Supplementary Material

Hyperattenins A–I, Bioactive Polyprenylated Acylphloroglucinols from *Hypericum attenuatum* Choisy

Dongyan Li,[ab]‡ Yongbo Xue,[a]‡ Hucheng Zhu,[a] Yan Li,[c] Bin Sun,[a] Junjun Liu,[a] Guangmin Yao,[a] Jinwen Zhang,[b] Guang Du*[b] and Yonghui Zhang [a]*

[a] Hubei Key Laboratory of Natural Medicinal Chemistry and Resource Evaluation, School of Pharmacy, Tongji Medical College, Huazhong University of Science and Technology, Wuhan 430030, People's Republic of China. Fax: 86-27-83692762; Tel: 86-27-83692311; E-mail: zhangyh@mails.tjmu.edu.cn

[b] Tongji Hospital Affliated to Tongji Medical College, Huazhong University of Science and Technology, Wuhan 430030, People's Republic of China. Tel: 86-27-83663643; E-mail:

[c] State Key Laboratory of Phytochemistry and Plant Resources in West China, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming 650204, People's Republic of China

List of Supporting Information

* Corresponding author. Tel.: +86 27 83692311; fax: +86 27 83691325.

E-mail address: zhangyh@mails.tjmu.edu.cn (Y. Zhang); tjyxb@sina.com (G. Du).

‡ These authors contribute equally to this work.

Figure S1.[1]H NMR spectrum (400 MHz) of compound **1** in $CDCl_3$.

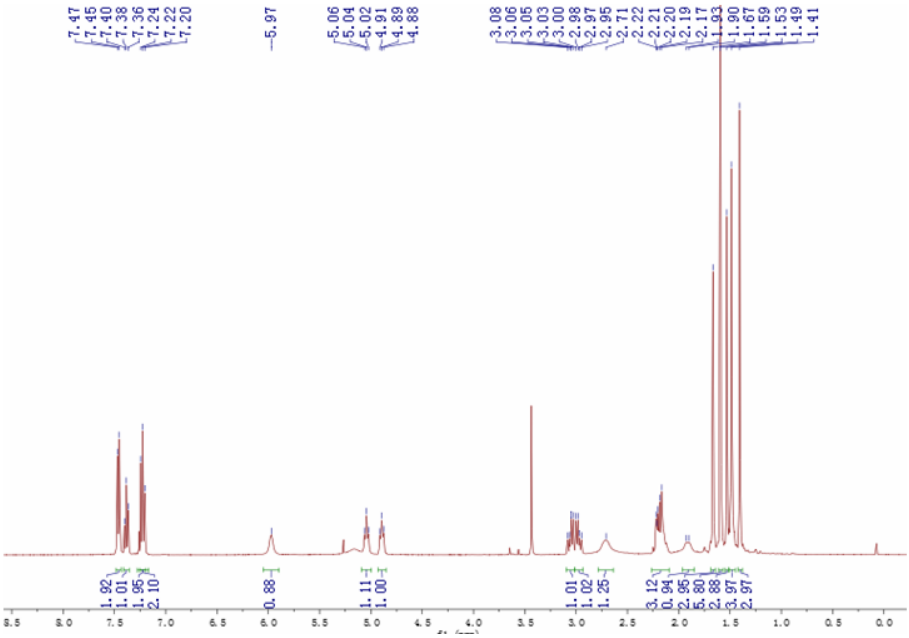


Figure S2.[13]C NMR spectrum (100 MHz) of compound **1** in $CDCl_3$

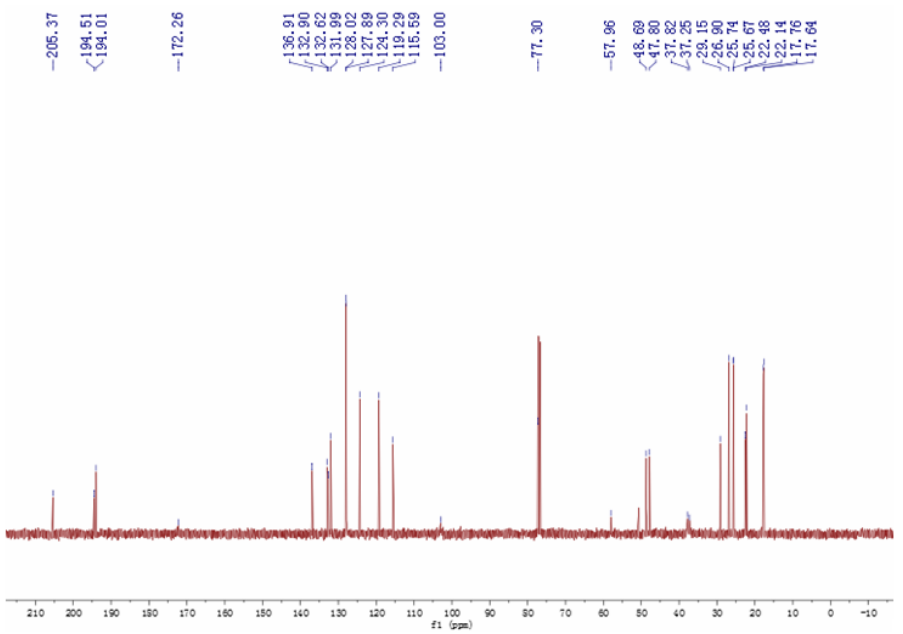


Figure S3. DEPT-135 spectrum (100 MHz) of compound **1** in $CDCl_3$

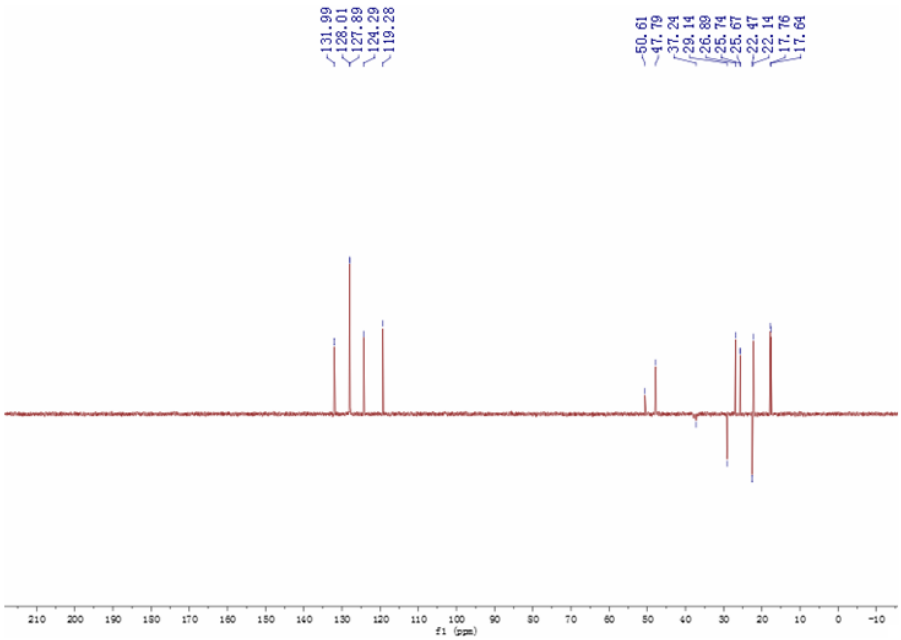


Figure S4. HSQC spectrum of compound **1** in $CDCl_3$

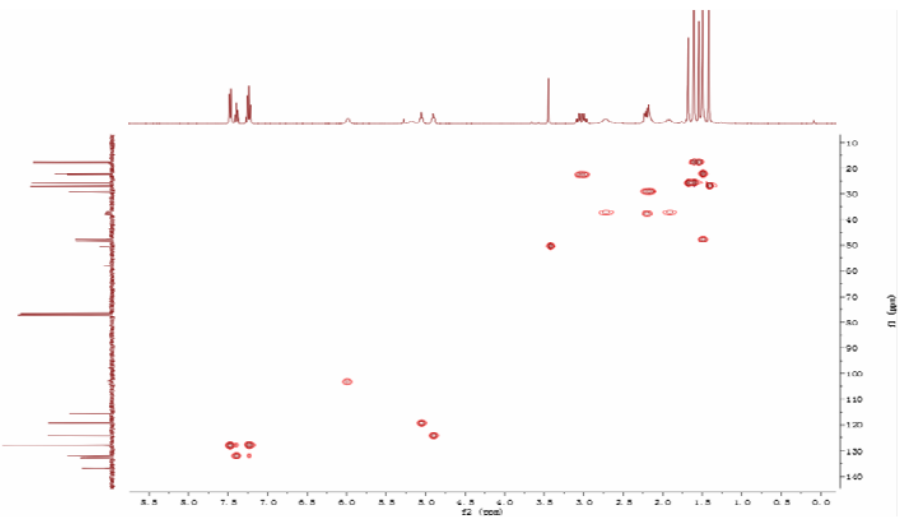


Figure S5. $^{1}H–^{1}H$ COSY spectrum of compound **1** in $CDCl_3$

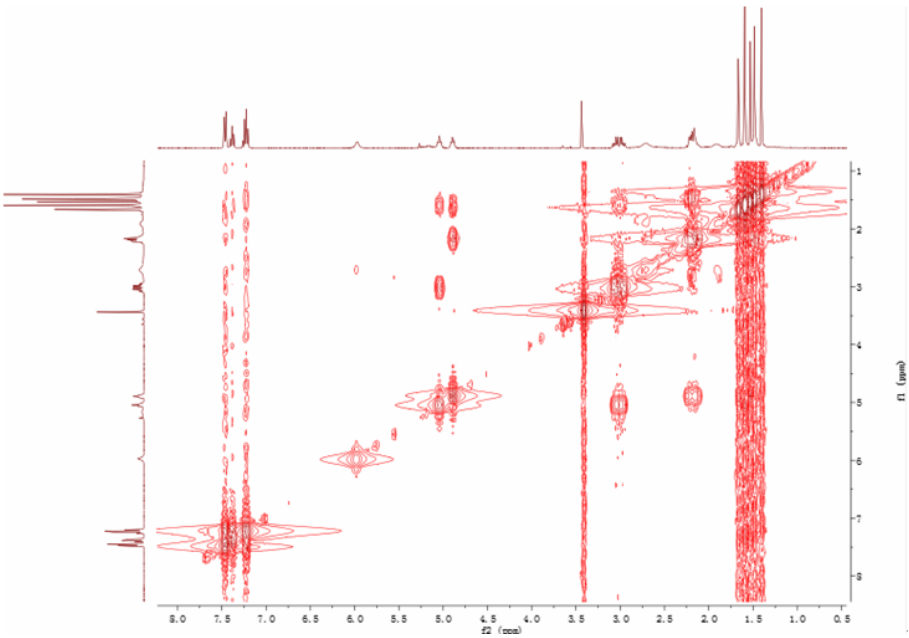


Figure S6. HMBC spectrum of compound **1** in $CDCl_3$

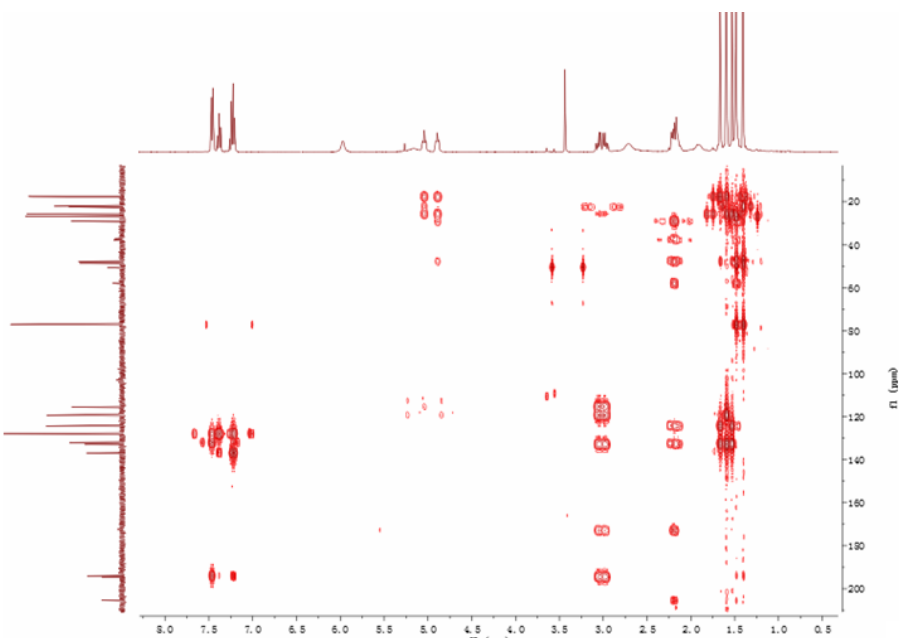


Figure S7. NOESY spectrum of compound **1** in $CDCl_3$

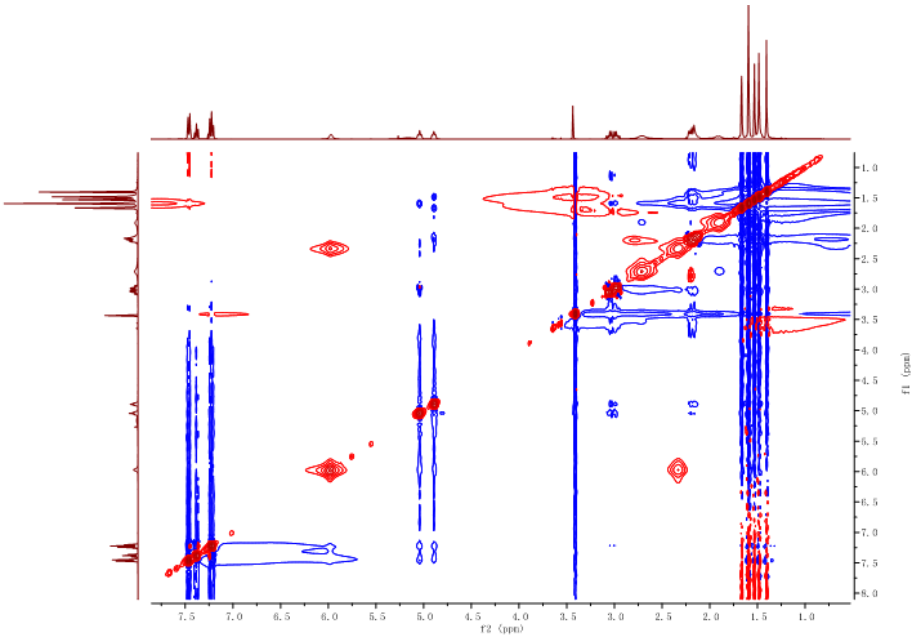


Figure S8. HRESIMS spectrum of compound **1**

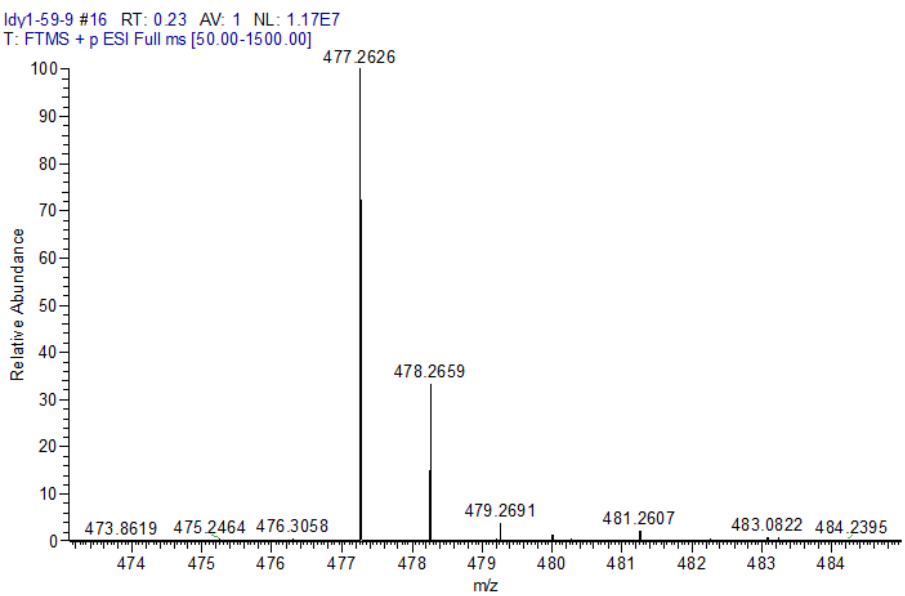


Figure S9. UV spectrum of compound **1**

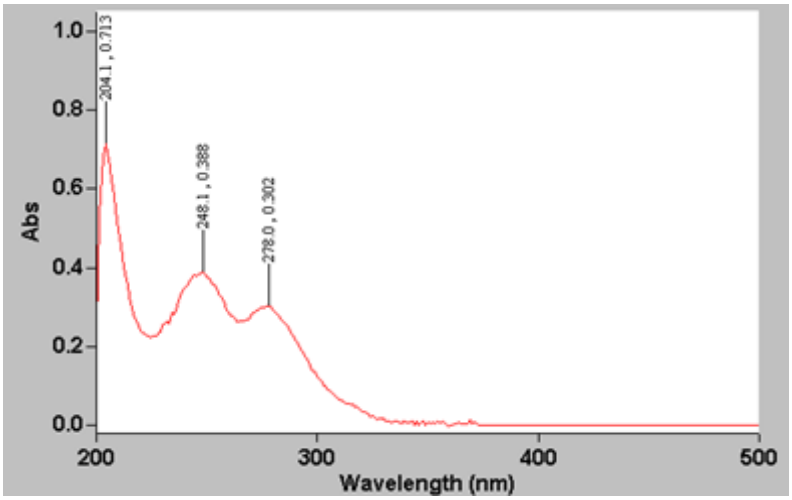


Figure S10. IR (KBr) spectrum of compound **1**

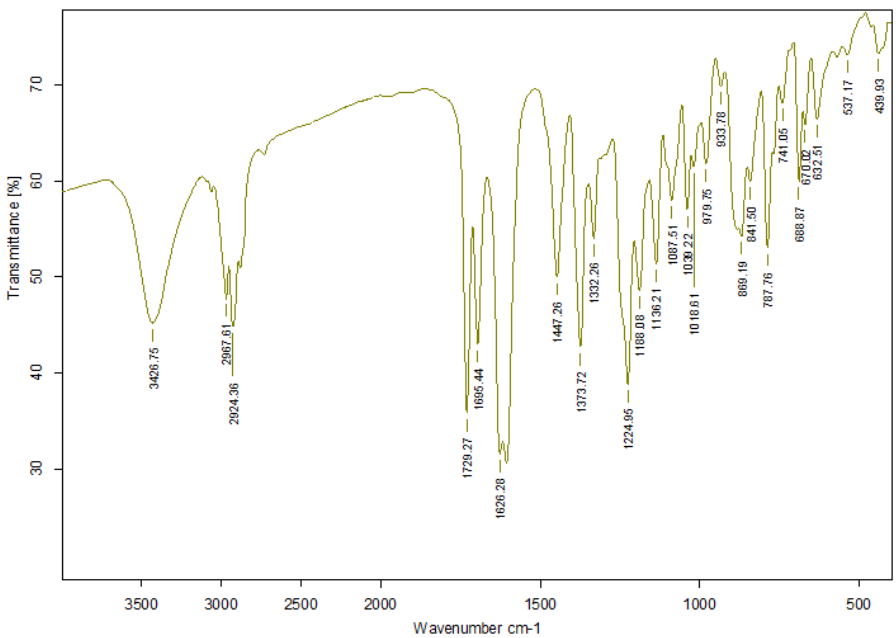


Figure S11.[1]H NMR spectrum (400 MHz) of compound **2** in $CDCl_3$

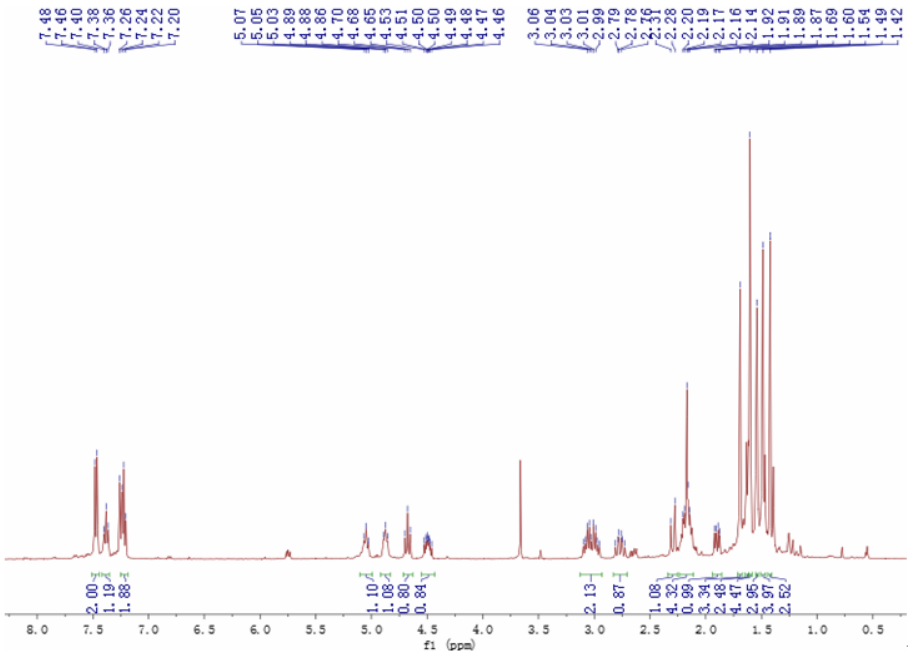


Figure S12.[13]C NMR spectrum (100 MHz) of compound **2** in $CDCl_3$

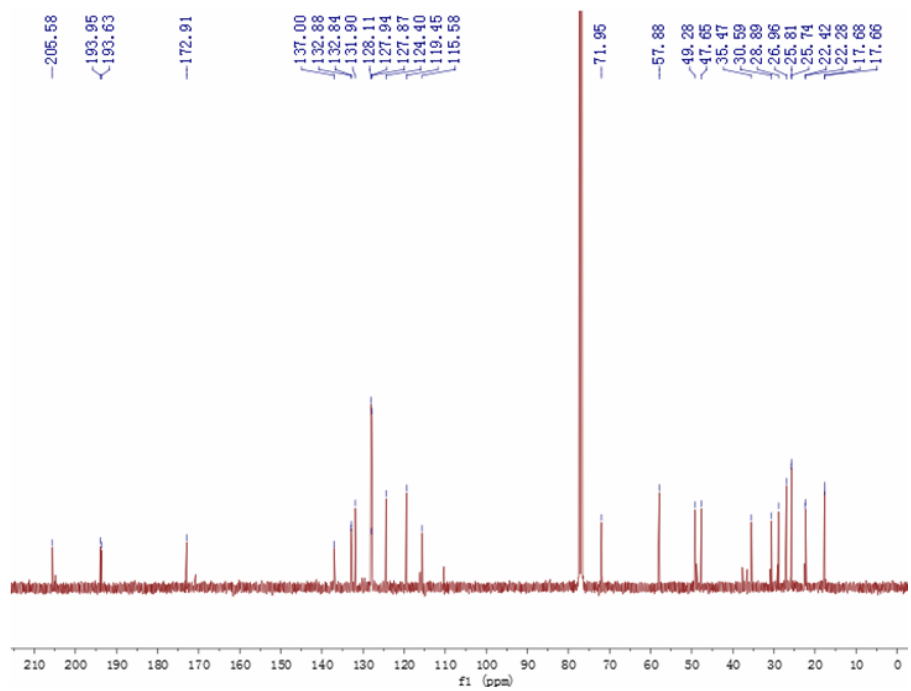


Figure S13. DEPT-135 spectrum (100 MHz) of compound **2** in $CDCl_3$

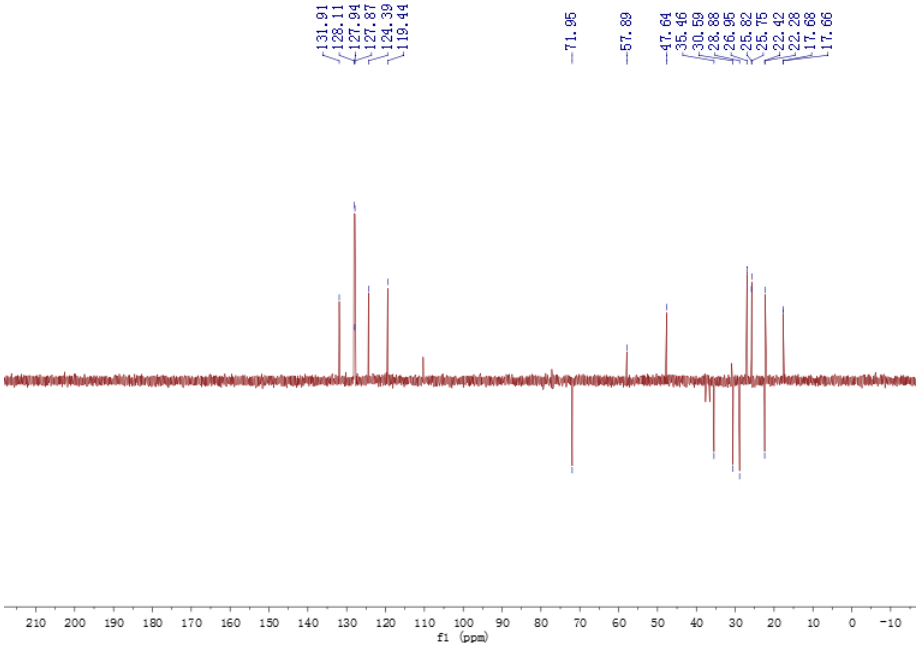


Figure S14. HSQC spectrum of compound **2** in $CDCl_3$

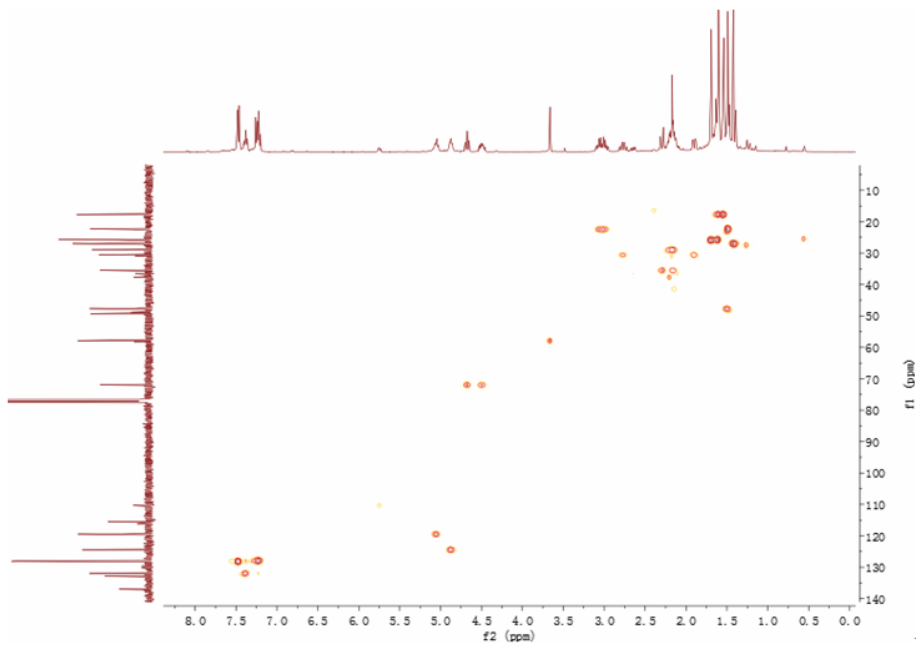


Figure S15. ^{1}H–^{1}H COSY spectrum of compound **2** in $CDCl_3$

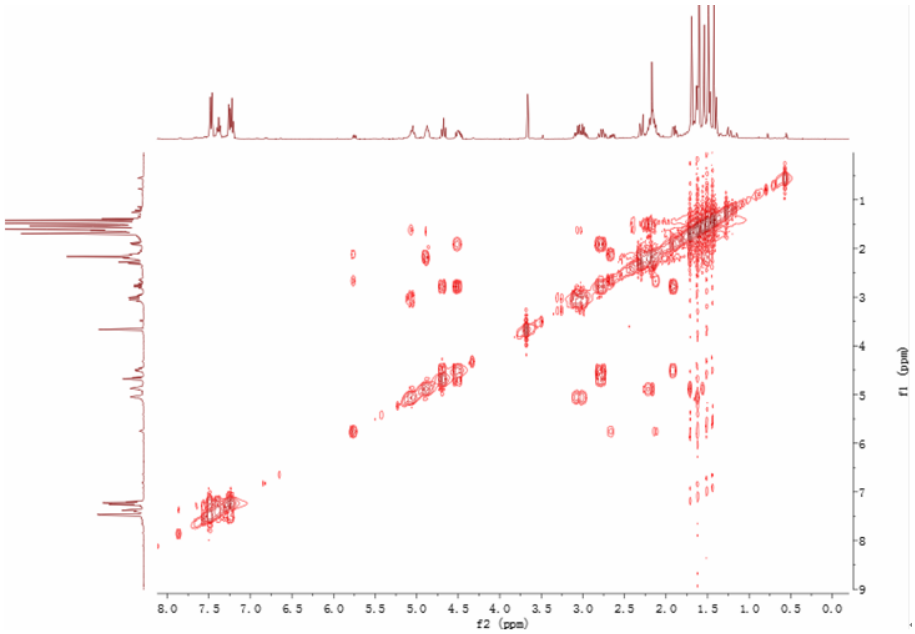


Figure S16. HMBC spectrum of compound **2** in $CDCl_3$

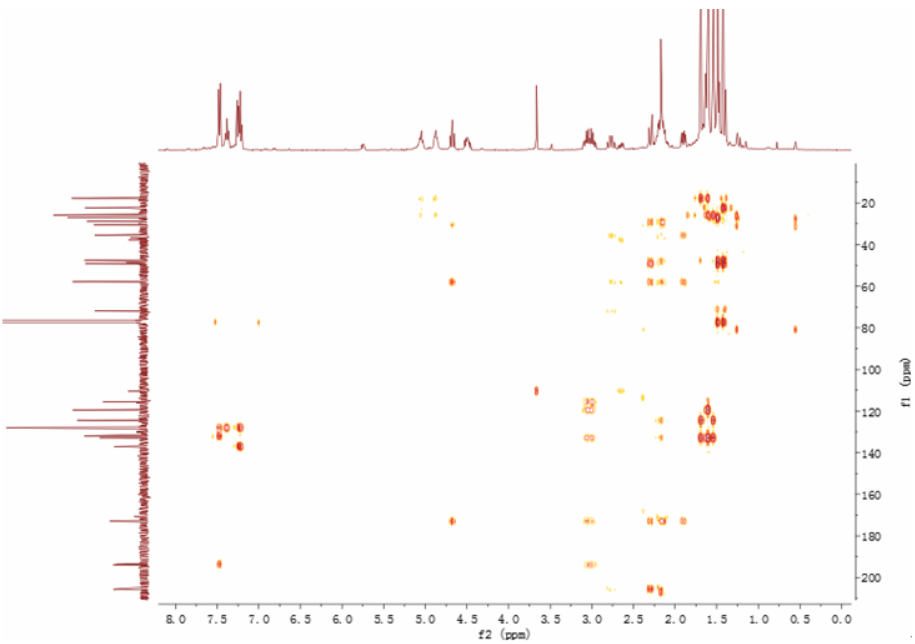


Figure S17. NOESY spectrum of compound **2** in $CDCl_3$

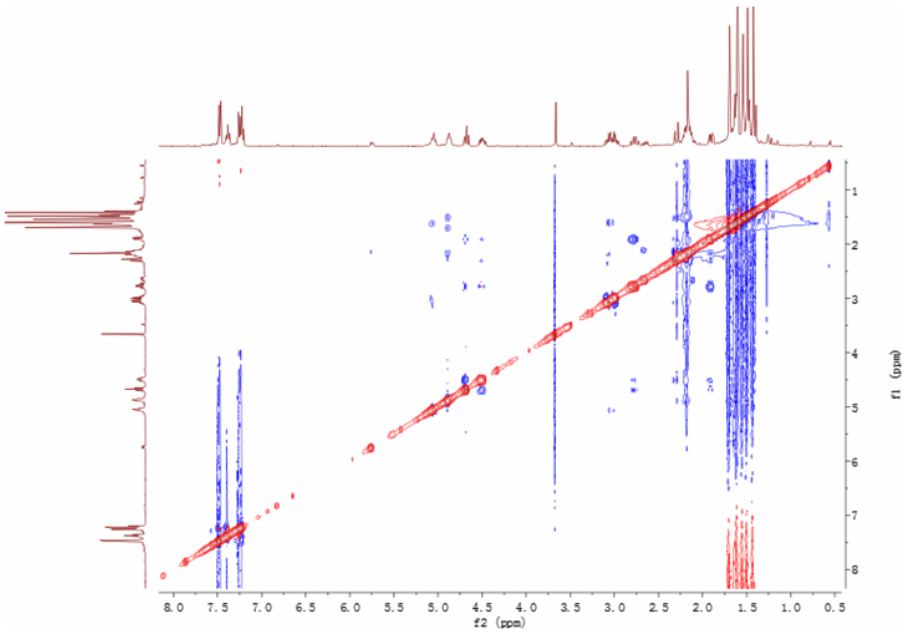


Figure S18. HRESIMS spectrum of compound **2**

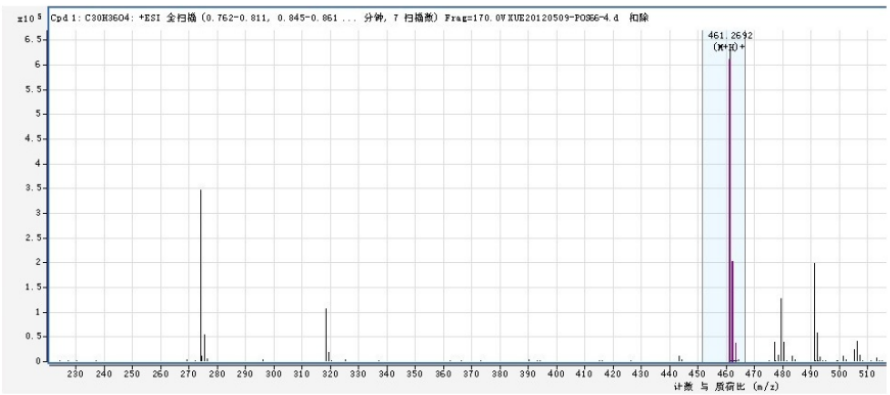


Figure S19. UV spectrum of compound **2**

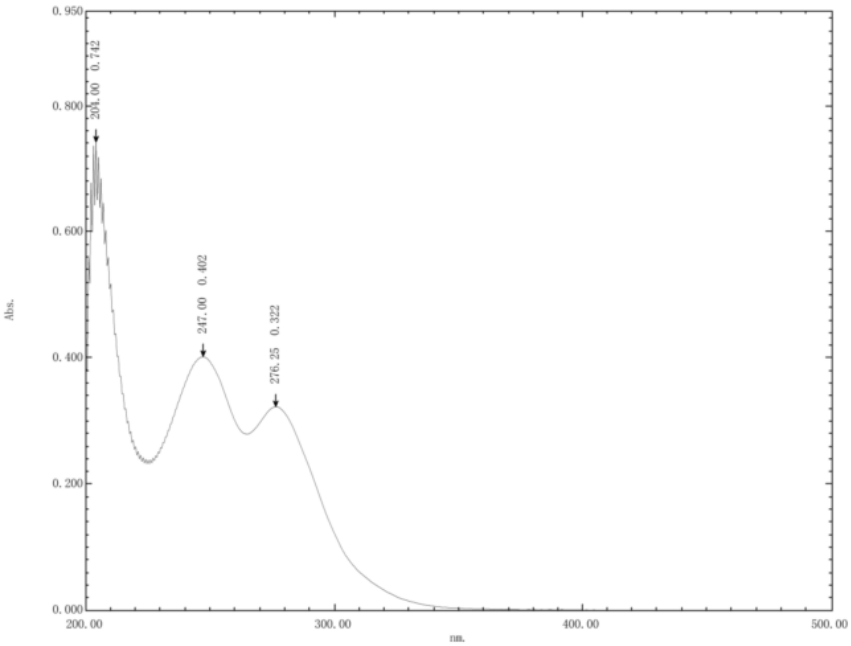


Figure S20. IR (KBr) spectrum of compound **2**

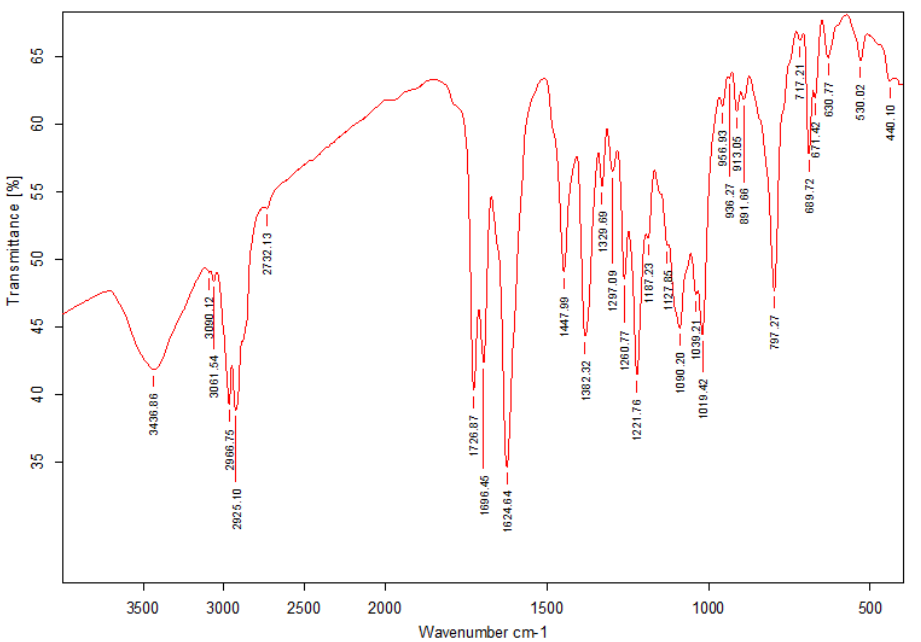


Figure S21.[1]H NMR spectrum (400 MHz) of compound **3** in $CDCl_3$

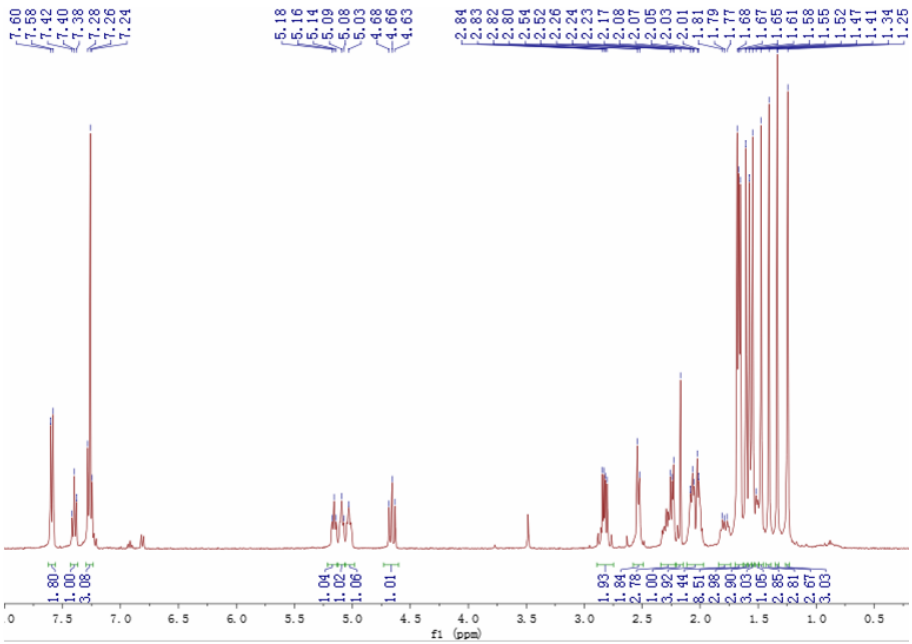


Figure S22.[13]C NMR spectrum (100 MHz) of compound **3** in $CDCl_3$

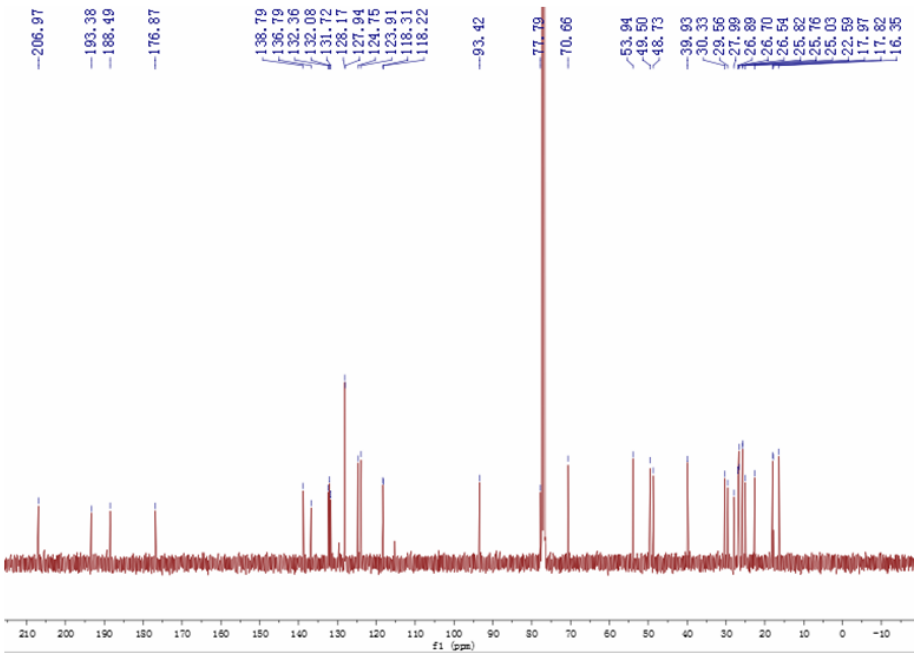


Figure S23. DEPT-135 spectrum (100 MHz) of compound **3** in $CDCl_3$

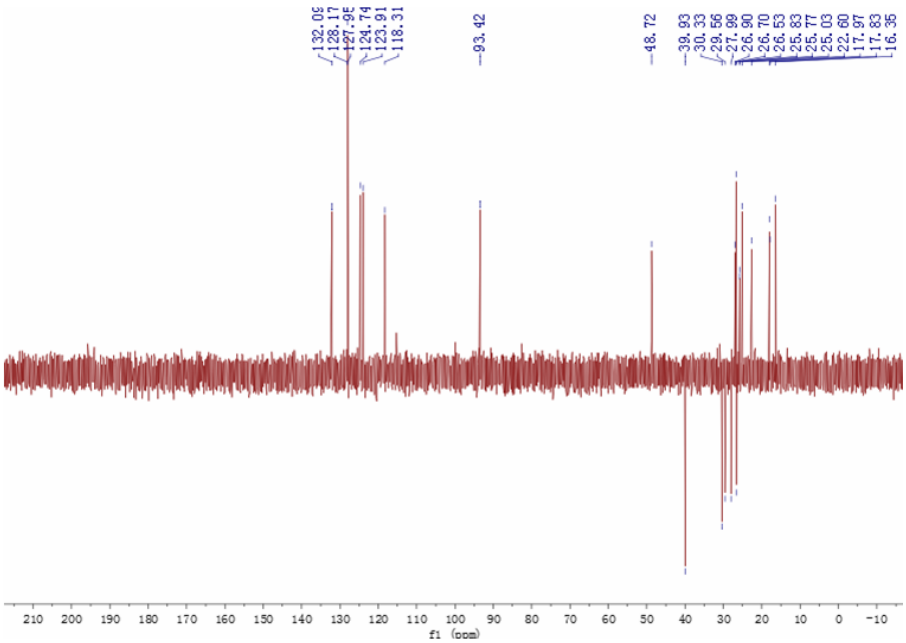


Figure S24. HSQC spectrum of compound **3** in $CDCl_3$

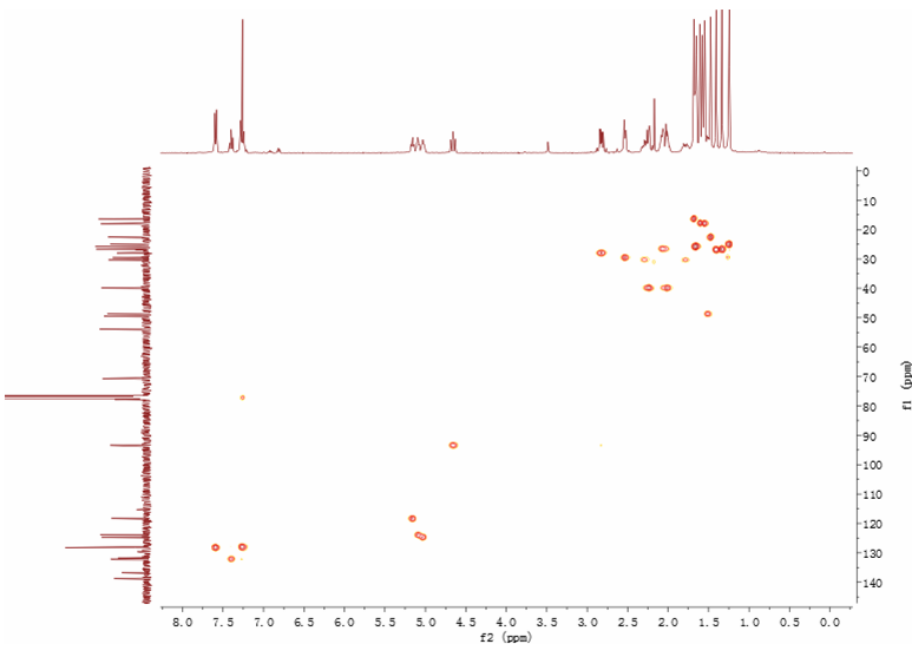


Figure S25. $^{1}H–^{1}H$ COSY spectrum of compound **3** in $CDCl_3$

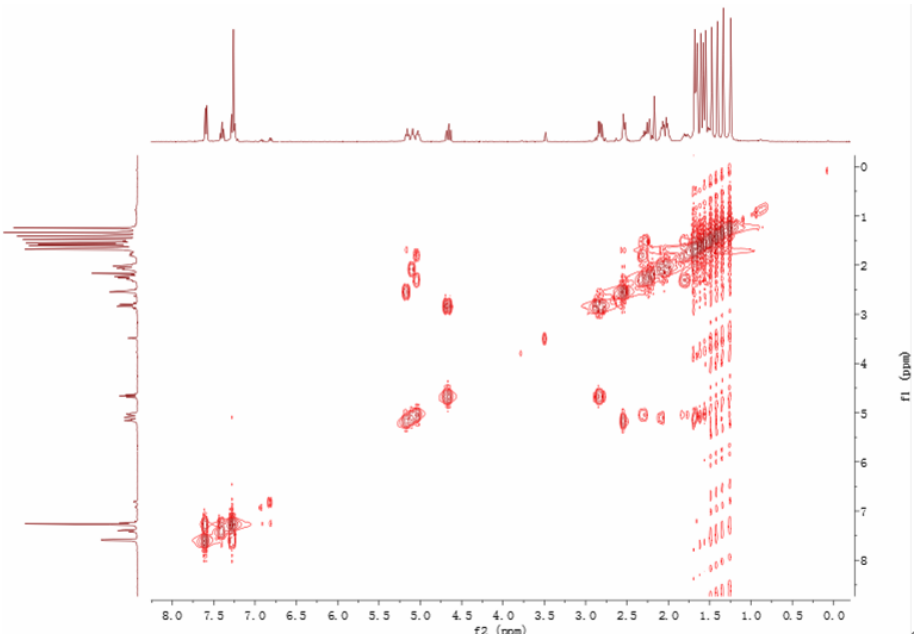


Figure S26. HMBC spectrum of compound **3** in $CDCl_3$

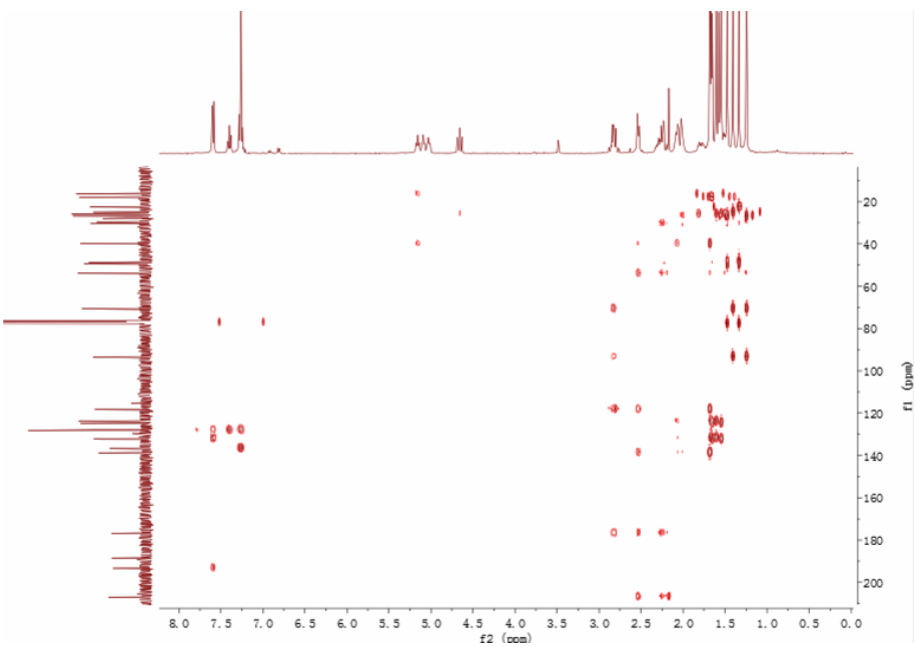


Figure S27. NOESY spectrum of compound **3** in $CDCl_3$

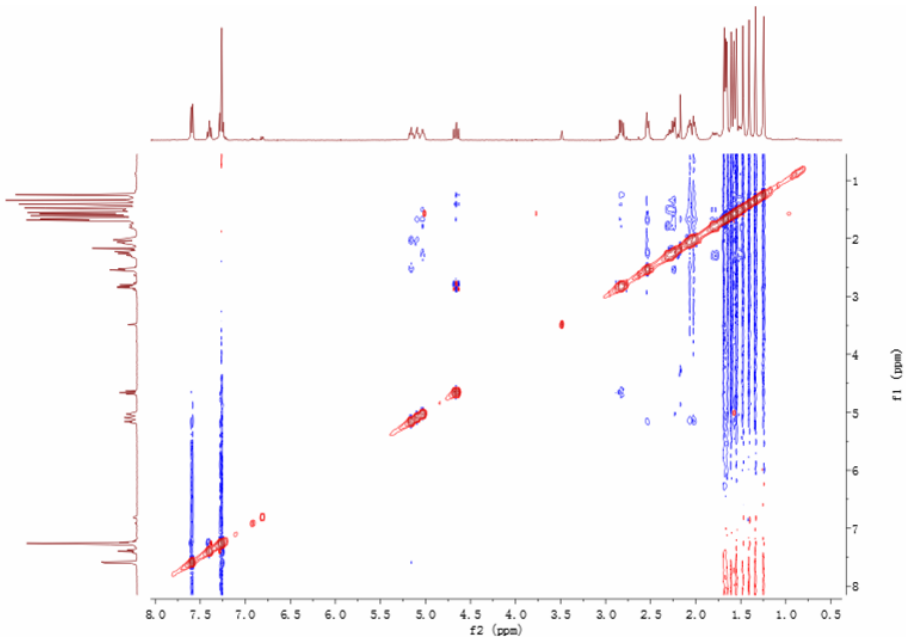


Figure S28. HRESIMS spectrum of compound **3**

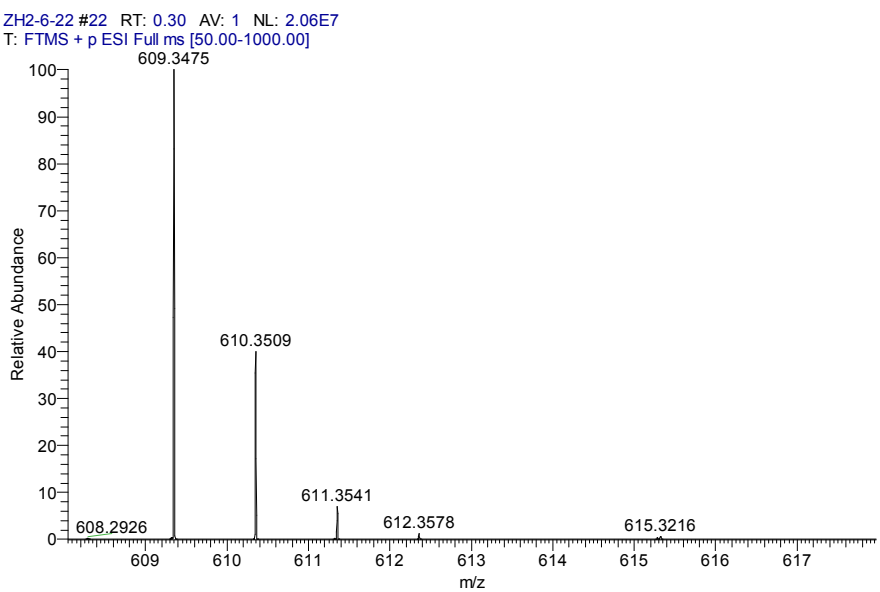


Figure S29. UV spectrum of compound **3**

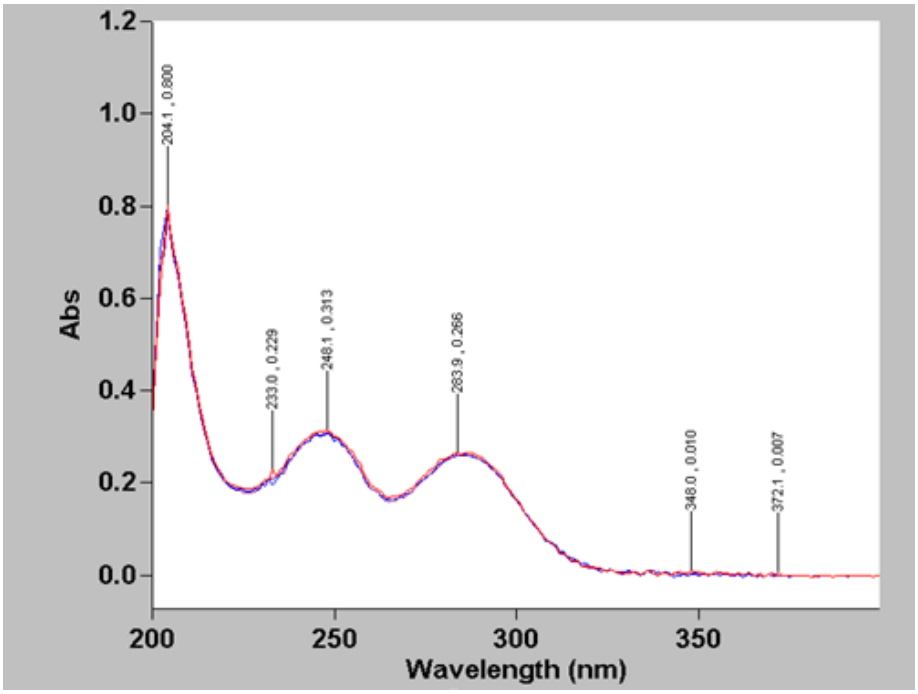


Figure S30. IR (KBr) spectrum of compound **3**

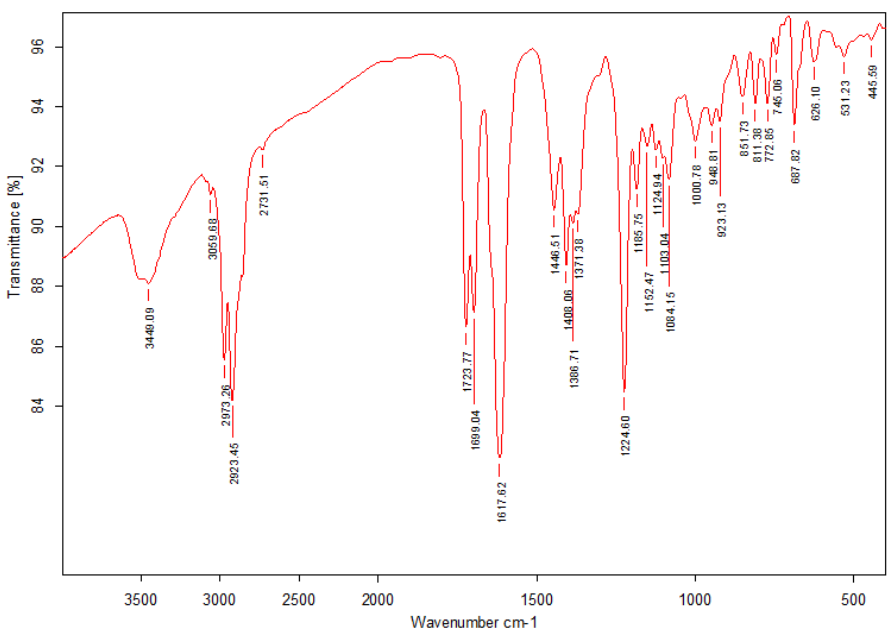


Figure S31.[1]H NMR spectrum (400 MHz) of compound **4** in $CDCl_3$

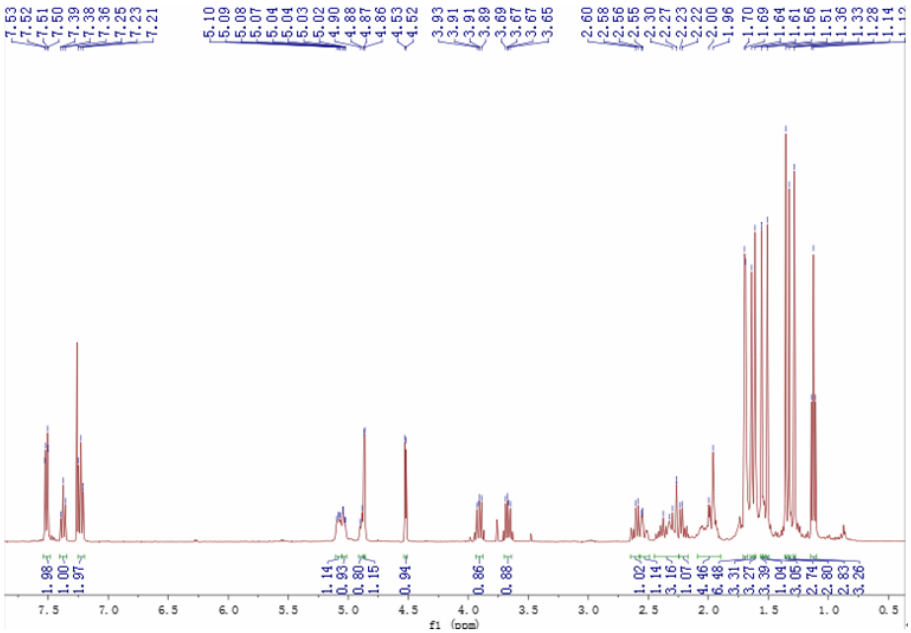


Figure S32.[13]C NMR spectrum (100 MHz) of compound **4** in $CDCl_3$

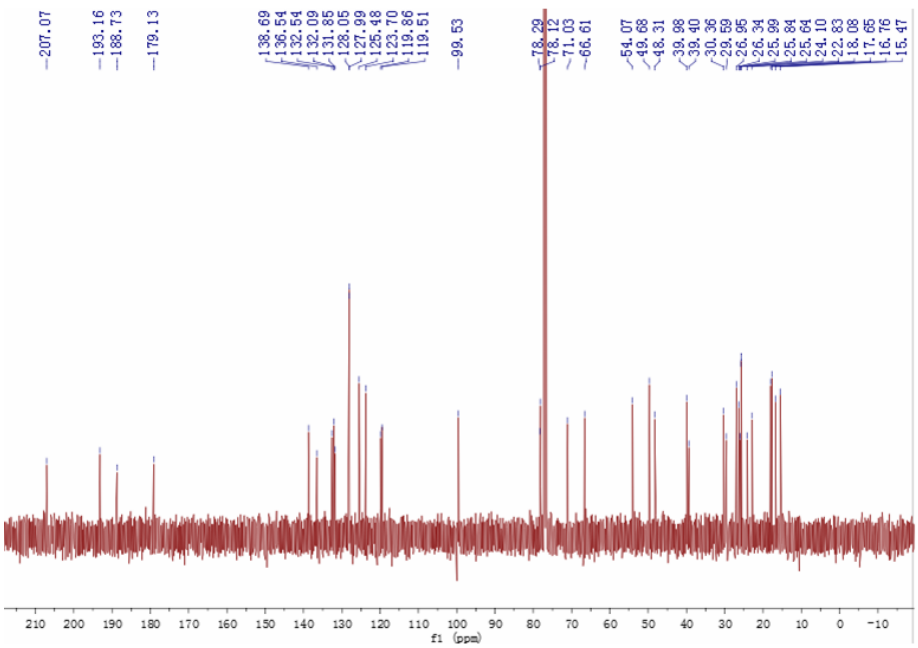


Figure S33. DEPT-135 spectrum (100 MHz) of compound **4** in $CDCl_3$

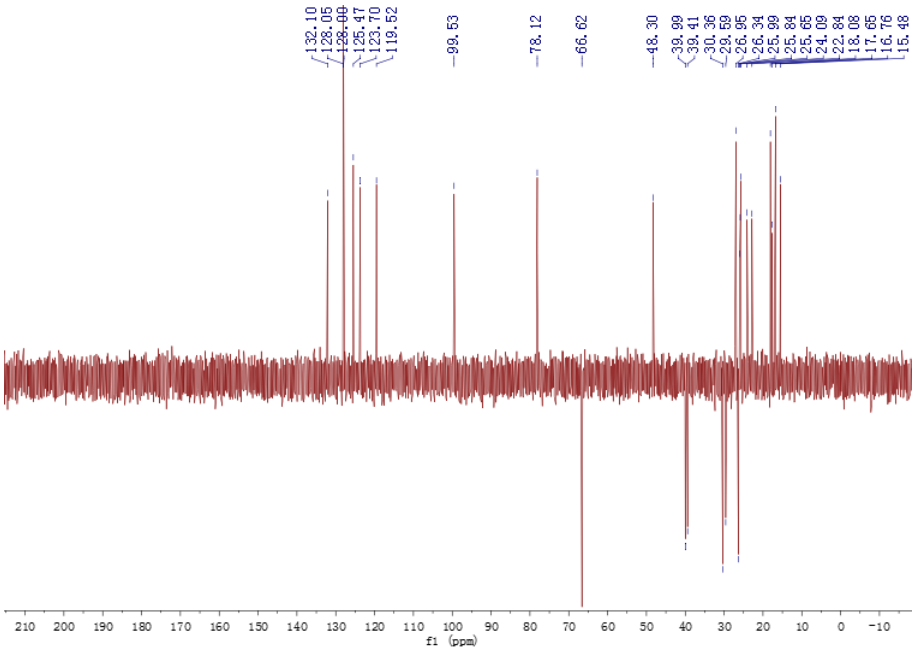


Figure S34. HSQC spectrum of compound **4** in $CDCl_3$

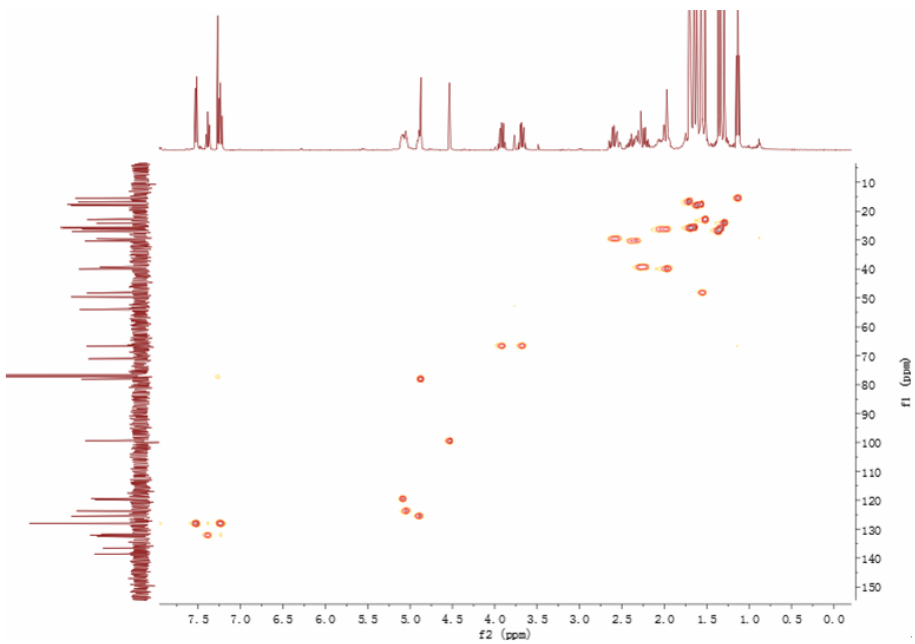


Figure S35. ^{1}H–^{1}H COSY spectrum of compound **4** in $CDCl_3$

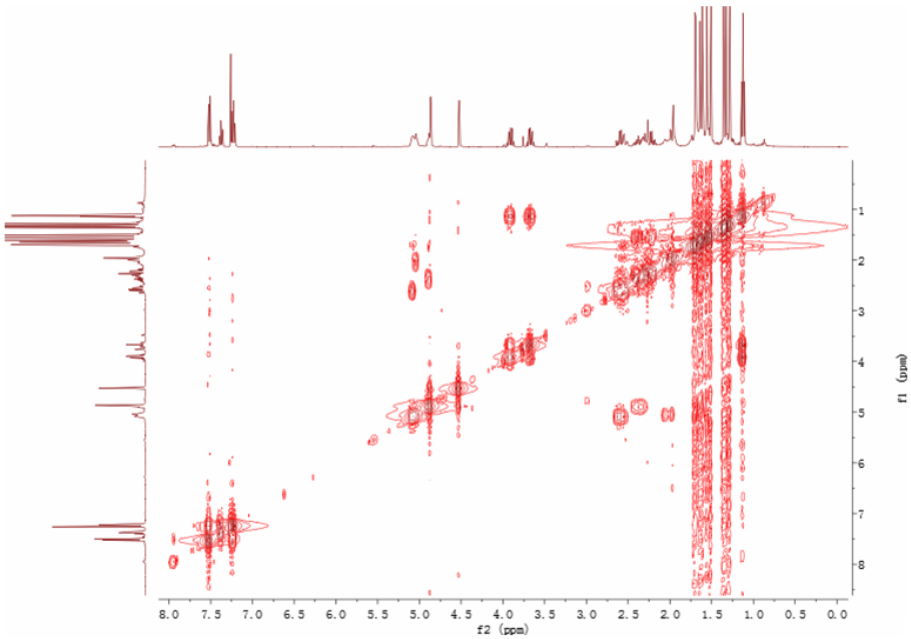


Figure S36. HMBC spectrum of compound **4** in $CDCl_3$

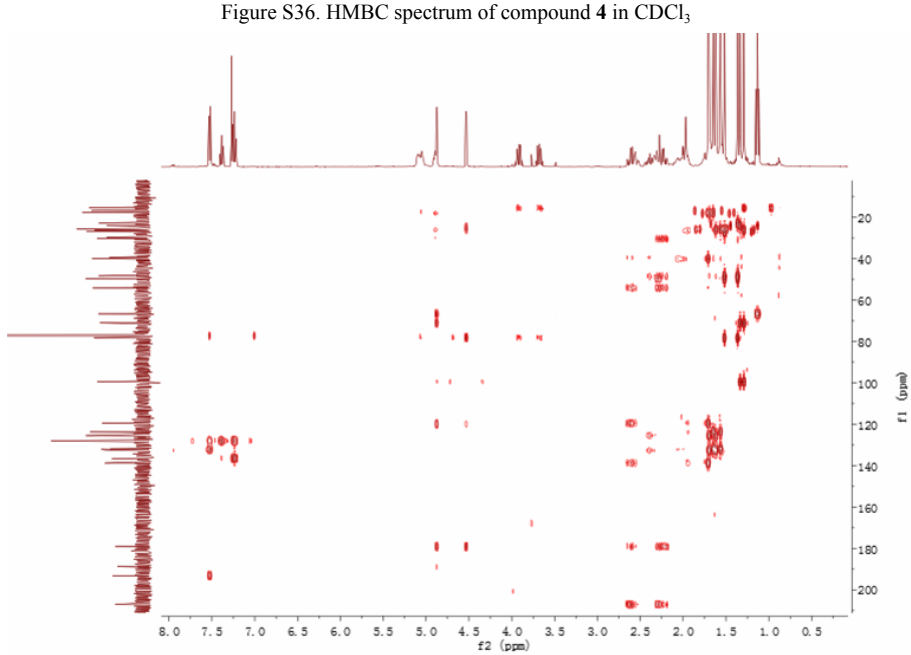


Figure S37. NOESY spectrum of compound **4** in $CDCl_3$

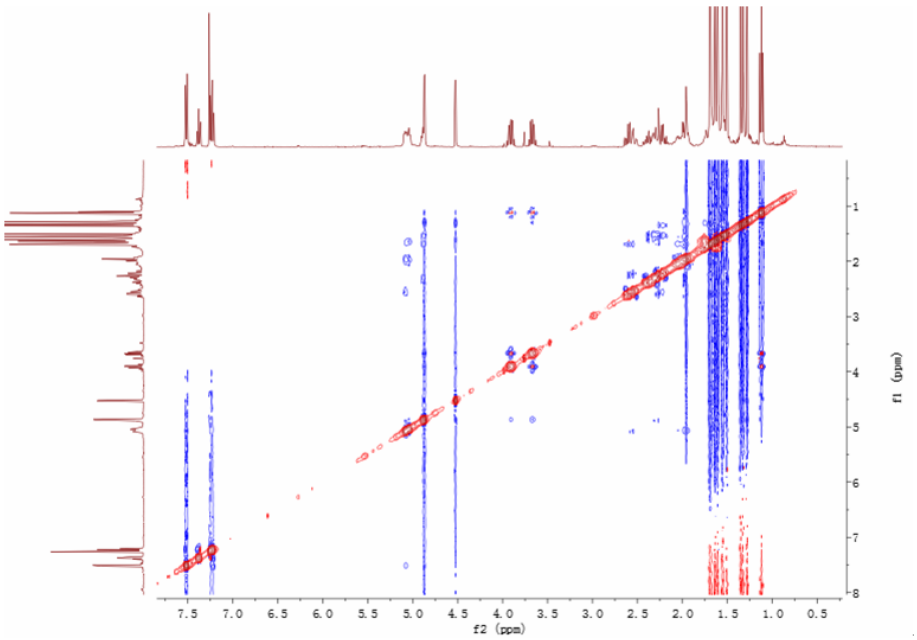


Figure S38. HRESIMS spectrum of compound **4**

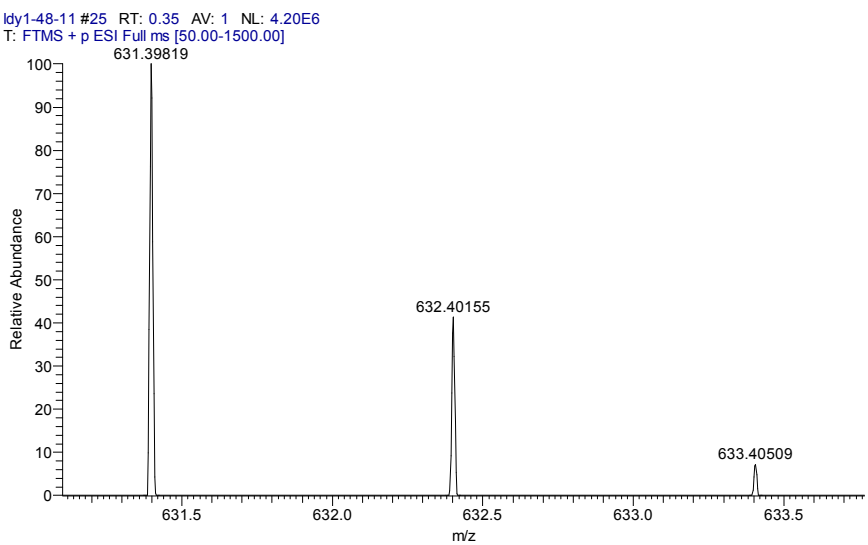


Figure S39. UV spectrum of compound **4**

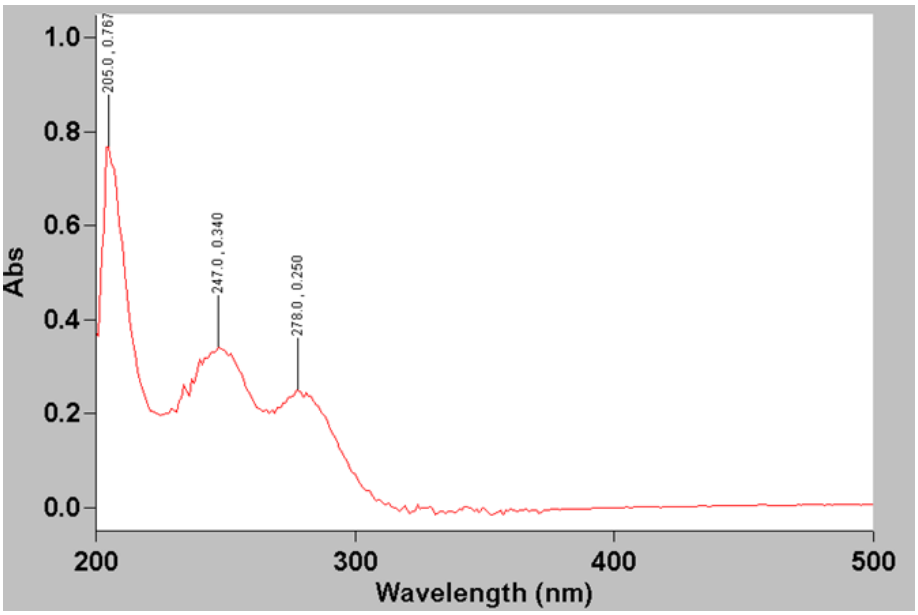


Figure S40. IR (KBr) spectrum of compound **4**

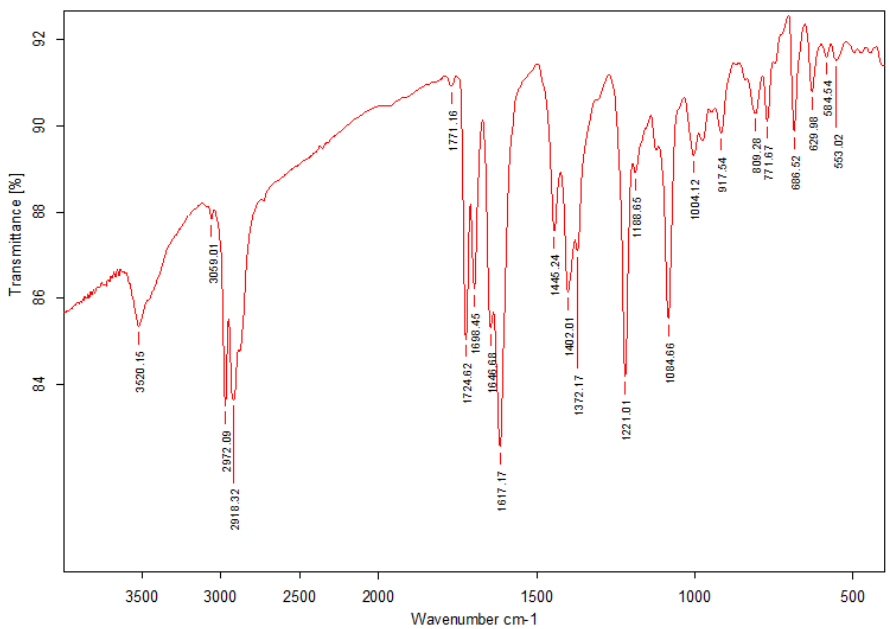


Figure S41.[1]H NMR spectrum (400 MHz) of compound **5** in $CDCl_3$

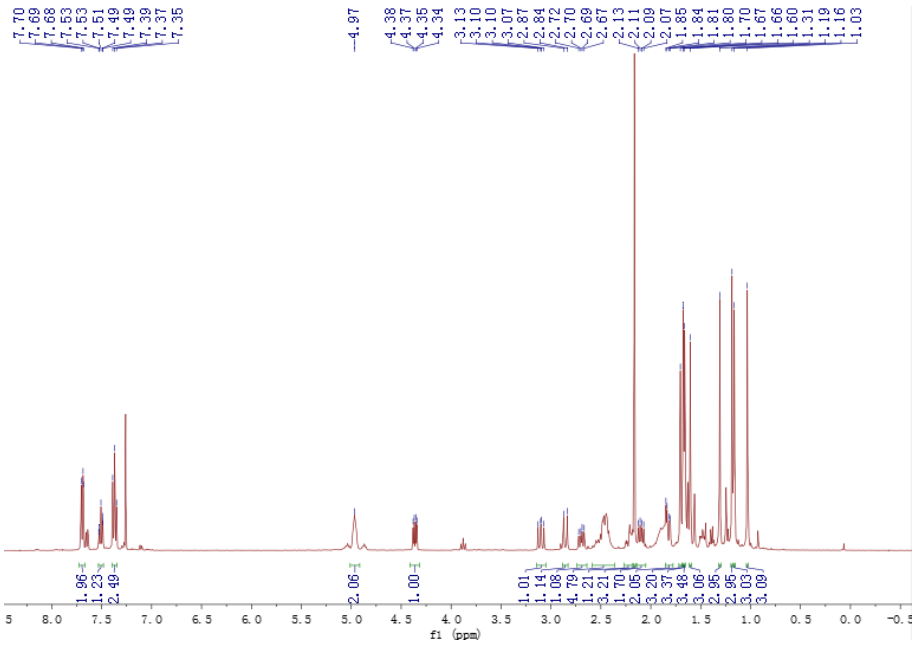


Figure S42.[13]C NMR spectrum (100 MHz) of compound **5** in $CDCl_3$

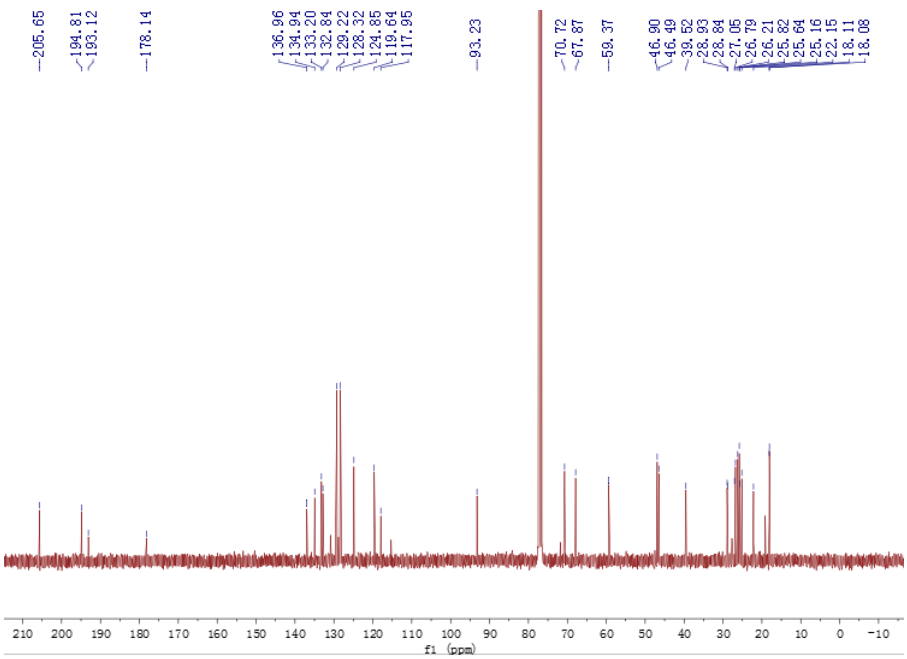


Figure S43. DEPT-135 spectrum (100 MHz) of compound **5** in $CDCl_3$

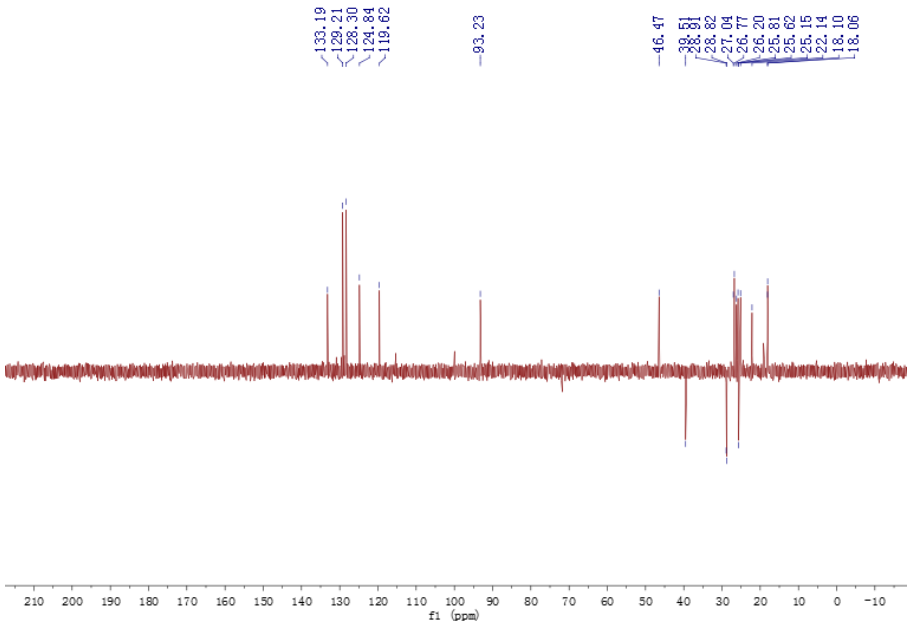


Figure S44. HSQC spectrum of compound **5** in $CDCl_3$

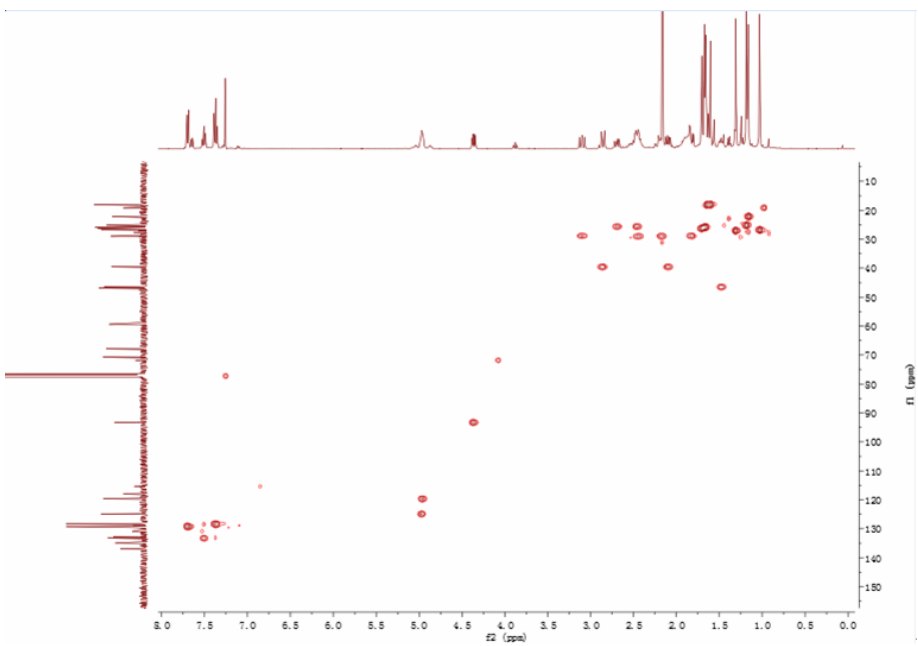


Figure S45. ^{1}H–^{1}H COSY spectrum of compound **5** in $CDCl_3$

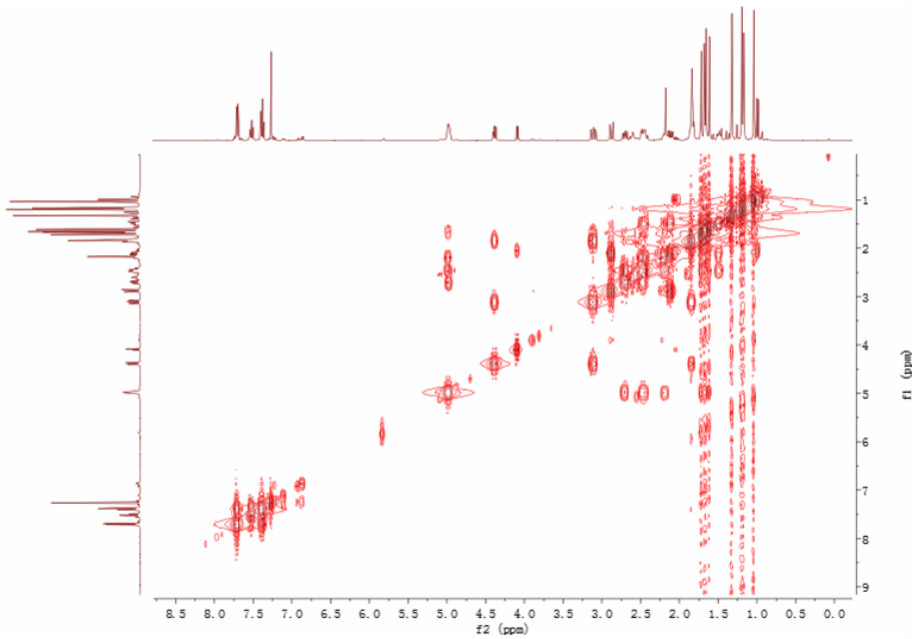


Figure S46. HMBC spectrum of compound **5** in $CDCl_3$

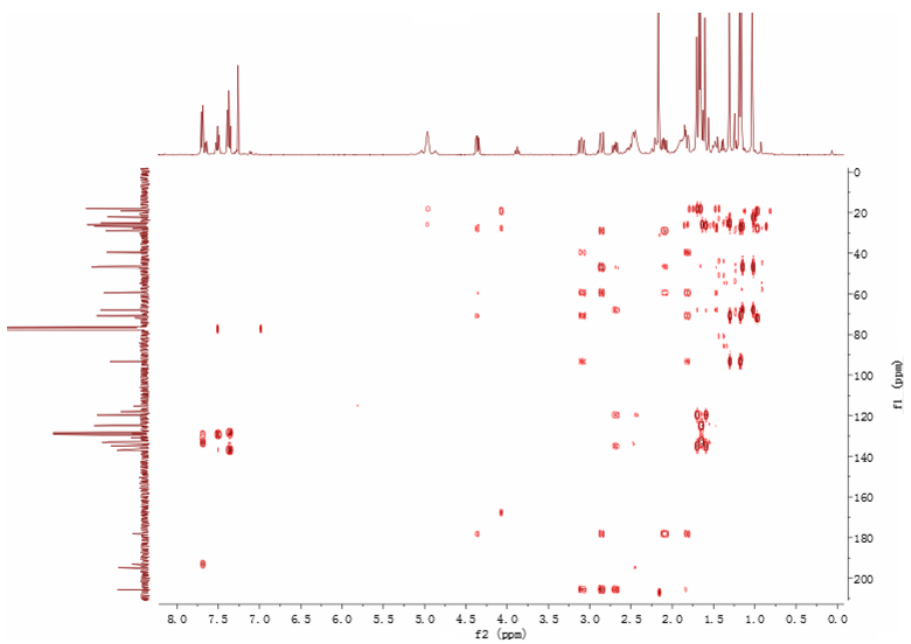


Figure S47. NOESY spectrum of compound **5** in $CDCl_3$

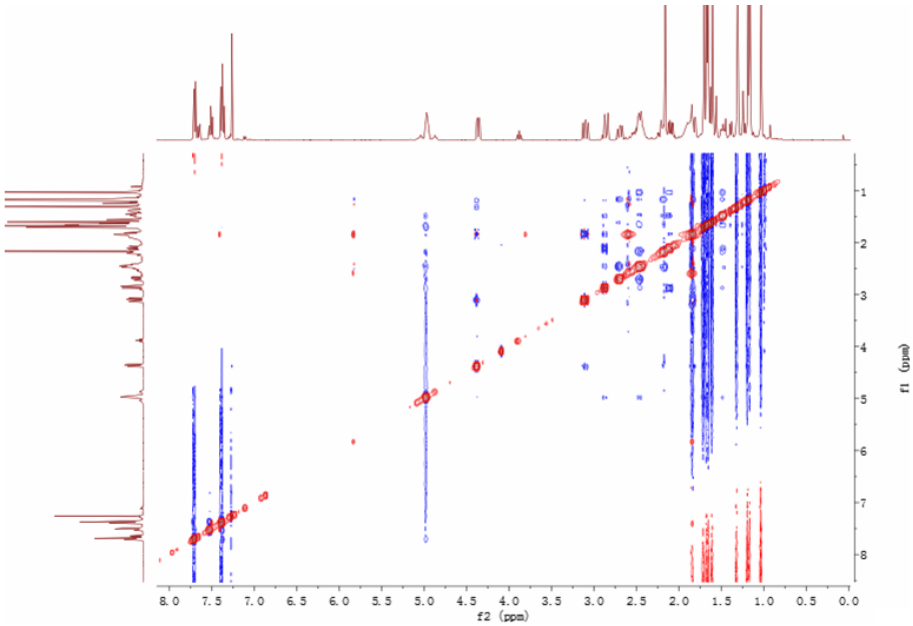


Figure S48. HRESIMS spectrum of compound **5**

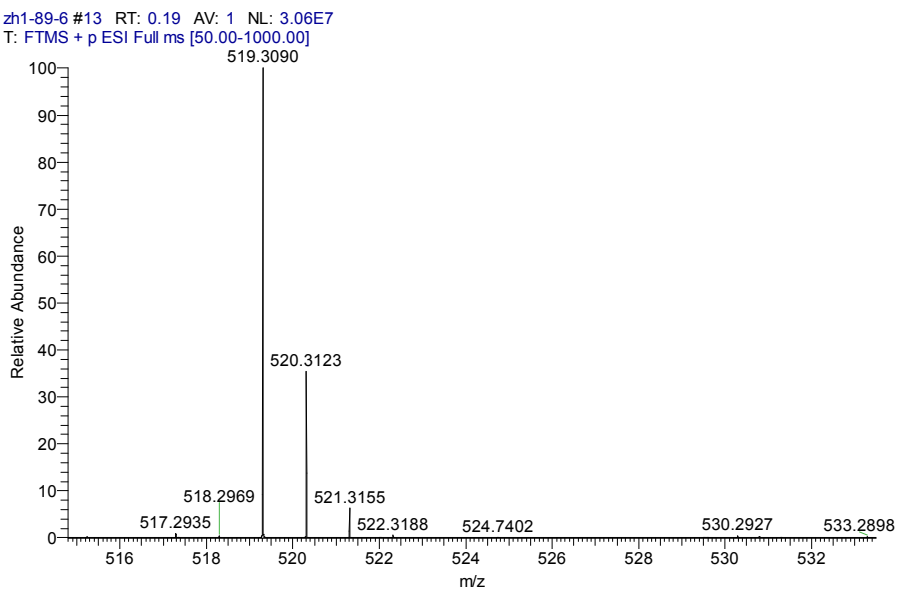


Figure S49. UV spectrum of compound **5**

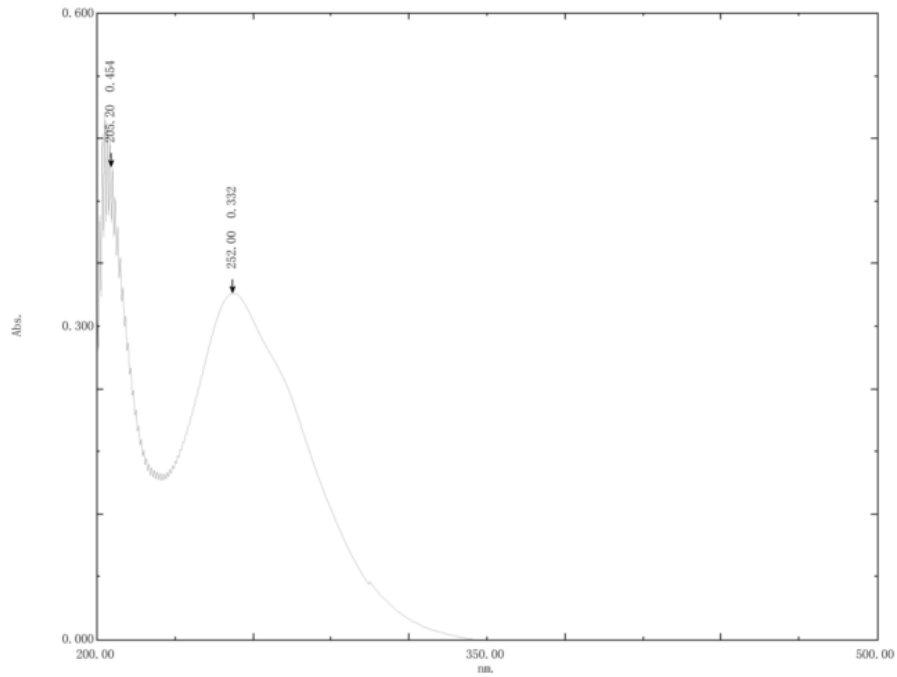


Figure S50. IR (KBr) spectrum of compound **5**

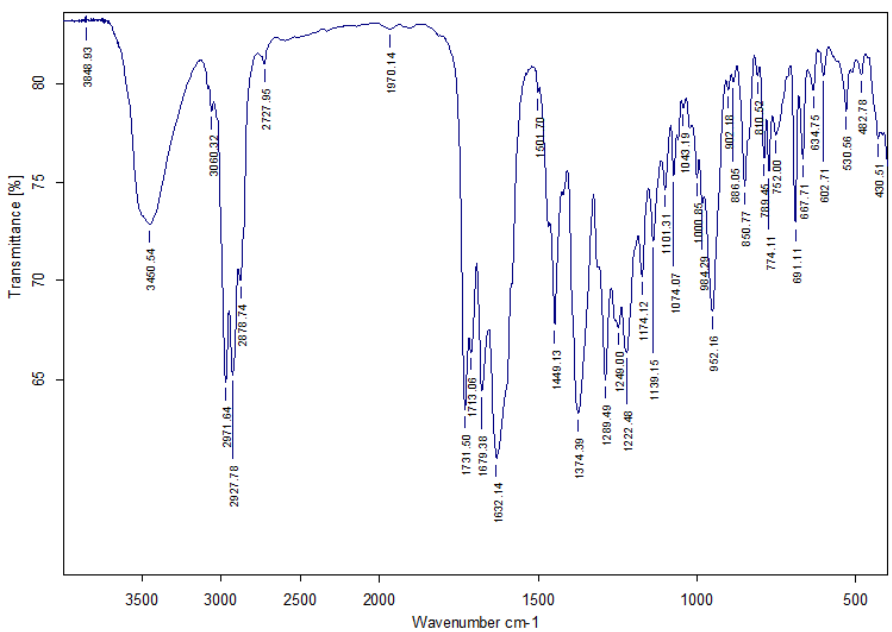


Figure S51.[1]H NMR spectrum (400 MHz) of compound **6** in $CDCl_3$

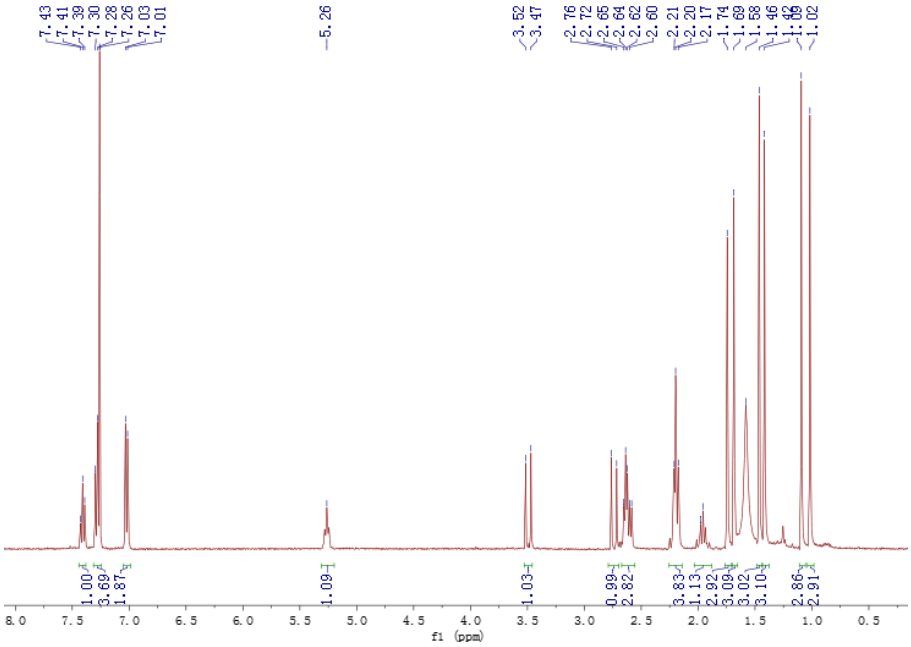


Figure S52.[13]C NMR spectrum (100 MHz) of compound **6** in $CDCl_3$

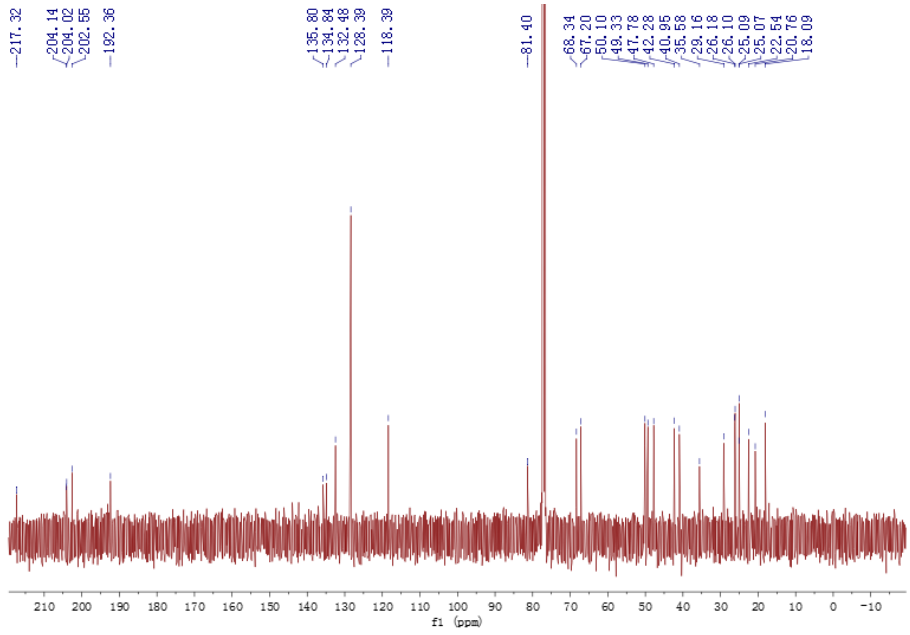


Figure S53. DEPT-135 spectrum (100 MHz) of compound **6** in $CDCl_3$

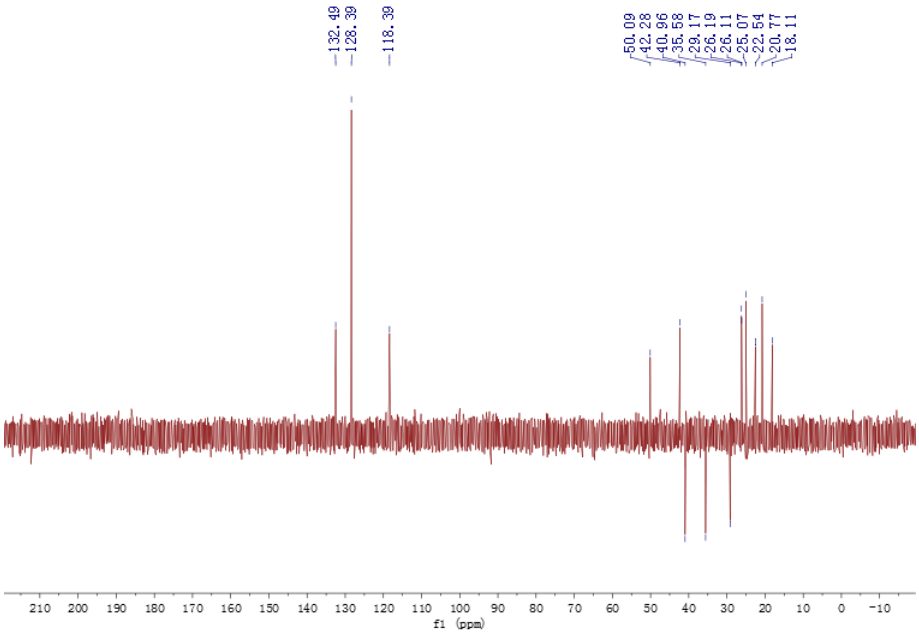


Figure S54. HSQC spectrum of compound **6** in $CDCl_3$

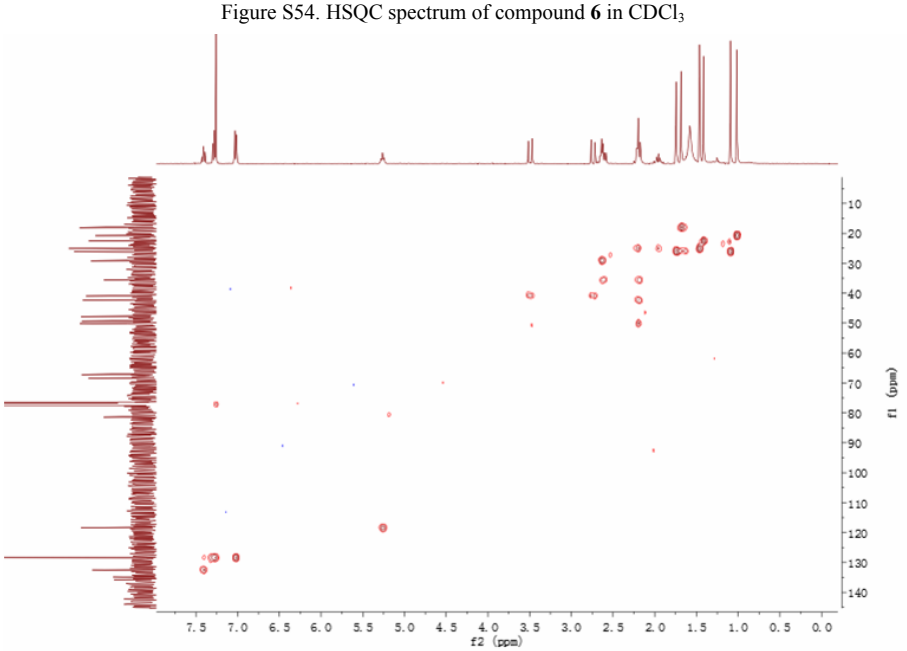


Figure S55. ^{1}H–^{1}H COSY spectrum of compound **6** in $CDCl_3$

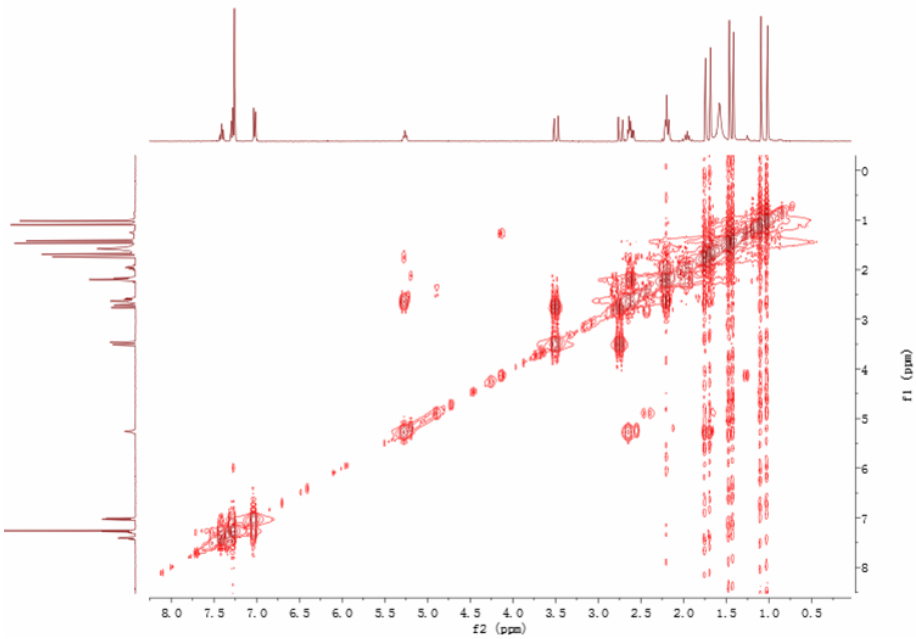


Figure S56. HMBC spectrum of compound **6** in $CDCl_3$

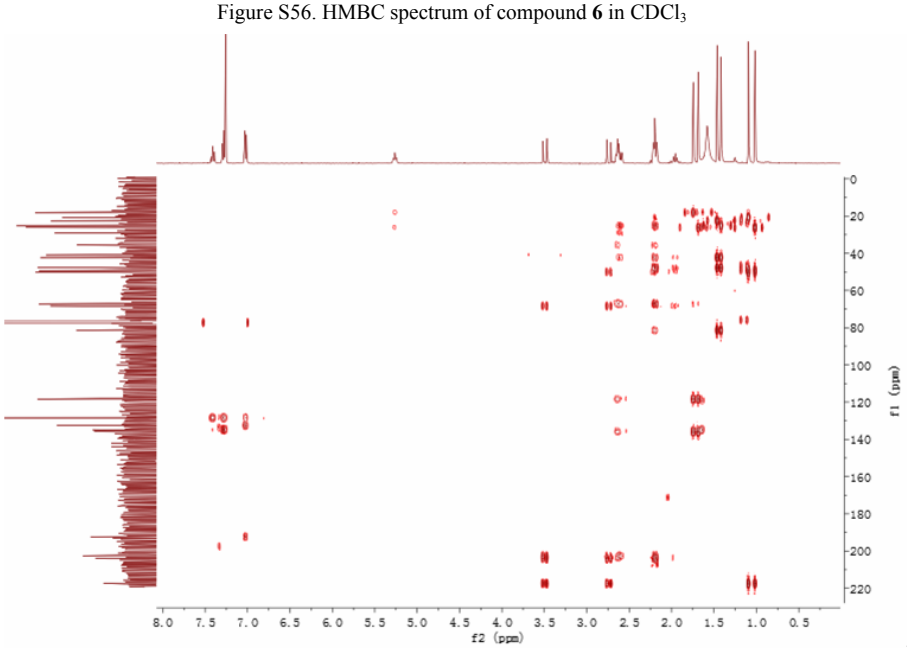


Figure S57. NOESY spectrum of compound **6** in $CDCl_3$

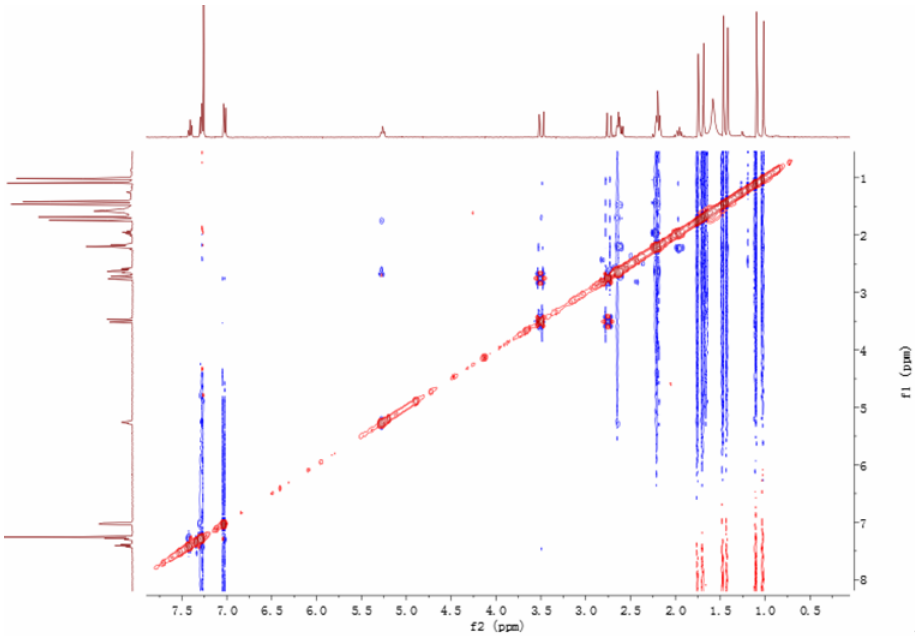


Figure S58. HRESIMS spectrum of compound **6**

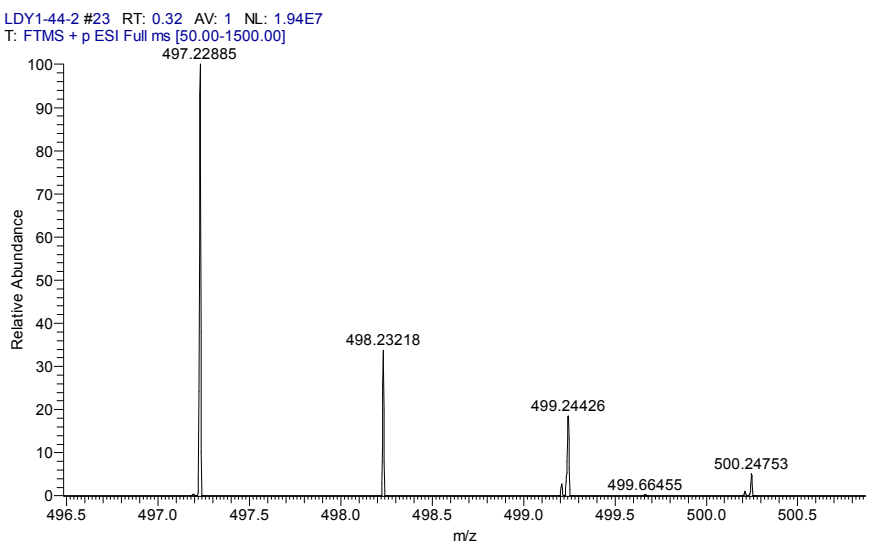


Figure S59. UV spectrum of compound **6**

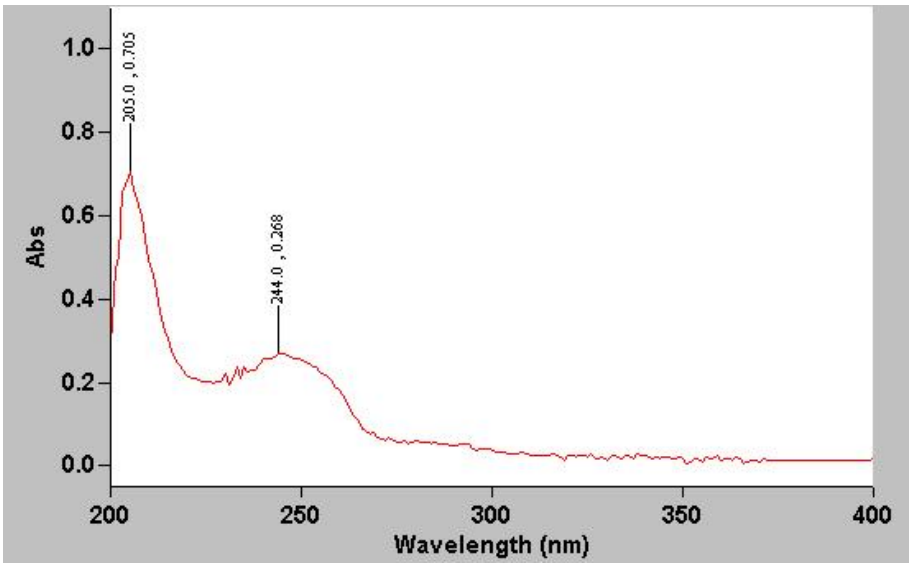


Figure S60. IR (KBr) spectrum of compound **6**

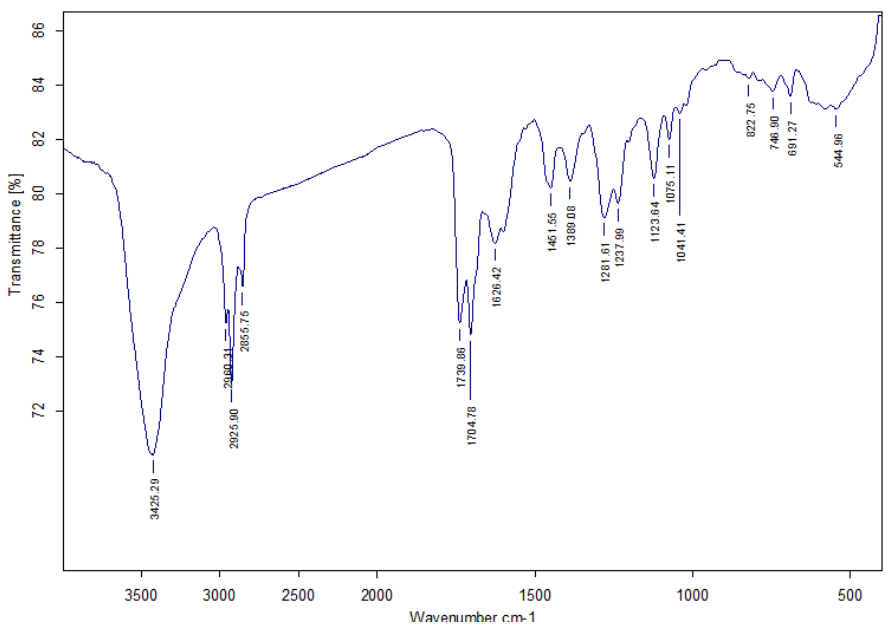


Figure S61.[1]H NMR spectrum (400 MHz) of compound **7** in $CDCl_3$

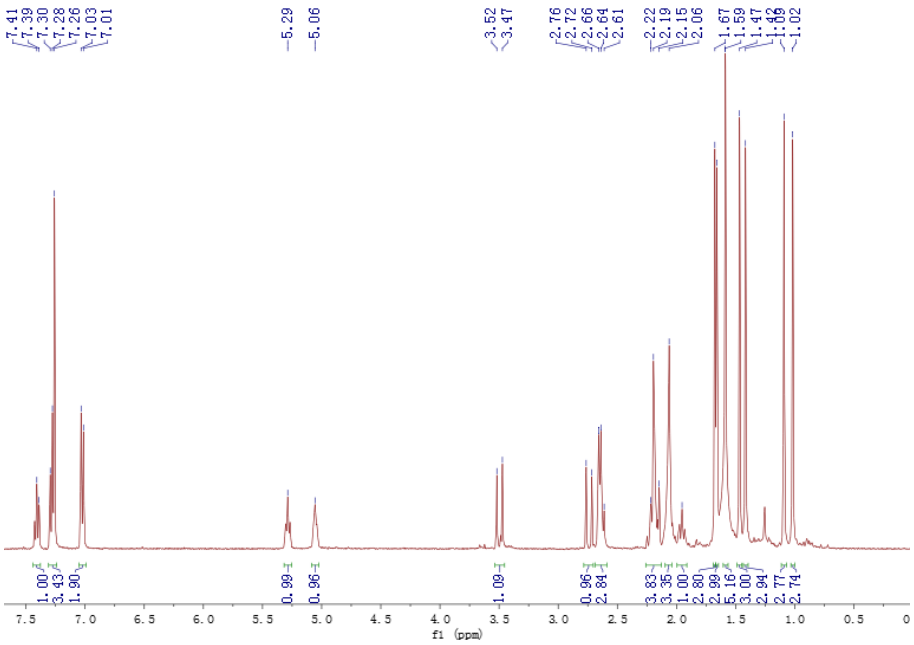


Figure S62.[13]C NMR spectrum (100 MHz) of compound **7** in $CDCl_3$

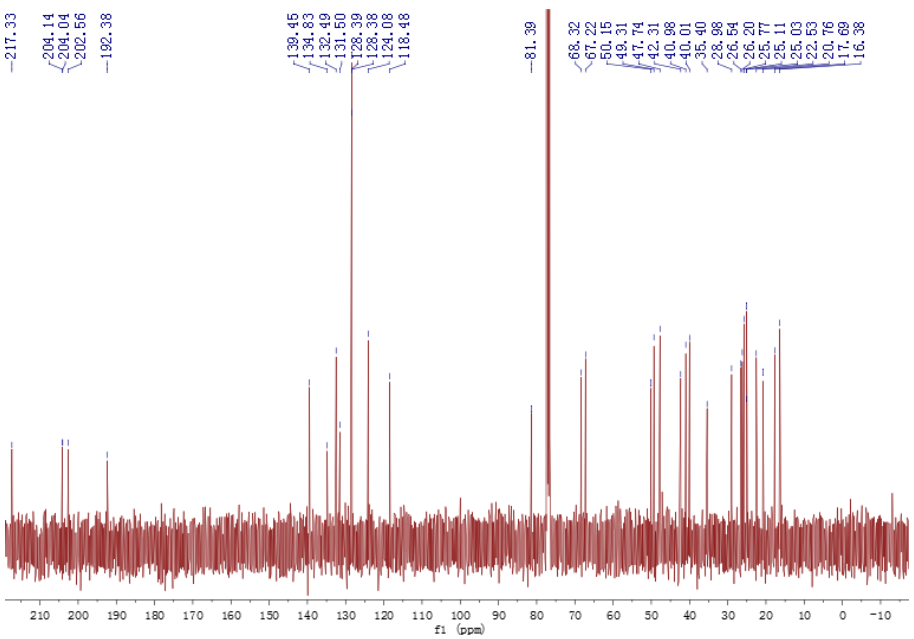


Figure S63. DEPT-135 spectrum (100 MHz) of compound **7** in $CDCl_3$

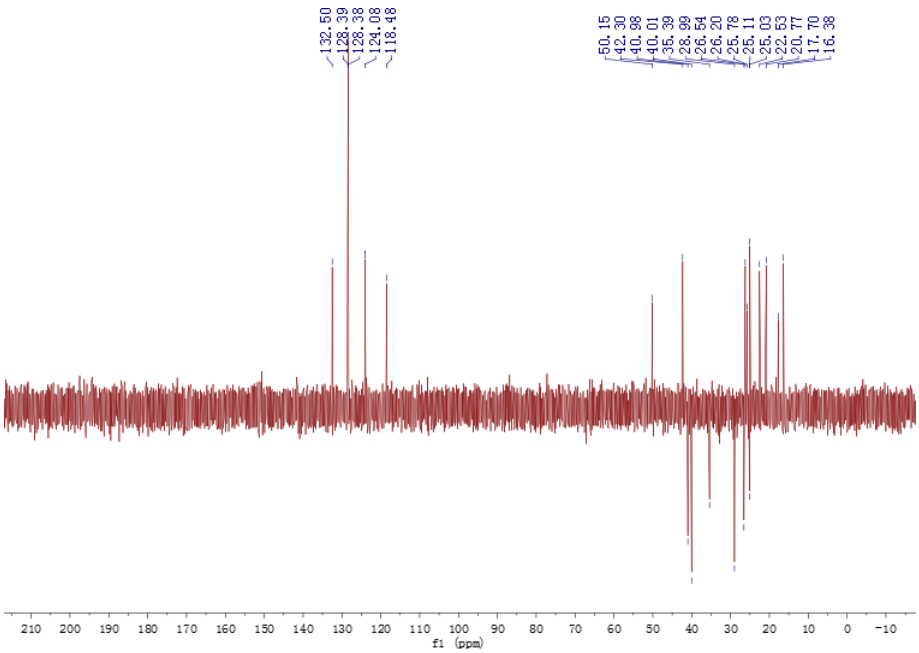


Figure S64. HSQC spectrum of compound **7** in $CDCl_3$

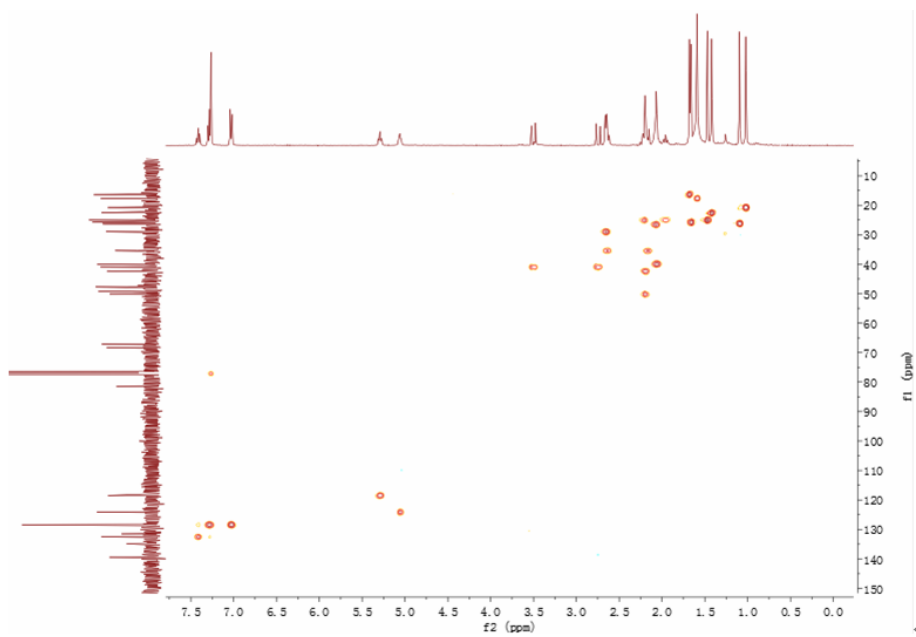


Figure S65. ^{1}H–^{1}H COSY spectrum of compound **7** in $CDCl_3$

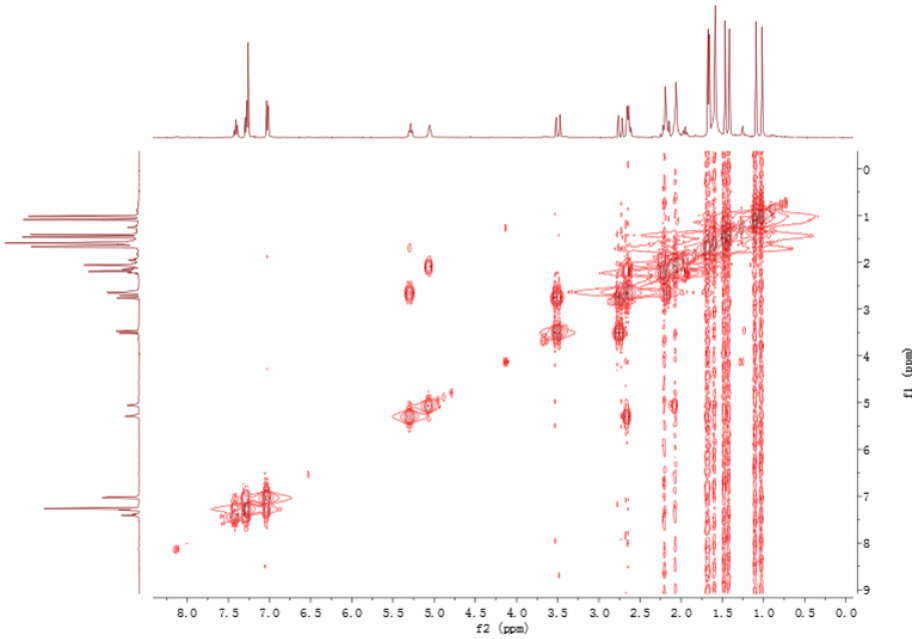


Figure S66. HMBC spectrum of compound **7** in $CDCl_3$

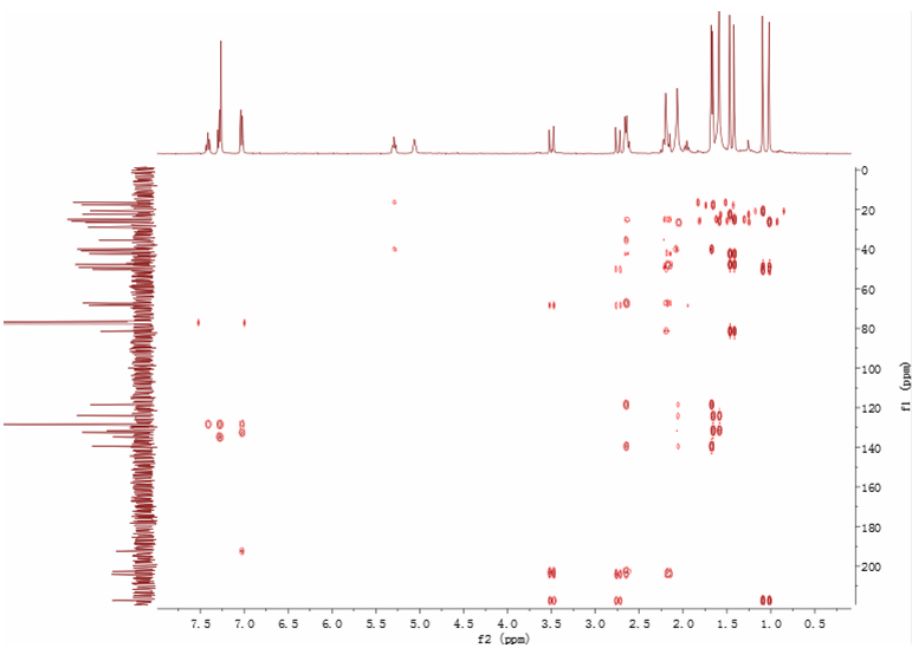


Figure S67. NOESY spectrum of compound **7** in $CDCl_3$

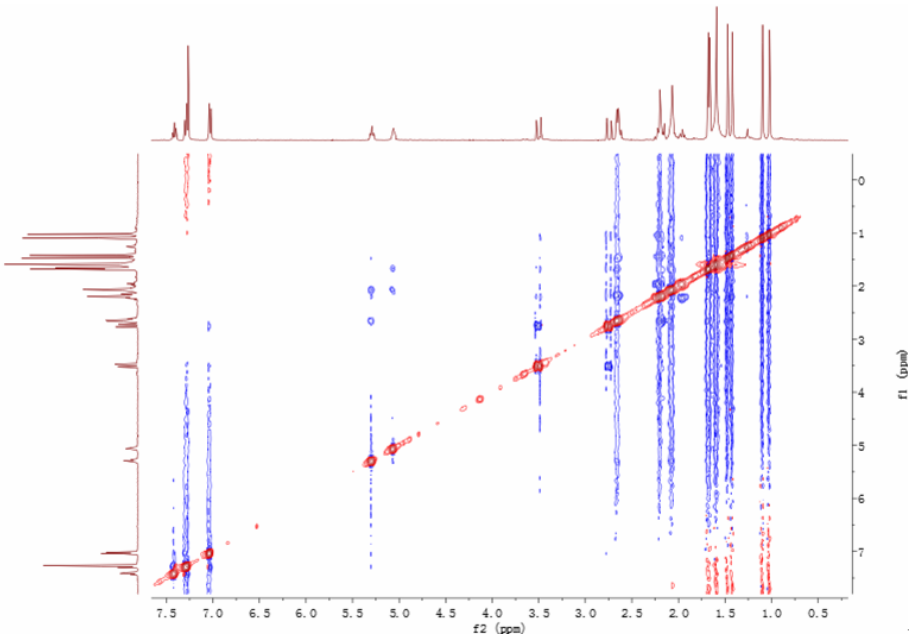


Figure S68. HRESIMS spectrum of compound **7**

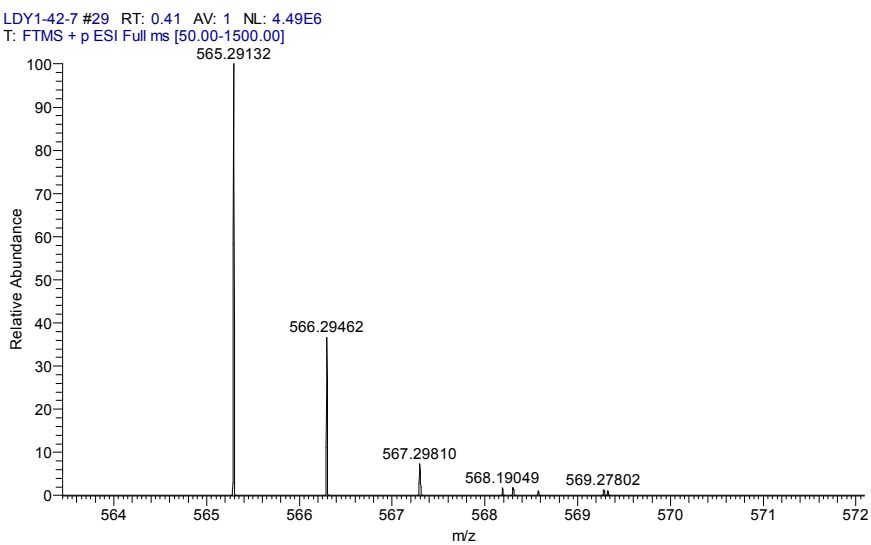


Figure S69. UV spectrum of compound **7**

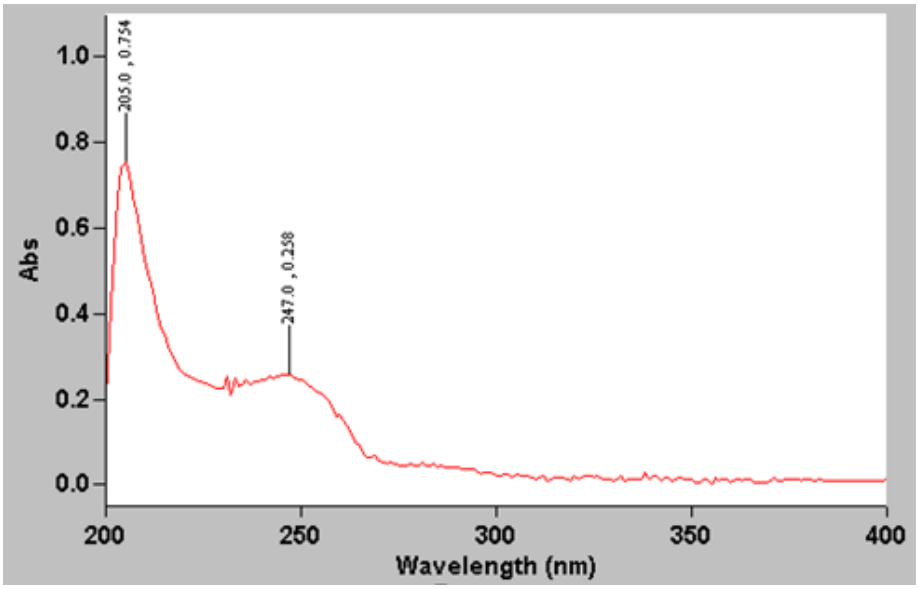


Figure S70. IR (KBr) spectrum of compound **7**

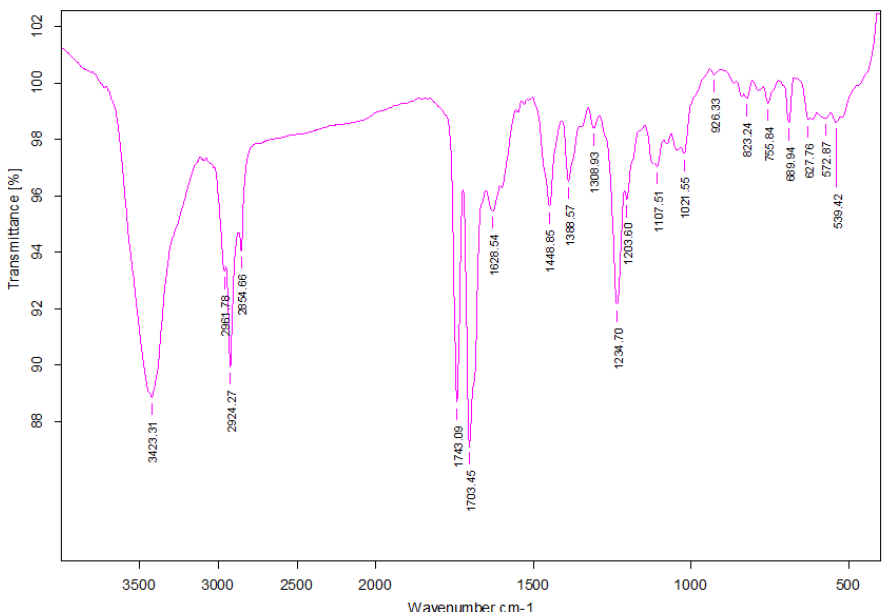


Figure S71.[1]H NMR spectrum (400 MHz) of compound **8** in $CDCl_3$

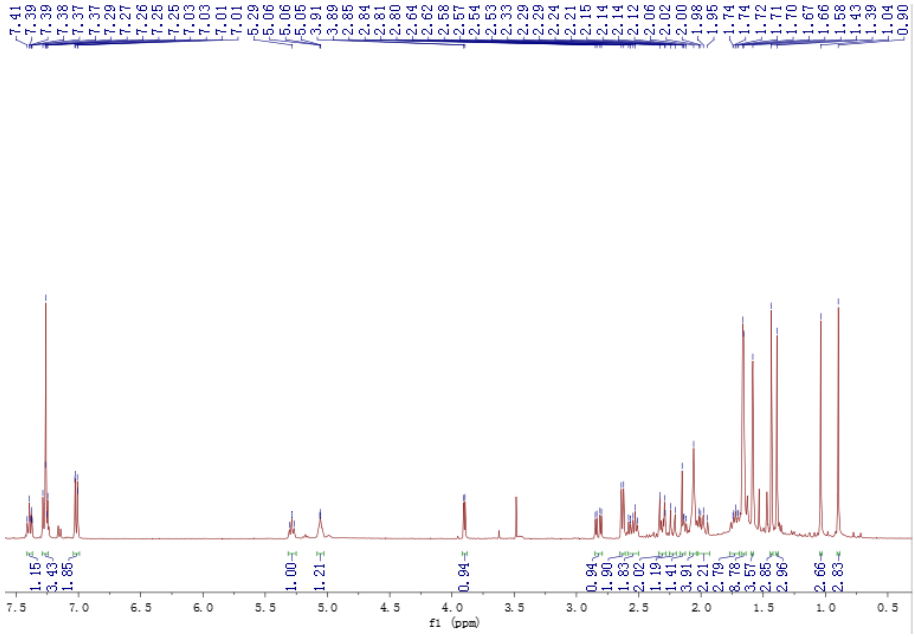


Figure S72.[13]C NMR spectrum (100 MHz) of compound **8** in $CDCl_3$

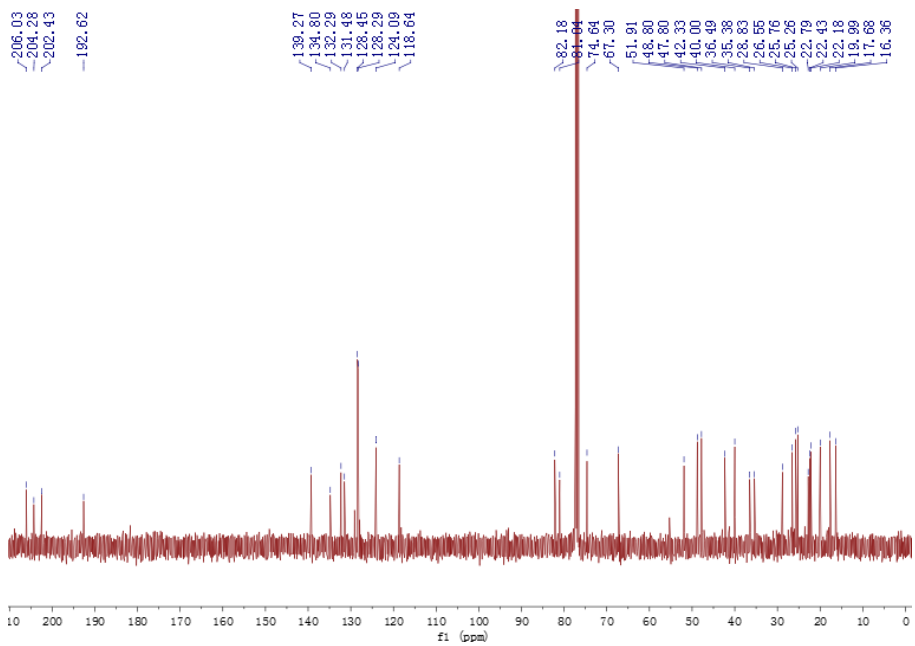


Figure S73. DEPT-135 spectrum (100 MHz) of compound **8** in $CDCl_3$

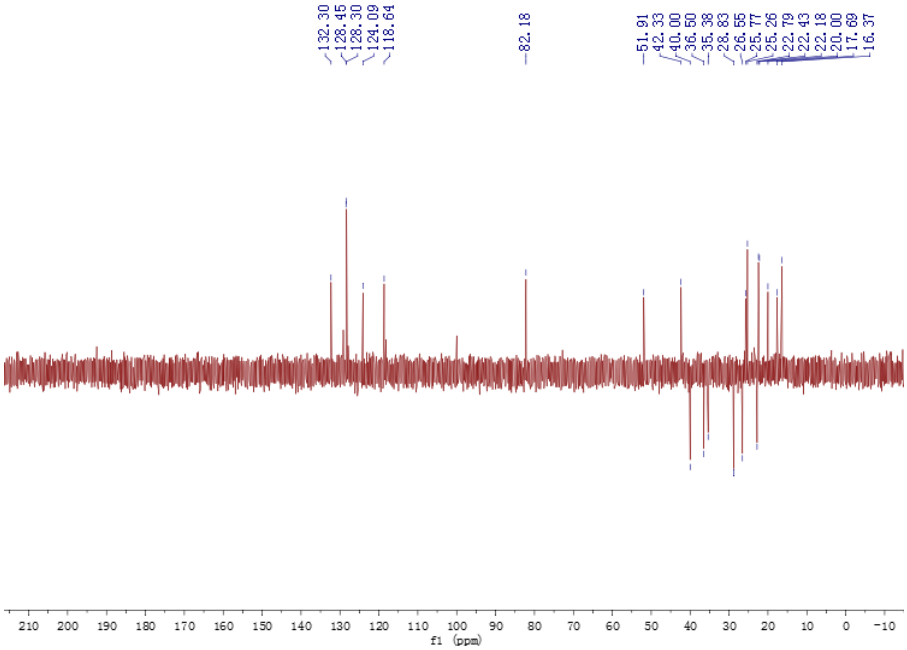


Figure S74. HSQC spectrum of compound **8** in $CDCl_3$

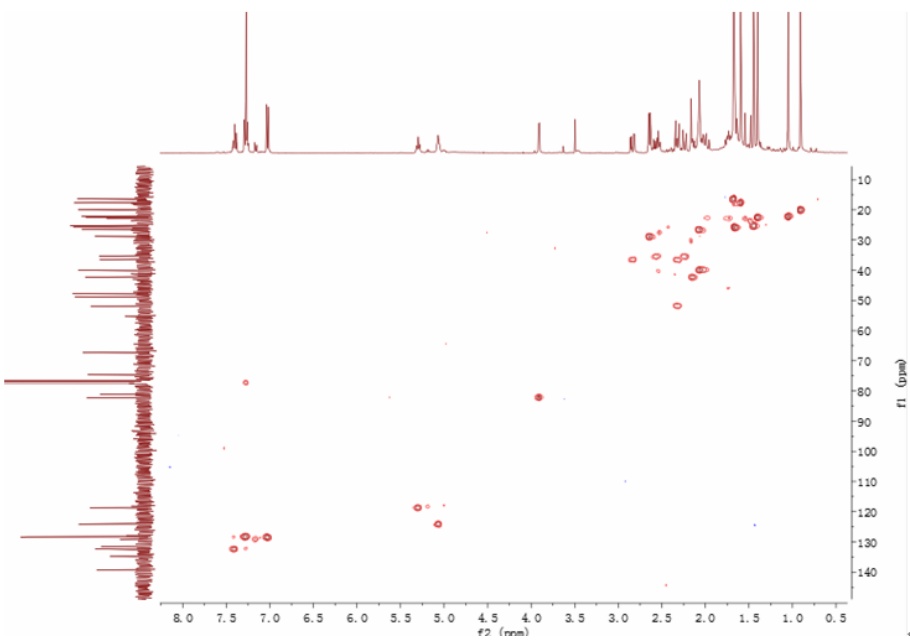


Figure S75. ^{1}H–^{1}H COSY spectrum of compound **8** in $CDCl_3$

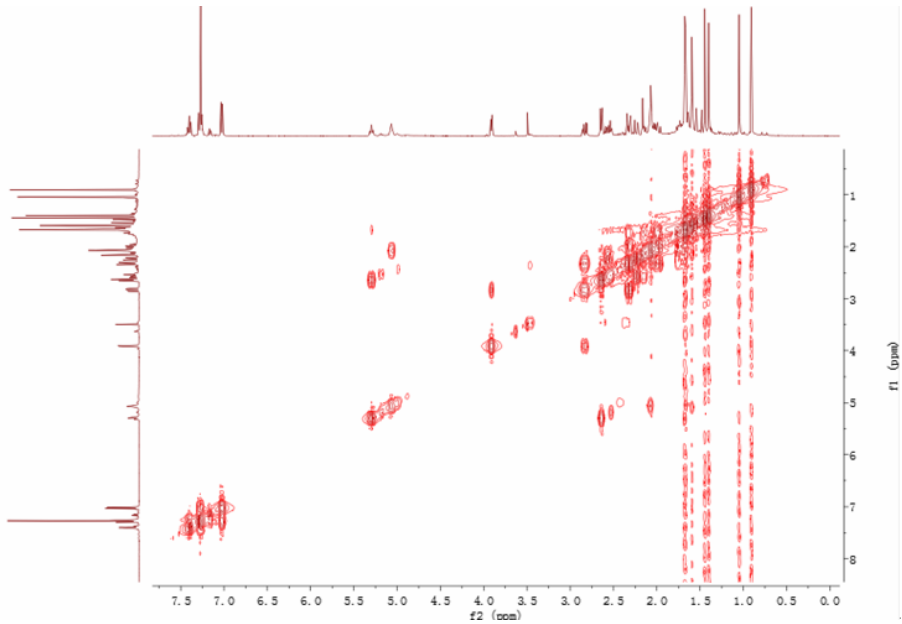


Figure S76. HMBC spectrum of compound **8** in $CDCl_3$

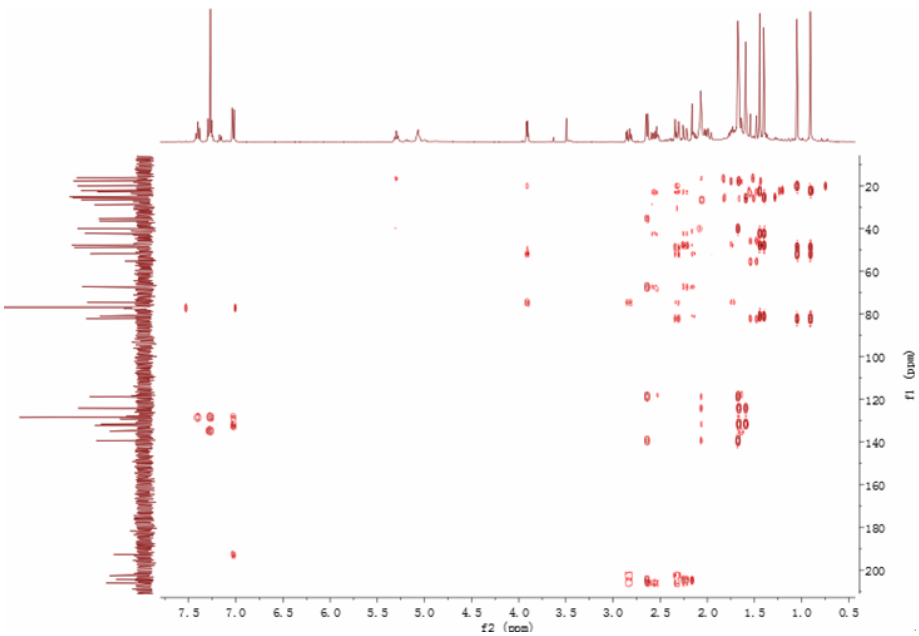


Figure S77. NOESY spectrum of compound **8** in $CDCl_3$

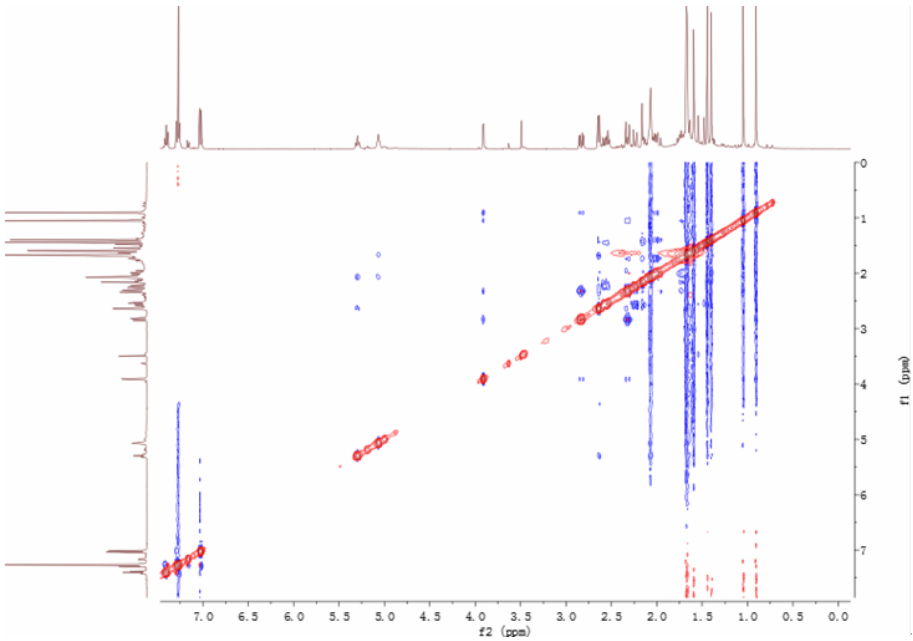


Figure S78. HRESIMS spectrum of compound **8**

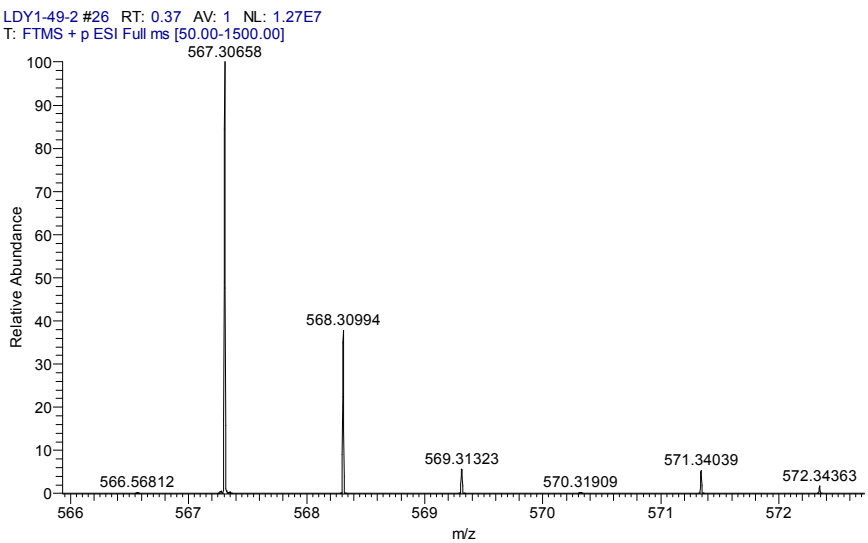


Figure S79. UV spectrum of compound **8**

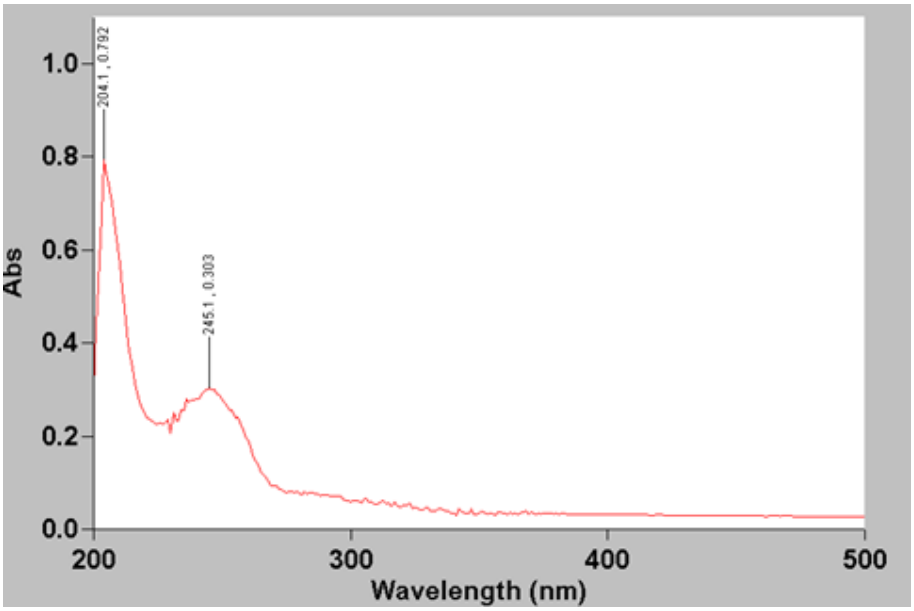


Figure S80. IR (KBr) spectrum of compound **8**

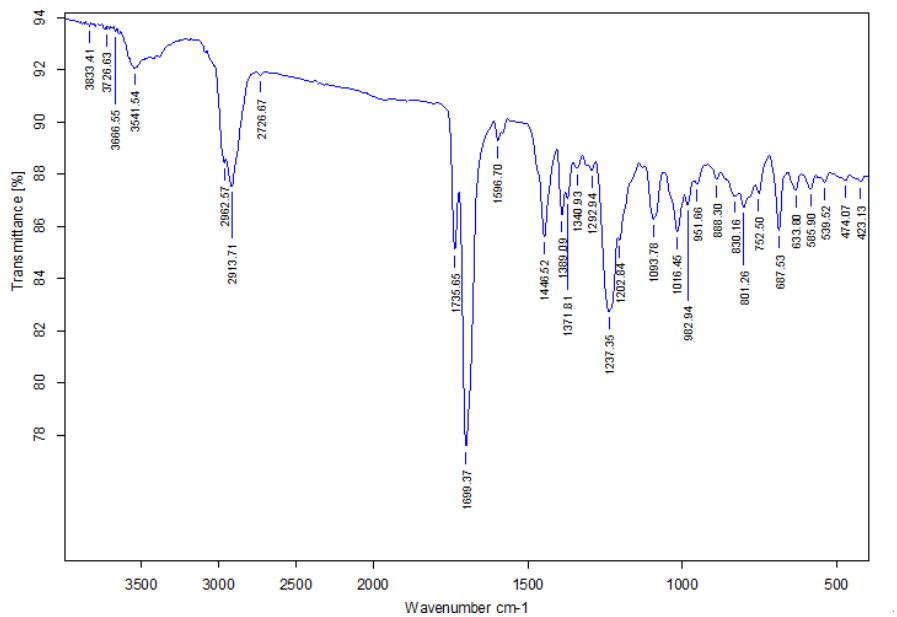


Figure S81.[1]H NMR spectrum (400 MHz) of compound **9** in $CDCl_3$

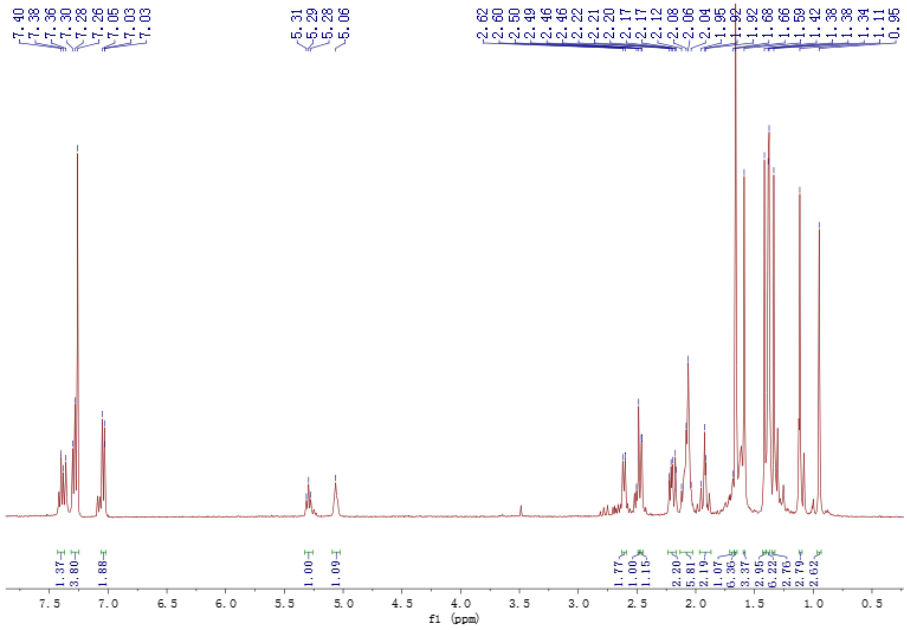


Figure S82.[13]C NMR spectrum (100 MHz) of compound **9** in $CDCl_3$

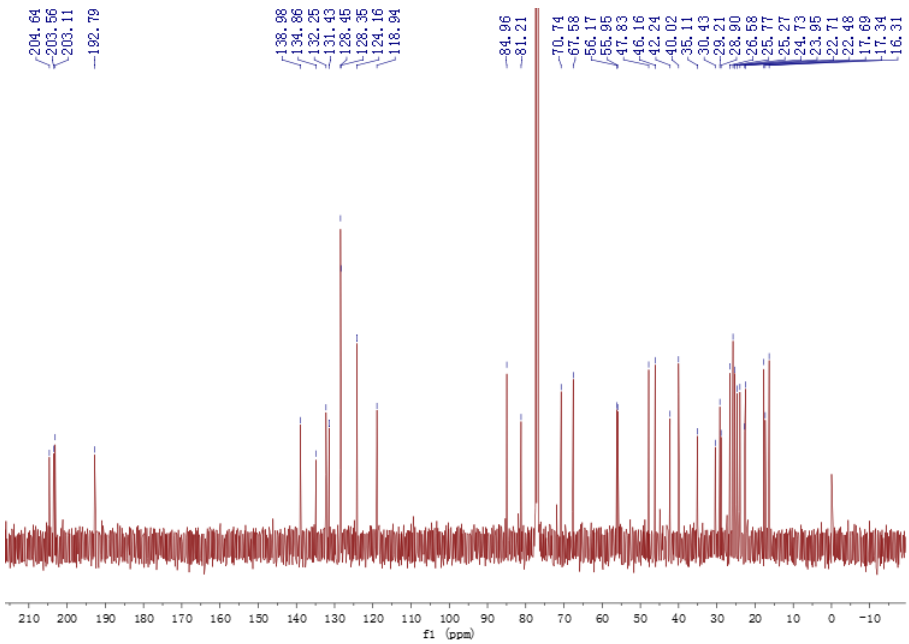


Figure S83. DEPT-135 spectrum (100 MHz) of compound **9** in $CDCl_3$

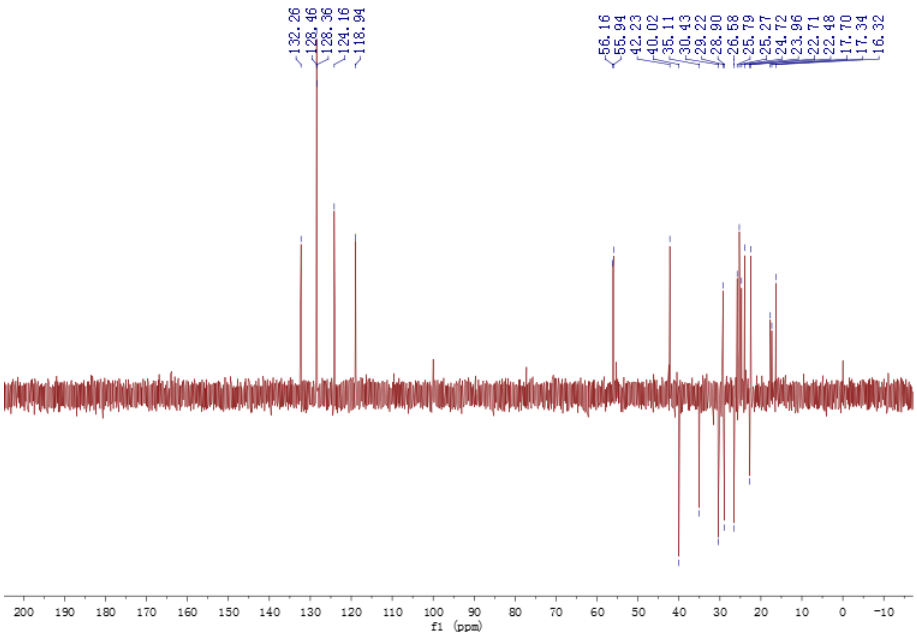


Figure S84. HSQC spectrum of compound **9** in $CDCl_3$

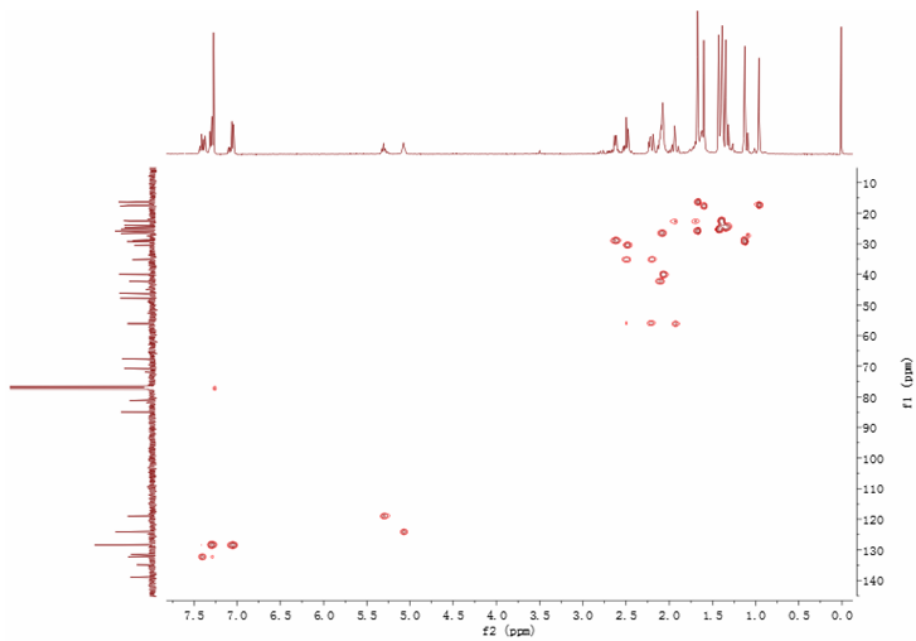


Figure S85. ^{1}H–^{1}H COSY spectrum of compound **9** in $CDCl_3$

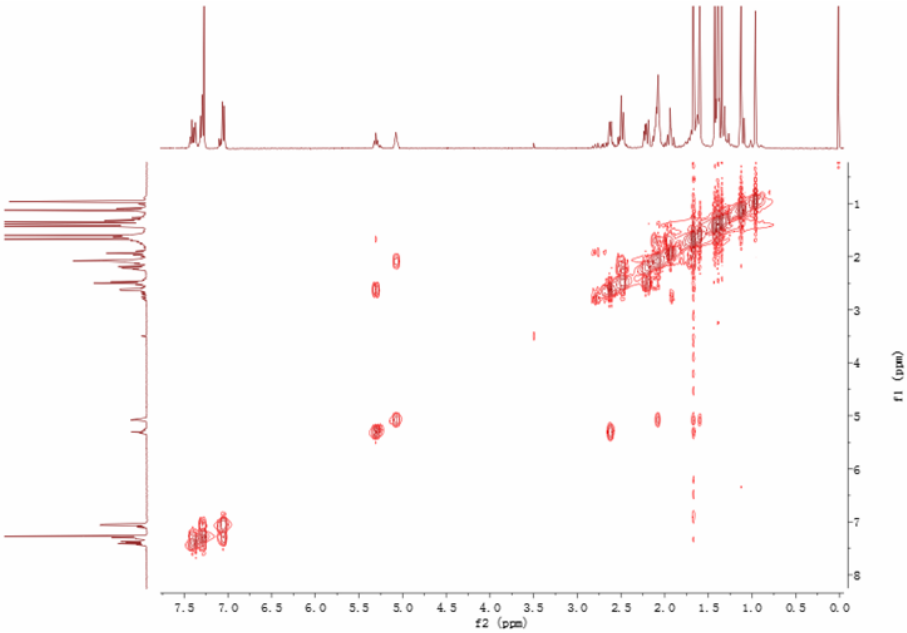


Figure S86. HMBC spectrum of compound **9** in $CDCl_3$

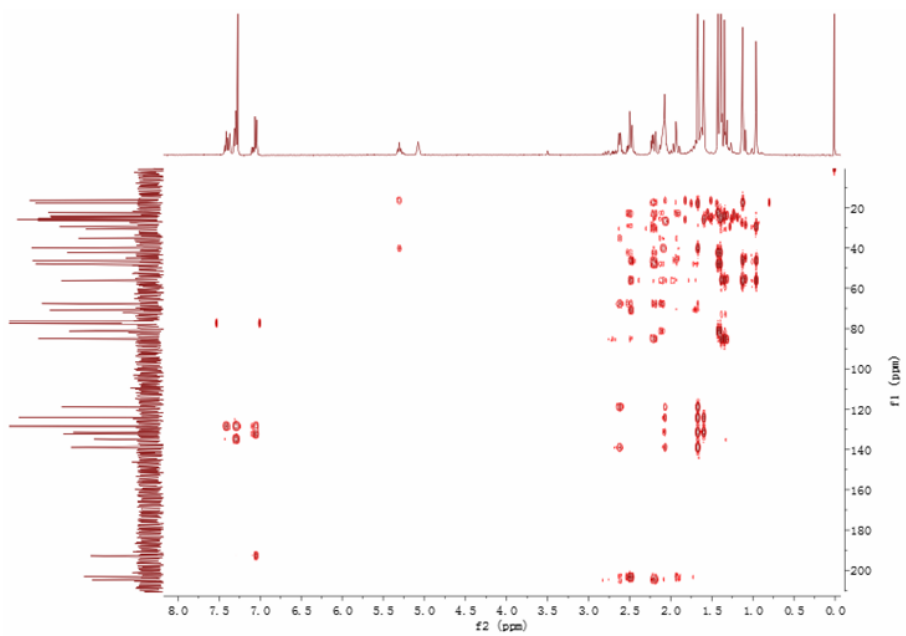


Figure S87. NOESY spectrum of compound **9** in $CDCl_3$

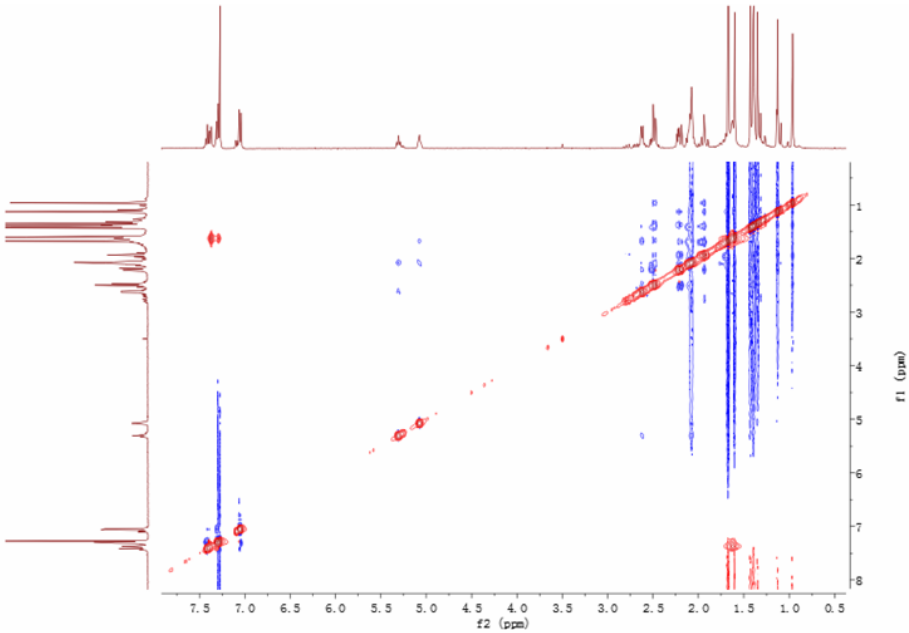


Figure S88. HRESIMS spectrum of compound **9**

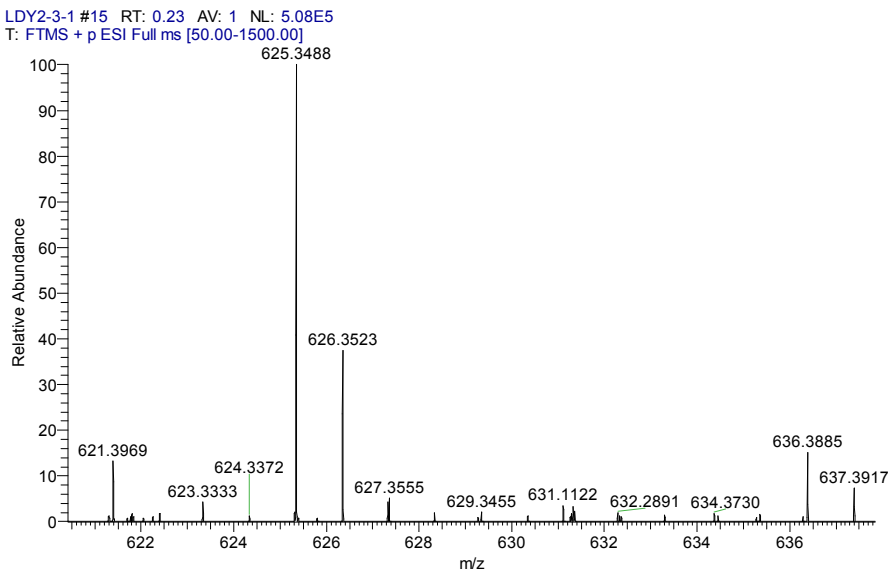


Figure S89. UV spectrum of compound **9**

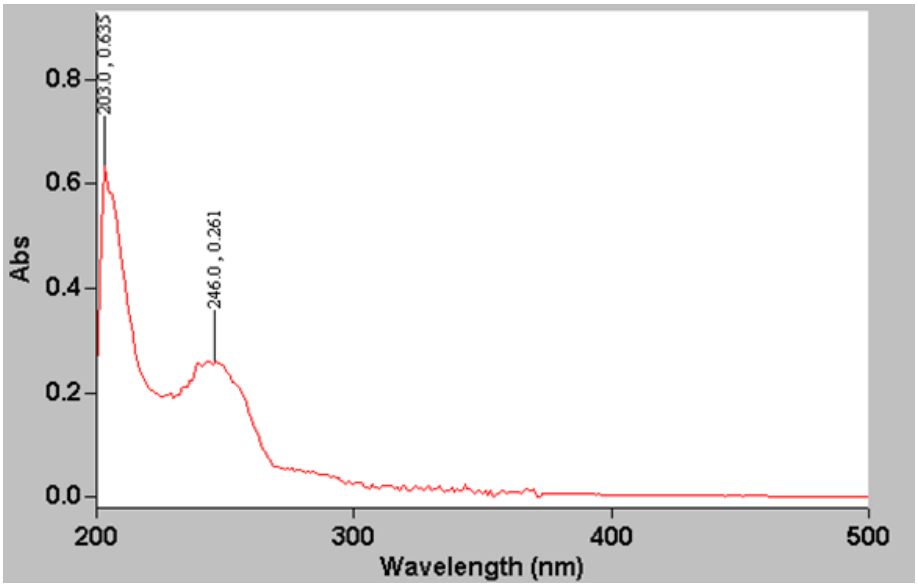


Figure S90. IR (KBr) spectrum of compound **9**

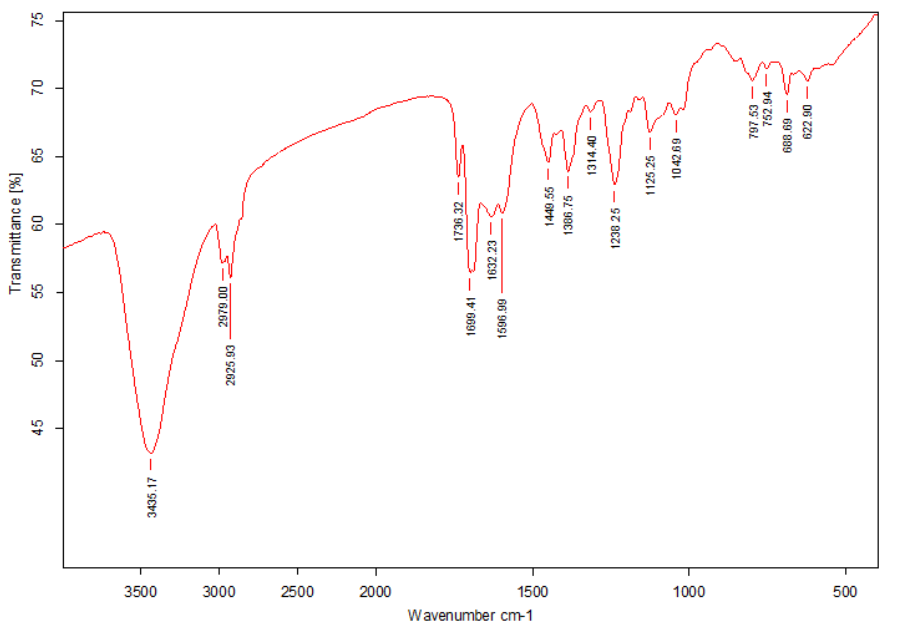


Figure S91.^{1}H NMR spectrum (400 MHz) of compound **6** in pyridine-d_5

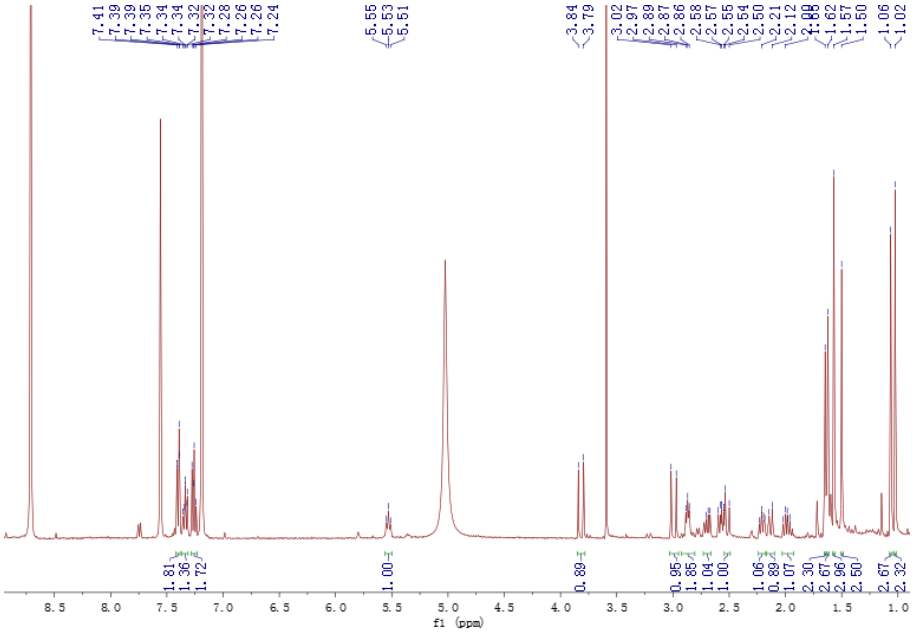


Figure S92.^{13}C NMR spectrum (100 MHz) of compound **6** in pyridine-d_5

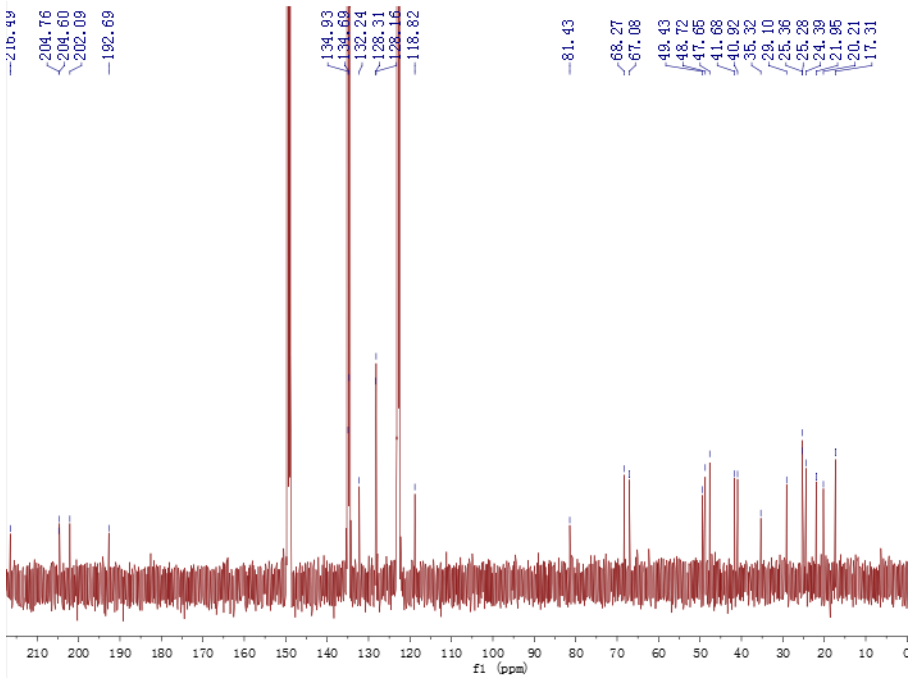


Figure S93. DEPT-135 spectrum (100 MHz) of compound **6** in pyridine-d_5

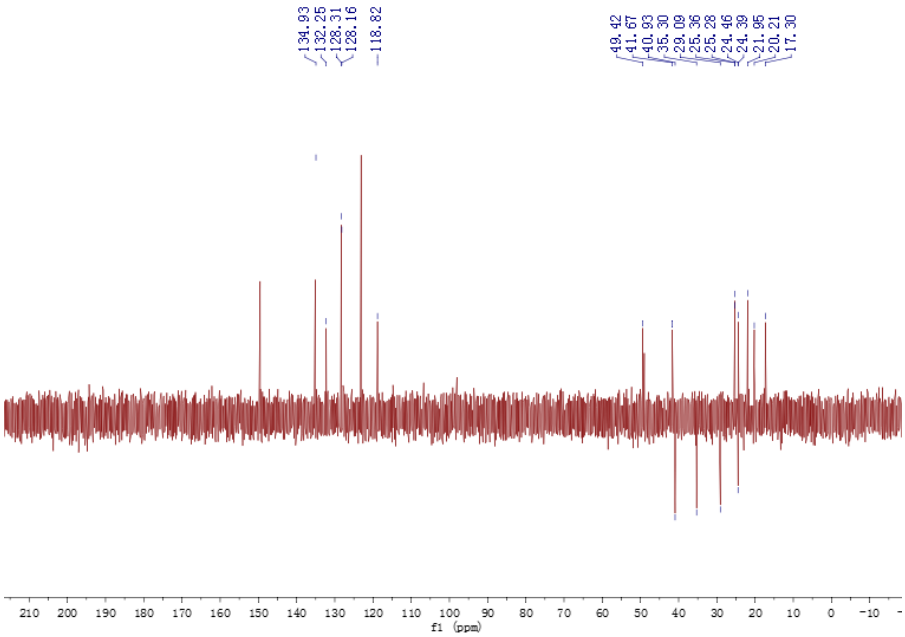


Figure S94. HSQC spectrum of compound **6** in pyridine-d_5

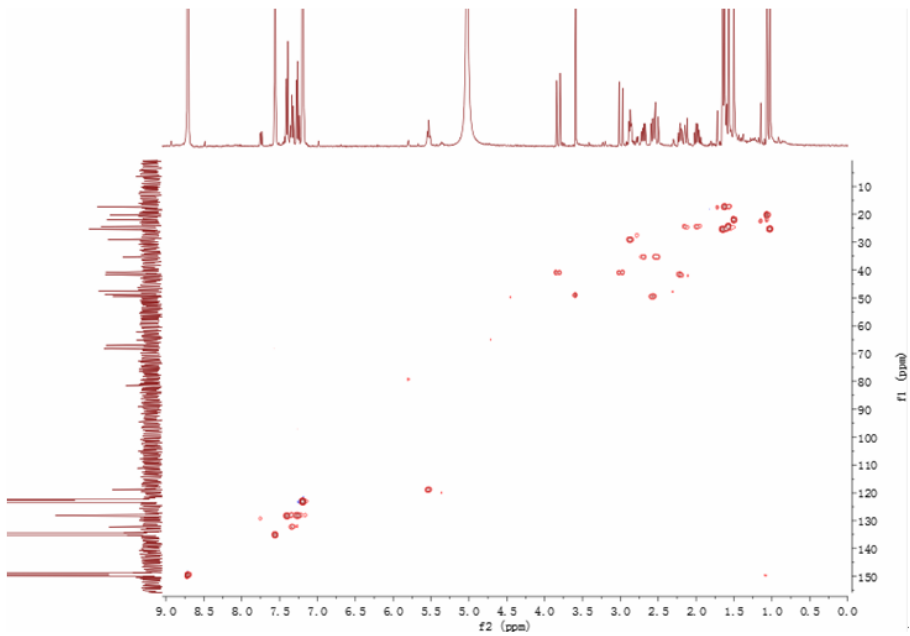


Figure S95. ^{1}H–^{1}H COSY spectrum of compound **6** in pyridine-d_5

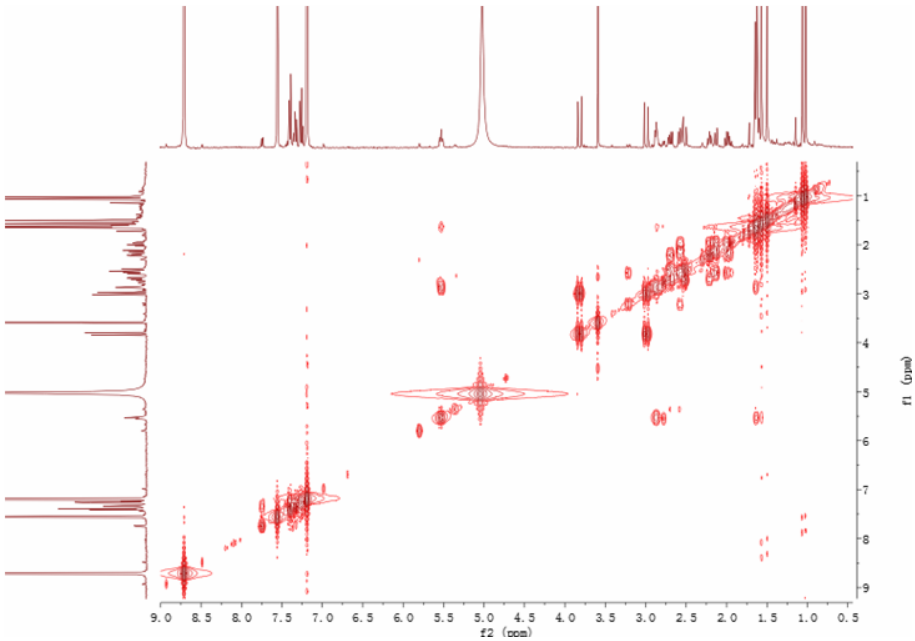


Figure S96. HMBC spectrum of compound **6** in pyridine-d_5

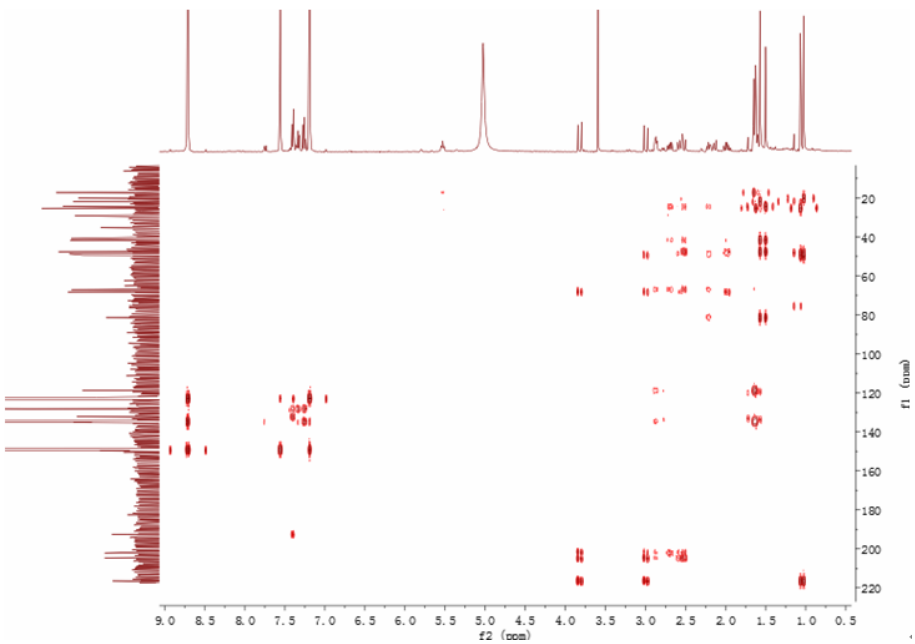


Figure S97. NOESY spectrum of compound **6** in pyridine-d_5

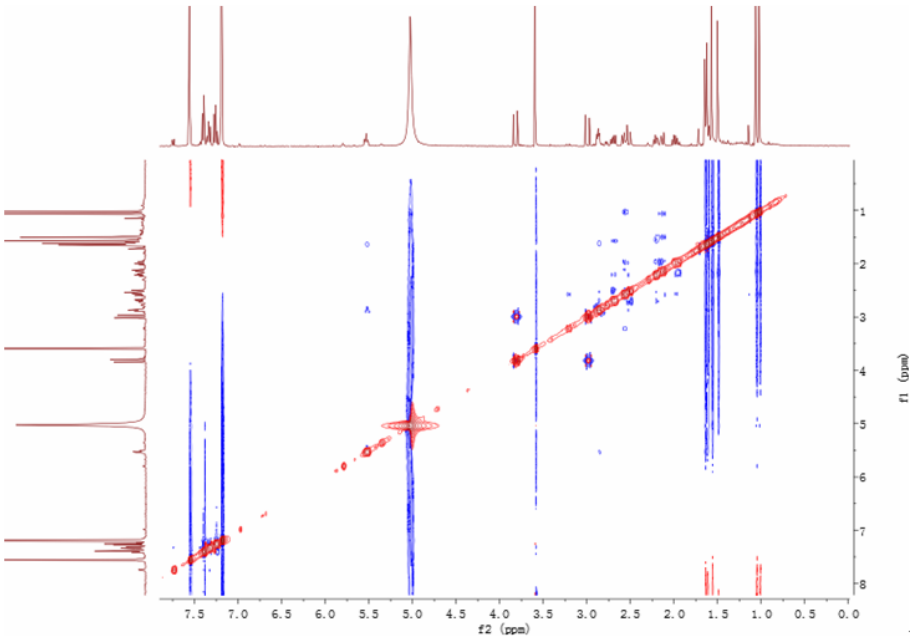


Figure S98.^{1}H NMR spectrum (400 MHz) of compound **7** in pyridine-d_5

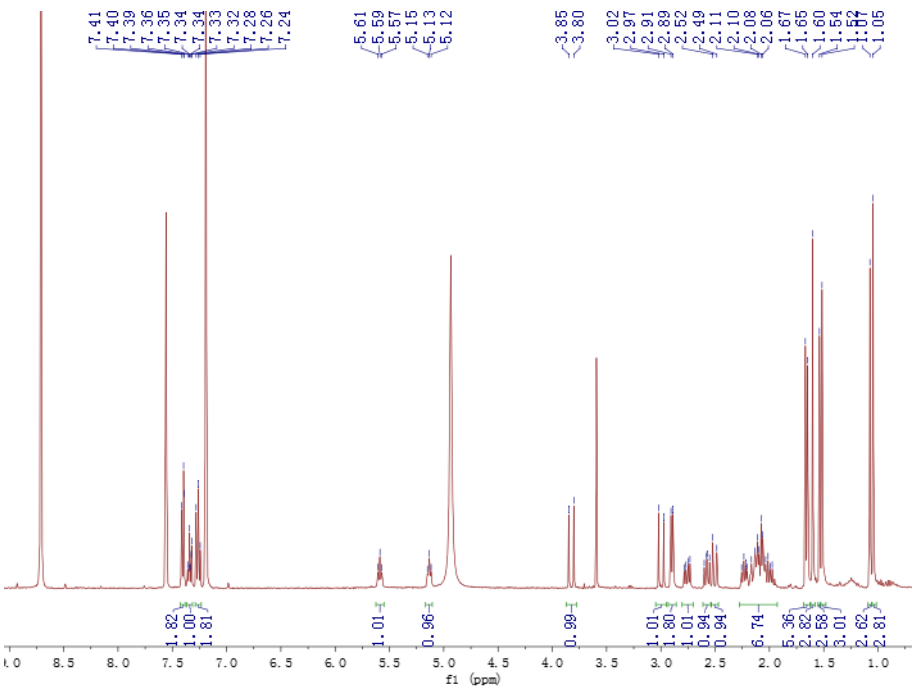


Figure S99.[13]C NMR spectrum (100 MHz) of compound **7** in pyridine-d_5

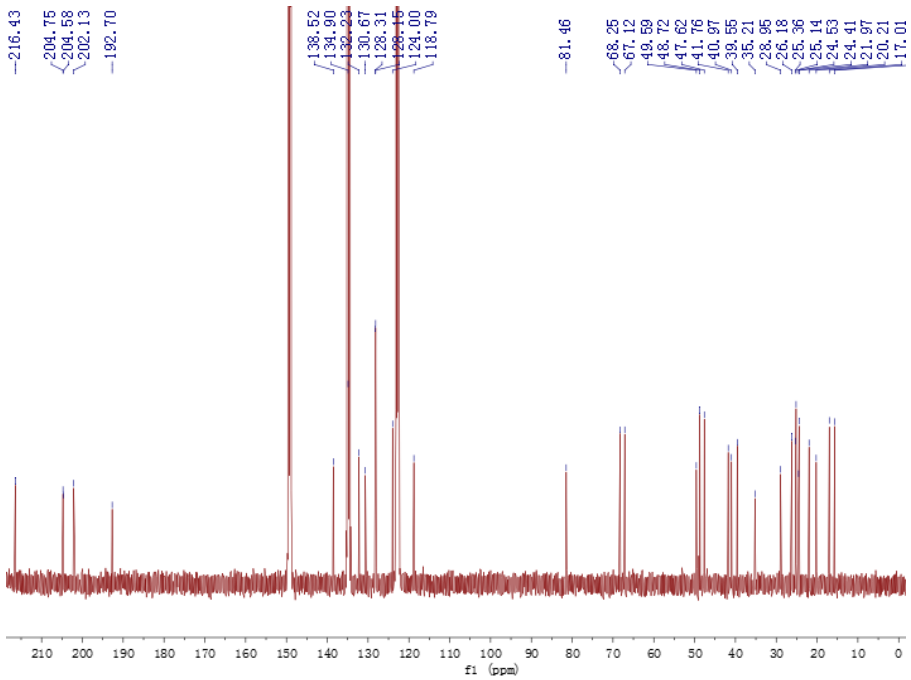


Figure S100. DEPT-135 spectrum (100 MHz) of compound **7** in pyridine-d_5

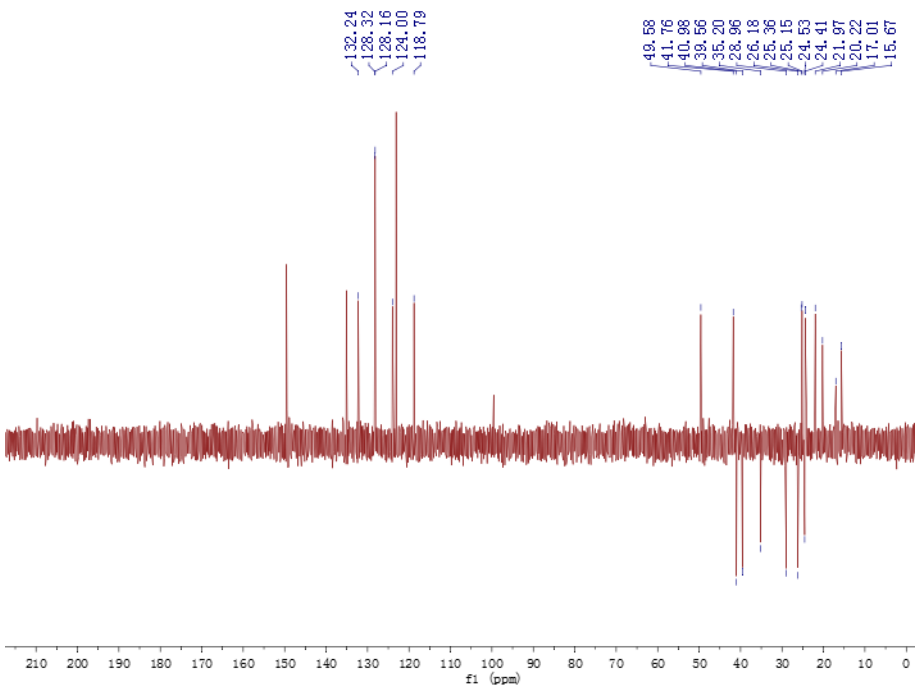


Figure S101. HSQC spectrum of compound **7** in pyridine-d_5

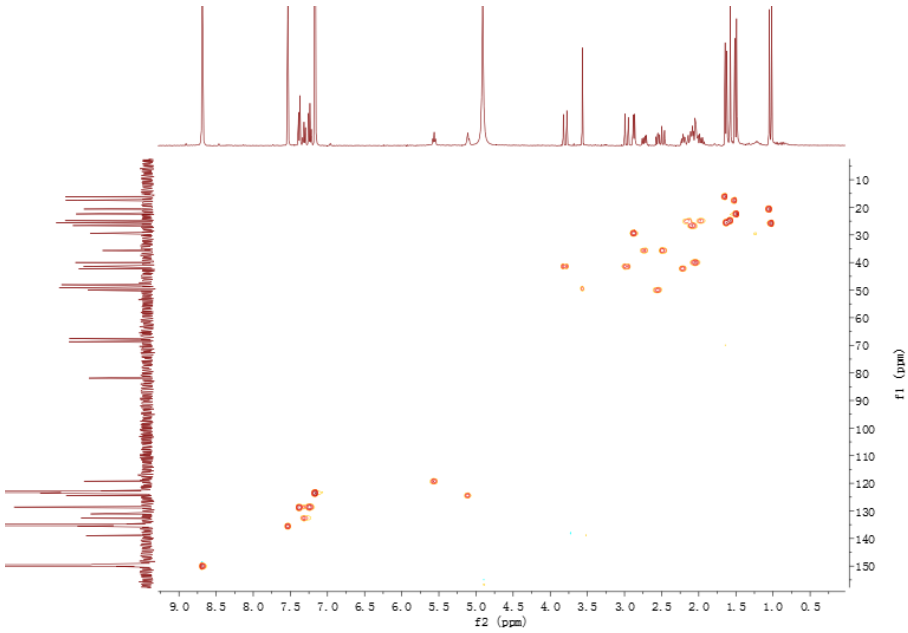


Figure S102. ^{1}H–^{1}H COSY spectrum of compound **7** in pyridine-d_5

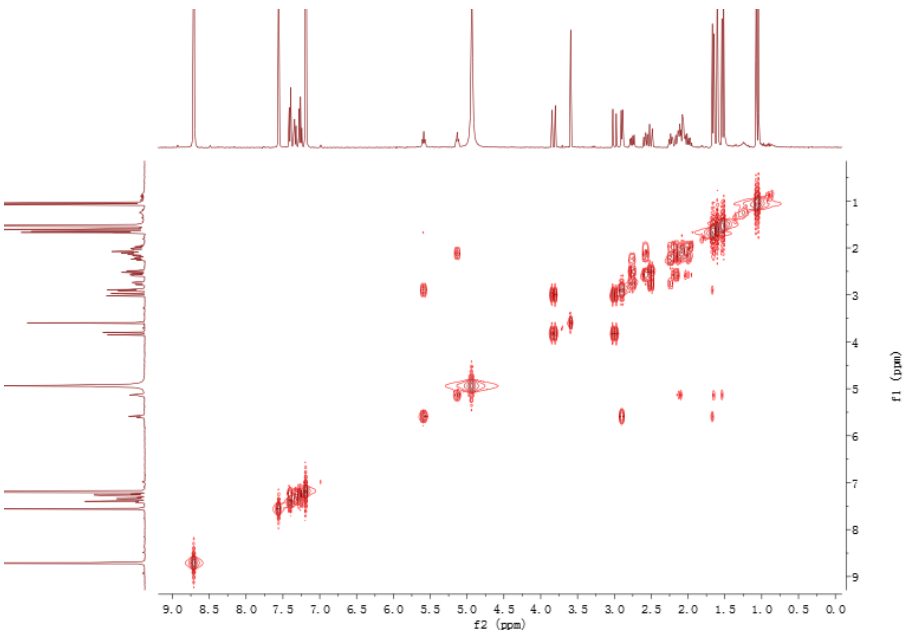


Figure S103. HMBC spectrum of compound **7** in pyridine-d_5

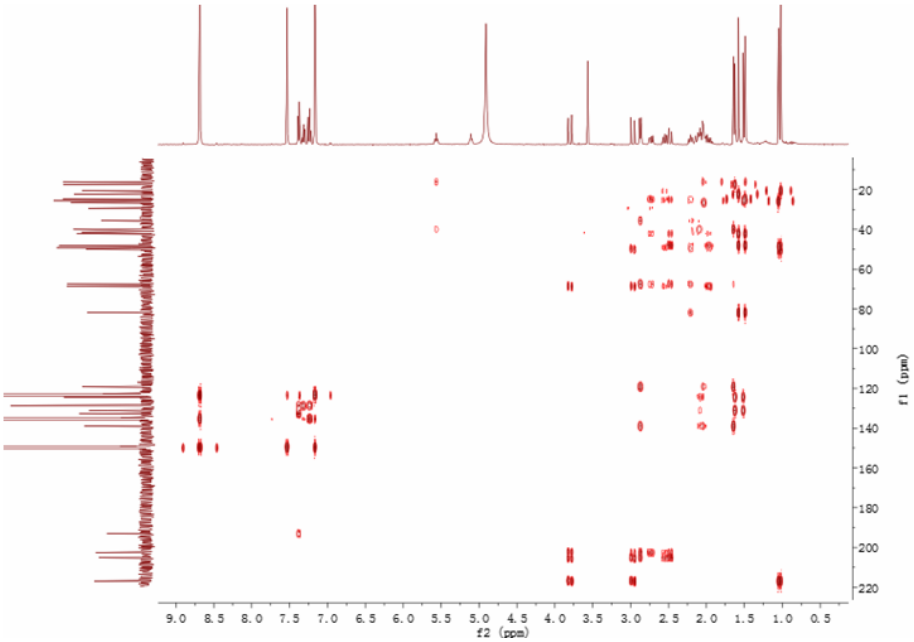


Figure S104. NOESY spectrum of compound **2** in pyridine-d_5

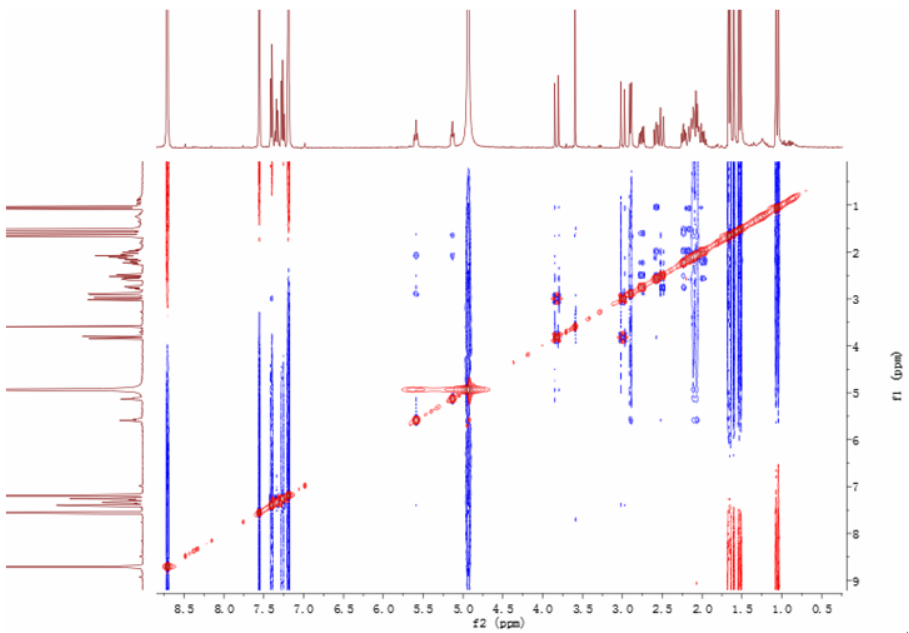


Figure S105. CD spectrum of compound **5**

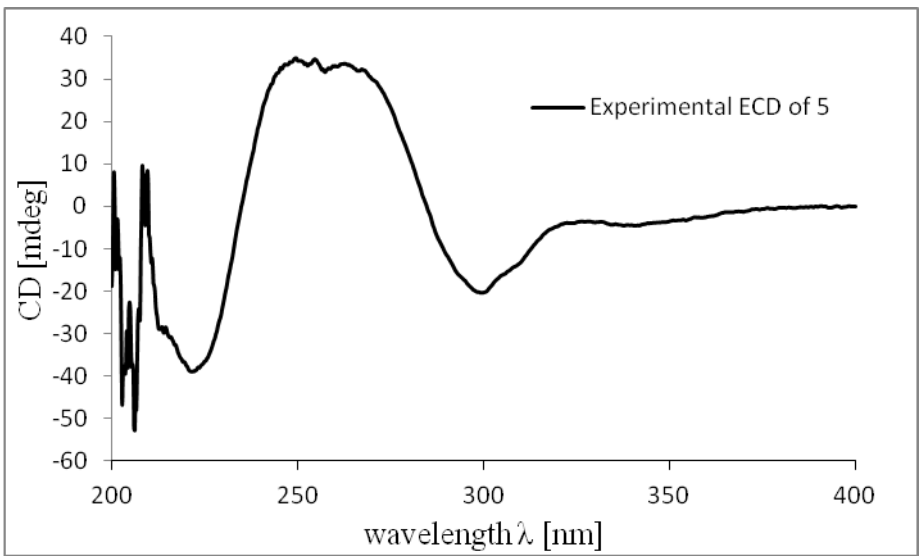
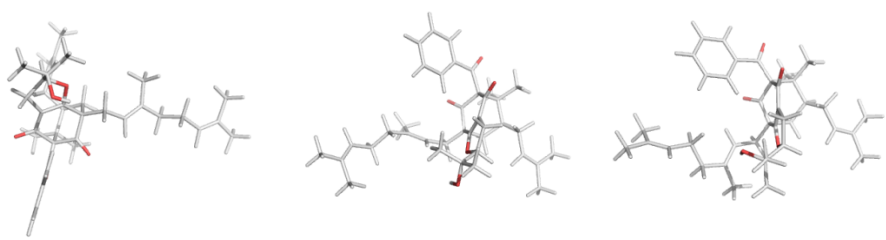


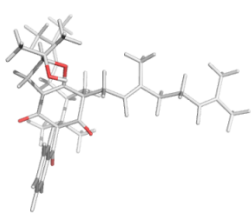
Figure S106. Twenty lowest energy conformers of the 1*S*,6*S*,8*S*,10*S* isomer and fourteen lowest energy conformers of the 1*R*,6*R*,8*R*,10*R* isomer of compound **3**.



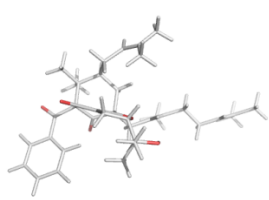
3a

3b

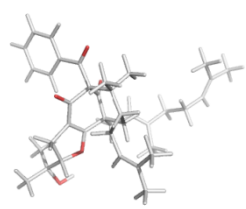
3c



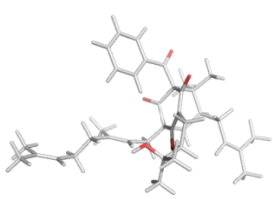
3d



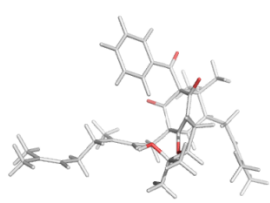
3e



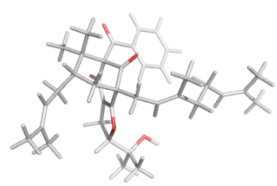
3f



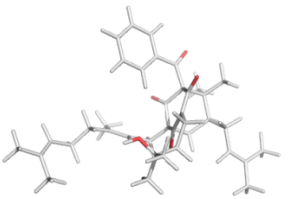
3g



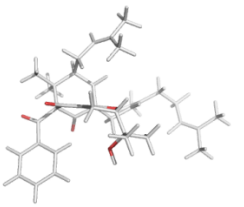
3h



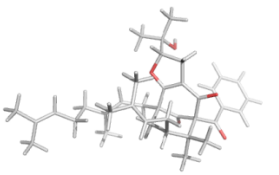
3i



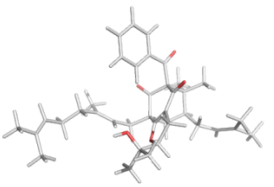
3j



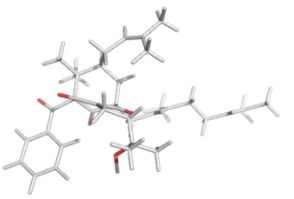
3k



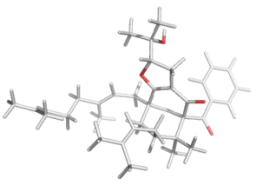
3l



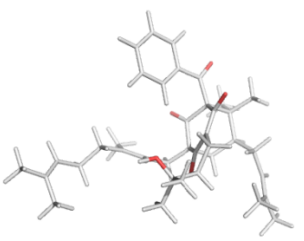
3m



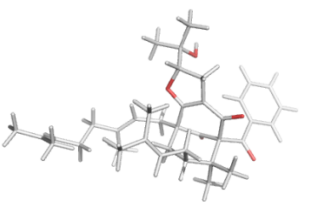
3n



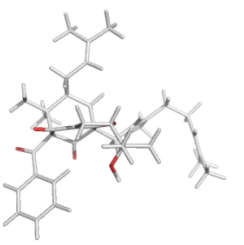
3o



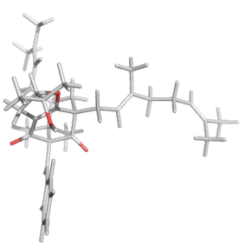
3p



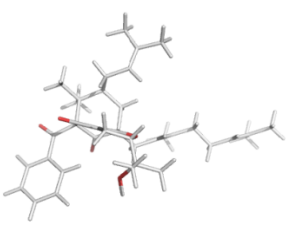
3q



3r

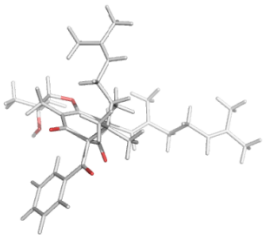


3s

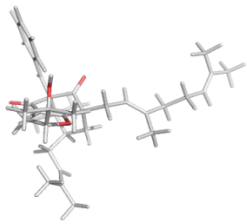


3t

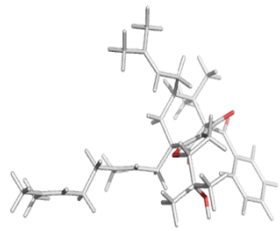
3a–3t: twenty lowest energy conformers of isomer 1*S*, 6*S*, 8*S*, 10*S* of compound **3**.



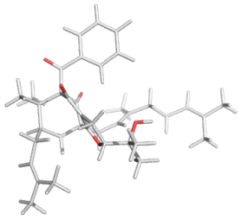
3a′



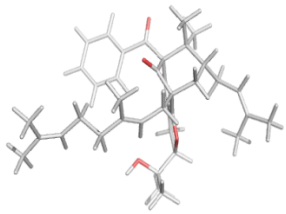
3b′



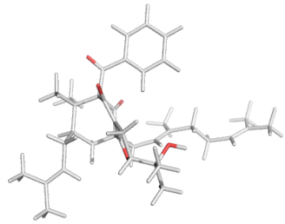
3c′



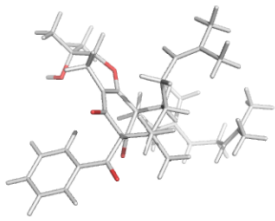
3d′



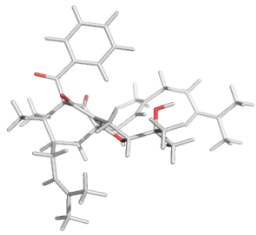
3e′



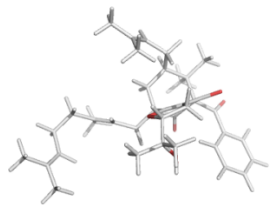
3f′



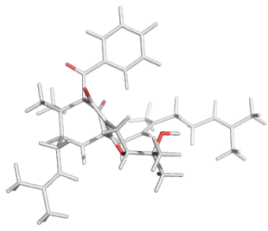
3g′



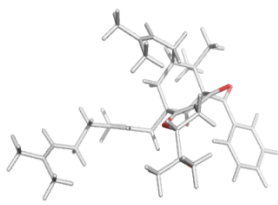
3h′



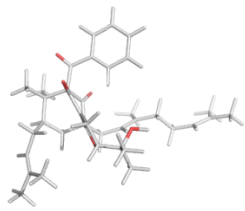
3i′



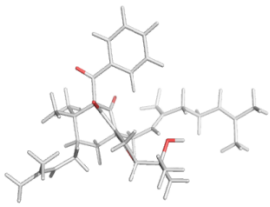
3j′



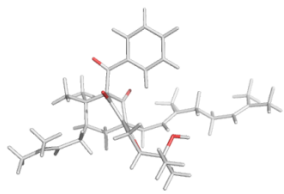
3k′



3l′



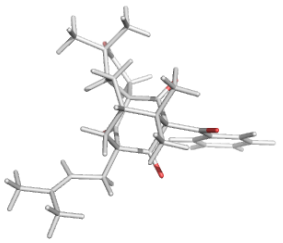
3m′



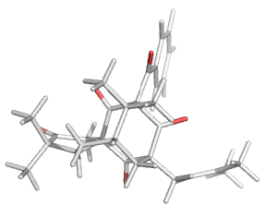
3n′

3a′−3n′: fourteen lowest energy conformers of isomer 1*R*, 6*R*, 8*R*, 10*R* of compound **3**.

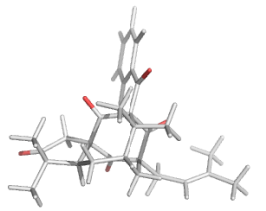
Figure S107. Six lowest energy conformers of the 1*R*,3*R*,7*S*,9*S*,11*S* isomer and four lowest energy conformers of the 1*S*,3*S*,7*R*,9*R*,11*R* isomer of compound **6**.



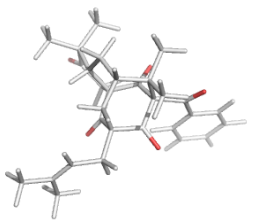
6a



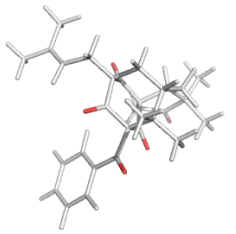
6b



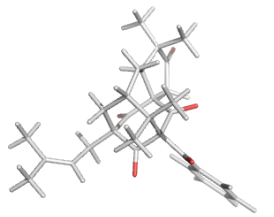
6c



6d

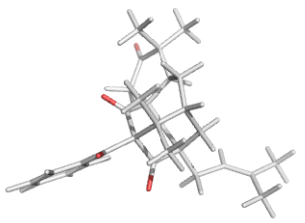


6e

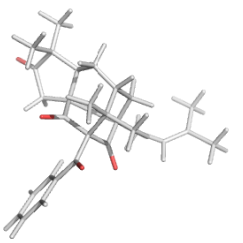


6f

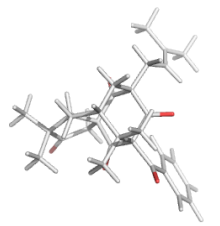
6a−6f: six lowest energy conformers of the 1*R*, 3*R*, 7*S*, 9*S*, 11*S* isomer of compound **6**.



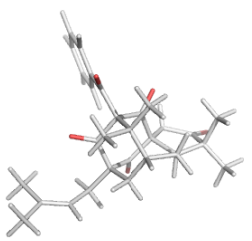
6g



6h



6i



6j

6g−6j: four lowest energy conformers of the 1*S*, 3*S*, 7*R*, 9*R*, 11*R* isomer of compound **6**.

Table S1. Relative free energies (ΔG) and equilibrium populations (P) of the conformers of the 1*S*,6*S*,8*S*,10*S* and 1*R*,6*R*,8*R*,10*R* isomers of compound **3**

conformer	isomer 1*S*,6*S*,8*S*,10*S*		conformer	Isomer 1*R*,6*R*,8*R*,10*R*	
	ΔG (kcal/mol)	P (%)		ΔG (kcal/mol)	P (%)
3a	0.0000	12.33	3a′	1.5041	2.35
3b	0.1176	10.11	3b′	1.4098	2.75
3c	0.8617	2.88	3c′	0.9930	5.56
3d	0.6950	3.81	3d′	0.8784	6.74
3e	0.0851	10.68	3e′	1.8339	1.34
3f	0.4622	5.65	3f′	1.6874	1.72
3g	1.1178	1.87	3g′	1.2539	3.58
3h	0.2112	8.63	3h′	0.0042	29.47
3i	1.2372	1.53	3i′	1.0709	4.87
3j	0.8405	2.98	3j′	1.4295	2.66
3k	0.5325	5.02	3k′	1.5862	2.04
3l	1.1824	1.68	3l′	0.0000	29.68
3m	0.5025	5.28	3m′	1.0909	4.71
3n	0.9201	2.61	3n′	1.4589	2.53
3o	1.1612	1.74			
3p	0.2913	7.54			
3q	0.8675	2.85			
3r	0.9747	2.38			
3s	0.7919	3.24			
3t	0.4319	5.95			

Table S2. Relative free energies (ΔG) and equilibrium populations (P) of the conformers of the 1*R*,3*R*,7*S*,9*S*,11*S* and 1*S*,3*S*,7*R*,9*R*,11*R* isomers of compound **6**

conformer	isomer 1*S*,6*S*,8*S*,10*S*		conformer	Isomer 1*R*,6*R*,8*R*,10*R*	
	ΔG (kcal/mol)	P (%)		ΔG (kcal/mol)	P (%)
6a	0.0000	43.08	6g	0.0000	51.24
6b	1.2125	5.57	6h	0.1212	41.77
6c	1.5769	3.01	6i	1.5983	3.45
6d	0.8600	10.10	6j	1.5851	3.53
6e	1.5937	2.93			
6f	0.1179	35.31			