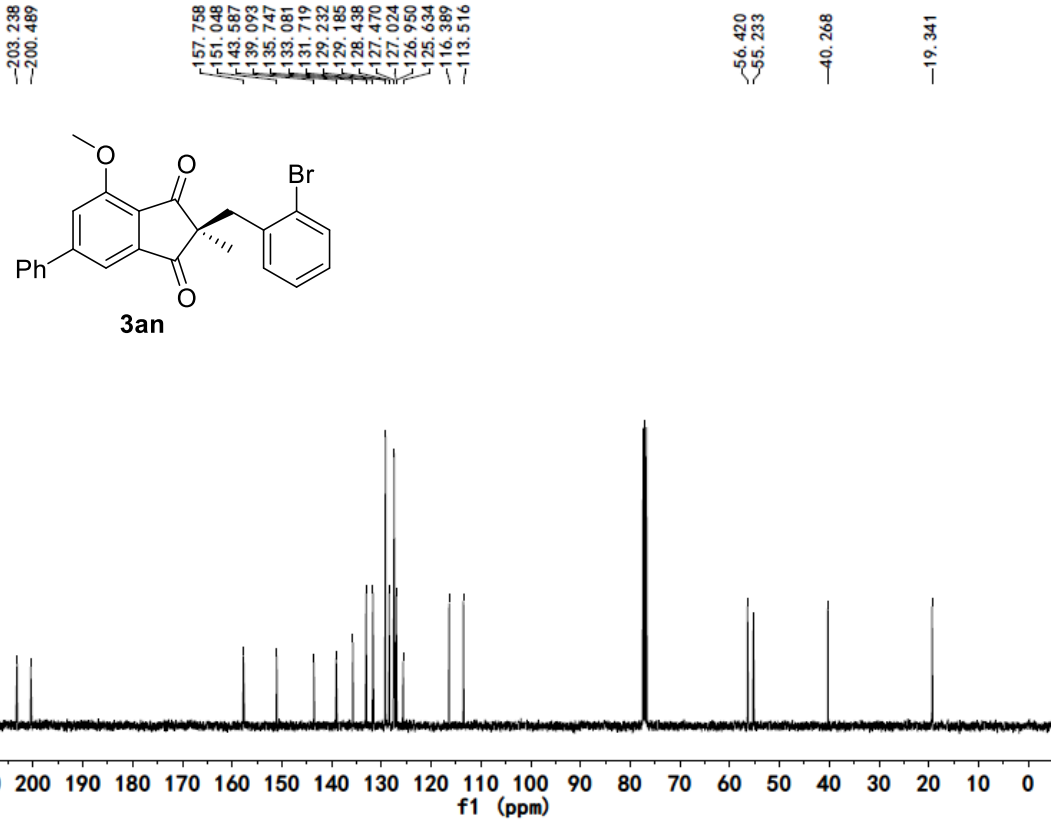
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Br
Ph
O
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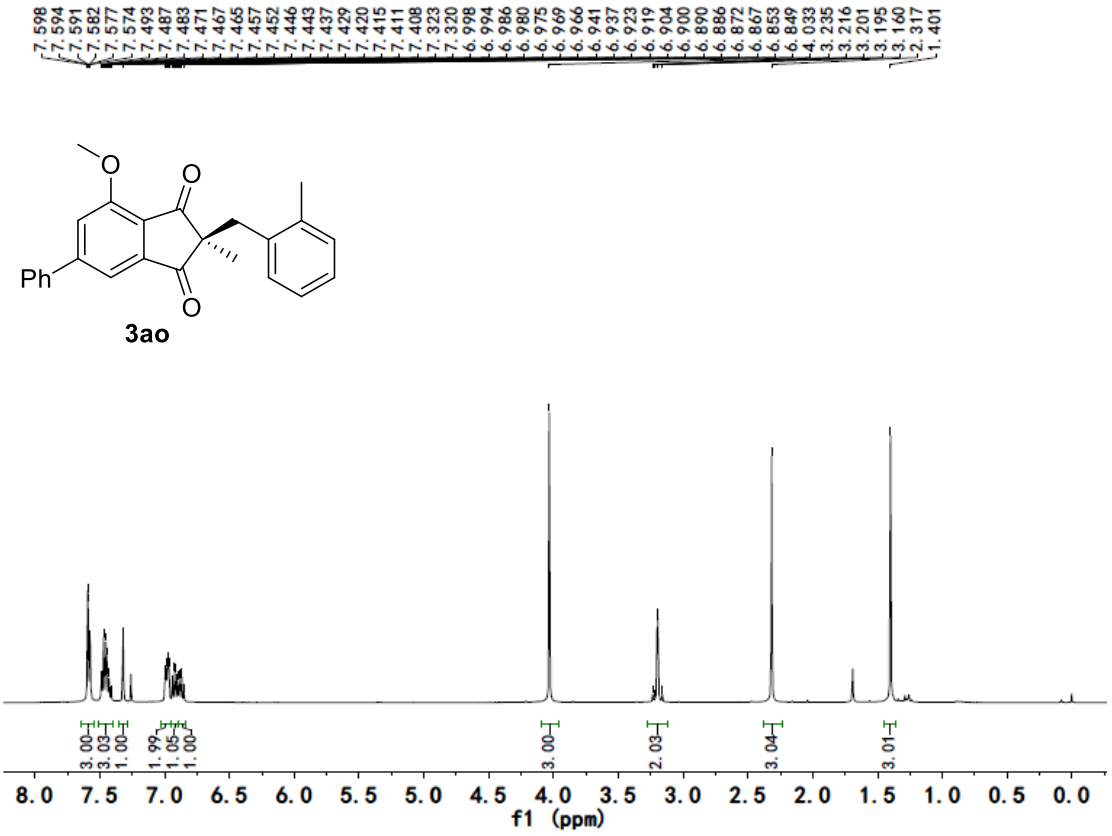
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6.937
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6.919
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3.216
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3.195
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1.401
O
O
Ph
O
3ao
3.00
3.03
1.00
1.99
1.05
1.00
3.00
2.03
3.04
3.01
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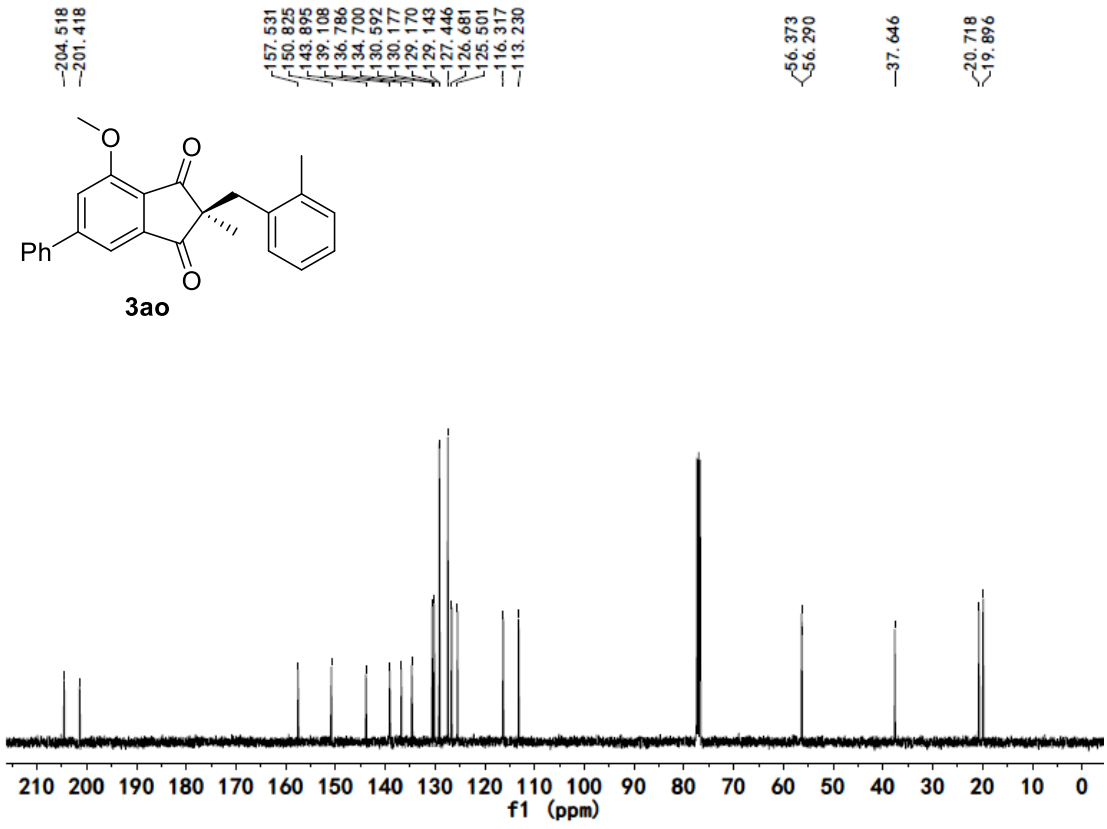
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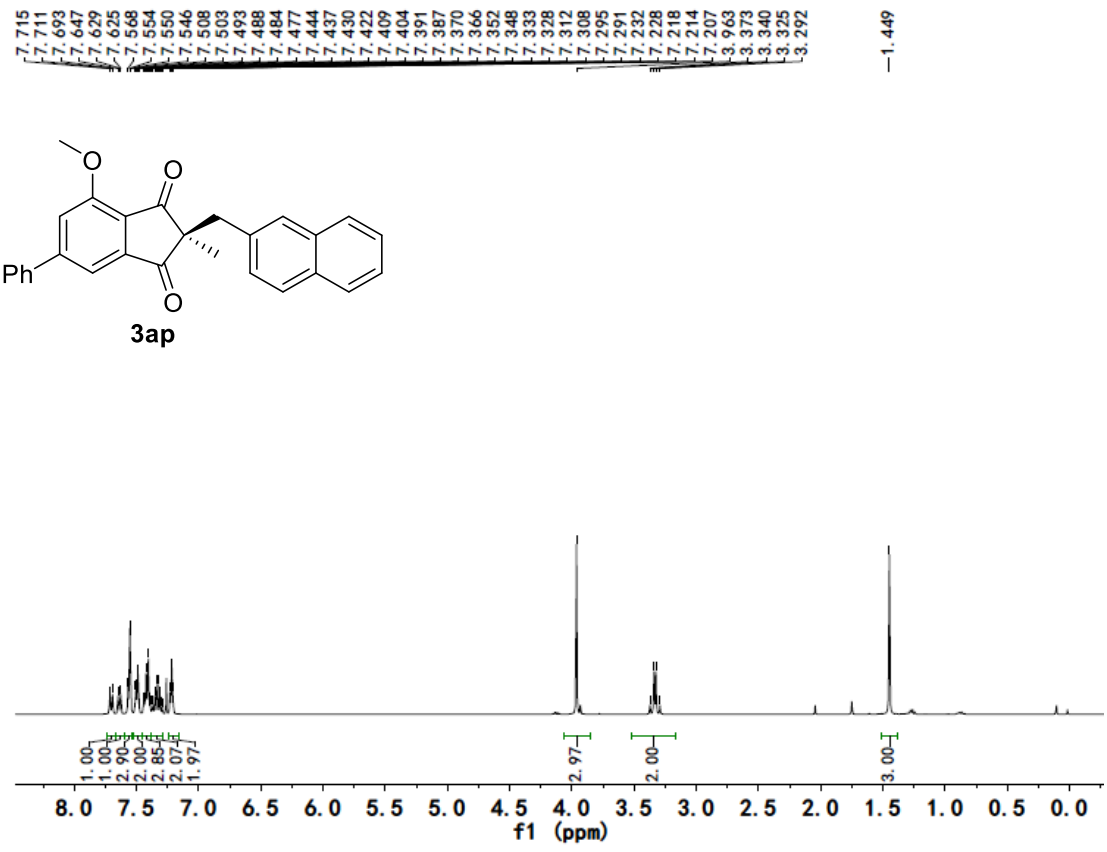
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7.477
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7.437
7.430
7.422
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7.207
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3.340
3.325
3.292
1.449
O
O
O
Ph
3ap
1.00
1.00
2.90
2.00
2.85
2.07
1.97
2.97
2.00
3.00
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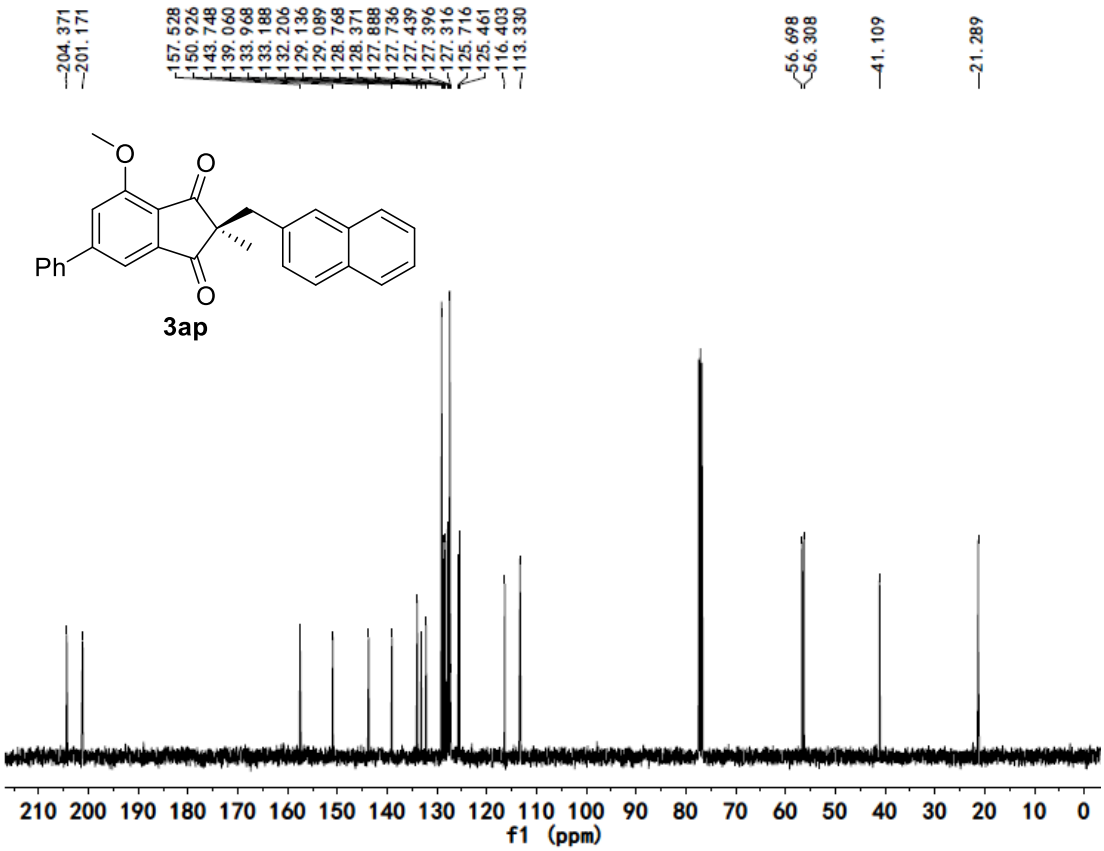
f1 (ppm)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128.371
127.888
127.736
127.439
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127.316
125.716
125.461
116.403
113.330
56.698
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O
O
Ph
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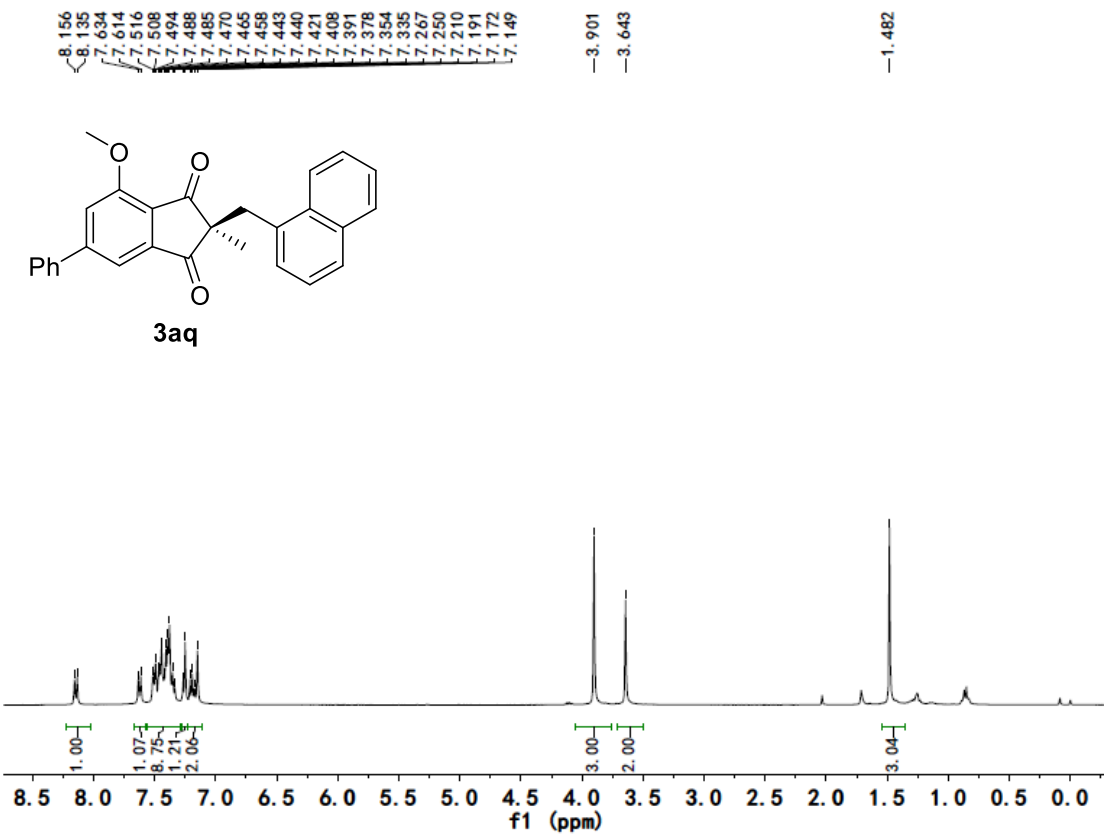
f1 (ppm)

3ap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7.378
7.354
7.335
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7.191
7.172
7.149
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3.643
1.482
O
O
O
Ph
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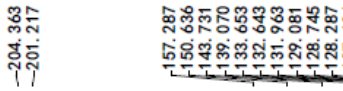
1.07
8.75
1.21
2.06
3.00
2.00
3.04
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

3aq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132.643
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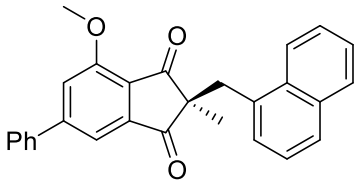
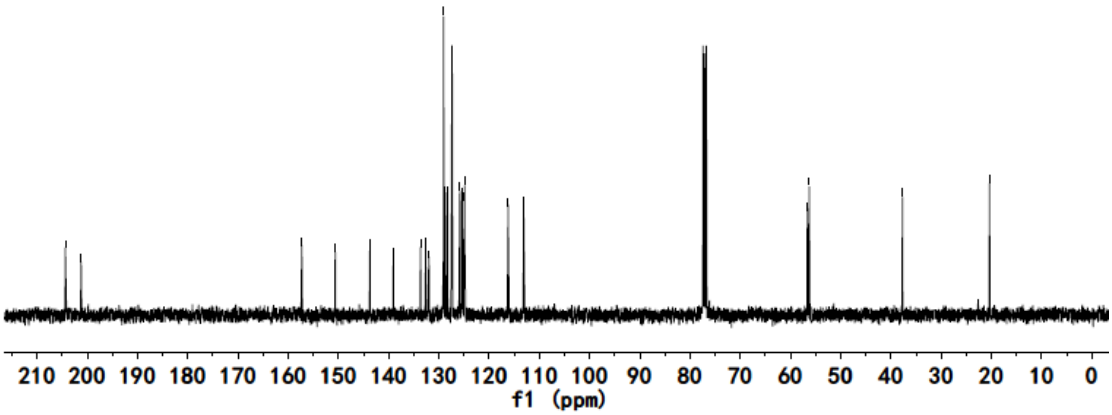
37.705
20.386


O
O
Ph
O

3aq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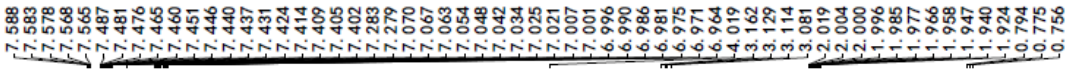
f1 (ppm)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7.440
7.437
7.431
7.424
7.414
7.409
7.405
7.402
7.283
7.279
7.070
7.067
7.063
7.054
7.048
7.042
7.034
7.025
7.021
7.007
7.001
6.996
6.990
6.986
6.981
6.975
6.971
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2.019
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2.000
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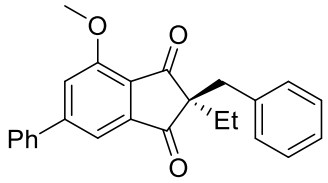
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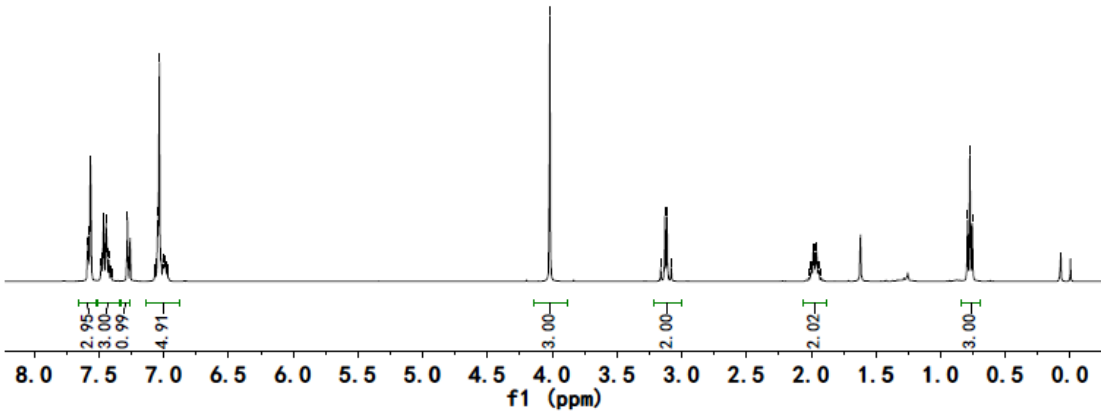
Et
Ph
O

3ar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2.00
2.02
3.00
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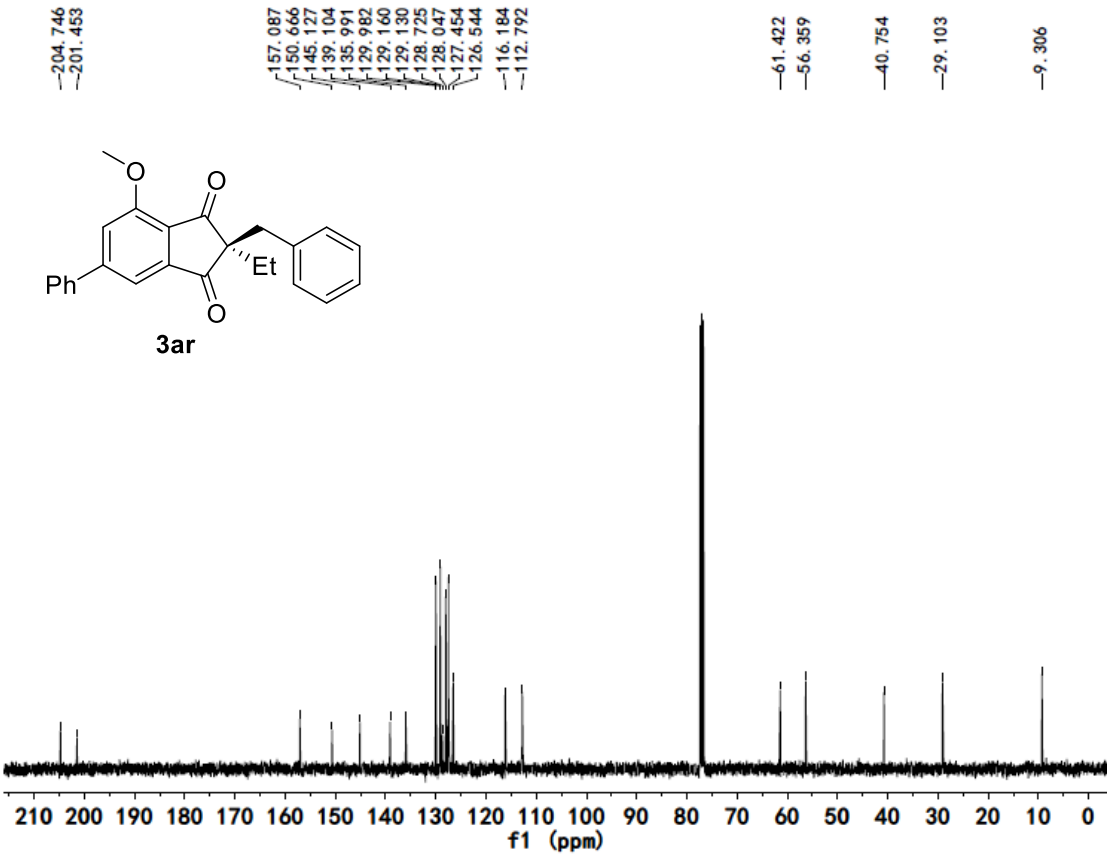
f1 (ppm)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61.422
56.359
40.754
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O
O
Ph
Et
3ar
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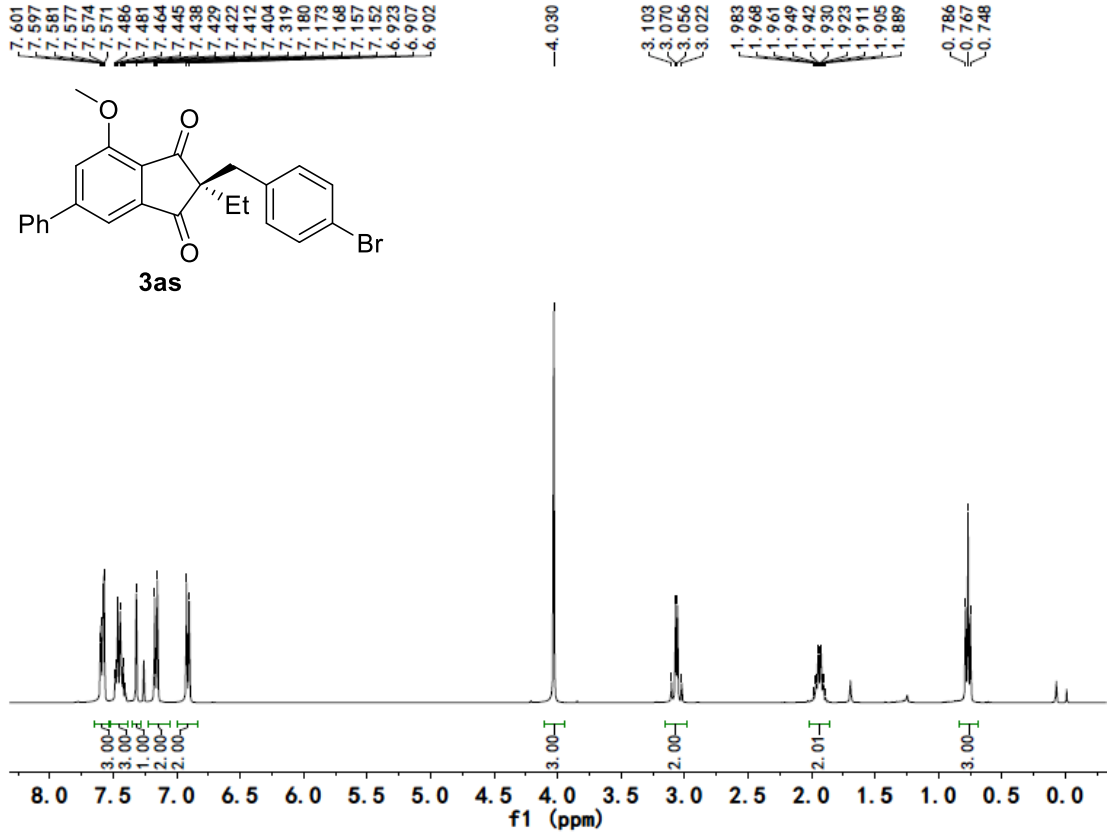
f1 (ppm)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7.152
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6.907
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1.961
1.949
1.942
1.930
1.923
1.911
1.905
1.889
0.786
0.767
0.748
O
O
O
Ph
Et
Br
3as
3.00
3.00
1.00
2.00
2.00
3.00
2.00
2.01
3.00
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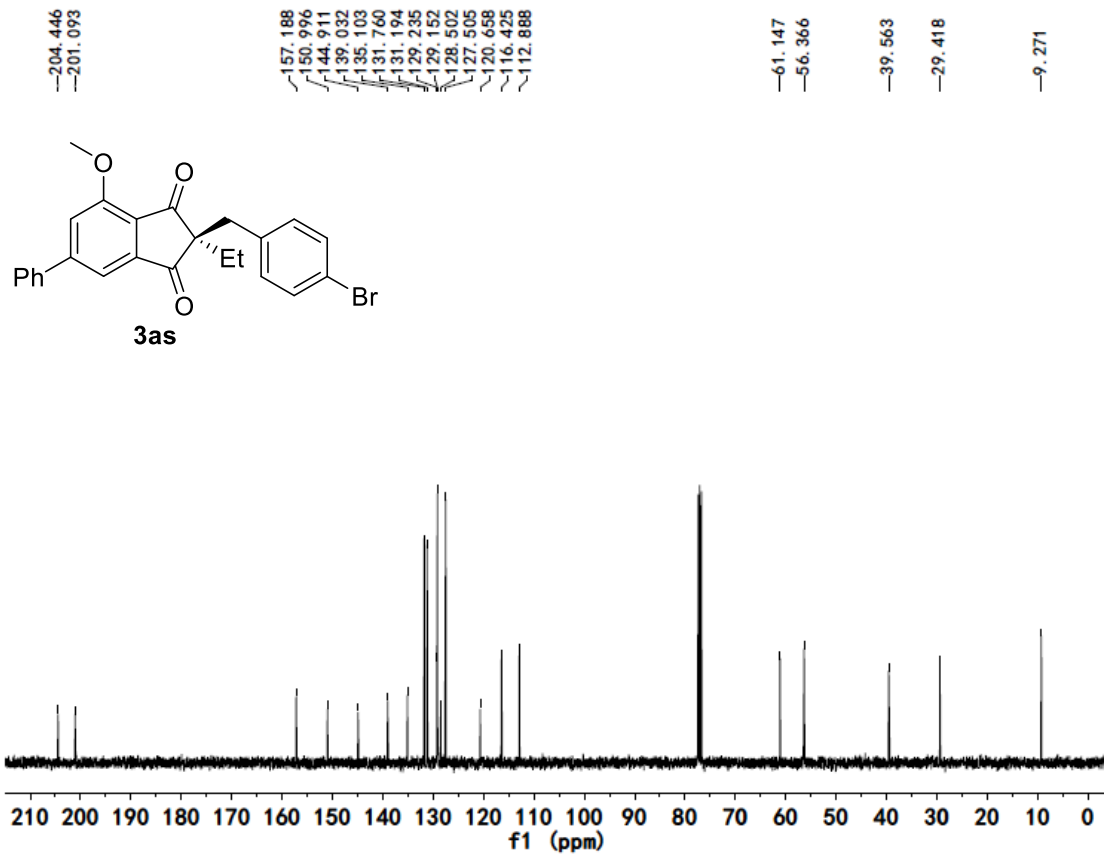
f1 (ppm)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61.147
56.366
39.563
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Ph
Et
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Br
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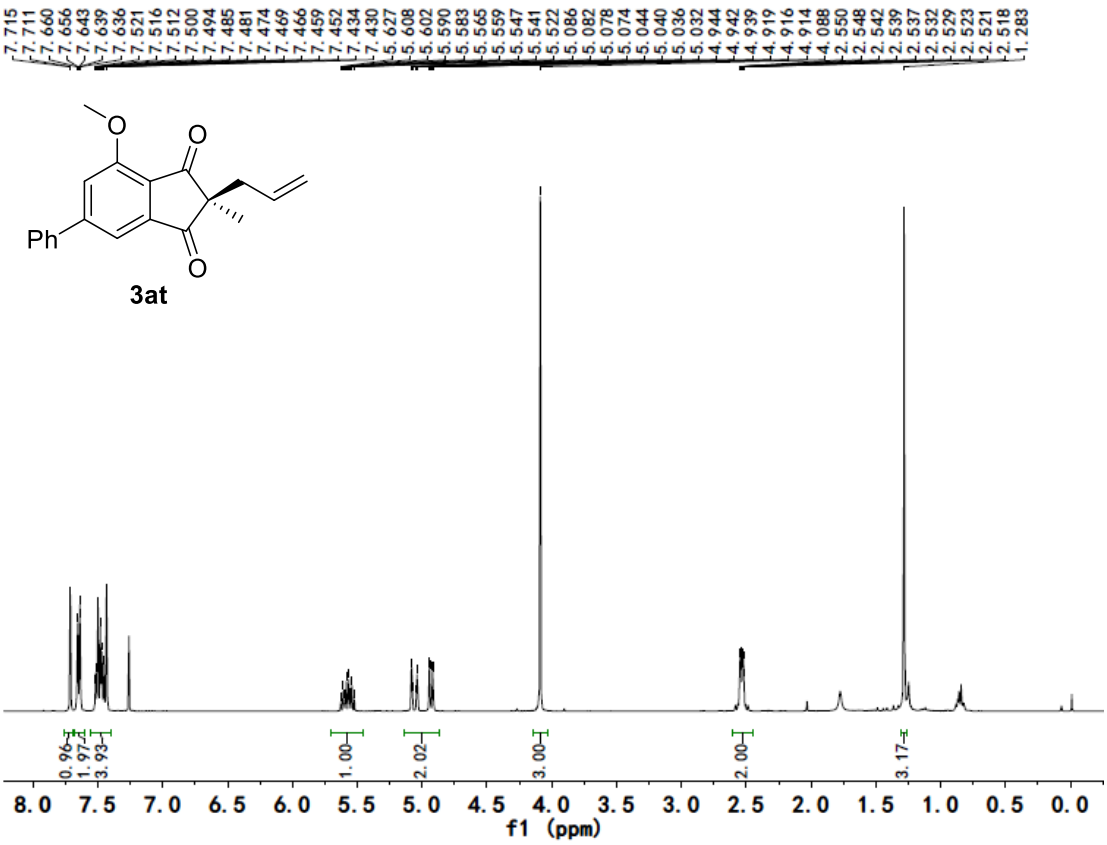
f1 (ppm)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2.537
2.532
2.529
2.523
2.521
2.518
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O
O
Ph
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3.00
2.00
3.17
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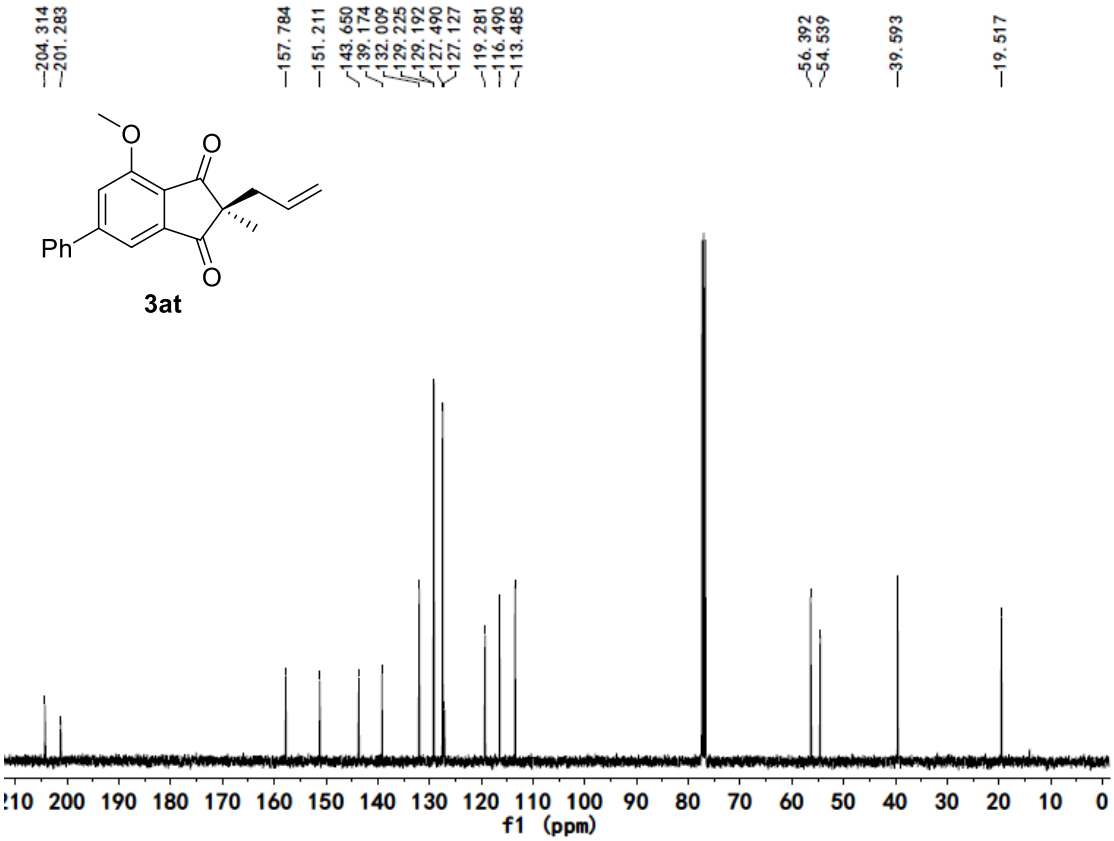
f1 (ppm)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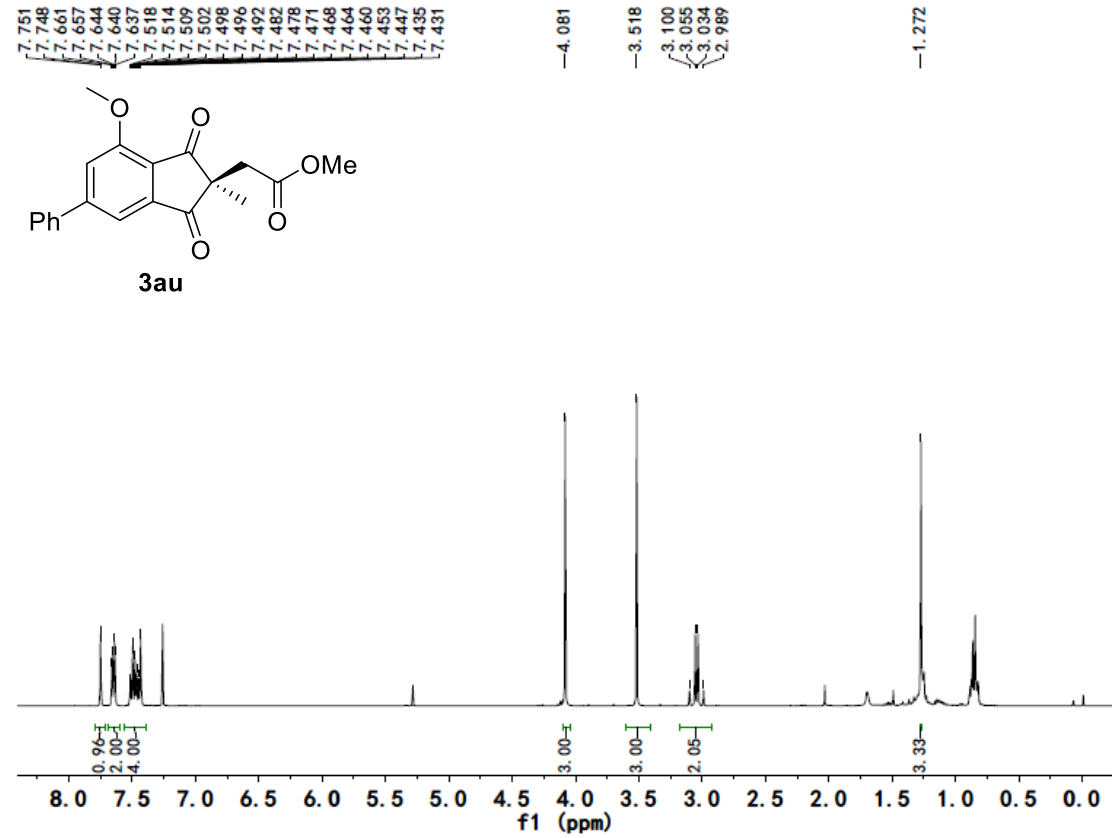
O
O
O
Ph
3at
f1 (ppm)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7.471
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7.464
7.460
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4.081
3.518
3.100
3.055
3.034
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1.272
O
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OMe
O
Ph
O
3au
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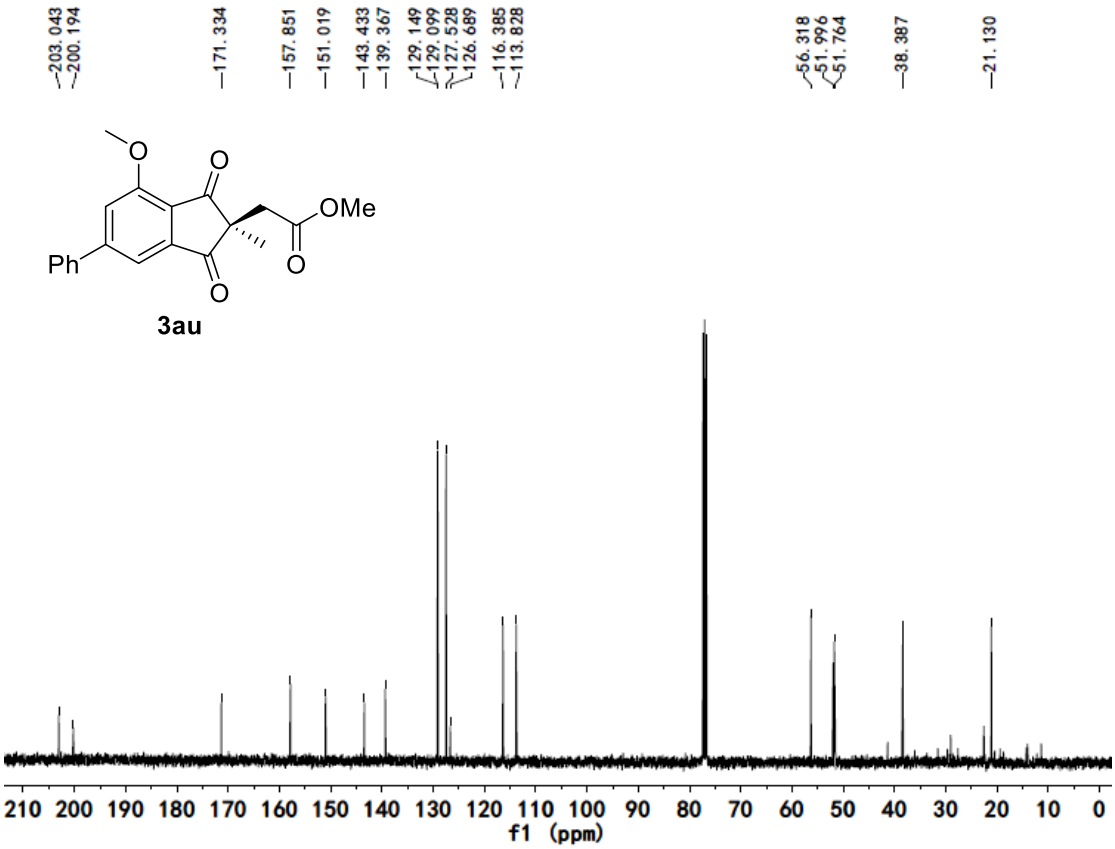
f1 (ppm)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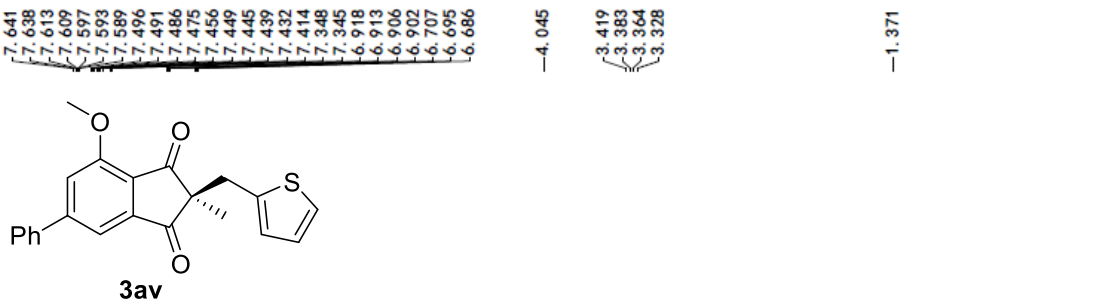
O
OMe
O
Ph
O
f1 (ppm)

3au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7.445
7.439
7.432
7.414
7.348
7.345
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6.906
6.902
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6.695
6.686
4.045
3.419
3.383
3.364
3.328
1.371
O
O
S
Ph
O
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3.04
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0.91
1.96
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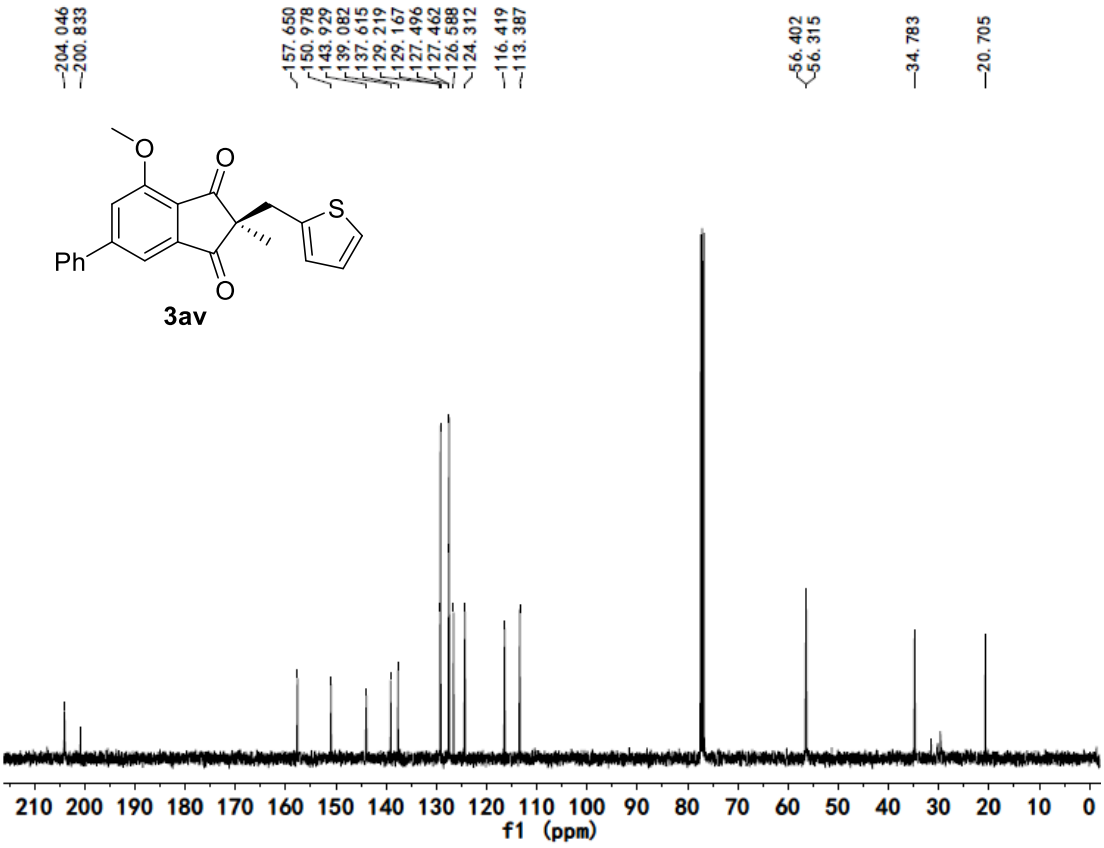
1.94
3.12
f1 (ppm)

3av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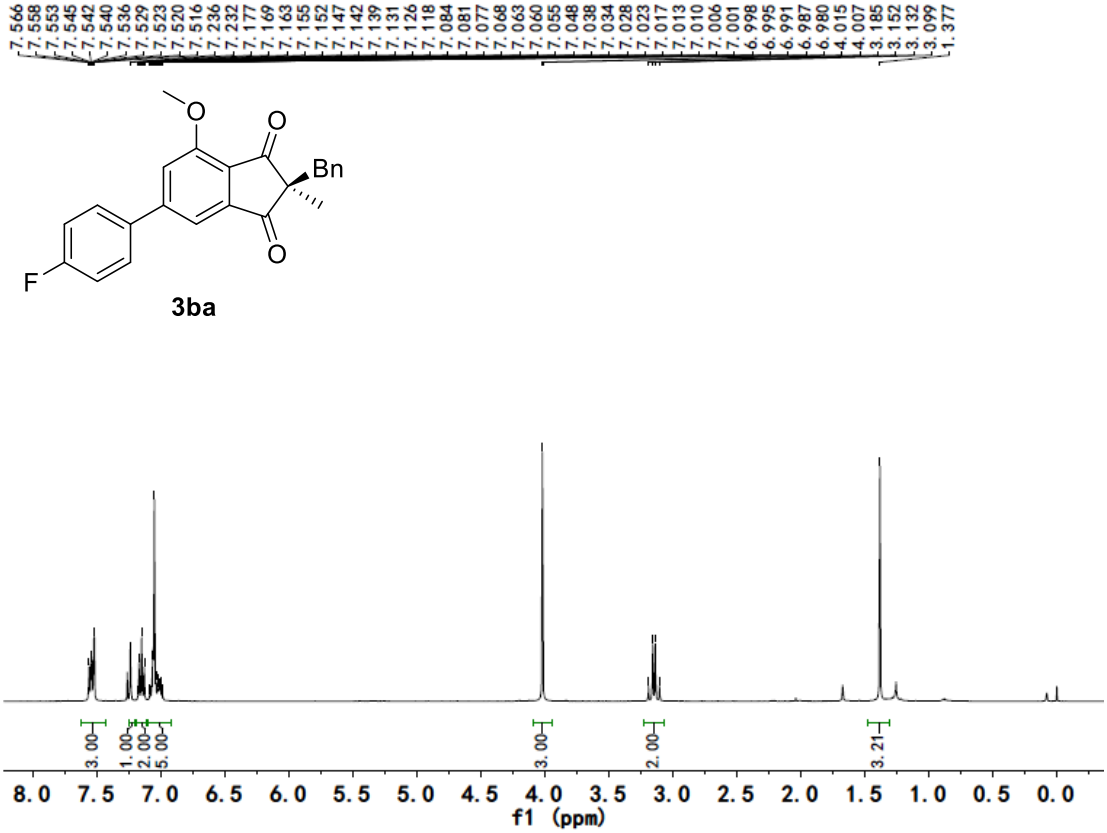
O
S
Ph
O
3av
f1 (ppm)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6.980
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4.007
3.185
3.152
3.132
3.099
1.377
O
O
Bn
O
F
3ba
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1.00
2.00
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3.00
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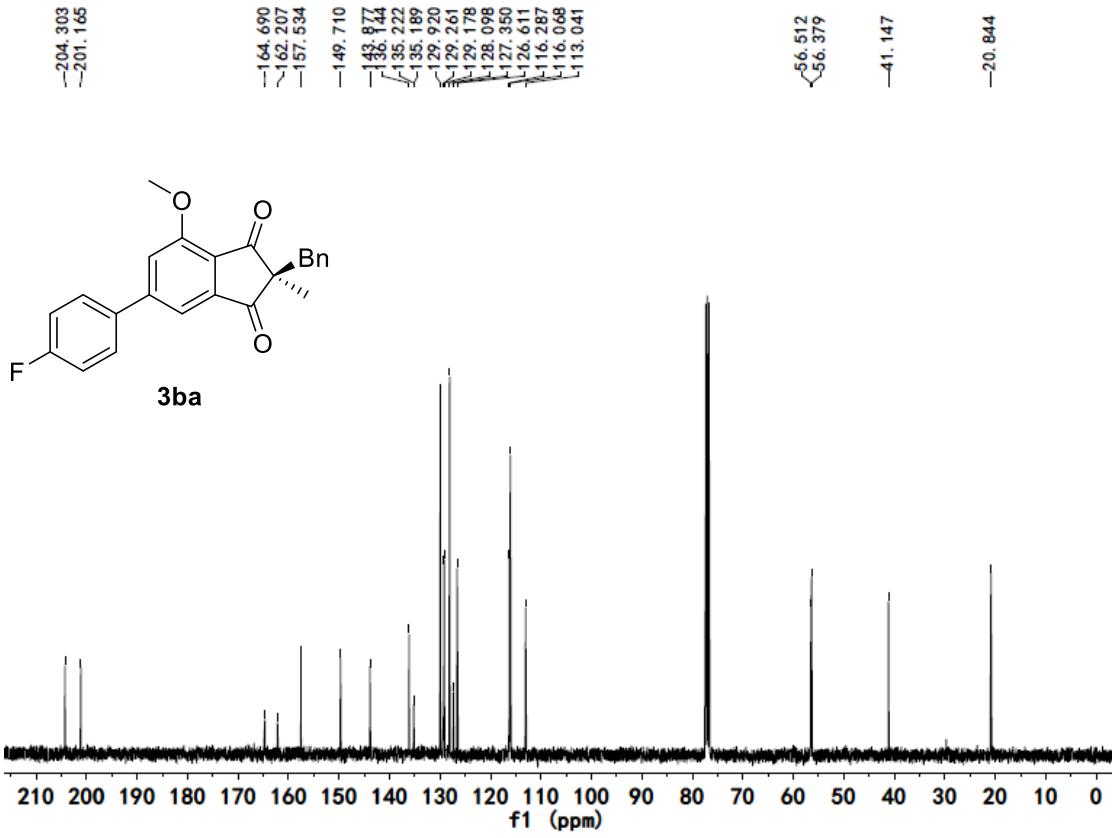
3.21
f1 (ppm)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126.611
116.287
116.068
113.041
56.512
56.379
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O
Bn
O
F
3ba
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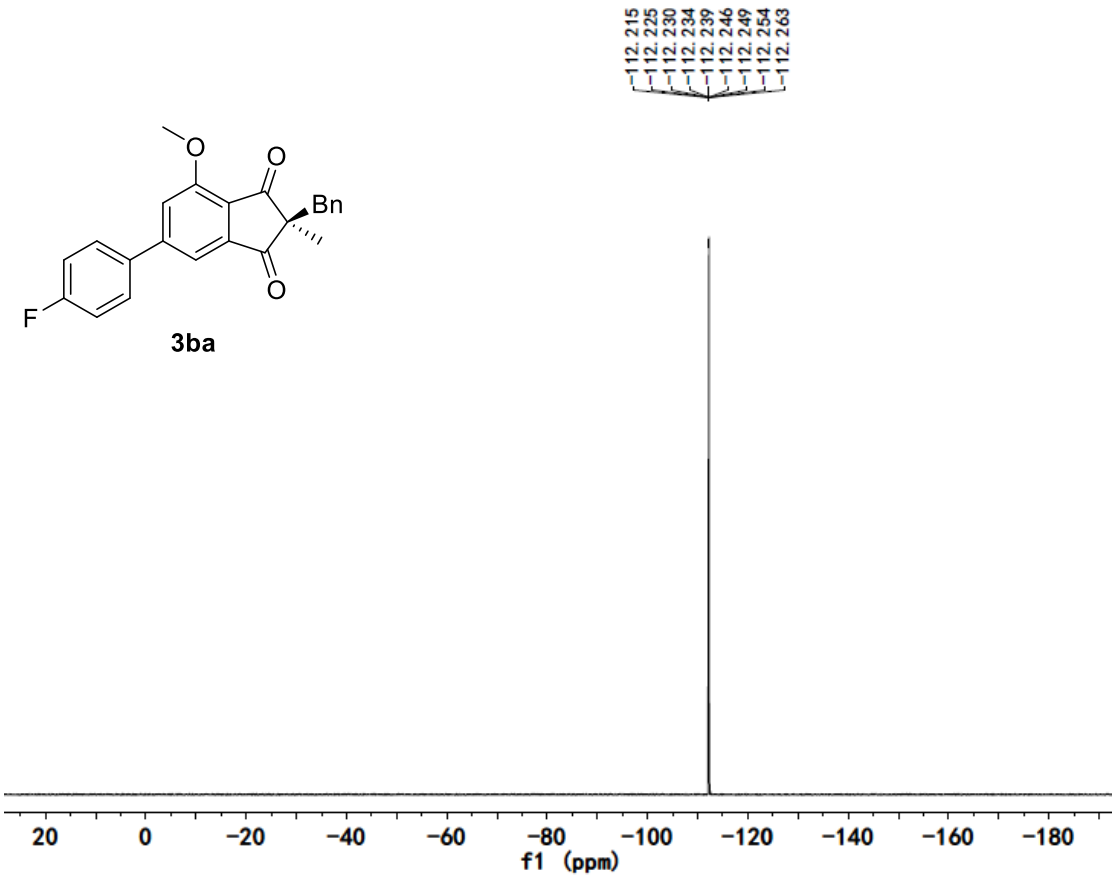
f1 (ppm)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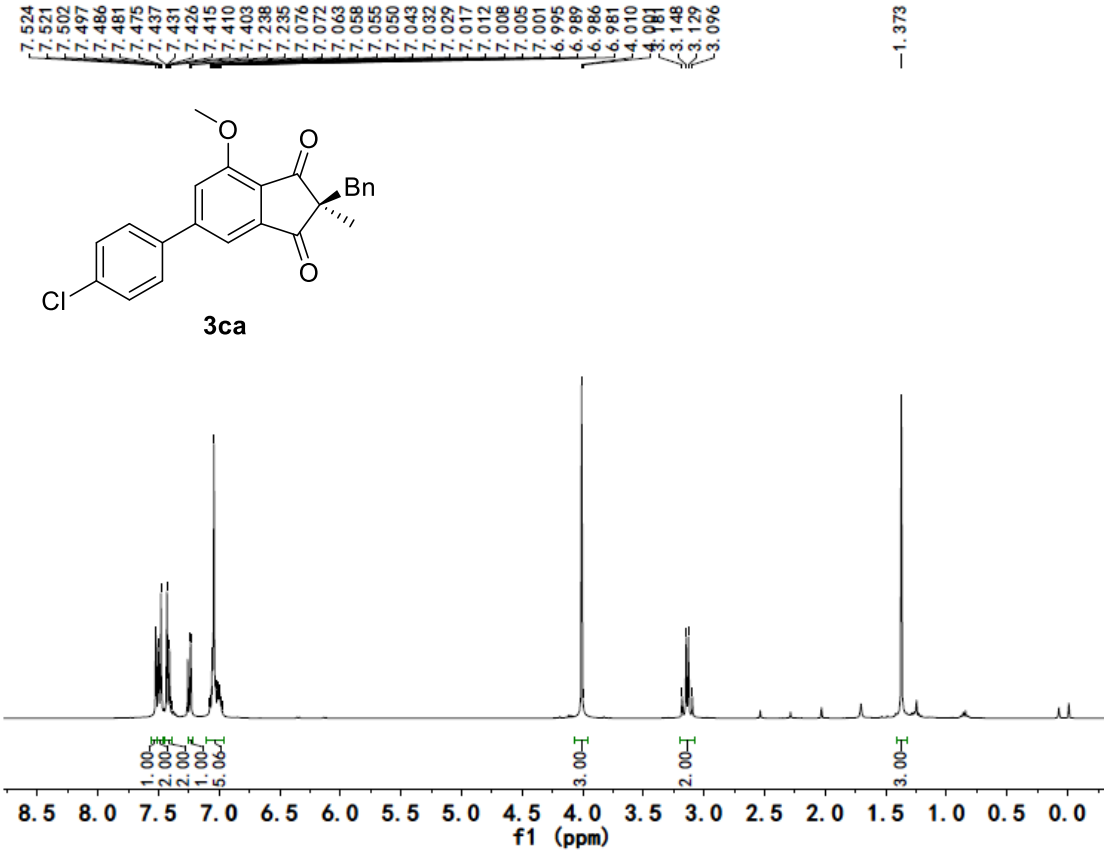
112.249
112.254
112.263
O
O
Bn
O
F
3ba
20 0 -20 -40 -60 -80 -100 -120 -140 -160 -180
f1 (ppm)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7.437
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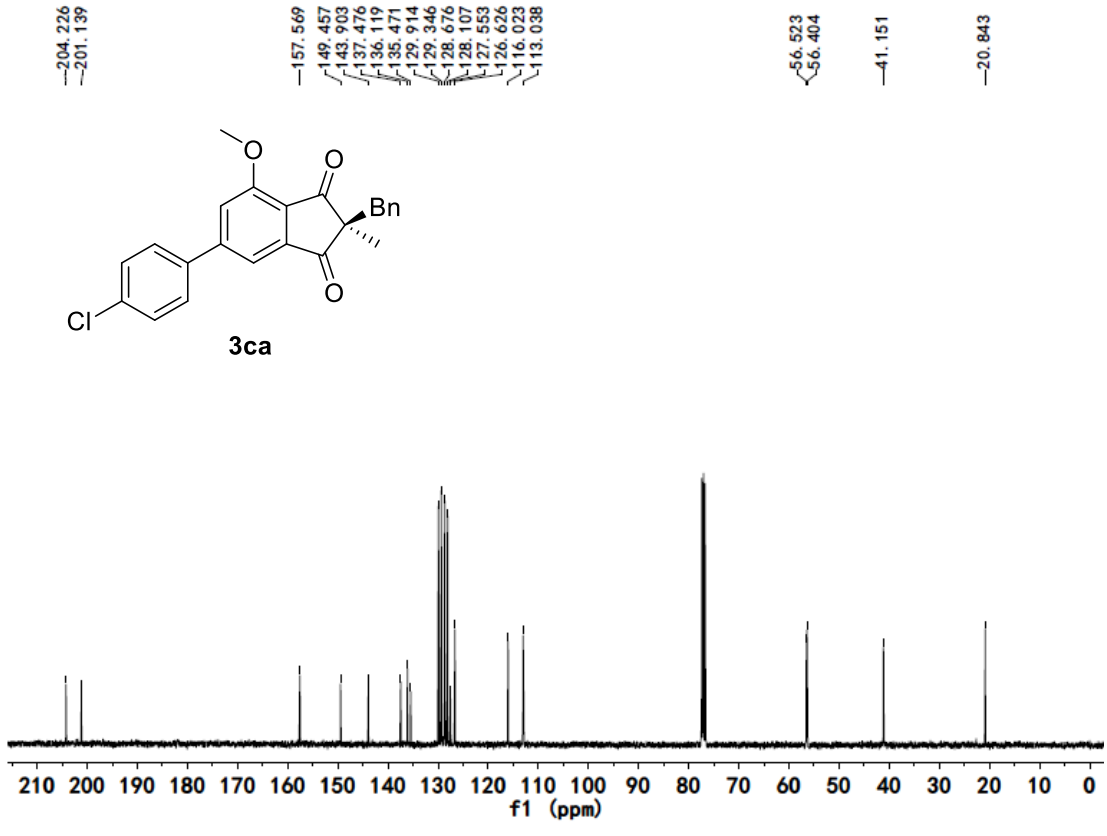
7.415
7.410
7.403
7.238
7.235
7.076
7.072
7.063
7.058
7.055
7.050
7.043
7.032
7.029
7.017
7.012
7.008
7.005
7.001
6.995
6.989
6.986
6.981
4.010
4.001
3.181
3.148
3.129
3.096
1.373
O
O
Bn
O
Cl
3ca
1.00
2.00
2.00
1.00
5.06
3.00
2.00
3.00
8.5 8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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137.476
136.119
135.471
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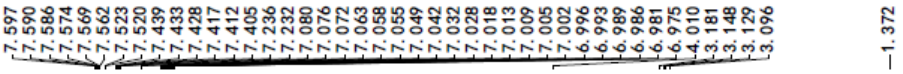
128.676
128.107
127.553
126.626
116.023
113.038
56.523
56.404
41.151
20.843
O
O
Bn
O
Cl
3ca
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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7.586
7.574
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7.562
7.523
7.520
7.439
7.433
7.428
7.417
7.412
7.405
7.236
7.232
7.080
7.076
7.072
7.063
7.058
7.055
7.049
7.042
7.032
7.028
7.018
7.013
7.009
7.005
7.002
6.996
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6.986
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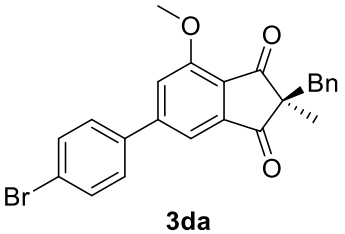
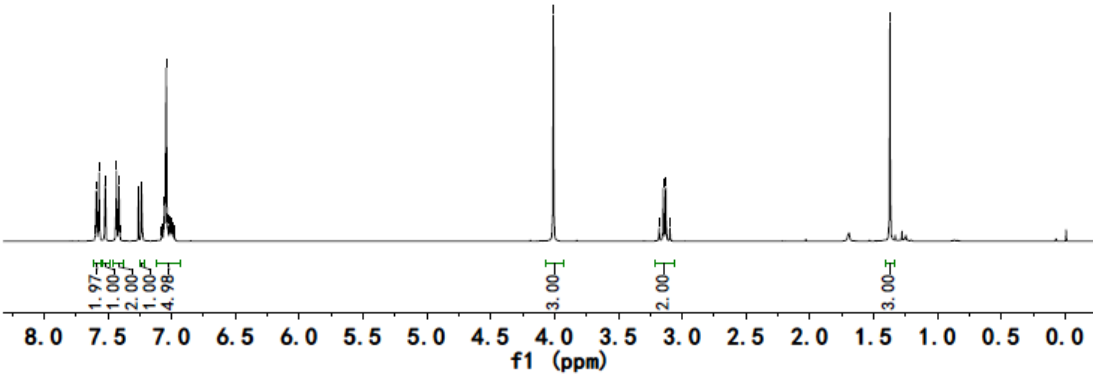
6.975
4.010
3.181
3.148
3.129
3.096
1.372


O
O
Bn
O
Br

3da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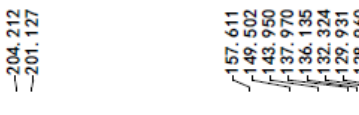
1.00
2.00
1.00
4.98
3.00
2.00
3.00
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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132.324
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113.016
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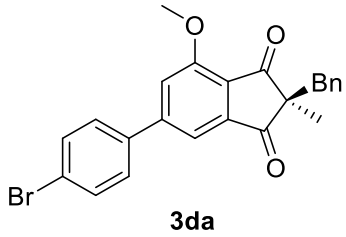
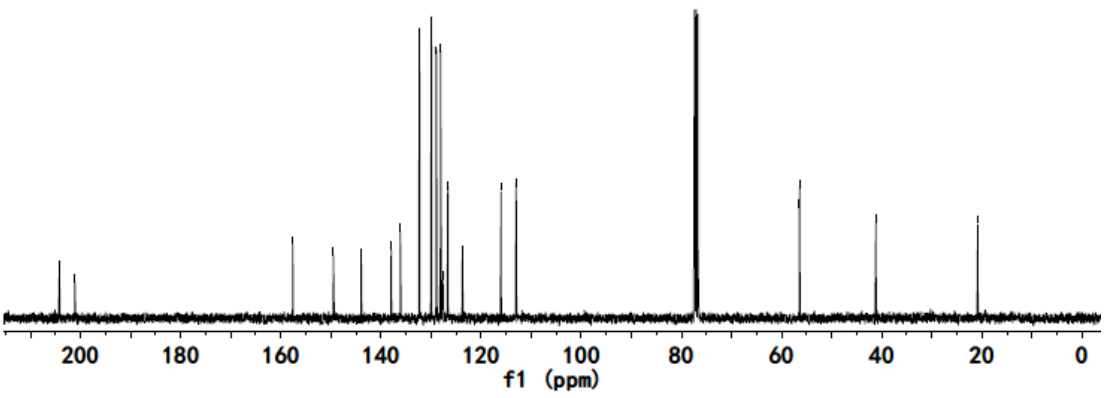
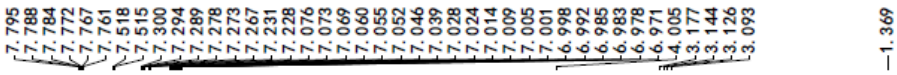
56.418
41.183
20.825


O
O
Bn
O
Br

3da


200 180 160 140 120 100 80 60 40 20 0
f1 (ppm)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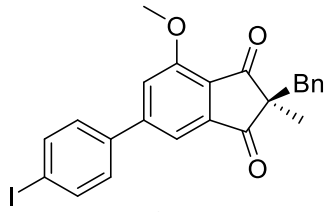
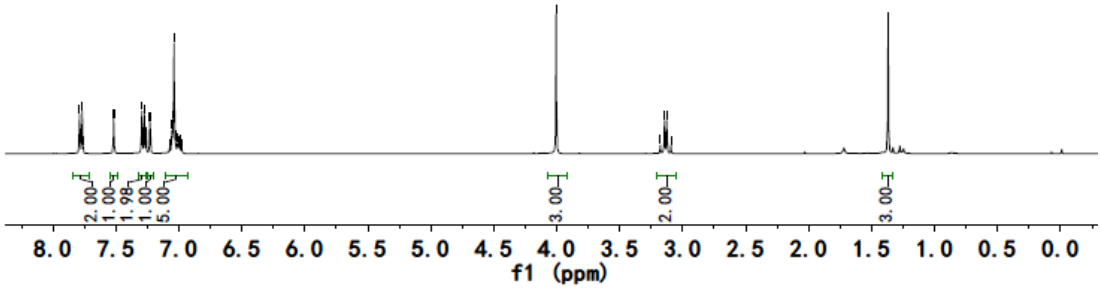
7.767
7.761
7.518
7.515
7.300
7.294
7.289
7.278
7.273
7.267
7.231
7.228
7.076
7.073
7.069
7.060
7.055
7.052
7.046
7.039
7.028
7.024
7.014
7.009
7.005
7.001
6.998
6.992
6.985
6.983
6.978
6.971
4.005
3.177
3.144
3.126
3.093
1.369


O
O
Bn
O
I

3ea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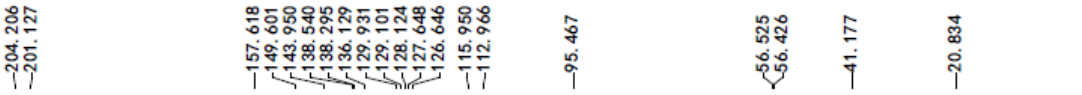
1.00
1.98
1.00
5.00
3.00
2.00
3.00
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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201.127
157.618
149.601
143.950
138.540
138.295
136.129
129.931
129.101
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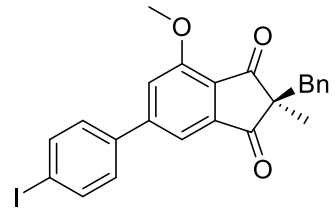
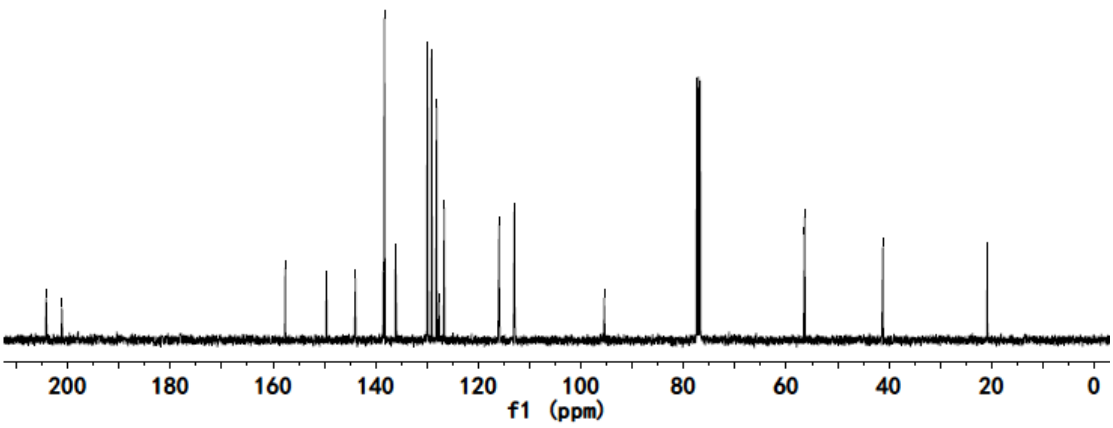
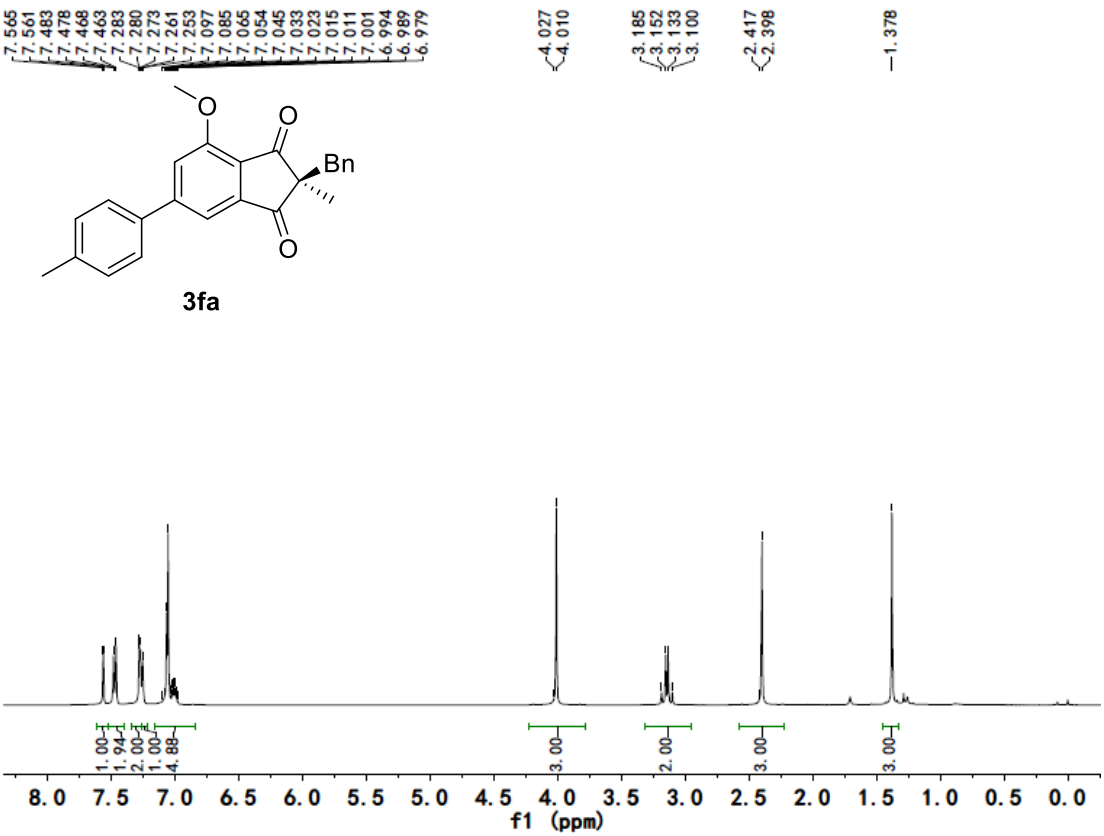
95.467
56.525
56.426
41.177
20.834


O
O
Bn
O
I

3ea


200 180 160 140 120 100 80 60 40 20 0
f1 (ppm)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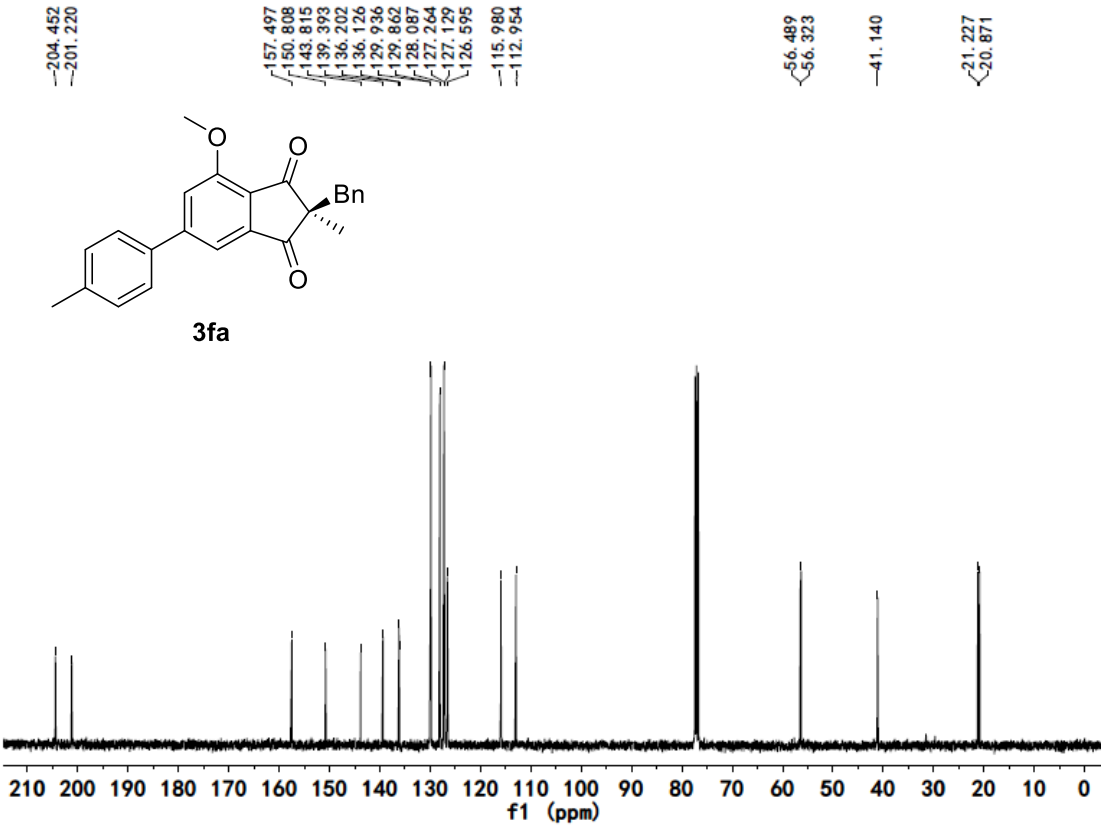
7.468
7.463
7.283
7.280
7.273
7.261
7.253
7.097
7.085
7.065
7.054
7.045
7.033
7.023
7.015
7.011
7.001
6.994
6.989
6.979
4.027
4.010
3.185
3.152
3.133
3.100
2.417
2.398
1.378
O
O
Bn
O
1.00
1.94
2.00
1.00
4.88
3.00
2.00
3.00
3.00
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)

3fa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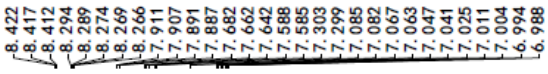
139.393
136.202
136.126
129.936
129.862
128.087
127.264
127.129
126.595
115.980
112.954
56.489
56.323
41.140
21.227
20.871
O
O
Bn
O
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)

3fa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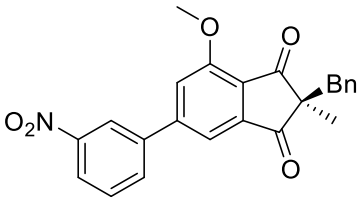
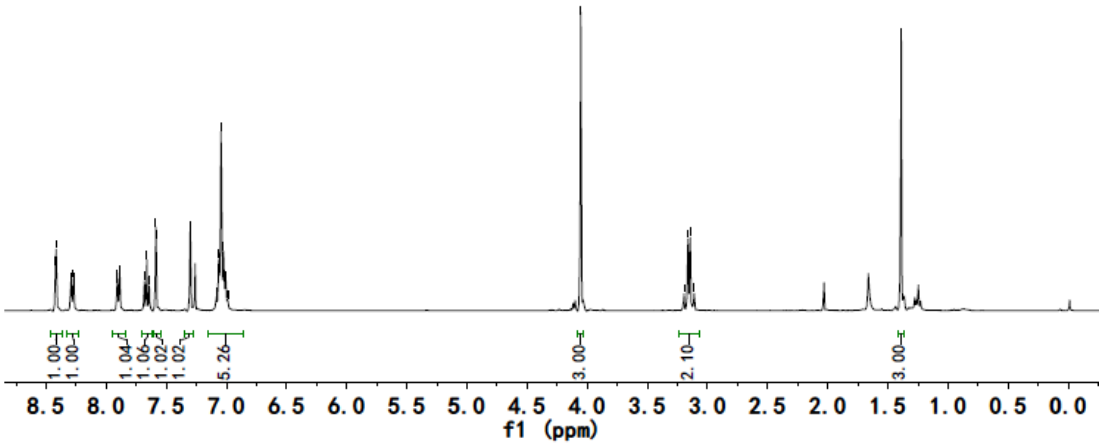
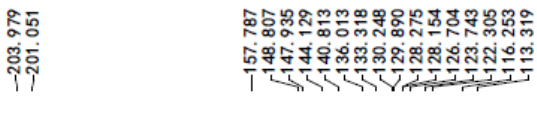
8.417
8.412
8.294
8.289
8.274
8.269
8.266
7.911
7.907
7.891
7.887
7.682
7.662
7.642
7.588
7.585
7.303
7.299
7.085
7.082
7.067
7.063
7.047
7.041
7.025
7.011
7.004
6.994
6.988
4.054
3.196
3.162
3.144
3.111
1.390


O
O
Bn
O2N
O

3ga


1.00
1.00
1.04
1.06
1.02
1.02
5.26
3.00
2.10
3.00
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)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144.129
140.813
136.013
133.318
130.248
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128.275
128.154
126.704
123.743
122.305
116.253
113.319
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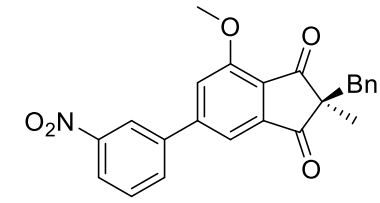
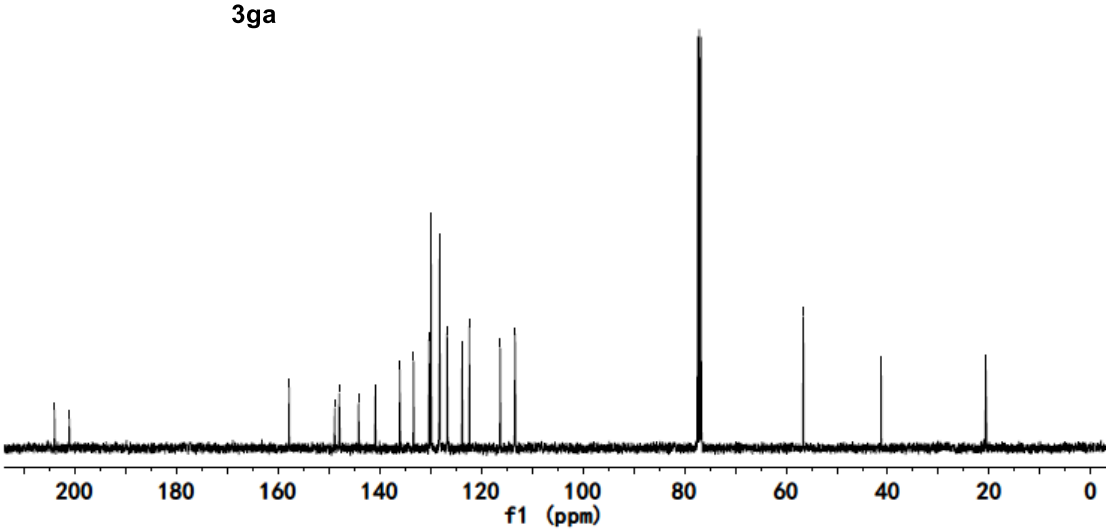
56.584
41.299
20.720


O
O
Bn
O2N
O

3ga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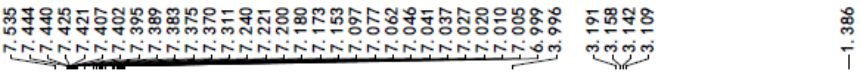
f1 (ppm)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7.444
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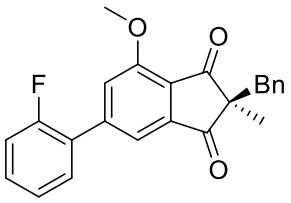
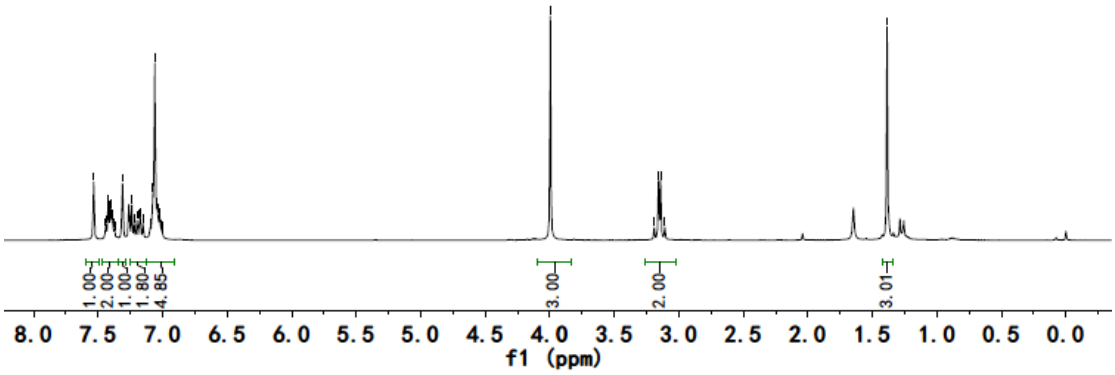
7.395
7.389
7.383
7.375
7.370
7.311
7.240
7.221
7.200
7.180
7.173
7.153
7.097
7.077
7.062
7.046
7.041
7.037
7.027
7.020
7.010
7.005
6.999
3.996
3.191
3.158
3.142
3.109
1.386


O
O
F
Bn
O

3ha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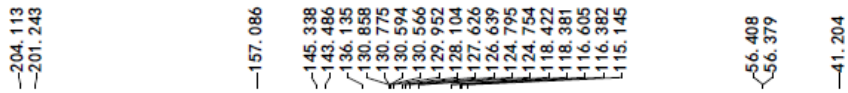
2.00
1.00
1.80
4.85
3.00
2.00
3.01
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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136.135
130.858
130.775
130.594
130.566
129.952
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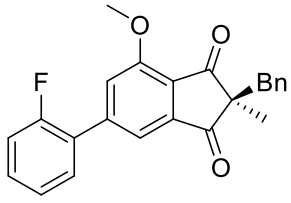
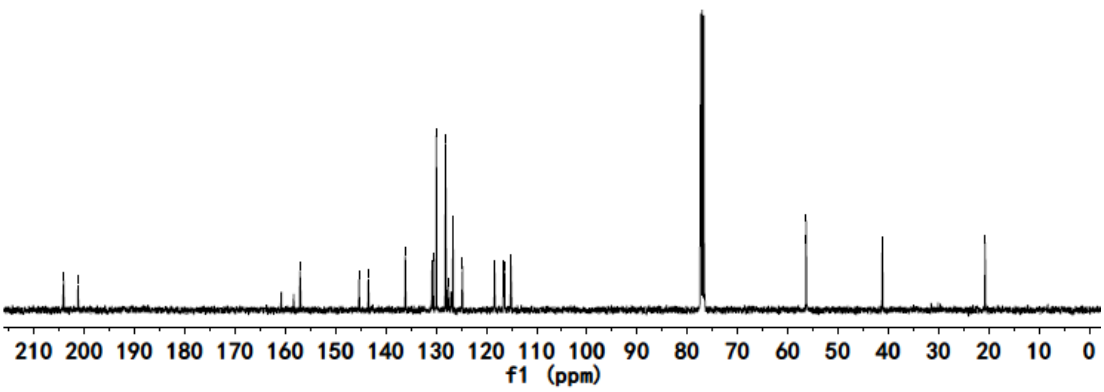
127.626
126.639
124.795
124.754
118.422
118.381
116.605
116.382
115.145
56.408
56.379
41.204
20.755


O
O
F
Bn
O

3ha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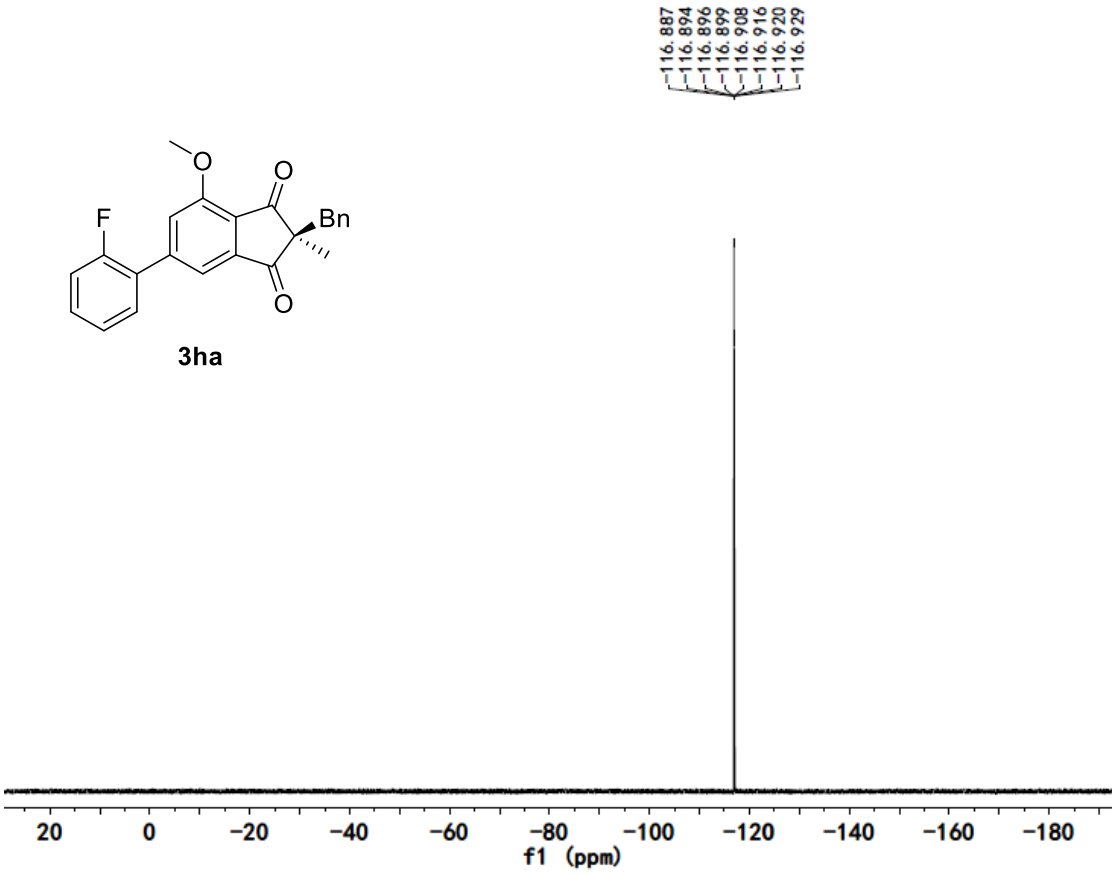
f1 (ppm)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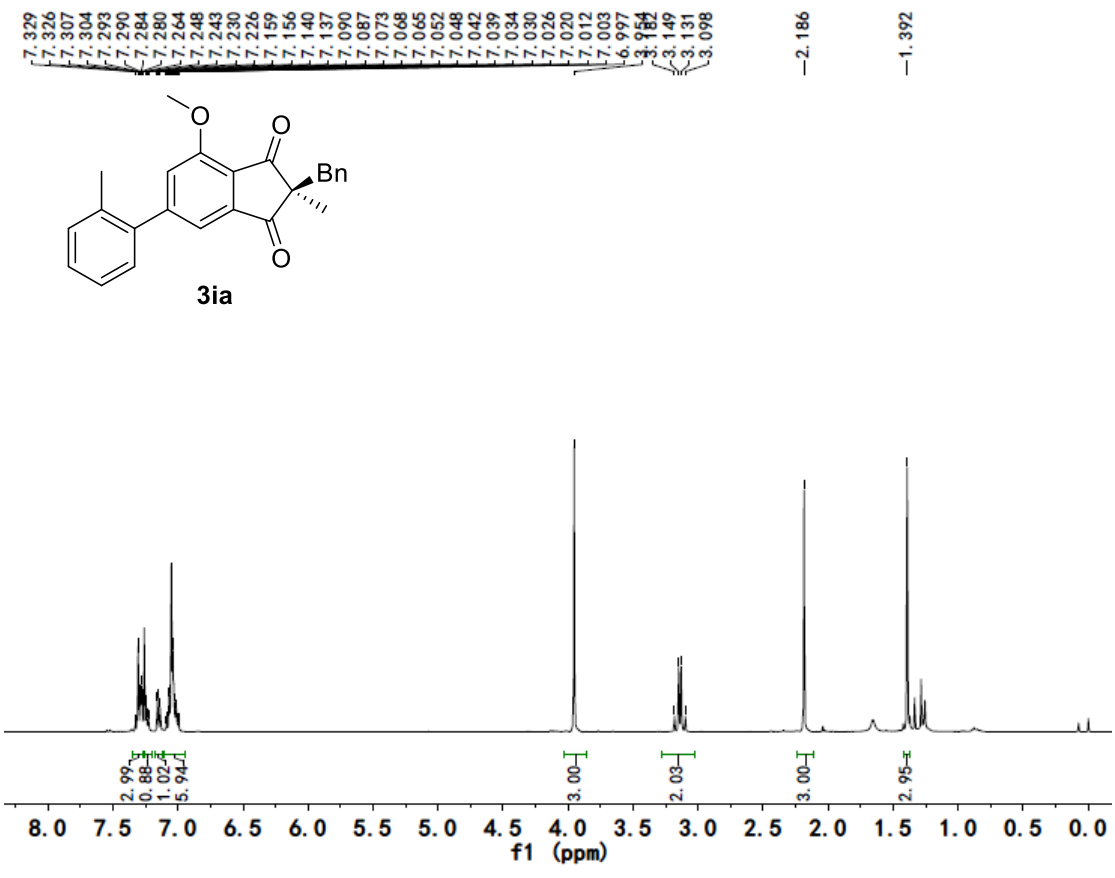
-116.894
-116.896
-116.899
-116.908
-116.916
-116.920
-116.929
O
O
F
Bn
O
20
0
-20
-40
-60
-80
-100
-120
-140
-160
-180
f1 (ppm)

3ha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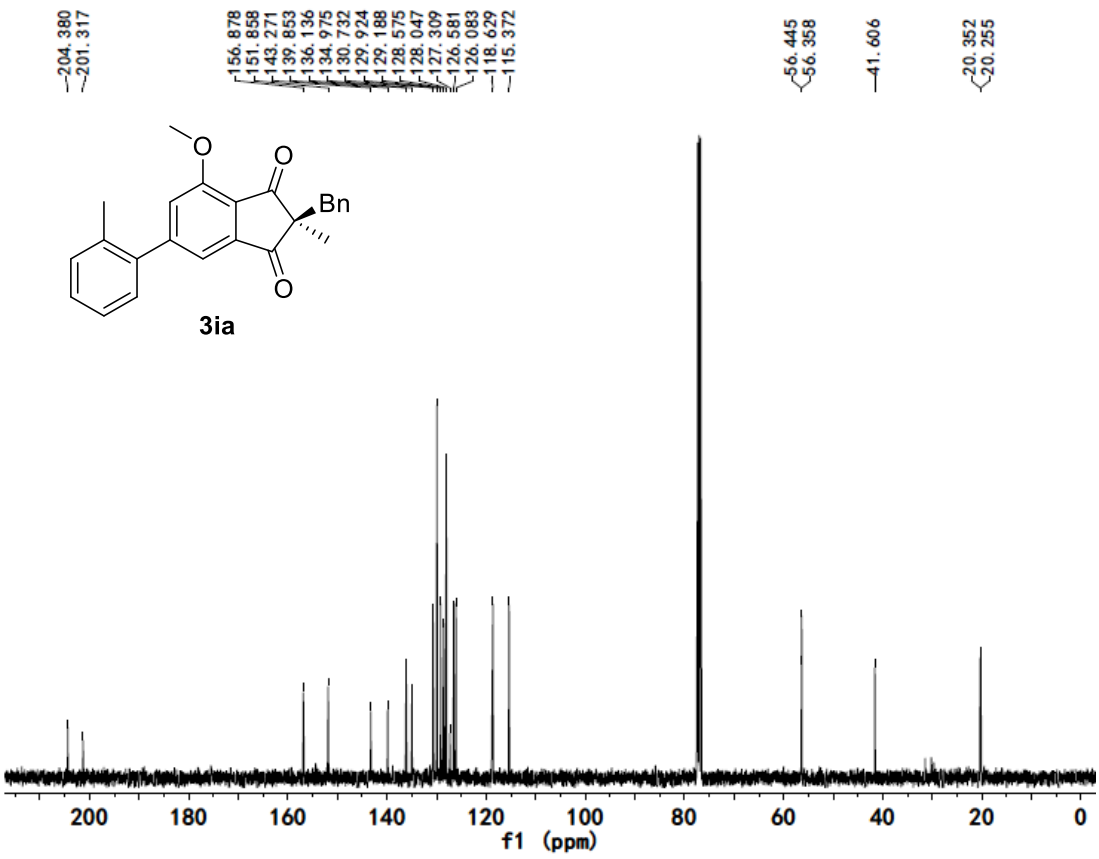
7.304
7.293
7.290
7.284
7.280
7.264
7.248
7.243
7.230
7.226
7.159
7.156
7.140
7.137
7.090
7.087
7.073
7.068
7.065
7.052
7.048
7.042
7.039
7.034
7.030
7.026
7.020
7.012
7.003
6.997
3.182
3.149
3.131
3.098
2.186
1.392
O
O
Bn
O
2.99
0.88
1.02
5.94
3.00
2.03
3.00
2.95
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

3ia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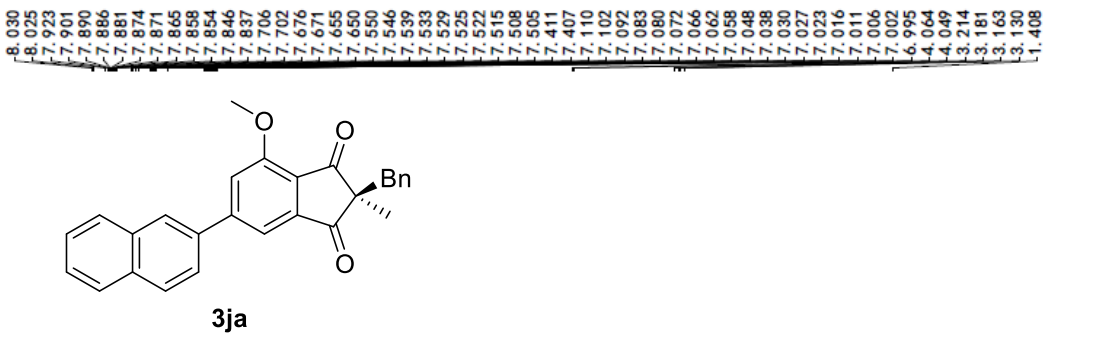
136.136
134.975
130.732
129.924
129.188
128.575
128.047
127.309
126.581
126.083
118.629
115.372
56.445
56.358
41.606
20.352
20.255
O
O
Bn
O
200
180
160
140
120
100
80
60
40
20
0
f1 (ppm)

3ia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7.874
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7.854
7.846
7.837
7.706
7.702
7.676
7.671
7.655
7.650
7.550
7.546
7.539
7.533
7.529
7.525
7.522
7.515
7.508
7.505
7.411
7.407
7.110
7.102
7.092
7.083
7.080
7.072
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7.038
7.030
7.027
7.023
7.016
7.011
7.006
7.002
6.995
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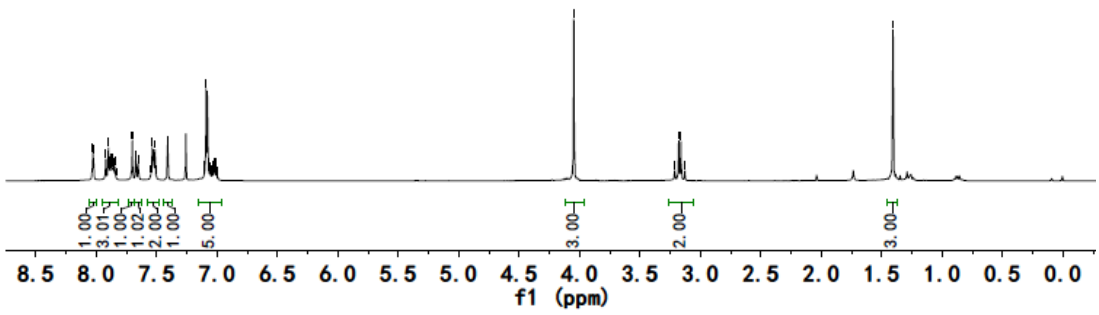
4.049
3.214
3.181
3.163
3.130
1.408
O
O
Bn
O

3ja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1.00
1.02
2.00
1.00
5.00
3.00
2.00
3.00
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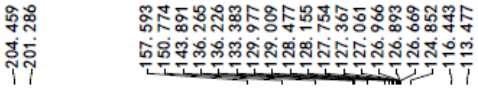
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)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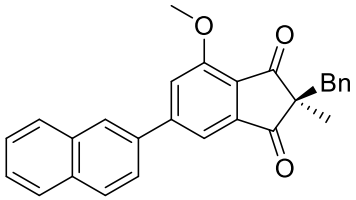
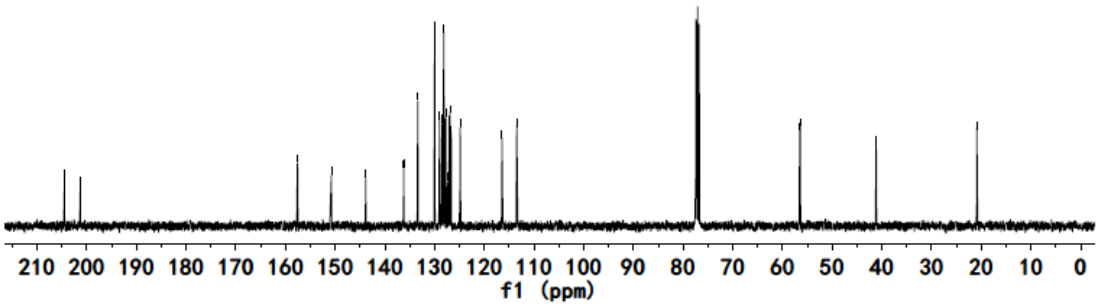
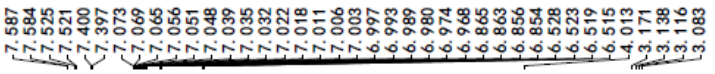
201.286
157.593
150.774
143.891
136.265
136.226
133.383
129.977
129.009
128.477
128.155
127.754
127.367
127.061
126.966
126.893
126.669
124.852
116.443
113.477
56.562
56.432
41.178
20.914


O
O
Bn
O

3ja


210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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7.521
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7.069
7.065
7.056
7.051
7.048
7.039
7.035
7.032
7.022
7.018
7.011
7.006
7.003
6.997
6.993
6.989
6.980
6.974
6.968
6.865
6.863
6.856
6.854
6.528
6.523
6.519
6.515
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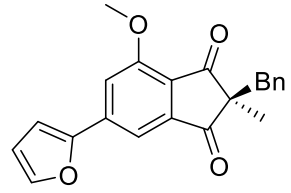
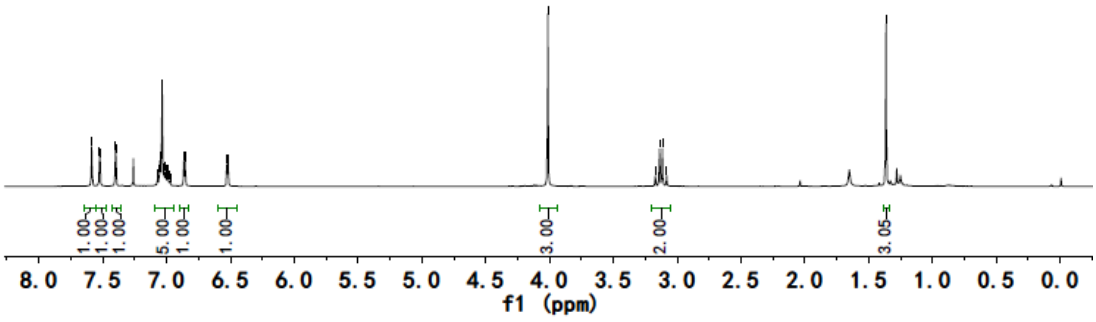
3.116
3.083
1.364


O
O
Bn
O
O

3ka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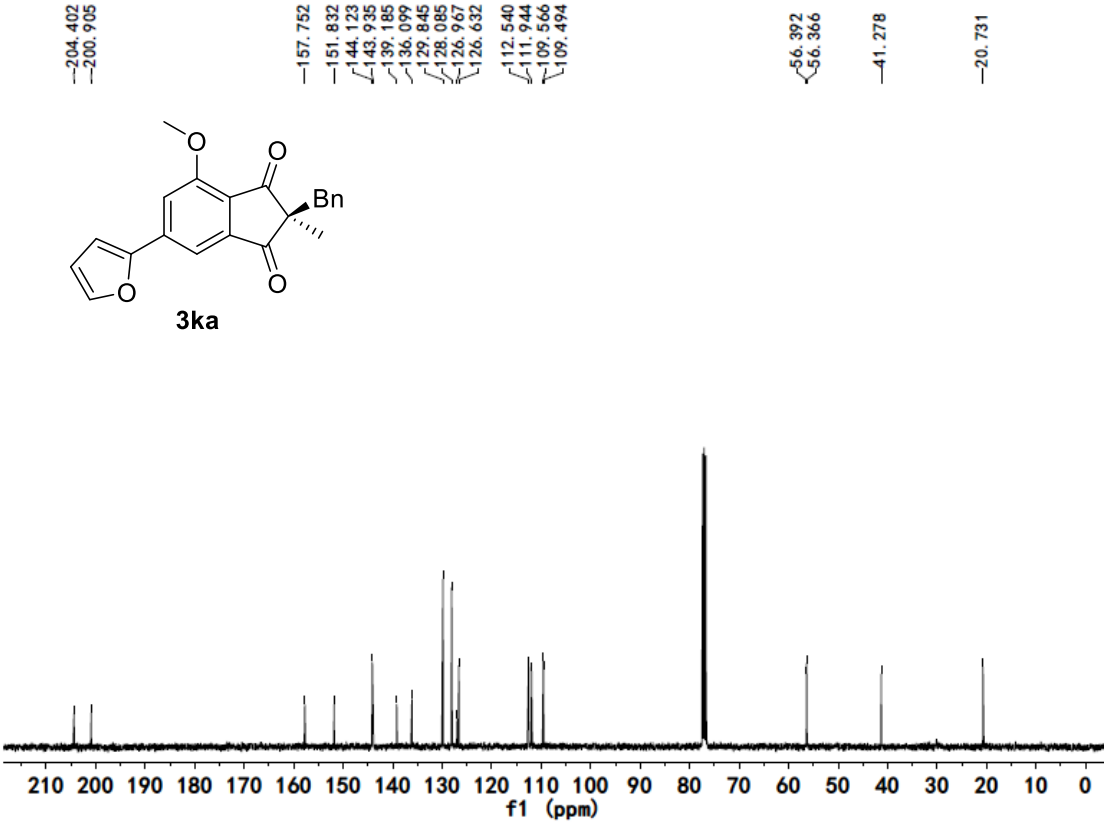
1.00
1.00
5.00
1.00
1.00
3.00
2.00
3.05
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)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157.752
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143.935
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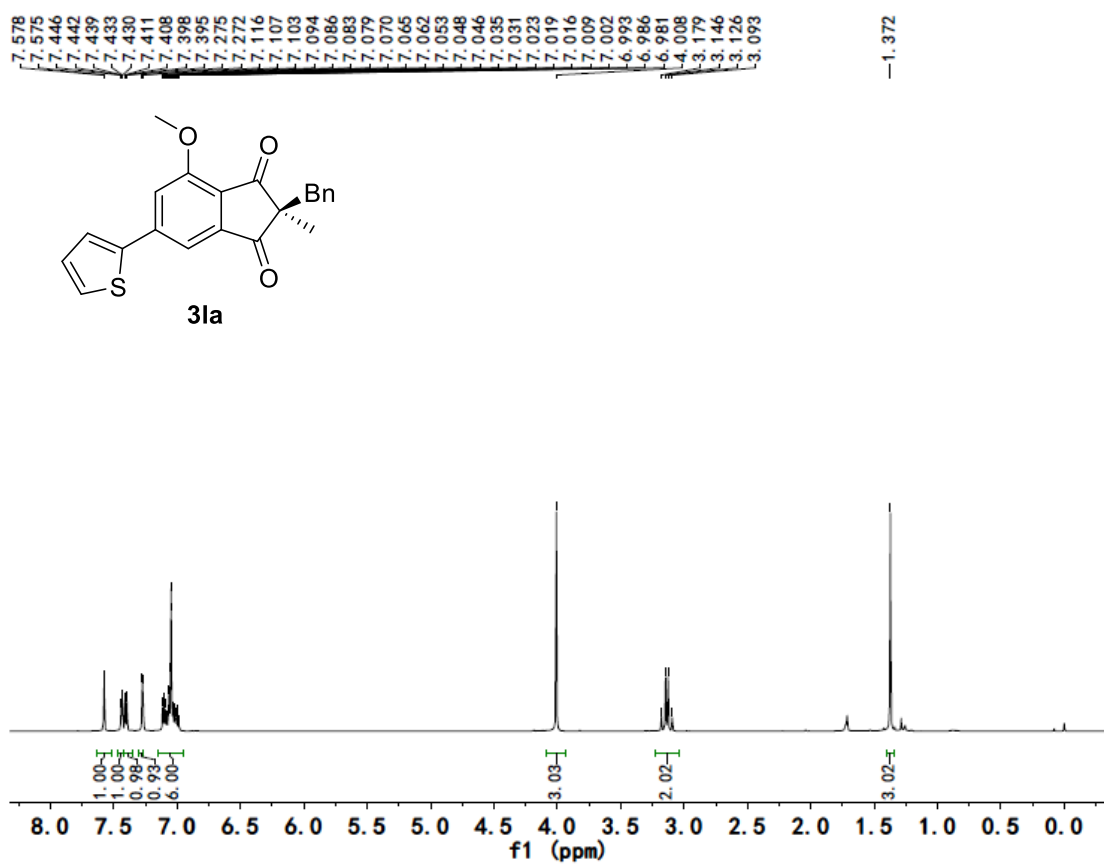
136.099
129.845
128.085
126.967
126.632
112.540
111.944
109.566
109.494
56.392
56.366
41.278
20.731
O
O
Bn
O
O
3ka
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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7.433
7.430
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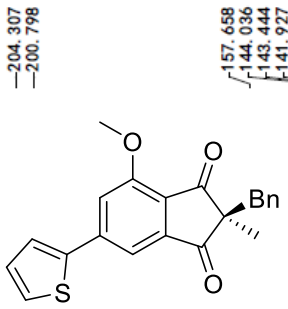
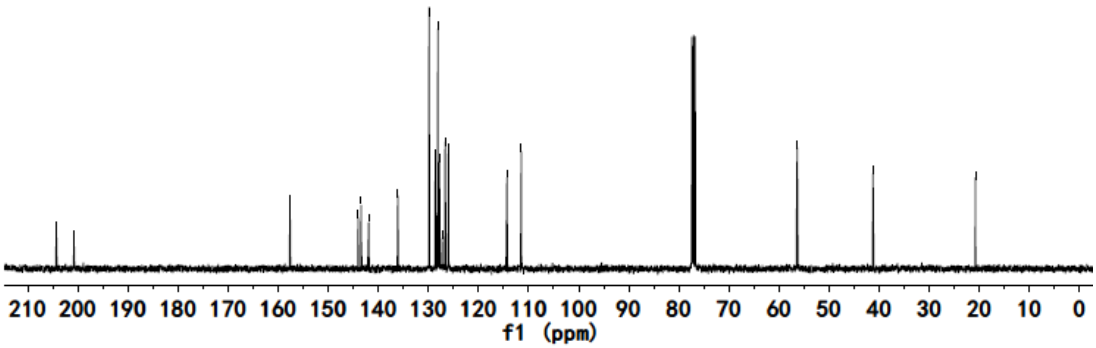
7.398
7.395
7.275
7.272
7.116
7.107
7.103
7.094
7.086
7.083
7.079
7.070
7.065
7.062
7.053
7.048
7.046
7.035
7.031
7.023
7.019
7.016
7.009
7.002
6.993
6.986
6.981
4.008
3.179
3.146
3.126
3.093
1.372
O
O
Bn
S
O
3la
1.00
1.00
0.98
0.93
6.00
3.03
2.02
3.02
8.0 7.5 7.0 6.5 6.0 5.5 5.0 4.5 4.0 3.5 3.0 2.5 2.0 1.5 1.0 0.5 0.0
f1 (ppm)


O
O
Bn
O
S

3la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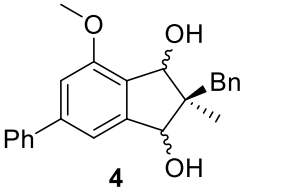
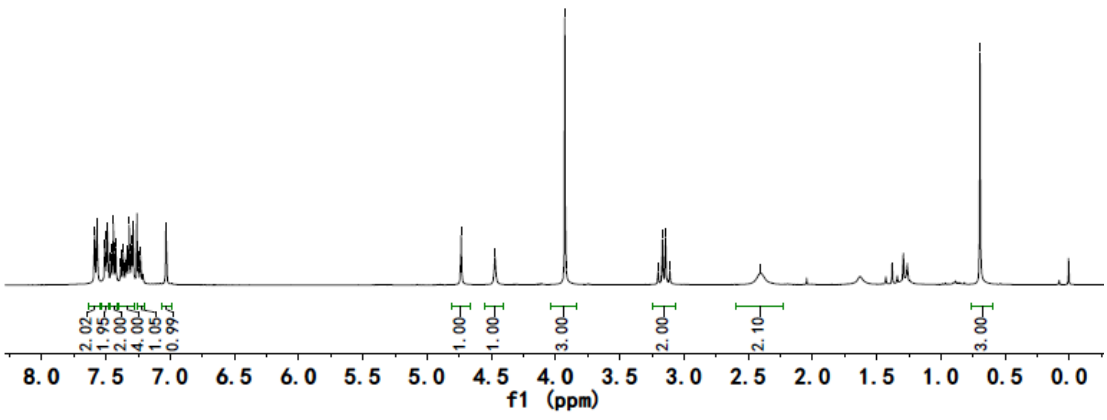
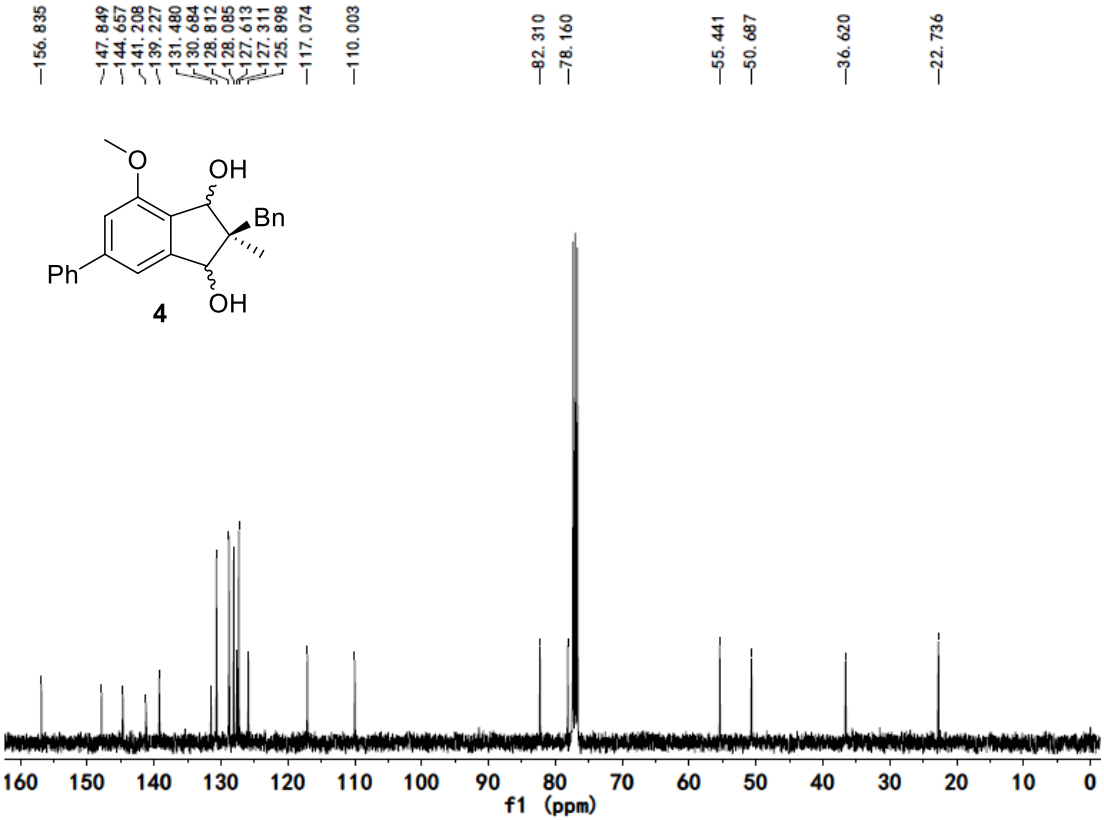
f1 (ppm)


O
OH
Bn
Ph
OH

4


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)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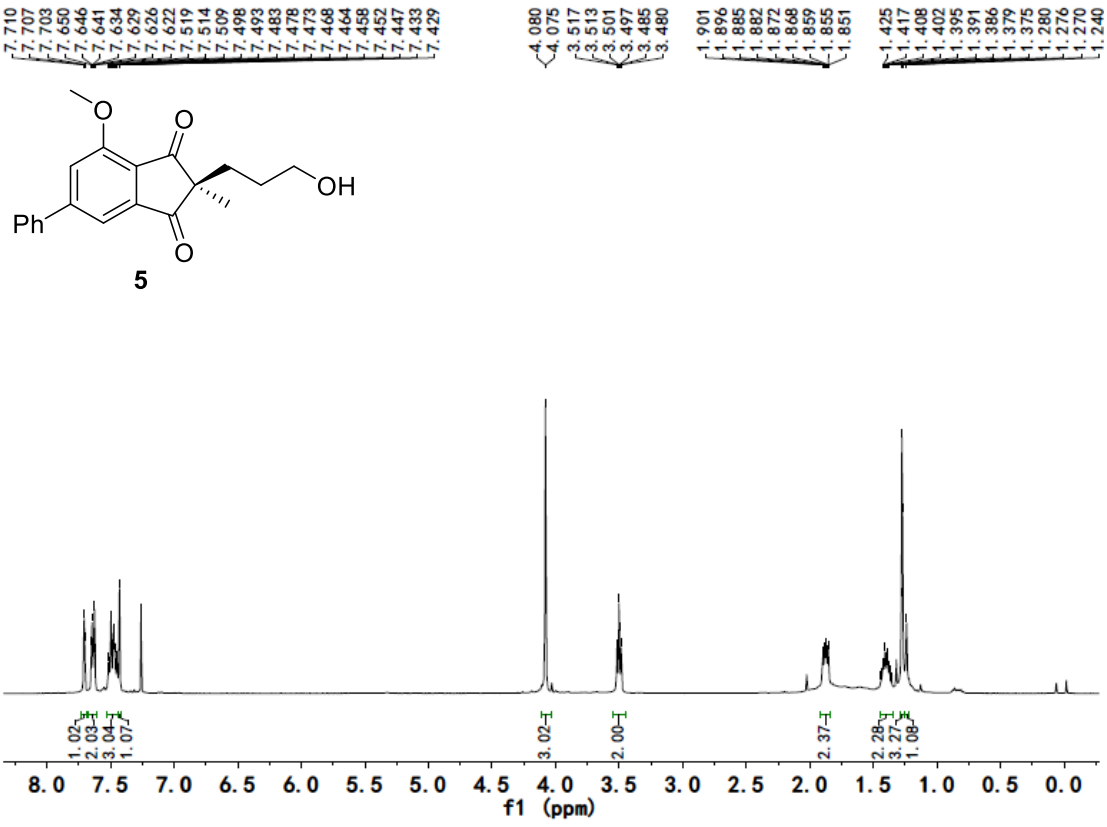
144.657
141.208
139.227
131.480
130.684
128.812
128.085
127.613
127.311
125.898
117.074
110.003
82.310
78.160
55.441
50.687
36.620
22.736
O
OH
Bn
Ph
OH
4
160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)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7.707
7.703
7.650
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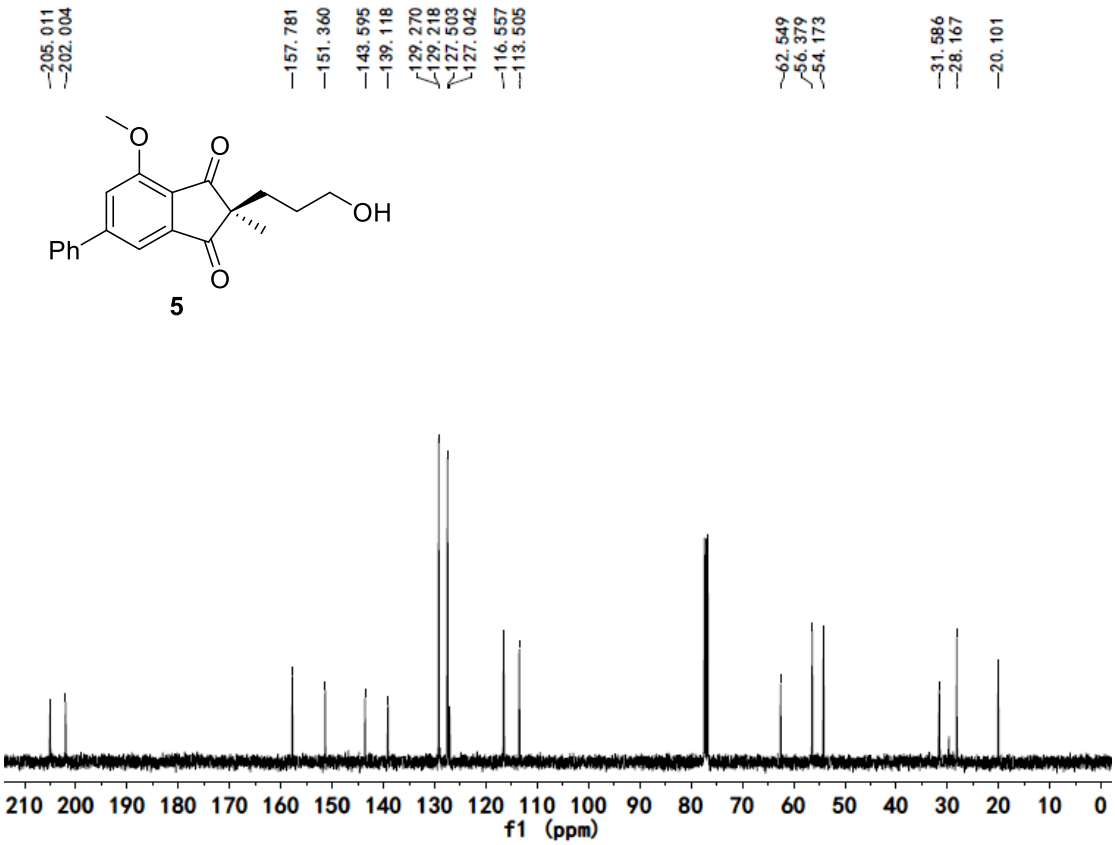
7.641
7.634
7.629
7.626
7.622
7.519
7.514
7.509
7.498
7.493
7.483
7.478
7.473
7.468
7.464
7.458
7.452
7.447
7.433
7.429
4.080
4.075
3.517
3.513
3.501
3.497
3.485
3.480
1.901
1.896
1.885
1.882
1.872
1.868
1.859
1.855
1.851
1.425
1.417
1.408
1.402
1.395
1.391
1.386
1.379
1.375
1.280
1.276
1.270
1.240
O
O
OH
Ph
O
5
1.02
2.03
3.04
1.07
3.02
2.00
2.37
2.28
3.27
1.08
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)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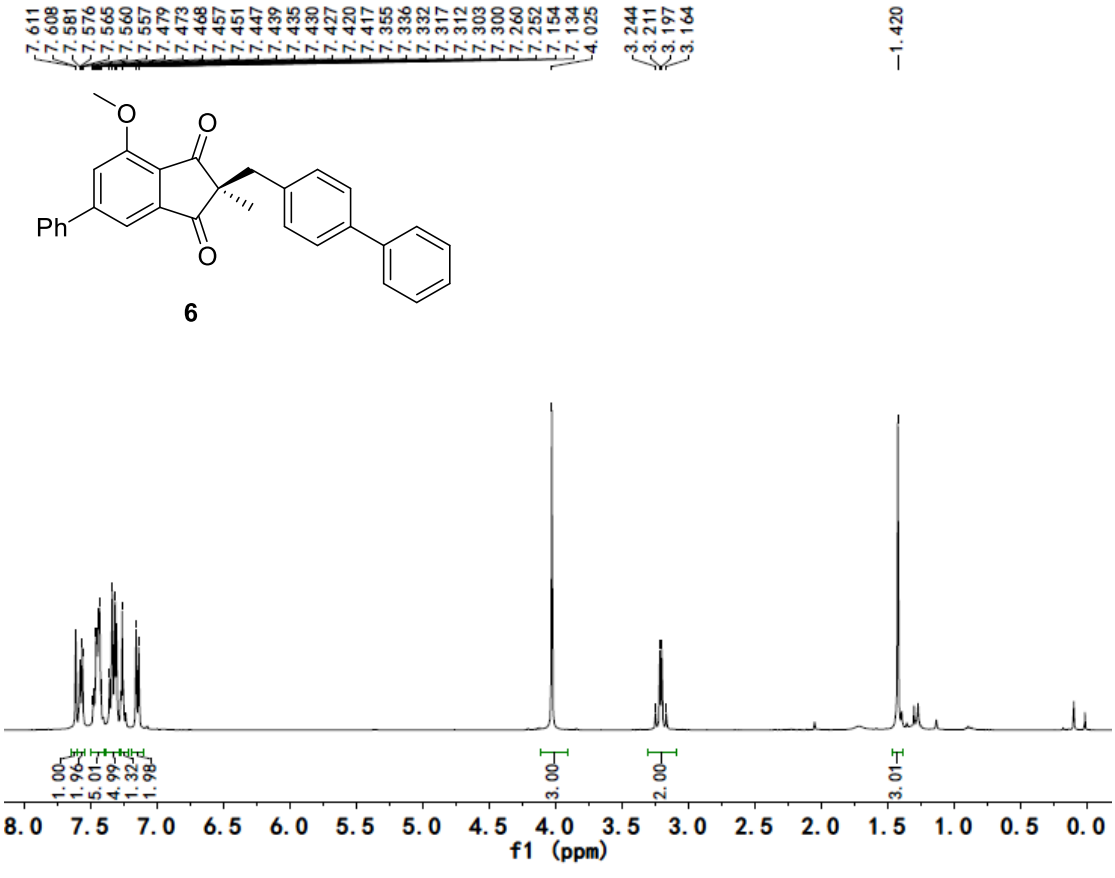
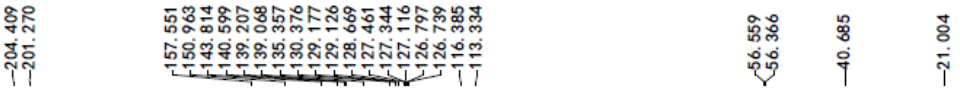
143.595
139.118
129.270
129.218
127.503
127.042
116.557
113.505
62.549
56.379
54.173
31.586
28.167
20.101
O
O
OH
Ph
O
5
210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0
f1 (ppm)


7.611
7.608
7.581
7.576
7.565
7.560
7.557
7.479
7.473
7.468
7.457
7.451
7.447
7.439
7.435
7.430
7.427
7.420
7.417
7.355
7.336
7.332
7.317
7.312
7.303
7.300
7.260
7.252
7.154
7.134
4.025
3.244
3.211
3.197
3.164
1.420
O
O
O
Ph
6
1.00
1.96
5.01
4.99
1.32
1.98
3.00
2.00
3.01
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)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140.599
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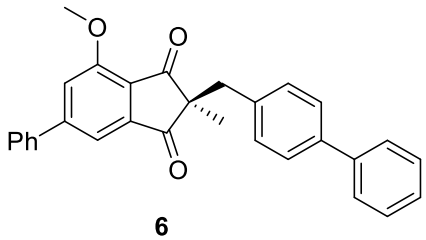
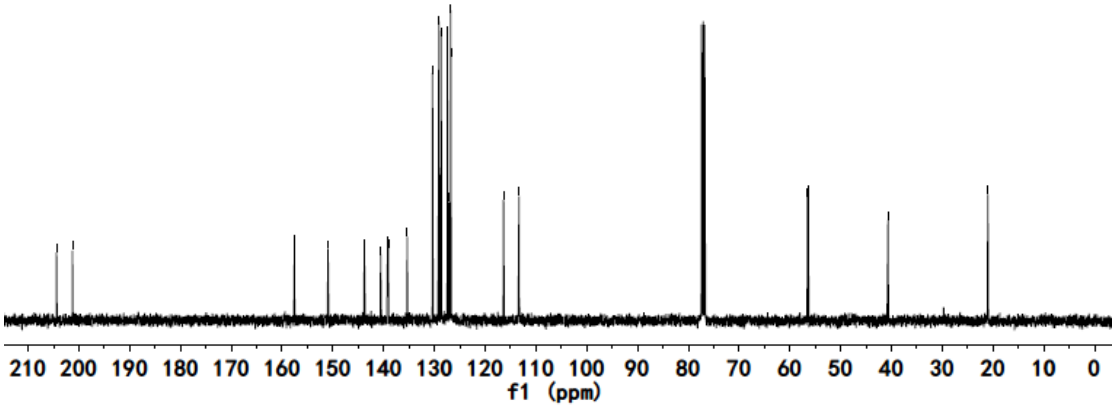
135.357
130.376
129.177
129.126
128.669
127.461
127.344
127.116
126.797
126.739
116.385
113.334
56.559
56.366
40.685
21.004


O
O
Ph
O

6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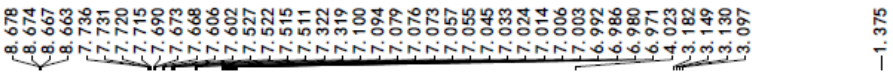
f1 (ppm)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7.673
7.668
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7.522
7.515
7.511
7.322
7.319
7.100
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7.057
7.055
7.045
7.033
7.024
7.014
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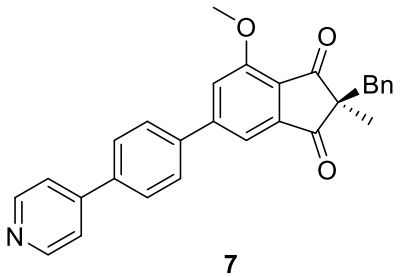
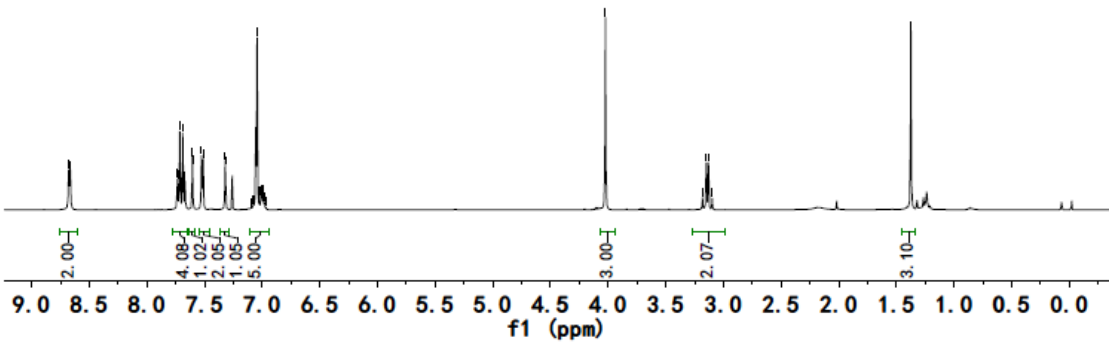
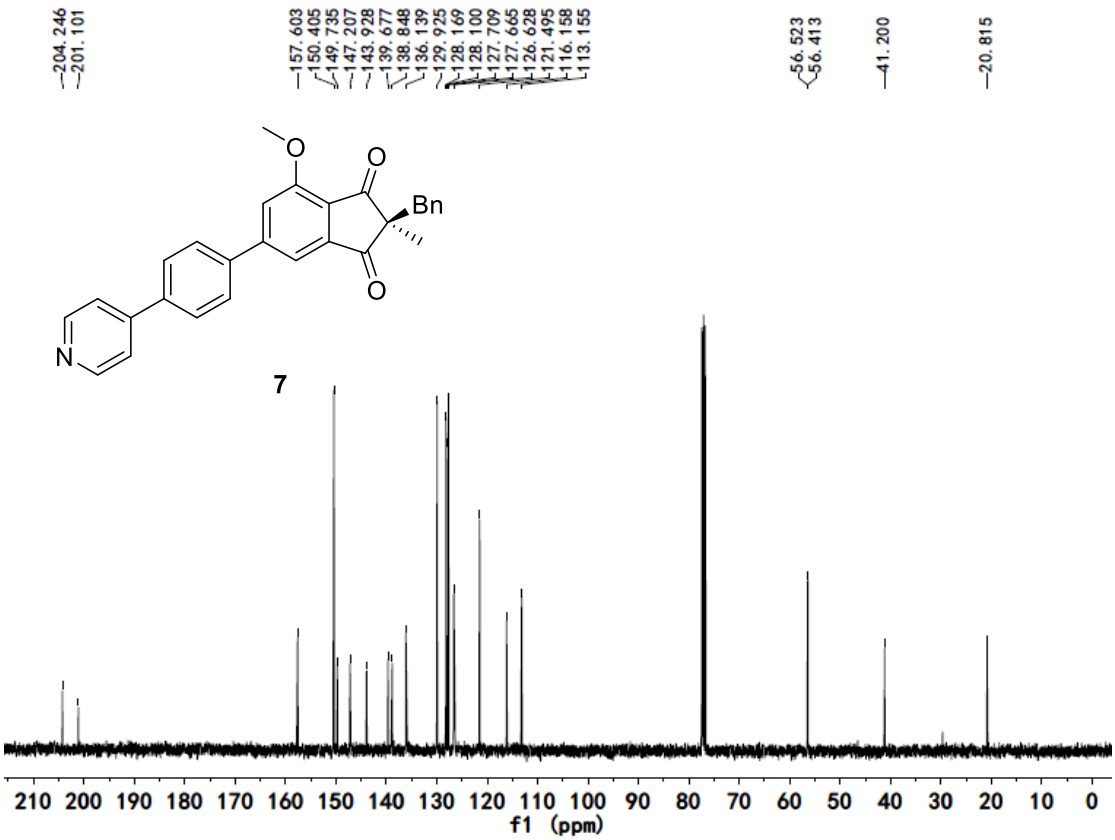
4.023
3.182
3.149
3.130
3.097
1.375


O
O
Bn
O
N

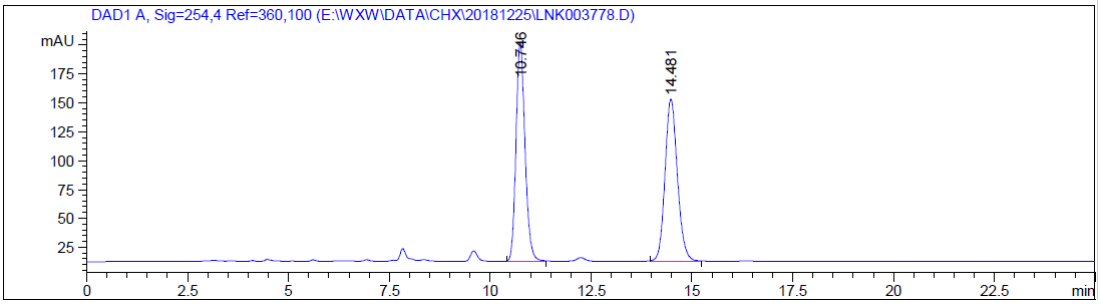
7


2.00
4.08
1.02
2.05
1.05
5.00
3.00
2.07
3.10
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)

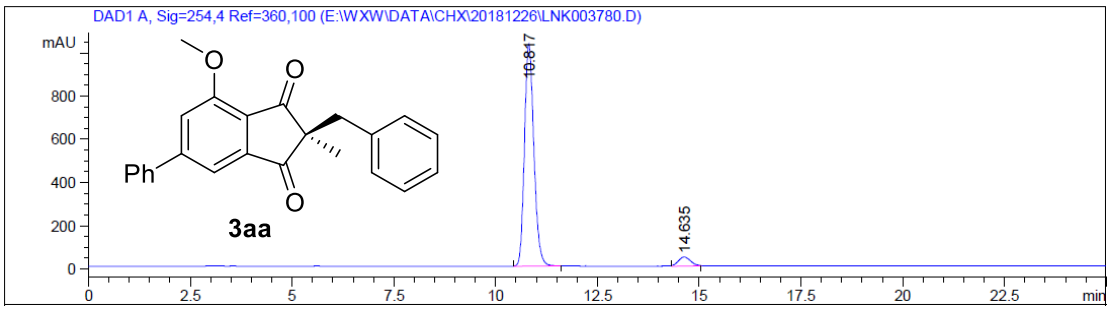


VII: HPLC profile spectrum of compounds

3aa

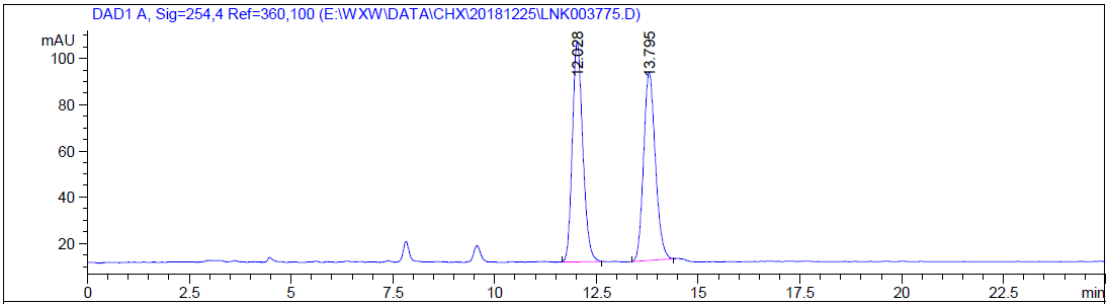


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.746	BB	0.2395	2943.81909	189.21471	49.4726
2	14.481	BB	0.3276	3006.58789	140.52664	50.5274

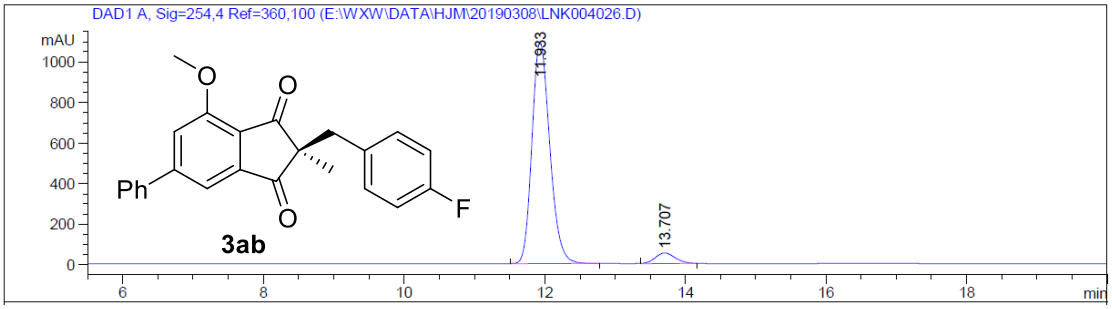


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.817	BB	0.2472	1.64734e4	1026.60278	95.0431
2	14.635	MM R	0.3447	859.15833	41.54665	4.9569

3ab

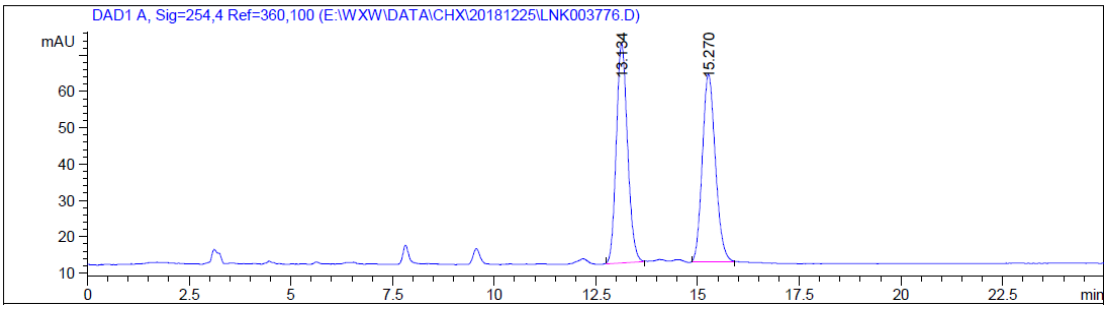


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.028	BB	0.2743	1699.27686	95.17080	51.0091
2	13.795	BB	0.3098	1632.04639	81.44794	48.9909

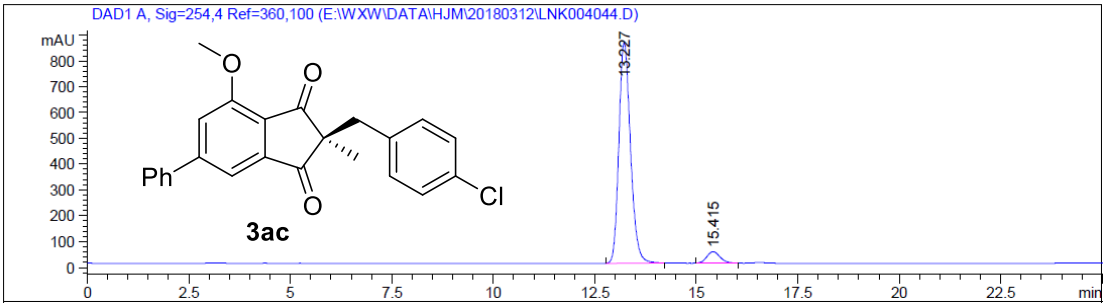


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.933	BB	0.2771	1.93844e4	1092.22046	95.0033
2	13.707	MM R	0.3255	1019.52667	52.19908	4.9967

3ac

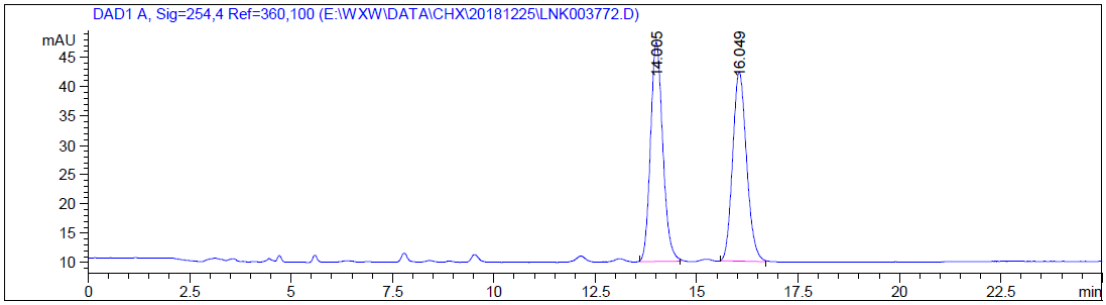


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.134	BB	0.2960	1163.38098	60.58612	50.1363
2	15.270	BB	0.3446	1157.05432	51.79548	49.8637

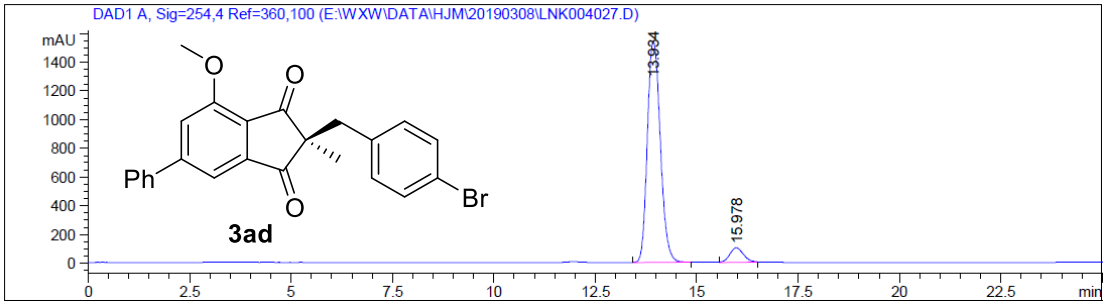


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.227	BB	0.3079	1.70193e4	856.28125	94.5250
2	15.415	MM R	0.3709	985.78345	44.29782	5.4750

3ad

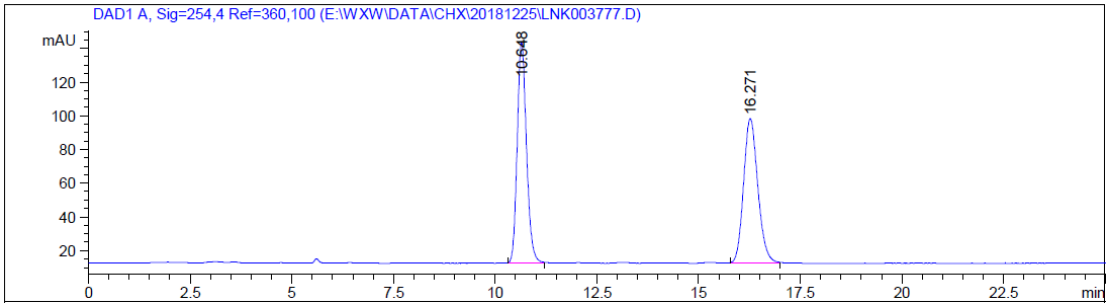


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.005	BB	0.3231	787.09344	37.46355	50.5514
2	16.049	BB	0.3684	769.92291	32.26977	49.4486

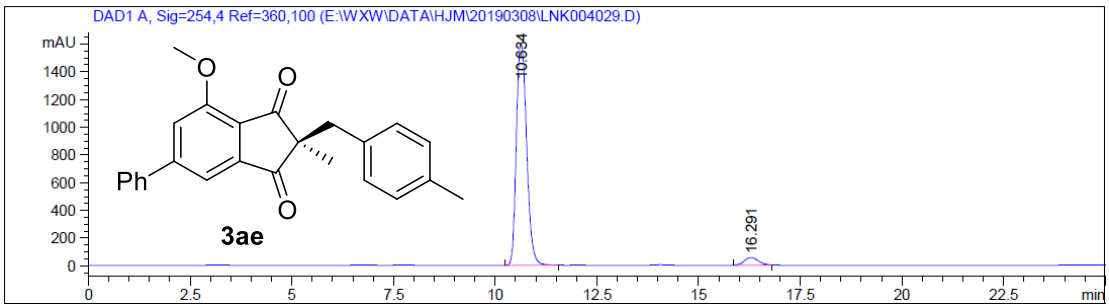


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.934	BB	0.3498	3.42056e4	1536.19019	93.5507
2	15.978	MM R	0.3891	2358.09790	101.00124	6.4493

3ae

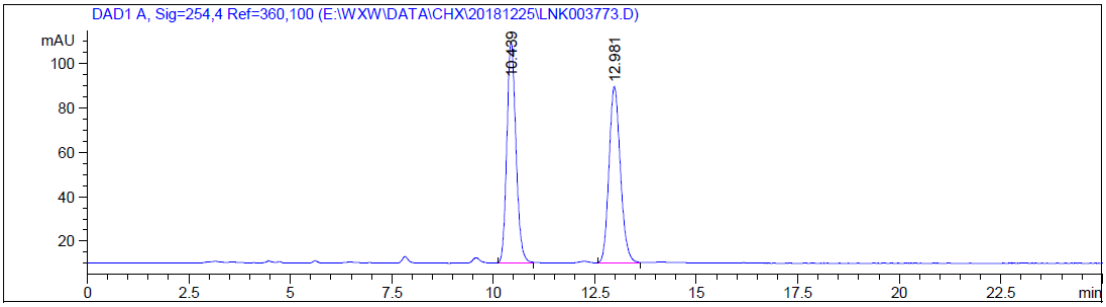


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.648	BB	0.2428	2077.24268	131.12067	49.8936
2	16.271	BB	0.3758	2086.10425	85.76928	50.1064

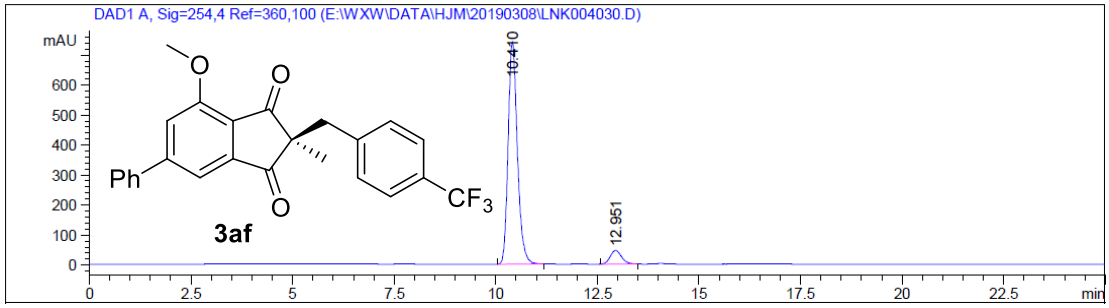


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.634	BB	0.2755	2.81107e4	1596.24841	95.5740
2	16.291	MM R	0.3898	1301.80139	55.66147	4.4260

3af

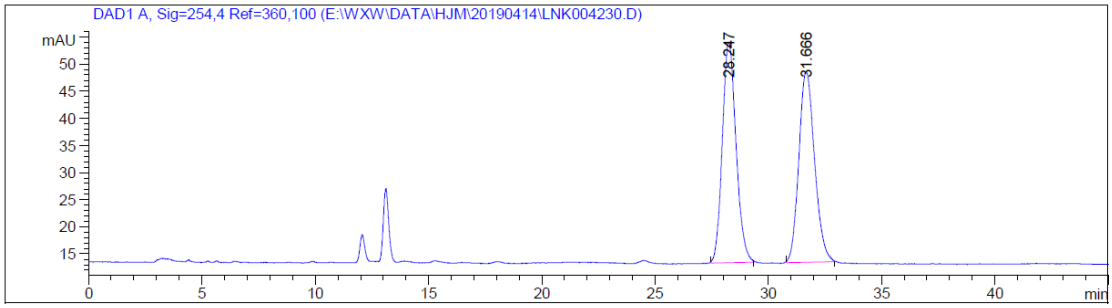


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.439	BB	0.2398	1547.82068	99.35235	50.0863
2	12.981	BB	0.3013	1542.48425	79.17458	49.9137

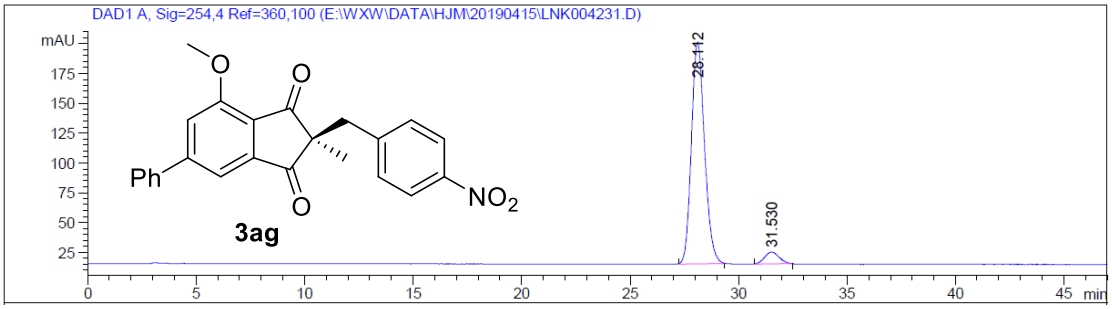


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.410	BB	0.2430	1.17190e4	739.07532	93.0110
2	12.951	BB	0.2995	880.58612	45.56285	6.9890

3ag

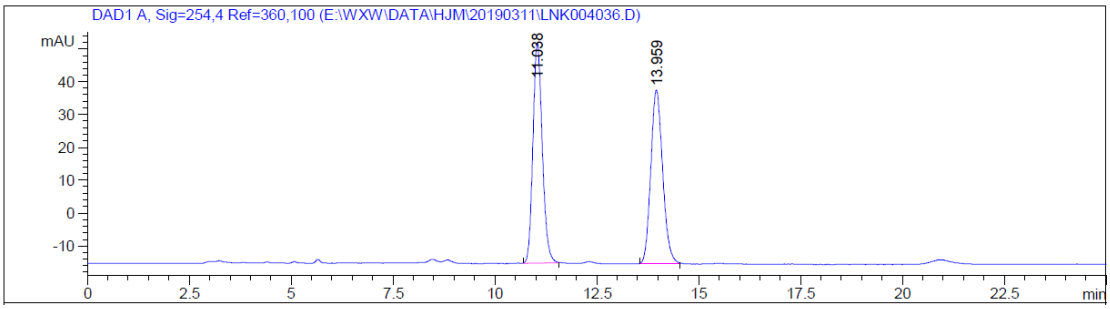


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	28.247	BB	0.6350	1709.41589	40.61483	50.1819
2	31.666	BB	0.7188	1697.02380	35.17855	49.8181

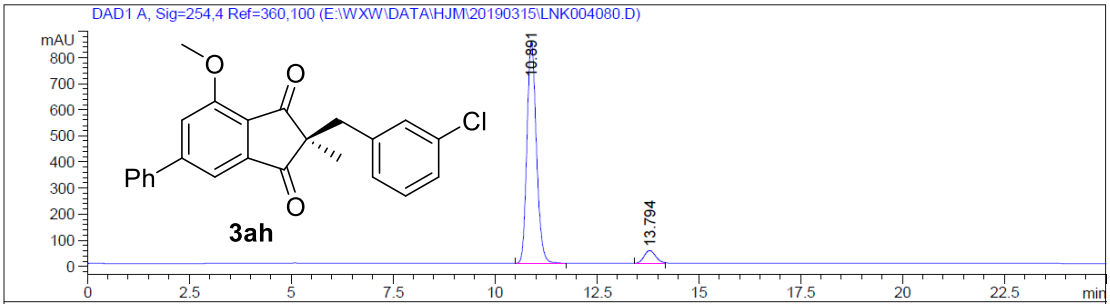


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	28.112	BB	0.6457	7792.57324	185.65417	94.5338
2	31.530	MM R	0.7622	450.58704	9.85304	5.4662

3ah

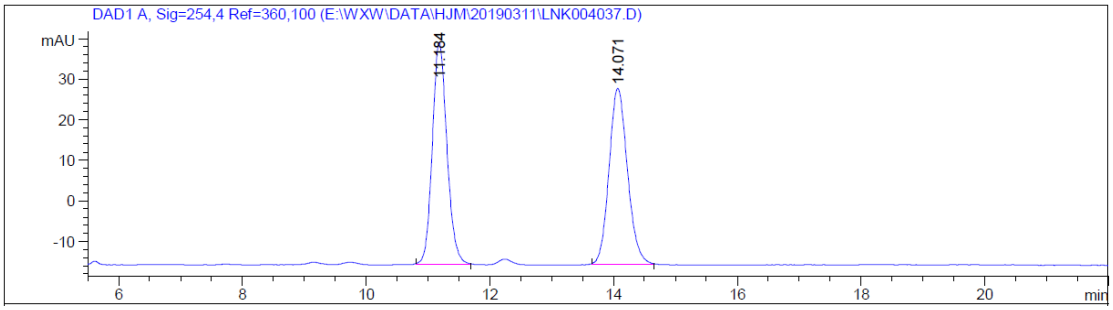


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.038	BB	0.2463	1068.06238	66.88206	49.9548
2	13.959	BB	0.3142	1069.99707	52.85118	50.0452

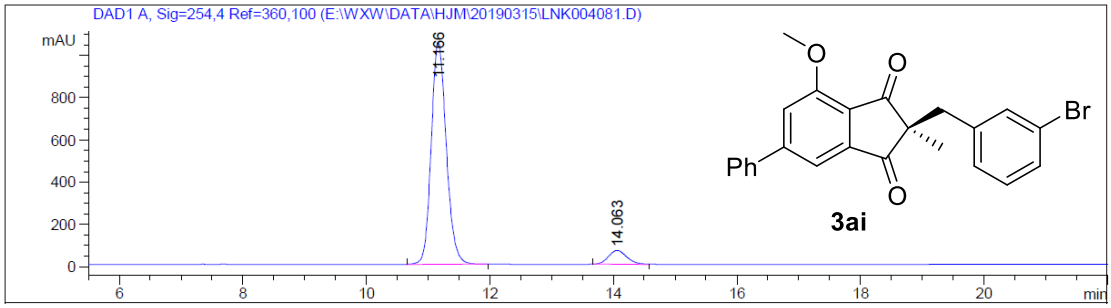


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.891	BB	0.2508	1.37193e4	847.78931	93.5002
2	13.794	MM R	0.3266	953.70898	48.66211	6.4998

3ai

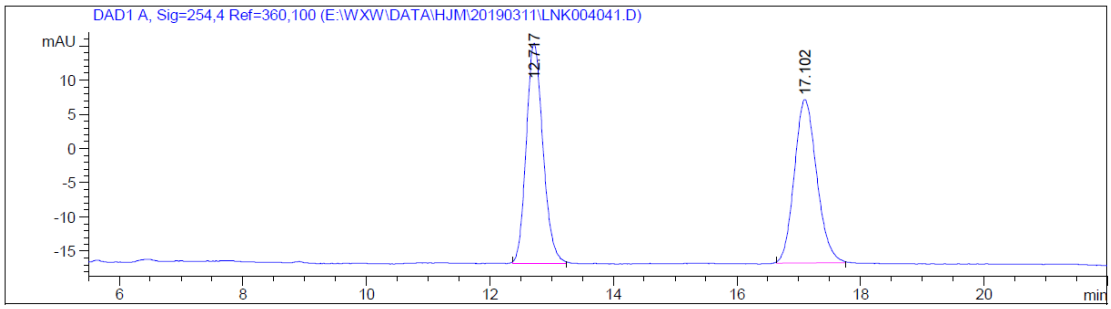


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.184	BB	0.2539	899.09448	54.65664	49.9382
2	14.071	BB	0.3200	901.32080	43.44766	50.0618

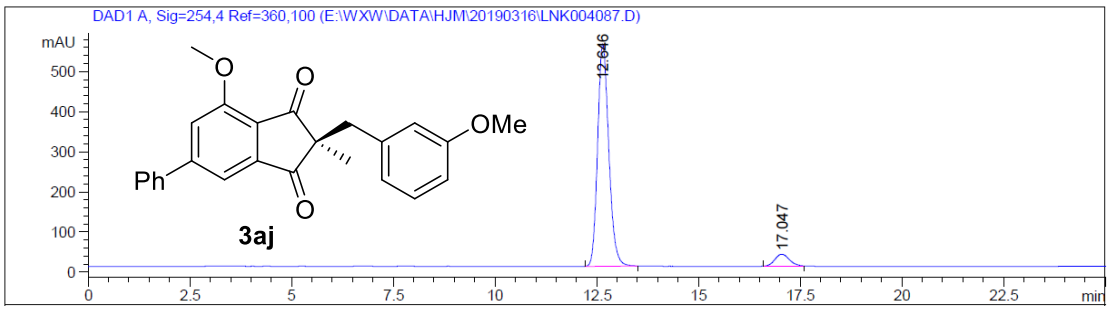


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	11.166	BB	0.2612	1.77721e4	1051.33655	93.0764
2	14.063	MM R	0.3387	1322.00061	65.04708	6.9236

3aj

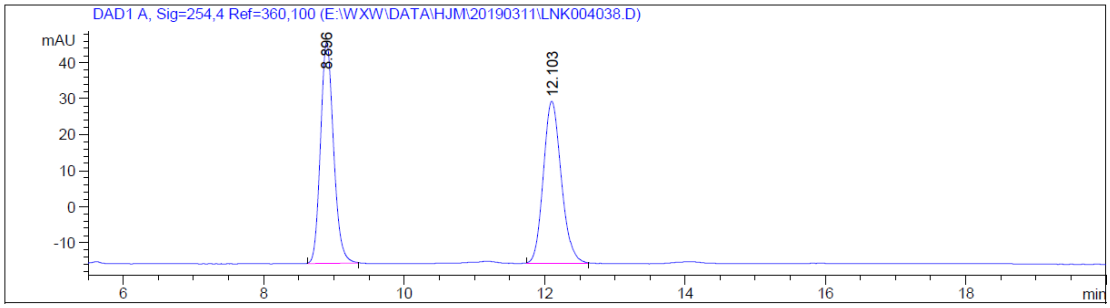


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.717	BB	0.2891	603.00537	32.10683	50.0340
2	17.102	BB	0.3863	602.18518	23.87220	49.9660

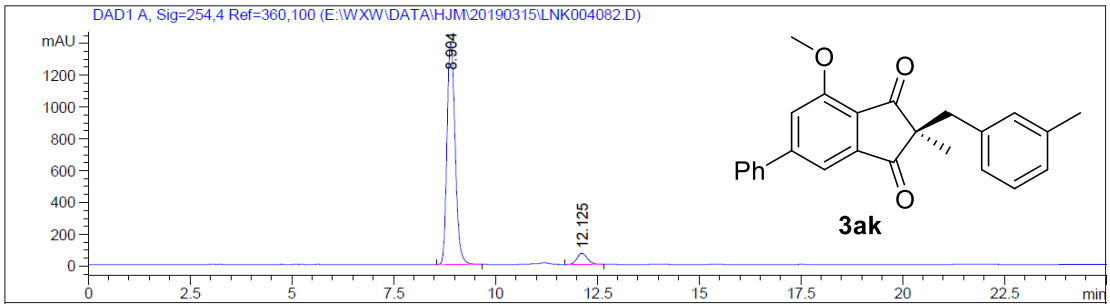


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.646	BB	0.2925	1.05453e4	553.03259	93.5448
2	17.047	MM R	0.4086	727.68872	29.68270	6.4552

3ak

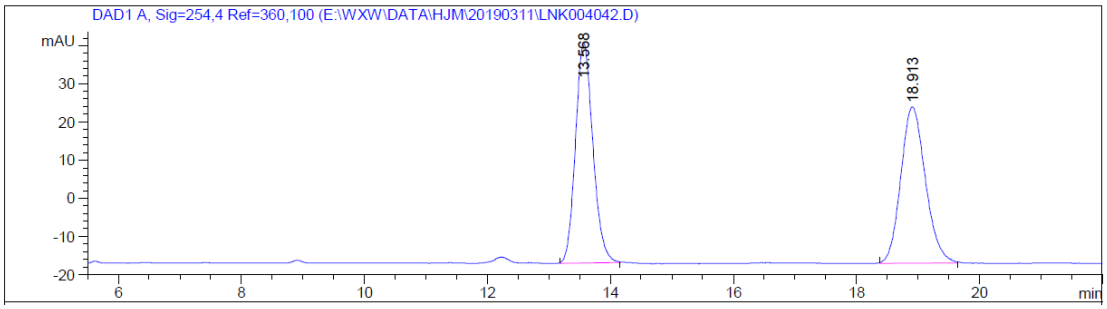


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.896	BB	0.2026	804.85364	61.51379	50.0415
2	12.103	BB	0.2741	803.51874	45.05550	49.9585

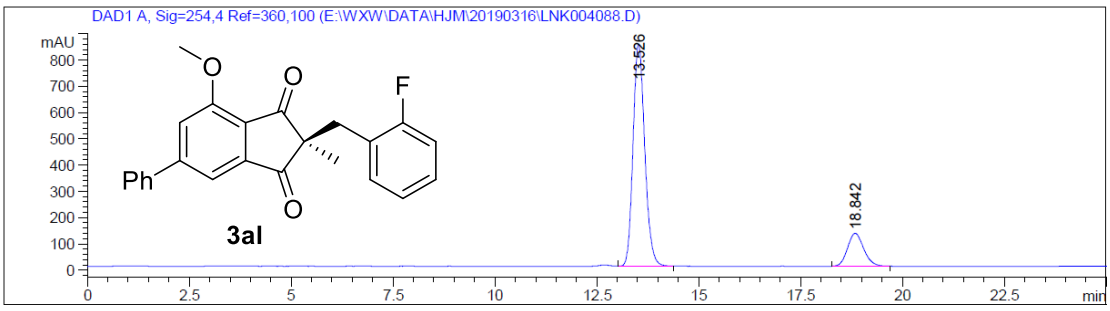


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.904	BB	0.2189	1.94256e4	1390.80750	94.0009
2	12.125	VB	0.2721	1239.72974	70.19080	5.9991

3al

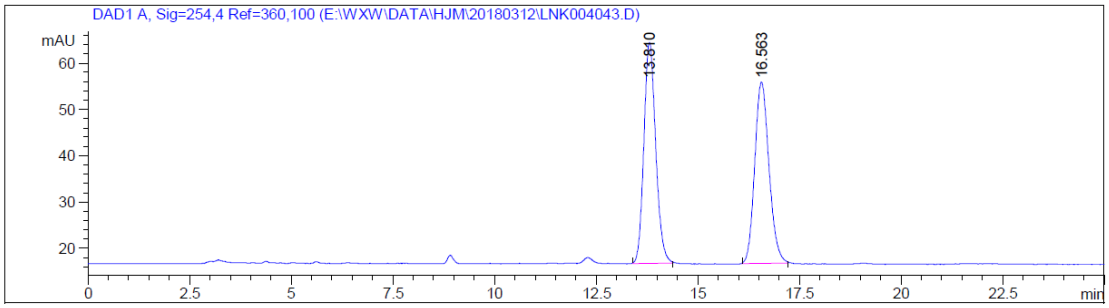


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.568	BB	0.3019	1136.10645	57.66617	49.9666
2	18.913	BB	0.4239	1137.62329	40.98212	50.0334

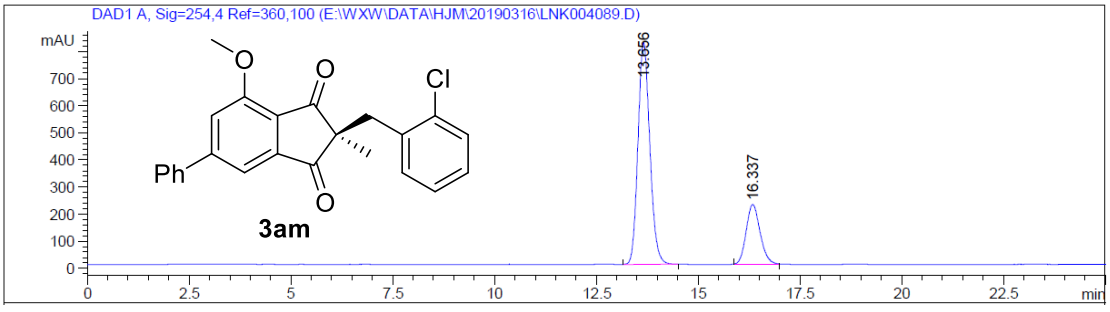


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.526	VB	0.3092	1.68900e4	845.15948	83.0037
2	18.842	BB	0.4236	3458.49048	125.46600	16.9963

3am

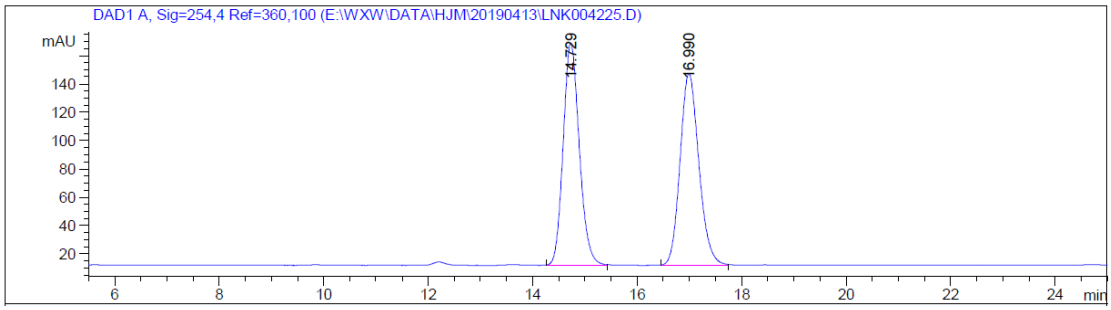


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.810	BB	0.3138	965.65308	47.77753	50.1804
2	16.563	BB	0.3748	958.70898	39.27549	49.8196

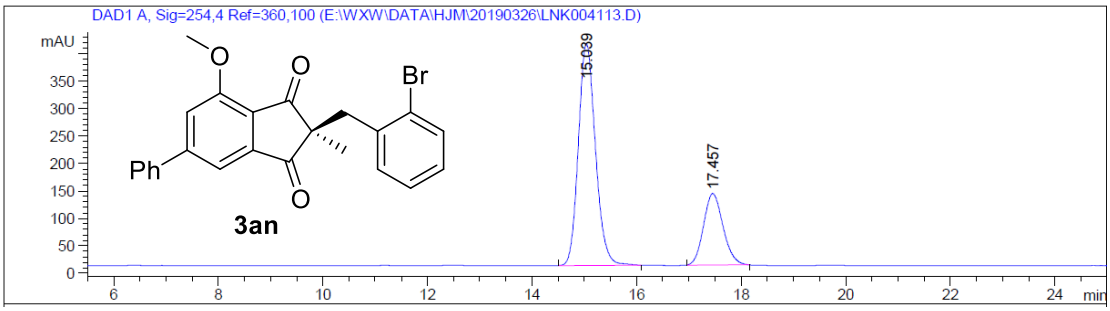


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.656	BB	0.3146	1.66103e4	818.96100	76.0361
2	16.337	MM R	0.3959	5235.00781	220.37730	23.9639

3an

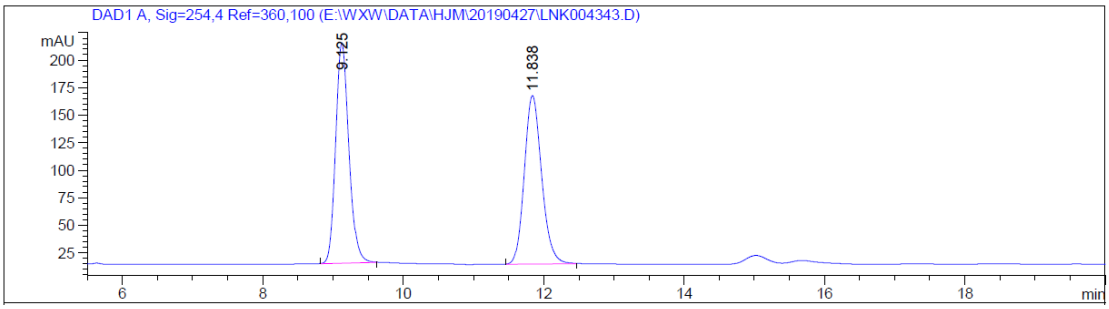


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.729	BB	0.3299	3354.78174	156.64880	49.8942
2	16.990	BB	0.3828	3369.01099	135.18442	50.1058

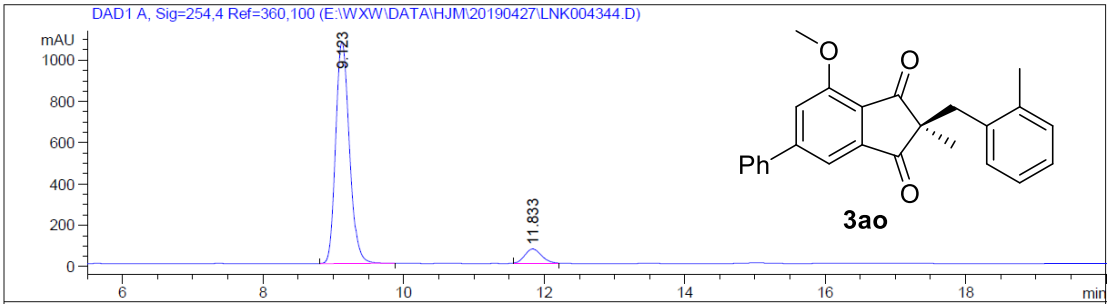


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.039	BB	0.3507	9177.19824	404.49304	73.1494
2	17.457	MM R	0.4313	3368.62256	130.16016	26.8506

3ao

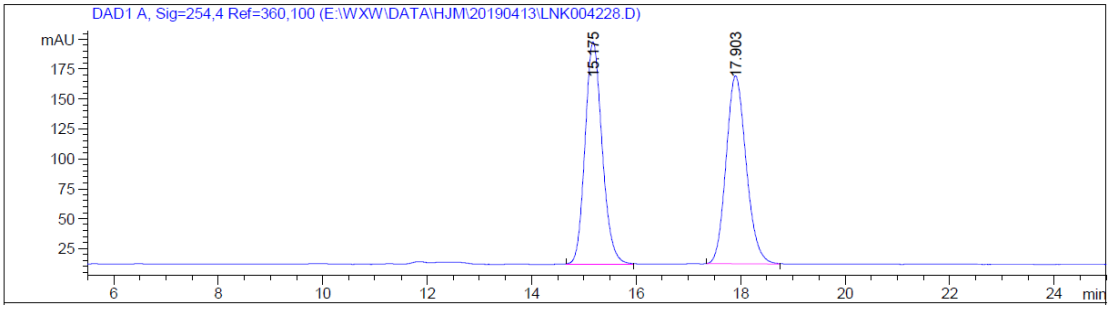


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.125	BB	0.2015	2631.30273	199.94556	49.9825
2	11.838	BB	0.2649	2633.15015	152.93456	50.0175

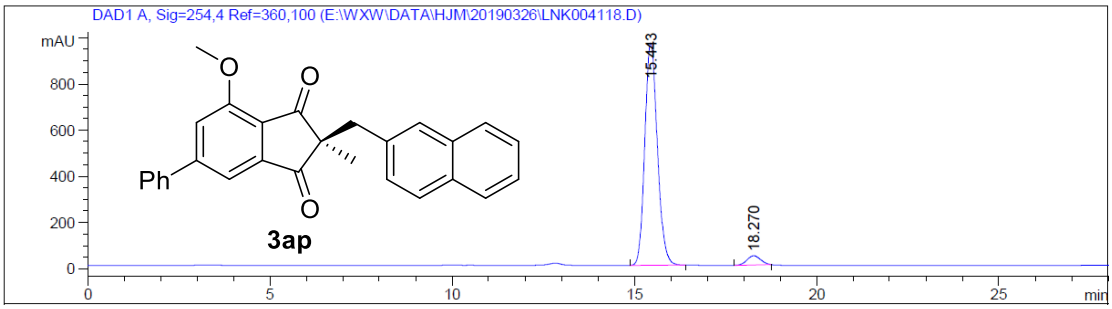


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.123	BB	0.2133	1.46528e4	1072.81726	92.5232
2	11.833	MM R	0.2809	1184.08887	70.26357	7.4768

3ap

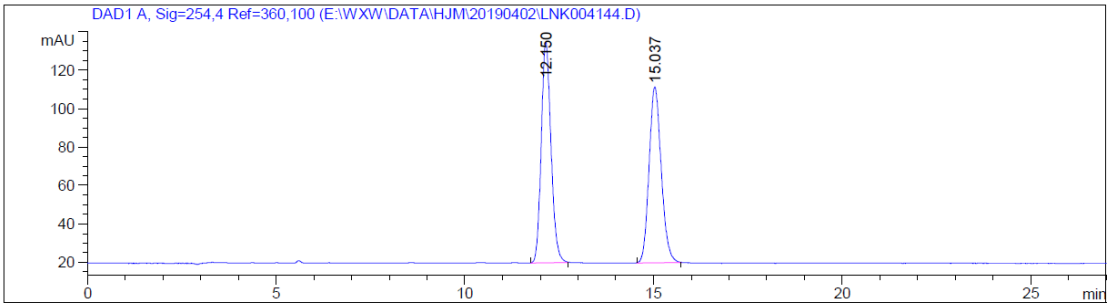


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.175	BB	0.3519	4232.92383	185.73996	50.1312
2	17.903	BB	0.4124	4210.76611	157.26924	49.8688

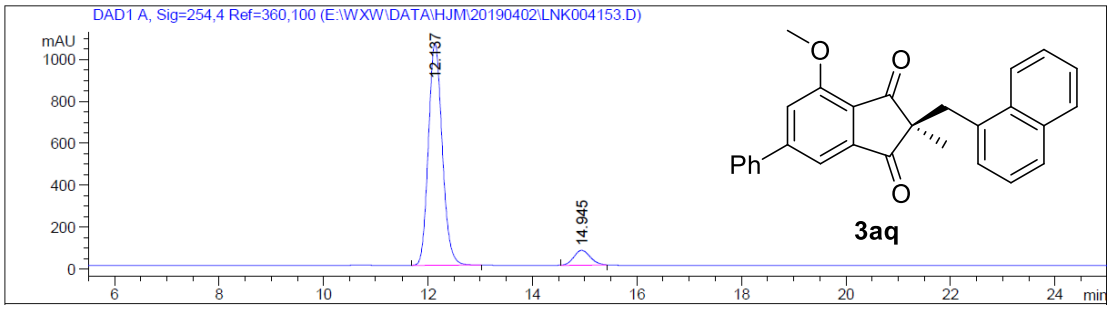


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.443	BB	0.3718	2.30425e4	960.89014	95.5561
2	18.270	MM R	0.4437	1071.60303	40.24857	4.4439

3aq

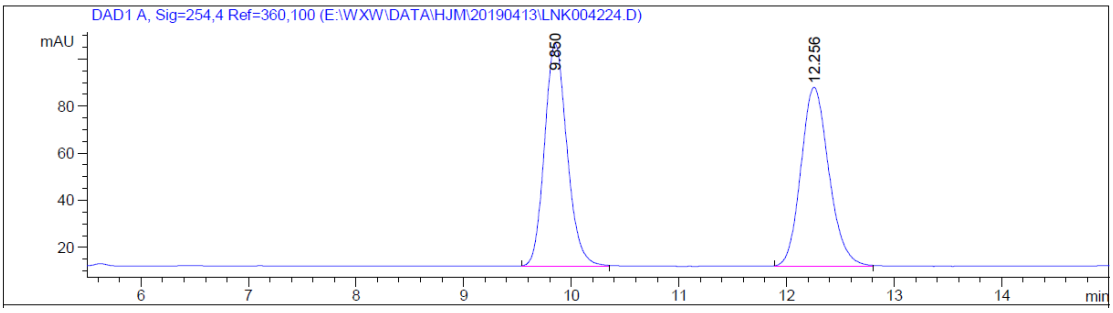


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.150	BB	0.2761	2067.51270	114.78390	50.1969
2	15.037	BB	0.3455	2051.29395	91.52007	49.8031

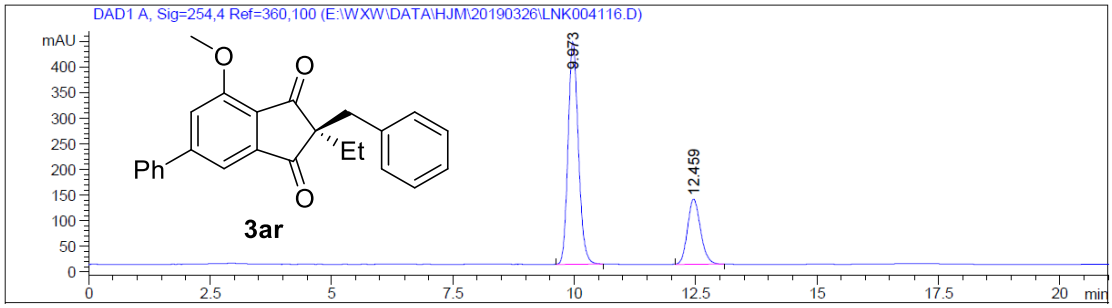


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.137	BB	0.2850	1.94987e4	1058.17444	92.6392
2	14.945	MM R	0.3635	1549.30298	71.03905	7.3608

3ar

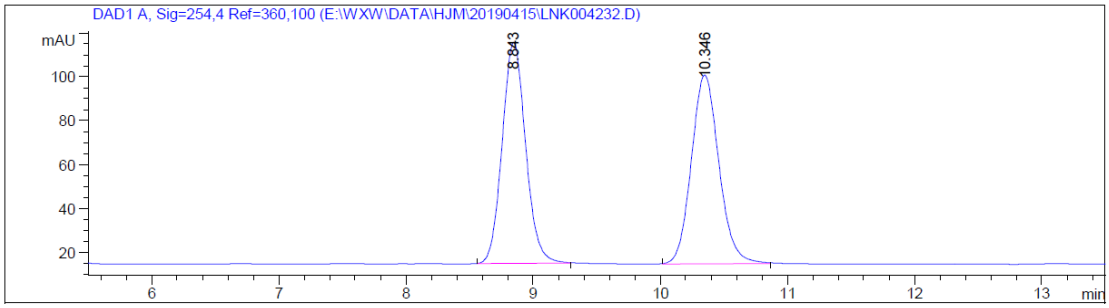


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.850	BB	0.2231	1370.37769	94.54195	49.9964
2	12.256	BB	0.2786	1370.57312	75.91089	50.0036

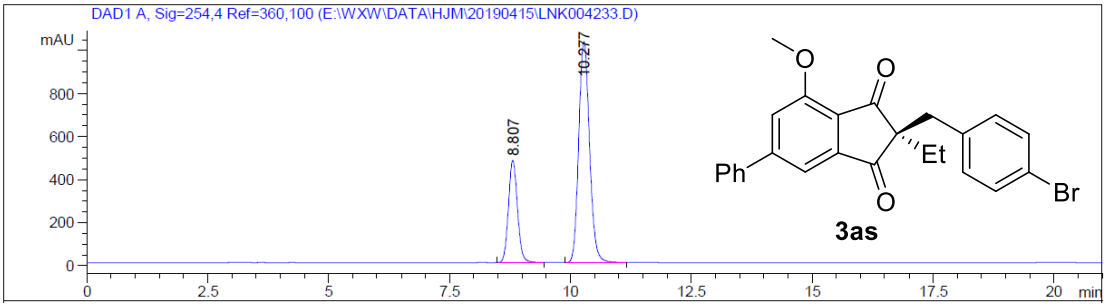


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	9.973	BB	0.2283	6397.44092	433.05740	73.0578
2	12.459	MM R	0.3091	2359.23926	127.21201	26.9422

3as

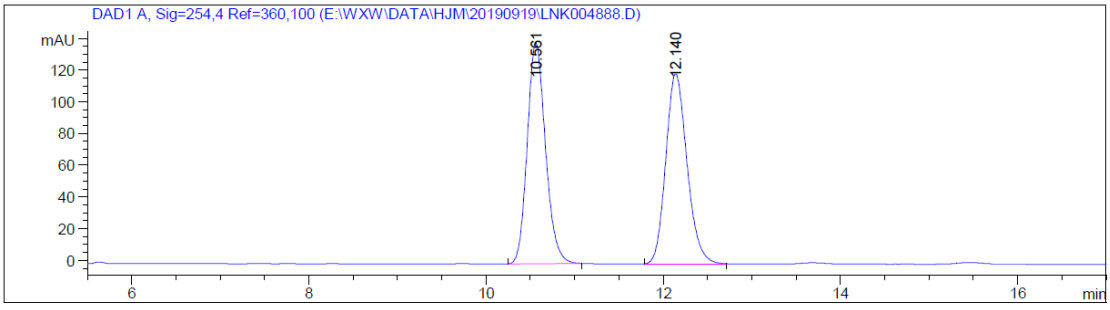


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.843	BB	0.1979	1293.26160	100.65012	49.9885
2	10.346	BB	0.2338	1293.85864	85.87302	50.0115

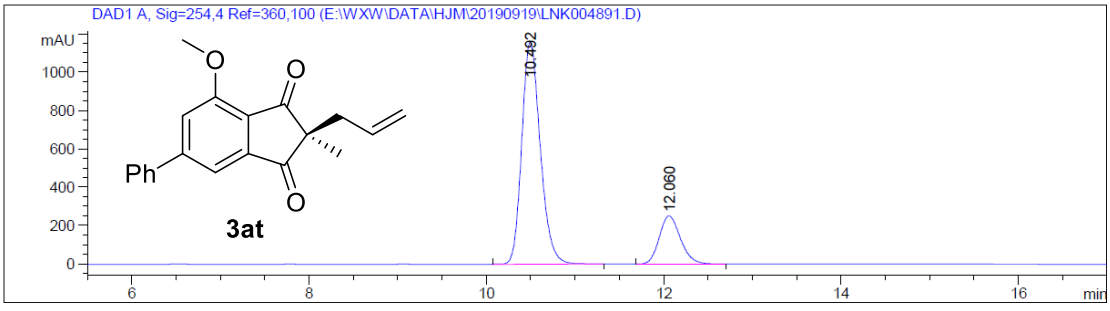


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.807	BB	0.2018	6174.36475	474.67734	27.9379
2	10.277	BB	0.2412	1.59260e4	1025.17078	72.0621

3at

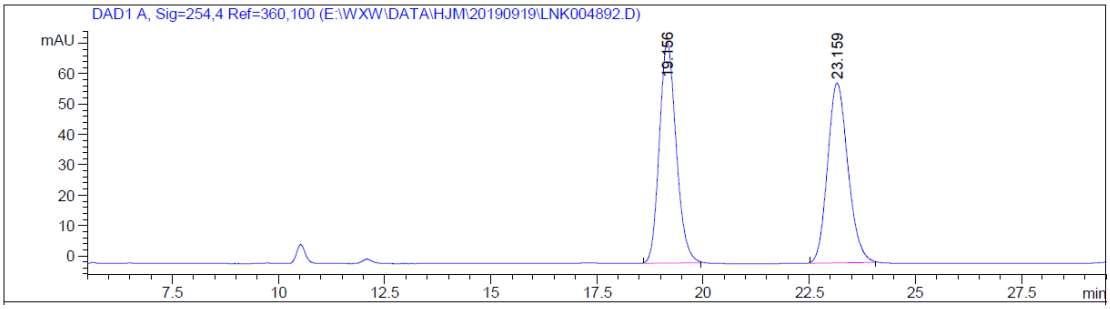


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.561	BB	0.2211	2002.22510	139.76830	49.9958
2	12.140	BB	0.2567	2002.55908	120.01533	50.0042

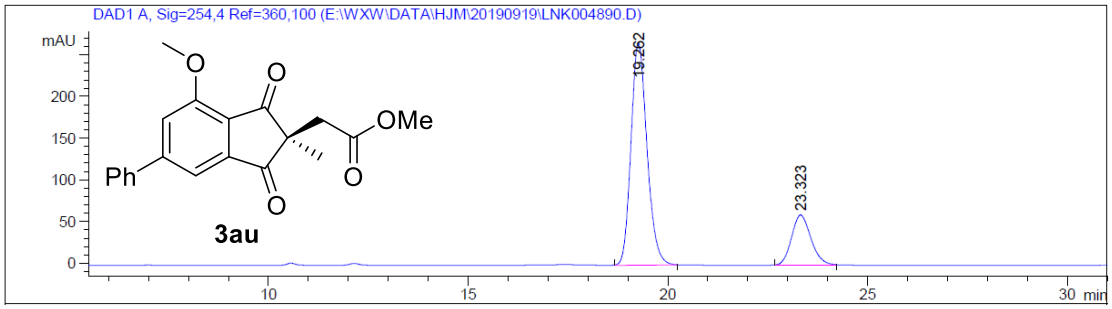


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.492	BB	0.2236	1.68380e4	1158.36096	79.9961
2	12.060	BB	0.2568	4210.53662	252.23546	20.0039

3au

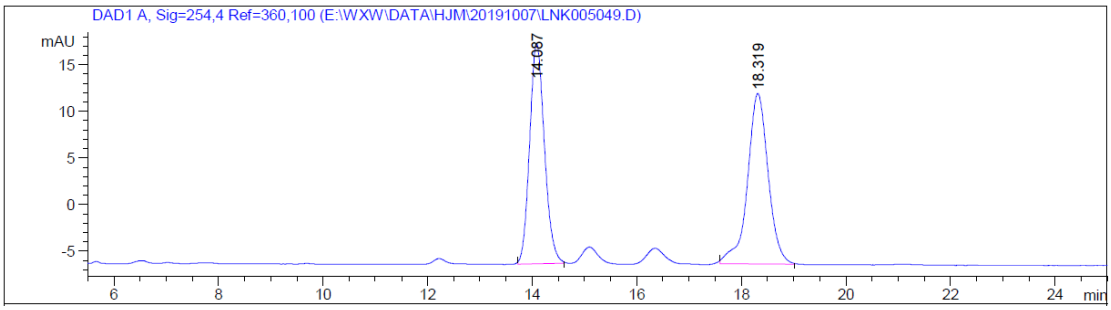


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.156	BB	0.4236	2004.57068	72.71276	50.3054
2	23.159	BB	0.5143	1980.22974	59.18496	49.6946

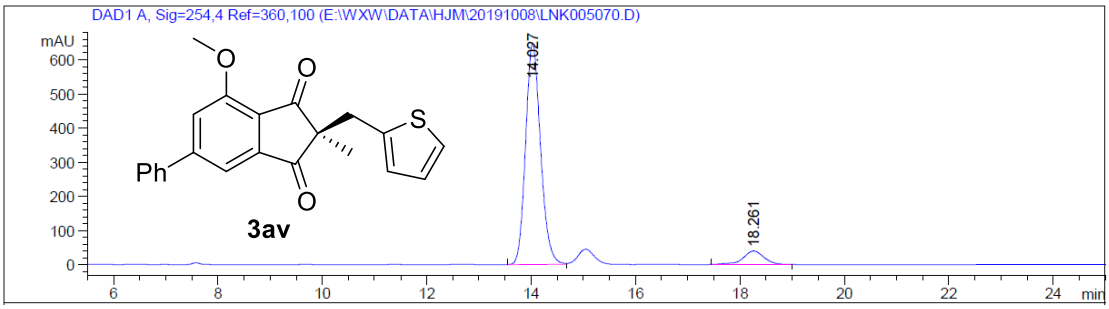


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	19.262	BB	0.4310	7427.23779	266.65482	78.6371
2	23.323	BB	0.5189	2017.71204	59.90947	21.3629

3av

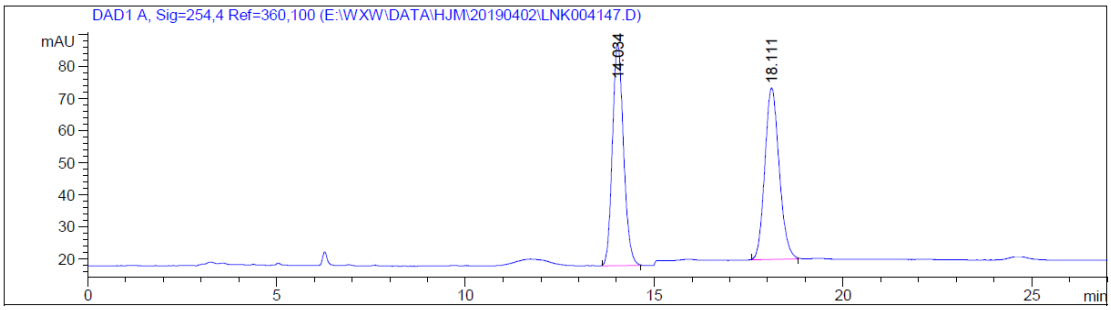


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.087	BB	0.3038	465.16116	23.61509	48.0966
2	18.319	BB	0.4149	501.97745	18.25272	51.9034

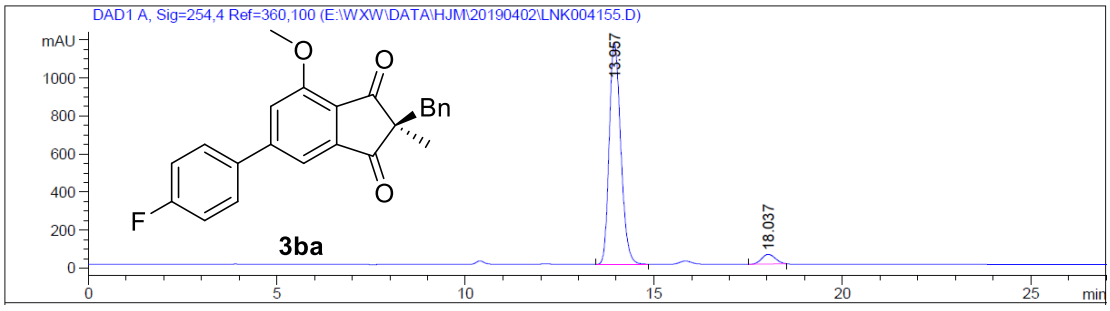


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.027	BV	0.3061	1.28820e4	647.44153	92.0418
2	18.261	BB	0.4236	1113.81140	39.66364	7.9582

3ba

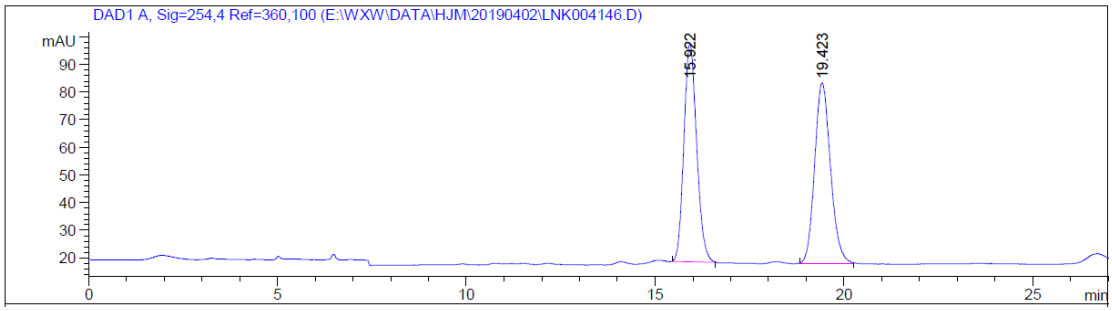


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.034	BB	0.3168	1416.66223	69.22543	49.9749
2	18.111	BB	0.4112	1418.08557	53.50586	50.0251

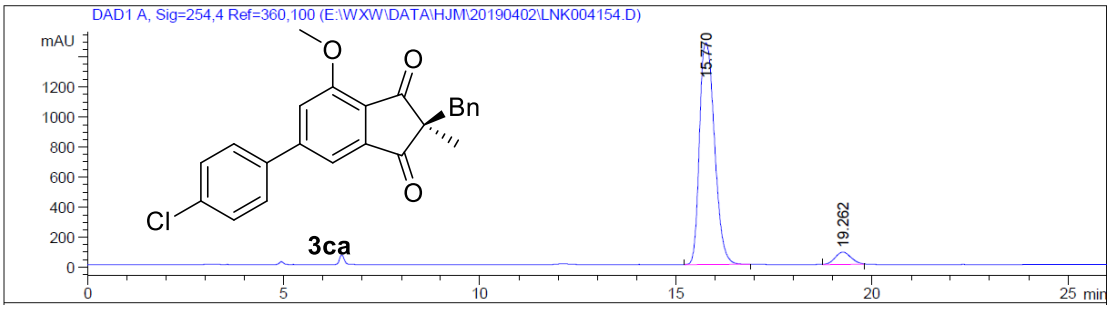


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	13.957	BB	0.3334	2.48810e4	1163.86755	94.9314
2	18.037	MM R	0.4258	1328.45215	52.00061	5.0686

3ca

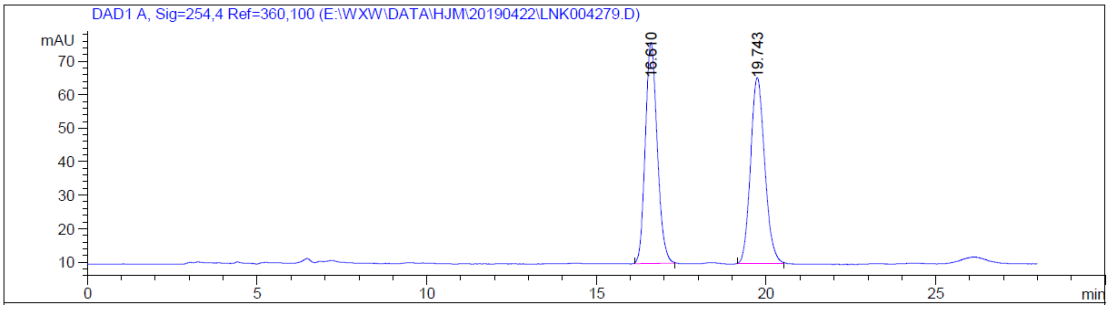


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.922	BB	0.3638	1858.69202	79.21178	49.3760
2	19.423	BB	0.4518	1905.66833	65.42010	50.6240

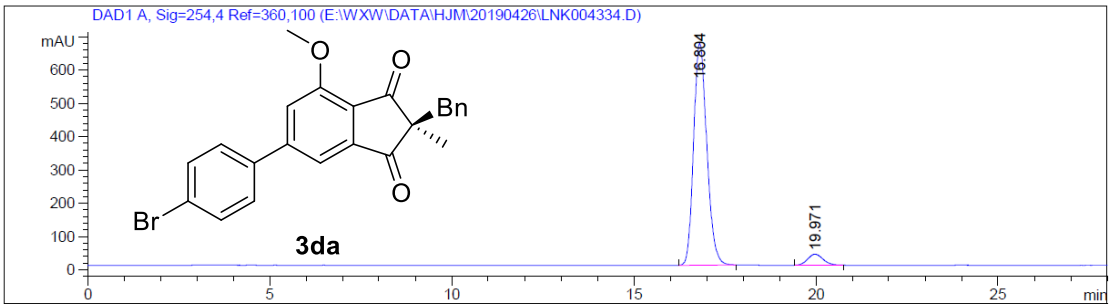


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.770	BB	0.4218	3.93744e4	1473.06665	94.5213
2	19.262	MM R	0.4669	2282.25146	81.46192	5.4787

3da

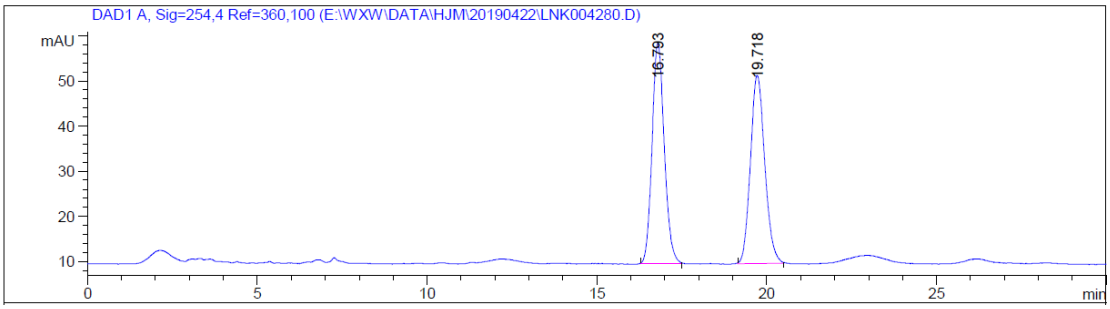


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.610	BB	0.3788	1612.69763	66.07236	49.9195
2	19.743	BB	0.4497	1617.89771	55.55811	50.0805

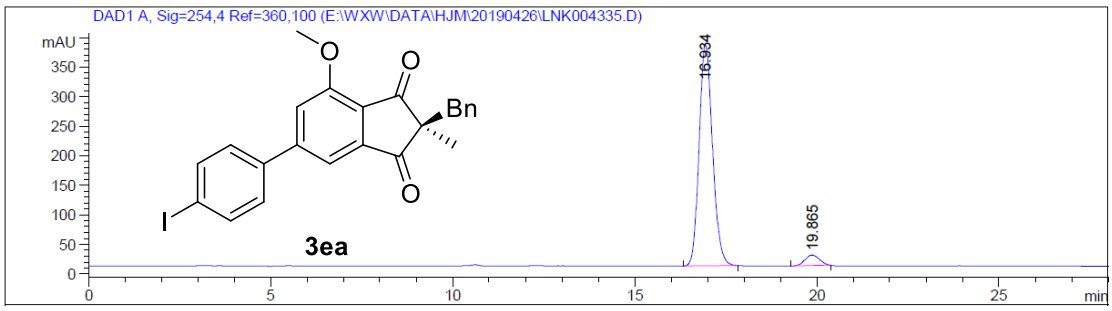


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.804	BB	0.3922	1.68102e4	666.58813	94.5015
2	19.971	BB	0.4502	978.09106	33.14847	5.4985

3ea

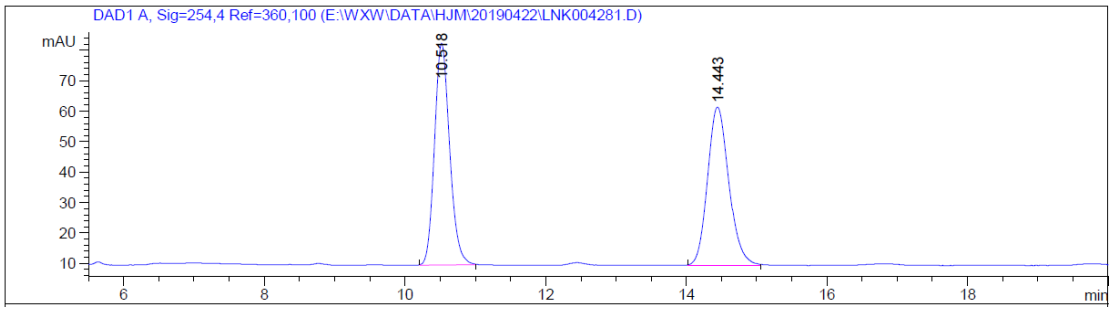


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.793	BB	0.3841	1225.02576	48.93368	50.0777
2	19.718	BB	0.4499	1221.22412	41.66651	49.9223

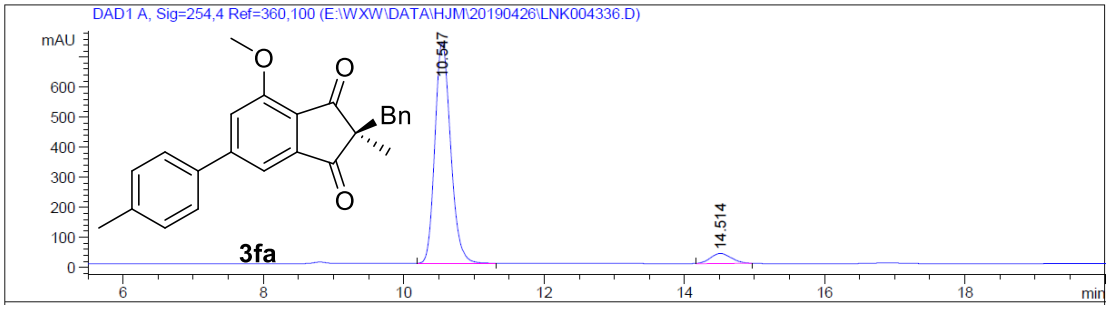


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.934	BB	0.3966	9599.82422	375.02945	95.0424
2	19.865	MM R	0.4639	500.74640	17.99135	4.9576

3fa

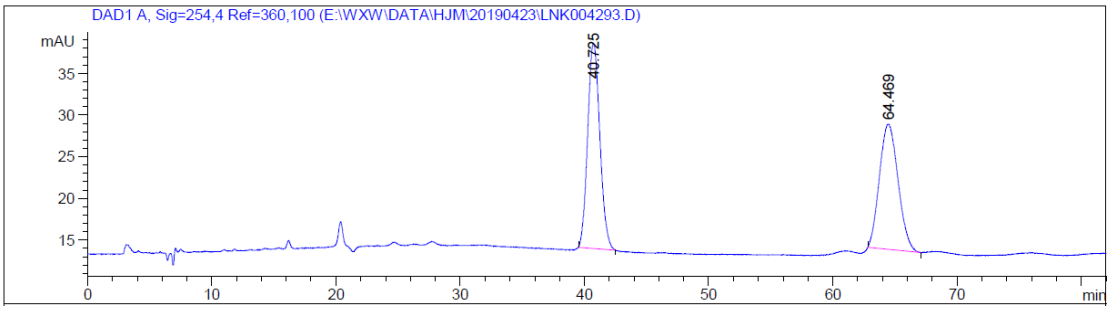


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.518	BB	0.2341	1098.27478	72.74692	50.1511
2	14.443	BB	0.3251	1091.65613	51.95306	49.8489

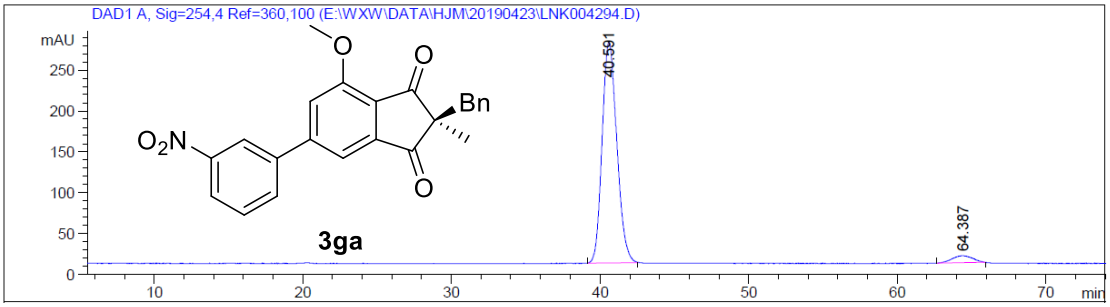


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.547	BB	0.2432	1.15518e4	735.74011	94.5226
2	14.514	MM R	0.3391	669.40955	32.90365	5.4774

3ga

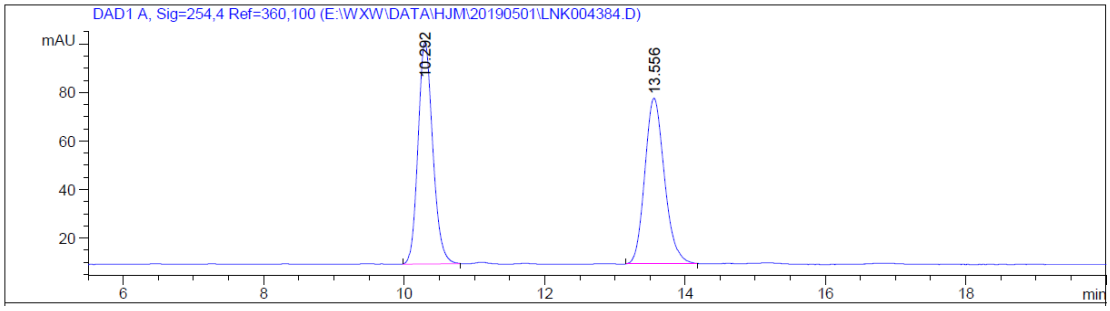


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	40.725	BB	0.8666	1676.13916	24.60958	51.6828
2	64.469	BB	1.2287	1566.98633	15.02503	48.3172

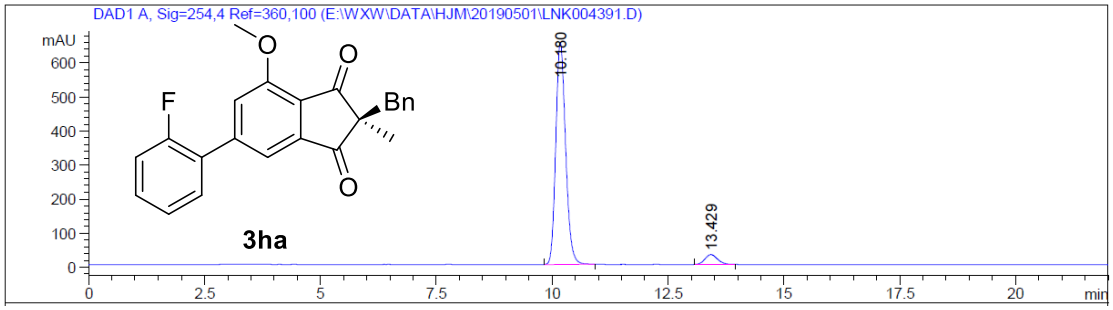


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	40.591	BB	1.0661	1.86156e4	270.78271	95.9210
2	64.387	MM R	1.5979	791.61713	8.25674	4.0790

3ha

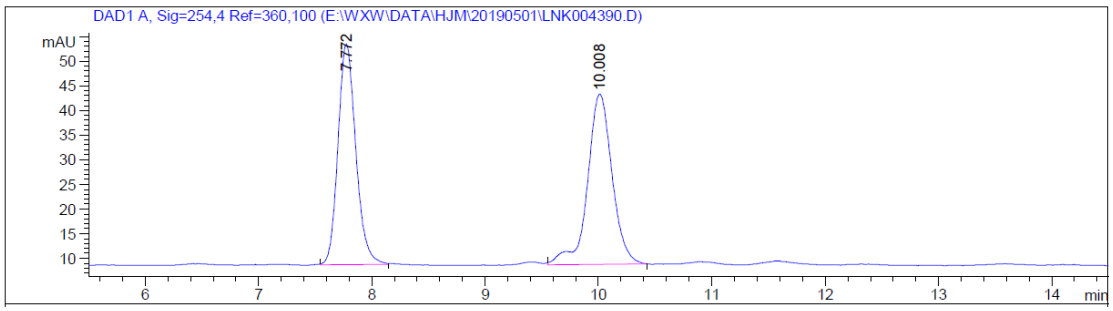


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.292	BB	0.2254	1342.79944	91.37619	50.0877
2	13.556	BB	0.3006	1338.09961	68.30328	49.9123

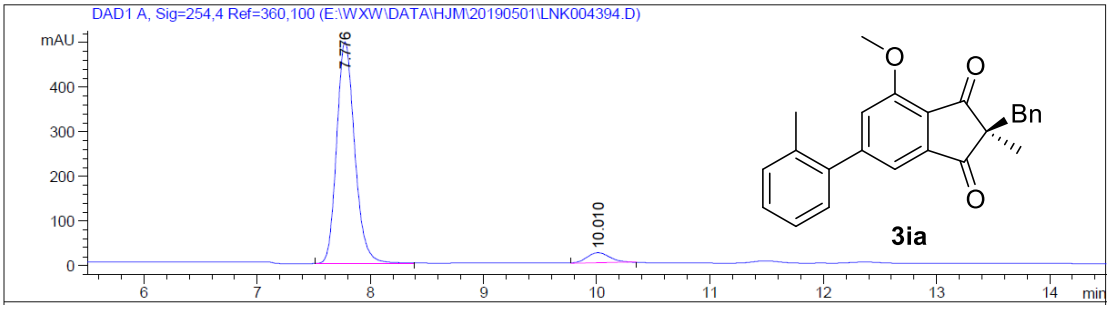


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	10.180	BB	0.2275	9590.61035	652.34155	94.5557
2	13.429	BB	0.2925	552.20898	28.94934	5.4443

3ia

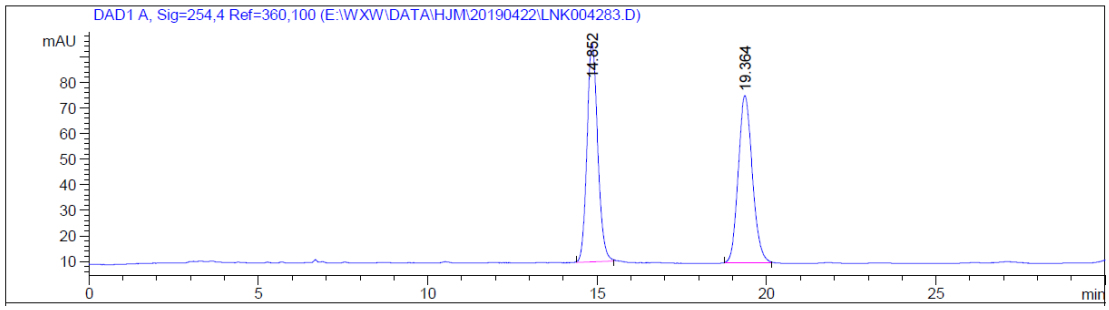


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.772	BB	0.1695	489.24783	44.76540	48.4138
2	10.008	BB	0.2279	521.30603	34.58310	51.5862

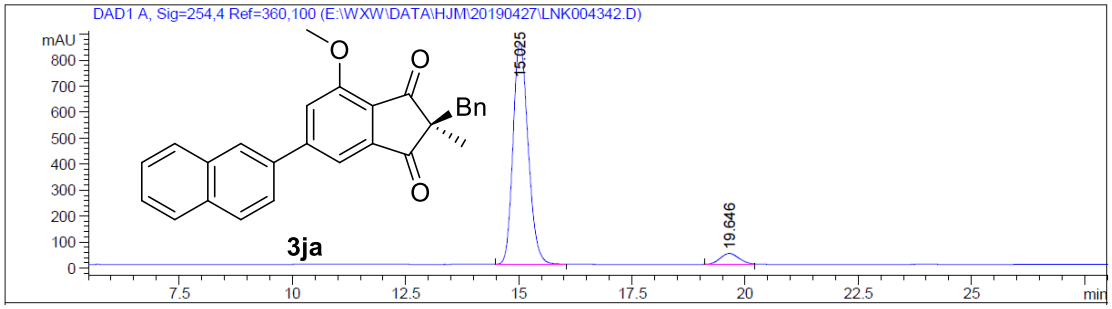


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	7.776	BB	0.1709	5482.39795	496.16434	94.6439
2	10.010	MM R	0.2300	310.26331	22.48162	5.3561

3ja

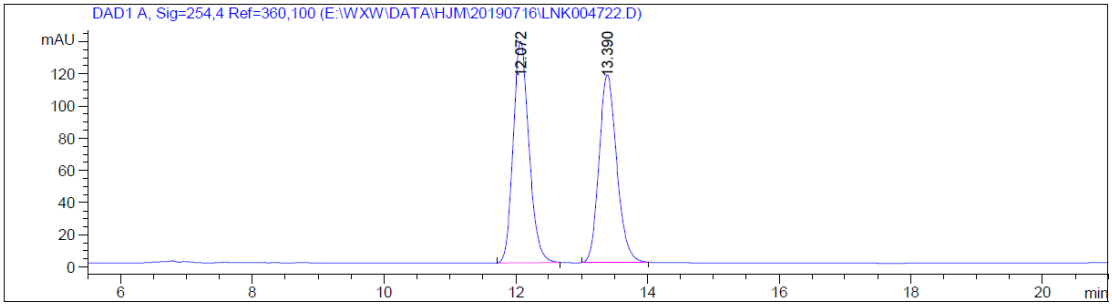


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	14.852	BB	0.3393	1868.81567	85.38871	49.7122
2	19.364	BB	0.4432	1890.45337	65.41597	50.2878

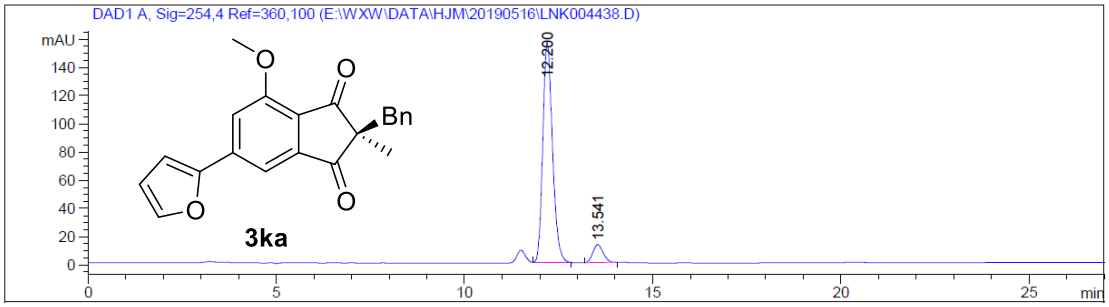


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	15.025	BB	0.3627	1.98147e4	854.06714	94.5417
2	19.646	MM R	0.4688	1143.99573	40.67279	5.4583

3ka

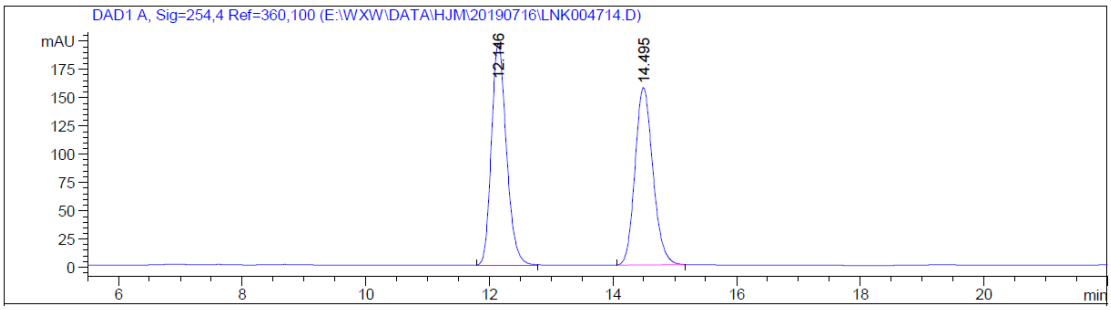


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.072	BB	0.2575	2304.64722	137.53784	51.3623
2	13.390	BB	0.2860	2182.39014	116.77705	48.6377

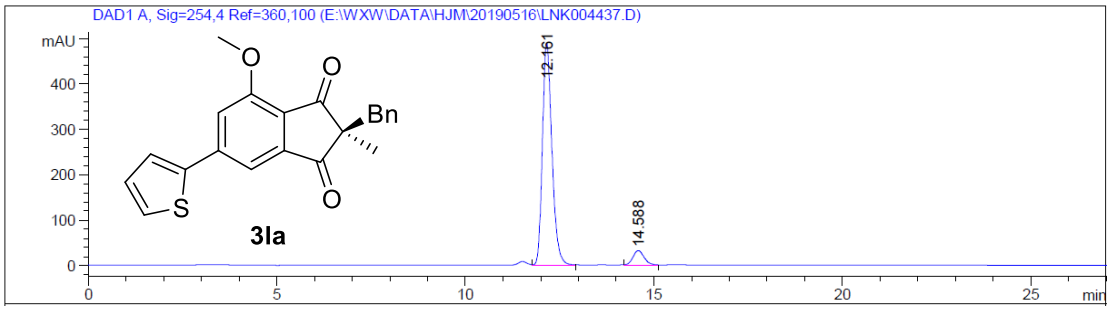


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.200	VB	0.2732	2804.24878	156.37102	92.0984
2	13.541	BB	0.2943	240.59225	12.74389	7.9016

3la

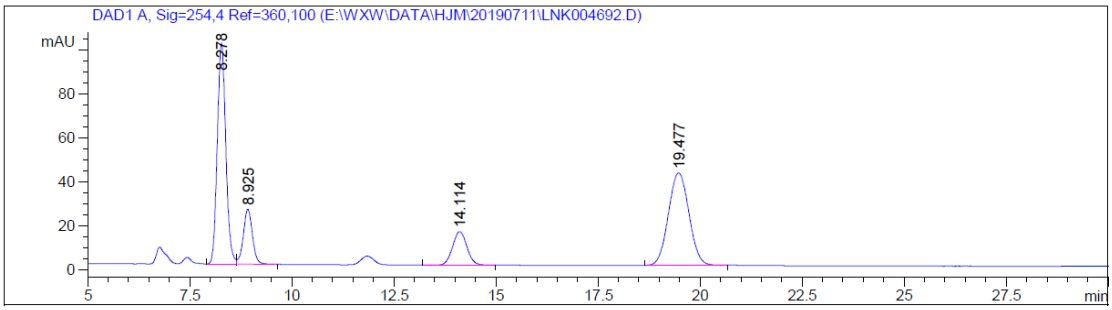


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.146	BB	0.2611	3313.34668	196.10257	51.2073
2	14.495	BB	0.3108	3157.10571	156.86118	48.7927

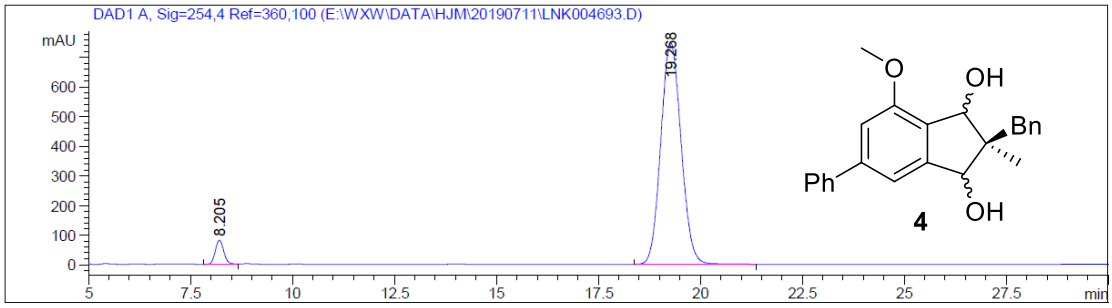


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.161	VB	0.2682	8540.95508	487.87503	92.9257
2	14.588	BB	0.3147	650.20807	31.78100	7.0743

4

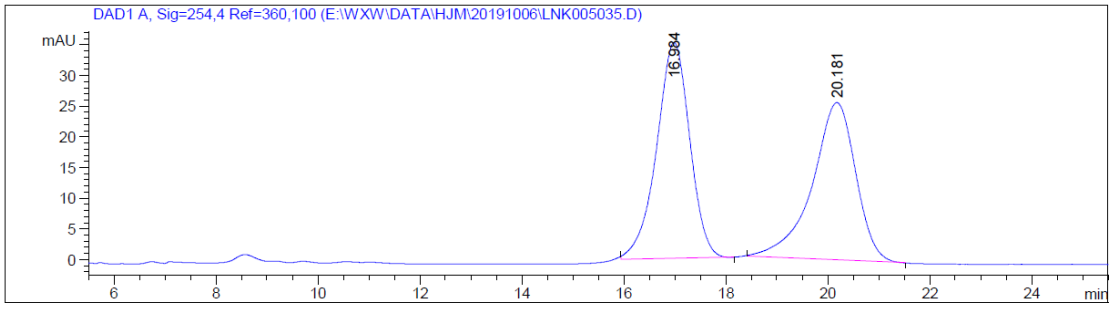


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.278	VV	0.2261	1462.57483	100.33953	39.5069
2	8.925	VB	0.2418	389.77615	25.01888	10.5286
3	14.114	BB	0.3802	370.96924	15.23041	10.0206
4	19.477	BB	0.5536	1478.75818	42.11973	39.9440

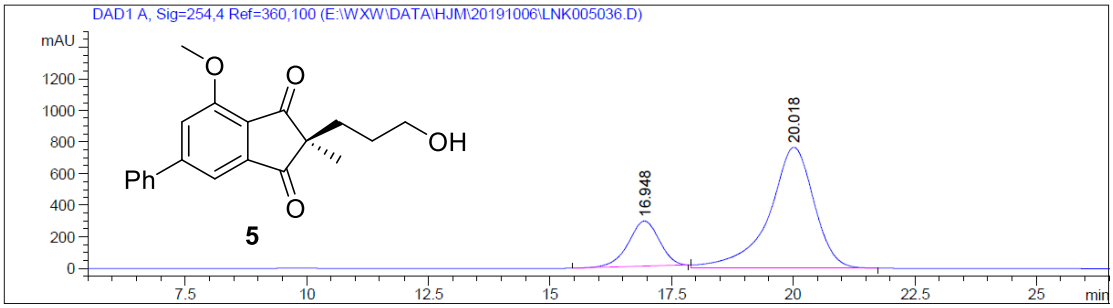


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	8.205	VV	0.2251	1180.63342	81.47739	4.3574
2	19.268	BB	0.5438	2.59142e4	748.69293	95.6426

5

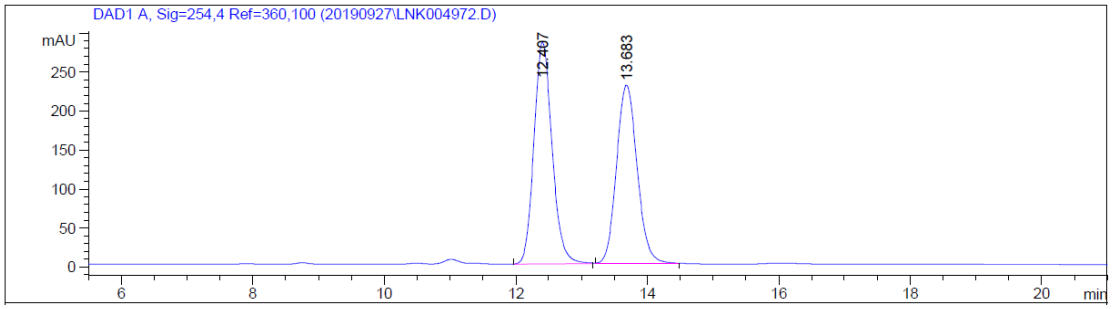


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.984	BB	0.6828	1586.88794	35.14643	51.1262
2	20.181	MM R	0.9870	1516.97412	25.61695	48.8738

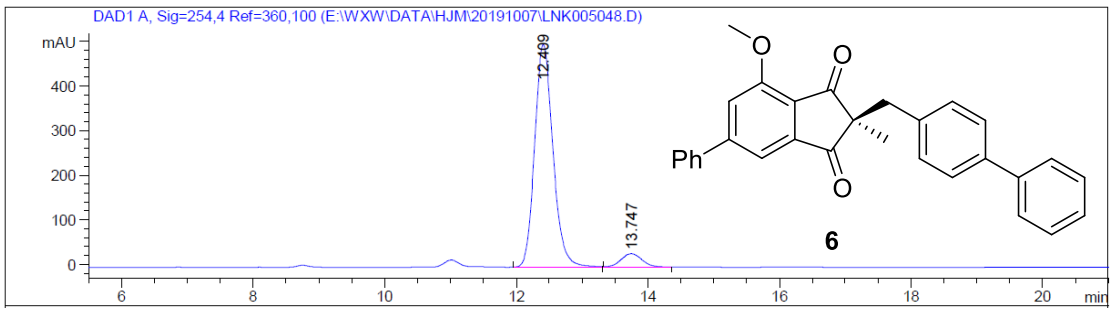


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	16.948	MM R	0.7399	1.26842e4	285.73050	20.3894
2	20.018	VB	0.9585	4.95255e4	765.77808	79.6106

6

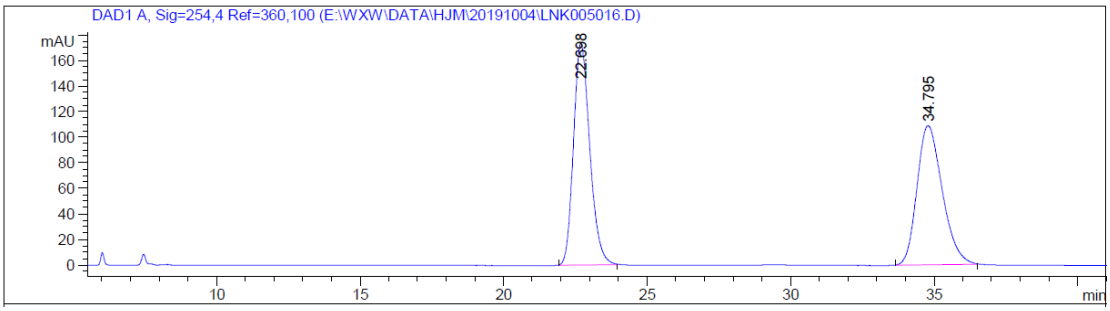


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.407	BB	0.2965	5466.01904	284.03055	52.1984
2	13.683	BB	0.3408	5005.60547	229.19531	47.8016

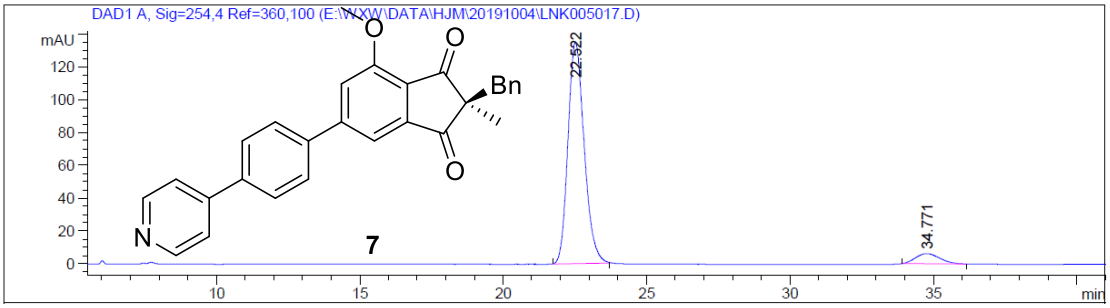


Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	12.409	BB	0.3001	9662.10547	498.62762	93.4774
2	13.747	BB	0.3484	674.19116	30.21092	6.5226

7



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.698	BB	0.6089	6847.92285	173.32408	50.6745
2	34.795	BB	0.9451	6665.63477	108.75040	49.3255



Peak #	RetTime [min]	Type	Width [min]	Area [mAU*s]	Height [mAU]	Area %
1	22.522	BB	0.6066	5305.90137	134.97458	93.4958
2	34.771	BB	0.7966	369.11435	6.27165	6.5042