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Supporting Information

Fluorosulfuryl Isocyanate Enabled SuFEx Ligation of Alcohols and Amines

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Supporting Information

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General Experimental

^{1}H and ^{19}F NMR spectra were recorded on an Agilent-400 instrument, ^{13}C NMR spectra were recorded on a Bruker AM-400 instrument. Proton magnetic resonance (^{1}H NMR) spectra were recorded at 400 MHz. Carbon magnetic resonance (^{13}C NMR) spectra were recorded at 101 MHz. Fluorine magnetic resonance (^{19}F NMR) spectra were recorded at 376 MHz. The ^{1}H, ^{13}C and ^{19}F NMR spectra were recorded at 297K in $CDCl_3$, CD_3CN, CD_3OD or $(CD_3)_2SO$, and the chemical shifts (δ) are presented in parts per million (ppm). Data for ^{1}H NMR were reported as follows: chemical shift, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, quint = quintet, sext = sextet, sept = septet, m = multiplet, br = broad), coupling constant (*J*) in Hertz (Hz), and integration. Data for ^{13}C and ^{19}F NMR spectra were reported in a similar pattern if applicable, with the exception that singlet peaks in the ^{13}C NMR spectra were reported only with their chemical shifts. For ^{1}H NMR, the chemical shifts were calibrated in reference to the tetramethylsilane (0 ppm), or the residual undeuterated solvents ($CDCl_3$, 7.26 ppm; CD_3CN, 1.94 ppm; CD_3OD, 3.34 ppm; $(CD_3)_2SO$, 2.50 ppm). Data of the ^{13}C NMR spectra were calibrated in reference to the deuterated solvents ($CDCl_3$, 77.16 ppm; CD_3OD, 49.86 ppm; CD_3CN, 1.32 ppm; $(CD_3)_2SO$, 39.52 ppm). Data for ^{19}F NMR spectra were calibrated in referenced to $CFCl_3$ (0 ppm).

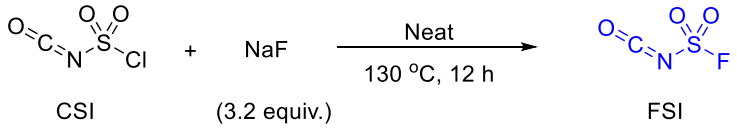
High resolution mass spectrometry (HRMS) was recorded on a Thermo Fisher Scientific LTQ FTICR-MS instrument with direct analysis in real time (DART or ESI) ionization mode. Melting points (m.p.) were determined using a Büchi M-565 melting point apparatus. X-ray crystallography was performed on a Bruker APEX-II CCD instrument.

Analytical LC-MS data were recorded on a Waters ACQUITY UPLC H-Class system with a Waters ACQUITY QDa system operating in the electrospray ionization (ESI) mode eluting with H_2O (with 0.1% trifluoroacetic acid) and CH_3CN. [Method: 7000 psi, flow rate = 0.6 mL/min. Eluent: t = 0, 95% H_2O; t = 0.10, 95% H_2O; t = 1.20, 5% H_2O; t = 2.00, 5% H_2O; t = 2.50, 95% H_2O. Total acquisition time = 2.5 min.]. The figures of LC-MS data in this supporting information show the plot of total UV

absorbance (wavelength range 210-400 nm) along the vertical axis with respect to time along the horizontal axis, and the peak annotations include the retention time (in min) and the wavelength (in nm) at maximal absorbance.

Thin layer chromatography (TLC) was performed using TLC silica gel plates HSG F254 (Jiangyou) and visualized using UV light, iodine, ninhydrin or potassium permanganate. Silica gel column chromatography was carried out using 300-400 mesh silica gel (Jiangyou). Reagents were purchased from Aladdin, TCI, Macklin, Energy, Alfa Aesar, Adamas, Tianlian, Shuya, and Bide. Solvents were purchased from Macklin, Adamas, Tianlian. All purchased reagents and solvents were used as received, without further purification or special handling practice.

Section 1. Preparation of Fluorosulfuryl Isocyanate (FSI).

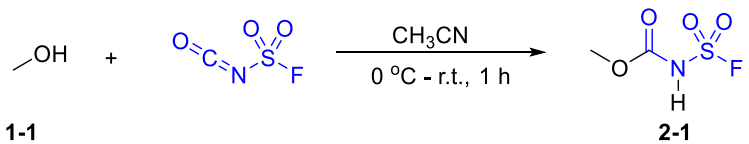


A 3L three-neck round-bottom flask containing 700 g sodium fluoride (16 moles) was dried overnight in a muffle furnace at 550 ℃ before use. Mechanical agitation was fixed on the middle neck, and two condensers with -20 ℃ circulating fluid were fixed on the other two necks under argon gas. The chlorosulfuryl isocyanate (CSI, 435 mL, 5 moles) was then added under mechanical stirring. The resulting mixture was heated to 130 ℃. At first, both condensers were sealed with a cap and an argon balloon. When there was fluid refluxing in the flask(about 2 hours), one condenser was replaced by a distillation unit. The receiving bottle was a 500 mL plastic bottle partly immersed in dry ice-acetone bath. The crude product was subjected to rectification that gave a colorless liquid at 62-65 ℃ (410 g, 65% yield). ^{13}C NMR (101 MHz, CD_3CN) δ 129.6; ^{19}F NMR (376 MHz, CD_3CN) δ 62.71.

Section 2. Ligation of Alcohols and Phenols with FSI.

Note: The references for the known compounds, including **FSI**[1] and **2-1**[1] are listed in **Section 9**

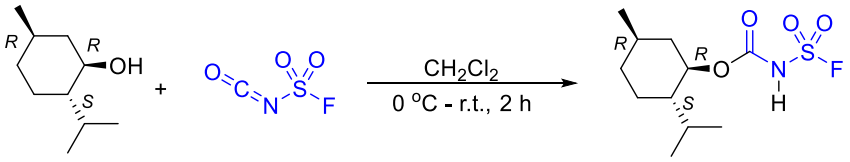
General Procedure 1. A solution of alcohols or phenols in dry acetonitrile (or dichloromethane, 1 mol/L) was cooled to 0 ℃. Fluorosulfuryl isocyanate in dry acetonitrile (or dichloromethane, 1 mol/L) was added dropwise. The resulting mixture was stirred at room temperature and monitored by TLC. After completion, the solvent was removed to give targeted product without further purification.



*Methyl (fluorosulfonyl)carbamate (**2-1**)*

Following the **General Procedure 1**, the title compound **2-1** was prepared from **1-1**

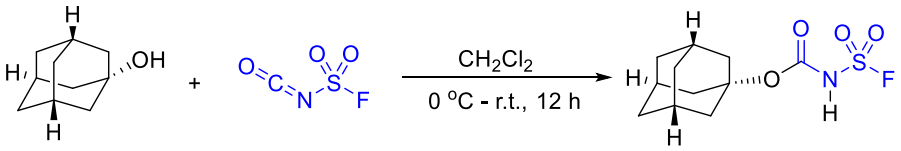
(Methanol, 0.203 mL, 5 mmol) and FSI (0.40 mL, 5 mmol) in CH_3CN for 1 hour. The physical properties of **2-1** are as follows: white solid (824 mg, 99% yield), m.p. 63.4-67.1℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 3.92 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 149.9, 55.3; ^{19}F NMR (376 MHz, $CDCl_3$) δ 53.07; ESI-MS (m/z): 156.0 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_2H_3O_4NFS$: 155.9772 $[M-H]^-$, found: 155.9772.



1-2, L-menthol **2-2**

*(1R,2S,5R)-2-isopropyl-5-methylcyclohexyl (fluorosulfonyl)carbamate (**2-2**)*

Following the **General Procedure 1**, the title compound was prepared from **1-2** (*L*-menthol, 781 mg, 5 mmol) and FSI (0.4 mL, 5 mmol) in CH_2Cl_2 for 2 hours. Recrystallization from CH_2Cl_2 giving **2-2** as a white solid (1.25 g, 89% yield), m.p. 96.6-97.9 ℃. ^{1}H NMR (400 MHz, $CDCl_3$) δ 4.76 (td, *J* = 11.2, 4.4 Hz, 1H), 2.11 (d, *J* = 12.0 Hz, 1H), 1.90 (sept, *J* = 7.6 Hz, 1H), 1.74-1.70 (m, 2H), 1.53-1.43 (m, 2H), 1.15-1.05 (m, 2H), 0.93 (t, *J* = 6.8 Hz, 6H), 0.88-0.84 (m, 1H), 0.80 (d, *J* = 6.8 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 149.1, 80.5, 46.9, 40.5, 34.0, 31.5, 26.2, 23.3, 22.0, 20.6, 16.2; ^{19}F NMR (376 MHz, $CDCl_3$) δ 52.99; ESI-MS (m/z): 280.0 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{11}H_{19}O_4NFS$: 280.1024 $[M-H]^-$, found: 280.1022.

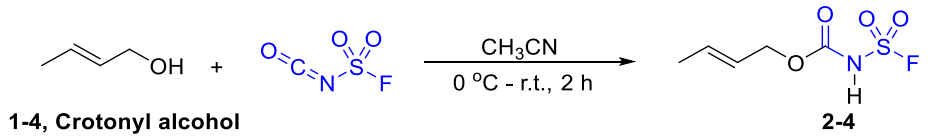


1-3 **2-3**

*Adamantan-1-yl (fluorosulfonyl)carbamate (**2-3**)*

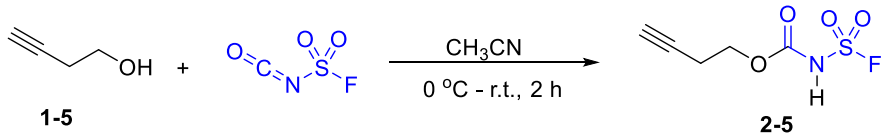
Following the **General Procedure 1**, the title compound was prepared from **1-3** (304 mg, 2 mmol) and FSI (0.16 mL, 2 mmol) in CH_2Cl_2 for 12 hours. The physical properties of **2-3** are as follows: white solid (551 mg, 99% yield), m.p. 128.2-129.7 ℃. ^{1}H NMR (400 MHz, CD_3CN) δ 2.19 (br, 3H), 2.12 (d, *J* = 2.8 Hz, 6H), 1.68 (t, *J* = 2.8 Hz, 6H); ^{13}C NMR (101 MHz, CD_3CN) δ 148.0, 86.0, 41.7, 36.4, 32.0; ^{19}F NMR (376 MHz, CD_3CN) δ 52.07; ESI-MS (m/z): 276.0 $[M-H]^-$; HRMS (DART, m/z): calcd for

$C_{11}H_{15}O_4NFS$: 276.0711 $[M-H]^-$, found: 276.0708.



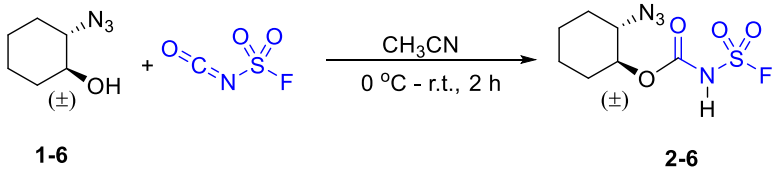
*(E)-but-2-en-1-yl (fluorosulfonyl)carbamate (**2-4**)*

Following the **General Procedure 1**, the title compound was prepared from **1-4** (Crotonyl alcohol, 212 mL, 2.5 mmol) and FSI (0.2 mL, 2.5 mmol) in CH_2Cl_2 for 2 hours. The physical properties of **2-4** are as follows: white solid (493 mg, 99% yield), m.p. 46.5 ℃ (decomposition). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.21 (br, 1H), 5.95-5-87 (m, 1H), 5.64-5-57 (m, 1H), 4.70 (d, *J* = 6.8 Hz, 2H), 1.76 (d, *J* = 6.4 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 149.1, 134.6, 123.1, 69.5, 17.9; ^{19}F NMR (376 MHz, $CDCl_3$) δ 53.14; ESI-MS (m/z): 196.0 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_5H_7O_4NFS$: 196.0085 $[M-H]^-$, found: 196.0081.



*But-3-yn-1-yl (fluorosulfonyl)carbamate (**2-5**)*

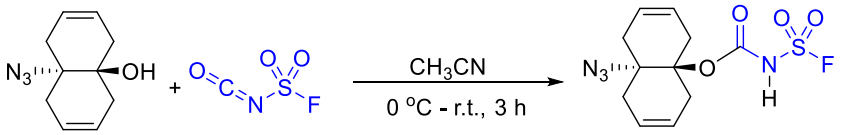
Following the **General Procedure 1**, the title compound was prepared from **1-5** (0.7 g, 10 mmol) and FSI (0.80 mL, 10 mmol) in CH_3CN for 2 hours. The physical properties of **2-5** are as follows: white solid (1.95 g, 99% yield), m.p. 72.2 ℃ (decomposition). ^{1}H NMR (400 MHz, $CDCl_3$) δ 4.37 (t, *J* = 6.8 Hz, 2H), 2.62 (td, *J* = 6.8, 2.8 Hz, 2H), 2.04 (t, *J* = 2.8 Hz, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 148.8, 78.8, 71.0, 66.1, 19.0; ^{19}F NMR (376 MHz, $CDCl_3$) δ 52.75; ESI-MS (m/z): 194.11 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_5H_5O_4NFS$: 193.9929 $[M-H]^-$, found: 193.9927.



*Anti-2-azidocyclohexyl (fluorosulfonyl)carbamate (**2-6**)*

Following the **General Procedure 1**, the title compound was prepared from **1-6** (141

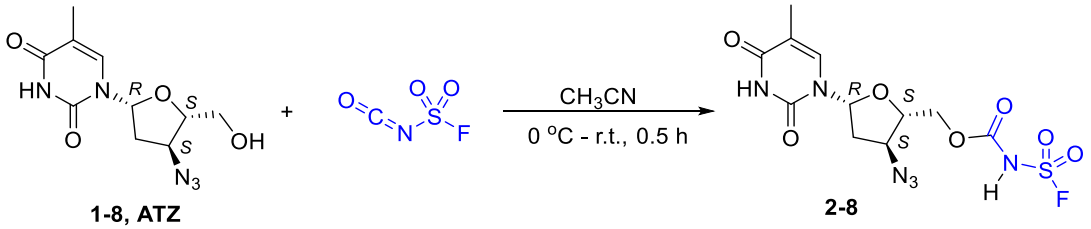
mg, 1 mmol) and FSI (0.08 mL, 1 mmol) in CH_3CN for 2 hours. The physical properties of **2-6** are as follows: white solid (260 mg, 97% yield), m.p. 85.1 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 4.70-4.64 (m, 1H), 3.51-3.45 (m, 1H), 2.09-2.05(m, 2H), 1.76-1.66 (m, 2H), 1.46-1.28 (m, 4H); ^{13}C NMR (101 MHz, CD_3CN) δ 149.3, 79.7, 63.5, 30.5, 30.4, 23.8, 23.6; ^{19}F NMR (376 MHz, CD_3CN) δ 52.60; ESI-MS (m/z): 265.0 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_7H_{10}O_4N4FS$: 265.0412 $[M-H]^-$, found: 265.0409.



1-7 **2-7**

*Anti-8a-azido-1,5,8,8a-tetrahydronaphthalen-4a(4H)-yl (fluorosulfonyl)carbamate (**2-7**)*

Following the **General Procedure 1**, the title compound was prepared from **1-7** (382 mg, 2 mmol) and FSI (0.16 mL, 2 mmol) in CH_3CN for 3 hours. The physical properties of **2-7** are as follows: white solid (610 mg, 96% yield), m.p. 105.7 ℃ (decomposition). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.05 (br, 1H), 5.70-5.57 (m, 4H), 3.19 (dd, *J* = 20.0, 4.0 Hz, 2H), 2.55-2.48 (m, 2H), 2.36 (dd, *J* = 18.8, 2.8 Hz, 2H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 147.0, 123.5, 122.6, 85.6, 61.0, 33.2, 30.3; ^{19}F NMR (376 MHz, $CDCl_3$) δ 53.32; ESI-MS (m/z): 315.0 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{11}H_{12}O_4N_4FS$: 315.0569 $[M-H]^-$, found: 315.0563.

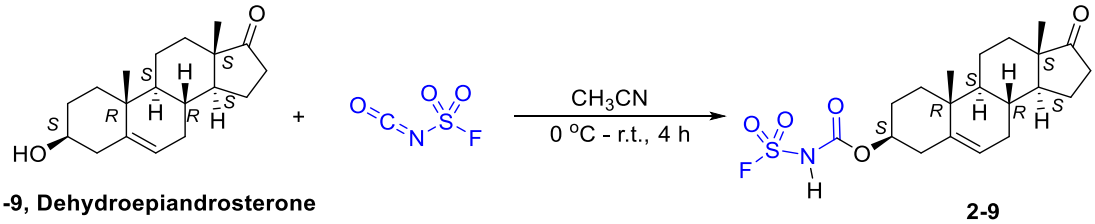


1-8, ATZ **2-8**

*((2S,3S,5R)-3-azido-5-(5-methyl-2,4-dioxo-3,4-dihydropyrimidin-1(2H)-yl)tetrahydrofuran-2-yl)methyl (fluorosulfonyl)carbamate (**2-8**)*

Following the **General Procedure 1**, the title compound was prepared from **1-8** (ATZ, 267 mg, 1 mmol) and FSI (0.08 mL, 1 mmol) in CH_3CN for half an hour. The physical

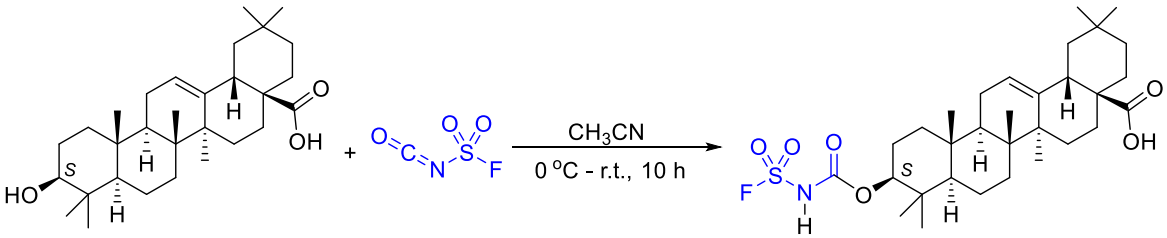
properties of **2-8** are as follows: white solid (384 mg, 98% yield), m.p. 60.5 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 9.12 (br, 1H), 7.23 (m, 1H), 6.11 (t, *J* = 6.8 Hz, 1H), 4.50 (dd, *J* = 13.2, 3.2 Hz, 1H), 4.40 (dd, *J* = 12.0, 4.8 Hz, 1H), 4.34 (dt, *J* = 7.2, 5.2 Hz, 1H), 4.06 (td, *J* = 4.8, 3.2 Hz, 1H), 2.42-2.37 (m, 2H), 1.96 (s, 1H), 1.84 (d, *J* = 1.2 Hz, 3H); ^{13}C NMR (101 MHz, CD_3CN) δ 150.5, 150.4, 149.0, 136.0, 110.7, 84.7, 80.8, 66.6, 60.3, 36.2, 11.5; ^{19}F NMR (376 MHz, CD_3CN) δ 52.77; ESI-MS (m/z): 391.10 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{11}H_{12}O_7N_6FS$: 391.0478 $[M-H]^-$, found: 391.0487.



1-9, Dehydroepiandrosterone **2-9**

*(3S,8R,9S,10R,13S,14S)-10,13-dimethyl-17-oxo-2,3,4,7,8,9,10,11,12,13,14,15,16,17-tetradecahydro-1H-cyclopenta[a]phenanthren-3-yl (fluorosulfonyl)carbamate (**2-9**)*

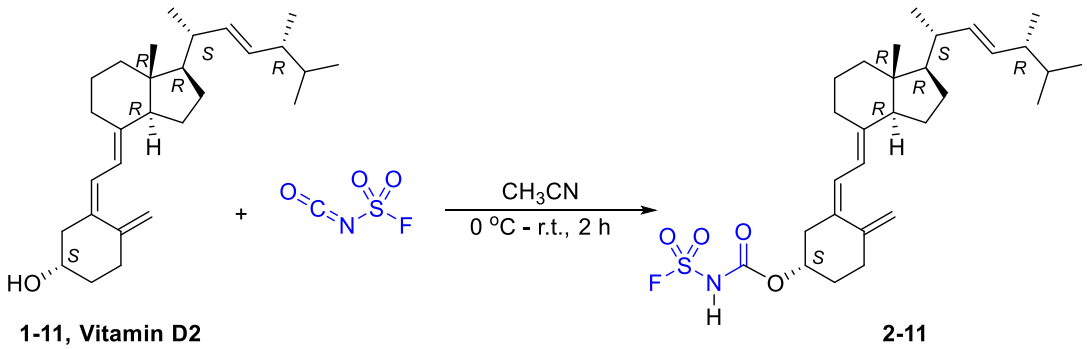
Following the **General Procedure 1**, the title compound was prepared from **1-9** (Dehydroepiandrosterone, 577 mg, 2 mmol) and FSI (0.16 mL, 2 mmol) in CH_3CN for 4 hours. The physical properties of **2-9** are as follows: white solid (775 mg, 94% yield), m.p. 173.4 ℃ (decomposition). ^{1}H NMR (400 MHz, DMSO-*d*$_6$) δ 5.38 (d, *J* = 4.8 Hz, 1H), 4.28 (tt, *J* = 11.4, 4.8 Hz, 1H), 2.40 (dd, *J* = 10.4, 8.8 Hz, 1H), 2.31 (dd, *J* = 8.0, 4.8 Hz, 1H), 2.21 (t, *J* = 12.4 Hz, 1H), 2.09-1.98 (m, 2H), 1.89-1.76 (m, 3H), 1.69-1.58 (m, 4H), 1.55-1.36 (m, 3H), 1.31-1.15 (m, 2H), 1.07 (dd, *J* = 9.6, 3.2 Hz, 1H), 1.02-0.94 (m, 1H), 0.99 (s, 3H), 0.88 (s, 3H); ^{13}C NMR (101 MHz, DMSO-*d*$_6$) δ 219.7, 154.0, 139.8, 121.7, 74.6, 50.9, 49.6, 46.9, 37.9, 36.5, 36.3, 35.3, 31.2, 31.0, 30.3, 27.6, 21.5, 20.0, 19.1, 13.2; ^{19}F NMR (376 MHz, DMSO-*d*$_6$) δ 50.47; ESI-MS (m/z): 412.0 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{20}H_{27}O_5NFS$: 412.1599 $[M-H]^-$, found: 412.1600.



1-10, Oleanic acid **2-10**

*(4aS,6aS,6bR,8aR,10S,12aR,12bR,14bS)-10-((((fluorosulfonyl)carbamoyl)oxy)-2,2,6a,6b,9,9,12a-heptamethyl-1,3,4,5,6,6a,6b,7,8,8a,9,10,11,12,12a,12b,13,14b-octadecahydropicene-4a(2H)-carboxylic acid (**2-10**)*

Following the **General Procedure 1**, the title compound was prepared from **1-10** (Oleanic acid, 456 mg, 1 mmol) and FSI (0.08 mL, 1 mmol) in CH_3CN for 10 hours. Recrystallization from ethyl acetate gave **2-10** as a white solid (415 mg, 71% yield), m.p. 172.3 ℃ (decomposition). ^{1}H NMR (400 MHz, $CDCl_3$) δ 5.31 (br, 1H), 4.56 (dd, *J* = 10.0, 4.8 Hz, 1H), 3.50 (q, *J* = 7.2 Hz, 1H), 2.86 (d, *J* = 13.6 Hz, 1H), 2.01 (t, *J* = 13.6 Hz, 1H), 1.87-1.73 (m, 6H), 1.68-1.52 (m, 8H), 1.47-1.41 (m, 2H), 1.38-1.30 (m, 3H), 1.27-1.25 (m, 1H), 1.21 (td, *J* = 7.2, 1.6 Hz, 2H), 1.14 (s, 3H), 1.09-1.04 (m, 2H), 0.95 (s, 3H), 0.93 (s, 3H), 0.92(s, 3H), 0.89 (s, 3H), 0.85-0.82 (m, 1H), 0.80 (s, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 173.1, 149.5, 143.3, 122.9, 87.1, 66.1, 55.3, 48.5, 47.6, 45.8, 41.9, 41.3, 39.5, 38.1, 37.0, 33.7, 33.1, 32.7, 31.5, 30.8, 28.0, 27.6, 26.0, 23.7, 23.5, 23.4, 23.1, 18.2, 17.2, 16.5, 15.4, 15.1; ^{19}F NMR (376 MHz, $CDCl_3$) δ 53.08; ESI-MS (m/z): 580.20 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{31}H_{47}O_6NFS_2$: 580.3114 $[M-H]^-$, found:580.3111.

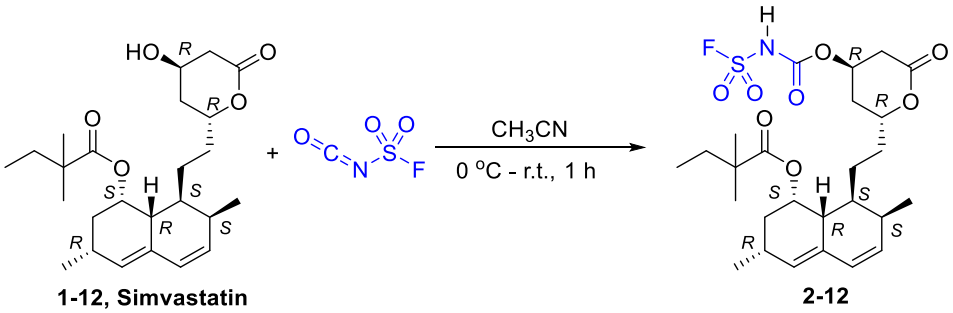


1-11, Vitamin D2 **2-11**

(S,Z)-3-(2-((1R,3aS,7aR,E)-1-((2R,5R,E)-5,6-dimethylhept-3-en-2-yl)-7a-methyloctahydro-4H-inden-4-ylidene)ethylidene)-4-methylenecyclohexyl

*(fluorosulfonyl)carbamate (**2-11**)*

Following the **General Procedure 1**, the title compound was prepared from **1-11** (Vitamin D2, 397 mg, 1 mmol) and FSI (0.08 mL, 1 mmol) in CH_3CN for 2 hours. The physical properties of **2-11** are as follows: green solid (520 mg, 99% yield), m.p. 55.5 ℃ (decomposition). ^{1}H NMR (400 MHz, $CDCl_3$) δ 8.12 (br, 1H), 6.23 (d, *J* = 11.2 Hz, 1H), 6.02 (d, *J* = 11.2 Hz, 1H), 5.19 (t, *J* = 6.4 Hz, 2H), 5.09 (s, 2H), 4.87 (s, 1H), 2.80 (dd, *J* = 12.0, 3.2 Hz, 1H), 2.63 (d, *J* = 13.6 Hz, 1H), 2.48 (dd, *J* = 13.6, 7.2 Hz, 1H), 2.43-2.36 (m, 1H), 2.27-2.21 (m, 1H), 2.03-1.97 (m, 4H), 1.92-1.81 (m, 3H), 1.73-1.66 (m, 3H), 1.55-1.44 (m, 5H), 1.36-1.25 (m, 4H), 1.02 (d, *J* = 6.4, Hz, 3H), 0.91 (d, *J* = 6.4, Hz, 3H), 0.83 (t, *J* = 6.4, Hz, 6H), 0.55 (s, 3H); ^{13}C NMR (101 MHz, CD_3CN) δ 149.6, 145.4, 143.4, 136.7, 134.7, 132.9, 123.6, 118.3, 113.6, 76.8, 57.3, 57.1, 46.6, 43.8, 42.1, 41.4, 41.2, 33.9, 32.2, 32.2, 29.7, 28.7, 24.4, 23.0, 21.7, 20.4, 20.1, 18.2, 12.7; ^{19}F NMR (376 MHz, $CDCl_3$) δ 53.02; ESI-MS (m/z): 521.99 $[M+H]^+$; HRMS (DART, m/z): calcd for $C_{29}H_{45}O_4NFS$: 522.3048 $[M+H]^+$, found: 522.3046.

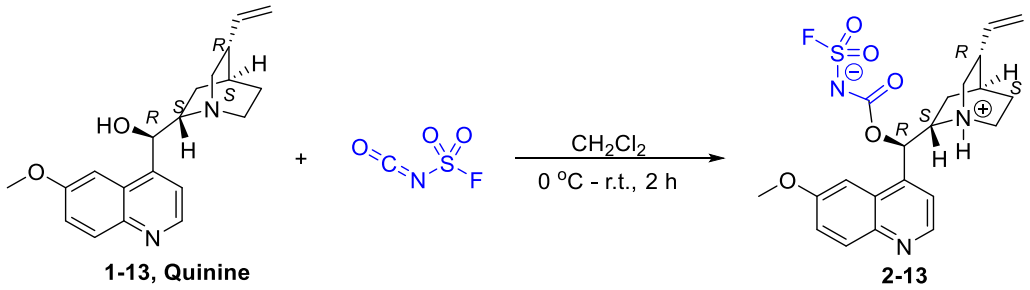


1-12, Simvastatin **2-12**

*(1S,3R,7S,8S,8aR)-8-(2-((2R,4R)-4-((((fluorosulfonyl)carbamoyl)oxy)-6-oxotetrahydro-2H-pyran-2-yl)ethyl)-3,7-dimethyl-1,2,3,7,8,8a-hexahydronaphthalen-1-yl 2,2-dimethylbutanoate (**2-12**)*

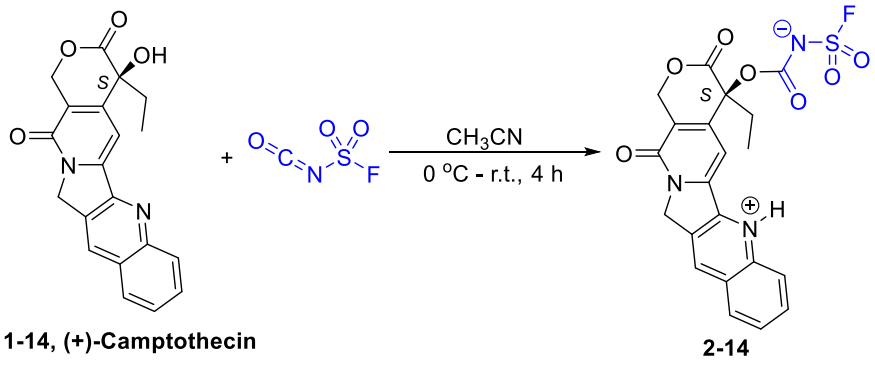
Following the **General Procedure 1**, the title compound was prepared from **1-12** (Simvastatin, 837 mg, 2 mmol) and FSI (0.16 mL, 2 mmol) in CH_3CN for 1 hours. The physical properties of **2-12** are as follows: white solid (1.0 g, 94% yield), m.p. 80.1 ℃ (decomposition). ^{1}H NMR (400 MHz, $CDCl_3$) δ 5.99 (d, *J* = 9.6 Hz, 1H), 5.77 (dd, *J* = 9.6, 6.0 Hz, 1H), 5.52 (t, *J* = 3.2 Hz, 1H), 5.38-5.33 (m, 2H), 4.56-4.50 (m, 1H), 2.83 (d, *J* = 3.6 Hz, 2H), 2.47-2.42 (m, 1H), 2.37-2.33 (m, 1H), 2.29-2.19 (m, 2H), 2.01-1.90 (m, 2H), 1.86-1.79 (m, 2H), 1.69-1.43 (m, 5H), 1.36-1.25 (m, 1H), 1.12 (d, *J* = 4.4 Hz,

6H), 1.08 (d, *J* = 7.6 Hz, 3H), 0.89 (d, *J* = 7.2 Hz, 3H), 0.81 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 179.0, 169.6, 149.5, 132.8, 131.4, 129.9, 128.5, 69.5, 68.7, 43.2, 37.4, 36.9, 35.1, 33.1, 33.0, 32.9, 32.7, 30.7, 27.3, 24.8, 24.7, 24.2, 23.1, 14.0, 9.3; ^{19}F NMR (376 MHz, $CDCl_3$) δ 52.64; ESI-MS (m/z): 542.0 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{26}H_{37}O_8NFS$: 542.2229 $[M-H]^-$, found: 542.2231.



(R)-(6-methoxyquinolin-4-yl)((1S,2S,4S,5R)-5-vinylquinuclidin-2-yl)methyl (fluorosulfonyl)carbamate ***(2-13)***

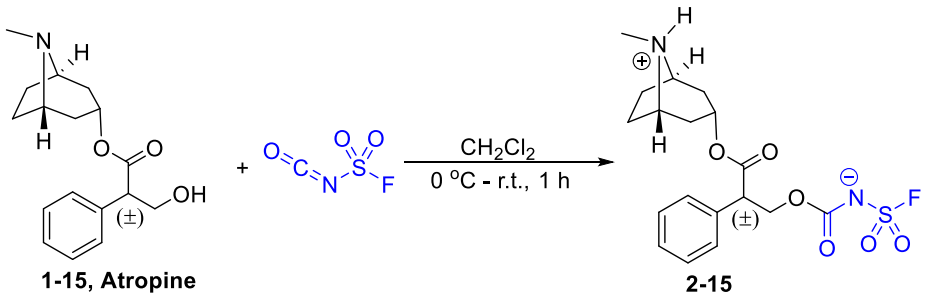
Following the **General Procedure 1**, the title compound was prepared from **1-13** (Quinine, 649 mg, 2 mmol) and FSI (0.16 mL, 2 mmol) in CH_2Cl_2 for 2 hours. The physical properties of **2-13** are as follows: yellow solid (884 mg, 98% yield), m.p. 151.1 ℃ (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.17 (s, 1H), 8.89 (s, 1H), 8.07 (d, *J* = 8.8 Hz, 1H), 7.61 (m, 2H), 7.53 (s, 1H), 6.73 (s, 1H), 5.86-5.76 (m, 1H), 5.12 (d, *J* = 17.2 Hz, 1H), 5.01 (d, *J* = 10.8 Hz, 1H), 4.02 (s, 3H), 3.84-3.80 (m, 1H), 3.65-3.53 (m, 2H), 3.42-3.27 (m, 2H), 2.76-2.70 (m, 1H), 2.19-2.07 (m, 3H), 1.89 (t, *J* = 13.2 Hz, 1H), 1.62 (t, *J* = 11.6 Hz, 1H); ^{13}C NMR (101 MHz, CD_3CN) δ 160.9, 158.8, 147.2, 143.1, 143.1, 138.5, 130.9, 126.3, 123.7, 119.1, 117.3, 101.4, 71.0, 60.3, 56.1, 55.8, 45.5, 37.6, 27.4, 24.4, 19.8; ^{19}F NMR (376 MHz, DMSO-d_6) δ 48.52; ESI-MS (m/z): 448.17 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{21}H_{23}O_5N_3FS$: 448.1351 $[M-H]^-$, found: 448.1348.



1-14, (+)-Camptothecin **2-14**

*(S)-(((4-ethyl-3,14-dioxo-3,4,12,14-tetrahydro-1H-pyrano[3',4':6,7]indolizino[1,2-b]quinolin-6-ium-4-yl)oxy)carbonyl)(fluorosulfonyl)amide (**2-14**)*

Following the **General Procedure 1**, the title compound was prepared from **1-14** ((+)-Camptothecin, 697 mg, 2 mmol) and FSI (0.16 mL, 2 mmol) in CH_3CN for 4 hours. Filtered and washed with CH_2Cl_2 gave **2-14** as a yellow solid (868 mg, 91% yield), m.p. 180.5 °C (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.67 (s, 1H), 8.21 (d, J = 8.8 Hz, 2H), 8.10 (d, J = 8.4 Hz, 1H), 7.85 (t, J = 7.2 Hz, 1H), 7.70 (t, J = 7.4 Hz, 1H), 7.09 (s, 1H), 5.41 (s, 2H), 5.24 (s, 2H), 2.13-1.98 (m, 2H), 0.87 (t, J = 7.4 Hz, 3H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 168.2, 156.6, 155.9, 152.2, 147.6, 146.9, 145.3, 131.8, 130.5, 129.6, 128.8, 128.5, 127.9, 127.7, 119.3, 95.5, 74.4, 66.2, 50.1, 30.9, 7.7; ^{19}F NMR (376 MHz, DMSO-d_6) δ 50.20; ESI-MS (m/z): 472.07 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{21}H_{15}O_7N_3FS$: 472.0620 $[M-H]^-$, found: 472.0634.

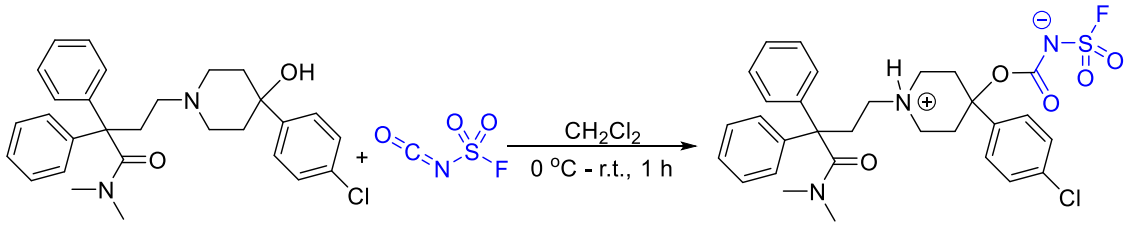


1-15, Atropine **2-15**

*N-atropinoxycarbonyl-fluorosulfurylamid (**2-15**)*

Following the **General Procedure 1**, the title compound was prepared from **1-15** (Atropine, 579 mg, 2 mmol) and FSI (0.16 mL, 2 mmol) in CH_2Cl_2 for 1 hour. The physical properties of **2-15** are as follows: white solid (798 mg, 96% yield), m.p. 185.8 °C (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.27 (s, 1H), 7.39-7.32 (m, 5H), 4.95 (t, J = 4.8 Hz, 1H), 4.35 (dd, J = 8.8, 1.6 Hz, 1H), 4.12 (dd, J = 5.6, 4.8 Hz, 1H),

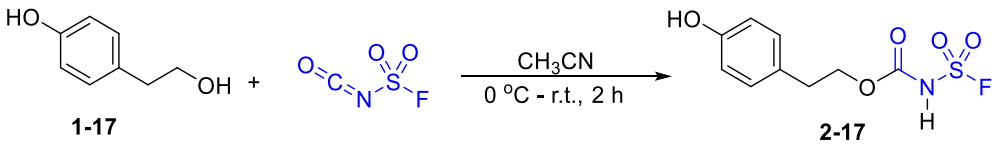
4.01 (dd, *J* = 5.6, 3.6 Hz, 1H), 3.81 (s, 1H), 3.74-3.71 (m, 1H), 2.81-2.62 (m, 3H), 2.32-2.22 (m, 2H), 2.12-2.06 (m, 2H), 2.00-1.96 (m, 2H), 1.78 (d, *J* = 16.0 Hz, 1H), 1.70-1.63 (m, 1H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 170.4, 157.3, 135.4, 128.8, 128.1, 127.7, 64.7, 64.7, 61.3, 61.2, 50.5, 38.2, 34.2, 34.1, 23.3, 23.0; ^{19}F NMR (376 MHz, DMSO-d_6) δ 49.53; ESI-MS (m/z): 413.21 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{18}H_{22}O_6N_2FS$: 413.1188 $[M-H]^-$, found: 413.1199.



1-16, Loperamide **2-16**

(((4-(4-chlorophenyl)-1-(4-(dimethylamino)-4-oxo-3,3-diphenylbutyl)piperidin-1-ium-4-yl)oxy)carbonyl)(fluorosulfonyl)amide ***(2-16)***

Following the **General Procedure 1**, the title compound was prepared from **1-16** (Loperamide, 477 mg, 1 mmol) and FSI (0.08 mL, 1 mmol) in CH_2Cl_2 for 1 hour. The physical properties of **2-16** are as follows: white solid (571 mg, 95% yield), m.p. 244.6 ℃ (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.13 (s, 1H), 7.48 (t, *J* = 7.8 Hz, 4H), 7.44 – 7.35 (m, 8H), 7.29 (d, *J* = 8.4 Hz, 2H), 3.44 (d, *J* = 12.0 Hz, 2H), 3.02-2.94 (m, 4H), 2.69-2.64 (m, 2H), 2.61-2.58 (m, 2H), 2.45 (d, *J* = 14.4 Hz, 2H), 2.24 (s, 3H), 2.06 (td, *J* = 13.2, 3.6 Hz, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 172.2, 154.6, 143.1, 139.3, 131.9, 129.0, 128.4, 127.9, 127.5, 126.4, 74.6, 59.1, 54.9, 48.4, 38.8, 38.6, 36.8, 32.9; ^{19}F NMR (376 MHz, DMSO-d_6) δ 50.95; ESI-MS (m/z): 600.15 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{30}H_{32}O_5N_3ClFS$: 600.1741 $[M-H]^-$, found: 600.1736.

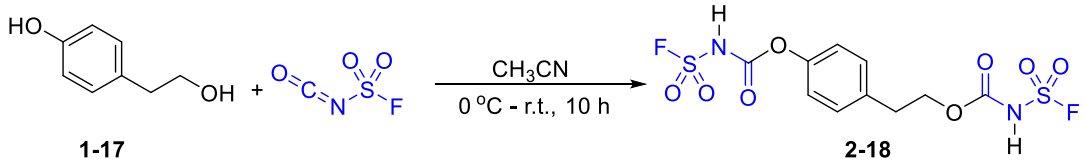


1-17 **2-17**

4-hydroxyphenethyl (fluorosulfonyl)carbamate ***(2-17)***

Following the **General Procedure 1**, the title compound was prepared from **1-17** (1.38 g, 10 mmol) and FSI (0.80 mL, 10 mmol) in CH_3CN for 2 hours. Filtered and washed with CH_2Cl_2 gave **2-17** as a white solid (2.4 g, 90% yield), m.p. 117.2-120.1 ℃

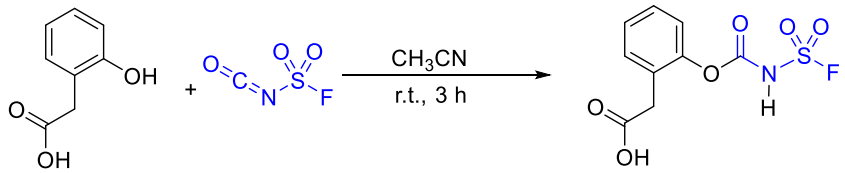
(decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 7.09 (d, *J* = 8.4 Hz, 2H), 6.75 (d, *J* = 9.2 Hz, 2H), 4.36 (t, *J* = 6.8 Hz, 2H), 2.88 (t, *J* = 6.8 Hz, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 155.9, 154.6, 129.8, 128.0, 115.2, 66.3, 33.8; ^{19}F NMR (376 MHz, CD_3CN) δ 52.41; ESI-MS (m/z): 262.06 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_9H_{14}O_5N_2FS$: 281.0602 $[M+NH_4]^+$, found: 281.0601.



1-17 2-18

*4-((((fluorosulfonyl)carbamoyl)oxy)phenethyl (fluorosulfonyl)carbamate (**2-18**)*

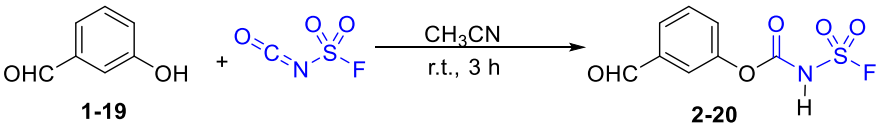
Following the **General Procedure 1**, the title compound was prepared from **1-17** (276 mg, 2 mmol) and FSI (0.32 mL, 4 mmol) in CH_3CN for 10 hours. Filtered and washed with DCM gave **2-18** as a white solid (657 mg, 85% yield), m.p. 121.0 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 7.35 (d, *J* = 8.8 Hz, 2H), 7.18 (d, *J* = 8.4 Hz, 2H), 4.44 (t, *J* = 6.4 Hz, 2H), 3.01 (t, *J* = 6.4 Hz, 2H); ^{13}C NMR (101 MHz, CD_3CN) δ 150.0, 149.5, 149.0, 137.5, 131.3, 122.2, 68.9, 34.5; ^{19}F NMR (376 MHz, CD_3CN) δ 52.96 (1F), 52.48 (1F); ESI-MS (m/z): 387.05 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{10}H_9O_8N_2F_2S_2$: 386.9774 $[M-H]^-$, found: 386.9771.



1-18 2-19

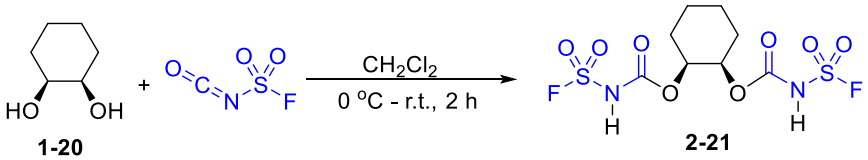
*2-(2-(((Fluorosulfonyl)carbamoyl)oxy)phenyl)acetic acid (**2-19**)*

Following the **General Procedure 1**, the title compound was prepared from **1-18** (1.5 g, 10 mmol) and FSI (0.80 mL, 10 mmol) in CH_3CN for 3 hours. The physical properties of **2-19** are as follows: white solid (2.7 g, 99% yield), m.p. 91.3 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 7.39-7.36 (m, 2H), 7.32-7.28 (m, 2H), 3.64 (s, 2H); ^{13}C NMR (101 MHz, CD_3CN) δ 172.1, 149.3, 148.4, 132.8, 129.6, 128.0, 123.2, 35.9; ^{19}F NMR (376 MHz, CD_3CN) δ 53.11; ESI-MS (m/z): 275.9 $[M-H]^-$; HRMS (ESI, m/z): calcd for $C_9H_7O_6NFS$: 275.9984 $[M-H]^-$, found: 275.9988.



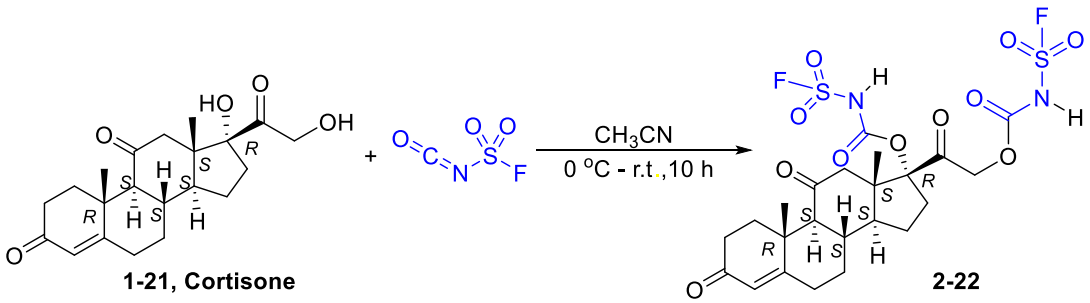
*3-Formylphenyl (fluorosulfonyl)carbamate (**2-20**)*

Following the **General Procedure 1**, the title compound was prepared from **1-19** (1.2 g, 10 mmol) and FSI (0.80 mL, 10 mmol) in CH_3CN for 3 hours. The physical properties of **2-20** are as follows: yellow solid (2.4 g, 98% yield), m.p. 93.1 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 10.00 (s, 1H), 7.88 (dt, *J* = 7.6, 1.2 Hz, 1H), 7.75 (dd, *J* = 2.4, 1.6 Hz, 1H), 7.67 (t, *J* = 6.0 Hz, 1H), 7.54 (ddd, *J* = 8.0, 2.4, 1.2 Hz, 1H); ^{13}C NMR (101 MHz, CD_3CN) δ 192.4, 151.3, 148.8, 139.1, 131.7, 129.3, 128.3, 122.4; ^{19}F NMR (376 MHz, CD_3CN) δ 53.13; ESI-MS (m/z): 245.9 $[M-H]^-$; HRMS (ESI, m/z): calcd for $C_8H_5O_5NFS$: 245.9878 $[M-H]^-$, found: 245.9800.



*Cis-(1R,2S)-cyclohexane-1,2-diyl bis((fluorosulfonyl)carbamate) (**2-21**)*

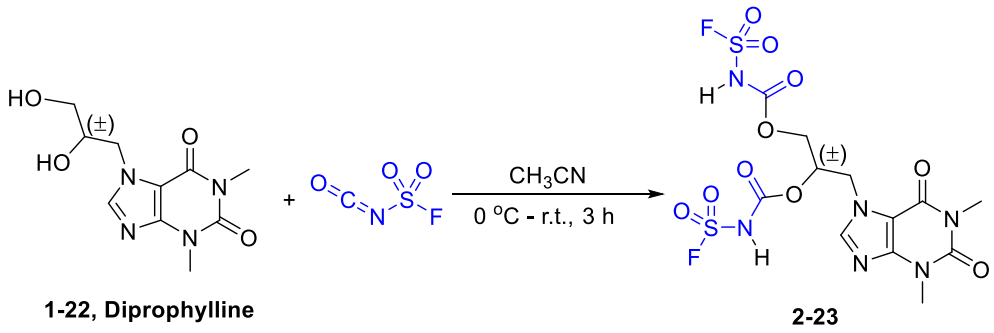
Following the **General Procedure 1**, the title compound was prepared from **1-20** (116 mg, 1 mmol) and FSI (0.16 mL, 2 mmol) in CH_2Cl_2 for 2 hours. The physical properties of **2-21** are as follows: white solid (349 mg, 95% yield), m.p. 94.0 ℃ (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 11.89 (br, 2H), 4.75 (d, *J* = 5.6 Hz , 2H), 1.78-1.71 (m, 2H), 1.59-1.52 (m, 4H), 1.40-1.32 (m, 2H); ^{13}C NMR (101 MHz, CD_3CN) δ 149.5, 75.6, 27.9, 21.9; ^{19}F NMR (376 MHz, CD_3CN) δ 51.02; ESI-MS (m/z): 364.99 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_8H_{11}O_8N_2F_2S_2$: 364.9957 $[M-H]^-$, found: 364.9949.



*N, N- cortisonoxydicarbonyl-fluorosulfurylamid (**2-22**)*

Following the **General Procedure 1**, the title compound was prepared from **1-21**

(Cortisone, 360 mg, 1 mmol) and FSI (0.16 mL, 2 mmol) in CH_3CN for 10 hours. Dissolved in ethyl acetate, then washed with 2M HCl and dried with anhydrous sodium sulfate. After filtration and removal of solvent, the product **2-22** was obtained as a white solid (580 mg, 95% yield), m.p. 140.5 °C (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 5.69 (s, 1H), 4.97 (s, 2H)，3.84 (br, 2H), 2.89 (d, *J* = 12.8 Hz, 1H), 2.82 (ddd, *J* = 15.0, 11.6, 3.2 Hz, 1H), 2.66 (ddd, *J* = 13.6, 5.0, 3.2 Hz, 1H), 2.48 (td, *J* = 16.8, 4.8 Hz, 2H), 2.35-2.28 (m, 2H), 2.22-2.16 (m, 3H), 2.07-1.96 (m, 4H), 1.68 (td, *J* = 14.4, 4.4 Hz, 1H), 1.60-1.51 (m, 1H), 1.39 (s, 3H), 1.29-1.22 (m, 1H), 0.72 (s, 3H); ^{13}C NMR (101 MHz, CD_3CN) δ 208.9, 201.1, 198.5, 171.6, 150.0, 149.7, 124.7, 97.0, 70.9, 63.0, 51.8, 50.5, 50.4, 39.2, 36.5, 35.3, 34.2, 32.9, 32.7, 31.1, 23.7, 17.5, 15.1; ^{19}F NMR (376 MHz, CD_3CN) δ 53.85 (1F), 52.71 (1F); ESI-MS (m/z): 609.10 $[M-H]^-$; HRMS (ESI, m/z): calcd for $C_{23}H_{27}O_{11}N_2F_2S_2$: 609.1030 $[M-H]^-$, found: 609.1033.

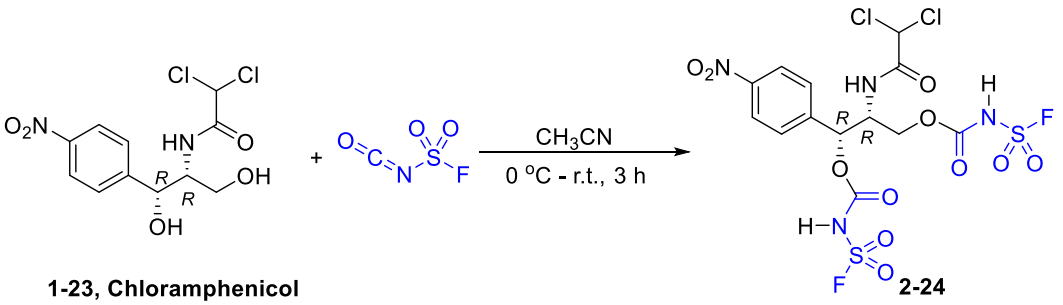


1-22, Diprophylline **2-23**

*3-(1,3-dimethyl-2,6-dioxo-1,2,3,6-tetrahydro-7H-purin-7-yl)propane-1,2-diyl bis((fluorosulfonyl)carbamate) (**2-23**)*

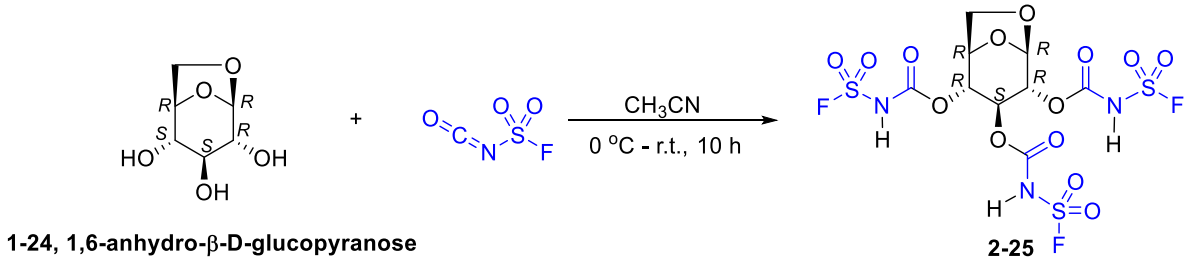
Following the **General Procedure 1**, the title compound was prepared from **1-22** (Diprophylline, 254 mg, 1 mmol) and FSI (0.16 mL, 2 mmol) in CH_3CN for 3 hours. After filtration and washed by CH_3CN, the product **2-23** was obtained as a white solid (330 mg, 65% yield), m.p. 164.9 °C (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 11.29 (br, 2H), 7.96 (s, 1H), 5.12-5.07 (m, 1H), 4.52 (dd, *J* = 10.8, 3.6 Hz, 1H), 4.42 (dd, *J* = 14.4, 8.4 Hz, 1H), 4.11 (dd, *J* = 12.0, 2.0 Hz, 1H), 3.99 (dd, *J* = 12.0, 4.8 Hz, 1H), 3.42 (s, 3H), 3.24 (s, 3H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 155.2, 154.9, 154.6, 151.2, 148.3, 143.2, 106.4, 71.1, 64.0, 46.9, 29.7, 27.7; ^{19}F NMR (376 MHz, DMSO-d_6) δ 50.13 (1F), 50.02 (1F); ESI-MS (m/z): 505.13 $[M+H]^+$; HRMS (DART, m/z):

calcd for $C_{14}H_{15}O_{10}N_6F_2S_2$: 505.0254 $[M+H]^+$, found: 505.0254.



*(1R,2R)-2-(2,2-dichloroacetamido)-1-(4-nitrophenyl)propane-1,3-diyl bis((fluorosulfonyl)carbamate) (**2-24**)*

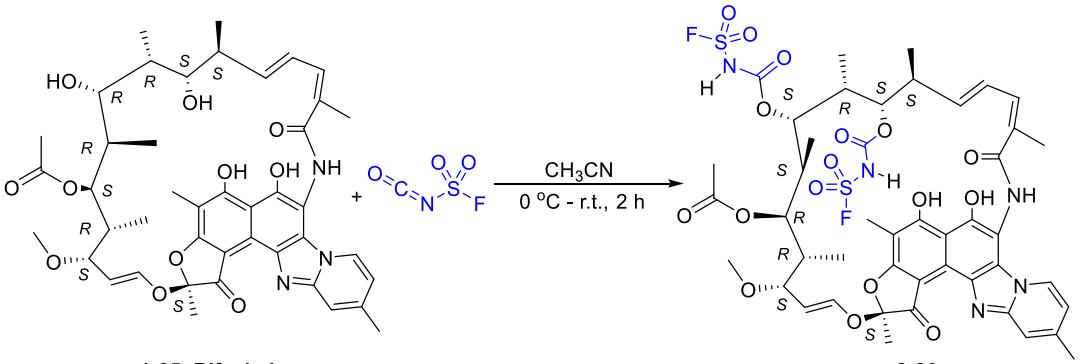
Following the **General Procedure 1**, the title compound was prepared from **1-23** (Chloramphenicol, 646 mL, 2 mmol) and FSI (0.32 mL, 4 mmol) in CH_3CN for 3 hours. The physical properties of **2-24** are as follows: white solid (1.1 g, 96% yield), m.p. 67.1 °C (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 8.25 (d, *J* = 8.8 Hz, 2H), 7.64 (d, *J* = 8.8 Hz, 2H), 7.23 (d, *J* = 9.6 Hz, 2H), 6.10 (s, 1H), 6.05 (d, *J* = 5.2 Hz, 1H), 4.69-4.62 (m, 1H), 4.40 (dd, *J* = 11.6, 4.8 Hz, 1H), 4.21 (dd, *J* = 11.2, 6.8 Hz, 1H); ^{13}C NMR (101 MHz, CD_3CN) δ 165.2, 149.7, 149.3, 149.2, 143.3, 128.7, 124.8, 77.3, 67.2, 66.1, 53.2; ^{19}F NMR (376 MHz, CD_3CN) δ 53.32 (1F), 52.86 (1F); ESI-MS (m/z): 570.80 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{13}H_{11}O_{11}N_4Cl_2F_2S_2$: 570.9216 $[M-H]^-$, found: 570.9235.



*(1R,2R,3S,4R,5R)-6,8-dioxabicyclo[3.2.1]octane-2,3,4-triyl tris((fluorosulfonyl)carbamate) (**2-25**)*

Following the **General Procedure 1**, the title compound was prepared from **1-24** (1,6-anhydro-β-D-glucopyranose, 162 mg, 1 mmol) and FSI (0.24 mL, 3 mmol) in CH_3CN for 10 hours. The physical properties of **2-25** are as follows: white solid (516 mg, 97%),

m.p. 129.7 ℃ (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.94 (s, 2H), 7.90 (s, 7H), 5.31 (s, 1H), 4.55 (d, *J* = 5.8 Hz, 1H), 4.41 (dd, *J* = 3.0, 1.5 Hz, 1H), 4.30 (s, 1H), 4.14 (s, 1H), 3.97 (d, *J* = 7.6 Hz, 1H), 3.62 (dd, *J* = 7.6, 6.0 Hz, 1H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 155.5, 155.4, 155.2, 98.9, 73.5, 71.1, 70.8, 70.1, 64.6; ^{19}F NMR (376 MHz, DMSO-d_6) δ 50.17 (1F), 49.96 (1F)，49.88 (1F); ESI-MS (m/z): 535.79 [M-H]$^-$; HRMS (DART, m/z): calcd for $C_9H_9O_{14}N_3F_3S_3$: 535.9204 [M-H]$^-$, found: 535.9205.



1-25, Rifaximin **2-26**

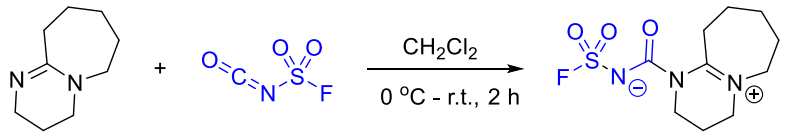
*Bis(fluorosulfonyl carbamate) of Rifaximin (**2-26**)*

Following the **General Procedure 1**, the title compound was prepared from **1-25** (Rifaximin, 786 mg, 1 mmol) and FSI (0.16 mL, 2 mmol) in CH_3CN for 2 hours. Recrystallized from ethyl acetate and petroleum ether gave **2-26** as an orange solid (818 mg, 79% yield), m.p. 106.5 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 8.50 (d, *J* = 6.8 Hz, 1H), 8.38 (s, 1H), 7.75 (s, 1H), 7.23 (dd, *J* = 7.2 1.6 Hz, 1H), 6.91 (d, *J* = 11.2 Hz, 1H), 6.44 (d, *J* = 11.2 Hz, 1H), 5.97-5.89 (m, 2H), 4.90 (dd, *J* = 12.8 6.0 Hz, 1H), 4.75 (dd, *J* = 8.0 3.2 Hz, 1H), 4.56 (d, *J* = 10.4 Hz, 1H), 4.31 (dd, *J* = 11.2, 2.8 Hz, 2H), 3.13 (d, *J* = 6.0 Hz, 1H), 2.91 (s, 3H), 2.58 (s, 3H), 2.49-2.42 (m, 1H), 2.21 (s, 3H), 1.97 (s, 3H), 1.87 (s, 3H), 1.79 (s, 3H), 1.53-1.41 (m, 1H), 0.90 (d, *J* = 6.8 Hz, 3H), 0.82 (d, *J* = 7.2 Hz, 3H), 0.77-0.69 (m, 1H), -0.01 (d, *J* = 6.8 Hz, 3H), -0.75 (d, *J* = 7.6 Hz, 3H); ^{13}C NMR (101 MHz, CD_3CN) δ 191.5, 173.4, 171.5, 170.7, 155.1, 152.0, 150.4, 149.9, 142.4, 140.5, 138.8, 137.9, 134.5, 132.6, 129.9, 129.2, 128.5, 126.2, 123.9, 120.8, 119.5, 116.5, 112.5, 112.1, 109.6, 105.6, 104.9, 100.2, 81.2, 79.2, 77.4, 71.9, 57.0, 40.0, 35.7, 22.3, 21.5, 21.4, 20.9, 20.5, 18.4, 12.6, 8.4, 8.2, 7.6; ^{19}F NMR (376 MHz, CD_3CN) δ 52.32 (1F), 52.08 (1F); ESI-MS (m/z): 1034.6 [M-H]$^-$; HRMS (ESI,

m/z): calcd for $C_{45}H_{52}O_{17}N_5F_2S_2$: 1036.2762 $[M+H]^+$, found: 1036.2770.

Section 3. Ligation of tertiary amines and *N*-hydroxysuccinimide with FSI.

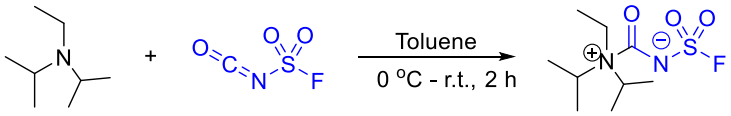
General Procedure 2 (Tertiary amines with FSI)**.** A solution of amines in dry solvent (1 mol/L) was cooled to 0 °C. FSI (1 equiv.) was added dropwise. The resulting mixture was stirred at room temperature to give the corresponding salts as precipitates.



3-1

Compound 3-1,

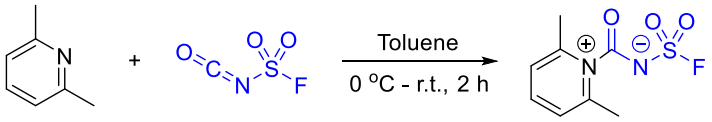
Following the **General Procedure 2**, the title compound was prepared from DBU (0.745 mL, 5 mmol) and FSI (0.40 mL, 5 mmol) in CH_2Cl_2 for 2 hours. Filtered and washed with CH_2Cl_2, the product (**3-1**) was obtained as a white solid (1.25 g, 90% yield), m.p. 150.7 °C (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 3.76-3.73 (m, 2H), 3.68-3.66 (m, 2H), 3.51 (t, *J* = 6.0 Hz, 2H), 3.05-3.03 (m, 2H), 2.07-2.01 (m, 2H), 1.82-1.72 (m, 6H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 169.0, 155.9, 54.7, 50.0, 44.0, 31.5, 27.6, 24.8, 22.4, 20.1; ^{19}F NMR (376 MHz, CD_3CN) δ 47.86; ESI-MS (m/z): 276.1 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{10}H_{15}O_3N_3FS$: 276.0824 $[M-H]^-$, found: 276.0825.



3-2

Compound 3-2,

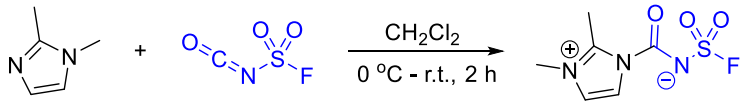
Following the **General Procedure 2**, the title compound was prepared from DIPEA (0.33 mL, 2 mmol) and FSI (0.16 mL, 2 mmol) in toluene for 2 hours. Removal of solvent gave **3-2** as a white solid (484 mg, 95% yield), m.p. 145.3 °C (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 3.74 (hept, *J* = 6.8 Hz, 2H), 3.21 (q, *J* = 7.6 Hz, 2H), 1.35 (d, *J* = 6.8 Hz, 12H), 1.34 (t, *J* = 7.6 Hz, 3H); ^{13}C NMR (101 MHz, CD_3CN) δ 164.4, 55.2, 43.3, 18.3, 12.1; ^{19}F NMR (376 MHz, CD_3CN) δ 49.47.



3-3

Compound 3-3,

Following the **General Procedure 2**, the title compound was prepared from 2,6-lutidine (0.233 mL, 2 mmol) and FSI (0.16 mL, 2 mmol) in toluene for 2 hours. Removal of solvent gave **3-3** as a white solid (435 mg, 94% yield), m.p. 118.5 °C (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 7.99 (t, *J* = 8.0 Hz, 1H), 7.38 (d, *J* = 8.0 Hz, 2H), 2.63 (s, 6H); ^{13}C NMR (101 MHz, CD_3CN) δ 155.4, 144.5, 124.6, 20.6; ^{19}F NMR (376 MHz, CD_3CN) δ 49.95.

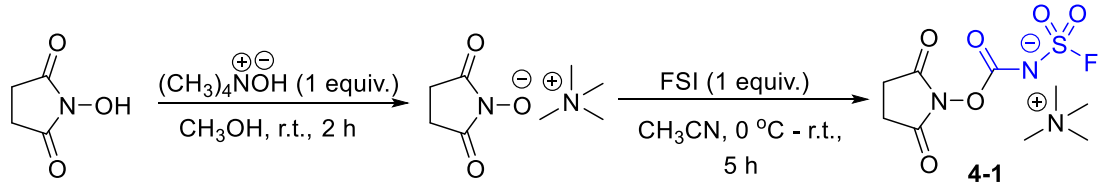


3-4

Compound 3-4,

Following the **General Procedure 2**, the title compound was prepared from 1,2-dimethyl-1H-imidazole (480 mg, 5 mmol) and FSI (0.40 mL, 5 mmol) in CH_2Cl_2 for 2 hours. Filtered and washed with CH_2Cl_2, the product **3-4** was obtained as white solid (978 mg, 88% yield), m.p. 148.2 °C (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 7.75 (t, *J* = 2.4 Hz, 1H), 7.16 (d, *J* = 2.4 Hz, 2H), 3.70 (s, 3H), 2.82 (s, 3H); ^{13}C NMR (101 MHz, CD_3CN) δ 150.9, 148.0, 122.0, 120.7, 35.7, 12.7; ^{19}F NMR (376 MHz, CD_3CN) δ 48.39; ESI-MS (m/z): 222.0 $[M+H]^+$; HRMS (DART, m/z): calcd for $C_6H_9O_3N_3FS$: 222.0343 $[M+H]^+$, found: 222.0342.

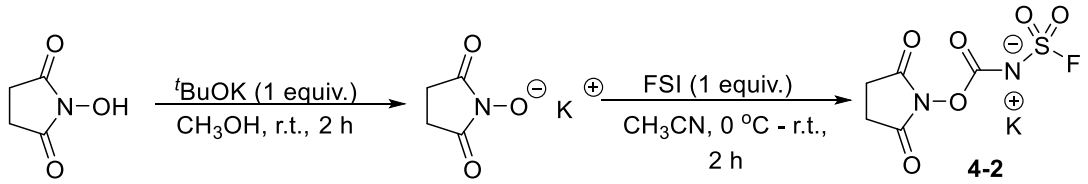
General Procedure 3 (*N*-hydroxysuccinimide with FSI)**.** A solution of dry *N*-hydroxysuccinimide in dry CH_3OH (1 mol/L) was cooled to 0 °C. Base (1 equiv.) was added and stirred at room temperature for 2 hours. After removal of CH_3OH through rotary evaporation, the azeotropic water with further removed with toluene three times. Then dry CH_3CN (1 mol/L) was added and the solution was cooled to 0 °C. After addition of FSI (1 equiv.) in dry CH_3CN (1 mol/L), the resulting mixture was stirred at room temperature for hours until full conversion of the starting materials.



4-1

*Florosulfuryl succinimide tetramethylammonium salt (**4-1**),*

Following the **General Procedure 3**, the title compound was prepared from *N*-hydroxy succinimide (391 mg, 3.4 mmol), tetramethylammonium hydroxide (wt. 25% in CH_3OH) (1.22 g, 3.4 mmol) and FSI (0.27 mL, 3.4 mmol). The mixture of succinimide tetramethylammonium salt and FSI stirred at room temperature for 5 hours. After completion, the mixture was poured into methyl *tert*-butyl ether (30 mL) with vigorous stirring. Filtered and washed with methyl *tert*-butyl ether, the product **4-1** was obtained as a white solid (1.7 g, 80% yield), m.p. 155.6 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 3.08 (s, 12H), 2.70 (s, 4H); ^{13}C NMR (101 MHz, CD_3CN) δ 172.2, 154.9, 56.1, 56.0, 56.0, 26.2; ^{19}F NMR (376 MHz, CD_3CN) δ 48.04; ESI-MS (m/z): 238.9 [M-$C_4H_{12}N]^-$; HRMS (DART, m/z): calcd for $C_5H_4O_6N_2FS$: 238.9780 [M-$C_4H_{12}N]^-$, found: 238.9778.



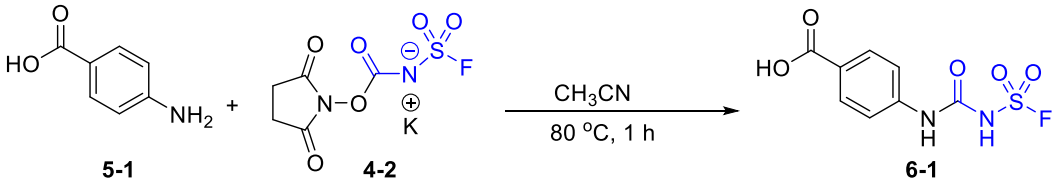
*Florosulfuryl succinimide potassium salt (**4-2**),*

Following the **General Procedure 3**, the title compound was prepared from *N*-hydroxy succinimide (11.5 g, 100 mmol), potassium *tert*-butoxide (11.2 g, 100 mmol) and FSI (8.00 mL, 100 mmol). The mixture of succinimide potassium salt and FSI stirred at room temperature overnight. Poured into methyl *tert*-butyl ether (800 mL) with vigorous stirring. Filtered and washed with methyl *tert*-butyl ether, the product **4-2** was obtained as a white solid (24.5 g, 87% yield), m.p. 166.7 ℃ (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 2.71 (s, 4H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 171.2, 153.3, 25.3; ^{19}F NMR (376 MHz, DMSO-d_6) δ 49.79; ESI-MS (m/z): 238.9 [M-K]$^-$. HRMS (DART, m/z): calcd for $C_5H_4O_6N_2FS$: 238.9780 [M-K]$^-$, found: 238.9778.

Section 4. Reaction between amines and salt 4-2.

General Procedure 4. A solution of fluorosulfuryl succinimide potassium salt **4-2** (1.2 equiv.) and amines (1.0 equiv.) in dry CH_3CN (0.2 mol/L) was stirred at 80 °C and

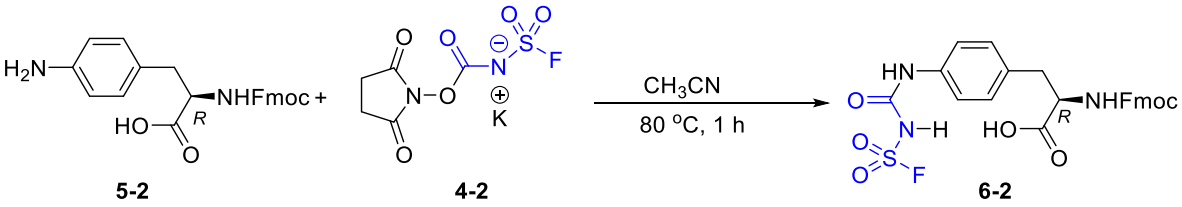
monitored by TLC and LC-MS. After completion, the solvent was cooled to room temperature, then added 1M H_2SO_4 (10 mL). The resulting mixture was extracted twice by ethyl acetate, and the organic layer was combined. Under basic conditions, the target product would be deprotonated and redistributed from organic phase to aqueous phase. So we use 0.5M sodium bicarbonate (30 mL) to extract the targeted product from the combined organic layer. Thereafter, the combined sodium bicarbonate solution was acidified to pH = 1, and then re-extracted twice by ethyl acetate. The combined organic phase was washed with brine and dried over Na_2SO_4, concentrated by rotary evaporation and dried in vacuo to give pure product.



5-1 4-2 6-1

4-(3-(fluorosulfonyl)ureido)benzoic acid ***(6-1)***,

Following the **General Procedure 4**, the title compound was prepared from **5-1** (137 mg, 1.0 mmol) and salt **4-2** (334 mg, 1.2 mmol) for 1 hour. The physical properties of **6-1** are as follows: white solid (236mg, 89%), m.p. 138.2 ℃(decomposition). ^{1}H NMR (400 MHz, CD_3OD) δ 7.96 (d, *J* = 8.4 Hz, 2H), 7.58 (d, *J* = 8.4 Hz, 2H); ^{13}C NMR (101 MHz, CD_3OD) δ 169.5, 144.2, 132.6, 131.8, 126.5, 119.7; ^{19}F NMR (376 MHz, CD_3OD) δ 53.45; ESI-MS (m/z): 261.01 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_8H_6O_5N_2FS$: 260.9987 $[M-H]^-$, found: 260.9985.

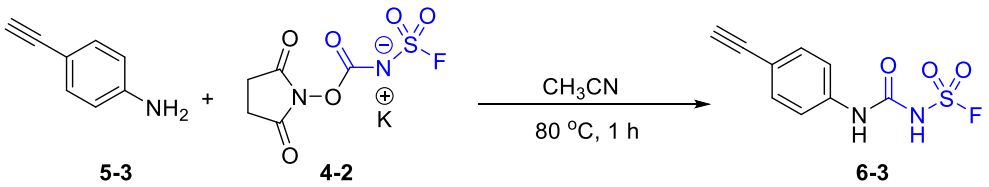


5-2 4-2 6-2

(R)-2-((((9H-fluoren-9-yl)methoxy)carbonyl)amino)-3-(4-(3-(fluorosulfonyl)ureido)phenyl)propanoic acid ***6-2***,

Following the **General Procedure 4**, the title compound was prepared from **5-2** (201 mg, 0.5 mmol) and salt **4-2** (167 mg, 0.6 mmol) for 1 hour. The physical properties of **6-2** are as follows: orange solid (205mg, 78% yield), m.p. 168.6 ℃ (decomposition).

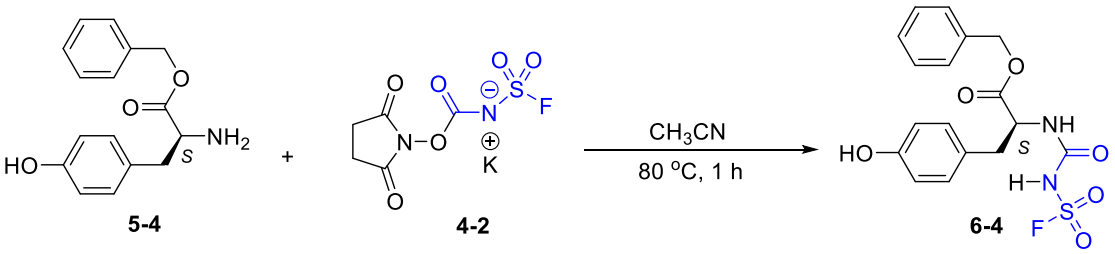
^{1}H NMR (400 MHz, CD_3OD) δ 7.77 (d, *J* = 7.6 Hz, 2H), 7.58 (t, *J* = 7.2 Hz, 2H), 7.39-7.35 (m, 4H), 7.28 (td, *J* = 7.2, 3.2 Hz, 2H), 7.20 (d, *J* = 8.4 Hz, 2H), 4.40 (dd, *J* = 9.6, 4.8 Hz, 1H), 4.30 (dd, *J* = 10.4, 7.2 Hz, 1H), 4.22 (dd, *J* = 10.4, 7.2 Hz, 1H), 4.15 (t, *J* = 7.2 Hz, 1H), 3.18 (dd, *J* = 13.6, 4.4 Hz, 1H), 2.91 (dd, *J* = 13.6, 9.6 Hz, 1H); ^{13}C NMR (101 MHz, CD_3CN) δ 173.5, 157.0, 144.9, 144.9, 142.0, 136.9, 134.2, 130.8, 128.6, 128.0, 126.0, 121.1, 120.9, 67.3, 56.0, 47.8. 37.2; ^{19}F NMR (376 MHz, CD_3OD) δ 52.83; ESI-MS (m/z): 526.09 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{25}H_{21}O_7N_3FS$: 526.1090 $[M-H]^-$, found: 526.1086.



5-3 4-2 6-3

*((4-ethynylphenyl)carbamoyl)sulfamoyl fluoride (**6-3**)*

Following the **General Procedure 4**, the title compound was prepared from **5-3** (117 mg, 1.0 mmol) and salt **4-2** (334 mg, 1.2 mmol) for 1 hour. The physical properties of **6-3** are as follows: orange solid (199 mg, 83% yield), m.p. 121.2 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 8.07 (br, 1H), 7.48-7.43 (m, 4H), 3.36 (s, 1H); ^{13}C NMR (101 MHz, CD_3CN) δ 148.0, 138.7, 133.7, 120.8, 118.8, 83.7, 78.6; ^{19}F NMR (376 MHz, CD_3CN) δ 53.48; ESI-MS (m/z): 241.06 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_9H_6O_3N_2FS$: 241.0089 $[M-H]^-$, found: 241.0086.

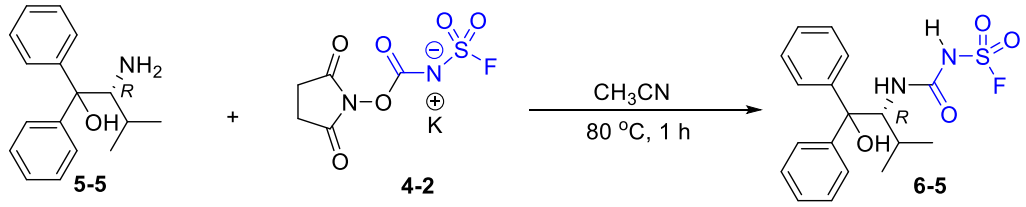


5-4 4-2 6-4

*Benzyl ((fluorosulfonyl)carbamoyl)-L-tyrosinate **6-4***

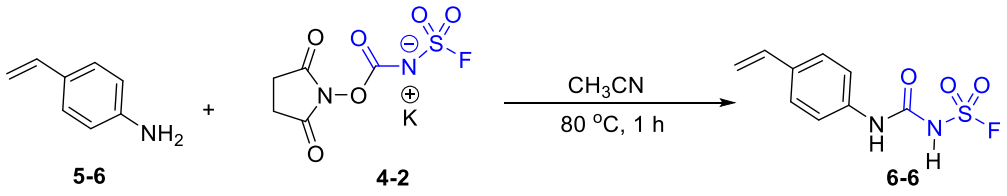
Following the **General Procedure 4**, the title compound was prepared from **5-4** (136 mg, 0.5 mmol) and salt **4-2** (167 mg, 0.6 mmol) for 1 hour. The physical properties of **6-4** are as follows: white solid (182 mg, 92% yield), m.p. 61.3 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 7.35 (d, *J* = 9.6 Hz, 4H), 6.95 (d, *J* = 8.0 Hz, 2H), 6.69 (d,

J = 8.0 Hz, 2H), 6.28 (d, *J* = 6.8 Hz, 1H), 5.10 (s, 2H), 4.52 (dd, *J* = 12.8, 6.0 Hz, 1H), 2.99 (m, 3H); ^{13}C NMR (101 MHz, CD_3CN) δ 172.1, 156.7, 153.5, 136.6, 131.3, 129.4, 129.1, 128.1, 116.1, 67.7, 55.9, 37.1; ^{19}F NMR (376 MHz, CD_3CN) δ 53.08; ESI-MS (m/z): 395.15 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{17}H_{16}O_6N_2FS$: 395.0719 $[M-H]^-$, found: 395.0716.



(R)-((1-hydroxy-3-methyl-1,1-diphenylbutan-2-yl)carbamoyl)sulfamoyl fluoride ***6-5***

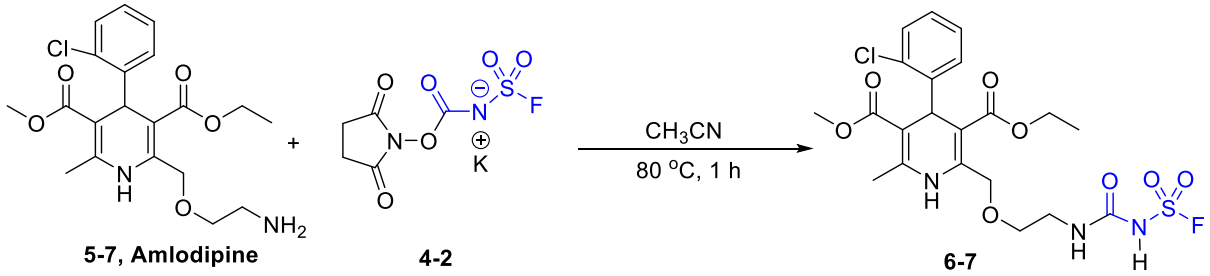
Following the **General Procedure 4**, the title compound was prepared from **5-5** (255 mg, 1.0 mmol) and salt **4-2** (334 mg, 1.2 mmol) for 1 hour, then was cooled to room temperature and added 1M H_2SO_4 (10 mL). The mixture was extracted twice with ethyl acetate. The combined organic layer was washed with 0.5M sodium bicarbonate, 1M H_2SO_4 (acidification) and saturated brine quickly. The organic layer was dried over Na_2SO_4, concentrated by rotary evaporation and dried in vacuo to give **6-5** as a white solid (346 mg, 91% yield), m.p. 68.7 °C (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 7.50 (dd, *J* = 8.0, 1.6 Hz, 4H), 7.31 (t, *J* = 7.2 Hz, 2H), 7.25 (t, *J* = 7.2 Hz, 2H), 7.19 (t, *J* = 7.6 Hz, 1H), 7.15 (t, *J* = 7.6 Hz, 1H), 4.72 (d, *J* = 2.0 Hz, 1H), 1.89 (heptd, *J* = 6.8, 2.4 Hz, 1H), 0.93 (d, *J* = 6.8 Hz, 3H), 0.87 (d, *J* = 6.8 Hz, 3H); ^{13}C NMR (101 MHz, CD_3CN) δ 151.9, 147.6, 146.9, 129.2, 129.0, 127.8, 127.7, 126.8, 126.8, 82.6, 61.3, 30.1, 23.4, 18.1; ^{19}F NMR (376 MHz, CD_3CN) δ 53.23; ESI-MS (m/z): 379.24 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_{18}H_{20}O_4N_2FS$: 379.1133 $[M-H]^-$, found: 379.1133.



*((4-vinylphenyl)carbamoyl)sulfamoyl fluoride (****6-6****)*

Following the **General Procedure 4**, the title compound was prepared from **5-6** (119 mg, 1.0 mmol) and salt **4-2** (334 mg, 1.2 mmol) for 1 hour, then was cooled to room

temperature and added 1M H_2SO_4 (10 mL). The mixture was extracted twice with ethyl acetate. The combined organic layer was washed with 0.5M sodium bicarbonate, 1M H_2SO_4 (acidification) and saturated brine quickly. The organic layer was dried over Na_2SO_4, concentrated by rotary evaporation and dried in vacuo to give **6-6** as a yellow solid (183 mg, 75% yield), m.p. 105.0 °C (decomposition). ^{1}H NMR (400 MHz, CD_3OD) δ 7.39 (d, *J* = 8.4 Hz, 2H), 7.29 (d, *J* = 8.4 Hz, 2H), 6.61 (dd, *J* = 17.6, 11.2 Hz, 1H), 5.62 (d, *J* = 17.6, Hz, 1H), 5.09 (d, *J* = 17.6, Hz, 1H); ^{13}C NMR (101 MHz, CD_3CN) δ 141.7, 140.0, 137.2, 130.2, 123.4, 115.5; ^{19}F NMR (376 MHz, CD_3OD) δ 52.55; ESI-MS (m/z): 243.01 $[M-H]^-$; HRMS (DART, m/z): calcd for $C_9H_8O_3N_2FS$: 243.0245 $[M-H]^-$, found: 243.0247.

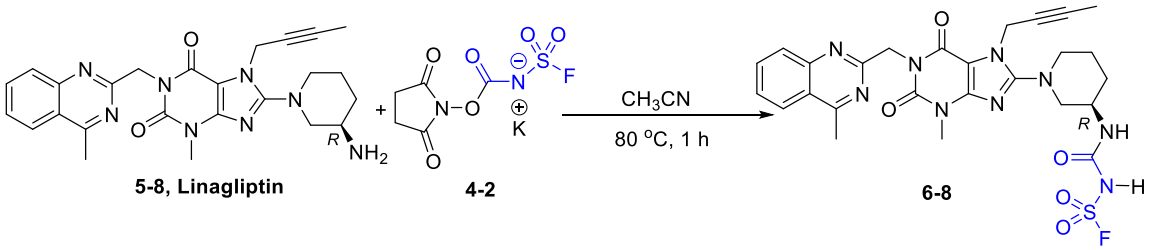


5-7, Amlodipine **4-2** **6-7**

3-ethyl 5-methyl 4-(2-chlorophenyl)-2-((2-(3-(fluorosulfonyl)ureido)ethoxy)methyl)-6-methyl-1,4-dihydropyridine-3,5-dicarboxylate ***6-7***

Following the **General Procedure 4**, the title compound was prepared from **5-7** (Amlodipine, 204 mg, 0.5 mmol) and salt **4-2** (167 mg, 0.6 mmol) for 1 hour, then was cooled to room temperature and added 1M H_2SO_4 (10 mL). The mixture was extracted twice with ethyl acetate. The combined organic layer was washed with 0.5M sodium bicarbonate, 1M H_2SO_4 (acidification) and saturated brine quickly. The organic layer was dried over Na_2SO_4, concentrated by rotary evaporation and dried in vacuo to give **6-7** as a yellow solid (233 mg, 87% yield), m.p. 110.0 °C (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 7.47 (br, 1H), 7.41 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.26 (dd, *J* = 8.0, 1.6 Hz, 1H), 7.20 (td, *J* = 8.0, 1.6 Hz, 1H), 7.10 (td, *J* = 8.0, 1.6 Hz, 1H), 6.23 (br, 1H), 5.36 (s, 1H), 4.71-4.58 (m, 2H), 4.00 (qd, *J* = 7.2, 3.2 Hz, 2H), 3.62 (t, *J* = 4.8 Hz, 2H), 3.54 (s, 3H), 3.45-3.42 (m, 2H), 2.31 (s, 3H), 1.14 (t, *J* = 7.2 Hz, 3H); ^{13}C NMR (101 MHz, CD_3CN) δ 168.7, 167.7, 147.0, 146.3, 145.7, 132.7, 132.4, 130.0, 128.7, 128.2, 103.9, 102.2, 70.6, 68.4, 60.5, 51.1, 40.9, 38.2, 27.2, 19.0, 14.6; ^{19}F NMR (376 MHz,

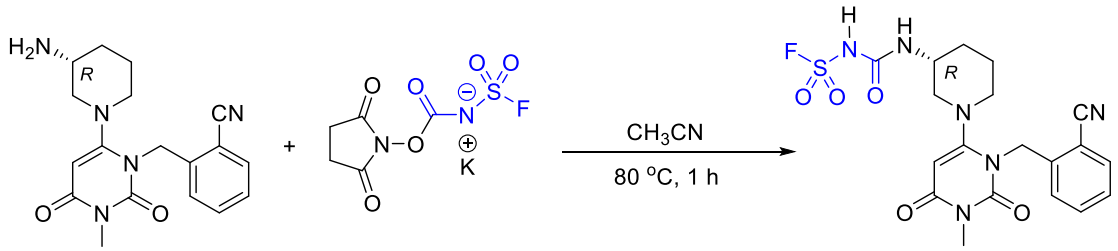
CD_3CN) δ 53.44; ESI-MS (m/z): 534.14 $[M+H]^+$; HRMS (DART, m/z): calcd for $C_{21}H_{24}O_8N_3FClS$: 532.0951 $[M+H]^+$, found: 532.0948.



5-8, Linagliptin **4-2** **6-8**

(R)-((1-(7-(but-2-yn-1-yl)-3-methyl-1-((4-methylquinazolin-2-yl)methyl)-2,6-dioxo-2,3,6,7-tetrahydro-1H-purin-8-yl)piperidin-3-yl)carbamoyl)sulfamoyl fluoride ***6-8,***

Following the **General Procedure 4**, the title compound was prepared from **5-8** (Linagliptin, 170 mg, 0.5 mmol) and salt **4-2** (167 mg, 0.6 mmol) for 1 hour. And we use dichloromethane and methanol (3:1, 20 mL) for extraction instead of ethyl acetate. The physical properties of **6-8** are as follows: white solid (236 mg, 79% yield), m.p. 95.6 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 8.19 (d, *J* = 8.0 Hz, 1H), 7.89 (t, *J* = 8.0 Hz, 1H), 7.78 (d, *J* = 8.4 Hz, 1H), 7.65 (t, *J* = 7.6 Hz, 1H), 6.63 (br, 1H), 5.40 (s, 2H), 4.86 (s, 2H), 3.99-3.93 (m, 1H), 3.67 (s, 3H), 3.60 (dd, *J* = 12.0, 3.2 Hz, 1H), 3.43 (s, 3H), 3.41-3.27 (m, 4H), 3.22-3.19 (m, 1H), 2.90 (s, 3H), 1.91-1.86 (m, 2H), 1.75 (s, 3H), 1.75-1.68 (m, 2H); ^{13}C NMR (101 MHz, CD_3CN) δ 170.1, 162.5, 157.5, 155.0, 152.5, 150.5, 149.3, 134.8, 128.8, 127.9, 126.5, 123.8, 104.8, 82.1, 74.4, 55.5, 46.8, 36.5, 30.4, 30.3, 30.0, 24.0, 22.1; ^{19}F NMR (376 MHz, CD_3CN) δ 52.91; ESI-MS (m/z): 596.10 $[M-H]^-$; HRMS (ESI, m/z): calcd for $C_{25}H_{31}O_9N_5FS$: 596.1832 $[M-H]^-$, found: 596.1854.

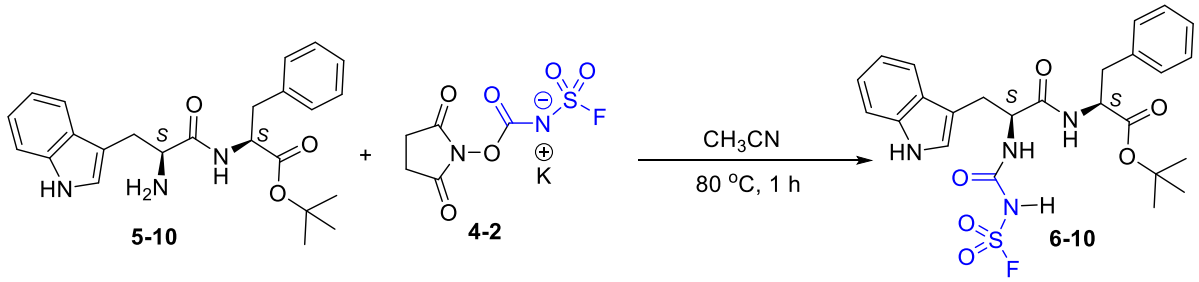


5-9, Alogliptin **4-2** **6-9**

(R)-((1-(3-(2-cyanobenzyl)-1-methyl-2,6-dioxo-1,2,3,6-tetrahydropyrimidin-4-yl)piperidin-3-yl)carbamoyl)sulfamoyl fluoride ***6-9***,

Following the **General Procedure 4**, the title compound was prepared from **5-9**

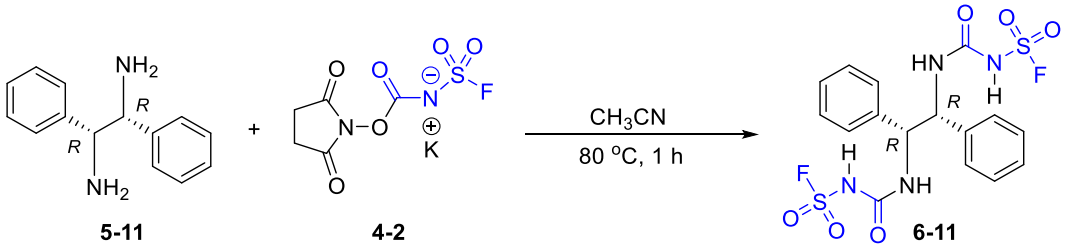
(Alogliptin, 170 mg, 0.5 mmol) and salt **4-2** (167 mg, 0.6 mmol) for 1 hour. The physical properties of **6-9** are as follows: white solid (223 mg, 95% yield), m.p. 133.7 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 7.71 (d, *J* = 8.0 Hz, 1H), 7.59 (t, *J* = 7.6 Hz, 1H), 7.41 (t, *J* = 7.6 Hz, 1H), 7.24 (d, *J* = 8.0 Hz, 1H), 6.21 (br, 1H), 5.32 (s, 1H), 5.21 (s, 2H), 3.80-3.71 (m, 1H), 3.19-3.11 (m, 1H), 3.13 (s, 3H), 2.95-2.87 (m, 1H), 2.78-2.64 (m, 3H), 1.87-1.83 (m, 1H), 1.77-1.70 (m, 1H), 1.65-1.56 (m, 1H), 1.53-1.47 (m, 1H); ^{13}C NMR (101 MHz, CD_3CN) δ 171.1, 163.9, 161.0, 153.3, 142.2, 134.2, 134.0, 128.7, 128.2, 111.6, 90.7, 56.0, 52.5, 47.1, 28.0, 26.3, 26.1; ^{19}F NMR (376 MHz, CD_3CN) δ 53.22; ESI-MS (m/z): 463.17 $[M-H]^-$; HRMS (ESI, m/z): calcd for $C_{19}H_{20}O_5N_6FS$: 463.1205 $[M-H]^-$, found: 463.1203.



tert-butyl ((fluorosulfonyl)carbamoyl)-L-tryptophyl-L-phenylalaninate ***6-10***,

Following the **General Procedure 4**, the title compound was prepared from **5-10** (222 mg, 0.5 mmol) and salt **4-2** (167 mg, 0.6 mmol) for 1 hour, then was cooled to room temperature and added 1M H_2SO_4 (10 mL). The mixture was extracted twice with ethyl acetate. The combined organic layer was washed with 0.5M sodium bicarbonate, 1M H_2SO_4 (acidification) and saturated brine quickly. The organic layer was dried over Na_2SO_4, concentrated by rotary evaporation and dried in vacuo to give **6-10** as a white solid (251 mg, 95% yield), m.p. 81.7 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 9.18 (s, 1H), 7.54 (d, *J* = 8.0 Hz, 1H), 7.37 (d, *J* = 8.0 Hz, 1H), 7.27-7.21 (m, 3H), 7.12 (dd, *J* = 14.4, 7.2 Hz, 3H), 7.04 (ddd, *J* = 14.4, 6.4, 2 Hz, 2H), 6.66 (dd, *J* = 238.4, 7.2 Hz, 1H), 4.55-4.47 (m, 2H), 3.21 (dd, *J* = 14.8, 6.0 Hz, 1H), 3.10 (dd, *J* = 14.8, 6.0 Hz, 1H), 3. 01 (dd, *J* = 14.0, 2.4 Hz, 1H), 2.92(dd, *J* = 14.0, 6.8 Hz, 1H), 1.39 (s, 9H); ^{13}C NMR (101 MHz, CD_3CN) δ 171.8, 170.8, 149.6, 137.5, 137.3, 130.4, 129.2, 128.5, 127.7, 125.0, 122.5, 120.0, 119.3, 112.3, 109.9, 82.9, 55.4, 55.2, 38.3, 29.1, 28.1; ^{19}F NMR (376 MHz, CD_3CN) δ 53.47; ESI-MS (m/z): 531.19 $[M-H]^-$; HRMS (ESI, m/z):

calcd for $C_{25}H_{28}O_6N_4FS$: 531.1726 $[M-H]^-$, found: 531.1726.

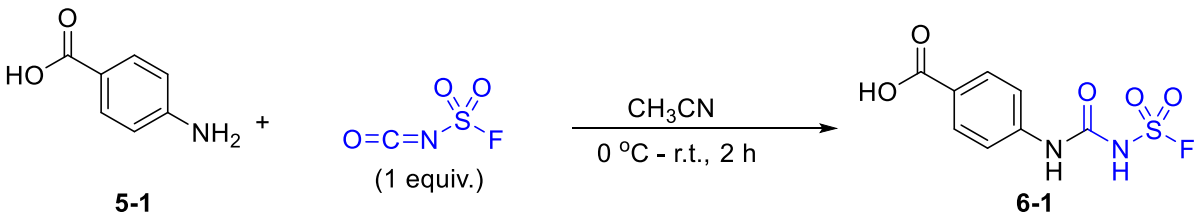


(((1R,2R)-2-(3-(fluorosulfonyl)ureido)-1,2-diphenylethyl)carbamoyl)sulfamoyl fluoride ***6-11***,

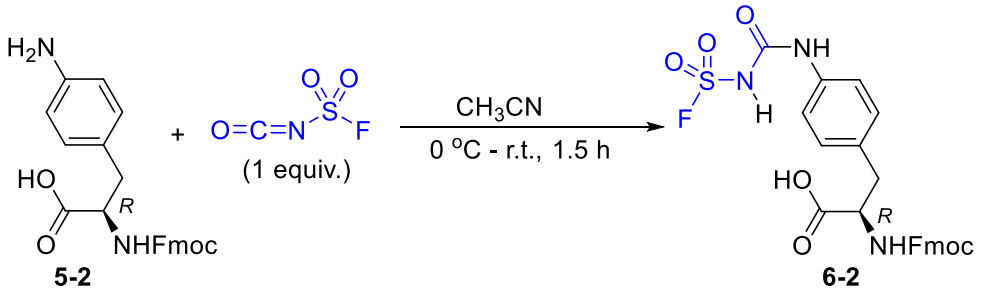
Following the **General Procedure 4**, the title compound was prepared from **5-9** (170 mg, 0.5 mmol) and salt **4-2** (167 mg, 0.6 mmol) for 1 hour. The physical properties of **6-11** are as follows: white solid (185 mg, 80%), m.p. 139.7 °C (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 7.23-7.18 (m, 6H), 7.17-7.12 (m, 4H), 5.07 (dd, *J* = 5.2, 2.4 Hz, 2H), 2.71 (br, 1H); ^{13}C NMR (101 MHz, CD_3CN) δ 139.8, 129.3, 128.8, 128.6, 60.1; ^{19}F NMR (376 MHz, CD_3CN) δ 53.17; ESI-MS (m/z): 463.1 $[M+H]^+$; HRMS (DART, m/z): calcd for $C_{16}H_{17}O_6N_4F_2S_2$: 463. 0552 $[M-H]^-$, found: 463. 0550.

Section 5. Direct reaction of anilines and aliphatic amines with FSI.

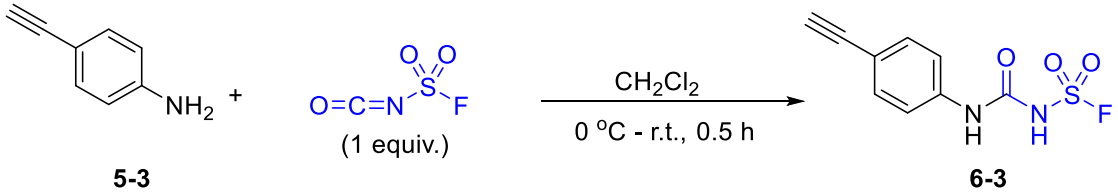
General Procedure 5 (Anilines with FSI). A solution of anilines in dry acetonitrile (or dichloromethane, 0.5 mol/L) was cooled to 0 °C. FSI was added dropwise. The resulting mixture was stirred at room temperature and monitored by TLC. After completion, the solvent was removed to give targeted product without further purification.



Following the **General Procedure 5**, the title compound was prepared from **5-1** (275 mg, 2 mmol) and FSI (0.16 mL, 2 mmol) in CH_3CN for 2 hours. Filtered and washed with CH_3CN, the product **6-1** was obtained as a white solid (446 mg, 85% yield).



Following the **General Procedure 5**, the title compound was prepared from **5-2** (804 mg, 2 mmol) and FSI (0.16 mL, 2 mmol) in CH_3CN for 1.5 hour. Filtered and washed with CH_3CN, the product **6-2** was obtained as an orange solid (446 mg, 85% yield).



Following the **General Procedure 5**, the title compound was prepared from **5-3** (234 mg, 2 mmol) and FSI (0.16 mL, 2 mmol) in CH_2Cl_2 for 0.5 hour. Filtered and washed with CH_2Cl_2, the product **6-3** was obtained as an orange solid (426 mg, 88% yield).

The reaction between **5-3** and FSI in CH_2Cl_2 was monitored by LC-MS (**Figure S1)**.

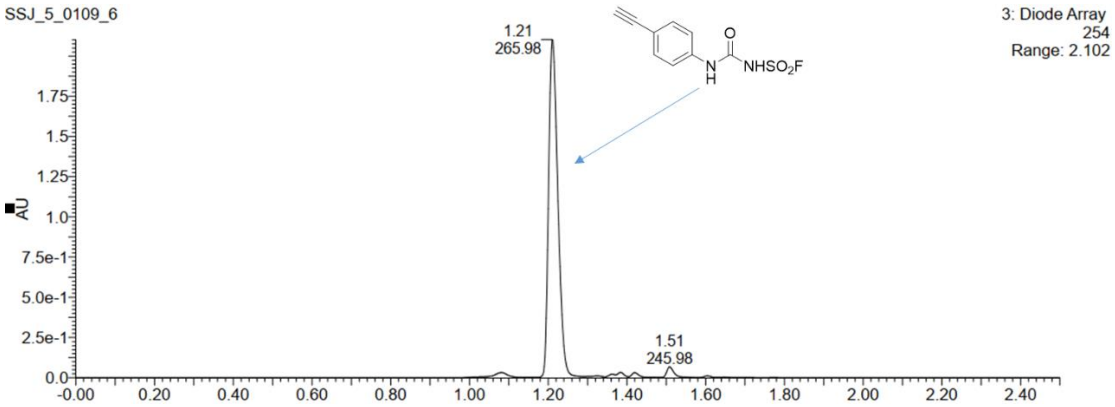
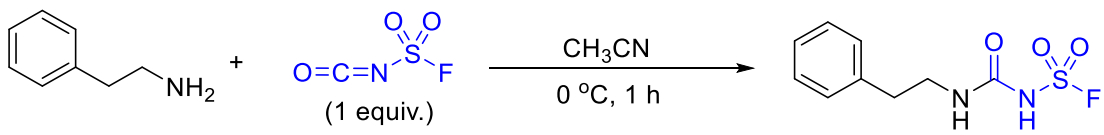


Figure S1. Nearly full conversion to product **6-3** after 0.5 h.

Phenethylamine with FSI.



A solution of phenethylamine (0.252 mL, 2 mmol) in dry acetonitrile (20 mL, 0.1 mol/L) was cooled to 0 °C. FSI was added dropwise. The resulting mixture was stirred at 0 °C

for 1h and monitored by LC-MS. (**Figure S2**).

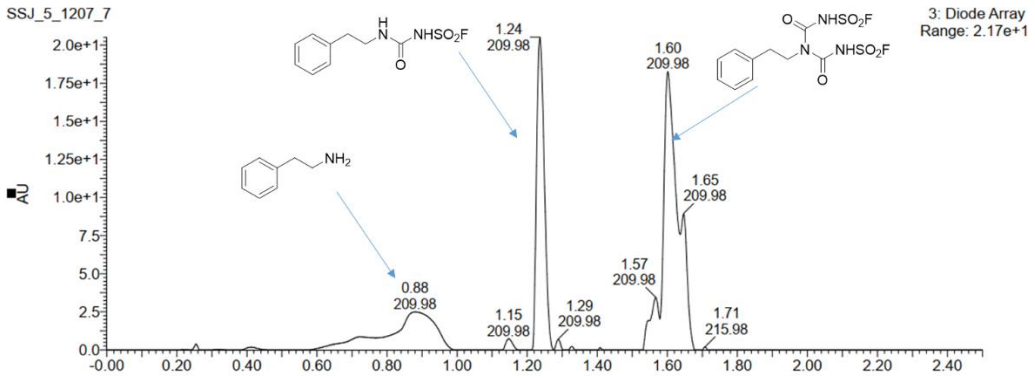
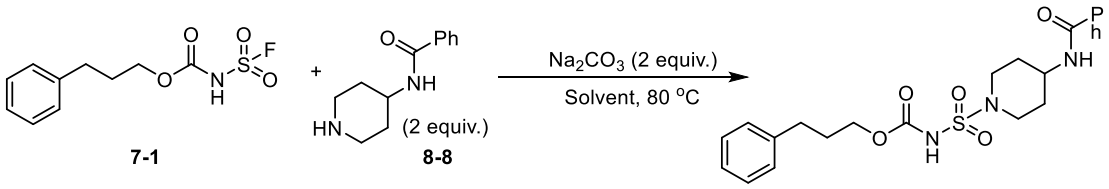


Figure S2. LC spectrum of the reaction mixture after 1 hour.

Section 6. Reaction between *N*-sulfonyl fluorides and amines.

Table 1, Screen of solvents.



7-1 8-8

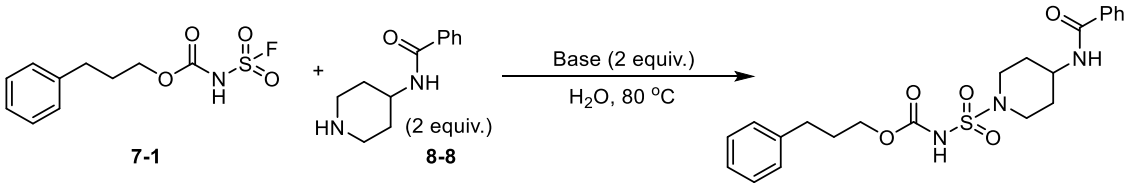
Entry	Solvent	Time	Yield (%)
1	H_2O	4	88
2	CH_3CN	6	75
3[a]	THF	4	74
4[a]	DCE	8	32
5	DMF	8	< 5
6	DMSO	8	< 5
7	Toluene	8	< 5

[a] Reflux.

To a solution of **7-1** (130 mg, 0.5 mmol, 1 equiv, 0.25 mol/L) and Na_2CO_3 (106 mg, 1 mmol) was added **8-8** (204 mg, 1 mmol) at room temperature. The reaction was heated to 80 °C and monitored by TLC and LC-MS. After completion, the resulting mixture was cooled to room temperature, quenched by 1M HCl (10 mL) and then extracted by ethyl acetate (10 mL, three times). The combined organic layer was washed with saturated brine and dried over Na_2SO_4 subsequently. Filtration and removal of solvent

gave the crude mixture which was further purified by column chromatography (eluent: PE : EA = 2:1).

Table 2, Screen of bases.



7-1 8-8

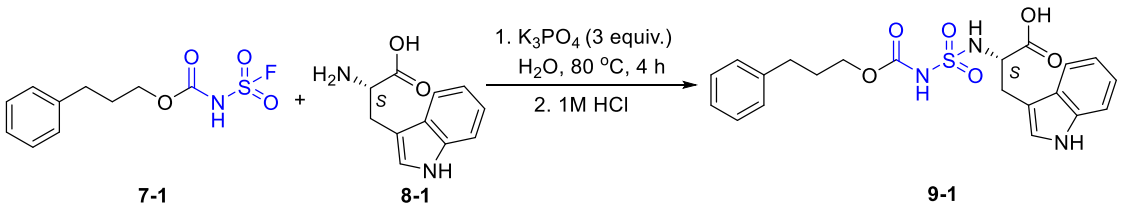
Entry	Base	Time	Yield (%)
1	KOH	2	84
2	Na_2CO_3	4	88
3	K_2CO_3	4	87
4	Cs_2CO_3	3	88
5	$NaHCO_3$	9	52
6	K_3PO_4	2	89
7	Na_3PO_4	2	88
8	DMAP	4	87
9	Pyridine	9	33
10	DBU	8	76
11	Et_3N	6	59
12	Imidazole	10	37
13	*N*-MethylImidazole	10	43
14[a]	K_3PO_4	2	89

[a] 1.5 equiv. **8-8**.

To a solution of **7-1** (130 mg, 0.5 mmol), base (2 equiv.) and H_2O (0.25 mol/L) was added **8-8** (204 mg, 1 mmol) at room temperature. The reaction was heated to 80 °C and monitored by TLC and LC-MS. After completion, the resulting mixture was cooled to room temperature, quenched by 1M HCl (10 mL) and then extracted by ethyl acetate (10 mL, three times). The combined organic layer was washed with saturated brine and

dried over Na_2SO_4 subsequently. Filtration and removal of solvent gave the crude mixture which was further purified by column chromatography (PE : EA = 2:1).

Scope of substrates. General Procedure 6. A solution of the *N*-oxycarbonyl-fluorsulfurylamid or *N*-aminocarbonyl-fluorsulfurylamid (1 equiv.) and tripotassium phosphate (3 equiv.) in H_2O (0.25 mol/L) was added amines (1.5 equiv.) at room temperature. Heated to 80 °C and monitored by TLC and LC-MS. After completion, the resulting mixture was cooled to room temperature, quenched by 1M HCl (10 mL) and then extracted by ethyl acetate (10 mL, three times). The combined organic layer was washed with saturated brine and dried over Na_2SO_4 subsequently. Filtration and removal of solvent gave the crude mixture which was further purified by column chromatography. (During the process of these reactions, most of the raw materials and nearly all of the final products were not well dissolved in water. We believe it is an on water reaction taking place at the interface of the aqueous phase, rather than a homogenous in water reaction.)

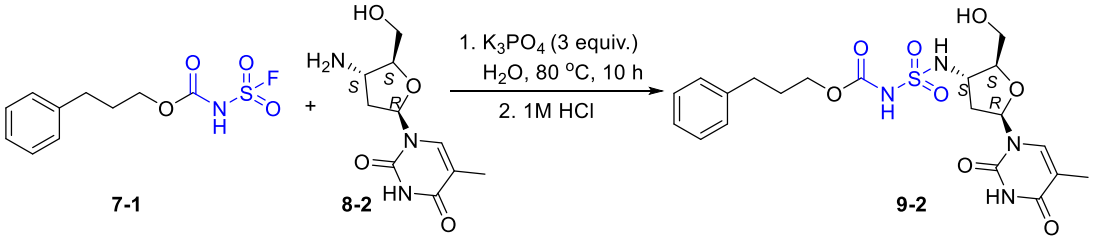


7-1 **8-1** **9-1**

(N-((3-phenylpropoxy)carbonyl)sulfamoyl)-L-tryptophan ***9-1***

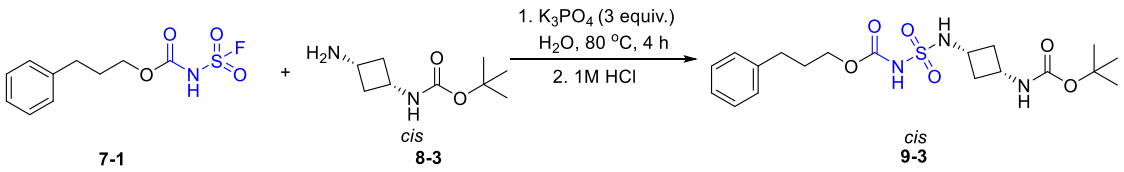
Following the **General Procedure 6**, the title compound was prepared from **7-1** (130 mg, 0.5 mmol) and **8-1** (153 mg, 0.75 mmol) in water for 4 hours. The crude product was purified by column chromatography on silica gel (eluent: CH_2Cl_2-CH_3OH = 10:1) to give **9-1** as a white solid (165 mg, 74% yield), m.p. 63.9-68.5 °C (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 10.87 (s, 1H), 8.16 (d, J = 8.0 Hz, 1H), 7.53 (d, J = 7.6 Hz, 1H), 7.34 (d, J = 8.0 Hz, 1H), 7.27 (t, J = 7.6 Hz, 2H), 7.20-7.17 (m, 4H), 7.07 (t, J = 7.6 Hz, 1H), 6.97 (t, J = 7.6 Hz, 1H), 4.13 (d, J = 6.8 Hz, 1H), 3.94 (t, J = 6.0 Hz, 2H), 3.14 (dd, J = 14.4, 5.2 Hz, 1H), 3.02 (dd, J = 13.2, 6.8 Hz, 1H), 2.61 (t, J = 7.2 Hz, 2H), 1.87-1.80 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 172.7, 151.6, 141.2, 136.1, 128.4, 128.3, 127.2, 125.9, 123.9, 120.9, 118.4, 118.1, 111.4, 109.2, 64.6, 57.1,

31.2, 29.8, 28.1; ESI-MS (m/z): 446.43 $[M+H]^+$; HRMS (ESI, m/z): calcd for $C_{21}H_{24}O_6N_3S$: 446.1380 $[M+H]^+$, found: 446.1378.



3-phenylpropyl (N-((2R,4S,5S)-2-(hydroxymethyl)-5-(5-methyl-2,4-dioxo-3,4-dihydropyrimidin-1(2H)-yl)tetrahydrofuran-3-yl)sulfamoyl)carbamate ***9-2****,*

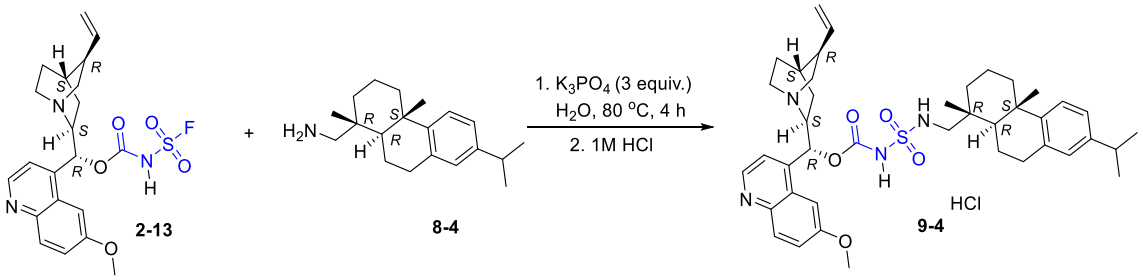
Following the **General Procedure 6**, the title compound was prepared from **7-1** (130 mg, 0.5 mmol) and **8-2** (181 mg, 0.75 mmol) in water for 10 hours. The crude product was purified by column chromatography on silica gel (eluent: CH_2Cl_2-CH_3OH = 10:1) to give **9-2** as a white solid (137 mg, 56% yield), m.p. 56.5-62.1 ℃ (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 11.32 (s, 2H), 8.36 (d, J = 8.0 Hz, 1H), 7.73 (s, 1H), 7.27 (t, J = 7.6 Hz, 2H), 7.20-7.16 (m, 3H), 6.12 (t, J = 6.4 Hz, 1H), 5.76 (s, 1H), 5.15 (t, J = 5.2 Hz, 1H), 4.06 (t, J = 6.4 Hz, 2H), 3.98-3.91 (m, 1H), 3.84-3.80 (m, 1H), 3.67 (d, J = 11.2 Hz, 1H), 3.56-3.51 (m, 1H), 2.63 (t, J = 7.2 Hz, 2H), 2.22-2.15 (m, 2H), 1.92-1.77 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 163.7, 151.7, 150.3, 141.0, 136.2, 128.4, 128.3, 125.9, 109.3, 84.2, 83.5, 64.7, 60.4, 52.5, 37.2, 31.1, 29.8, 12.3; ESI-MS (m/z): 483.39 $[M+H]^+$; HRMS (ESI, m/z): calcd for $C_{20}H_{27}O_8N_4S$: 483.1544 $[M+H]^+$, found: 483.1542.



tert-butyl ((1s,3s)-3-((N-((3-phenylpropoxy)carbonyl)sulfamoyl)amino)cyclobutyl) carbamate ***9-3****,*

Following the **General Procedure 6**, the title compound was prepared from **7-1** (130 mg, 0.5 mmol) and **8-3** (140 mg, 0.75 mmol) in water for 4 hours. The crude product was purified by column chromatography on silica gel (eluent: P. Ether-EtOAc = 2:1) to give **9-3** as a white solid (186 mg, 87% yield), m.p. 147.4-149.9 ℃ (decomposition).

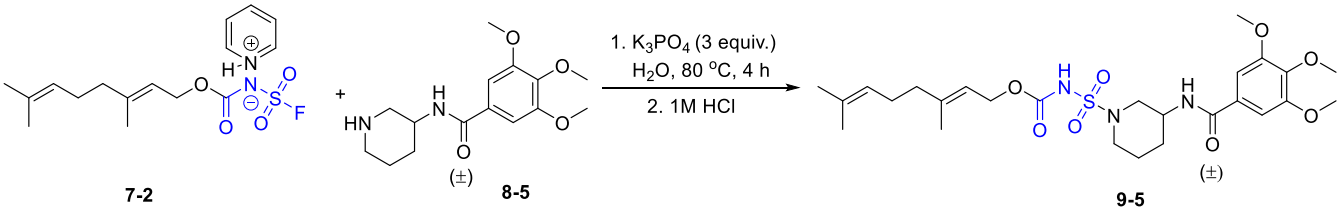
^{1}H NMR (400 MHz, DMSO-d_6) δ 11.13 (s, 1H), 8.04 (d, J = 8.0 Hz, 1H), 7.29 (t, J = 7.6 Hz, 2H), 7.21-7.17 (m, 3H), 7.12 (d, J = 6.4 Hz, 1H), 4.04 (t, J = 6.4 Hz, 2H), 3.55 (dd, J = 14.8, 7.2 Hz, 1H), 3.34 (dd, J = 14.8, 7.2 Hz, 1H), 2.64 (t, J = 7.6 Hz, 2H), 2.46-2.40 (m, 2H), 1.92-1.79 (m, 4H), 1.35 (s, 9H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 154.6, 151.6, 141.0, 128.3, 128.3, 125.9, 77.6, 64.4, 41.5, 37.9, 31.1, 29.8, 28.2; ESI-MS (m/z): 426.1 [M-H]$^-$; HRMS (ESI, m/z): calcd for $C_{19}H_{28}O_6N_3S$: 426.1704 [M-H]$^-$, found: 426.1703.



(1R)-(6-methoxyquinolin-4-yl)((2S,4S,5R)-5-vinylquinuclidin-2-yl)methyl (N-(((1R,4aS,10aR)-7-isopropyl-1,4a-dimethyl-1,2,3,4,4a,9,10,10a-octahydrophenanthren-1-yl)methyl)sulfamoyl)carbamate ***9-4***,

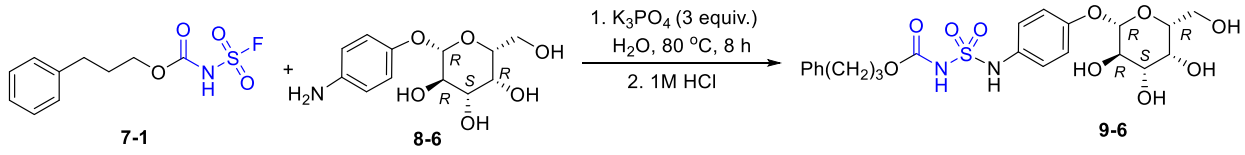
Following the **General Procedure 6**, the title compound was prepared from **2-13** (112 mg, 0.25 mmol) and **8-4** (107 mg, 0.375 mmol) in water for 4 hours. Cooled to room temperature and added CH_2Cl_2 and ^{i}PrOH (10 mL, 5:1) and 1M HCl (10 mL). The water layer was extracted with CH_2Cl_2 and ^{i}PrOH (10 mL, 5:1). The combined organic layer was subsequently washed with saturated brine, dried with Na_2SO_4, filtered and concentrated. The crude product was purified by column chromatography on silica gel (eluent: CH_2Cl_2-CH_3OH = 10:1) to give **9-4** as a yellow solid (126 mg, 67% yield), m.p. 147.3 °C (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 8.72 (d, J = 4.4 Hz, 1H), 8.32 (s, 1H), 7.96 (d, J = 9.2 Hz, 1H), 7.53 (d, J = 2.4 Hz, 1H), 7.50 (d, J = 4.8 Hz, 1H), 7.44 (dd, J = 9.2, 2.4 Hz, 1H), 7.10 (d, J = 8.0 Hz, 1H), 6.92 (d, J = 8.0 Hz, 1H), 6.82 (s, 1H), 6.48 (br, 1H), 5.91-5.82 (m, 1H), 5.06 (d, J = 17.2 Hz, 1H), 4.99 (d, J = 14.8 Hz, 1H), 3.96 (s, 3H), 3.63-3.51 (m, 1H), 2.79-2.72 (m, 3H), 2.50-2.38 (m, 3H), 2.30-2.25 (m, 1H), 2.18 (d, J = 12.8 Hz, 1H), 1.92-1.85 (m, 1H), 1.78-1.70 (m, 2H), 1.65-1.58 (m, 3H), 1.54-1.34 (m, 4H), 1.25-1.21 (m, 2H), 1.16-1.11 (m, 1H), 1.15 (d, J = 6.8 Hz, 6H), 1.07 (s, 3H), 1.00 (d, J = 13.6 Hz, 1H), 0.88-0.83 (m, 1H), 0.71 (s, 3H); ^{13}C

NMR (101 MHz, $CDCl_3$) δ 160.0, 157.8, 147.3, 147.1, 145.6, 144.0, 141.2, 137.1, 134.9, 131.5, 126.8, 125.2, 124.3, 123.9, 122.0, 118.0, 117.4, 99.9, 69.2, 60.0, 55.8, 55.3, 54.4, 45.1, 44.1, 38.4, 37.5, 36.9, 36.0, 33.5, 30.2, 29.8, 29.4, 26.8, 25.4, 24.1, 19.0, 18.8, 18.7; ESI-MS (m/z): 715.60 $[M+H]^+$; HRMS (ESI, m/z): calcd for $C_{41}H_{55}O_5N_4S$: 715.3888 $[M+H]^+$, found: 715.3890.



(E)-3,7-dimethylocta-2,6-dien-1-yl ((3-(3,4,5-trimethoxybenzamido)piperidin-1-yl)sulfonyl)carbamate ***9-5***,

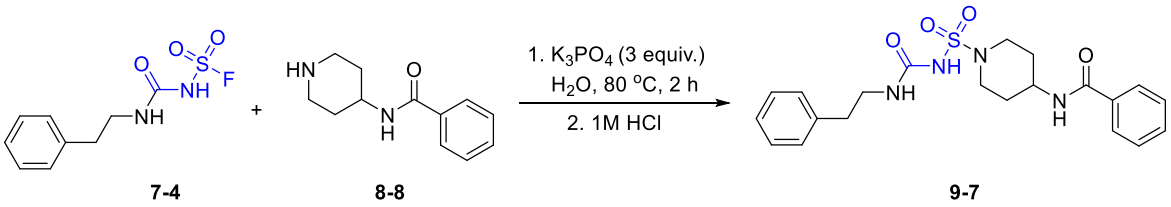
Following the **General Procedure 6**, the title compound was prepared from **7-2** (179 mg, 0.5 mmol) and **8-5** (220 mg, 0.75 mmol) in water for 4 hours. The crude product was purified by column chromatography on silica gel (eluent: P. Ether-EtOAc = 2:1) to give **9-5** as a white solid (197 mg, 74% yield), m.p. 41.6 °C (decomposition). ^{1}H NMR (400 MHz, $CDCl_3$) δ 7.41 (br, 1H), 7.08 (s, 2H), 6.86 (d, *J* = 7.8 Hz, 1H), 5.28 (t, *J* = 7.2 Hz, 1H), 5.05 (t, *J* = 6.8 Hz, 1H), 4.66-4.58 (m, 2H), 4.38-4.32 (m, 1H), 3.91 (s, 6H), 3.88 (s, 3H), 3.75-3.72 (m, 2H), 3.38 (dd, *J* = 12.4, 2.4 Hz, 1H), 3.15 (t, *J* = 7.6 Hz, 1H), 2.08-2.01 (m, 5H), 1.68 (s, 3H), 1.67 (s, 3H), 1.60 (s, 3H), 1.81-1.63 (m, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 167.0, 153.2, 151.6, 144.1, 141.0, 132.1, 129.7, 123.5, 117.1, 104.8, 63.7, 61.0, 56.4, 50.9, 47.3, 44.9, 39.6, 28.1, 26.3, 25.7, 21.4, 17.8, 16.5; ESI-MS (m/z): 554.40 $[M+H]^+$; HRMS (ESI, m/z): calcd for $C_{26}H_{39}O_8N_3SNa$: 576.2350 $[M+Na]^+$, found: 576.2351.



3-phenylpropyl (N-(4-(((2S,3R,4S,5R,6R)-3,4,5-trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)oxy)phenyl)sulfamoyl)carbamate ***9-6***,

Following the **General Procedure 6**, the title compound was prepared from **7-1** (65 mg, 0.25 mmol) and **8-6** (101 mg, 0.375 mmol) in water for 8 hours. The crude product

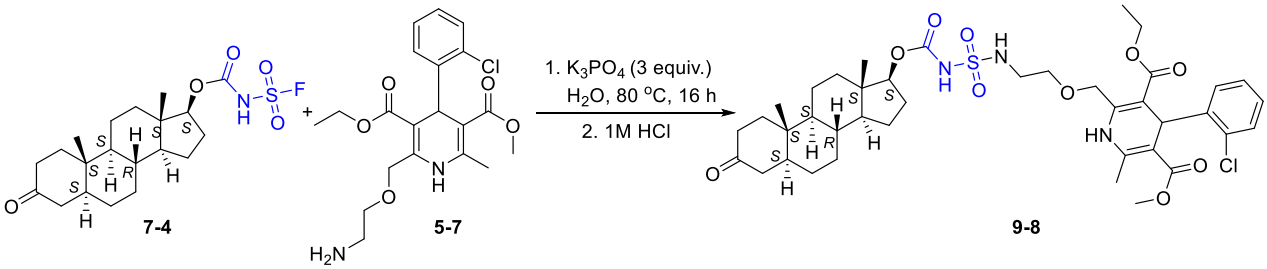
was purified by thin layer chromatography (CH_2Cl_2:CH_3OH = 5:1) to give **9-6** as a white solid (85 mg, 66% yield), m.p. 126.1-129.3 ℃ (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ11.46 (s, 1H), 10.18 (s, 1H), 7.28 (t, *J* = 7.6 Hz, 2H), 7.20-7.15 (m, 3H), 7.09 (d, *J* = 8.4 Hz, 2H), 6.99 (d, *J* = 8.4 Hz, 2H), 5.15 (d, *J* = 4.8 Hz, 1H), 4.87 (d, *J* = 4.0 Hz, 1H), 4.73 (d, *J* = 7.6 Hz, 1H), 4.65 (t, *J* = 4.4 Hz, 1H), 4.51 (d, *J* = 2.8 Hz, 1H), 4.02 (t, *J* = 6.4 Hz, 2H), 3.68 (s, 1H), 3.53-3.47 (m, 4H), 2.57 (t, *J* = 7.2 Hz, 2H), 1.86-1.83 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 154.6, 151.4, 140.9, 131.2, 128.4, 128.3, 125.9, 122.1, 116.8, 101.3, 75.5, 73.3, 70.3, 68.1, 64.7, 60.4, 31.0, 29.7; ESI-MS (m/z): 511.25 $[M-H]^-$; HRMS (ESI, m/z): calcd for $C_{22}H_{27}O_{10}N_2S$: 511.1392 $[M-H]^-$, found: 511.1392.



7-4 **8-8** **9-7**

N-(1-(N-(phenethylcarbamoyl)sulfamoyl)piperidin-4-yl)benzamide ***9-7***,

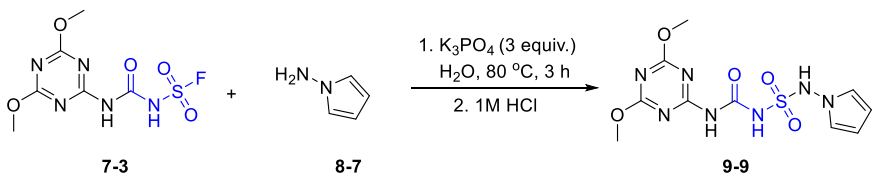
Following the **General Procedure 6**, the title compound was prepared from **7-4** (123 mg, 0.5 mmol) and **8-8** (153 mg, 0.75 mmol) in water for 2 hours. The crude product was purified by column chromatography on silica gel (eluent: P. Ether-EtOAc = 2:1) to give **9-7** as a white solid (160 mg, 74% yield), m.p. 159.2-162.7 ℃ (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 9.99 (s, 1H), 8.33 (d, *J* = 7.2 Hz, 1H), 7.84 (d, *J* = 7.2 Hz, 1H), 7.52 (t, *J* = 7.6 Hz, 2H), 7.45 (t, *J* = 7.6 Hz, 2H), 7.31(t, *J* = 7.6 Hz, 2H), 7.23-7.21 (m, 3H), 6.33 (s, 1H), 3.91-3.82 (m, 1H), 3.58 (d, *J* = 12.8 Hz, 2H), 3.33-3.29 (m, 2H), 2.84 (t, *J* = 11.6 Hz, 2H), 2.74 (t, *J* = 7.2 Hz, 2H), 1.87 (d, *J* = 10.4 Hz, 2H), 1.61-1.53 (m, 2H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 165.8, 151.9, 139.1, 134.6, 131.1, 128.7, 128.4, 128.2, 127.3, 126.2, 46.0, 45.5, 40.6, 35.3, 30.8; ESI-MS (m/z): 431.22 $[M+H]^+$; HRMS (ESI, m/z): calcd for $C_{21}H_{27}O_4N_4S$: 431.1748 $[M+H]^+$, found: 431.1751.



7-4 5-7 9-8

3-ethyl 5-methyl 4-(2-chlorophenyl)-2-((2-((N-((((5S,8R,9S,10S,13S,14S,17S)-10,13-dimethyl-3-oxohexadecahydro-1H-cyclopenta[a]phenanthren-17-yl)oxy)carbonyl)sulfamoyl)amino)ethoxy)methyl)-6-methyl-1,4-dihydropyridine-3,5-dicarboxylate ***9-8***,

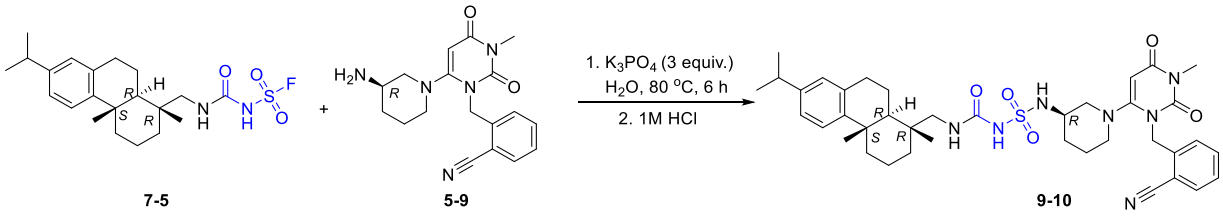
Following the **General Procedure 6**, the title compound was prepared from **7-4** (104 mg, 0.25 mmol) and **5-7** (212 mg, 0.375 mmol) in water for 16 hours. The crude product was purified by column chromatography on silica gel (eluent: CH_2Cl_2:CH_3OH = 20:1) to give **9-8** as a white solid (183 mg, 91% yield), m.p. 113.0-115.7 ℃ (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 11.17 (d, *J* = 6.0 Hz, 1H), 8.35 (d, *J* = 4.4 Hz, 1H), 7.86-7.81 (m, 1H), 7.33 (d, *J* = 7.6 Hz, 1H), 7.27-7.20 (m, 2H), 7.12 (td, *J* = 7.6, 1.6 Hz, 1H), 5.30 (d, *J* = 4.4 Hz, 1H), 4.64 (dd, *J* = 14.8, 4.0 Hz, 1H), 4.52-4.39 (m, 2H), 3.98-3.91 (m, 2H), 3.56-3.53 (m, 2H), 3.49 (d, *J* = 6.0 Hz, 3H), 3.20-3.14 (m, 2H), 2.46-2.38 (m, 1H), 2.34 (d, *J* = 10.8 Hz, 3H), 2.29-2.26 (m, 1H), 2.11-1.99 (m, 2H), 1.93-1.86 (m, 2H), 1.65-1.58 (m, 2H), 1.53-1.38 (m, 5H), 1.31-1.17 (m, 6H), 1.12-1.06 (m, 4H), 0.97-0.95 (m, 4H), 0.88-0.83 (m, 1H), 0.74 (d, *J* = 1.2 Hz, 3H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 212.3, 168.1, 167.3, 151.9, 145.8, 145.0, 144.7, 132.4, 131.6, 129.3, 127.4, 127.0, 103.9, 101.6, 85.6, 68.1, 59.9, 53.7, 50.9, 50.4, 46.6, 44.6, 43.5, 42.9, 42.8, 38.5, 38.1, 35.7, 35.2, 31.1, 28.7, 27.5, 23.4, 20.9, 19.3, 14.3, 12.1, 11.5; ESI-MS (m/z): 804.62 $[M+H]^+$; HRMS (ESI, m/z): calcd for $C_{40}H_{55}O_{10}N_3SCl$: 804.3291 $[M+H]^+$, found: 804.3292.



7-3 8-7 9-9

Compound 9-9,

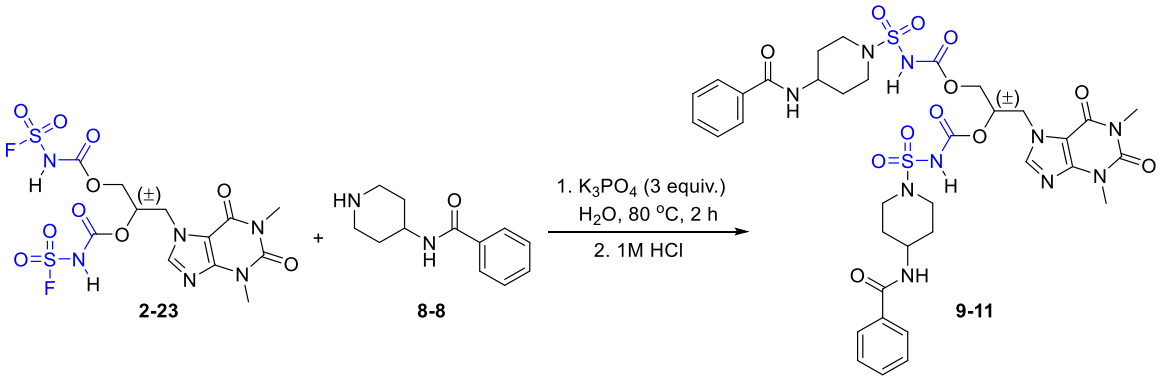
Following the **General Procedure 6**, the title compound was prepared from **7-3** (141 mg, 0.5 mmol) and **8-7** (0.058 mL, 0.75 mmol) in water for 3 hours. The crude product was purified by column chromatography on silica gel (eluent: CH_2Cl_2:CH_3OH = 10:1) to give **9-9** as a white solid (69 mg, 40% yield), m.p. 160.2-162.3 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3OD) δ 6.64 (t, *J* = 2.4 Hz, 2H), 6.00 (t, *J* = 2.4 Hz, 2H), 3.97 (s, 6H); ^{13}C NMR (101 MHz, DMSO-*d*$_6$) δ 171.9, 122.1, 105.8, 54.5; ESI-MS (m/z): 344.29 $[M+H]^+$; HRMS (ESI, m/z): calcd for $C_{10}H_{14}O_5N_7S$: 344.0772 $[M+H]^+$, found: 344.0771.



7-5 **5-9** **9-10**

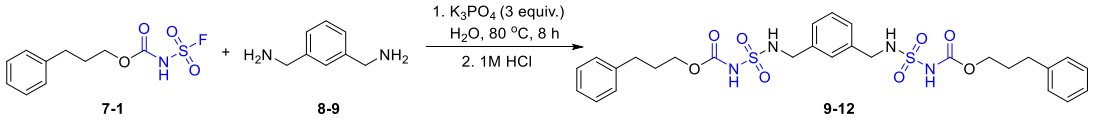
Compound 9-10,

Following the **General Procedure 6**, the title compound was prepared from **7-5** (103 mg, 0.25 mmol) and **5-9** (127 mg, 0.375 mmol) in water for 6 hours. The crude product was purified by column chromatography on silica gel (eluent: CH_2Cl_2:CH_3OH = 20:1) to give **9-10** as a white solid (103 mg, 55% yield), m.p. 136.7 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3CN) δ 7.60 (d, *J* = 7.6 Hz, 1H), 7.56 (t, *J* = 8.0 Hz, 1H), 7.37 (t, *J* = 7.6 Hz, 1H), 7.23 (d, *J* = 8.0 Hz, 1H), 7.15 (t, *J* = 8.0 Hz, 1H), 6.97 (d, *J* = 8.0 Hz, 1H), 6.88 (s, 1H), 5.95-5.78 (m, 2H), 5.28-5.11 (m, 3H), 3.41 (br, 1H), 3.23-3.10 (m, 2H), 3.12 (s, 3H), 2.95 (dd, *J* = 14.0, 6.8 Hz, 1H), 2.84-2.80 (m, 2H), 2.57 (br, 1H), 2.26 (d, *J* = 12.8 Hz, 2H), 1.77-1.55 (m, 7H), 1.42-1.35 (m, 3H), 1.31-1.24 (m, 4H), 1.16 (d, *J* = 6.8 Hz, 6H), 1.15 (s, 3H), 0.88 (s, 3H), 0.86-0.80 (m, 1H); ^{13}C NMR (101 MHz, $CDCl_3$) δ 163.5, 159.5, 152.9, 152.5, 147.0, 145.8, 140.6, 134.8, 133.5, 133.4, 128.1, 127.0, 124.4, 123.9, 117.7, 110.4, 90.7, 56.7, 51.0, 50.4, 49.9, 46.4, 45.6, 38.6, 37.7, 37.6, 36.0, 33.5, 30.5, 29.8, 28.1, 25.5, 24.1, 19.0, 18.7, 18.6; ESI-MS (m/z): 730.64 $[M+H]^+$; HRMS (ESI, m/z): calcd for $C_{39}H_{52}O_5N_7S$: 730.3745 $[M+H]^+$, found: 730.3748.



Compound 9-11,

Following the **General Procedure 6**, the title compound was prepared from **2-23** (126 mg, 0.25 mmol) and **8-8** (153 mg, 0.75 mmol) in water for 2 hours. Using CH_2Cl_2 and ^{i}PrOH (10 mL, 5:1) for extraction instead of ethyl acetate, the crude product was purified by column chromatography on silica gel (eluent: CH_2Cl_2:CH_3OH = 10:1) to give **9-11** as a white solid (166 mg, 76% yield), m.p. 101.9 ℃ (decomposition). ^{1}H NMR (400 MHz, CD_3OD) δ 7.95 (s, 1H), 7.90 (s, 1H), 7.80 (t, *J* = 7.2 Hz, 4H), 7.50 (td, *J* = 7.2, 2.0 Hz, 2H), 7.50 (dd, *J* = 7.6, 7.2 Hz, 4H), 5.51-5.46 (m, 1H), 4.74 (dd, *J* = 14.4, 3.2 Hz, 1H), 4.60-4.51 (m, 2H), 4.26 (dd, *J* = 12.4, 6.0 Hz, 2H), 4.05-3.99 (m, 2H), 3.85 (d, *J* = 12.4, Hz, 2H), 3.74 (d, *J* = 12.4, Hz, 2H), 3.54 (s, 3H), 3.34 (s, 3H), 3.14-3.05 (m, 4H), 2.98-2.89 (m, 4H), 2.05-1.96 (m, 4H), 1.74-1.60 (m, 4H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 165.7, 154.6, 151.0, 148.3, 143.2, 134.6, 131.1, 128.1, 127.3, 106.3, 79.3, 46.0, 45.9, 45.5, 30.9, 29.5, 27.6; ESI-MS (m/z): 873.70 $[M+H]^+$; HRMS (ESI, m/z): calcd for $C_{36}H_{45}O_{12}N_{10}S_2$: 873.2654 $[M+H]^+$, found: 873.2656.



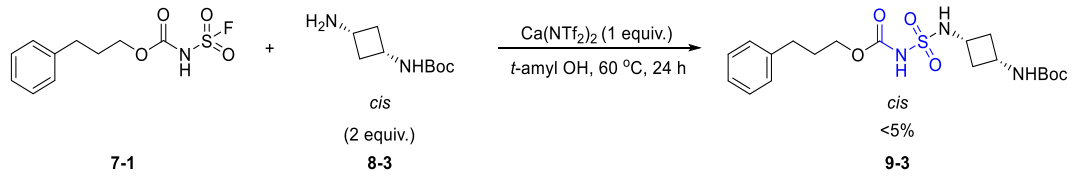
Compound 9-12,

Following the **General Procedure 6**, the title compound was prepared from **7-1** (391 mg, 1.5 mmol) and **8-9** (0.066 mL, 0. 5 mmol) in water for 8 hours. The crude product was purified by column chromatography on silica gel (eluent: CH_2Cl_2:CH_3OH = 20:1) to give **9-12** as a white solid (301 mg, 97% yield), m.p. 125.3-127.7 ℃ (decomposition). ^{1}H NMR (400 MHz, DMSO-d_6) δ 11.17 (s, 2H), 8.29 (t, *J* = 6.0 Hz, 2H), 7.31-7.27 (m,

4H), 7.23-7.17 (m, 10H), 4.10 (d, J = 6.4 Hz, 4H), 3.98 (t, J = 6.4 Hz, 4H), 2.62 (t, J = 7.6 Hz, 4H), 1.89-1.82 (m, 4H); ^{13}C NMR (101 MHz, DMSO-d_6) δ 151.6, 141.1, 137.7, 128.4, 128.3, 128.1, 126.9, 126.5, 125.9, 64.6, 46.3, 31.1, 29.8; ESI-MS (m/z): 619.56 $[M+H]^+$; HRMS (ESI, m/z): calcd for $C_{28}H_{35}O_8N_4S_2$: 619.1891 $[M+H]^+$, found: 619.1890.

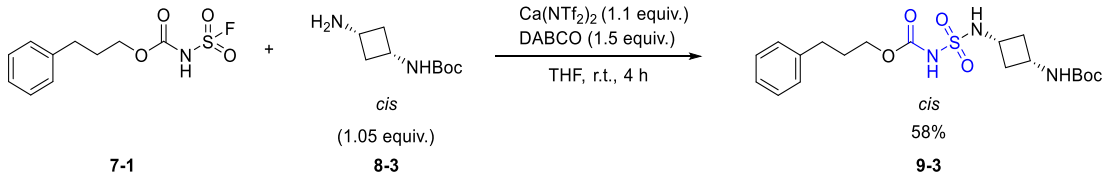
Examine the $Ca(NTf_2)_2$ promoted SuFEx ligation.

Experiment A[2]:



To a 25 mL flask containing **7-1** (79 mg, 0.3 mmol) and **8-3** (112 mg, 0.6 mmol), $Ca(NTf_2)_2$ (180 mg, 0.3 mmol) and *t*-amyl alcohol (1.2 mL) were added. The reaction mixture was stirred at 60 °C for 24 h, then cooled to room temperature and partitioned between ethyl acetate and ether 0.5M HCl (1x) and brine. The brine layer was washed with ethyl acetate. The organic fractions were combined and dried over sodium sulfate and the concentrated under reduced pressure. The crude residue was monitored by LC-MS (Figure 1A) and purified by column chromatography (PE : EtOAc = 1:1) to give a white solid (6 mg, 5% yield).

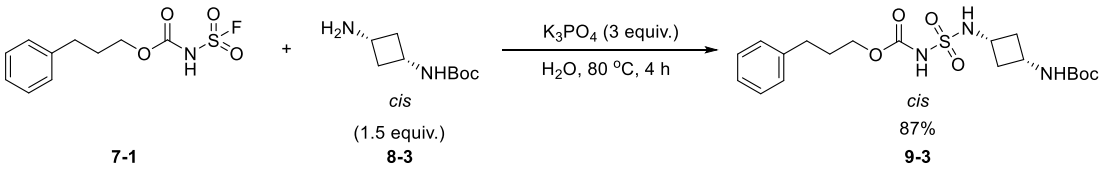
Experiment B[3]:



To a 25 mL flask containing **7-1** (79 mg, 0.3 mmol), **8-3** (59 mg, 0.315 mmol), $Ca(NTf_2)_2$ (198 mg, 0.33 mmol), and DABCO (51 mg, 0.45 mmol), was added THF (0.6 mL). The reaction mixture was stirred at room temperature for 24 h, then diluted with ethyl acetate. The organic layer was washed with satd. Aq. NH_4Cl followed by brine. The organic phase was dried with anhydrous sodium sulfate and concentrated under reduced pressure. The crude residue was monitored by LC-MS (Figure 1B) and purified by column chromatography (PE : EA = 1:1) to give a white solid (75 mg, 58%

yield).

Experiment C (Our protocol):



Following the **General Procedure 6**, the title compound was prepared from **7-1** (130 mg, 0.5 mmol), **8-3** (140 mg, 0.75 mmol) and K_3PO_4 (318 mg, 1.5 mmol) on water at 80 °C for 8 hours. The product was purified by column chromatography (PE : EA = 1:1) to give a white solid (186 mg, 87% yield).

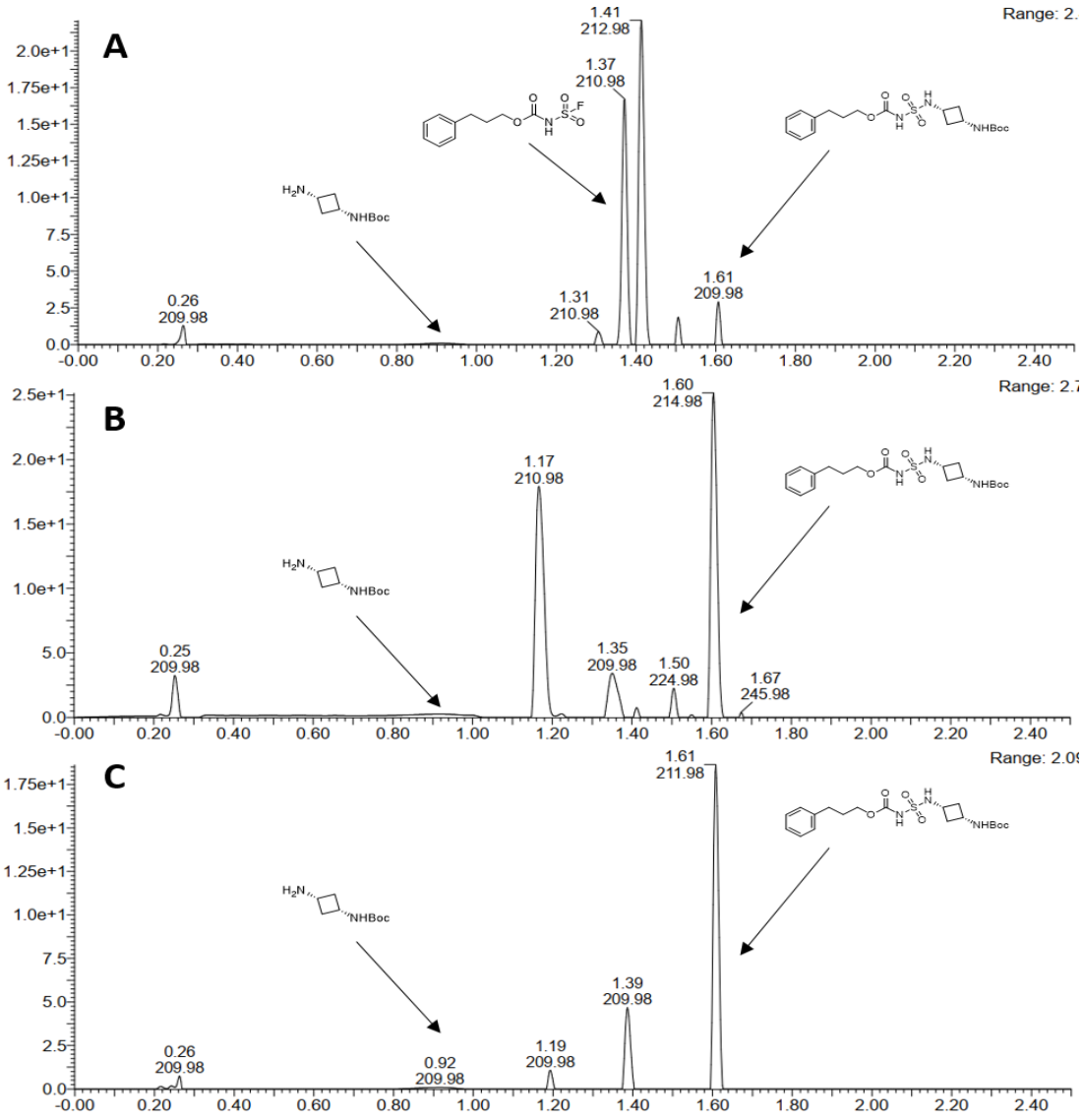
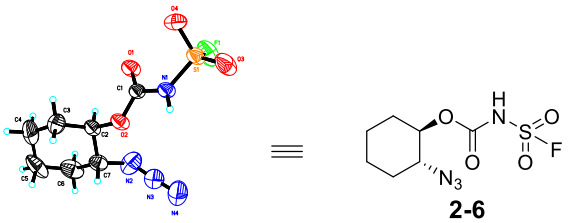


Figure S3. A) $Ca(NTf_2)_2$ as catalyst in t-amyl OH. B) $Ca(NTf_2)_2$ as catalyst in THF. C) K_3PO_4 as base in water.

Section 7. Crystallographic Data.

*N-trans-2-azido-1-cyclohexanoxycarbonyl-fluorsulfurylamid (**2-6**)*



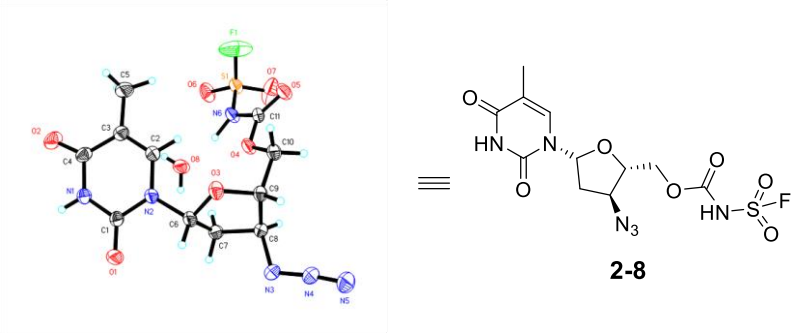
Deposition NO. CCDC 2094855

Table S1. Crystal data and structure refinement for **2-6**.

Identification code	mo_d8v18639_0m	
Empirical formula	C7 H11 F N4 O4 S	
Formula weight	266.26	
Temperature	296(2) K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	P 21/c	
Unit cell dimensions	a = 11.4963(5) Å	α= 90°.
	b = 9.4769(4) Å	β= 110.756(2)°.
	c = 11.6960(6) Å	γ = 90°.
Volume	1191.57(10) $Å^3$	
Z	4	
Density (calculated)	1.484 Mg/m^3	
Absorption coefficient	0.295 mm^{-1}	
F(000)	552	
Crystal size	0.190 x 0.170 x 0.120 mm^3	
Theta range for data collection	2.844 to 25.997°.	
Index ranges	-14<=h<=14, -11<=k<=11, -14<=l<=14	
Reflections collected	21572	
Independent reflections	2334 [R(int) = 0.0577]	
Completeness to theta = 25.242°	99.4 %	
Absorption correction	Multi-scna	
Max. and min. transmission	0.7456 and 0.6088	
Refinement method	Full-matrix least-squares on F^2	

Data / restraints / parameters	2334 / 0 / 155
Goodness-of-fit on F^2	1.061
Final R indices [I>2sigma(I)]	R1 = 0.0535, wR2 = 0.1449
R indices (all data)	R1 = 0.0703, wR2 = 0.1615
Largest diff. peak and hole	0.318 and -0.262 e.$Å^{-3}$

*N- 3'-azido-2',3'-deoxythymidinoxycarbonyl-fluorsulfurylamid (**2-8**)*



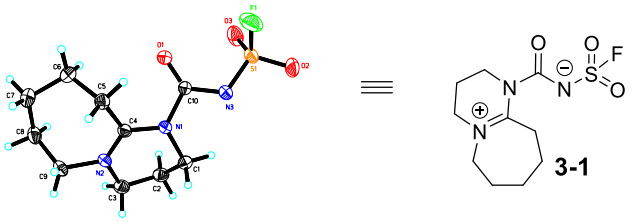
Deposition NO. CCDC 2094887

Table S2. Crystal data and structure refinement for **2-8**.

Identification code	mo_d8v18703_0m	
Empirical formula	C11 H15 F N6 O8 S	
Formula weight	410.35	
Temperature	296(2) K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	P 21	
Unit cell dimensions	a = 7.2157(8) Å	α= 90°.
	b = 8.4485(9) Å	β= 91.567(4)°.
	c = 14.2834(16) Å	γ = 90°.
Volume	870.42(17) $Å^3$	
Z	2	
Density (calculated)	1.566 Mg/m^3	
Absorption coefficient	0.252 mm^{-1}	
F(000)	424	
Crystal size	0.150 x 0.120 x 0.070 mm^3	
Theta range for data collection	2.824 to 25.996°.	
Index ranges	-8<=h<=8, -10<=k<=10, -17<=l<=17	

Reflections collected	9899
Independent reflections	3367 [R(int) = 0.0586]
Completeness to theta = 25.242°	98.9 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.7456 and 0.4441
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	3367 / 13 / 253
Goodness-of-fit on F^2	1.067
Final R indices [I>2sigma(I)]	R1 = 0.0464, wR2 = 0.1191
R indices (all data)	R1 = 0.0511, wR2 = 0.1247
Absolute structure parameter	-0.01(5)
Largest diff. peak and hole	0.405 and -0.288 e.$Å^{-3}$

Compound 3-1



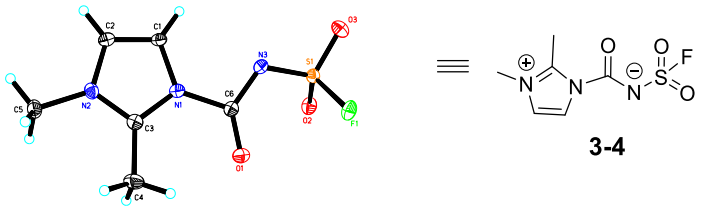
Deposition NO. CCDC 2094856

Table S3. Crystal data and structure refinement for **3-1**.

Identification code	mo_d8v18414_0m	
Empirical formula	C10 H16 F N3 O3 S	
Formula weight	277.32	
Temperature	296(2) K	
Wavelength	0.71073 Å	
Crystal system	Triclinic	
Space group	P -1	
Unit cell dimensions	a = 7.2670(8) Å	α= 101.275(4)°.
	b = 8.6077(10) Å	β= 102.063(4)°.
	c = 10.2762(11) Å	γ = 91.602(4)°.
Volume	614.88(12) $Å^3$	
Z	2	
Density (calculated)	1.498 Mg/m^3	

Absorption coefficient	0.281 mm^{-1}
F(000)	292
Crystal size	0.200 x 0.170 x 0.120 mm^3
Theta range for data collection	2.419 to 25.993°.
Index ranges	-8<=h<=8, -10<=k<=10, -12<=l<=12
Reflections collected	9626
Independent reflections	2373 [R(int) = 0.0373]
Completeness to theta = 25.242°	98.8 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.7456 and 0.5860
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	2373 / 0 / 164
Goodness-of-fit on F^2	1.060
Final R indices [I>2sigma(I)]	R1 = 0.0396, wR2 = 0.1068
R indices (all data)	R1 = 0.0465, wR2 = 0.1134
Extinction coefficient	0.067(12)
Largest diff. peak and hole	0.318 and -0.396 $e.Å^{-3}$

Compound 3-4



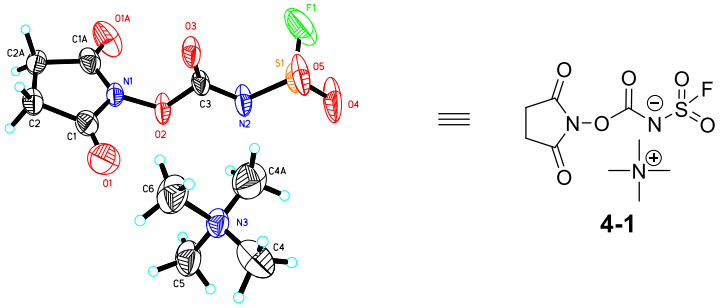
Deposition NO. CCDC 2094857

Table S4. Crystal data and structure refinement for **3-4**.

Identification code	mo_d8v18420_0m	
Empirical formula	C6 H8 F N3 O3 S	
Formula weight	221.21	
Temperature	173(2) K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	P 21/n	
Unit cell dimensions	a = 7.1356(2) Å	α= 90°.
	b = 10.1704(3) Å	β= 91.1050(10)°.

	c = 12.1404(4) Å γ = 90°.
Volume	880.89(5) Å^3
Z	4
Density (calculated)	1.668 Mg/m^3
Absorption coefficient	0.370 mm^{-1}
F(000)	456
Crystal size	0.200 x 0.170 x 0.130 mm^3
Theta range for data collection	3.340 to 26.000°.
Index ranges	-8<=h<=8, -12<=k<=12, -14<=l<=14
Reflections collected	9935
Independent reflections	1716 [R(int) = 0.0277]
Completeness to theta = 25.242°	98.7 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.7456 and 0.6701
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	1716 / 0 / 129
Goodness-of-fit on F^2	1.095
Final R indices [I>2sigma(I)]	R1 = 0.0329, wR2 = 0.0881
R indices (all data)	R1 = 0.0341, wR2 = 0.0890
Extinction coefficient	n/a
Largest diff. peak and hole	0.438 and -0.269 e.Å^{-3}

Compound 4-1



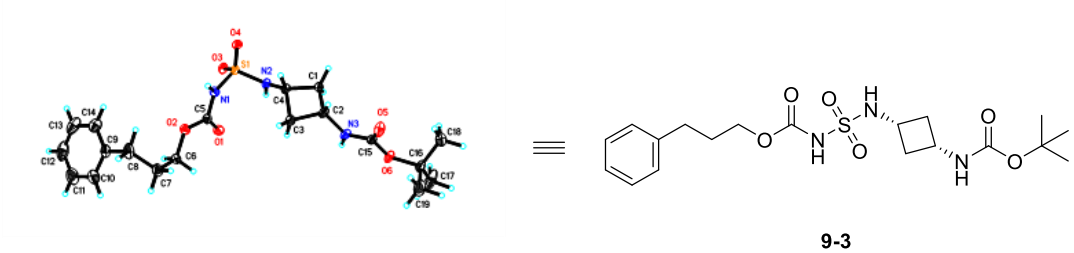
Deposition NO. CCDC 2094858

Table S5. Crystal data and structure refinement for **4-1**.

Identification code	mo_d8v18900_0m

Empirical formula	C9 H16 F N3 O6 S	
Formula weight	313.31	
Temperature	293(2) K	
Wavelength	0.71073 Å	
Crystal system	Orthorhombic	
Space group	C m c 21	
Unit cell dimensions	a = 9.526(2) Å	α= 90°.
	b = 19.130(4) Å	β= 90°.
	c = 7.9949(16) Å	γ = 90°.
Volume	1456.9(5) $Å^3$	
Z	4	
Density (calculated)	1.428 Mg/m^3	
Absorption coefficient	0.261 mm^{-1}	
F(000)	656	
Crystal size	0.190 x 0.160 x 0.130 mm^3	
Theta range for data collection	2.129 to 25.981°.	
Index ranges	-11<=h<=11, -19<=k<=23, -9<=l<=9	
Reflections collected	5742	
Independent reflections	1514 [R(int) = 0.0566]	
Completeness to theta = 25.242°	99.5 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	0.7456 and 0.5339	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	1514 / 1 / 120	
Goodness-of-fit on F^2	1.127	
Final R indices [I>2sigma(I)]	R1 = 0.0657, wR2 = 0.1825	
R indices (all data)	R1 = 0.0785, wR2 = 0.1933	
Absolute structure parameter	0.6(3)	
Extinction coefficient	0.074(16)	
Largest diff. peak and hole	0.329 and -0.249 $e.Å^{-3}$	

Compound 9-3



9-3

Deposition NO. CCDC 2094859

Table S6. Crystal data and structure refinement for **9-3**.

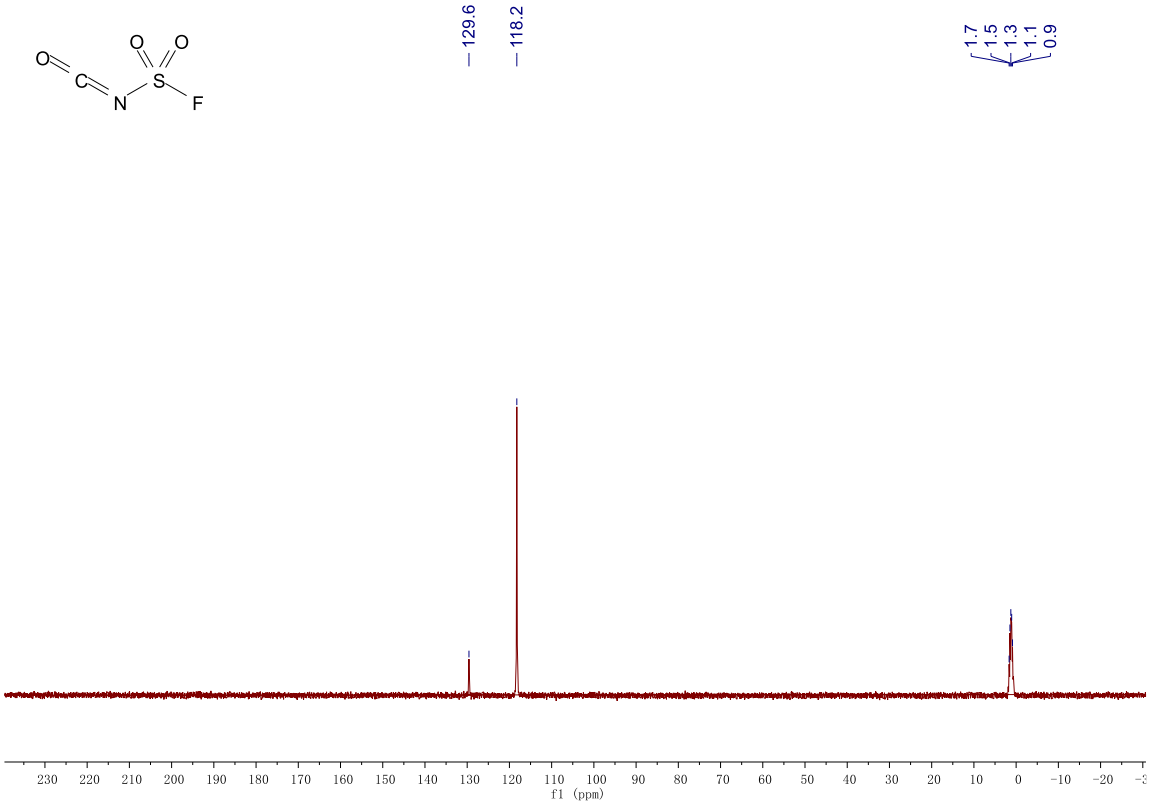
Identification code	d8v20624	
Empirical formula	C19 H29 N3 O6 S	
Formula weight	427.51	
Temperature	192(2) K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	P 21/c	
Unit cell dimensions	a = 20.7604(12) Å	α= 90°.
	b = 9.1510(5) Å	β= 106.682(2)°.
	c = 11.9951(8) Å	γ = 90°.
Volume	2182.9(2) $Å^3$	
Z	4	
Density (calculated)	1.301 Mg/m^3	
Absorption coefficient	0.187 mm^{-1}	
F(000)	912	
Crystal size	0.180 x 0.140 x 0.080 mm^3	
Theta range for data collection	2.846 to 26.000°.	
Index ranges	-25<=h<=25, -11<=k<=11, -14<=l<=14	
Reflections collected	21329	
Independent reflections	4270 [R(int) = 0.0756]	
Completeness to theta = 25.242°	99.8 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	0.7456 and 0.5475	
Refinement method	Full-matrix least-squares on F^2	
Data / restraints / parameters	4270 / 0 / 270	
Goodness-of-fit on F^2	1.019	

Final R indices [I>2sigma(I)]	R1 = 0.0502, wR2 = 0.1131
R indices (all data)	R1 = 0.0704, wR2 = 0.1273
Extinction coefficient	0.0057(12)
Largest diff. peak and hole	0.467 and -0.419 e.Å^{-3}

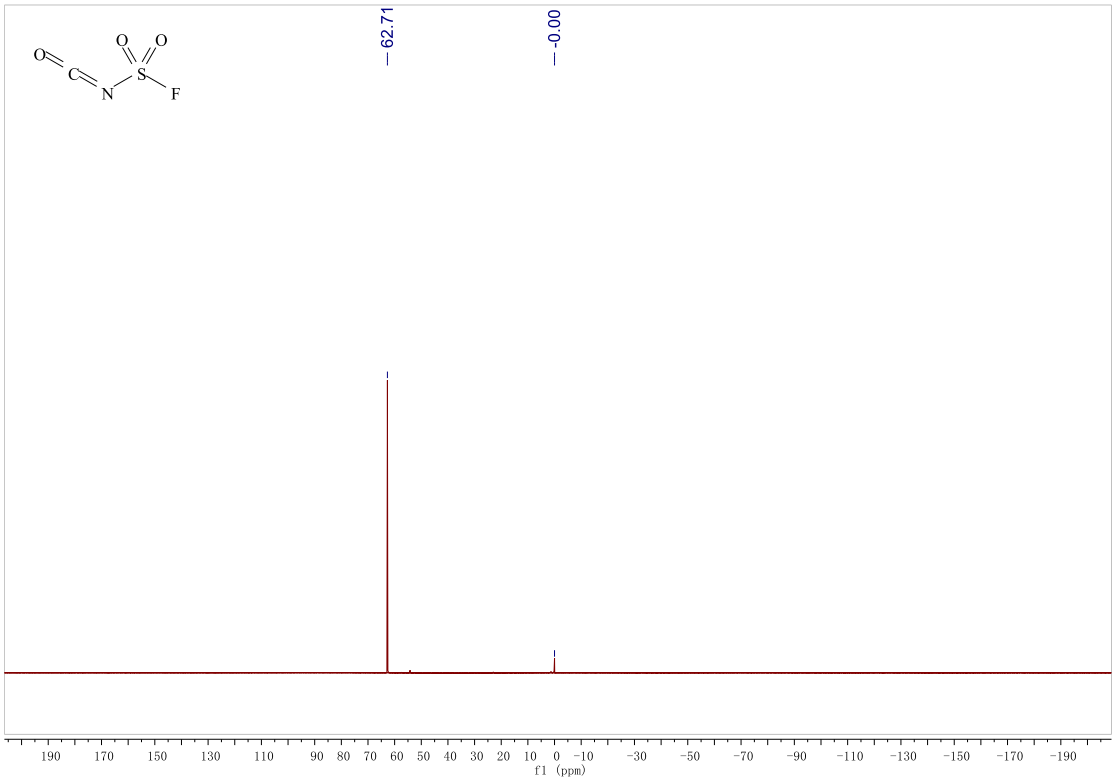
Section 8. NMR Spectra for Compounds

*Fluorosulforyl Isocyanate(**FSI**)*

^{13}C NMR(CD_3CN)

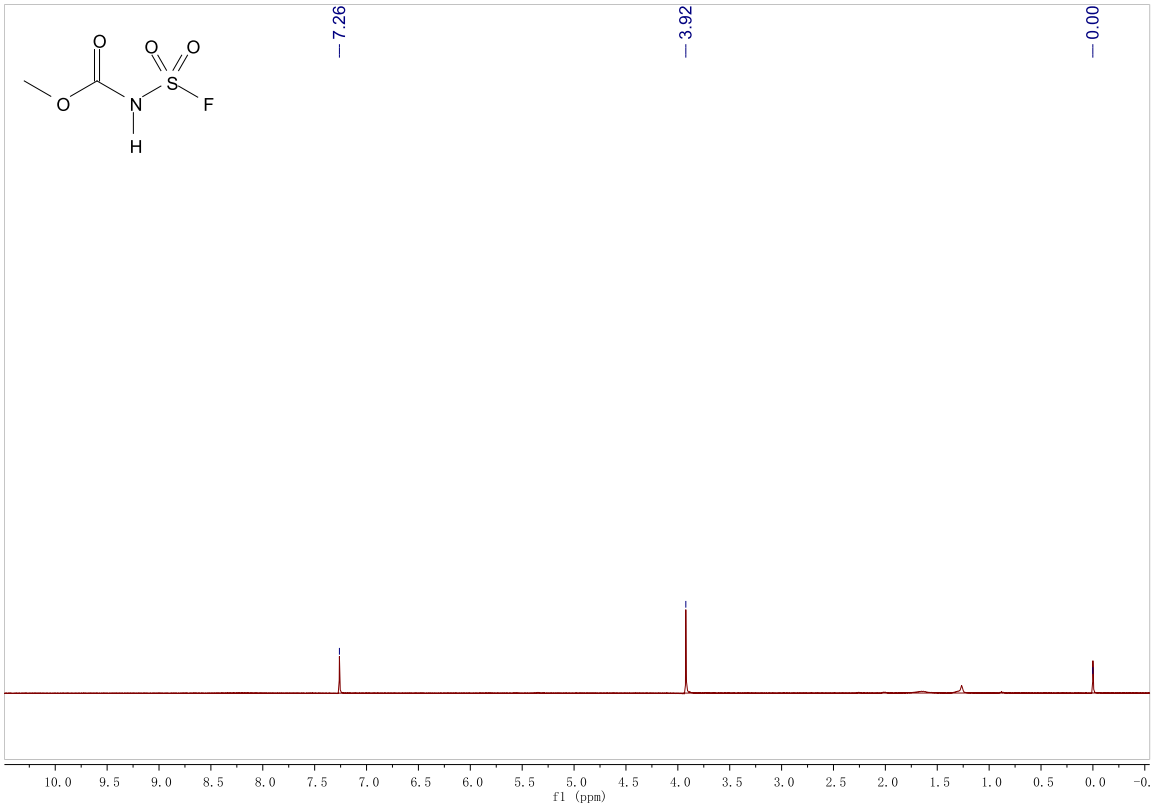


^{19}F NMR

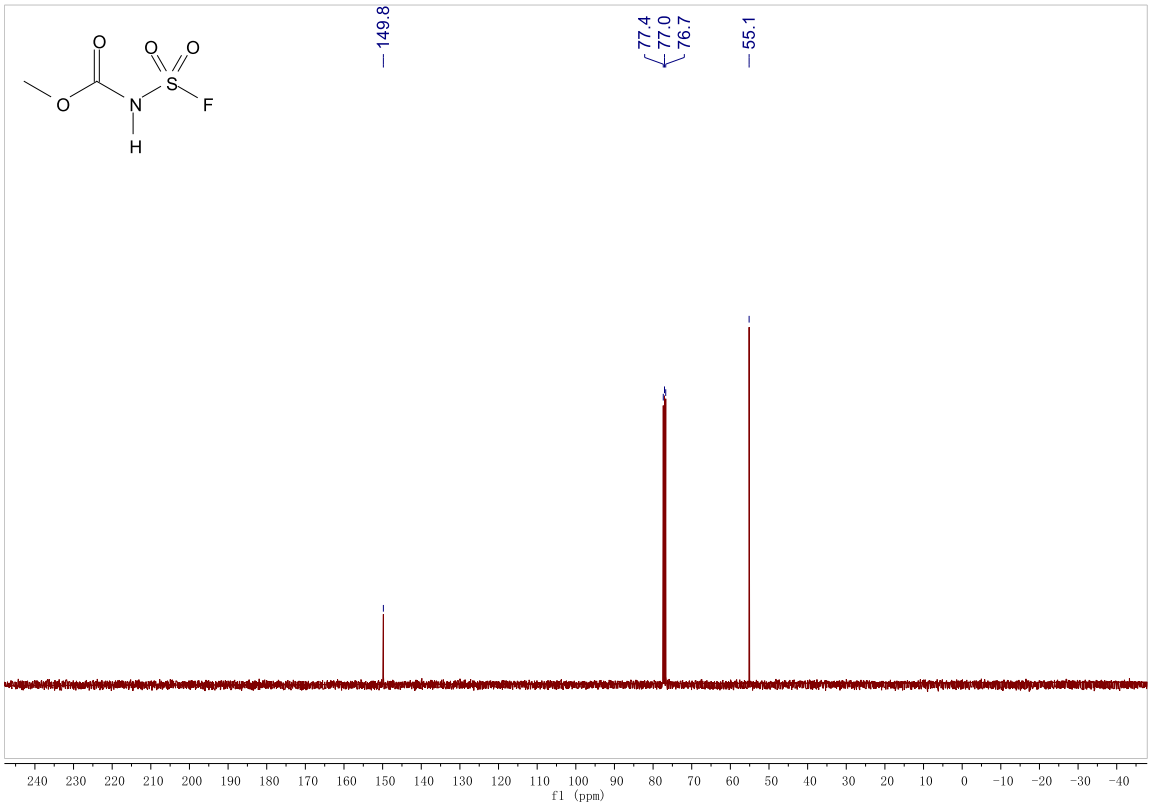


*N-Methoxycarbonyl-fluorsulfurylamid(**2-1**)*

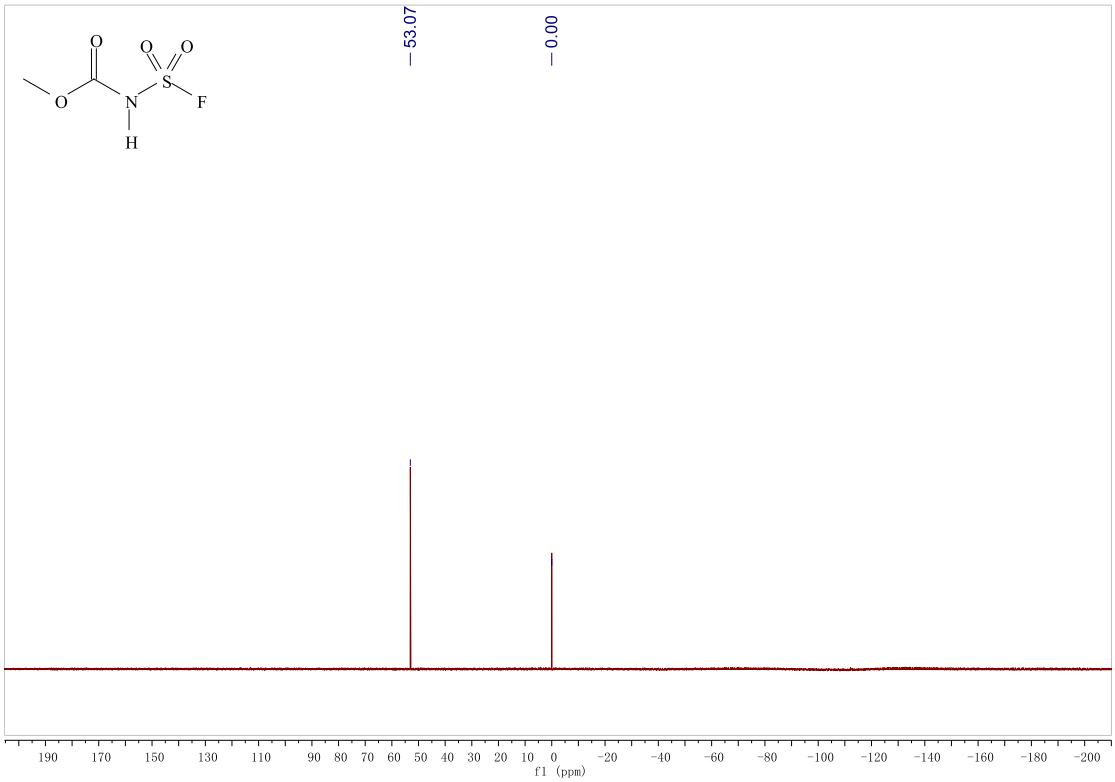
^{1}H NMR



^{13}C NMR

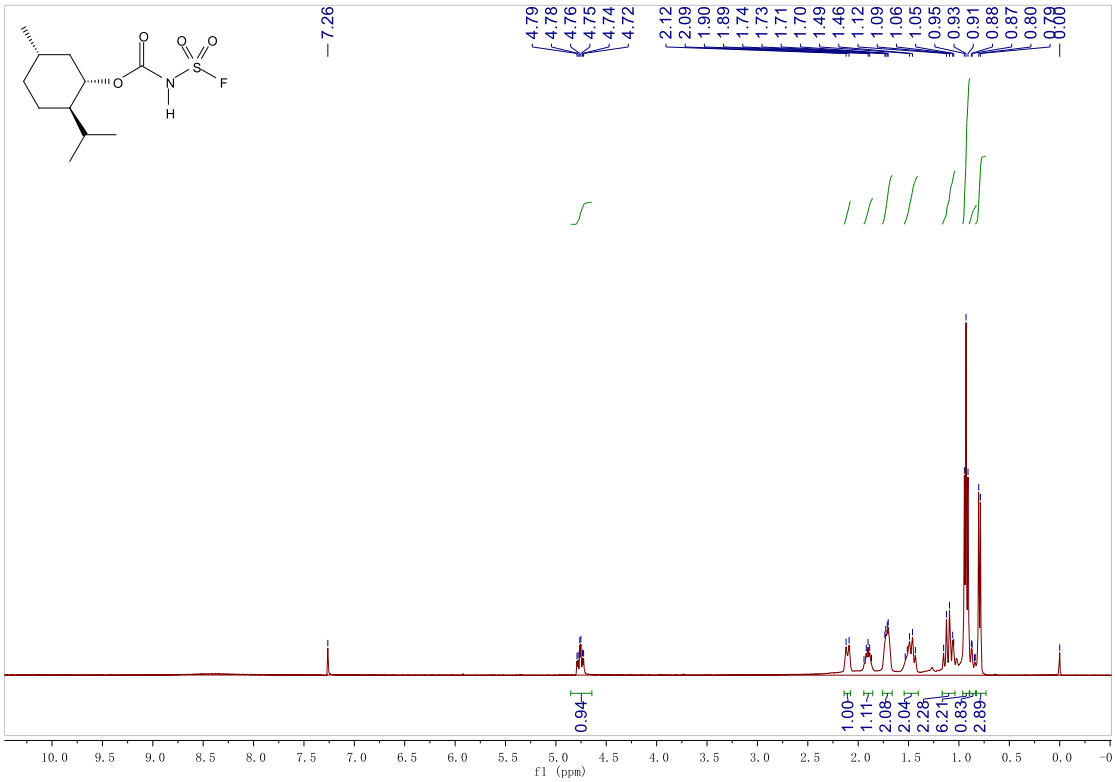


^{19}F NMR

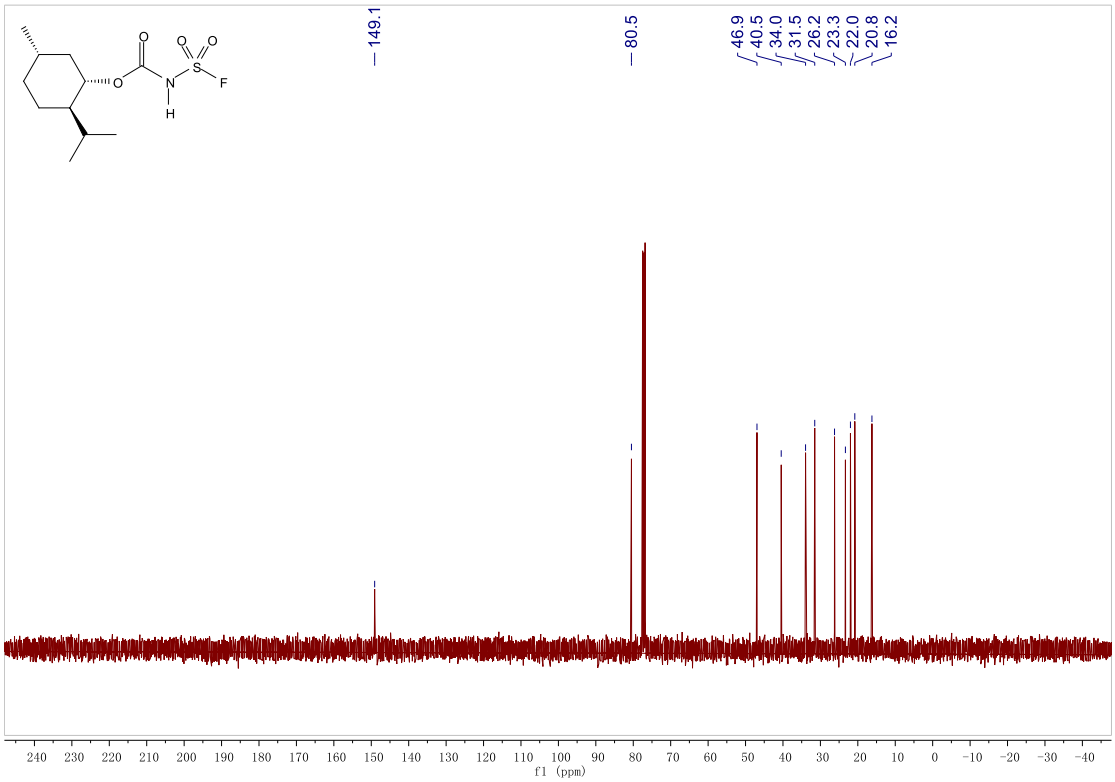


N-(1S,2R,5S)-(+)-menthoxycarbonyl-fluorsulfurylamid(***2-2***).

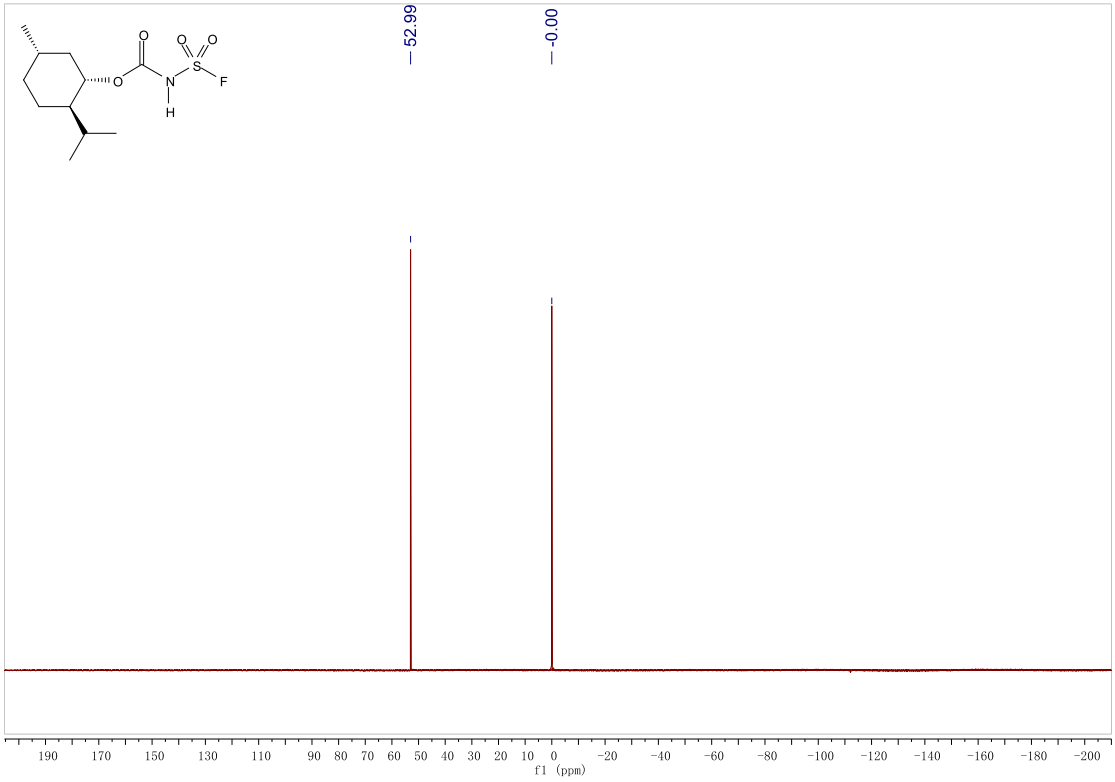
^{1}H NMR



^{13}C NMR

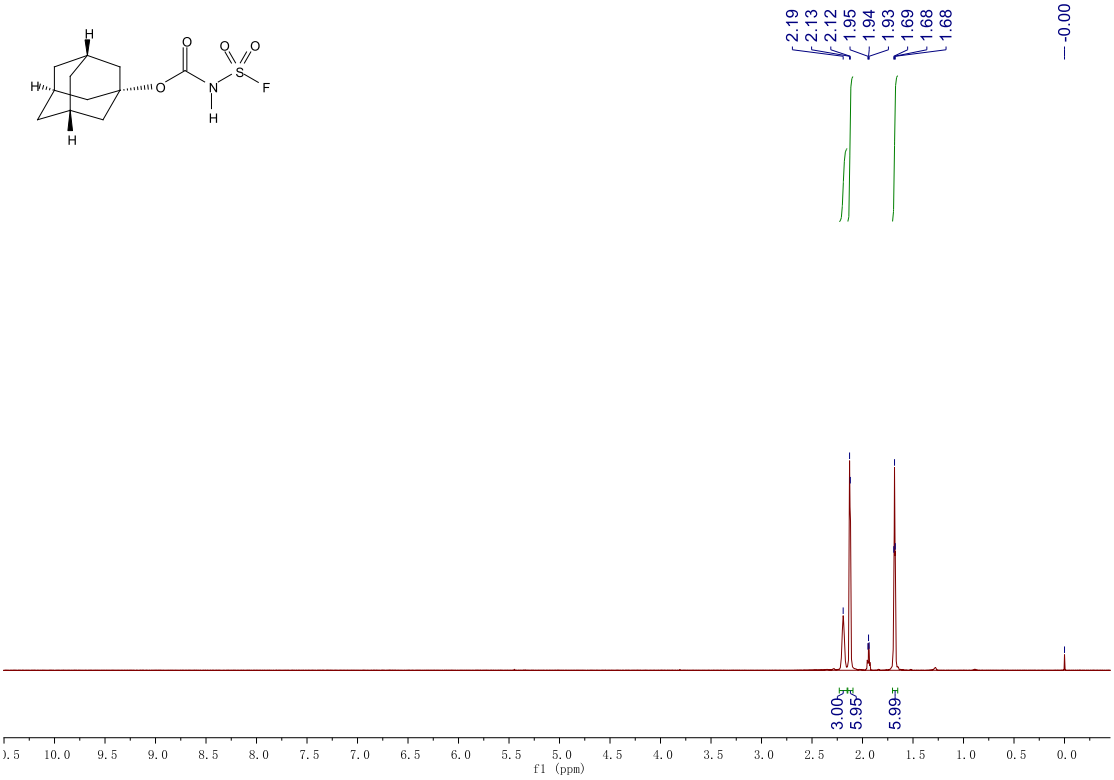


^{19}F NMR

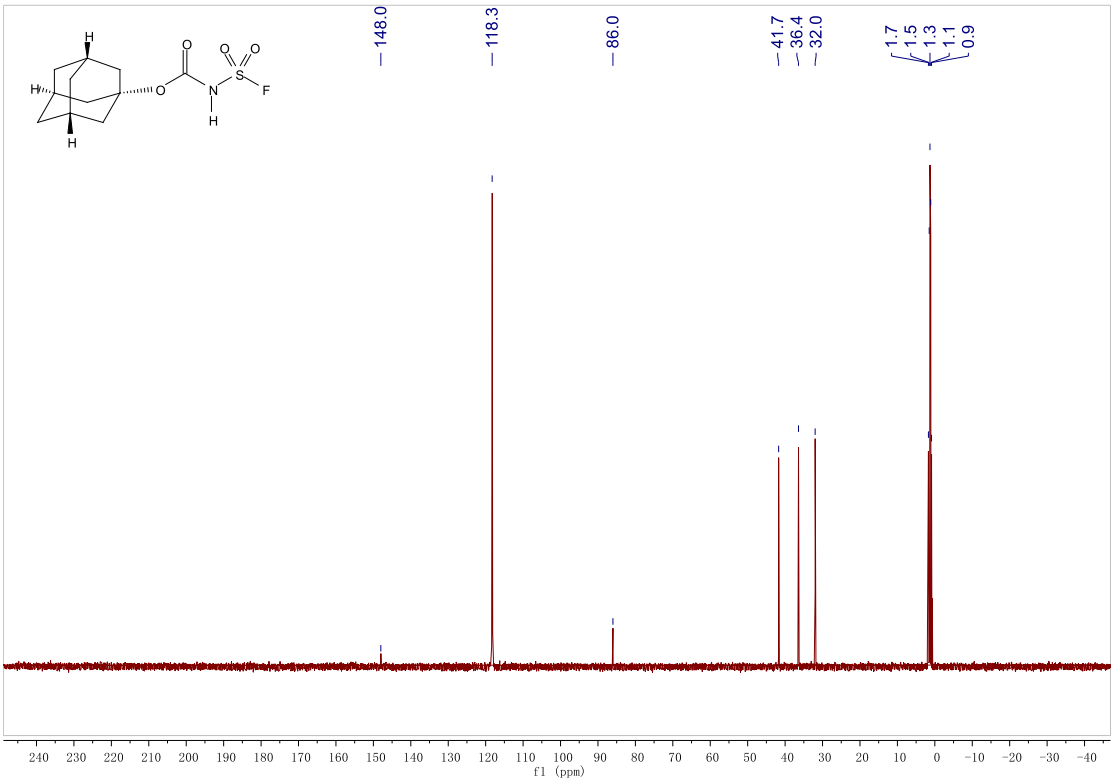


*N-1-adamanthanoxycarbonyl-fluorsulfurylamid (**2-3**).*

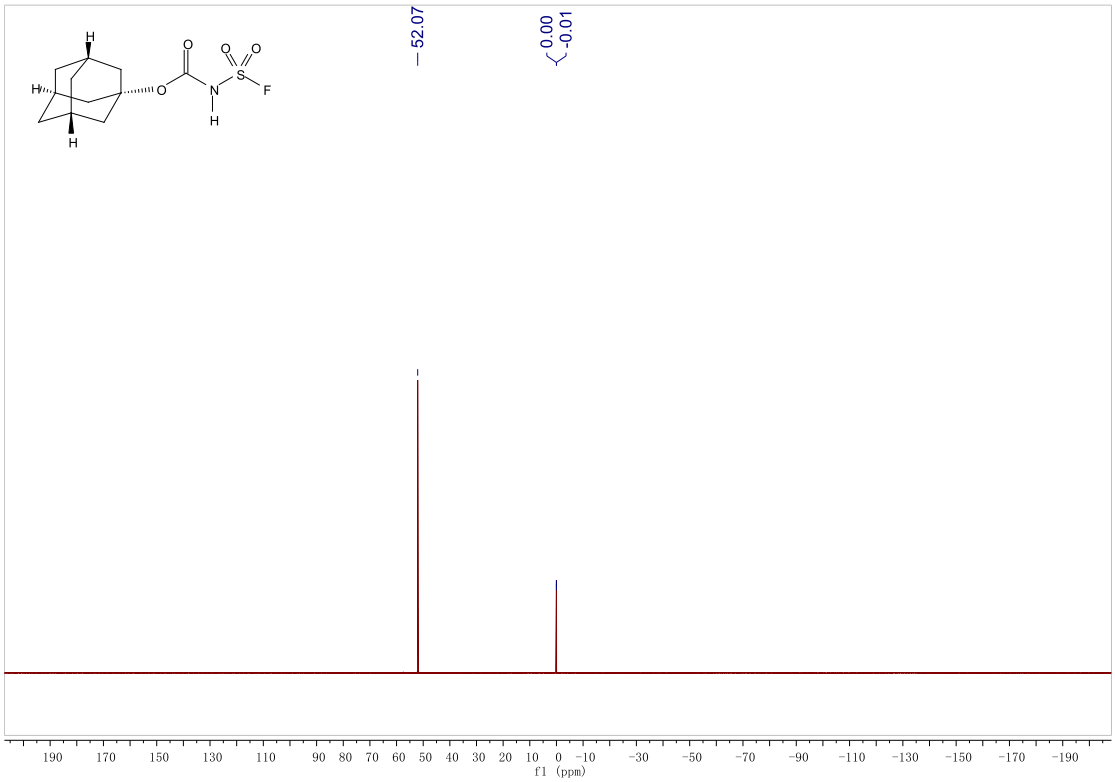
^{1}H NMR



^{13}C NMR

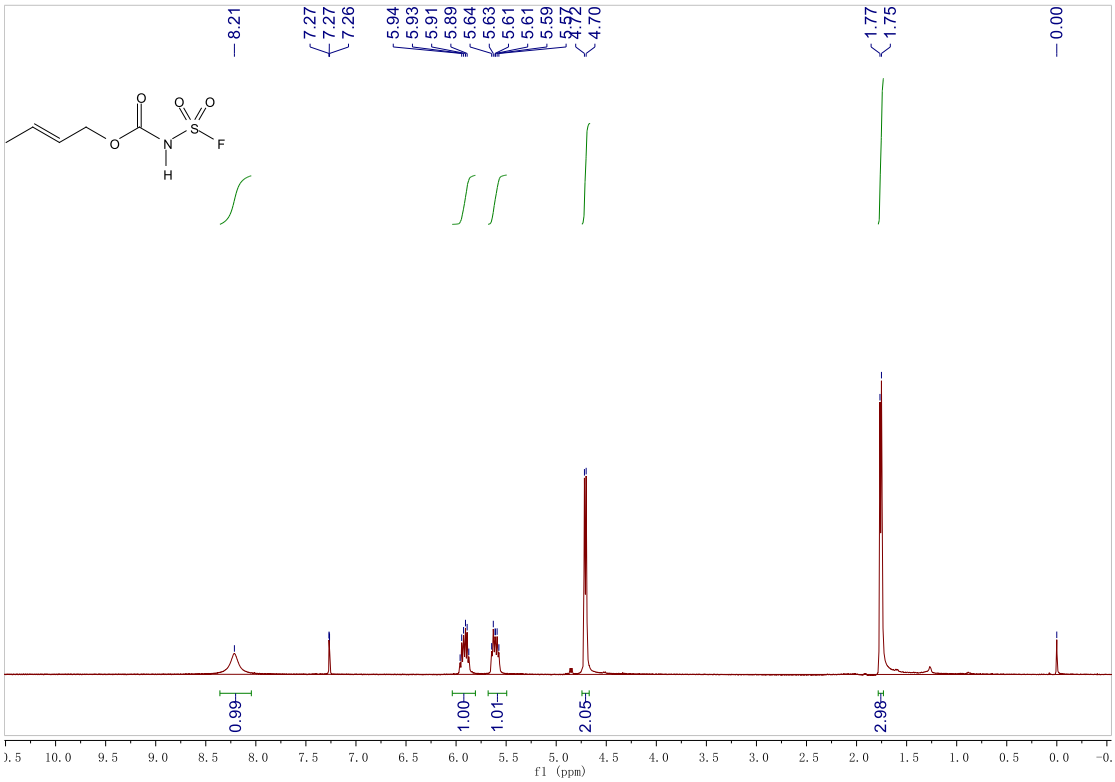


^{19}F NMR

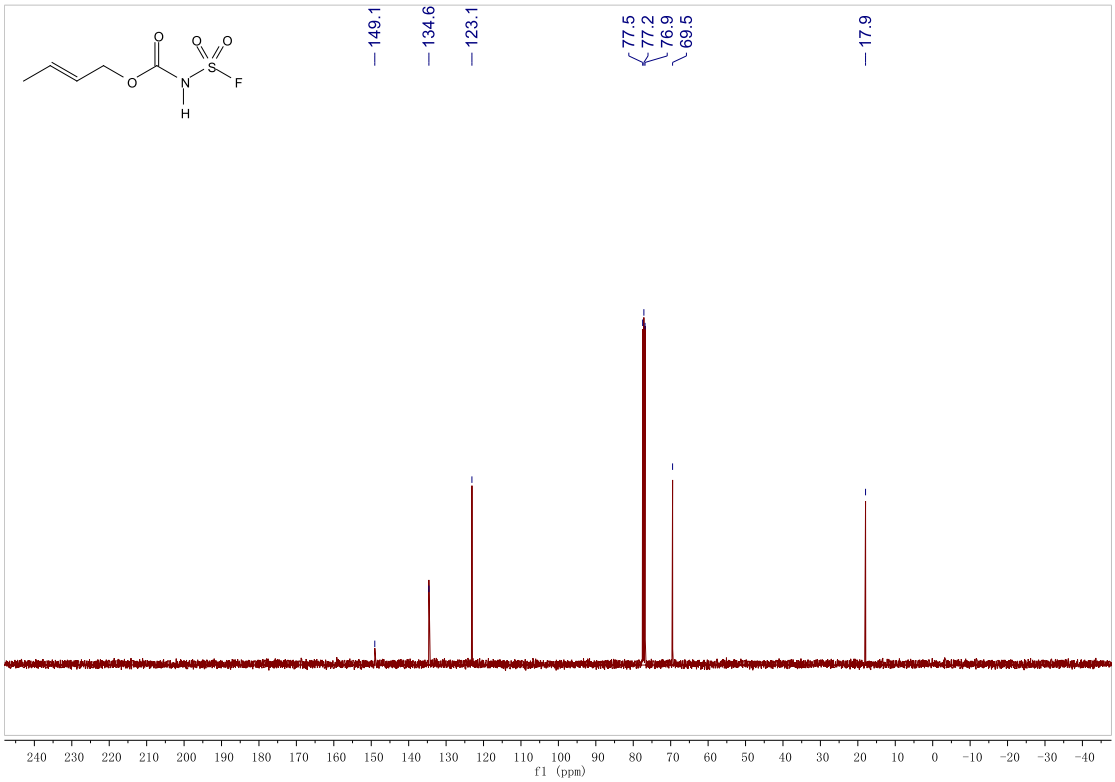


*N-(E)-but-2-enoxycarbonyl-fluorsulfurylamid(**2-4**)*

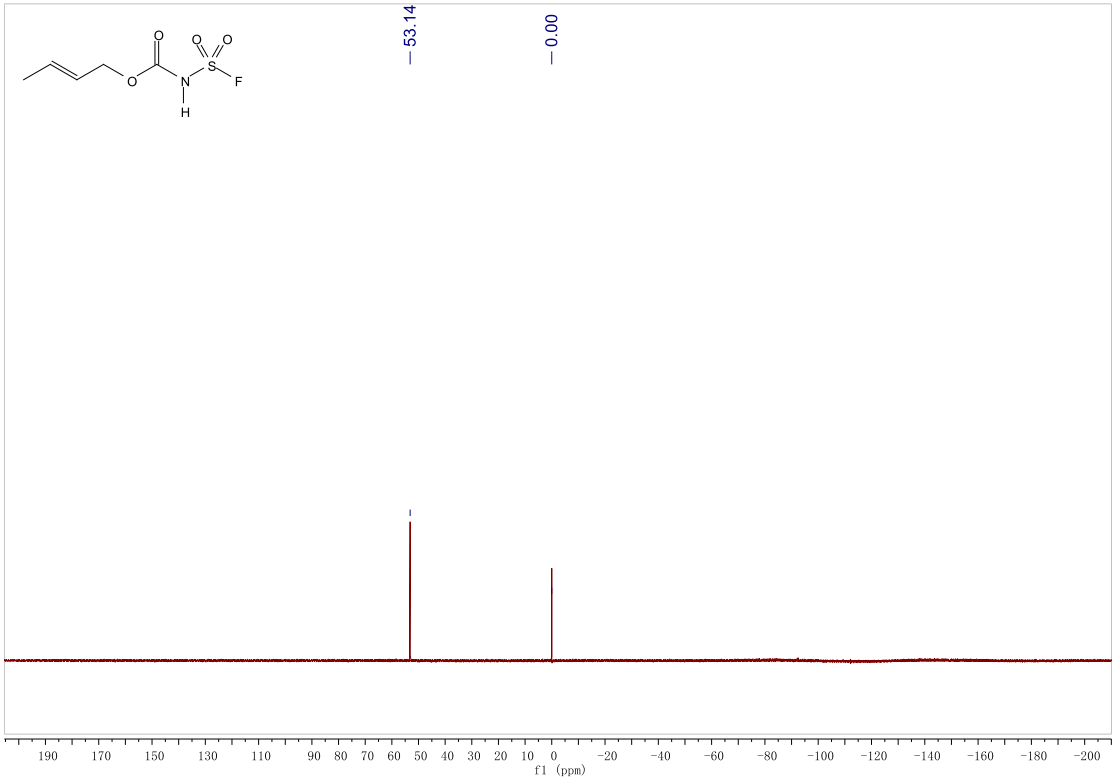
^{1}H NMR



^{13}C NMR

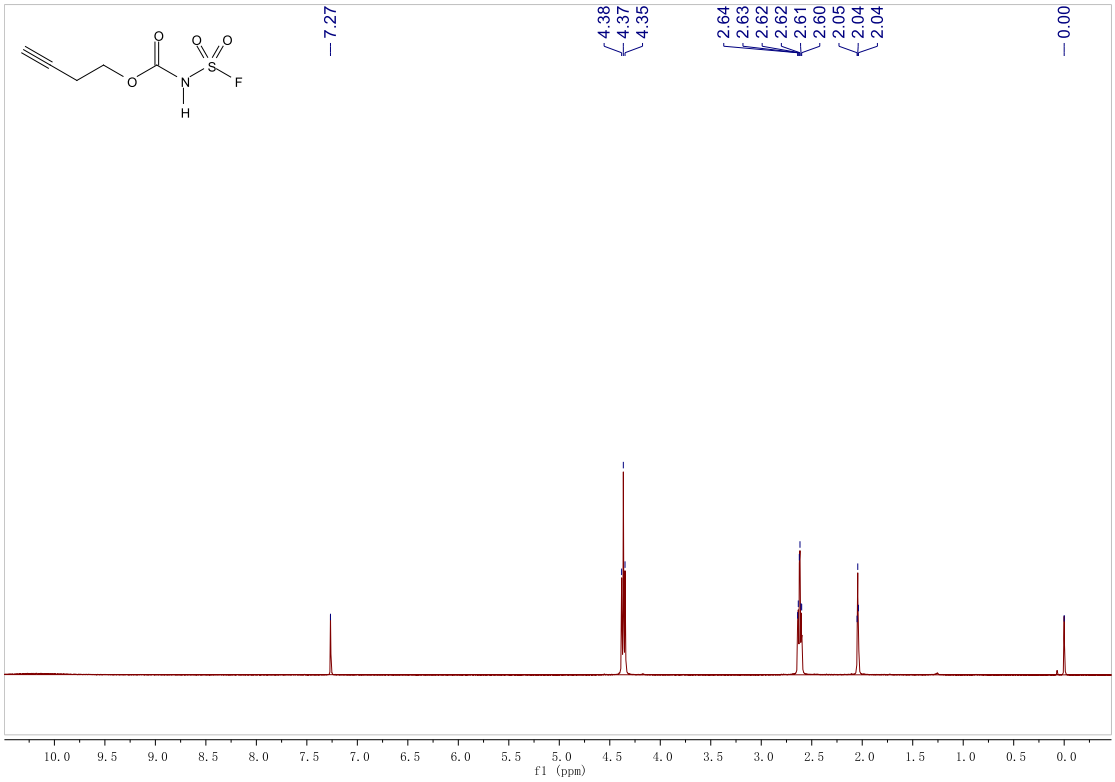


^{19}F NMR

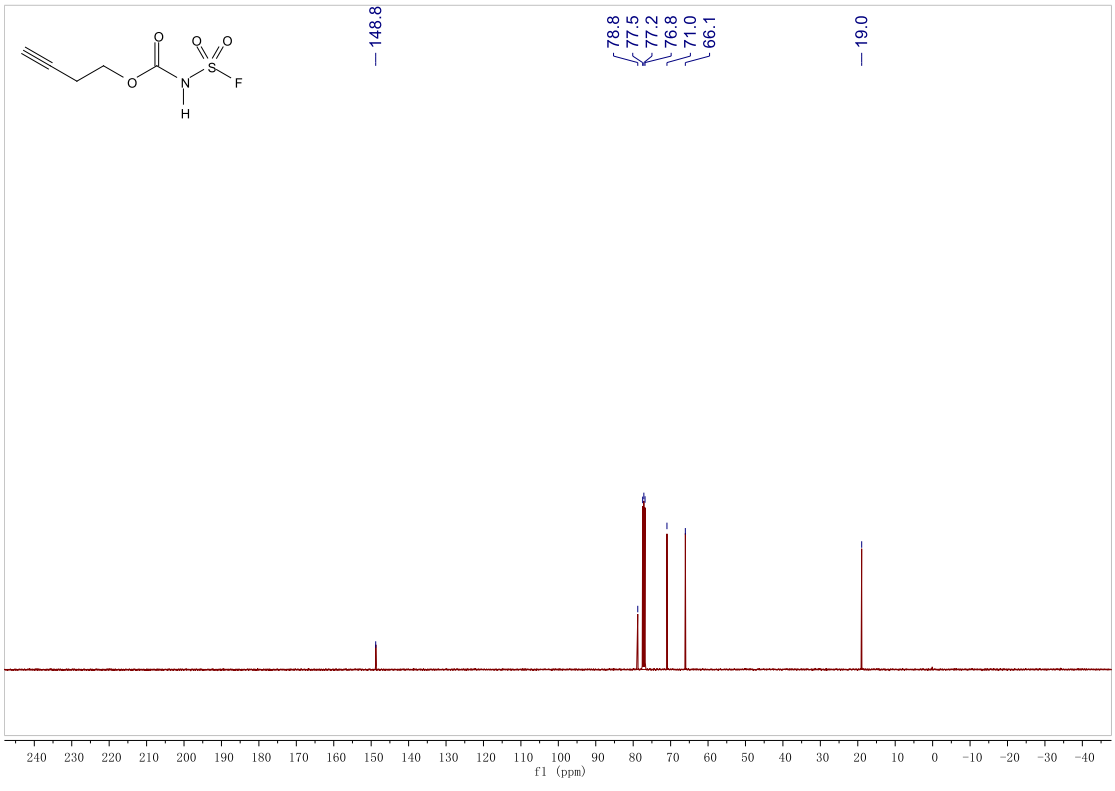


*N-1-butynloxycarbonyl-fluorsulfurylamid(**2-5**)*

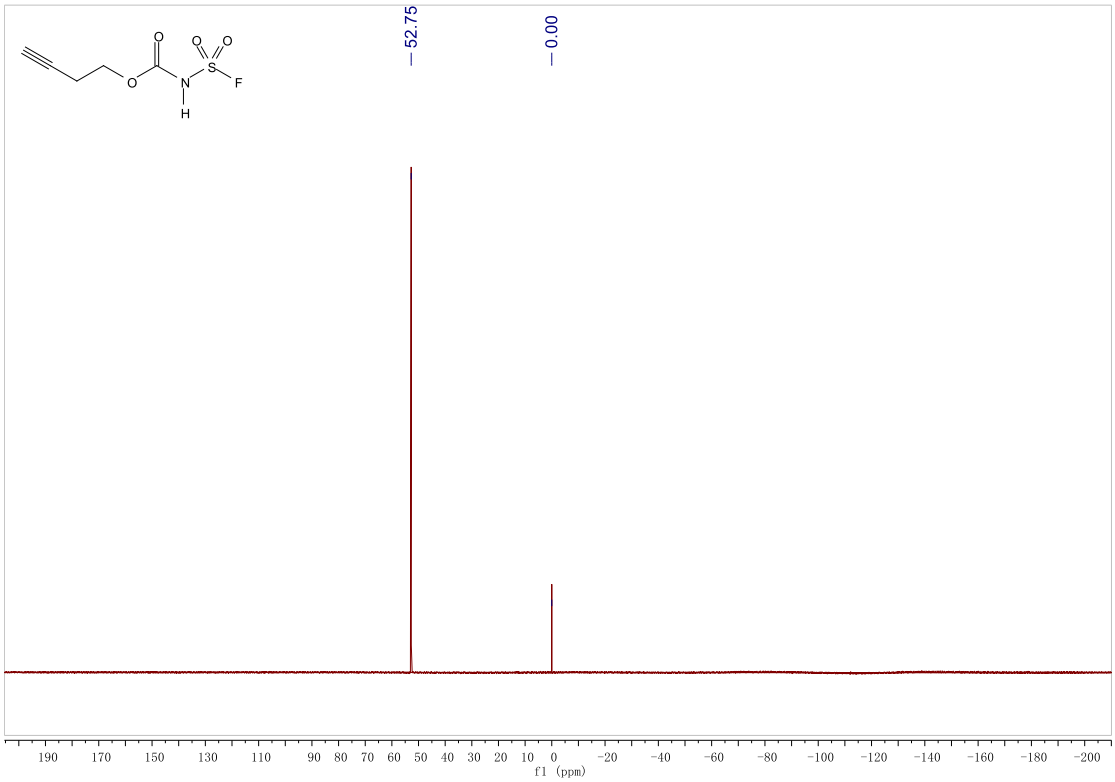
^{1}H NMR



^{13}C NMR

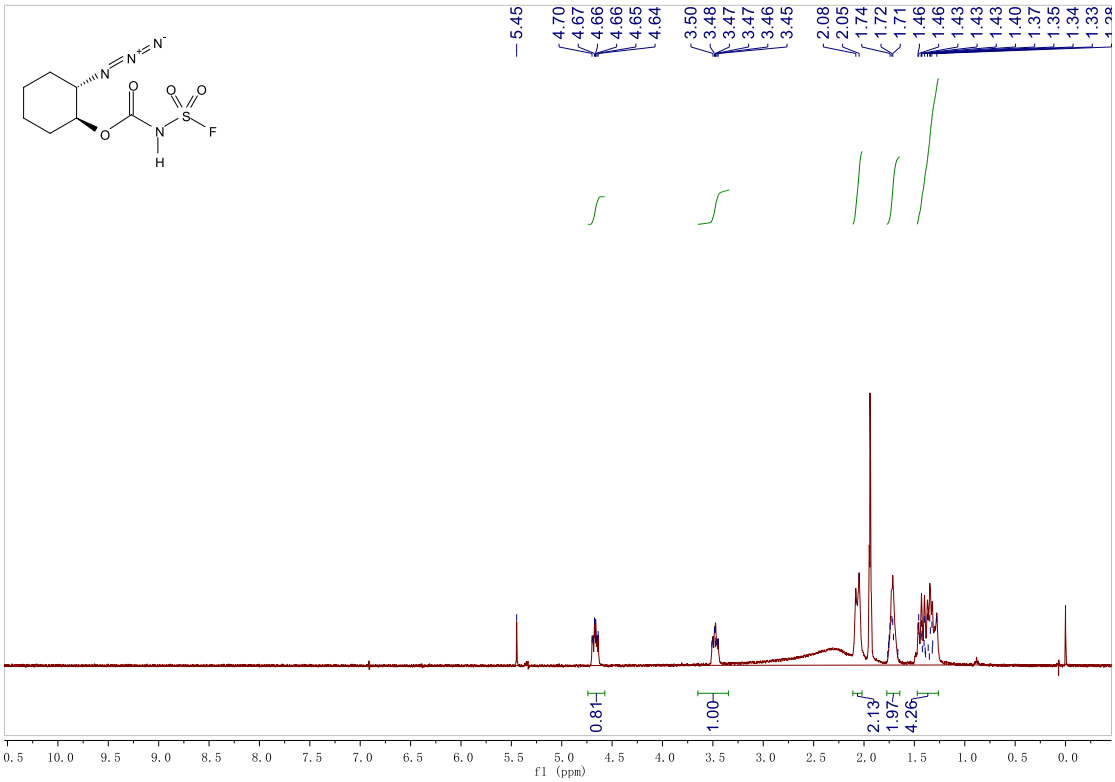


^{19}F NMR

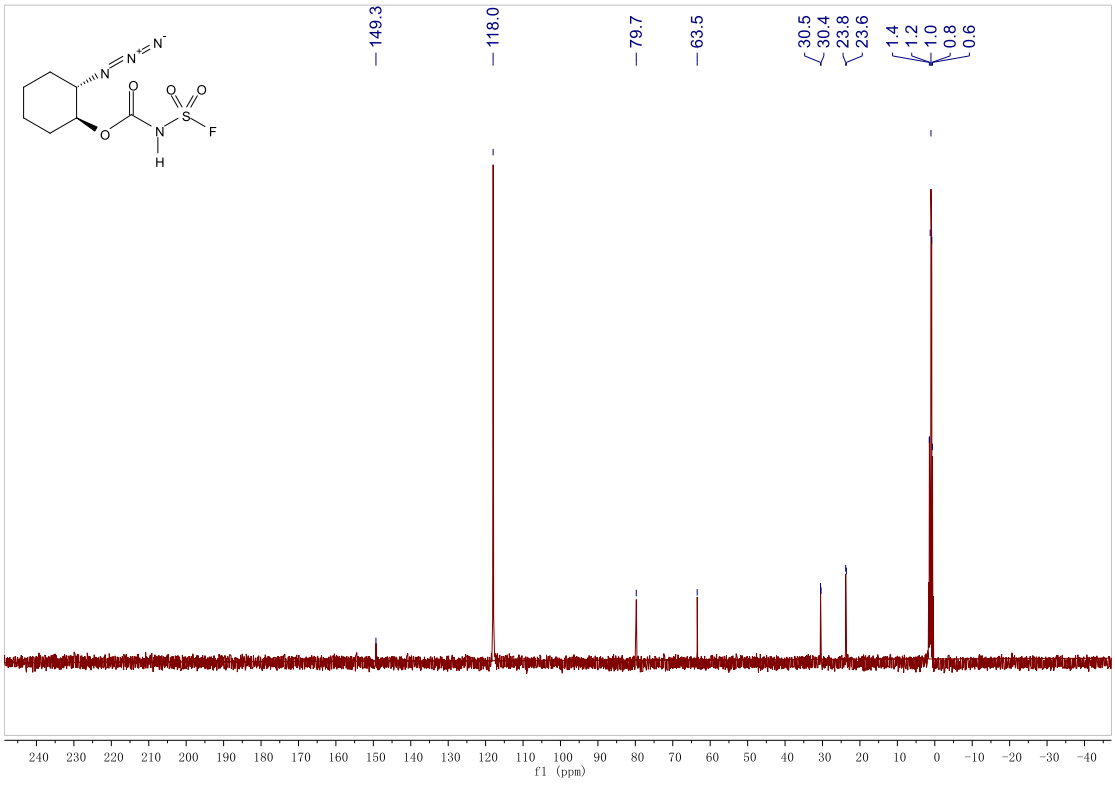


*N-trans-2-azido-1-cyclohexanoxycarbonyl-fluorsulfurylamid(**2-6**).*

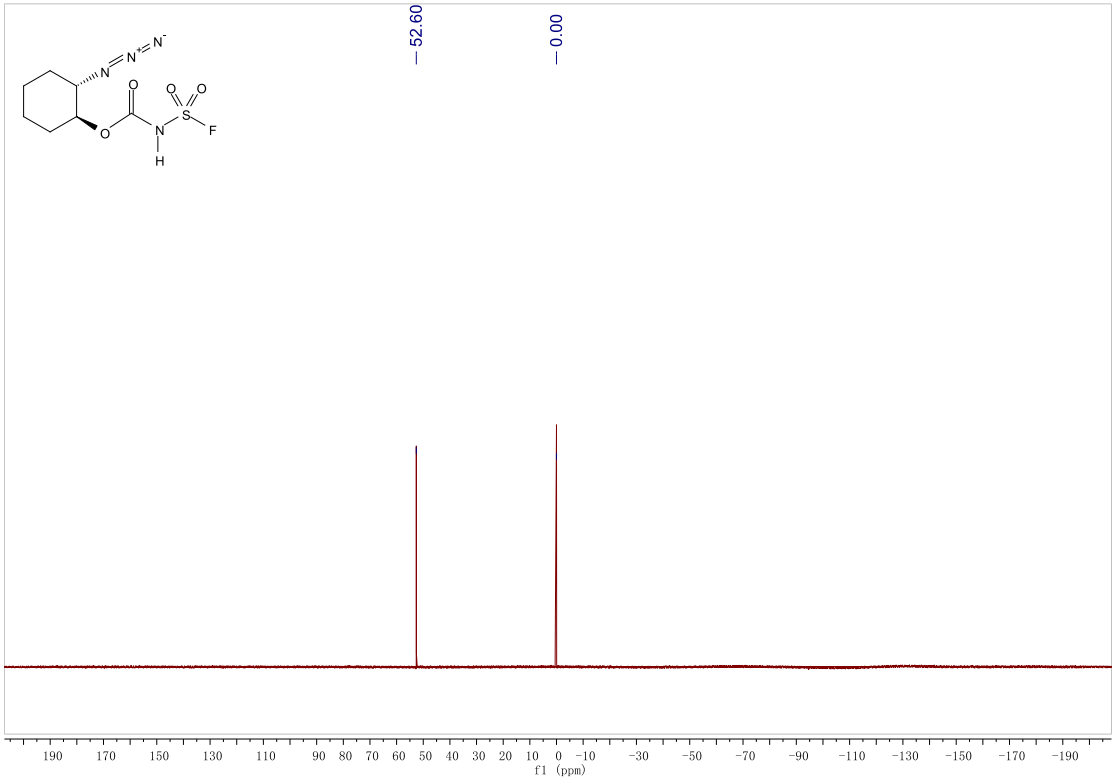
^{1}H NMR



^{13}C NMR

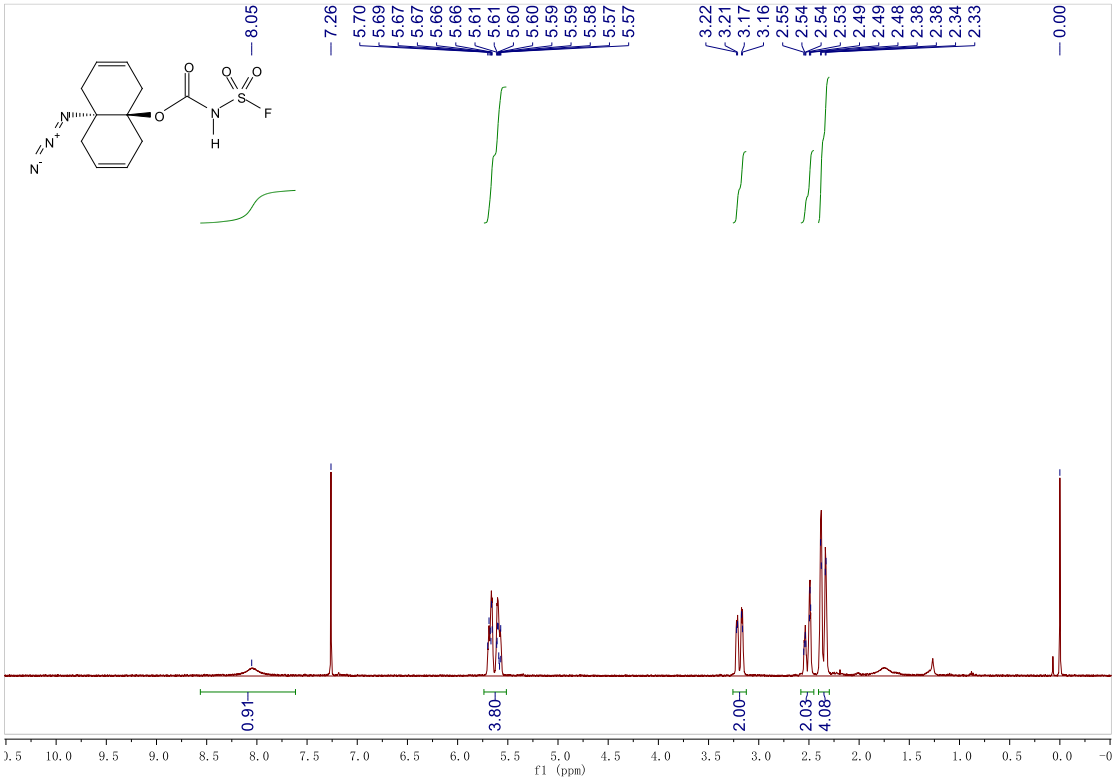


^{19}F NMR

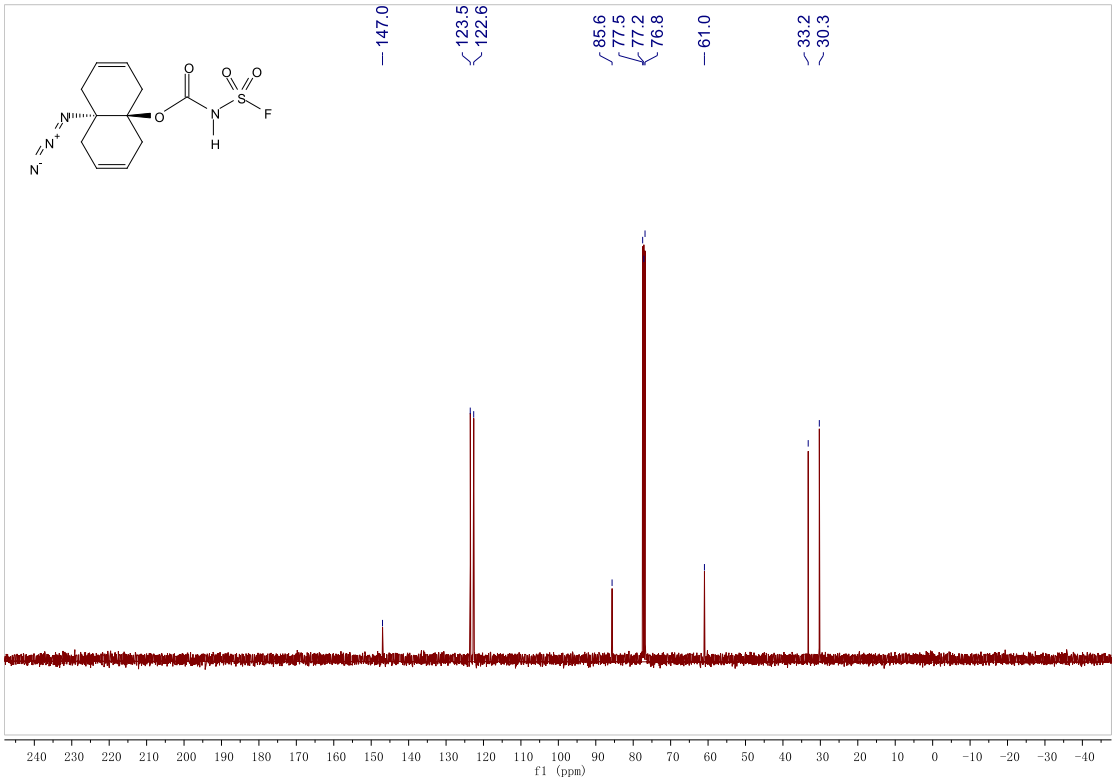


*N-anti-8a-azido-1,4,4a,5,8,8a-hexahydro-4a-naphthalenoxycarbonyl-fluorsulfurylamid(**2-7**).*

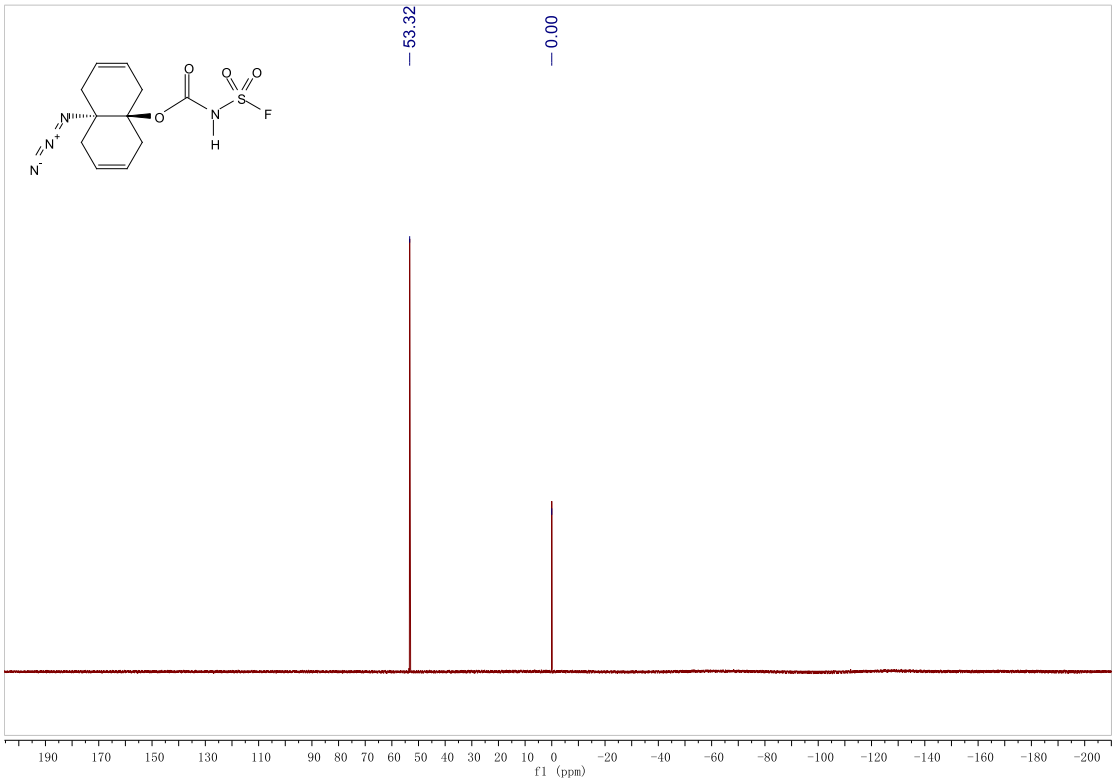
^{1}H NMR



^{13}C NMR

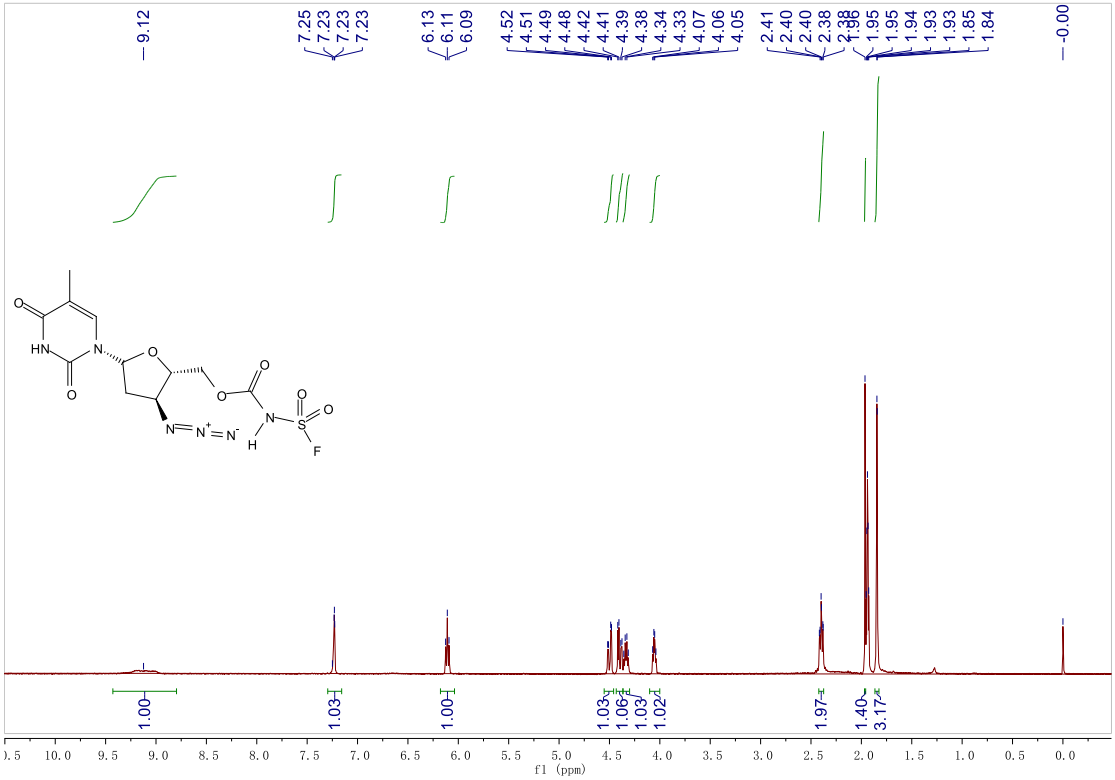


^{19}F NMR

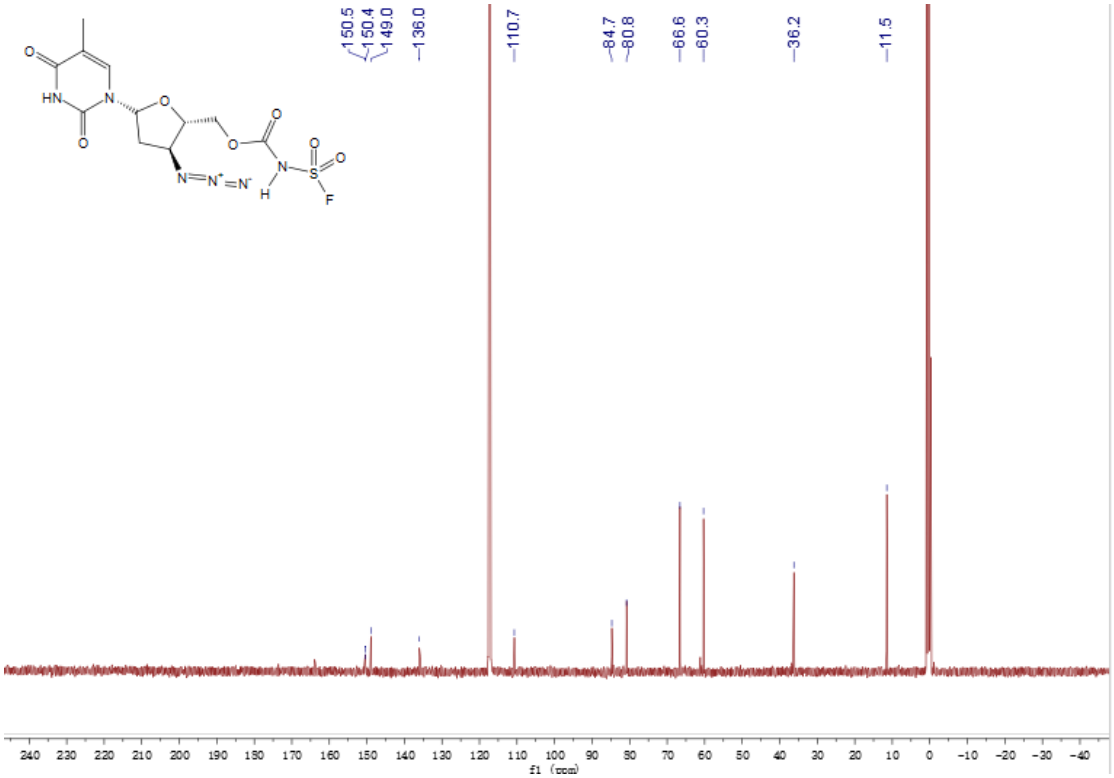


*N- 3'-azido-2',3'-deoxythymidinoxycarbonyl-fluorsulfurylamid(**2-8**).*

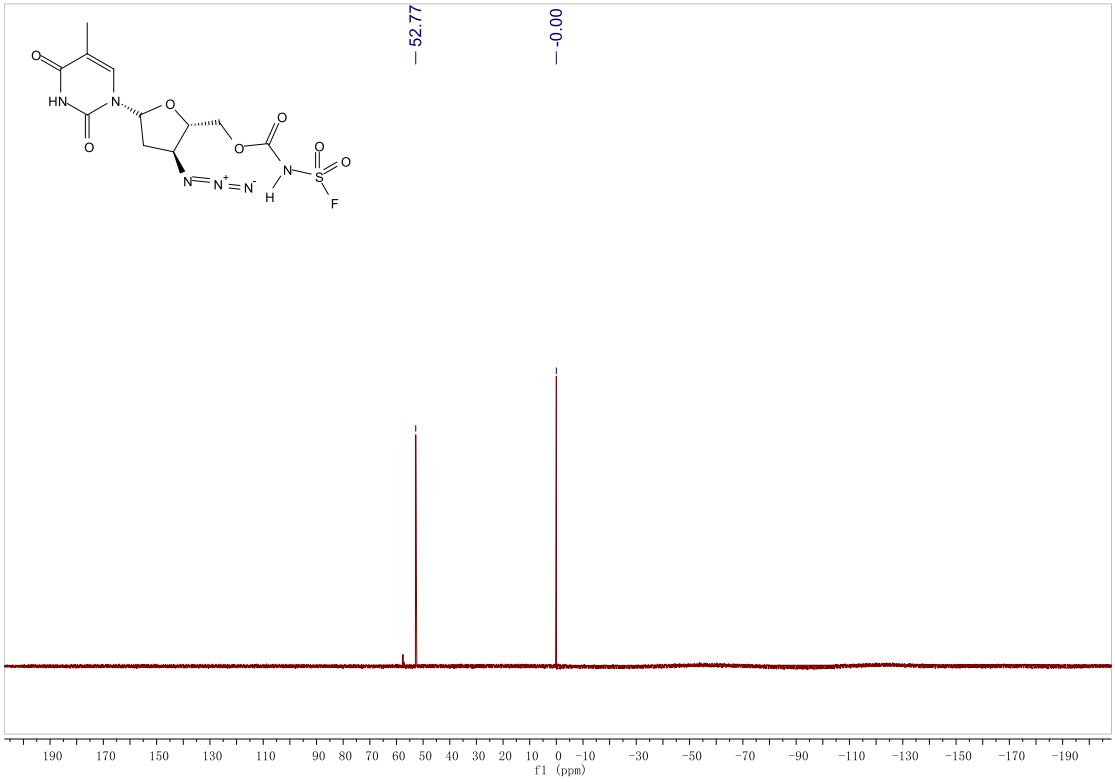
^{1}H NMR



^{13}C NMR

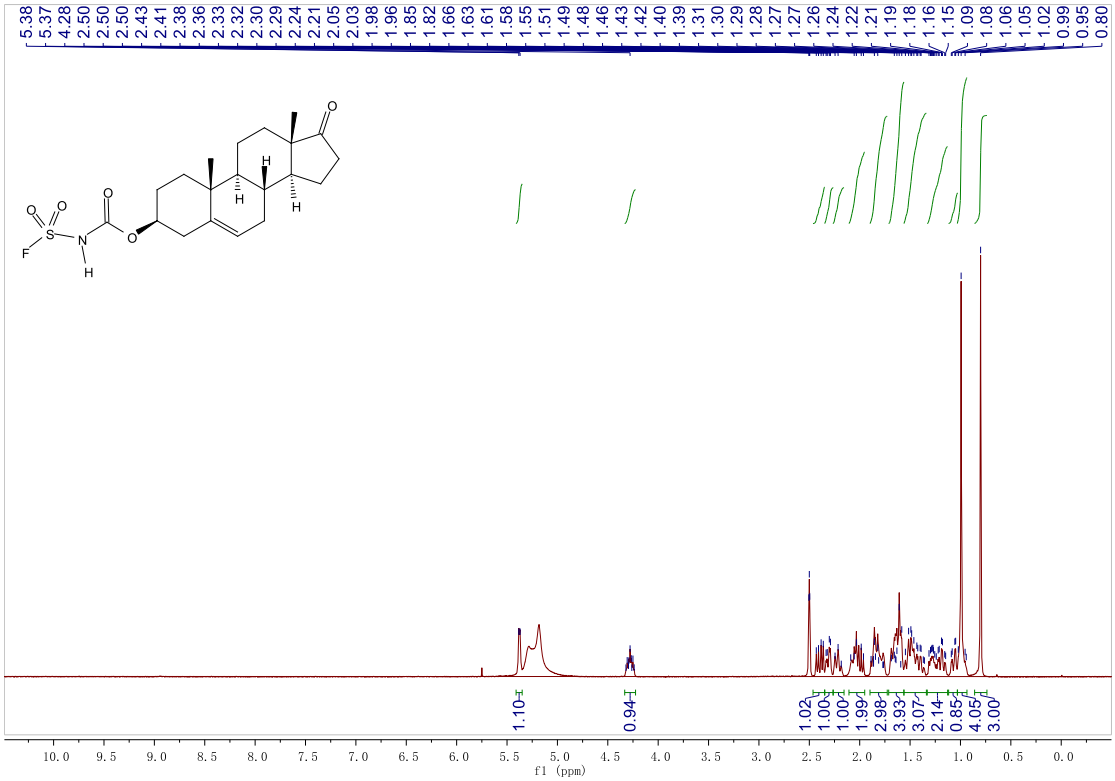


^{19}F NMR

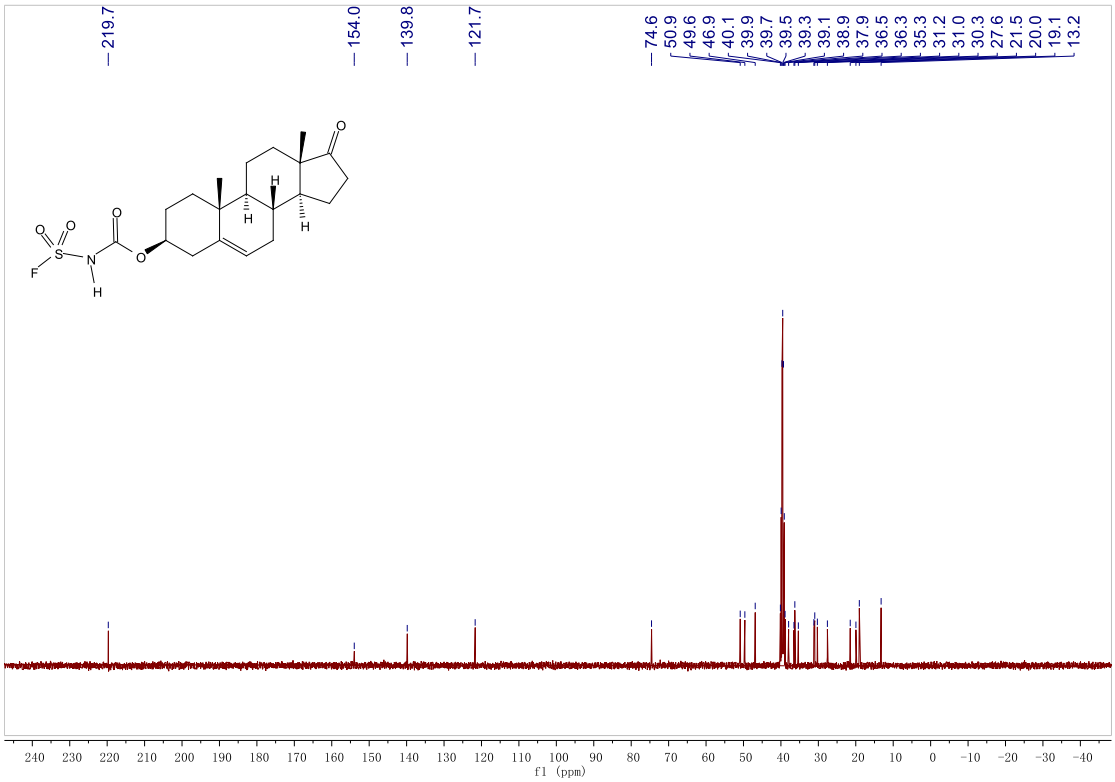


*N- dehydroepiandrosteronoxycarbonyl-fluorsulfurylamid (**2-9**).*

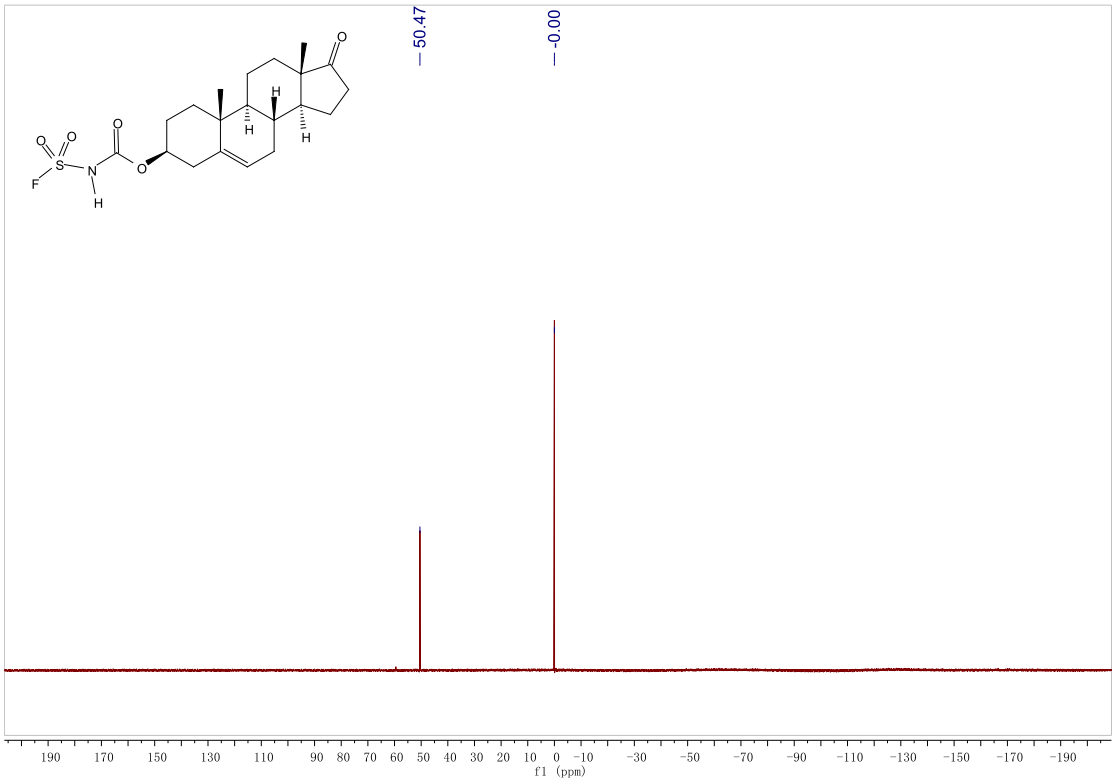
^{1}H NMR



^{13}C NMR

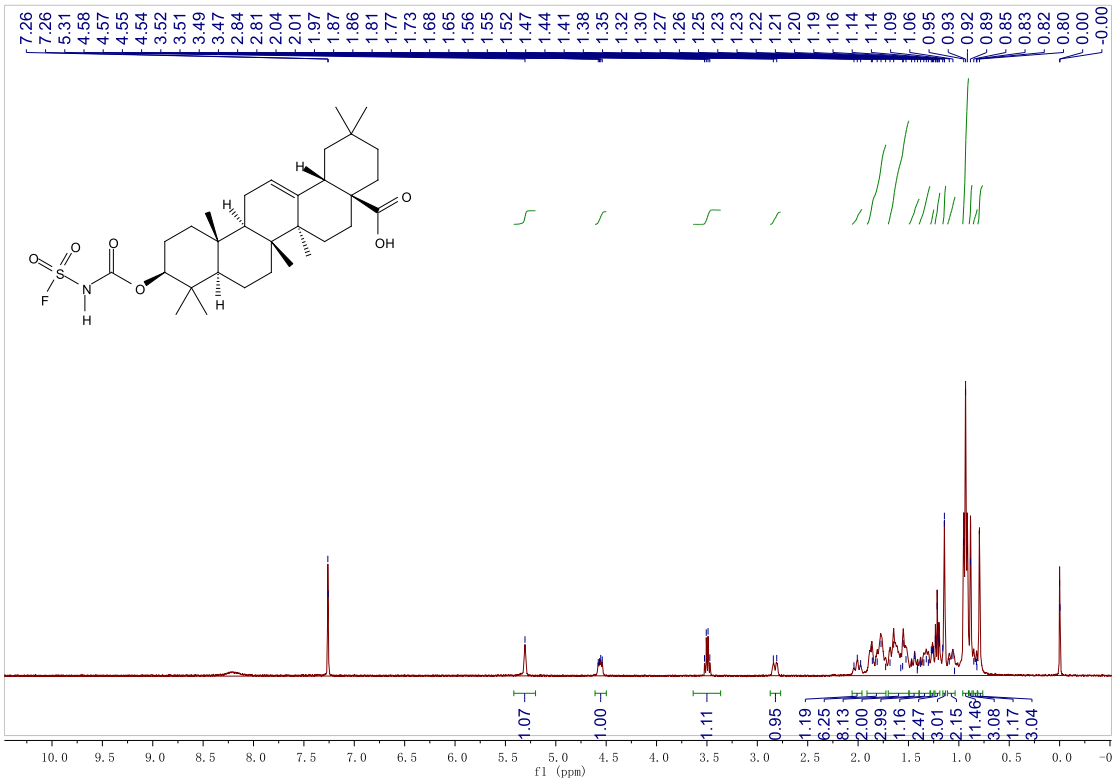


^{19}F NMR

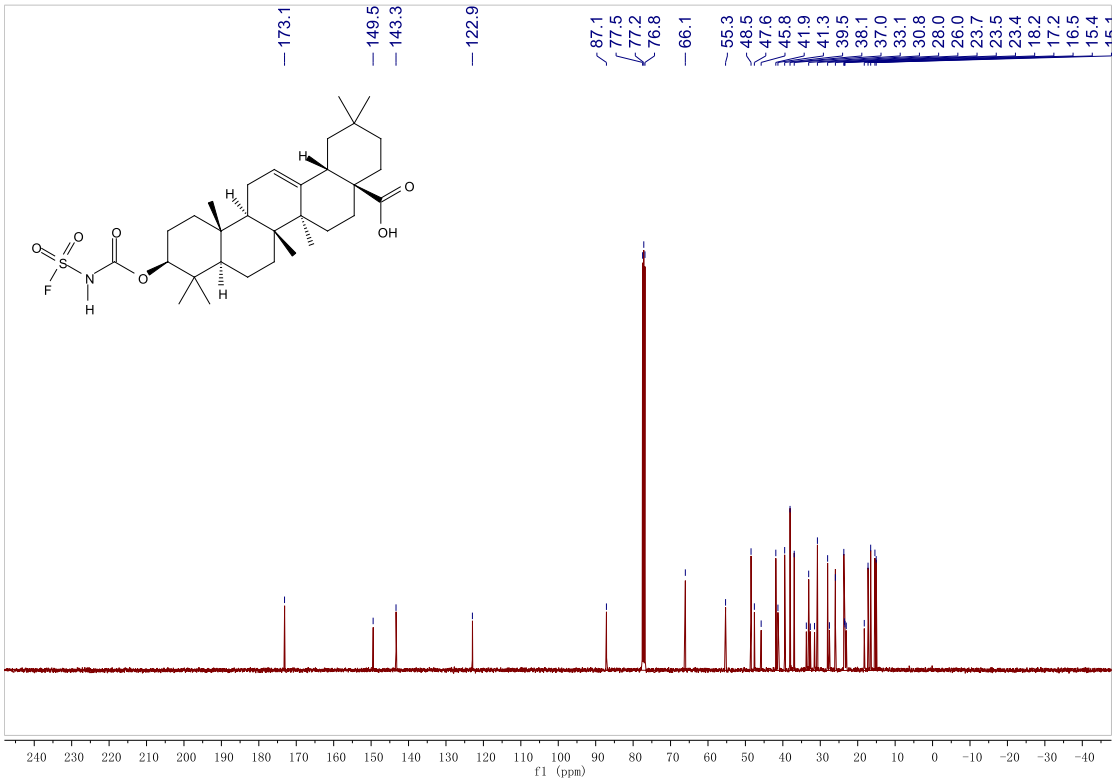


*N- oleanoxycarbonyl-fluorsulfurylamid (**2-10**).*

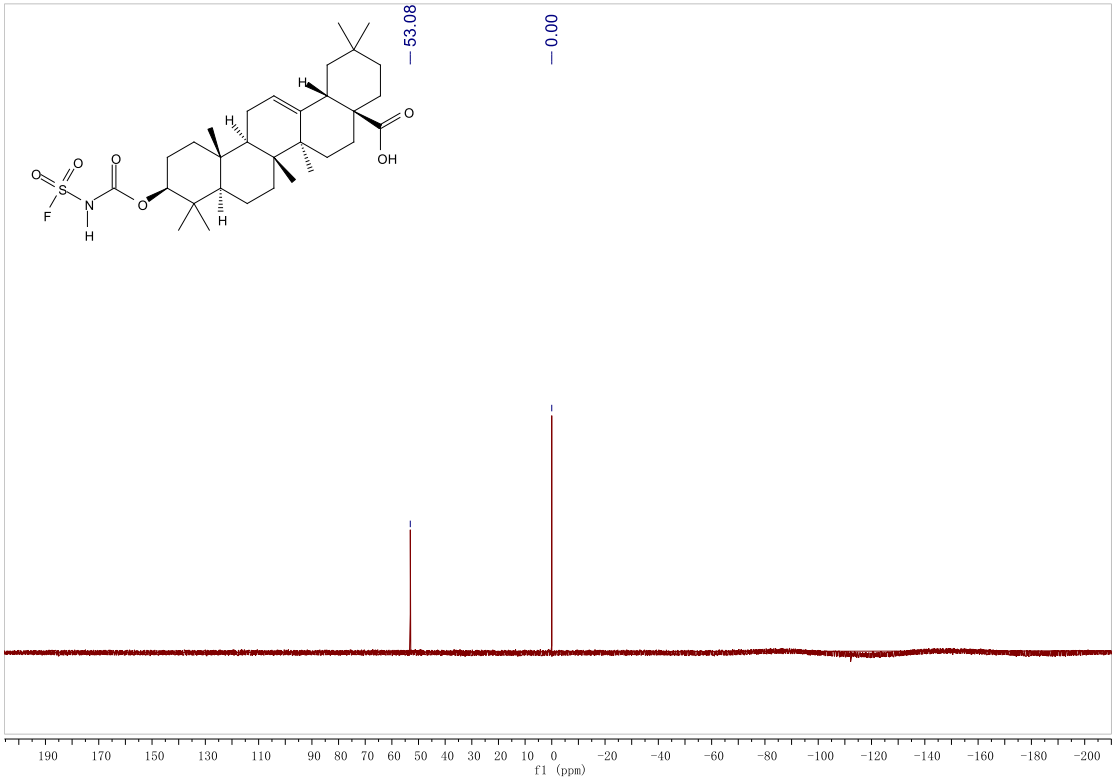
^{1}H NMR



^{13}C NMR

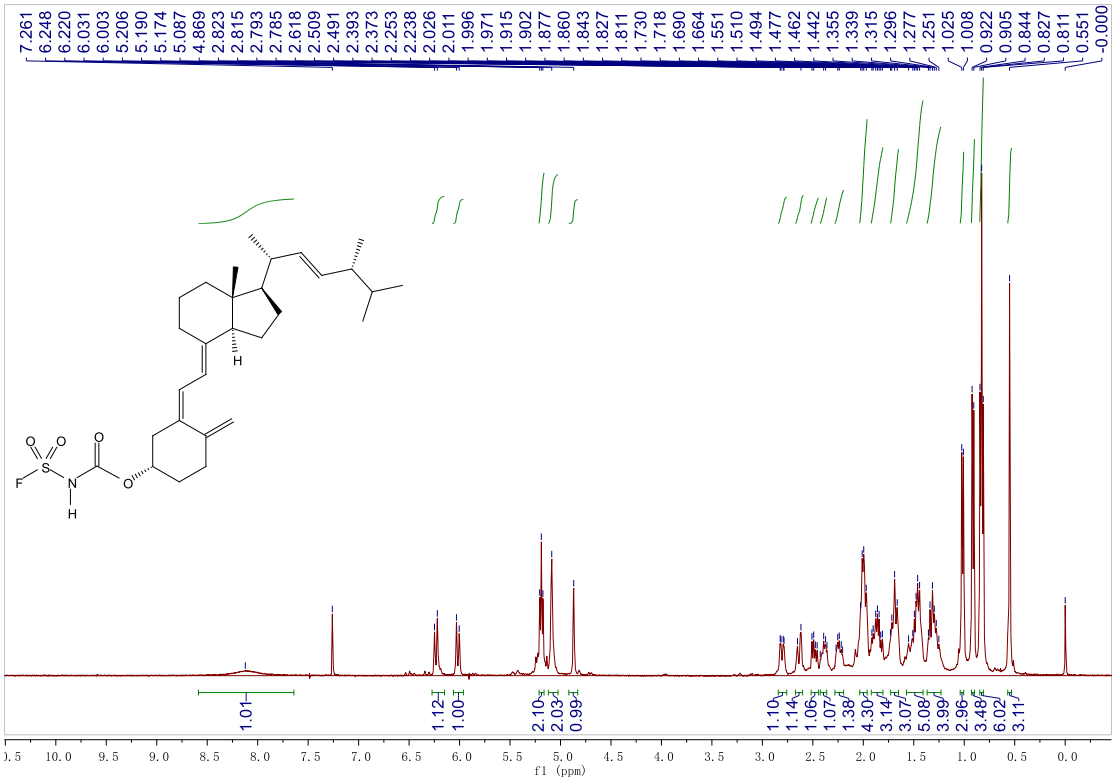


^{19}F NMR

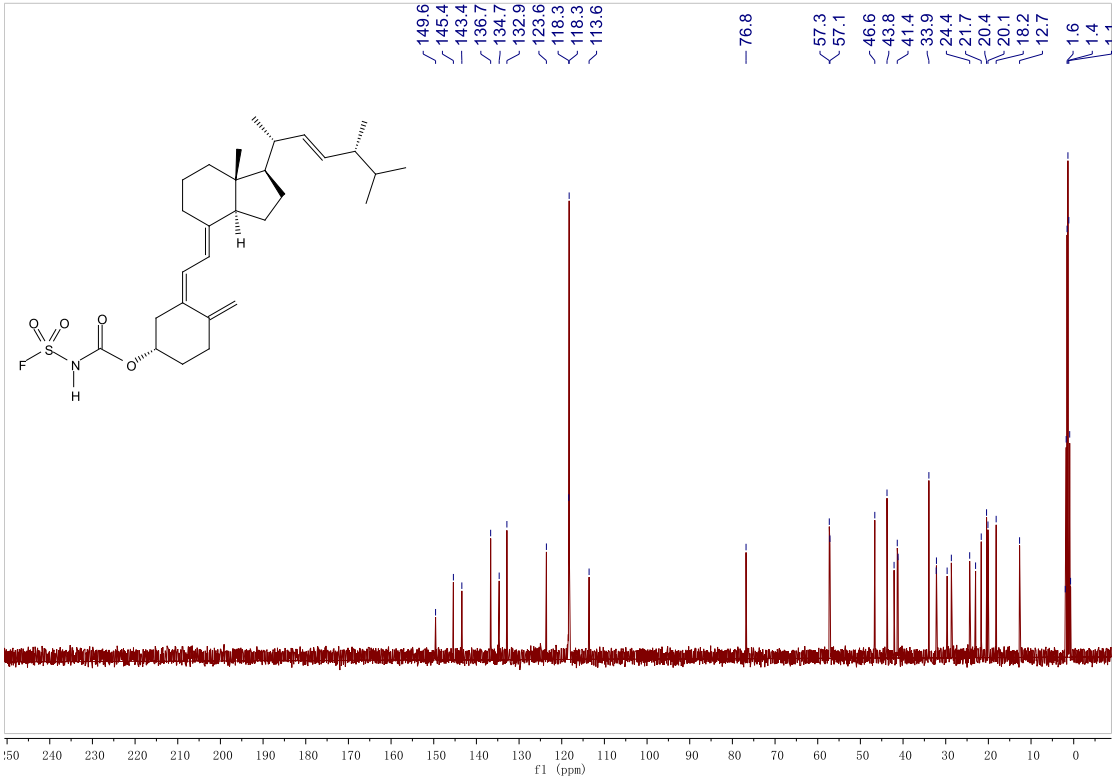


*N- ergocalciferoxycarbonyl-fluorsulfurylamid (**2-11**).*

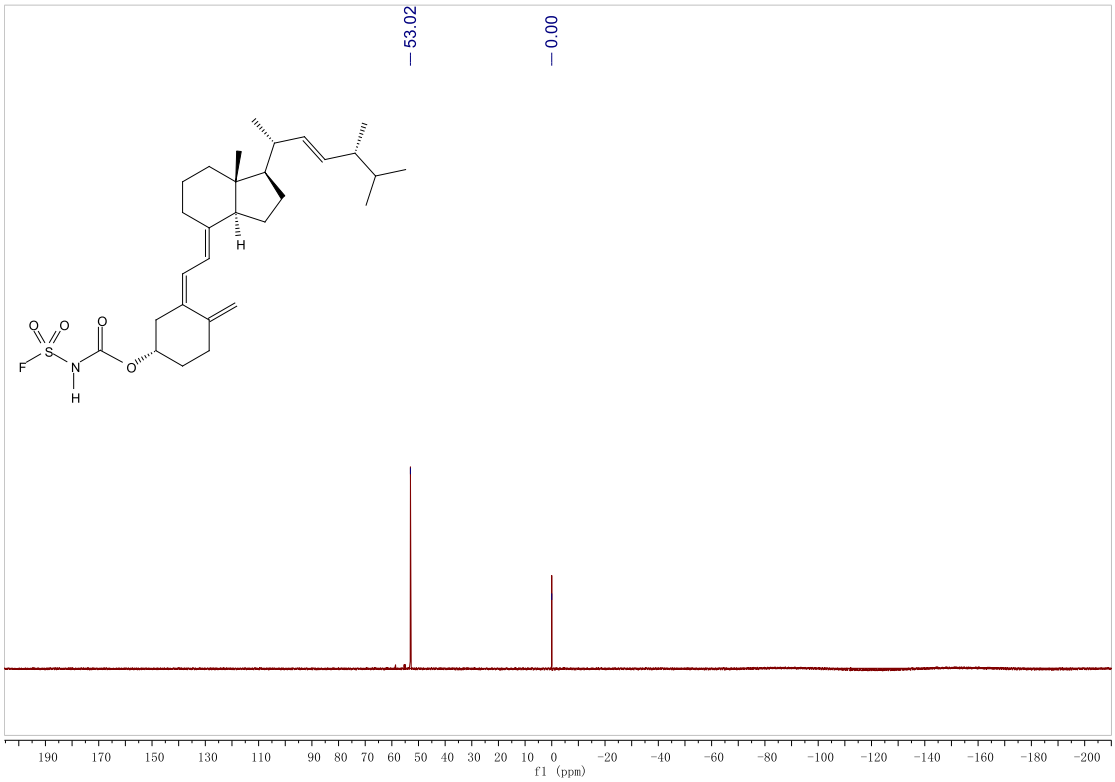
^{1}H NMR



^{13}C NMR

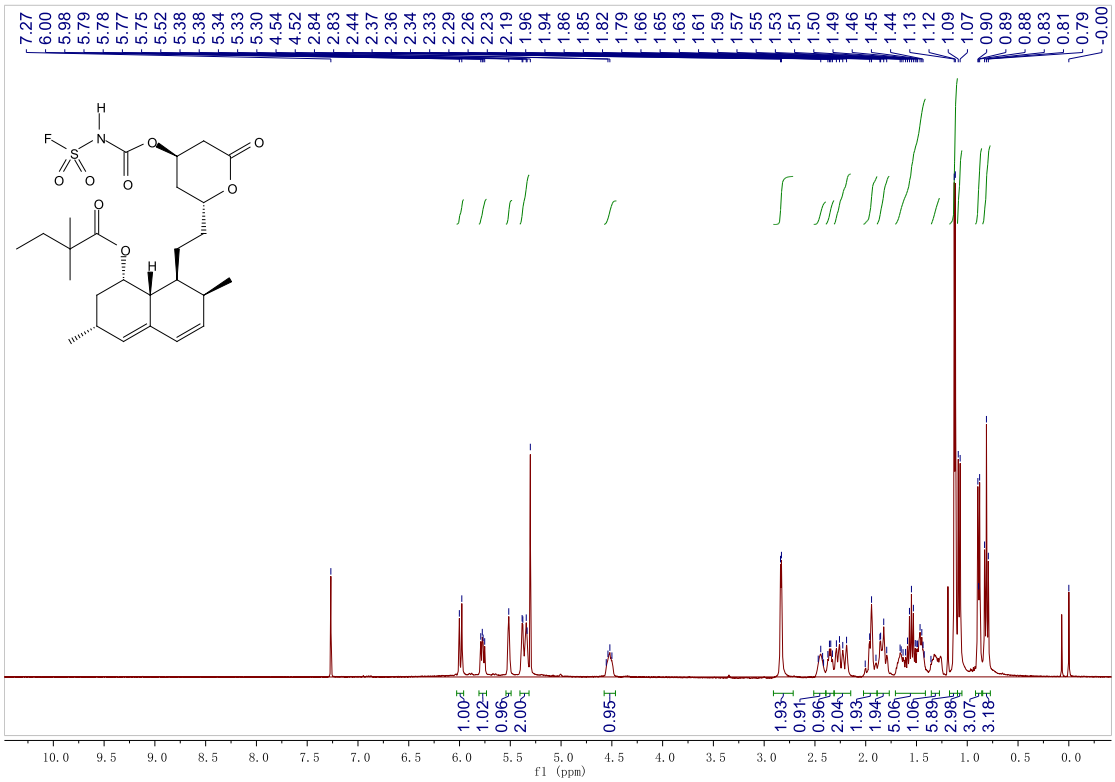


^{19}F NMR

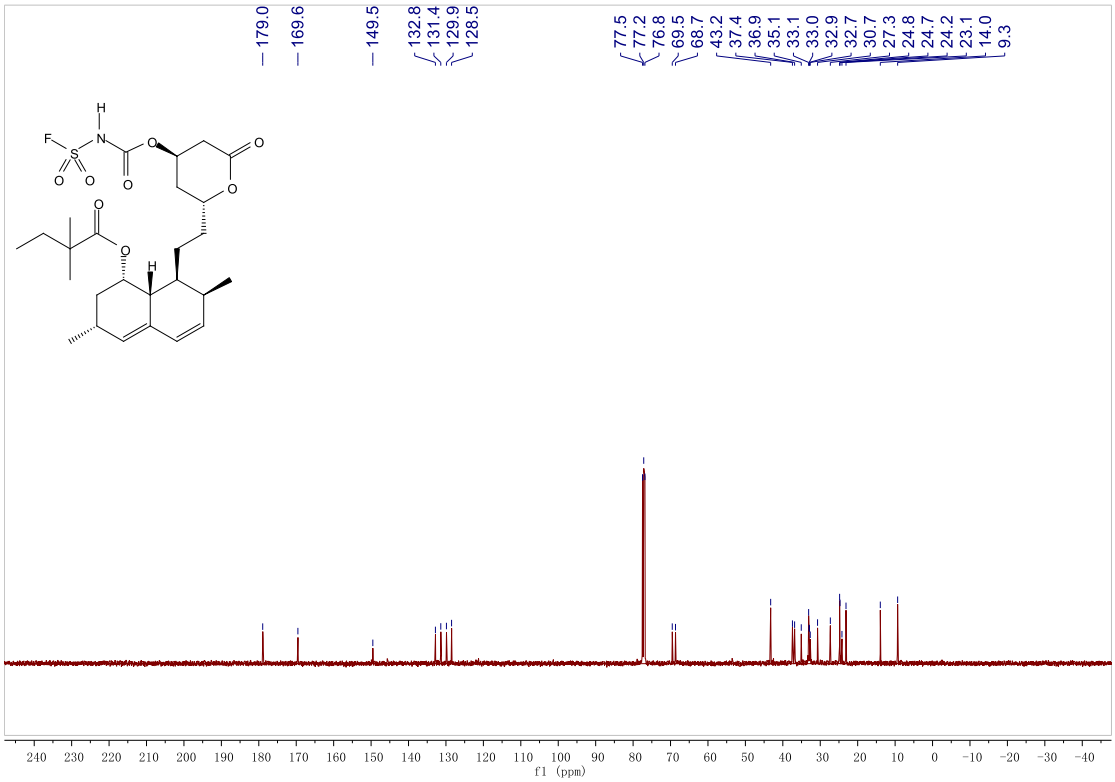


*N- Simvastatinoxycarbonyl-fluorsulfurylamid (**2-12**).*

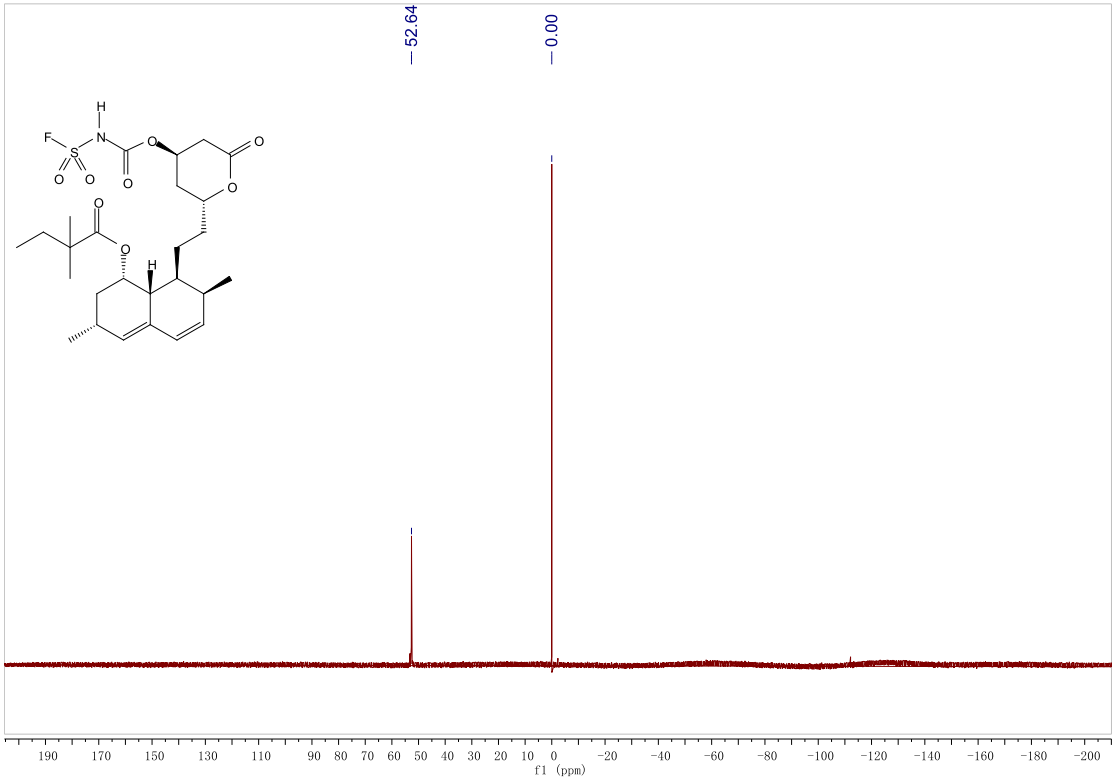
^{1}H NMR



^{13}C NMR

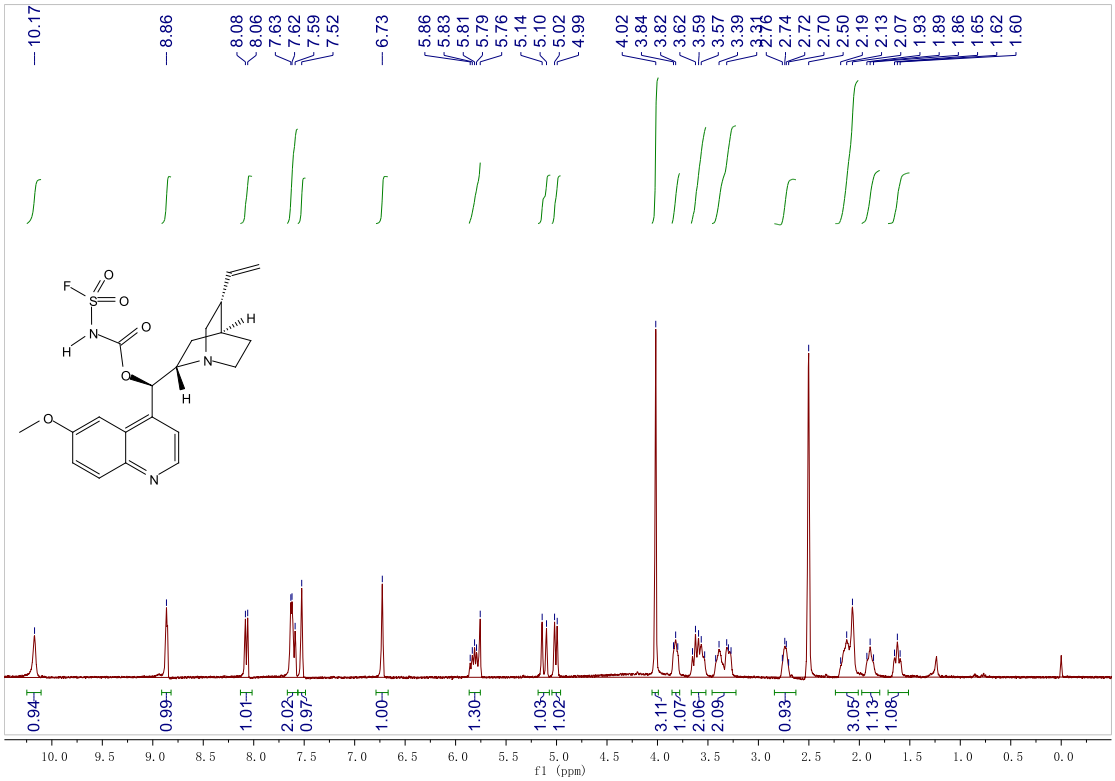


^{19}F NMR

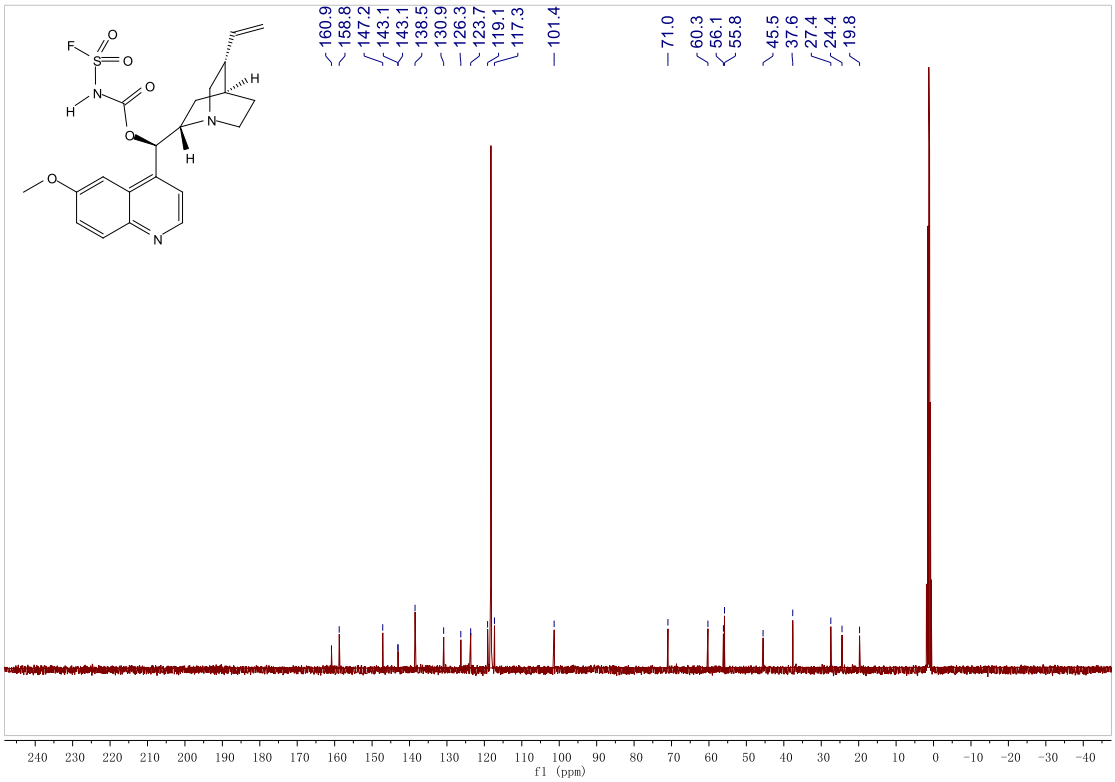


*N- Cinchonan-9-oxycarbonyl-fluorsulfurylamid (**2-13**)*

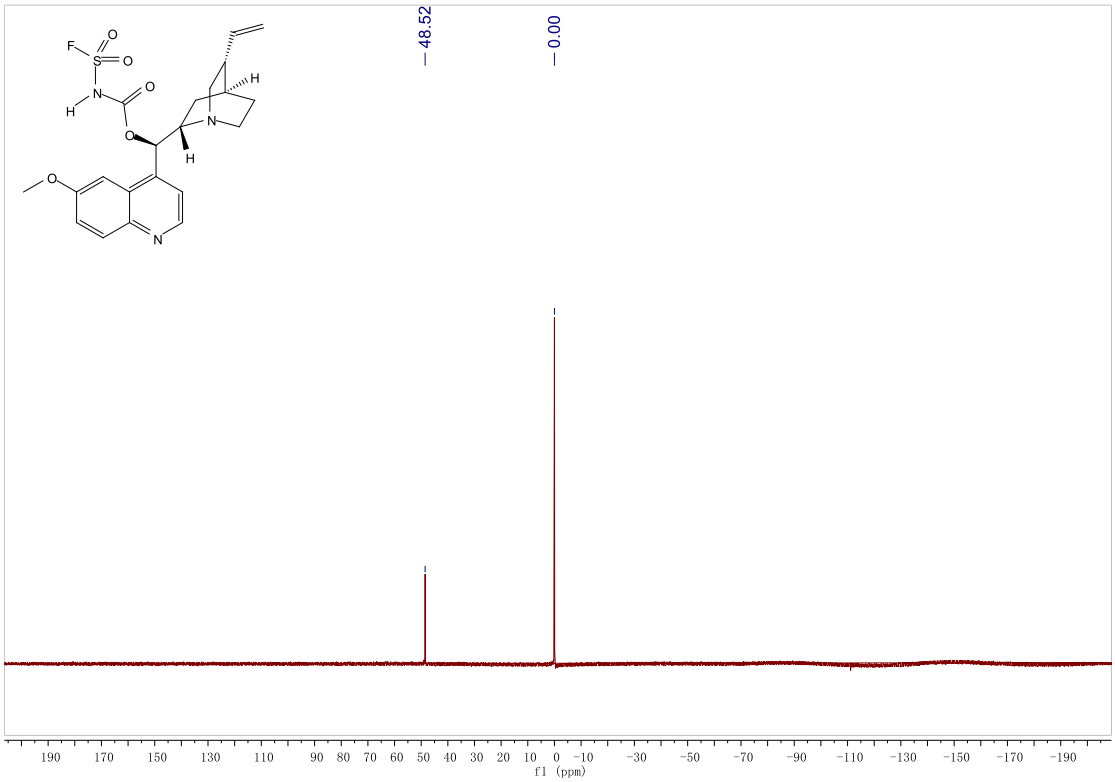
^{1}H NMR



^{13}C NMR

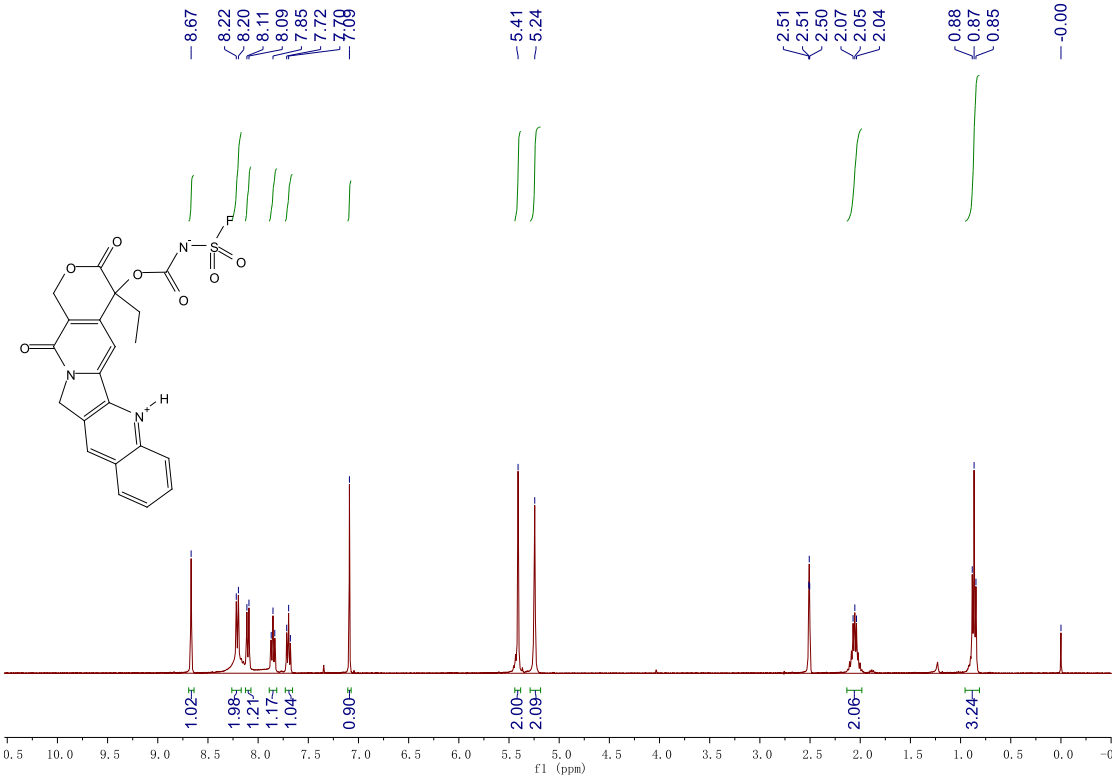


^{19}F NMR

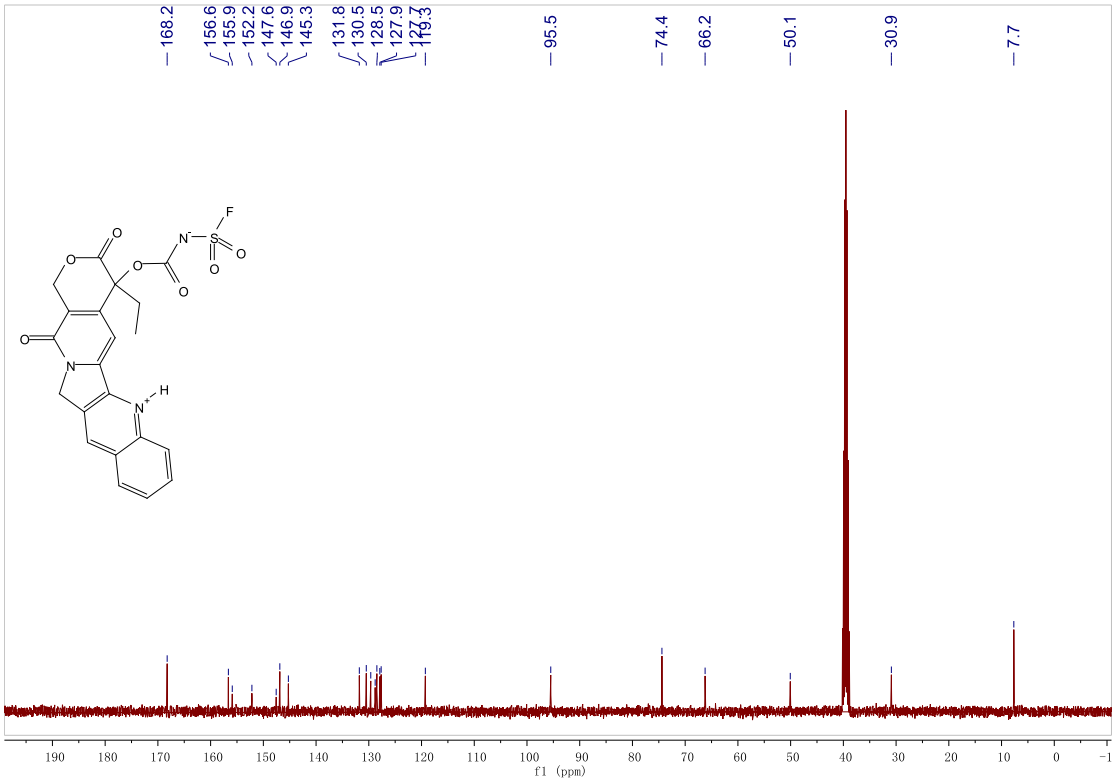


*N-camptothecinoxycarbonyl-fluorsulfurylamid (**2-14**).*

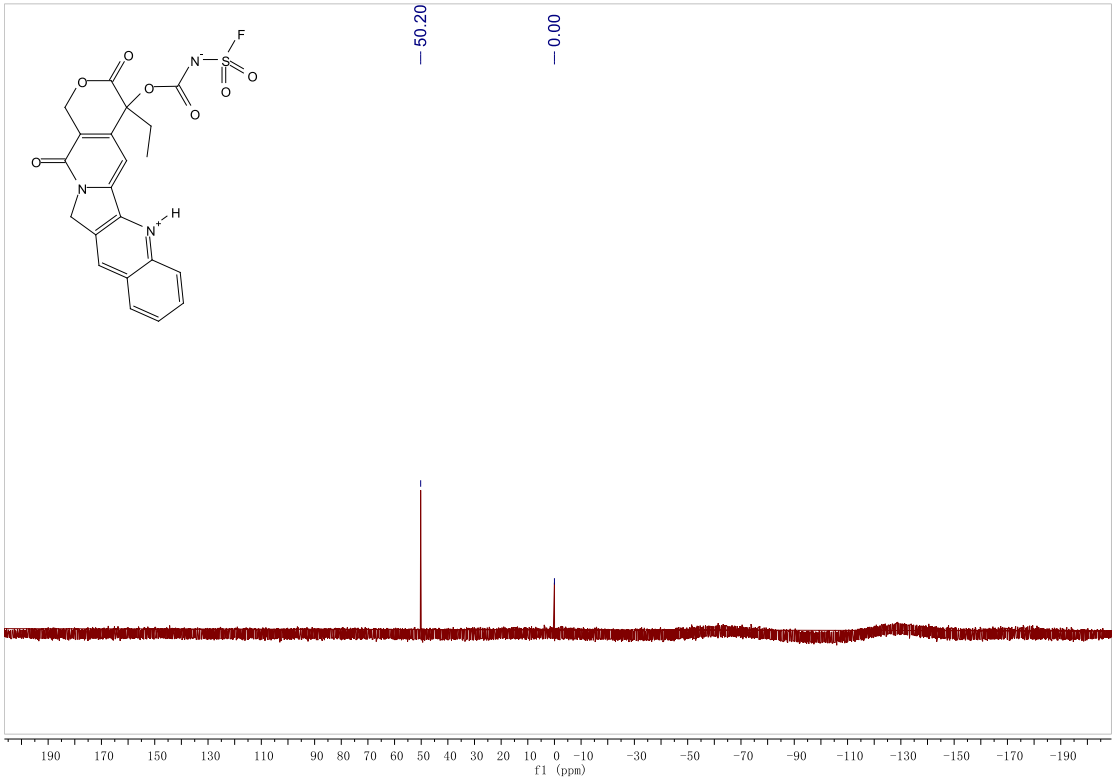
^{1}H NMR



^{13}C NMR

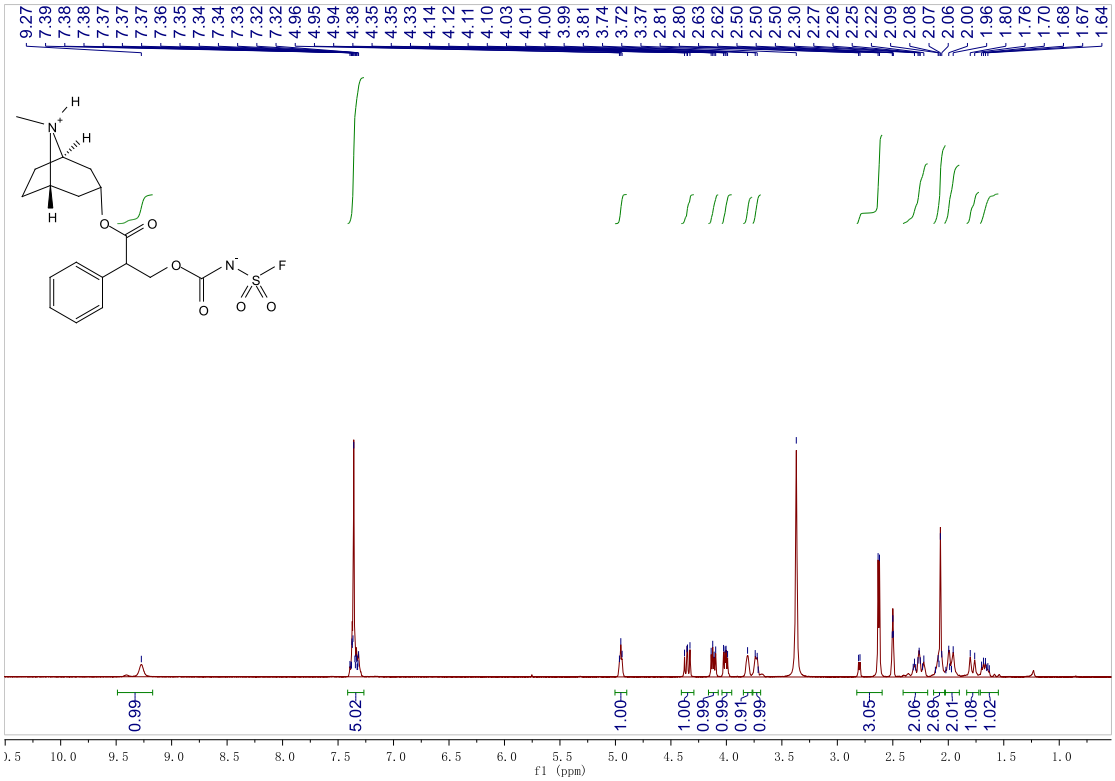


^{19}F NMR

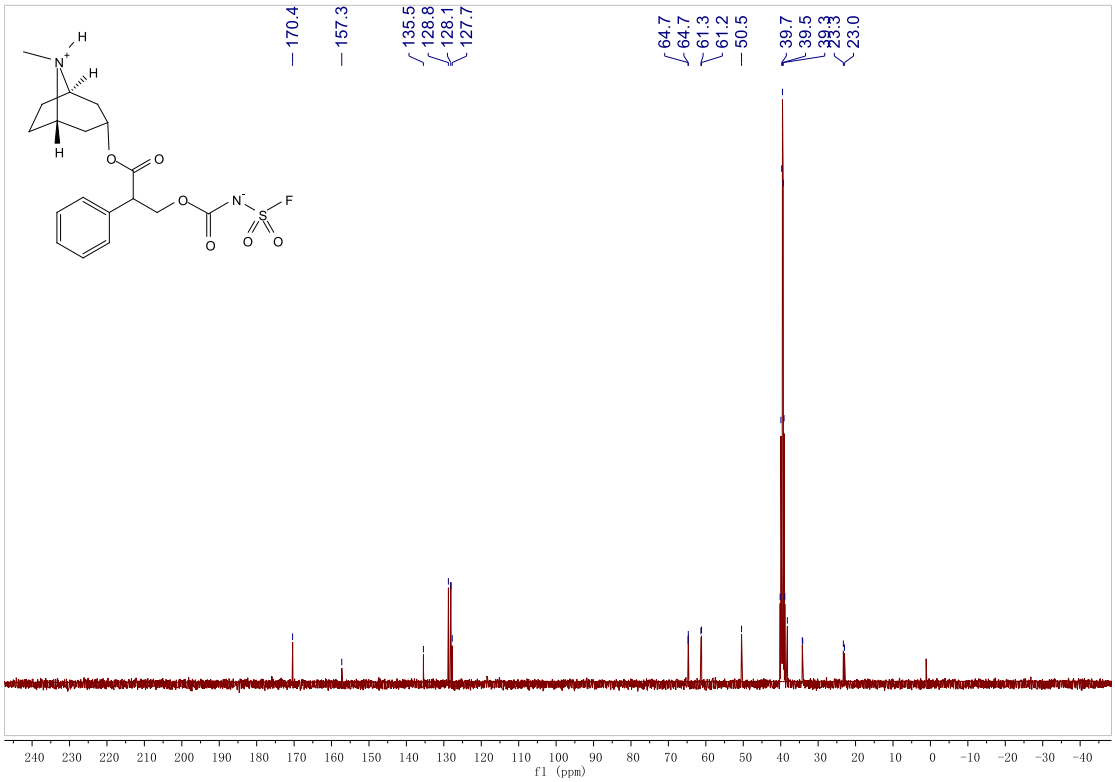


*N- atropinoxycarbonyl-fluorsulfurylamid (**2-15**).*

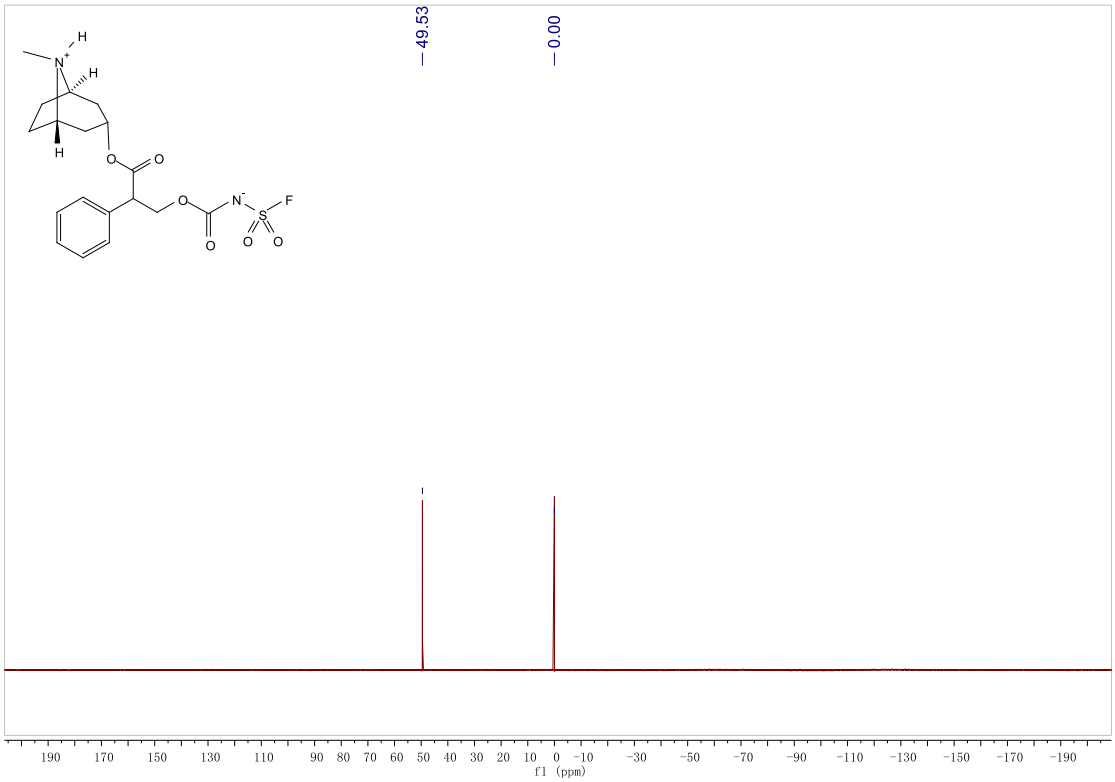
^{1}H NMR



^{13}C NMR

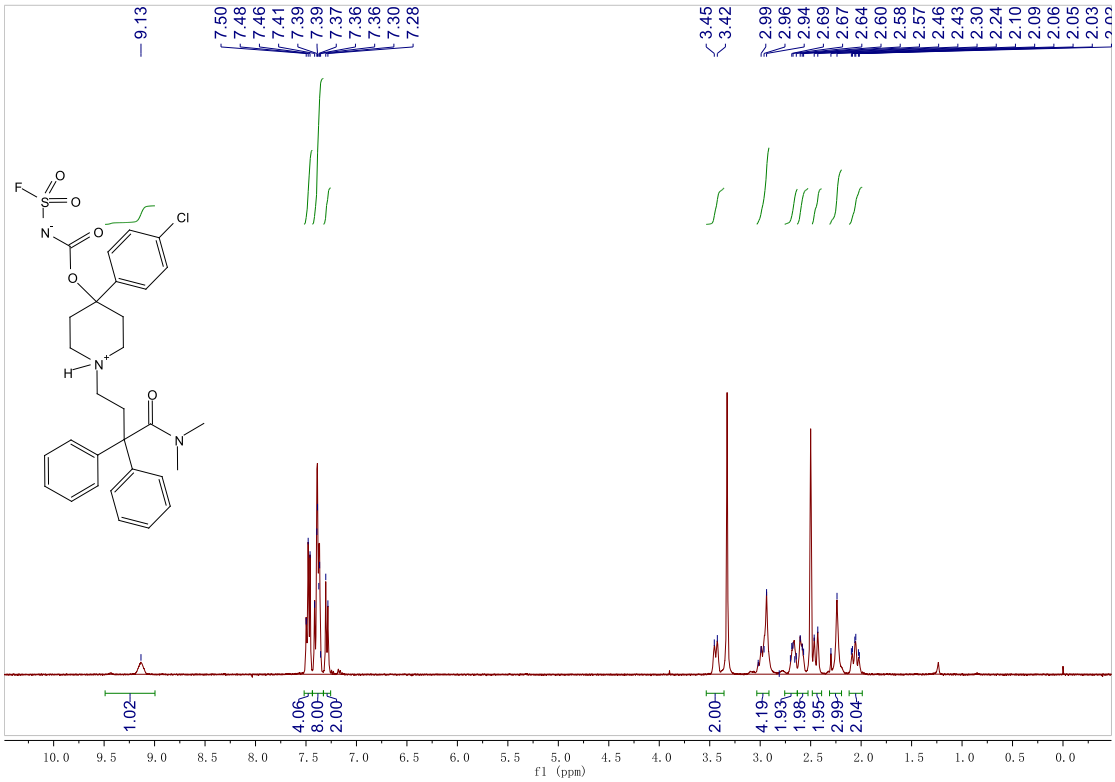


^{19}F NMR

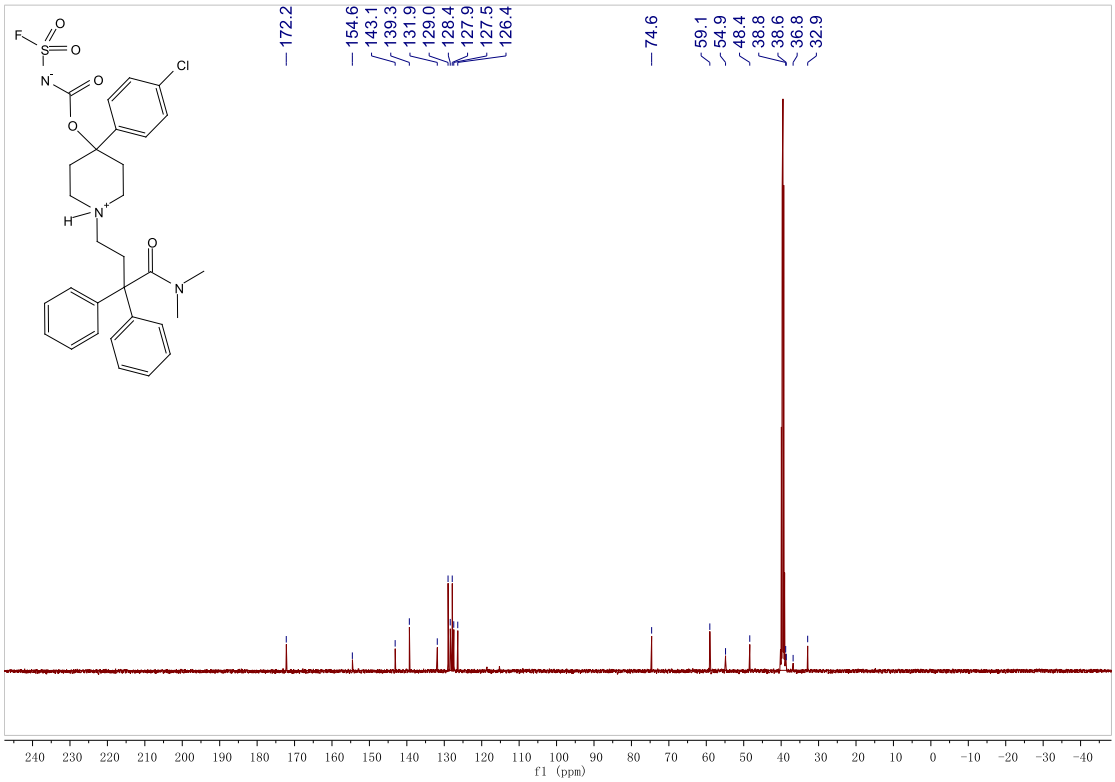


*N- loperamidoxycarbonyl-fluorsulfurylamid (**2-16**)*

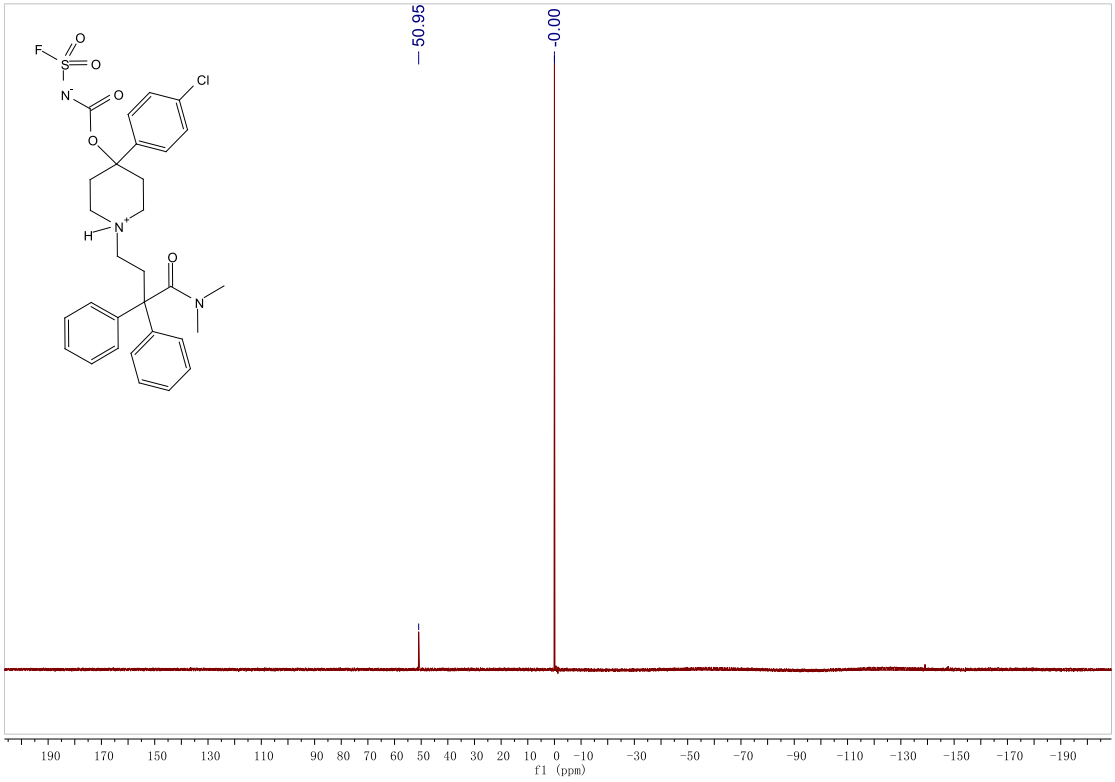
^{1}H NMR



^{13}C NMR

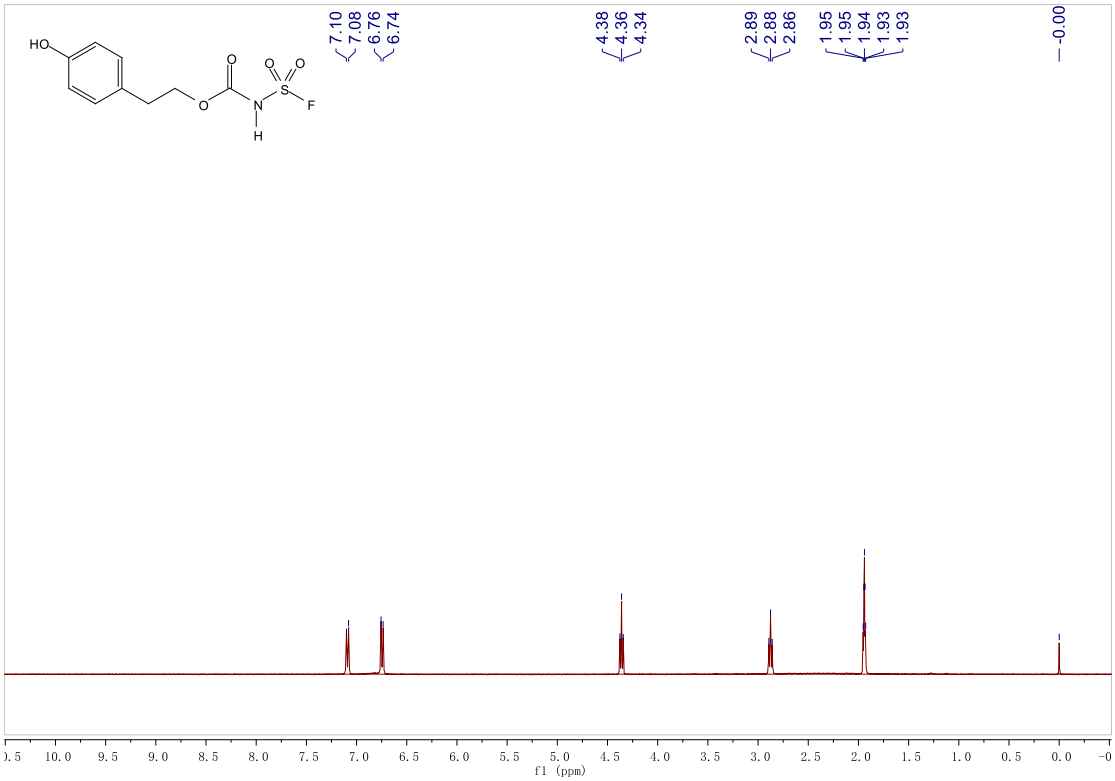


^{19}F NMR

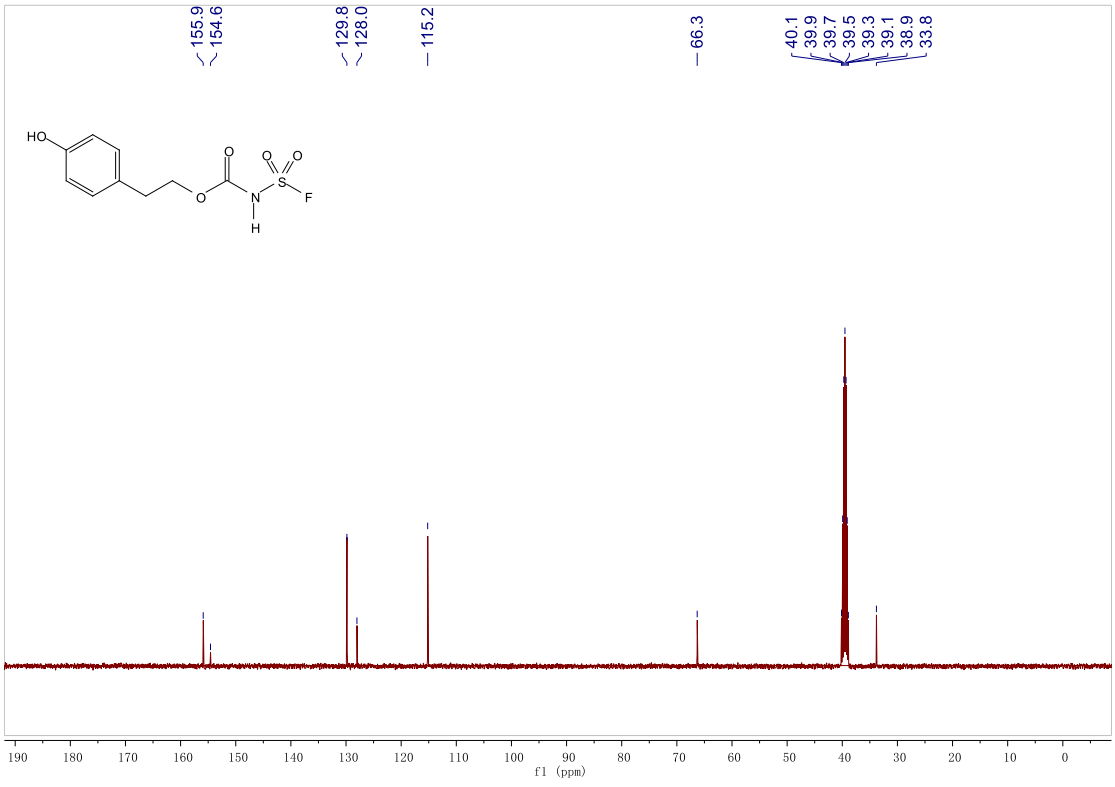


N-4-Hydroxyphenethyl aethoxycarbonyl-fluorsulfurylamid ***(2-17)***.

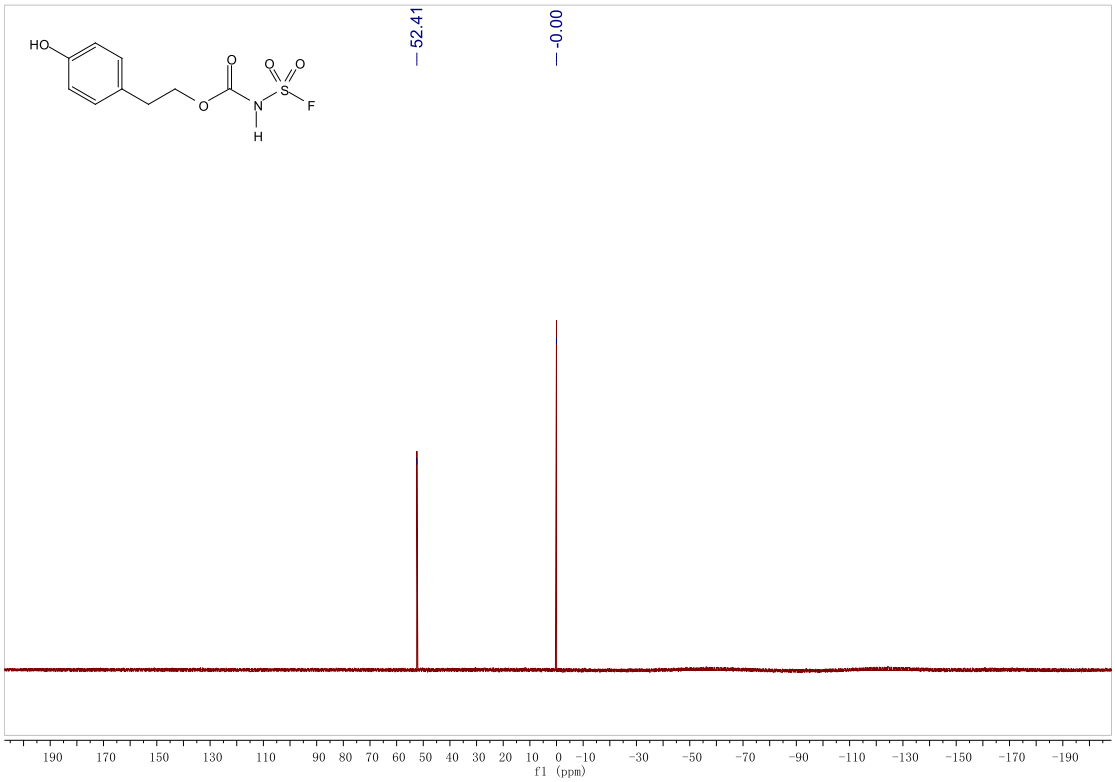
^{1}H NMR



^{13}C NMR

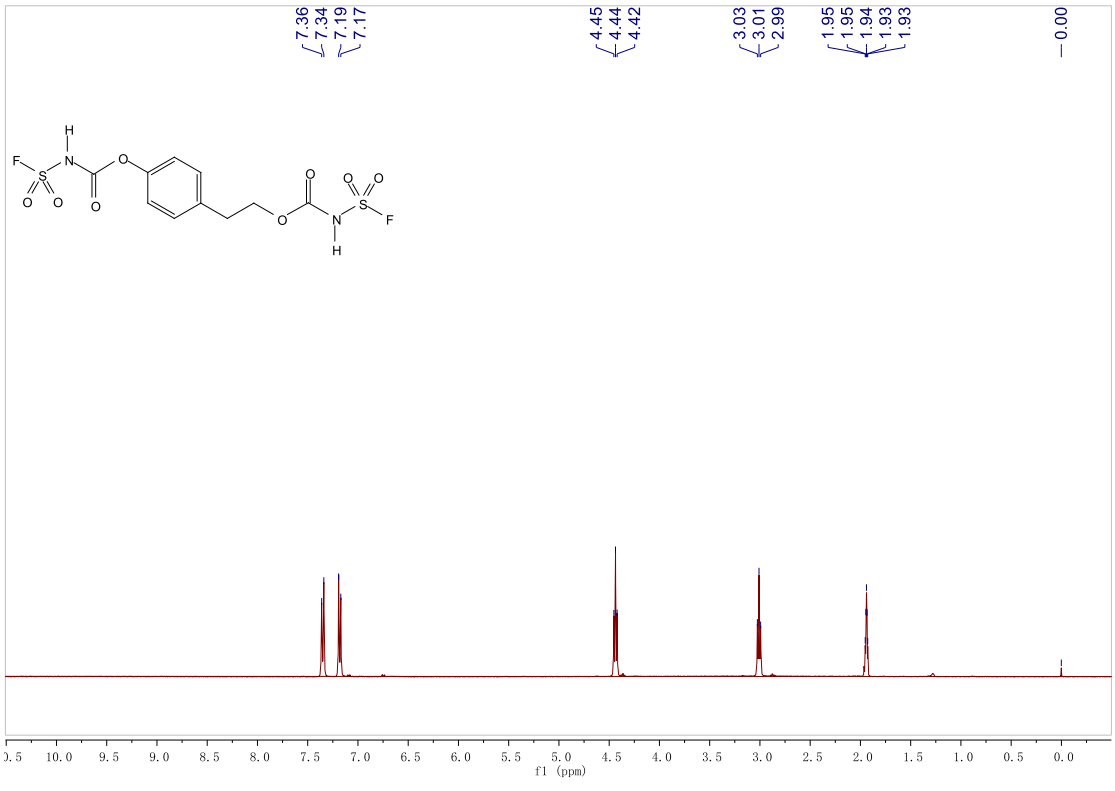


^{19}F NMR

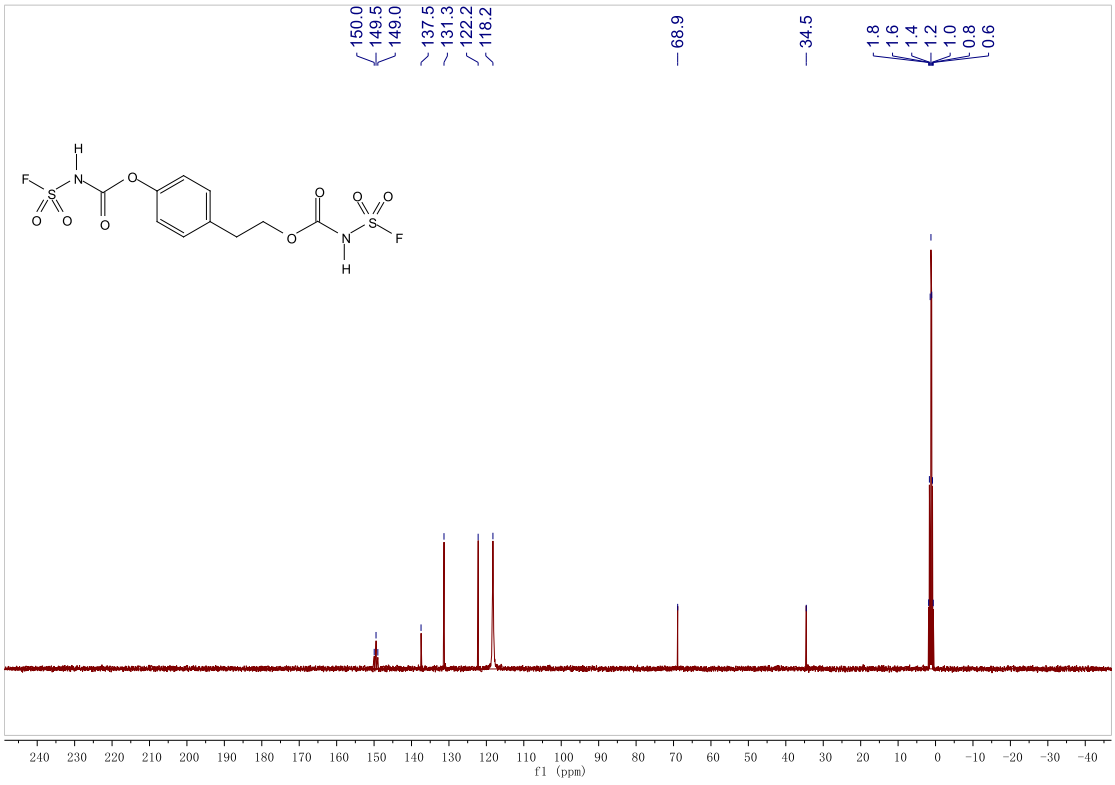


*N-4-Hydroxyphenethyl aethoxycarbonyl-fluorsulfurylamid (**2-18**).*

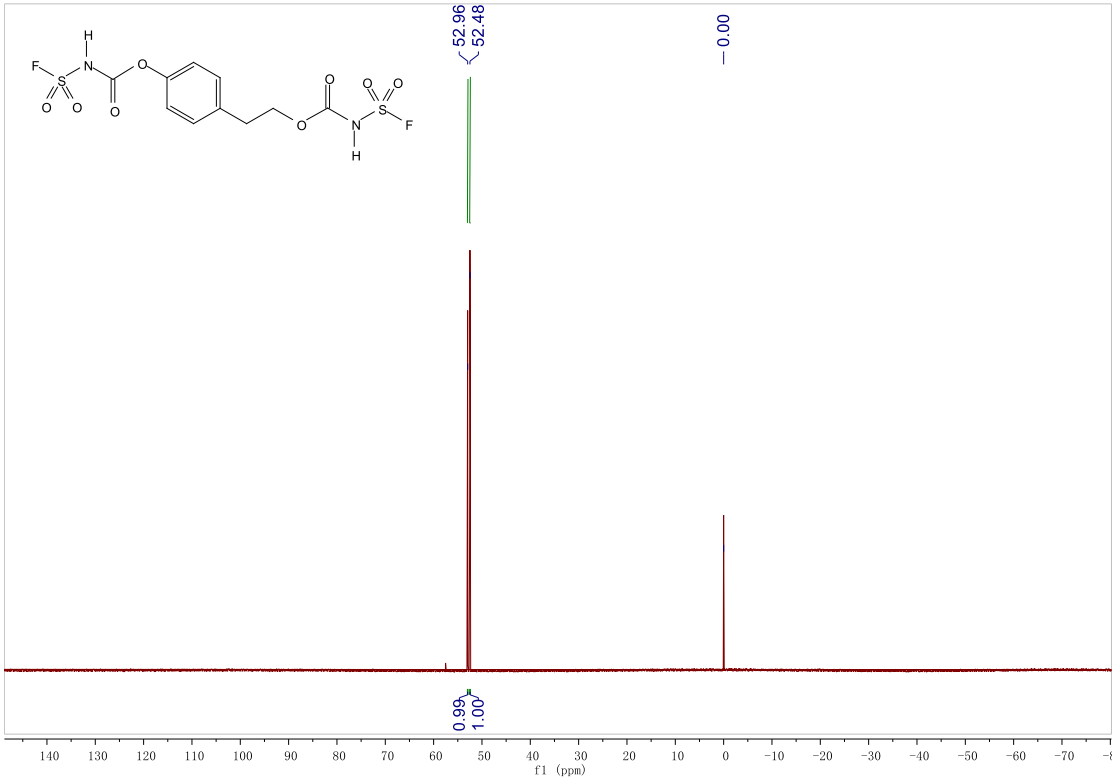
^{1}H NMR



^{13}C NMR

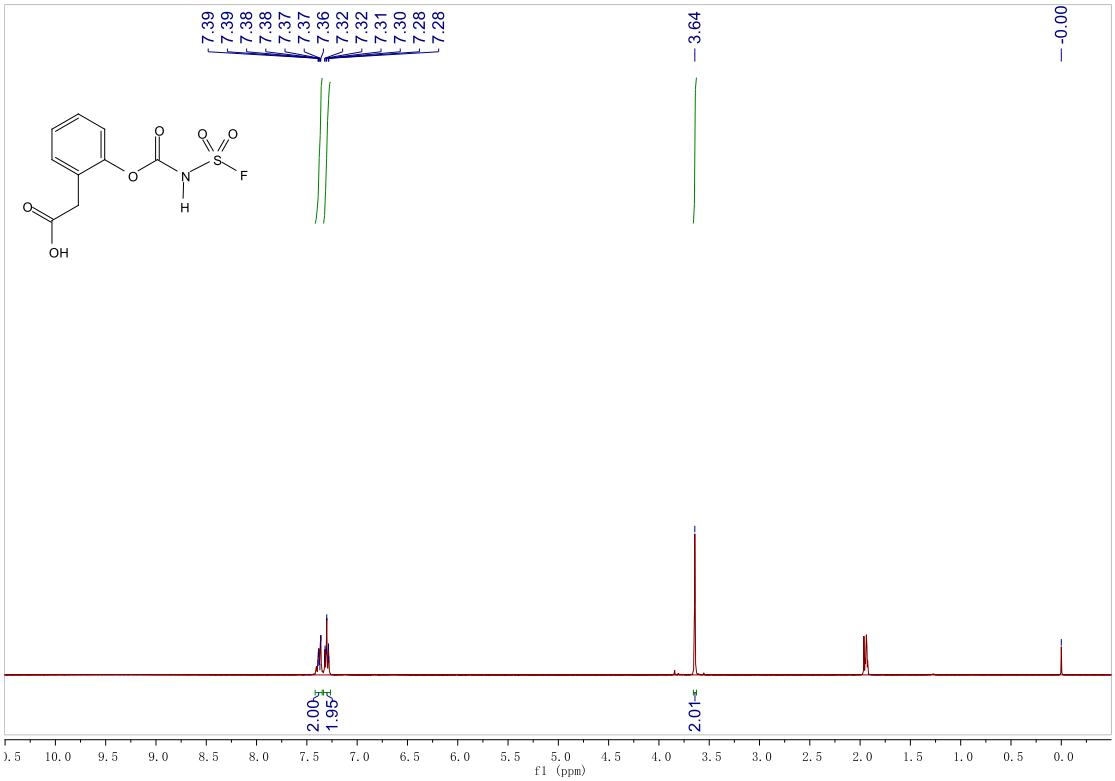


^{19}F NMR

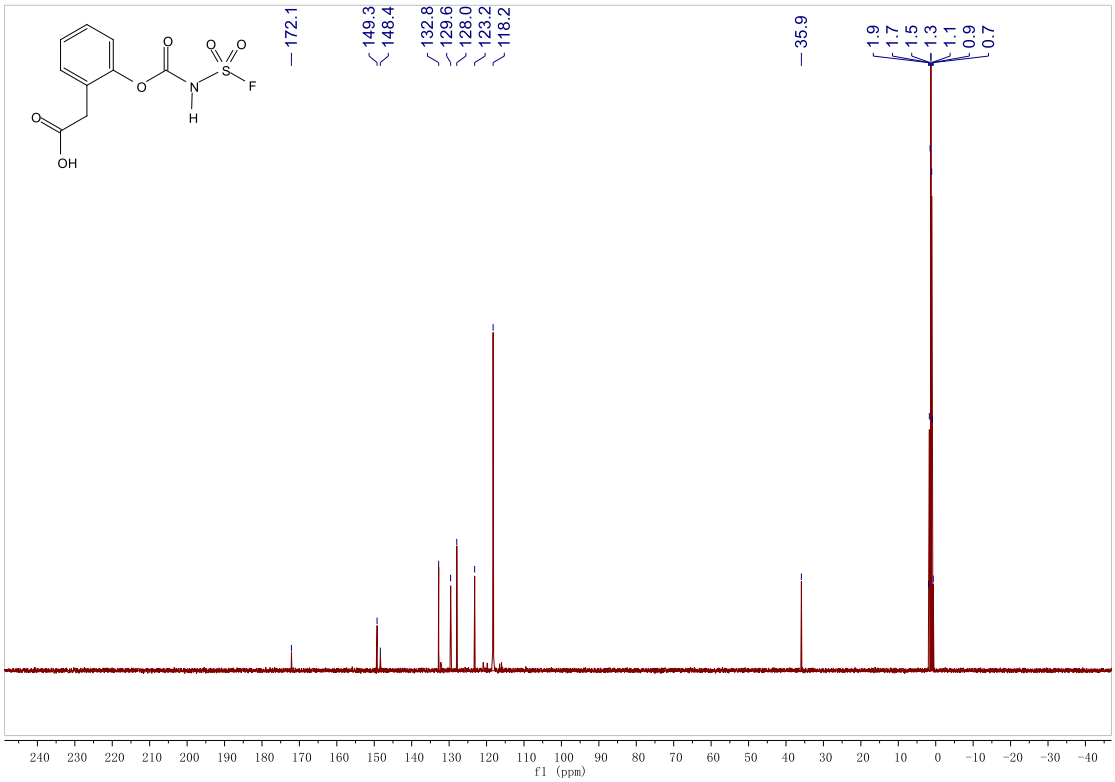


N-Fluorsulfonyl-carbaminsaeure-2-ethyl carboxylphenylester ***(2-19).***

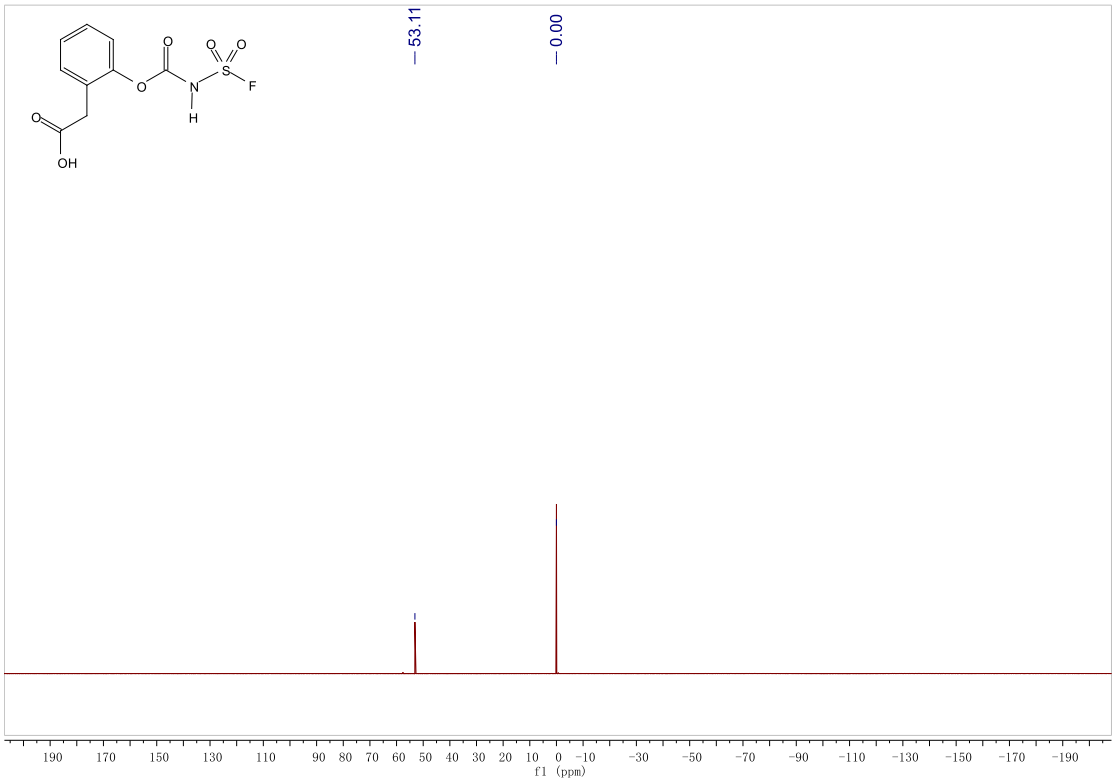
^{1}H NMR



^{13}C NMR

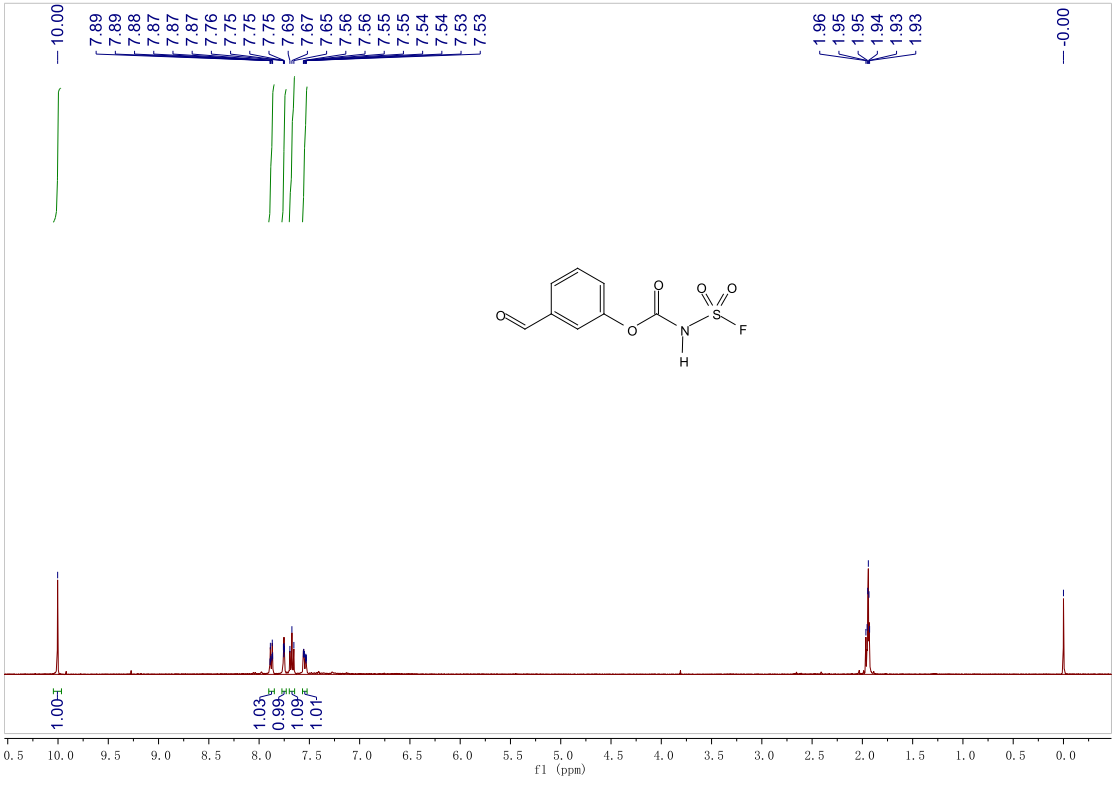


^{19}F NMR

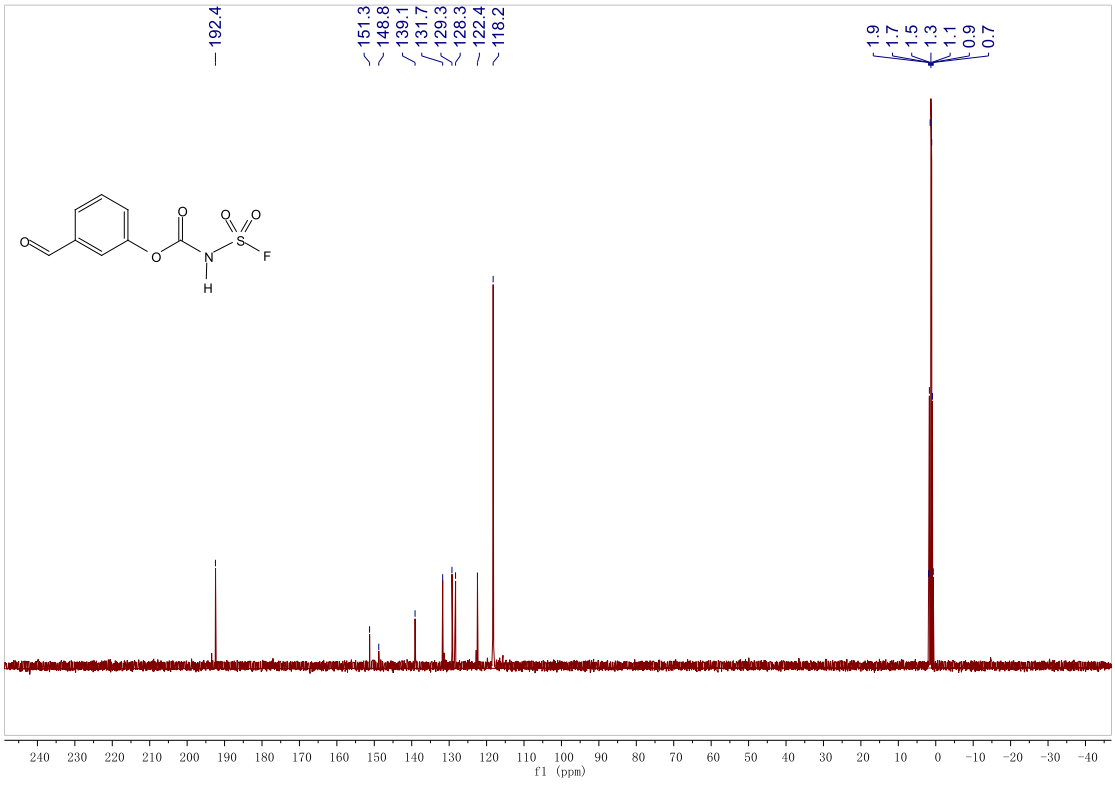


*N-Fluorsulfonyl-carbaminsaeure-3-aldehydephenylester (**2-20**).*

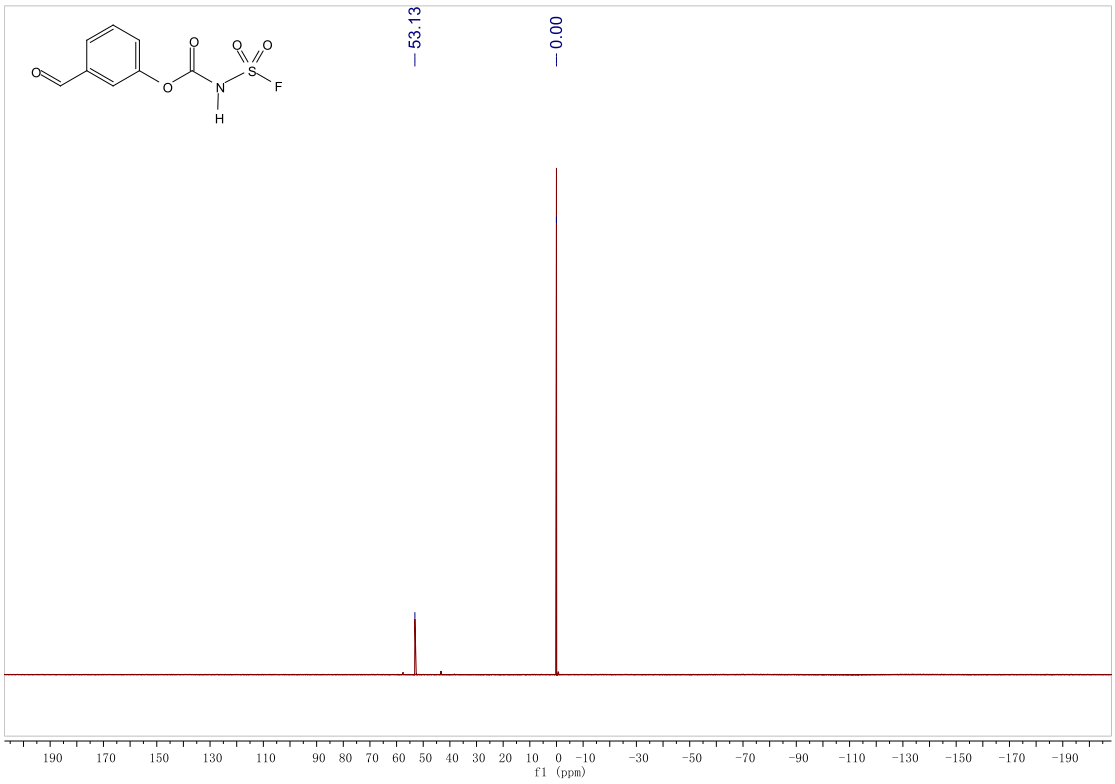
^{1}H NMR



^{13}C NMR

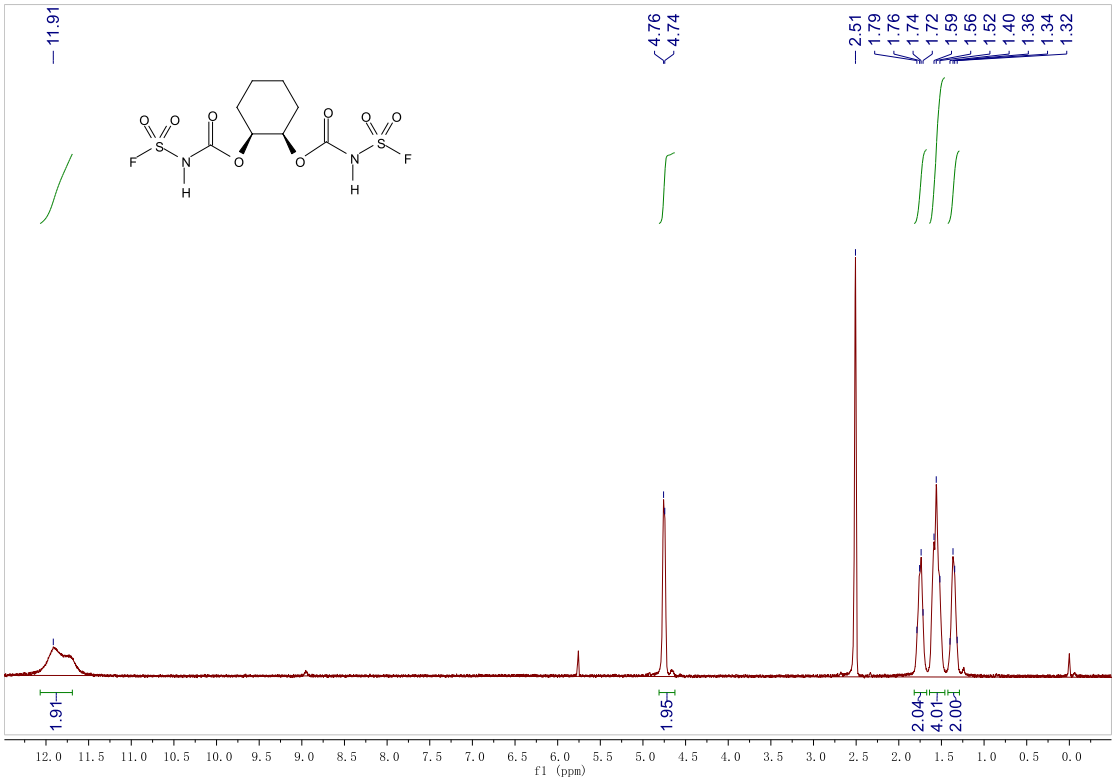


^{19}F NMR

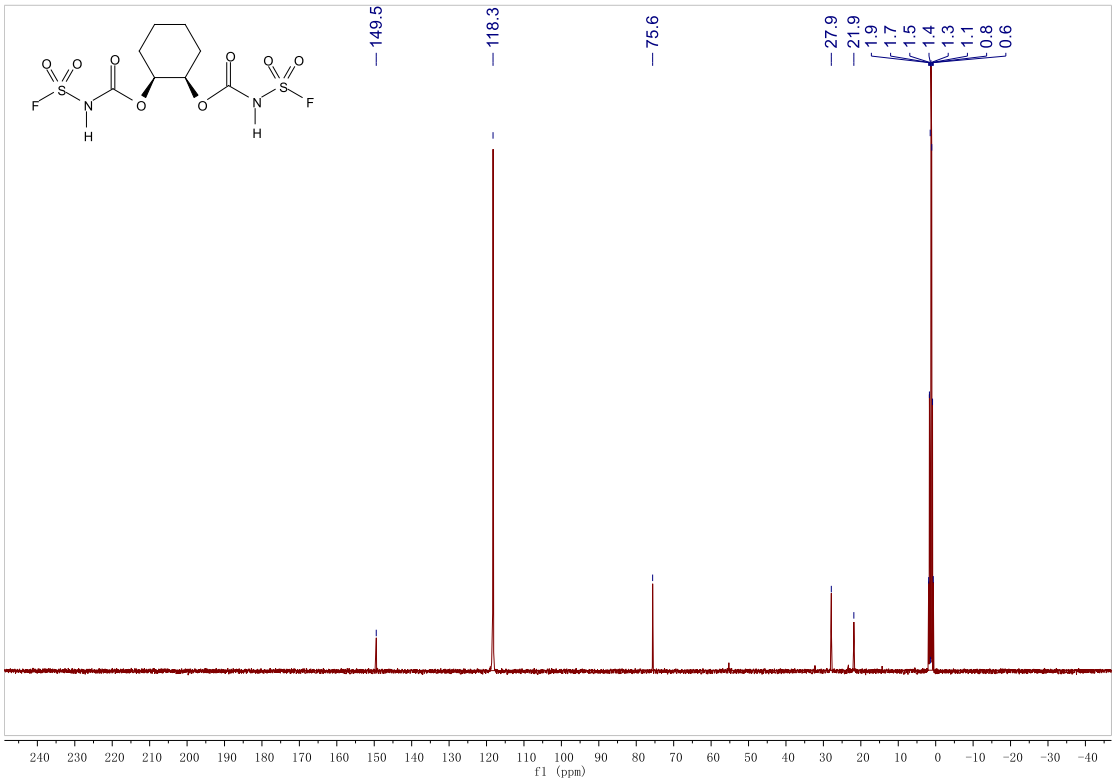


*N-cis-cyclohexane-1,2-dioxycarbonyl-fluorsulfurylamid (**2-22**).*

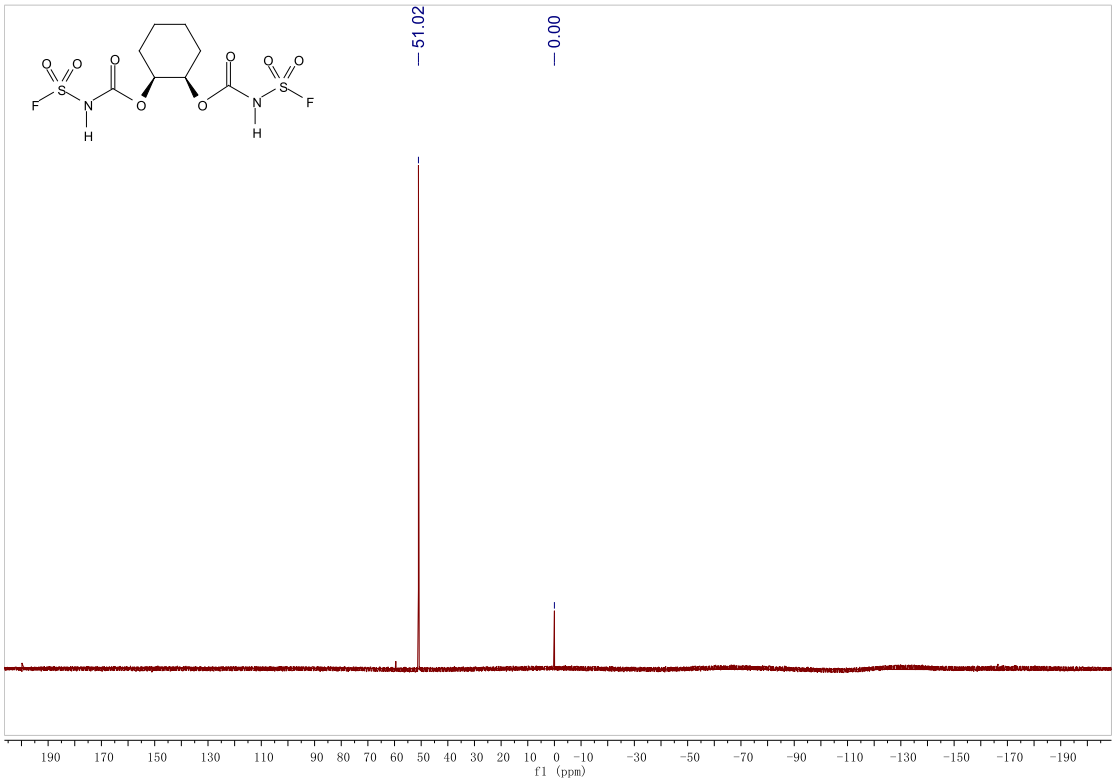
^{1}H NMR



^{13}C NMR

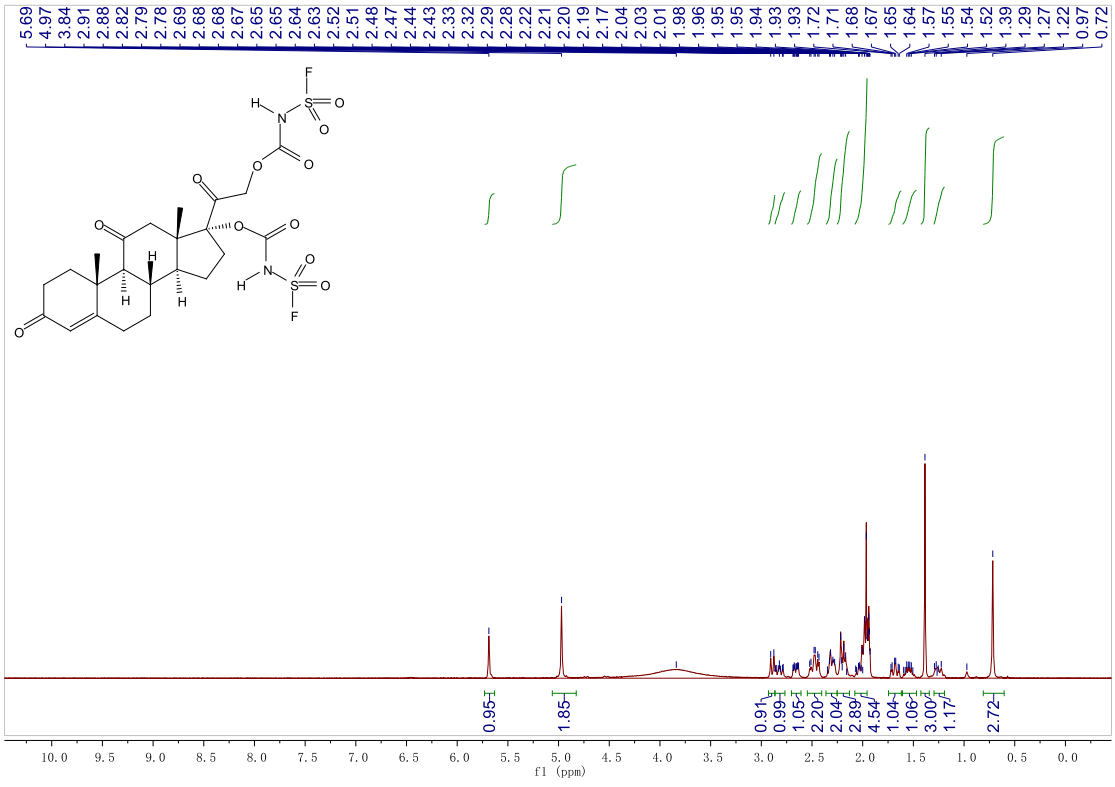


^{19}F NMR

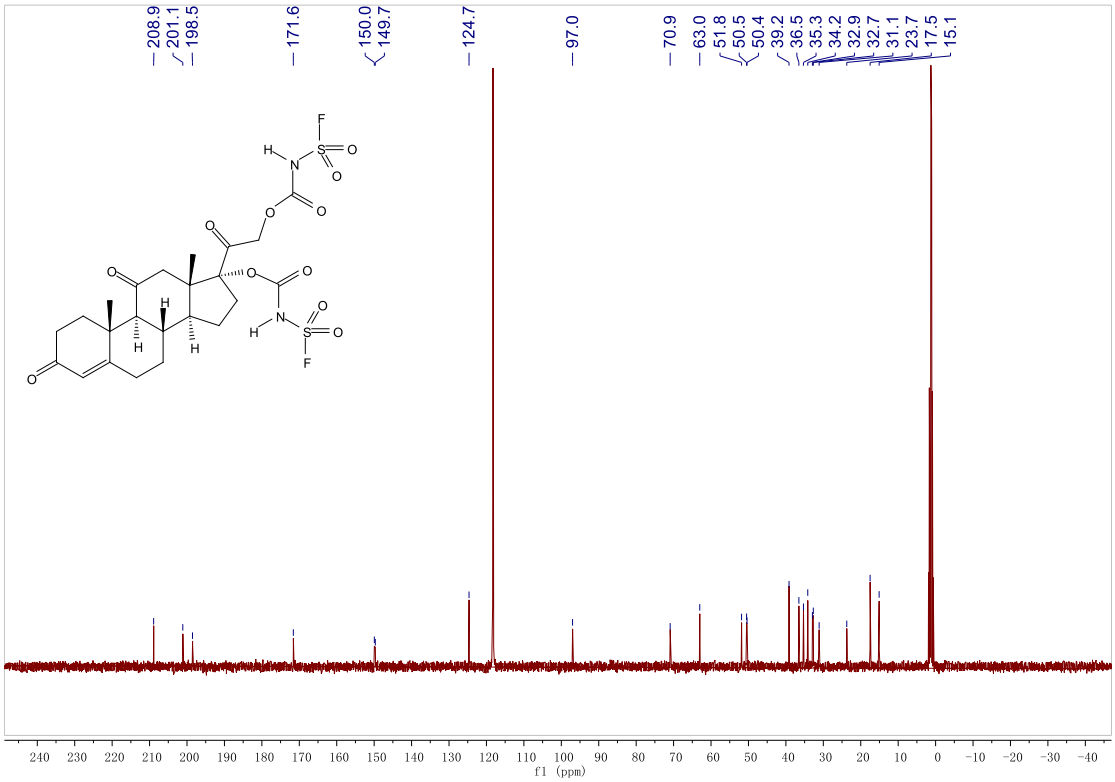


*N- cortisonoxycarbonyl-fluorsulfurylamid (**2-22**).*

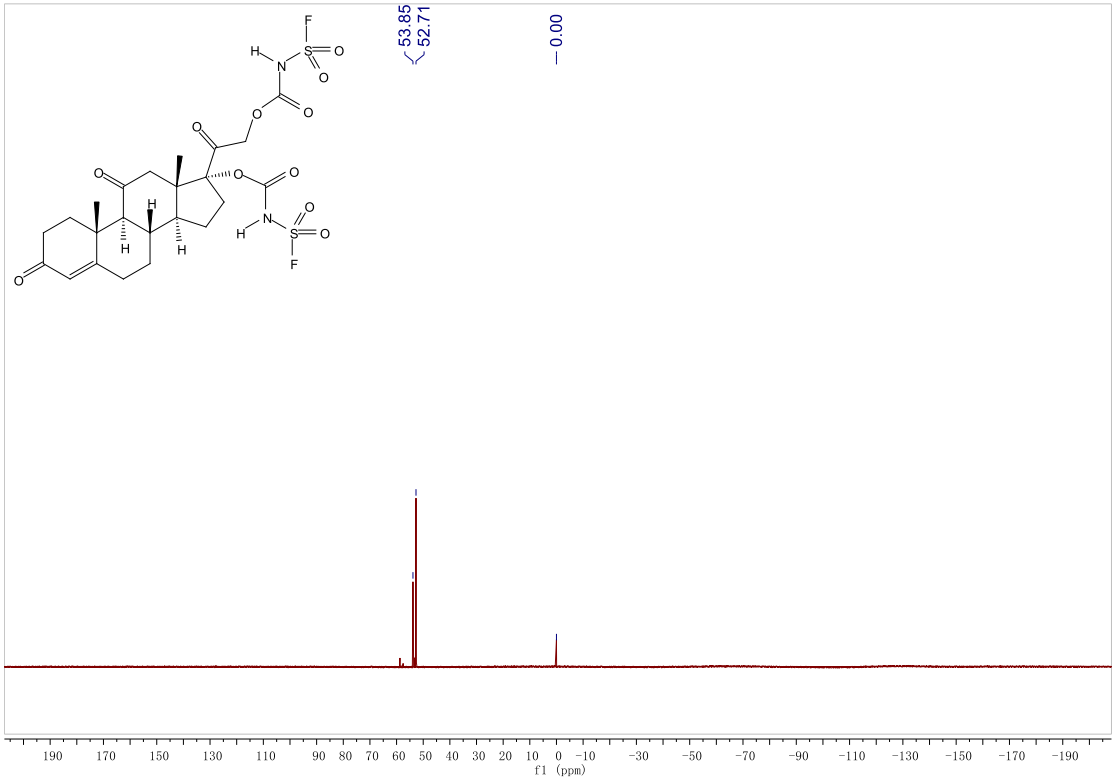
^{1}H NMR



^{13}C NMR

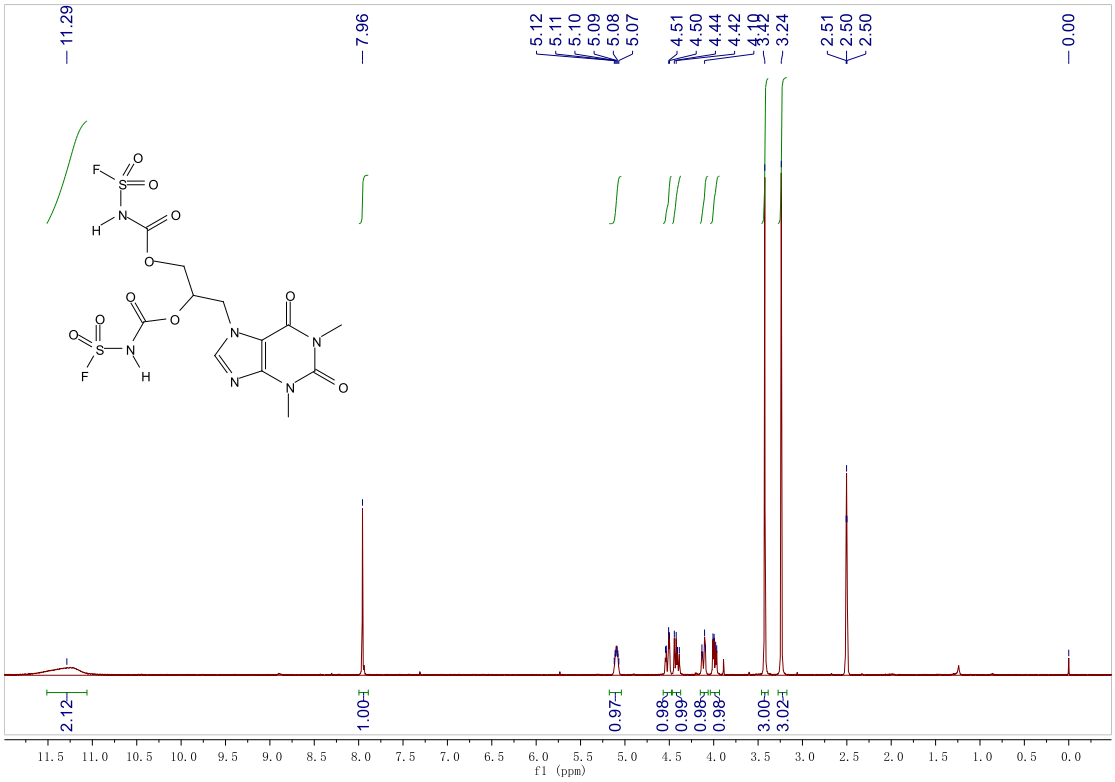


^{19}F NMR

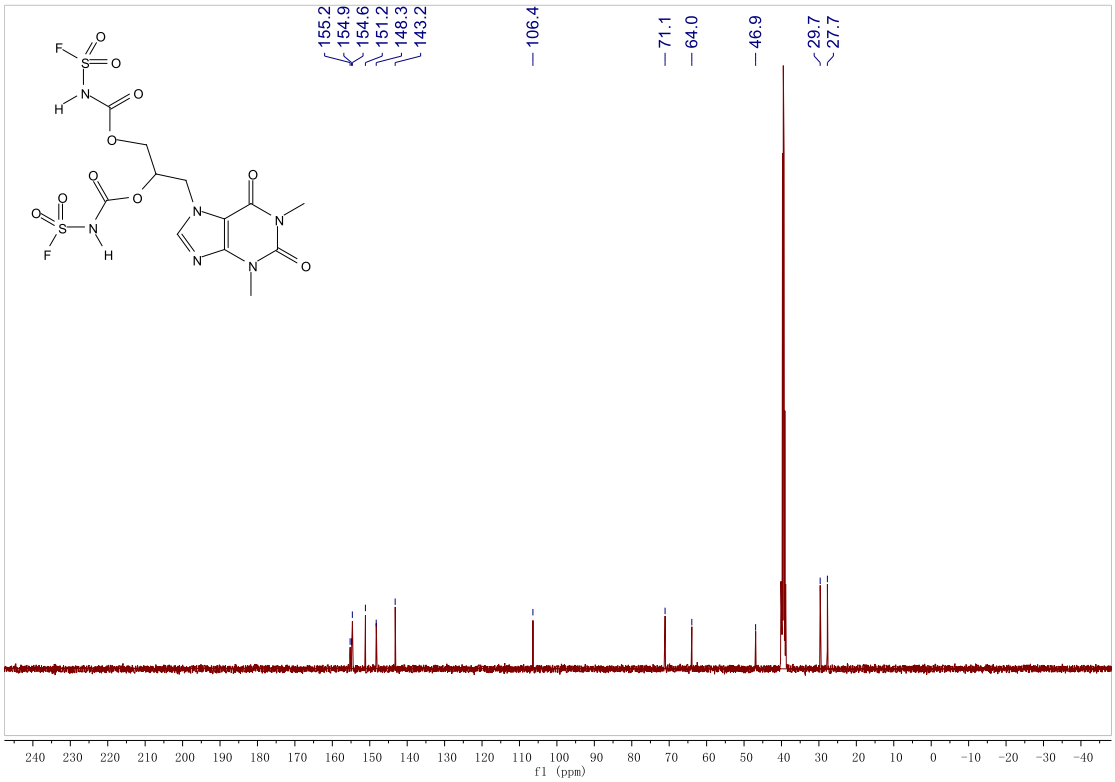


*N- diprophyllinoxycarbonyl-fluorsulfurylamid (**2-23**).*

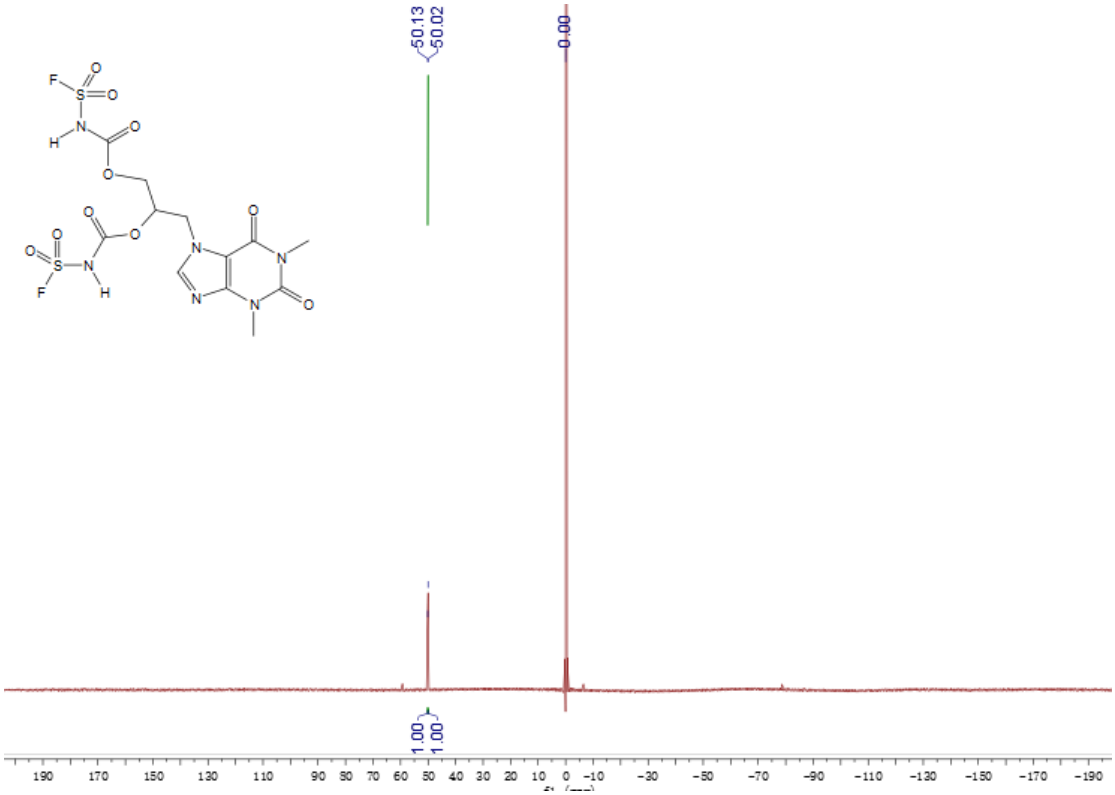
^{1}H NMR



^{13}C NMR

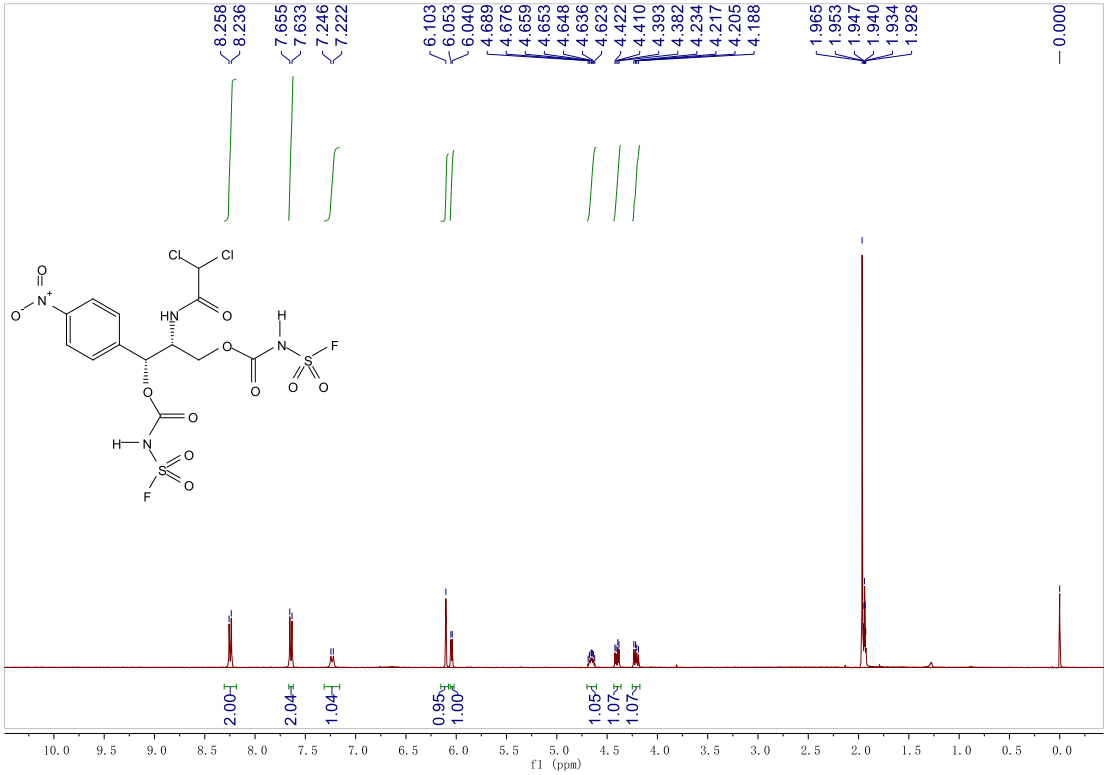


^{19}F NMR

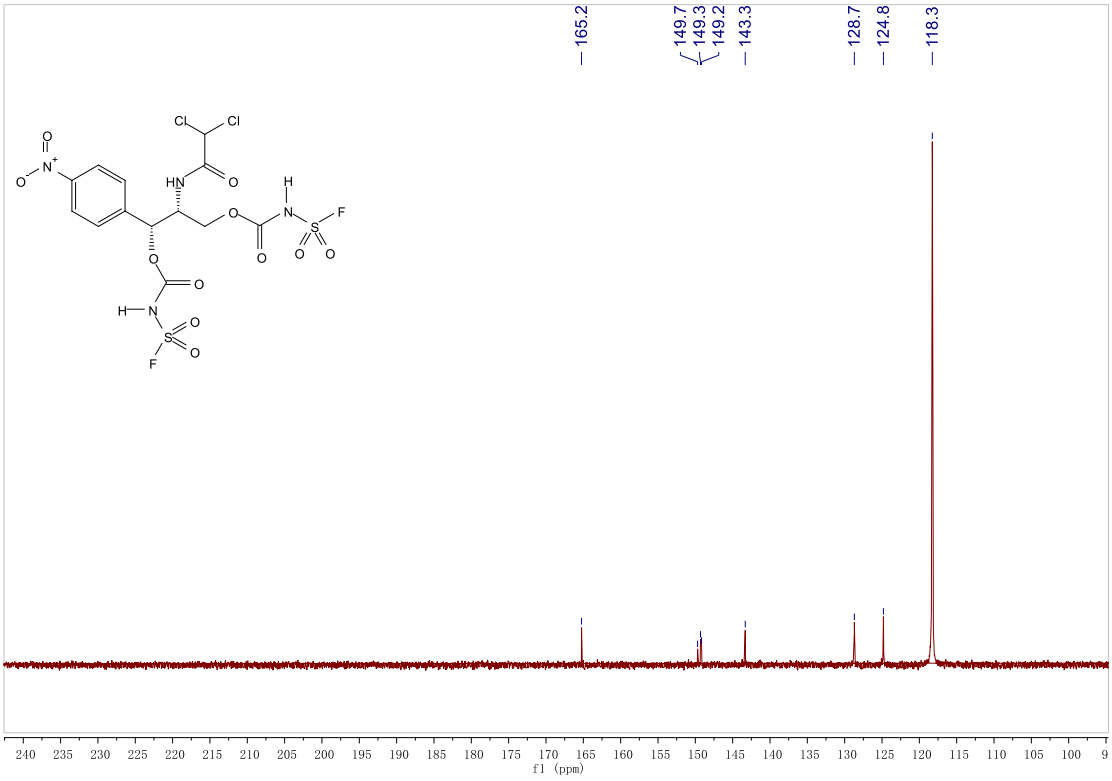


*N- chloramphenicoxycarbonyl-fluorsulfurylamid (**2-24**).*

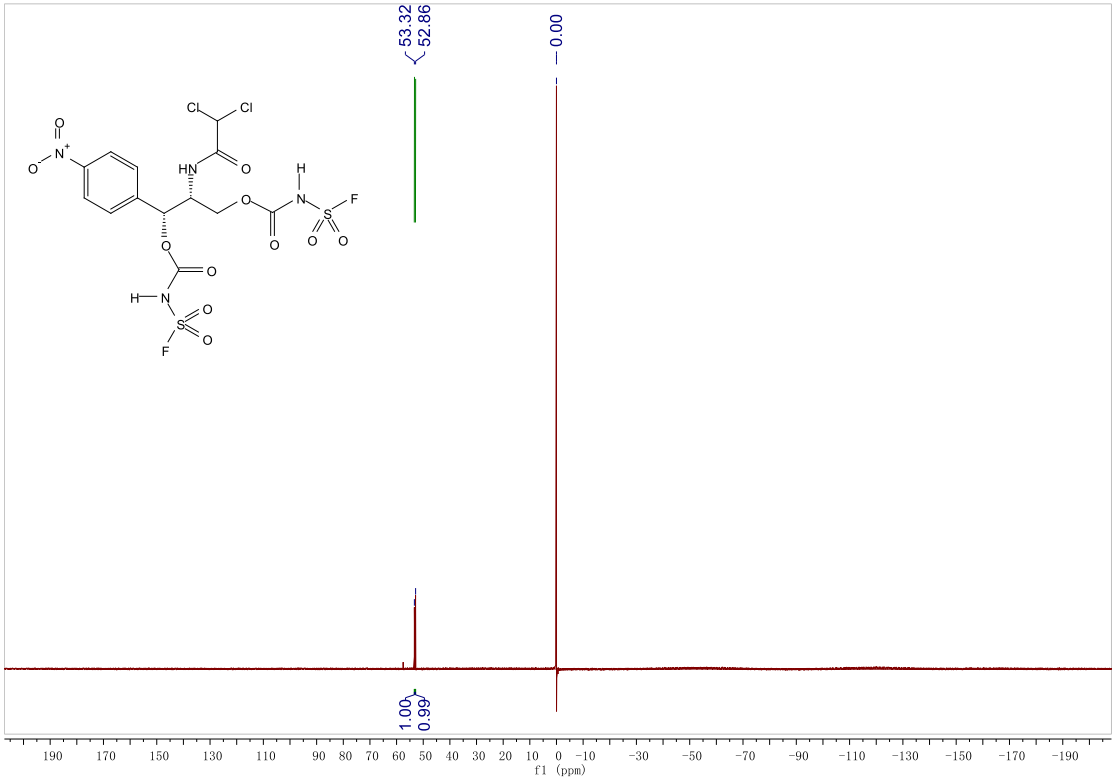
^{1}H NMR



^{13}C NMR

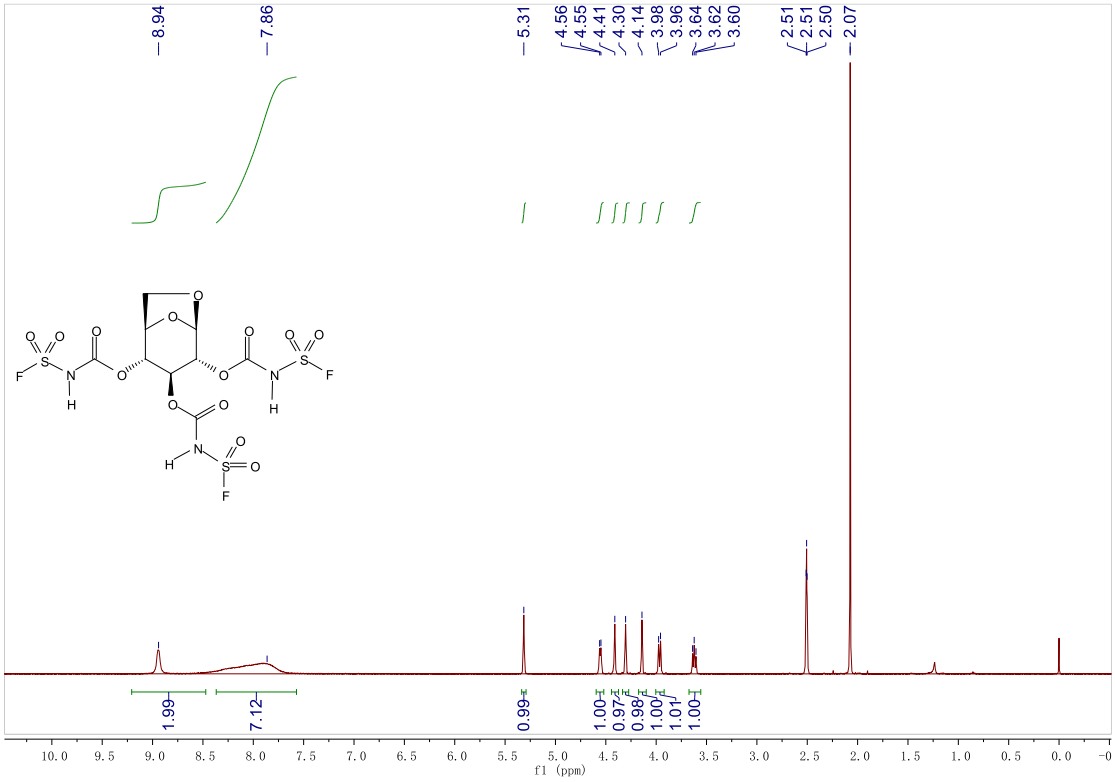


^{19}F NMR

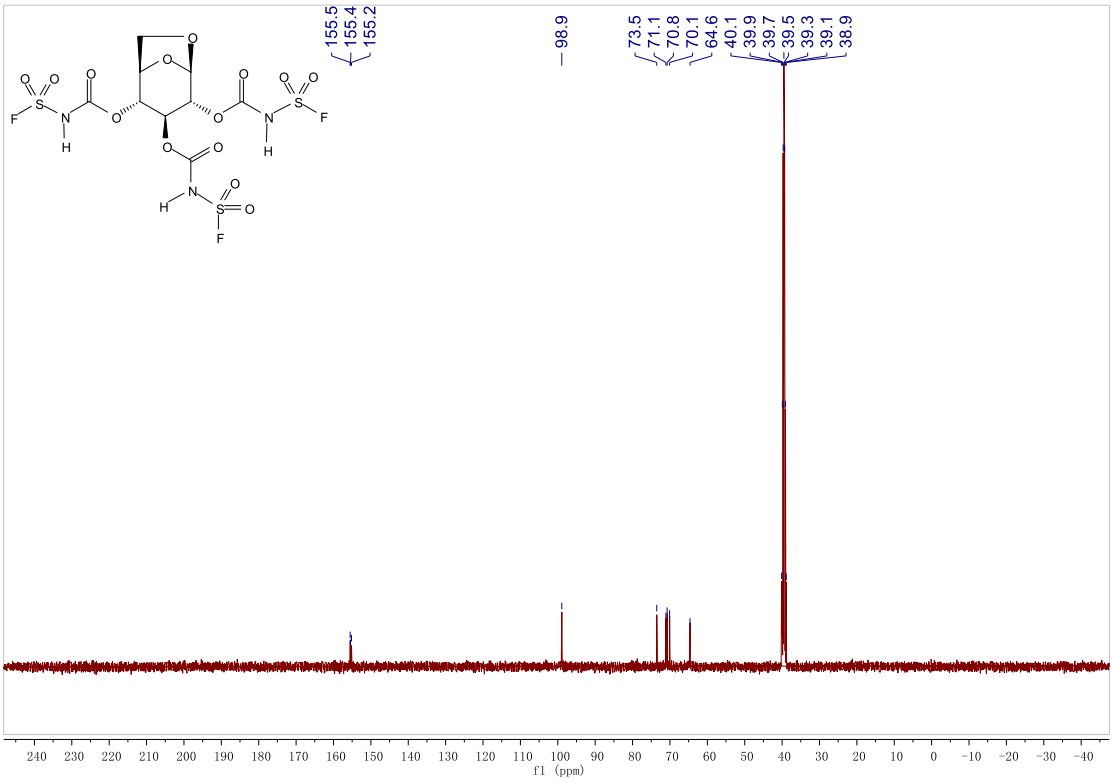


*N- (1R,2S,3S,4R,5R)-6,8-dioxabicyclo[3.2.1]octane-2,3,4-trioxycarbonyl-fluorsulfurylamid (**2-25**).*

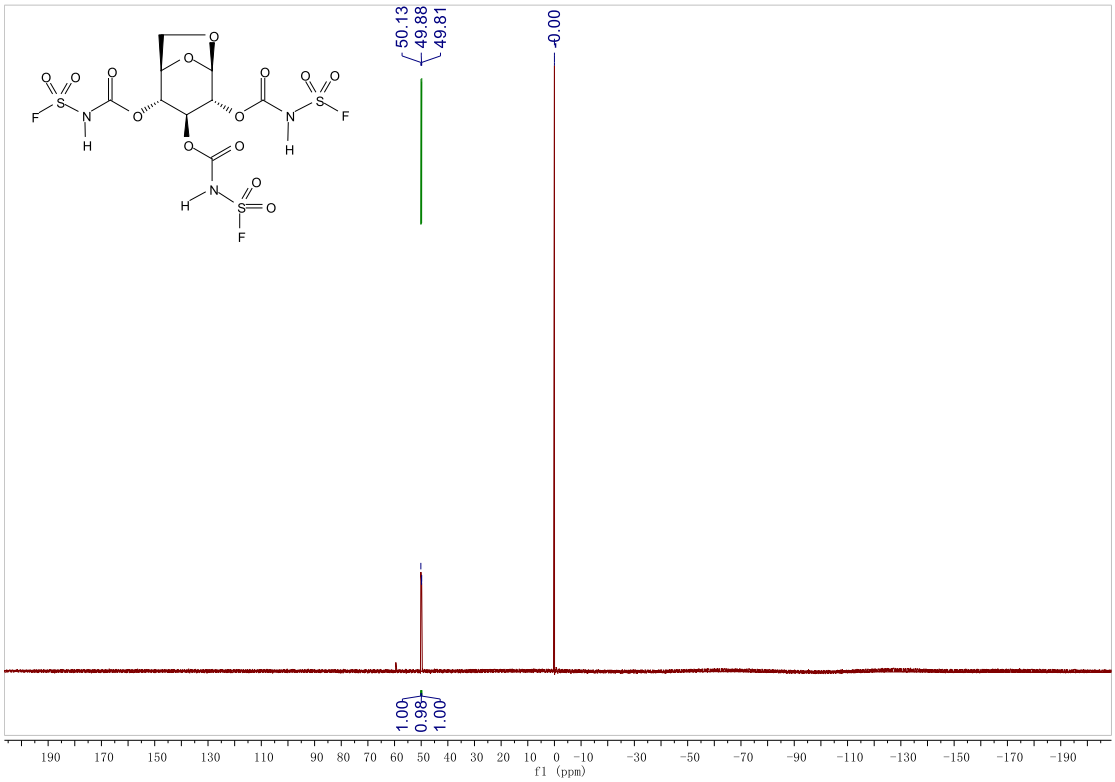
^{1}H NMR



^{13}C NMR [1]

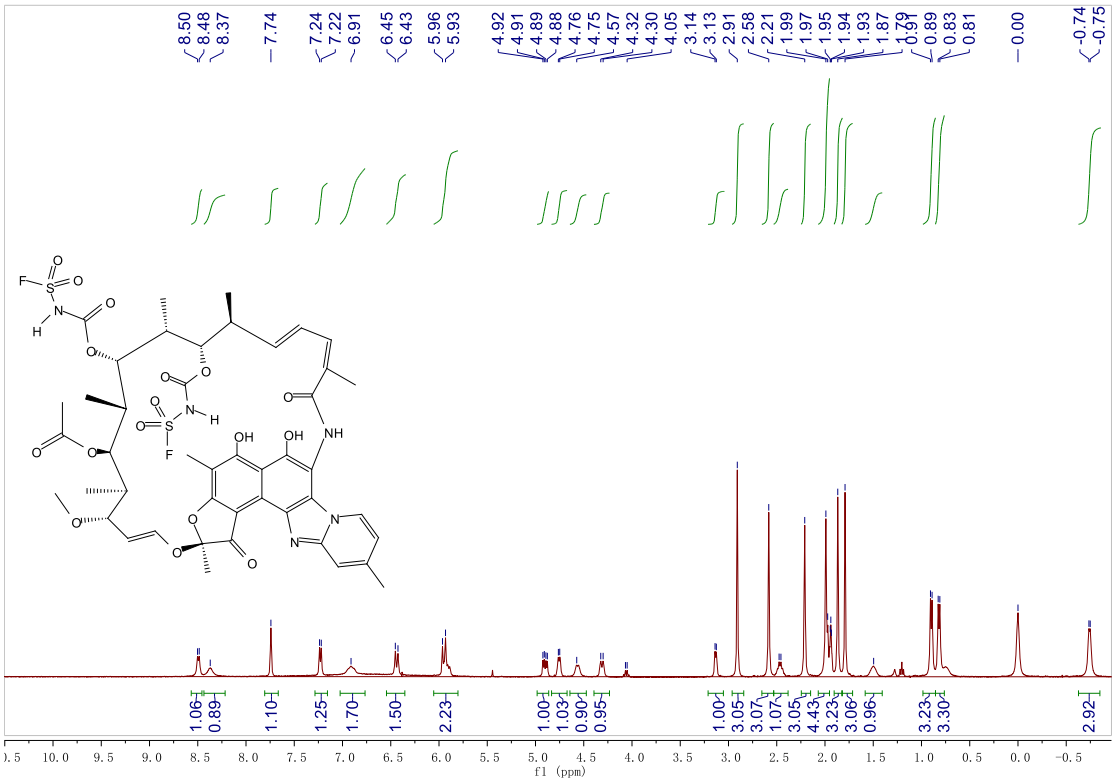


^{19}F NMR

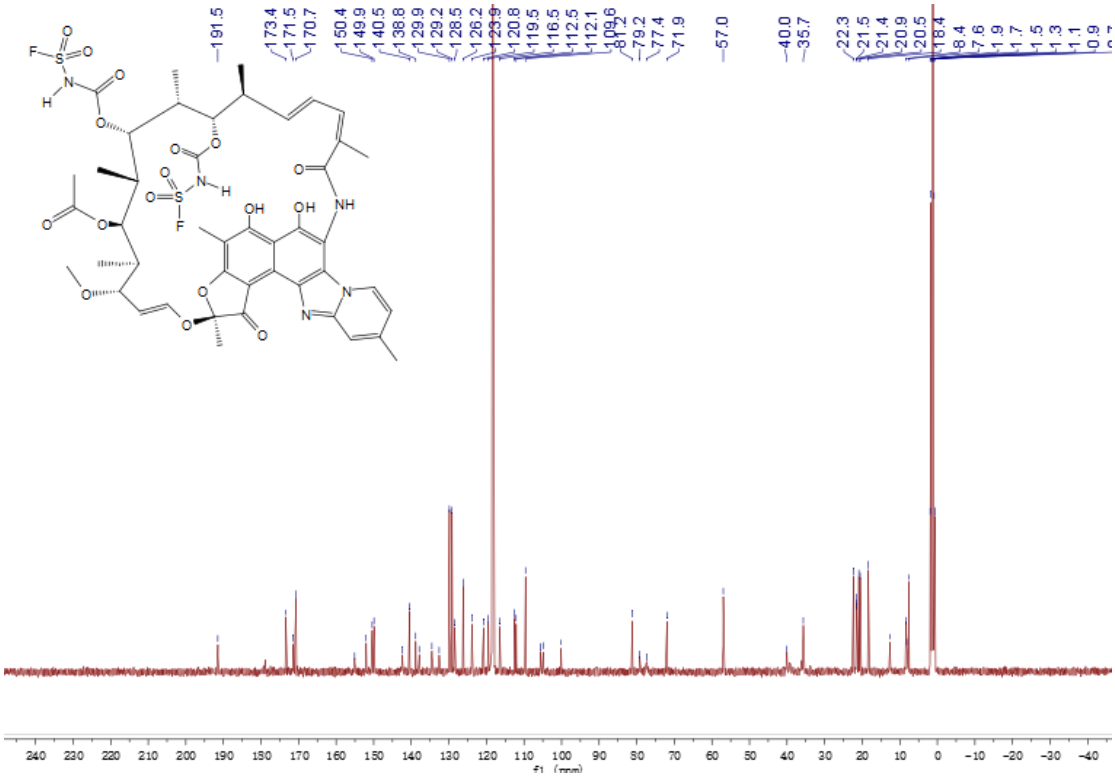


N- rifaximinoxycarbonyl-fluorsulfurylamid(Compound **2-26**).

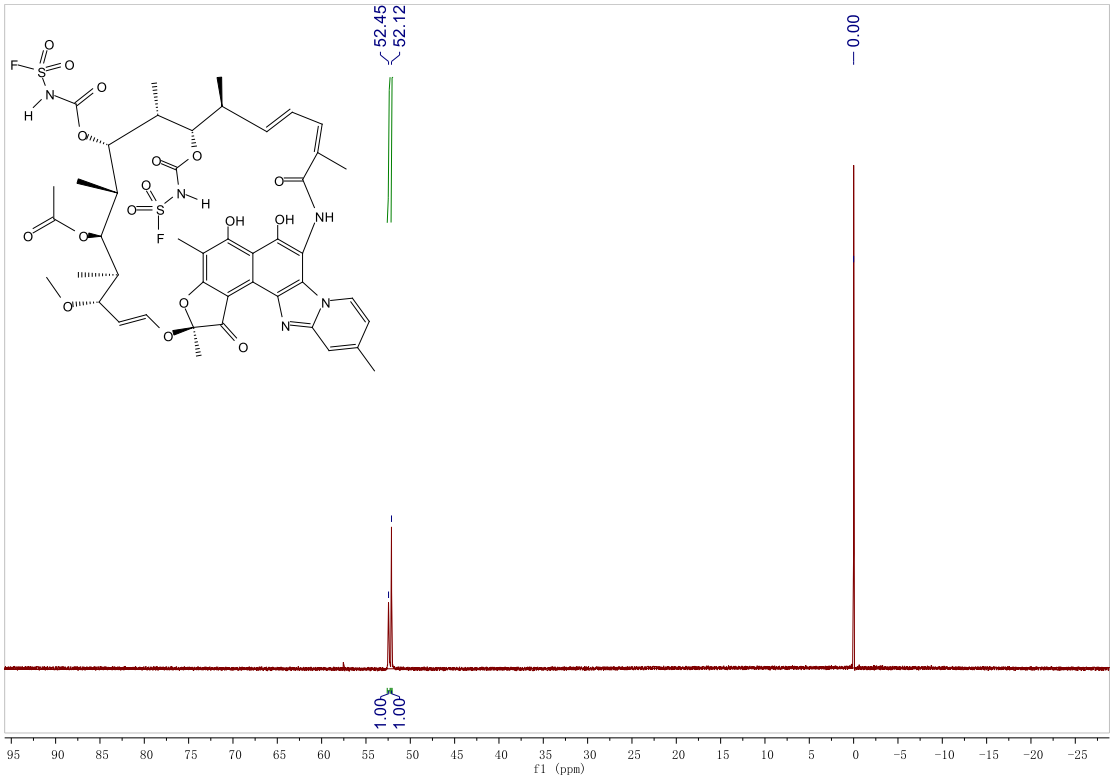
^{1}H NMR



^{13}C NMR

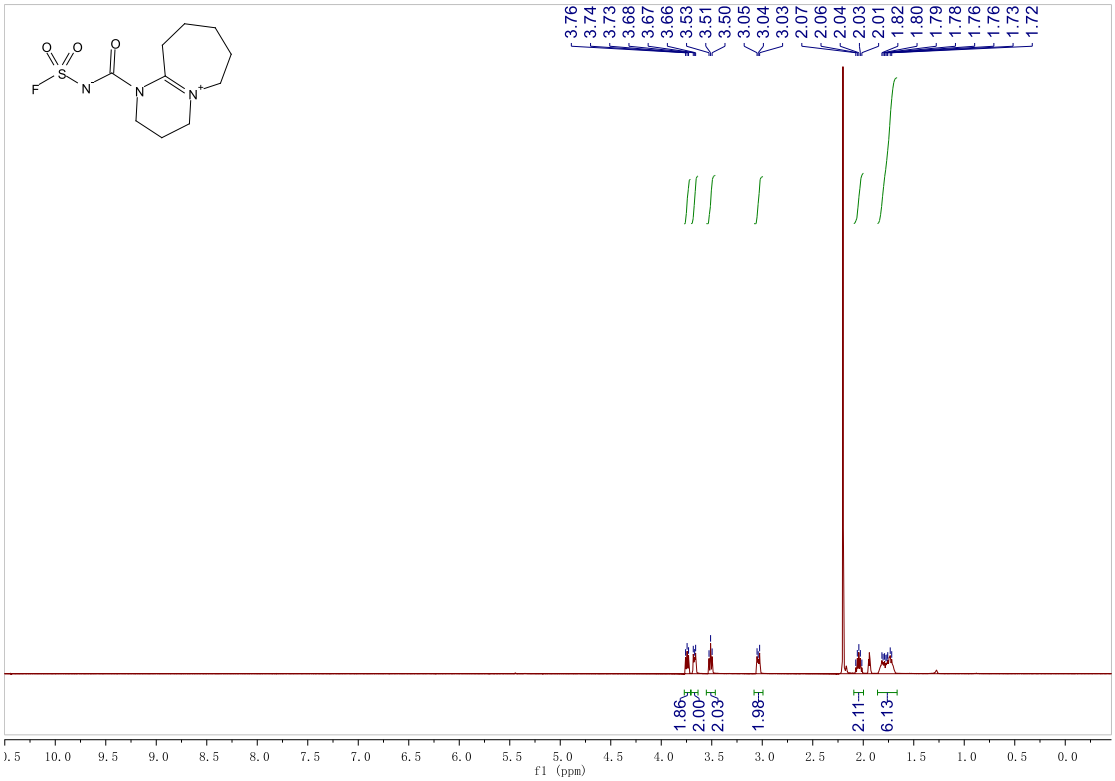


^{19}F NMR

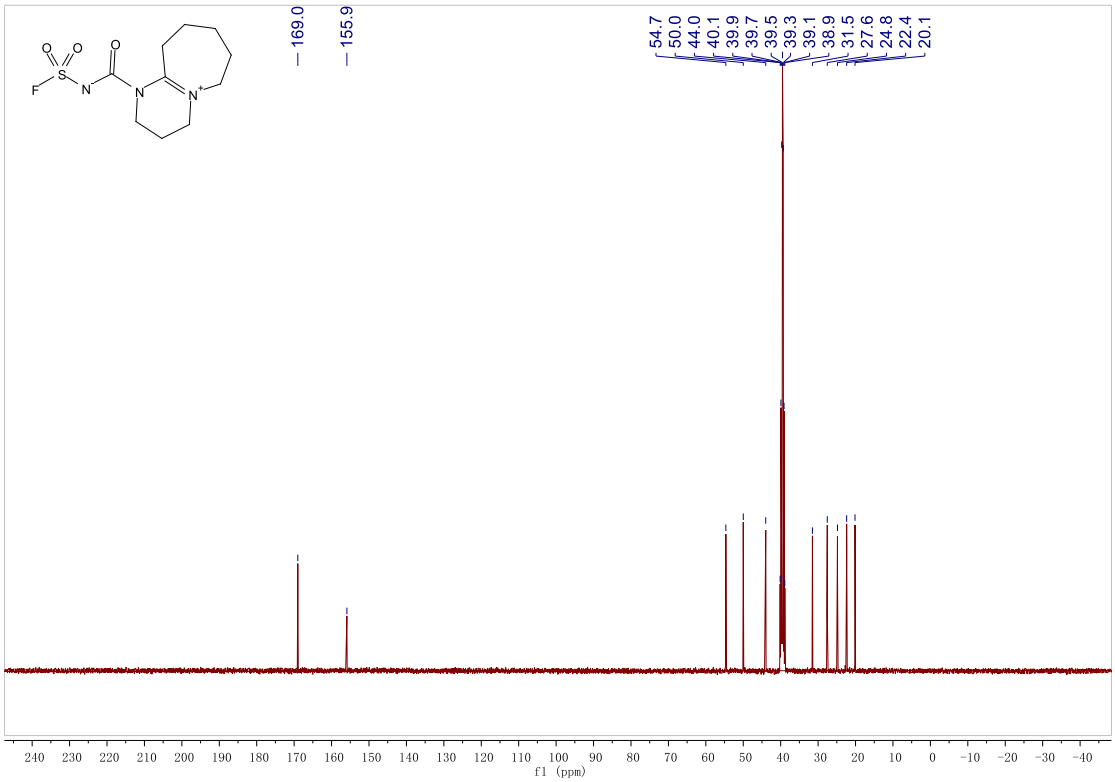


Compound 3-1

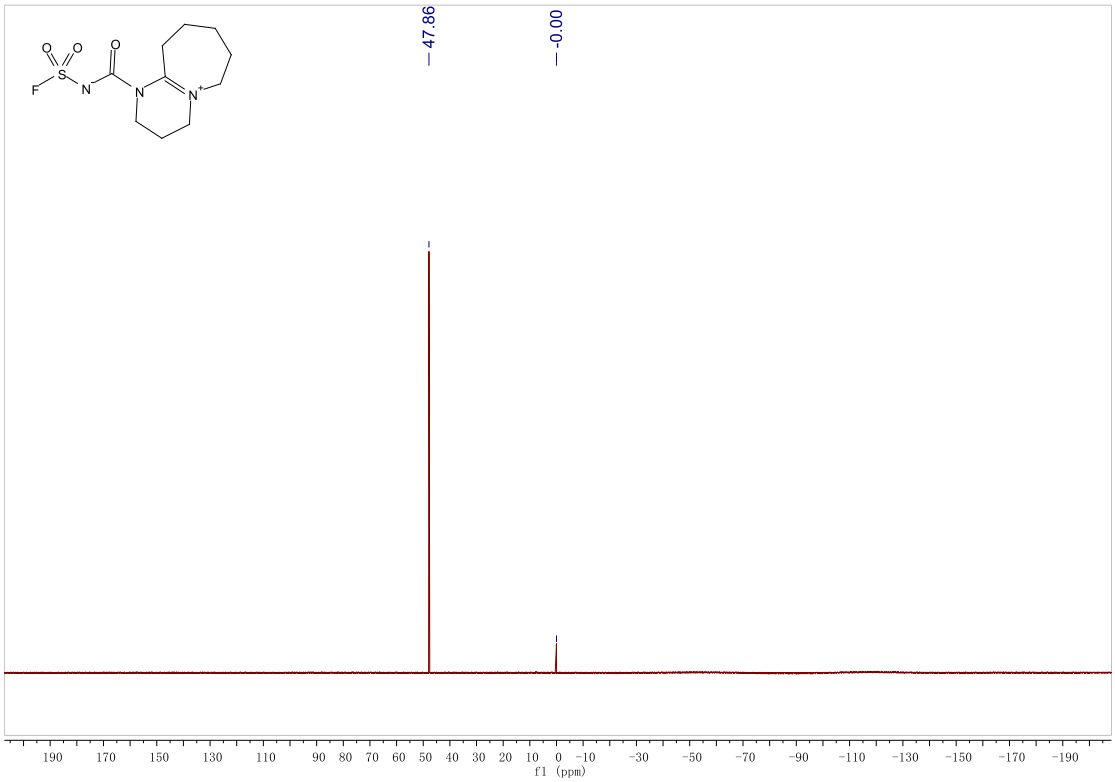
^{1}H NMR



^{13}C NMR

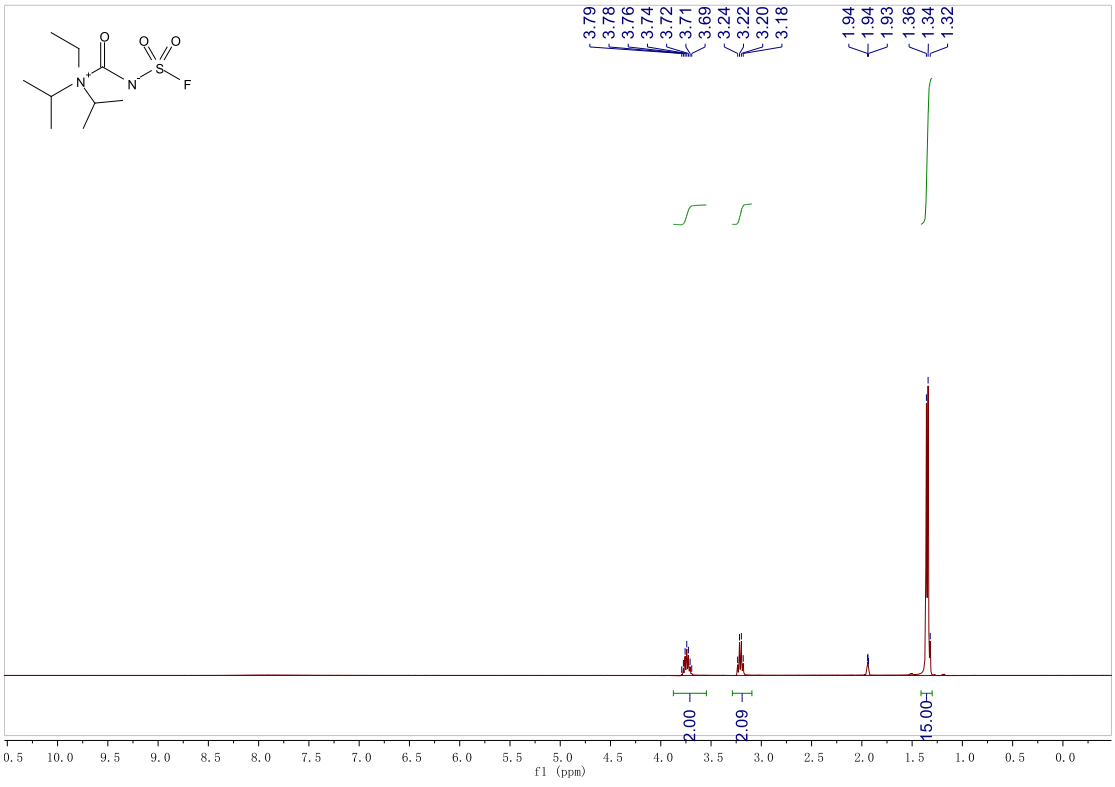


^{19}F NMR

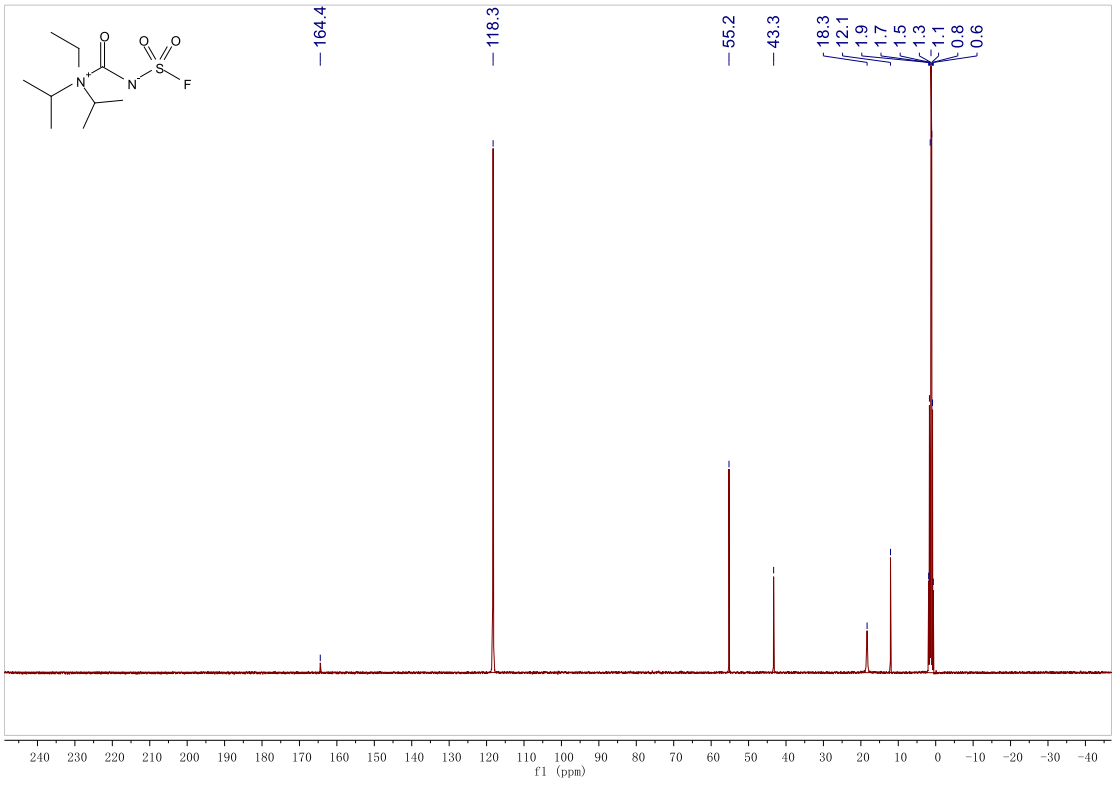


Compound 3-2

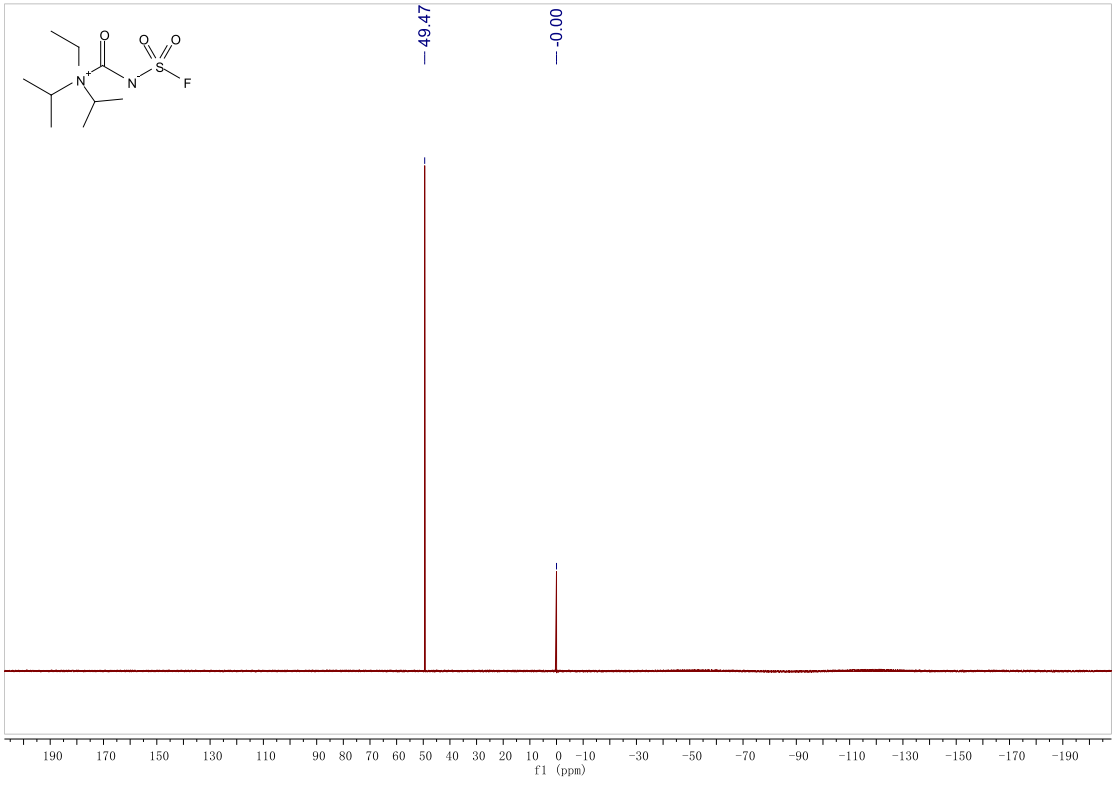
^{1}H NMR



^{13}C NMR

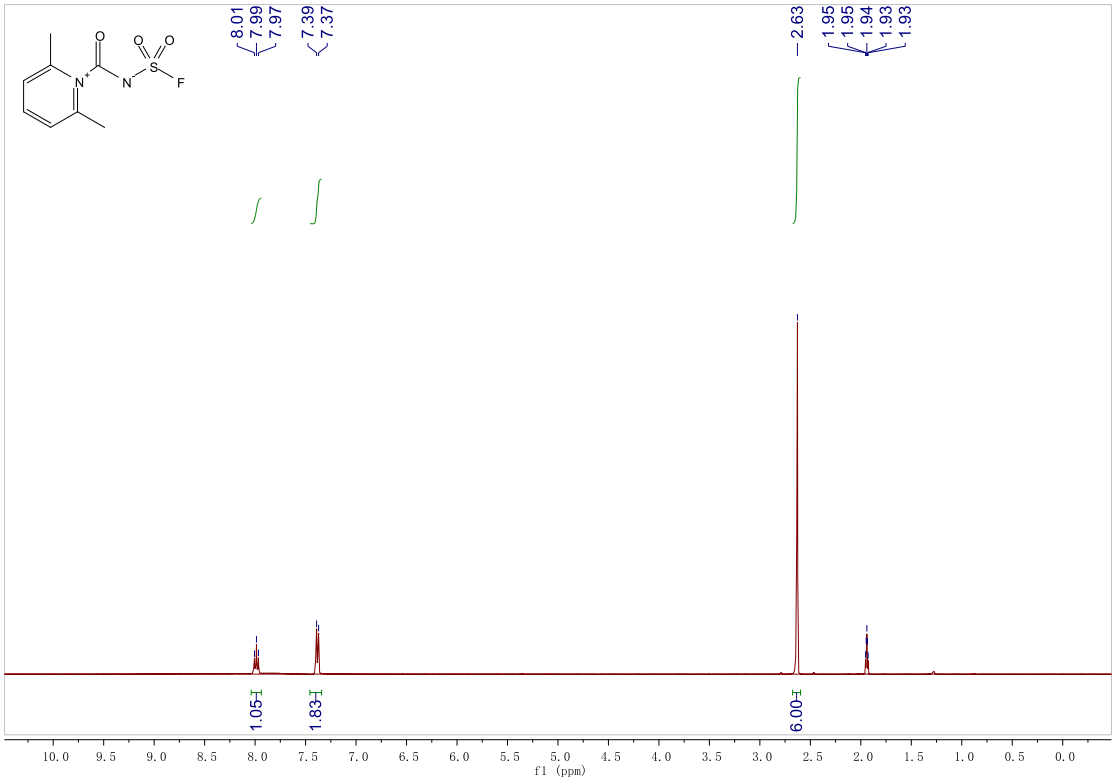


^{19}F NMR

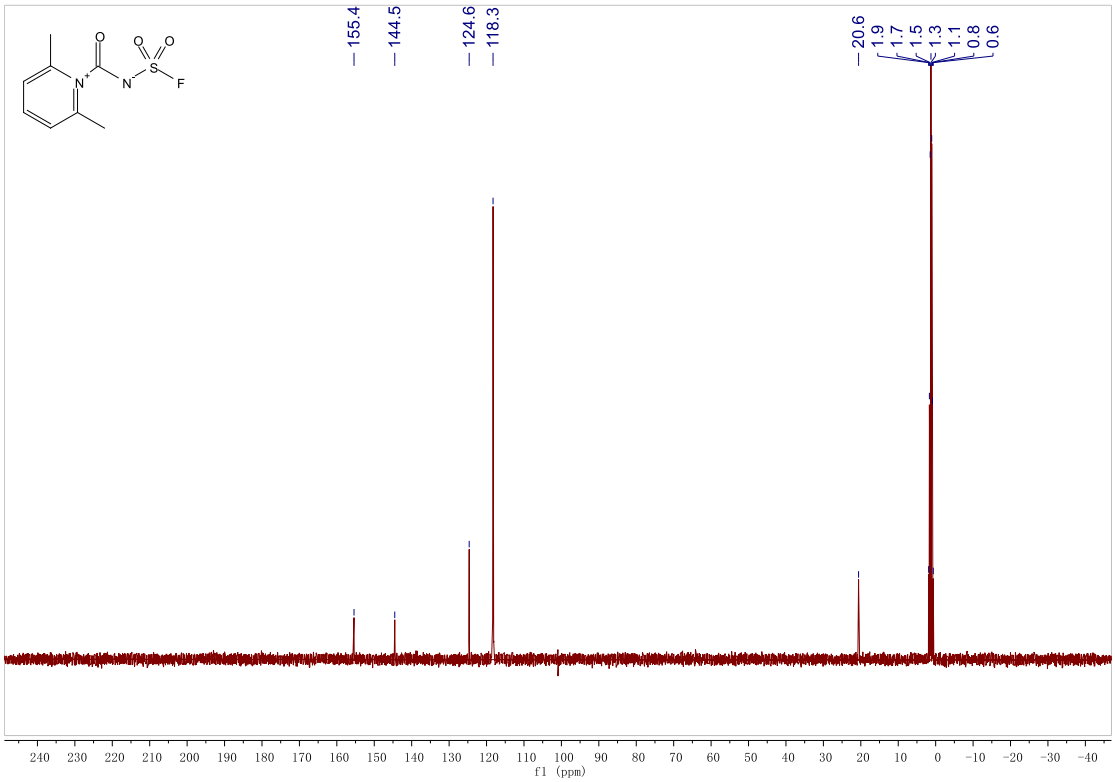


Compound 3-3

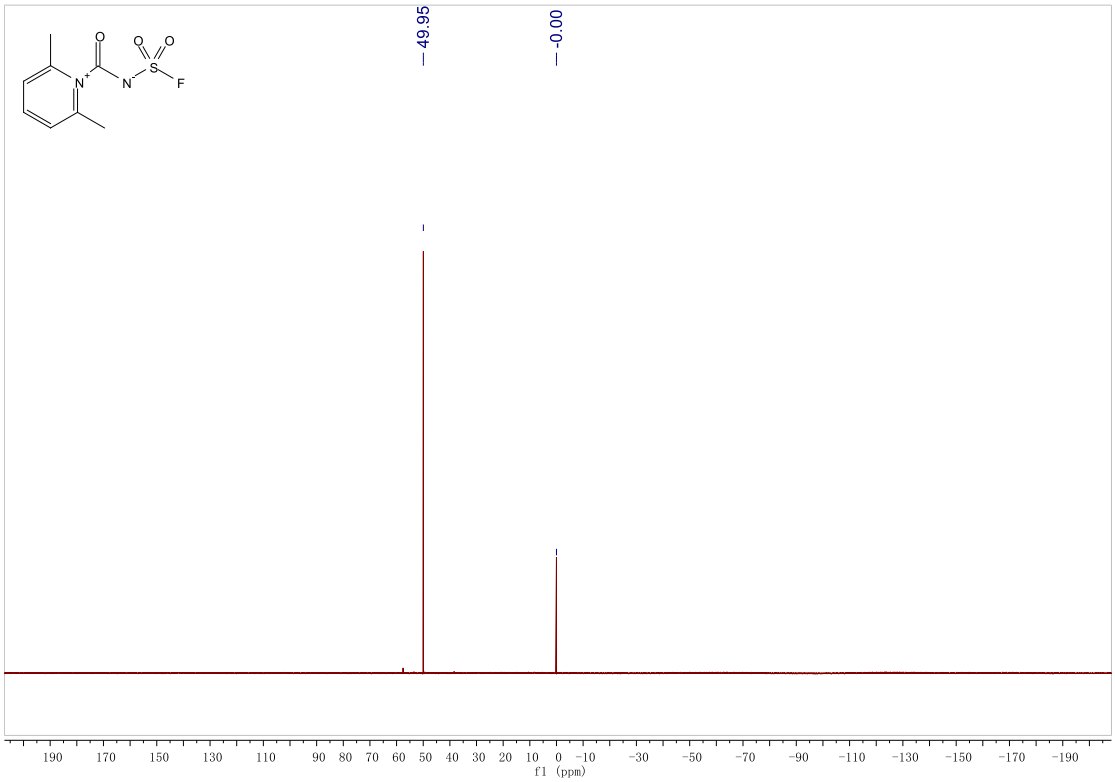
^{1}H NMR



^{13}C NMR

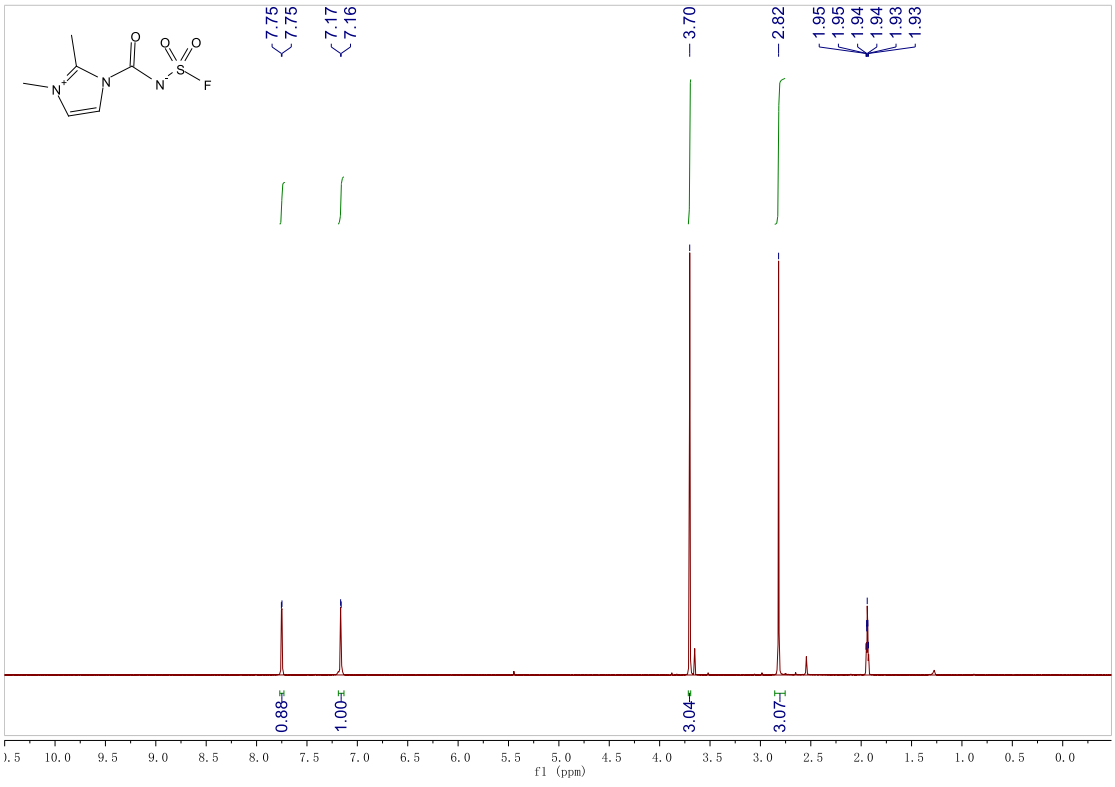


^{19}F NMR

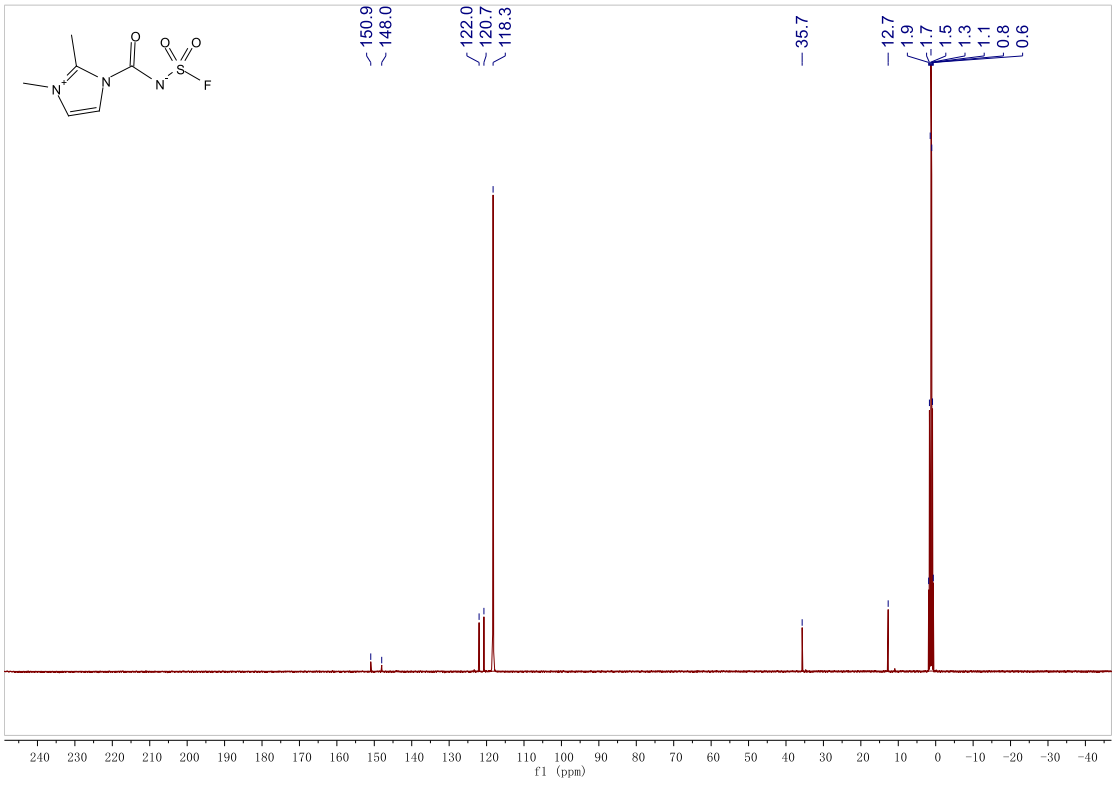


Compound 3-4

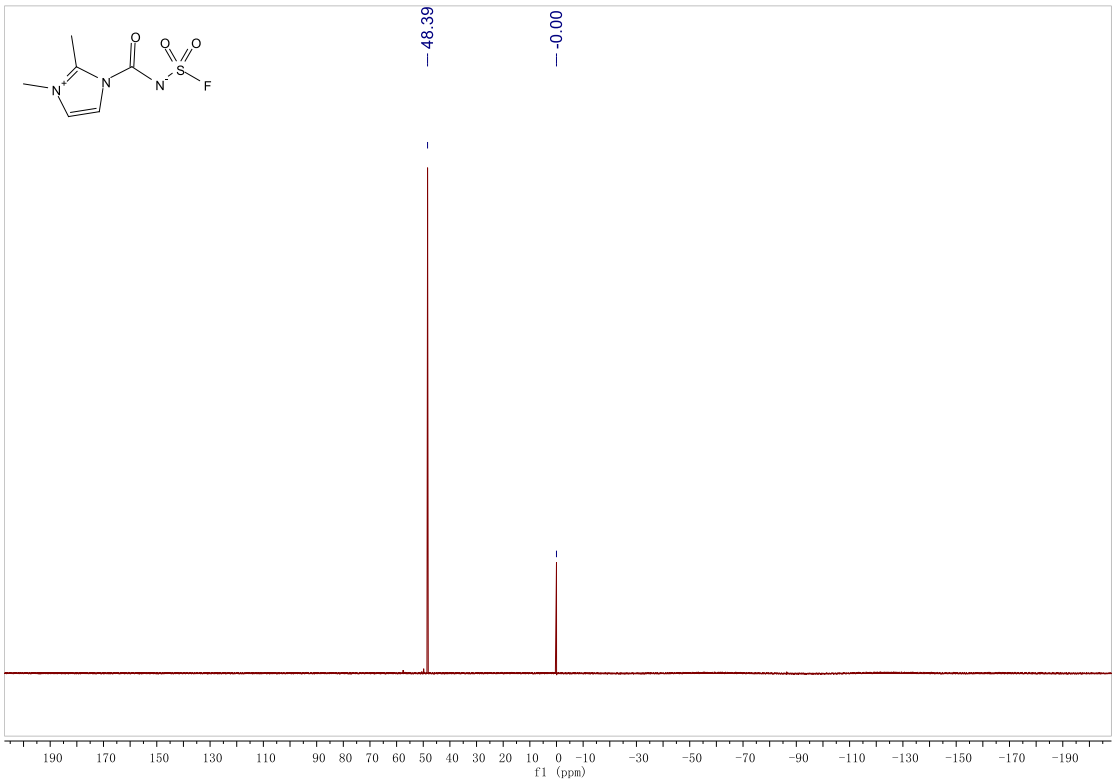
^{1}H NMR



^{13}C NMR

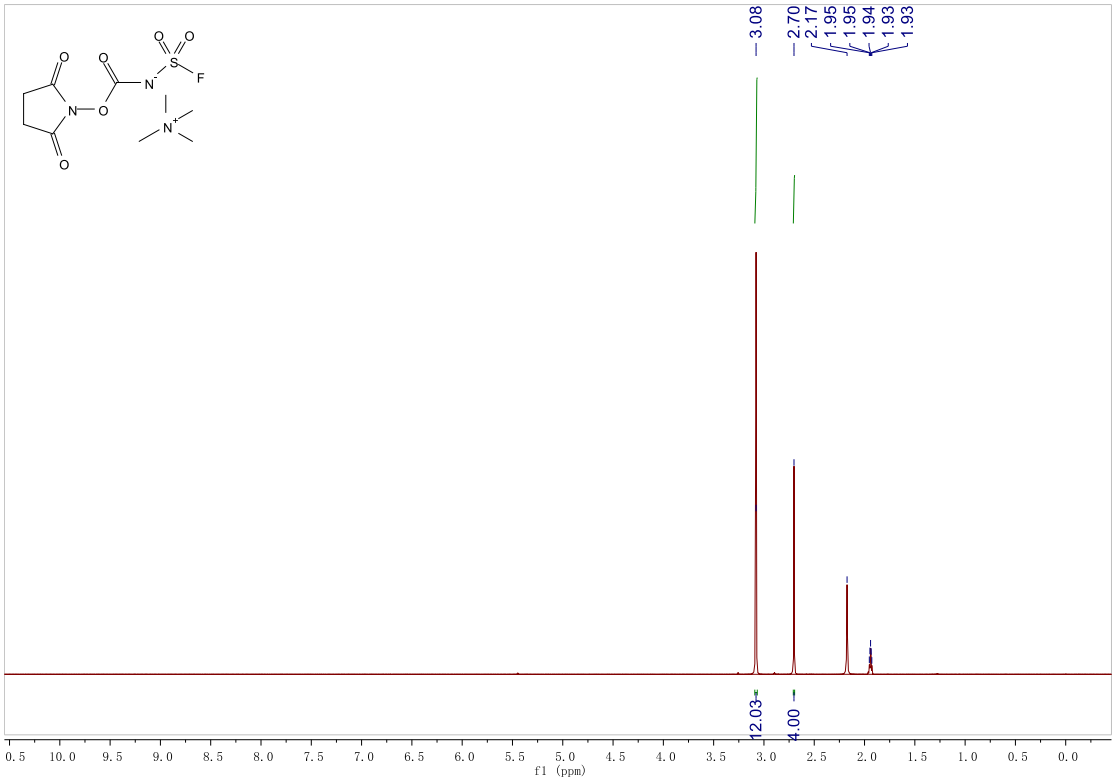


^{19}F NMR

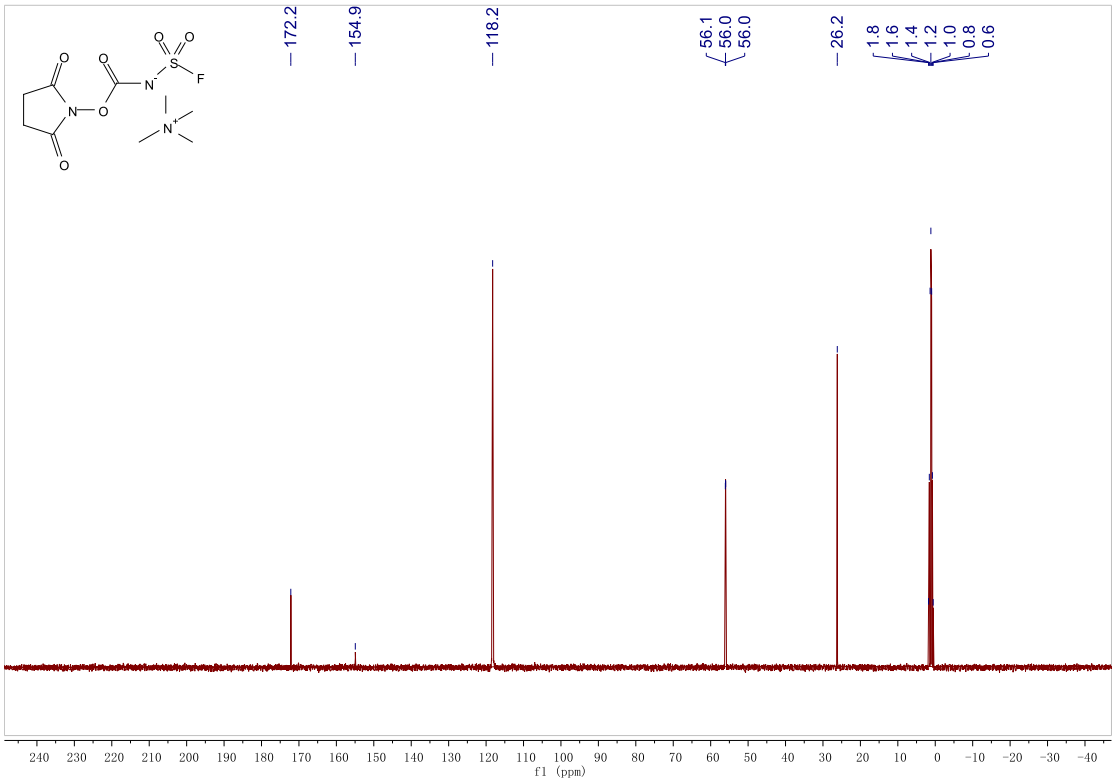


*Florosulfonyl succinimide tetramethylammonium salt (**4-1**).*

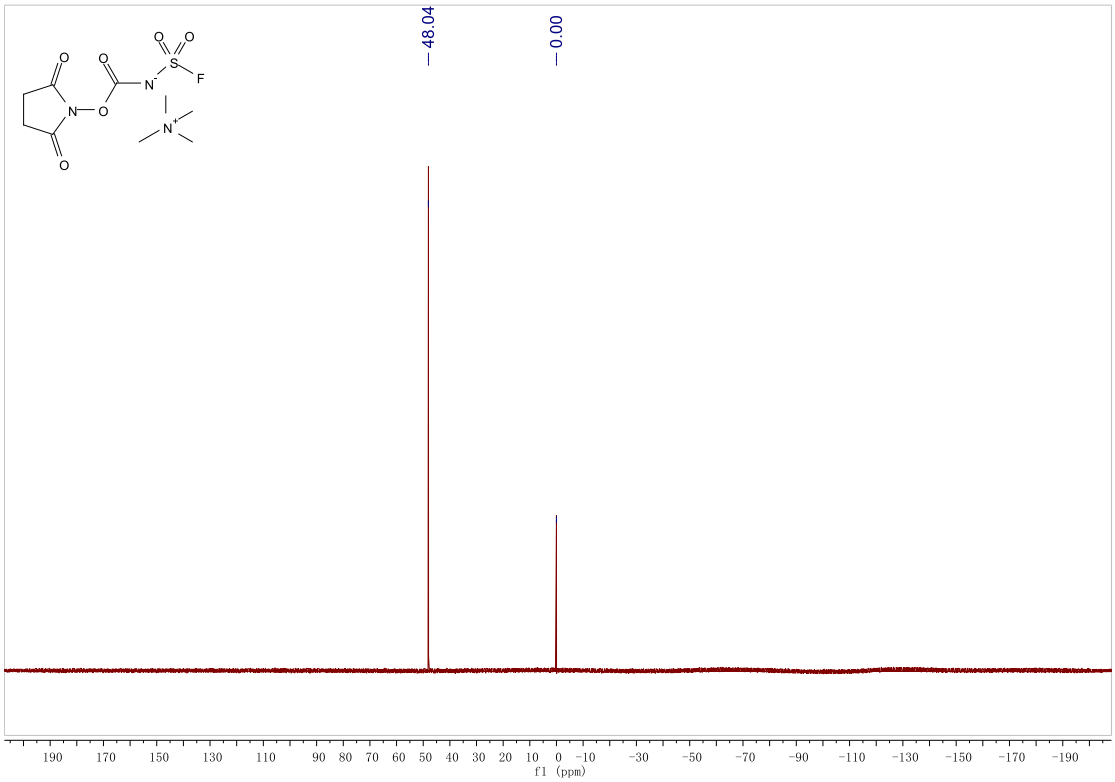
^{1}H NMR



^{13}C NMR

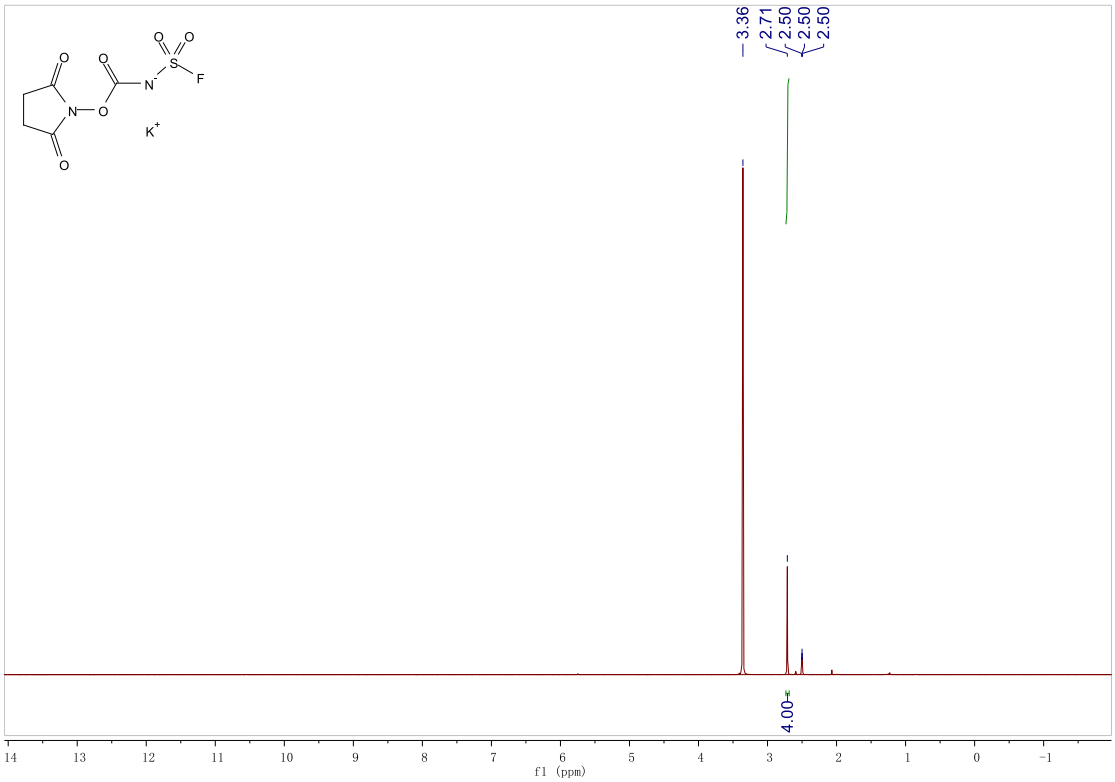


^{19}F NMR

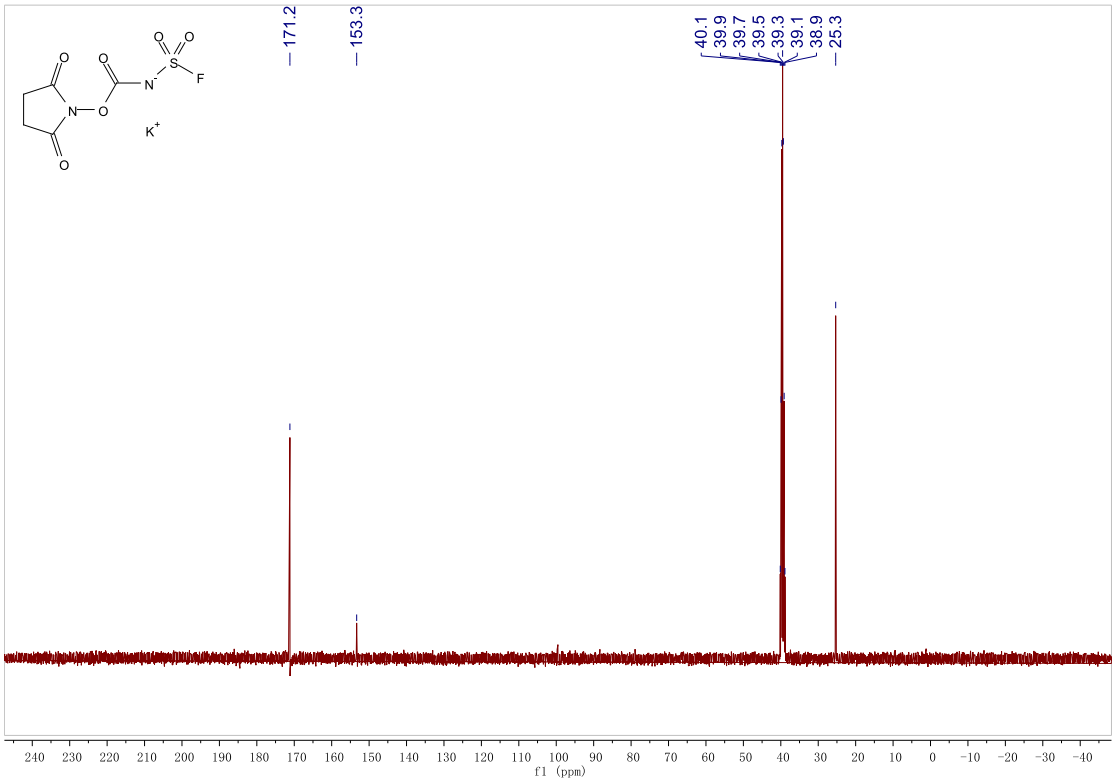


*Florosulfonyl succinimide potassium salt (**4-2**).*

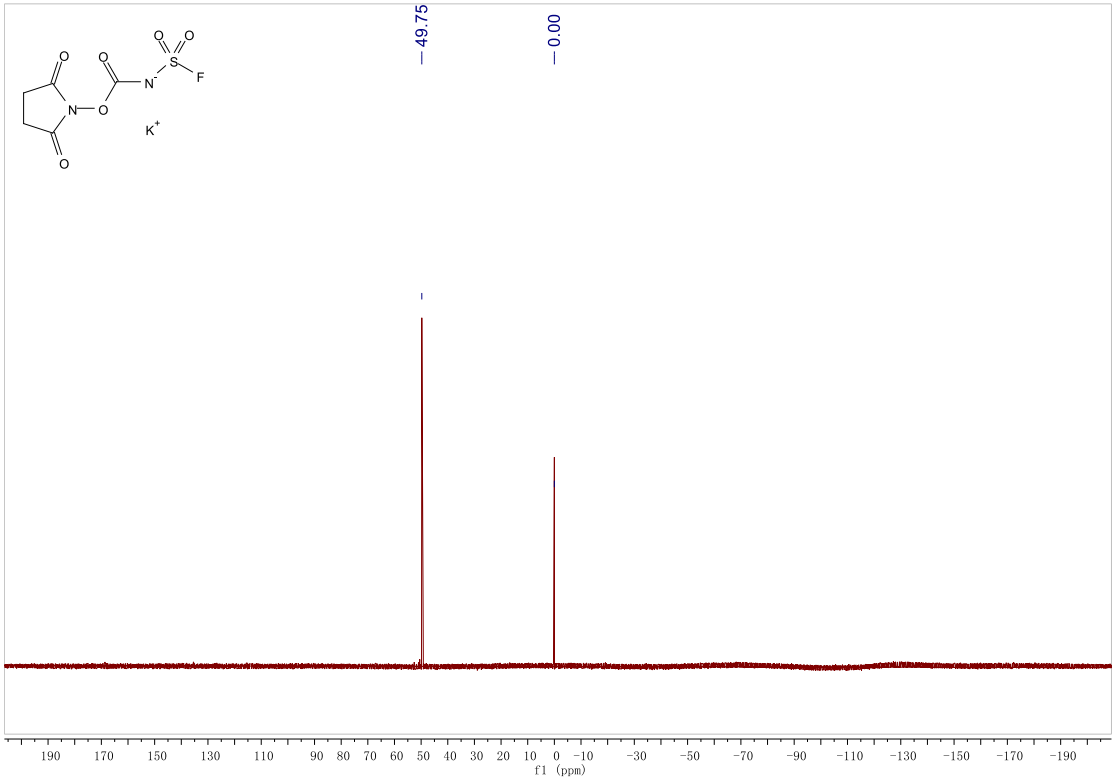
^{1}H NMR



^{13}C NMR

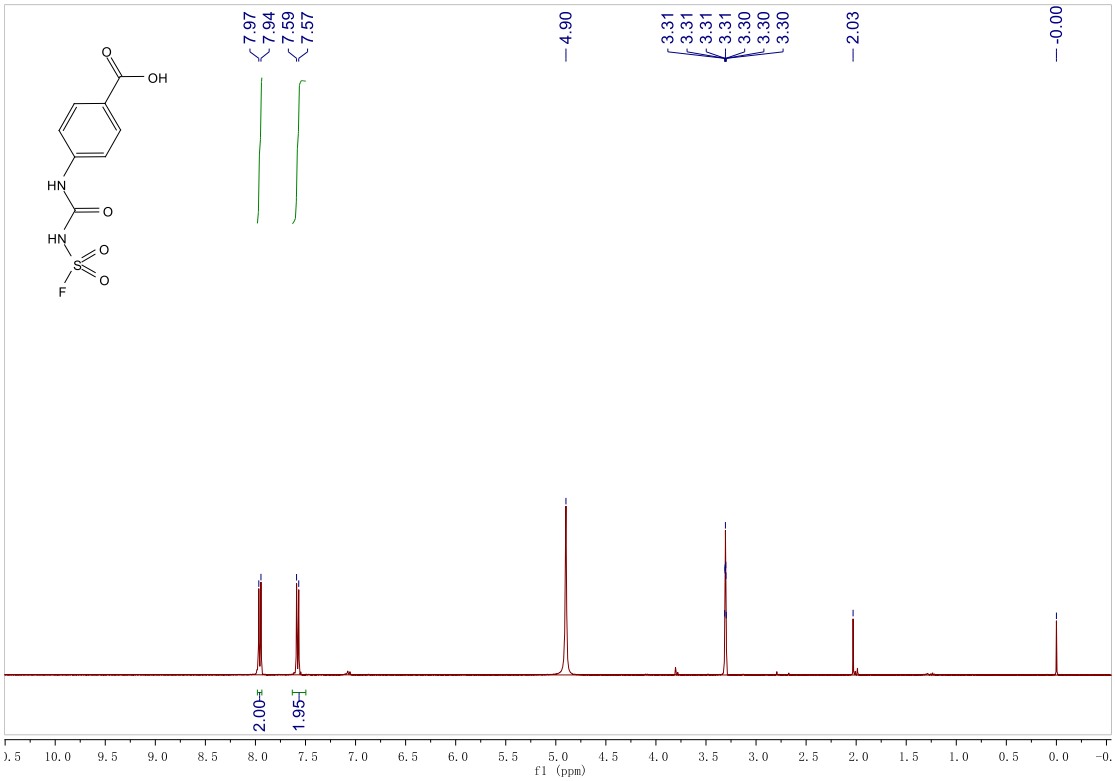


^{19}F NMR

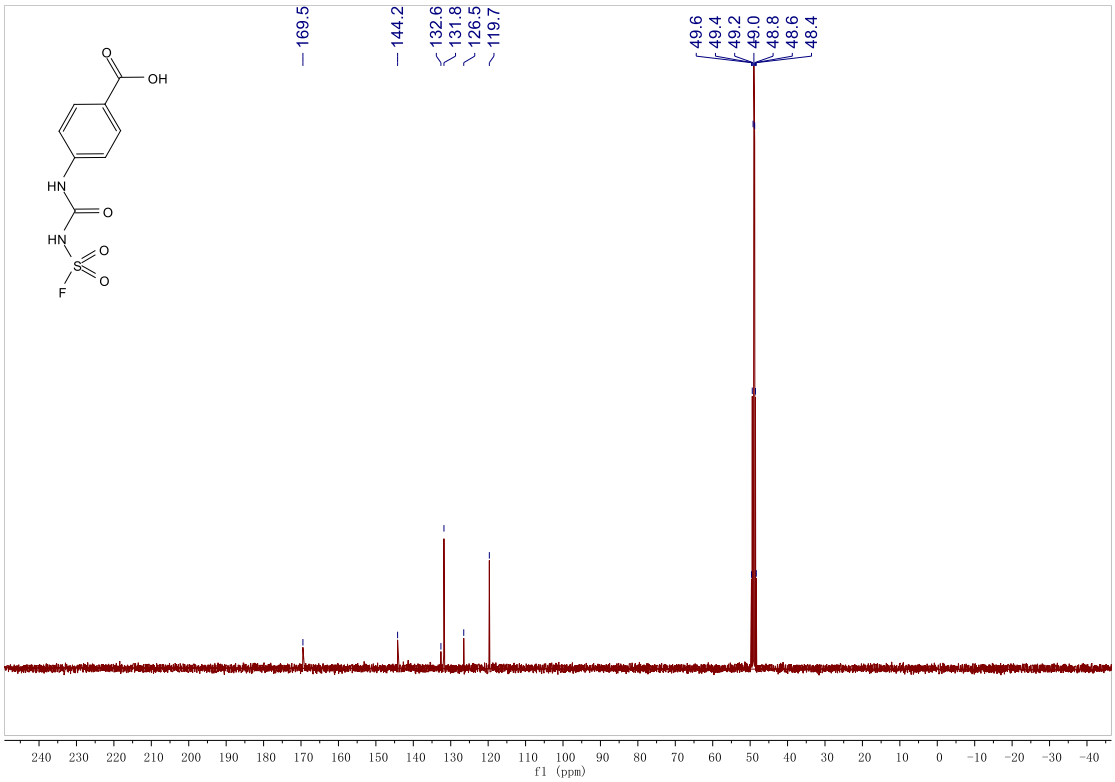


*N-4-carboxylphenylaminocarbonyl-fluorsulfurylamid (**6-1**)*

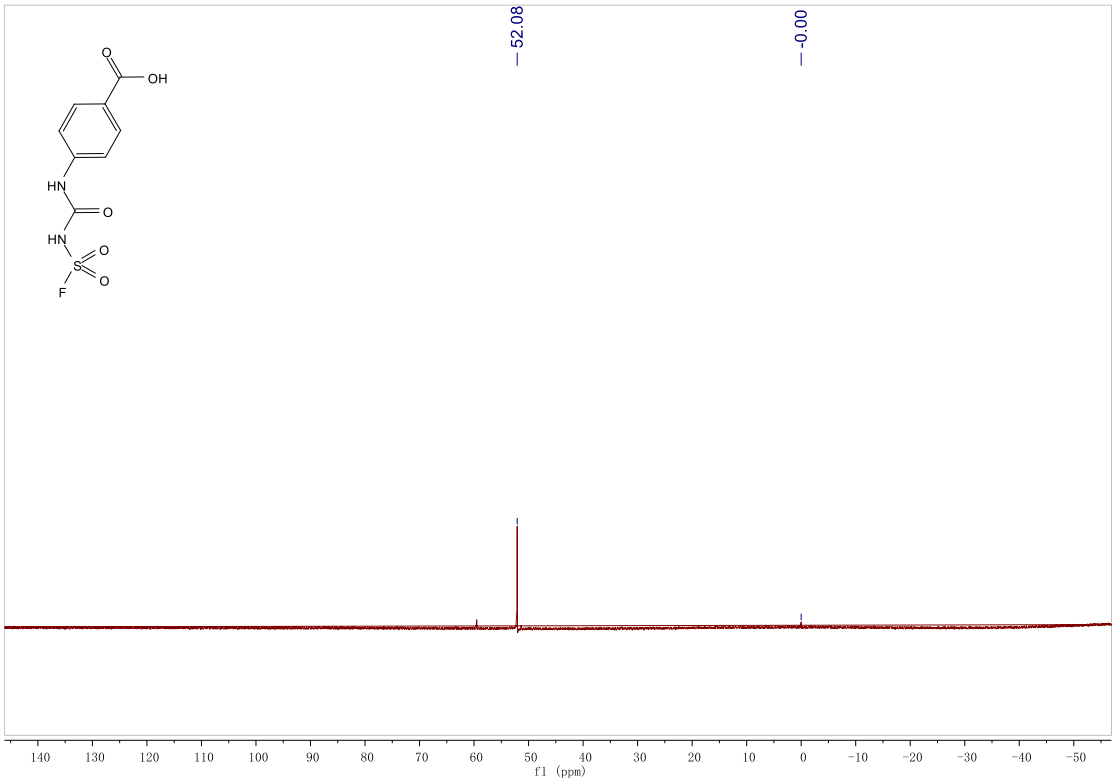
^{1}H NMR



^{13}C NMR

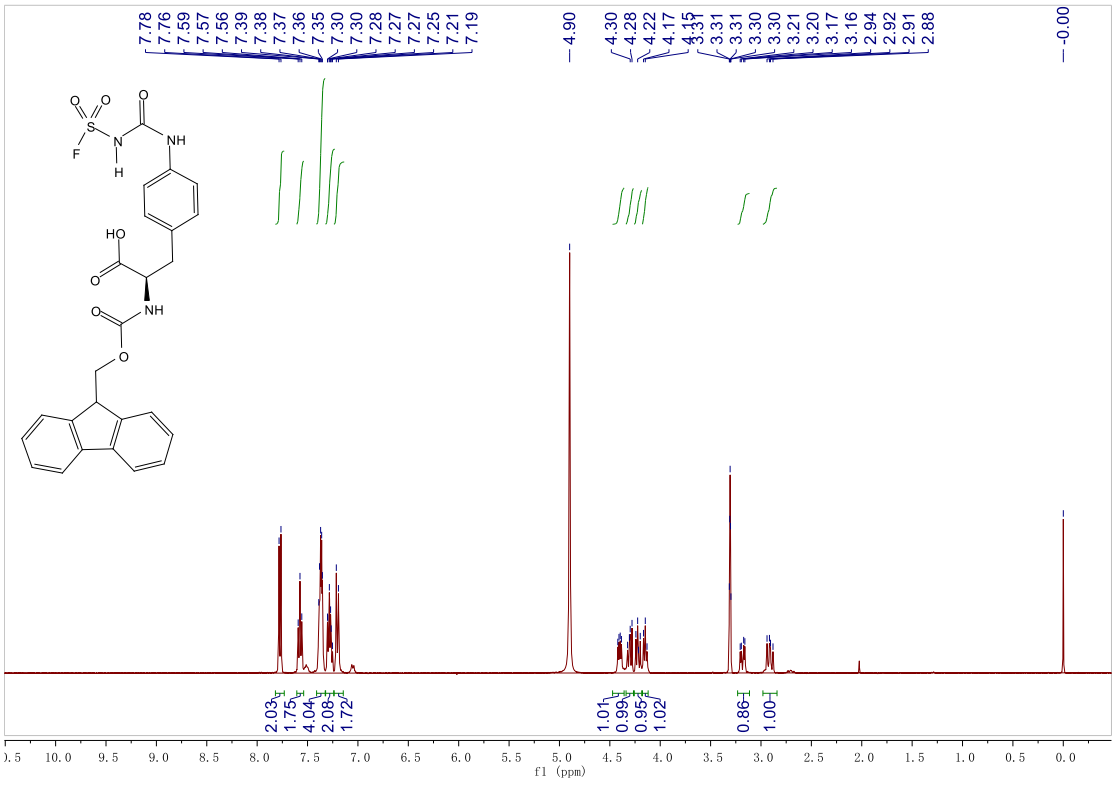


^{19}F NMR

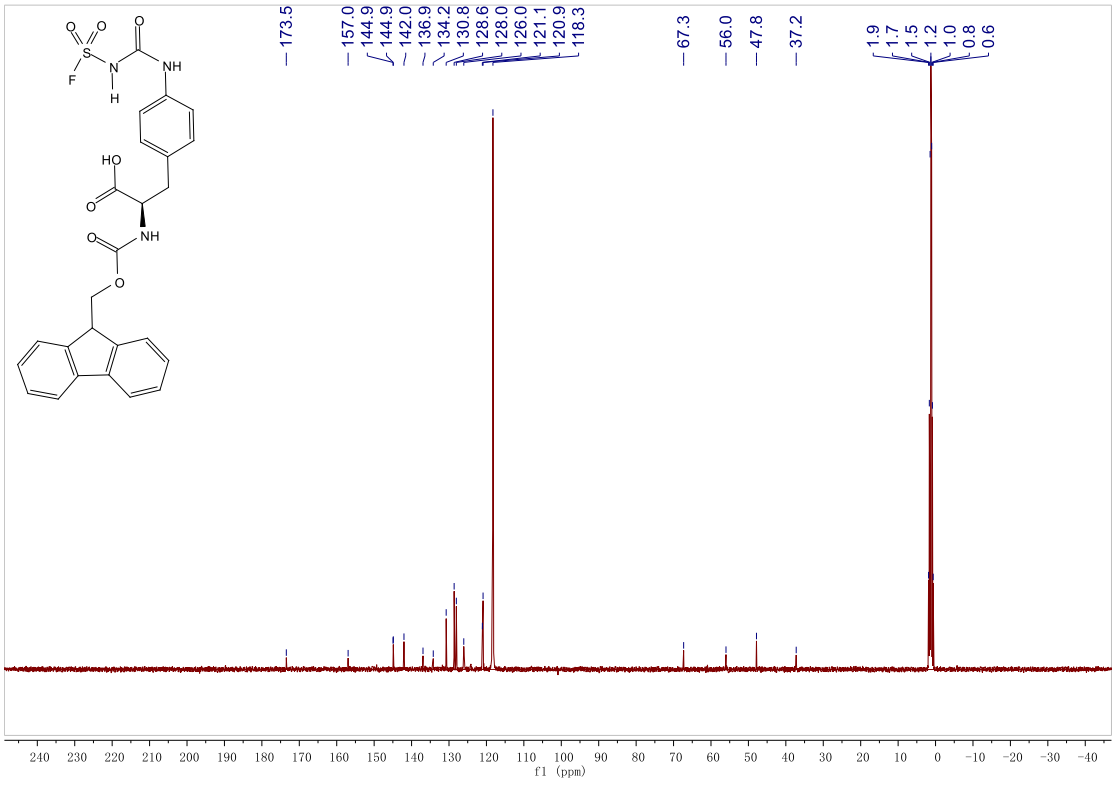


Compound 6-2

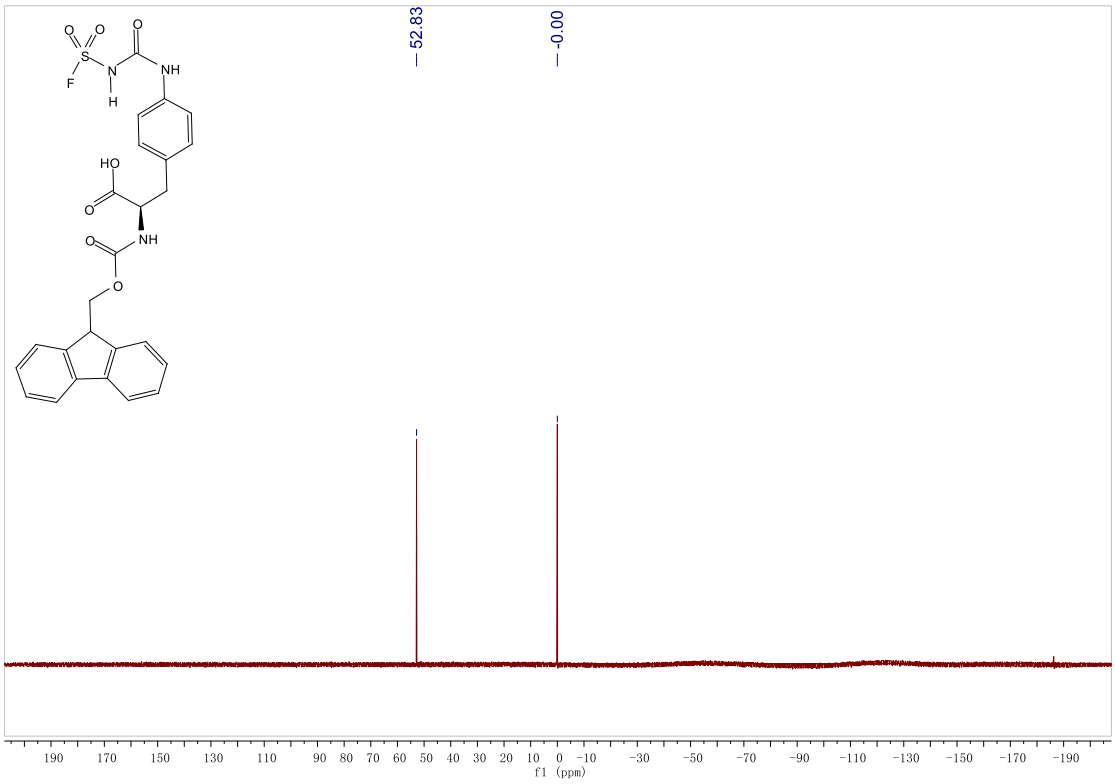
^{1}H NMR



^{13}C NMR

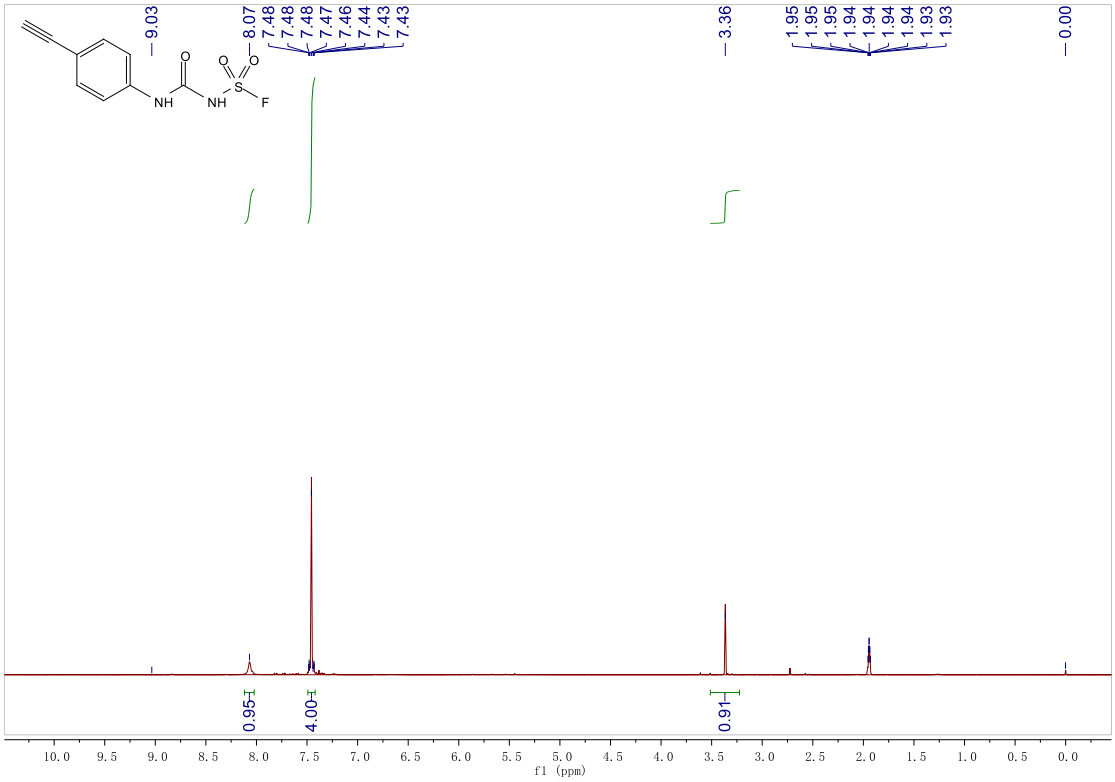


^{19}F NMR

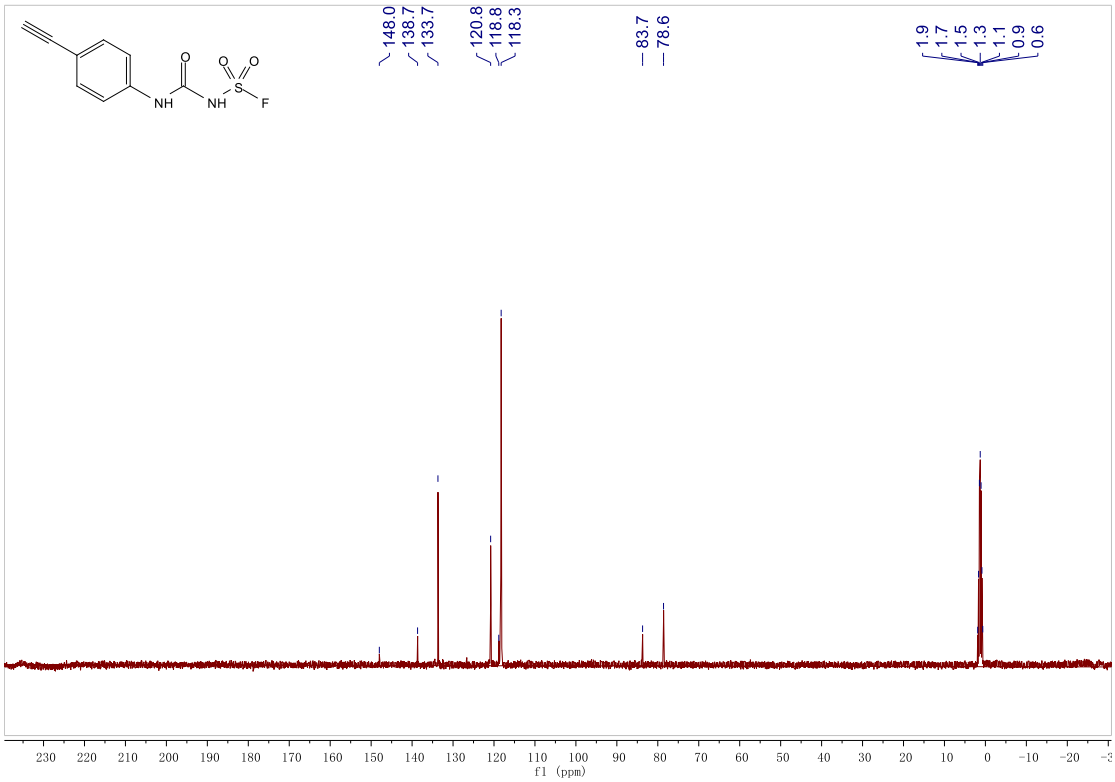


*N-4-ethynylaminocarbonyl-fluorsulfurylamid (**6-3**).*

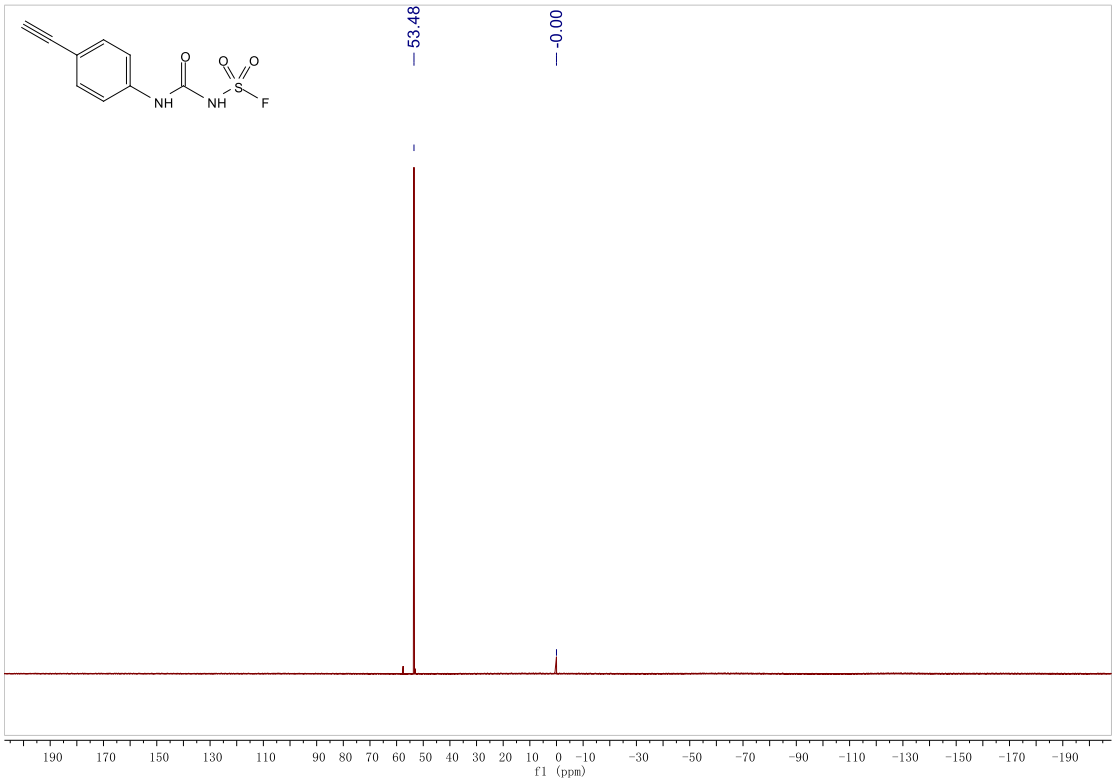
^{1}H NMR



^{13}C NMR

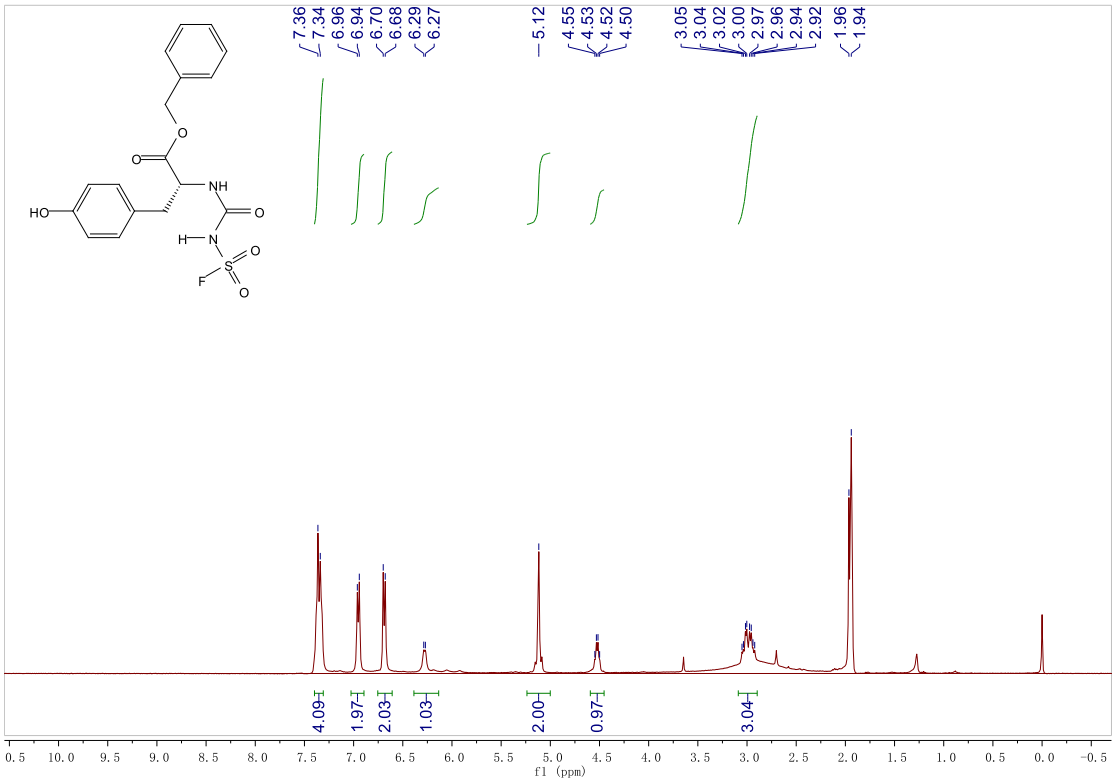


^{19}F NMR

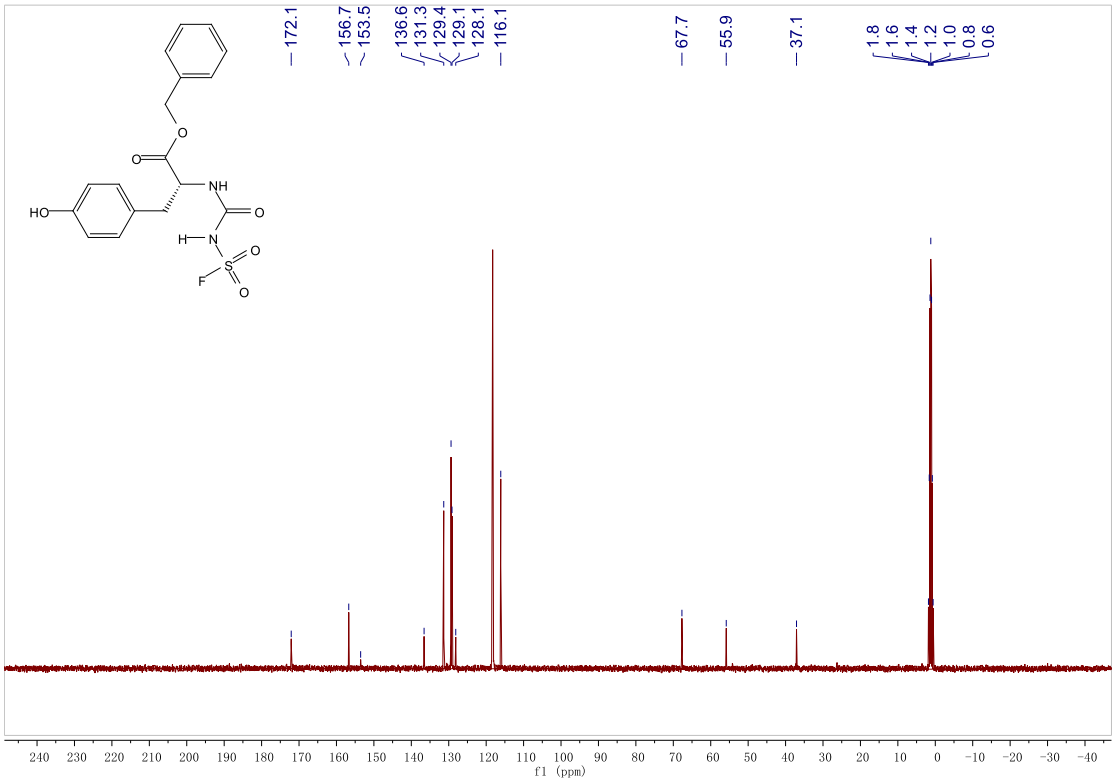


Compound 6-4

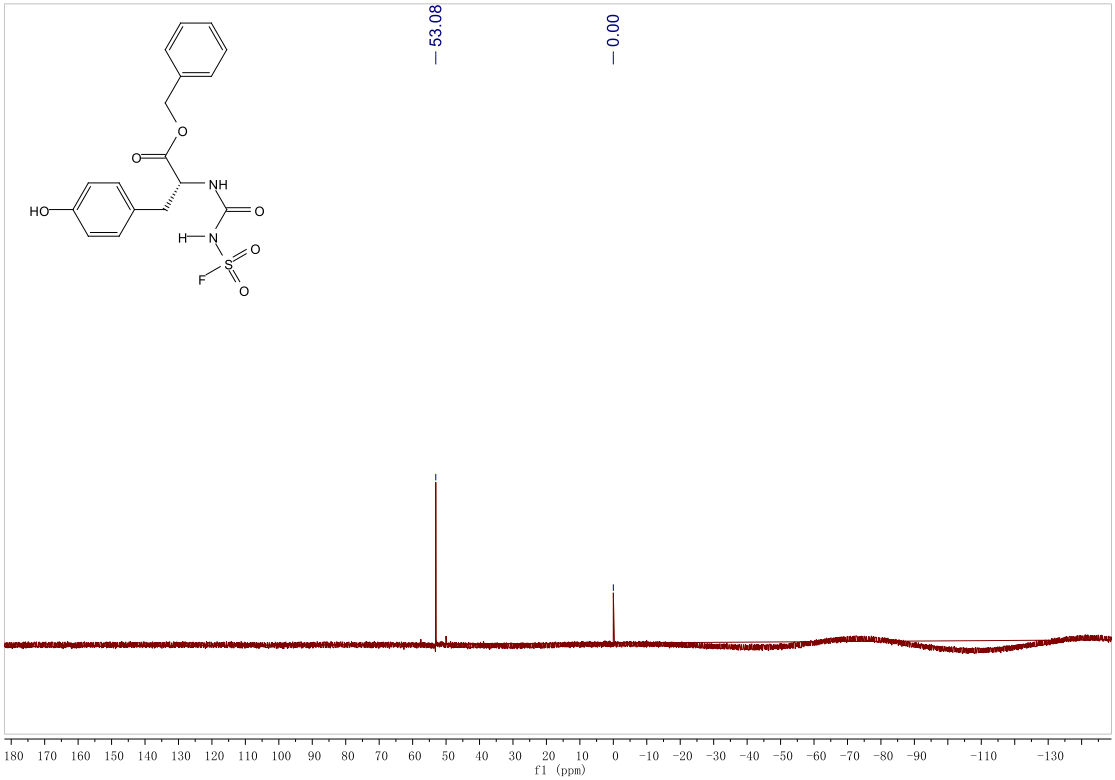
^{1}H NMR



^{13}C NMR

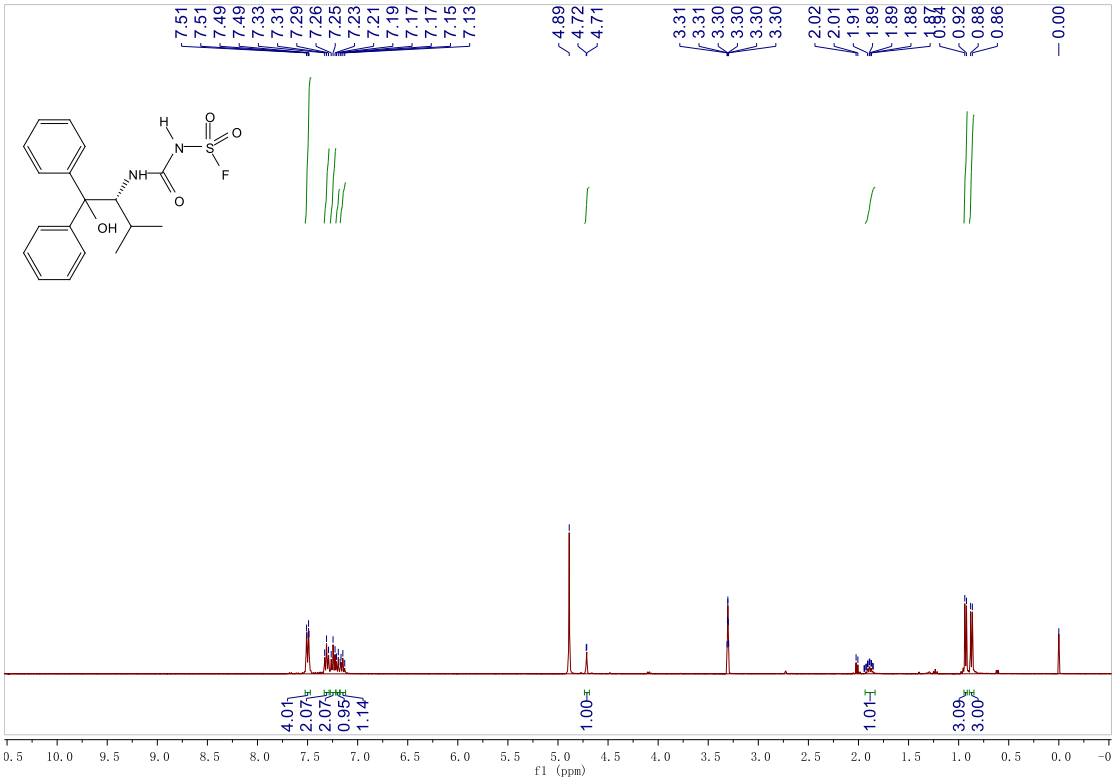


^{19}F NMR

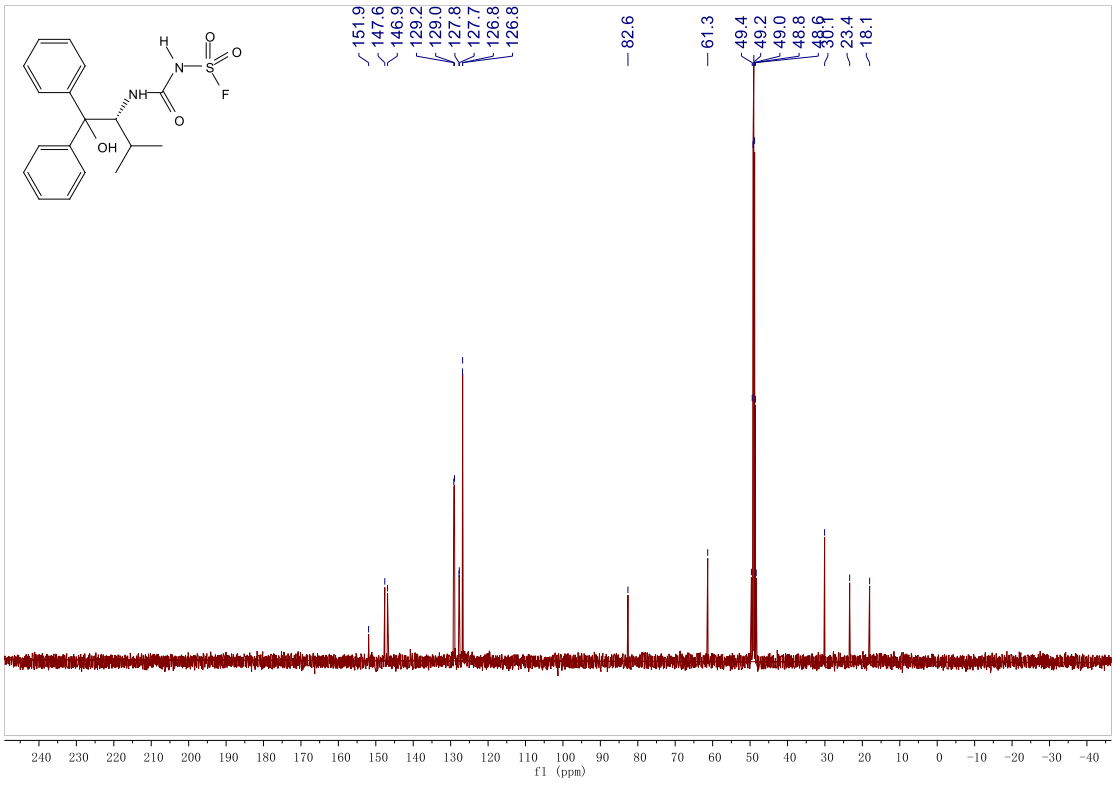


Compound 6-5

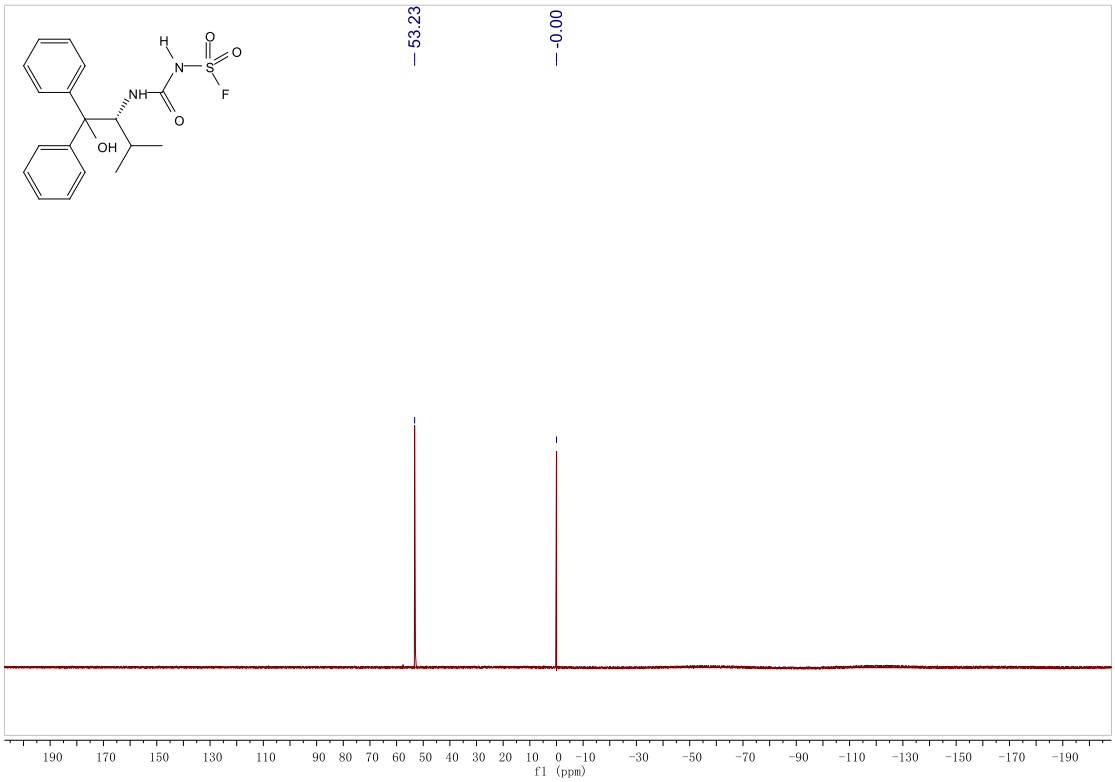
^{1}H NMR



^{13}C NMR

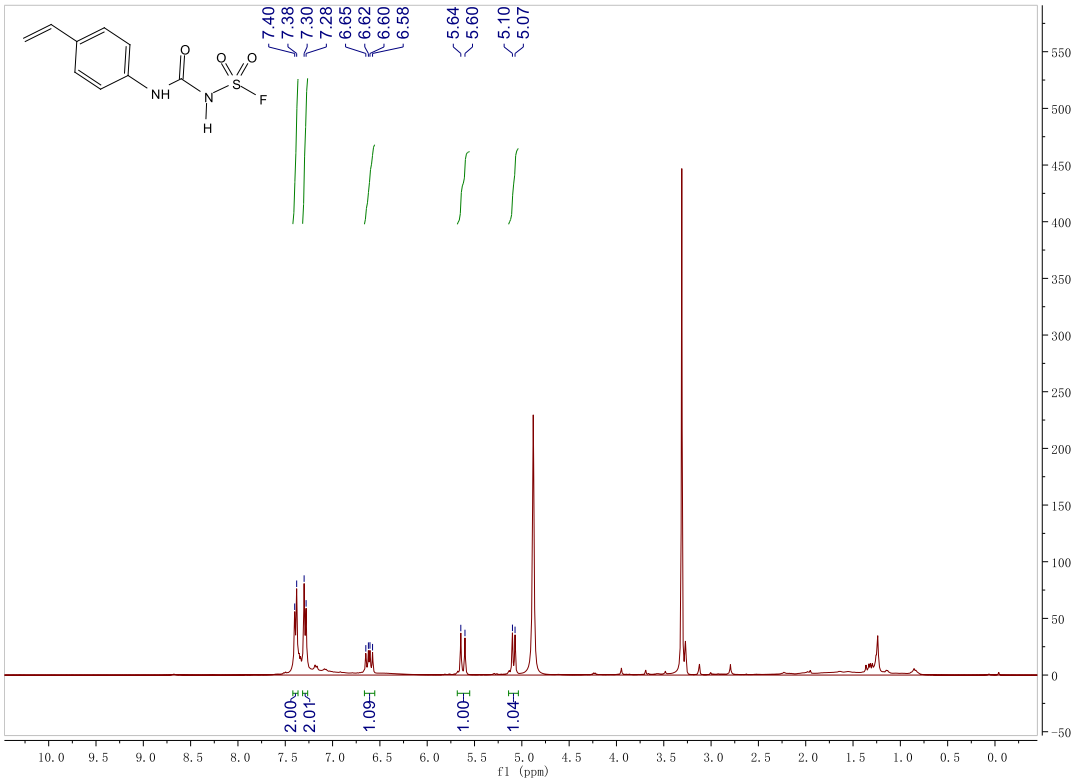


^{19}F NMR

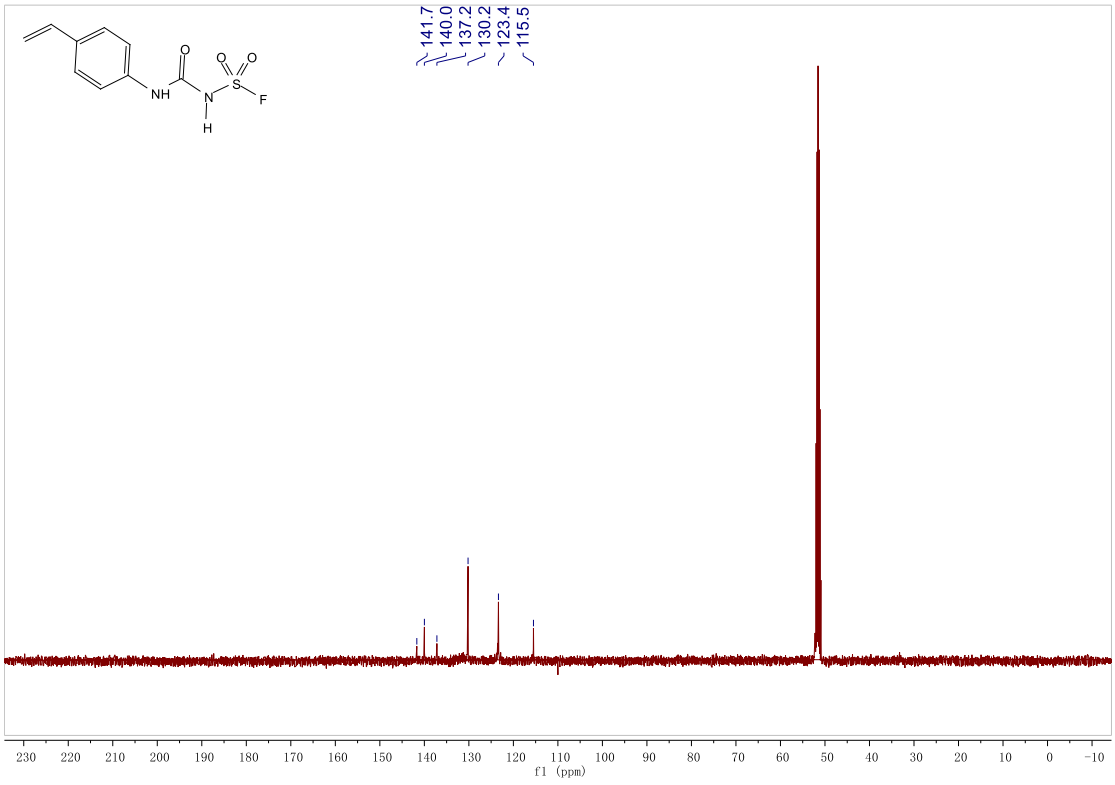


N-4-ethenylaminocarbonyl-fluorsulfurylamid ***(6-6)***

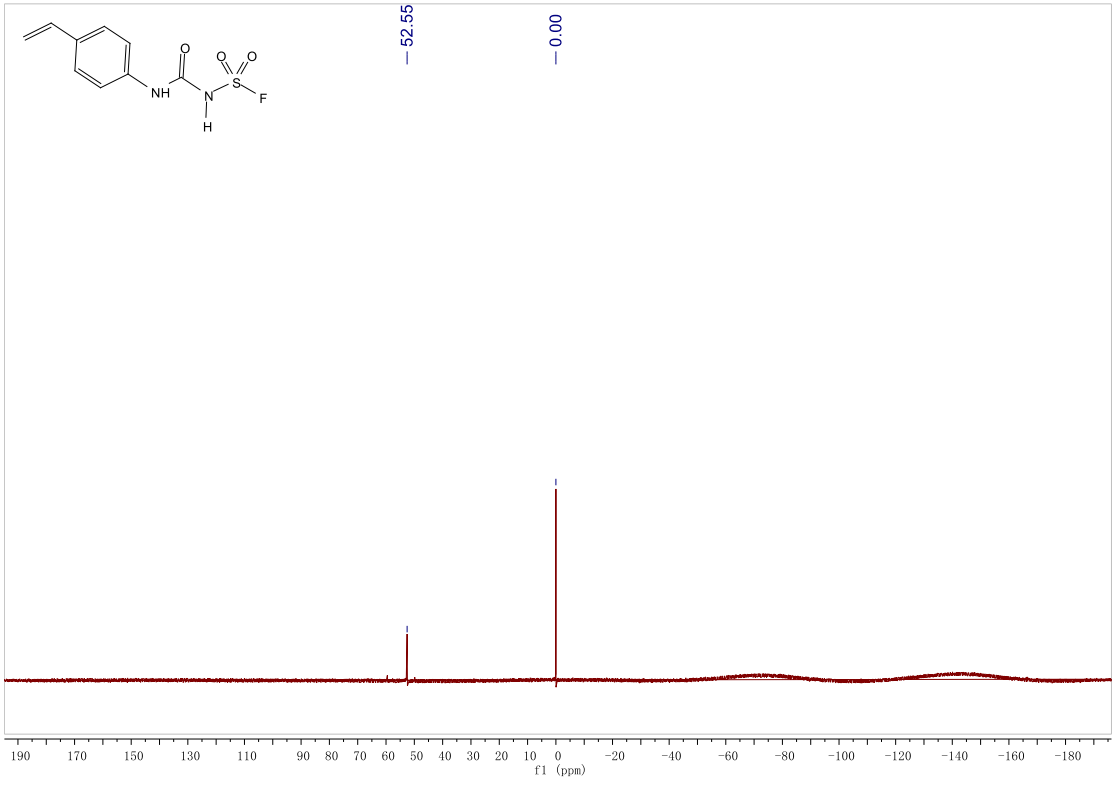
^{1}H NMR



^{13}C NMR

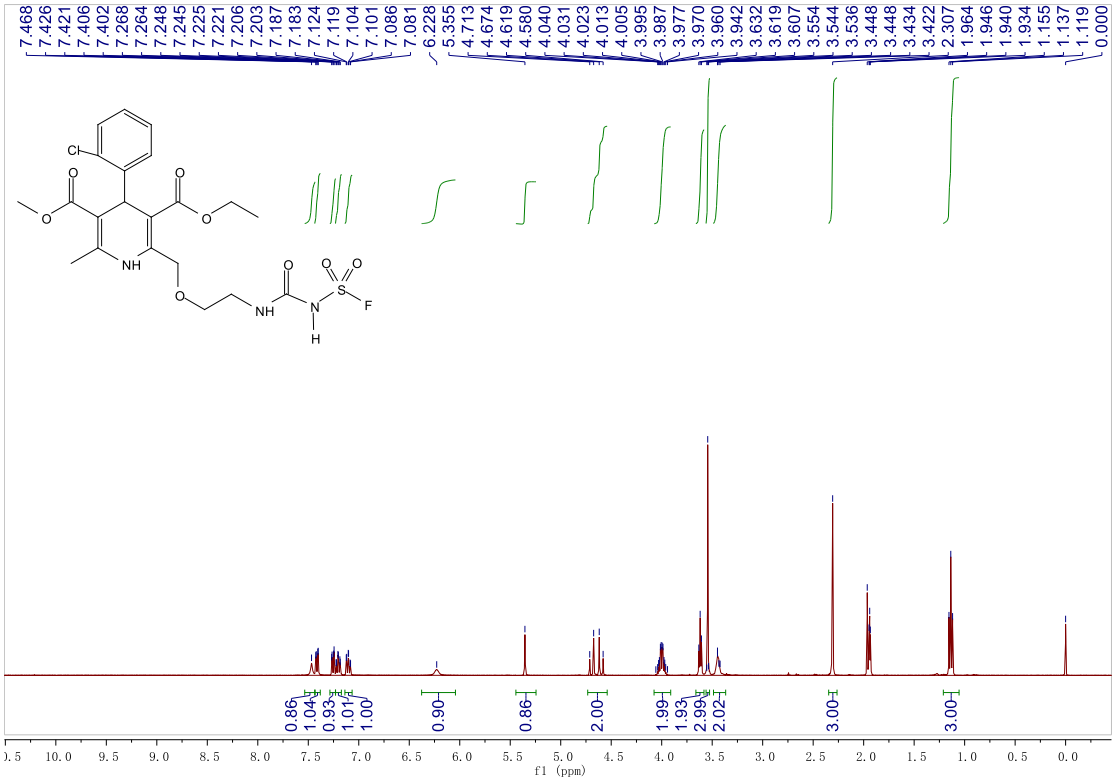


^{19}F NMR

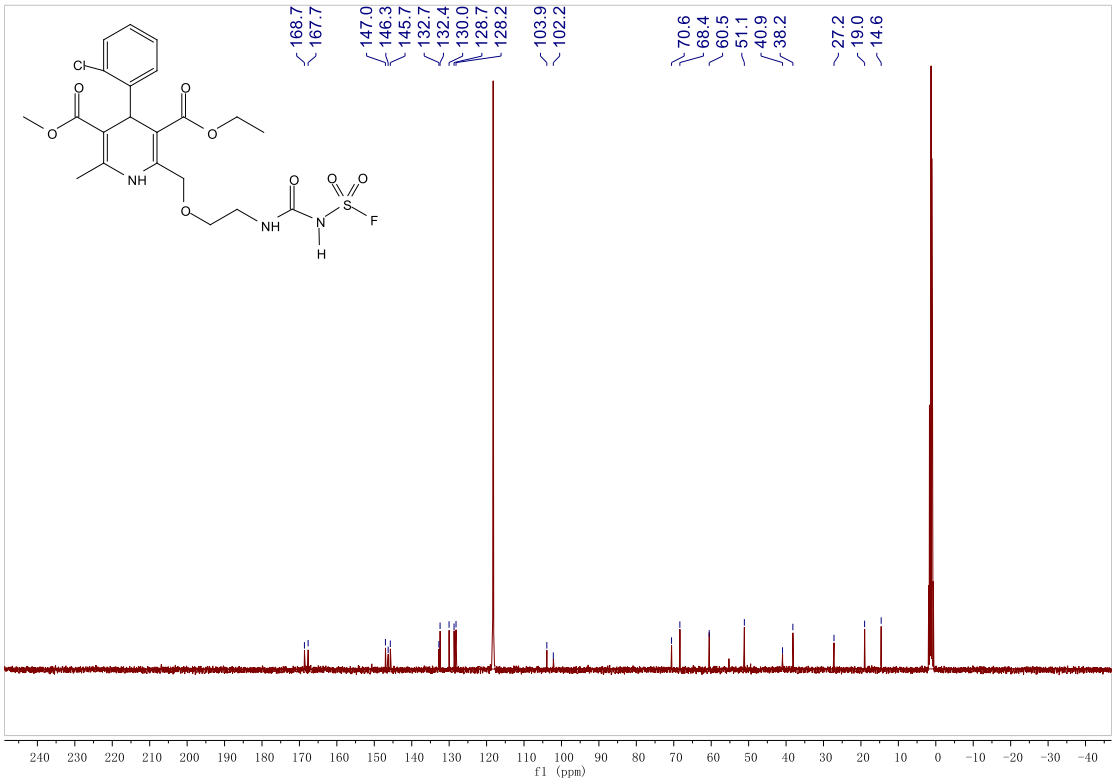


Compound 6-7

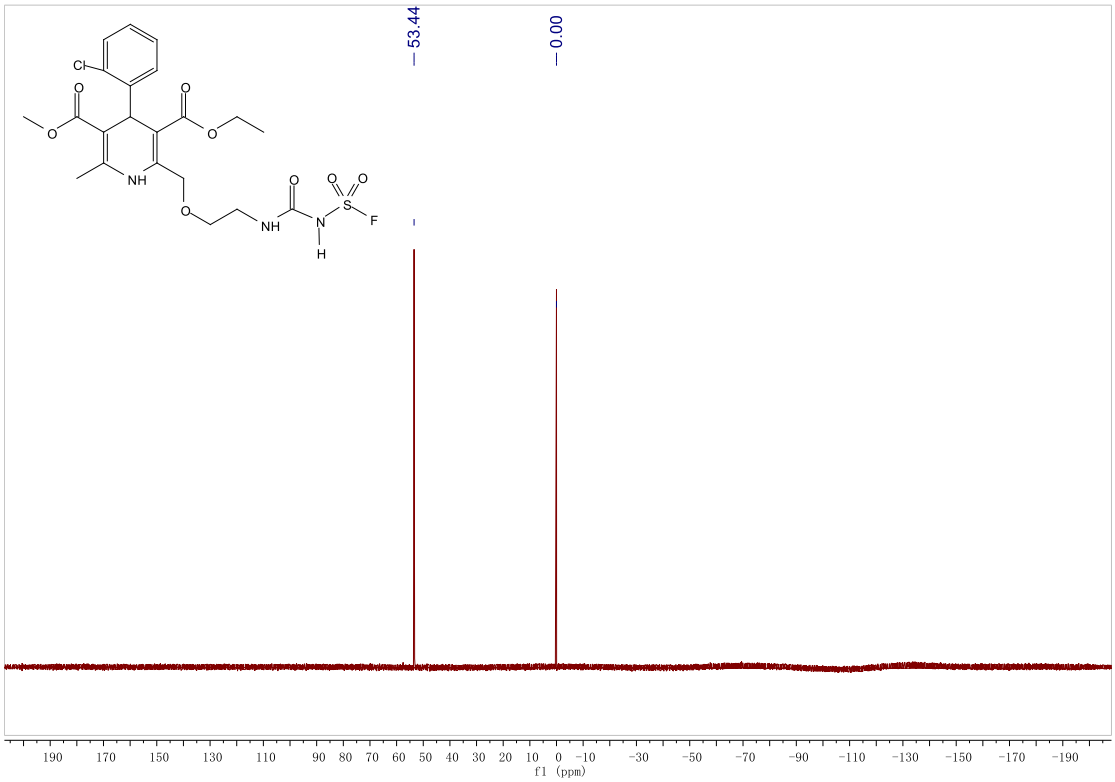
^{1}H NMR



^{13}C NMR

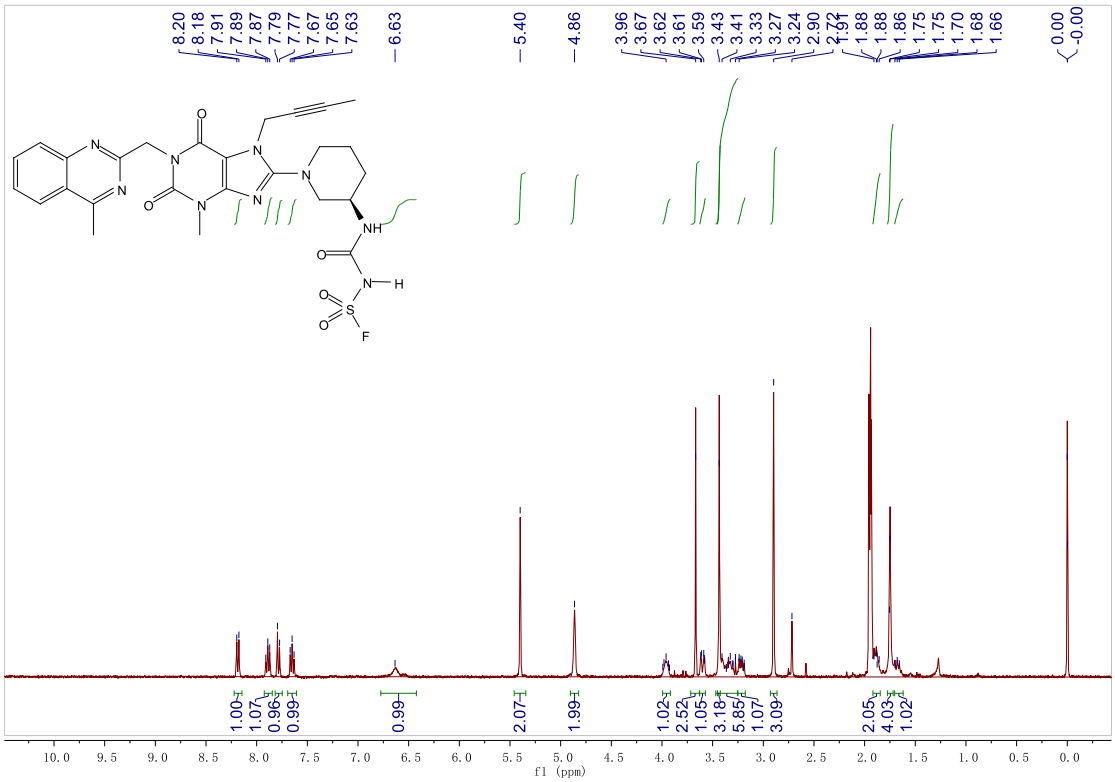


^{19}F NMR

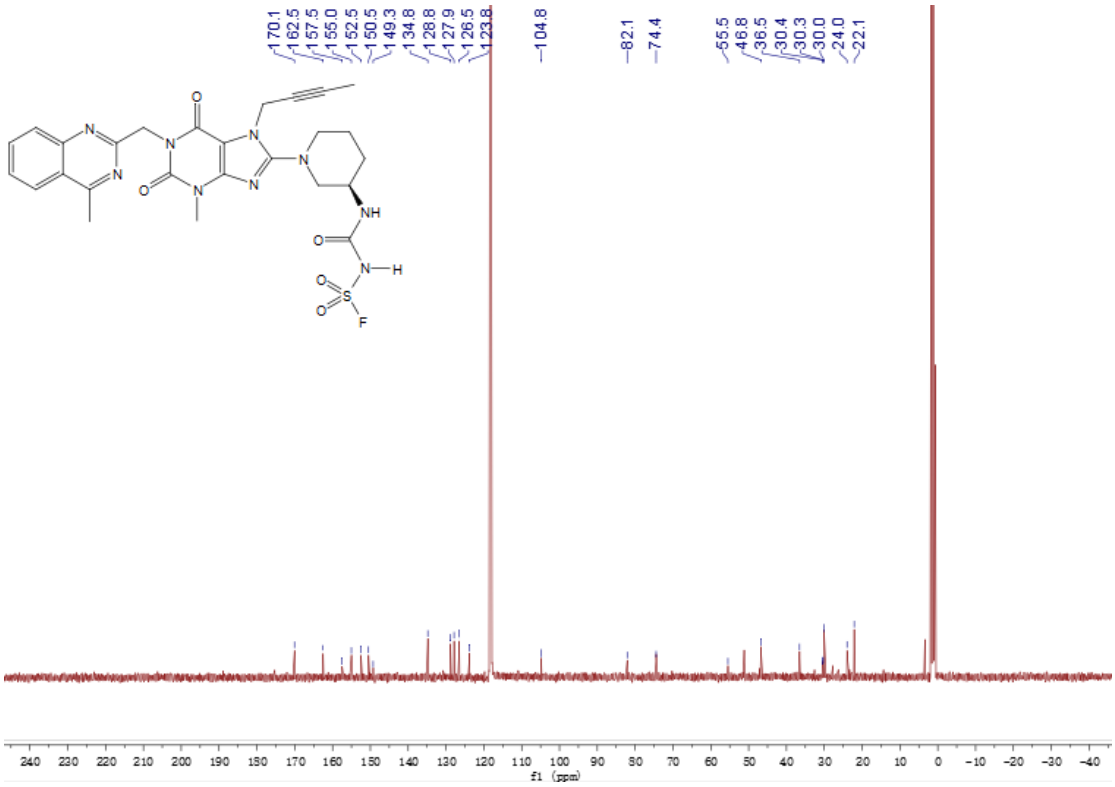


Compound 6-8

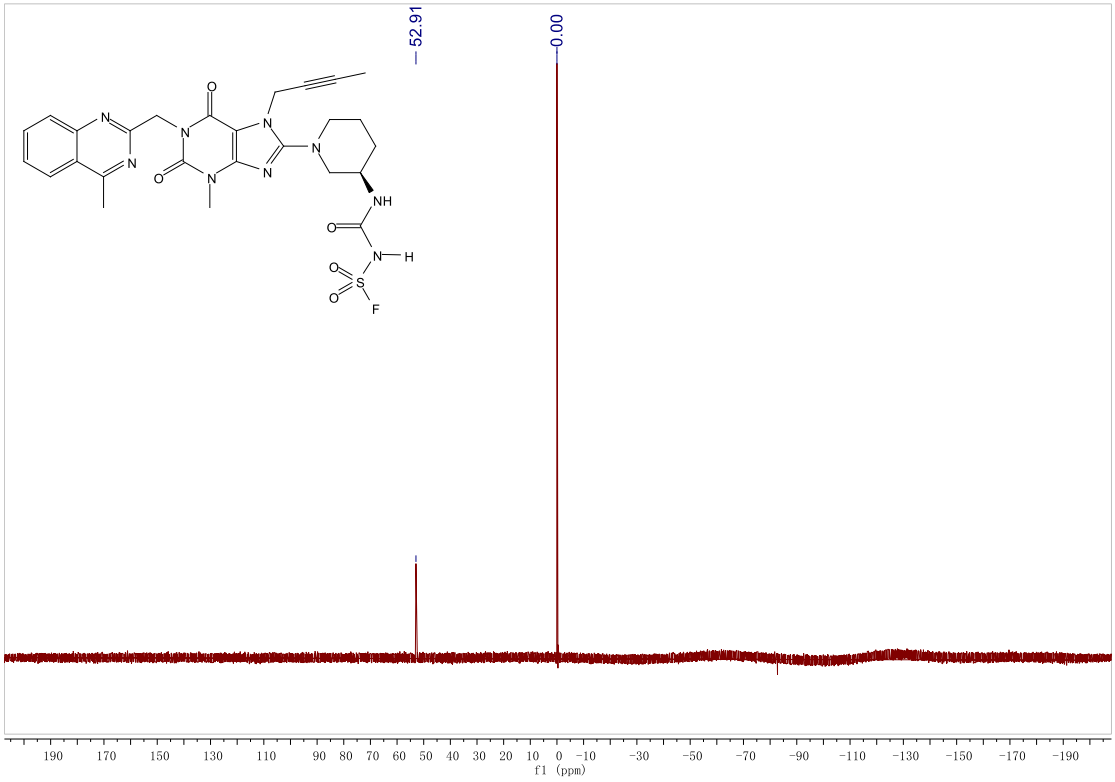
^{1}H NMR



^{13}C NMR

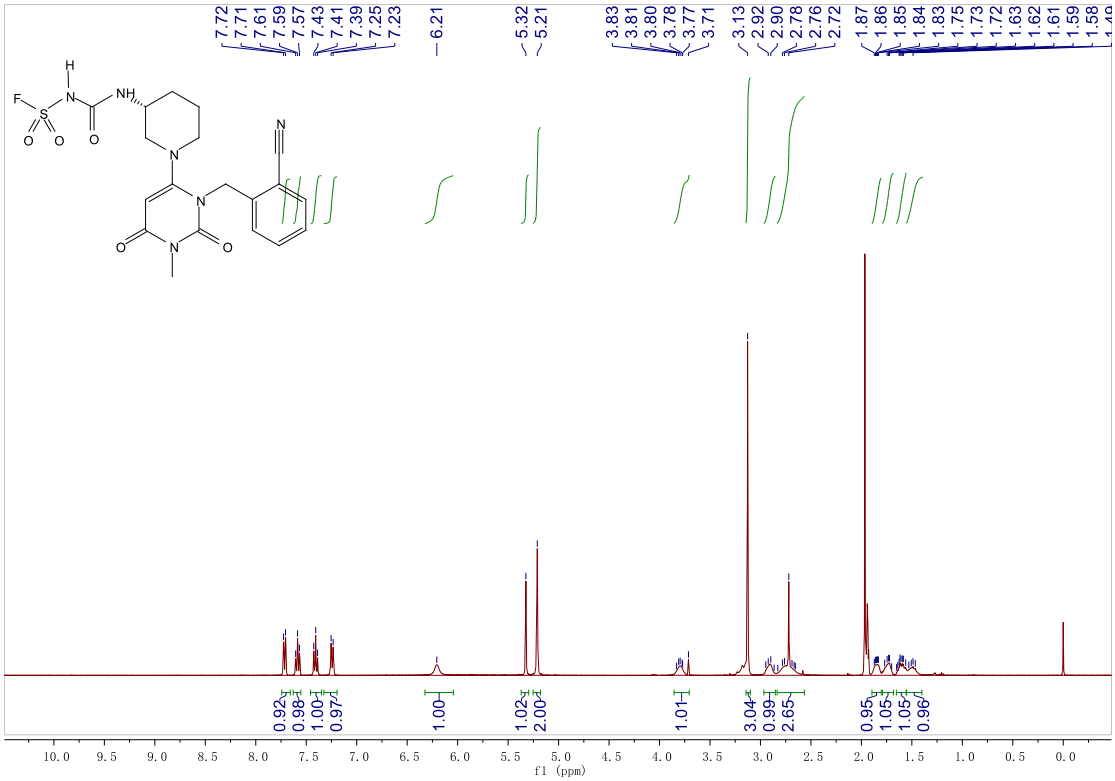


^{19}F NMR

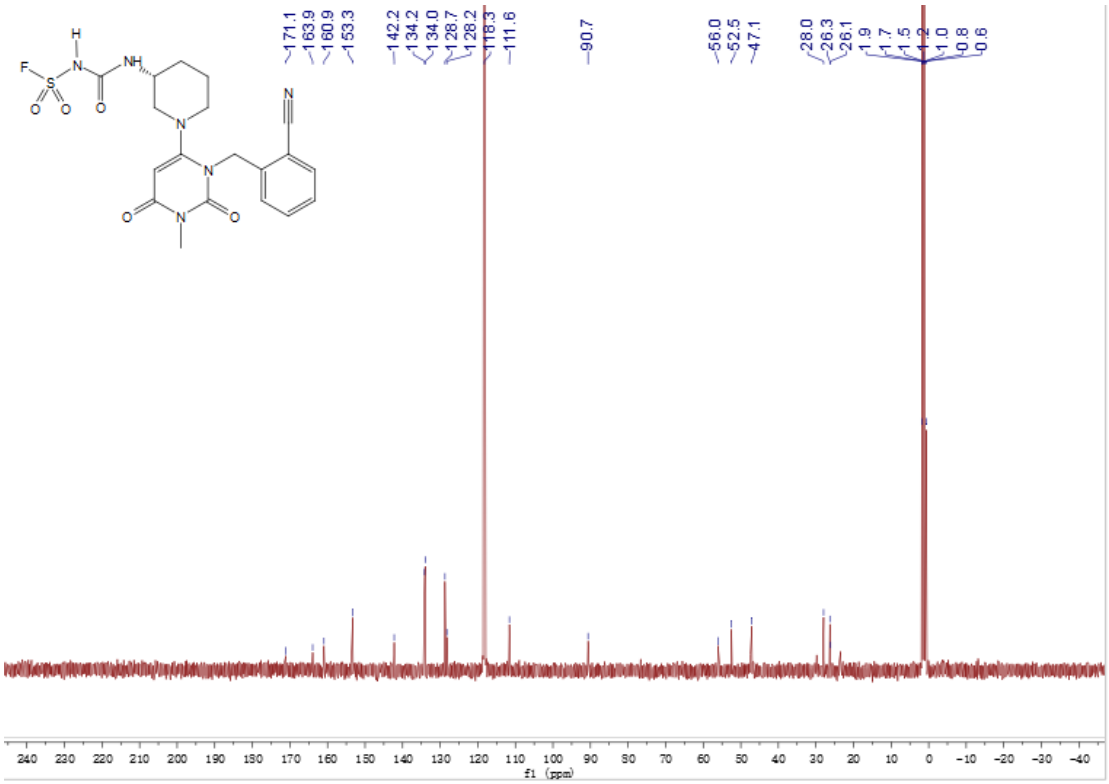


Compound 6-9

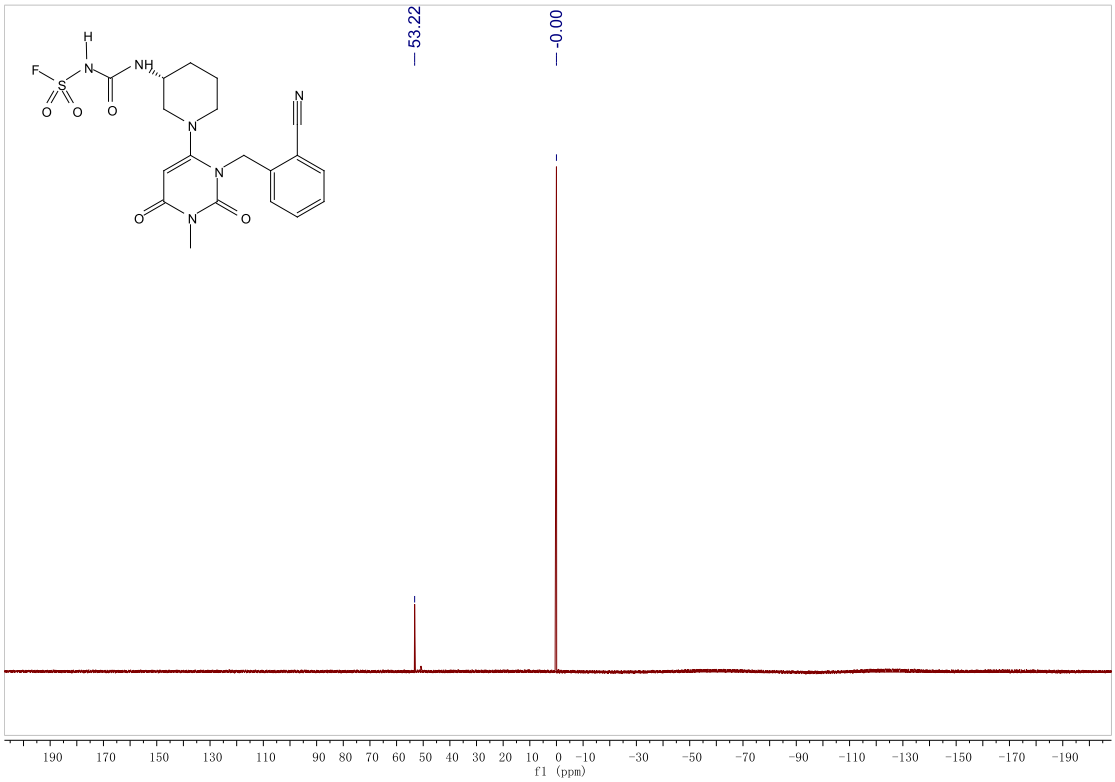
^{1}H NMR



^{13}C NMR

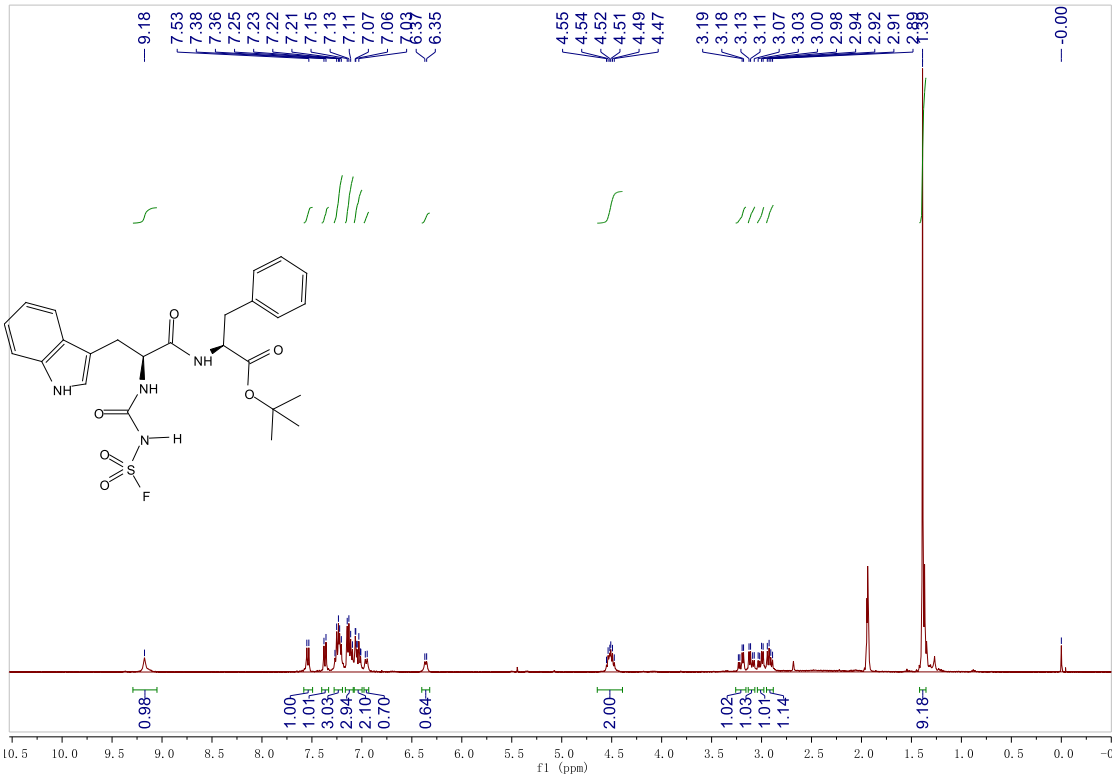


^{19}F NMR

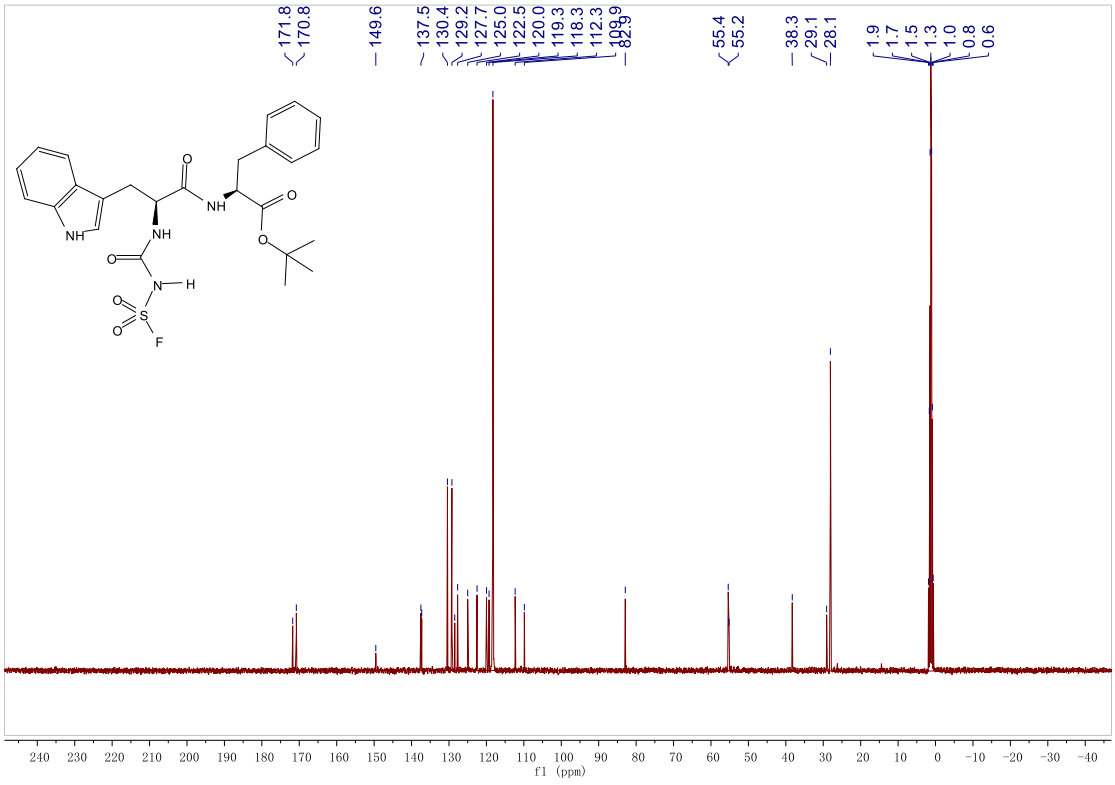


Compound 6-10

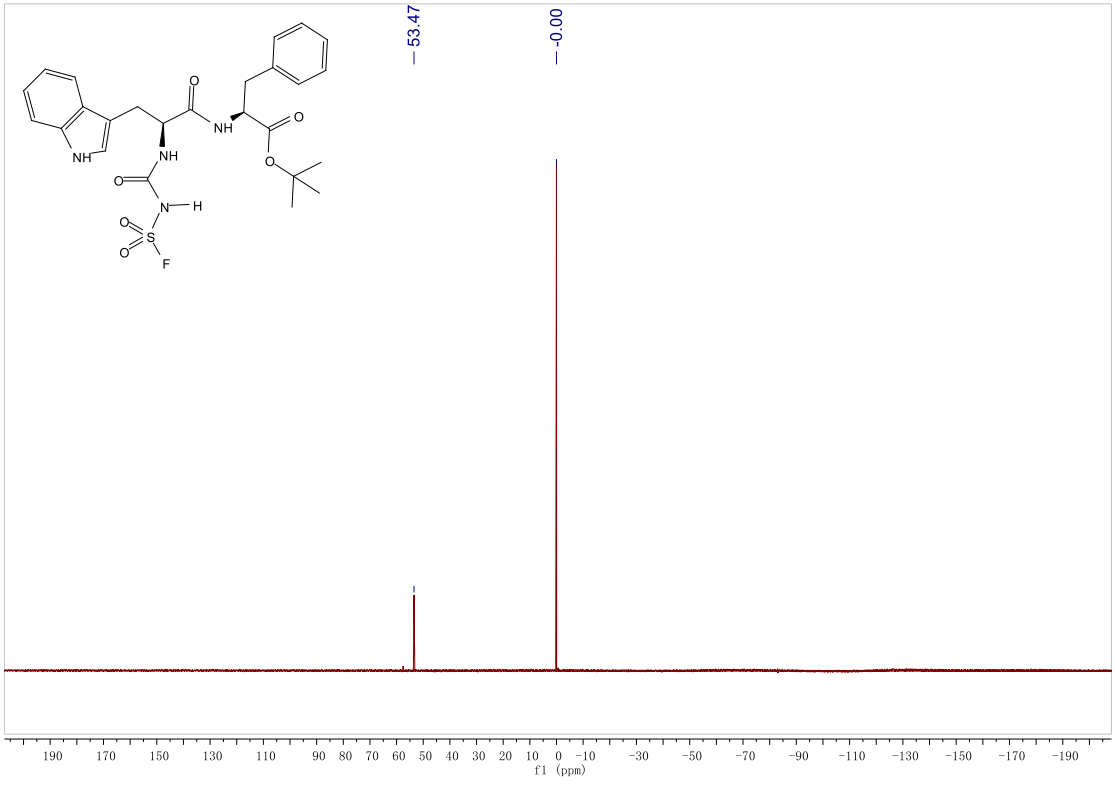
^{1}H NMR



^{13}C NMR

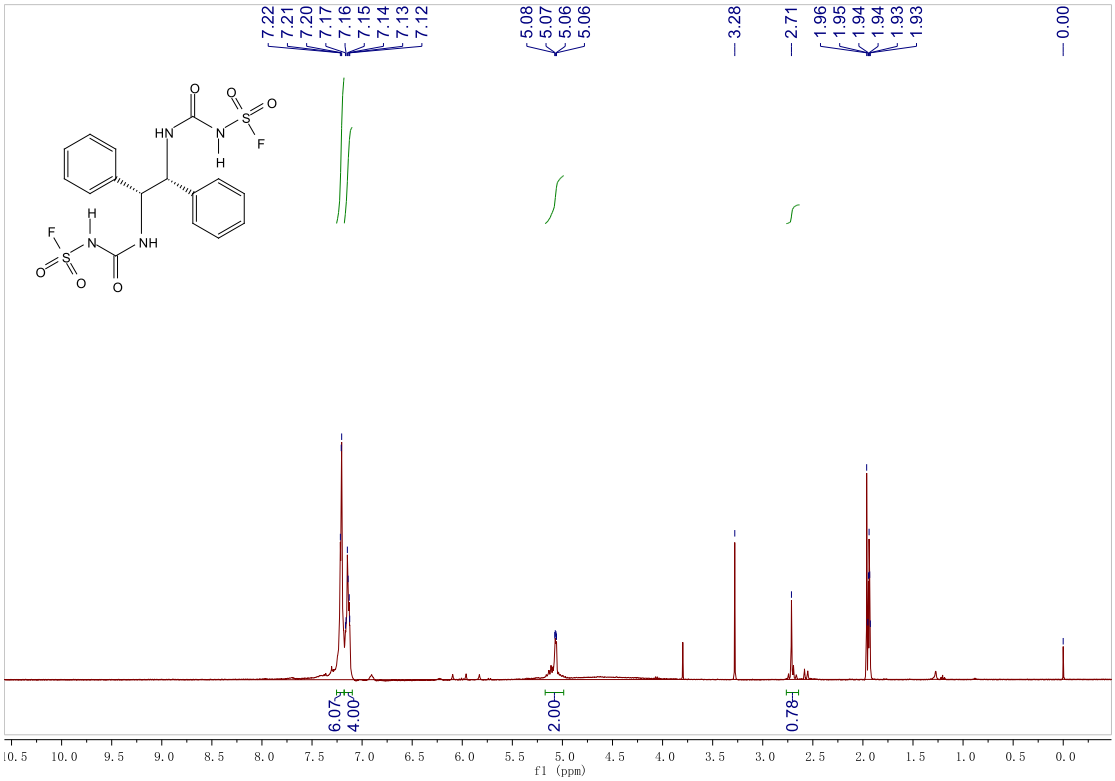


^{19}F NMR

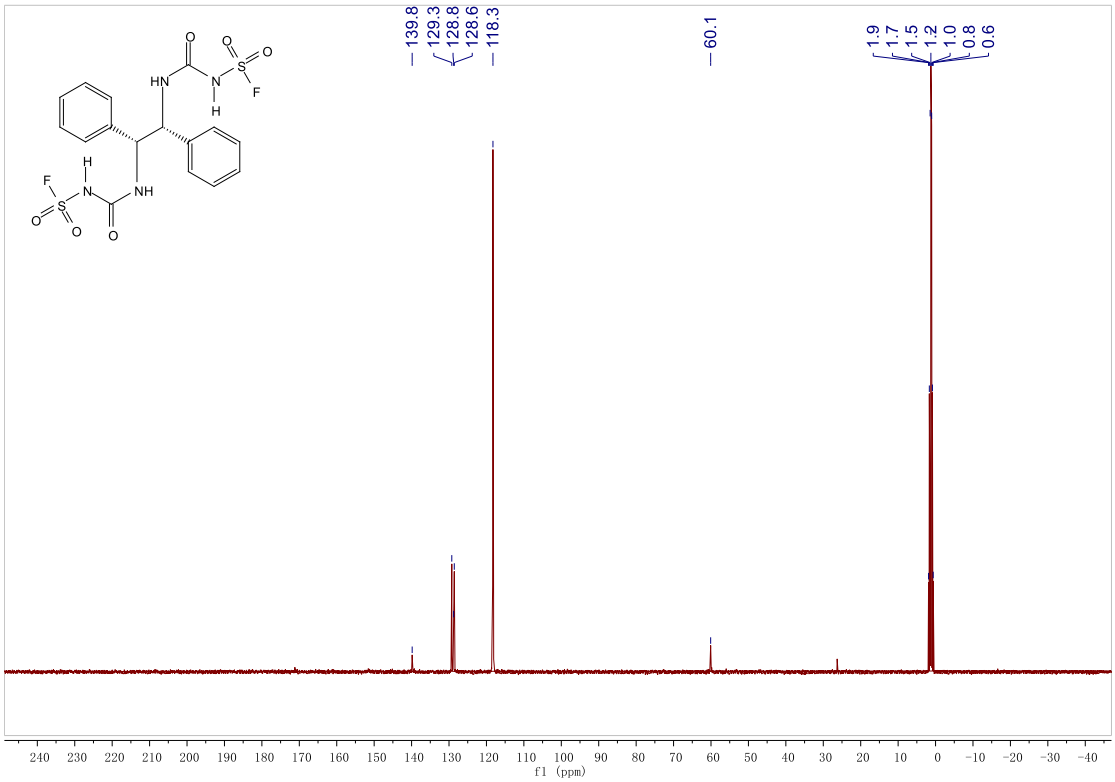


Compound 6-11

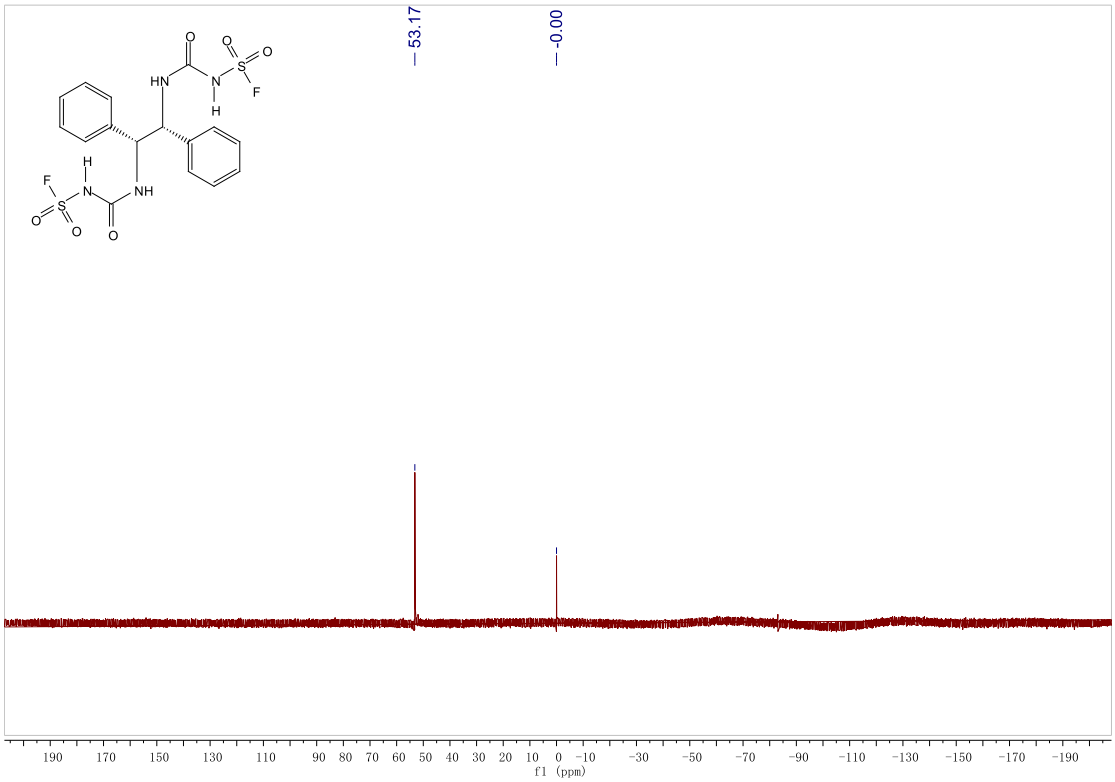
^{1}H NMR



^{13}C NMR

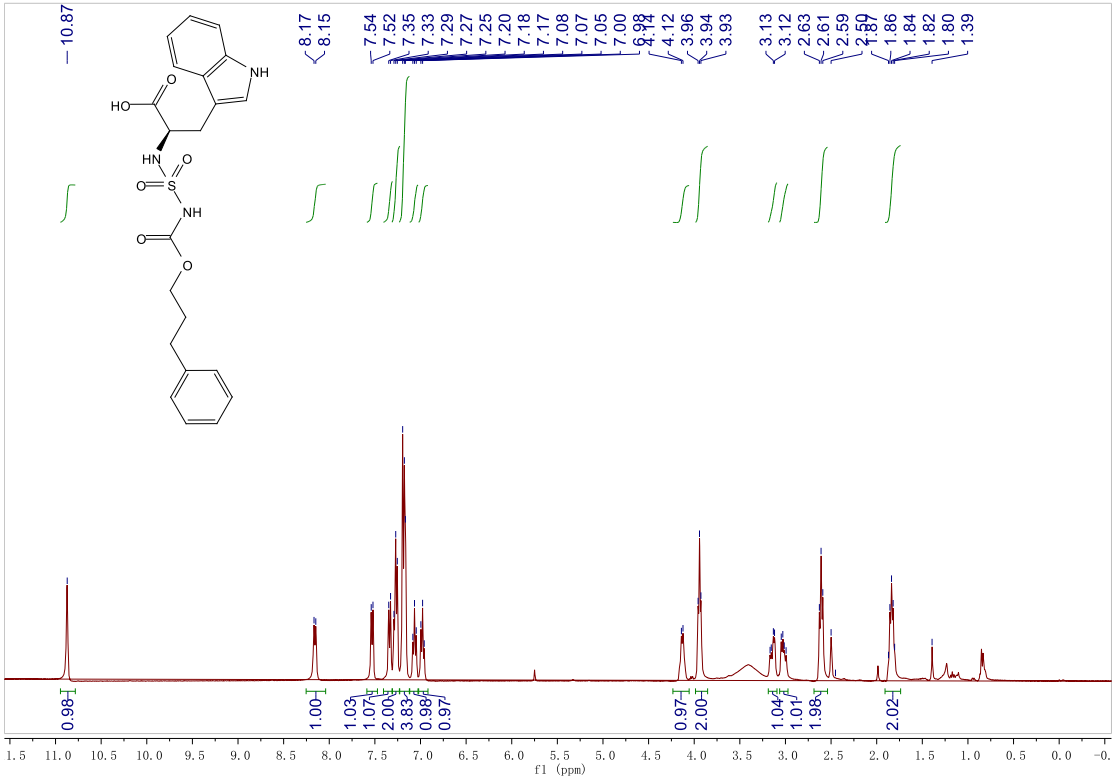


^{19}F NMR

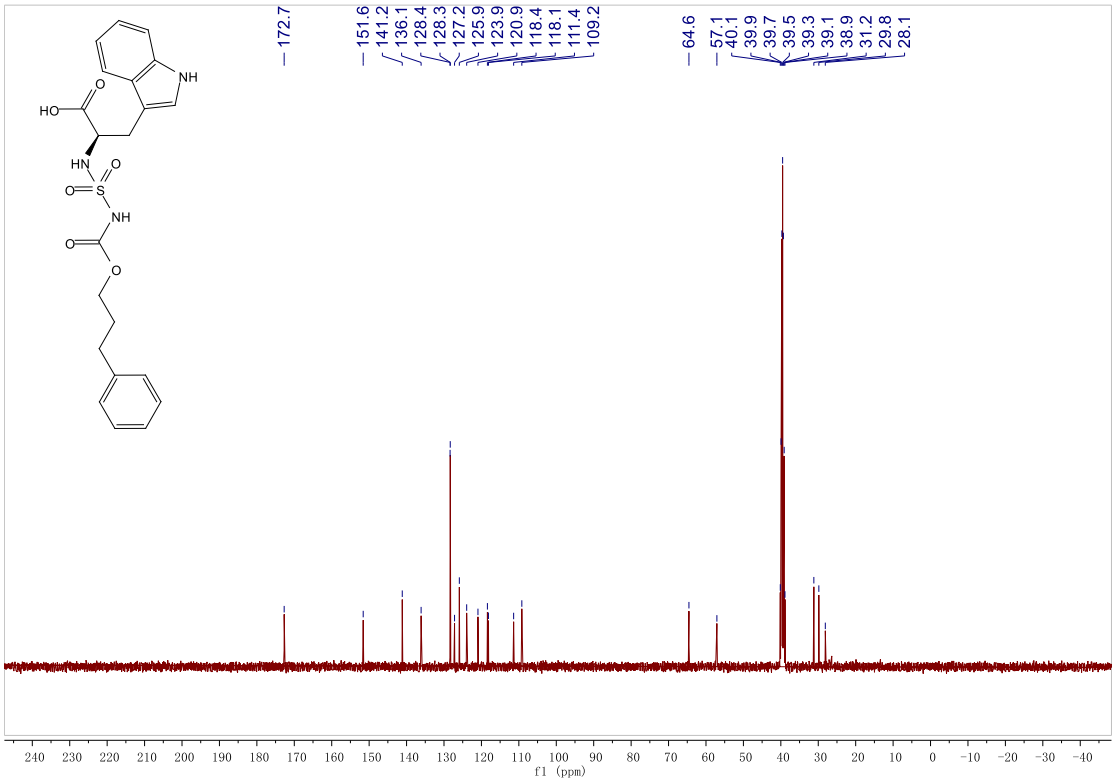


Compound 9-1

^{1}H NMR

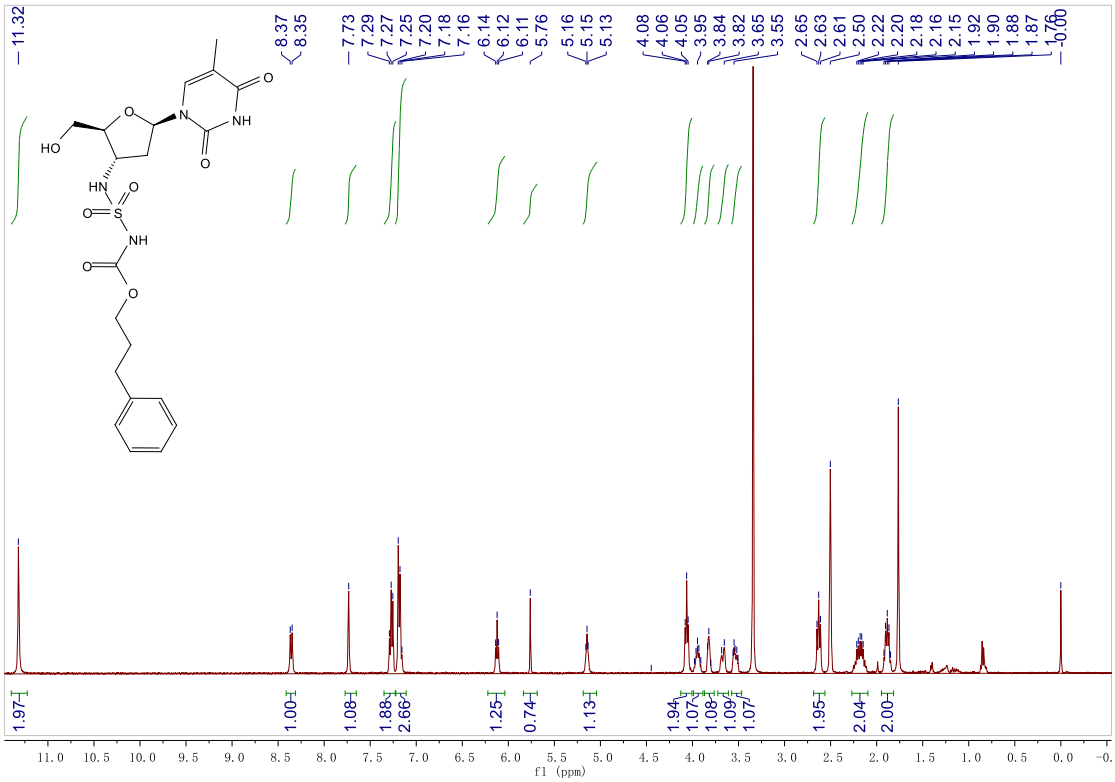


^{13}C NMR

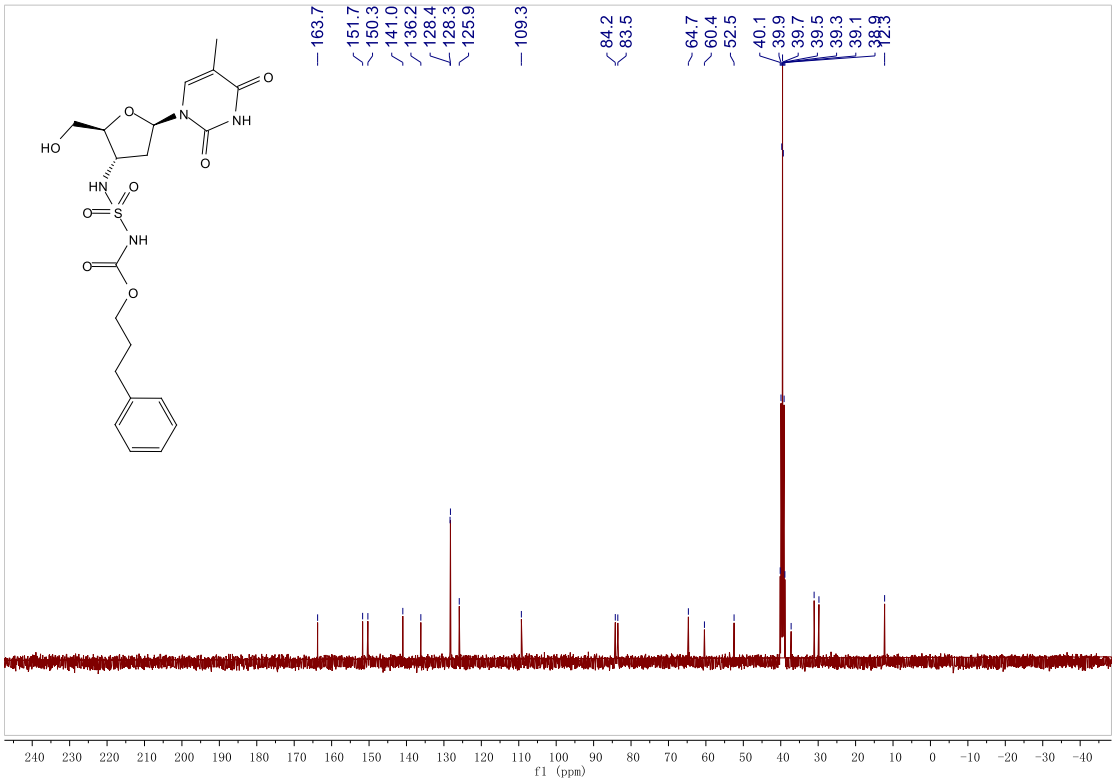


Compound 9-2

^{1}H NMR

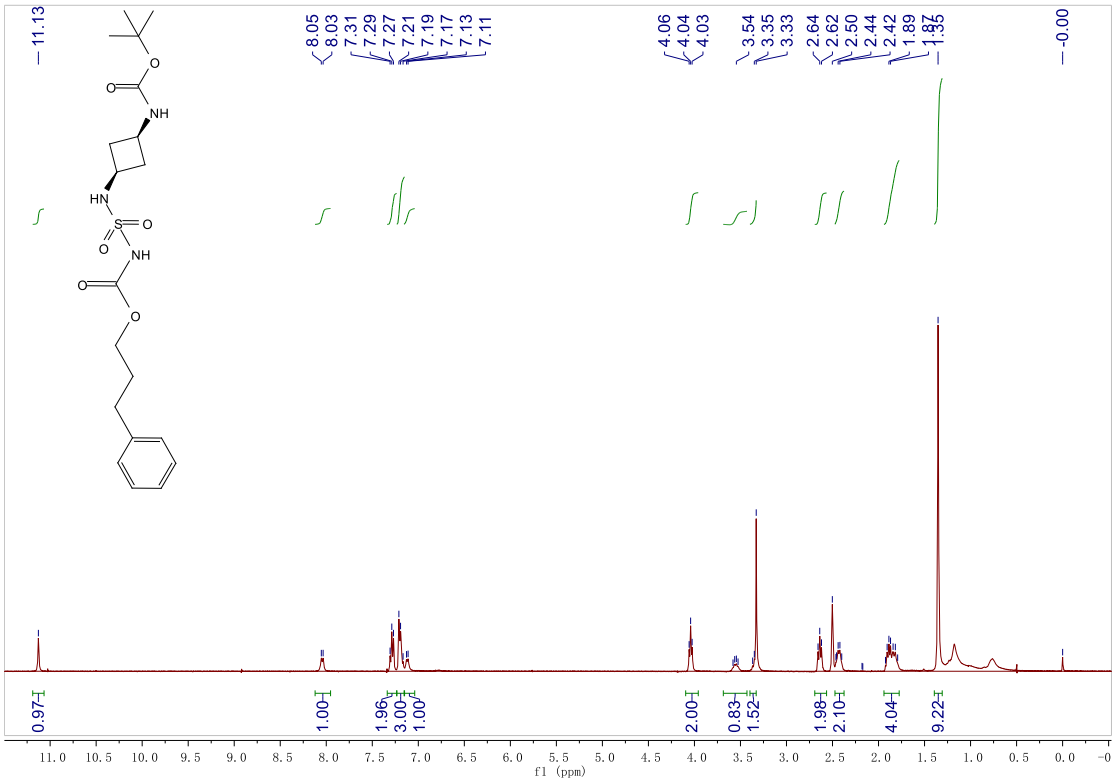


^{13}C NMR

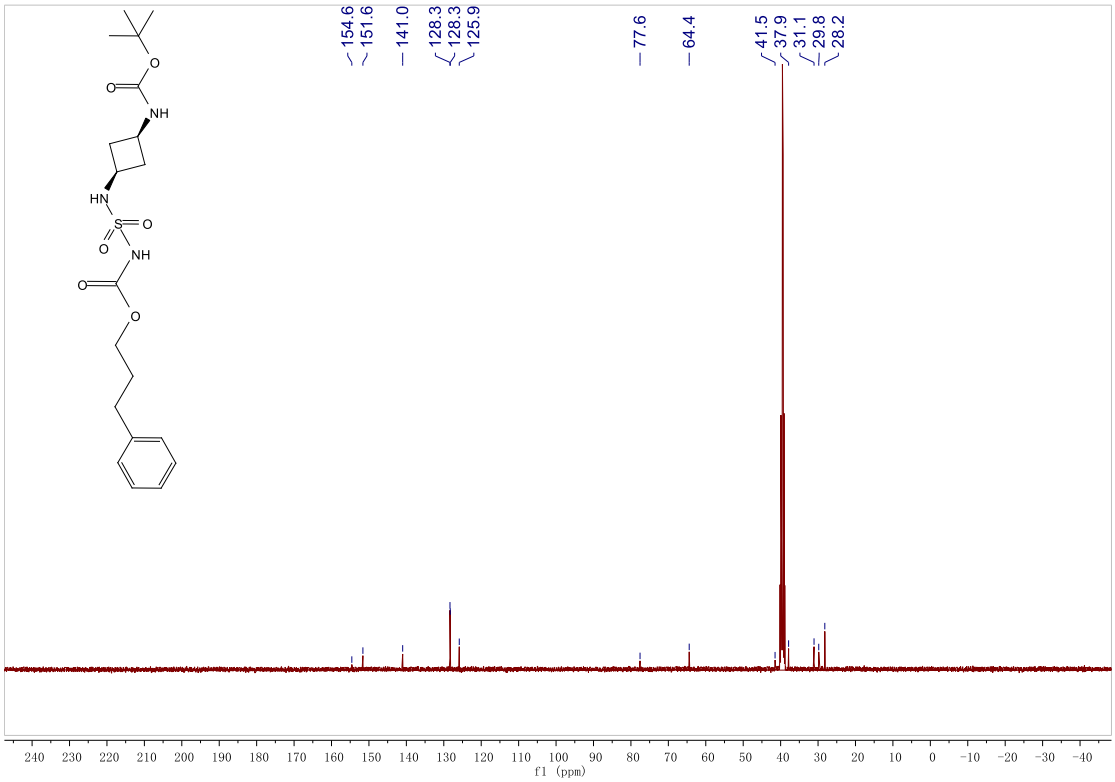


Compound 9-3

^{1}H NMR

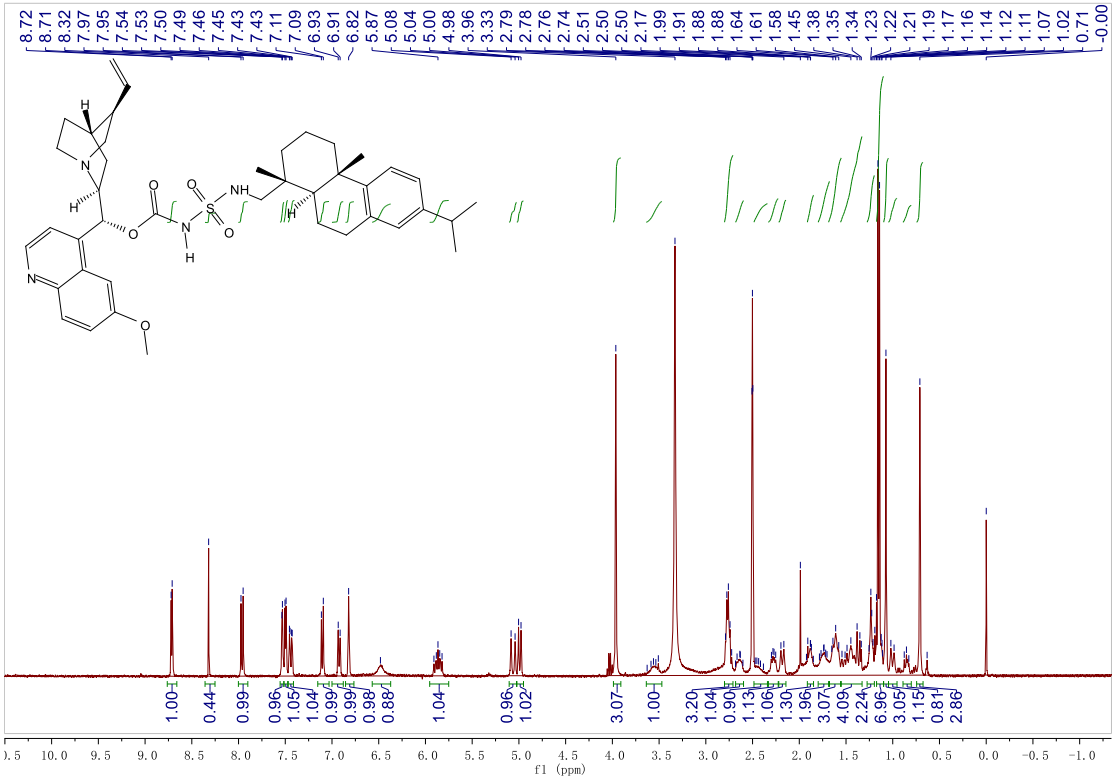


^{13}C NMR

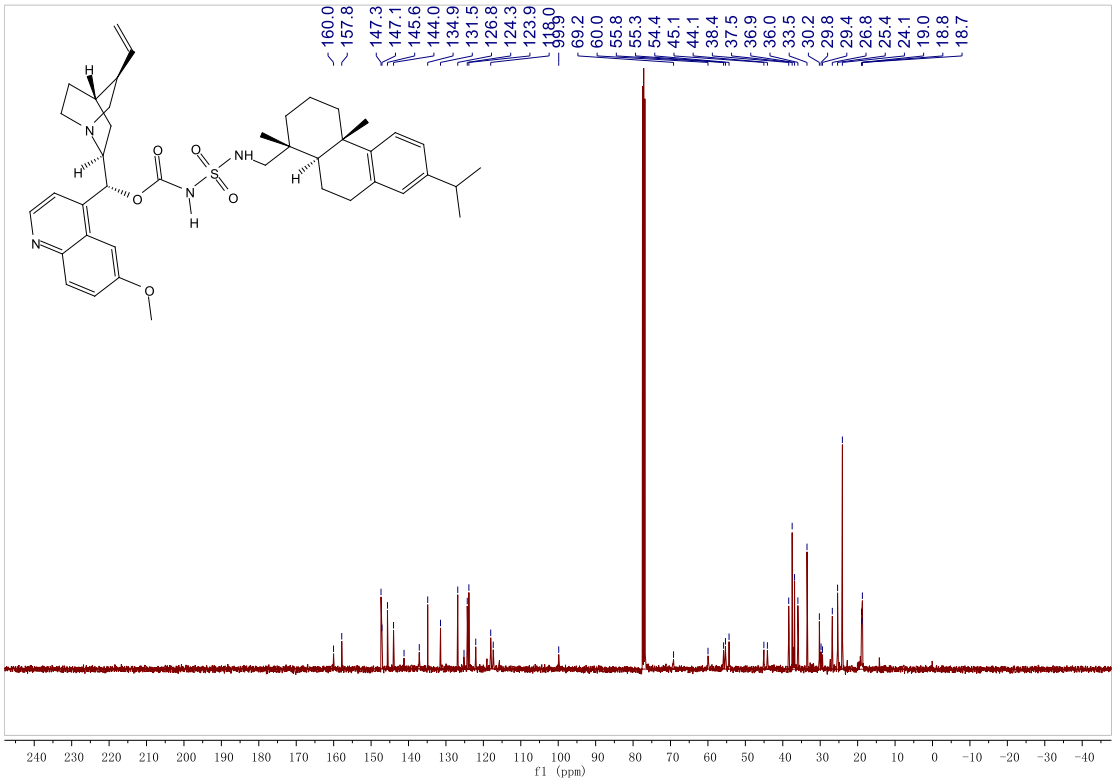


Compound 9-4

^{1}H NMR

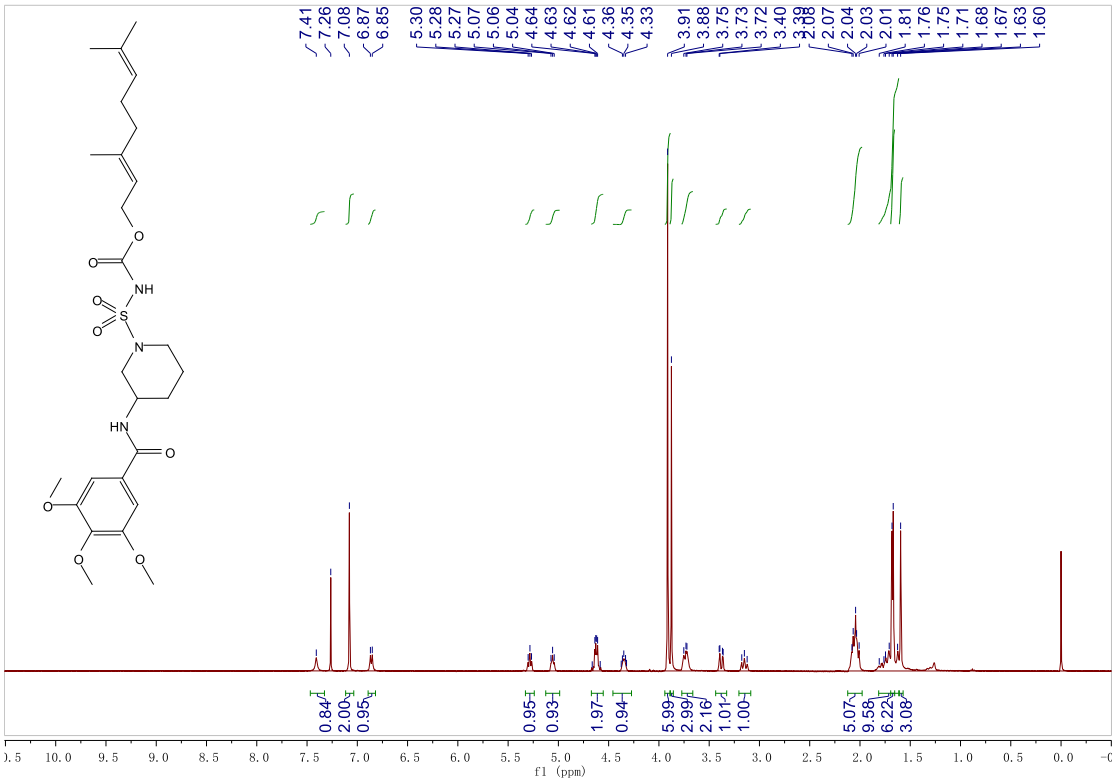


^{13}C NMR

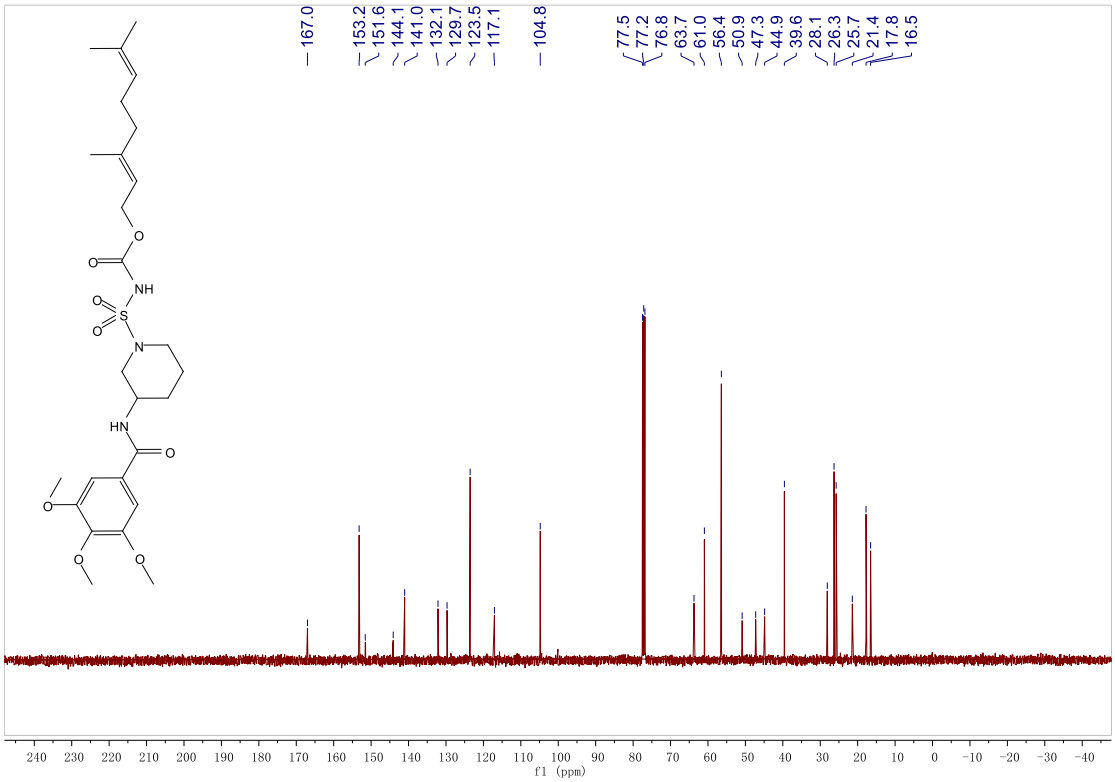


Compound 9-5

^{1}H NMR

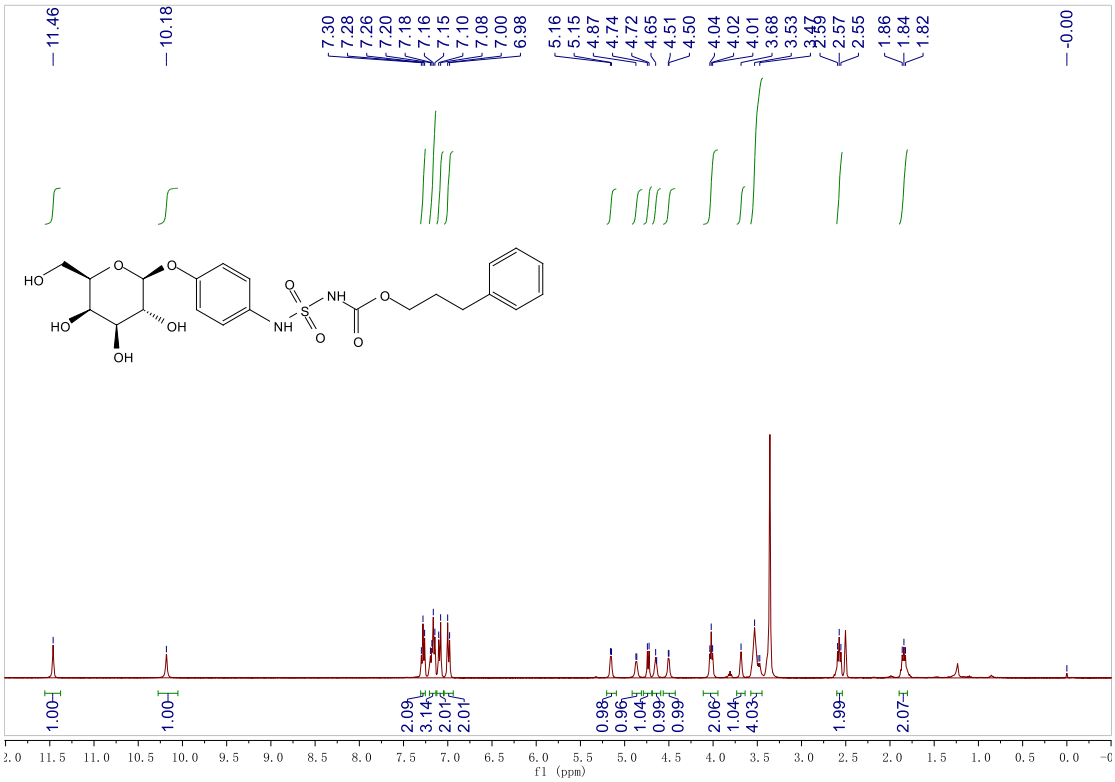


^{13}C NMR

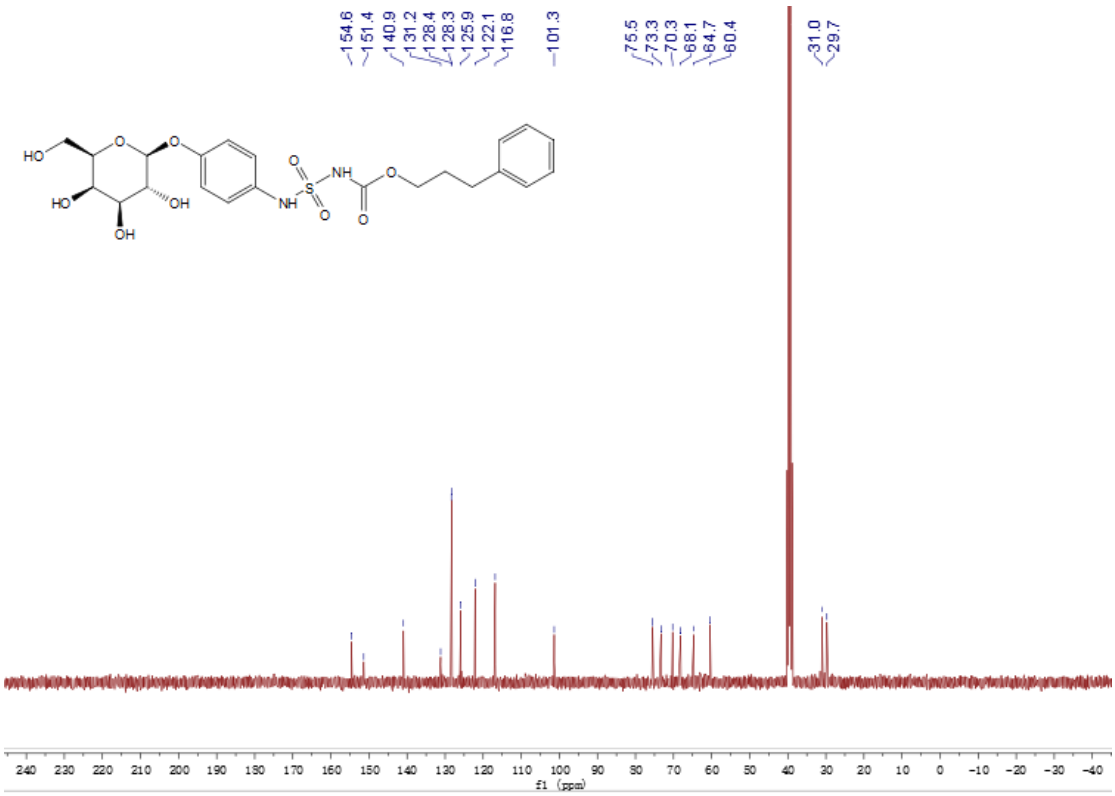


Compound 9-6

^{1}H NMR

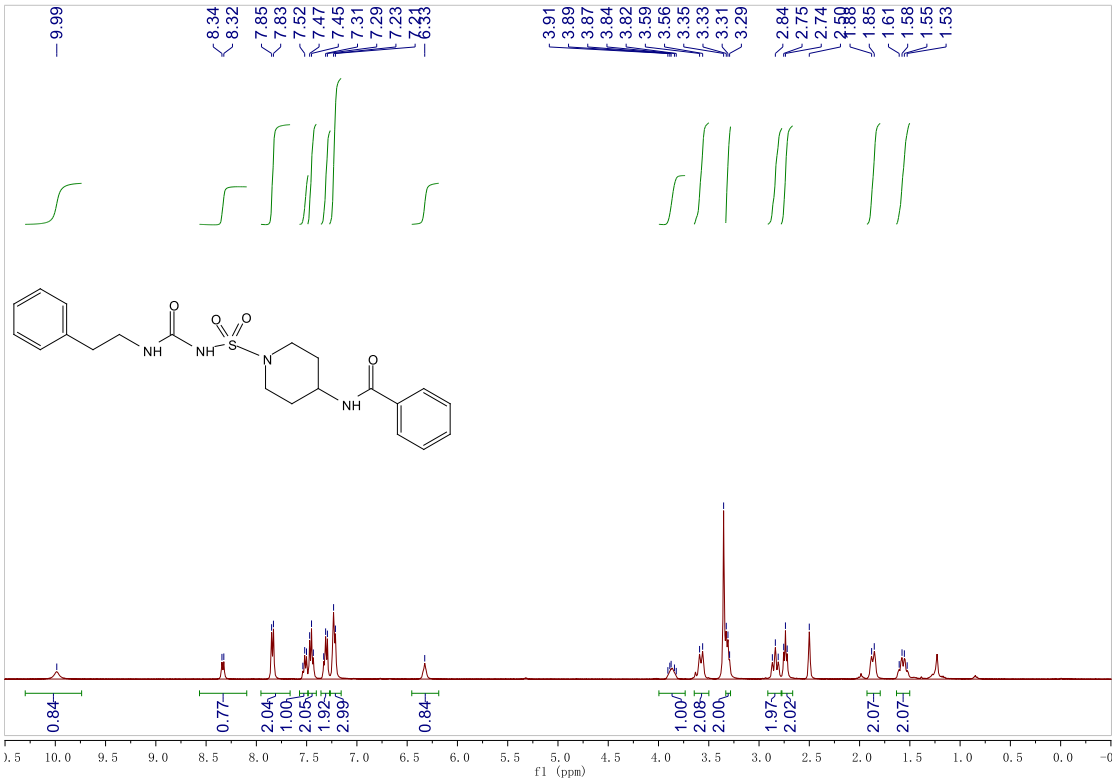


^{13}C NMR

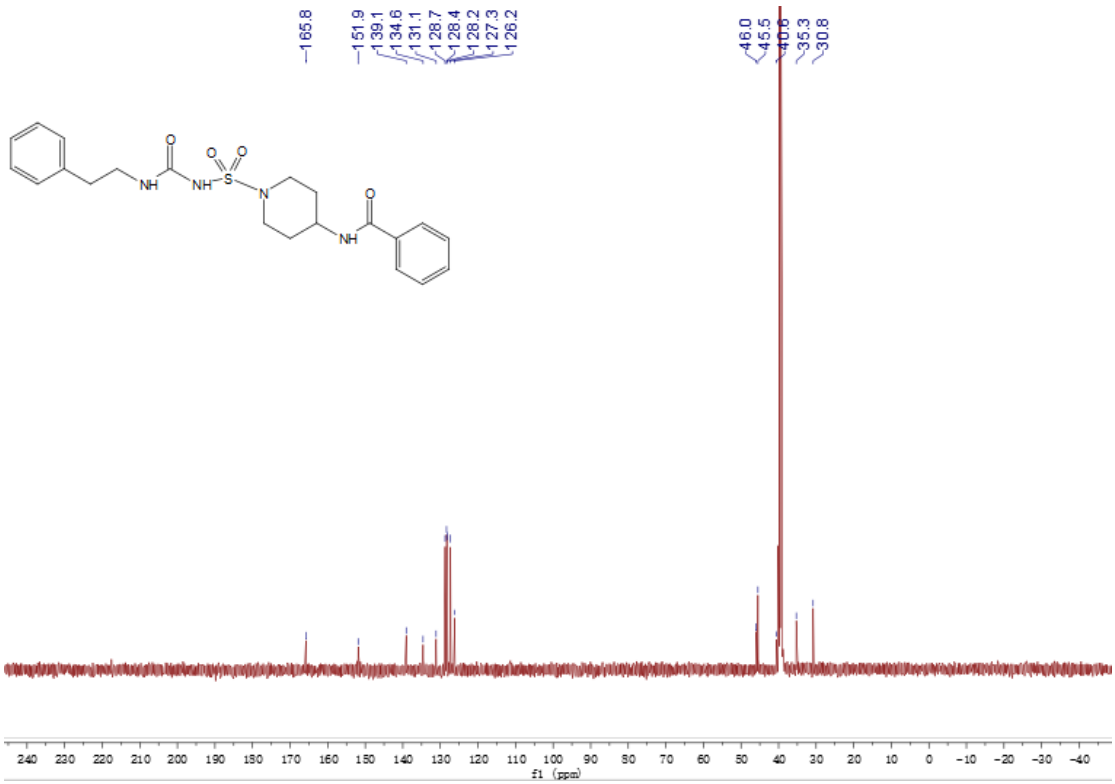


Compound 9-7

^{1}H NMR

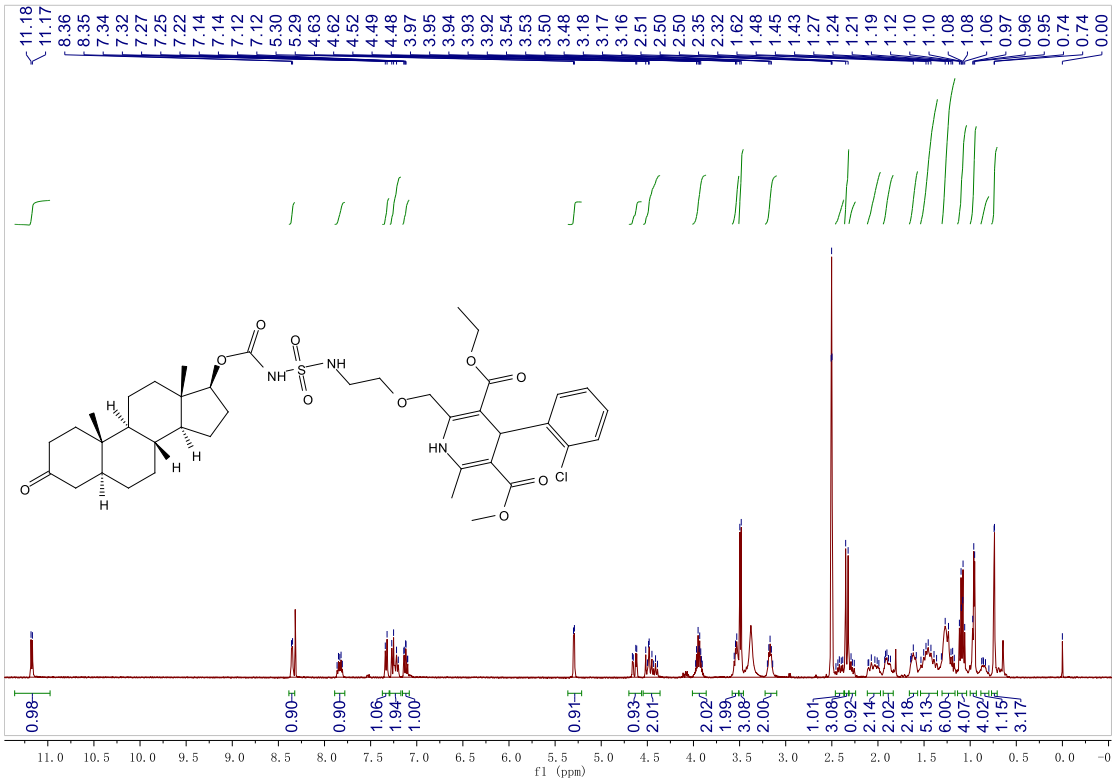


^{13}C NMR

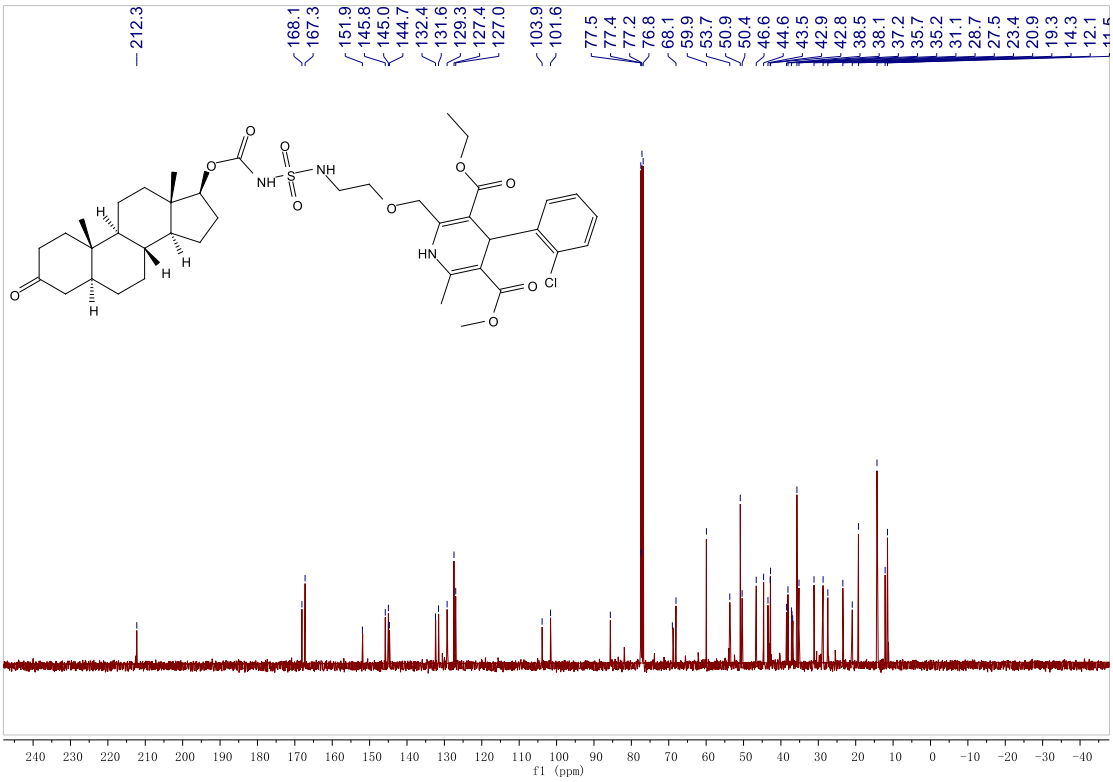


Compound 9-8

^{1}H NMR

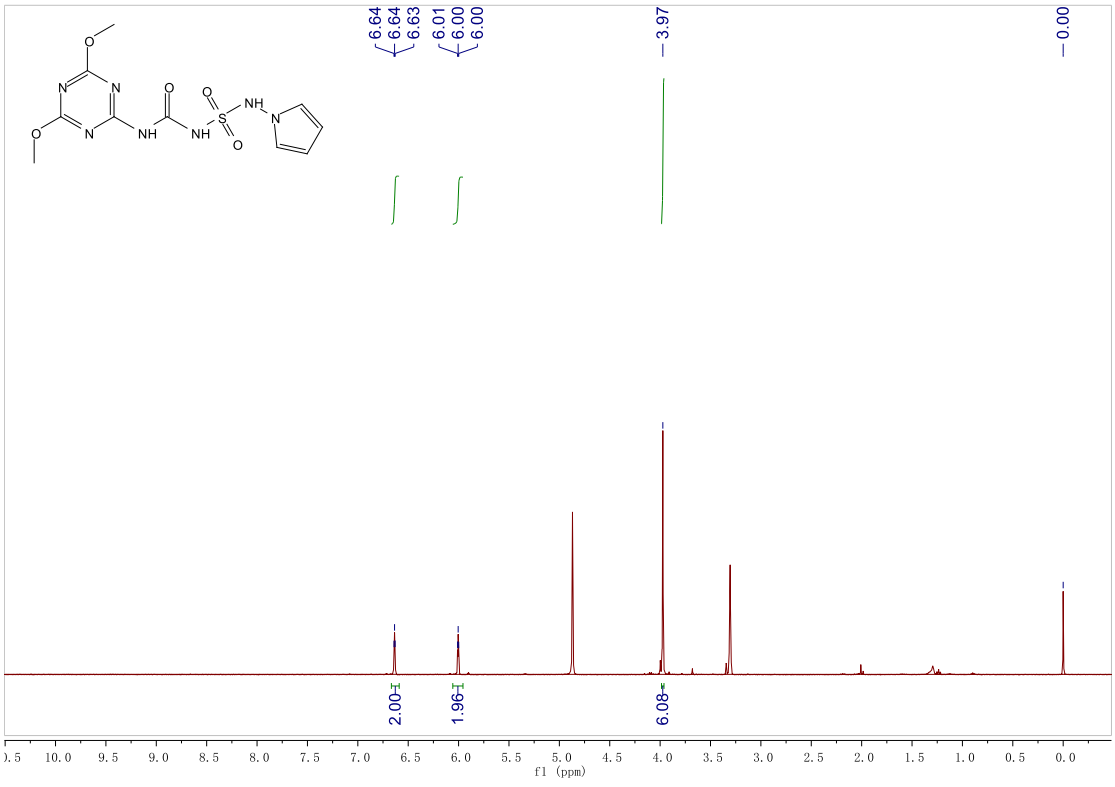


^{13}C NMR

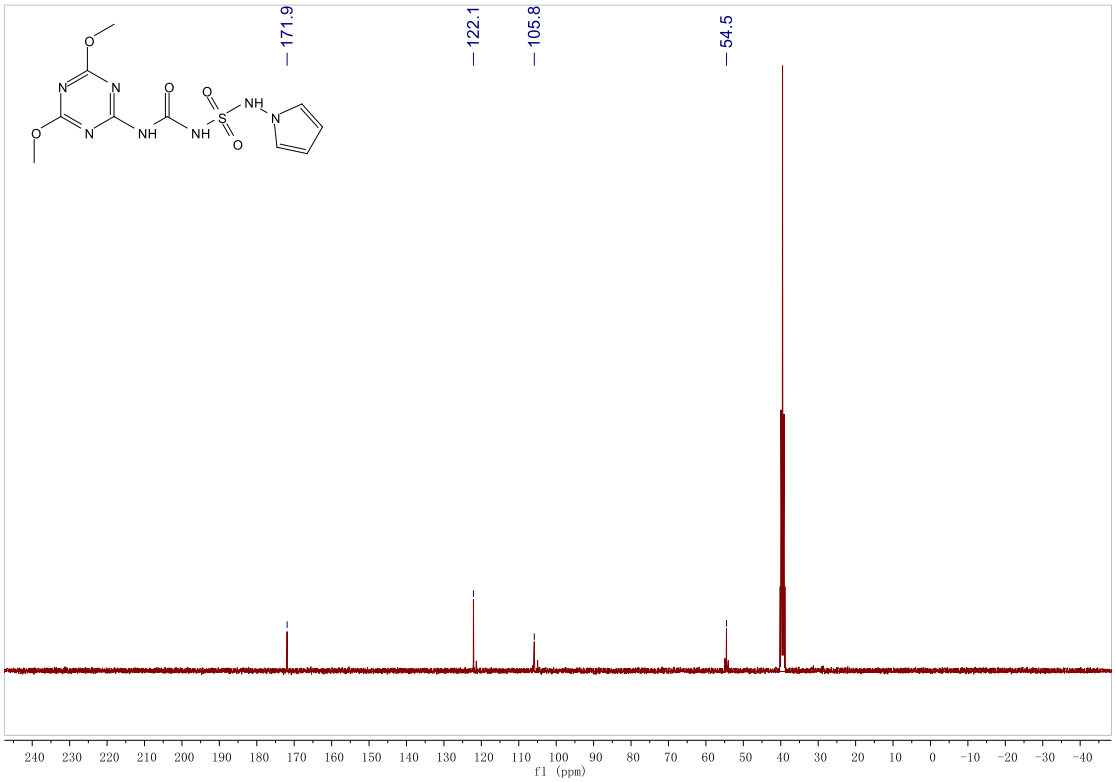


Compound 9-9

^{1}H NMR

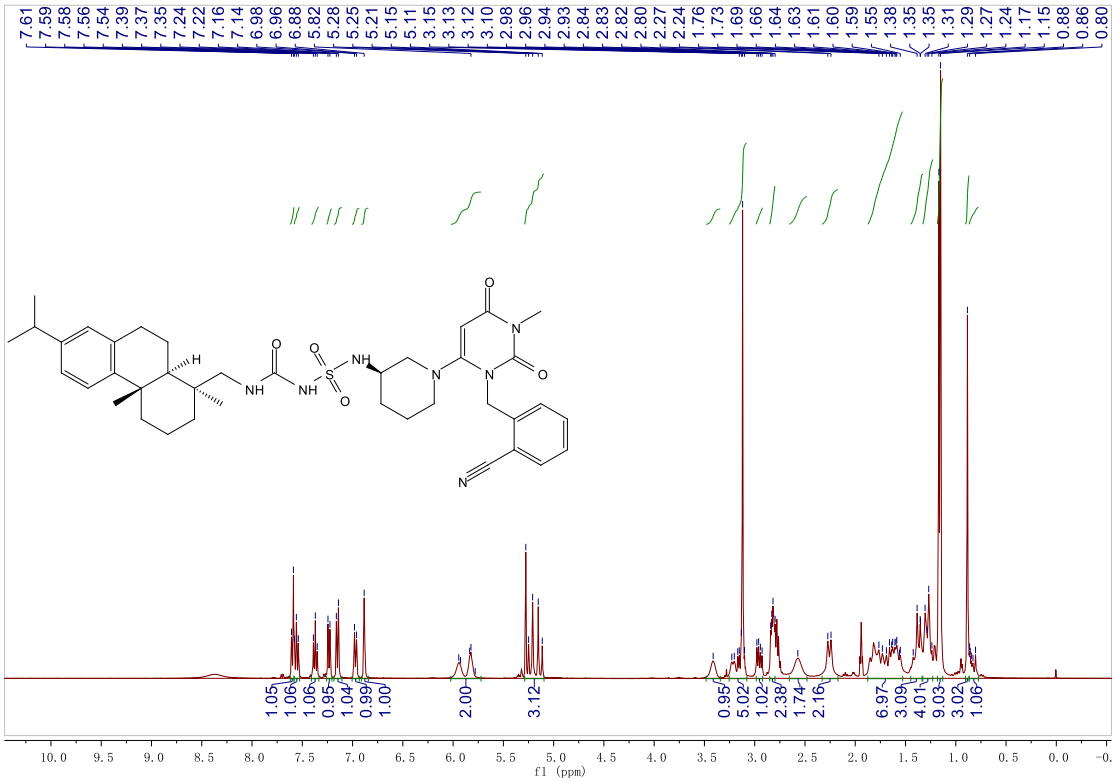


^{13}C NMR

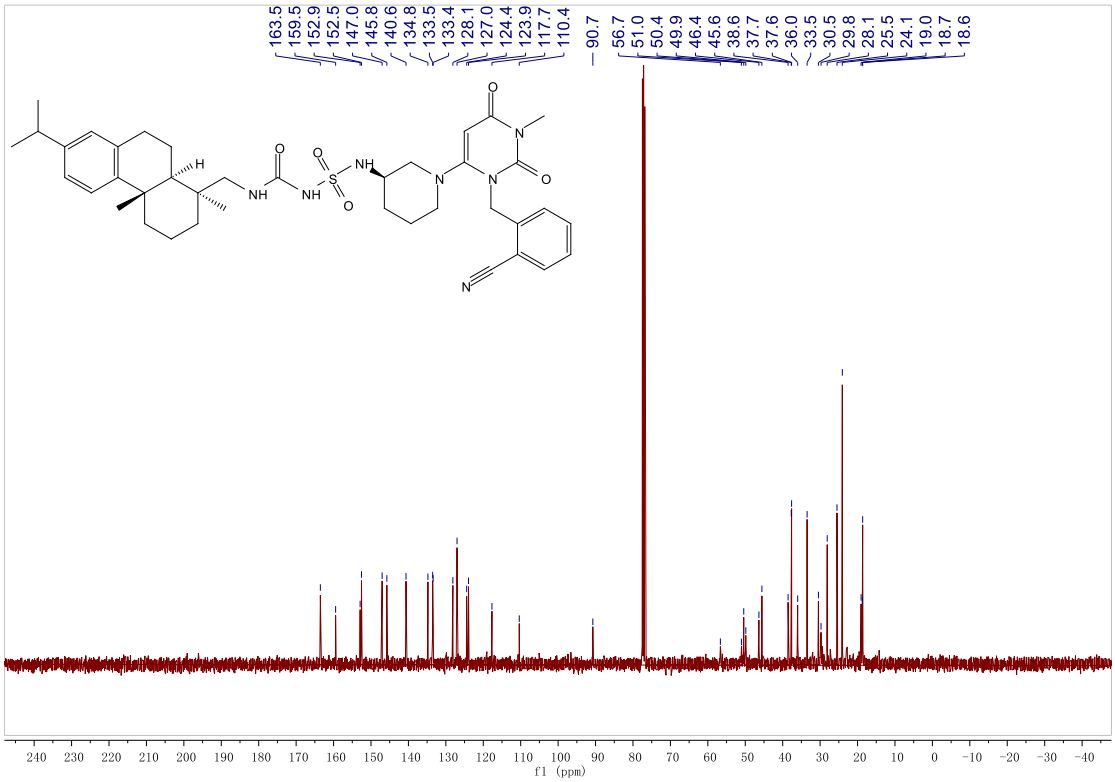


Compound 9-10

^{1}H NMR

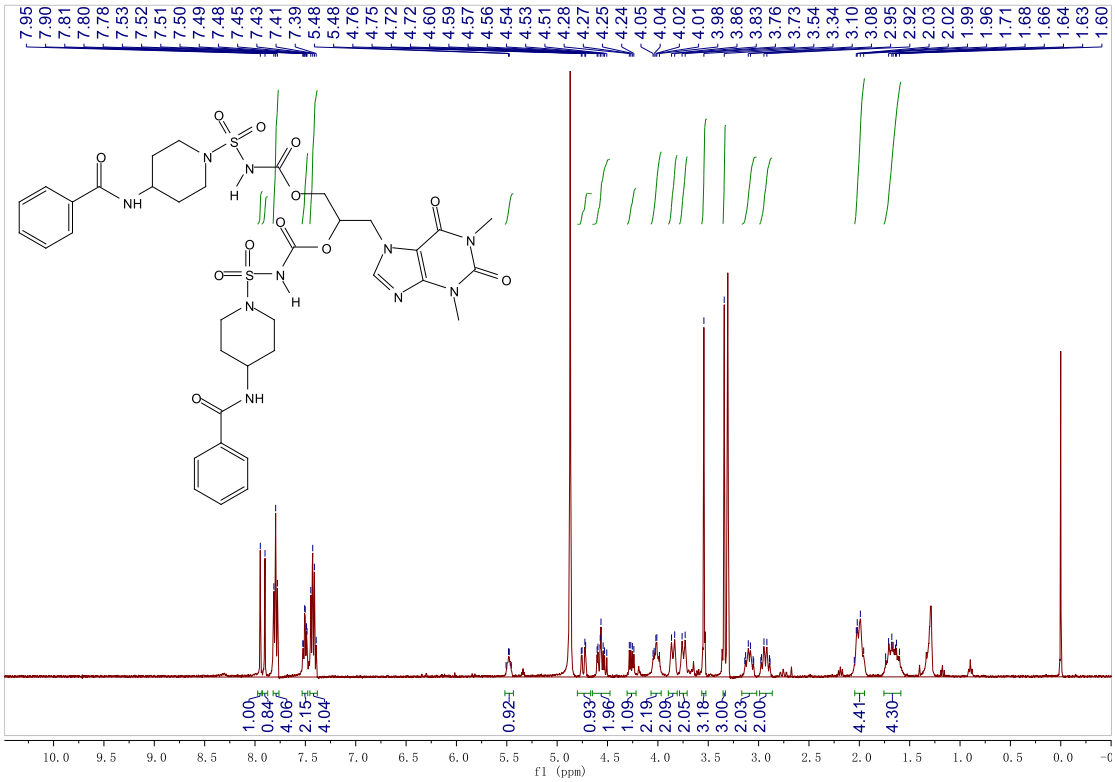


^{13}C NMR

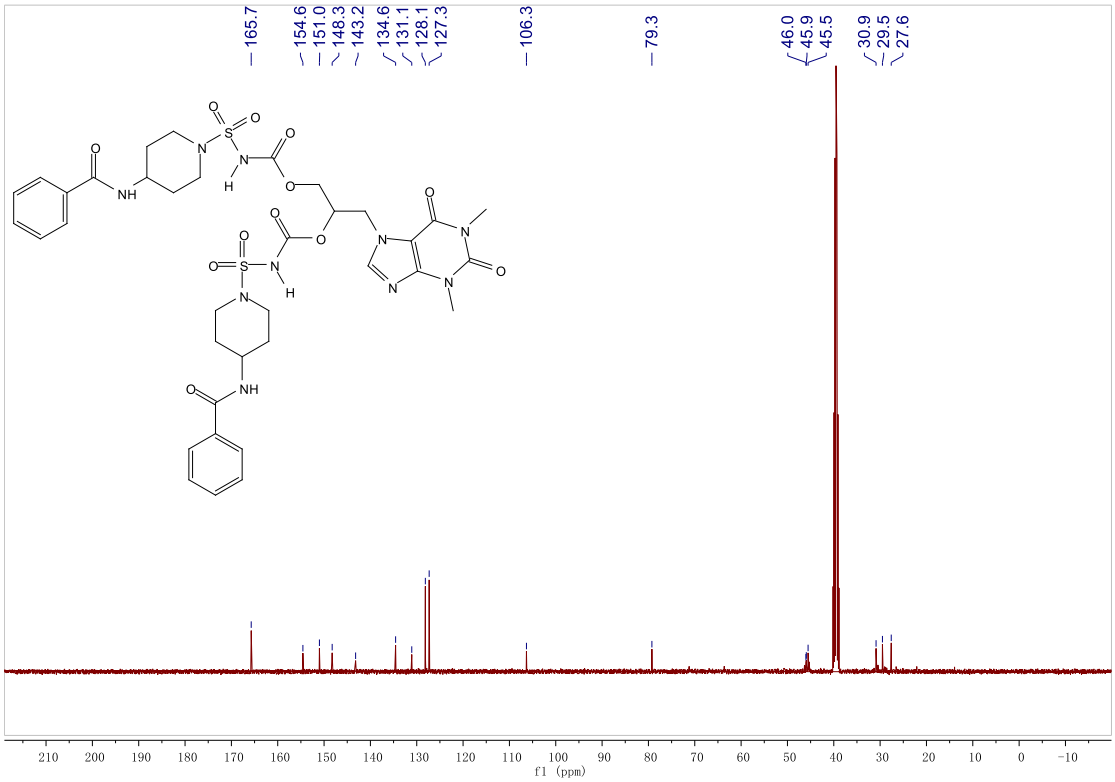


Compound 9-11

^{1}H NMR

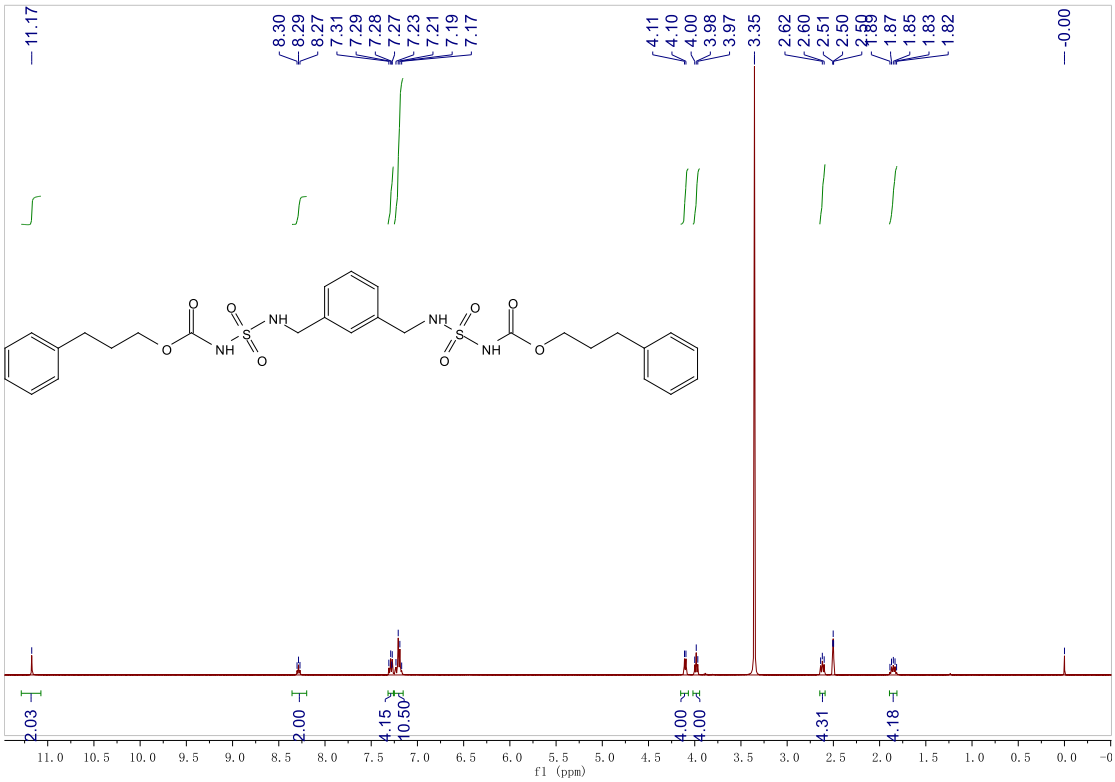


^{13}C NMR

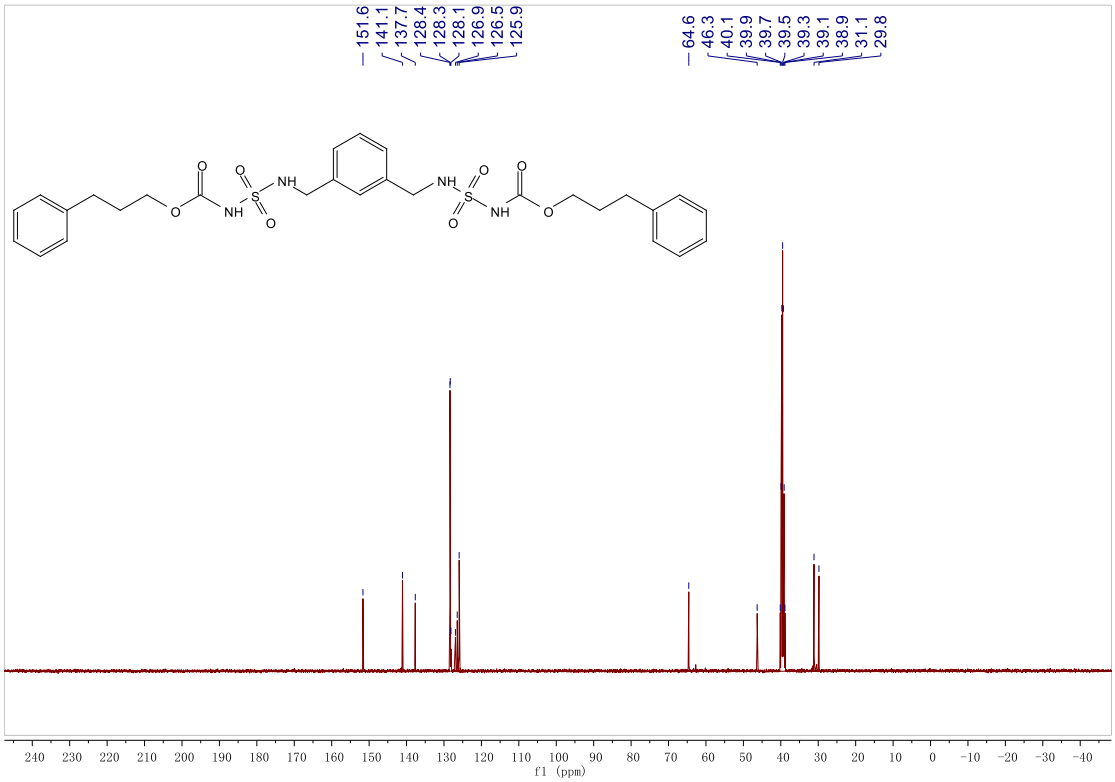


Compound 9-12

^{1}H NMR



^{13}C NMR



Section 9. References for the Known Compounds

(1) H. W. Roesky, A. Hoff, *Chem. Ber.* **1968**, *101*, 162-173.

(2) P. Mukherjee, C. P. Woroch, L. Cleary, M. Rusznak, R. W. Franzese, M. R. Reese, J. W. Tucker, J. M. Humphrey, S. M. Etuk, S. C. Kwan, C. W. am Ende, N. D. Ball, *Org. Lett.* **2018**, *20*, 3943-3947.

(3) S. Mahapatra, C. P. Woroch, T. W. Butler, S. N. Carneiro, S. C. Kwan, S. R. Khasnavis, J. Gu, J. K. Dutra, B. C. Vetelino, J. Bellenger, Ch. W. am Ende, N. D. Ball, *Org. Lett.* **2020**, *22*, 4389-4394.