Electronic Supplementary Material (ESI) for Organic Chemistry Frontiers.

(±)-Spiroganoapplanin A, a complex polycyclic meroterpenoid dimer from *Ganoderma applanatum* displaying the potential against Alzheimer's disease

Xing-Rong Peng,[a,c,‡] Rong-Can Luo,[b,c,‡] Hai-Guo Su,[a] Lin Zhou,[a] Xiao-Qian Ran,[b,c] Ya-Rong Guo,[d] Yong-Gang Yao,[b,c,e,*] Ming-Hua Qiu[a,c,*]

[a] State Key Laboratory of Phytochemistry and Plant Resources in West China, Kunming Institute of Botany, Chinese Academy of Science, Kunming 650201, China

[b] Kunming College of Life Science, University of Chinese Academy of Sciences, Kunming, Yunnan 650204, China

[c] Key Laboratory of Animal Models and Human Disease Mechanisms of the Chinese Academy of Sciences & Yunnan Province, KIZ-CUHK Joint Laboratory of Bioresources and Molecular Research in Common Diseases, Kunming Institute of Zoology, Chinese Academy of Sciences, Kunming 650204, China

[d] School of Life Sciences, Division of Life Sciences and Medicine, University of Science and Technology of China, Hefei 230026, China

[e] CAS Center for Excellence in Brain Science and Intelligence Technology, Chinese Academy of Sciences, Shanghai 200031, China

[‡]These authors equally contributed to this work.

Contents

Table S1. ^{1}H and ^{13}C NMR Spectroscopic Data (Methanol-d_4) of (±)-1. (δ in *ppm*).....4

1D and 2D NMR spectra of compound 1 (298 K).....5

Figure S1. ^{1}H NMR (600 MHz, CD_3OD) spectrum of 1.....5

Figure S2. ^{13}C NMR (150 MHz, CD_3OD) spectrum of 1. 6

Figure S3. ^{1}H-^{1}H COSY (600 MHz, CD_3OD) spectrum of 1. 7

Figure S4. HSQC (600/150 MHz, CD_3OD) spectrum of 1. 8

Figure S5. HMBC (600/150 MHz, CD_3OD) spectrum of 1. 9

Figure S6. ROESY (600 MHz, CD_3OD) spectrum of 1. 10

1D and 2D NMR spectra of compound 1 (253 K).....11

Figure S7. ^{1}H NMR (400 MHz, CD_3OD) spectrum of 1.....11

Figure S8. The comparison of the^{1}H NMR (400 MHz, CD_3OD) spectra of 1 at variational temperature.....12

Figure S9. ^{13}C NMR (100 MHz, CD_3OD) spectrum of 1. 13

Figure S10. The comparison of the ^{13}C NMR spectra of 1 at 298 K (150 MHz, CD_3OD) and 253 K (100 MHz, CD_3OD). 14

Figure S11. ^{1}H-^{1}H COSY (400 MHz, CD_3OD) spectrum of 1. 15

Figure S12. HSQC (400/100 MHz, CD_3OD) spectrum of 1. 16

Figure S13. HMBC (400/100 MHz, CD_3OD) spectrum of 1. 17

HRESIMS, CD spectra, X-ray crystallographic and computational ECD data of 1 18

Figure S14. HRESIMS spectrum of 1.....18

X-ray crystallographic data for 1 19

Table S2. Crystal data and structure refinement for 1.....19

Figure S15. CD spectrum of (–)-1 and (+)-1. 21

Figure S16. Four optimized conformers of 1a. 22

Table S3. Conformational analysis of the four optimized conformers of 1a in the gas phase (T = 298.15 K) 22

Table S4. Atomic coordinates (Å) of 1a obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 24

Table S5. Atomic coordinates (Å) of 1b obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 25

Table S6. Atomic coordinates (Å) of 1c obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 26

Table S7. Atomic coordinates (Å) of 1d obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 27
Table S8. Atomic coordinates (Å) of 1e obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 28
Table S9. Atomic coordinates (Å) of 1f obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 29
Table S10. Atomic coordinates (Å) of 1g obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 30
Table S11. Atomic coordinates (Å) of 1h obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 31
Table S12. Atomic coordinates (Å) of 1i obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 32
Table S13. Atomic coordinates (Å) of 1j obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 33
Table S14. Atomic coordinates (Å) of 1k obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 34
Table S15. Atomic coordinates (Å) of 1l obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 35
Table S16. Atomic coordinates (Å) of 1m obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 36
Table S17. Atomic coordinates (Å) of 1n obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 37
Table S18. Atomic coordinates (Å) of 1o obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 38
Table S19. Atomic coordinates (Å) of 1p obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH. 39
Figure S17. Uncropped images of western blot 40
Figure S18. The molecular docking mode of (+)-1 and (–)-1 with BACE1. 42
Scheme S1. The proposal biosynthetic pathway for (±)-1. 43

Table S1. ^{1}H and ^{13}C NMR Spectroscopic Data (Methanol-d_4) of (±)-1. (δ in *ppm*)

No.	$^{1}H^{a}$ (J in Hz)	$^{13}C^{a}$	$^{1}H^{b}$ (J in Hz)	$^{13}C^{b}$
1a		166.6 C		165.5 C
2a		121.9 C		120.7 C
3a	6.80, d (2.7)	107.9 CH	6.64, d (2.7)	106.2 CH
4a		154.5 C		152.0 C
5a	7.14, dd (8.9, 2.7)	129.0 CH	7.04, dd (8.9, 2.7)	127.6 CH
6a	6.92, d (8.9)	114.7 CH	6.84, d (8.9)	113.5 CH
7a		n.o.		200.2 C
8a		n.o.		91.3 C
9a	3.82, d (9.7)	56.9 CH	3.76, d (9.4)	55.2 CH
10a	4.85, br s	76.7 CH	4.78 m	75.1 CH
11a	n.o.	n.o.	3.47 m	45.8 CH
12a	n.o.	n.o.	3.18 overlapped	42.8 CH
13a		143.1 C		141.6 C
14a	n.o.	n.o.	6.35, s; 6.76, s	142.3 CH_2
15a	n.o.	n.o.	8.95, s	192.5 CH
16a		170.1 C		170.5 C
17a	3.50, s	52.6 CH_3	3.43, s	51.4 CH_3
1b		153.3 C		151.2 C
2b		120.5 C		119.2 C
3b	6.30, d (2.9)	112.5 CH	6.18, d (2.8)	111.0 CH
4b		149.5 C		148.1 C
5b	6.75, dd (9.0, 2.9)	119.5 CH	6.65, dd (8.9, 2.8)	118.0 CH
6b	6.84, d (9.0)	119.8 CH	6.75, d (8.9)	118.5 CH
7b		87.5 C		86.2 C
8b	8.05, s	154.0 CH	8.02, s	153.3 CH
9b		129.8 C		128.2 C
10b	6.83, overlapped	130.7 CH	6.74, overlapped	129.5 CH
11b	7.89, dd (15.6, 11.6)	131.4 CH	7.81, dd (15.2, 11.4)	130.0 CH
12b	7.22, d (11.6)	152.1 CH	7.15, d (11.6)	151.3 CH
13b		140.5 C		139.1 C
14b	4.25, d (3.7)	64.4 CH_2	4.14, d (1.9)	62.8 CH_2
15b	9.49, s	195.2 CH	9.39, s	194.3 CH
16b		171.7 C		170.5 C
17b	3.32, s	58.7 CH_3	3.21, s	57.6 CH_3

[a]: 600/150 MHz, 298 K; [b]: 400/100 MHz, 253 K; n.o.: no signal

1D and 2D NMR spectra of compound 1 (298 K)

Figure S1. ^{1}H NMR (600 MHz, CD_3OD) spectrum of 1.

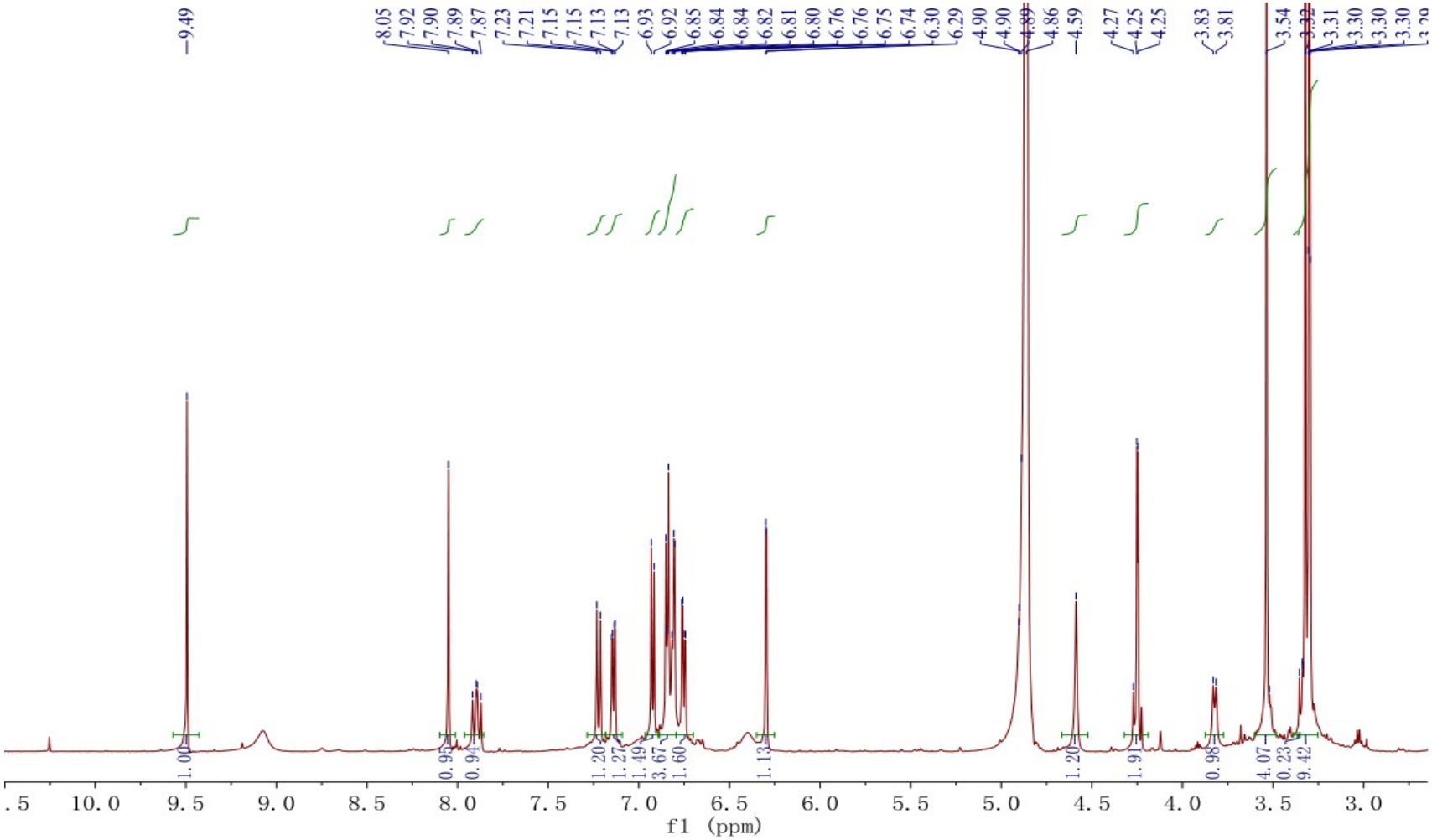


Figure S2. ^{13}C NMR (150 MHz, CD_3OD) spectrum of 1.

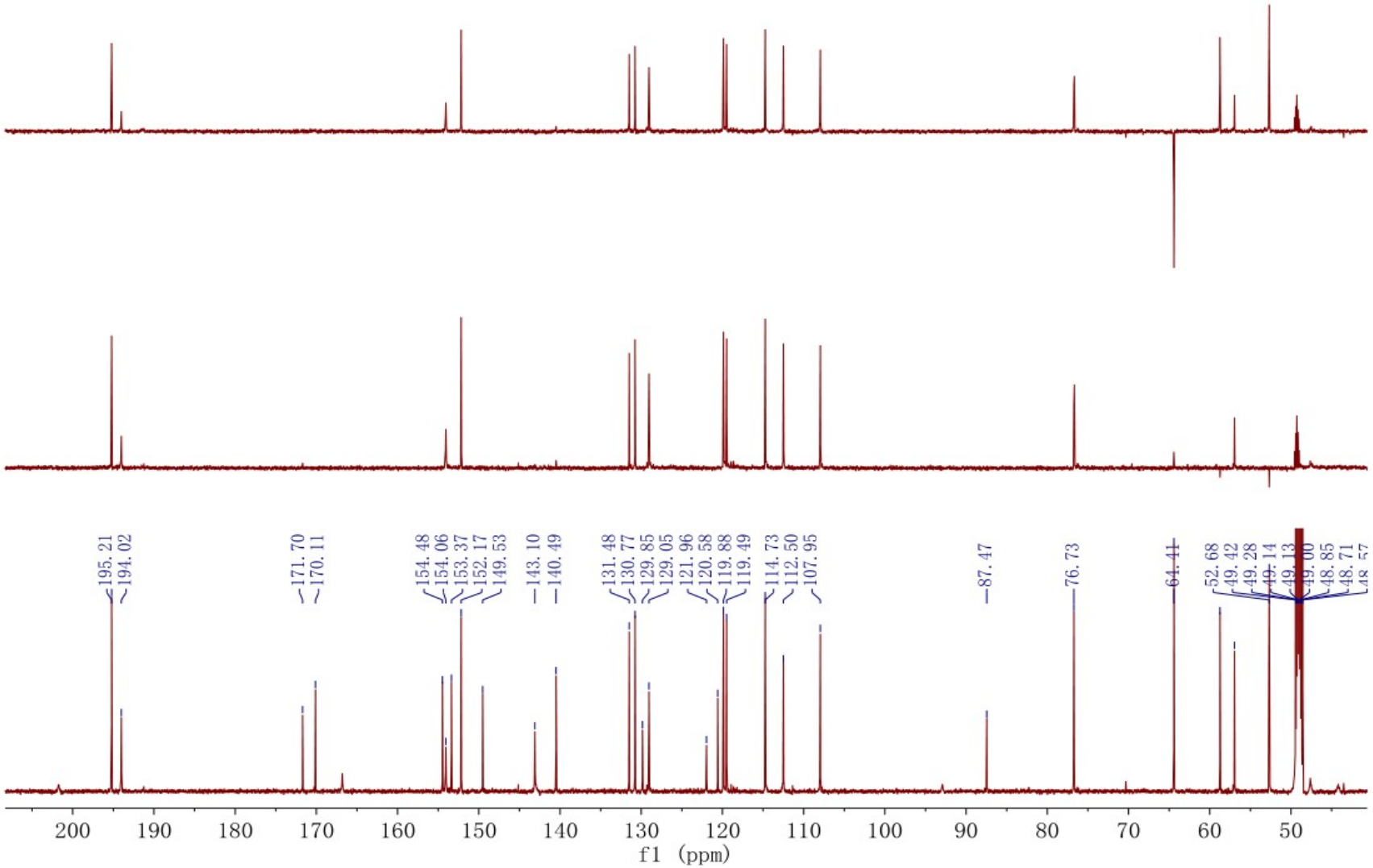


Figure S3. ^{1}H-^{1}H COSY (600 MHz, CD_3OD) spectrum of 1.

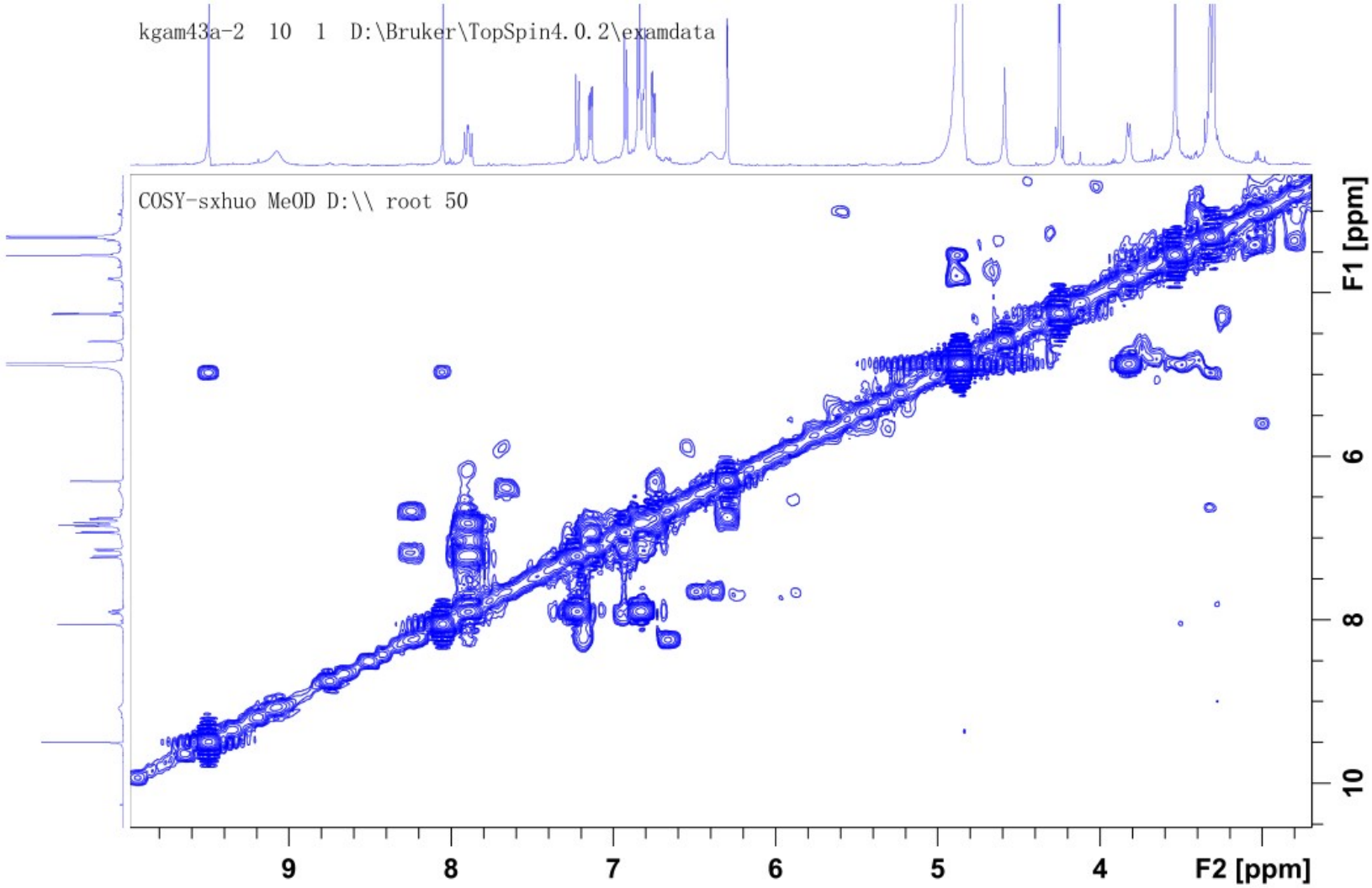


Figure S4. HSQC (600/150 MHz, CD_3OD) spectrum of 1.

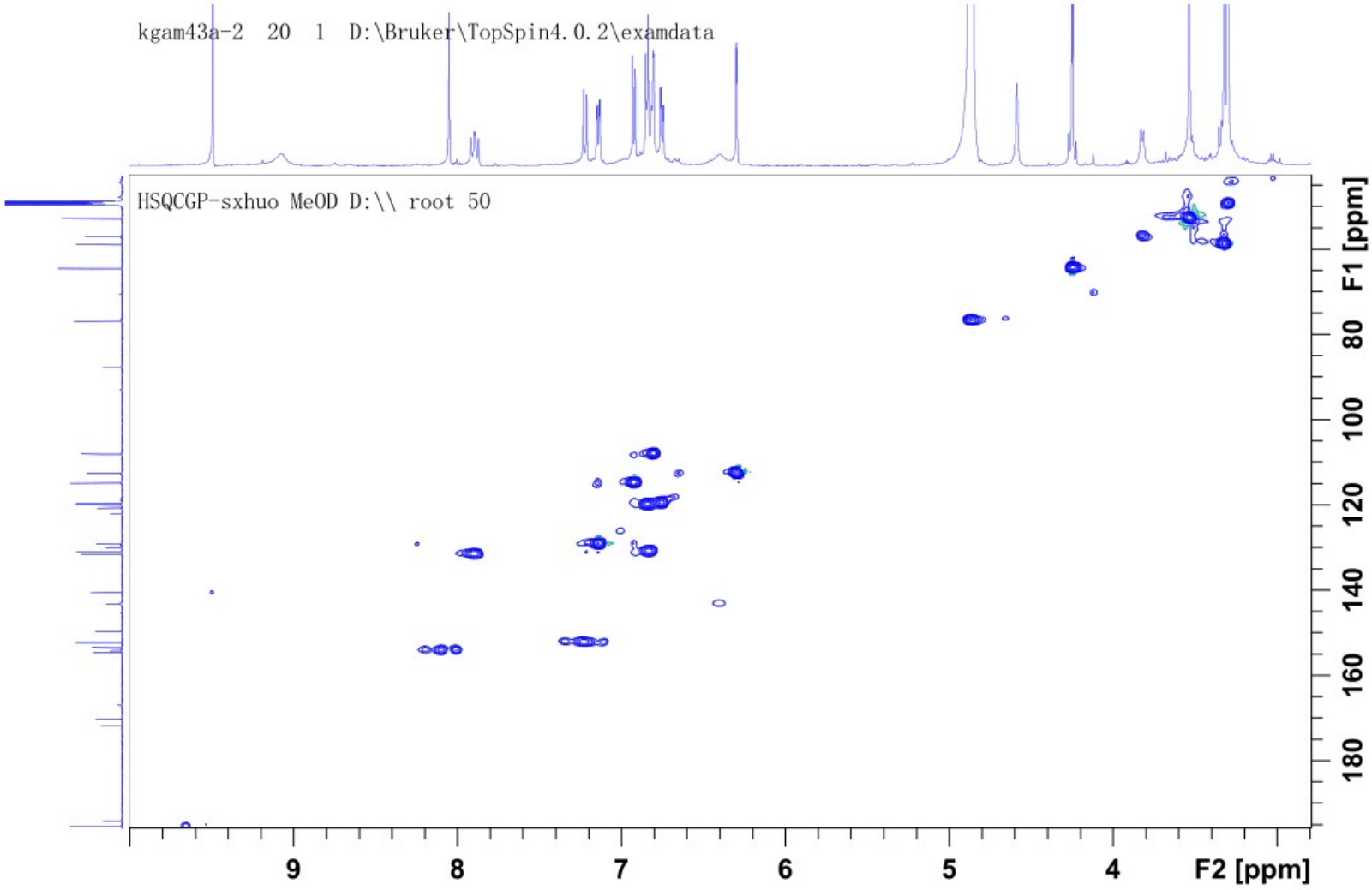


Figure S5. HMBC (600/150 MHz, CD_3OD) spectrum of 1.

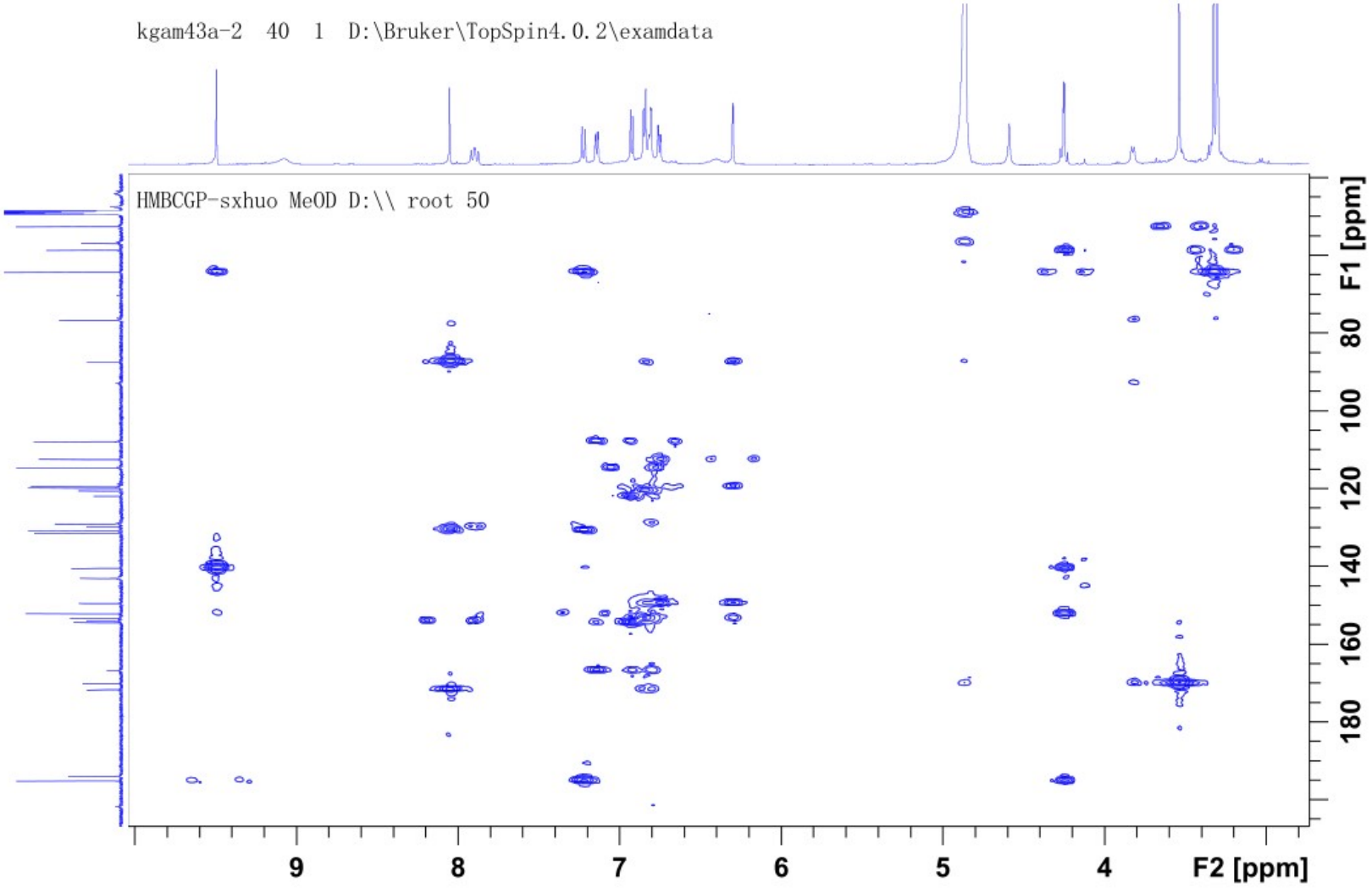
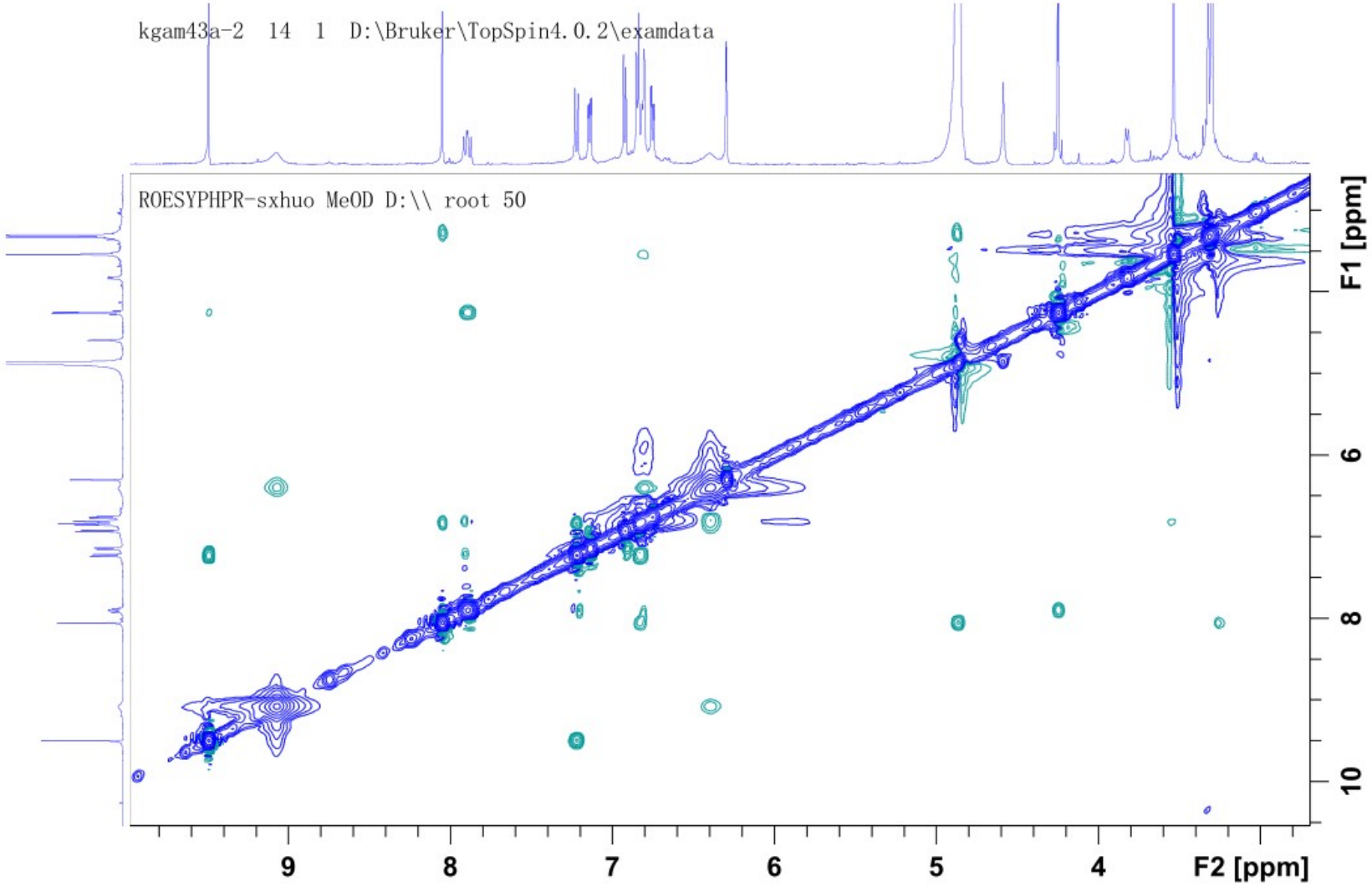


Figure S6. ROESY (600 MHz, CD_3OD) spectrum of 1.



1D and 2D NMR spectra of compound 1 (253 K)

Figure S7. ^{1}H NMR (400 MHz, CD_3OD) spectrum of 1.

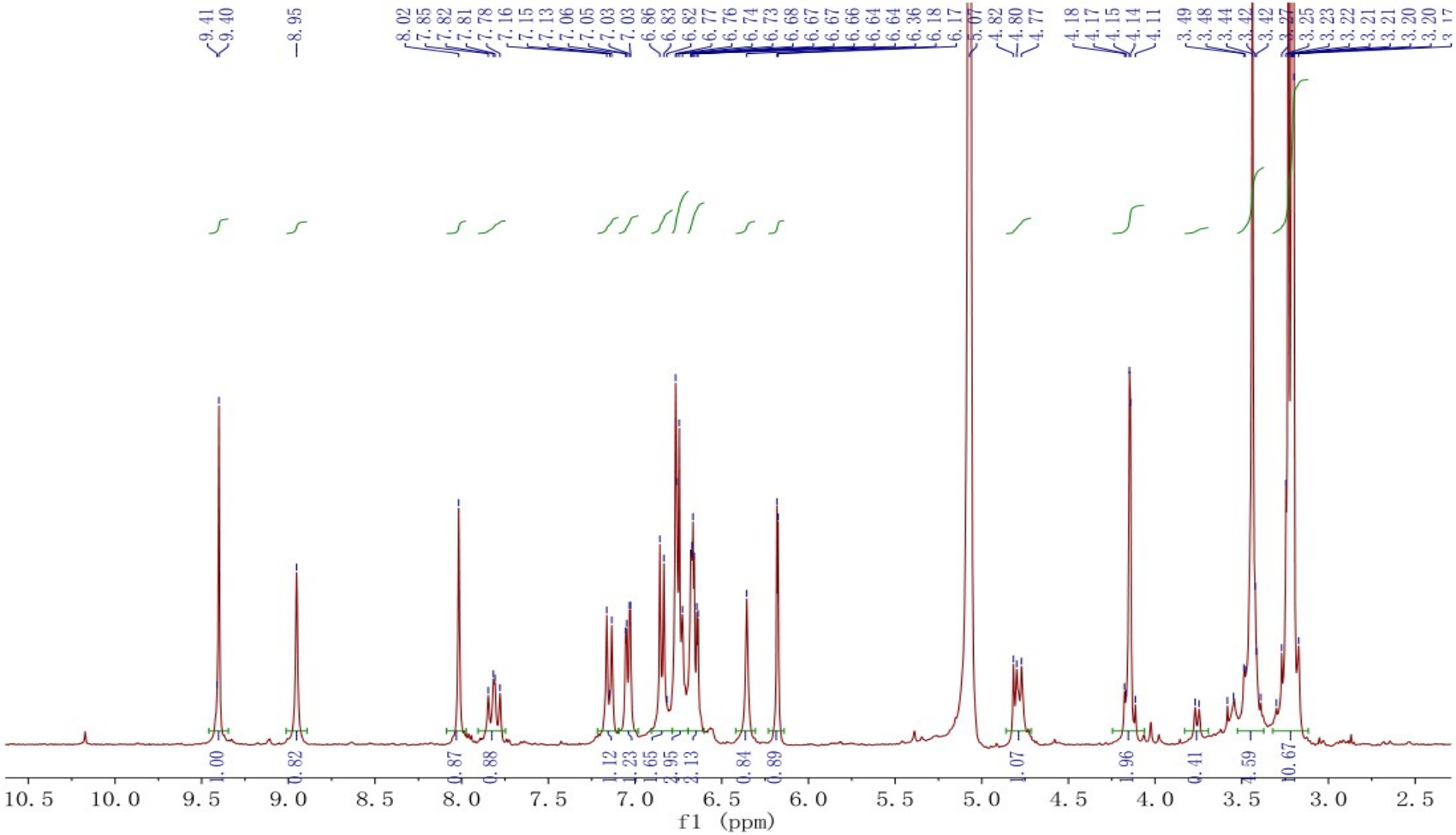


Figure S8. The comparison of the ^{1}H NMR (400 MHz, CD_3OD) spectra of 1 at variational temperature.

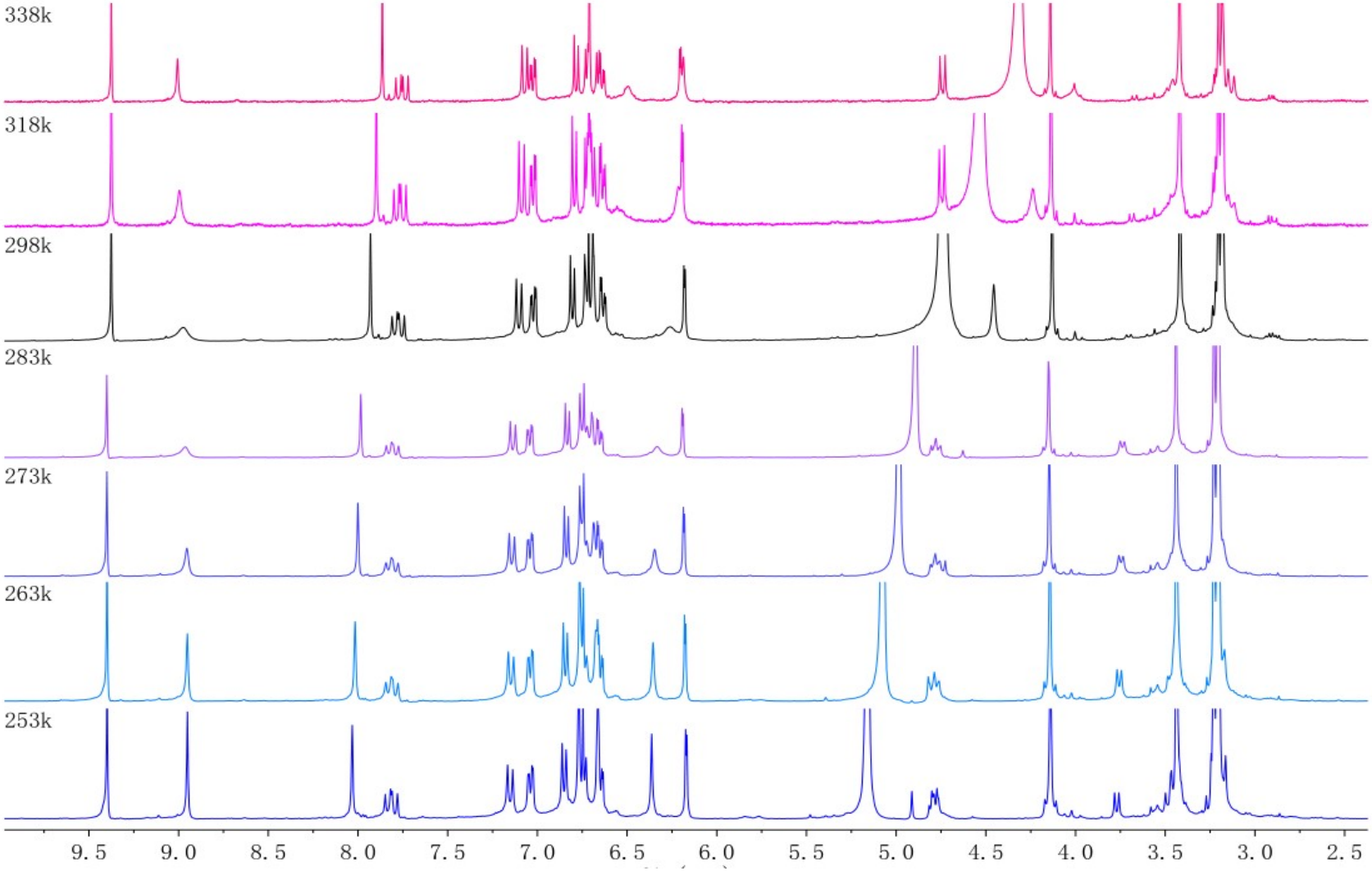


Figure S9. ^{13}C NMR (100 MHz, CD_3OD) spectrum of 1.

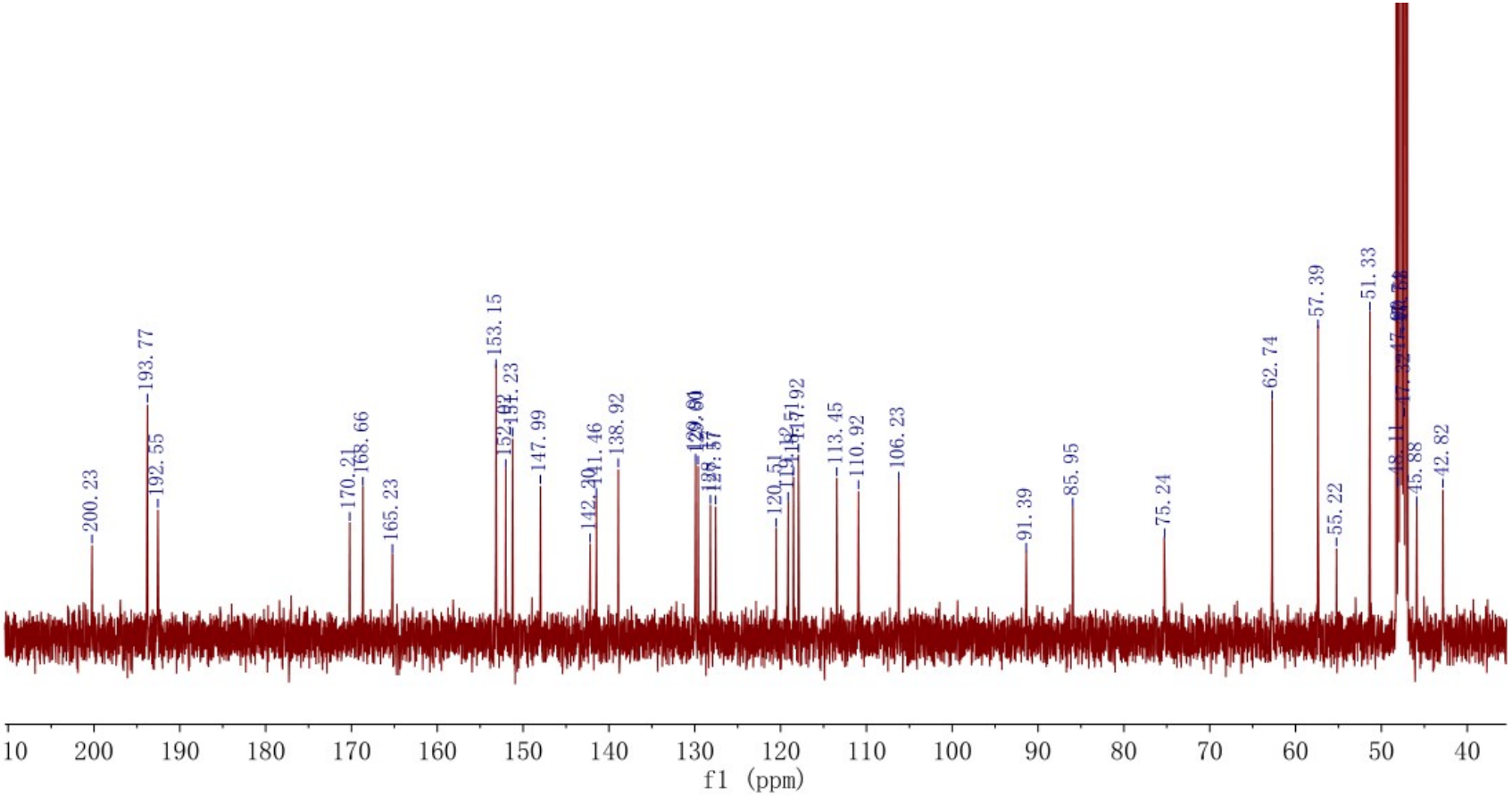


Figure S10. The comparison of the ^{13}C NMR spectra of 1 at 298 K (150 MHz, CD_3OD) and 253 K (100 MHz, CD_3OD).

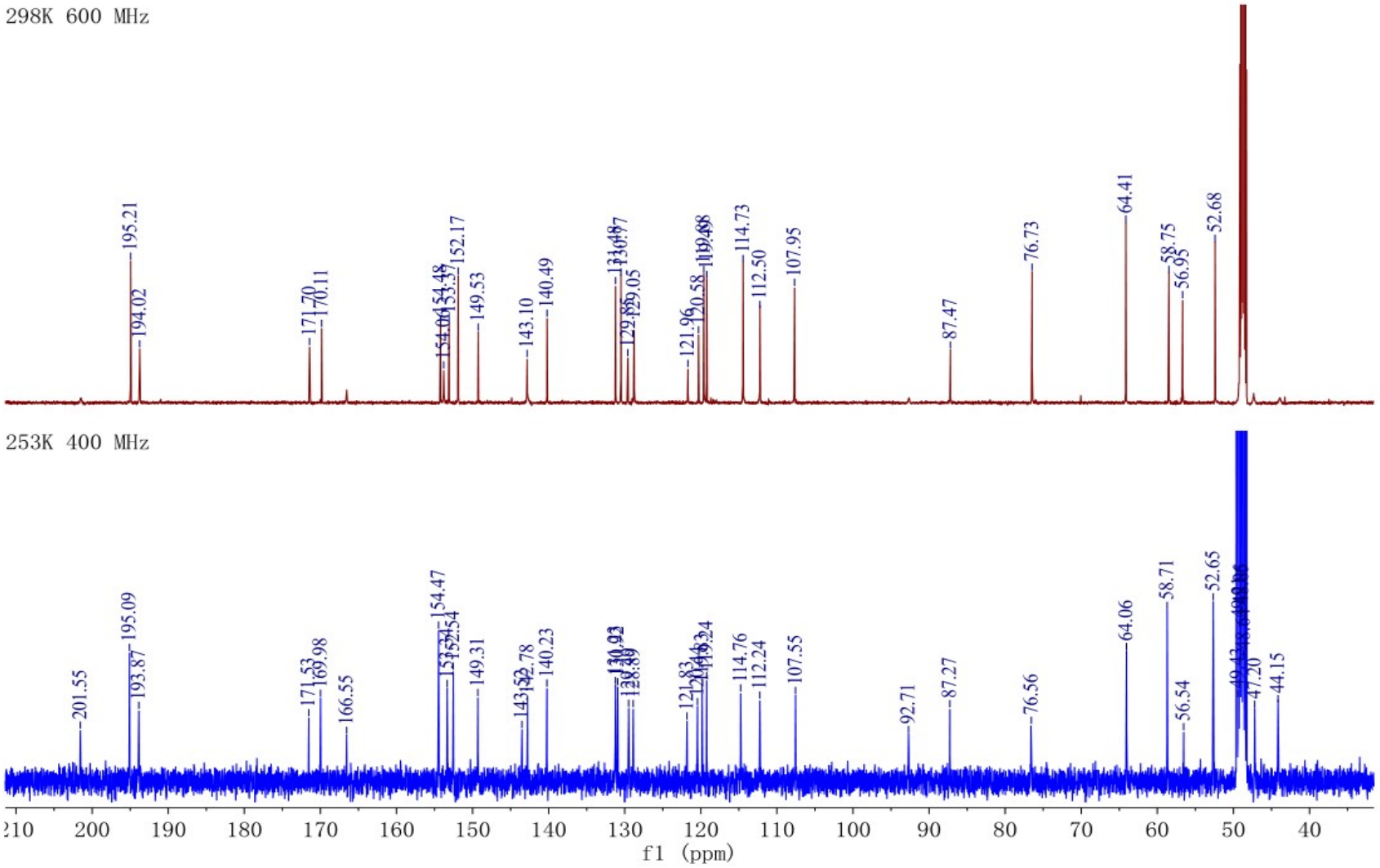


Figure S11. ^{1}H-^{1}H COSY (400 MHz, CD_3OD) spectrum of 1.

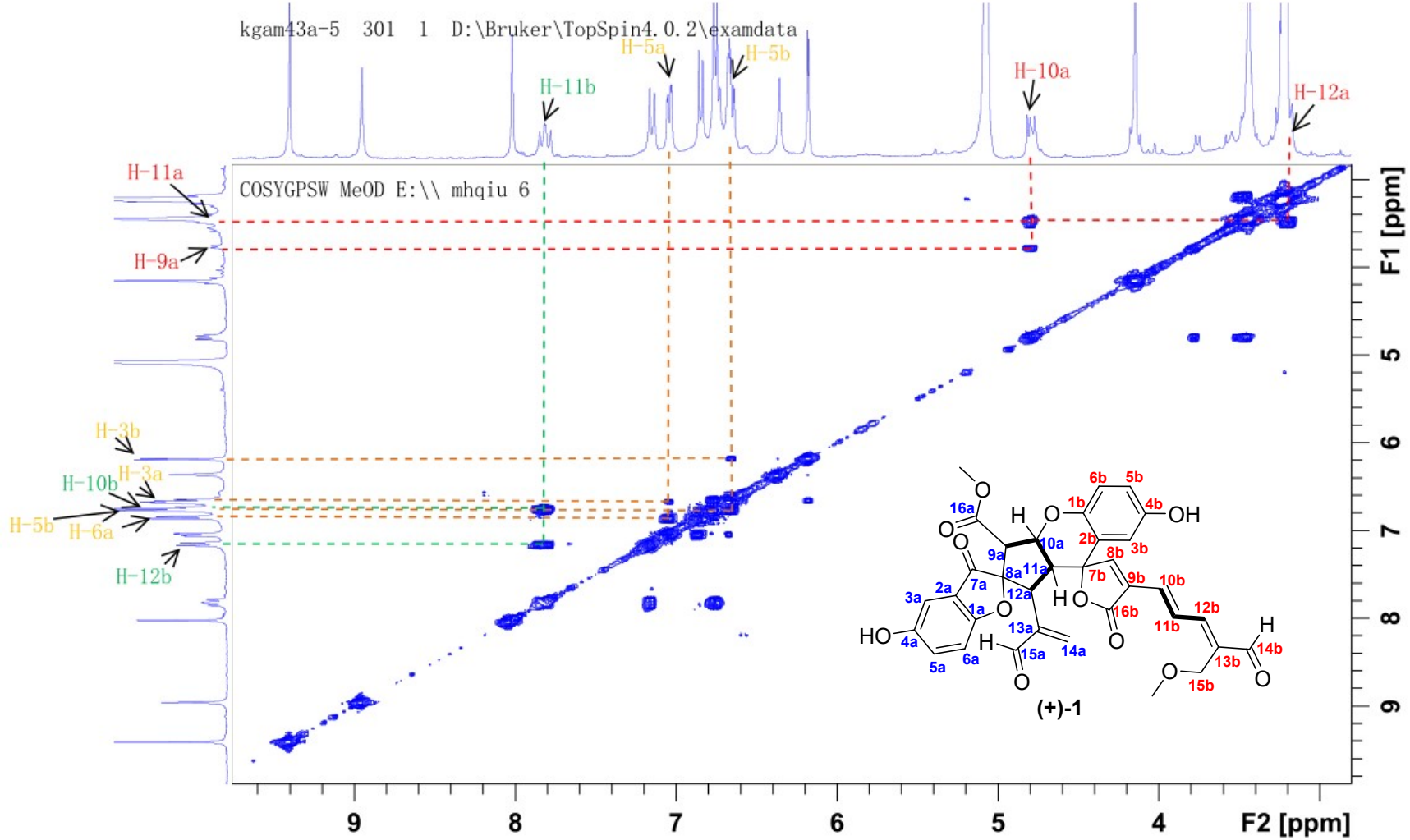


Figure S12. HSQC (400/100 MHz, CD_3OD) spectrum of 1.

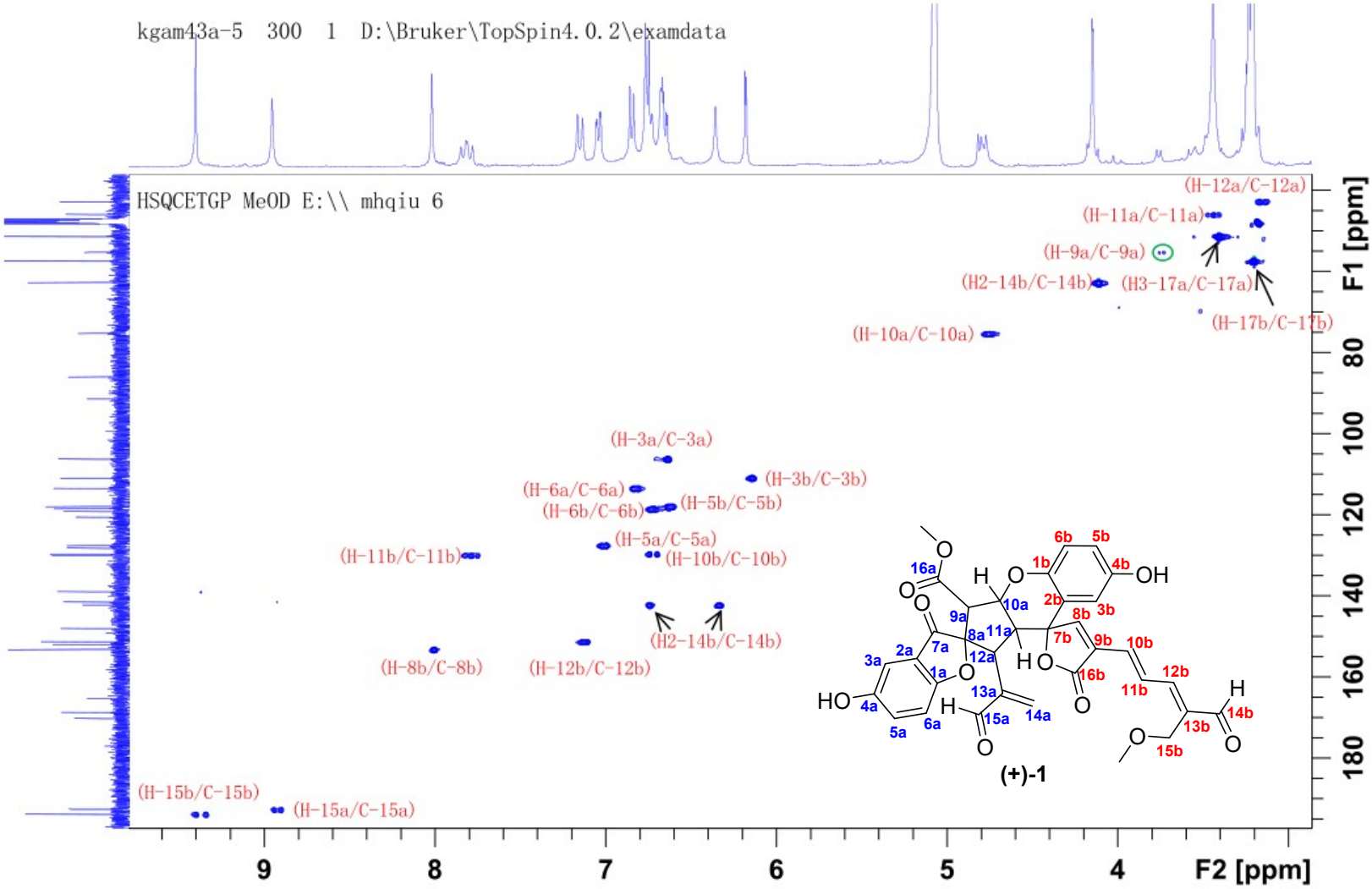
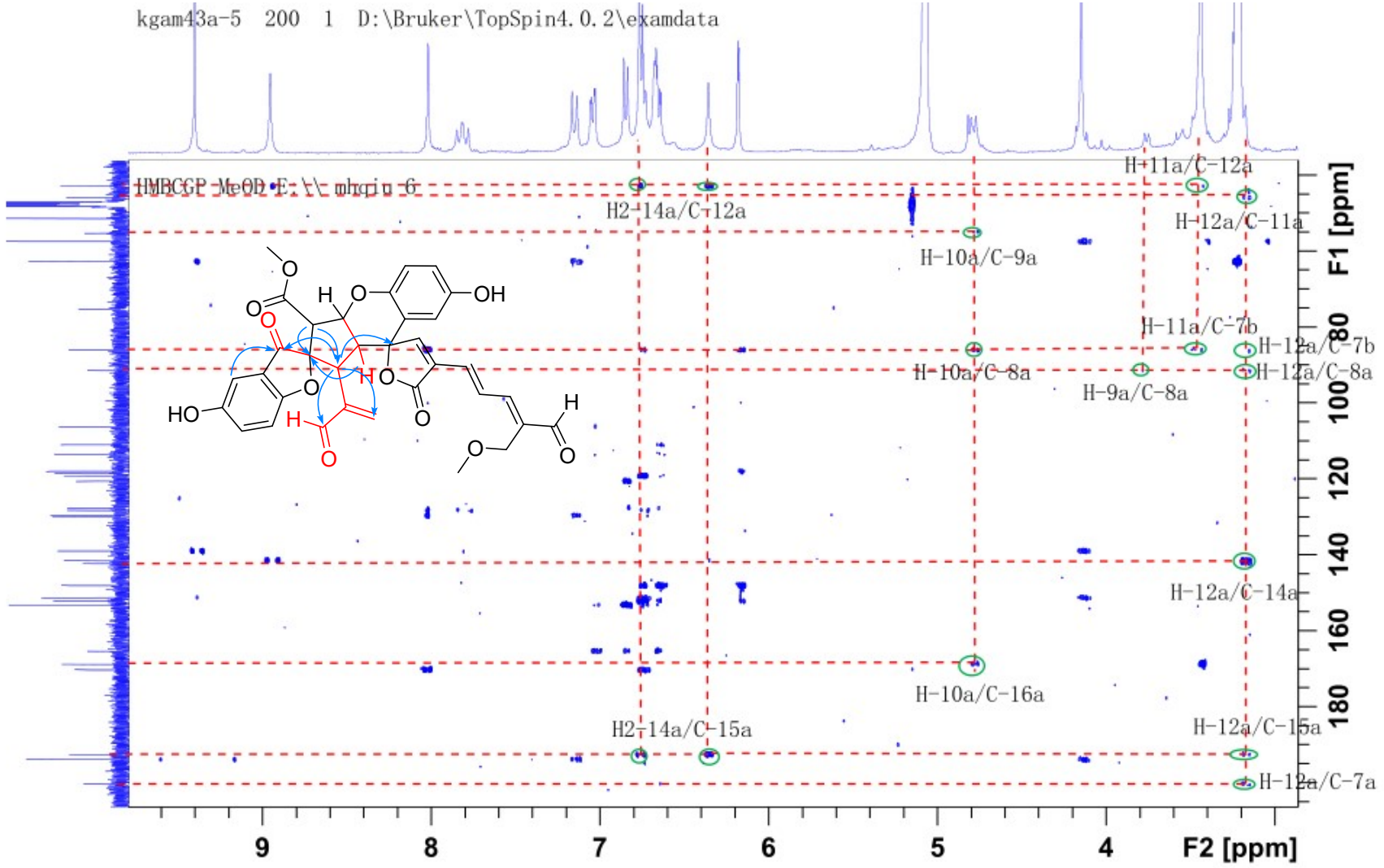
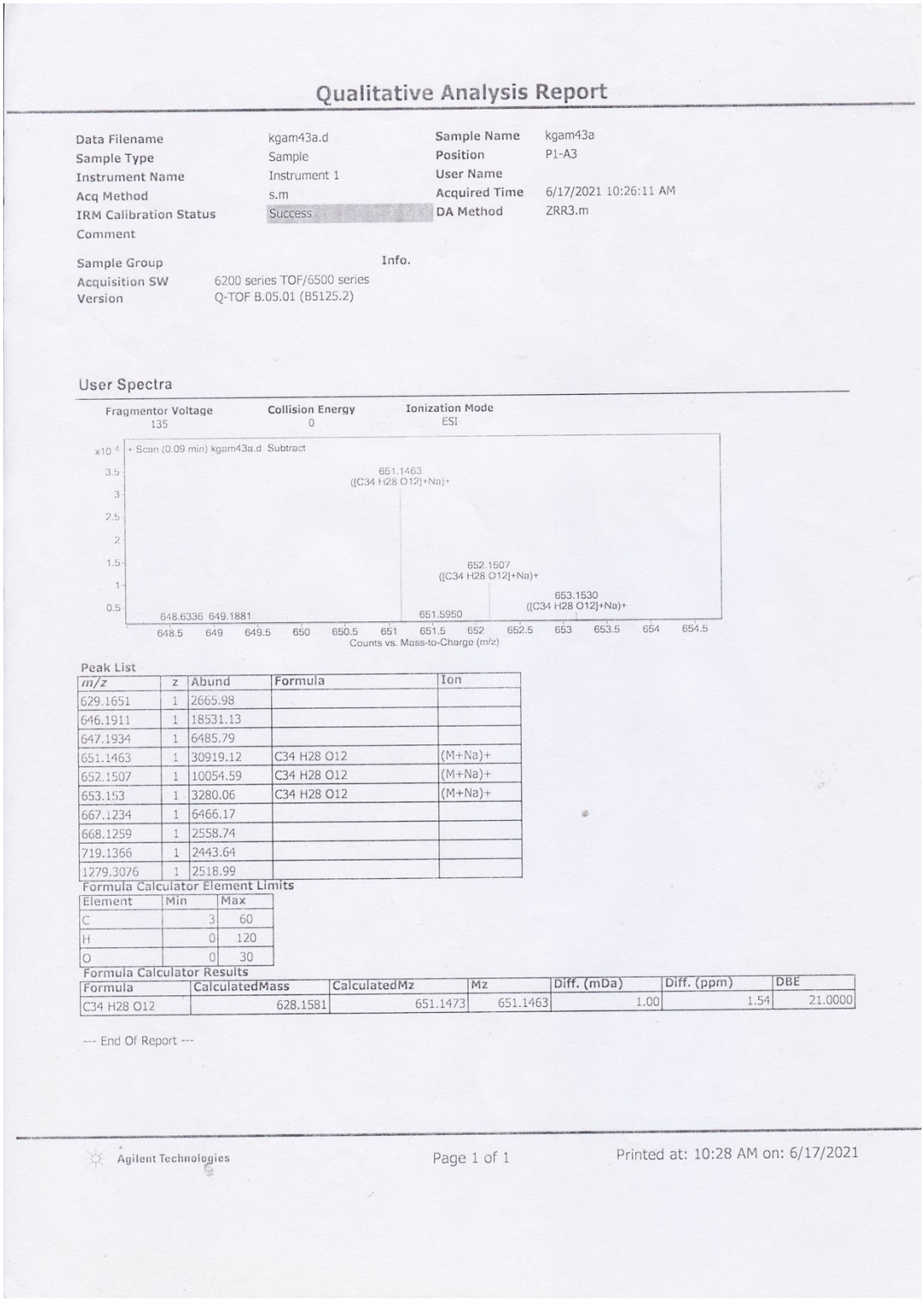


Figure S13. HMBC (400/100 MHz, CD_3OD) spectrum of 1.



HRESIMS, CD spectra, X-ray crystallographic and computational ECD data of 1

Figure S14. HRESIMS spectrum of 1.



Qualitative Analysis Report

Data Filename	kgam43a.d	Sample Name	kgam43a
Sample Type	Sample	Position	P1-A3
Instrument Name	Instrument 1	User Name	
Acq Method	s.m	Acquired Time	6/17/2021 10:26:11 AM
IRM Calibration Status	Success	DA Method	ZRR3.m
Comment			

Info.

Sample Group	
Acquisition SW Version	6200 series TOF/6500 series Q-TOF B.05.01 (B5125.2)

User Spectra

Fragmentor Voltage	Collision Energy	Ionization Mode
135	0	ESI

Peak List

m/z	z	Abund	Formula	Ion
629.1651	1	2665.98		
646.1911	1	18531.13		
647.1934	1	6485.79		
651.1463	1	30919.12	C34 H28 O12	(M+Na)+
652.1507	1	10054.59	C34 H28 O12	(M+Na)+
653.153	1	3280.06	C34 H28 O12	(M+Na)+
667.1234	1	6466.17		
668.1259	1	2558.74		
719.1366	1	2443.64		
1279.3076	1	2518.99		

Formula Calculator Element Limits

Element	Min	Max
C	3	60
H	0	120
O	0	30

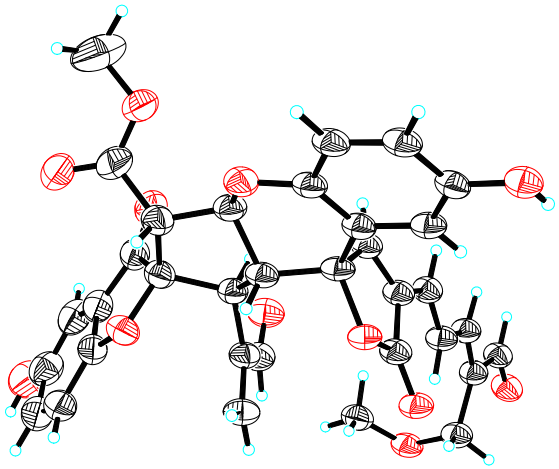
Formula Calculator Results

Formula	CalculatedMass	CalculatedMz	Mz	Diff. (mDa)	Diff. (ppm)	DBE
C34 H28 O12	628.1581	651.1473	651.1463	1.00	1.54	21.0000

--- End Of Report ---

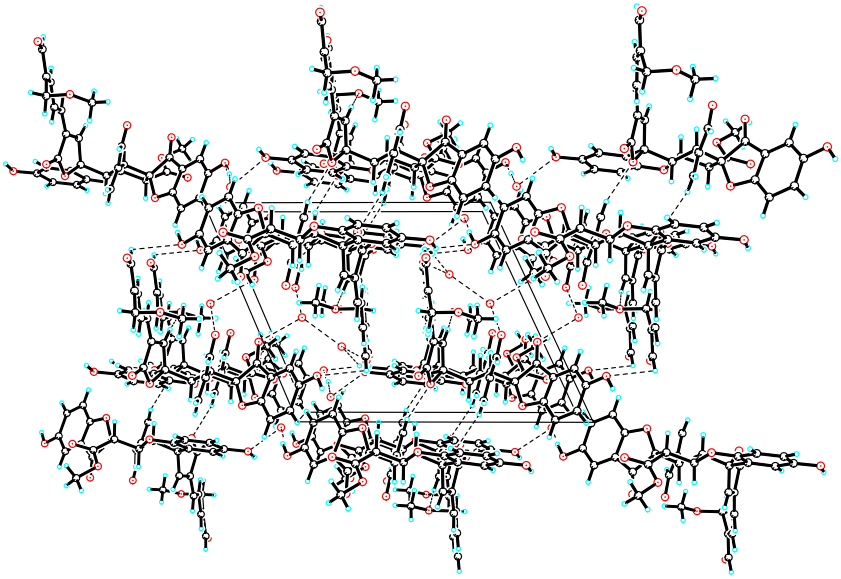
Agilent Technologies Page 1 of 1 Printed at: 10:28 AM on: 6/17/2021

X-ray crystallographic data for 1



View of a molecule of 1 with the atom-labelling scheme.

Displacement ellipsoids are drawn at the 30% probability level.



View of the pack drawing of 1.

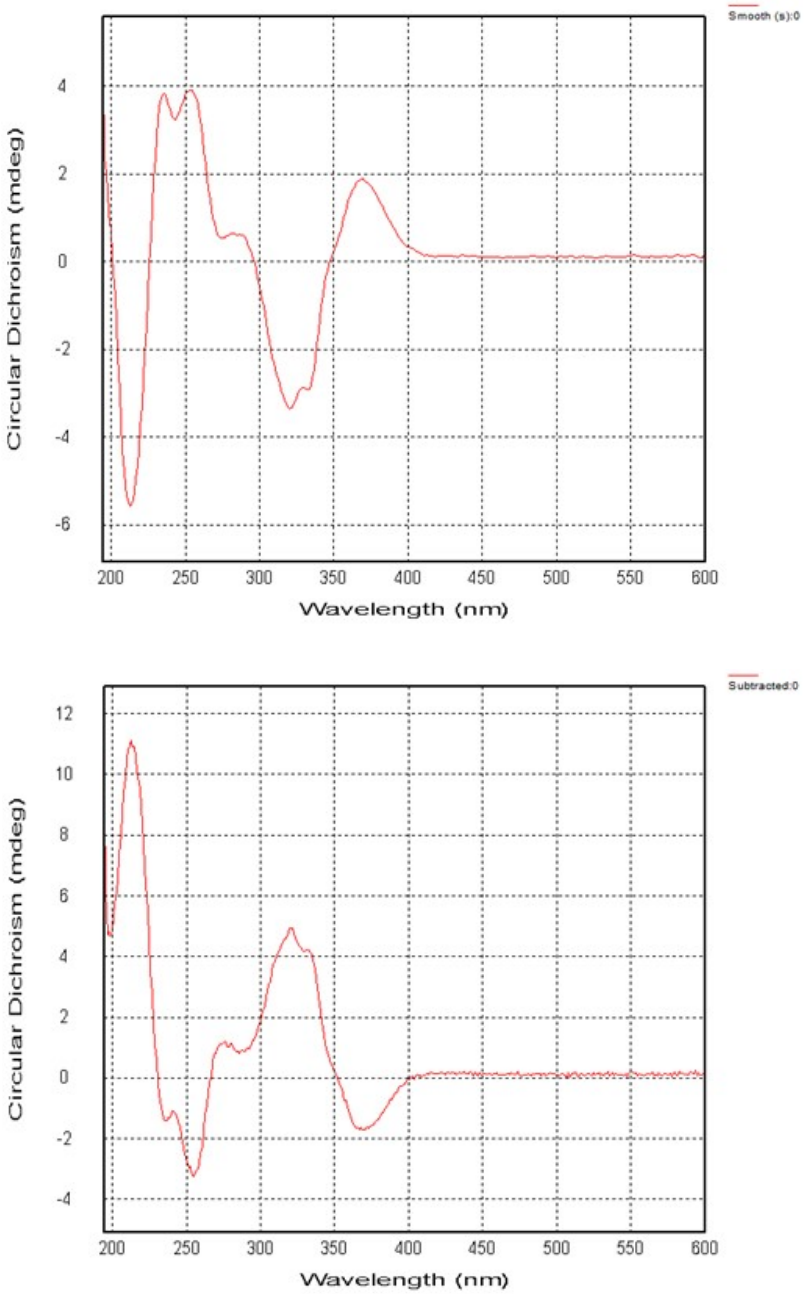
Hydrogen-bonds are shown as dashed lines.

Table S2. Crystal data and structure refinement for 1.

Identification code	global
Empirical formula	$C_{34}H_{34}O_{15}$
Formula weight	682.61
Temperature	100(2) K
Wavelength	1.54178 Å
Crystal system	Triclinic
Space group	P-1

Unit cell dimensions	a = 9.8432(6) Å, α= 66.313(3)°, b = 12.6520(8) Å, β = 88.319(3)°, c = 14.8226(9) Å, γ = 75.334(3)°
Volume	1629.89(18) Å3
Z	2
Density (calculated)	1.391 mg/m^3
Absorption coefficient	0.937 mm^{-1}
F(000)	716
Crystal size	0.500 × 0.280 × 0.120 mm^3
Theta range for data collection	3.27 to 72.43°
Index ranges	-10<=h<=11, -15<=k<=14, -18<=l<=18
Reflections collected	33527
Independent reflections	6395 [R(int) = 0.0809]
Completeness to theta = 72.43°	98.8 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.90 and 0.59
Refinement method	Full-matrix least-squares on F2
Data / restraints / parameters	6395 / 6 / 446
Goodness-of-fit on F2	1.371
Final R indices [I>2sigma(I)]	R1 = 0.1125, wR2 = 0.3355
R indices (all data)	R1 = 0.1407, wR2 = 0.3711
Largest diff. peak and hole	1.011 and -0.590 $e.Å^{-3}$

Figure S15. CD spectrum of (–)-1 and (+)-1.



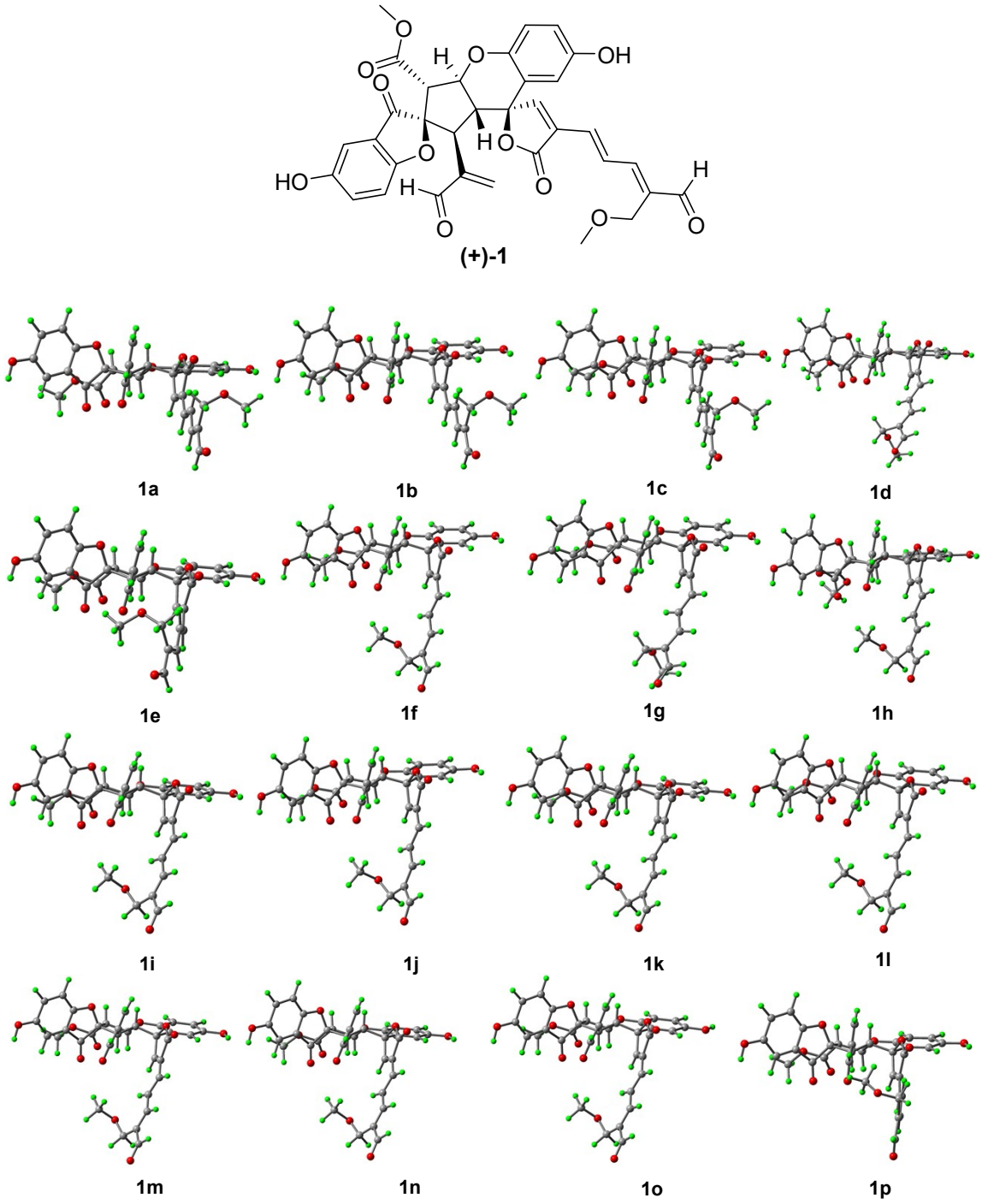


Figure S16. Four optimized conformers of 1a.

Table S3. Conformational analysis of the four optimized conformers of 1a in the gas phase (T = 298.15 K)

Conformer	E (Hartree)	C (Hartree)	G (kcal/mol)	ΔG (kcal/mol)	Population
1a	-2215.140587	0.493936	-1389711.591	0	22.16%
1b	-2215.140588	0.493938	-1389711.591	0.000564759	22.13%
1c	-2215.140588	0.493941	-1389711.589	0.00267319	22.06%

1d	-2215.139069	0.493989	-1389710.606	0.985610189	4.19%
1e	-2215.140357	0.495374	-1389710.544	1.046917858	3.78%
1f	-2215.139017	0.494252	-1389710.407	1.183771383	3.00%
1g	-2215.139107	0.494394	-1389710.375	1.215868488	2.84%
1h	-2215.136746	0.492095	-1389710.336	1.255037626	2.66%
1i	-2215.13903	0.494446	-1389710.294	1.297005454	2.48%
1j	-2215.138996	0.494425	-1389710.286	1.305489381	2.44%
1k	-2215.139004	0.494437	-1389710.283	1.307811166	2.43%
1l	-2215.139	0.494434	-1389710.283	1.30808727	2.43%
1m	-2215.138998	0.494435	-1389710.281	1.310195702	2.42%
1n	-2215.139017	0.494535	-1389710.23	1.361067889	2.22%
1o	-2215.13888	0.494795	-1389709.981	1.610283247	1.46%
1p	-2215.137094	0.493132	-1389709.904	1.687567305	1.28%

Electronic energy obtained at M062X/Def2TZVP SCRF=(IEFPCM, Solvent=Methanol) level of theory; Thermal correction to Gibbs free energy obtained at M062X/def2SVP SCRF=(SMD, Solvent=Methanol), Empirical Dispersion=GD3 level of theory; Gibbs free energy (E + C); The relative Gibbs free energy; The Boltzmann distribution of each conformer.

Table S4. Atomic coordinates (Å) of 1a obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	3.66564	-1.92466	-1.27996	H	3.75617	1.52352	-0.62716
C	3.62777	-2.43337	0.01608	H	1.57731	1.94764	1.45217
C	4.10508	-3.71291	0.32356	H	1.26992	1.54304	-1.56161
C	4.618	-4.47372	-0.72011	H	0.79818	-0.24535	0.88519
C	4.64529	-3.95075	-2.03358	H	0.80645	-0.34893	-2.93329
C	4.17384	-2.68072	-2.33594	H	-0.23668	-1.9014	-2.85947
C	3.04848	-1.3859	0.84889	H	-0.86945	-2.93178	-0.9175
C	2.66867	-0.25957	-0.12607	H	-2.37389	3.85404	-0.60099
C	3.18566	1.16121	0.24142	H	0.06112	7.36974	-0.16764
C	1.93577	2.01465	0.40829	H	2.08456	5.91725	0.1232
C	0.94131	1.3552	-0.52536	H	-0.89724	1.50803	1.82787
C	1.11663	-0.11301	-0.1616	H	-3.03939	-0.10674	2.17967
C	0.38703	-1.12861	-0.99333	H	-4.32621	-0.90777	-0.51219
C	0.3213	-1.12182	-2.332	H	-4.86232	-1.60627	2.49813
C	-0.32917	-2.20546	-0.27067	H	-5.45303	-2.97958	-1.05057
C	4.10842	1.1814	1.43804	H	-7.11441	-3.44854	-0.59943
C	0.9877	4.08581	-0.07689	H	-6.53596	-3.004	3.02978
C	-0.2687	3.4975	-0.28323	H	6.82674	-0.46	2.01186
C	-1.39487	4.31433	-0.43822	H	6.48127	1.19231	2.63598
C	-1.28146	5.70068	-0.39533	H	5.50127	-0.2023	3.203
C	-0.02087	6.28214	-0.19836	H	-8.80804	-1.78383	-0.72904
C	1.09784	5.47997	-0.0372	H	-7.9624	-0.73787	0.45564
C	-0.43766	1.98613	-0.36166	H	-8.30945	-0.12404	-1.18755
C	-1.20795	1.3946	0.78814	H	5.05312	-5.9888	0.37572
C	-2.25182	0.68437	0.32732	H	-3.15742	6.01608	-0.6505
C	-3.18302	-0.12455	1.09475	O	3.92515	1.82511	2.4398
C	-4.16255	-0.88878	0.56685	O	2.84315	-1.34224	2.04176
C	-5.02734	-1.68204	1.41662	O	-0.34813	-2.3074	0.9363
C	-6.01553	-2.48969	0.9661	O	-2.34443	6.52965	-0.53638
C	-6.34829	-2.66089	-0.4982	O	5.10901	-5.72462	-0.55459
C	-6.84852	-3.16294	1.97289	O	3.18167	-0.65927	-1.39202
C	-2.2557	0.83292	-1.15734	O	-1.23376	1.64065	-1.50455
C	6.04482	0.22658	2.35002	O	-6.78749	-1.46717	-1.10901
C	-8.02434	-1.01422	-0.61208	O	2.1453	3.36769	0.08008
H	4.07183	-4.09631	1.34566	O	-7.82157	-3.84107	1.71186
H	5.05589	-4.58475	-2.82187	O	-2.99133	0.35772	-1.98023
H	4.20161	-2.28657	-3.35186	O	5.15641	0.39221	1.24396

Table S5. Atomic coordinates (Å) of 1b obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	3.66517	-1.92496	-1.28005	H	3.75628	1.5231	-0.62715
C	3.62733	-2.43368	0.01599	H	1.57747	1.9477	1.4521
C	4.10447	-3.71329	0.32344	H	1.2699	1.543	-1.56166
C	4.61724	-4.47414	-0.72027	H	0.79802	-0.24523	0.88524
C	4.64454	-3.95116	-2.03372	H	0.80567	-0.34864	-2.93318
C	4.17322	-2.68109	-2.33606	H	-0.23746	-1.90111	-2.85929
C	3.04816	-1.38618	0.84882	H	-0.86993	-2.9316	-0.91726
C	2.66844	-0.25978	-0.12608	H	-2.37349	3.85463	-0.60089
C	3.18568	1.16091	0.24142	H	0.06211	7.36991	-0.16758
C	1.93592	2.01457	0.40822	H	2.08533	5.91711	0.12309
C	0.94134	1.35523	-0.52538	H	-0.89715	1.50849	1.82792
C	1.11645	-0.11298	-0.16157	H	-3.03939	-0.1062	2.17979
C	0.38666	-1.12851	-0.99321	H	-4.32613	-0.90733	-0.51207
C	0.32066	-1.1216	-2.33186	H	-4.86232	-1.6058	2.49822
C	-0.32946	-2.20538	-0.27049	H	-5.45258	-2.97946	-1.05042
C	4.1084	1.18098	1.43806	H	-7.11397	-3.44847	-0.59941
C	0.98817	4.08585	-0.077	H	-6.53585	-3.00371	3.02982
C	-0.26833	3.49773	-0.28329	H	6.48062	1.19186	2.63651
C	-1.39437	4.31473	-0.4382	H	5.50134	-0.20354	3.2028
C	-1.28075	5.70107	-0.39527	H	6.82704	-0.45997	2.01165
C	-0.02007	6.28233	-0.19835	H	-8.80761	-1.784	-0.72908
C	1.09854	5.47999	-0.03729	H	-7.96217	-0.73758	0.45534
C	-0.43754	1.98639	-0.36163	H	-8.30928	-0.12427	-1.18804
C	-1.20786	1.39497	0.78819	H	5.05242	-5.98925	0.37552
C	-2.25182	0.68484	0.32741	H	-3.15678	6.01682	-0.64973
C	-3.18302	-0.12404	1.09487	O	3.92512	1.82466	2.43985
C	-4.1625	-0.88832	0.56697	O	2.84288	-1.3425	2.04171
C	-5.02725	-1.68165	1.41671	O	-0.34823	-2.30739	0.93648
C	-6.01528	-2.48947	0.96615	O	-2.34358	6.53022	-0.53627
C	-6.3479	-2.66078	-0.49816	O	5.10814	-5.72511	-0.55481
C	-6.84825	-3.16282	1.97291	O	3.18136	-0.65952	-1.39209
C	-2.25568	0.83331	-1.15726	O	-1.23372	1.64099	-1.50451
C	6.04473	0.22603	2.35006	O	-6.78711	-1.46711	-1.10908
C	-8.02404	-1.01423	-0.61231	O	2.14567	3.36755	0.07991
H	4.07125	-4.09665	1.34555	O	-7.82116	-3.84113	1.71183
H	5.05503	-4.5852	-2.82204	O	-2.99133	0.35806	-1.98011
H	4.201	-2.28693	-3.35197	O	5.1563	0.39168	1.24402

Table S6. Atomic coordinates (Å) of 1c obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	3.66516	-1.92511	-1.27995	H	3.75616	1.52307	-0.62746
C	3.62728	-2.43369	0.01615	H	1.57751	1.94766	1.45198
C	4.10438	-3.71328	0.32375	H	1.26981	1.54306	-1.56177
C	4.61717	-4.47426	-0.71985	H	0.79797	-0.24528	0.88507
C	4.64449	-3.95143	-2.03337	H	0.80574	-0.34851	-2.93335
C	4.17321	-2.68138	-2.33586	H	-0.2374	-1.90098	-2.85957
C	3.0481	-1.38609	0.84885	H	-0.86988	-2.9316	-0.91757
C	2.66843	-0.25979	-0.12619	H	-2.37355	3.85465	-0.60058
C	3.18568	1.1609	0.2412	H	0.06209	7.36992	-0.16733
C	1.93593	2.01455	0.40808	H	2.08534	5.9171	0.12306
C	0.94131	1.35524	-0.52549	H	-0.89709	1.50837	1.8279
C	1.11644	-0.11298	-0.16173	H	-3.03914	-0.10656	2.17975
C	0.38667	-1.12848	-0.99343	H	-4.32625	-0.90717	-0.5121
C	0.32069	-1.12149	-2.33208	H	-4.86212	-1.60613	2.49815
C	-0.32945	-2.20538	-0.27075	H	-5.45278	-2.97926	-1.05064
C	4.10853	1.18108	1.43773	H	-7.11416	-3.44827	-0.59953
C	0.98816	4.08586	-0.077	H	-6.53557	-3.00414	3.0297
C	-0.26835	3.49774	-0.28321	H	6.82731	-0.45971	2.01114
C	-1.39441	4.31475	-0.43798	H	6.48079	1.19212	2.63596
C	-1.28079	5.70108	-0.39497	H	5.50172	-0.20336	3.20244
C	-0.02009	6.28234	-0.19815	H	-8.30934	-0.12388	-1.18749
C	1.09854	5.47999	-0.03725	H	-8.80777	-1.78371	-0.72895
C	-0.43757	1.98641	-0.36163	H	-7.96221	-0.73766	0.45571
C	-1.20784	1.3949	0.78818	H	5.0523	-5.98928	0.3761
C	-2.25179	0.68477	0.32739	H	-3.15686	6.01683	-0.64908
C	-3.18291	-0.12421	1.09484	O	3.92537	1.82488	2.43946
C	-4.16249	-0.88837	0.56693	O	2.84281	-1.34227	2.04173
C	-5.02717	-1.68182	1.41664	O	-0.34826	-2.3074	0.93621
C	-6.01525	-2.48955	0.96606	O	-2.34364	6.53023	-0.53577
C	-6.34804	-2.66062	-0.49825	O	5.10805	-5.72521	-0.55425
C	-6.84811	-3.16306	1.9728	O	3.1814	-0.65967	-1.39215
C	-2.25574	0.83336	-1.15726	O	-1.2338	1.64108	-1.5045
C	6.04497	0.22623	2.34962	O	-6.78725	-1.46685	-1.10894
C	-8.02414	-1.01402	-0.612	O	2.14568	3.36753	0.07979
H	4.07113	-4.0965	1.34592	O	-7.82104	-3.84133	1.71172
H	5.05499	-4.58557	-2.8216	O	-2.99143	0.35817	-1.98011
H	4.20103	-2.28734	-3.35182	O	5.15639	0.39173	1.24367

Table S7. Atomic coordinates (Å) of 1d obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	3.75825	0.89705	-1.17925	H	1.70565	3.33586	0.32886
C	3.85995	-0.03235	-0.14684	H	-0.52166	1.69257	1.59883
C	4.94389	-0.91225	-0.04705	H	-0.15691	2.49499	-1.32763
C	5.9253	-0.8341	-1.02753	H	0.2127	-0.10876	0.25372
C	5.81087	0.10952	-2.07413	H	0.50711	1.32192	-3.25692
C	4.73622	0.983	-2.16978	H	0.75794	-0.41273	-3.91259
C	2.68389	0.16096	0.69404	H	0.91814	-2.28236	-2.58206
C	1.84242	1.22423	-0.03137	H	-4.57395	1.96968	-0.98585
C	1.36783	2.42109	0.83935	H	-4.78987	5.63985	1.24029
C	-0.15228	2.36445	0.8015	H	-2.33647	5.46852	1.73625
C	-0.43929	1.75695	-0.55826	H	-2.23755	-0.12557	0.89019
C	0.52285	0.57516	-0.55305	H	-3.50779	-2.49783	-2.05137
C	0.66297	-0.23639	-1.80851	H	-1.69887	-2.61124	0.45255
C	0.64326	0.25646	-3.05458	H	-3.27946	-4.77193	-1.18212
C	0.84546	-1.69651	-1.63986	H	-0.44306	-5.87605	1.78704
C	1.95112	2.43183	2.23302	H	-0.12891	-4.32593	0.95742
C	-2.09071	3.63556	0.65139	H	-3.02621	-6.94633	-0.64499
C	-2.71484	2.64328	-0.1179	H	3.70429	3.17373	4.09039
C	-4.08638	2.74067	-0.38195	H	3.66903	1.38396	3.94136
C	-4.83184	3.81182	0.10142	H	5.02394	2.32019	3.21338
C	-4.19884	4.80288	0.86509	H	-3.27861	-5.24287	2.6373
C	-2.84371	4.70905	1.13929	H	-1.92926	-5.85691	3.64477
C	-1.93413	1.47858	-0.71267	H	-2.72626	-4.30482	4.056
C	-2.30464	0.12092	-0.17069	H	7.00556	-2.23267	-0.28298
C	-2.63641	-0.69404	-1.18443	H	-6.47745	3.21724	-0.68371
C	-2.89535	-2.1272	-1.22313	O	1.30606	2.44013	3.2504
C	-2.34904	-2.98887	-0.34261	O	2.34979	-0.37419	1.72755
C	-2.56193	-4.42014	-0.43132	O	0.91311	-2.23917	-0.55756
C	-1.92469	-5.32982	0.34125	O	-6.15946	3.94818	-0.13412
C	-0.91314	-4.95545	1.40122	O	7.01829	-1.63296	-1.04377
C	-2.29386	-6.74305	0.16876	O	2.65047	1.68262	-1.1102
C	-2.61275	0.1193	-2.42939	O	-2.23809	1.37316	-2.11393
C	3.95465	2.32166	3.44521	O	-1.47282	-4.20909	2.45987
C	-2.39423	-4.94537	3.22875	O	-0.75348	3.62716	0.95333
H	5.00873	-1.63401	0.77013	O	-1.86115	-7.64852	0.85183
H	6.60591	0.13448	-2.822	O	-2.86077	-0.21556	-3.55653
H	4.65784	1.70776	-2.98029	O	3.27683	2.43275	2.19289

Table S8. Atomic coordinates (Å) of 1e obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	0.3258	-3.57815	-1.29983	H	3.32561	-1.90393	-0.49456
C	-0.2204	-3.76741	-0.03276	H	2.46913	0.21406	1.51194
C	-1.13839	-4.79015	0.23254	H	2.14384	0.24871	-1.52637
C	-1.50056	-5.61674	-0.8241	H	0.18396	-0.23779	0.78406
C	-0.9425	-5.41464	-2.10745	H	0.44121	-0.36996	-3.02687
C	-0.02946	-4.40182	-2.36759	H	-1.42564	-0.2774	-3.1229
C	0.36606	-2.74166	0.82229	H	-2.80661	-0.22847	-1.31948
C	1.21369	-1.87105	-0.11977	H	2.22369	4.55325	-0.66057
C	2.67299	-1.58678	0.33303	H	6.4657	4.24151	-0.03731
C	2.76451	-0.07454	0.48631	H	6.21908	1.77212	0.32101
C	1.74779	0.43687	-0.51395	H	0.89248	2.11078	1.81307
C	0.55039	-0.46139	-0.23094	H	-1.641	3.25031	2.06671
C	-0.61712	-0.3754	-1.17369	H	-3.0637	2.69787	-0.6186
C	-0.52127	-0.34179	-2.51033	H	-4.05546	3.48732	2.24897
C	-1.97511	-0.31229	-0.58573	H	-6.73852	1.93441	-0.66265
C	3.08655	-2.35928	1.56408	H	-5.29344	2.7296	-1.34284
C	4.09514	1.78641	0.02792	H	-6.24488	3.32169	2.73756
C	2.96392	2.56785	-0.25194	H	2.97	-5.52475	2.18112
C	3.10737	3.94672	-0.44196	H	4.20224	-4.39921	2.85474
C	4.35935	4.54991	-0.36582	H	2.47787	-4.22647	3.3276
C	5.48711	3.76236	-0.09466	H	-4.89766	-1.08004	-0.04802
C	5.35145	2.39705	0.10368	H	-5.19021	0.10518	1.25757
C	1.58064	1.94627	-0.36257	H	-6.50782	-0.30713	0.11203
C	0.65002	2.30033	0.76648	H	-2.71392	-6.6842	0.21135
C	-0.50984	2.76246	0.27327	H	3.69633	6.31583	-0.71423
C	-1.74009	3.04786	0.99585	O	3.50344	-1.86575	2.58105
C	-2.96435	2.95344	0.43926	O	0.23391	-2.52531	2.00661
C	-4.16948	3.09474	1.23147	O	-2.19555	-0.33526	0.60613
C	-5.40039	2.72479	0.80895	O	4.5445	5.88069	-0.5437
C	-5.65241	2.07859	-0.5332	O	-2.38562	-6.63356	-0.6987
C	-6.50818	2.8426	1.7676	O	1.20907	-2.547	-1.3724
C	-0.35223	2.84017	-1.20871	O	0.89775	2.44294	-1.52247
C	3.16364	-4.50073	2.51428	O	-4.97343	0.84877	-0.68212
C	-5.41878	-0.14807	0.2074	O	4.05328	0.42895	0.22099
H	-1.5578	-4.92561	1.23183	O	-7.6378	2.44945	1.55843
H	-1.25678	-6.08774	-2.90748	O	-1.13737	3.18752	-2.04907
H	0.39393	-4.25425	-3.3612	O	2.92948	-3.66332	1.38113

Table S9. Atomic coordinates (Å) of 1f obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	3.75666	-0.97162	1.1467	H	1.60098	-3.32981	-0.39211
C	3.82304	0.01152	0.16203	H	-0.56291	-1.55528	-1.59217
C	4.89956	0.90154	0.07554	H	-0.26061	-2.54738	1.28404
C	5.91106	0.7777	1.02005	H	0.20709	0.15749	-0.0878
C	5.83321	-0.22086	2.01795	H	0.4273	-1.59407	3.27535
C	4.76559	-1.10441	2.1003	H	0.76848	0.0593	4.08264
C	2.61976	-0.14002	-0.64739	H	1.04251	2.02354	2.93297
C	1.80279	-1.24069	0.0505	H	-4.62315	-1.88861	1.02453
C	1.29461	-2.38529	-0.86765	H	-4.93613	-5.45236	-1.35837
C	-0.22278	-2.28349	-0.83236	H	-2.4906	-5.29437	-1.89338
C	-0.49862	-1.74983	0.56037	H	-2.21072	0.17609	-0.92182
C	0.50454	-0.60776	0.64723	H	-3.20283	2.66418	2.07188
C	0.68021	0.07676	1.97235	H	-2.0359	2.59899	-0.79376
C	0.6235	-0.52429	3.1685	H	-3.10564	4.849	1.09516
C	0.94469	1.53235	1.94029	H	-2.59394	5.04371	-2.89504
C	1.8842	-2.35765	-2.25799	H	-1.18369	6.01439	-2.44184
C	-2.19603	-3.51546	-0.73337	H	-3.17008	6.94214	0.51349
C	-2.79206	-2.55027	0.09166	H	3.64454	-3.05361	-4.12467
C	-4.15914	-2.63955	0.37845	H	3.61216	-1.26787	-3.93278
C	-4.92932	-3.67779	-0.13741	H	4.96178	-2.22408	-3.22125
C	-4.3259	-4.64142	-0.95764	H	0.77266	3.09448	-1.79153
C	-2.97456	-4.5548	-1.25362	H	0.85384	4.86619	-2.05886
C	-1.98237	-1.41524	0.70209	H	0.14016	4.21446	-0.54912
C	-2.29416	-0.05207	0.14194	H	6.95595	2.22562	0.32247
C	-2.58864	0.79319	1.14293	H	-6.54935	-3.09339	0.70469
C	-2.79661	2.23417	1.151	O	1.24331	-2.33735	-3.27782
C	-2.46703	3.02951	0.11273	O	2.24992	0.44725	-1.64052
C	-2.66602	4.4648	0.16664	O	1.05173	2.16742	0.91333
C	-2.37001	5.37257	-0.79357	O	-6.25394	-3.80559	0.11904
C	-1.77574	5.12471	-2.16077	O	6.99982	1.5818	1.04512
C	-2.71822	6.77096	-0.48941	O	2.64916	-1.75731	1.07098
C	-2.60212	-0.00571	2.39783	O	-2.29872	-1.28415	2.0965
C	3.89362	-2.21783	-3.4581	O	-1.00092	3.96086	-2.28171
C	0.2484	4.04616	-1.6341	O	-0.86371	-3.51585	-1.05863
H	4.9357	1.66634	-0.70339	O	-2.54694	7.69423	-1.25892
H	6.65085	-0.28033	2.739	O	-2.82954	0.35371	3.52153
H	4.7151	-1.87102	2.87368	O	3.20978	-2.35792	-2.21193

Table S10. Atomic coordinates (Å) of 1g obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	3.63054	1.27274	-1.18636	H	1.31296	3.5159	0.27001
C	3.81962	0.37351	-0.13948	H	-0.69977	1.64441	1.58522
C	4.98229	-0.39771	-0.02653	H	-0.44952	2.46111	-1.3493
C	5.9527	-0.24066	-1.00856	H	0.21236	-0.07672	0.24354
C	5.75061	0.67259	-2.06862	H	0.29152	1.35158	-3.27493
C	4.59741	1.43753	-2.17768	H	0.75655	-0.34144	-3.92201
C	2.62805	0.4645	0.69702	H	1.18686	-2.15903	-2.58302
C	1.68766	1.42641	-0.04809	H	-4.77747	1.43492	-0.95823
C	1.08754	2.57934	0.80283	H	-5.39723	5.06773	1.25422
C	-0.41626	2.34932	0.78095	H	-2.9357	5.18615	1.72341
C	-0.64299	1.70269	-0.5722	H	-2.20094	-0.36499	0.89685
C	0.44457	0.63535	-0.5652	H	-3.20878	-2.8794	-2.02965
C	0.6717	-0.15985	-1.81808	H	-1.38738	-2.77154	0.46532
C	0.56917	0.31513	-3.06705	H	-2.71273	-5.1084	-1.15355
C	1.04313	-1.58244	-1.64343	H	0.27134	-5.85932	1.78044
C	1.67673	2.68857	2.1894	H	0.37767	-4.27894	0.95512
C	-2.48926	3.38821	0.64387	H	-2.19914	-7.23481	-0.61555
C	-3.00199	2.32606	-0.11395	H	3.36582	3.65841	4.00317
C	-4.37802	2.26131	-0.36301	H	3.49406	1.86889	3.91688
C	-5.23826	3.24069	0.12387	H	4.75257	2.89857	3.14374
C	-4.71692	4.30302	0.87611	H	-1.17361	-6.03009	3.66263
C	-3.35715	4.36928	1.13562	H	-2.15492	-4.59239	4.09071
C	-2.09809	1.25699	-0.71293	H	-2.6057	-5.59162	2.67817
C	-2.30554	-0.13165	-0.16395	H	7.15536	-1.52432	-0.2488
C	-2.54954	-0.98332	-1.1724	H	-6.81206	2.44864	-0.63393
C	-2.64009	-2.43697	-1.20552	O	1.04045	2.66677	3.2121
C	-1.9922	-3.22557	-0.32563	O	2.34636	-0.08194	1.74016
C	-2.03489	-4.67225	-0.41008	O	1.1853	-2.10527	-0.55854
C	-1.28709	-5.49769	0.35785	O	-6.57497	3.22005	-0.09887
C	-0.31546	-5.00338	1.40574	O	7.11618	-0.93252	-1.01449
C	-1.48895	-6.94495	0.19137	O	2.45179	1.9489	-1.12946
C	-2.63072	-0.17754	-2.41981	O	-2.39975	1.11244	-2.11117
C	3.68915	2.81044	3.38556	O	-0.94888	-4.33645	2.47584
C	-1.75708	-5.18471	3.25663	O	-1.15665	3.5361	0.93013
H	5.11461	-1.09808	0.80095	O	-0.947	-7.79175	0.87178
H	6.5407	0.76208	-2.81671	O	-2.84764	-0.54316	-3.54372
H	4.4515	2.13949	-2.99873	O	2.99593	2.81474	2.13677

Table S11. Atomic coordinates (Å) of 1h obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	-3.69811	-1.44666	-1.09884	H	-1.10682	-3.53879	0.17762
C	-3.83916	-0.51177	-0.07611	H	0.72924	-1.49199	1.48965
C	-5.01482	0.22864	0.09266	H	0.56459	-2.44322	-1.41044
C	-6.04948	0.00239	-0.80686	H	-0.30563	0.12799	0.01539
C	-5.89528	-0.94576	-1.84408	H	-0.4822	-1.66324	-3.34058
C	-4.72853	-1.67948	-2.00928	H	-0.99262	-0.04931	-4.13892
C	-2.58448	-0.52672	0.66792	H	-1.36877	1.89523	-2.98351
C	-1.67303	-1.49711	-0.10316	H	4.76103	-1.09575	-1.17309
C	-0.97809	-2.59646	0.73532	H	5.67322	-4.62742	1.10092
C	0.50457	-2.24478	0.71129	H	3.24087	-4.88117	1.65833
C	0.67557	-1.63578	-0.66734	H	2.08267	0.49453	0.86037
C	-0.49821	-0.66806	-0.721	H	2.66478	3.19478	-2.05767
C	-0.79928	-0.0065	-2.03487	H	1.55785	2.8722	0.81426
C	-0.75534	-0.6107	-3.23011	H	2.27298	5.31222	-1.00514
C	-1.17257	1.42527	-1.99502	H	1.76724	5.28142	2.98898
C	-1.61248	-2.82319	2.08703	H	0.23641	6.07235	2.57949
C	2.64975	-3.14017	0.55554	H	2.0386	7.37324	-0.35037
C	3.07259	-2.0694	-0.24546	H	-1.86827	-4.21885	4.32144
C	4.43225	-1.92957	-0.54598	H	-0.35759	-3.49282	4.97872
C	5.3664	-2.84287	-0.06589	H	-1.81053	-2.46561	4.70218
C	4.93569	-3.91456	0.72881	H	-1.3132	2.94201	1.80841
C	3.59166	-4.05535	1.03739	H	-1.63315	4.67409	2.14775
C	2.08305	-1.06162	-0.81244	H	-0.84334	4.18673	0.6137
C	2.1856	0.31546	-0.21115	H	-7.23926	1.27518	-0.00608
C	2.33981	1.2266	-1.18559	H	6.86594	-1.97684	-0.89404
C	2.3384	2.68195	-1.14737	O	-2.80637	-2.82295	2.26735
C	1.91265	3.38855	-0.08047	O	-2.23291	0.09919	1.64324
C	1.90124	4.8383	-0.08836	O	-1.25893	2.06524	-0.96925
C	1.48354	5.66081	0.90295	O	6.69178	-2.74702	-0.33339
C	0.93953	5.28167	2.26094	O	-7.23333	0.65708	-0.75182
C	1.62149	7.1044	0.64613	O	-2.49669	-2.08327	-1.10462
C	2.45389	0.47891	-2.46686	O	2.35163	-0.83978	-2.2054
C	-1.23089	-3.32529	4.3416	O	0.3283	4.02055	2.33635
C	-0.92375	3.96182	1.69076	O	1.33964	-3.36294	0.89386
H	-5.10937	0.95794	0.90025	O	1.32243	7.96668	1.44674
H	-6.73433	-1.08855	-2.52784	O	2.60537	0.90448	-3.58013
H	-4.61948	-2.40858	-2.81233	O	-0.72043	-3.05671	3.03332

Table S12. Atomic coordinates (Å) of 1i obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	3.7628	0.95313	-1.14579	H	1.61759	3.3226	0.39082
C	3.82406	-0.02986	-0.16064	H	-0.55482	1.55883	1.59153
C	4.89578	-0.92557	-0.0738	H	-0.24678	2.54787	-1.28508
C	5.90789	-0.80763	-1.01843	H	0.20767	-0.15838	0.08849
C	5.83552	0.19116	-2.01651	H	0.43664	1.58946	-3.27603
C	4.77257	1.08032	-2.09925	H	0.77075	-0.06605	-4.08183
C	2.6215	0.1282	0.64861	H	1.03575	-2.03049	-2.93066
C	1.80996	1.23225	-0.05019	H	-4.61298	1.90839	-1.02512
C	1.30682	2.37985	0.86701	H	-4.91053	5.47391	1.35717
C	-0.211	2.28499	0.83142	H	-2.4654	5.3063	1.89104
C	-0.48886	1.75183	-0.56111	H	-2.21093	-0.16625	0.91992
C	0.50898	0.60498	-0.64699	H	-3.21245	-2.64901	-2.07542
C	0.6819	-0.0814	-1.97155	H	-2.05185	-2.58889	0.79284
C	0.62812	0.51892	-3.16822	H	-3.12845	-4.8345	-1.09743
C	0.94038	-1.53808	-1.93834	H	-2.62587	-5.03328	2.8946
C	1.89605	2.35054	2.25747	H	-1.21734	-6.00694	2.44263
C	-2.17859	3.5258	0.73151	H	-3.20554	-6.92693	-0.51425
C	-2.77887	2.5629	-0.09309	H	3.61896	1.25391	3.93322
C	-4.14571	2.65762	-0.37939	H	4.97281	2.20391	3.22144
C	-4.9115	3.69895	0.13679	H	3.65889	3.0396	4.12406
C	-4.30372	4.66046	0.95631	H	0.11376	-4.21016	0.55388
C	-2.95262	4.56853	1.25168	H	0.74674	-3.09083	1.79671
C	-1.97413	1.42431	-0.70345	H	0.82416	-4.86259	2.06482
C	-2.2927	0.06251	-0.14385	H	6.94339	-2.26289	-0.32209
C	-2.59082	-0.78105	-1.14521	H	-6.53538	3.11978	-0.70195
C	-2.80601	-2.22096	-1.15373	O	1.25493	2.33393	3.27721
C	-2.4828	-3.01768	-0.11454	O	2.24872	-0.45658	1.64211
C	-2.68893	-4.45197	-0.16816	O	1.04544	-2.17277	-0.91093
C	-2.39961	-5.36068	0.79321	O	-6.23583	3.83202	-0.11848
C	-1.80675	-5.1155	2.16149	O	6.99197	-1.61801	-1.0435
C	-2.7546	-6.75741	0.48934	O	2.65914	1.74431	-1.07068
C	-2.59965	0.01822	-2.39991	O	-2.29043	1.29512	-2.09808
C	3.90458	2.20237	3.45804	O	-1.02923	-3.95372	2.28474
C	0.22086	-4.04158	1.63893	O	-0.84626	3.52048	1.05666
H	4.92778	-1.69036	0.70533	O	-2.58967	-7.68094	1.25991
H	6.65347	0.24604	-2.73757	O	-2.82813	-0.33981	-3.52385
H	4.72622	1.8469	-2.87293	O	3.22164	2.34462	2.21163

Table S13. Atomic coordinates (Å) of 1j obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	-3.7486	-0.99635	-1.14777	H	-1.58164	-3.33674	0.39942
C	-3.82241	-0.01147	-0.16535	H	0.57396	-1.54903	1.59419
C	-4.9058	0.87048	-0.0809	H	0.27664	-2.54708	-1.2805
C	-5.91634	0.73646	-1.02501	H	-0.20601	0.15722	0.08737
C	-5.83042	-0.26316	-2.02118	H	-0.41852	-1.60152	-3.2728
C	-4.75606	-1.13861	-2.10155	H	-0.76712	0.04882	-4.08308
C	-2.61852	-0.1528	0.64497	H	-1.04929	2.01409	-2.93666
C	-1.79384	-1.24994	-0.04949	H	4.6345	-1.8675	-1.02515
C	-1.27953	-2.3893	0.87184	H	4.96526	-5.42838	1.35955
C	0.23737	-2.28011	0.83559	H	2.51996	-5.2796	1.89819
C	0.51027	-1.74719	-0.55798	H	2.21144	0.18765	0.92453
C	-0.49899	-0.61073	-0.64657	H	3.19405	2.68104	-2.06714
C	-0.6781	0.0706	-1.97282	H	2.01501	2.61128	0.79355
C	-0.61929	-0.5324	-3.16789	H	3.07986	4.86528	-1.09335
C	-0.94799	1.52518	-1.94321	H	2.55532	5.05309	2.89363
C	-1.86836	-2.3603	2.26253	H	1.14542	6.0243	2.44001
C	2.21649	-3.50286	0.73721	H	3.12887	6.95943	-0.51438
C	2.80747	-2.53579	-0.08928	H	-3.62413	-3.05964	4.13273
C	4.17446	-2.61982	-0.37786	H	-3.60096	-1.27443	3.93462
C	4.9495	-3.65474	0.13727	H	-4.94606	-2.24002	3.22715
C	4.35129	-4.62004	0.95929	H	-0.80888	3.10518	1.782
C	3.00004	-4.53851	1.25727	H	-0.88969	4.87729	2.04699
C	1.99223	-1.40474	-0.69971	H	-0.17313	4.22311	0.53955
C	2.29643	-0.03999	-0.1392	H	-6.97635	2.17287	-0.32645
C	2.58668	0.807	-1.13993	H	6.56419	-3.06638	-0.71174
C	2.78659	2.24911	-1.14769	O	-1.22695	-2.33273	3.28185
C	2.44817	3.04325	-0.11132	O	-2.25304	0.43966	1.63664
C	2.6393	4.47959	-0.16592	O	-1.05559	2.16178	-0.91727
C	2.33498	5.38656	0.79242	O	6.27411	-3.77734	-0.12192
C	1.73843	5.13557	2.1581	O	-7.01204	1.53106	-1.05132
C	2.67534	6.78675	0.48754	O	-2.63581	-1.7742	-1.06971
C	2.60514	0.00838	-2.39495	O	2.30825	-1.27172	-2.09395
C	-3.87783	-2.22745	3.46341	O	0.96397	3.97101	2.2751
C	-0.2838	4.0564	1.62453	O	0.88453	-3.50885	1.06383
H	-4.94808	1.63639	0.69663	O	2.49604	7.71005	1.25515
H	-6.64752	-0.33041	-2.74214	O	2.83128	0.36914	-3.51846
H	-4.6995	-1.90645	-2.87328	O	-3.19395	-2.36839	2.21735

Table S14. Atomic coordinates (Å) of 1k obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	3.75077	0.98899	-1.14772	H	1.5863	3.33566	0.39521
C	3.82242	0.00537	-0.16388	H	-0.57055	1.55142	1.59319
C	4.90362	-0.8791	-0.07835	H	-0.2727	2.54693	-1.28234
C	5.91431	-0.74906	-1.02289	H	0.20638	-0.15696	0.08743
C	5.83076	0.2495	-2.02031	H	0.4198	1.59878	-3.27404
C	4.75854	1.12752	-2.10171	H	0.76695	-0.05246	-4.08314
C	2.61869	0.15028	0.64607	H	1.04795	-2.01701	-2.93541
C	1.79627	1.24793	-0.05022	H	-4.63177	1.87208	-1.02472
C	1.28353	2.38931	0.8694	H	-4.95845	5.43371	1.35939
C	-0.23344	2.28158	0.83394	H	-2.51283	5.28333	1.8965
C	-0.50729	1.74789	-0.55919	H	-2.21055	-0.18469	0.92386
C	0.50051	0.61003	-0.64705	H	-3.19469	-2.67732	-2.06841
C	0.67872	-0.07249	-1.97285	H	-2.02193	-2.60808	0.79485
C	0.6199	0.52962	-3.16836	H	-3.08591	-4.86146	-1.09326
C	0.94784	-1.52722	-1.94228	H	-2.56481	-5.05415	2.89499
C	1.87306	2.36204	2.2598	H	-1.15317	-6.02197	2.43983
C	-2.21143	3.50609	0.73571	H	-3.13842	-6.9554	-0.514
C	-2.80365	2.53923	-0.09009	H	3.63046	3.06229	4.12783
C	-4.17077	2.62422	-0.3779	H	3.60534	1.27675	3.93298
C	-4.94469	3.65986	0.13746	H	4.95111	2.23964	3.22314
C	-4.34524	4.6249	0.95891	H	0.16391	-4.21842	0.5442
C	-2.99387	4.54247	1.25604	H	0.79608	-3.09821	1.78647
C	-1.98971	1.40724	-0.70055	H	0.88095	-4.86992	2.0525
C	-2.29555	0.04292	-0.13989	H	6.96899	-2.18939	-0.32438
C	-2.58701	-0.8038	-1.14049	H	-6.56076	3.07154	-0.70895
C	-2.78866	-2.24567	-1.14821	O	1.23215	2.33716	3.27951
C	-2.45338	-3.03991	-0.1109	O	2.2521	-0.43968	1.63881
C	-2.64591	-4.47606	-0.16543	O	1.05621	-2.16303	-0.91591
C	-2.34354	-5.38332	0.79325	O	-6.26931	3.78356	-0.12108
C	-1.74762	-5.1337	2.15943	O	7.00781	-1.54669	-1.04831
C	-2.68554	-6.78309	0.48828	O	2.63964	1.76938	-1.07073
C	-2.60458	-0.00526	-2.39557	O	-2.30615	1.27449	-2.09477
C	3.88297	2.22862	3.45991	O	-0.97513	-3.96813	2.27874
C	0.27337	-4.05075	1.62915	O	-0.87923	3.5112	1.0614
H	4.94409	-1.64407	0.7002	O	-2.50822	-7.70641	1.25634
H	6.64788	0.31378	-2.74152	O	-2.83149	-0.36584	-3.51901
H	4.70383	1.89442	-2.87451	O	3.19864	2.36801	2.21391

Table S15. Atomic coordinates (Å) of 1l obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	-3.74848	-0.99574	-1.14778	H	-1.58024	-3.33833	0.39568
C	-3.82184	-0.012	-0.1642	H	0.57382	-1.5504	1.59325
C	-4.90461	0.8706	-0.07894	H	0.2777	-2.54665	-1.28218
C	-5.91514	0.73837	-1.02334	H	-0.20616	0.15656	0.08744
C	-5.82985	-0.26031	-2.02048	H	-0.41523	-1.59951	-3.27405
C	-4.756	-1.13633	-2.10174	H	-0.7658	0.051	-4.08316
C	-2.61795	-0.15471	0.64591	H	-1.05184	2.01479	-2.93543
C	-1.79358	-1.25102	-0.05016	H	4.63543	-1.86389	-1.02442
C	-1.2789	-2.39142	0.86965	H	4.96817	-5.42543	1.35908
C	0.2379	-2.2812	0.83406	H	2.52231	-5.2794	1.89608
C	0.51081	-1.74715	-0.55907	H	2.2103	0.18849	0.9241
C	-0.49893	-0.61102	-0.64701	H	3.19113	2.68296	-2.06754
C	-0.67827	0.07113	-1.97284	H	2.0149	2.61163	0.79423
C	-0.61771	-0.53079	-3.16837	H	3.07709	4.8669	-1.09264
C	-0.95077	1.52523	-1.94228	H	2.55322	5.0567	2.89516
C	-1.86829	-2.36482	2.26012	H	1.14114	6.02391	2.44001
C	2.21791	-3.50238	0.73573	H	3.12624	6.96081	-0.51281
C	2.80849	-2.53441	-0.08997	H	-3.624	-3.06811	4.12857
C	4.17575	-2.61695	-0.37773	H	-3.60252	-1.28257	3.93321
C	4.95148	-3.65126	0.13762	H	-4.94643	-2.24839	3.22382
C	4.35361	-4.61757	0.95873	H	-0.89161	4.8712	2.05015
C	3.00209	-4.53756	1.25581	H	-0.17357	4.22016	0.54211
C	1.99258	-1.40384	-0.70038	H	-0.80597	3.09953	1.78389
C	2.29572	-0.03895	-0.13965	H	-6.97353	2.1755	-0.32385
C	2.58567	0.80834	-1.14023	H	6.56674	-3.06052	-0.70886
C	2.78474	2.25058	-1.14783	O	-1.22729	-2.33882	3.27975
C	2.44679	3.04422	-0.11094	O	-2.25224	0.43635	1.63831
C	2.6371	4.48068	-0.16515	O	-1.06089	2.16077	-0.91594
C	2.33276	5.38729	0.79354	O	6.27645	-3.77247	-0.12035
C	1.73636	5.13627	2.15925	O	-7.01007	1.53405	-1.049
C	2.67294	6.78762	0.48913	O	-2.63597	-1.77412	-1.07067
C	2.60491	0.00987	-2.39532	O	2.3088	-1.27044	-2.09456
C	-3.87829	-2.23515	3.46044	O	0.96464	3.97003	2.27722
C	-0.28354	4.0523	1.62699	O	0.88577	-3.50968	1.06159
H	-4.9464	1.63573	0.69939	O	2.49357	7.71054	1.2572
H	-6.64693	-0.3263	-2.74159	O	2.83095	0.37093	-3.51877
H	-4.69987	-1.90334	-2.87434	O	-3.19385	-2.37346	2.2144

Table S16. Atomic coordinates (Å) of 1m obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	3.74785	0.99766	-1.14793	H	1.57832	3.33936	0.39531
C	3.82176	0.01411	-0.16418	H	-0.57452	1.55029	1.59333
C	4.905	-0.8679	-0.07881	H	-0.27922	2.54639	-1.28226
C	5.91532	-0.73539	-1.02338	H	0.20631	-0.15644	0.0875
C	5.82942	0.26301	-2.02076	H	0.41482	1.59991	-3.27382
C	4.75518	1.13855	-2.10204	H	0.76604	-0.05039	-4.08309
C	2.61777	0.15627	0.64588	H	1.05261	-2.01429	-2.93527
C	1.79287	1.25213	-0.05028	H	-4.63665	1.86138	-1.02418
C	1.27762	2.39233	0.86946	H	-4.97109	5.42297	1.35898
C	-0.23913	2.28121	0.83402	H	-2.52519	5.27814	1.89602
C	-0.51186	1.74686	-0.55903	H	-2.2104	-0.18961	0.92435
C	0.49854	0.61132	-0.64695	H	-3.18918	-2.68485	-2.06739
C	0.67825	-0.07072	-1.97277	H	-2.014	-2.6129	0.79481
C	0.61765	0.53125	-3.16826	H	-3.07381	-4.86877	-1.0927
C	0.95109	-1.52474	-1.94216	H	-2.55109	-5.05684	2.895
C	1.86713	2.36632	2.25988	H	-1.13863	-6.02418	2.44118
C	-2.21987	3.50125	0.73572	H	-3.12052	-6.9629	-0.51324
C	-2.80997	2.53289	-0.08987	H	3.6015	1.28469	3.93323
C	-4.17728	2.61473	-0.37761	H	4.94538	2.2502	3.22332
C	-4.9535	3.64876	0.13756	H	3.62307	3.0703	4.1279
C	-4.35615	4.61538	0.95867	H	0.89395	-4.87137	2.0502
C	-3.00459	4.53603	1.25576	H	0.17599	-4.21997	0.54226
C	-1.99349	1.4027	-0.70022	H	0.80814	-3.09963	1.78439
C	-2.29597	0.0377	-0.13942	H	6.97439	-2.17199	-0.32388
C	-2.58535	-0.80984	-1.13994	H	-6.5682	3.05721	-0.70931
C	-2.78345	-2.2522	-1.14752	O	1.2262	2.34041	3.27956
C	-2.44533	-3.04568	-0.11055	O	2.25243	-0.43477	1.63843
C	-2.63442	-4.48228	-0.16503	O	1.06083	-2.16027	-0.91577
C	-2.32944	-5.38867	0.79365	O	-6.27847	3.76932	-0.12071
C	-1.73384	-5.13681	2.15958	O	7.01062	-1.53055	-1.04904
C	-2.6678	-6.78937	0.4889	O	2.63497	1.77552	-1.07085
C	-2.60502	-0.01146	-2.39509	O	-2.30967	1.26905	-2.0944
C	3.87726	2.23707	3.46007	O	-0.96238	-3.97036	2.27733
C	0.28583	-4.05241	1.62719	O	-0.8877	3.50933	1.06147
H	4.94727	-1.63286	0.69966	O	-2.48766	-7.71224	1.25685
H	6.64634	0.32916	-2.74204	O	-2.83095	-0.37271	-3.5185
H	4.69857	1.90534	-2.87481	O	3.1927	2.37495	2.21404

Table S17. Atomic coordinates (Å) of 1n obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	3.77455	0.92109	-1.14388	H	1.65046	3.3107	0.39397
C	3.82511	-0.06427	-0.16049	H	-0.5403	1.56742	1.59078
C	4.88725	-0.9716	-0.07492	H	-0.21902	2.55095	-1.28607
C	5.90106	-0.86238	-1.01892	H	0.21024	-0.15724	0.09107
C	5.83968	0.13933	-2.01493	H	0.47112	1.58457	-3.27466
C	4.78603	1.03948	-2.09668	H	0.78199	-0.07626	-4.07883
C	2.62523	0.10649	0.65012	H	1.01223	-2.04456	-2.92362
C	1.82465	1.21883	-0.04789	H	-4.59135	1.94412	-1.02654
C	1.33042	2.37049	0.869	H	-4.86318	5.51463	1.35162
C	-0.18845	2.28982	0.83078	H	-2.41894	5.33167	1.88348
C	-0.46902	1.75781	-0.56167	H	-2.20821	-0.14675	0.91594
C	0.51911	0.60216	-0.64544	H	-3.23042	-2.6179	-2.08284
C	0.68625	-0.08877	-1.96849	H	-2.07641	-2.56954	0.78804
C	0.64568	0.51124	-3.16588	H	-3.16684	-4.80538	-1.10604
C	0.922	-1.54931	-1.93218	H	-2.69039	-5.00841	2.88895
C	1.91658	2.33401	2.26063	H	-1.28761	-5.99419	2.44555
C	-2.14524	3.5467	0.72745	H	-3.26707	-6.89708	-0.52207
C	-2.75283	2.58718	-0.09575	H	3.62063	1.21464	3.93932
C	-4.11915	2.69067	-0.38135	H	4.98868	2.14744	3.232
C	-4.8778	3.73716	0.13499	H	3.68359	2.99934	4.13239
C	-4.26235	4.69633	0.95164	H	0.07111	-4.20193	0.56424
C	-2.9116	4.59592	1.24593	H	0.70819	-3.09707	1.81754
C	-1.95635	1.44271	-0.70613	H	0.76419	-4.87114	2.07581
C	-2.28734	0.08344	-0.14774	H	6.9236	-2.32923	-0.32573
C	-2.59224	-0.75669	-1.15006	H	-6.5091	3.16408	-0.69466
C	-2.82179	-2.19433	-1.16002	O	1.27298	2.32591	3.27895
C	-2.50883	-2.99453	-0.12039	O	2.24658	-0.47591	1.64281
C	-2.72867	-4.42666	-0.17453	O	1.01461	-2.18404	-0.90369
C	-2.45432	-5.33755	0.78916	O	-6.20188	3.8781	-0.11738
C	-1.86744	-5.09757	2.16089	O	6.97683	-1.68376	-1.0462
C	-2.82195	-6.73081	0.48467	O	2.67913	1.72364	-1.06744
C	-2.59237	0.04334	-2.40427	O	-2.27172	1.31714	-2.1013
C	3.91992	2.15976	3.46593	O	-1.08022	-3.94291	2.2896
C	0.17283	-4.04099	1.6509	O	-0.81317	3.53103	1.0535
H	4.9114	-1.73829	0.70267	O	-2.6727	-7.65479	1.25787
H	6.65883	0.18725	-2.73513	O	-2.82336	-0.31179	-3.52861
H	4.74814	1.80816	-2.86876	O	3.24203	2.31224	2.21797

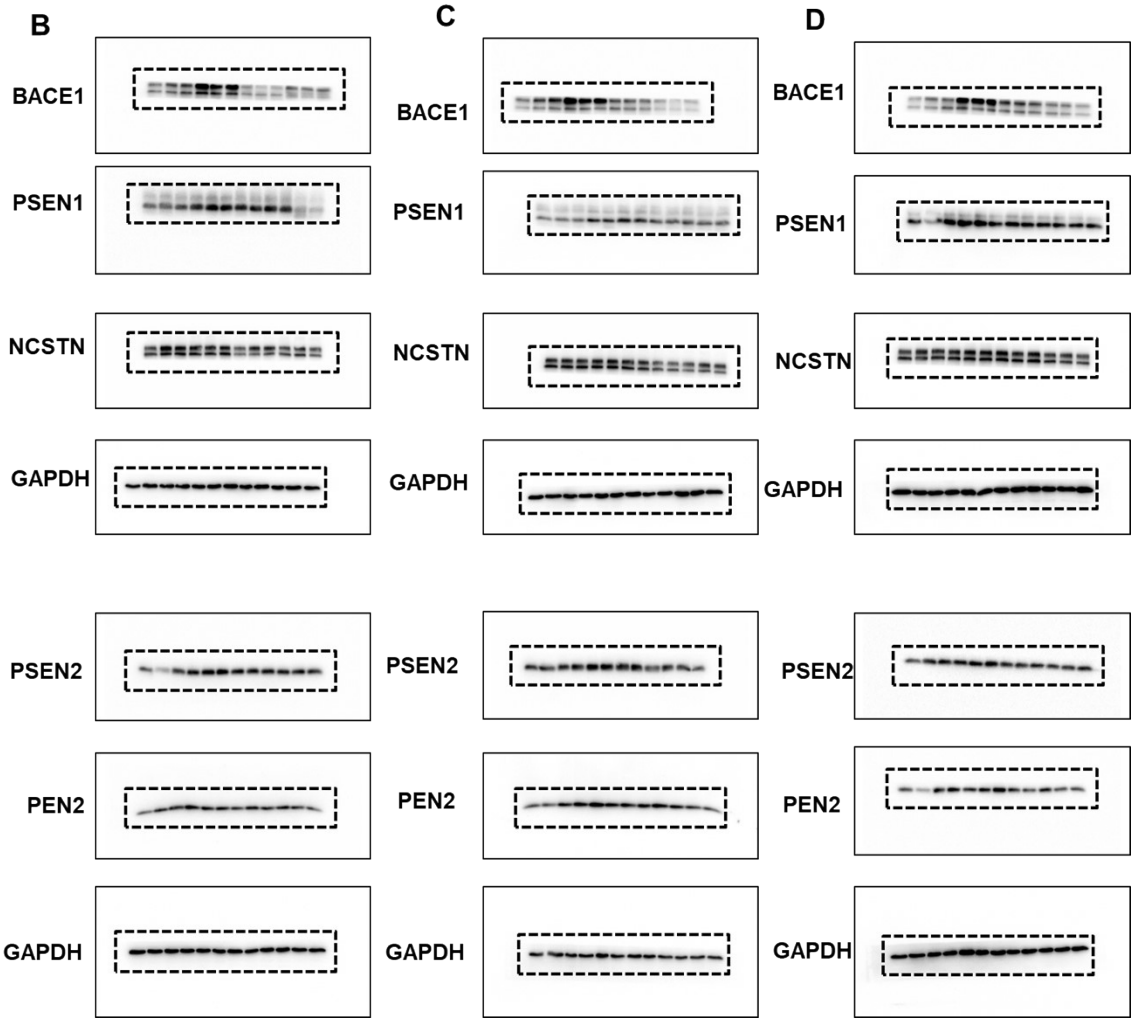
Table S18. Atomic coordinates (Å) of 1o obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

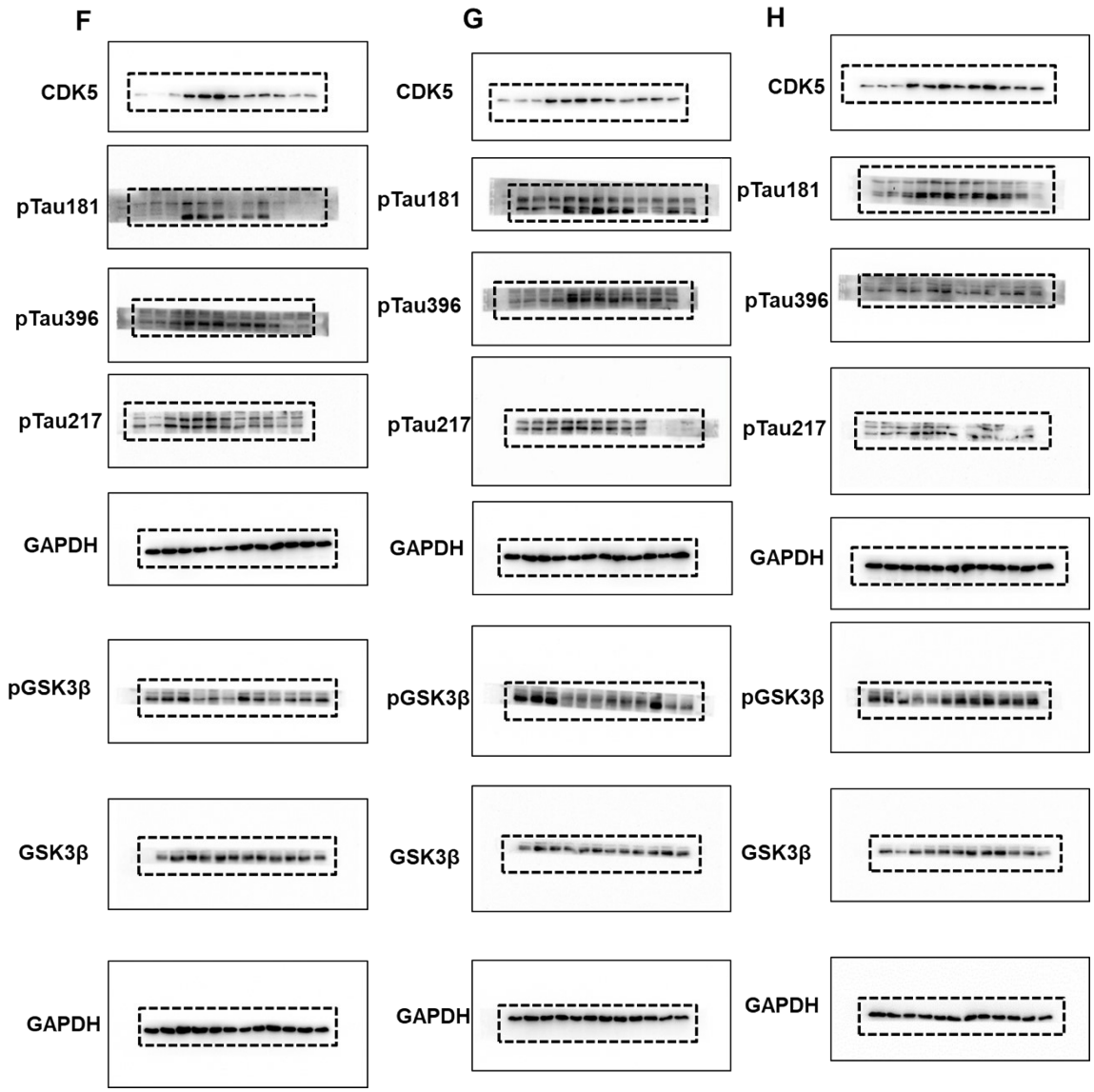
C	-3.68738	-1.16572	-1.15088	H	-1.37613	-3.43583	0.3087
C	-3.79555	-0.20763	-0.1454	H	0.65148	-1.5463	1.57216
C	-4.91748	0.62097	-0.02965	H	0.44639	-2.51833	-1.31955
C	-5.93179	0.45998	-0.9659	H	-0.20344	0.14048	0.06775
C	-5.8106	-0.5116	-1.98567	H	-0.26612	-1.60177	-3.30172
C	-4.69763	-1.33364	-2.09733	H	-0.72835	0.02328	-4.10539
C	-2.57711	-0.31147	0.64887	H	-1.17205	1.9534	-2.94881
C	-1.71062	-1.35323	-0.07912	H	4.76188	-1.56618	-0.98349
C	-1.13783	-2.48664	0.81345	H	5.27613	-5.12456	1.37242
C	0.3693	-2.28431	0.79811	H	2.82389	-5.14508	1.85825
C	0.62362	-1.71518	-0.58475	H	2.1862	0.30946	0.9281
C	-0.45085	-0.63965	-0.66997	H	3.04168	2.87849	-2.03899
C	-0.66604	0.03606	-1.99375	H	1.83698	2.71992	0.80748
C	-0.5477	-0.55155	-3.19208	H	2.78235	5.0446	-1.05698
C	-1.04737	1.46528	-1.95771	H	2.20099	5.18502	2.92343
C	-1.74068	-2.53785	2.19694	H	0.73694	6.06556	2.45645
C	2.42168	-3.37894	0.71269	H	2.69046	7.13628	-0.47123
C	2.96178	-2.3638	-0.09371	H	-3.53224	-1.59801	3.8948
C	4.33394	-2.35121	-0.35542	H	-4.83073	-2.58372	3.1298
C	5.17039	-3.33541	0.16654	H	-3.48679	-3.38976	4.01489
C	4.62403	-4.34992	0.96289	H	-1.21396	4.79426	2.02809
C	3.26266	-4.36454	1.23481	H	-0.43715	4.18169	0.53313
C	2.08403	-1.28236	-0.70747	H	-1.0196	3.02979	1.77103
C	2.29693	0.09476	-0.13603	H	-7.05438	1.82569	-0.22286
C	2.5433	0.96476	-1.12865	H	6.96445	-4.00105	0.2985
C	2.65163	2.41661	-1.12651	O	-1.11043	-2.52505	3.22351
C	2.25246	3.18253	-0.09049	O	-2.22836	0.27332	1.65108
C	2.3549	4.6282	-0.13673	O	-1.21819	2.08318	-0.92883
C	1.98313	5.51041	0.82095	O	6.49294	-3.26762	-0.12273
C	1.38854	5.21736	2.17908	O	-7.06457	1.20137	-0.96344
C	2.23716	6.93063	0.5246	O	-2.53871	-1.89249	-1.10237
C	2.62637	0.17667	-2.38772	O	2.40665	-1.1213	-2.09721
C	-3.76635	-2.53953	3.37933	O	0.6889	4.00549	2.28499
C	-0.55247	4.01134	1.61707	O	1.0873	-3.47504	1.01499
H	-4.98668	1.36625	0.76579	O	1.98951	7.83768	1.29265
H	-6.63191	-0.60078	-2.69942	O	2.84227	0.55787	-3.50645
H	-4.61406	-2.08043	-2.88703	O	-3.06441	-2.59872	2.13661

Table S19. Atomic coordinates (Å) of 1p obtained at the Cam-B3LYP/6-311+G(d,p) level of theory in the MeOH.

C	3.02786	-2.39154	-1.20944	H	3.78789	0.96676	-0.4796
C	2.7672	-2.88826	0.06524	H	1.62914	1.79267	1.49653
C	2.91893	-4.24444	0.37669	H	1.43503	1.56988	-1.54572
C	3.3346	-5.09344	-0.6419	H	0.40176	-0.18601	0.7482
C	3.58968	-4.58047	-1.93459	H	0.86898	-0.18592	-3.04778
C	3.4419	-3.23448	-2.24032	H	-0.51531	-1.43829	-3.18754
C	2.36523	-1.74367	0.87463	H	-1.60918	-2.33738	-1.42183
C	2.32446	-0.55474	-0.10004	H	-1.65805	4.56825	-0.7844
C	3.10633	0.71246	0.34642	H	1.45829	7.45785	-0.13957
C	2.06088	1.8099	0.47885	H	3.07991	5.5941	0.28983
C	1.01185	1.41136	-0.53914	H	-0.79972	1.96639	1.77503
C	0.84497	-0.07635	-0.25497	H	-3.24579	0.8466	2.08822
C	0.01035	-0.87129	-1.21999	H	-4.40464	-0.01949	-0.63725
C	0.13449	-0.82673	-2.55416	H	-5.20467	-0.48487	2.362
C	-1.04336	-1.75135	-0.6643	H	-7.51066	-2.07593	-0.76533
C	3.94642	0.50394	1.58468	H	-6.07554	-1.16518	-1.28988
C	1.62207	4.05059	-0.00876	H	-7.75609	-2.96872	1.44234
C	0.28462	3.75618	-0.31316	H	6.17159	-1.73817	2.24624
C	-0.61673	4.80108	-0.54418	H	6.19662	-0.05599	2.88613
C	-0.20077	6.12783	-0.48378	H	4.8901	-1.18401	3.38308
C	1.13833	6.4157	-0.18482	H	-4.0567	-4.10253	-1.24723
C	2.03538	5.38574	0.05307	H	-4.1344	-2.39204	-1.77668
C	-0.20597	2.31906	-0.40573	H	-3.93664	-2.79254	-0.03742
C	-1.10392	1.90845	0.72901	H	3.31844	-6.67431	0.44568
C	-2.25468	1.40926	0.2481	H	-1.9295	6.84567	-0.90488
C	-3.32644	0.77847	0.999	O	3.86928	1.163	2.59021
C	-4.33219	0.06739	0.44818	O	2.07661	-1.6635	2.04807
C	-5.28112	-0.64353	1.28017	O	-1.30125	-1.84026	0.51655
C	-6.21881	-1.51635	0.84531	O	-1.03928	7.1699	-0.70387
C	-6.43458	-1.93473	-0.5864	O	3.51468	-6.42416	-0.46931
C	-7.03831	-2.22413	1.85552	O	2.8488	-1.04885	-1.327
C	-2.19328	1.53613	-1.23733	O	-1.03337	2.14207	-1.56368
C	5.55883	-0.88884	2.56295	O	-5.82367	-3.17991	-0.86068
C	-4.42223	-3.10204	-0.98029	O	2.57822	3.09448	0.22036
H	2.71367	-4.61806	1.38225	O	-6.97113	-2.04149	3.05273
H	3.91285	-5.28482	-2.70354	O	-2.9793	1.18503	-2.07627
H	3.64299	-2.8492	-3.24003	O	4.78761	-0.50851	1.42241

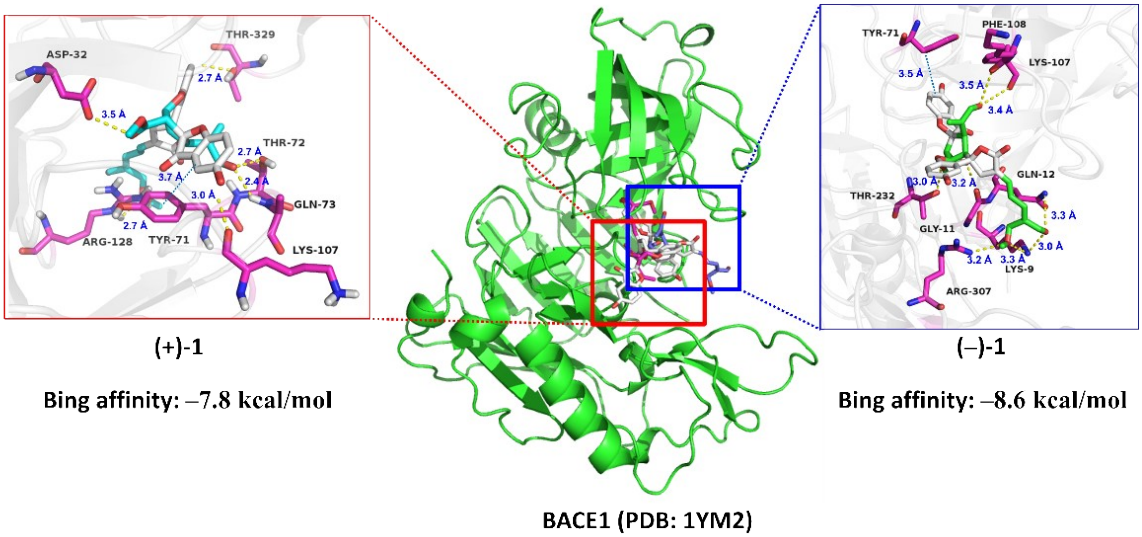
Figure S17. Uncropped images of western blot





Note: B–D and F–H are corresponding to the B–D and F–H in Figure 4 of paper.

Figure S18. The molecular docking mode of (+)-1 and (–)-1 with BACE1.



Molecular docking method: The crystal structures of BACE1 (PDB code: 1YM2)was used for preparing the new docking templates through Swiss-model server.[26] After removed the peptide and inhibitors, hydrogens were added for new models. The best confirmation was refined with energy minimization and molecular docking was performed by Autodock Vina with center box: x = 33.469, y = 0.459, z = 20.935 and the dimensions: 58 × 56 × 50 Å for BACE1. The docking results were analyzed and shown with Discovery Studio® Visualizer (BIOVIA, San Diego, USA) and PyMOL software (Schrödinger, LLC: NY, USA).

Results: The further molecular docking experiment displayed that (+)-**1** can form eight hydrogen bonds with residue PHE108, LYS107, GLN32, LYS9, ARG307, and THR232, as well as one hydrophobic bond with TYR71. Meanwhile, (–)-**1** had six hydrogen bonds with THR329, THR72, GLN73, LYS107, AGR128, and ASP32, as well as one hydrophobic bond with TYR71. Moreover, the binding energy of (–)-**1** was -8.6 kcal/mol, while that of (+)-**1** was -7.8 kcal/mol, which suggested that the binding effect of (–)-**1** was stronger than that of (+)-**1**.

Scheme S1. The proposal biosynthetic pathway for (±)-1.