

Synthesis of 2-(6-hydroxy-carbonyl-hexyl-10,11-b)quinolines in biomass-derived solvent γ -valerolactone and their biological evaluation against protein tyrosine phosphatase 1B

Xu-Yang Mu^{a, #}, Zhi-Jia Wang^{a, #}, Bo Feng^{a, #}, Lei Xu^b, Li-Xin Gao^b, Rajendran Satheeshkumar^a,
Jia Li^b, Yu-Bo Zhou^{b, *}, Wen-Long Wang^{a, *}

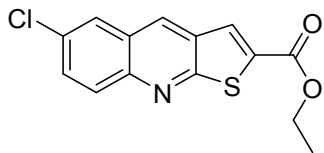
^aSchool of Pharmaceutical Sciences, Jiangnan University, Wuxi, 214122, China.

^bState key Laboratory of Drug Research, Shanghai Institute of Materia Medica, Chinese Academy of Sciences, Shanghai, 201203, China.

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All chemicals were reagent grade and used as purchased. ^1H (400 MHz) NMR spectra were recorded on a Bruker AVIII 400 MHz spectrometer and a Varian MR-400 spectrometer. The chemical shifts were reported in (ppm) using the 7.26 signal of CDCl_3 (^1H -NMR) as internal standards and the 77.00 signal of CDCl_3 (^{13}C -NMR) as internal standards. ESI Mass spectra (MS) was obtained on a Waters ACQUITY TQD Mass Spectrometer. Compounds **4a-4n** are synthesized as reference¹

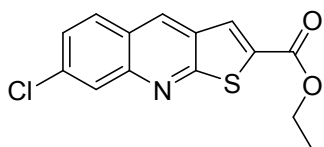
II. Preparation of Compounds **6a-6n**



Ethyl 6-chlorothieno[2,3-b]quinoline-2-carboxylate (6a)

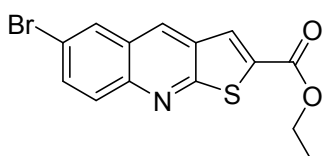
The compound **4a** (678.3 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μL , 3.6 mmol) consequently. The mixture was heated to 90 $^\circ\text{C}$ and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the white solid **6a** (717.3 mg, 82%).

^1H NMR (400 MHz, CDCl_3) δ : 8.58 (s, 1H), 8.11 – 8.09 (m, 2H), 7.97 (d, $J = 2.4$ Hz, 1H), 7.72 (dd, $J = 9.2$, 2.4 Hz, 1H), 4.46 (q, $J = 7.2$ Hz, 2H), 1.45 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 163.64, 162.16, 146.27, 135.95, 131.81, 131.66, 131.53, 131.45, 130.04, 127.42, 126.89, 126.12, 62.17, 14.28; MS (ESI): m/z calcd. For $\text{C}_{14}\text{H}_{11}\text{ClNO}_2\text{S}$ $[\text{M}+\text{H}]^+$ 292.0/294.0, found 292.0/294.0.



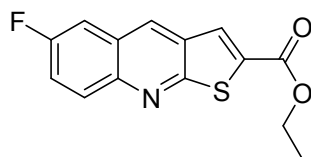
Ethyl 7-chlorothieno[2,3-b]quinoline-2-carboxylate (6b)

The compound **4b** (678.3 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μL , 3.6 mmol) consequently. The mixture was heated to 90 $^\circ\text{C}$ and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the white solid **6b** (656.4 mg, 75%). ^1H NMR (400 MHz, CDCl_3) δ : 8.65 (s, 1H), 8.16 (d, $J = 1.6$ Hz, 1H), 8.10 (s, 1H), 7.94 (d, $J = 8.8$ Hz, 1H), 7.53 (dd, $J = 8.8$, 2.0 Hz, 1H), 4.46 (q, $J = 7.2$ Hz, 2H), 1.45 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, CDCl_3) δ : 164.44, 162.20, 148.03, 136.47, 135.38, 132.72, 131.18, 129.76, 127.54, 127.33, 127.07, 124.00, 62.14, 14.29; MS (ESI): m/z calcd. For $\text{C}_{14}\text{H}_{11}\text{ClNO}_2\text{S}$ $[\text{M}+\text{H}]^+$ 292.0/294.0, found 291.9/293.9.



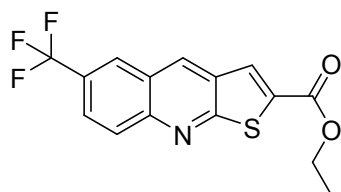
Ethyl 6-bromothieno[2,3-b]quinoline-2-carboxylate (6c)

The compound **4c** (811.5 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μ L, 3.6 mmol) consequently. The mixture was heated to 90 °C and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the yellow solid **6c** (786.7 mg, 78%), ¹H NMR (400 MHz, CDCl₃) δ 8.57 (s, 1H), 8.15 (d, J = 2.4 Hz, 1H), 8.10 (s, 1H), 8.03 (d, J = 8.8 Hz, 1H), 7.84 (dd, J = 9.2, 2.4 Hz, 1H), 4.46 (q, J = 7.2 Hz, 2H), 1.45 (t, J = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ : 163.78 , 162.17 , 146.46 , 136.02 , 133.90 , 131.75 , 131.64 , 130.34 , 130.13 , 127.48 , 126.70 , 119.62 , 62.19 , 14.29; MS (ESI): m/z calcd. For C₁₄H₁₁BrNO₂S [M+H]⁺ 336.0/338.0, found 335.8/337.9.



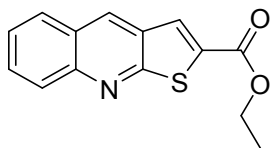
Ethyl 6-fluorothieno[2,3-b]quinoline-2-carboxylate (6d)

The compound **4d** (628.8 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μ L, 3.6 mmol) consequently. The mixture was heated to 90 °C and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the white solid **6d** (760 mg, 92%). ¹H NMR (400 MHz, CDCl₃) δ : 8.61 (s, 1H), 8.18– 8.14 (m, 1H), 8.09 (s, 1H), 7.61– 7.57 (m, 2H), 4.46 (q, J = 7.2 Hz, 2H), 1.46 (t, J = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ : 162.82 , 162.23 , 159.75(d, J = 247.0 Hz, 1C), 145.24 , 135.92 , 132.07(d, J = 6.4 Hz, 1C), 131.61 , 130.95(d, J = 9.2 Hz,1C), 127.27 , 126.08(d, J = 10.2 Hz,1C), 121.30(d, J = 26.6 Hz, 1C), 110.86 (d, J = 21.9 Hz, 1C), 62.14 , 14.29; MS (ESI): m/z calcd. For C₁₄H₁₁FNO₂S [M+H]⁺ 276.0, found 276.0.



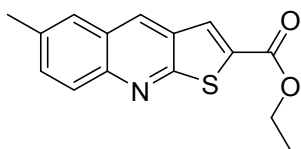
Ethyl 6-(trifluoromethyl)thieno[2,3-b]quinoline-2-carboxylate (6e)

The compound **4e** (778.8 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μ L, 3.6 mmol) consequently. The mixture was heated to 90 °C and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the white solid **6e** (497.8 mg, 51%). ¹H NMR (400 MHz, CDCl₃) δ : 8.77 (s, 1H), 8.33 (s, 1H), 8.28 (d, J = 9.2 Hz, 1H), 8.15 (s, 1H), 7.95 (dd, J = 8.8, 2.0 Hz, 1H), 4.48 (q, J = 7.2 Hz, 2H), 1.46 (t, J = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ : 165.56 , 162.07 , 148.43 , 136.36 , 133.78 , 132.00 , 129.82 , 127.73 (d, J = 32.6 Hz, 1C), 127.37 , 126.75 (d, J = 3.0 Hz, 1C), 125.88 (d, J = 1.2 Hz, 1C), 125.40 (q, J = 217.8 Hz, 1C), 124.40 , 62.28 , 14.29; MS (ESI): m/z calcd. For C₁₅H₁₁F₃NO₂S [M+H]⁺ 326.0, found 326.0.



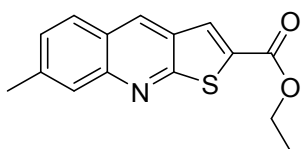
Ethyl thieno[2,3-*b*]quinoline-2-carboxylate (6f)²

The compound **4f** (574.8 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μ L, 3.6 mmol) consequently. The mixture was heated to 90 °C and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the white solid **6f** (617.3 mg, 80%). ¹H NMR (400 MHz, CDCl₃) δ : 8.65 (s, 1H), 8.15 (d, J = 8.4 Hz, 1H), 8.09 (s, 1H), 7.99 – 7.97 (m, 1H), 7.82 – 7.78 (m, 1H), 7.59 – 7.55 (m, 1H), 4.46 (q, J = 7.2 Hz, 2H), 1.45 (t, J = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ : 163.56 , 162.42 , 148.11 , 135.07 , 133.01 , 131.17 , 130.58 , 128.67 , 128.48 , 127.77 , 125.88 , 125.77 , 62.06 , 14.32; MS (ESI): m/z calcd. For C₁₄H₁₂NO₂S [M+H]⁺ 258.1, found 258.0.



Ethyl 6-methylthieno[2,3-*b*]quinoline-2-carboxylate (6g)

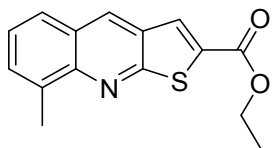
The compound **4g** (616.8 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μ L, 3.6 mmol) consequently. The mixture was heated to 90 °C and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the white solid **6g** (675.3 mg, 83%). ¹H NMR (400 MHz, CDCl₃) δ : 8.56 (s, 1H), 8.09 (s, 1H), 8.05 (d, J = 8.8 Hz, 1H), 7.73 (s, 1H), 7.63 (dd, J = 8.8, 2.0 Hz, 1H), 4.45 (q, J = 7.2 Hz, 2H), 2.58 (s, 3H), 1.45 (t, J = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ : 162.72 , 162.48 , 146.97 , 135.72 , 134.76 , 133.17 , 132.18 , 131.17 , 128.09 , 127.85 , 127.08 , 125.86 , 62.00 , 21.61 , 14.31; MS (ESI): m/z calcd. For C₁₅H₁₄NO₂S [M+H]⁺ 272.1, found 272.0.



Ethyl 7-methylthieno[2,3-*b*]quinoline-2-carboxylate (6h)

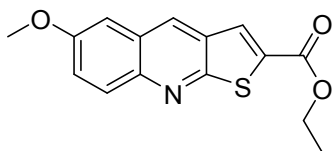
The compound **4h** (616.8 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μ L, 3.6 mmol) consequently. The mixture was heated to 90 °C and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the white solid **6h** (610.3 mg, 75%). ¹H NMR (400 MHz, CDCl₃) δ : 8.57 (s, 1H), 8.05 (s, 1H), 7.90 (s, 1H), 7.85 (d, J = 8.4 Hz, 1H), 7.39 (d, J = 8.4, 1H), 4.45 (q, J = 7.2 Hz, 2H), 2.60 (s, 3H), 1.44 (t, J = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ : 163.62 , 162.50 , 148.44 , 141.29 , 134.21 , 132.68 , 130.50 , 128.40 ,

128.24 , 127.92 , 127.20 , 123.97 , 61.97 , 22.20 , 14.32; MS (ESI): m/z calcd. For $C_{15}H_{14}NO_2S$ $[M+H]^+$ 272.1, found 272.0.



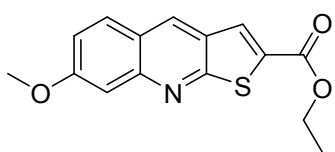
Ethyl 8-methylthieno[2,3-b]quinoline-2-carboxylate (6i)

The compound **4i** (616.8 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μ L, 3.6 mmol) consequently. The mixture was heated to 90 °C and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the white solid **6i** (667.2 mg, 82%). 1H NMR (400 MHz, $CDCl_3$) δ : 8.63 (s, 1H), 8.10 (s, 1H), 7.83 (d, $J = 8.0$ Hz, 1H), 7.64 (d, $J = 7.2$ Hz, 1H), 7.46 (m, 1H), 4.46 (q, $J = 7.2$ Hz, 2H), 2.88 (s, 3H), 1.45 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ : 162.70 , 162.56 , 147.50 , 136.48 , 134.85 , 133.09 , 130.79 , 130.34 , 127.73 , 126.61 , 125.72 , 125.59 , 61.96 , 18.33 , 14.32; MS (ESI): m/z calcd. For $C_{15}H_{14}NO_2S$ $[M+H]^+$ 272.1, found 272.0.



Ethyl 6-methoxythieno[2,3-b]quinoline-2-carboxylate (6j)³

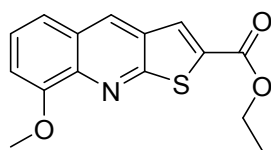
The compound **4j** (664.8 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μ L, 3.6 mmol) consequently. The mixture was heated to 90 °C and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the white solid **6j** (723.7 mg, 84%). 1H NMR (400 MHz, $CDCl_3$) δ : 8.55 (s, 1H), 8.08 (s, 1H), 8.05 (d, $J = 8.8$ Hz, 1H), 7.47 (dd, $J = 9.2, 2.8$ Hz, 1H), 7.19 (d, $J = 2.8$ Hz, 1H), 4.46 (q, $J = 7.2$ Hz, 2H), 3.97 (s, 3H), 1.45 (t, $J = 7.2$ Hz, 3H); ^{13}C NMR (100 MHz, $CDCl_3$) δ : 162.47 , 161.09 , 157.13 , 144.80 , 134.90 , 131.30 , 131.25, 129.79 , 127.57 , 126.74 , 124.42 , 104.73 , 61.98 , 55.56 , 14.31; MS (ESI): m/z calcd. For $C_{15}H_{14}NO_3S$ $[M+H]^+$ 288.1, found 288.0.



Ethyl 7-methoxythieno[2,3-b]quinoline-2-carboxylate (6k)

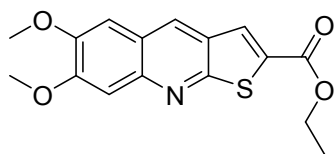
The compound **4k** (664.8 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μ L, 3.6 mmol) consequently. The mixture was heated to 90 °C and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and

dried to afford the white solid **6k** (706.5 mg, 82%). ¹H NMR (400 MHz, CDCl₃) δ: 8.55 (s, 1H), 8.07 (s, 1H), 7.85 (d, *J* = 9.2 Hz, 1H), 7.43 (d, *J* = 2.4 Hz, 1H), 7.23 (dd, *J* = 8.8, 2.4 Hz, 1H), 4.45 (q, *J* = 7.2 Hz, 2H), 3.99 (s, 3H), 1.44 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ: 164.09, 162.57, 161.75, 150.09, 133.05, 132.64, 129.70, 129.39, 128.09, 121.46, 120.15, 105.66, 61.90, 55.65, 14.33; MS (ESI): *m/z* calcd. For C₁₅H₁₄NO₃S [M+H]⁺ 288.1, found 288.0.



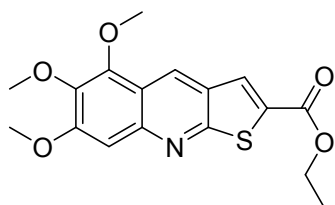
Ethyl 8-methoxythieno[2,3-*b*]quinoline-2-carboxylate (6l)

The compound **4l** (664.8 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μL, 3.6 mmol) consequently. The mixture was heated to 90 °C and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the white solid **6l** (689.4 mg, 80%). ¹H NMR (400 MHz, CDCl₃) δ: 8.64 (s, 1H), 8.10 (s, 1H), 7.58-7.56 (m, 1H), 7.51-7.47 (m, 1H), 7.15-7.12 (m, 1H), 4.45 (q, *J* = 7.2 Hz, 2H), 4.15 (s, 3H), 1.45 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ: 162.72, 162.42, 154.52, 140.36, 135.64, 132.88, 131.60, 127.41, 126.81, 125.81, 120.44, 108.01, 62.02, 56.19, 14.31; MS (ESI): *m/z* calcd. For C₁₅H₁₄NO₃S [M+H]⁺ 288.1, found 288.0.



Ethyl 6,7-dimethoxythieno[2,3-*b*]quinoline-2-carboxylate (6m)

The compound **4m** (755.1 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μL, 3.6 mmol) consequently. The mixture was heated to 90 °C and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the white solid **6m** (849.9 mg, 89%). ¹H NMR (400 MHz, CDCl₃) δ: 8.46 (s, 1H), 8.05 (s, 1H), 7.43 (s, 1H), 7.15 (s, 1H), 4.44 (q, *J* = 7.2 Hz, 2H), 4.08 (s, 3H), 4.05 (s, 3H), 1.44 (t, *J* = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ: 162.63, 161.57, 153.85, 149.63, 145.97, 132.93, 130.68, 129.61, 127.87, 121.78, 106.48, 105.00, 61.84, 56.25, 56.07, 14.32; MS (ESI): *m/z* calcd. For C₁₆H₁₆NO₄S [M+H]⁺ 318.1, found 318.0.



Ethyl 5,6,7-trimethoxythieno[2,3-*b*]quinoline-2-carboxylate (6n)

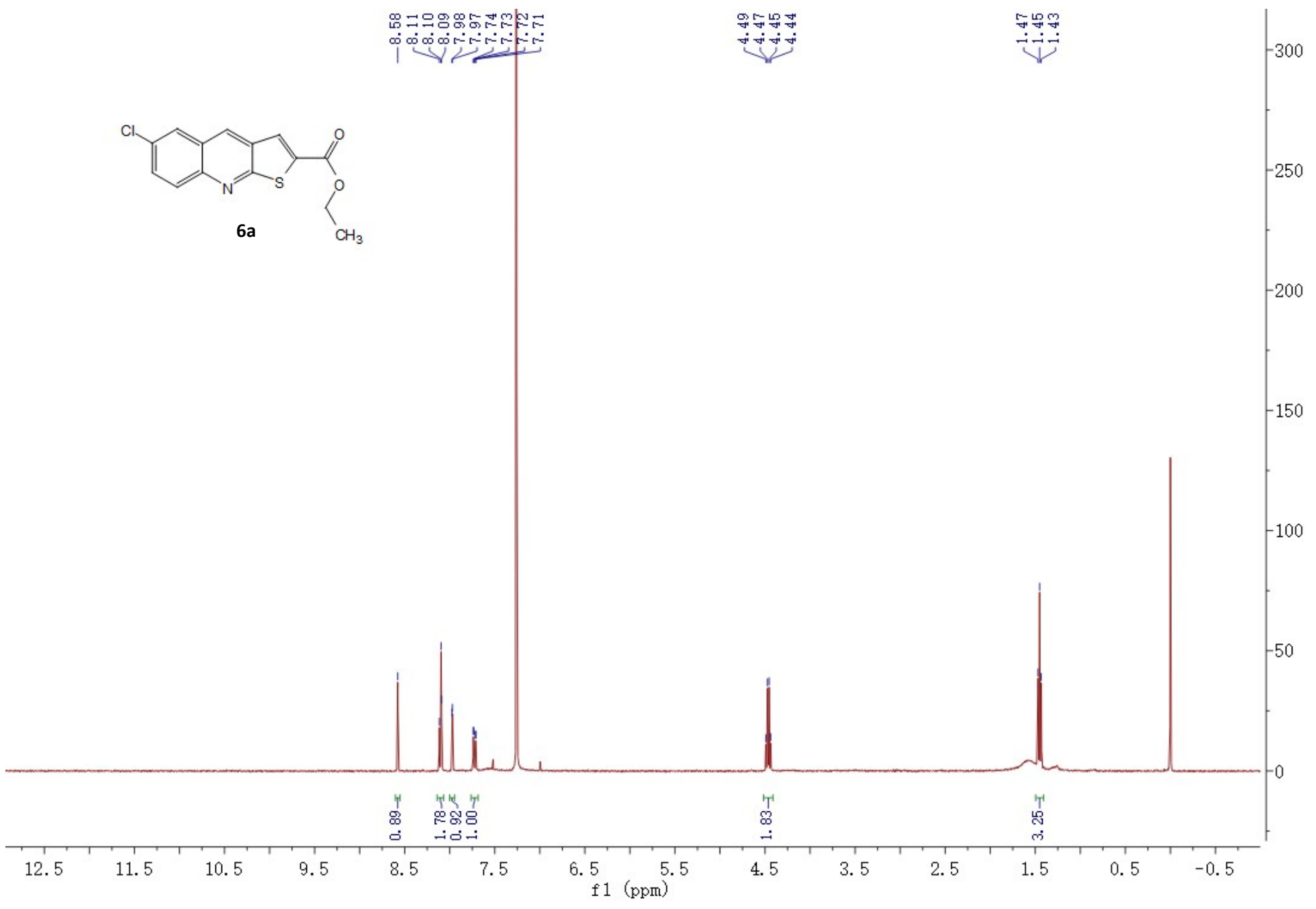
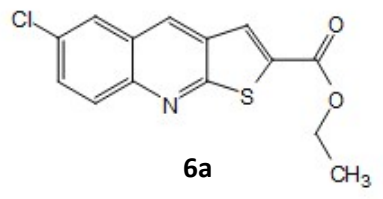
The compound **4n** (845.1 mg, 3 mmol) was dissolved in GVL (6 mL) followed by addition of triethylamine (2.5 mL, 18 mmol) and ethyl mercaptoacetate (395 μ L, 3.6 mmol) consequently. The mixture was heated to 90 °C and stirred at that temperature for 1 h. After the reaction finished, the mixture was dropped into ice water (10 mL). The precipitate was isolated by filtration, washed with ethanol (10 mL) and cold water (2 mL) successively, and dried to afford the white solid **6n** (708.5 mg, 68%). ¹H NMR (400 MHz, CDCl₃) δ : 8.83 (s, 1H), 8.09 (s, 1H), 7.26 (s, 1H), 4.44 (q, J = 7.2 Hz, 2H), 4.14 (s, 3H), 4.05 (s, 3H), 4.00 (s, 3H), 1.44 (t, J = 7.2 Hz, 3H); ¹³C NMR (100 MHz, CDCl₃) δ : 163.31, 162.61, 157.35, 147.16, 146.30, 140.05, 132.89, 129.23, 128.34, 127.60, 117.78, 102.48, 61.88, 61.66, 61.34, 56.22, 14.33; MS (ESI): m/z calcd. For C₁₇H₁₈NO₅S [M+H]⁺ 348.1, found 348.0.

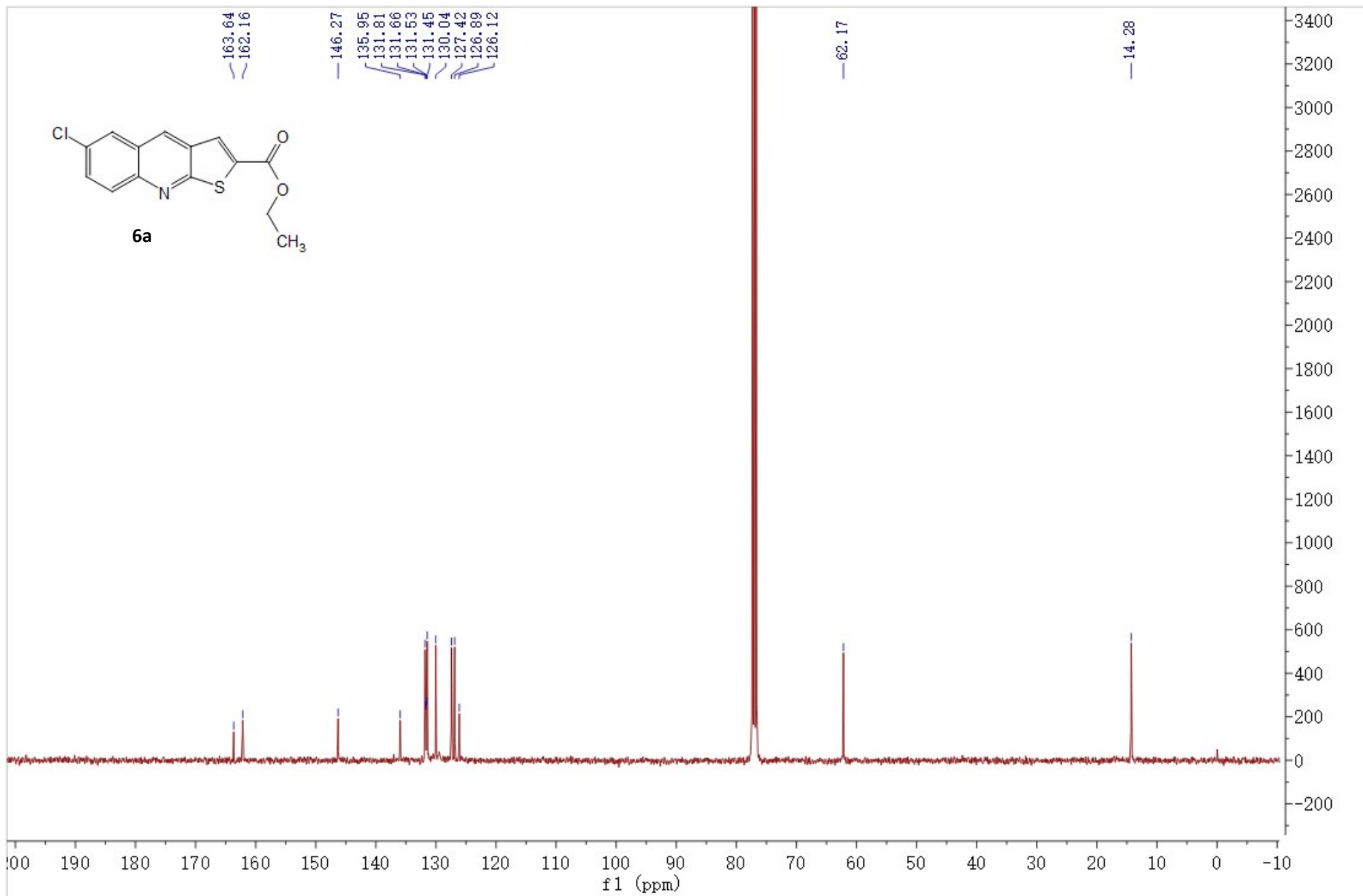
III. PTP1B and Related PTPs Biological Assay

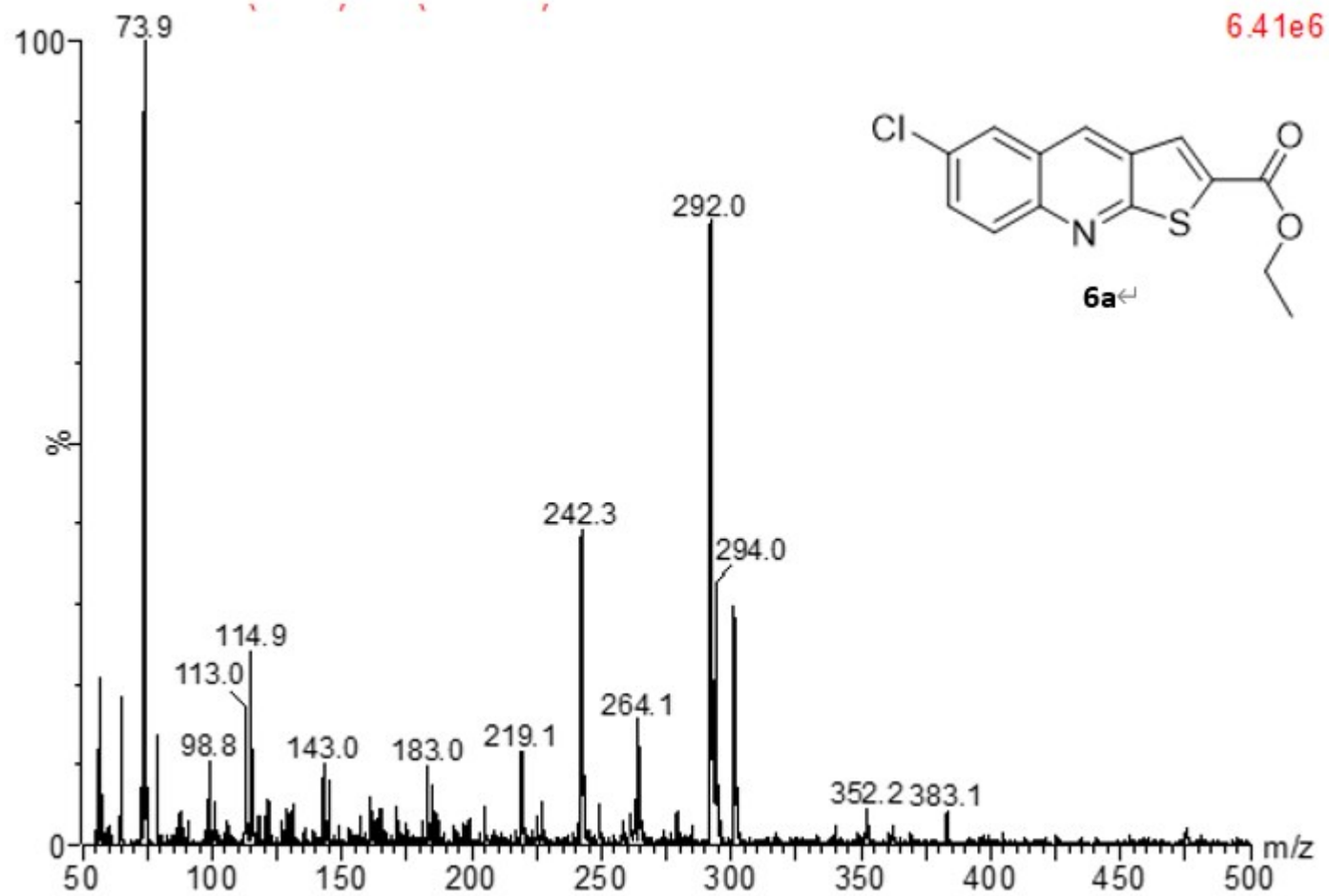
A colorimetric assay to measure inhibition against PTP1B (1 – 321), TCPTP (13 – 358) and SHP2 (219 – 525) was performed in OptiPlate-384 black plates (cat no. 6007279). Briefly, the tested compounds and NSC87877 (purchased from Selleck) were solubilized in DMSO and serially diluted into concentrations for the inhibitory test and then incubated with enzymes for 20 minutes, followed by addition of 6,8-difluoro-4-methylumbelliferyl phosphate (DiFMUP, Invitrogen, cat. no. D22065). The enzymatic activities of the PTP1B, TCPTP and SHP2 were determined at room temperature by monitoring the dephosphorylation of DiFMUP, products were then detected at a 340 nm excitation wavelength and 450 nm emission wavelength by the EnVision multilabe plate reader (Perkin-Elmer Life Sciences, Boston, MA, USA) within 10 minutes. The assays were carried out in a final volume of 50 μ L containing 50 mM 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid (HEPES), pH 7.2, 50 μ M DiFMUP, 1 nM enzyme, 1 mM dithiothreitol (DTT), 100 mM NaCl, 0.05% BSA and 1% DMSO. The enzyme reaction rate (FI / min) was defined by the slope of the reaction curve that was linear at the beginning of the reaction. The inhibitor dose-response curves were analyzed using a four-parameter concentration–response model in GraphPad Prism 8^{6,7}.

IV. References

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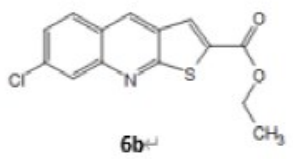






NAME XY-291-2-20200110-HNMR
EXPNO 1
PROCNO 1
Date_ 20200110
Time 11.01
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 8
DS 0
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9923444 sec
RG 203
DW 60.800 usec
DE 6.50 usec
TE 673.2 K
D1 1.00000000 sec
TD0 1

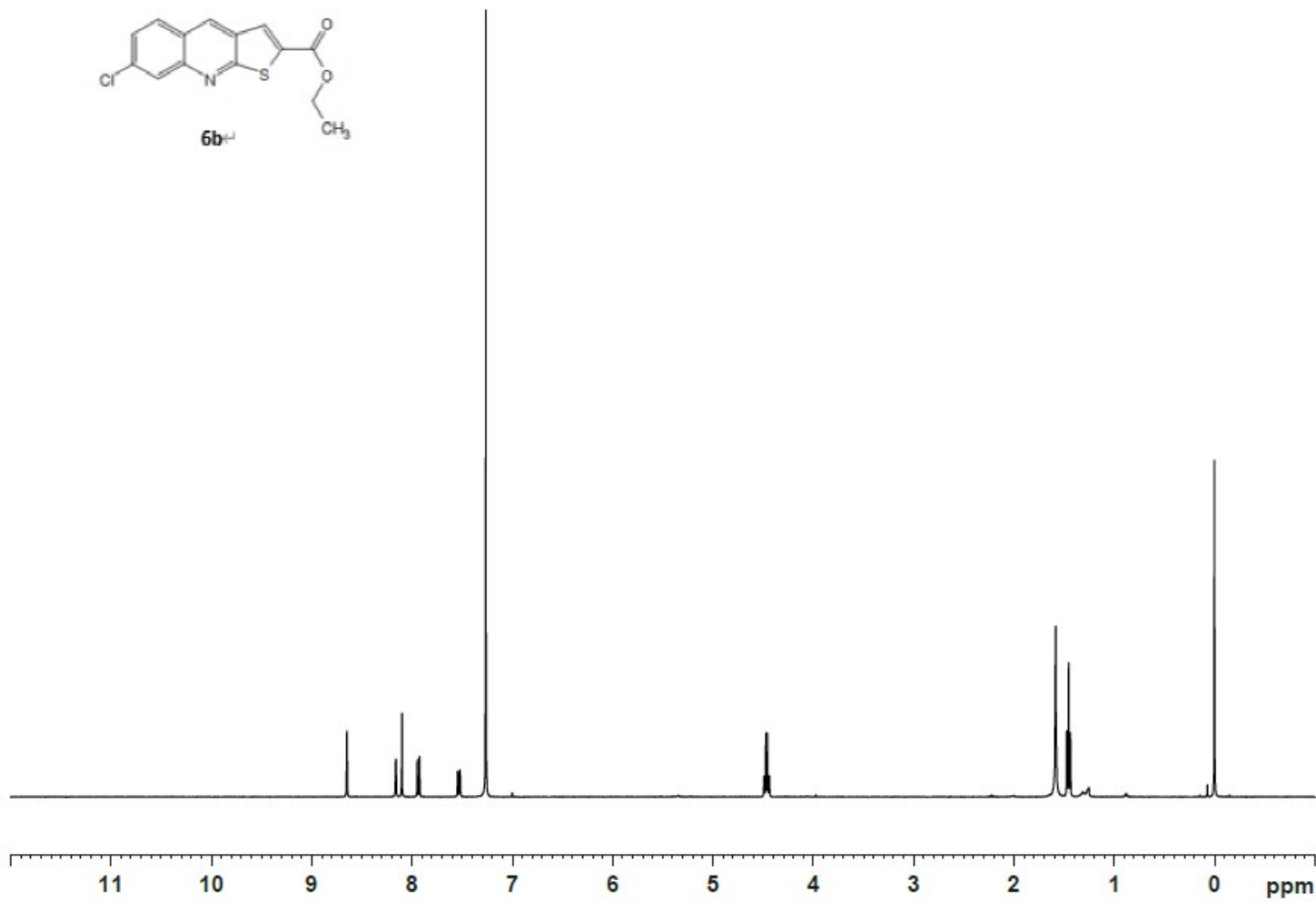
==== CHANNEL f1 =====
NUC1 1H
P1 11.90 usec
PL1 -2.30 dB
PL1W 18.55620956 W
SFO1 400.1424710 MHz
SI 32768
SF 400.1400083 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00



8.649
8.163
8.159
8.100
7.946
7.924
7.545
7.540
7.523
7.518
7.264
7.000

4.490
4.472
4.455
4.437

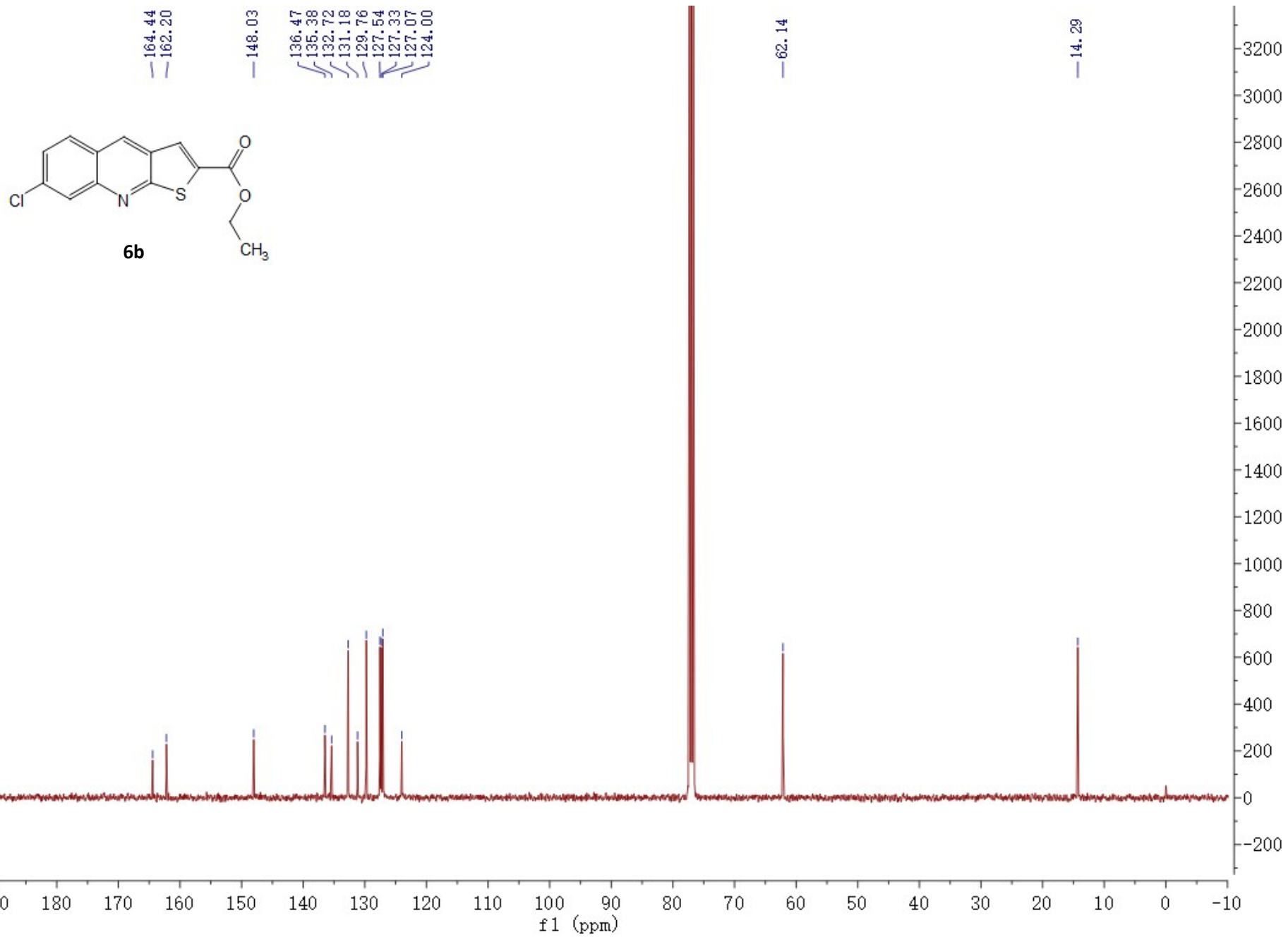
1.583
1.471
1.454
1.436
1.311
1.252
0.880
0.070
-0.000

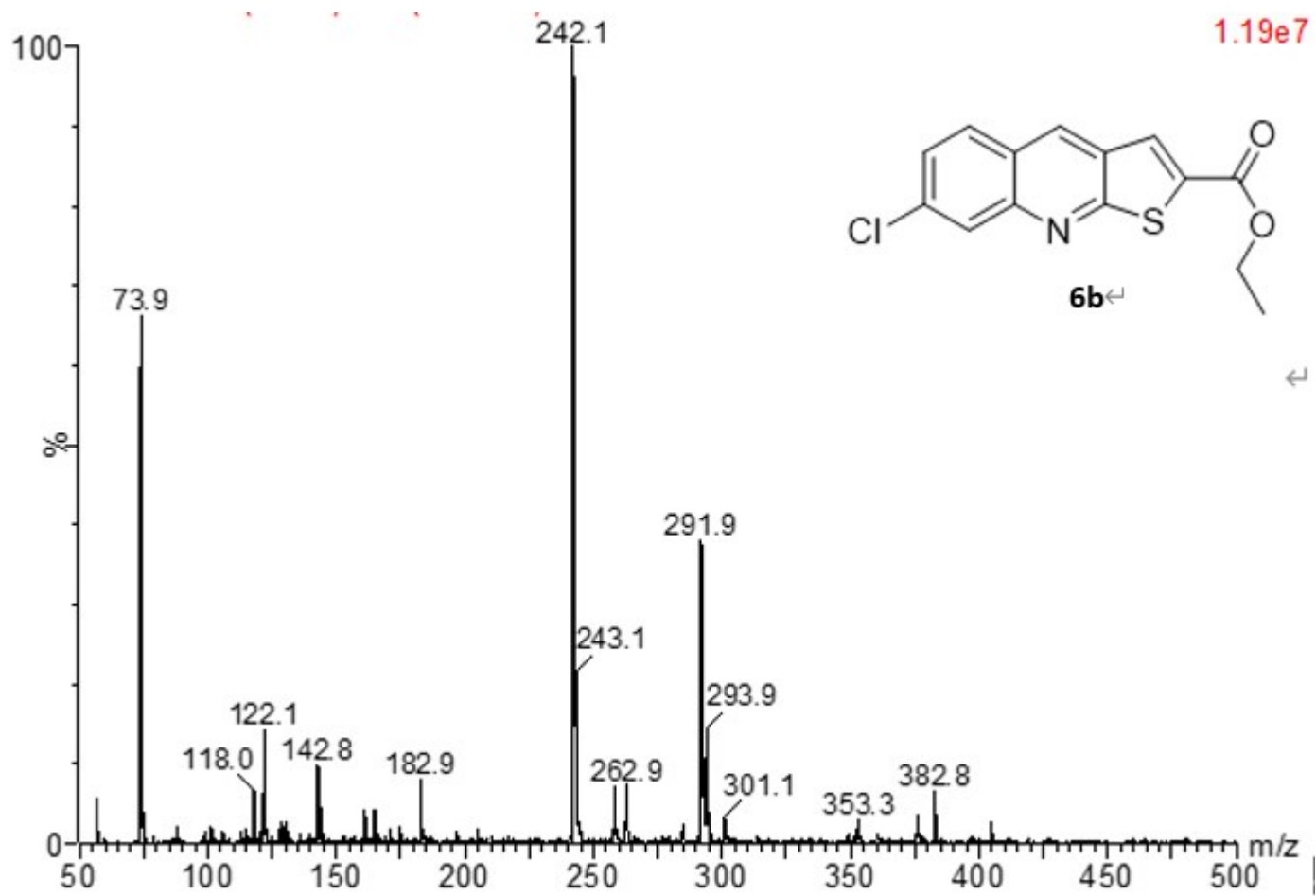


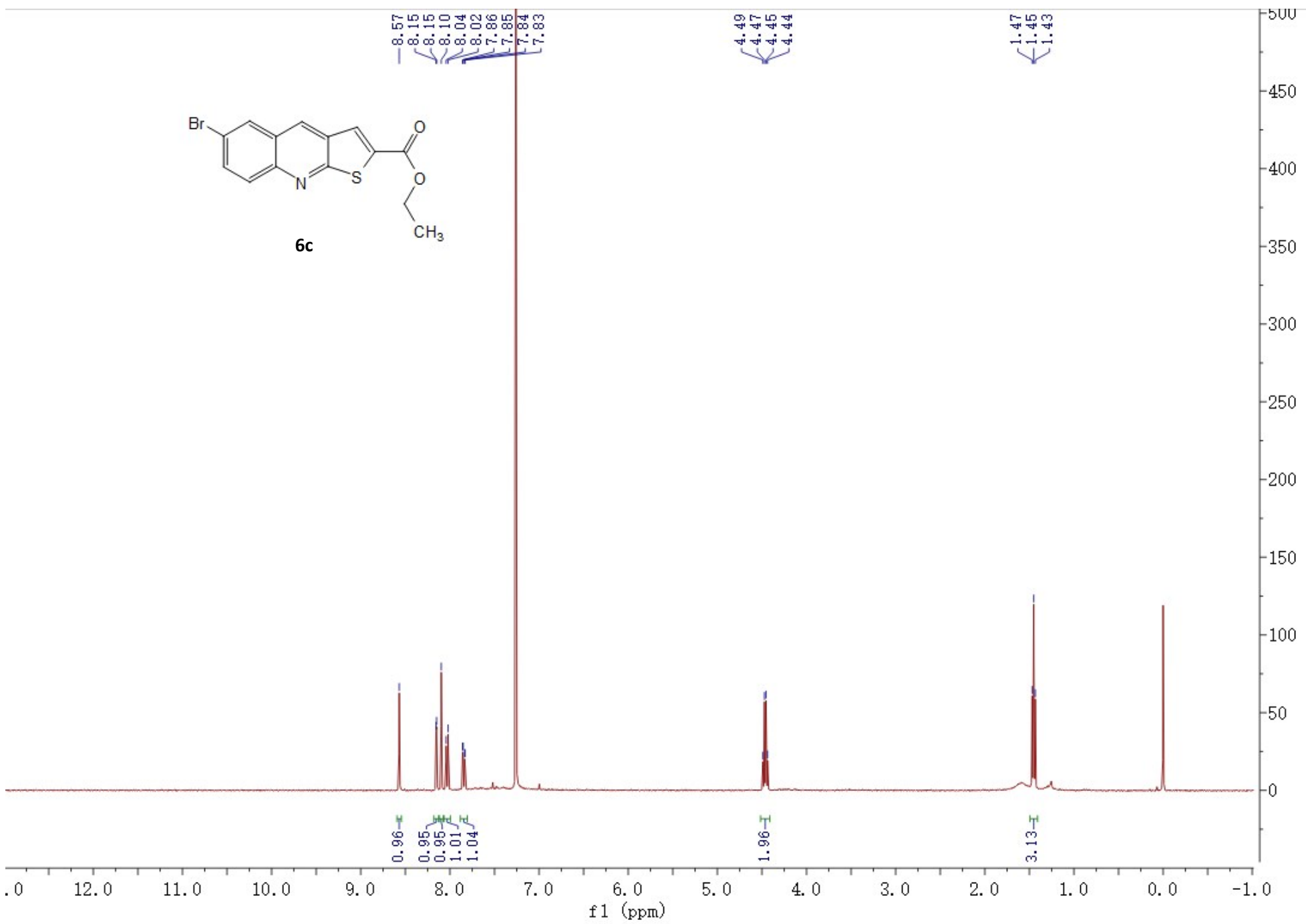
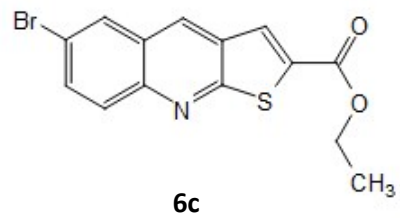
1.000
0.942
0.982
1.030
1.042

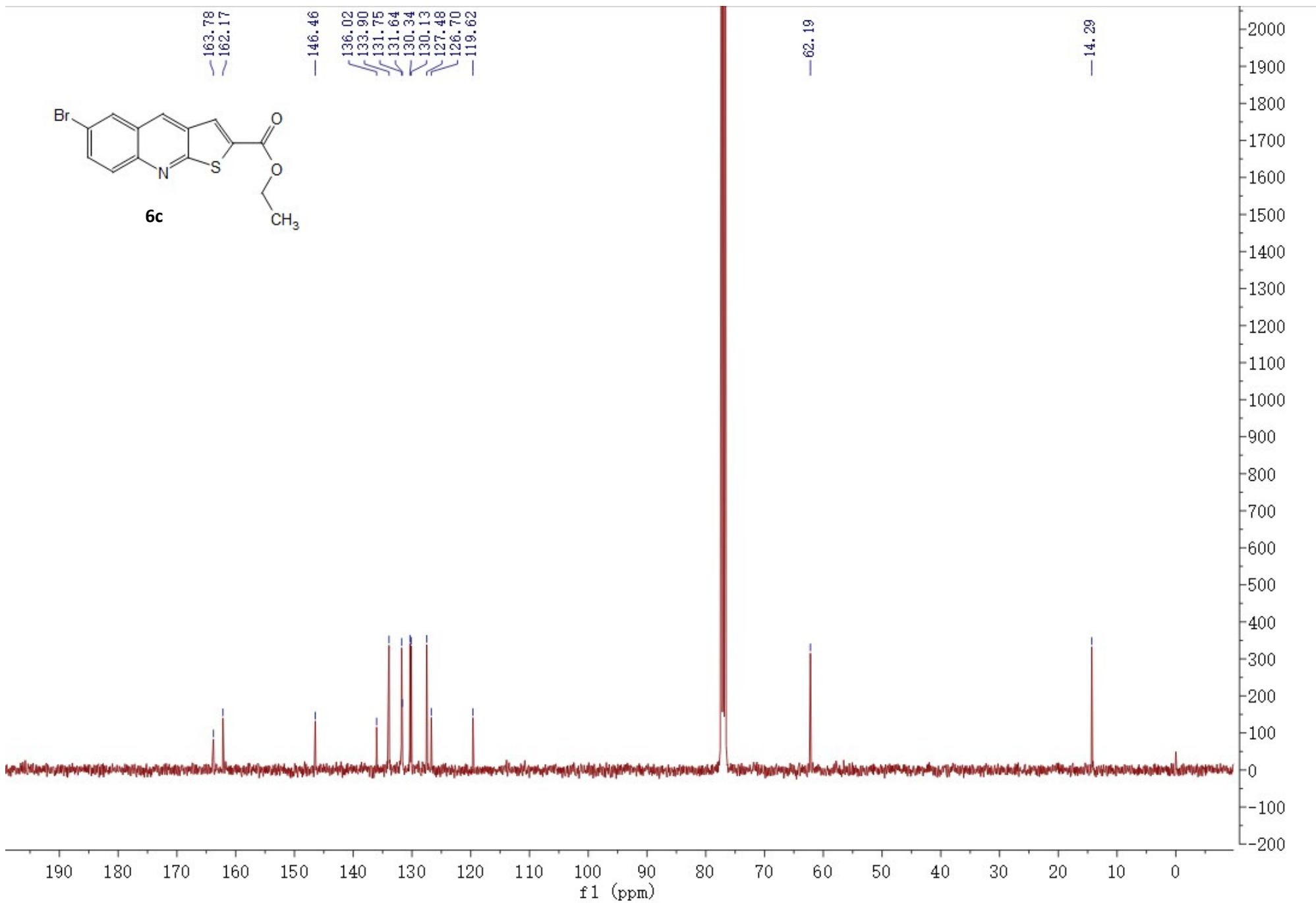
2.086

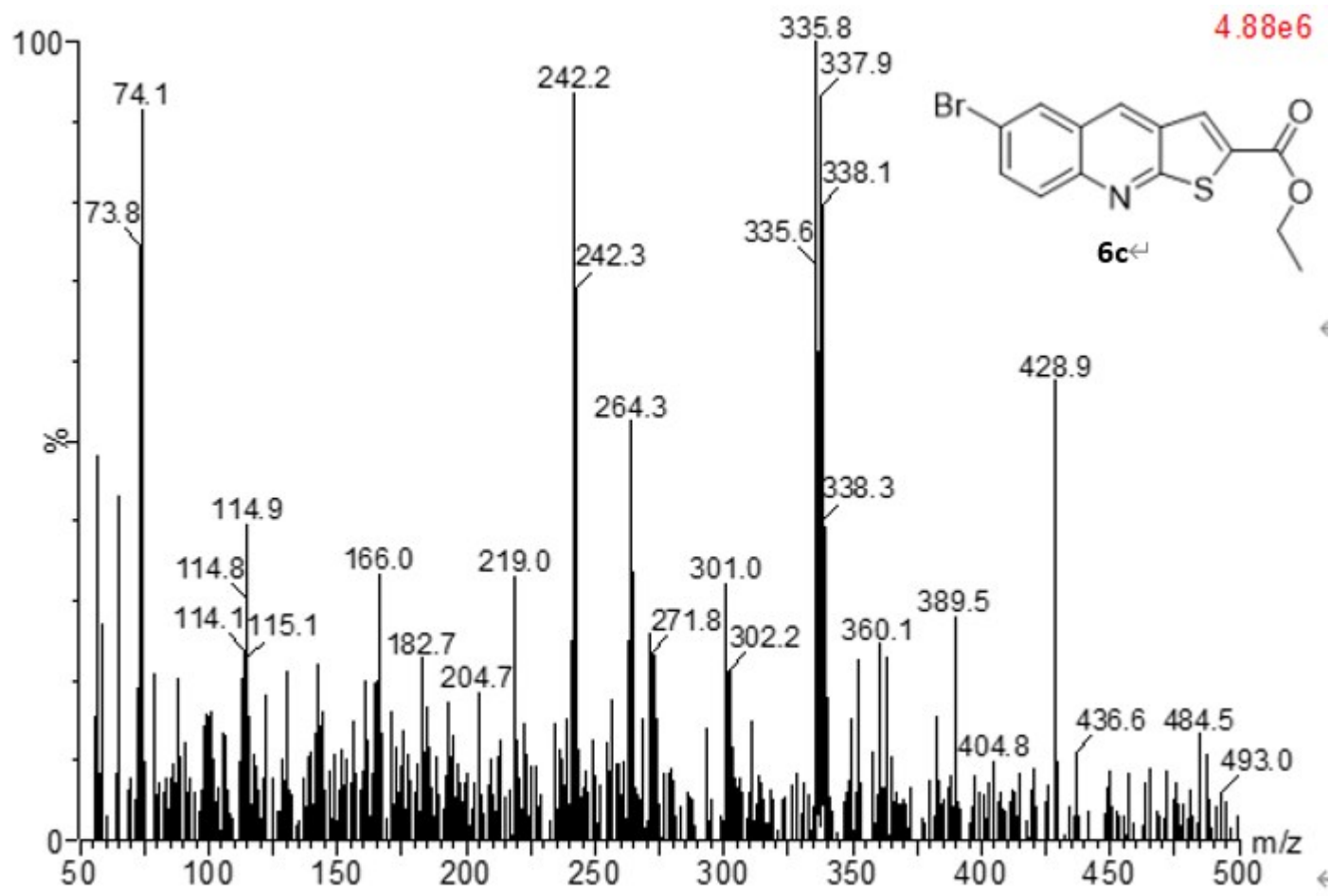
3.173







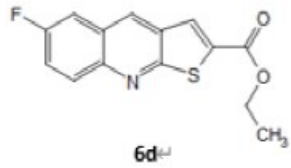






NAME XY-275-20200117-HNMR
EXPNO 1
PROCNO 1
Date_ 20200117
Time_ 12.03
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 8
DS 0
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9923444 sec
RG 203
DW 60.800 usec
DE 6.50 usec
TE 673.2 K
D1 1.00000000 sec
TDO 1

===== CHANNEL f1 =====
NUC1 1H
P1 11.90 usec
PL1 -2.30 dB
PL1W 18.55620956 W
SFO1 400.1424710 MHz
SI 32768
SF 400.1400076 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

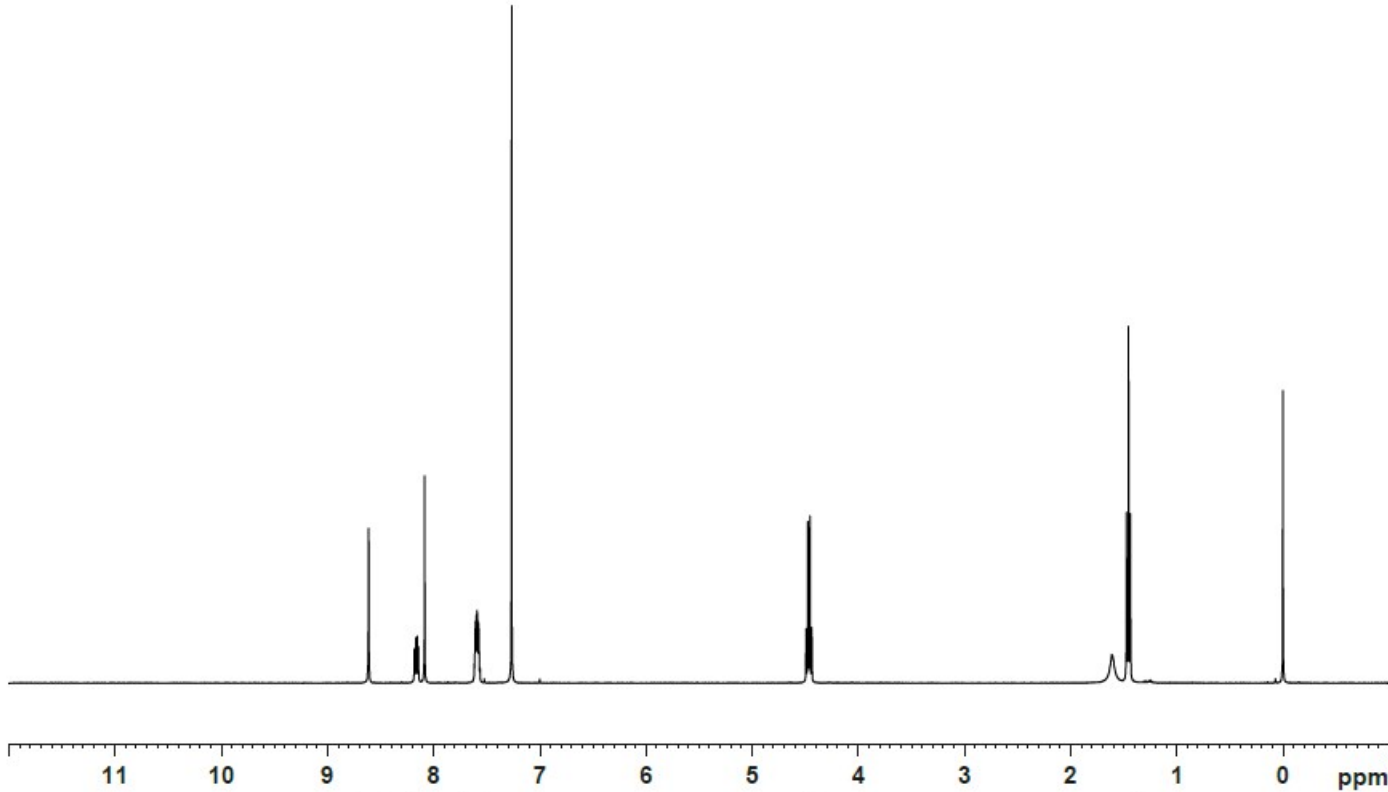


8.612
8.181
8.168
8.155
8.143
8.085
7.617
7.610
7.604
7.598
7.591
7.583
7.576
7.571
7.564
7.265

4.491
4.473
4.455
4.438

1.612
1.473
1.455
1.437

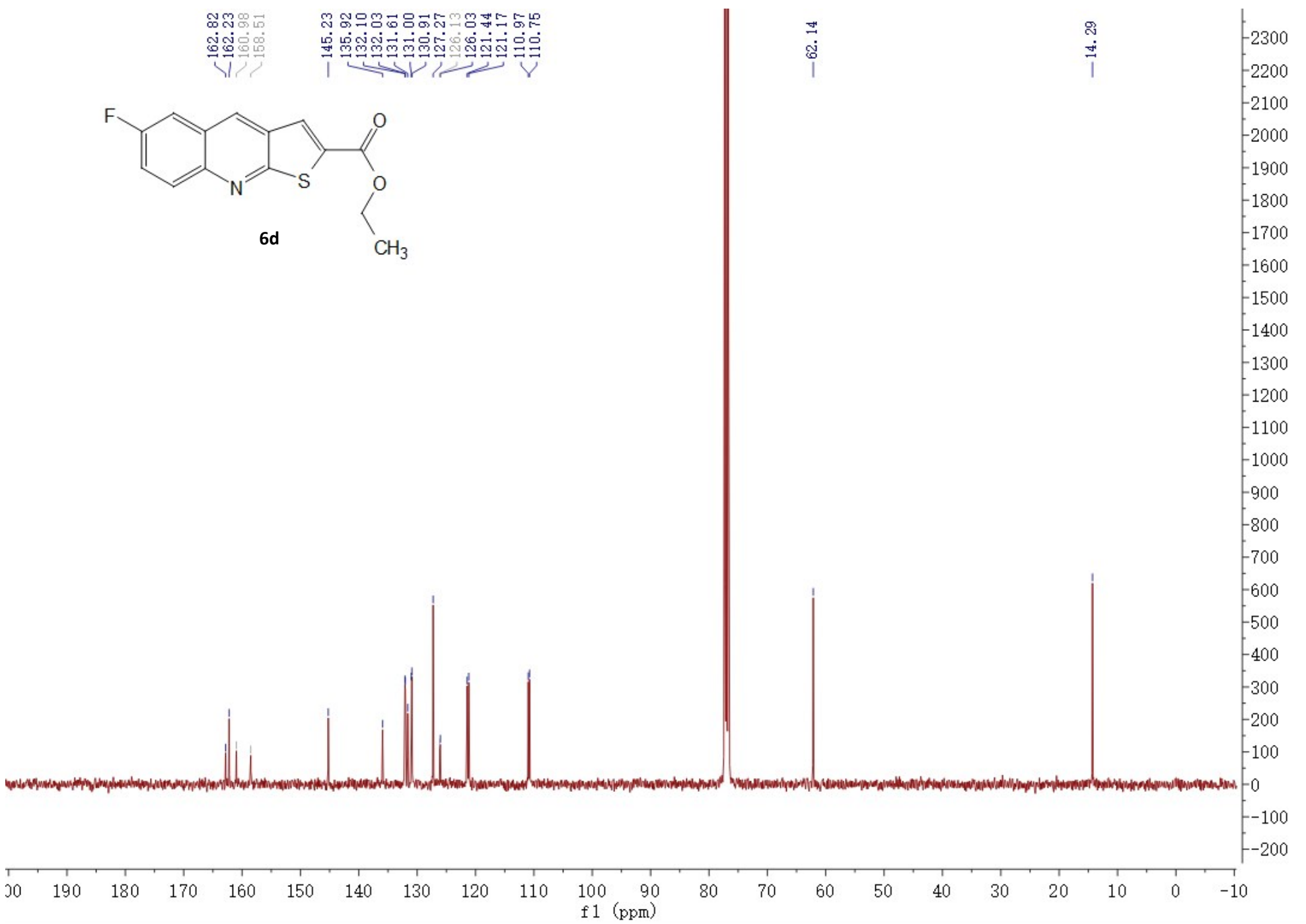
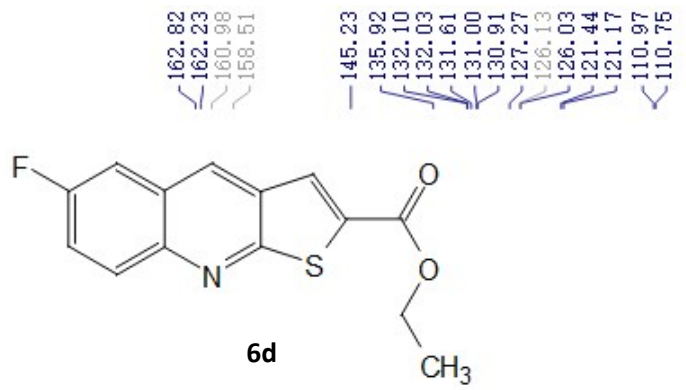
0.007
-0.000
-0.008

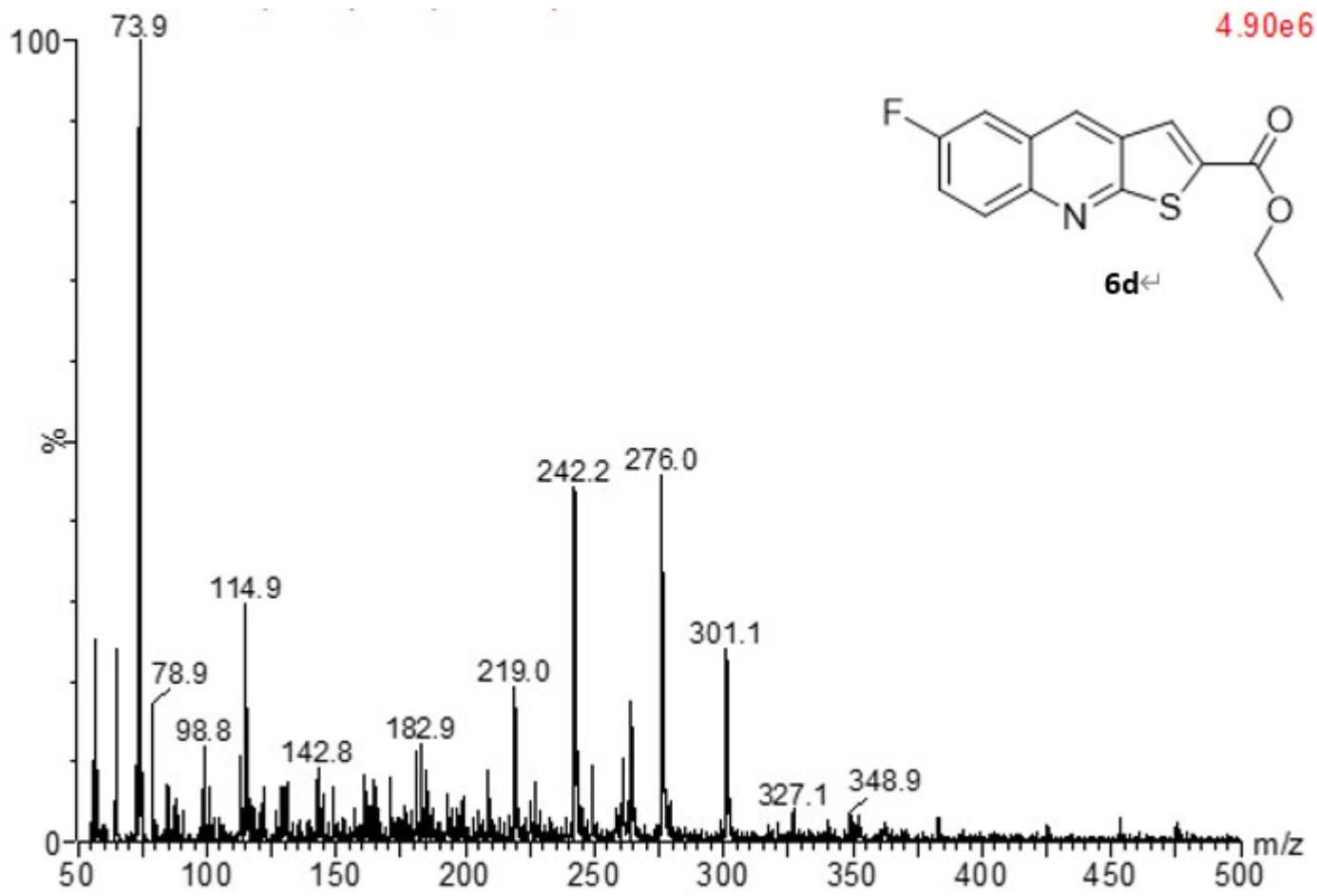


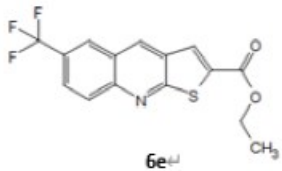
1.028
1.000
0.988
2.053

2.070

3.122







8.772
8.329
8.288
8.265
8.151
7.967
7.962
7.944
7.940
7.523
7.265
7.000

4.505
4.487
4.469
4.451

1.596
1.481
1.463
1.445
1.251

0.070
-0.000

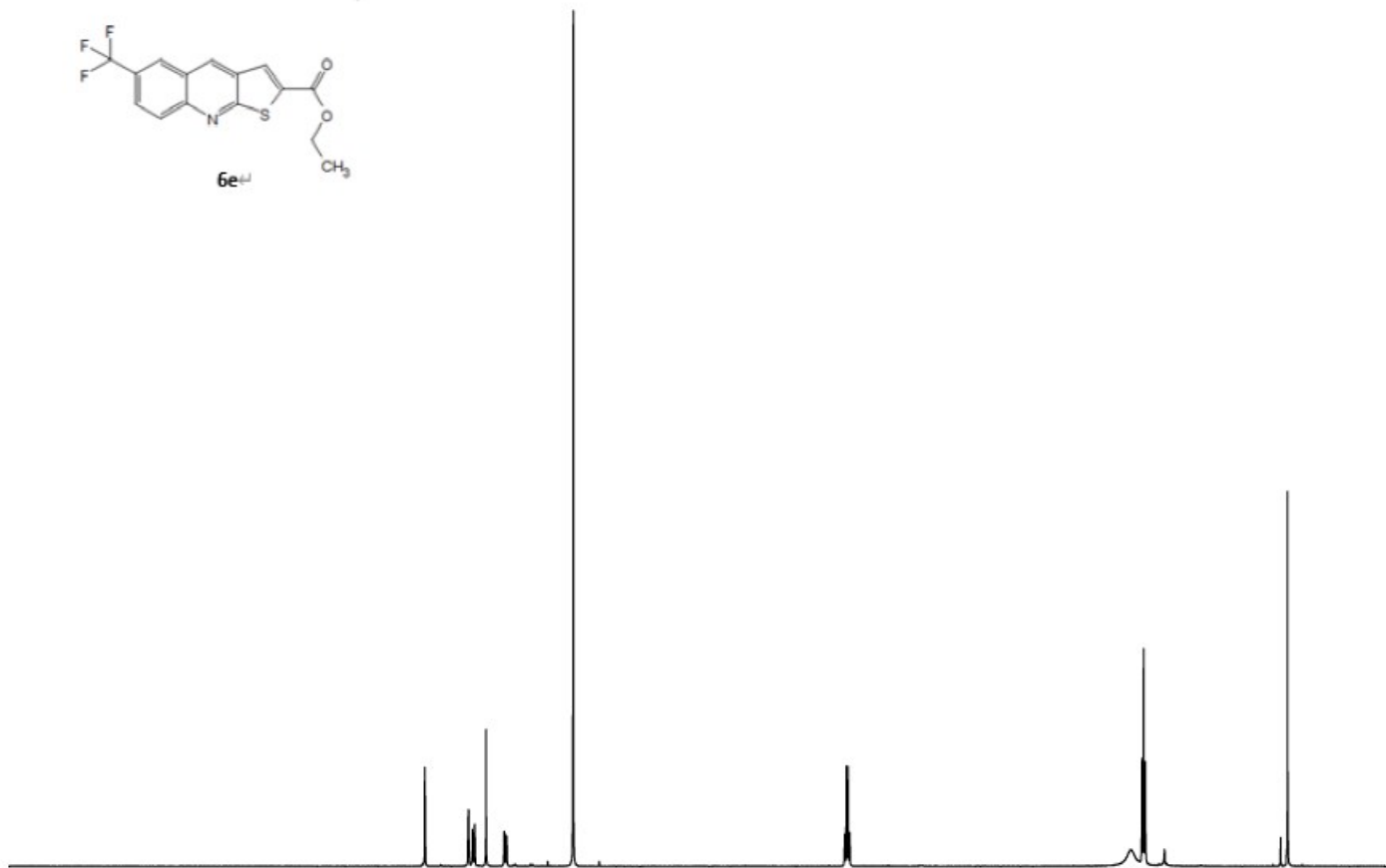


```

NAME      XY-325-20200115-HNMR
EXPNO     1
PROCNO    1
Date_     20200115
Time      10.46
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zg30
TD         32768
SOLVENT   CDC13
NS         8
DS         0
SWH        8223.685 Hz
FIDRES     0.250967 Hz
AQ         1.9923444 sec
RG         203
DW         60.800 usec
DE         6.50 usec
TE         673.2 K
D1         1.00000000 sec
TDO       1
  
```

```

===== CHANNEL f1 =====
NUC1      1H
P1        11.90 usec
PL1       -2.30 dB
PL1W      18.55620956 W
SFO1      400.1424710 MHz
SI         32768
SF         400.1400077 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00
  
```

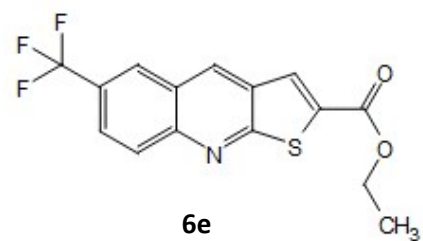


12 11 10 9 8 7 6 5 4 3 2 1 0 ppm

1.000
0.961
0.989
0.997
1.022

2.021

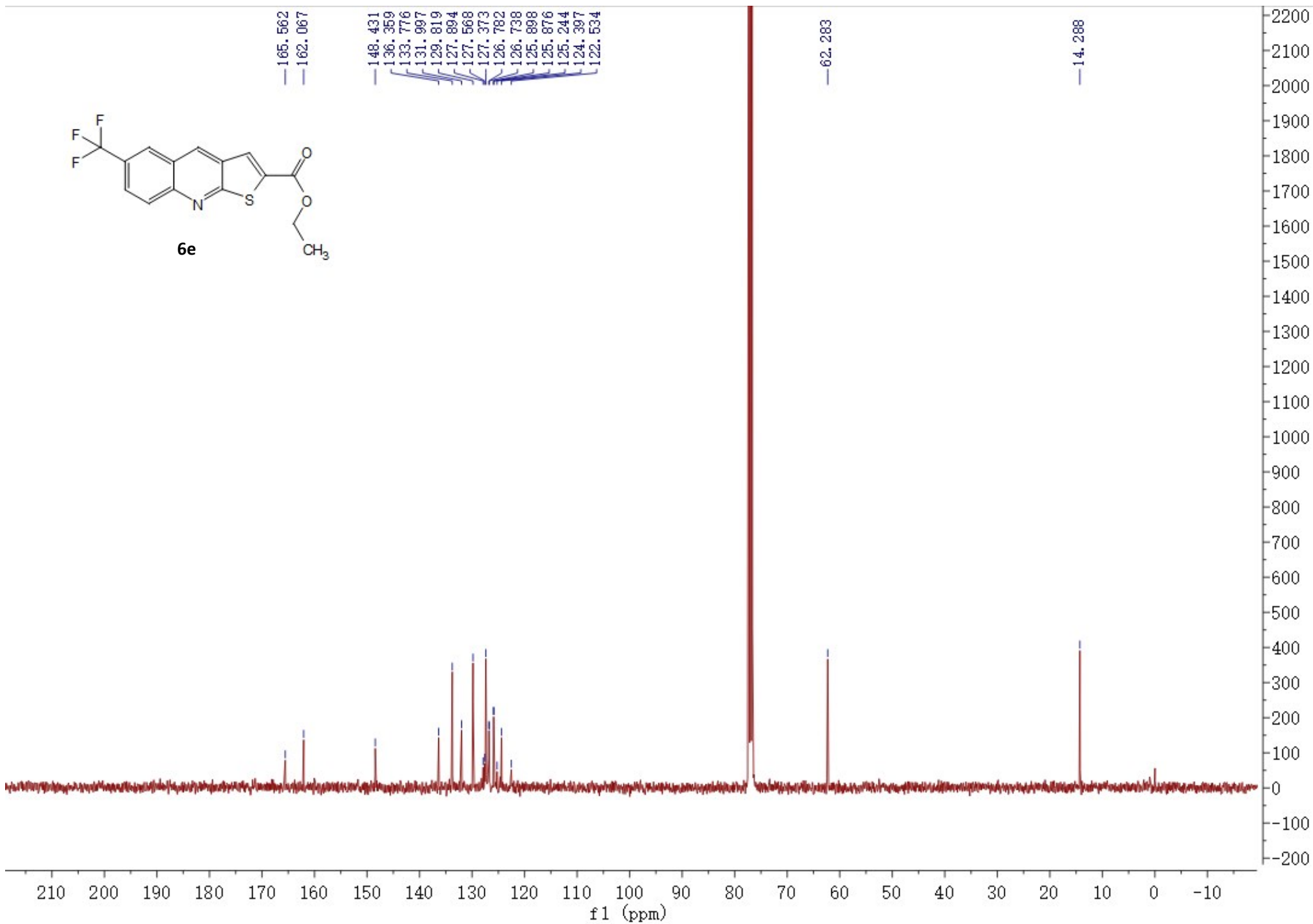
3.236

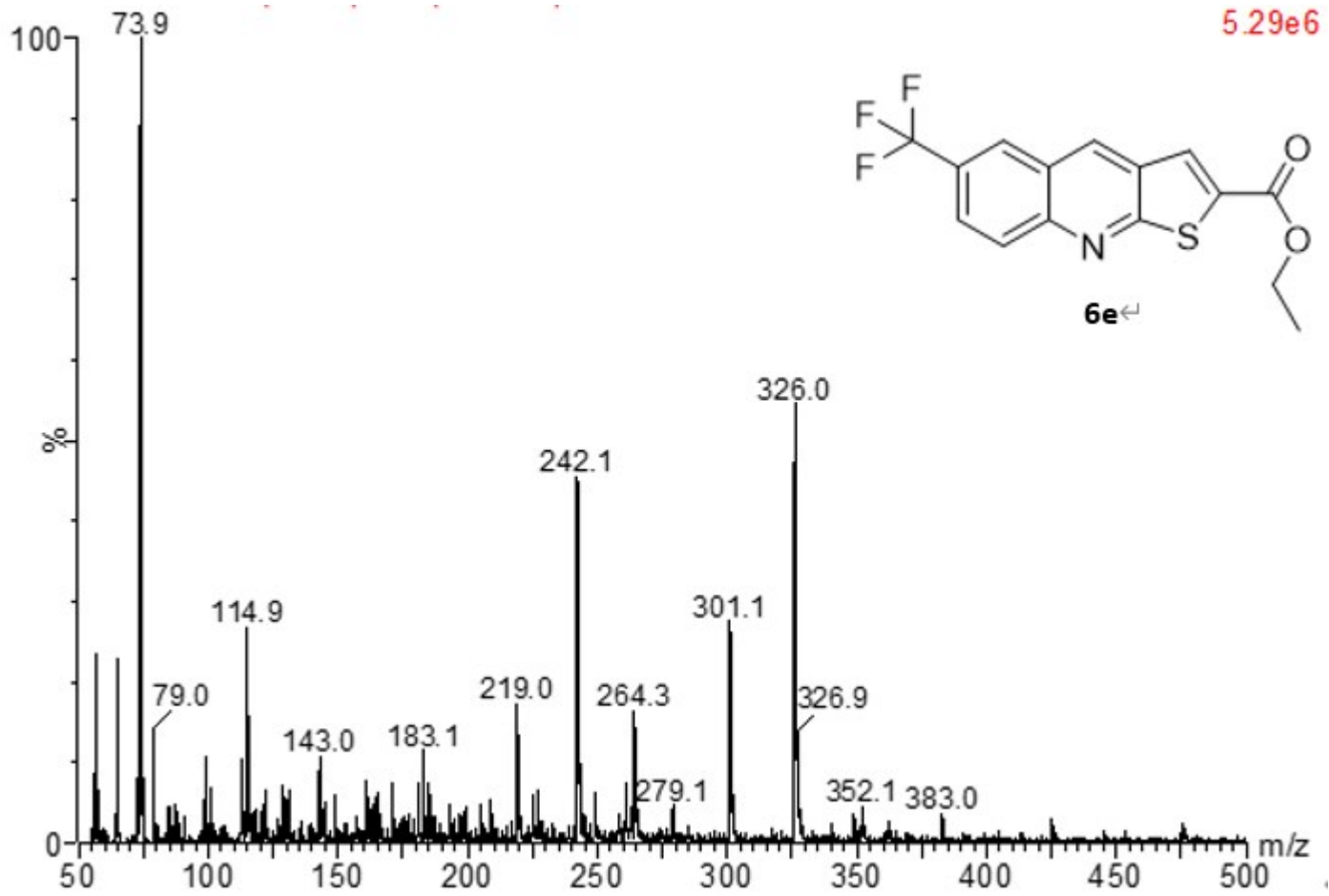


165.562
162.067
148.431
136.359
133.776
131.997
129.819
127.894
127.568
127.373
126.782
126.738
125.898
125.876
125.244
124.397
122.534

62.283

14.288

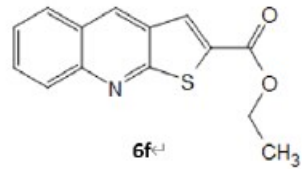






NAME XY-259-20200110-HNMR
EXPNO 1
PROCNO 1
Date_ 20200110
Time_ 10.58
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 32768
SOLVENT CDCl3
NS 8
DS 0
SWH 8223.685 Hz
FIDRES 0.250967 Hz
AQ 1.9923444 sec
RG 203
DW 60.800 usec
DE 6.50 usec
TE 673.2 K
D1 1.00000000 sec
TDO 1

----- CHANNEL f1 -----
NUC1 1H
P1 11.90 usec
PL1 -2.30 dB
PL1W 18.55620956 W
SFO1 400.1424710 MHz
SI 32768
SF 400.1400070 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

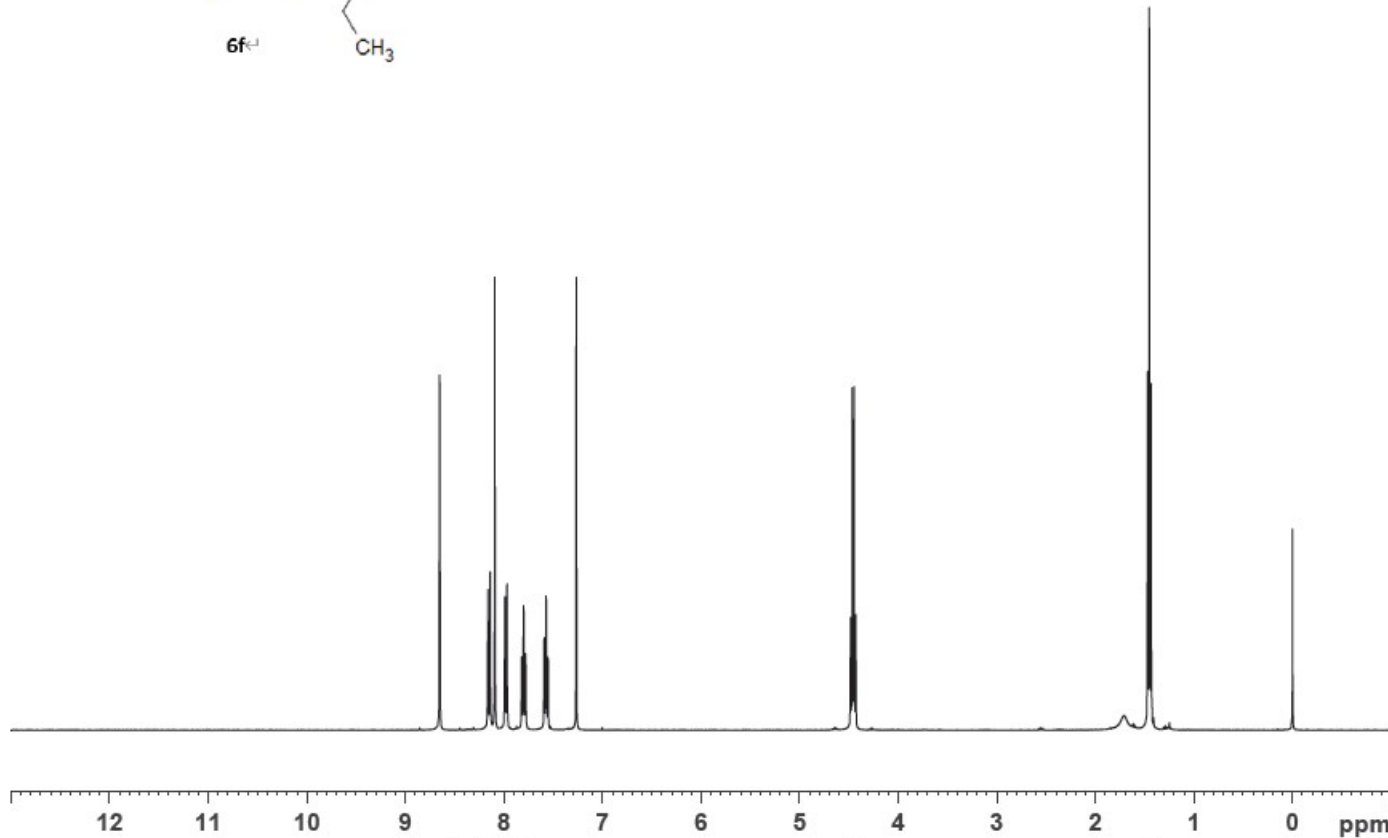


8.653
8.163
8.141
8.094
7.991
7.970
7.821
7.818
7.804
7.801
7.782
7.780
7.592
7.573
7.554
7.267

4.484
4.466
4.448
4.431

1.709
1.470
1.452
1.434

--- -0.000



1.003
1.000
0.943
1.012
1.031
1.042

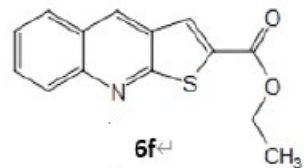
1.984

3.028



NAME XY-259-20200113-CNMR
 EXPNO 1
 PROCNO 1
 Date_ 20200114
 Time_ 1.13
 INSTRUM spect
 PROBHD 5 mm PABBO BB/
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1024
 DS 4
 SWH 24038.461 Hz
 FIDRES 0.366798 Hz
 AQ 1.3631988 sec
 RG 203
 DW 20.800 usec
 DE 6.50 usec
 TE 298.0 K
 D1 2.00000000 sec
 D11 0.03000000 sec
 TD0 1

===== CHANNEL f1 =====
 SFO1 100.6253441 MHz
 NUC1 13C
 P1 11.00 usec
 SI 32768
 SF 100.6152830 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40



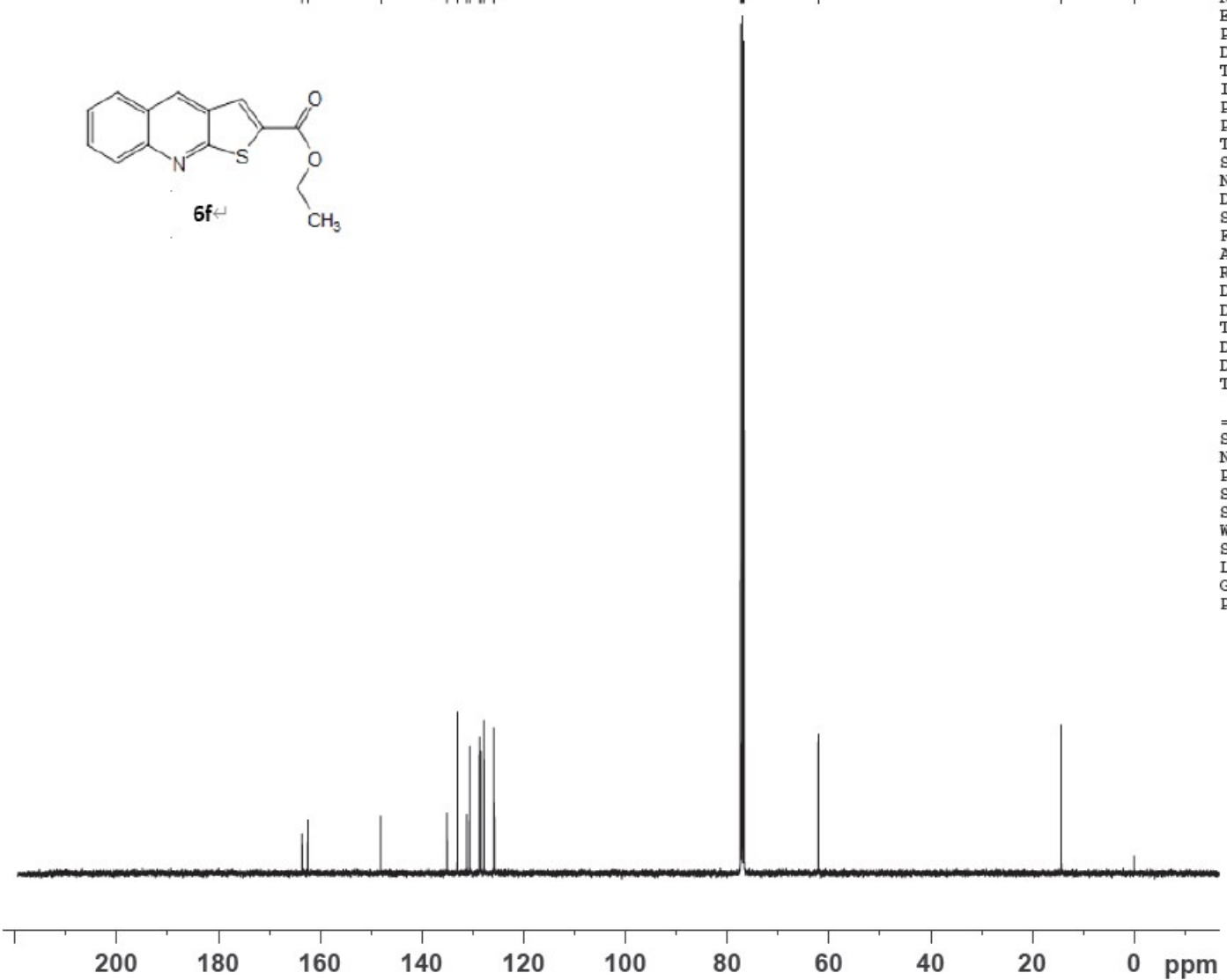
163.561
 162.416
 148.113
 135.069
 133.013
 131.173
 130.582
 128.672
 128.475
 127.771
 125.881
 125.772

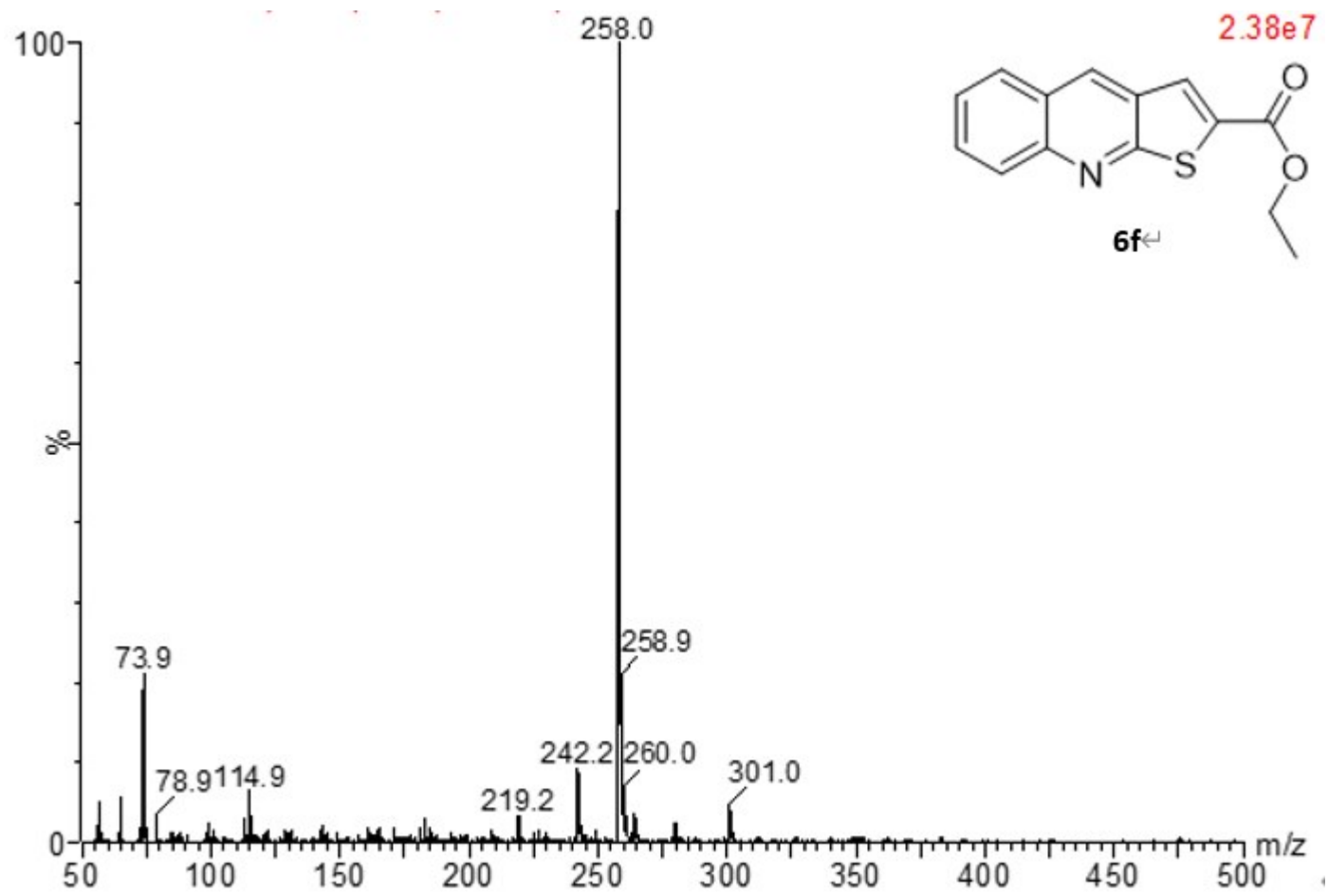
77.343
 77.228
 77.025
 76.707

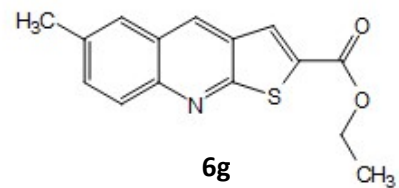
62.063

14.322

-0.006







8.56
8.09
8.06
8.04
7.73
7.65
7.64
7.63
7.62

4.48
4.46
4.44
4.43

2.58

1.47
1.45
1.43

1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
-100

0.96
0.91
0.90
0.96
0.96

2.00

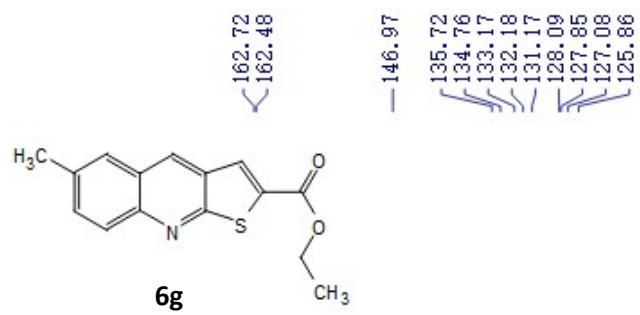
2.94

2.95

.0 12.0 11.0 10.0 9.0 8.0 7.0 6.0 5.0 4.0 3.0 2.0 1.0 0.0 -1.0

f1 (ppm)

V

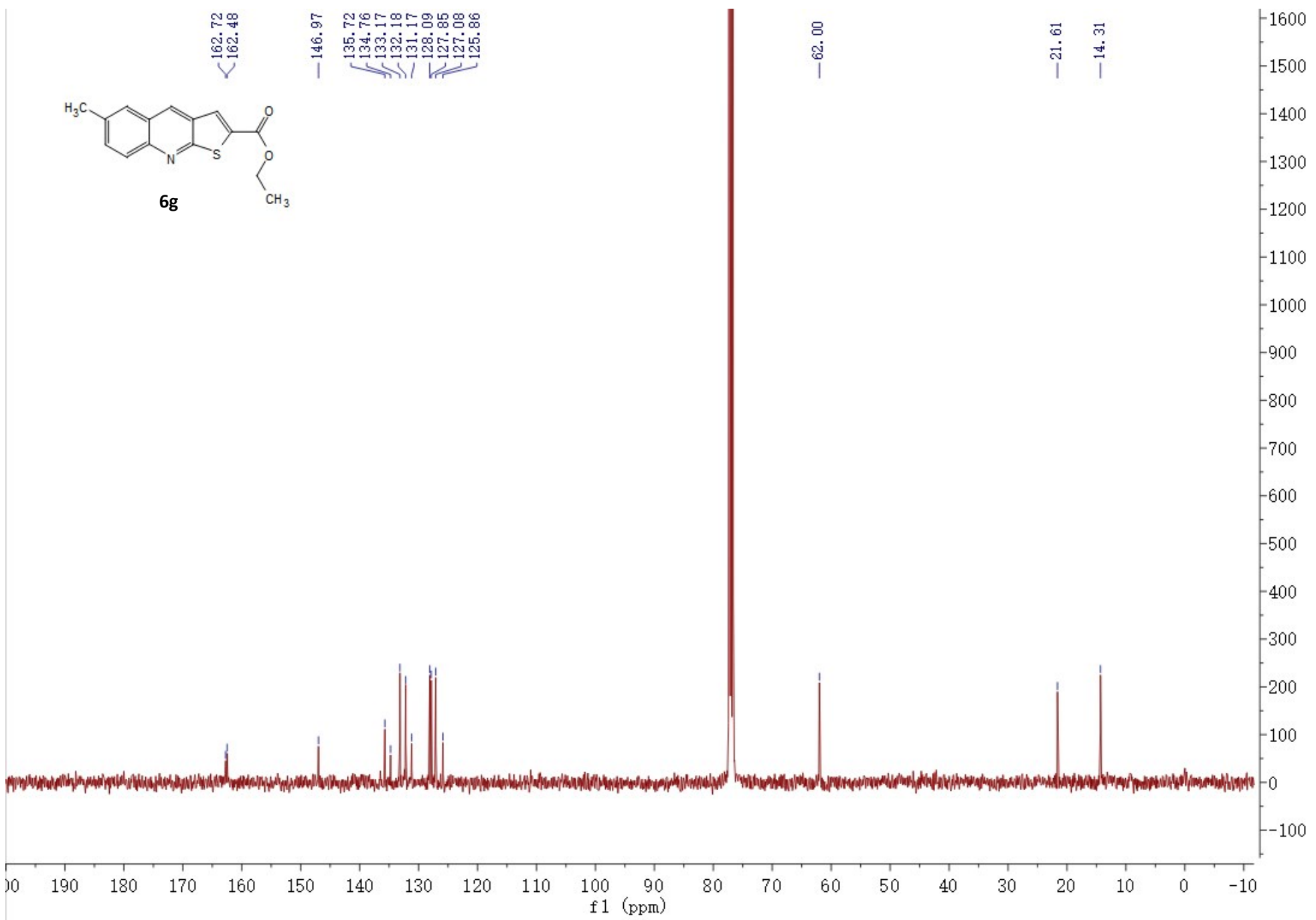


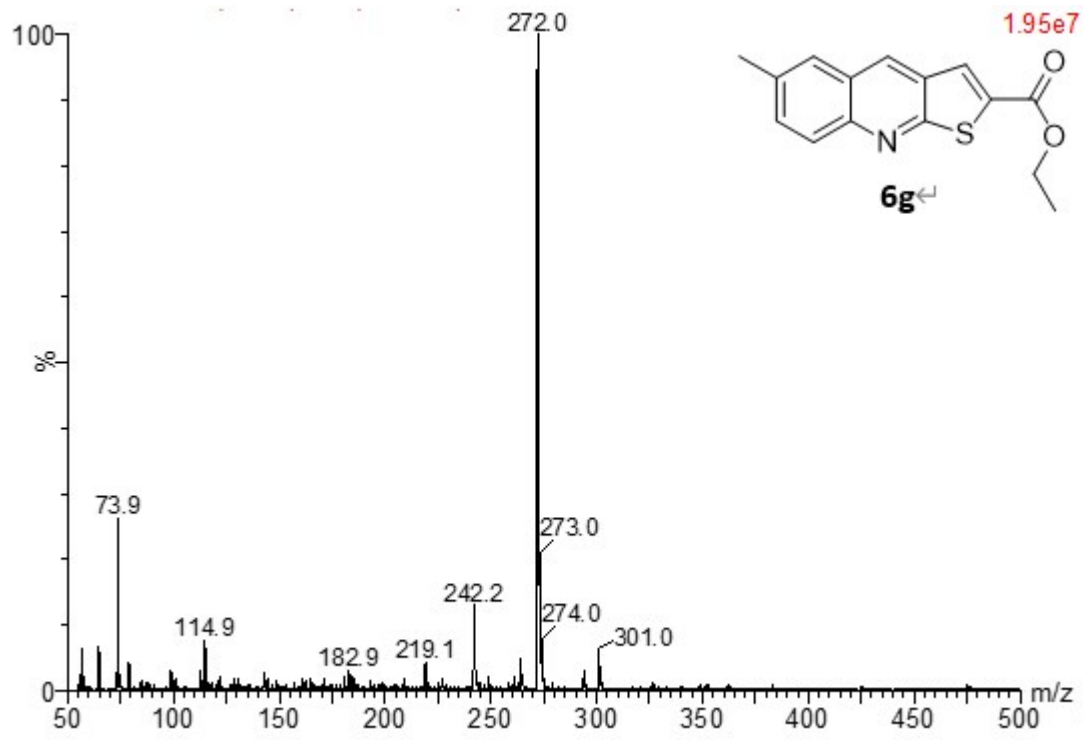
162.72
 162.48
 146.97
 135.72
 134.76
 133.17
 132.18
 131.17
 128.09
 127.85
 127.08
 125.86

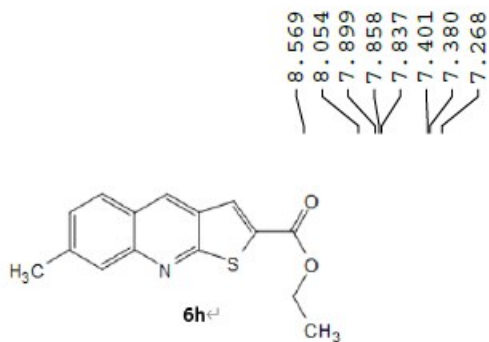
62.00

21.61

14.31





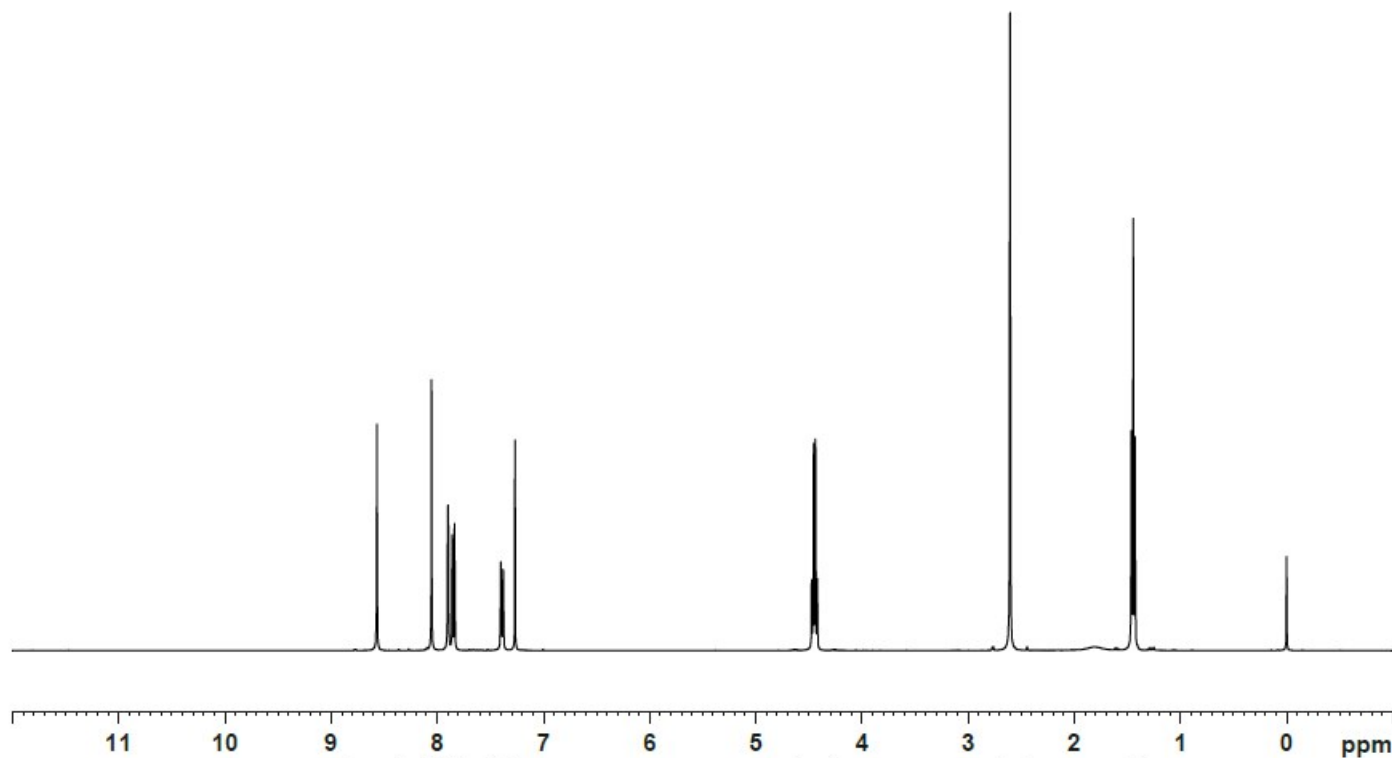


```

NAME      XY-287-3-20200110-HNMR
EXPNO     1
PROCNO    1
Date_     20200110
Time_     10.55
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zg30
TD         32768
SOLVENT   CDCl3
NS         8
DS         0
SWH       8223.685 Hz
FIDRES    0.250967 Hz
AQ         1.9923444 sec
RG         203
DW         60.800 usec
DE         6.50 usec
TE         673.2 K
D1         1.00000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
NUC1      1H
P1        11.90 usec
PL1       -2.30 dB
PL1W      18.55620956 W
SFO1      400.1424710 MHz
SI         32768
SF         400.1400067 MHz
WDW       EM
SSB       0
LB         0.30 Hz
GB         0
PC         1.00
  
```

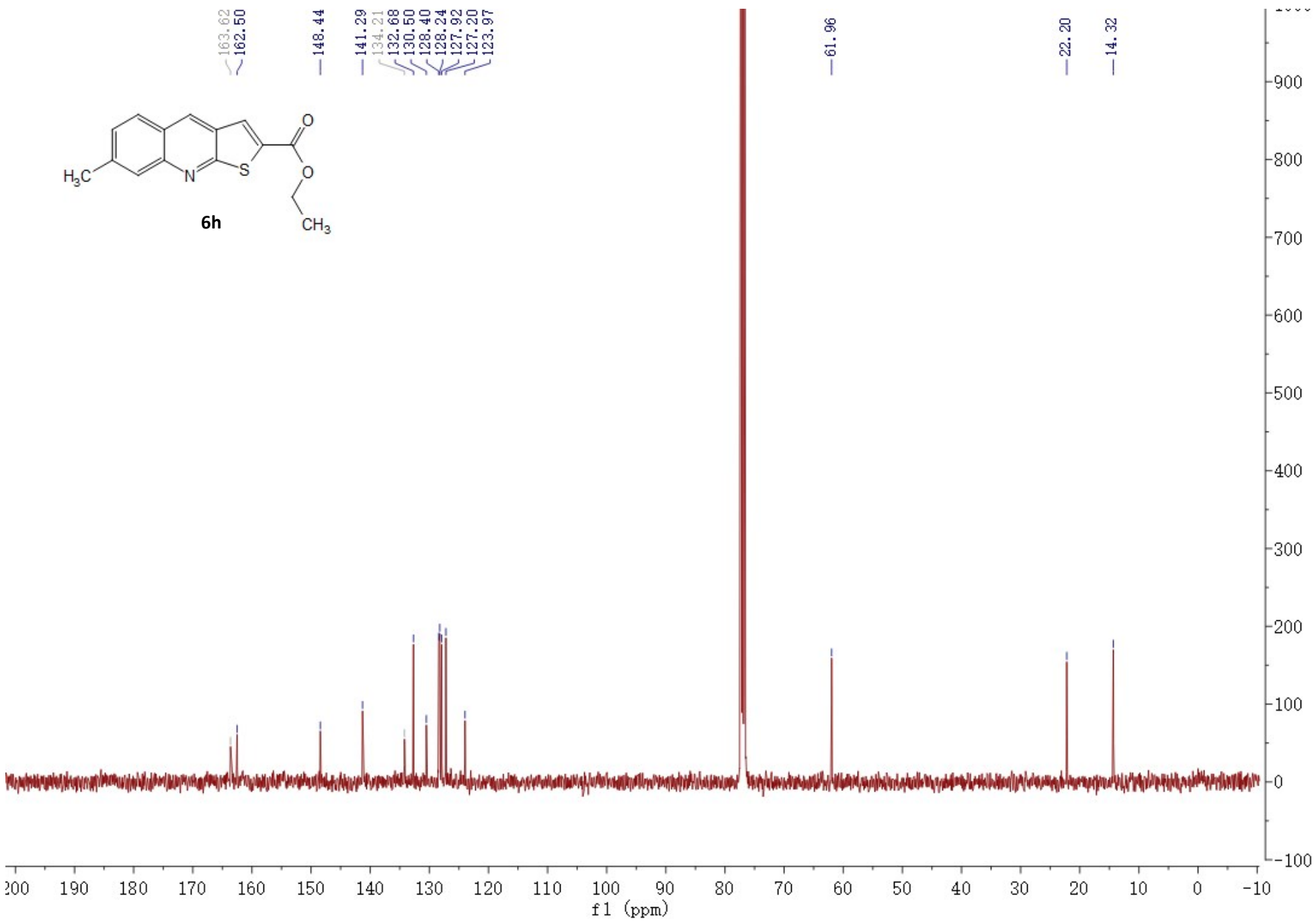
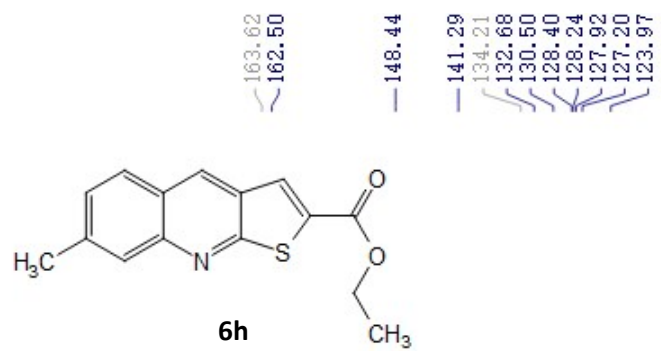


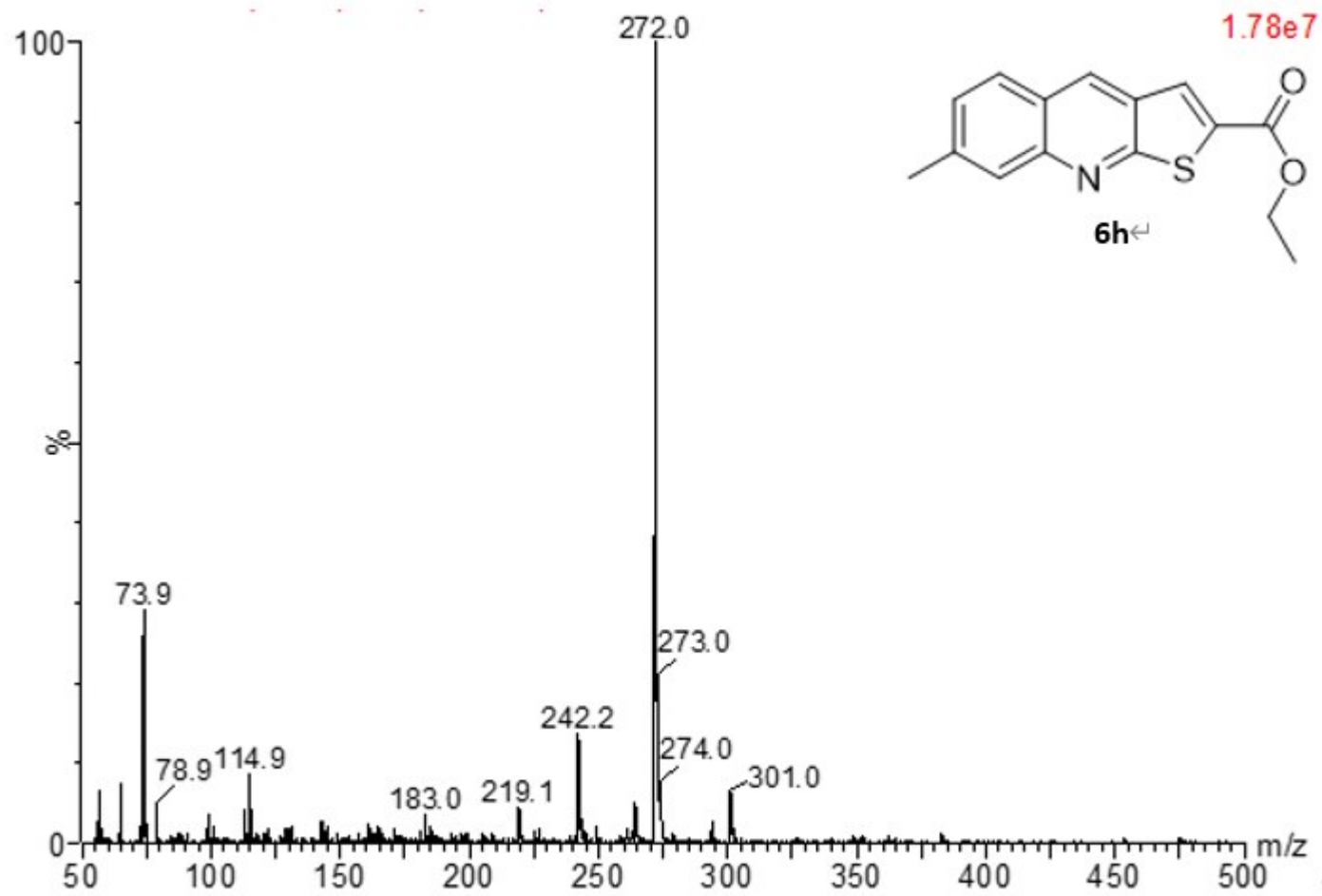
1.000
 0.973
 0.988
 0.971
 0.990

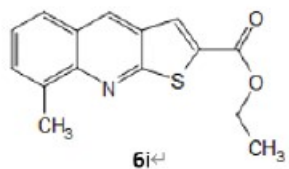
2.018

3.030

3.035







8.632
8.102
7.838
7.818
7.653
7.636
7.521
7.482
7.464
7.462
7.444
7.262
7.236
6.998

4.487
4.469
4.451
4.433

2.883

1.569
1.471
1.453
1.435
1.427
1.412

0.007
-0.000
-0.008

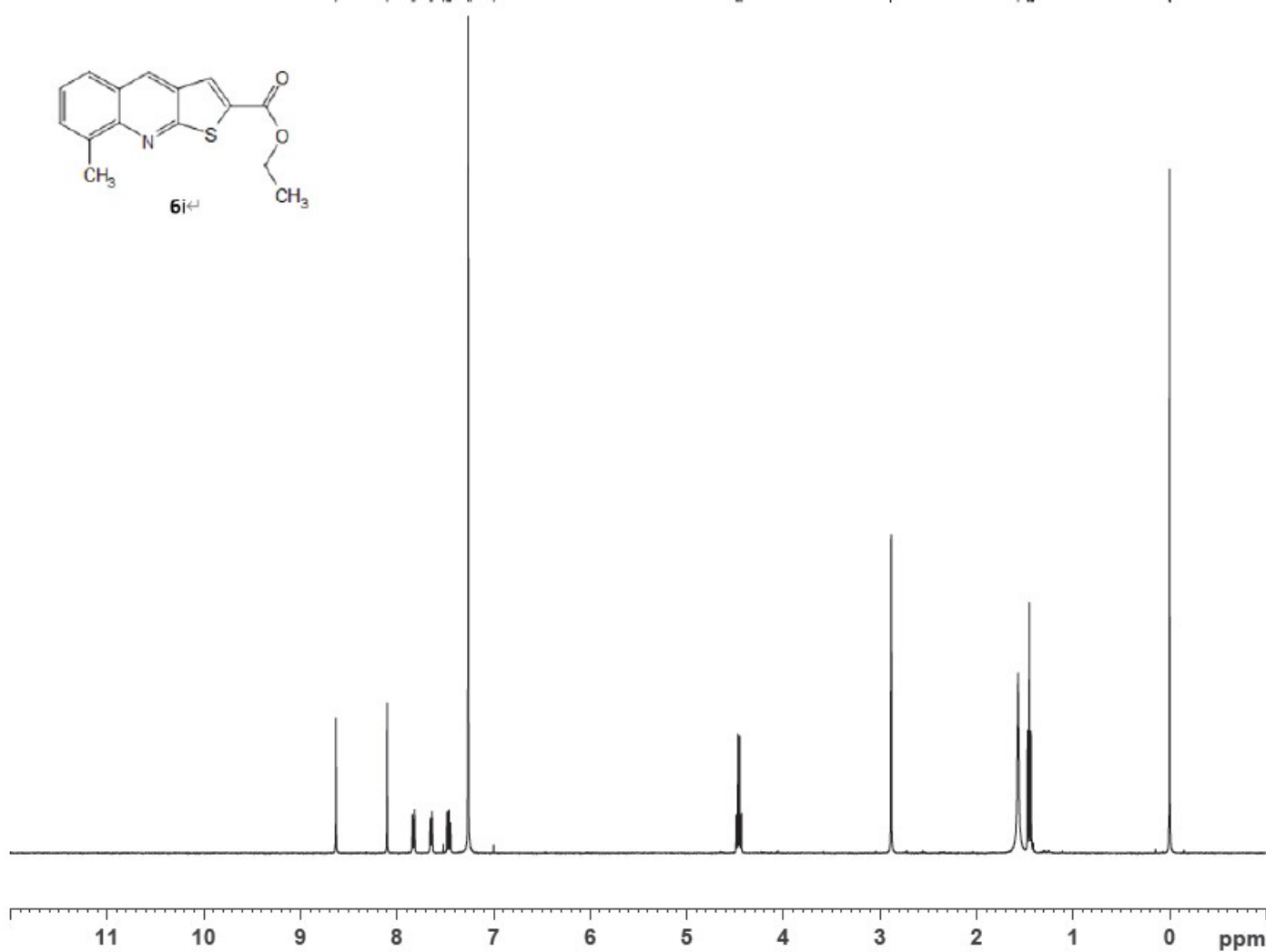


```

NAME      XY-271-20200107-HNMR
EXPNO     1
PROCNO    1
Date_     20200107
Time      12.07
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zg30
TD        32768
SOLVENT   CDC13
NS        8
DS        0
SWH       8223.685 Hz
FIDRES    0.250967 Hz
AQ        1.9923444 sec
RG        203
DW        60.800 usec
DE        6.50 usec
TE        673.2 K
D1        1.00000000 sec
TDO       1
  
```

```

===== CHANNEL f1 =====
NUC1      1H
P1        11.90 usec
PL1       -2.30 dB
PL1W      18.55620956 W
SFO1     400.1424710 MHz
SI        32768
SF        400.1400089 MHz
WDW       EM
SSB       0
LB        0.30 Hz
GB        0
PC        1.00
  
```

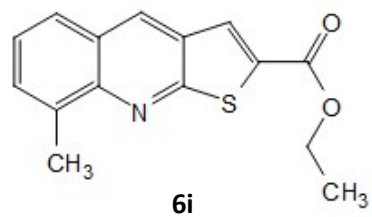


0.962
0.932
1.000
0.975
0.985

2.009

2.981

3.304

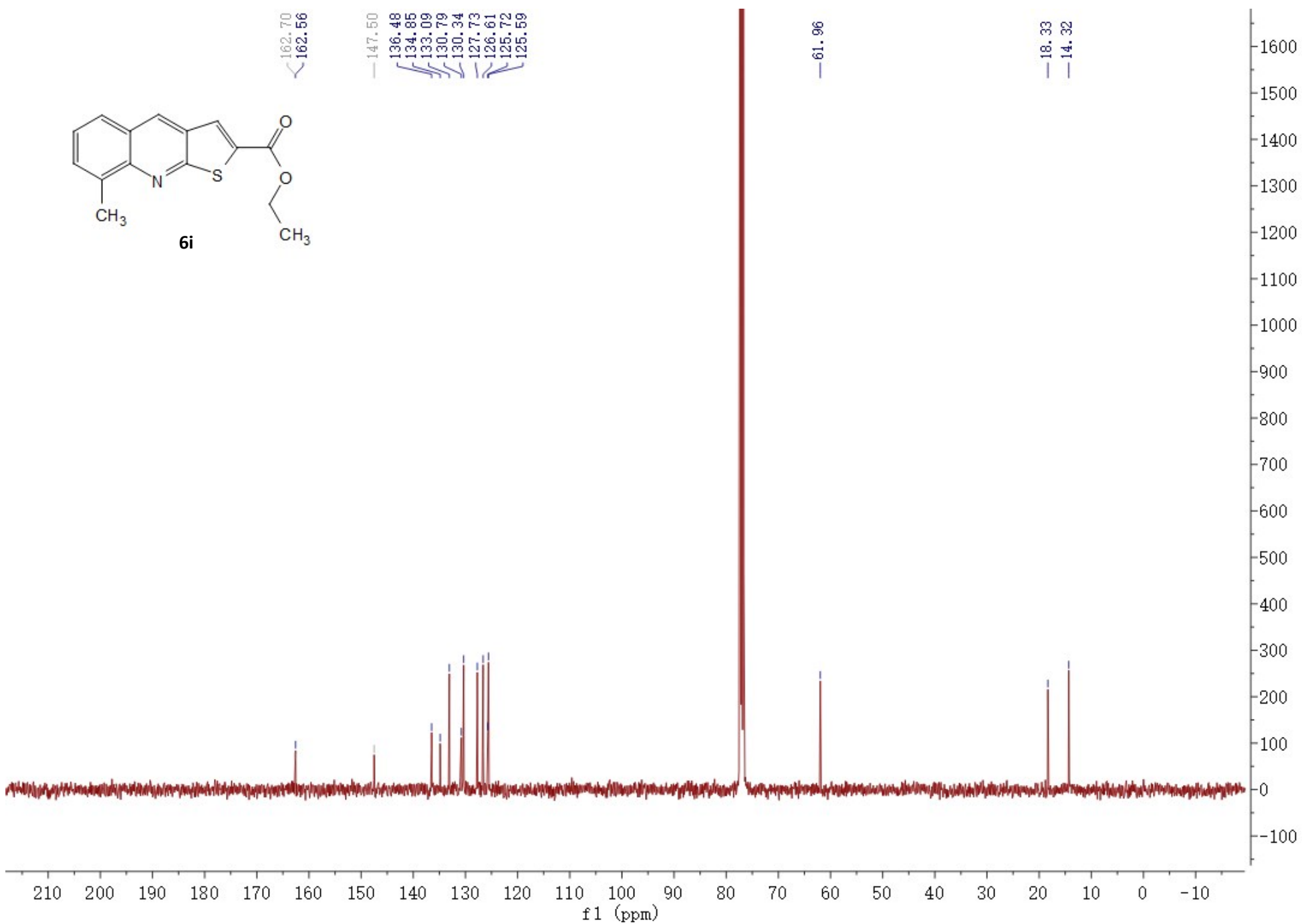


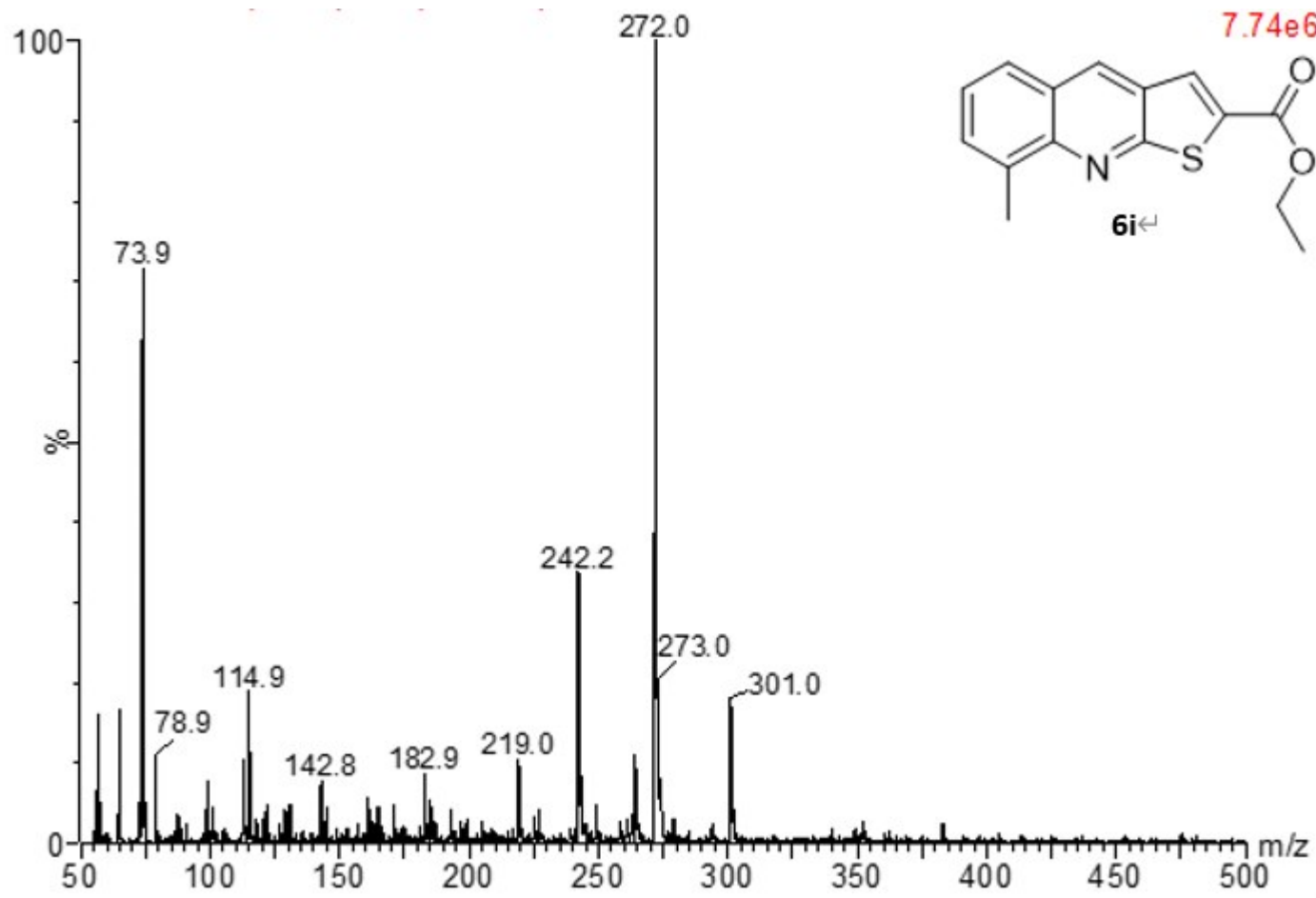
162.70
162.56

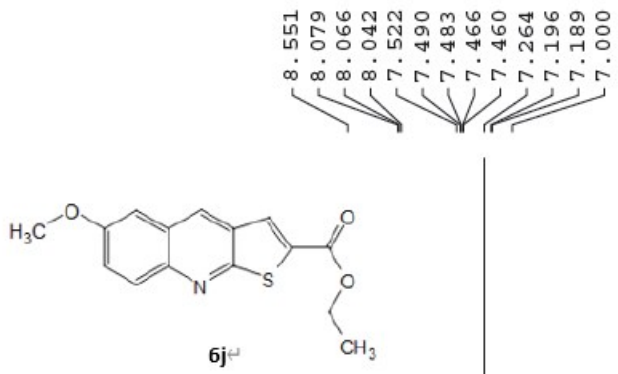
147.50
136.48
134.85
133.09
130.79
130.34
127.73
126.61
125.72
125.59

61.96

18.33
14.32



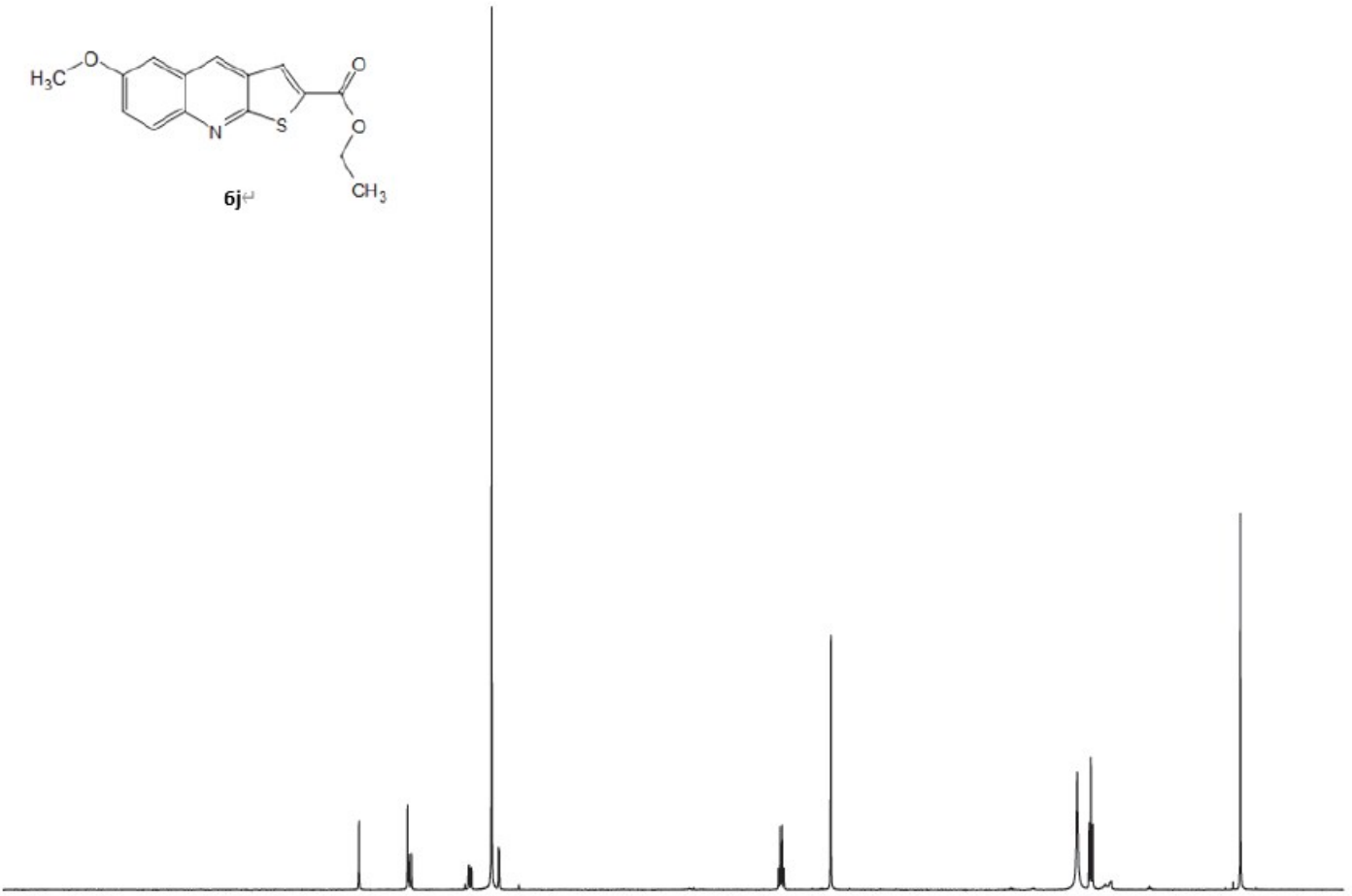




8.551
8.079
8.066
8.042
7.522
7.490
7.483
7.466
7.460
7.264
7.196
7.189
7.000

4.482
4.464
4.447
4.429
3.973

1.583
1.468
1.450
1.432
1.310
1.264
1.253
0.070
-0.000

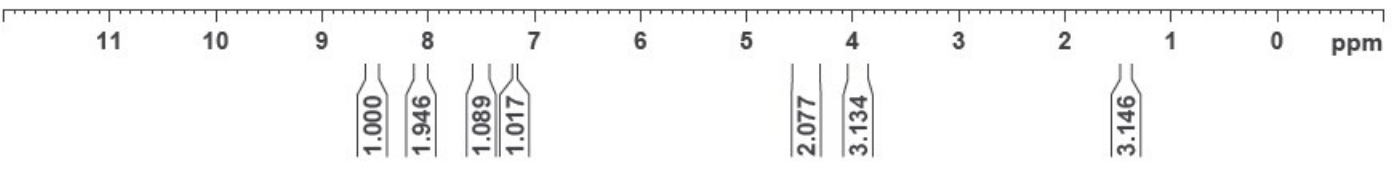


```

NAME      XY-287-3-20200109-HNMR
EXPNO     1
PROCNO    1
Date_     20200109
Time      10.40
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zg30
TD         32768
SOLVENT   CDCl3
NS         8
DS         0
SWH       8223.685 Hz
FIDRES    0.250967 Hz
AQ         1.9923444 sec
RG         203
DW         60.800 usec
DE         6.50 usec
TE         673.2 K
D1         1.00000000 sec
TDO        1
  
```

```

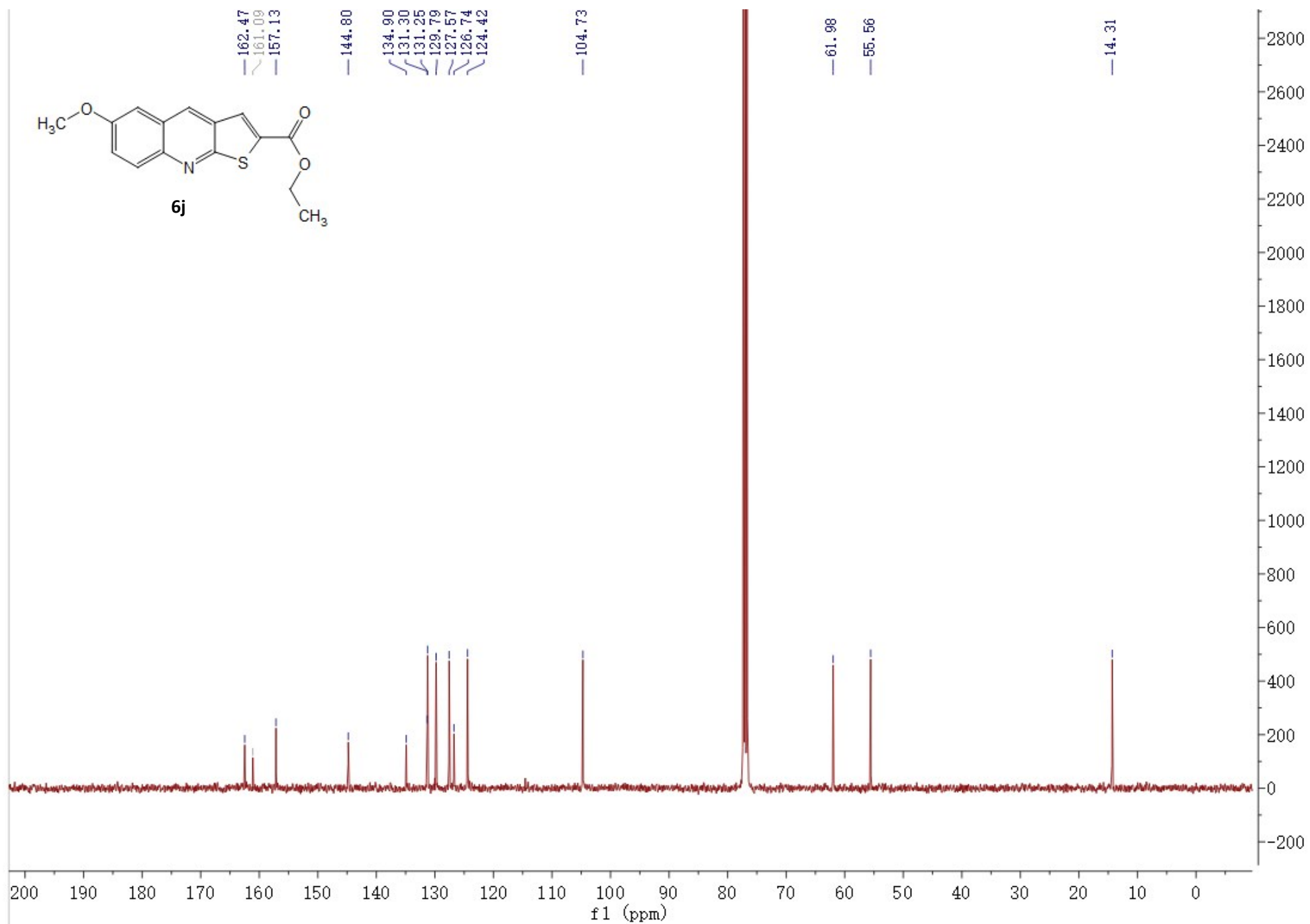
===== CHANNEL f1 =====
NUC1      1H
P1         11.90 usec
PL1        -2.30 dB
PL1W      18.55620956 W
SFO1      400.1424710 MHz
SI         32768
SF         400.1400083 MHz
WDW        EM
SSB         0
LB         0.30 Hz
GB         0
PC         1.00
  
```

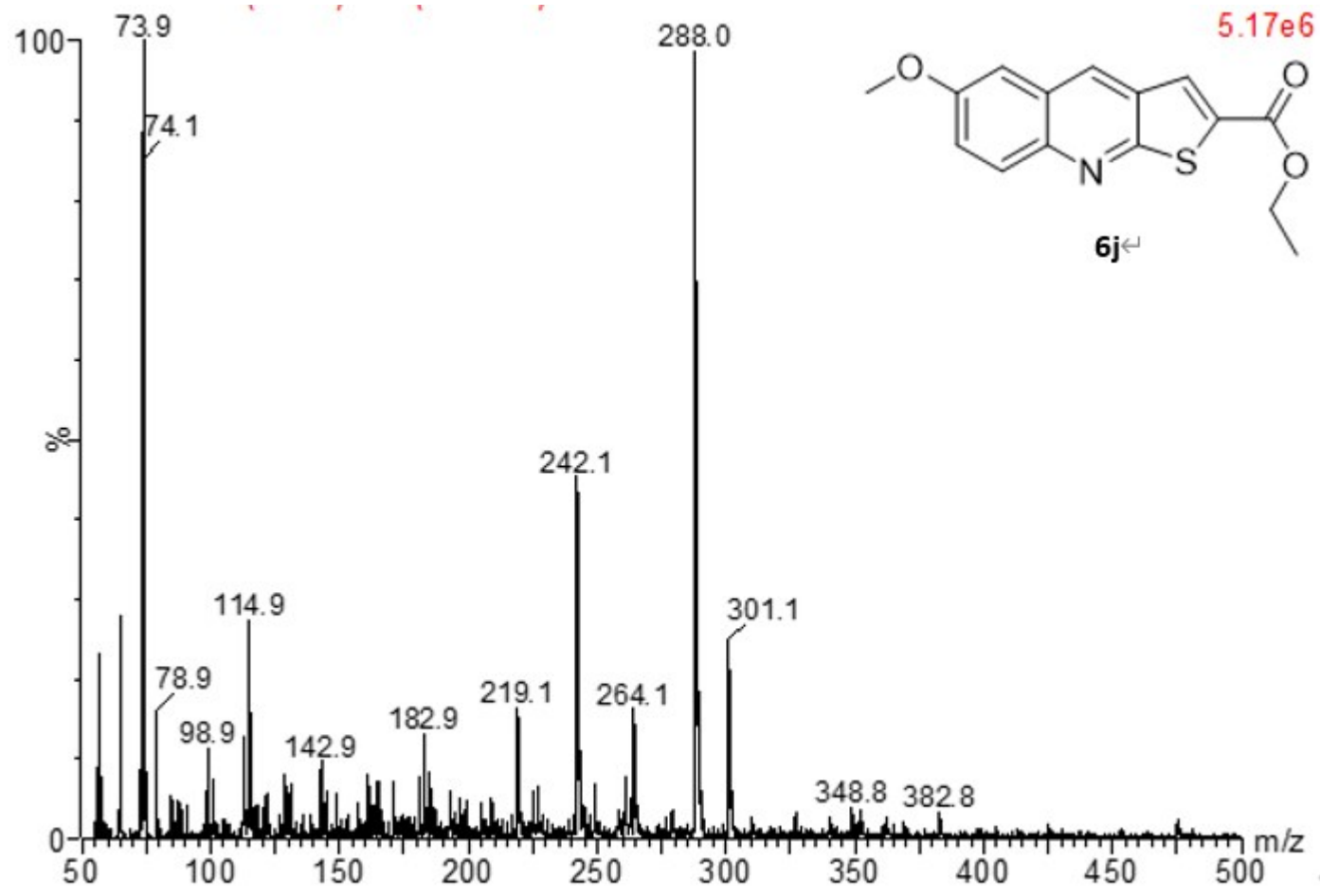


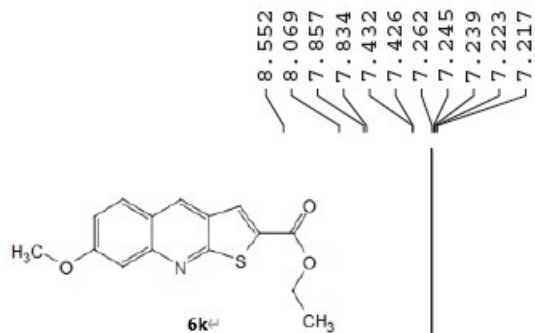
1.000
1.946
1.089
1.017

2.077
3.134

3.146







8.552
8.069
7.857
7.834
7.432
7.426
7.262
7.245
7.239
7.223
7.217

4.473
4.455
4.438
4.420
3.994

1.617
1.601
1.583
1.461
1.443
1.425

0.008
-0.000
-0.008

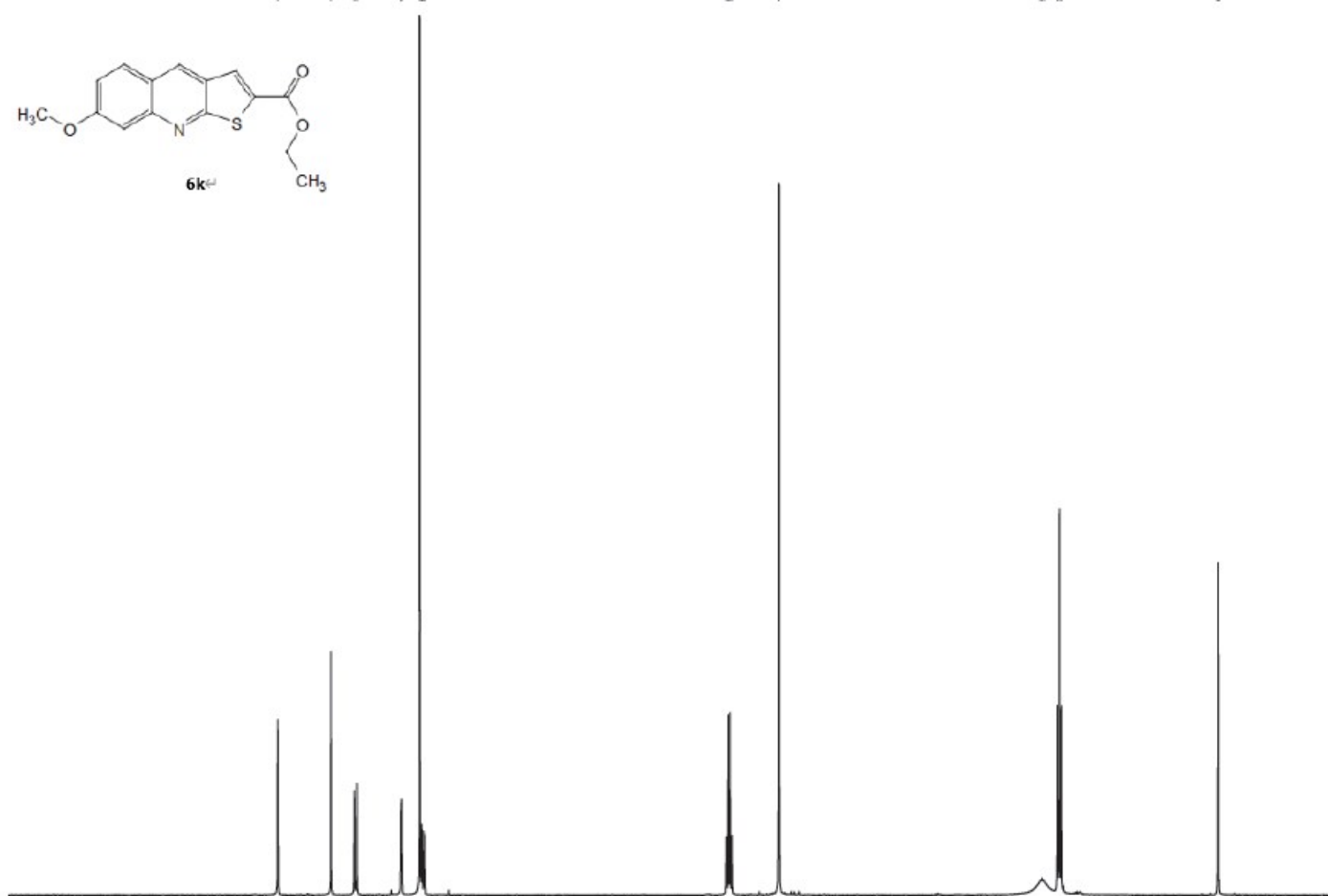


```

NAME      XY-287-3-20200103-HNMR
EXPNO     1
PROCNO    1
Date_     20200103
Time      13.09
INSTRUM   spect
PROBHD    5 mm PABBO BB/
PULPROG   zg30
TD         65536
SOLVENT   CDCl3
NS         8
DS         0
SWH       8012.820 Hz
FIDRES    0.122266 Hz
AQ         4.0894966 sec
RG         203
DW         62.400 usec
DE         6.50 usec
TE         298.1 K
D1         1.00000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
SFO1     400.1424710 MHz
NUC1      1H
P1        13.35 usec
SI        65536
SF        400.1400089 MHz
WDW       EM
SSB       0
LB        0.30 Hz
GB        0
PC        1.00
  
```

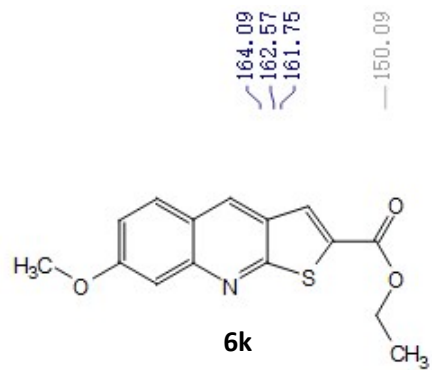


10 9 8 7 6 5 4 3 2 1 0 ppm

0.982
0.926
1.000
0.987
0.951

1.971
2.997

3.183



164.09
162.57
161.75

150.09

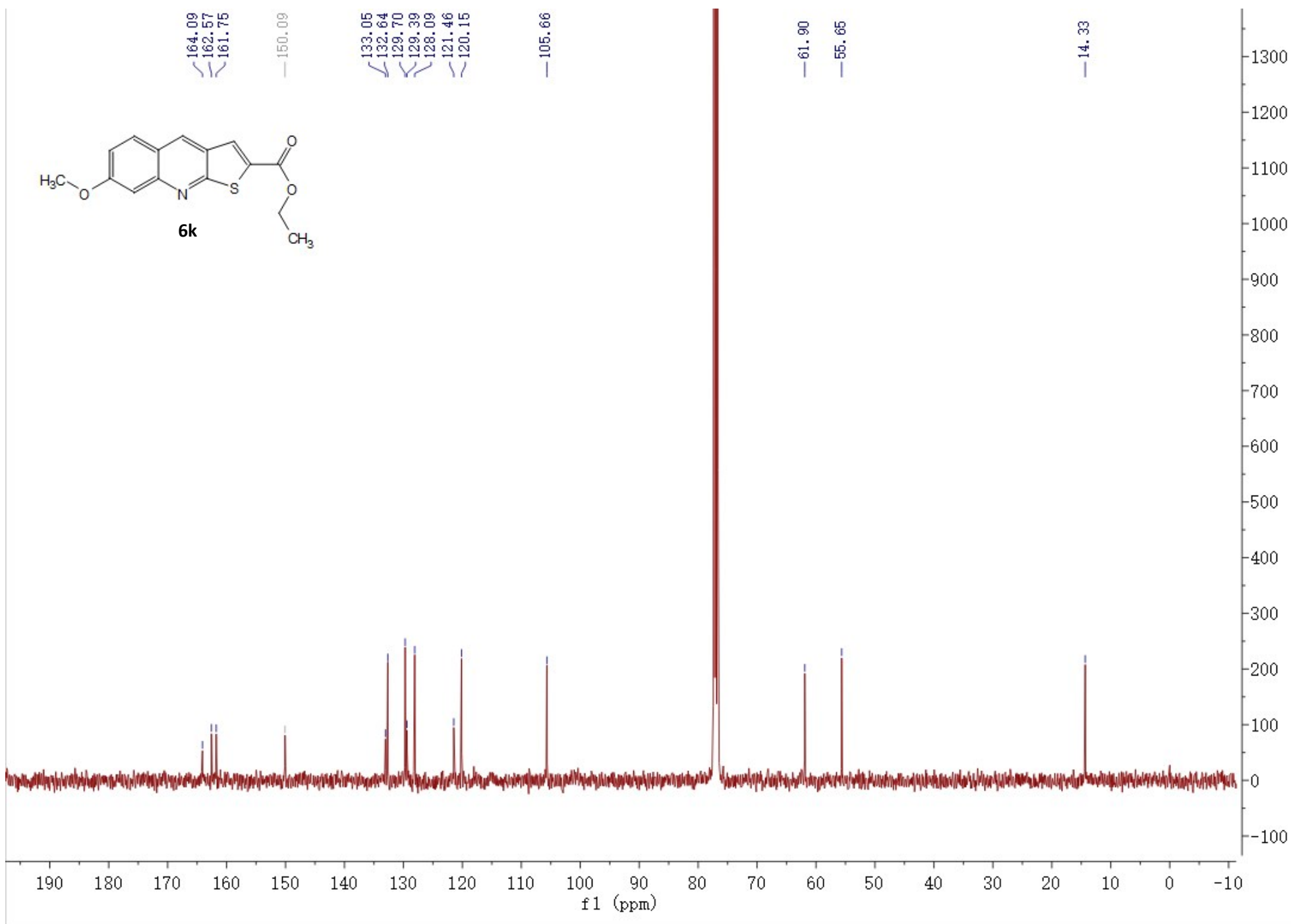
133.05
132.64
129.70
129.39
128.09
121.46
120.15

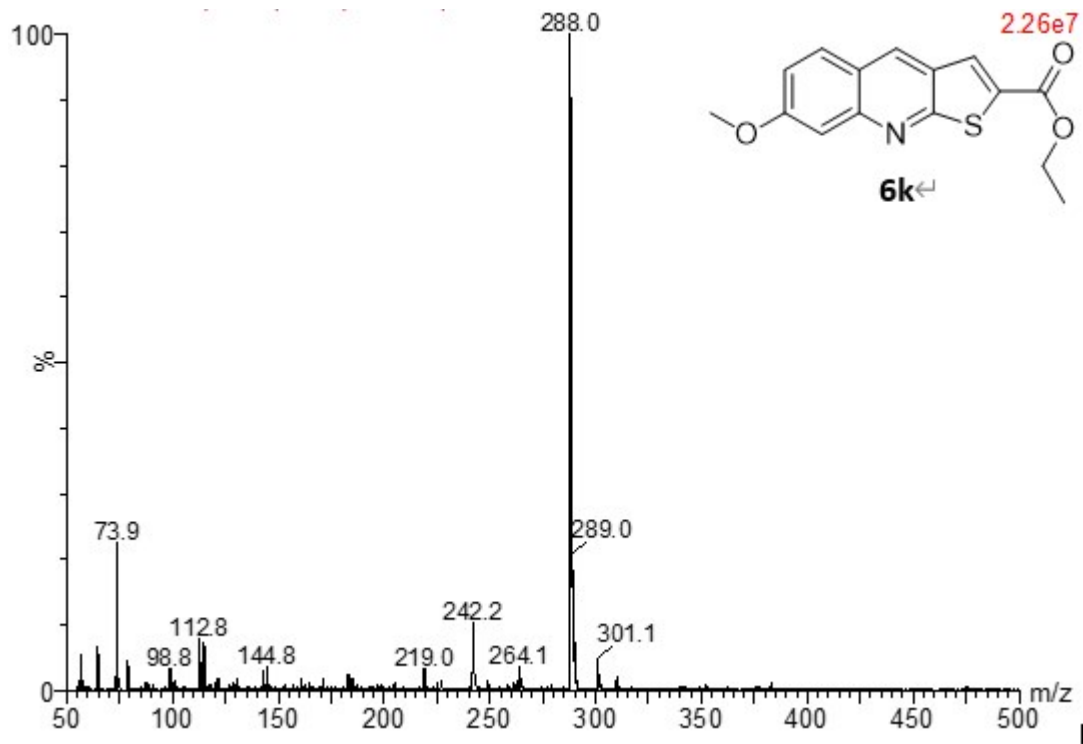
105.66

61.90

55.65

14.33







NAME XY-287-1-20200102-HNMR
EXPNO 1
PROCNO 1
Date_ 20200102
Time_ 11.55
INSTRUM spect
PROBHD 5 mm PABBO BB/
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 8
DS 0
SWH 8012.820 Hz
FIDRES 0.122266 Hz
AQ 4.0894966 sec
RG 203
DW 62.400 usec
DE 6.50 usec
TE 298.0 K
D1 1.00000000 sec
TD0 1

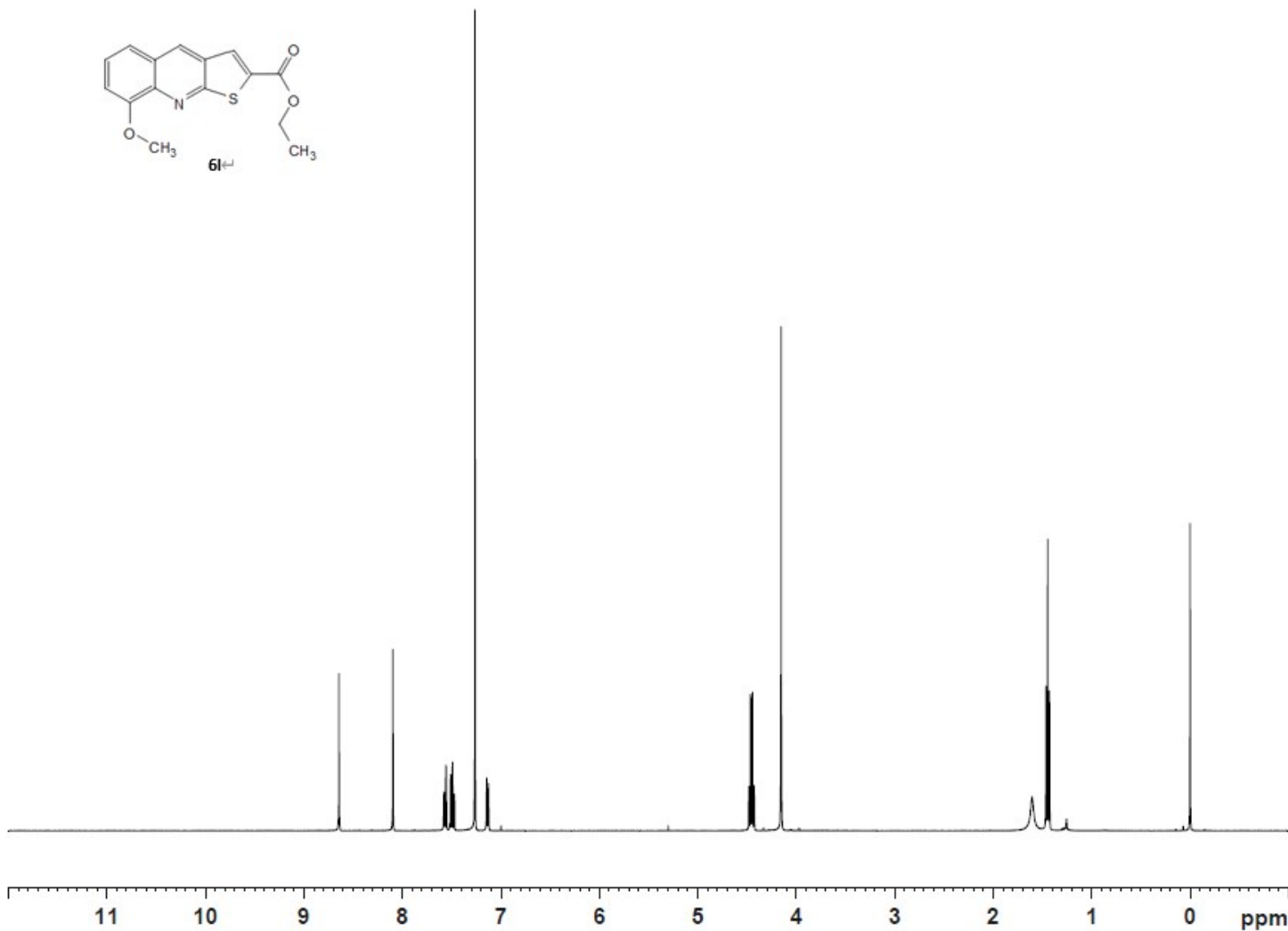
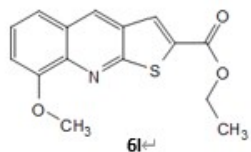
=====
CHANNEL f1
SFO1 400.1424710 MHz
NUC1 1H
P1 13.35 usec
SI 65536
SF 400.1400088 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

8.643
8.096
7.579
7.576
7.558
7.556
7.510
7.491
7.471
7.262
7.144
7.142
7.126

4.481
4.463
4.445
4.427
4.153

1.603
1.464
1.446
1.428
1.254

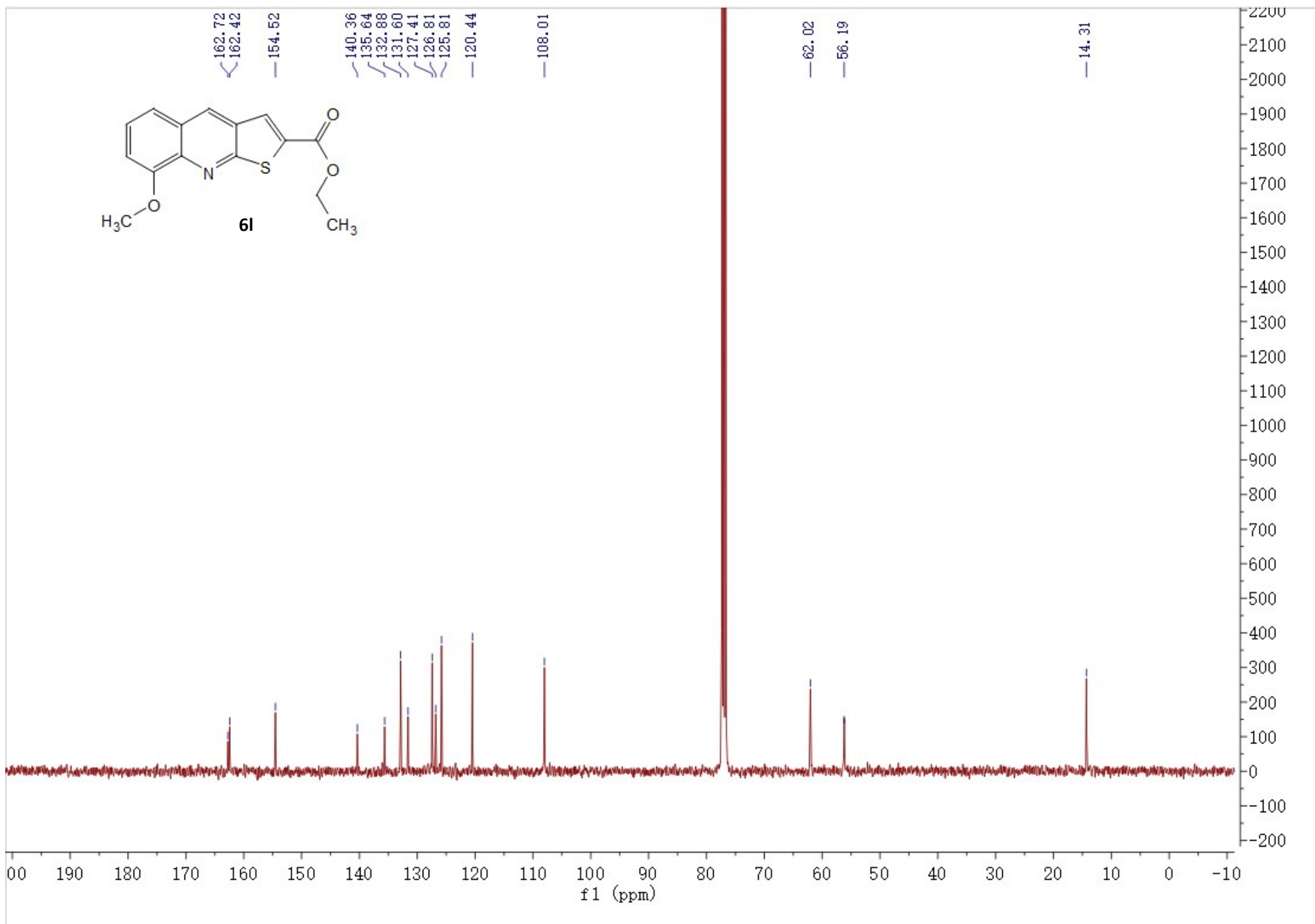
0.008
-0.000
-0.008

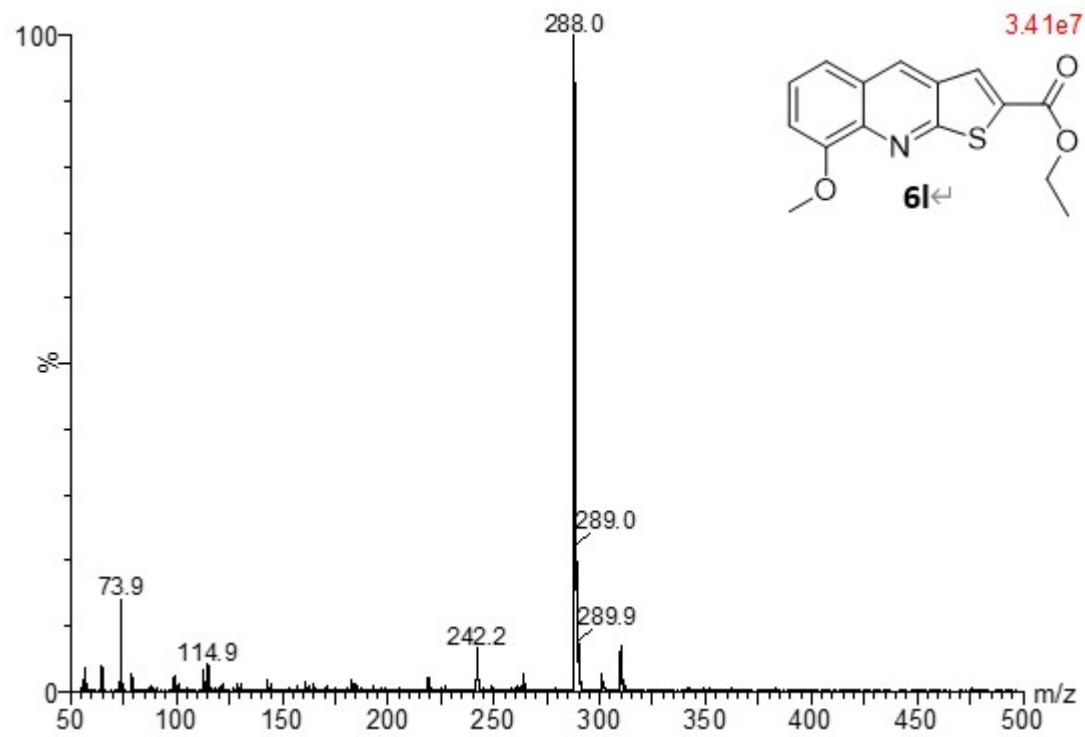


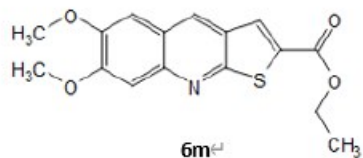
0.941
0.938
1.000
1.018
0.948

1.913
2.875

2.907







8.461
8.053
7.434
7.268
7.148

4.471
4.453
4.436
4.418
4.078
4.052

1.462
1.444
1.427
1.301
1.291
1.283
1.255
1.231
0.880
0.874
0.857
0.835
0.007
-0.000
-0.008



```

NAME      XY-317-20200115-HNMR
EXPNO     1
PROCNO    1
Date_     20200115
Time      10.48
INSTRUM   spect
PROBHD    5 mm PABBO BB-
PULPROG   zg30
TD         32768
SOLVENT   CDC13
NS         8
DS         0
SWH       8223.685 Hz
FIDRES    0.250967 Hz
AQ         1.9923444 sec
RG         203
DW         60.800 usec
DE         6.50 usec
TE         673.2 K
D1         1.00000000 sec
TD0        1
  
```

```

===== CHANNEL f1 =====
NUC1      1H
P1         11.90 usec
PL1        -2.30 dB
PL1W      18.55620956 W
SFO1      400.1424710 MHz
SI         32768
SF         400.1400062 MHz
WDW        EM
SSB         0
LB         0.30 Hz
GB         0
PC         1.00
  
```

