Electronic Supplementary Material (ESI) for Organic Chemistry Frontiers.

Supplementary Information

Atroposelective Carbonylation of Aryl Iodides with Amides: Facile Synthesis of Enantioenriched Cyclic and Acyclic Amides

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1. General Considerations

Unless otherwise noted, all chemicals were purchased from commercial suppliers and used without further purification. ^{1}H NMR and ^{13}C NMR spectra were recorded at ambient temperature on a 500 MHz spectrometer (125 MHz for ^{13}C NMR). NMR experiments are reported in units, parts per million (ppm), and were referenced to $CDCl_3$ (7.26 or 77.0 ppm) as the internal standard. The coupling constants *J* are given in Hertz. Column chromatography was performed using EM silica gel 60 (200−300 mesh). ABsciex5600plusQTOF HR mass spectrometer equipped with an ESI source was used for analysis.

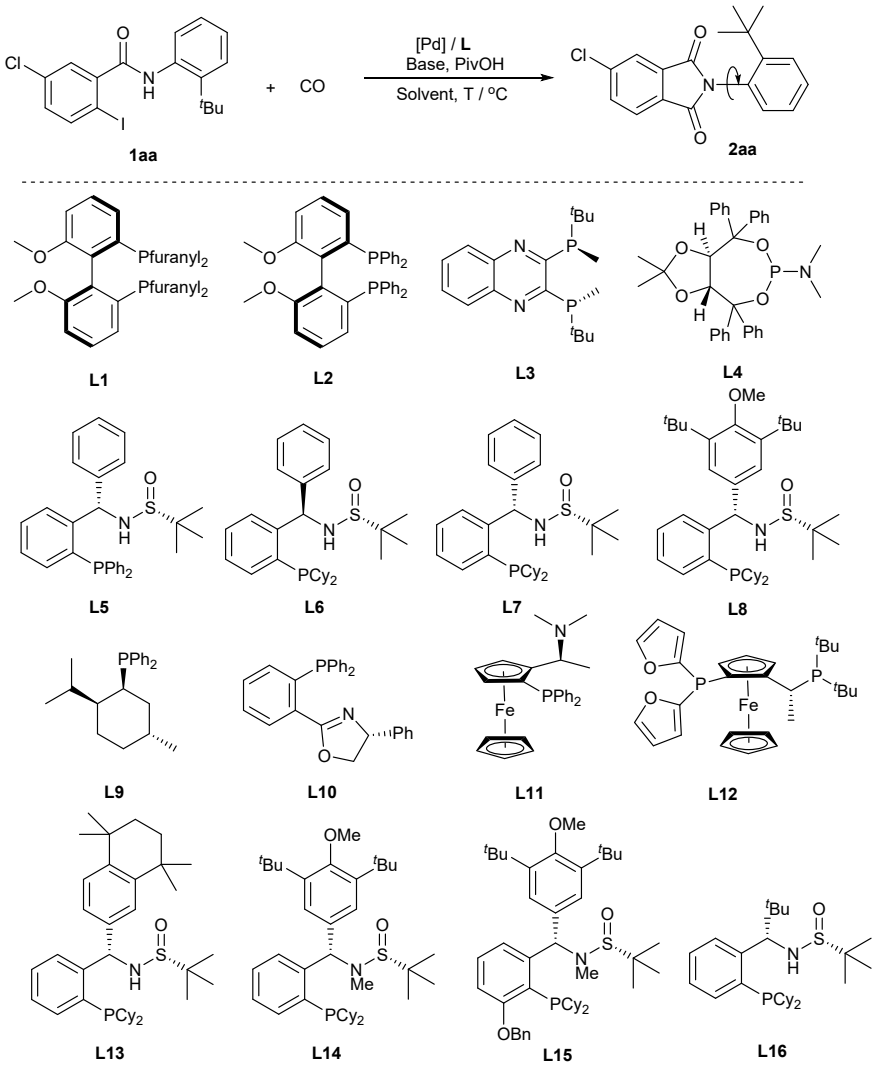
2. Experimental Procedures.

2.1 General procedure (0.1 mmol scale; 2aa)

An oven-dried 25 mL Schlenk tube charged with **1aa** (0.1 mmol), $PdCl_2$ (0.005 mmol, 0.9 mg), **L8** (0.012 mmol, 7.5 mg) and K_2CO_3 (0.12 mmol, 16.6 mg), PivOH (0.1 mmol, 12 μL) was vacuumed and refilled with CO for 3 times. Then, 1.2 mL of $PhCF_3$ was added by syringe and the tube was placed in 45 °C oil-bath for 24 h. The crude reaction mixture was extracted with EA (2 mL × 3) and washed with brine (5 mL). The organic phase was concentrated in vacuo and the residue was purified by silica gel flash column chromatography to afford the corresponding products **2aa**.

2.2 Detailed Information of Conditions Optimization for 2aa[a]

Table S1:



entry	catalyst	ligand	solvent	base	T / °C	yields / %	ee / %
1	$Pd(OAc)_2$	**PPh_3**	PhMe	K_2CO_3	60	32	--
2	$Pd(OAc)_2$	**L1**	PhMe	K_2CO_3	60	66	53
3	$Pd(OAc)_2$	**L2**	PhMe	K_2CO_3	60	34	7
4	$Pd(OAc)_2$	**L3**	PhMe	K_2CO_3	60	19	39
5	$Pd(OAc)_2$	**L4**	PhMe	K_2CO_3	60	59	47
6	$Pd(OAc)_2$	**L5**	PhMe	K_2CO_3	60	31	53
7	$Pd(OAc)_2$	**L6**	PhMe	K_2CO_3	60	59	83
8	$Pd(OAc)_2$	**L7**	PhMe	K_2CO_3	60	86	84
9	$Pd(OAc)_2$	**L8**	PhMe	K_2CO_3	60	96	90
10	$Pd(OAc)_2$	**L9**	PhMe	K_2CO_3	60	16	2
11	$Pd(OAc)_2$	**L10**	PhMe	K_2CO_3	60	N.R.	--
12	$Pd(OAc)_2$	**L11**	PhMe	K_2CO_3	60	50	45
13	$Pd(OAc)_2$	**L12**	PhMe	K_2CO_3	60	21	5
14	$Pd(OAc)_2$	**L13**	PhMe	K_2CO_3	60	84	89
15	$Pd(OAc)_2$	**L14**	PhMe	K_2CO_3	60	41	35
16	$Pd(OAc)_2$	**L15**	PhMe	K_2CO_3	60	54	77
17	$Pd(OAc)_2$	**L16**	PhMe	K_2CO_3	60	87	84
18	**$Pd(dba)_2$**	L4	PhMe	K_2CO_3	60	64	89
19	**$Pd(MeCN)_2Cl_2$**	L4	PhMe	K_2CO_3	60	82	90
20	**$Pd(OTf)_2$**	L4	PhMe	K_2CO_3	60	77	87
21	**$PdCl_2$**	L4	PhMe	K_2CO_3	60	93	91
22	**$Pd(PPh_3)_2Cl_2$**	L4	PhMe	K_2CO_3	60	84	81
23	**$Pd(PPh_3)_4$**	L4	PhMe	K_2CO_3	60	88	73
24	$PdCl_2$	L4	**DCE**	K_2CO_3	60	84	90
25	$PdCl_2$	L4	**THF**	K_2CO_3	60	41	51
26	$PdCl_2$	L4	**PhF**	K_2CO_3	60	83	87
27	$PdCl_2$	L4	**PhCl**	K_2CO_3	60	84	89
28	$PdCl_2$	L4	**PhH**	K_2CO_3	60	88	90

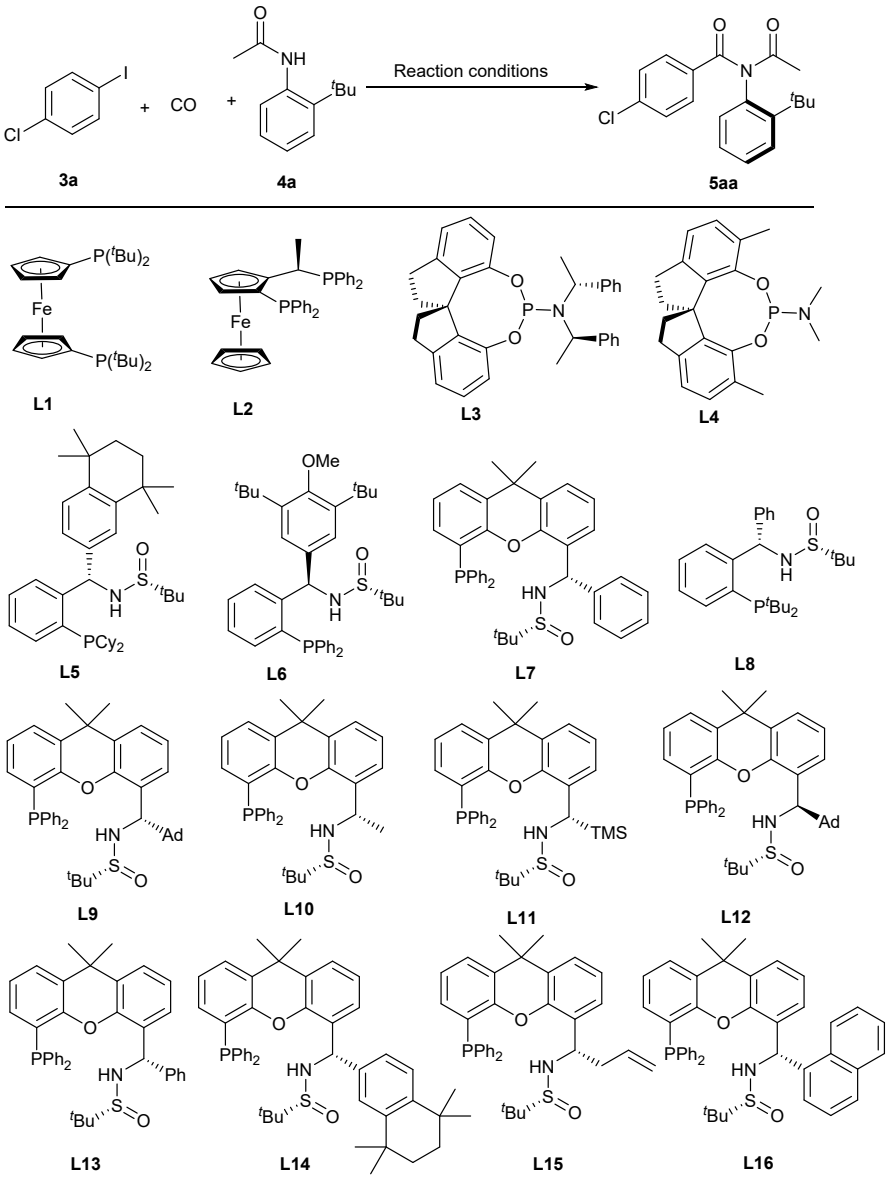
29	$PdCl_2$	L4	**$PhCF_3$**	K_2CO_3	60	43	91
30	$PdCl_2$	L4	**MeCN**	K_2CO_3	60	51	68
31	$PdCl_2$	L4	$PhCF_3$	**Na_2CO_3**	60	57	81
32	$PdCl_2$	L4	$PhCF_3$	**Ru_2CO_3**	60	63	82
33	$PdCl_2$	L4	$PhCF_3$	**Cs_2CO_3**	60	86	86
34	$PdCl_2$	L4	$PhCF_3$	**$KHCO_3$**	60	80	73
35	$PdCl_2$	L4	$PhCF_3$	K_2CO_3	**50**	92	92
36	$PdCl_2$	L4	$PhCF_3$	K_2CO_3	**45**	98	94
37	$PdCl_2$	L4	$PhCF_3$	K_2CO_3	**40**	43	94

[a] Reaction conditions: **1aa** (0.10 mmol), Pd catalyst (5 mol%), ligand (12 mol%), K_2CO_3 (0.10 mmol), PivOH (0.10 mmol), solvent (1.2 mL) at 60 °C for 24 h, in CO, isolated yield.

2.3 General procedure (0.1 mmol scale; 5aa)

An oven-dried 25 mL Schlenk tube charged with **3a** (0.15 mmol), **4a** (0.1 mmol), $Pd(OAc)_2$ (0.005 mmol, 1.1 mg), **L9** (0.012 mmol, 7.9 mg), Cs_2CO_3 (0.2 mmol, 65.2 mg), Hantzsch ester (0.12 mmol, 30.4 mg) and PhMe(1.2 mL) was vacuumed and refilled with CO for 3 times. The reaction mixture was stirred at 0 °C for 120 h. After the reaction was complete, the mixture was then filtered through silica and washed by EtOAc (10 mL). The mixture was concentrated in vacuo. Then the residue was purified by silica gel column chromatography to afford the corresponding products **5aa**.

Table S2:



entry	catalyst	ligand	solvent	base	T / °C	yields / %	ee / %
1	$Pd(OAc)_2$	**L1**	PhMe	Cs_2CO_3	25	83	--
2	$Pd(OAc)_2$	**L2**	PhMe	Cs_2CO_3	25	42	13
3	$Pd(OAc)_2$	**L3**	PhMe	Cs_2CO_3	25	51	7
4	$Pd(OAc)_2$	**L4**	PhMe	Cs_2CO_3	25	52	9
5	$Pd(OAc)_2$	**L5**	PhMe	Cs_2CO_3	25	43	27
6	$Pd(OAc)_2$	**L6**	PhMe	Cs_2CO_3	25	64	44
7	$Pd(OAc)_2$	**L7**	PhMe	Cs_2CO_3	25	53	45
8	$Pd(OAc)_2$	**L8**	PhMe	Cs_2CO_3	25	N.R	--
9	$Pd(OAc)_2$	**L9**	PhMe	Cs_2CO_3	25	68	72
10	$Pd(OAc)_2$	**L10**	PhMe	Cs_2CO_3	25	62	51
11	$Pd(OAc)_2$	**L11**	PhMe	Cs_2CO_3	25	25	46
12	$Pd(OAc)_2$	**L12**	PhMe	Cs_2CO_3	25	57	60
13	$Pd(OAc)_2$	**L13**	PhMe	Cs_2CO_3	25	55	45
14	$Pd(OAc)_2$	**L14**	PhMe	Cs_2CO_3	25	71	54
15	$Pd(OAc)_2$	**L15**	PhMe	Cs_2CO_3	25	64	43
16	$Pd(OAc)_2$	**L16**	PhMe	Cs_2CO_3	25	66	45
17	**$Pd(TFA)_2$**	L9	PhMe	Cs_2CO_3	25	43	71
18	**$Pd(dba)_2$**	L9	PhMe	Cs_2CO_3	25	N.R	--
19	**$Pd(PhCN)_2Cl_2$**	L9	PhMe	Cs_2CO_3	25	27	--
20	**$Pd(PPh_3)_2Cl_2$**	L9	PhMe	Cs_2CO_3	25	31	--
21	**$PdCl_2$**	L9	PhMe	Cs_2CO_3	25	13	--
22	$Pd(OAc)_2$	L9	PhMe	**NaOH**	25	N.R	--
23	$Pd(OAc)_2$	L9	PhMe	**DBU**	25	N.R	--
24	$Pd(OAc)_2$	L9	PhMe	**$NaHCO_3$**	25	25	67
25	$Pd(OAc)_2$	L9	PhMe	**Rb_2CO_3**	25	N.R	--
26	$Pd(OAc)_2$	L9	**PhCl**	Cs_2CO_3	25	36	71
27	$Pd(OAc)_2$	L9	**$PhCF_3$**	Cs_2CO_3	25	N.R	--
28	$Pd(OAc)_2$	L9	**DCB**	Cs_2CO_3	25	21	73

29	$Pd(OAc)_2$	L9	**MeCN**	Cs_2CO_3	25	N.R	--
30	$Pd(OAc)_2$	L9	**DCM**	Cs_2CO_3	25	N.R	--
31	$Pd(OAc)_2$	L9	PhMe	Cs_2CO_3	**20**	68	78
32	$Pd(OAc)_2$	L9	PhMe	Cs_2CO_3	**0**	36	81
33	$Pd(OAc)_2$	L9	PhMe	Cs_2CO_3	**-10**	13	86
34[b]	**$Pd(OAc)_2$**	**L9**	**PhMe**	**Cs_2CO_3**	**0**	**70**	**81**
34[b]	$Pd(OAc)_2$	L9	PhMe	Cs_2CO_3	-10	23	86

[a] Reaction conditions: **3a** (0.15 mmol), **4a** (0.10 mmol), CO (1 atm), Pd catalysis (5 mol%), ligand (12 mol%), base (0.20 mmol), PhMe (1.2 mL), 0 °C, and 120 h. [b] Hantzsch ester (0.12 mmol).

2.4 General procedure (3.0 mmol scale; 2aa)

An oven-dried 100 mL Schlenk tube charged with **1aa** (3.0 mmol), $PdCl_2$ (0.15 mmol, 27.0 mg), **L8** (0.36 mmol, 225.0 mg) and K_2CO_3 (3.6 mmol, 498 mg), PivOH (3.0 mmol, 360.0 μL) was vacuumed and refilled with CO for 3 times. Then, 36 mL of $PhCF_3$ was added by syringe and the tube was placed in 45 °C oil-bath for 24 h. The crude reaction mixture was extracted with EA (20 mL × 3) and washed with brine (20 mL). The organic phase was concentrated in vacuo and the residue was purified by silica gel flash column chromatography to afford the corresponding products **2aa** in 97% yield and 93% ee

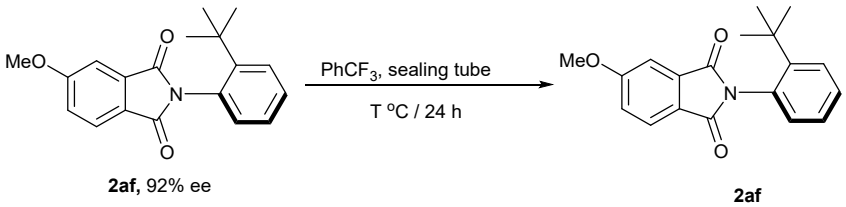
2.5 General procedure (3.0 mmol scale; 5aa)

An oven-dried 100 mL Schlenk tube charged with with **3a** (3 mmol), **4a** (3 mmol),, $Pd(OAc)_2$ (0.15 mmol, 33.0 mg), **L9** (0.36 mmol, 237.1 mg), Cs_2CO_3 (6.0 mmol, 1.956 g), Hantzsch ester (3.6 mmol, 1.013 g) was vacuumed and refilled with CO for 3 times. Then, 36 mL of PhMe was added by syringe and the tube was placed in 45 °C oil-bath for 120 h. The crude reaction mixture was extracted with EA (20 mL × 3) and washed with brine (20 mL). The organic phase was concentrated in vacuo and the residue was purified by silica gel flash column chromatography to afford the corresponding products **5aa** in 58% yield and 79% ee

2.6 Stability on racemization of product 2af

We investigated the racemization temperature of this axially chiral 2-arylisoindoline-1,3-dione and *N*-acetyl-*N*-(2-(tert-butyl)phenyl)benzamide scaffold.

Table S3 Investigation on the racemization temperature of compound **2af**

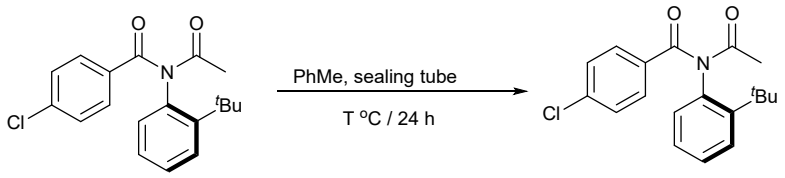


2af, 92% ee

2af

entry	T / (°C)	recovery yield of **2af** (%)	ee of recovered **2af** (%)
1	40	99	92
2	50	99	92
3	60	99	91
4	70	99	88
5	80	99	84
6	90	99	64

Table S4 Investigation on the racemization temperature of compound **5aa**



5aa, 81% ee

5aa

entry	T / (°C)	recovery yield of **5aa** (%)	ee of recovered **5aa** (%)
1	0	99	81
2	20	99	81
3	30	99	78
4	40	99	69
5	50	99	33

3. DFT (density functional theory) calculations

All DFT (density functional theory) calculations were carried out using the Gaussian 16 program[1]. The geometries of all the species were fully optimized with no constraints of freedom by using the M06 functional[2]. The 6-31G(d) basis set was used for C, H, N, O, P, S and Cl. For Pd, we used the LANL (Los Alamos National Laboratory) basis sets, also known as LANL2DZ (LANL-2-double zeta)[3]. Vibrational analyses at such SMD-M06/6-31G(d)/ LANL2DZ level of theory were performed to confirm each stationary point to be either a local minimum or a transition state (TS). The connection of each TS to its corresponding reactant and product was confirmed by IRC (intrinsic reaction coordinate)[4] calculations. Single-point energies of the SMD-M06/6-31G(d)/LANL2DZ-optimized structures were further computed at the SMD-M06/6-311+G(d,p)/SDD[5] level of theory. Solvent effects were taken into account by using the SMD-flavor[6] of self-consistent reaction field (SCRF) theory. $PhCF_3$ (ε = 9.2) as solvent. The 3D structures of molecules were generated using CYLView.[7]

Cartesian Coordinates and Thermochemical Data (Energies in Hartree)

3.1 Mechanism Research

TS_R

Number of imaginary frequencies: 1

S	-0.79767800	-2.56383900	-1.40210700
O	0.33934800	-1.59756600	-1.68596400
N	-1.25873900	-2.41576200	0.24055300
H	-0.45750000	-2.65271800	0.83402800
C	-1.72738800	-1.06658500	0.61817200
H	-1.01757000	-0.29654800	0.25924300
C	-0.00078600	-4.25462600	-1.28071800
C	1.11168400	-4.25997200	-0.24839900
H	1.72077700	-5.16434800	-0.39020300
H	1.77938200	-3.39381800	-0.36913100
H	0.73874500	-4.29056300	0.78466300
C	-1.09635100	-5.25823600	-0.96767300
H	-0.66613900	-6.27038800	-0.97547200

H	-1.54491800	-5.09042600	0.01977800
H	-1.89588200	-5.23800200	-1.72243800
C	0.56875100	-4.47641700	-2.67592300
H	0.99024200	-5.48968200	-2.73301400
H	-0.20291500	-4.39406100	-3.45543700
H	1.37057100	-3.76160700	-2.90390800
C	-1.71687200	-1.03274100	2.13877900
C	-0.66745500	-0.47026300	2.89456200
C	-2.77824200	-1.66521000	2.79569800
C	-0.76338100	-0.53863300	4.29517300
C	-2.84137200	-1.73506900	4.17839900
H	-3.57499300	-2.10692700	2.19713600
C	-1.82721300	-1.15840400	4.93501100
H	0.01316300	-0.09257600	4.90959100
H	-3.68012600	-2.23293000	4.66237400
H	-1.85959500	-1.18956900	6.02295400
C	-3.08145600	-0.72202300	0.03804600
C	-3.95781100	-1.66473800	-0.47850800
C	-3.48228300	0.60936600	0.07274700
C	-5.24175400	-1.32454900	-0.92331900
H	-3.63506000	-2.70378200	-0.51872600
C	-4.75722300	1.02345300	-0.31445300
H	-2.77129100	1.34203800	0.45808300
C	-5.64857500	0.01611800	-0.75376300
P	0.84196800	0.31442600	2.14317400
C	2.29682200	-0.17038400	3.22734500
C	2.35642200	-1.68789200	3.42297800
C	2.57244600	0.57426300	4.53750100
H	3.12852100	0.10036400	2.55244400
C	3.68493700	-2.11634300	4.04096100

H	1.53106700	-2.00838800	4.08004700
H	2.20865200	-2.19841600	2.45676400
C	3.92415500	0.14498100	5.10576700
H	1.80075400	0.35515800	5.29115300
H	2.56277400	1.66207500	4.37611400
C	3.97161300	-1.36085300	5.33257500
H	3.67909600	-3.20152000	4.21912800
H	4.49844200	-1.92202600	3.32109200
H	4.12055400	0.68462200	6.04353300
H	4.72356600	0.43601300	4.40216000
H	4.94803100	-1.65885100	5.74126000
H	3.21683800	-1.63527900	6.08996800
C	0.64156300	2.16556600	2.37263700
C	-0.18245100	2.59916500	3.58601300
C	0.10634900	2.83452400	1.10301400
H	1.68484700	2.50655100	2.50301700
C	-0.19606000	4.11946000	3.72717300
H	-1.21878700	2.23951000	3.46045700
H	0.19852800	2.14177500	4.50986200
C	0.07867900	4.35251900	1.24879700
H	-0.91509300	2.46306100	0.89327800
H	0.72722900	2.54903800	0.23975500
C	-0.72438500	4.79031400	2.46602400
H	-0.79928700	4.40494300	4.60148900
H	0.83117800	4.47207900	3.92515200
H	-0.32029100	4.80816700	0.33005200
H	1.11606300	4.71534300	1.35407100
H	-0.69865600	5.88470600	2.57176100
H	-1.78387800	4.51436900	2.32238600
C	-6.07976100	-2.46190600	-1.54455300

C	-5.22576200	-3.17728800	-2.60533600
C	-7.36301300	-2.03995900	-2.26790900
C	-6.45571700	-3.47078000	-0.45253500
H	-4.31743100	-3.63602000	-2.19560100
H	-4.91964700	-2.48381800	-3.40220600
H	-5.80885900	-3.98501000	-3.07085800
H	-8.14796800	-1.67965800	-1.59482400
H	-7.76871300	-2.92058100	-2.78830200
H	-7.17930400	-1.26503000	-3.02282500
H	-7.02691100	-4.30632900	-0.88499400
H	-7.08090300	-3.00885400	0.32581500
H	-5.57039800	-3.89628500	0.04124000
C	-5.07318500	2.52855900	-0.17884800
C	-6.35454400	3.01680700	-0.86347100
C	-3.93455600	3.34819700	-0.80790100
C	-5.16168700	2.87884700	1.31201200
H	-7.27194300	2.66424000	-0.38062900
H	-6.39547900	2.72931900	-1.92179300
H	-6.37088200	4.11616800	-0.81716000
H	-2.95350600	3.16087200	-0.35260700
H	-4.14151900	4.42149500	-0.68793500
H	-3.85118800	3.14438700	-1.88538200
H	-5.34154800	3.95685100	1.44269800
H	-4.23582500	2.62658400	1.84907600
H	-5.98431900	2.34159000	1.80628400
O	-6.95119400	0.35491700	-1.02041100
C	-7.80080700	0.21031400	0.09594300
H	-7.48692600	0.84806200	0.93878600
H	-7.83509100	-0.83064100	0.45731900
H	-8.80830200	0.50919600	-0.21836100

Pd	1.41353200	-0.03024800	-0.11809400
C	5.50311200	-2.52325700	-1.42919800
C	5.70404500	-2.09250000	-0.12147600
H	6.41041200	-2.60977700	0.52461300
C	4.99776300	-0.98532800	0.34205900
H	5.14908700	-0.62276000	1.35911500
C	4.09297800	-0.34910300	-0.50331700
C	3.91359400	-0.78982400	-1.81932900
C	4.62776900	-1.87628400	-2.29697100
H	4.49911000	-2.19858400	-3.32879500
C	3.24228300	0.78323600	-0.03598000
C	2.98109900	0.01459000	-2.68443900
C	1.50630000	1.92584300	-2.51618300
C	1.85395500	3.26677800	-2.80058300
C	0.79808100	4.11907500	-3.17235900
H	1.00964400	5.17158900	-3.35075200
C	-0.51373500	3.69326700	-3.32357300
H	-1.28681300	4.40602800	-3.61015100
C	-0.82163000	2.35105900	-3.12184400
H	-1.83611800	1.97835200	-3.26340000
C	0.18399900	1.49013200	-2.71890800
H	-0.02945900	0.43665900	-2.53173400
C	3.25863500	3.88776900	-2.68872200
C	4.40918900	2.88101600	-2.78297200
H	5.35746400	3.42900900	-2.88713000
H	4.31033100	2.22382400	-3.65868900
H	4.49343300	2.25869400	-1.88762600
Cl	6.39760700	-3.91777100	-2.00884700
N	2.40026700	0.98452700	-1.94644500
O	3.57613700	1.76815800	0.56799600

O	2.87796300	-0.19854200	-3.89098300
C	3.36337600	4.62187000	-1.34747400
H	3.21823300	3.92677800	-0.50794600
H	2.61351400	5.42292000	-1.26690600
H	4.35752500	5.08290800	-1.23562700
C	3.49100400	4.90008900	-3.82154500
H	4.51960100	5.28419600	-3.76386700
H	2.83072900	5.77488300	-3.77324900
H	3.36484100	4.43477400	-4.81032200

SMD-M06/6-31G(d)/LANL2DZ

Electronic Energy (0K) = -3914.752085

Electronic Energy (0K) + ZPE = -3913.539522

Enthalpy (298K) = -3913.470001

Free Energy (298K) = -3913.641144

SMD-M06/6-311+G(d,p)/SDD

Electronic Energy (0K) = -3916.7015008

TS$_S$

Number of imaginary frequencies: 1

S	0.58509200	2.80137700	-0.53611800
O	-0.51309200	1.94831100	-1.14342500
N	0.98692800	2.19674100	1.01566100
H	0.14736000	2.20521700	1.60468200
C	1.53307600	0.82467600	1.01095100
H	0.90100600	0.16099200	0.39215900
C	-0.26348700	4.37131900	0.03627800
C	-1.43750900	4.04490300	0.94110200
H	-2.07496600	4.93616900	1.03252800
H	-2.05955100	3.23860000	0.52279800

H	-1.12721300	3.77327300	1.95942100
C	0.77538600	5.24560700	0.71579000
H	0.31323100	6.20839700	0.97880700
H	1.16169100	4.79401900	1.63813700
H	1.62408200	5.46303200	0.05091800
C	-0.74922100	5.00552700	-1.26036300
H	-1.19992300	5.98213900	-1.03508900
H	0.07378000	5.17558600	-1.97000900
H	-1.51077800	4.38767500	-1.75342400
C	1.45310300	0.32465100	2.44407200
C	0.42335100	-0.51716800	2.90948000
C	2.43467100	0.77394900	3.33452500
C	0.46672300	-0.91653000	4.25662500
C	2.44233400	0.38565600	4.66482000
H	3.21536100	1.43711500	2.96160100
C	1.45562700	-0.47911100	5.12622400
H	-0.29469000	-1.58796600	4.64298900
H	3.21901500	0.74942200	5.33572200
H	1.44990100	-0.81255200	6.16273200
C	2.93882800	0.73634600	0.45845700
C	3.77822900	1.82813700	0.29786000
C	3.42347900	-0.52698100	0.13495900
C	5.10610700	1.69047700	-0.12872600
H	3.39013800	2.81895200	0.53035900
C	4.74011800	-0.75113900	-0.26634000
H	2.74123900	-1.37269900	0.23318700
C	5.58899200	0.37946700	-0.32564700
P	-1.01622800	-1.06262400	1.86446800
C	-2.52051100	-0.98945800	2.99102600
C	-2.61317500	0.36260100	3.70441600

C	-2.82637100	-2.15124400	3.94219400
H	-3.32396200	-1.01281000	2.23517700
C	-3.96341900	0.54059100	4.39384200
H	-1.81397900	0.43636700	4.45976500
H	-2.44201100	1.18285500	2.98704600
C	-4.19647700	-1.95198800	4.58823700
H	-2.07540200	-2.22227000	4.74408800
H	-2.80588300	-3.10812500	3.40043300
C	-4.26985900	-0.62265500	5.32881800
H	-3.97567500	1.49308200	4.94348400
H	-4.75818000	0.61065500	3.63157900
H	-4.40908800	-2.78788900	5.27043800
H	-4.97500500	-1.98029600	3.80609400
H	-5.25960000	-0.49244600	5.79000900
H	-3.53684600	-0.62854300	6.15421500
C	-0.74765700	-2.88151800	1.50079500
C	-0.00940500	-3.69819400	2.56187900
C	-0.07371500	-3.06969500	0.14006800
H	-1.78205200	-3.25869200	1.40785900
C	0.04073800	-5.17422500	2.16932800
H	1.02095400	-3.31307100	2.65706400
H	-0.47796600	-3.59000400	3.55008000
C	-0.02006200	-4.53953100	-0.25729700
H	0.95466900	-2.66197100	0.18669200
H	-0.60832700	-2.48987600	-0.62687000
C	0.68742600	-5.37291300	0.80330500
H	0.58093700	-5.74459300	2.93928300
H	-0.98819600	-5.57362100	2.14669400
H	0.47232200	-4.64342200	-1.23686600
H	-1.05339100	-4.90603700	-0.38936300

H	0.68409900	-6.43760500	0.52783100
H	1.74739200	-5.06528900	0.85523500
C	5.89633900	2.99854000	-0.34226700
C	5.08212600	3.90624000	-1.27971700
C	7.27547200	2.86516200	-0.99577400
C	6.07924700	3.70911700	1.00435200
H	4.09002300	4.15889500	-0.88538100
H	4.93850600	3.43202900	-2.26160800
H	5.61626200	4.85404500	-1.44076800
H	8.01864800	2.37929300	-0.35430700
H	7.65116300	3.87743100	-1.20877100
H	7.23637400	2.31967400	-1.94664900
H	6.61641400	4.65935800	0.86400700
H	6.66568300	3.09650500	1.70503000
H	5.11998000	3.94173400	1.48781400
C	5.13329700	-2.21142700	-0.57574100
C	6.48521100	-2.41674900	-1.26709300
C	4.08706700	-2.82409200	-1.52187100
C	5.13519700	-3.01418900	0.73150100
H	7.34382800	-2.19738000	-0.62387300
H	6.58071800	-1.81538100	-2.18001400
H	6.56557000	-3.47529500	-1.55665400
H	3.07659400	-2.85058700	-1.09227800
H	4.36072200	-3.86332700	-1.75487800
H	4.03794000	-2.26990100	-2.47124800
H	5.38389800	-4.06785400	0.53277300
H	4.15464800	-2.99290000	1.22968000
H	5.87693100	-2.62503300	1.44450600
O	6.92507200	0.19367600	-0.57753800
C	7.68807600	0.02542700	0.59659200

H	7.37412600	-0.86322300	1.16892300
H	7.61434500	0.89889300	1.26547400
H	8.73421800	-0.10123400	0.29217900
Pd	-1.53594500	-0.07541700	-0.23902800
C	-5.63073400	2.59664400	-0.79524600
C	-5.72247000	1.87985800	0.39599800
H	-6.35993400	2.23631300	1.20275900
C	-5.00481600	0.69633300	0.53242800
H	-5.08767500	0.10927300	1.44677800
C	-4.18929000	0.26878000	-0.51318600
C	-4.12413900	0.99267600	-1.70557000
C	-4.86144700	2.15594700	-1.86651500
H	-4.83842900	2.69286300	-2.81303600
C	-3.32519300	-0.94542400	-0.43098100
C	-3.35782900	0.32889400	-2.81130200
C	-2.13300000	-1.71054100	-3.11142200
C	-0.91397600	-1.88224300	-3.82131300
C	-0.73835800	-3.11463900	-4.46924100
H	0.18133100	-3.29584900	-5.01924900
C	-1.68832000	-4.12977600	-4.46539600
H	-1.48485800	-5.06210900	-4.99111600
C	-2.89293300	-3.93174200	-3.80619200
H	-3.66699100	-4.69838200	-3.80326600
C	-3.09747300	-2.73127000	-3.14323000
H	-4.03324400	-2.55666400	-2.61425400
C	0.21063800	-0.83636000	-3.90668000
C	0.96322200	-0.80056600	-2.57405300
H	1.78930100	-0.07225400	-2.61718900
H	1.39075800	-1.78887300	-2.34529900
H	0.30079300	-0.51162400	-1.74667000

Cl	-6.54327600	4.08669100	-0.95865400
N	-2.49078300	-0.58887800	-2.31450900
O	-3.62513400	-2.07665900	-0.15353800
O	-3.60260300	0.57842700	-3.98874100
C	-0.32600800	0.55778400	-4.24091800
H	-0.98794500	0.94621600	-3.46443100
H	-0.87170300	0.55406900	-5.19511400
H	0.51657700	1.26039300	-4.33608000
C	1.24101500	-1.17599500	-4.98975700
H	1.97674700	-0.36121500	-5.04820800
H	0.78326400	-1.27718600	-5.98478500
H	1.80565600	-2.09443900	-4.77567100

SMD-M06/6-31G(d)/LANL2DZ

Electronic Energy (0K) = -3914.7501144

Electronic Energy (0K) + ZPE = -3913.537178

Enthalpy (298K) = -3913.467999

Free Energy (298K) = -3913.637086

SMD-M06/6-311+G(d,p)/SDD

Electronic Energy (0K) = -3916.699936

3.2 Optimized Structures and Associated Thermodynamic Data

2aa-GS

C	-2.15564900	-2.17110400	-0.20771800
C	-3.46402100	-2.58846900	-0.40381600
C	-4.46164500	-1.62656800	-0.48336900
C	-4.14684700	-0.27692300	-0.36049100
C	-2.83861000	0.18076000	-0.15444400
C	-1.84923500	-0.81754800	-0.08519300
N	-0.45921600	-0.51389900	0.08899900

C	-2.55538900	1.68191500	0.03438800
C	-3.77973300	2.53008200	-0.34586100
C	-2.24823600	1.94765700	1.51875800
C	-1.38006200	2.17358100	-0.83547600
C	0.43104600	-0.38924300	-0.99297600
C	1.78811800	-0.24493500	-0.37926000
C	1.65844400	-0.35799100	0.99758100
C	0.21571300	-0.57481400	1.31993600
O	0.13388300	-0.39763800	-2.15882600
O	-0.29046600	-0.75934900	2.39762200
C	3.01137400	-0.04270600	-0.99032400
C	4.11582300	0.04466600	-0.14130800
C	4.00273700	-0.06799200	1.24728500
C	2.75550400	-0.27453100	1.83694300
Cl	5.69038000	0.30260100	-0.83374200
H	-1.34430200	-2.88978600	-0.14871600
H	-3.69520200	-3.64375300	-0.49736700
H	-5.49416000	-1.92015600	-0.64289700
H	-4.95579500	0.43806500	-0.43292200
H	-3.52852000	3.58715200	-0.22456300
H	-4.07550200	2.36975500	-1.38749400
H	-4.63918000	2.32652500	0.29853300
H	-2.03363800	3.01158000	1.66709400
H	-1.39156500	1.37031400	1.87102200
H	-3.10578000	1.67902800	2.14286600
H	-0.41234000	1.92202200	-0.39760600
H	-1.42222900	1.75548100	-1.84478300
H	-1.41922100	3.26437800	-0.91092200
H	3.10903700	0.04289200	-2.06656400
H	4.89751000	0.00704000	1.85464600

H	2.64560300	-0.36658700	2.91199700

Zero-point correction= 0.302987 (Hartree/Particle)

Thermal correction to Energy= 0.322032

Thermal correction to Enthalpy= 0.322976

Thermal correction to Gibbs Free Energy= 0.255401

Sum of electronic and zero-point Energies= -1360.298543

Sum of electronic and thermal Energies= -1360.279498

Sum of electronic and thermal Enthalpies= -1360.278554

Sum of electronic and thermal Free Energies= -1360.346129

E(m062x/def2tzvp) = -1360.60153

2aa-TS

C	1.84116400	2.28830400	-0.10425900
C	3.04637700	2.96919400	-0.02927600
C	4.21541900	2.25747500	0.13270600
C	4.12910000	0.87507400	0.14598500
C	2.94402300	0.13111800	0.03702600
C	1.72279300	0.88882200	-0.02559400
N	0.31886000	0.41191000	-0.02460300
C	3.14079000	-1.39720900	-0.04124200
C	2.68910300	-2.04717700	1.29123900
C	2.50913300	-1.91920200	-1.35861600
C	4.62172900	-1.82376600	-0.17654200
C	-0.81217500	1.31077200	-0.00294700
C	-2.05162200	0.49439200	-0.00403800
C	-1.69819100	-0.82843500	0.02636600
C	-0.21856300	-0.92032600	0.04529800
O	-0.84835300	2.51551700	0.02459800
O	0.35654100	-1.97156400	0.11654700
C	-3.36926100	0.91719800	-0.01575400

C	-4.32622600	-0.09598400	-0.00056800
C	-3.98204900	-1.45357200	0.03081600
C	-2.64398700	-1.84066300	0.04750700
Cl	-6.01038500	0.33604800	-0.01908300
H	0.96375400	2.89256300	-0.21677400
H	3.04091100	4.05216400	-0.09125800
H	5.17916800	2.74720500	0.22211300
H	5.05857500	0.33323000	0.23163800
H	1.81476700	-1.57790000	1.73392900
H	2.46808400	-3.10910400	1.15132100
H	3.50486200	-1.95717000	2.01576900
H	2.24994300	-2.97774600	-1.27356900
H	3.24062500	-1.80726200	-2.16527200
H	1.61840700	-1.37809100	-1.66838500
H	5.10610600	-1.38006100	-1.05065100
H	5.21782800	-1.59950100	0.71162900
H	4.63385800	-2.91100300	-0.30616600
H	-3.63859600	1.96679200	-0.03505000
H	-4.77387800	-2.19384500	0.04347900
H	-2.35072600	-2.88417200	0.07607700

Zero-point correction = 0.303677 (Hartree/Particle)

Thermal correction to Energy = 0.321522

Thermal correction to Enthalpy = 0.322466

Thermal correction to Gibbs Free Energ y= 0.257038

Sum of electronic and zero-point Energies = -1360.252969

Sum of electronic and thermal Energies = -1360.235124

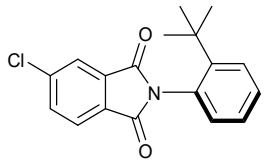
Sum of electronic and thermal Enthalpies = -1360.234180

Sum of electronic and thermal Free Energies = -1360.299608

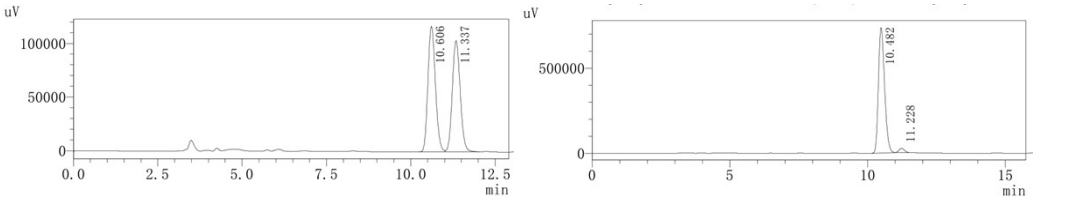
E(m062x/def2tzvp) = -1360.5566456

4. Characterization Data for the Products

(*R*)-2-(2-(*tert*-butyl)phenyl)-5-chloroisoindoline-1,3-dione (2aa)



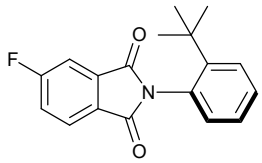
Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (30.8 mg, 98% yield) as a yellow solid: mp 182−183 °C; $[\alpha]_D^{25}$ = 11.0 (c = 0.46 in MeCN, 94% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.93 (d, J = 2.0 Hz, 1H), 7.90 (d, J = 8.0 Hz, 1H), 7.76 (dd, J = 8.0, 2.0 Hz, 1H), 7.63 (dd, J = 8.5, 1.5 Hz, 1H), 7.46−7.43 (m, 1H), 7.33−7.30 (m, 1H), 6.99 (dd, J = 8.0, 1.5 Hz, 1H), 1.31 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.6, 167.3, 149.2, 141.1, 134.4, 133.9, 131.2, 130.3, 130.0, 129.4, 128.8, 127.3, 125.1, 124.2, 35.6, 31.6; MS (EI) 313 (M^+); HRMS (ESI) m/z calcd for $C_{18}H_{17}ClNO_2^+$ $(M+H)^+$ 314.0942, found 314.0939. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 10.5 min, t (minor) = 11.2 min.



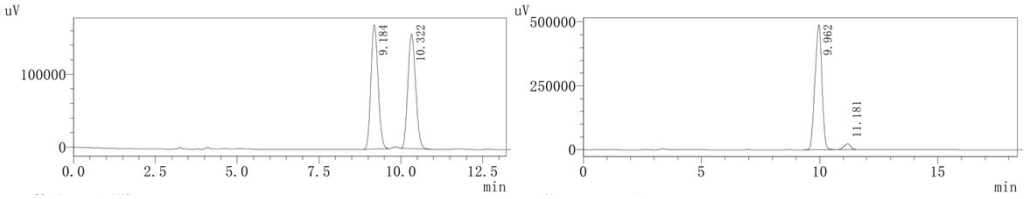
峰#	RT(min)	Area	Height	Area%	Height%
1	10.606	1810139	117122	51.746	53.057
2	11.337	1687962	103627	48.254	46.943
总计		3498102	220749	100.000	100.000

峰#	RT(min)	Area	Height	Area%	Height%
1	10.482	11412784	737109	97.100	96.757
2	11.228	340841	24705	2.900	3.243
总计		11753625	761814	100.000	100.000

(*R*)-2-(2-(*tert*-butyl)phenyl)-5-fluoroisoindoline-1,3-dione (2ab)



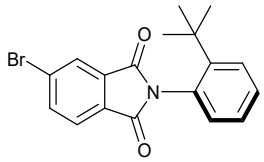
Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (29.4 mg, 99% yield) as a white solid: mp 142−143 °C; $[\alpha]_D^{25}$ = 10.7 (c = 0.38 in MeCN, 92% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.96 (dd, J = 8.0, 4.5 Hz, 1H), 7.64−7.62 (m, 2H), 7.48−7.42 (m, 2H), 7.33−7.30 (m, 1H), 6.99 (dd, J = 8.0, 1.5 Hz, 1H), 1.31 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.6 (d, J = 3.8 Hz), 167.2 (d, J = 2.5 Hz), 165.5, 149.2, 135.1 (d, J = 10.0 Hz), 131.2, 127.0, 129.5, 128.8, 128.1 (d, J = 2.5 Hz), 127.3, 126.2 (d, J = 10.0 Hz), 121.4 (d, J = 23.8 Hz), 111.6 (d, J = 2.5 Hz), 35.6, 31.6; MS (EI) 297 (M^+); HRMS (ESI) m/z calcd for $C_{18}H_{17}FNO_2^+$ $(M+H)^+$ 298.1238, found 298.1232. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 10.0 min, t (minor) = 11.2 min.



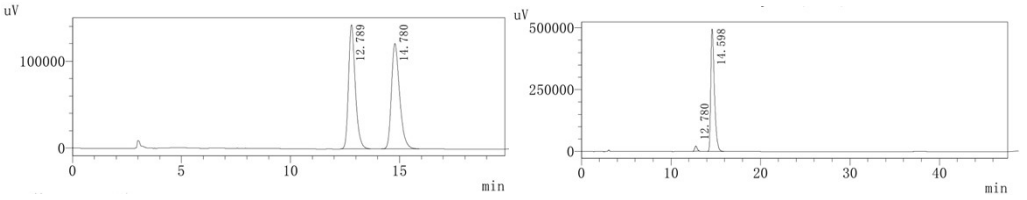
峰#	RT(min)	Area	Height	Area%	Height%
1	9.184	2605820	170572	50.026	51.973
2	10.322	2603132	157621	49.974	48.027
总计		5208952	328193	100.000	100.000

峰#	RT(min)	Area	Height	Area%	Height%
1	9.962	9978242	488208	95.777	95.597
2	11.181	439952	22486	4.223	4.403
总计		10418194	510694	100.000	100.000

(*R*)- 5-bromo-2-(2-(*tert*-butyl)phenyl)isoindoline-1,3-dione (2ac)



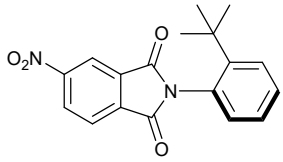
Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (28.1 mg, 79% yield) as a white solid: mp 172−173 °C; $[\alpha]_D^{25}$ = 11.8 (c = 0.29 in MeCN, 94% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 8.10 (d, J = 1.5 Hz, 1H), 7.93 (dd, J = 8.0, 1.5 Hz, 1H), 7.82 (d, J = 8.0 Hz, 1H), 7.63 (dd, J = 8.5, 1.5 Hz, 1H), 7.46−7.42 (m, 1H), 7.33−7.30 (m, 1H), 6.98 (dd, J = 8.0, 1.5 Hz, 1H), 1.31 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.8, 167.2, 149.2, 137.3, 133.9, 131.2, 130.8, 130.0, 129.4, 129.3, 128.8, 127.3, 127.1, 125.2, 35.6, 31.6; MS (EI) 357 (M^+); HRMS (ESI) m/z calcd for $C_{18}H_{17}BrNO_2^+$ $(M+H)^+$ 358.0437, found 358.0420. The enantiomeric ratio was determined by Daicel Chiralcel OD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 14.6 min, t (minor) = 12.8 min.



峰#	RT(min)	Area	Height	Area%	Height%
1	12.789	3117145	142556	49.787	54.051
2	14.780	3143846	121189	50.213	45.949
总计		6260990	263745	100.000	100.000

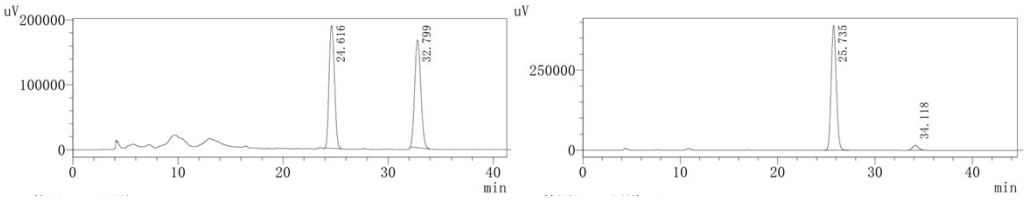
峰#	RT(min)	Area	Height	Area%	Height%
1	12.780	415237	21306	2.903	4.128
2	14.598	13888699	494796	97.097	95.872
总计		14303936	516102	100.000	100.000

(*R*)- 2-(2-(*tert*-butyl)phenyl)-5-nitroisoindoline-1,3-dione (2ad)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (30.8 mg, 95% yield) as a white solid: mp 160−161 °C; $[\alpha]_D^{25}$ = −17.7 (c = 0.30 in MeCN, 92% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 8.78 (d, J = 2.0 Hz, 1H), 8.68 (dd, J = 8.0, 2.0 Hz, 1H), 8.61 (d, 8.0 Hz, 1H), 7.66 (dd, J = 8.0, 1.5 Hz, 1H), 7.49−7.46 (m, 1H), 7.35−7.32 (m, 1H), 7.00 (dd, J = 7.5, 1.5 Hz, 1H), 1.31 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 166.5, 166.2, 152.0, 149.0, 136.6, 133.6, 131.0, 130.3, 129.6, 129.0, 128.9, 127.4, 125.1, 119.3, 35.6, 31.6; MS (EI) 324 (M^+); HRMS (ESI) m/z calcd for $C_{18}H_{17}N_2O_4^+$ $(M+H)^+$ 325.1183, found 325.1175. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, λ = 254

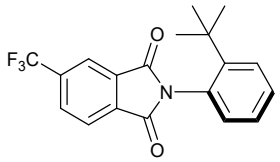
nm, t (major) = 25.7 min, t (minor) = 34.1 min.



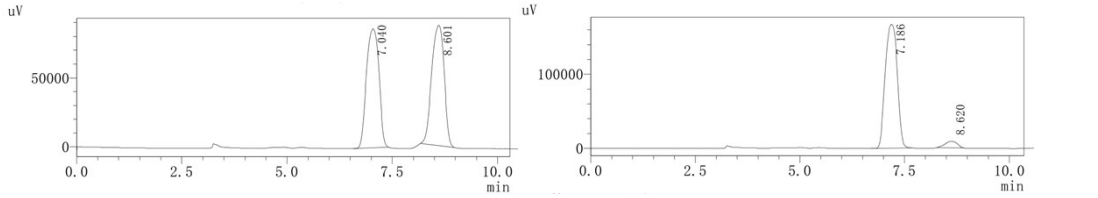
峰#	RT(min)	Area	Height	Area%	Height%
1	24.616	6786642	189123	50.097	53.190
2	32.799	6760396	166441	49.903	46.810
总计		13547037	355565	100.000	100.000

峰#	RT(min)	Area	Height	Area%	Height%
1	25.735	14266577	390092	95.766	96.200
2	34.118	630679	15410	4.234	3.800
总计		14897256	405502	100.000	100.000

(*R*)- 2-(2-(*tert*-butyl)phenyl)-5-(trifluoromethyl)isoindoline-1,3-dione (2ae)



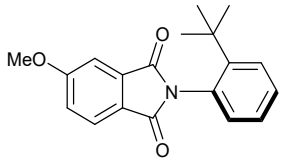
Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (32.3 mg, 93% yield) as a white solid: mp 120−121 °C; $[\alpha]_D^{25}$ = −12.1 (c = 0.22 in MeCN, 90% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 8.24 (dd, J = 1.5, 0.5 Hz, 1H), 8.10−8.09 (m, 2H), 7.65 (dd, J = 8.0, 1.5 Hz, 1H), 7.48−7.44 (m, 1H), 7.00 (dd, J = 8.0, 1.5 Hz, 1H), 1.32 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.2, 167.1, 149.2, 136.4 (q, J = 33.75 Hz) 135.0, 132.9, 131.5 (q, J = 47.5 Hz), 130.1, 129.2, 128.9, 127.4, 124.4, 123.0 (q, J = 271.3 Hz), 121.9, 121.1 (q, J = 3.8 Hz), 119.7, 35.6, 31.6; MS (EI) 347 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{17}F_3NO_2^+$ $(M+H)^+$ 348.1206, found 348.1229. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 7.2 min, t (minor) = 8.6 min.



峰#	RT(min)	Area	Height	Area%	Height%
1	7.040	1785868	86307	49.804	49.730
2	8.601	1799890	87245	50.196	50.270
总计		3585758	173552	100.000	100.000

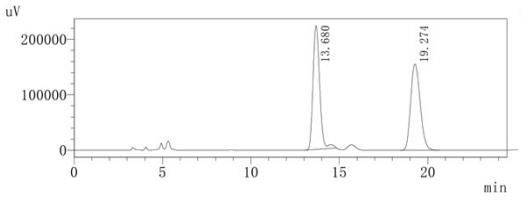
峰#	RT(min)	Area	Height	Area%	Height%
1	7.186	3357370	167328	94.763	94.853
2	8.620	185526	9079	5.237	5.147
总计		3542896	176407	100.000	100.000

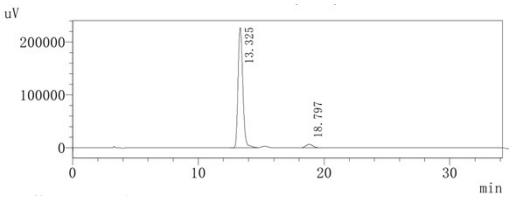
(*R*)- 2-(2-(*tert*-butyl)phenyl)-5-methoxyisoindoline-1,3-dione (2af)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (28.7 mg, 93% yield) as a white solid: mp 135−136 °C; $[\alpha]_D^{25}$ = 15.2 (c = 0.25 in MeCN, 93% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.86 (d, J = 8.0 Hz, 1H), 7.62 (dd, J = 8.0, 1.5 Hz, 1H), 7.44−7.40

(m, 2H), 7.32−7.30 (m, 1H), 7.24 (dd, *J* = 8.5, 2.5 Hz, 1H), 7.00 (dd, *J* = 7.5, 1.5 Hz, 1H), 3.95 (d, *J* = 1.5 Hz, 3H), 1.32 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 168.4, 168.4, 164.9, 149.3, 135.0, 131.4, 129.9, 129.7, 128.6, 127.2, 125.5, 124.2, 120.4, 108.2, 56.1, 35.5, 31.6; MS (EI) 309 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{20}NO_3^+$ $(M+H)^+$ 310.1438, found 310.1454. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 13.3 min, t (minor) = 18.8 min.

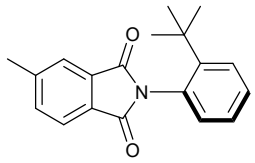




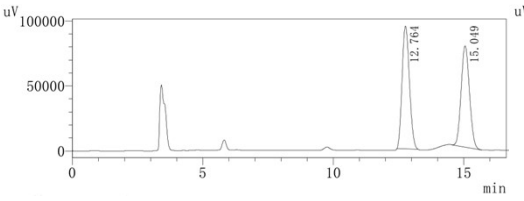
峰#	RT(min)	Area	Height	Area%	Height%
1	13.680	5898101	223080	50.388	58.916
2	19.274	5807240	155559	49.612	41.084
总计		11705341	378639	100.000	100.000

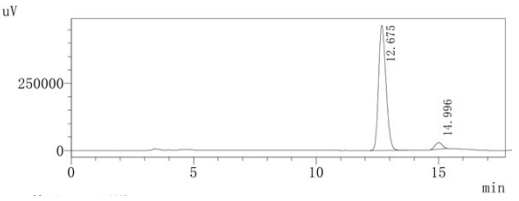
峰#	RT(min)	Area	Height	Area%	Height%
1	13.325	5980778	227816	96.343	97.304
2	18.797	226993	6313	3.657	2.696
总计		6207771	234128	100.000	100.000

(*R*)- 2-(2-(*tert*-butyl)phenyl)-5-methylisoindoline-1,3-dione (2ag)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (26.1 mg, 89% yield) as a white solid: mp 136−137 °C; $[\alpha]_D^{25}$ = 9.8 (c = 0.30 in MeCN, 90% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.84 (d, *J* = 8.0 Hz, 1H), 7.76 (d, *J* = 1.0 Hz, 1H), 7.63 (dd, *J* = 8.0, 1.5 Hz, 1H), 7.58 (dd, *J* = 7.5, 1.5 Hz, 1H), 7.44−7.41 (m, 1H), 7.32−7.29 (m, 1H), 7.00 (dd, *J* = 7.5, 1.5 Hz, 1H), 2.55 (s, 3H), 1.32 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 168.8, 168.7, 149.3, 145.6, 134.8, 132.7, 131.4, 129.9, 129.7, 129.7, 128.6, 127.2, 124.3, 123.7, 35.5, 31.6, 22.0; MS (EI) 293 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{20}NO_2^+$ $(M+H)^+$ 294.1489, found 294.1494. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 12.7 min, t (minor) = 15.0 min.

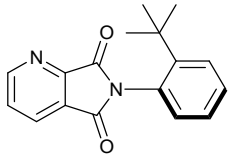




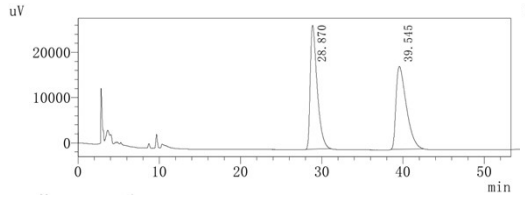
峰#	RT(min)	Area	Height	Area%	Height%
1	12.764	1841551	94538	51.623	54.808
2	15.049	1725757	77951	48.377	45.192
总计		3567308	172489	100.000	100.000

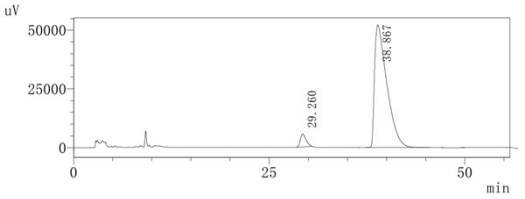
峰#	RT(min)	Area	Height	Area%	Height%
1	12.675	9843227	465558	95.084	95.009
2	14.996	508889	24457	4.916	4.991
总计		10352117	490015	100.000	100.000

(*R*)-6-(2-(*tert*-butyl)phenyl)-5*H*-pyrrolo[3,4-*b*]pyridine-5,7(6*H*)-dione (2ah)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (27.2 mg, 97% yield) as a white solid: mp 176−177 °C; $[\alpha]_D^{25}$ = −27.3 (c = 0.22 in MeCN, 90% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 9.27 (s, 1H), 9.14 (d, J = 4.5 Hz, 1H), 7.86 (dd, J = 5.0, 1.5 Hz, 1H), 7.65 (dd, J = 8.5, 1.5 Hz, 1H), 7.48−7.44 (m, 1H), 7.34−7.30 (m, 1H), 6.98 (dd, J = 8.0, 1.5 Hz, 1H), 1.30 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.4, 167.1, 155.9, 149.1, 145.3, 139.5, 131.1, 130.2, 129.0, 128.9, 127.4, 126.1, 117.2, 35.6, 31.6; MS (EI) 280 (M^+); HRMS (ESI) m/z calcd for $C_{17}H_{17}N_2O_2^+$ $(M+H)^+$ 281.1285, found 281.1285. The enantiomeric ratio was determined by Daicel Chiralcel OD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 38.9 min, t (minor) = 29.3 min.

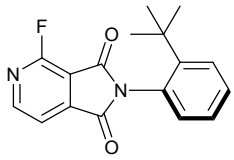




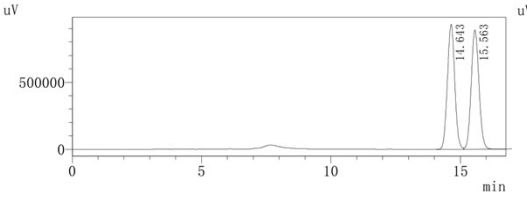
峰#	RT(min)	Area	Height	Area%	Height%
1	28.870	1620961	27356	50.012	59.881
2	39.545	1620185	18328	49.988	40.119
总计		3241146	45684	100.000	100.000

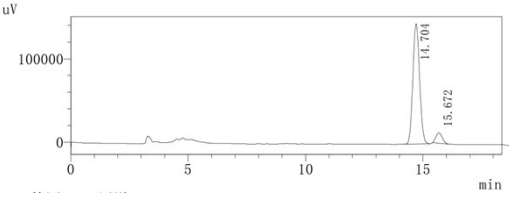
峰#	RT(min)	Area	Height	Area%	Height%
1	29.260	283188	5491	4.727	9.524
2	38.867	5707207	52163	95.273	90.476
总计		5990395	57653	100.000	100.000

(*R*)-2-(2-(*tert*-butyl)phenyl)-4-fluoro-1*H*-pyrrolo[3,4-*c*]pyridine-1,3(2*H*)-dione (2ai)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (26.2 mg, 88% yield) as a yellow solid: mp 165−166 °C; $[\alpha]_D^{25}$ = 42.9 (c = 0.35 in MeCN, 85% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 8.70 (d, J = 5.0 Hz, 1H), 7.79 (dd, J = 4.5, 2.0 Hz, 1H), 7.65 (dd, J = 8.5, 1.5 Hz, 1H), 7.48−7.45 (m, 1H), 7.34−7.30 (m, 1H), 6.97 (dd, J = 8.0,1.5 Hz, 1H), 1.31 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 165.8 (d, J = 3.8 Hz), 164.2 (d, J = 6.2 Hz), 159.0, 157.0, 155.5 (d, J = 13.8 Hz), 149.1, 145.2 (d, J = 2.5 Hz), 131.1, 130.3, 129.0, 128.6, 127.4, 116.0 (d, J = 6.2 Hz), 112.2 (d, J = 28.8 Hz), 35.6, 31.6; MS (EI) 298 (M^+); HRMS (ESI) m/z calcd for $C_{17}H_{16}FN_2O_2^+$ $(M+H)^+$ 299.1190, found 299.1190. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 14.7 min, t (minor) = 15.7 min.

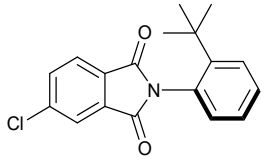




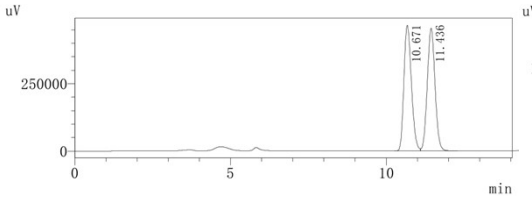
峰#	RT(min)	Area	Height	Area%	Height%
1	14.643	18454486	932249	49.844	51.139
2	15.563	18570072	890724	50.156	48.861
总计		37024558	1822973	100.000	100.000

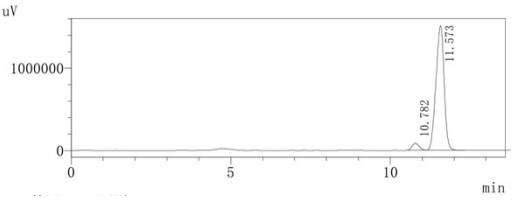
峰#	RT(min)	Area	Height	Area%	Height%
1	14.704	2872692	144342	92.487	92.075
2	15.672	233370	12424	7.513	7.925
总计		3106062	156766	100.000	100.000

(*S*)-2-(2-(*tert*-butyl)phenyl)-5-chloroisoindoline-1,3-dione (2aj)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (31.0 mg, 99% yield) as a white solid: mp 182−183 °C; $[\alpha]_D^{25}$ = −9.1 (c = 0.29 in MeCN, 91% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.86 (t, J = 2.5 Hz, 1H), 7.82 (dd, J = 7.5, 2.5 Hz, 1H), 7.70−7.67 (m, 1H), 7.58−7.54 (m, 1H), 7.39−7.34 (m, 1H), 7.25−7.18 (m, 1H), 6.93−6.90 (m, 1H), 1.25 (dd, J = 4.0, 2.0 Hz, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.6, 167.3, 149.2, 141.1, 134.4, 134.0, 131.2, 130.3, 130.0, 129.4, 128.8, 127.3, 125.1, 124.2, 35.6, 31.6; MS (EI) 313 (M^+); HRMS (ESI) m/z calcd for $C_{18}H_{17}ClNO_2^+$ $(M+H)^+$ 314.0942, found 314.0939. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 10.8 min, t (minor) = 11.6 min.

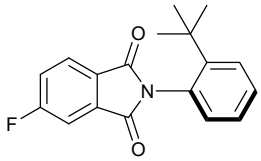




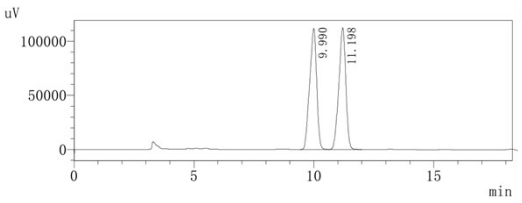
峰#	RT(min)	Area	Height	Area%	Height%
1	10.671	7815102	466650	49.825	50.607
2	11.436	7869871	455448	50.175	49.393
总计		15684973	922098	100.000	100.000

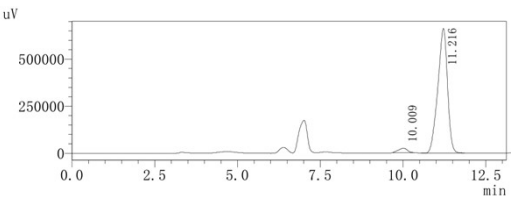
峰#	RT(min)	Area	Height	Area%	Height%
1	10.782	1295194	84354	4.582	5.269
2	11.573	26968988	1516742	95.418	94.731
总计		28264181	1601097	100.000	100.000

(*S*)-2-(2-(*tert*-butyl)phenyl)-5-fluoroisoindoline-1,3-dione (2ak)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (26.7 mg, 90% yield) as a white solid: mp 142−143 °C; $[\alpha]_D^{25}$ = −12.0 (c = 0.18 in MeCN, 94% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.96 (dd, J = 8.0, 4.5 Hz, 1H), 7.74−7.62 (m, 2H), 7.48−7.43 (m, 2H), 7.33−7.30 (m, 1H), 6.99 (dd, J = 8.0, 1.5 Hz, 1H), 1.31 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.5 (d, J = 7.5 Hz), 167.2 (d, J = 3.8 Hz), 165.5, 149.2, 135.1 (d, J = 5.0 Hz), 131.2, 130.0, 129.5, 128.8, 128.1 (d, J = 2.5 Hz), 127.3, 126.2 (d, J = 8.8 Hz), 121.4 (d, J = 23.8 Hz), 111.5 (d, J = 25.0 Hz), 35.6, 31.6; MS (EI) 297 (M^+), HRMS (ESI) m/z calcd for $C_{18}H_{17}FNO_2^+$ $(M+H)^+$ 298.1238, found 298.1232. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 11.2 min, t (minor) = 10.0 min.

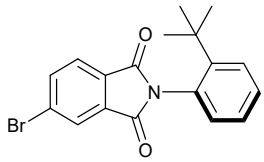




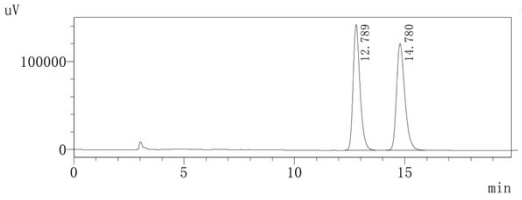
峰#	RT(min)	Area	Height	Area%	Height%
1	9.990	2267806	111717	49.939	49.850
2	11.198	2273320	112390	50.061	50.150
总计		4541125	224107	100.000	100.000

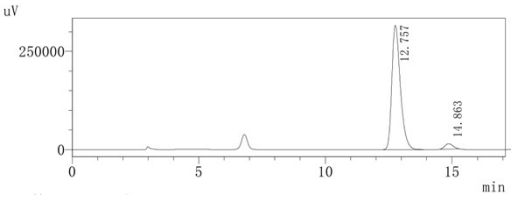
峰#	RT(min)	Area	Height	Area%	Height%
1	10.009	438518	24021	3.158	3.501
2	11.216	13448851	662013	96.842	96.499
总计		13887370	686034	100.000	100.000

(*S*)-5-bromo-2-(2-(*tert*-butyl)phenyl)isoindoline-1,3-dione (2al)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (31.8 mg, 89% yield) as a white solid: mp 172−173 °C; $[\alpha]_D^{25}$ = 17.1 (c = 0.15 in MeCN, 92% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 8.10 (s, 1H), 7.95−7.93 (m, 1H), 7.82 (d, J = 8.0 Hz, 1H), 7.63 (d, J = 8.0 Hz, 1H), 7.46−7.42 (m, 1H), 7.31 (t, J = 7.5 Hz, 1H), 6.98 (dd, J = 8.0, 1.5 Hz, 1H), 1.31 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.8, 167.2, 149.2, 137.3, 133.9, 131.2, 130.8, 130.0, 129.4, 129.3, 128.8, 127.3, 127.2, 125.2, 35.6, 31.6; MS (EI) 357 (M^+); HRMS (ESI) m/z calcd for $C_{18}H_{17}BrNO_2^+$ $(M+H)^+$ 358.0437, found 358.0420. The enantiomeric ratio was determined by Daicel Chiralcel OD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 12.8 min, t (minor) = 14.9 min.

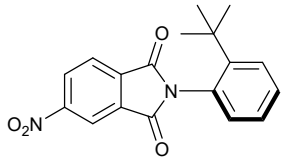




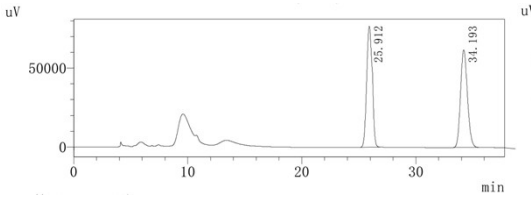
峰#	RT(min)	Area	Height	Area%	Height%
1	12.789	3117145	142556	49.787	54.051
2	14.780	3143846	121189	50.213	45.949
总计		6260990	263745	100.000	100.000

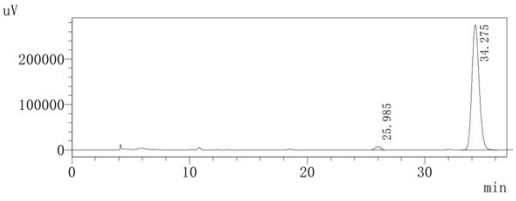
峰#	RT(min)	Area	Height	Area%	Height%
1	12.757	7373586	315902	95.958	95.790
2	14.863	310558	13883	4.042	4.210
总计		7684144	329784	100.000	100.000

(*S*)-2-(2-(*tert*-butyl)phenyl)-5-nitroisoindoline-1,3-dione (2am)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (28.8 mg, 89% yield) as a white solid: mp 160−161 °C; $[\alpha]_D^{25}$ = 12.0 (c = 0.35 in MeCN, 96% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 8.78 (d, J = 2.0 Hz, 1H), 8.68 (dd, J = 8.0, 2.0 Hz, 1H), 8.16 (d, J = 8.0 Hz, 1H), 7.66 (dd, J = 8.0, 1.5 Hz, 1H), 7.49−7.46 (m, 1H), 7.35−7.32 (m, 1H), 7.00 (dd, J = 7.5, 1.5 Hz, 1H), 1.31 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 166.5, 166.2, 152.0, 149.1, 136.6, 133.6, 131.0, 130.3, 129.6, 129.0, 128.9, 127.4, 125.1, 119.2, 35.6, 31.6; MS (EI) 324 (M^+); HRMS (ESI) m/z calcd for $C_{18}H_{17}N_2O_4^+$ $(M+H)^+$ 325.1183, found 325.1175. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 34.3 min, t (minor) = 26.0 min.

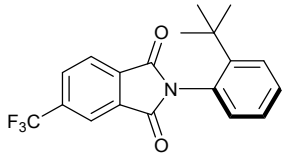




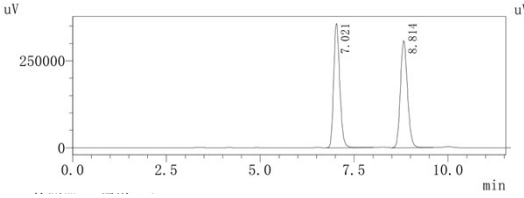
峰#	RT(min)	Area	Height	Area%	Height%
1	25.912	2618453	76898	50.192	55.346
2	34.193	2598429	62042	49.808	44.654
总计		5216882	138940	100.000	100.000

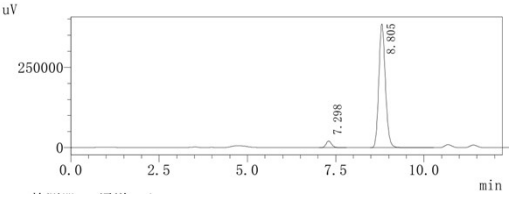
峰#	RT(min)	Area	Height	Area%	Height%
1	25.985	246239	7425	2.051	2.628
2	34.275	11758971	275127	97.949	97.372
总计		12005211	282552	100.000	100.000

(*S*)-2-(2-(*tert*-butyl)phenyl)-5-(trifluoromethyl)isoindoline-1,3-dione (2an)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (34.4 mg, 99% yield) as a white solid: mp 120−121 °C; $[\alpha]_D^{25}$ = 16.7 (c = 0.20 in MeCN, 91% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 8.24 (s, 1H), 8.11−8.07 (m, 2H), 7.65 (dd, J = 8.0, 1.5 Hz, 1H), 7.48−7.44 (m, 1H), 7.34−7.31 (m, 1H), 7.00 (dd, J = 7.5, 1.5 Hz, 1H), 1.32 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.2, 167.1, 149.2, 136.4 (q, J = 32.5 Hz), 135.0, 132.9, 131.5 (q, J = 2.5 Hz), 131.1, 130.1, 129.2, 128.9, 127.4, 124.4, 123.0 (q, J = 271.2 Hz), 121.1 (d, J = 3.8 Hz), 35.6, 31.6; MS (EI) 347 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{17}F_3NO_2^+$ $(M+H)^+$ 348.1206, found 348.1229. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 8.8 min, t (minor) = 7.3 min.

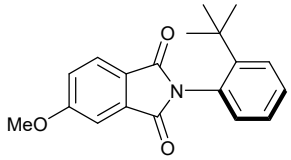




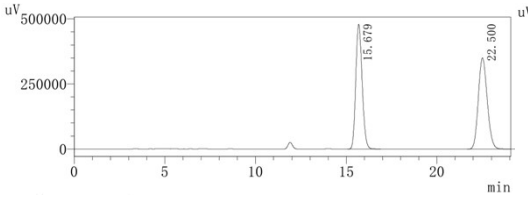
峰#	RT(min)	Area	Height	Area%	Height%
1	7.021	4008415	357098	49.822	53.745
2	8.814	4037071	307327	50.178	46.255
总计		8045486	664425	100.000	100.000

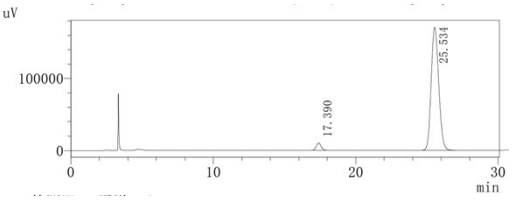
峰#	RT(min)	Area	Height	Area%	Height%
1	7.298	230018	20654	4.381	5.085
2	8.805	5020883	385542	95.619	94.915
总计		5250901	406196	100.000	100.000

(*S*)-2-(2-(*tert*-butyl)phenyl)-5-methoxyisoindoline-1,3-dione (2ao)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (24.7 mg, 80% yield) as a white solid: mp 135−136 °C; $[\alpha]_D^{25}$ = −14.7 (c = 0.14 in MeCN, 93% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.86 (d, J = 8.5 Hz, 1H), 7.63 (dd, J = 8.5, 1.5 Hz, 1H), 7.44−7.41 (m, 2H), 7.32−7.29 (m, 1H), 7.24 (dd, J = 8.5, 2.5 Hz, 1H), 7.00 (dd, J = 7.5, 1.5 Hz, 1H), 3.95 (s, 3H), 1.32 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 168.5, 168.4, 164.9, 149.3, 135.0, 131.4, 129.9, 129.7, 128.6, 127.2, 125.5, 124.2, 120.4, 108.2, 56.1, 35.5, 31.6; MS (EI) 309 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{20}NO_3^+$ $(M+H)^+$ 310.1438, found 310.1454. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, λ = 254 nm, t (major) = 25.5 min, t (minor) = 17.4 min.

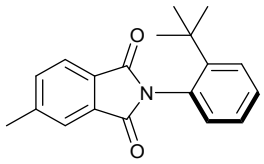




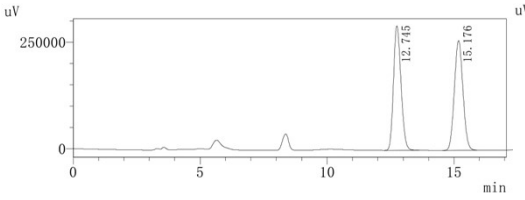
峰#	RT(min)	Area	Height	Area%	Height%
1	15.679	11706045	480410	49.335	57.779
2	22.500	12021499	351048	50.665	42.221
总计		23727543	831458	100.000	100.000

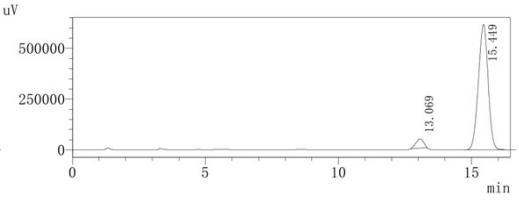
峰#	RT(min)	Area	Height	Area%	Height%
1	17.390	233832	10132	3.596	5.603
2	25.534	6268630	170694	96.404	94.397
总计		6502462	180826	100.000	100.000

(*S*)-2-(2-(*tert*-butyl)phenyl)-5-methylisoindoline-1,3-dione (2ap)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (26.4 mg, 90% yield) as a white solid: mp 136−137 °C; $[\alpha]_D^{25}$ = −8.5 (c = 0.54 in MeCN, 89% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.84 (d, J = 8.0 Hz, 1H), 7.76 (d, J = 1.5 Hz, 1H), 7.63 (dd, J = 8.5, 1.5 Hz, 1H), 7.59−7.58 (m, 1H), 7.44−7.41 (m, 1H), 7.32−7.29 (m, 1H), 7.00 (dd, J = 8.0, 1.5 Hz, 1H), 2.55 (s, 3H), 1.32 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 168.8, 168.7, 149.3, 145.6, 139.2, 134.8, 132.7, 131.4, 129.9, 129.7, 128.6, 127.2, 124.3, 123.7, 35.5, 31.6, 22.0; MS (EI) 293 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{20}NO_2^+$ $(M+H)^+$ 294.1489, found 294.1494. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 15.4 min, t (minor) = 13.1 min.

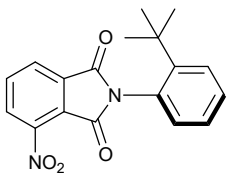




峰#	RT(min)	Area	Height	Area%	Height%
1	12.745	5981638	292076	49.763	53.151
2	15.176	6038729	257449	50.237	46.849
总计		12020367	549525	100.000	100.000

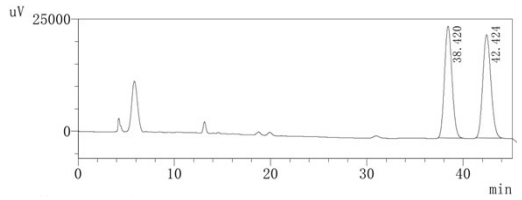
峰#	RT(min)	Area	Height	Area%	Height%
1	13.069	912170	45232	5.493	6.829
2	15.449	15694269	617130	94.507	93.171
总计		16606439	662362	100.000	100.000

(*S*)-2-(2-(*tert*-butyl)phenyl)-4-nitroisoindoline-1,3-dione (2aq)

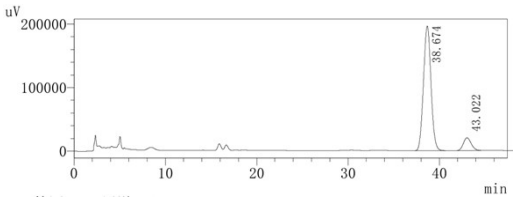


Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (31.8 mg, 98% yield) as a yellow oil; $[\alpha]_D^{25}$ = −74.7 (c = 0.47 in MeCN, 81% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 8.21 (dd, J = 7.5, 1.0 Hz, 1H), 8.17 (dd, J = 8.5, 1.0 Hz, 1H), 7.98 (dd, J = 8.0, 7.5 Hz, 1H), 7.64 (dd, J = 8.5, 1.5 Hz, 1H), 7.47−7.44 (m, 1H), 7.33−7.30 (m, 1H), 6.99 (dd, J = 7.5, 2.0 Hz, 1H), 1.32 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 166.1, 163.0, 149.1, 145.4, 135.7, 134.2, 131.1, 130.2, 128.9, 128.9, 128.9, 127.5, 127.4, 123.9, 35.6, 31.6; MS (EI) 324 (M^+);

HRMS (ESI) m/z calcd for $C_{18}H_{17}N_2O_4^+$ $(M+H)^+$ 325.1183, found 325.1183. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 38.7 min, t (minor) = 42.0 min.

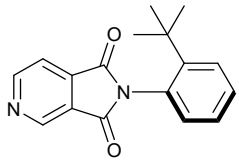


峰#	RT(min)	Area	Height	Area%	Height%
1	38.420	1347198	24932	49.906	51.988
2	42.424	1352271	23025	50.094	48.012
总计		2699469	47957	100.000	100.000

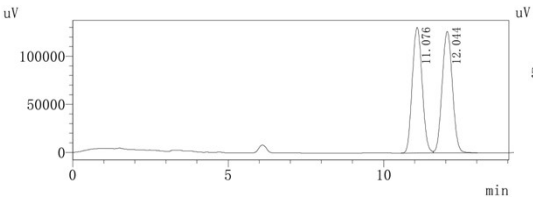


峰#	RT(min)	Area	Height	Area%	Height%
1	38.674	11227372	196191	90.372	90.710
2	43.022	1196170	20092	9.628	9.290
总计		12423542	216282	100.000	100.000

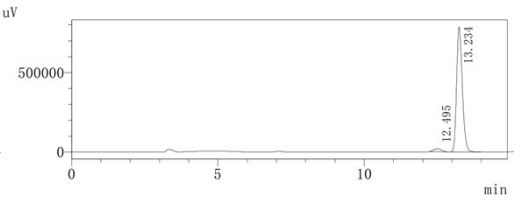
(*S*)-2-(2-(*tert*-butyl)phenyl)-1*H*-pyrrolo[3,4-*c*]pyridine-1,3(2*H*)-dione (2ar)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (23.1 mg, 79% yield) as a white solid: mp 169−170 °C; $[\alpha]_D^{25}$ = 11.9 (c = 0.43 in MeCN, 94% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 8.10 (d, J = 1.5 Hz, 1H), 7.93 (dd, J = 8.0, 1.5 Hz, 1H), 7.82 (d, J = 8.0 Hz, 1H), 7.63 (dd, J = 8.0, 1.5 Hz, 1H), 7.46−7.42 (m, 1H), 7.33−7.26 (m, 1H), 6.98 (dd, J = 8.0, 1.5 Hz, 1H), 1.31 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.8, 167.2, 149.2, 137.3, 133.9, 131.2, 130.8, 130.0, 129.3, 128.8, 127.3, 127.1, 125.2, 35.6, 31.6; MS (EI) 280 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{20}NO_2^+$ $(M+H)^+$ 281.1285, found 281.1285. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 13.2 min, t (minor) = 12.5 min.

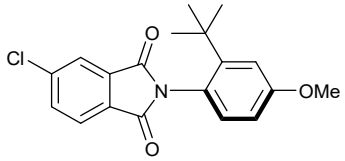


峰#	RT(min)	Area	Height	Area%	Height%
1	11.076	2878740	130309	49.784	50.800
2	12.044	2903697	126205	50.216	49.200
总计		5782437	256514	100.000	100.000



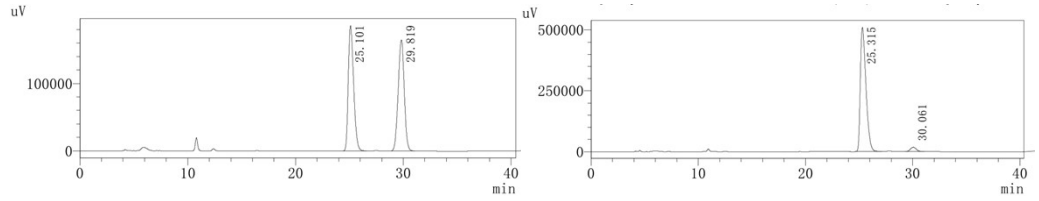
峰#	RT(min)	Area	Height	Area%	Height%
1	12.495	340682	18486	3.104	2.300
2	13.234	10633938	785143	96.896	97.700
总计		10974621	803629	100.000	100.000

(*R*)-2-(2-(*tert*-butyl)-4-methoxyphenyl)-5-chloroisoindoline-1,3-dione (2ba)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (33.6 mg, 98% yield) as a white solid: mp 98−99 °C; $[\alpha]_D^{25}$ = 13.2 (c = 0.24 in MeCN, 93% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.92 (d, J = 1.5 Hz, 1H), 7.88 (d, J = 8.0 Hz, 1H), 7.75 (dd, J = 8.0,

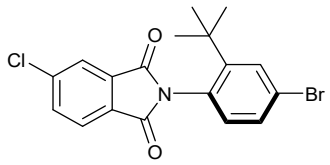
2.0 Hz, 1H), 7.14 (d, *J* = 3.0 Hz, 1H), 6.92 (d, *J* = 8.5 Hz, 1H), 6.83 (dd, *J* = 8.0, 2.5 Hz, 1H), 3.83 (s, 3H), 1.28 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.9, 167.6, 160.2, 150.6, 141.0, 134.3, 133.9, 132.2, 130.3, 125.0, 124.2, 121.9, 115.4, 111.4, 55.3, 35.5, 31.4; MS (EI) 343 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{19}ClNO_3^+$ $(M+H)^+$ 344.1048, found 344.1052. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 25.3 min, t (minor) = 30.1 min.



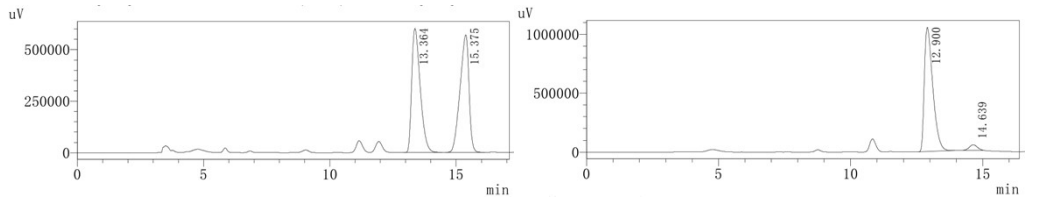
峰#	RT(min)	Area	Height	Area%	Height%
1	25.101	6422020	186050	49.907	53.002
2	29.819	6445829	164975	50.093	46.998
总计		12867849	351025	100.000	100.000

峰#	RT(min)	Area	Height	Area%	Height%
1	25.315	18527184	510244	96.446	96.579
2	30.061	682655	18075	3.554	3.421
总计		19209839	528319	100.000	100.000

(*R*)-2-(4-bromo-2-(*tert*-butyl)phenyl)-5-chloroisoindoline-1,3-dione (2bb)



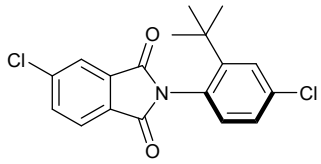
Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (38.6 mg, 99% yield) as a white solid: mp 116−117 °C; $[\alpha]_D^{25}$ = 17.5 (c = 0.24 in MeCN, 92% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.92 (d, *J* = 2.0 Hz, 1H), 7.89 (d, *J* = 8.0 Hz, 1H), 7.78−7.74 (m, 2H), 7.44 (dd, *J* = 8.5, 2.0 Hz, 1H), 6.86 (d, *J* = 8.0 Hz, 1H), 1.29 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.3, 167.0, 151.6, 141.3, 134.6, 133.8, 132.8, 132.2, 130.5, 130.2, 128.6, 125.1, 124.4, 124.3, 35.8, 31.4; MS (EI) 391 (M^+); HRMS (ESI) m/z calcd for $C_{18}H_{16}BrClNO_2^+$ $(M+H)^+$ 392.0047, found 392.0016. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 12.9 min, t (minor) = 14.6 min.



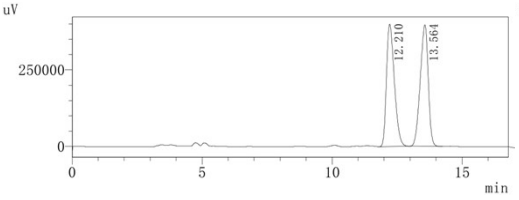
峰#	RT(min)	Area	Height	Area%	Height%
1	13.364	14119126	602716	50.095	51.356
2	15.375	14065720	570886	49.905	48.644
总计		28184846	1173602	100.000	100.000

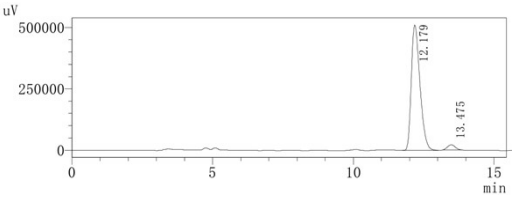
峰#	RT(min)	Area	Height	Area%	Height%
1	12.900	23535009	1053754	96.071	95.798
2	14.639	962626	46222	3.929	4.202
总计		24497634	1099976	100.000	100.000

(*R*)-2-(2-(*tert*-butyl)-4-chlorophenyl)-5-chloroisoindoline-1,3-dione (2bc)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (34.0 mg, 98% yield) as a white solid: mp 143−144 °C; $[\alpha]_D^{25}$ = 8.2 (c = 0.30 in MeCN, 93% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.93 (d, J = 1.5 Hz, 1H), 7.89 (d, J = 8.0 Hz, 1H), 7.77 (dd, J = 8.0, 2.0 Hz, 1H), 7.59 (d, J = 2.5 Hz, 1H), 7.29 (dd, J = 8.0, 2.5 Hz, 1H), 6.93 (d, J = 8.0 Hz, 1H), 1.29 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.4, 167.1, 151.3, 141.3, 136.0, 134.6, 133.8, 132.6, 130.2, 129.2, 128.1, 127.5, 125.2, 124.4, 35.8, 31.4; MS (EI) 347 (M^+); HRMS (ESI) m/z calcd for $C_{18}H_{16}Cl_2NO_2^+$ $(M+H)^+$ 348.0553, found 348.0568. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 12.2 min, t (minor) = 13.5 min.

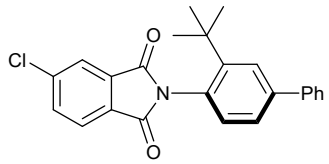




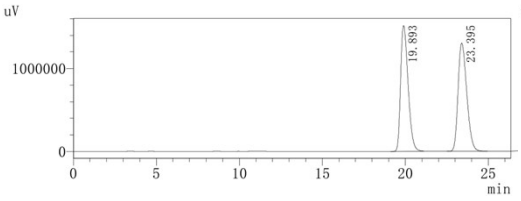
峰#	RT(min)	Area	Height	Area%	Height%
1	12.210	8404677	399047	49.782	50.151
2	13.564	8478158	396644	50.218	49.849
总计		16882835	795691	100.000	100.000

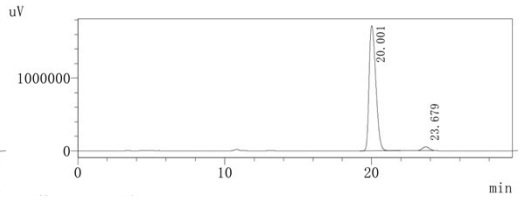
峰#	RT(min)	Area	Height	Area%	Height%
1	12.179	10938038	511029	96.419	95.996
2	13.475	406195	21318	3.581	4.004
总计		11344233	532347	100.000	100.000

(*R*)-2-(3-(*tert*-butyl)-[1,1'-biphenyl]-4-yl)-5-chloroisoindoline-1,3-dione (2bd)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (38.1 mg, 98% yield) as a white solid: mp 178−179 °C; $[\alpha]_D^{25}$ = 16.1 (c = 0.27 in MeCN, 94% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.95 (d, J = 1.5 Hz, 1H), 7.92 (d, J = 8.0 Hz, 1H), 7.81 (d, J = 2.0 Hz, 1H), 7.78 (dd, J = 8.0, 1.5 Hz, 1H), 7.61−7.59 (m, 2H), 7.51 (dd, J = 8.0, 2.0 Hz, 1H), 7.48−7.45 (m, 2H), 7.40−7.37 (m, 1H), 7.07 (d, J = 8.0 Hz, 1H), 1.36 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.7, 167.4, 149.4, 143.0, 141.2, 140.7, 134.4, 135.0, 131.6, 130.4, 128.8, 128.5, 128.0, 127.7, 127.4, 126.2, 125.1, 124.3, 35.8, 31.6; MS (EI) 389 (M^+); HRMS (ESI) m/z calcd for $C_{24}H_{21}ClNO_2^+$ $(M+H)^+$ 390.1255, found 390.1237. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 20.0 min, t (minor) = 23.7 min.

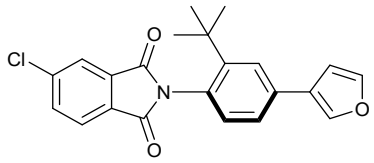




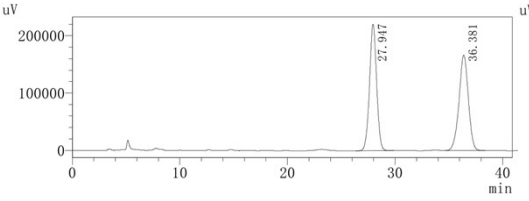
峰#	RT(min)	Area	Height	Area%	Height%
1	19.893	47309116	1516538	49.794	53.717
2	23.395	47701358	1306638	50.206	46.283
总计		95010474	2823176	100.000	100.000

峰#	RT(min)	Area	Height	Area%	Height%
1	20.001	54522243	1717373	97.133	97.082
2	23.679	1609567	51623	2.867	2.918
总计		56131810	1768996	100.000	100.000

(*R*)-2-(2-(*tert*-butyl)-4-(furan-3-yl)phenyl)-5-chloroisoindoline-1,3-dione (2be)



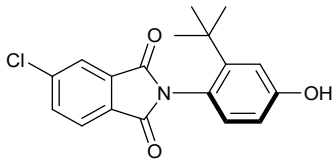
Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (36.8 mg, 97% yield) as a white solid: mp 175−176 °C; $[\alpha]_D^{25}$ = −18.0 (c = 0.20 in MeCN, 95% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.94 (d, J = 2.0 Hz, 1H), 7.90 (d, J = 2.0 Hz, 1H), 7.76 (d, J = 5.0 Hz, 2H), 7.72 (d, J = 2.0 Hz, 1H), 7.50 (d, J = 1.8 Hz, 1H), 7.41 (dd, J = 7.5, 2.0 Hz, 1H), 7.00 (d, J = 8.0 Hz, 1H), 6.71 (d, J = 2.0 Hz, 1H), 1.34 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.7, 167.3, 149.6, 143.8, 141.1, 138.9, 134.4, 134.2, 133.9, 131.7, 130.3, 128.3, 126.4, 126.0, 125.1, 124.9, 124.2, 109.0, 35.6, 31.6; MS (EI) 379 (M^+); HRMS (ESI) m/z calcd for $C_{22}H_{19}ClNO_3^+$ $(M+H)^+$ 380.1048, found 380.1028. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 27.9 min, t (minor) = 36.5 min.



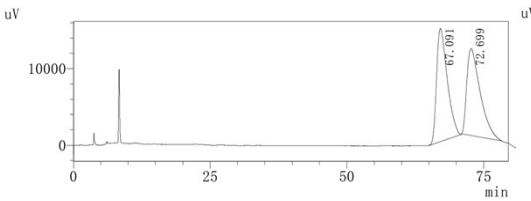
峰#	RT(min)	Area	Height	Area%	Height%
1	27.947	10110194	220832	50.089	56.961
2	36.381	10074403	166855	49.911	43.039
总计		20184598	387688	100.000	100.000

峰#	RT(min)	Area	Height	Area%	Height%
1	27.927	28690917	614094	97.412	97.748
2	36.533	762199	14150	2.588	2.252
总计		29453116	628244	100.000	100.000

(*R*)-2-(2-(*tert*-butyl)-4-hydroxyphenyl)-5-chloroisoindoline-1,3-dione (2bf)



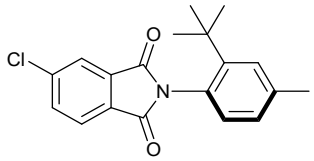
Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (18.0 mg, 55% yield) as a brown solid: mp 177−178 °C; $[\alpha]_D^{25}$ = 23.3 (c = 0.23 in MeCN, 96% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.92 (d, J = 2.0 Hz, 1H), 7.89 (d, J = 8.0 Hz, 1H), 7.76 (dd, J = 7.5, 1.5 Hz, 1H), 7.02 (d, J = 3.0 Hz, 1H), 6.79 (dd, J = 8.5, 0.5 Hz, 1H), 6.64−6.61 (m, 1H), 1.26 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 168.3, 167.9, 156.8, 150.8, 141.2, 134.5, 133.8, 132.2, 130.2, 125.1, 124.3, 121.4, 115.9, 114.3, 35.5, 31.4; MS (EI) 329 (M^+). HRMS (ESI) m/z calcd for $C_{18}H_{17}ClNO_3^+$ $(M+H)^+$ 330.0891, found 330.0897. The enantiomeric ratio was determined by Daicel Chiralcel OD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 70.5 min, t (minor) = 66.9 min.



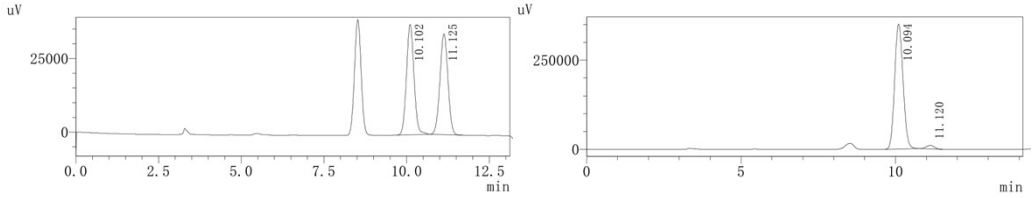
峰#	RT(min)	Area	Height	Area%	Height%
1	67.091	2004642	14761	50.905	56.487
2	72.699	1933380	11371	49.095	43.513
总计		3938022	26132	100.000	100.000

峰#	RT(min)	Area	Height	Area%	Height%
1	66.936	154201	1600	2.173	4.221
2	70.462	6940993	36298	97.827	95.779
总计		7095194	37898	100.000	100.000

(*R*)- 2-(2-(*tert*-butyl)-4-methylphenyl)-5-chloroisoindoline-1,3-dione (2bg)



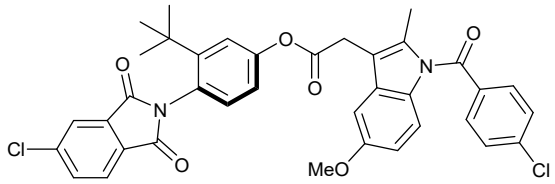
Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (27.1 mg, 83% yield) as a white solid: mp 172−173 °C; $[\alpha]_D^{25}$ = 10.7 (c = 0.24 in MeCN, 95% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.93 (d, J = 1.5 Hz, 1H), 7.89 (d, J = 8.0 Hz, 1H), 7.75 (dd, J = 8.0, 1.5 Hz, 1H), 7.42 (d, J = 1.5 Hz, 1H), 7.13−7.11 (m, 1H), 6.87 (d, J = 8.0 Hz, 1H), 2.40 (s, 3H), 1.29 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 167.8, 167.4, 148.7, 141.0, 139.8, 134.3, 134.0, 131.0, 130.4, 129.6, 128.1, 126.7, 125.0, 124.2, 35.4, 31.6, 21.6; MS (EI) 327 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{19}ClNO_2^+$ $(M+H)^+$ 328.1099, found 328.1096 The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 10.1 min, t (minor) = 11.1 min.



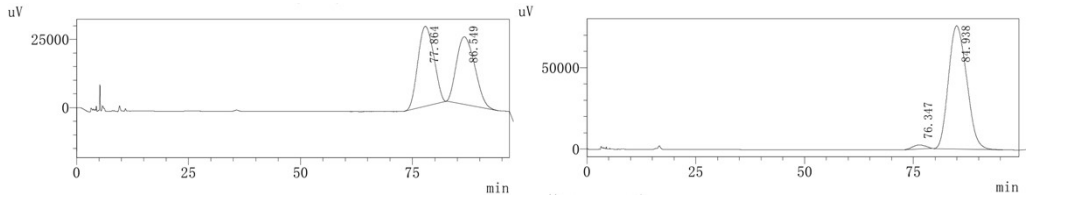
峰#	RT(min)	Area	Height	Area%	Height%
1	10.102	594847	37473	50.817	52.287
2	11.125	575725	34194	49.183	47.713
总计		1170571	71667	100.000	100.000

峰#	RT(min)	Area	Height	Area%	Height%
1	10.094	6604206	350486	97.362	97.253
2	11.120	178905	9898	2.638	2.747
总计		6783111	360384	100.000	100.000

(*R*)-3-(*tert*-butyl)-4-(5-chloro-1,3-dioxoisoindolin-2-yl)phenyl 2-(1-(4-chloro-benzoyl)-5-methoxy-1*H*-indol-3-yl)acetate (2bh)



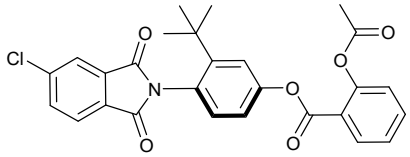
Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (50.0 mg, 75% yield) as a yellow solid: mp 109−110 °C; $[\alpha]_D^{25}$ = 11.5 (c = 0.22 in MeCN, 96% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.91 (d, J = 2.0 Hz, 1H), 7.88 (d, J = 8.0 Hz, 1H), 7.75 (dd, J = 8.0, 2.0 Hz, 1H), 7.68 (d, J = 8.5 Hz, 2H), 7.48 (d, J = 8.0 Hz, 2H), 7.31 (d, J = 3.0 Hz, 1H), 7.08−7.06 (m, 2H), 6.97 (d, J = 8.5 Hz, 1H), 6.90 (d, J = 9.0 Hz, 1H), 6.70 (dd, J = 9.0, 2.5 Hz, 1H), 3.93 (s, 2H), 3.85 (s, 3H), 2.46 (s, 3H), 1.27 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 168.8, 168.3, 167.5, 167.1, 156.1, 151.5, 151.2, 141.2, 139.3, 136.2, 134.5, 133.8, 133.8, 132.3, 131.2, 130.8, 130.4, 130.2, 129.1, 127.0, 125.1, 124.3, 121.7, 120.2, 115.0, 111.8, 101.2, 55.7, 35.7, 31.3, 30.6, 13.4; MS (EI) 668 (M^+); HRMS (ESI) m/z calcd for $C_{37}H_{31}Cl_2N_2O^+$ $(M+H)^+$ 669.1554, found 669.1524. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 84.9 min, t (minor) = 76.3 min.



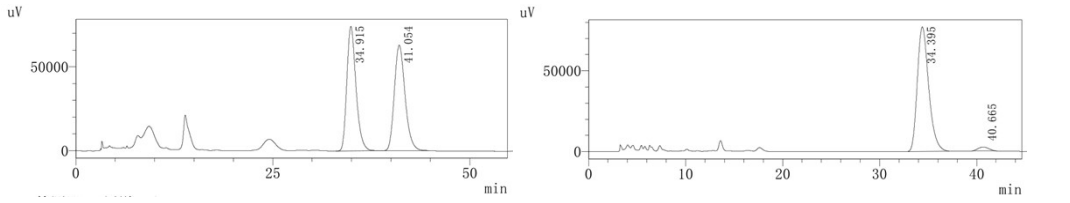
峰#	RT(min)	Area	Height	Area%	Height%
1	77.864	7236723	29252	50.693	54.210
2	86.549	7038993	24709	49.307	45.790
总计		14275716	53960	100.000	100.000

峰#	RT(min)	Area	Height	Area%	Height%
1	76.347	504335	2459	2.241	3.154
2	84.938	22002240	75519	97.759	96.846
总计		22506575	77978	100.000	100.000

(*R*)-3-(*tert*-butyl)-4-(5-chloro-1,3-dioxoisoindolin-2-yl)phenyl-2-acetoxybenzoate (2bi)



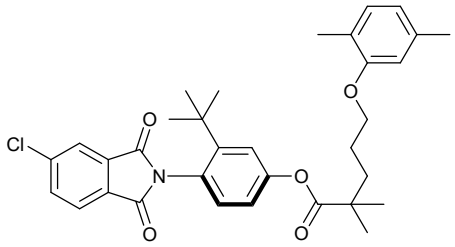
Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (42.2 mg, 86% yield) as a white solid: mp 173−174 °C; $[\alpha]_D^{25}$ = 7.5 (c = 0.32 in MeCN, 94% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 8.23 (d, J = 7.5 Hz, 1H), 7.93−7.89 (m, 2H), 7.77 (d, J = 8.0 Hz, 1H), 7.66 (t, J = 8.0 Hz, 1H), 7.41 (d, J = 7.5 Hz, 2H), 7.18 (t, J = 7.8 Hz, 2H), 7.04 (d, J = 8.5 Hz, 1H), 2.34 (s, 3H), 1.31 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 169.7, 167.5, 167.1, 162.4, 151.4, 151.3, 151.2, 141.2, 134.7, 134.5, 133.8, 132.5, 132.2, 130.2, 127.2, 126.2, 125.1, 124.3, 124.0, 122.4, 122.0, 120.6, 35.8, 31.4, 21.0; MS (EI) 491 (M^+); HRMS (ESI) m/z calcd for $C_{27}H_{23}ClNO_6^+$ $(M+H)^+$ 492.1208, found 429.1204. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 34.4 min, t (minor) = 40.7 min.



峰#	RT(min)	Area	Height	Area%	Height%
1	34.915	6009707	74340	50.194	54.136
2	41.054	5963237	62980	49.806	45.864
总计		11972944	137320	100.000	100.000

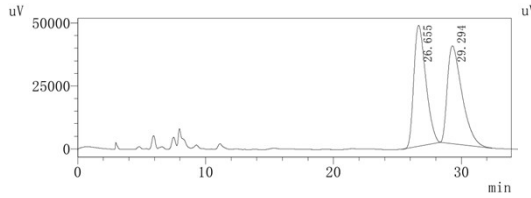
峰#	RT(min)	Area	Height	Area%	Height%
1	34.395	6284613	76990	97.152	96.943
2	40.665	184220	2427	2.848	3.057
总计		6468833	79417	100.000	100.000

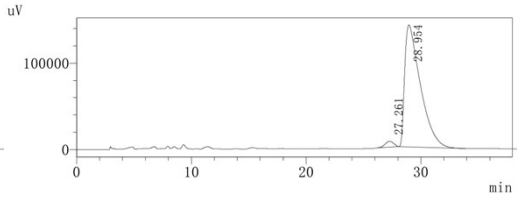
(*R*)-3-(*tert*-butyl)-4-(5-chloro-1,3-dioxoisoindolin-2-yl)phenyl 5-(2,5-dimethyl-phenoxy)-2,2-dimethylpentanoate (2bj)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (41.9 mg, 75% yield) as a white oil; $[\alpha]_D^{25}$ = 23.3 (c = 0.40 in MeCN, 95% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.93 (d, J = 1.5 Hz, 1H), 7.90 (d, J = 8.0 Hz, 1H), 7.76 (dd, J = 8.0, 2.0 Hz, 1H), 7.31 (t, J = 2.0 Hz, 1H), 7.07−7.05 (m, 1H), 7.02−6.99 (m, 2H), 6.68−6.65 (m, 2H), 4.01 (t, J = 5.0 Hz,

2H), 2.32 (s, 3H), 2.20 (s, 3H), 1.92−1.91 (m, 4H), 1.41 (s, 6H), 1.30 (d, J = 1.5 Hz, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 175.8, 167.5, 167.1, 156.8, 151.8, 151.0, 141.1, 136.4, 134.4, 133.8, 132.2, 130.3, 130.2, 126.7, 125.1, 124.2, 123.5, 121.7, 120.7, 120.3, 111.9, 67.7, 42.5, 37.1, 35.6, 31.3, 25.2, 25.1, 21.4, 15.8; MS (EI) 561 (M^+); HRMS (ESI) m/z calcd for $C_{33}H_{37}ClNO_5^+$ $(M+H)^+$ 562.2355, found 562.2355. The enantiomeric ratio was determined by Daicel Chiralcel OD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 29.0 min, t (minor) = 27.3 min.

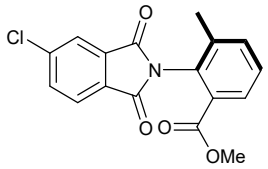




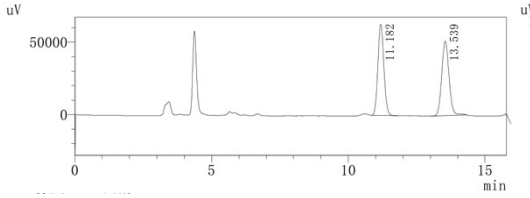
峰#	RT(min)	Area	Height	Area%	Height%
1	26.655	3128980	48044	50.141	55.264
2	29.294	3111341	38892	49.859	44.736
总计		6240321	86936	100.000	100.000

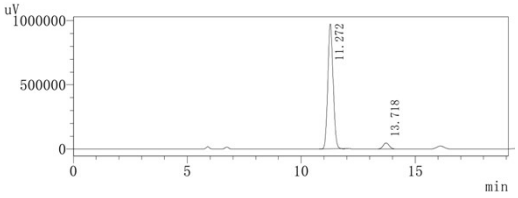
峰#	RT(min)	Area	Height	Area%	Height%
1	27.261	340679	6690	2.476	4.526
2	28.954	13418444	141124	97.524	95.474
总计		13759123	147814	100.000	100.000

(*S*)-methyl-2-(5-chloro-1,3-dioxoisoindolin-2-yl)-3-methylbenzoate (2bk)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (27.4 mg, 83% yield) as a white solid: mp 125−126 °C; $[\alpha]_D^{25}$ = 22.9 (c = 0.22 in MeCN, 90% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 8.01 (dd, J = 7.5, 1.5 Hz, 1H), 7.93 (d, J = 1.5 Hz, 1H), 7.89 (d, J = 8.0 Hz, 1H), 7.75 (dd, J = 8.0, 2.0 Hz, 1H), 7.57 (dd, J = 8.0, 1.5 Hz, 1H), 7.46 (t, J = 7.8 Hz, 1H), 3.72 (s, 3H), 2.26 (s, 3H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 166.6, 166.3, 165.1, 140.9, 138.9, 135.3, 134.2, 134.0, 130.8, 130.4, 129.6, 129.4, 128.0, 125.0, 124.2, 52.3, 17.9; MS (EI) 329 (M^+); HRMS (ESI) m/z calcd for $C_{17}H_{13}ClNO_4^+$ $(M+H)^+$ 330.0528, found 330.0528. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 11.3 min, t (minor) = 13.7 min.

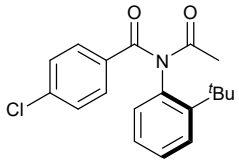




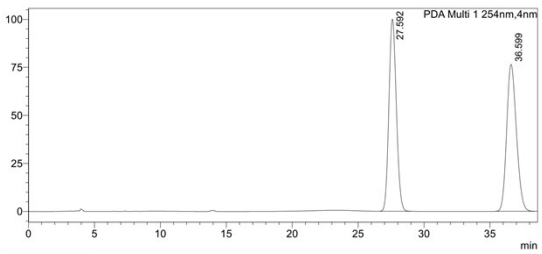
峰#	RT(min)	Area	Height	Area%	Height%
1	11.182	960701	62890	50.279	55.041
2	13.539	950043	51371	49.721	44.959
总计		1910743	114261	100.000	100.000

峰#	RT(min)	Area	Height	Area%	Height%
1	11.272	15766123	971961	94.888	95.385
2	13.718	849308	47026	5.112	4.615
总计		16615431	1018987	100.000	100.000

(R)-*N*-acetyl-*N*-(2-(*tert*-butyl)phenyl)-4-chlorobenzamide (5aa)

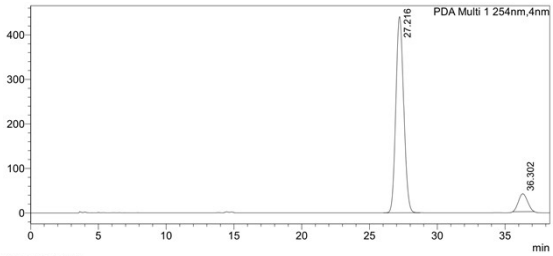


Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:5) gave the product (23.1 mg, 70% yield) as a white solid: mp 148−149 °C; $[\alpha]_D^{25}$ = −45.0 (c = 0.16 in MeCN, 81% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.59 (t, J = 8.2 Hz, 3H), 7.40−7.37 (m, 3H), 7.29 (t, J = 7.5 Hz, 1H), 7.05 (d, J = 7.5 Hz, 1H), 2.12 (s, 3H), 1.40 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 174.0, 172.0, 146.7, 137.7, 136.9, 134.4, 132.1, 130.0, 129.6, 129.4, 128.4, 127.4, 36.0, 31.6, 26.4; MS (EI) 329 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{21}ClNO_2^+$ $(M+H)^+$ 330.1255, found 330.1255. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 98/2, 0.8 mL/min, λ = 254 nm, t (major) = 27.6 min, t (minor) = 36.6 min.



PDA Ch1 254nm

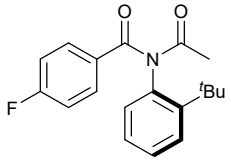
Peak#	Ret. Time	Area	Height	Name	Area%
1	27.592	3930429	100015		49.996
2	36.599	3931045	76441		50.004
总计		7861475	176456		100.000



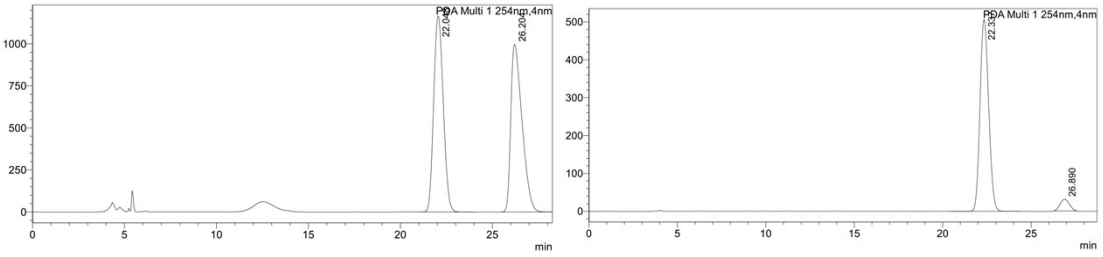
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	27.216	17828189	440497		90.516
2	36.302	1868053	40193		9.484
总计		19696242	480689		100.000

(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)phenyl)-4-fluorobenzamide (5ba)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:5) gave the product (15.6 mg, 50% yield) as a white solid: mp 115−116 °C; $[\alpha]_D^{25}$ = −25.3 (c = 0.19 in MeCN, 88% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.71−7.68 (m, 2H), 7.58 (dd, J = 8.0, 1.5 Hz, 1H), 7.40−7.37 (m, 1H), 7.31−7.28 (m, 1H), 7.10−7.04 (m, 3H), 2.13 (s, 3H), 1.40 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 174.1, 171.9, 164.6 (d, J = 251.2 Hz), 146.7, 137.0, 132.2, 132.07, 132.0 (d, J = 2.5 Hz), 131.2 (d, J = 8.8 Hz), 129.6, 129.3, 127.3, 115.4 (d, J = 22.5 Hz), 36.0, 31.6, 26.4; MS (EI) 313 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{21}FNO_2^+$ $(M+H)^+$ 314.1551, found 314.1532. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 98/2, 0.8 mL/min, λ = 254 nm, t (major) = 22.0 min, t (minor) = 26.2 min.



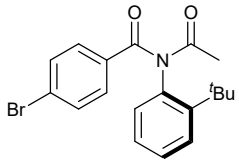
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	22.048	42268038	1165988		50.035
2	26.204	42209506	996618		49.965
总计		84477544	2162606		100.000

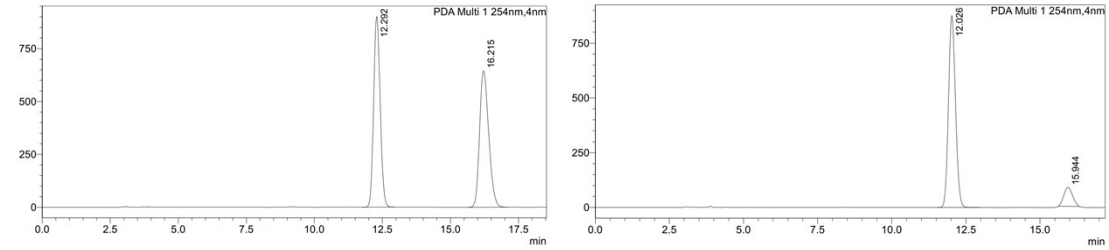
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	22.337	17253968	506596		93.787
2	26.890	1142965	31244		6.213
总计		18396933	537841		100.000

(*R*)-*N*-acetyl-4-bromo-*N*-(2-(*tert*-butyl)phenyl)benzamide (5ca)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:5) gave the product (15.3 mg, 41% yield) as a white solid: mp 143−144 °C; $[\alpha]_D^{25}$ = −68.6 (c = 0.18 in MeCN, 78% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.59 (d, J = 8.0 Hz, 1H), 7.53(s, 4H), 7.39 (t, J = 7.2 Hz, 1H), 7.29 (t, J = 7.5 Hz, 1H), 7.04 (d, J = 7.5 Hz, 1H), 2.12 (s, 3H), 1.40 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 174.0, 172.2, 146.7, 136.8, 134.9, 132.1, 131.4, 130.1, 129.6, 129.4, 127.4, 126.2, 36.0, 31.6, 26.4; MS (EI) 373 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{21}BrNO_2^+$ $(M+H)^+$ 374.0750, found 374.0754. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 95/5, 1.0 mL/min, λ = 254 nm, t (major) = 12.3 min, t (minor) = 16.2 min.



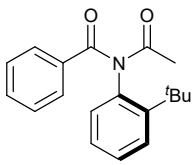
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	12.292	15043117	900454		50.048
2	16.215	15014164	645012		49.952
总计		30057281	1545466		100.000

PDA Ch1 254nm

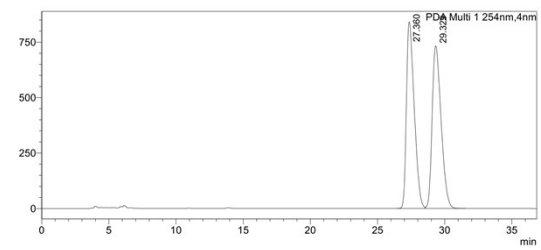
Peak#	Ret. Time	Area	Height	Name	Area%
1	12.026	14448908	875342		88.972
2	15.944	1790953	86649		11.028
总计		16239861	961991		100.000

(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)phenyl)benzamide (5da)



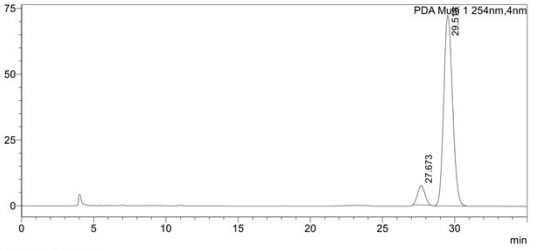
Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:5) gave the product (10.3 mg, 35% yield) as a white solid: mp 83−84 °C; $[\alpha]_D^{25}$ = −17.5 (c = 0.17 in MeCN, 86% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.66 (d, J = 7.5 Hz, 2H), 7.57 (d, J = 8.5 Hz, 1H), 7.48−7.45 (m,

1H), 7.41−7.35 (m, 3H), 7.27 (dd, J = 7.5, 3.5 Hz, 1H), 7.06 (d, J = 7.5 Hz, 1H), 2.13 (s, 3H), 1.41 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 174.0, 173.0, 146.8, 137.0, 136.0, 132.1, 131.4, 129.5, 129.2, 128.5, 128.0, 127.2, 36.0, 31.6, 26.4; MS (EI) 295 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{22}NO_2^+$ $(M+H)^+$ 296.1645, found 296.1652. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 98/2, 0.8 mL/min, λ = 254 nm, t (major) = 29.5 min, t (minor) = 27.7 min.



PDA Ch1 254nm

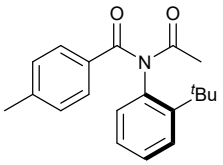
Peak#	Ret. Time	Area	Height	Name	Area%
1	27.360	34027545	841452		49.982
2	29.329	34051523	733188		50.018
总计		68079068	1574641		100.000



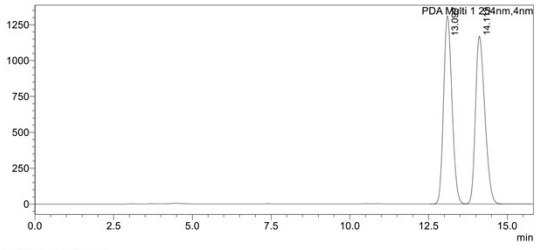
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	27.673	259559	7326		7.751
2	29.518	3089184	72403		92.249
总计		3348744	79729		100.000

(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)phenyl)-4-methylbenzamid (5ea)

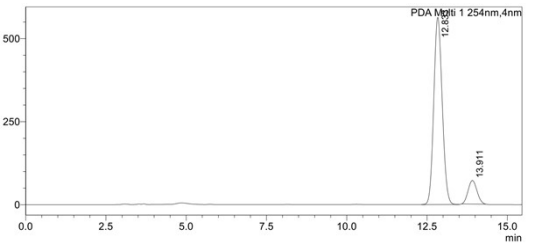


Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:5) gave the product (9.0 mg, 29% yield) as a white solid: mp 95−96 °C; $[\alpha]_D^{25}$ = −22.5 (c = 0.10 in MeCN, 77% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.58 (t, J = 9.0 Hz, 3H), 7.37 (t, J = 8.0 Hz, 1H), 7.28 (d, J = 7.5 Hz, 1H), 7.21 (d, J = 8.0 Hz, 2H), 7.06 (d, J = 7.5 Hz, 1H), 2.39 (s, 3H), 2.13 (s, 3H), 1.41 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 174.2, 173.0, 146.8, 142.3, 137.3, 133.1, 132.2, 129.5, 129.1, 128.9, 128.8, 127.2, 36.0, 31.6, 26.5, 21.6; MS (EI) 309 (M^+); HRMS (ESI) m/z calcd for $C_{20}H_{24}NO_2^+$ $(M+H)^+$ 310.1802, found 310.1819. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 95/5, 1.0 mL/min, λ = 254 nm, t (major) = 12.8 min, t (minor) = 13.9 min.



PDA Ch1 254nm

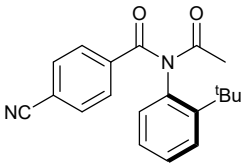
Peak#	Ret. Time	Area	Height	Name	Area%
1	13.099	24427429	1312648		50.051
2	14.112	24378053	1170270		49.949
总计		48805483	2482918		100.000



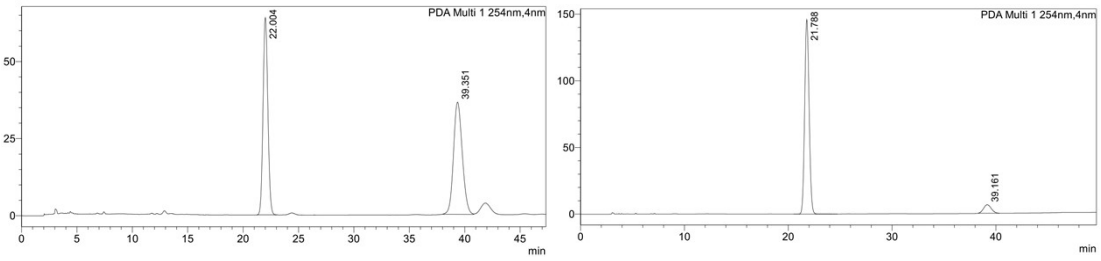
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	12.833	10334777	563516		88.341
2	13.911	1364018	70997		11.659
总计		11698796	634514		100.000

(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)phenyl)-4-cyanobenzamide (5fa)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:5) gave the product (11.5 mg, 36% yield) as a white solid: mp 150−151 °C; $[\alpha]_D^{25}$ = −15.0 (c = 0.18 in MeCN, 86% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.70 (s, 4H), 7.61 (dd, J = 8.0, 1.5 Hz, 1H), 7.44−7.40 (m, 1H), 7.34−7.30 (m, 1H), 7.05 (dd, J = 8.0, 1.5 Hz, 1H), 2.08 (s, 3H), 1.41 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 173.8, 171.4, 146.7, 140.5, 136.3, 131.9, 131.8, 129.8, 129.7, 128.3, 127.6, 118.0, 114.4, 36.0, 31.7, 26.1; MS (EI) 320 (M^+); HRMS (ESI) m/z calcd for $C_{20}H_{21}N_2O_2^+$ $(M+H)^+$ 321.1598, found 321.1567. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 95/5, 1.0 mL/min, λ = 254 nm, t (major) = 22.0 min, t (minor) = 39.4 min.



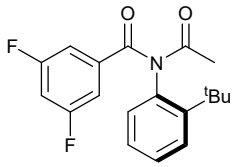
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	22.004	1933448	63969		49.088
2	39.351	2005254	36375		50.912
总计		3938702	100344		100.000

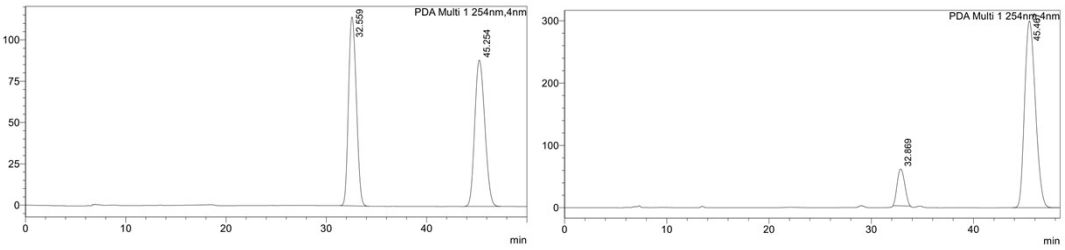
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	21.788	4334116	145687		92.993
2	39.161	326559	6379		7.007
总计		4660675	152066		100.000

(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)phenyl)-3,5-difluorobenzamide (5ga)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:5) gave the product (10.9 mg, 33% yield) as a white solid: mp 99−100 °C; $[\alpha]_D^{25}$ = −16.1 (c = 0.19 in MeCN, 76% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.61 (d, J = 8.0 Hz, 1H), 7.41 (t, J = 7.5 Hz, 1H), 7.31 (t, J = 7.5 Hz, 1H), 7.13 (d, J = 6.0 Hz, 2H), 7.03 (d, J = 7.5 Hz, 1H), 6.92 (t, J = 8.5 Hz, 1H), 2.11 (s, 3H), 1.41 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 173.8, 170.7 (q, J = 5.0 Hz), 163.4 (d, J = 12.5 Hz), 161.5 (d, J = 11.2 Hz), 146.8, 139.4, 136.4, 131.8, 129.7 (d, J = 21.2 Hz), 127.5, 111.3 (q, J = 21.3 Hz), 106.6 (t, J = 25.0 Hz), 36.1, 31.7, 26.2; MS (EI) 331 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{20}F_2NO_2^+$ $(M+H)^+$ 332.1457, found 332.1433. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 99/1, 0.5 mL/min, λ = 254 nm, t (major) = 44.5 min, t (minor) = 32.9 min.



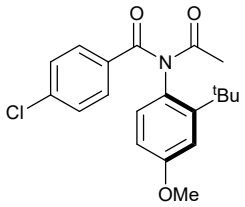
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	32.559	6199912	114280		50.076
2	45.254	6181112	88515		49.924
总计		12381024	202795		100.000

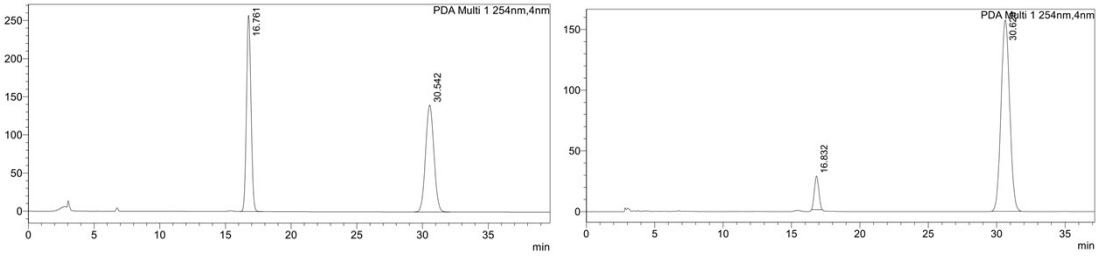
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	32.869	3032231	58973		12.122
2	45.467	21982533	299888		87.878
总计		25014764	358861		100.000

(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)-4-methoxyphenyl)-4-chlorobenzamide (5ab)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:5) gave the product (14.4 mg, 40% yield) as a white solid: mp 98−99 °C; $[\alpha]_D^{25}$ = −135.6 (c = 0.18 in MeCN, 84% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.60 (d, J = 8.0 Hz, 2H), 7.38 (d, J = 8.5 Hz, 2H), 7.09 (d, J = 2.0 Hz, 1H), 6.96 (d, J = 8.5 Hz, 2H), 6.82 (dd, J = 8.5, 2.5 Hz, 1H), 3.84 (s, 3H), 2.12 (s, 3H), 1.38 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 174.4, 172.3, 159.7, 148.0, 137.7, 134.5, 133.2, 130.0, 129.7, 128.4, 115.8, 111.6, 55.3, 36.0, 31.4, 26.2; MS (EI) 359 (M^+); HRMS (ESI) m/z calcd for $C_{20}H_{23}ClNO_3^+$ $(M+H)^+$ 360.1364, found 360.1377. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 95/5, 1.0 mL/min, λ = 254 nm, t (major) = 30.5 min, t (minor) = 16.8 min.



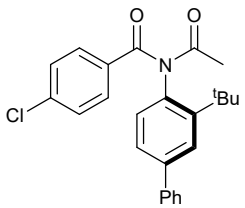
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	16.761	6191604	257312		49.973
2	30.542	6198310	140365		50.027
总计		12389914	397677		100.000

PDA Ch1 254nm

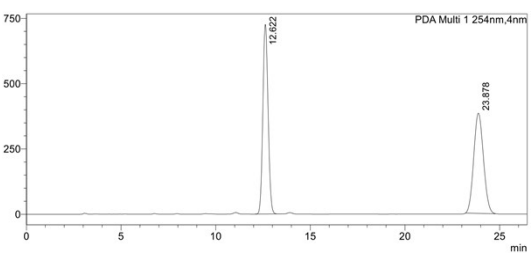
Peak#	Ret. Time	Area	Height	Name	Area%
1	16.832	623051	27754		8.231
2	30.628	6946929	157594		91.769
总计		7569981	185348		100.000

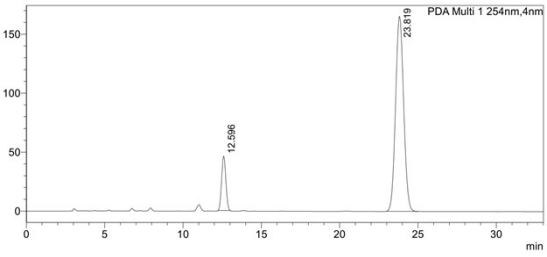
(*R*)-*N*-acetyl-*N*-(3-(*tert*-butyl)-[1,1'-biphenyl]-4-yl)-4-chlorobenzamide (5ac)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:5) gave the product (24.3 mg, 60% yield) as a white solid: mp 137−138 °C; $[\alpha]_D^{25}$ = −21.7 (c = 0.46 in MeCN, 75% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.80 (s, 1H), 7.65 (d, J = 8.5 Hz, 2H), 7.61 (d, J = 7.5 Hz, 2H), 7.51 (d, J = 8.0 Hz, 1H), 7.48 (t, J = 7.5 Hz, 2H), 7.40 (d, J = 8.0 Hz, 3H), 7.13 (d, J = 8.0 Hz, 1H), 2.18 (s, 3H), 1.47 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 174.0, 172.1, 146.9, 142.1, 140.3, 137.8,

136.0, 134.4, 132.5, 130.0, 128.8, 128.5, 128.4, 127.7, 127.2, 126.1, 36.1, 31.7, 26.4; MS (EI) 405 (M^+); HRMS (ESI) m/z calcd for $C_{25}H_{24}ClNO_2^+$ $(M+H)^+$ 405.1568, found 406.1570. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 95/5, 1.0 mL/min, λ = 254 nm, t (major) = 23.8 min, t (minor) = 12.6 min.





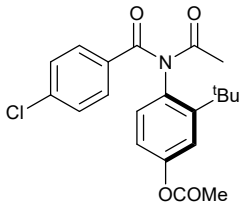
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	12.622	13966745	725891		50.551
2	23.878	13662261	383452		49.449
总计		27629006	1109344		100.000

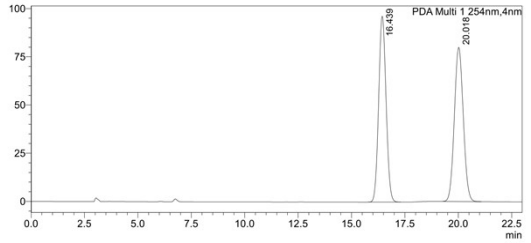
PDA Ch1 254nm

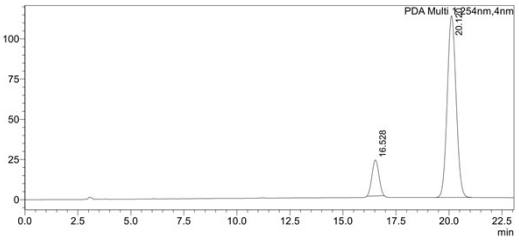
Peak#	Ret. Time	Area	Height	Name	Area%
1	12.596	867536	46122		12.757
2	23.819	5932690	165309		87.243
总计		6800226	211431		100.000

(*R*)-4-(*N*-acetyl-4-chlorobenzamido)-3-(*tert*-butyl)phenyl acetate (5ad)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:5) gave the product (18.2 mg, 47% yield) as a yellow solid: mp 111−112 °C; $[\alpha]_D^{25}$ = −61.6 (c = 0.2 in MeCN, 73% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.60 (d, J = 8.0 Hz, 2H), 7.38 (d, J = 8.0 Hz, 2H), 7.28−7.26 (m, 1H), 7.10−7.05 (m, 2H), 2.31 (s, 3H), 2.11 (s, 3H), 1.38 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 173.9, 172.0, 168.9, 150.9, 148.4, 137.9, 134.2, 133.0, 130.0, 128.4, 122.5, 120.6, 36.1, 31.3, 26.3, 21.2; MS (EI) 387 (M^+); HRMS (ESI) m/z calcd for $C_{21}H_{23}ClNO_4^+$ $(M+H)^+$ 388.1310, found 388.1318. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 95/5, 1.0 mL/min, λ = 254 nm, t (major) = 20.1 min, t (minor) = 16.5 min.





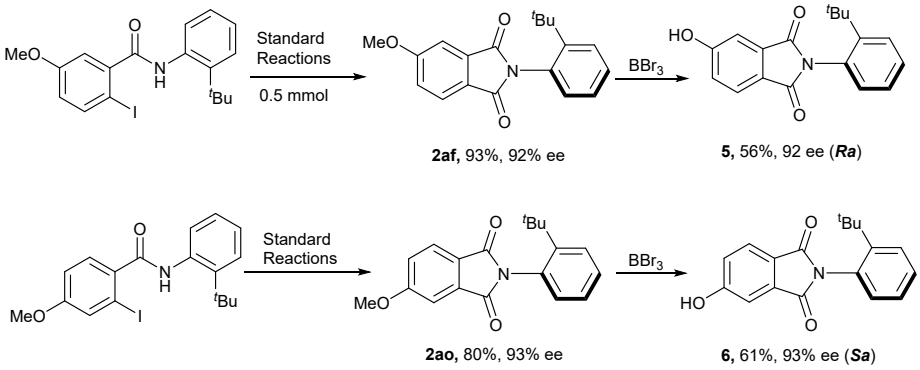
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	16.439	2322923	96372		49.968
2	20.018	2325856	79942		50.032
总计		4648778	176314		100.000

PDA Ch1 254nm

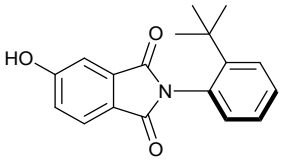
Peak#	Ret. Time	Area	Height	Name	Area%
1	16.528	510372	22348		13.402
2	20.120	3297761	113025		86.598
总计		3808133	135373		100.000

5. Synthetic applications

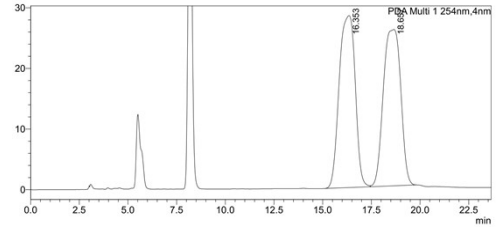


A total of 0.2 mmol of **2af**–**2ao** was dissolved in CH_2Cl_2. Then, 0.2 mL 2.5 M borontribromide solution in hexanes was added dropwise at 78 °C. The reaction was kept at ambient temperature for 48 h. The reaction was carefully quenched with water at low temperature, and the mixture was then extracted with CH_2Cl_2. The organic phase was concentrated in vacuo and the residue was purified by silica gel flash column chromatography to afford the corresponding products (**6** or **7**).

(*R*)-2-(2-(*tert*-butyl)phenyl)-5-hydroxyisoindoline-1,3-dione (6)

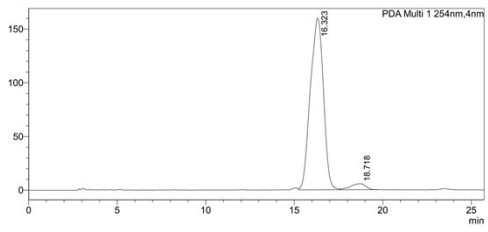


Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (16.6 mg, 56% yield) as a brown oil; $[\alpha]_D^{25}$ = 51.1 (c = 0.18 in MeCN, 92% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.82 (d, J = 8.0 Hz, 1H), 7.62 (dd, J = 8.5, 1.5 Hz, 1H), 7.44−7.41 (m, 1H), 7.36 (d, J = 2.5 Hz, 1H), 7.32−7.26 (m, 1H), 7.15 (dd, J = 8.0, 2.0 Hz, 1H), 6.99 (dd, J = 8.0, 1.5 Hz, 1H), 6.59 (s, 1H), 1.32 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 168.5, 168.5, 161.6, 149.5, 149.4, 135.1, 131.4, 129.8, 128.7, 127.3, 125.9, 124.2, 120.9, 110.8, 35.6, 31.6; MS (EI) 295 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{20}NO_2^+$ $(M+H)^+$ 296.1281, found 296.1279. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 16.3 min, t (minor) = 18.7 min.



PDA Ch1 254nm

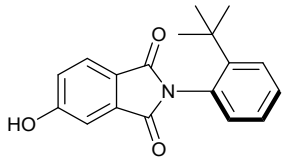
Peak#	Ret. Time	Area	Height	Name	Area%
1	16.353	1624786	28362		50.305
2	18.657	1605061	25787		49.695
总计		3229848	54149		100.000



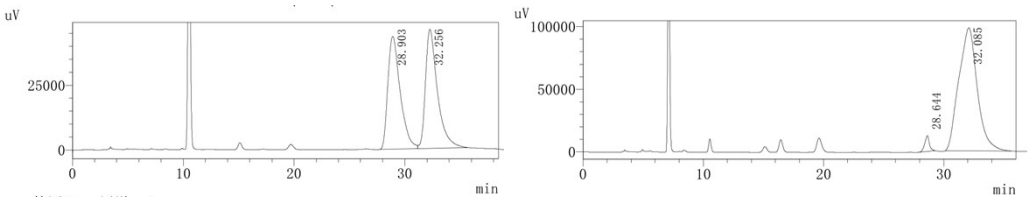
PDA Ch1 254nm

Peak#	Ret. Time	Area	Height	Name	Area%
1	16.323	8225402	159888		96.074
2	18.718	336121	5568		3.926
总计		8561524	165455		100.000

(*S*)-2-(2-(*tert*-butyl)phenyl)-5-hydroxyisoindoline-1,3-dione (7)



Flash column chromatography on silica gel (ethyl acetate/petroleum ether, 1:10) gave the product (18.1 mg, 61% yield) as a brown oil; $[\alpha]_D^{25}$ = −42.9 (c = 0.21 in MeCN, 94% ee); ^{1}H NMR ($CDCl_3$, 500 MHz) δ 7.78 (d, J = 8.0 Hz, 1H), 7.62 (dd, J = 8.5, 1.5 Hz, 1H), 7.43−7.40 (m, 1H), 7.33 (d, J = 2.5 Hz, 1H), 7.31−7.28 (m, 1H), 7.08 (dd, J = 8.0, 2.0 Hz, 1H), 7.00 (dd, J = 7.5, 1.5 Hz, 1H), 1.32 (s, 9H); ^{13}C NMR ($CDCl_3$, 125 MHz) δ 168.9, 168.9, 162.3, 149.4, 134.8, 131.3, 129.9, 129.7, 128.8, 127.3, 126.0, 123.5, 121.0, 111.0, 35.6, 31.6; MS (EI) 295 (M^+); HRMS (ESI) m/z calcd for $C_{19}H_{20}NO_2^+$ $(M+H)^+$ 296.1281, found 296.1279. The enantiomeric ratio was determined by Daicel Chiralcel AD-H (0.46 cm × 25 cm), Hexanes/IPA = 97/3, 1.0 mL/min, λ = 254 nm, t (major) = 32.1min, t (minor) = 28.6 min.



峰#	RT(min)	Area	Height	Area%	Height%
1	28.903	3364060	43537	49.270	48.668
2	32.256	3463722	45921	50.730	51.332
总计		6827781	89458	100.000	100.000

峰#	RT(min)	Area	Height	Area%	Height%
1	28.644	330554	12623	3.047	11.379
2	32.085	10518694	98308	96.953	88.621
总计		10849249	110932	100.000	100.000

6. References

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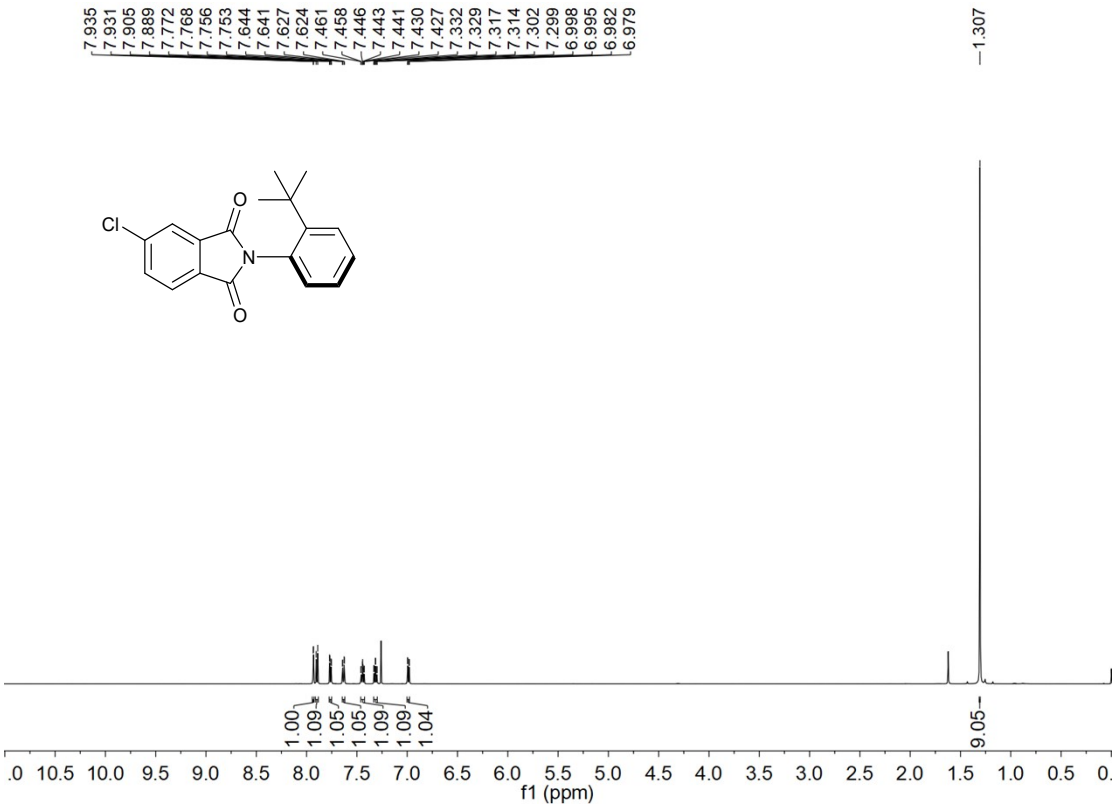
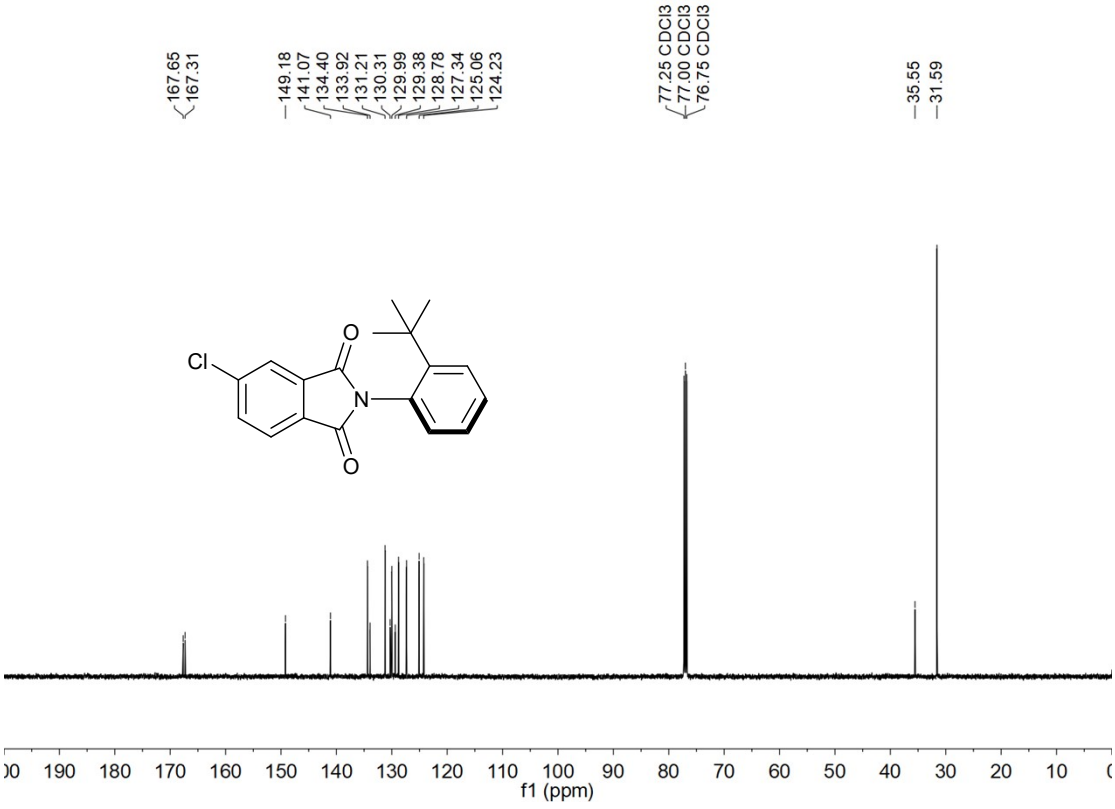
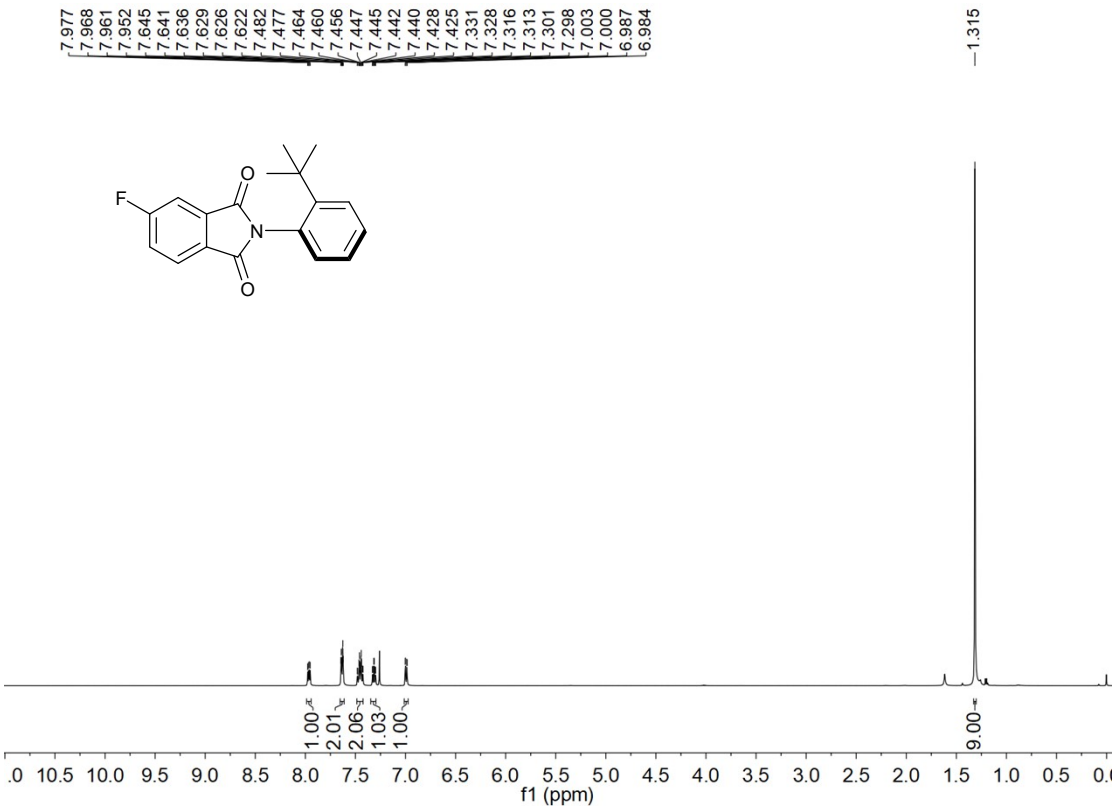
7. Copies of the ^{1}H NMR and ^{13}C NMR Spectra

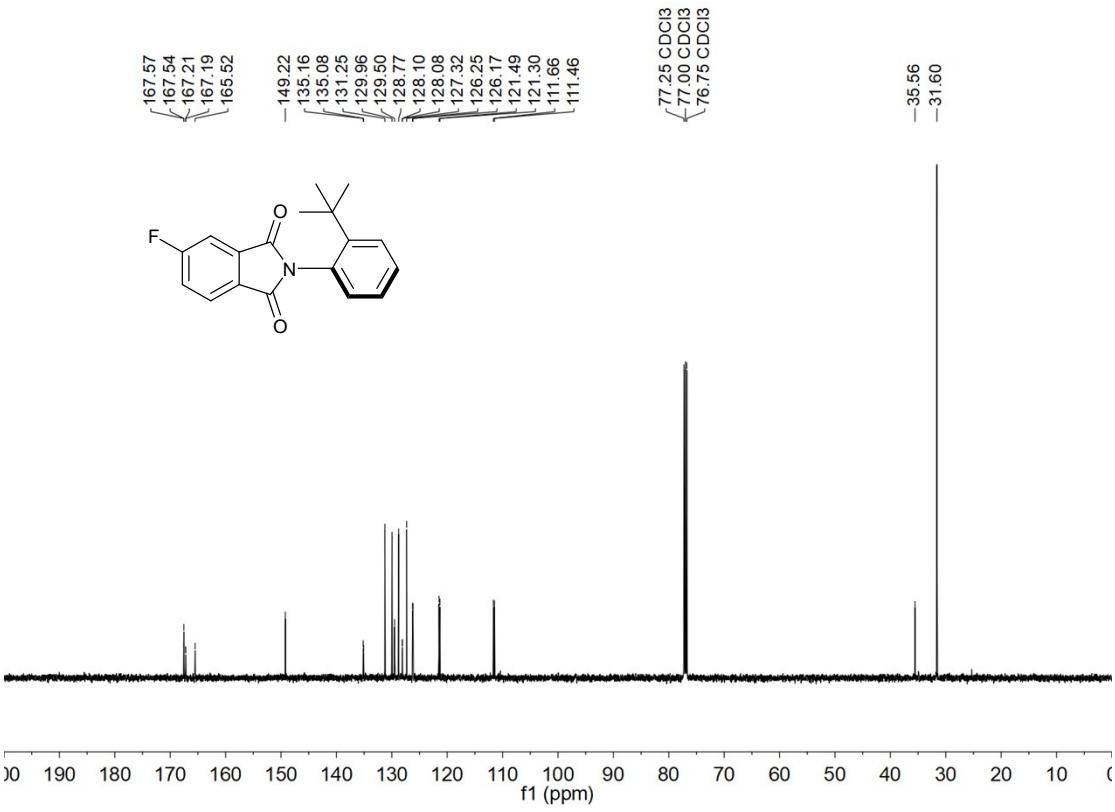
(*R*)-2-(2-(*tert*-butyl)phenyl)-5-chloroisoindoline-1,3-dione (2aa)



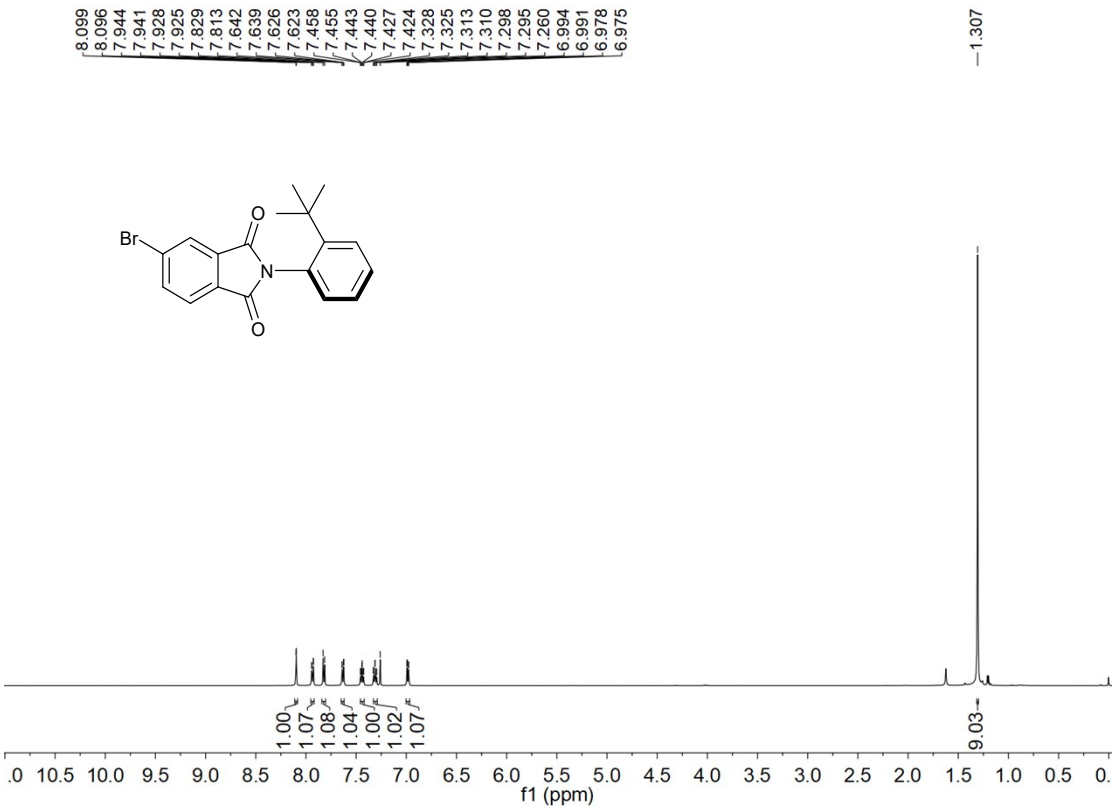


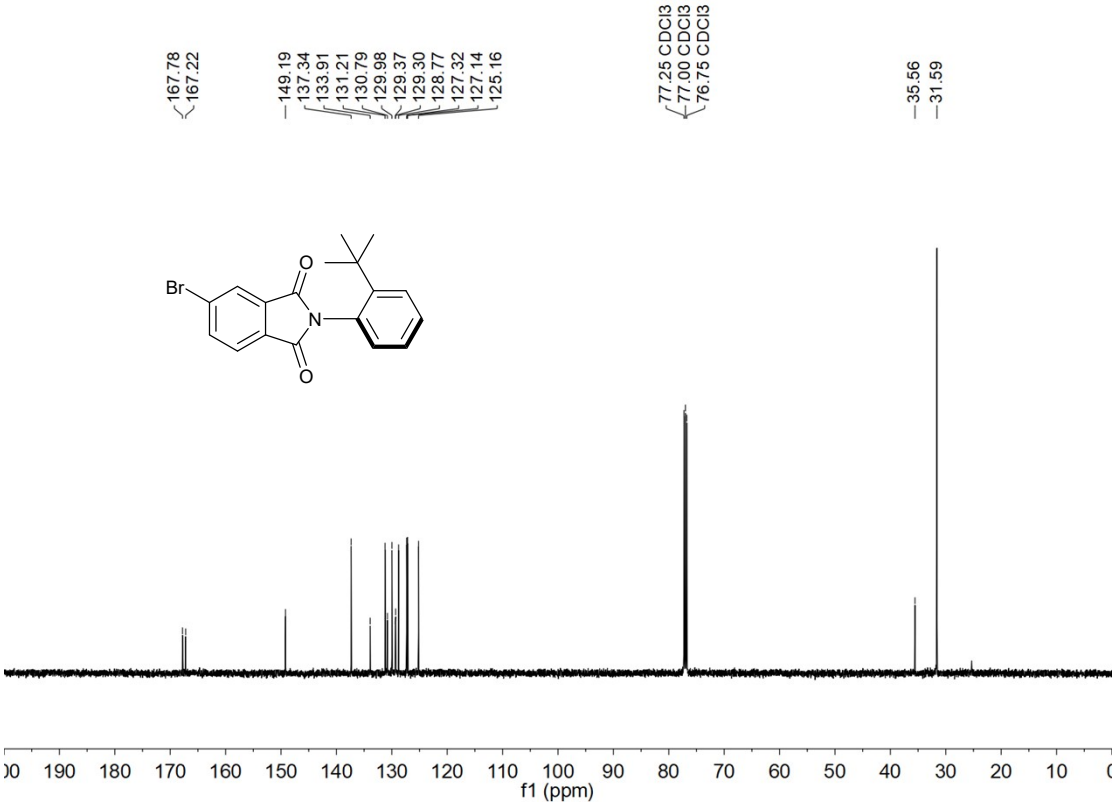
(*R*)-2-(2-(*tert*-butyl)phenyl)-5-fluoroisoindoline-1,3-dione (2ab)



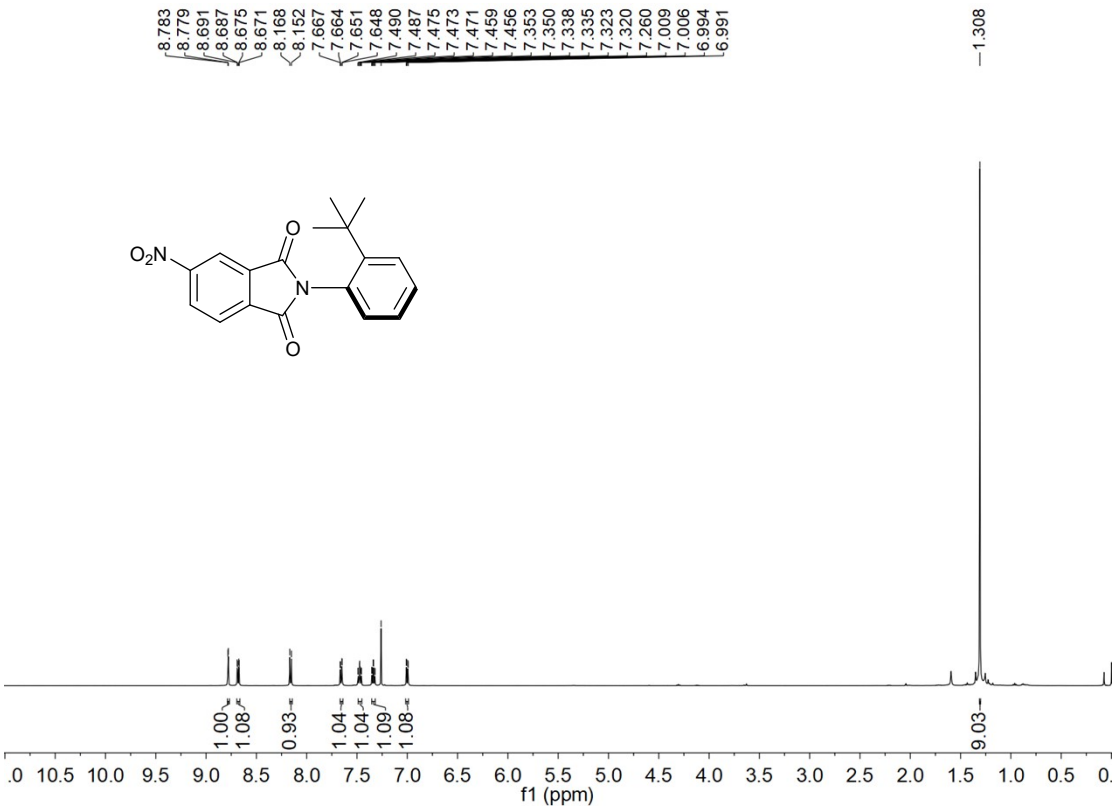


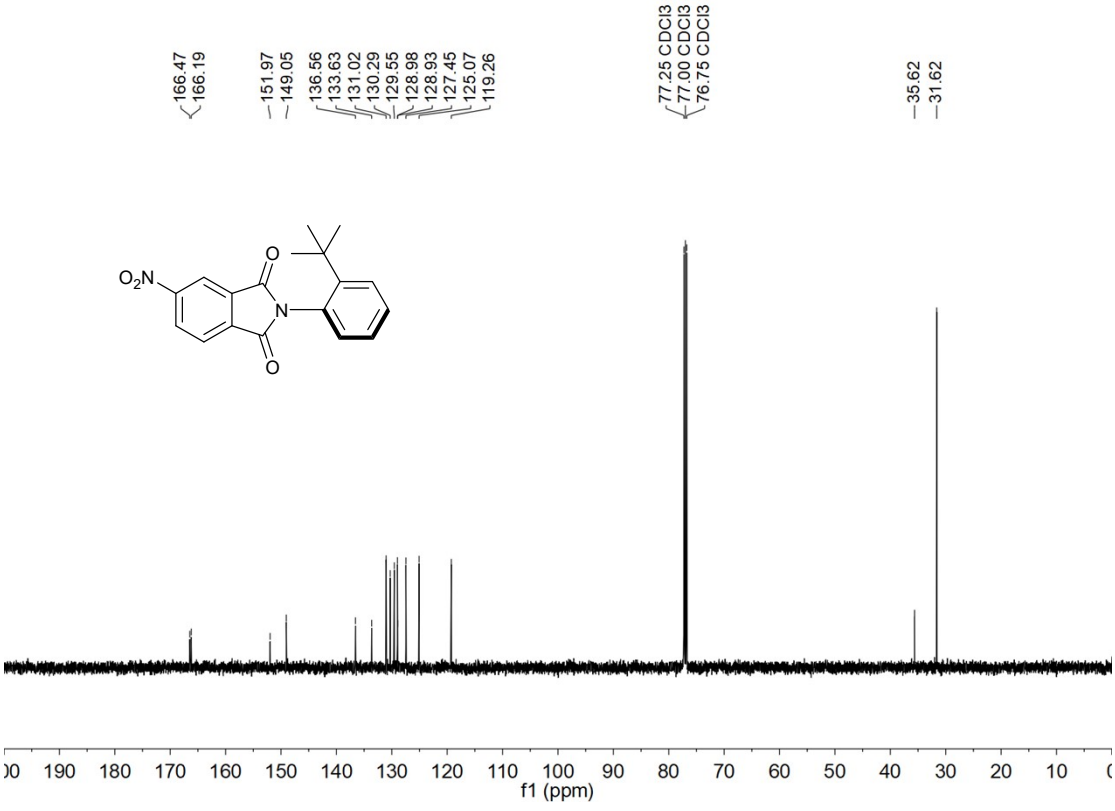
(*R*)- 5-bromo-2-(2-(*tert*-butyl)phenyl)isoindoline-1,3-dione (2ac)



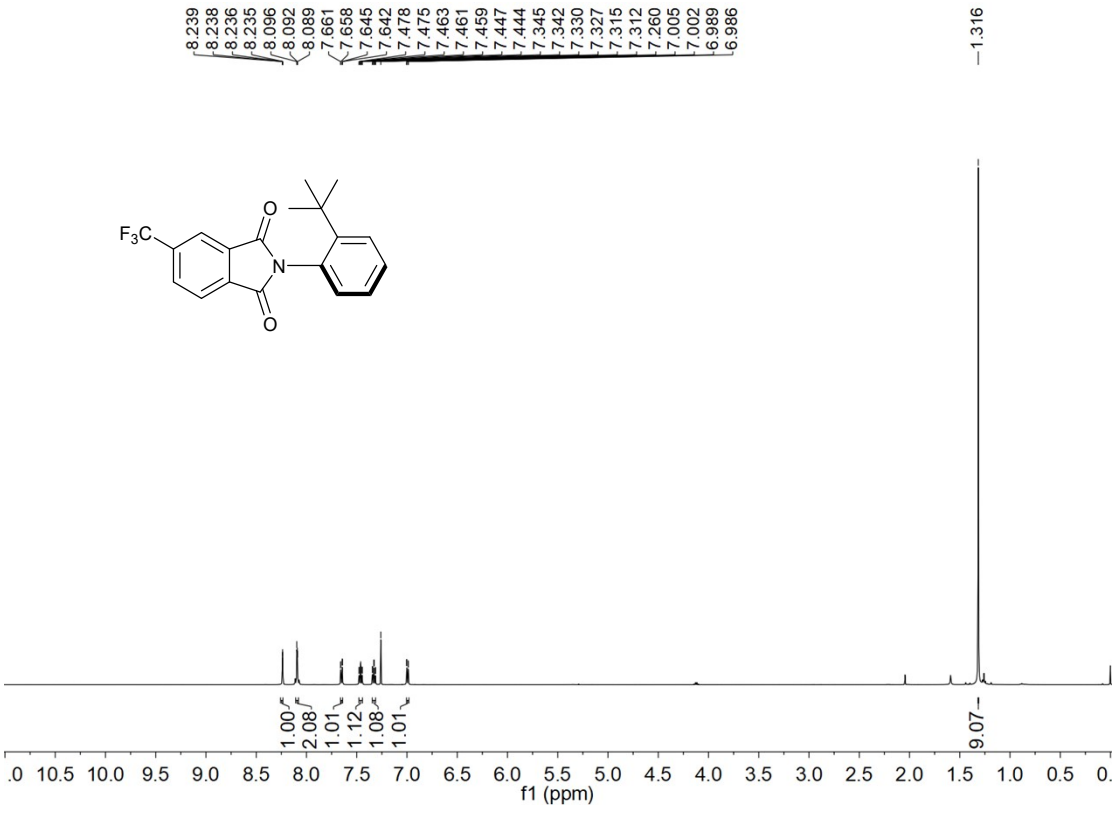


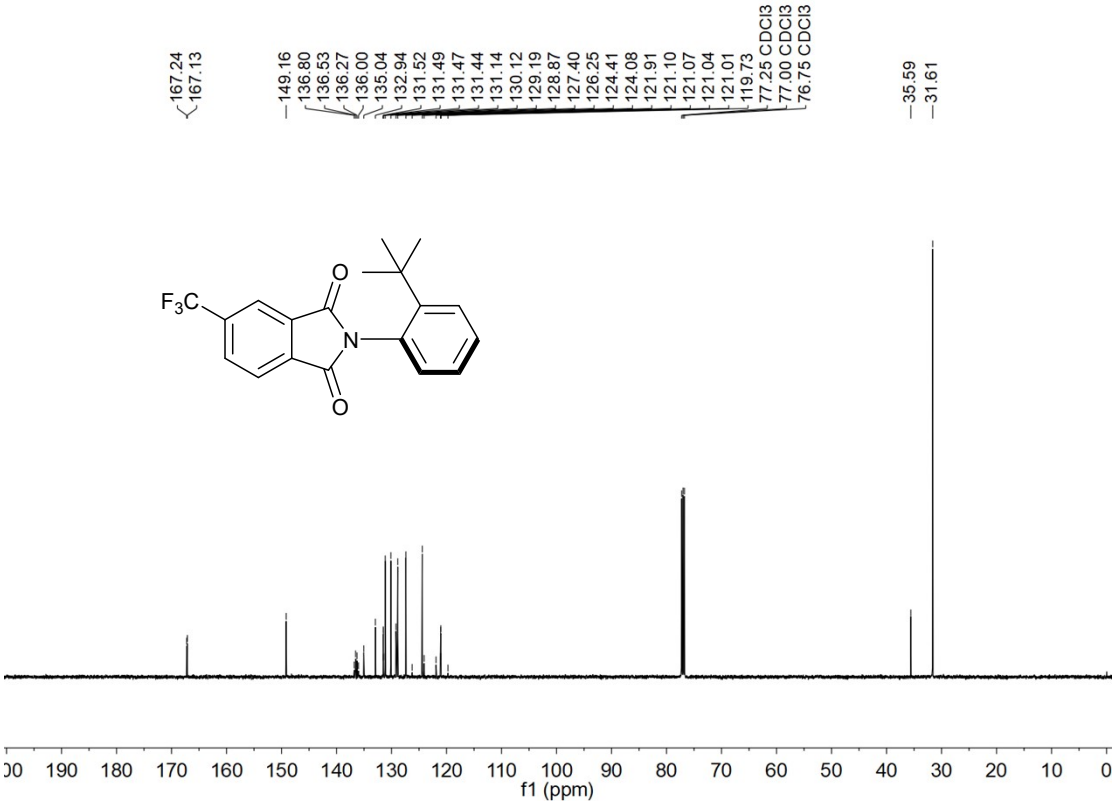
(*R*)- 2-(2-(*tert*-butyl)phenyl)-5-nitroisoindoline-1,3-dione (2ad)



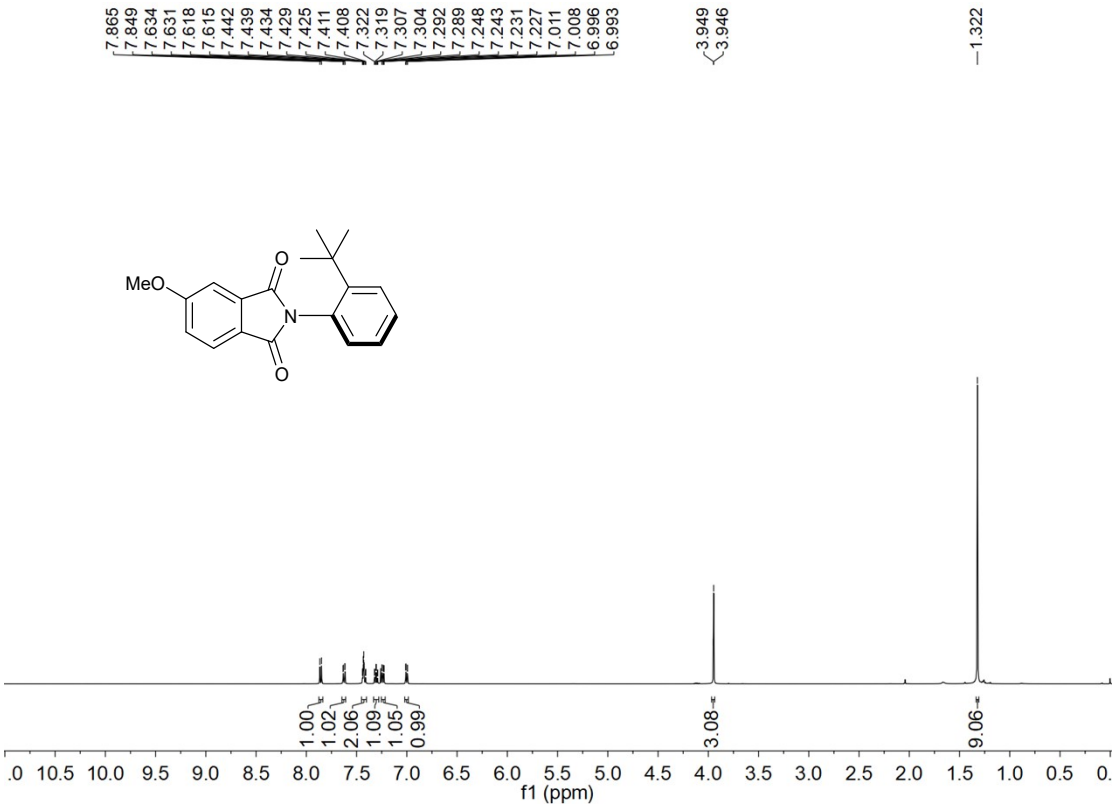


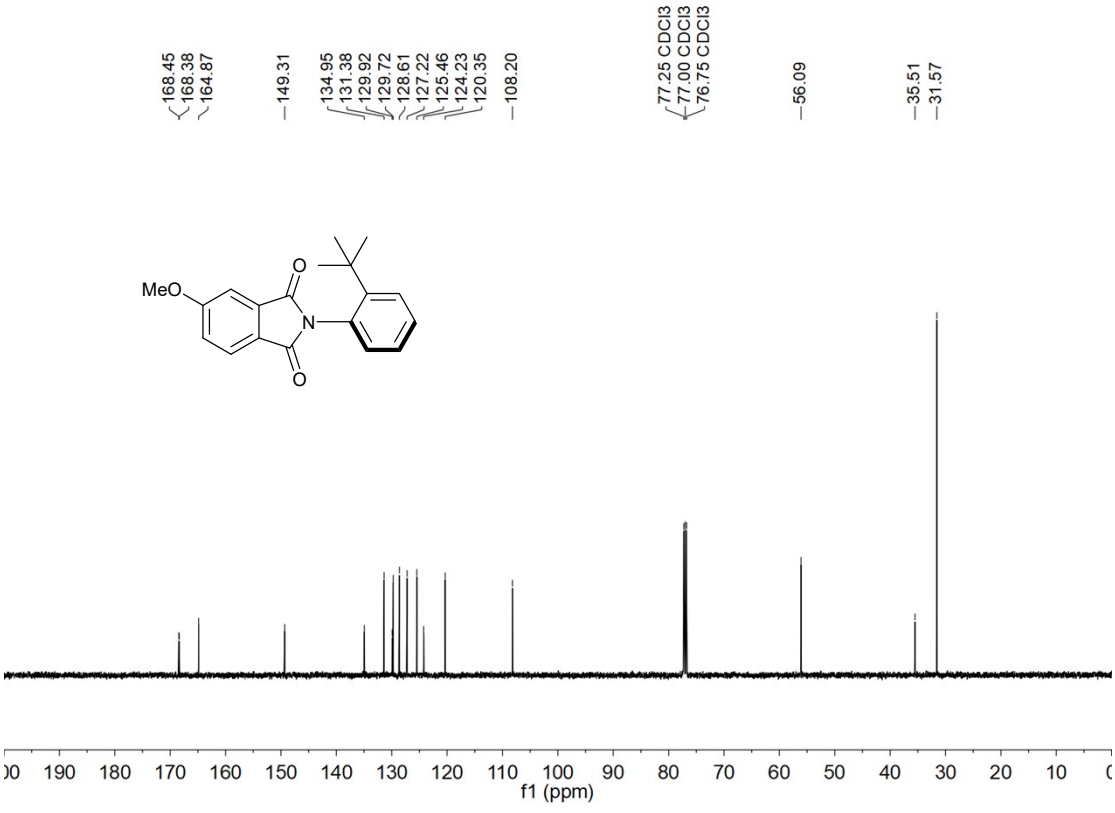
(*R*)- 2-(2-(*tert*-butyl)phenyl)-5-(trifluoromethyl)isoindoline-1,3-dione (2ae)



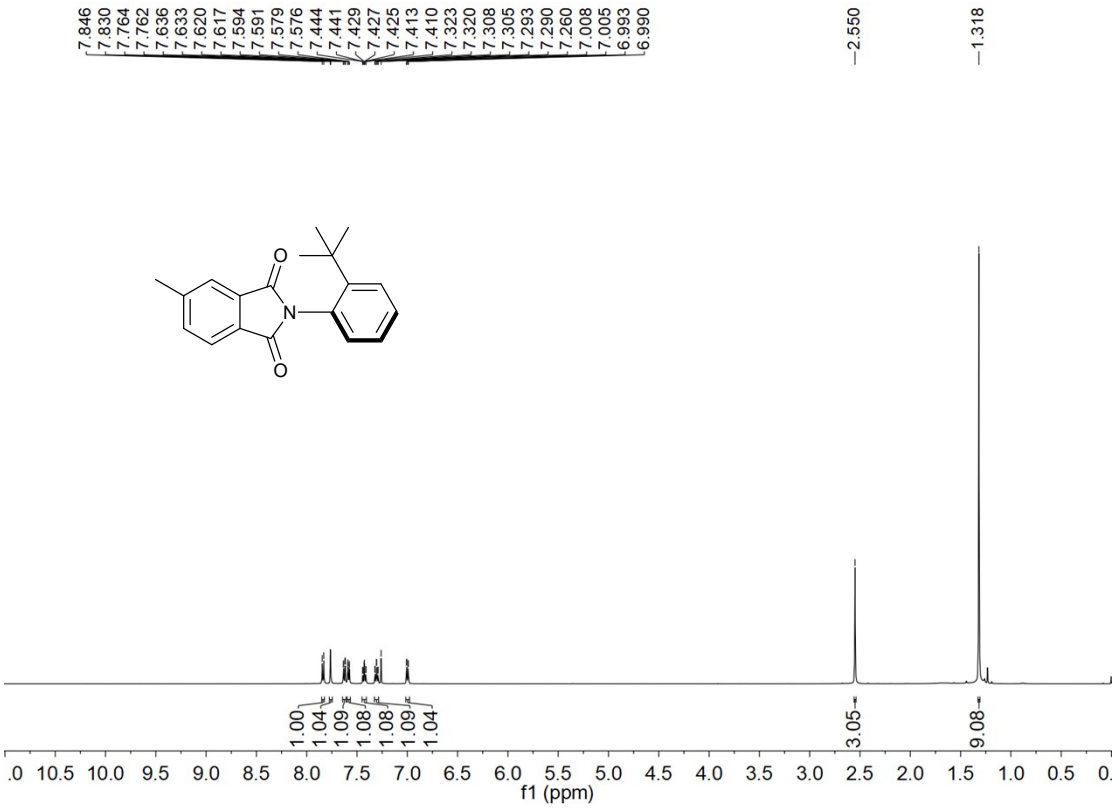


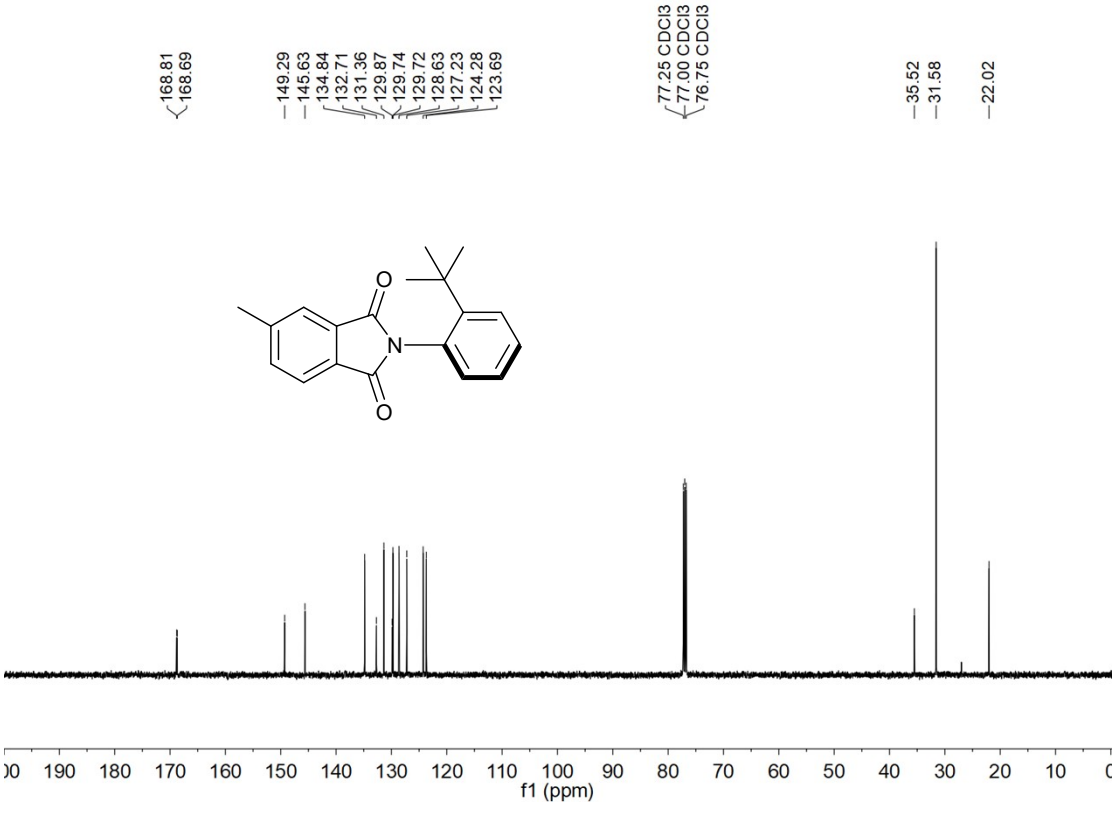
(*R*)- 2-(2-(*tert*-butyl)phenyl)-5-methoxyisoindoline-1,3-dione (2af)



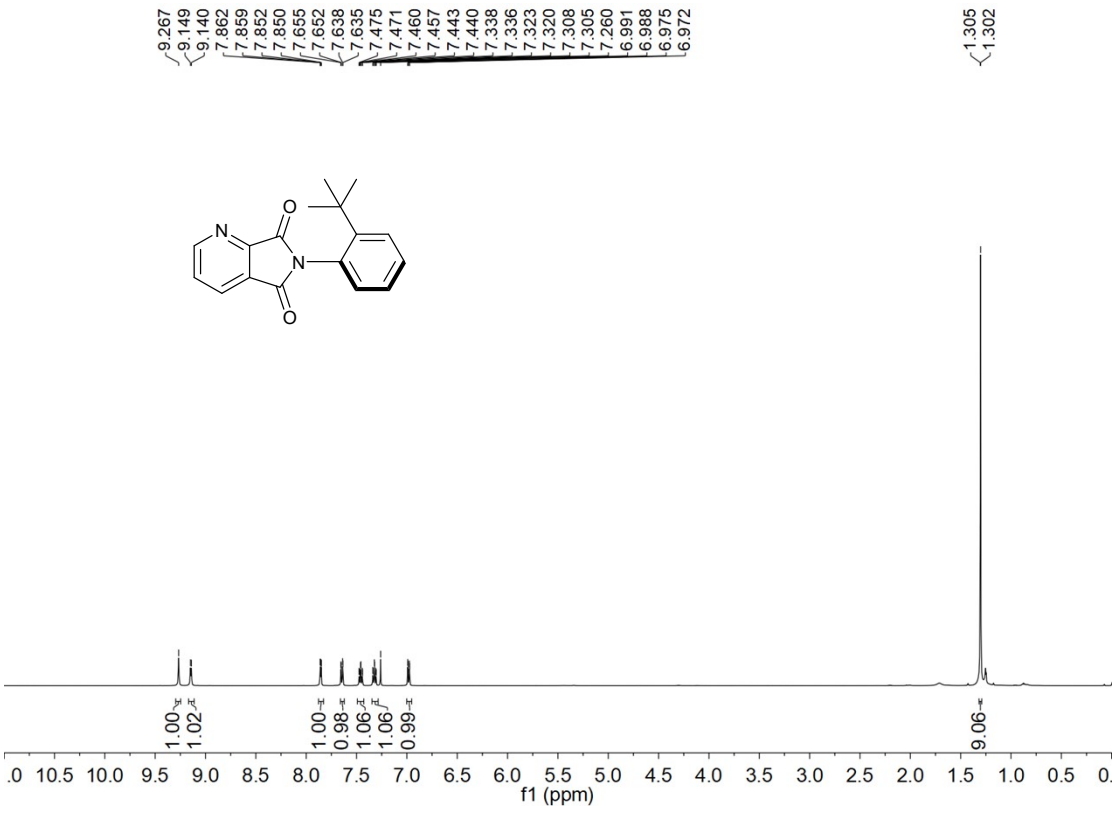


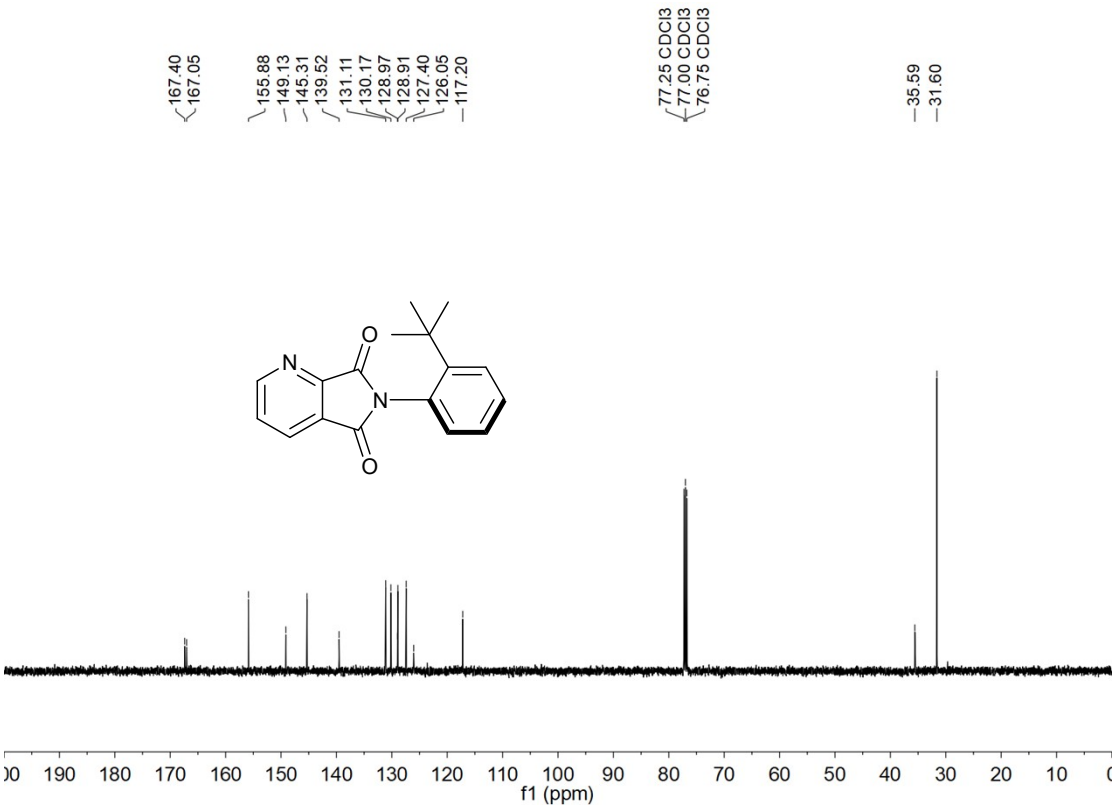
(*R*)- 2-(2-(*tert*-butyl)phenyl)-5-methylisoindoline-1,3-dione (2ag)



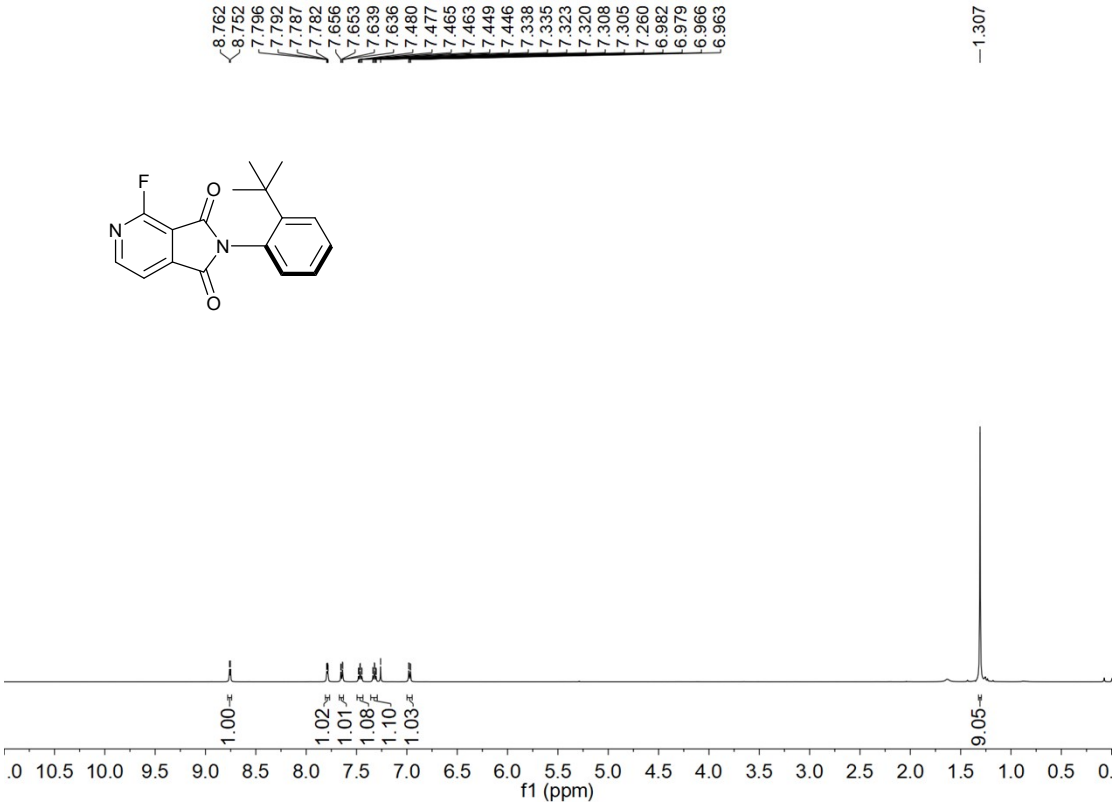


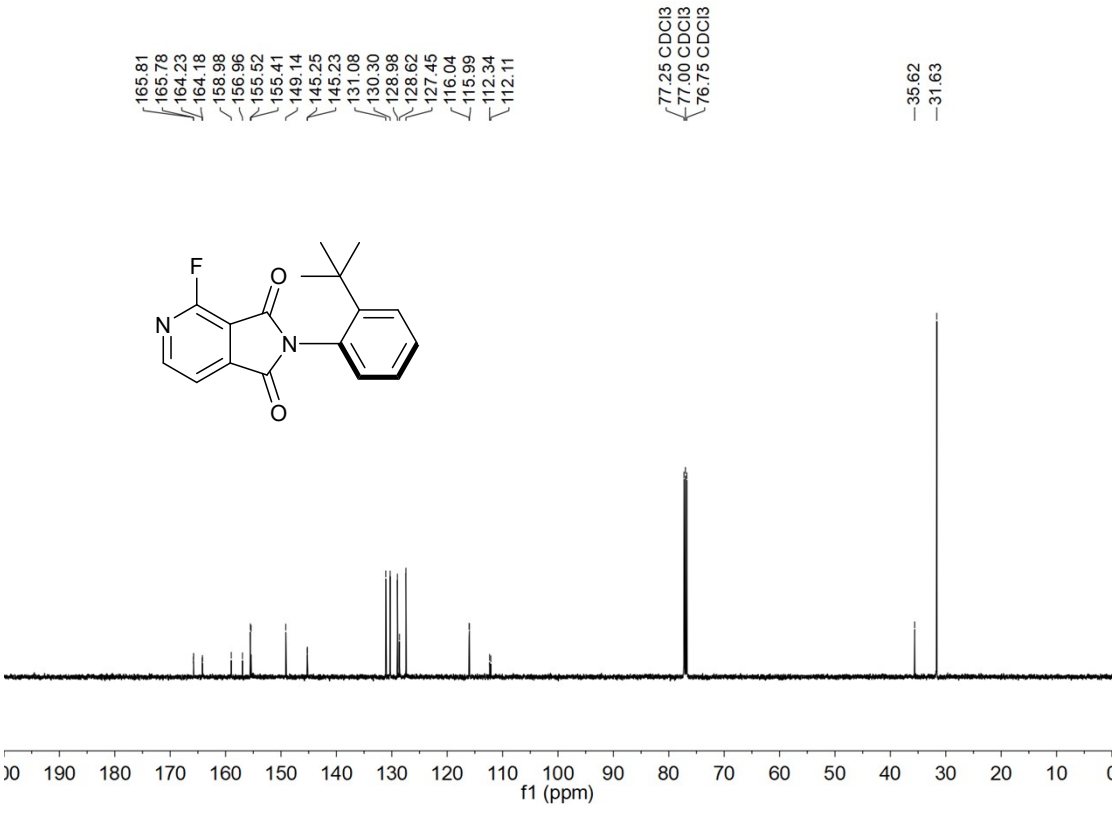
(*R*)-6-(2-(*tert*-butyl)phenyl)-5*H*-pyrrolo[3,4-*b*]pyridine-5,7(6*H*)-dione (2ah)



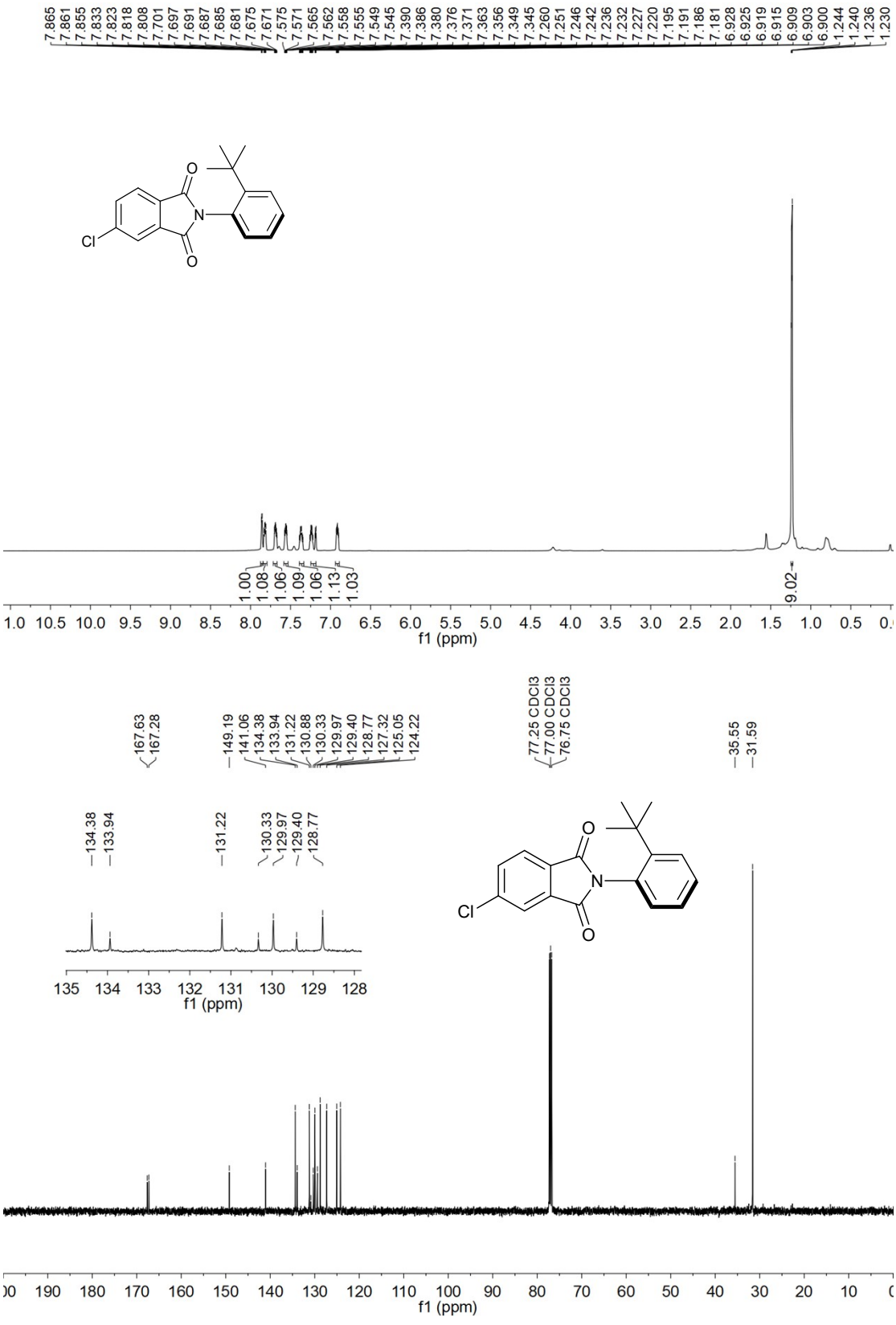


(*R*)-2-(2-(*tert*-butyl)phenyl)-4-fluoro-1*H*-pyrrolo[3,4-*c*]pyridine-1,3(2*H*)-dione (2ai)

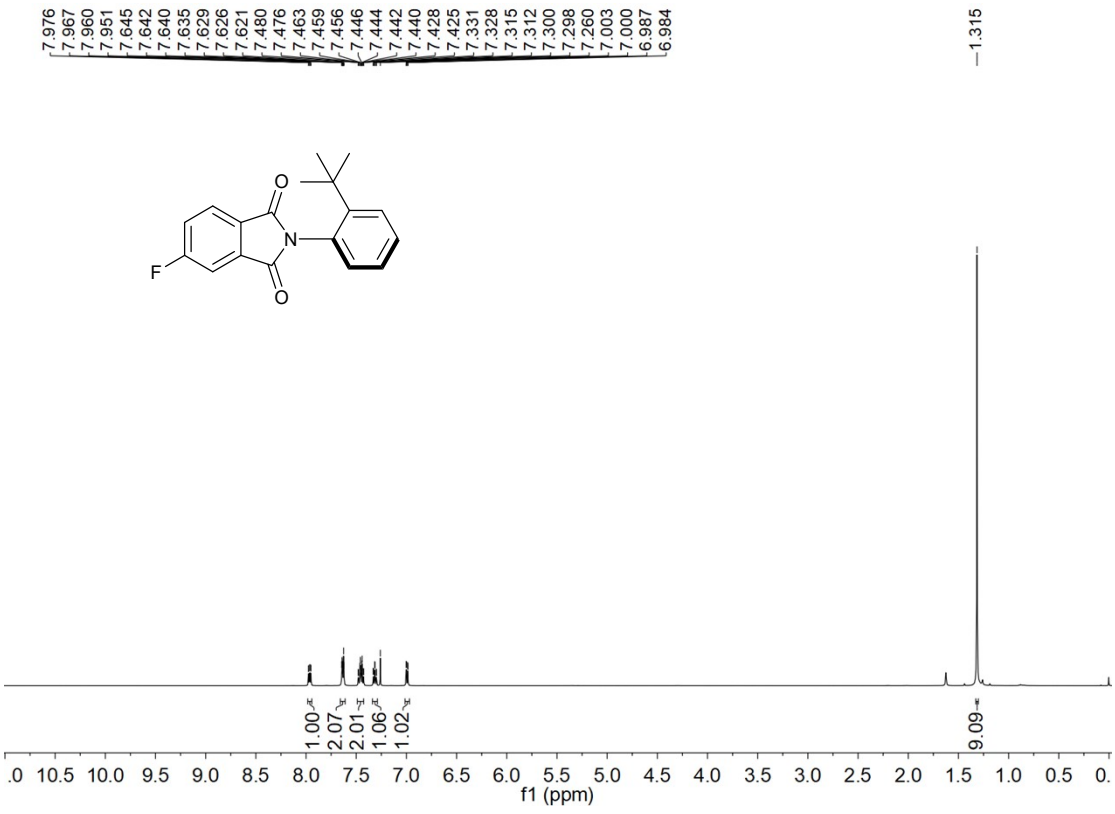


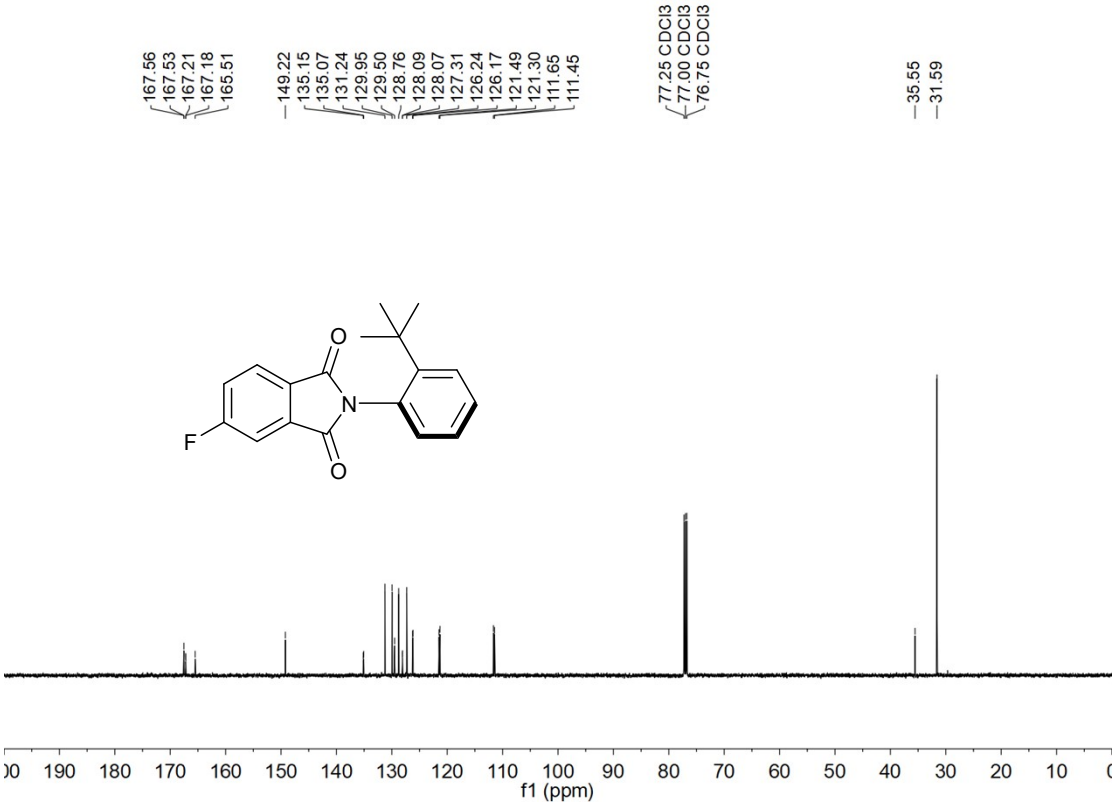


(*S*)- 2-(2-(*tert*-butyl)phenyl)-5-chloroisoindoline-1,3-dione (2aj)

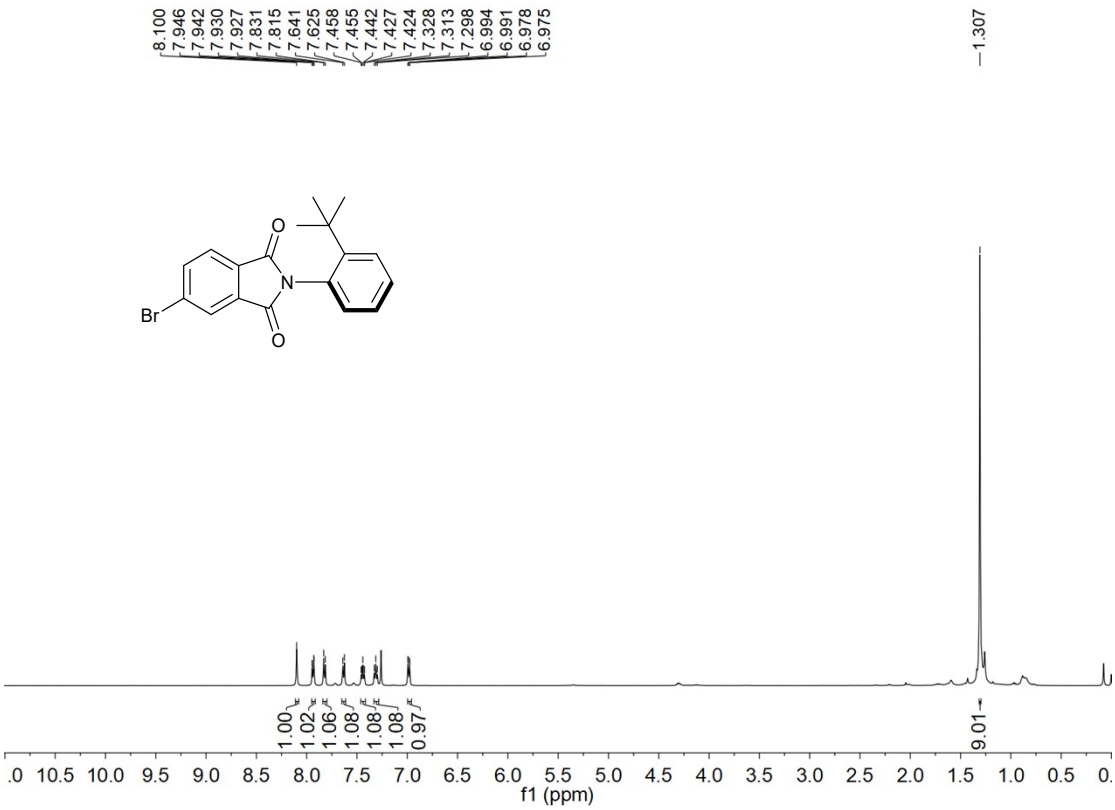


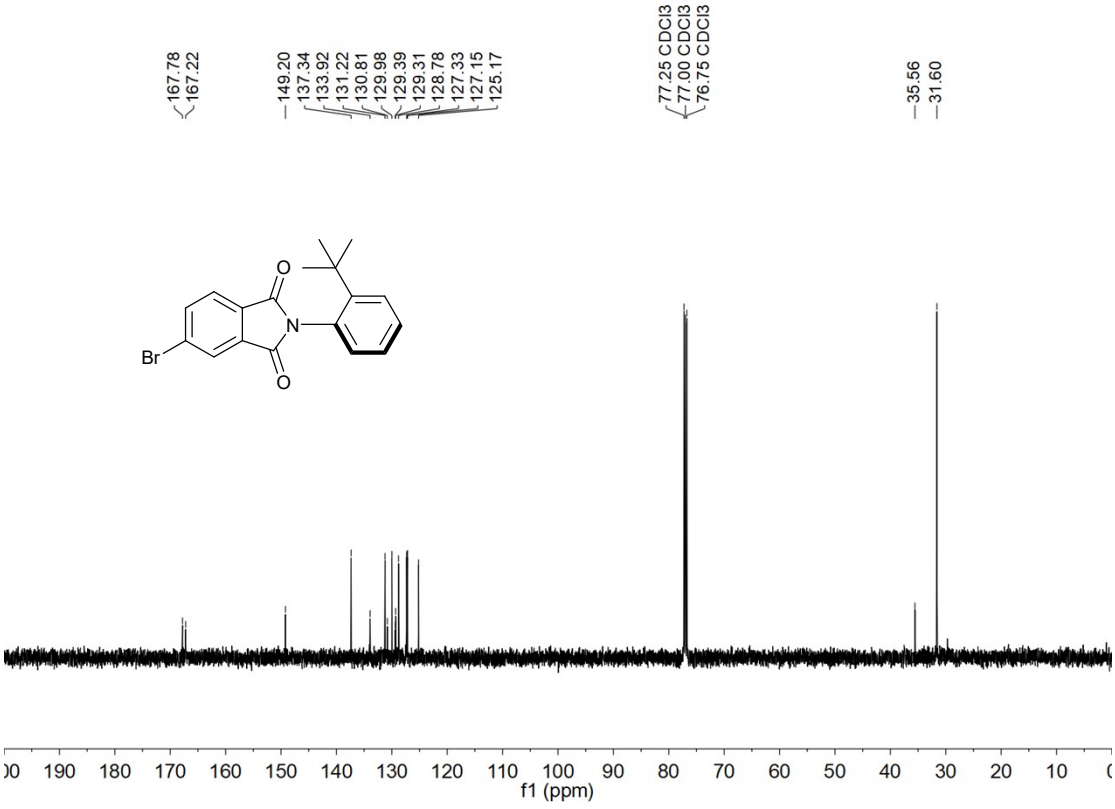
(*S*)- 2-(2-(*tert*-butyl)phenyl)-5-fluoroisoindoline-1,3-dione (2ak)



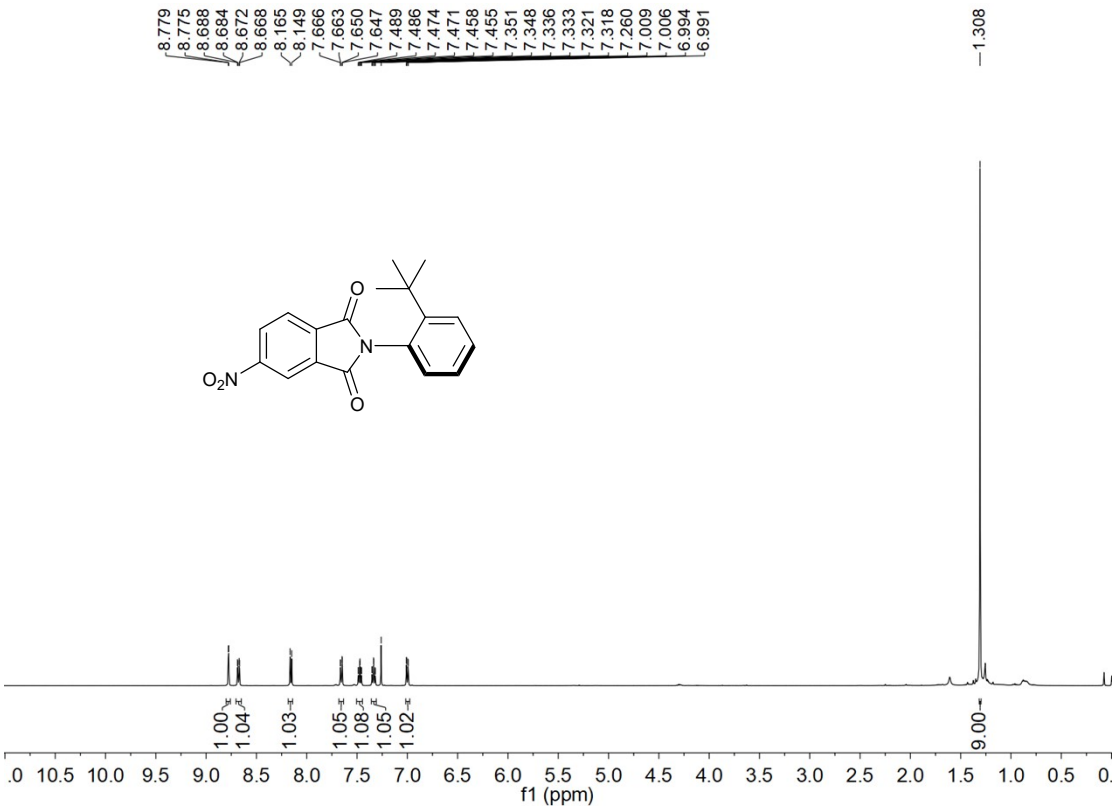


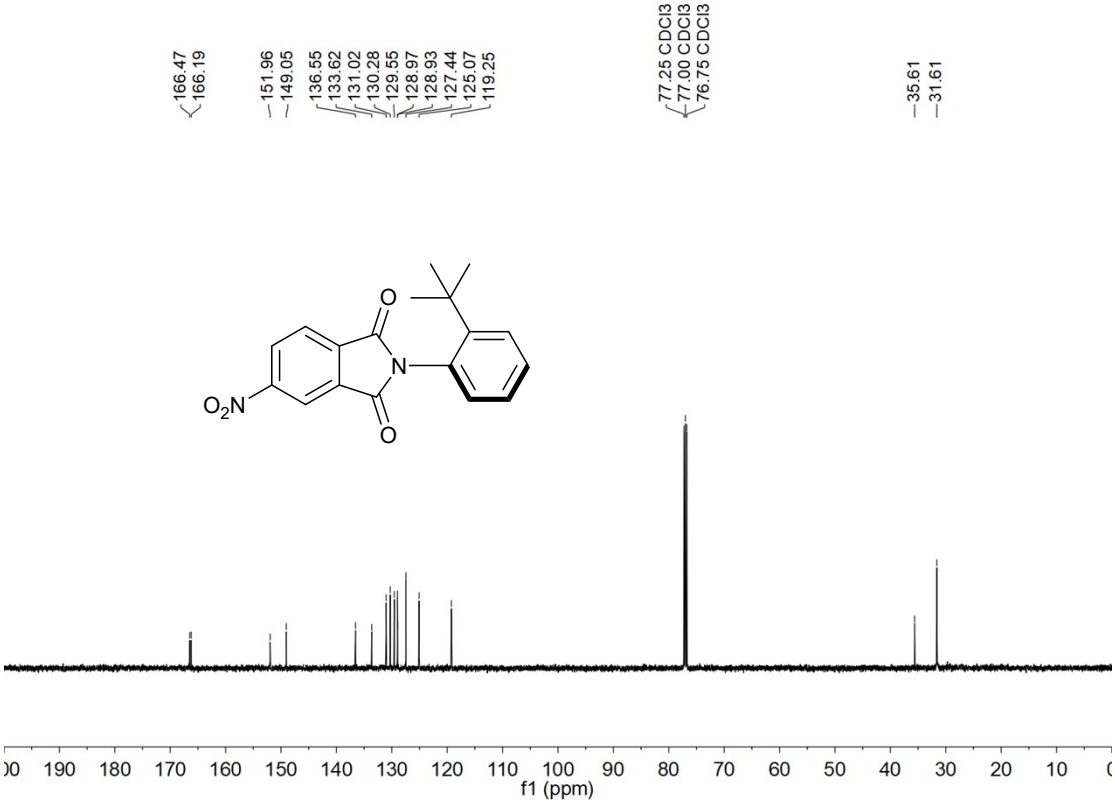
(*S*)- 5-bromo-2-(2-(*tert*-butyl)phenyl)isoindoline-1,3-dione (2al)



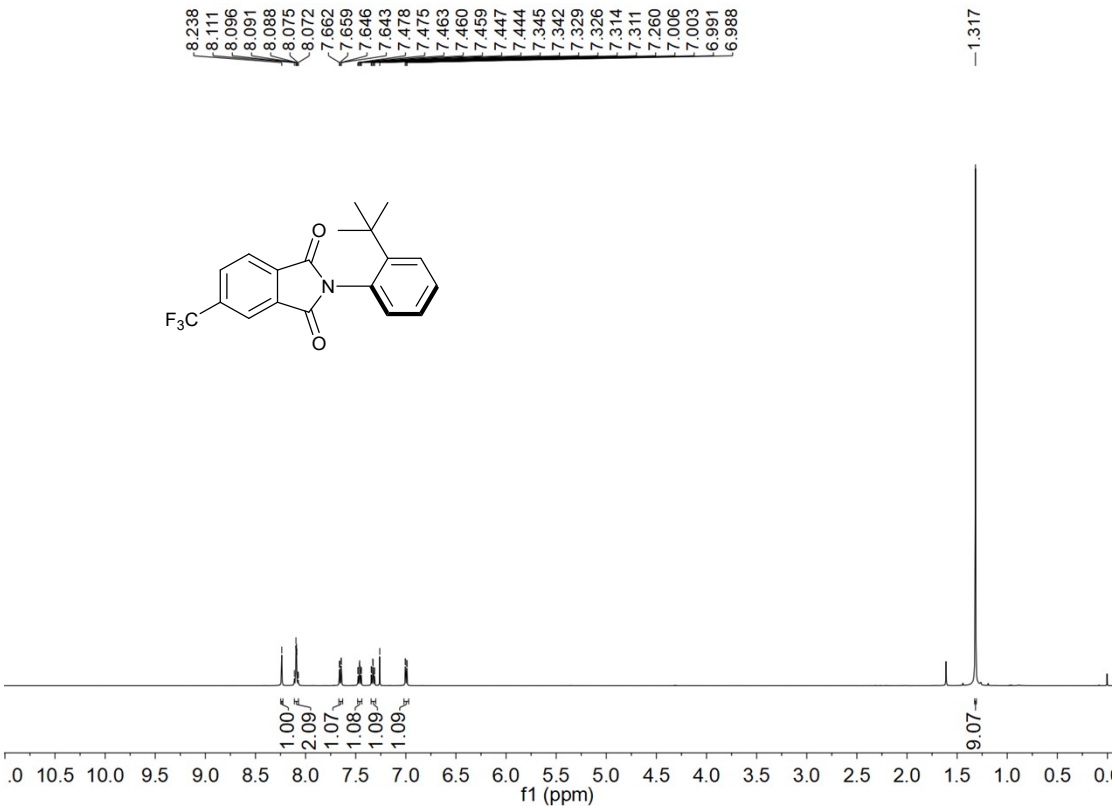


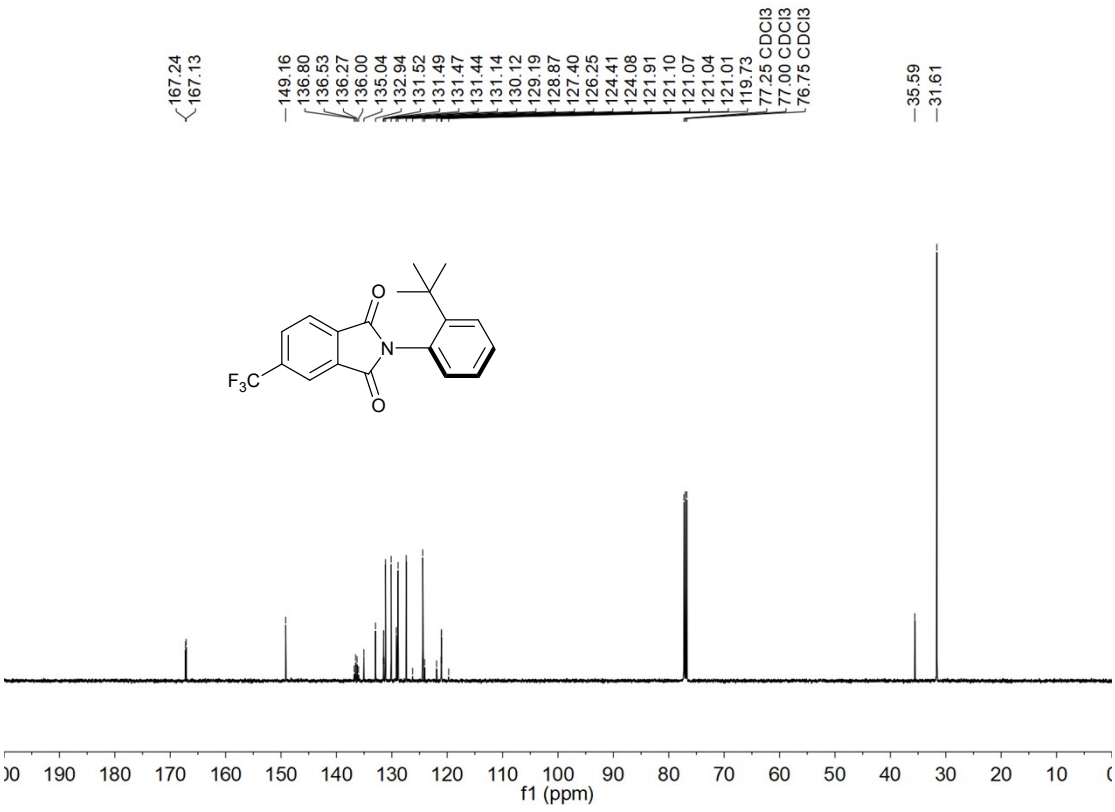
(*S*)- 2-(2-(*tert*-butyl)phenyl)-5-nitroisoindoline-1,3-dione (2am)



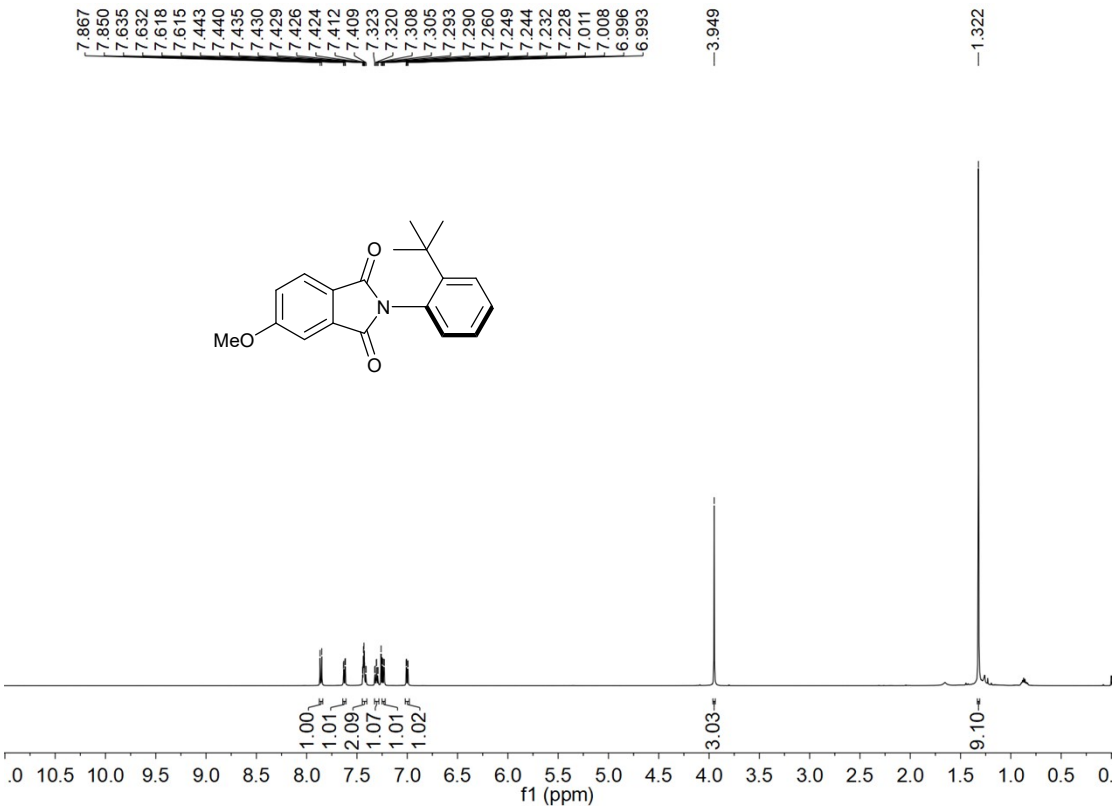


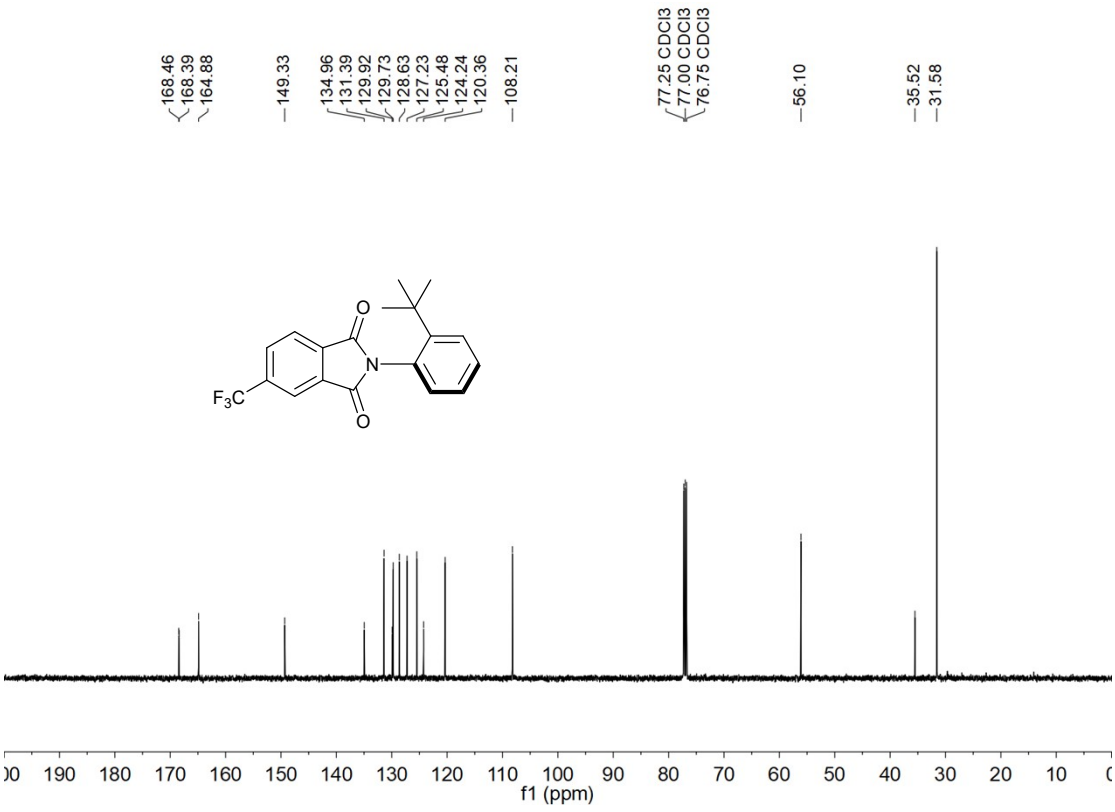
(*S*)-2-(2-(*tert*-butyl)phenyl)-5-(trifluoromethyl)isoindoline-1,3-dione (2an)



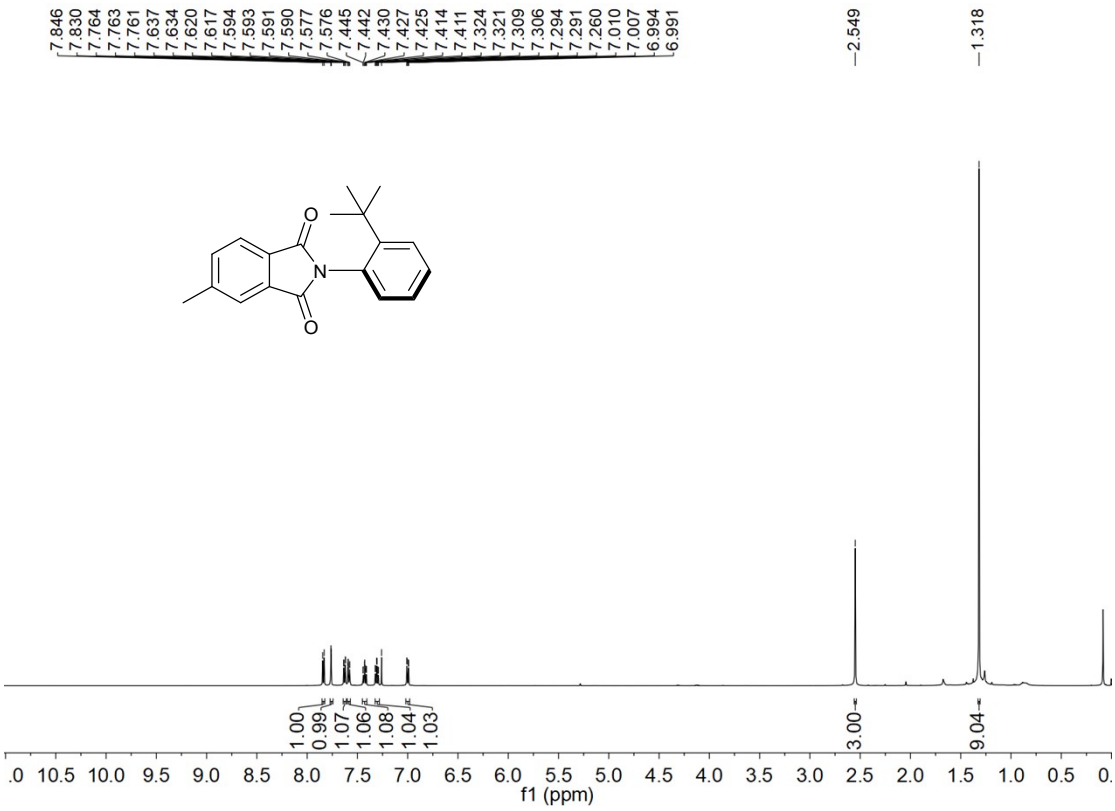


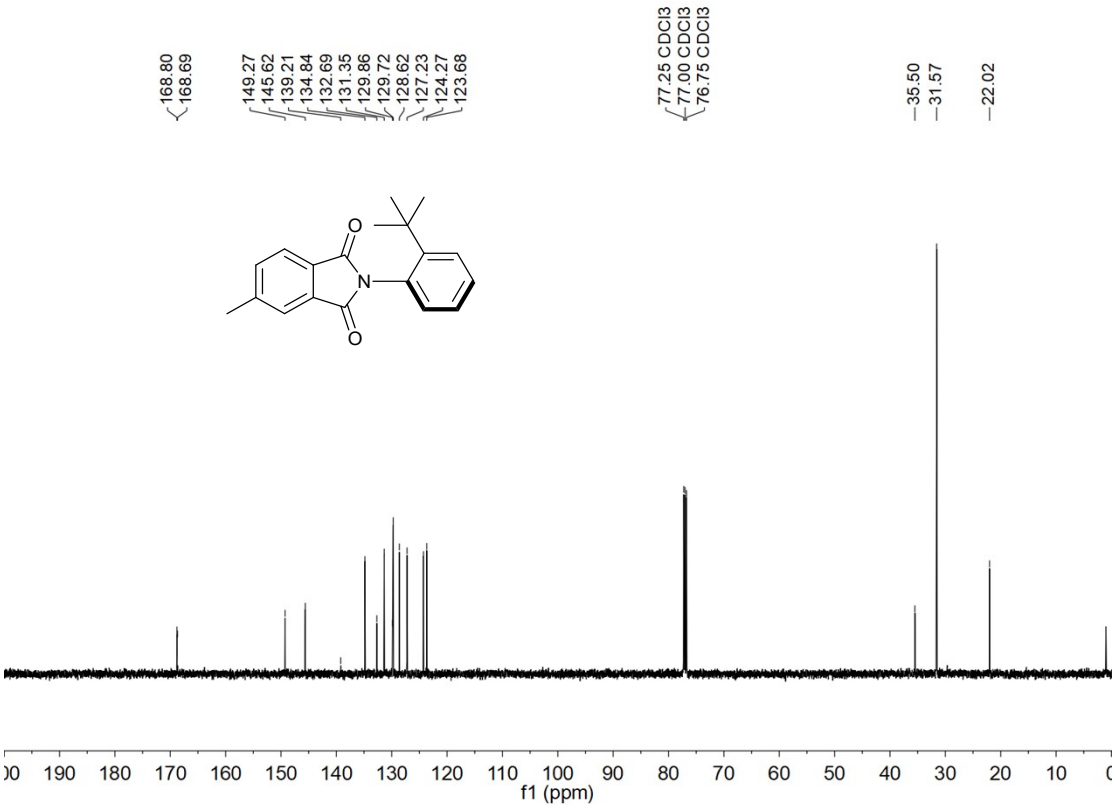
(*S*)-2-(2-(*tert*-butyl)phenyl)-5-methoxyisoindoline-1,3-dione (2ao)



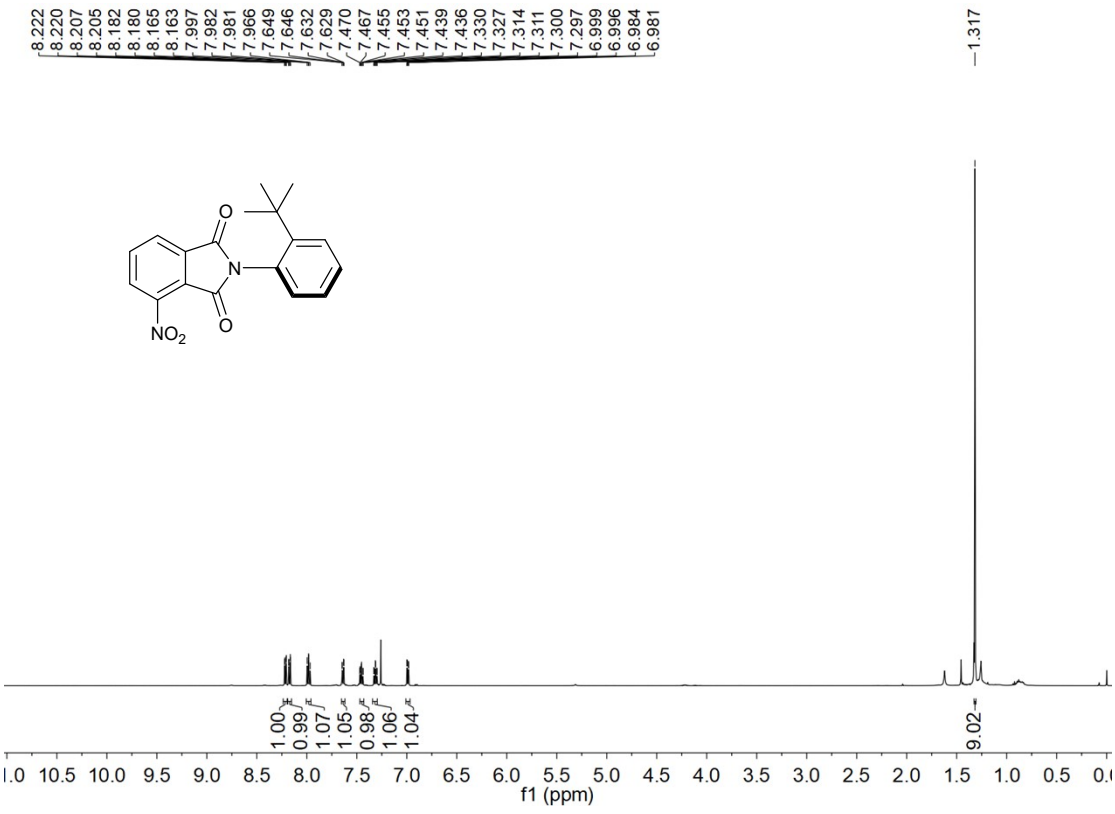


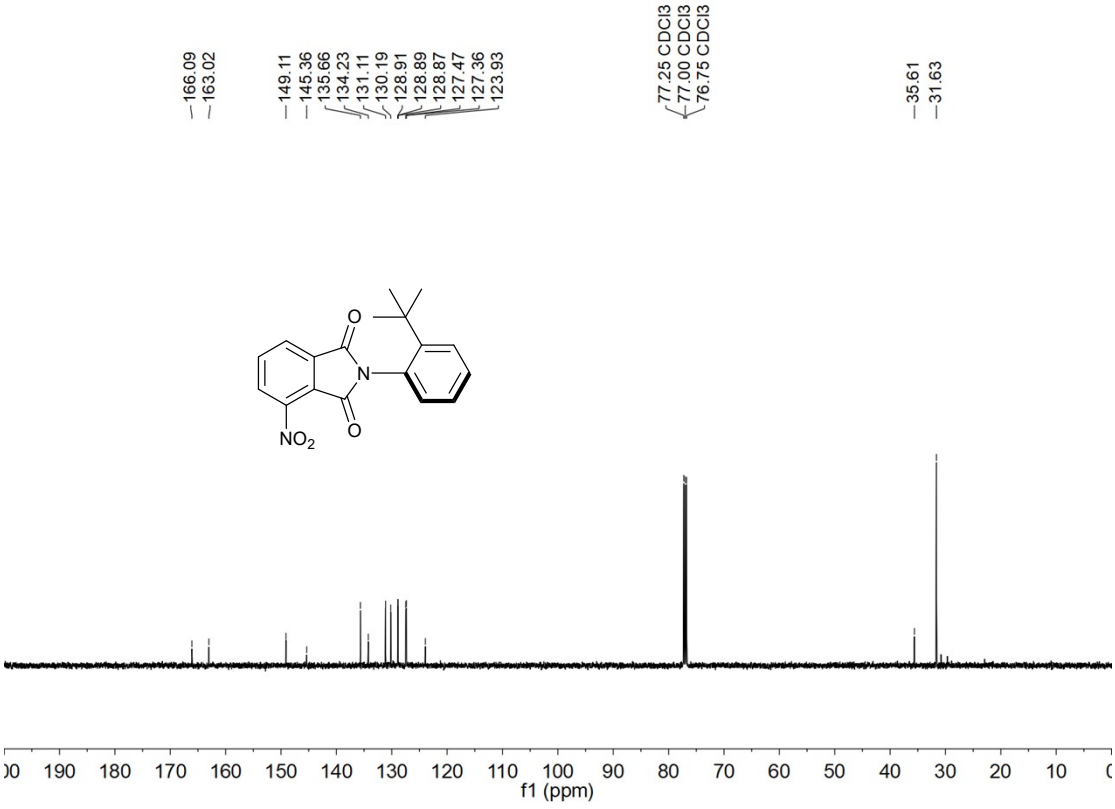
(*S*)-2-(2-(*tert*-butyl)phenyl)-5-methylisoindoline-1,3-dione (2ap)



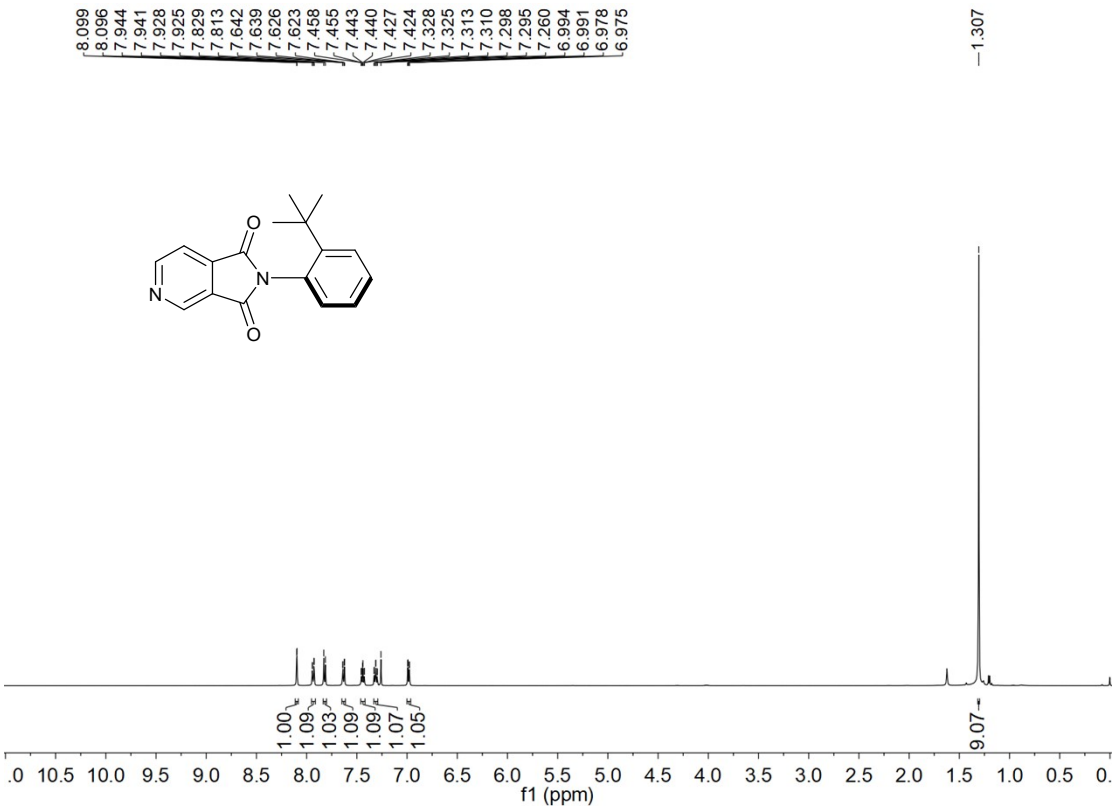


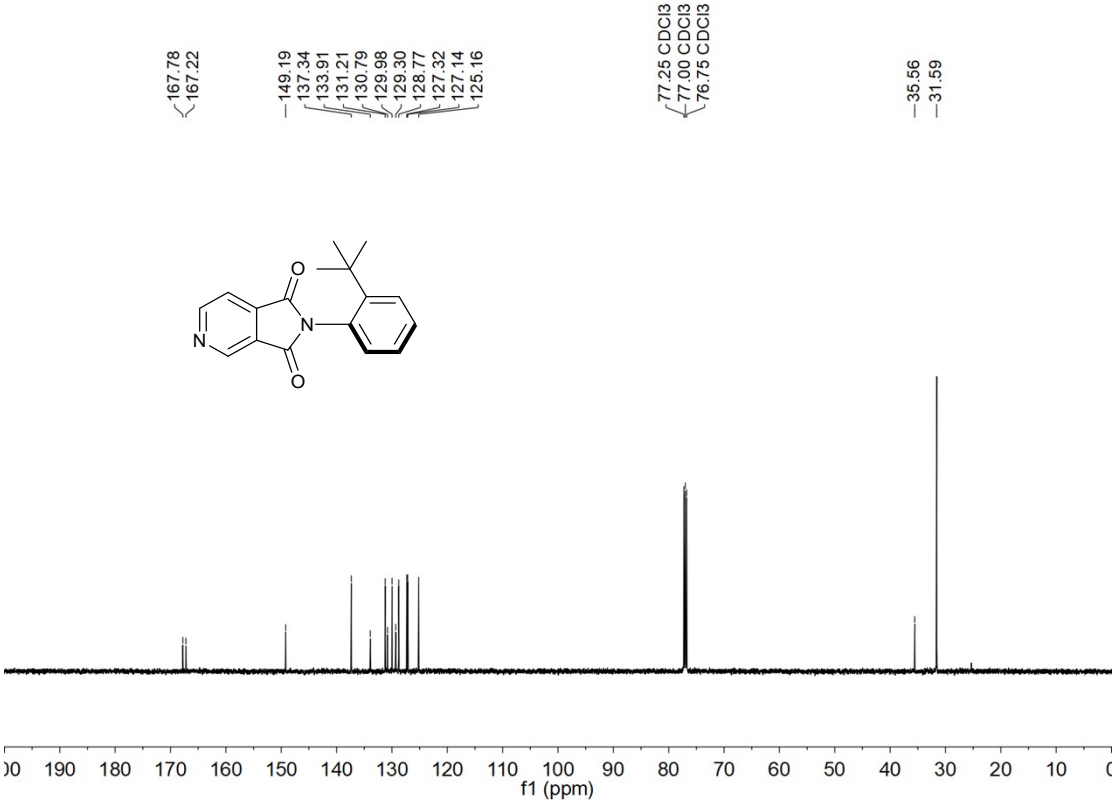
(*S*)-2-(2-(*tert*-butyl)phenyl)-4-nitroisoindoline-1,3-dione (2aq)



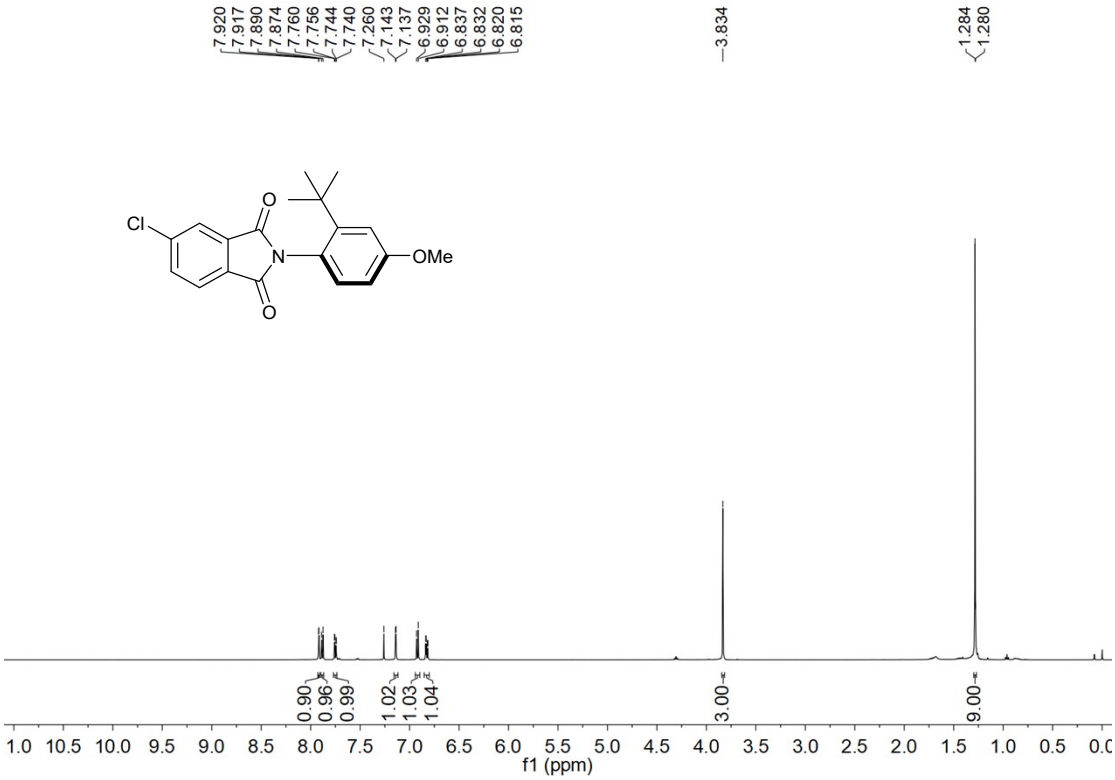


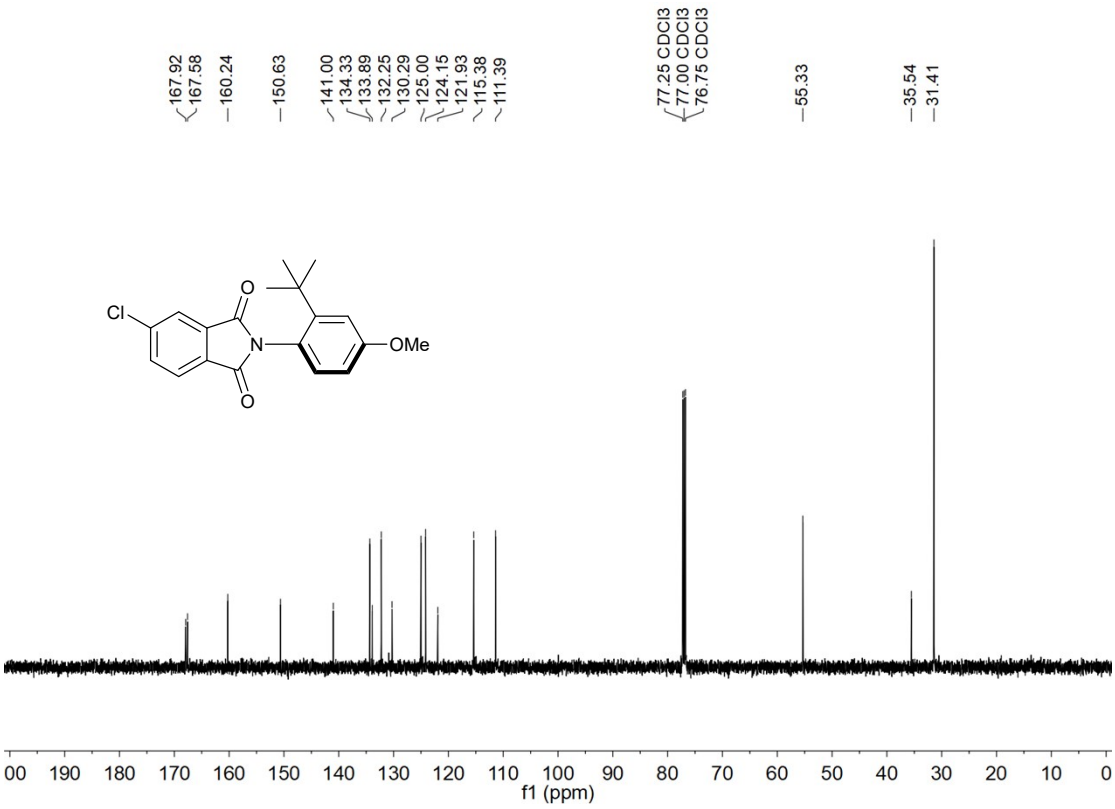
(*S*)-2-(2-(*tert*-butyl)phenyl)-1*H*-pyrrolo[3,4-*c*]pyridine-1,3(2*H*)-dione (2ar)





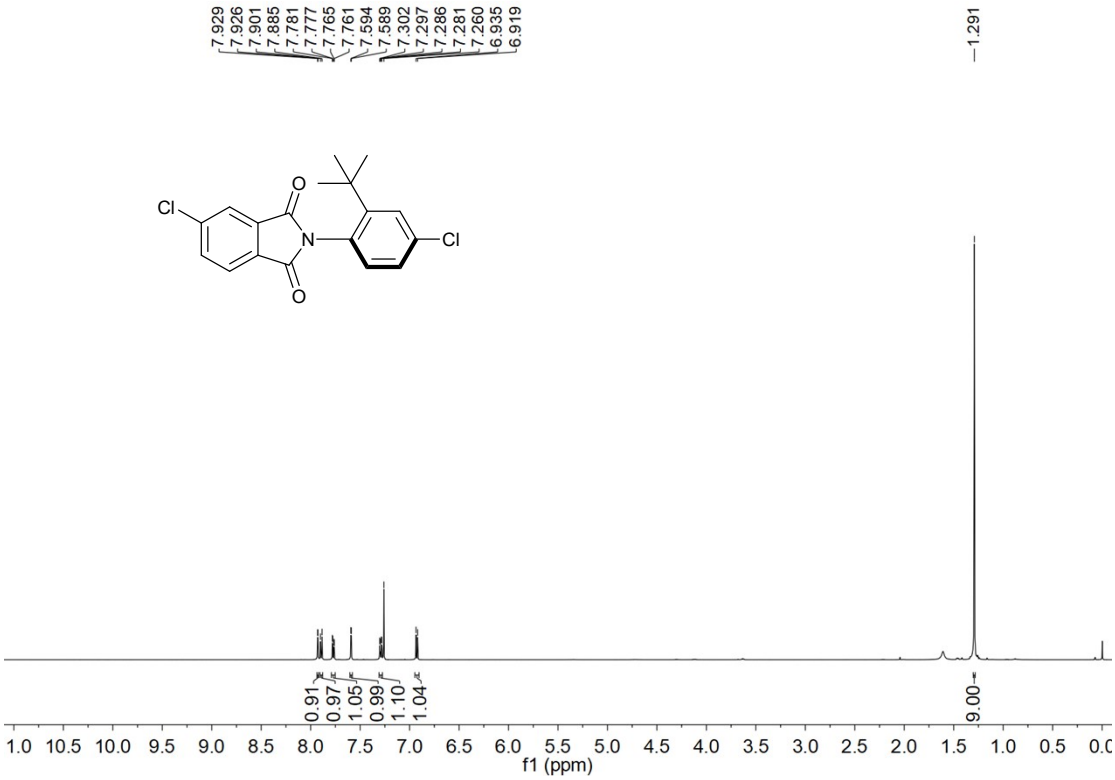
(*R*)-2-(2-(*tert*-butyl)-4-methoxyphenyl)-5-chloroisoindoline-1,3-dione (2ba)

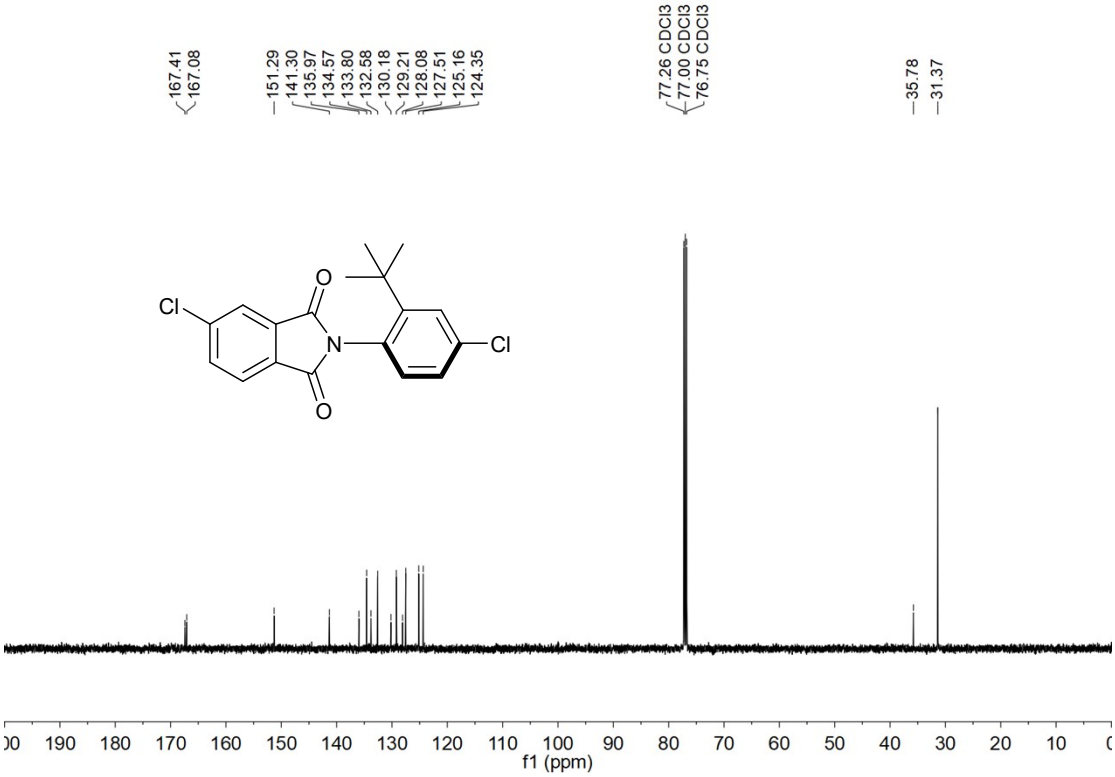




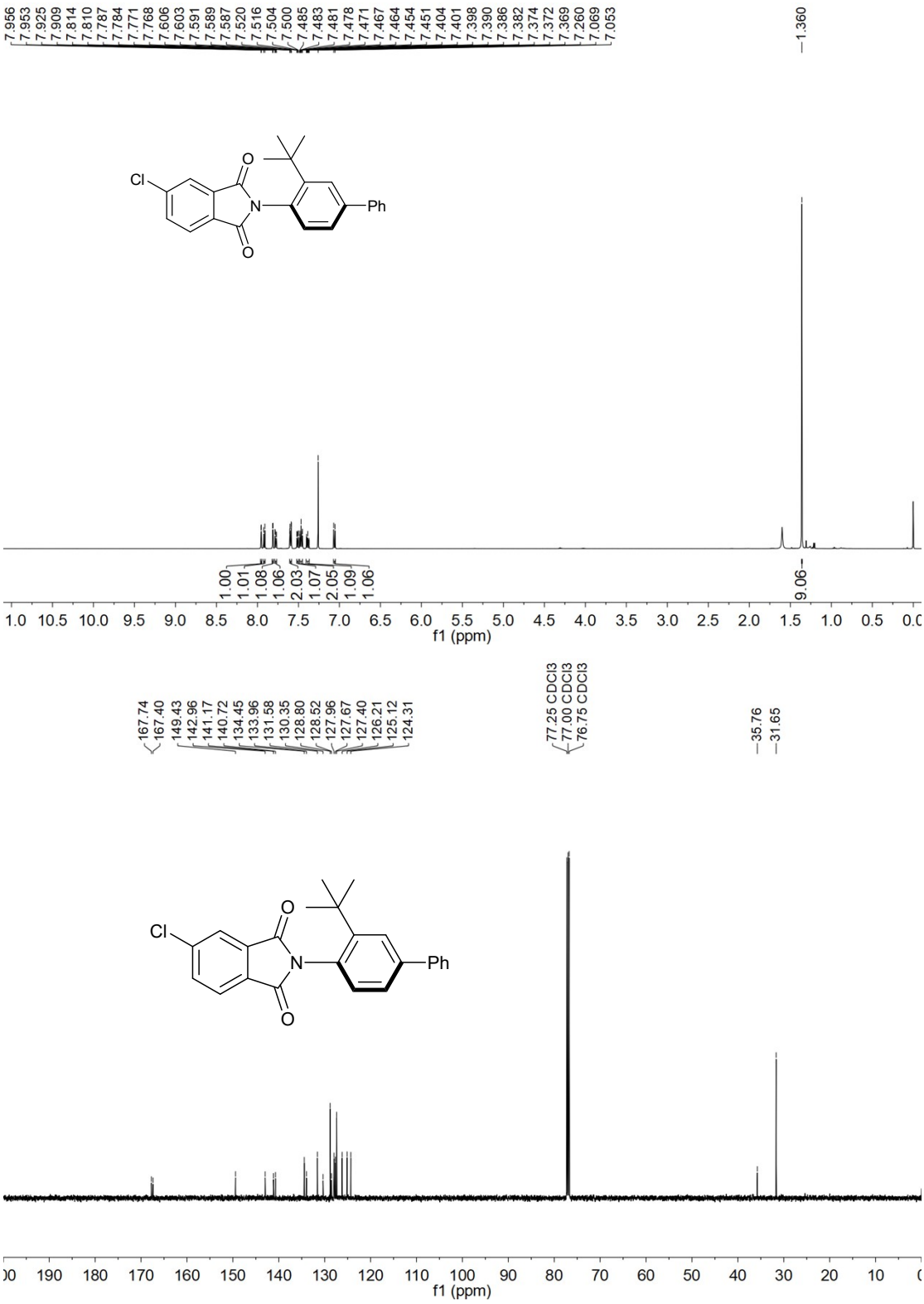
(*R*)-2-(4-bromo-2-(*tert*-butyl)phenyl)-5-chloroisoindoline-1,3-dione (2bb)

(*R*)- 2-(2-(*tert*-butyl)-4-chlorophenyl)-5-chloroisoindoline-1,3-dione (2bc)

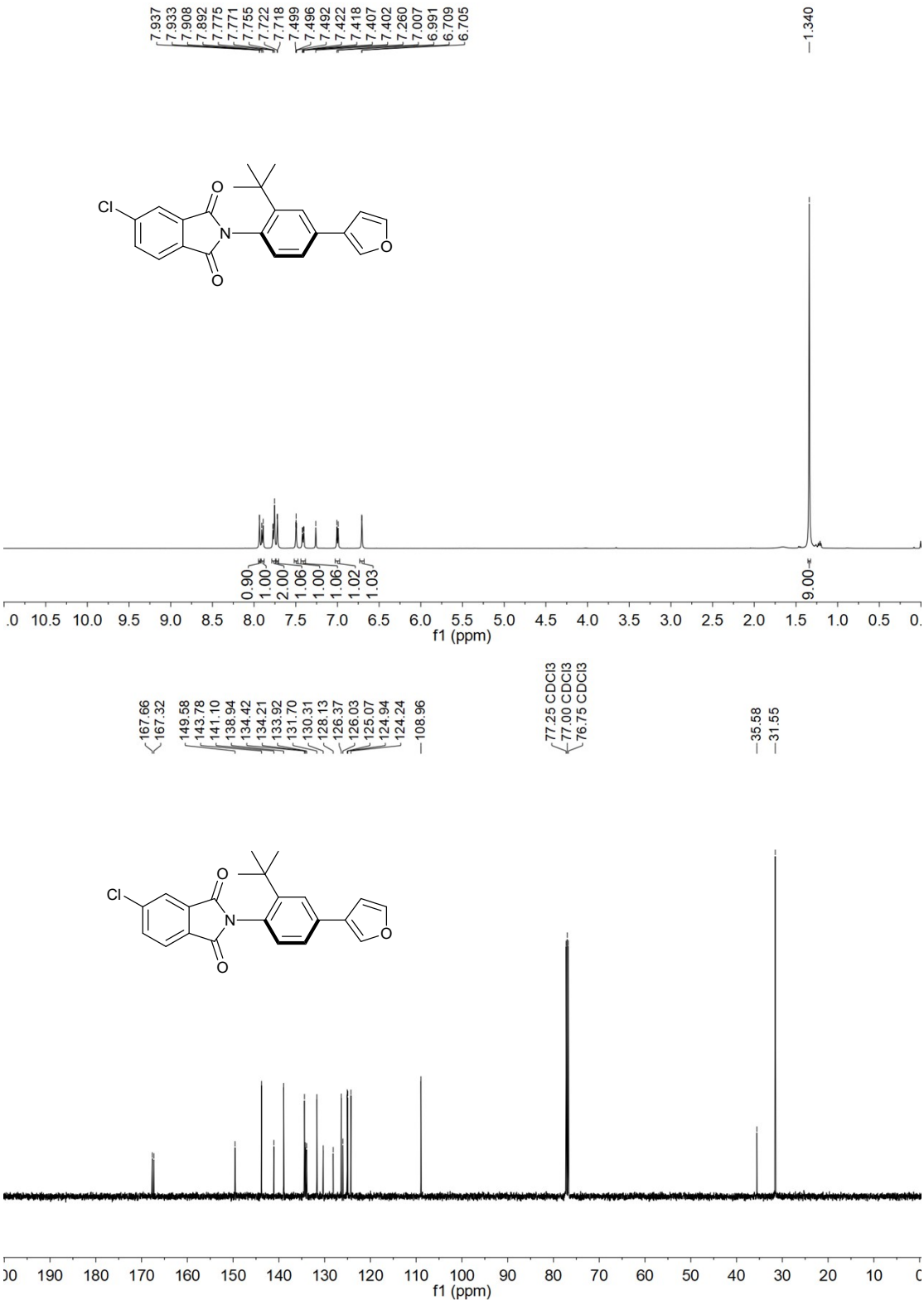




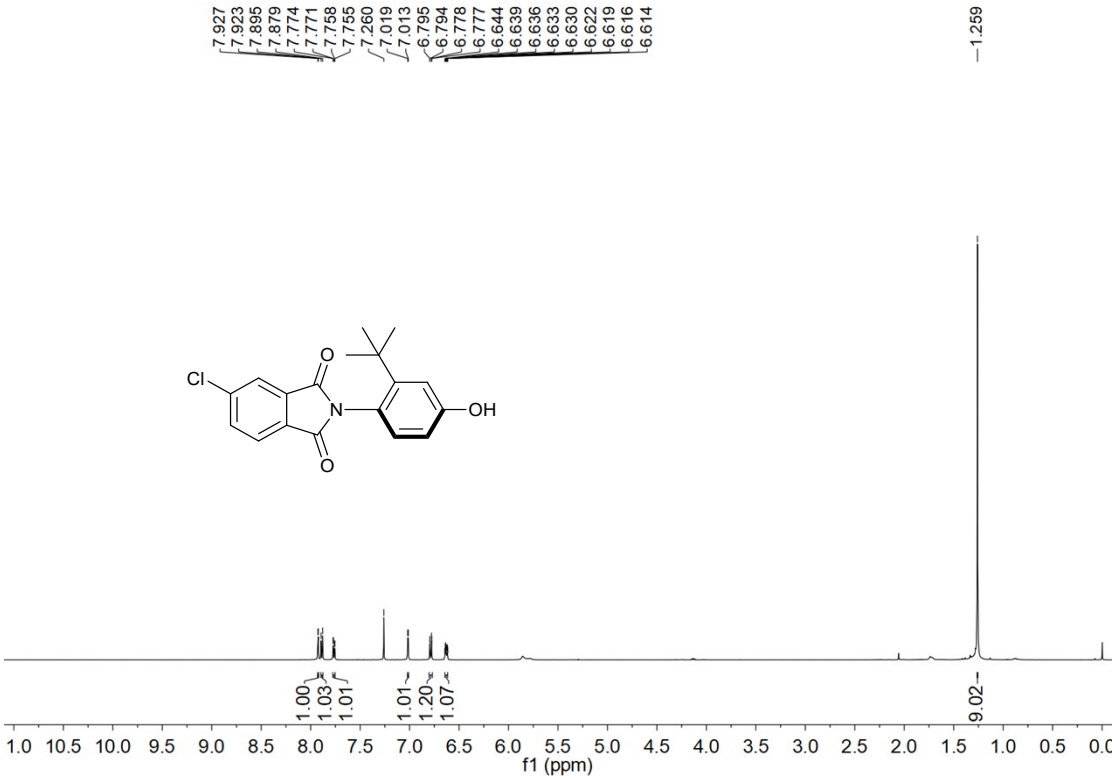
(*R*)-2-(3-(*tert*-butyl)-[1,1'-biphenyl]-4-yl)-5-chloroisoindoline-1,3-dione (2bd)

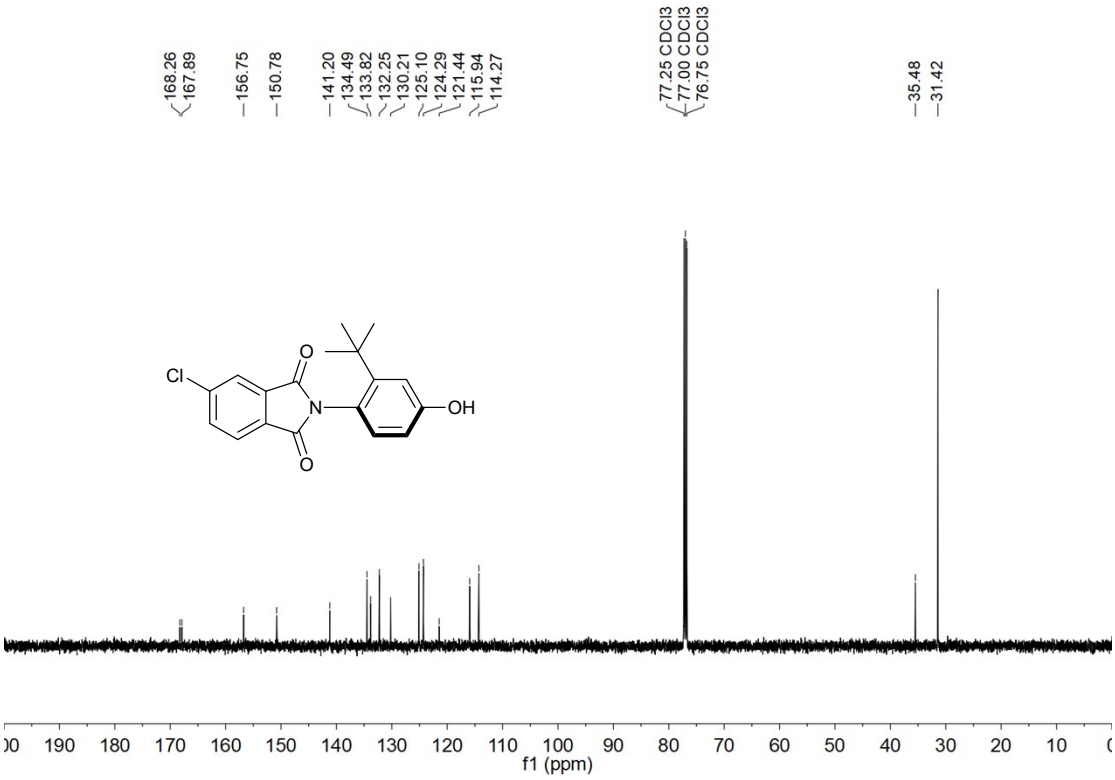


(*R*)-2-(2-(*tert*-butyl)-4-(furan-3-yl)phenyl)-5-chloroisoindoline-1,3-dione (2be)

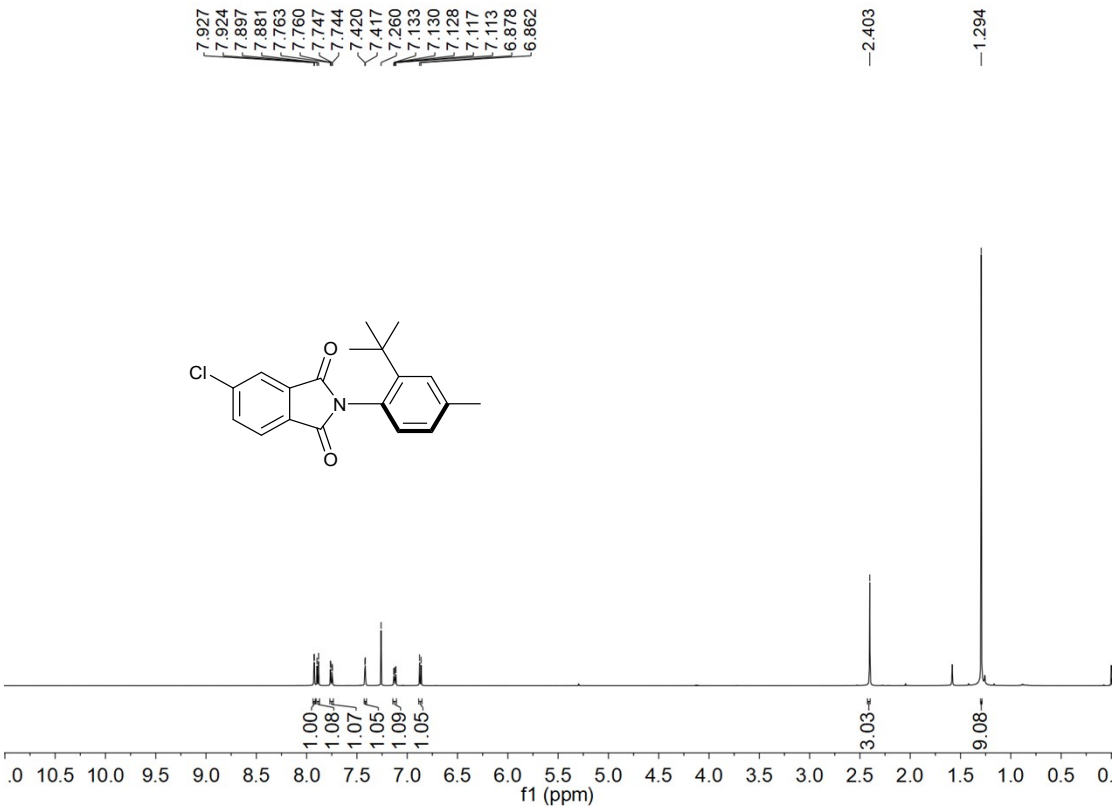


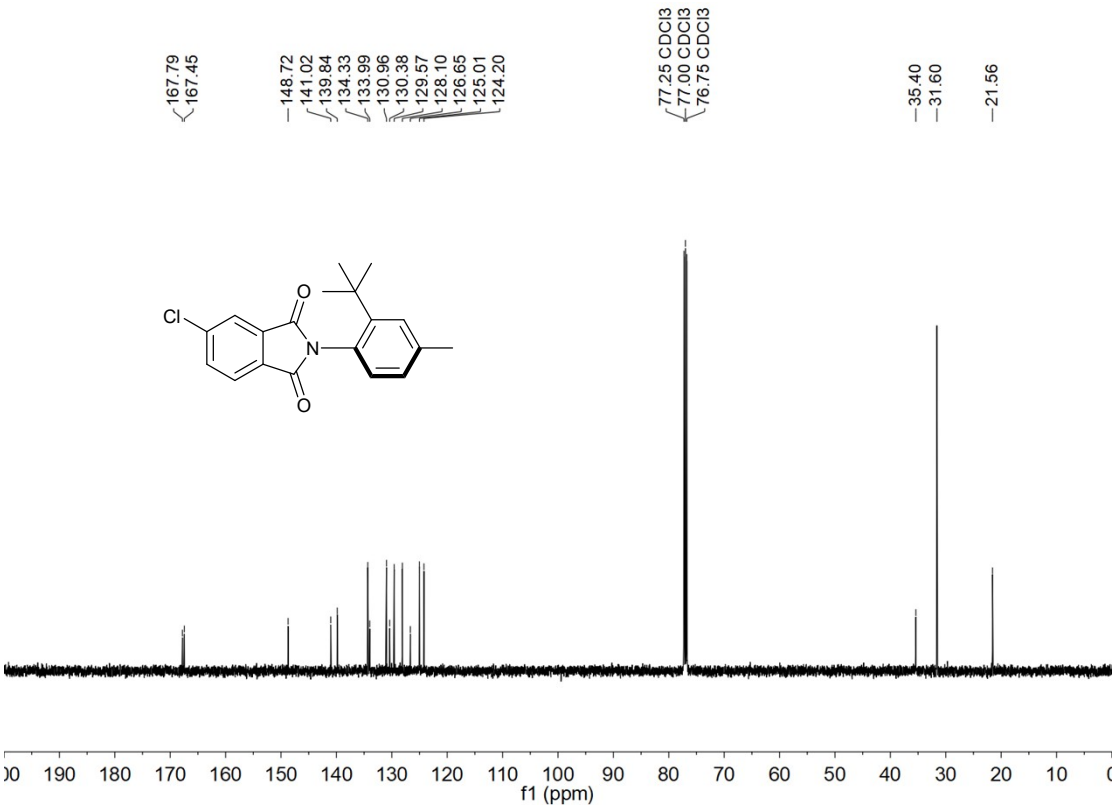
(*R*)-2-(2-(*tert*-butyl)-4-hydroxyphenyl)-5-chloroisoindoline-1,3-dione (2bf)



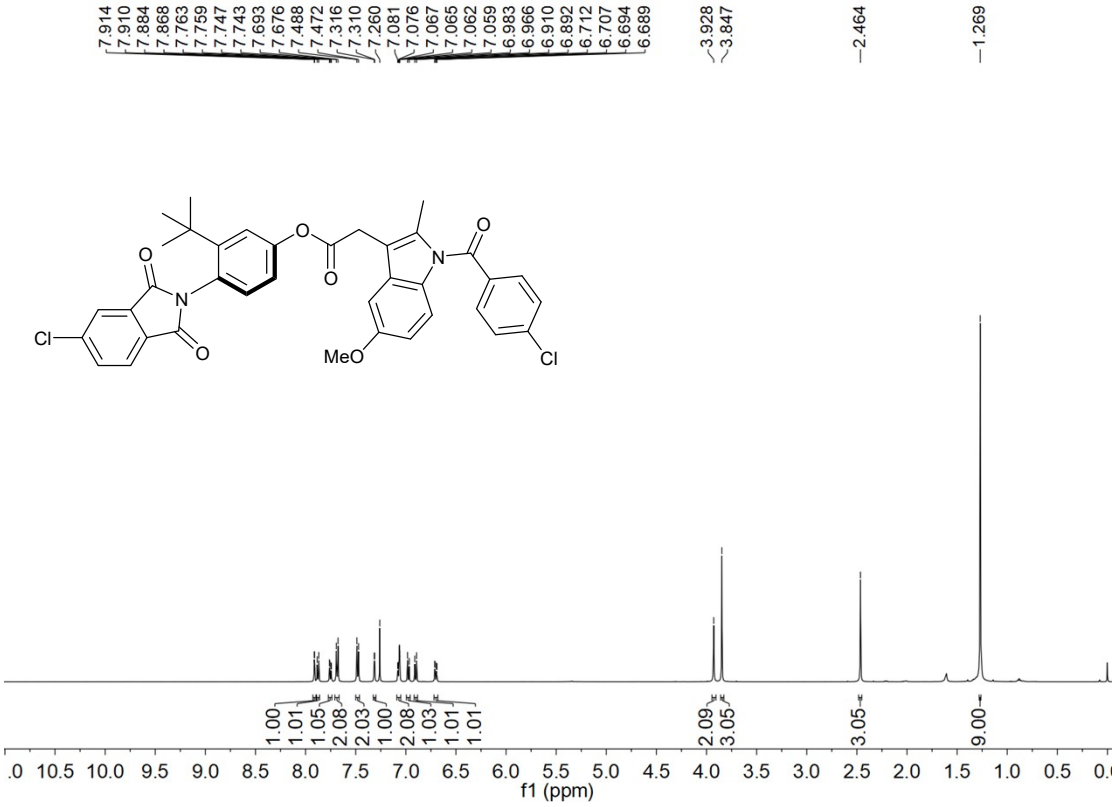


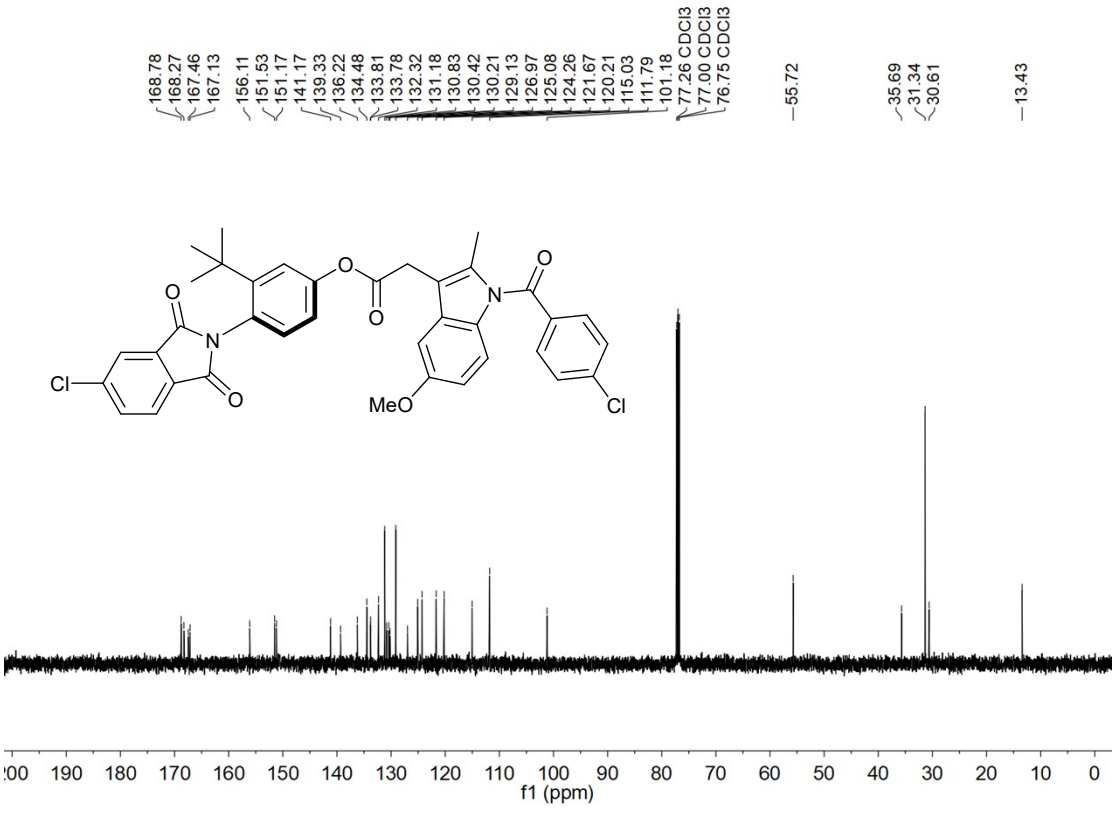
(*R*)-2-(2-(*tert*-butyl)-4-methylphenyl)-5-chloroisoindoline-1,3-dione (2bg)



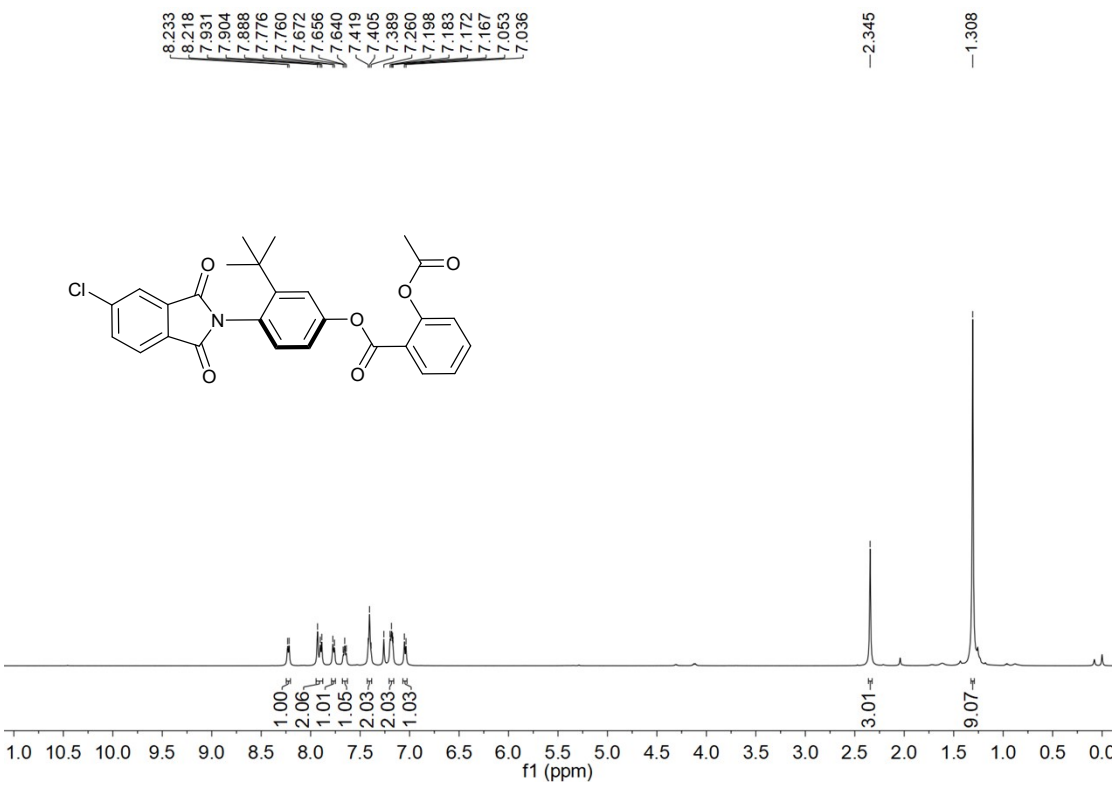


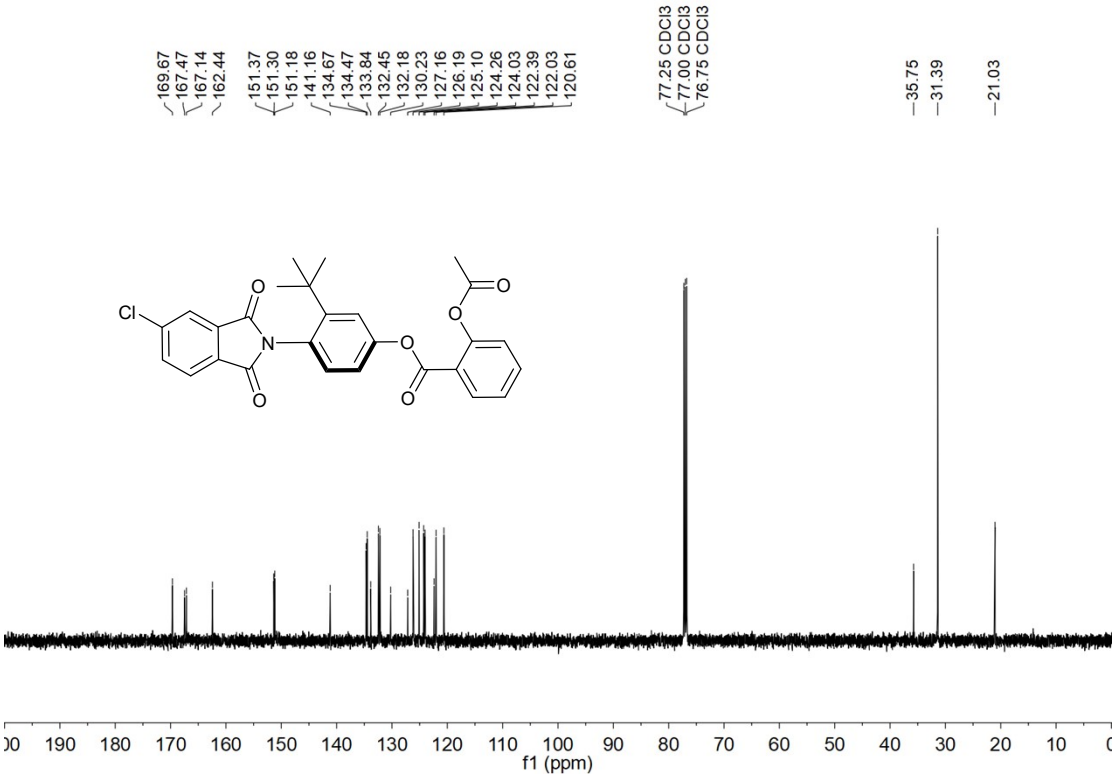
(*R*)-3-(*tert*-butyl)-4-(5-chloro-1,3-dioxoisoindolin-2-yl)phenyl 2-(1-(4-chloro-benzoyl)-5-methoxy-1*H*-indol-3-yl)acetate (2bh)



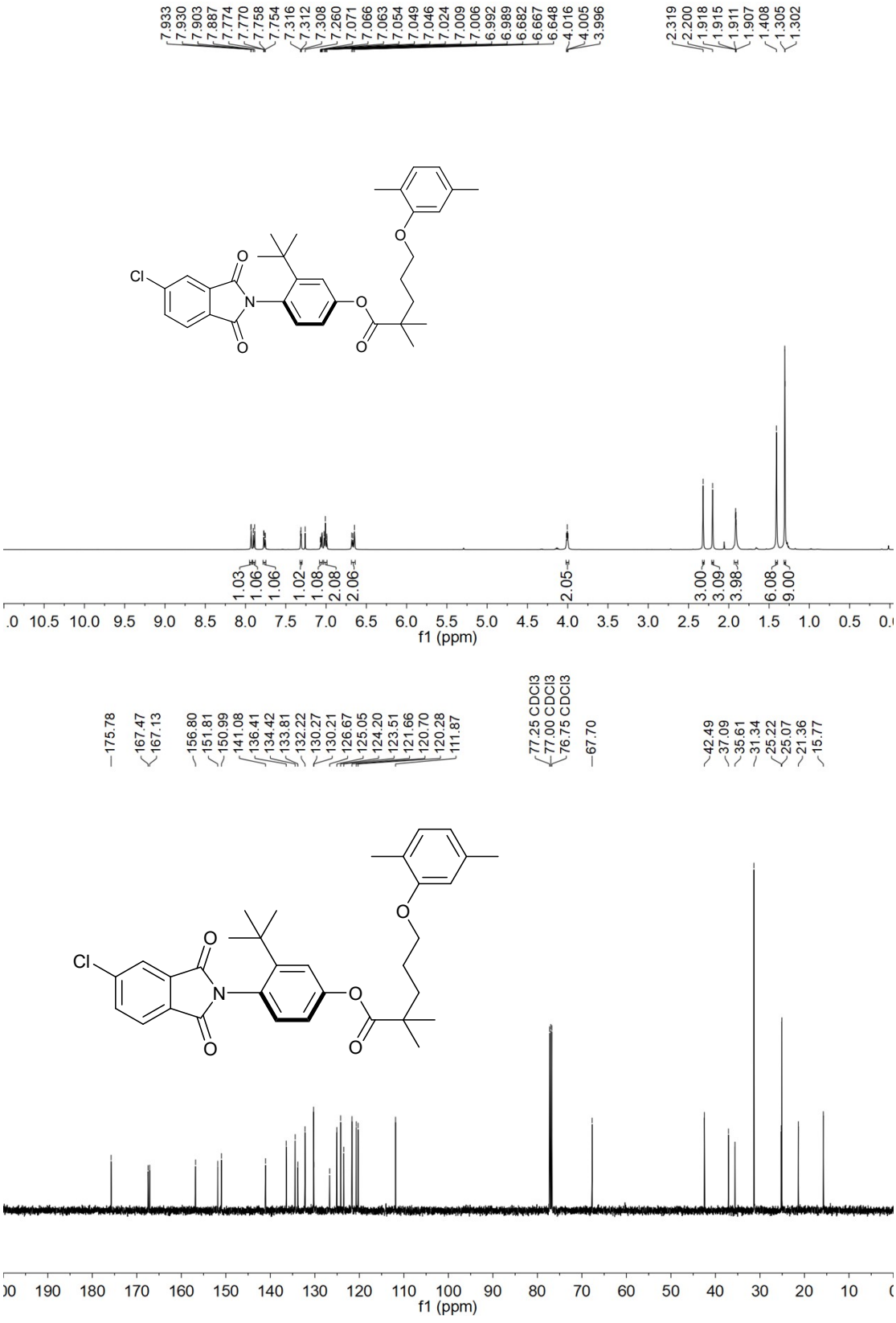


(*R*)-3-(*tert*-butyl)-4-(5-chloro-1,3-dioxoisoindolin-2-yl)phenyl-2-acetoxybenzoate (2bi)

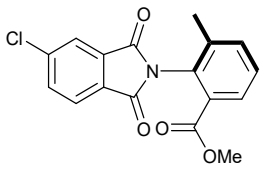


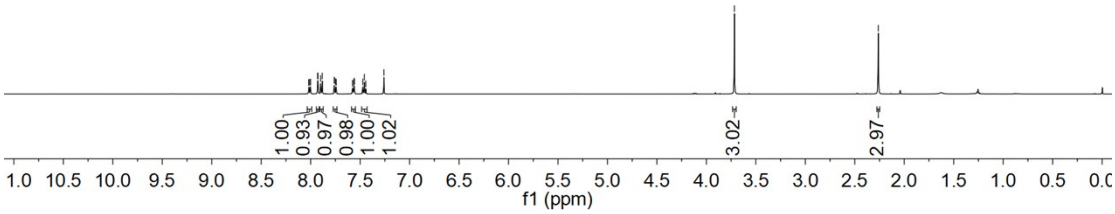


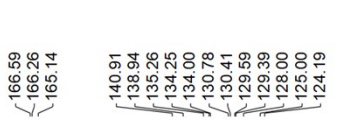
(*R*)-3-(*tert*-butyl)-4-(5-chloro-1,3-dioxoisoindolin-2-yl)phenyl 5-(2,5-dimethyl-phenoxy)-2,2-dimethylpentanoate (2bj)

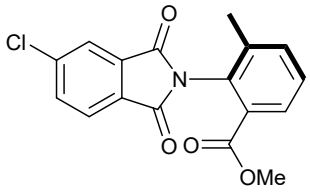


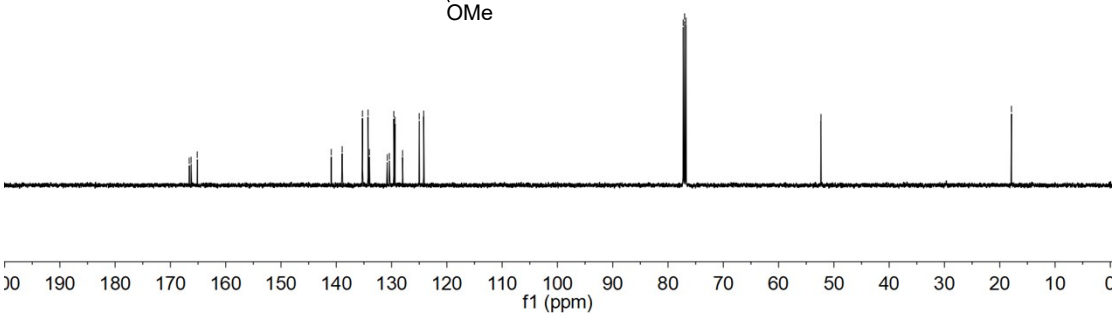
(*S*)-methyl-2-(5-chloro-1,3-dioxoisoindolin-2-yl)-3-methylbenzoate (2bk)



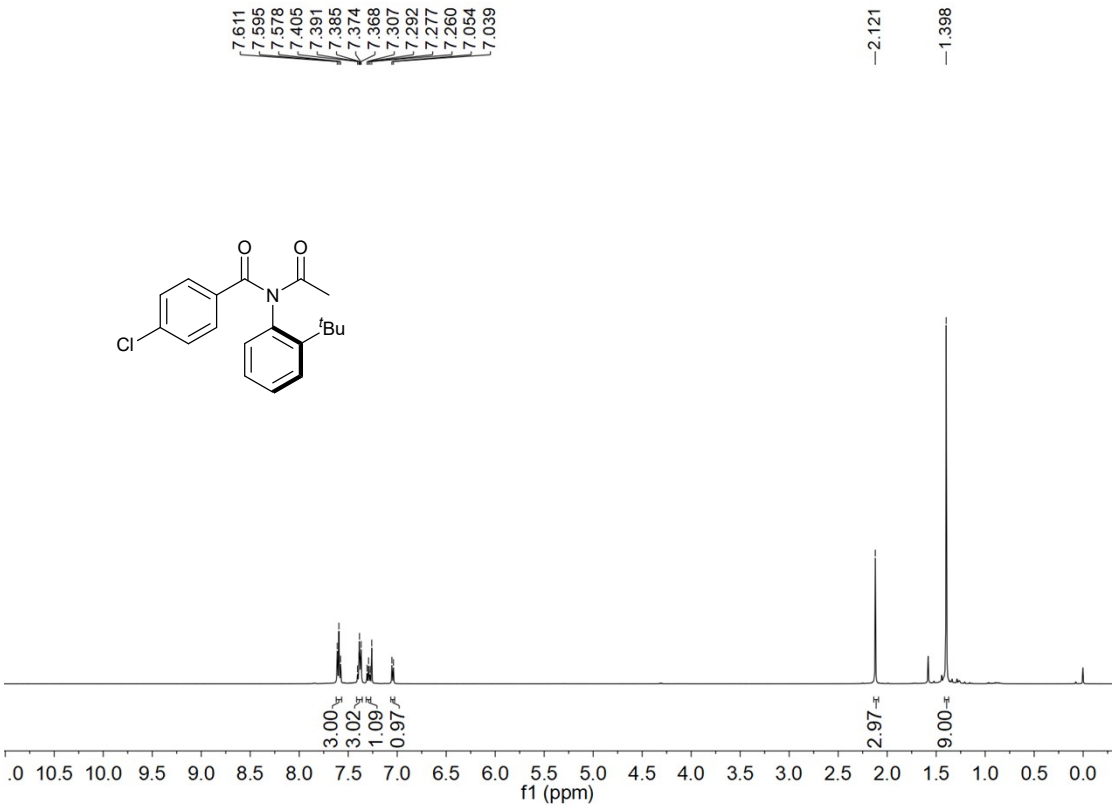


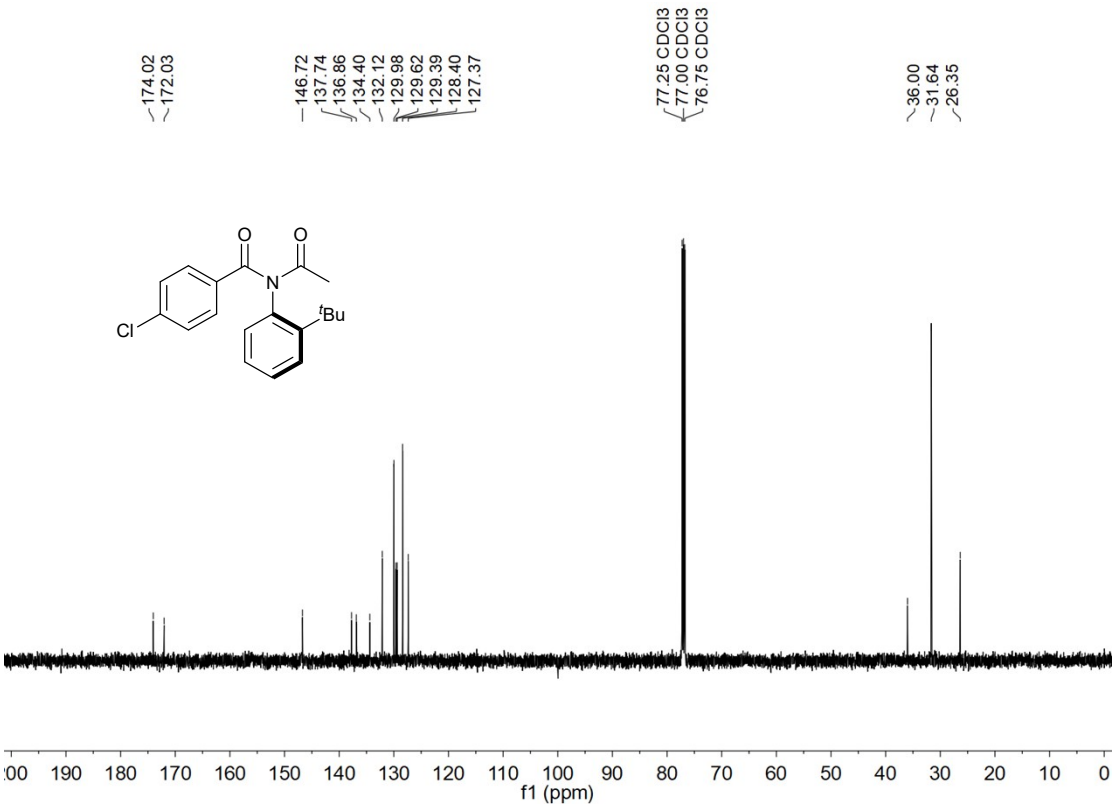




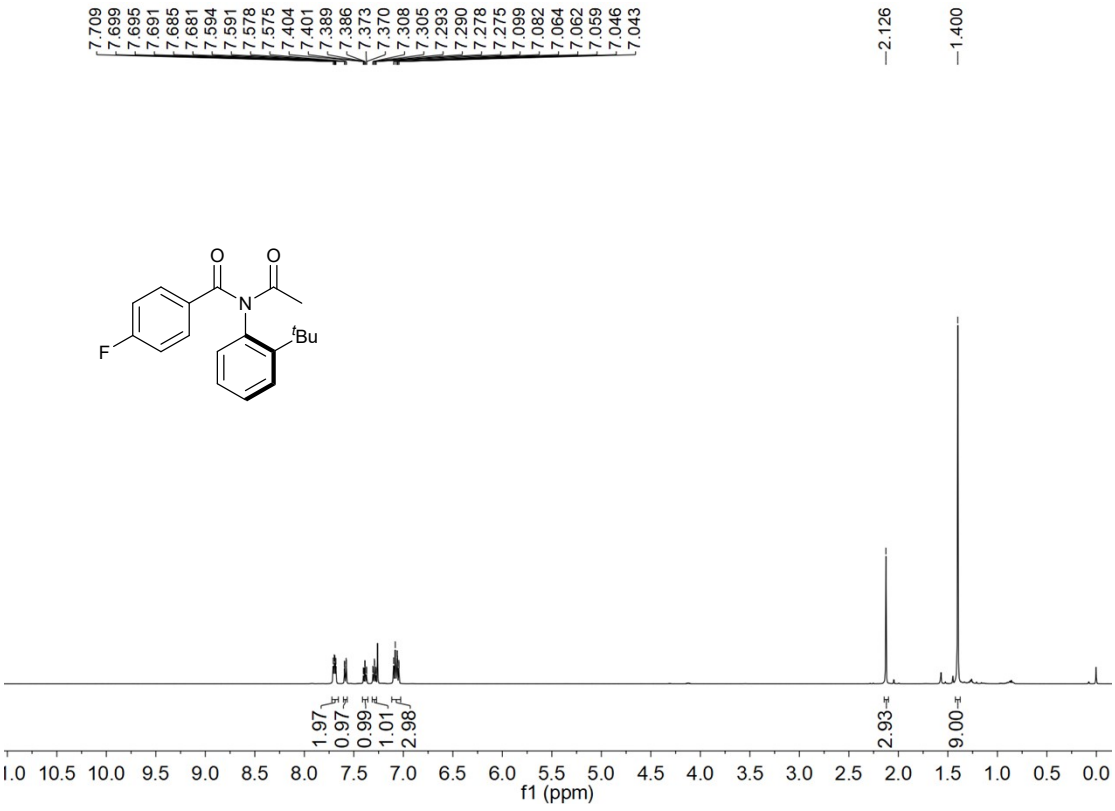


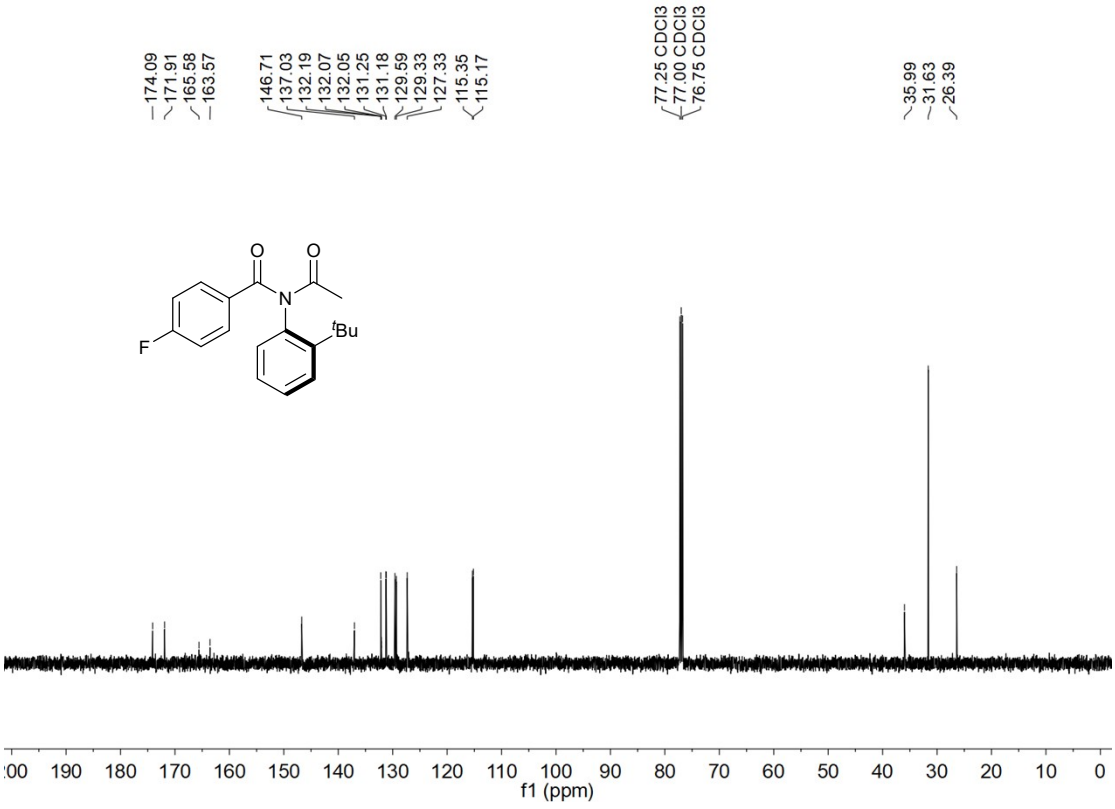
(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)phenyl)-4-chlorobenzamide (5aa)



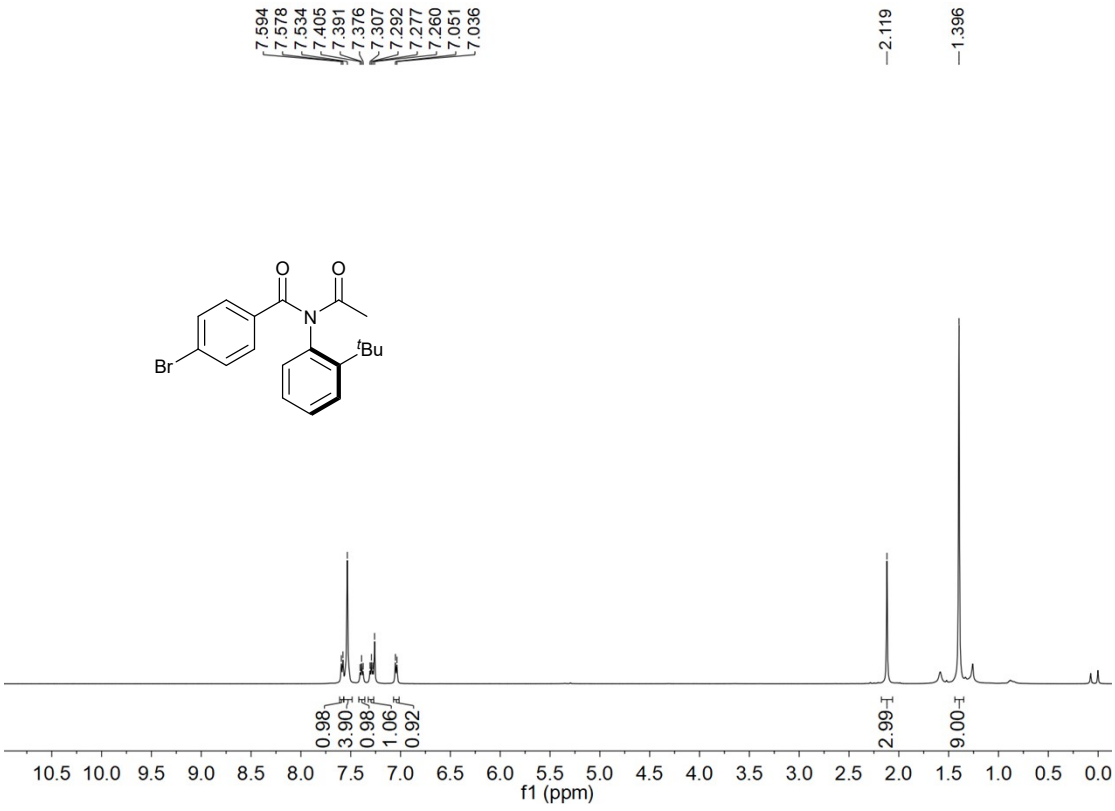


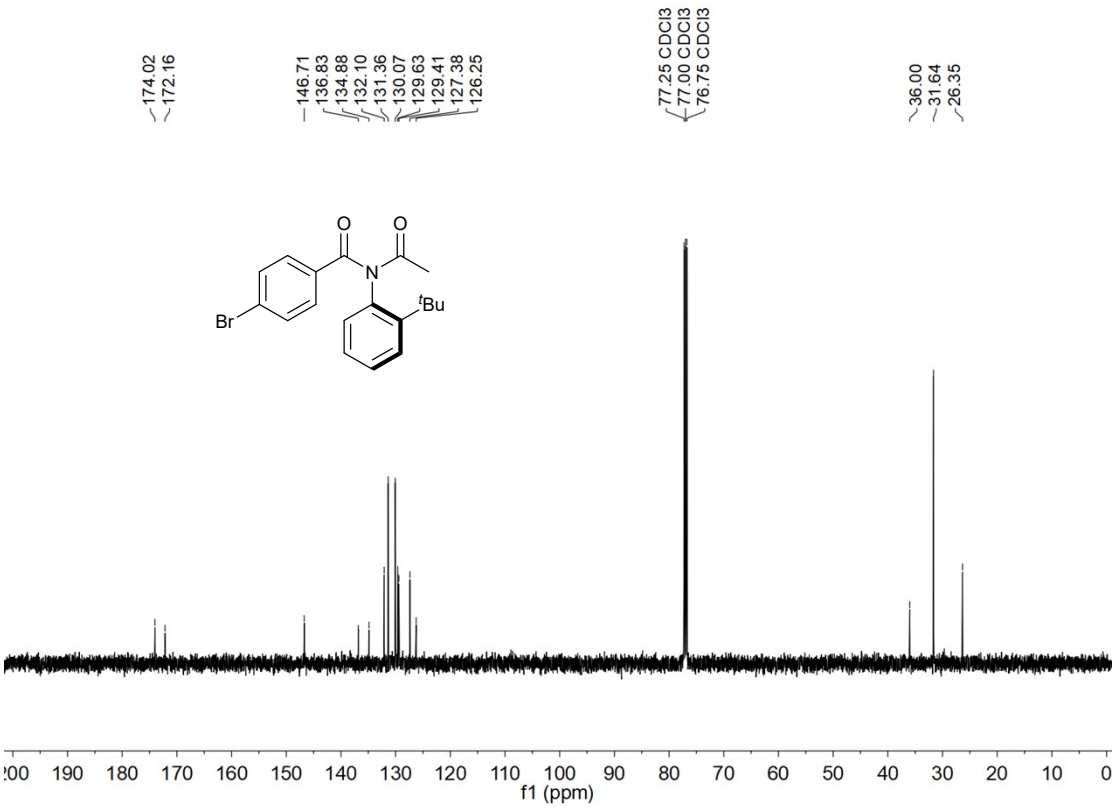
(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)phenyl)-4-fluorobenzamide (5ba)



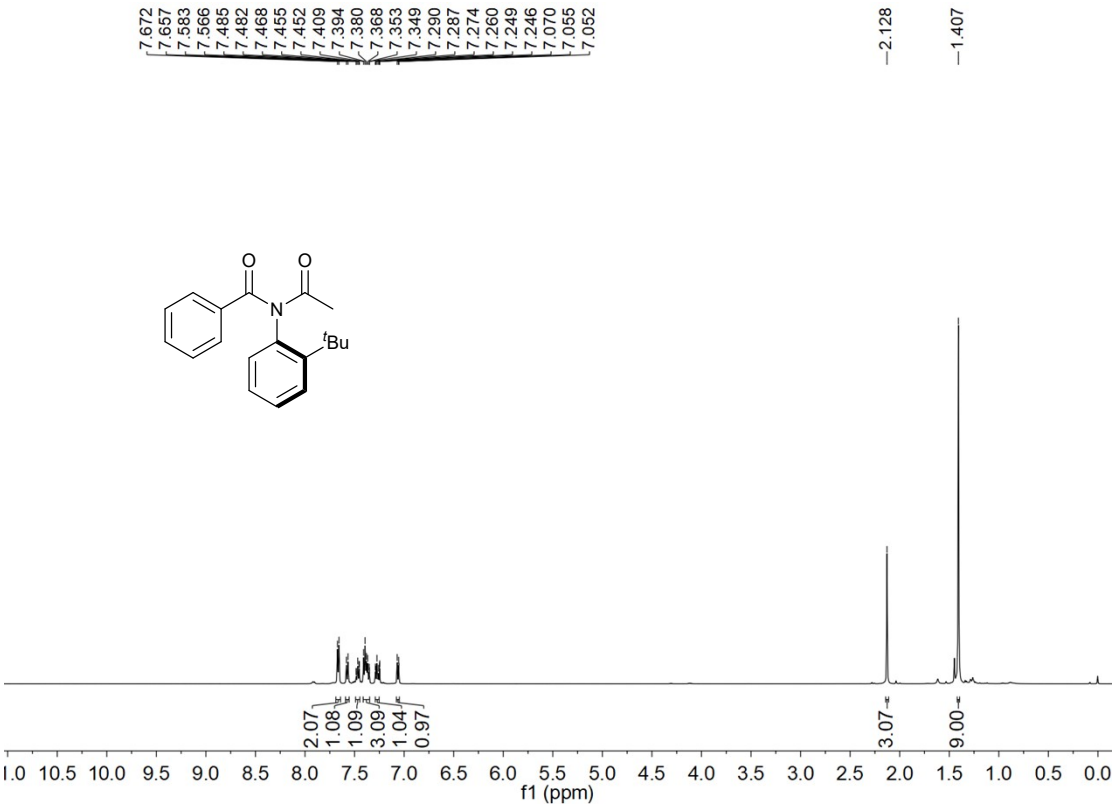


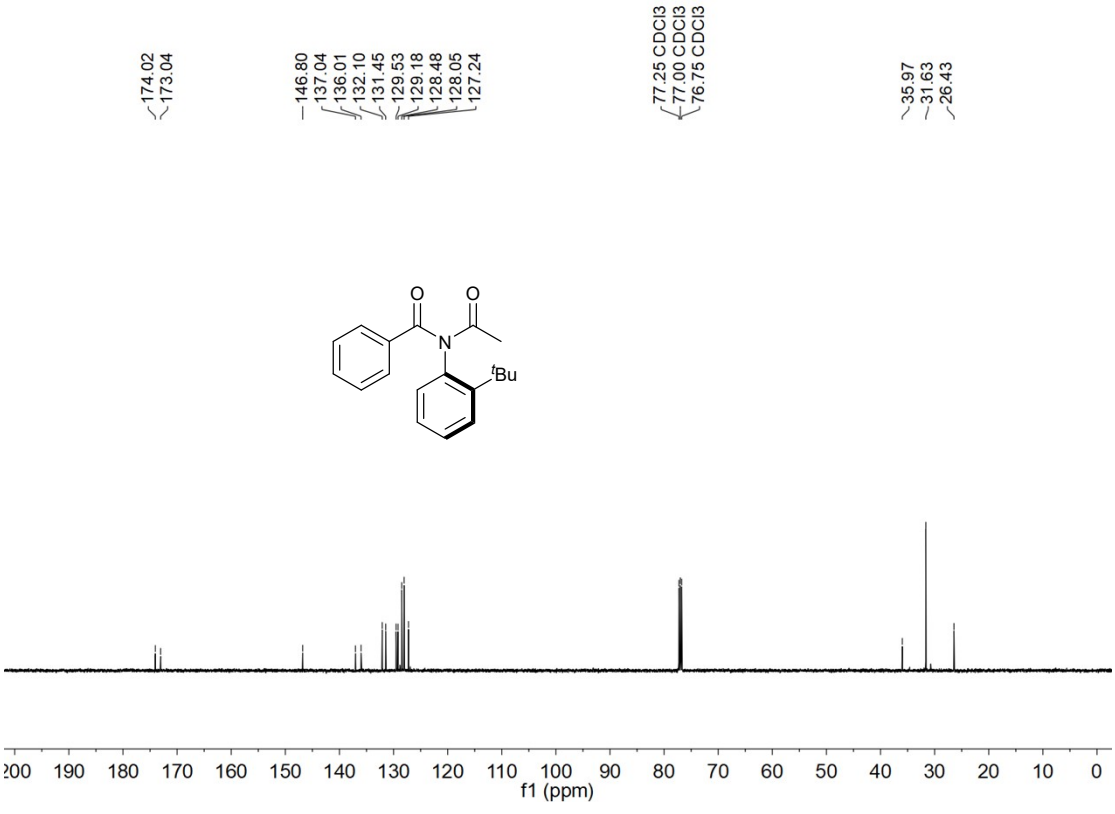
(*R*)-*N*-acetyl-4-bromo-*N*-(2-(*tert*-butyl)phenyl)benzamide (5ca)



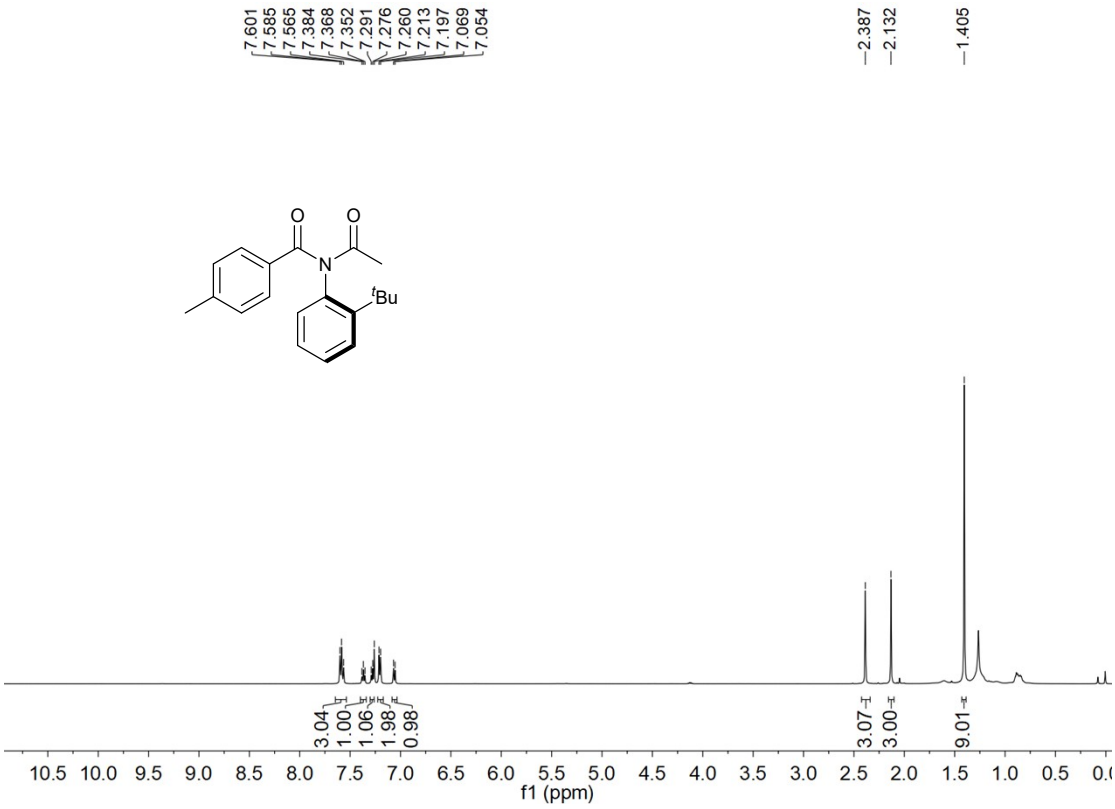


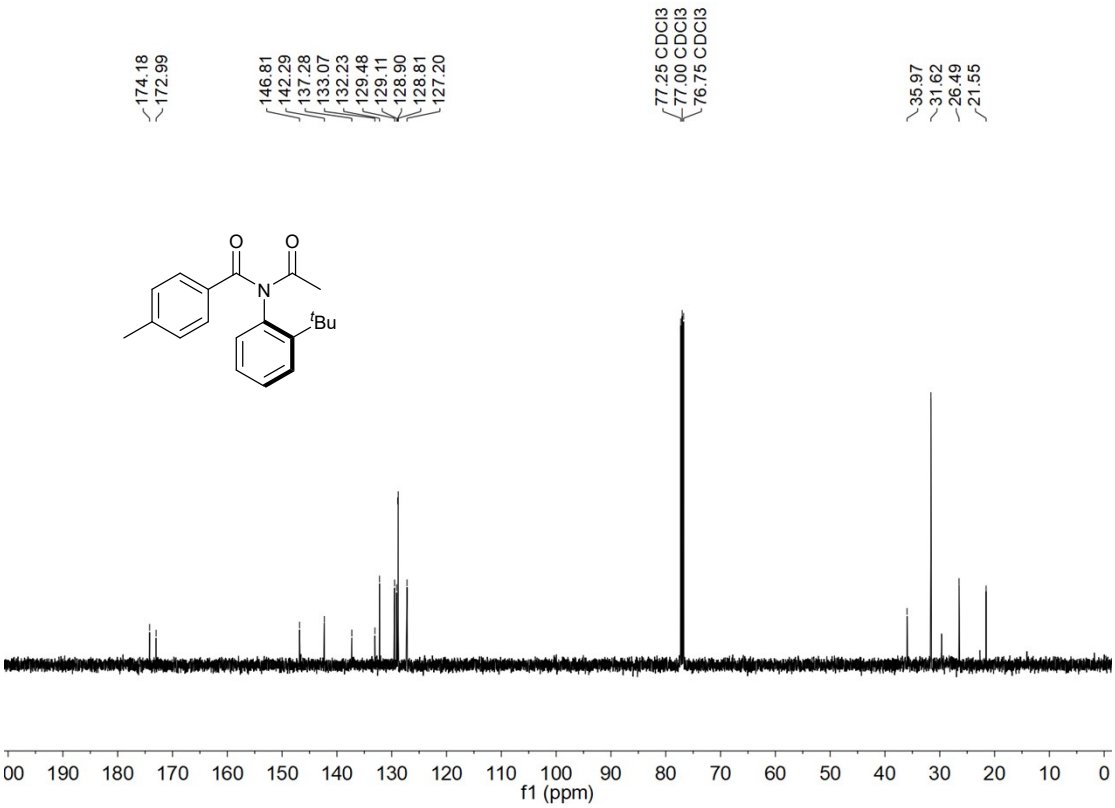
(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)phenyl)benzamide (5da)



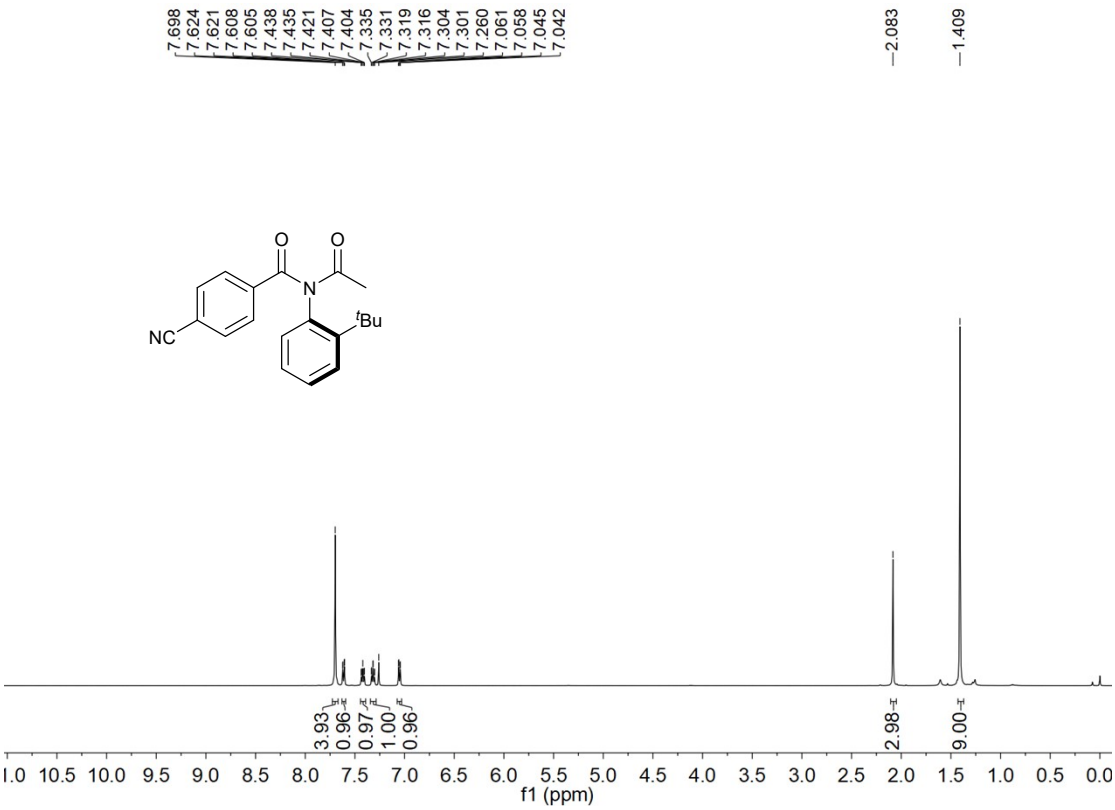


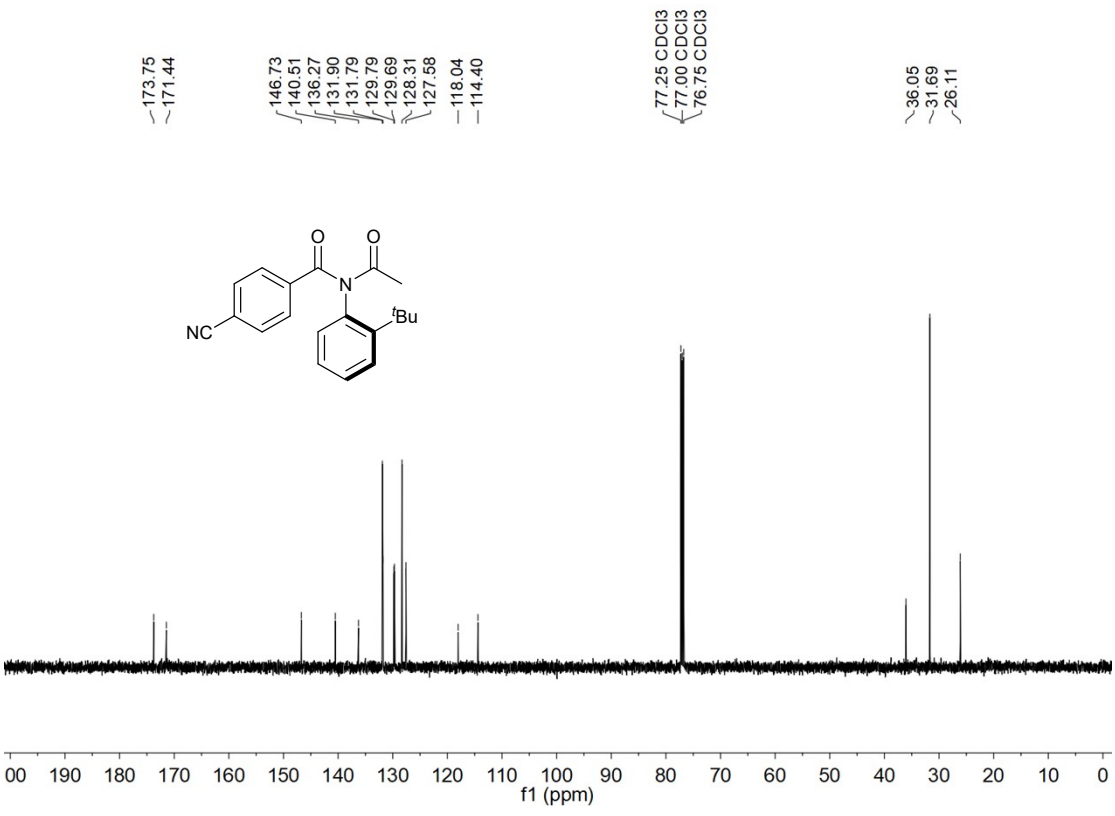
(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)phenyl)-4-methylbenzamid (5ea)



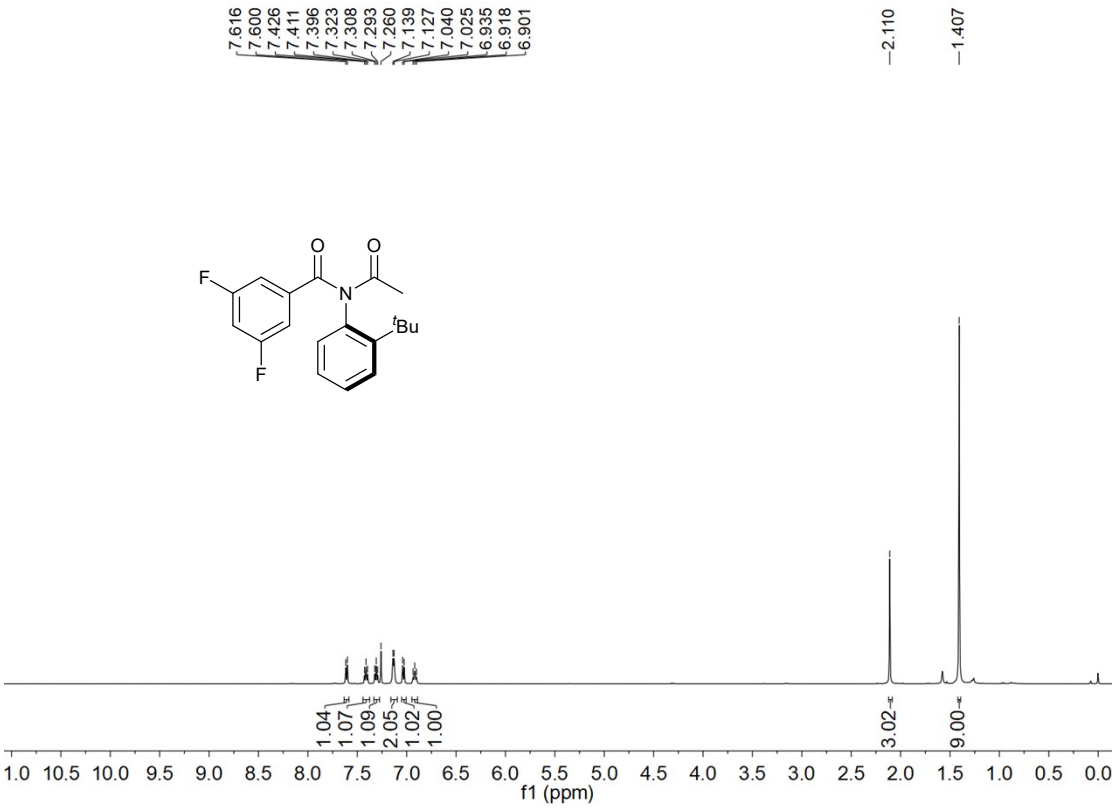


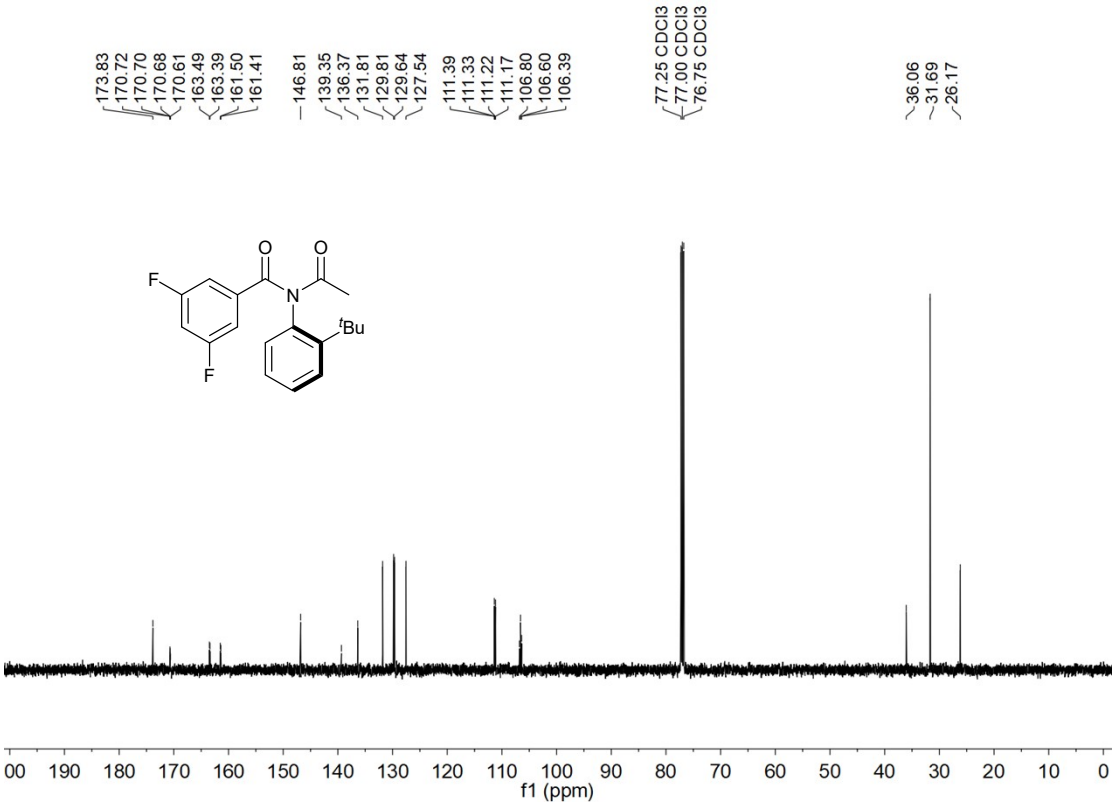
(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)phenyl)-4-cyanobenzamide (5fa)



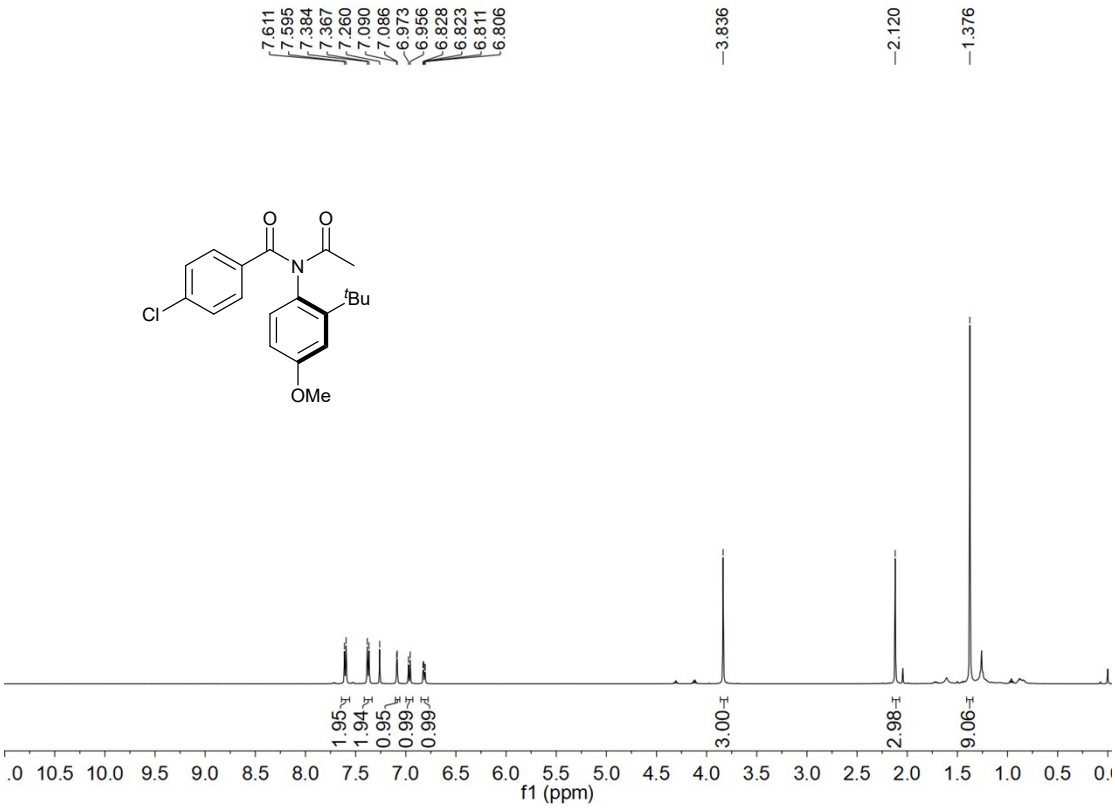


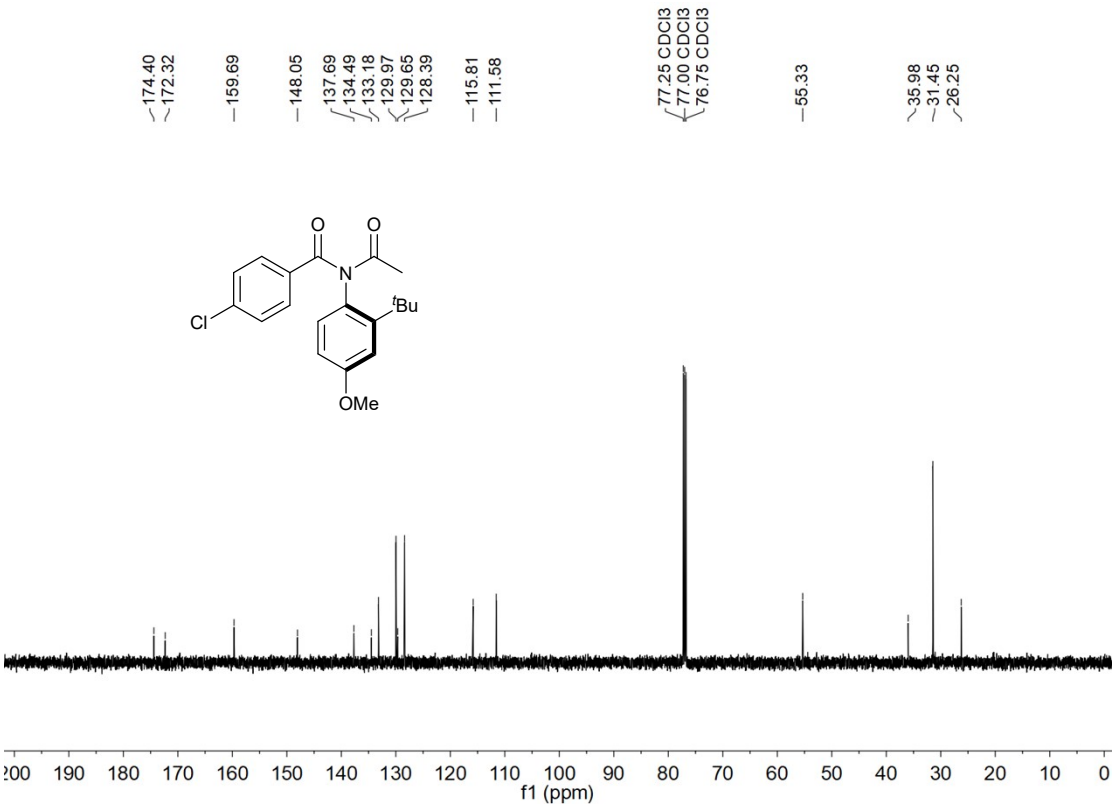
(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)phenyl)-3,5-difluorobenzamide (5ga)



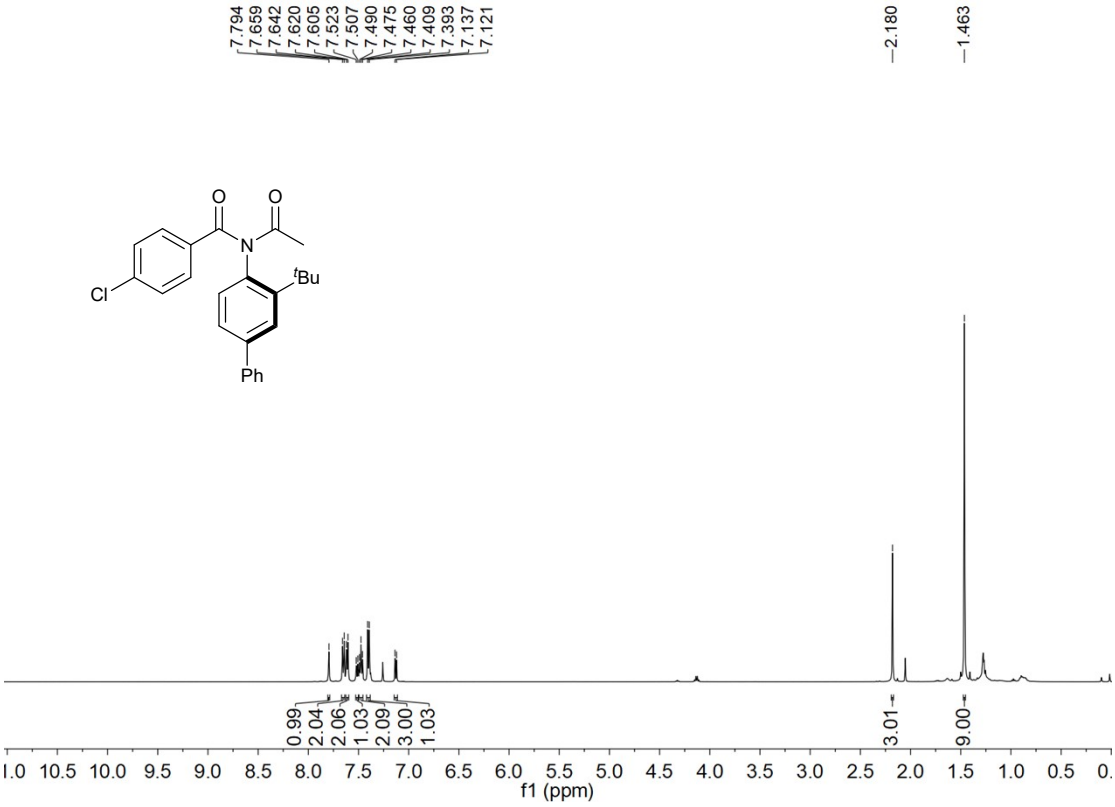


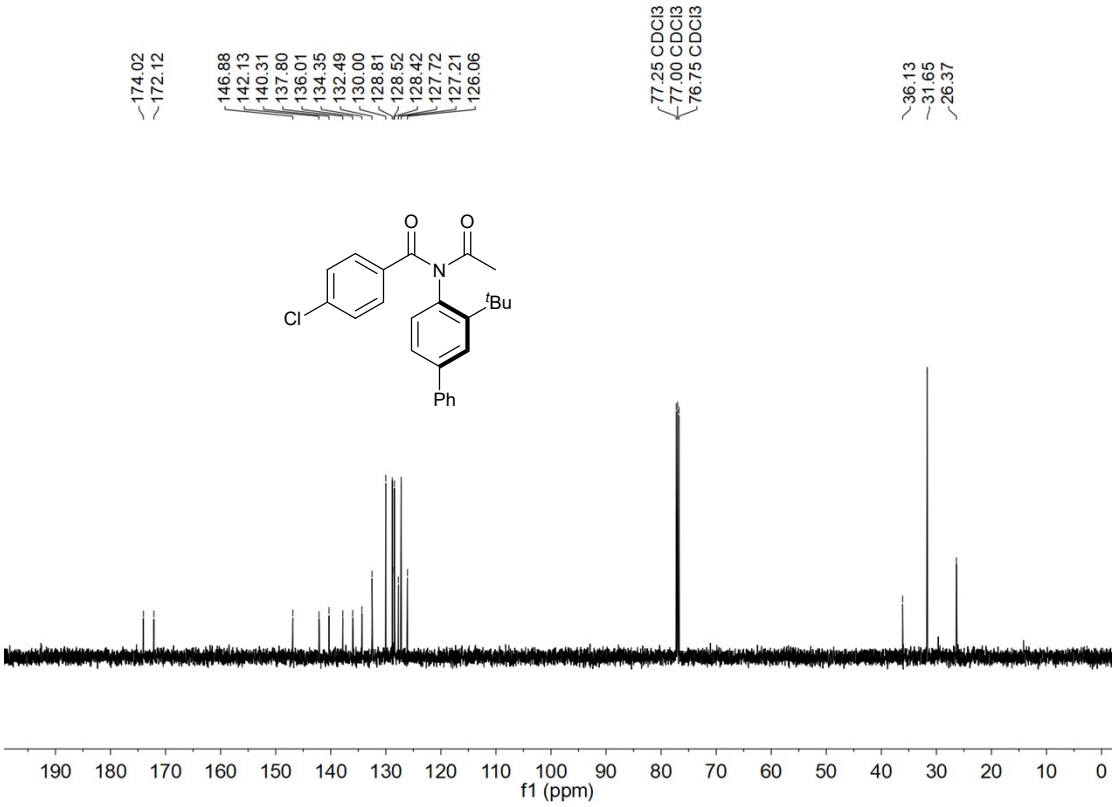
(*R*)-*N*-acetyl-*N*-(2-(*tert*-butyl)-4-methoxyphenyl)-4-chlorobenzamide (5ab)



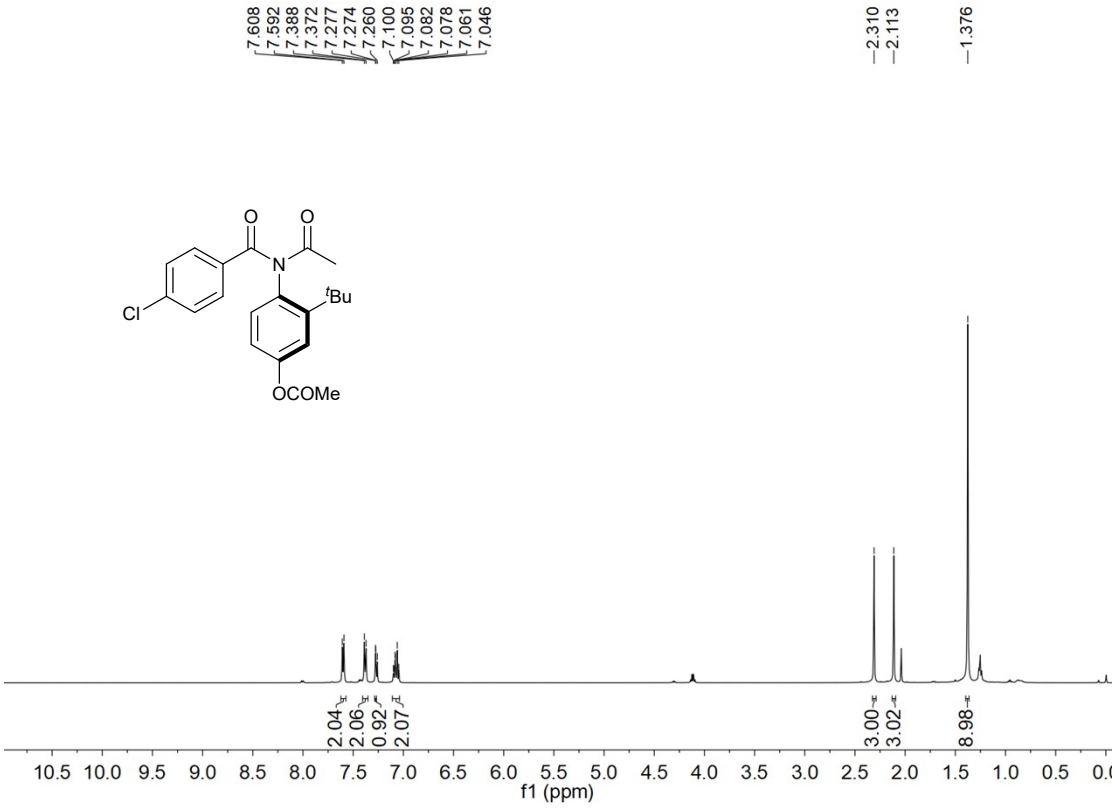


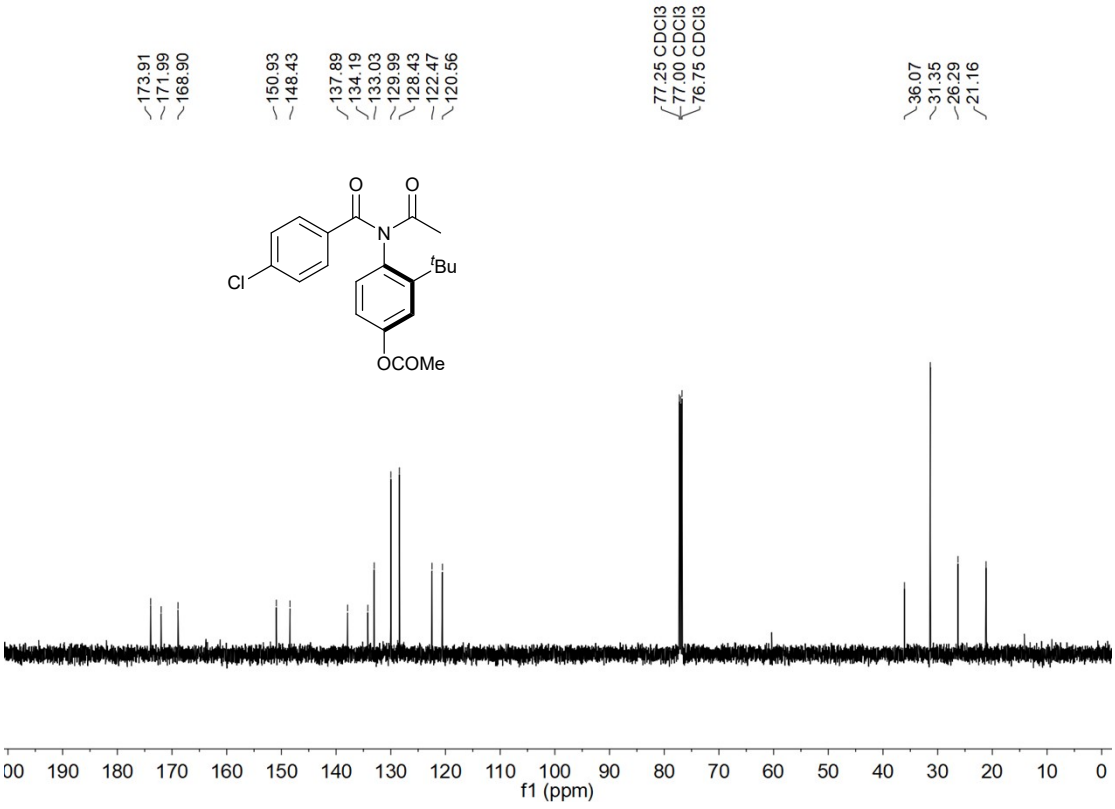
(*R*)-*N*-acetyl-*N*-(3-(*tert*-butyl)-[1,1'-biphenyl]-4-yl)-4-chlorobenzamide (5ac)



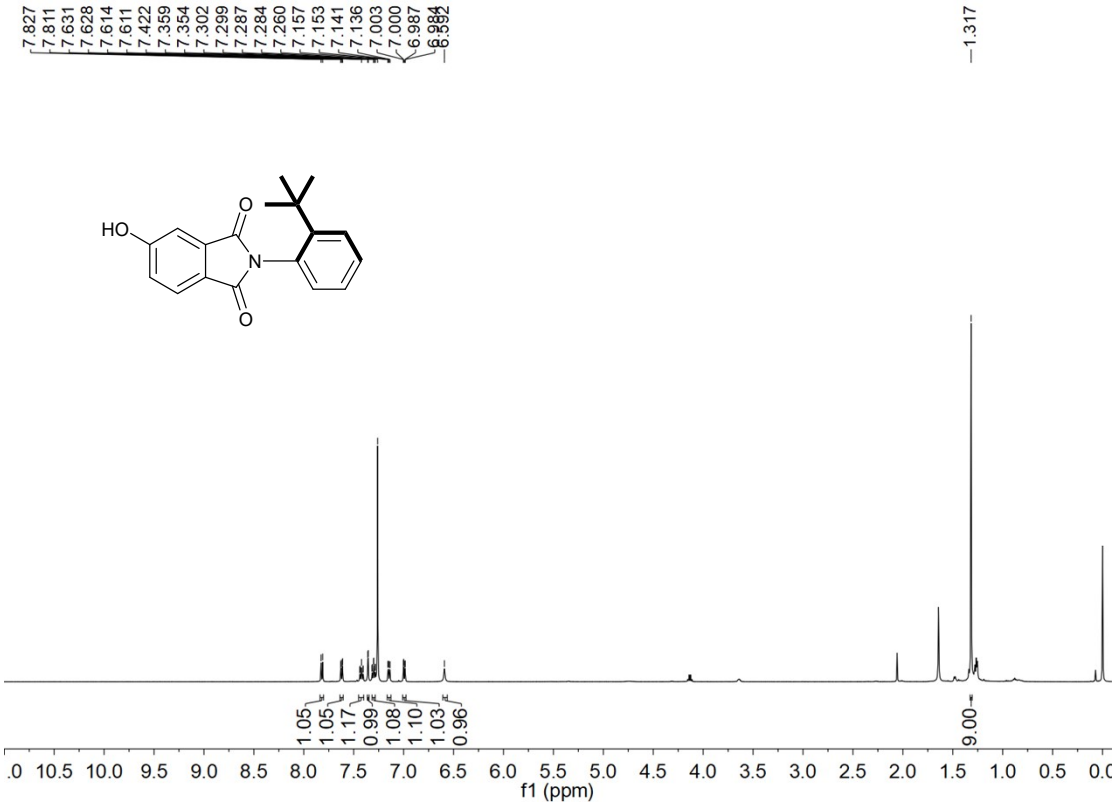


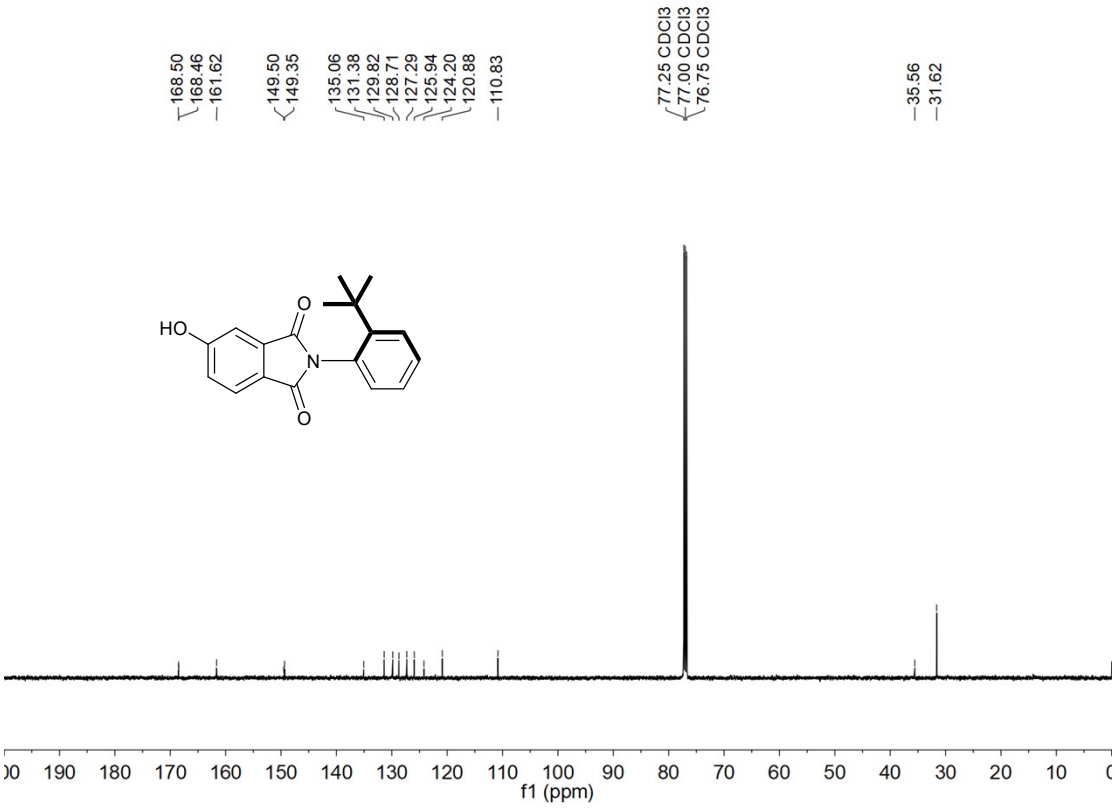
(*R*)-4-(*N*-acetyl-4-chlorobenzamido)-3-(*tert*-butyl)phenyl acetate (5ad)





(*R*)-2-(2-(*tert*-butyl)phenyl)-5-hydroxyisoindoline-1,3-dione (6)





(*S*)-2-(2-(*tert*-butyl)phenyl)-5-hydroxyisoindoline-1,3-dione (7)