

Synthesis of gypsogenin and gypsogenic acid derivatives with antitumor activity by damaging cell membranes

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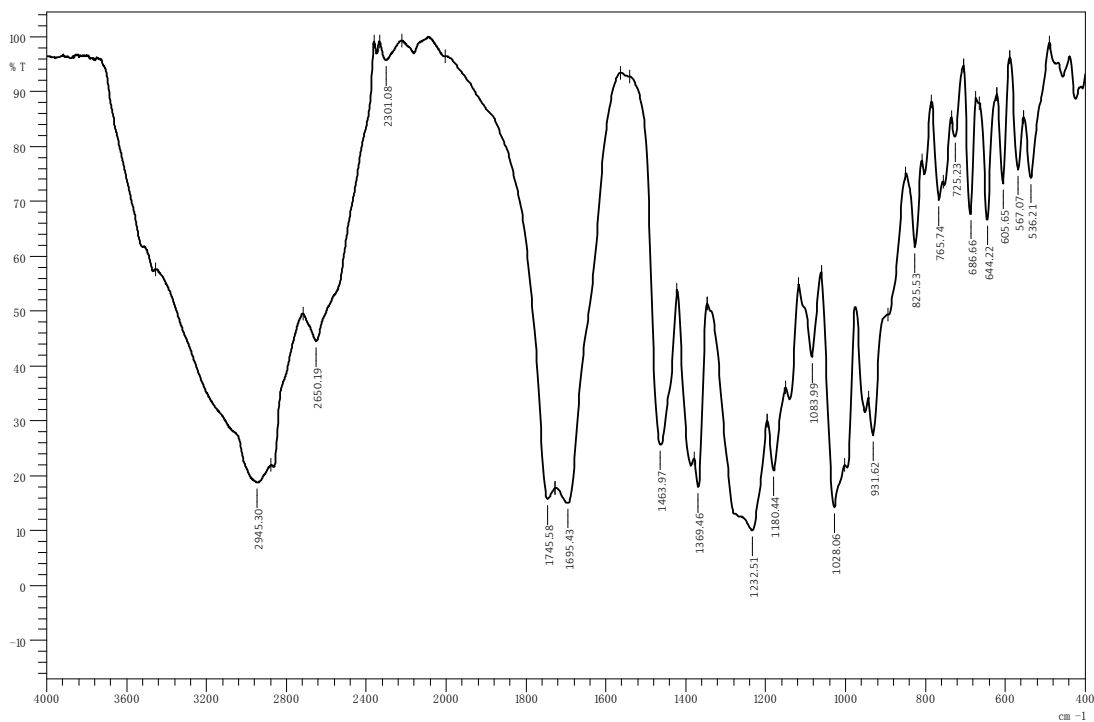
Supporting Information

Contents

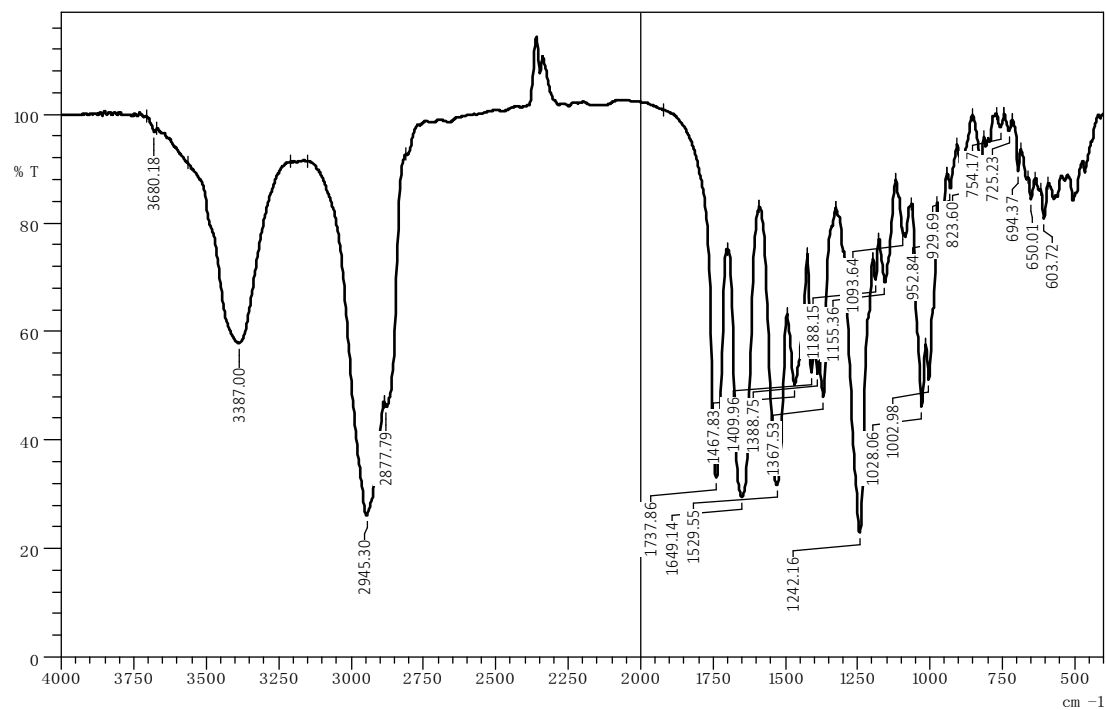
IR(KBr) of compounds 3-14d.....	错误! 未定义书签。
Mass spectra of compounds 3-14d.....	25
¹ H NMR(600 MHz) of compounds 3-14d.....	41
¹³ C NMR(150 MHz) of compounds 3-14d.....	63

IR(KBr) of compounds 3-14d

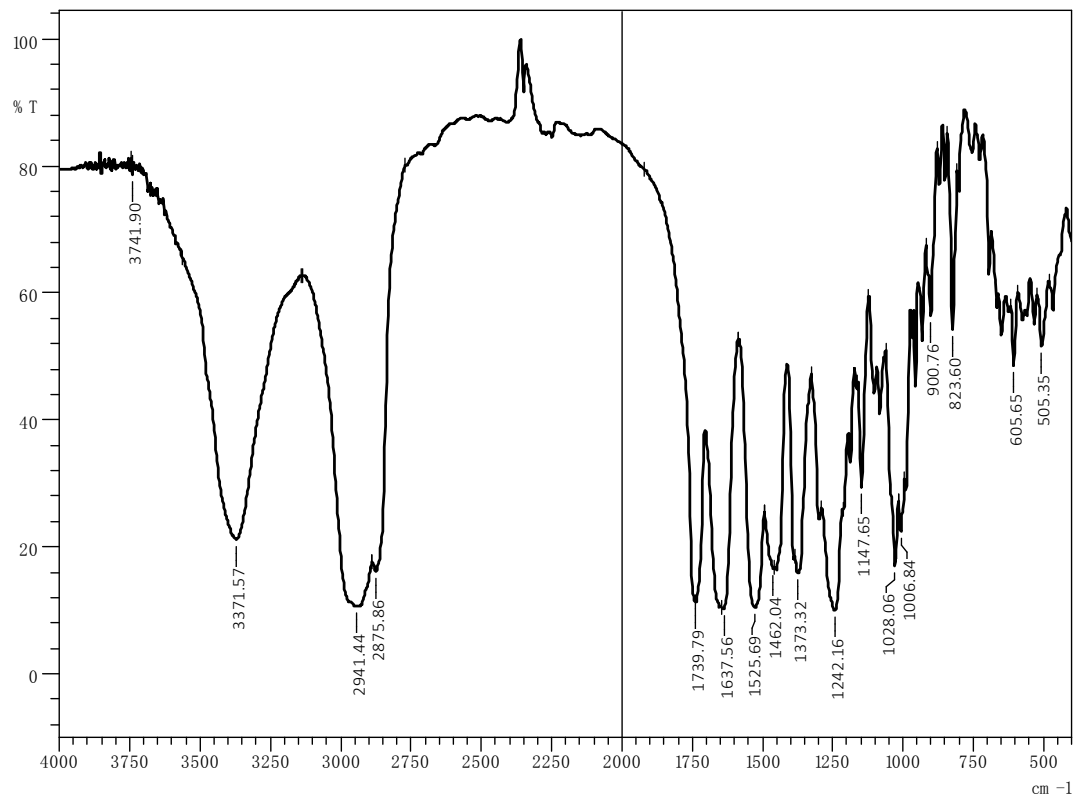
For compound **3**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



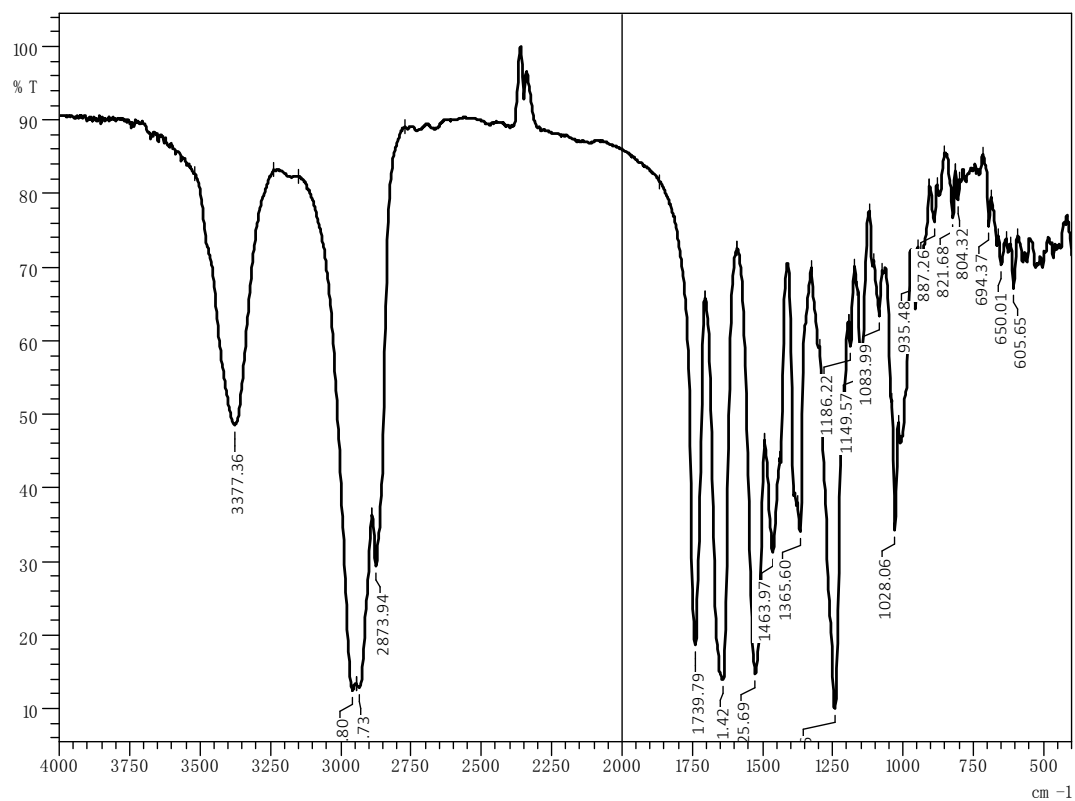
For compound **4a**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



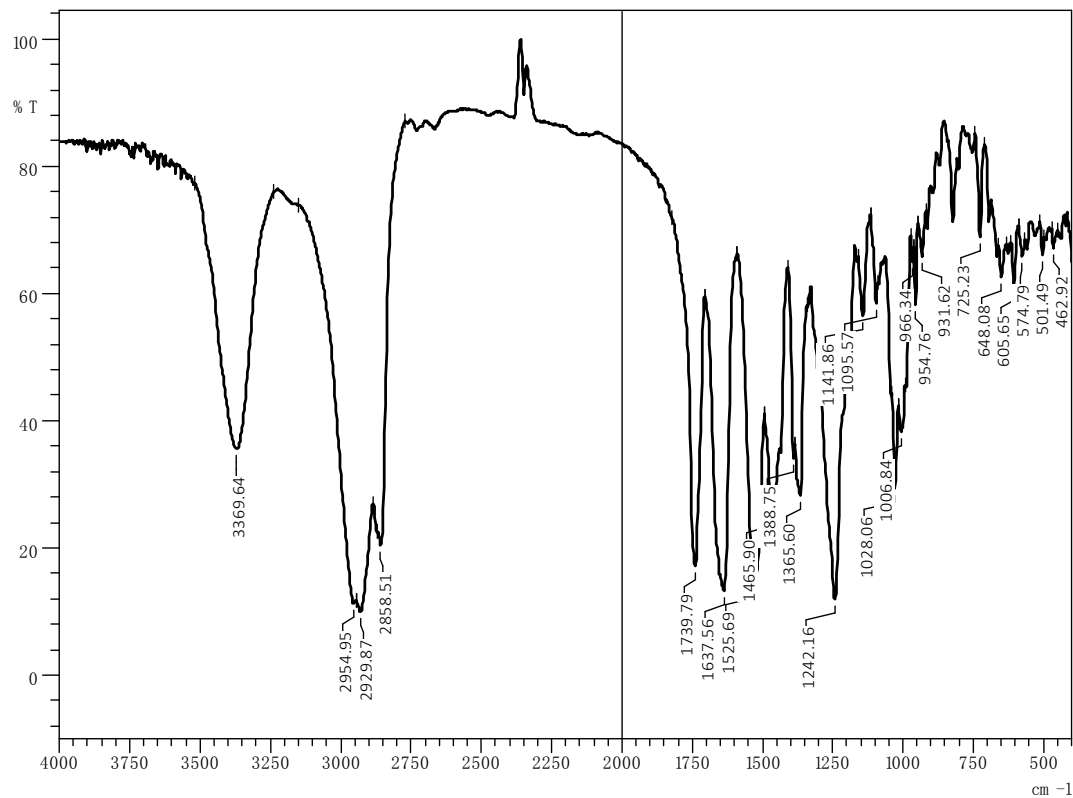
For compound **4b**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



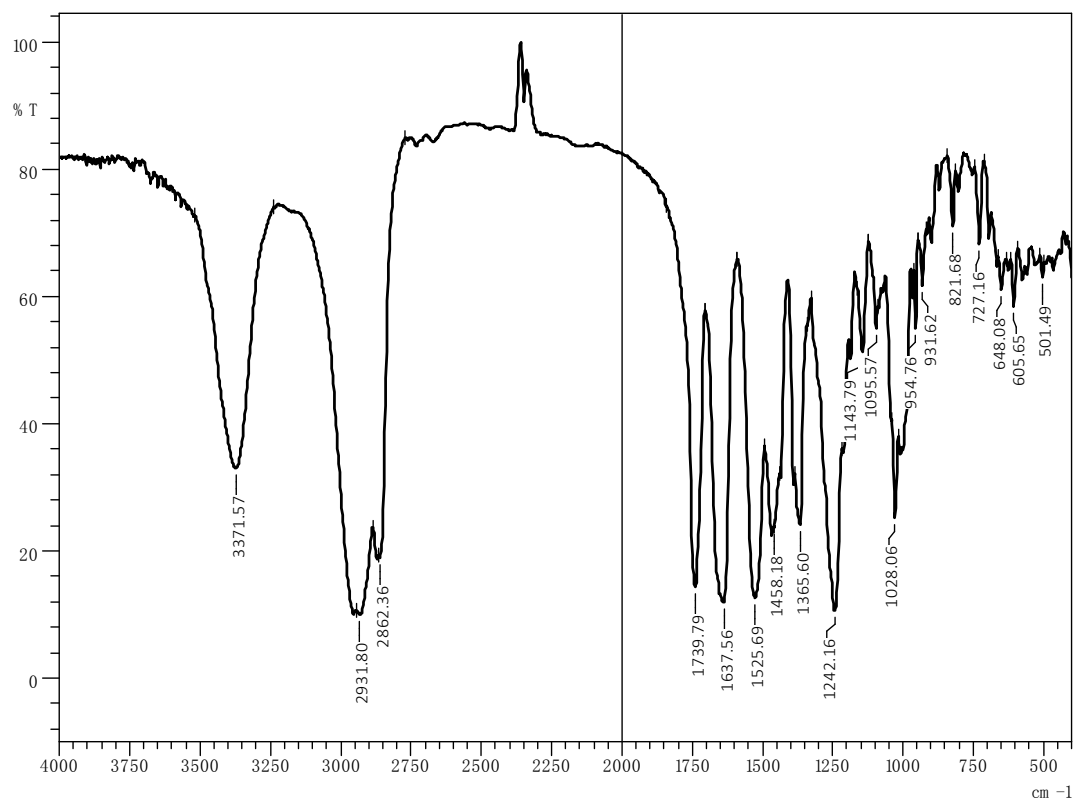
For compound **4c**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



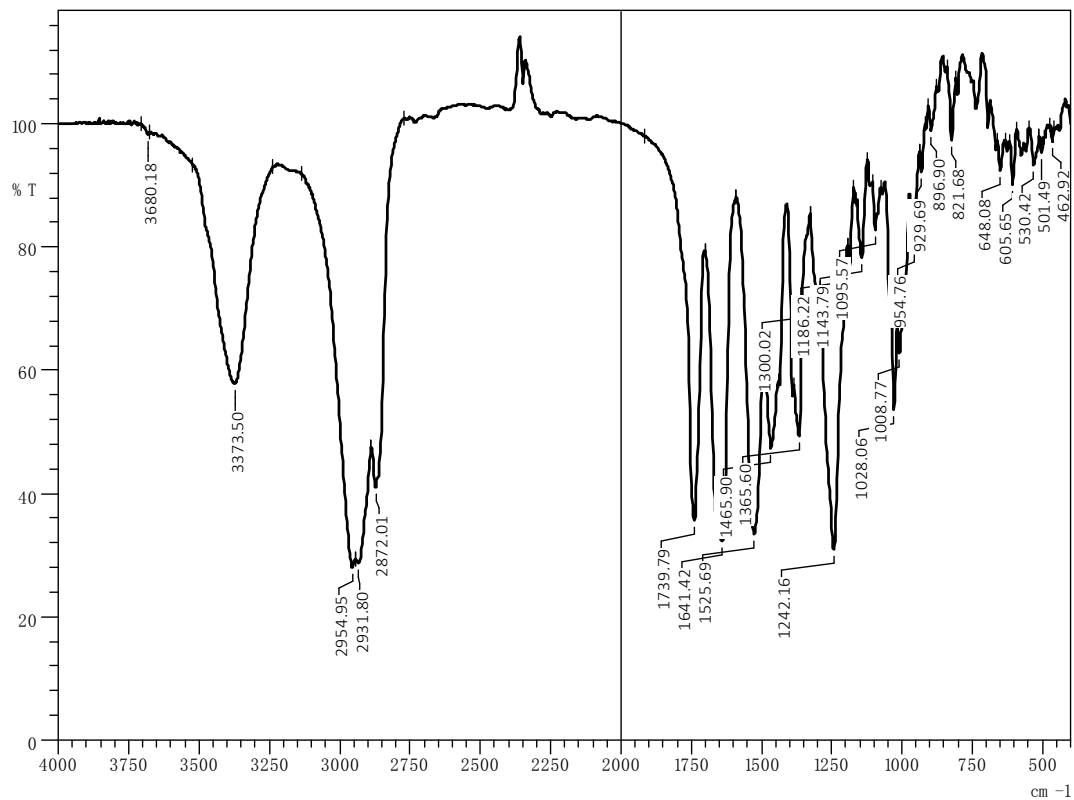
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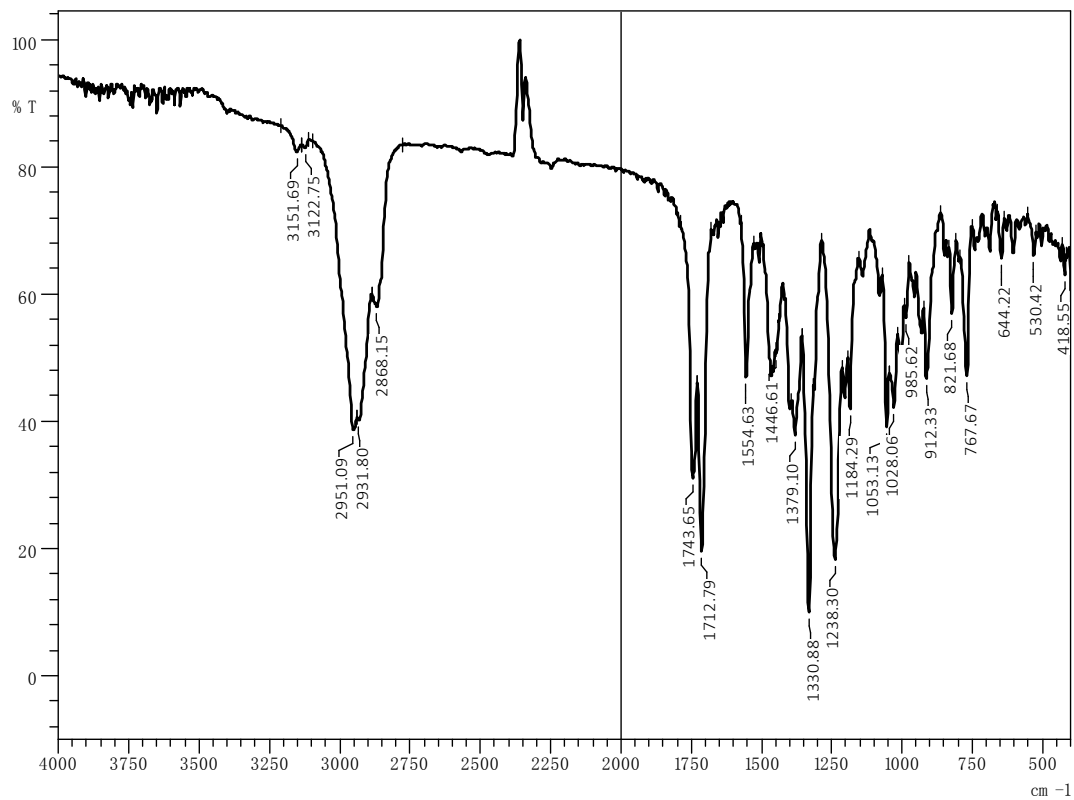
For compound **4e**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



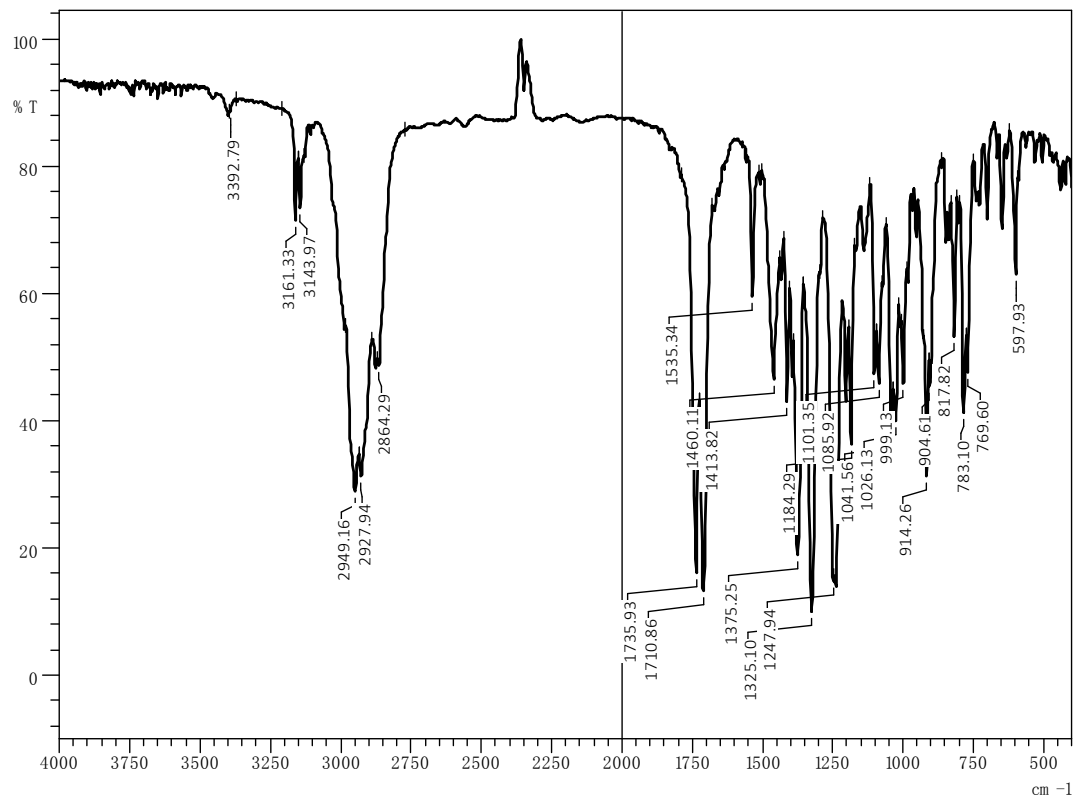
For compound **4f**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



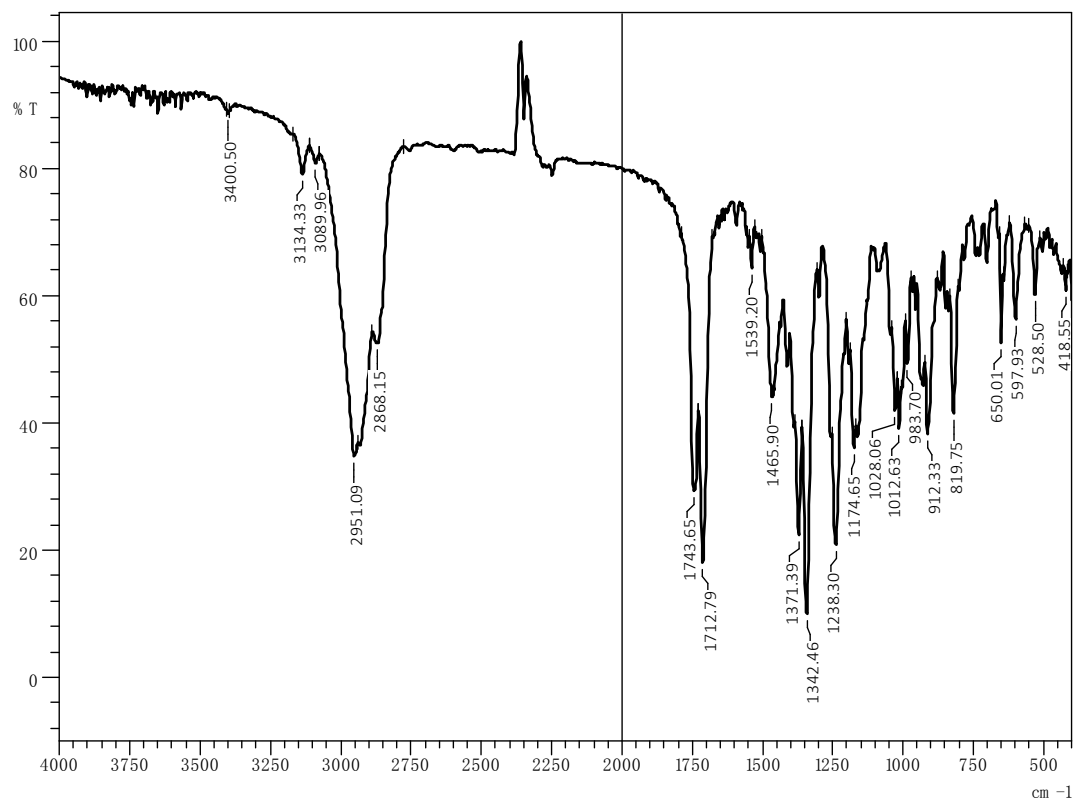
For compound **5a**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



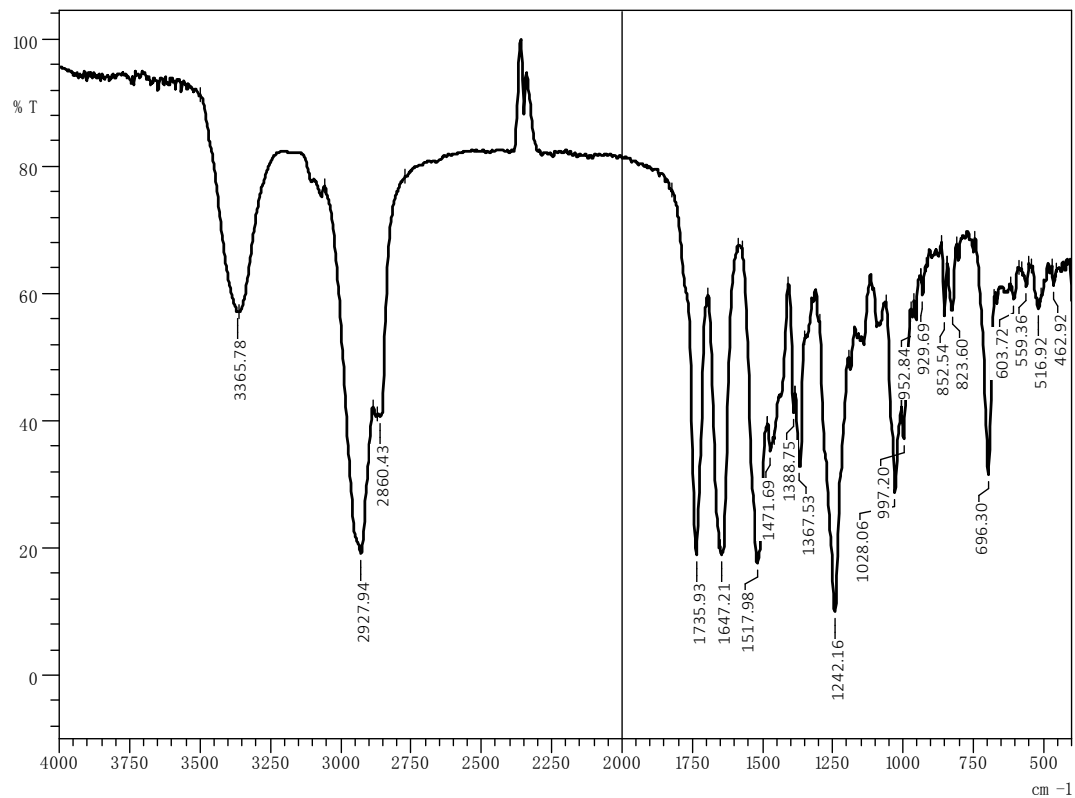
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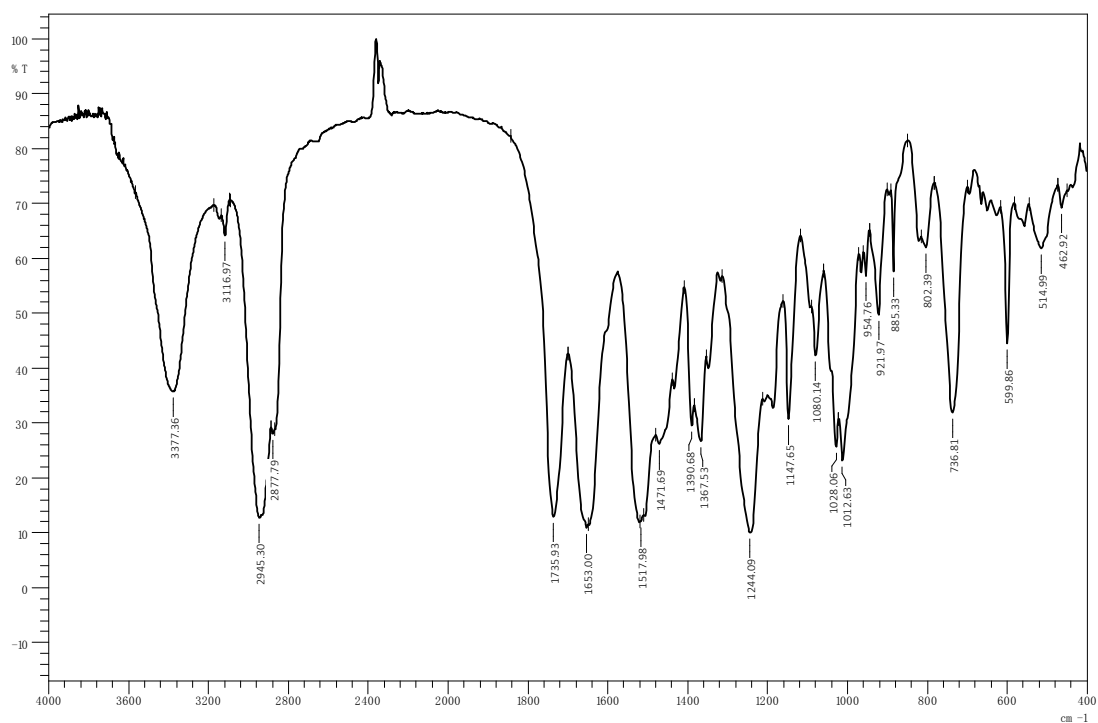
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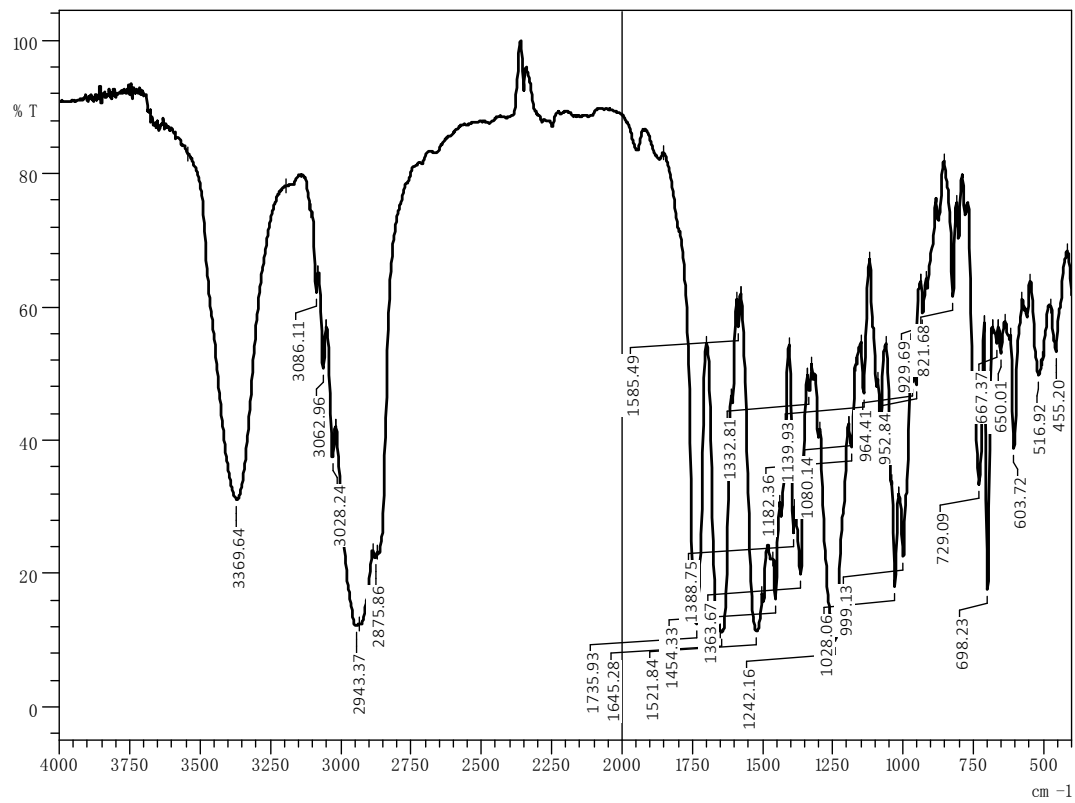
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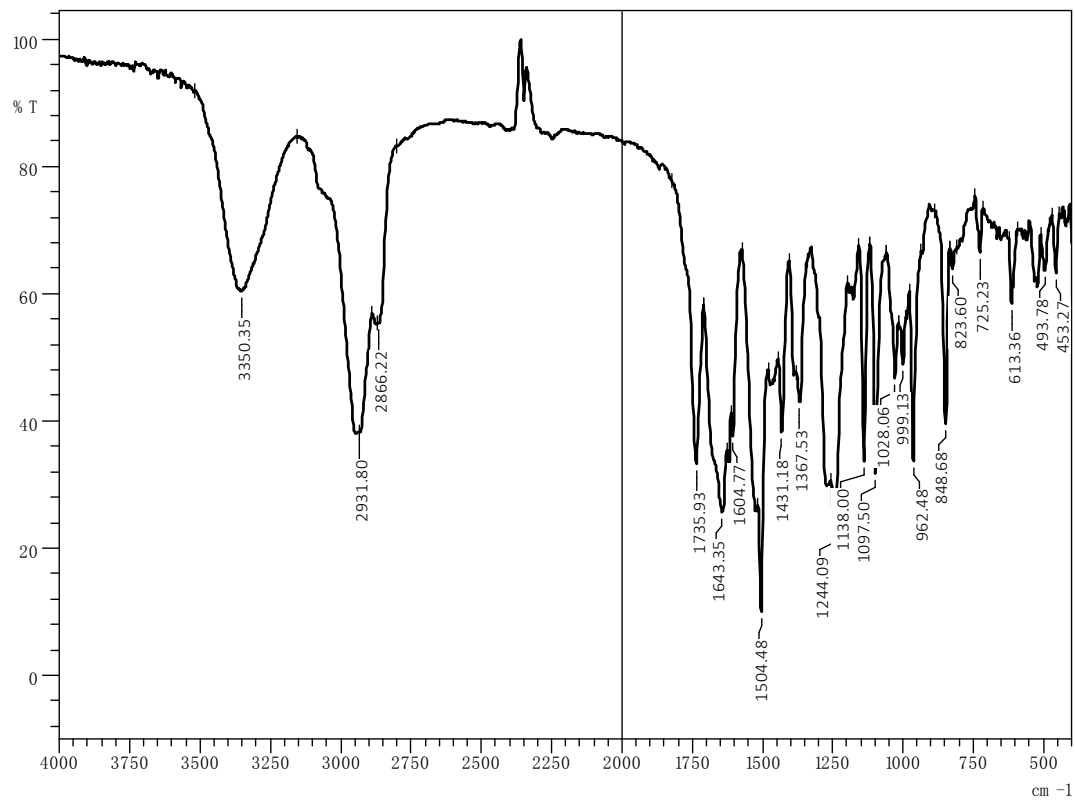
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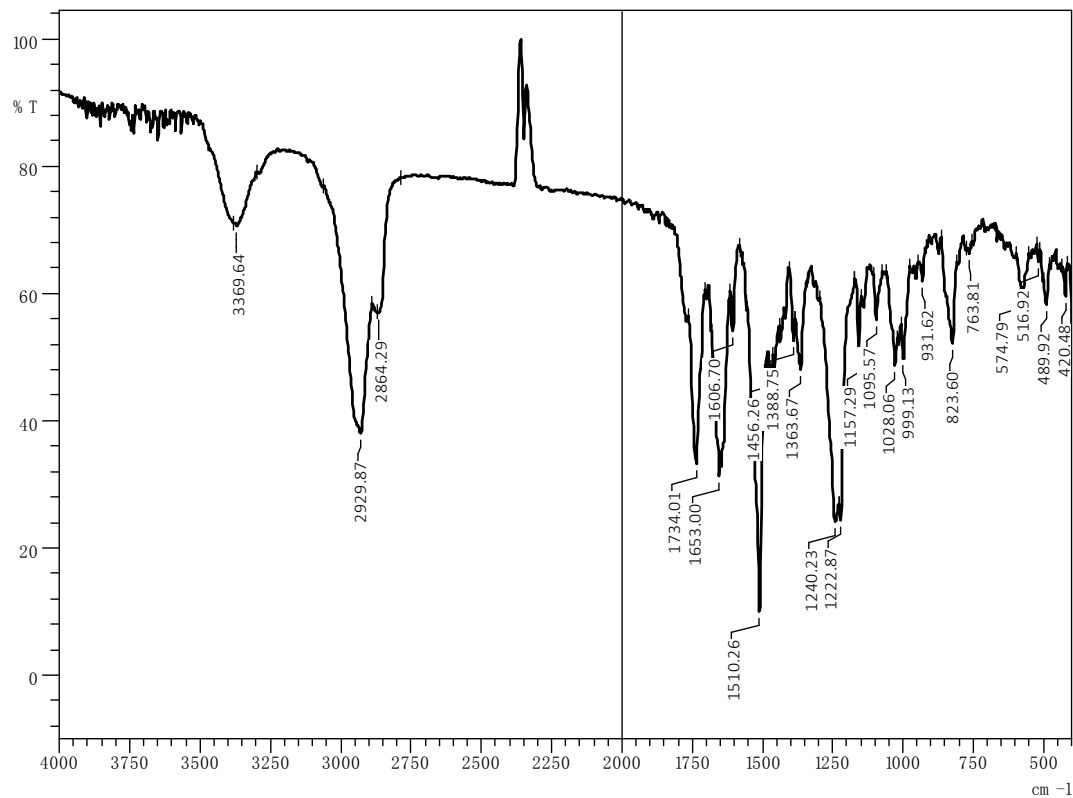
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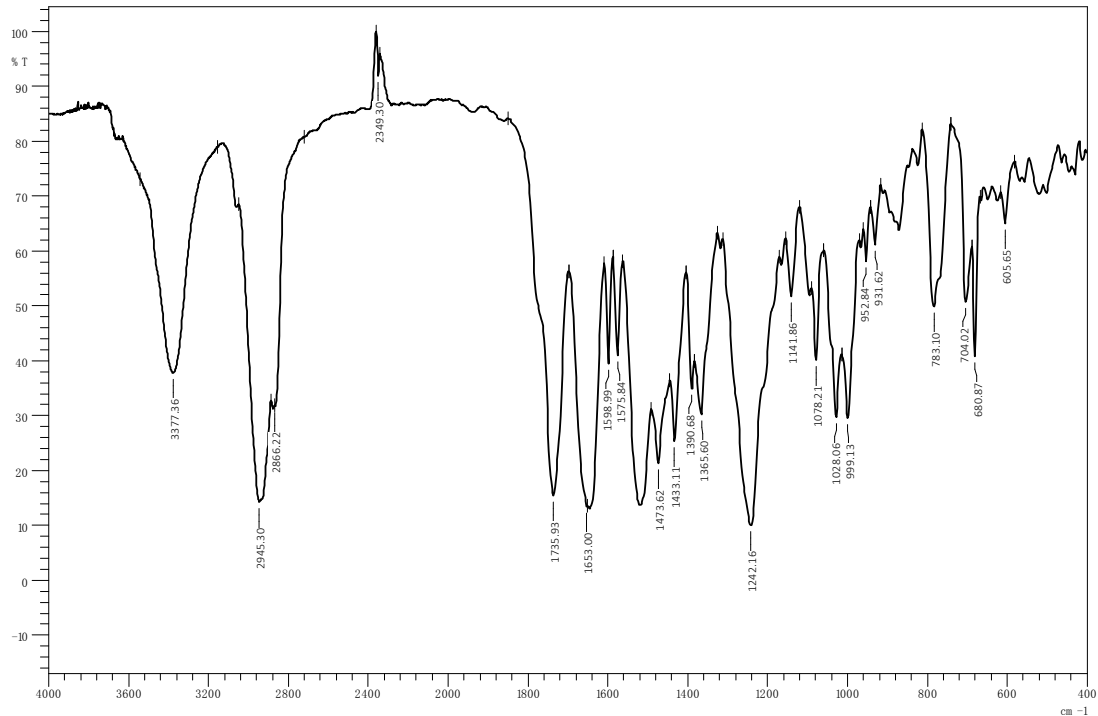
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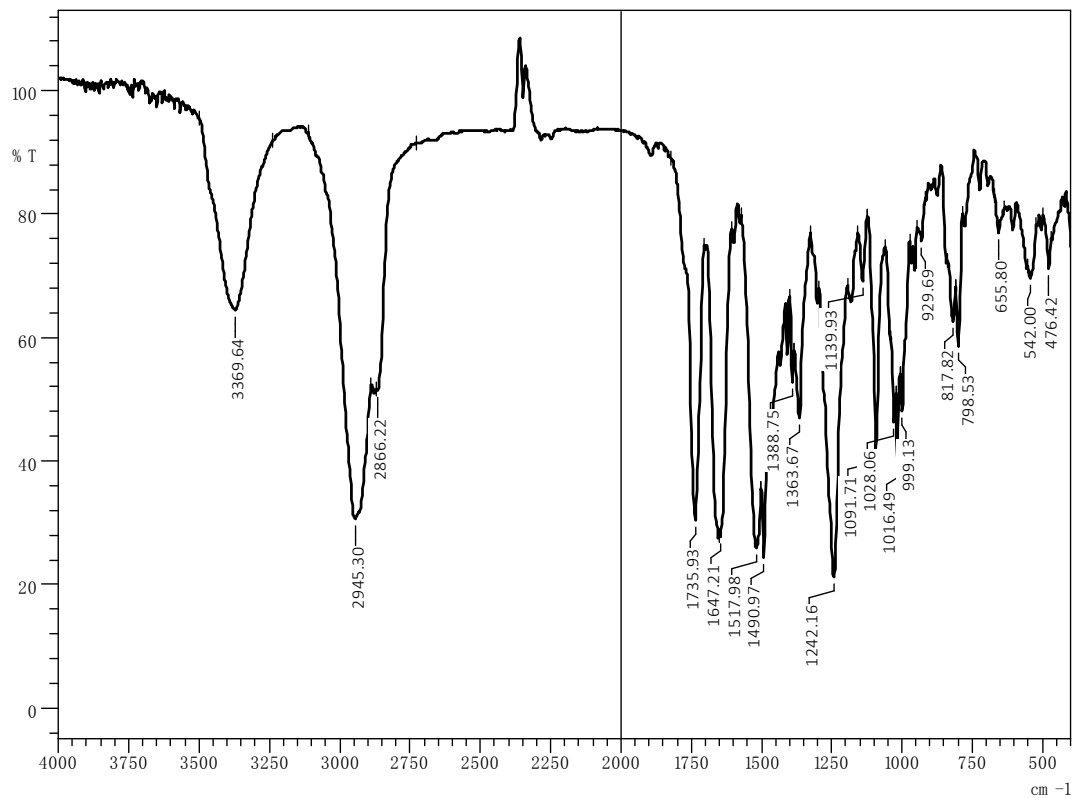
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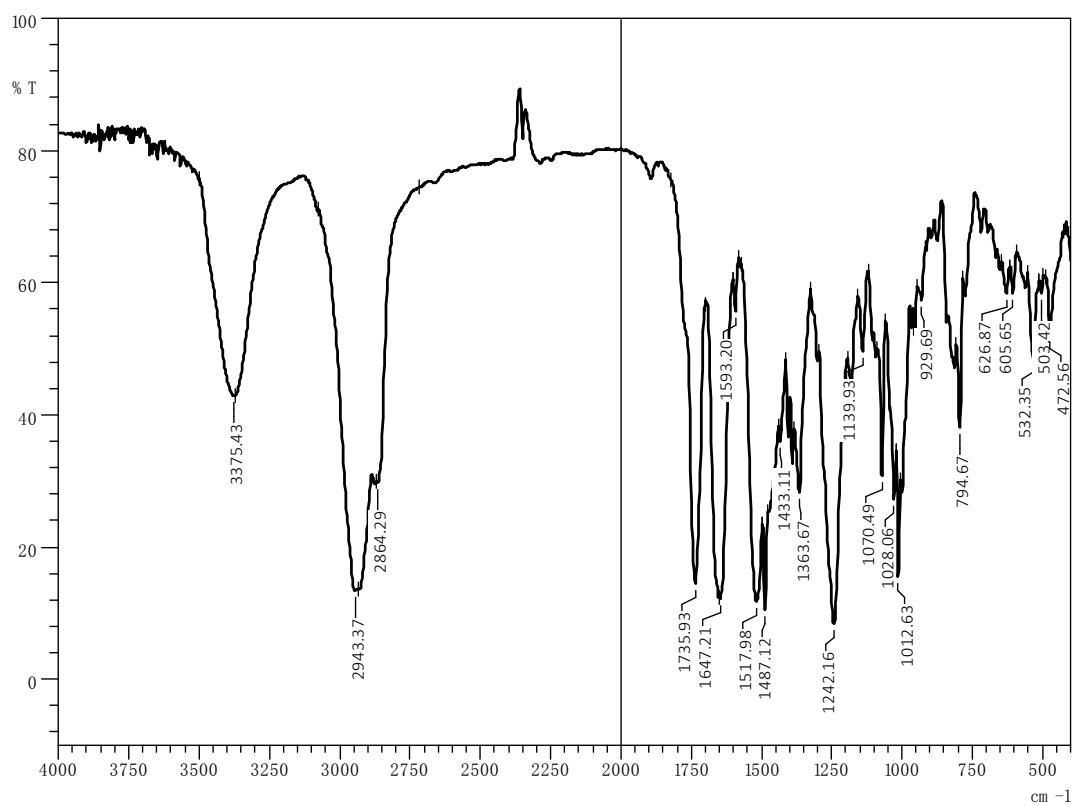
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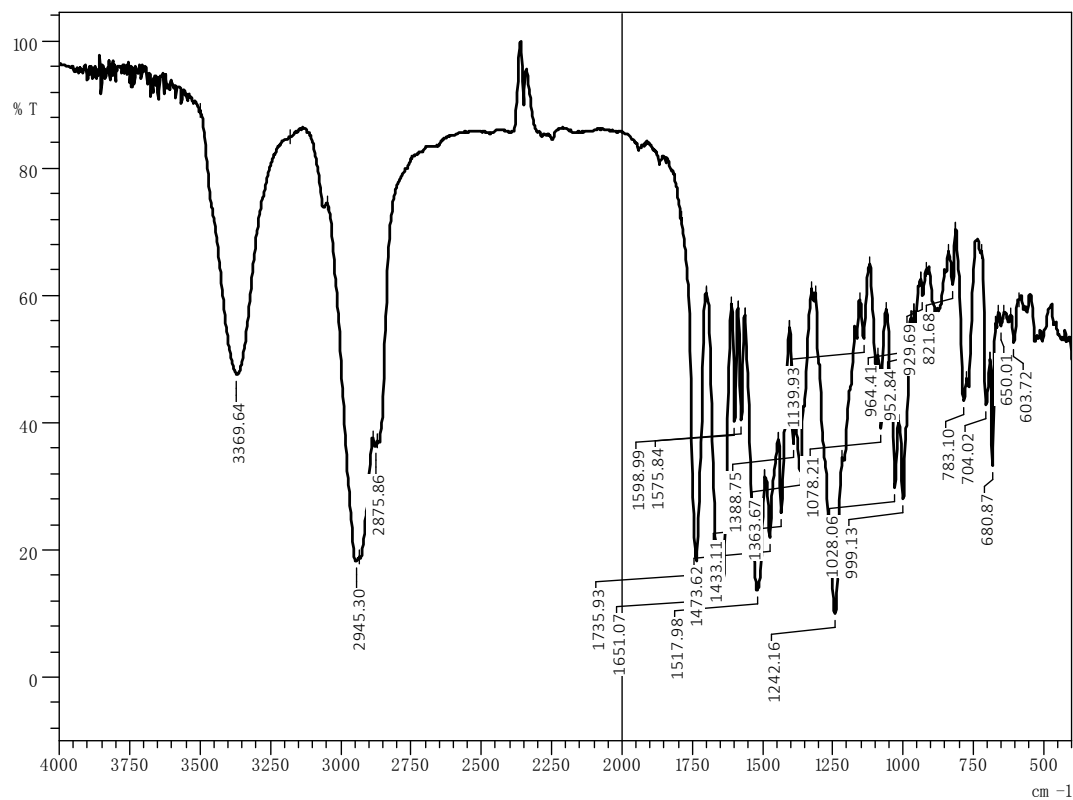
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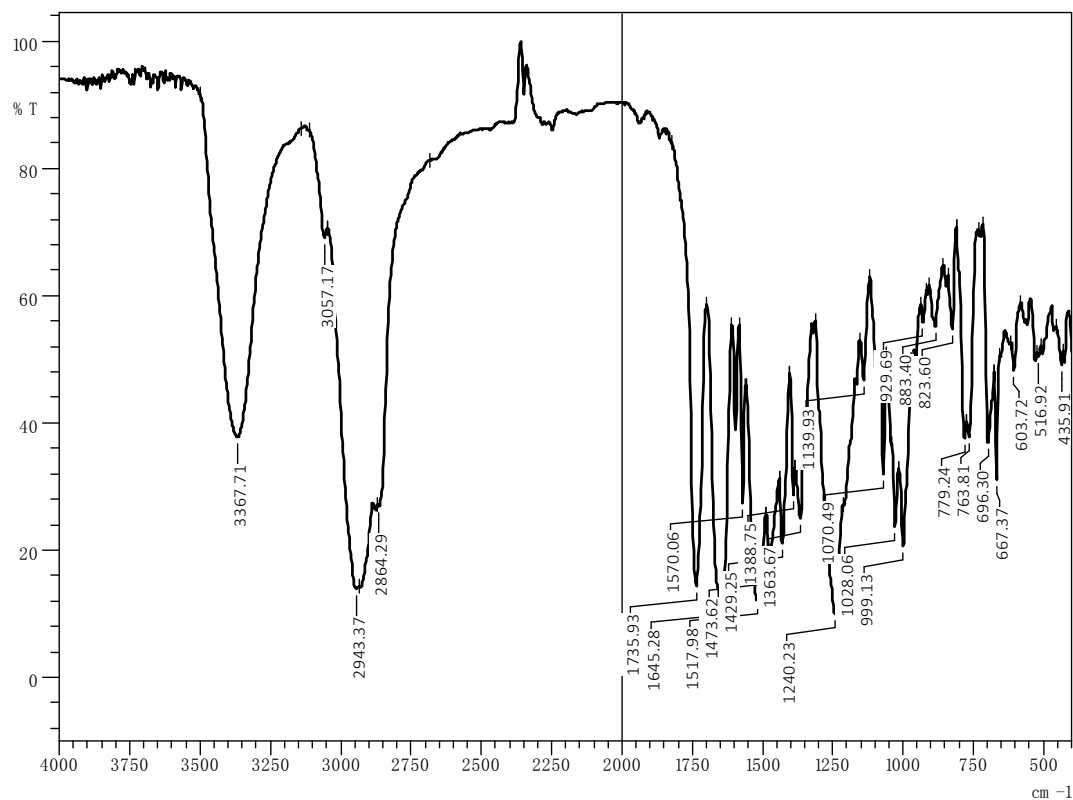
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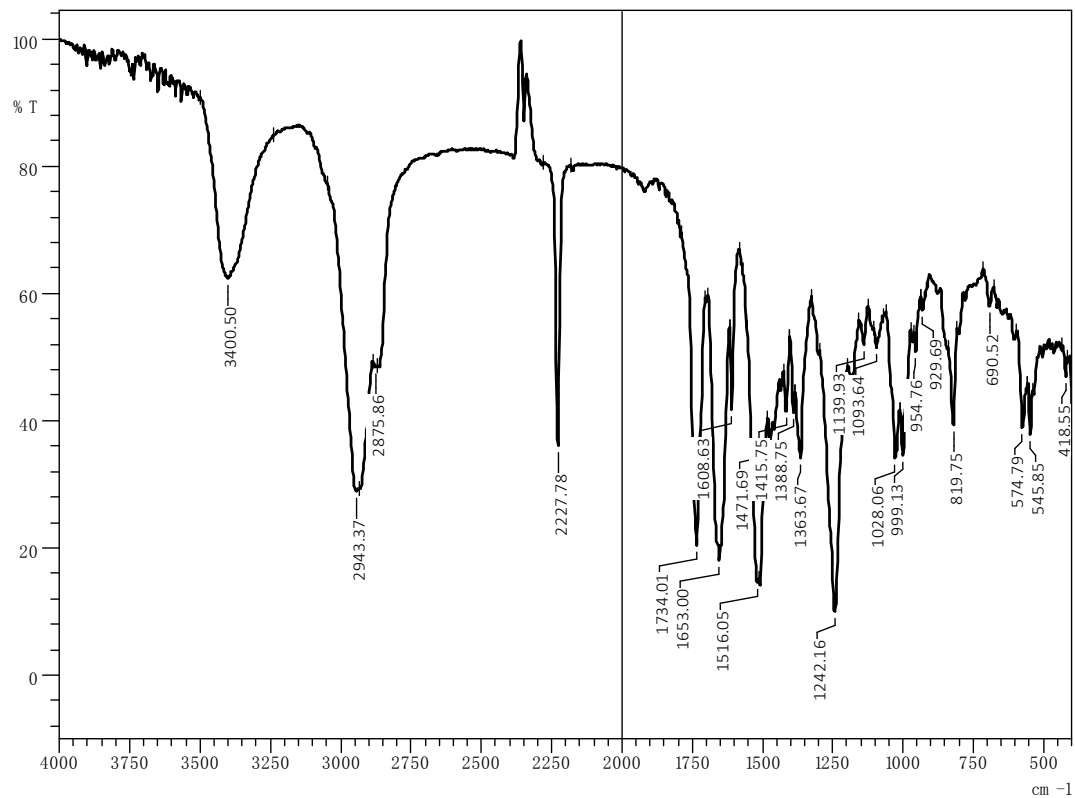
For compound **6g**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



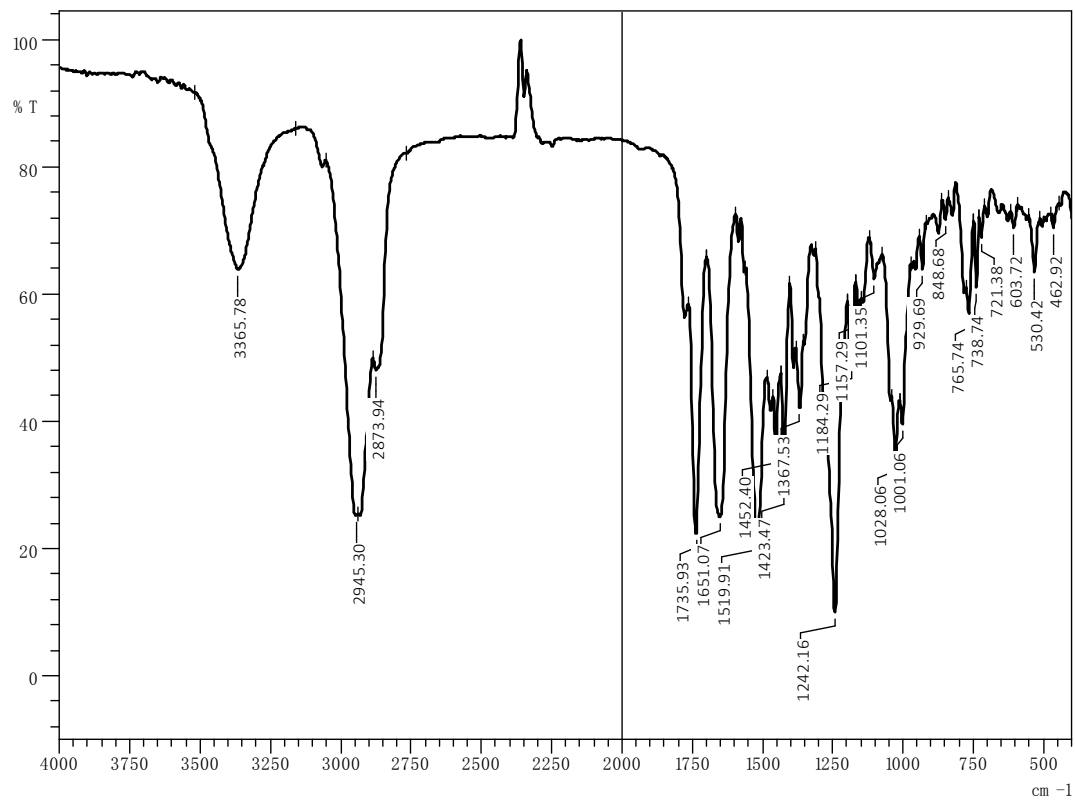
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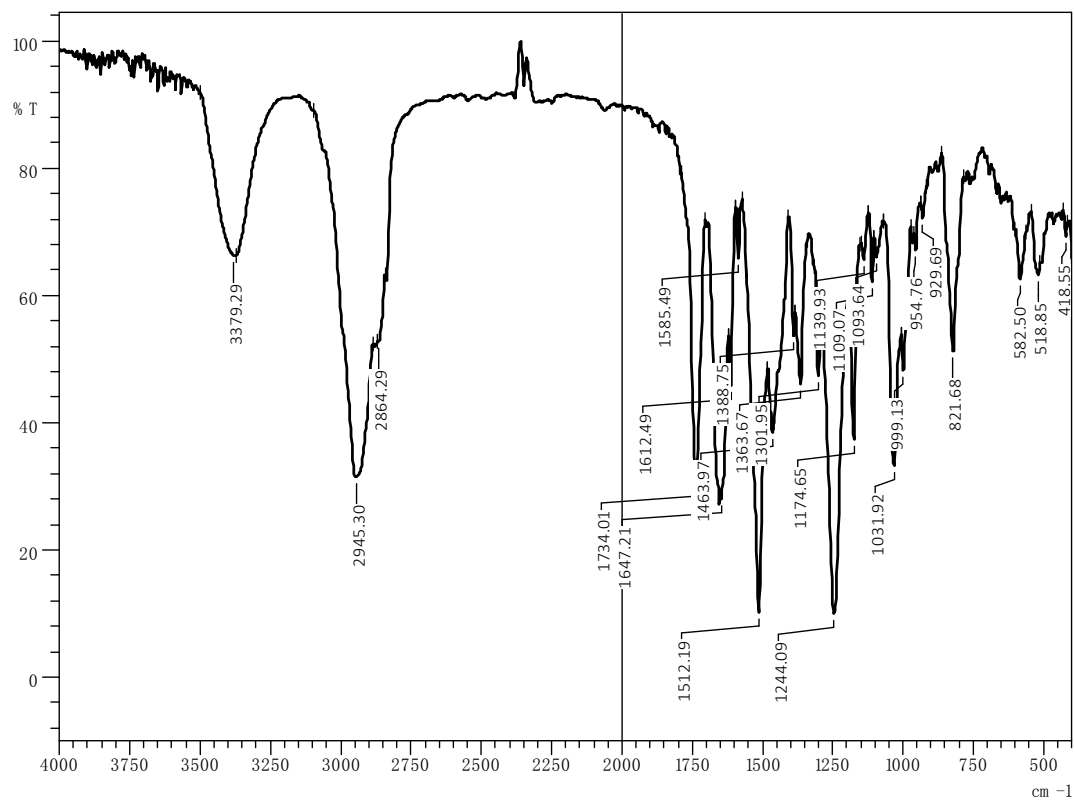
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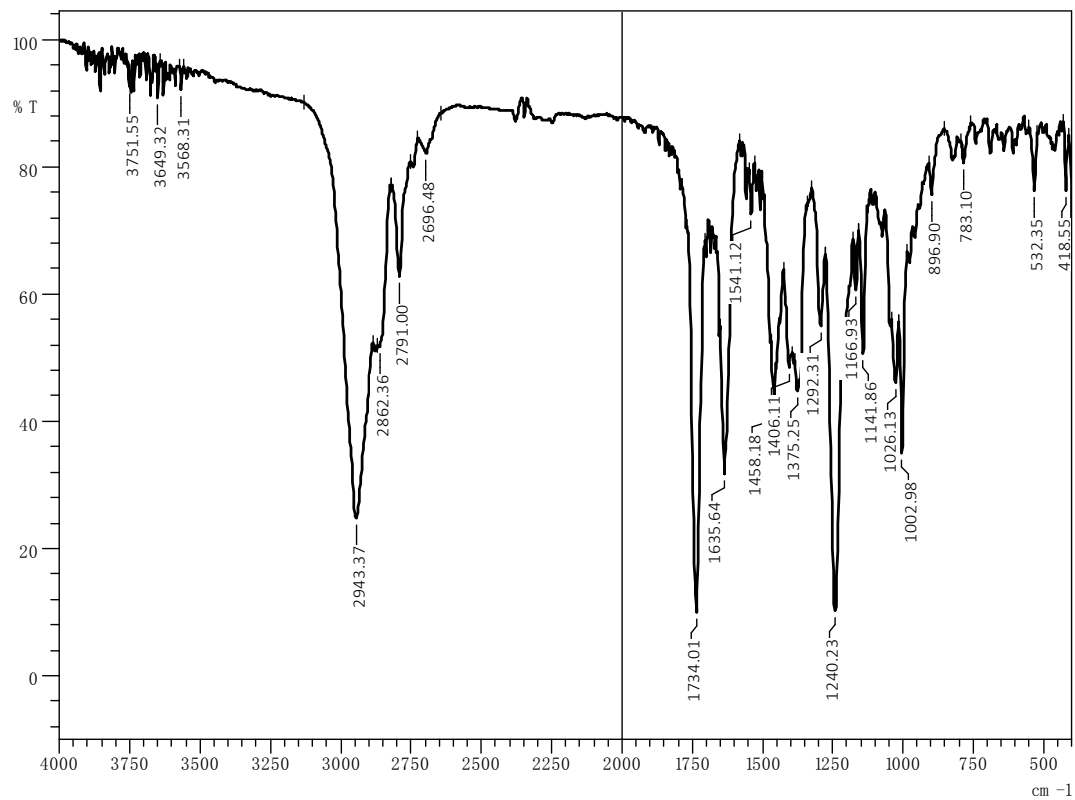
For compound **6j**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



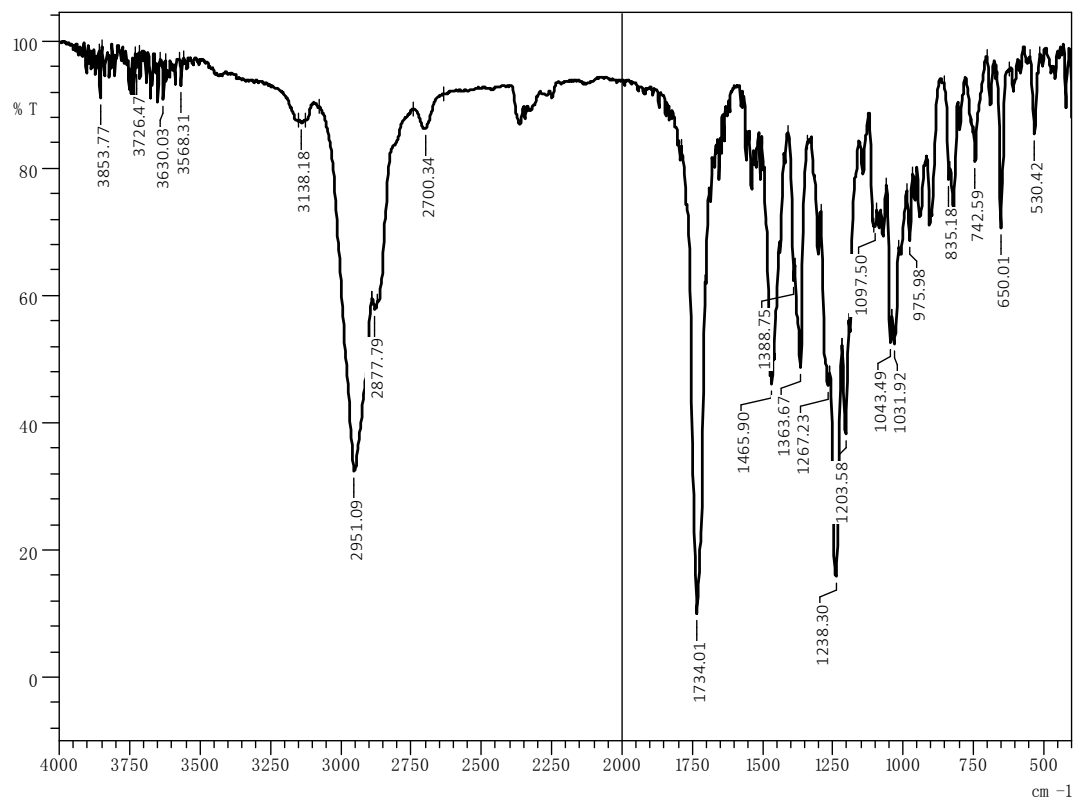
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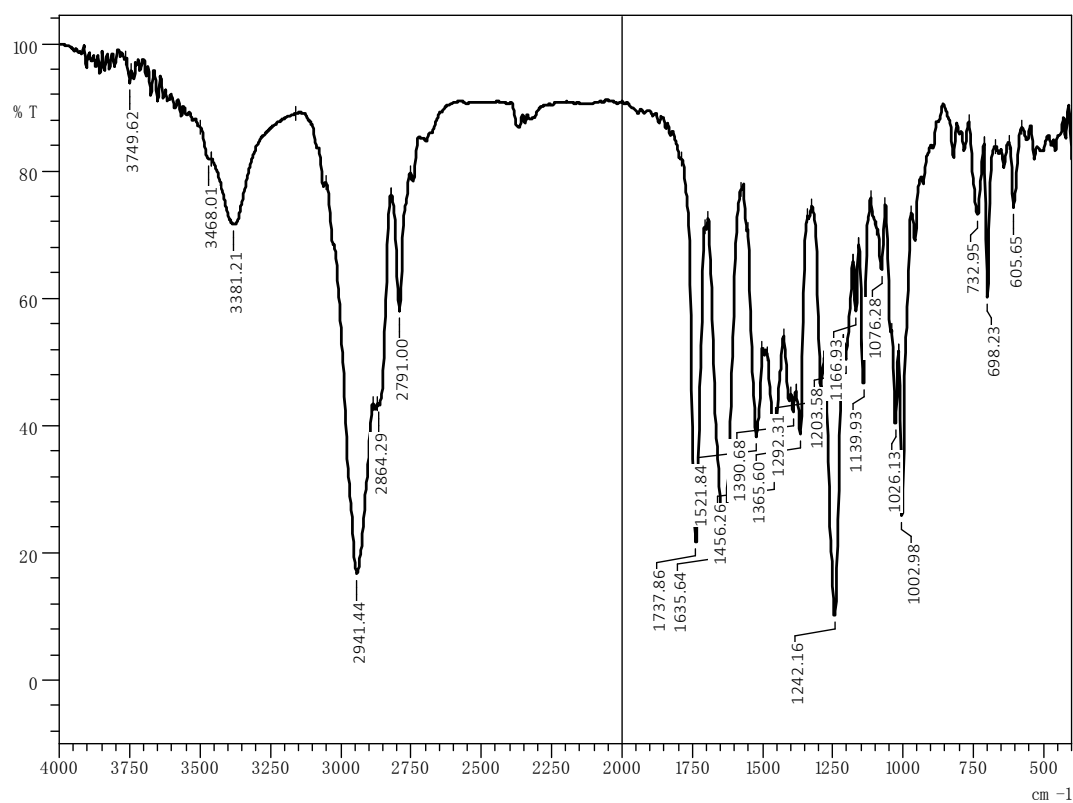
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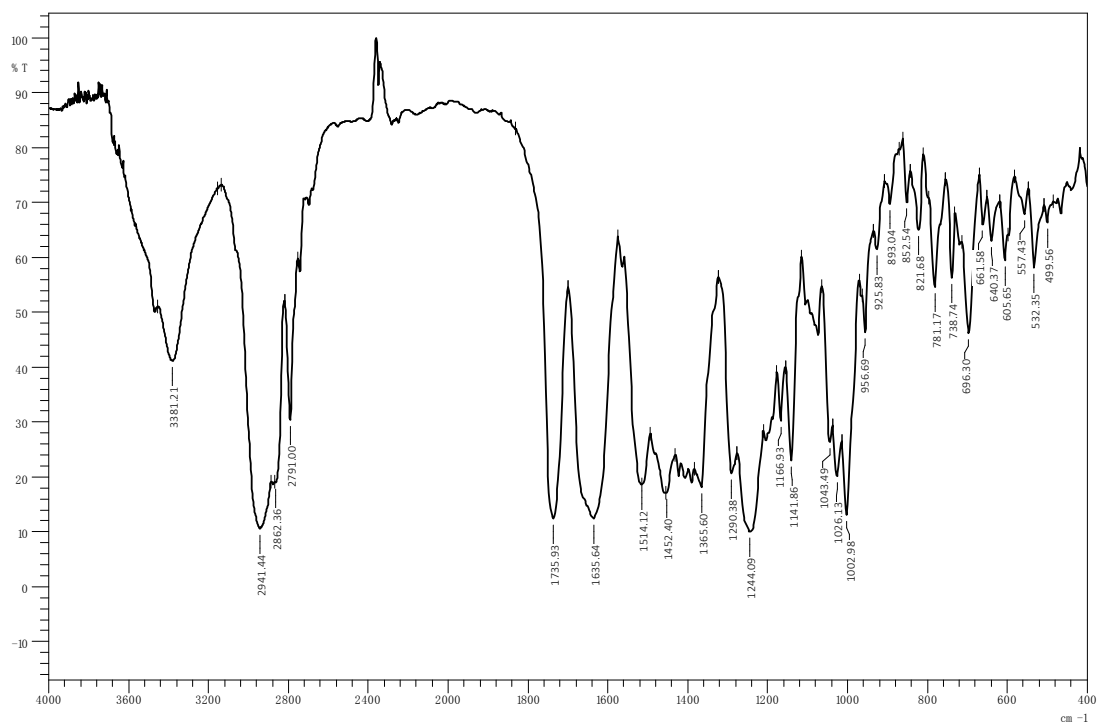
For compound **7a**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



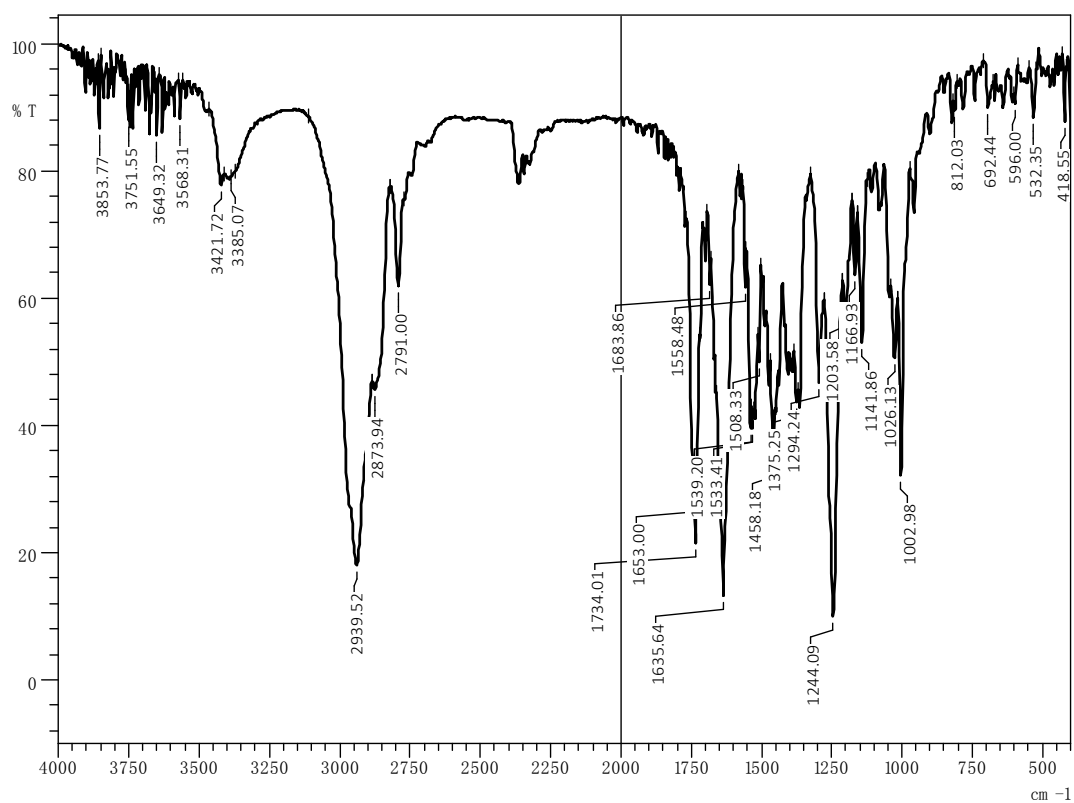
For compound **7b**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



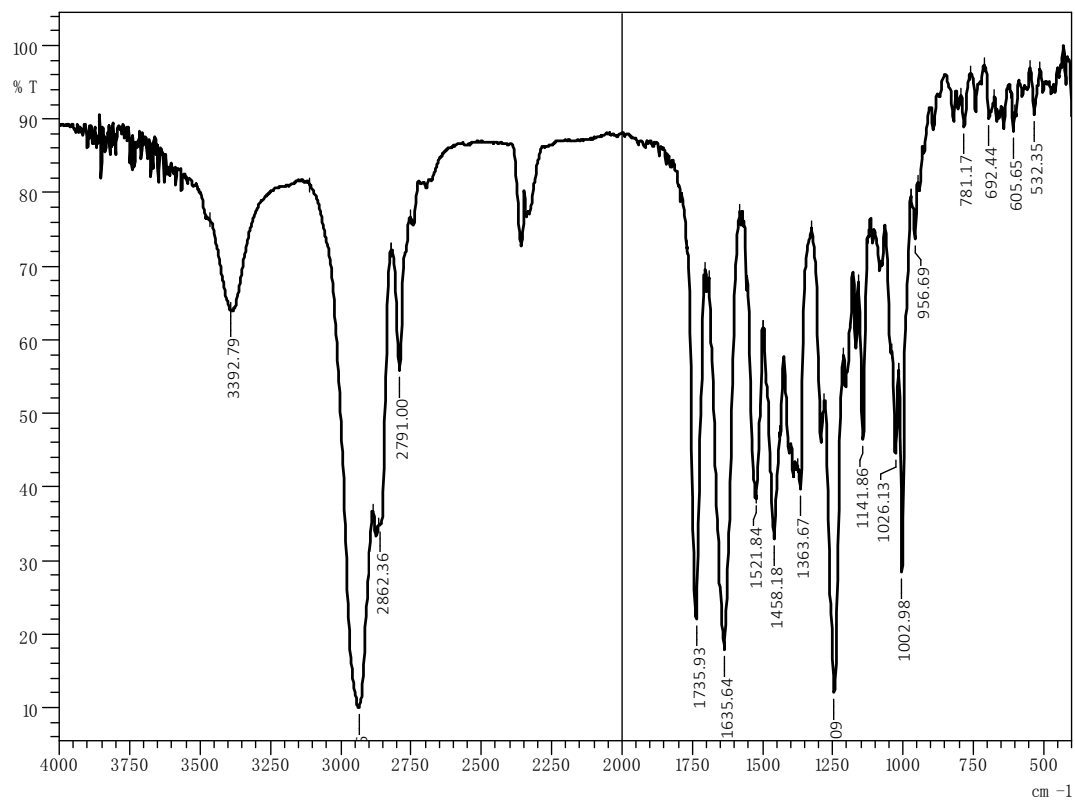
For compound **7c**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



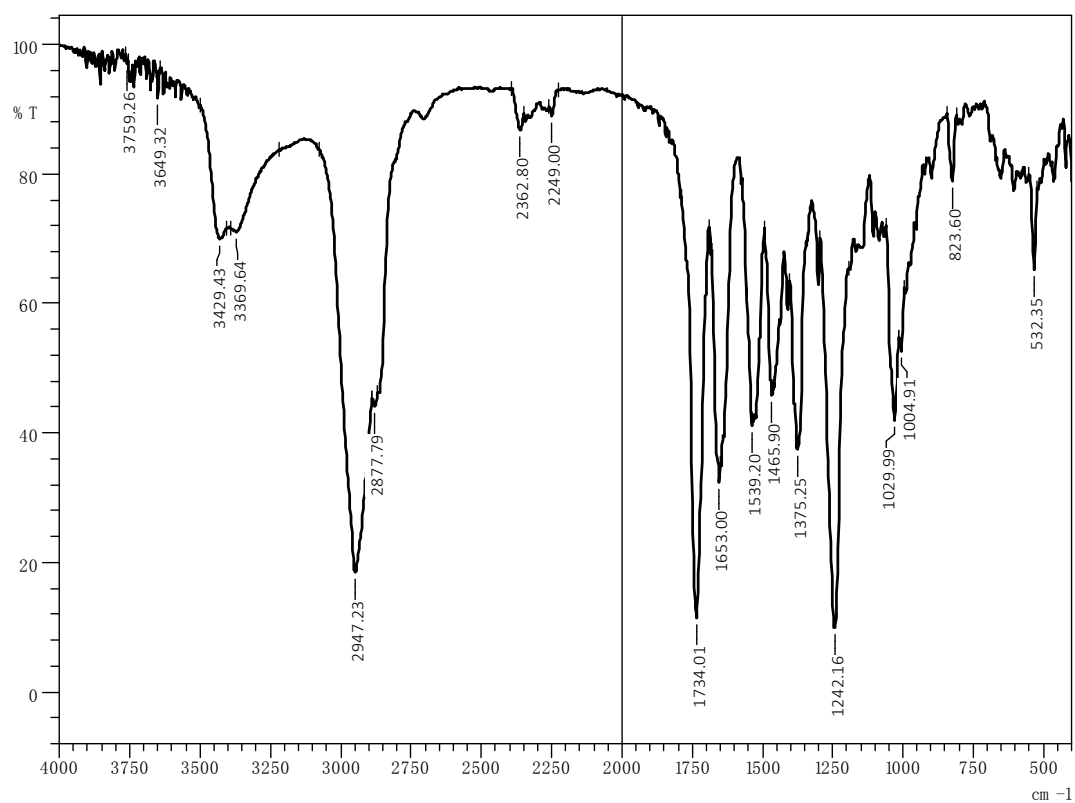
For compound **7d**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



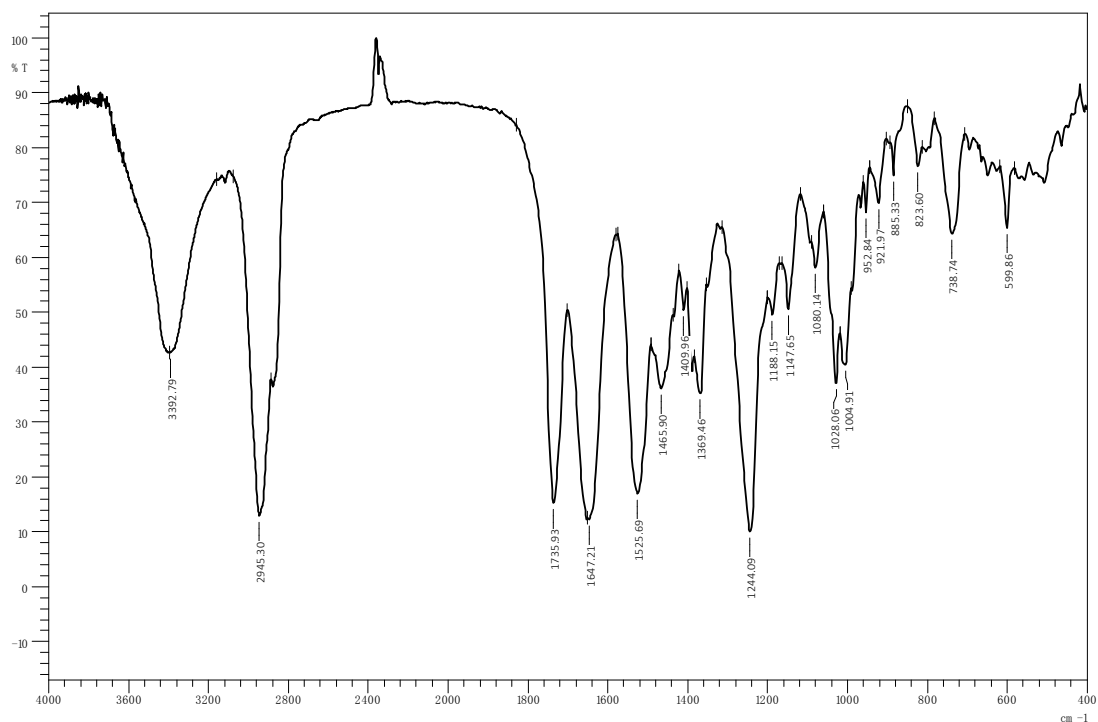
For compound **7e**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



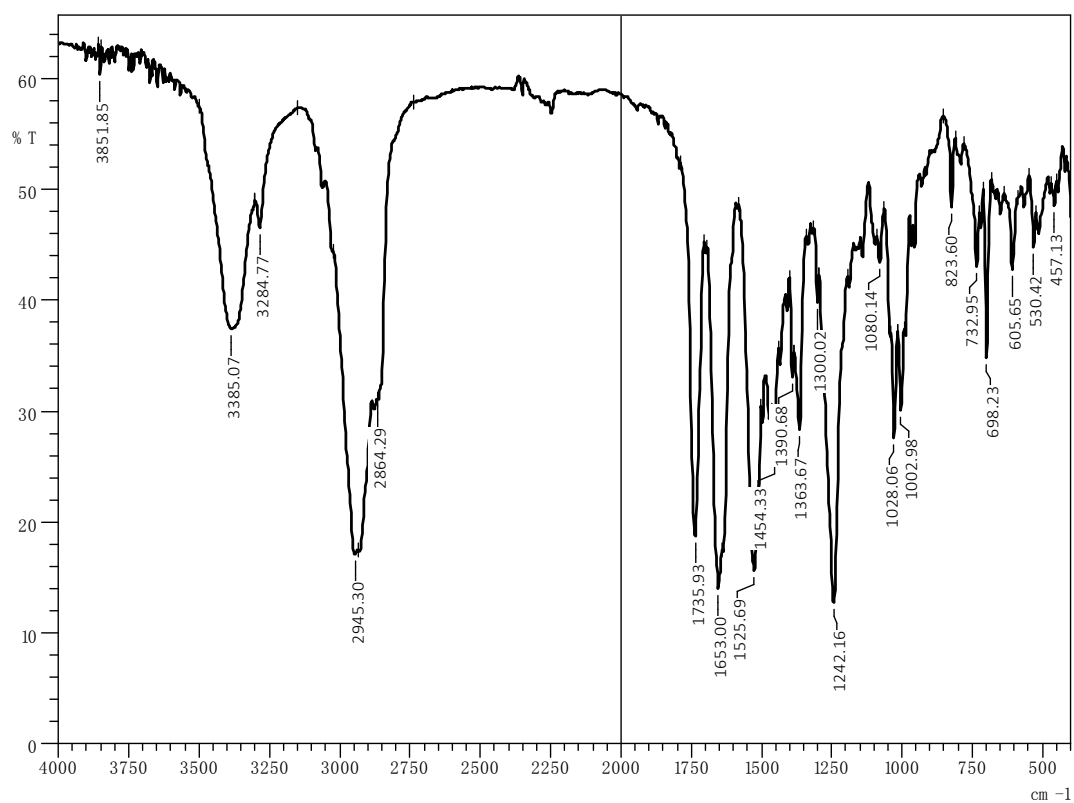
For compound **8**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



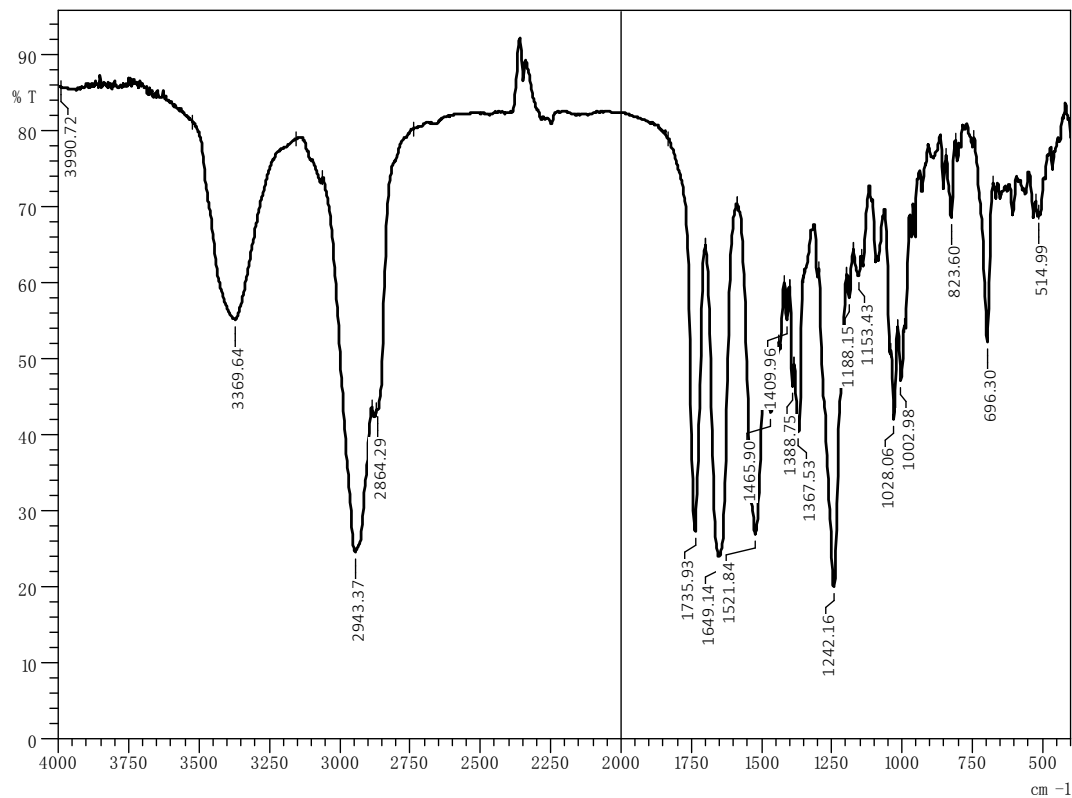
For compound **8a**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



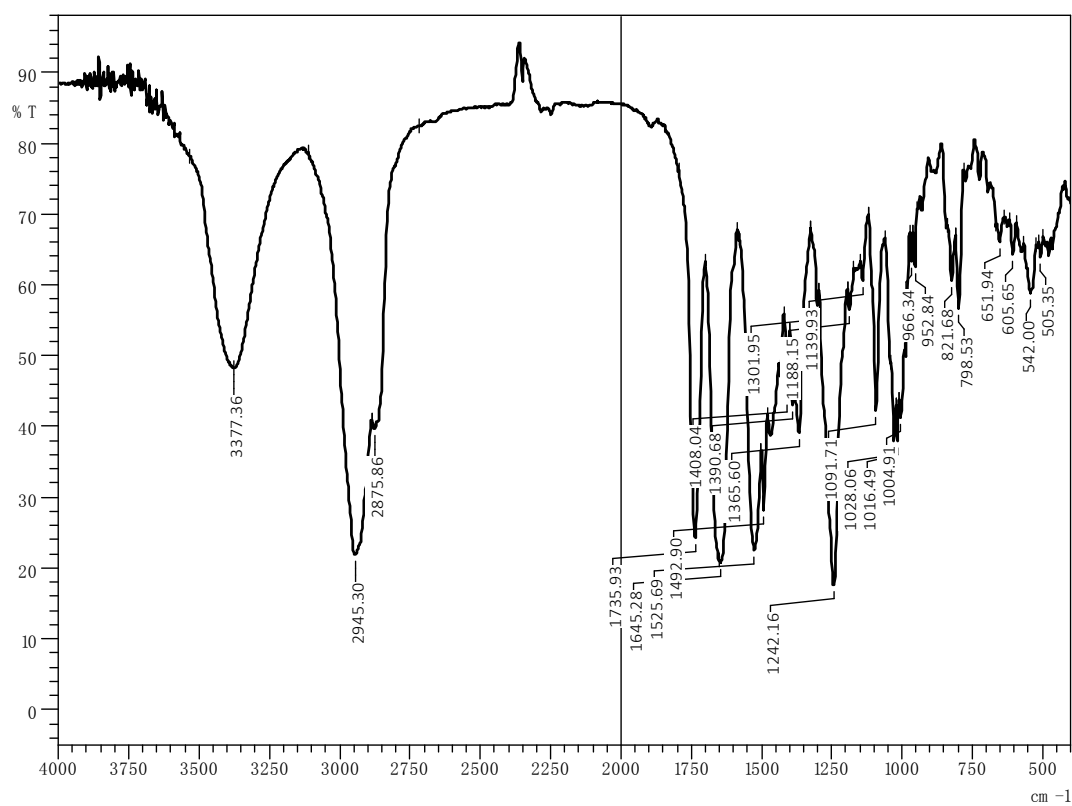
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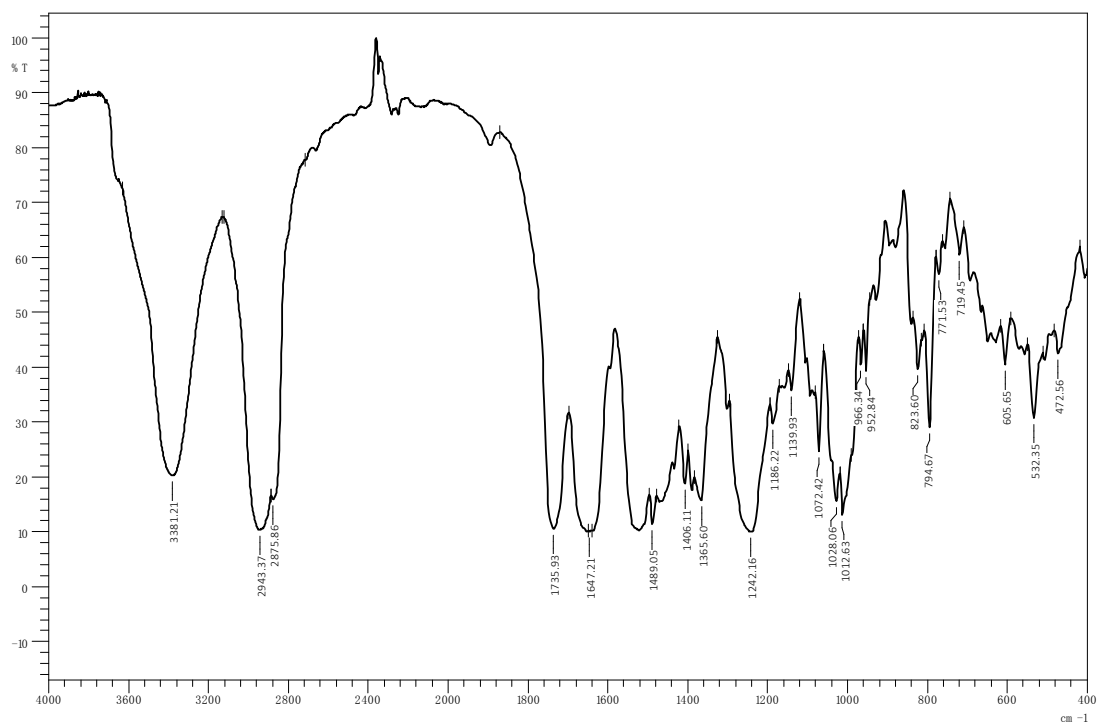
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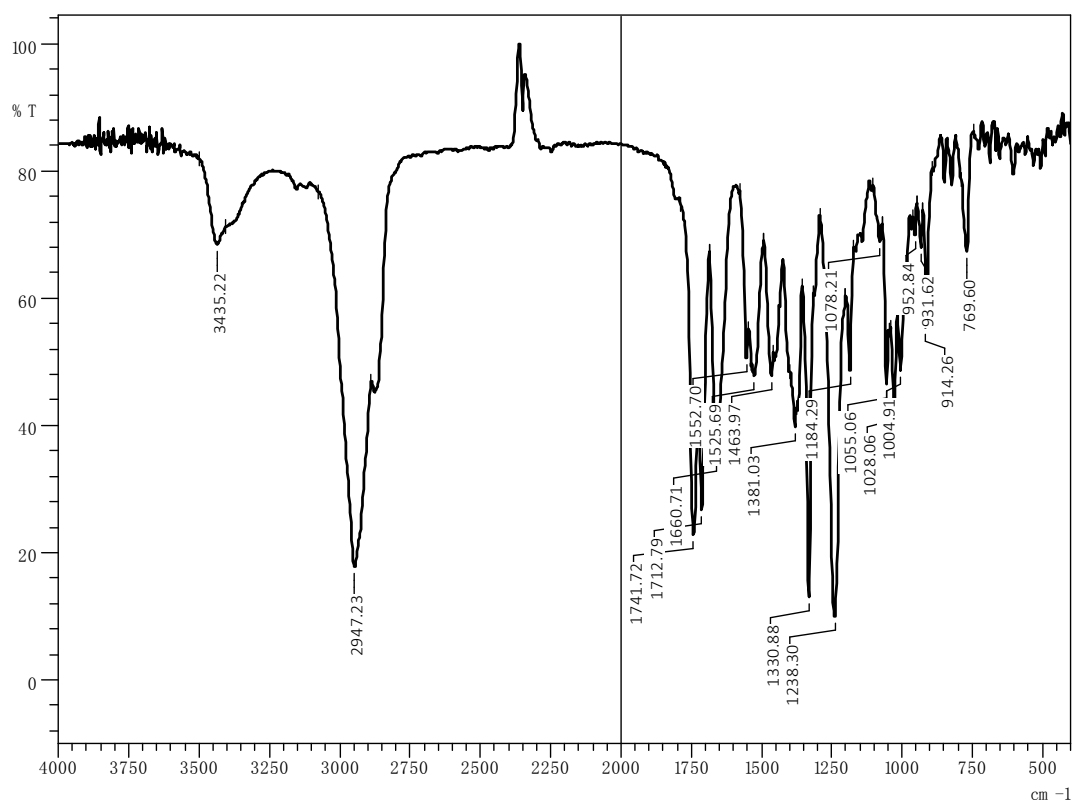
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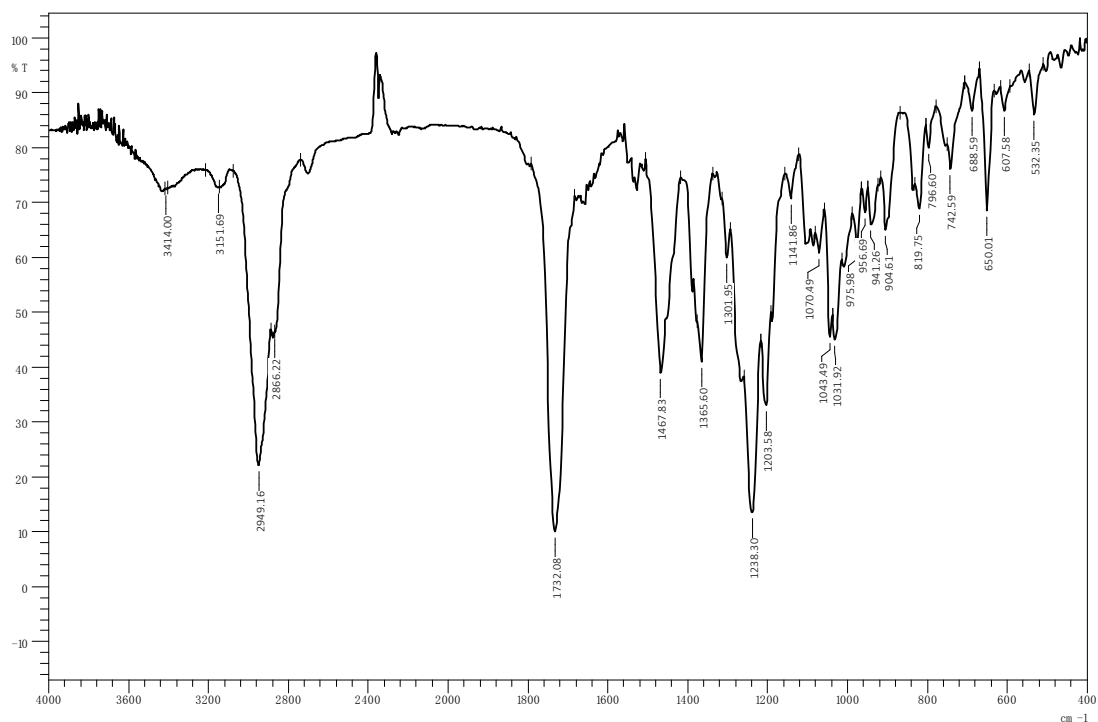
For compound **8e**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



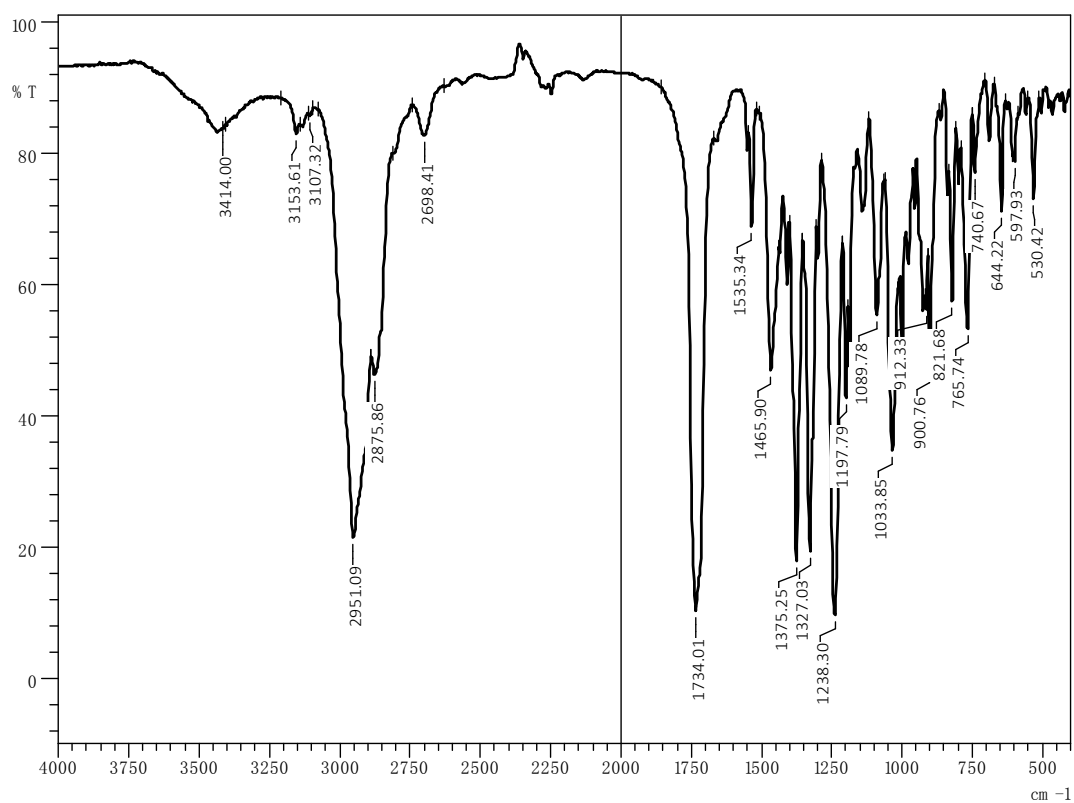
For compound **8f**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



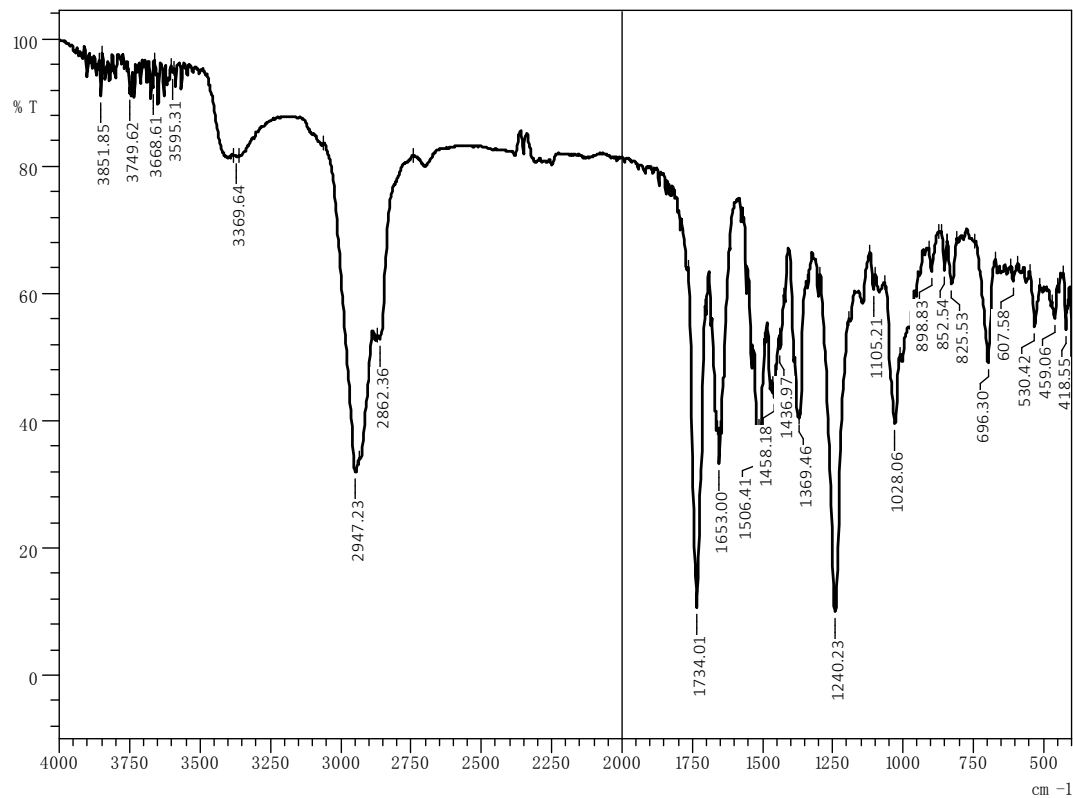
For compound **9**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



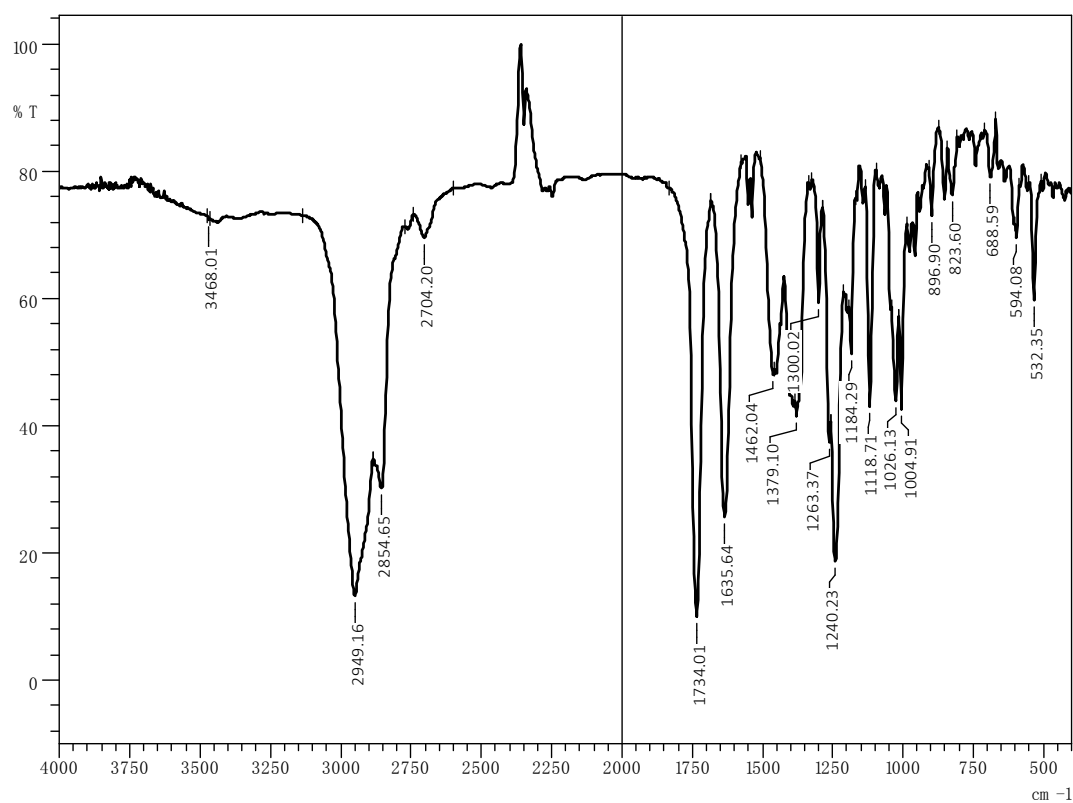
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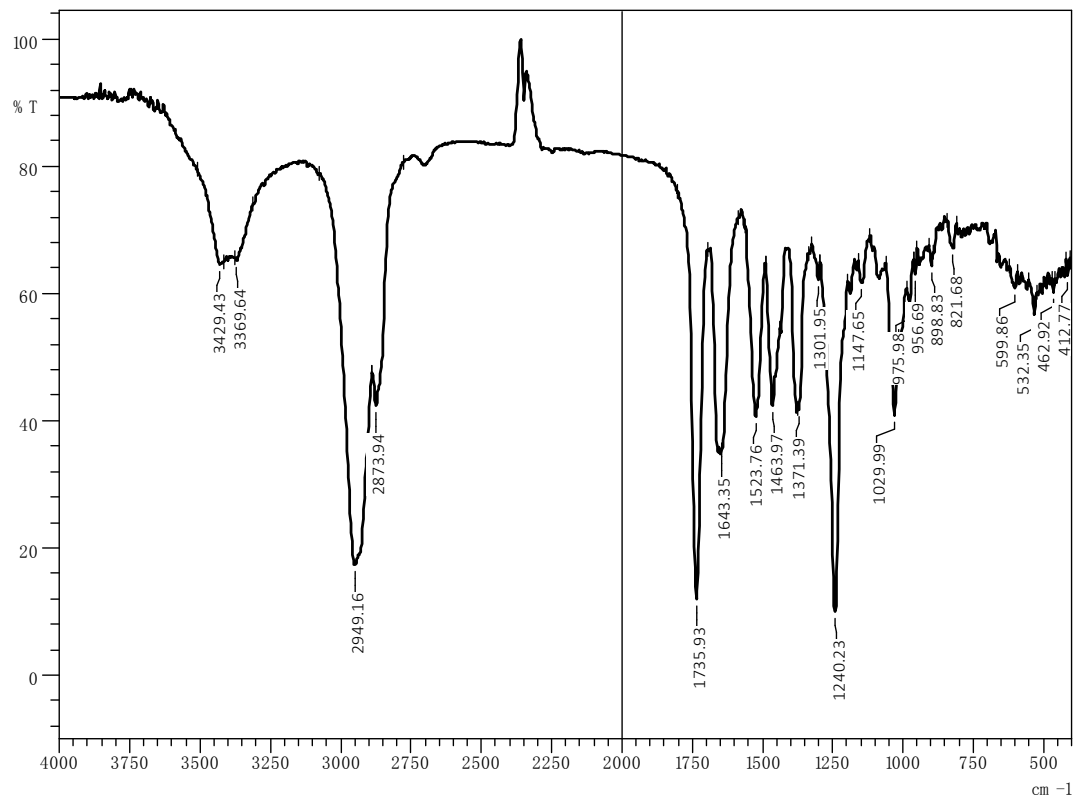
For compound 11, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



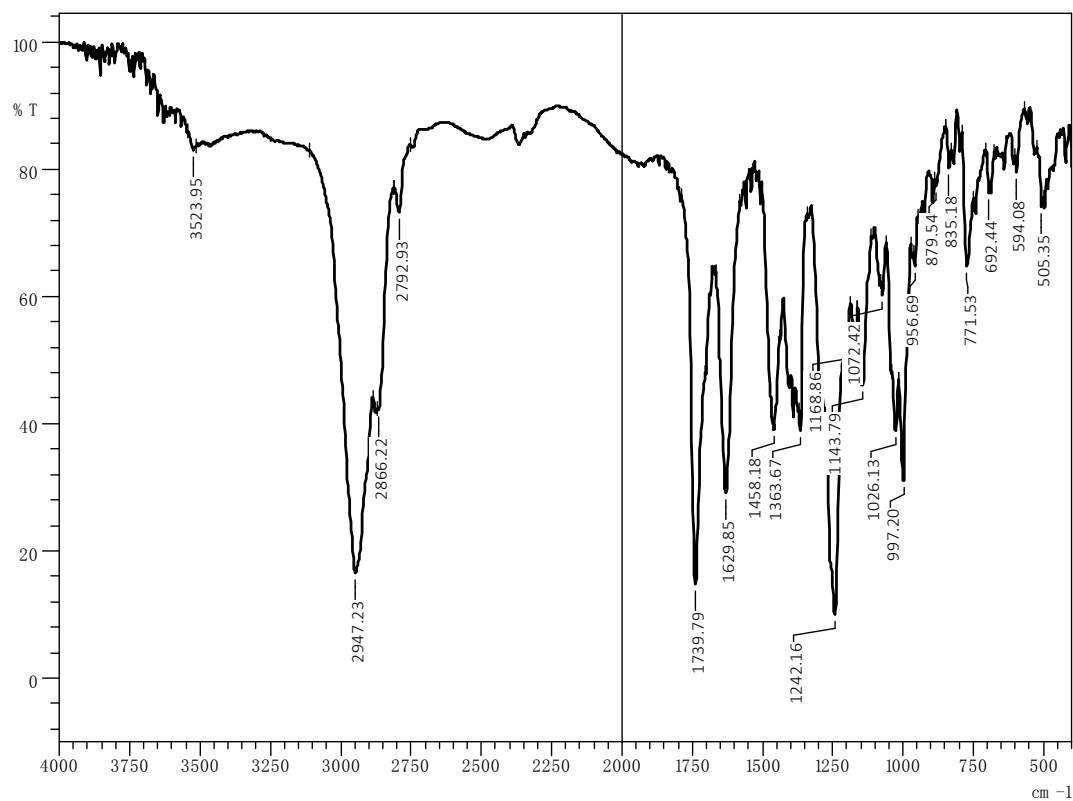
For compound **12**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



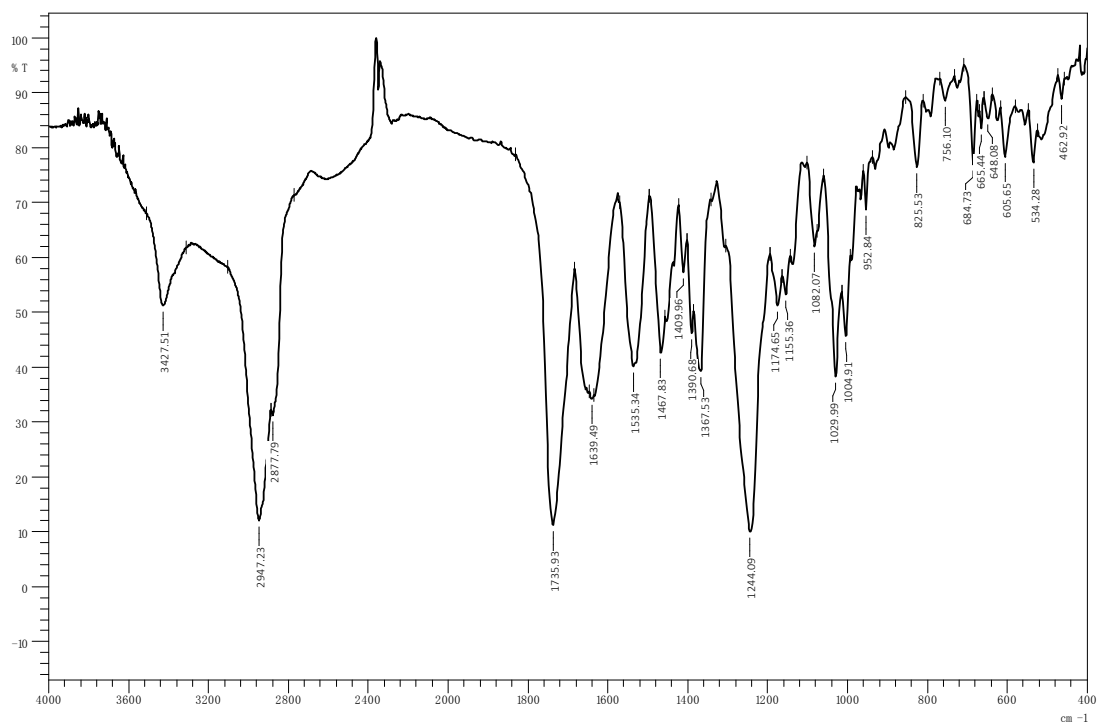
For compound **13**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



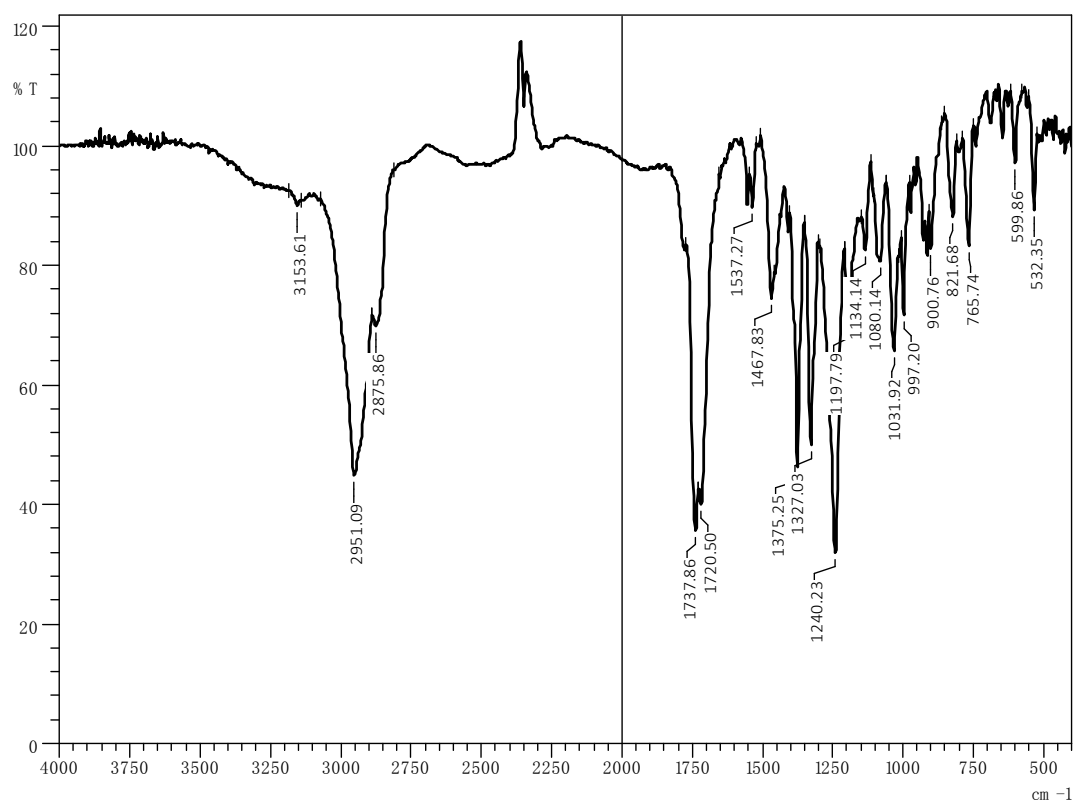
For compound **14a**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



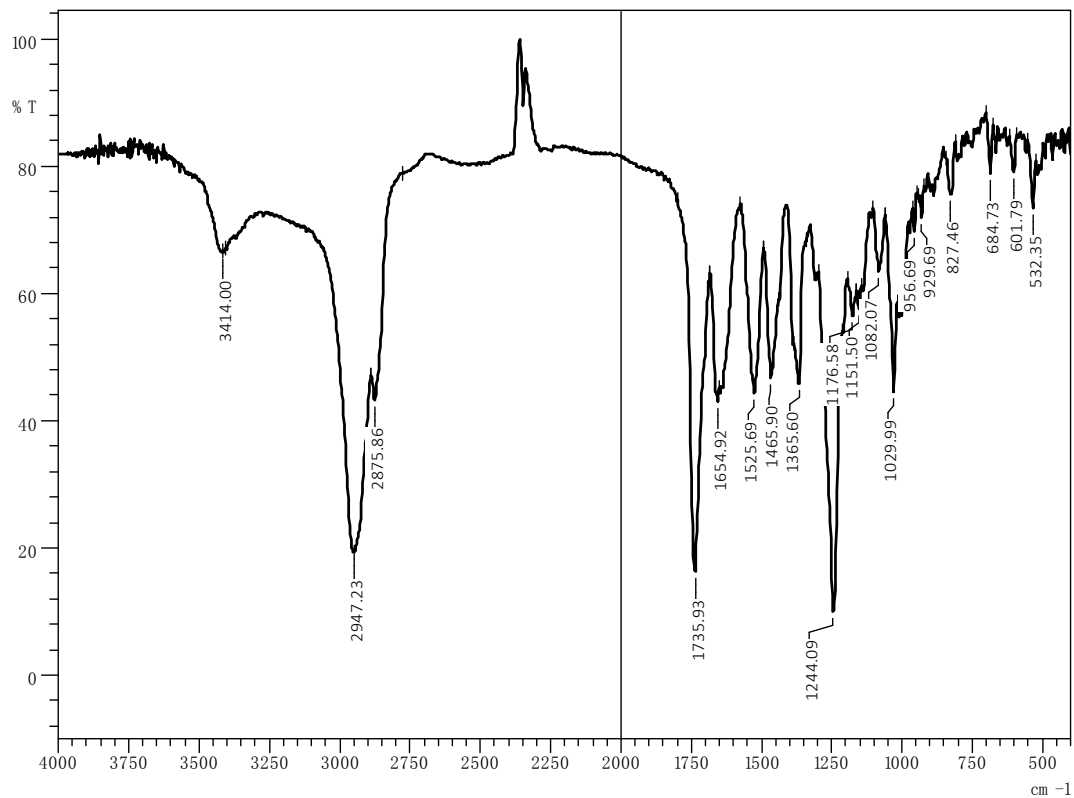
For compound **14b**, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:



For compound 14c, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:

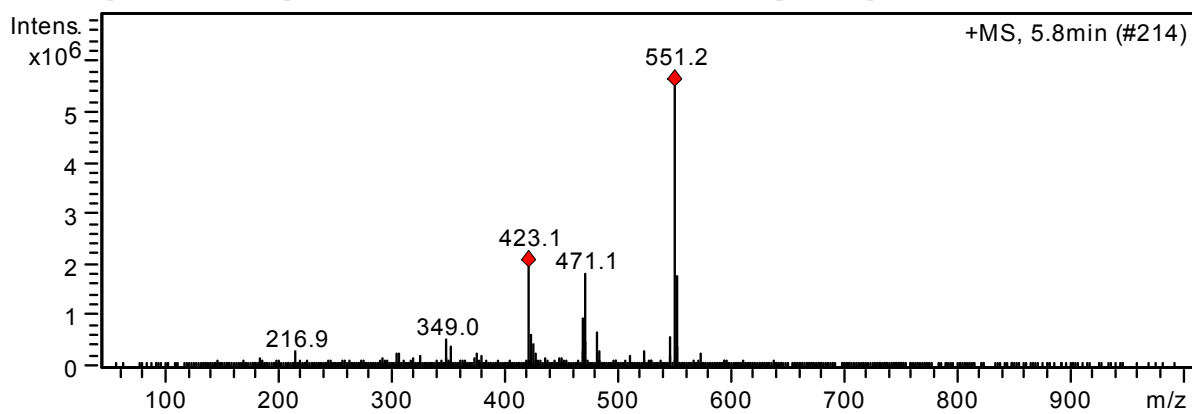


For compound 14d, IR spectra were recorded on a Thermo Nicolet Nexus 670 FT-IR spectrometer:

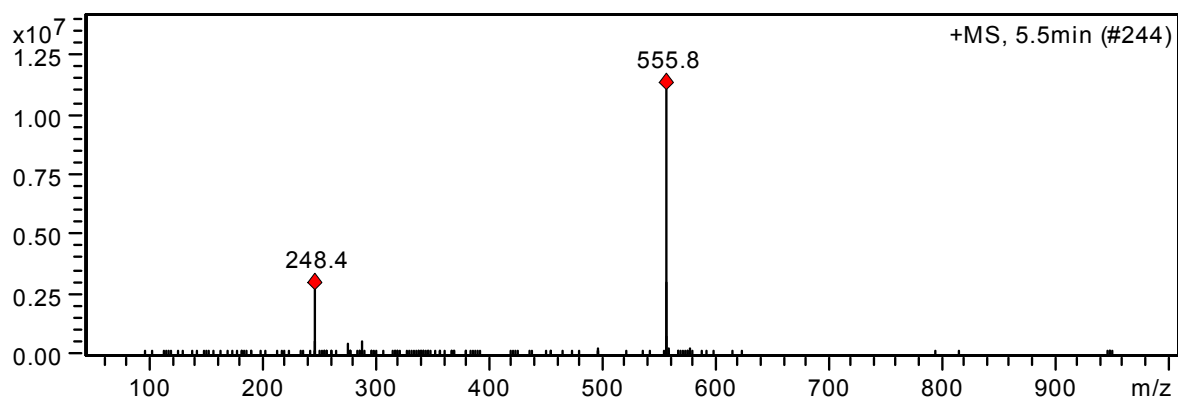


Mass spectra of compounds 3-14d

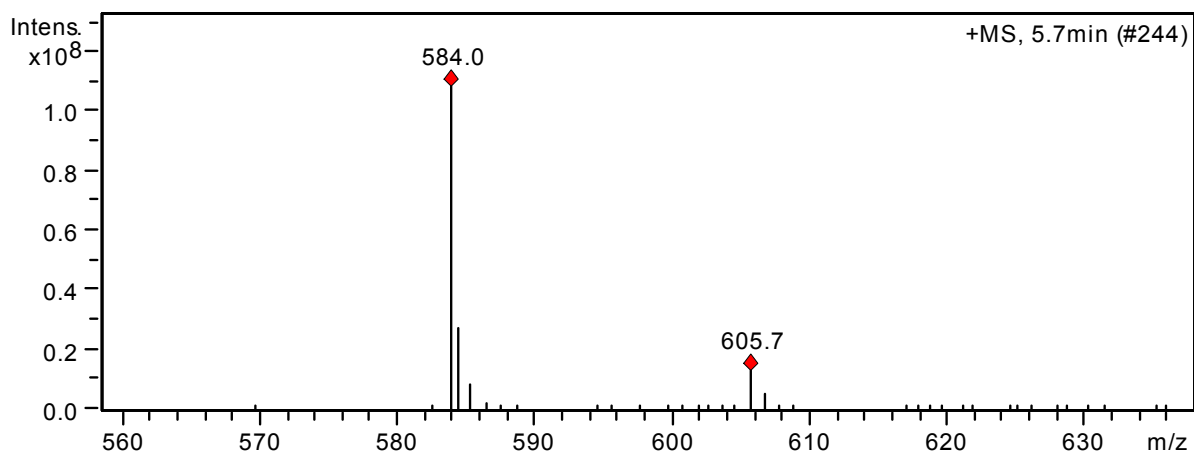
ESI mass spectrum of compound **3** recorded on an AGILENT 1200 Capillary spectrometer:



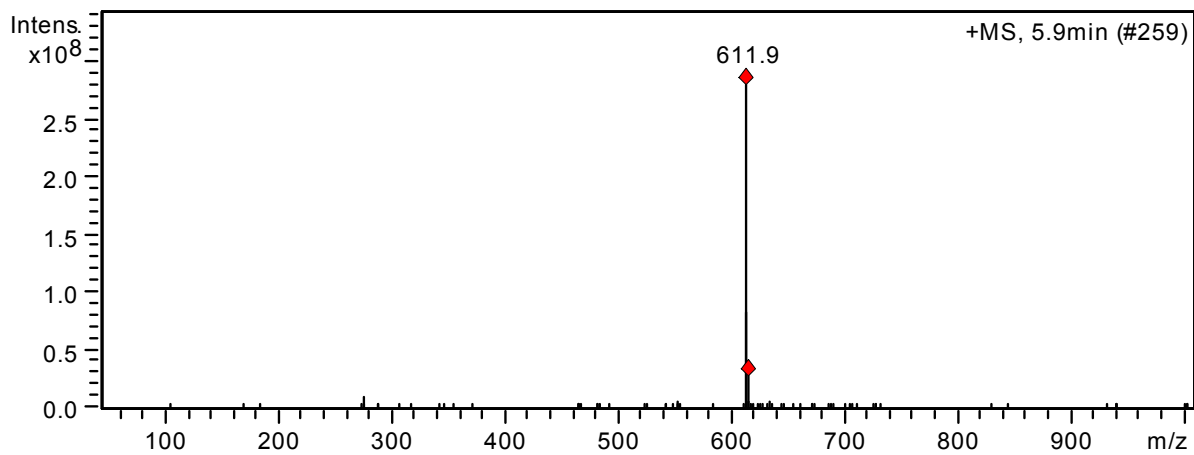
ESI mass spectrum of compound **4a** recorded on an AGILENT 1200 Capillary spectrometer:



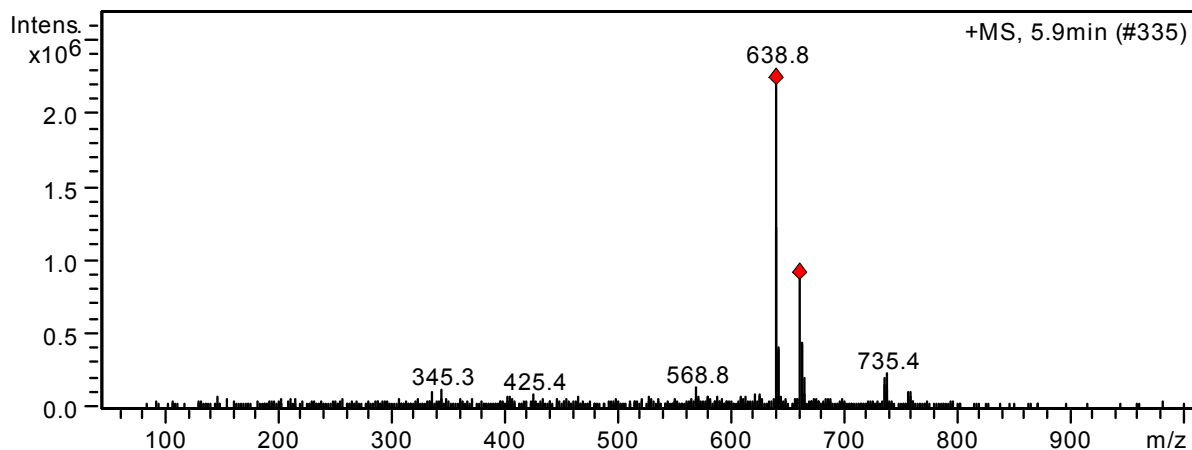
ESI mass spectrum of compound **4b** recorded on an AGILENT 1200 Capillary spectrometer:



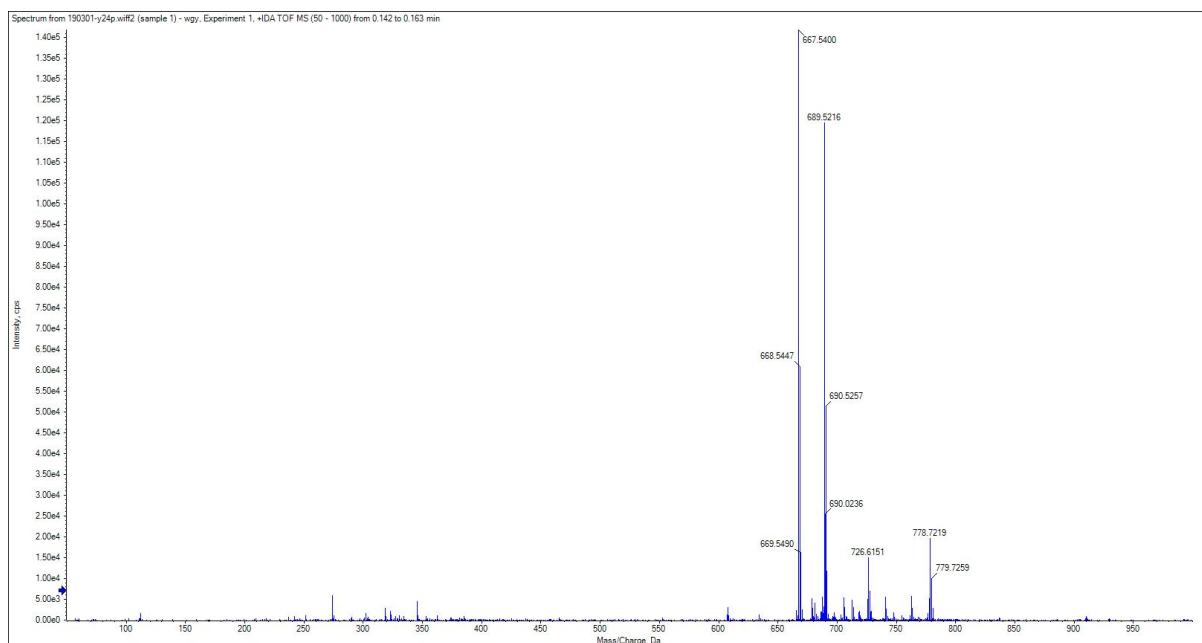
ESI mass spectrum of compound **4c** recorded on an AGILENT 1200 Capillary spectrometer:



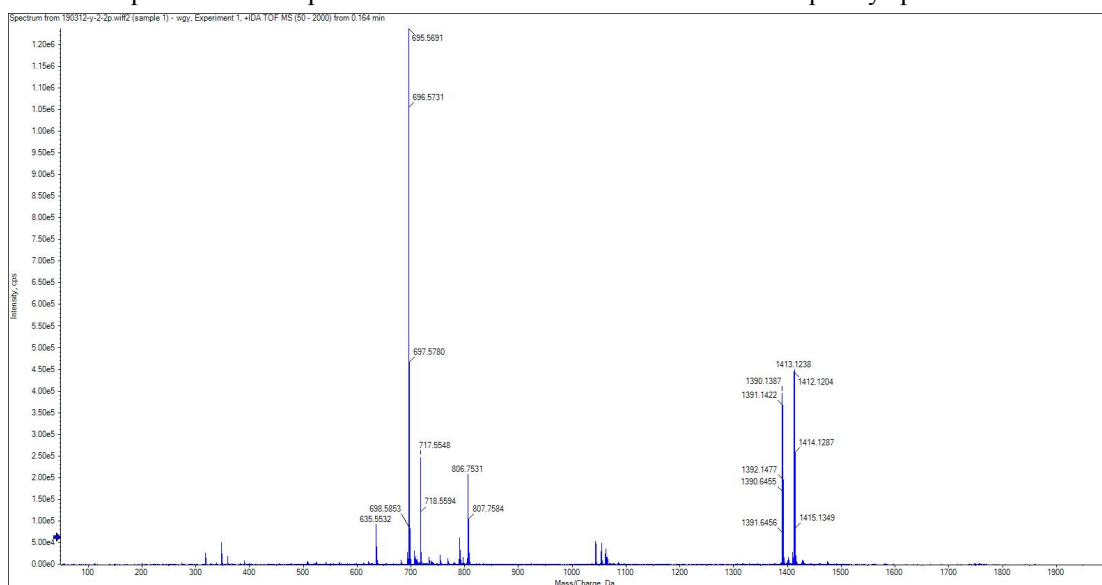
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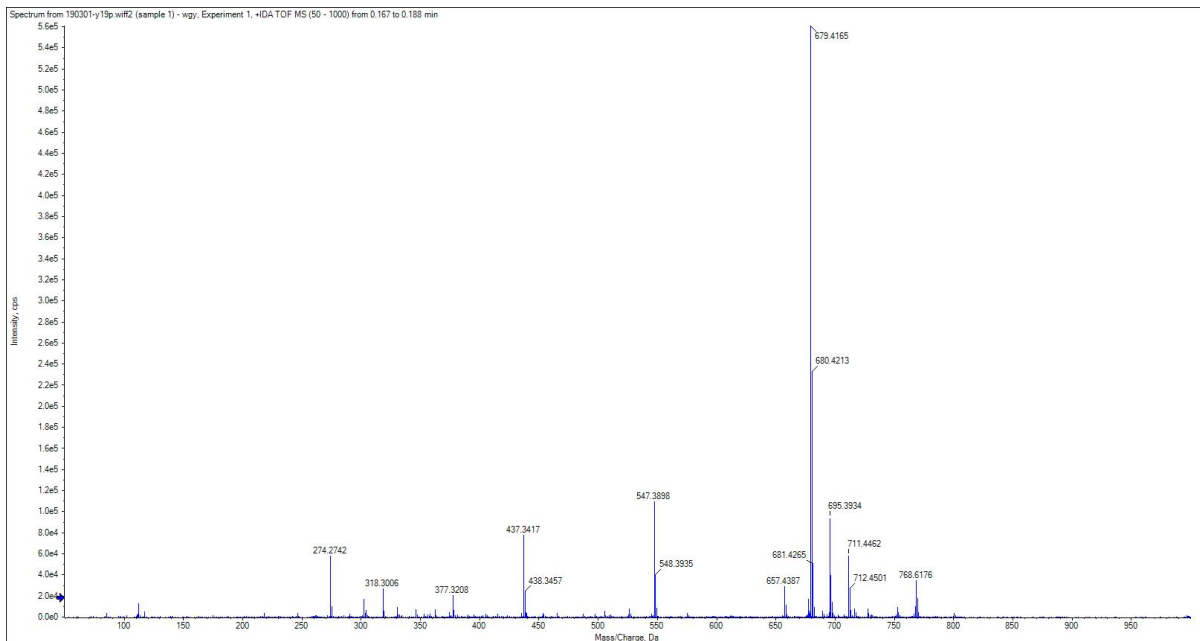
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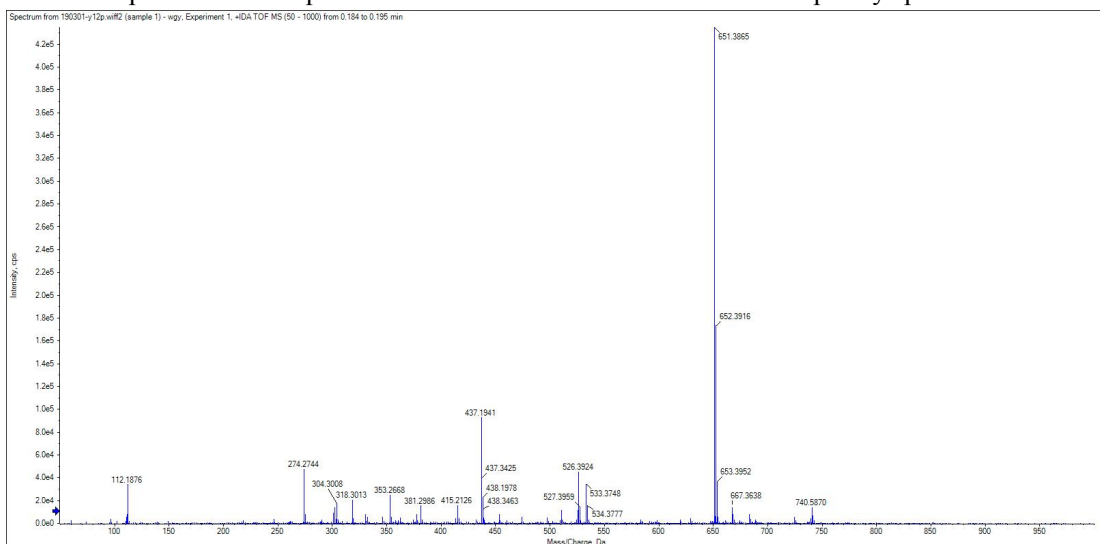
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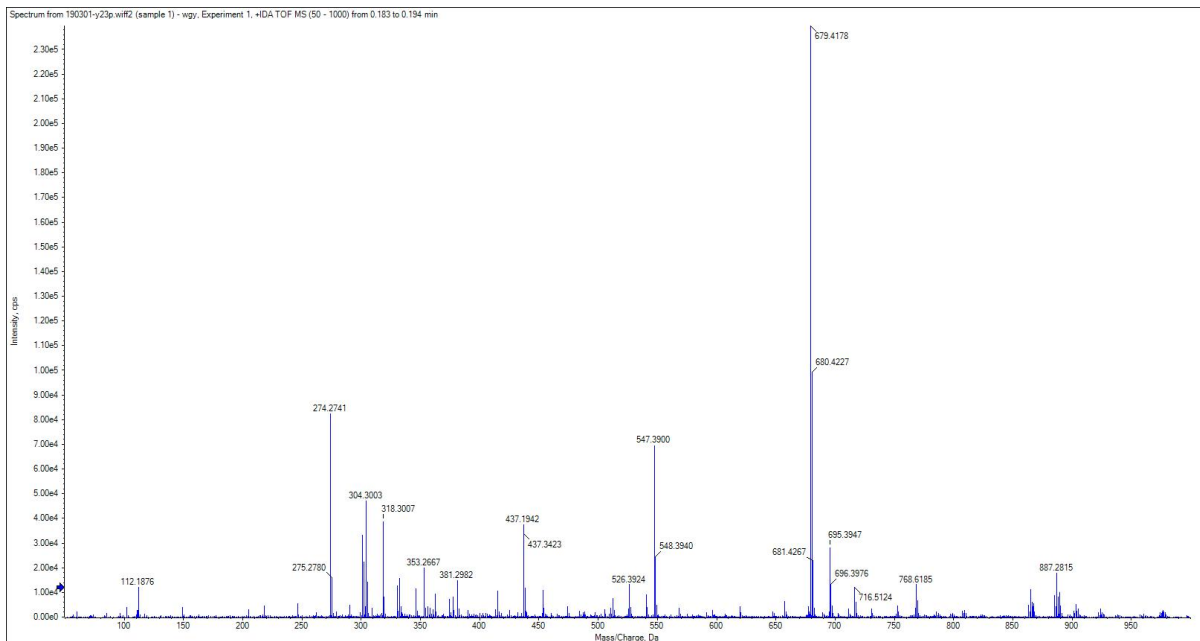
ESI mass spectrum of compound **5a** recorded on an AGILENT 1200 Capillary spectrometer:



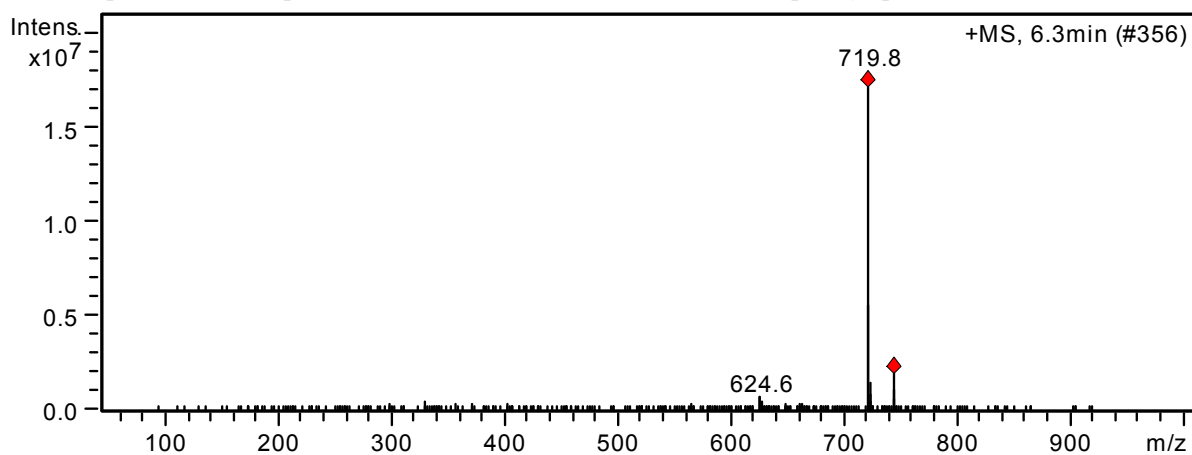
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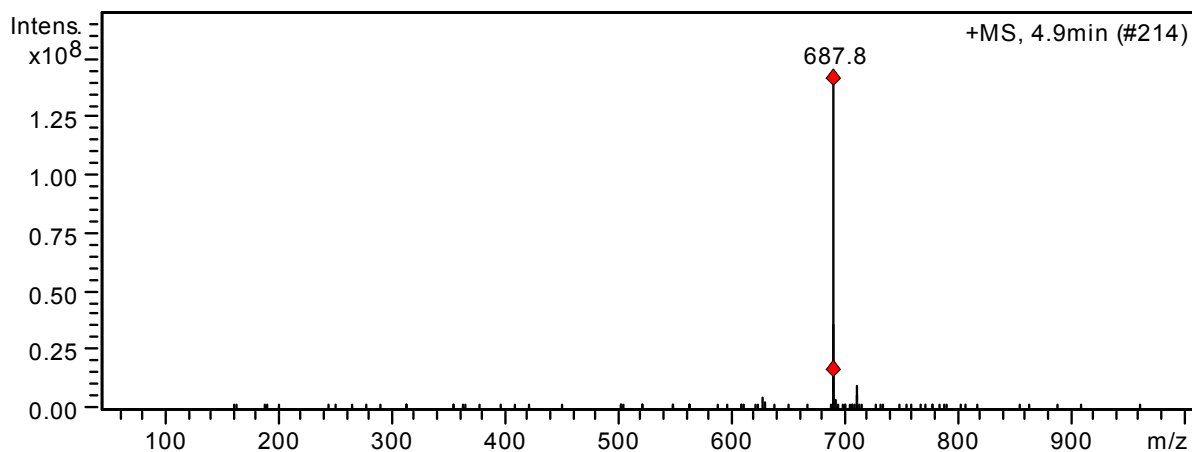
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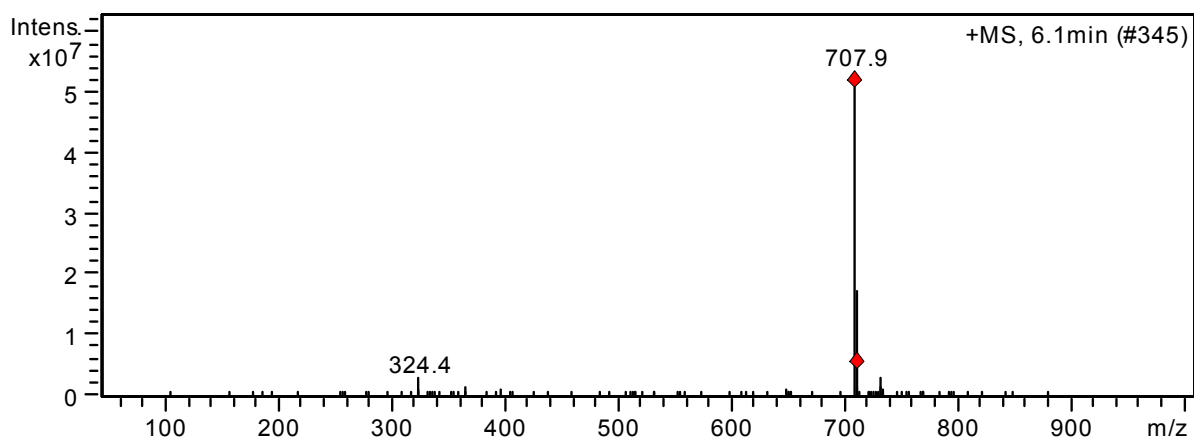
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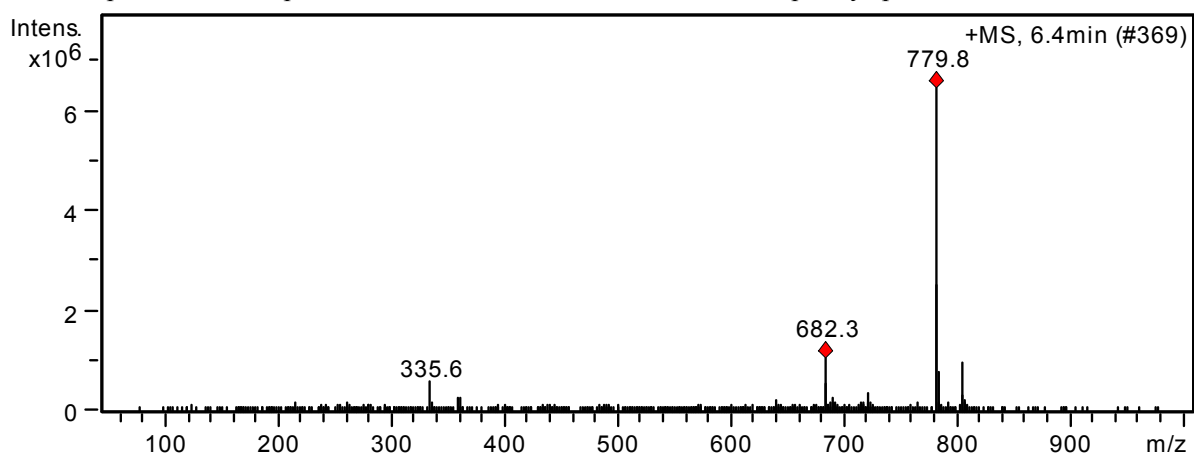
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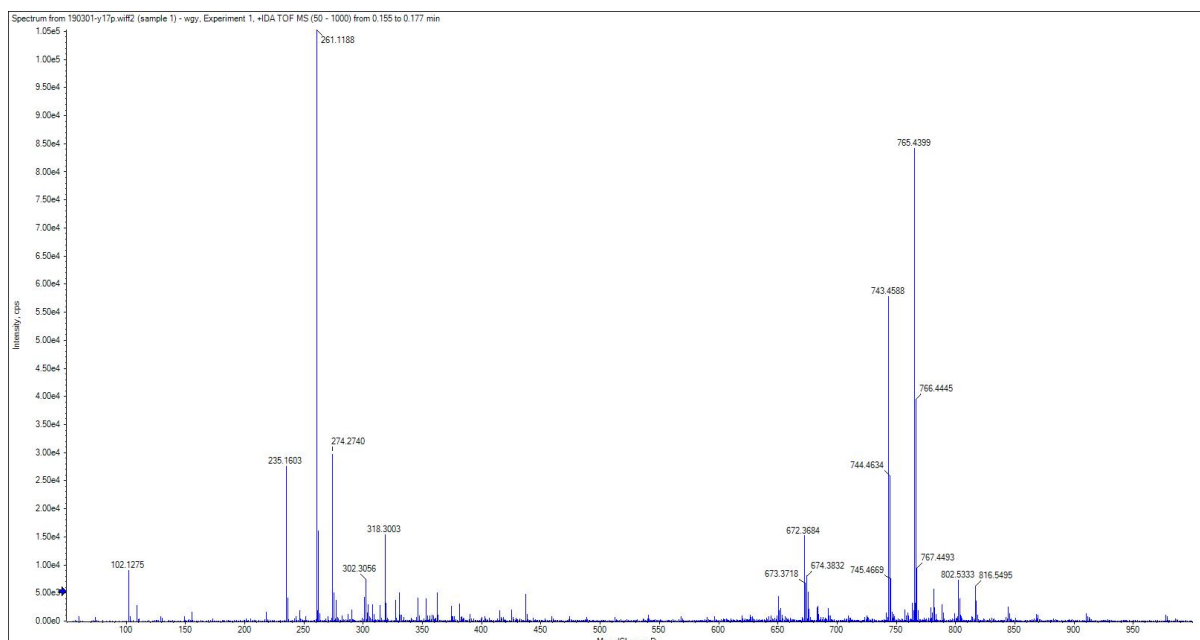
ESI mass spectrum of compound **6a** recorded on an AGILENT 1200 Capillary spectrometer:



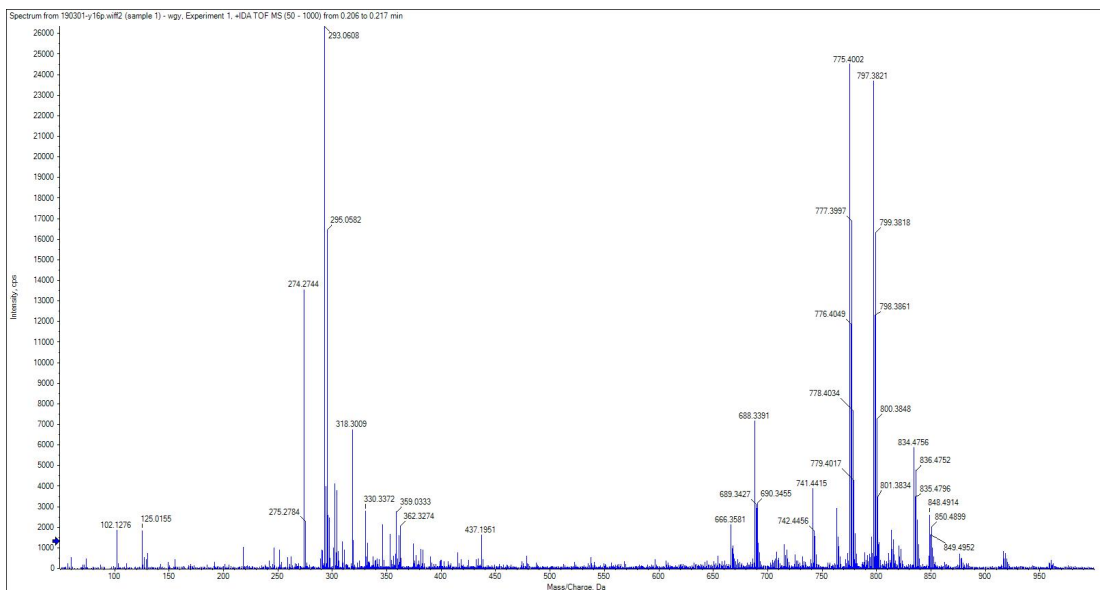
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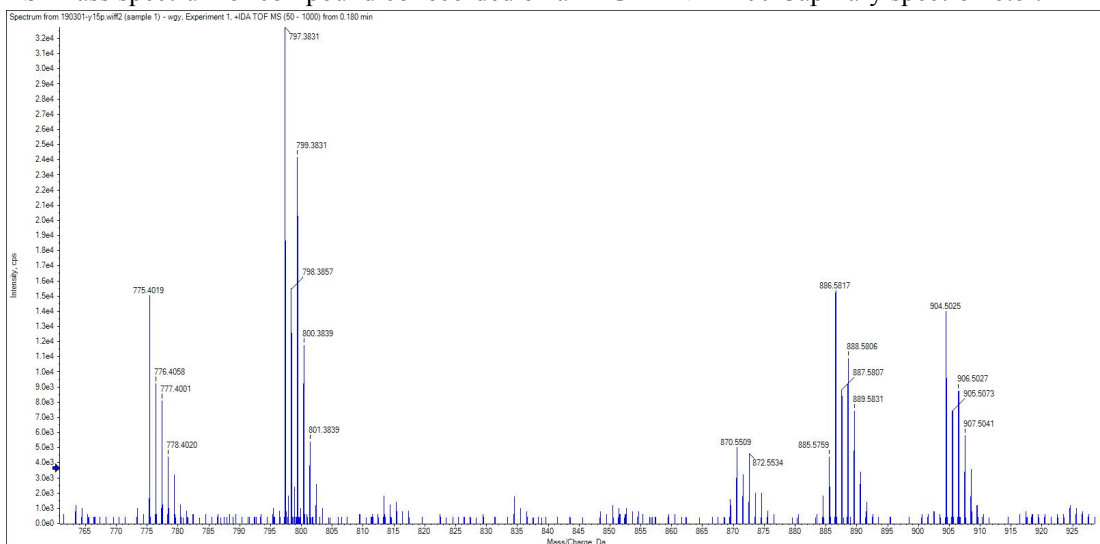
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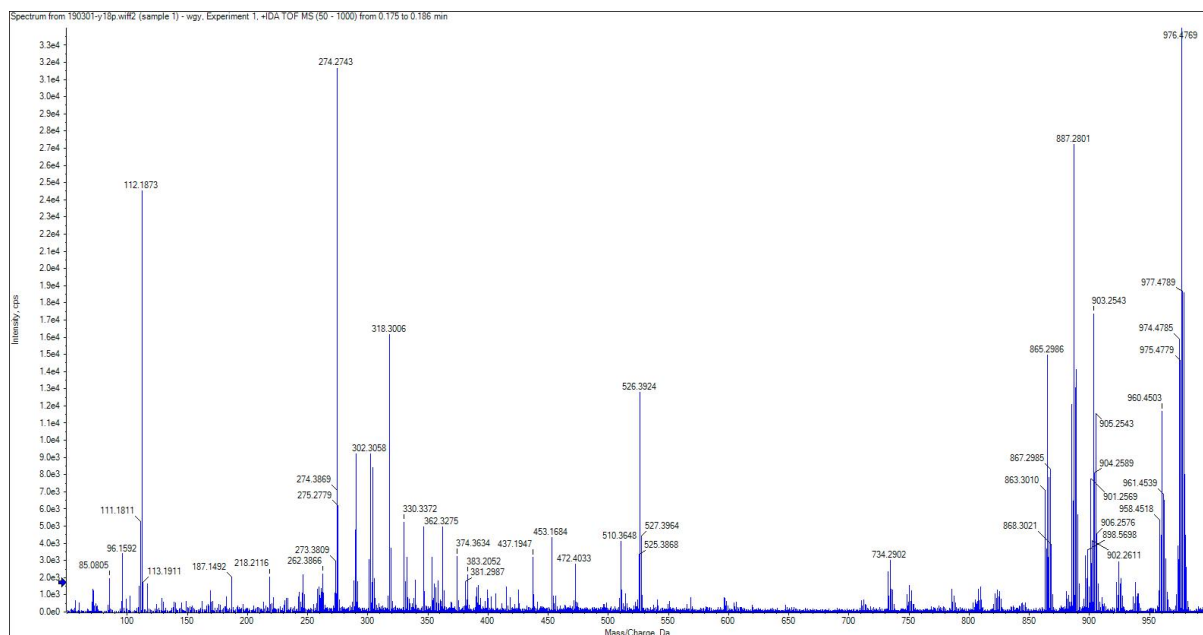
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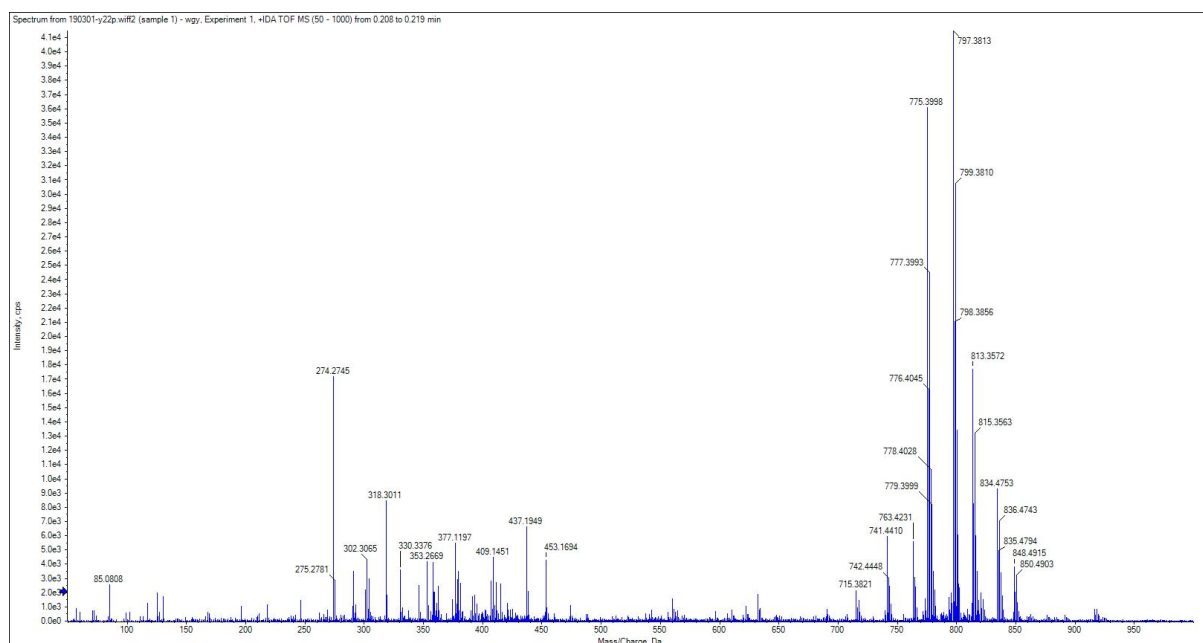
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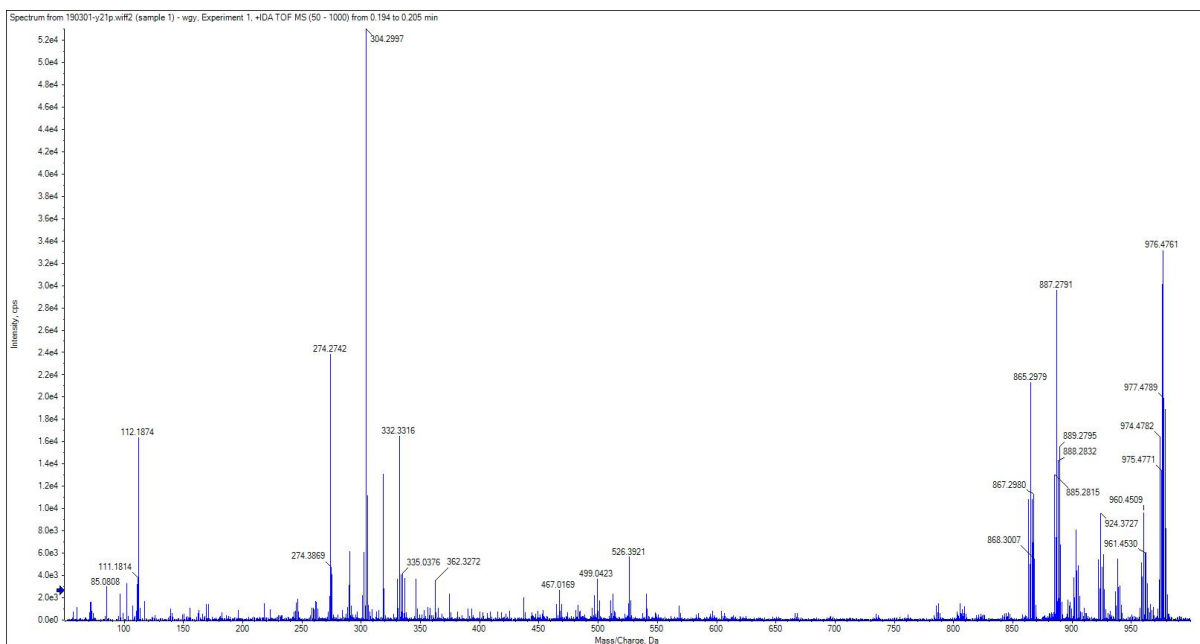
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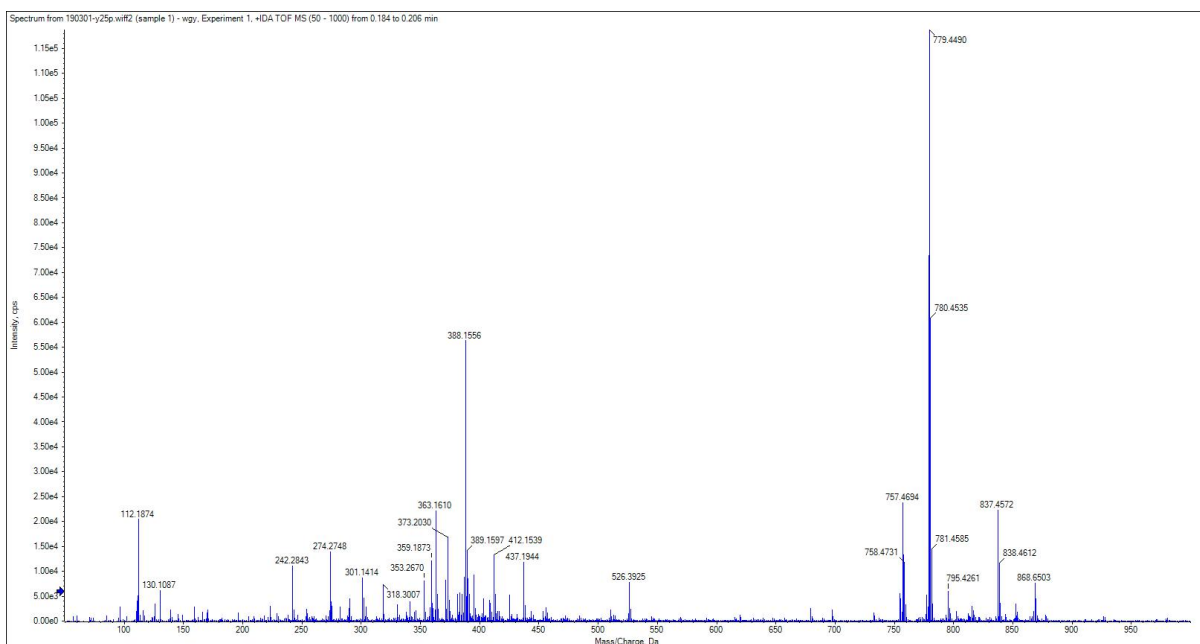
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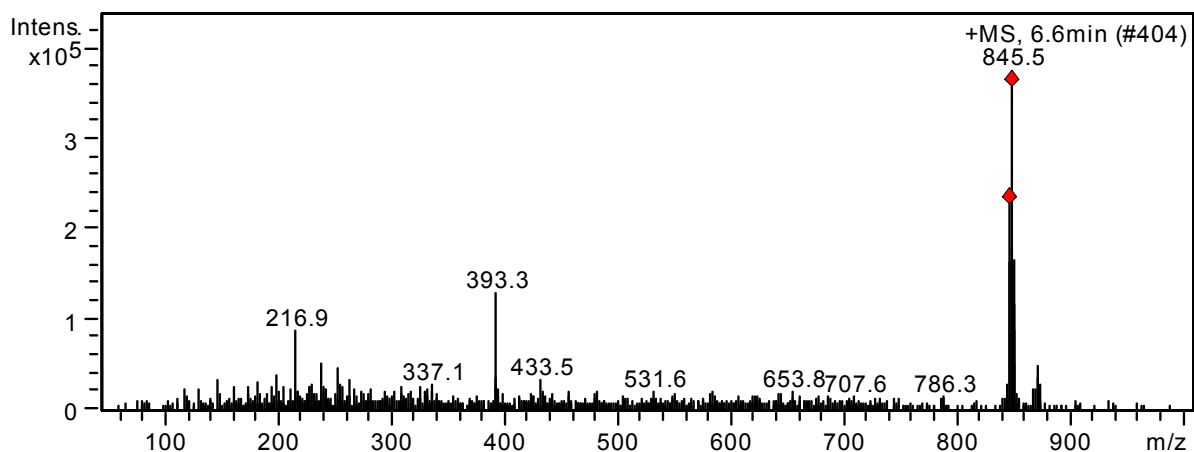
ESI mass spectrum of compound **6h** recorded on an AGILENT 1200 Capillary spectrometer:



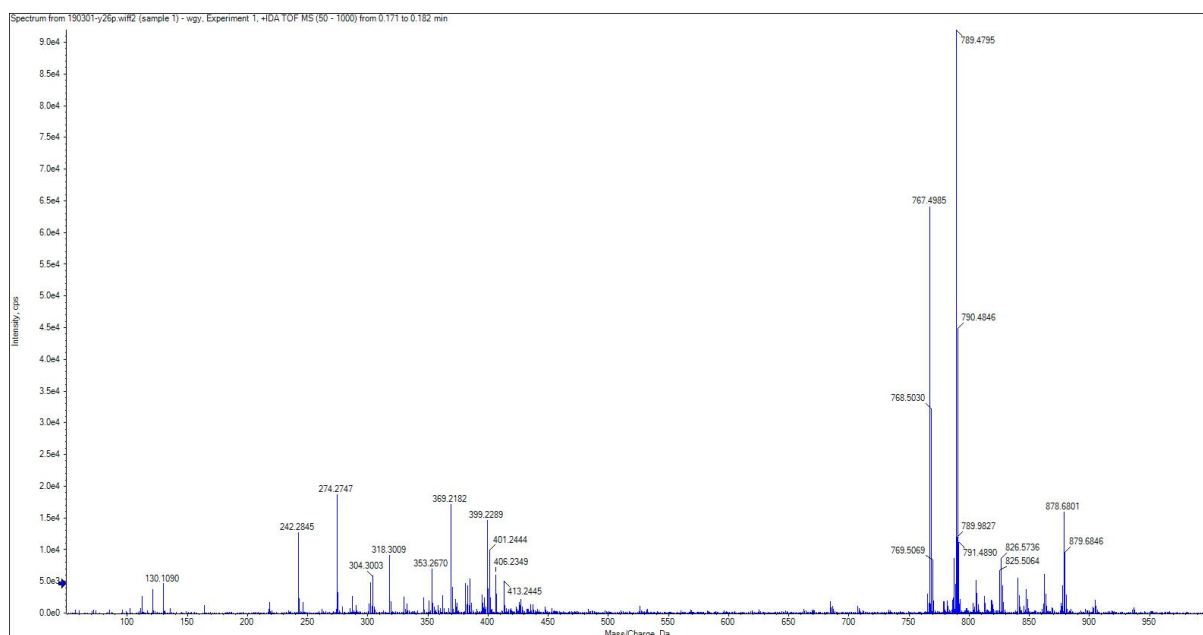
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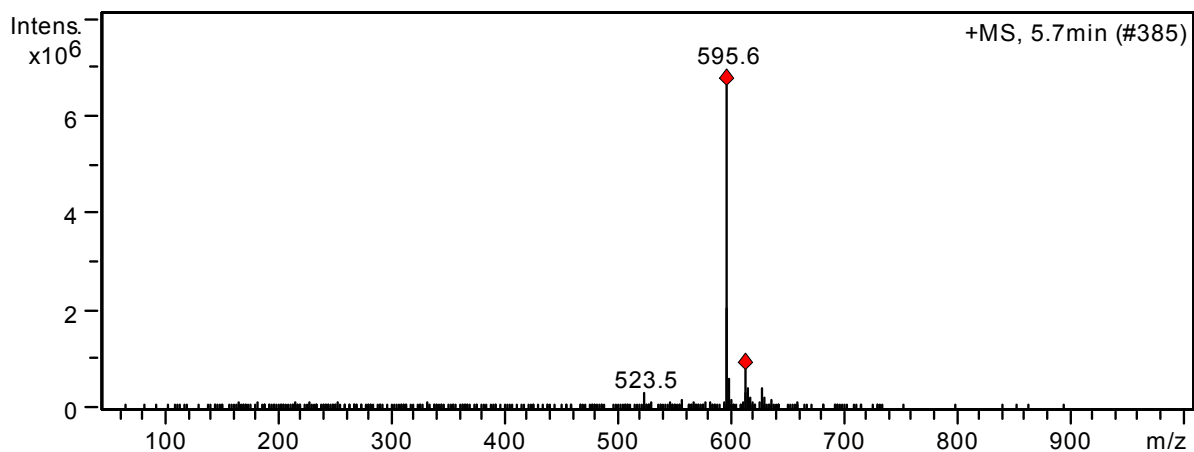
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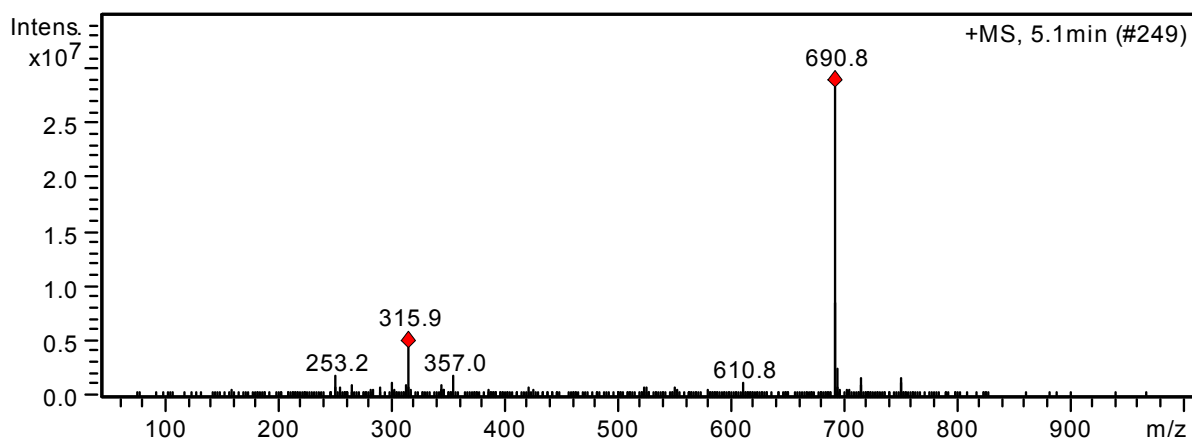
ESI mass spectrum of compound **6k** recorded on an AGILENT 1200 Capillary spectrometer:



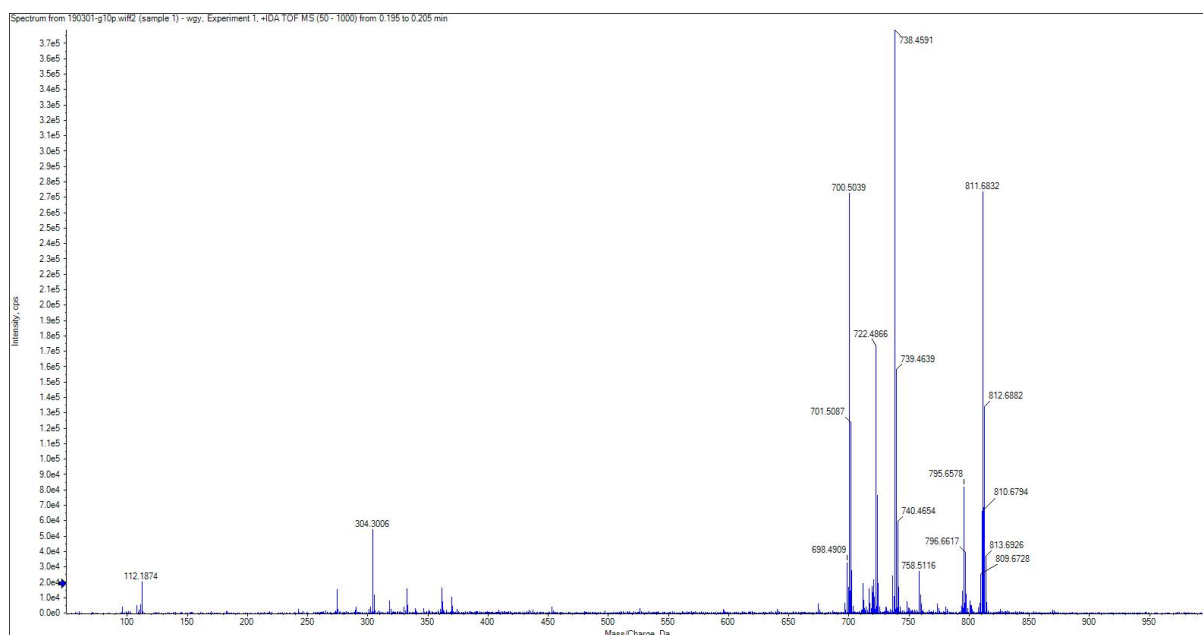
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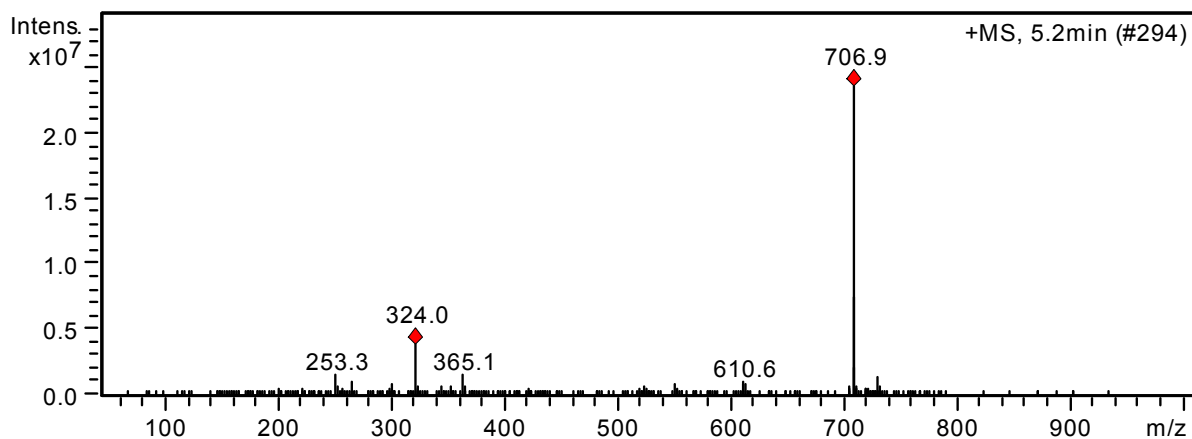
ESI mass spectrum of compound **7a** recorded on an AGILENT 1200 Capillary spectrometer:



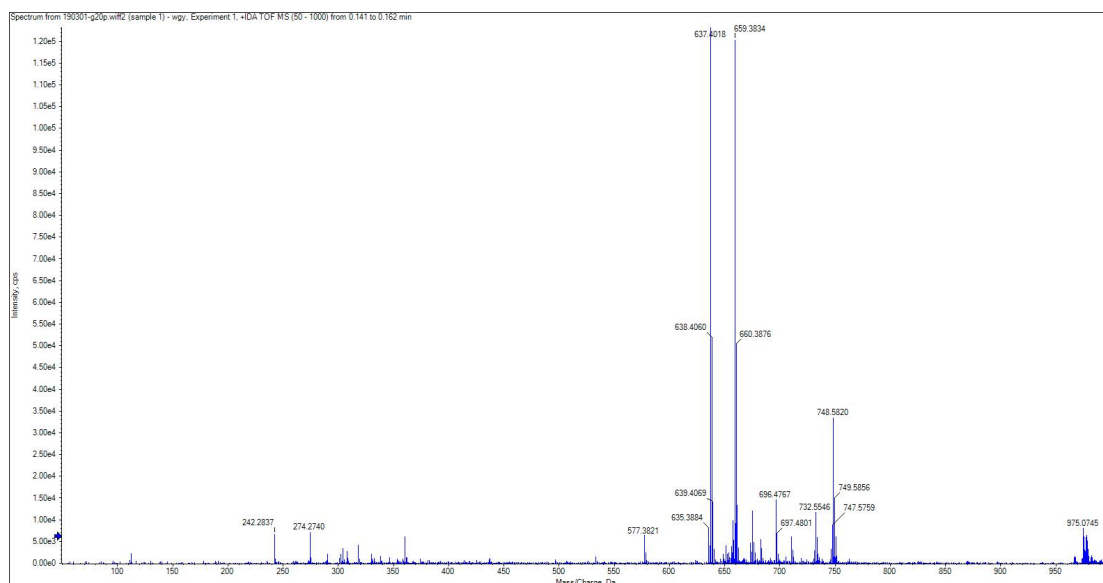
ESI mass spectrum of compound **7b** recorded on an AGILENT 1200 Capillary spectrometer:



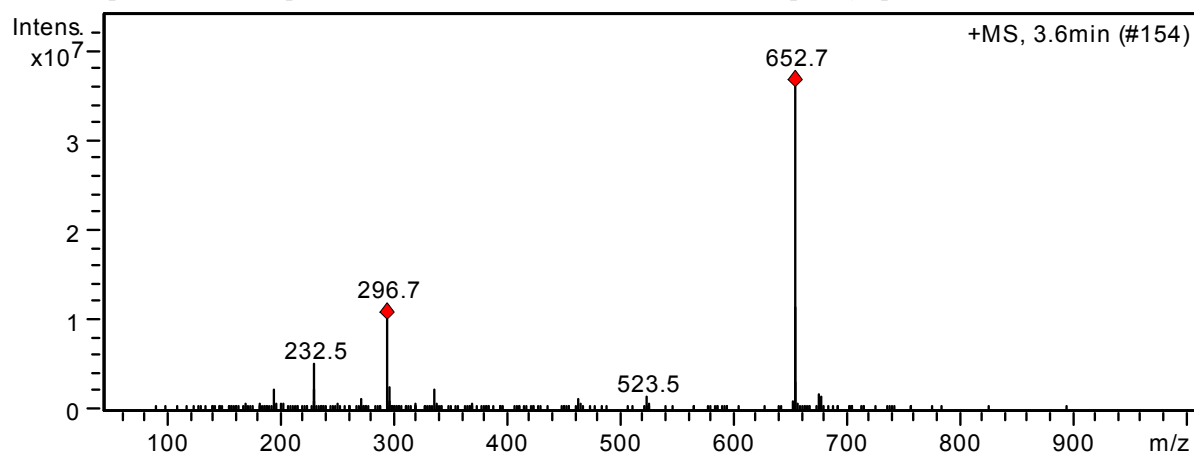
ESI mass spectrum of compound **7c** recorded on an AGILENT 1200 Capillary spectrometer:



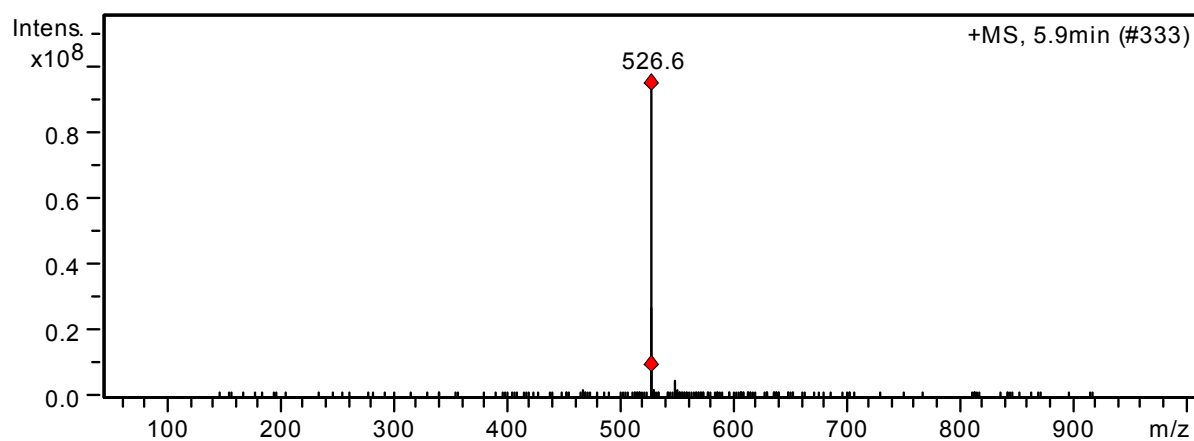
ESI mass spectrum of compound **7d** recorded on an AGILENT 1200 Capillary spectrometer:



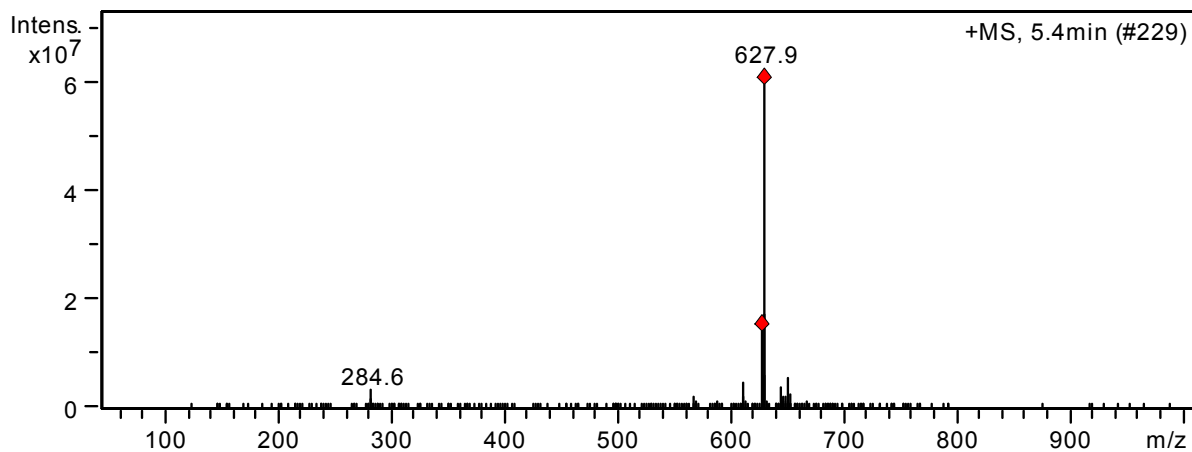
ESI mass spectrum of compound **7e** recorded on an AGILENT 1200 Capillary spectrometer:



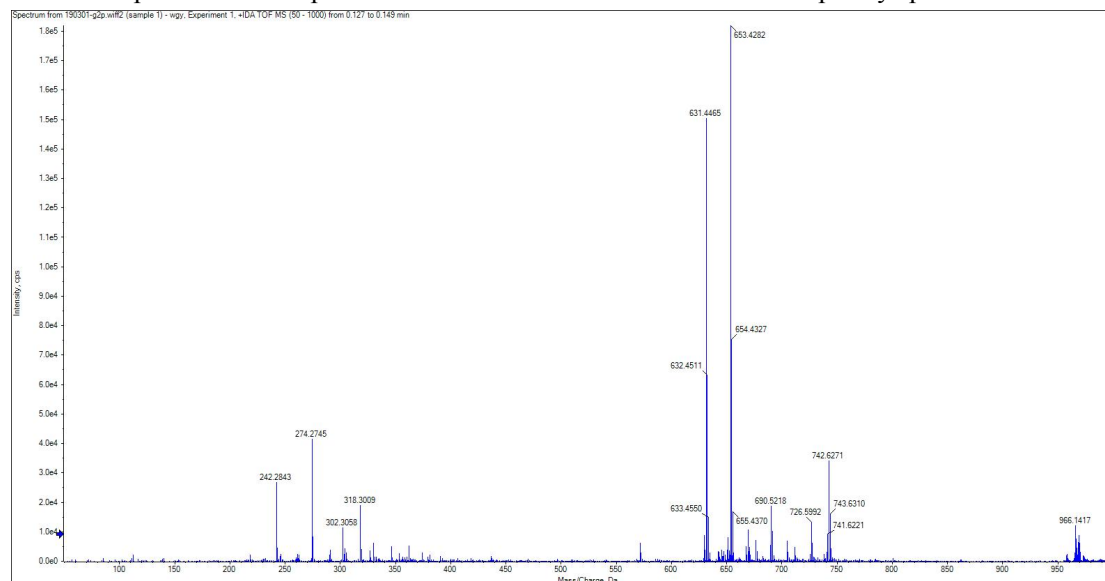
ESI mass spectrum of compound **8** recorded on an AGILENT 1200 Capillary spectrometer:



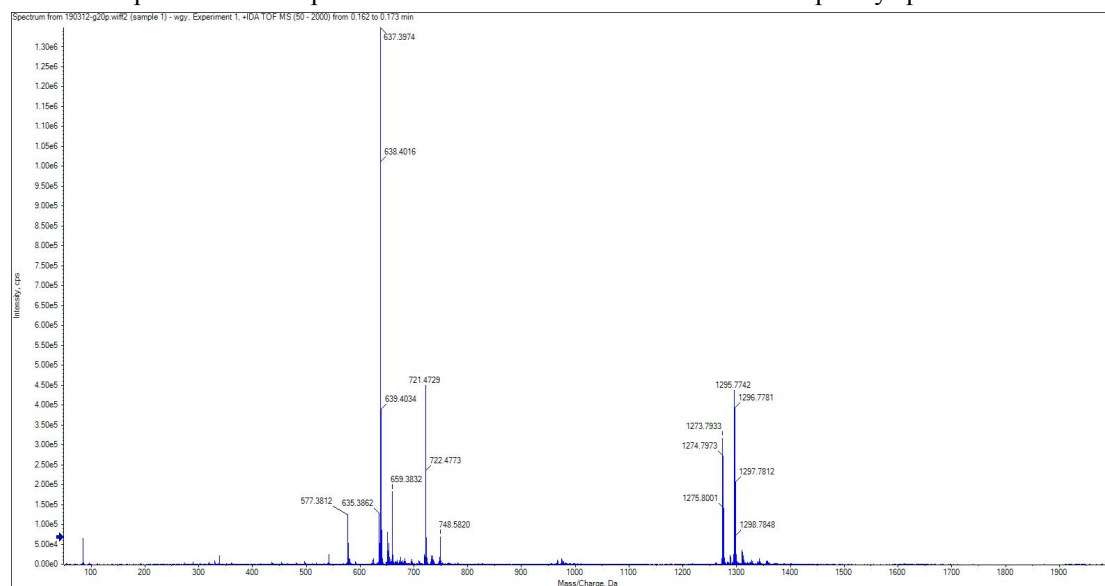
ESI mass spectrum of compound **8a** recorded on an AGILENT 1200 Capillary spectrometer:



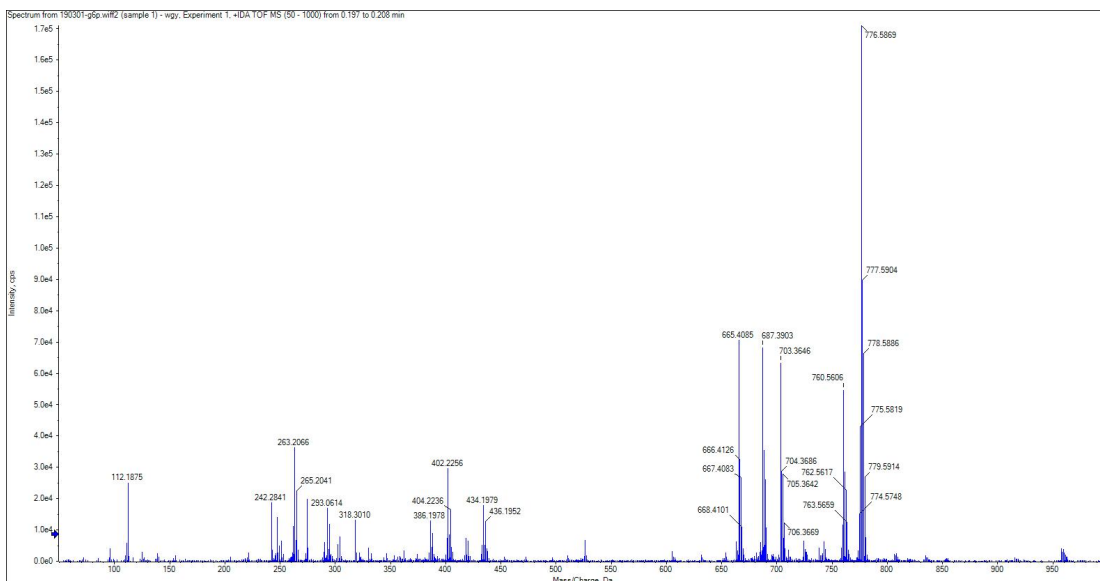
ESI mass spectrum of compound **8b** recorded on an AGILENT 1200 Capillary spectrometer:



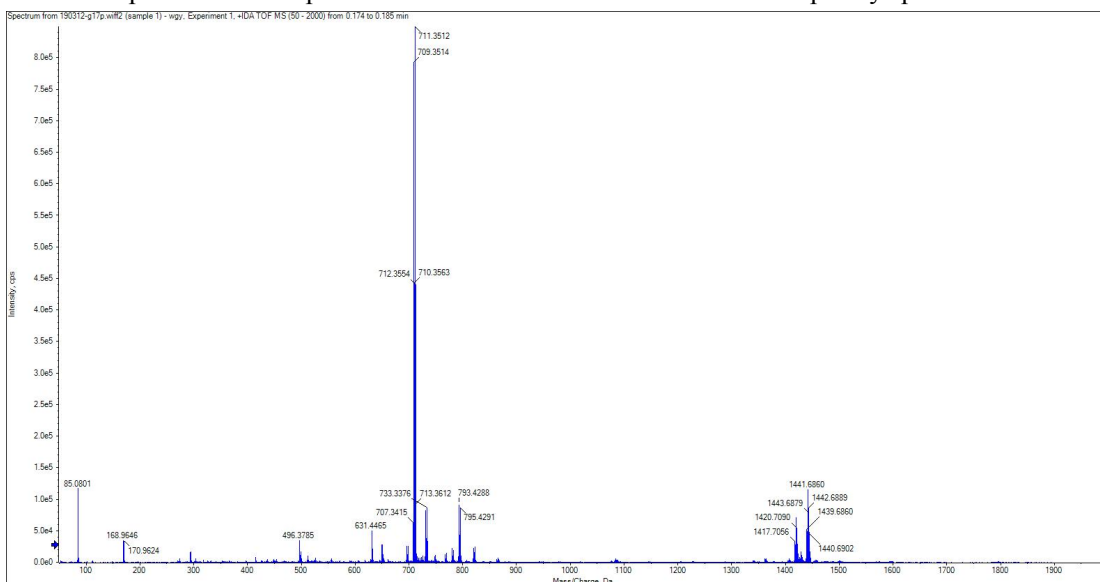
ESI mass spectrum of compound **8c** recorded on an AGILENT 1200 Capillary spectrometer:



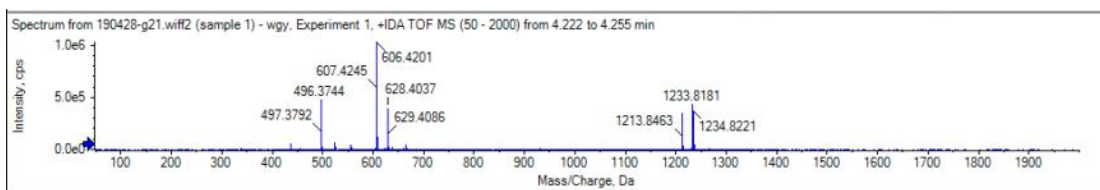
ESI mass spectrum of compound **8d** recorded on an AGILENT 1200 Capillary spectrometer:



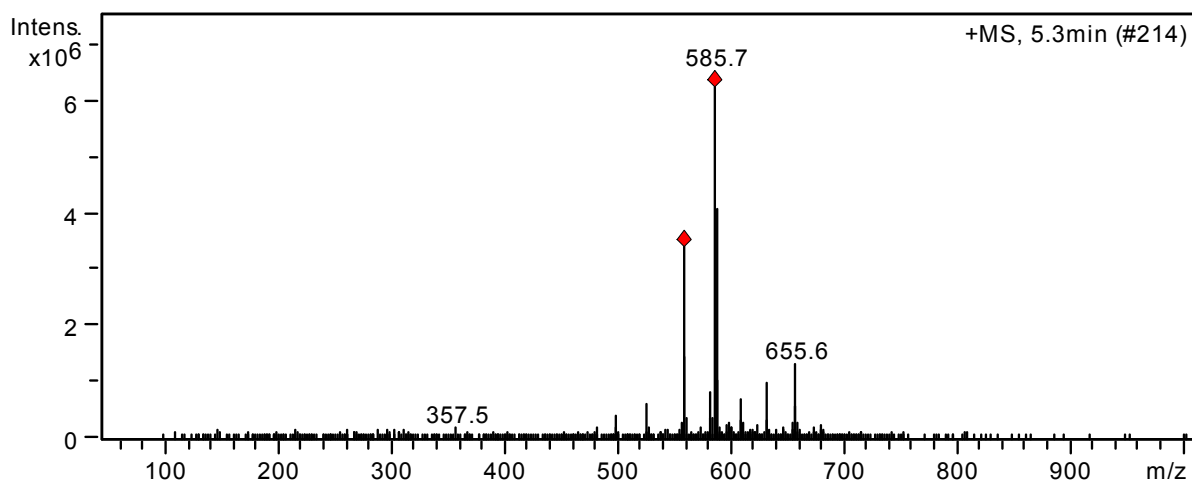
ESI mass spectrum of compound **8e** recorded on an AGILENT 1200 Capillary spectrometer:



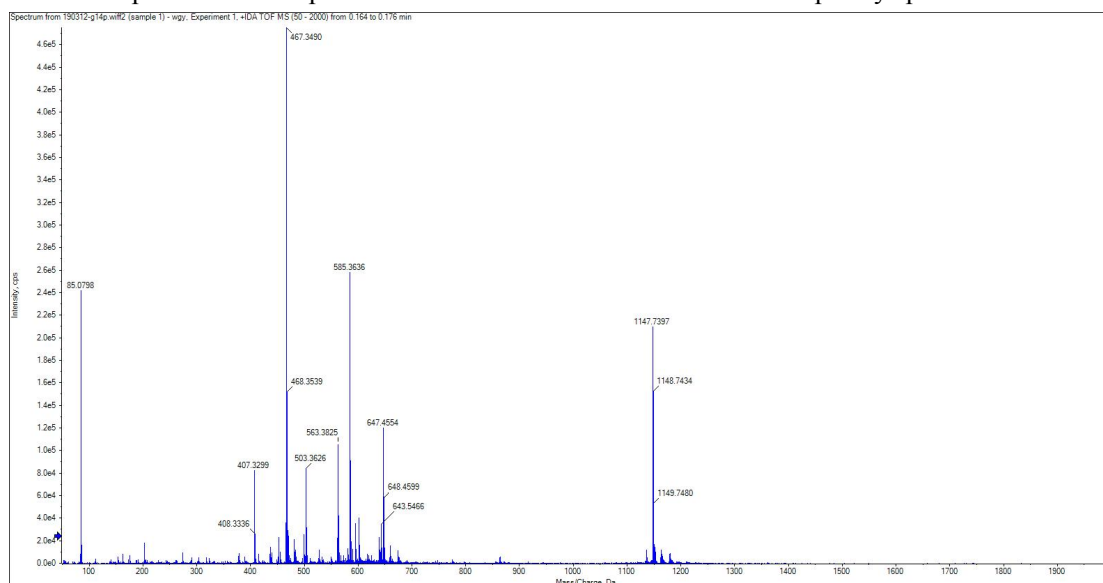
ESI mass spectrum of compound **8f** recorded on an AGILENT 1200 Capillary spectrometer:



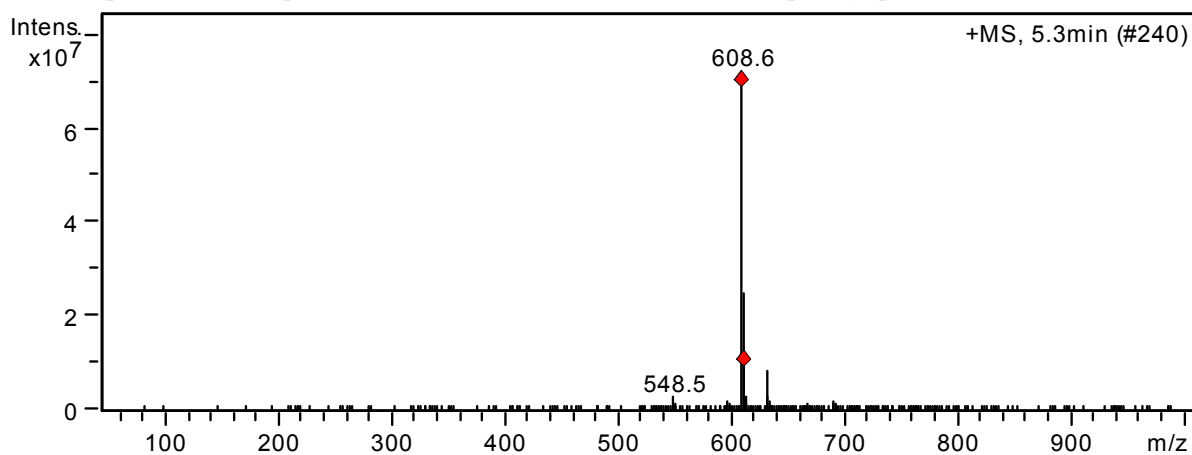
ESI mass spectrum of compound **9** recorded on an AGILENT 1200 Capillary spectrometer:



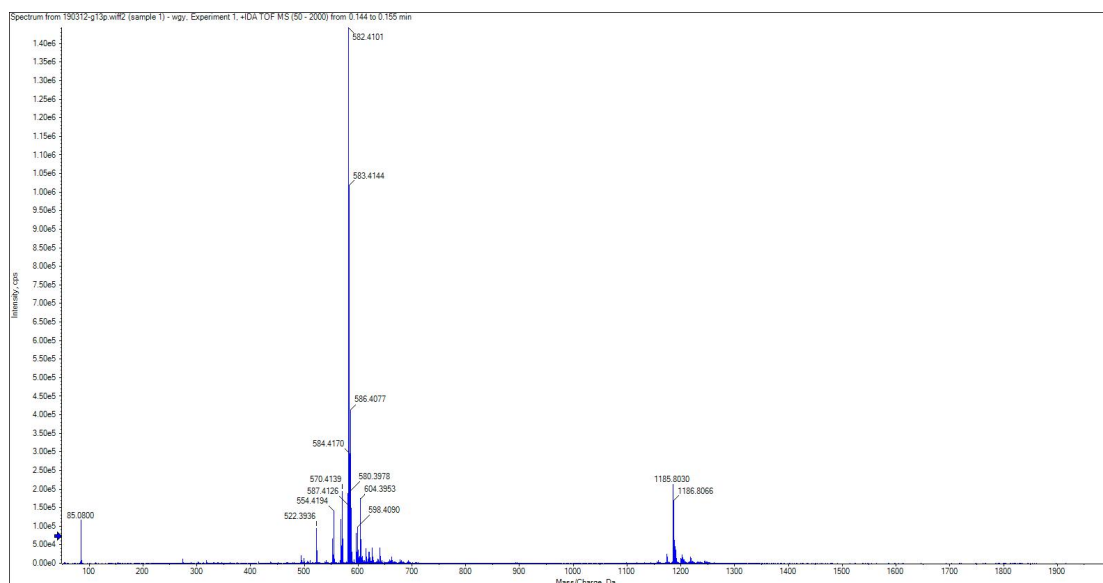
ESI mass spectrum of compound **10** recorded on an AGILENT 1200 Capillary spectrometer:



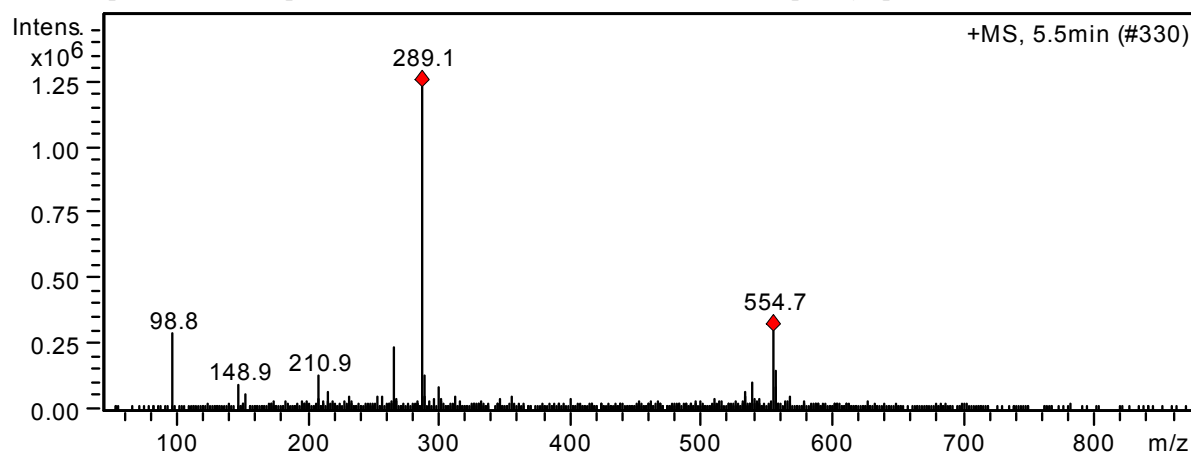
ESI mass spectrum of compound **11** recorded on an AGILENT 1200 Capillary spectrometer:



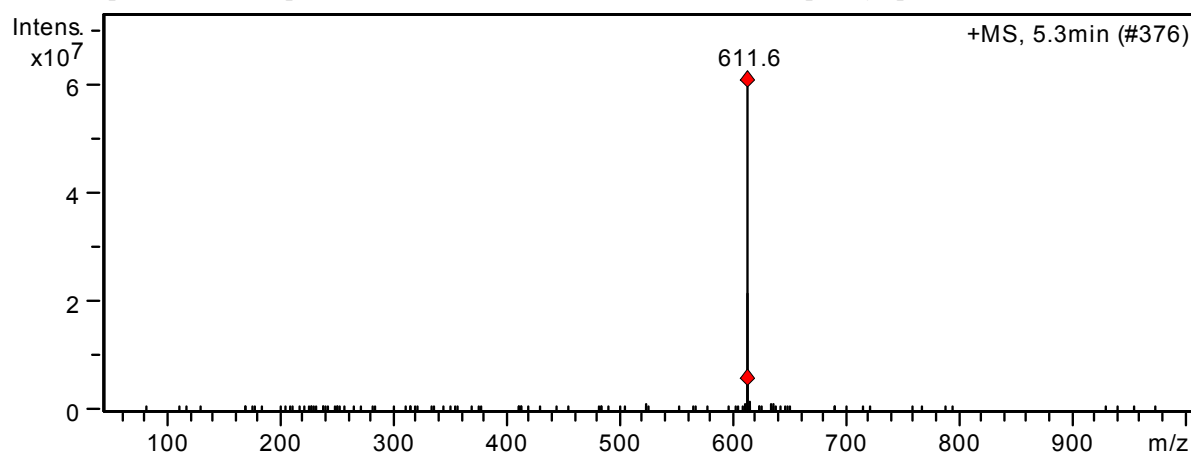
ESI mass spectrum of compound **12** recorded on an AGILENT 1200 Capillary spectrometer:



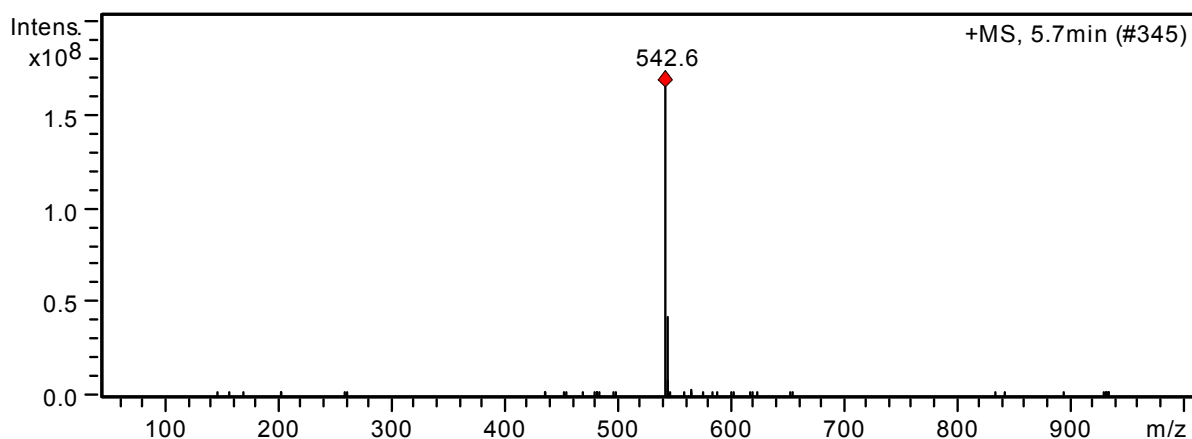
ESI mass spectrum of compound **13** recorded on an AGILENT 1200 Capillary spectrometer:



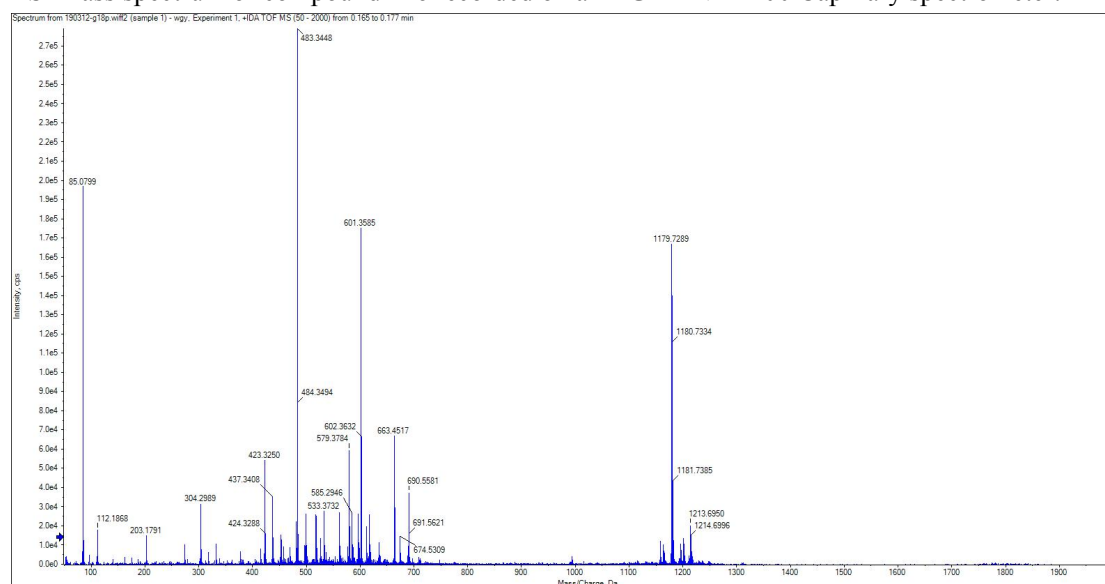
ESI mass spectrum of compound **14a** recorded on an AGILENT 1200 Capillary spectrometer:



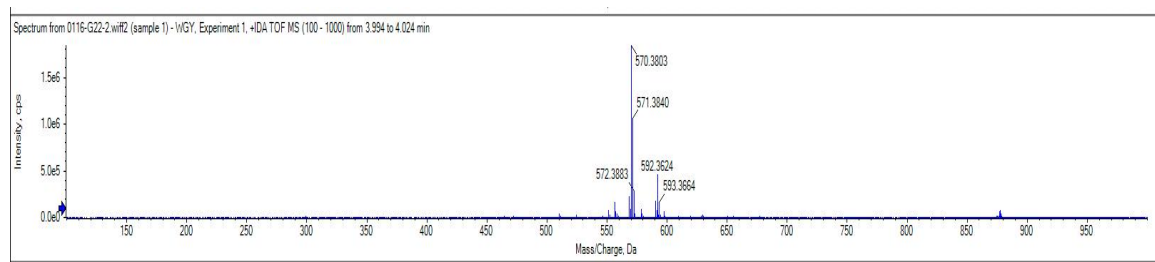
ESI mass spectrum of compound **14b** recorded on an AGILENT 1200 Capillary spectrometer:



ESI mass spectrum of compound **14c** recorded on an AGILENT 1200 Capillary spectrometer:

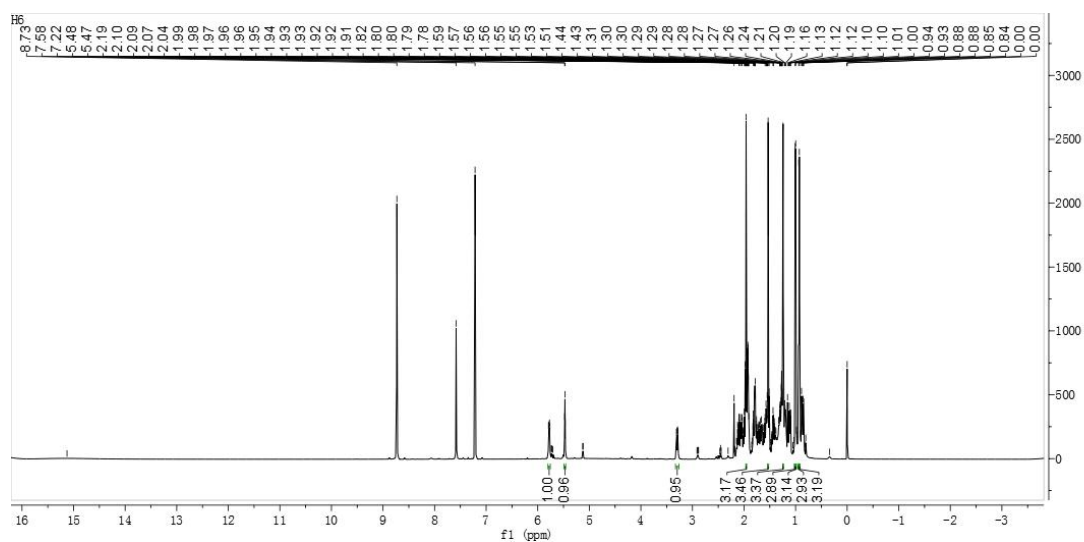


ESI mass spectrum of compound **14d** recorded on an AGILENT 1200 Capillary spectrometer:

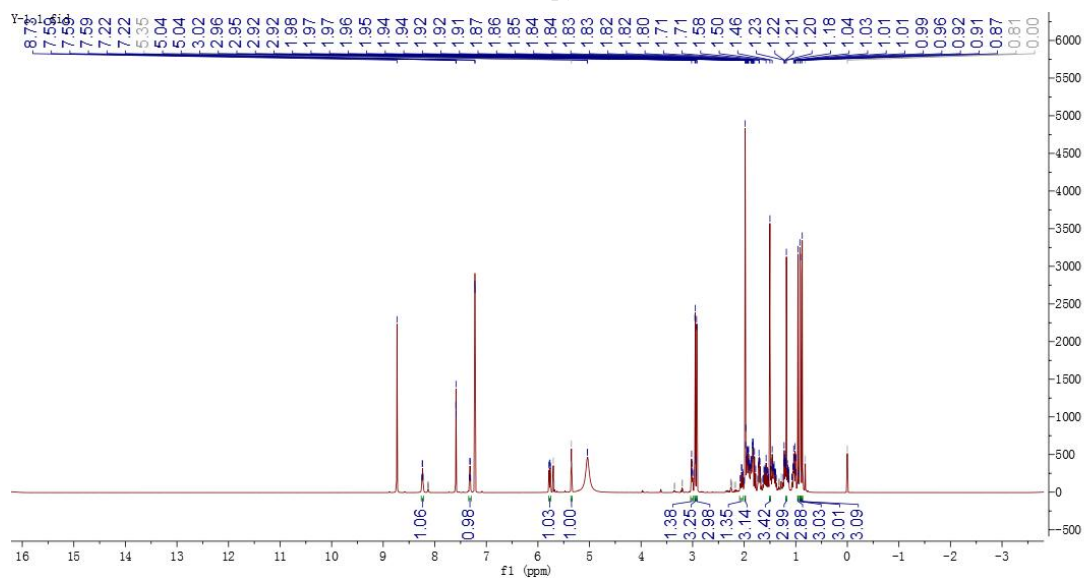


^1H NMR (600MHz) of compounds 3-14d

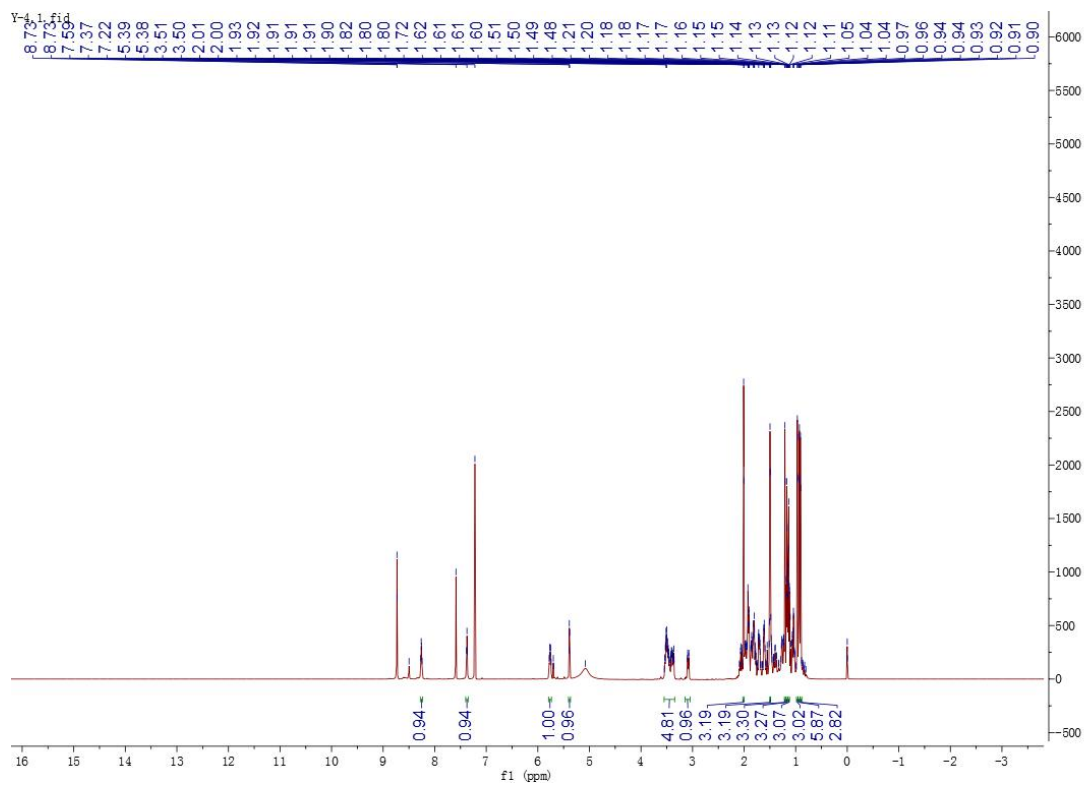
^1H NMR (600MHz) of compound **3** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



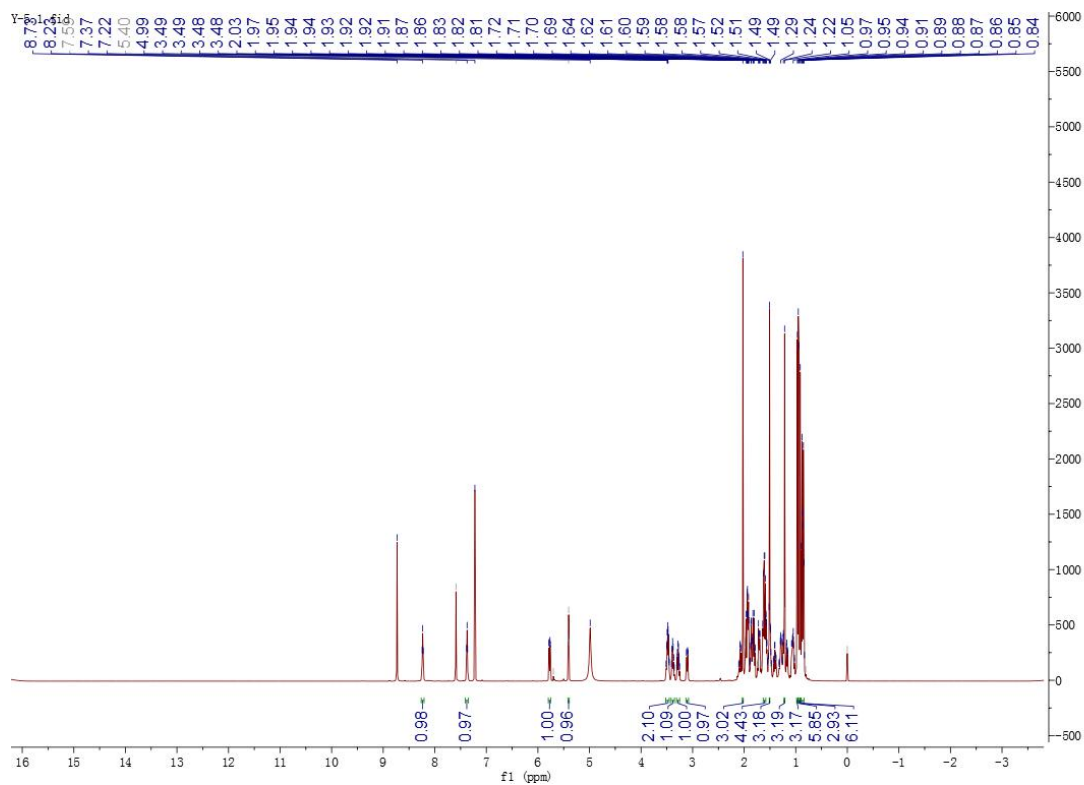
^1H NMR (600MHz) of compound **4a** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



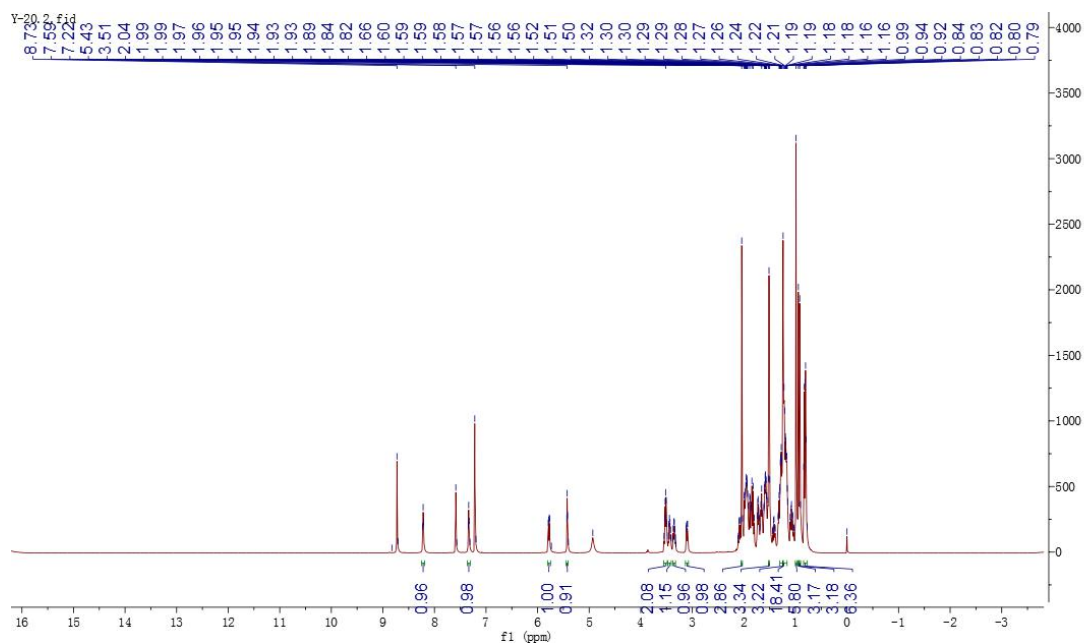
^1H NMR (600MHz) of compound **4b** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



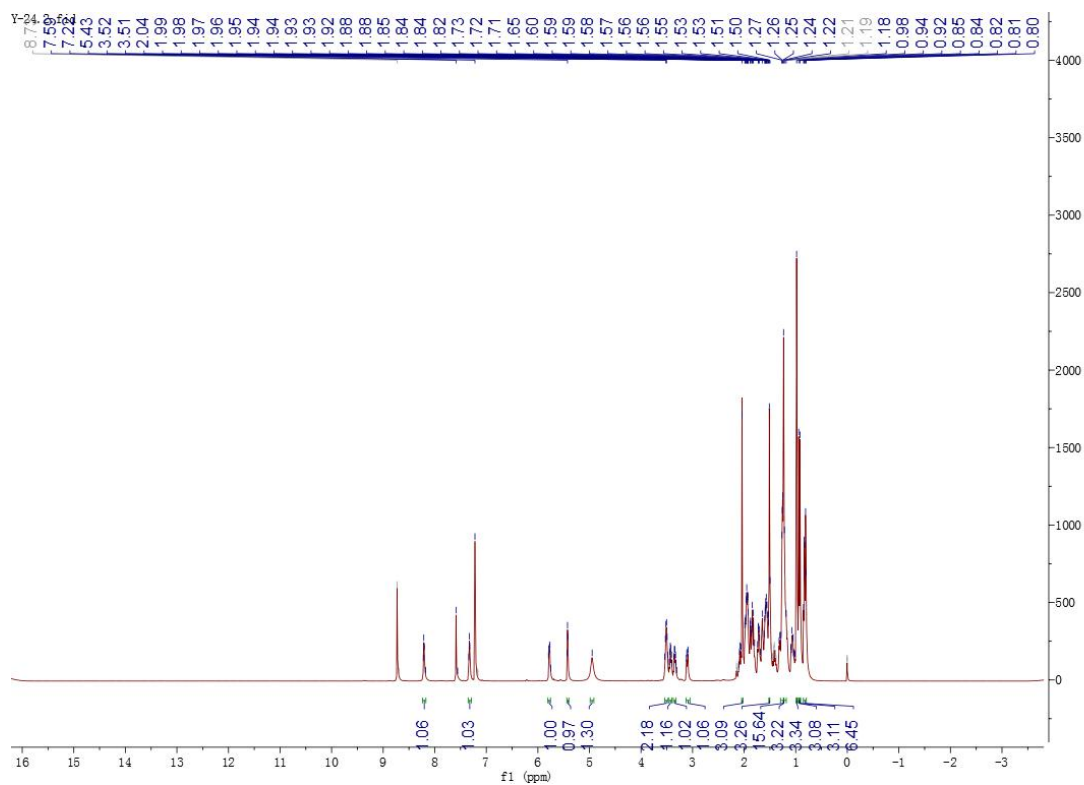
^1H NMR (600MHz) of compound **4c** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



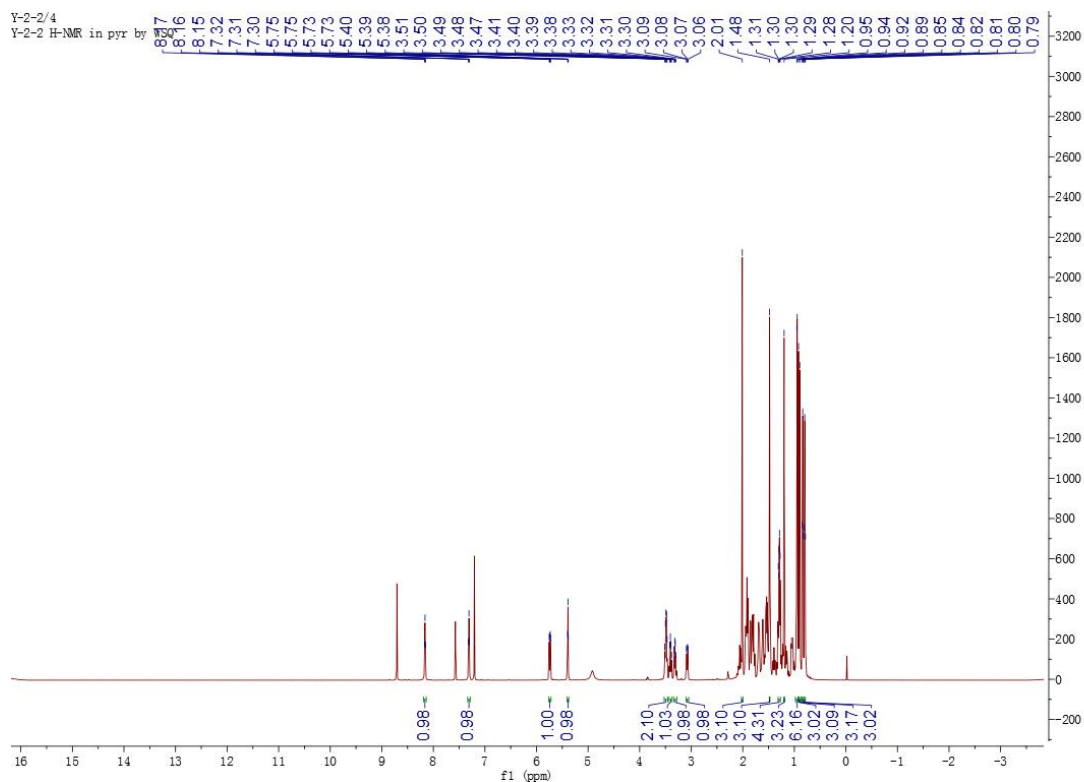
^1H NMR (600MHz) of compound **4d** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



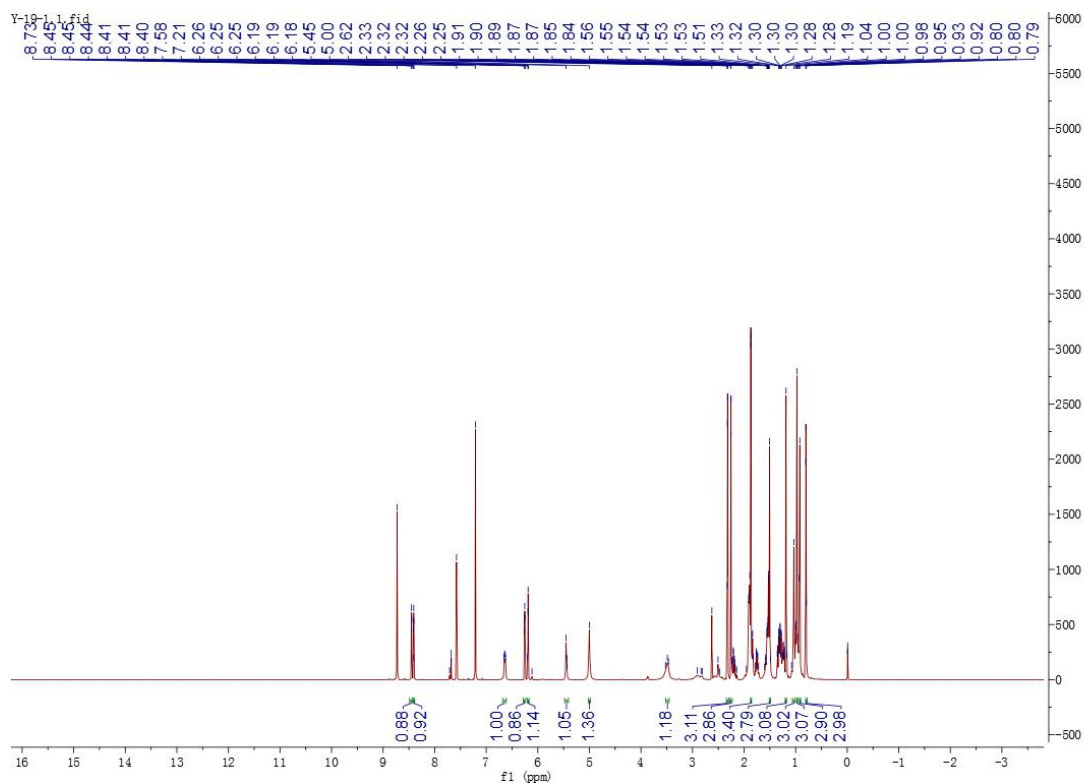
^1H NMR (600MHz) of compound **4e** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



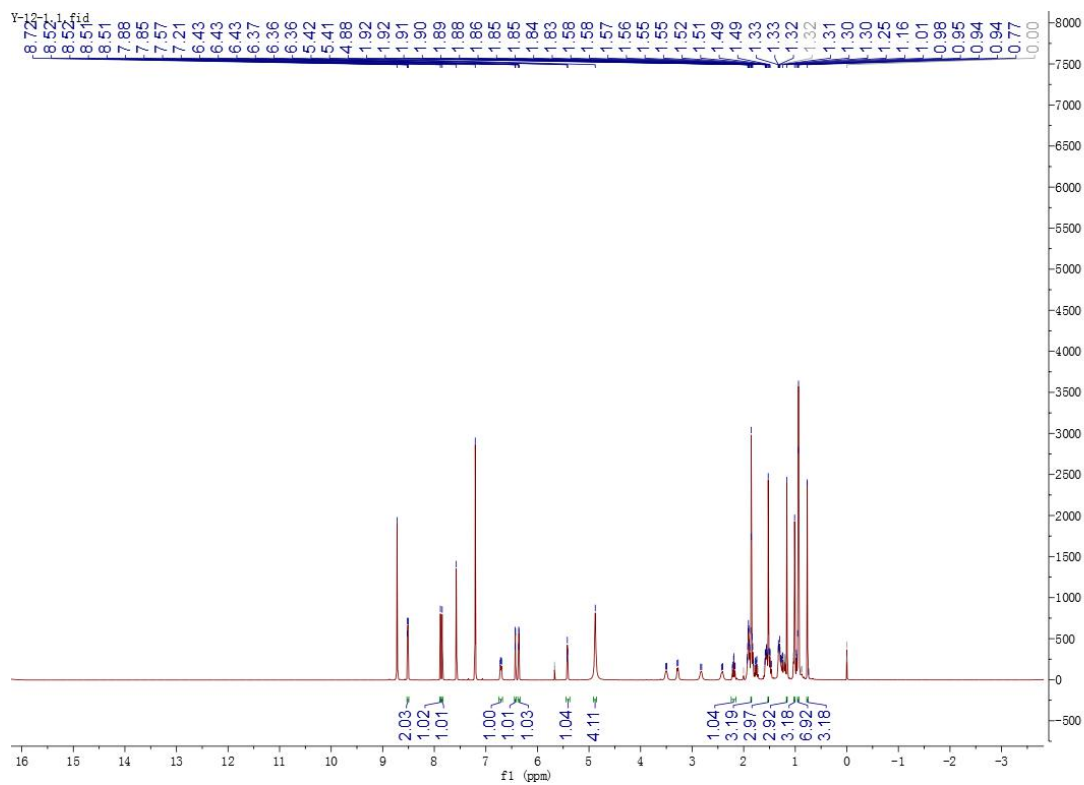
^1H NMR (600MHz) of compound **4f** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



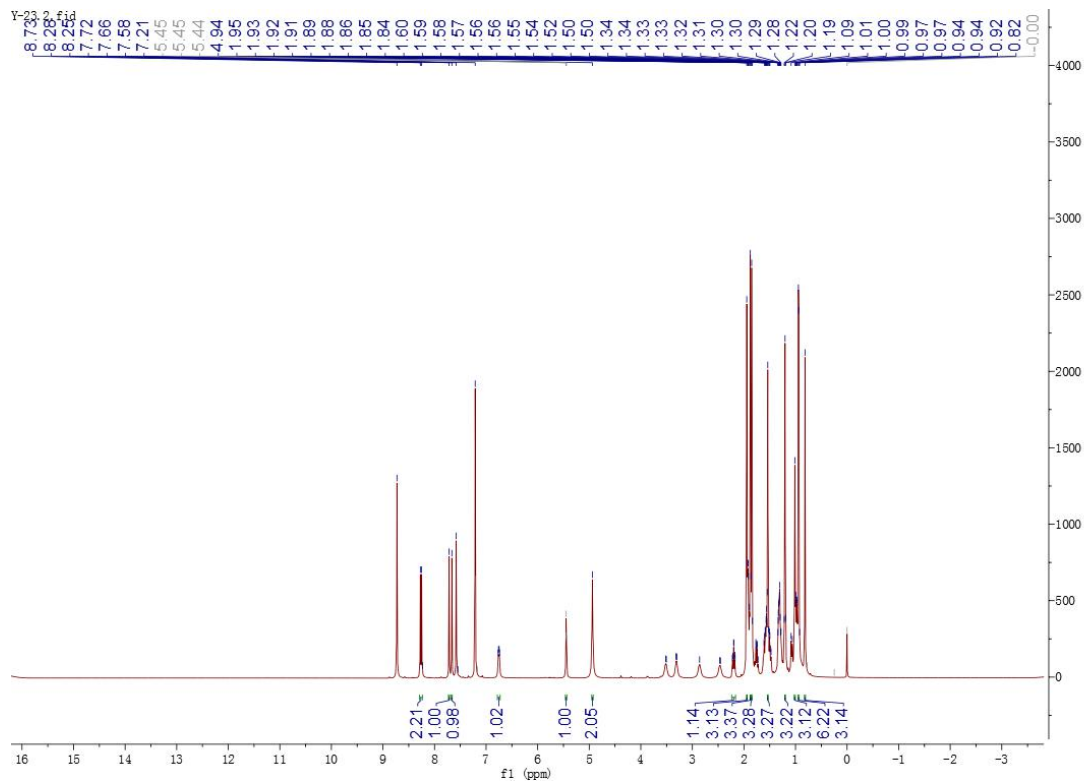
^1H NMR (600MHz) of compound **5a** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



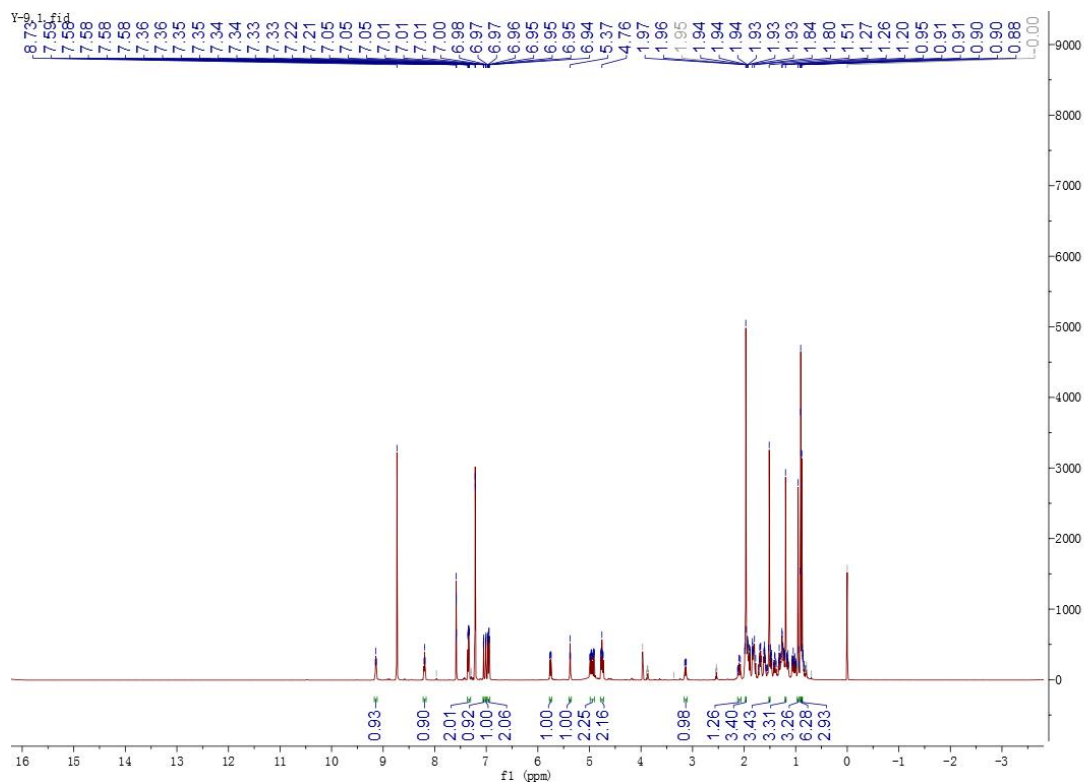
^1H NMR (600MHz) of compound **5b** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



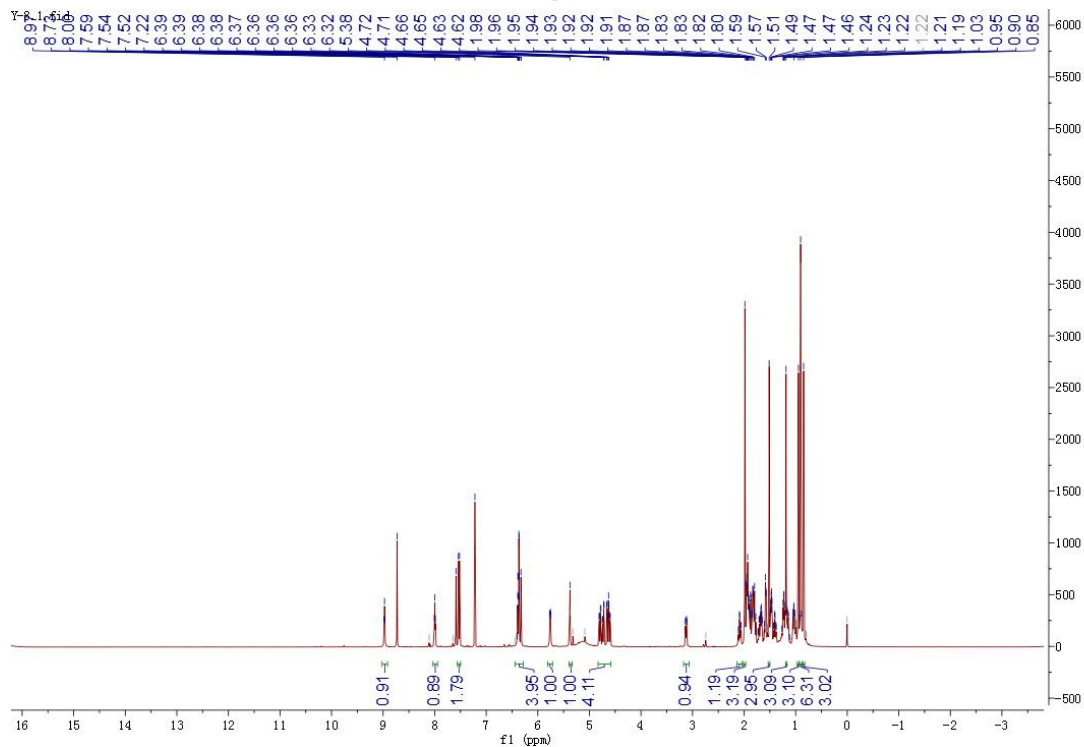
^1H NMR (600MHz) of compound **5c** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



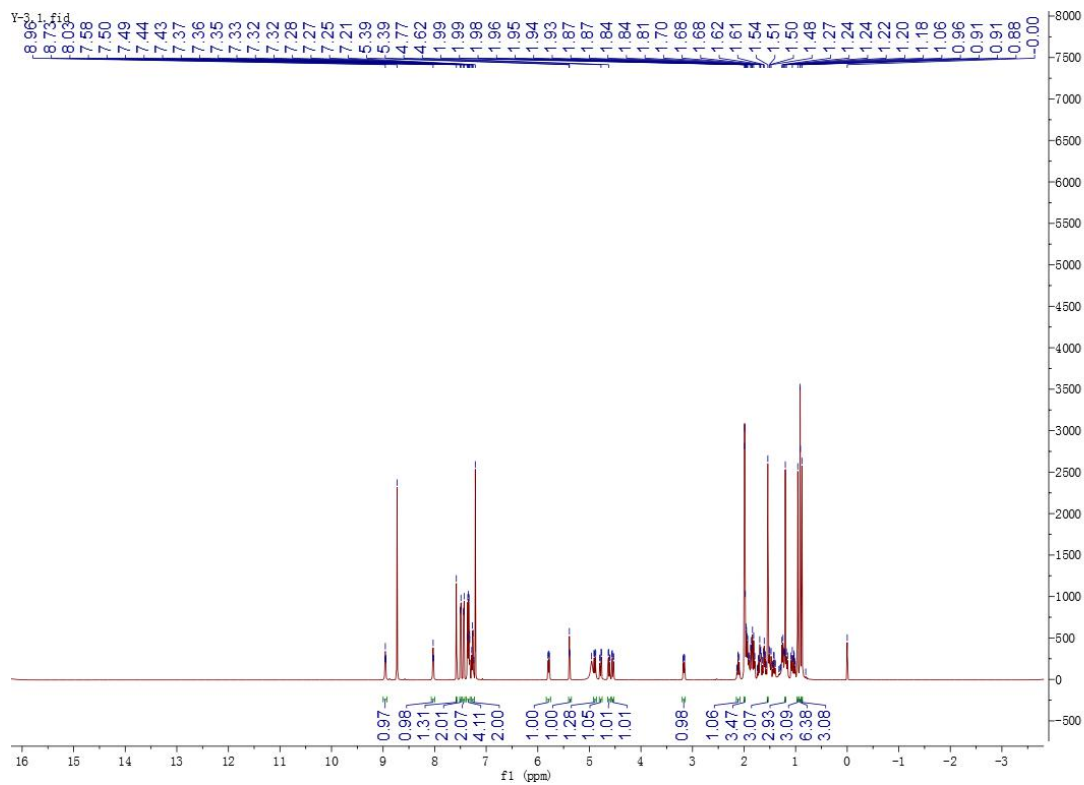
^1H NMR (600MHz) of compound **5d** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



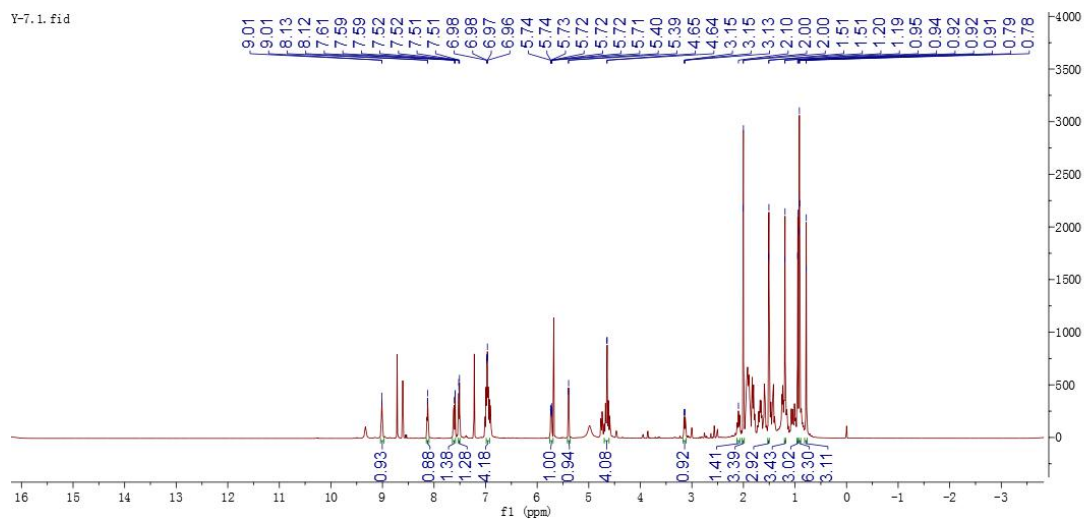
¹H NMR (600MHz) of compound **5e** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine-d₅):



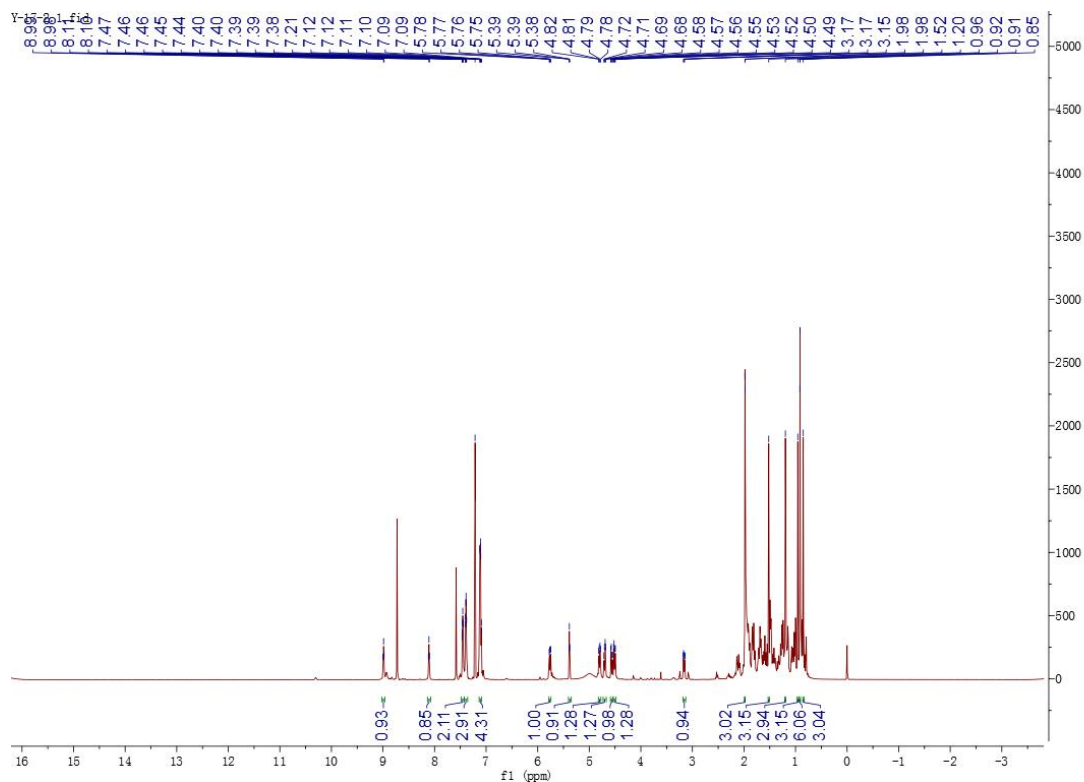
¹H NMR (600MHz) of compound **6a** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine-d₅):



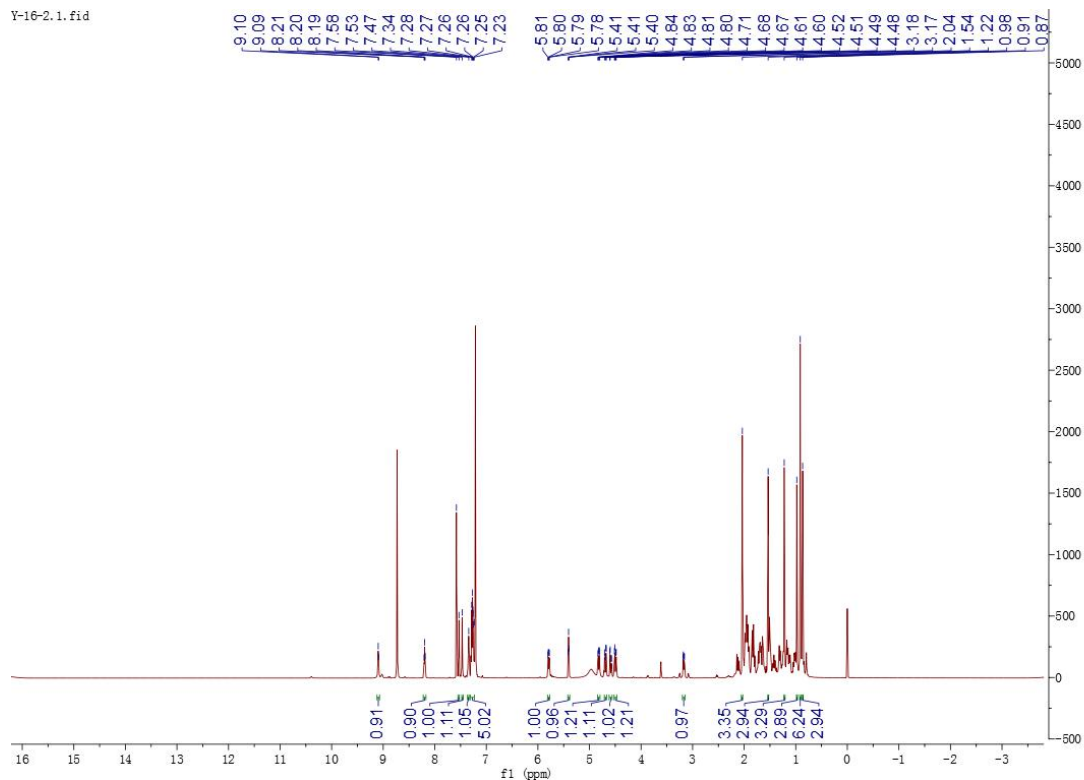
^1H NMR (600MHz) of compound **6b** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



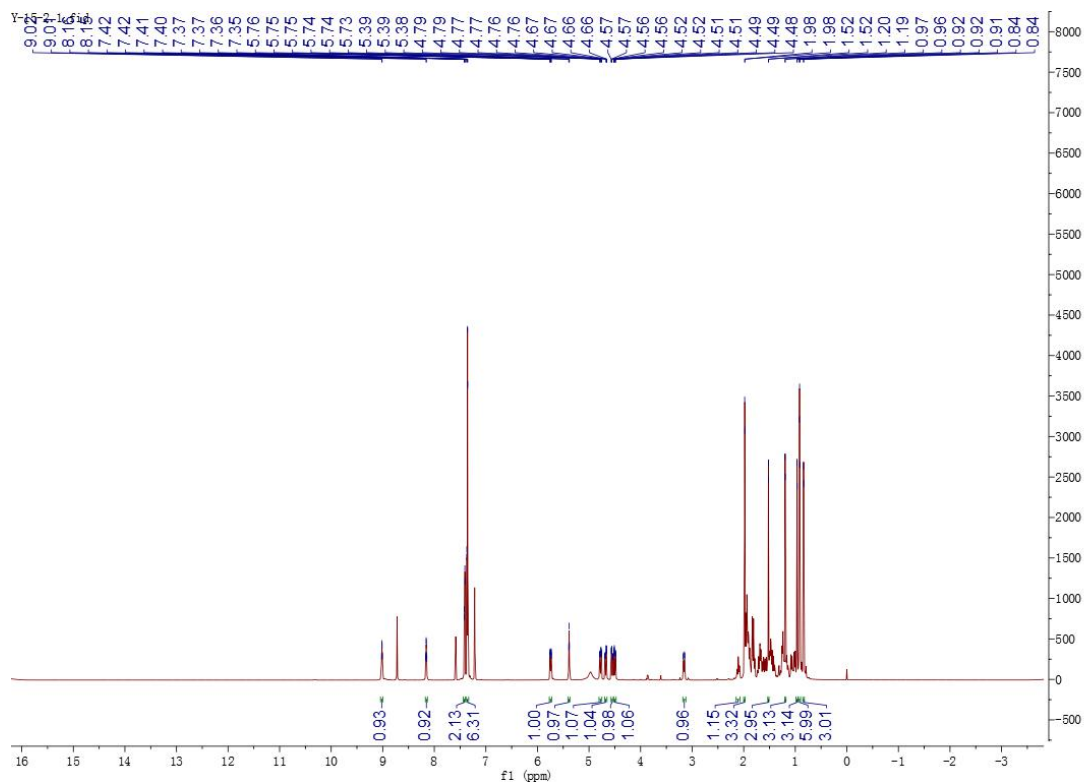
^1H NMR (600MHz) of compound **6c** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



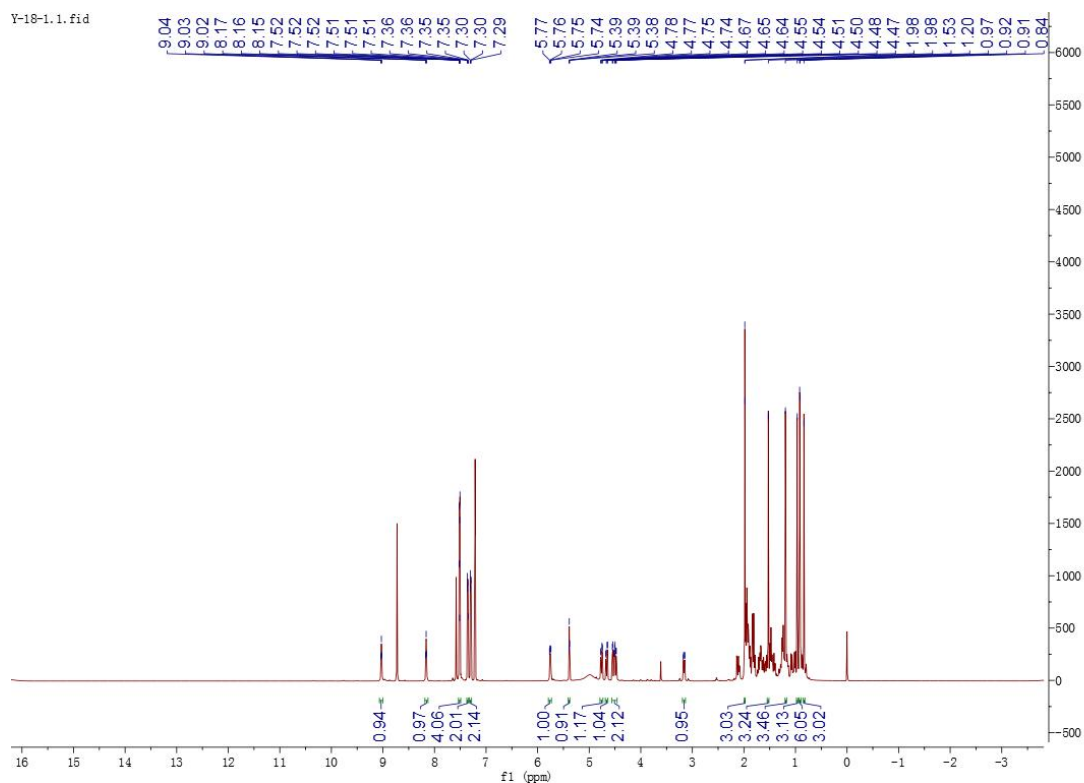
^1H NMR (600MHz) of compound **6d** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



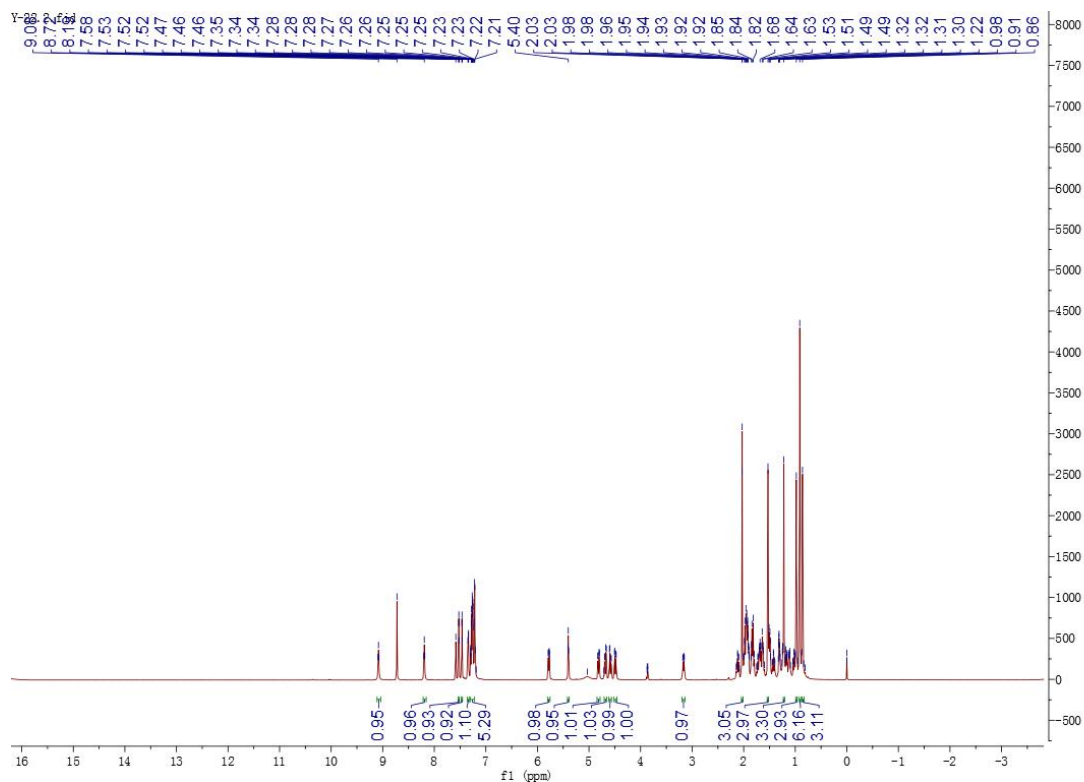
^1H NMR (600MHz) of compound **6e** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



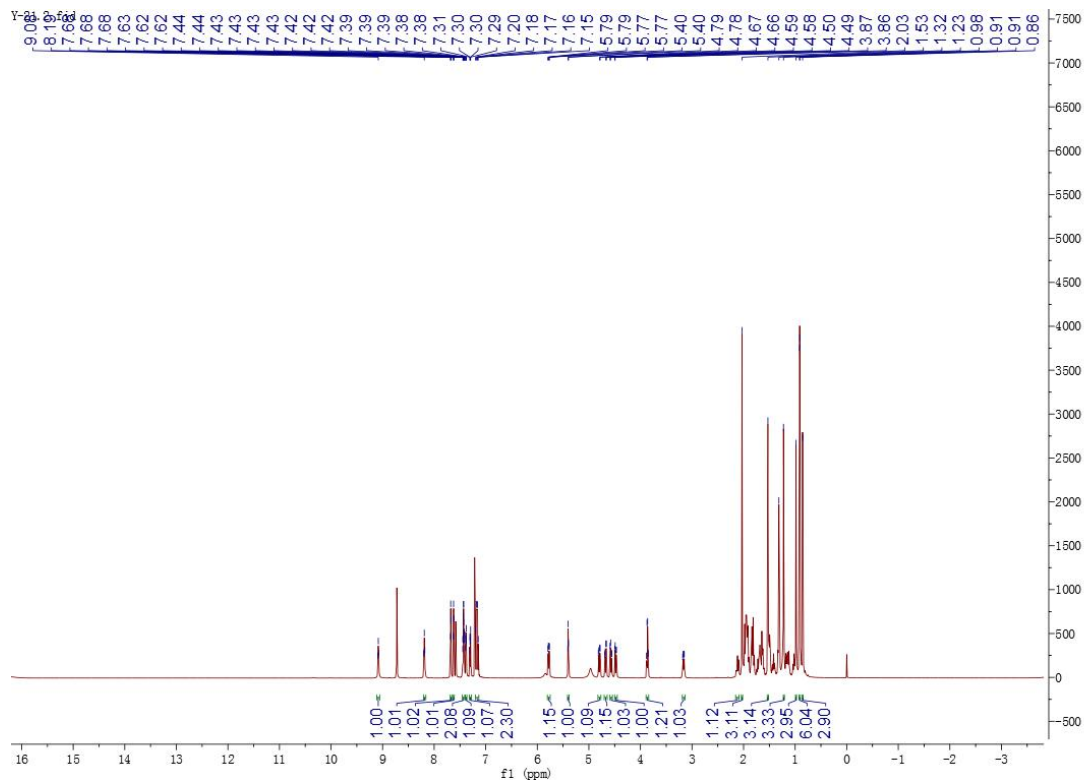
^1H NMR (600MHz) of compound **6f** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



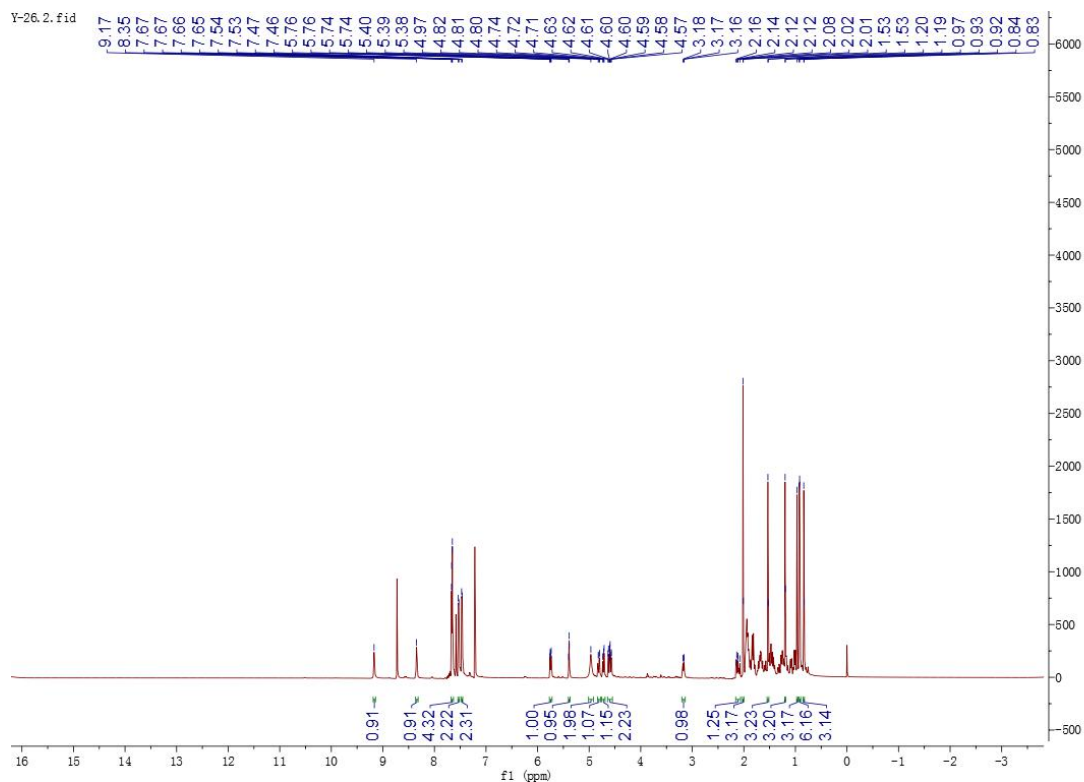
^1H NMR (600MHz) of compound **6g** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



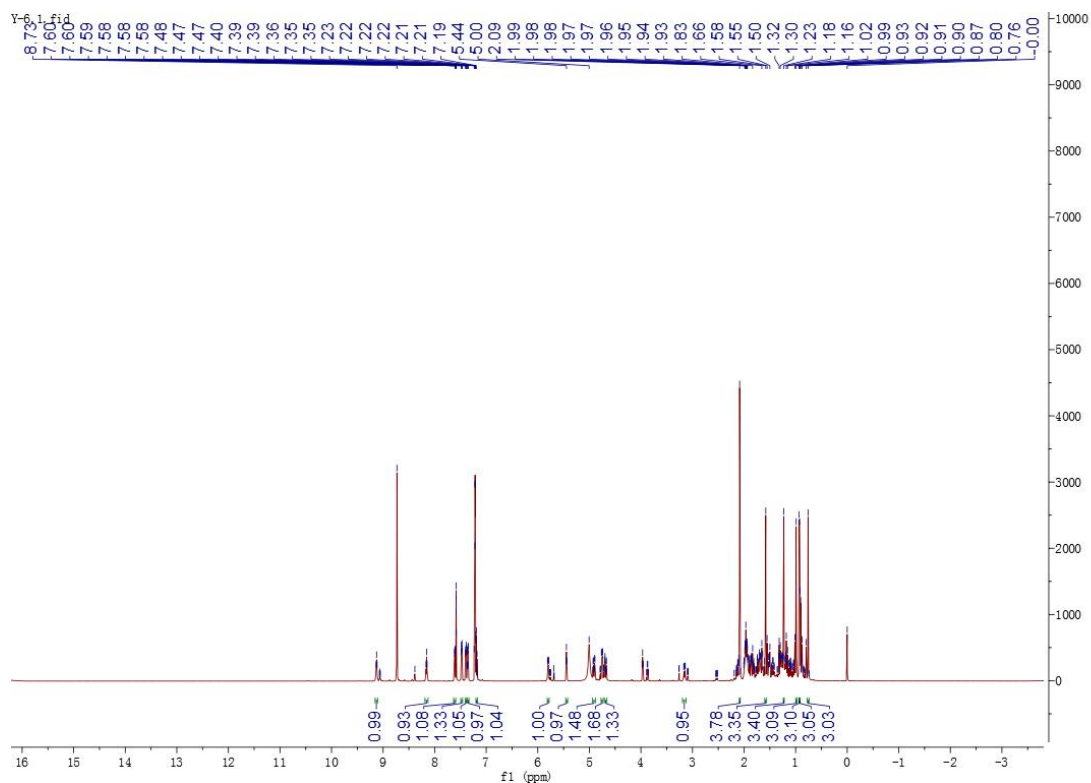
^1H NMR (600MHz) of compound **6h** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



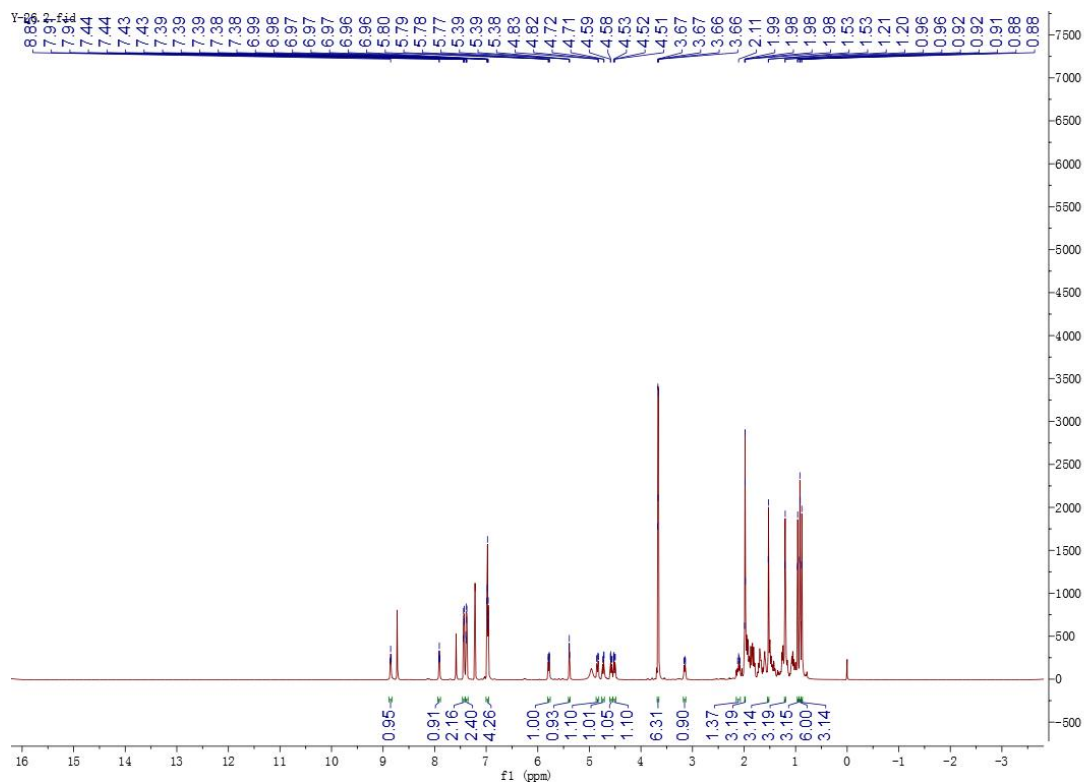
^1H NMR (600MHz) of compound **6i** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



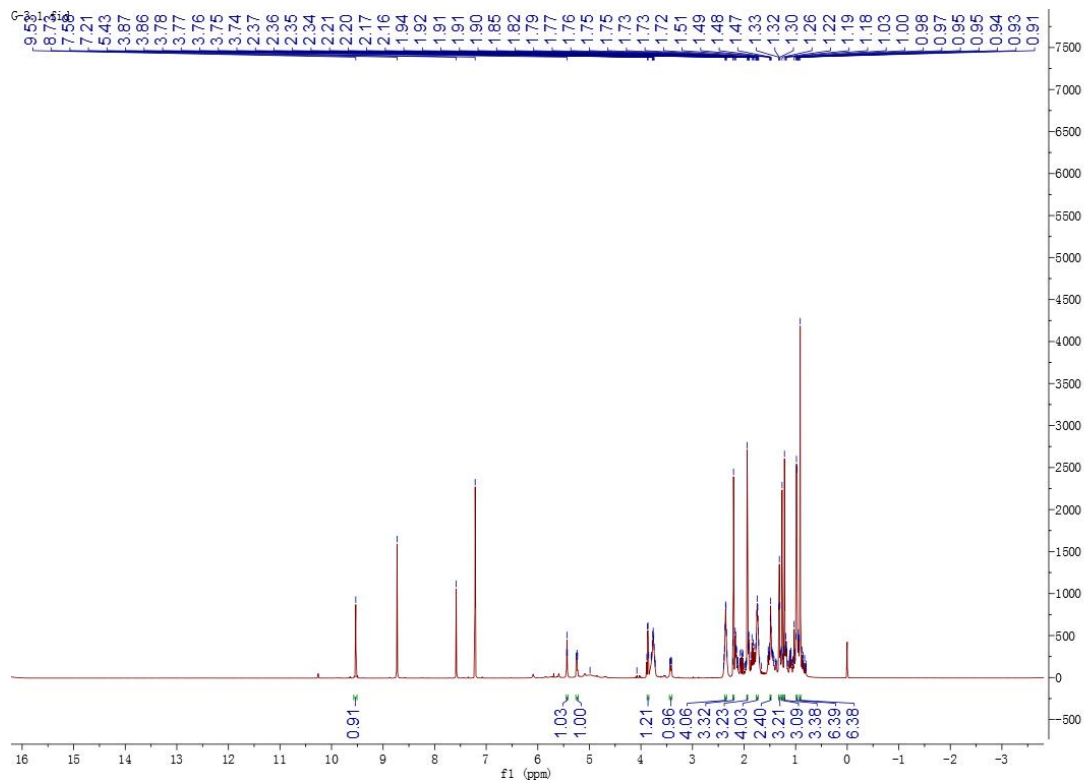
^1H NMR (600MHz) of compound **6j** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



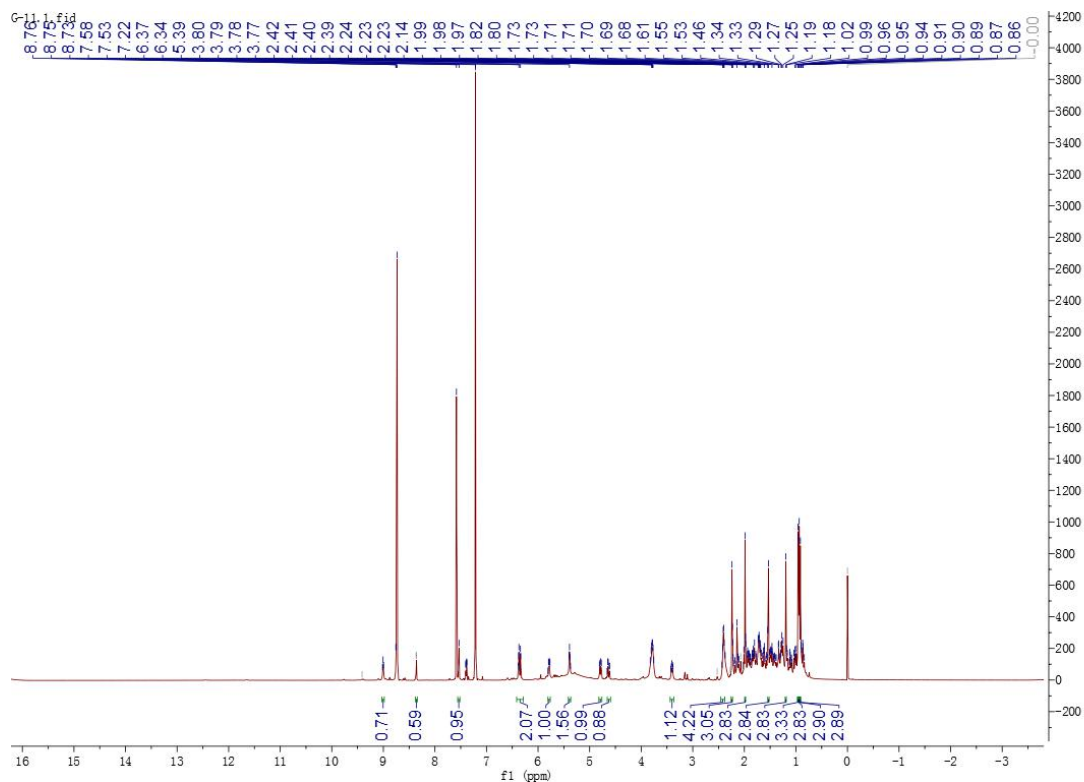
^1H NMR (600MHz) of compound **6k** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



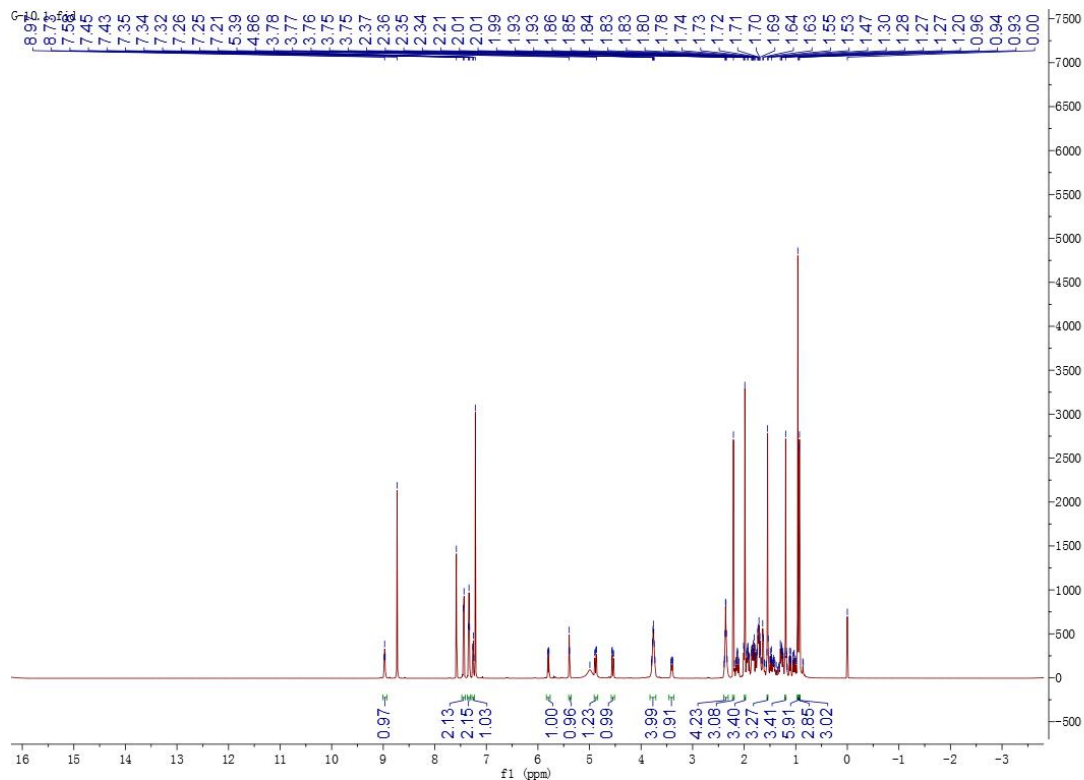
¹H NMR (600MHz) of compound **7** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine-d₅):



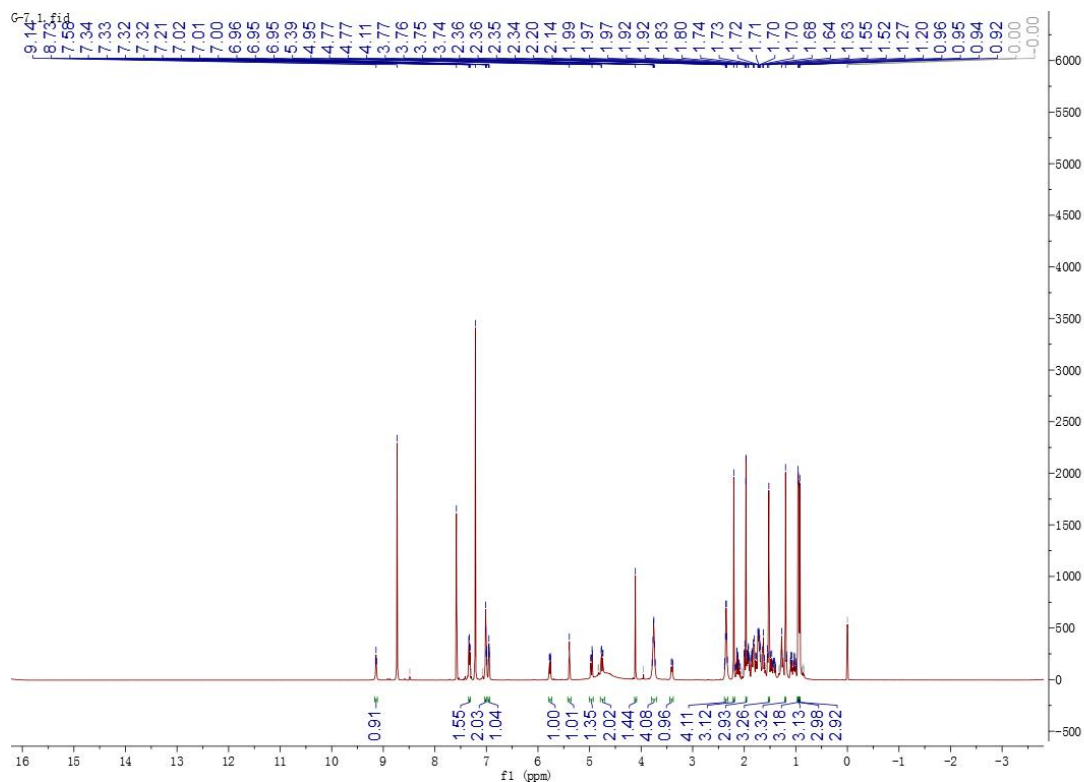
¹H NMR (600MHz) of compound **7a** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine-d₅):



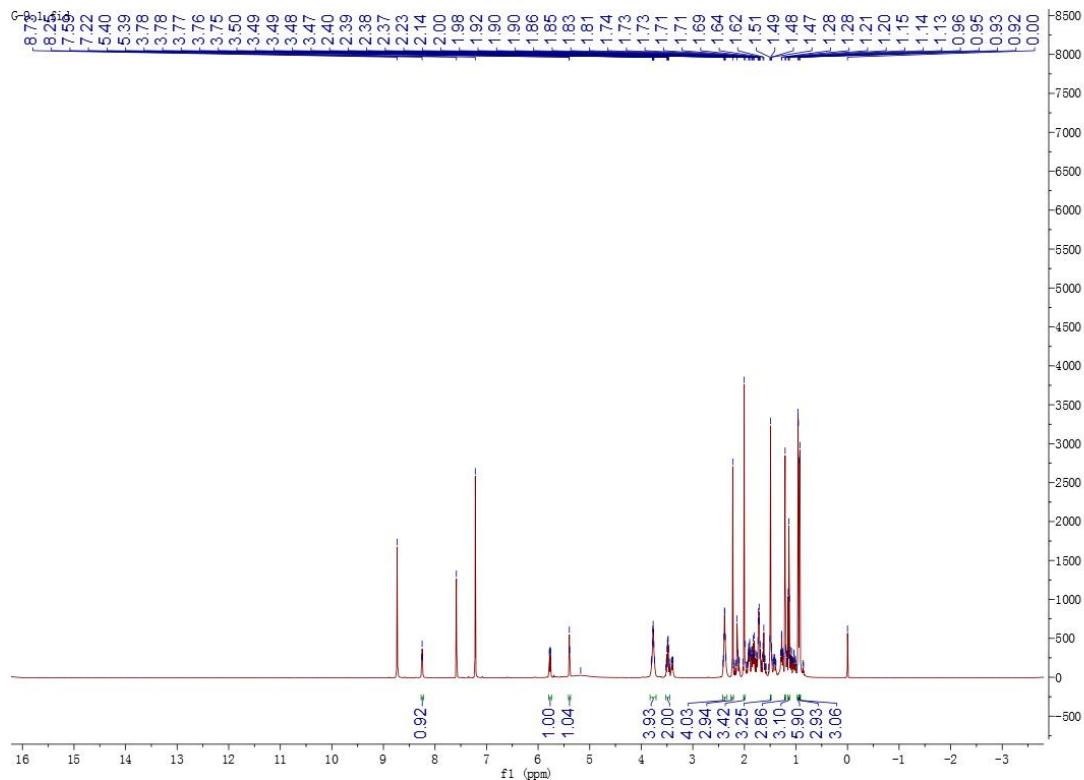
¹H NMR (600MHz) of compound **7b** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine-d₅):



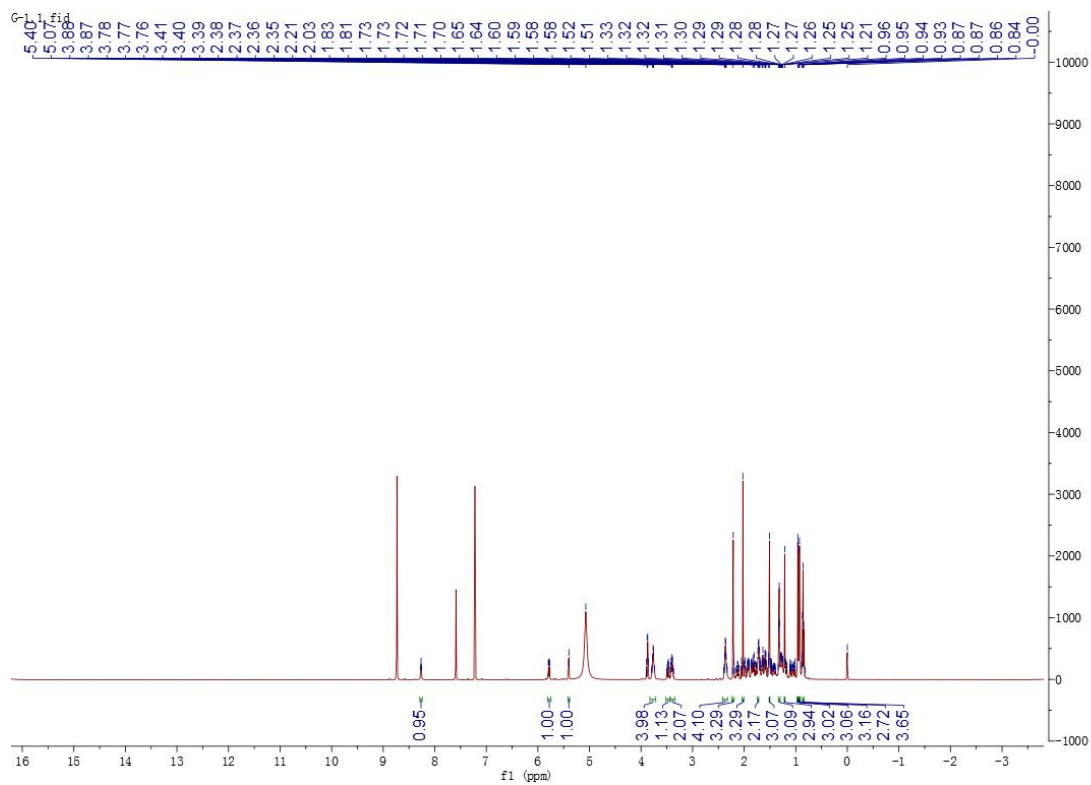
¹H NMR (600MHz) of compound **7c** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine-d₅):



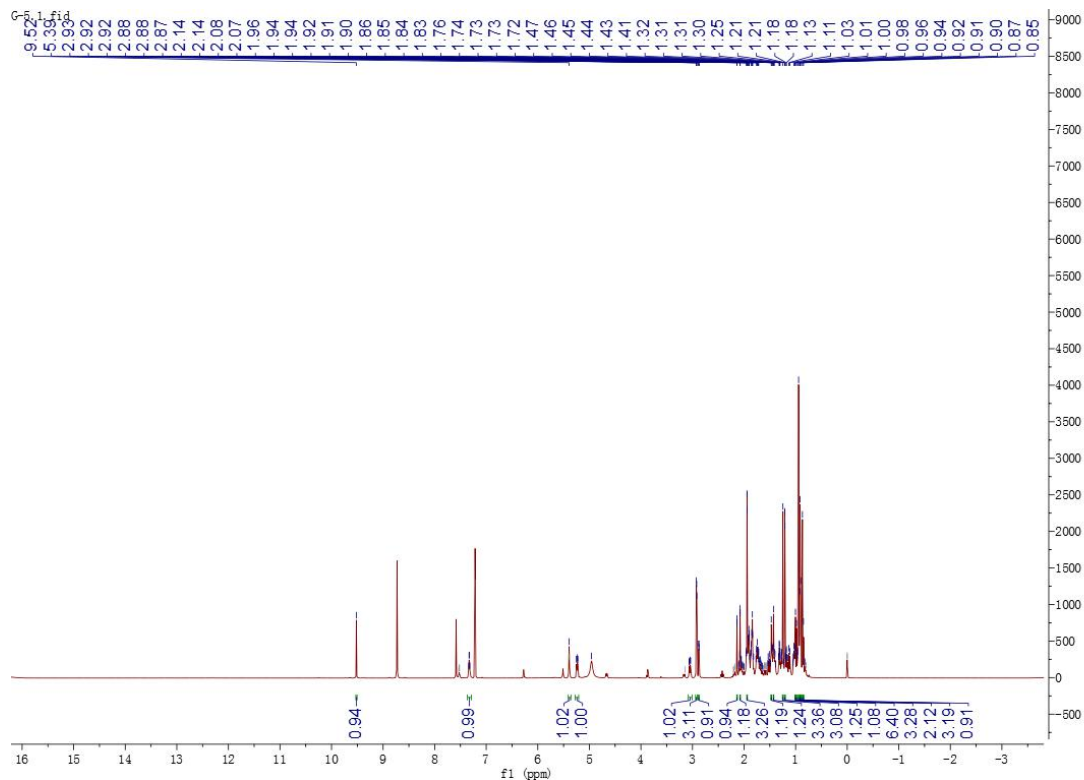
^1H NMR (600MHz) of compound **7d** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



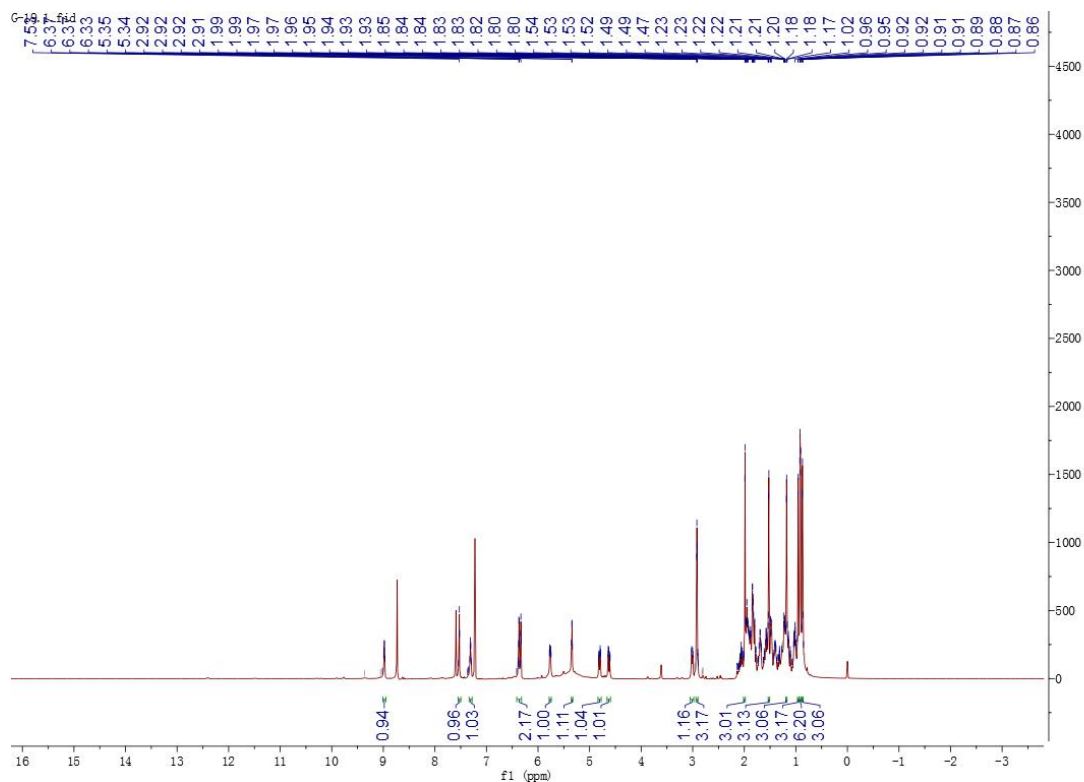
^1H NMR (600MHz) of compound **7e** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



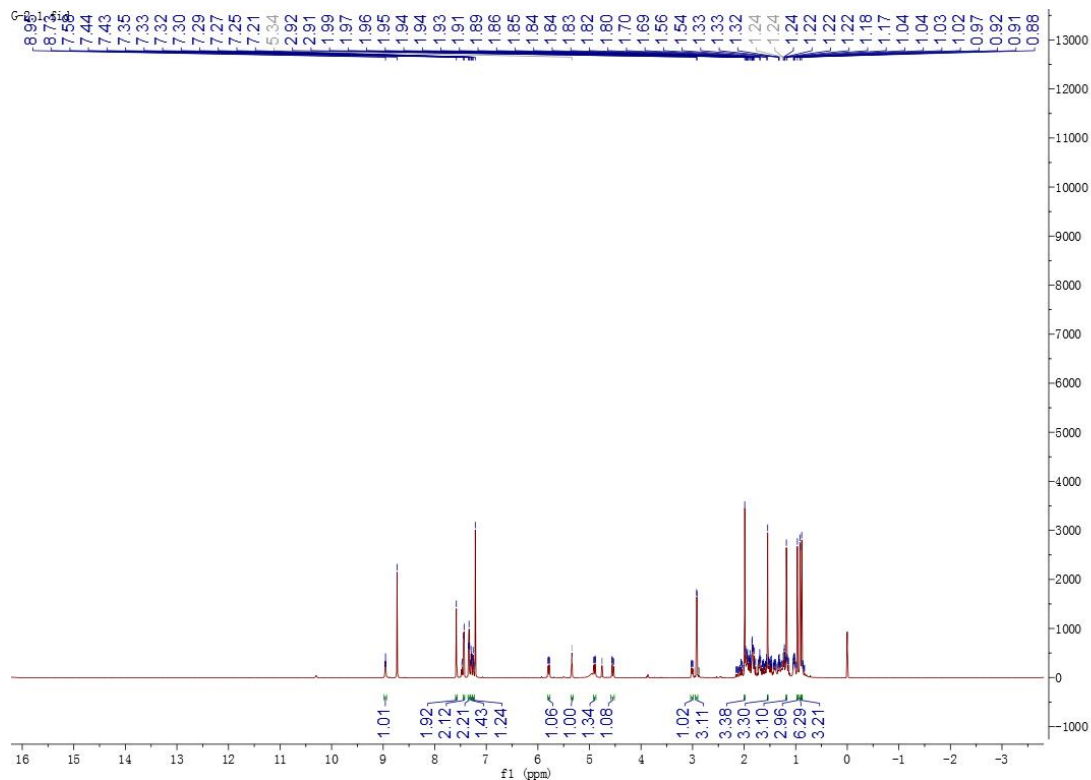
¹H NMR (600MHz) of compound **8** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine-d₅):



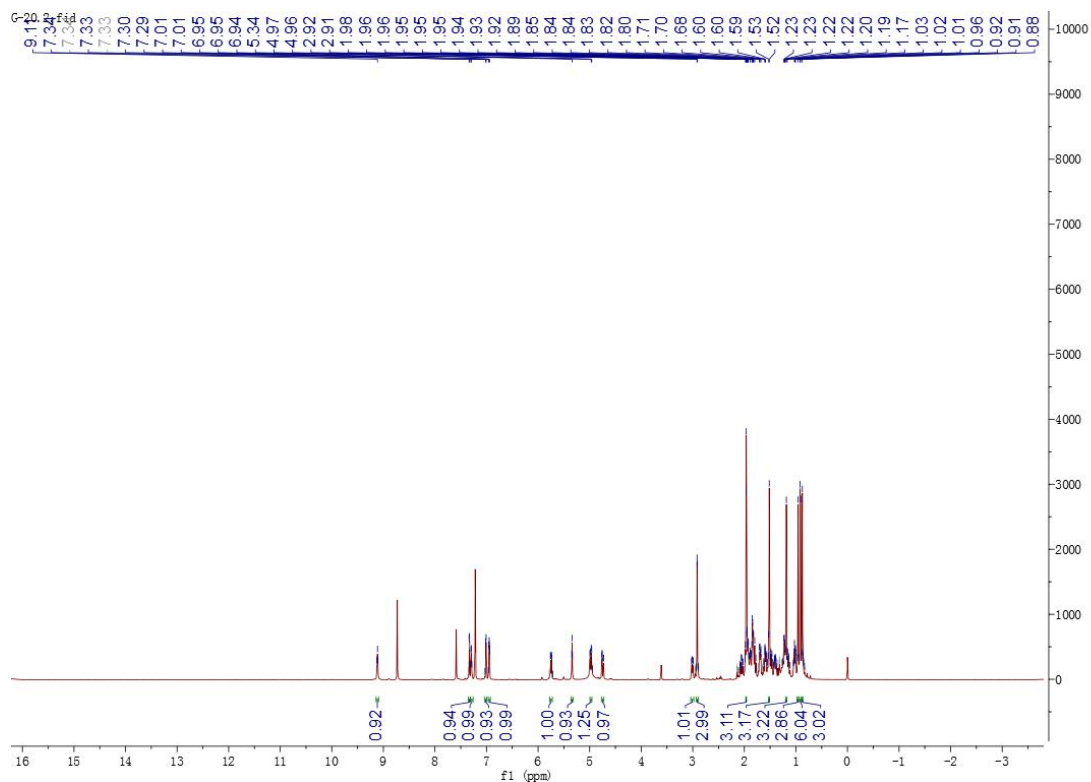
¹H NMR (600MHz) of compound **8a** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine-d₅):



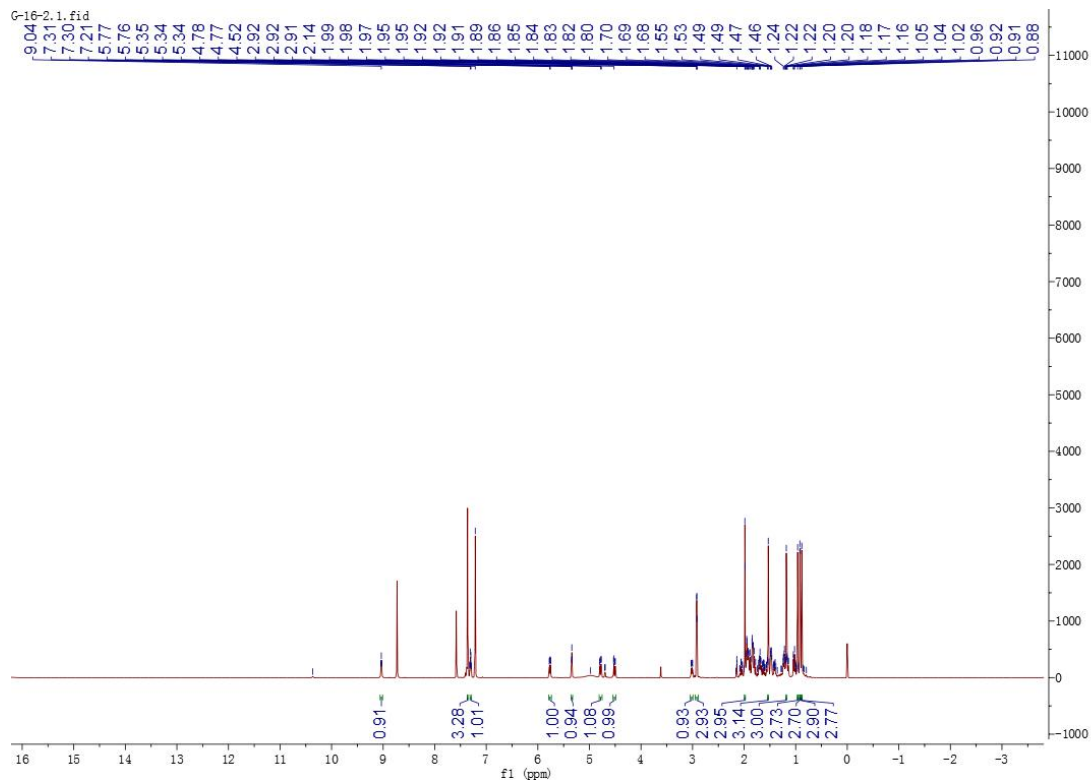
^1H NMR (600MHz) of compound **8b** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



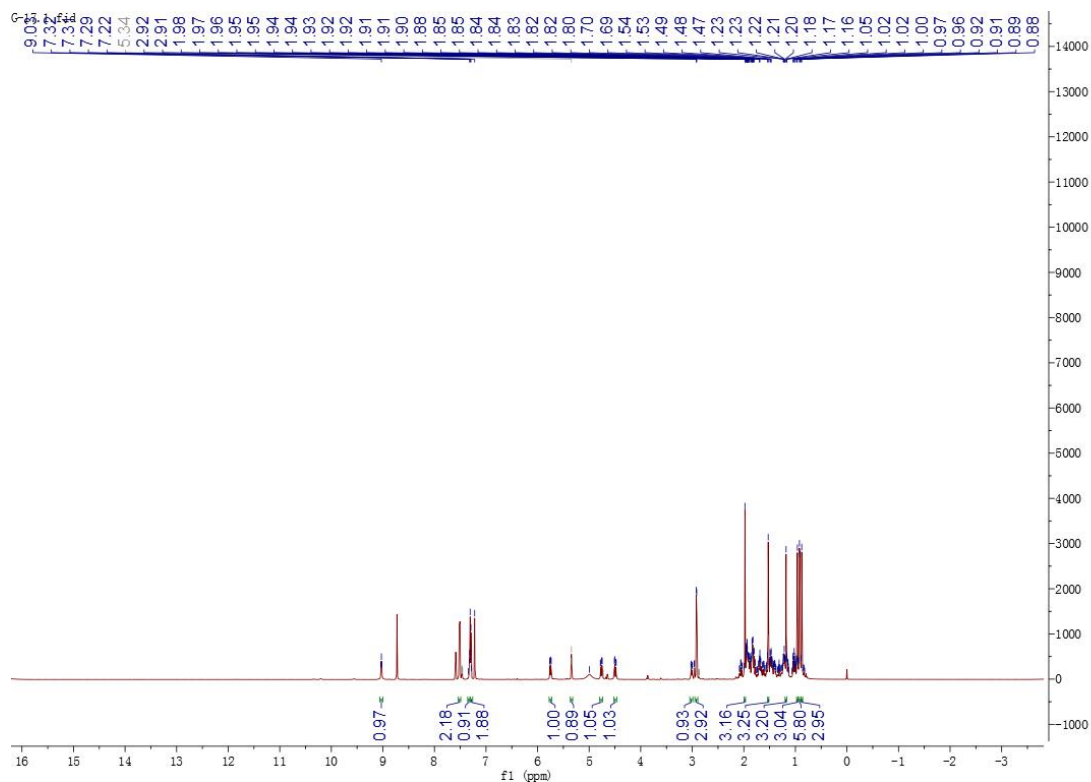
^1H NMR (600MHz) of compound **8c** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



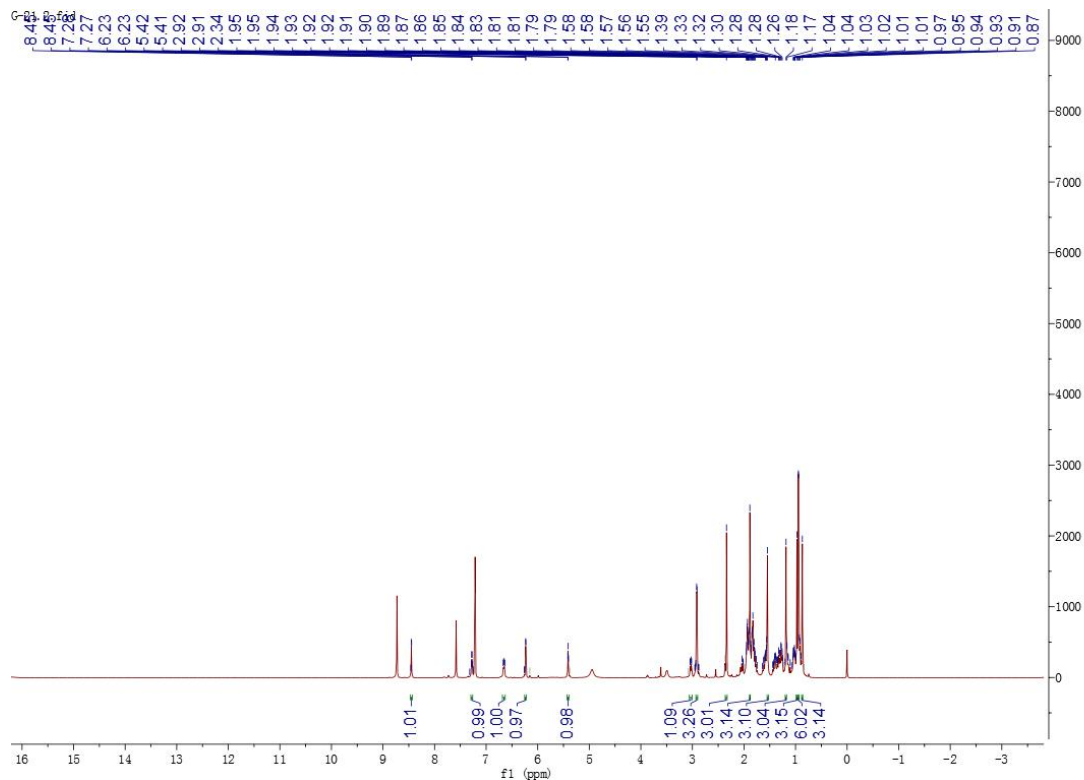
^1H NMR (600MHz) of compound **8d** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



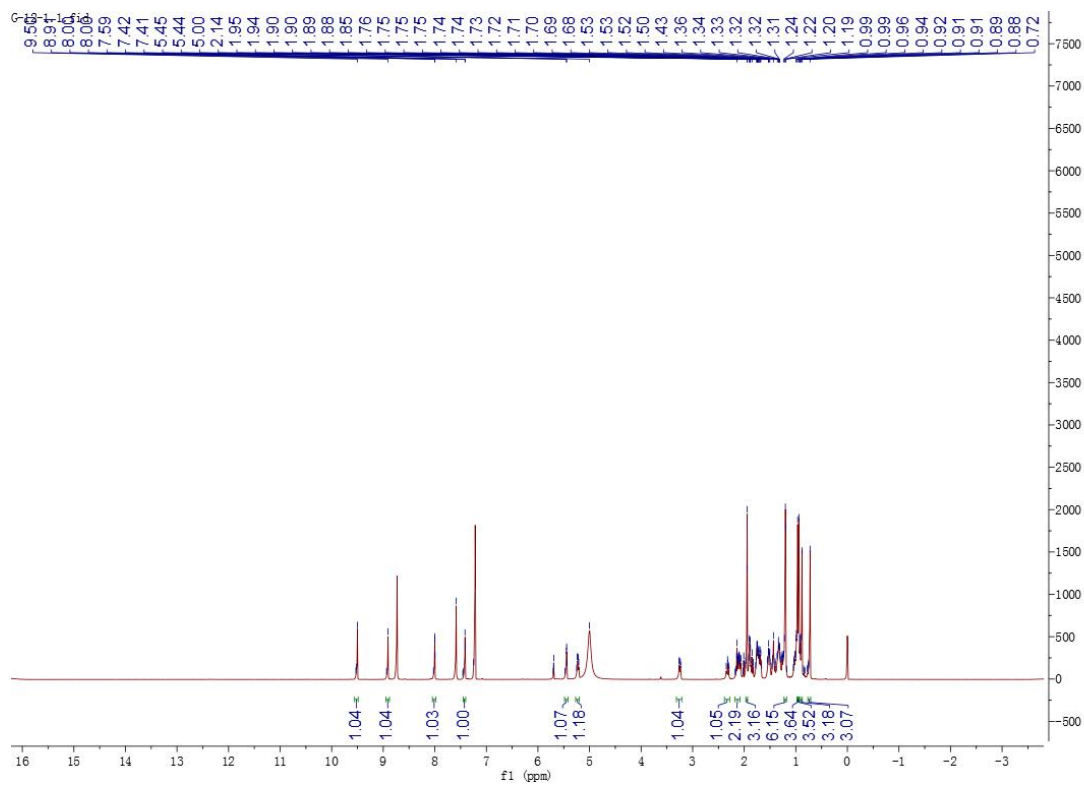
^1H NMR (600MHz) of compound **8e** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



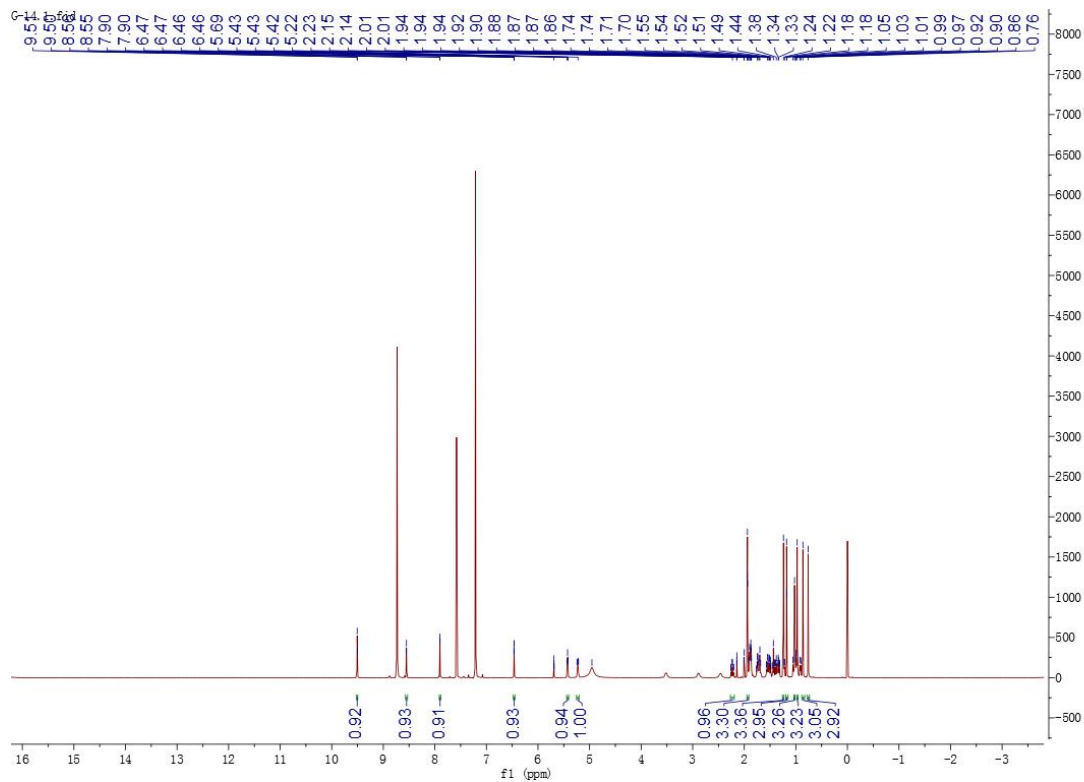
¹H NMR (600MHz) of compound **8f** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine-d₅):



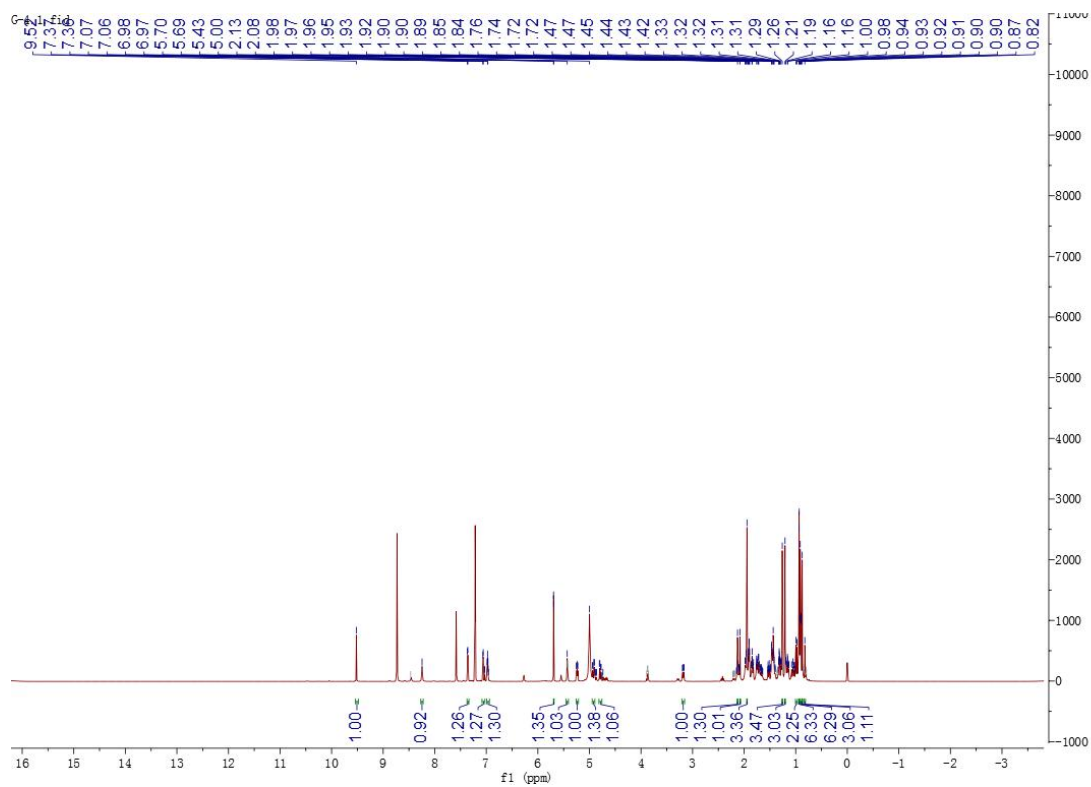
¹H NMR (600MHz) of compound **9** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine-d₅):



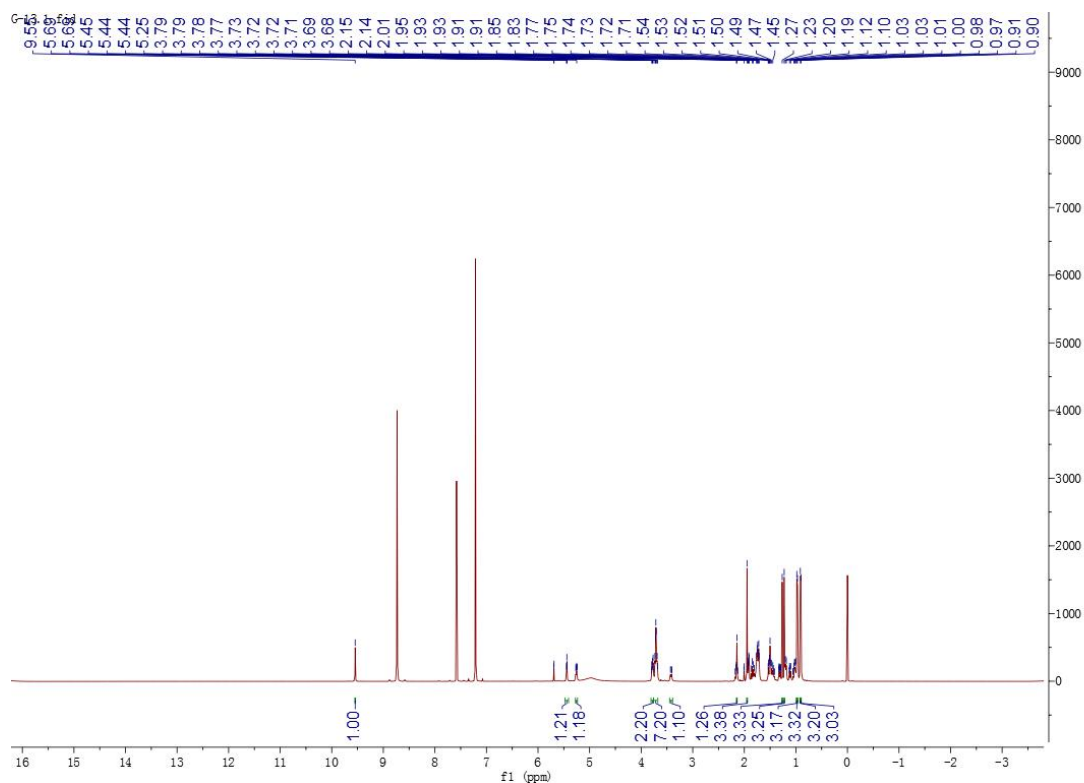
¹H NMR (600MHz) of compound **10** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine-d₅):



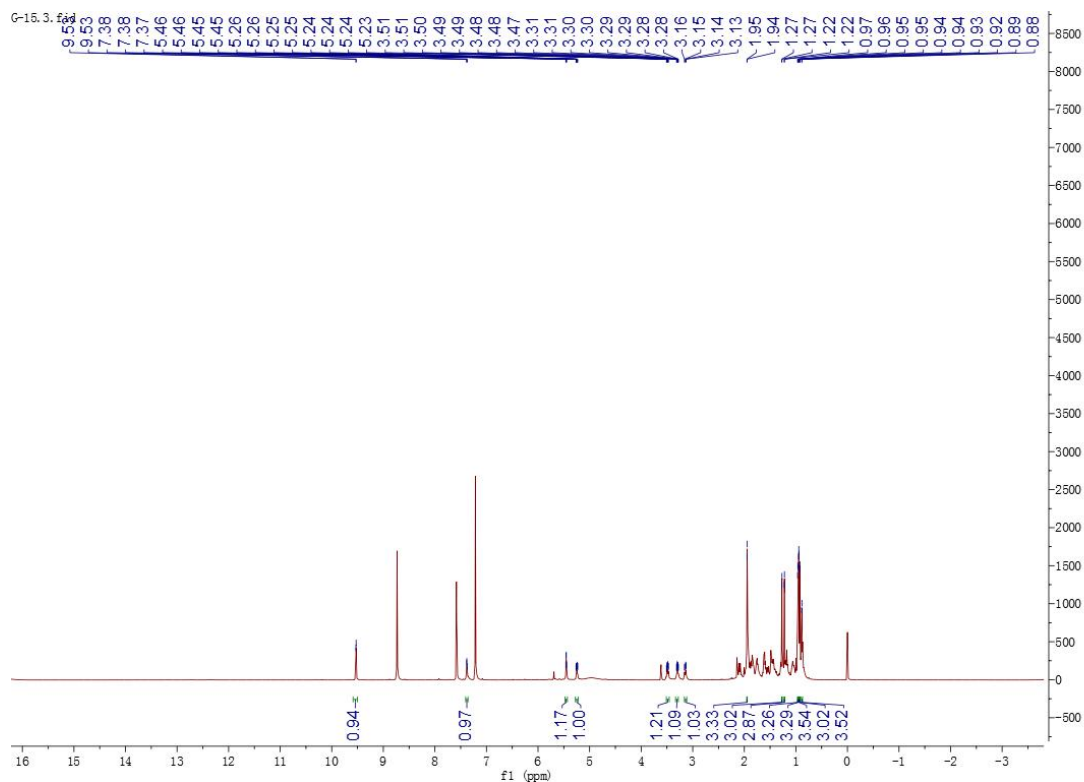
¹H NMR (600MHz) of compound **11** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine-d₅):



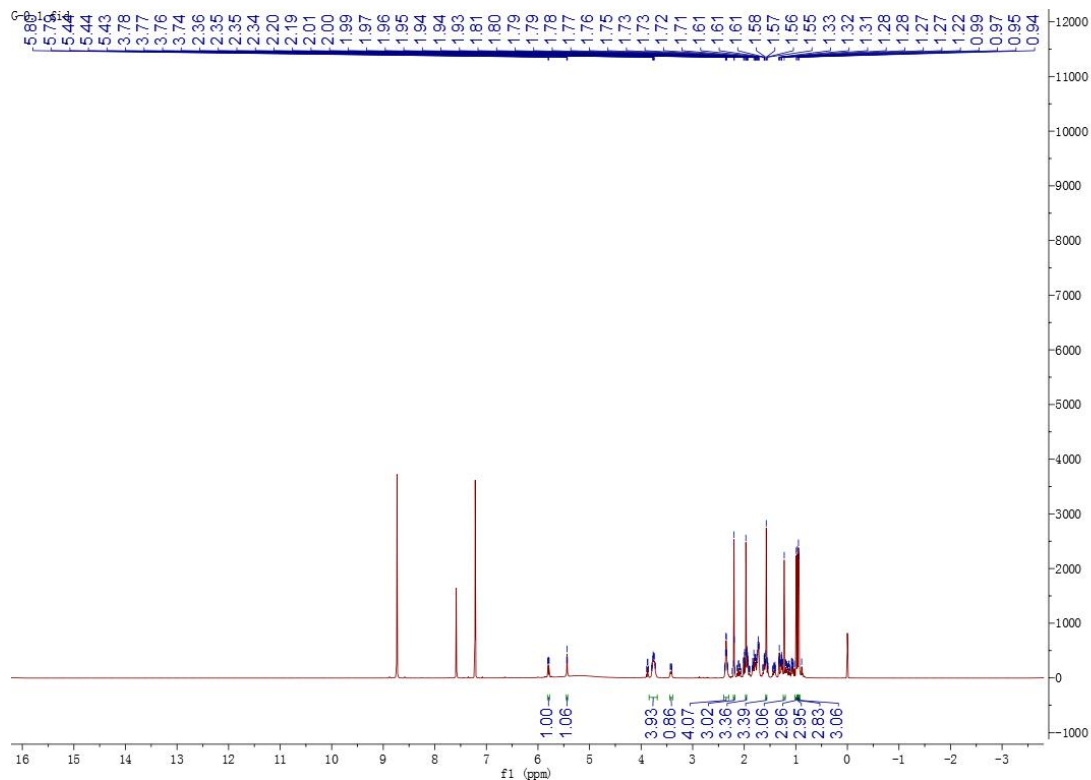
^1H NMR (600MHz) of compound **12** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



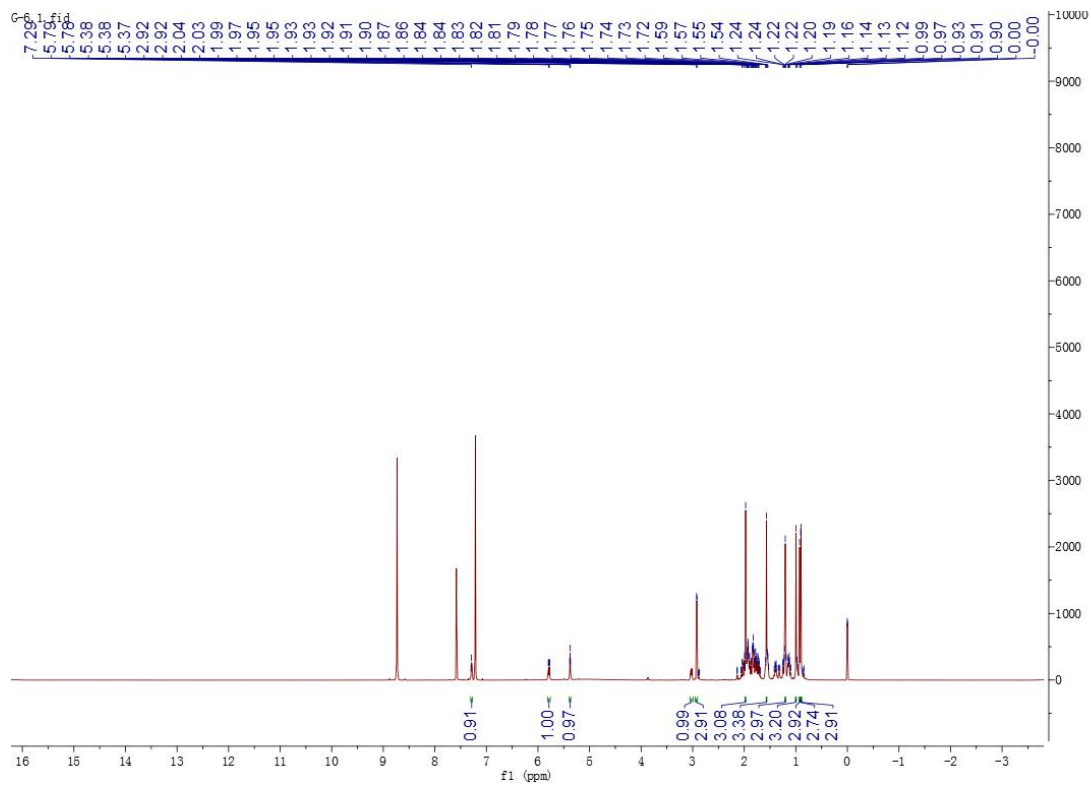
^1H NMR (600MHz) of compound **13** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



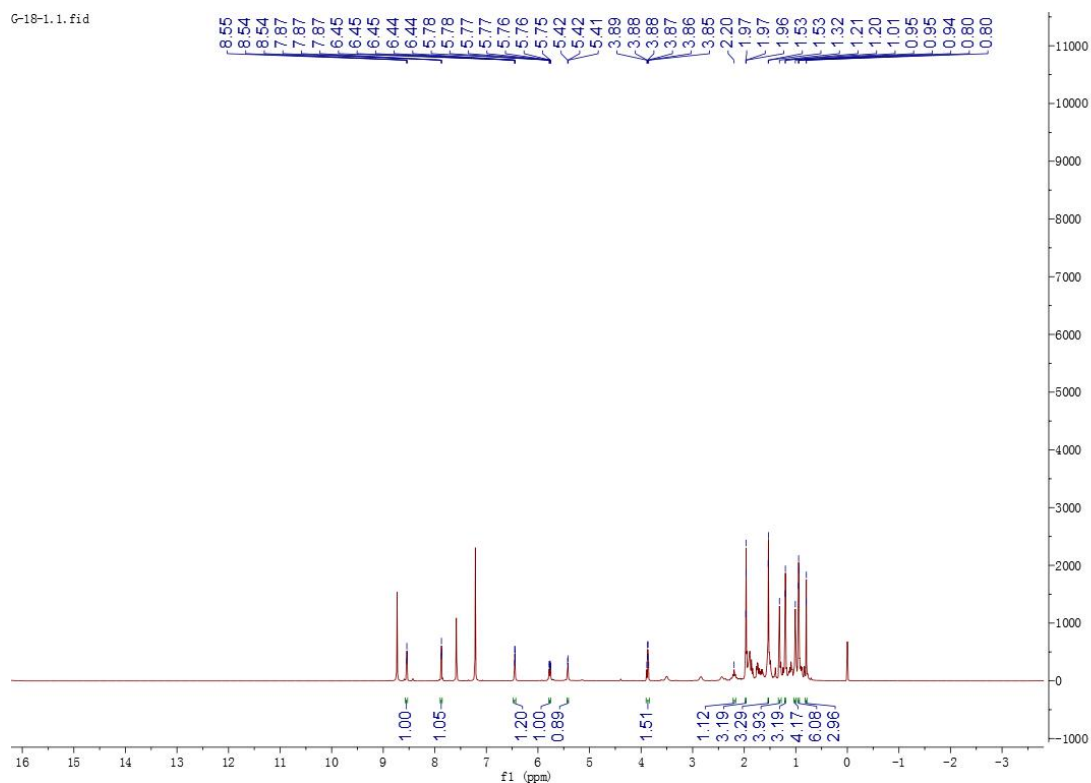
^1H NMR (600MHz) of compound **14a** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



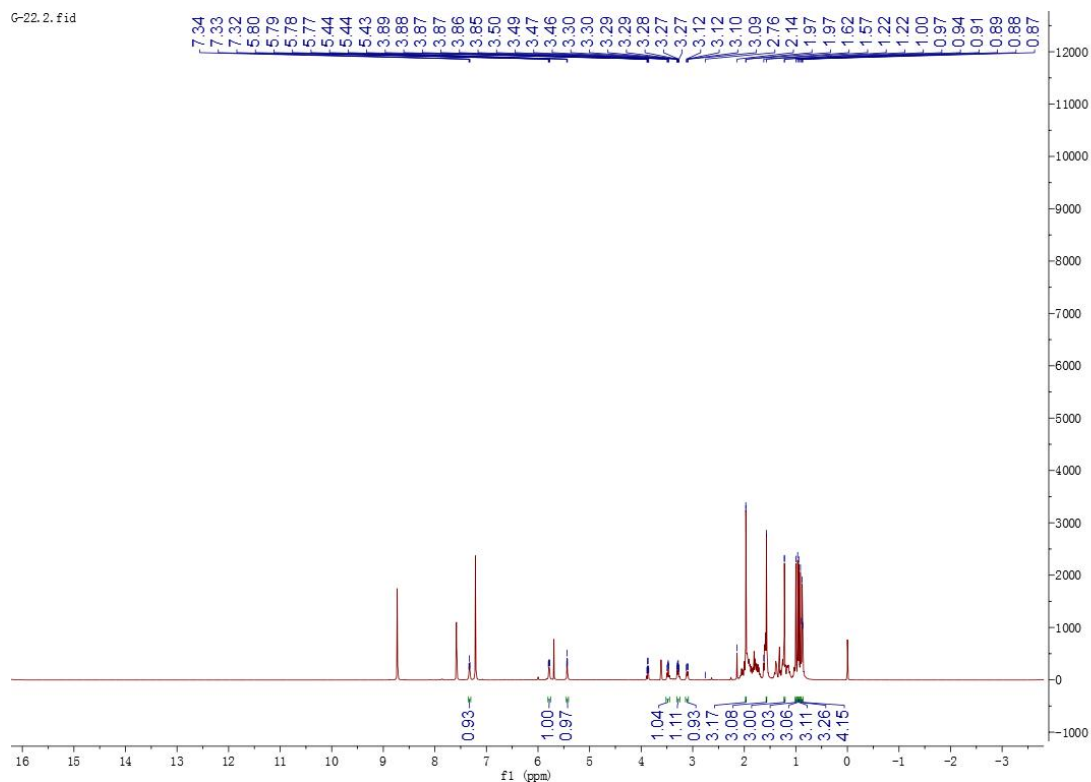
^1H NMR (600MHz) of compound **14b** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):



^1H NMR (600MHz) of compound **14c** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):

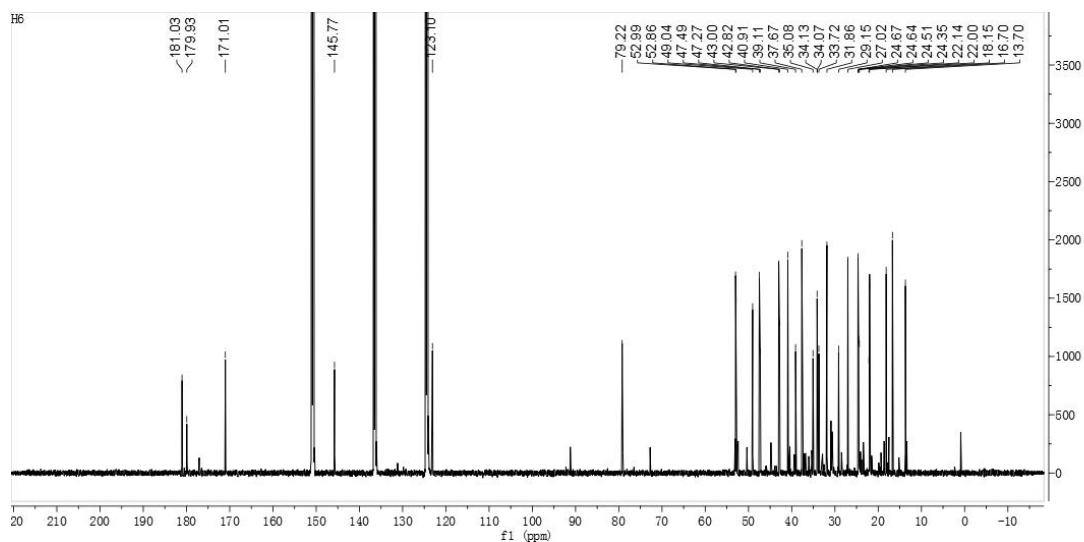


^1H NMR (600MHz) of compound **14d** recorded on a Bruker Avance III 600 spectrometer (600MHz,pyridine- d_5):

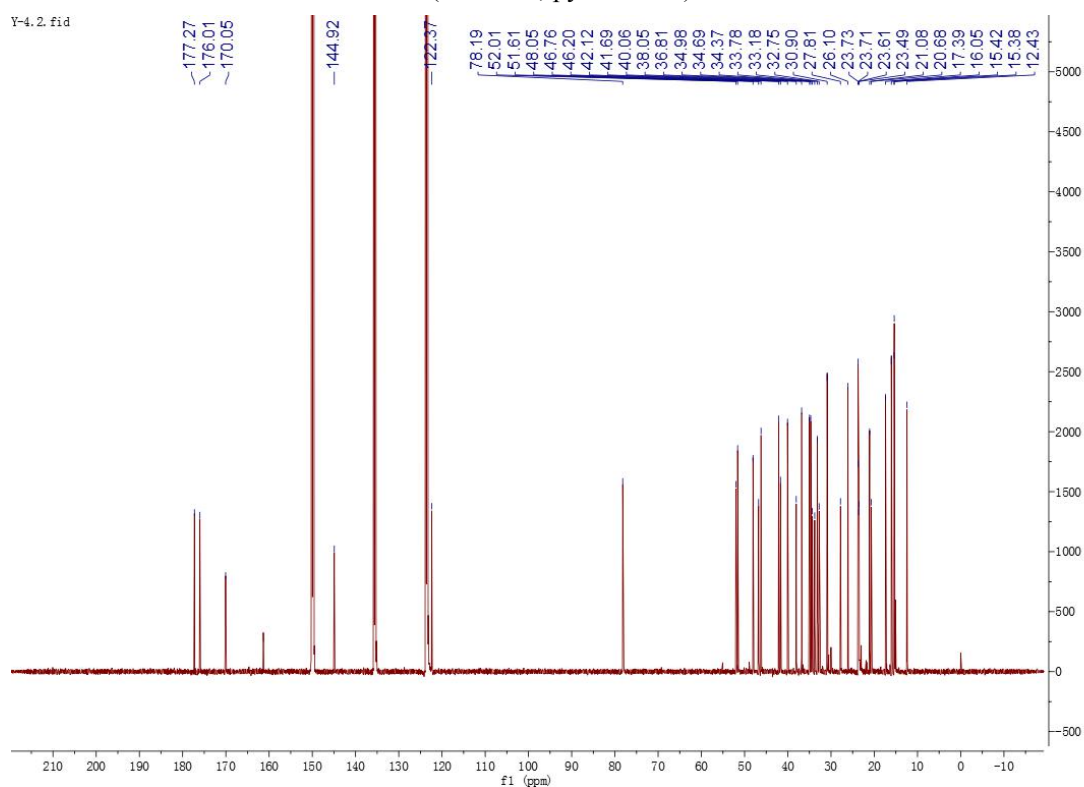
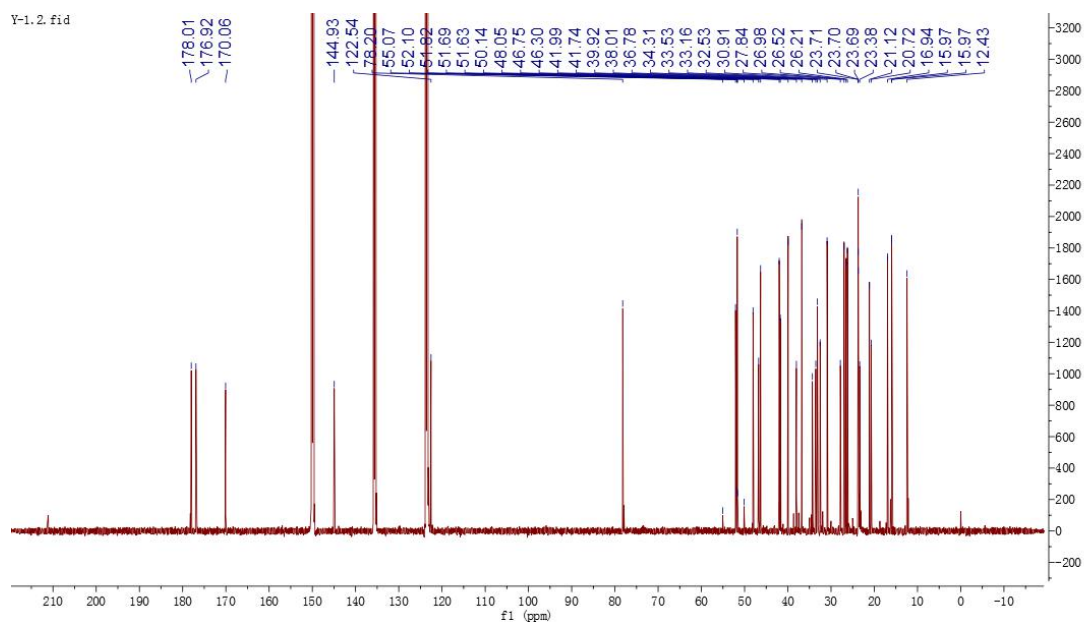


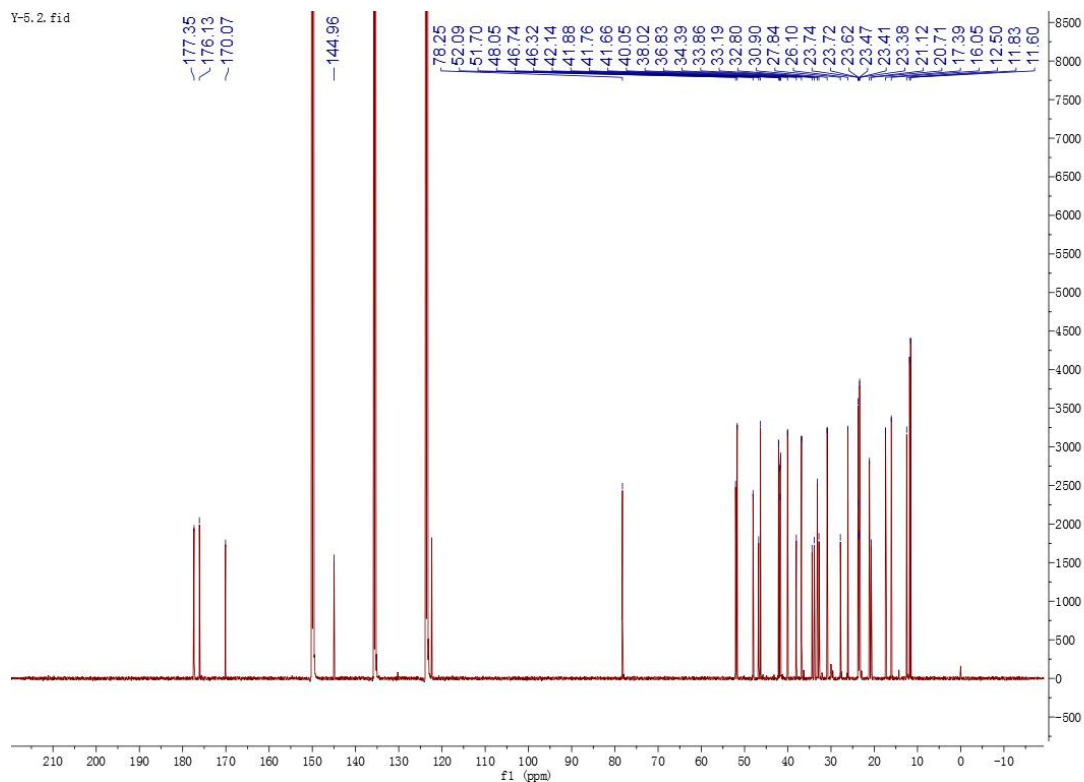
¹³C NMR (150MHz) of compounds 3-14d

¹³C NMR (600MHz) of compound **3** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d5):

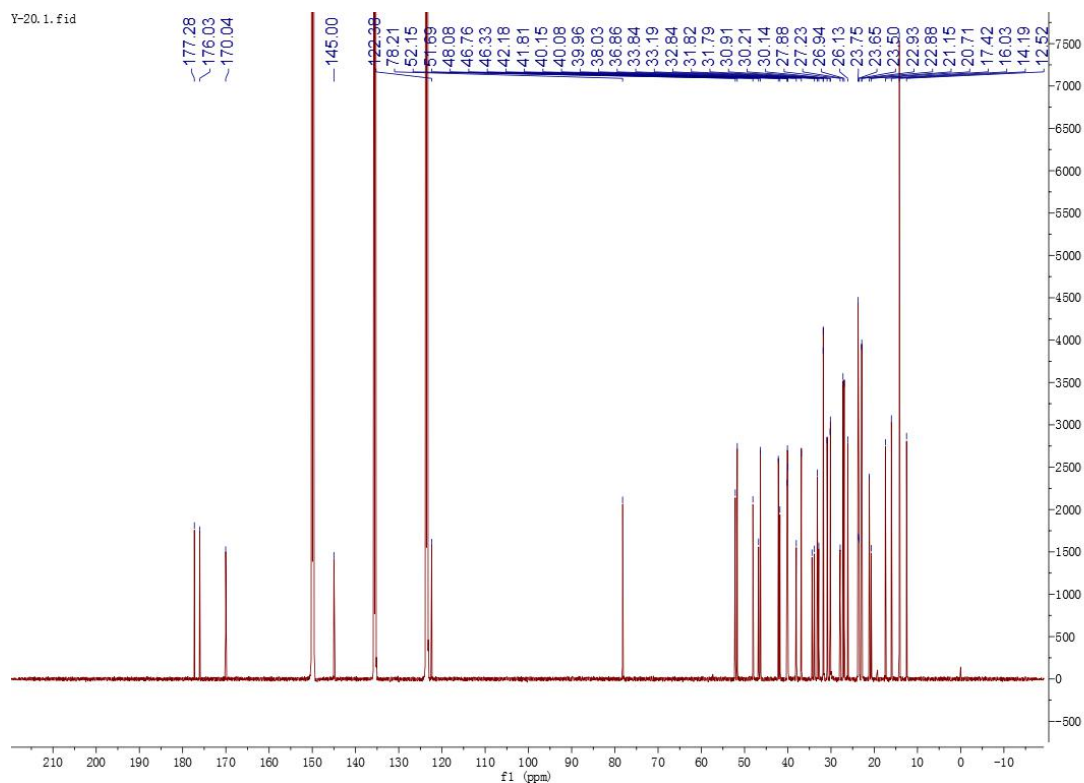


¹³C NMR (600MHz) of compound **4a** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d5):

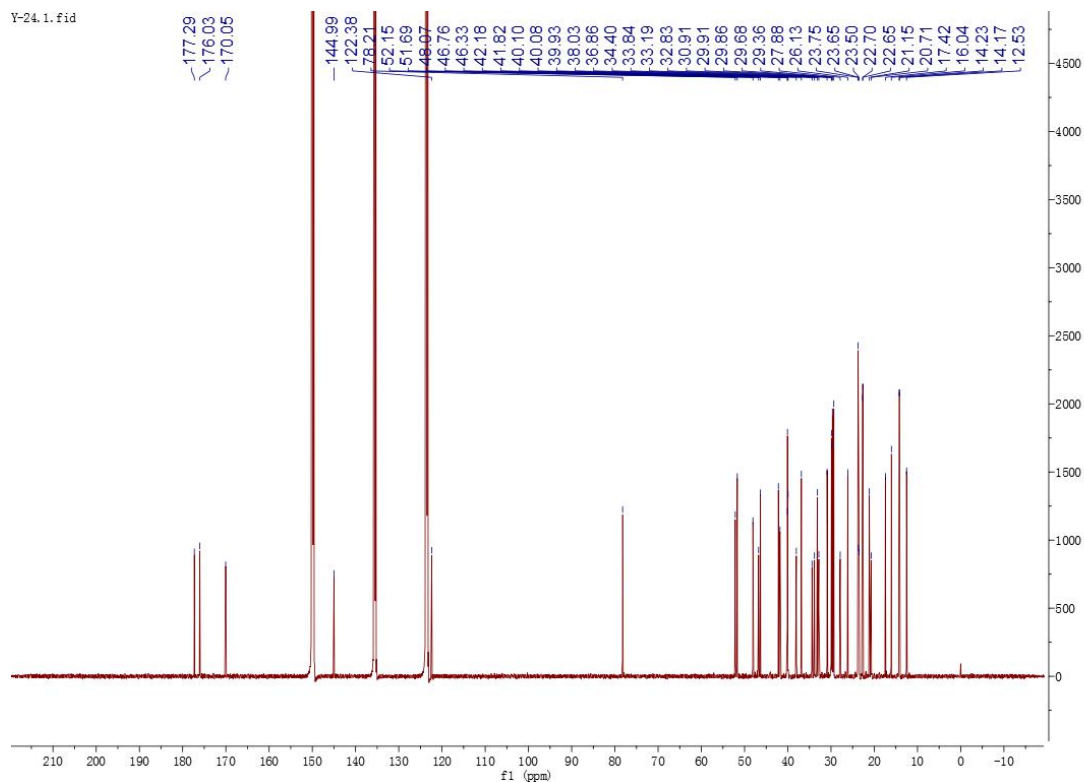




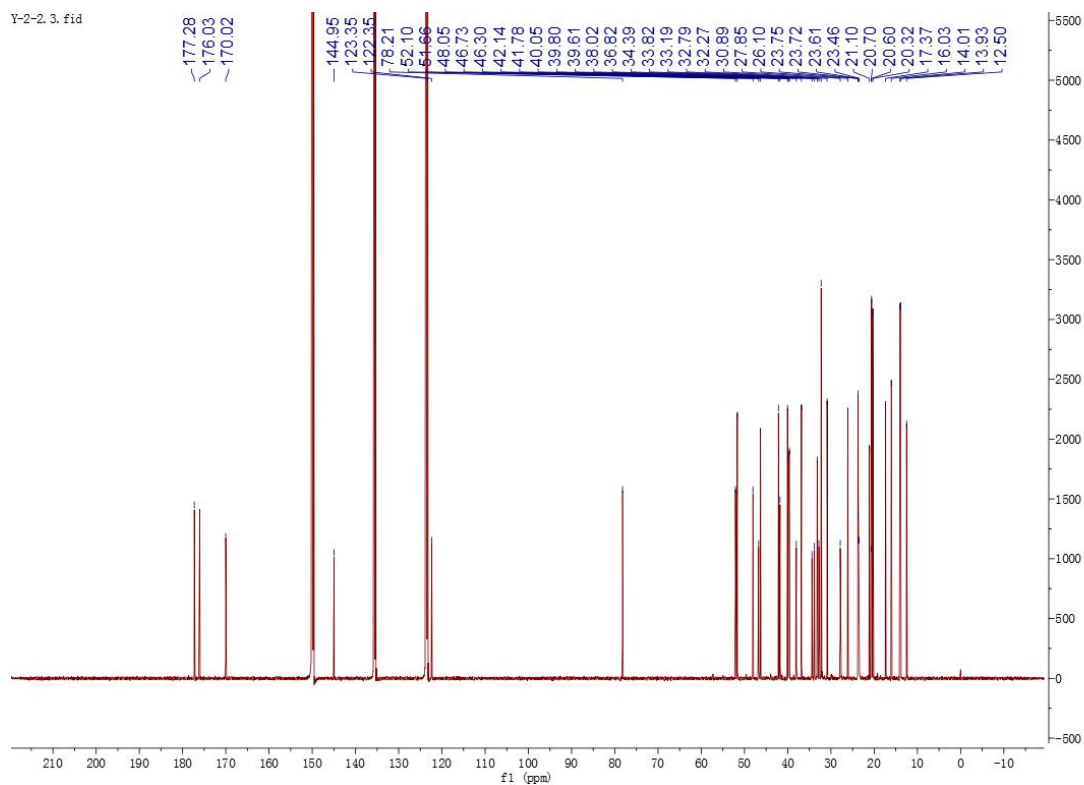
^{13}C NMR (600MHz) of compound **4d** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



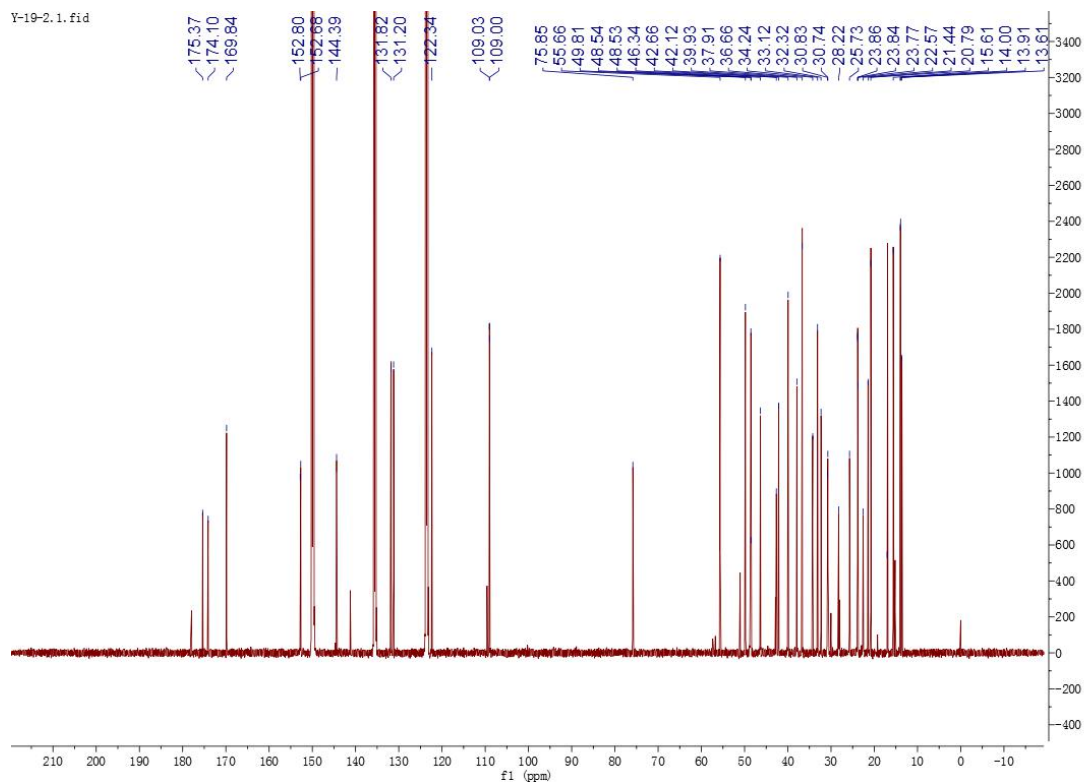
^{13}C NMR (600MHz) of compound **4e** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



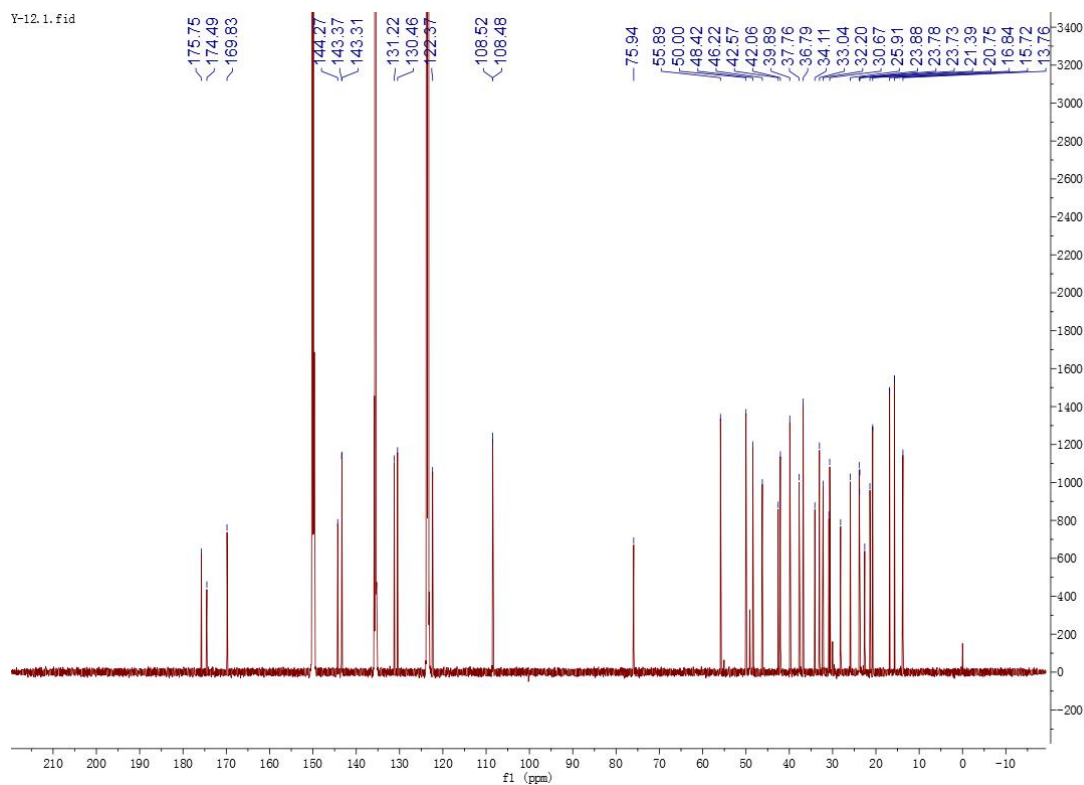
^{13}C NMR (600MHz) of compound **4f** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



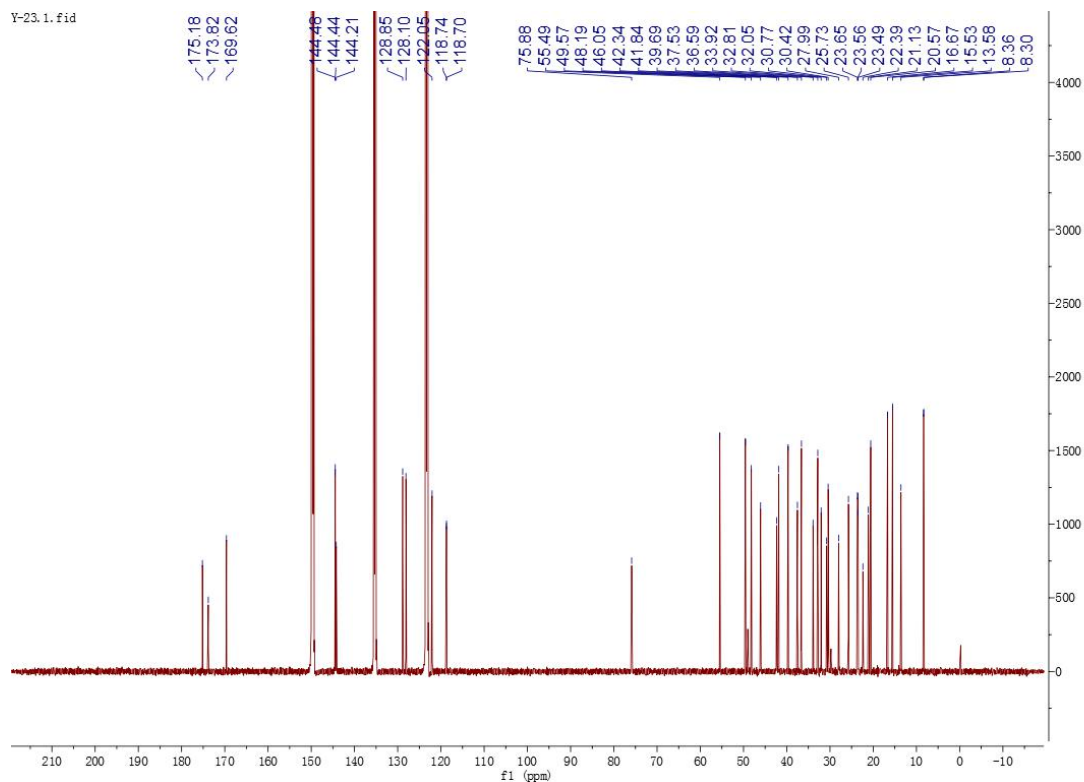
^{13}C NMR (600MHz) of compound **5a** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



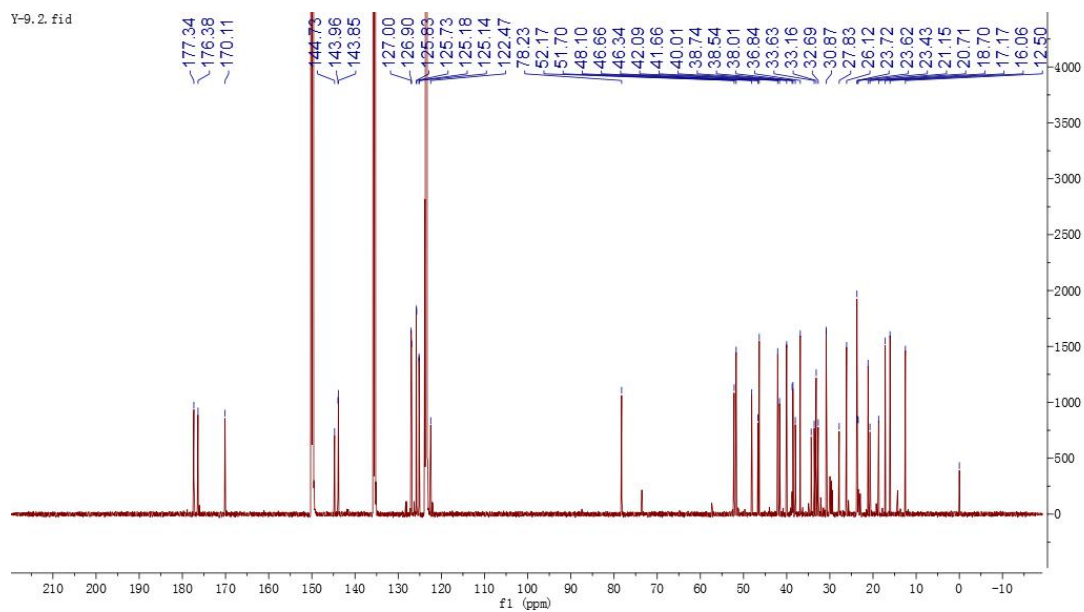
^{13}C NMR (600MHz) of compound **5b** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



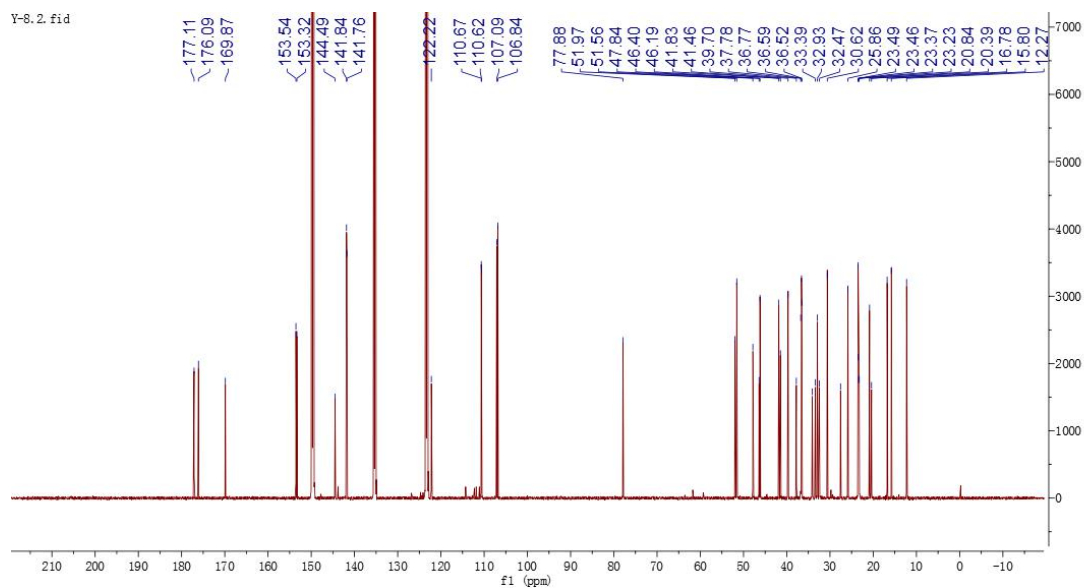
^{13}C NMR (600MHz) of compound **5c** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



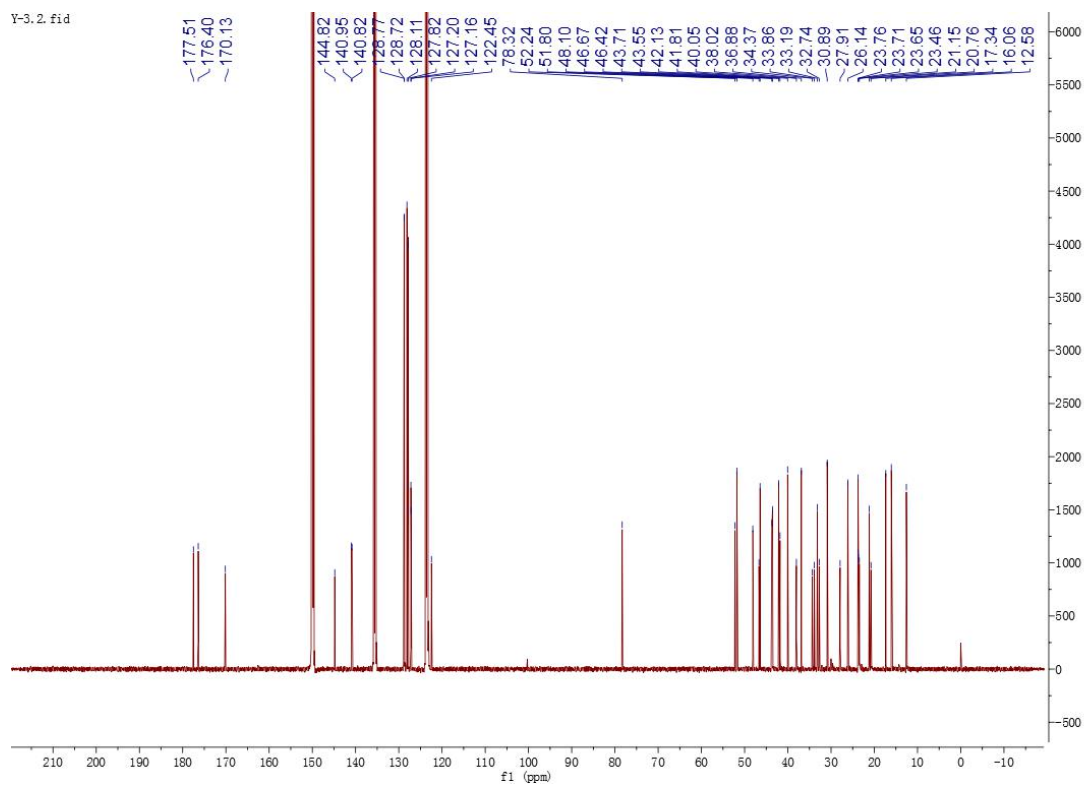
^{13}C NMR (600MHz) of compound **5d** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



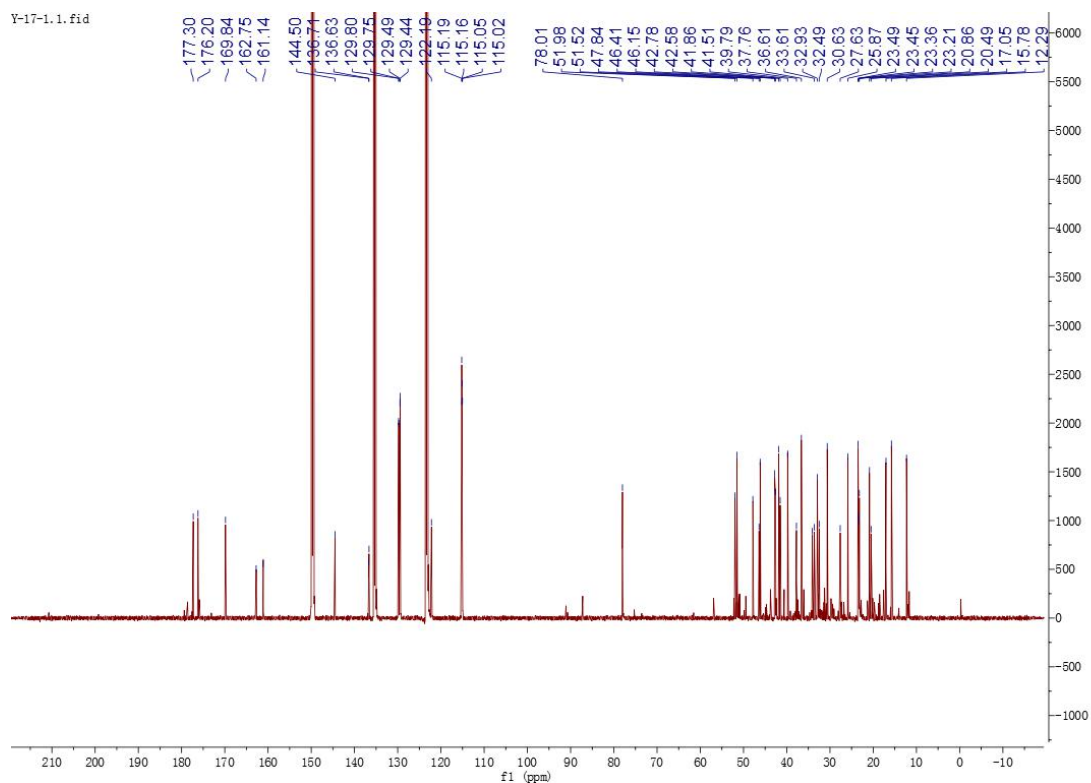
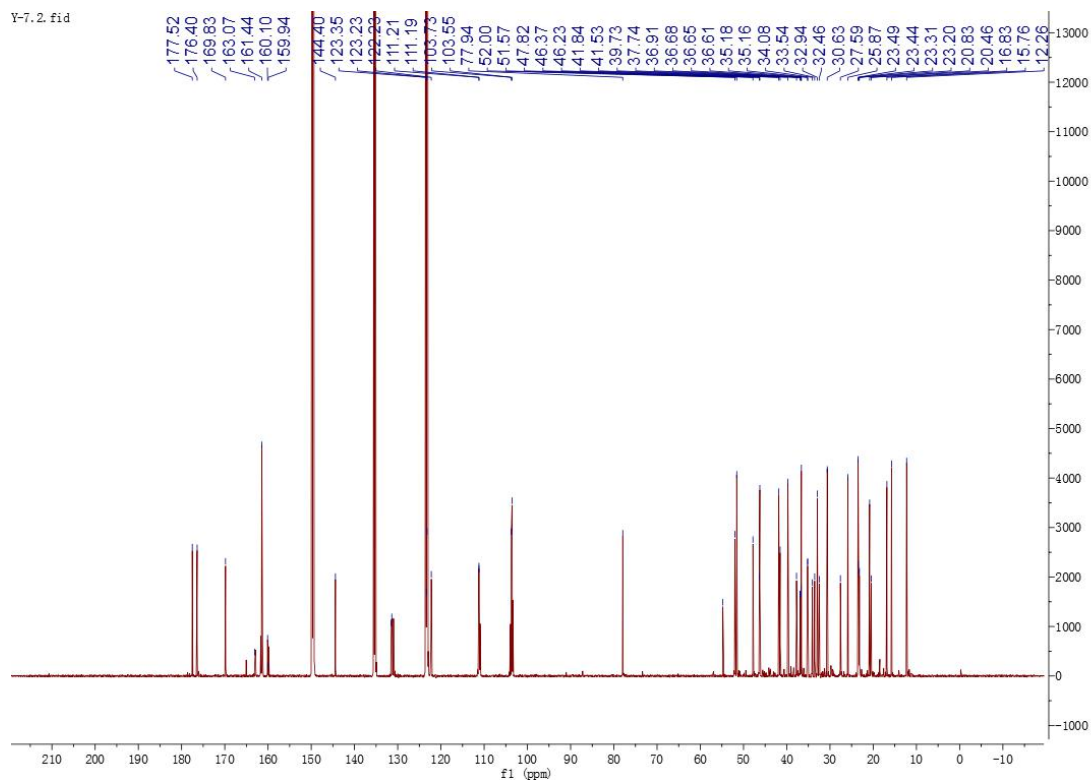
^{13}C NMR (600MHz) of compound **5e** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):

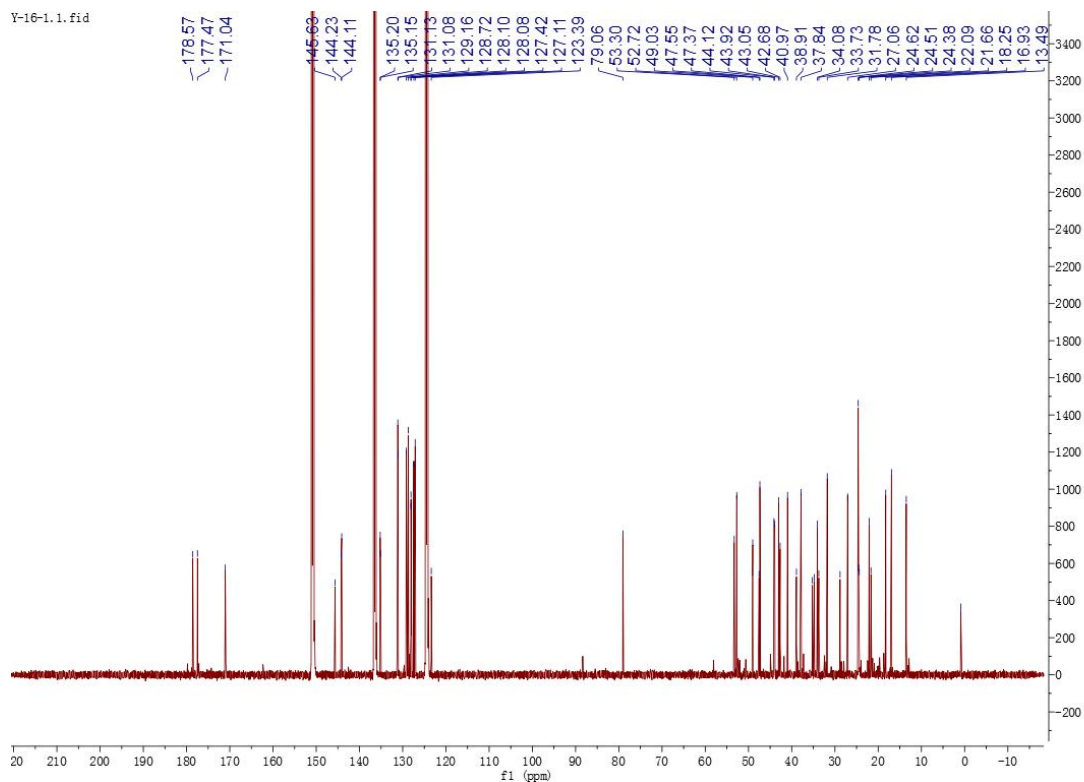


^{13}C NMR (600MHz) of compound **6a** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d5):

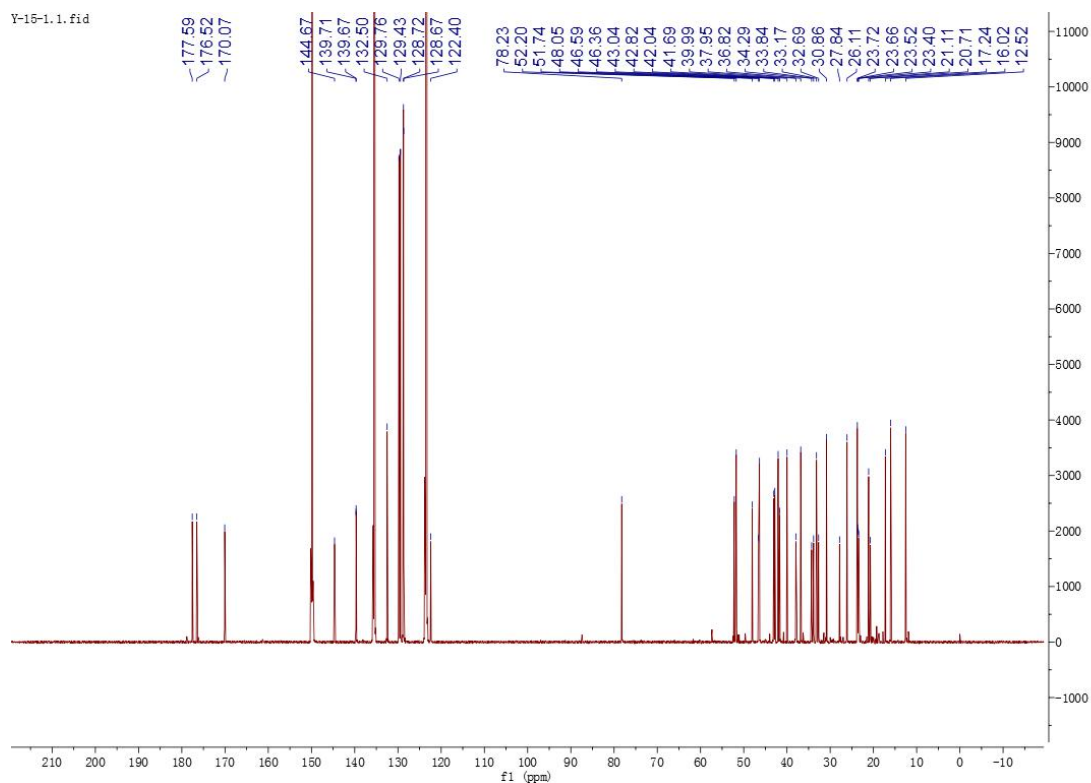


^{13}C NMR (600MHz) of compound **6b** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d5):

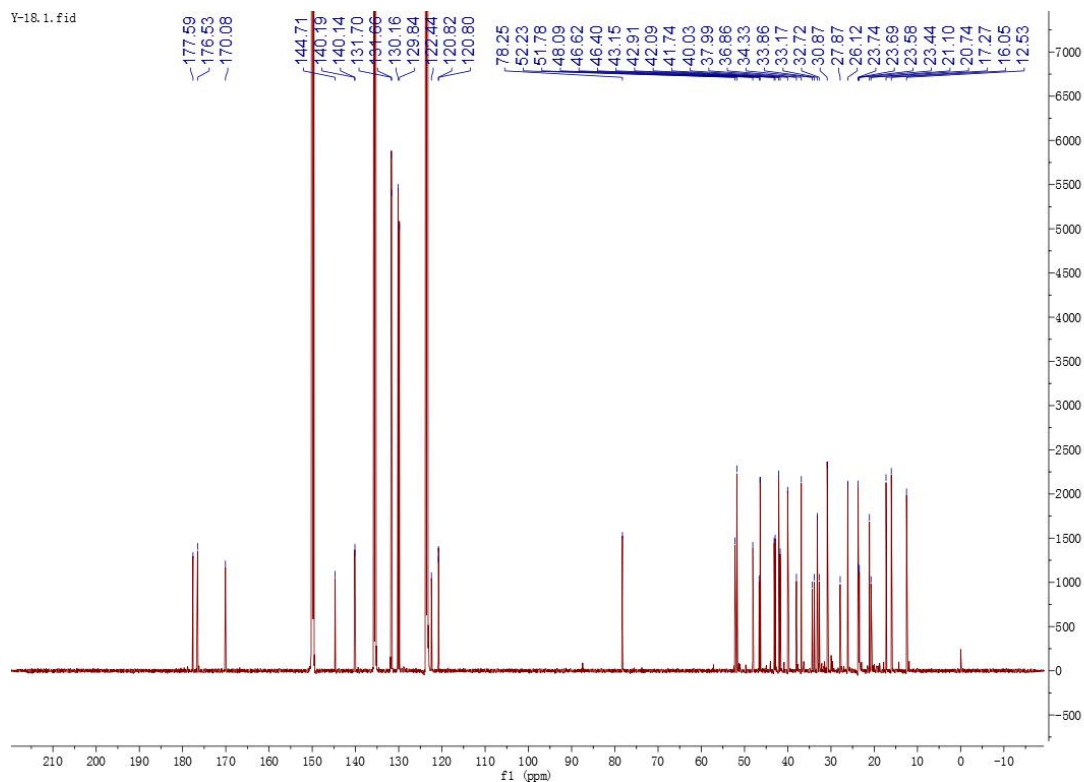




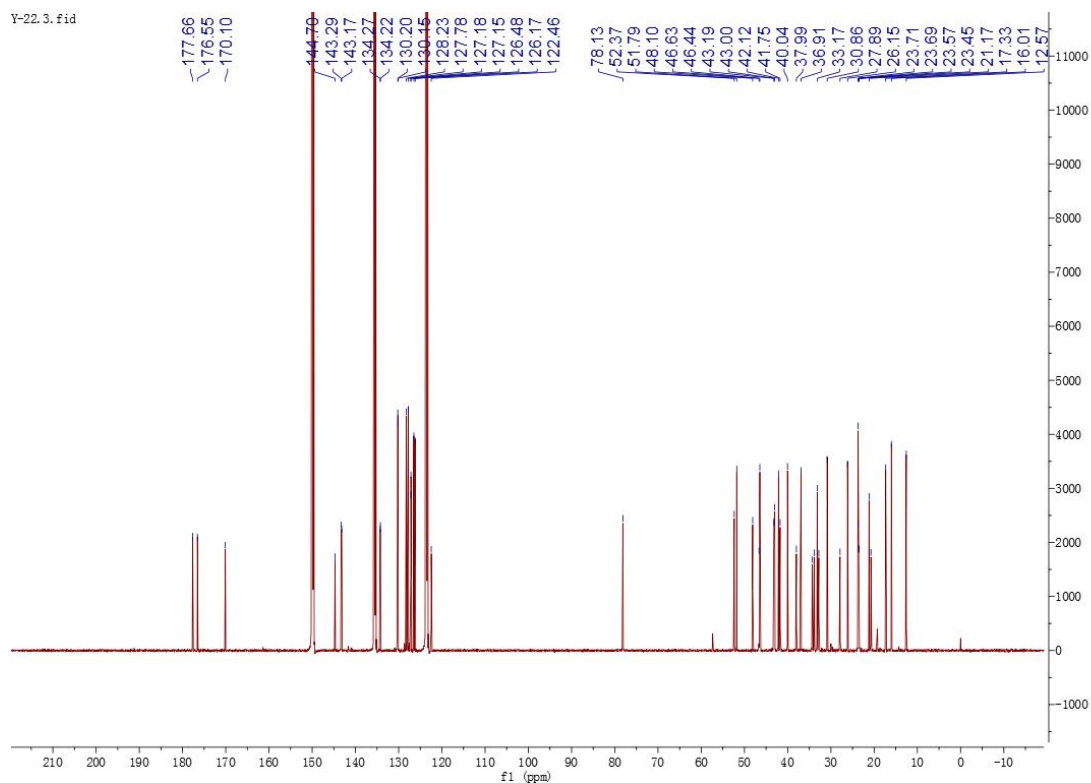
^{13}C NMR (600MHz) of compound **6e** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine- d_5):



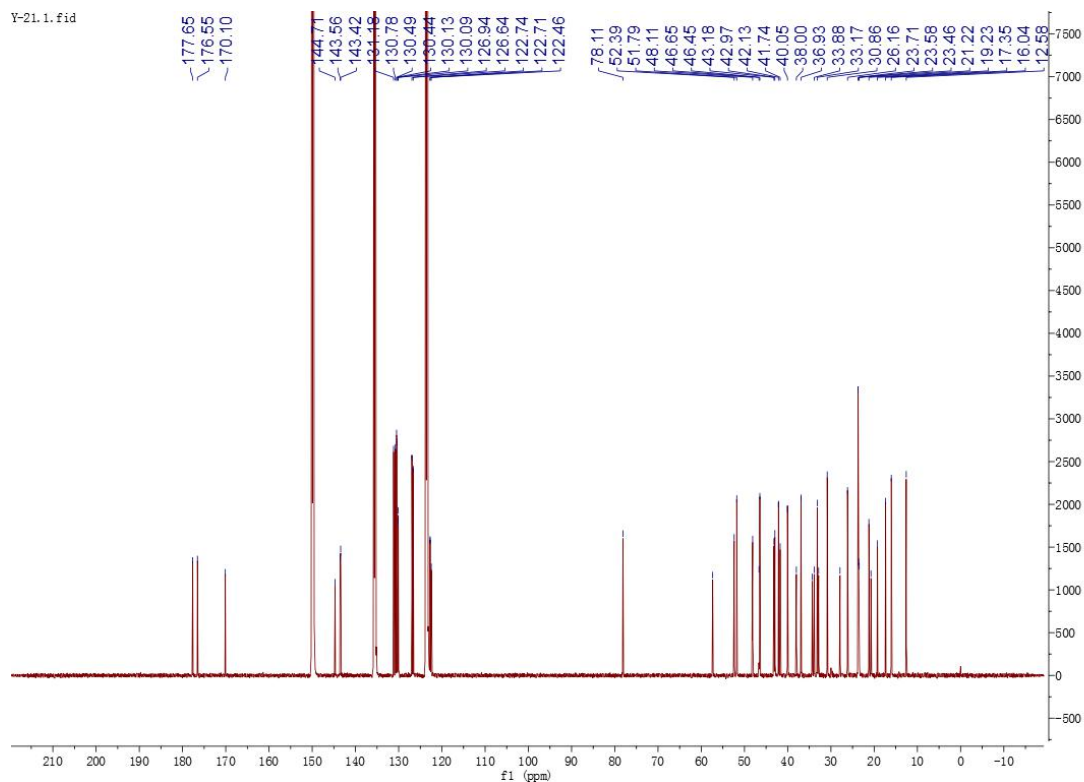
^{13}C NMR (600MHz) of compound **6f** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine- d_5):



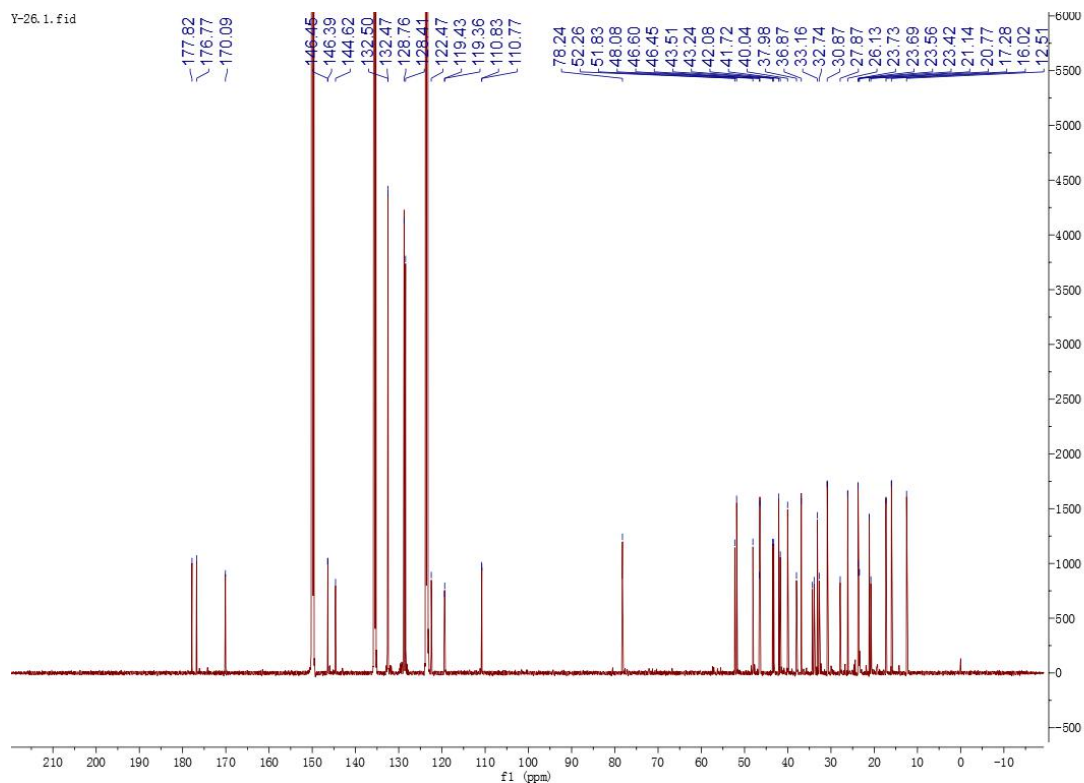
^{13}C NMR (600MHz) of compound **6g** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



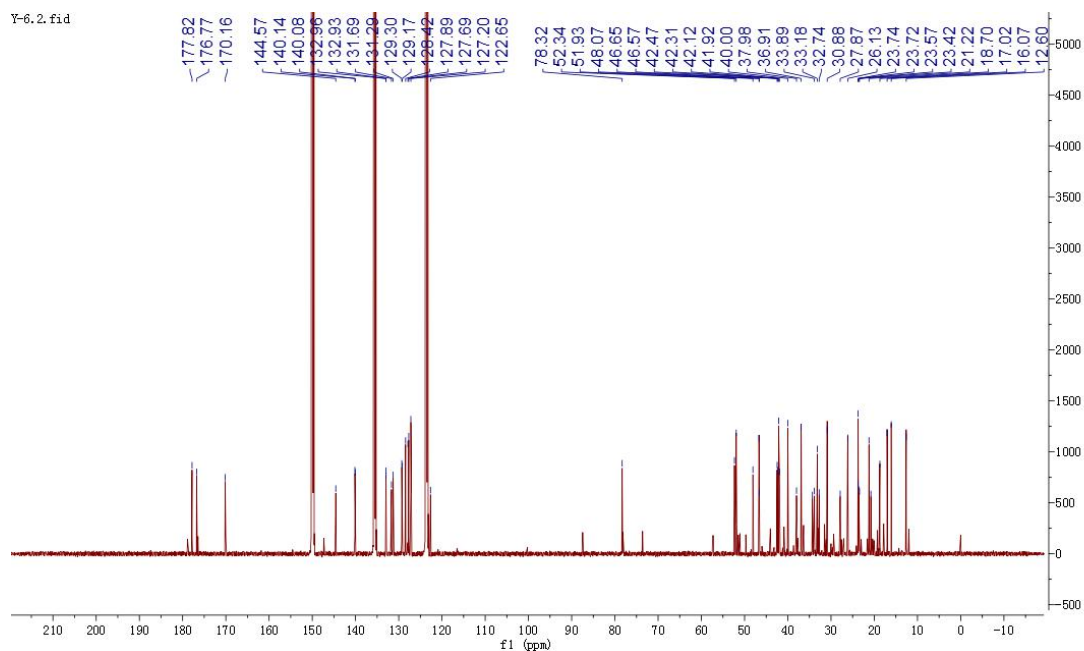
^{13}C NMR (600MHz) of compound **6h** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



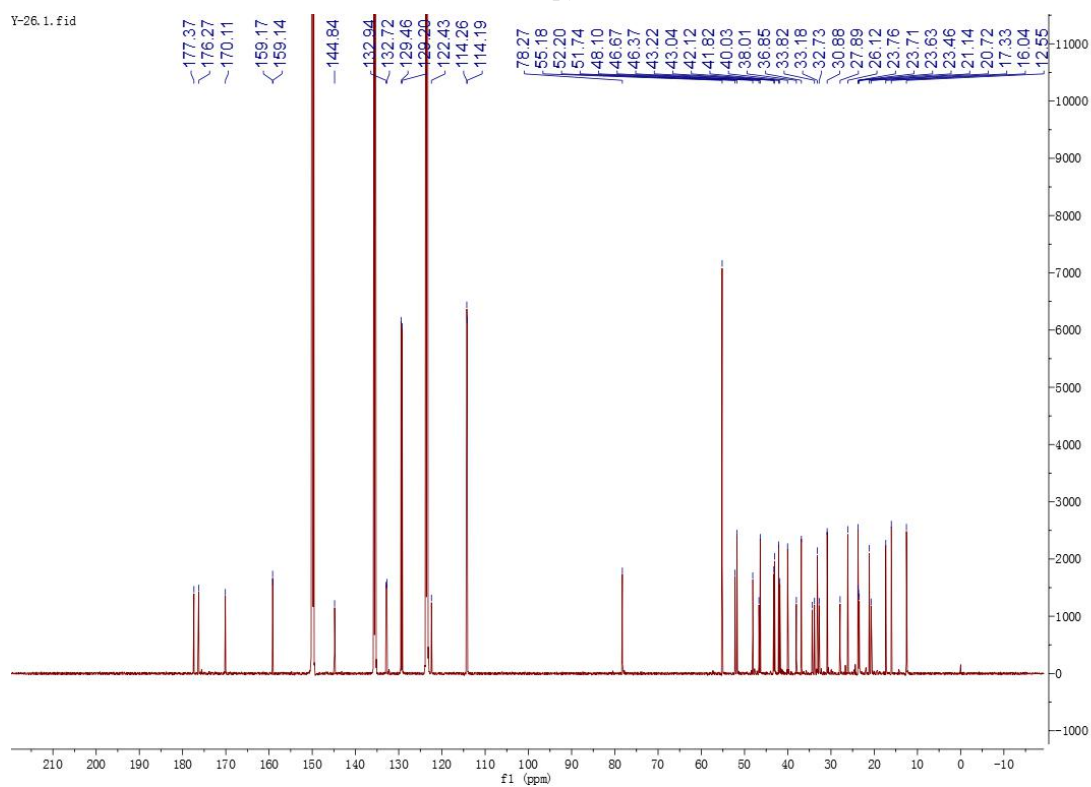
^{13}C NMR (600MHz) of compound **6i** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine- d_5):



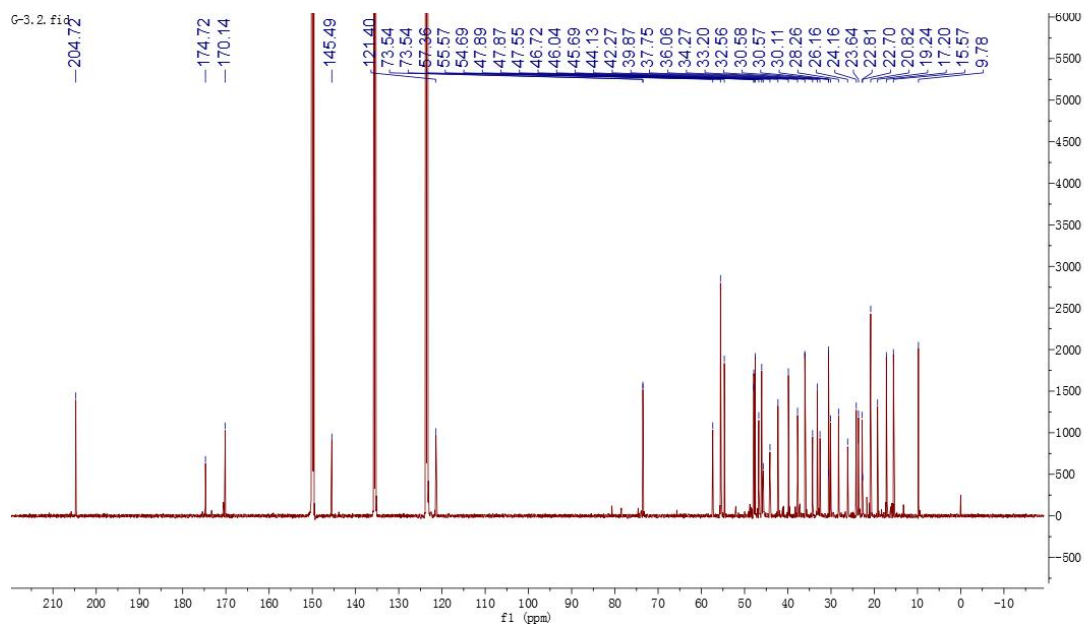
^{13}C NMR (600MHz) of compound **6j** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine- d_5):



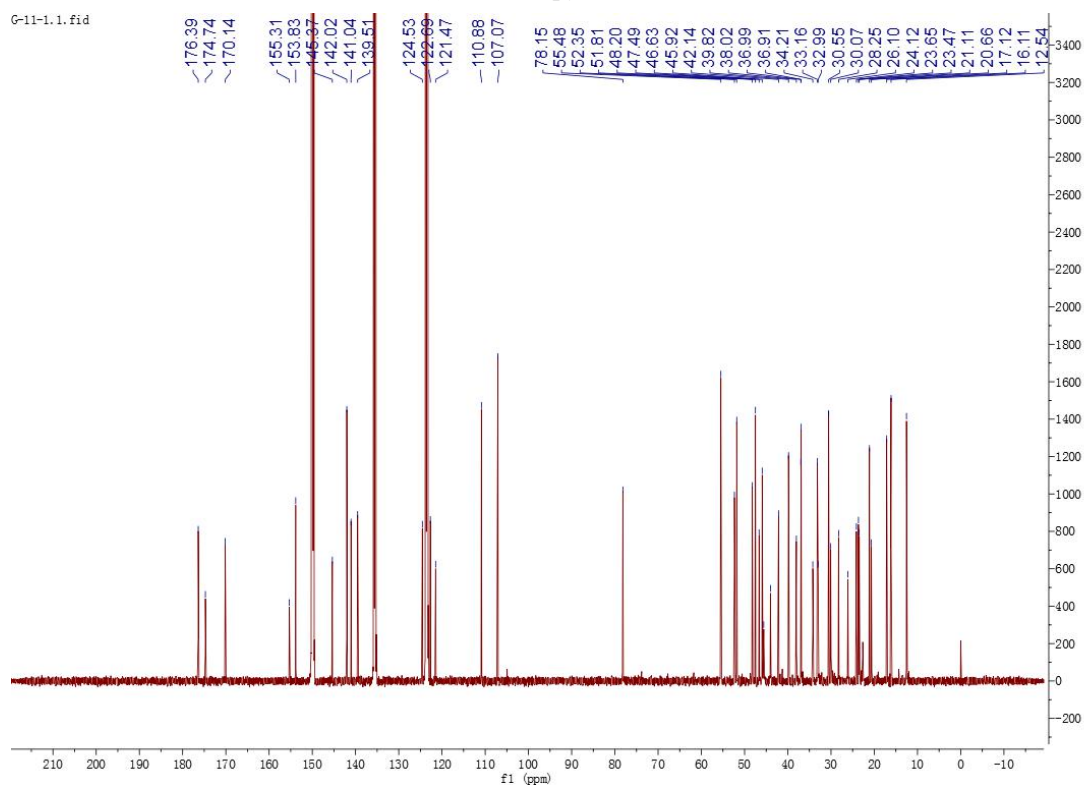
^{13}C NMR (600MHz) of compound **6k** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



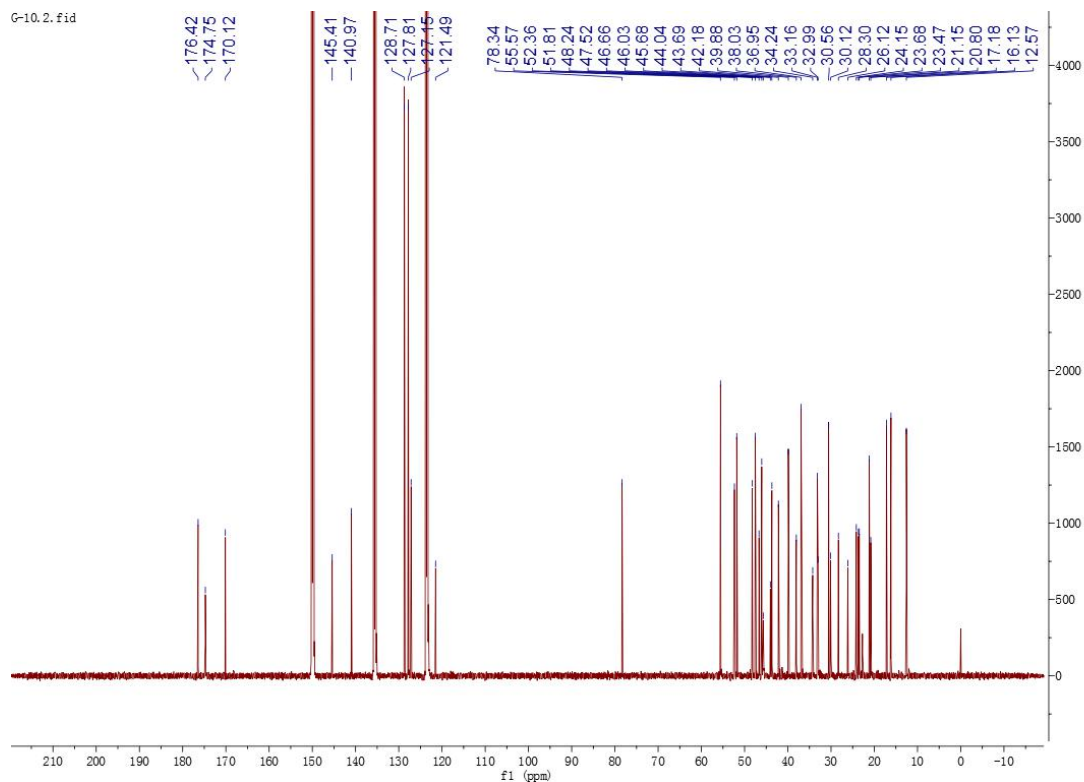
^{13}C NMR (600MHz) of compound **7** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



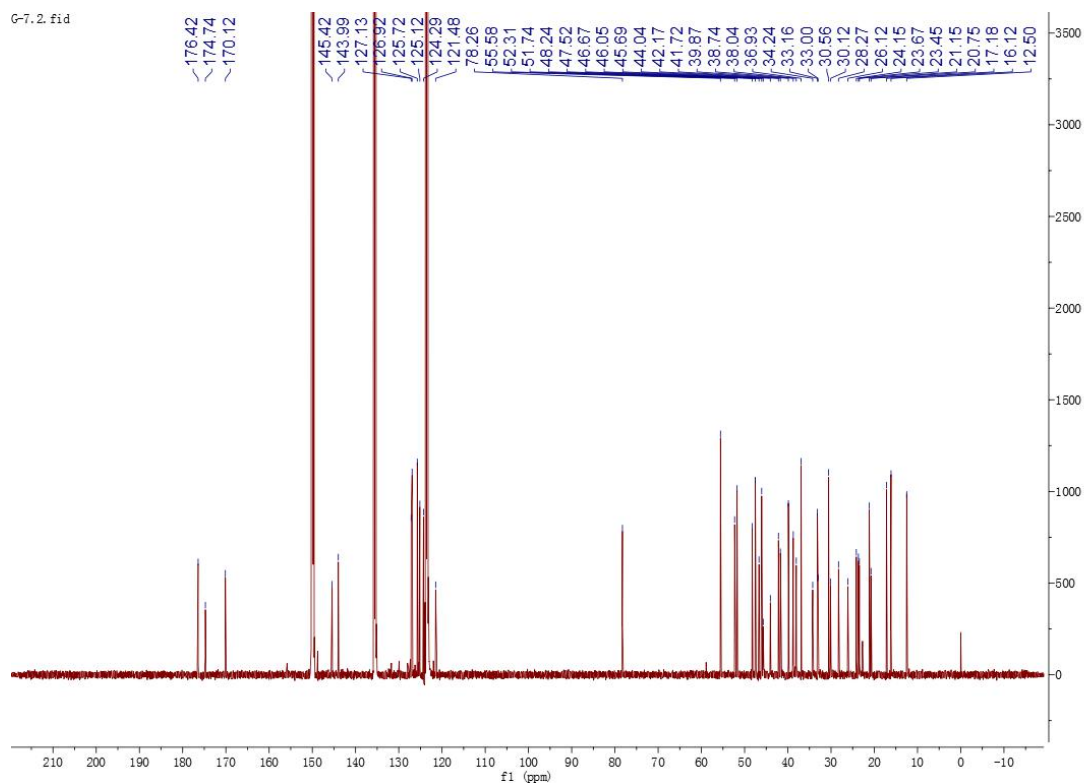
^{13}C NMR (600MHz) of compound **7a** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d5):



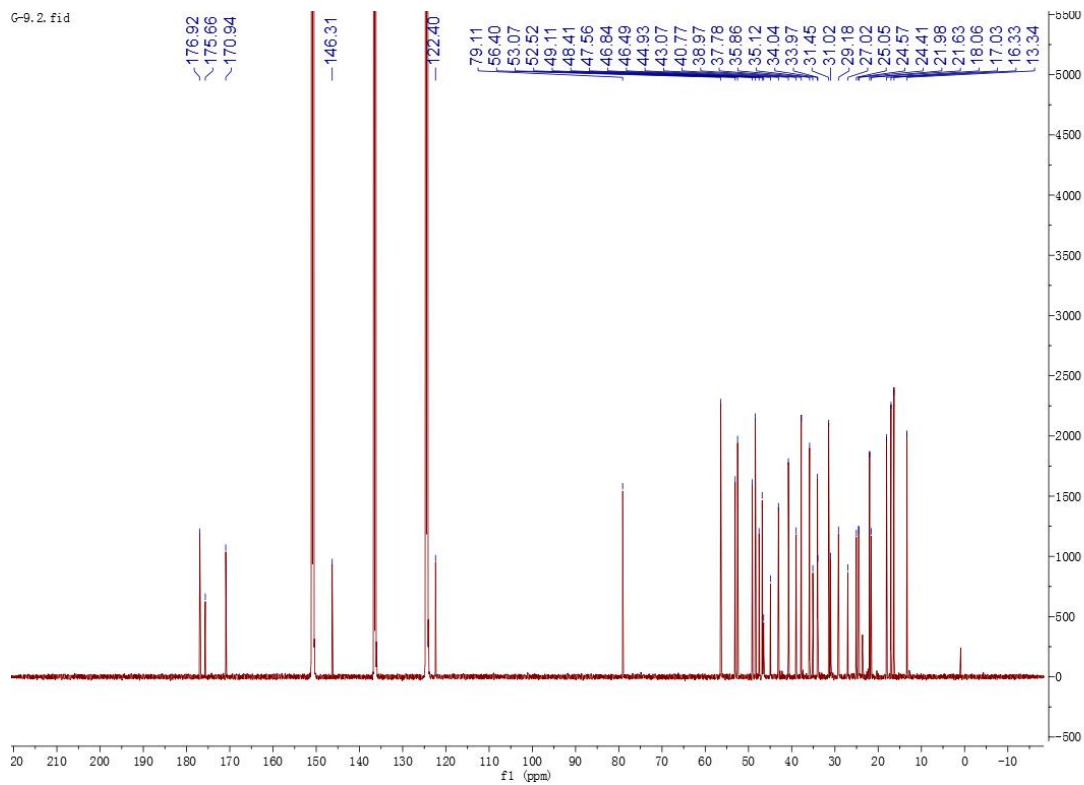
^{13}C NMR (600MHz) of compound **7b** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d5):



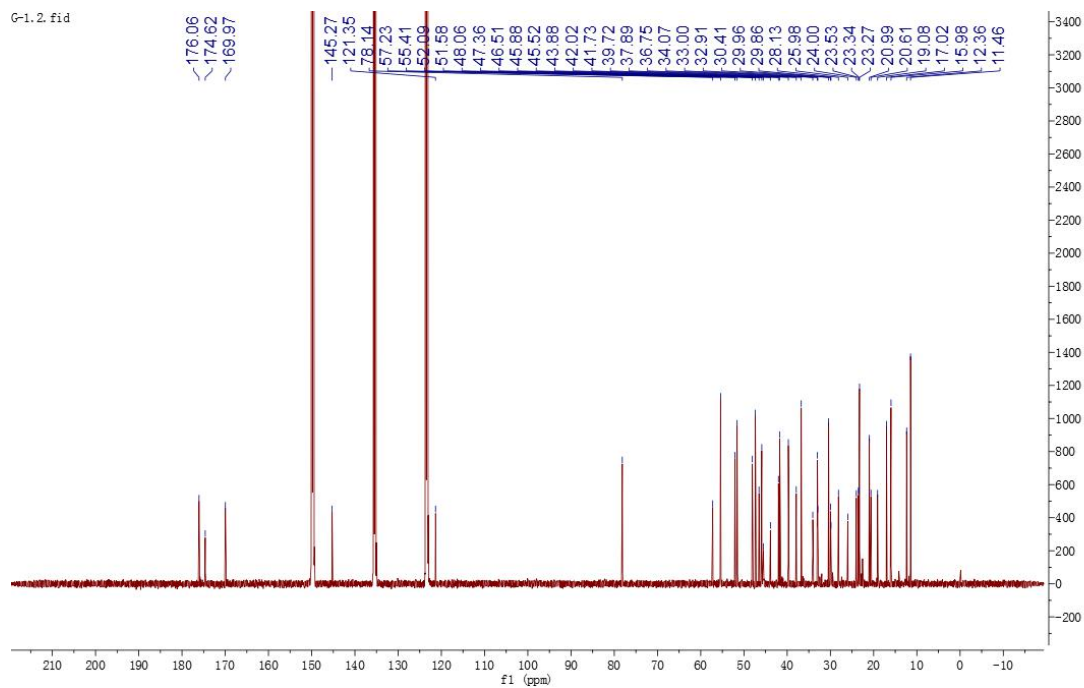
^{13}C NMR (600MHz) of compound **7c** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



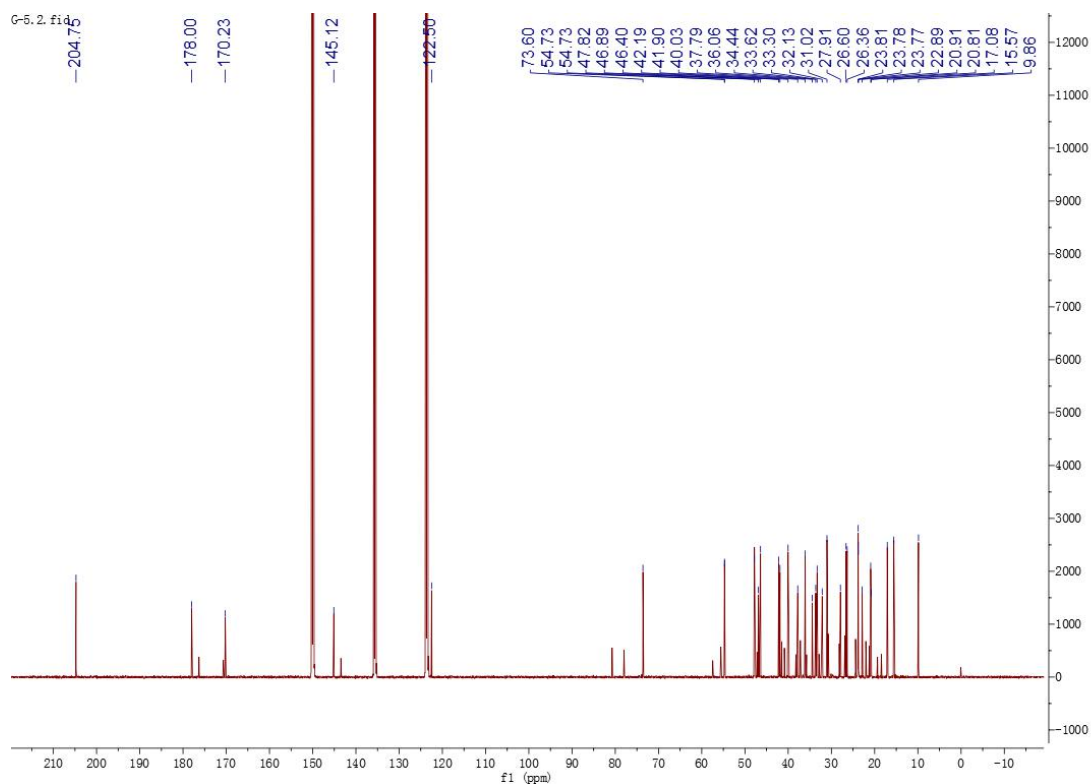
^{13}C NMR (600MHz) of compound **7d** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



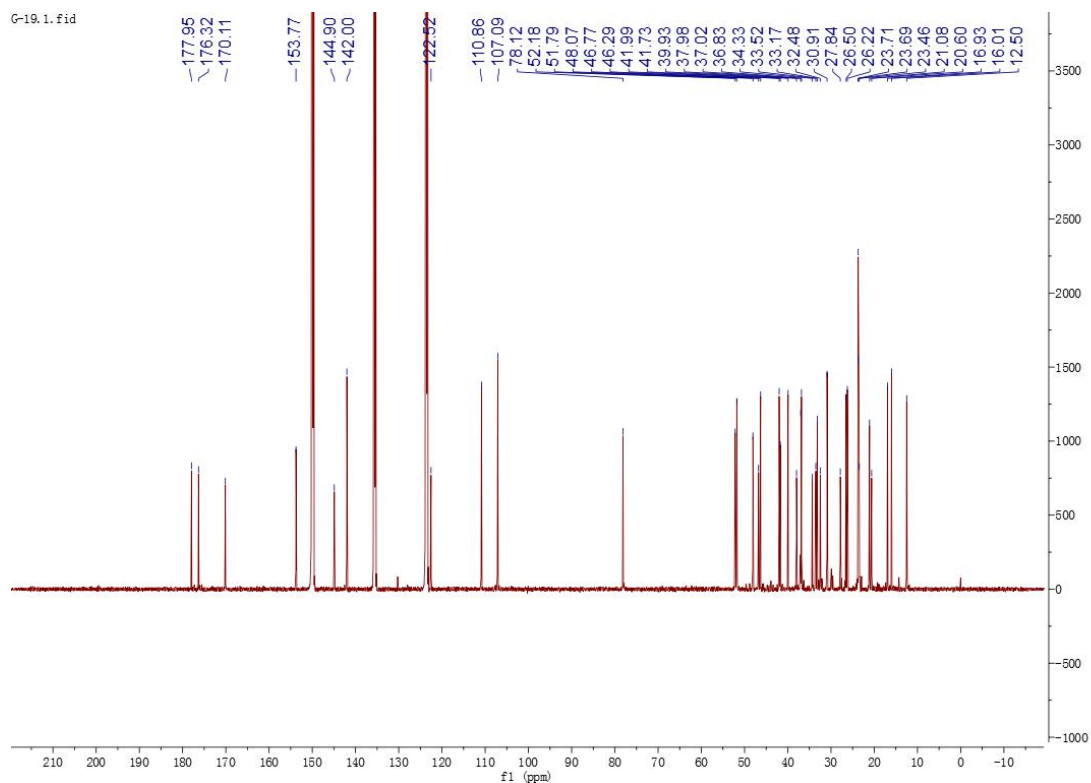
^{13}C NMR (600MHz) of compound **7e** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d5):



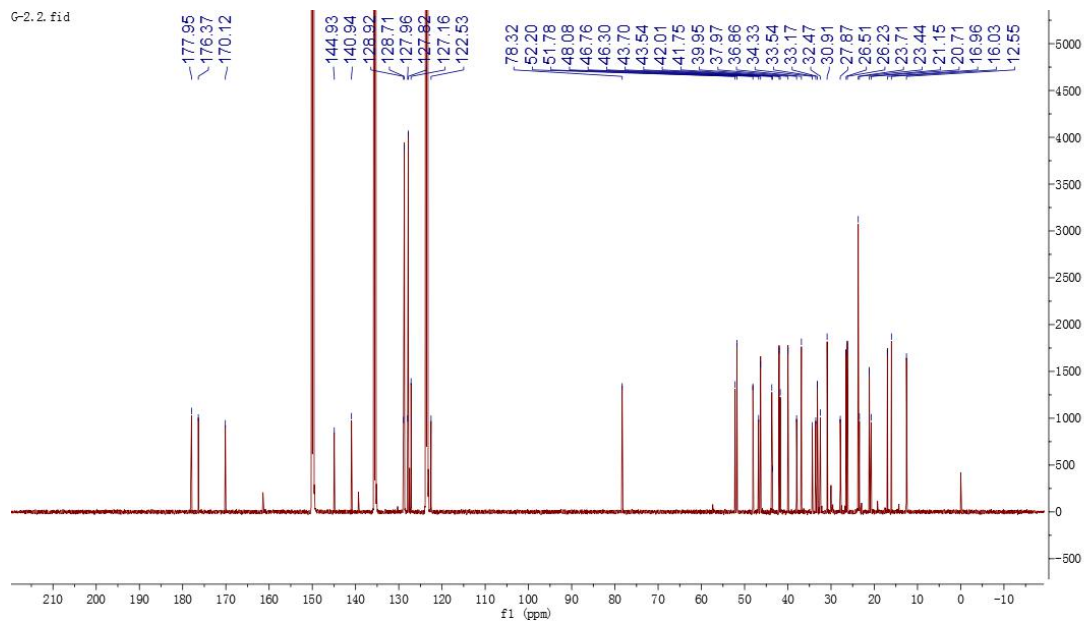
^{13}C NMR (600MHz) of compound **8** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d5):



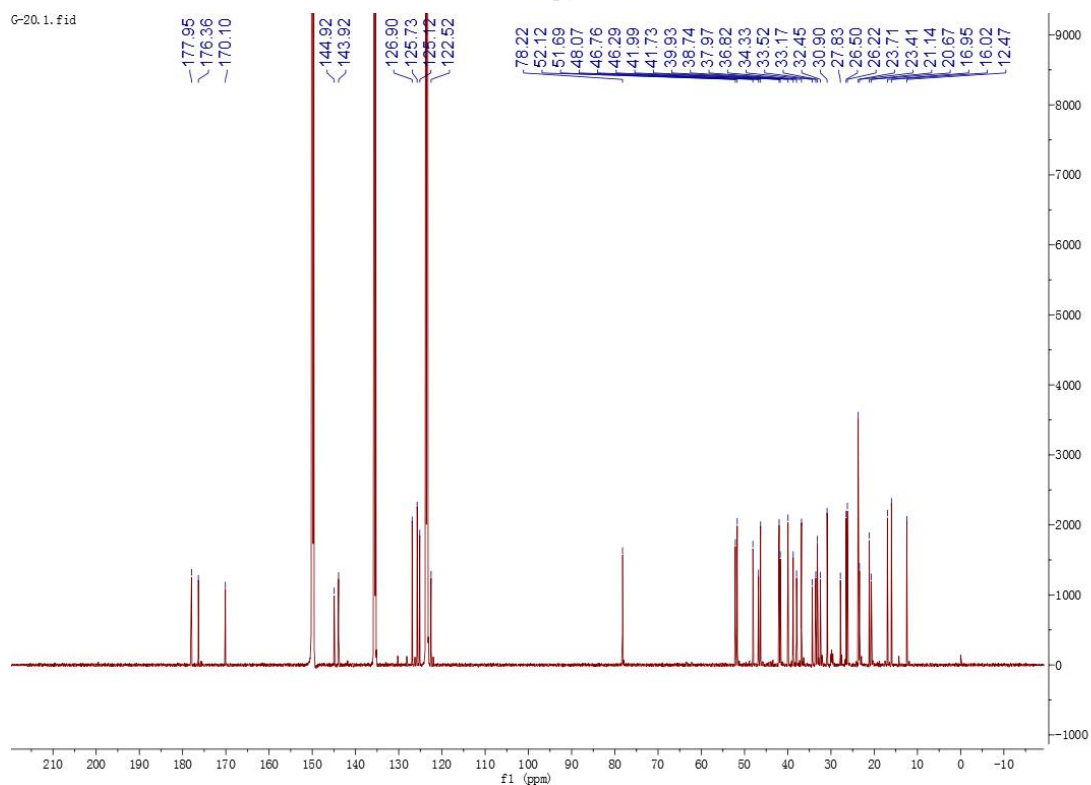
^{13}C NMR (600MHz) of compound **8a** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d5):



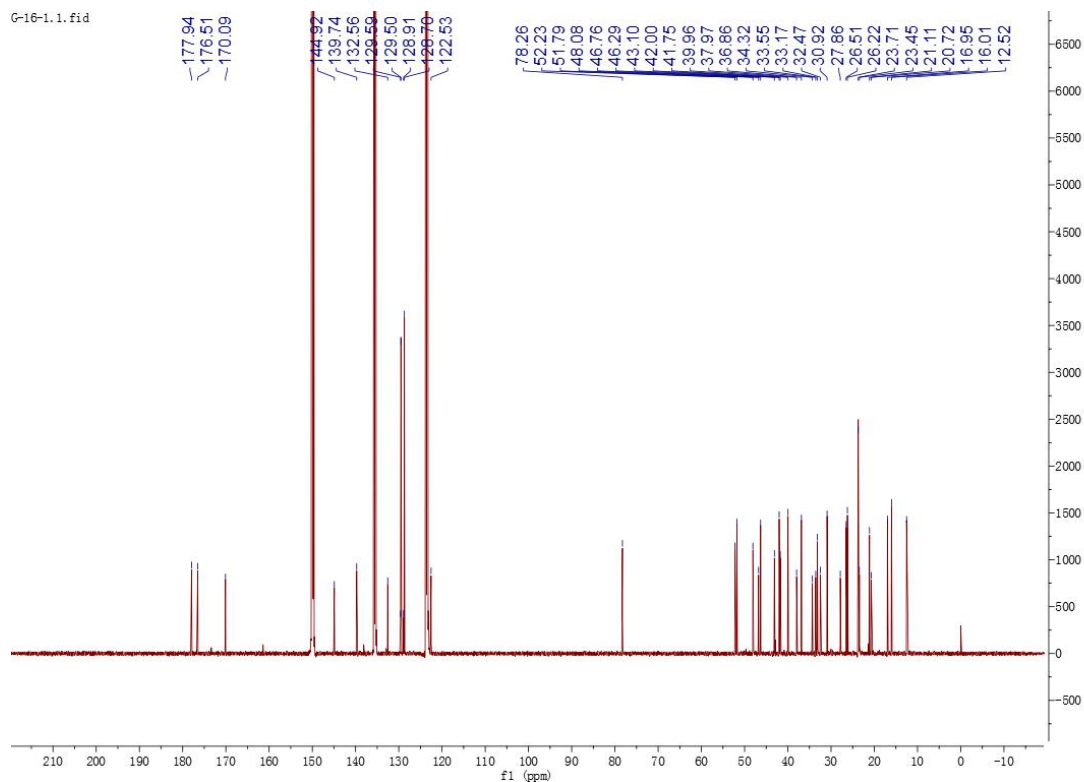
^{13}C NMR (600MHz) of compound **8b** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d5):



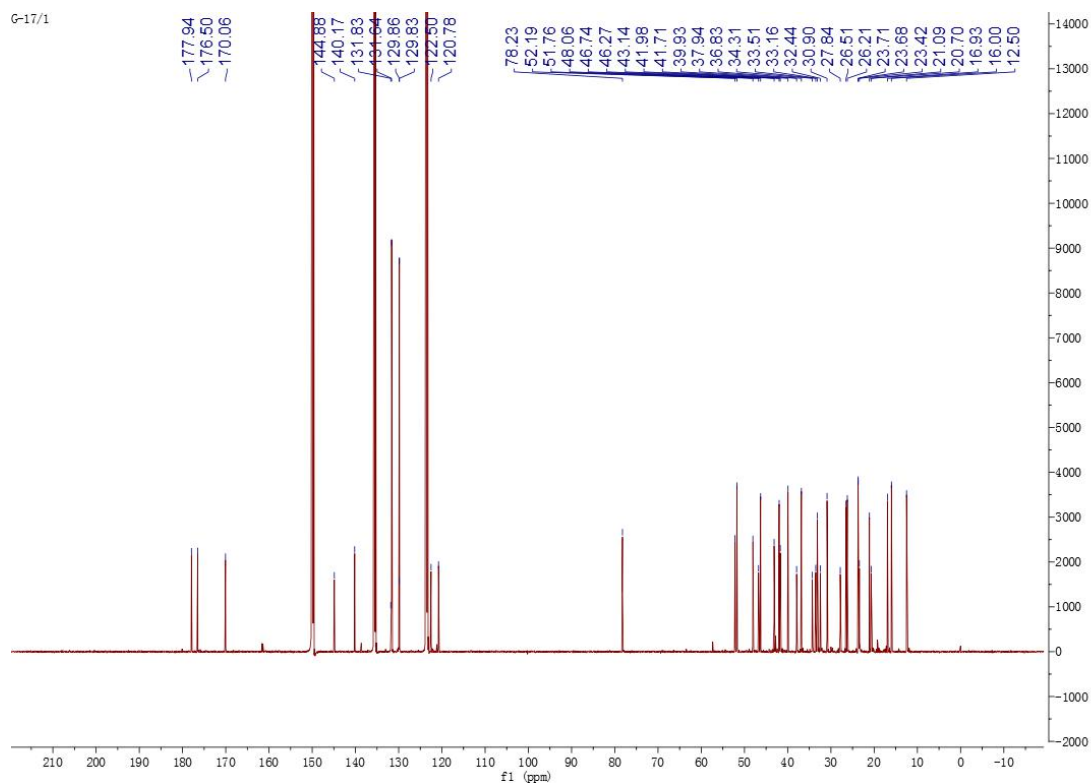
^{13}C NMR (600MHz) of compound **8c** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



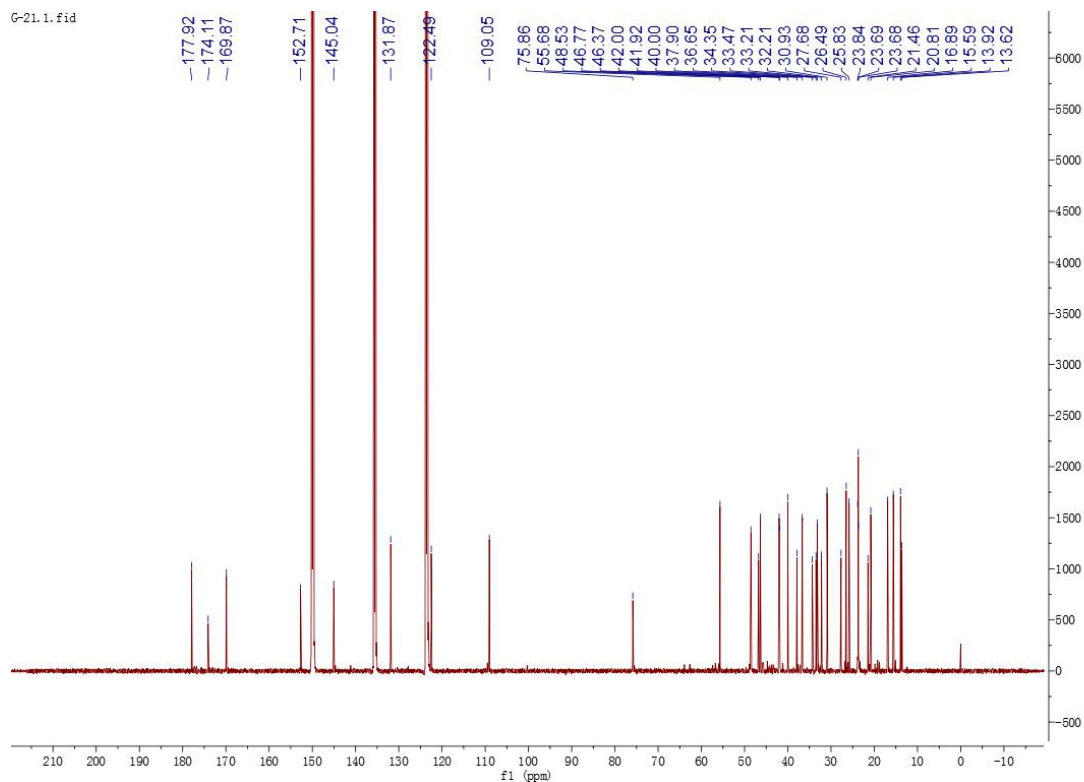
^{13}C NMR (600MHz) of compound **8d** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



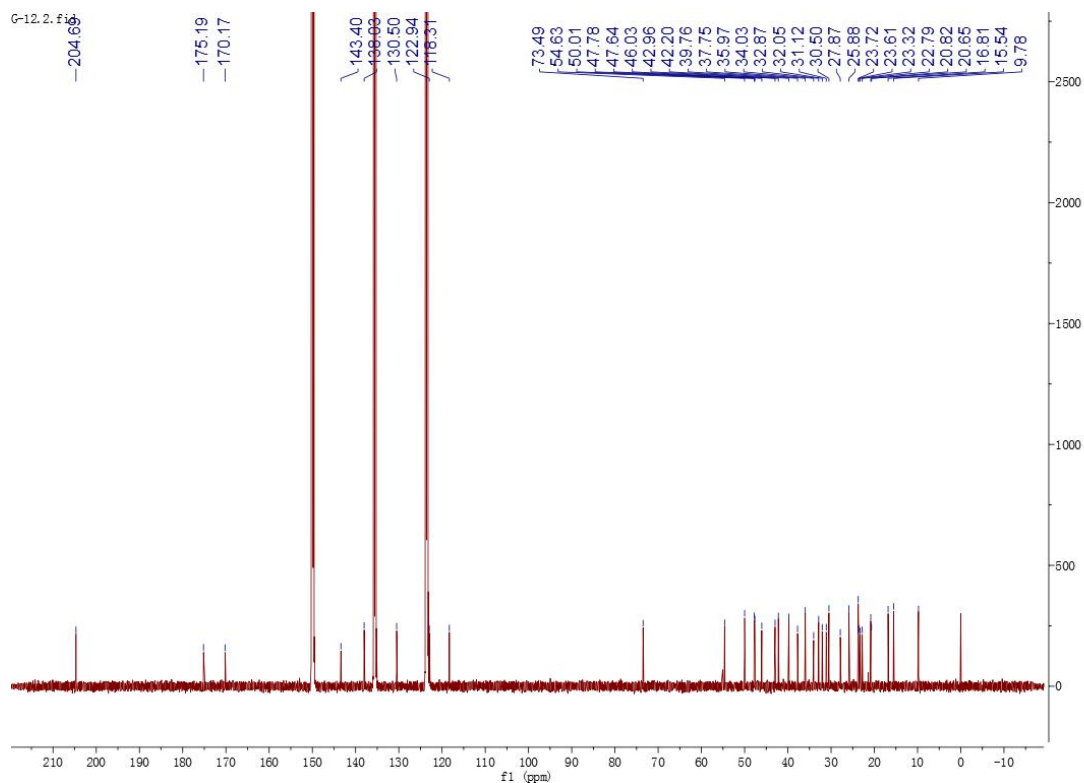
^{13}C NMR (600MHz) of compound **8e** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



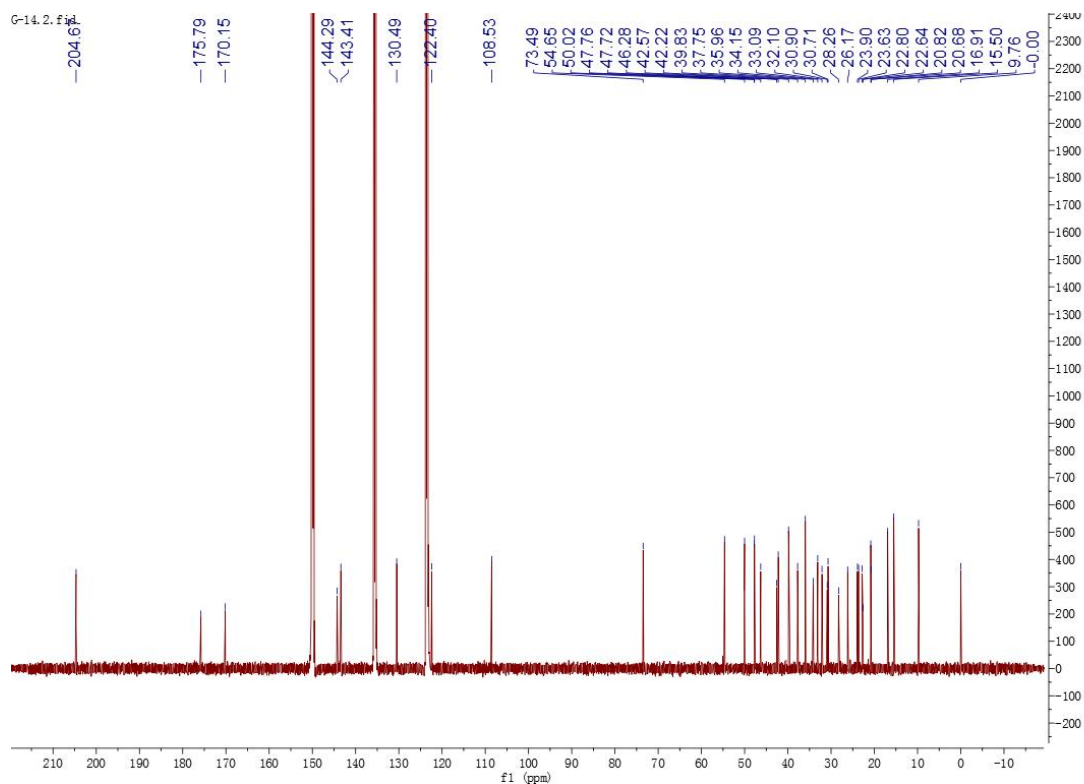
^{13}C NMR (600MHz) of compound **8f** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



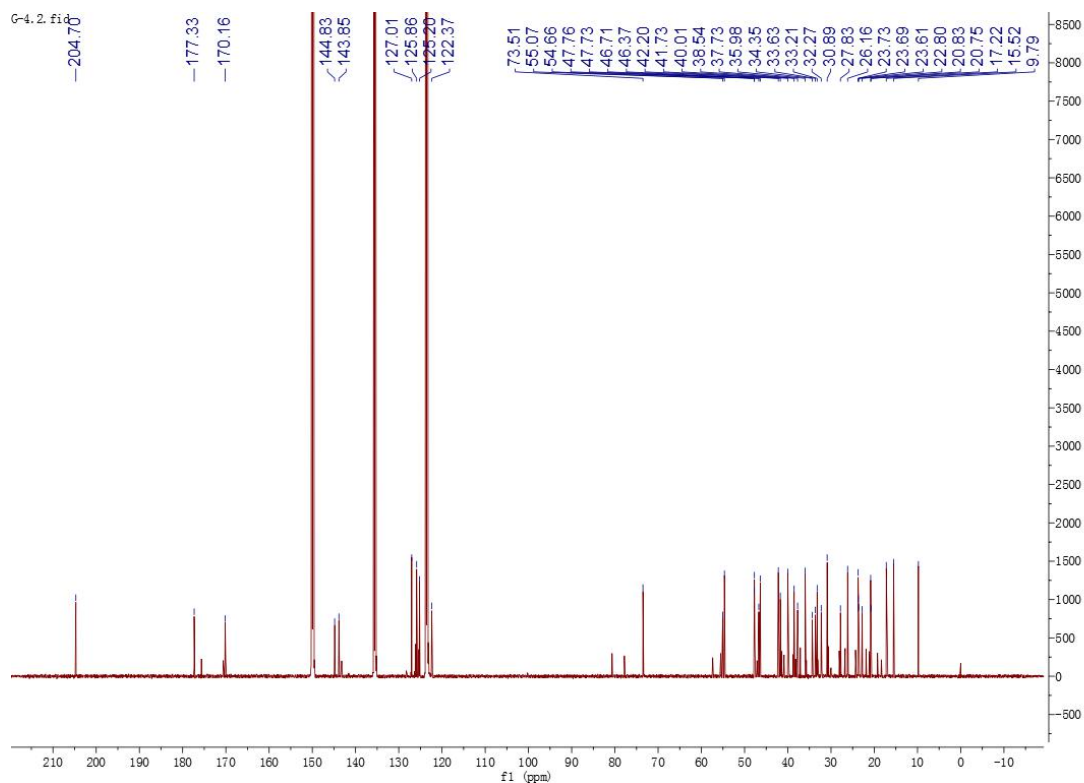
^{13}C NMR (600MHz) of compound **9** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine- d_5):



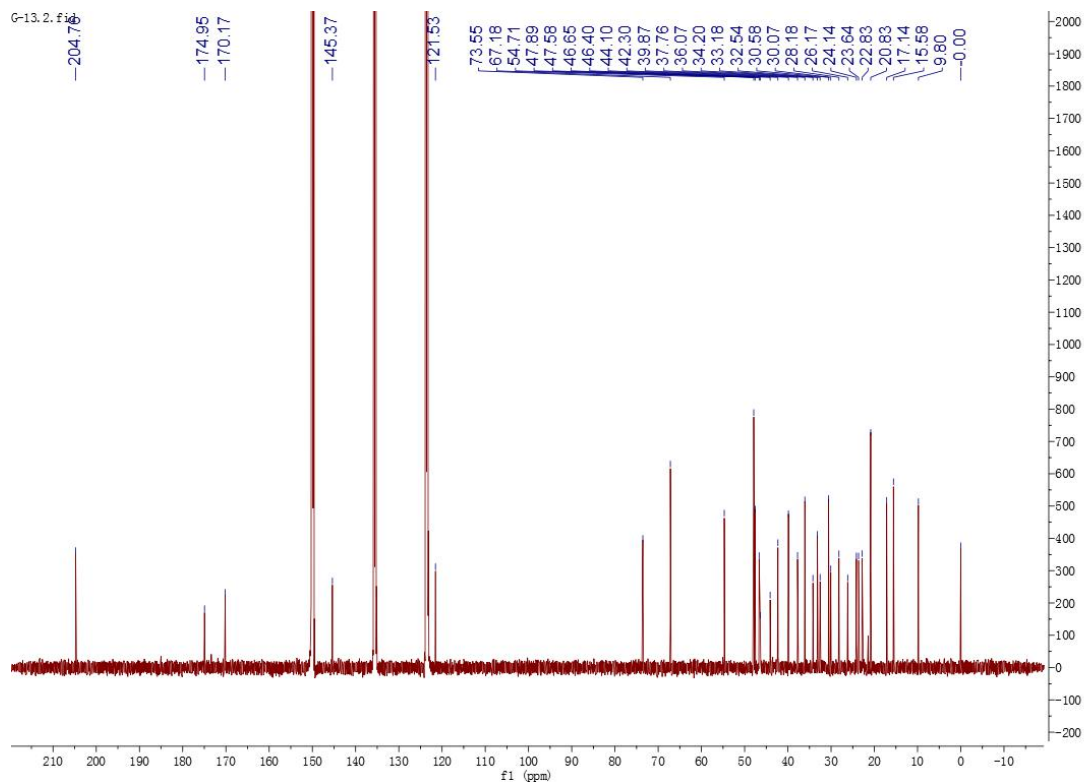
^{13}C NMR (600MHz) of compound **10** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine- d_5):



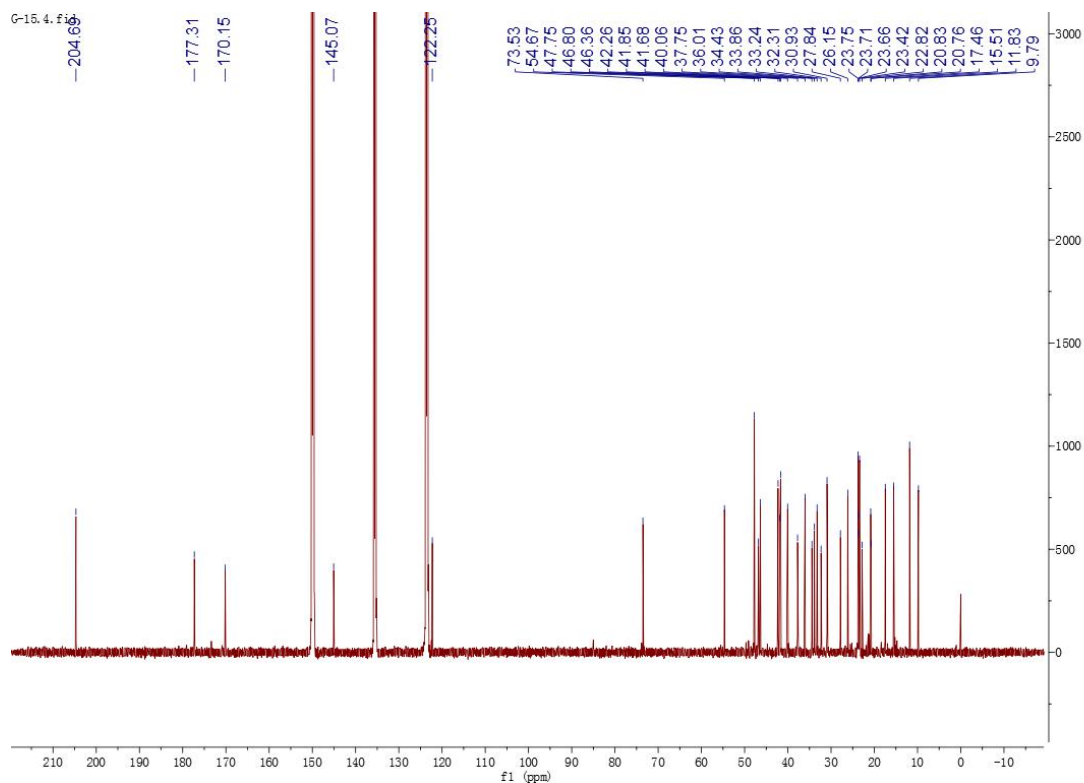
¹³C NMR (600MHz) of compound **11** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



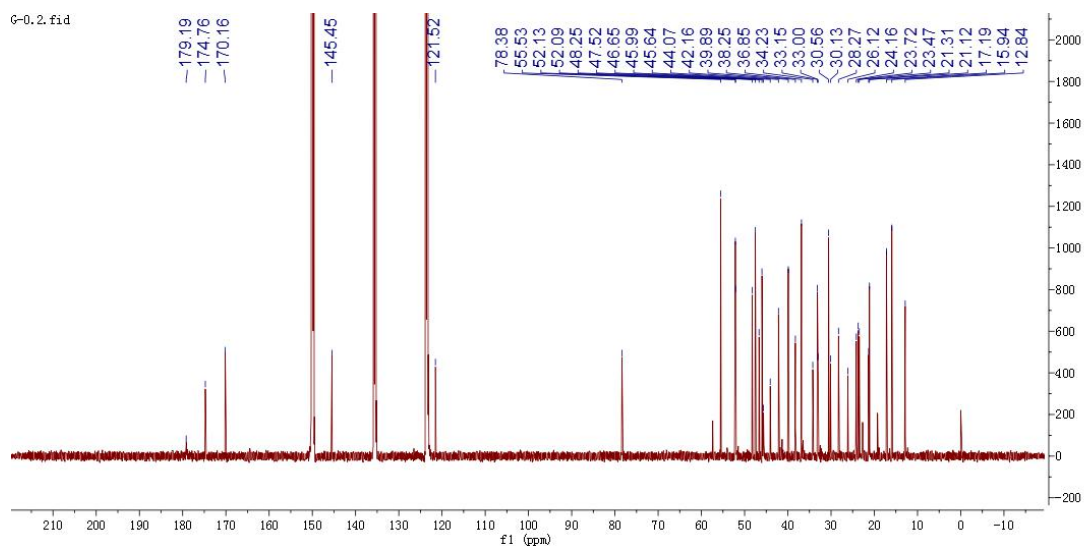
¹³C NMR (600MHz) of compound **12** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



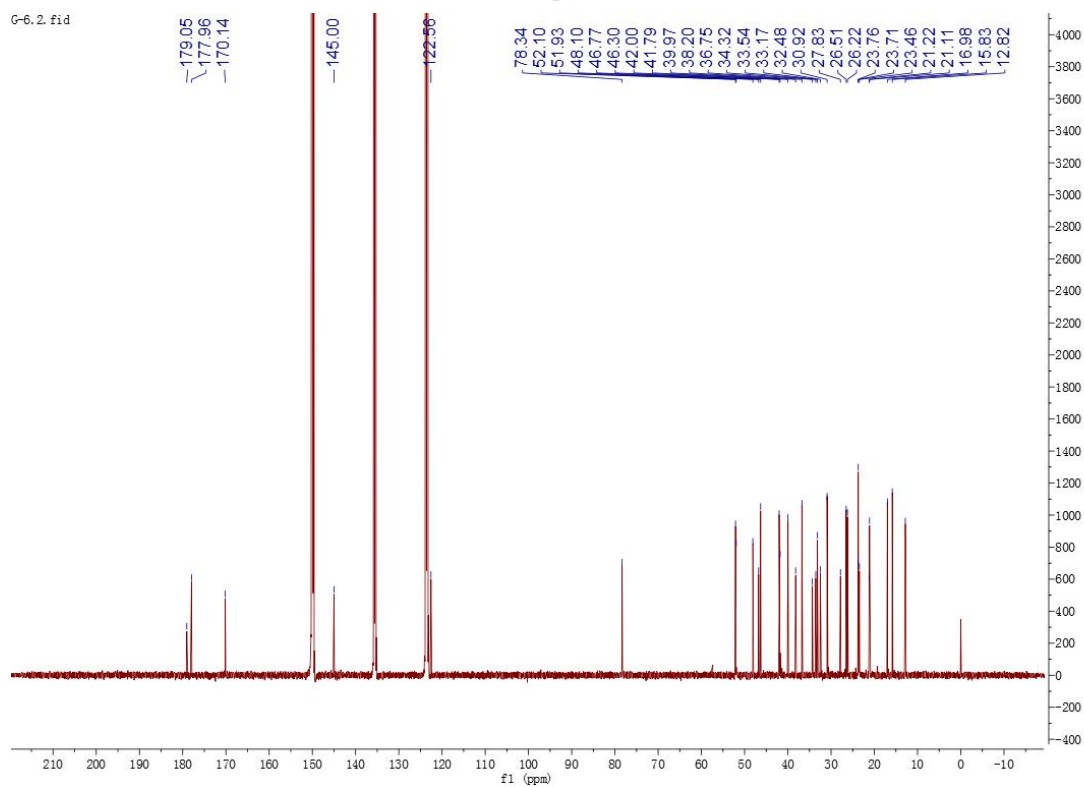
^{13}C NMR (600MHz) of compound **13** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



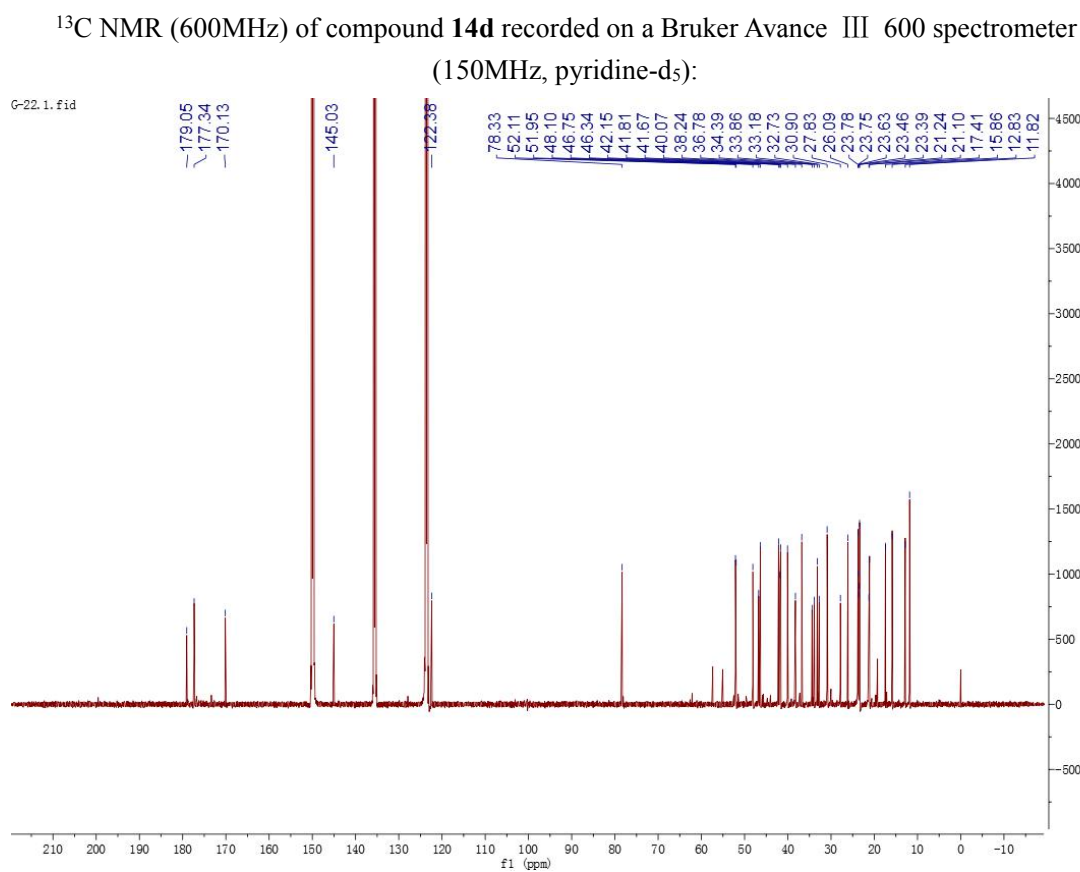
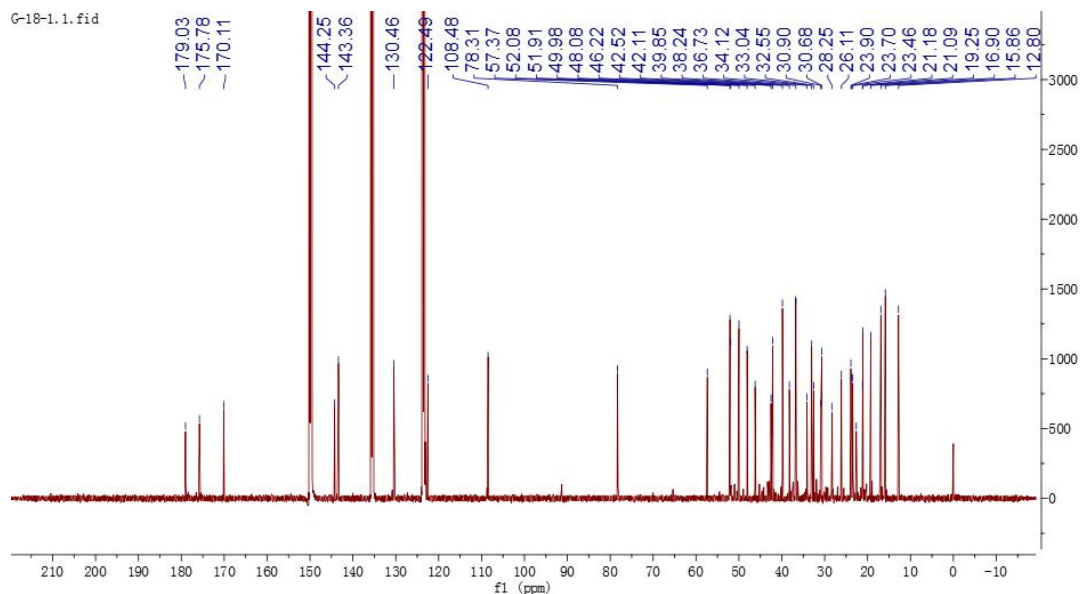
^{13}C NMR (600MHz) of compound **14a** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



^{13}C NMR (600MHz) of compound **14b** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):

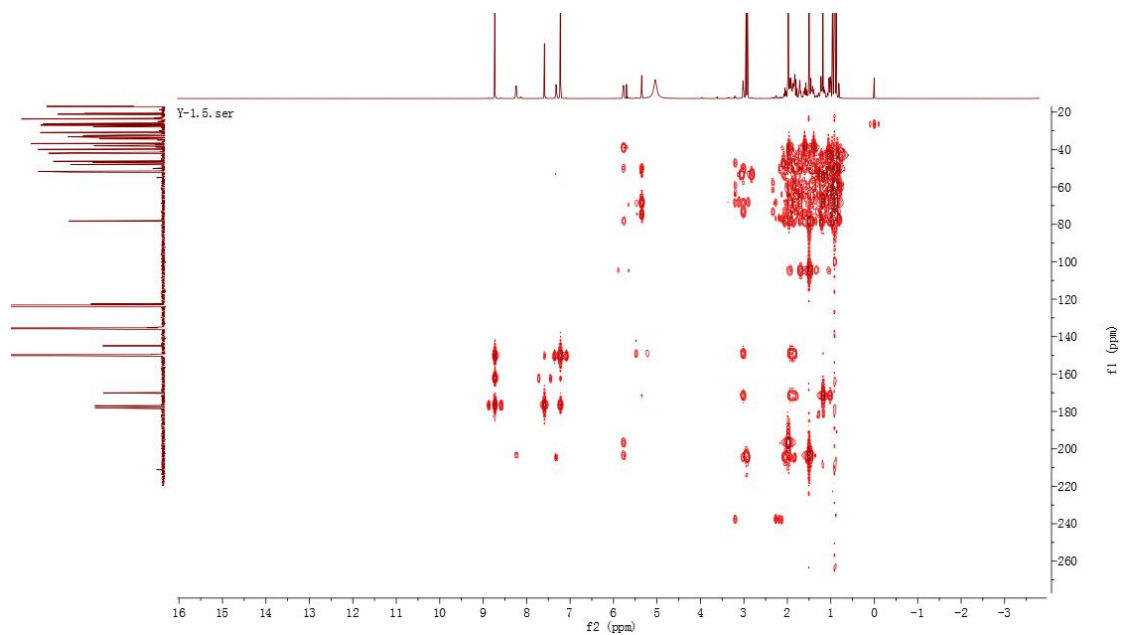


^{13}C NMR (600MHz) of compound **14c** recorded on a Bruker Avance III 600 spectrometer (150MHz, pyridine-d₅):



HSQC, HMBC spectrum of compound **4a**

HSQC of compound **4a** recorded on a Bruker Avance III 600 spectrometer (pyridine- d_5):



HMBC of compound **4a** recorded on a Bruker Avance III 600 spectrometer (pyridine-d₅):

