Electronic Supplementary Material (ESI) for Organic Chemistry Frontiers.

Supporting Information

Isatin-based spiro indolenine alkaloids from *Isatis indigotica* Fortune with anti-neuroinflammatory and acetylcholinesterase inhibitor effects

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[1] *The two authors contributed equally to this work*

Content

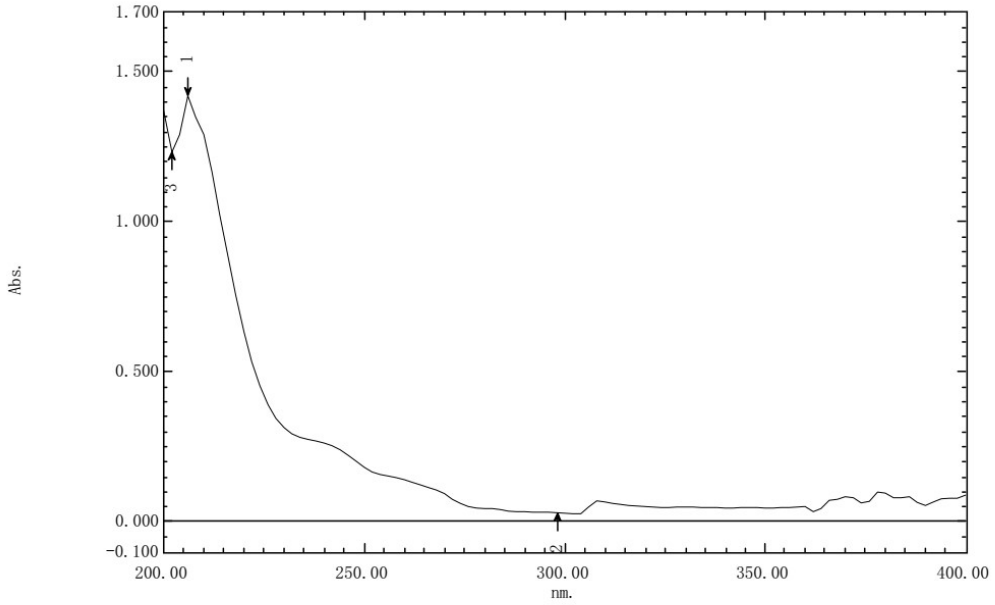
Fig. S27. NOESY spectrum (600 MHz, DMSO-d_6) of compound **3**.

Fig. S28. Experimental ECD spectra of **3**.

Table S1. ^{1}H (400 MHz) and ^{13}C NMR (100 MHz) spectroscopic data of **1-3** in DMSO-d_6.

Position	**1**		**2**		**3**	
	δ_H (multi, *J* in Hz)	δ_C	δ_H (multi, *J* in Hz)	δ_C	δ_H (multi, *J* in Hz)	δ_C
1	10.28, s	–	7.74, s	–	10.95, s	–
2	–	173.1	–	90.1	–	124.6
3	–	83.6	–	193.3	–	134.0
3a	–	128.1	–	121.4	–	120.3
4	7.97, d (7.7)	128.6	7.61, d (8.0)	124.4	7.69, d (7.6)	117.8
5	7.00, t (7.7)	121.2	7.29, t (8.0)	124.9	6.97, t (7.6)	118.6
6	7.18, t (7.7)	129.4	7.80, t (8.0)	137.7	7.07, t (7.6)	121.7
7	6.58, d (7.7)	109.5	8.37, d (8.0)	116.4	7.27, d (7.6)	111.4
7a	–	142.1	–	150.7	–	133.0
8	–	–	–	167.7	–	–
9	–	–	–	83.7	–	–
10	–	–	4.99, s	85.6	–	–
11	–	–	4.23, d (4.4)	78.9	–	–
12	–	–	3.82, t (6.6)	89.4	–	–
13	–	–	3.42, overlapped	62.1	–	–
1'	3.47, d (12.2)	49.2	7.02, s	–	4.51, d (7.1)	108.2
2'	3.44, overlapped	48.8	–	68.1	4.58, overlapped	70.5
3'	2.79, m	66.4	–	196.6	–	172.1
3'a	–	–	–	123.2	–	–
4'	1.91, m; 1.68, m	24.4	7.51, d (7.6)	123.3	5.01, d (8.2)	76.5
5'	1.79, m	17.5	6.83, overlapped	119.0	3.20, m	78.3

6'	3.10, dd (6.8, 8.2); 2.58, m	52.1	7.39, t (7.6)	136.6	3.71, m; 3.62, m	61.0
7'	–	171.6	6.83, overlapped	112.9	6.06, s	112.4
7'a	–	–	–	160.4	–	–
8'	–	–	–	–	–	172.1
1"	–	124.6	–	–	4.59, overlapped	63.3
2",6"	6.00, s	106.7	–	–	–	–
3",5"	–	147.0	–	–	–	–
4"	–	134.5	–	–	–	–
9-OH	–	–	6.57 (1H, s)	–	–	–
11-OH	–	–	7.07, d (4.6)	–	–	–
13-OH	–	–	4.83, t (4.8)	–	–	–
2'-OH	–	–	–	–	6.76, d (5.9)	–
6'-OH	–	–	–	–	5.06, t (5.5)	–
7'-OCH_3	3.46, s	51.7	–	–	–	–
1"-OCH_3	–	–	–	–	3.28, s	57.2
3",5"-OCH_3	3.43, s	55.7	–	–	–	–
4"-OH	8.17, s	–	–	–	–	–



测定属性
波长范围（nm.）：　200.00到400.00
扫描速度：　高速
采样间隔：　2.0
自动采样间隔：停用
扫描模式：　单一的

No.	P/V	Wavelength	Abs.	描述
1	↑	206.00	1.420	
2	↓	298.00	.031	
3	↓	202.00	1.232	

Fig. S1 UV spectrum of compound **1**.

Mass Spectrum SmartFormula Report

Analysis Info

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Method	20200916ceyang.m	Operator	Bruker Customer
Sample Name	DQY-110	Instrument / Ser#	micrOTOF-Q 125
Comment			

Acquisition Parameter

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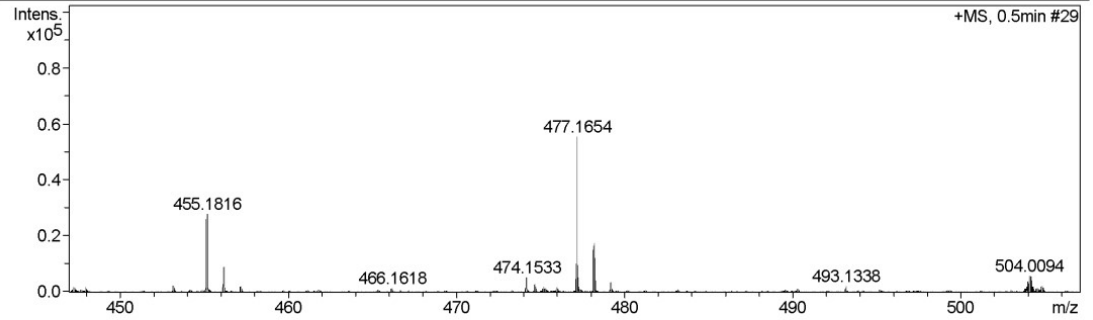
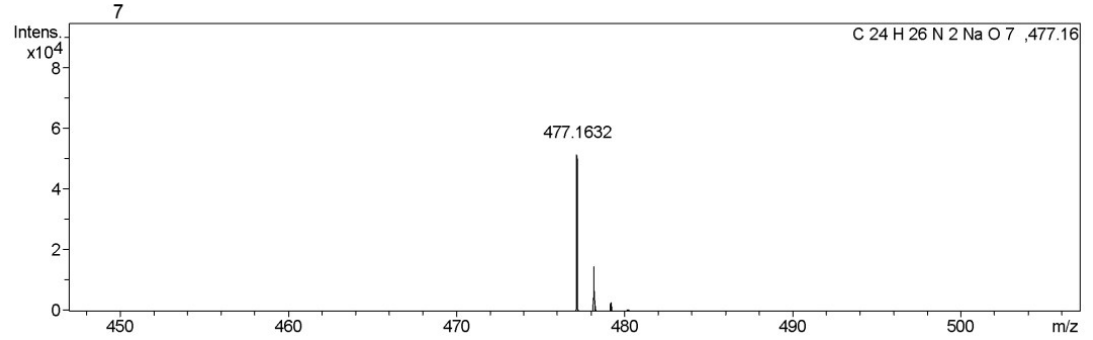
Scan End	1500 m/z	Set Collision Cell RF	400.0 Vpp	Set Divert Valve	Source



Meas. m/z	#	Formula	m/z	err [ppm]	Mean err [ppm]	rdb	N-Rule	e⁻ Conf	mSigma	Std I	Std Mean m/z	Std I VarNorm	Std m/z Diff	Std Comb Dev
477.1654														
	1	C 24 H 26 N 2 Na O 7	477.1632	-4.5	-0.9	12.5	ok	even	24.99	0.0450	0.0028	0.0142	0.0059	0.8427



Meas. m/z	#	Formula	m/z	err [ppm]	Mean err [ppm]	rdb	N-Rule	e⁻ Conf	mSigma	Std I	Std Mean m/z	Std I VarNorm	Std m/z Diff	Std Comb Dev

Fig. S2 HRESIMS spectrum of compound **1**.

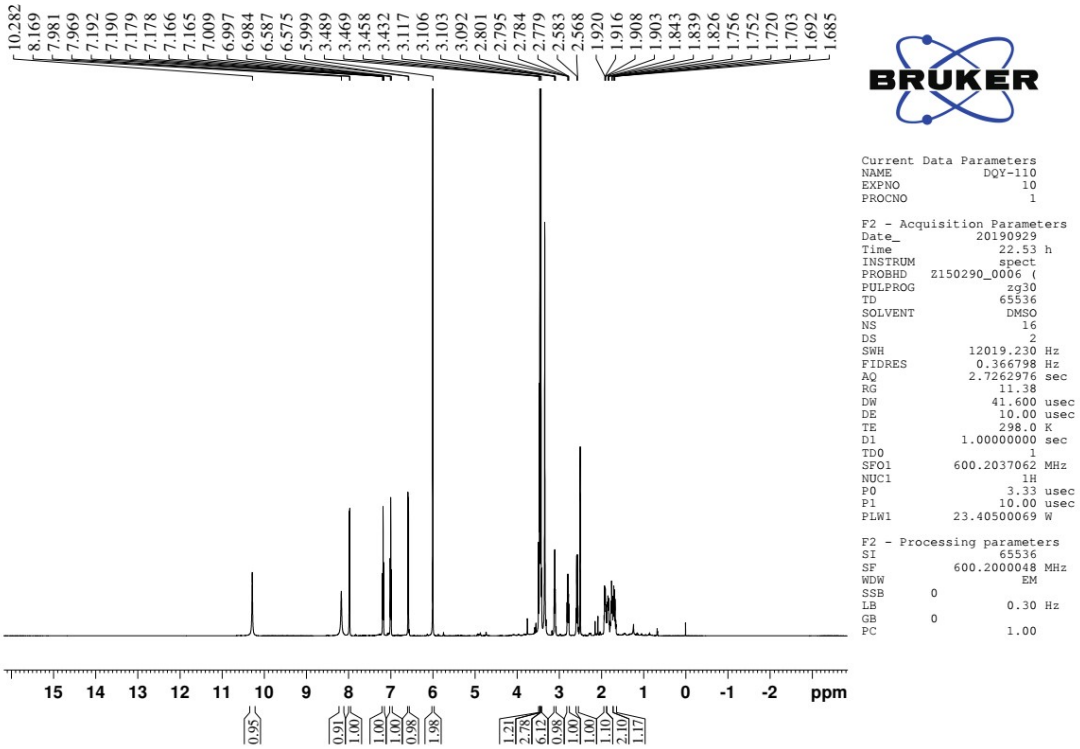


Fig. S3 ^{1}H NMR spectrum (400 MHz, DMSO-d_6) of compound **1**.

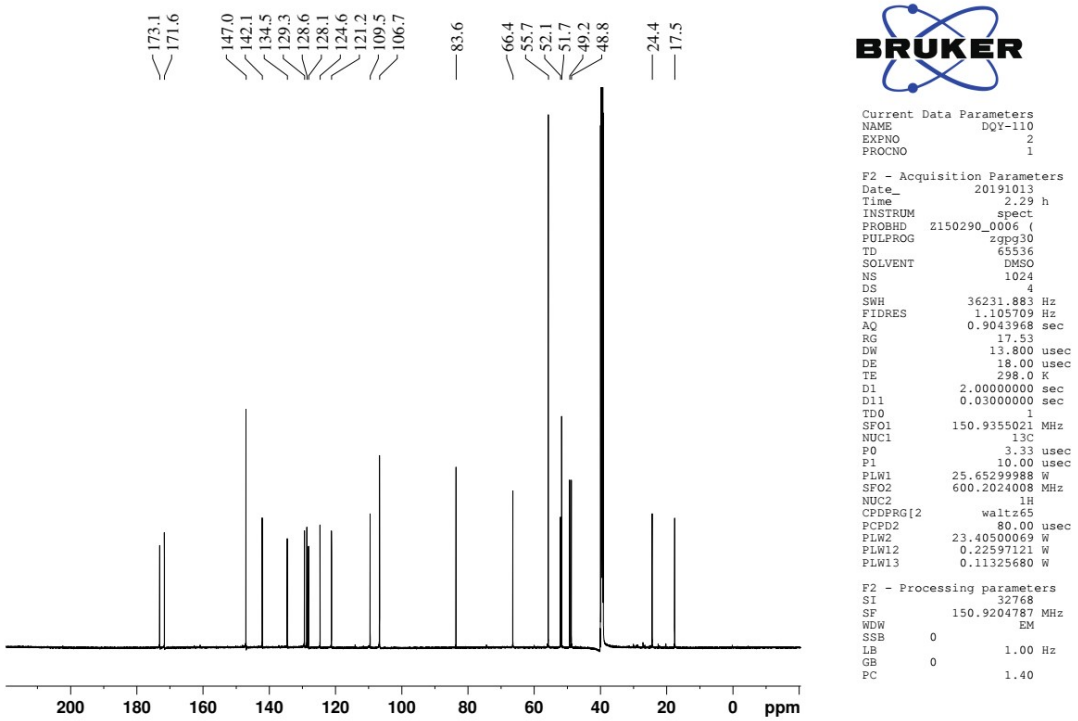


Fig. S4 ^{13}C NMR spectrum (100 MHz, DMSO-d_6) of compound **1**.

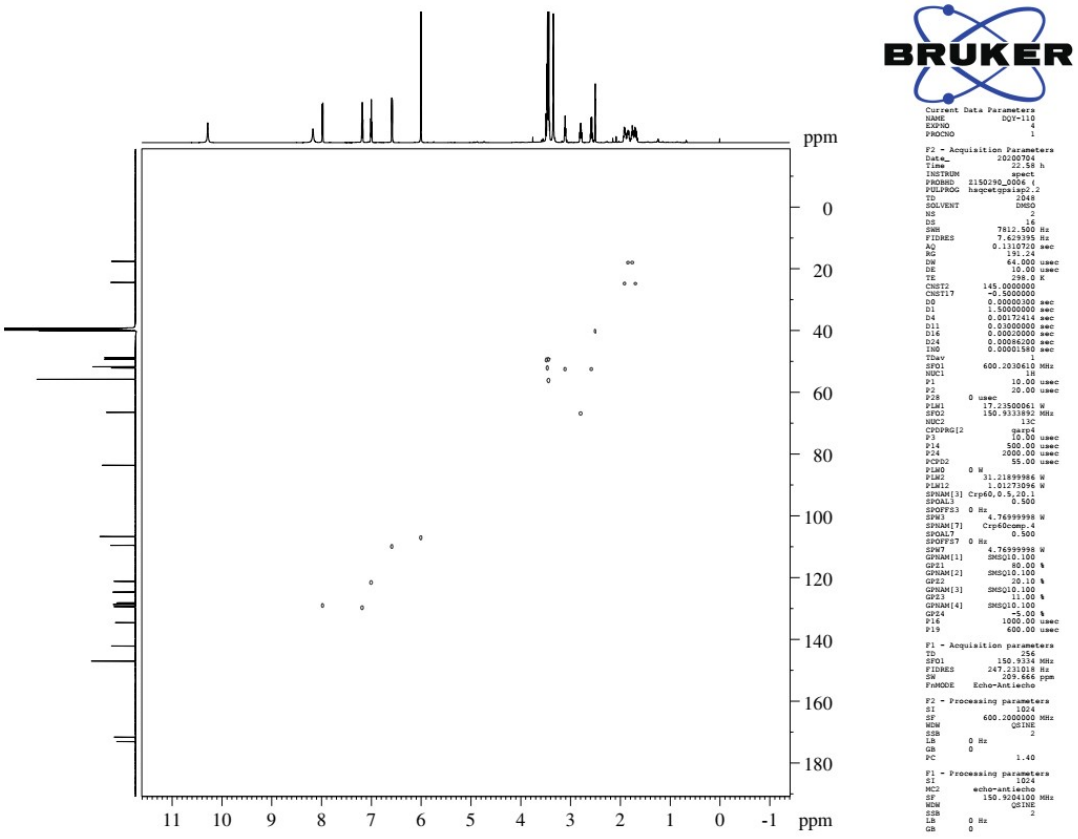


Fig. S5. HSQC spectrum (600 MHz, DMSO-d_6) of compound **1**.

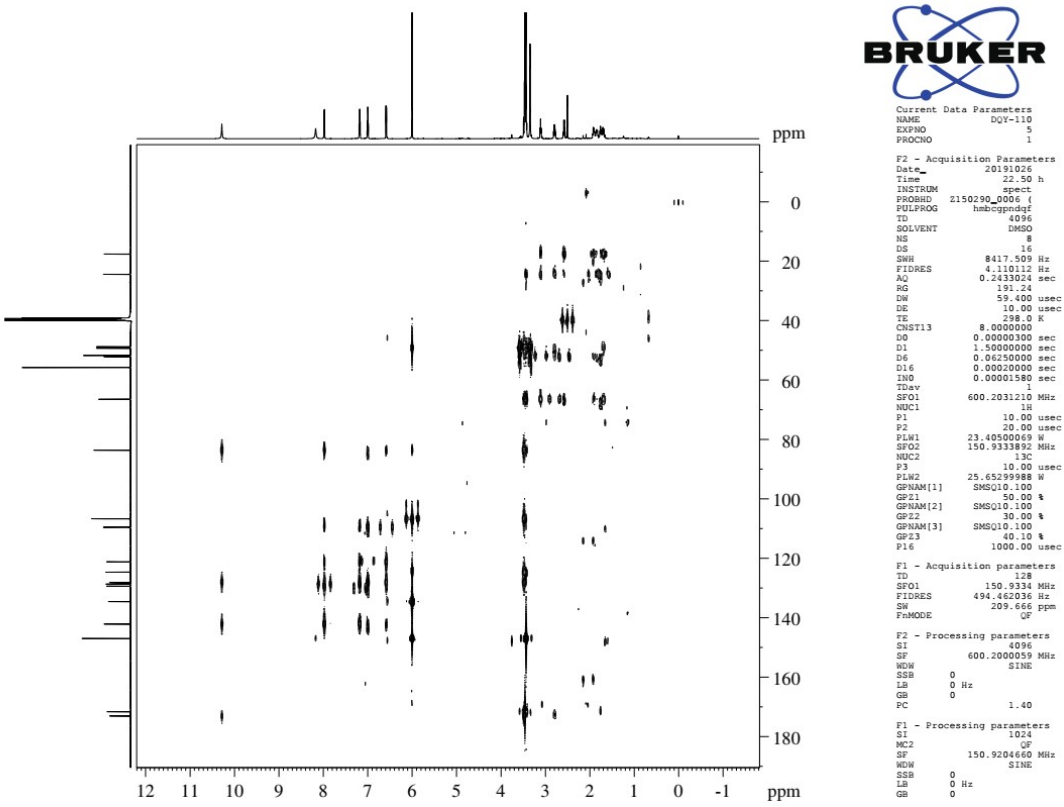


Fig. S6. HMBC spectrum (600 MHz, DMSO-d_6) of compound **1**.

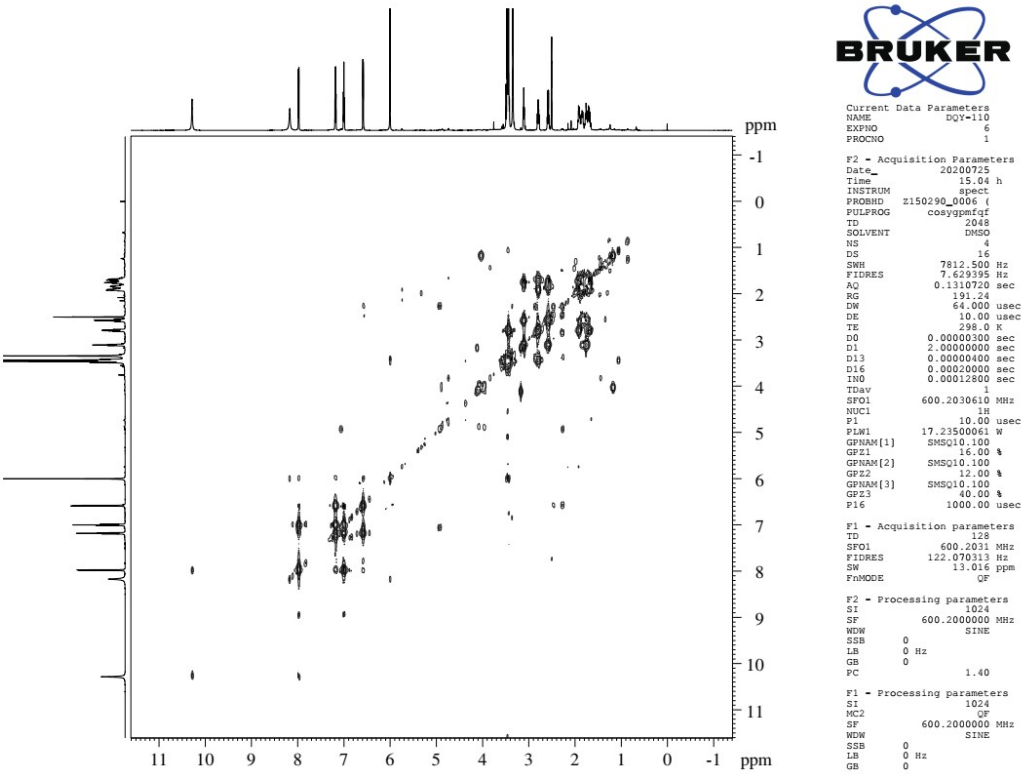


Fig. S7. ^{1}H-^{1}H COSY spectrum (600 MHz, DMSO-d_6) of compound **1**.

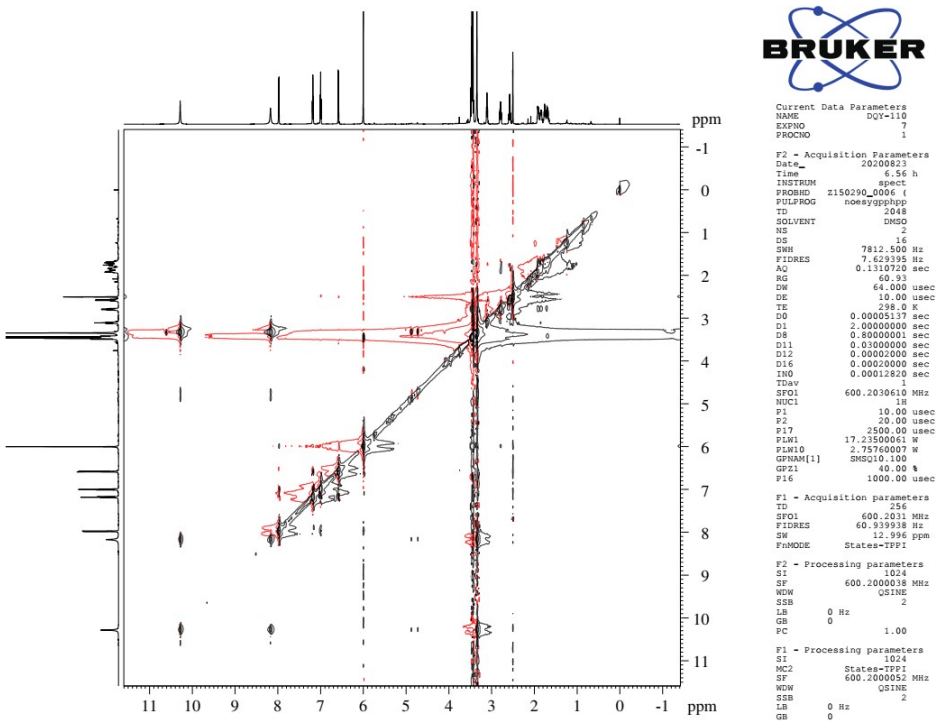


Fig. S8. NOESY spectrum (600 MHz, DMSO-d_6) of compound **1**.

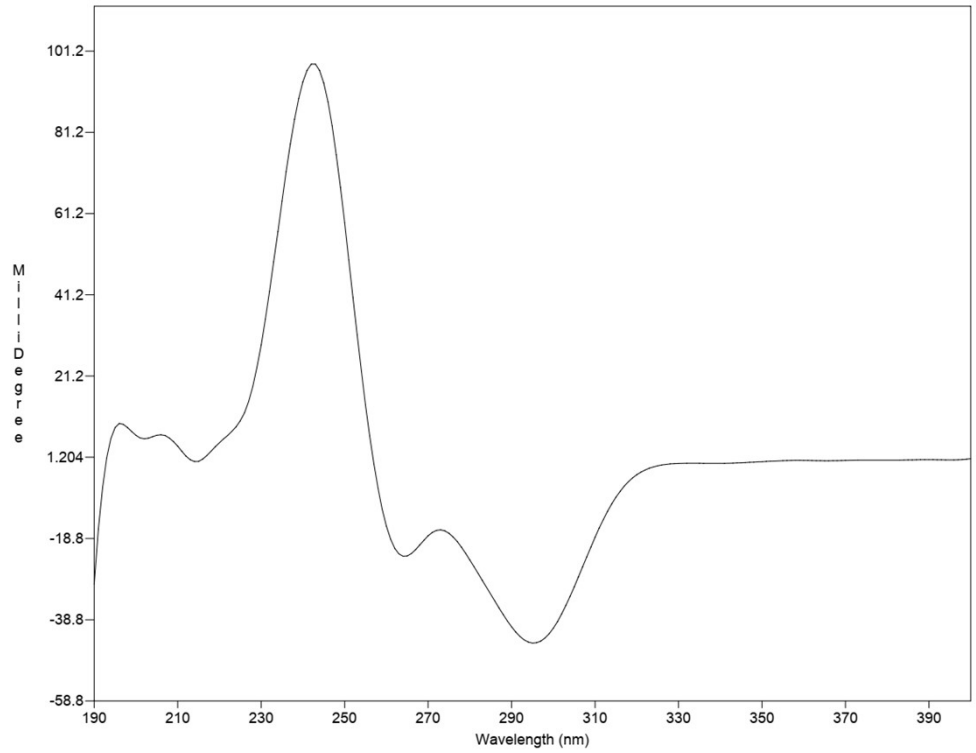


Fig. S9. Experimental ECD spectra of **1a**.

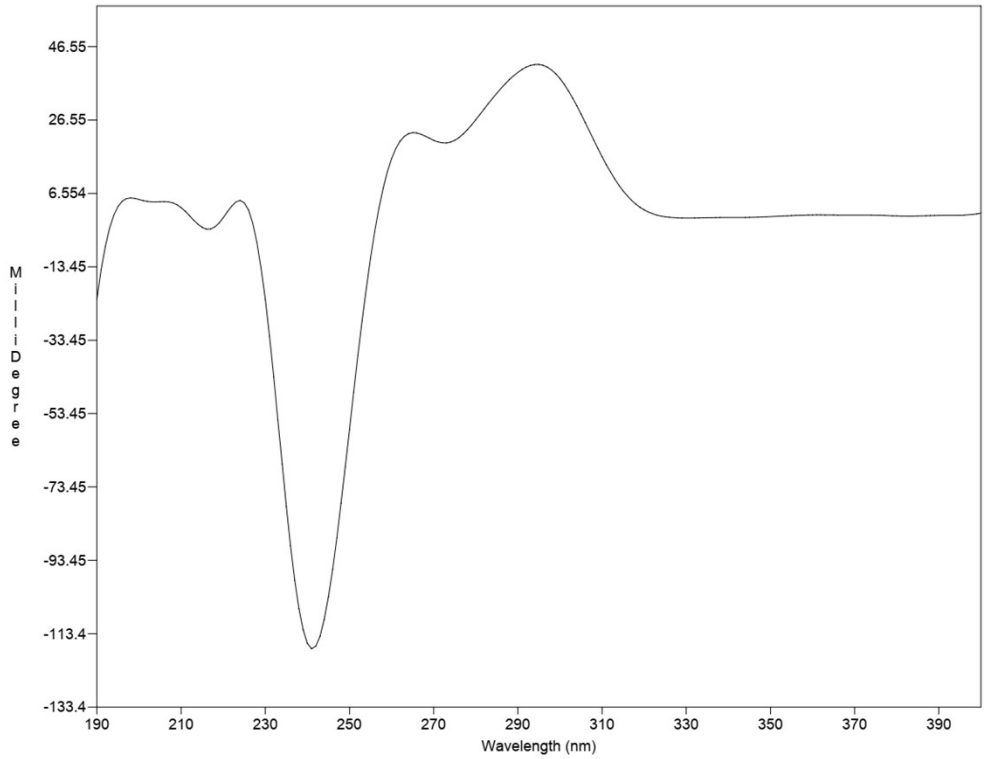


Fig. S10. Experimental ECD spectra of **1b**.

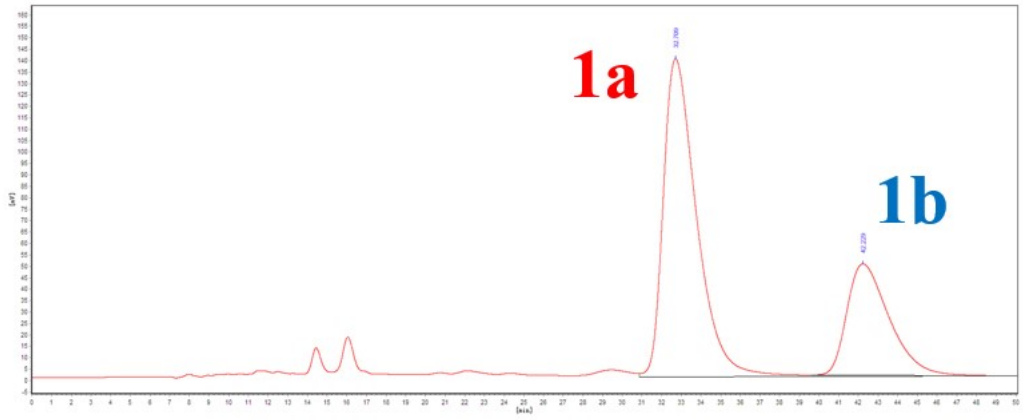
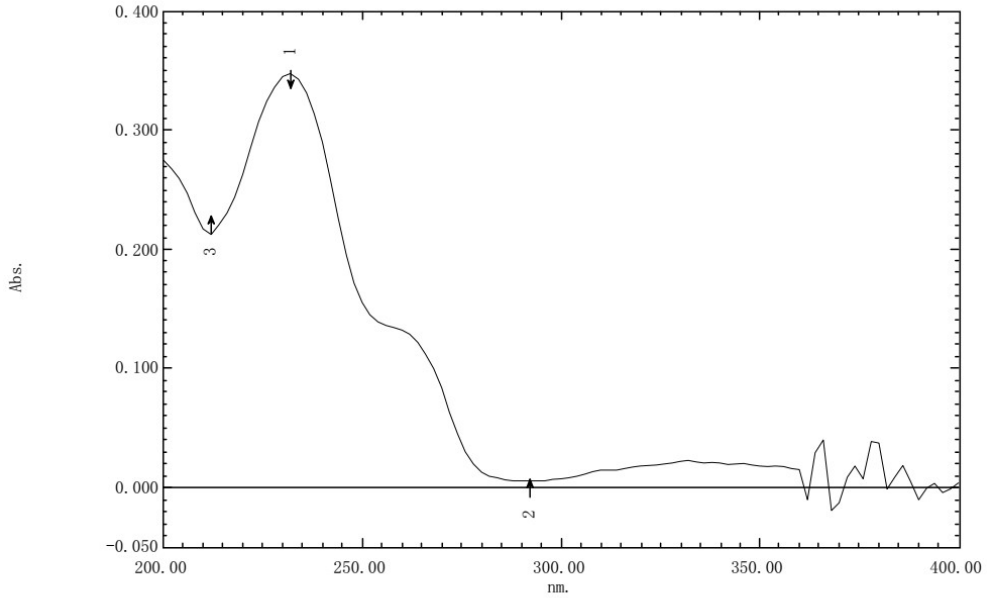


Fig. S11. The chiral HPLC chromatogram of compounds **1a** and **1b**.



测定属性
波长范围（nm.）: 200.00到400.00
扫描速度: 高速
采样间隔: 2.0
自动采样间隔: 停用
扫描模式: 单一的

No.	P/V	Wavelength	Abs.	描述
1	↑	232.00	.335	
2	↓	292.00	.006	
3	↓	212.00	.228	

Fig. S12 UV spectrum of compound **2**.

Mass Spectrum SmartFormula Report

Analysis Info

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Method	20131026_ceyang.m	Operator	Bruker Customer
Sample Name	C2-8-6	Instrument / Ser#	micrOTOF-Q 125
Comment			

Acquisition Parameter

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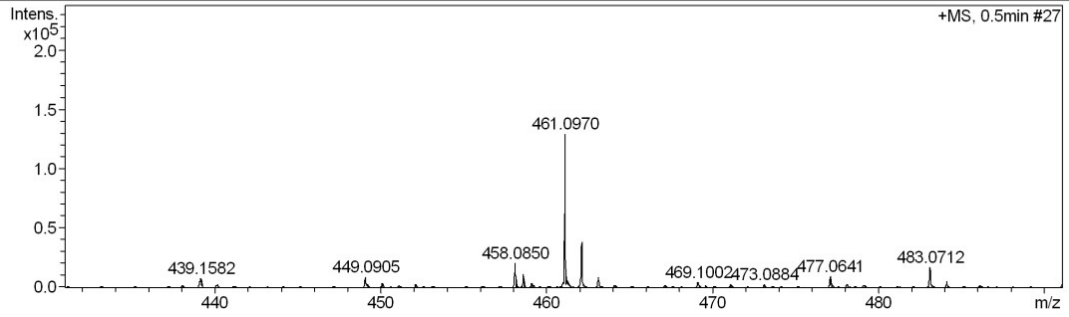
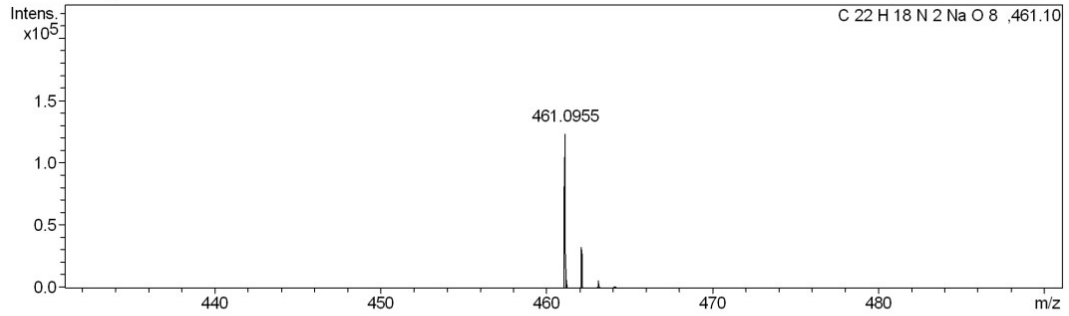
Focus	Active	Set Capillary	4500 V	Set Dry Heater	180 °C
Scan Begin	50 m/z	Set End Plate Offset	-500 V	Set Dry Gas	8.0 l/min
Scan End	1500 m/z	Set Collision Cell RF	400.0 Vpp	Set Divert Valve	Source



Meas. m/z	#	Formula	m/z	err [ppm]	Mean err [ppm]	rdb	N-Rule	e⁻ Conf	mSigma	Std I	Std Mean m/z	Std I VarNorm	Std m/z Diff	Std Comb Dev
461.0970	1	C 22 H 18 N 2 Na O 8	461.0955	-3.2	0.6	14.5	ok	even	30.06	0.0584	0.0029	0.0189	0.0062	0.8427



Meas. m/z	#	Formula	m/z	err [ppm]	Mean err [ppm]	rdb	N-Rule	e⁻ Conf	mSigma	Std I	Std Mean m/z	Std I VarNorm	Std m/z Diff	Std Comb Dev

Fig. S13 HRESIMS spectrum of compound **2**.

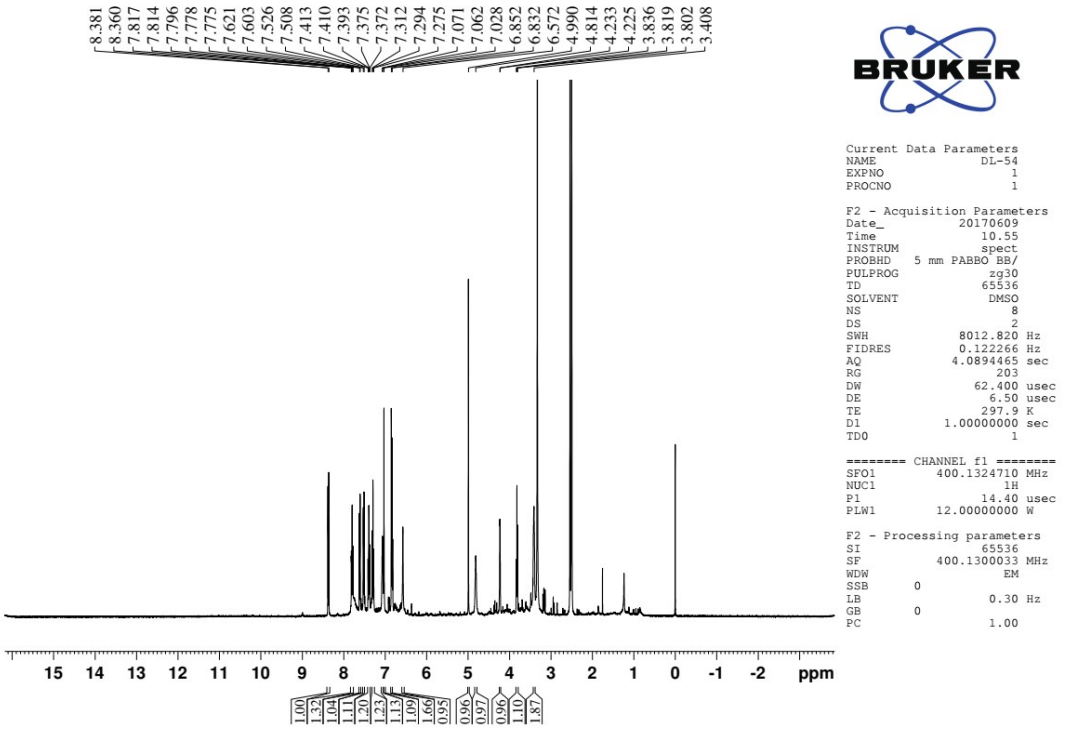


Fig. S14 ^{1}H NMR spectrum (400 MHz, DMSO-d_6) of compound **2**.

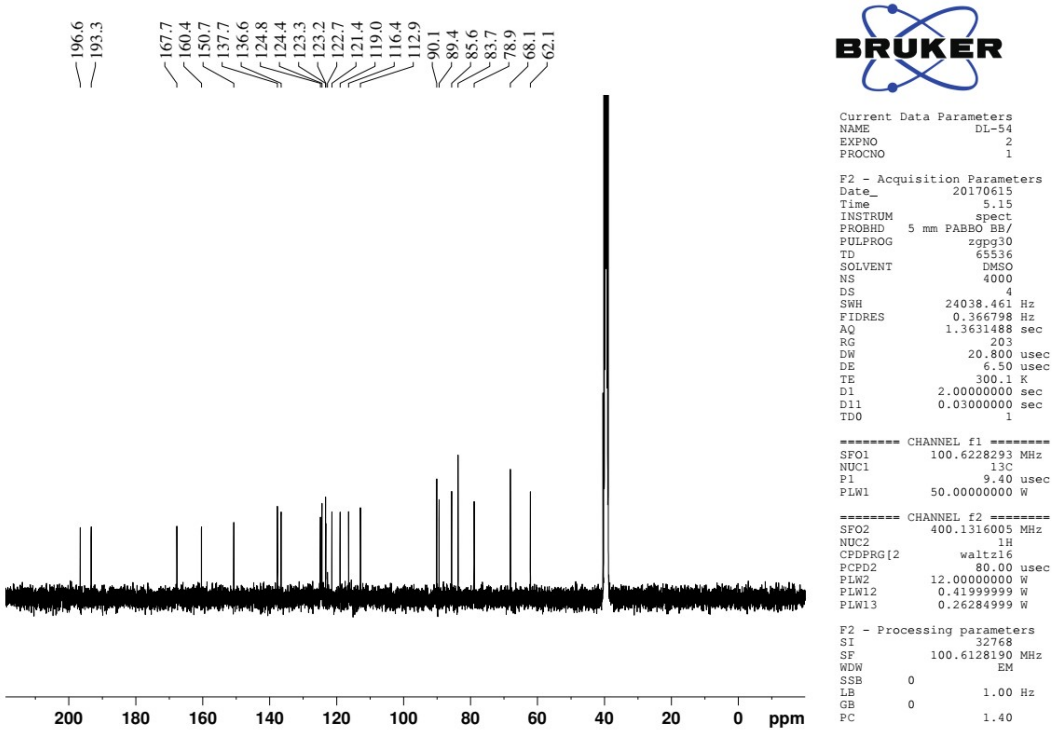


Fig. S15 ^{13}C NMR spectrum (100 MHz, DMSO-d_6) of compound **2**.

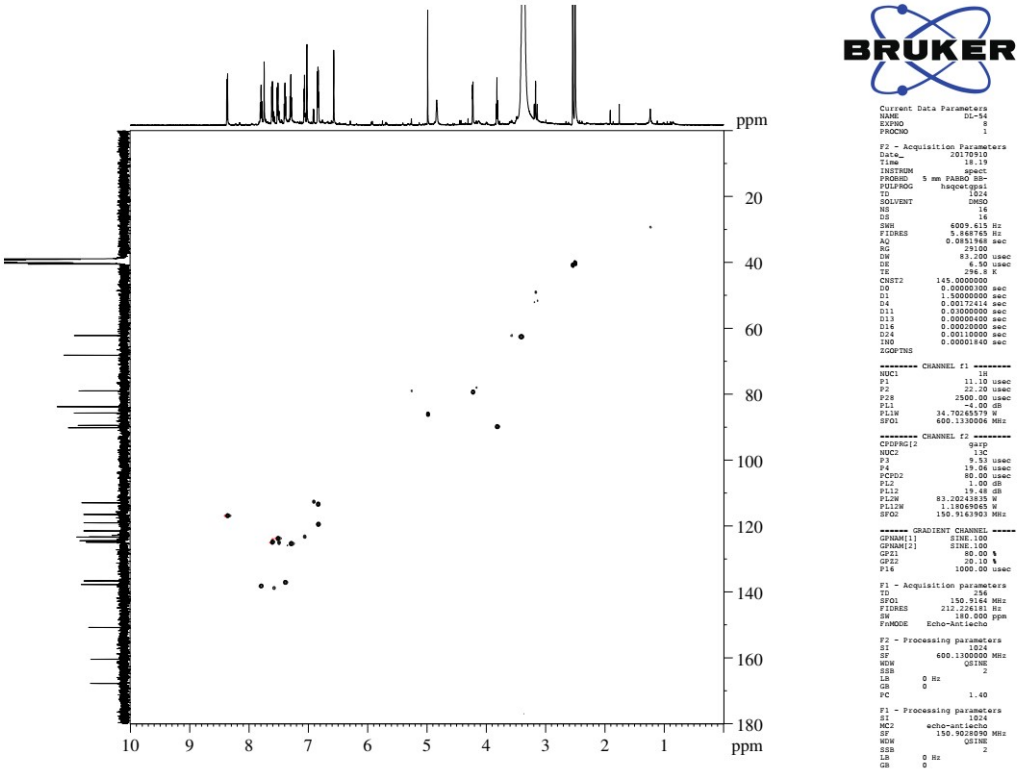


Fig. S16. HSQC spectrum (600 MHz, DMSO-d_6) of compound **2**.

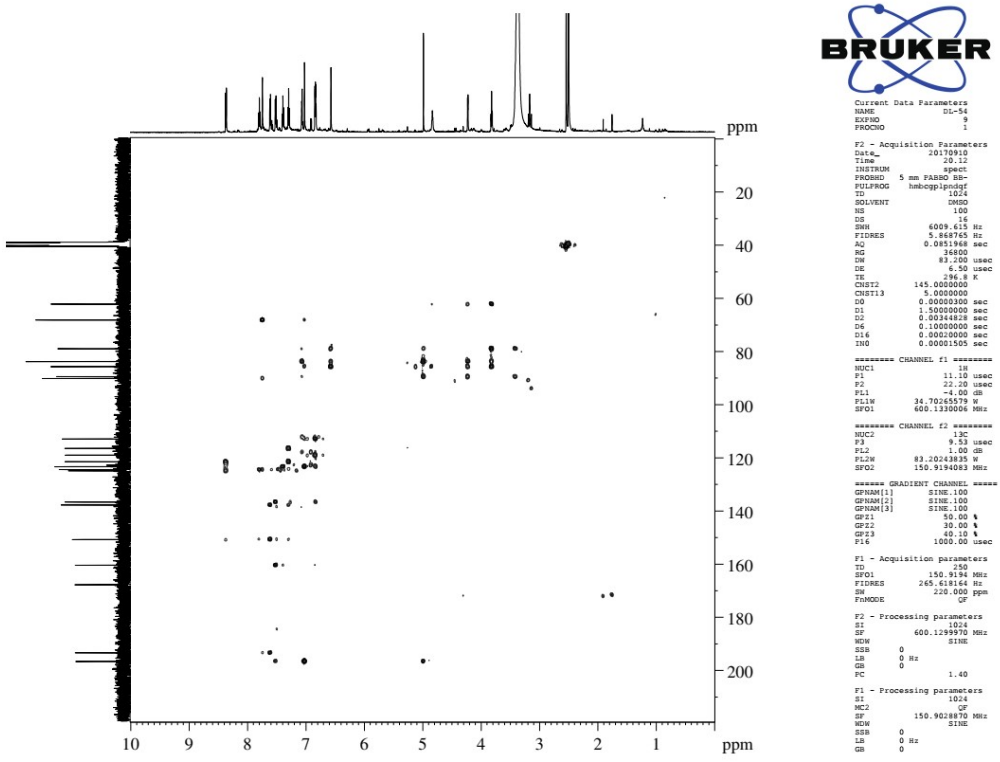


Fig. S17. HMBC spectrum (600 MHz, DMSO-d_6) of compound **2**.

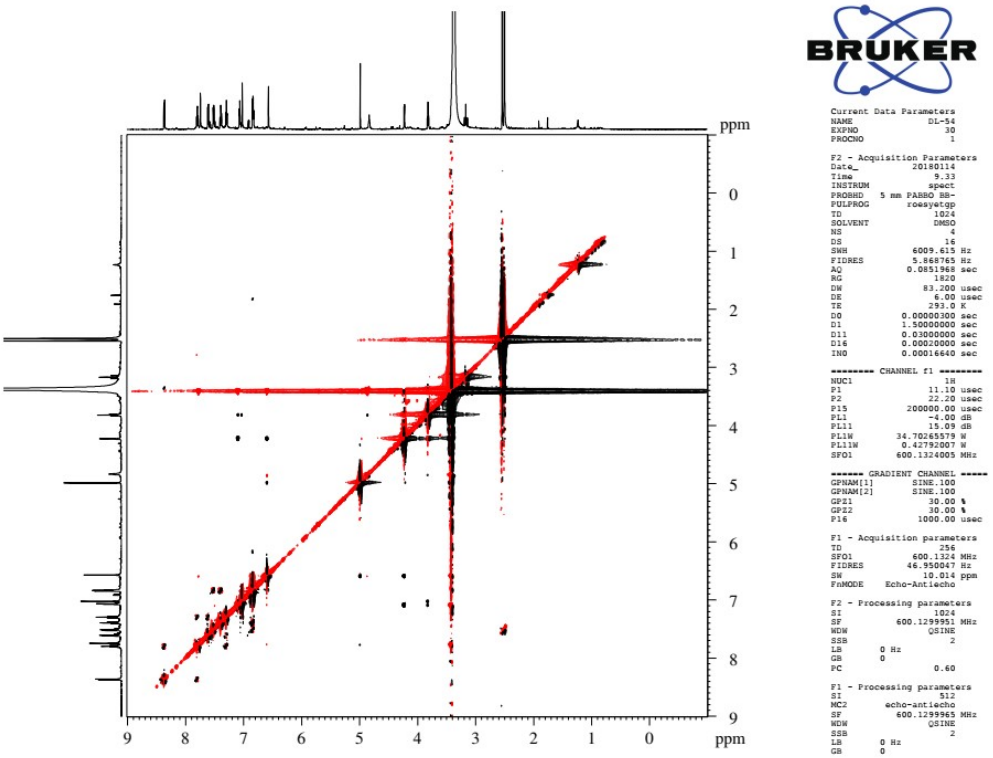


Fig. S18. ROESY spectrum (600 MHz, DMSO-d_6) of compound **2**.

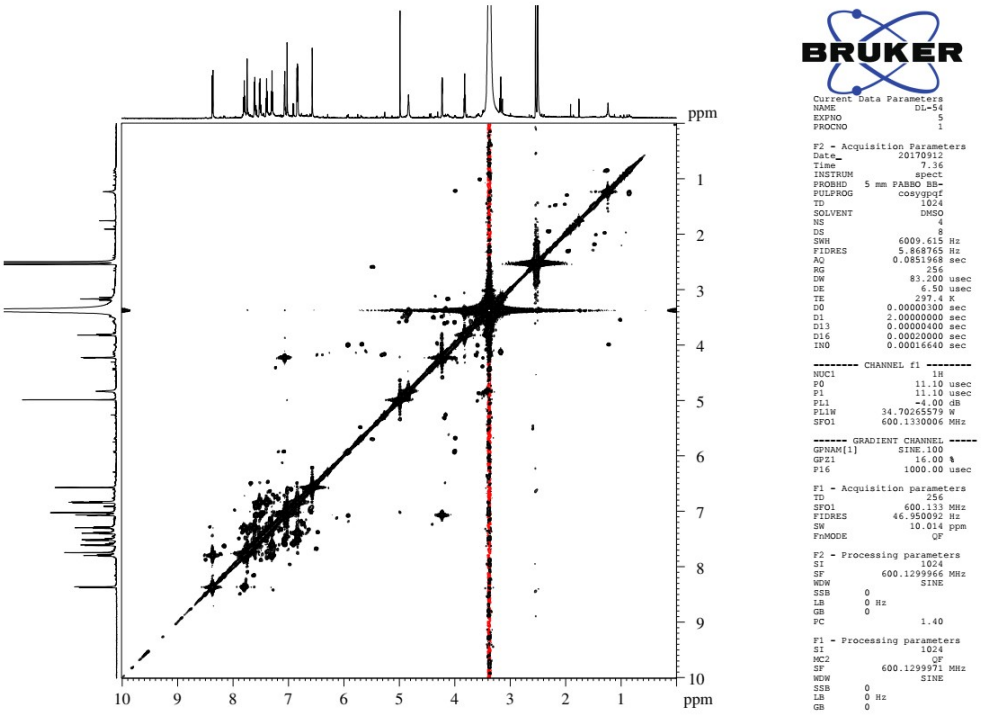


Fig. S19. ^{1}H-^{1}H COSY spectrum (600 MHz, DMSO-d_6) of compound **2**.

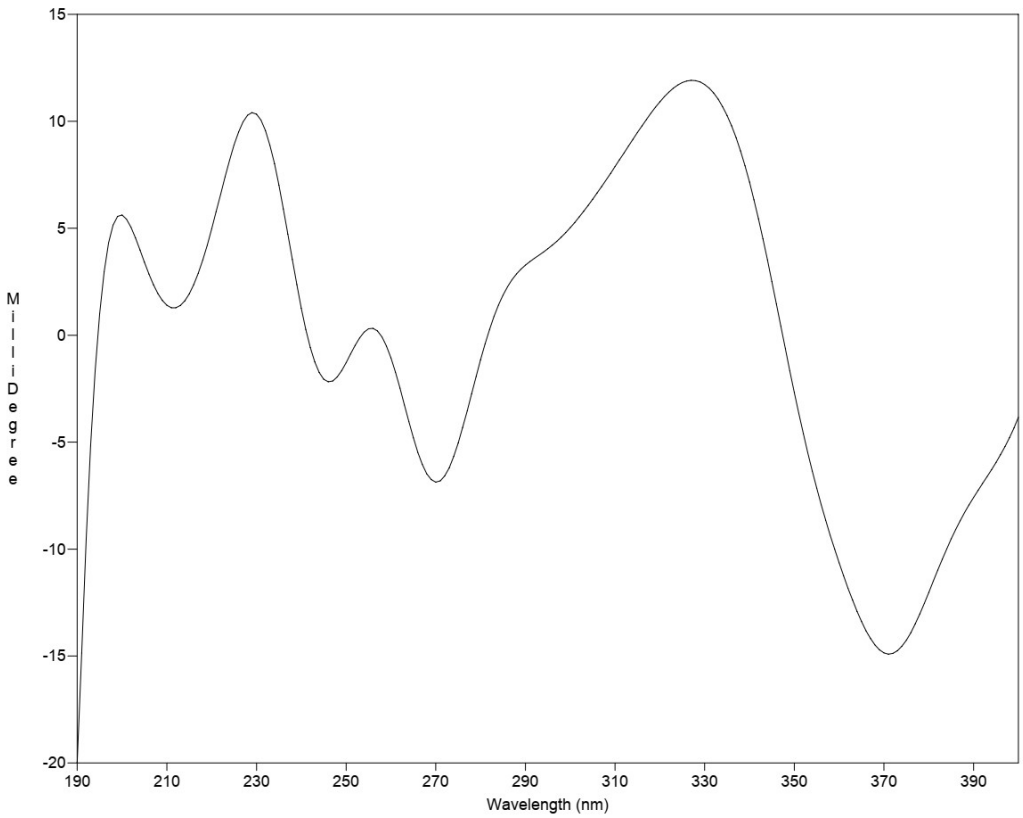
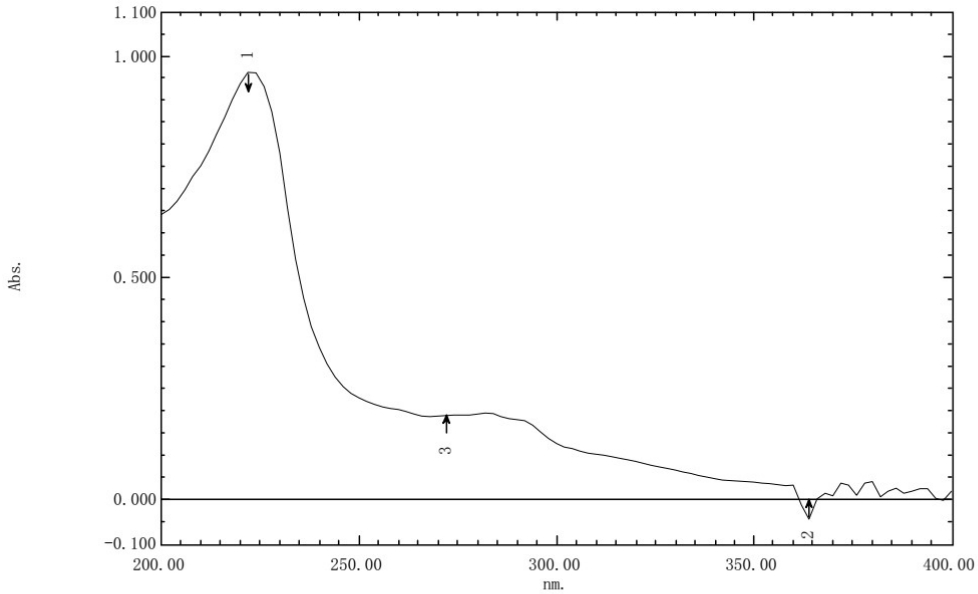


Fig. S20. Experimental ECD spectra of **2**.



测定属性
波长范围（nm.）： 200.00到400.00
扫描速度： 高速
采样间隔： 2.0
自动采样间隔: 停用
扫描模式： 单一的

No.	P/V	Wavelength	Abs.	描述
1	↑	222.00	.921	
2	↓	364.00	.001	
3	↓	272.00	.190	

Fig. S21 UV spectrum of compound **3**.

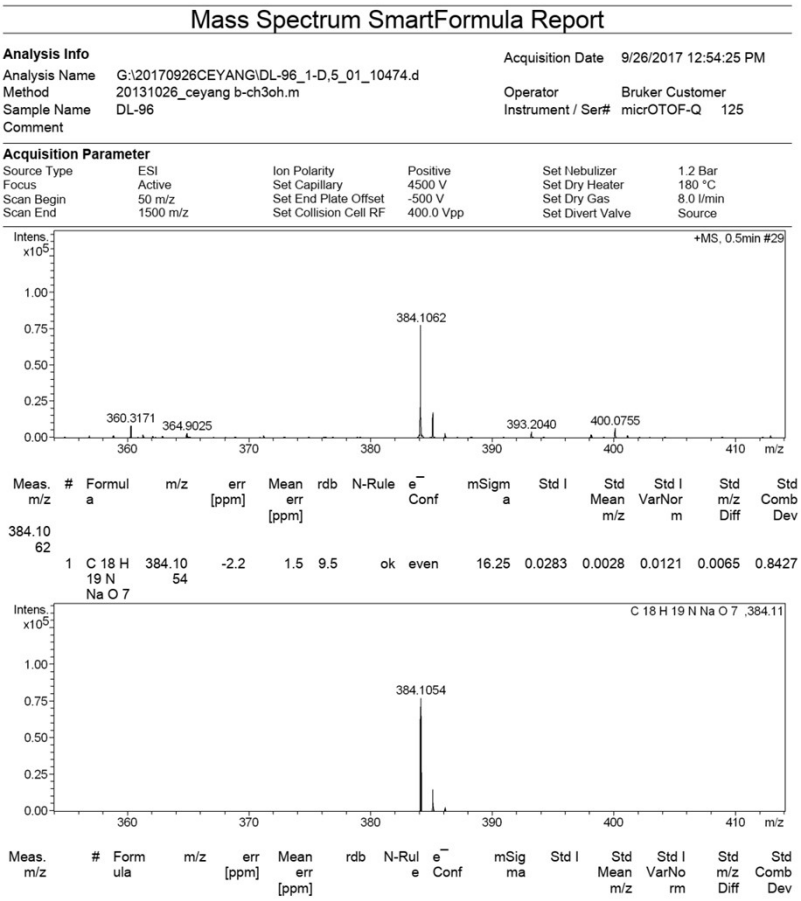


Fig. S22 HRESIMS spectrum of compound **3**.

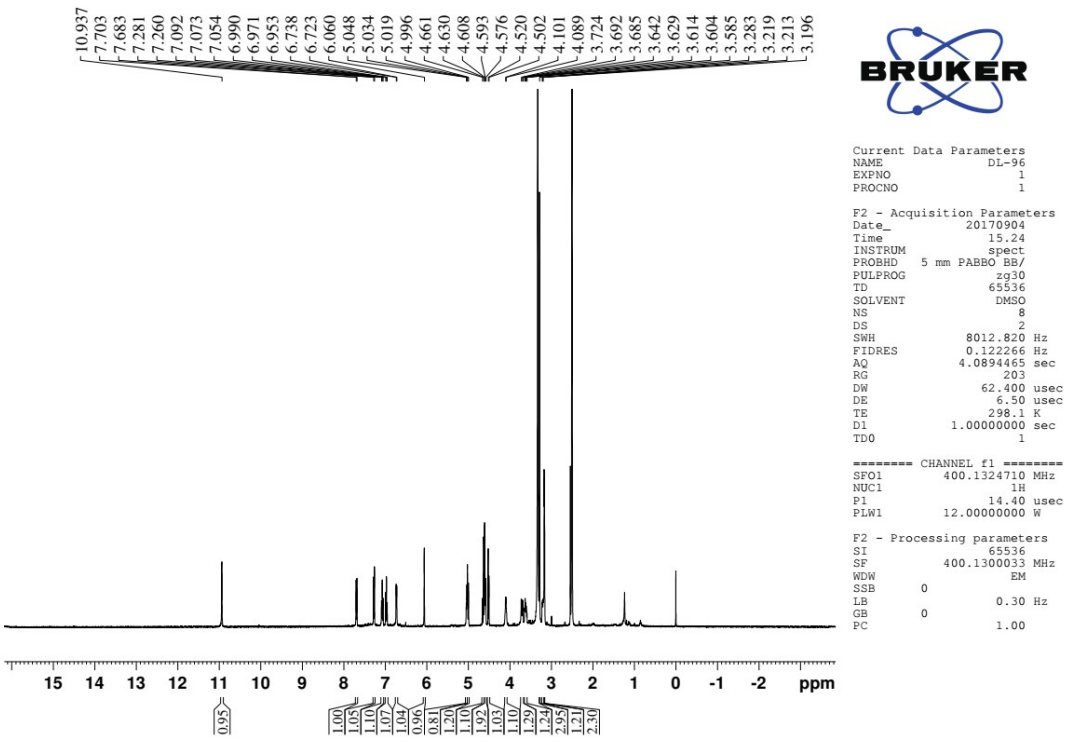


Fig. S23 ^{1}H NMR spectrum (400 MHz, DMSO-d_6) of compound **3**.

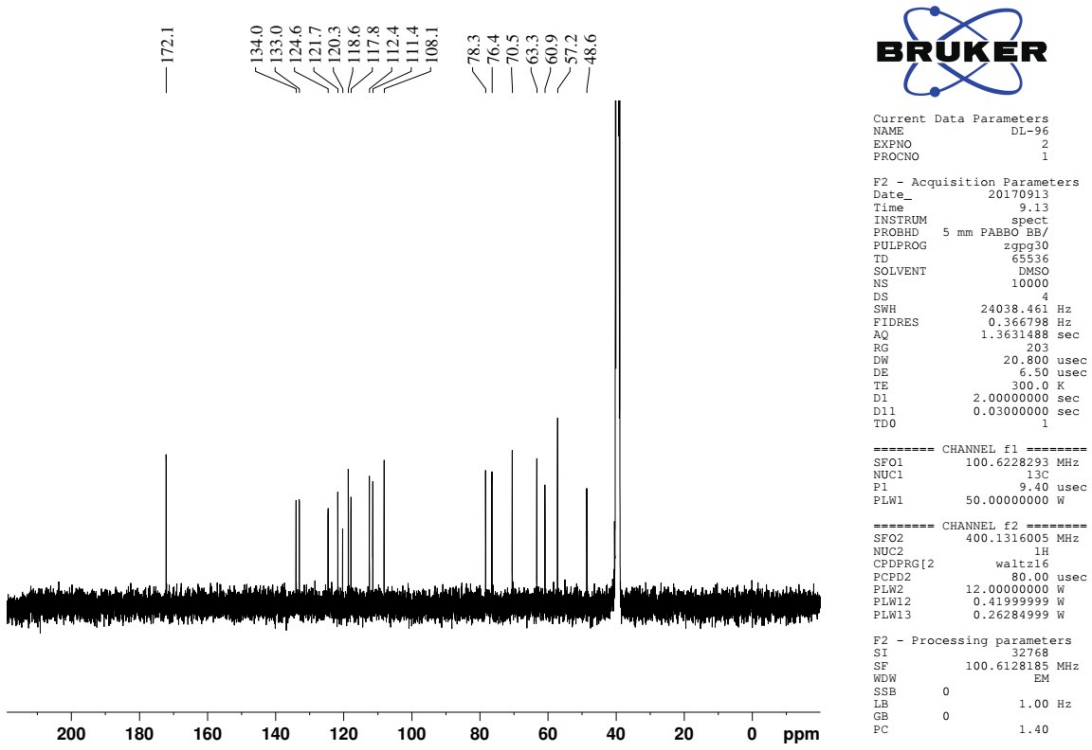


Fig. S24 ^{13}C NMR spectrum (100 MHz, DMSO-d_6) of compound **3**.

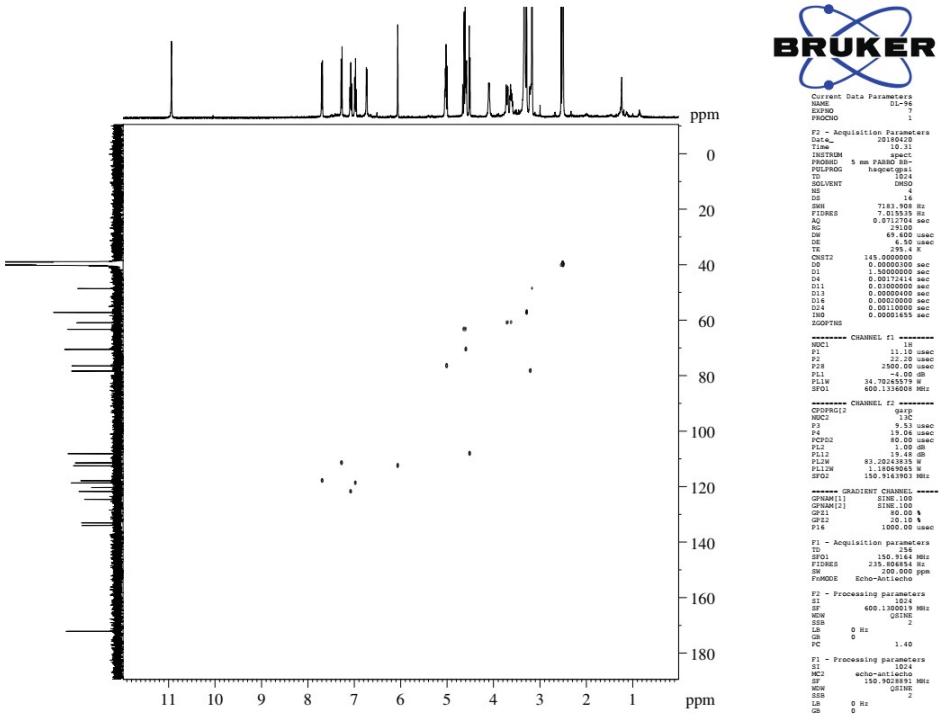


Fig. S25. HSQC spectrum (600 MHz, DMSO-d_6) of compound **3**.

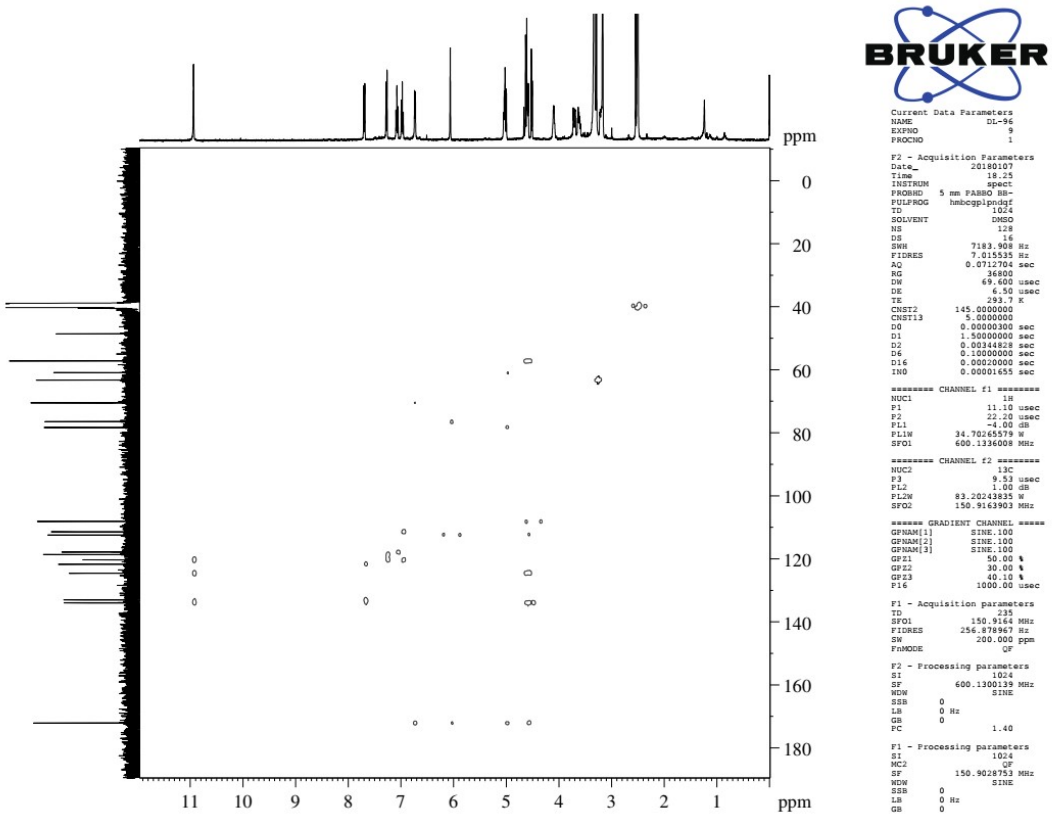


Fig. S26. HMBC spectrum (600 MHz, DMSO-d_6) of compound **3**.

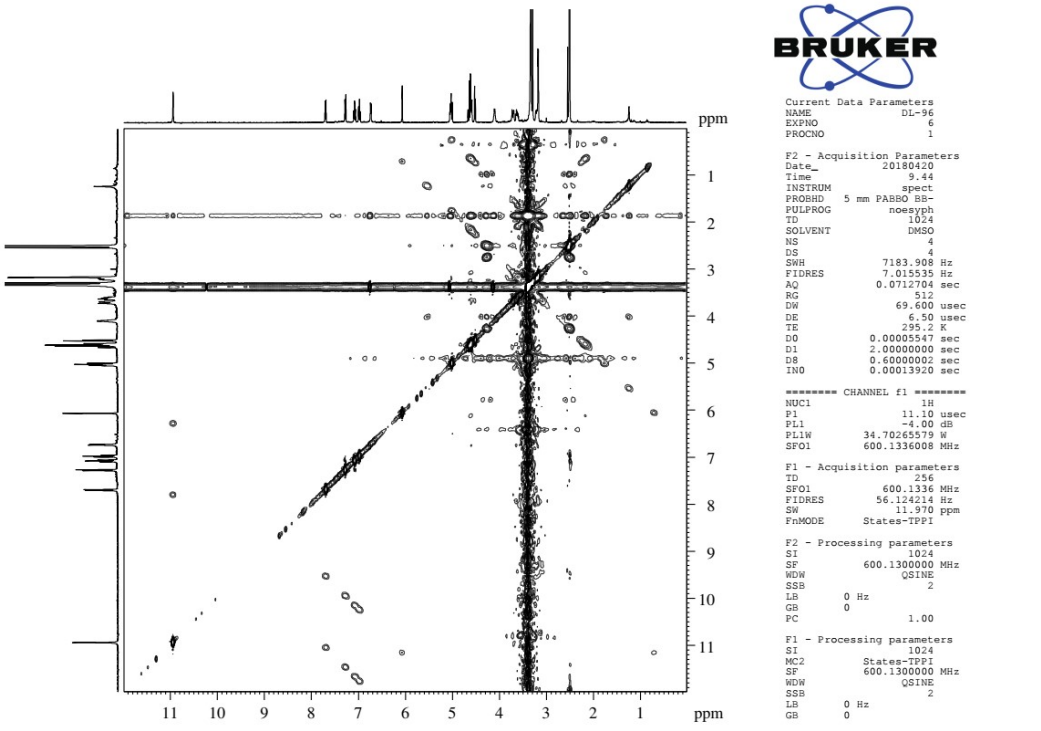


Fig. S27. NOESY spectrum (600 MHz, DMSO-d_6) of compound **3**.

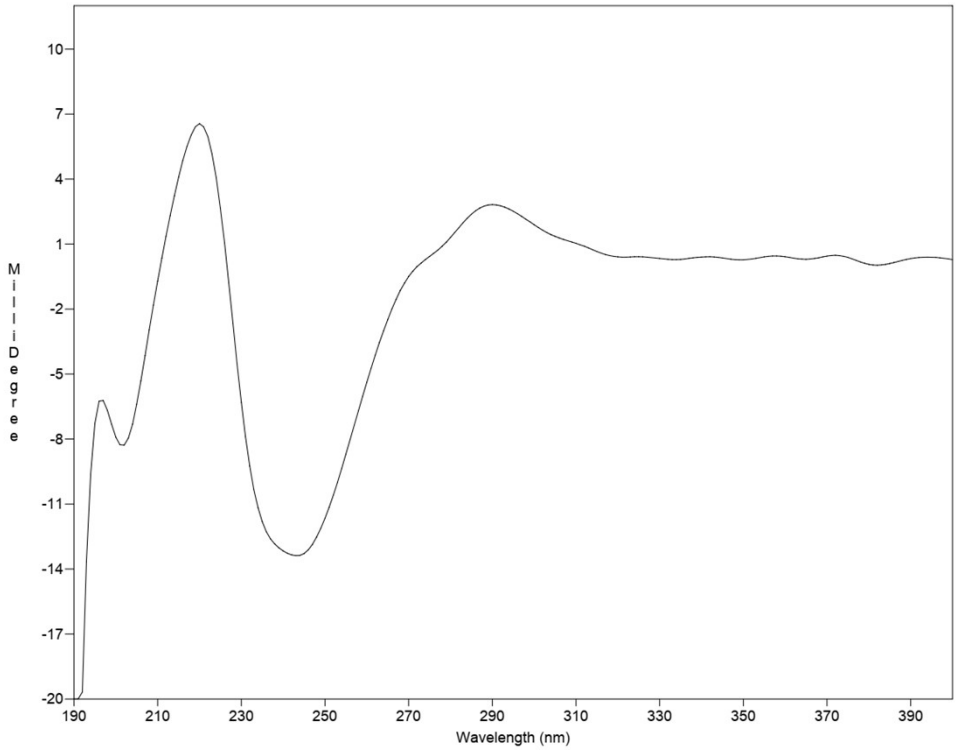


Fig. S28. Experimental ECD spectra of **3**.