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Supporting Information

Enantioselective Synthesis of α-Tetrasubstituted (3-Indolizinyl) (diaryl)-methanamines via Chiral Phosphoric Acid Catalysis

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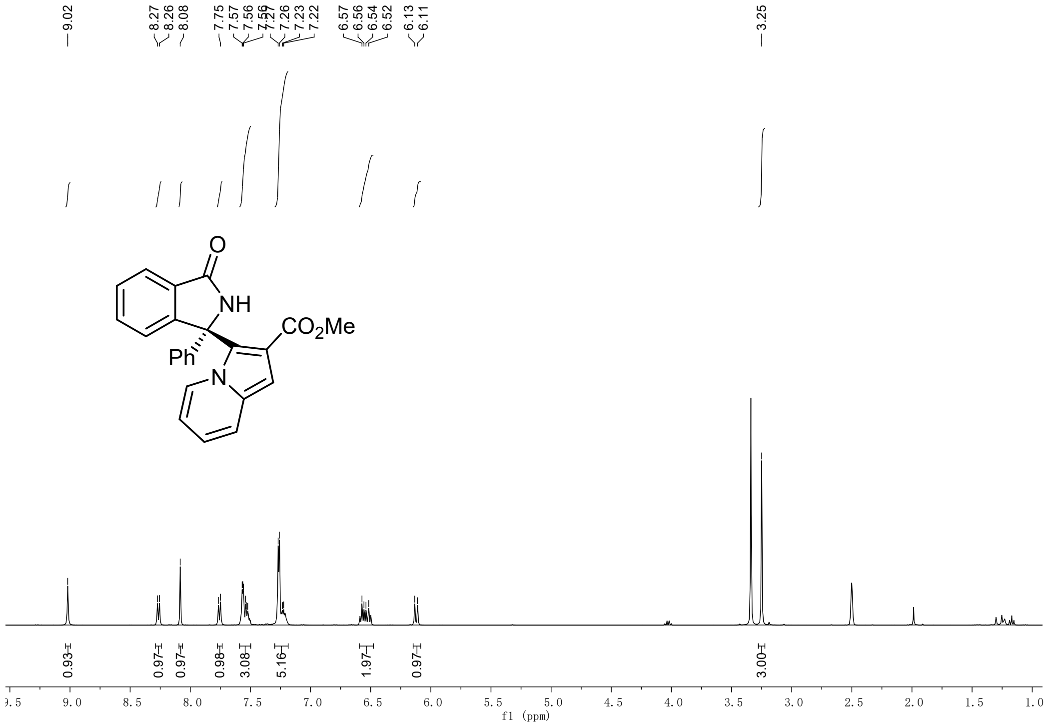
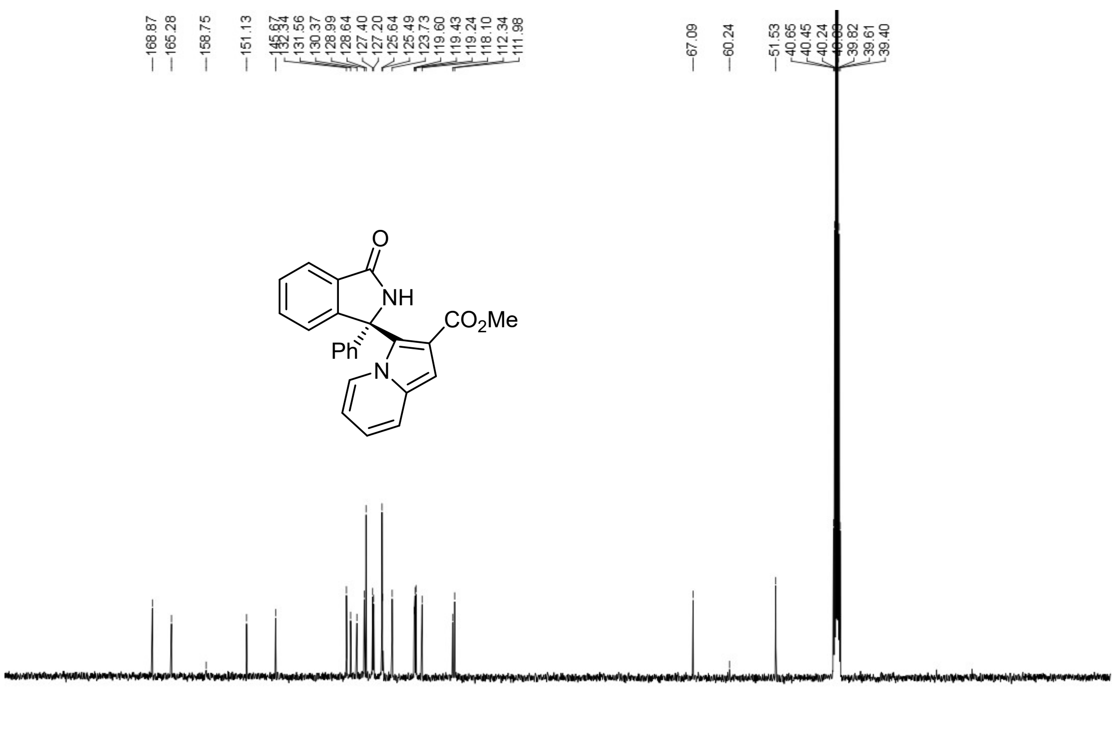
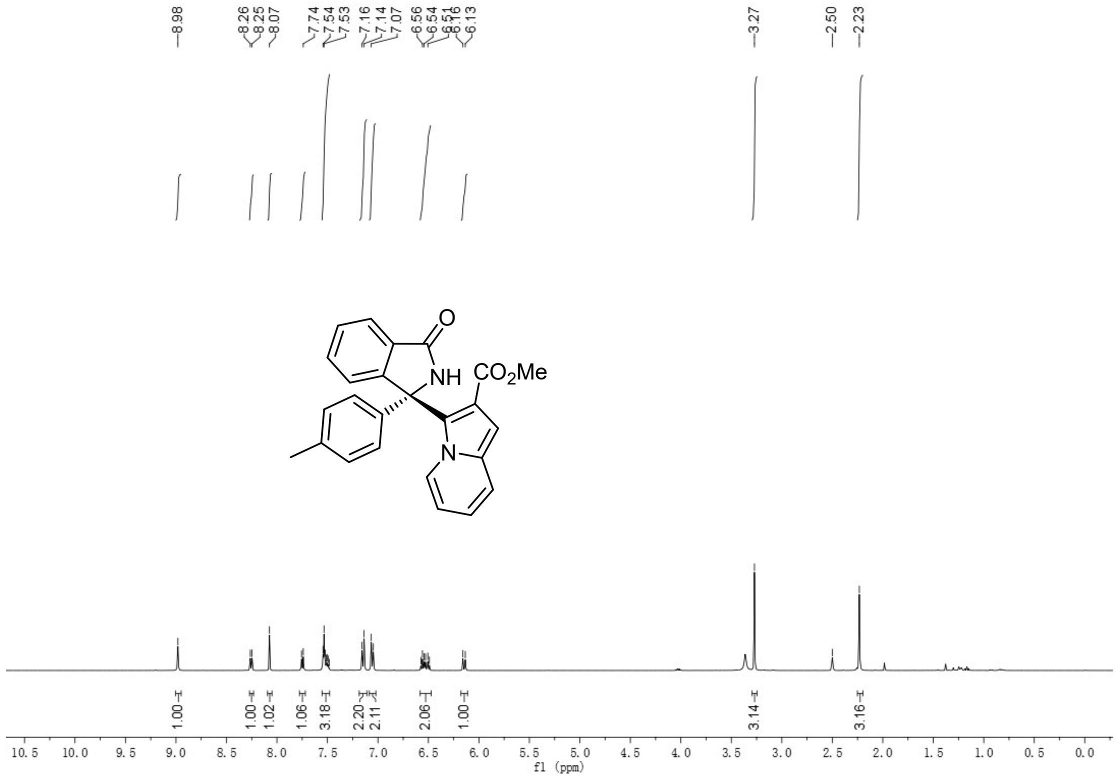
1. Copies of 1H NMR, 13C NMR and 19F NMR Spectra

3a ^{1}H NMR (400 MHz, DMSO-d_6)



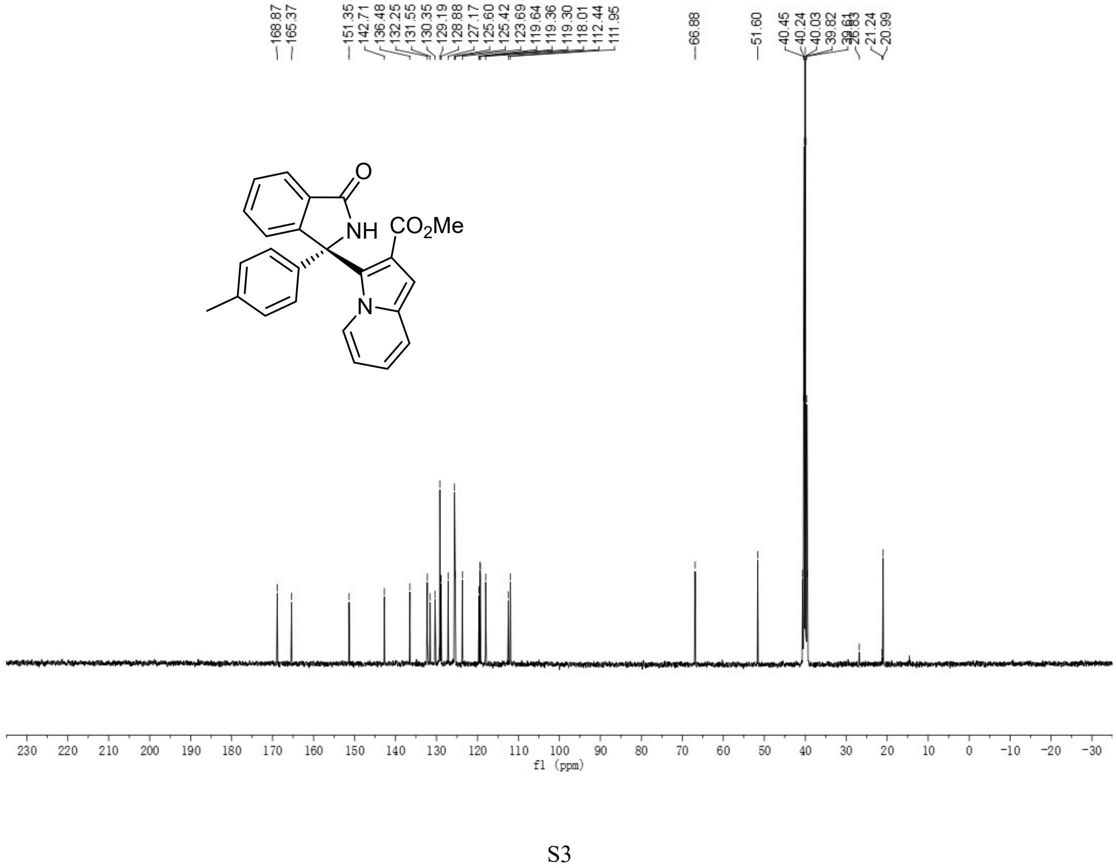
3a ^{13}C NMR (101 MHz, DMSO-d_6)



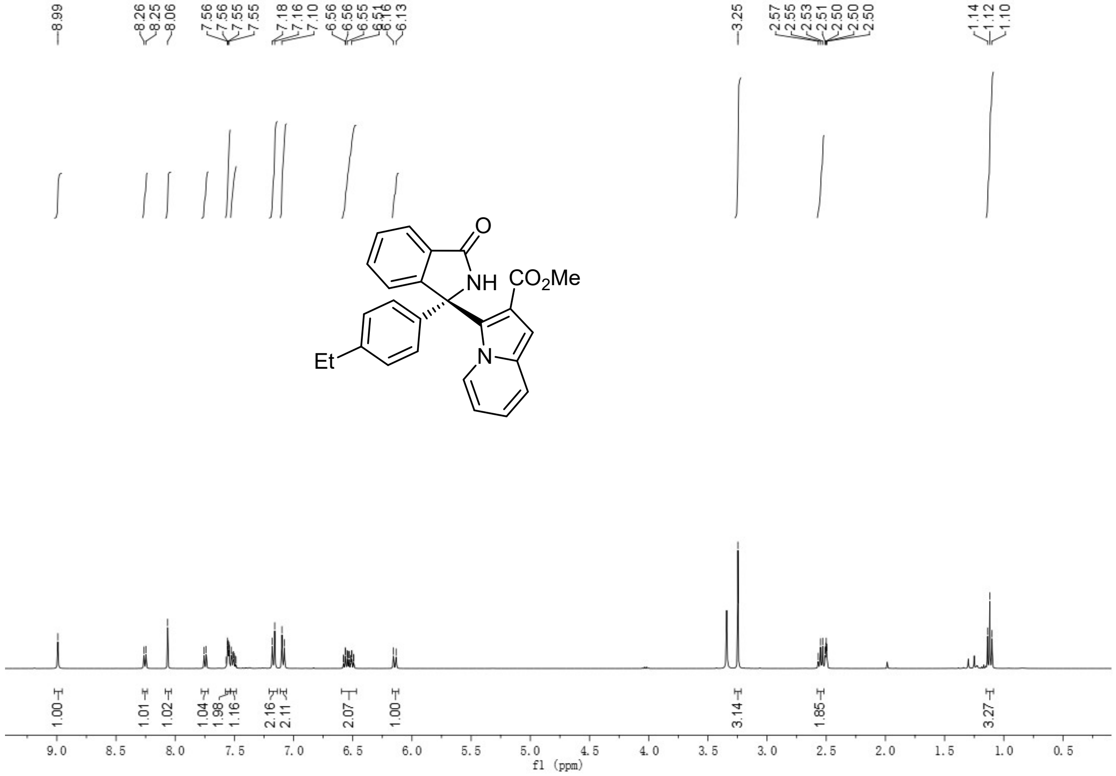


3b ^{1}H NMR (400 MHz, DMSO-d_6)

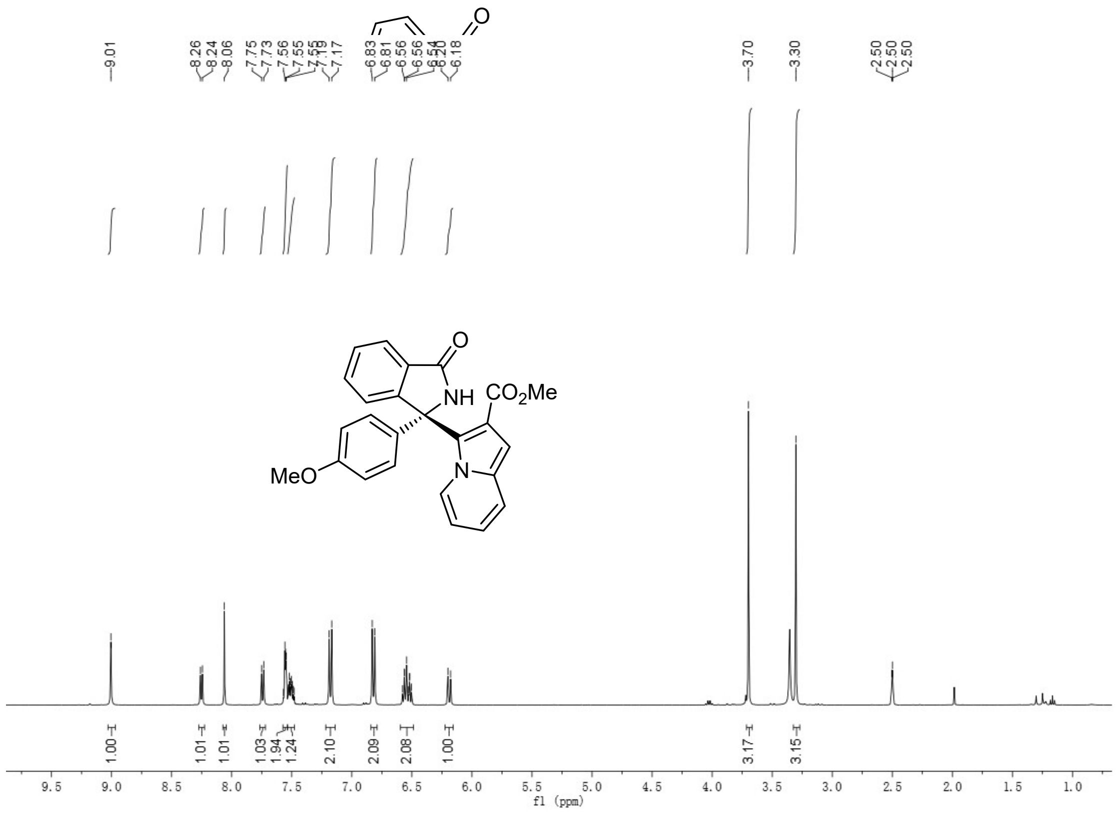
3b ^{13}C NMR (101 MHz, DMSO-d_6)

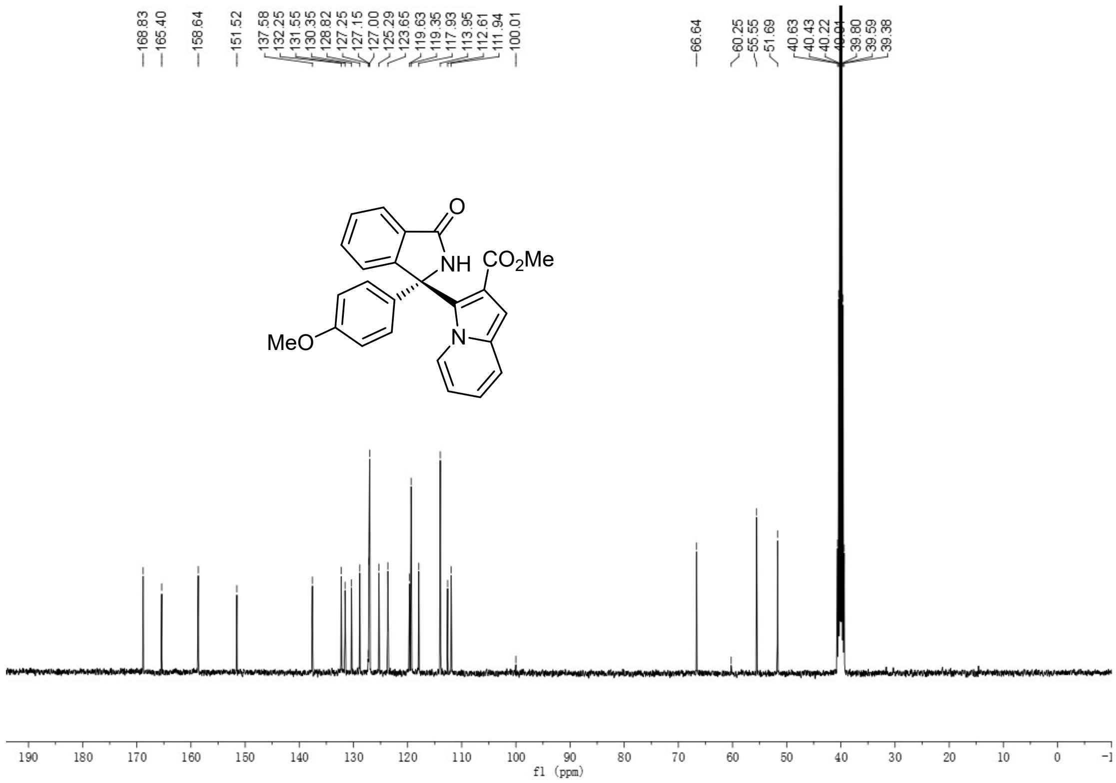


3c ^{1}H NMR (400 MHz, DMSO-d_6)

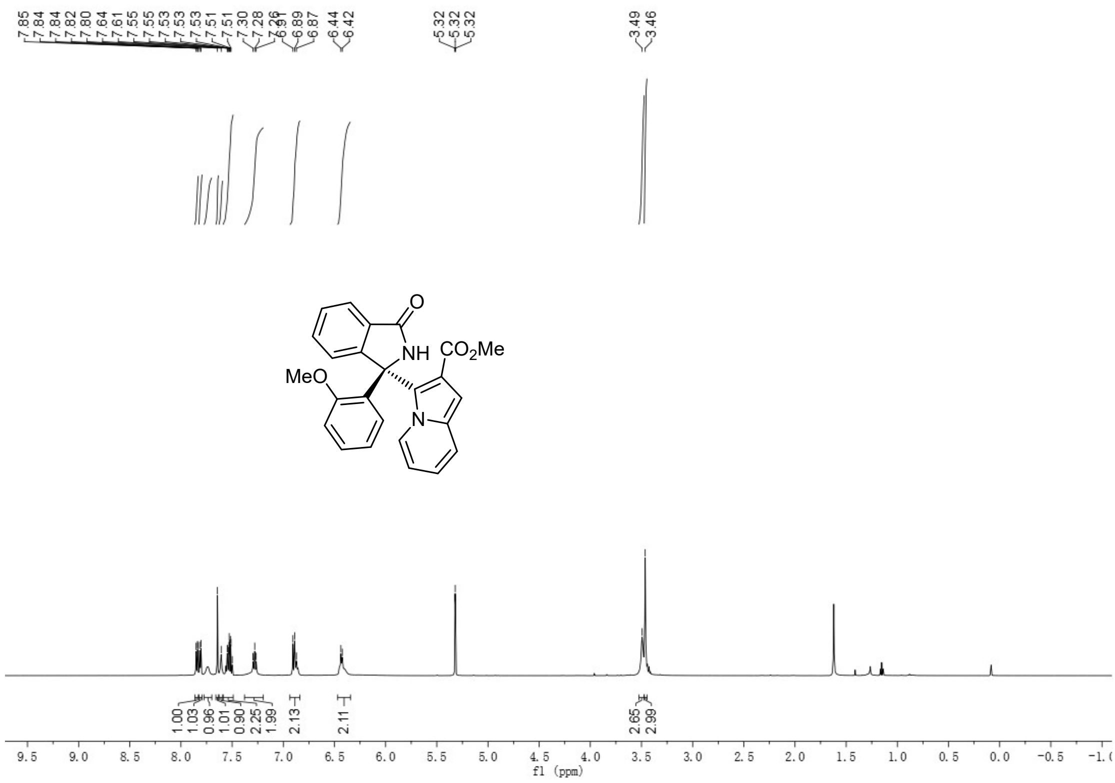


3c ^{13}C NMR (101 MHz, DMSO-d_6)

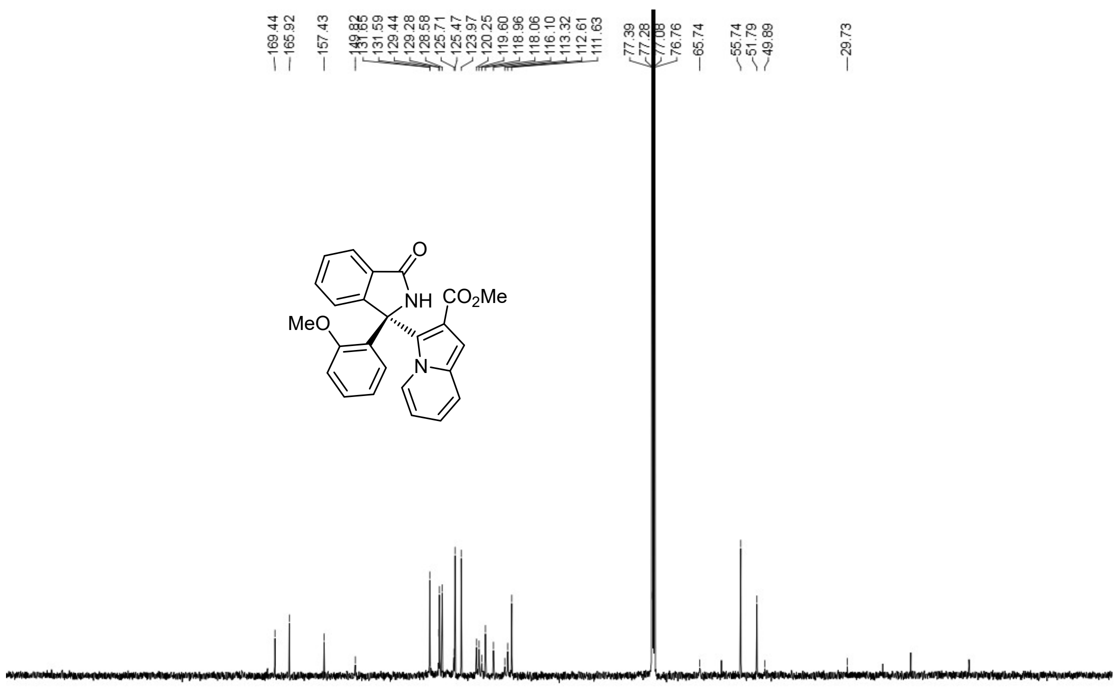




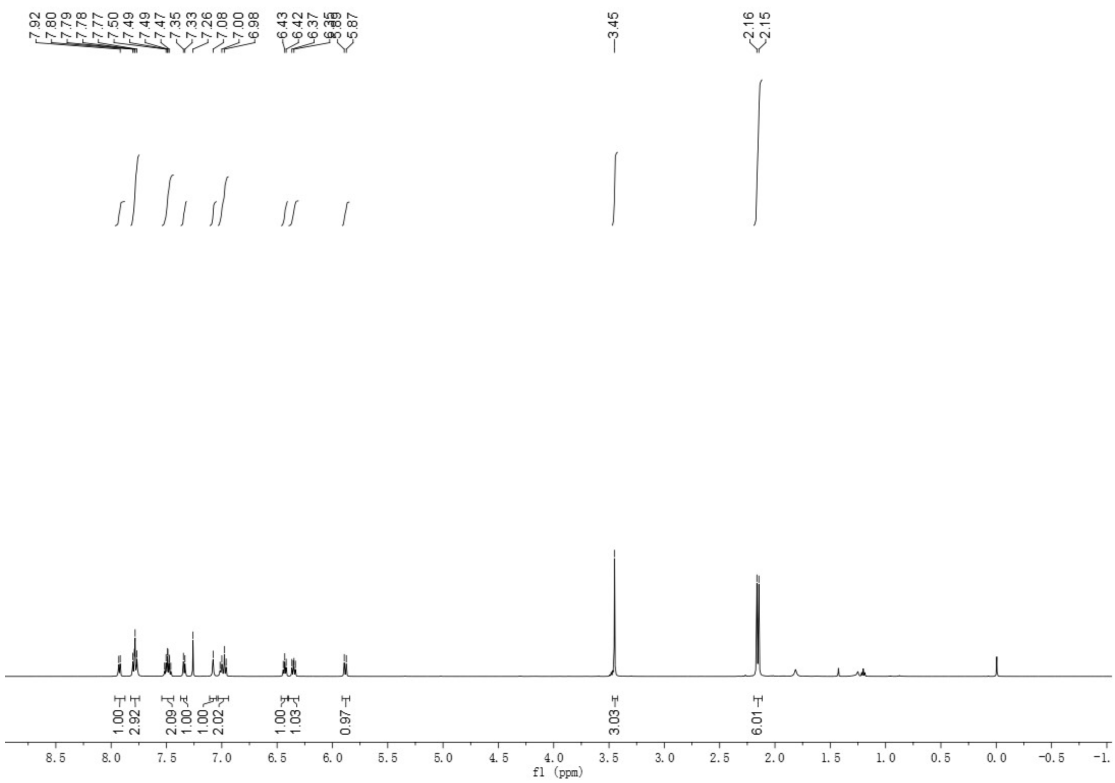
3d ^{13}C NMR (101 MHz, DMSO-d_6)



3e ^{1}H NMR (500 MHz, CD_2Cl_2)

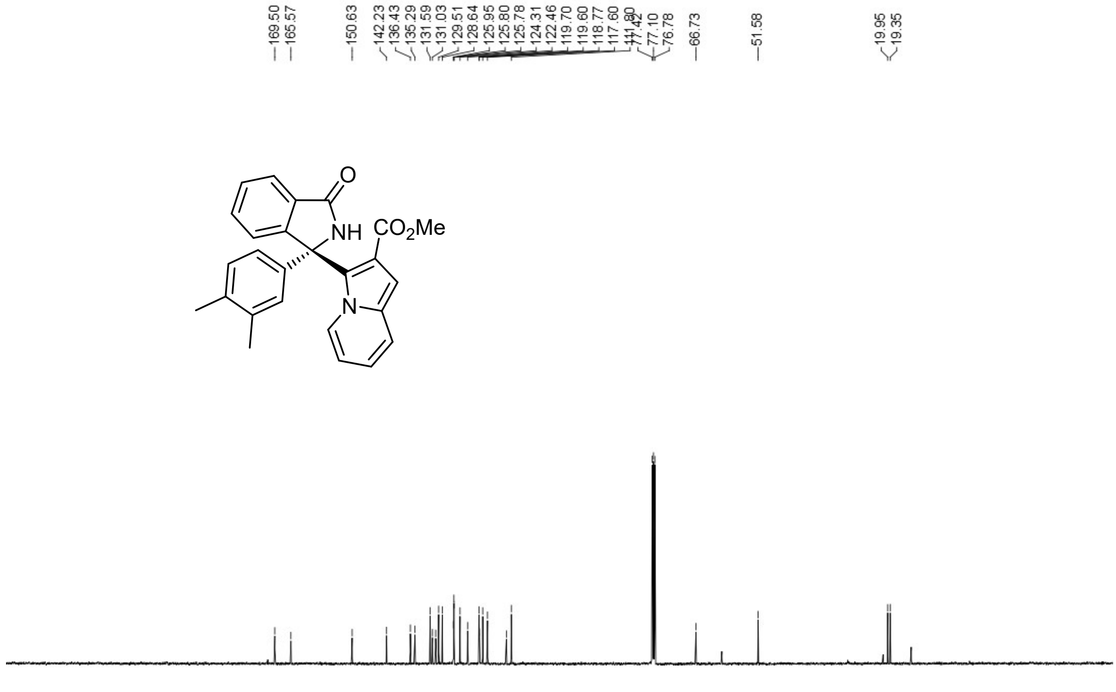


3e ^{13}C NMR (101 MHz, $CDCl_3$-d_6)

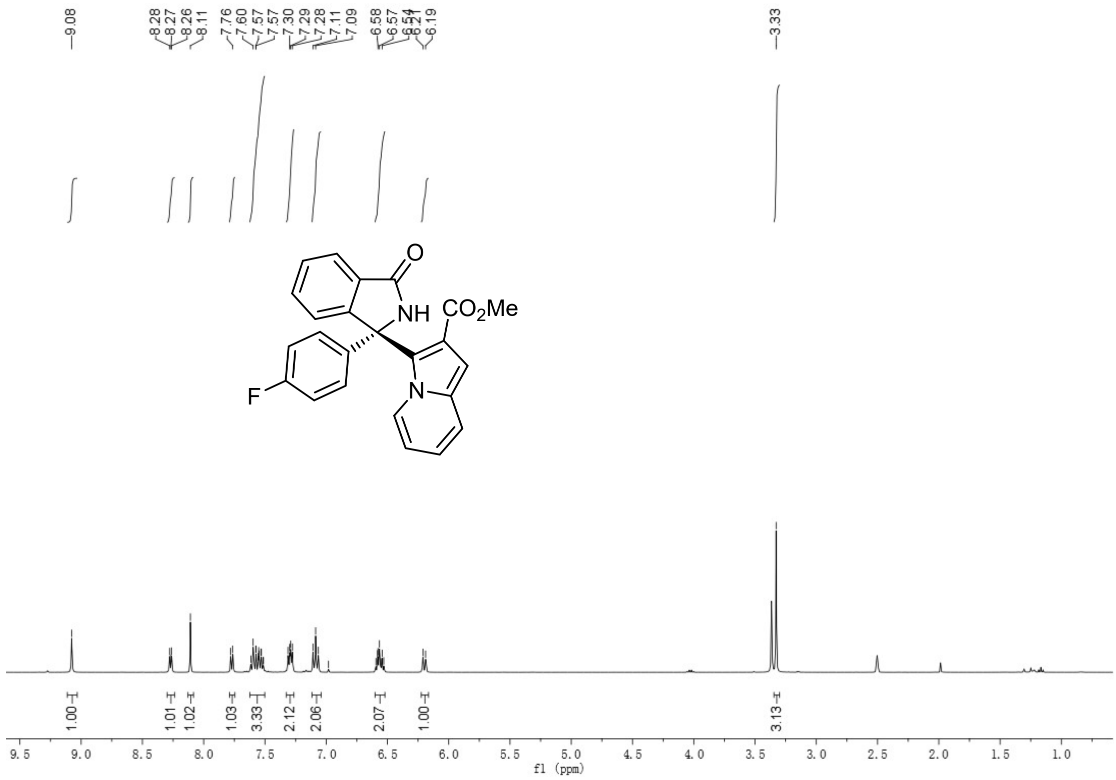


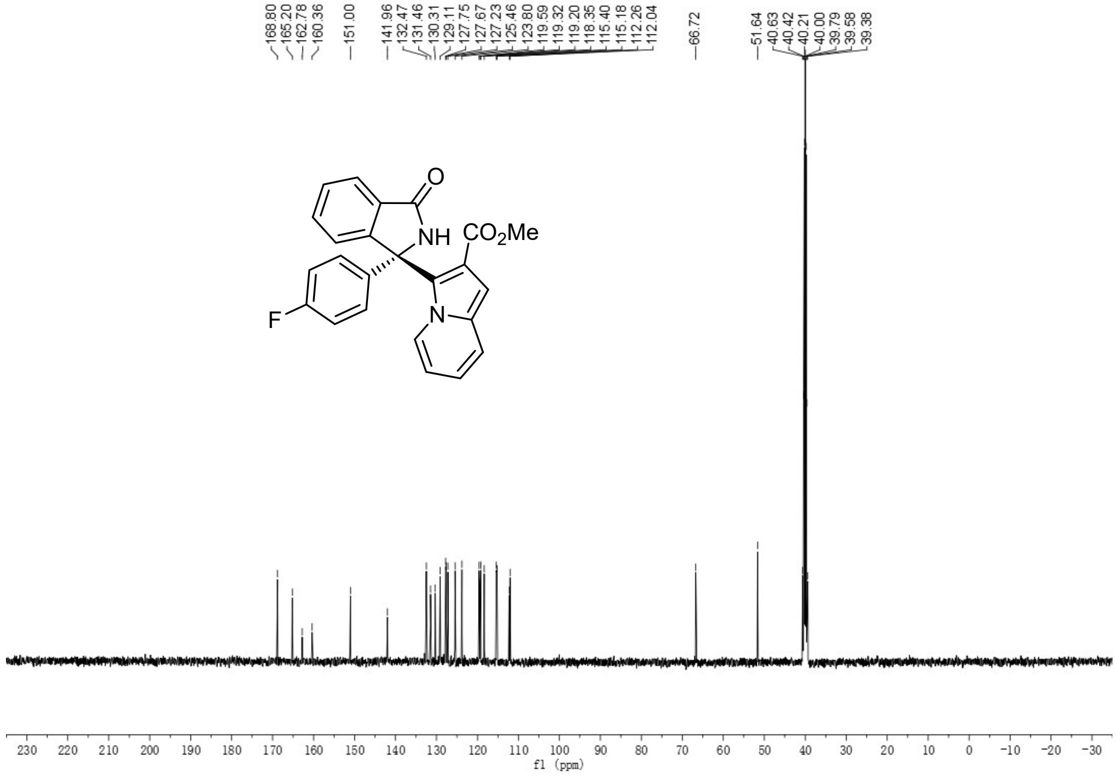
3f ^{1}H NMR (500 MHz, $CDCl_3$)

3f ^{13}C NMR (101 MHz, $CDCl_3$)



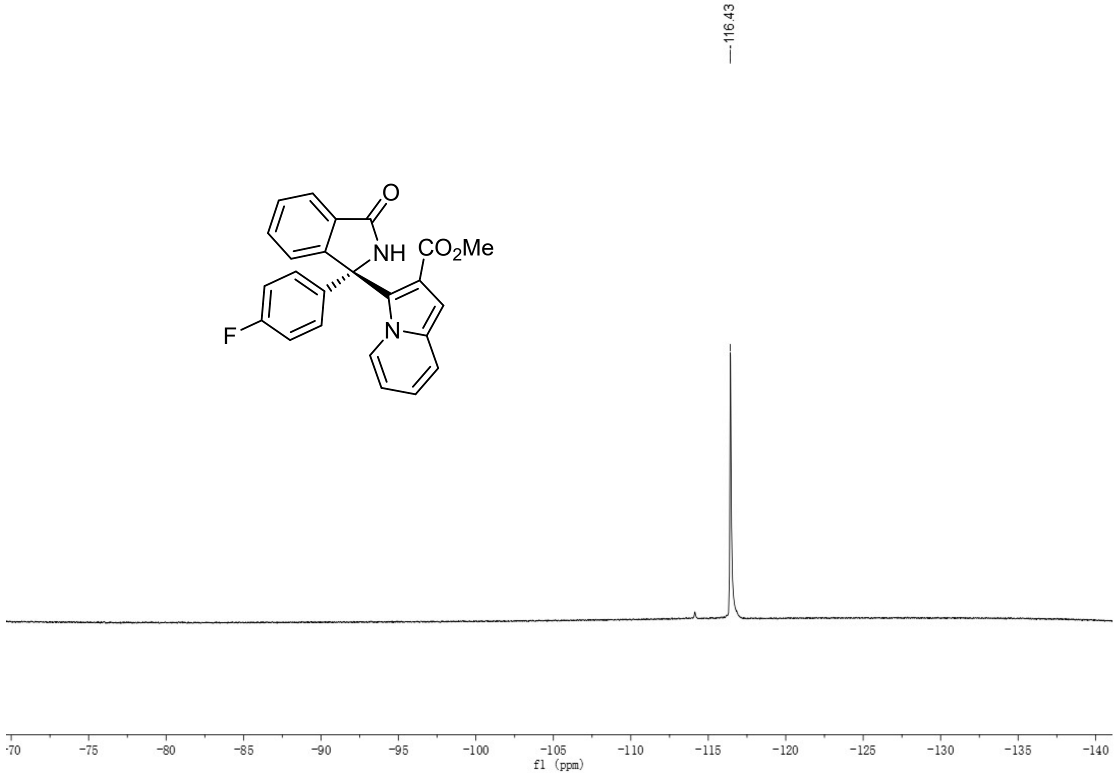
3g ^{1}H NMR (400 MHz, DMSO-d_6)



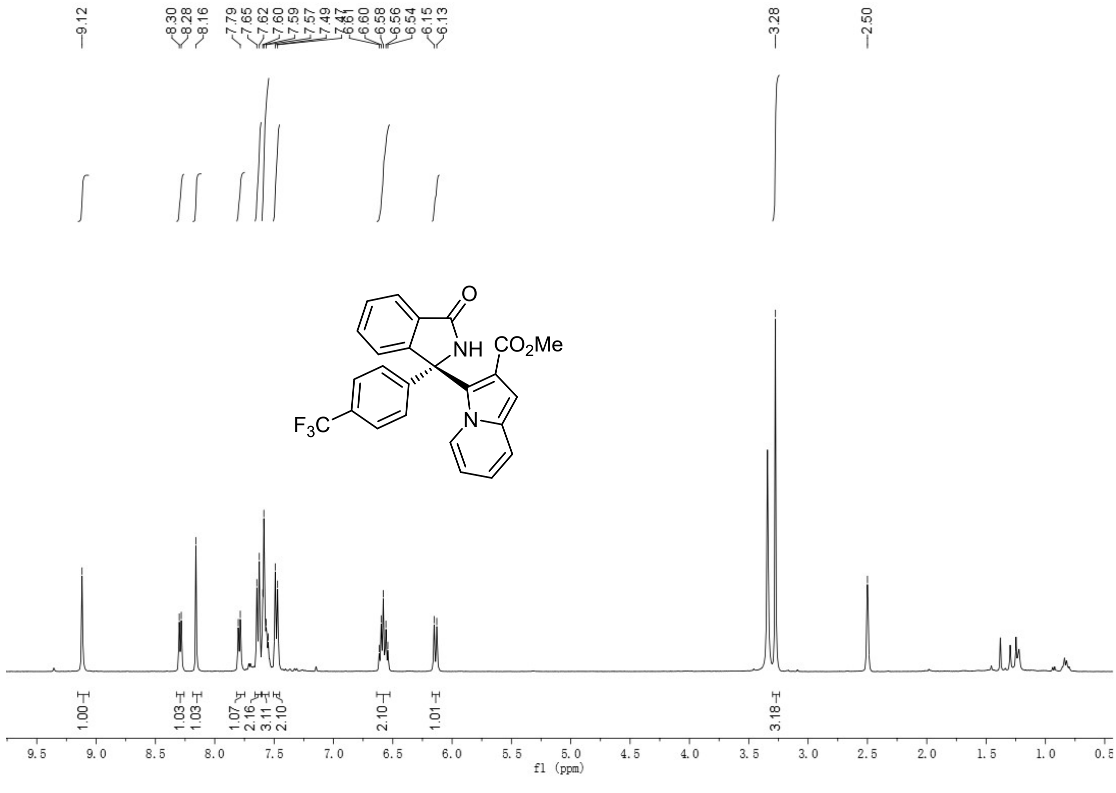


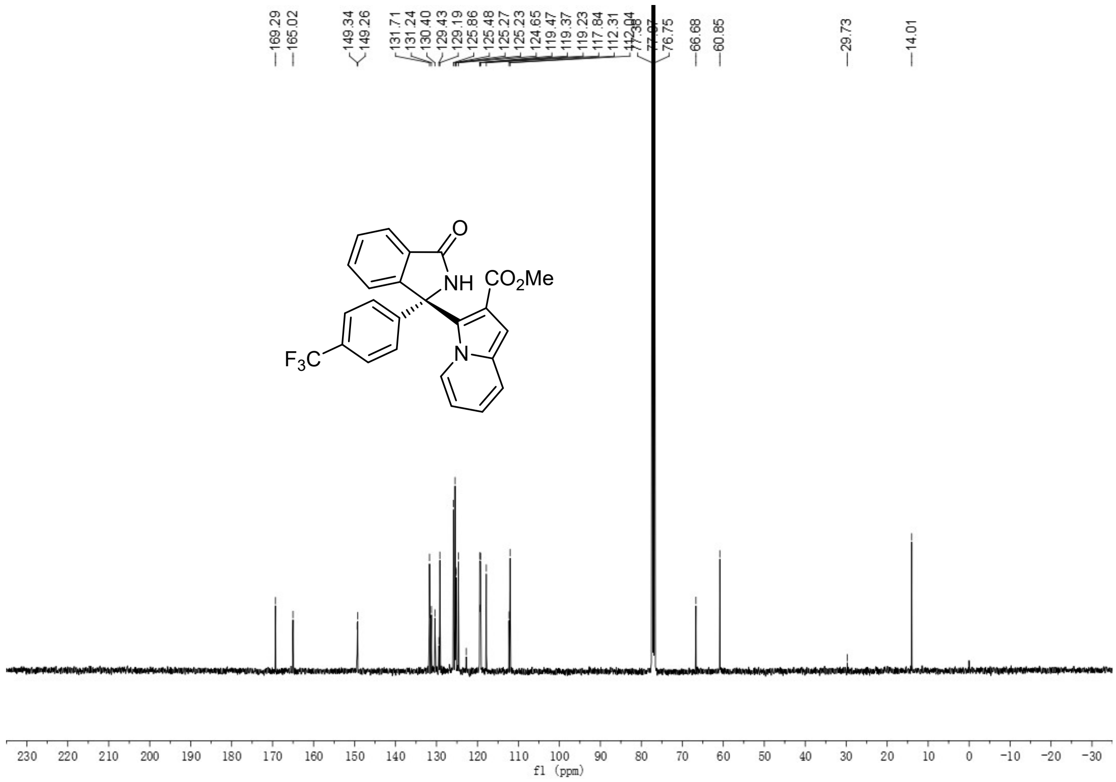
3g ^{13}C NMR (101 MHz, DMSO-d_6)

3g ^{19}F NMR (376 MHz, $CDCl_3$)



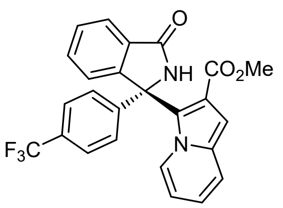
3h ^{1}H NMR (400 MHz, DMSO-d_6)

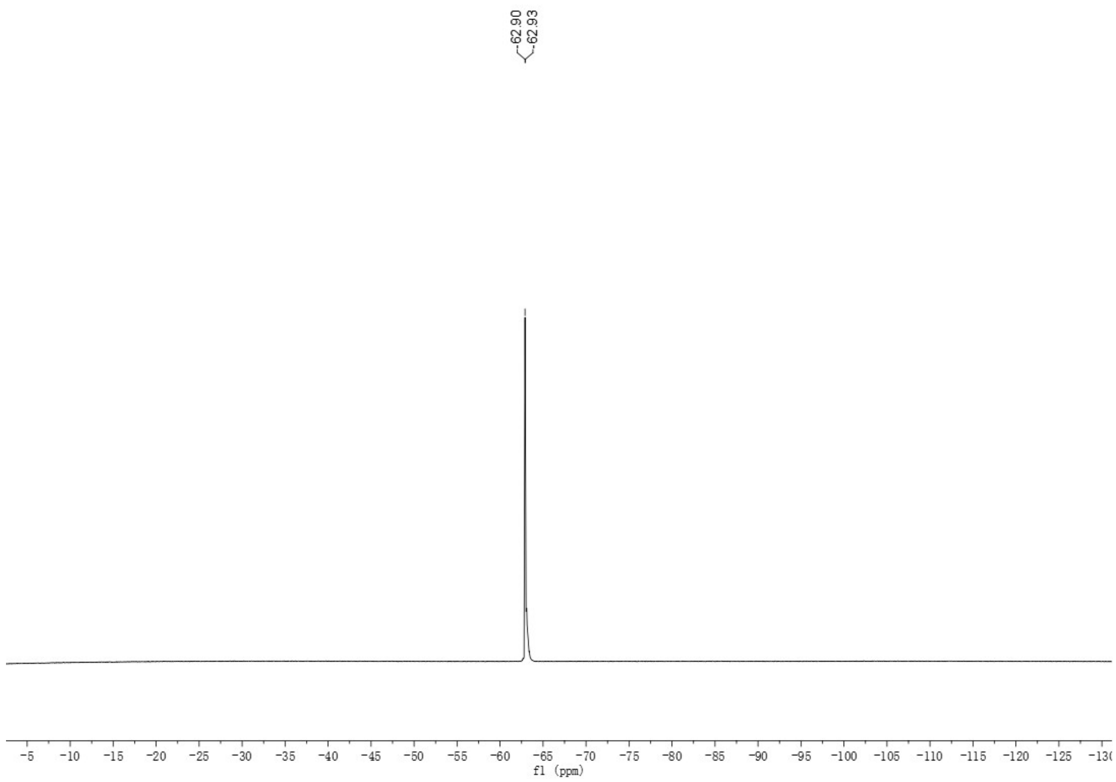




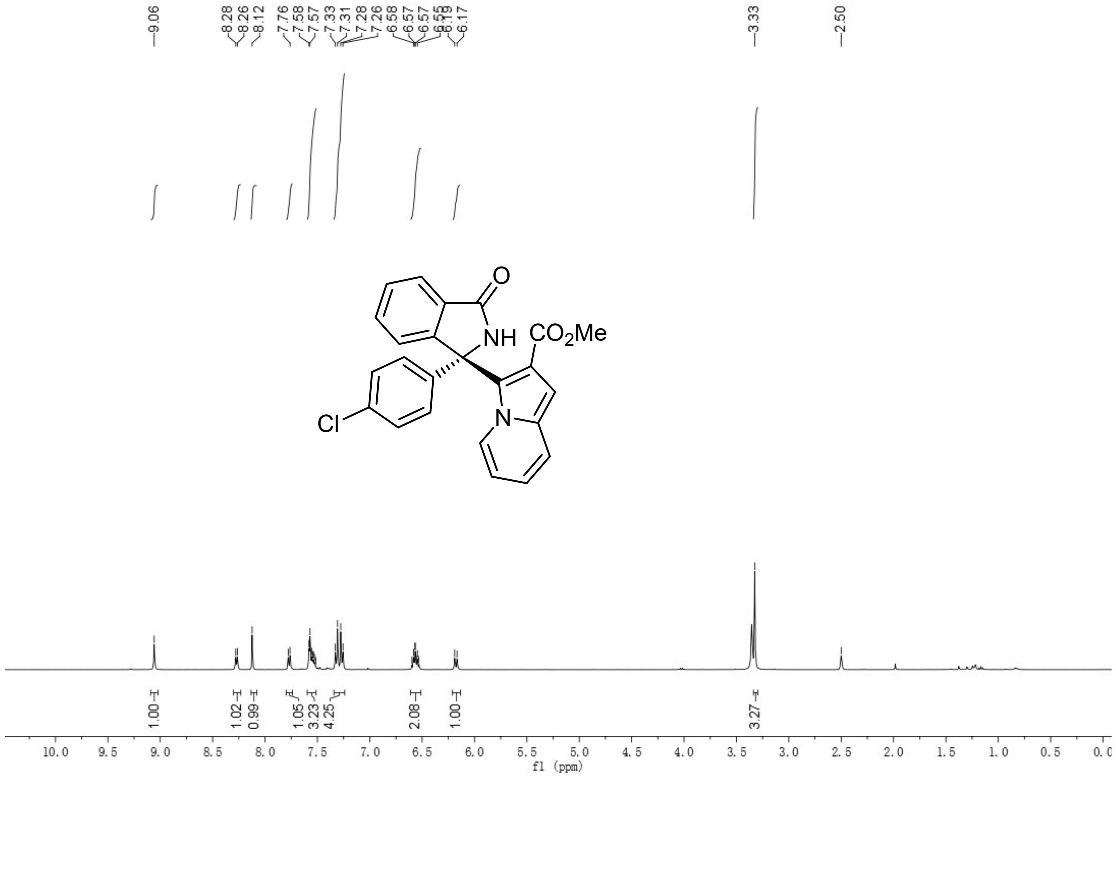
3h ^{13}C NMR (101 MHz, $CDCl_3$)

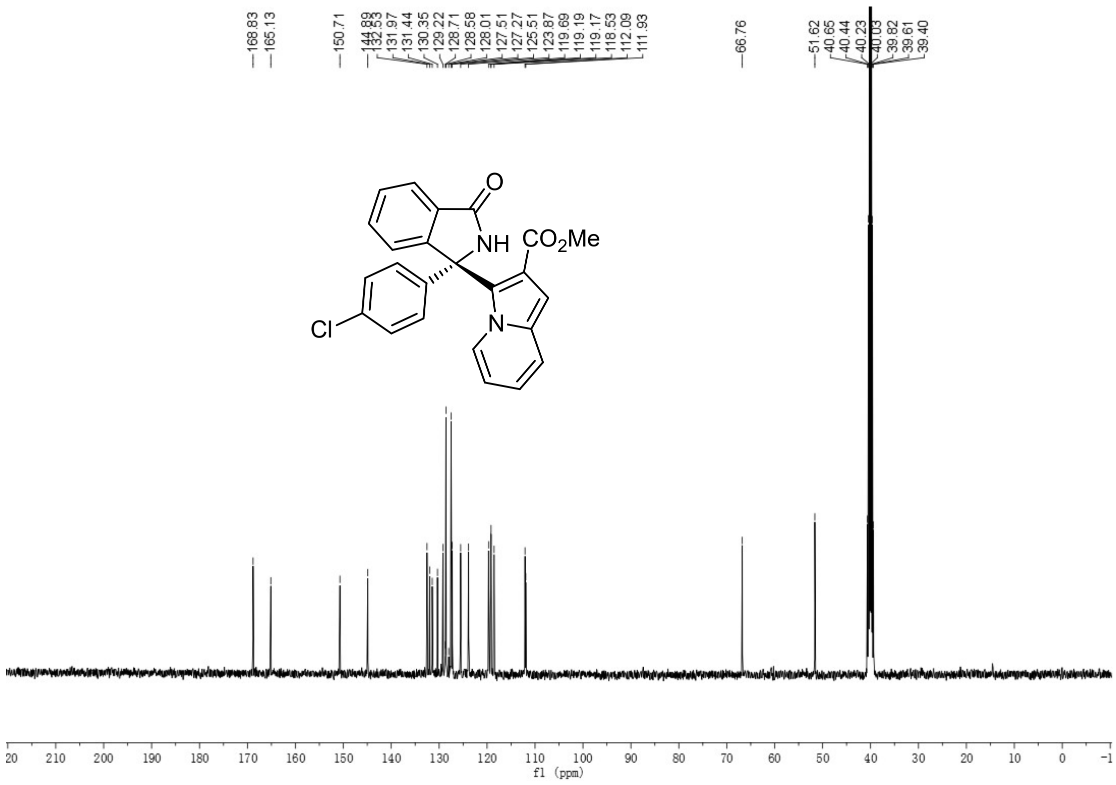
3h ^{19}F NMR (376 MHz, $CDCl_3$)





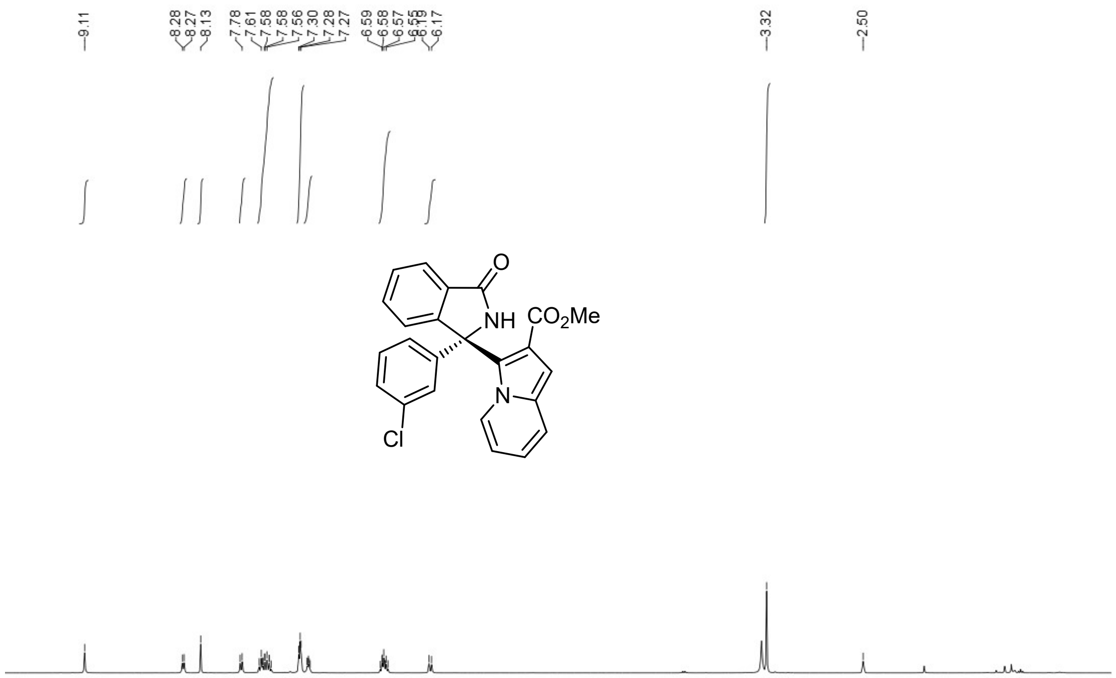
3i ^{1}H NMR (400 MHz, DMSO-d_6)



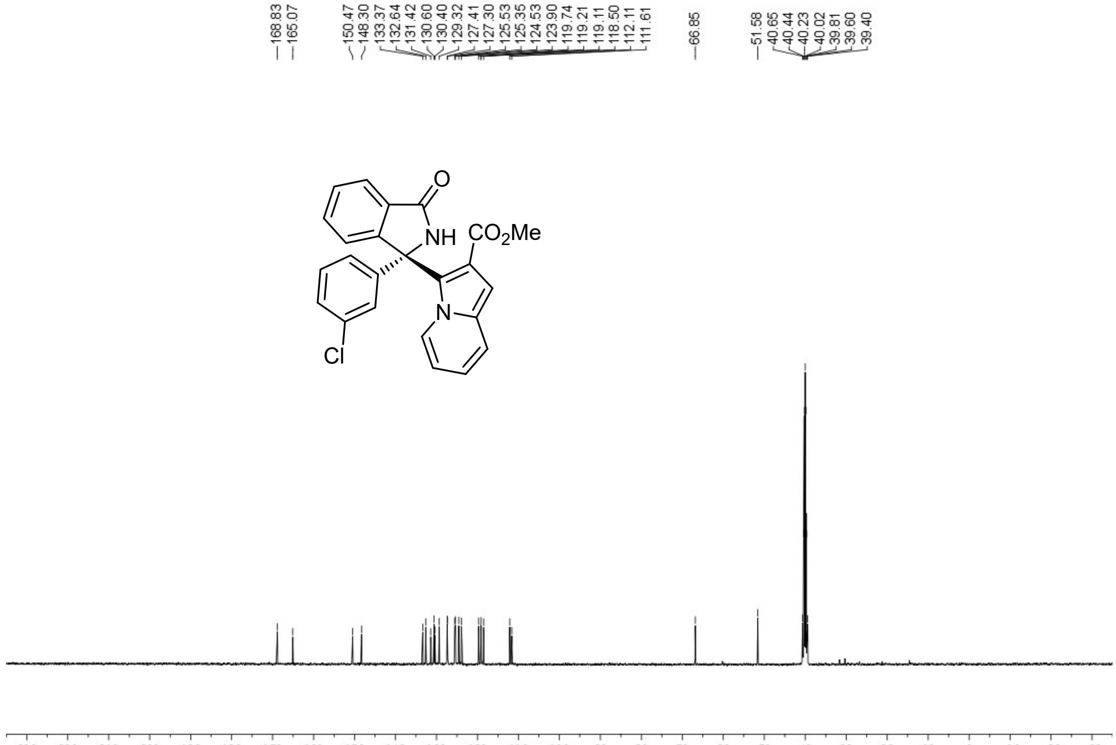


3i ^{13}C NMR (101 MHz, DMSO-d_6)

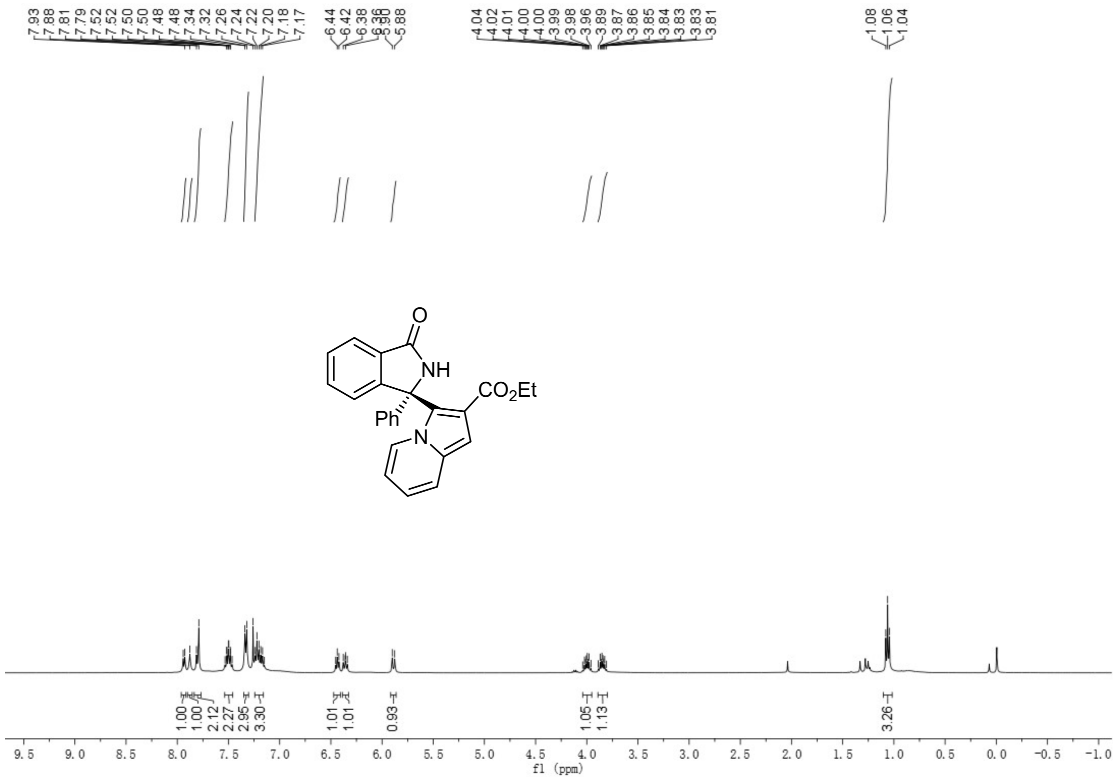
3j ^{1}H NMR (400 MHz, DMSO-d_6)

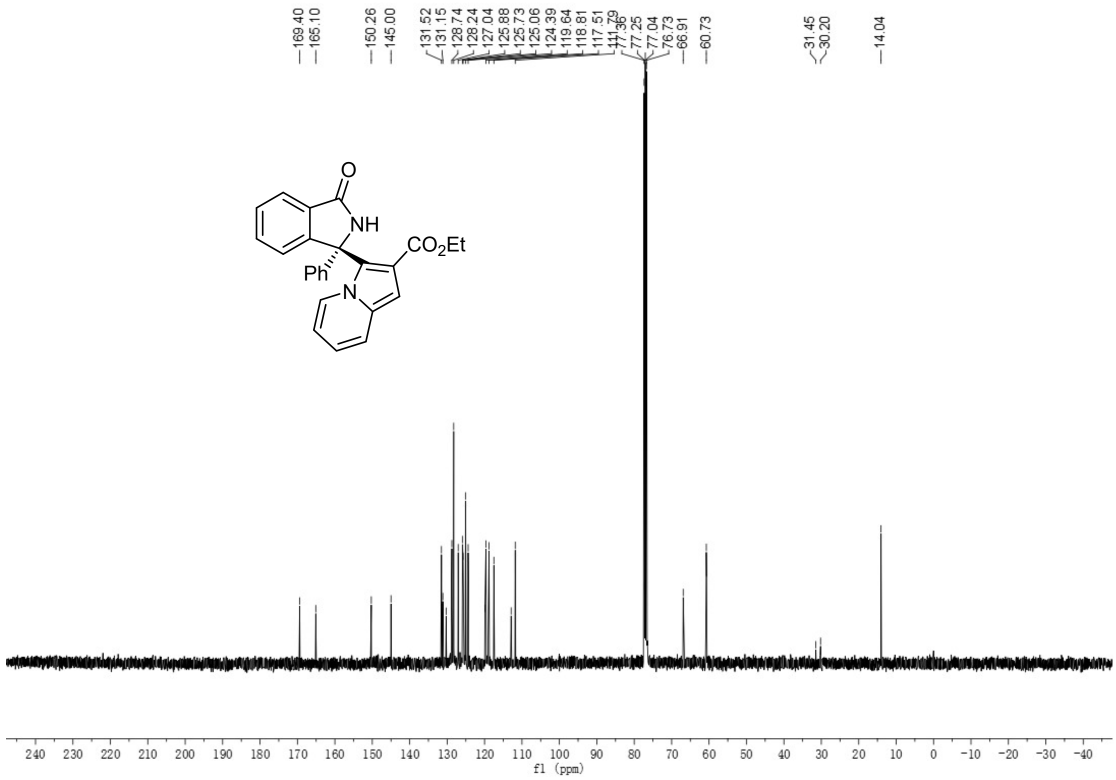


3j ^{13}C NMR (101 MHz, DMSO-d_6)



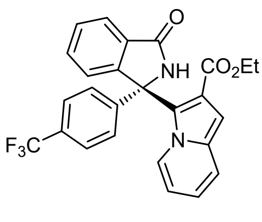
3k ^{1}H NMR (400 MHz, $CDCl_3$)

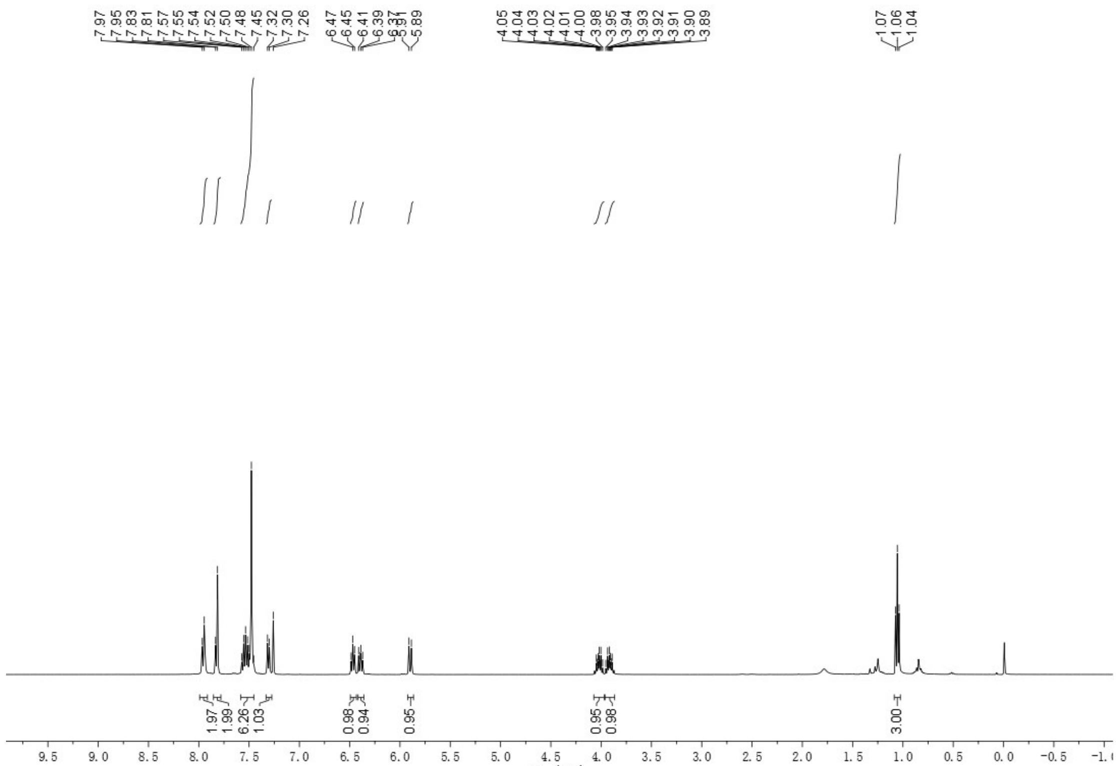




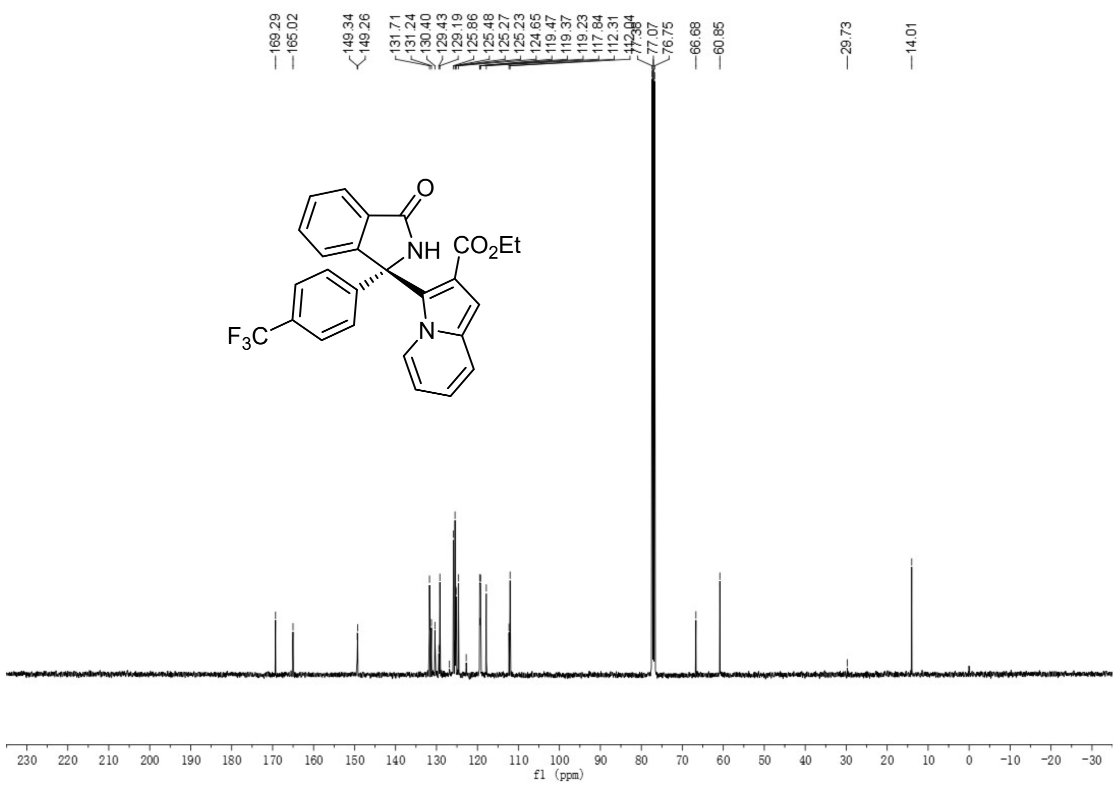
3k ^{13}C NMR (101 MHz, $CDCl_3$)

3l ^{1}H NMR (400 MHz, $CDCl_3$)

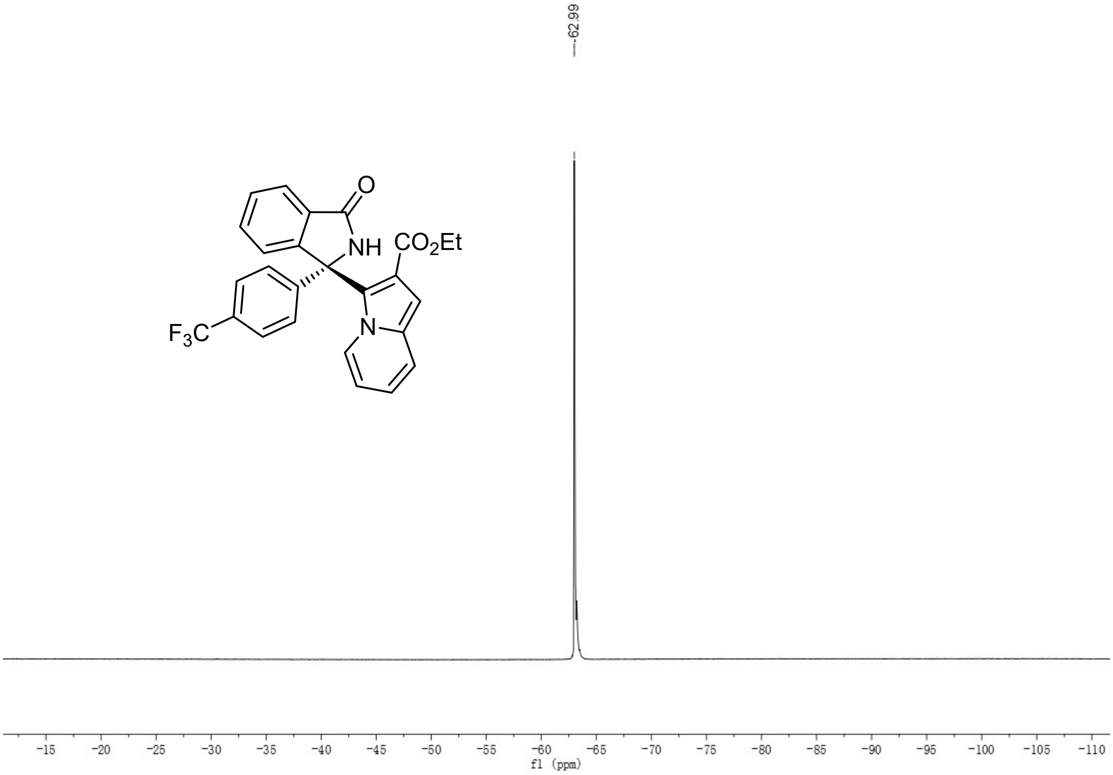




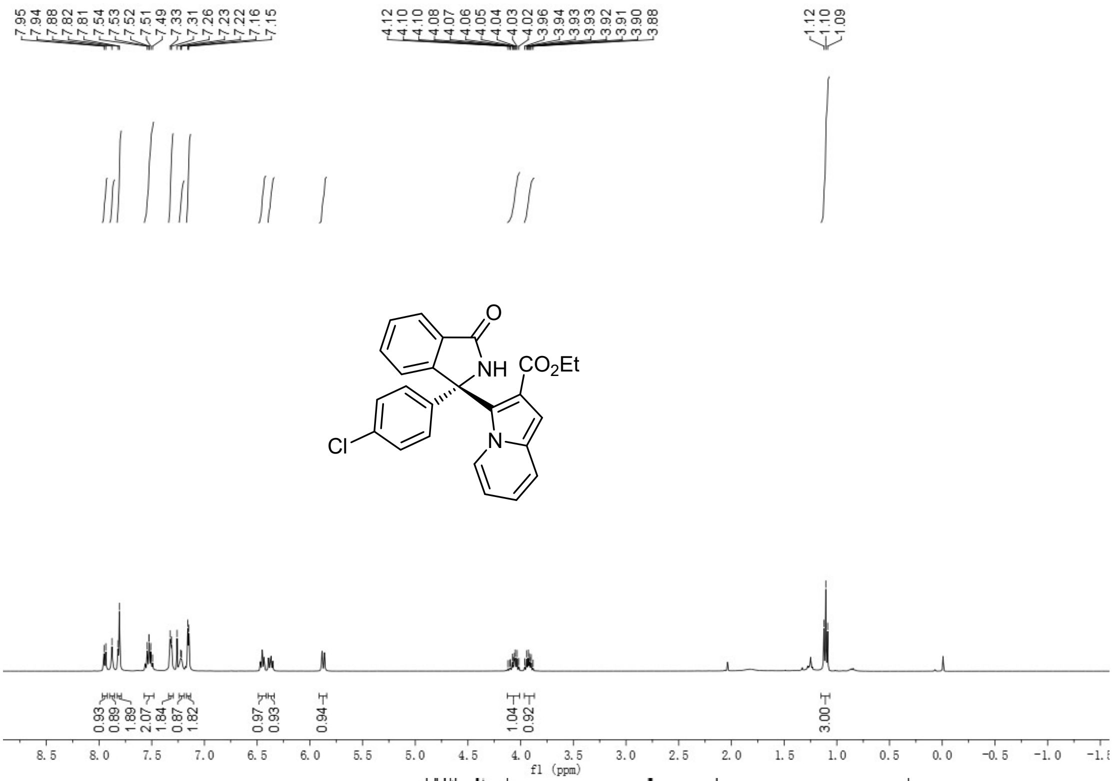
3l ^{13}C NMR (101 MHz, $CDCl_3$)

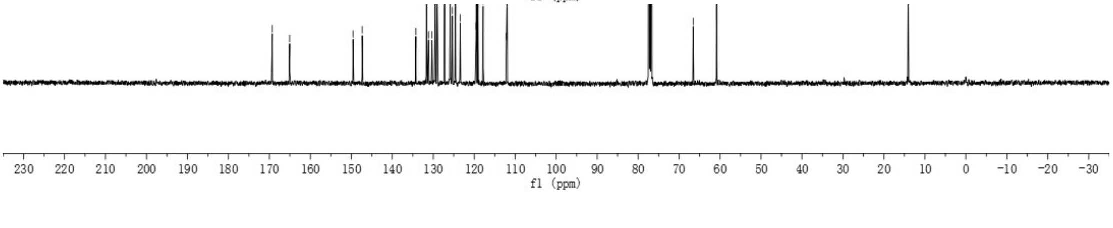


3l ^{19}F NMR (376 MHz, $CDCl_3$)



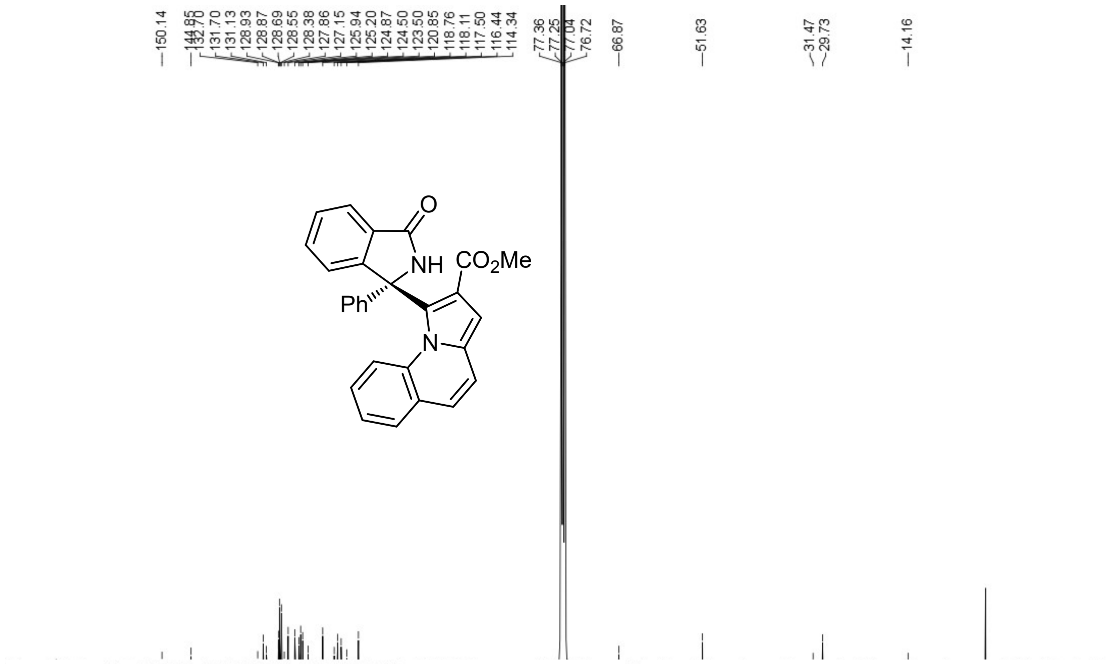
3m ^{1}H NMR (400 MHz, $CDCl_3$)

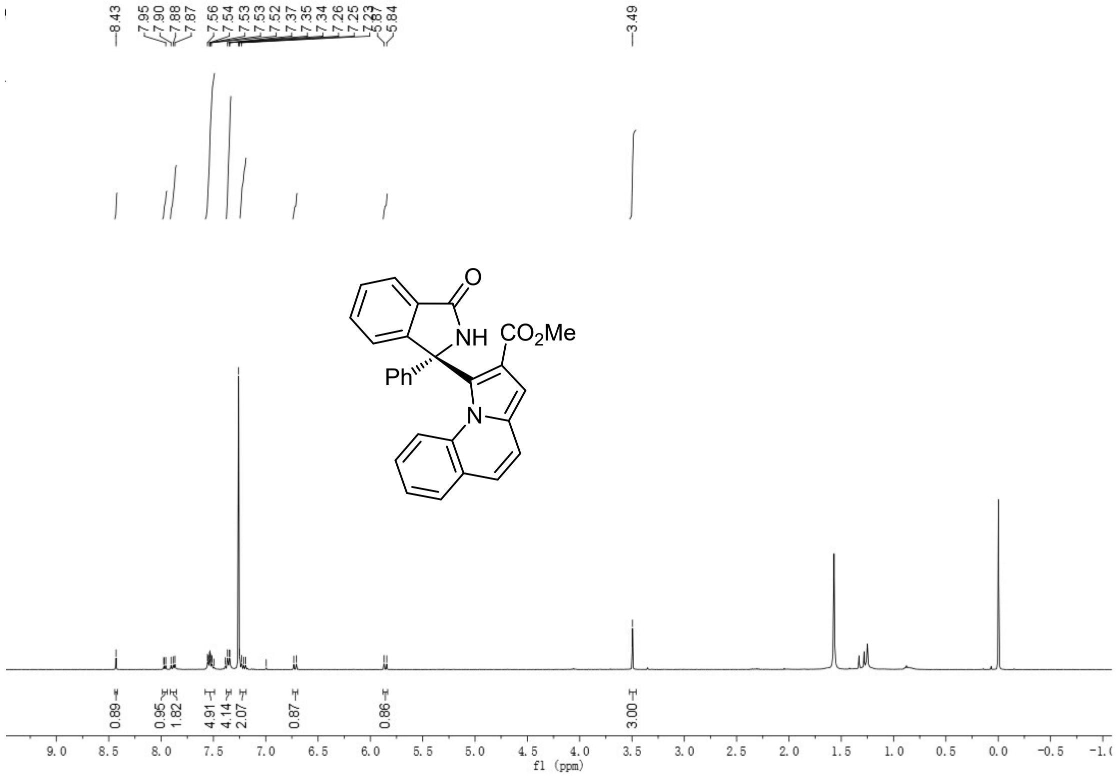




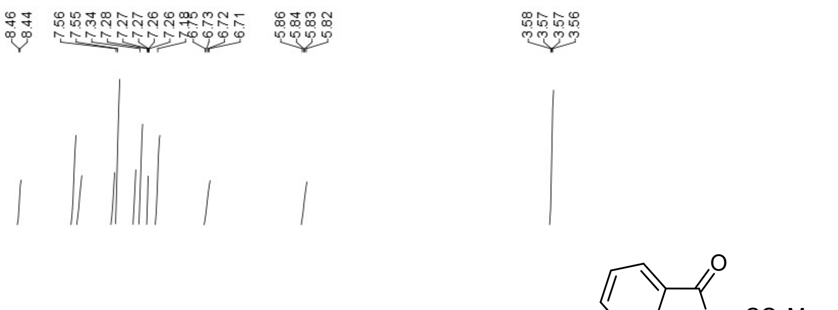
3n ^{1}H NMR (400 MHz, $CDCl_3$)

3n ^{13}C NMR (101 MHz, $CDCl_3$)

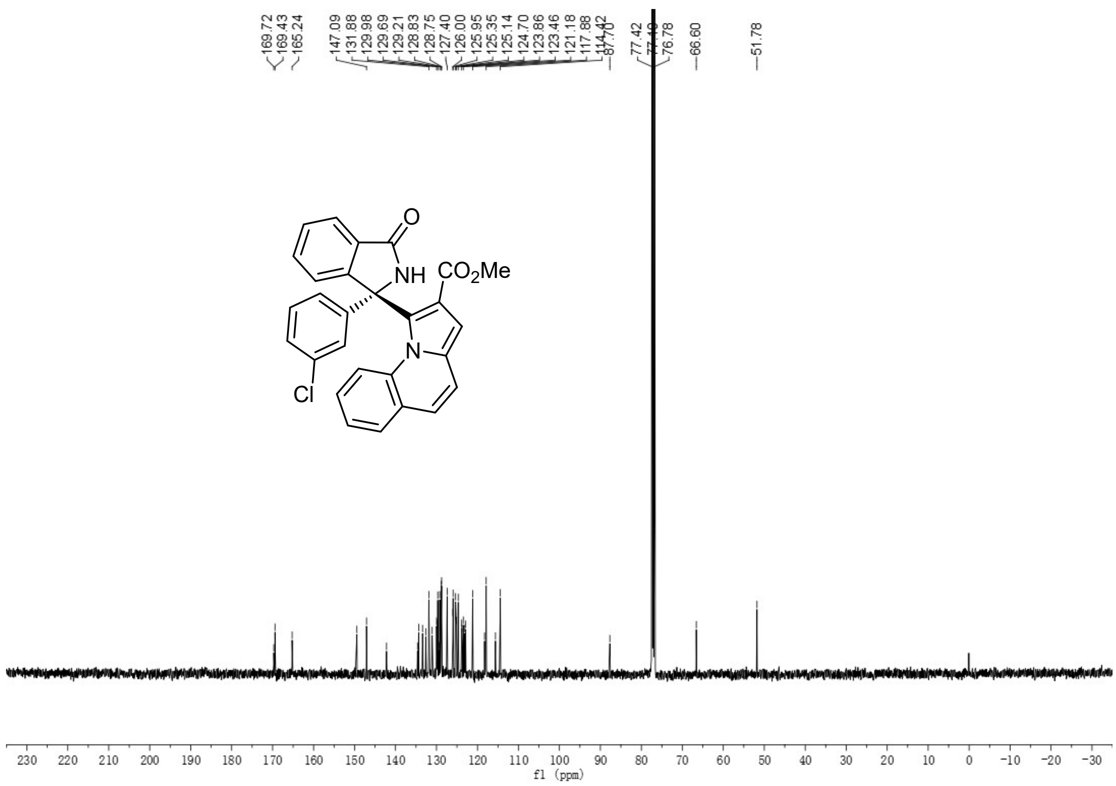




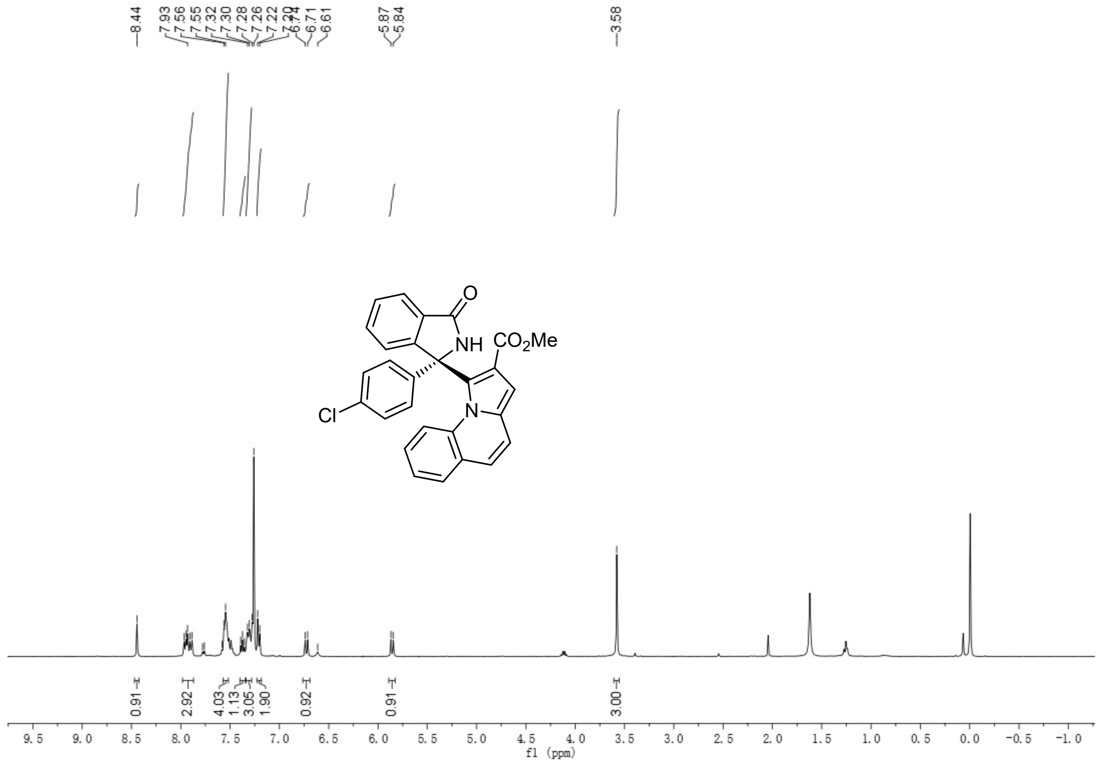
3o ^{1}H NMR (400 MHz, $CDCl_3$)



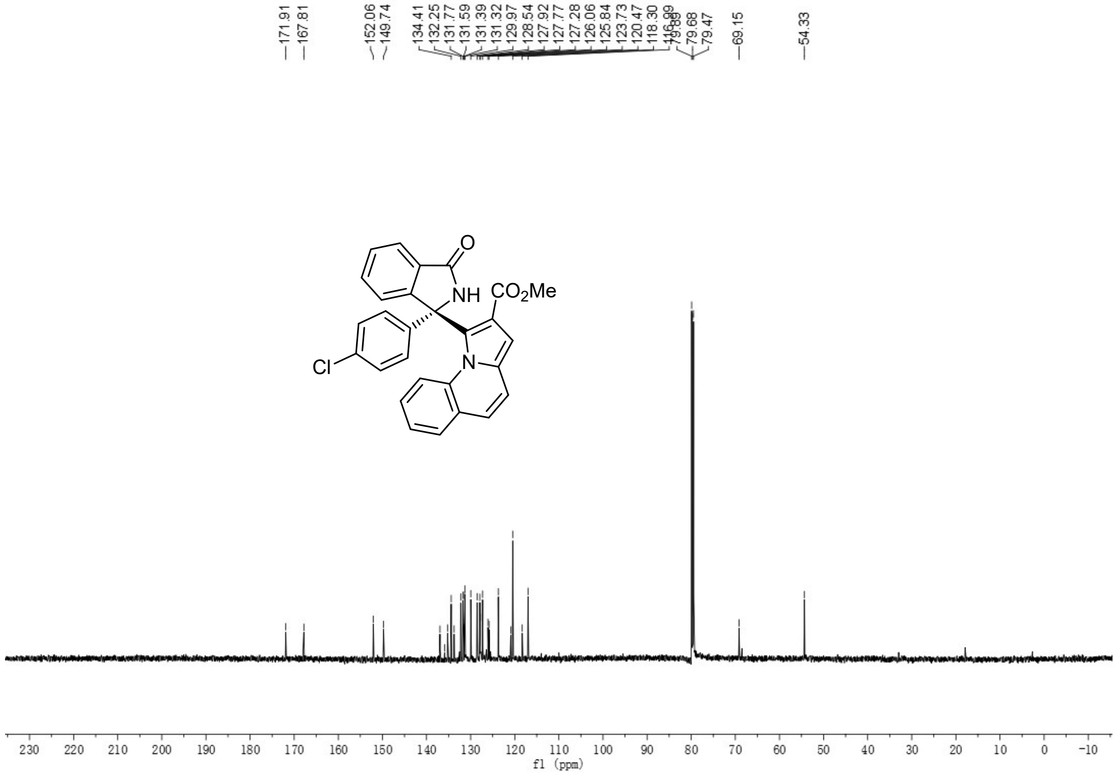
3o ^{13}C NMR (101 MHz, $CDCl_3$)



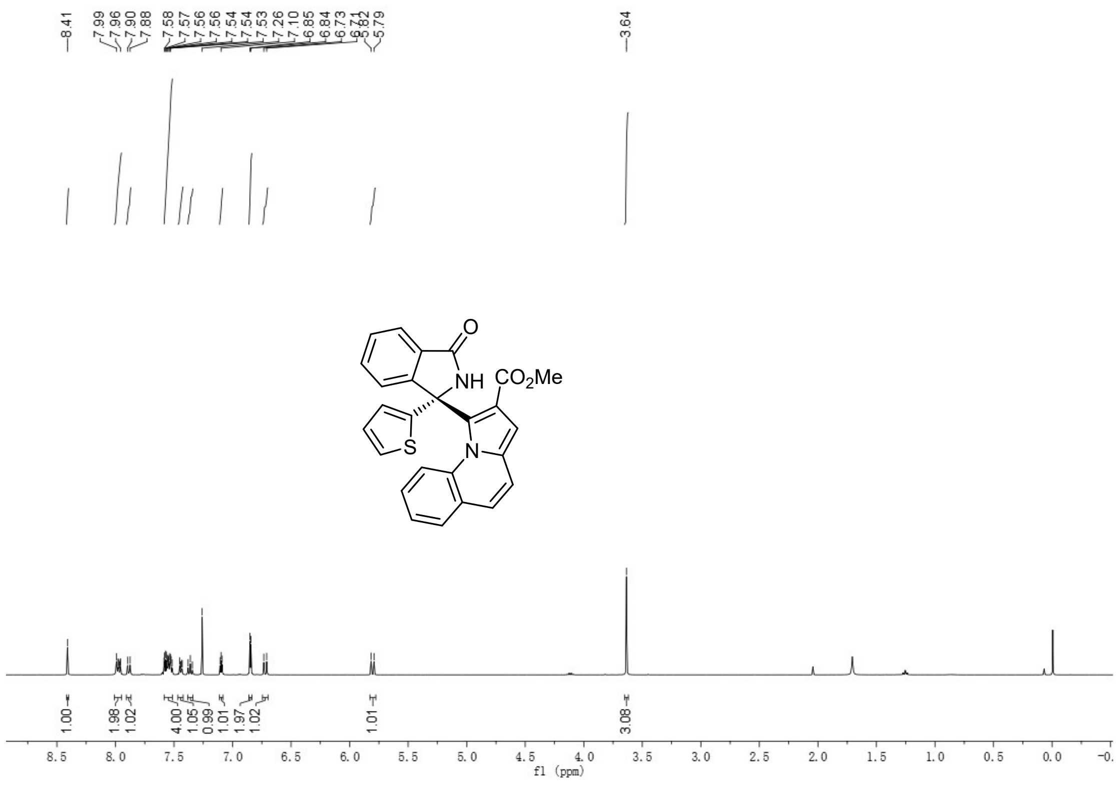
3p ^{1}H NMR (400 MHz, $CDCl_3$)



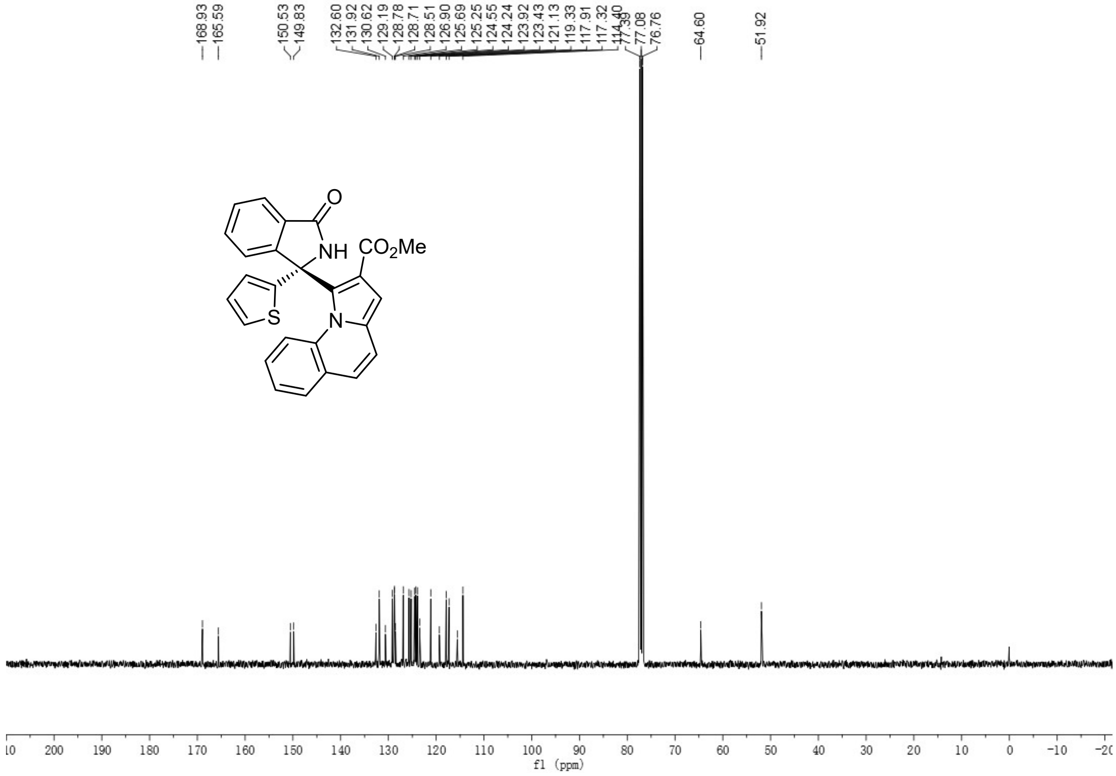
3p ^{13}C NMR (101 MHz, $CDCl_3$)



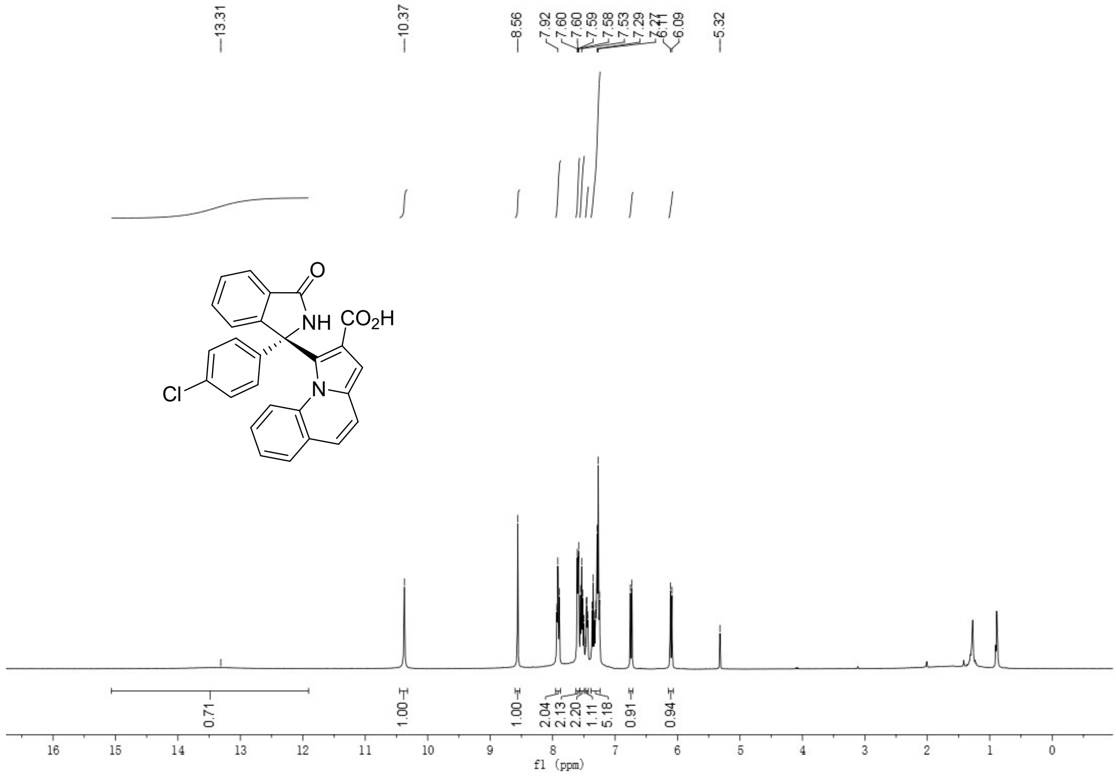
3q ^{1}H NMR (400 MHz, $CDCl_3$)



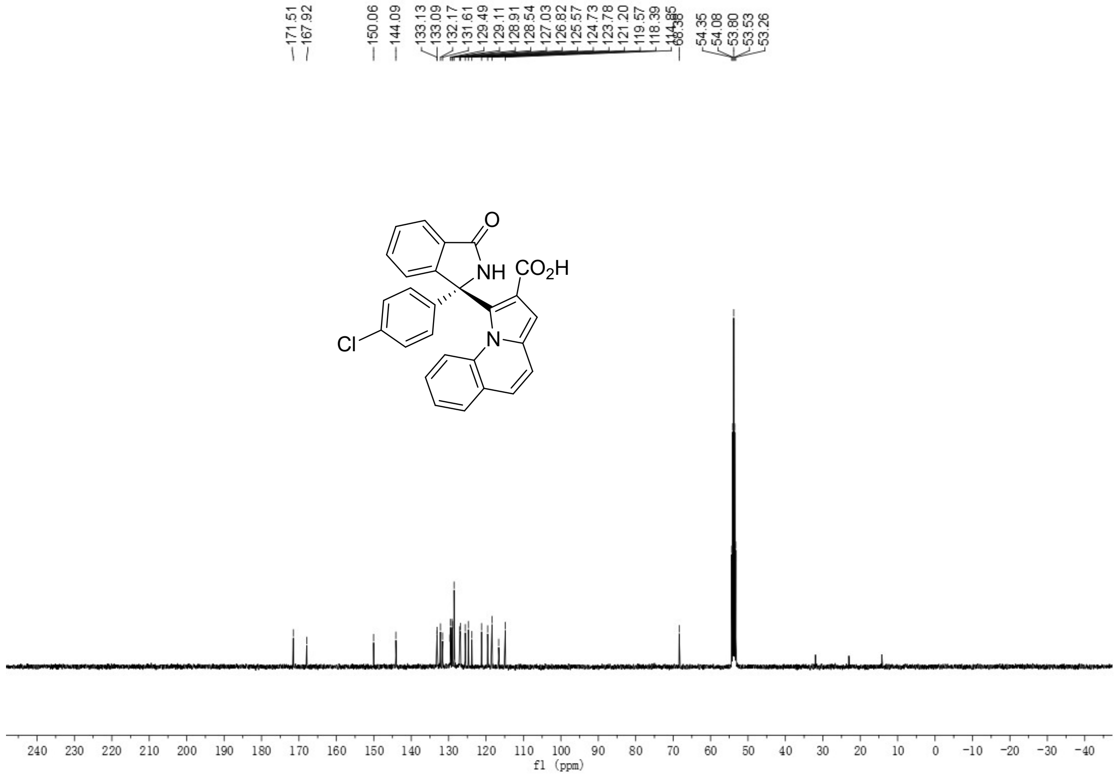
3q ^{13}C NMR (101 MHz, $CDCl_3$)



4 ^{1}H NMR (400 MHz, CD_2Cl_2)



4 ^{13}C NMR (101 MHz, CD_2Cl_2)



2. X-Ray Single Crystal Data for Product (*R*)-3p

Deposition Number CCDC 2167990

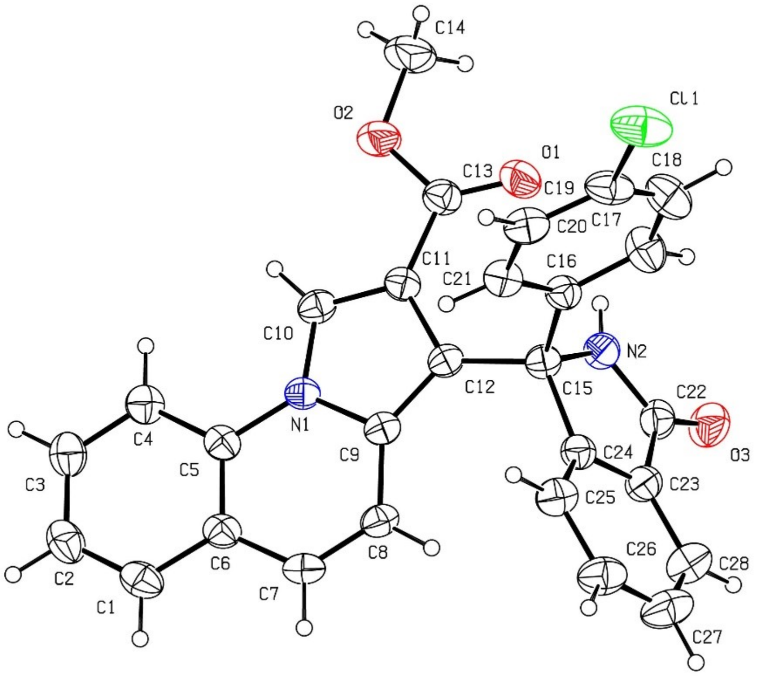
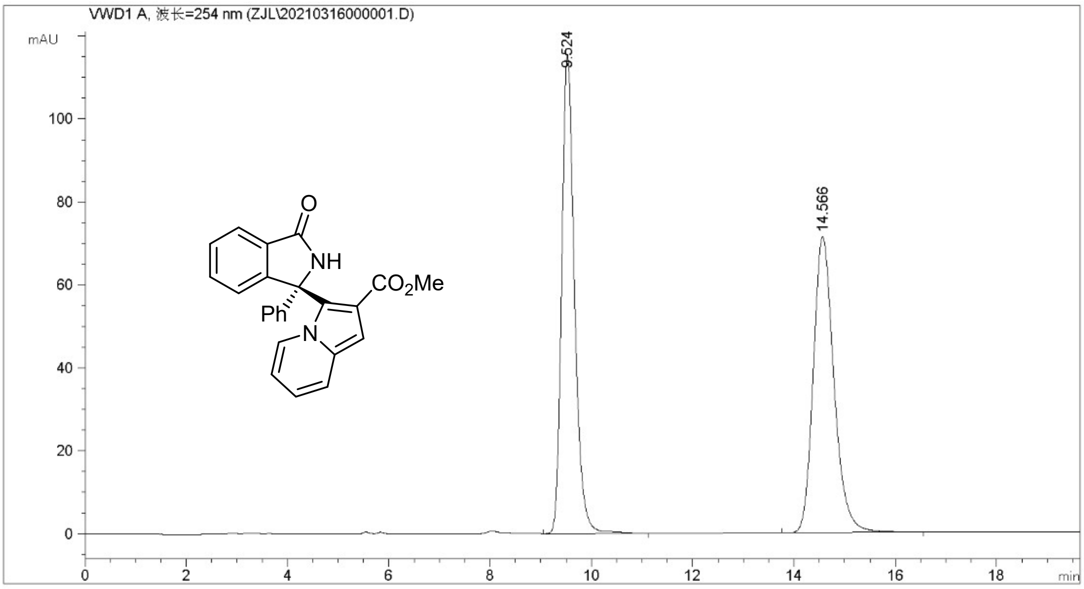


Table 1 Crystal data and structure refinement

Empirical formula	$C_{86}H_{63}Cl_3N_6O_{10}$
Formula weight	1446.77
Temperature/K	296.15
Crystal system	monoclinic
Space group	C2
a/Å	24.5506(14)
b/Å	14.4941(4)
c/Å	24.9660(13)
α/°	90
β/°	125.773(8)
γ/°	90
Volume/Å^3	7207.8(8)
Z	4
ρ_{calc}g/cm^3	1.333
μ/mm^{-1}	0.195
F(000)	3008.0
Crystal size/mm^3	0.48 × 0.19 × 0.15

Radiation	MoKα (λ = 0.71073)
2Θ range for data collection/°	3.698 to 58.786
Index ranges	$-32 \le h \le 33$, $-19 \le k \le 19$, $-34 \le l \le 33$
Reflections collected	63847
Independent reflections	17756 [R_{int} = 0.0422, R_{sigma} = 0.0461]
Data/restraints/parameters	17756/1/951
Goodness-of-fit on F^2	1.008
Final R indexes [I>=2σ (I)]	R_1 = 0.0516, wR_2 = 0.1104
Final R indexes [all data]	R_1 = 0.0951, wR_2 = 0.1289
Largest diff. peak/hole / e Å^{-3}	0.32/-0.27
Flack parameter	-0.039(19)

3. Copies of HPLC Spectra



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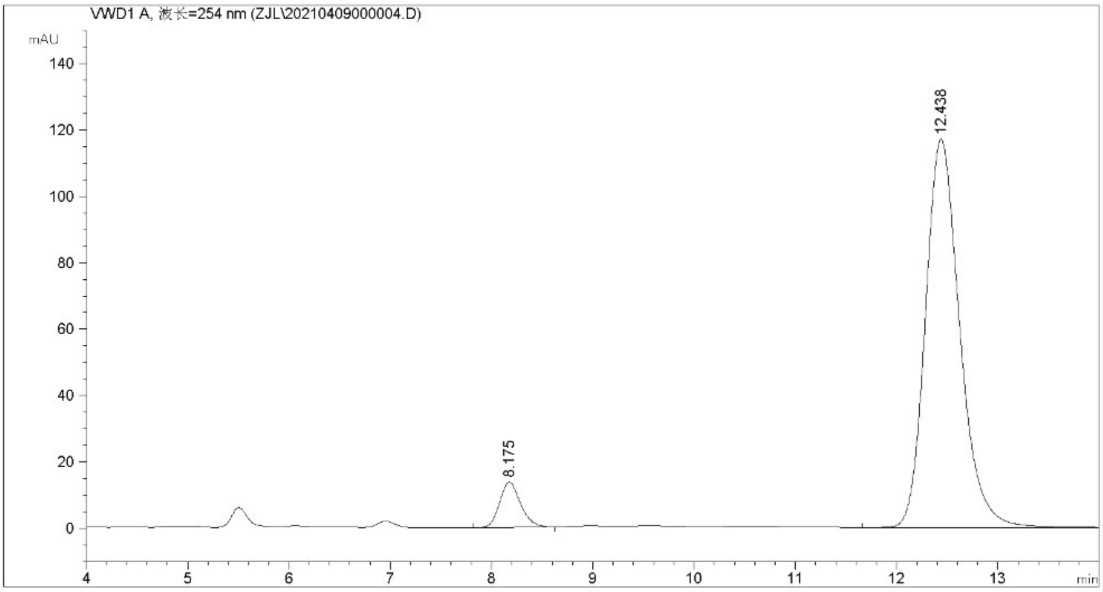

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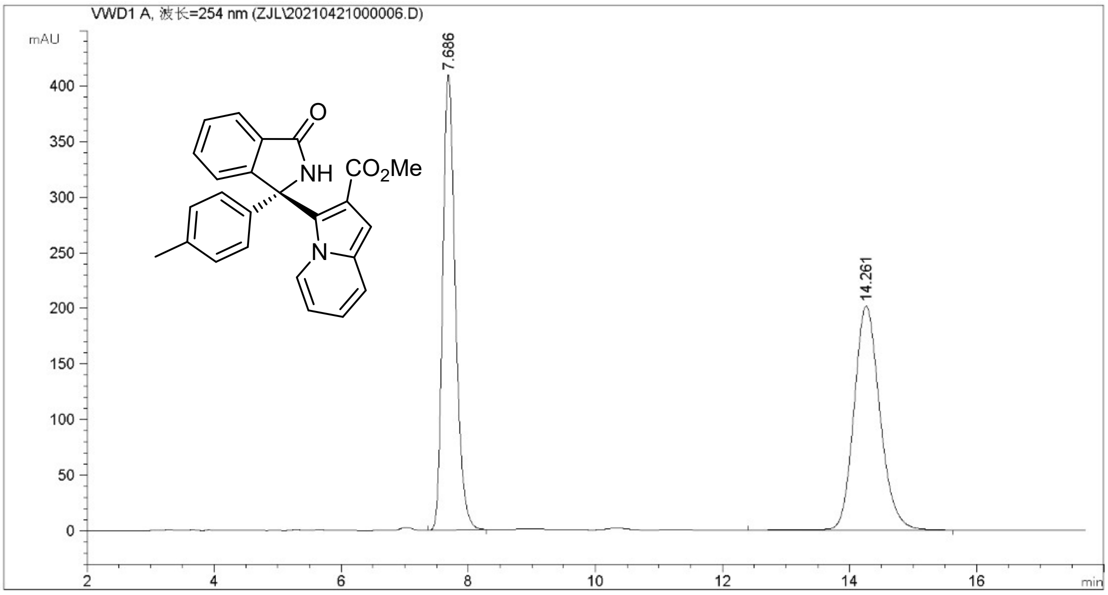

#	[min]		[min]	mAU *s	[mAU]	%
1	7.686	BB	0.2100	5638.29492	409.88458	49.6129
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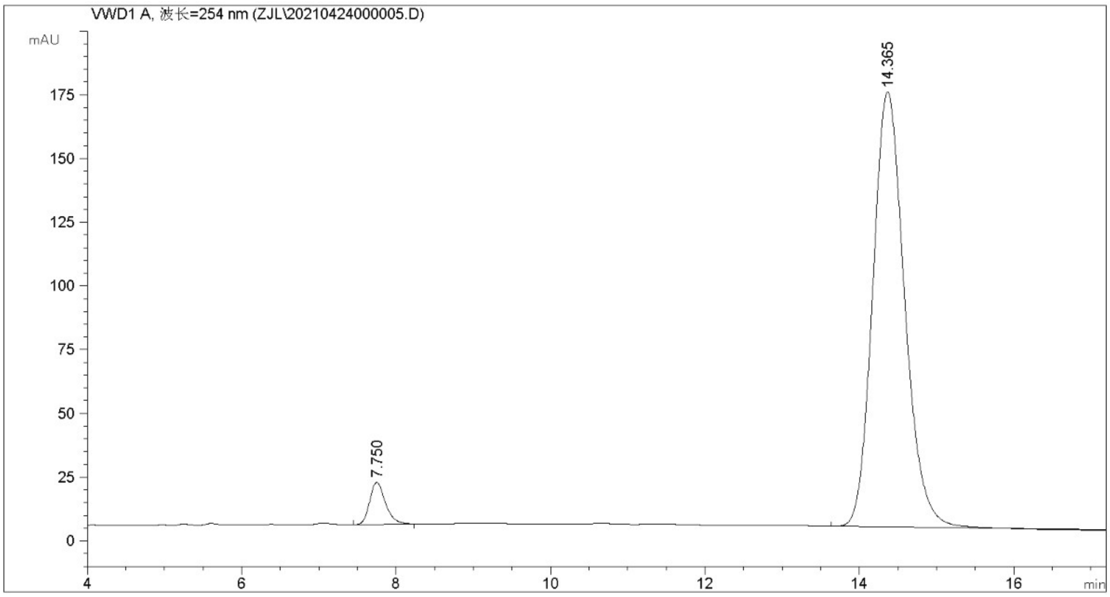

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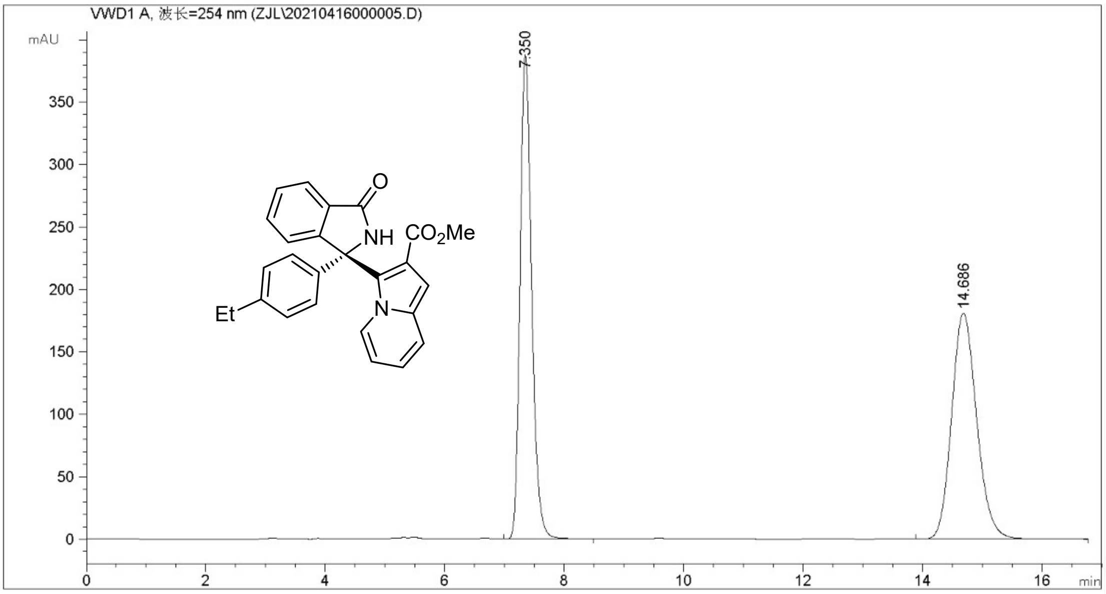

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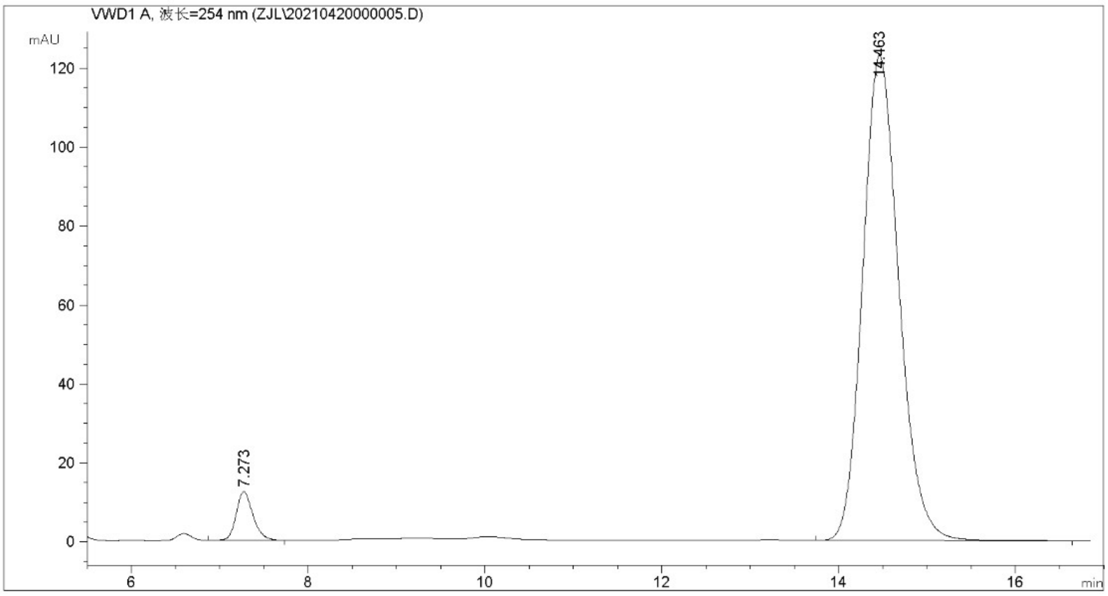

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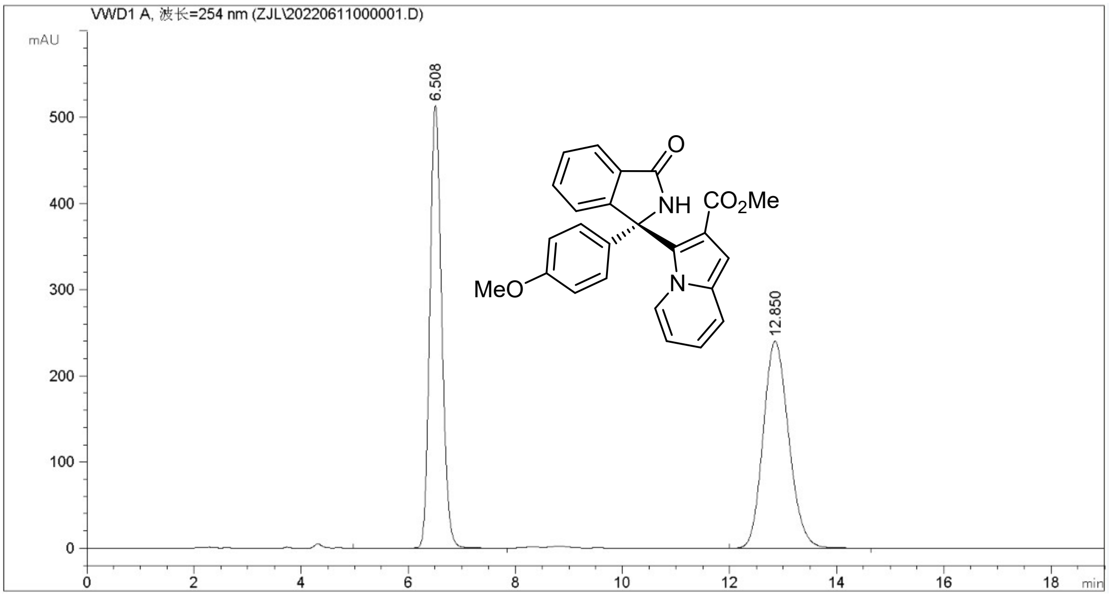

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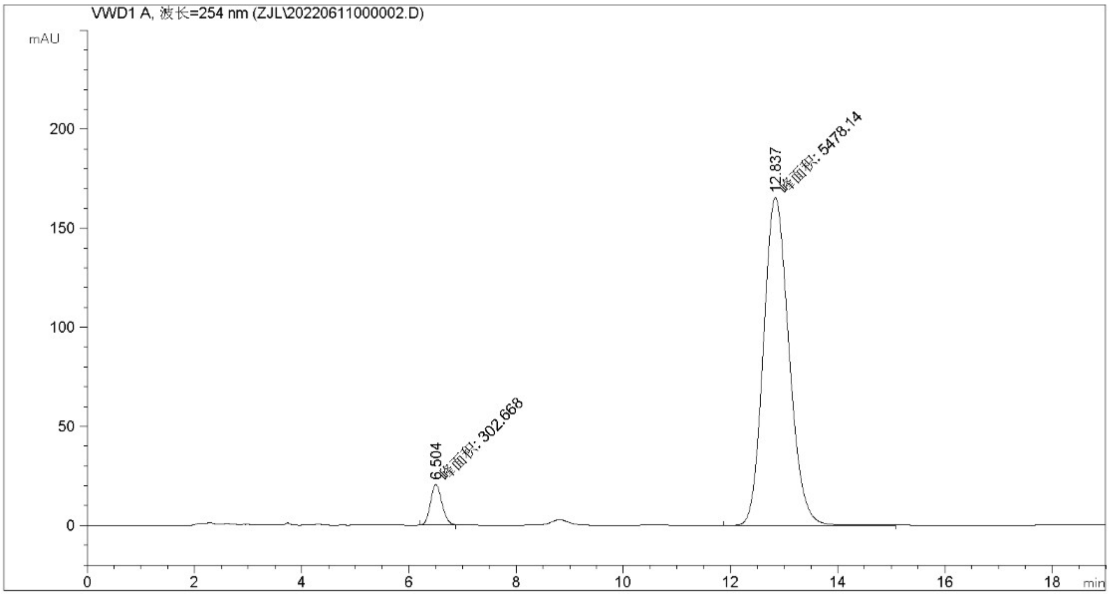

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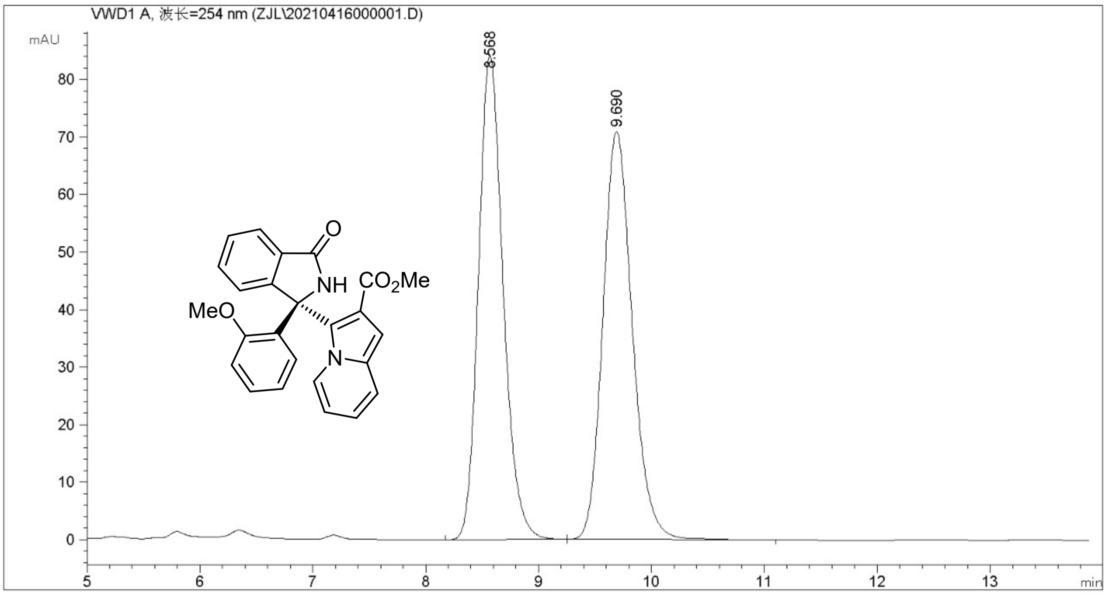

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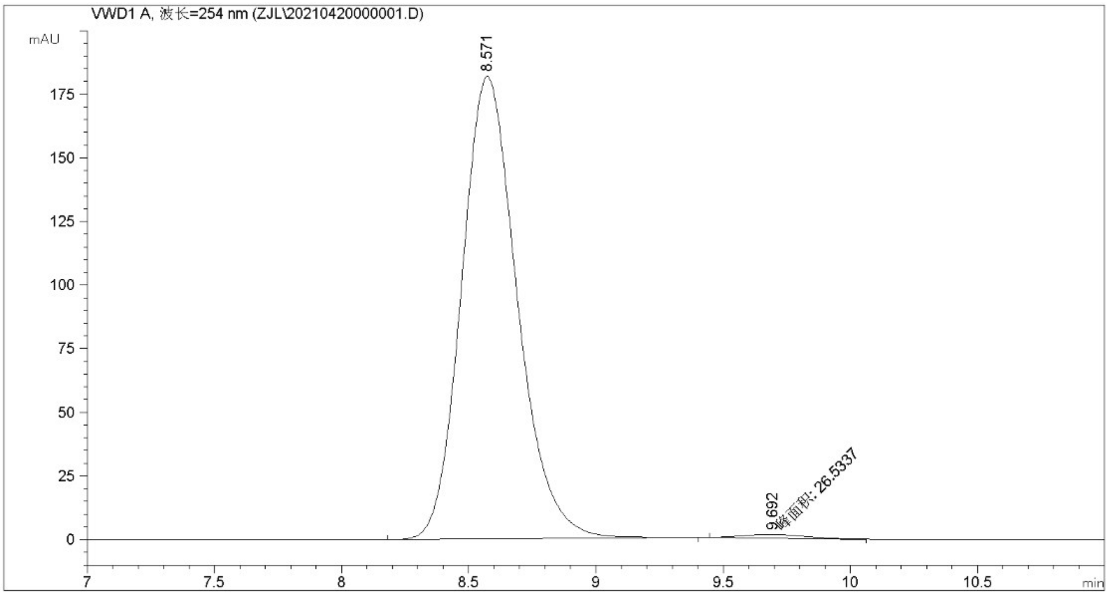

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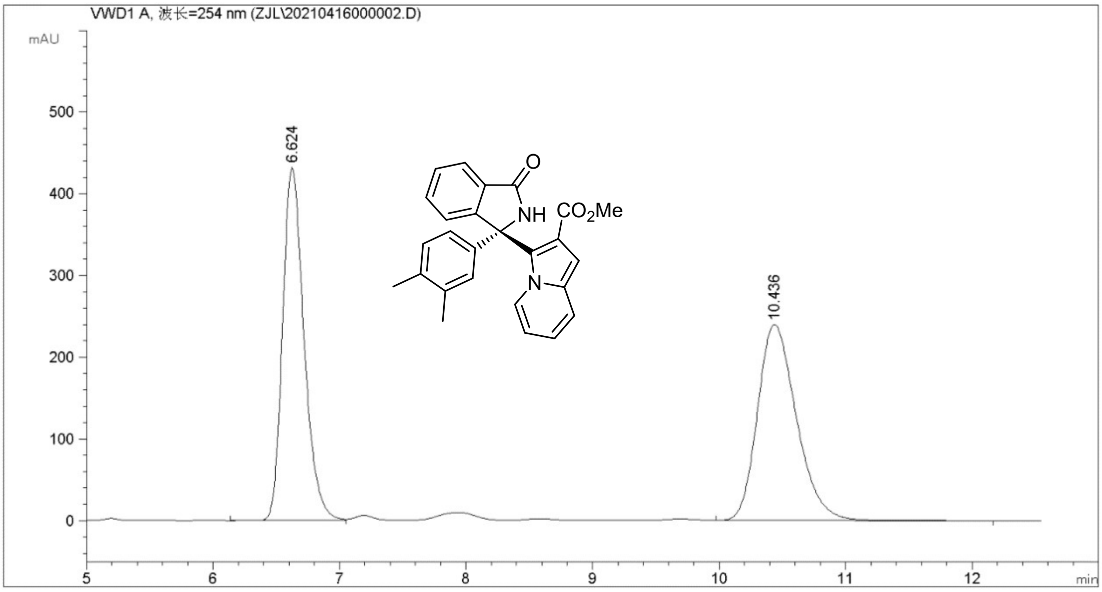

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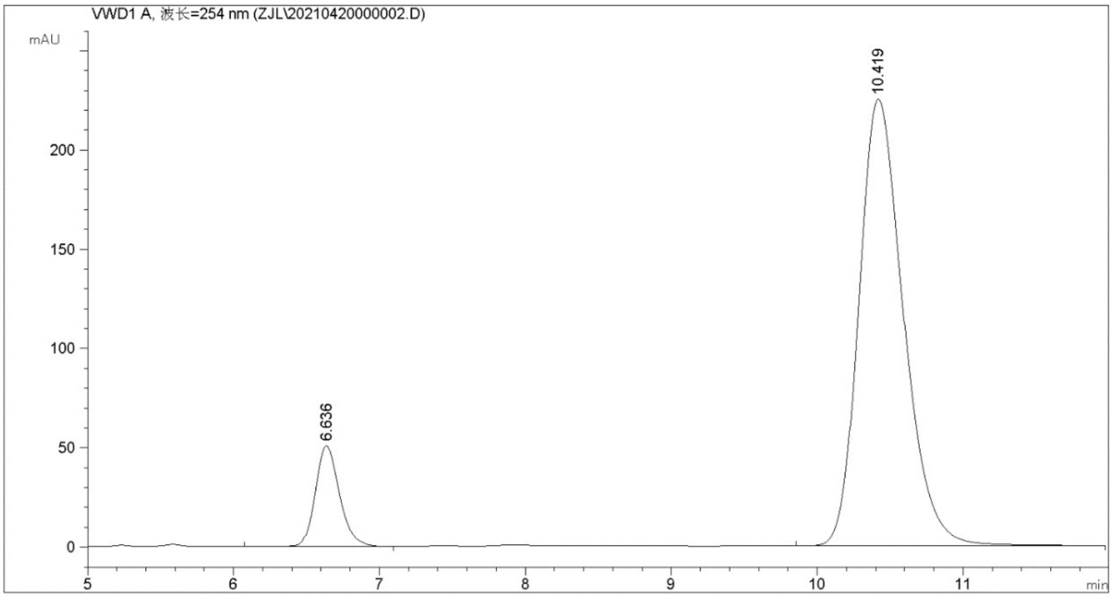

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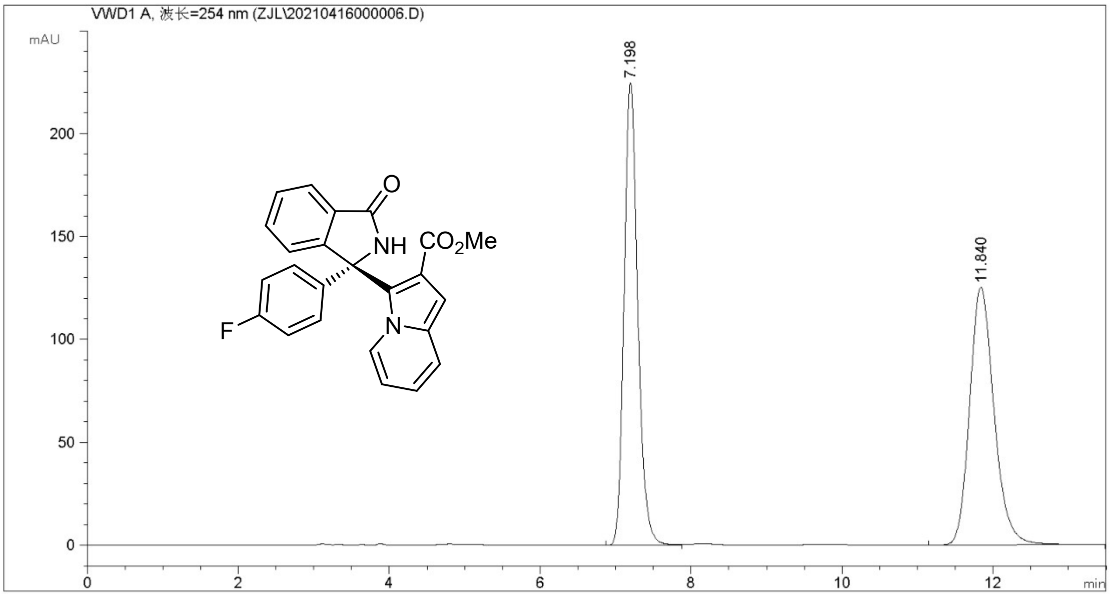

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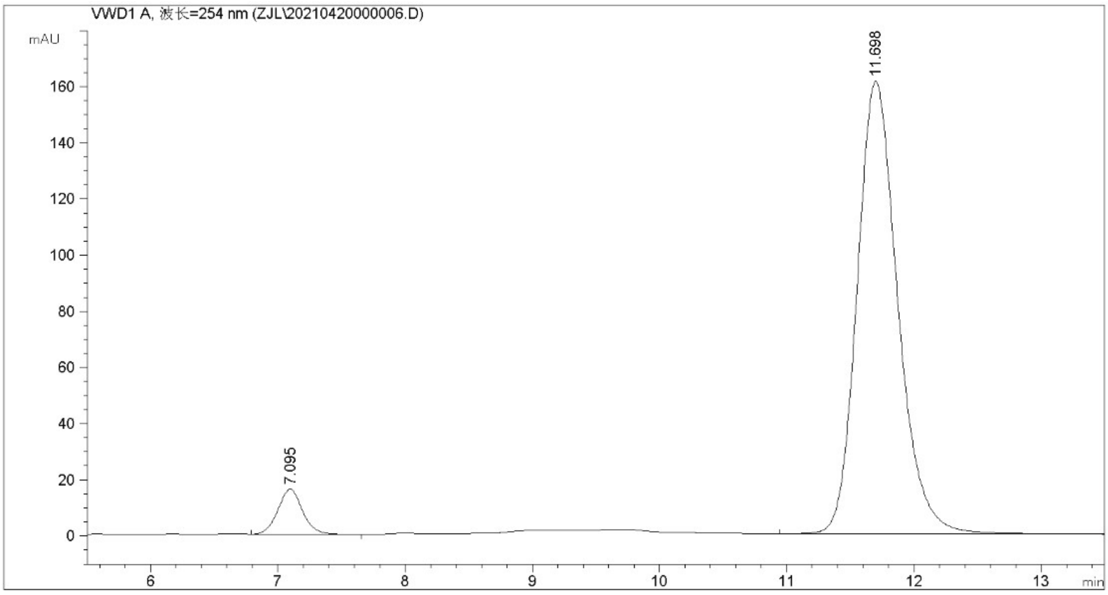
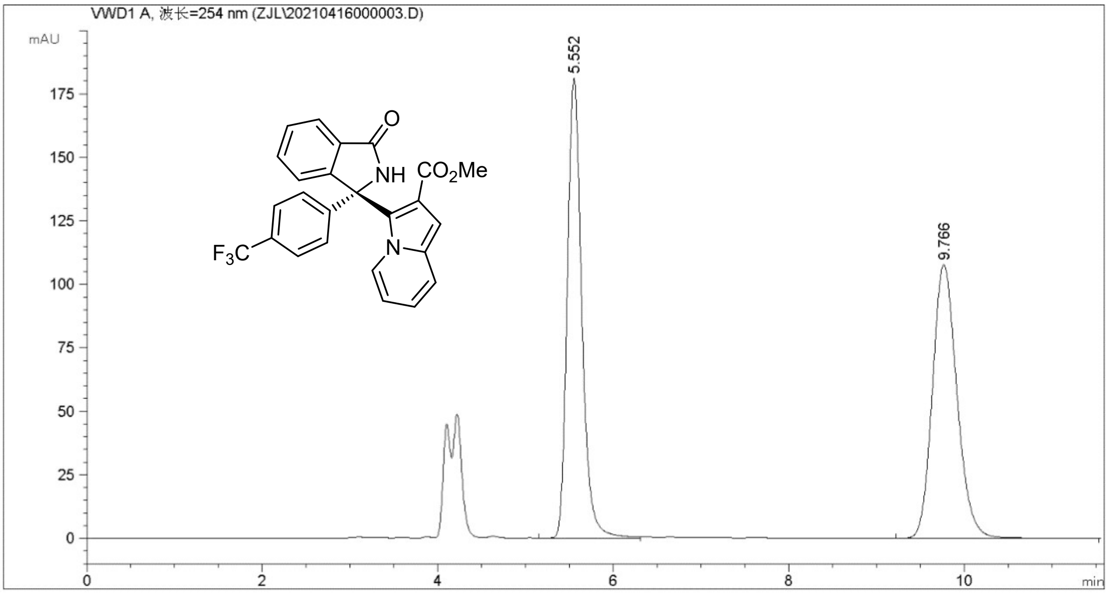
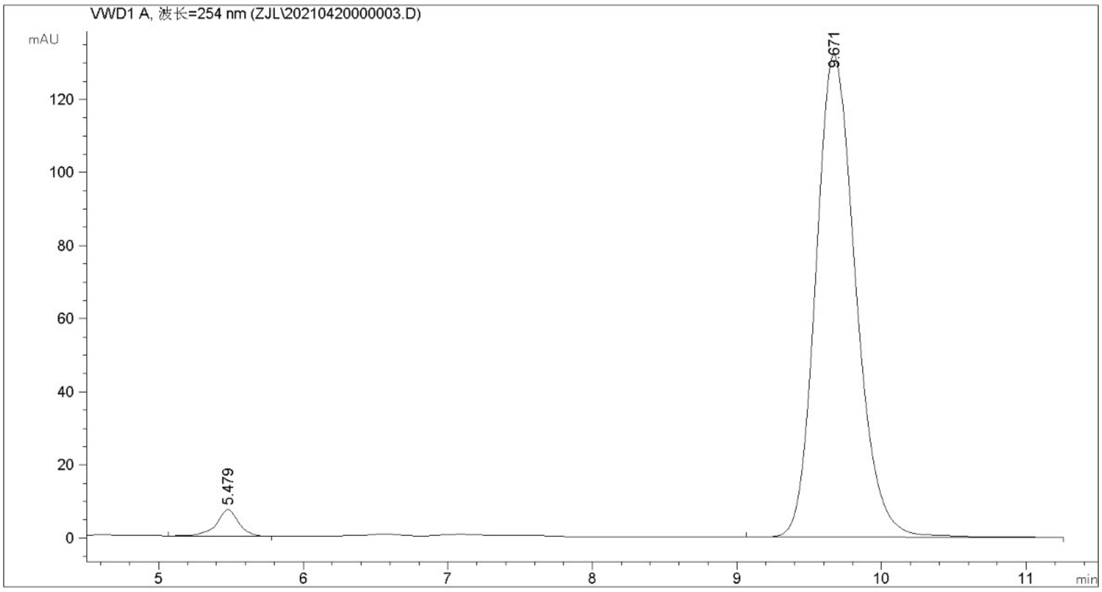


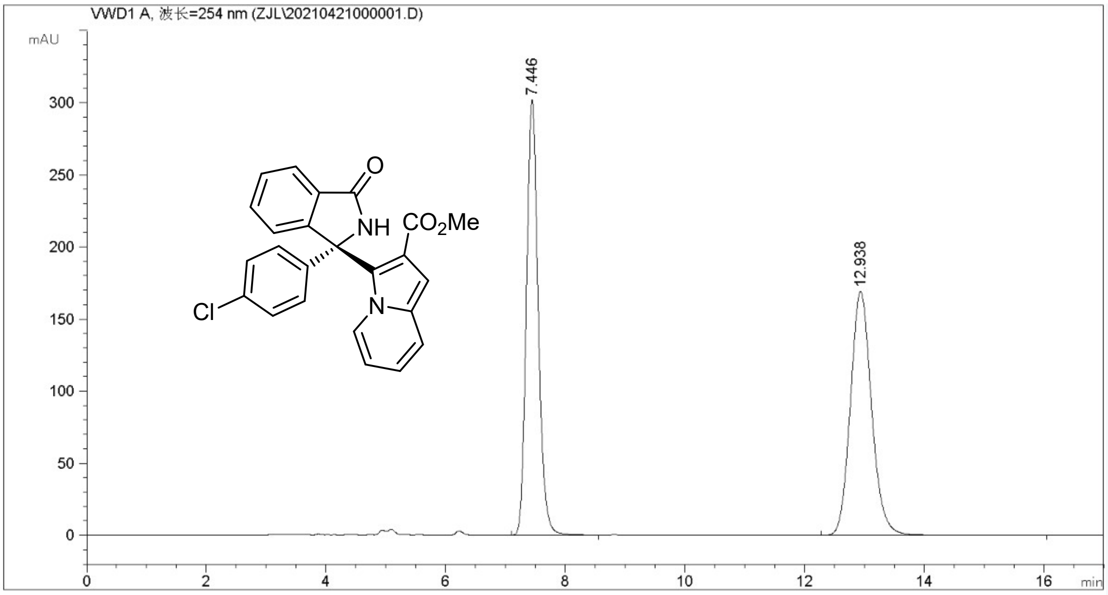
#	[min]		[min]	mAU *s	[mAU]	%
1	7.095	VB	0.2063	222.46303	16.25377	5.8550
2	11.698	BBA	0.3390	3577.09814	161.20660	94.1450



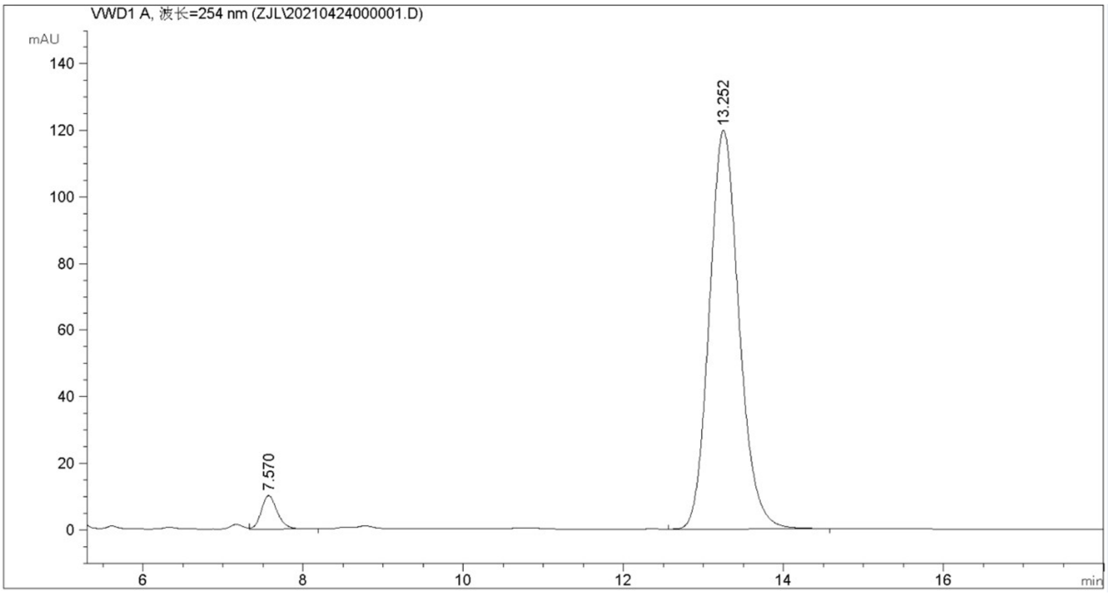
#	[min]		[min]	mAU *s	[mAU]	%
1	5.552	BV	0.1776	2078.40649	181.06479	49.8345
2	9.766	BBA	0.2993	2092.21387	107.78885	50.1655



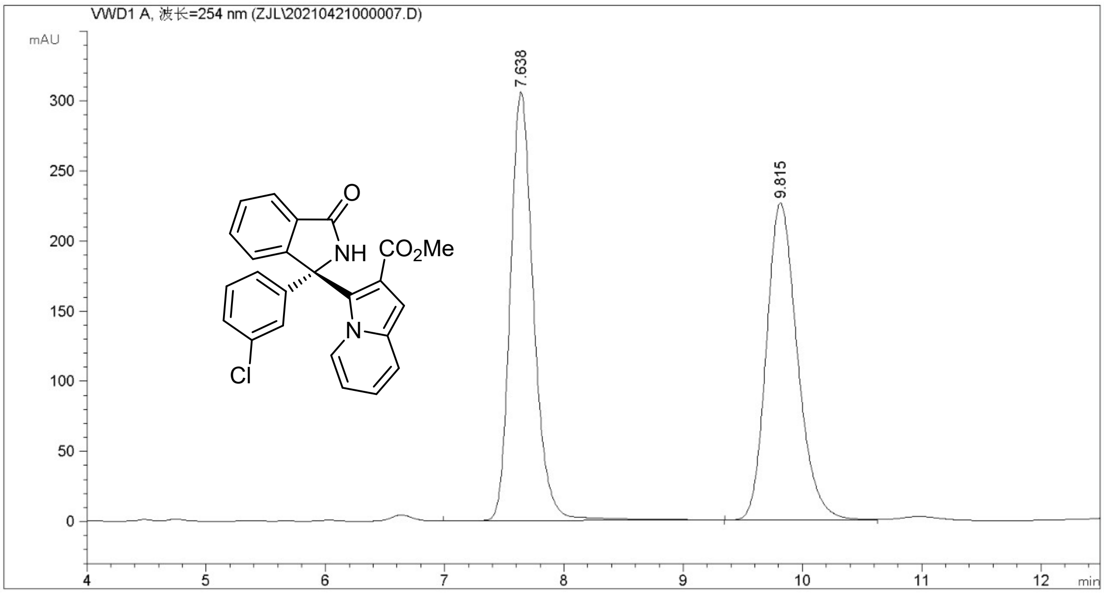
#	[min]		[min]	mAU *s	[mAU]	%
1	5.479	BB	0.1613	79.69964	7.27233	3.0656
2	9.671	BBA	0.2927	2520.07837	131.98145	96.9344



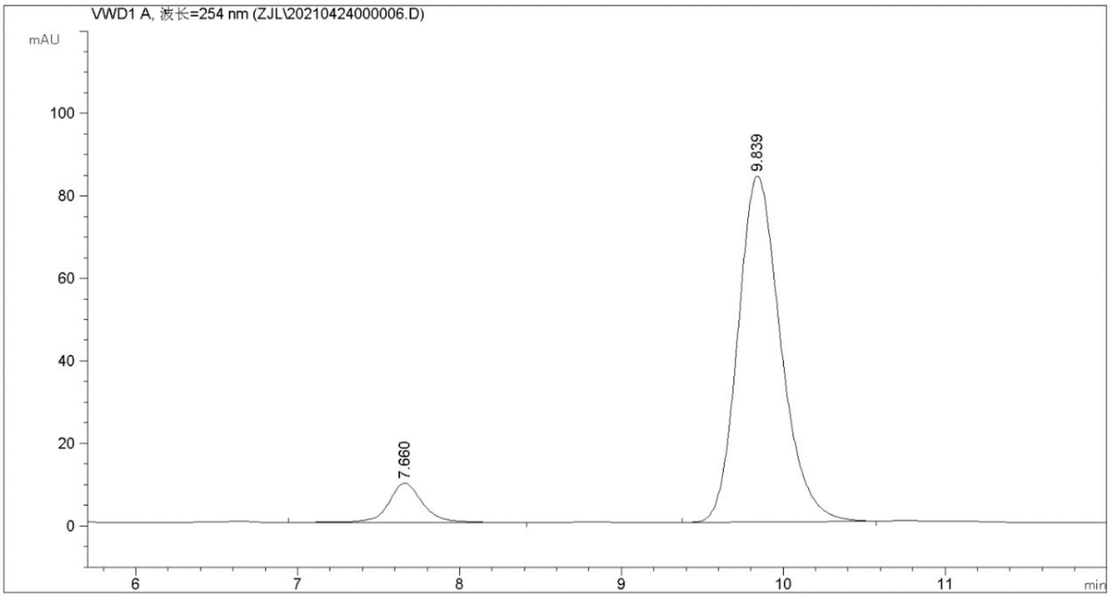
#	[min]		[min]	mAU *s	[mAU]	%
1	7.446	VV	0.2122	4135.87793	302.00452	49.7356
2	12.938	VB	0.3815	4179.84424	169.12788	50.2644



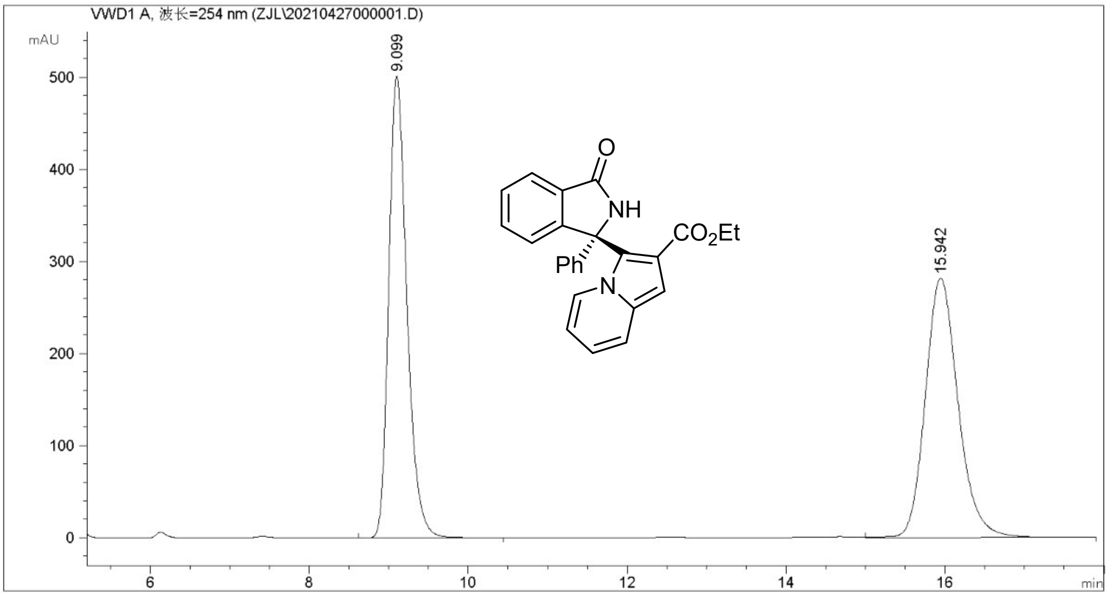
#	[min]		[min]	mAU *s	[mAU]	%
1	7.570	VB	0.2102	138.31201	10.04095	4.2778
2	13.252	BB	0.3976	3094.96118	119.76265	95.7222



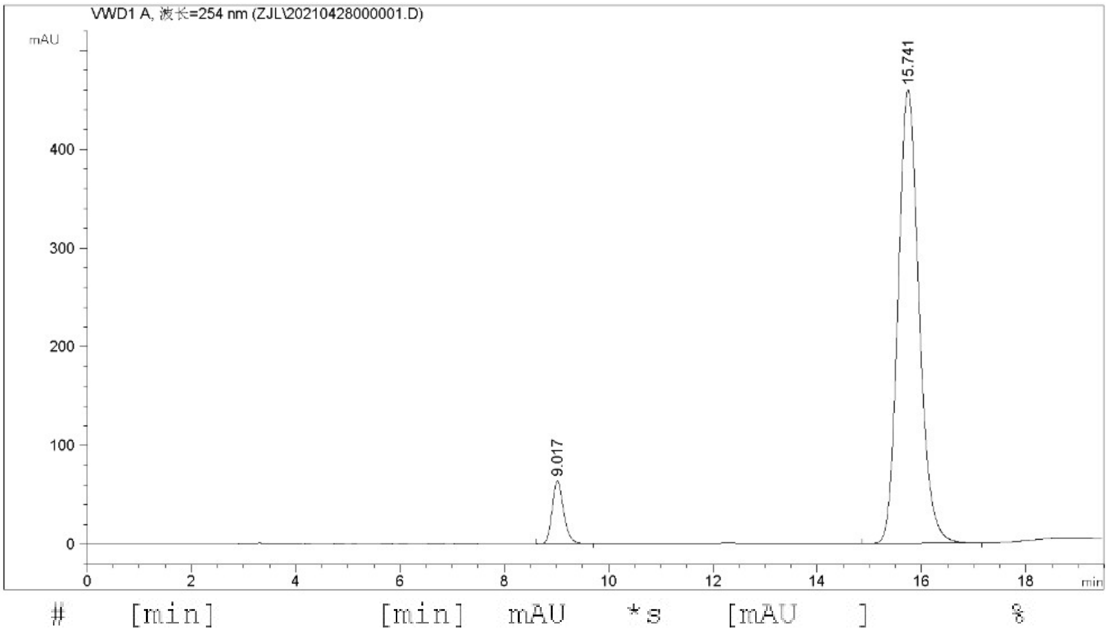
#	[min]		[min]	mAU *s	[mAU]	%
1	7.638	BB	0.2081	4159.29834	305.87772	50.3478
2	9.815	BV	0.2784	4101.83203	226.35027	49.6522



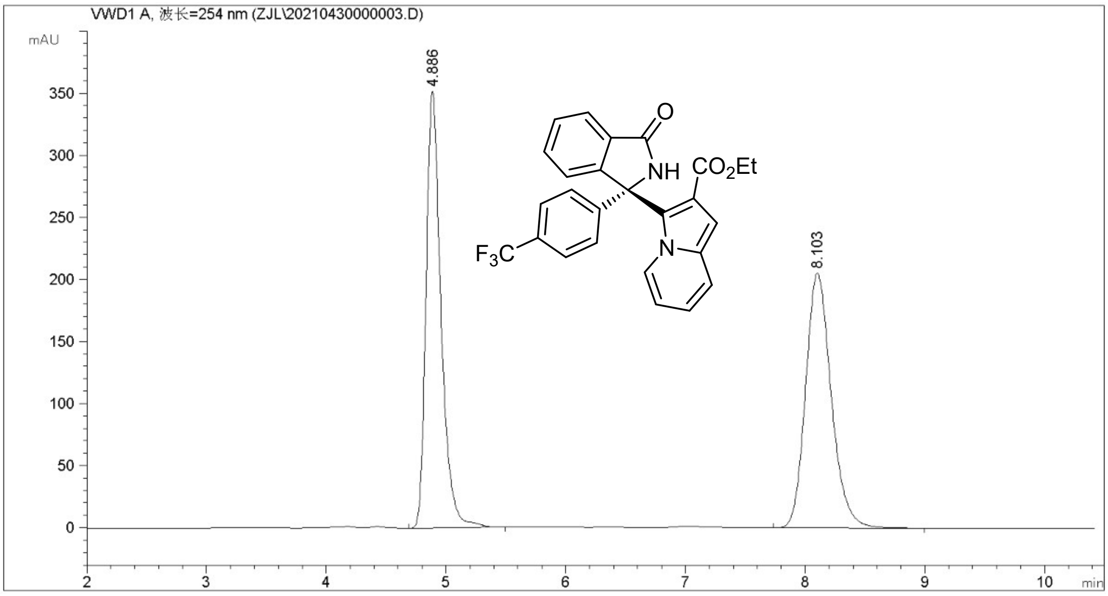
#	[min]		[min]	mAU *s	[mAU]	%
1	7.660	BB	0.2232	143.88104	9.58637	8.5500
2	9.839	BB	0.2825	1538.93970	83.86980	91.4500



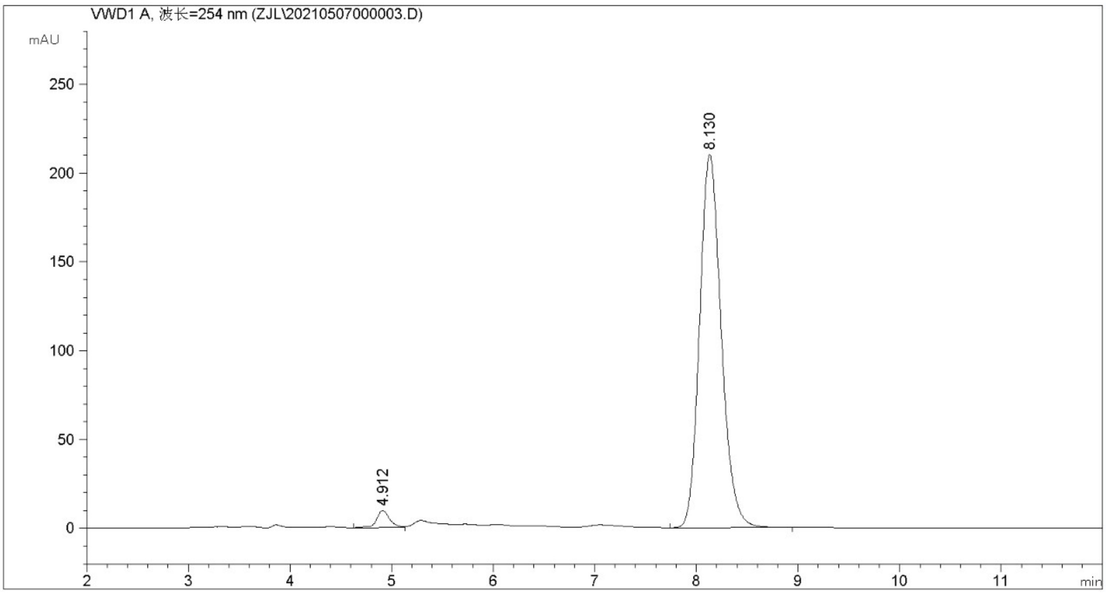
#	[min]		[min]	mAU *s	[mAU]	%
1	9.099	BB	0.2429	7932.20752	501.04297	49.5839
2	15.942	VBA	0.4404	8065.34717	281.62671	50.4161



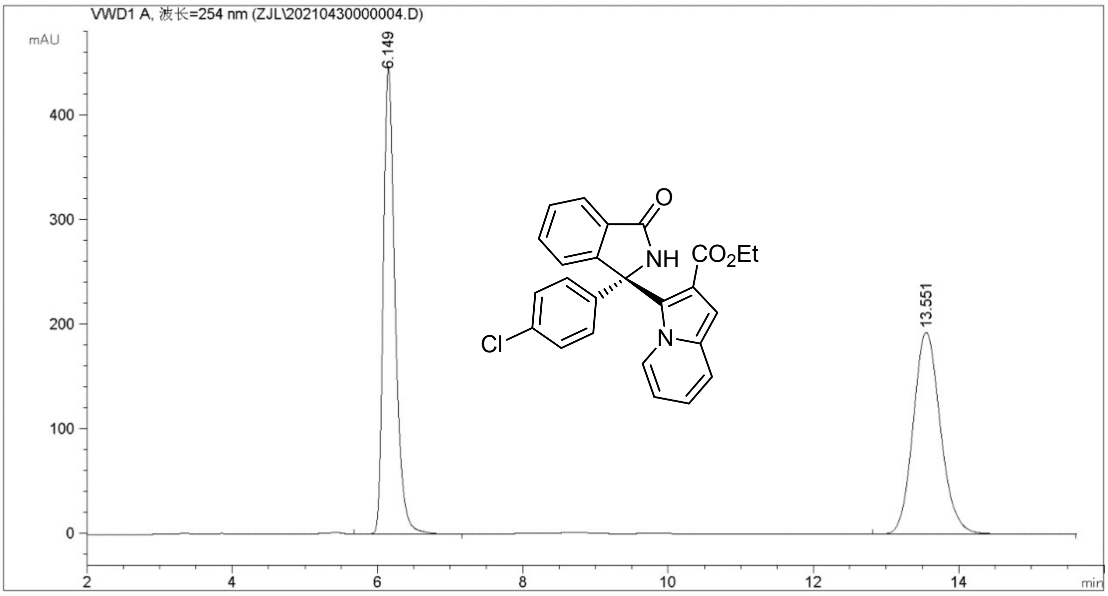
#	[min]		[min]	mAU *s	[mAU]	%
1	9.017	BB	0.2362	977.97791	63.58527	7.0860
2	15.741	BB	0.4307	1.28236e4	459.14005	92.9140



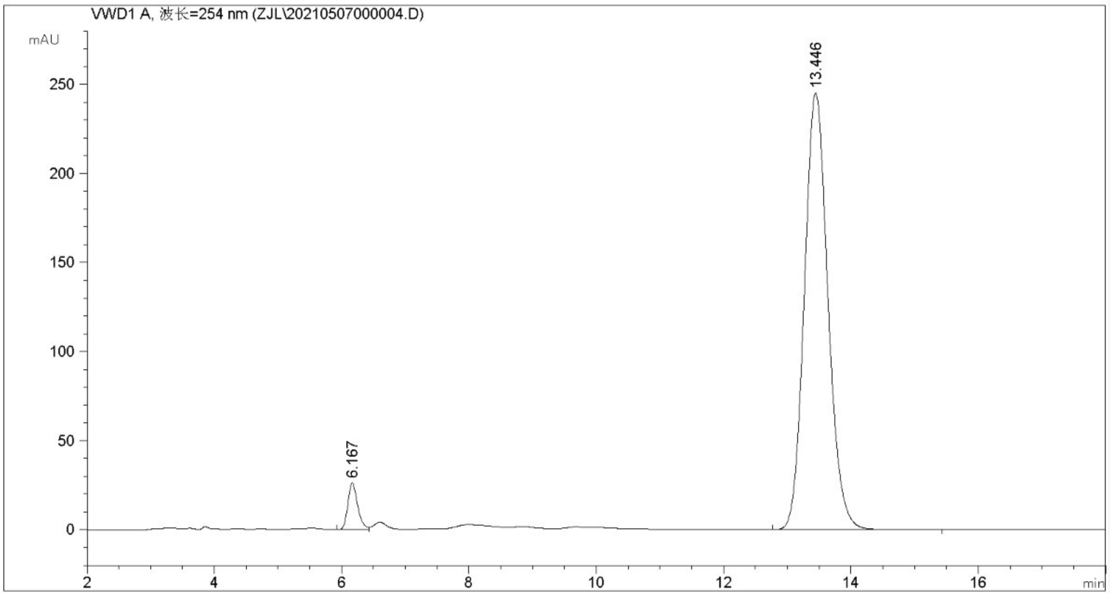
#	[min]		[min]	mAU *s	[mAU]	%
1	4.886	BB	0.1306	3056.93433	351.46359	49.9732
2	8.103	VB	0.2295	3060.21631	204.99005	50.0268



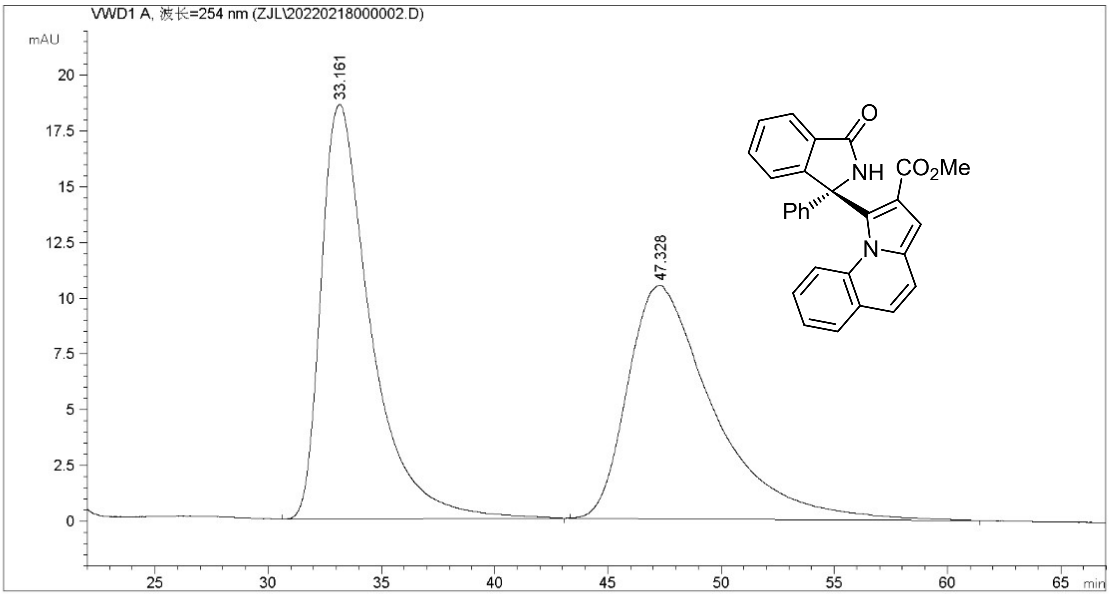
#	[min]		[min]	mAU *s	[mAU]	%
1	4.912	BV	0.1318	83.21060	9.58670	2.6059
2	8.130	BB	0.2266	3109.95288	210.05093	97.3941



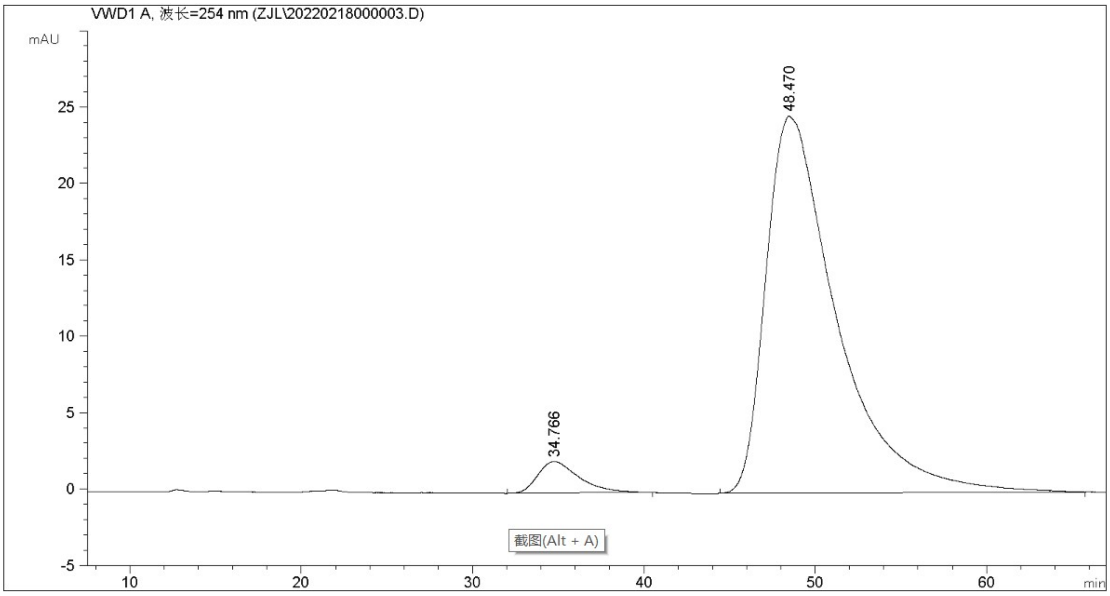
#	[min]		[min]	mAU *s	[mAU]	%
1	6.149	VB	0.1699	4986.59082	445.57922	49.7901
2	13.551	BBA	0.4033	5028.63525	192.83023	50.2099



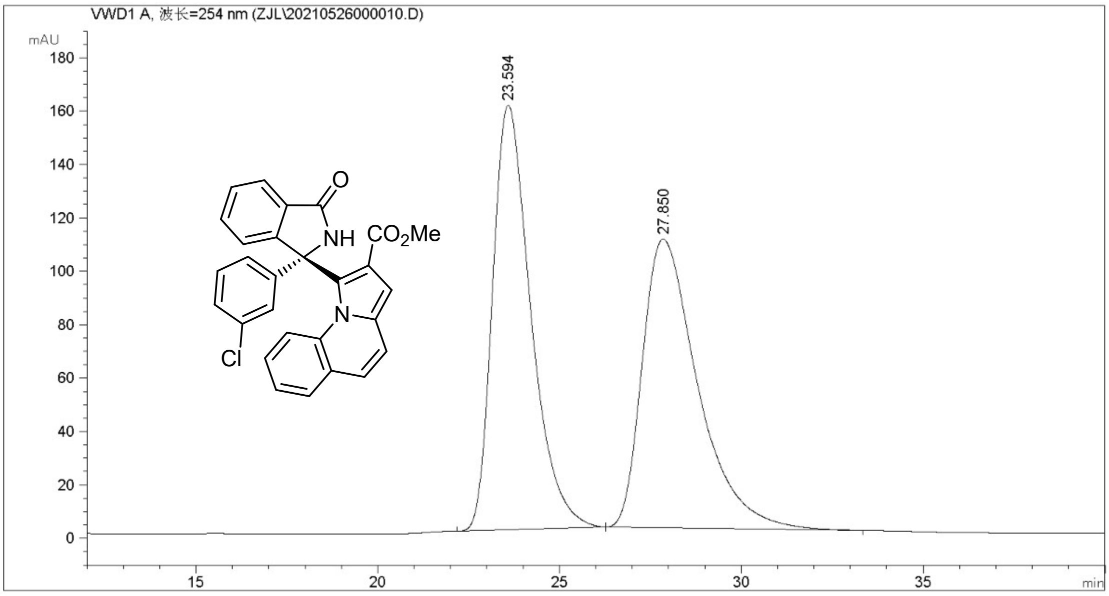
#	[min]		[min]	mAU *s	[mAU]	%
1	6.167	BV	0.1626	279.25687	26.12478	4.2521
2	13.446	BB	0.3968	6288.31006	245.14624	95.7479



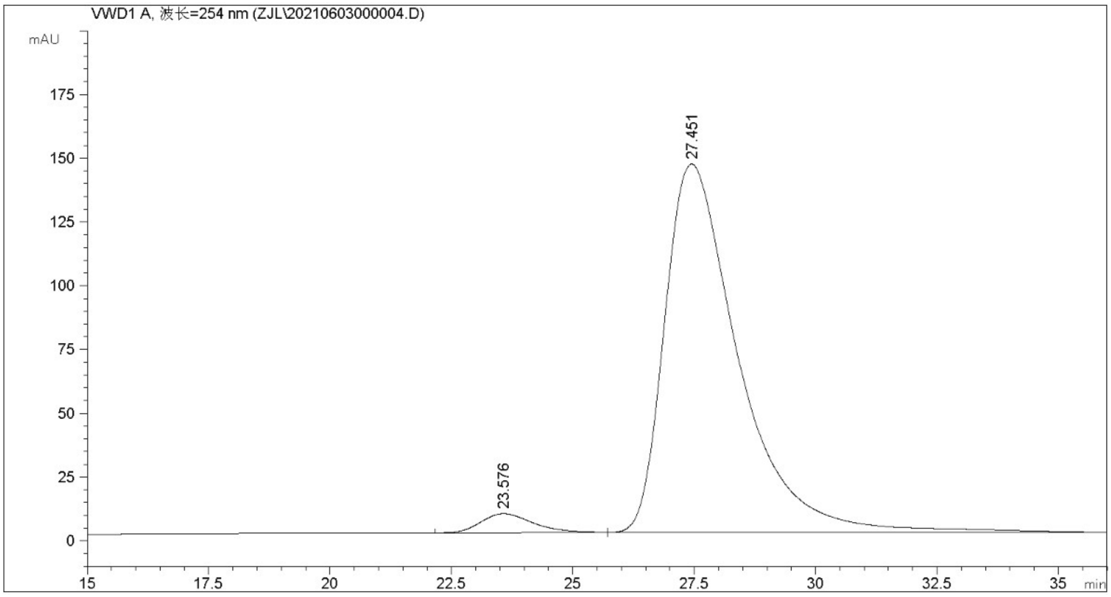
#	[min]		[min]	mAU *s	[mAU]	%
1	33.161	BB	2.1936	2830.71313	18.61337	50.5632
2	47.328	BB	3.1382	2767.65625	10.47377	49.4368



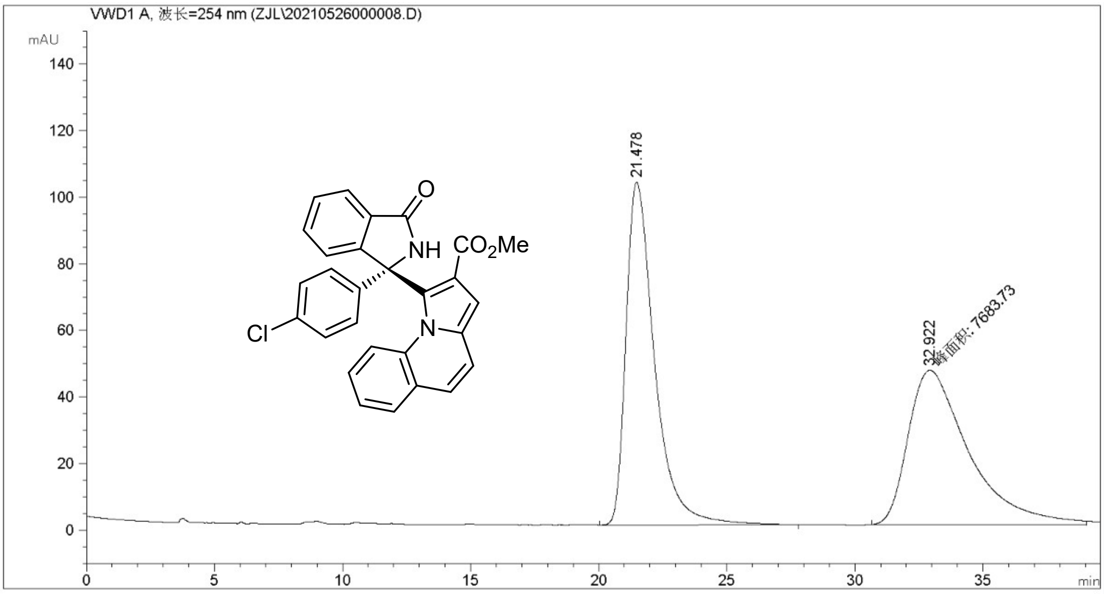
#	[min]		[min]	mAU *s	[mAU]	%
1	34.766	BB	1.9806	348.20053	2.06934	4.6804
2	48.470	BB	3.7377	7091.32373	24.67168	95.3196



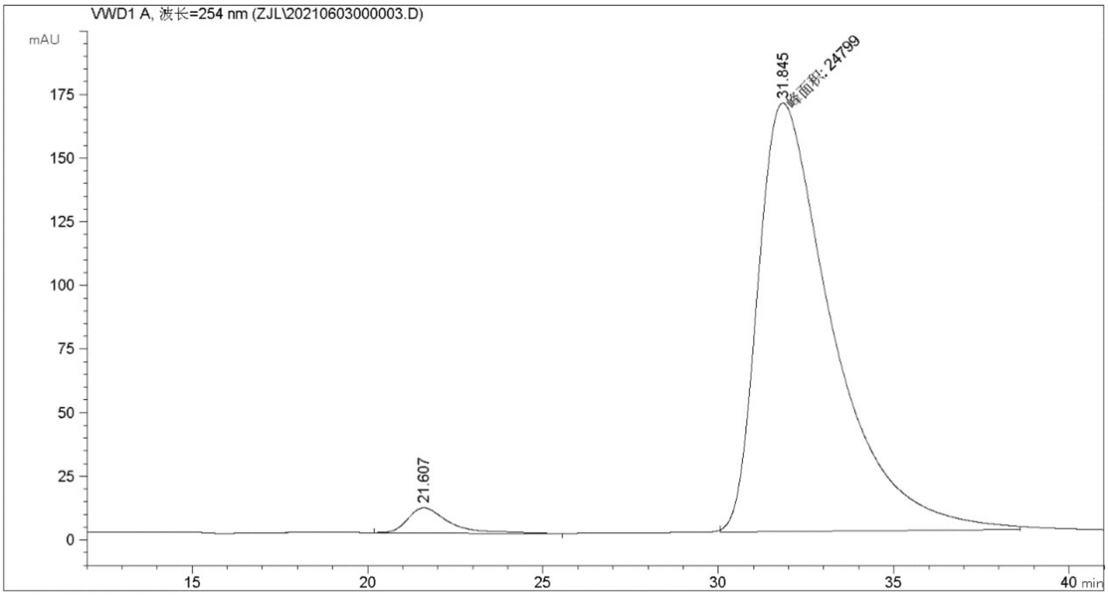
#	[min]		[min]	mAU *s	[mAU]	%
1	23.594	BB	1.1135	1.16263e4	159.04231	50.3877
2	27.850	BB	1.5763	1.14474e4	108.21740	49.6123



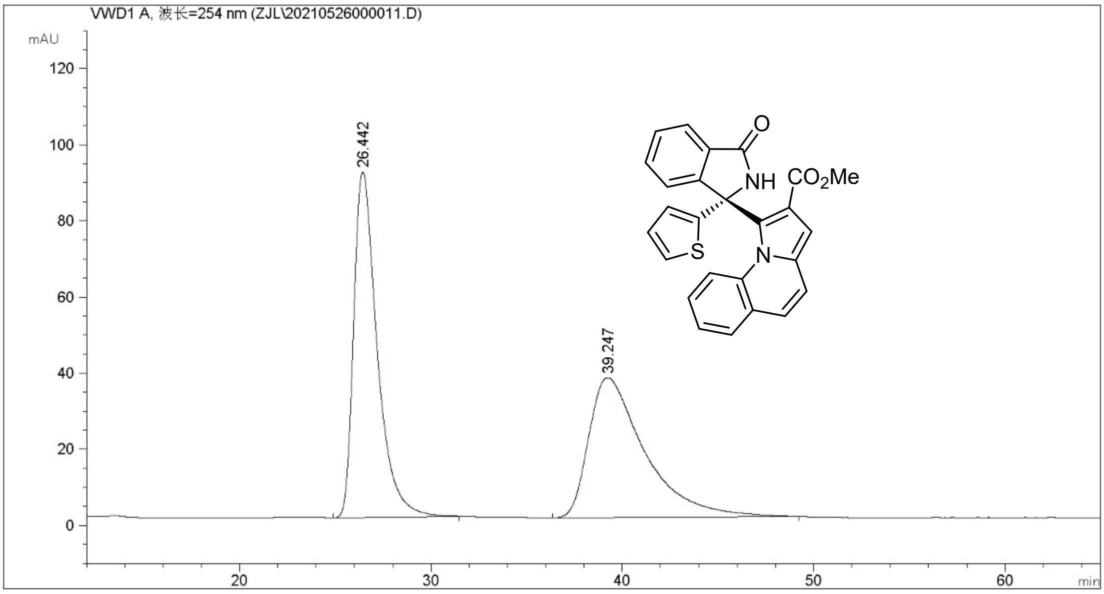
#	[min]		[min]	mAU *s	[mAU]	%
1	23.576	BB	1.0578	551.65576	7.43492	3.4718
2	27.451	BBA	1.5650	1.53379e4	144.43932	96.5282



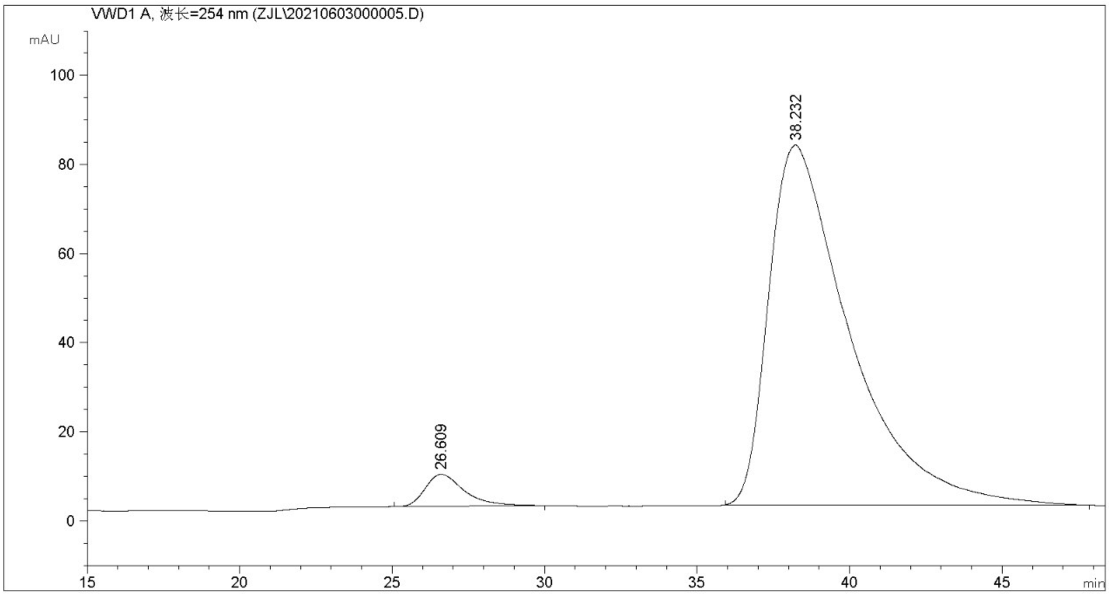
#	[min]		[min]	mAU *s	[mAU]	%
1	21.478	BB	1.1635	7991.38428	103.09573	50.9813
2	32.922	MM	2.7541	7683.73486	46.49799	49.0187



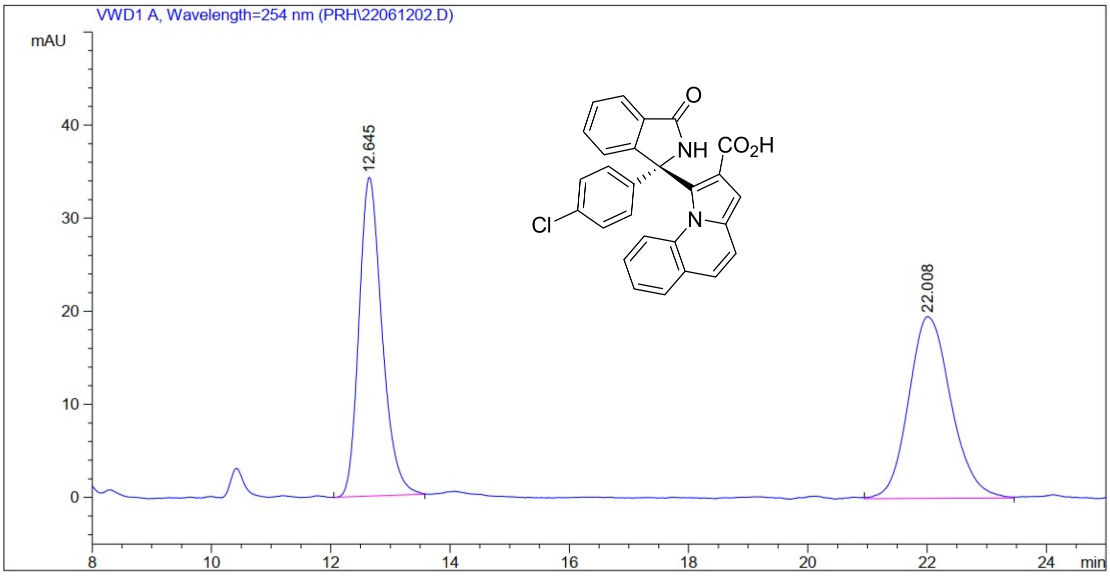
#	[min]		[min]	mAU *s	[mAU]	%
1	21.607	BB	1.1491	790.69824	9.81941	3.0899
2	31.845	MM	2.4562	2.47990e4	168.27695	96.9101



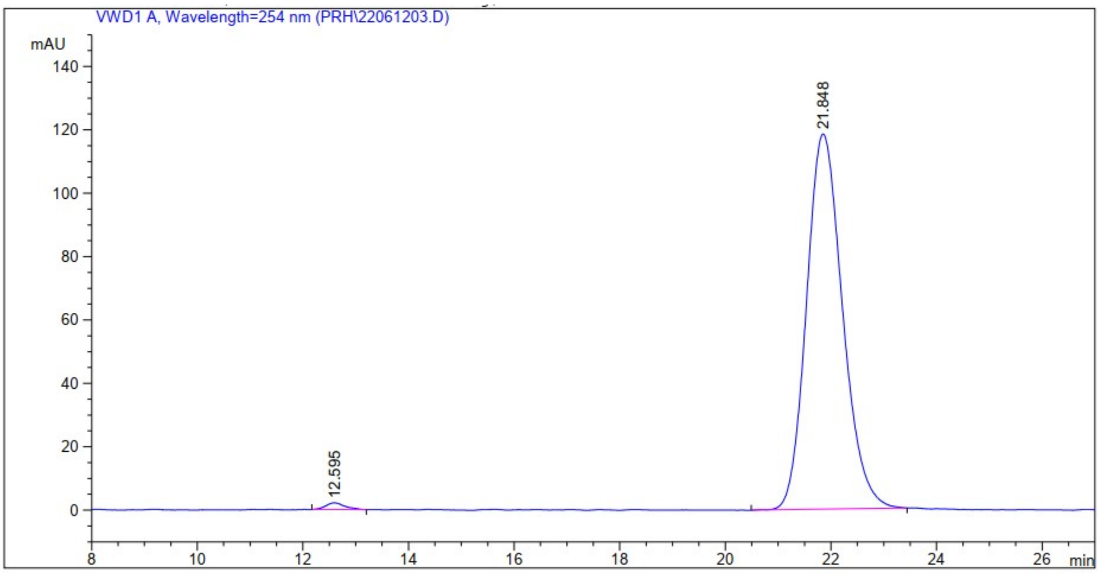
#	[min]		[min]	mAU *s	[mAU]	%
1	26.442	BB	1.2877	7738.06934	90.72737	50.8038
2	39.247	BB	2.3954	7493.19922	36.71794	49.1962



#	[min]		[min]	mAU *s	[mAU]	%
1	26.609	BB	1.1658	640.45844	7.18032	4.1116
2	38.232	BB	2.3671	1.49362e4	80.76825	95.8884



#	[min]		[min]	mAU *s	[mAU]	%
1	12.645	VB	0.4157	921.29767	34.26003	48.7227
2	22.008	VB	0.7258	969.60193	19.54516	51.2773



#	[min]		[min]	mAU *s	[mAU]	%
1	12.595	BP	0.3523	53.79910	2.14515	0.9493
2	21.848	PB	0.7350	5613.18701	118.42151	99.0507