

Supporting information

Neolignan Constituents with Potential Beneficial Effects in Prevention of Type 2 Diabetes from *Viburnum fordiae* Hance Fruits

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Supplementary Material

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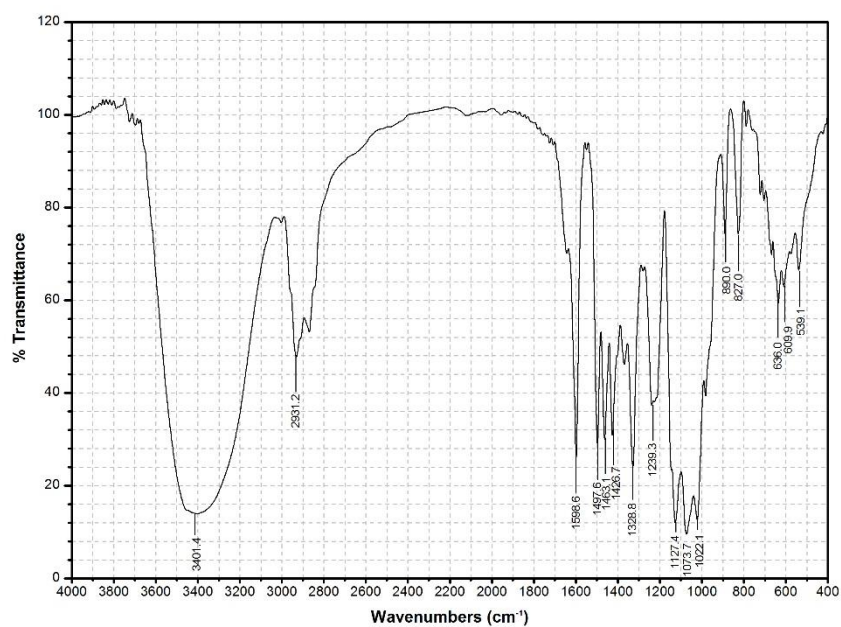


Figure S1. The IR Spectrum of Compound **1**.

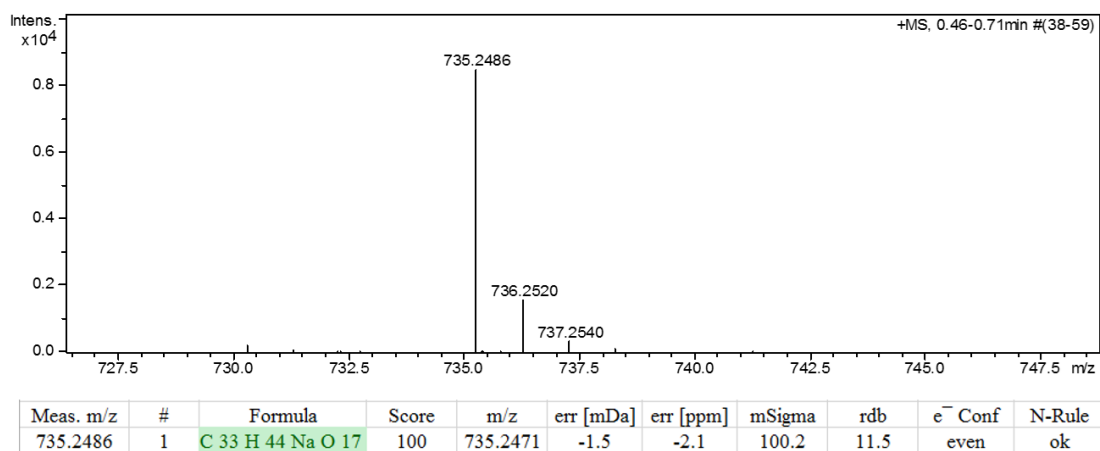


Figure S2. The (+)-HRESIMS Spectrum of Compound **1**.

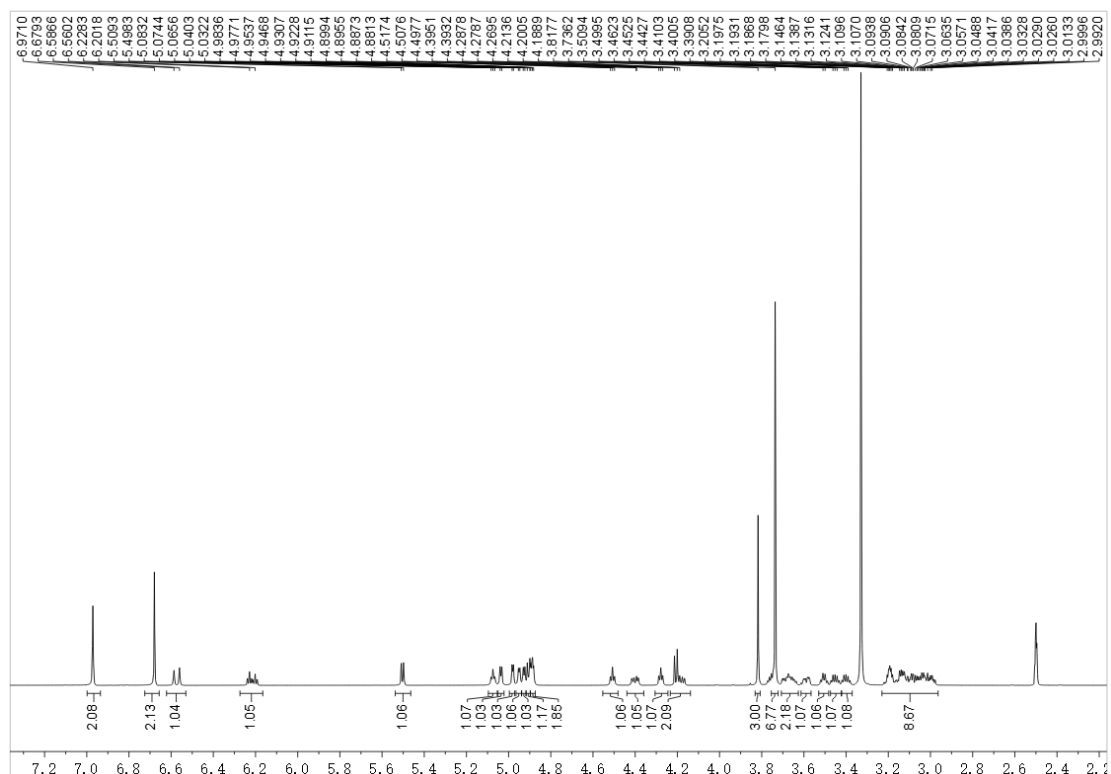


Figure S3. The ^1H NMR Spectrum of Compound **1** in $\text{DMSO-}d_6$.

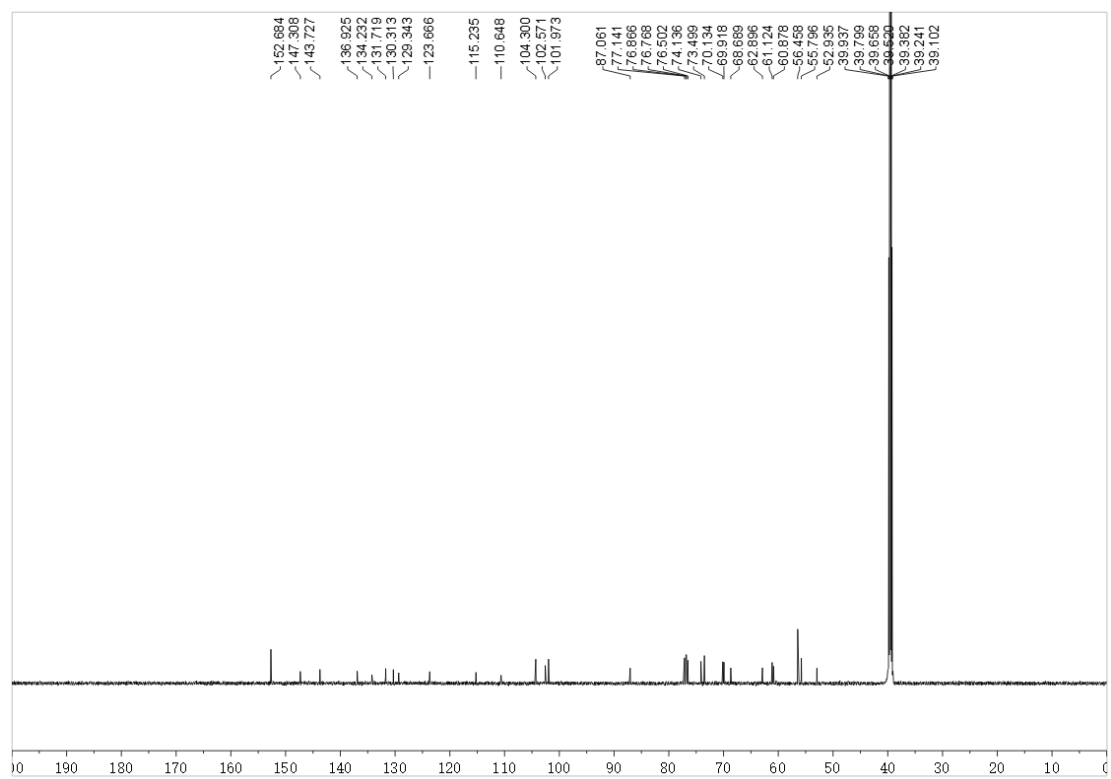


Figure S4. The ^{13}C NMR Spectrum of Compound **1** in $\text{DMSO-}d_6$.

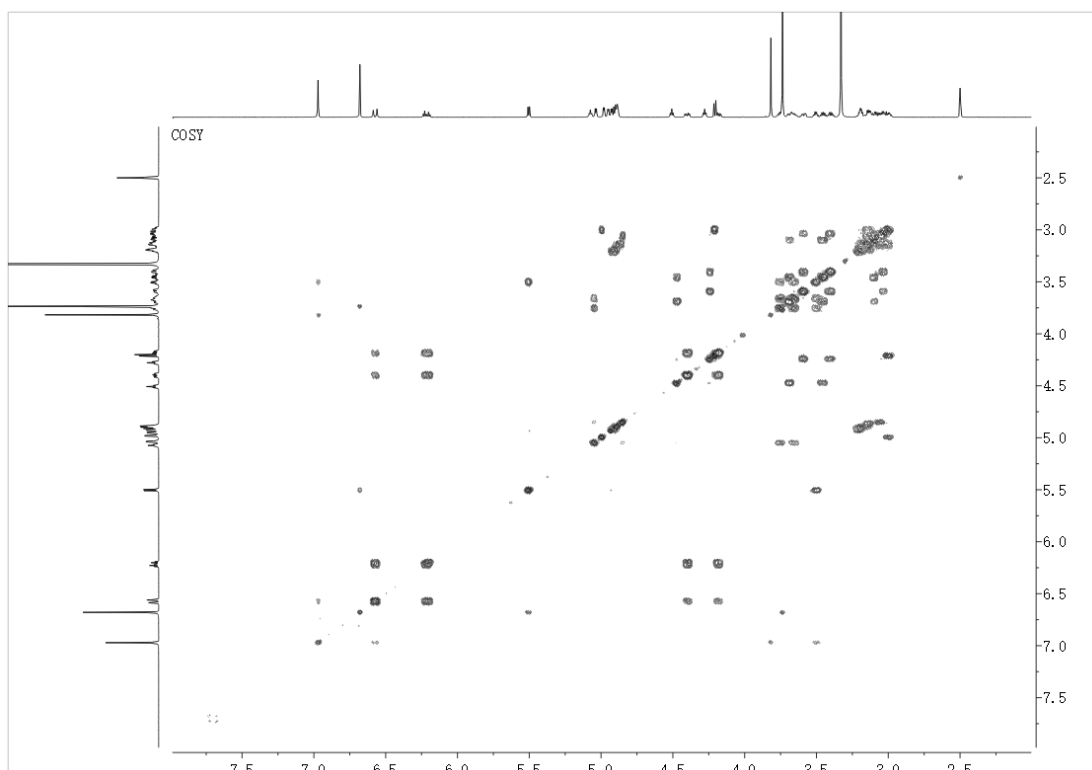


Figure S5. The ^1H - ^1H COSY Spectrum of Compound **1** in $\text{DMSO}-d_6$.

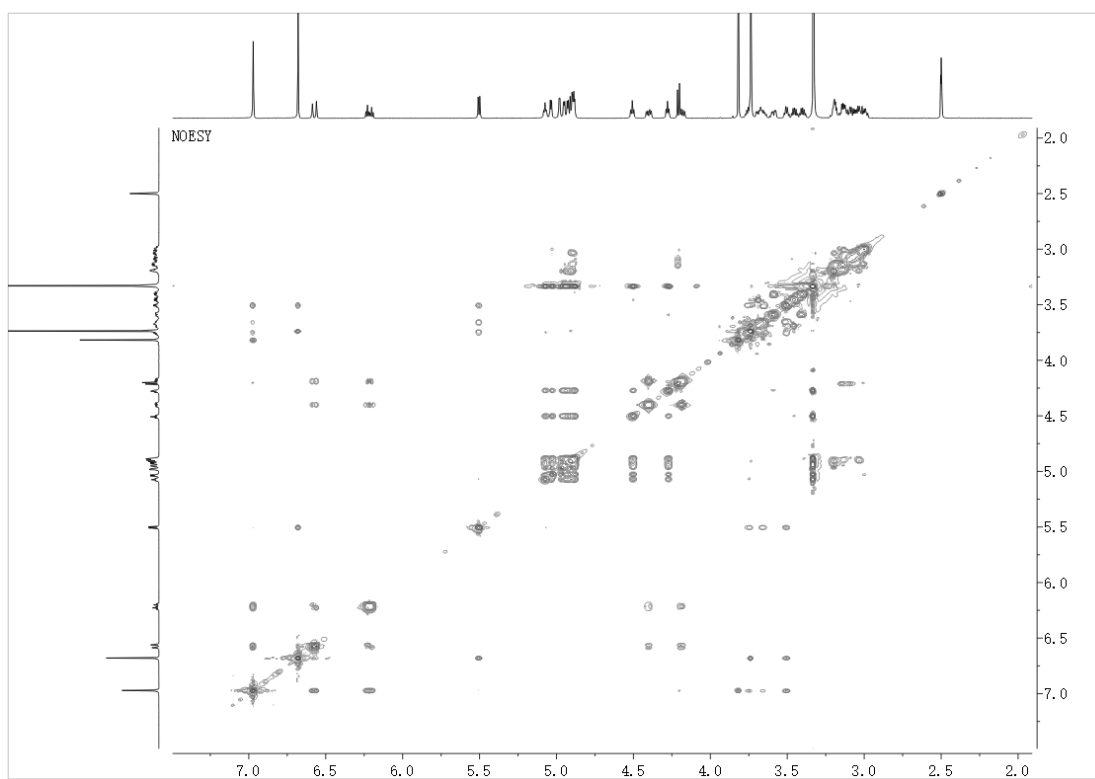


Figure S6. The NOESY Spectrum of Compound **1** in $\text{DMSO}-d_6$.

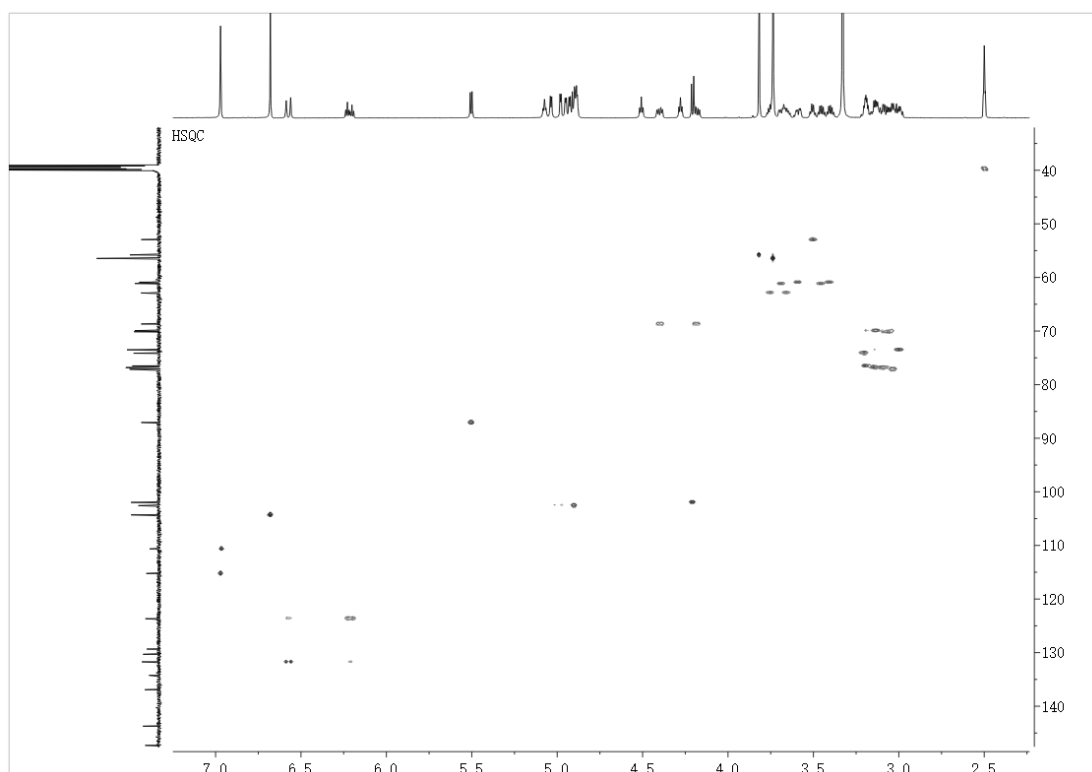


Figure S7. The HSQC Spectrum of Compound **1** in DMSO- d_6 .

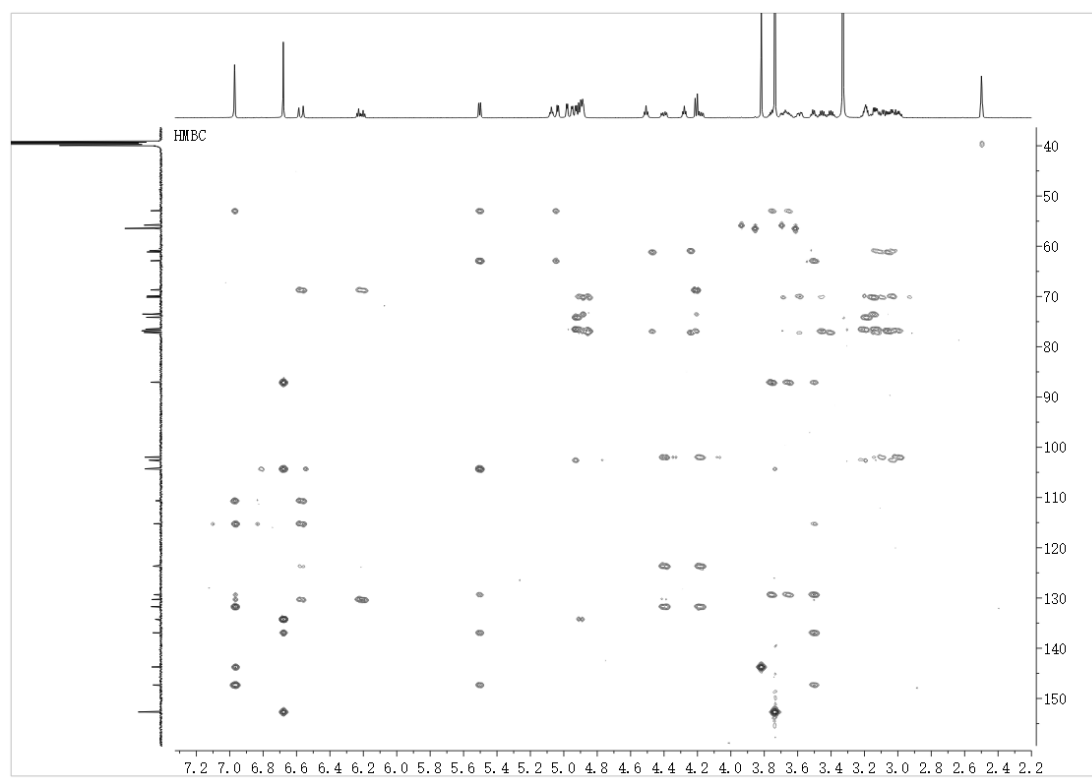


Figure S8. The HMBC Spectrum of Compound **1** in DMSO- d_6 .

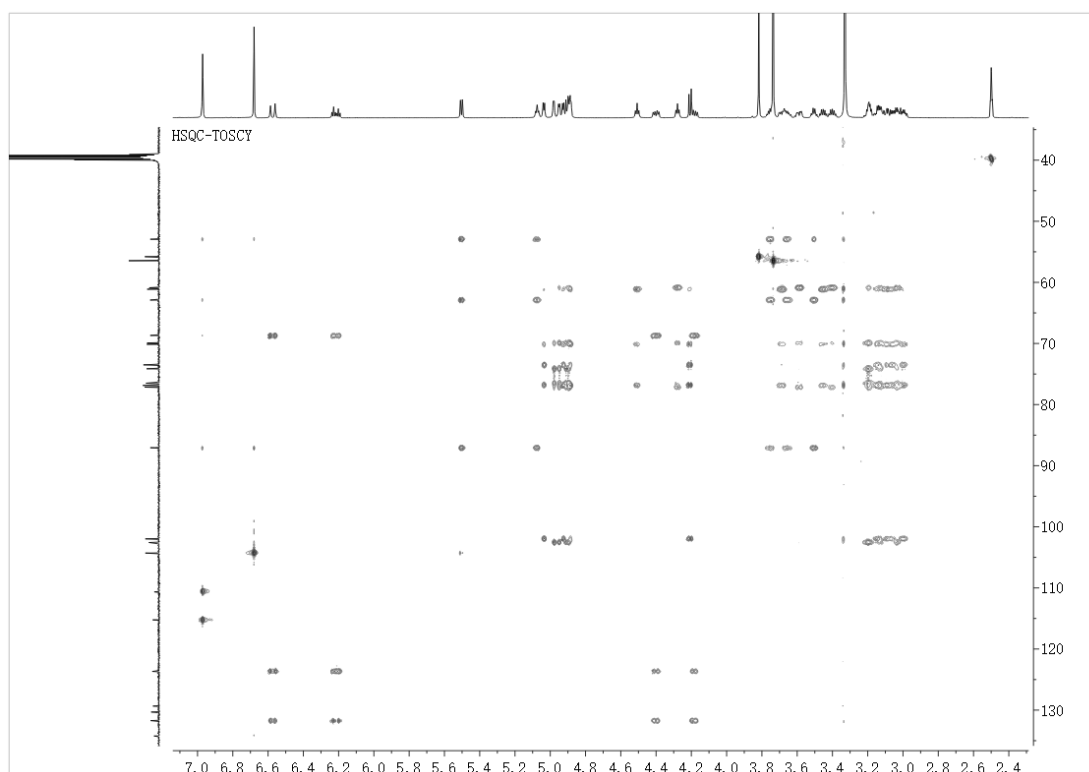


Figure S9. The HSQC-TOCSY Spectrum of Compound **1** in DMSO- d_6 .

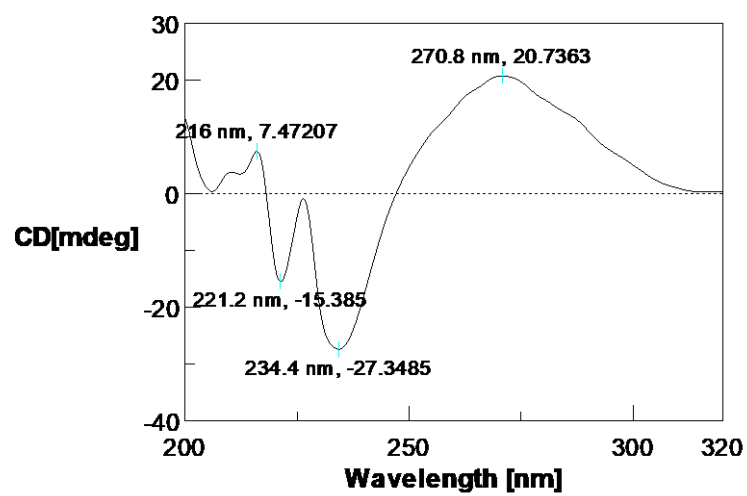


Figure S10. The CD Spectrum of Compound **1** in MeOH.

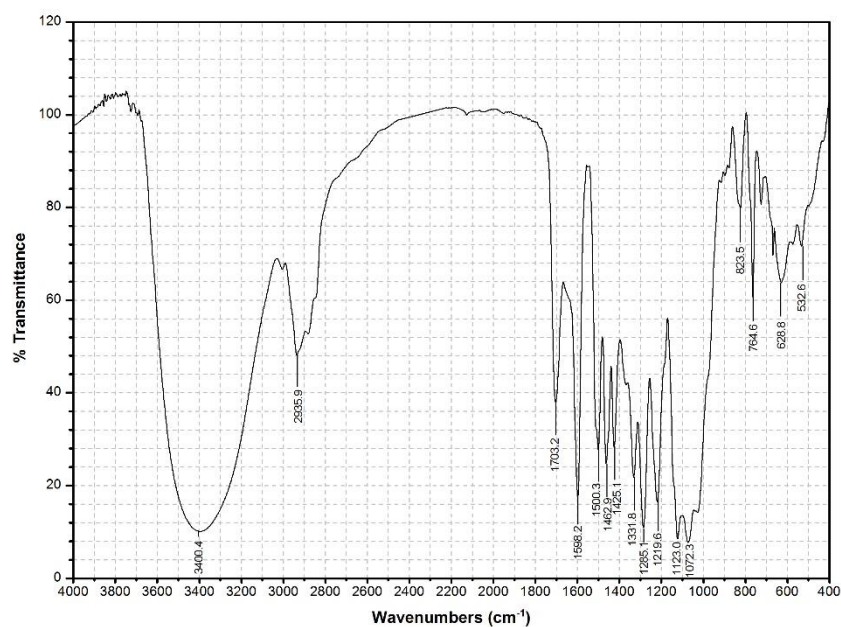


Figure S11. The IR Spectrum of Compound **2**.

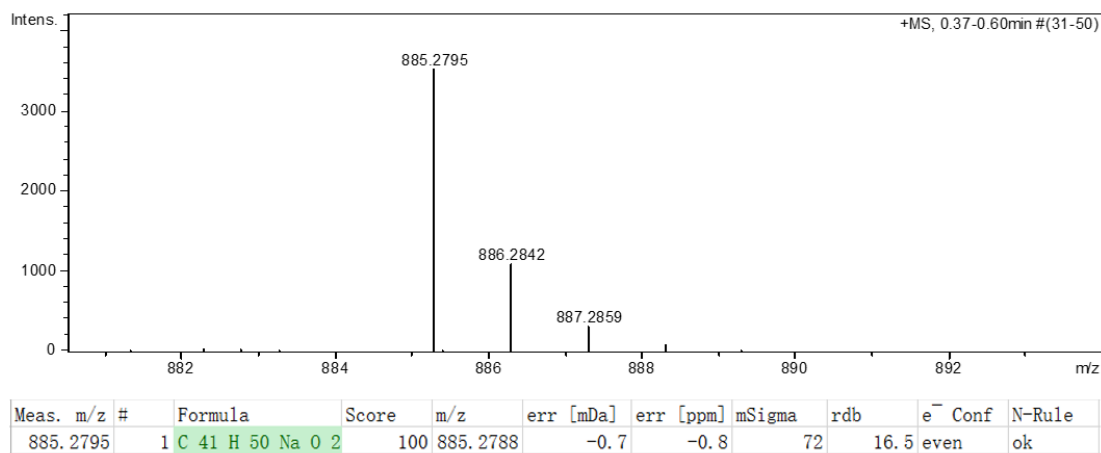
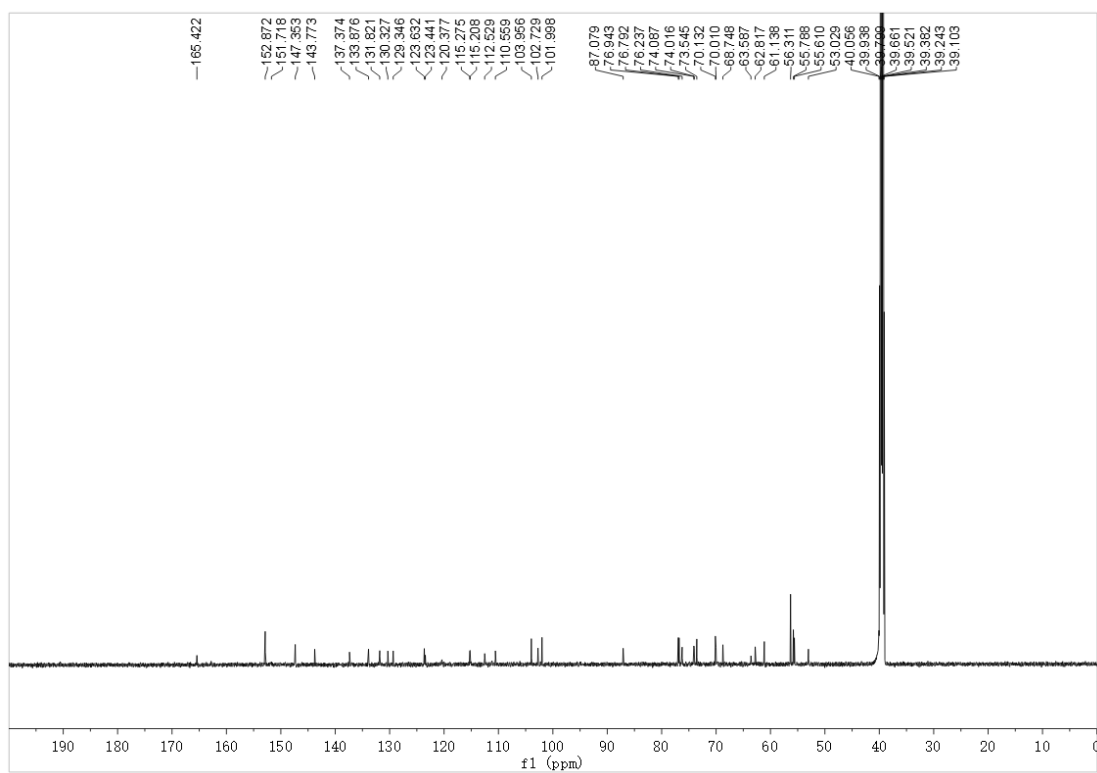
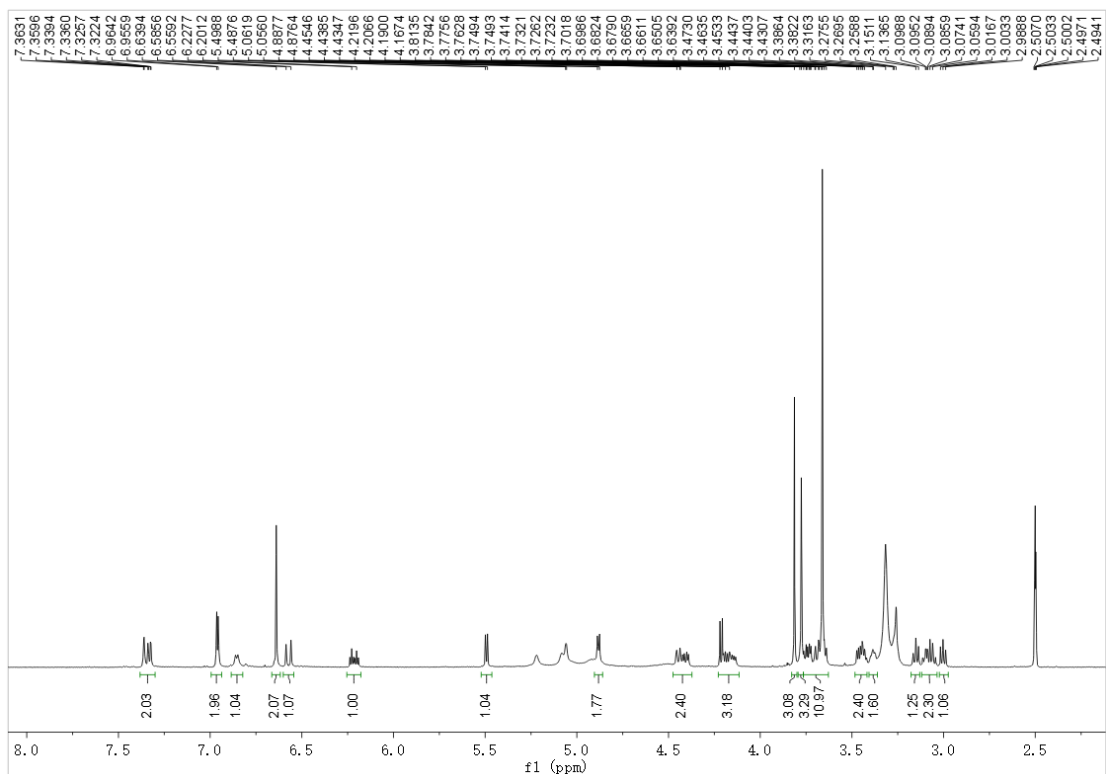


Figure S12. The (+)-HRESIMS Spectrum of Compound **2**.



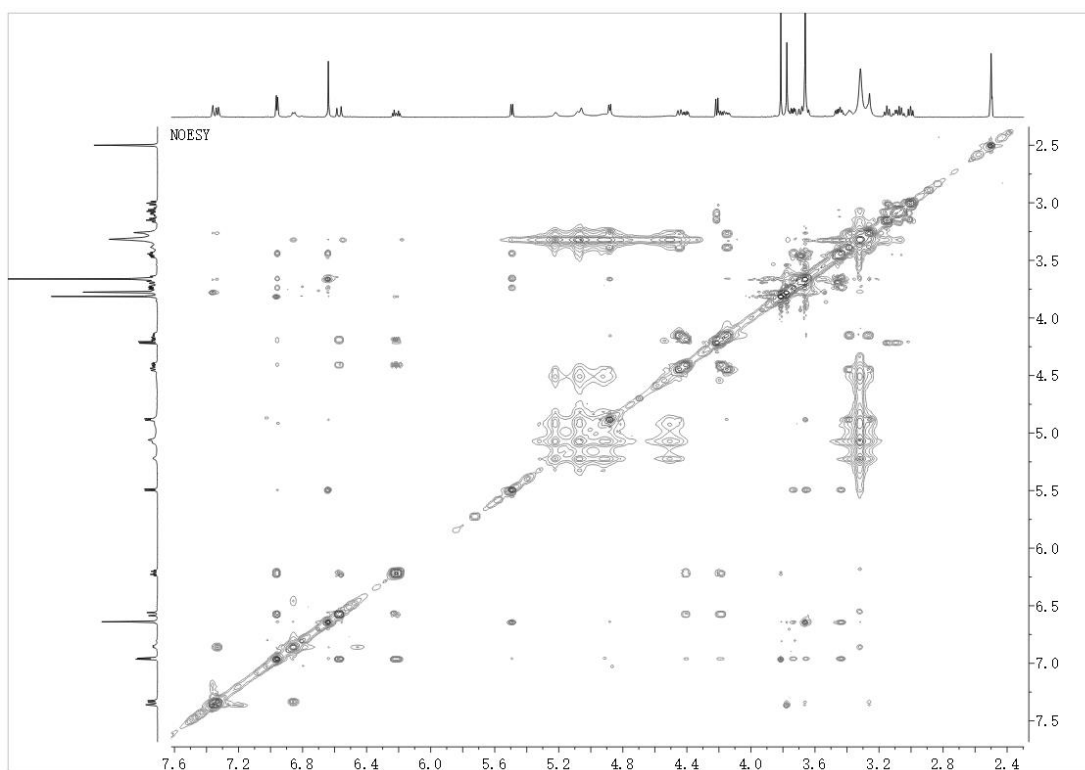


Figure S15. The NOESY Spectrum of Compound **2** in DMSO- d_6 .

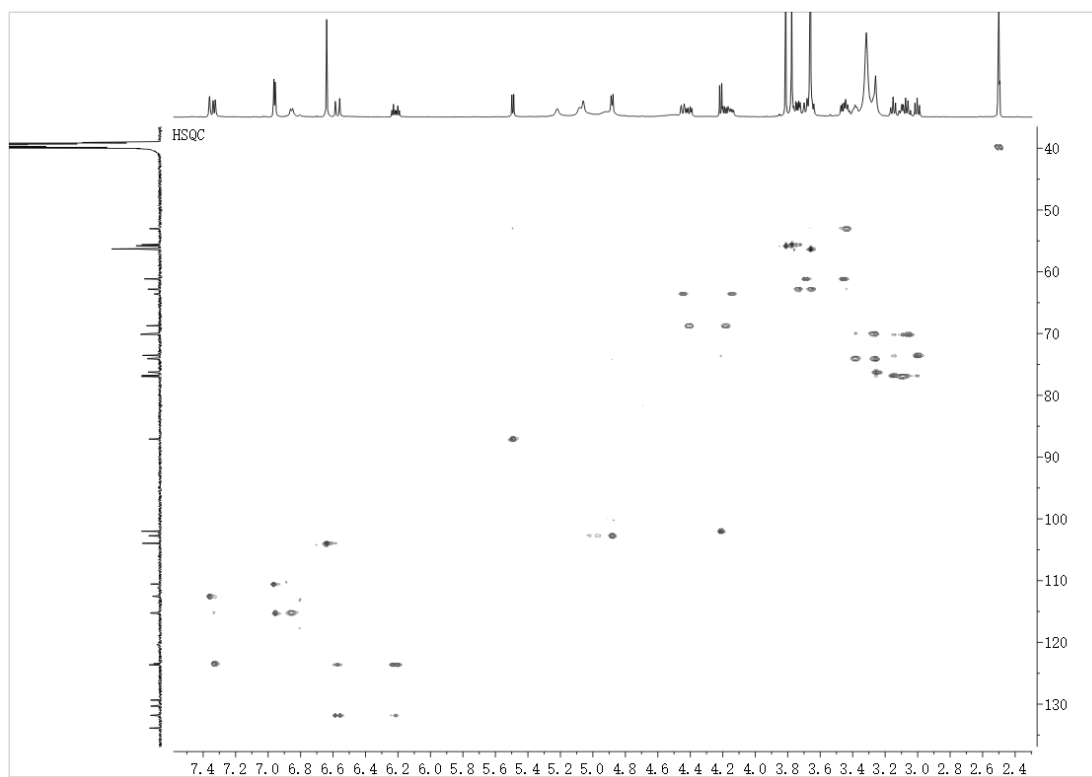


Figure S16. The HSQC Spectrum of Compound **2** in DMSO- d_6 .

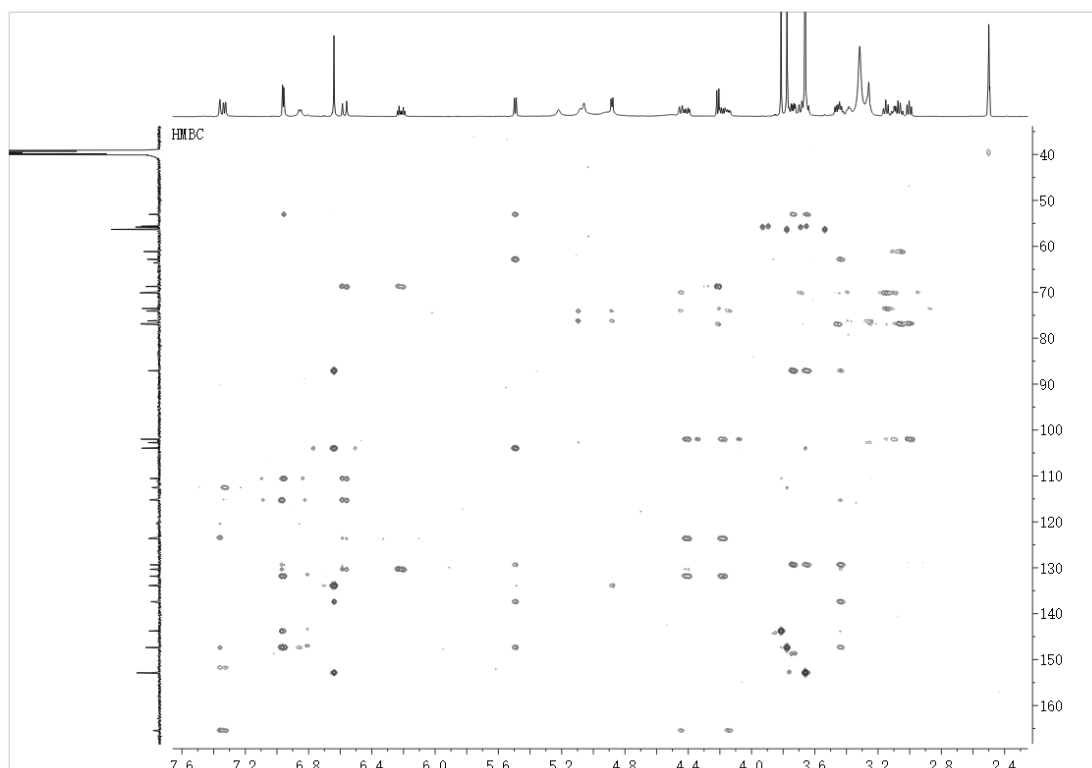


Figure S17. The HMBC Spectrum of Compound **2** in DMSO- d_6 .

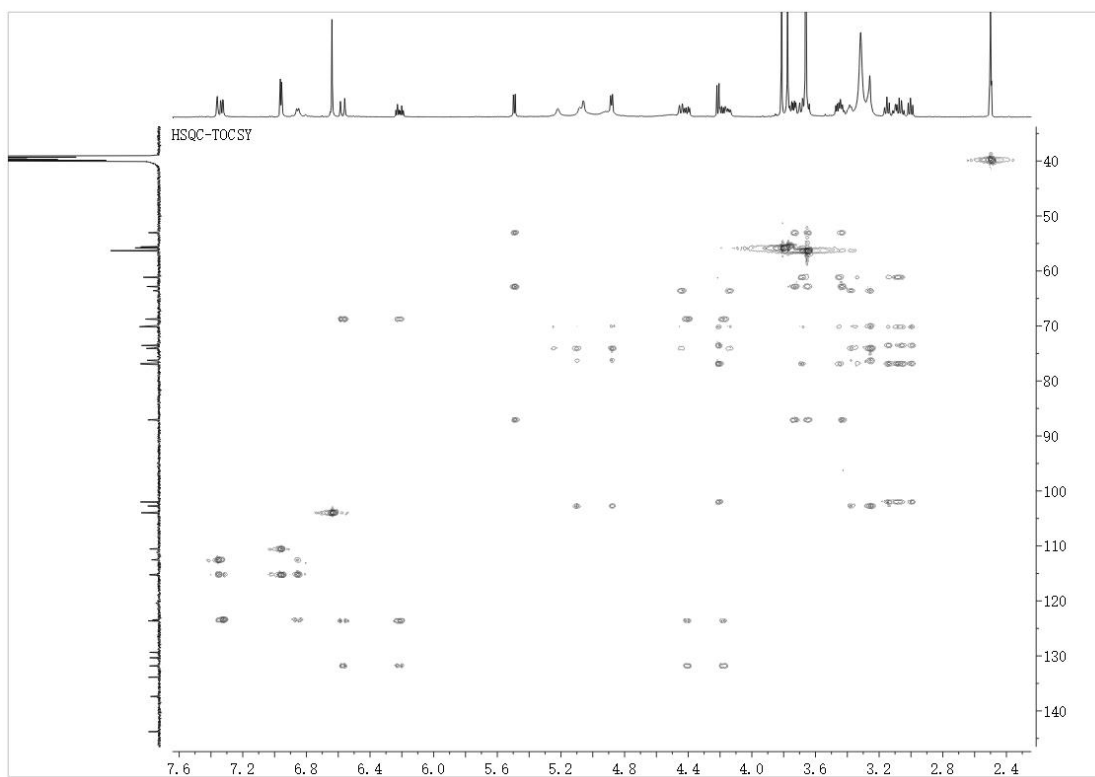


Figure S18. The HSQC-TOCSY Spectrum of Compound **2** in DMSO- d_6 .

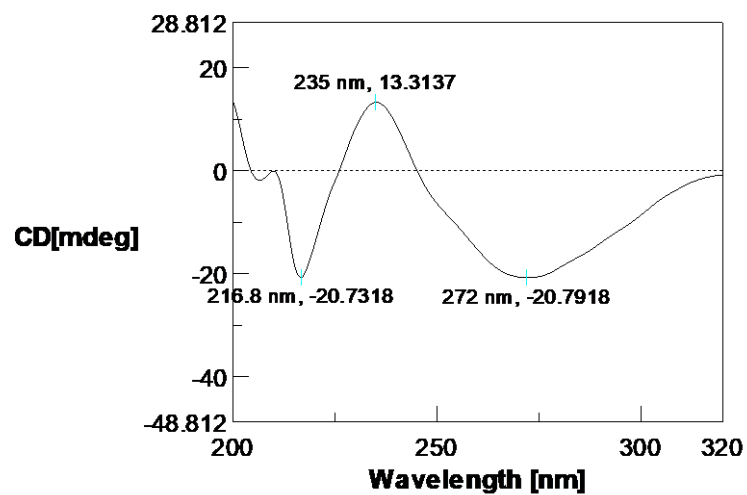


Figure S19. The CD Spectrum of Compound **2** in MeOH.

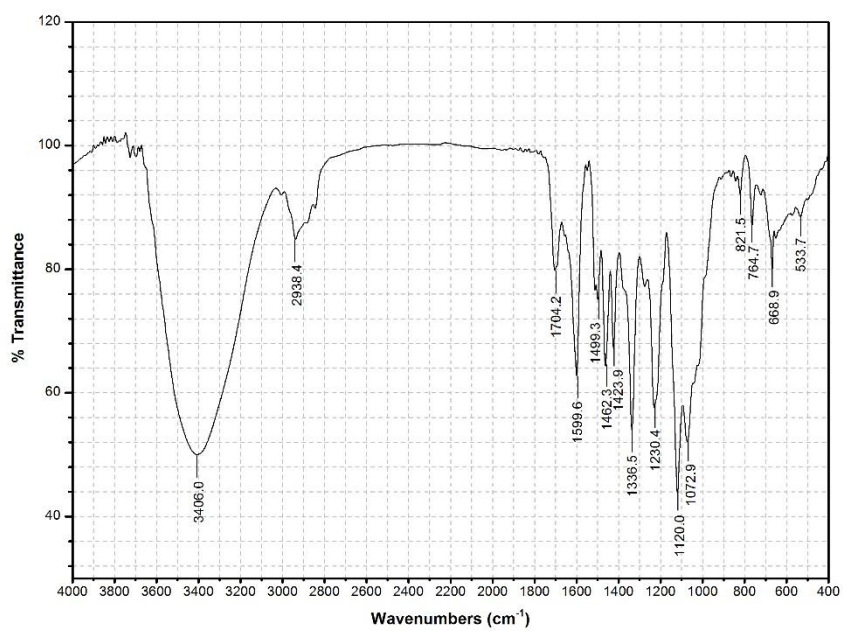


Figure S20. The IR Spectrum of Compound **3**.

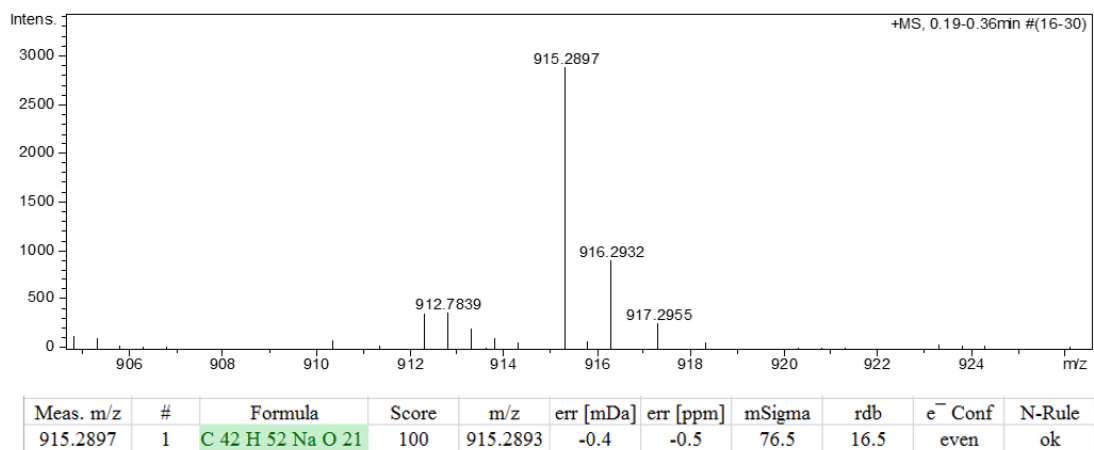


Figure S21. The (+)-HRESIMS Spectrum of Compound **3**.

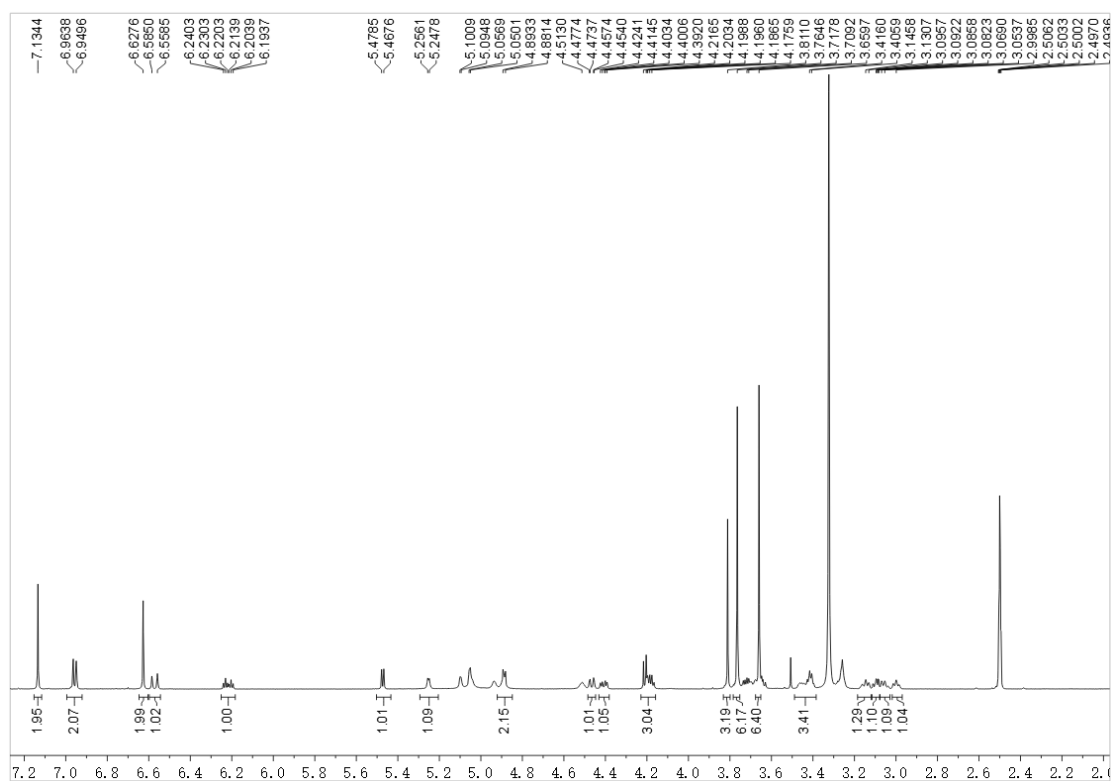


Figure S22. The ¹H NMR Spectrum of Compound **3** in DMSO-*d*₆.

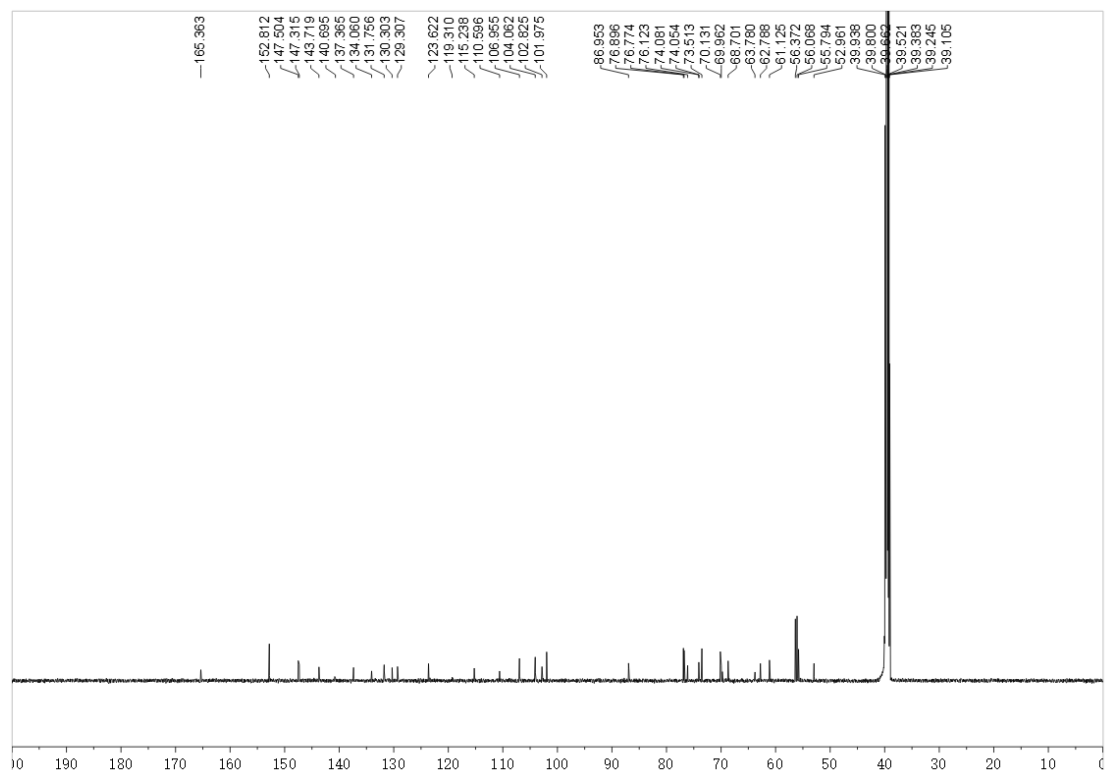


Figure S23. The ^{13}C NMR Spectrum of Compound **3** in $\text{DMSO}-d_6$.

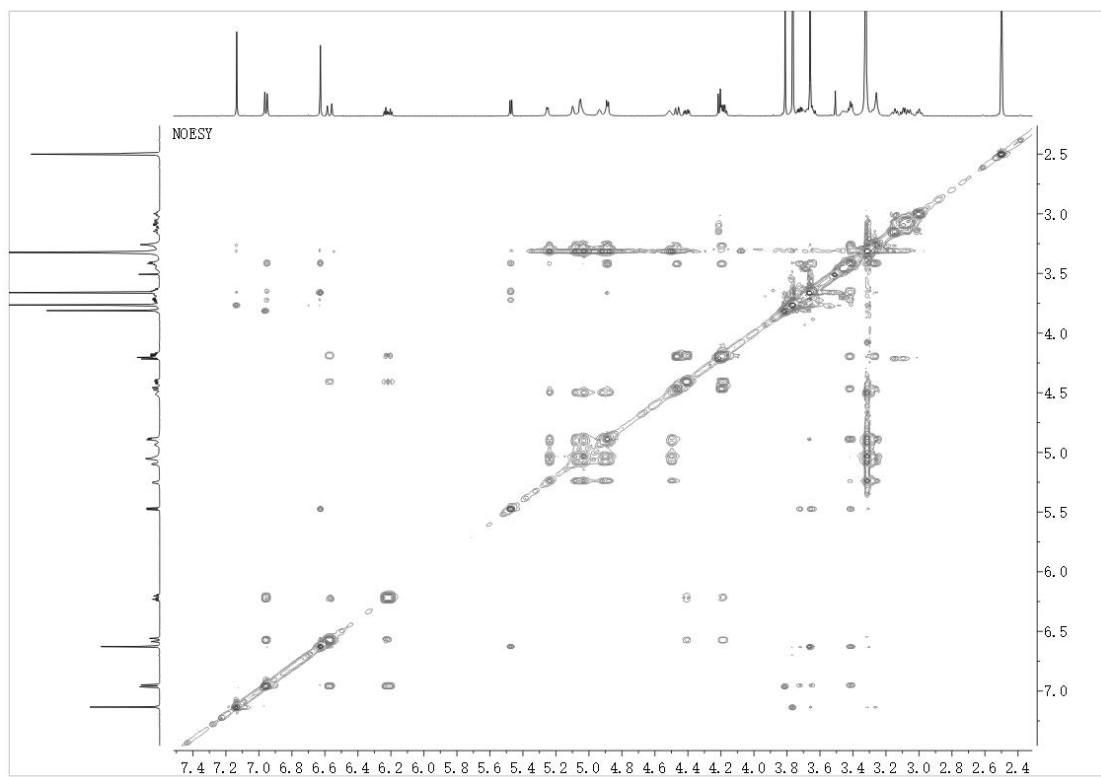


Figure S24. The NOESY Spectrum of Compound **3** in $\text{DMSO}-d_6$.

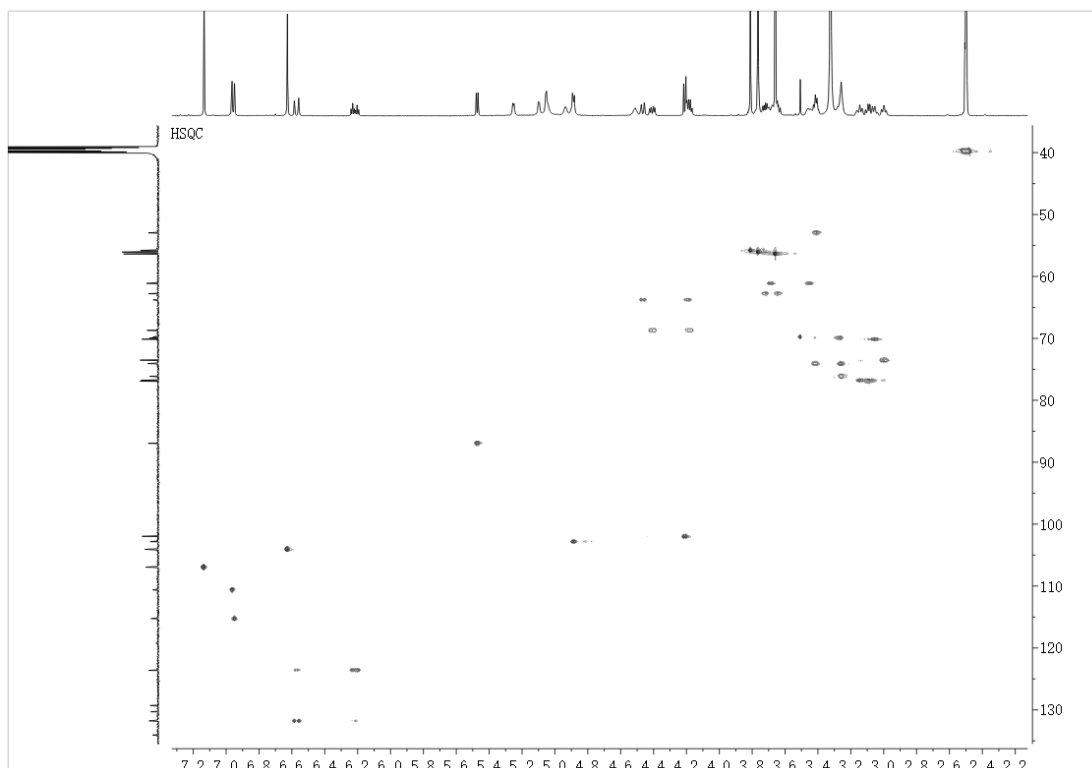


Figure S25. The HSQC Spectrum of Compound **3** in DMSO- d_6 .

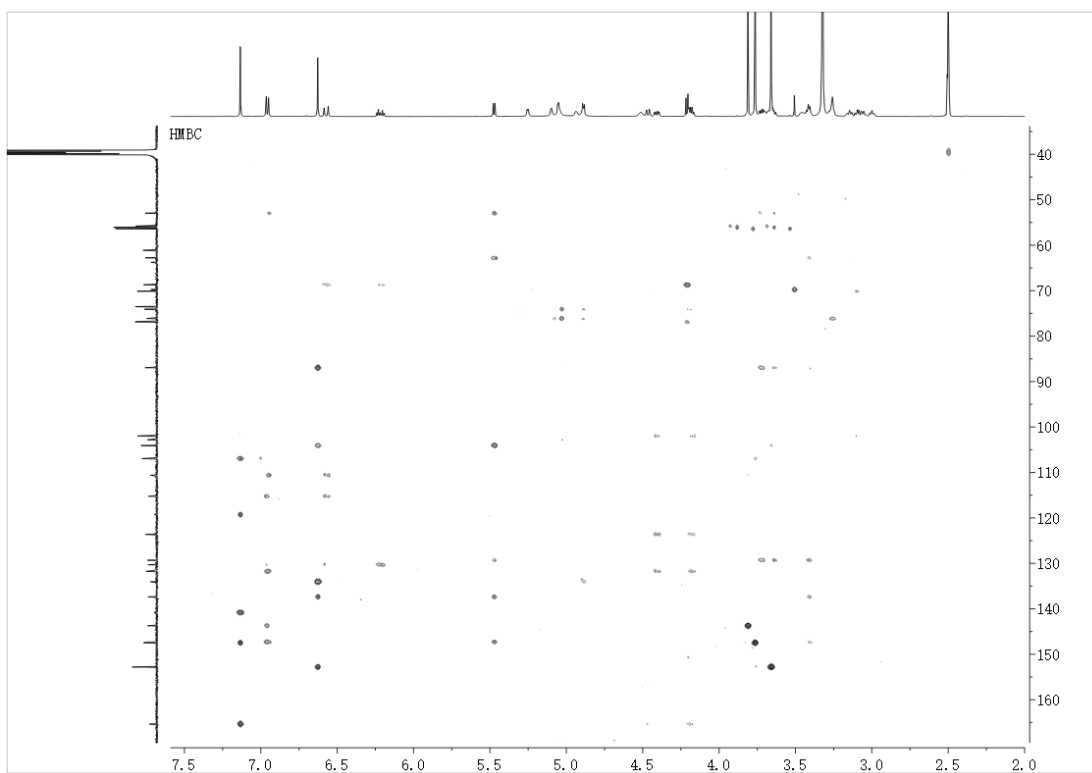


Figure S26. The HMBC Spectrum of Compound **3** in DMSO- d_6 .

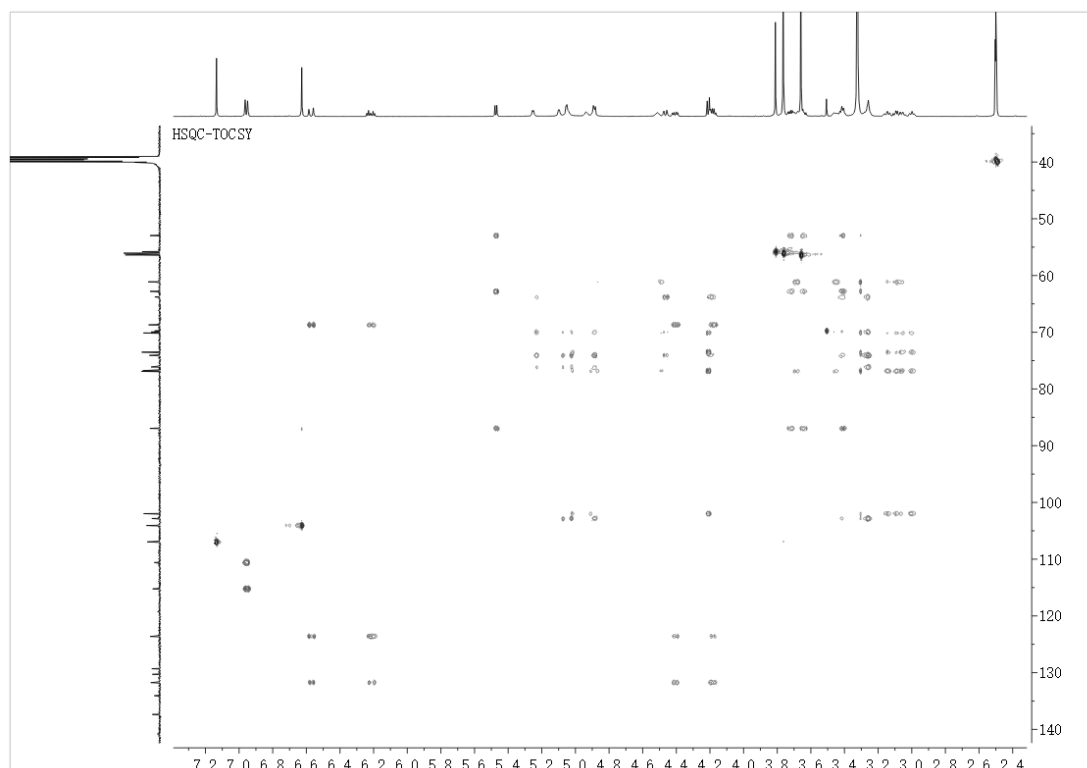


Figure S27. The HSQC-TOCSY Spectrum of Compound **3** in DMSO- d_6 .

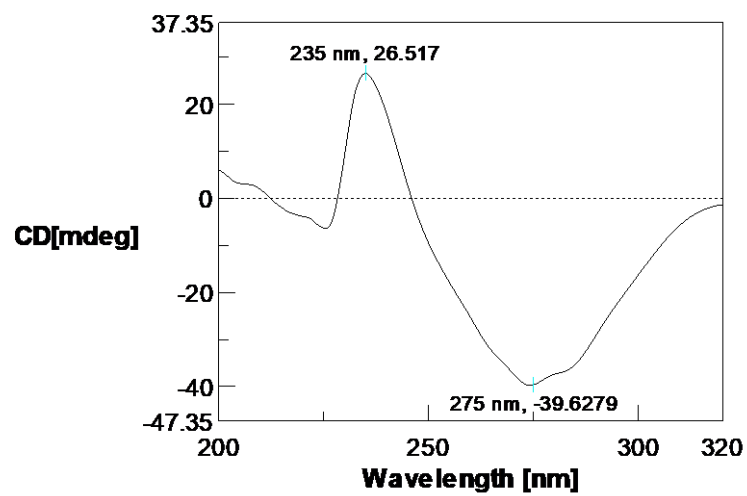


Figure S28. The CD Spectrum of Compound **3** in MeOH.

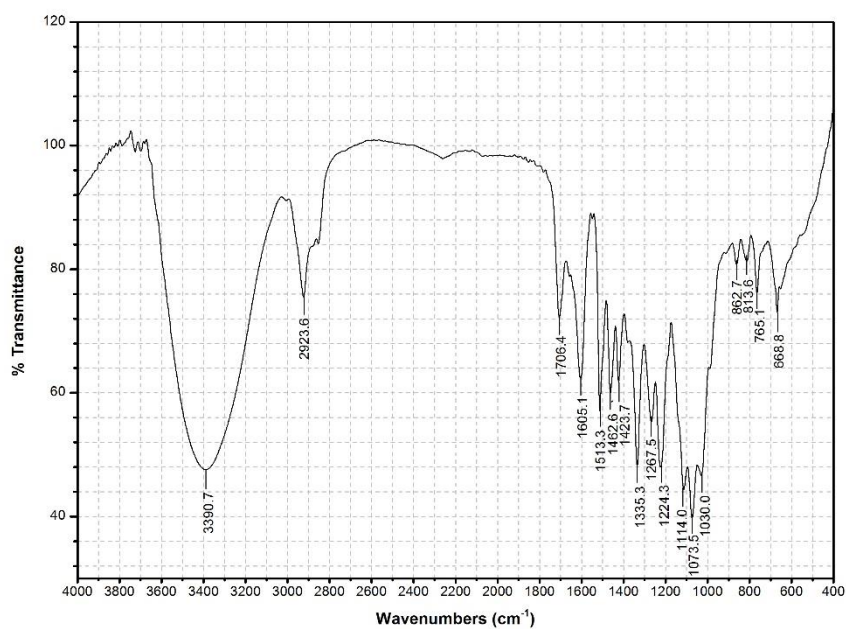
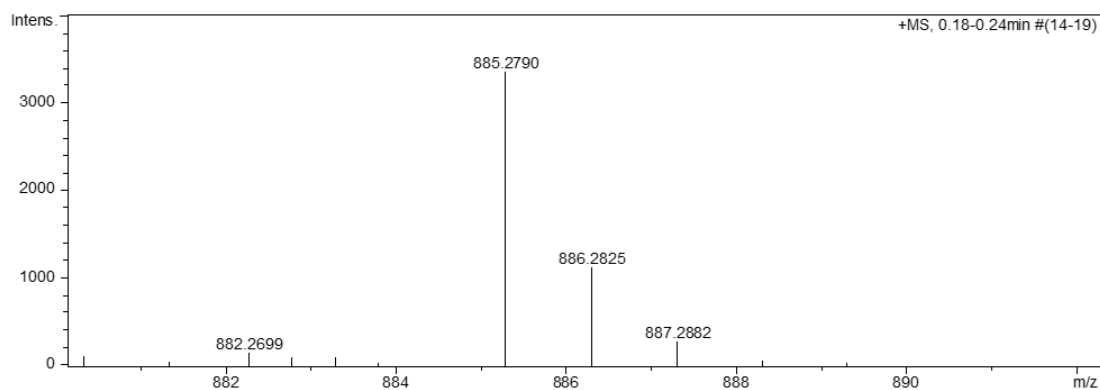


Figure S29. The IR Spectrum of Compound **4**.



Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdB	e ⁻ Conf	N-Rule
885.2790	1	C ₄₁ H ₅₀ NaO ₂₀	100	885.2788	-0.2	-0.2	62.4	16.5	even	ok

Figure S30. The (+)-HRESIMS Spectrum of Compound **4**.

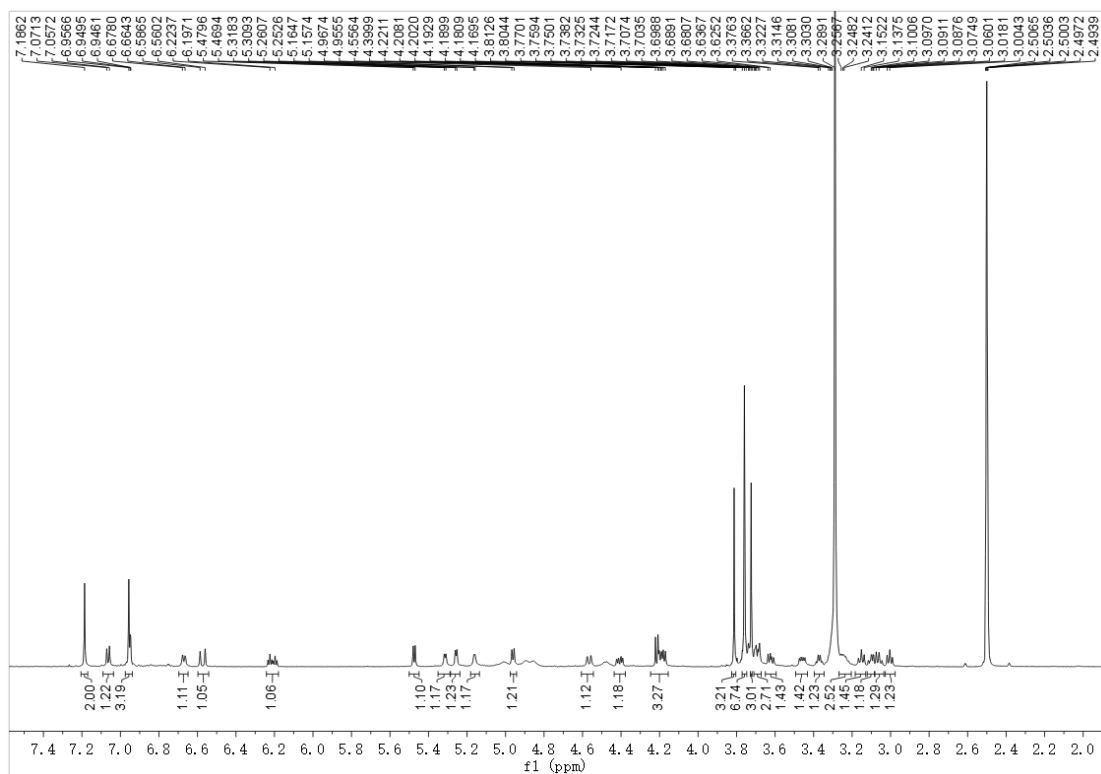


Figure S31. The ¹H NMR Spectrum of Compound 4 in DMSO-*d*₆.

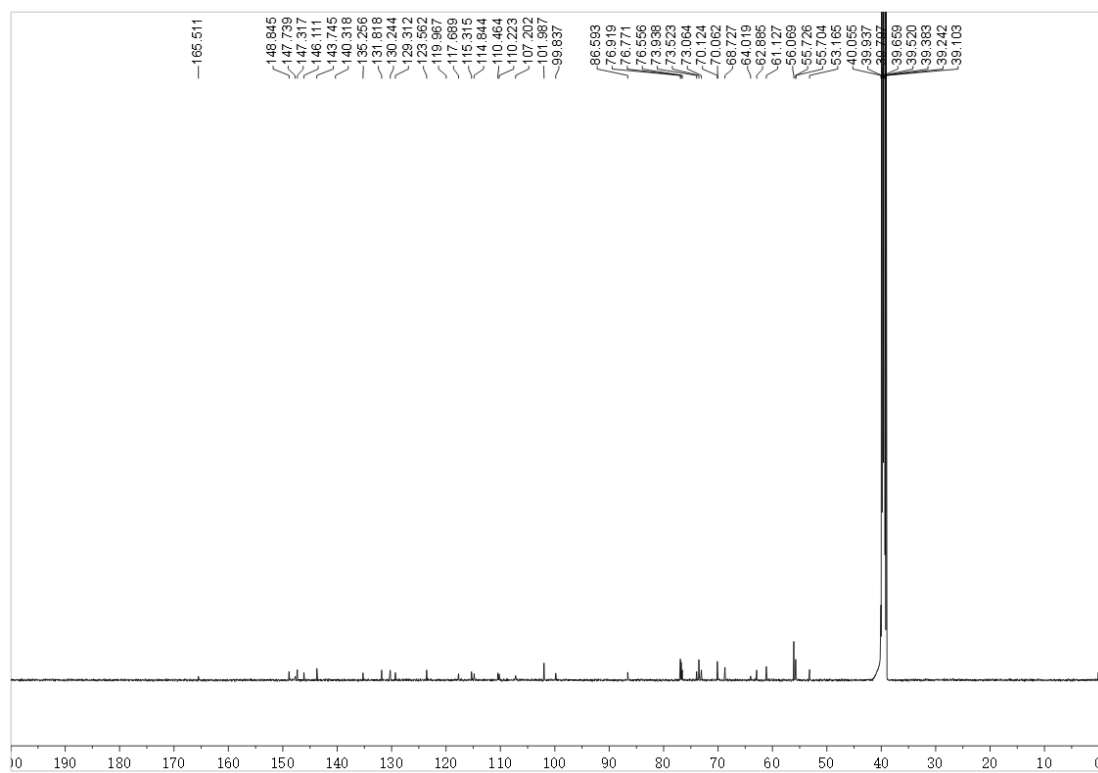


Figure S32. The ¹³C NMR Spectrum of Compound 4 in DMSO-*d*₆.

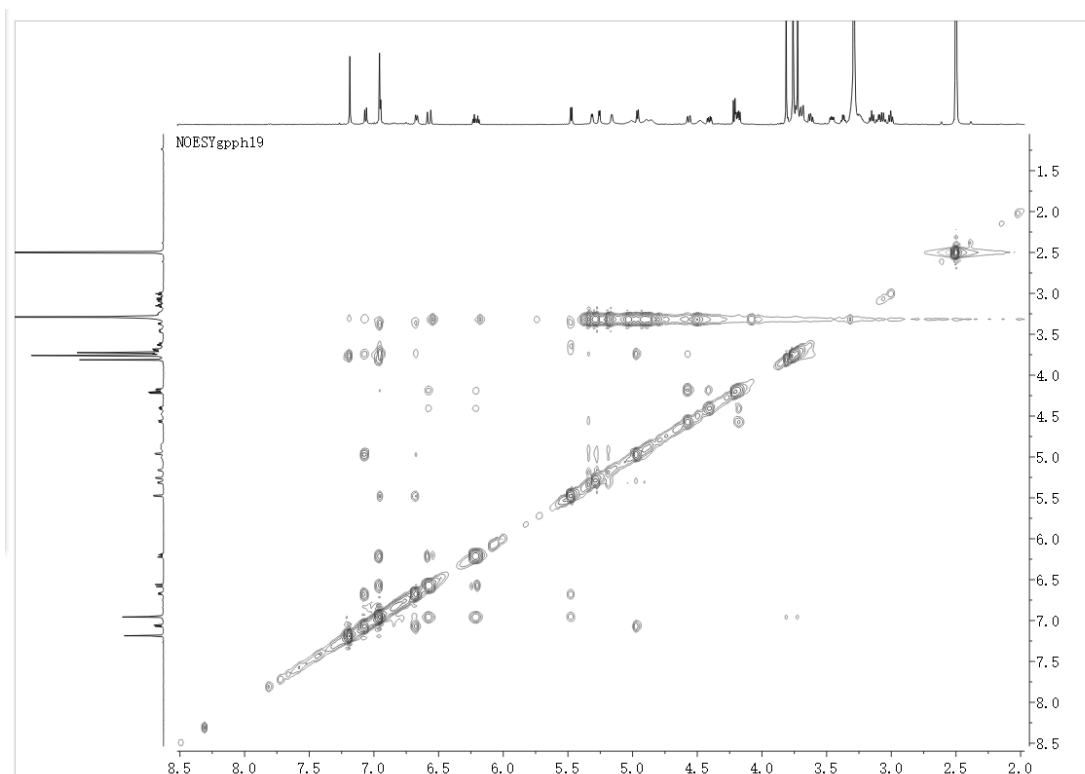


Figure S33. The NOESY Spectrum of Compound **4** in DMSO- d_6 .

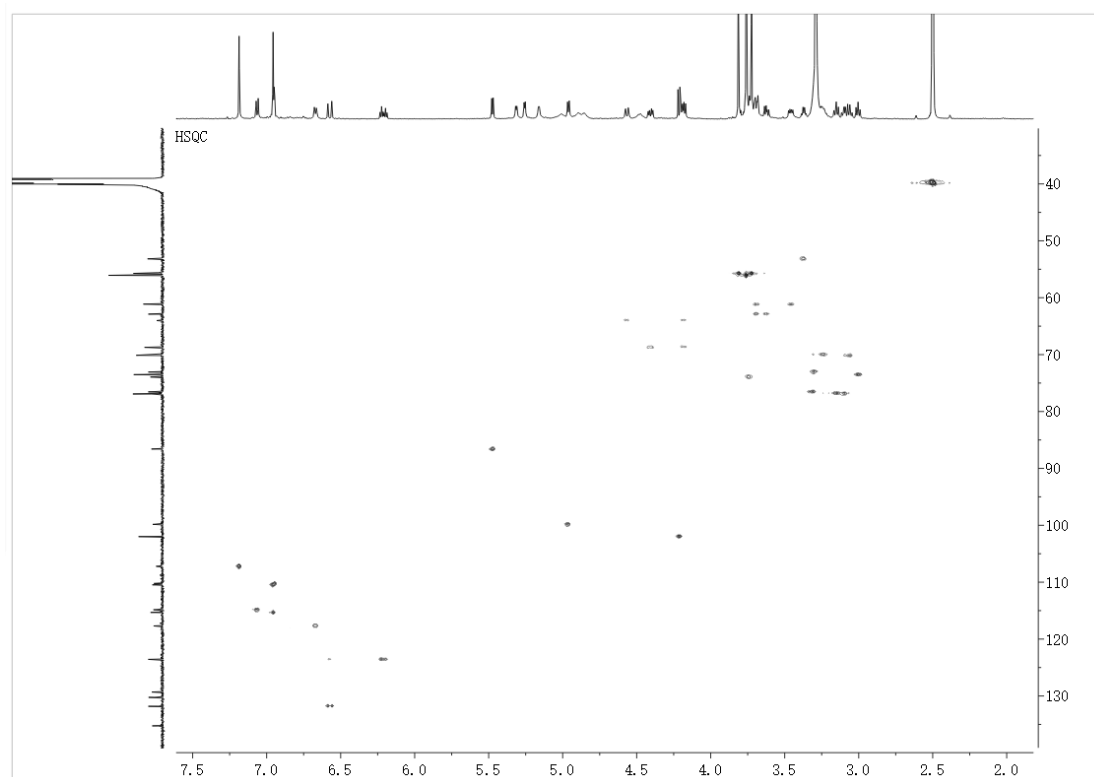


Figure S34. The HSQC Spectrum of Compound **4** in DMSO- d_6 .

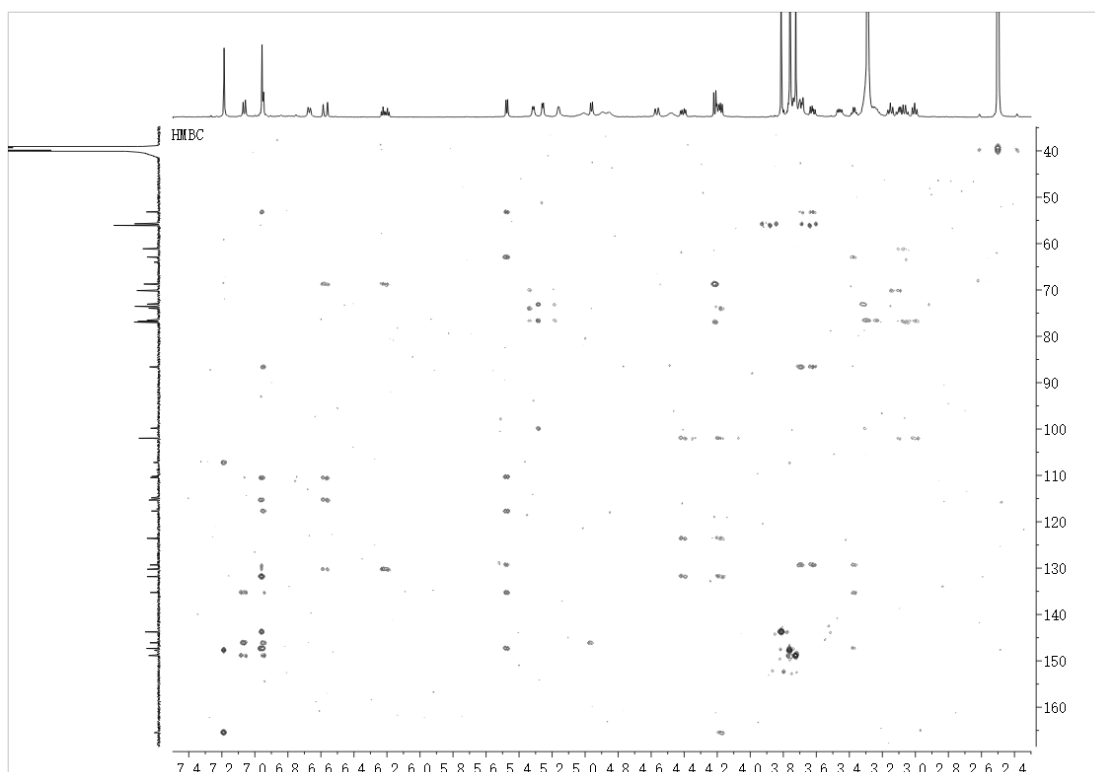


Figure S35. The HMBC Spectrum of Compound **4** in DMSO- d_6 .

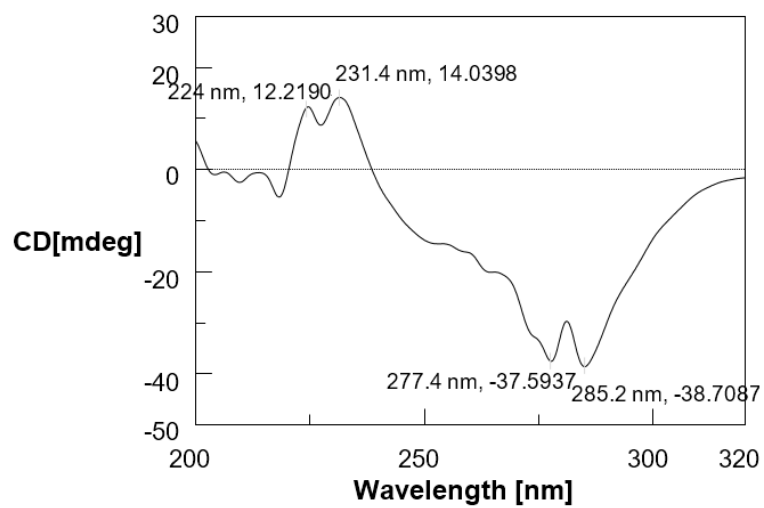


Figure S36. The CD Spectrum of Compound **4** in MeOH.

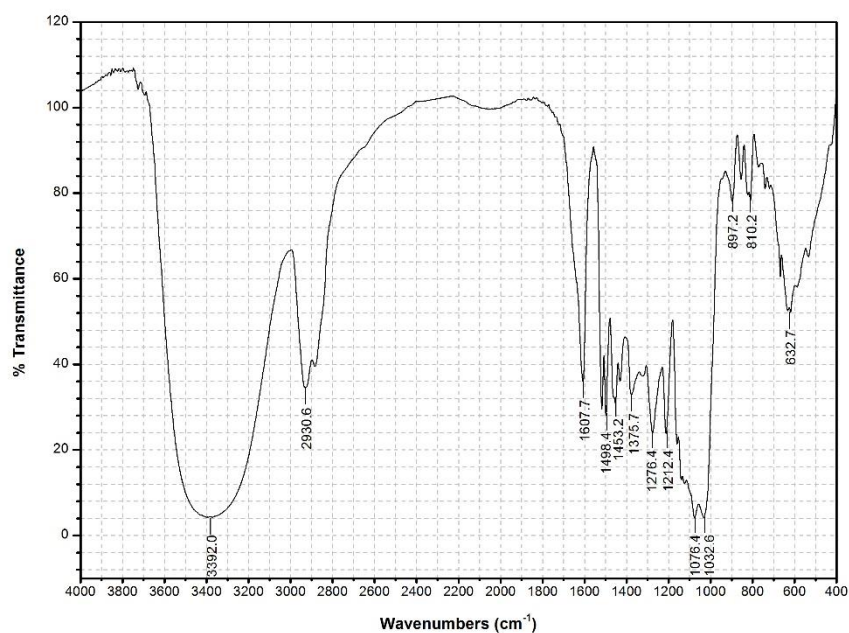
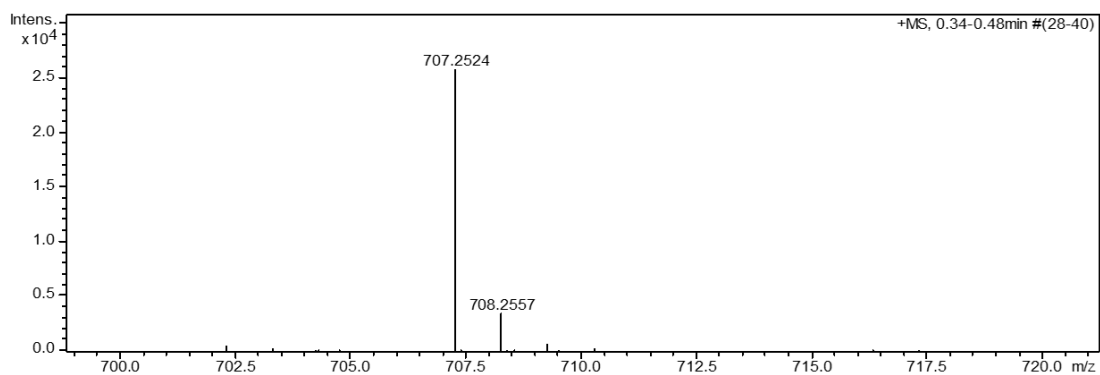


Figure S37. The IR Spectrum of Compound **5**.



Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdb	e ⁻ Conf	N-Rule
707.2524	1	C ₃₂ H ₄₄ NaO ₁₆	100	707.2522	-0.2	-0.3	119.5	10.5	even	ok

Figure S38. The (+)-HRESIMS Spectrum of Compound **5**.

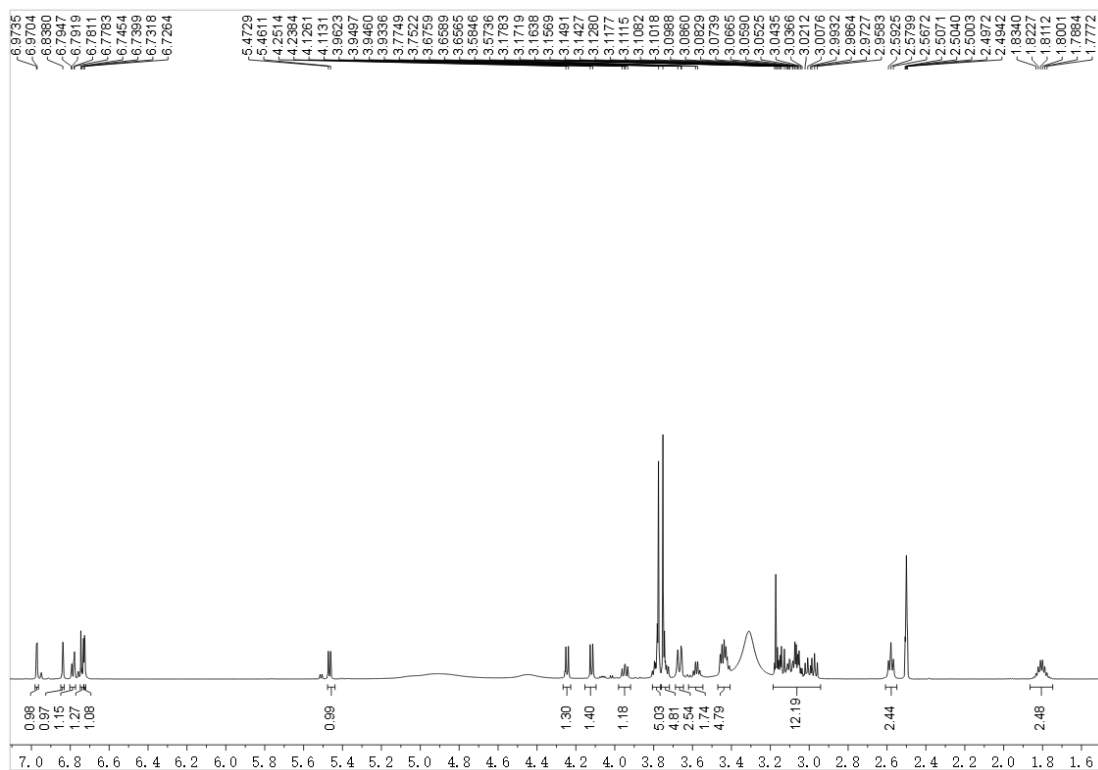


Figure S39. The ^1H NMR Spectrum of Compound **5** in $\text{DMSO}-d_6$.

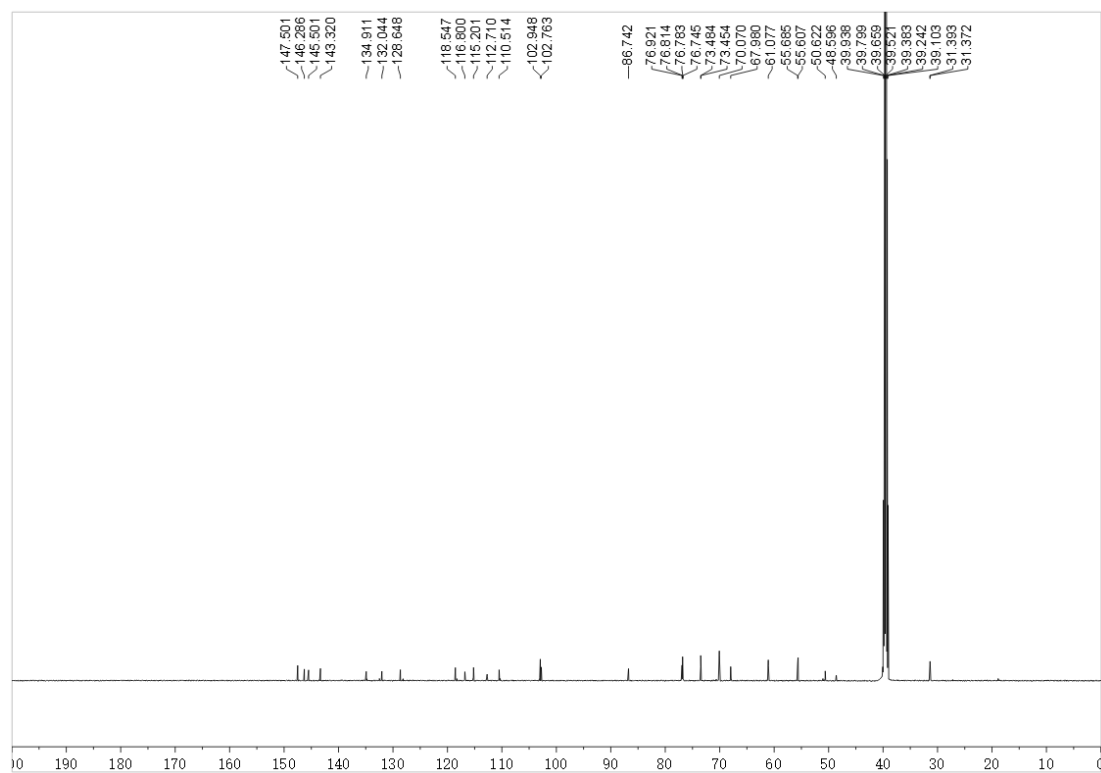


Figure S40. The ^{13}C NMR Spectrum of Compound **5** in $\text{DMSO}-d_6$.

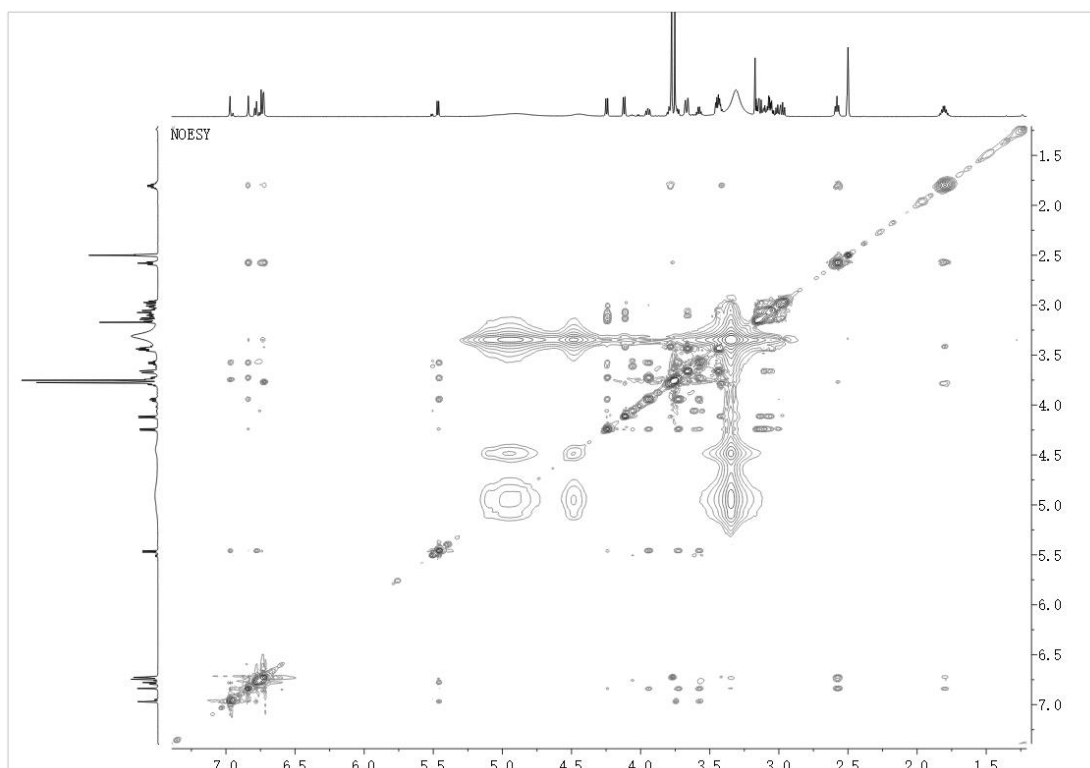


Figure S41. The NOESY Spectrum of Compound **5** in DMSO- d_6 .

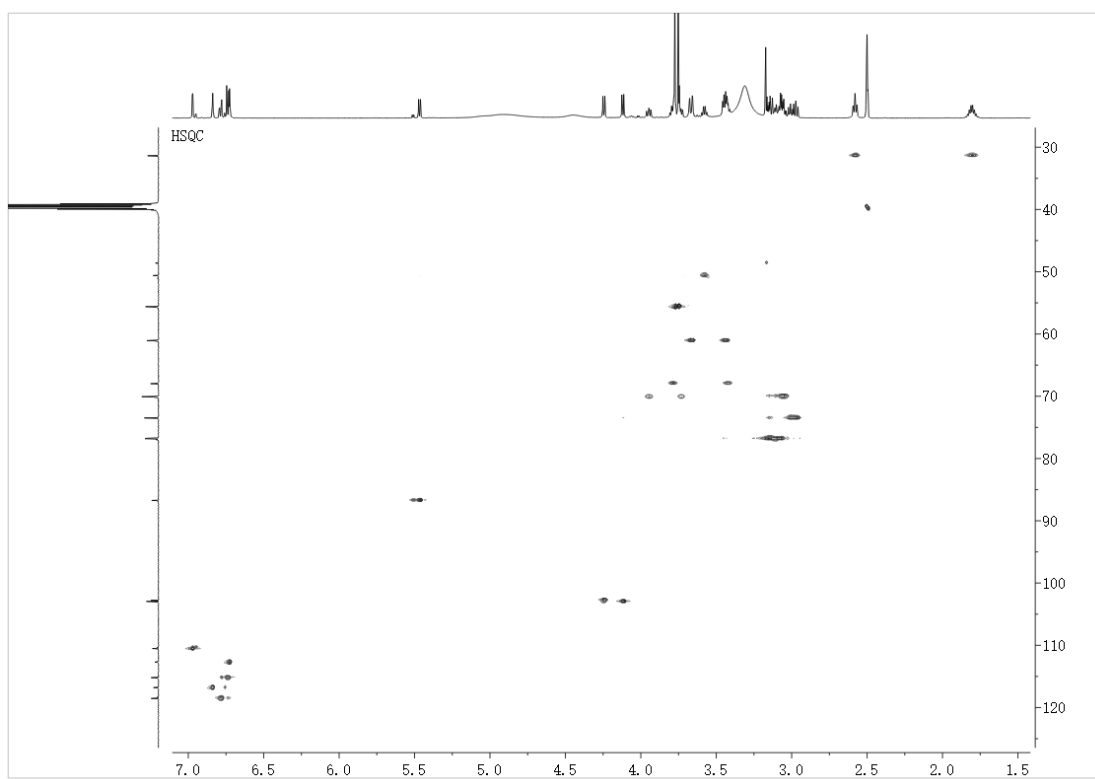


Figure S42. The HSQC Spectrum of Compound **5** in DMSO- d_6 .

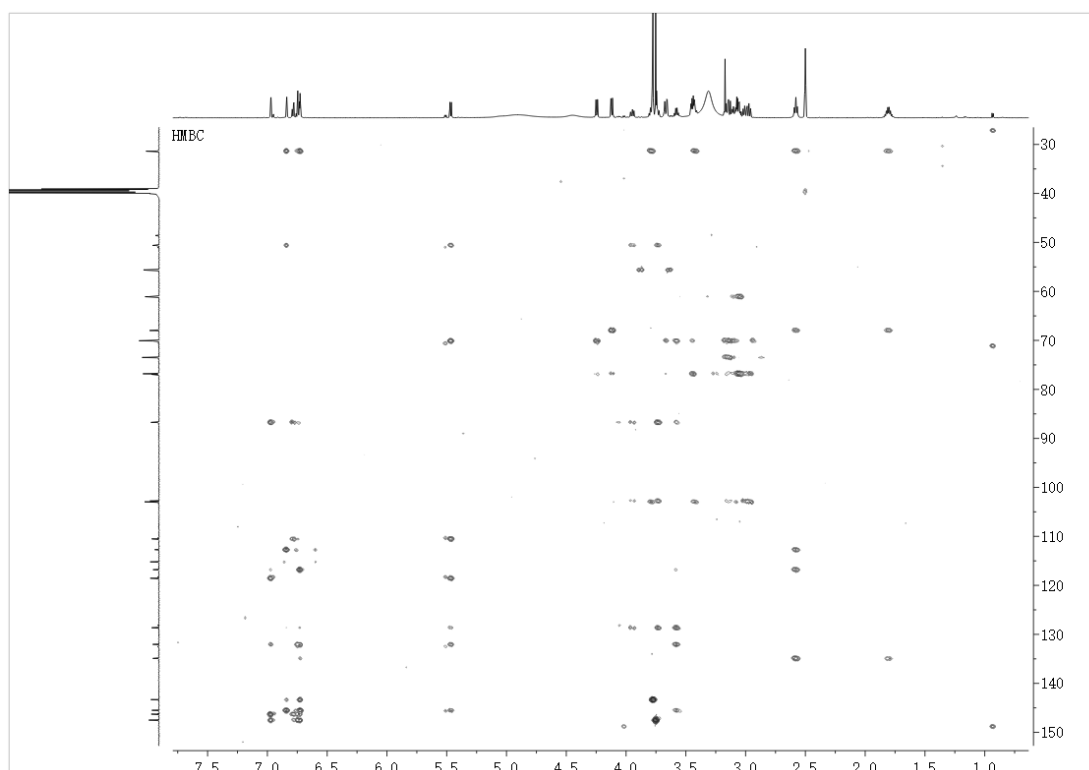


Figure S43. The HMBC Spectrum of Compound **5** in DMSO- d_6 .

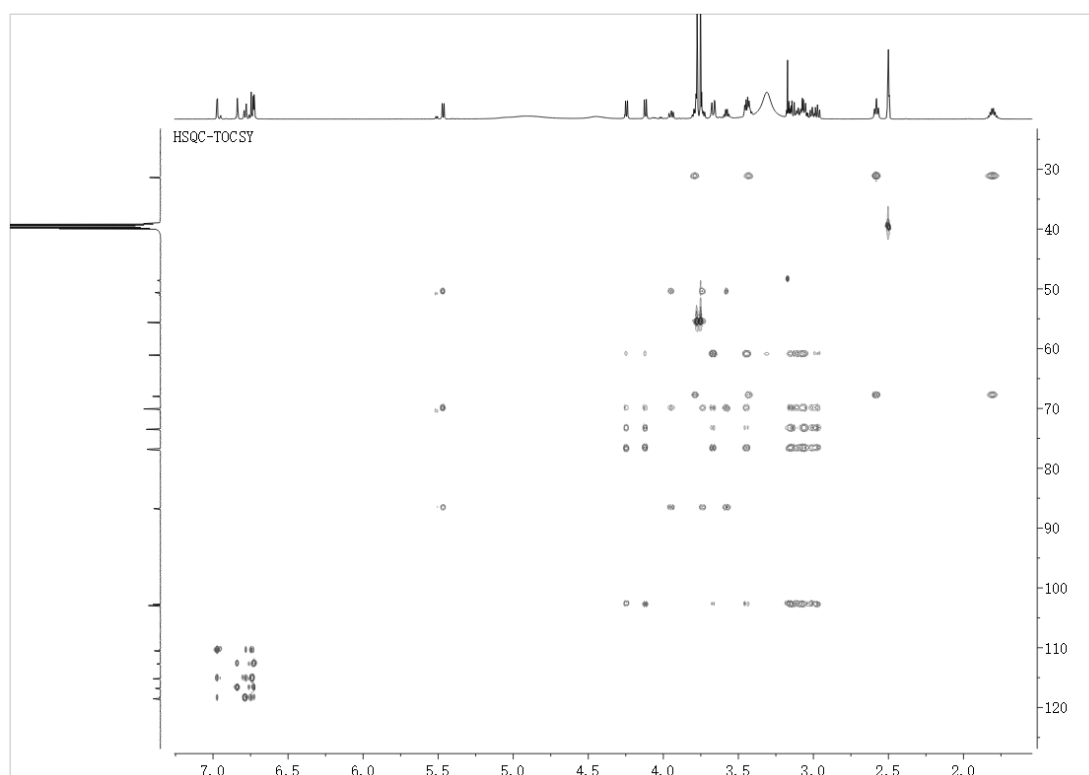


Figure S44. The HSQC-TOCSY Spectrum of Compound **5** in DMSO- d_6 .

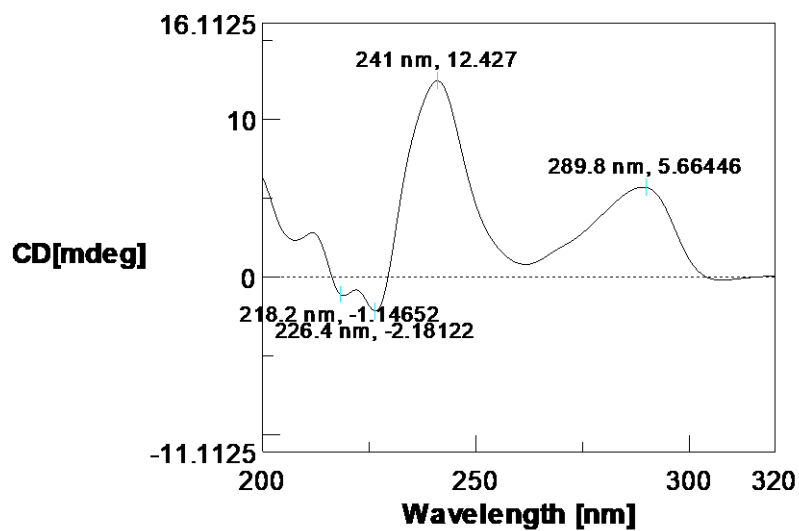


Figure S45. The CD Spectrum of Compound **5** in MeOH.

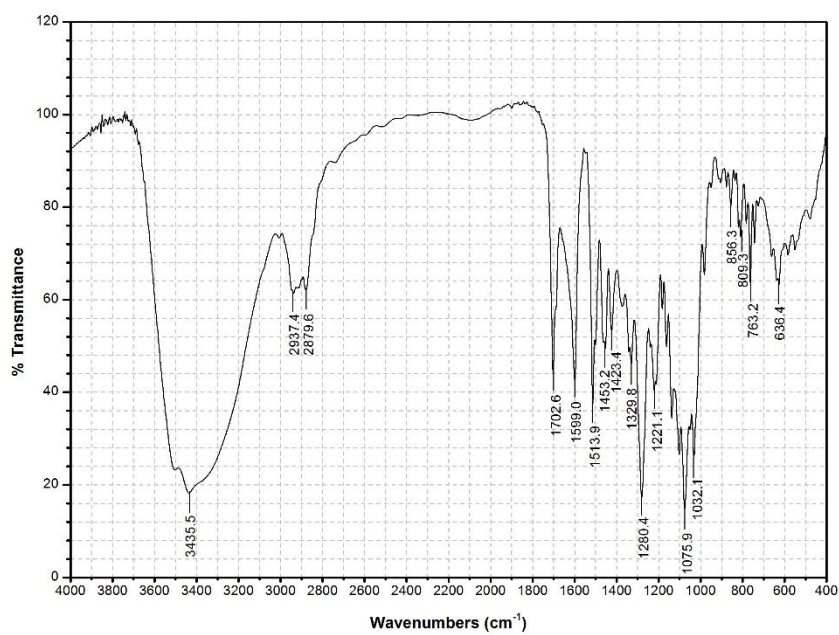


Figure S46. The IR Spectrum of Compound **6**.

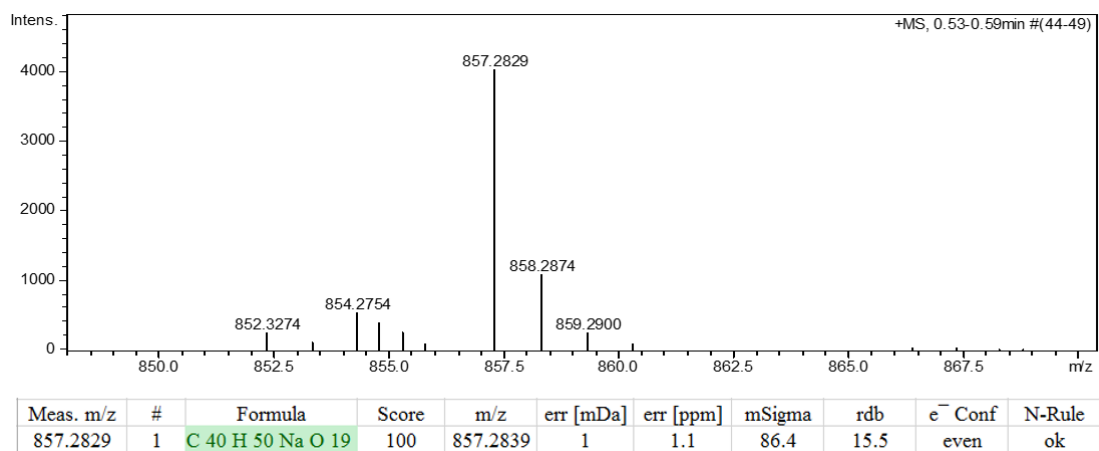


Figure S47. The (+)-HRESIMS Spectrum of Compound **6**.

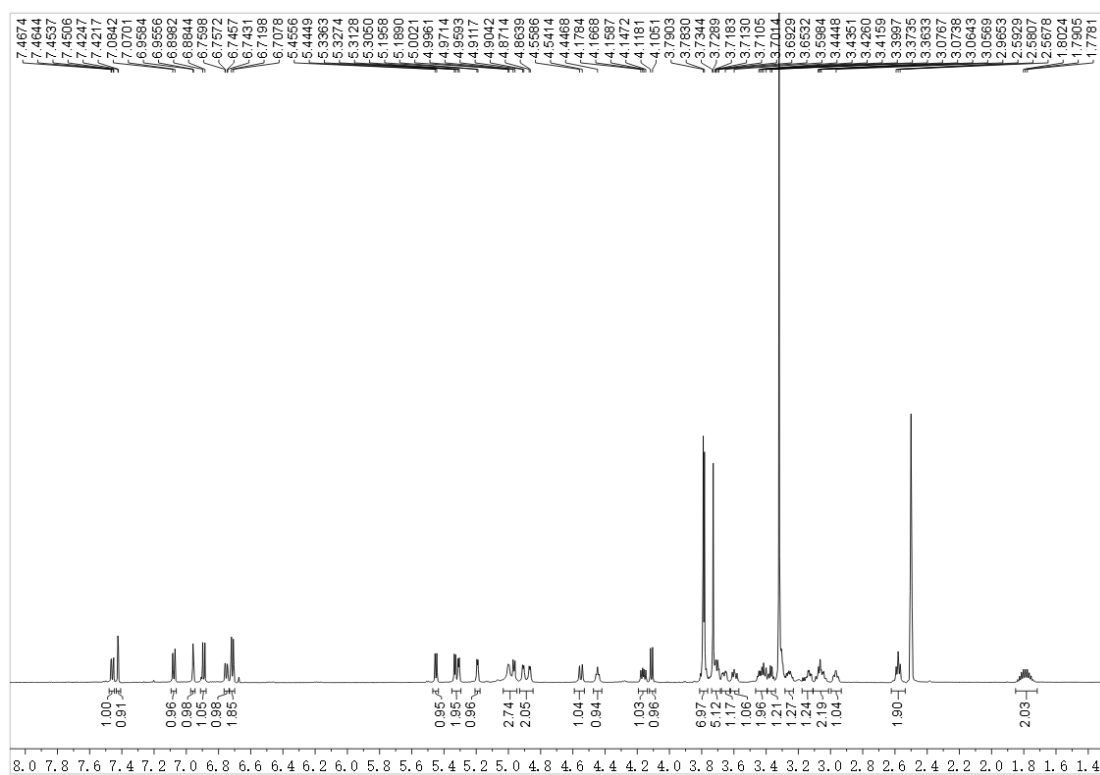


Figure S48. The ¹H NMR Spectrum of Compound **6** in DMSO-*d*₆.

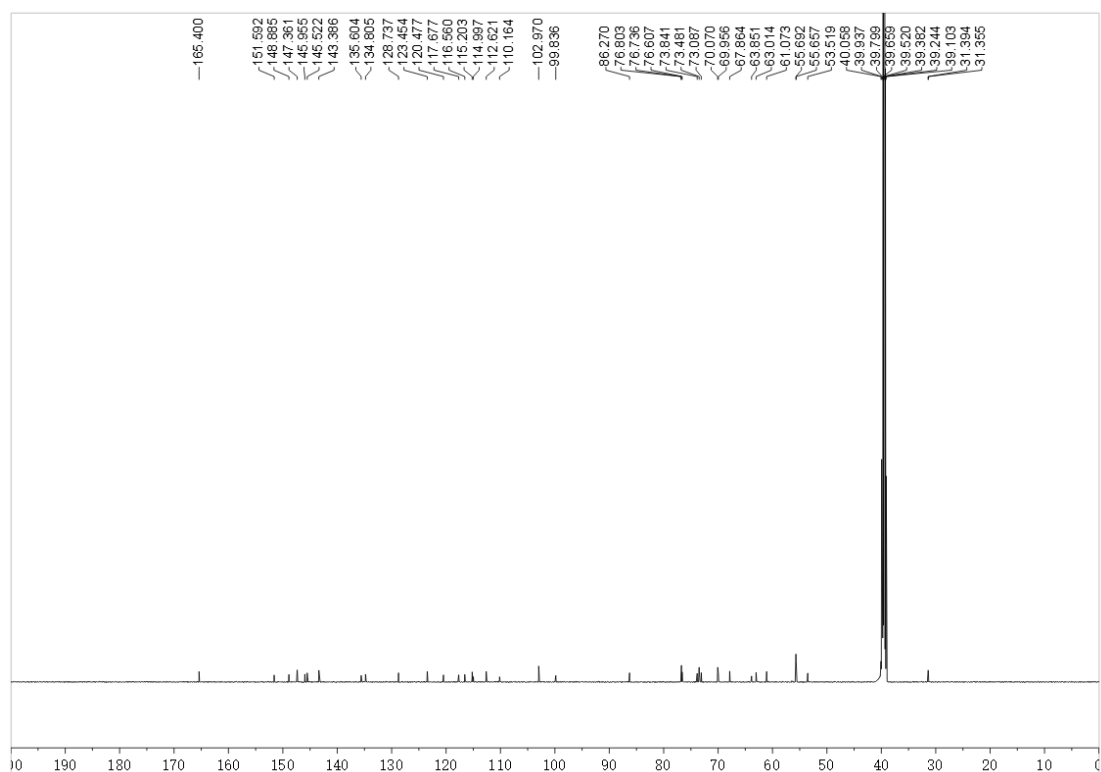


Figure S49. The ^{13}C NMR Spectrum of Compound **6** in $\text{DMSO}-d_6$.

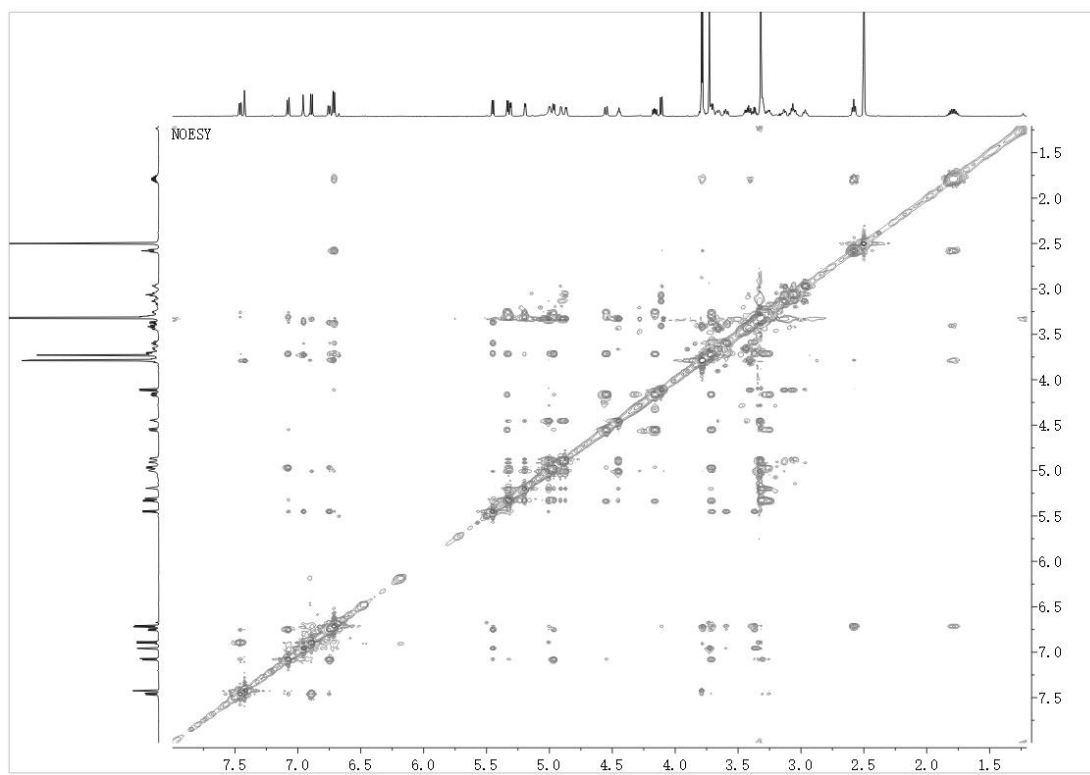


Figure S50. The NOESY Spectrum of Compound **6** in $\text{DMSO}-d_6$.

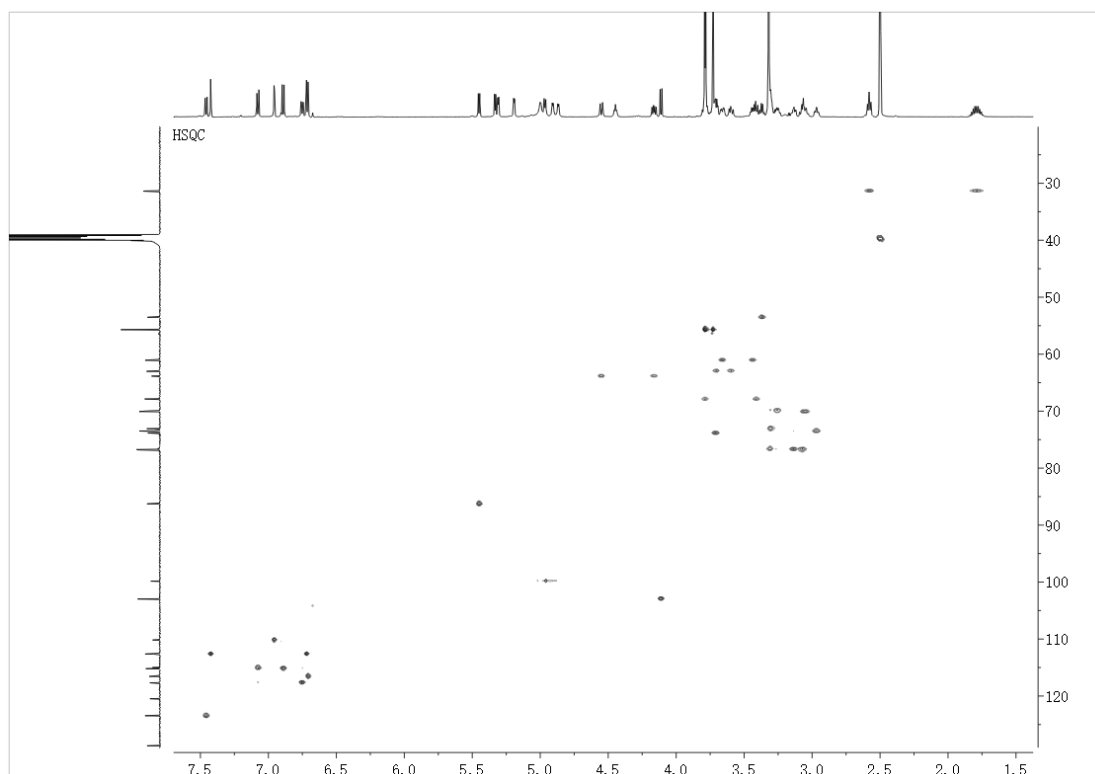


Figure S51. The HSQC Spectrum of Compound **6** in DMSO-*d*₆.

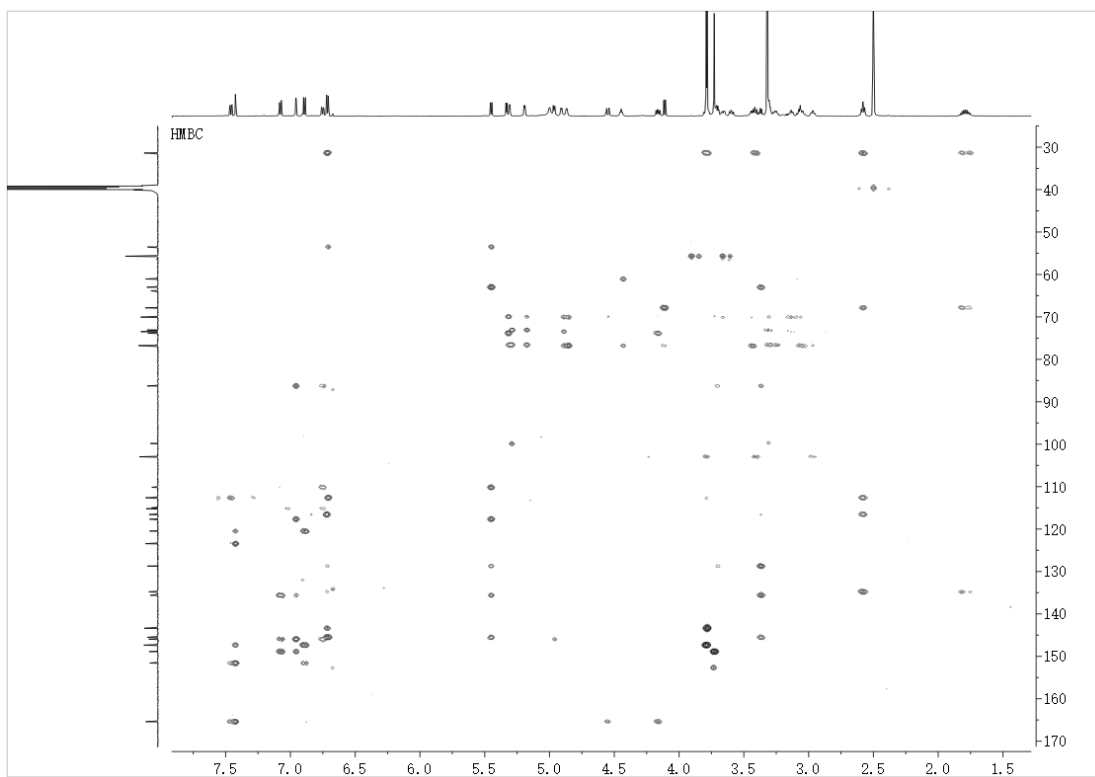


Figure S52. The HMBC Spectrum of Compound **6** in DMSO-*d*₆.

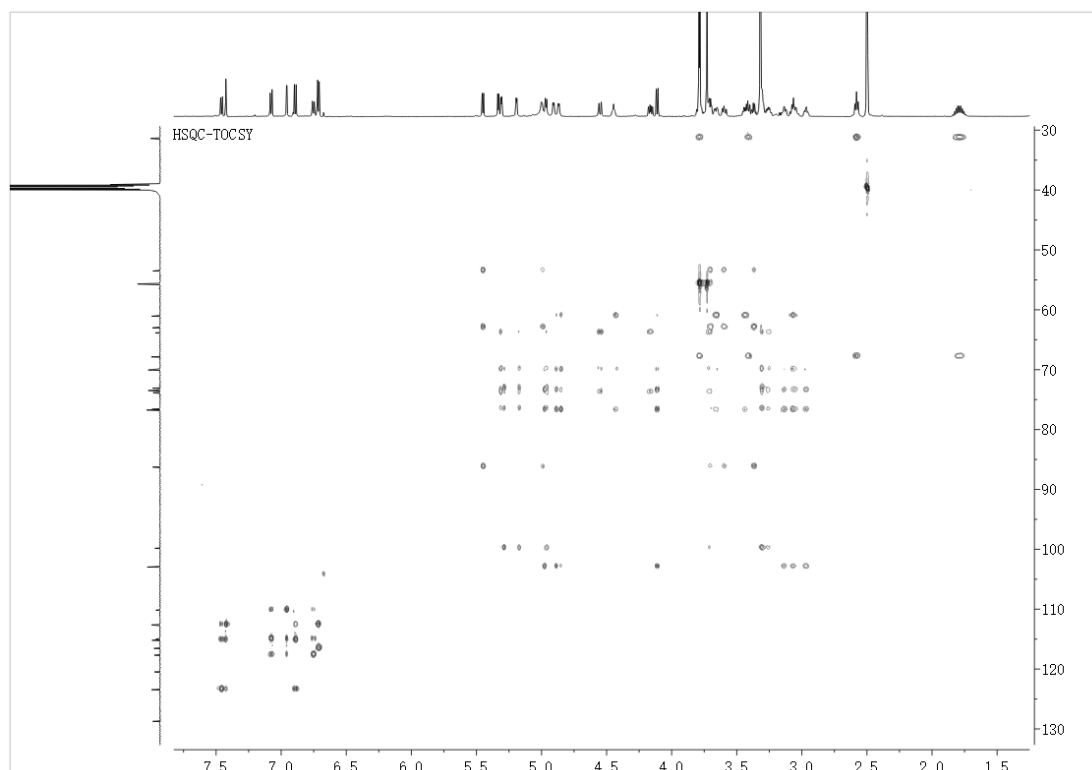


Figure S53. The HSQC-TOCSY Spectrum of Compound **6** in DMSO- d_6 .

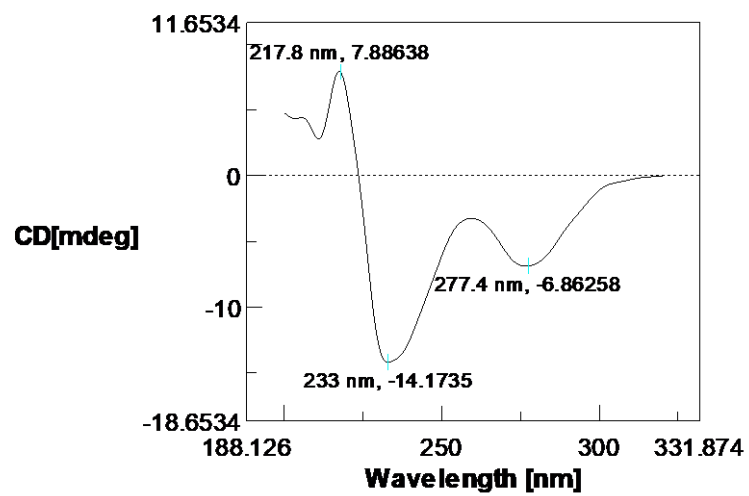


Figure S54. The CD Spectrum of Compound **6** in MeOH.

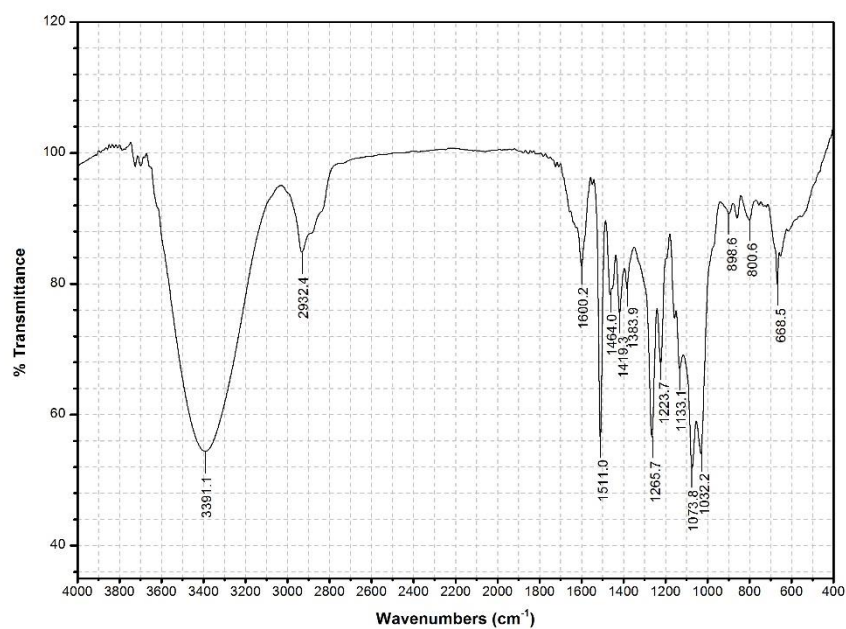


Figure S55. The IR Spectrum of Compound **7**.

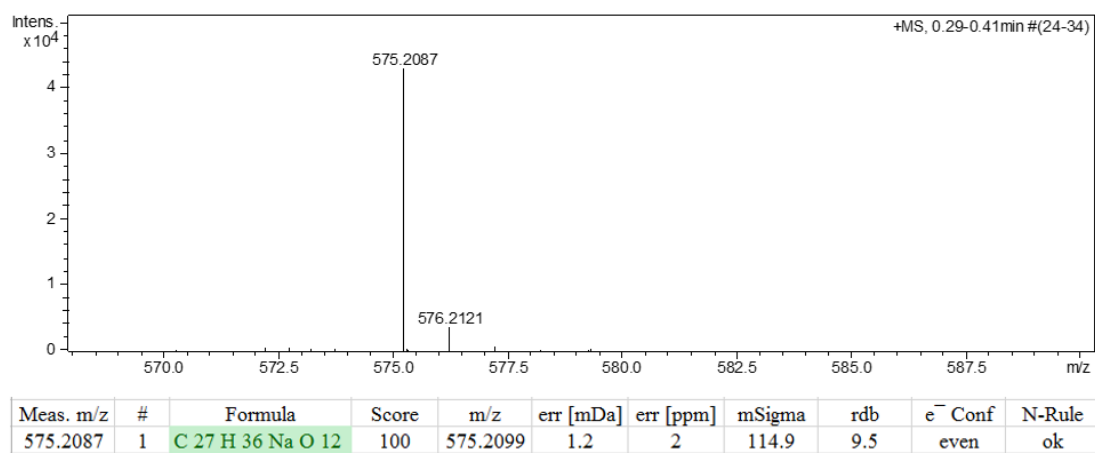


Figure S56. The (+)-HRESIMS Spectrum of Compound **7**.

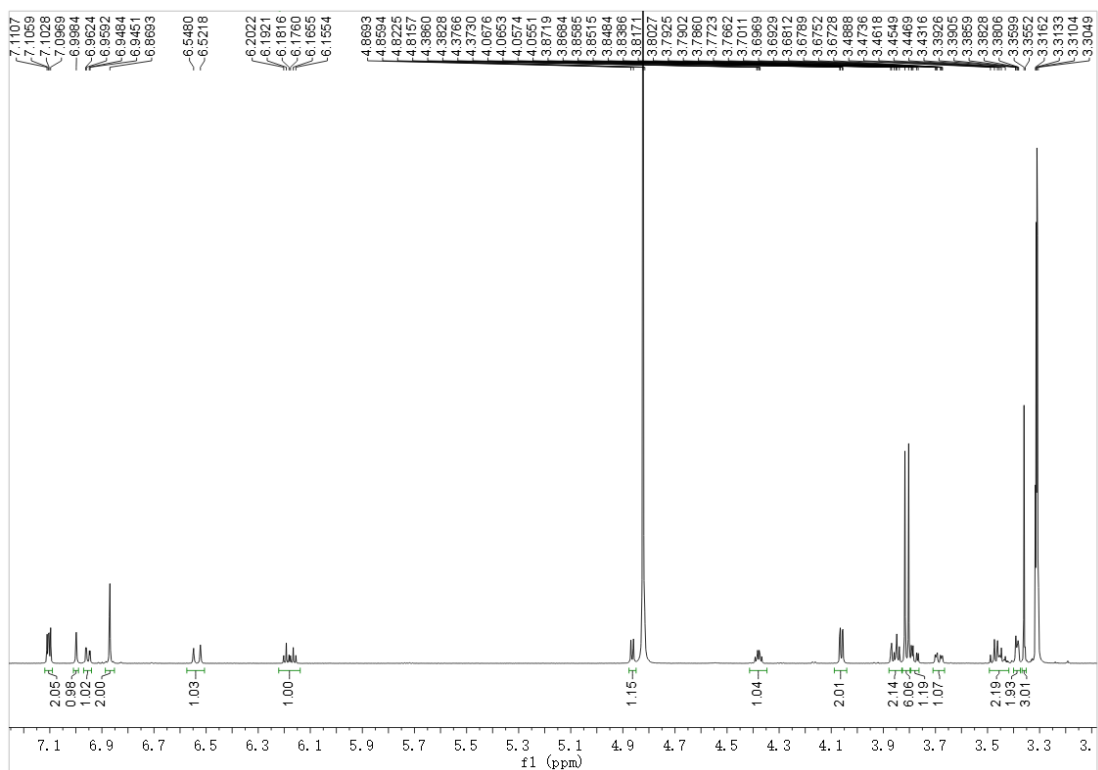


Figure S57. The ^1H NMR Spectrum of Compound **7** in CD_3OD .

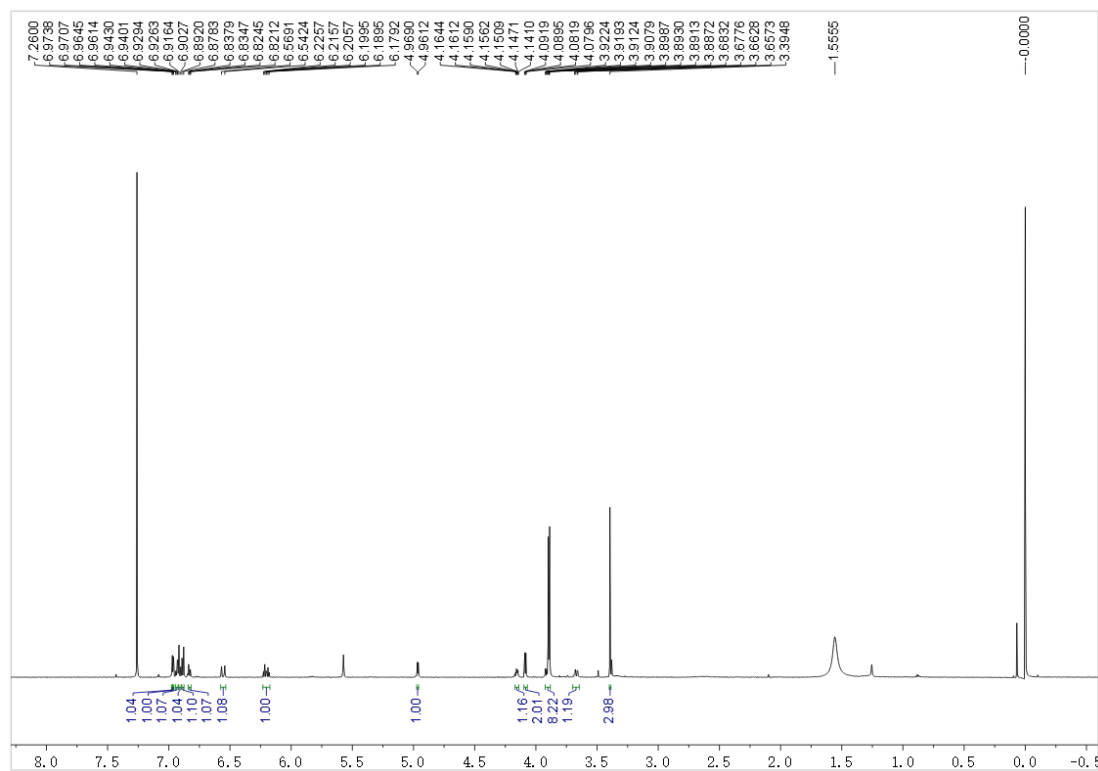


Figure S58. The ^1H NMR Spectrum of Compound **7a** in CDCl_3 .

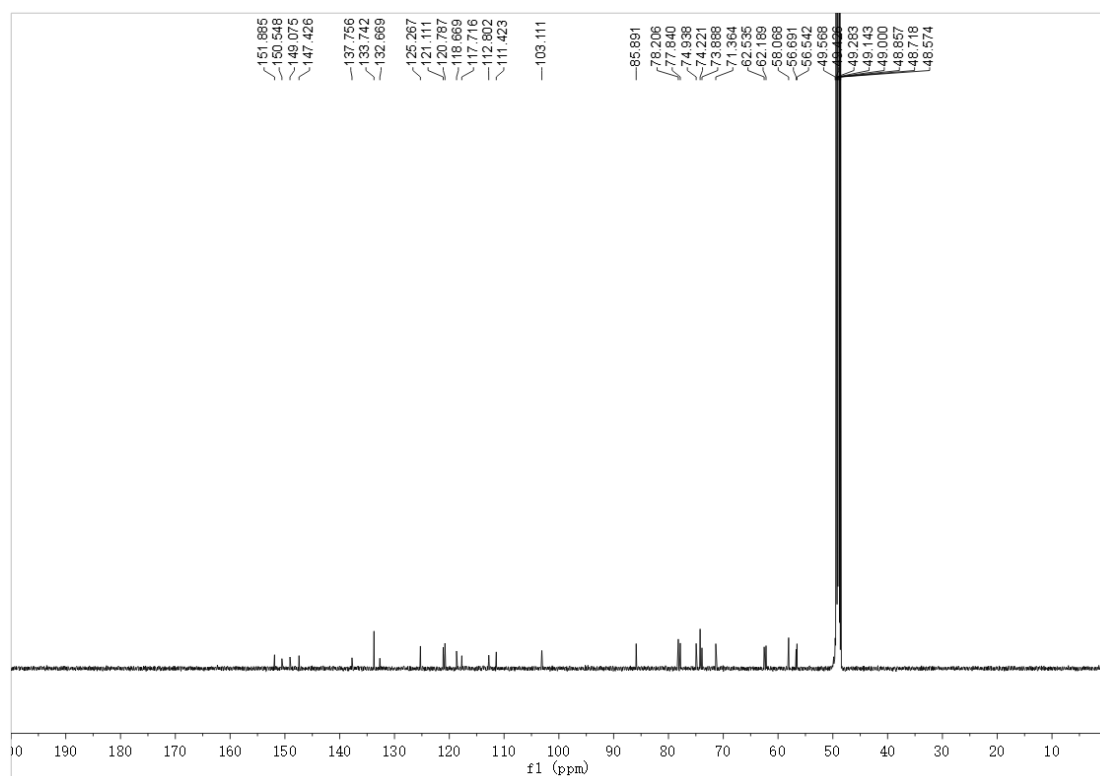


Figure S59. The ^{13}C NMR Spectrum of Compound **7** in CD_3OD .

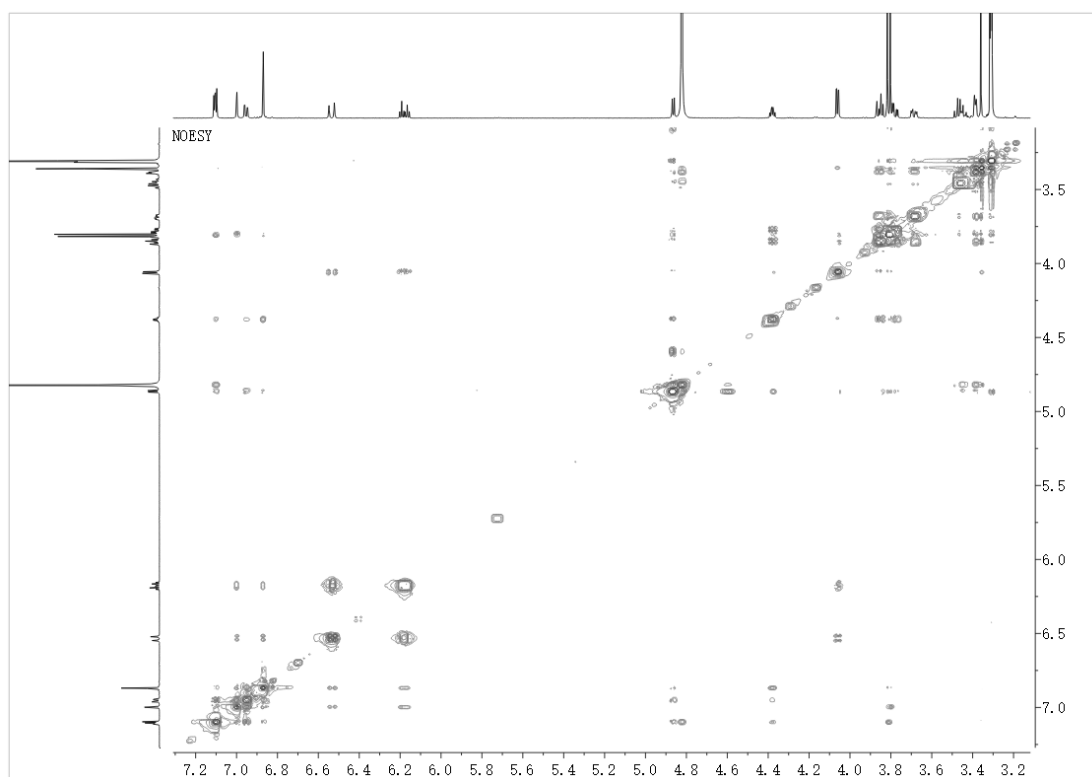


Figure S60. The NOESY Spectrum of Compound **7** in CD_3OD .

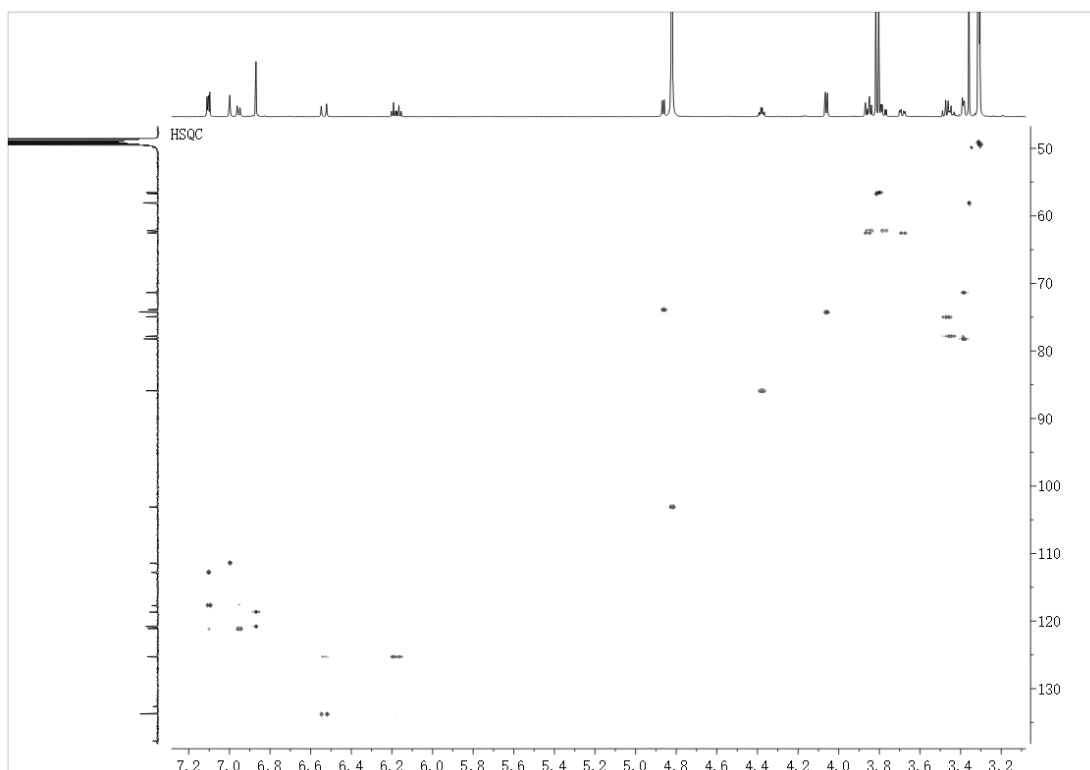


Figure S61. The HSQC Spectrum of Compound **7** in CD₃OD.

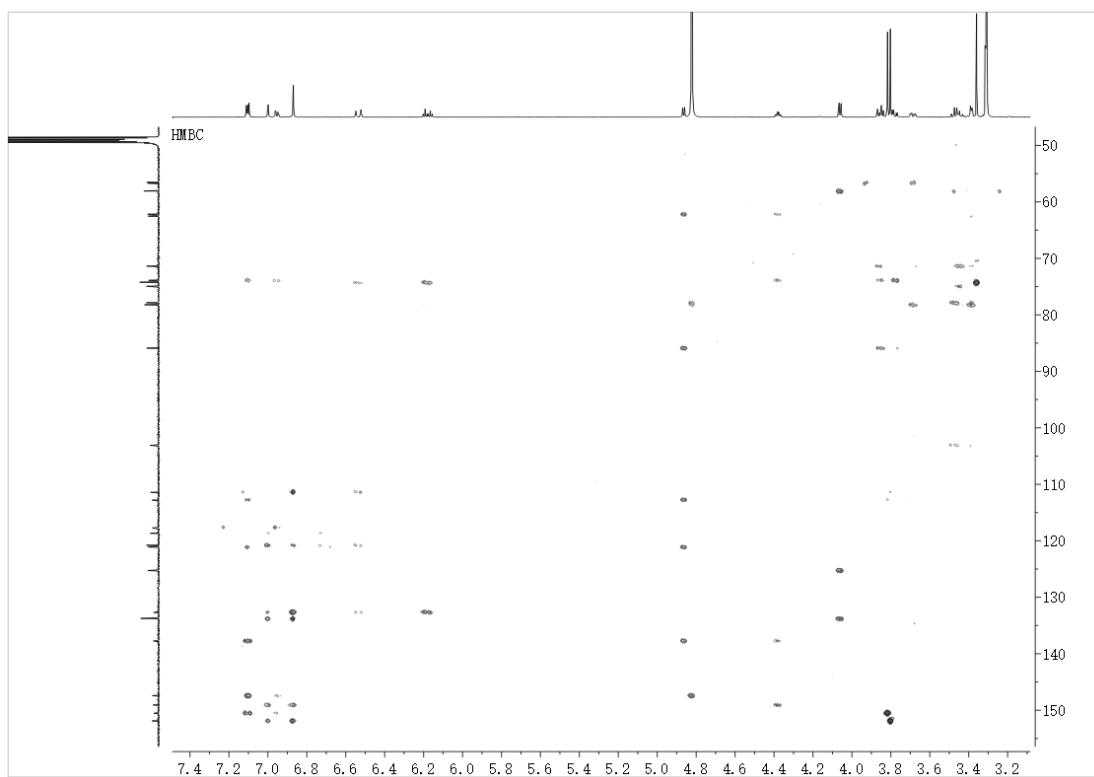


Figure S62. The HMBC Spectrum of Compound **7** in CD₃OD.

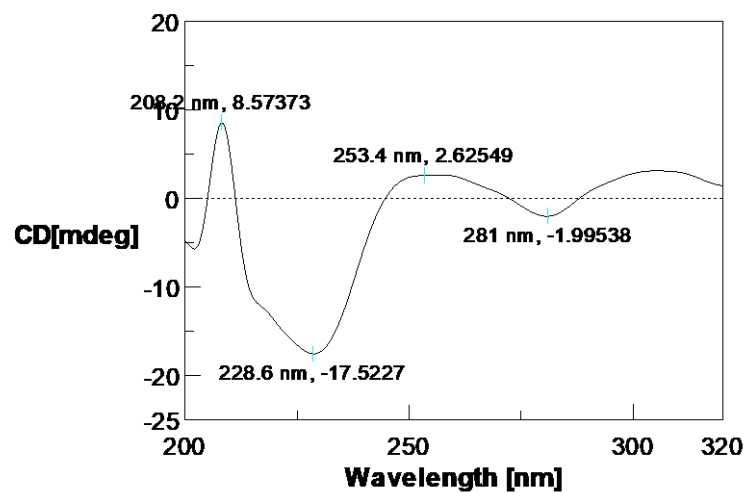


Figure S63. The CD Spectrum of Compound **7** in MeOH.

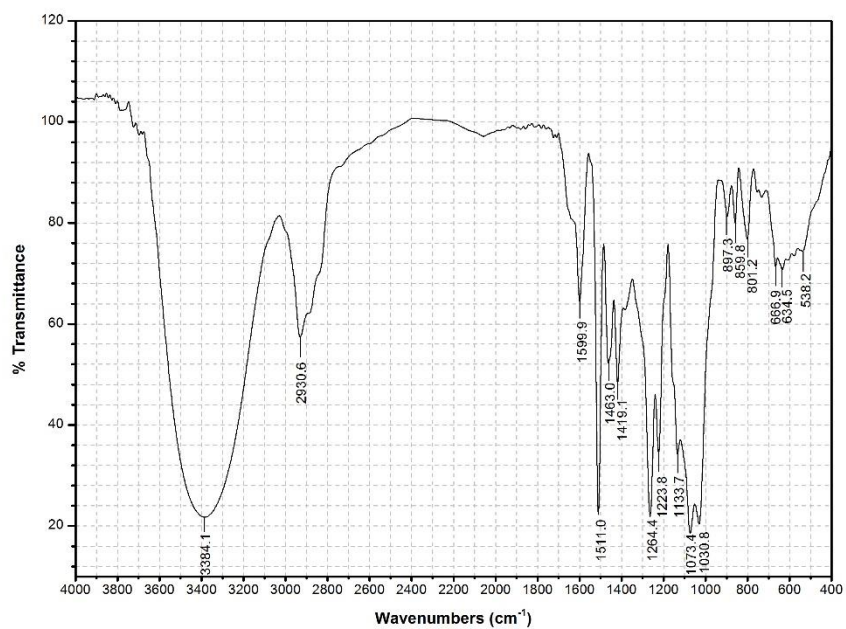


Figure S64. The IR Spectrum of Compound **8**.

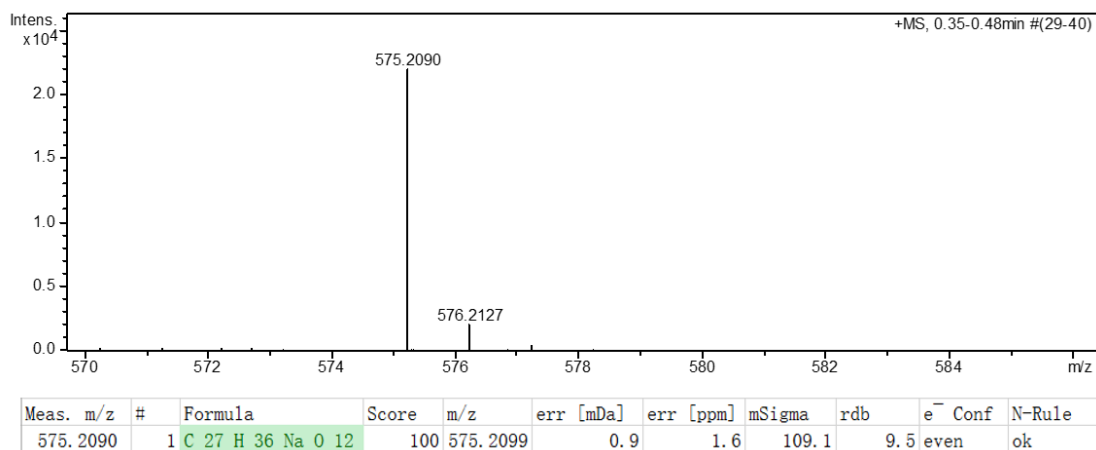


Figure S65. The (+)-HRESIMS Spectrum of Compound **8**.

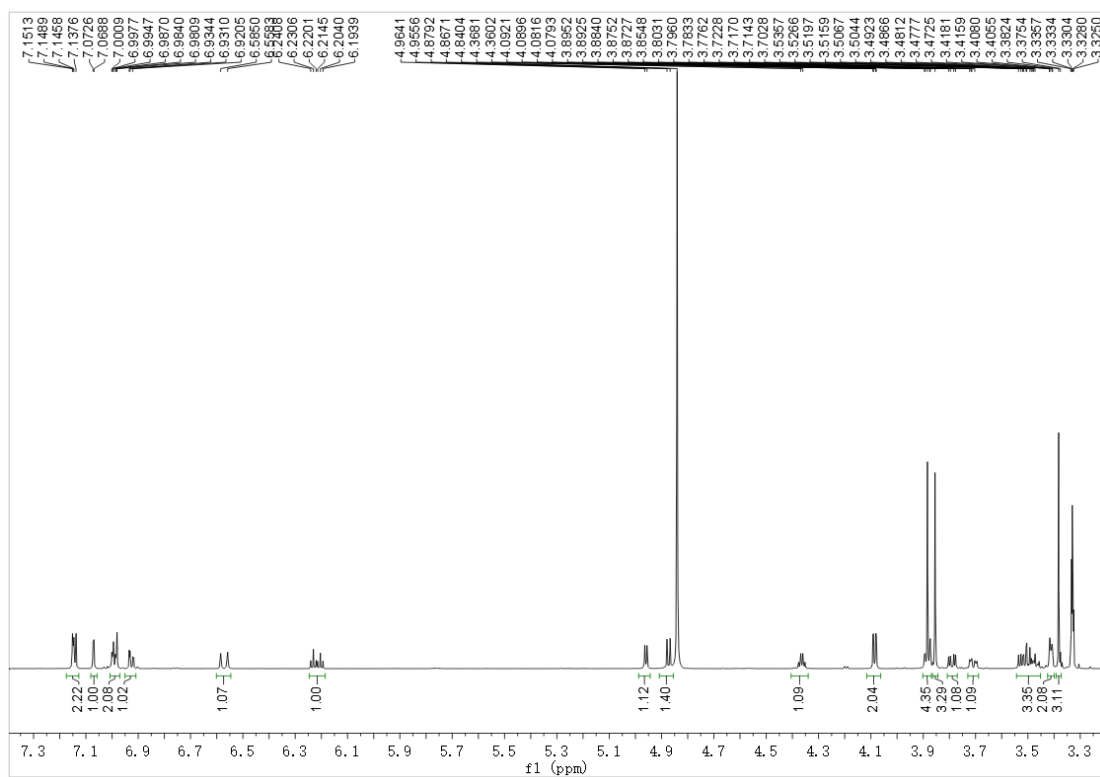


Figure S66. The ¹H NMR Spectrum of Compound **8** in CD₃OD.

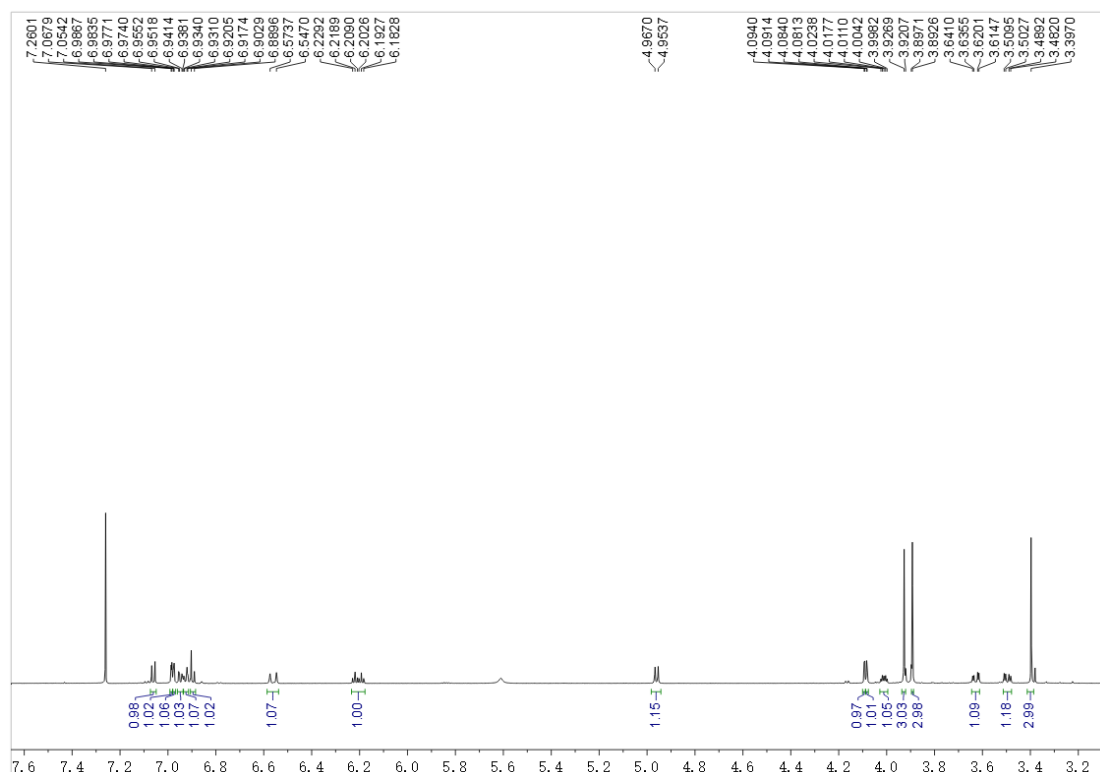


Figure S67. The ¹H NMR Spectrum of Compound **8a** in CDCl₃.

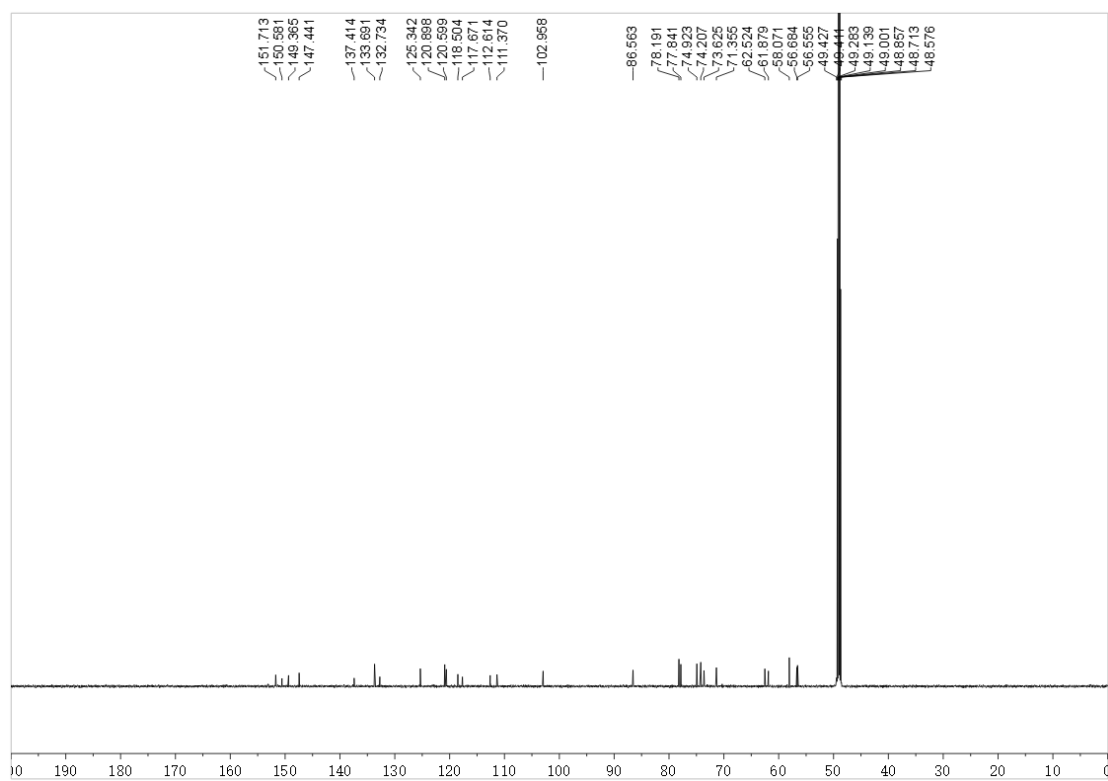


Figure S68. The ¹³C NMR Spectrum of Compound **8** in CD₃OD.

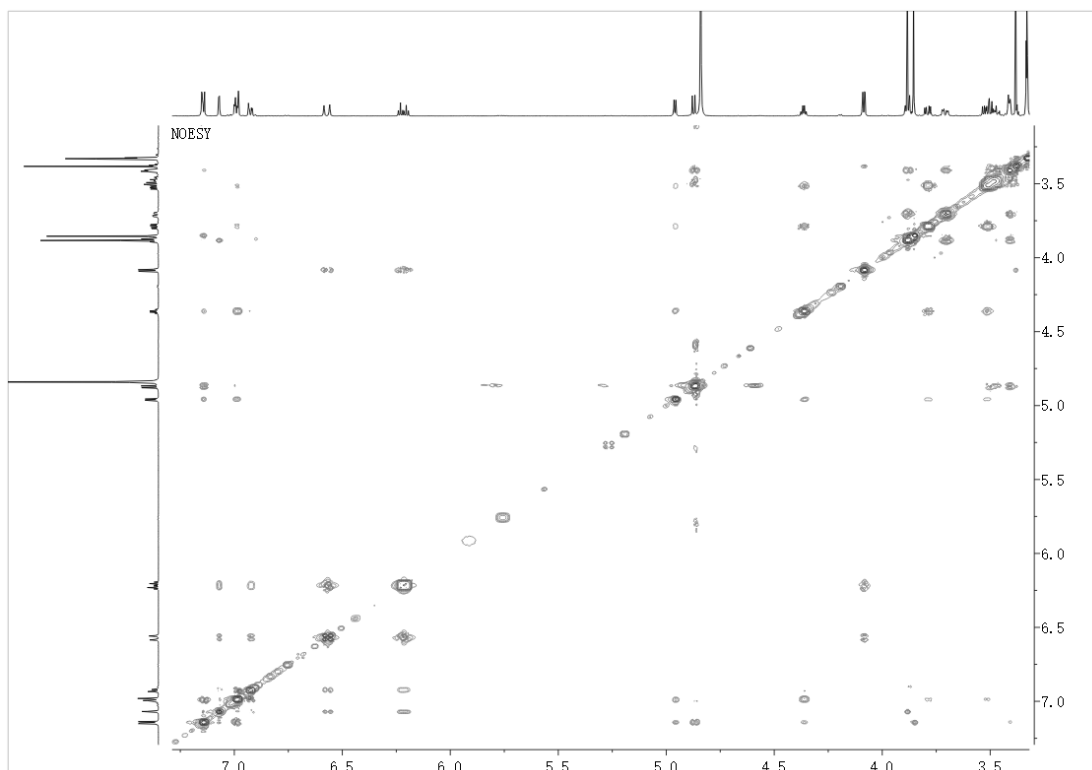


Figure S69. The NOESY Spectrum of Compound **8** in CD₃OD.

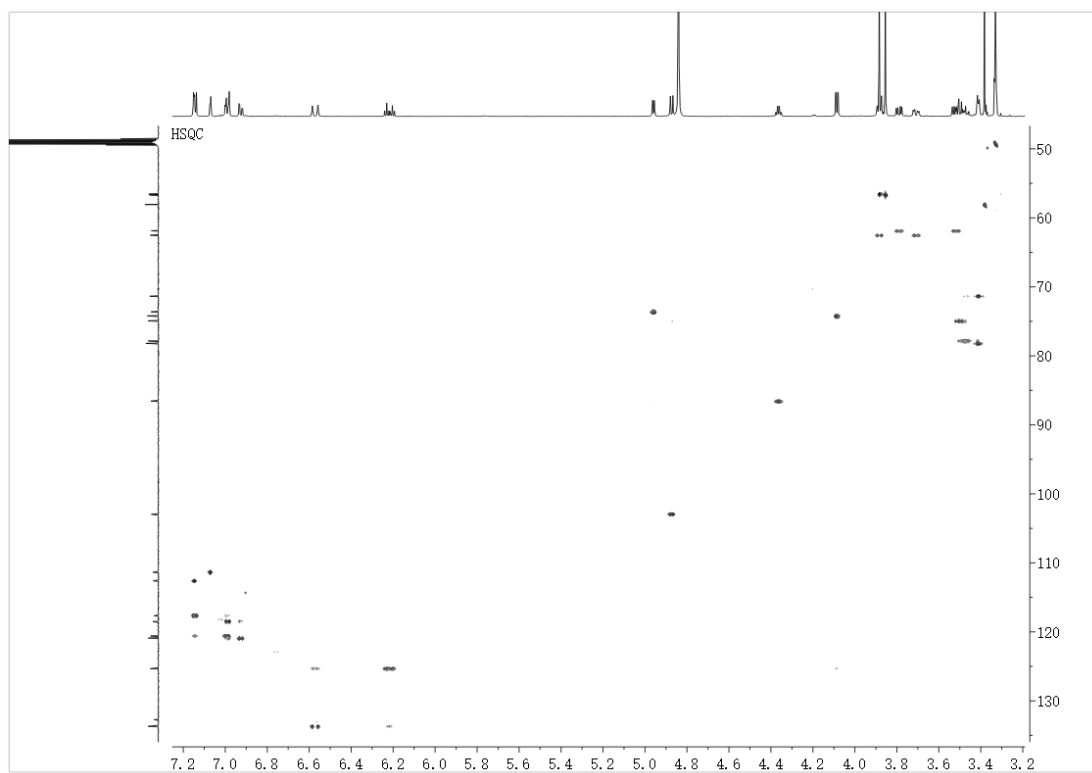


Figure S70. The HSQC Spectrum of Compound **8** in CD₃OD.

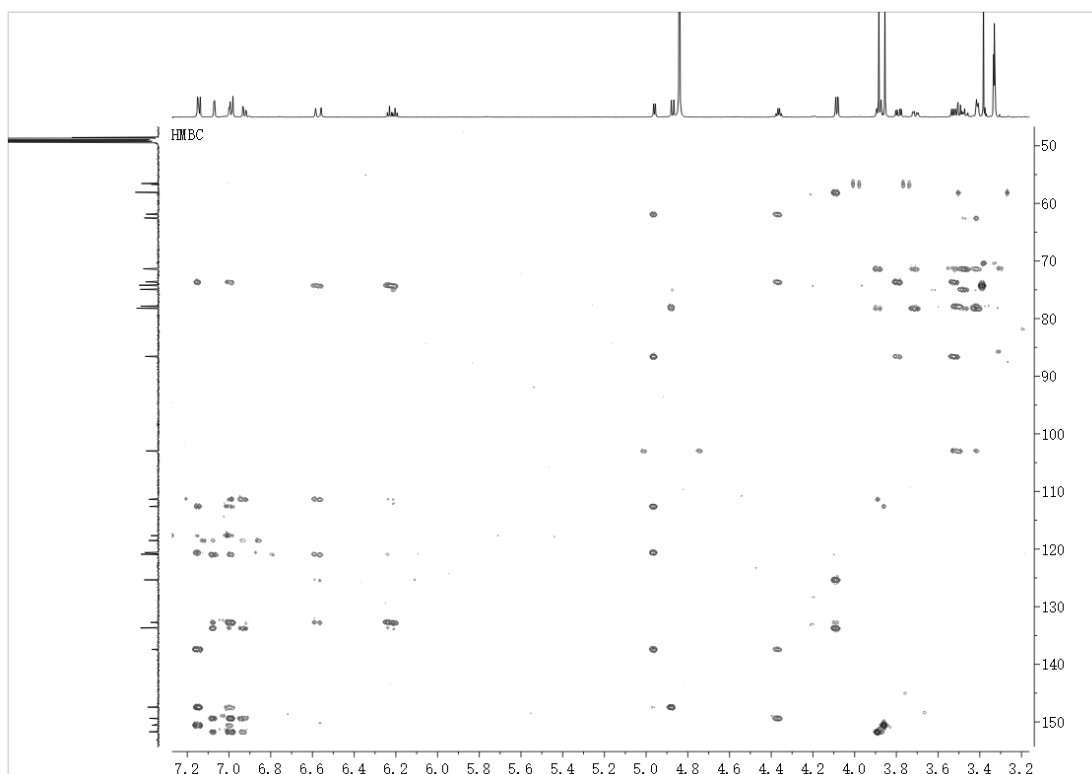


Figure S71. The HMBC Spectrum of Compound **8** in CD₃OD.

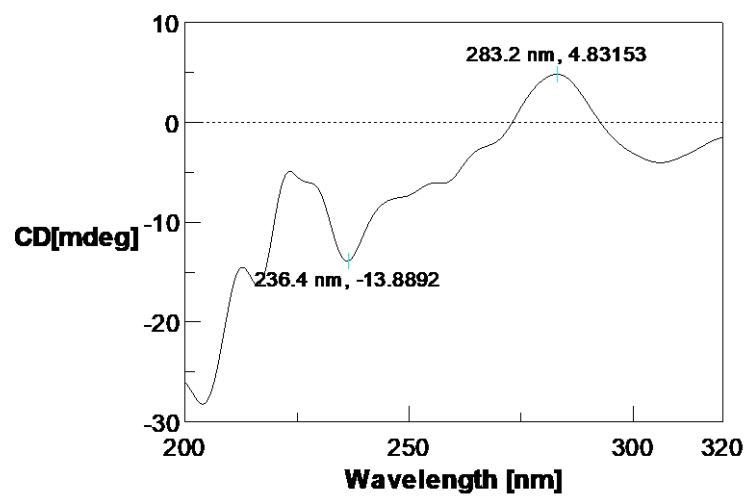


Figure S72. The CD Spectrum of Compound **8** in MeOH.

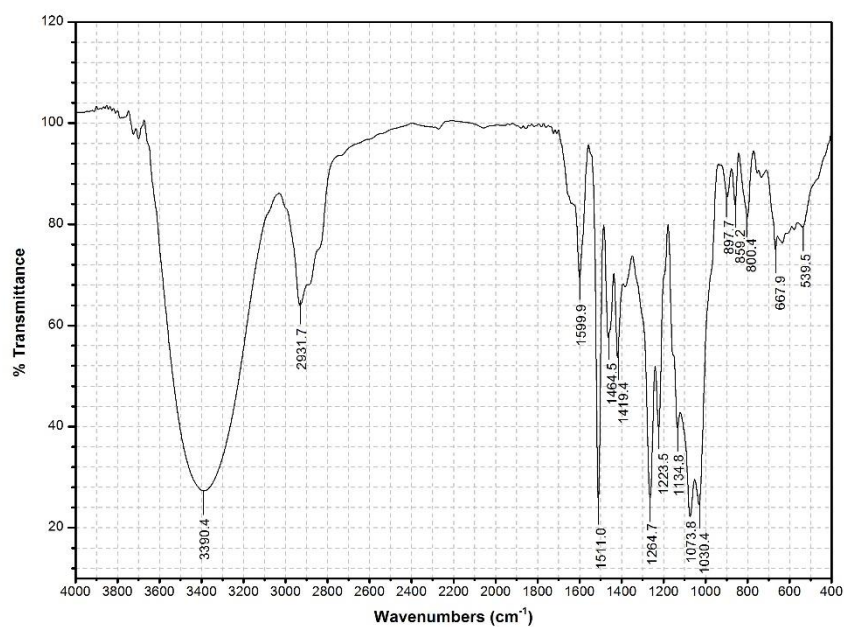
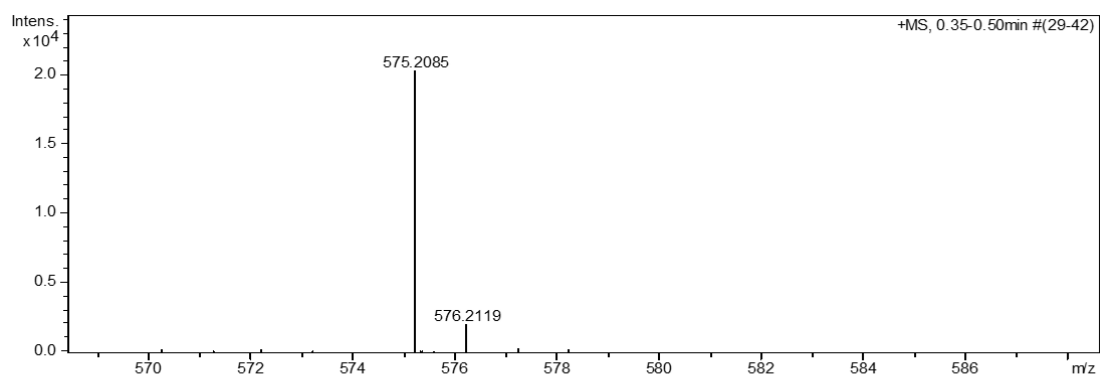


Figure S73. The IR Spectrum of Compound **9**.



Meas. m/z	#	Formula	Score	m/z	err [mDa]	err [ppm]	mSigma	rdB	e ⁻ Conf	N-Rule
575.2085	1	C ₂₇ H ₃₆ NaO ₁₂	100	575.2099	1.4	2.5	107.4	9.5	even	ok

Figure S74. The (+)-HRESIMS Spectrum of Compound **9**.

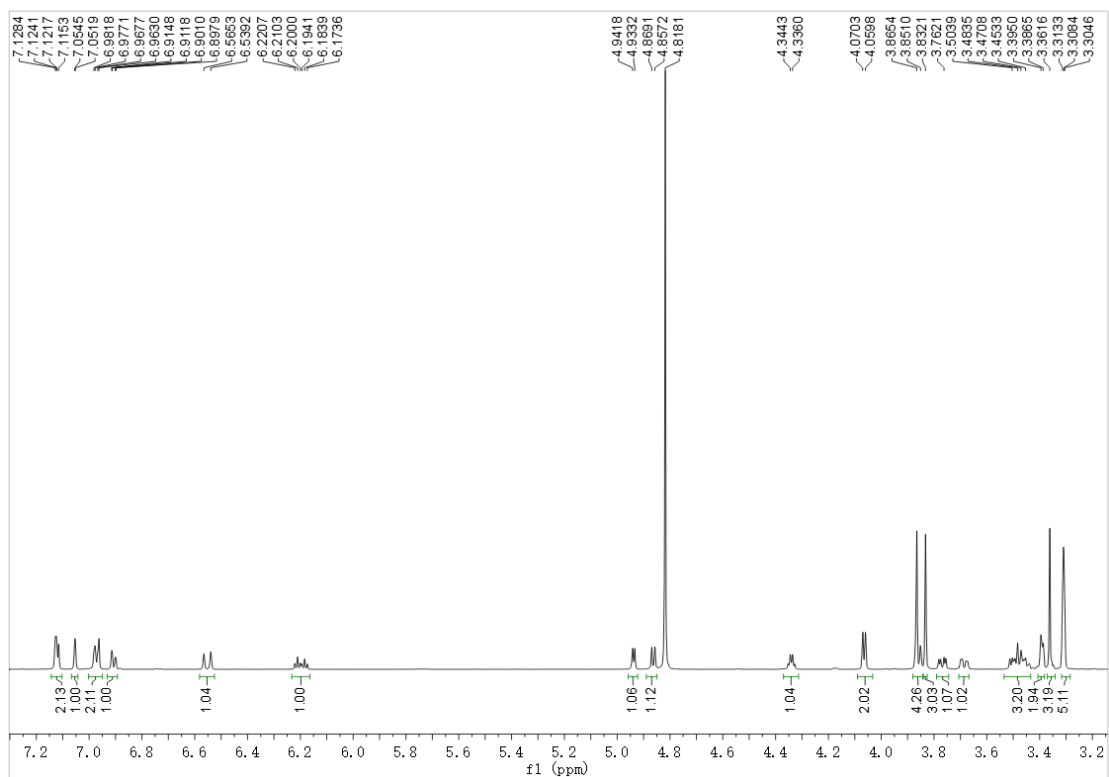


Figure S75. The ¹H NMR Spectrum of Compound **9** in CD₃OD.

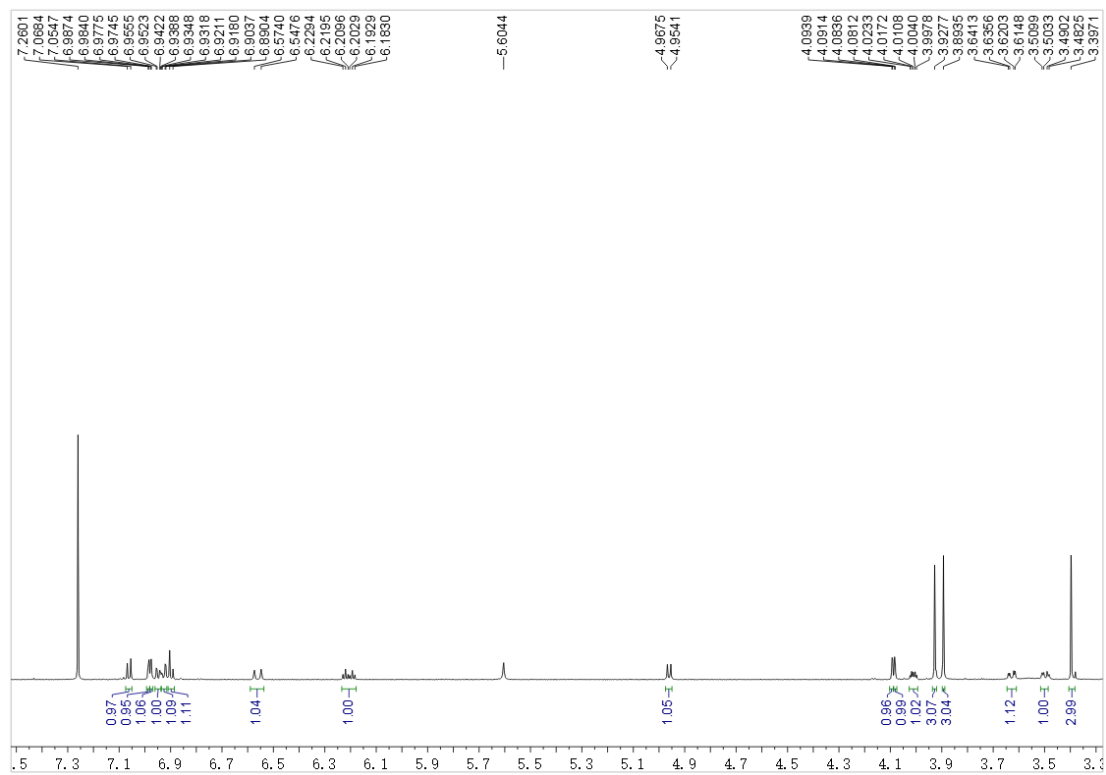


Figure S76. The ¹H NMR Spectrum of Compound **9a** in CDCl₃.

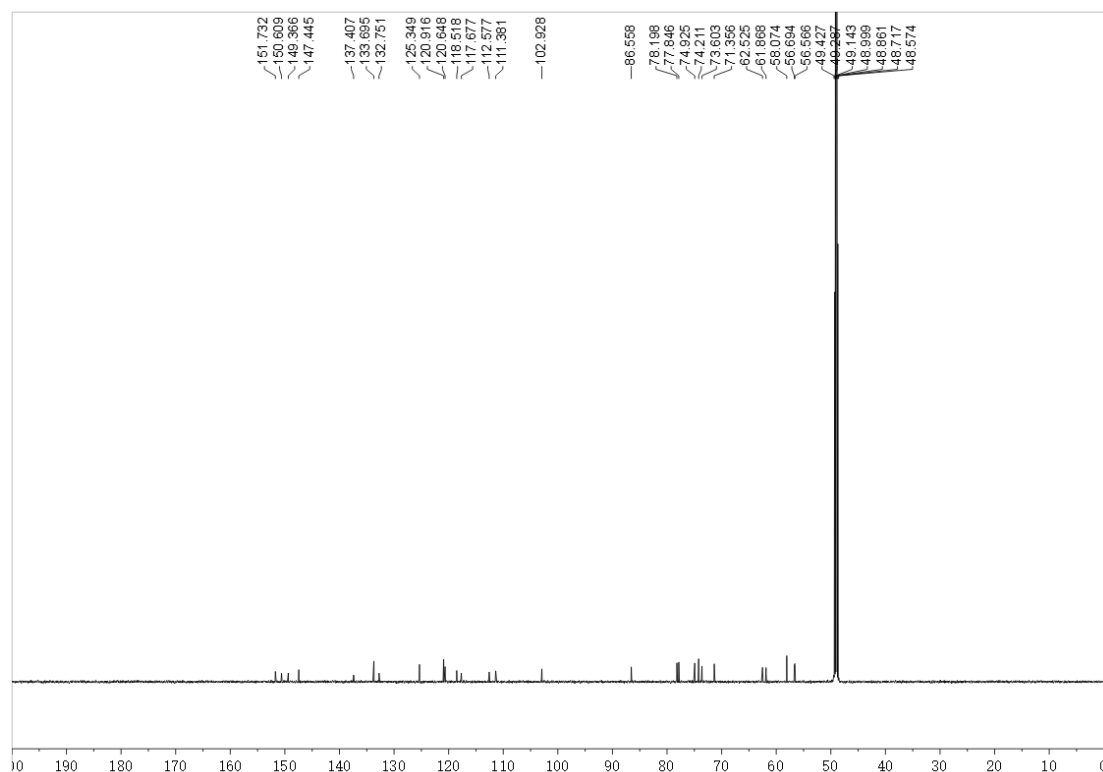


Figure S77. The ^{13}C NMR Spectrum of Compound **9** in CD_3OD .

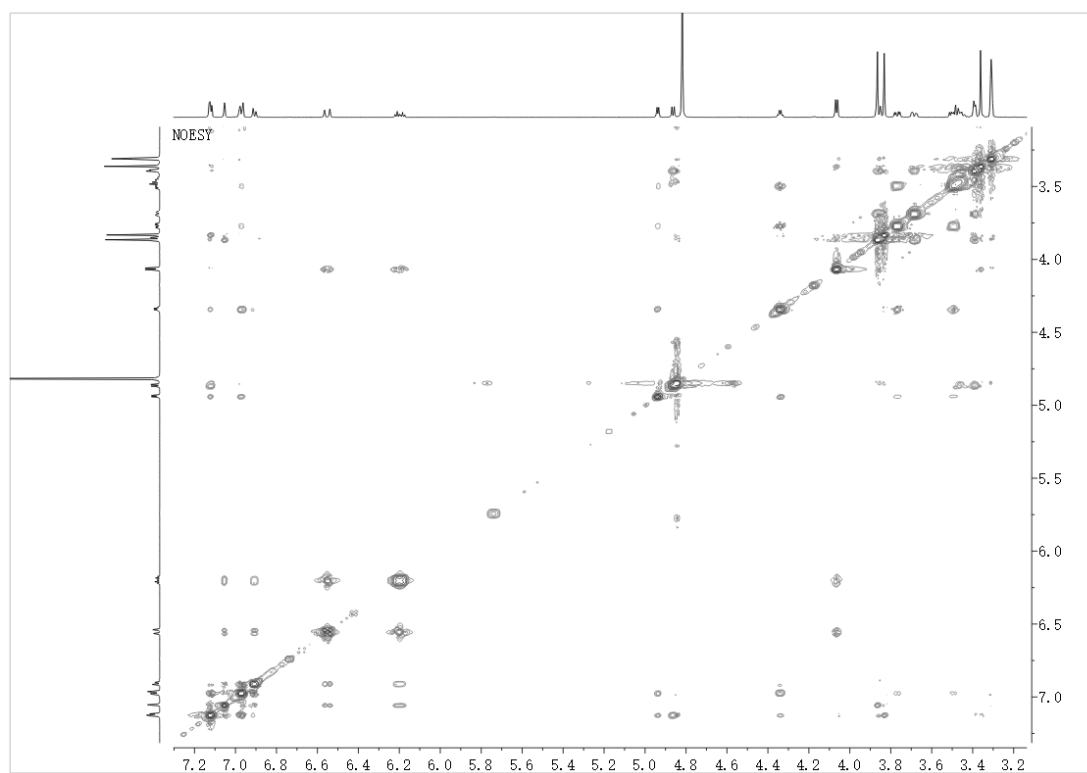


Figure S78. The NOESY Spectrum of Compound **9** in CD_3OD .

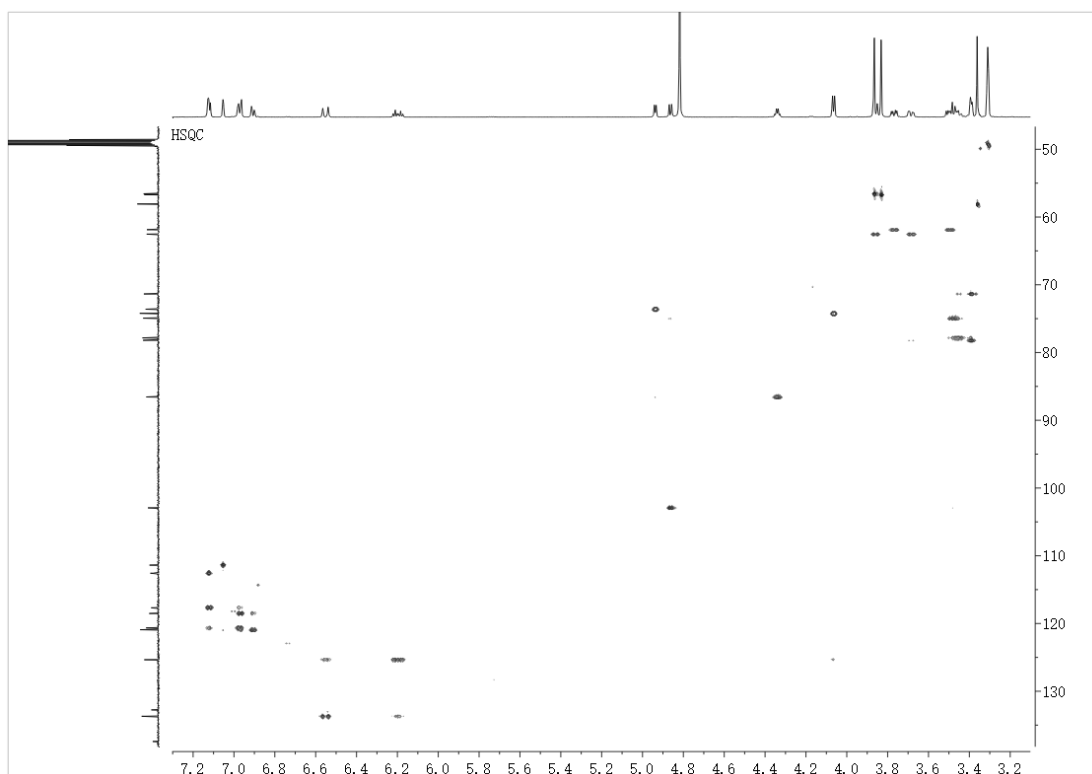


Figure S79. The HSQC Spectrum of Compound **9** in CD₃OD.

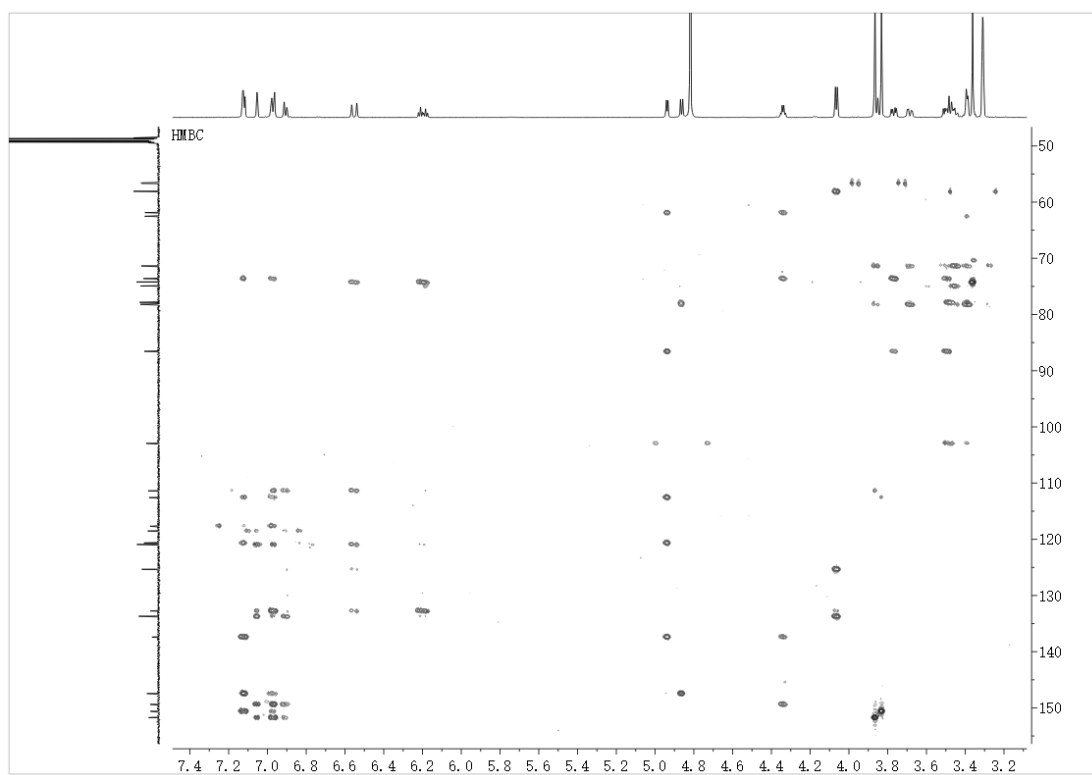


Figure S80. The HMBC Spectrum of Compound **9** in CD₃OD.

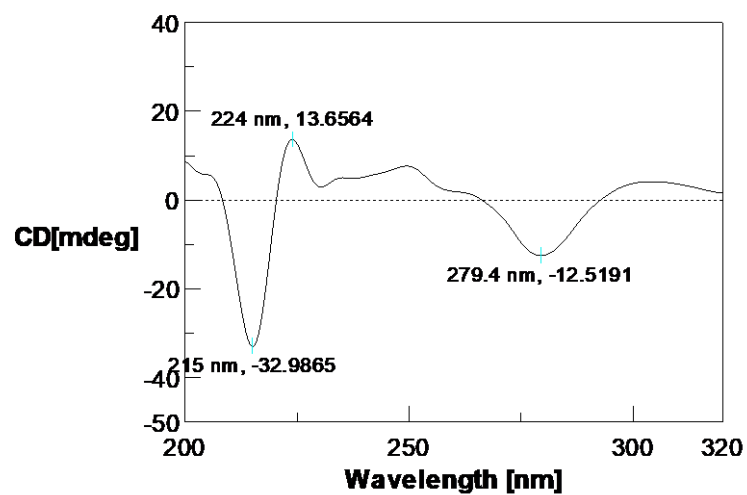


Figure S81. The CD Spectrum of Compound **9** in MeOH.

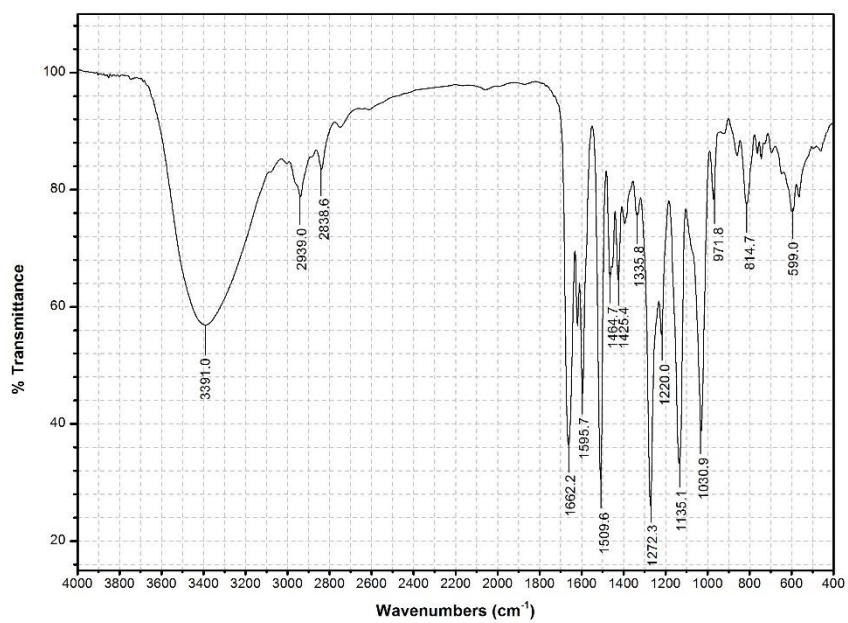


Figure S82. The IR Spectrum of Compound **10**.

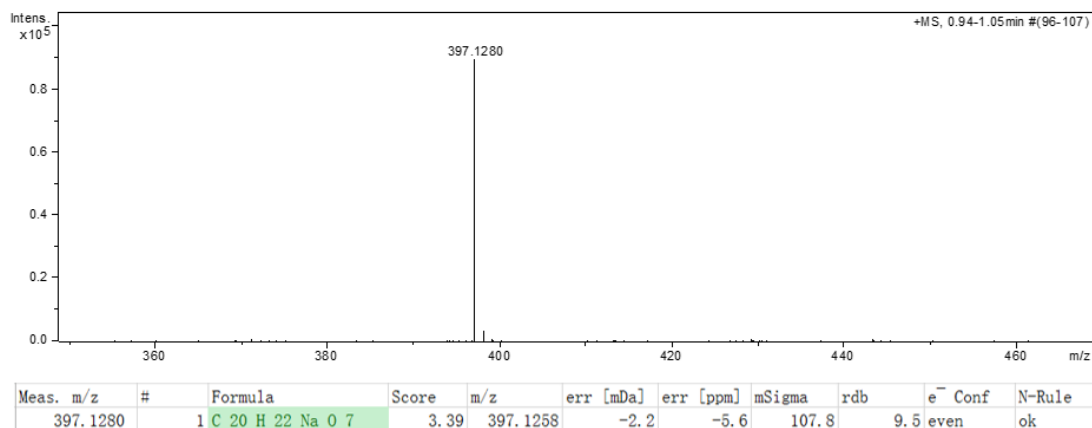


Figure S83. The (+)-HRESIMS Spectrum of Compound **10**.

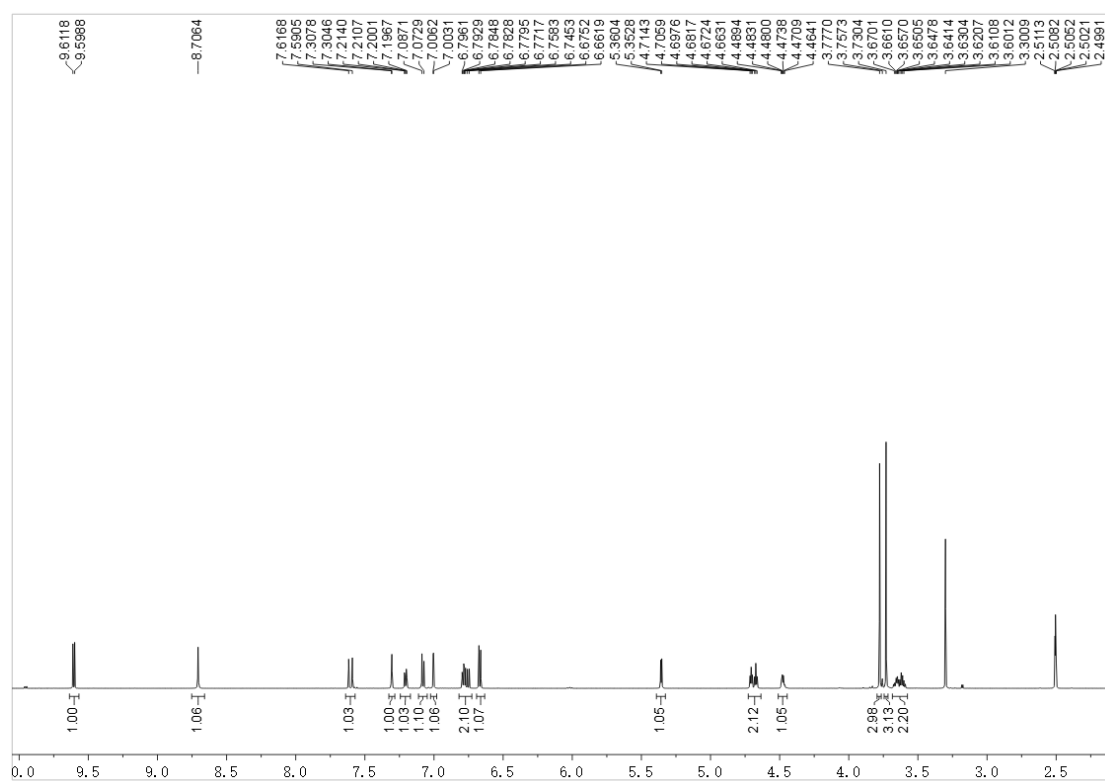


Figure S84. The ¹H NMR Spectrum of Compound **10** in DMSO-*d*₆.

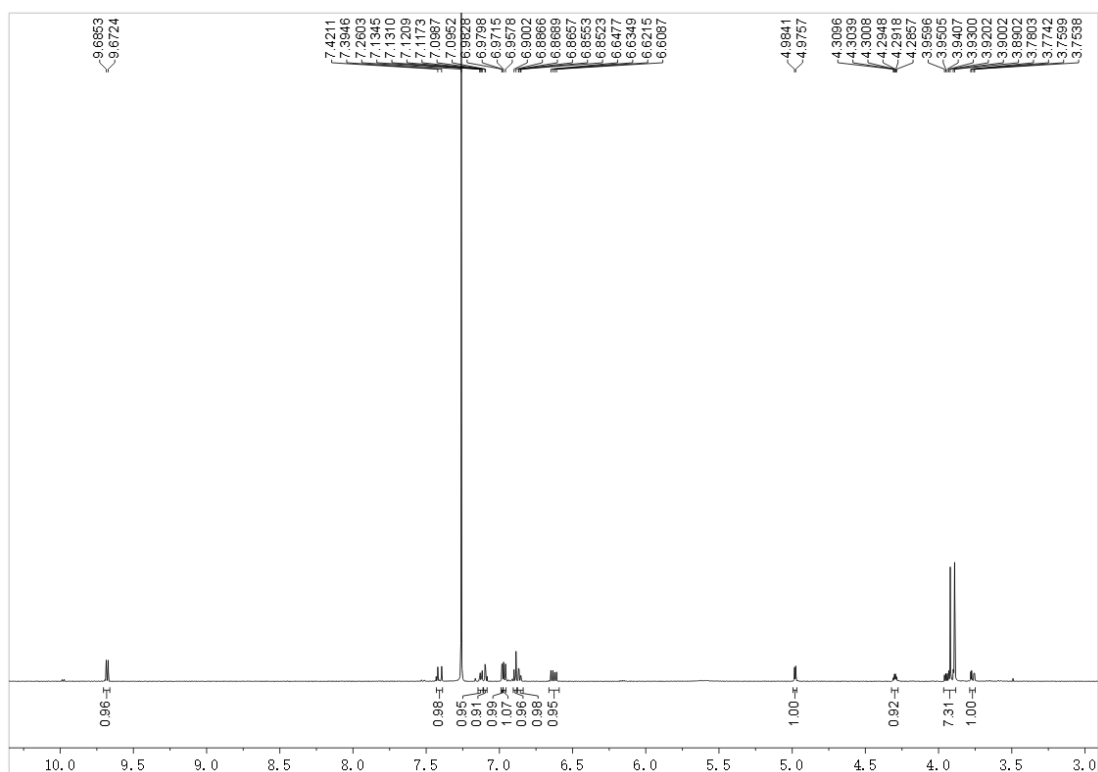


Figure S85. The ^1H NMR Spectrum of Compound **10** in CDCl_3 .

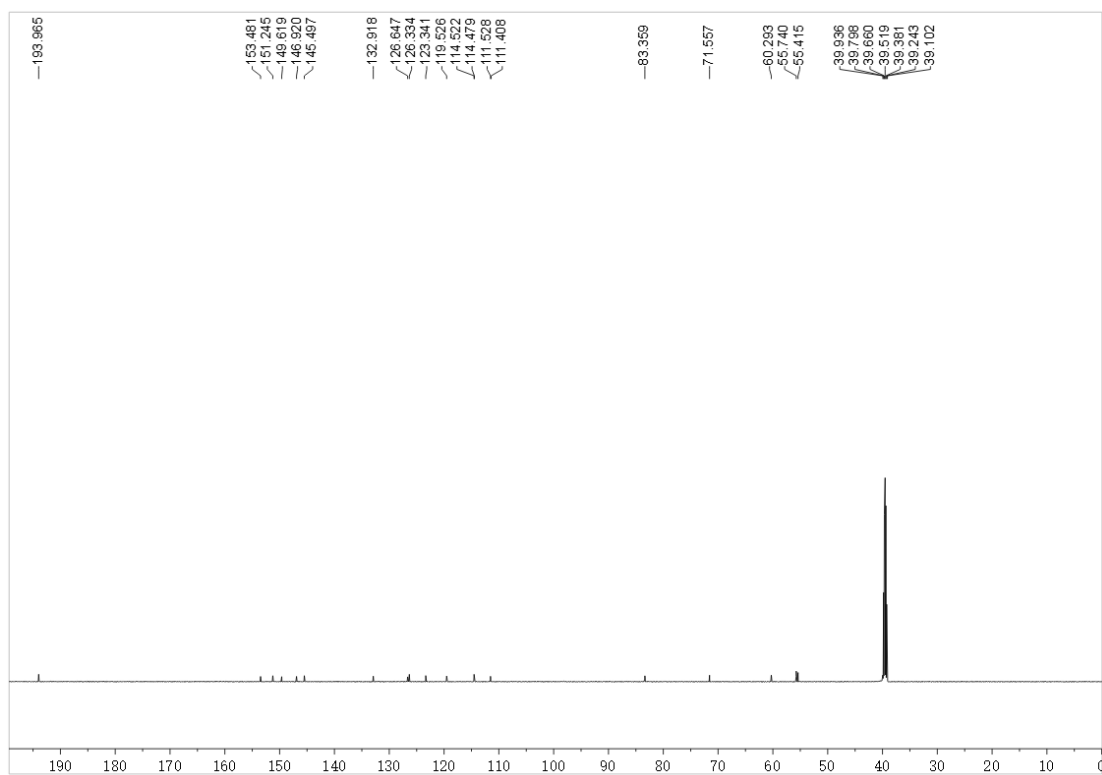


Figure S86. The ^{13}C NMR Spectrum of Compound **10** in $\text{DMSO}-d_6$.

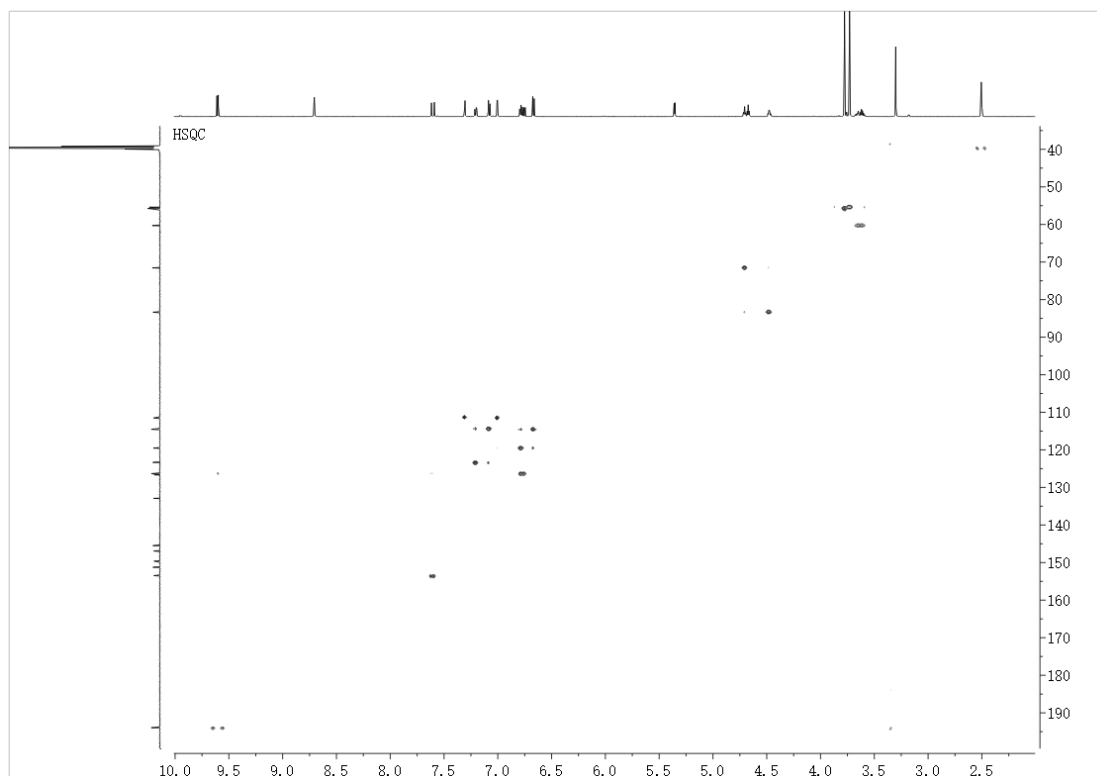


Figure S87. The HSQC Spectrum of Compound **10** in DMSO- d_6 .

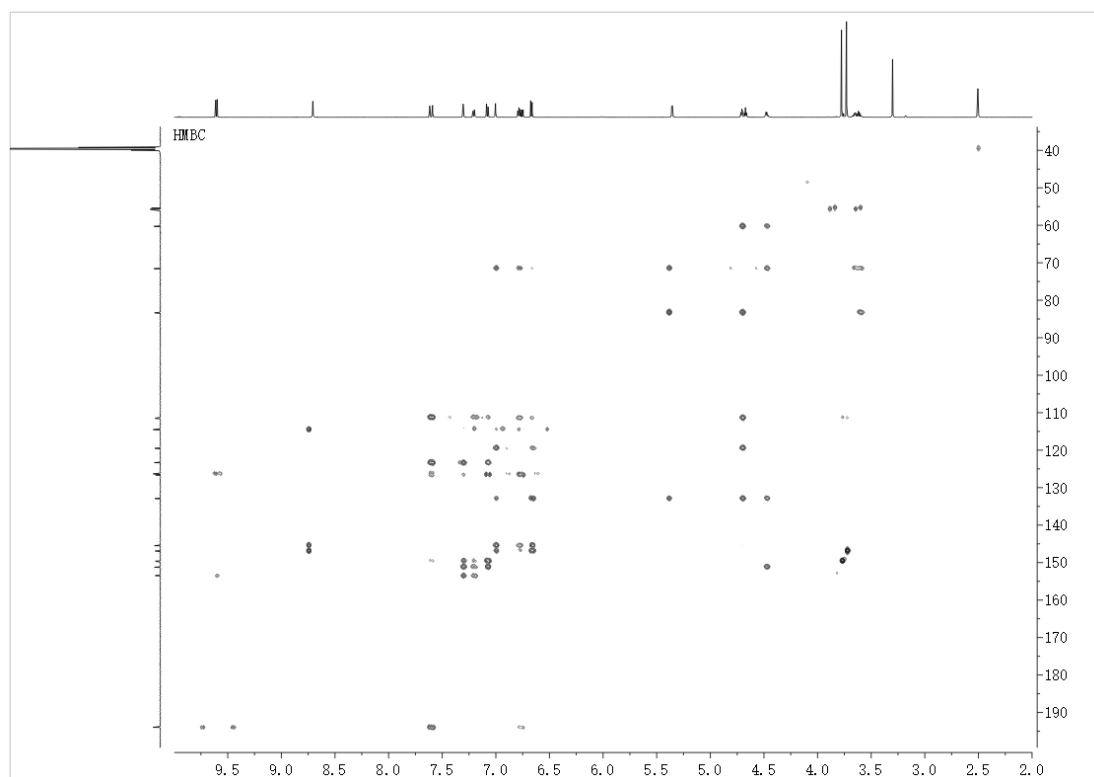


Figure S88. The HMBC Spectrum of Compound **10** in DMSO- d_6 .

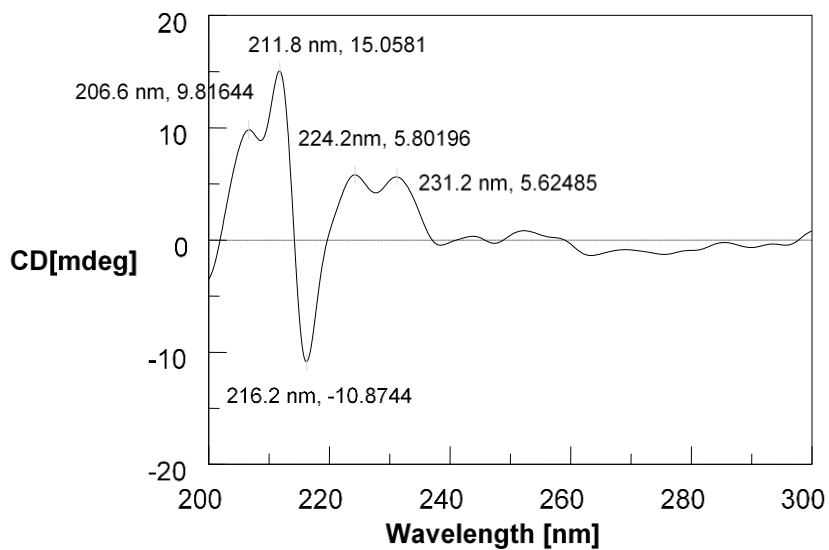


Figure S89. The CD Spectrum of Compound **10** in MeOH.

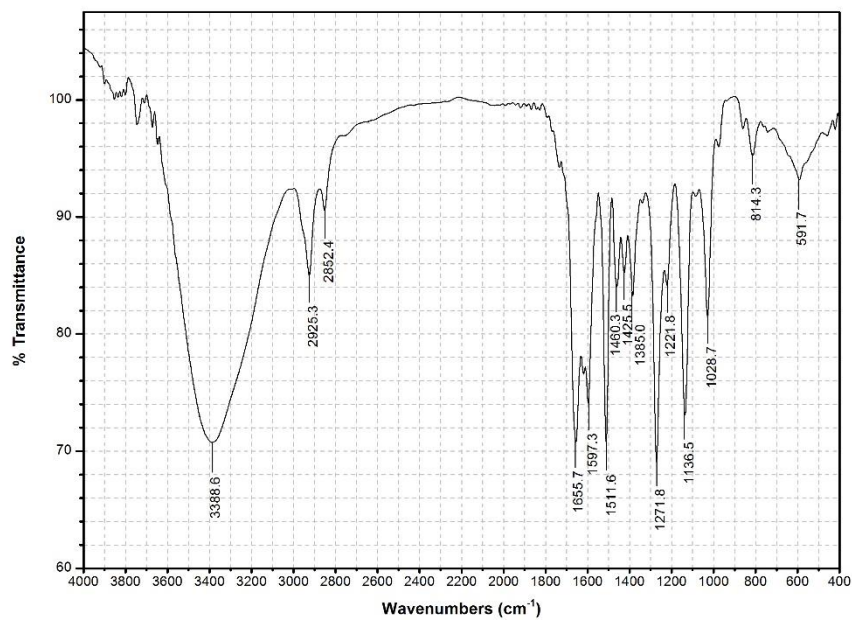


Figure S90. The IR Spectrum of Compound **11**.

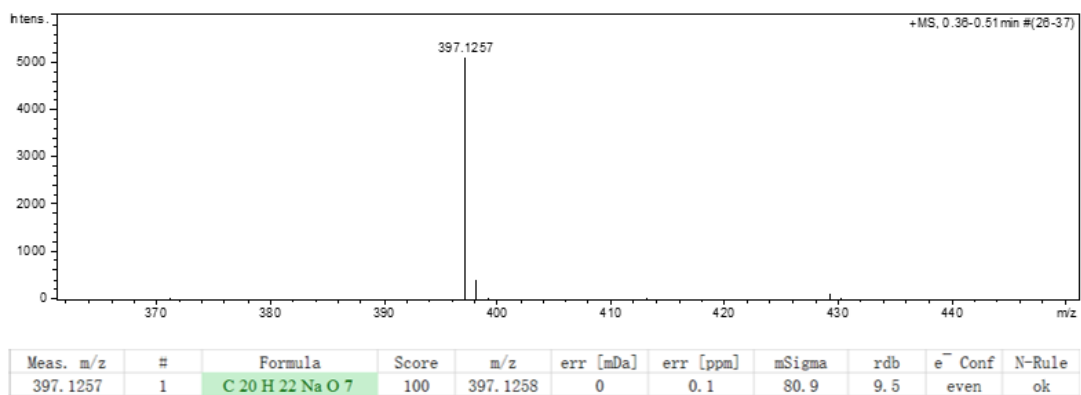


Figure S91. The (+)-HRESIMS Spectrum of Compound **11**.

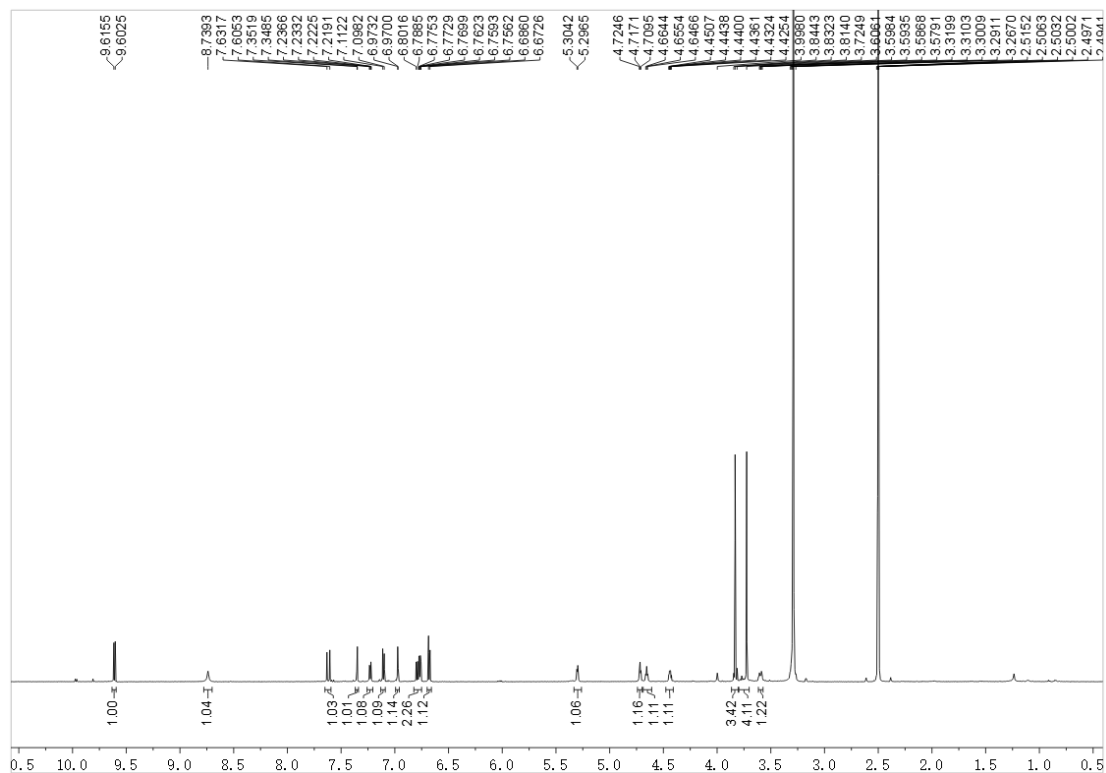


Figure S92. The ¹H NMR Spectrum of Compound **11** in DMSO-*d*₆.

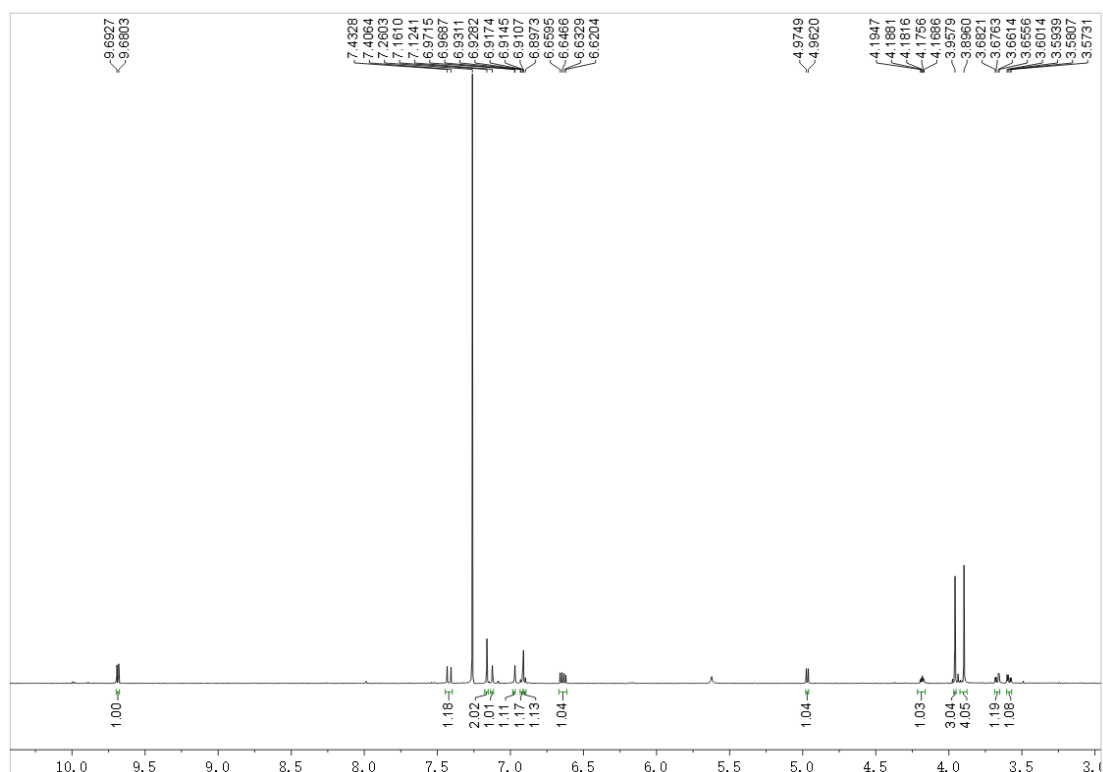


Figure S93. The ¹H NMR Spectrum of Compound **11** in CDCl₃.

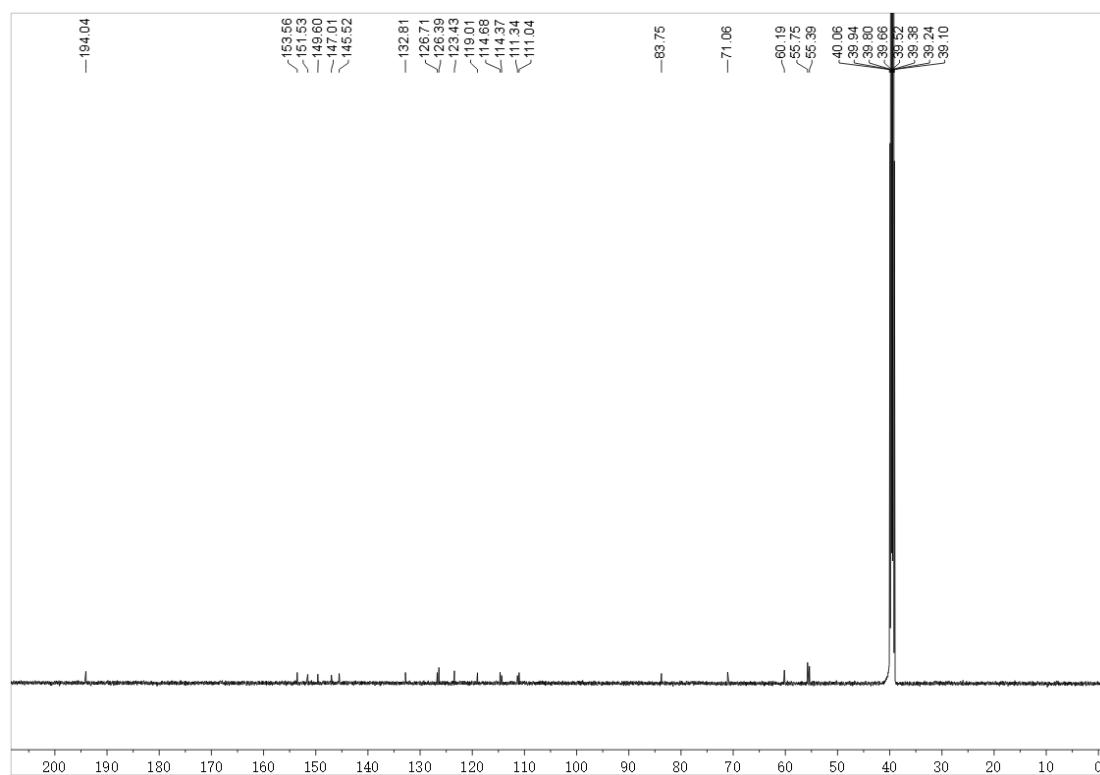


Figure S94. The ¹³C NMR Spectrum of Compound **11** in DMSO-*d*₆.

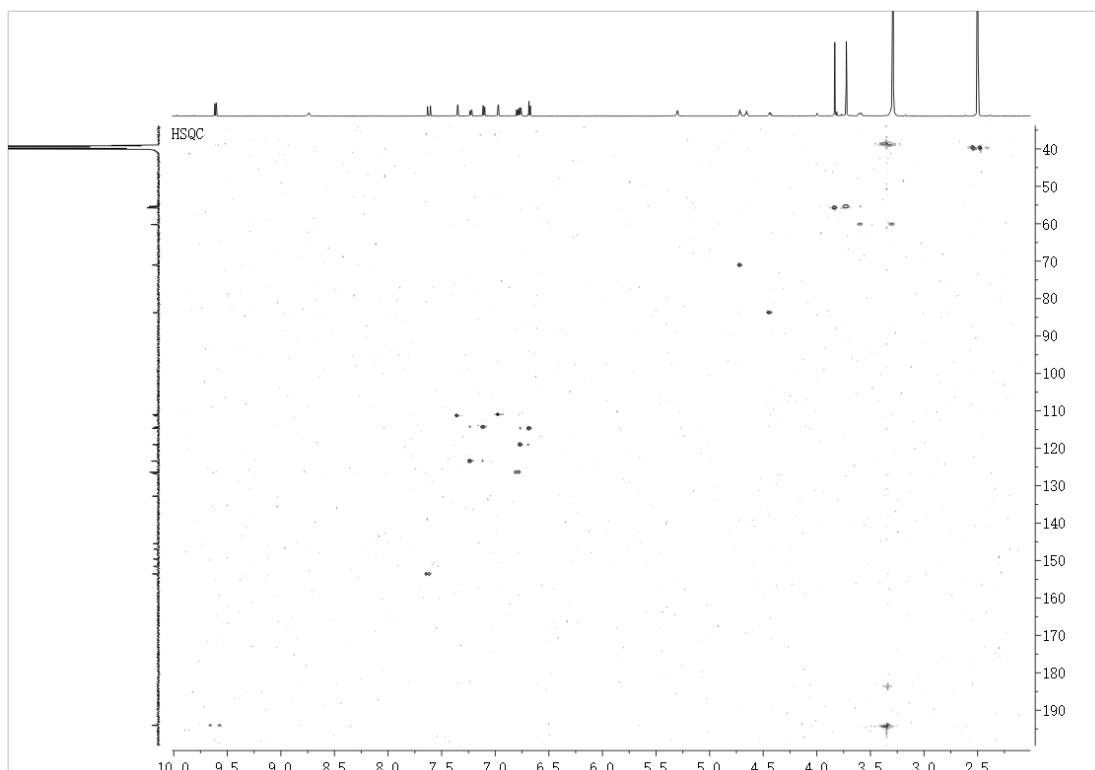


Figure S95. The HSQC Spectrum of Compound **11** in DMSO- d_6 .

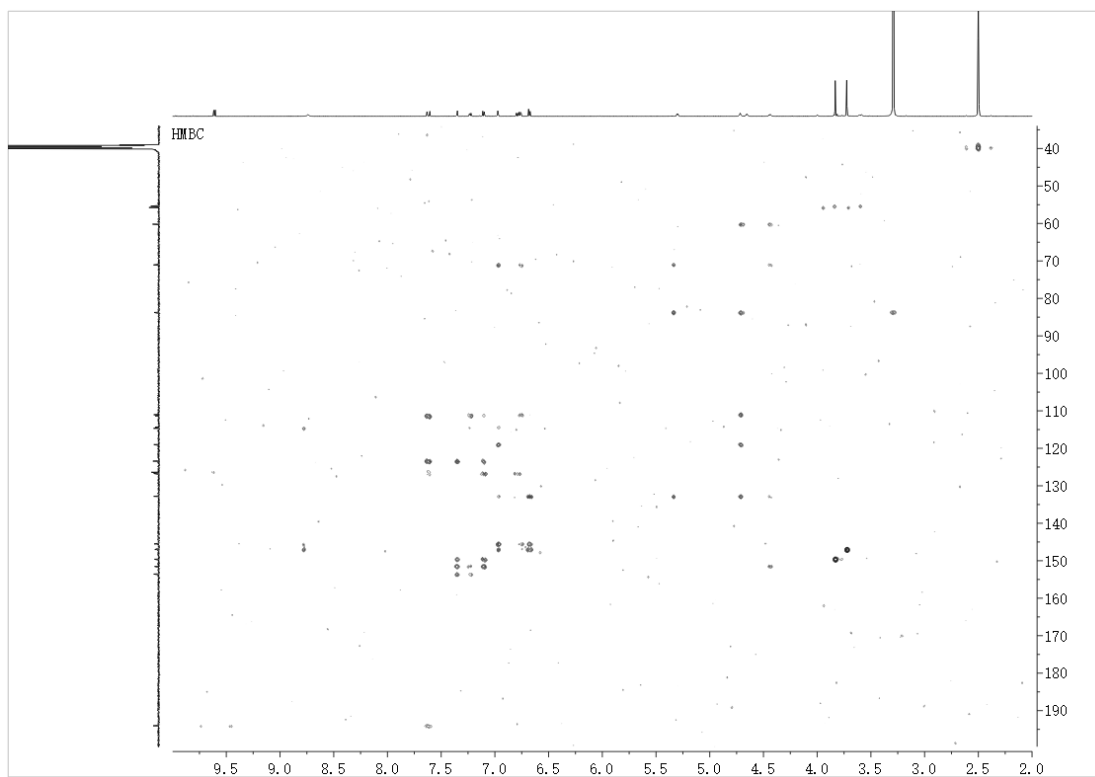


Figure S96. The HMBC Spectrum of Compound **11** in DMSO- d_6 .

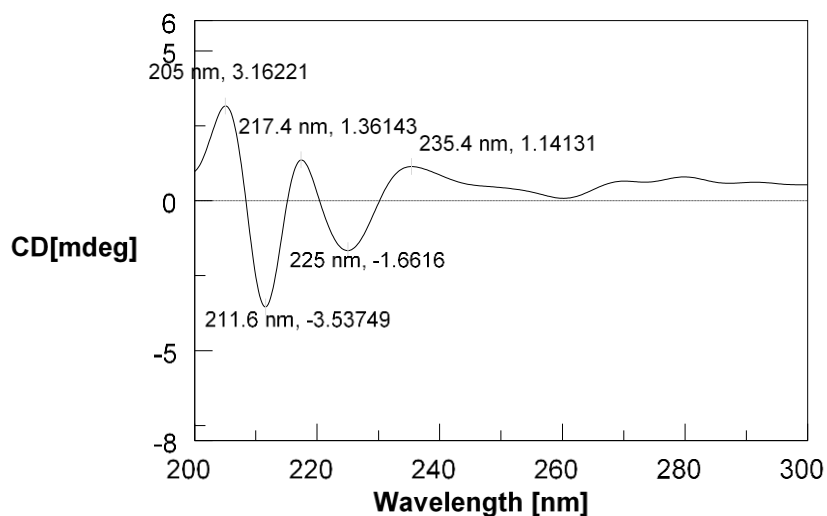


Figure S97. The CD Spectrum of Compound **11** in MeOH.

Table S98. The ^1H NMR (600 MHz, CDCl_3) spectroscopic data of **7a–9a**, **10**, **11**

NO.	7a	8a	9a	10	11
2	6.97 (d, 1.9)	6.99 (d, 1.9)	6.99 (d, 2.0)	6.98 (d, 1.8)	7.00 (d, 1.7)
5	6.91 (d, 8.2)	7.06 (d, 8.2)	7.06 (d, 8.2)	6.90 (d, 8.2)	6.90 (d, 8.0)
6	6.94 (dd, 8.2, 1.9)	6.95 (dd, 8.2, 1.9)	6.95 (dd, 8.2, 2.0)	6.86 (dd, 8.2, 1.8)	6.93 (dd, 8.0, 1.7)
7	4.97 (d, 4.7)	4.96 (d, 8.0)	4.96 (d, 8.0)	4.98 (d, 5.0)	4.97 (d, 7.7)
8	4.16 (m)	4.01 (m)	4.01 (m)	4.30 (m)	4.18 (m)
9	3.89 (overlap)	3.91 (dd, 12.5, 3.7)	3.63 (dd, 12.6, 3.4)	3.95 (dd, 12.2, 5.5)	3.67 (dd, 12.4, 3.5)
	3.67 (dd, 12.2, 3.4)	3.63 (dd, 12.5, 3.3)	3.50 (dd, 12.6, 4.0)	3.77 (dd, 12.2, 3.7)	3.29 (dd, 12.4, 4.5)
2'	6.96 (d, 1.9)	6.98 (d, 1.9)	6.98 (d, 1.8)	7.10 (d, 2.1)	7.16 (br.s)
5'	6.89 (d, 8.2)	6.90 (d, 8.0)	6.90 (d, 8.0)	6.97 (d, 8.2)	7.12 (br.s)
6'	6.83 (dd, 8.2, 1.9)	6.93 (dd, 8.0, 1.9)	6.93 (dd, 8.0, 1.8)	7.13 (dd, 8.2, 2.1)	7.16 (br.s)
7'	6.56 (dt, 15.7, 1.4)	6.56 (dt, 16.0, 1.6)	6.56 (dt, 15.9, 1.5)	7.41 (d, 15.9)	7.42 (d, 15.8)
8'	6.20 (dt, 15.7, 6.0)	6.21 (dt, 16.0, 6.2)	6.21 (dt, 15.9, 5.9)	6.63 (dd, 15.9, 7.7)	6.65 (dd, 15.8, 7.7)
9'	4.09 (dd, 6.0, 1.4)	4.09 (dd, 6.2, 1.6)	4.09 (dd, 5.9, 1.5)	9.68 (d, 7.7)	9.69 (d, 7.7)
3-OCH ₃	3.90 (s)	3.93 (s)	3.93 (s)	3.73 (s)	3.73 (s)
3'-OCH ₃	3.89 (s)	3.89 (s)	3.89 (s)	3.77 (s)	3.83 (s)
9'-OCH ₃	3.39 (s)	3.40 (s)	3.40 (s)		

Proton coupling constants (J) in Hz were given in parentheses.

Table S99. The ORD values of **7a–9a, 12a**

	7a	8a	9a	12a
$[\alpha]_D^{23}$	+23.3	–26.4	+26.4	–23.3

The ORD values of **7a–9a, 12a** were measured in CHCl₃ at *c* = 0.05 g/100ml.

Table S100. α -Glucosidase inhibitory, free radical scavenging and anti-inflammatory activities of the extracts from *V. fordiae* fruits

Test material	α -glucosidase inhibition (IC ₅₀ , μ g/mL) ^a	DPPH (IC ₅₀ , μ g/mL) ^a	ABTS (IC ₅₀ , μ g/mL) ^a	NO inhibition (IC ₅₀ , μ g/mL) ^a
Petroleum ether extract	> 500	> 500	> 500	> 500
<i>n</i> -Butanol extract	79.24 \pm 4.31	108.73 \pm 5.64	86.59 \pm 4.18	68.61 \pm 3.85
Acarbose	9.95 \pm 0.31			
Trolox		9.68 \pm 0.82	6.58 \pm 0.76	
Indomethacin				17.70 \pm 0.96

^a Values are represented as means \pm SD (n = 3)