

Supplementary Materials

Design, Synthesis, In Vitro Antifungal Activity and Mechanism Study of the Novel 4-Substituted Mandelic Acid Derivatives

Biao Chen ¹, Dandan Song ², Huabin Shi ², Kuai Chen ², Zhibing Wu ^{2,*} and Huifang Chai ^{1,*}

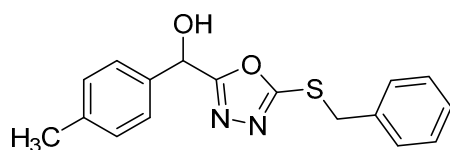
¹ School of Pharmacy, Guizhou University of Traditional Chinese Medicine, Guiyang 550025, China; gzdxcchenbiao@163.com

² State Key Laboratory Breeding Base of Green Pesticide and Agricultural Bioengineering, Key Laboratory of Green Pesticide and Agricultural Bioengineering, Ministry of Education, Center for R&D of Fine Chemicals of Guizhou University, Guiyang 550025, China; 15284637047@163.com (D.S.); shb1126@163.com (H.S.); m15185174268@163.com (K.C.)

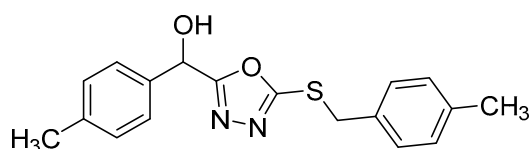
* Correspondence: zbwu@gzu.edu.cn (Z.W.); hfchai@gzy.edu.cn (H.C.)

1. ¹ H, ¹³ C NMR and HRMS data of the title compounds.....	2-11
2. Copies of ¹ H, ¹³ C, ¹⁹ F NMR, HRMS, and HPLC of the title compounds.....	12-76
3. Crystallographic data of compound E ₉	77
4. The regression equation of the title compounds with EC ₅₀ values	78-82

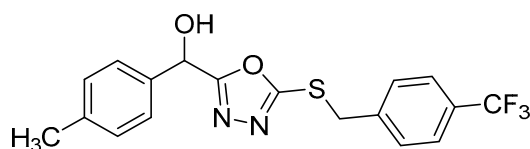
1. ^1H , ^{13}C NMR, and HRMS data of the title compounds



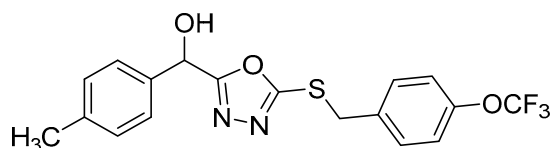
data for E₁: A yellow solid, yield 56%, purity 99.5%, m.p. 95-96 °C. ^1H NMR (400 MHz, DMSO- d_6) δ 7.35-7.26 (m, 7 H, benzene H), 7.19 (d, J = 8.0 Hz, 2H benzene H), 6.69 (d, J = 8.0 Hz, 1H, OH), 5.95 (d, J = 4.0 Hz, 1H, CH), 4.44 (s, 2H, CH₂), 2.29 (s, 3H, CH₃); ^{13}C NMR (101 MHz, DMSO- d_6) δ 169.1, 163.9, 138.0, 136.9, 136.7, 129.5, 129.4, 129.0, 128.2, 126.8, 66.7, 36.2, 21.2; HRMS: calcd for C₁₇H₁₆N₂O₂S, $[\text{M}+\text{H}]^+$ 313.1005, found 313.1002.



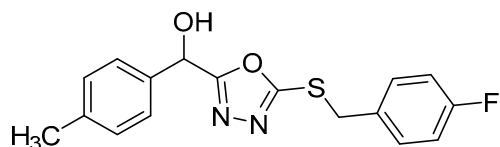
Data for E₂: A yellow solid, yield 55%, purity 95.4%, m.p. 135-136 °C. ^1H NMR (400 MHz, DMSO- d_6) δ 7.32 (d, J = 12.0 Hz, 2H, benzene H), 7.20 (t, J = 8.0 Hz, 4H, benzene H), 7.07 (d, J = 8.0 Hz, 2H, benzene H), 6.66 (d, J = 4.0 Hz, 1H, OH), 5.94 (d, J = 8.0 Hz, 1H, CH), 4.40 (s, 2H, CH₂), 2.30 (s, 3H, CH₃), 2.25 (s, 3H, CH₃); ^{13}C NMR (101 MHz, DMSO- d_6) δ 169.1, 163.9, 137.9, 137.5, 136.7, 133.8, 129.6, 129.5, 129.3, 126.8, 66.8, 36.1, 21.2; HRMS: calcd for C₁₈H₁₈N₂O₂S, $[\text{M}+\text{H}]^+$ 327.1162, found 327.1152.



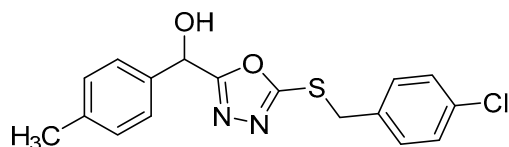
data for E₃: A white solid, yield 38%, purity 99.7%, m.p. 117-118 °C. ^1H NMR (400 MHz, DMSO- d_6) δ 7.59 (dd, J = 20.0, 8.0 Hz, 4 H, benzene H), 7.3 (d, J = 8.0 Hz, 2 H, benzene H), 7.18 (d, J = 8.0 Hz, 2H, benzene H), 6.65 (d, J = 8.0 Hz, 1H, CH), 5.92 (d, J = 8.0 Hz, 1H, OH), 4.53 (s, 2H, CH₂), 2.29 (s, 3H, CH₃); ^{13}C NMR (101 MHz, DMSO- d_6) δ 169.2, 163.6, 142.2, 137.9, 136.6, 130.2, 129.5, 128.6 (q, J = 31.7 Hz), 126.8, 125.8 (q, J = 3.8 Hz), 66.6, 35.4, 21.2; ^{19}F NMR (376 MHz, DMSO- d_6) δ -61.05; HRMS: calcd for C₁₈H₁₅F₃N₂O₂S, $[\text{M}+\text{H}]^+$ 381.0879, found 381.0868.



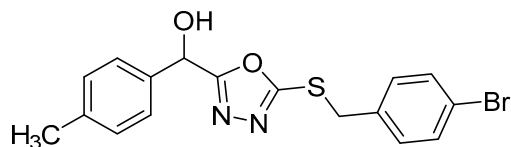
data for E₄: A yellow solid, yield 56%, purity 93.5%, m.p. 140-141 °C. ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.48 (dd, *J* = 8.0, 4.0 Hz, 2H, benzene H), 7.31 (d, *J* = 8.0 Hz, 2H, benzene H), 7.25 (d, *J* = 8.0 Hz, 2H, benzene H), 7.19 (d, *J* = 8.0 Hz, 2H, benzene H), 6.65 (d, *J* = 8.0 Hz, 1H, OH), 5.93 (d, *J* = 4.0 Hz, 1H, CH), 4.48 (s, 2H, CH₂), 2.29 (s, 3H, CH₃); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 169.2, 163.7, 148.2, 137.9, 136.7 (d, *J* = 5.0 Hz), 131.4, 129.5, 126.8, 121.5, 66.6, 35.2, 21.2; ¹⁹F NMR (377 MHz, DMSO-*d*₆) δ -56.8; HRMS: calcd for C₁₈H₁₆F₃N₂O₃S, [M+H]⁺ 397.0828, found 397.0818.



data for E₅: A white solid, yield 58%, purity 96.1%, m.p. 132-133 °C. ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.41-7.36 (m, 2H, benzene H), 7.30 (d, *J* = 8.0 Hz, 2H, benzene H), 7.19 (d, *J* = 8.0 Hz, 2H, benzene H), 7.12-7.06 (m, 2H, benzene H), 6.65 (d, *J* = 4.0 Hz, 1H, OH), 5.92 (d, *J* = 8.0 Hz, 1H, CH), 4.44 (s, 2H, CH₂), 2.30 (s, 3H, CH₃); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 169.1, 163.8, 162.0 (d, *J* = 244.1 Hz), 138.0, 136.7, 133.3 (d, *J* = 3.0 Hz), 131.5 (d, *J* = 8.2 Hz), 129.5, 126.8, 115.8 (d, *J* = 21.4 Hz), 66.6, 35.4, 21.2; ¹⁹F NMR (377 MHz, DMSO-*d*₆) δ -114.4; HRMS: calcd for C₁₇H₁₅FN₂O₂S, [M+H]⁺ 331.0911, found 331.0902.



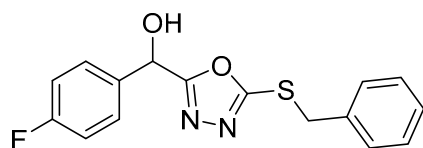
data for E₆: A white solid, yield 39%, purity 96.8%, m.p. 114-115 °C. ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.40-7.29 (m, 6 H, benzene H), 7.19 (d, *J* = 8.0 Hz, 2 H, benzene H), 6.66 (d, *J* = 8.0 Hz, 1H, OH), 5.92 (d, *J* = 8.0 Hz, 1H, CH), 4.44 (s, 2H, CH₂), 2.30 (s, 3H, CH₃); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 169.2, 163.7, 138.0, 136.6, 136.3, 132.8, 131.3, 129.5, 128.9, 126.8, 66.6, 35.4, 21.2; HRMS: calcd for C₁₇H₁₅ClN₂O₂S, [M+H]⁺ 347.0616, found 347.0606.



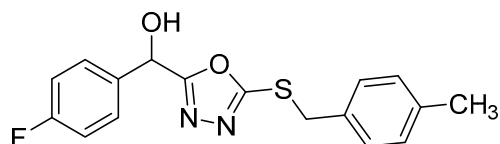
data for E₇: A yellow solid, yield 67%, purity 98.9%, m.p. 143-144 °C. ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.37-7.29 (m, 6 H, benzene H), 7.19 (d, *J* = 8.0 Hz, 2 H, benzene H), 6.66 (d, *J* = 8.0 Hz, 1H, OH), 5.92 (d, *J* = 4.0 Hz, 1H, CH), 4.44 (s, 2H, CH₂), 2.30 (s, 3H, CH₃); ¹³C NMR (101 MHz,

DMSO-*d*₆) δ 169.2, 163.7, 138.0, 136.6, 136.2, 132.8, 131.3, 129.5, 128.9, 126.8, 66.6, 35.4, 21.2;

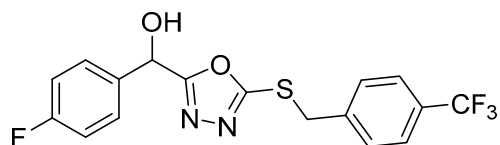
HRMS: calcd for C₁₇H₁₅BrN₂O₂S, [M+H]⁺ 391.0110, found 391.0105.



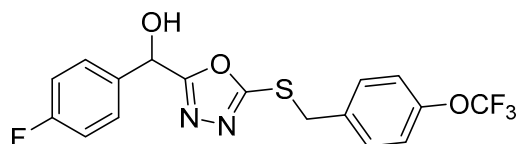
data for E₈: A yellow solid, yield 77%, purity 99.4%, m.p. 92-93 °C. ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.29-7.24 (m, 5 H, benzene H), 7.10-7.06 (m, 2H, benzene H), 7.00-6.95 (m, 2H, benzene H), 5.96 (d, *J* = 4.0 Hz, 1H, OH), 4.74 (d, *J* = 4.0 Hz, 1H, CH), 3.96 (s, 2H, CH₂); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 170.3, 163.0, 160.6, 138.3, 137.8 (d, *J* = 2.9 Hz), 129.1, 129.0 (d, *J* = 8.2 Hz), 128.5, 127.4, 114.9 (d, *J* = 21.3 Hz), 72.5, 59.9; ¹⁹F NMR (377 MHz, DMSO-*d*₆) δ -115.6; HRMS: calcd for C₁₆H₁₃FN₂O₂S, [M+H]⁺ 317.0755, found 317.0753.



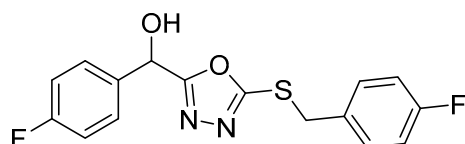
data for E₉: A white solid, yield 78%, purity 99.5%, m.p. 169-170 °C. ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.51-7.46 (m, 2H, benzene H), 7.25-7.19 (m, 4H, benzene H), 7.08 (d, *J* = 8.0 Hz, 2H, benzene H), 6.78 (d, *J* = 4.0 Hz, 1H, OH), 6.00 (d, *J* = 4.0 Hz, 1H, CH), 4.41 (s, 2H, CH₂), 2.25 (s, 3H, CH₃); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 168.8, 164.1, 163.6, 159.3, 135.9 (d, *J* = 2.9 Hz), 130.7, 130.3, 129.1 (d, *J* = 8.4 Hz), 115.8 (d, *J* = 21.5 Hz), 114.4, 66.1, 55.5, 35.9; ¹⁹F NMR (377 MHz, DMSO-*d*₆) δ -114.1; HRMS: calcd for C₁₇H₁₅FN₂O₂S, [M+H]⁺ 331.0911, found 331.0902.



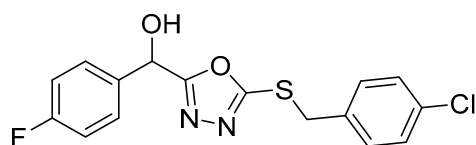
data for E₁₀: A yellow solid, yield 88%, purity 96.9%, m.p. 74-75 °C. ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.62 (dd, *J* = 20.0, 8.0 Hz, 4 H, benzene H), 7.49-7.45 (m, 2 H, benzene H), 7.24-7.18 (d, 2H, benzene H), 6.79 (d, *J* = 8.0 Hz, 1H, OH), 5.99 (d, *J* = 4.0 Hz, 1H, CH), 4.54 (s, 2H, CH₂), 2.29 (s, 3H, CH₃); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 169.0 (d, *J* = 0.5 Hz), 163.8, 162.4 (d, *J* = 244.1 Hz), 161.1, 142.2, 135.8 (d, *J* = 3.0 Hz), 130.2, 129.1 (d, *J* = 8.4 Hz), 125.8 (q, *J* = 3.8 Hz), 124.6 (q, *J* = 272.1 Hz), 115.7 (d, *J* = 21.6 Hz), 66.0, 35.4; ¹⁹F NMR (376 MHz, DMSO-*d*₆) δ -61.0, -114.11; HRMS: calcd for C₁₇H₁₂F₄N₂O₂S, [M+H]⁺ 385.0628, found 385.0619.



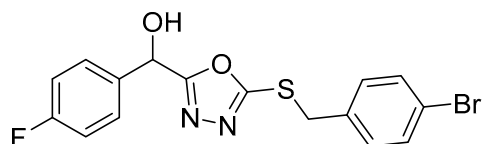
data for E11: A white solid, yield 28%, purity 99.3%, m.p. 66-67 °C. ^1H NMR (400 MHz, DMSO- d_6) δ 7.42-7.38 (m, 4H, benzene H), 7.17-7.13 (m, 4H, benzene H), 6.77 (d, J = 8.0 Hz, 1H, OH), 6.00 (d, J = 4.0 Hz, 1H, CH), 4.49 (s, 2H, CH₂); ^{13}C NMR (101 MHz, DMSO- d_6) δ 163.9, 160.9, 136.7, 131.4, 131.0, 129.2 (d, J = 8.2 Hz), 129.0, 121.5, 115.7 (d, J = 21.6 Hz), 115.2 (d, J = 21.3 Hz), 66.1, 35.2; ^{19}F NMR (377 MHz, DMSO- d_6) δ -56.8, -114.1; HRMS: calcd for C₁₇H₁₂F₄N₂O₃S, [M+H]⁺ 401.0578, found 401.0570.



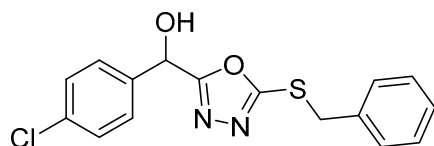
data for E12: A white solid, yield 71%, purity 98.8%, m.p. 63-64 °C. ^1H NMR (400 MHz, DMSO- d_6) δ 7.50-7.46 (m, 2H, benzene H), 7.40-7.33 (m, 2H, benzene H), 7.24-7.19 (m, 3H, benzene H), 7.12-7.08 (m, 1H, benzene H), 6.79 (d, J = 8.0 Hz, 1H, OH), 6.00 (d, J = 4.0 Hz, 1H, CH), 4.48 (s, 2H, CH₂); ^{13}C NMR (101 MHz, DMSO- d_6) δ 169.1, 163.6, 135.8 (d, J = 3.0 Hz), 131.8 (d, J = 3.4 Hz), 130.7 (d, J = 8.2 Hz), 129.1 (d, J = 8.3 Hz), 125.0 (d, J = 3.8 Hz), 123.9, 115.9 (d, J = 2.8 Hz), 115.6, 66.1, 30.2 (d, J = 3.3 Hz); ^{19}F NMR (377 MHz, DMSO- d_6) δ -115.7, -116.0; HRMS: calcd for C₁₆H₁₂F₂N₂O₂S, [M+H]⁺ 335.0660, found 335.0655.



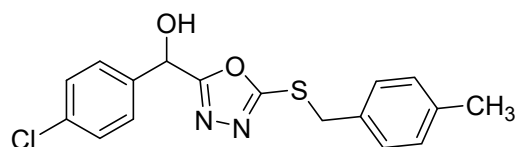
data for E13: A white solid, yield 38%, purity 96.6%, m.p. 82-83 °C. ^1H NMR (400 MHz, DMSO- d_6) δ 7.50-7.46 (m, 2H, benzene H), 7.39-7.32 (m, 4H, benzene H), 7.25-7.19 (m, 2H, benzene H), 6.78 (d, J = 4.0 Hz, 1H, OH), 6.00 (d, J = 4.0 Hz, 1H, CH), 4.45 (s, 2H, CH₂); ^{13}C NMR (101 MHz, DMSO- d_6) δ 168.9, 163.9, 162.4 (d, J = 244.2 Hz), 136.2, 135.8, 132.8, 131.3, 129.1 (d, J = 8.4 Hz), 128.9, 115.7 (d, J = 21.6 Hz), 66.1, 35.4; ^{19}F NMR (377 MHz, DMSO- d_6) δ -114.1; HRMS: calcd for C₁₆H₁₂ClFN₂O₂S, [M+H]⁺ 351.0365, found 351.0354.



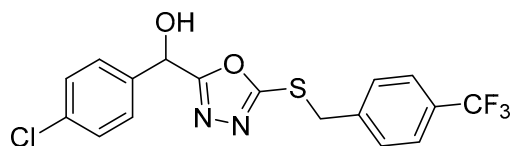
data for E14: A yellow solid, yield 75%, purity 98.1%, m.p. 130-131 °C. ^1H NMR (400 MHz, DMSO- d_6) δ 7.50-7.46 (dd, J = 12.0, 8.0 Hz, 4H, benzene H), 7.32 (d, J = 8.0 Hz, 2H, benzene H), 7.24-7.19 (m, 2H, benzene H), 6.78 (d, J = 4.0 Hz, 1H, OH), 6.00 (d, J = 4.0 Hz, 1H, CH), 4.43 (s, 2H, CH₂); ^{13}C NMR (101 MHz, DMSO- d_6) δ 68.9, 163.9, 162.4 (d, J = 244.2 Hz), 136.7, 135.8 (d, J = 2.9 Hz), 131.7 (d, J = 24.7 Hz), 131.4, 129.1 (d, J = 8.4 Hz), 121.4, 115.7 (d, J = 21.6 Hz), 66.1, 35.5; ^{19}F NMR (377 MHz, DMSO- d_6) δ -114.0; HRMS: calcd for C₁₆H₁₂BrFN₂O₂S, [M+H]⁺ 394.9860, found 394.9851.



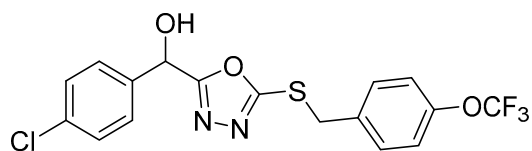
data for E15: A light yellow solid, yield 13%, purity 99.8%, m.p. 89-90 °C. ^1H NMR (400 MHz, DMSO- d_6) δ 7.46 (s, 4H, benzene H), 7.34-7.26 (m, 5H, benzene H), 6.86 (d, J = 4.0 Hz, 1H, OH), 6.00 (d, J = 4.0 Hz, 1H, CH), 4.45 (s, 2H, CH₂); ^{13}C NMR (125 MHz, DMSO- d_6) δ 168.7, 164.1, 138.6, 136.9, 133.3, 129.4, 129.0, 128.9, 128.8, 128.2, 66.0, 36.2; HRMS: calcd for C₁₆H₁₃ClN₂O₂S, [M+H]⁺ 345.0459, found 345.0479.



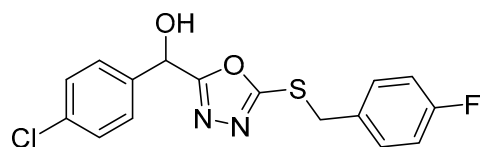
data for E16: A white solid, yield 59%, purity 99.1%, m.p. 165-166 °C. ^1H NMR (400 MHz, DMSO- d_6) δ 7.49 (dd, J = 4.0, 8.0 Hz, 2H, benzene H), 7.24-7.20 (m, 4H, benzene H), 7.07 (d, J = 8.0 Hz, 2H, benzene H), 6.78 (d, J = 4.0 Hz, 1H, OH), 6.00 (d, J = 8.0 Hz, 1H, CH), 4.41 (s, 2H, CH₂), 2.25 (s, 3H, CH₃); ^{13}C NMR (101 MHz, DMSO- d_6) δ 168.8, 164.0, 163.5, 161.2, 137.5, 135.9 (d, J = 3.0 Hz), 133.8, 129.4 (d, J = 22.4 Hz), 129.1 (d, J = 8.4 Hz), 115.7 (d, J = 21.6 Hz), 66.1, 36.1, 21.2; HRMS: calcd for C₁₇H₁₅ClN₂O₂S, [M+H]⁺ 347.0616, found 347.0609.



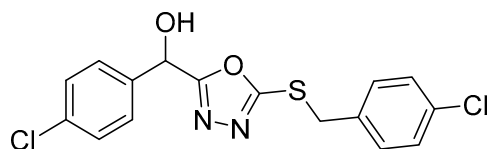
data for E17: A yellow solid, yield 53%, purity 98.1%, m.p. 74-75 °C. ^1H NMR (400 MHz, DMSO- d_6) δ 7.63 (d, J = 8.0 Hz, 2 H, benzene H), 7.47-7.42 (m, 4H, benzene H), 7.13 (d, J = 8.0 Hz, 1H, benzene H), 7.01 (d, J = 8.0 Hz, 1H, benzene H), 6.85 (d, J = 4.0 Hz, 1H, OH), 6.01 (d, J = 8.0 Hz, 1H, CH), 4.54 (s, 2H, CH₂); ^{13}C NMR (101 MHz, DMSO- d_6) δ 170.2, 168.8, 163.9, 138.5, 130.2, 129.8, 128.9 (d, J = 10.5 Hz), 128.5, 128.0, 125.8 (q, J = 3.7 Hz), 125.2 (dd, J = 7.3, 3.6 Hz), 66.0, 35.4; ^{19}F NMR (377 MHz, DMSO- d_6) δ -60.9, HRMS: calcd for C₁₇H₁₃ClF₃N₂O₂S, [M+H]⁺ 401.0333, found 401.0321.



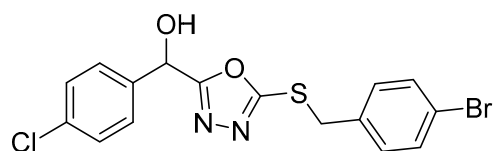
data for E18: A yellow solid, yield 70%, purity 97.6%, m.p. 124-125 °C. ^1H NMR (400 MHz, DMSO- d_6) δ 7.43 (d, J = 12.0 Hz, 4 H, benzene H), 7.22-7.19 (m, 4H, benzene H), 7.07 (d, J = 4.0 Hz, 1H, OH), 6.01 (d, J = 4.0 Hz, 1H, CH), 4.01 (s, 2H, CH₂); ^{13}C NMR (101 MHz, DMSO- d_6) δ 170.3, 168.7, 164.0, 147.8, 140.4, 137.7, 130.8, 128.6, 128.0, 120.9, 72.5, 59.4; ^{19}F NMR (377 MHz, DMSO- d_6) δ -56.8, HRMS: calcd for C₁₇H₁₂ClF₃N₂O₃S, [M+H]⁺ 417.0282, found 417.0280.



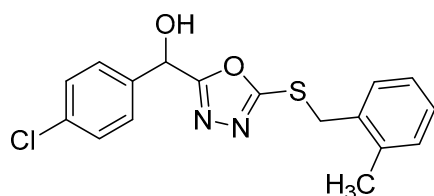
data for E19: A yellow solid, yield 75%, purity 99.6%, m.p. 74-75 °C. ^1H NMR (400 MHz, DMSO- d_6) δ 7.51-7.46 (m, 2H, benzene H), 7.43-7.38 (m, 2H, benzene H), 7.25-7.20 (m, 2H, benzene H), 7.13-7.07 (s, 2H, benzene H), 6.80 (d, J = 4.0 Hz, 1H, OH), 6.01 (d, J = 4.0 Hz, 1H, CH), 4.45 (s, 2H, CH₂); ^{13}C NMR (101 MHz, DMSO- d_6) δ 168.9, 164.0, 163.4 (d, J = 33.3 Hz), 161.0 (d, J = 33.4 Hz), 135.8 (d, J = 3.0 Hz), 133.3 (d, J = 3.1 Hz), 131.5 (d, J = 8.4 Hz), 129.1 (d, J = 8.4 Hz), 115.9 (d, J = 4.0 Hz), 115.7 (d, J = 4.0 Hz), 66.1, 35.4; ^{19}F NMR (377 MHz, DMSO- d_6) δ -114.4; HRMS: calcd for C₁₆H₁₂ClFN₂O₂S, [M+H]⁺ 351.0365, found 351.0357.



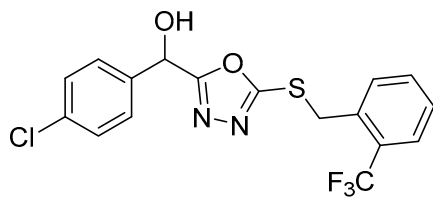
data for E₂₀: A white solid, yield 65%, purity 98.2%, m.p. 82-83 °C. ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.50-7.45 (m, 2H, benzene H), 7.40-7.32 (m, 4H, benzene H), 7.25-7.19 (m, 2H, benzene H), 6.78 (d, *J* = 8.0 Hz, 1H, OH), 6.00 (d, *J* = 4.0 Hz, 1H, CH), 4.45 (s, 2H, CH₂); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 168.9, 163.9, 162.4 (d, *J* = 244.2 Hz), 136.2, 135.8 (d, *J* = 3.0 Hz), 132.8, 131.3, 129.1 (d, *J* = 8.4 Hz), 128.9, 115.7 (d, *J* = 21.6 Hz), 66.1, 35.4; HRMS: calcd for C₁₆H₁₂Cl₂N₂O₂S, [M+H]⁺ 367.0069, found 367.0064.



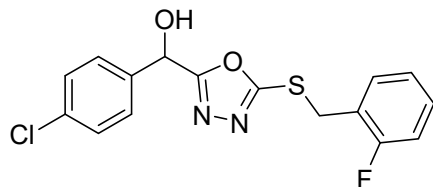
data for E₂₁: A white solid, yield 65%, purity 99.7%, m.p. 81-82 °C. ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.45 (s, 4H, benzene H), 7.29-7.26 (m, 4H, benzene H), 6.98 (s, 1H, OH), 6.00 (s, 1H, CH), 4.42 (s, 2H, CH₂); ¹³C NMR (101 MHz, DMSO-*d*₆) δ 170.1, 168.7, 163.9, 133.3, 132.3, 131.7 (d, *J* = 23.8 Hz), 131.3 (d, *J* = 9.2 Hz), 128.9 (d, *J* = 12.0 Hz), 128.3 (d, *J* = 53.7 Hz), 66.0, 35.4; HRMS: calcd for C₁₆H₁₂BrClN₂O₂S, [M+H]⁺ 410.9564, found 410.9561.



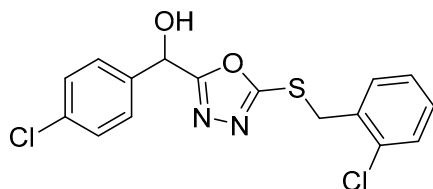
data for E₂₂: A yellow liquid, yield 47%, purity 98.5%. ¹H NMR (400 MHz, DMSO) δ 7.49-7.44 (m, 4H, phenyl H), 7.21 (d, *J* = 8.0 Hz, 1H, phenyl H), 7.18 (d, *J* = 4.0 Hz, 2H, phenyl H), 7.08-7.03 (m, 1H, phenyl H), 6.86 (d, *J* = 4.0 Hz, 1H, CHOH), 6.03 (d, *J* = 4.0 Hz, 1H, CHOH), 4.47 (s, 2H, SCH₂), 2.33 (s, 3H, CH₃); ¹³C NMR (101 MHz, DMSO) δ 168.30, 163.51, 138.13, 136.80, 133.71, 132.87, 130.51, 129.91, 128.51, 128.40, 128.24, 126.08, 65.60, 34.38, 18.75. HRMS: calcd for C₁₇H₁₅ClN₂O₂S [M+H]⁺ 347.06155, found 347.06152.



data for E₂₃: A yellow liquid, yield 47%, purity 97.5%. ¹H NMR (400 MHz, DMSO) δ 7.51-7.49 (m, 1H, phenyl H), 7.46 (s, 4H, phenyl H), 7.44-7.42 (m, 1H, phenyl H), 7.37-7.34 (m, 1H, phenyl H), 7.31-7.27 (m, 1H, phenyl H), 6.85 (d, J = 4.0 Hz, 1H, CHOH), 6.01 (d, J = 4.0 Hz, 1H, CHOH), 4.51 (s, 2H, SCH₂). ¹³C NMR (101 MHz, DMSO) δ 168.49, 163.17, 146.78, 138.08, 132.86, 131.65, 130.17, 128.52, 128.44 (d, J = 4.0 Hz), 127.42, 121.39, 120.24, 118.83, 65.59, 30.62. ¹⁹F NMR (376 MHz, DMSO) δ -55.94 (d, J = 3.8 Hz). HRMS: calcd for C₁₇H₁₂ClF₃N₂O₃S [M+H]⁺ 417.02820, found 417.02808.

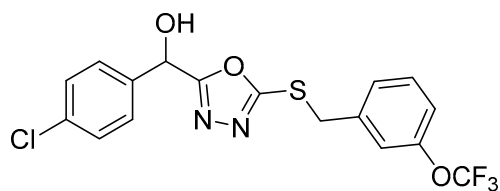


data for E₂₄: A white solid, yield 46%, purity 99.3%. ¹H NMR (400 MHz, DMSO) δ 7.49-7.44 (m, 4H, phenyl H), 7.39-7.31 (m, 2H, phenyl H), 7.20-7.15 (m, 1H, phenyl H), 7.11-7.07 (m, 1H, phenyl H), 6.86 (d, J = 4.0 Hz, 1H, CHOH), 6.02 (d, J = 4.0 Hz, 1H, CHOH), 4.48 (s, 2H, SCH₂). ¹³C NMR (101 MHz, DMSO) δ 168.45, 163.22, 161.58, 159.13, 138.07, 132.86, 131.30 (d, J = 3.0 Hz), 130.26 (d, J = 8.1 Hz), 128.44 (d, J = 9.1 Hz), 124.50 (d, J = 4.0 Hz), 123.38 (d, J = 14.1 Hz), 115.53 (d, J = 21.2 Hz), 65.60, 29.72 (d, J = 3.0 Hz). ¹⁹F NMR (376 MHz, DMSO) δ -116.67- -116.74 (m). HRMS: calcd for C₁₆H₁₂ClFN₂O₂S [M+H]⁺ 351.03648, found 351.03647.

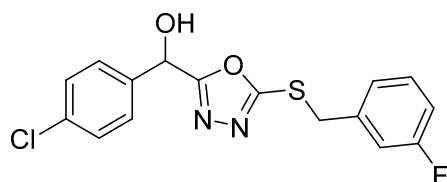


data for E₂₅: A yellow solid, yield 48%, purity 99.5%, m.p. 54-56 °C. ¹H NMR (400 MHz, DMSO) δ 7.49-7.42 (m, 6H, phenyl H), 7.34-7.30 (m, 1H, phenyl H), 7.25-7.21 (m, 1H, phenyl H), 6.87 (d, J = 4.0 Hz, 1H, CHOH), 6.03 (d, J = 4.0 Hz, 1H, CHOH), 4.53 (s, 2H, SCH₂). ¹³C NMR (101 MHz,

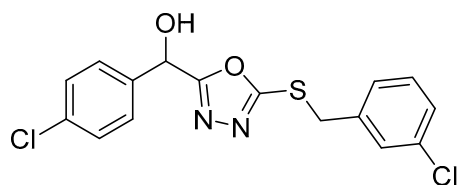
DMSO) δ 168.50, 163.21, 138.09, 133.71, 133.32, 132.89, 131.44, 130.01, 129.66, 128.50, 128.41, 127.41, 65.61, 34.20. HRMS: calcd for $C_{16}H_{12}Cl_2N_2O_2S$ $[M+H]^+$ 367.00693, found 367.00690.



data for E₂₆: A yellow liquid, yield 39%, purity 99.6%. 1H NMR (400 MHz, DMSO) δ 7.47-7.42 (m, 4H, phenyl H), 7.40-7.37 (m, 3H, phenyl H), 7.26 (d, J = 8.0 Hz, 1H, phenyl H), 6.85 (d, J = 4.0 Hz, 1H, CHOH), 6.01 (d, J = 4.0 Hz, 1H, CHOH), 4.51 (s, 2H, SCH₂). ^{13}C NMR (101 MHz, DMSO) δ 168.34, 163.51, 148.27 (q, J = 2.0 Hz), 139.58, 138.09, 132.87, 130.46, 128.47, 128.37, 128.09, 121.46, 120.24, 118.77, 65.58, 34.94. ^{19}F NMR (376 MHz, DMSO) δ -56.78 (s). HRMS: calcd for $C_{17}H_{12}ClF_3N_2O_3S$ $[M+H]^+$ 417.02820, found 417.02814.



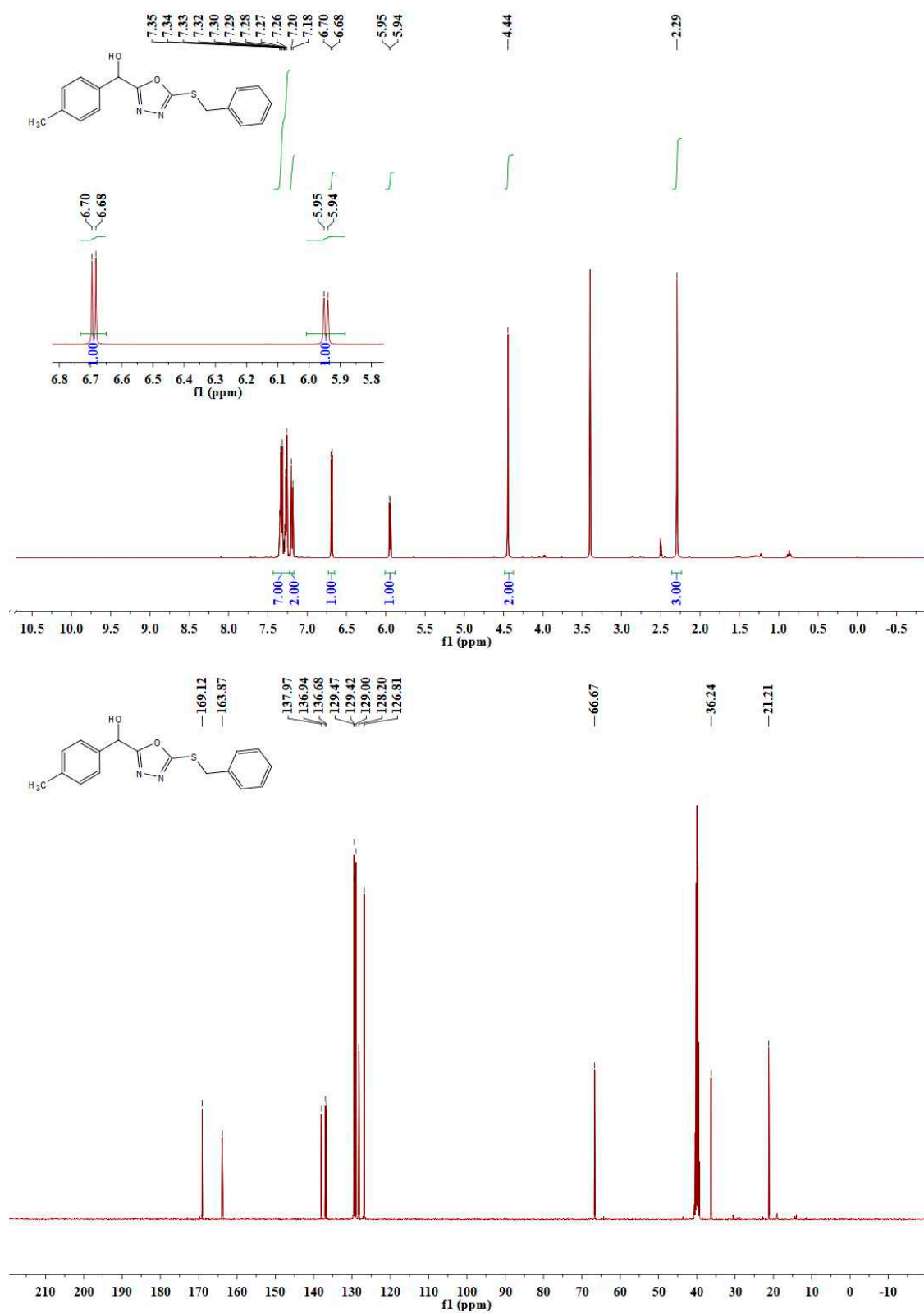
data for E₂₇: A yellow liquid, yield 49%, purity 98.7%. 1H NMR (400 MHz, DMSO) δ 7.48-7.43 (m, 4H, phenyl H), 7.34-7.29 (m, 1H, phenyl H), 7.24-7.17 (m, 2H, phenyl H), 7.12-7.09 (m, 1H, phenyl H), 6.85 (d, J = 4.0 Hz, 1H, CHOH), 6.02 (d, J = 4.0 Hz, 1H, CHOH), 4.47 (s, 2H, SCH₂). ^{13}C NMR (101 MHz, DMSO) δ 168.32, 163.53, 163.16, 160.73, 139.47 (d, J = 8.1 Hz), 138.08, 132.86, 130.47 (d, J = 8.1 Hz), 128.42 (d, J = 11.1 Hz), 125.09 (d, J = 2.0 Hz), 115.77 (d, J = 22.2 Hz), 114.63 (d, J = 21.2 Hz), 65.57, 35.10 (d, J = 1.0 Hz). ^{19}F NMR (376 MHz, DMSO) δ -112.87 - -112.99 (m). HRMS: calcd for $C_{16}H_{12}FN_2O_2S$ $[M+H]^+$ 351.03648, found 351.03647.



data for E₂₈: A yellow liquid, yield 47%, purity 99.6%. 1H NMR (400 MHz, DMSO) δ 7.48-7.43 (m, 5H, phenyl H), 7.34-7.29 (m, 3H, phenyl H), 6.86 (d, J = 4.0 Hz, 1H, CHOH), 6.01 (d, J = 4.0 Hz, 1H, CHOH), 4.46 (s, 2H, SCH₂). ^{13}C NMR (101 MHz, DMSO) δ 168.33, 163.52, 139.25, 138.07,

133.01, 132.87, 130.34, 128.83, 128.49, 128.37, 127.72, 127.66, 65.58, 34.98. HRMS: calcd for $\text{C}_{16}\text{H}_{12}\text{Cl}_2\text{N}_2\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$ 367.00693, found 367.00693.

2. Copies of ^1H , ^{13}C NMR, ^{19}F NMR, HRMS and HPLC of the title compounds



2018121406 #79 RT: 0.81 AV: 1 NL: 4.91E5
T: FTMS+pESFull.ms [100.0000-1000.0000]

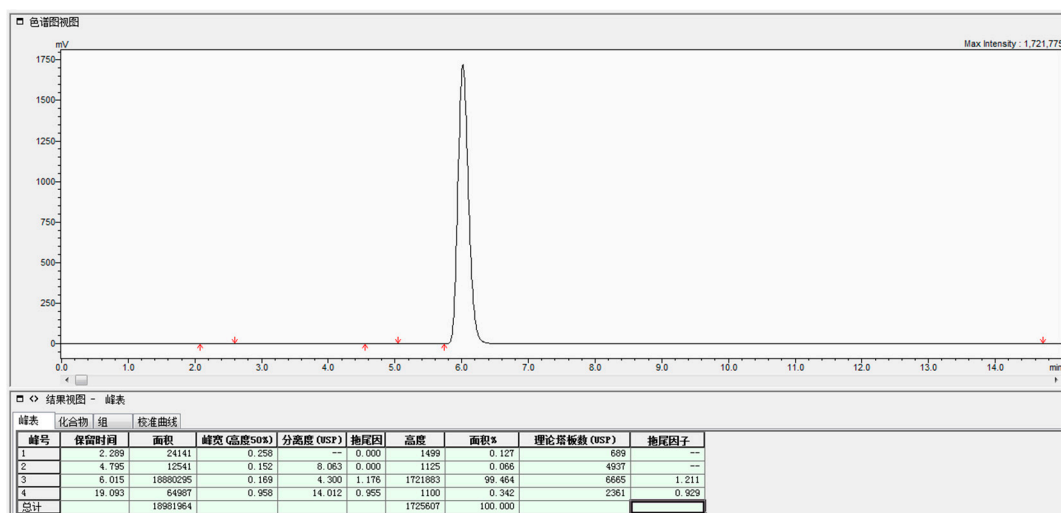
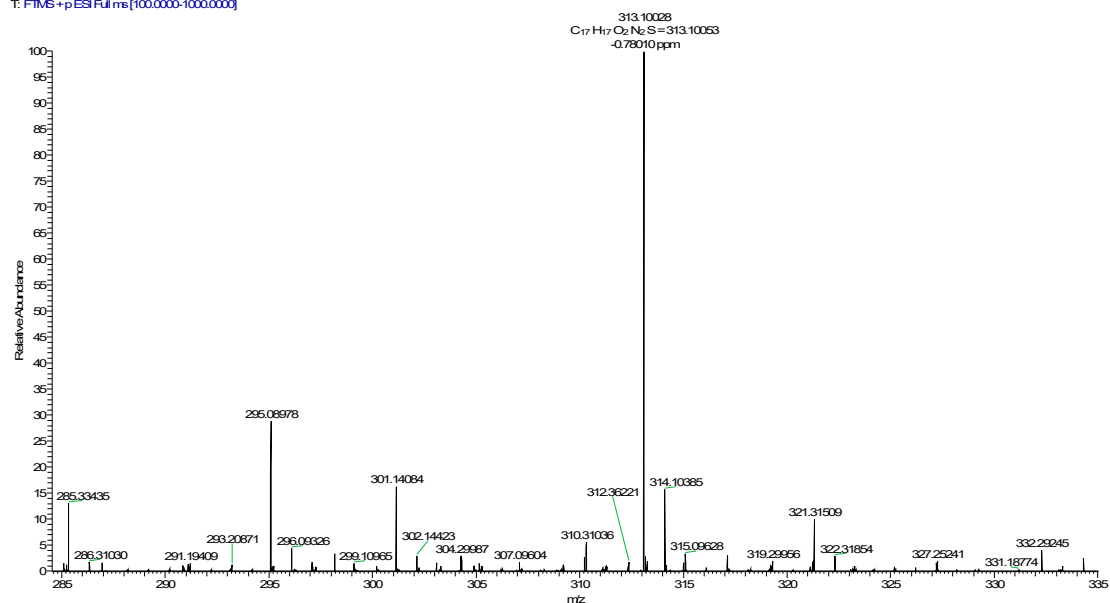
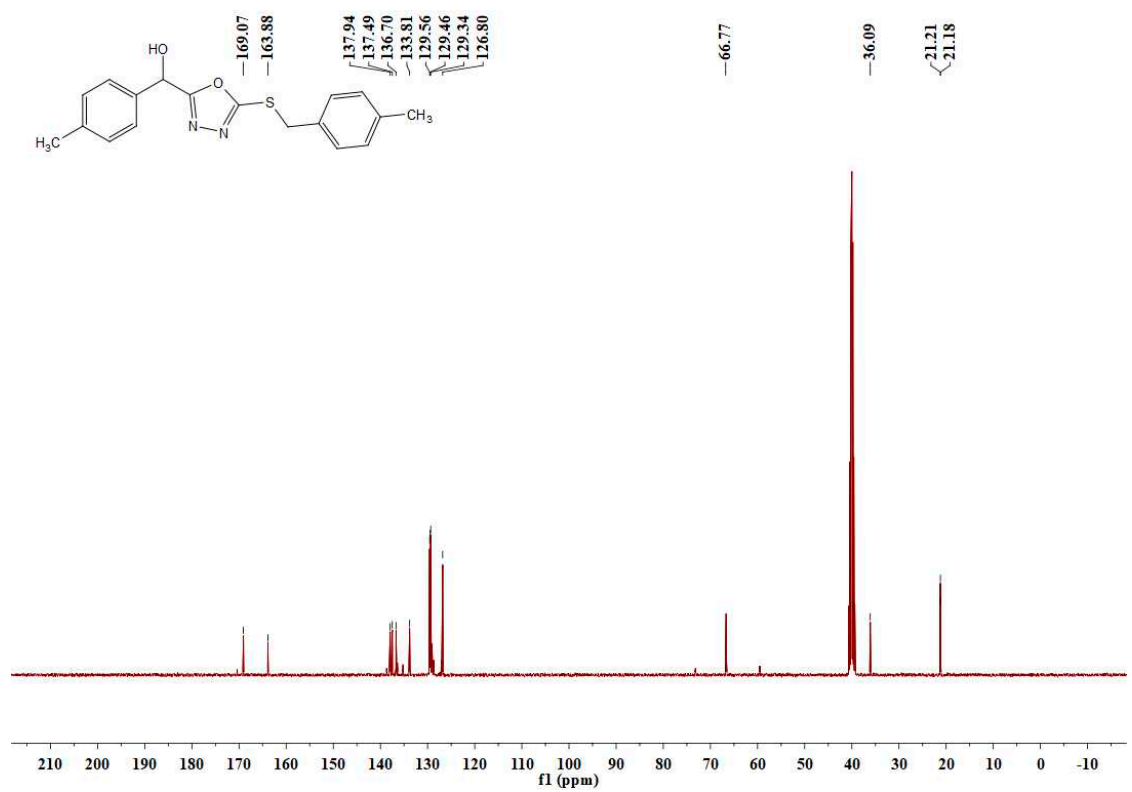
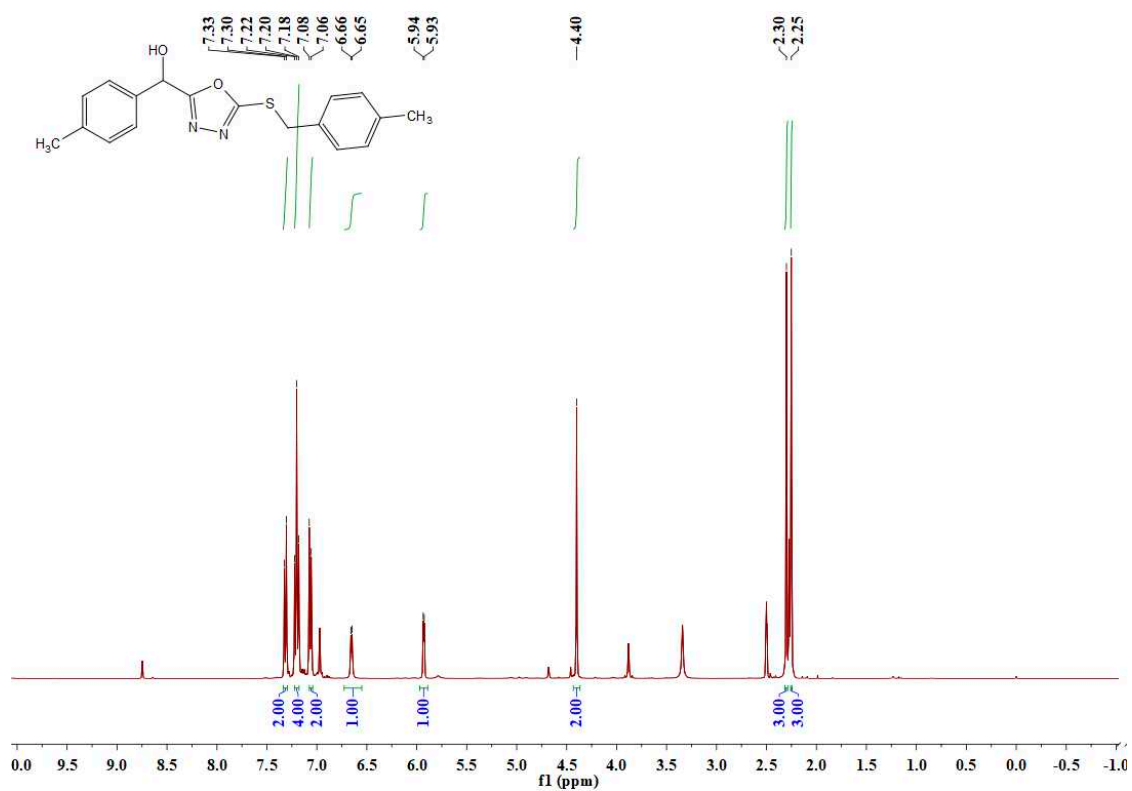


Figure S1. ^1H NMR, ^{13}C NMR, HRMS, and HPLC for **E₁**.



20181205121#85 RT: 0.85 AV: 1 NL: 6.49E6
T: FTMS+pESI Full ms [100.0000-1000.0000]

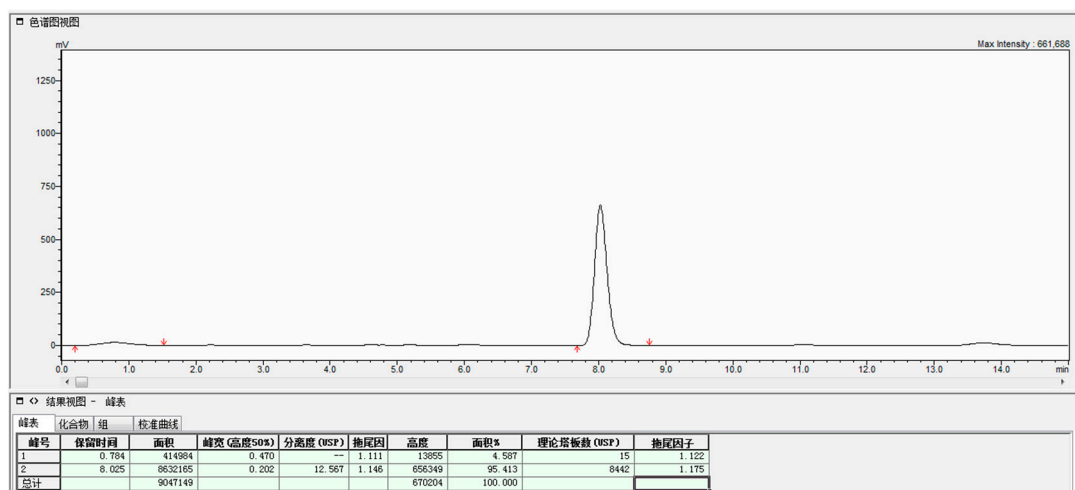
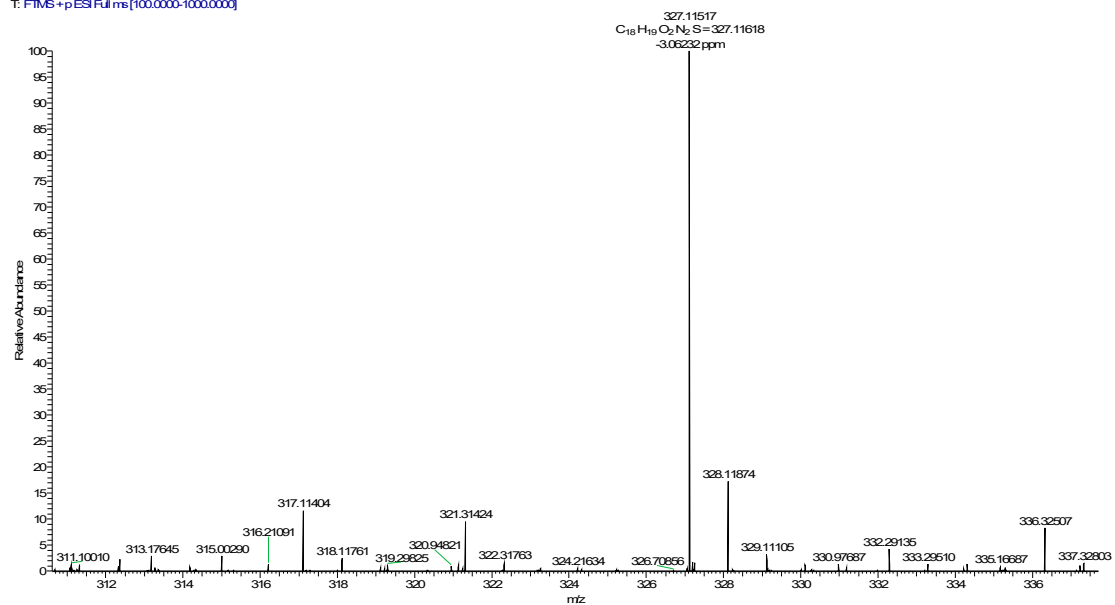
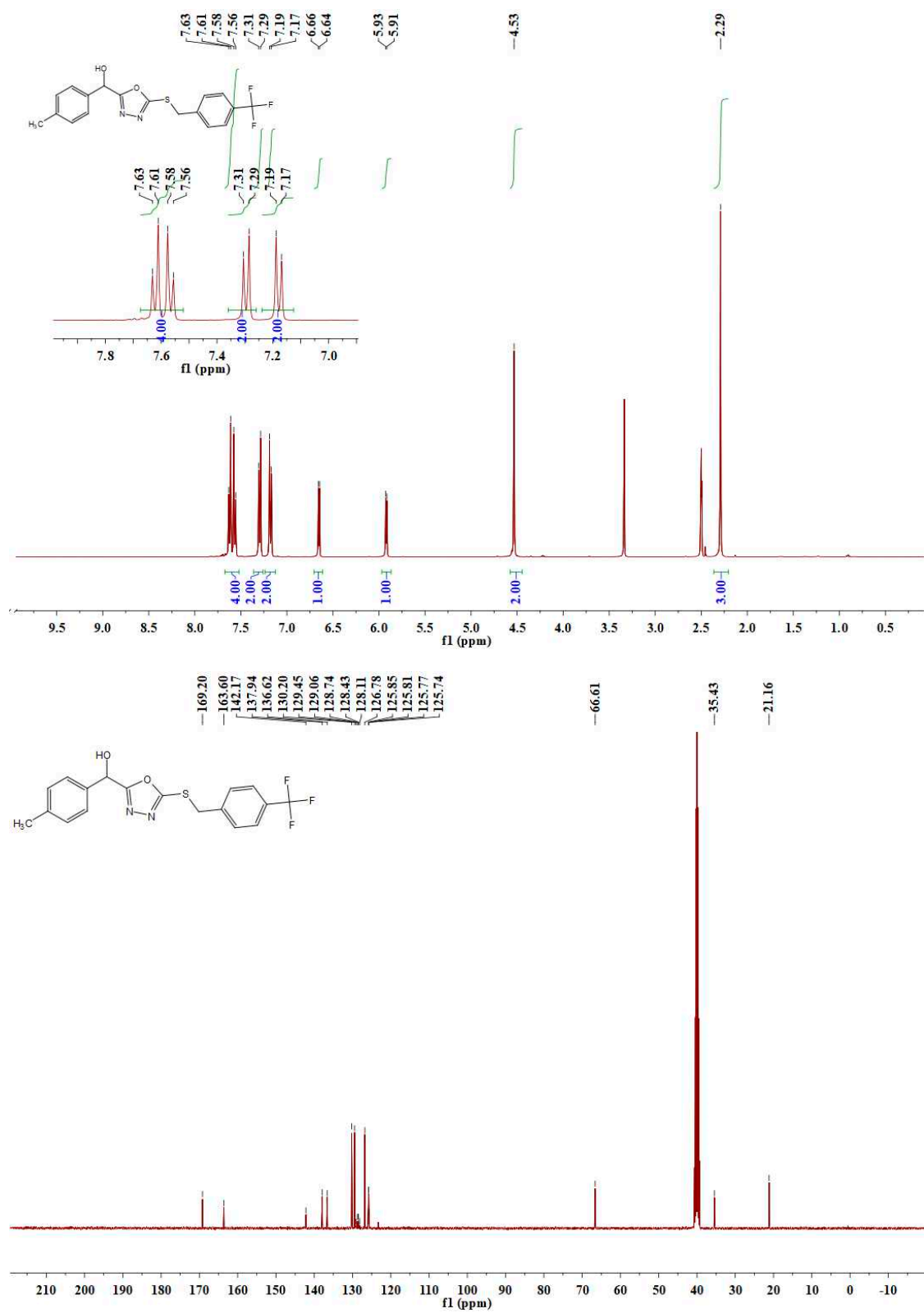
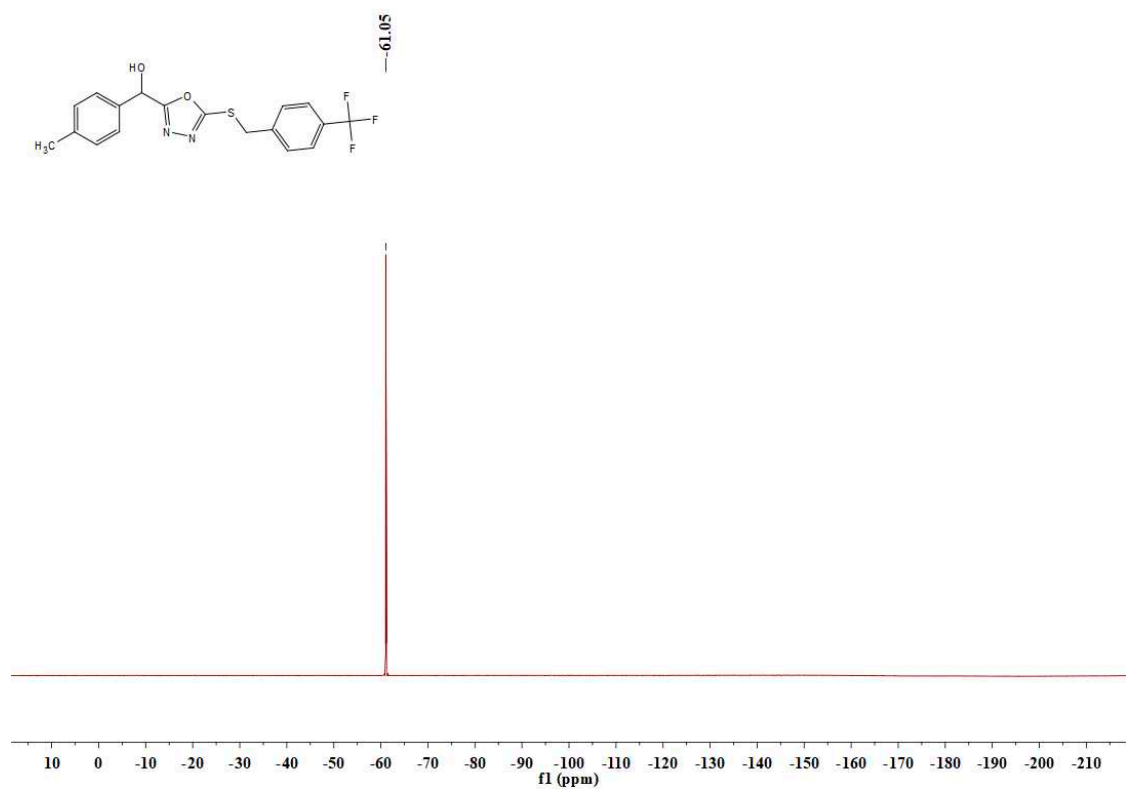
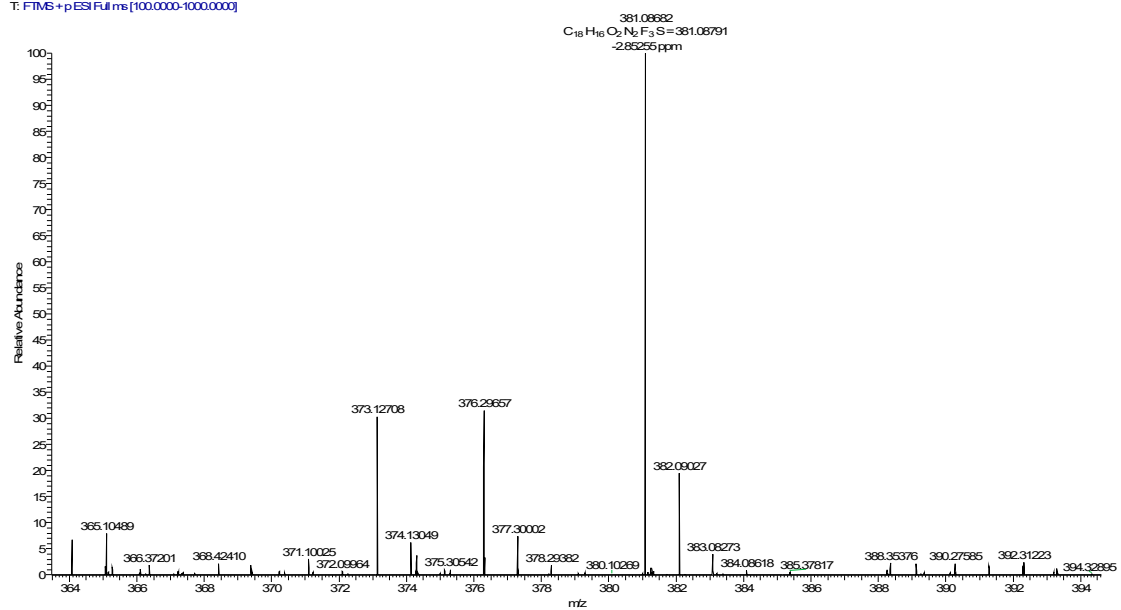


Figure S2. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for E2.





20181205116#79 RT: 0.78 AV: 1 NL: 3.00E7
T: FTMS+pESI Full ms [100.0000-1000.0000]



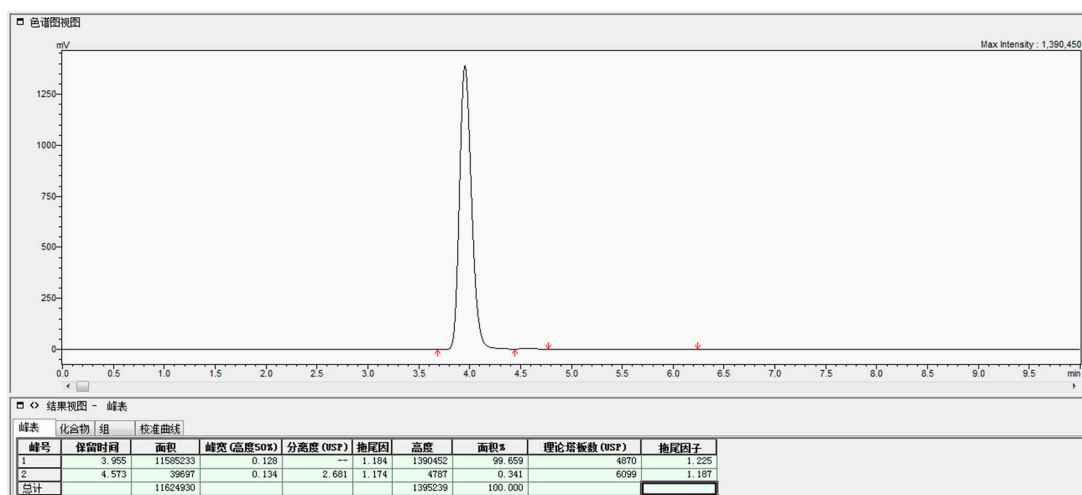
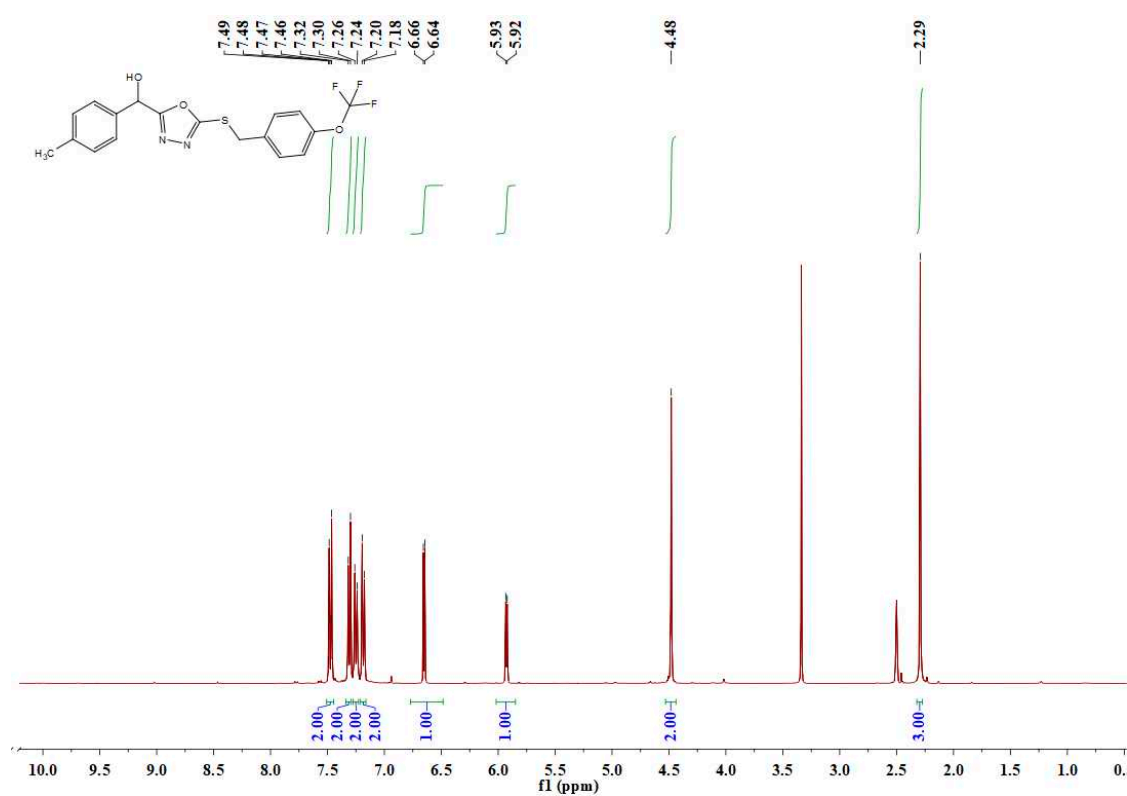
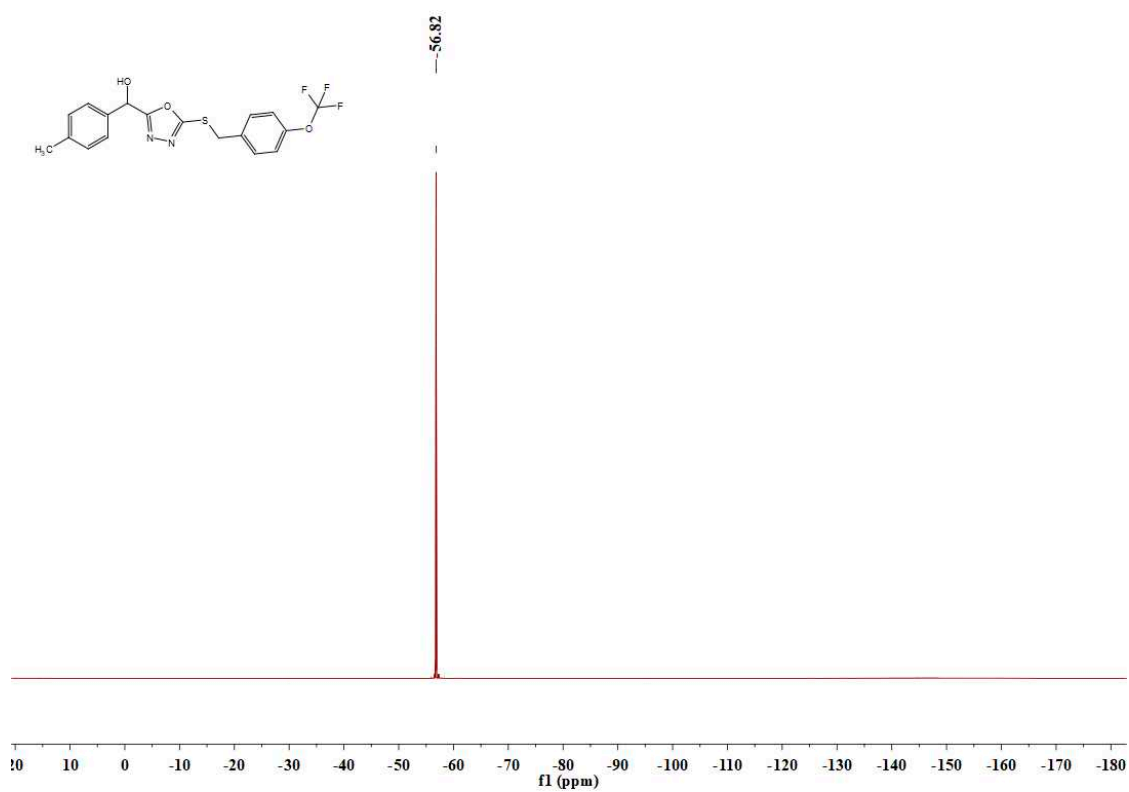
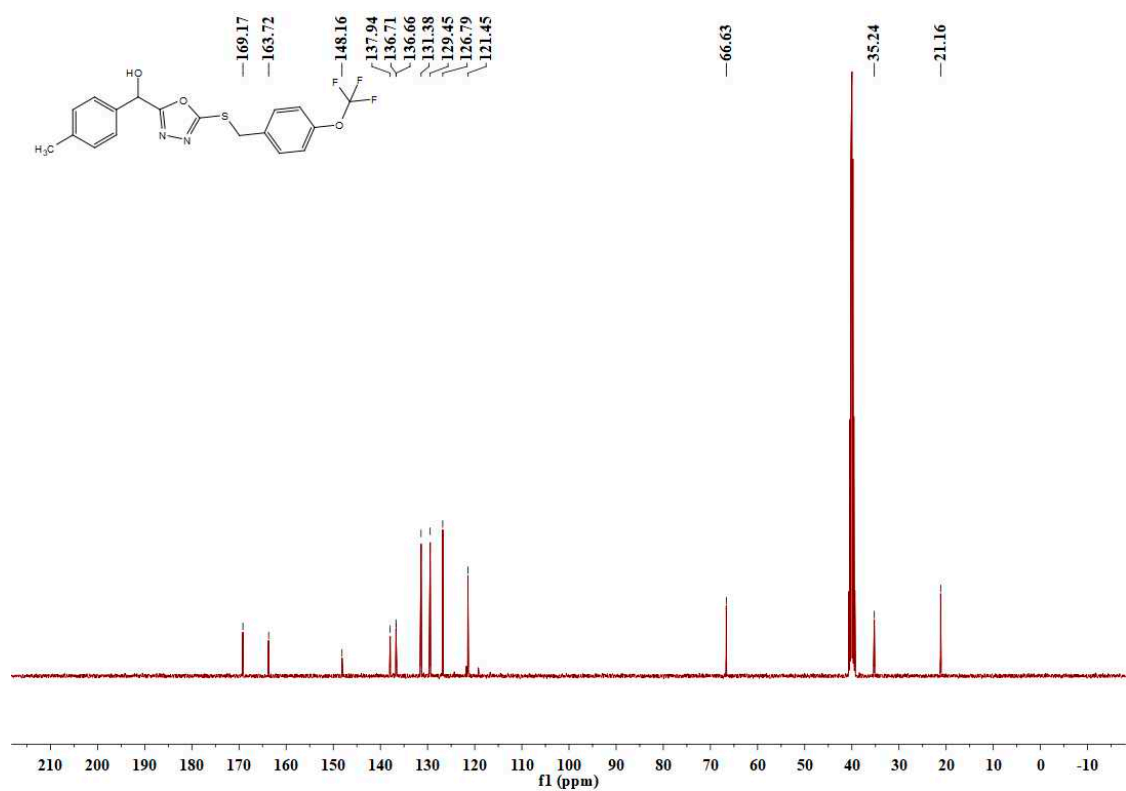


Figure S3. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for of **E3**.





20181205118#77 RT: 0.75 AV: 1 NL: 3.96E7
T: FTMS+pESI Full ms [100.0000-1000.0000]

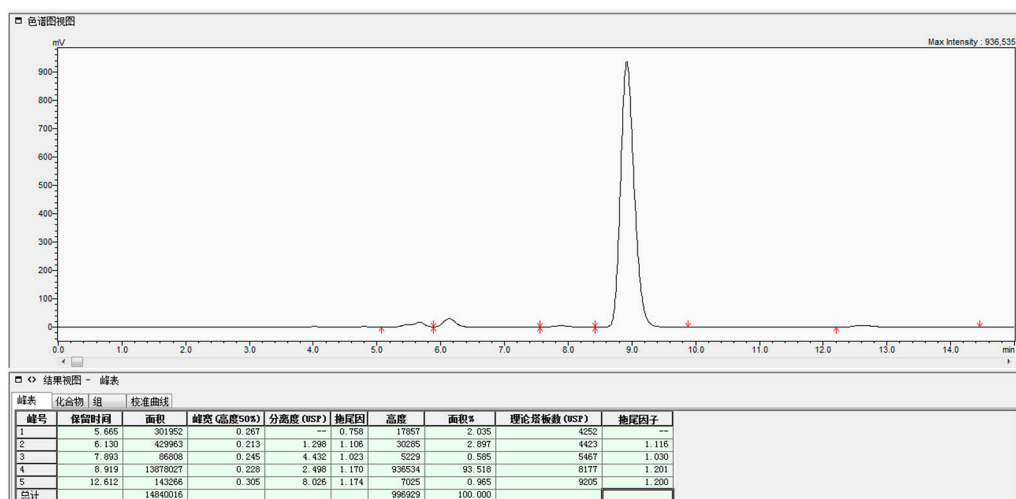
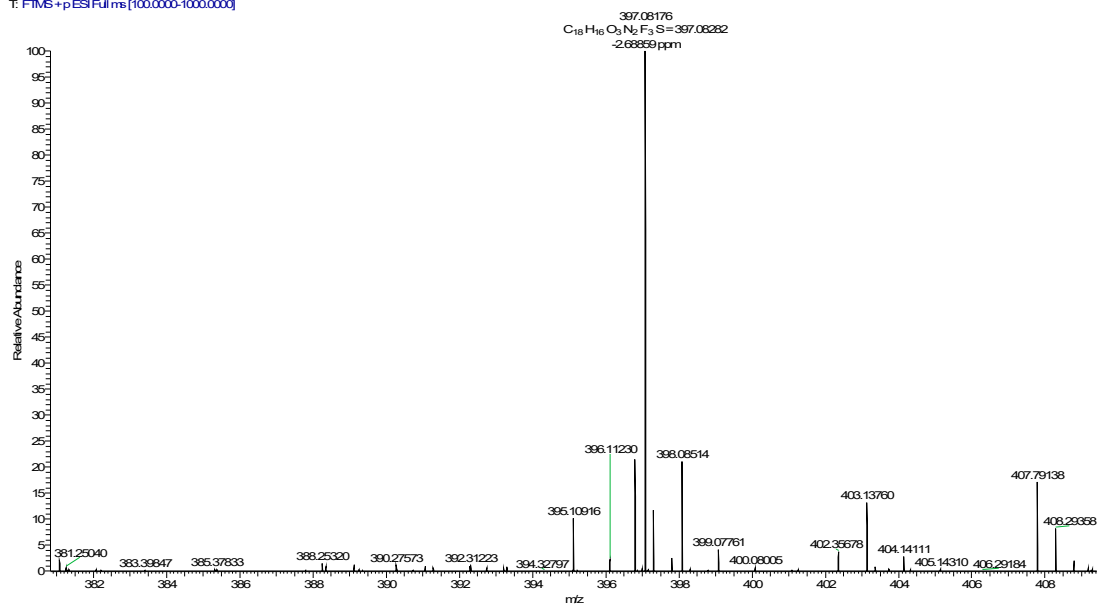
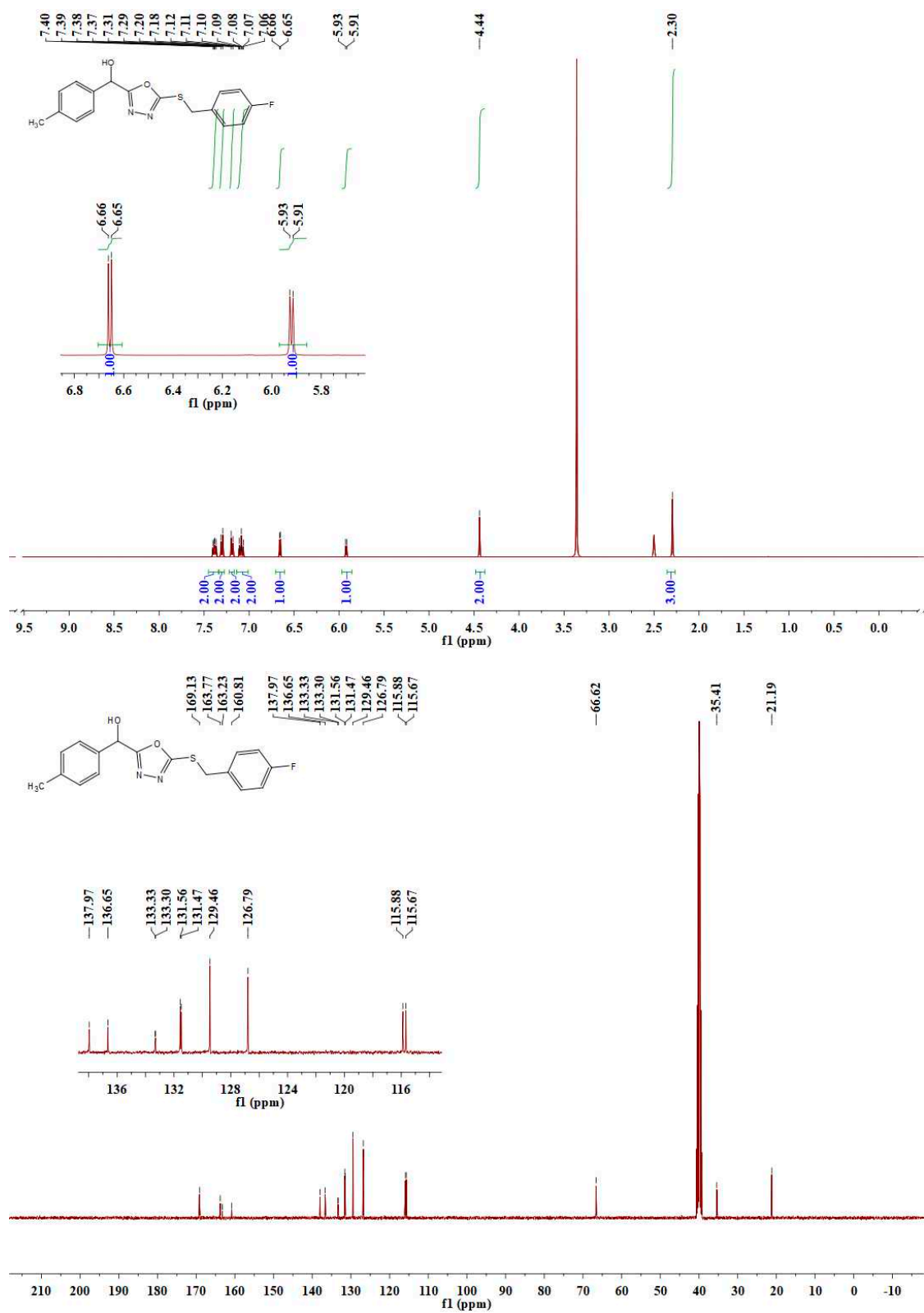
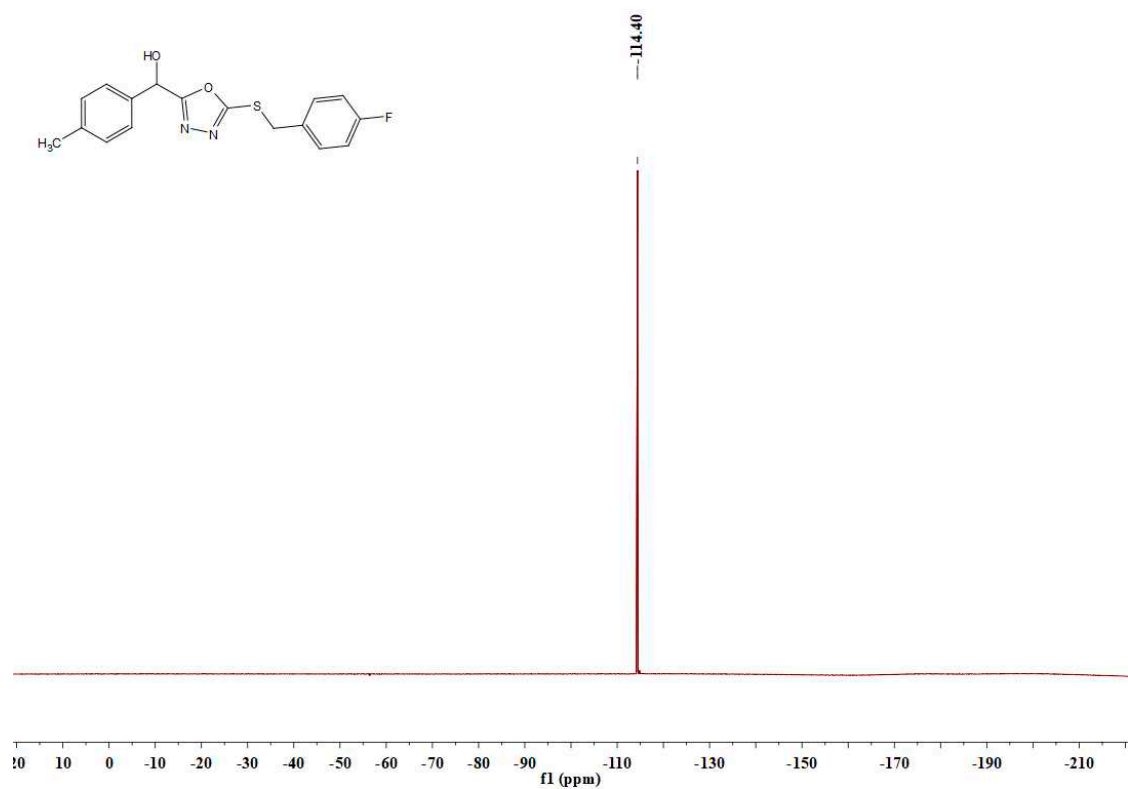
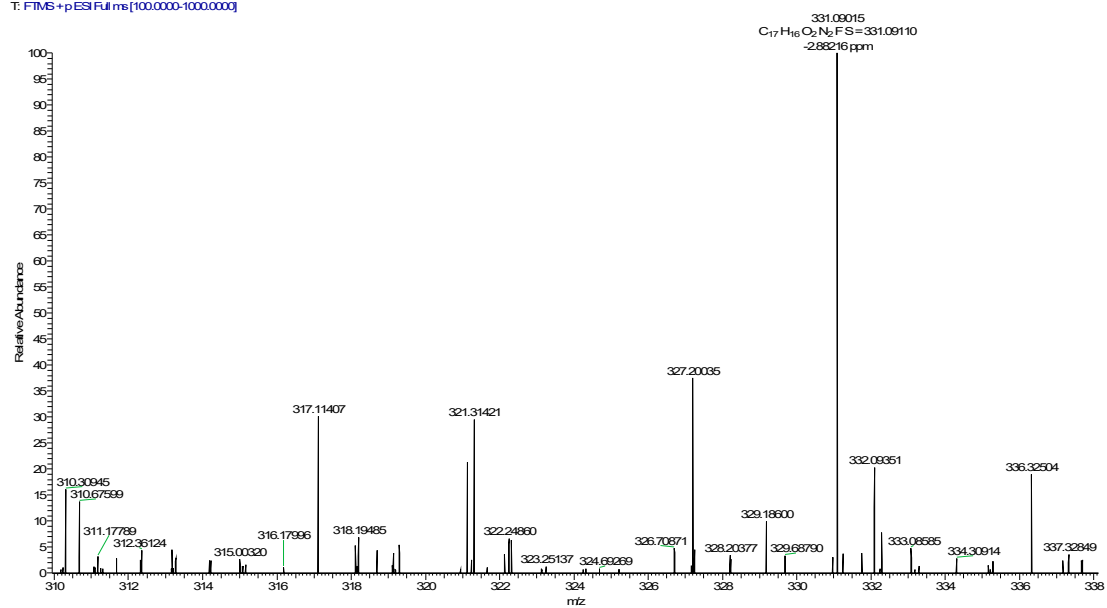


Figure S4. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for of E4.





20181205117 #69 RT: 0.69 AV: 1 NL: 2.4256
T: FIMS+pESI Full ms [100.0000-1000.0000]



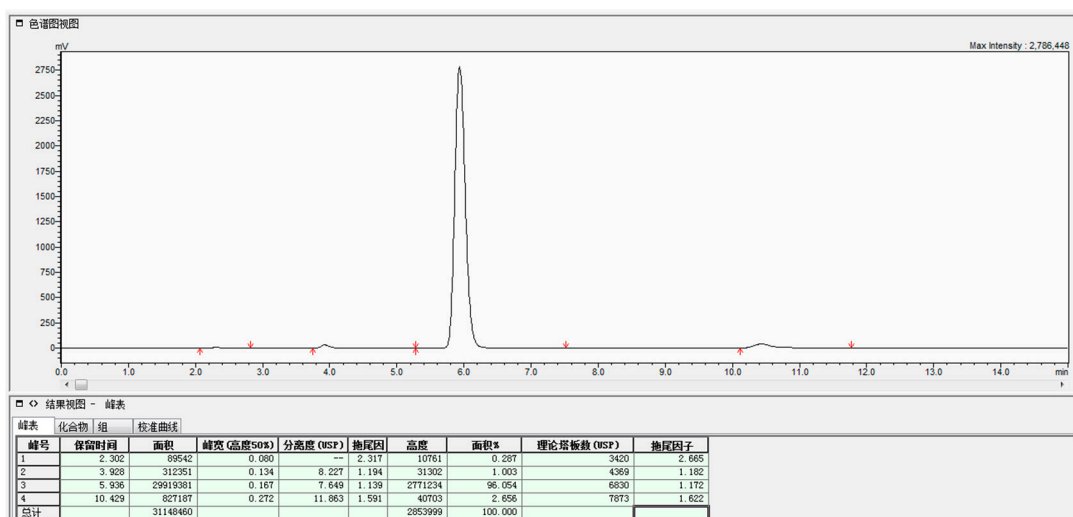
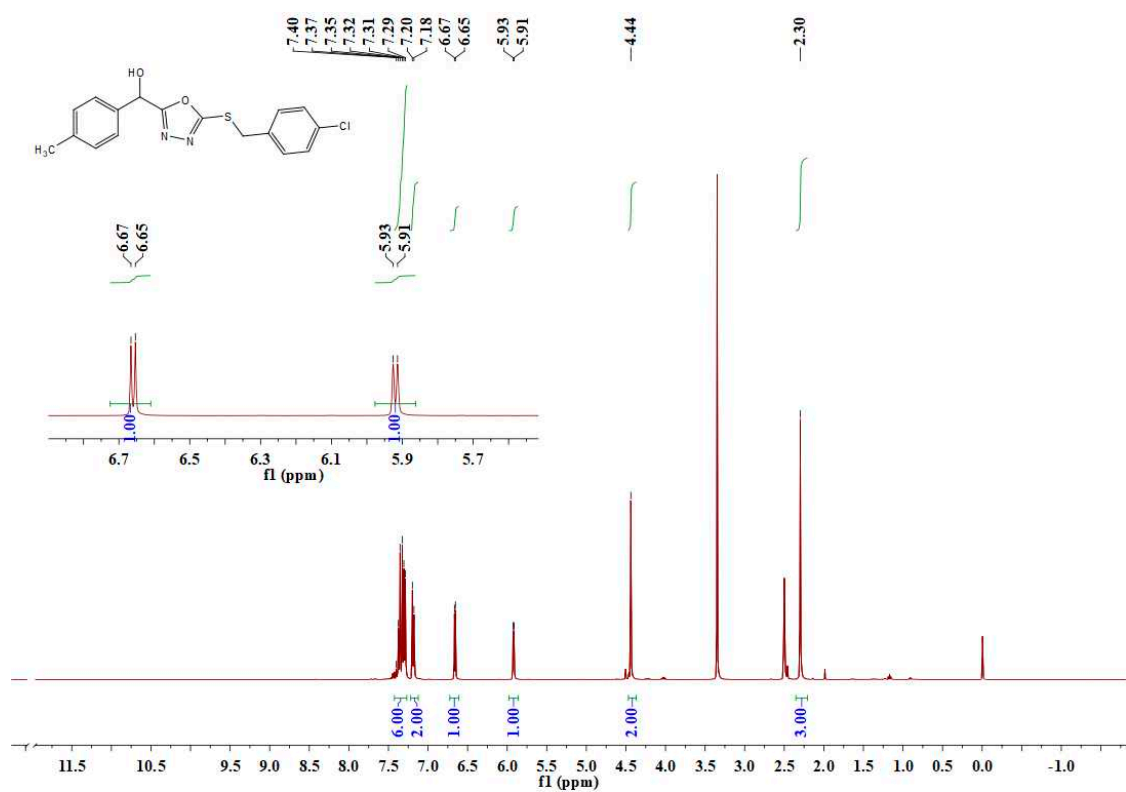
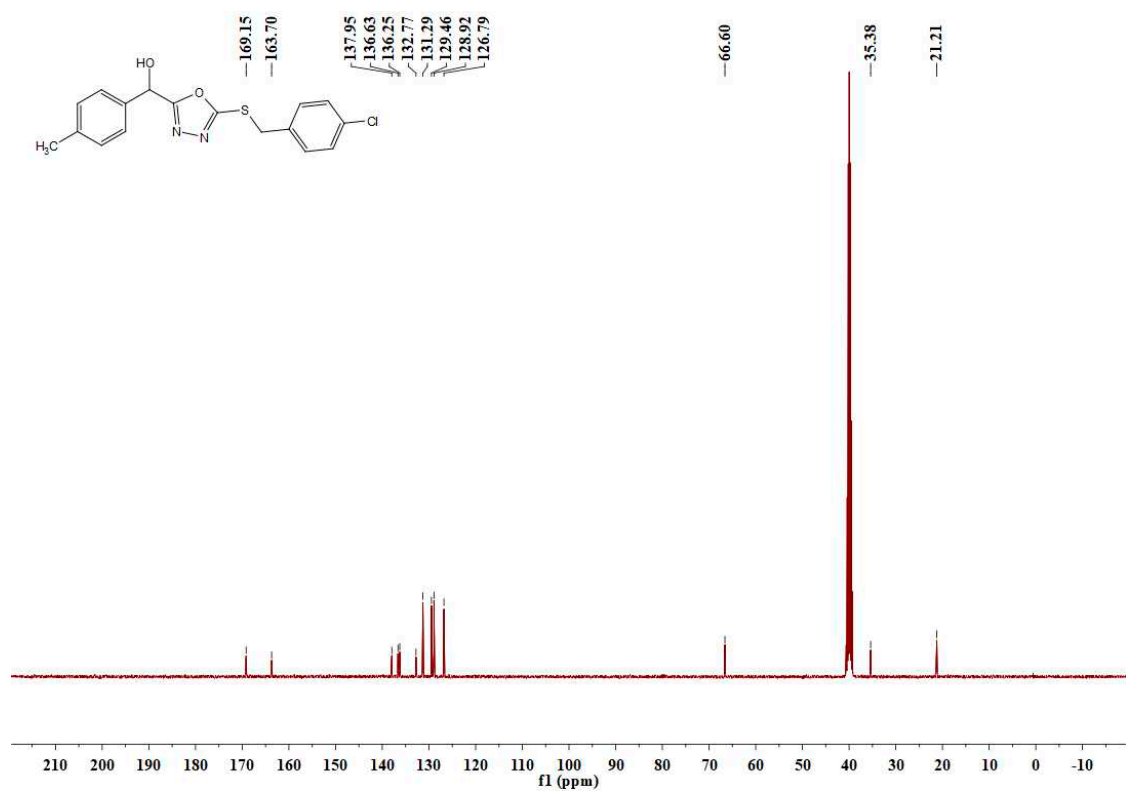
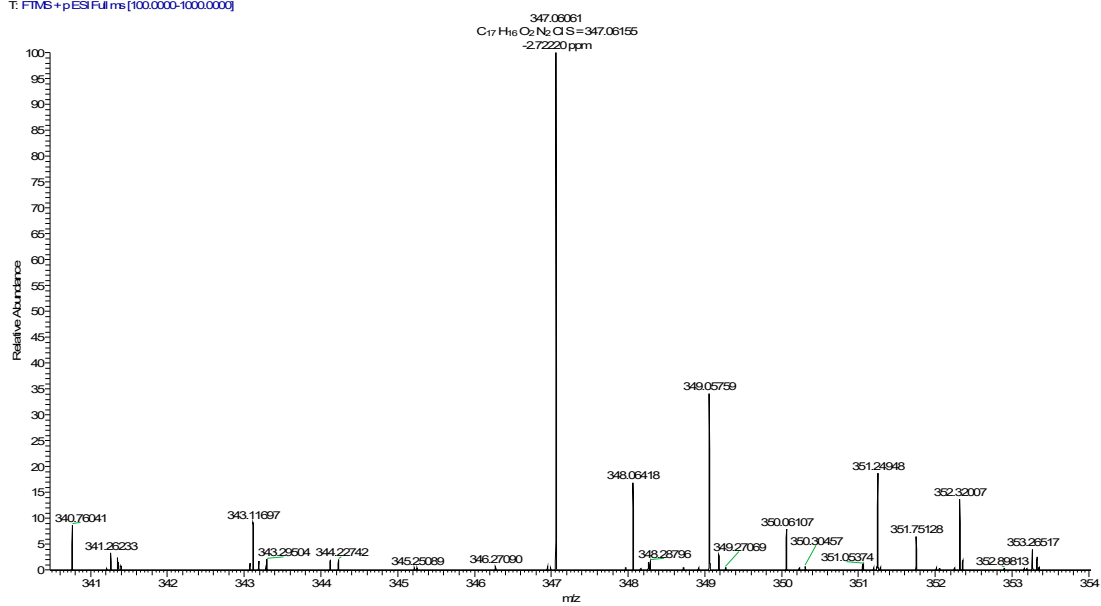


Figure S5. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E5**.





20181205119 #89 RT: 0.89 AV: 1 NL: 2.82E6
T: FTMS+pESI Full ms [100.0000-1000.0000]



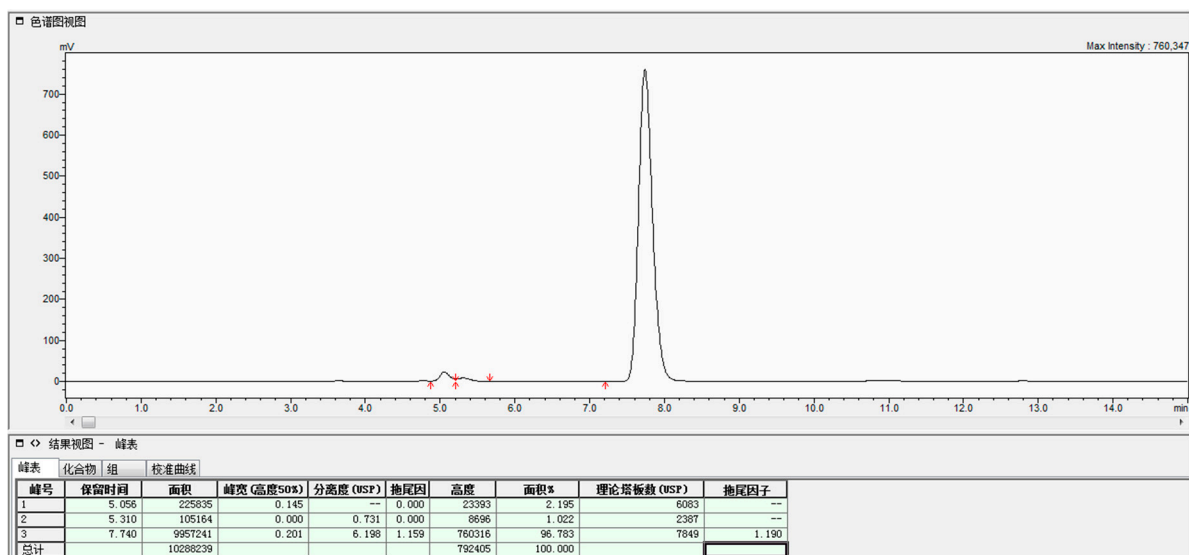
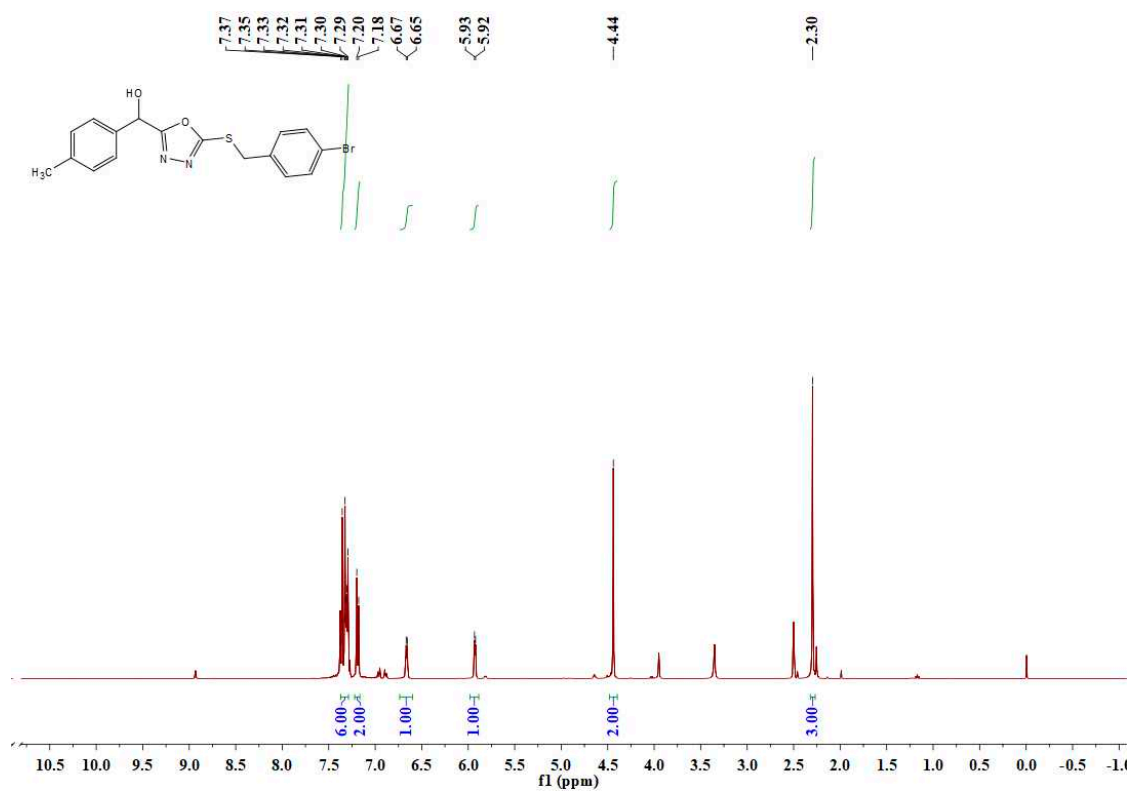
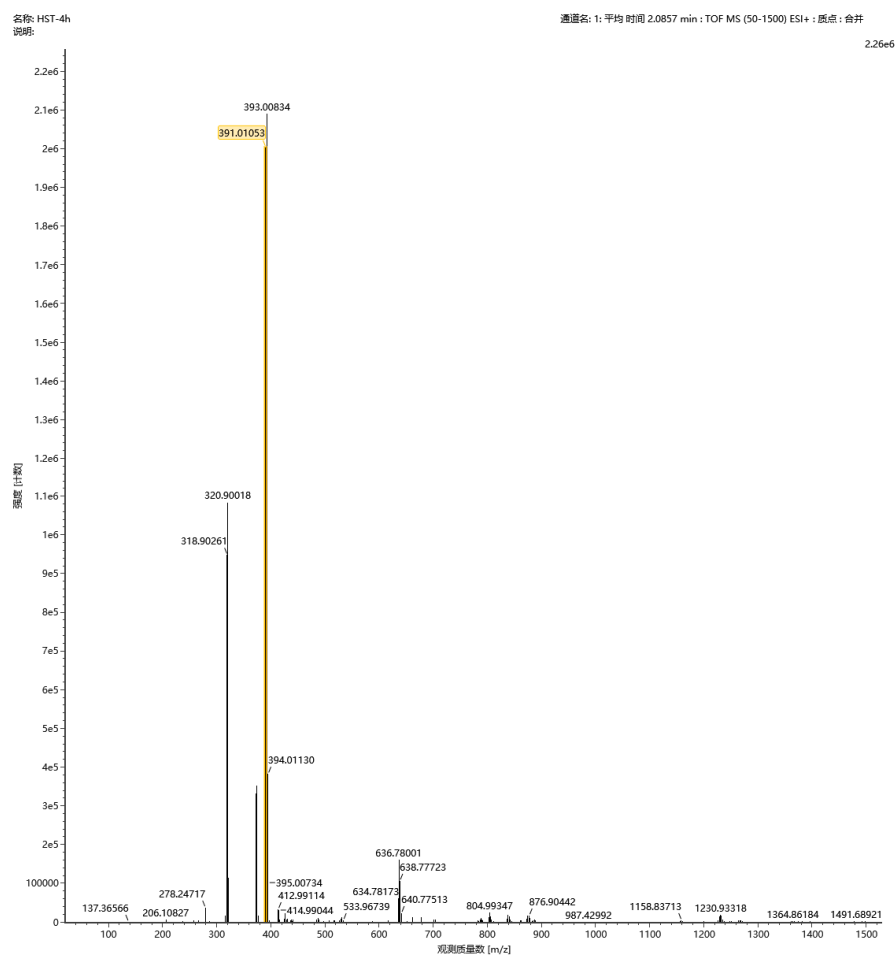
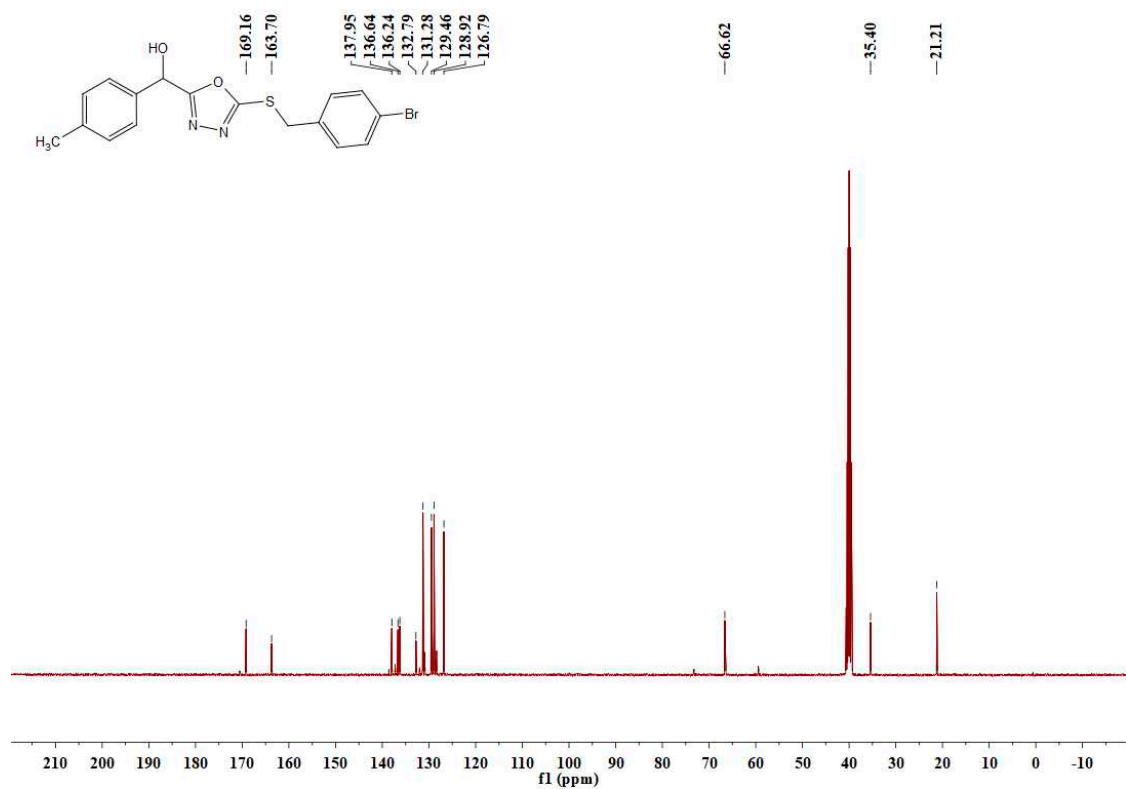


Figure S6. ^1H NMR, ^{13}C NMR, HRMS, and HPLC for E6.





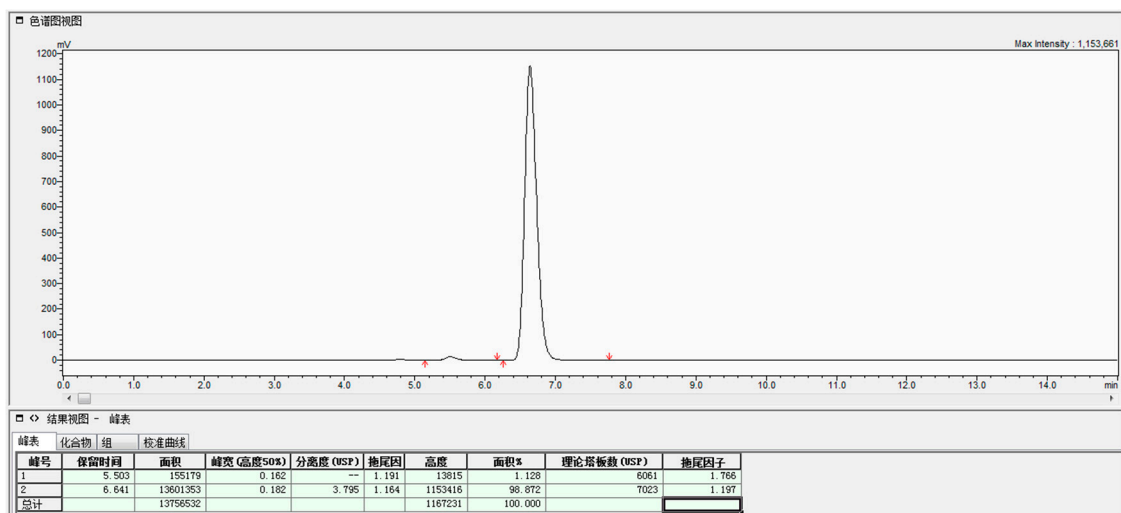
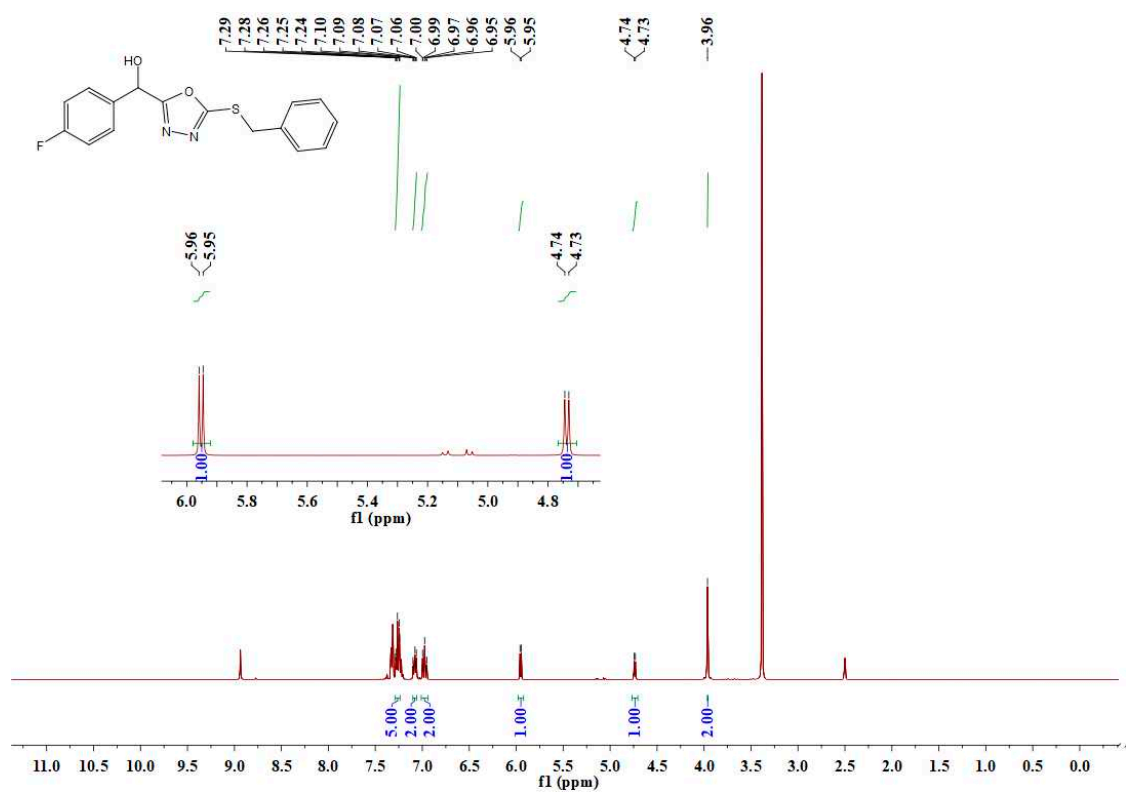
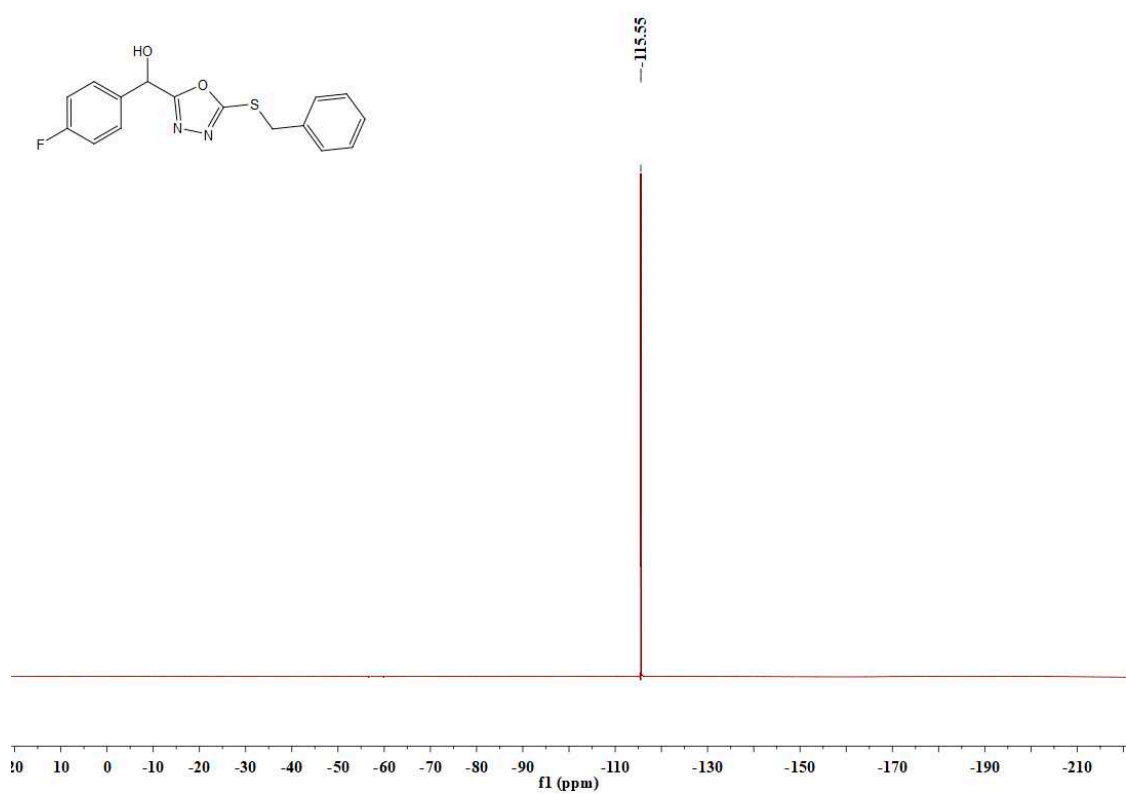
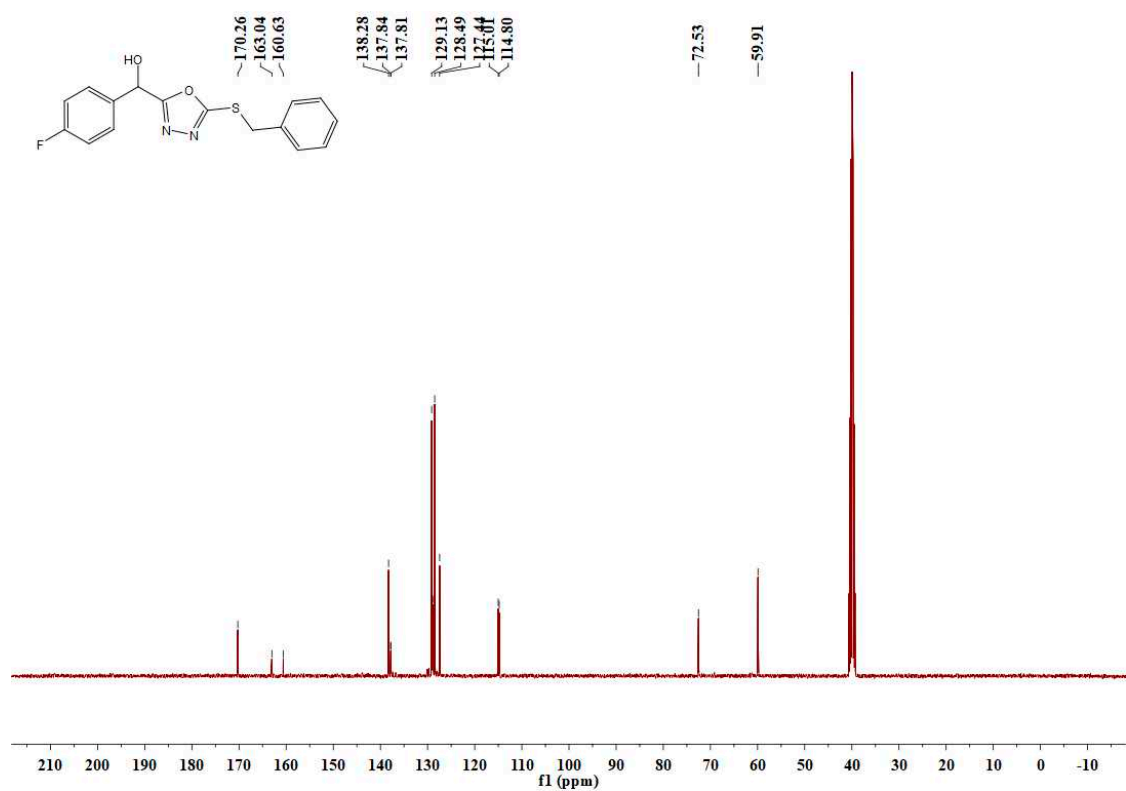


Figure S7. ^1H NMR, ^{13}C NMR, HRMS, and HPLC for E7.





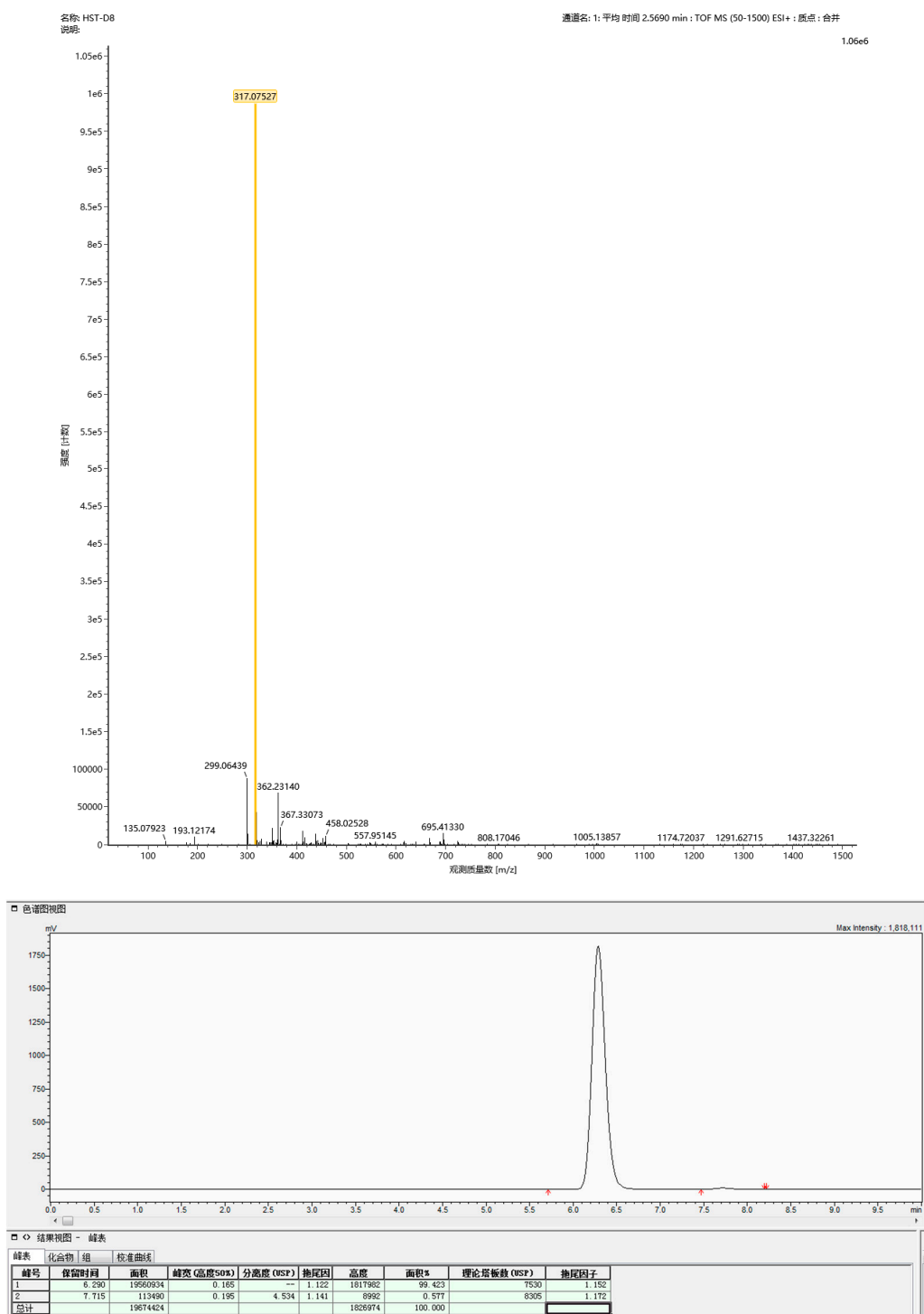
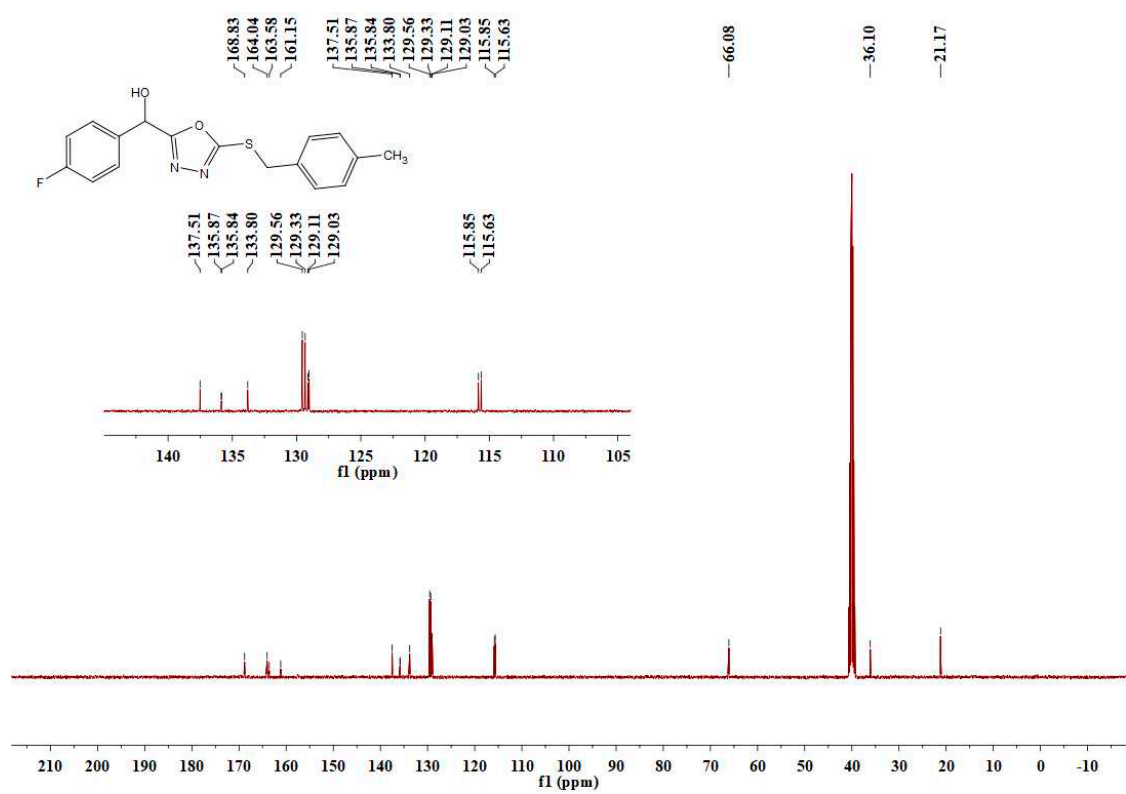
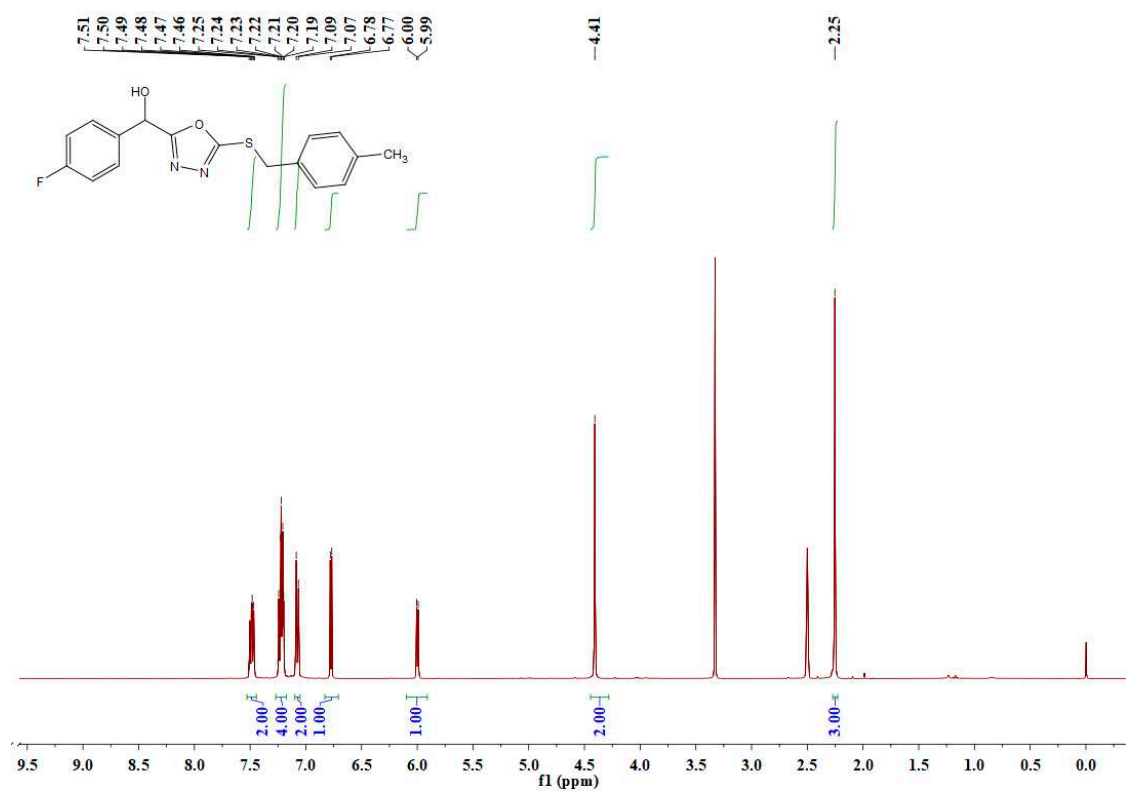
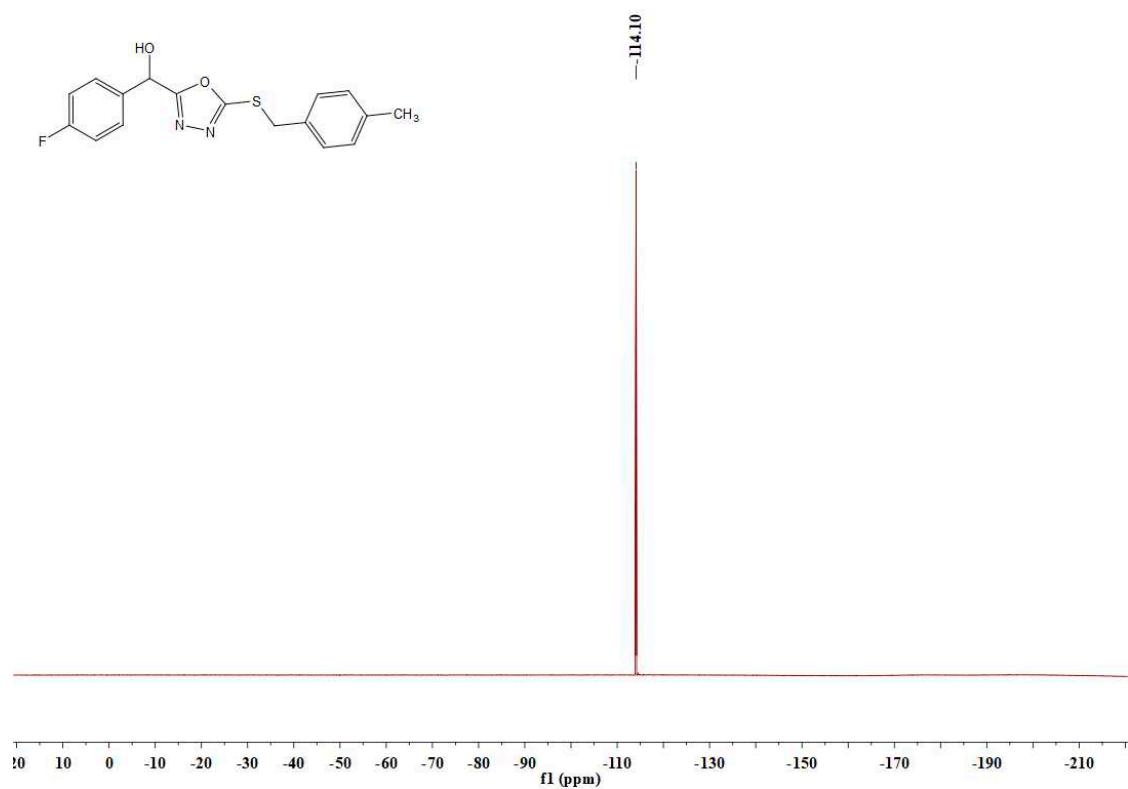
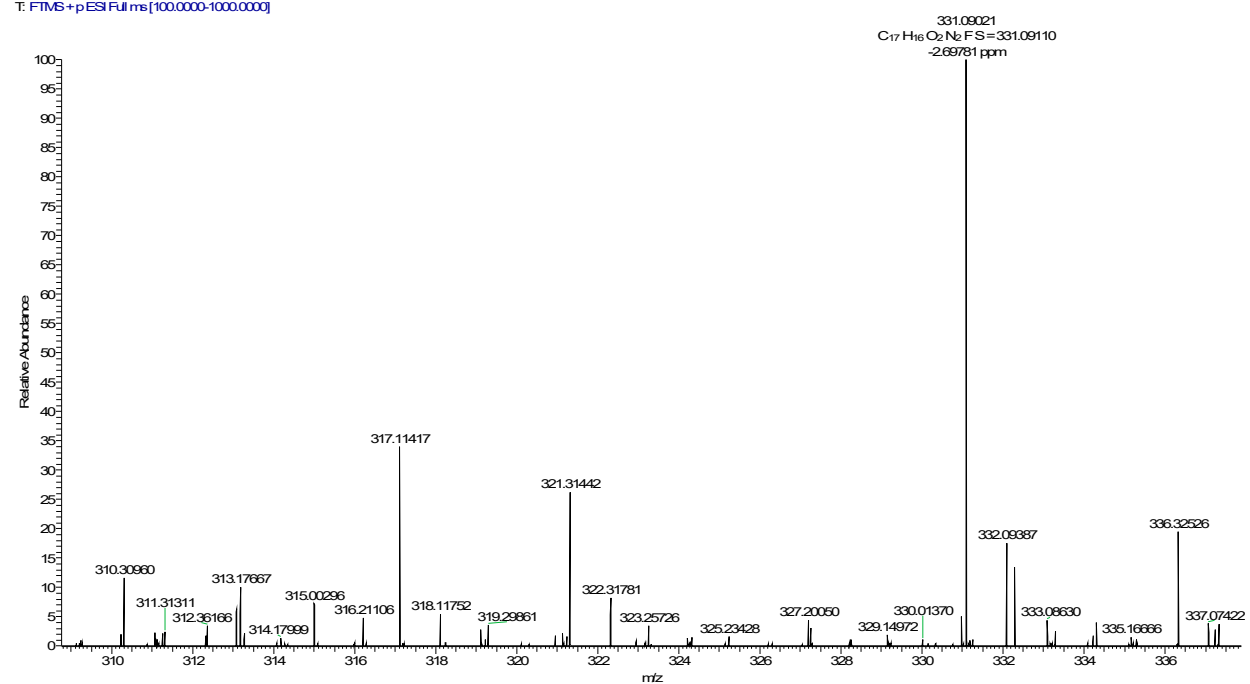


Figure S8. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E8**.





20181205108 #79 RT: 0.78 AV: 1 NL: 5.30E6
T: FTMS+pESI Fullms[100.0000-1000.0000]



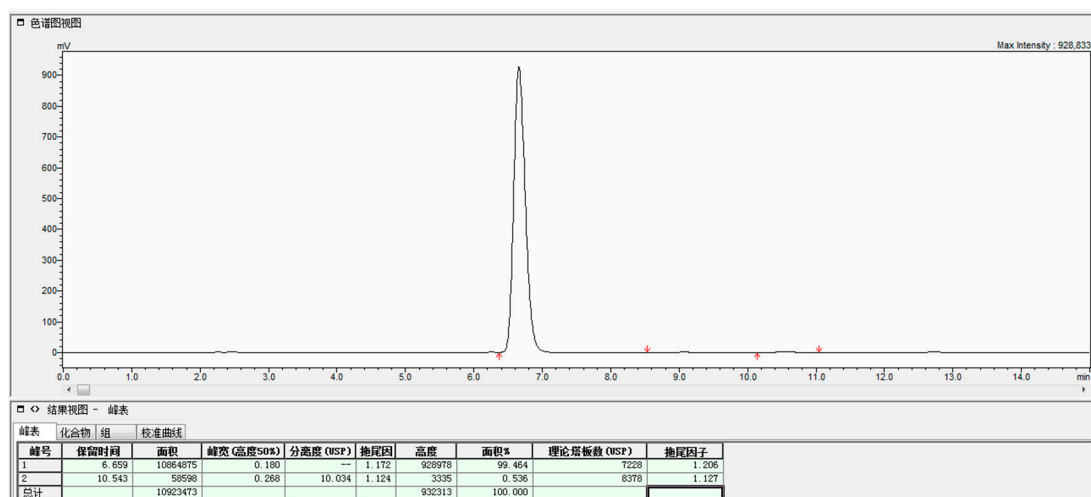
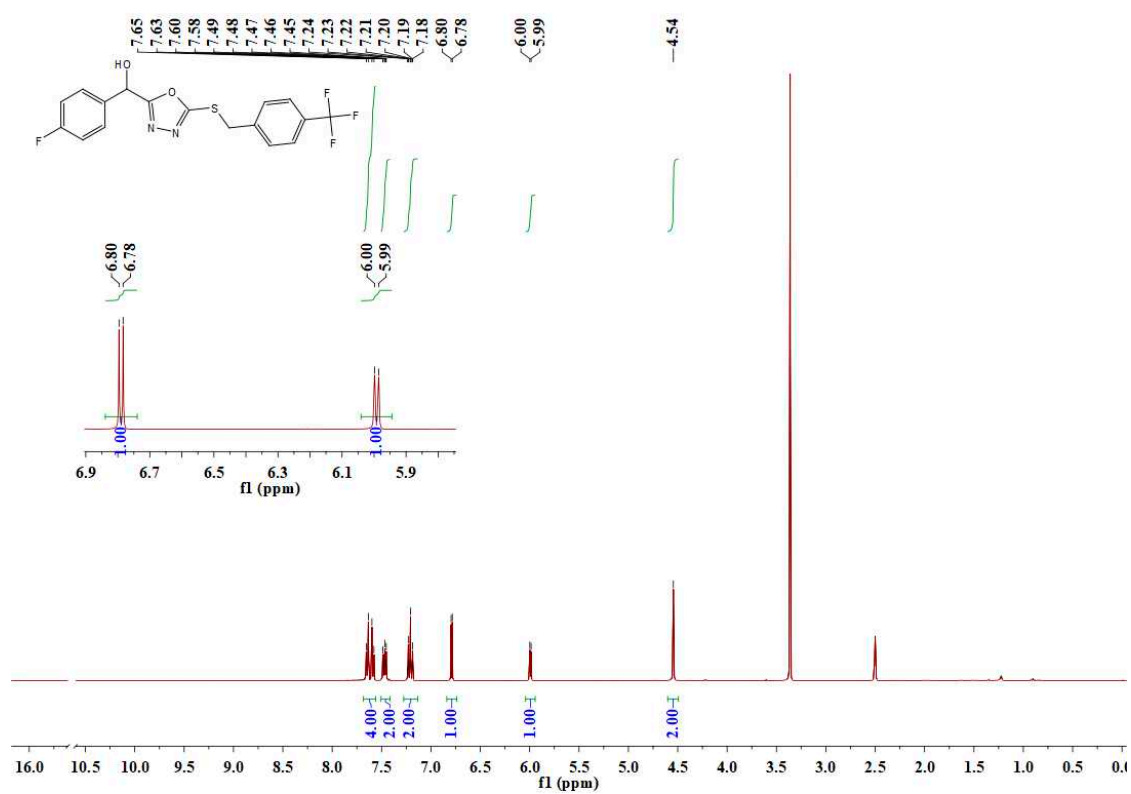
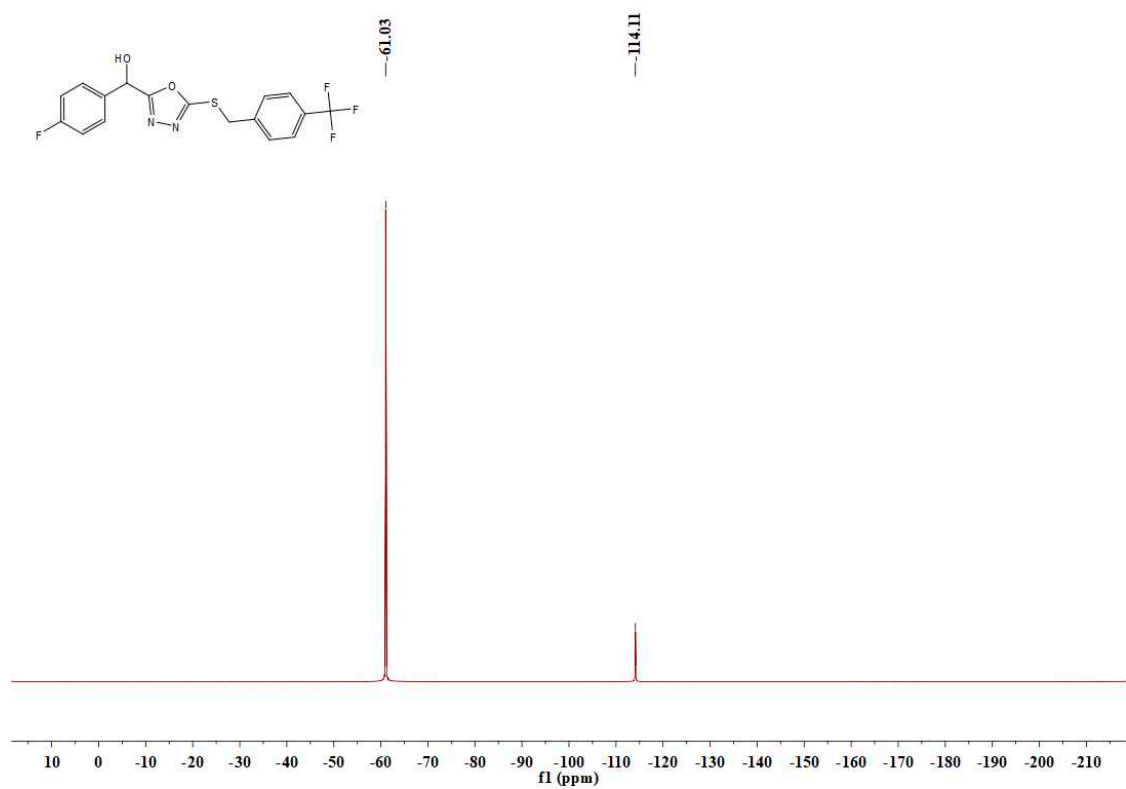
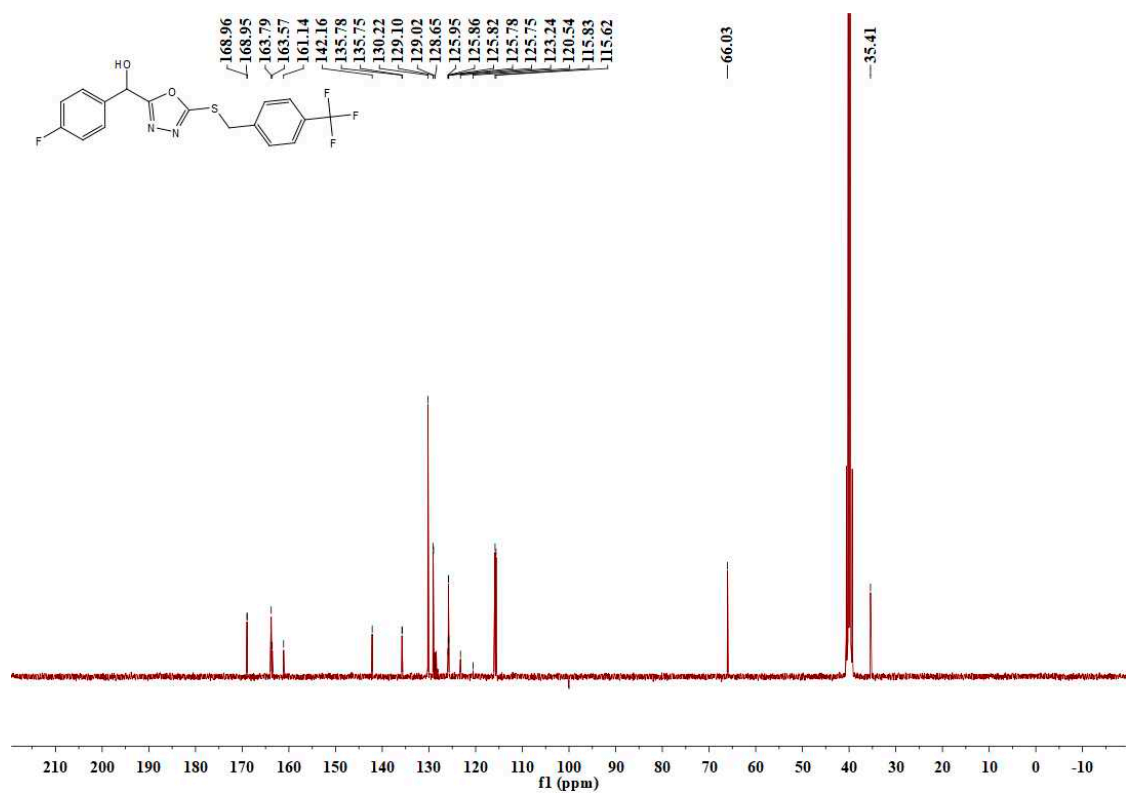


Figure S9. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for E9.





2018041706 #97 RT: 0.93 AV: 1 NL: 7.83E5
T: FTMS+p.ESSIFull.ms[100.0000-1000.0000]

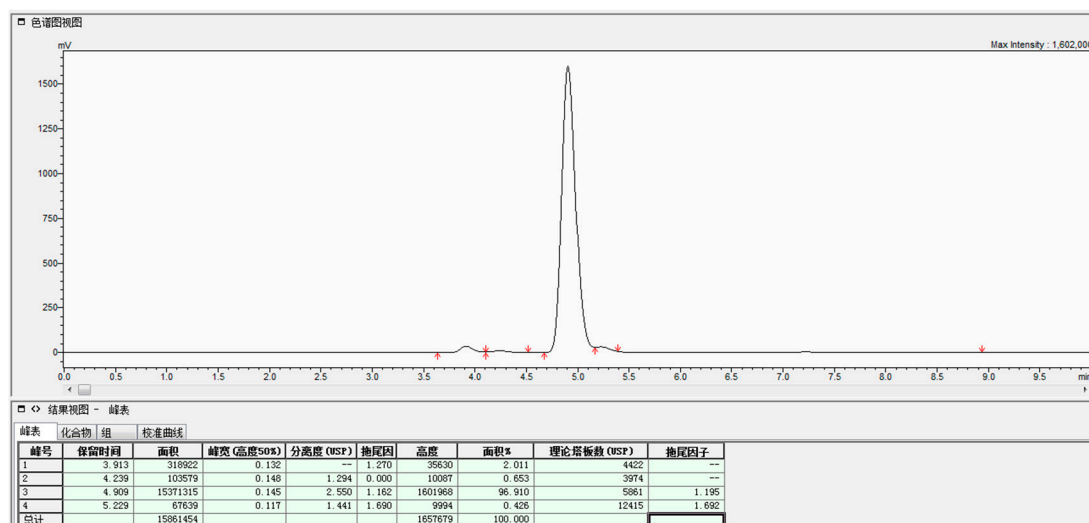
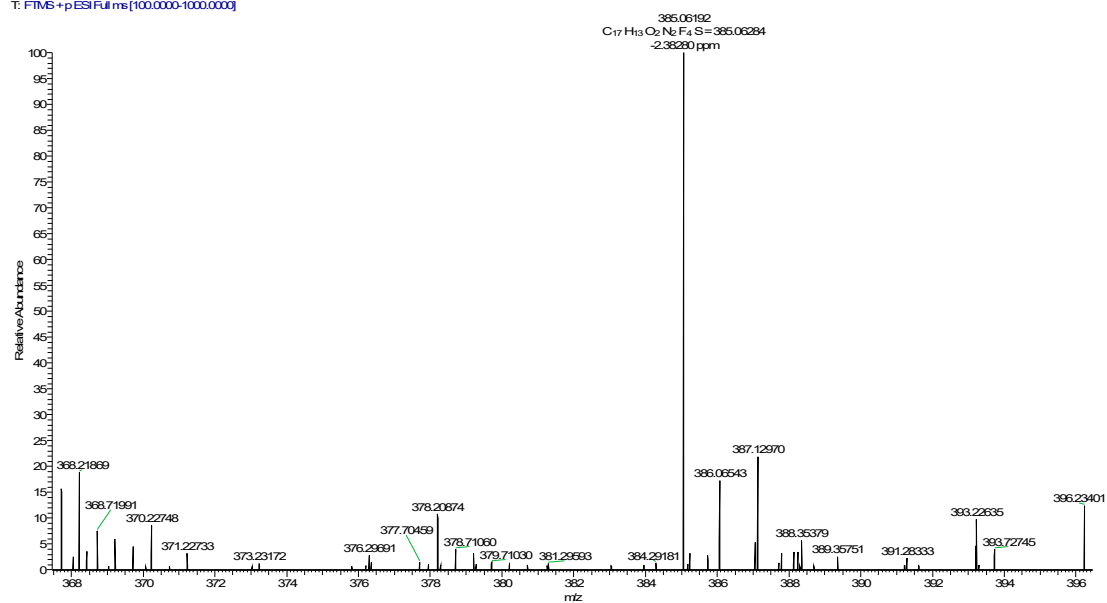
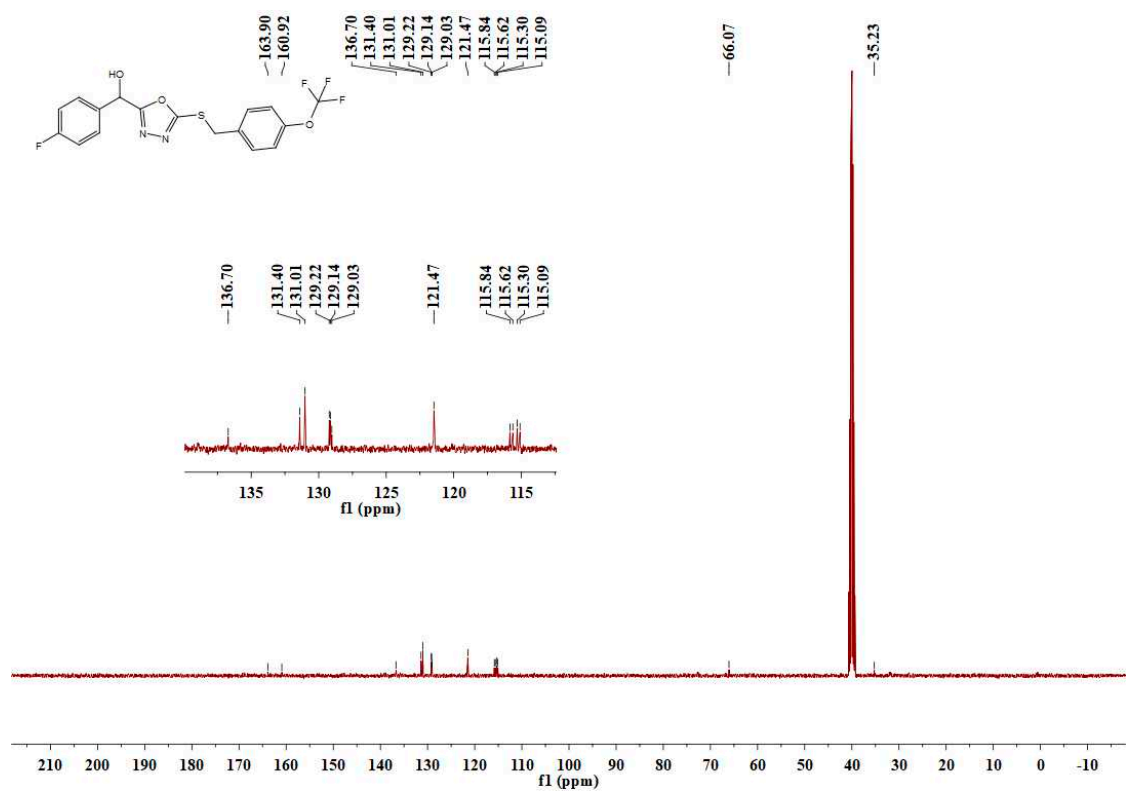
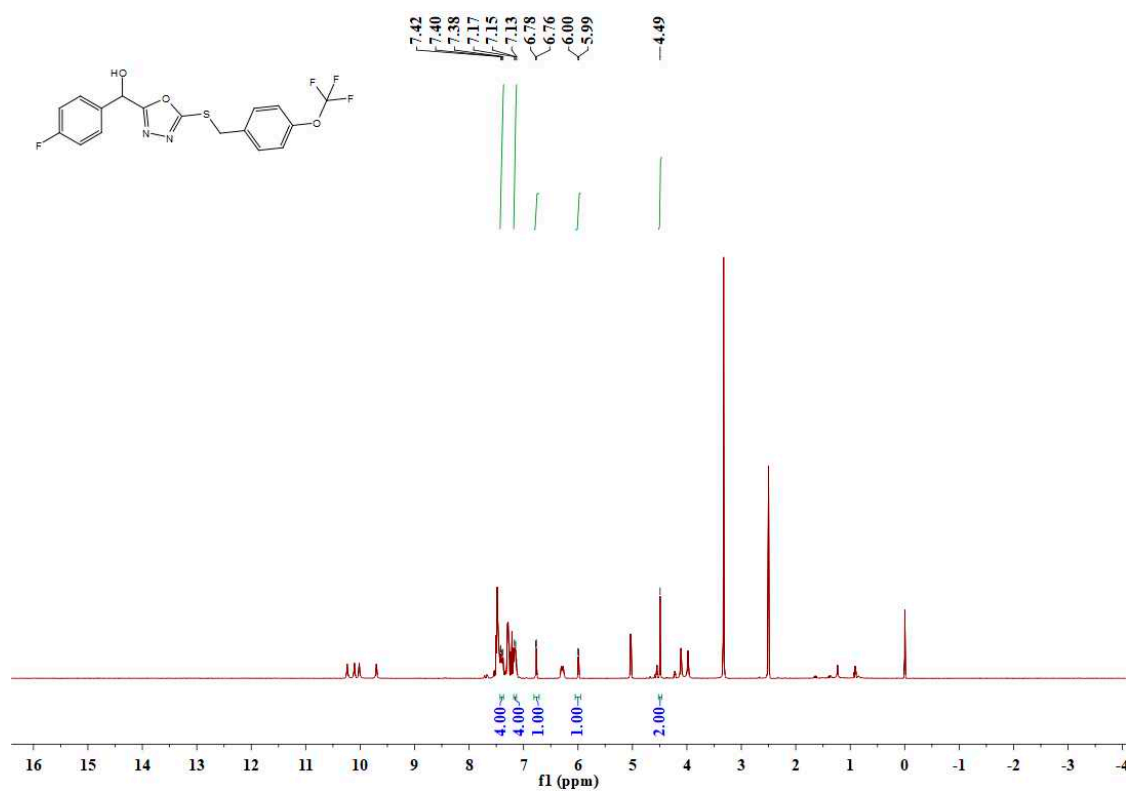
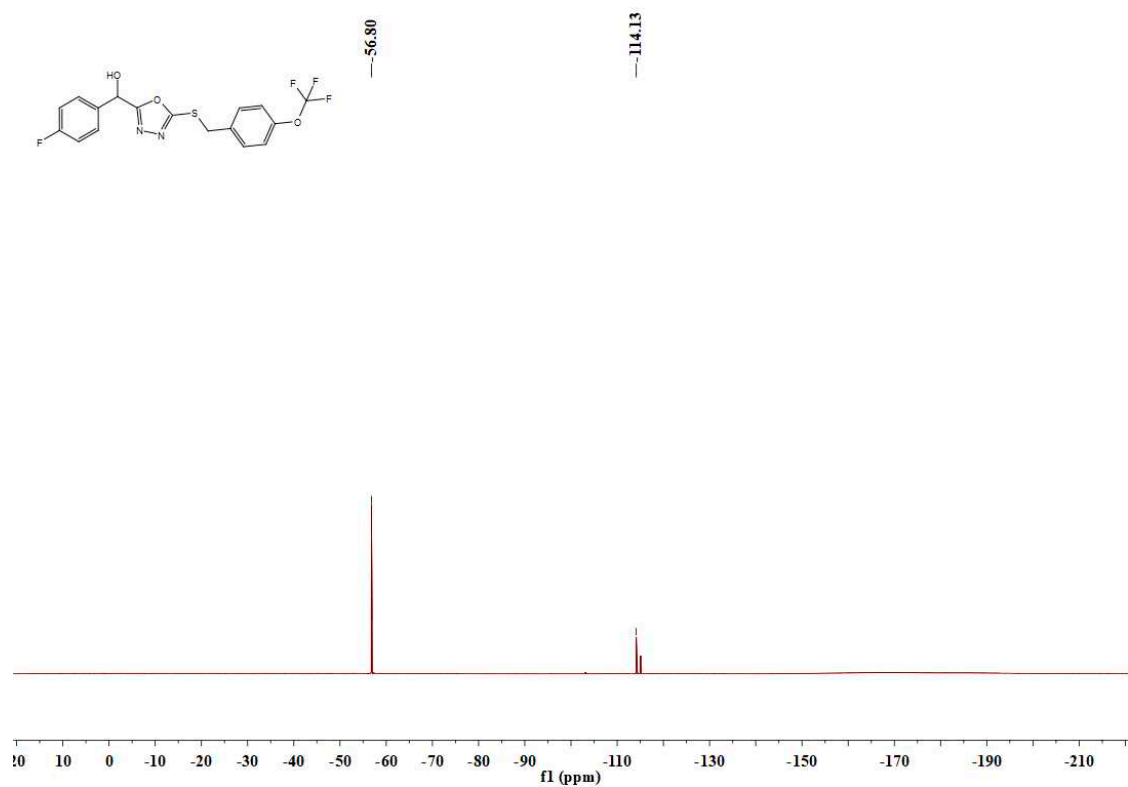
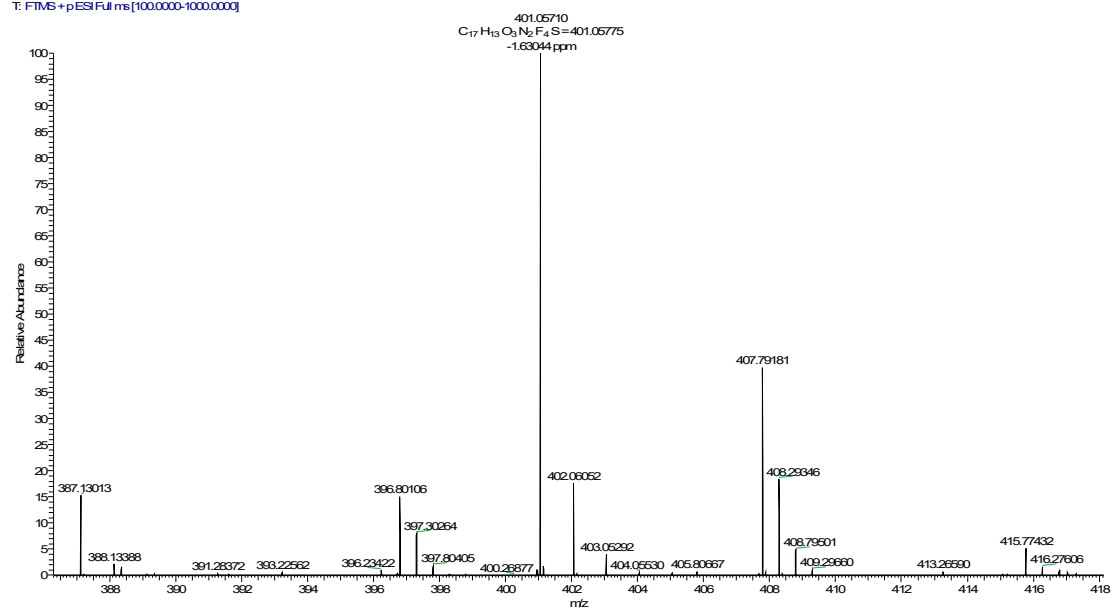


Figure S10. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E**₁₀.





2018032365#93 RT: 0.91 AV: 1 NL: 3.88E7
T: FTMS+pESFull.ms[100.0000-1000.0000]



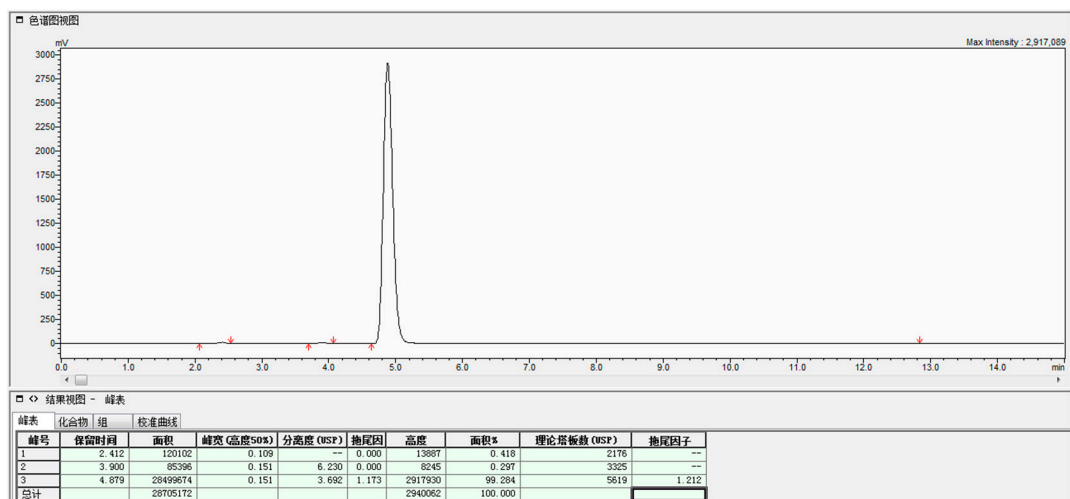
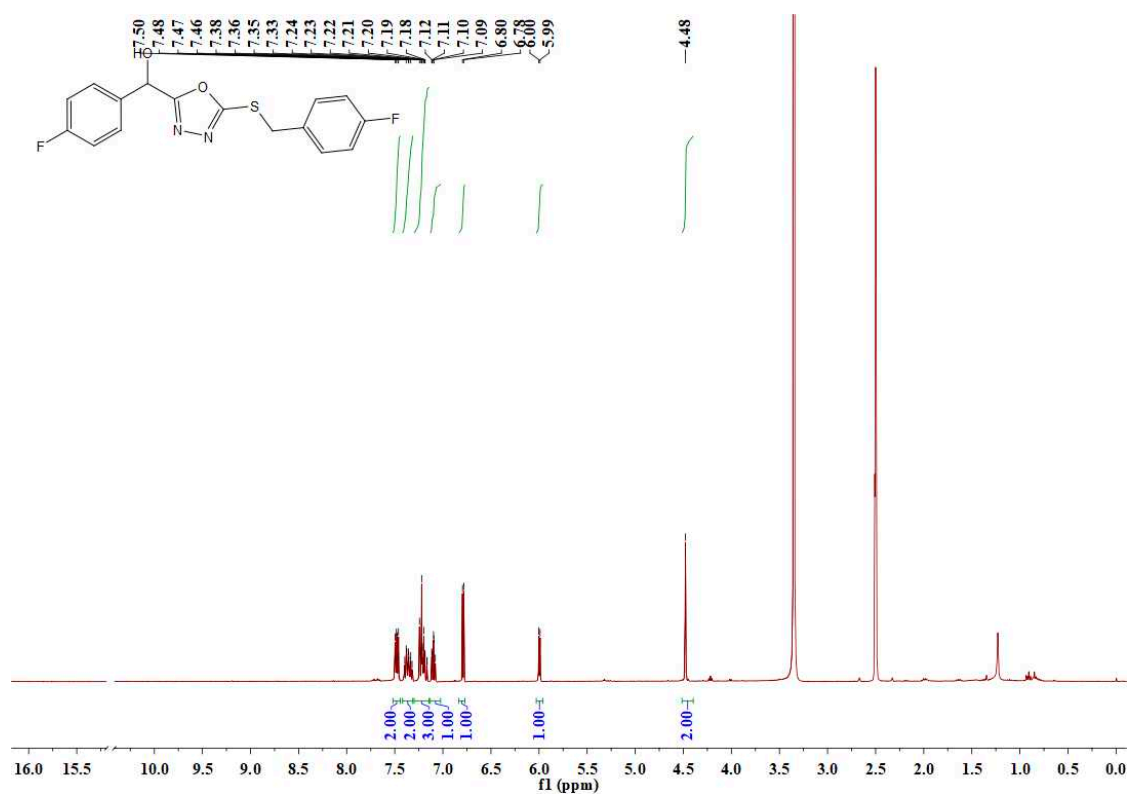
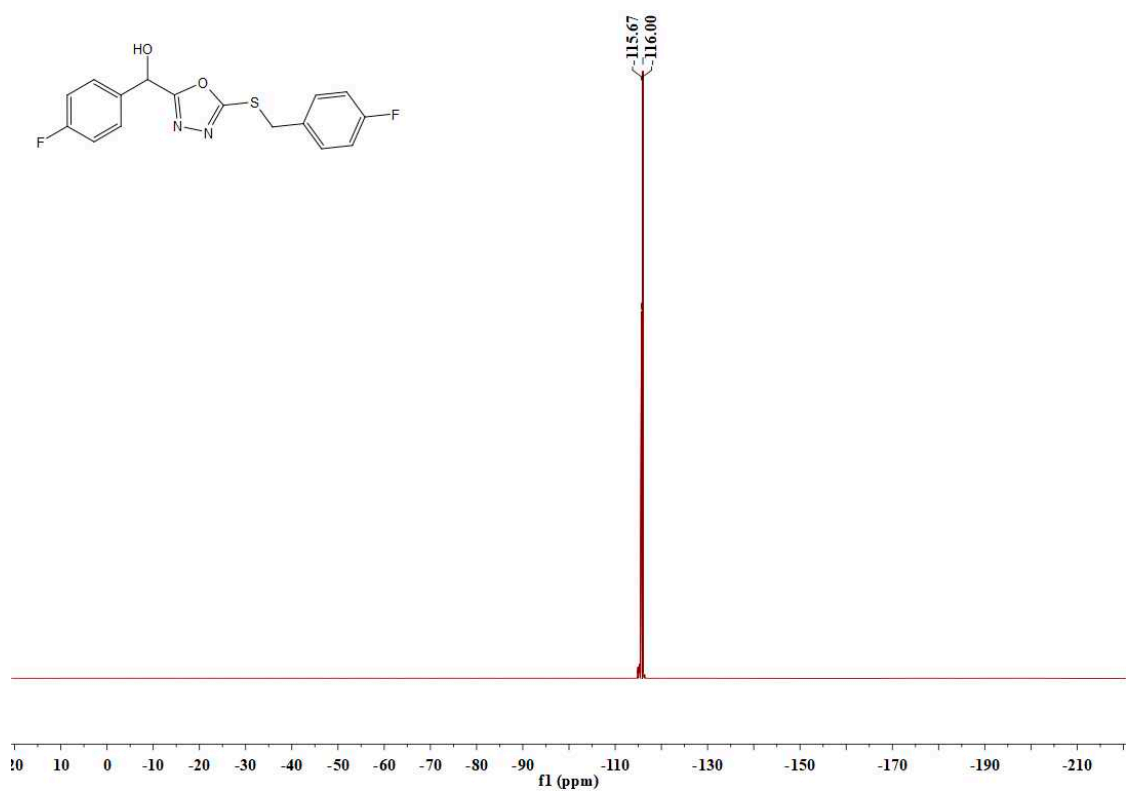
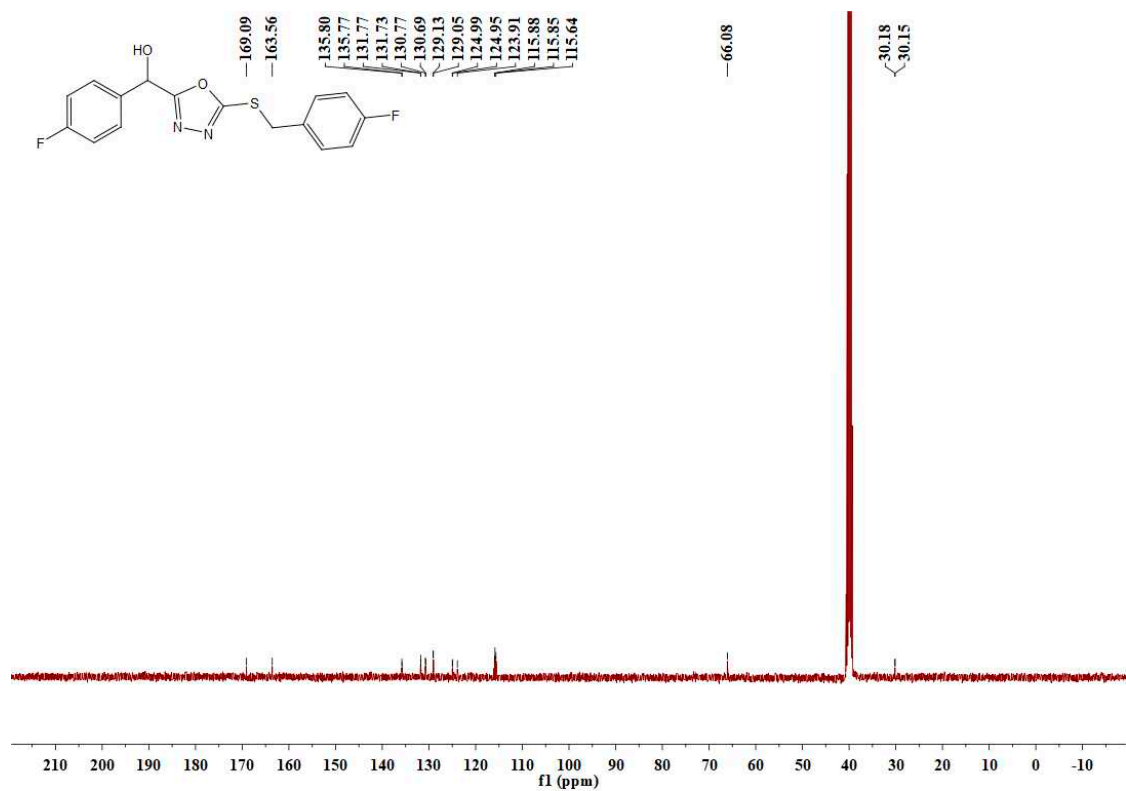


Figure S11. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E11**.





2018032304 #83 RT: 0.81 AV: 1 NL: 1.85E7
T: FTMS + pESI Full ms [100.0000-1000.0000]

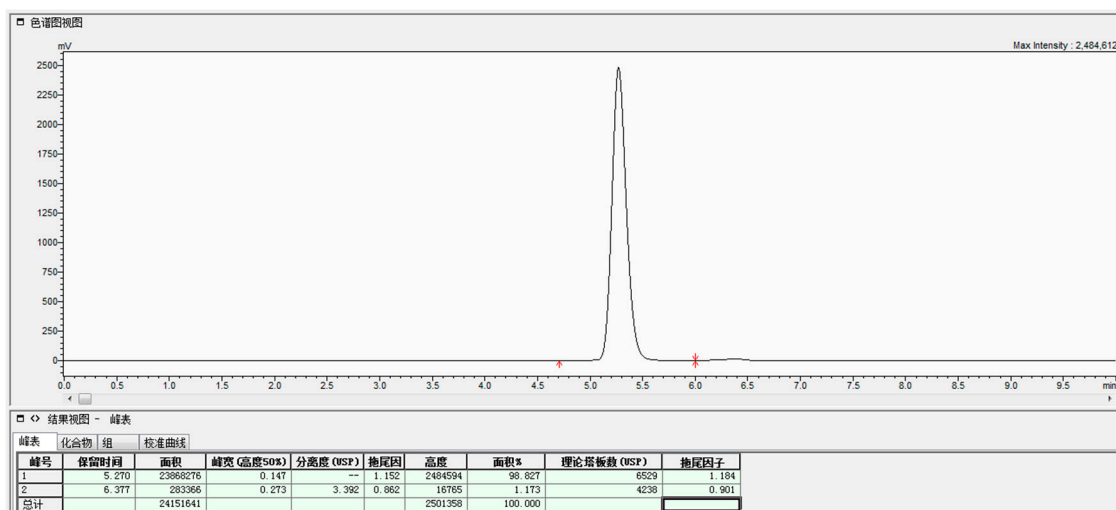
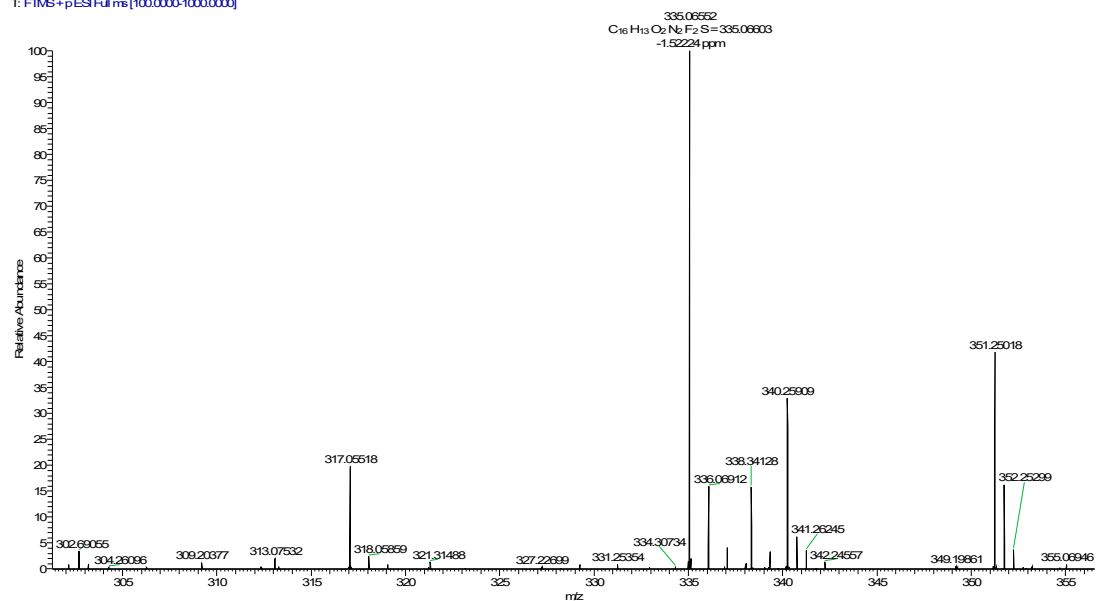
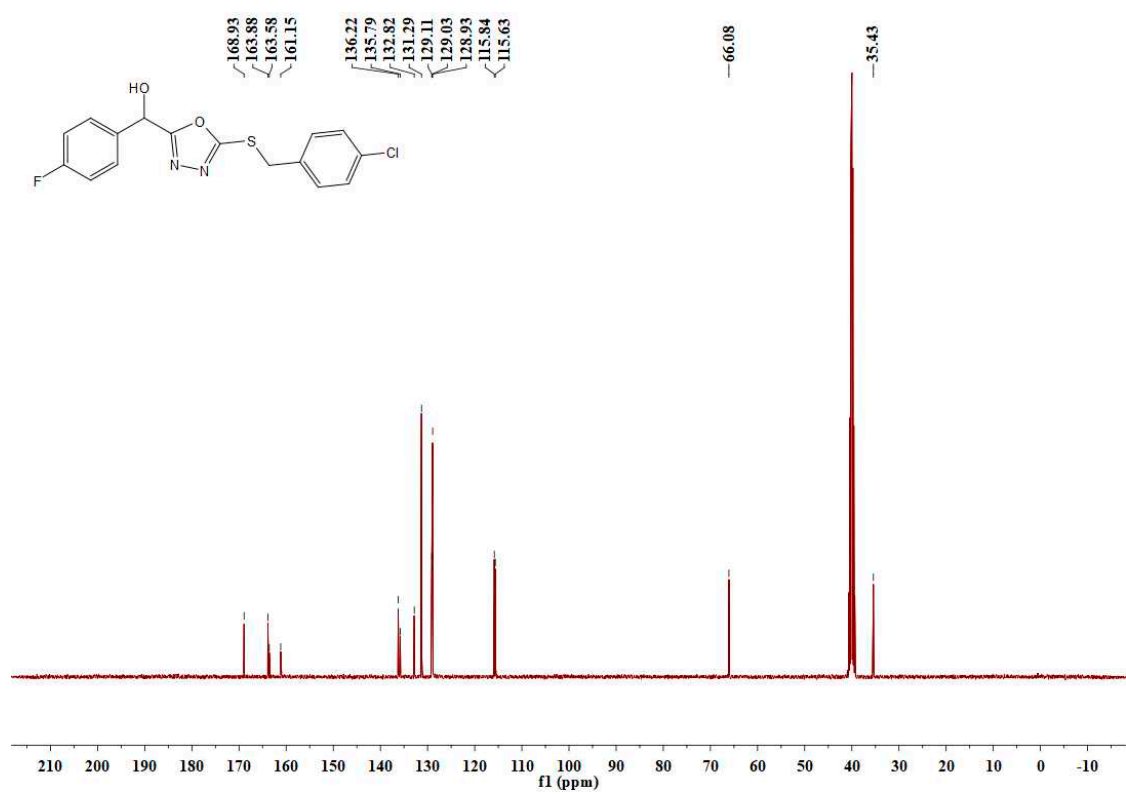
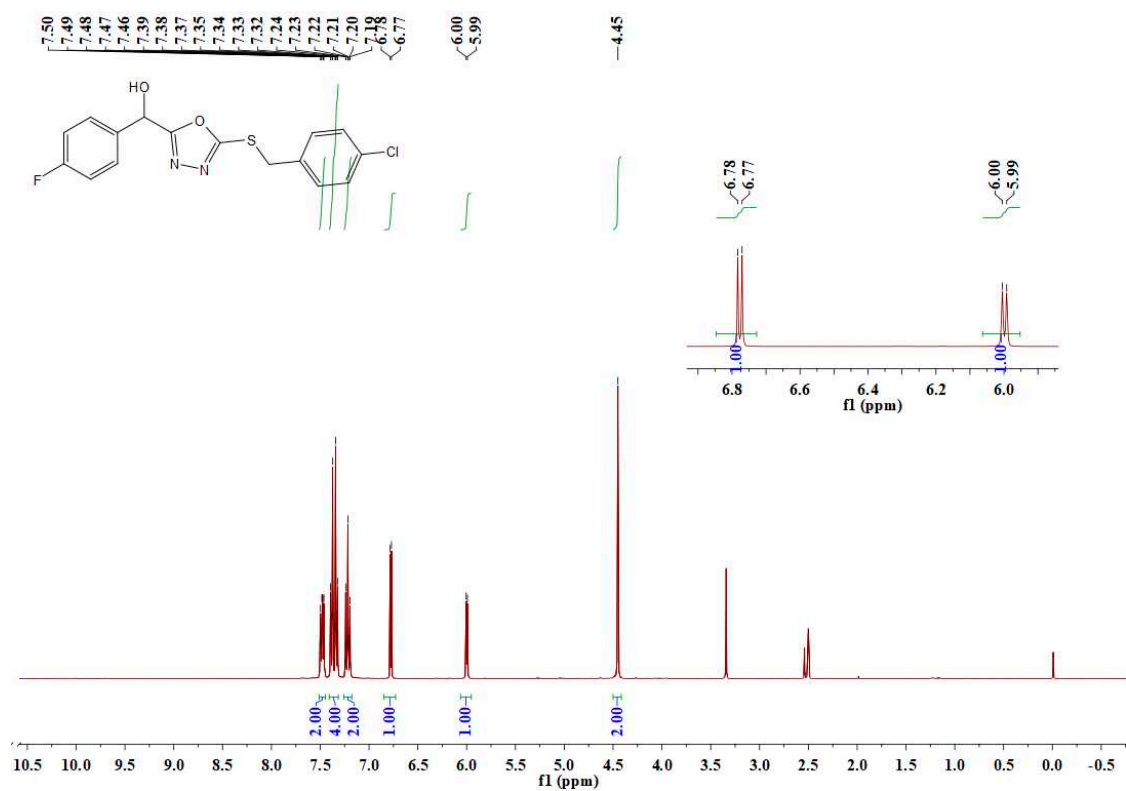
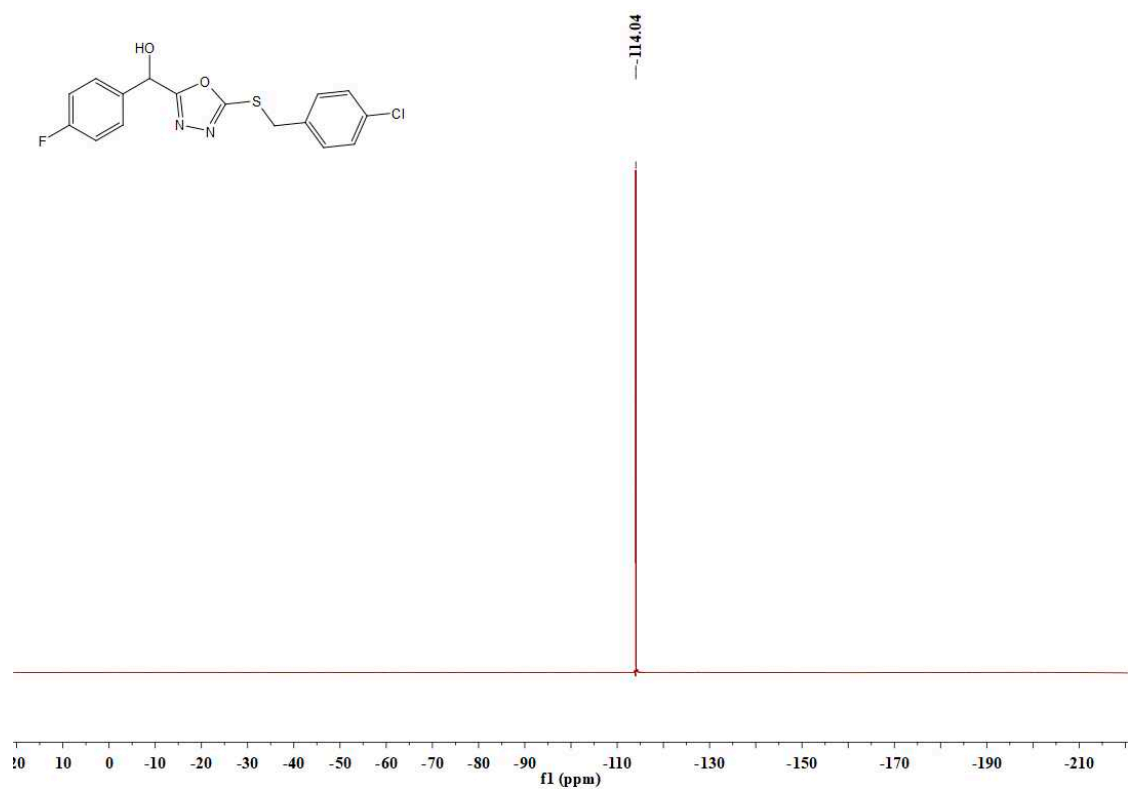
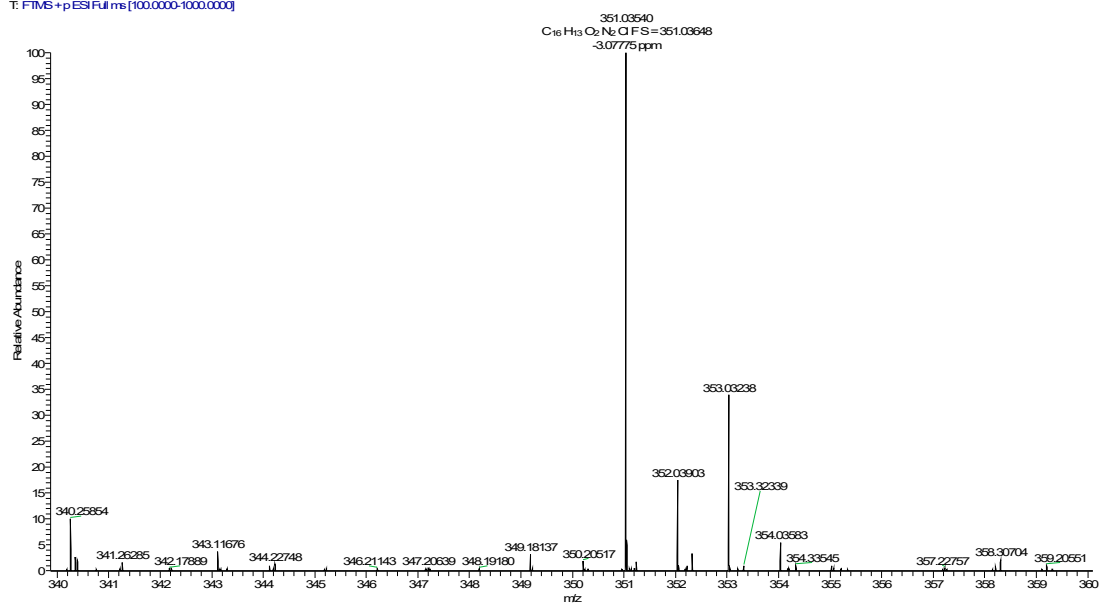


Figure S12. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E12**.





2018120510E #77 RT: 0.77 AV: 1 NL: 6.0366
T: FTMS+pESI Full ms [100.0000-1000.0000]



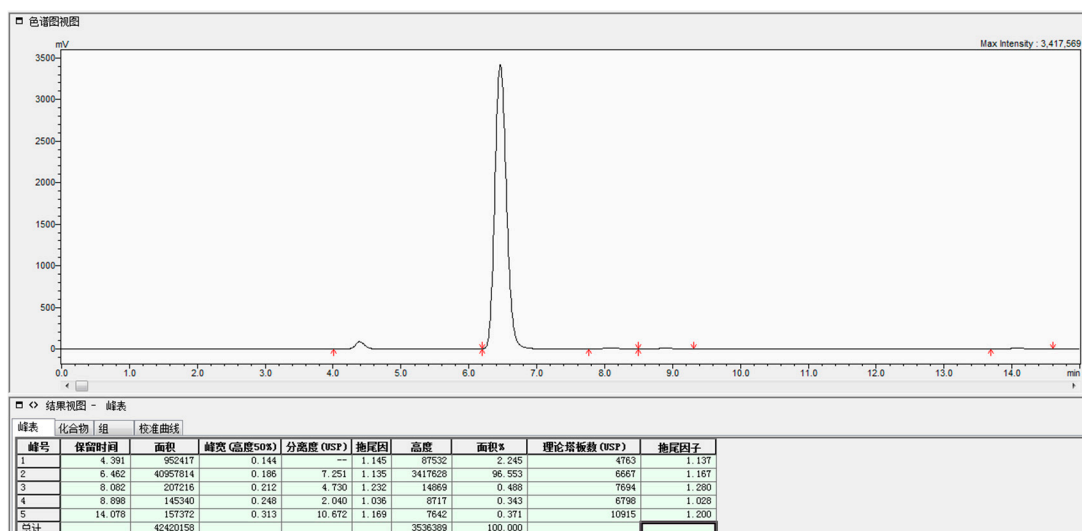
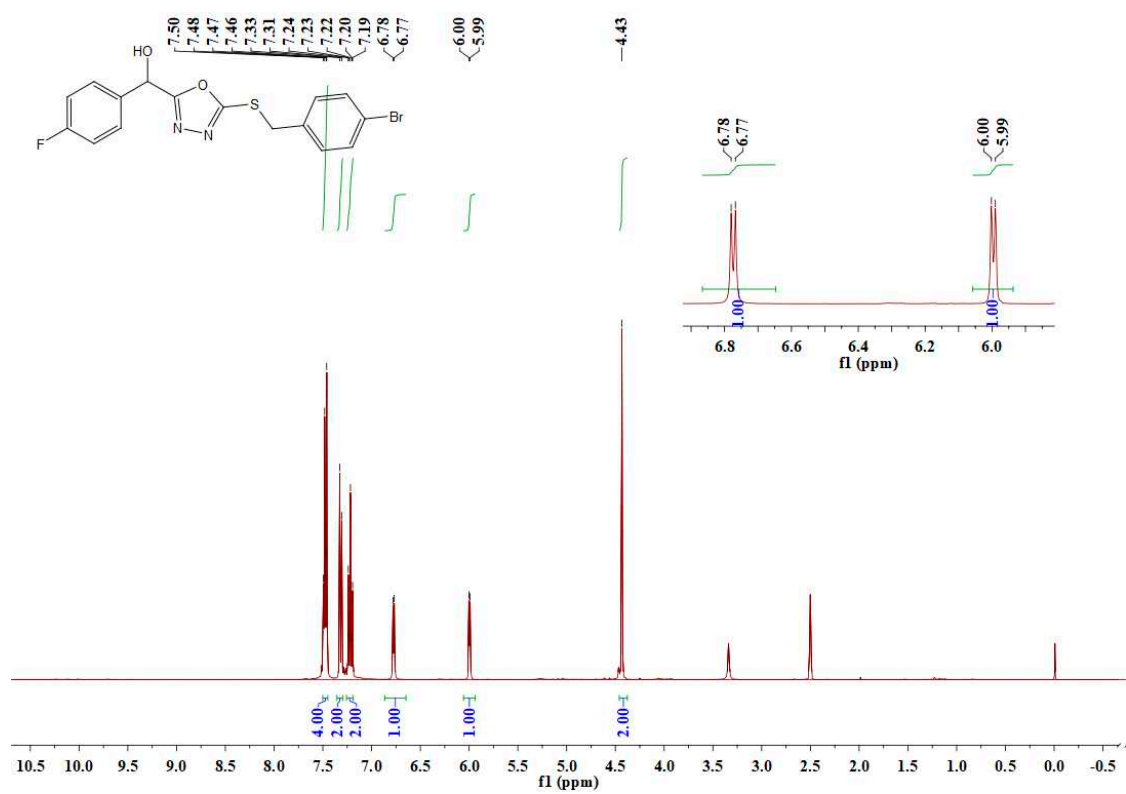
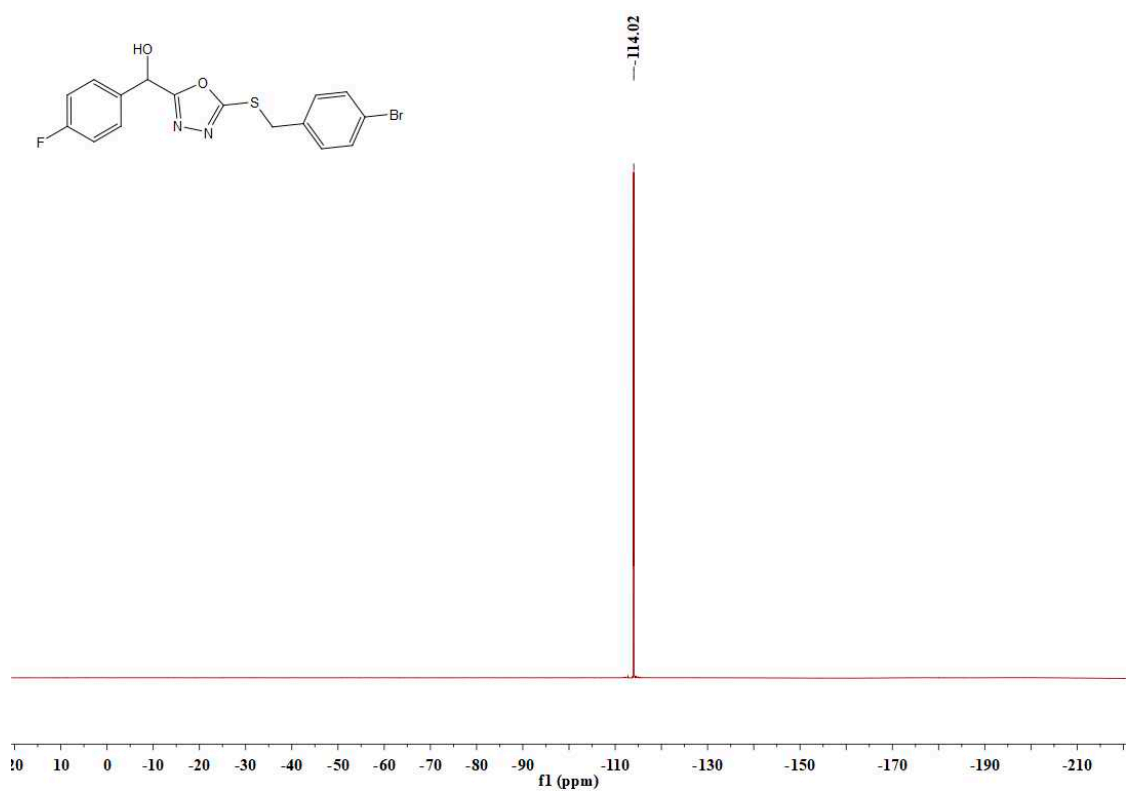
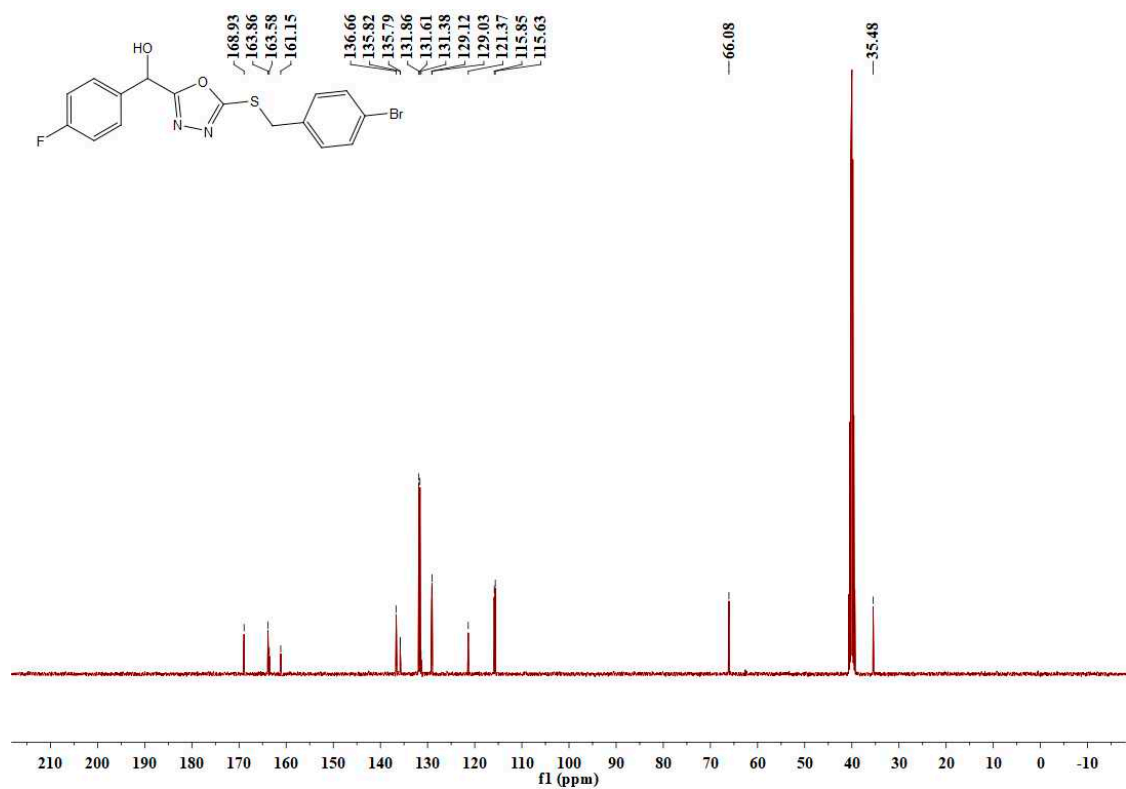


Figure S13. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E13**.





20181205107 #75 RE: 0.75 AV: 1 NL: 1.39E7
T: FTMS+pESI Full ms [100.0000-1000.0000]

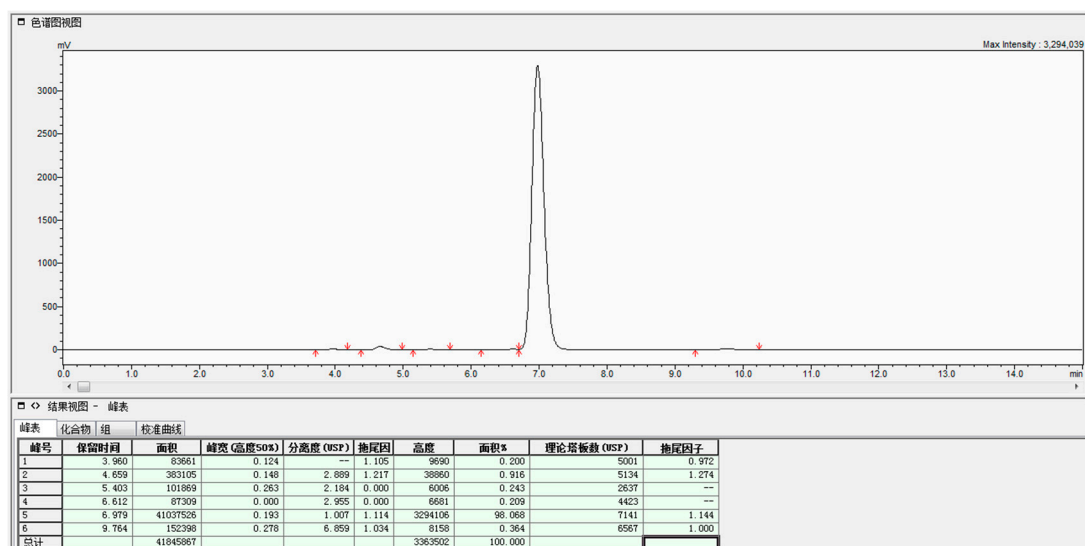
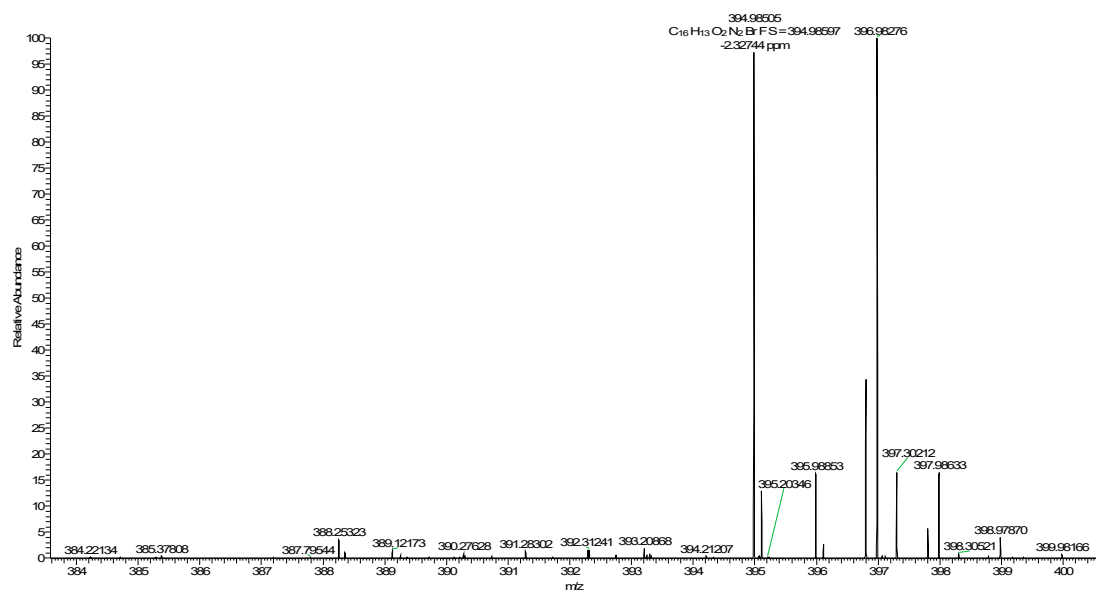
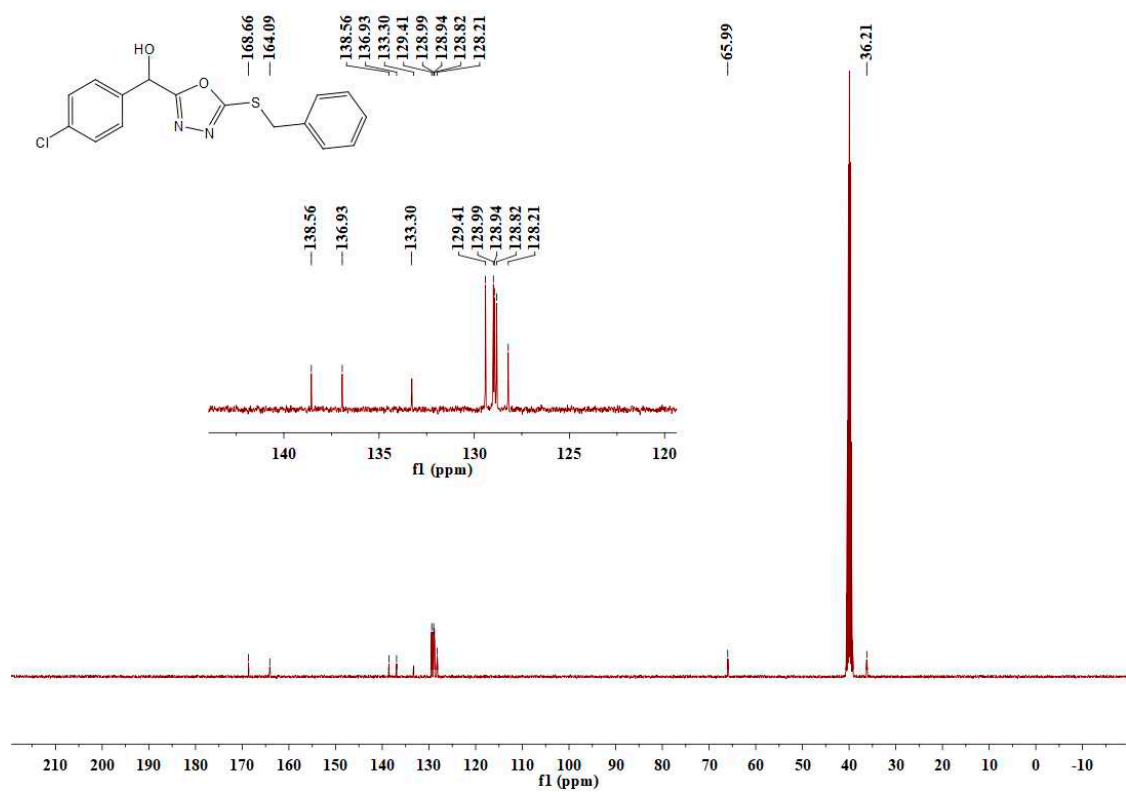
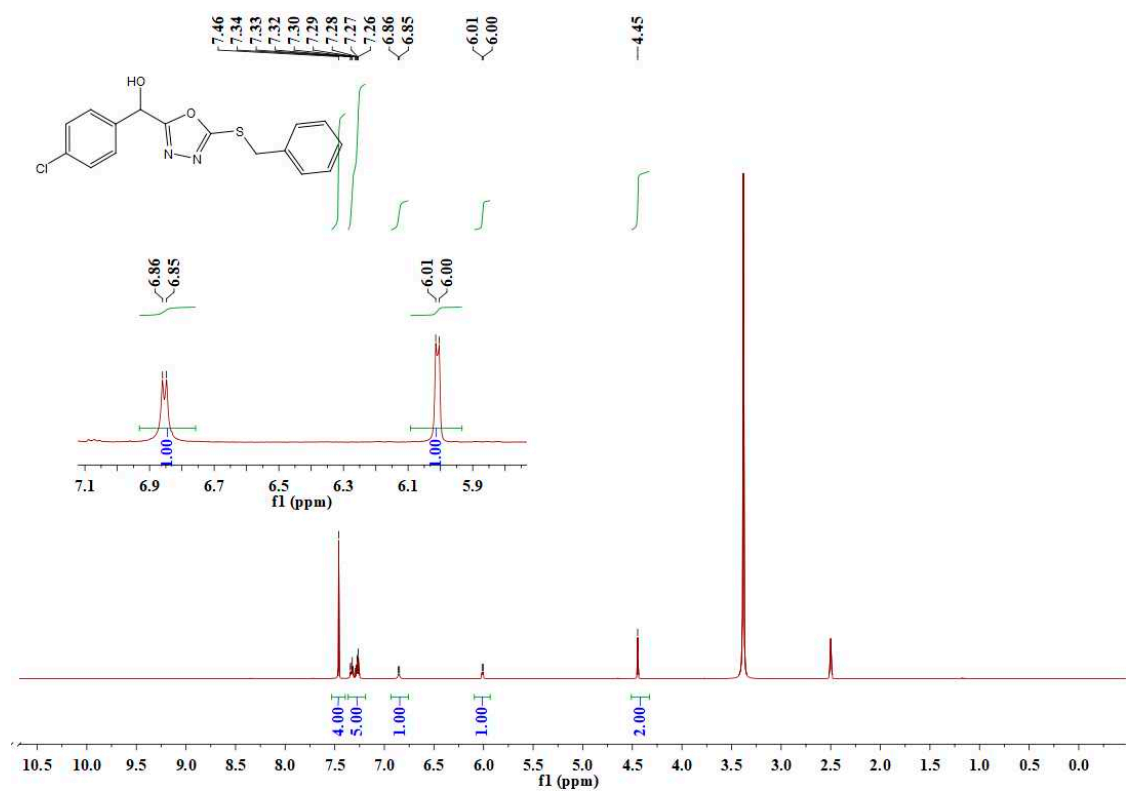


Figure S14. 1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E14**.



2018121406 #83 RT: 0.84 AV: 1 NL: 4.29E5
T: FTMS + pESI Full ms [100.0000-1000.0000]

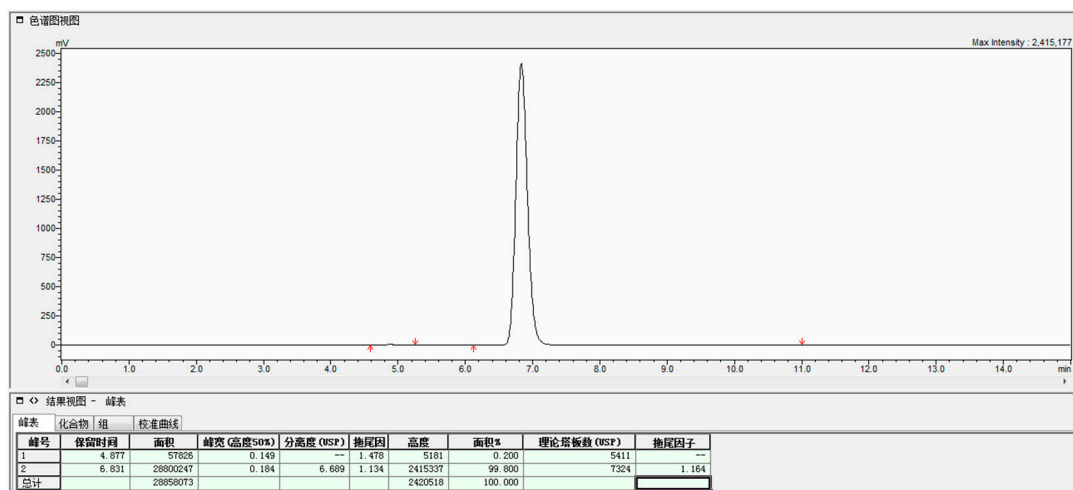
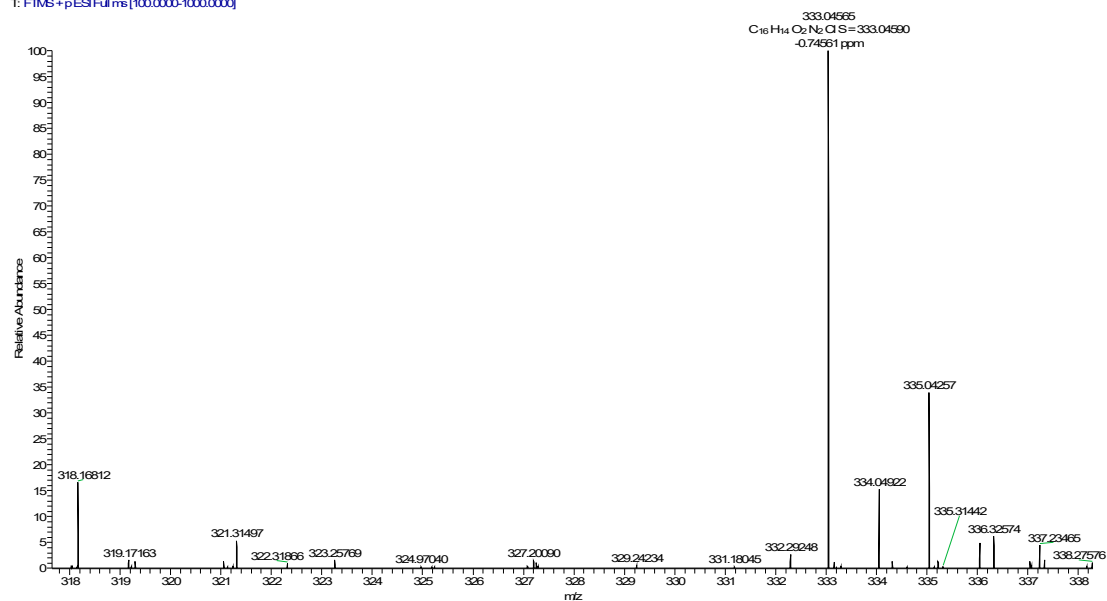
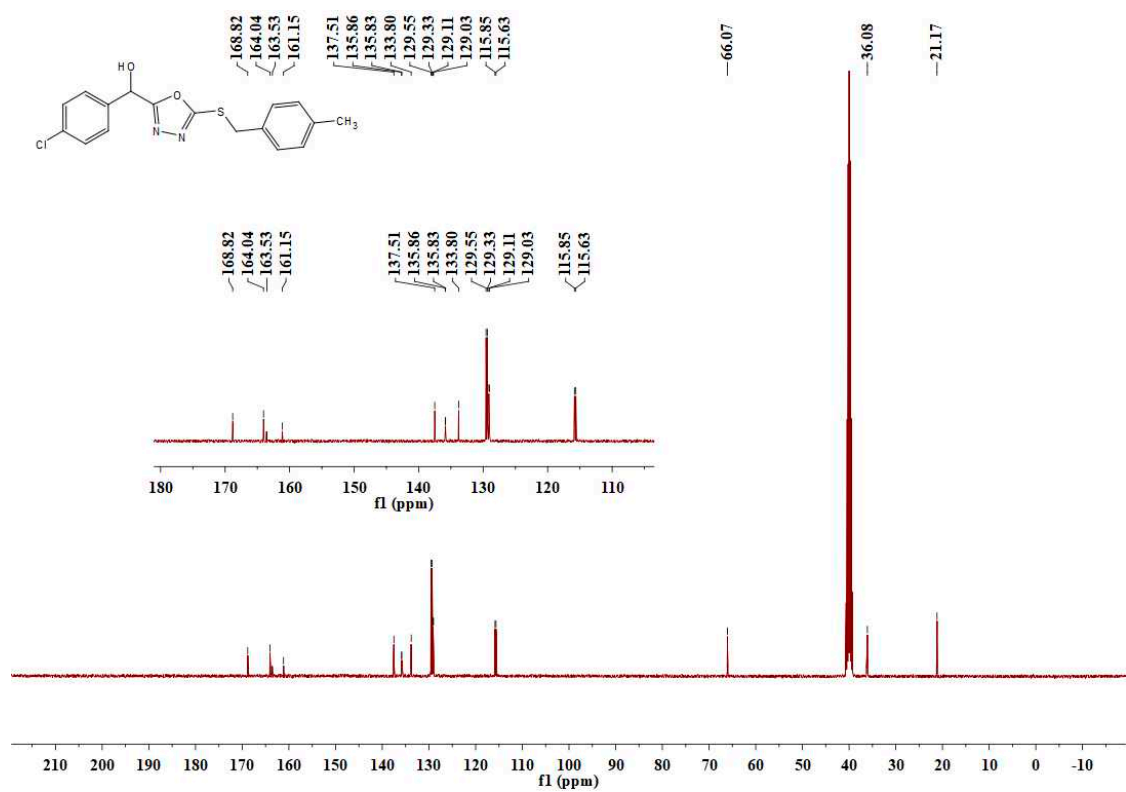
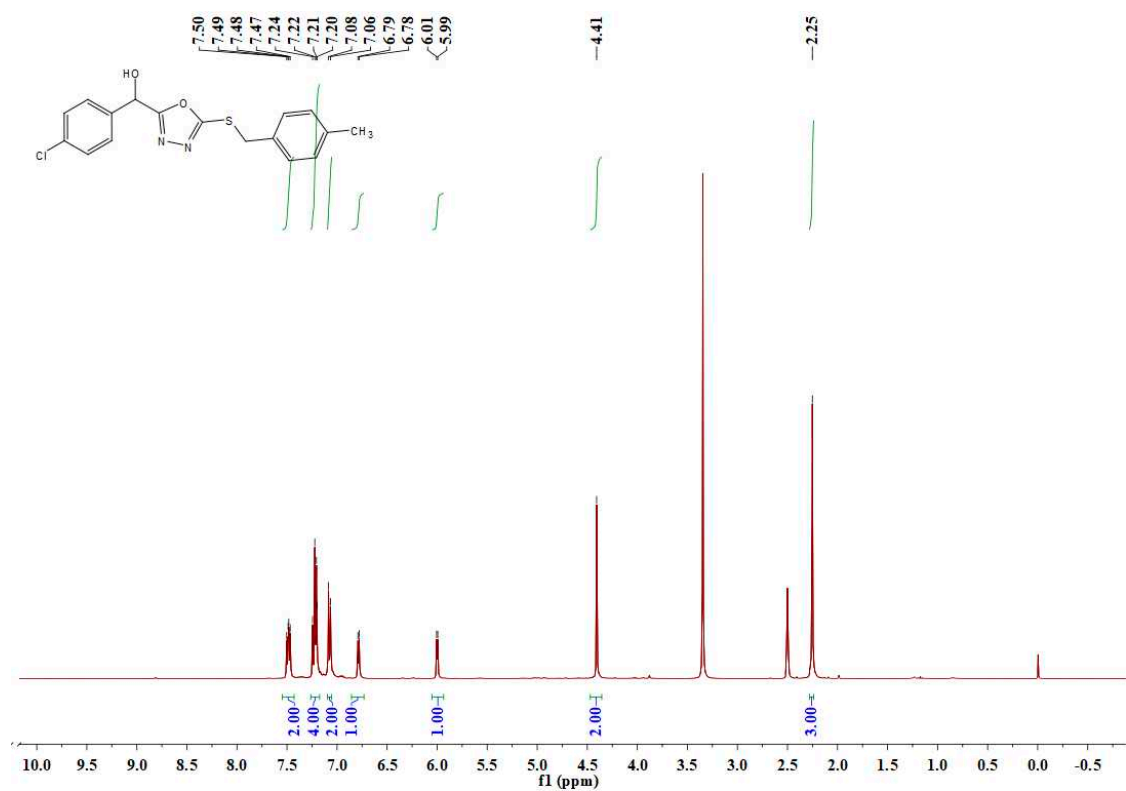


Figure S15. ^1H NMR, ^{13}C NMR, HRMS, and HPLC for E15.



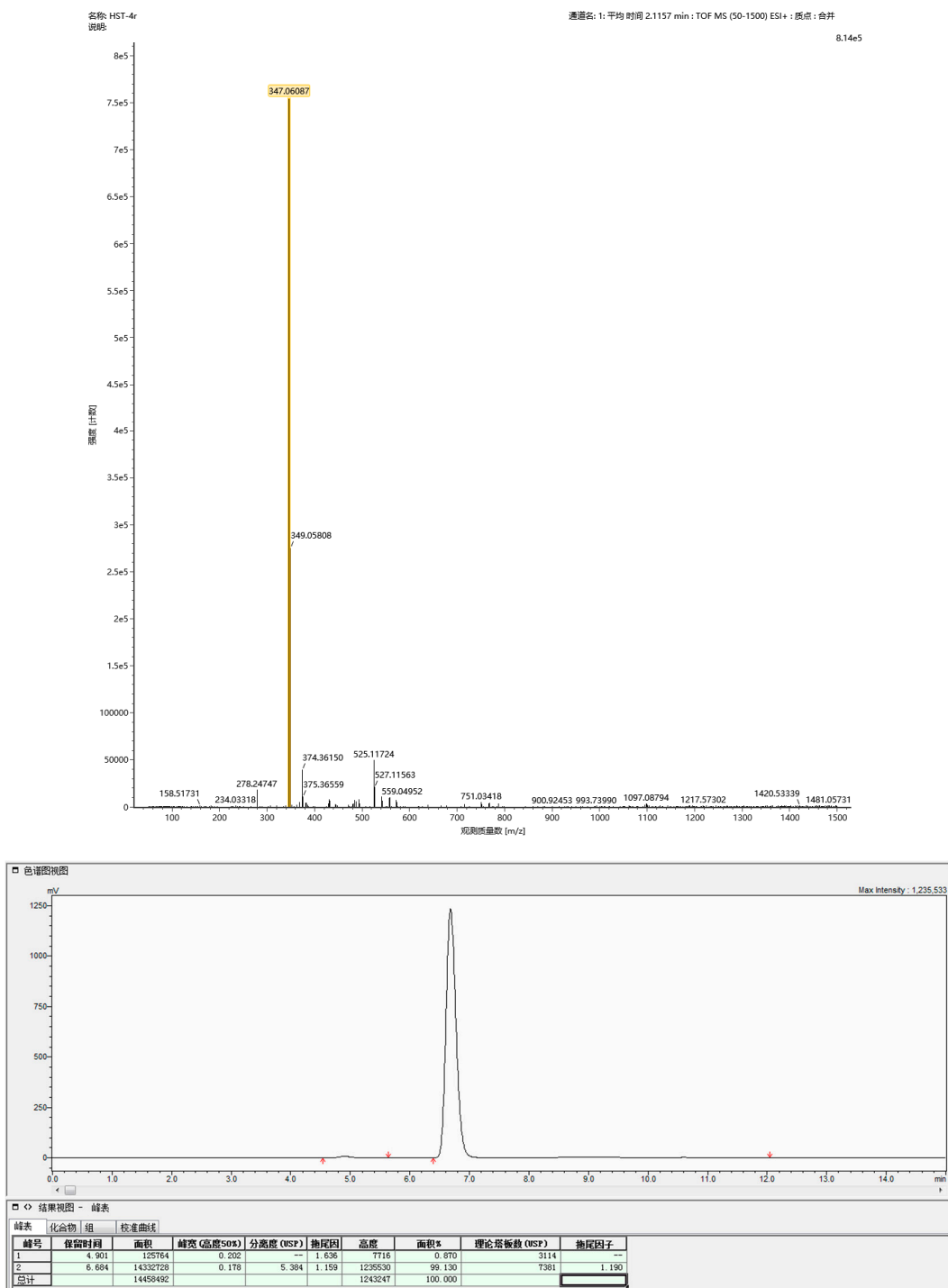
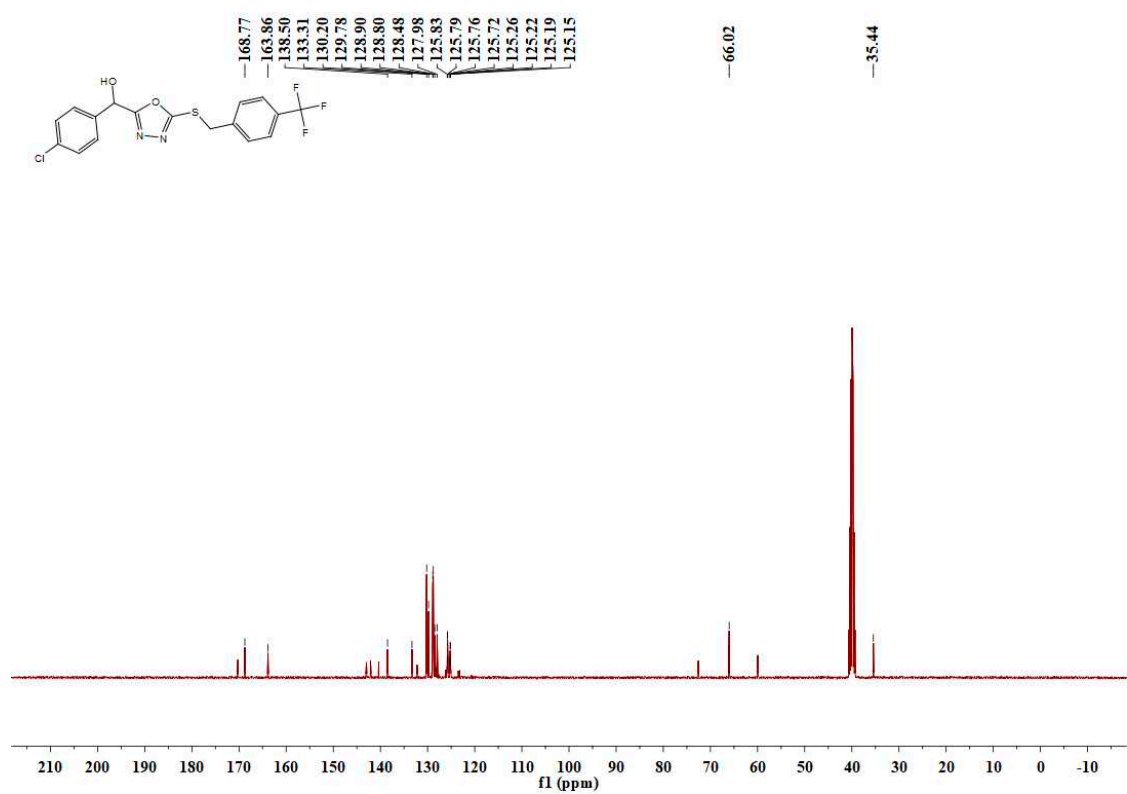
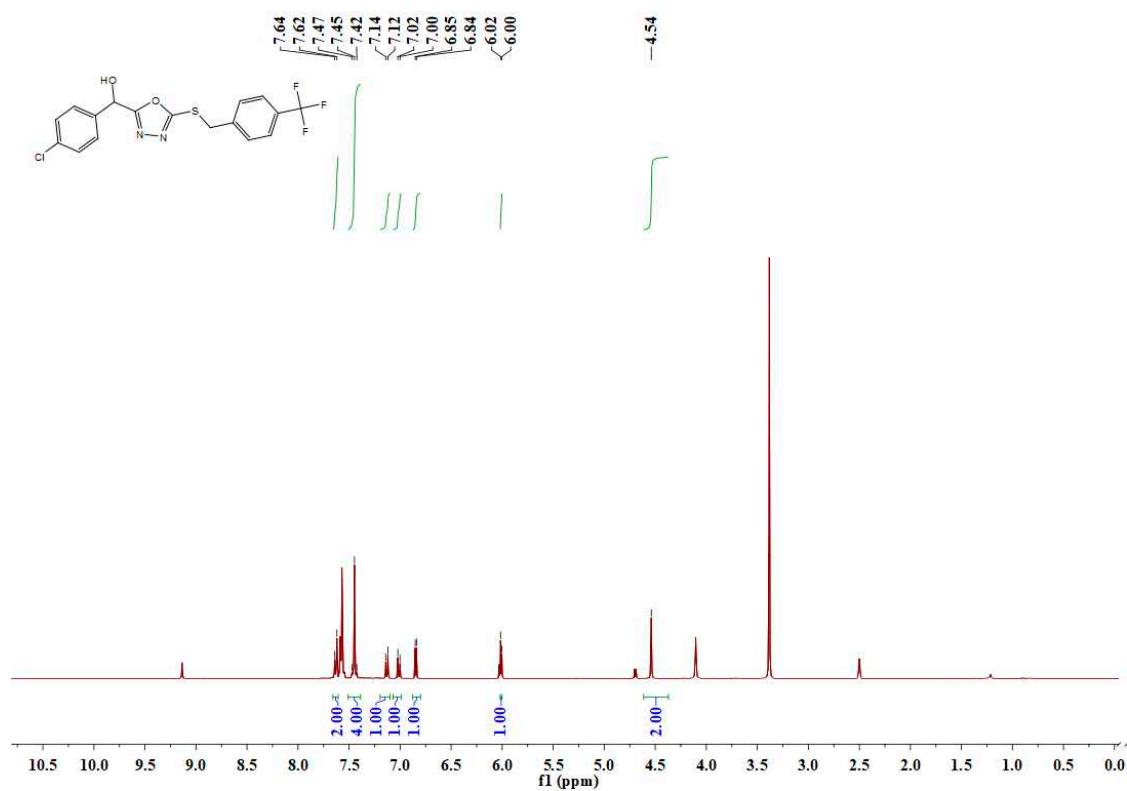
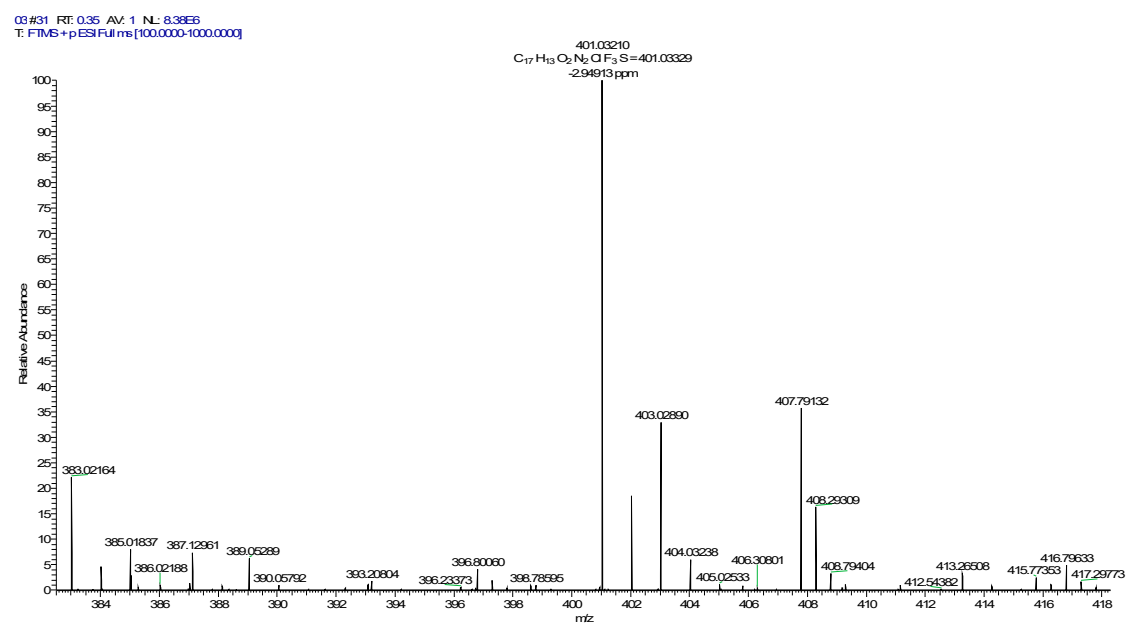
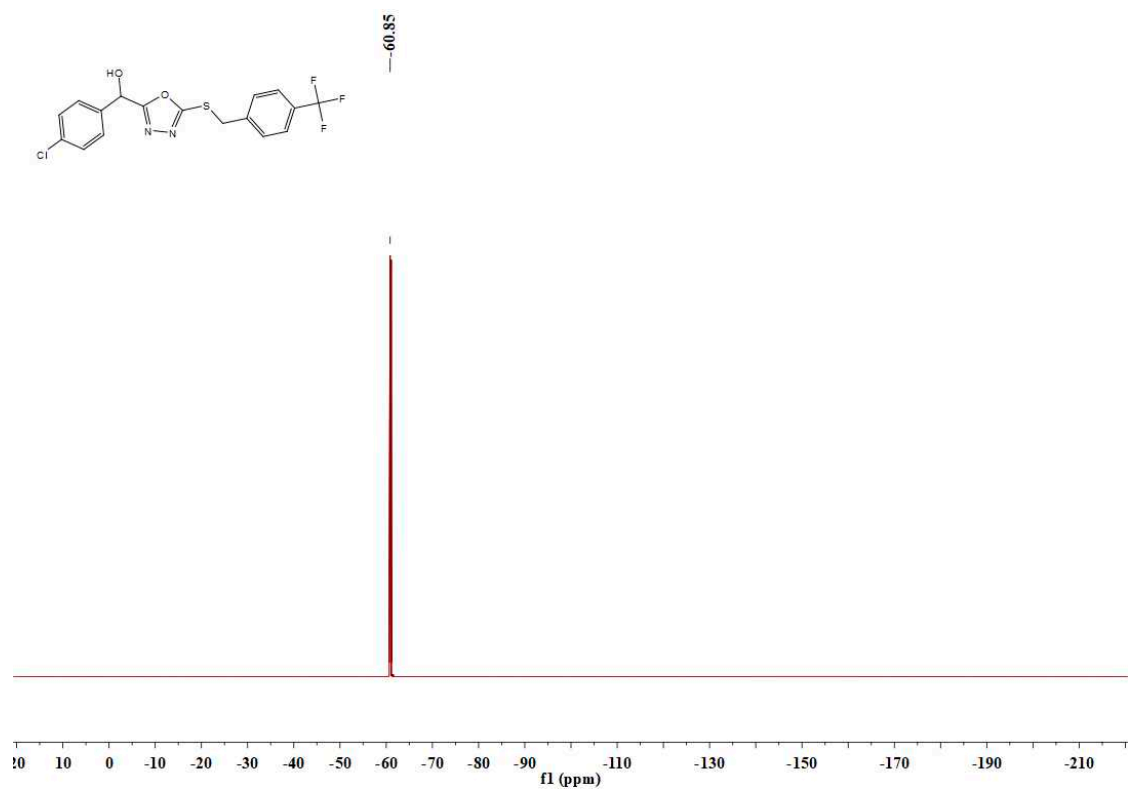


Figure S16. ^1H NMR, ^{13}C NMR, HRMS, and HPLC for **E₁₆**.





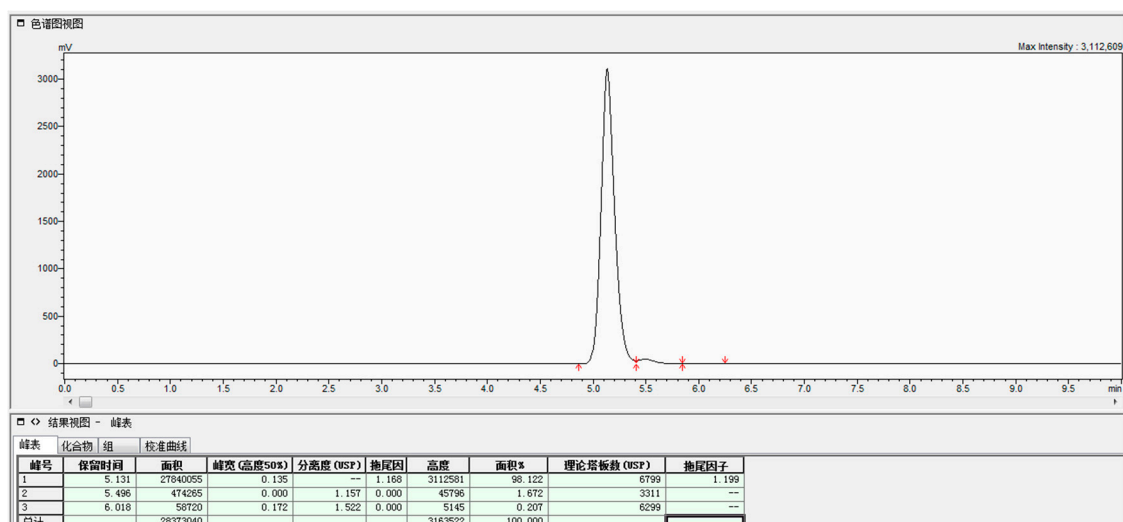
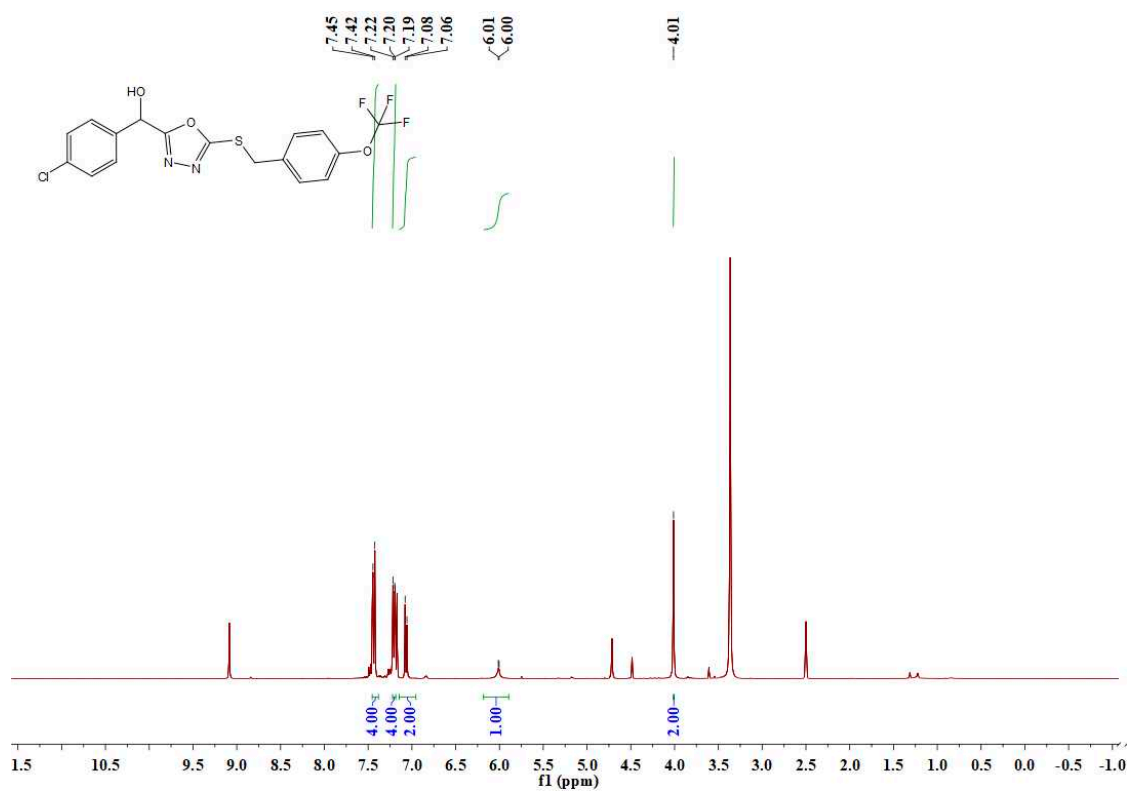
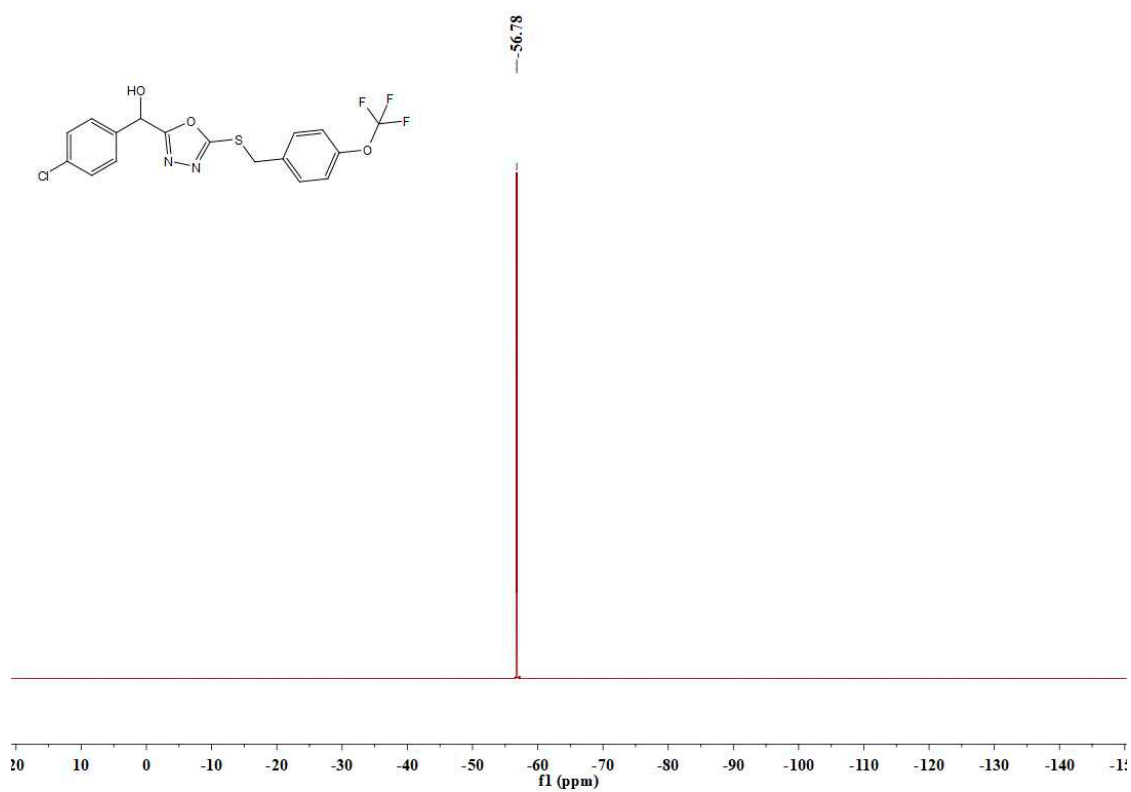
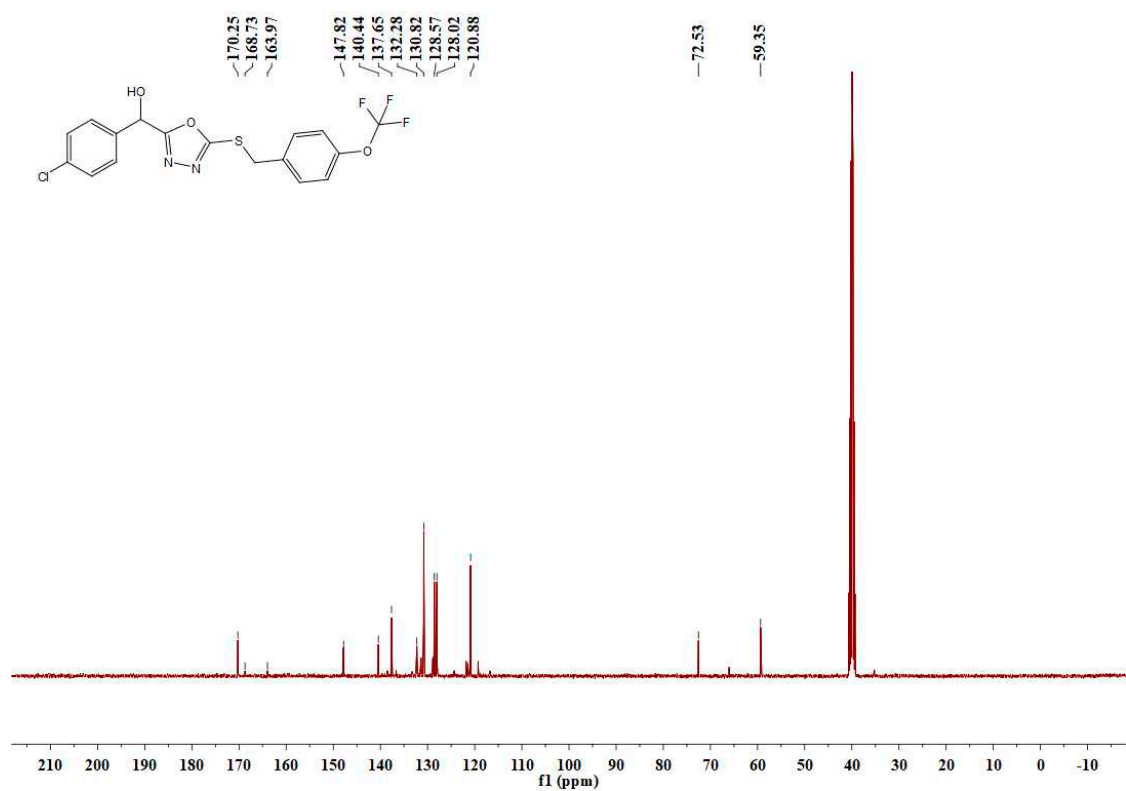


Figure S17. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E17**.





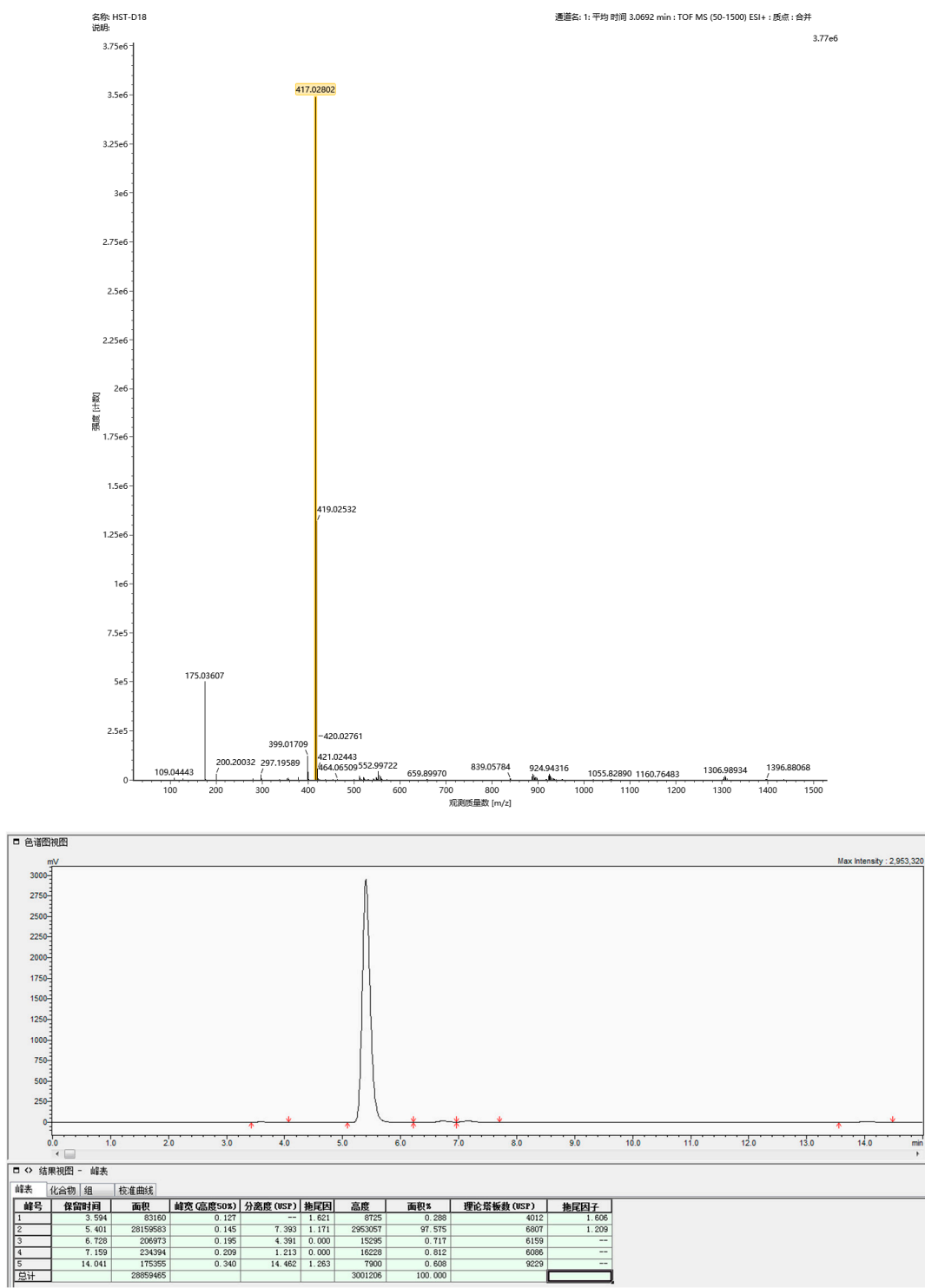
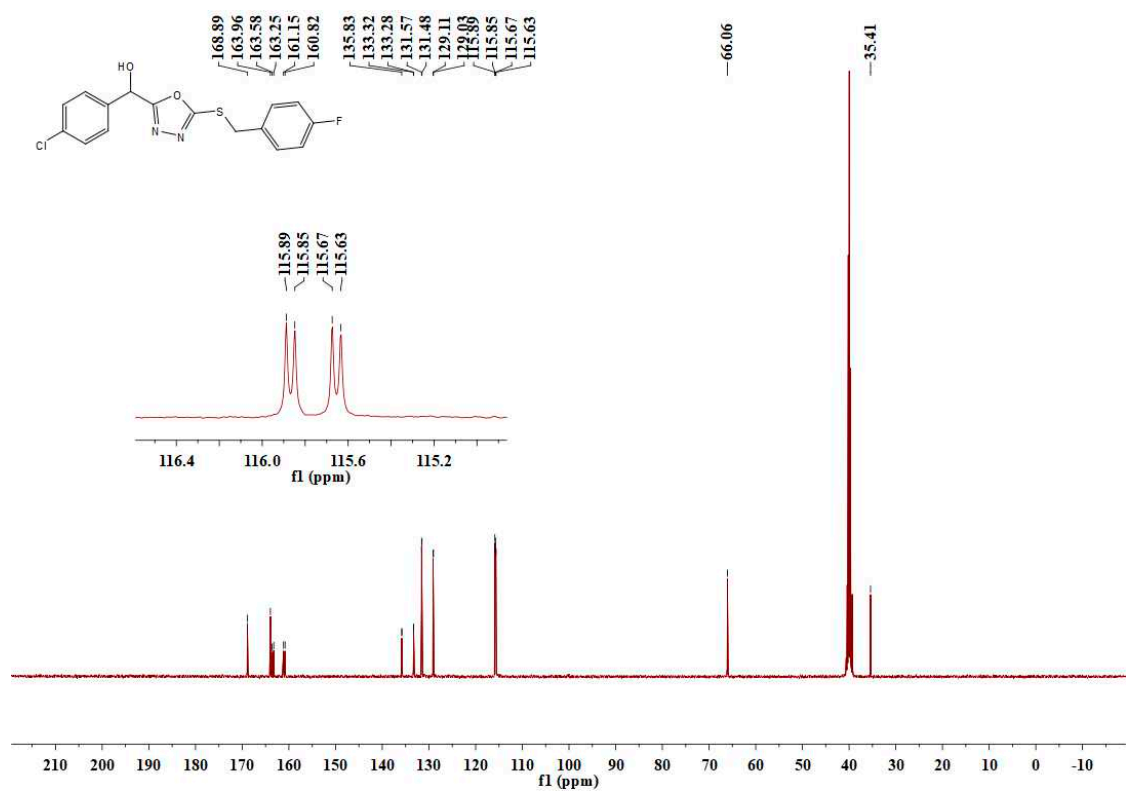
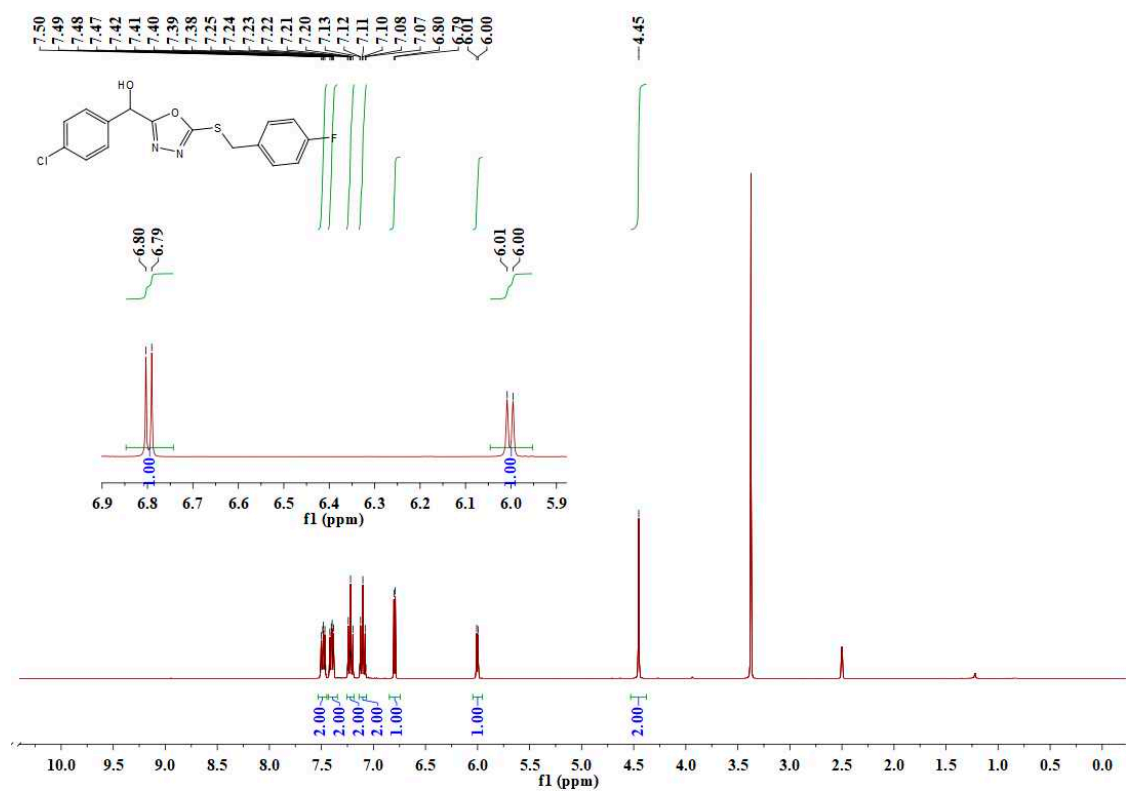
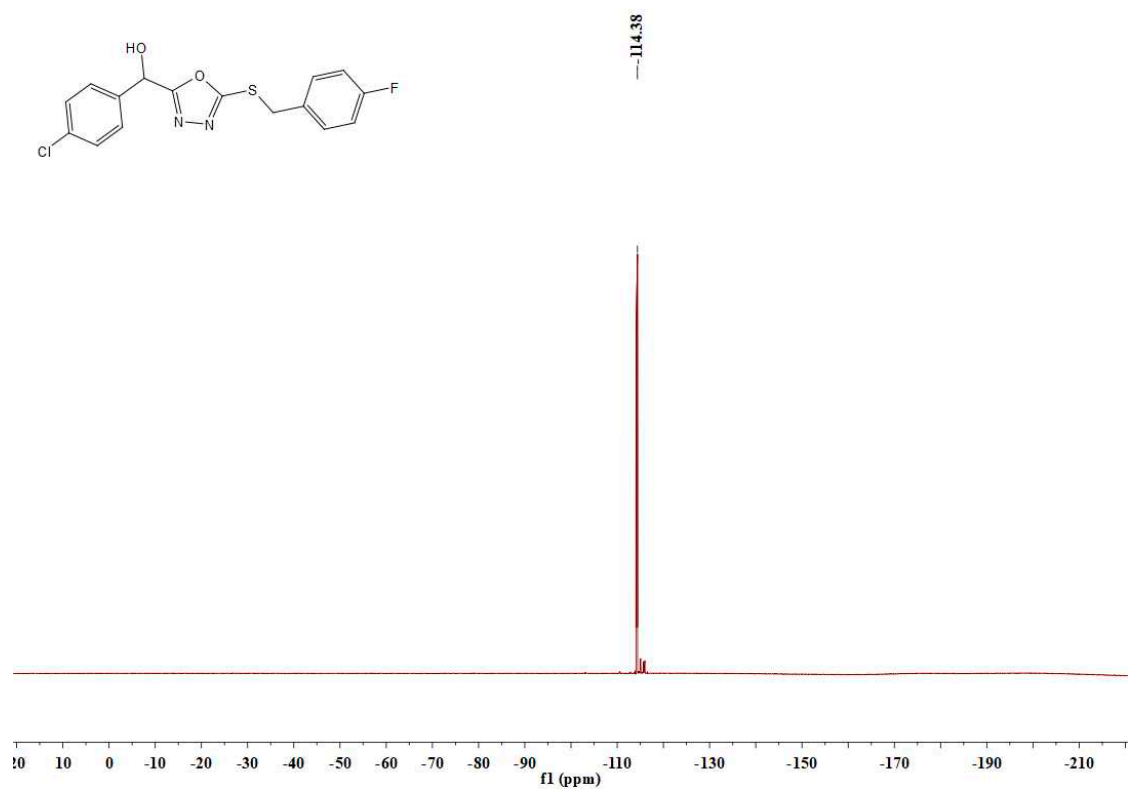


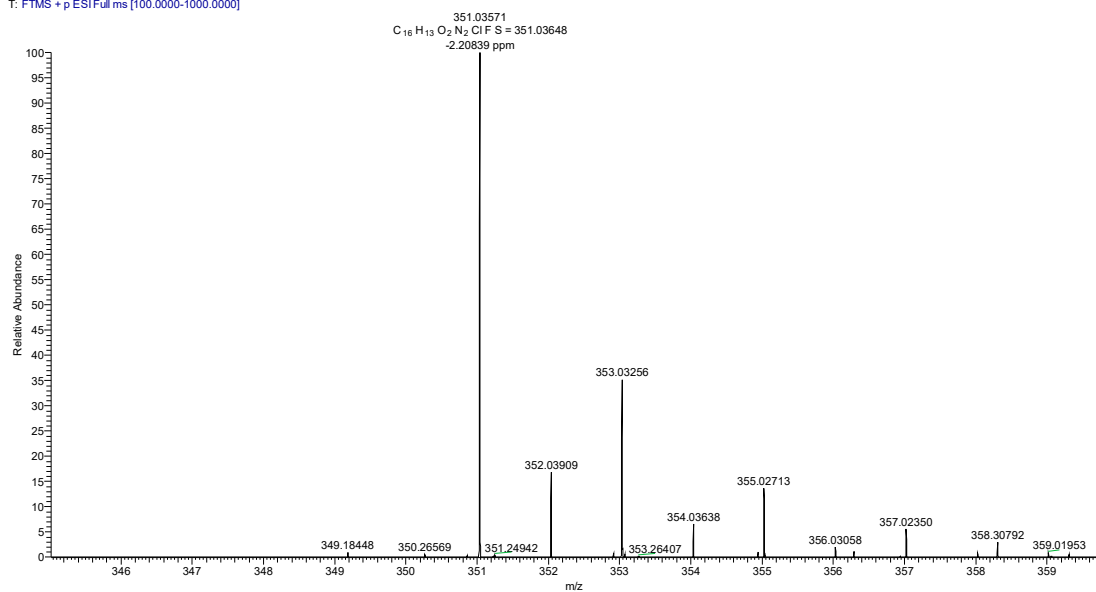
Figure S18. ¹H NMR, ¹³C NMR, ¹⁹F NMR, HRMS and HPLC for E₁₈.





24 #39 RT: 0.39 AV: 1 NL: 8.22E7

T: FTMS + p ESI Full ms [100.0000-1000.0000]



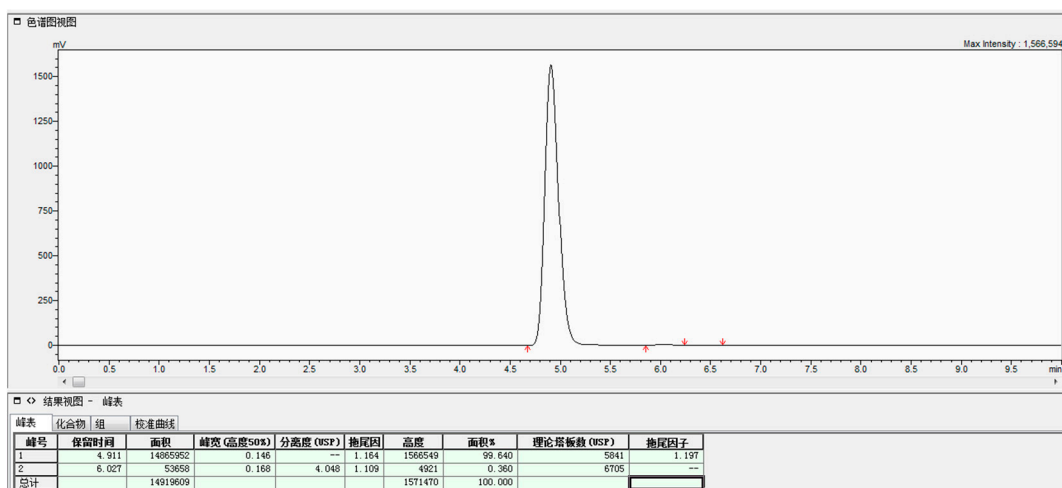
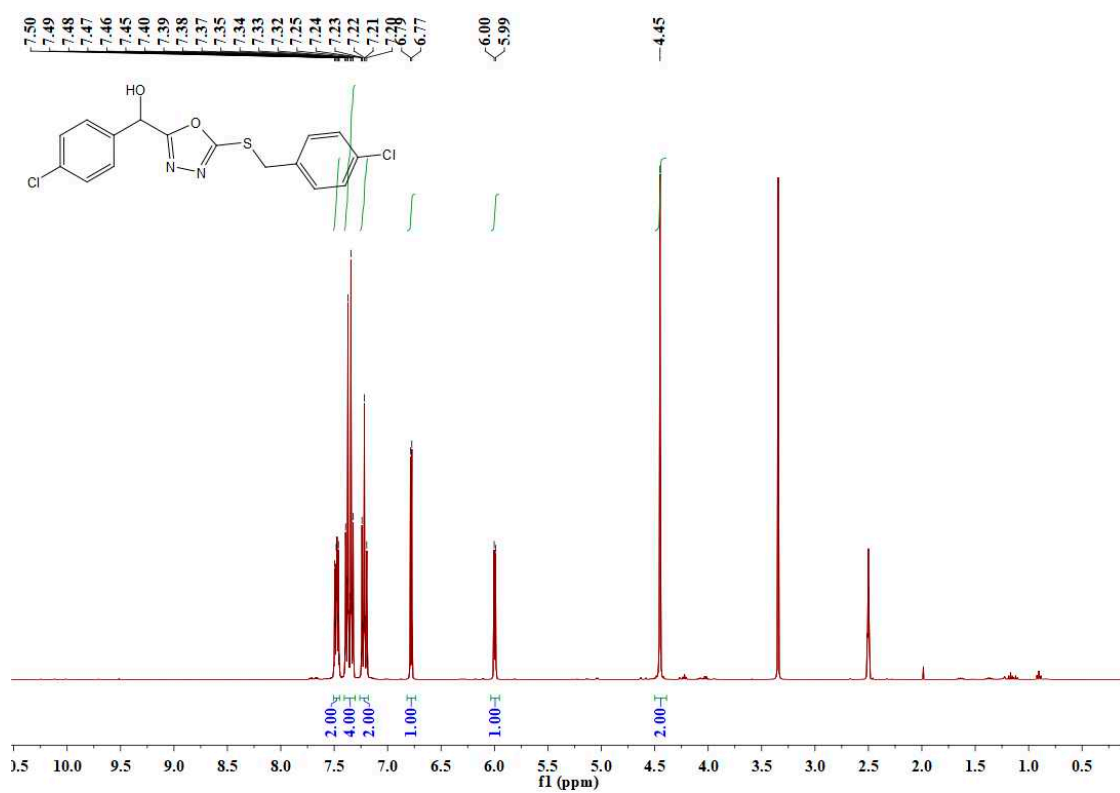
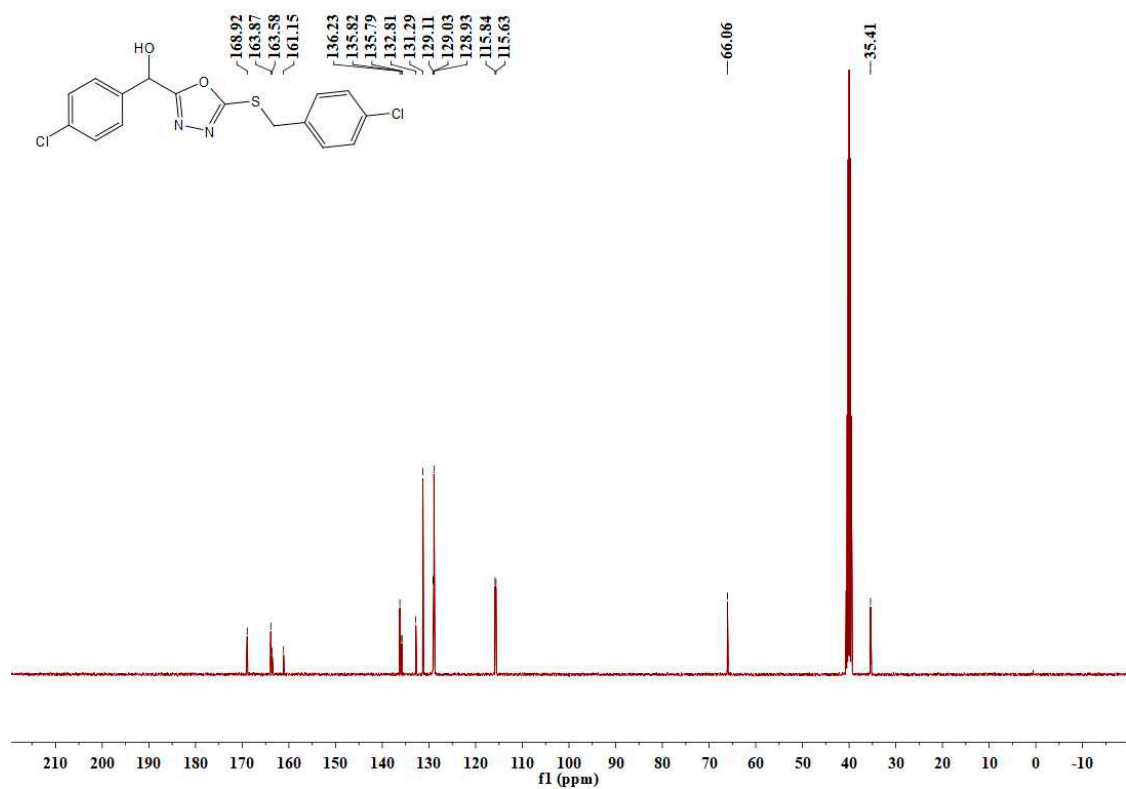


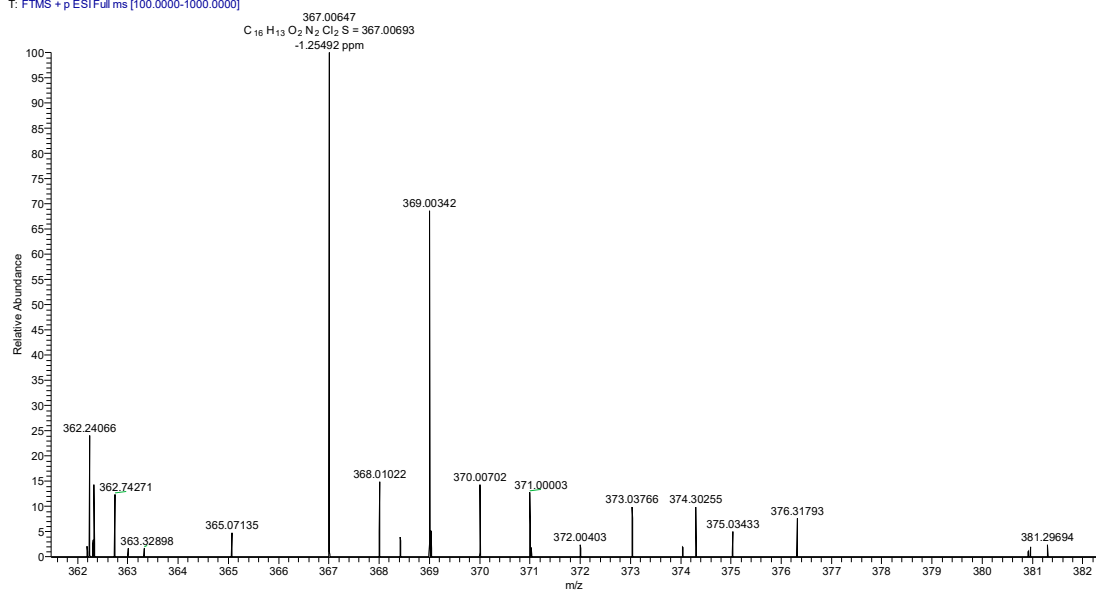
Figure S19. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E**₁₉.





25 #35 RT: 0.35 AV: 1 NL: 8.79E6

T: FTMS + p ESIFull ms [100.0000-1000.0000]



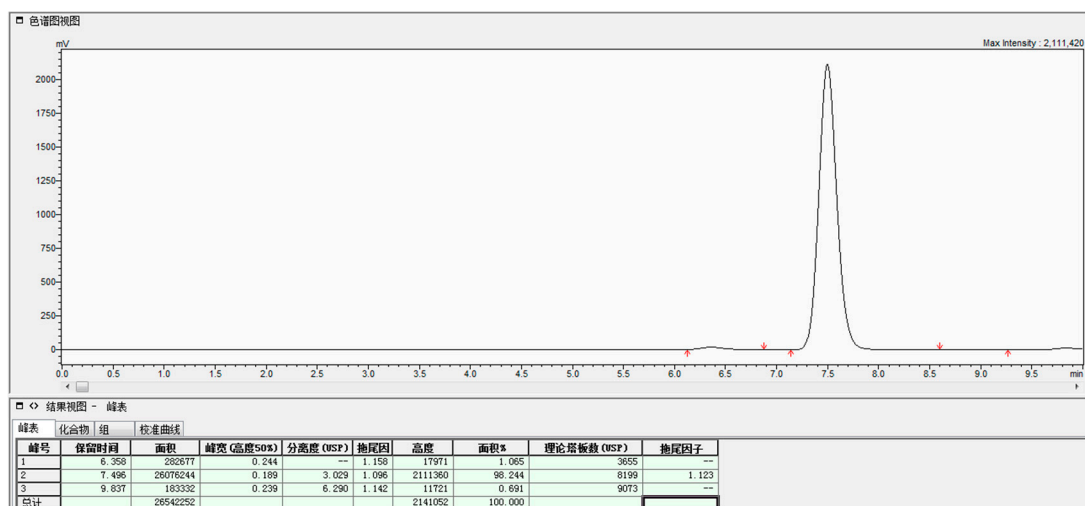
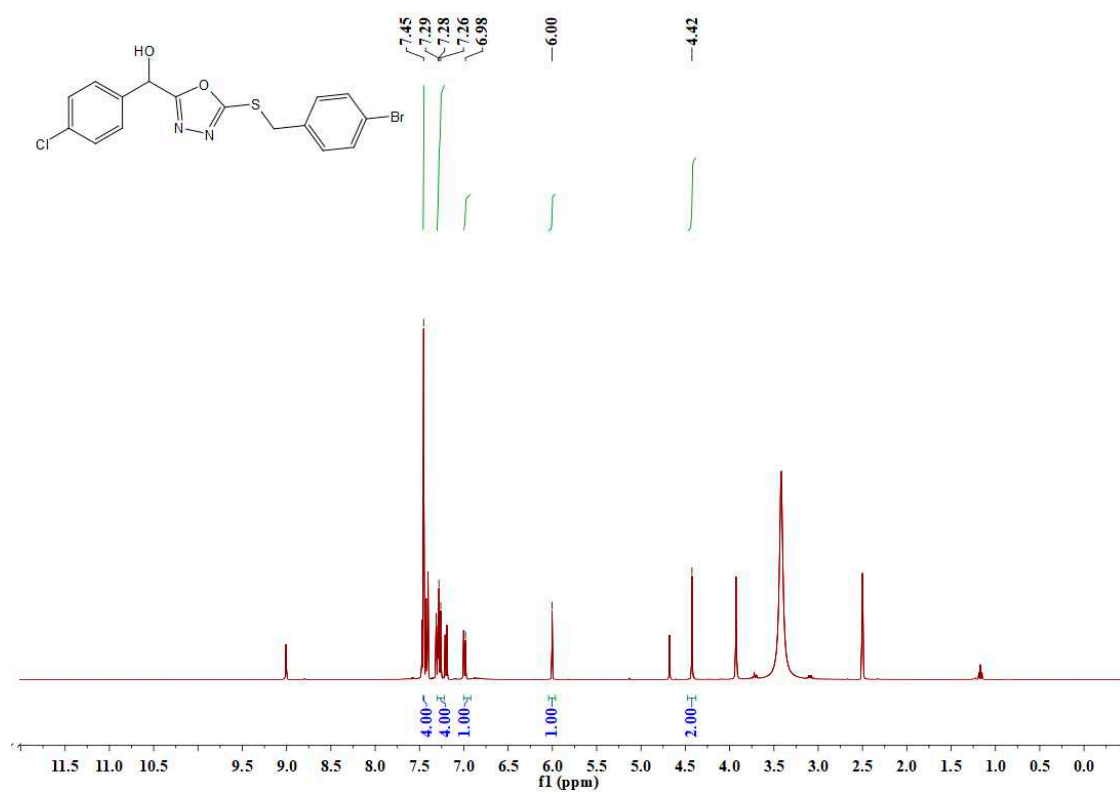
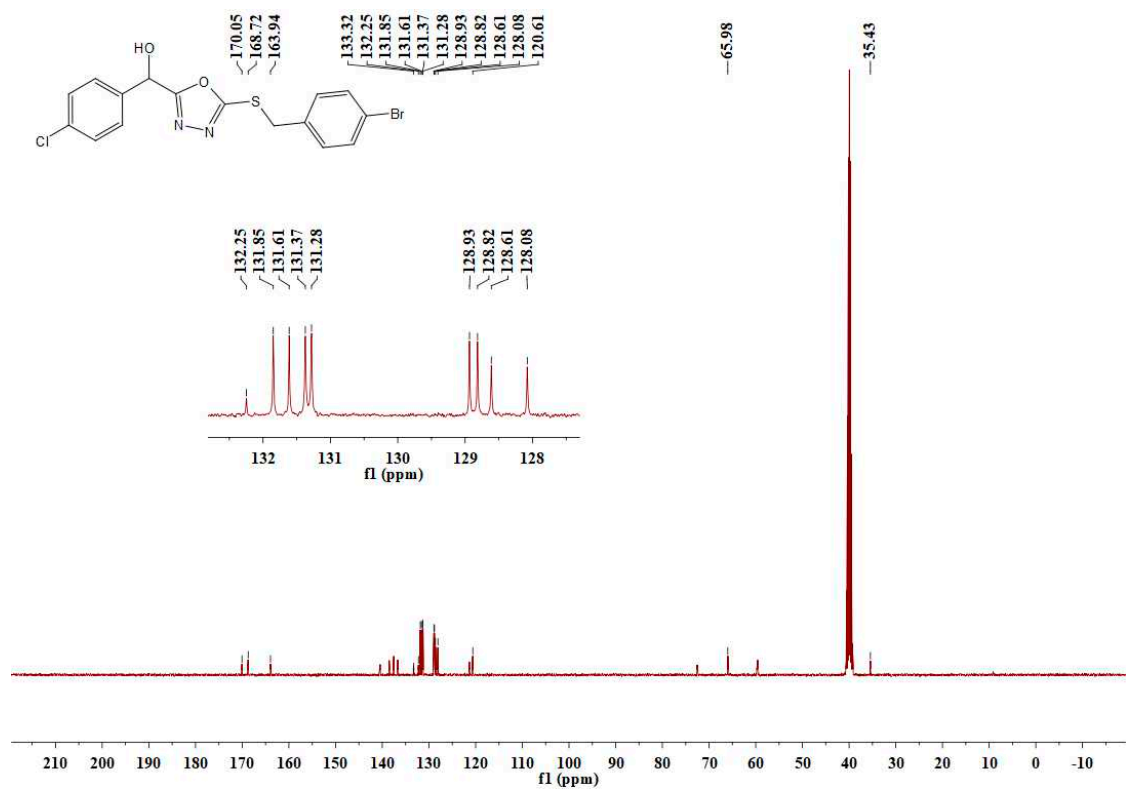


Figure S20. ^1H NMR, ^{13}C NMR, HRMS, and HPLC for **E20**.

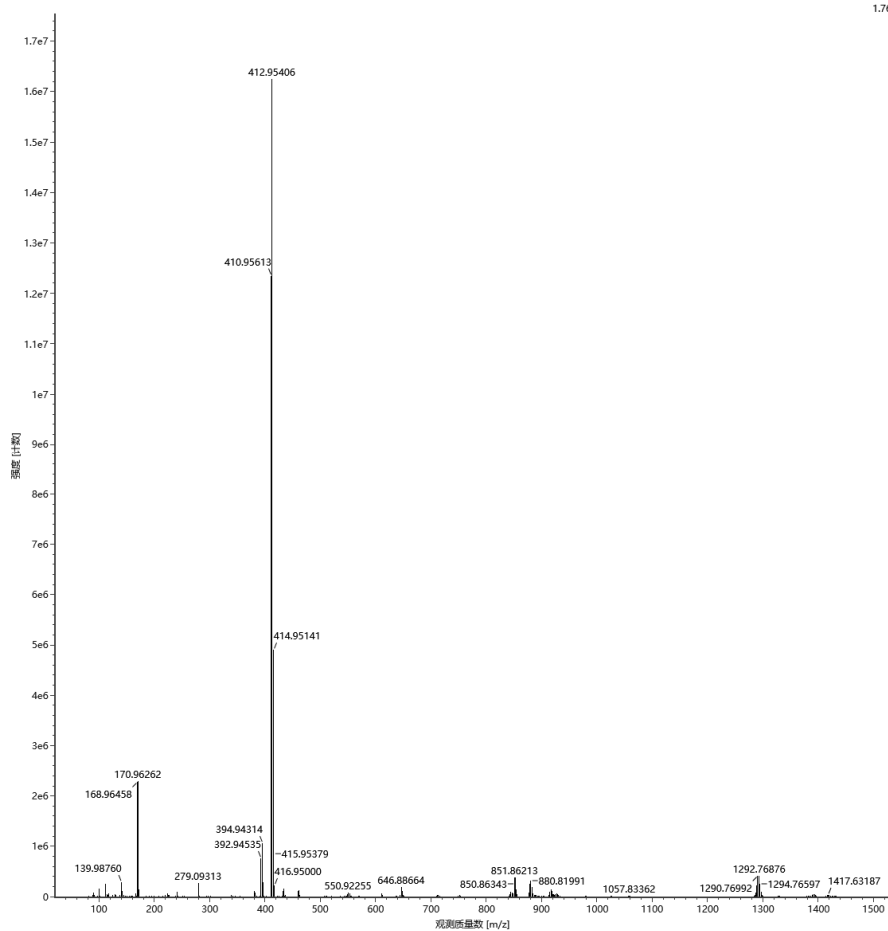




名称: HST-4w
说明:

通道名: 1; 平均时间: 3.1247 min; TOF MS (50-1500) ESI+; 质点: 合并

1.76e7



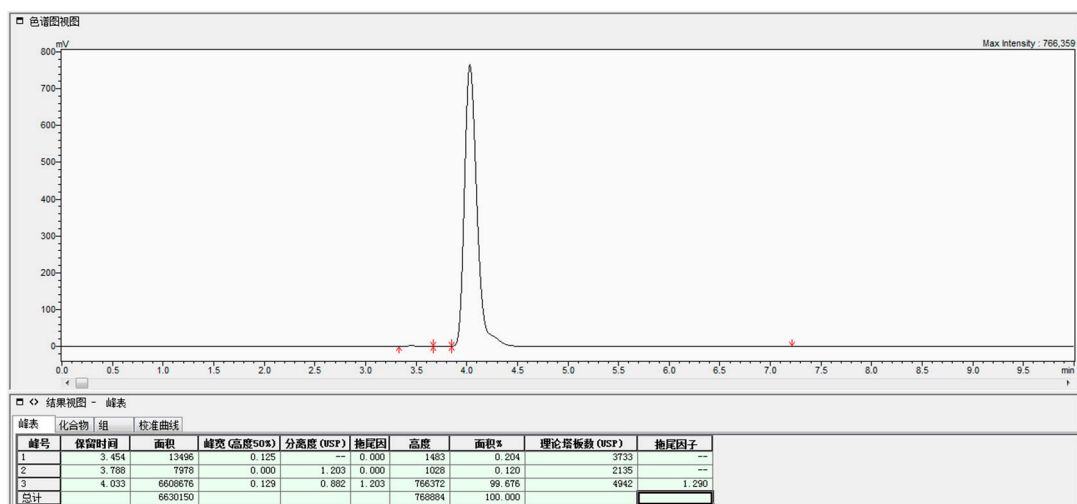
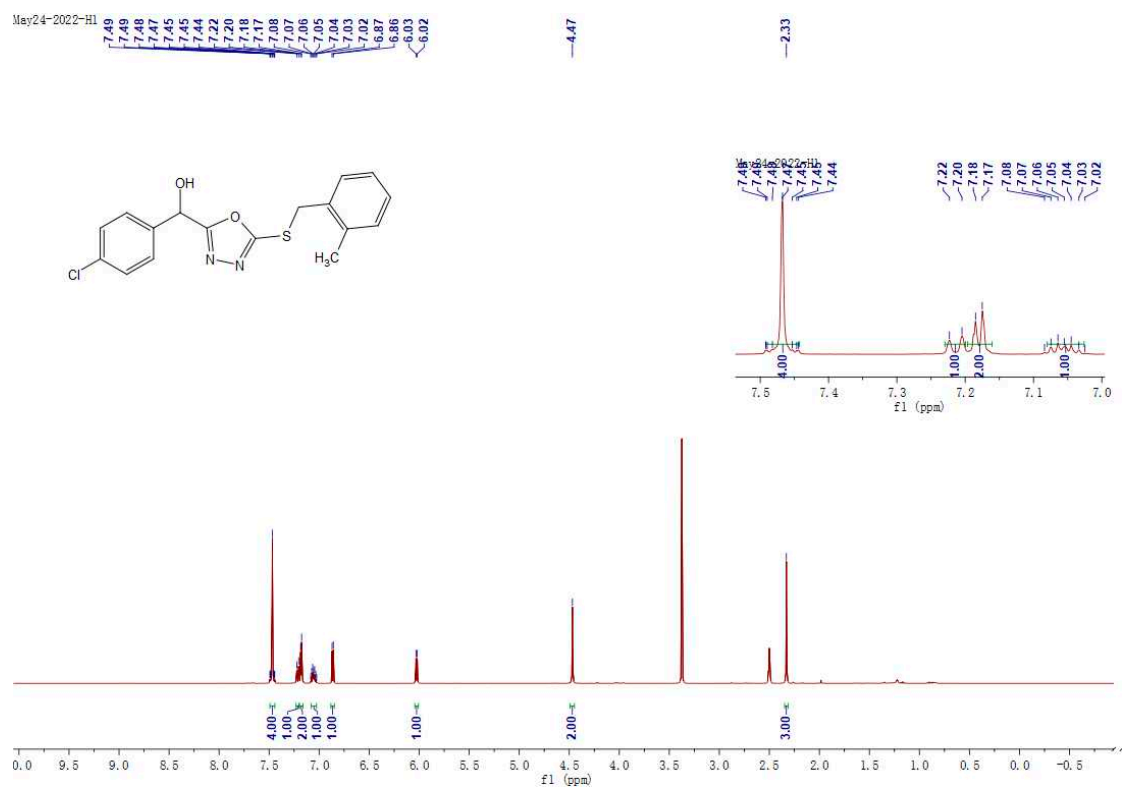
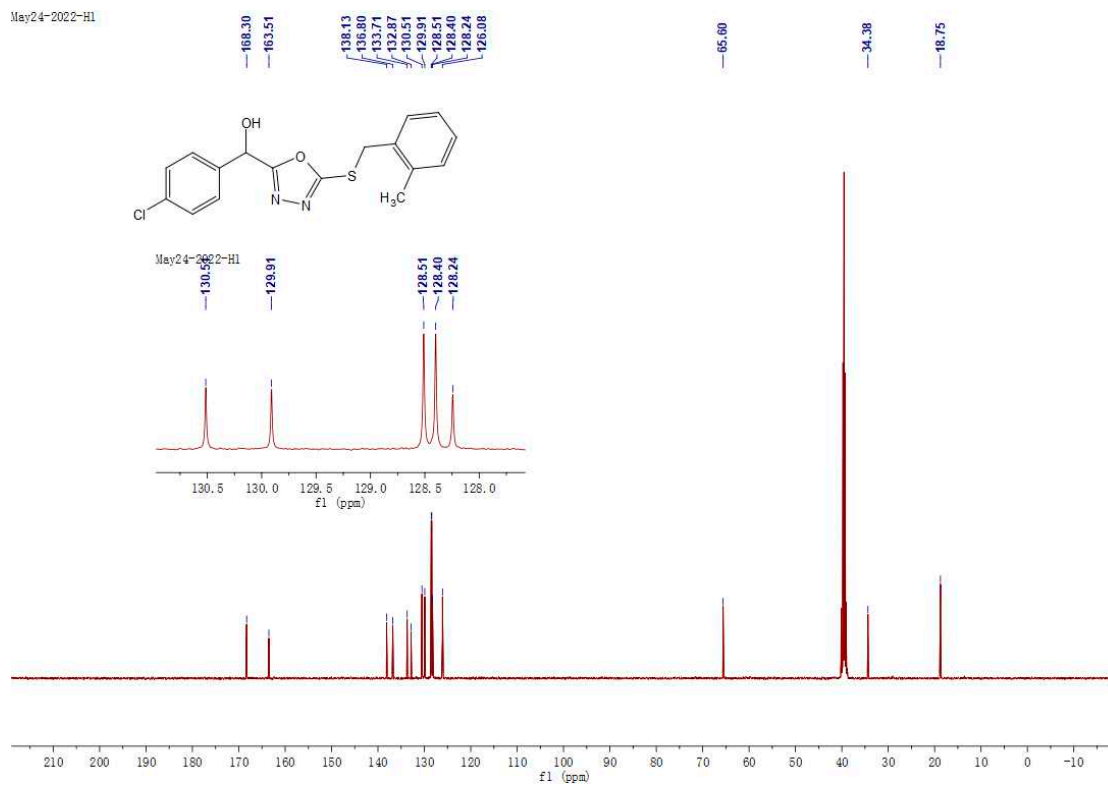


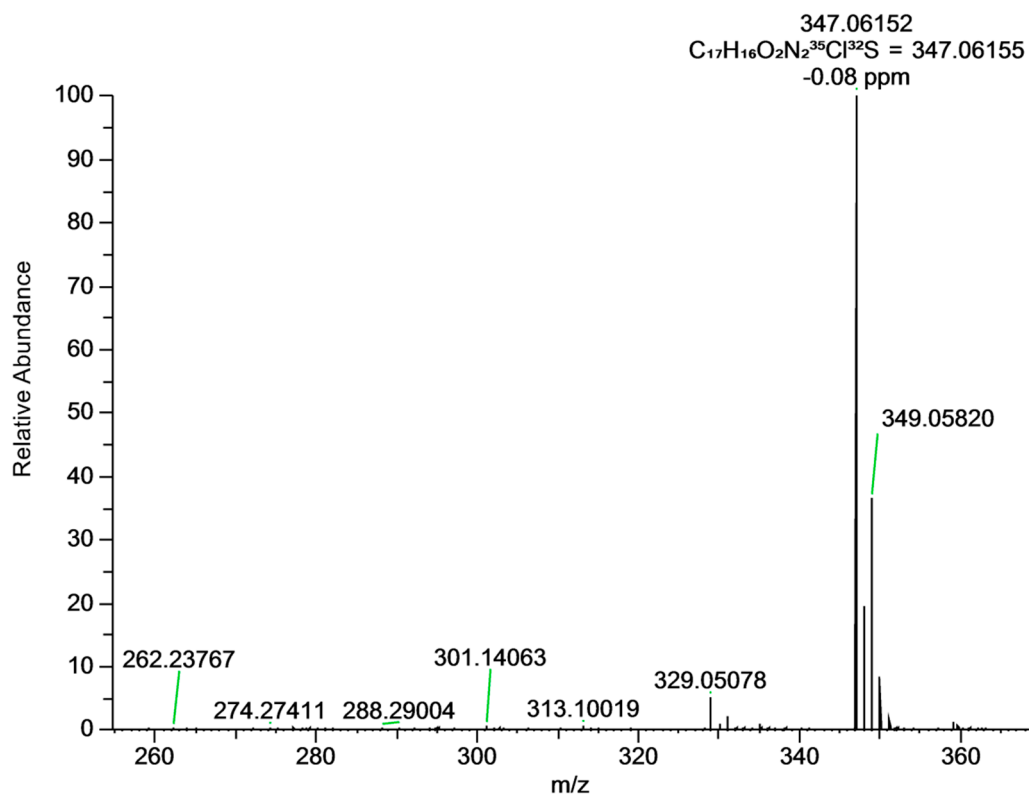
Figure S21. ^1H NMR, ^{13}C NMR, HRMS, and HPLC for E_{21} .



May24-2022-H1



43 #37 RT: 0.37 AV: 1 NL: 6.19E+008
T: FTMS + p ESI Full ms [150.0000-2200.0000]



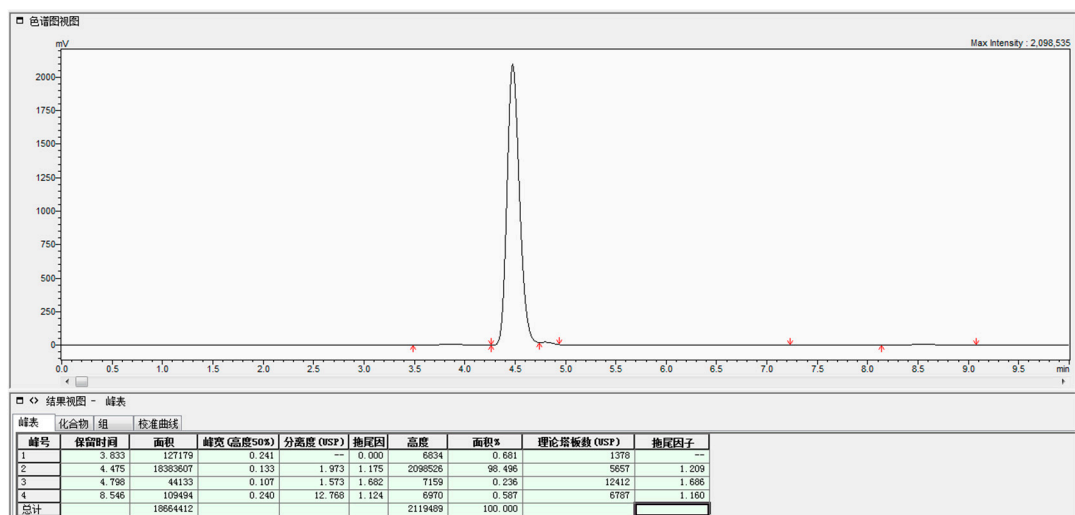
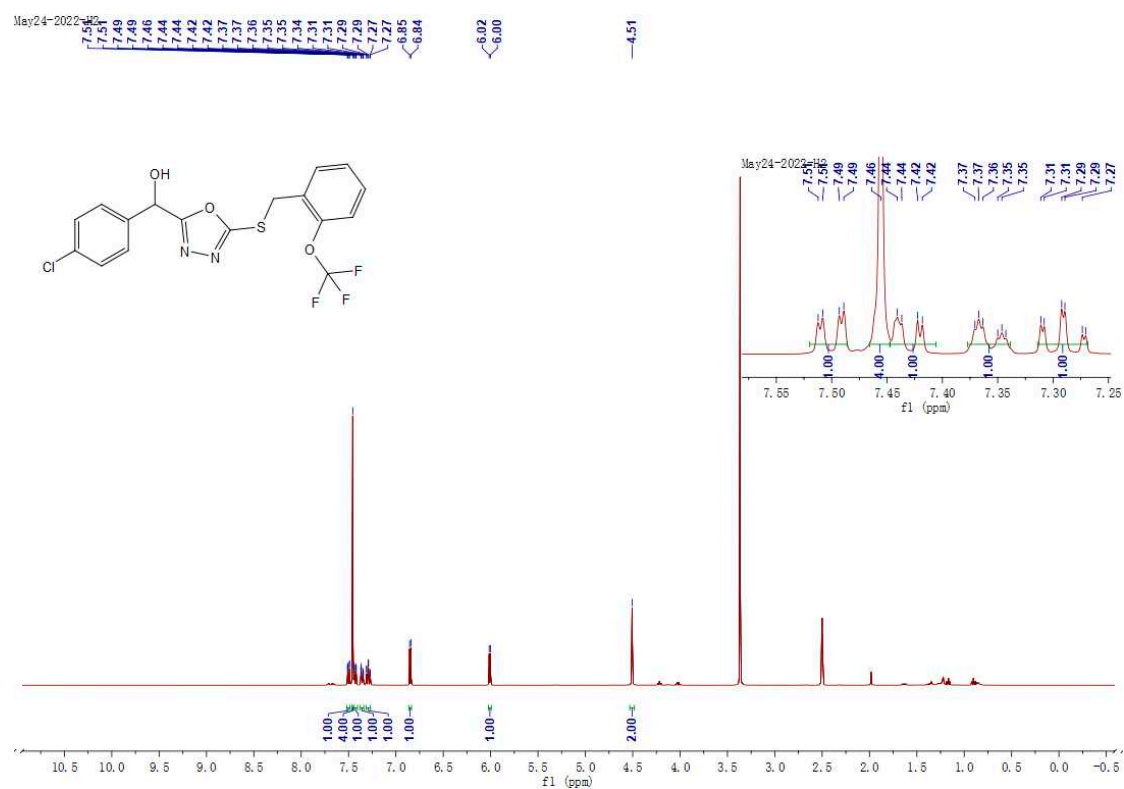
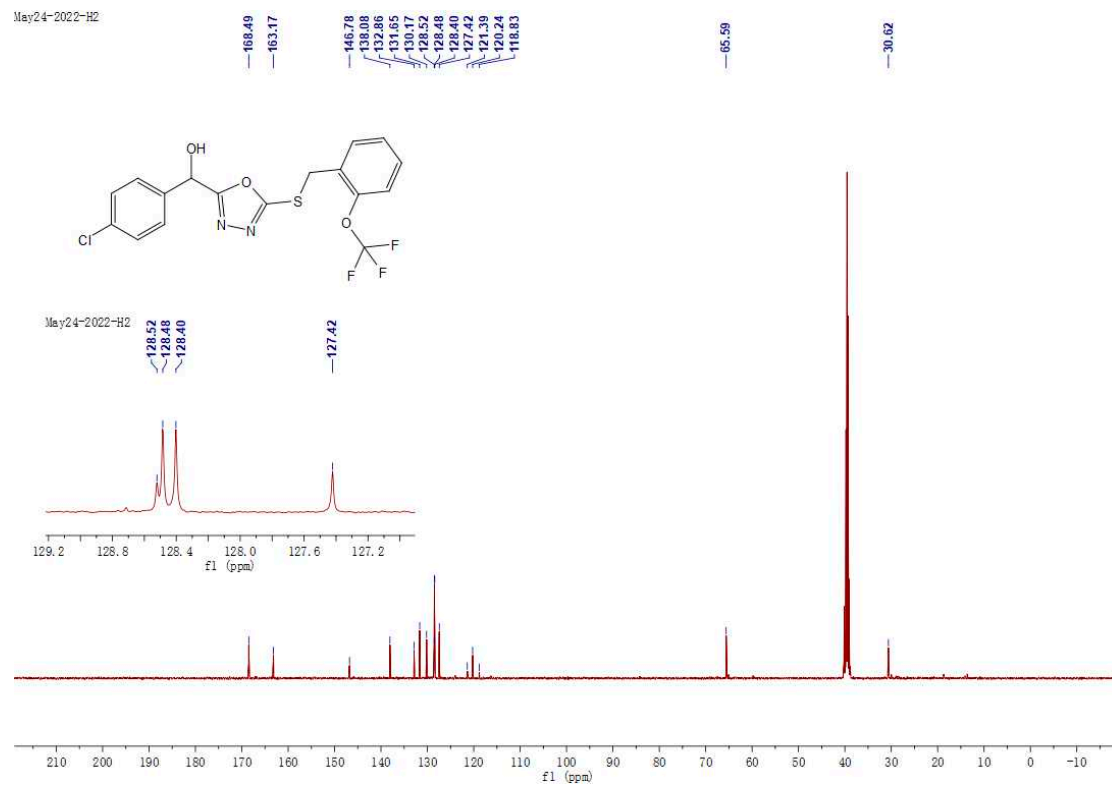


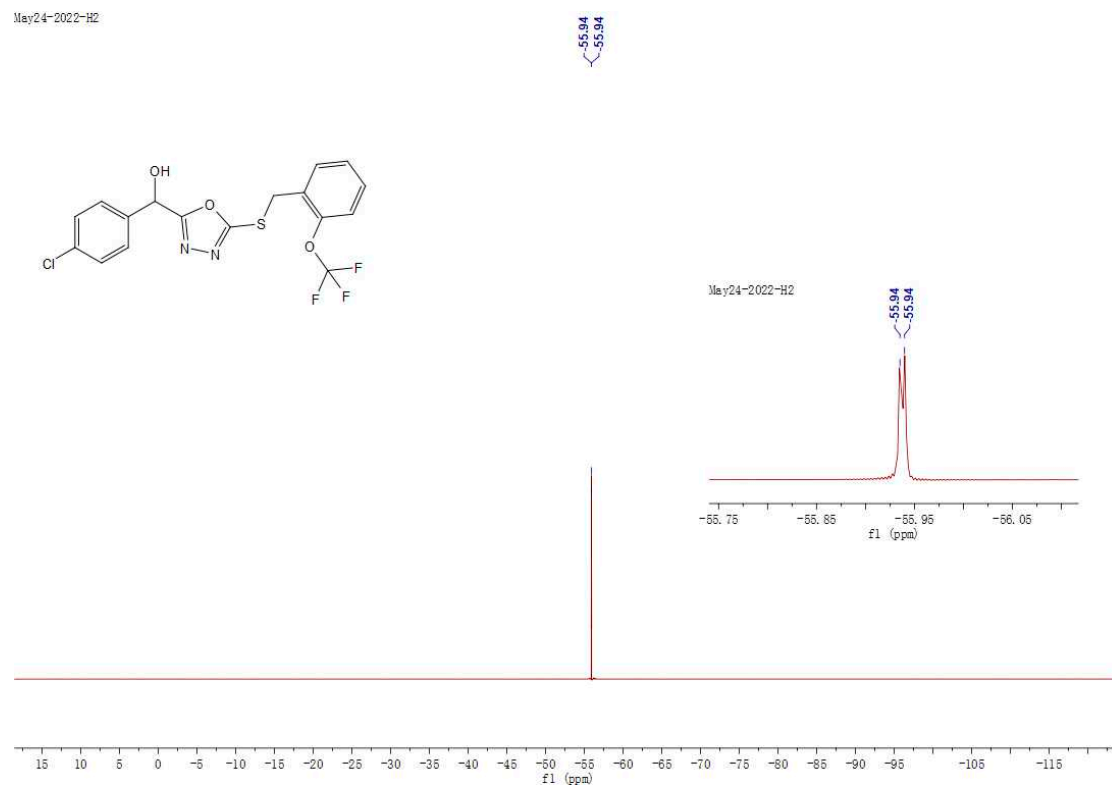
Figure S22. ^1H NMR, ^{13}C NMR, HRMS, and HPLC for E22.



May24-2022-H2



May24-2022-H2



44 #43 RT: 0.43 AV: 1 NL: 7.29E+008
T: FTMS + p ESI Full ms [150.0000-2200.0000]

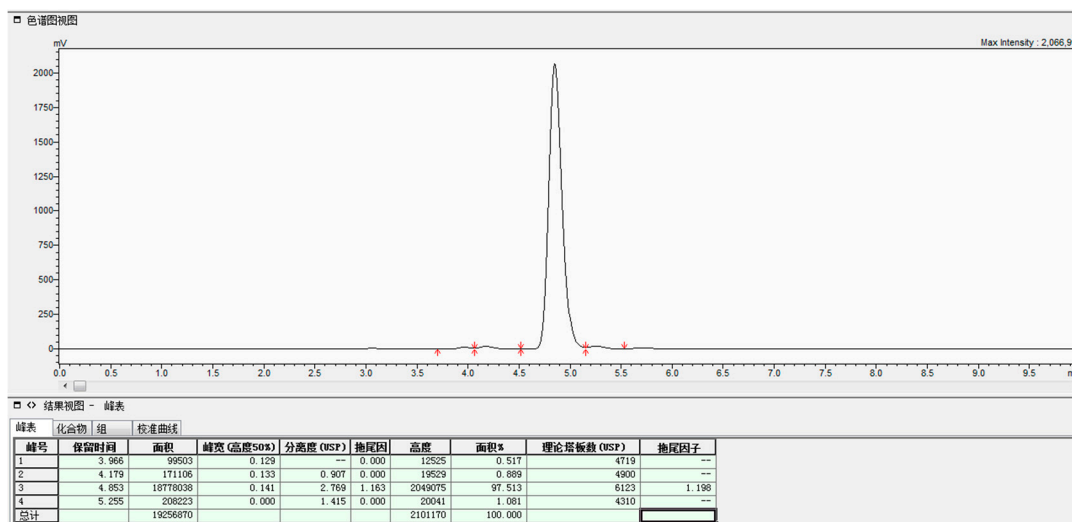
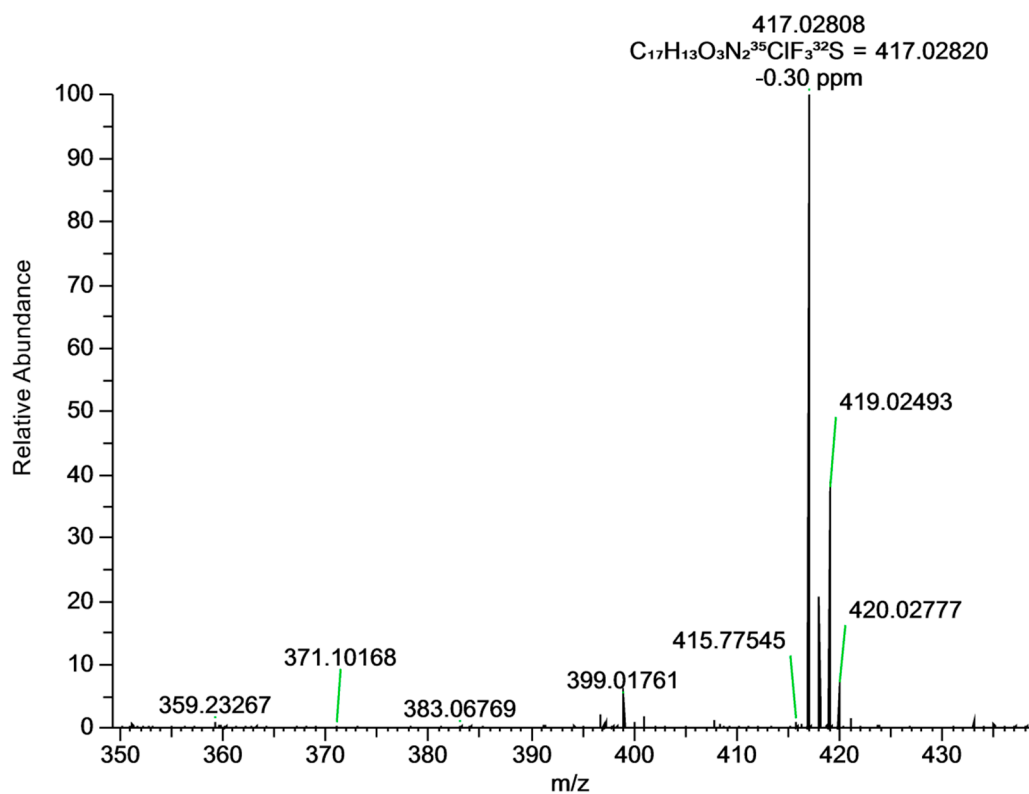
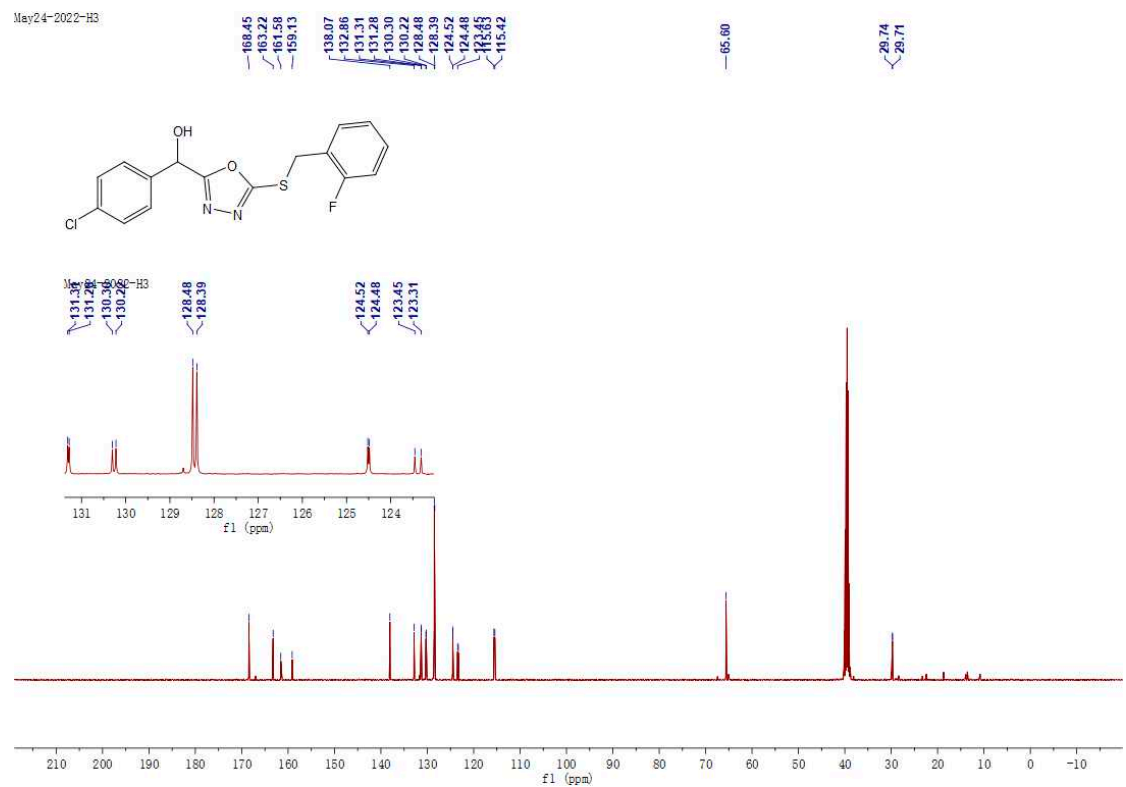
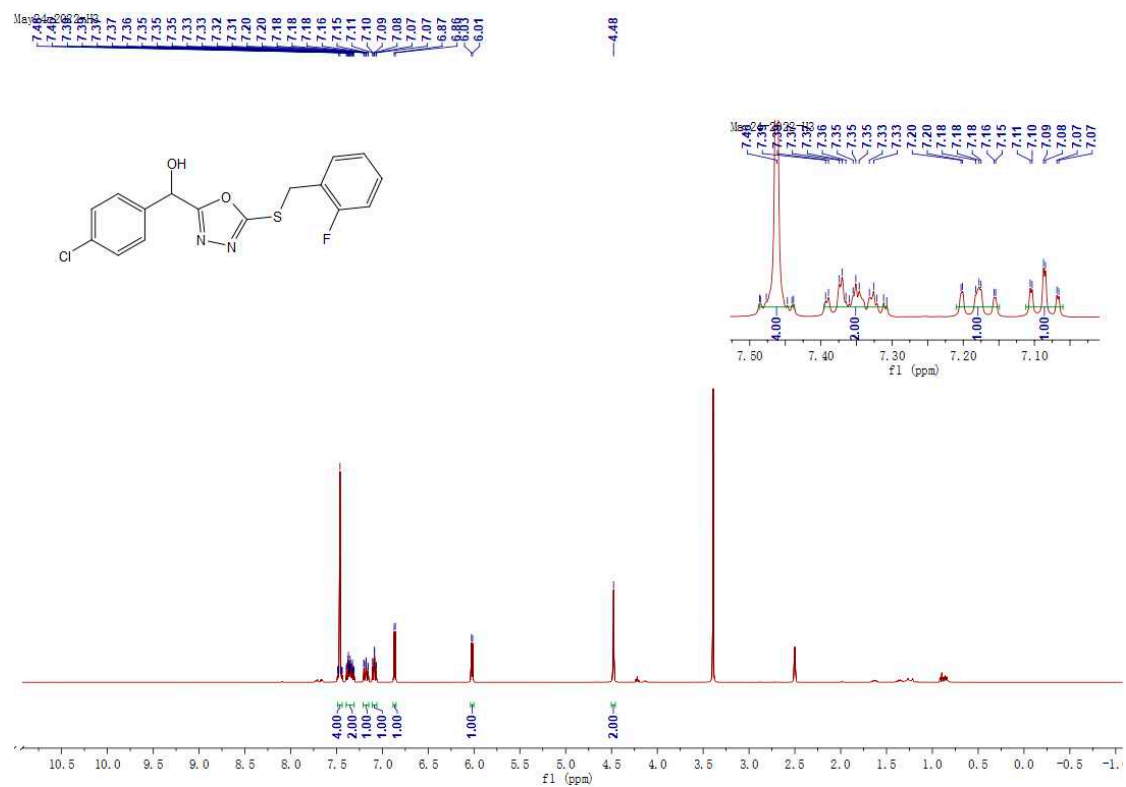
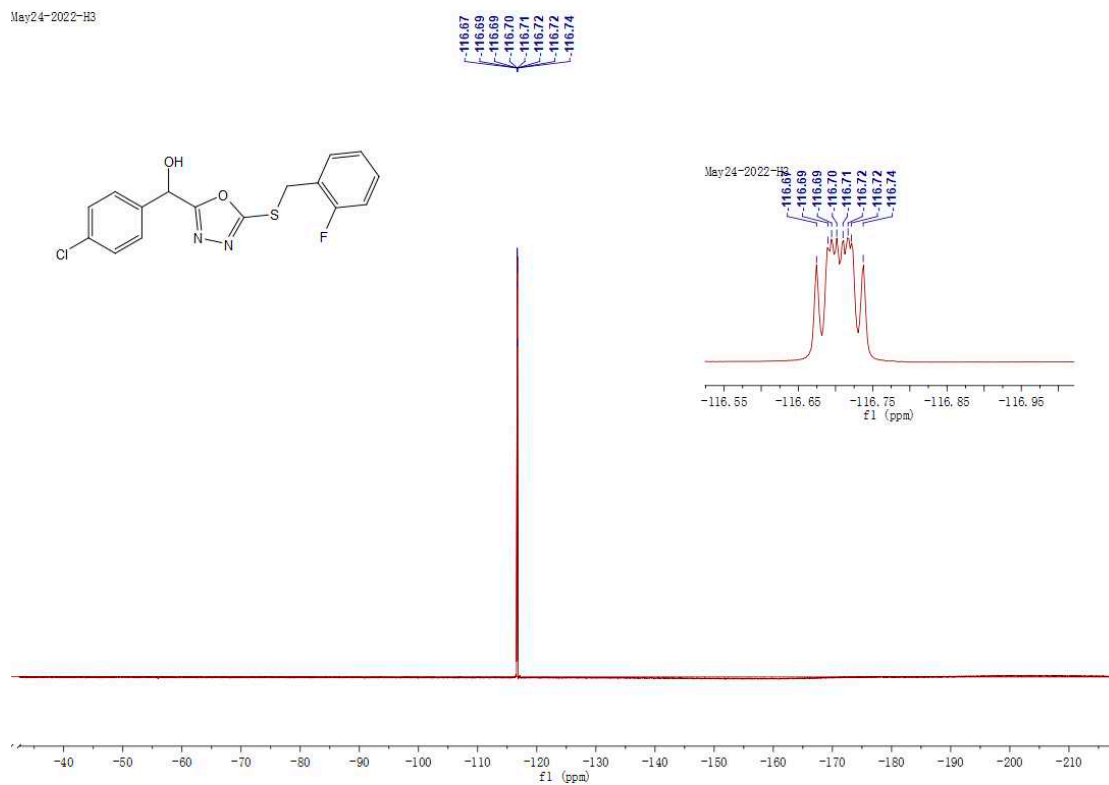


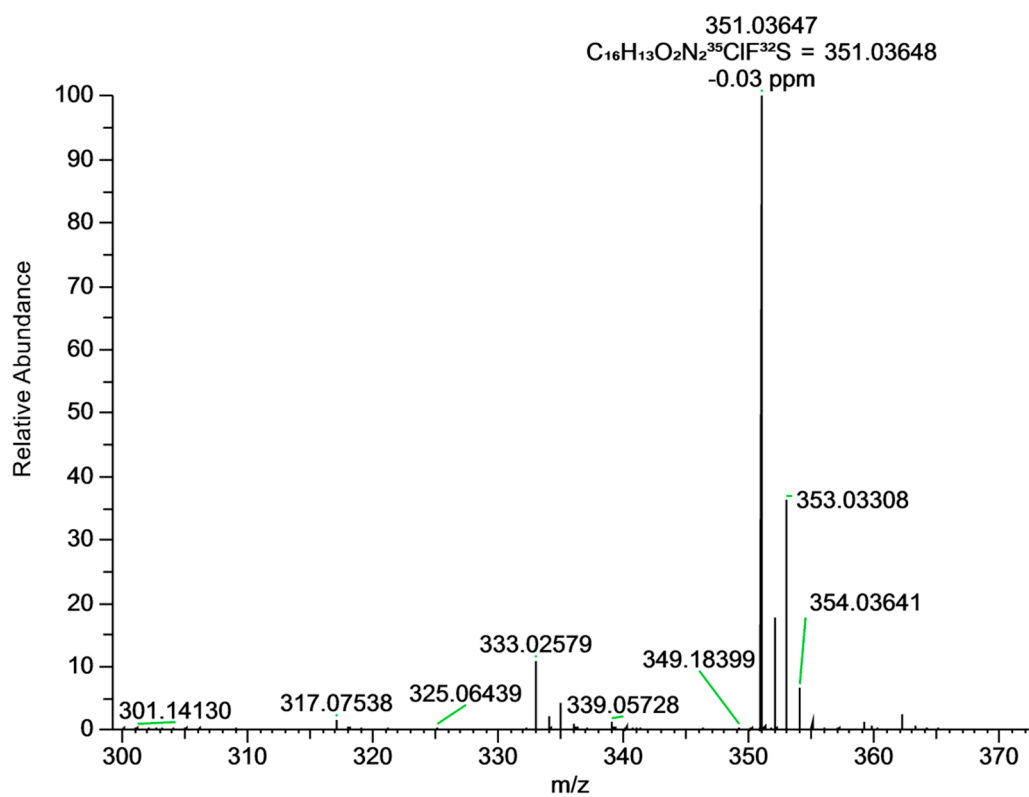
Figure S23. 1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E**₂₃.



May24-2022-H3



45 #31 RT: 0.32 AV: 1 NL: 9.12E+008
T: FTMS + p ESI Full ms [150.0000-2200.0000]



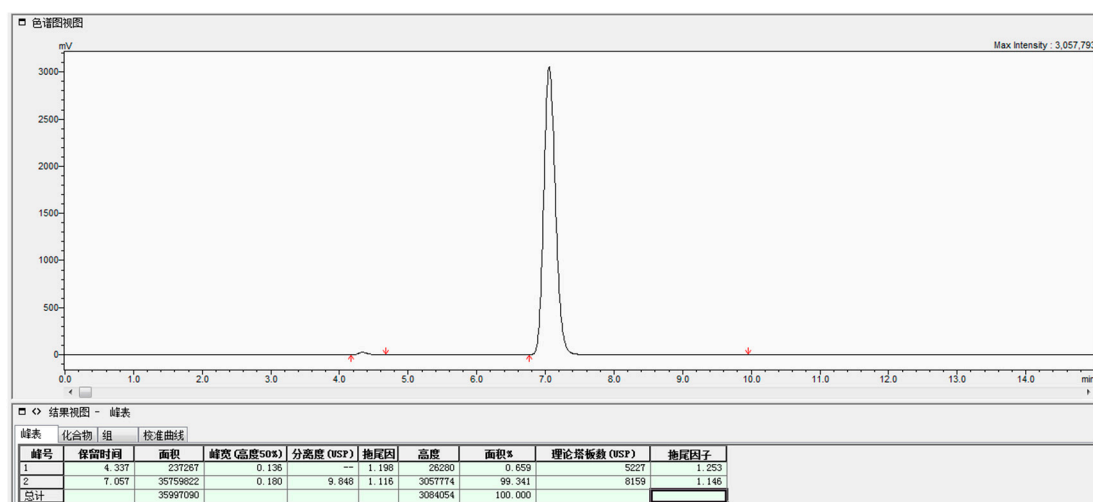
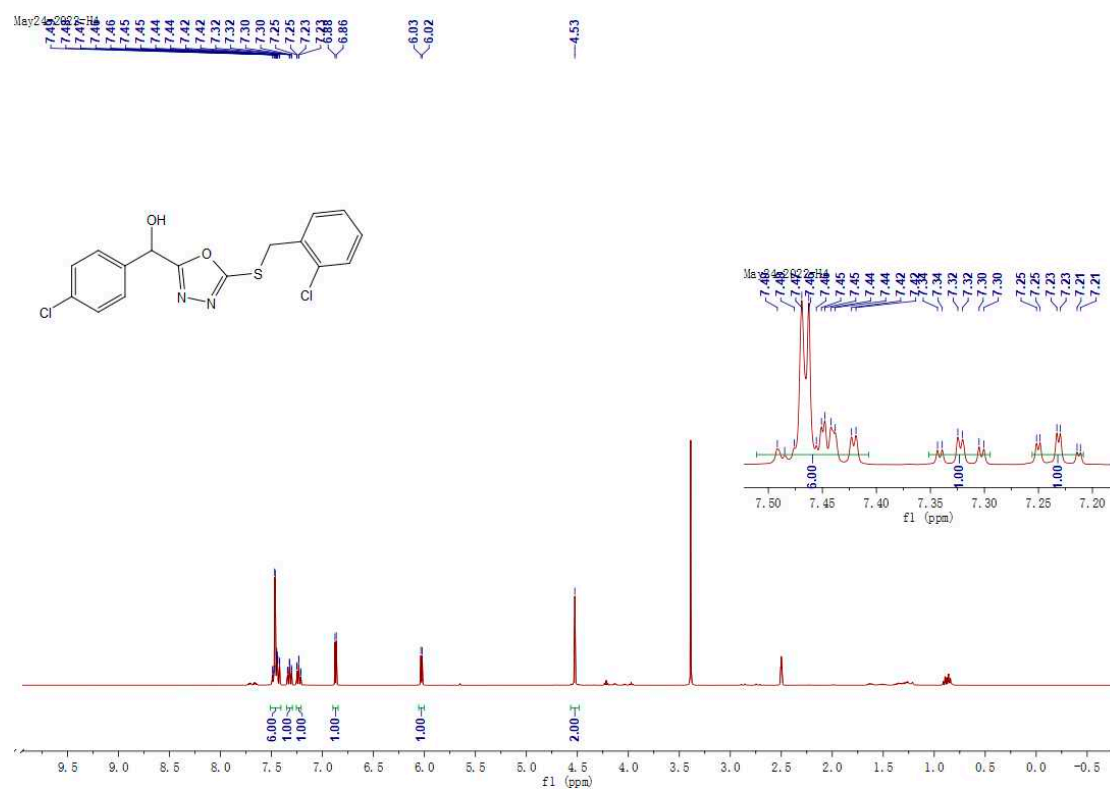
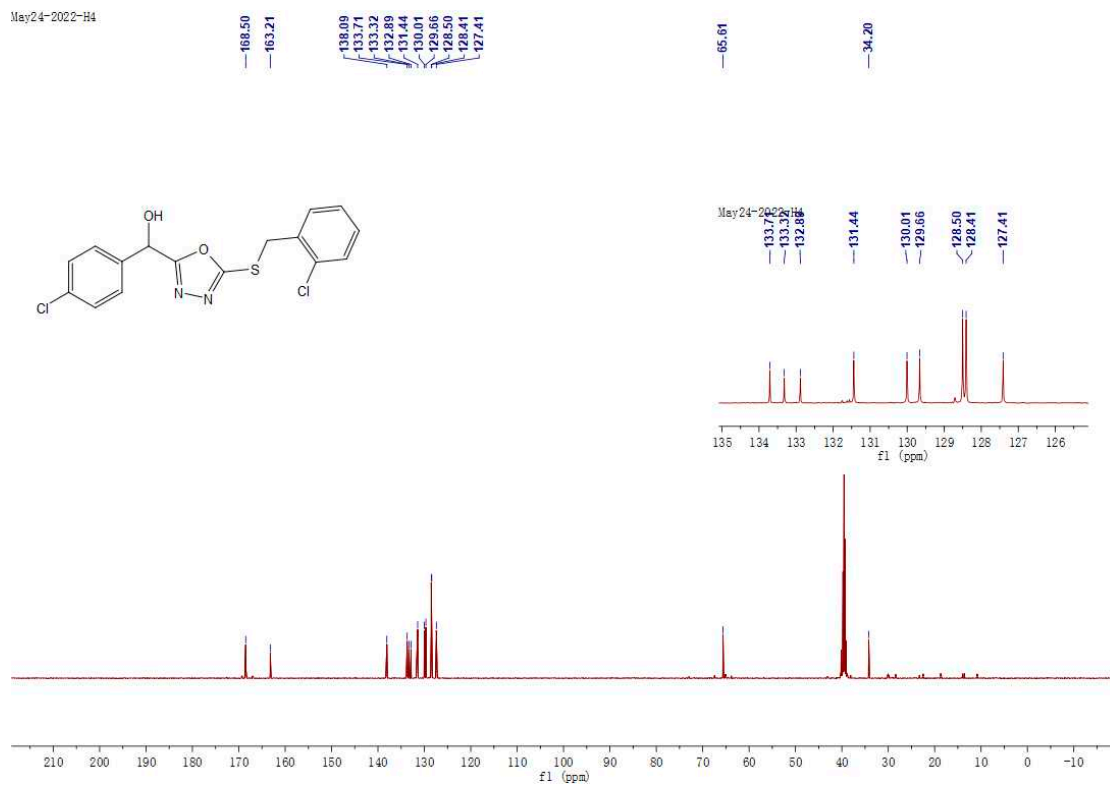


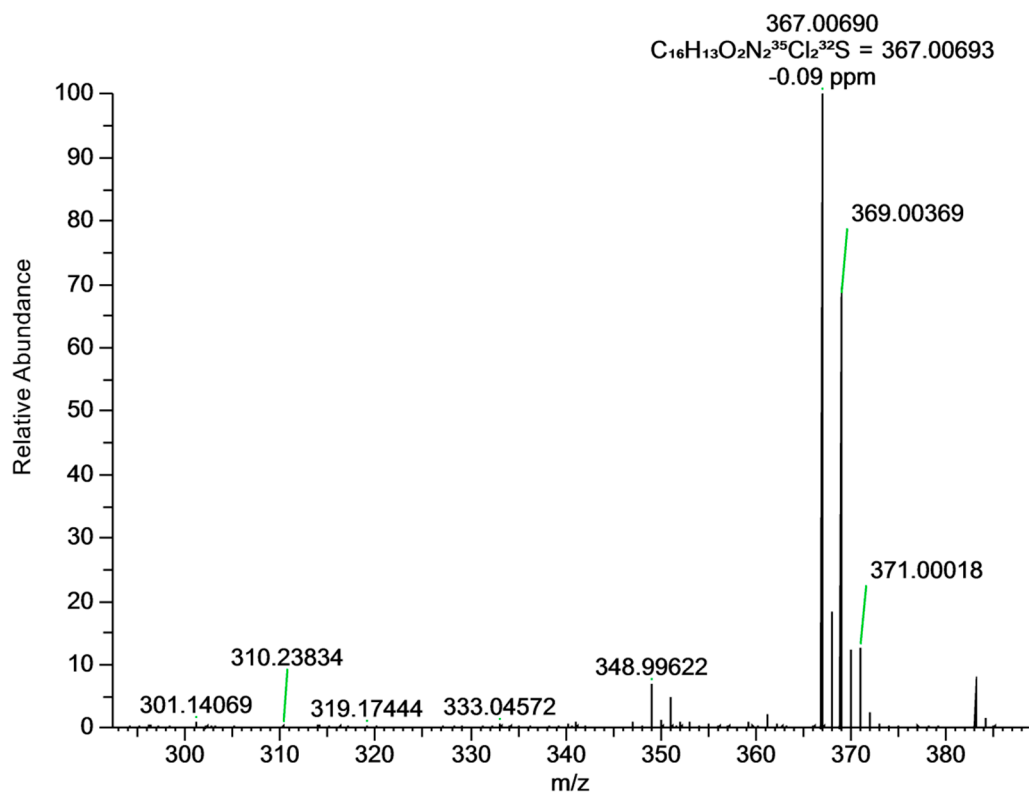
Figure S24. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E**₂₄.



May24-2022-H4



46 #39 RT: 0.39 AV: 1 NL: 8.02E+008
T: FTMS + p ESI Full ms [150.0000-2200.0000]



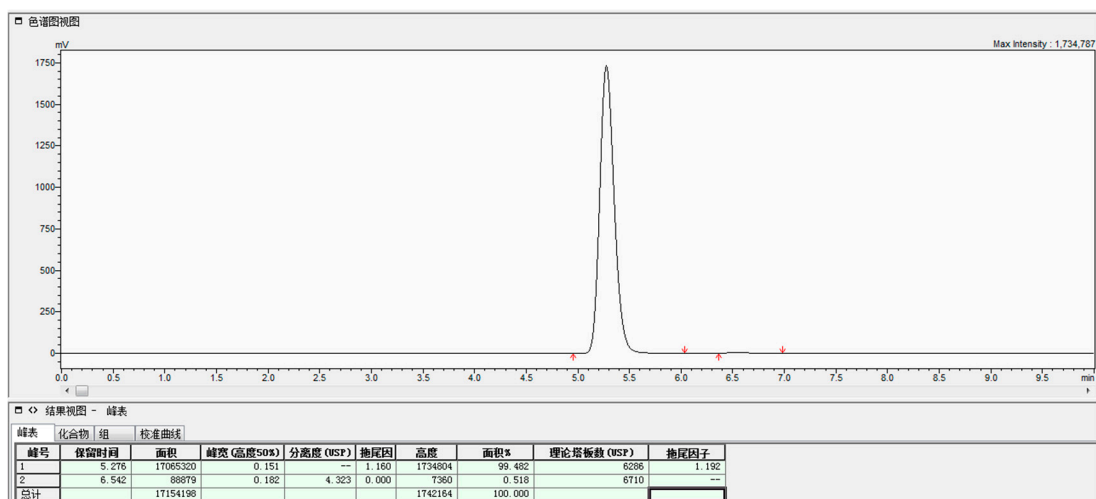
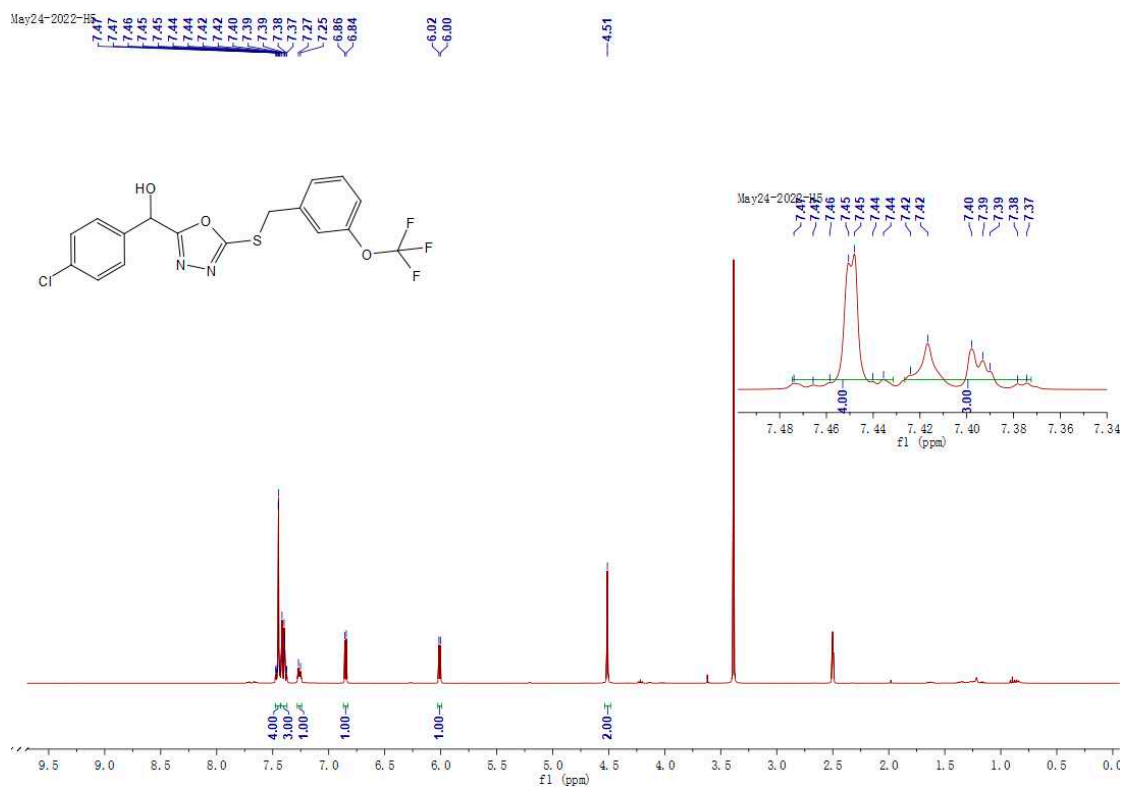
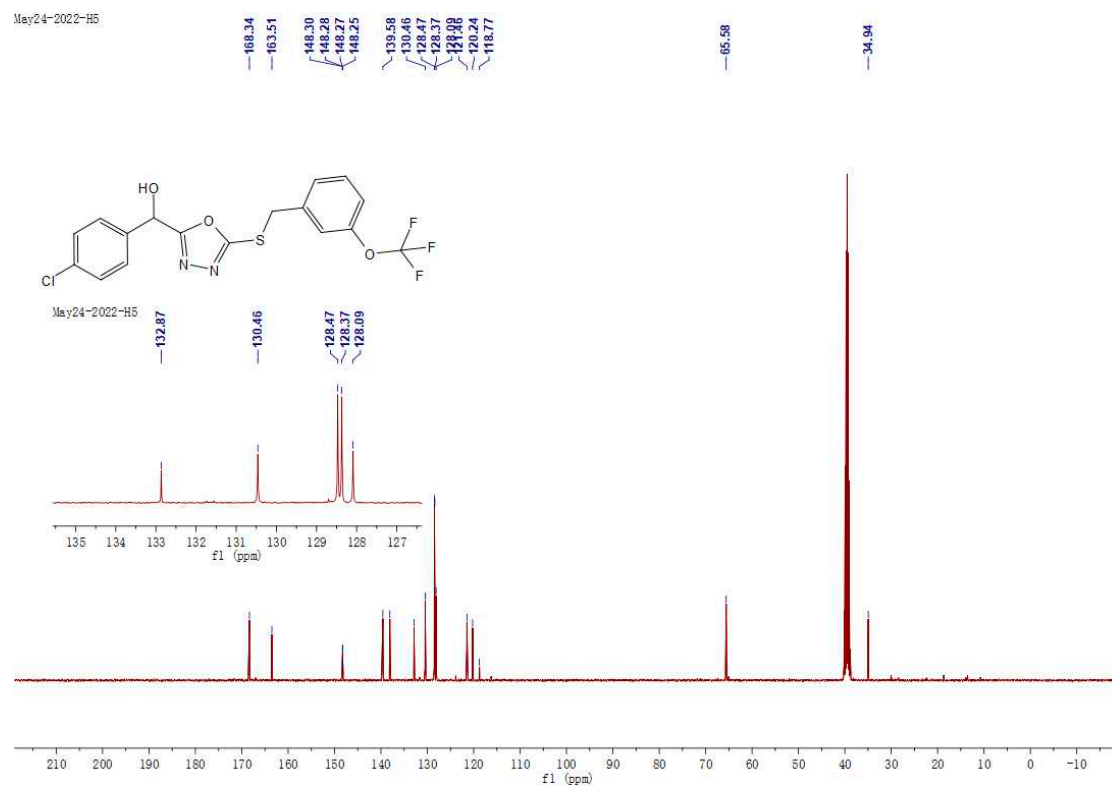


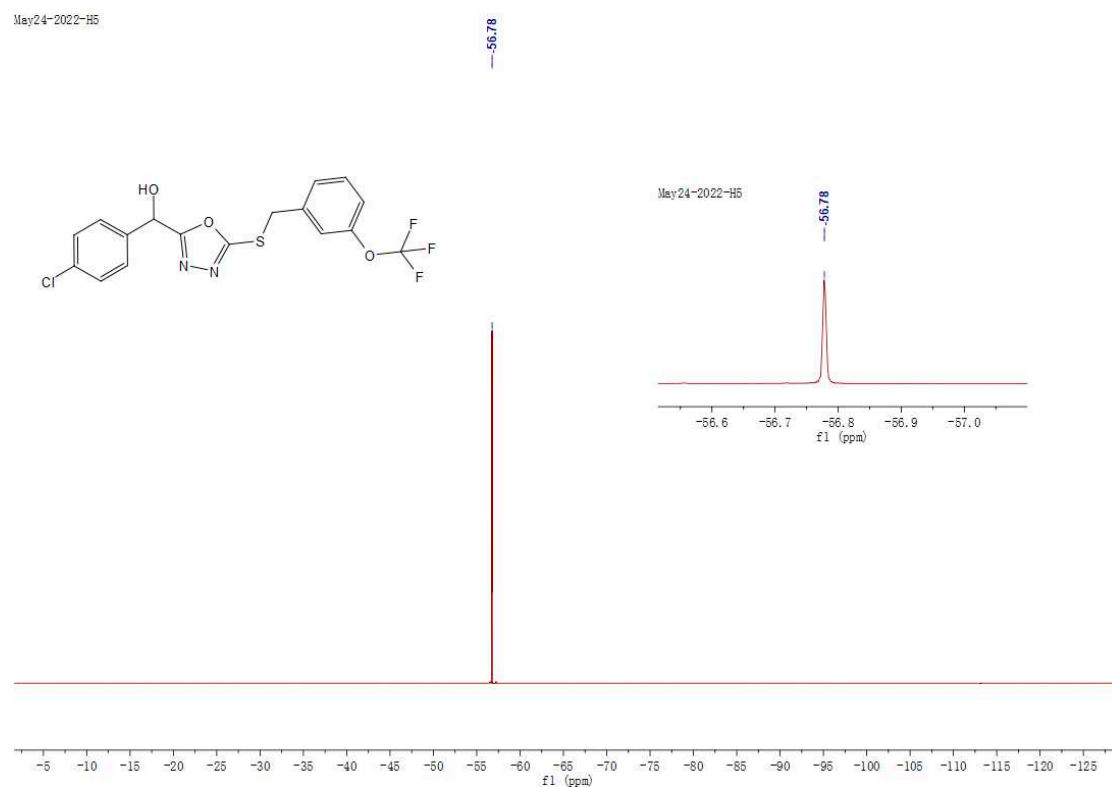
Figure S25. ^1H NMR, ^{13}C NMR, HRMS, and HPLC for E₂₅.



May24-2022-H5



May24-2022-H5



47 #35 RT: 0.36 AV: 1 NL: 1.01E+009
T: FTMS + p ESI Full ms [150.0000-2200.0000]

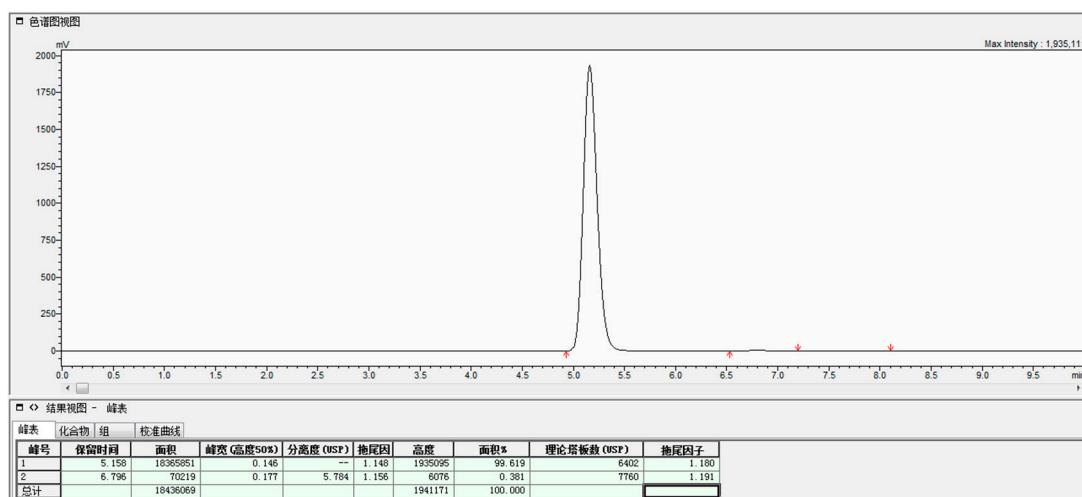
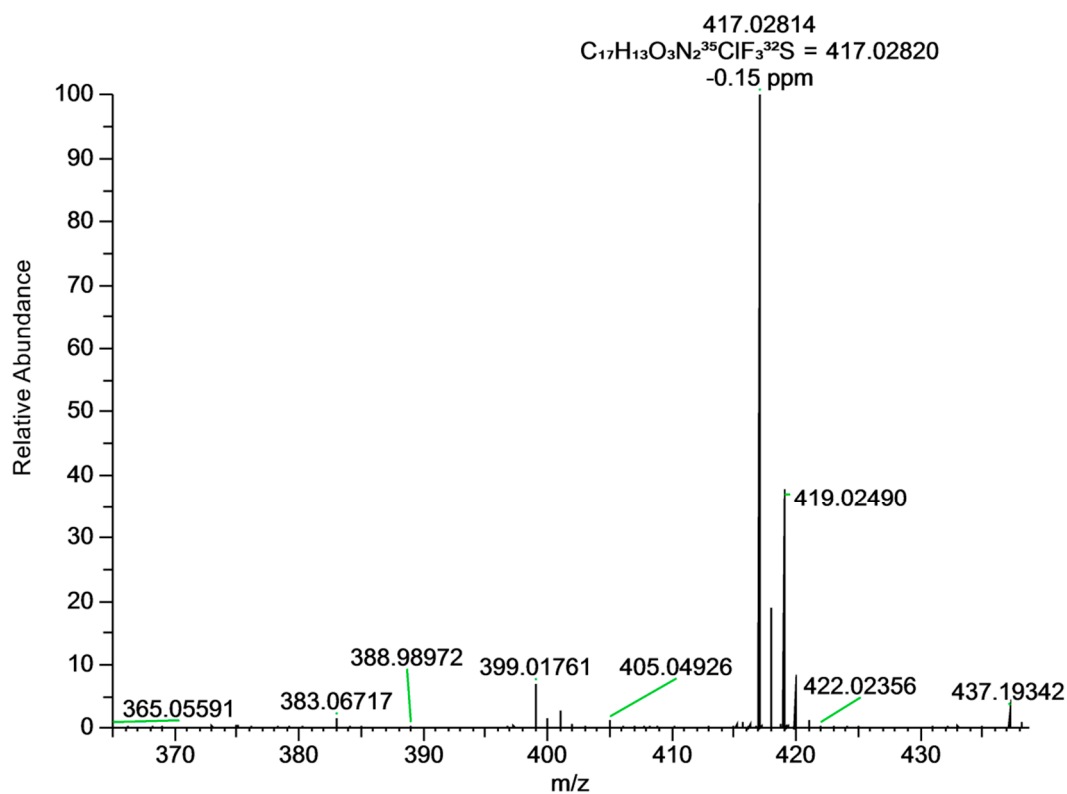
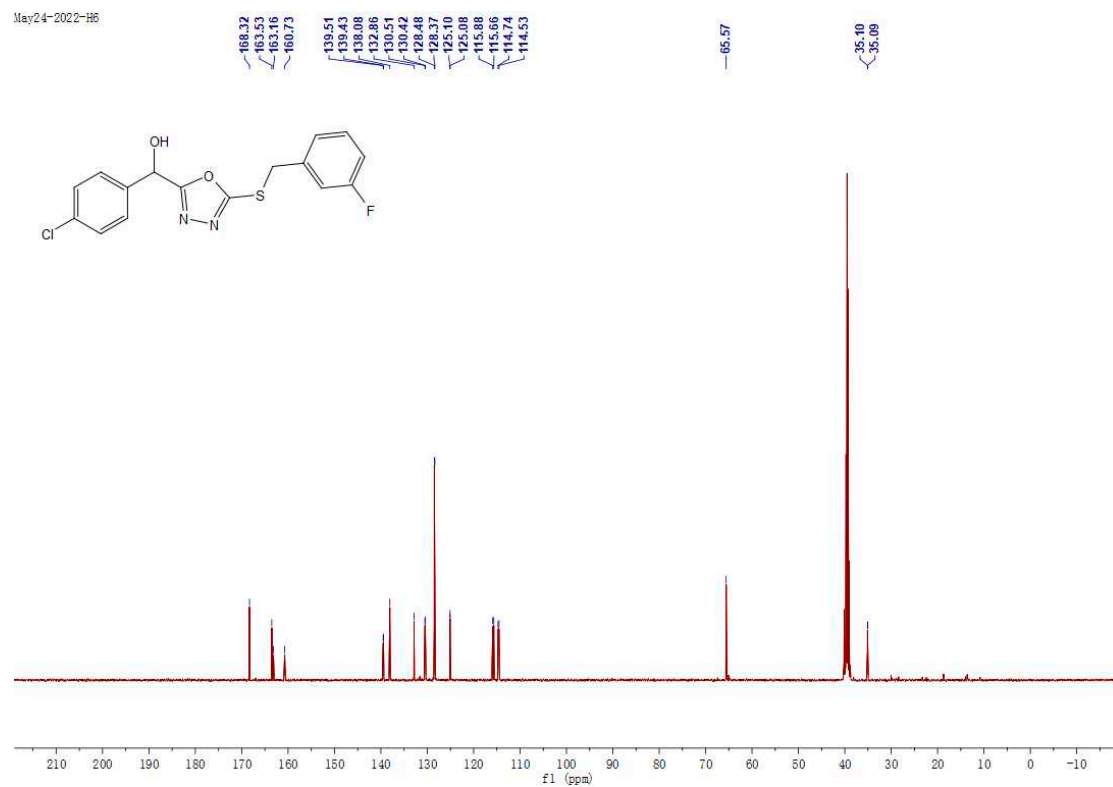
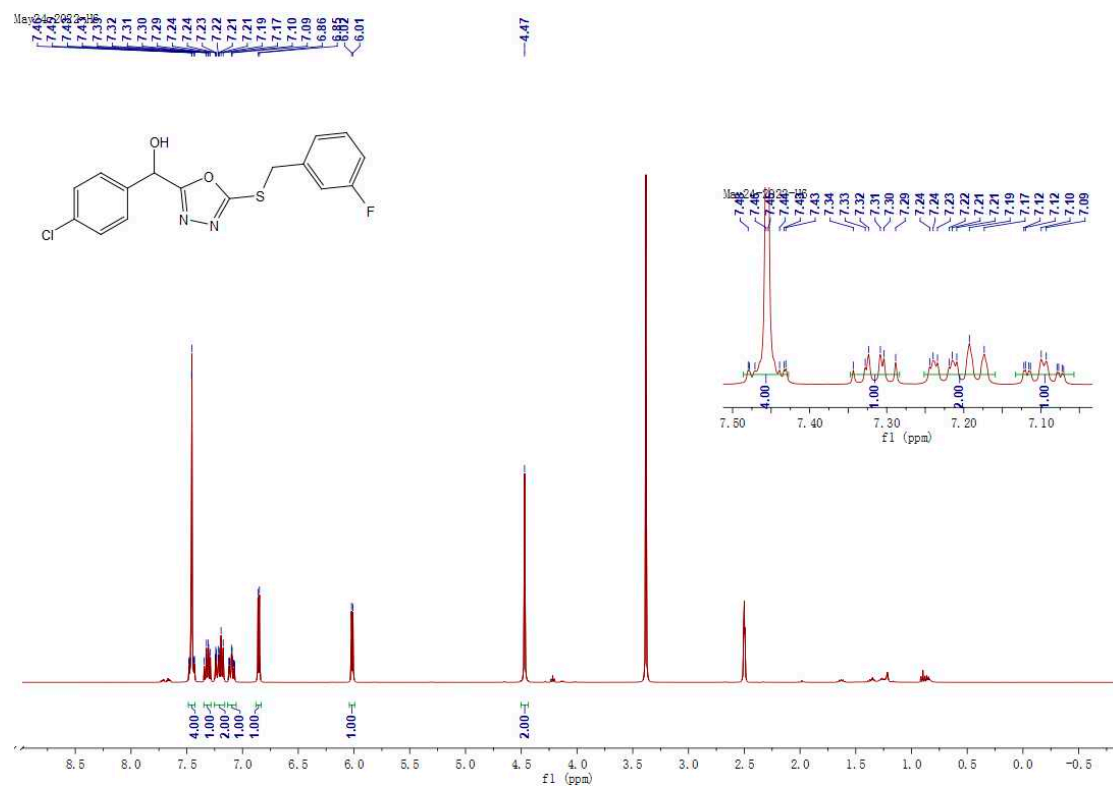
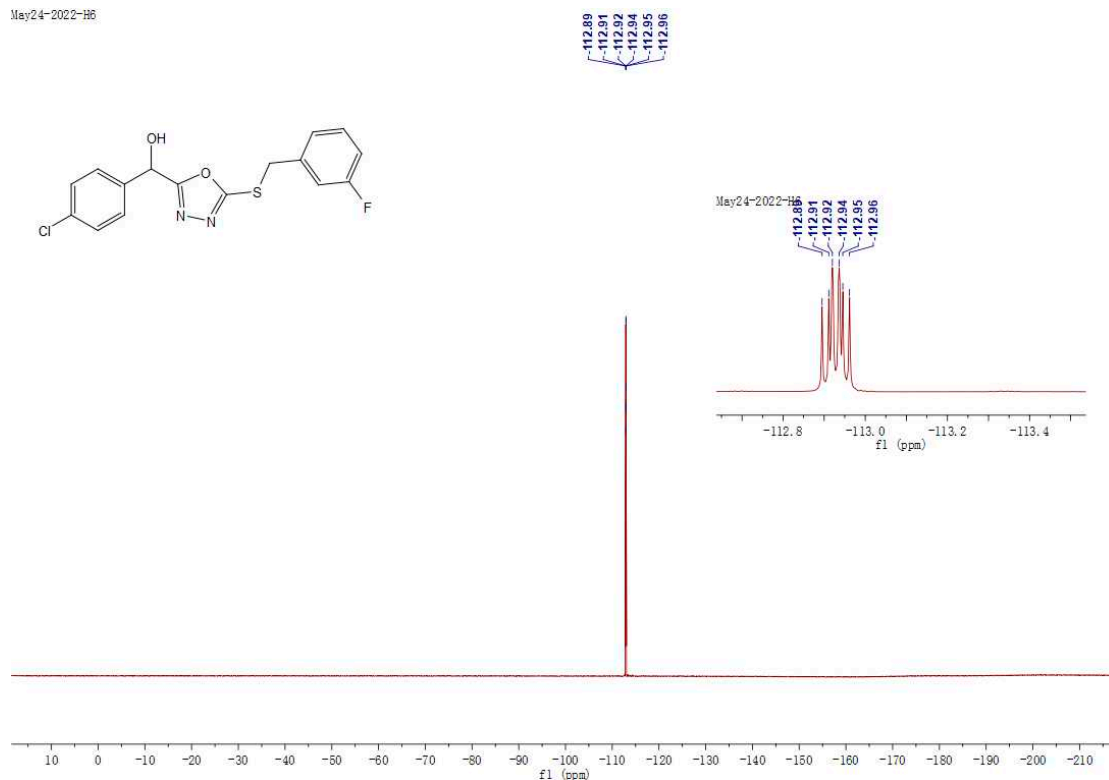


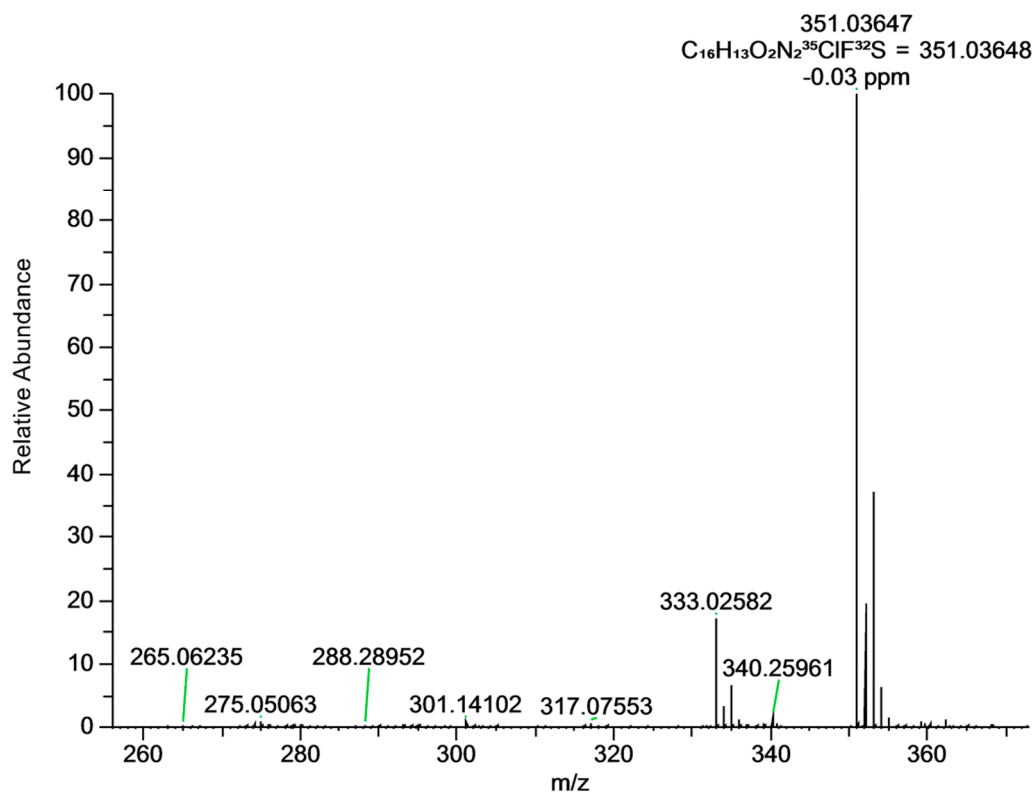
Figure S26. 1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E**₂₆.



May24-2022-H6



48 #33 RT: 0.34 AV: 1 NL: 7.13E+008
T: FTMS + p ESI Full ms [150.0000-2200.0000]



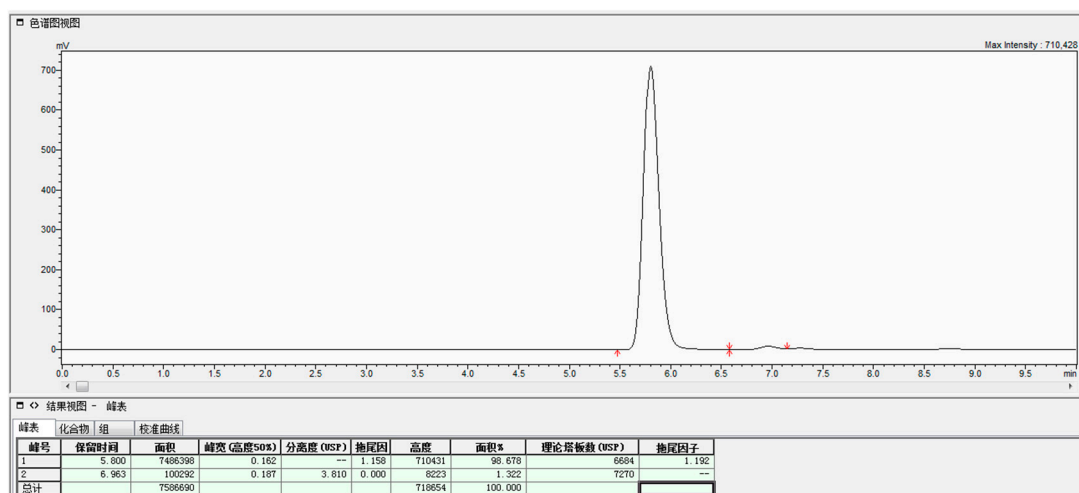
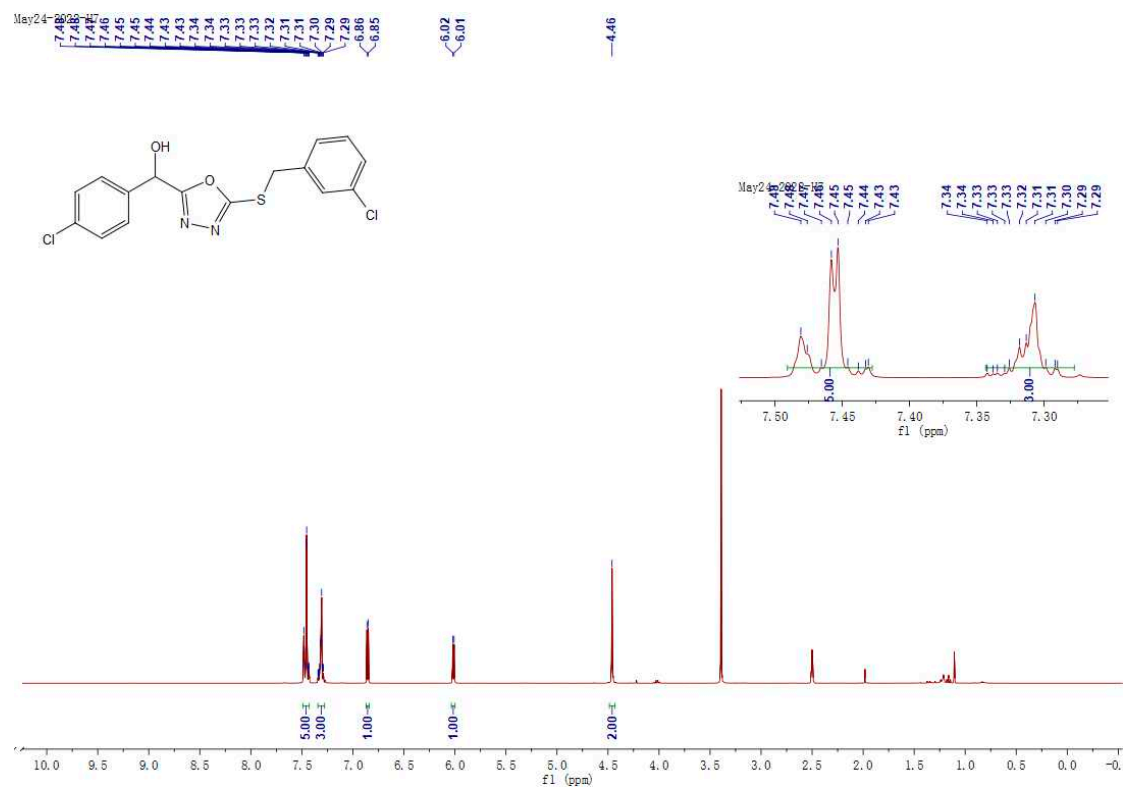
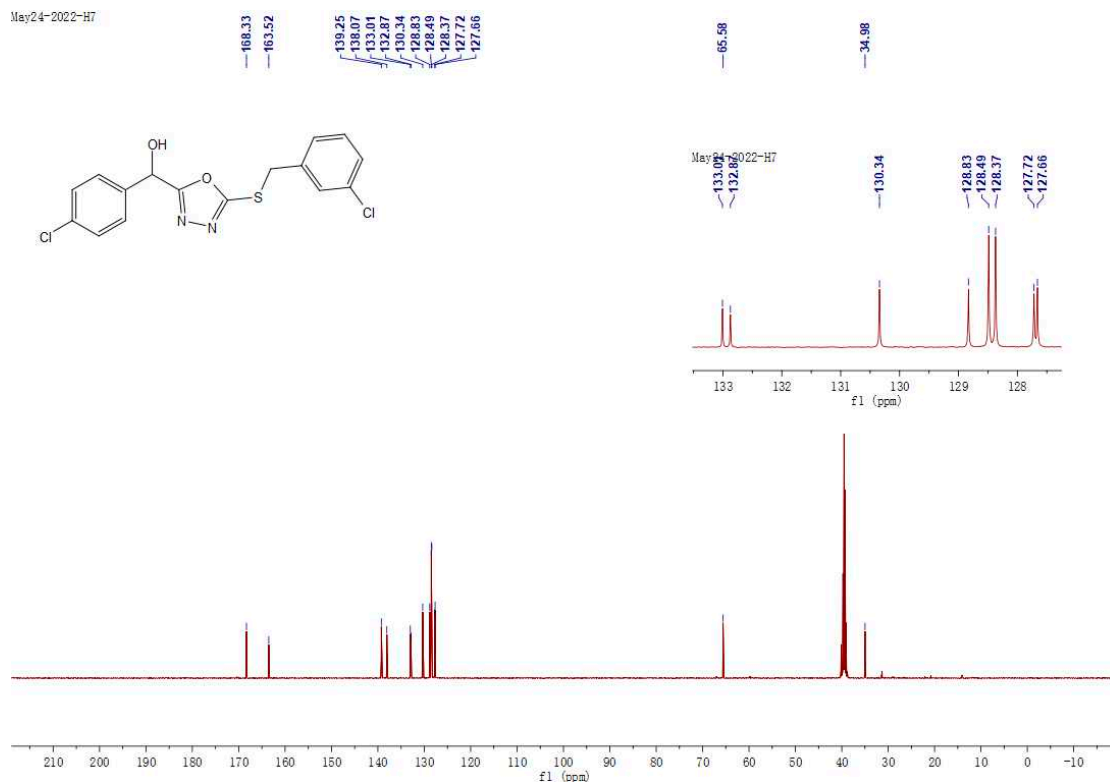


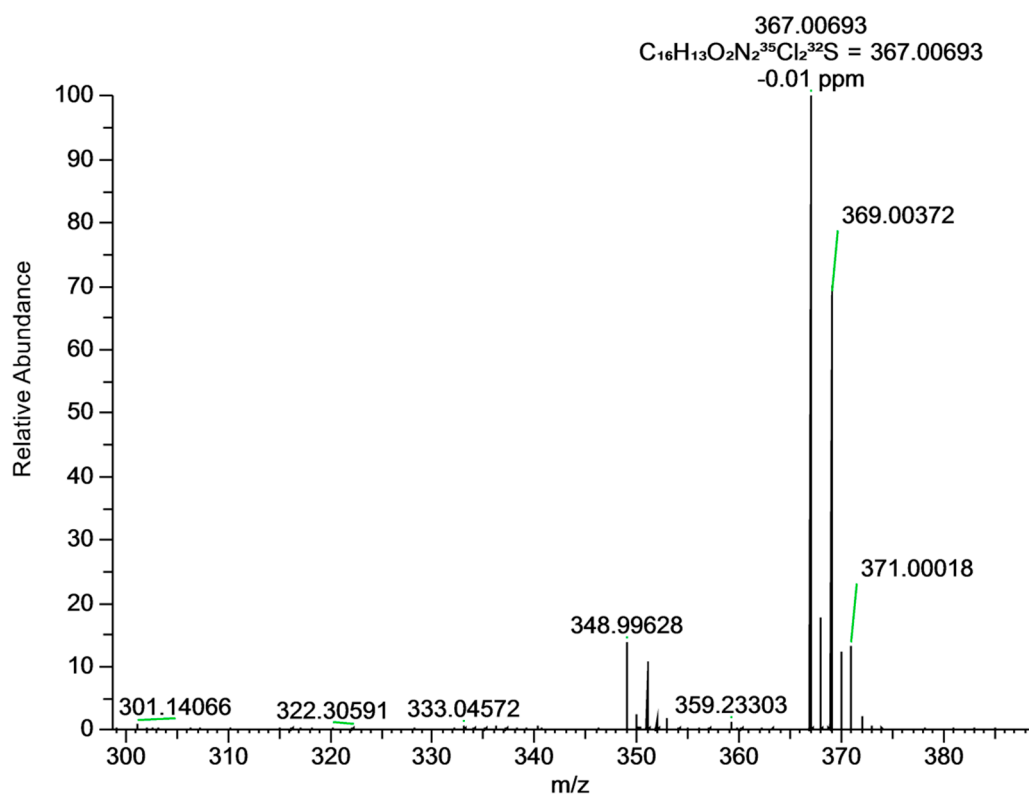
Figure S27. ^1H NMR, ^{13}C NMR, ^{19}F NMR, HRMS and HPLC for **E**₂₇.



May24-2022-H7



49 #39 RT: 0.39 AV: 1 NL: 4.39E+008
T: FTMS + p ESI Full ms [150.0000-2200.0000]



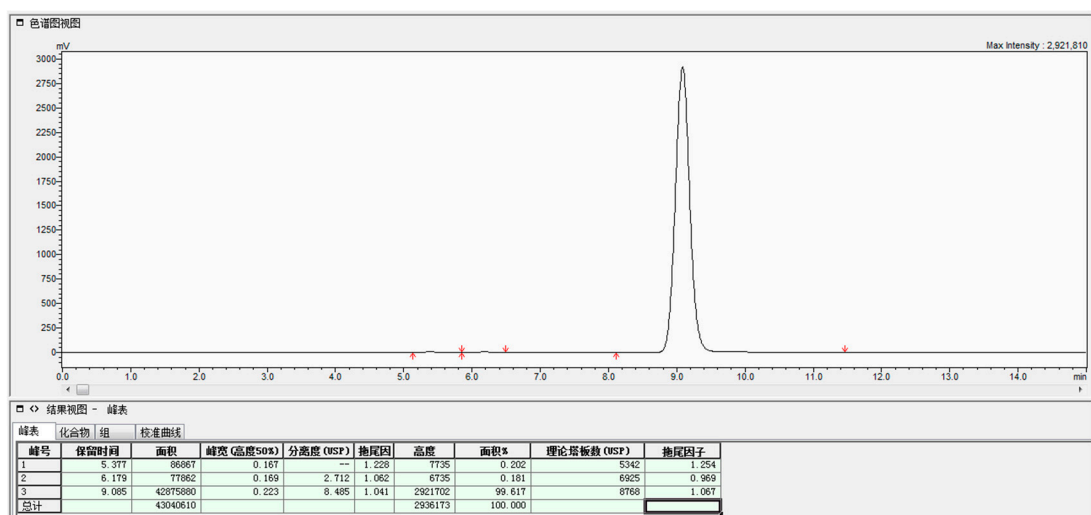


Figure S28. ^1H NMR, ^{13}C NMR, HRMS, and HPLC for E₂₈.

3. Crystallographic data of compound E₉

Table S1

Crystallographic data of compound D₉

Chemical formula	C ₁₇ H ₁₅ FN ₂ O ₂ S
Formula weight	330.37
Temperature[K]	273 K
Crystal system	Orthorhombic
Space group	P c a 21
a [Å]	11.2260 (5)
b [Å]	17.9952 (8)
c [Å]	7.8108 (3)
α [°]	90
β [°]	90
γ [°]	90
V[Å ³]	1577.89 (12)
Z	4
ρ (calculated)[g/cm ³]	1.391 g cm ⁻¹
μ [mm ⁻¹]	2.018 mm ⁻¹
F (000)	688.0
Crystal size [mm ³]	0.22 × 0.21 × 0.18
Color, shape	Water clear crystal, Peism
Radiation [Å]	MoKα (λ = 1.54178)
Theta Min-Max [°]	4.642, 72.080
<i>h, k, l</i>	--13 ≤ <i>h</i> ≤ 12, -17 ≤ <i>k</i> ≤ 22, -7 ≤ <i>l</i> ≤ 9
Reflections collected	2728
Independent reflections	2645
Data/restraints/parameters	3843/4/243
Goodness-of-fit	1.076
Final R indexes [<i>I</i> ≥ 2σ (<i>I</i>)]	R1 = 0.0435, wR2 = 0.1112
Final R indexes [all data]	R1 = 0.0443, wR2 = 0.1112

4. The regression equation of the title compounds with EC₅₀ values

Table S2

The regression equation of the title compounds with EC₅₀ values against *G. saubinetii* in vitro. ^a

Compound	<i>G. saubinetii</i>		
	EC ₅₀ (mg L ⁻¹)	Regression equation	R ²
E ₁	47.4±2.6	y = 1.6838x + 2.1778	0.977
E ₂	37.3±1.4	y = 1.4566x + 2.7104	0.946
E ₆	49.9±0.4	y = 1.1125x + 3.1111	0.939
E ₇	30.6±3.0	y = 1.6075x + 2.6106	0.975
E ₈	79.1±0.6	y = 1.2835x + 2.564	0.980
E ₉	24.6±0.7	y = 1.1498x + 3.4001	0.931
E ₁₀	29.4±0.6	y = 1.5341x + 2.7478	0.993
E ₁₃	20.4±1.3	y = 1.3199x + 3.271	0.967
E ₁₄	21.5±1.0	y = 1.3439x + 3.2081	0.974
E ₁₇	22.0±1.5	y = 1.0217x + 3.6276	0.905
E ₁₈	25.4±0.9	y = 1.1308x + 3.4115	0.990
E ₁₉	56.1±0.9	y = 1.1576x + 2.8856	0.987
E ₂₀	31.6±0.6	y = 1.3543x + 2.9688	0.972
E ₂₁	27.3±2.0	y = 0.9419x + 3.6478	0.9241
E ₂₂	51.1±0.2	y=1.8303x+2.1571	0.974
E ₂₃	32.5±0.9	y=1.5487x+2.6594	0.941
E ₂₄	30.8±1.5	y=1.4254x+2.8775	0.991
E ₂₅	31.3±1.5	y=1.3693x+2.9521	0.975

E ₂₆	32.7±1.1	y=1.5711x+2.6199	0.930
E ₂₇	25.2±1.0	y=1.2166x+3.2957	0.984
E ₂₈	24.2±0.4	y=1.2832x+3.2237	0.972

^a Values are means ± SD of three replicates.

Table S3

The regression equation of the title compounds with EC₅₀ values against *V. dahliae* in vitro. ^a

Compound	<i>V. dahliae</i>		
	EC ₅₀ (mg L ⁻¹)	Regression equation	R ²
E ₁	50.7±2.8	y = 2.0379x + 1.5258	0.997
E ₂	37.2±1.2	y = 1.7372x + 2.272	0.933
E ₆	12.7±0.5	y = 1.5729x + 3.2621	0.970
E ₇	14.3±0.1	y = 1.0199x + 3.8215	0.999
E ₈	>100	y = 1.1396x + 2.5042	0.979
E ₉	29.0±2.1	y = 1.5996x + 2.6596	0.984
E ₁₀	37.2±1.0	y = 2.9854x + 0.3104	0.969
E ₁₃	18.5±1.2	y = 3.3564x + 0.7478	0.901
E ₁₄	23.1±0.8	y = 2.4461x + 1.6658	0.984
E ₁₇	16.1±0.2	y = 1.382x + 3.332	0.974
E ₁₈	15.8±1.4	y = 1.2028x + 3.5587	0.902
E ₁₉	65.7±0.7	y = 1.4397x + 2.3835	0.948
E ₂₀	29.6±2.3	y = 2.6387x + 1.1189	0.951
E ₂₁	13.4±0.6	y = 1.1821x + 3.6673	0.960
E ₂₂	61.3±1.6	y=1.6208x+ 2.1025	0.993

E ₂₃	32.3±0.4	y=1.7528x+2.4201	0.997
E ₂₄	38.5±1.0	y=2.2253x+1.4731	0.996
E ₂₅	33.7±3.5	y=1.5801x+2.5869	0.974
E ₂₆	30.4±1.3	y=1.9004x+2.1816	0.958
E ₂₇	43.0±1.6	y=1.6554x+ 2.2961	0.970
E ₂₈	26.9±0.2	y=1.4439x+ 2.9346	0.917

^a Values are means ± SD of three replicates.

Table S4

The regression equation of the title compounds with EC₅₀ values against *S. sclerotiorum* in vitro. ^a

Compound	<i>S. sclerotiorum</i>		
	EC ₅₀ (mg L ⁻¹)	Regression equation	R ²
E ₁	23.0±1.5	y = 0.7946x + 4.6336	0.962
E ₂	27.1±1.5	y = 1.0694x + 3.4795	0.947
E ₆	90.5±3.5	y = 1.0506x + 2.9442	0.976
E ₇	40.1±2.7	y = 1.4621x + 2.6562	0.957
E ₈	13.8±3.1	y = 1.1276x + 3.7162	0.976
E ₉	10.3±1.0	y = 1.6198x + 3.3315	0.951
E ₁₀	21.9±0.4	y = 1.5274x + 2.9524	0.903
E ₁₃	33.5±1.8	y = 2.8357x + 0.6741	0.965
E ₁₄	37.6±1.9	y = 1.4025x + 2.7904	0.990
E ₁₇	27.9±0.2	y = 2.137x + 1.9092	0.980
E ₁₈	8.0±0.3	y = 0.7293x + 4.3422	0.956
E ₁₉	47.8±1.7	y = 1.6349x + 2.2543	0.998

E20	39.1±1.1	y = 1.779x + 2.1667	0.919
E21	36.3±0.3	y = 1.6215x + 2.4701	0.988
E22	48.5±0.4	y=1.6458x+ 2.2258	0.981
E23	81.4±2.1	y=1.4601x+ 2.2101	0.948
E24	51.6±5.4	y=1.3459x+2.6952	0.997
E25	75.2±3.4	y=1.5022x+ 2.1818	0.958
E26	54.0±1.8	y=1.4843x+2.4292	0.986
E27	37.2±0.8	y=1.8064x+2.1623	0.968
E28	47.9±0.2	y=1.6462x+2.2342	0.984

^a Values are means ± SD of three replicates.

Table S5

The regression equation of the title compounds with EC₅₀ values against *T. cucumeris* in vitro. ^a

Compound	<i>T. cucumeris</i>		
	EC ₅₀ (mg L ⁻¹)	Regression equation	R ²
E5	18.5±0.4	y = 1.6449x + 2.9151	0.943
E7	5.7±0.2	y = 0.8461x + 4.3567	0.968
E10	36.3±1.3	y = 1.6703x + 2.3936	0.955
E13	7.1±0.1	y = 1.1273x + 4.0374	0.953
E21	37.6±1.0	y = 1.0234x + 3.3884	0.925
hymexazol	13.8±1.5	y = 1.0312x + 3.825	0.999

^a Values are means ± SD of three replicates.

Table S6

The regression equation of the title compounds with EC₅₀ values against *P. capsici* in vitro. ^a

Compound	<i>P. capsici</i>		
	EC ₅₀ (mg L ⁻¹)	Regression equation	R ²
E13	42.9±0.7	y = 1.95x + 1.8161	0.988
E14	49.3±1.4	y = 1.6695x + 2.1737	0.971
E20	50.9±1.4	y = 1.709x + 2.0825	0.965
hymexazol	17.9±1.3	y = 0.7519x + 4.0573	0.916

^a Values are means \pm SD of three replicates.