

Supplementary Material for

**Pentacyclic Triterpenoid's Based Ionic Compounds:
Synthesis, Study of Structure-Antitumor Activity
Relationship, Effects on Mitochondria and Activation of
Signaling Pathways of Prolife-ration, Genome
Reparation and Early Apoptosis**

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^1H and ^{13}C NMR Spectra of all Products

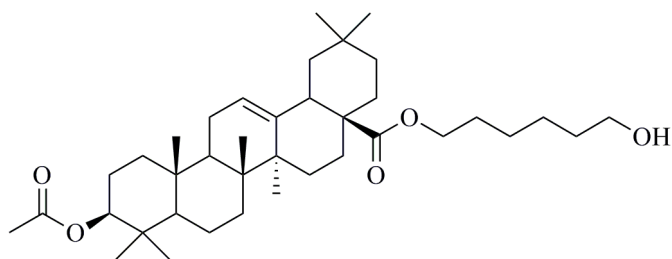


Figure S1. ^{13}C NMR Spectrum of compound 2 (125 MHz, CDCl_3)

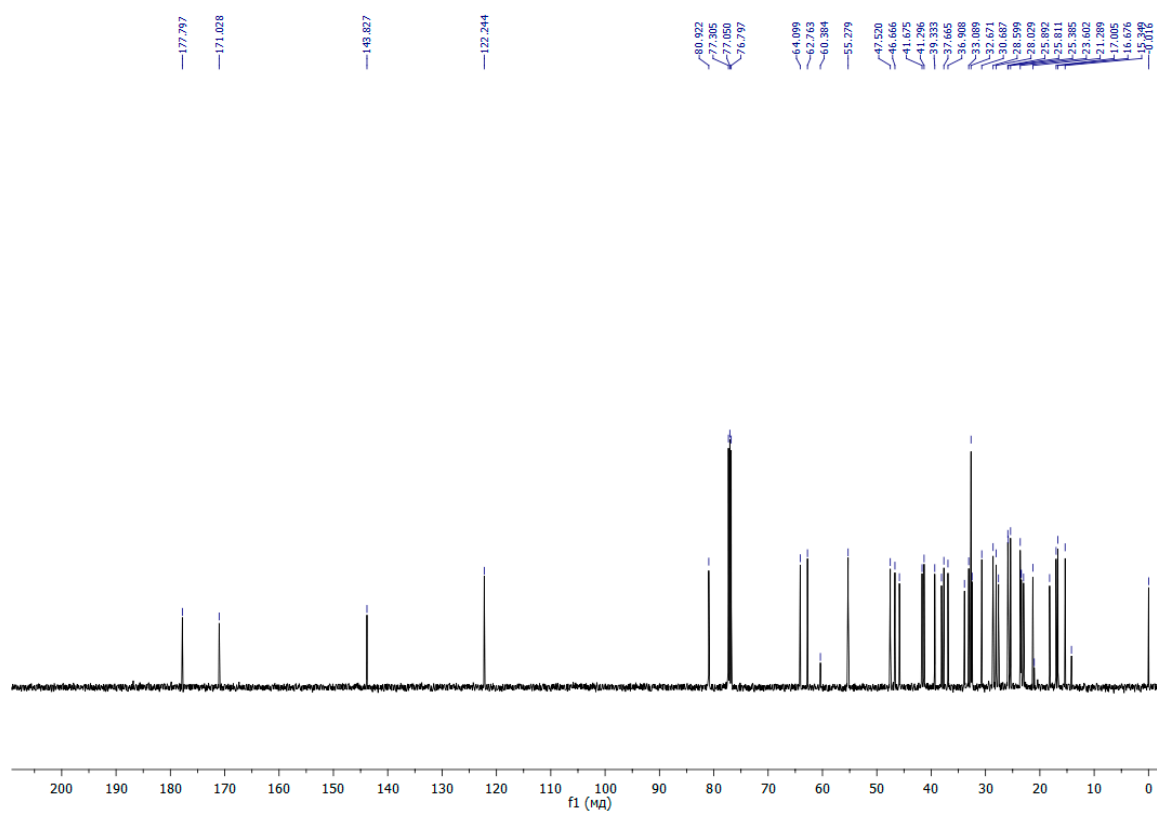
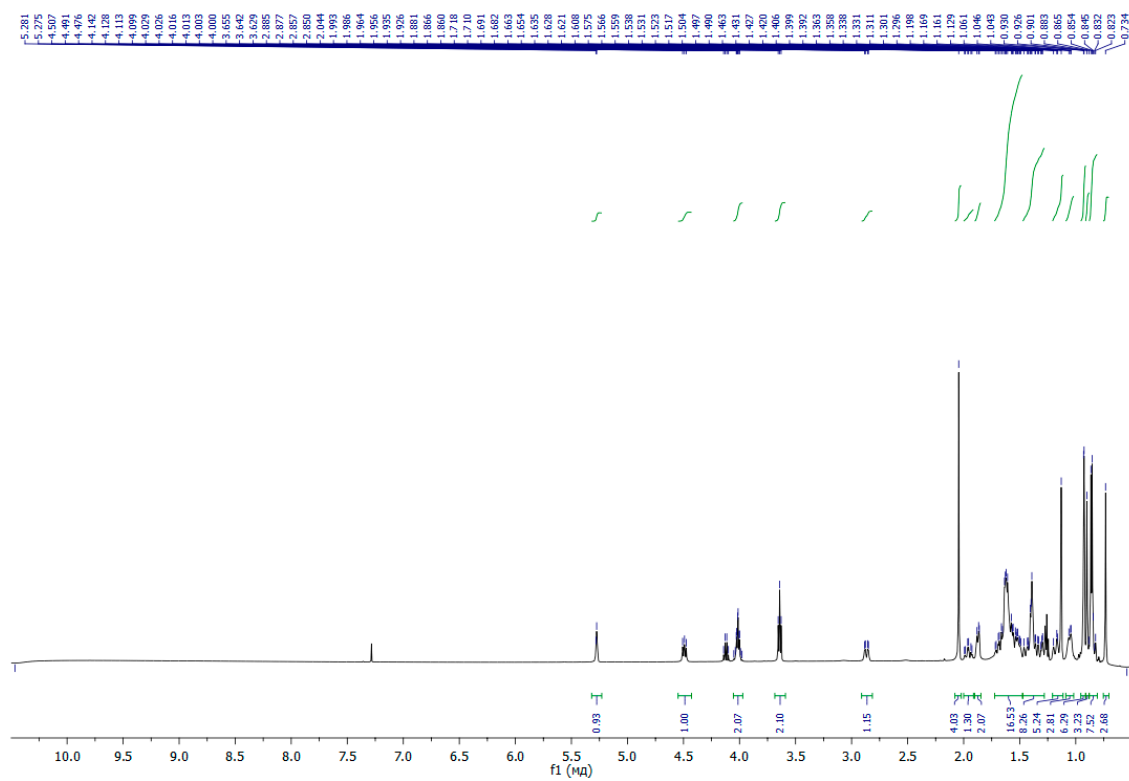


Figure S2. ^1H NMR Spectrum of compound **2** (500 MHz, CDCl_3)



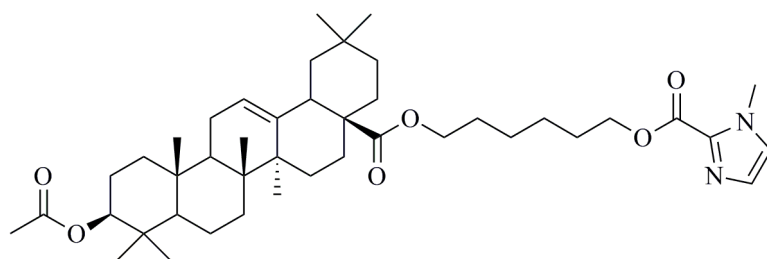


Figure S3. ^{13}C NMR Spectrum of compound **3** (100 MHz, CDCl_3)

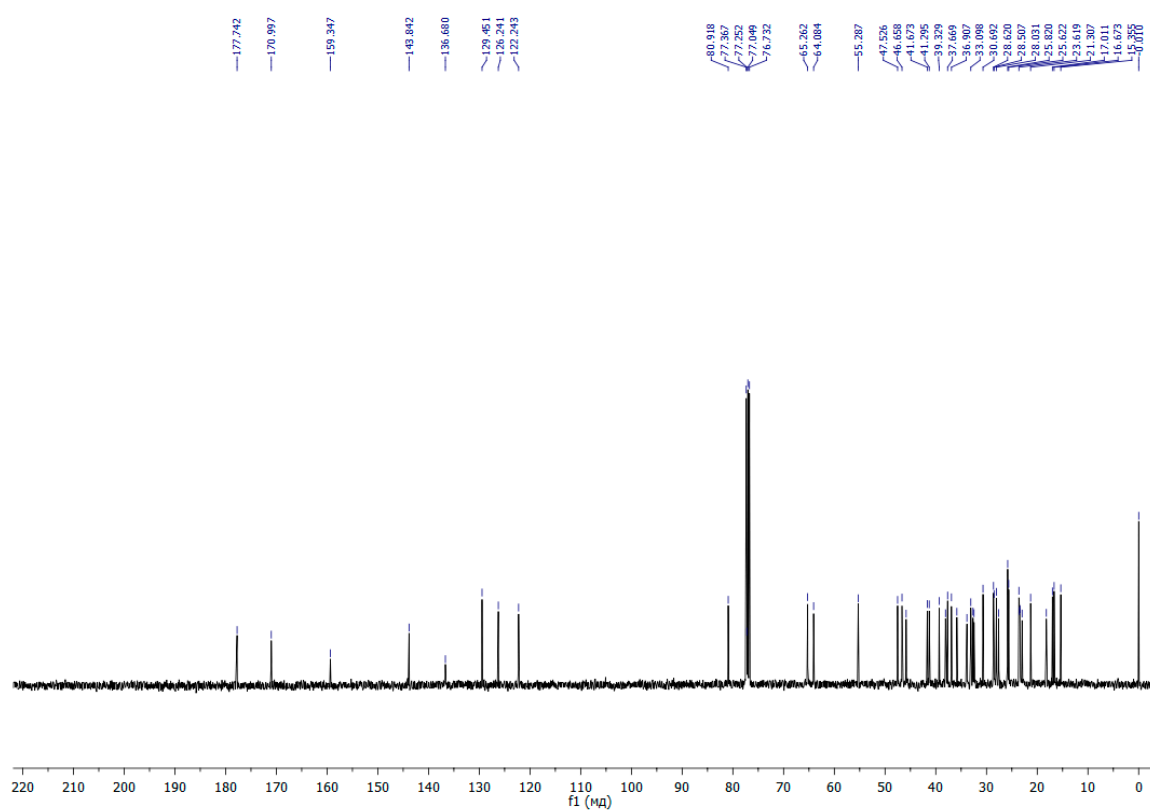
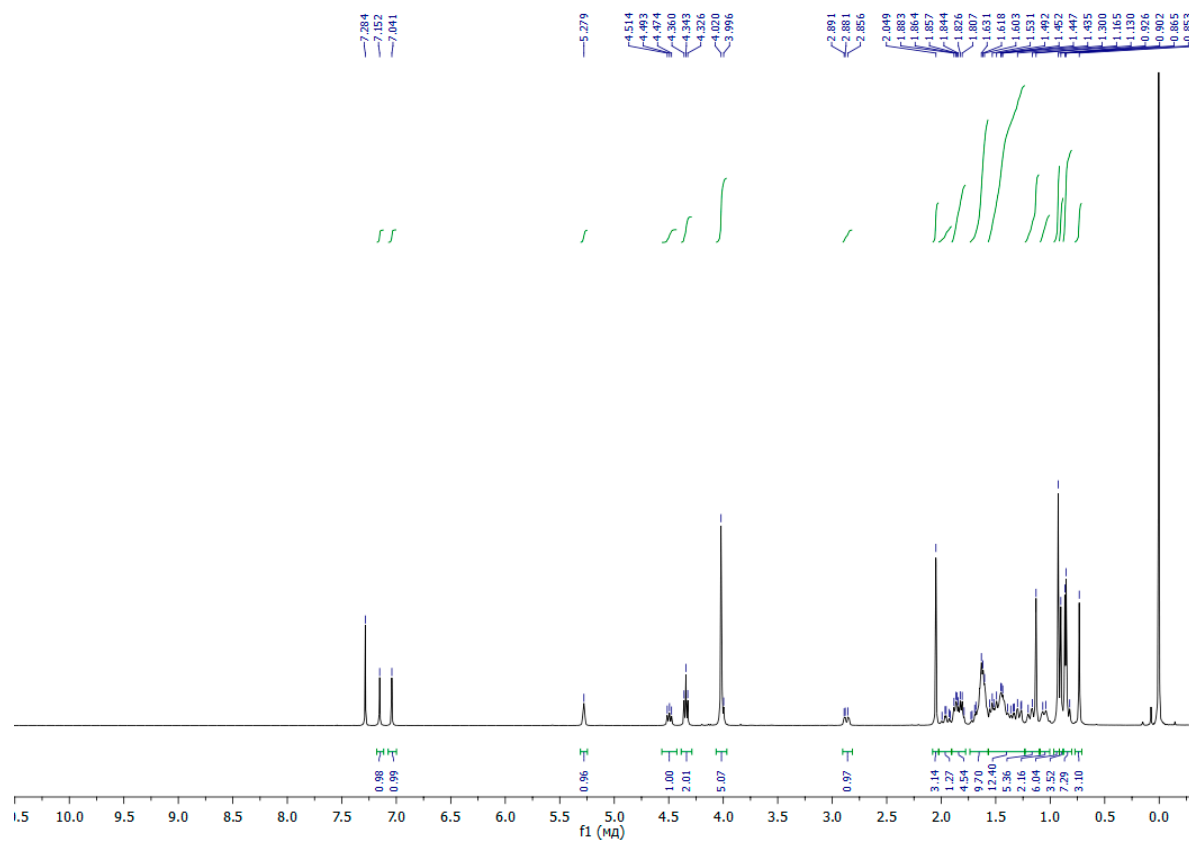


Figure S4. ^1H NMR Spectrum of compound **3** (400 MHz, CDCl_3)



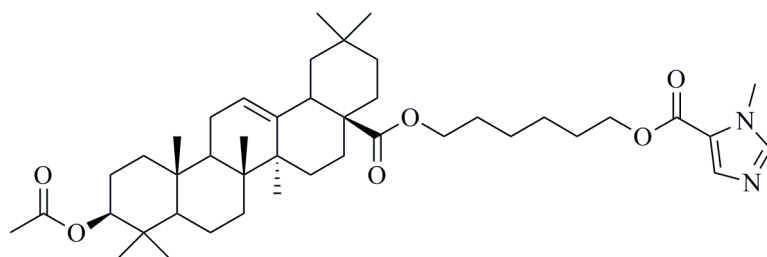


Figure S5. ^{13}C NMR Spectrum of compound **4** (125 MHz, CDCl_3)

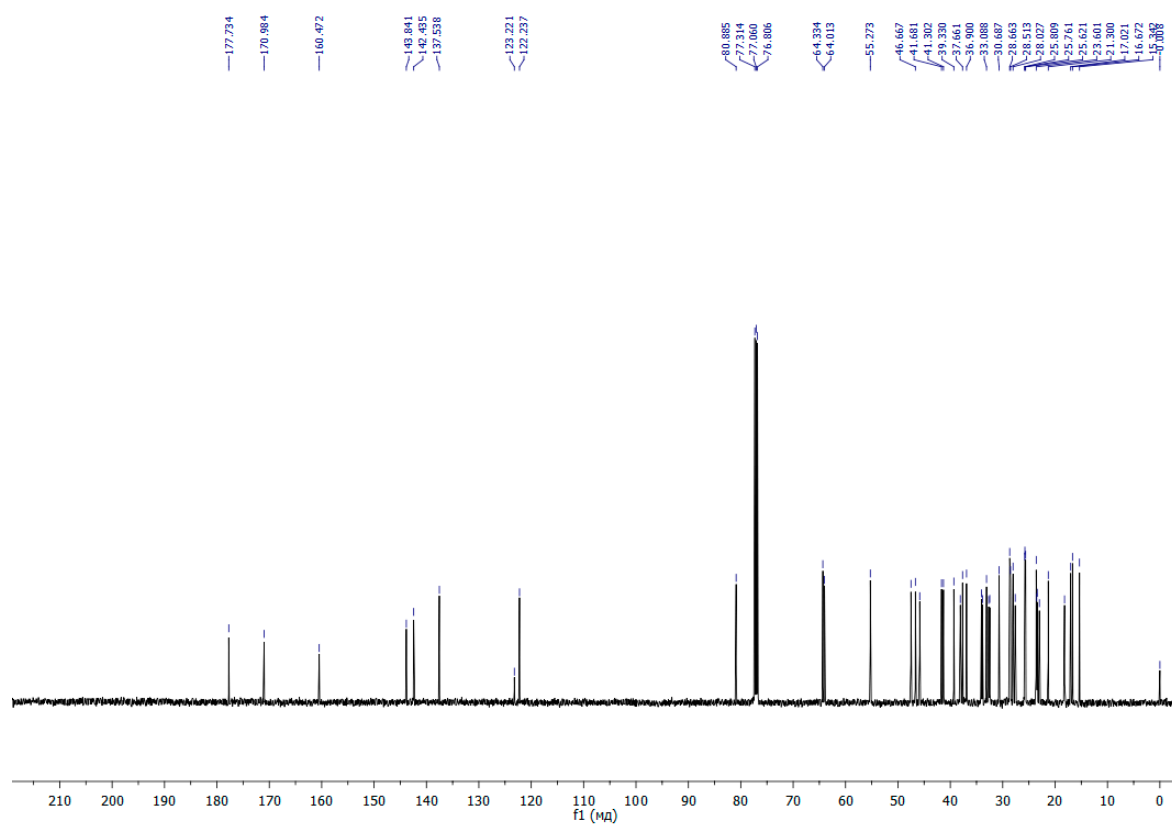
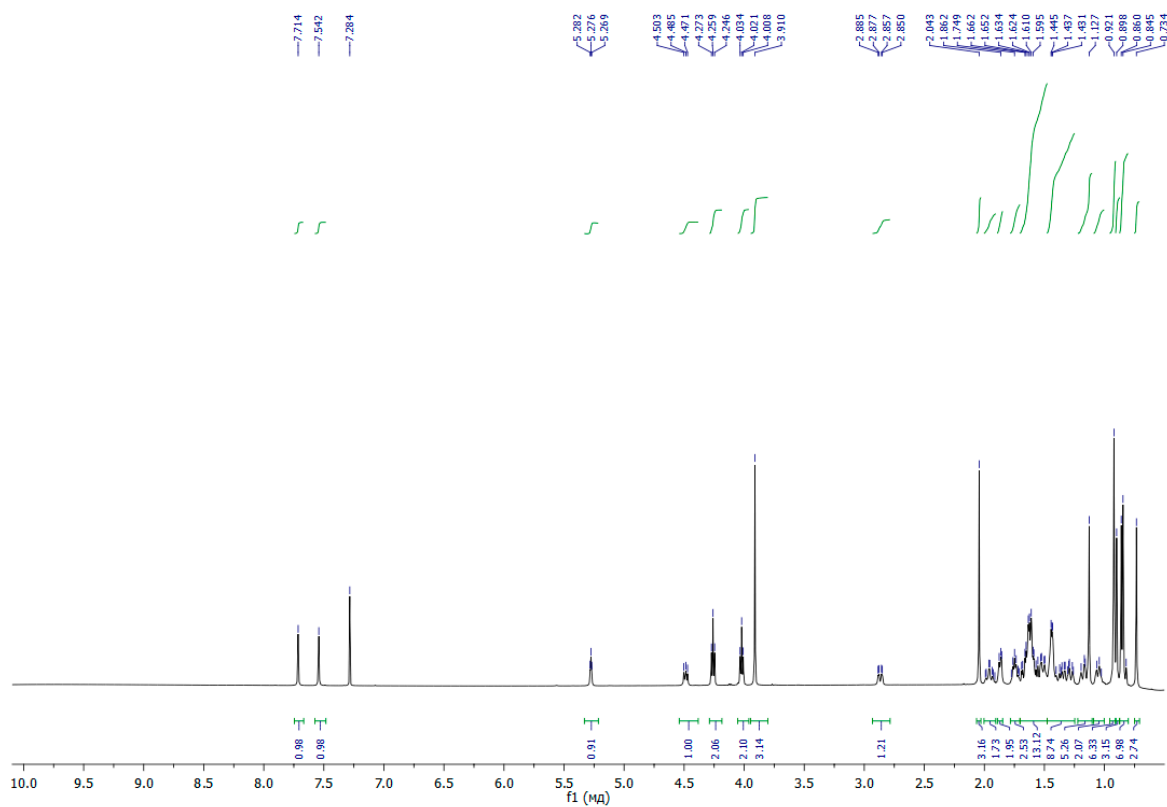


Figure S6. ^1H NMR Spectrum of compound **4** (500 MHz, CDCl_3)



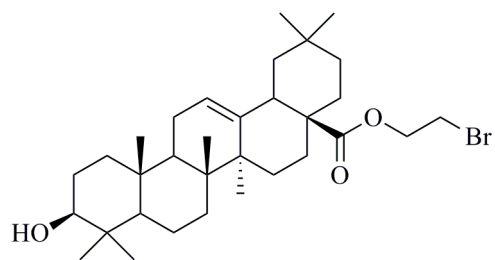


Figure S7. ^{13}C NMR Spectrum of compound **6a** (100 MHz, CDCl_3)

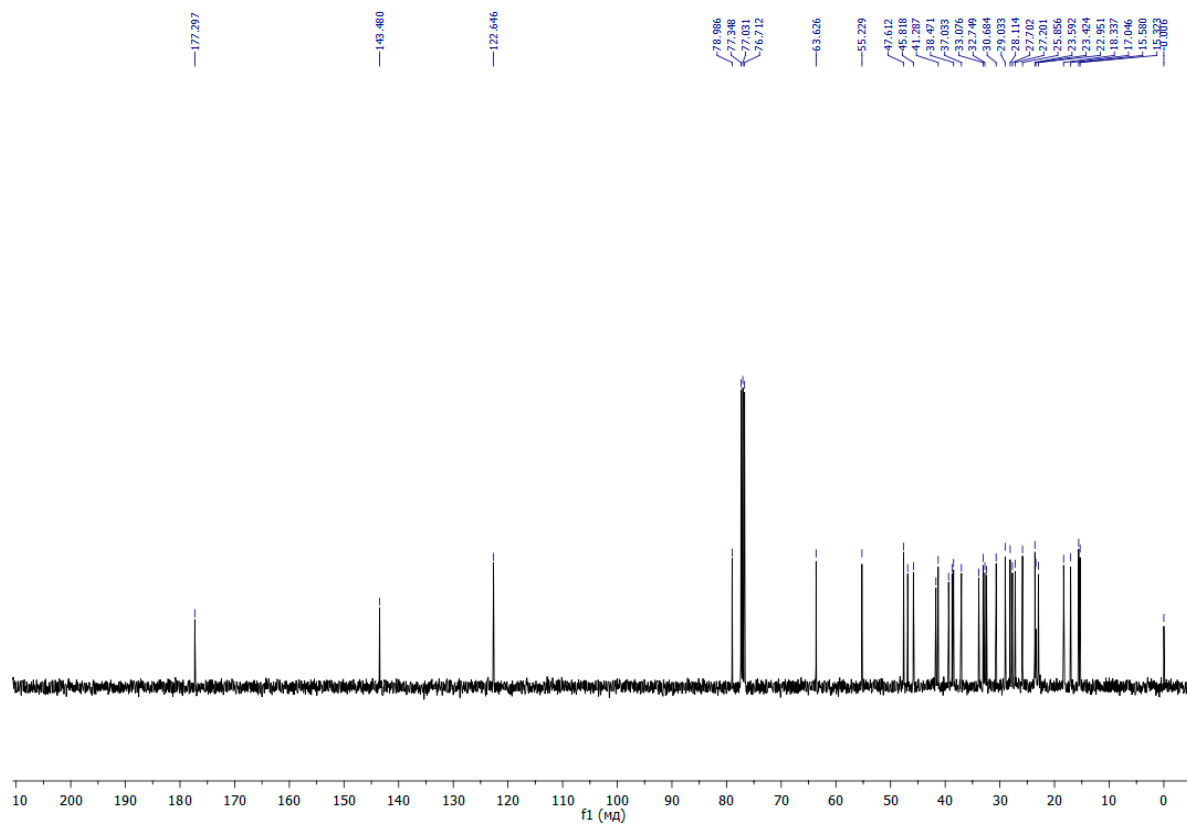
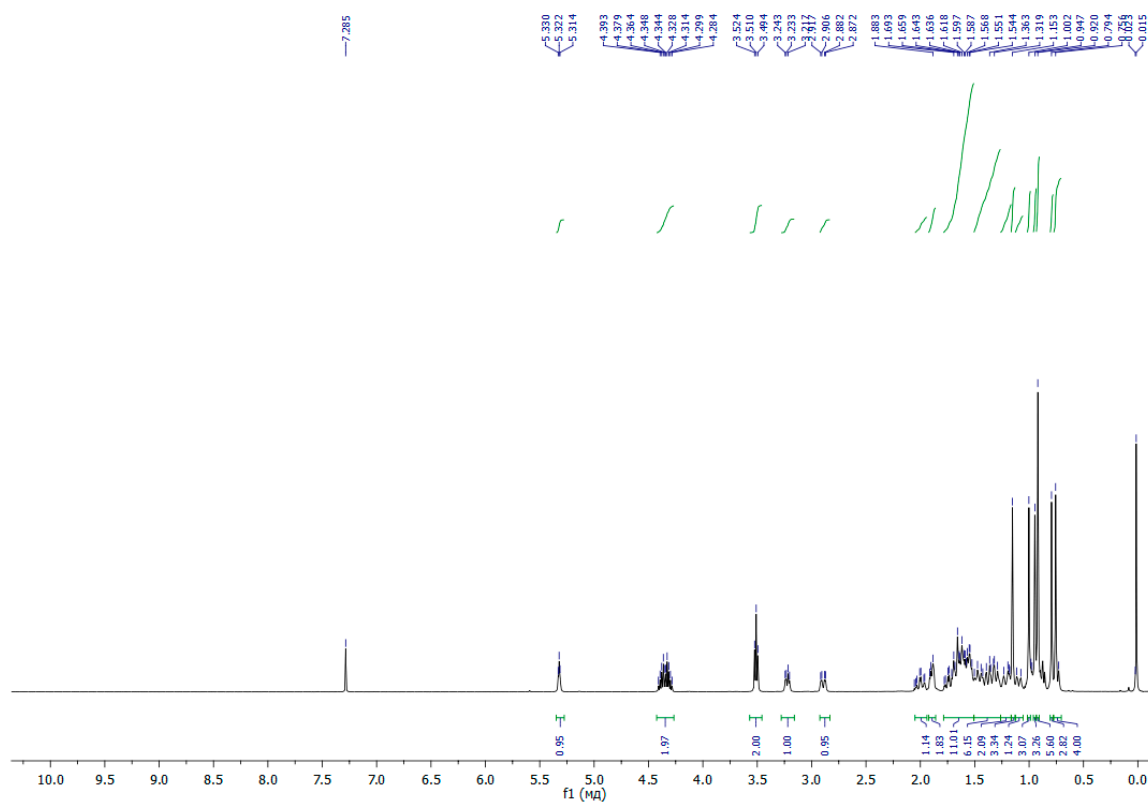


Figure S8. ^1H NMR Spectrum of compound **6a** (400 MHz, CDCl_3)



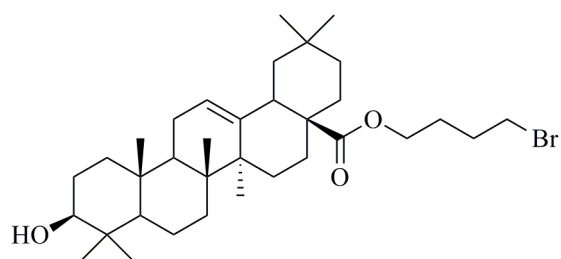


Figure S9. ^{13}C NMR Spectrum of compound **6b** (125 MHz, CDCl_3)

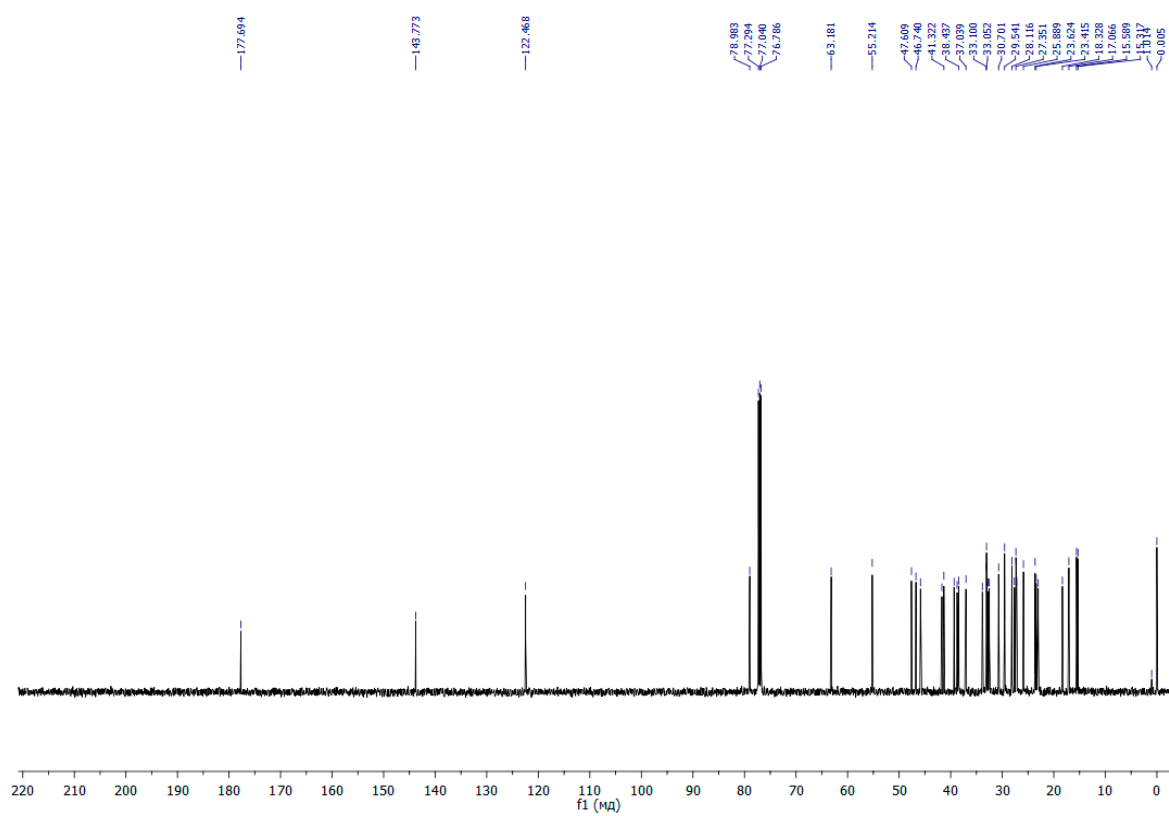
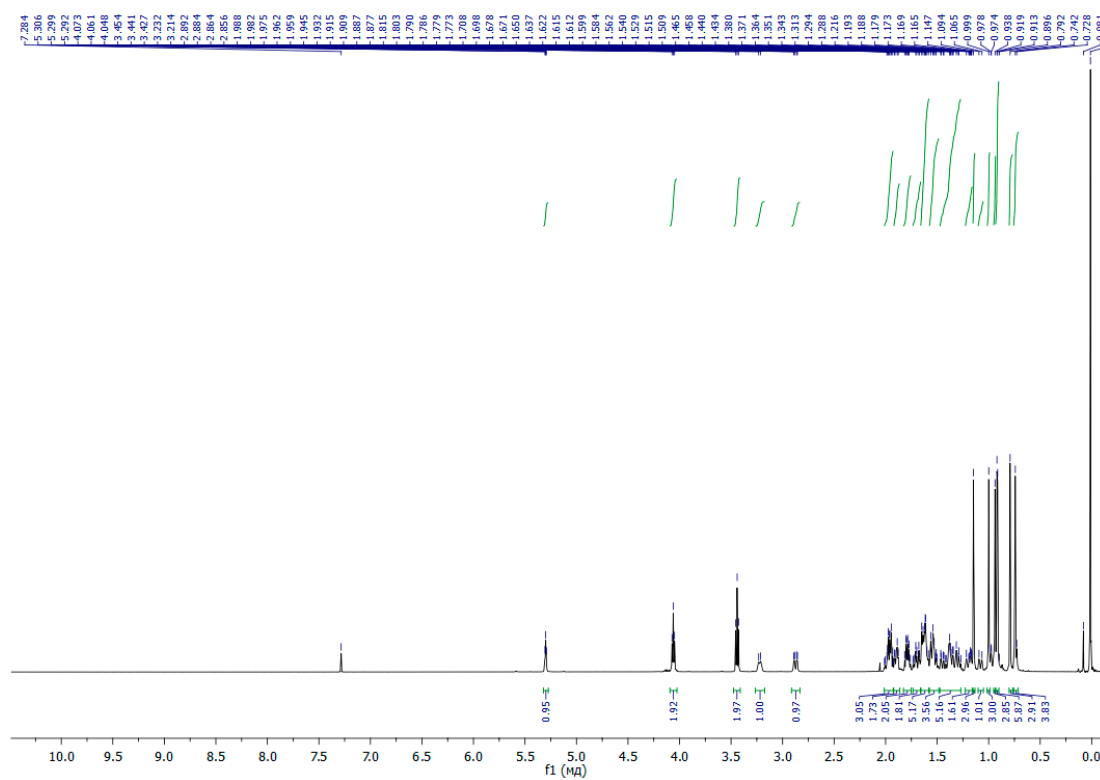


Figure S10. ^1H NMR Spectrum of compound **6b** (500 MHz, CDCl_3)



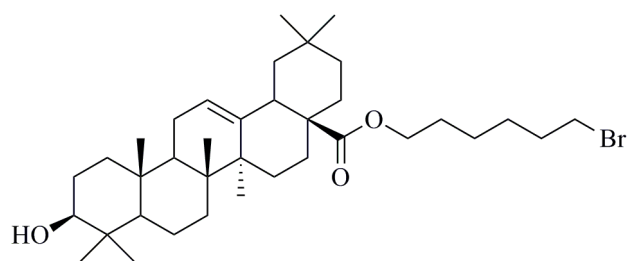


Figure S11. ^{13}C NMR Spectrum of compound **6c** (125 MHz, CDCl_3)

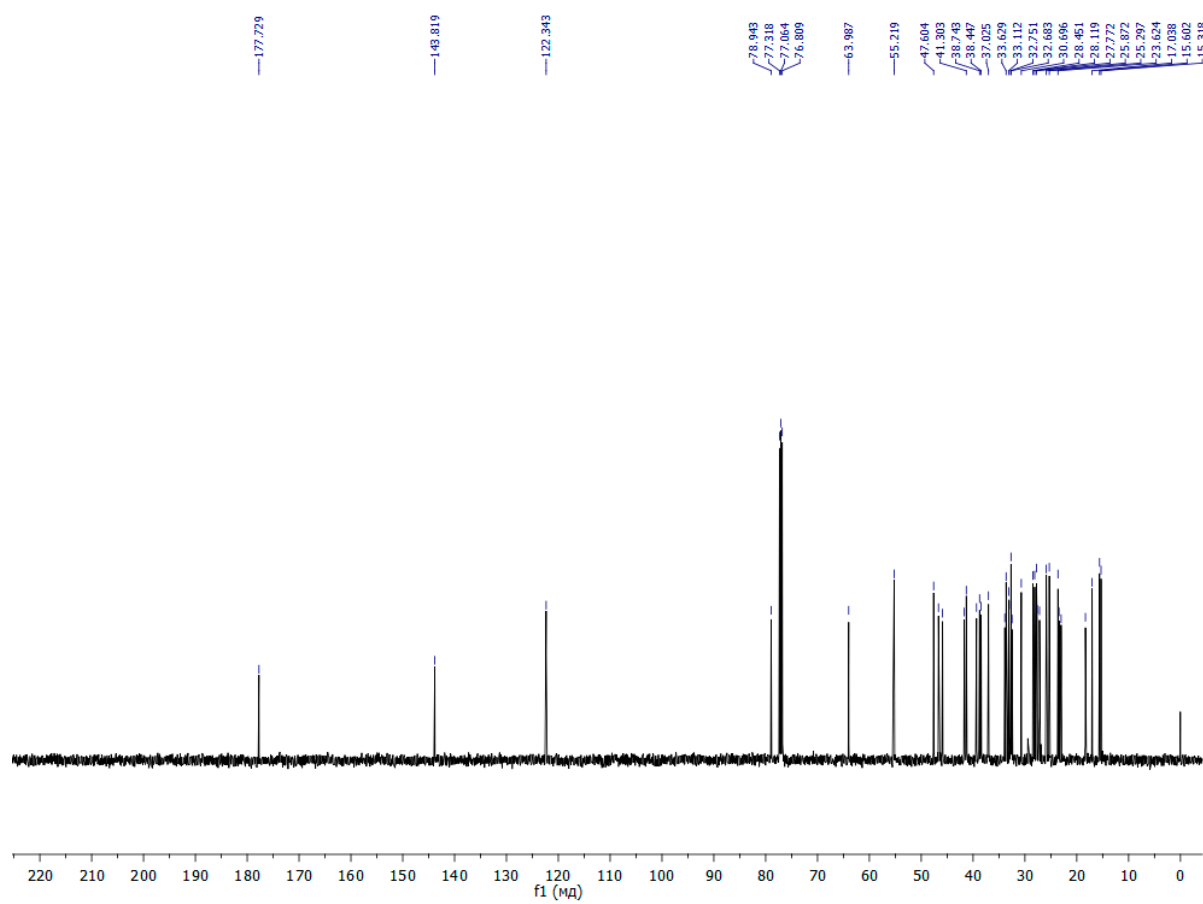
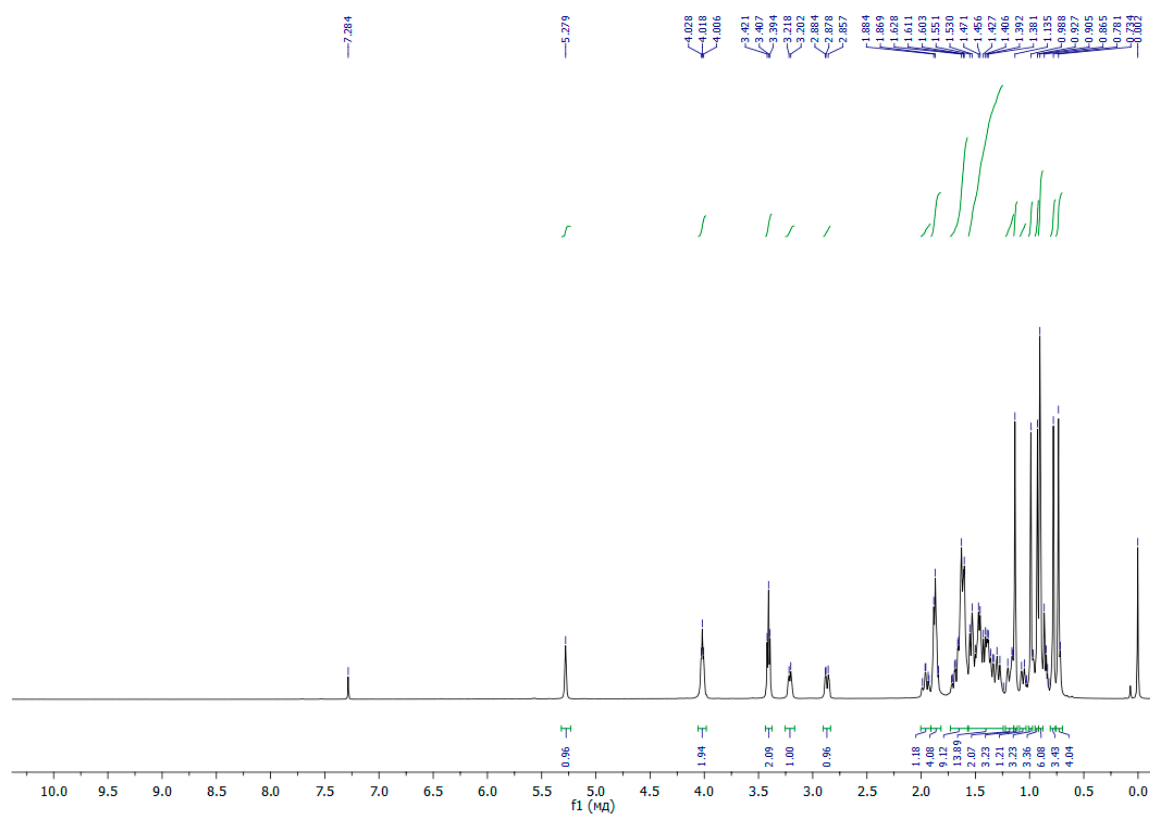


Figure S12. ^1H NMR Spectrum of compound **6c** (500 MHz, CDCl_3)



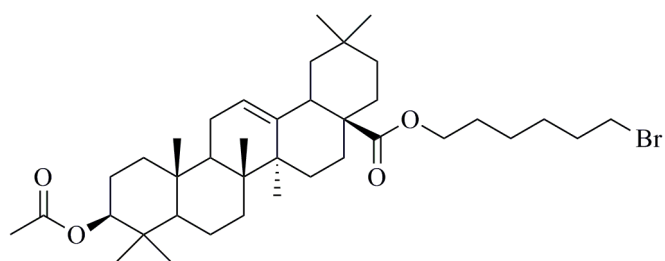


Figure S13. ^{13}C NMR Spectrum of compound **6d** (125 MHz, CDCl_3)

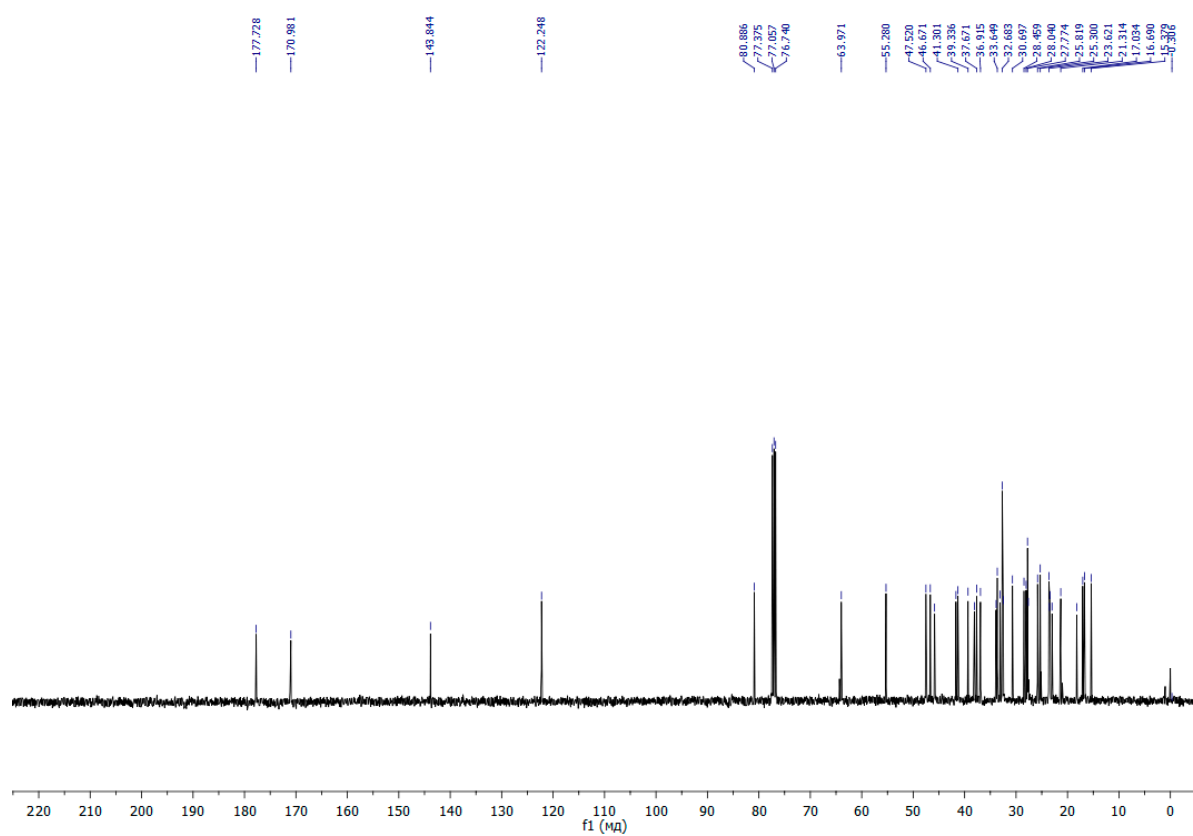
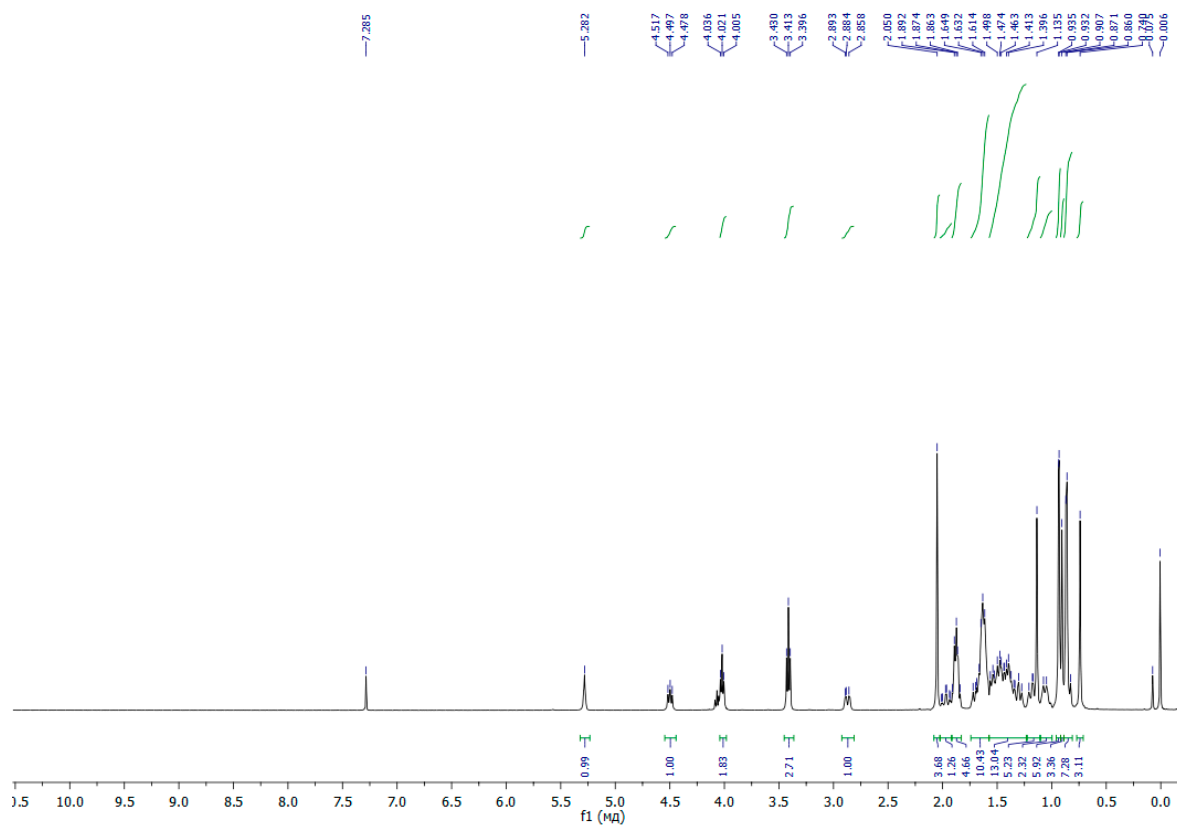


Figure S14. ^1H NMR Spectrum of compound **6d** (500 MHz, CDCl_3)



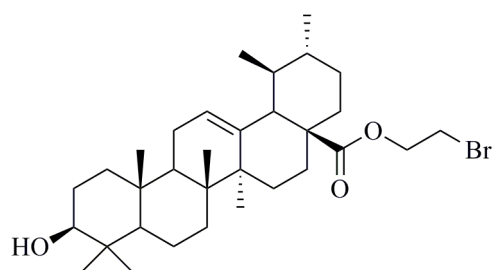


Figure S15. ^{13}C NMR Spectrum of compound 7a (100 MHz, CDCl_3)

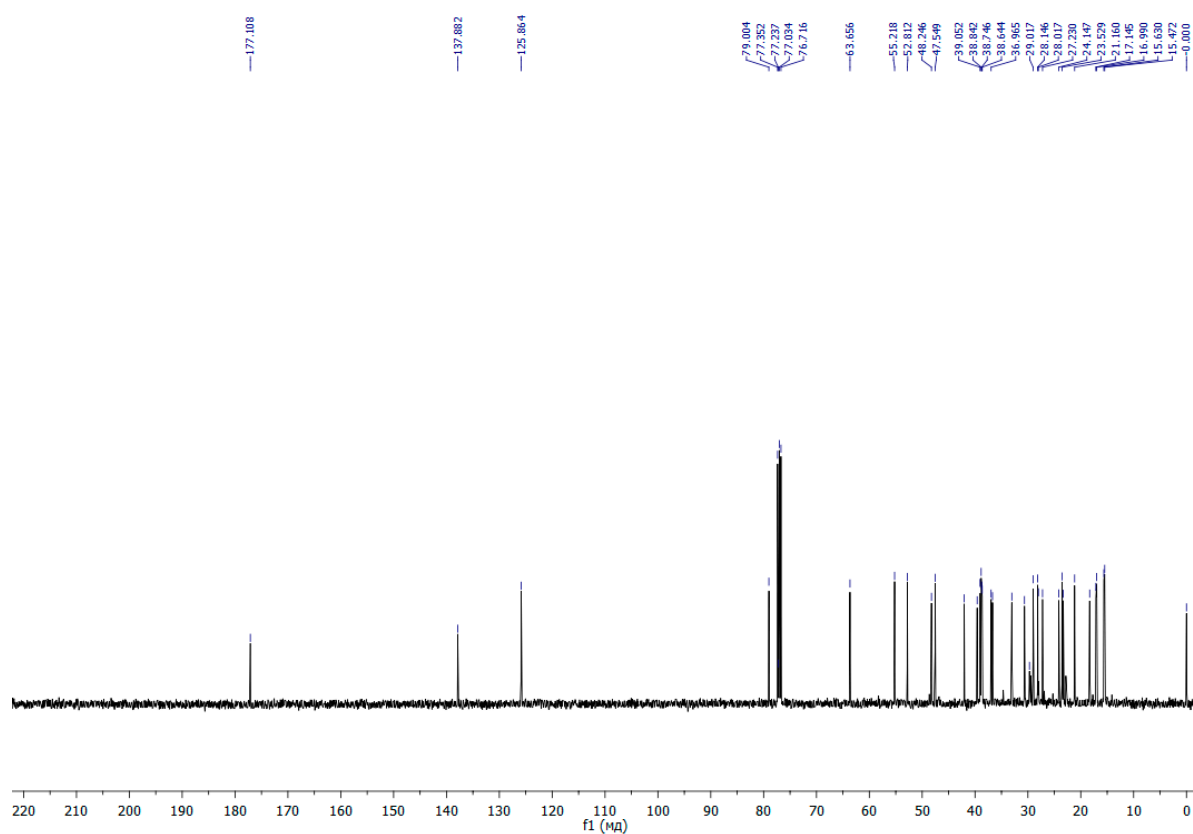
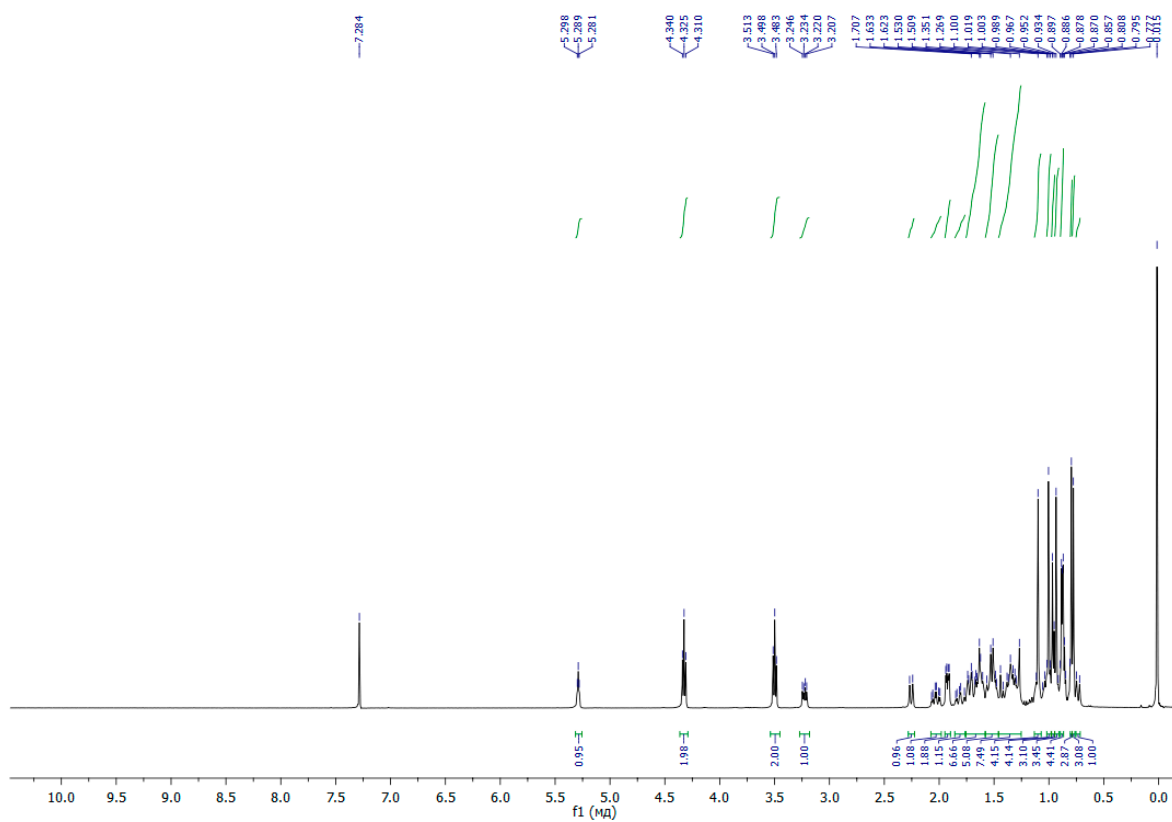


Figure S16. ^1H NMR Spectrum of compound **7a** (400 MHz, CDCl_3)



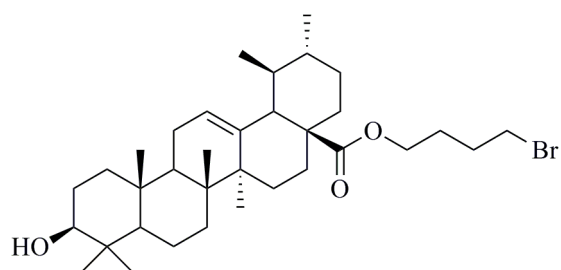


Figure S17. ^{13}C NMR Spectrum of compound **7b** (125 MHz, CDCl_3)

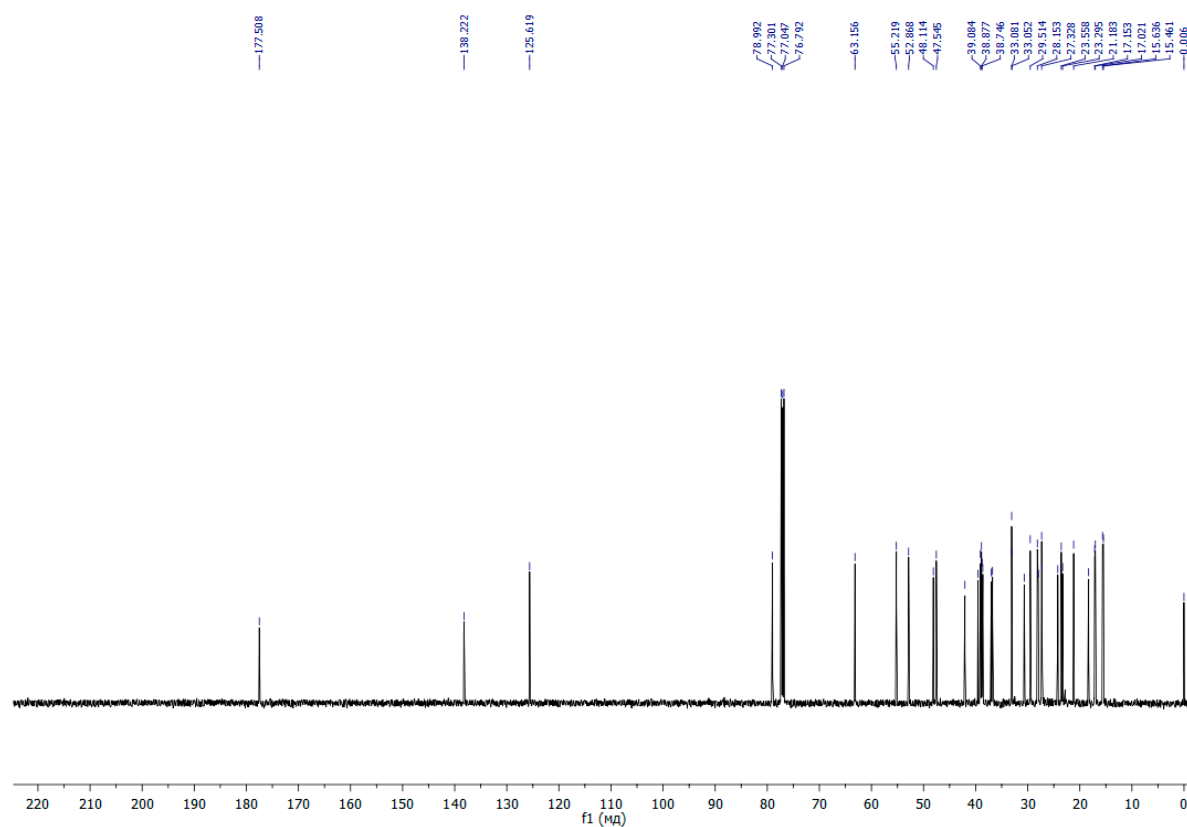
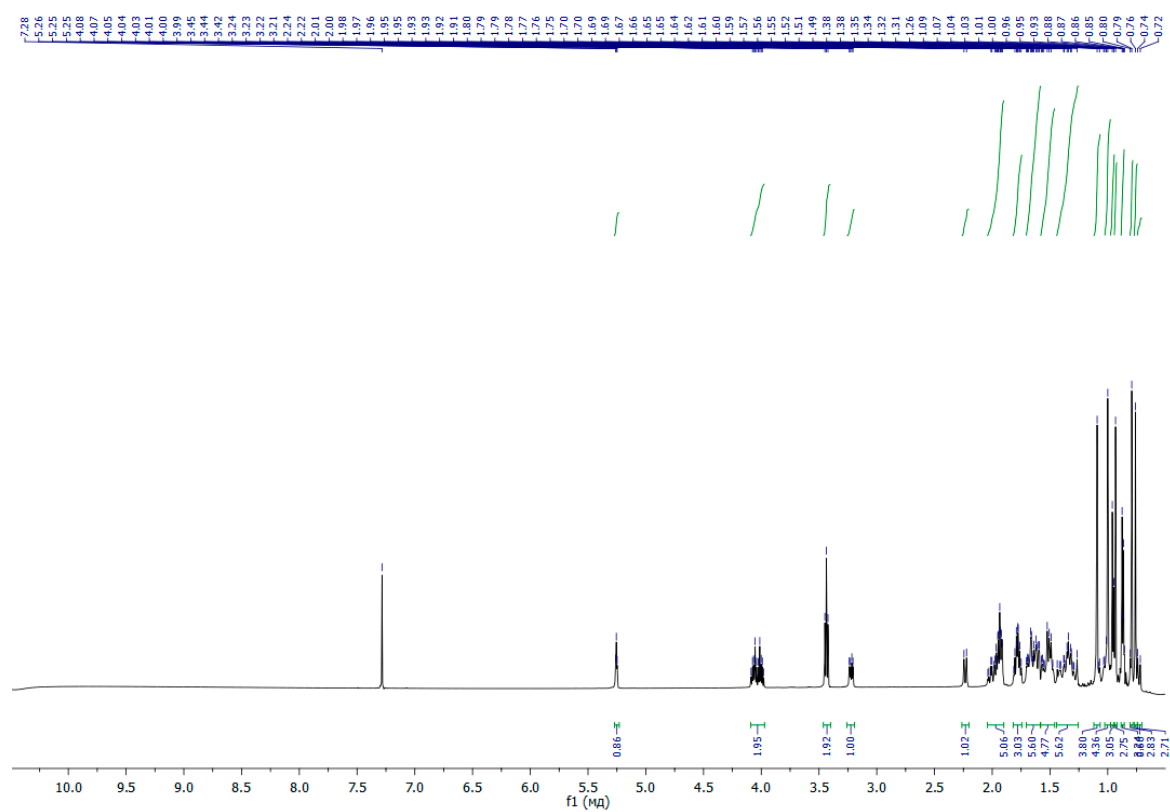


Figure S18. ^1H NMR Spectrum of compound **7b** (500 MHz, CDCl_3)



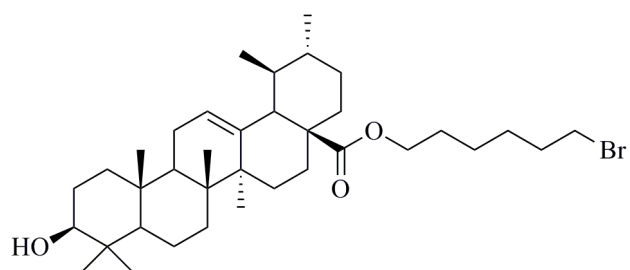


Figure S19. ^{13}C NMR Spectrum of compound **7c** (125 MHz, CDCl_3)

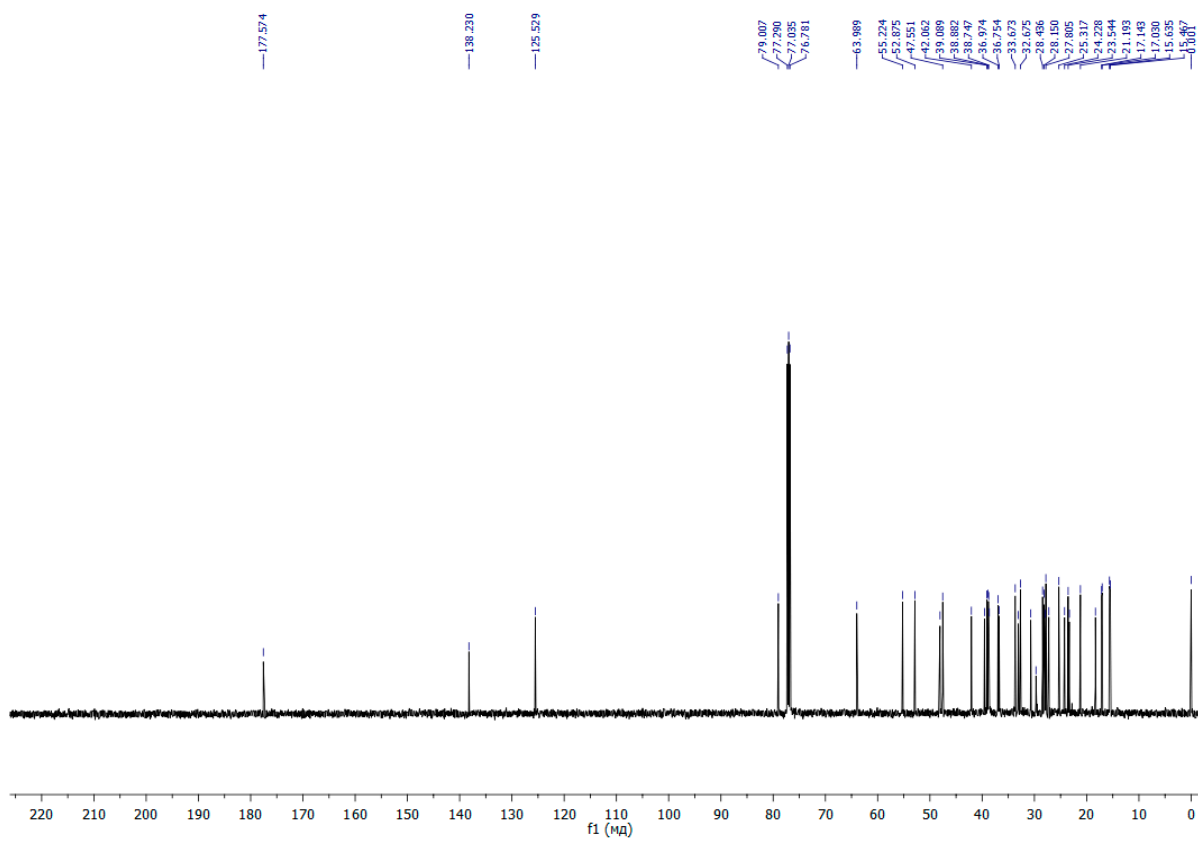
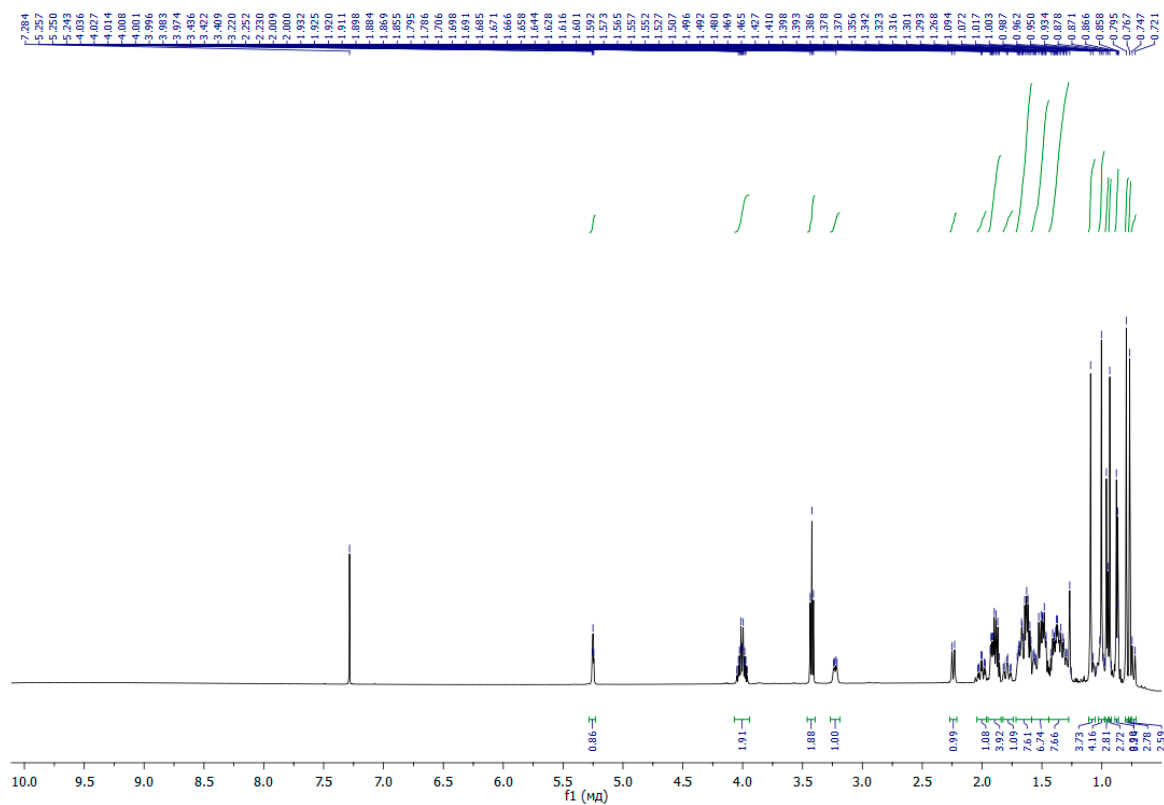


Figure S20. ^1H NMR Spectrum of compound **7c** (500 MHz, CDCl_3)



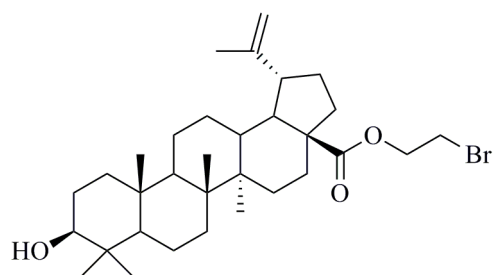


Figure S21. ^{13}C NMR Spectrum of compound **8a** (125 MHz, CDCl_3)

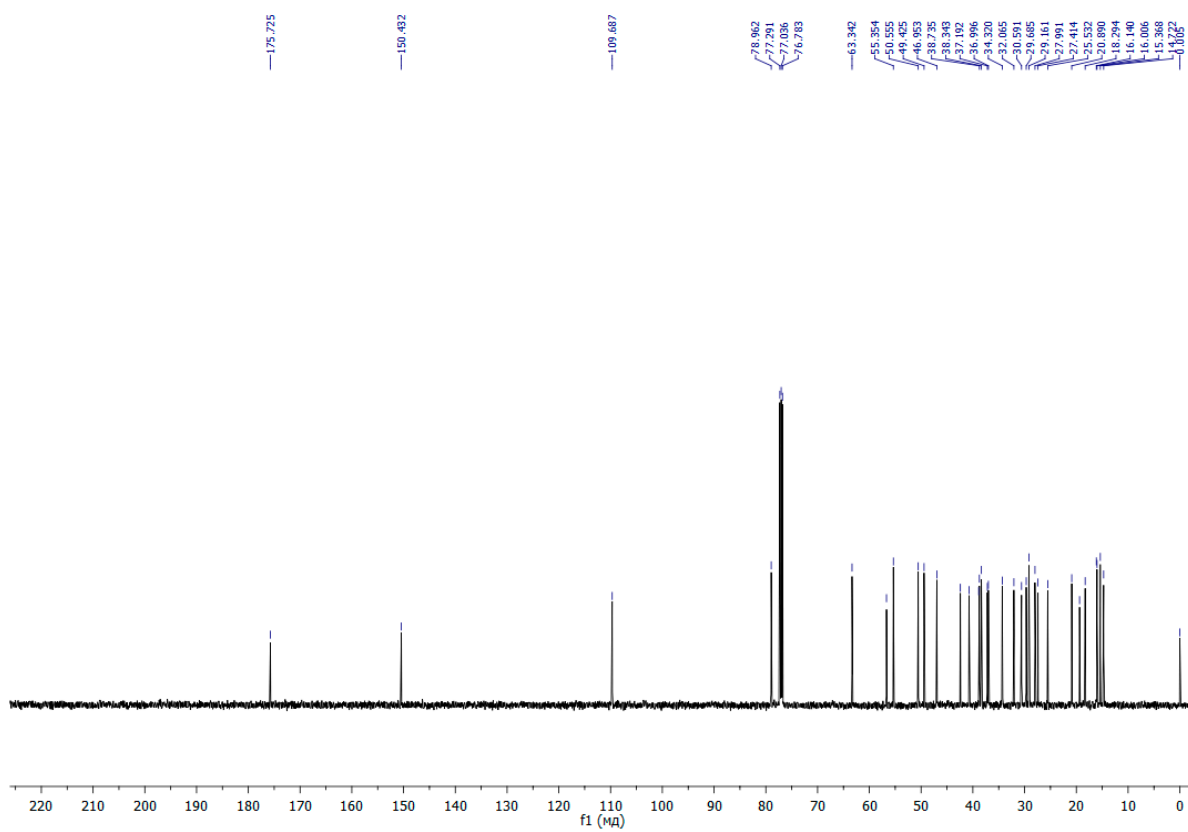
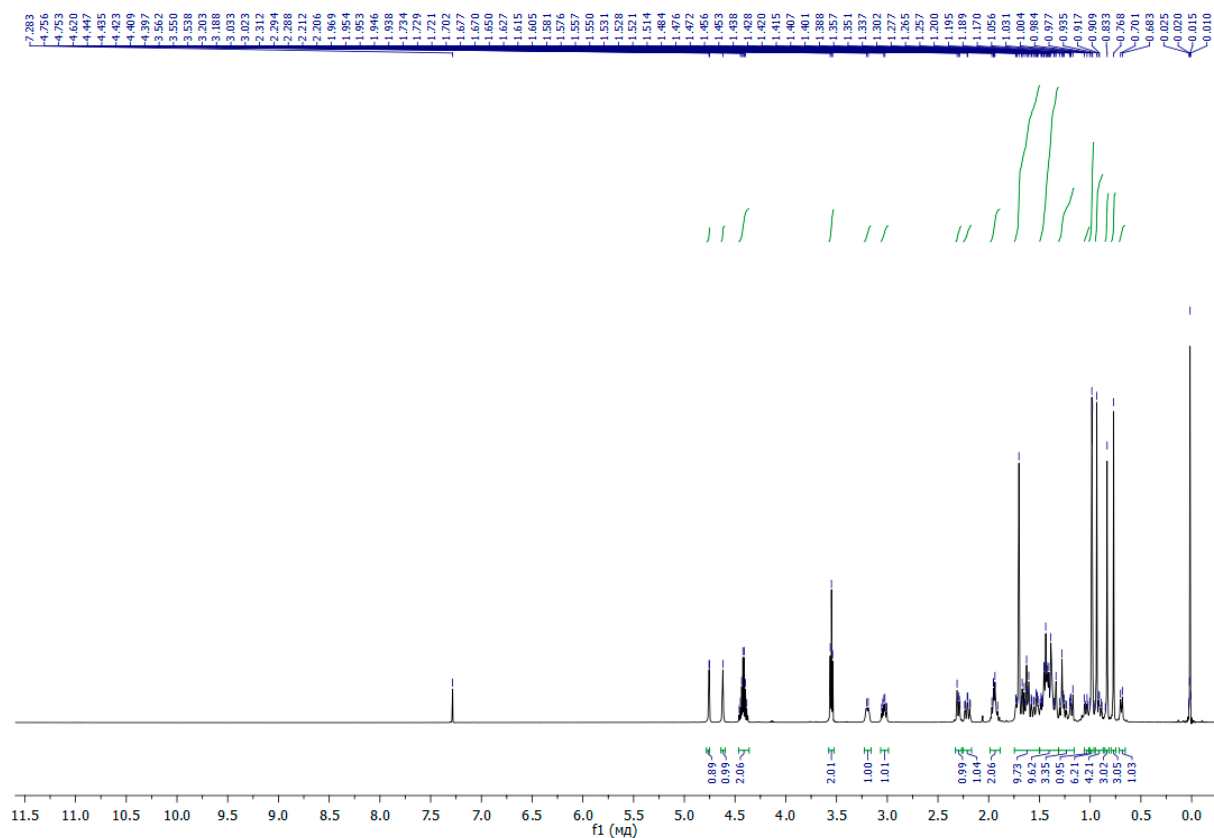


Figure S22. ^1H NMR Spectrum of compound **8a** (500 MHz, CDCl_3)



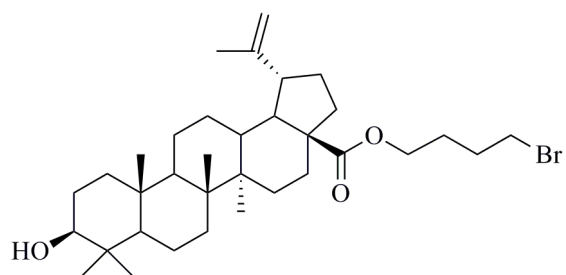


Figure S23. ^{13}C NMR Spectrum of compound **8b** (100 MHz, CDCl_3)

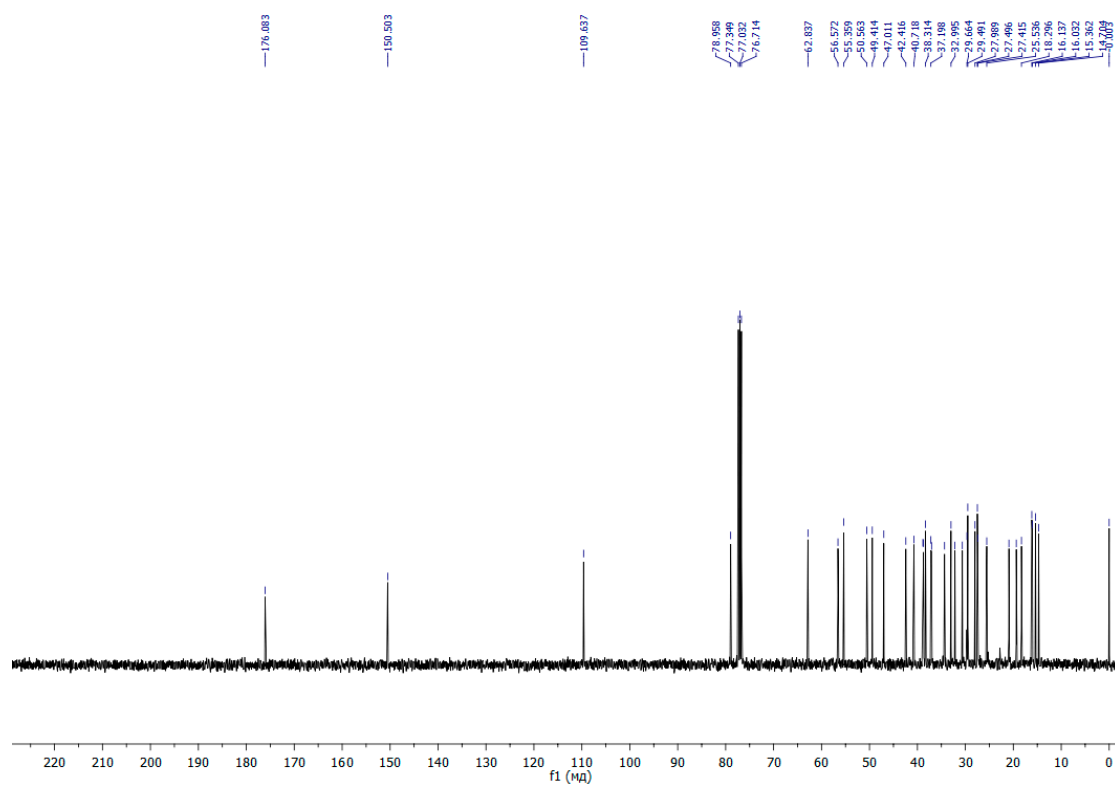
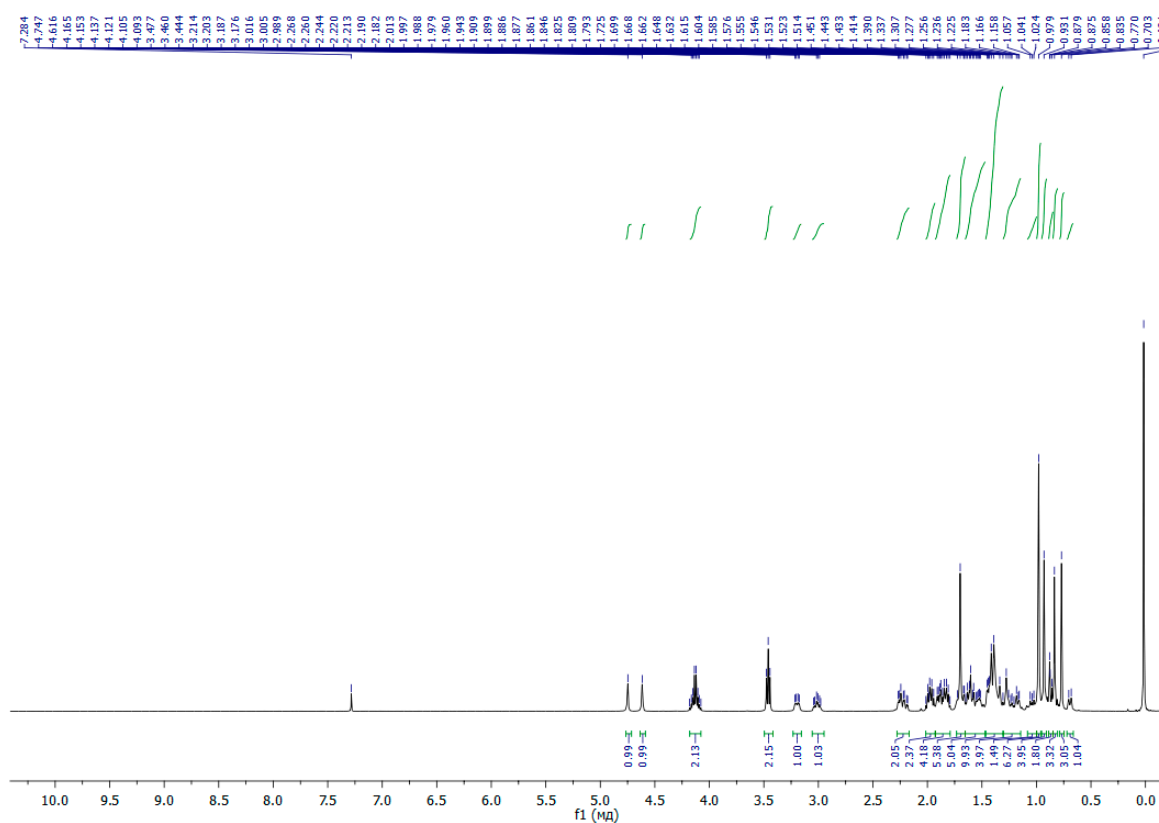


Figure S24. ^1H NMR Spectrum of compound **8b** (400 MHz, CDCl_3)



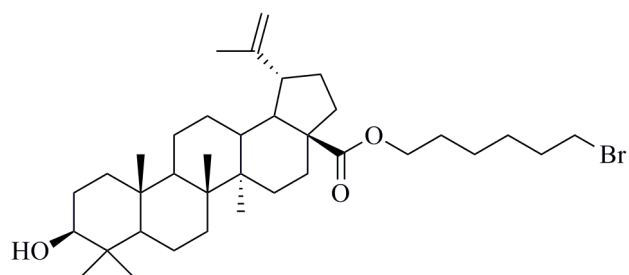


Figure S25. ^{13}C NMR Spectrum of compound **8c** (125 MHz, CDCl_3)

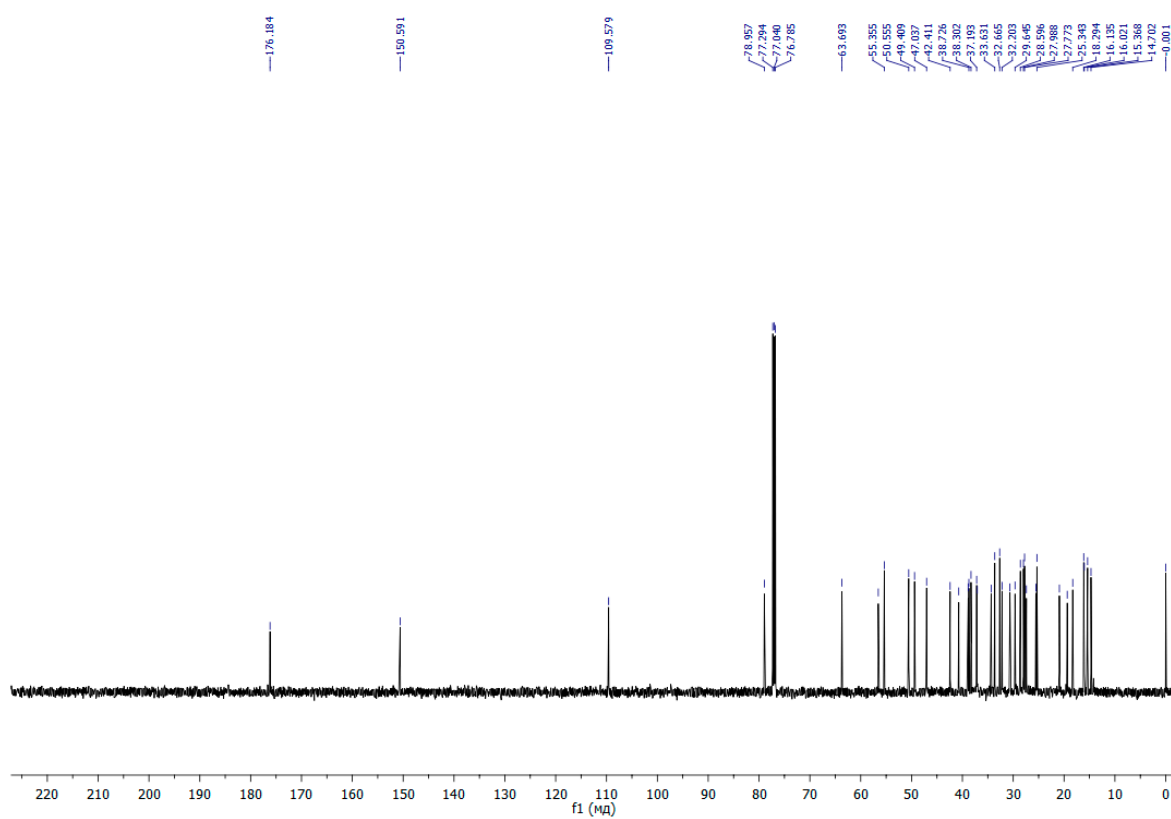
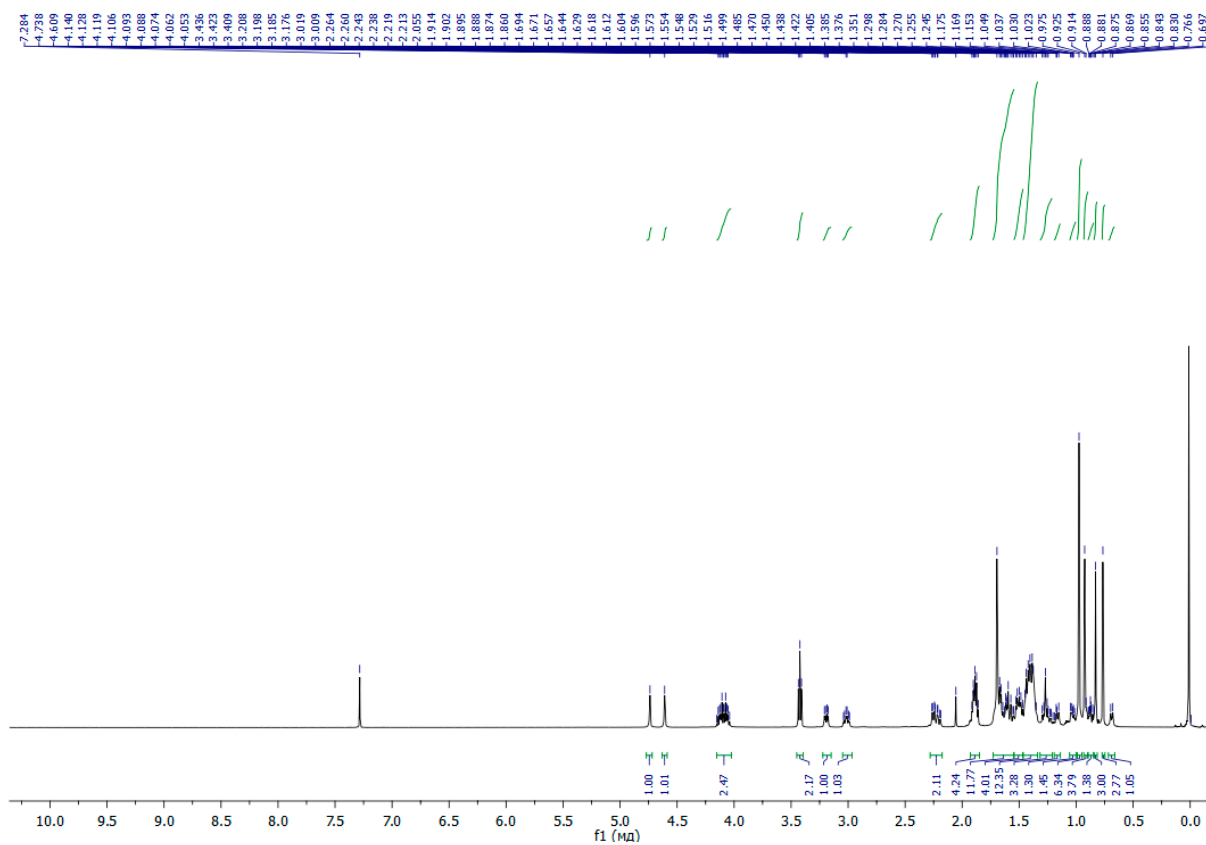


Figure S26. ^1H NMR Spectrum of compound **8c** (500 MHz, CDCl_3)



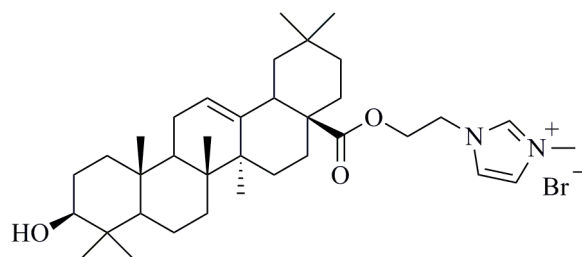


Figure S27. ¹³C NMR Spectrum of compound **9a** (100 MHz, DMSO-d₆)

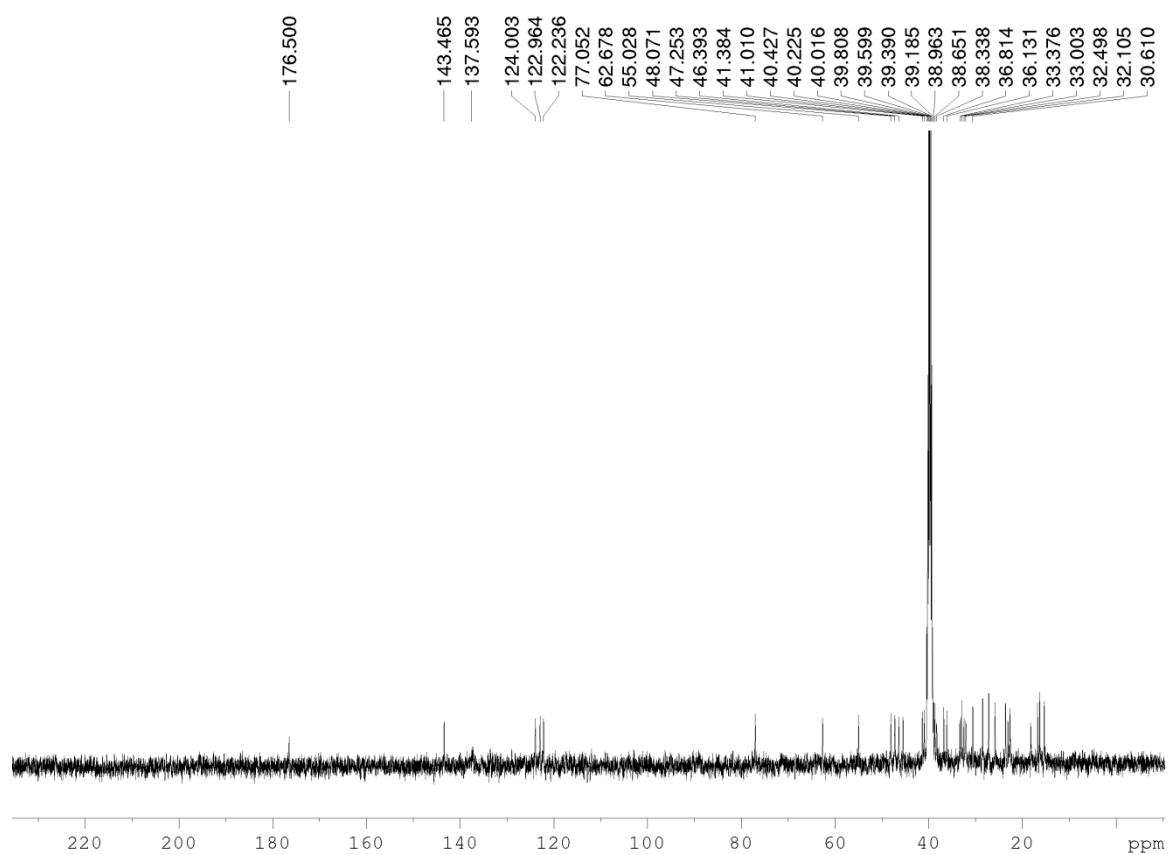
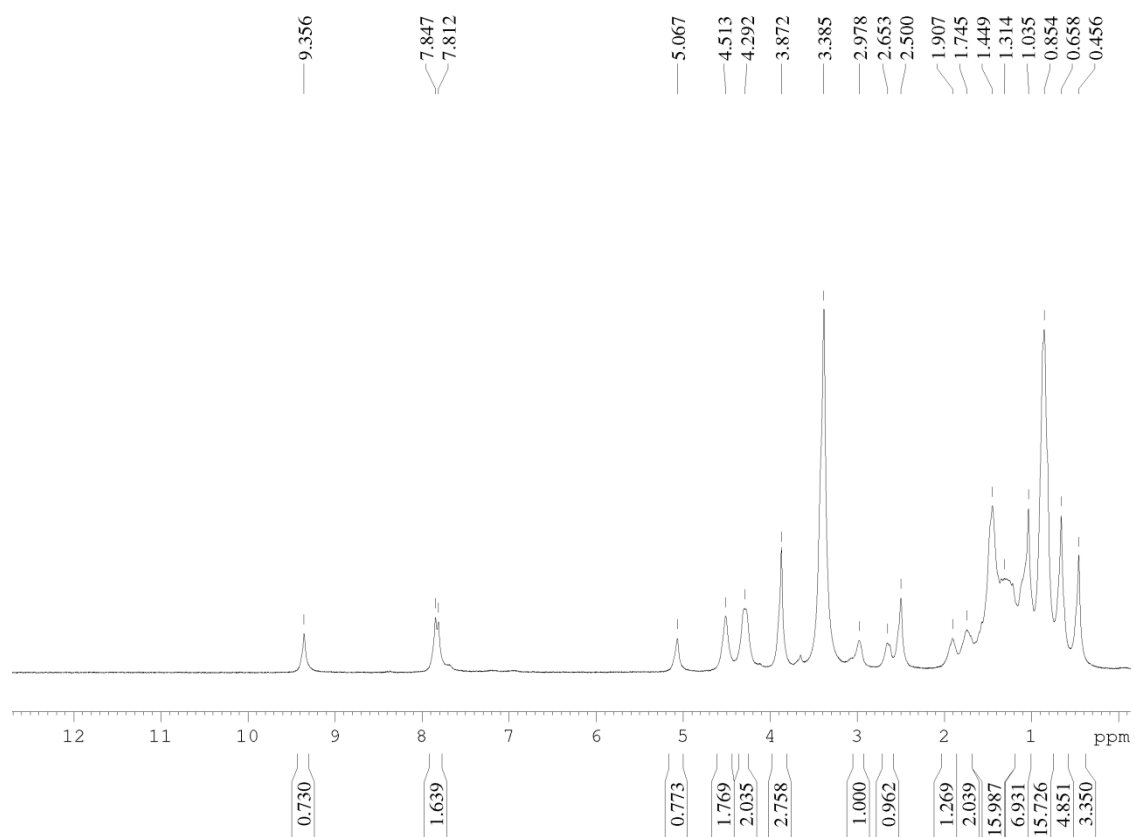


Figure S28. ^1H NMR Spectrum of compound **9a** (400 MHz, DMSO-d_6)



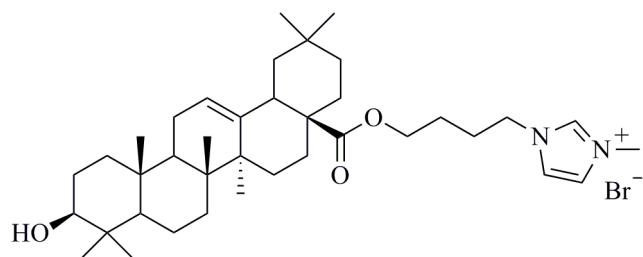


Figure S29. ^{13}C NMR Spectrum of compound **9b** (125 MHz, DMSO-d_6)

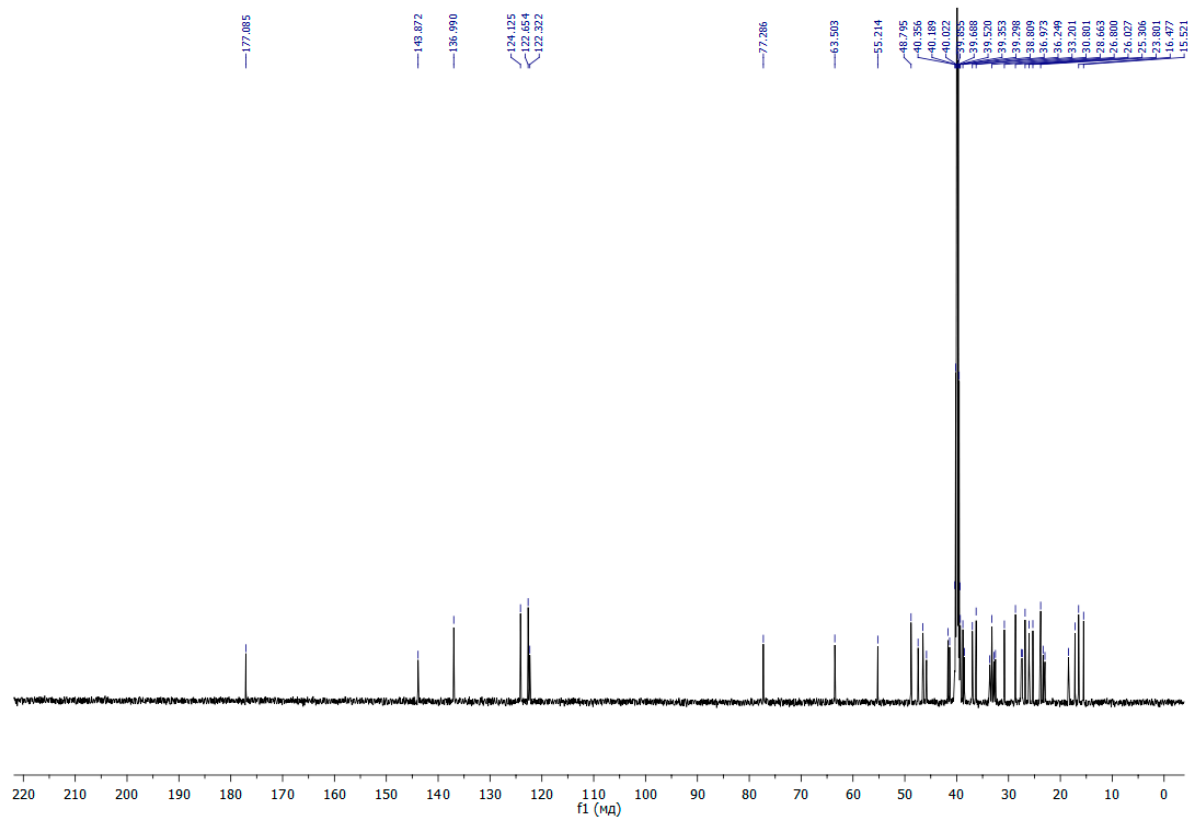
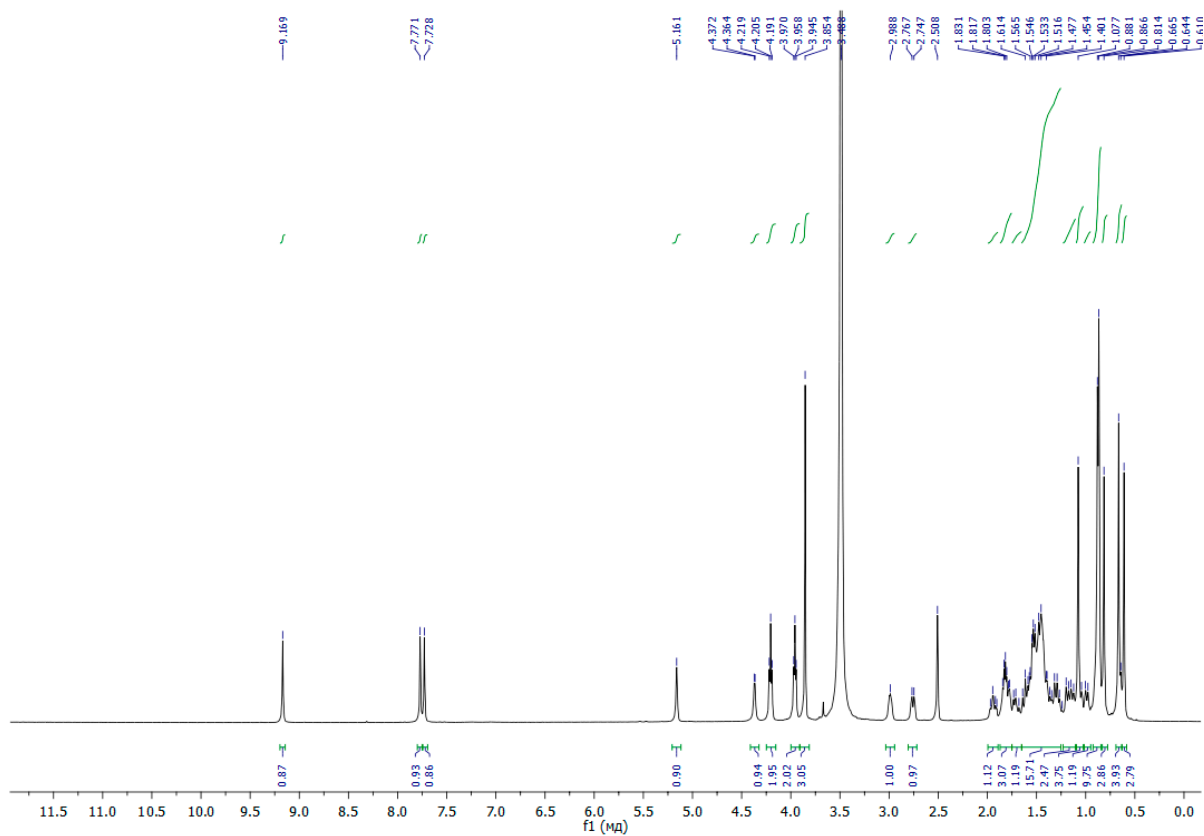


Figure S30. ^1H NMR Spectrum of compound **9b** (500 MHz, DMSO-d_6)



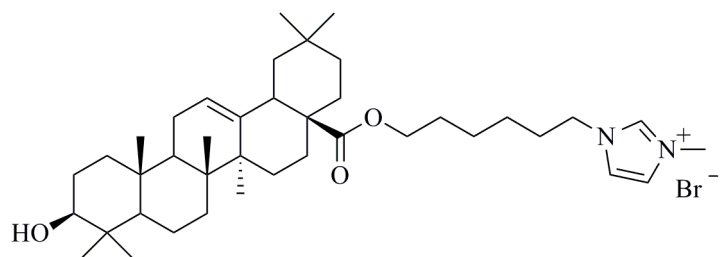


Figure S31. ^{13}C NMR Spectrum of compound **9c** (125 MHz, DMSO-d_6)

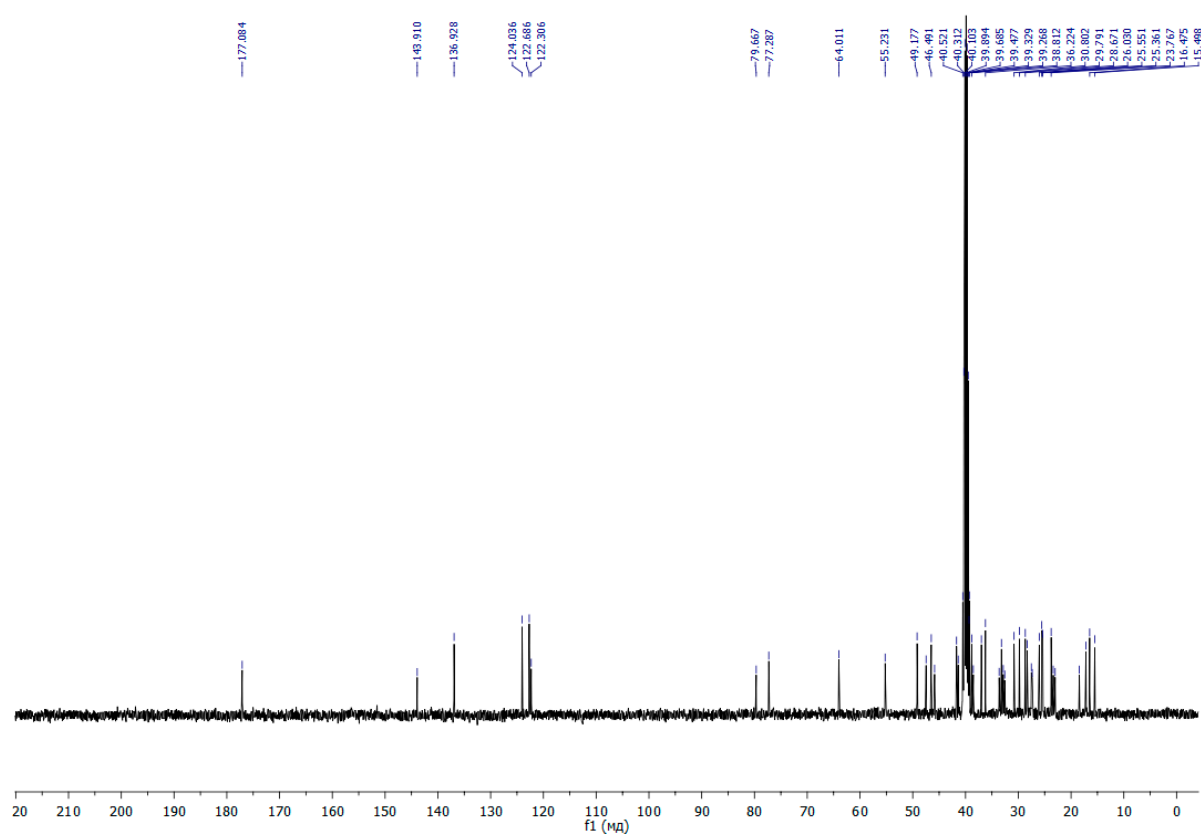
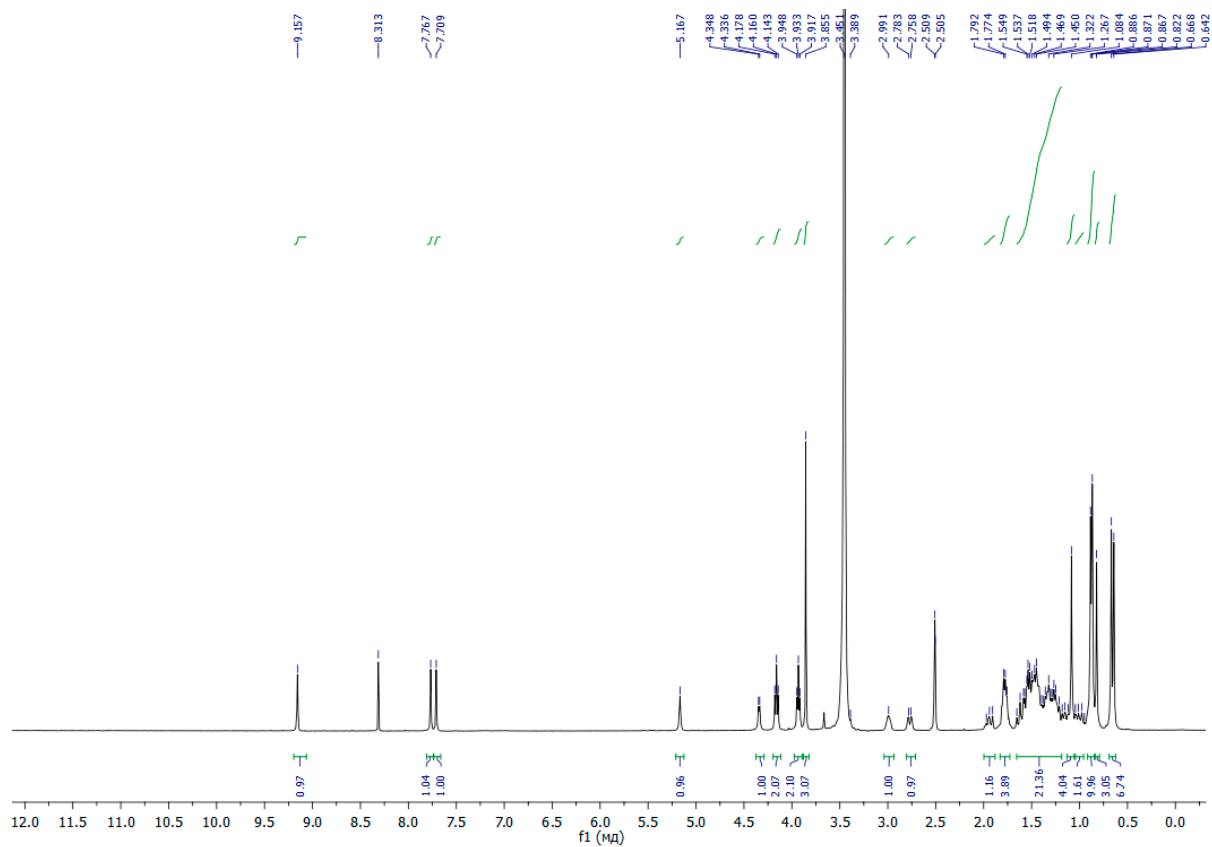


Figure S32. ^1H NMR Spectrum of compound **9c** (500 MHz, DMSO-d_6)



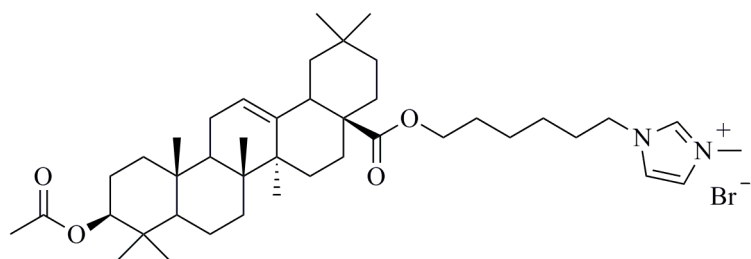


Figure S33. ^{13}C NMR Spectrum of compound **9d** (100 MHz, DMSO-d_6)

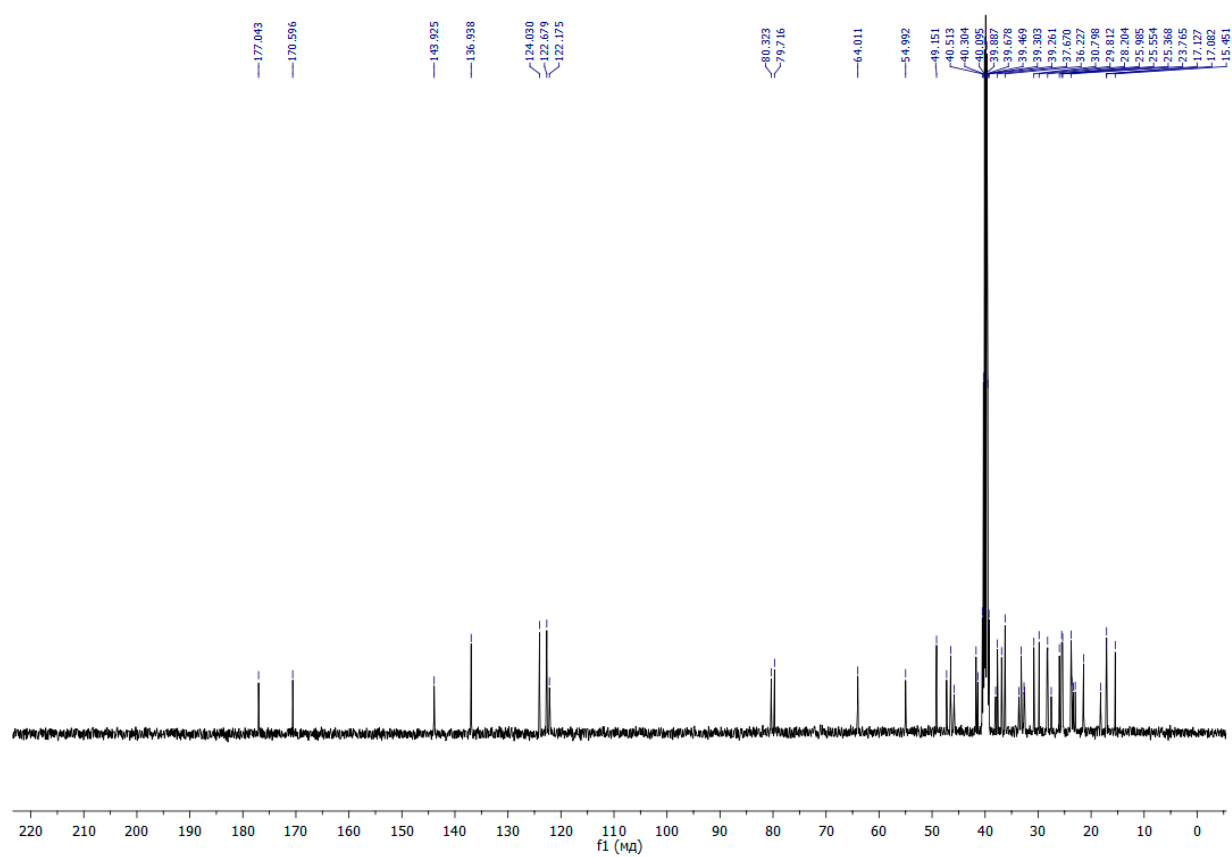
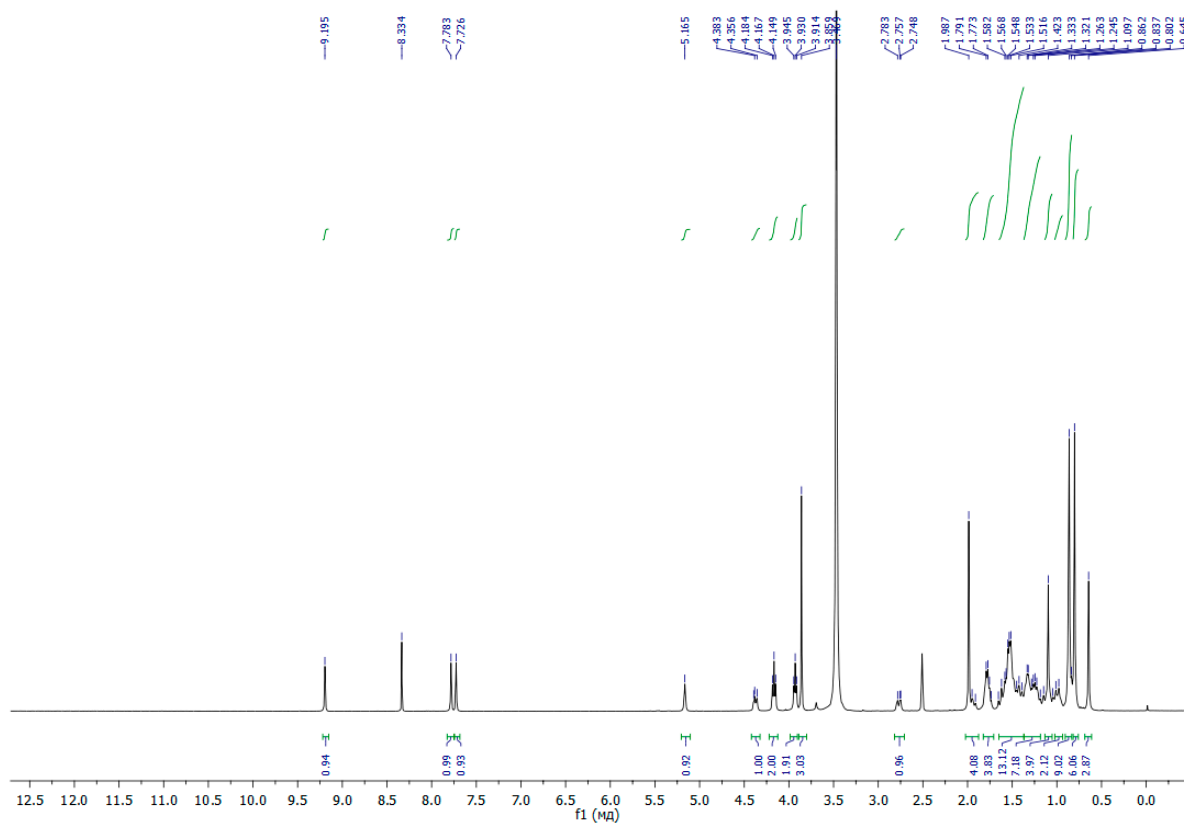


Figure S34. ^1H NMR Spectrum of compound **9d** (400 MHz, DMSO-d_6)



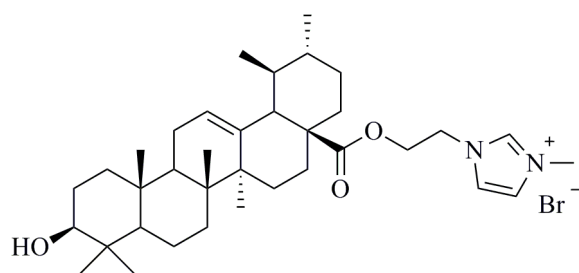


Figure S35. ^{13}C NMR Spectrum of compound **10a** (100 MHz, DMSO-d_6)

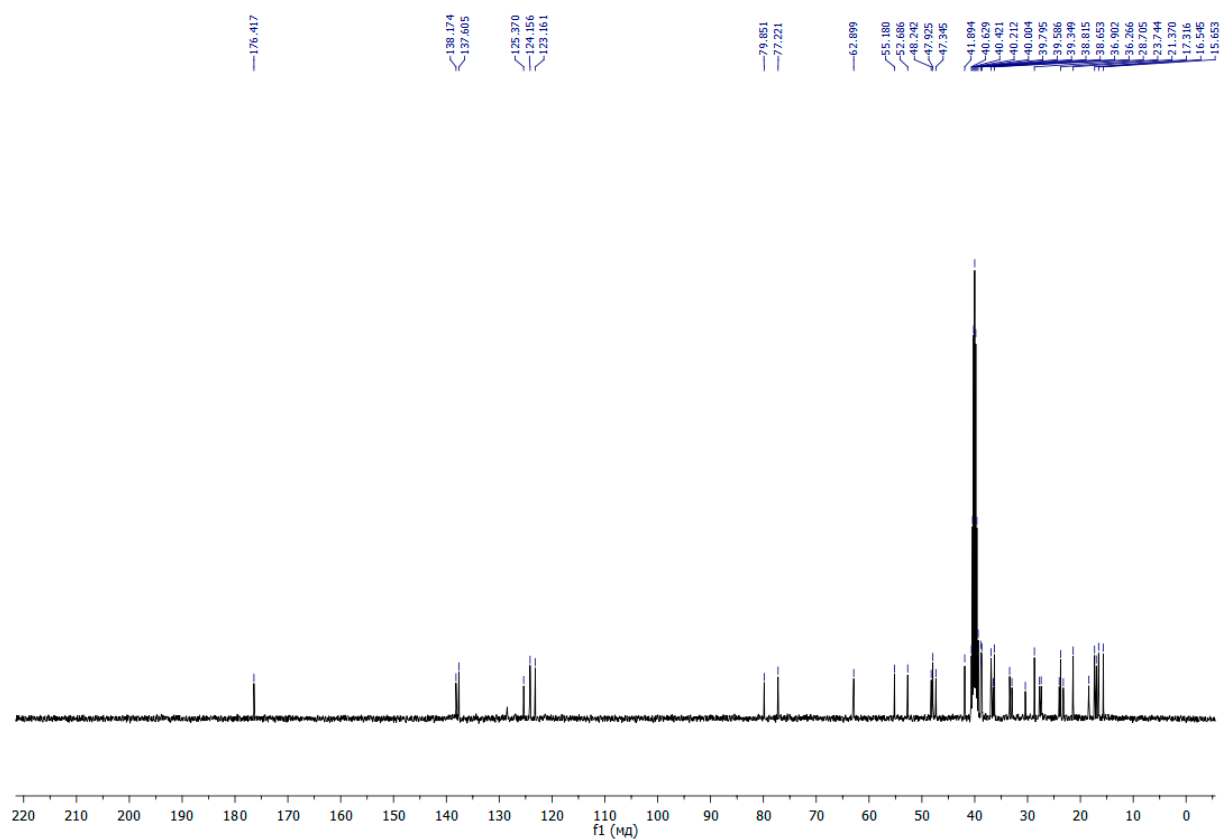
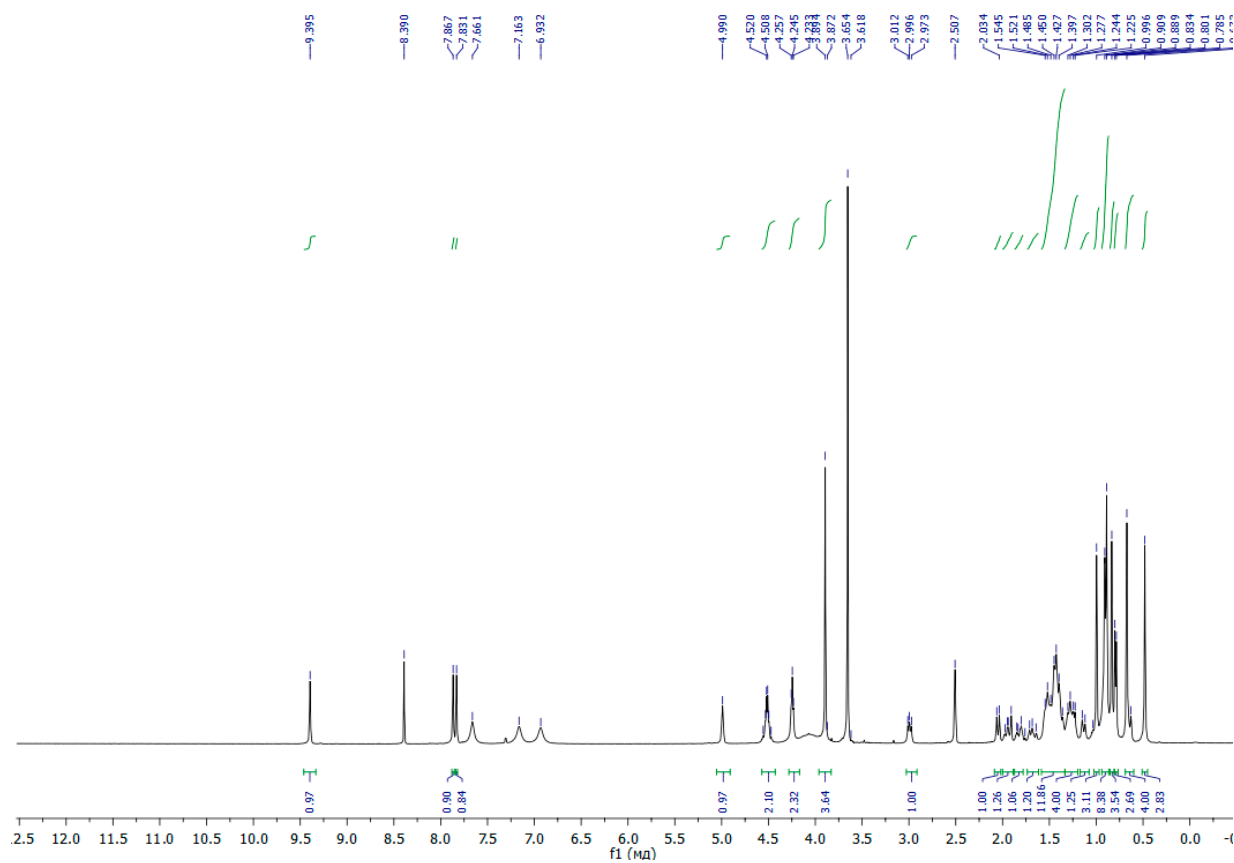


Figure S36. ^1H NMR Spectrum of compound **10a** (400 MHz, DMSO-d_6)



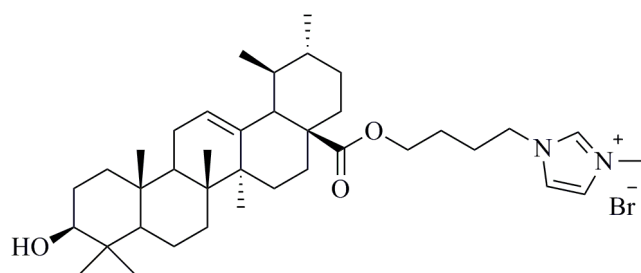


Figure S37. ^{13}C NMR Spectrum of compound **10b** (100 MHz, DMSO-d_6)

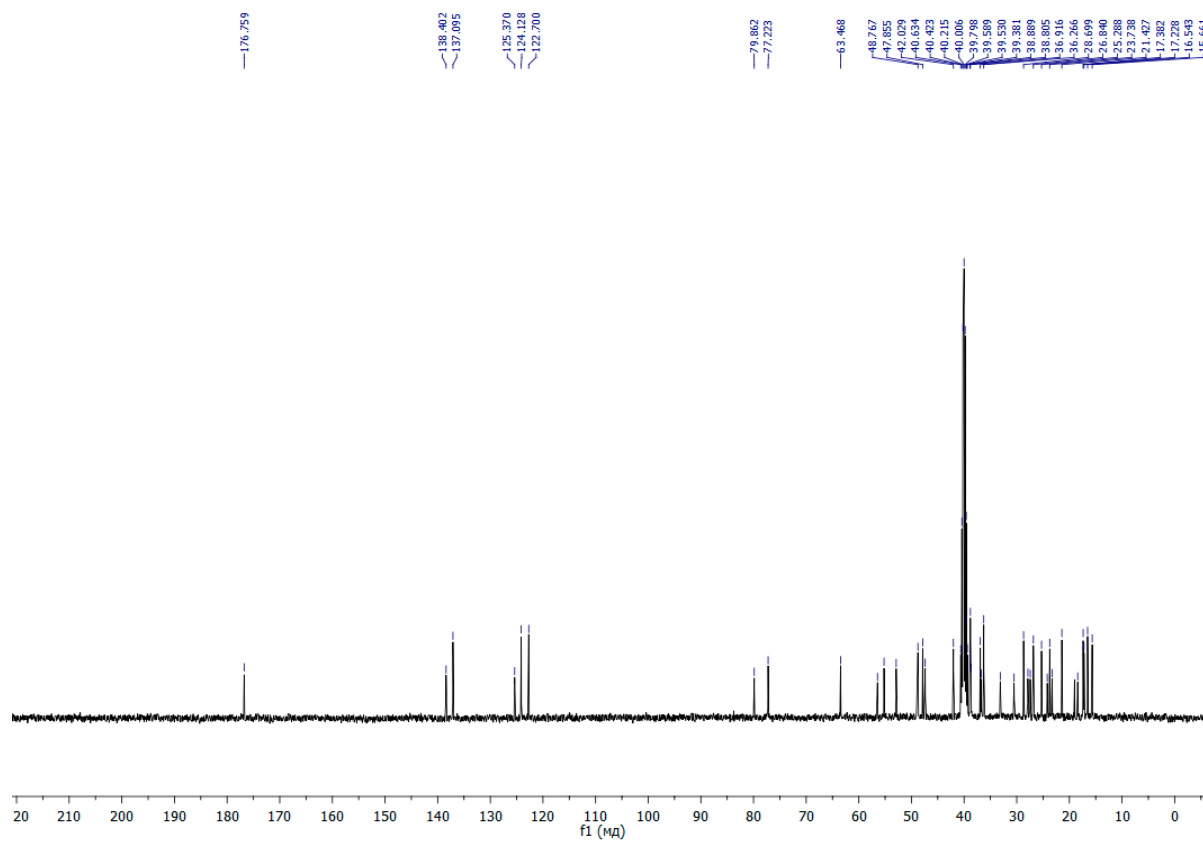
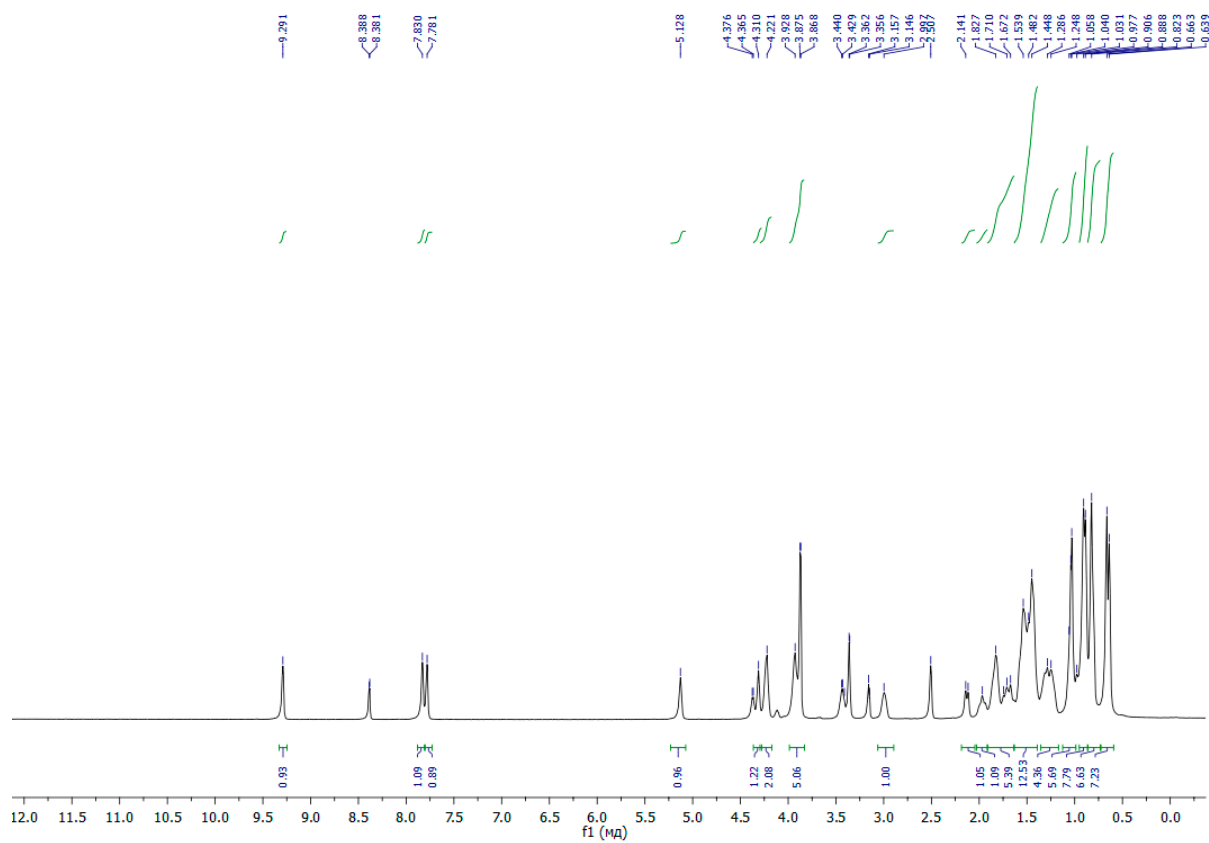


Figure S38. ^1H NMR Spectrum of compound **10b** (400 MHz, DMSO-d_6)



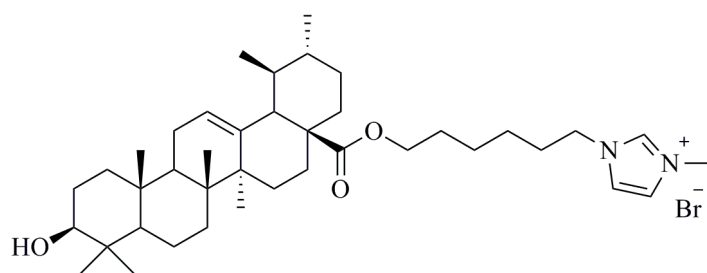


Figure S39. ^{13}C NMR Spectrum of compound **10c** (100 MHz, DMSO-d_6)

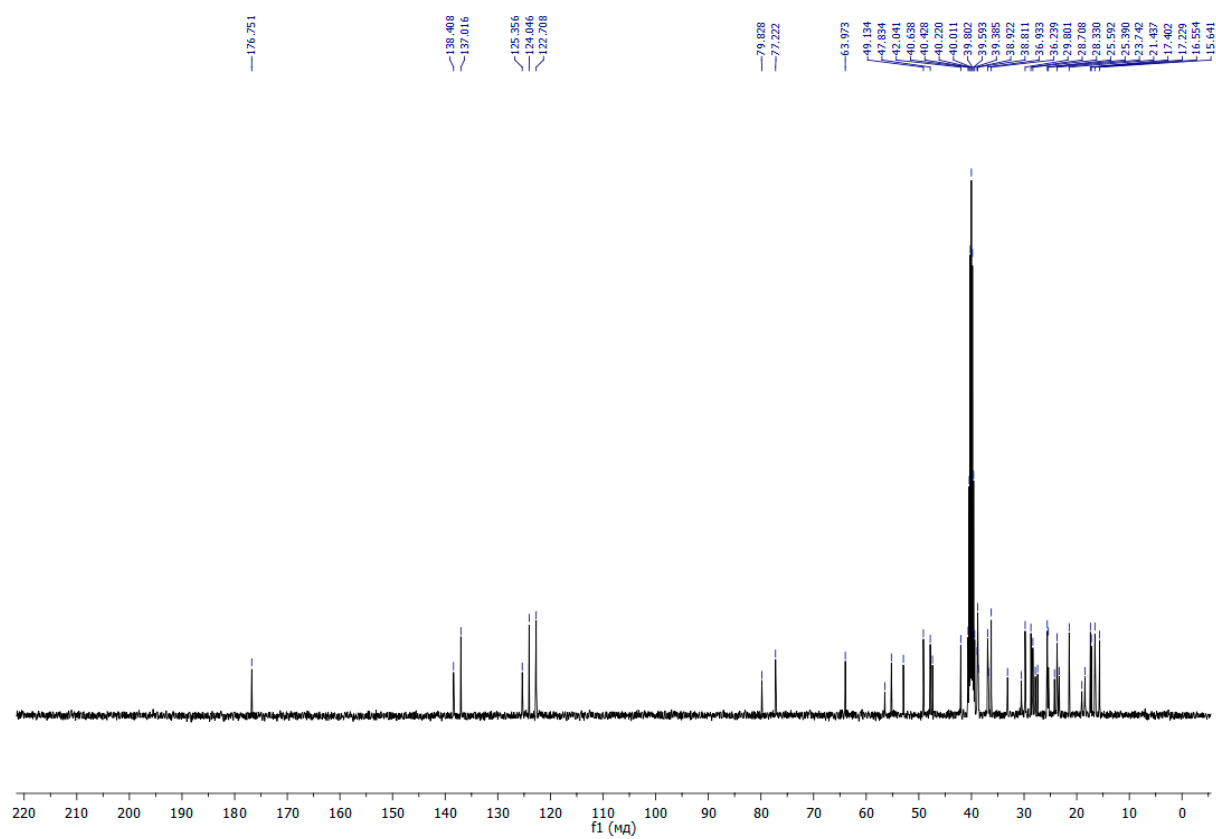
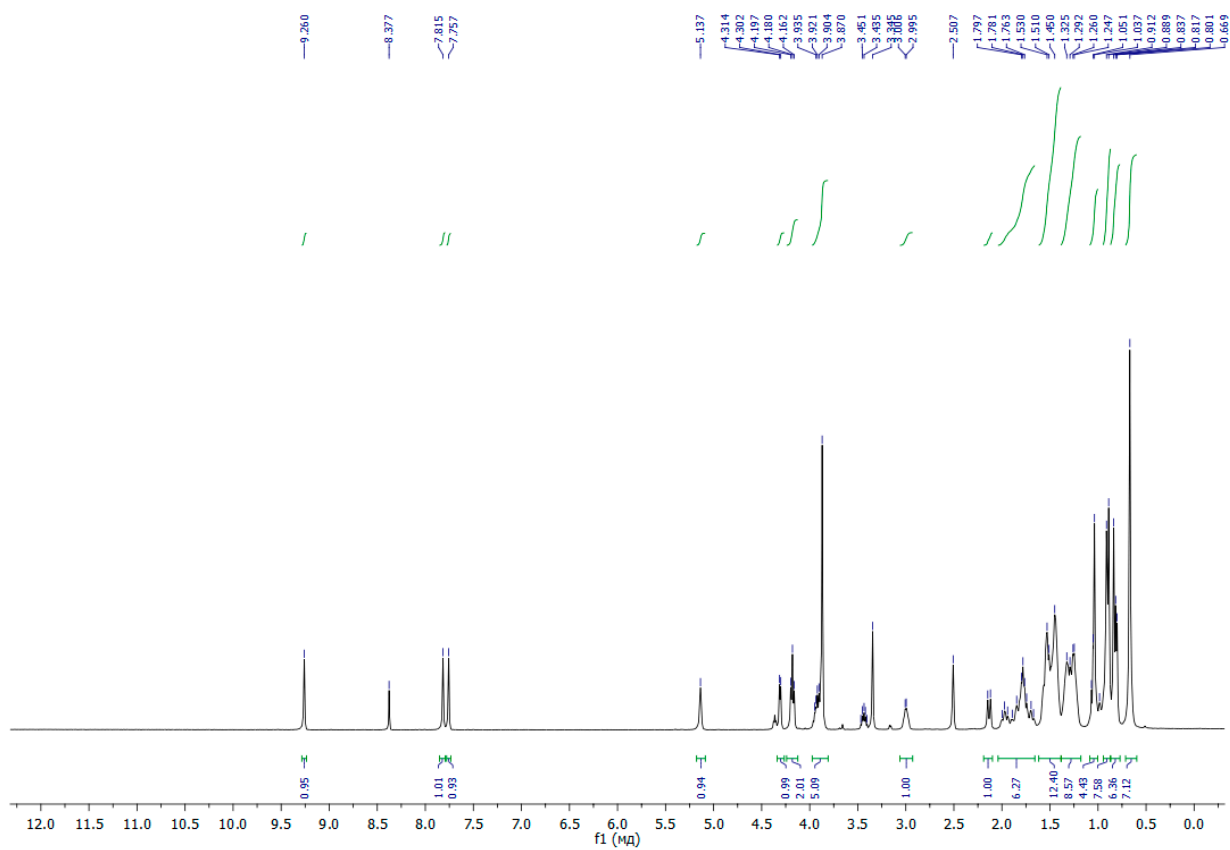


Figure S40. ^1H NMR Spectrum of compound **10c** (400 MHz, DMSO-d_6)



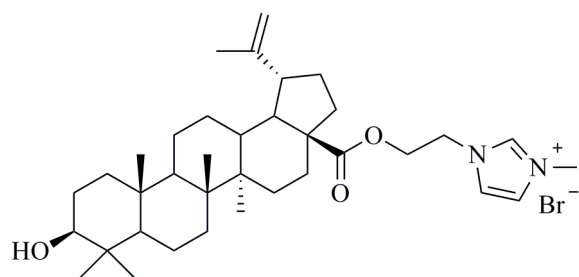


Figure S41. ^{13}C NMR Spectrum of compound **11a** (100 MHz, DMSO-d_6)

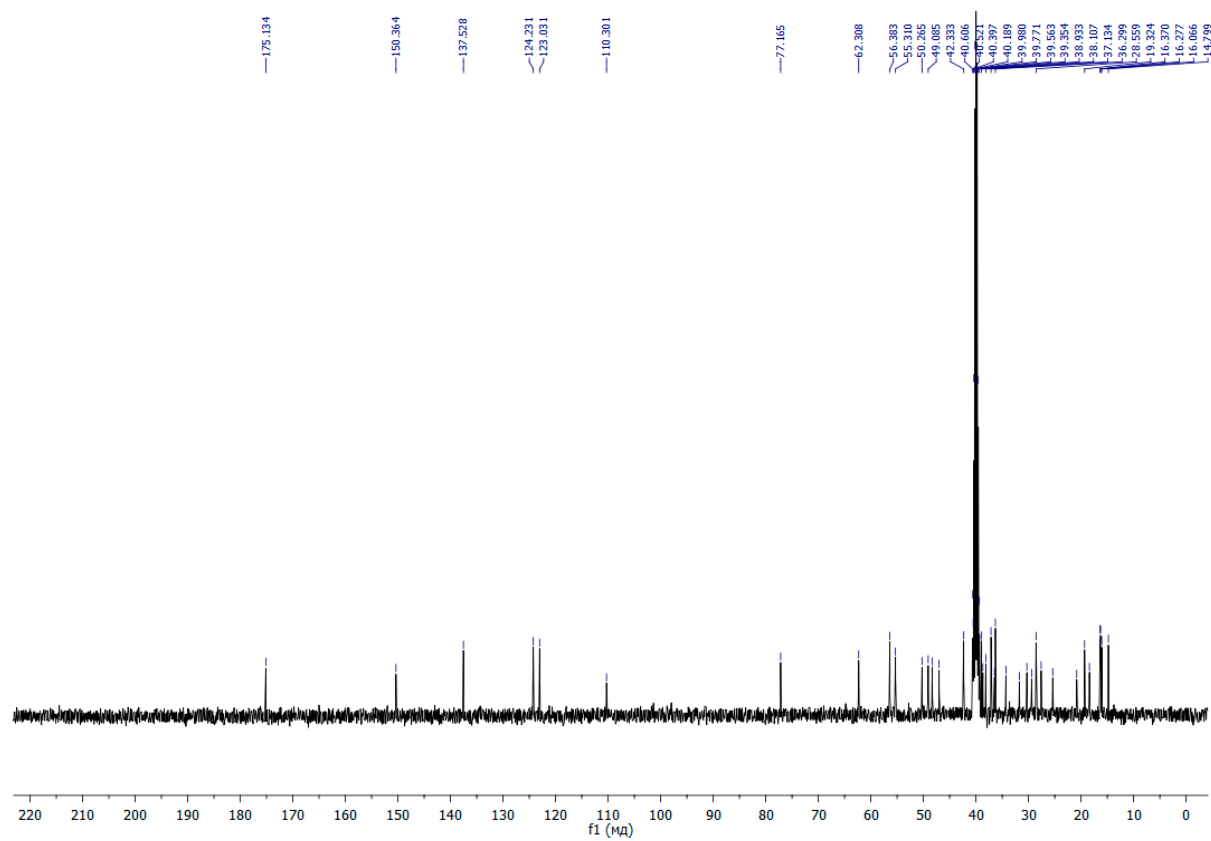
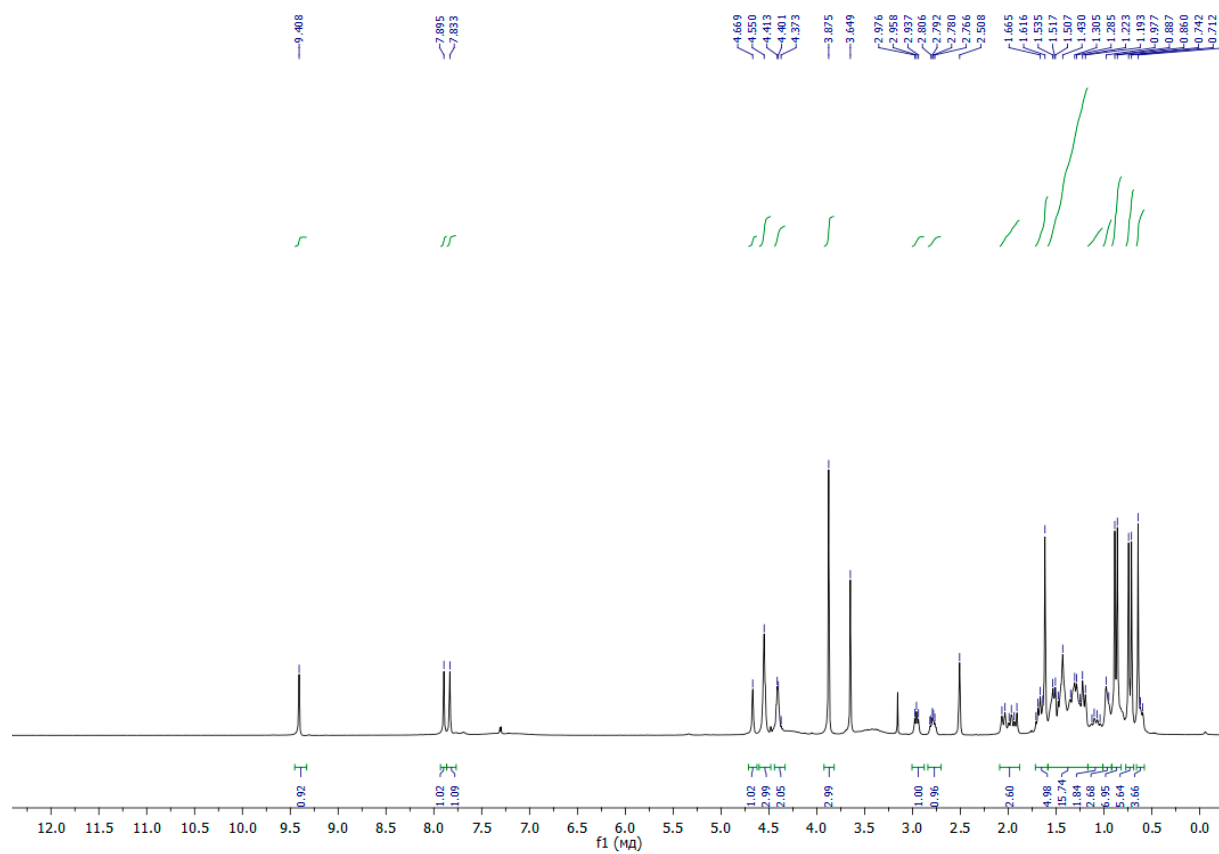


Figure S42. ^1H NMR Spectrum of compound **11a** (400 MHz, DMSO-d_6)



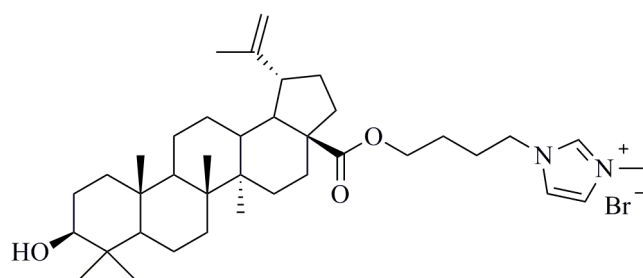


Figure S43. ^{13}C NMR Spectrum of compound **11b** (100 MHz, DMSO-d_6)

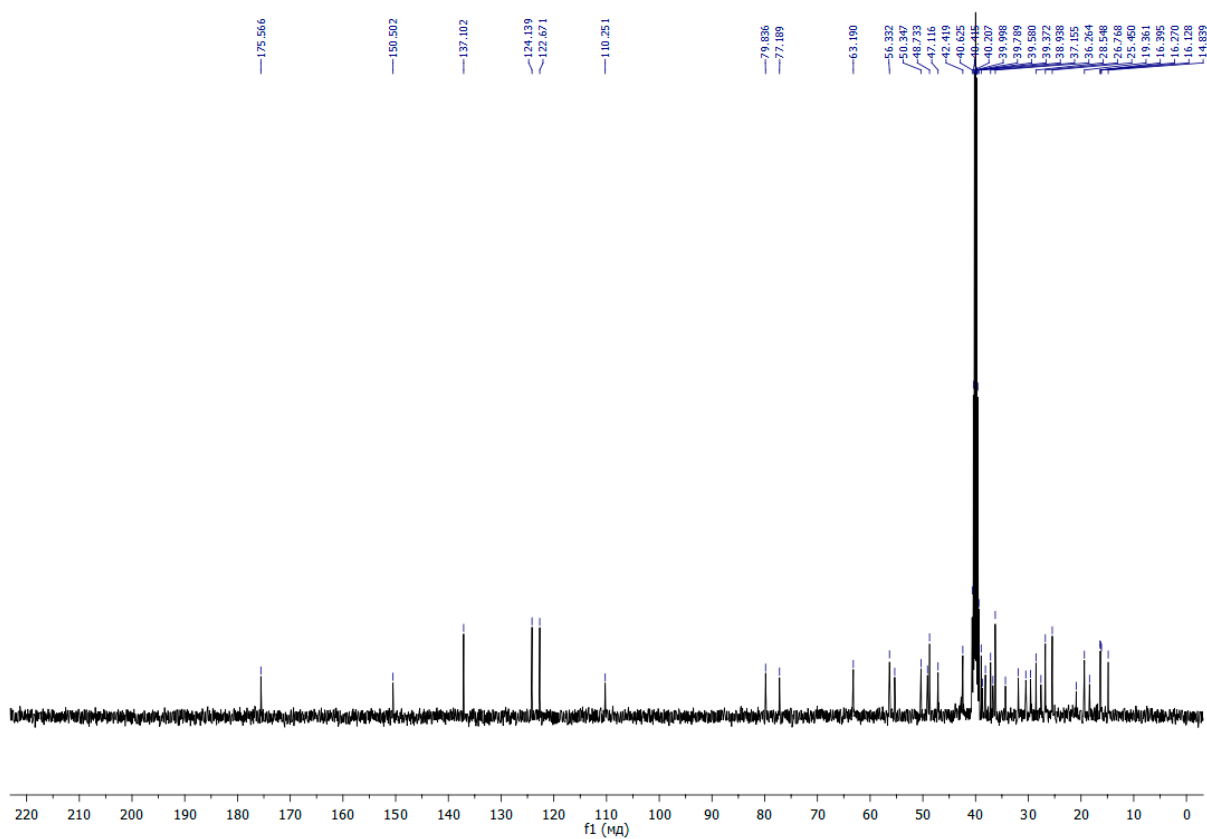
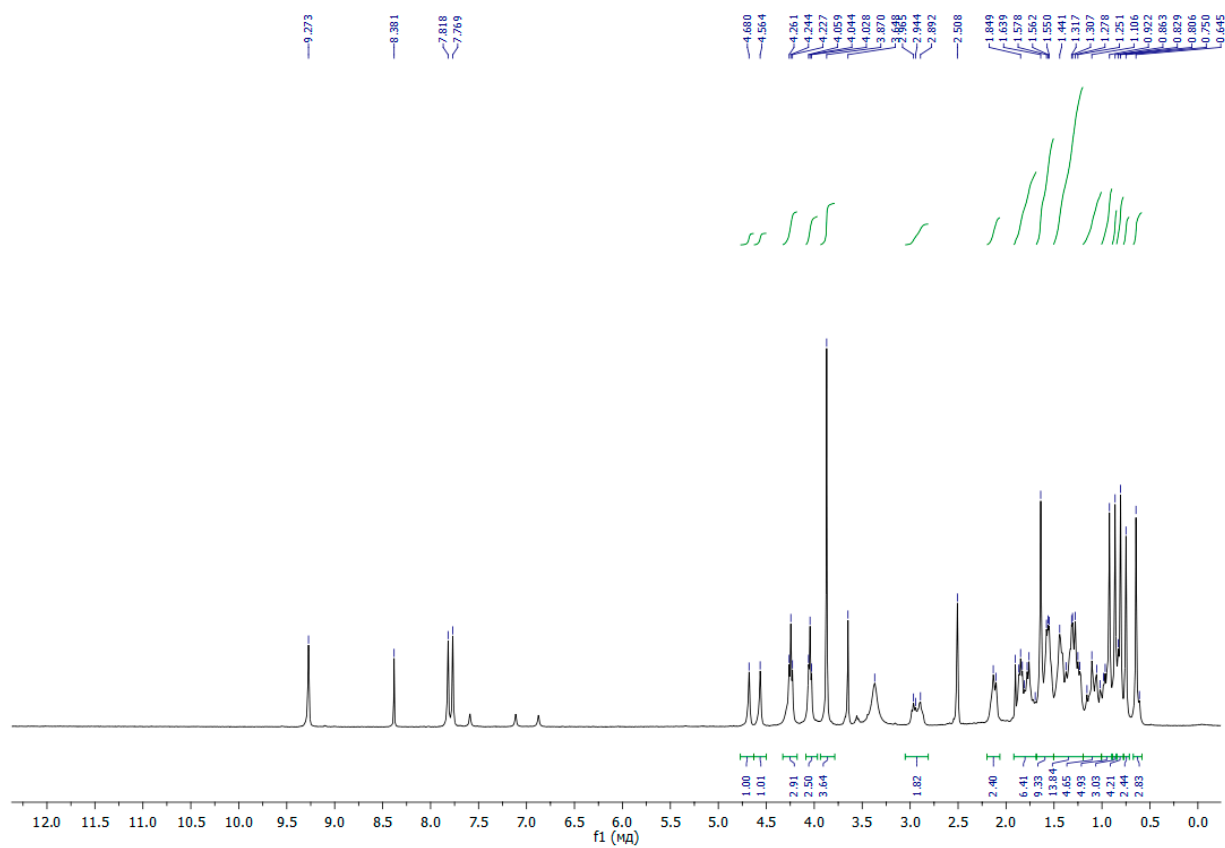


Figure S44. ^1H NMR Spectrum of compound **11b** (400 MHz, DMSO-d_6)



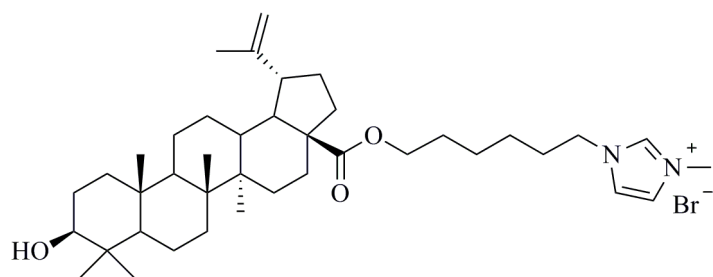


Figure S45. ^{13}C NMR Spectrum of compound **11c** (125 MHz, DMSO-d_6)

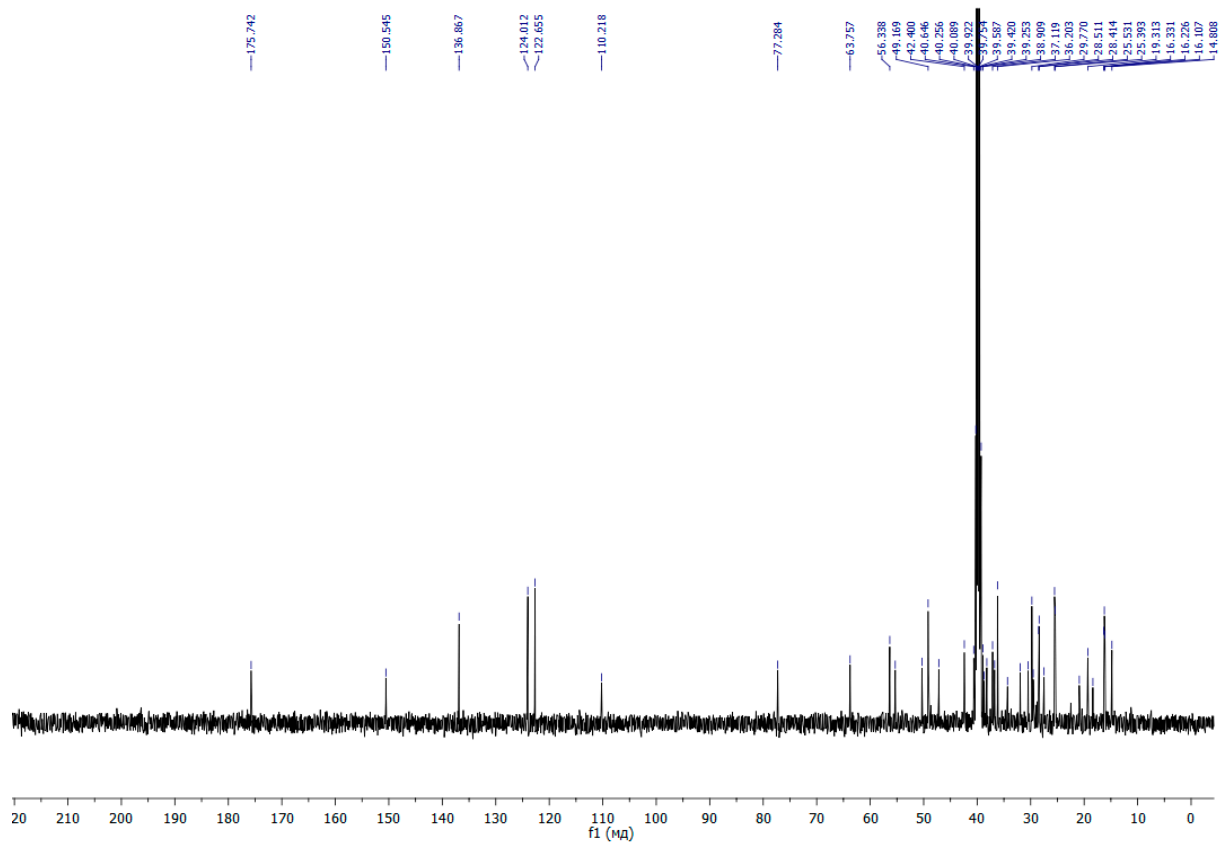
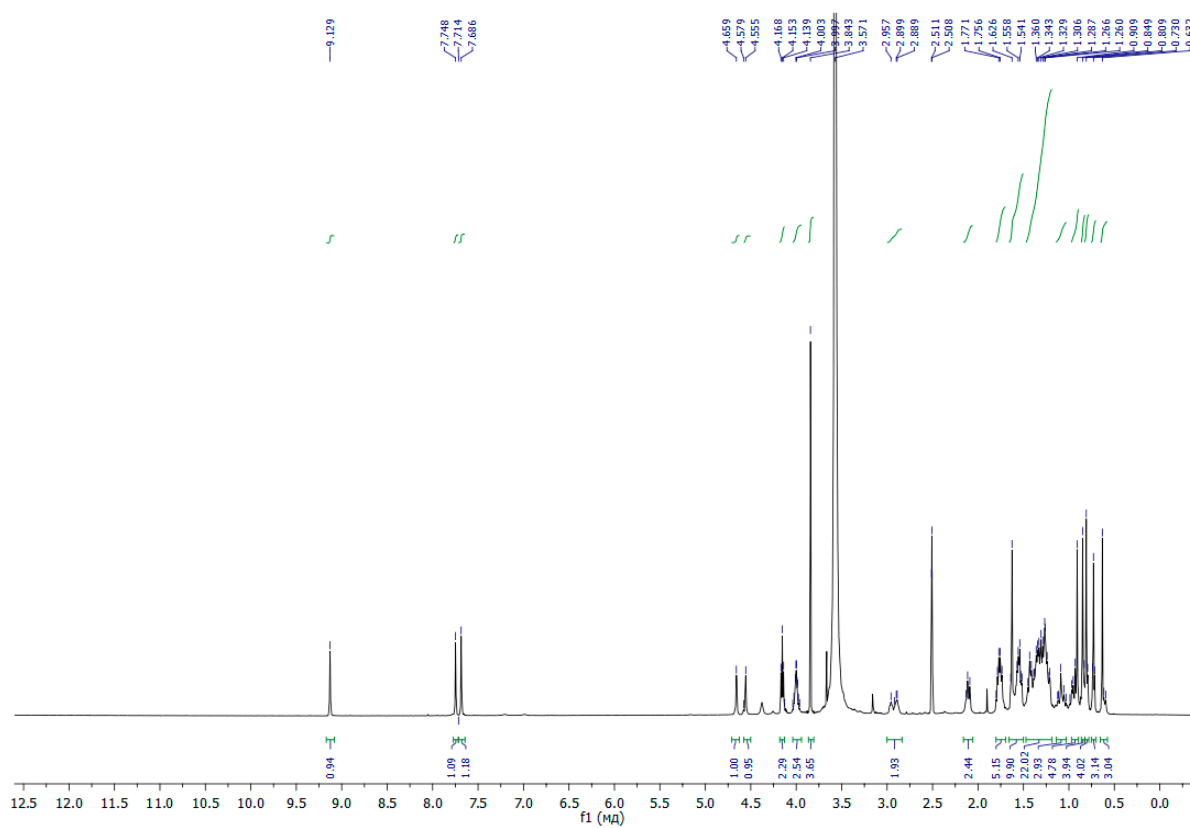


Figure S46. ^1H NMR Spectrum of compound **11c** (500 MHz, DMSO-d_6)



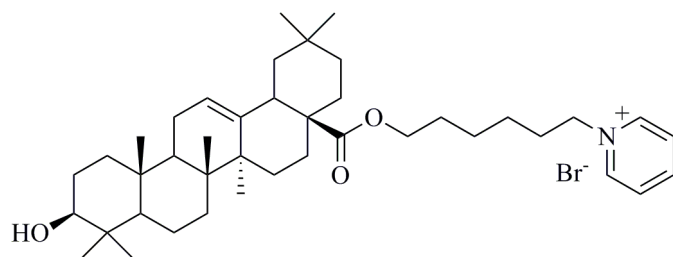


Figure S47. ^{13}C NMR Spectrum of compound **12a** (125 MHz, DMSO-d_6)

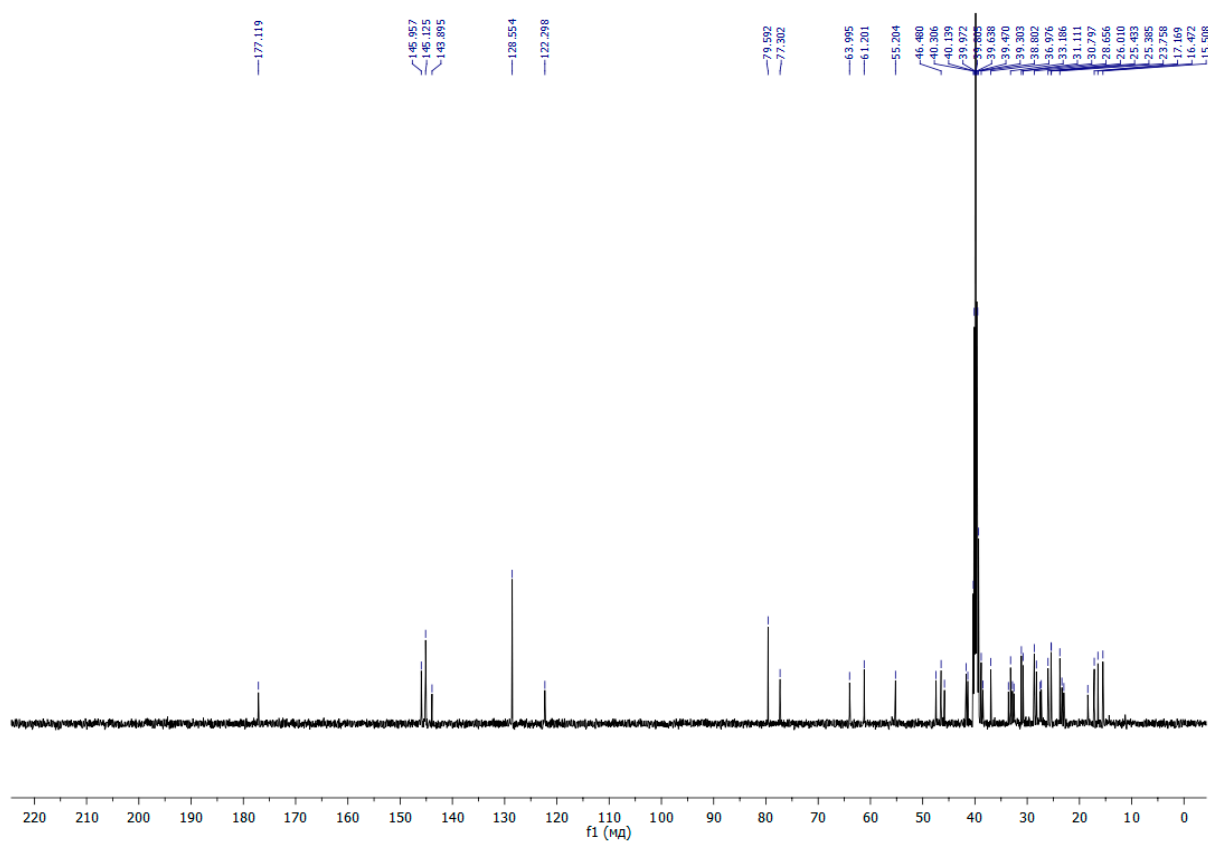
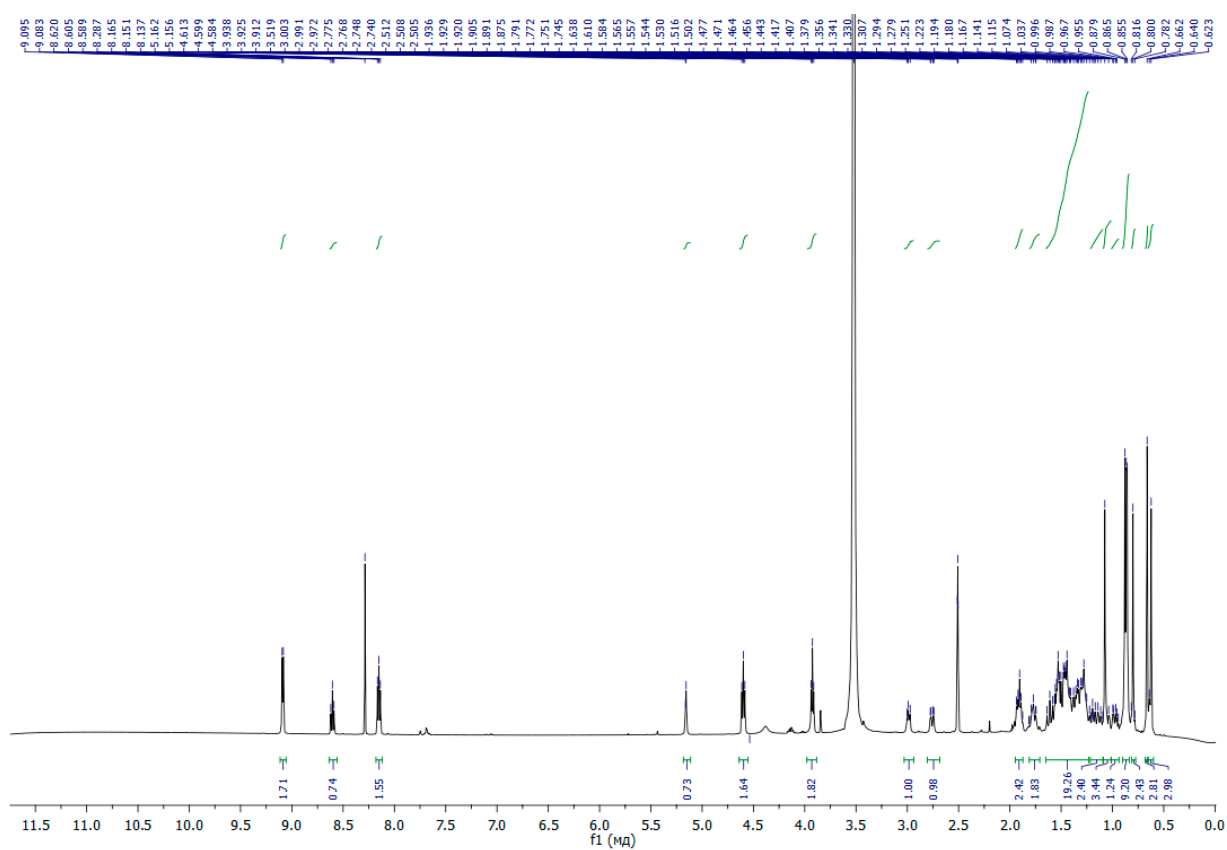


Figure S48. ^1H NMR Spectrum of compound **12a** (500 MHz, DMSO-d_6)



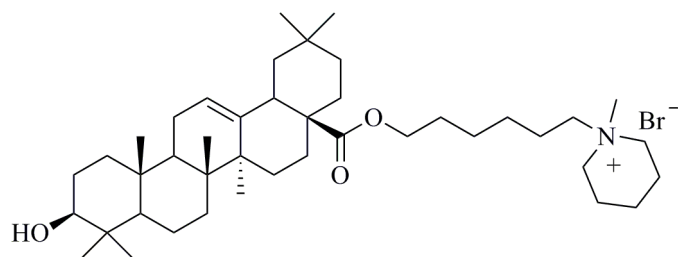


Figure S49. ^{13}C NMR Spectrum of compound **12b** (100 MHz, DMSO- d_6)

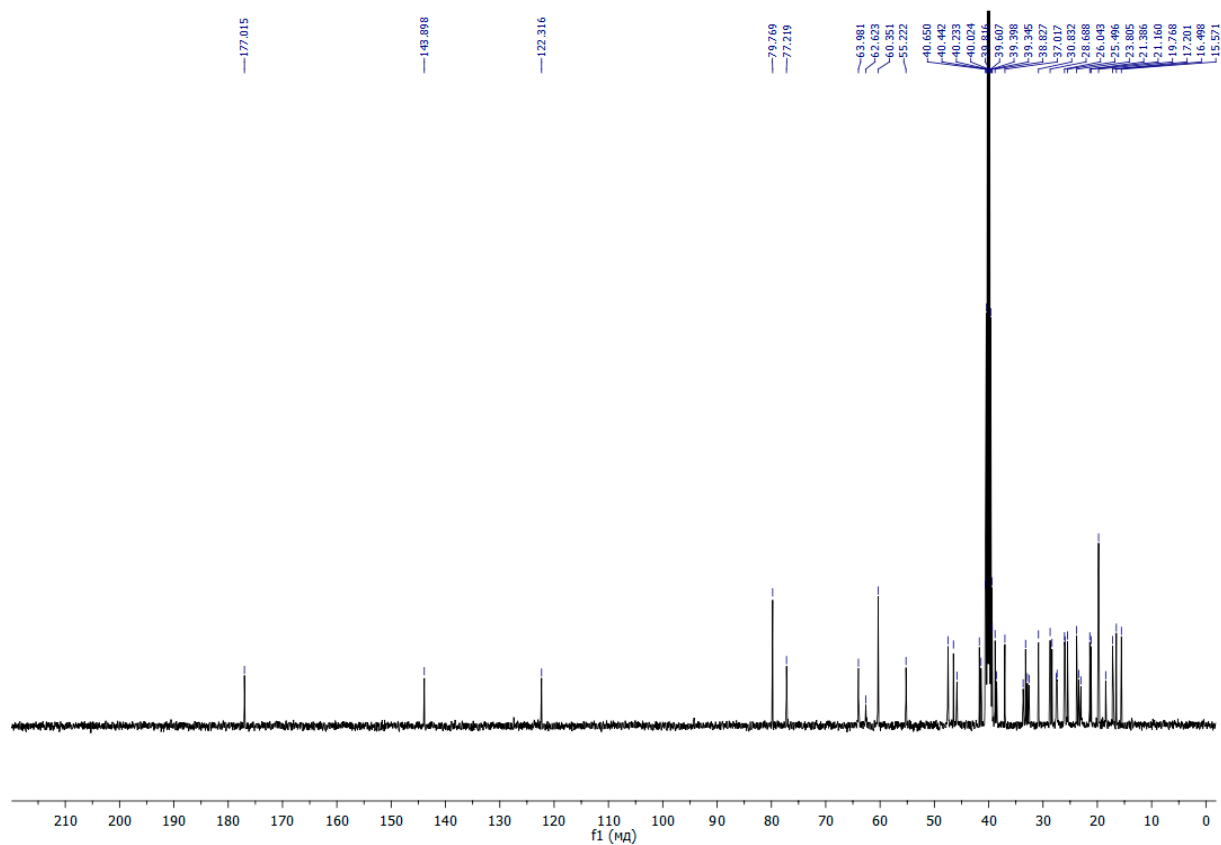
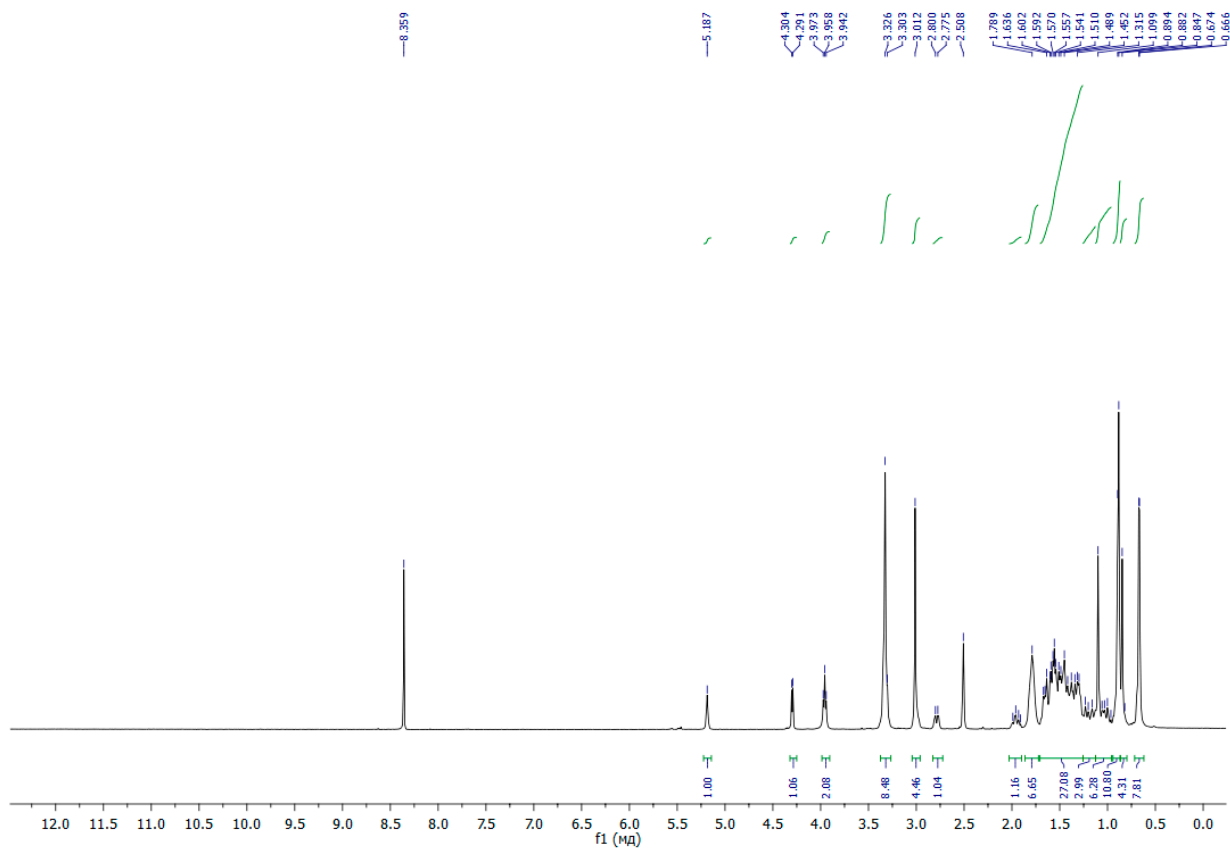


Figure S50. ^1H NMR Spectrum of compound **12b** (500 MHz, DMSO-d_6)



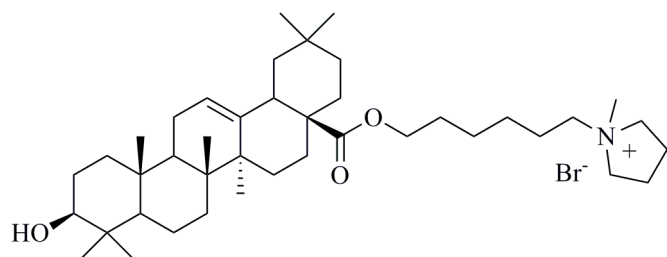


Figure S51. ^{13}C NMR Spectrum of compound **12c** (125 MHz, DMSO-d_6)

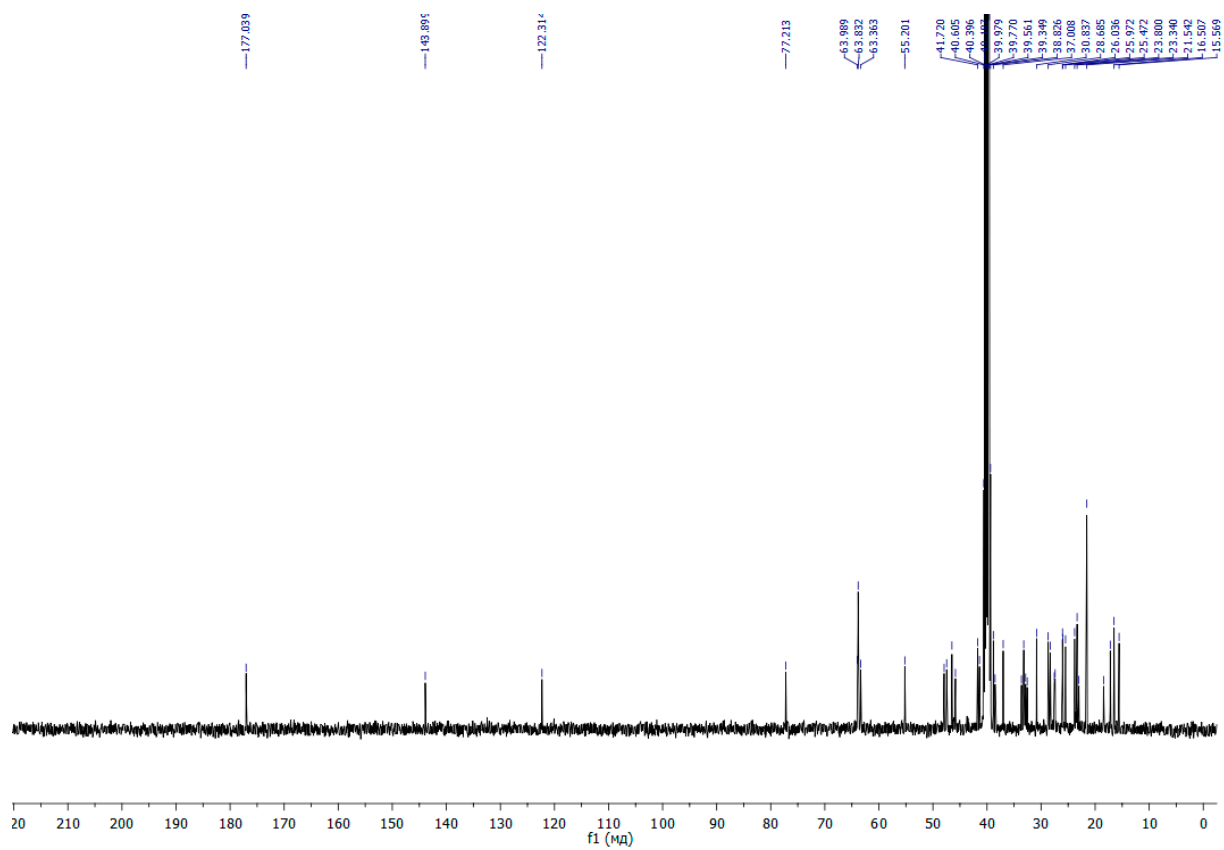
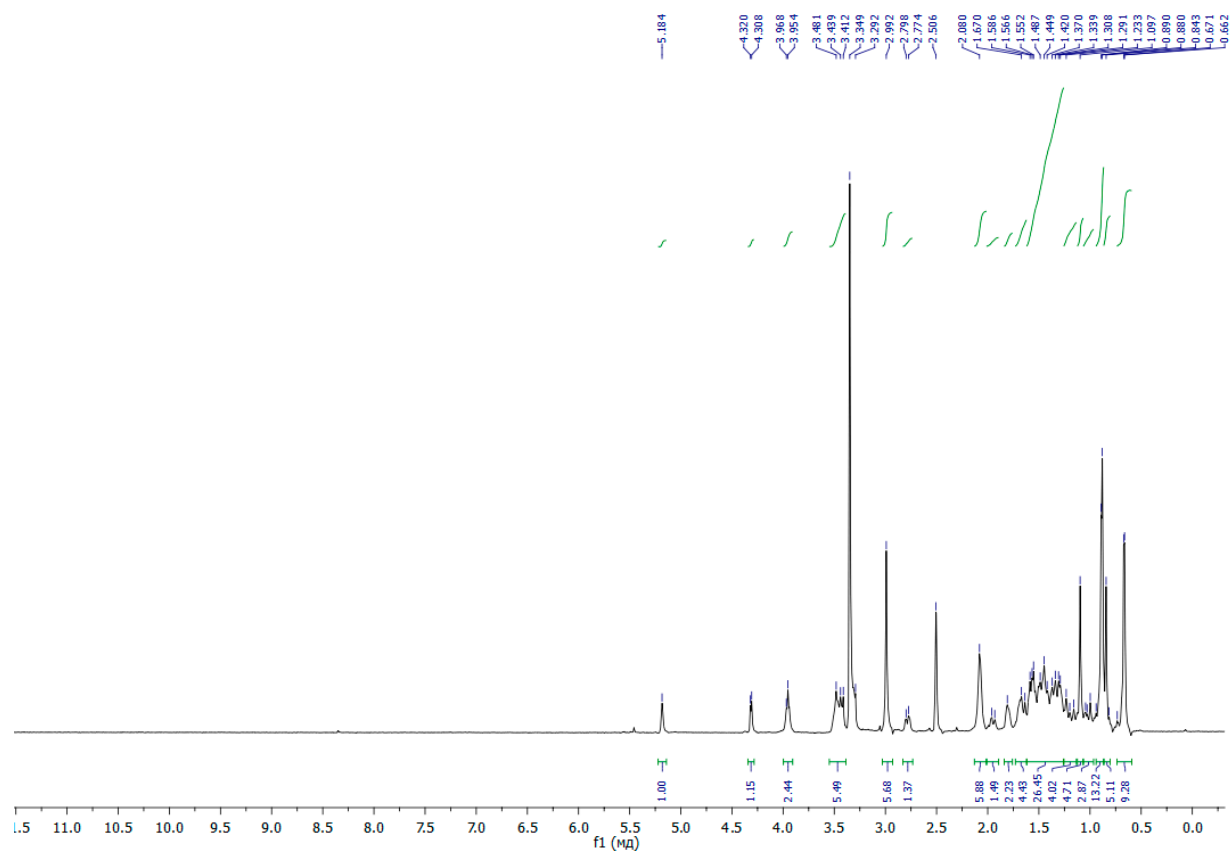


Figure S52. ^1H NMR Spectrum of compound **12c** (500 MHz, DMSO-d_6)



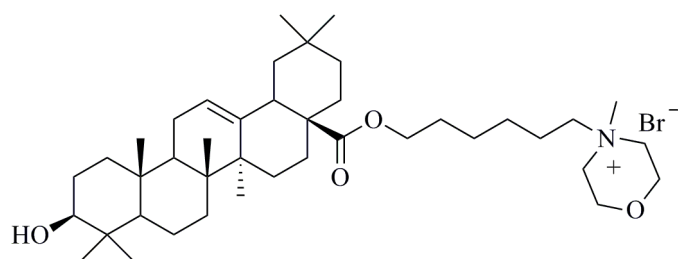


Figure S53. ^{13}C NMR Spectrum of compound **12d** (100 MHz, DMSO-d_6)

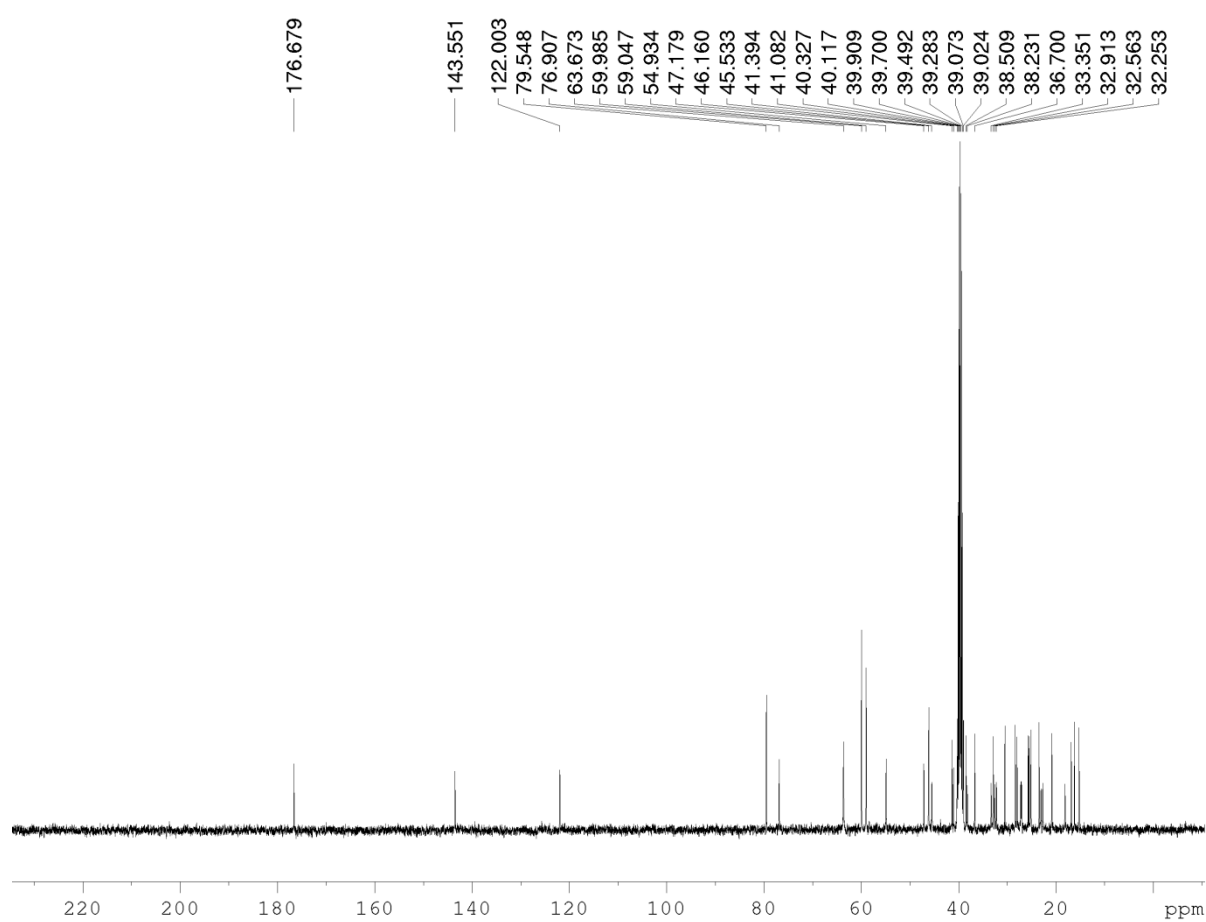
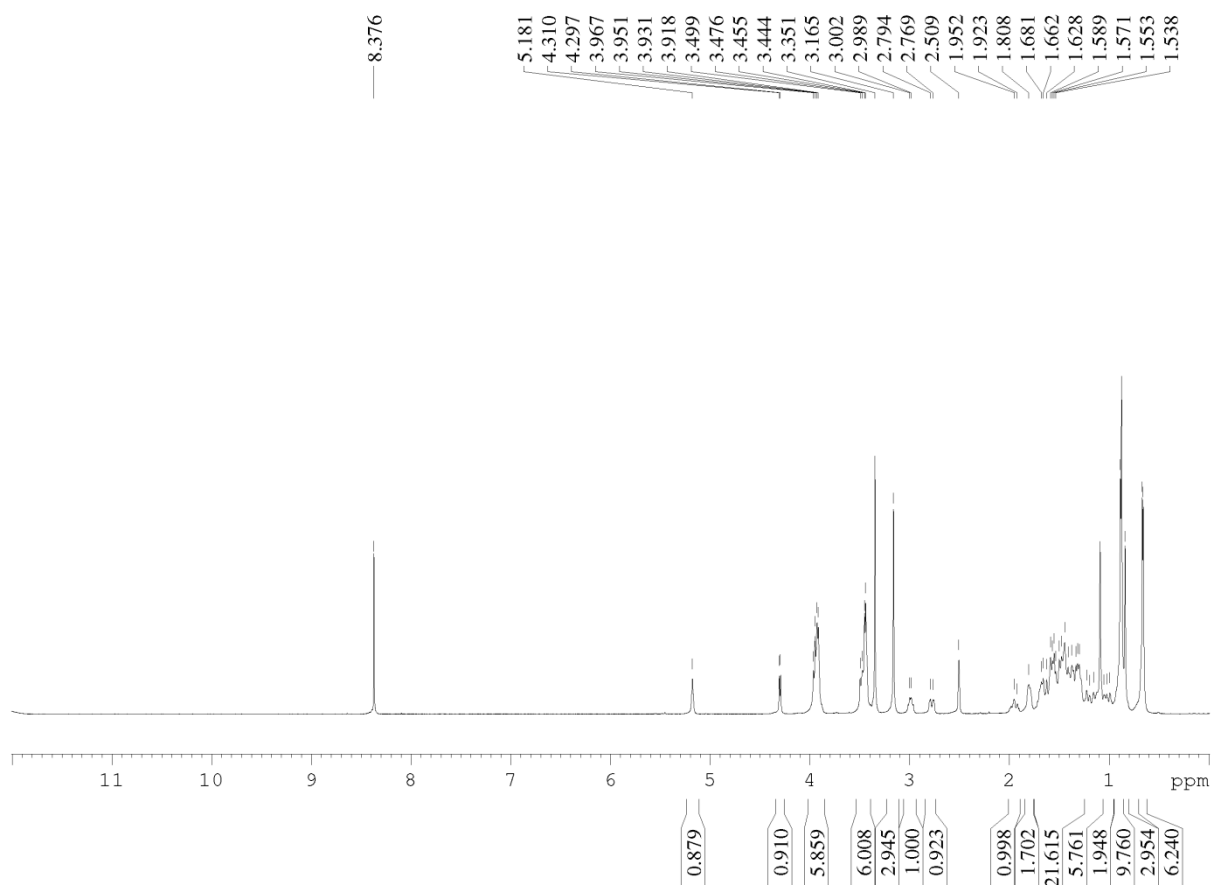


Figure S54. ^1H NMR Spectrum of compound **12d** (400 MHz, DMSO-d_6)



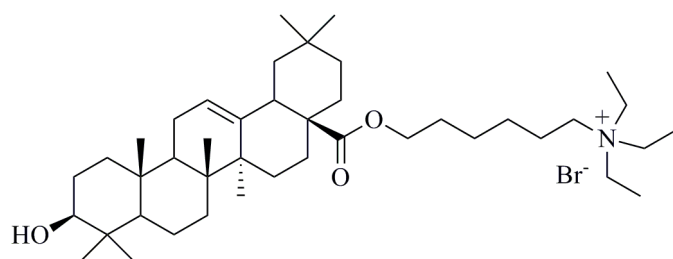


Figure S55. ^{13}C NMR Spectrum of compound **12e** (125 MHz, DMSO-d_6)

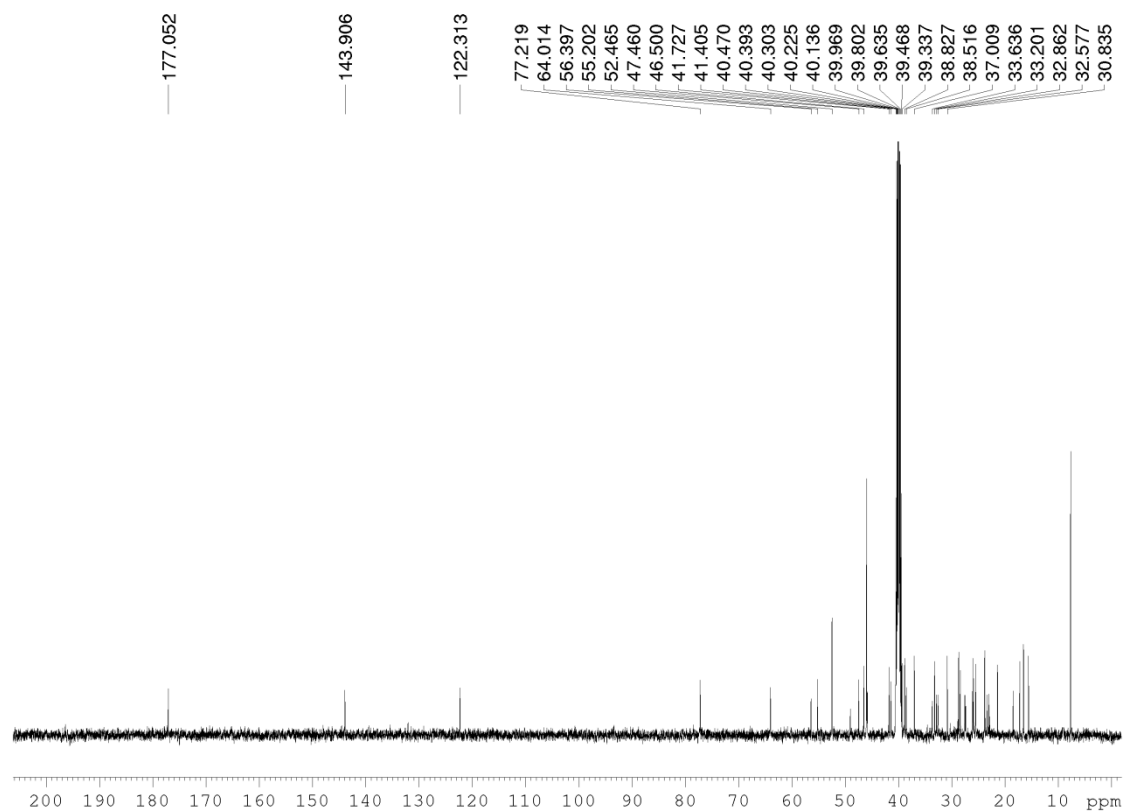
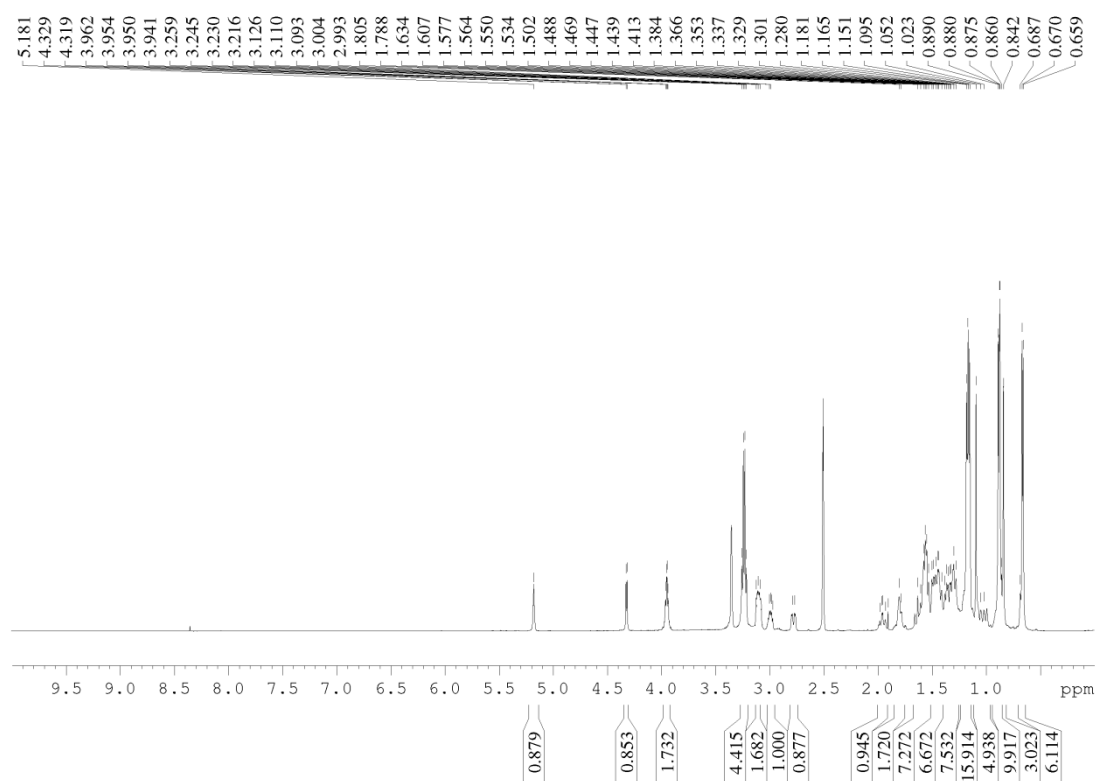


Figure S56. ^1H NMR Spectrum of compound **12e** (500 MHz, DMSO-d_6)



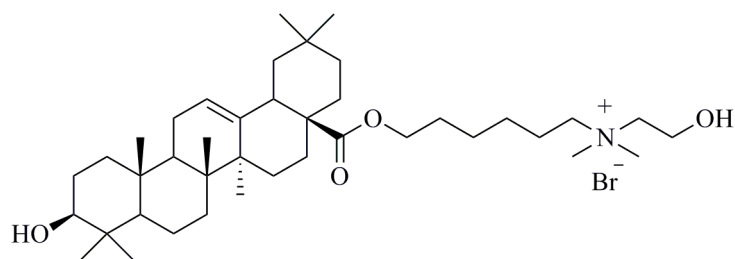


Figure S57. ^{13}C NMR Spectrum of compound **12f** (100 MHz, DMSO-d_6)

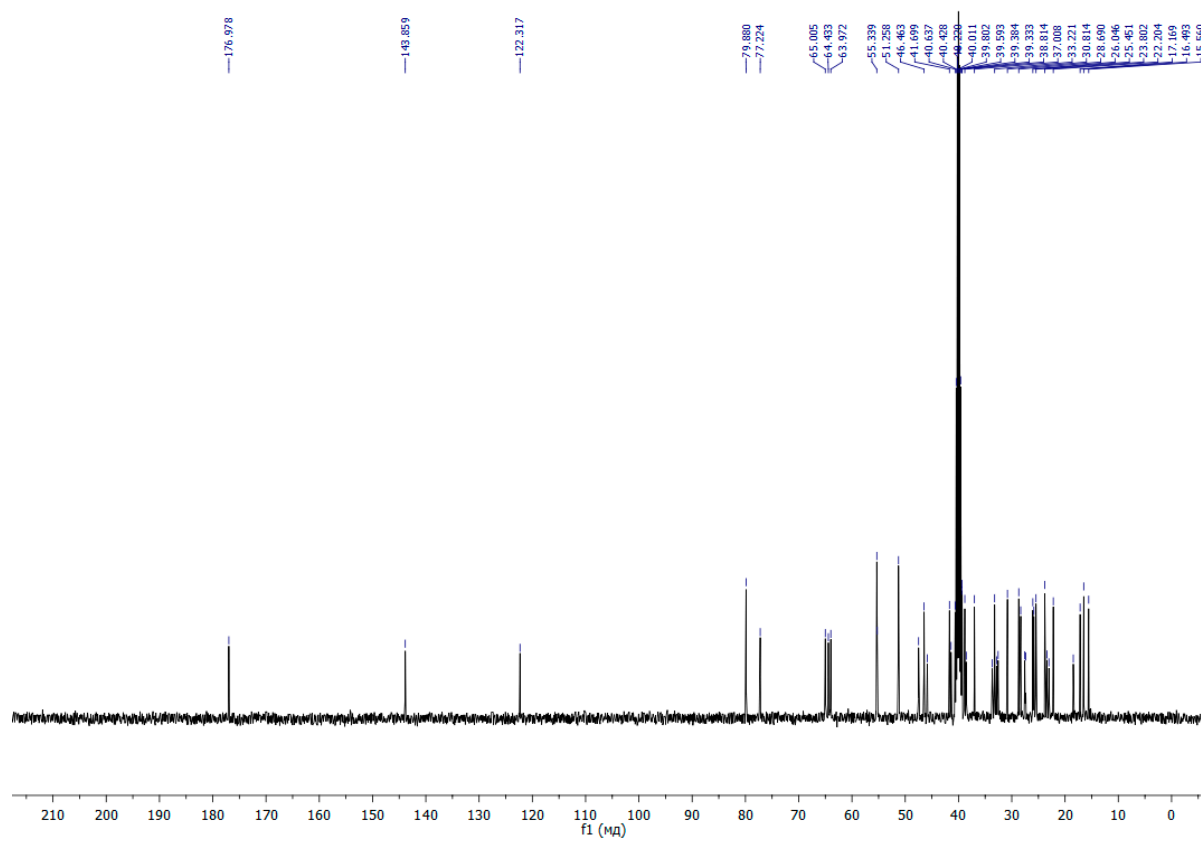


Figure S58. ^1H NMR Spectrum of compound **12f** (400 MHz, DMSO-d_6)

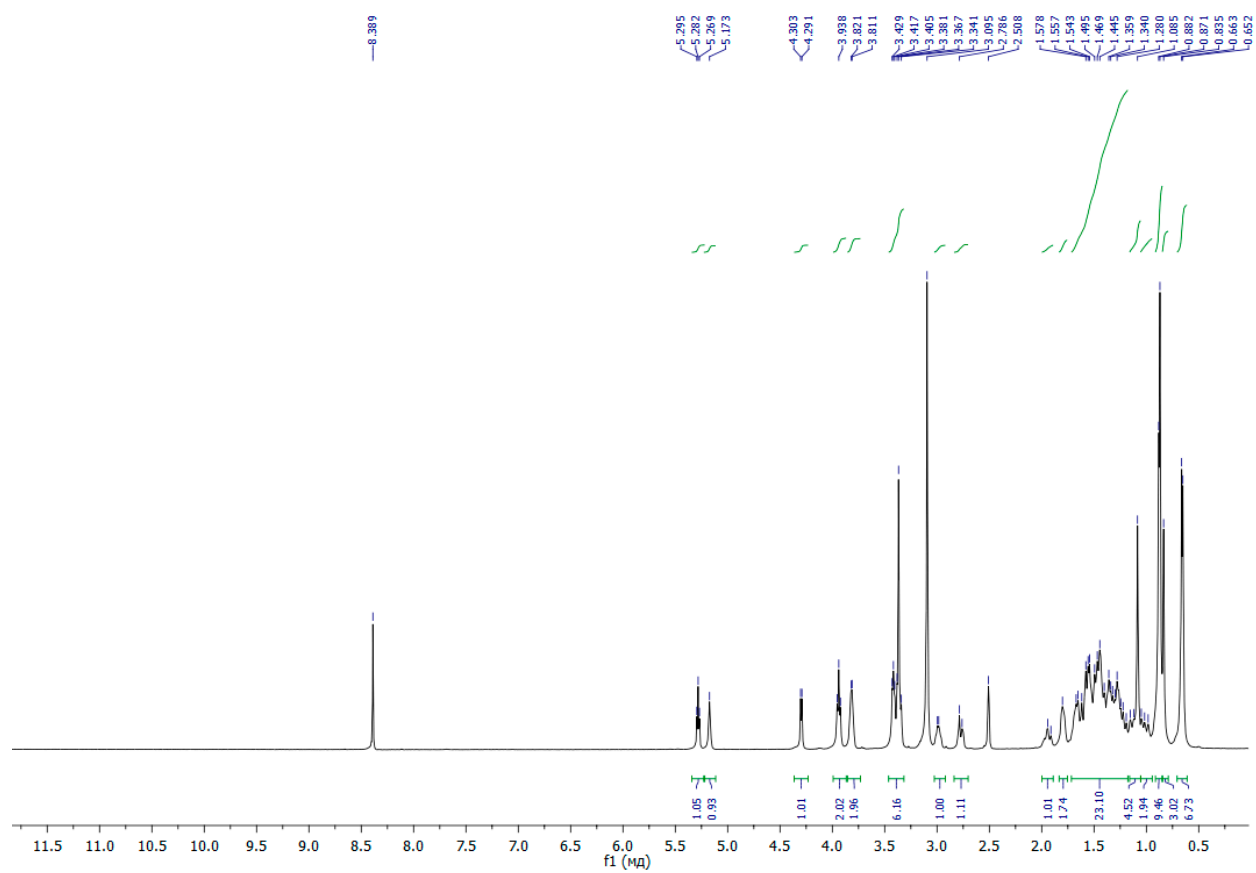




Figure S60. ^1H NMR Spectrum of compound **13a** (500 MHz, DMSO-d_6)

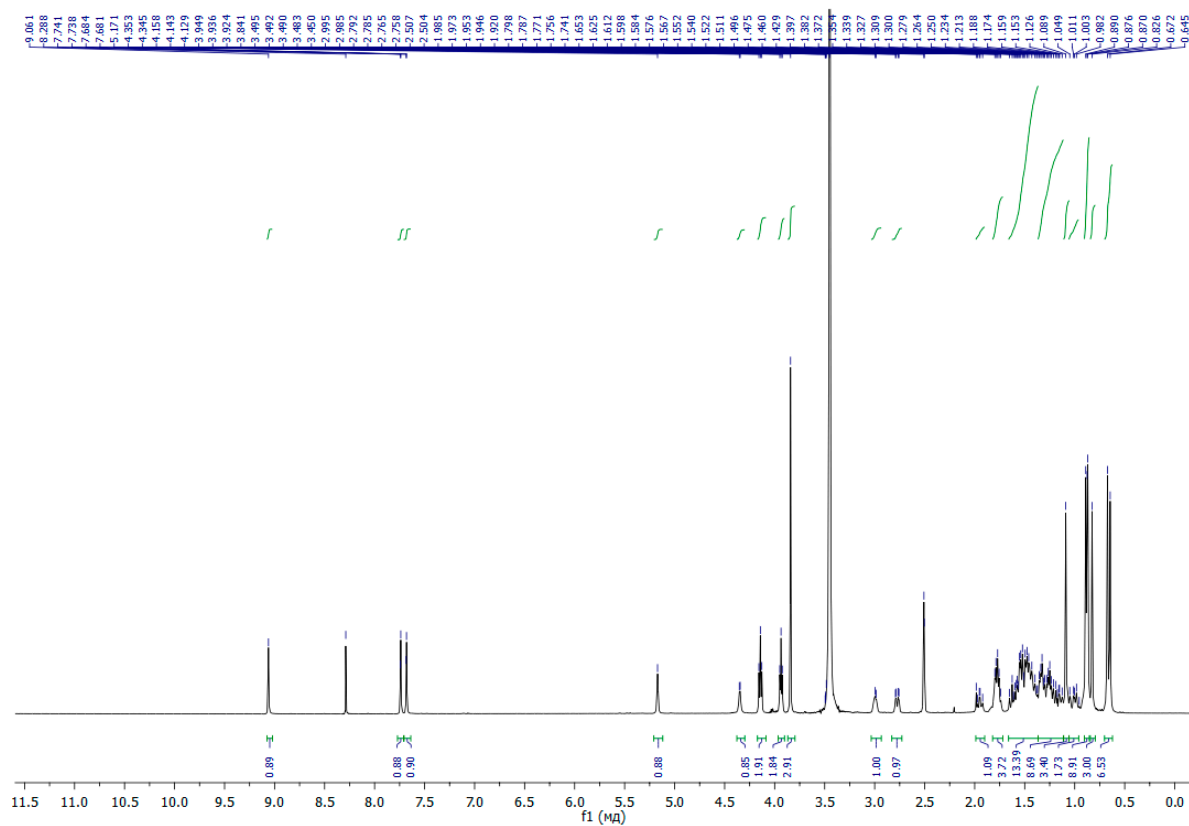


Figure S61. ^{19}F NMR Spectrum of compound **13a** (376 MHz, DMSO-d_6)

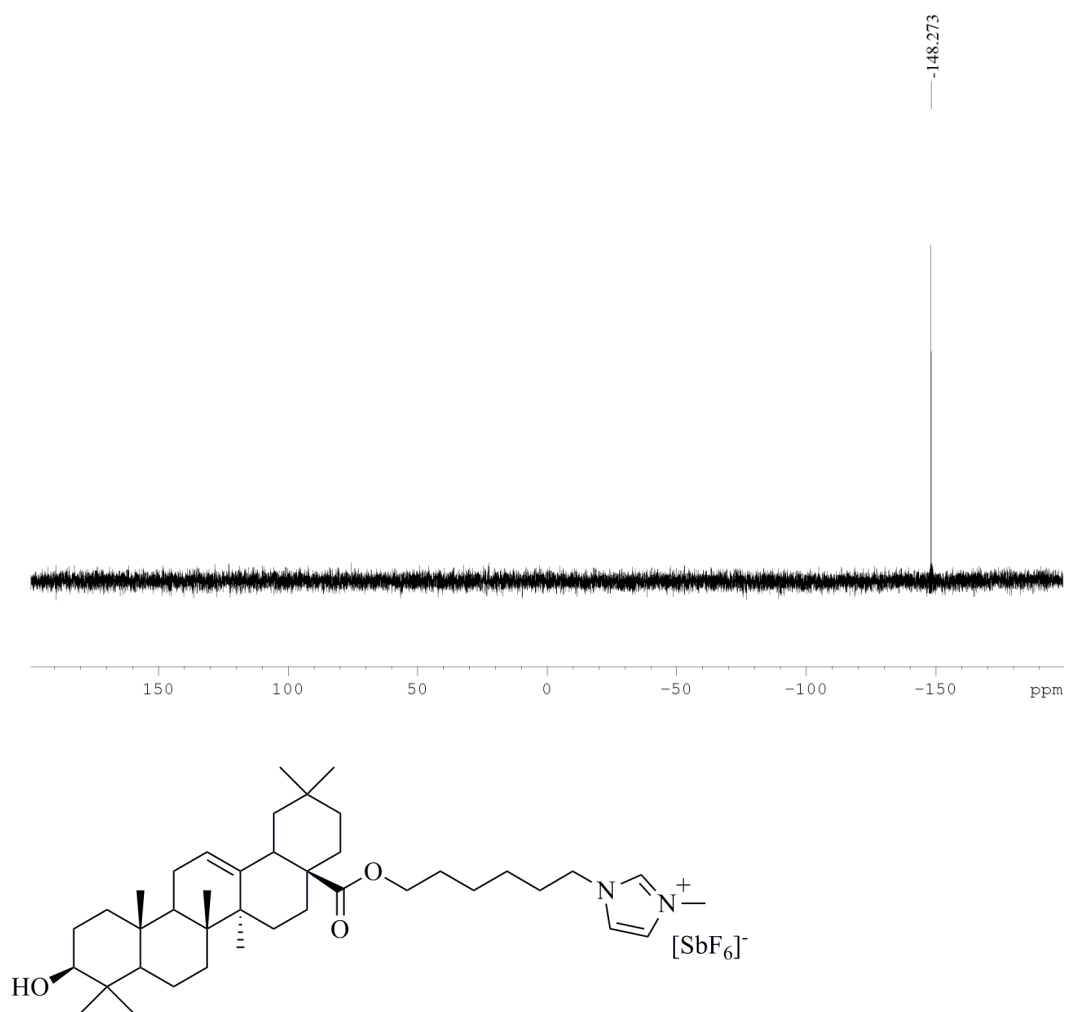


Figure S62. ^{13}C NMR Spectrum of compound **13b** (100 MHz, DMSO- d_6)

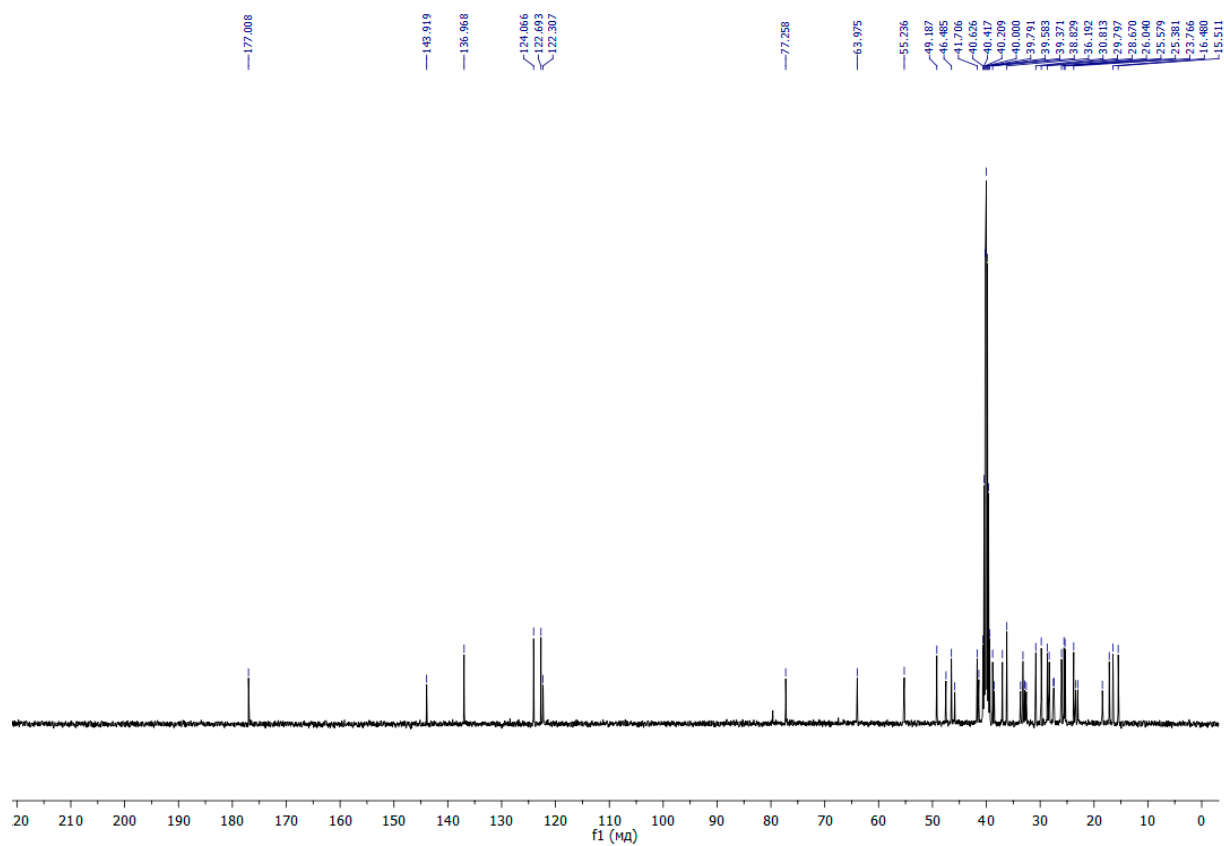


Figure S63. ^1H NMR Spectrum of compound **13b** (400 MHz, DMSO-d_6)

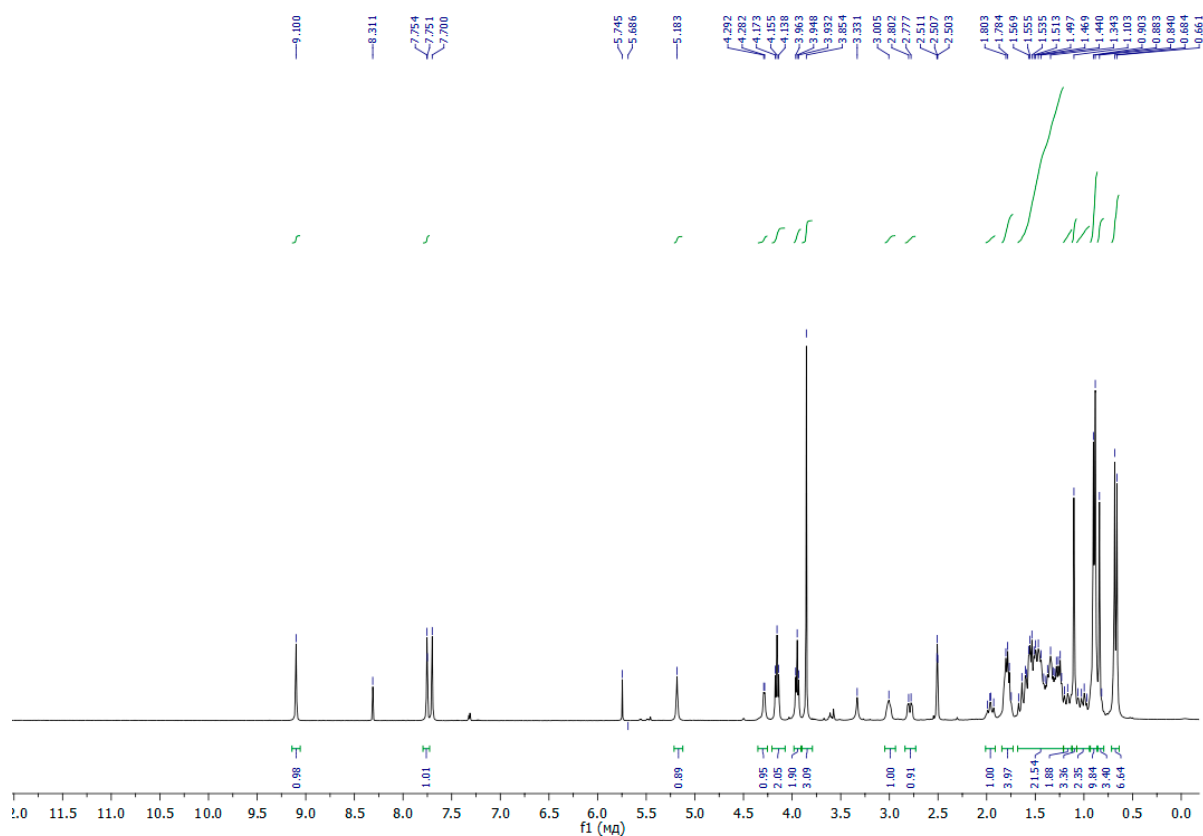
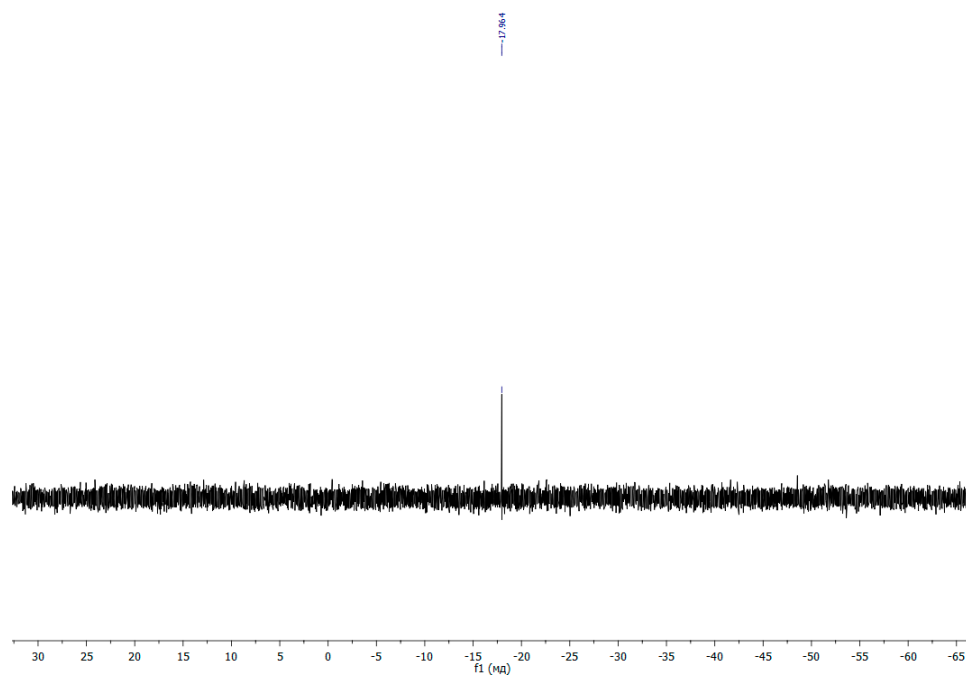


Figure S64. ¹H NMR Spectrum of compound **13b** (376 MHz, DMSO-d₆)



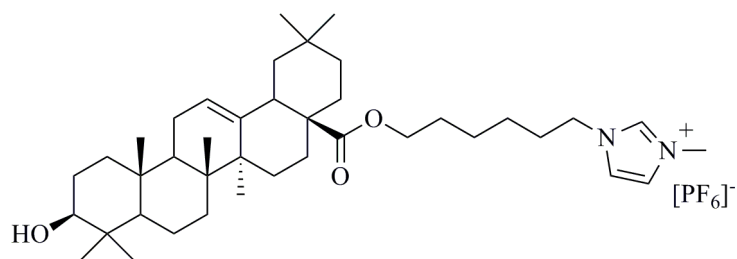


Figure S65. ^{13}C NMR Spectrum of compound 13c (100 MHz, DMSO-d_6)

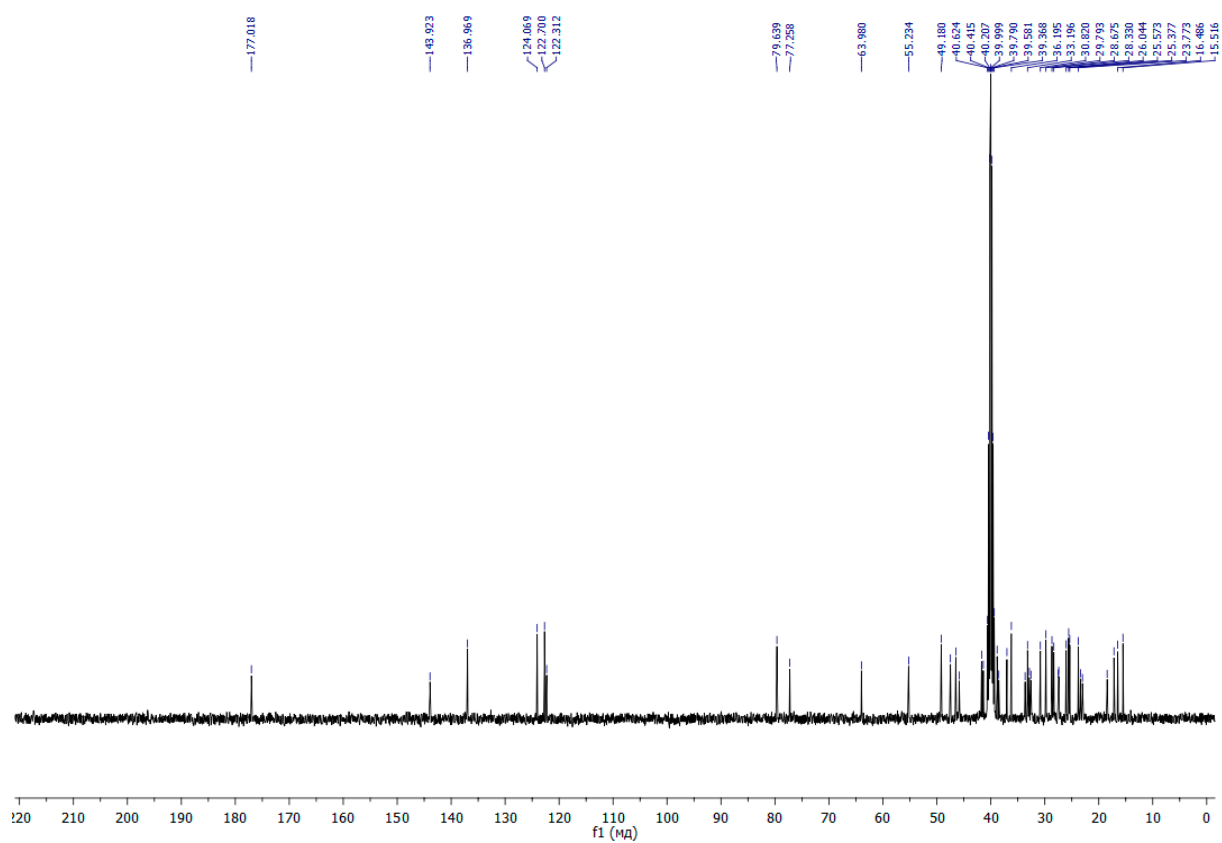


Figure S66. ^1H NMR Spectrum of compound **13c** (400 MHz, DMSO-d_6)

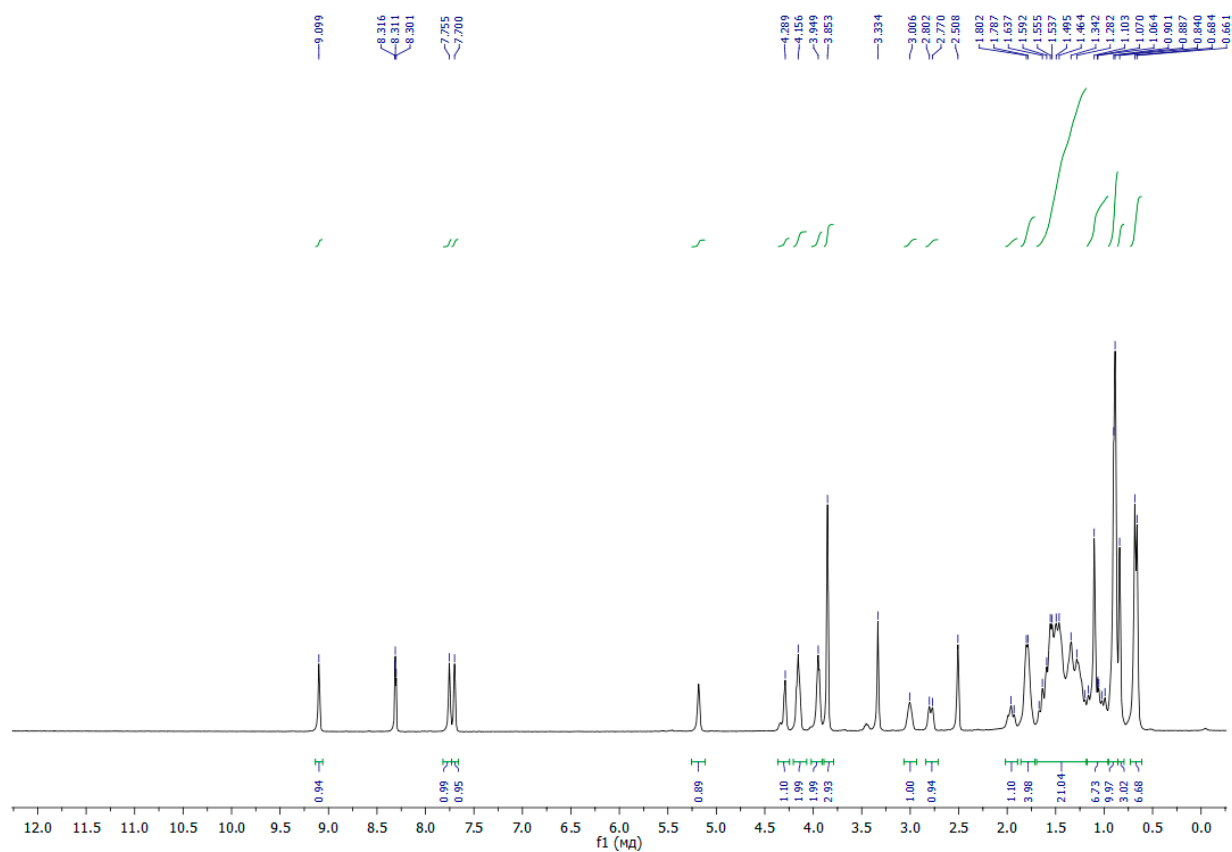
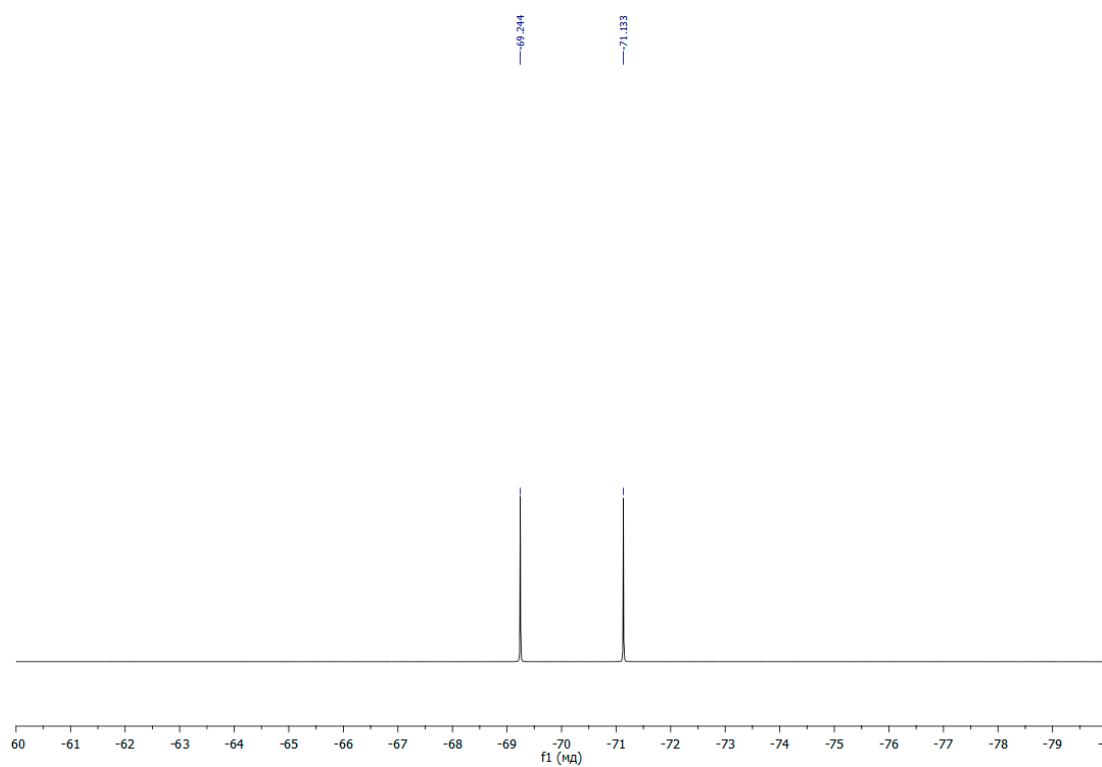


Figure S67. ^{19}F NMR Spectrum of compound **13c** (376 MHz, DMSO-d_6)



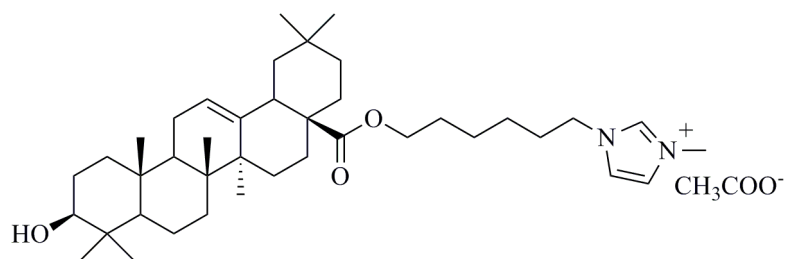


Figure S68. ¹³C NMR Spectrum of compound 13d (100 MHz, DMSO-d₆)

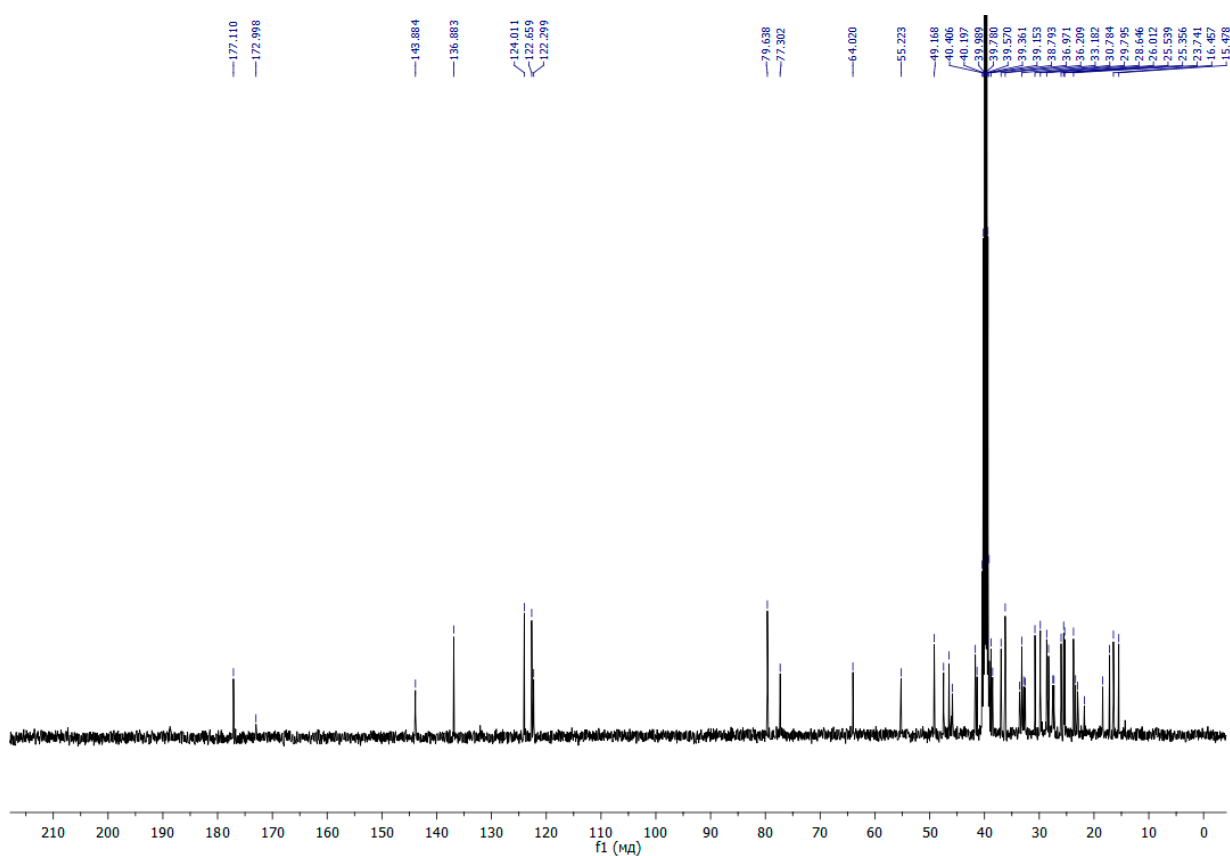
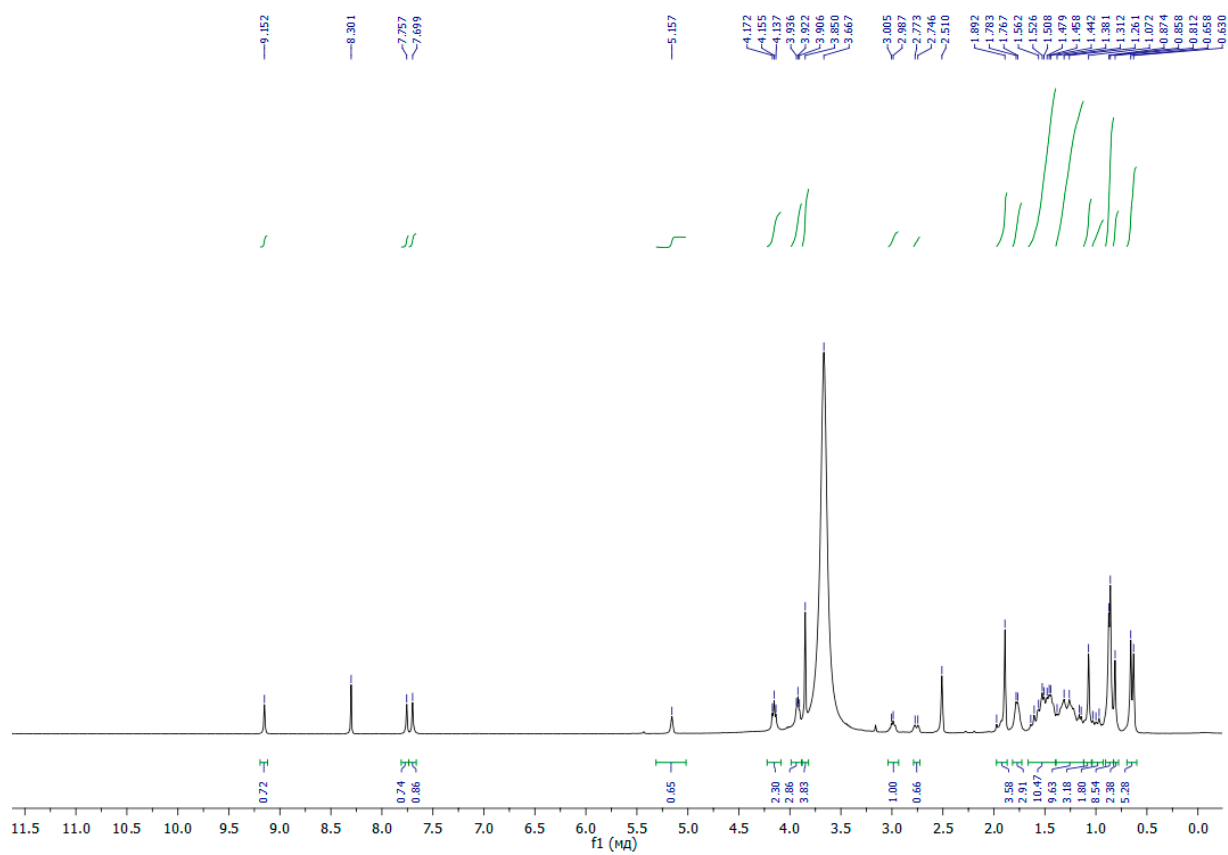


Figure S69. ^1H NMR Spectrum of compound **13d** (400 MHz, DMSO-d_6)



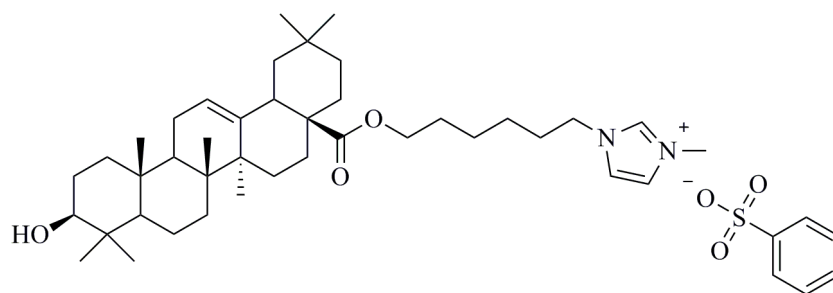


Figure S70. ^{13}C NMR Spectrum of compound **13e** (100 MHz, DMSO-d_6)

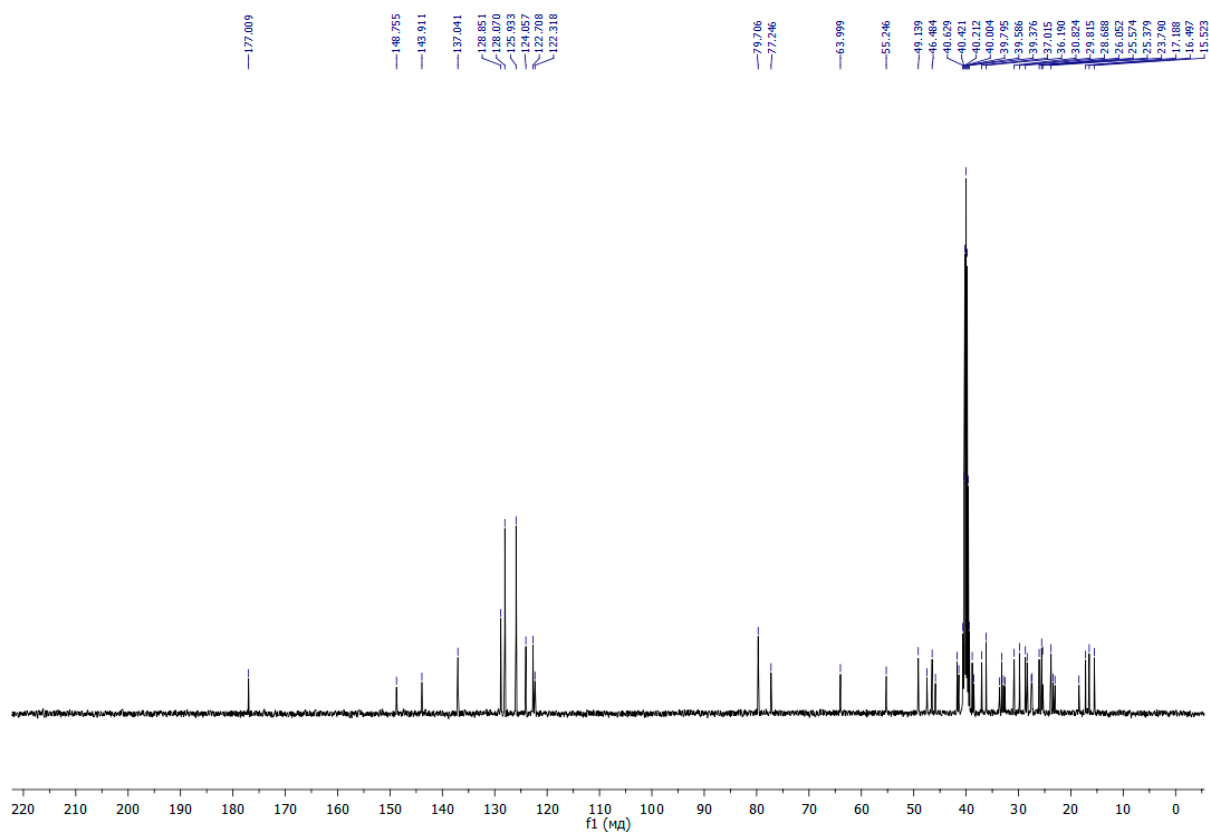
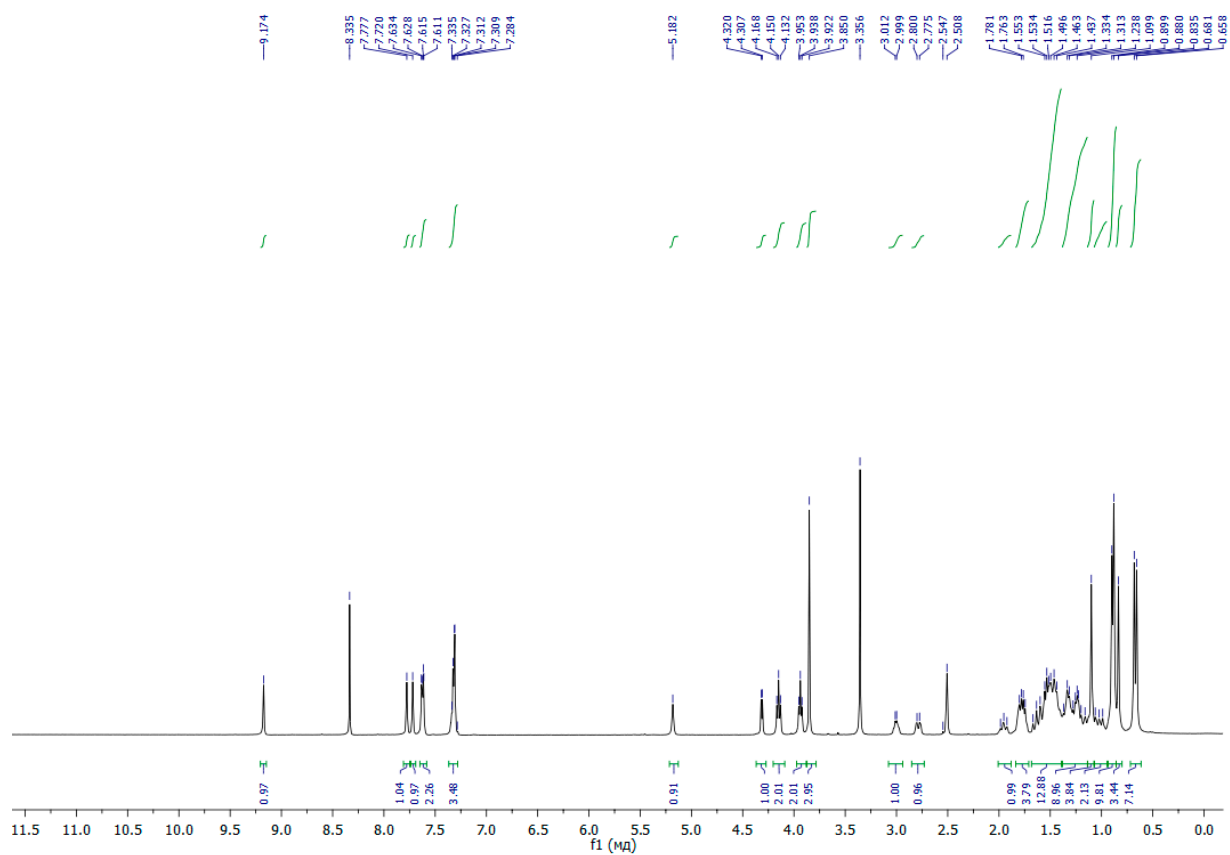


Figure S71. ^1H NMR Spectrum of compound **13e** (400 MHz, DMSO-d_6)



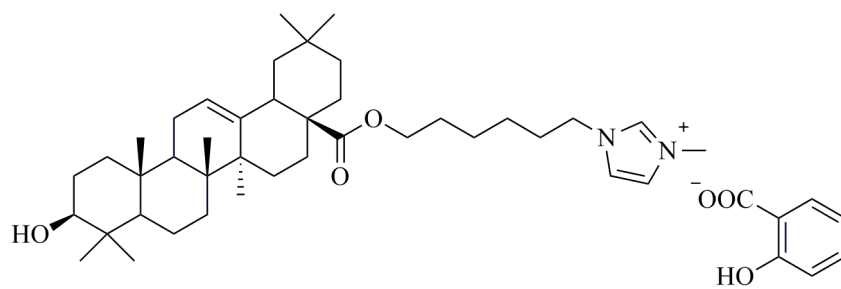


Figure S72. ^{13}C NMR Spectrum of compound **13f** (100 MHz, DMSO-d_6)

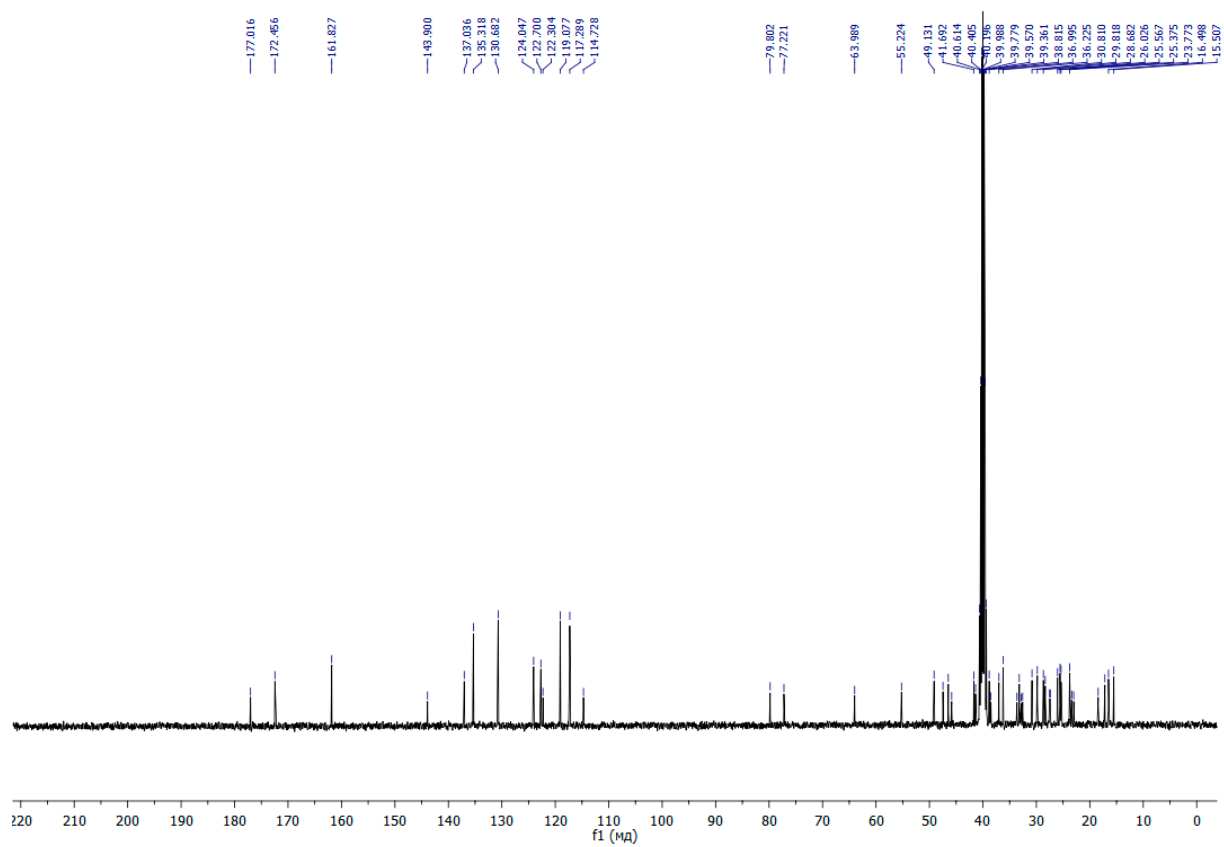
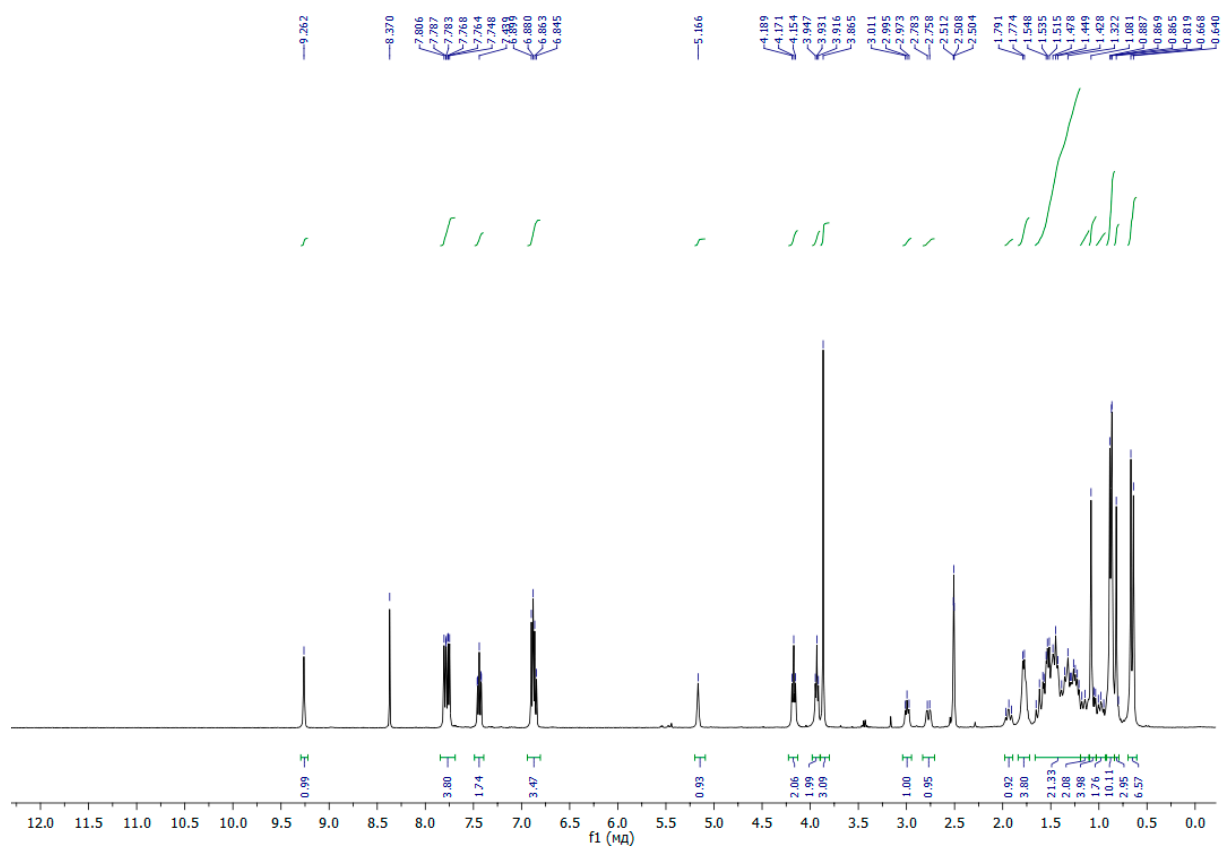


Figure S73. ^1H NMR Spectrum of compound **13f** (400 MHz, DMSO-d_6)



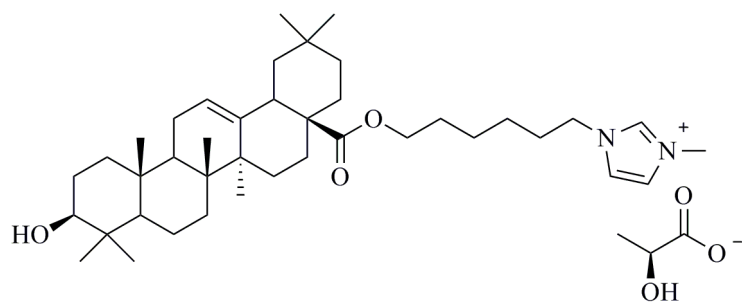


Figure S74. ^{13}C NMR Spectrum of compound **13g** (100 MHz, DMSO-d_6)

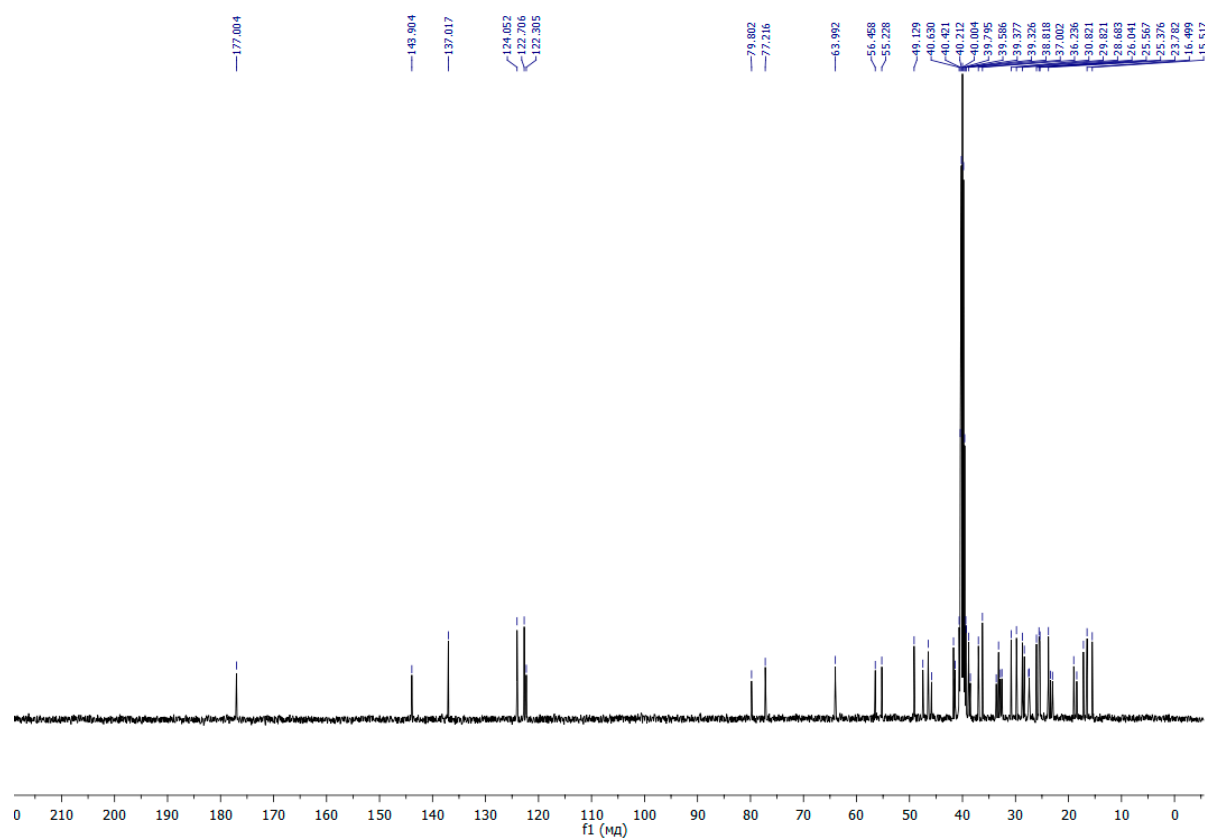
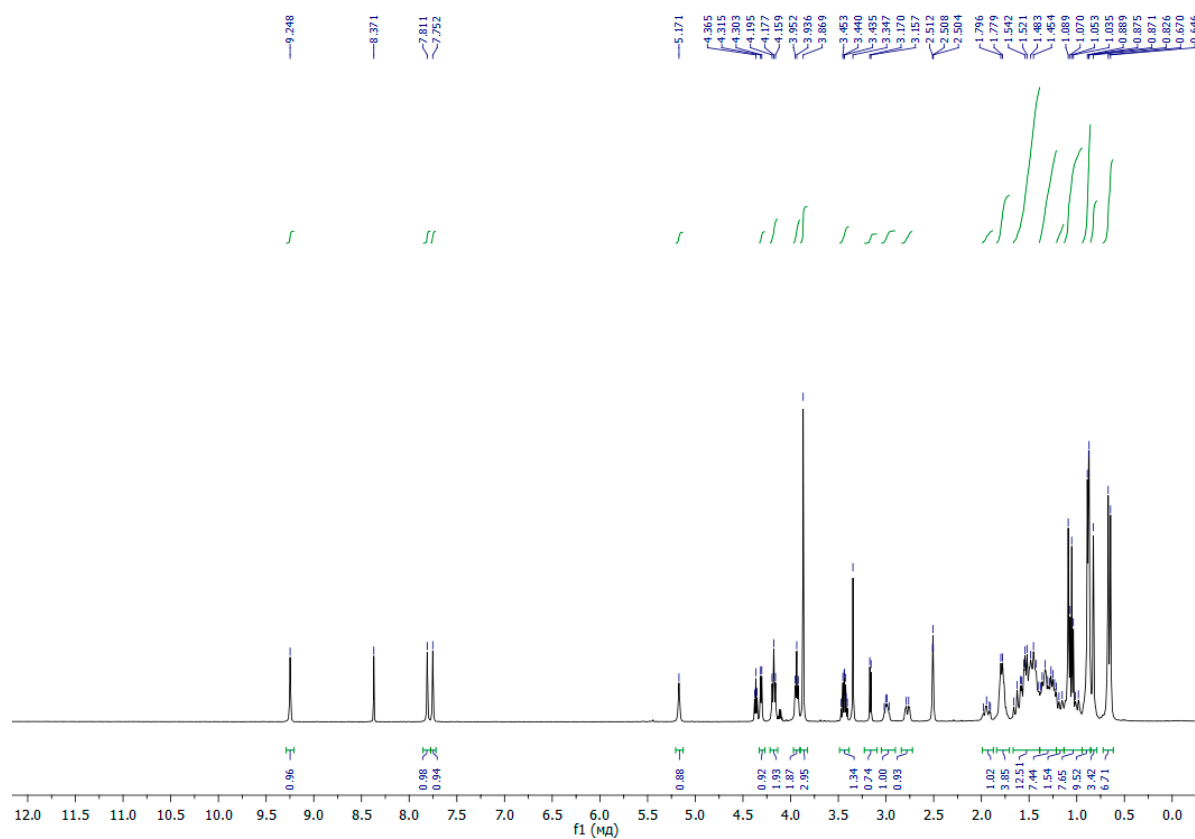


Figure S75. ^1H NMR Spectrum of compound **13g** (400 MHz, DMSO-d_6)



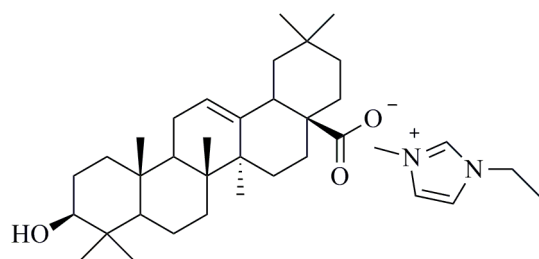


Figure S76. ^{13}C NMR Spectrum of compound **15a** (100 MHz, DMSO-d_6)

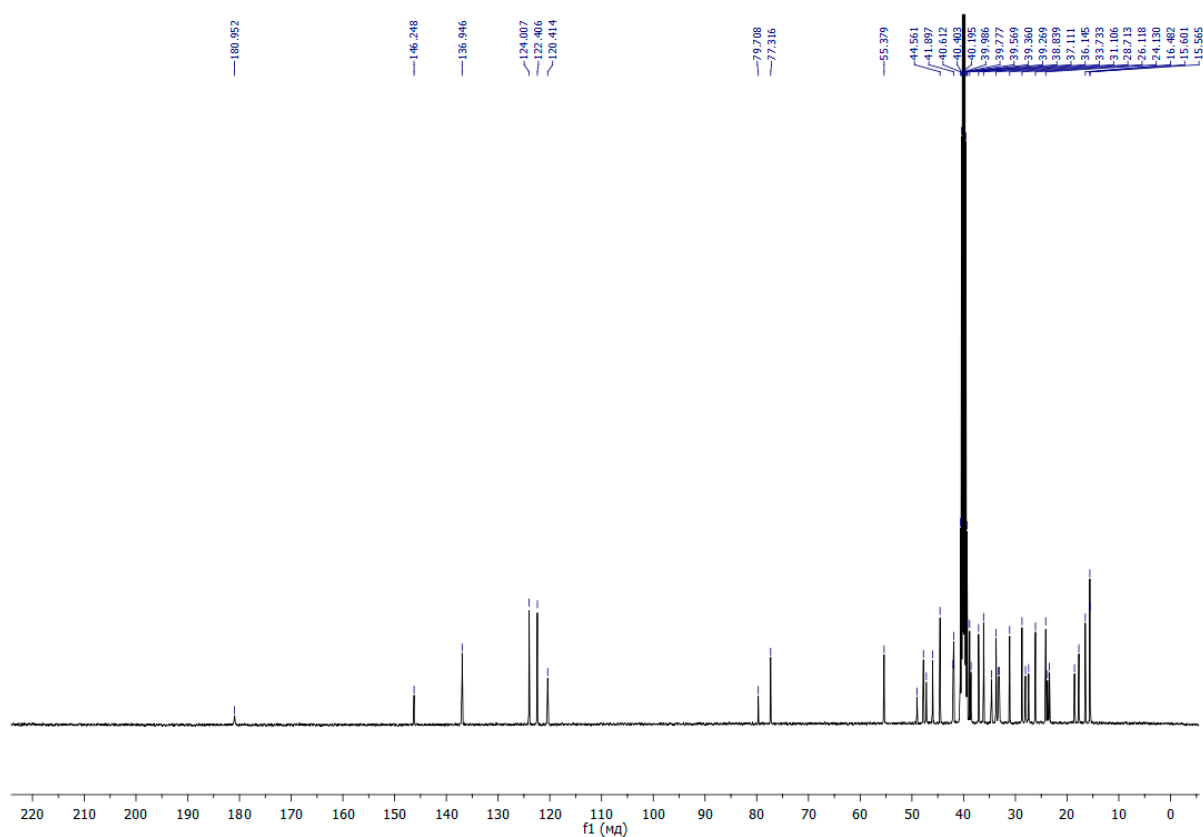
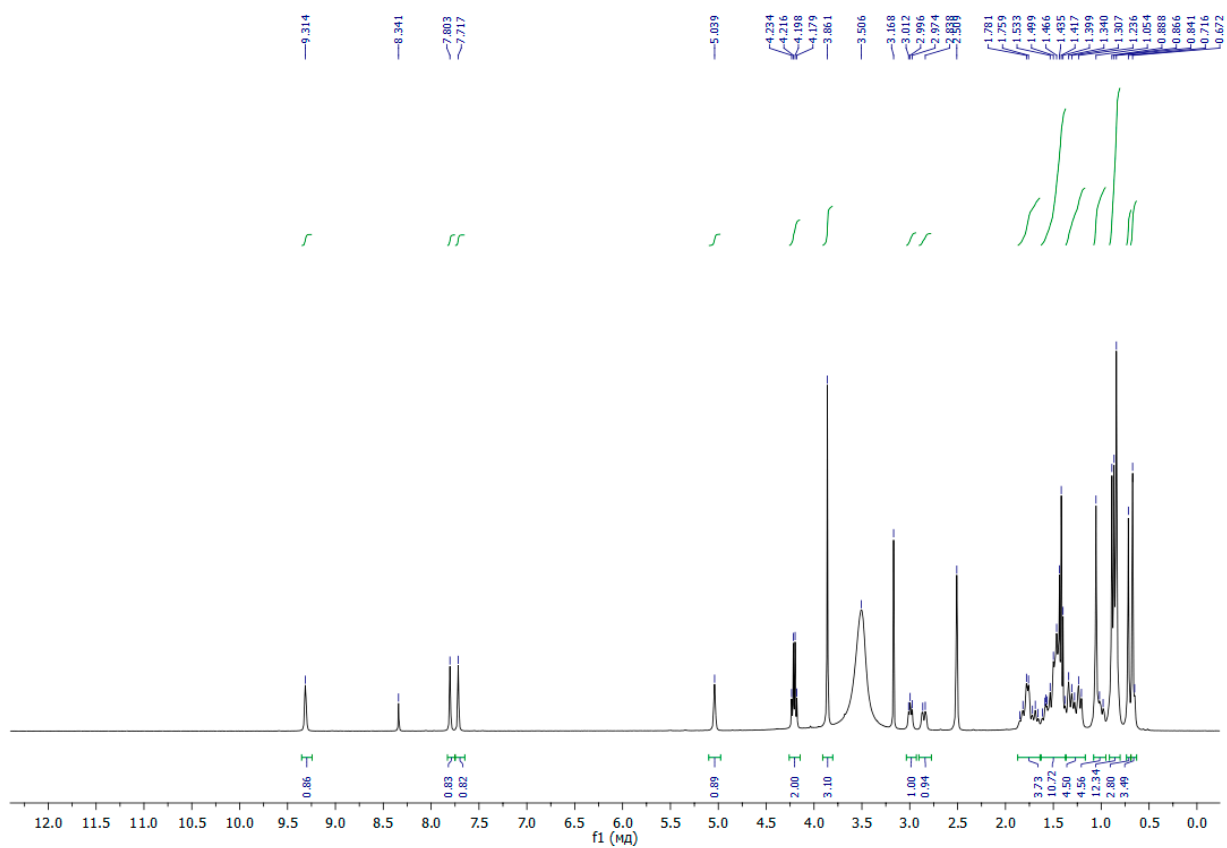


Figure S77. ^1H NMR Spectrum of compound **15a** (400 MHz, DMSO- d_6)



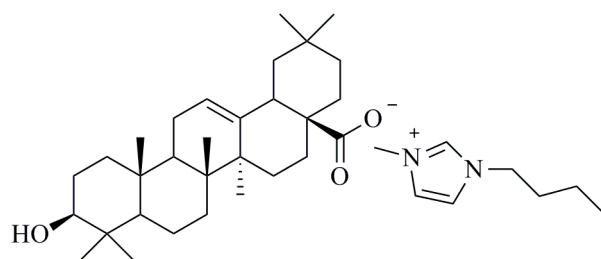


Figure S78. ^{13}C NMR Spectrum of compound **15b** (100 MHz, DMSO-d_6)

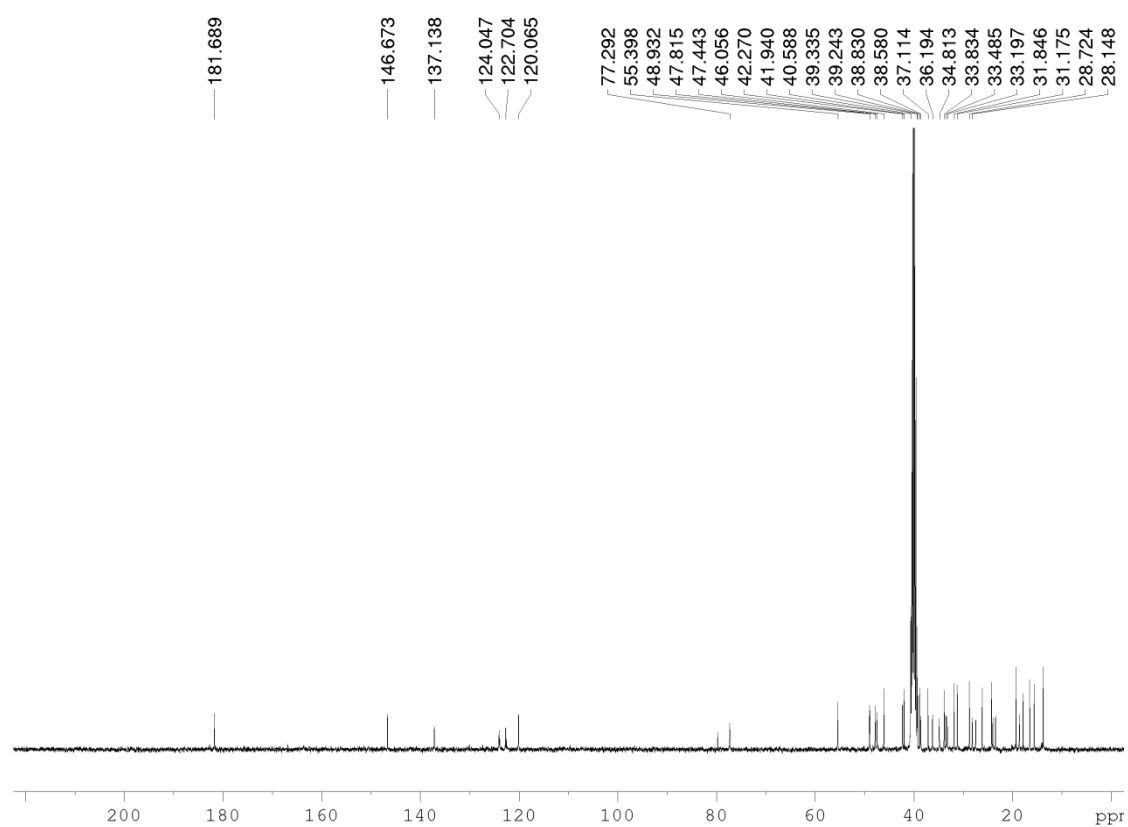
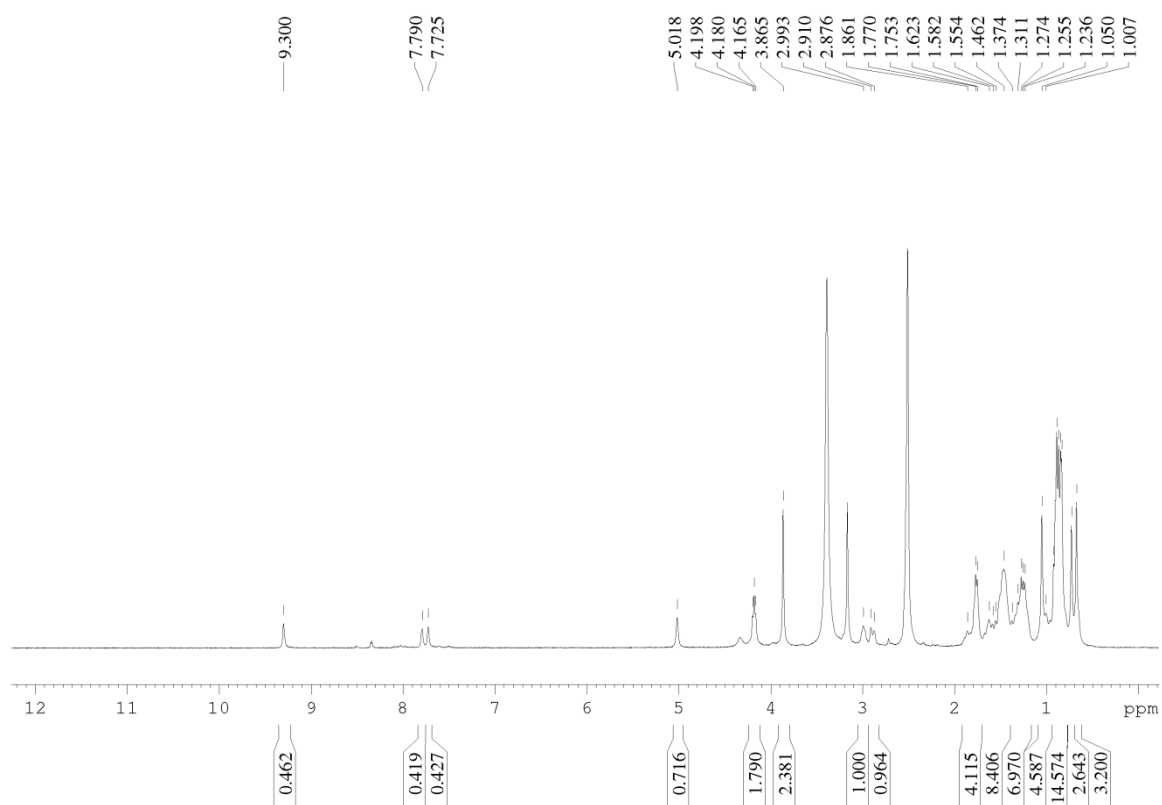


Figure S79. ^1H NMR Spectrum of compound **15b** (400 MHz, DMSO-d_6)



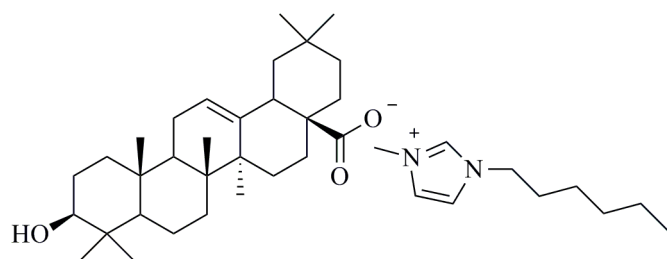


Figure S80. ^{13}C NMR Spectrum of compound **15c** (100 MHz, DMSO-d_6)

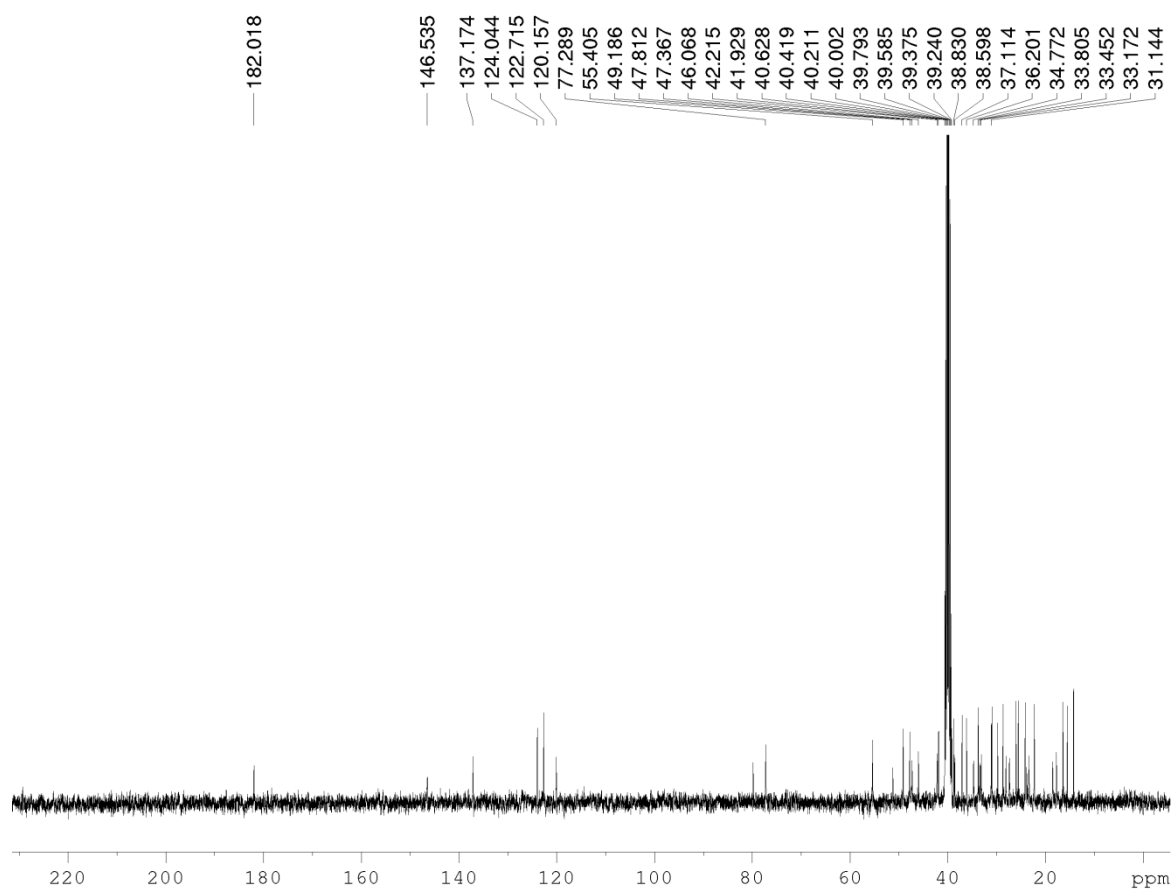
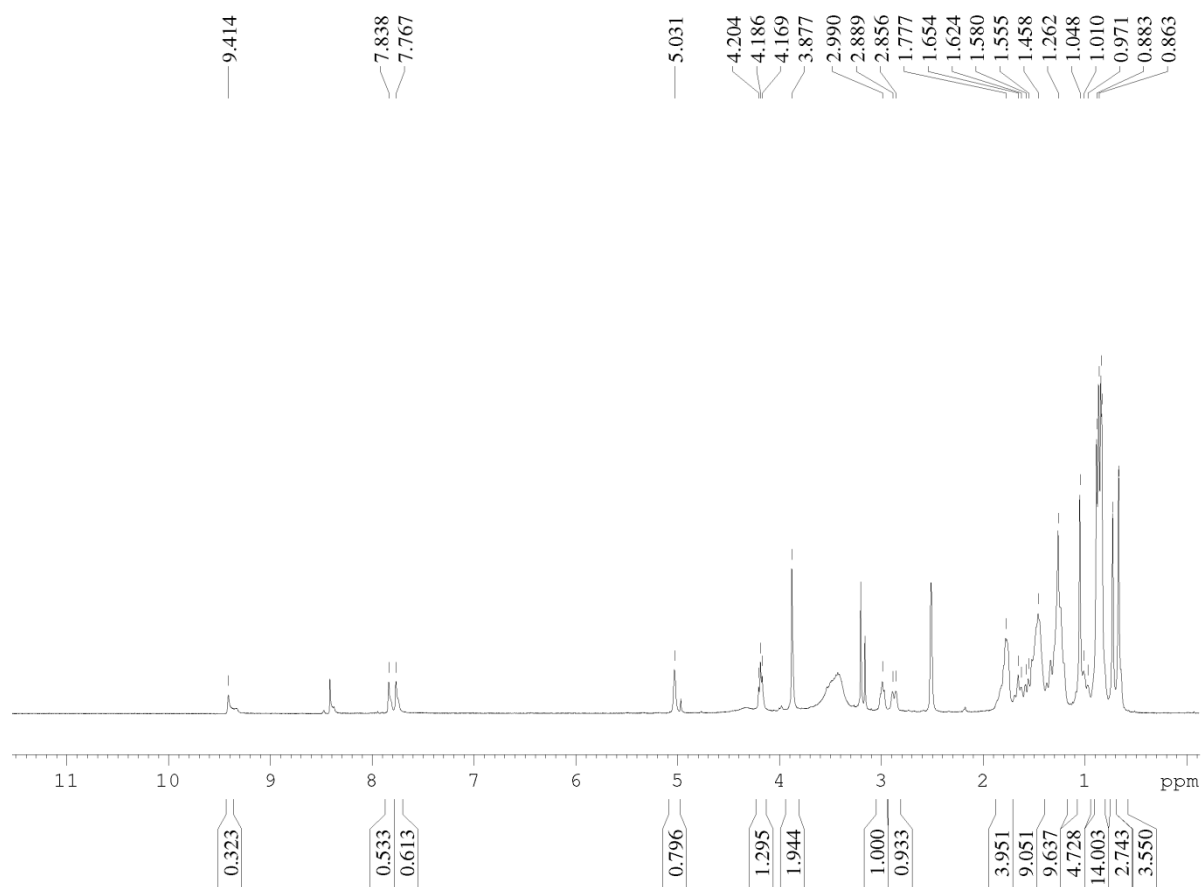


Figure S81. ^1H NMR Spectrum of compound **15c** (400 MHz, DMSO-d_6)



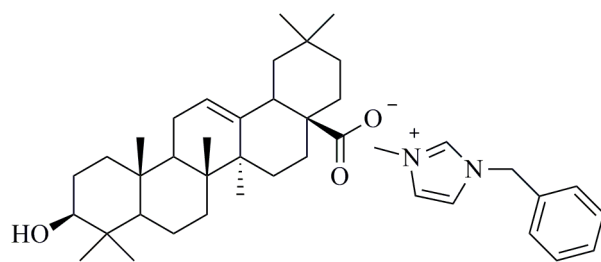


Figure S82. ^{13}C NMR Spectrum of compound **15d** (100 MHz, DMSO-d_6)

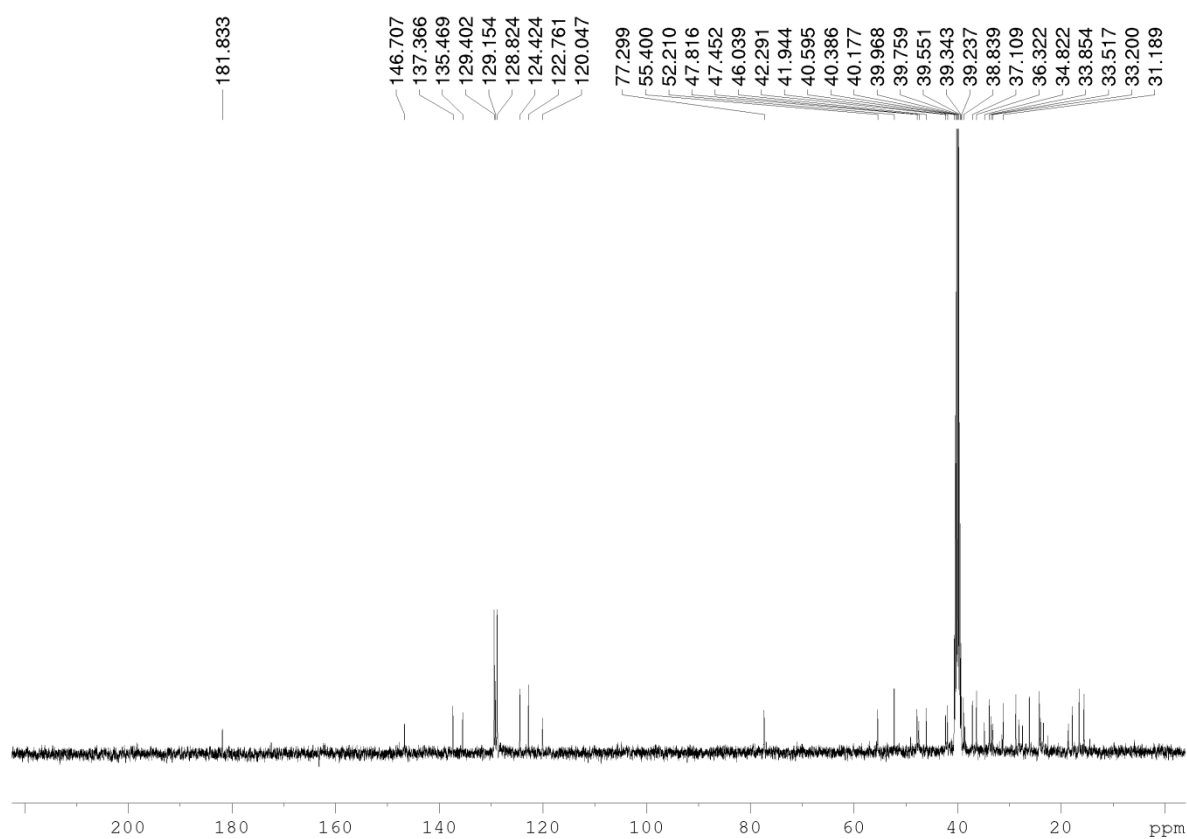
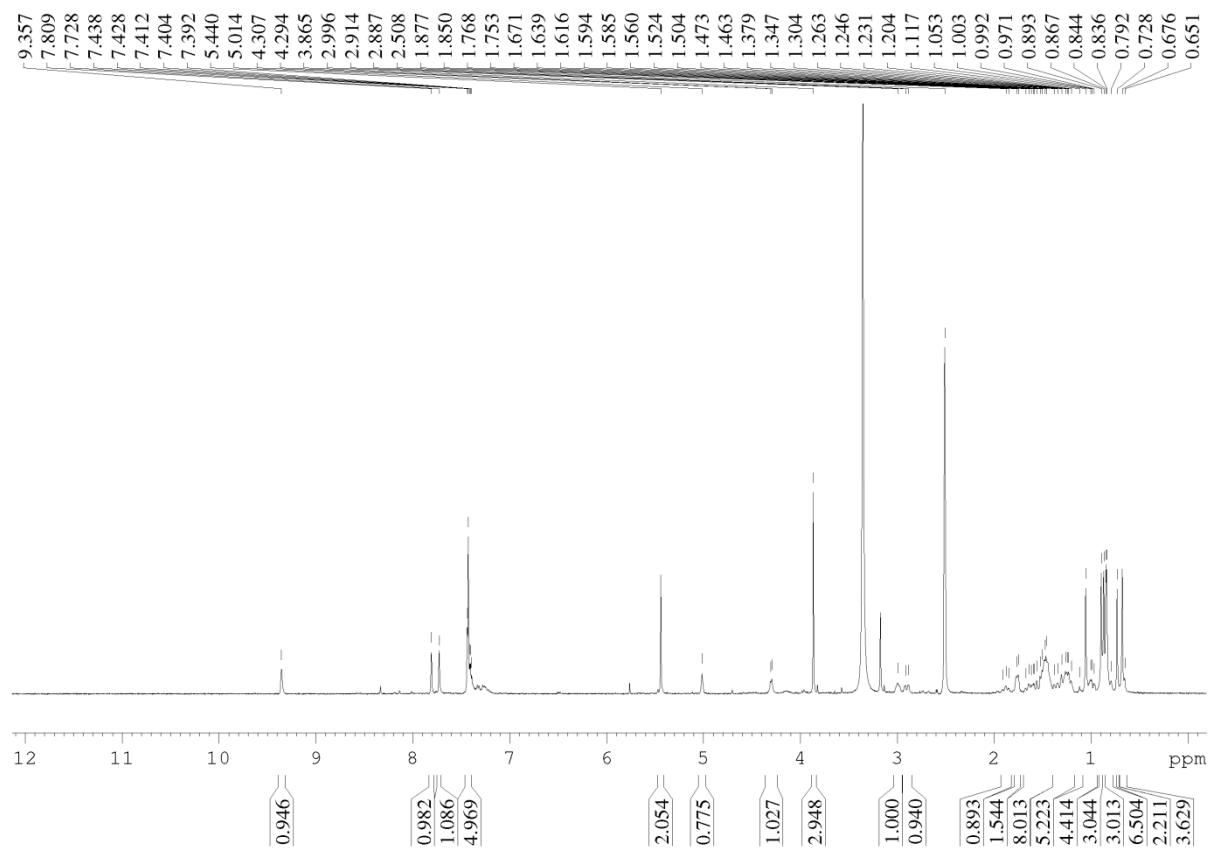


Figure S83. ^1H NMR Spectrum of compound **15d** (400 MHz, DMSO-d_6)



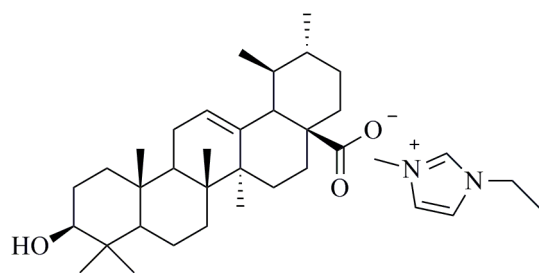


Figure S84. ^{13}C NMR Spectrum of compound **16a** (100 MHz, DMSO-d_6)

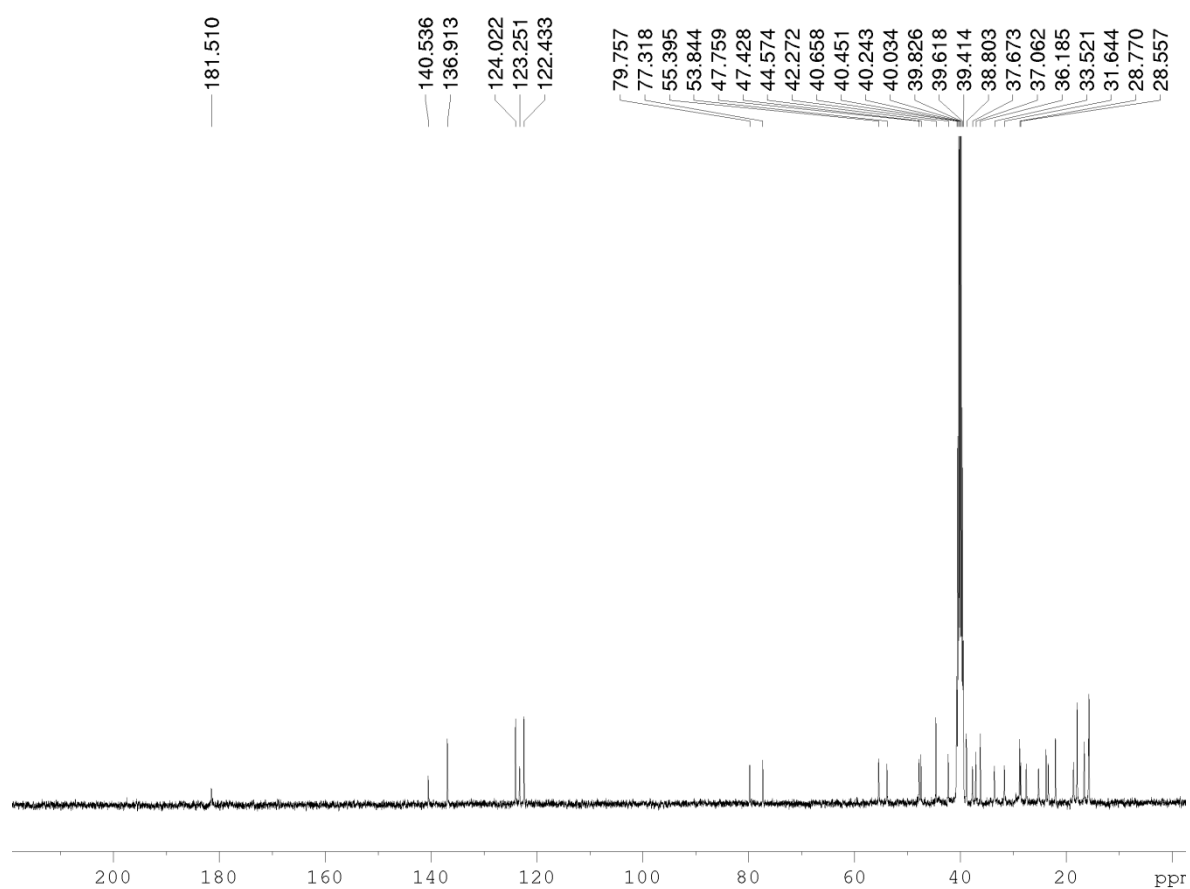
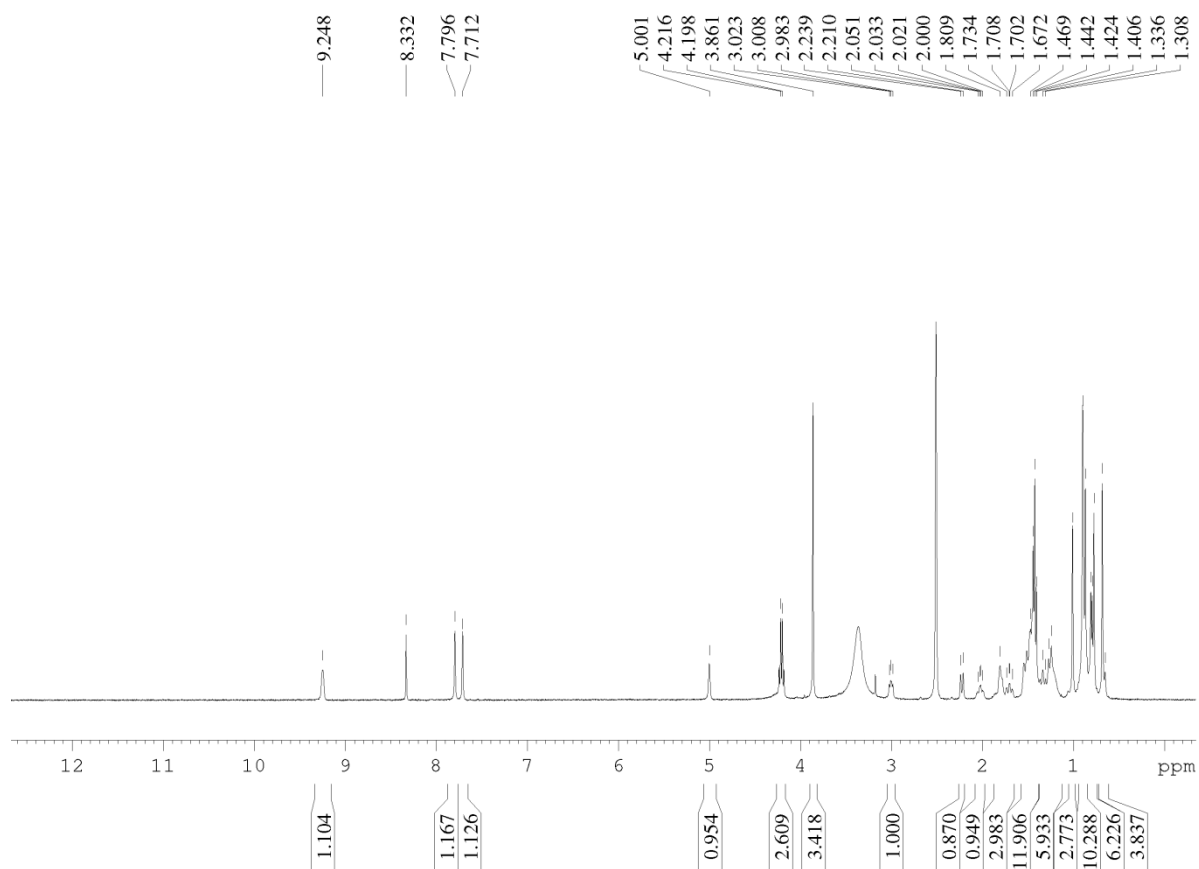


Figure S85. ^1H NMR Spectrum of compound **16a** (400 MHz, DMSO-d_6)



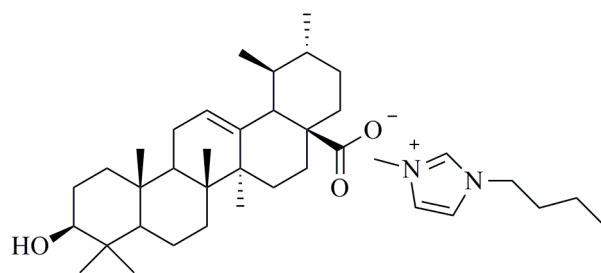


Figure S86. ^{13}C NMR Spectrum of compound **16b** (100 MHz, DMSO-d_6)

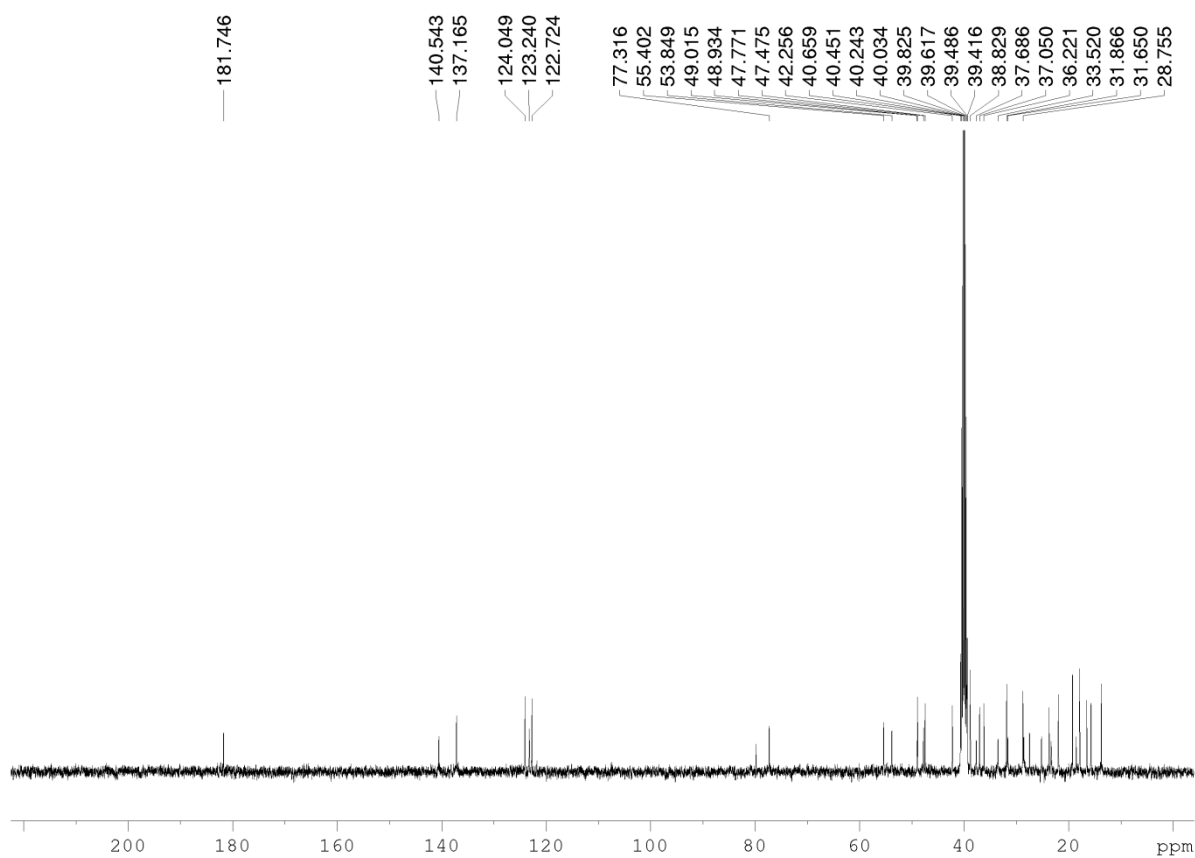
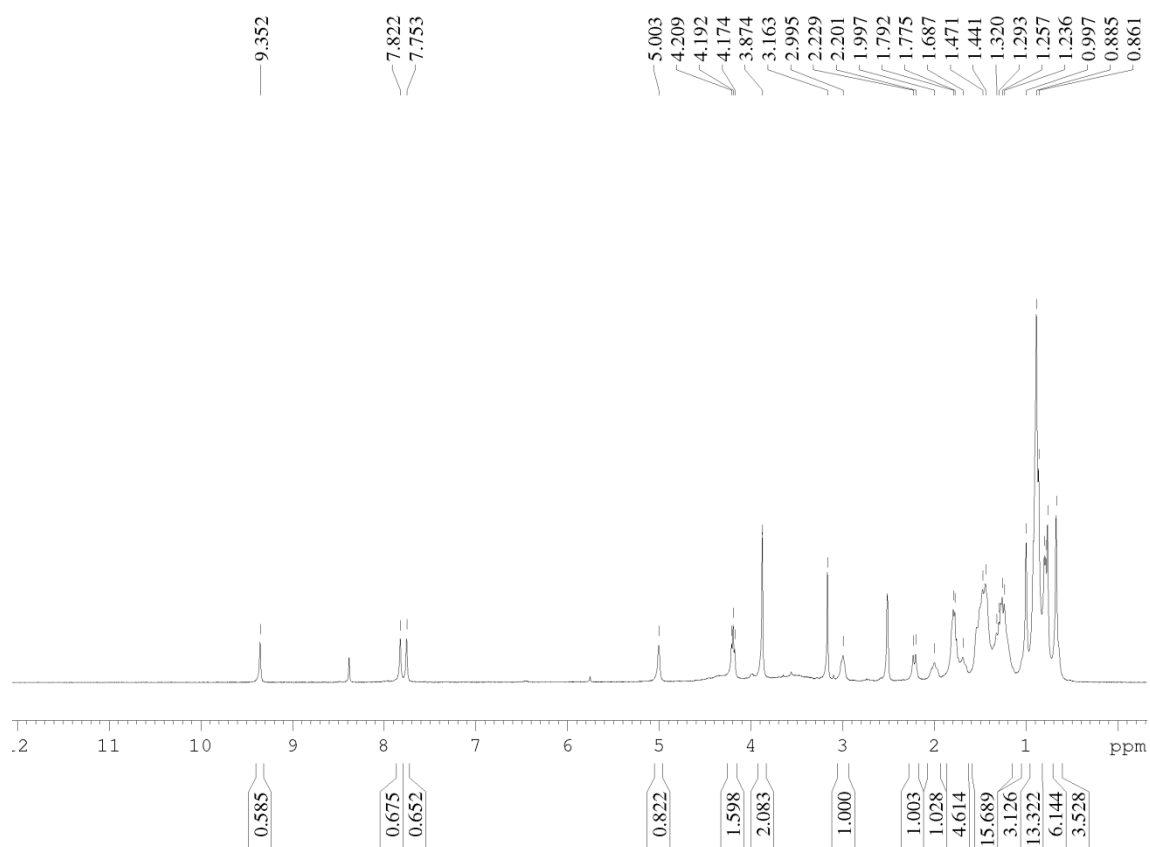


Figure S87. ^1H NMR Spectrum of compound **16b** (400 MHz, DMSO-d_6)



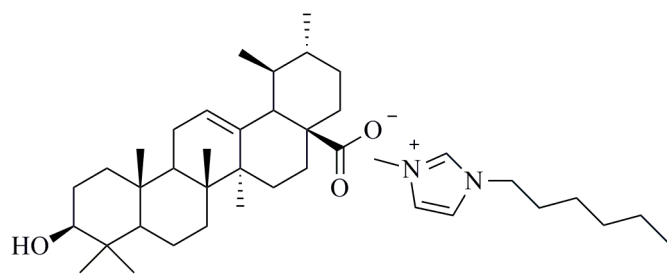


Figure S88. ^{13}C NMR Spectrum of compound **16c** (100 MHz, DMSO-d_6)

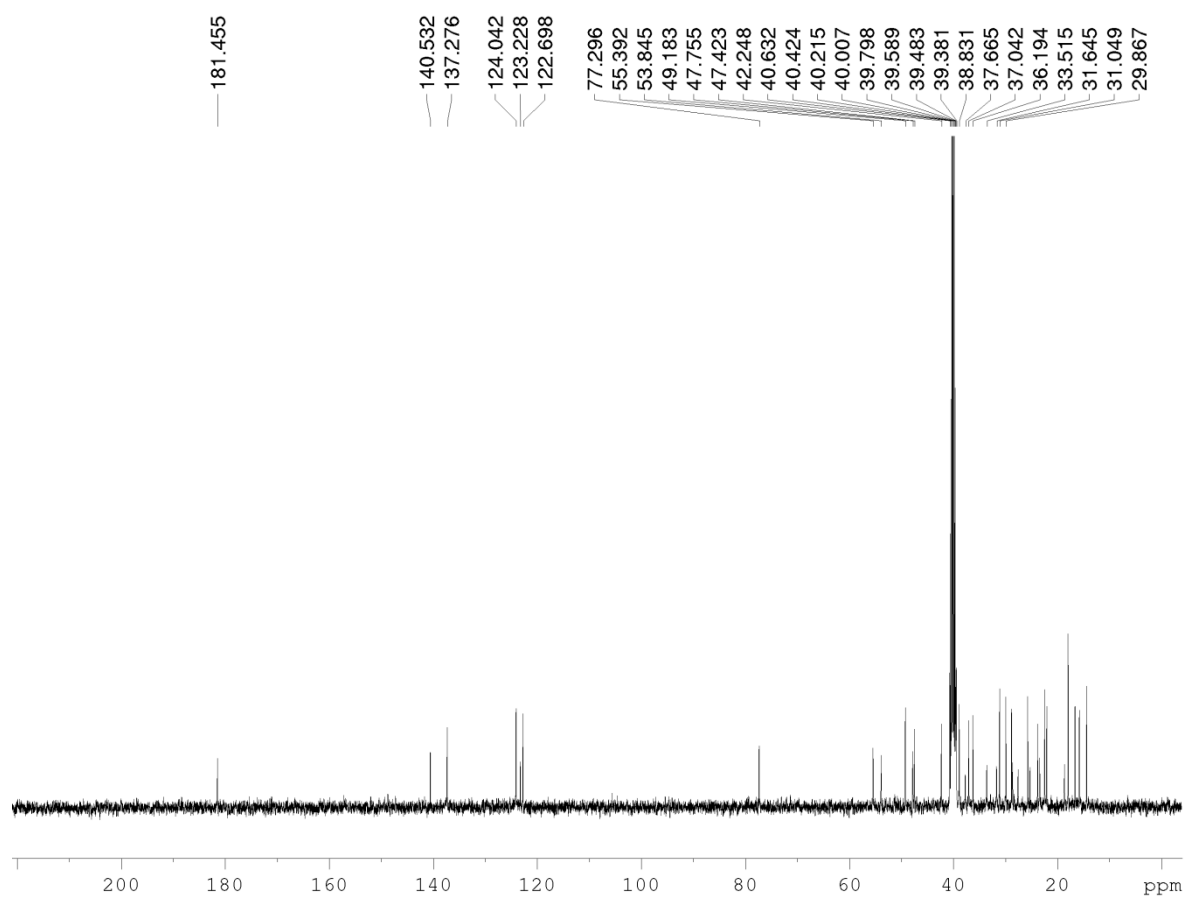
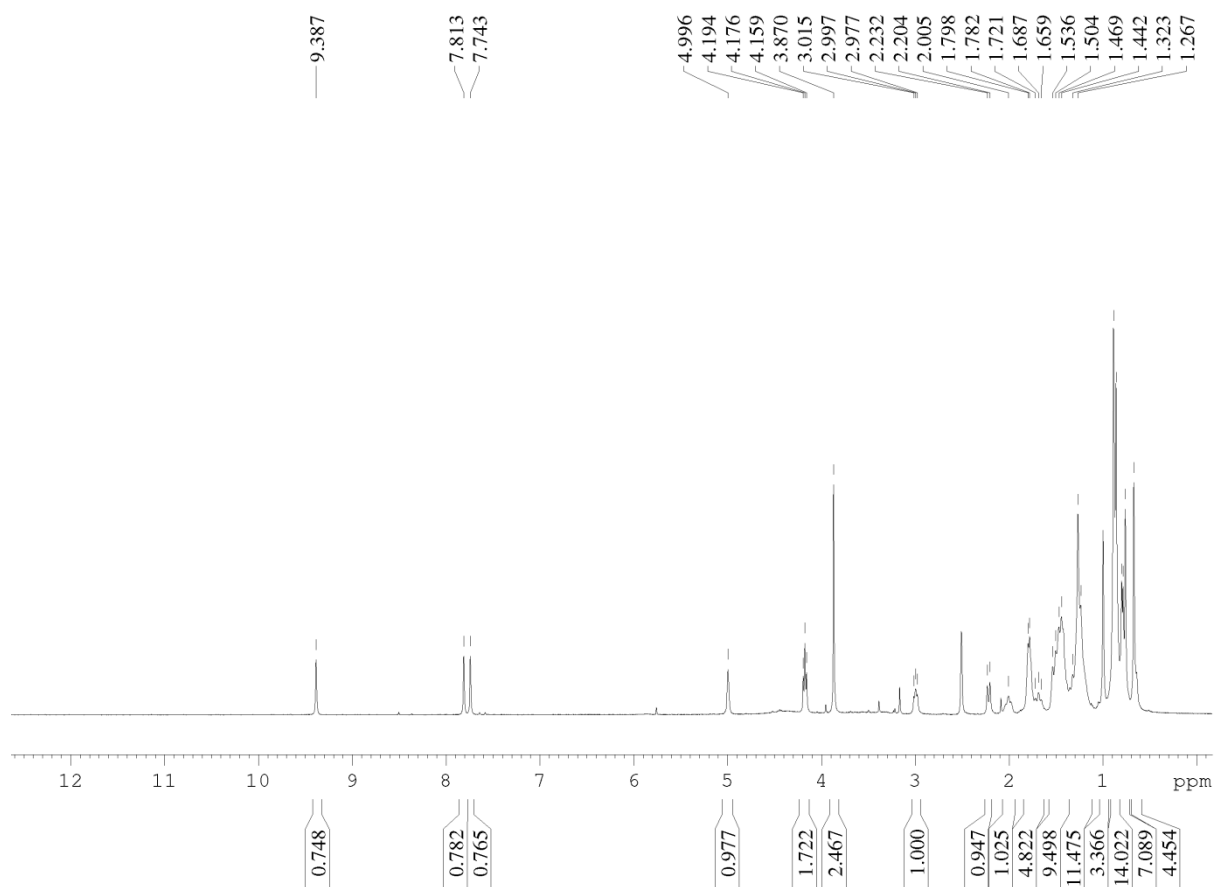


Figure S89. ^1H NMR Spectrum of compound **16c** (400 MHz, DMSO-d_6)



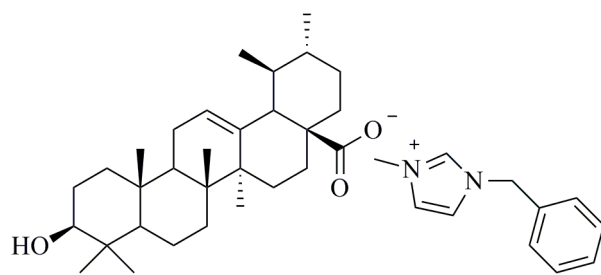


Figure S90. ^{13}C NMR Spectrum of compound **16d** (100 MHz, DMSO-d_6)

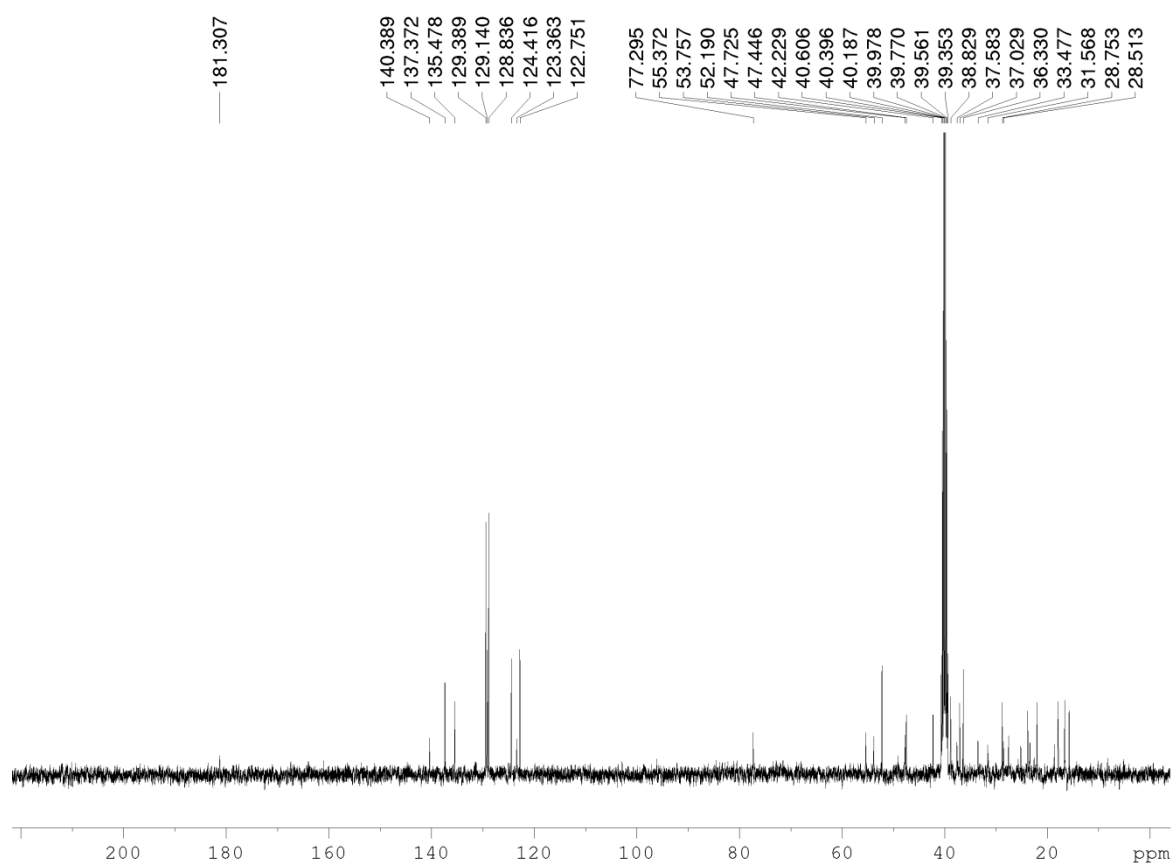
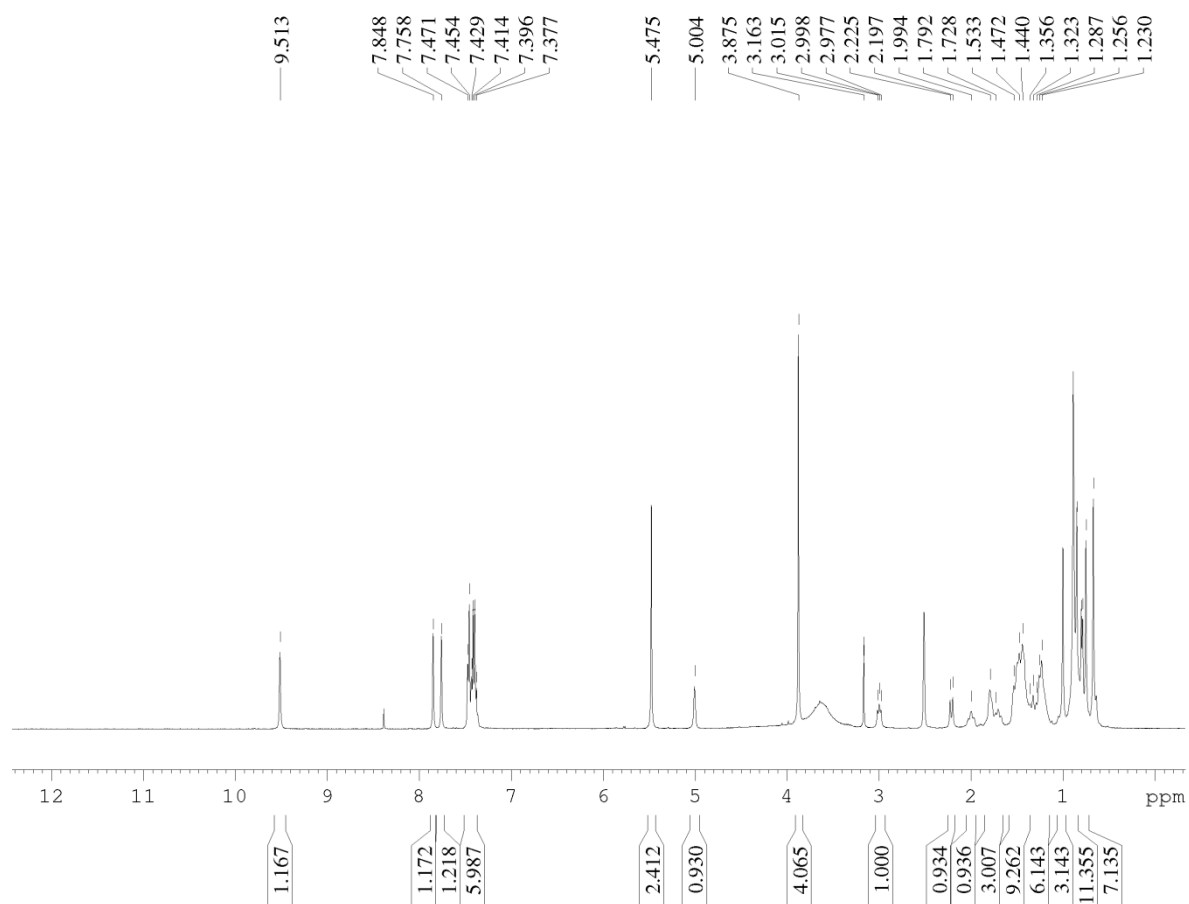


Figure S91. ^1H NMR Spectrum of compound **16d** (400 MHz, DMSO-d_6)



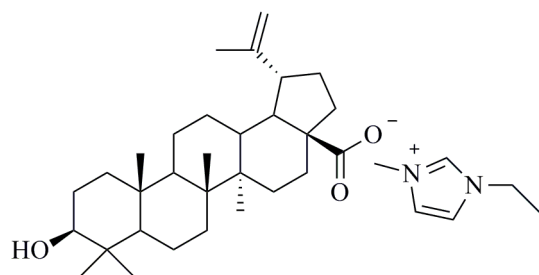


Figure S92. ^{13}C NMR Spectrum of compound **17a** (100 MHz, DMSO-d_6)

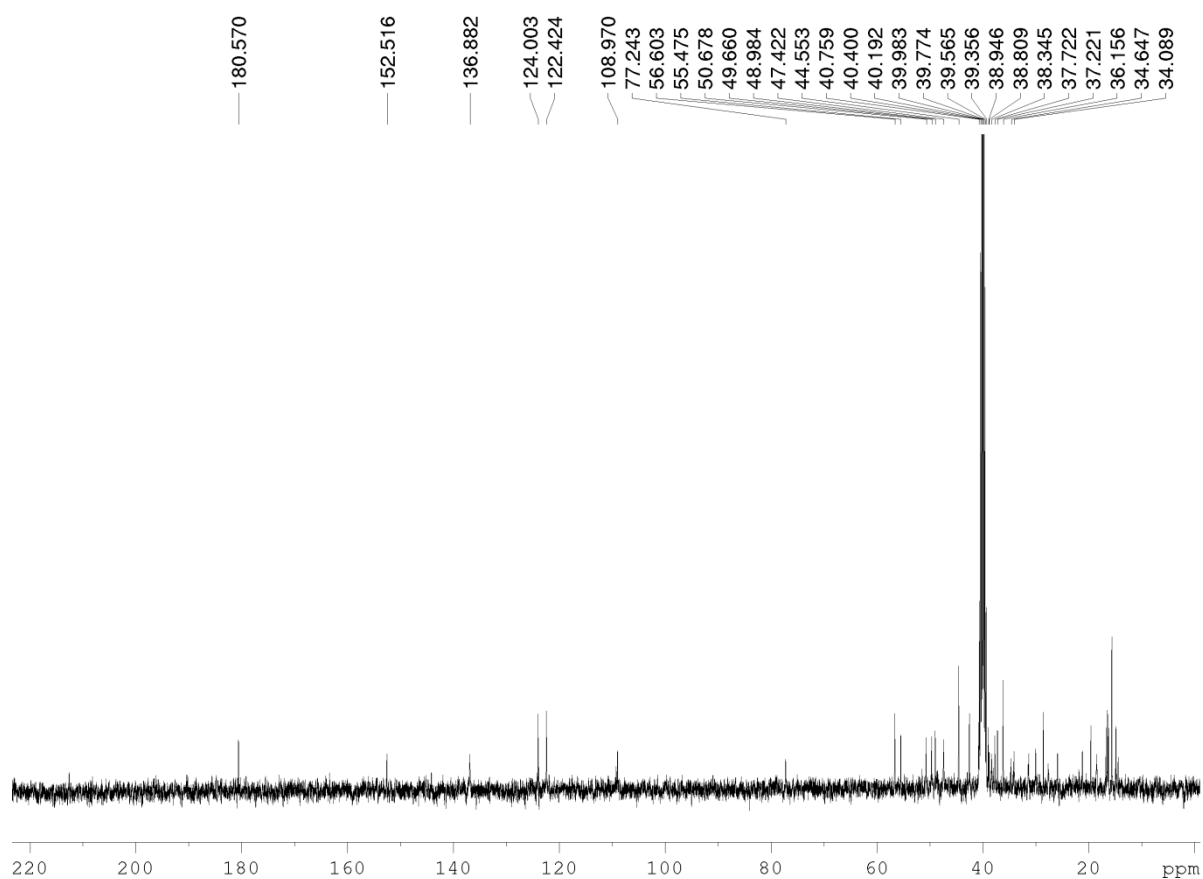
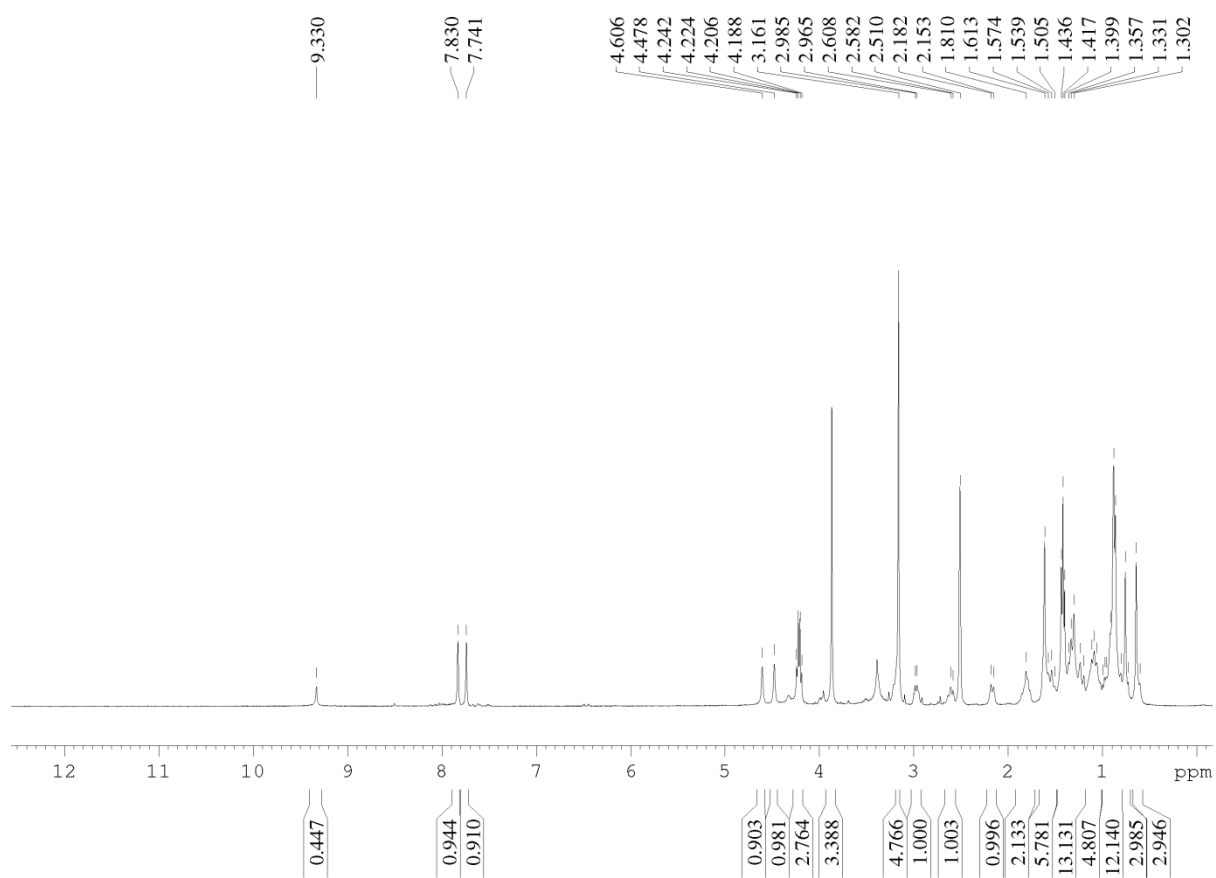


Figure S93. ^1H NMR Spectrum of compound **17a** (400 MHz, DMSO-d_6)



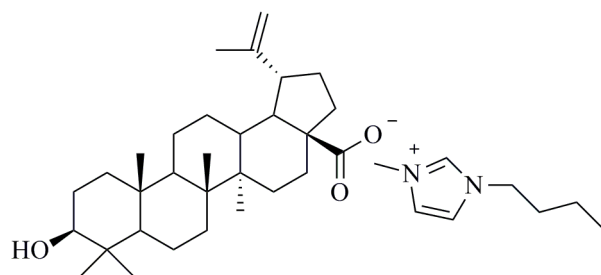


Figure S94. ^{13}C NMR Spectrum of compound **17b** (100 MHz, DMSO-d_6)

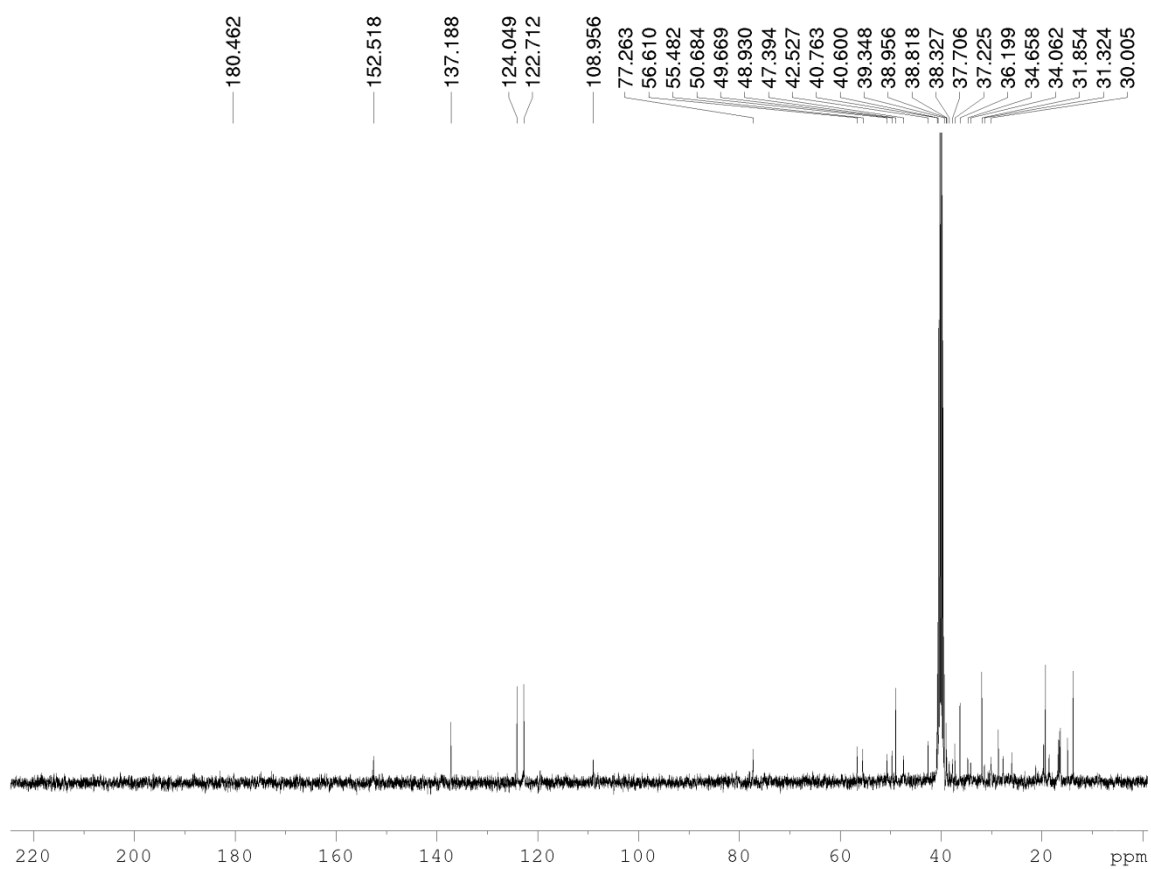
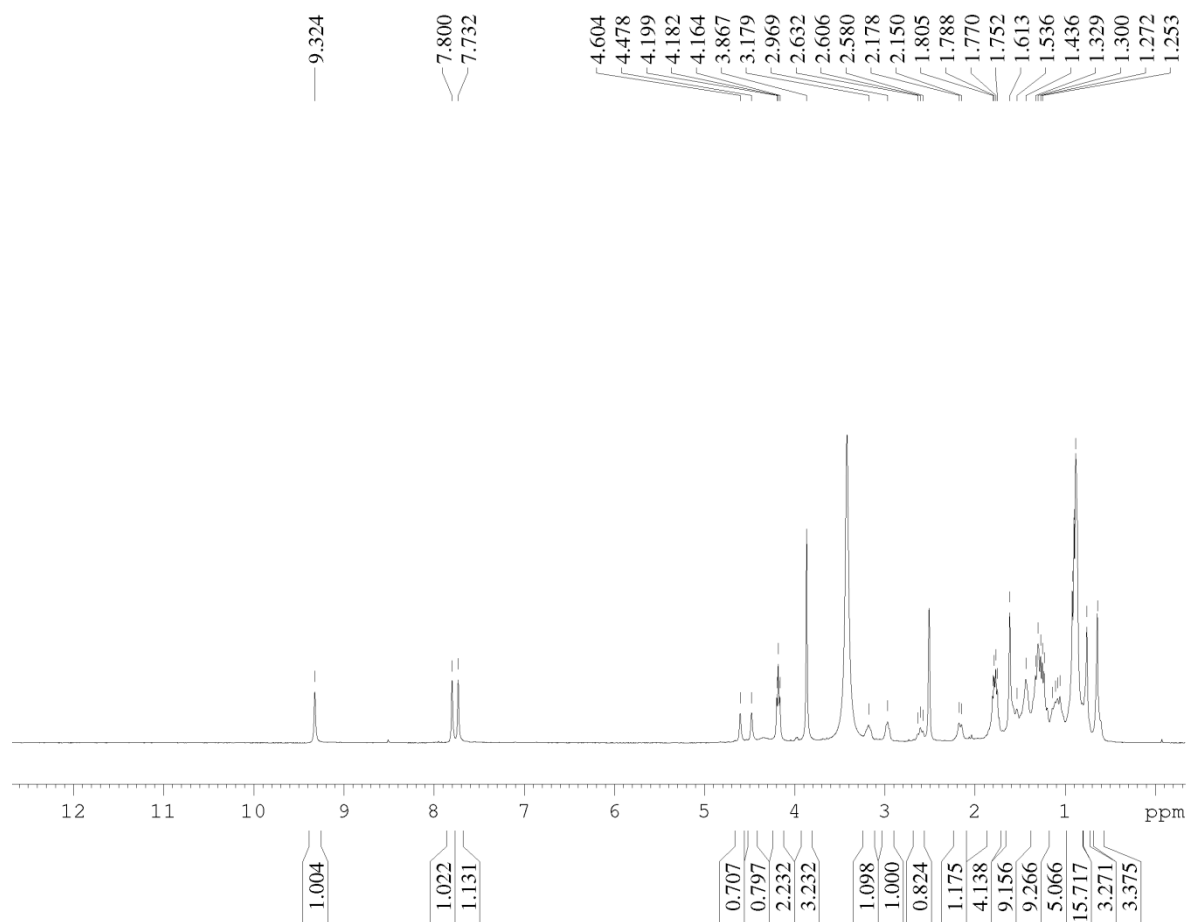


Figure S95. ^1H NMR Spectrum of compound **17b** (400 MHz, DMSO-d_6)



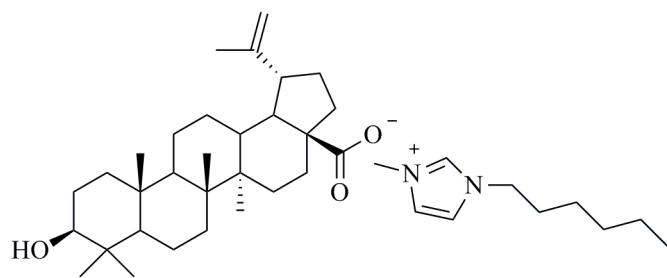


Figure S96. ^{13}C NMR Spectrum of compound **17c** (100 MHz, DMSO-d_6)

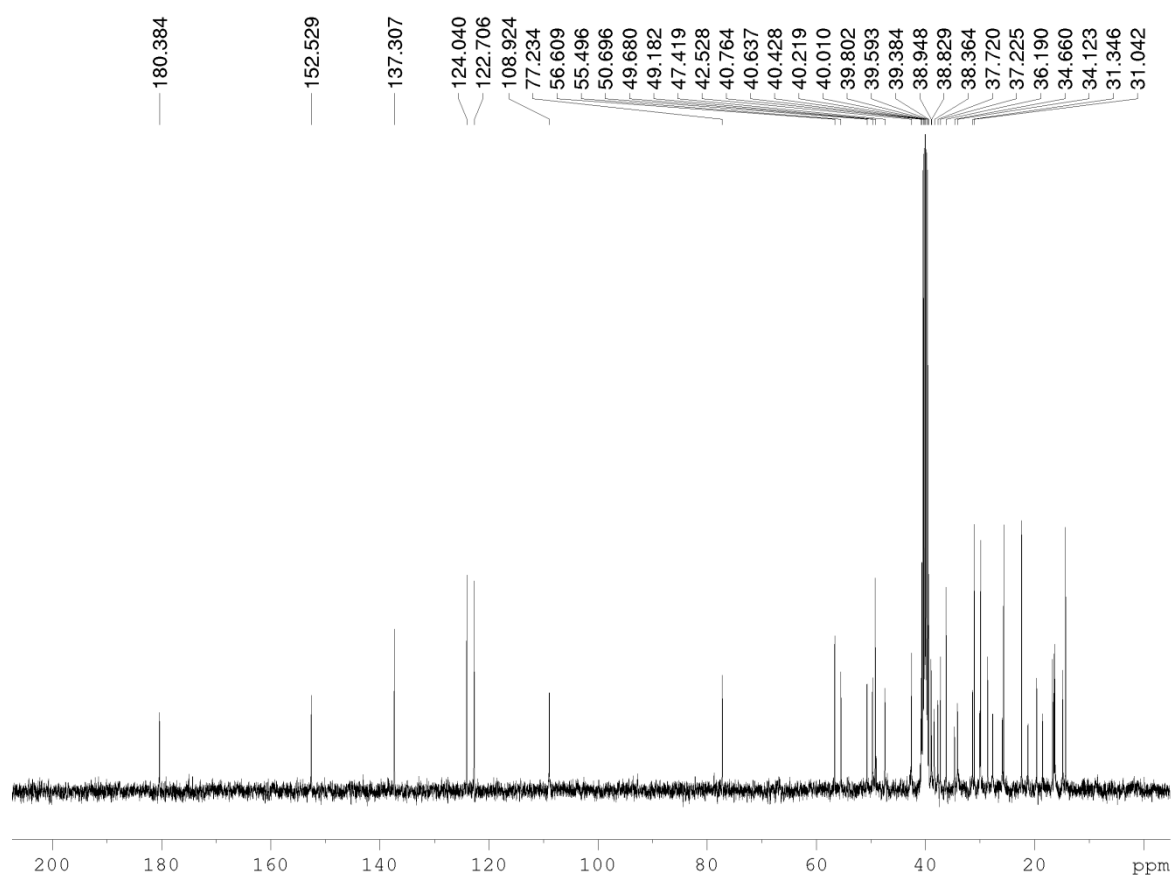
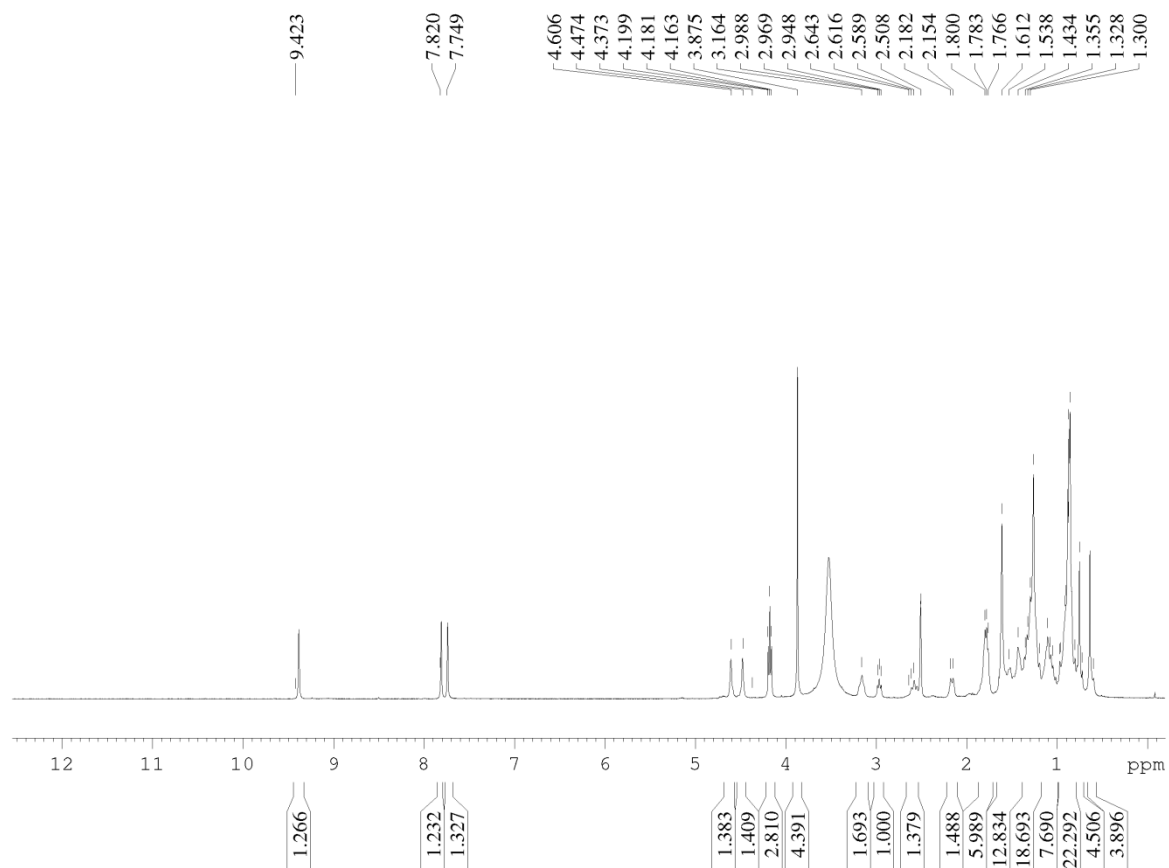


Figure S97. ^1H NMR Spectrum of compound **17c** (400 MHz, DMSO-d_6)



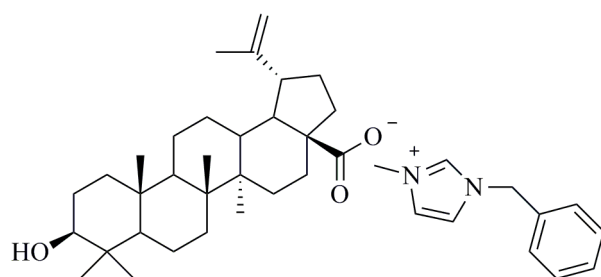


Figure S98. ^{13}C NMR Spectrum of compound **17d** (100 MHz, DMSO-d_6)

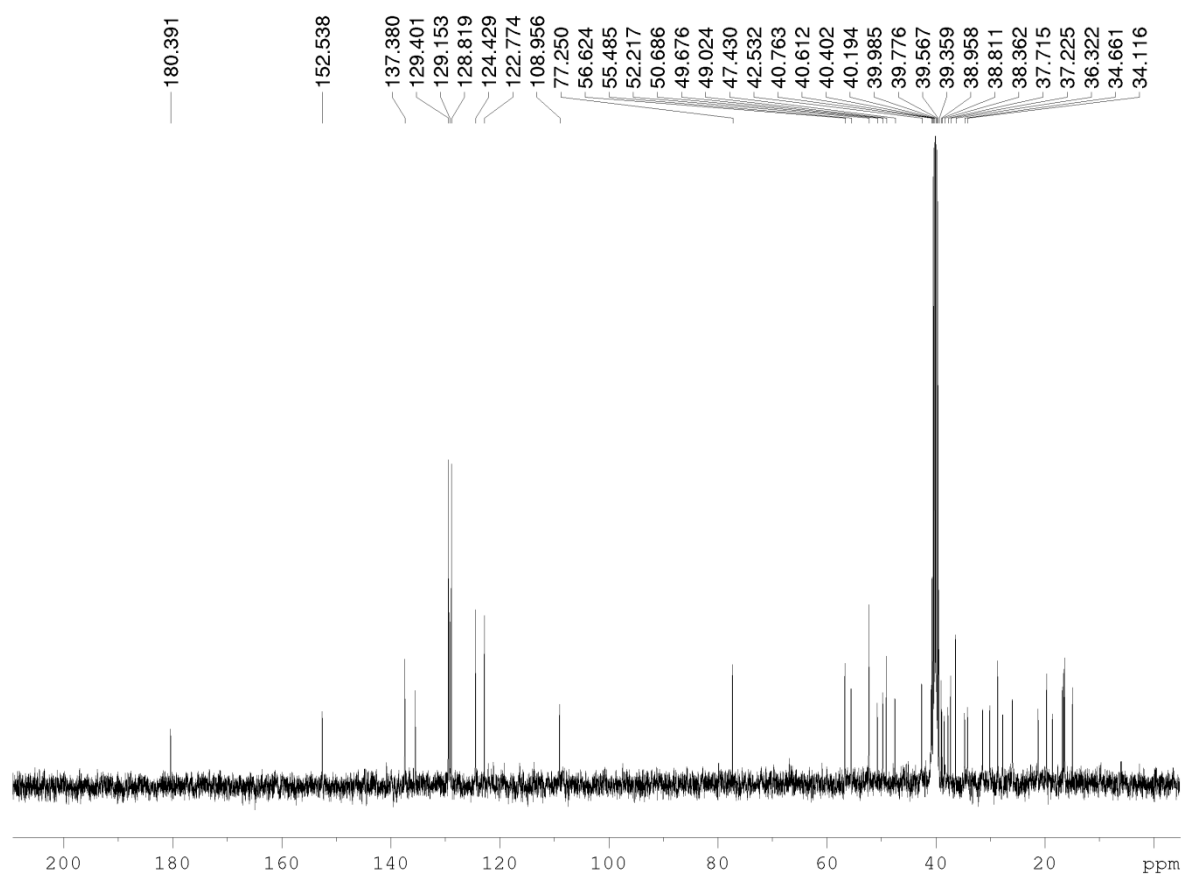


Figure S99. ^1H NMR Spectrum of compound **17d** (400 MHz, DMSO-d_6)

