Supporting Information

Photoredox-catalyzed unsymmetrical diamination of alkenes for access to vicinal diamines

Jie Liu, [#a] Lu Guo,[#c] Zhang Chen,[a] Yu Guo,*[a] Wei Zhang,[a] Xue Peng,[a]

Zhen Wang*[a,b] and Yao-Fu Zeng*[a]

[a] School of Pharmaceutical Science, Hengyang Medical School, University of South China, Hengyang, Hunan, 421001, China.

[b] MOE Key Lab of Rare Pediatric Diseases, University of South China, Hengyang, Hunan, 421001, China.

[c]Department of Sports Medicine, Affiliated Nanhua Hospital, Hengyang Medical School, University of South China, Hengyang, Hunan, 421001, China.

Table of contents

1. General information

All reagents were obtained commercially and used without further purification. Column chromatography was performed on silica gel (200-300 mesh). ^{1}H and ^{13}C NMR spectra were recorded in $CDCl_3$ on a Bruker Ascend 500 spectrometer operating at 500 MHz and 126 MHz, respectively. The following abbreviations are used for the multiplicities: s: singlet, d: doublet, t: triplet, q: quartet, m: multiplet. The chemical shifts (δ) were expressed in ppm and coupling constants (*J*) were in Hz. High-resolution mass spectra (HRMS) were recorded on a waters G2-Xs QTOF mass spectrometer with ESI mode. Analytical thin layer chromatography was performed on Polygram SIL G/UV254 plates. Visualization was accomplished with short wave UV light.

2. Experimental Section

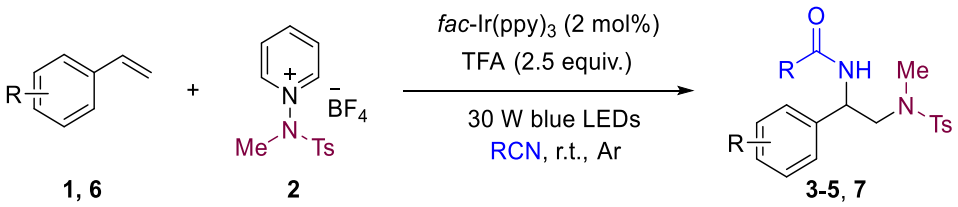
2.1 General procedure for the synthesis of *N*-protected aminopyridinium salts

N-protected amidopyridinium salts were synthesized according to the known methods[1].

2.2 General procedure for the synthesis of alkenes 6a-6f

The alkenes **6a-6f** were synthesized according to the known methods[2-5].

2.3 General procedure for the synthesis of products 3-5, 7



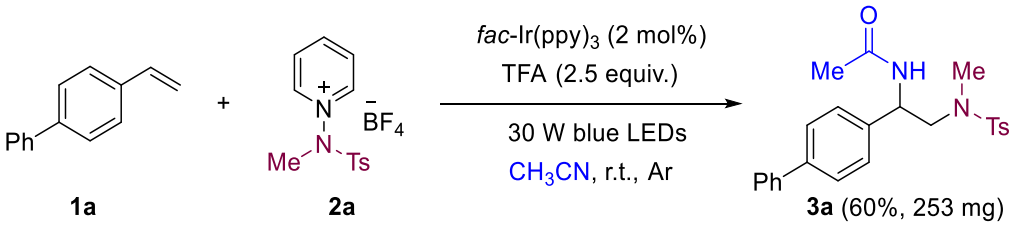
The light source used for illuminating the reaction vessel consists of blue LEDs (λmax=450 nm) purchased from Taobao.

Figure 1. Light source and photoreactor used in this research

To a schlenk flask equipped with a magnetic stirring bar, olefin **1** or **6** (0.1 mmol, 1.0 equiv.), *N*-aminopyridinium salt **2** (0.12 mmol, 1.2 equiv.), *fac*-Ir(ppy)$_3$ (2 mol%), TFA (0.25 mmol, 2.5 equiv.) and nitrile (2 mL) were added. The vessel was evacuated and backfilled with Ar for three times. The tube was screw-capped and stirred at room temperature under irradiation of 30 W blue LEDs (distance app. 5 cm) for 6 h. After the reaction was completed, the reaction mixture was concentrated in vacuum. The residue

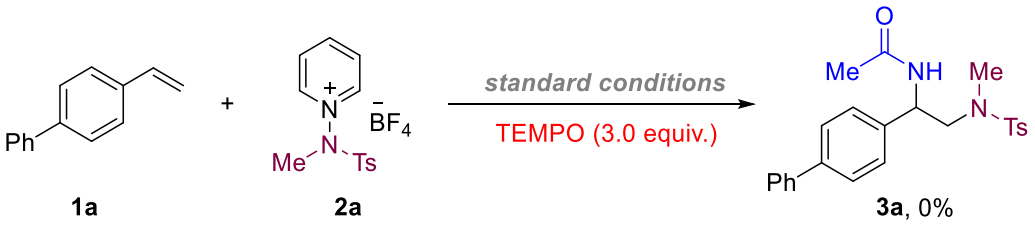
was purified by flash column chromatography over silica gel using a mixture of petroleum ether and ethyl acetate as eluent to give the desired products **3-5**, **7**.

2.4 Scaled-up experiment

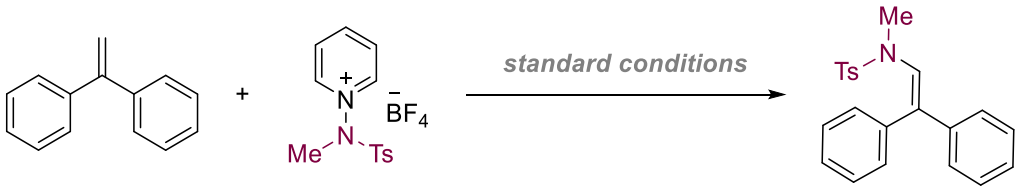


To a schlenk flask equipped with a magnetic stirring bar, olefin **1a** (1.0 mmol, 1.0 equiv.), *N*-aminopyridinium salt **2a** (1.2 mmol, 1.2 equiv.), *fac*-Ir(ppy)$_3$ (2 mol%), TFA (2.5 mmol, 2.5 equiv.) and CH_3CN (5 mL) were added. The vessel was evacuated and backfilled with Ar for three times. The tube was screw-capped and stirred at room temperature under irradiation of 30 W blue LEDs (distance app. 5 cm) for 6 h. After the reaction was completed, the reaction mixture was concentrated in vacuum. The residue was purified by flash column chromatography over silica gel using a mixture of petroleum ether and ethyl acetate as eluent to give the desired product **3a**.

2.5 Radical trapping experiment



To a schlenk flask equipped with a magnetic stirring bar, olefin **1a** (0.1 mmol, 1.0 equiv.), *N*-aminopyridinium salt **2a** (0.12 mmol, 1.2 equiv.), *fac*-Ir(ppy)$_3$ (2 mol%), TFA (0.25 mmol, 2.5 equiv.), TEMPO (0.3 mmol, 3.0 equiv.), and CH_3CN (2 mL) were added. The vessel was evacuated and backfilled with Ar for three times. The tube was screw-capped and stirred at room temperature under irradiation of 30 W blue LEDs (distance app. 5 cm) for 6 h. No product was detected by TLC analysis.



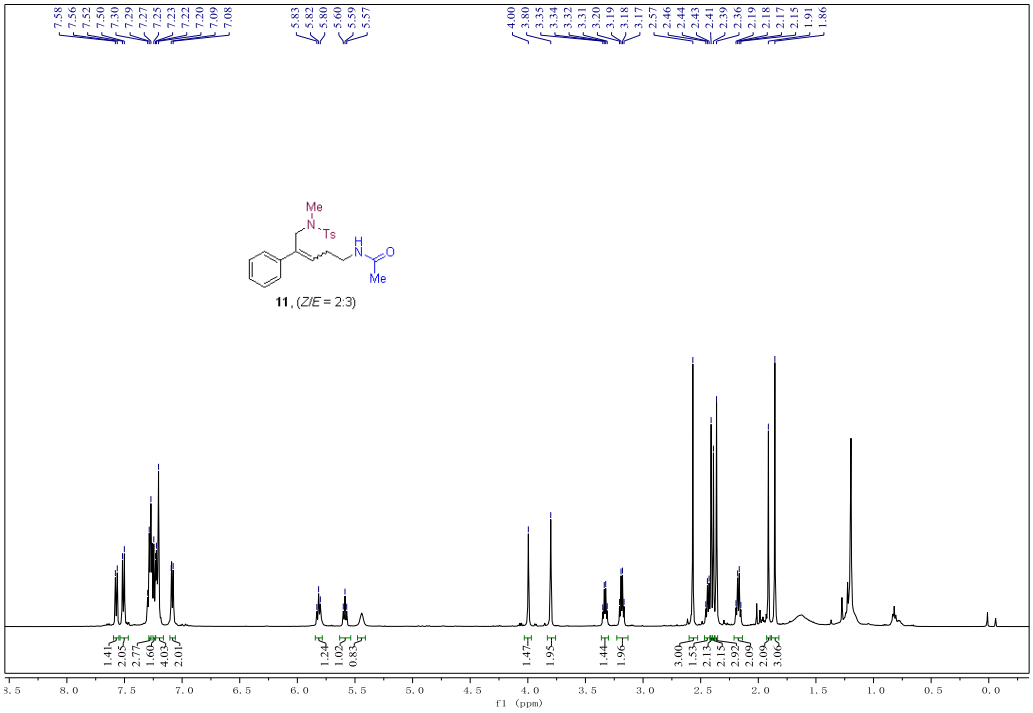
8 **2a** **9**, 85%

To a schlenk flask equipped with a magnetic stirring bar, 1,1-diphenylethylene **8** (0.1 mmol, 1.0 equiv.), *N*-aminopyridinium salt **2a** (0.12 mmol, 1.2 equiv.), *fac*-Ir(ppy)$_3$ (2 mol%), TFA (0.25 mmol, 2.5 equiv.), and CH_3CN (2 mL) were added. The vessel was evacuated and backfilled with Ar for three times. The tube was screw-capped and stirred at room temperature under irradiation of 30 W blue LEDs (distance app. 5 cm) for 6 h. The reaction mixture was concentrated in vacuum. The residue was purified by flash column chromatography over silica gel using a mixture of petroleum ether and ethyl acetate as eluent to give compound **9**.

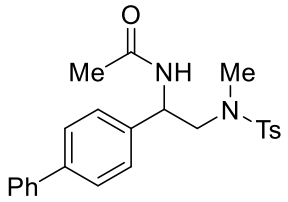
2.6 Radical clock experiment

10 **2a** **11**, 85% (*Z*/*E* = 2:3)

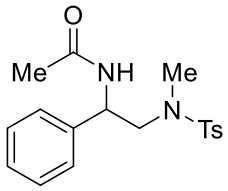
To a schlenk flask equipped with a magnetic stirring bar, alpha-cyclopropylstyrene **10** (0.1 mmol, 1.0 equiv.), *N*-aminopyridinium salt **2a** (0.12 mmol, 1.2 equiv.), *fac*-Ir(ppy)$_3$ (2 mol%), TFA (0.25 mmol, 2.5 equiv.), and CH_3CN (2 mL) were added. The vessel was evacuated and backfilled with Ar for three times. The tube was screw-capped and stirred at room temperature under irradiation of 30 W blue LEDs (distance app. 5 cm) for 6 h. The reaction mixture was concentrated in vacuum. The residue was purified by flash column chromatography over silica gel using a mixture of petroleum ether and ethyl acetate as eluent to give compound **11**.


7.58
7.56
7.52
7.50
7.30
7.29
7.27
7.25
7.23
7.22
7.20
7.09
7.08
5.83
5.82
5.80
5.60
5.59
5.57
4.00
3.80
3.35
3.34
3.32
3.31
3.20
3.19
3.18
3.17
2.57
2.46
2.44
2.43
2.41
2.39
2.36
2.19
2.18
2.17
2.15
1.91
1.86
Me
N
Ts
H
N
O
Me
11, (Z/E = 2:3)
1.41
2.05
2.77
1.60
4.03
2.01
1.24
1.03
0.85
1.47
1.95
1.44
1.96
3.00
1.55
2.15
2.18
2.92
2.00
2.00
3.06
3.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)

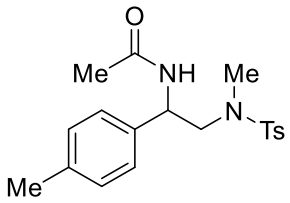
3. Characterization data of products



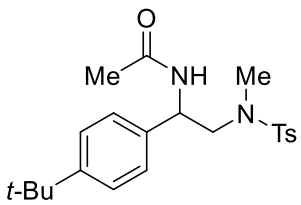
***N*-(1-([1,1'-biphenyl]-4-yl)-2-((*N*,4-dimethylphenyl)sulfonamido) ethyl)acetamide (3a):** Colorless oil (31.2 mg, 74% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.65 (d, *J* = 8.1 Hz, 2H), 7.57 – 7.54 (m, 4H), 7.43 (t, *J* = 7.7 Hz, 2H), 7.38 – 7.34 (m, 3H), 7.31 (d, *J* = 8.0 Hz, 2H), 6.77 (d, *J* = 7.0 Hz, 1H), 5.18 – 5.14 (m, 1H), 3.52 – 3.47 (m, 1H), 3.05 – 3.01 (m, 1H), 2.75 (s, 3H), 2.41 (s, 3H), 2.11 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.7, 144.0, 140.9, 140.7, 138.4, 134.6, 130.0, 128.9, 127.7, 127.5, 127.3, 127.2, 127.0, 55.0, 51.3, 36.0, 23.5, 21.6. HRMS (ESI): calcd for $C_{24}H_{26}N_2O_3SNa$ $[M + Na]^+$: 445.1562, Found: 445.1559.



***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylethyl) acetamide (3b)[6]:** Colorless oil (22.8 mg, 66% yield); R_f = 0.25 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.4 Hz, 2H), 7.35 – 7.27 (m, 7H), 6.71 (d, *J* = 7.1 Hz, 1H), 5.13 – 5.09 (m, 1H), 3.47 – 3.42 (m, 1H), 3.01 – 2.97 (m, 1H), 2.71 (s, 3H), 2.41 (s, 3H), 2.08 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.6, 143.9, 139.4, 134.6, 130.0, 128.9, 128.0, 127.3, 126.6, 55.1, 51.5, 35.9, 23.5, 21.6.

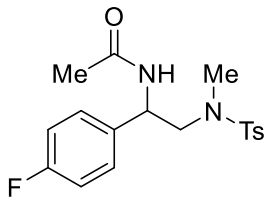


***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(*p*-tolyl)ethyl) acetamide (3c):** Colorless oil (24.9 mg, 69% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.0 Hz, 2H), 7.30 (d, *J* = 8.0 Hz, 2H), 7.18 (d, *J* = 7.9 Hz, 2H), 7.14 (d, *J* = 8.0 Hz, 2H), 6.62 (d, *J* = 7.2 Hz, 1H), 5.09 – 5.05 (m, 1H), 3.46 – 3.42 (m, 1H), 2.97 – 2.94 (m, 1H), 2.72 (s, 3H), 2.41 (s, 3H), 2.32 (s, 3H), 2.08 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.6, 143.9, 137.7, 136.4, 134.6, 130.0, 129.6, 127.3, 126.5, 55.1, 51.2, 35.9, 23.5, 21.6, 21.2. HRMS (ESI): calcd for $C_{19}H_{24}N_2O_3SNa$ $[M + Na]^+$: 383.1405, Found: 383.1408.

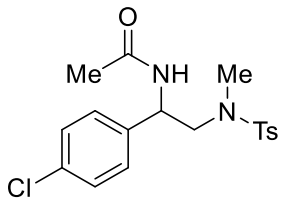


***N*-(1-(4-(*tert*-butyl)phenyl)-2-((*N*,4-dimethylphenyl) sulfonamido) ethyl) acetamide (3d):** Colorless oil (32.2 mg, 80% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.2 Hz, 2H), 7.35 (d, *J* = 8.3 Hz, 2H), 7.30 (d, *J* = 7.9 Hz, 2H), 7.21 (d, *J* = 8.2 Hz, 2H), 6.65 (d, *J* = 7.3 Hz, 1H), 5.12 – 5.08 (m, 1H), 3.50 – 3.46 (m, 1H), 2.96 – 2.93 (m, 1H), 2.74

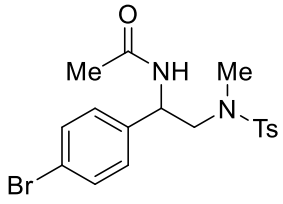
(s, 3H), 2.41 (s, 3H), 2.08 (s, 3H), 1.31 (s, 9H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.7, 150.9, 143.9, 136.2, 134.7, 130.0, 127.3, 126.3, 125.9, 55.0, 51.1, 35.8, 34.6, 31.4, 23.5, 21.6. HRMS (ESI): calcd for $C_{22}H_{30}N_2O_3SNa$ $[M + Na]^+$: 425.1875, Found: 425.1882.



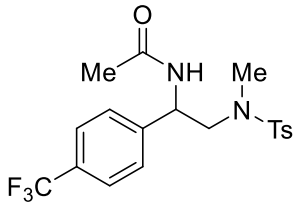
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(4-fluorophenyl) ethyl)acetamide (3e):** Colorless oil (30.2 mg, 83% yield); R_f = 0.25 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.0 Hz, 2H), 7.31 (d, *J* = 8.0 Hz, 2H), 7.28 – 7.25 (m, 2H), 7.02 (t, *J* = 8.6 Hz, 2H), 6.74 (d, *J* = 6.9 Hz, 1H), 5.08 – 5.04 (m, 1H), 3.42 – 3.37 (m, 1H), 3.00 – 2.96 (m, 1H), 2.70 (s, 3H), 2.42 (s, 3H), 2.08 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.4, 162.3 (d, *J* = 246.5 Hz), 144.0, 135.2 (d, *J* = 3.5 Hz), 134.4, 130.0, 128.1 (d, *J* = 7.7 Hz), 127.2, 115.7 (d, *J* = 21.3 Hz), 54.9, 50.9, 35.9, 23.4, 21.5. ^{19}F NMR (471 MHz, $CDCl_3$) δ -114.53. HRMS (ESI): calcd for $C_{18}H_{21}FN_2O_3SNa$ $[M + Na]^+$: 387.1155, Found: 387.1159.



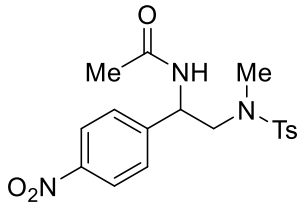
***N*-(1-(4-chlorophenyl)-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl) acetamide (3f):** Colorless oil (32.0 mg, 84% yield); R_f = 0.25 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.2 Hz, 2H), 7.32 – 7.29 (m, 4H), 7.24 – 7.22 (m, 2H), 6.79 (d, *J* = 6.7 Hz, 1H), 5.07 – 5.03 (m, 1H), 3.41 – 3.36 (m, 1H), 3.01 – 2.97 (m, 1H), 2.70 (s, 3H), 2.42 (s, 3H), 2.08 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.6, 144.1, 138.0, 134.4, 133.7, 130.1, 129.1, 128.0, 127.3, 54.9, 51.2, 36.1, 23.4, 21.7. HRMS (ESI): calcd for $C_{18}H_{21}ClN_2O_3SNa$ $[M + Na]^+$: 403.0859, Found: 403.0864.



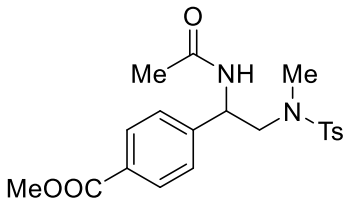
***N*-(1-(4-bromophenyl)-2-((*N*,4-dimethylphenyl)sulfonamido) ethyl)acetamide (3g):** Colorless oil (17.0 mg, 40% yield); R_f = 0.25 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.4 Hz, 2H), 7.46 (d, *J* = 8.4 Hz, 2H), 7.31 (d, *J* = 8.2 Hz, 2H), 7.17 (d, *J* = 8.5 Hz, 2H), 6.75 (d, *J* = 6.9 Hz, 1H), 5.05 – 5.01 (m, 1H), 3.41 – 3.36 (m, 1H), 2.99 – 2.96 (m, 1H), 2.70 (s, 3H), 2.42 (s, 3H), 2.08 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.6, 144.1, 138.6, 134.4, 132.1, 130.1, 128.3, 127.3, 121.8, 54.9, 51.3, 36.1, 23.5, 21.7. HRMS (ESI): calcd for $C_{18}H_{21}BrN_2O_3SNa$ $[M + Na]^+$: 447.0354, Found: 447.0359.



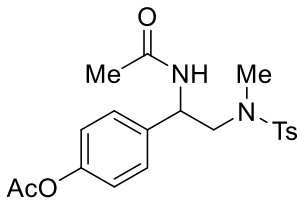
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(4-(trifluoromethyl) phenyl)ethyl)acetamide (3h):** Colorless oil (34.0 mg, 82% yield); R_f = 0.25 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 6.7 Hz, 2H), 7.58 (d, *J* = 7.9 Hz, 2H), 7.42 (d, *J* = 7.9 Hz, 2H), 7.31 (d, *J* = 7.9 Hz, 2H), 6.94 (d, *J* = 6.6 Hz, 1H), 5.14 – 5.10 (m, 1H), 3.44 – 3.39 (m, 1H), 3.02 – 2.98 (m, 1H), 2.71 (s, 3H), 2.41 (s, 3H), 2.08 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.7, 144.2, 143.7, 134.3, 130.2 (q, *J* = 32.2 Hz), 130.1, 127.3, 127.0, 125.9 (q, *J* = 3.7 Hz), 124.1 (q, *J* = 272.4 Hz), 54.8, 51.6, 36.1, 23.4, 21.6. ^{19}F NMR (471 MHz, $CDCl_3$) δ -62.44. HRMS (ESI): calcd for $C_{19}H_{21}F_3N_2O_3SNa$ [M + Na]+: 437.1123, Found: 437.1120.



***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(4-nitrophenyl) ethyl)acetamide (3i):** Colorless oil (30.9 mg, 79% yield); R_f = 0.25 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.20 (d, *J* = 8.4 Hz, 2H), 7.64 (d, *J* = 8.0 Hz, 2H), 7.48 (d, *J* = 8.4 Hz, 2H), 7.33 (d, *J* = 7.9 Hz, 2H), 6.97 (d, *J* = 6.0 Hz, 1H), 5.14 – 5.10 (m, 1H), 3.43 – 3.38 (m, 1H), 3.06 – 3.02 (m, 1H), 2.71 (s, 3H), 2.43 (s, 3H), 2.12 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.8, 147.7, 147.1, 144.4, 134.2, 130.2, 127.6, 127.3, 124.2, 54.7, 51.8, 36.4, 23.4, 21.7. HRMS (ESI): calcd for $C_{18}H_{21}N_3O_5SNa$ [M + Na]$^+$: 414.1100, Found: 414.1105.

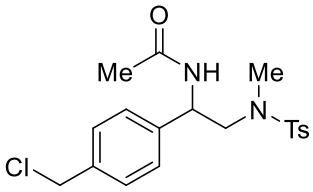


Methyl-4-(1-acetamido-2-((*N*,4-dimethylphenyl)sulfonamido) ethyl)benzoate (3j): Colorless oil (27.9 mg, 69% yield); R_f = 0.25 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.00 (d, *J* = 8.1 Hz, 2H), 7.63 (d, *J* = 8.0 Hz, 2H), 7.37 (d, *J* = 8.0 Hz, 2H), 7.31 (d, *J* = 7.9 Hz, 2H), 6.85 (d, *J* = 6.6 Hz, 1H), 5.14 – 5.10 (m, 1H), 3.90 (s, 3H), 3.42 – 3.38 (m, 1H), 3.04 – 3.01 (m, 1H), 2.68 (s, 3H), 2.10 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.7, 166.8, 144.7, 144.1, 134.4, 130.2, 130.1, 129.8, 127.3, 126.6, 54.9, 52.3, 51.7, 36.2, 23.4, 21.7. HRMS (ESI): calcd for $C_{20}H_{24}N_2O_5SNa$ [M + Na]$^+$: 427.1304, Found: 427.1305.

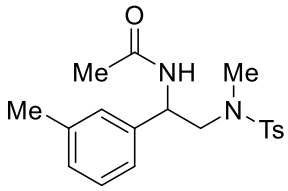


4-(1-acetamido-2-((N,4-dimethylphenyl)sulfonamido) ethyl)phenyl acetate (3k): Colorless oil (25.9 mg, 64% yield); R_f = 0.25 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.0 Hz, 2H), 7.39 – 7.27 (m, 4H), 7.05 (d, *J* = 8.2 Hz, 2H), 6.69 (d, *J* =

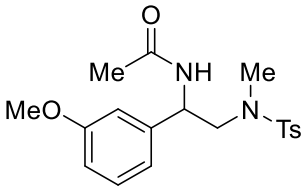
4.1 Hz, 1H), 5.11 – 5.07 (m, 1H), 3.46 – 3.41 (m, 1H), 2.95 – 2.92 (m, 1H), 2.73 (s, 3H), 2.42 (s, 3H), 2.28 (s, 3H), 2.07 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.5, 169.6, 150.3, 144.0, 137.1, 134.5, 130.1, 127.7, 127.3, 122.1, 55.0, 51.0, 35.9, 23.5, 21.6, 21.3. HRMS (ESI): calcd for $C_{20}H_{24}N_2O_5SNa$ $[M + Na]^+$: 427.1304, Found: 427.1305.



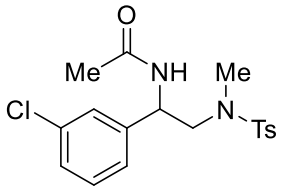
***N*-(1-(4-(chloromethyl)phenyl)-2-((*N*,4-dimethylphenyl) sulfonamido)ethyl)acetamide (3l):** Colorless oil (33.2 mg, 84% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.62 (d, *J* = 8.0 Hz, 2H), 7.35 (d, *J* = 7.9 Hz, 2H), 7.29 (t, *J* = 7.9 Hz, 4H), 6.82 (d, *J* = 7.0 Hz, 1H), 5.11 – 5.07 (m, 1H), 4.55 (s, 2H), 3.45 – 3.40 (m, 1H), 2.98 – 2.95 (m, 1H), 2.71 (s, 3H), 2.41 (s, 3H), 2.06 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.6, 144.0, 139.8, 137.2, 134.4, 130.0, 129.2, 127.3, 127.0, 54.9, 51.3, 45.9, 35.9, 23.4, 21.6. HRMS (ESI): calcd for $C_{19}H_{23}ClN_2O_3SNa$ $[M + Na]^+$: 417.1016, Found: 417.1019.



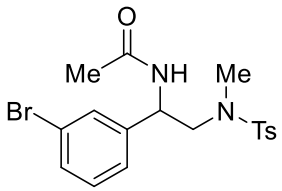
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(*m*-tolyl)ethyl)acetamide (3m):** Colorless oil (28.1 mg, 78% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 7.9 Hz, 2H), 7.30 (d, *J* = 7.8 Hz, 2H), 7.22 (t, *J* = 7.7 Hz, 1H), 7.08 – 7.07 (m, 3H), 6.66 (d, *J* = 4.2 Hz, 1H), 5.09 – 5.05 (m, 1H), 3.49 – 3.44 (m, 1H), 2.96 – 2.92 (m, 1H), 2.73 (s, 3H), 2.41 (s, 3H), 2.33 (s, 3H), 2.09 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.6, 143.9, 139.4, 138.6, 134.7, 130.0, 128.8, 128.7, 127.3, 123.5, 55.1, 51.4, 35.8, 23.5, 21.6, 21.6. HRMS (ESI): calcd for $C_{19}H_{24}N_2O_3SNa$ $[M + Na]^+$: 383.1405, Found: 383.1409.



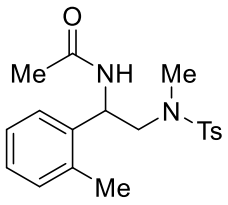
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(3-methoxyphenyl) ethyl)acetamide (3n):** Colorless oil (29.4 mg, 78% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.1 Hz, 2H), 7.30 (d, *J* = 8.0 Hz, 2H), 7.24 (d, *J* = 7.8 Hz, 1H), 6.87 (d, *J* = 7.7 Hz, 1H), 6.82 – 6.79 (m, 2H), 6.68 (d, *J* = 7.1 Hz, 1H), 5.10 – 5.05 (m, 1H), 3.79 (s, 3H), 3.46 – 3.42 (m, 1H), 3.00 – 2.96 (m, 1H), 2.72 (s, 3H), 2.41 (s, 3H), 2.08 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.6, 160.1, 144.0, 141.1, 134.6, 130.0, 127.3, 118.8, 113.1, 112.5, 55.4, 55.0, 51.5, 35.9, 23.5, 21.6. HRMS (ESI): calcd for $C_{19}H_{24}N_2O_4SNa$ $[M + Na]^+$: 399.1354, Found: 399.1357.



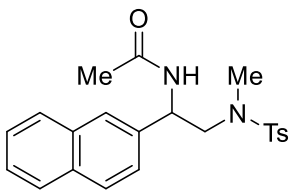
***N*-(1-(3-chlorophenyl)-2-((*N*,4-dimethylphenyl)sulfonamido) ethyl)acetamide (3o):** Colorless oil (28.1 mg, 72% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 7.9 Hz, 2H), 7.31 (d, *J* = 8.0 Hz, 2H), 7.27 – 7.22 (m, 3H), 7.17 (d, *J* = 6.8 Hz, 1H), 6.82 (d, *J* = 6.7 Hz, 1H), 5.07 – 5.03 (m, 1H), 3.43 – 3.39 (m, 1H), 2.97 – 2.94 (m, 1H), 2.72 (s, 3H), 2.42 (s, 3H), 2.09 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.6, 144.0, 141.6, 134.7, 134.3, 130.1, 130.0, 128.0, 127.2, 126.6, 124.7, 54.8, 51.2, 35.9, 23.3, 21.5. HRMS (ESI): calcd for $C_{18}H_{21}ClN_2O_3SNa$ $[M + Na]^+$: 403.0859, Found: 403.0864.



***N*-(1-(3-bromophenyl)-2-((*N*,4-dimethylphenyl)sulfonamido) ethyl)acetamide (3p):** Colorless oil (33.2 mg, 78% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.0 Hz, 2H), 7.42 (s, 1H), 7.38 (d, *J* = 7.6 Hz, 1H), 7.31 (d, *J* = 8.1 Hz, 2H), 7.23 – 7.17 (m, 2H), 6.84 (d, *J* = 6.7 Hz, 1H), 5.06 – 5.02 (m, 1H), 3.43 – 3.39 (m, 1H), 3.97 – 2.93 (m, 1H), 2.71 (s, 3H), 2.41 (s, 3H), 2.08 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.6, 144.1, 142.0, 134.4, 131.0, 130.5, 130.1, 129.6, 127.3, 125.3, 123.0, 54.9, 51.2, 36.0, 23.4, 21.6. HRMS (ESI): calcd for $C_{18}H_{21}BrN_2O_3SNa$ $[M + Na]^+$: 447.0354, Found: 447.0359.

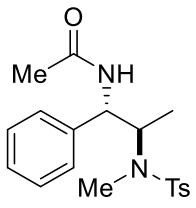


***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(*o*-tolyl)ethyl)acetamide(3q):** Colorless oil (31.7 mg, 88% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.0 Hz, 2H), 7.31 (t, *J* = 7.0 Hz, 3H), 7.21 (t, *J* = 7.4 Hz, 1H), 7.16 (t, *J* = 7.6 Hz, 1H), 7.12 (d, *J* = 7.5 Hz, 1H), 6.69 (d, *J* = 6.8 Hz, 1H), 5.35 – 5.30 (m, 1H), 3.45 – 3.40 (m, 1H), 2.88 – 2.85 (m, 1H), 2.74 (s, 3H), 2.41 (s, 3H), 2.37 (s, 3H), 2.06 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.4, 143.9, 137.6, 135.2, 134.6, 130.8, 130.0, 127.8, 127.3, 126.7, 125.7, 53.8, 48.0, 35.8, 23.4, 21.6, 19.2. HRMS (ESI): calcd for $C_{19}H_{24}N_2O_3SNa$ $[M + Na]^+$: 383.1405, Found: 383.1408.

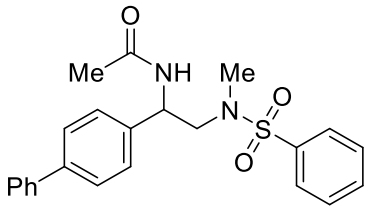


***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(naphthalen-2-yl)ethyl)acetamide (3r):** Colorless oil (27.8 mg, 70% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.81 (t, *J* = 7.5 Hz, 3H), 7.76 (s, 1H), 7.63 (d, *J* = 8.0 Hz, 2H), 7.49 – 7.44 (m, 2H), 7.40 (d, *J* = 8.6 Hz, 1H), 7.28 (d, *J* = 7.9 Hz, 2H), 6.84 (d, *J* = 7.0 Hz, 1H), 5.30 – 5.26 (m, 1H), 3.56 – 3.51 (m,

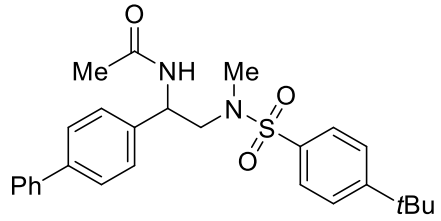
1H), 3.10 – 3.07 (m, 1H), 2.73 (s, 3H), 2.40 (s, 3H), 2.12 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.6, 144.0, 136.8, 134.5, 133.4, 133.0, 130.0, 128.8, 128.0, 127.8, 127.3, 126.5, 126.2, 125.5, 124.4, 55.0, 51.7, 36.0, 23.5, 21.6. HRMS (ESI): calcd for $C_{22}H_{24}N_2O_3SNa$ $[M + Na]^+$: 419.1405, Found: 419.1411.



***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylpropyl)acetamide (3s):** According to the general procedure in part 2.3, compound **3s** was obtained as colorless oil (17.3 mg, 48% yield) by using *E*-*β*-methylstyrene as the starting material. The diastereomeric ratio is greater than 10:1 based on the ^{1}H NMR spectrum of the unpurified product mixtures; R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.68 (d, *J* = 7.9 Hz, 2H), 7.35 – 7.27 (m, 7H), 6.54 (d, *J* = 8.1 Hz, 1H), 4.82 – 4.78 (m, 1H), 4.12 – 4.06 (m, 1H), 2.79 (s, 3H), 2.41 (s, 3H), 2.00 (s, 3H), 0.63 (d, *J* = 6.8 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 169.9, 143.5, 140.0, 136.9, 129.9, 128.9, 127.9, 127.4, 126.7, 56.4, 55.7, 28.2, 23.4, 21.5, 14.4. HRMS (ESI): calcd for $C_{19}H_{24}N_2O_3SNa$ $[M + Na]^+$: 383.1405, Found: 383.1411.

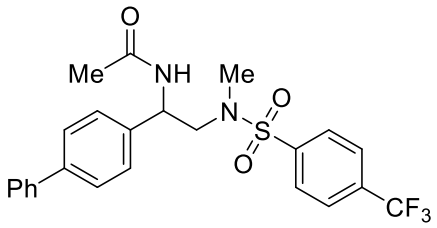


***N*-(1-([1,1'-biphenyl]-4-yl)-2-(*N*-methylphenylsulfonamido) ethyl)acetamide (4a):** Colorless oil (36.4 mg, 89% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.77 (d, *J* = 8.4 Hz, 2H), 7.61 – 7.51 (m, 7H), 7.43 (t, *J* = 7.6 Hz, 2H), 7.38 – 7.33 (m, 3H), 6.72 (d, *J* = 8.1 Hz, 1H), 5.21 – 5.17 (m, 1H), 3.55 – 3.50 (m, 1H), 3.08 – 3.04 (m, 1H), 2.78 (s, 3H), 2.11 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.6, 141.0, 140.7, 138.4, 137.7, 133.1, 129.4, 128.9, 127.7, 127.5, 127.2, 127.2, 127.0, 55.0, 51.3, 35.9, 23.5. HRMS (ESI): calcd for $C_{23}H_{24}N_2O_3SNa$ $[M + Na]^+$: 431.1405, Found: 431.1400.

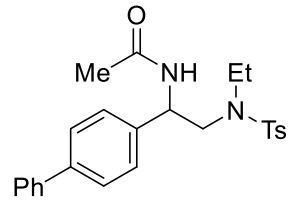


***N*-(1-([1,1'-biphenyl]-4-yl)-2-((4-(*tert*-butyl)-*N*-methylphenyl)sulfonamido)ethyl)acetamide (4b):** Colorless oil (42.3 mg, 91% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.68 (d, *J* = 8.5 Hz, 2H), 7.56 (t, *J* = 6.4 Hz, 4H), 7.52 (d, *J* = 8.5 Hz, 2H), 7.43 (t, *J* = 7.6 Hz, 2H), 7.38 – 7.32 (m, 3H), 6.75 (d, *J* = 7.0 Hz, 1H), 5.18 – 5.13 (m, 1H), 3.54 – 3.49 (m, 1H), 3.07 – 3.03 (m, 1H), 2.78 (s, 3H), 2.11 (s, 3H), 1.32 (s, 9H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.5, 156.8, 140.8, 140.6, 138.4, 134.5, 128.8, 127.6, 127.4, 127.1, 127.0, 126.9, 126.3, 54.9, 51.2, 35.9, 35.2, 31.0, 23.4. HRMS

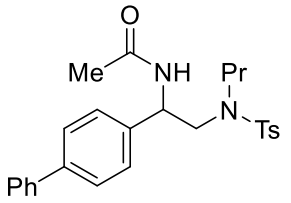
(ESI): calcd for $C_{27}H_{32}N_2O_3SNa$ $[M + Na]^+$: 487.2031, Found: 487.2028.



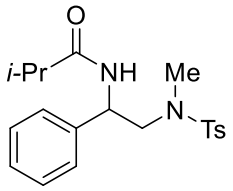
***N*-(1-([1,1'-biphenyl]-4-yl)-2-((*N*-methyl-4-(trifluoromethyl)phenyl)sulfonamido)ethyl)acetamide (4c):** Colorless oil (40.5 mg, 85% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.89 (d, *J* = 8.1 Hz, 2H), 7.79 (d, *J* = 8.2 Hz, 2H), 7.59 – 7.55 (m, 4H), 7.44 (t, *J* = 7.5 Hz, 2H), 7.38 – 7.34 (m, 3H), 6.53 (d, *J* = 7.4 Hz, 1H), 5.25 – 5.20 (m, 1H), 3.59 – 3.54 (m, 1H), 3.12 – 3.09 (m, 1H), 2.82 (s, 3H), 2.11 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.5, 141.5, 141.2, 140.6, 138.0, 134.8 (q, *J* = 33.1 Hz), 129.0, 127.8, 127.7, 127.6, 127.2, 127.1, 126.6 (q, *J* = 3.6 Hz), 123.2 (q, *J* = 273.2 Hz), 54.9, 51.0, 35.7, 23.5. ^{19}F NMR (471 MHz, $CDCl_3$) δ -63.21. HRMS (ESI): calcd for $C_{24}H_{23}F_3N_2O_3SNa$ $[M + Na]^+$: 499.1279, Found: 499.1278.



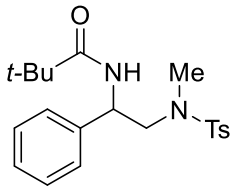
***N*-(1-([1,1'-biphenyl]-4-yl)-2-((*N*-ethyl-4-methylphenyl) sulfonamido)ethyl)acetamide (4d):** Colorless oil (31.4 mg, 72% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.67 (d, *J* = 7.2 Hz, 2H), 7.57 – 7.54 (m, 4H), 7.43 (t, *J* = 7.5 Hz, 2H), 7.39 – 7.33 (m, 3H), 7.29 (d, *J* = 7.9 Hz, 2H), 6.92 (d, *J* = 6.8 Hz, 1H), 5.15 – 5.11 (m, 1H), 3.67 – 3.62 (m, 1H), 3.46 – 3.39 (m, 1H), 3.22 – 3.15 (m, 1H), 3.14 – 3.10 (m, 1H), 2.40 (s, 3H), 2.10 (s, 3H), 1.11 (t, *J* = 7.1 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.5, 143.7, 140.9, 140.7, 138.7, 136.8, 129.9, 128.8, 127.6, 127.4, 127.1, 127.0, 126.9, 52.2, 52.1, 43.6, 23.4, 21.5, 13.7. HRMS (ESI): calcd for $C_{25}H_{28}N_2O_3SNa$ $[M + Na]^+$: 459.1718, Found: 459.1713.



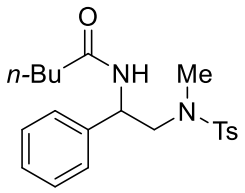
***N*-(1-([1,1'-biphenyl]-4-yl)-2-((4-methyl-*N*-propylphenyl) sulfonamido)ethyl)acetamide (4e):** Colorless oil (36.5 mg, 81% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.67 (d, *J* = 8.0 Hz, 2H), 7.57 – 7.54 (m, 4H), 7.43 (t, *J* = 7.6 Hz, 2H), 7.39 – 7.33 (m, 3H), 7.29 (d, *J* = 8.0 Hz, 2H), 6.94 (d, *J* = 6.8 Hz, 1H), 5.15 – 5.11 (m, 1H), 3.67 – 3.62 (m, 1H), 3.46 – 3.39 (m, 1H), 3.22 – 3.10 (m, 2H), 2.41 (s, 3H), 2.11 – 1.98 (m, 5H), 1.12 – 1.09 (m, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.6, 143.8, 141.0, 140.8, 138.8, 136.9, 130.0, 128.9, 127.7, 127.5, 127.2, 127.1, 127.0, 52.3, 52.2, 43.7, 29.8, 23.5, 21.6, 13.8. HRMS (ESI): calcd for $C_{26}H_{30}N_2O_3SNa$ $[M + Na]^+$: 473.1875, Found: 473.1872.



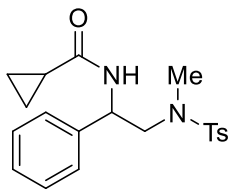
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylethyl)*iso*butyramide (5a):** Colorless oil (22.1 mg, 59% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.62 (d, *J* = 7.9 Hz, 2H), 7.36 – 7.25 (m, 7H), 6.74 (d, *J* = 6.9 Hz, 1H), 5.16 – 5.06 (m, 1H), 3.52 – 3.39 (m, 1H), 3.03 – 2.94 (m, 1H), 2.71 (s, 3H), 2.55 – 2.46 (m, 1H), 2.41 (s, 3H), 1.23 (d, *J* = 6.9 Hz, 3H), 1.20 (d, *J* = 6.9 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 177.4, 143.9, 139.7, 134.7, 130.0, 128.9, 127.8, 127.2, 126.4, 55.1, 51.2, 35.8, 35.7, 21.6, 19.7, 19.6. HRMS (ESI): calcd for $C_{20}H_{26}N_2O_3SNa$ $[M + Na]^+$: 397.1562, Found: 397.1565.



***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylethyl) pivalamide (5b):** Colorless oil (25.3 mg, 65% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.64 (d, *J* = 7.8 Hz, 2H), 7.35 – 7.25 (m, 7H), 6.99 (d, *J* = 6.1 Hz, 1H), 5.08 – 5.04 (m, 1H), 3.49 – 3.45 (m, 1H), 3.30 – 2.97 (m, 1H), 2.72 (s, 3H), 2.41 (s, 3H), 1.29 (s, 9H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 179.0, 143.9, 139.9, 134.8, 130.0, 128.9, 127.8, 127.2, 126.3, 55.3, 51.5, 39.0, 35.9, 27.7, 21.6. HRMS (ESI): calcd for $C_{21}H_{28}N_2O_3SNa$ $[M + Na]^+$: 411.1718, Found: 411.1721.

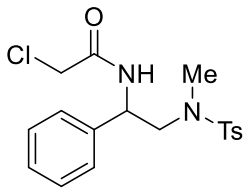


***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylethyl) pentanamide (5c):** Colorless oil (25.1 mg, 62% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.62 (d, *J* = 7.9 Hz, 2H), 7.35 – 7.27 (m, 7H), 6.65 (d, *J* = 6.9 Hz, 1H), 5.13 – 5.09 (m, 1H), 3.47 – 3.43 (m, 1H), 2.99 – 2.95 (m, 1H), 2.71 (s, 3H), 2.41 (s, 3H), 2.32 – 2.28 (m, 2H), 1.69 – 1.64 (m, 2H), 1.40 – 1.35 (m, 2H), 0.93 (t, *J* = 7.3 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 173.5, 143.8, 139.5, 134.6, 129.9, 128.8, 127.8, 127.2, 126.4, 55.0, 51.2, 36.5, 35.8, 27.7, 22.4, 21.5, 13.8. HRMS (ESI): calcd for $C_{21}H_{28}N_2O_3SNa$ $[M + Na]^+$: 411.1718, Found: 411.1721.

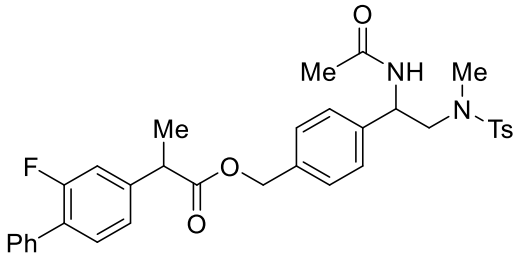


***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylethyl) cyclopropanecarboxamide (5d):** Colorless oil (27.9 mg, 75% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.64 (d, *J* = 7.9 Hz, 2H), 7.35 – 7.24 (m, 7H), 6.86 (d, *J* = 6.7 Hz, 1H), 5.10 – 5.06 (m, 1H), 3.48 – 3.44 (m, 1H), 3.02 – 2.98 (m, 1H), 2.71 (s, 3H), 2.41 (s, 3H), 1.56 – 1.51 (m, 1H), 1.01 – 0.89 (m, 2H), 0.82 – 0.72 (m, 2H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 173.9, 143.9, 139.7, 134.6, 130.0, 128.9,

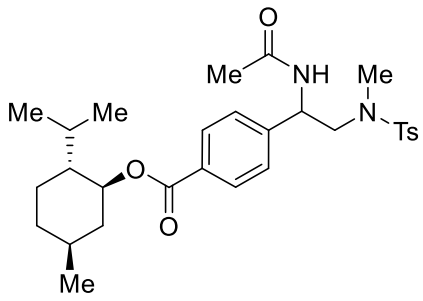
127.9, 127.3, 126.6, 55.1, 51.8, 35.9, 21.6, 14.9, 7.5. HRMS (ESI): calcd for $C_{20}H_{24}N_2O_3SNa$ [M + Na]$^+$: 395.1405, Found: 395.1409.



2-chloro-*N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylethyl)acetamide (5e): Colorless oil (22.9 mg, 60% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.65 – 7.63 (m, 2H), 7.36 (t, *J* = 7.5 Hz, 2H), 7.31– 7.30 (m, 5H), 5.14 – 5.12 (m, 1H), 4.16 – 4.05 (m, 2H), 3.57 – 3.52 (m, 1H), 3.08 – 3.05 (m, 1H), 2.71 (s, 3H), 2.41 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 166.4, 143.8, 138.5, 134.6, 129.9, 129.0, 128.1, 127.2, 126.4, 54.8, 52.0, 42.6, 35.9, 21.5. HRMS (ESI): calcd for $C_{18}H_{21}ClN_2O_3SNa$ [M + Na]$^+$: 403.0859, Found: 403.0864.

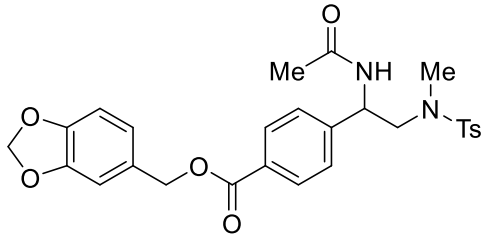


4-(1-acetamido-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl)benzyl-2-(2-fluoro-[1,1'-biphenyl]-4-yl)propanoate (7a): Colorless oil (52.4 mg, 87% yield); R_f = 0.30 (PE:EA = 1:2); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.61 (d, *J* = 7.0 Hz, 2H), 7.53 – 7.51 (m, 2H), 7.44 – 7.33 (m, 4H), 7.29 – 7.22 (m, 6H), 7.13 (d, *J* = 7.9 Hz, 1H), 7.09 – 7.06 (m, 1H), 6.72 (d, *J* = 6.9 Hz, 1H), 5.12 – 5.06 (m, 3H), 3.80 – 3.76 (m, 1H), 3.43 – 3.38 (m, 1H), 2.97 – 2.92 (m, 1H), 2.68 (s, 3H), 2.40 (s, 3H), 2.05 (s, 3H), 1.53 (d, *J* = 7.1 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 173.6, 170.3, 159.5 (d, *J* = 247.3 Hz), 143.7, 141.5 (d, *J* = 7.4 Hz), 139.3, 135.3, 135.3, 134.3, 130.7 (d, *J* = 4.1 Hz), 129.8, 128.8 (d, *J* = 2.8 Hz), 128.3, 127.5, 127.0, 123.5, 123.5 (d, *J* = 7.2 Hz), 126.5, 115.2 (d, *J* = 23.0 Hz), 115.1 (d, *J* = 23.9 Hz), 66.1, 54.7, 51.1, 44.8, 35.6, 23.1, 21.3, 18.1. ^{19}F NMR (471 MHz, $CDCl_3$) δ -117.61. HRMS (ESI): calcd for $C_{34}H_{35}FN_2O_5SNa$ [M + Na]$^+$: 625.2148, Found: 625.2155.

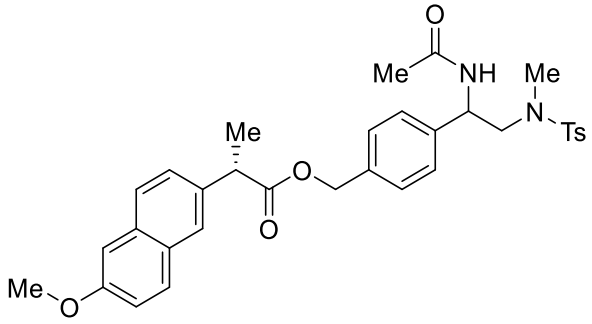


(1*S*,2*R*,5*S*)-2-isopropyl-5-methylcyclohexyl-4-(1-acetamido-2-((*N*,4-dimethylphenyl)sulfonamido) ethyl)benzoate (7b): Colorless oil (43.9 mg, 83% yield); R_f = 0.50 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.01 (d, *J* = 8.3 Hz, 2H), 7.63 (d, *J* = 6.9 Hz, 2H), 7.36 (d, *J* = 8.0 Hz, 2H), 7.31 (d, *J* = 8.0 Hz, 2H), 6.87 (d, *J* = 6.7 Hz, 1H), 5.13 – 5.09 (m, 1H), 4.93 – 4.88 (m, 1H), 3.44 – 3.38 (m, 1H), 3.02 – 2.98 (m, 1H), 2.70

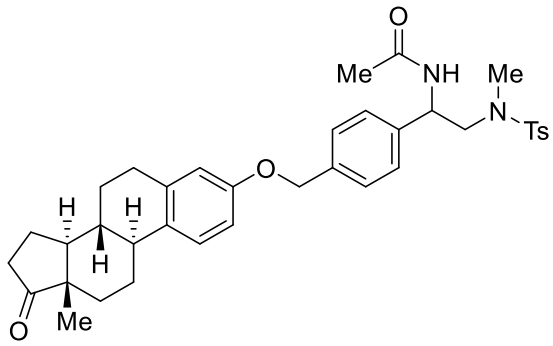
(s, 3H), 2.41 (s, 3H), 2.10– 2.07 (m, 4H), 1.94 – 1.91 (m, 1H), 1.72 (d, J = 12.0 Hz, 2H), 1.56 – 1.51 (m, 2H), 1.15 – 1.04 (m, 2H), 0.93 – 0.89 (m, 7H), 0.78 – 0.76 (m, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.8, 165.8, 144.4, 144.1, 134.3, 130.5, 130.2, 130.1, 127.3, 126.5, 75.0, 54.9, 51.7, 47.4, 41.0, 36.2, 34.4, 31.6, 26.6, 23.7, 23.4, 22.2, 21.6, 20.9, 16.6. HRMS (ESI): calcd for $C_{29}H_{40}N_2O_5SNa$ $[M + Na]^+$: 551.2556, Found: 551.2561.



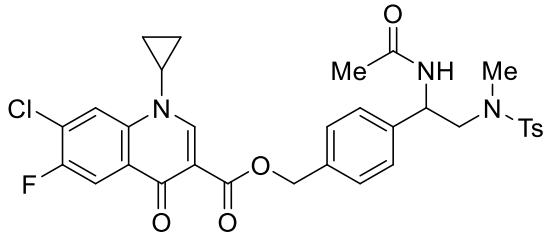
benzo[*d*][1,3]dioxol-5-ylmethyl-4-(1-acetamido-2-((*N*,4-dimethylphenyl)sulfonamido) ethyl) benzoate (7c): Colorless oil (44.6 mg, 85% yield); R_f = 0.20 (PE:EA = 1:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.02 (d, J = 8.4 Hz, 2H), 7.62 (d, J = 8.4 Hz, 2H), 7.36 (d, J = 8.2 Hz, 2H), 7.30 (d, J = 8.2 Hz, 2H), 6.92 – 6.89 (m, 2H), 6.83 – 6.79 (m, 2H), 5.97 (s, 2H), 5.24 (s, 2H), 5.14 – 5.10 (m, 1H), 3.42 – 3.37 (m, 1H), 3.03 – 3.00 (m, 1H), 2.68 (s, 3H), 2.41 (s, 3H), 2.09 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 170.4, 165.9, 147.7, 147.6, 144.6, 143.9, 134.2, 130.1, 129.8, 129.6, 127.0, 126.4, 122.1, 108.9, 108.2, 101.1, 66.6, 54.6, 51.4, 35.9, 23.2, 21.4. HRMS (ESI): calcd for $C_{27}H_{28}N_2O_7SNa$ [M + Na]+: 547.1515, Found: 547.1519.



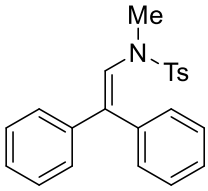
4-(1-acetamido-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl)benzyl-(2*S*)-2-(6-methoxy naphthalen-2-yl) propanoate (7d): Colorless oil (31.8 mg, 54% yield); R_f = 0.30 (PE:EA = 3:4); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.70 – 7.61 (m, 5H), 7.39 (d, J = 8.4 Hz, 1H), 7.30 (d, J = 8.1 Hz, 2H), 7.19 – 7.11 (m, 6H), 6.65 (d, J = 6.9 Hz, 1H), 5.11 – 5.04 (m, 3H), 3.91 – 3.87 (m, 4H), 3.42 – 3.36 (m, 1H), 2.97 – 2.91 (m, 1H), 2.66 (d, J = 4.3 Hz, 3H), 2.41 (s, 3H), 2.07 (s, 3H), 1.58 (d, J = 7.2 Hz, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 174.4, 170.4, 157.7, 143.9, 139.3, 135.7, 135.5, 134.5, 133.7, 129.9, 129.3, 128.9, 128.4, 127.2, 126.6, 126.3, 126.3, 126.0, 119.0, 105.6, 66.0, 55.3, 54.9, 51.2, 45.5, 35.8, 23.4, 21.5, 18.5. HRMS (ESI): calcd for $C_{33}H_{36}N_2O_6SNa$ $[M + Na]^+$: 611.2192, Found: 611.2184.



***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(4-((((8*R*,9*S*,13*S*,14*S*)-13-methyl-17-oxo-7,8,9,11,12,13,14,15,16,17-decahydro-6*H*-cyclopenta[*a*]phenanthren-3-yl)oxy)methyl)phenyl)ethyl)acetamide (7e):** Colorless oil (25.2 mg, 40% yield); R_f = 0.20 (PE:EA = 1:2); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.63 (d, *J* = 8.0 Hz, 2H), 7.40 (d, *J* = 7.9 Hz, 2H), 7.31 (d, *J* = 7.8 Hz, 4H), 7.19 (d, *J* = 8.6 Hz, 1H), 6.76 (d, *J* = 8.6 Hz, 1H), 6.71 (s, 1H), 6.68 (d, *J* = 7.0 Hz, 1H), 5.13 – 5.08 (m, 1H), 5.00 (s, 2H), 3.47 – 3.42 (m, 1H), 2.98 – 2.95 (m, 1H), 2.91 – 2.87 (m, 2H), 2.72 (s, 3H), 2.53 – 2.47 (m, 1H), 2.42 (s, 3H), 2.27 – 2.22 (m, 1H), 2.18 – 2.12 (m, 1H), 2.09 (s, 3H), 2.05 – 1.94 (m, 4H), 1.62 – 1.41 (m, 6H), 0.91 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 221.2, 170.7, 156.9, 144.0, 139.1, 138.0, 137.1, 134.5, 132.5, 130.1, 128.1, 127.3, 126.8, 126.5, 114.9, 112.5, 69.7, 55.0, 51.4, 50.5, 48.1, 44.1, 38.4, 36.0, 36.0, 31.7, 29.8, 26.7, 26.0, 23.5, 21.7, 21.7, 14.0. HRMS (ESI): calcd for $C_{37}H_{44}N_2O_5SNa$ $[M + Na]^+$: 651.2869, Found: 651.2875.



4-(1-acetamido-2-((*N*,4-dimethylphenyl) sulfonamido)ethyl)benzyl-7-chloro-1-cyclopropyl-6-fluoro-4-oxo-1,4-dihydroquinoline-3-carboxylate (7f): Yellow oil (42.2 mg, 66% yield); R_f = 0.30 (PE:EA = 1:4); ^{1}H NMR (500 MHz, $CDCl_3$) δ 8.53 (s, 1H), 8.13 (d, *J* = 9.0 Hz, 1H), 7.98 (d, *J* = 5.8 Hz, 1H), 7.60 (d, *J* = 8.3 Hz, 2H), 7.44 (d, *J* = 7.9 Hz, 2H), 7.29 (d, *J* = 6.4 Hz, 4H), 6.79 (d, *J* = 6.9 Hz, 1H), 5.31 (s, 2H), 5.10 – 5.05 (m, 1H), 3.45 – 3.38 (m, 2H), 2.96 – 2.93 (m, 1H), 2.70 (s, 3H), 2.40 (s, 3H), 2.05 (s, 3H), 1.36 – 1.31 (m, 2H), 1.14 – 1.11 (m, 2H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 172.8, 170.5, 165.0, 155.8 (d, *J* = 250.8 Hz), 149.2, 144.0, 139.3, 137.2 (d, *J* = 1.6 Hz)., 135.9, 134.4, 130.0, 128.7, 128.6, 127.2, 127.1, 126.8, 119.2, 113.9 (d, *J* = 22.6 Hz), 110.4, 66.2, 54.9, 51.3, 35.9, 35.0, 23.4, 21.6, 8.4. HRMS (ESI): calcd for $C_{32}H_{31}ClFN_3O_6SNa$ $[M + Na]^+$: 662.1504, Found: 662.1509.



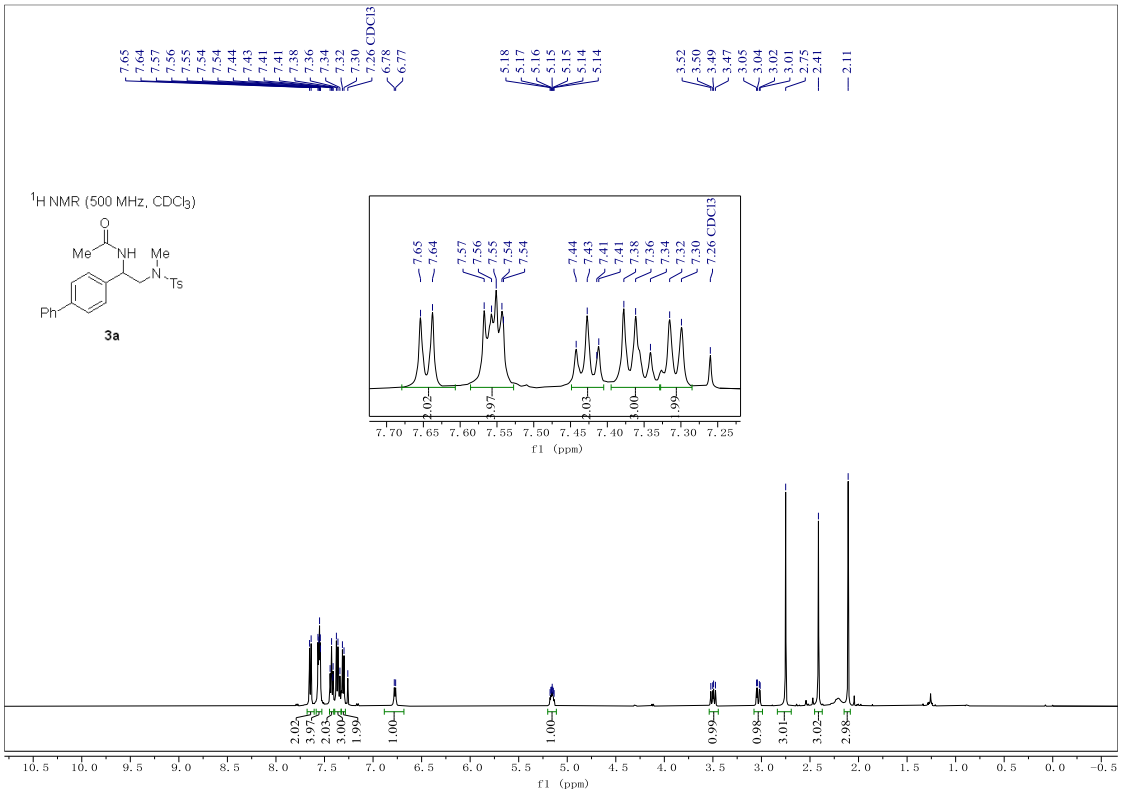
***N*-(2,2-diphenylvinyl)-*N*,4-dimethylbenzenesulfonamide (9)**[7]**:** Colorless oil (30.9 mg, 85% yield); R_f = 0.50 (PE:EA = 6:1); ^{1}H NMR (500 MHz, $CDCl_3$) δ 7.71 (d, *J* = 8.0 Hz, 2H), 7.37 (d, *J* = 7.9 Hz, 2H), 7.25 – 7.18 (m, 6H), 7.12 – 7.10 (m, 2H), 6.84 (t, *J* = 3.8 Hz, 3H), 2.56 (s, 3H), 2.48 (s, 3H). ^{13}C NMR (126 MHz, $CDCl_3$) δ 144.0, 141.3, 138.4, 134.9, 132.6, 130.2, 130.0, 128.3, 128.3, 127.9, 127.8, 127.6, 127.4, 126.0, 36.6, 21.7.

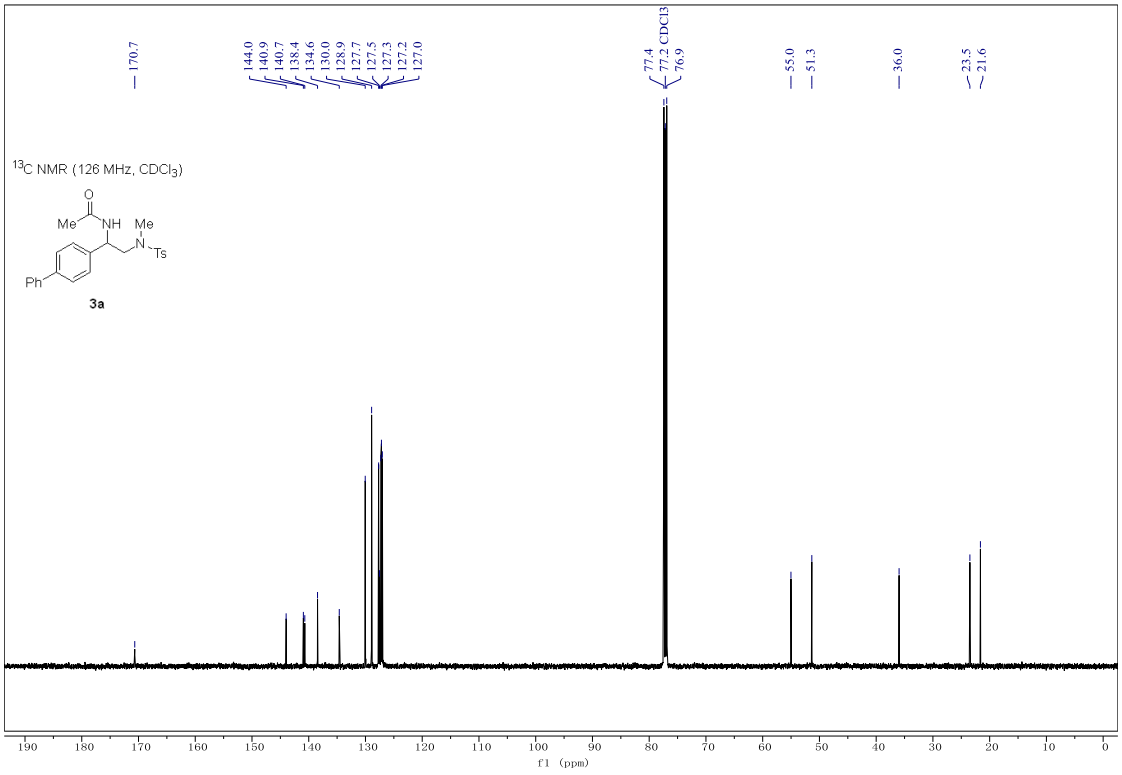
4. References

1. J. Kim, M. Kim, J. Jeong and S. Hong, *J. Am. Chem. Soc.*, 2023, 145, 14510;
2. S. Kc, R. K. Dhungana, B. Shrestha, S. Thapa, N. Khanal, P. Basnet, R. W. Lebrun, R. Giri, *J. Am. Chem. Soc.*, 2018, 140, 9801;
3. A. Reichle, M. Koch, H. Sterzel, L.-J. Großkopf, J. Floss, J. Rehbein, O. Reiser, *Angew. Chem. Int. Ed.*, 2023, 62, e202219086;
4. S. Kawashima, K. Aikawa, K. Mikami, *Eur. J. Org. Chem.*, 2016, 2016, 3166;
5. A. Samanta, S. Pramanik, S. Mondal, S. Maity, *Chem. Commun.*, 2022, 58, 8400.
6. S. Engl, O. Reiser, *Org. Lett.*, 2021, 23, 5581.
7. Y. Gao, S. Chen, W. Lu, W. Gu, P. Liu, P. Sun. *Org. Biomol. Chem.* 2017, 15, 8102.

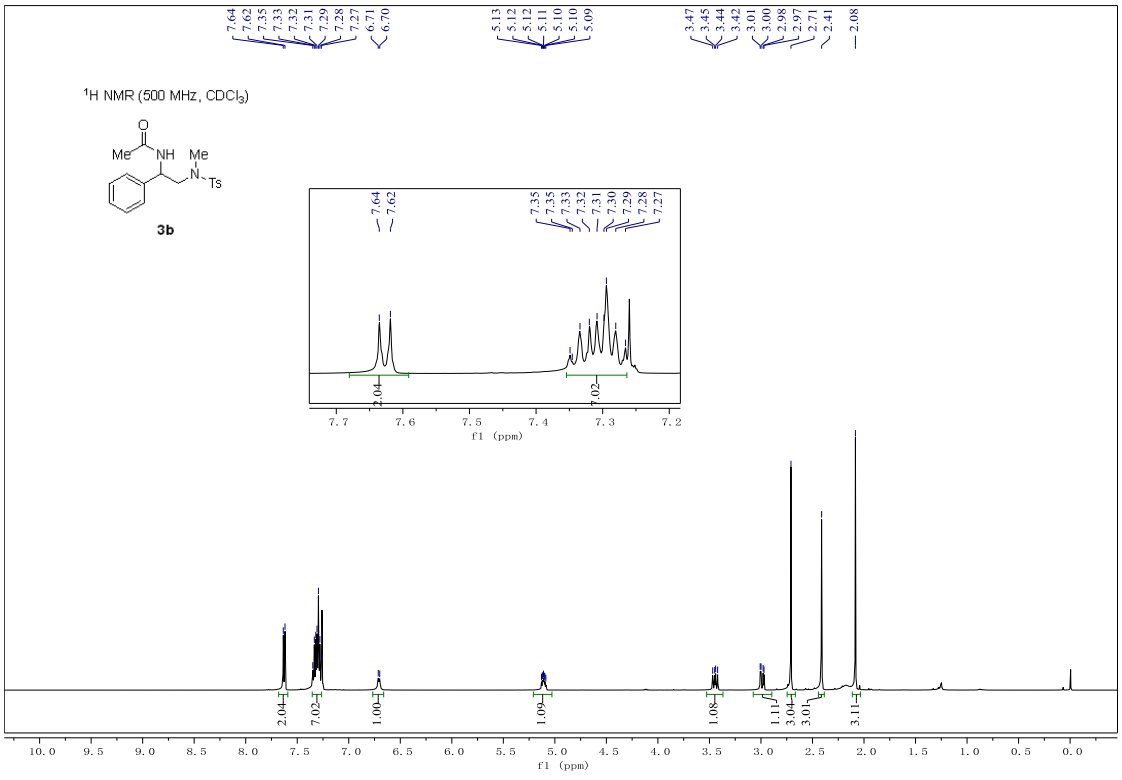
5. NMR spectra of products

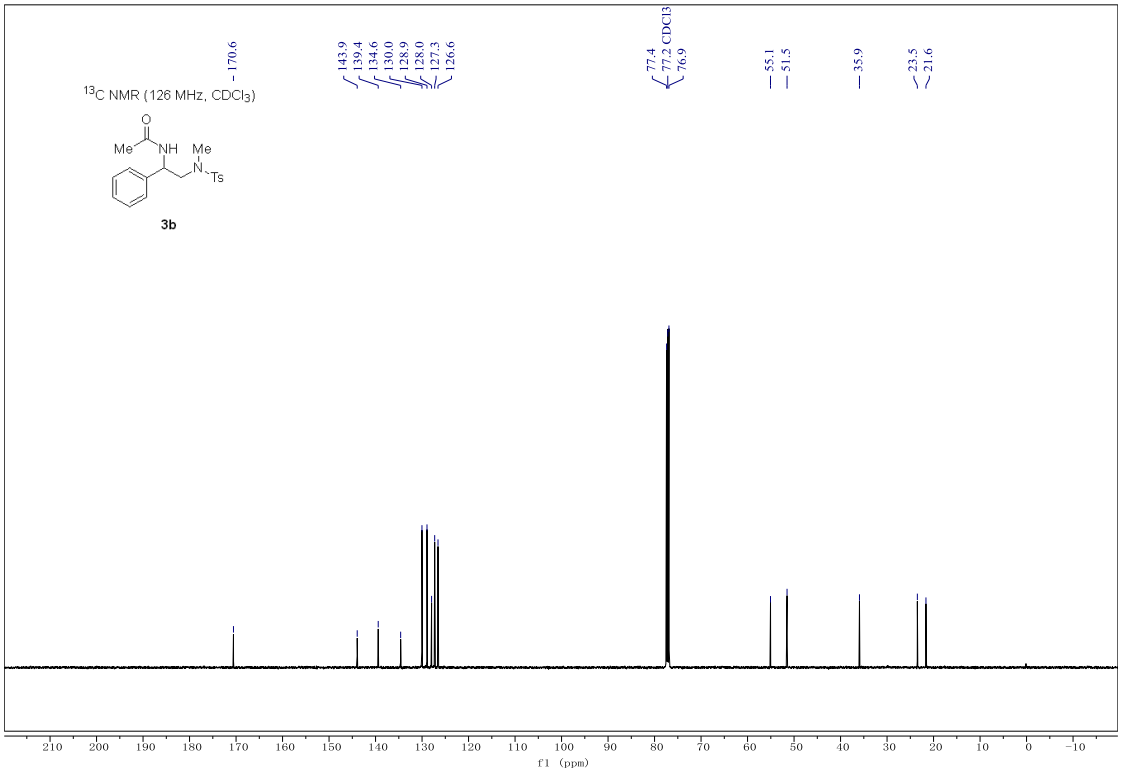
_N_-(1-([1,1'-biphenyl]-4-yl)-2-((_N_,4-dimethylphenyl)sulfonamido)ethyl)acetamide (3a):



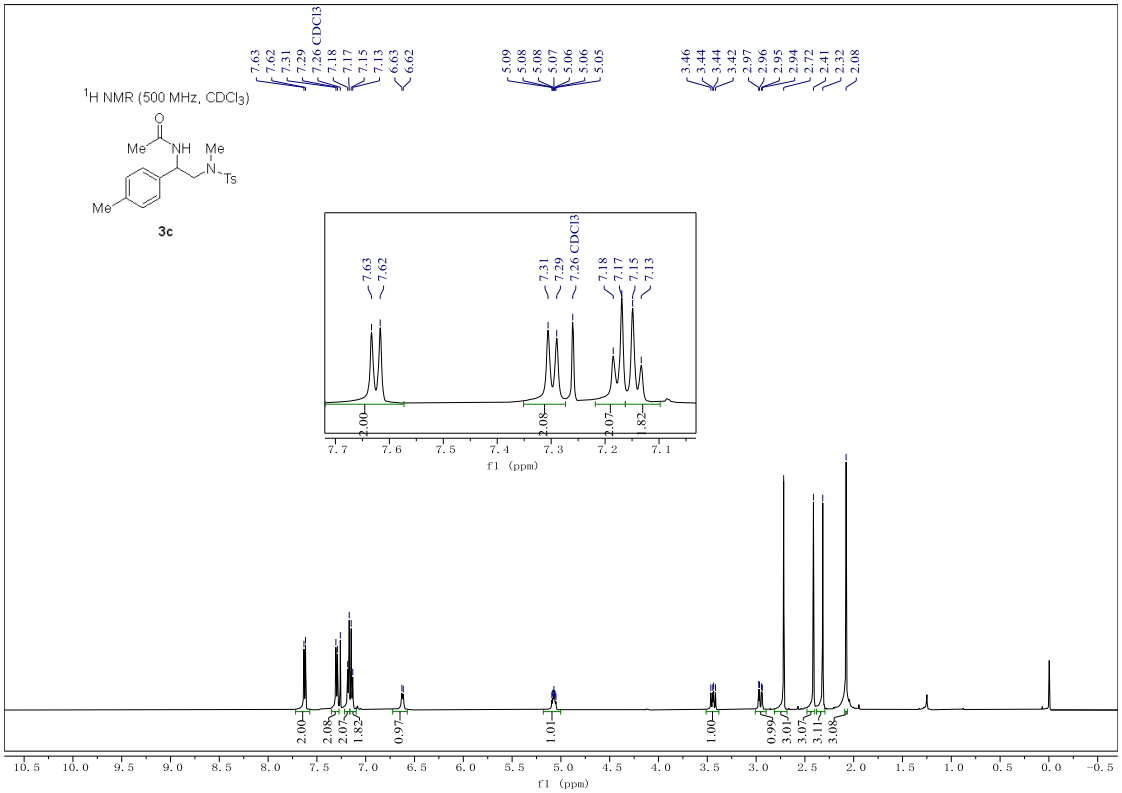


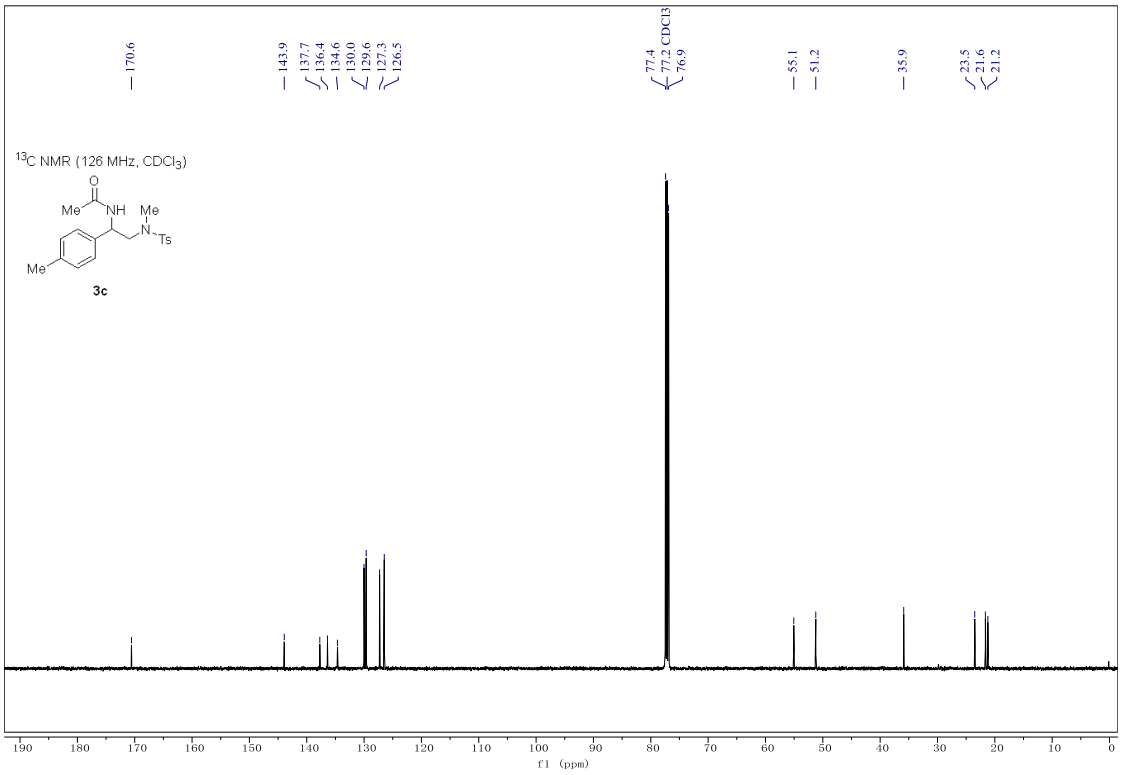
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylethyl)acetamide (3b):**



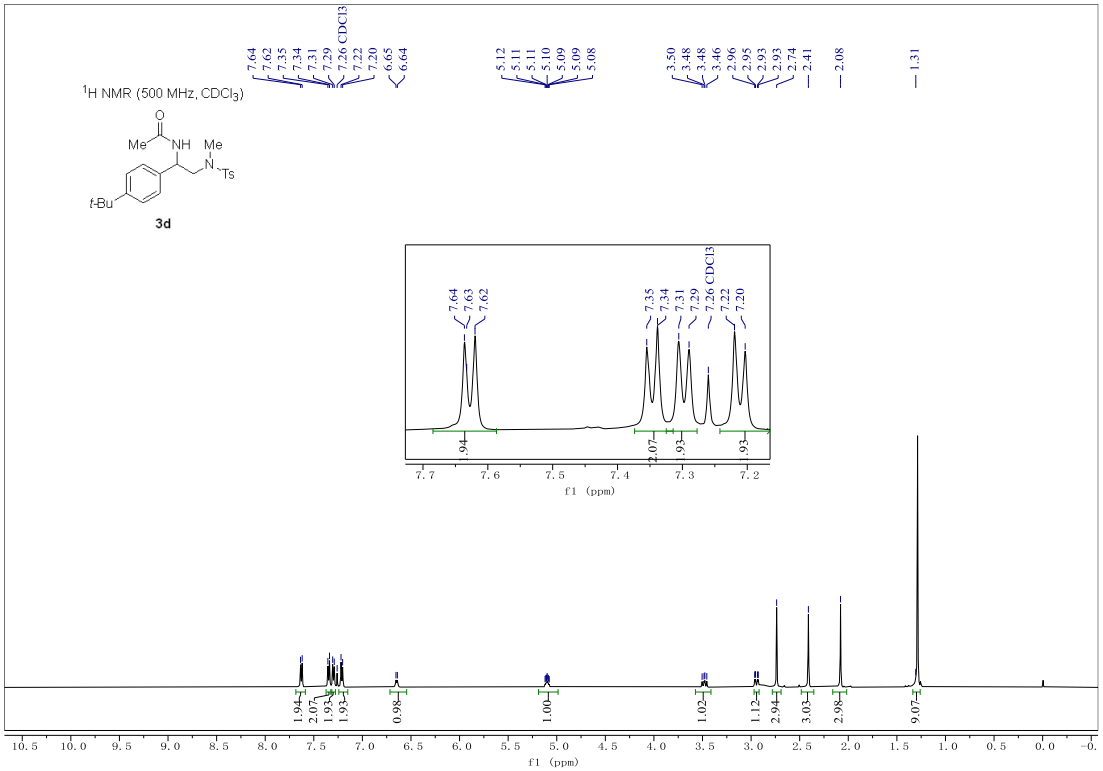


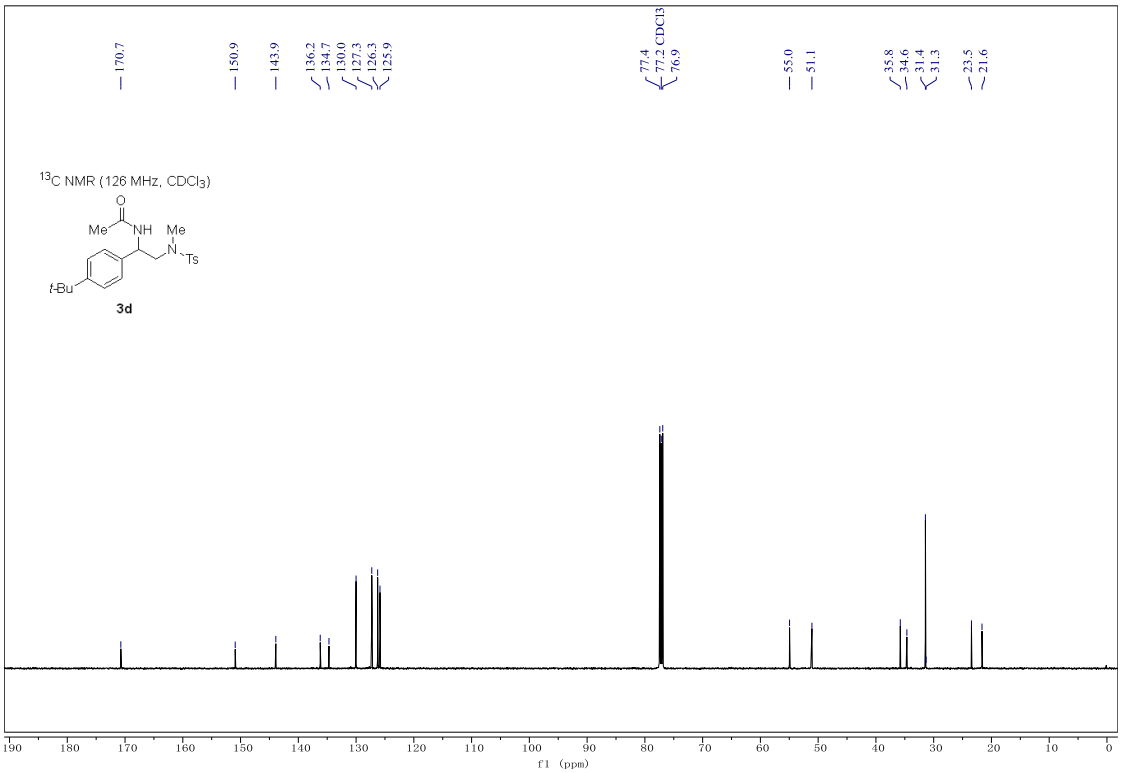
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(*p*-tolyl)ethyl)acetamide (3c):**



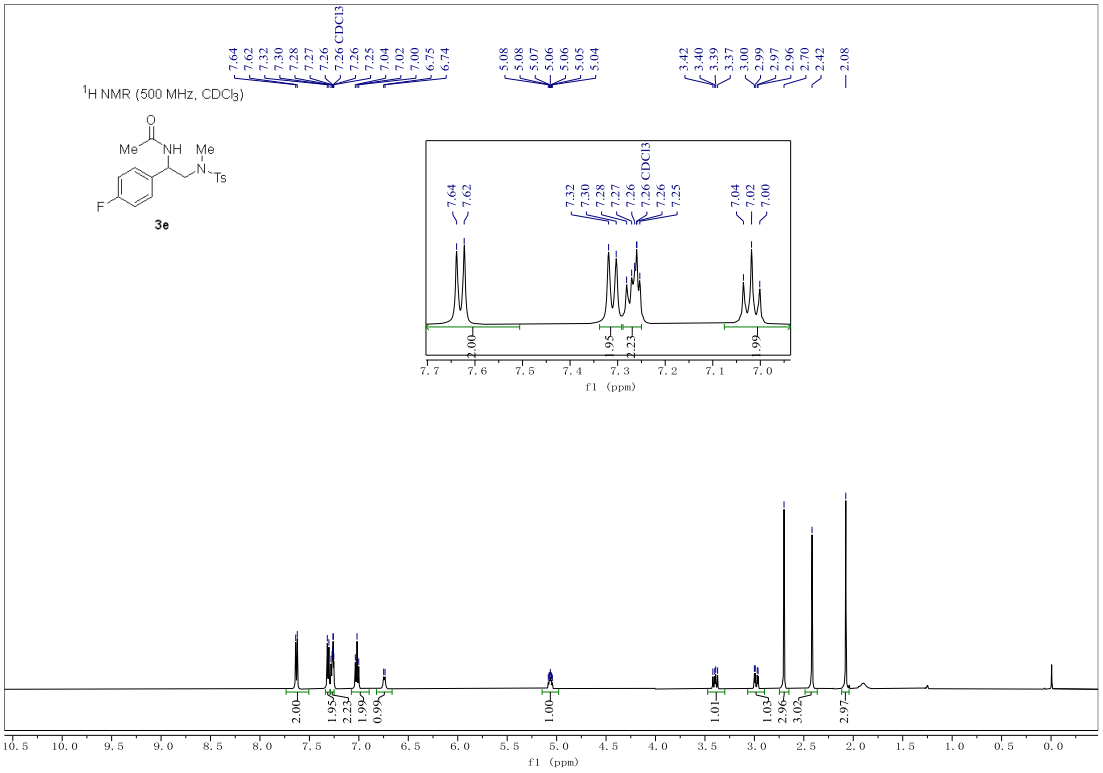


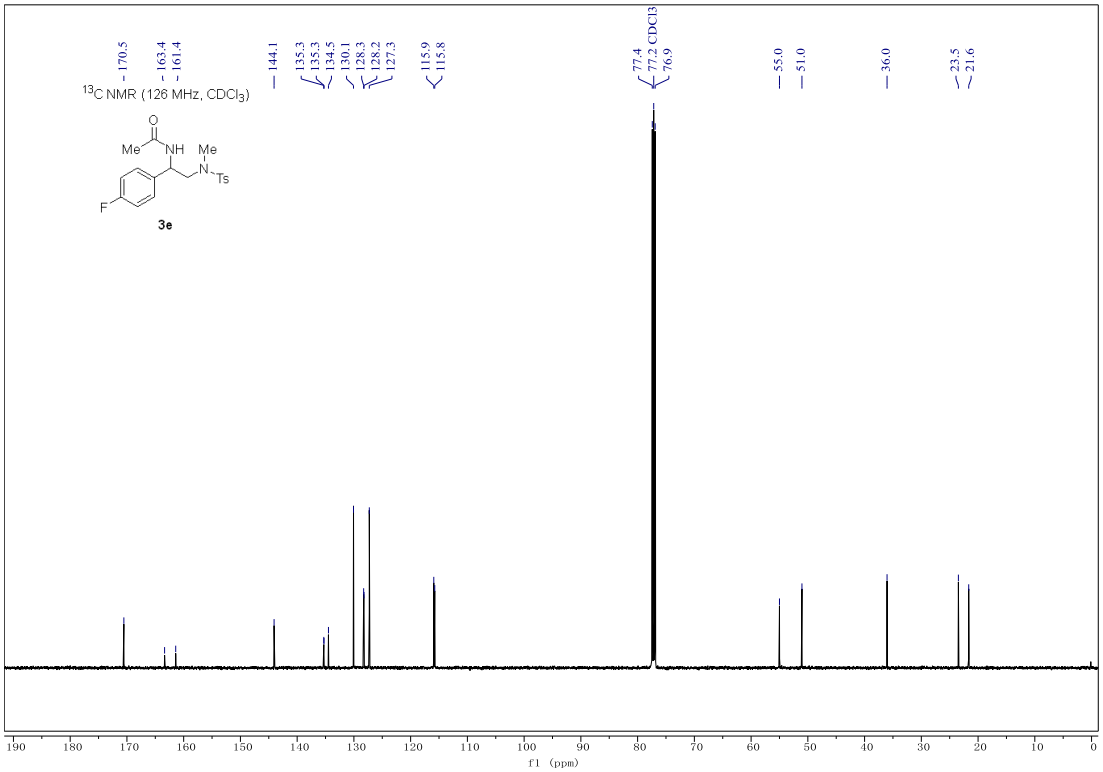
***N*-(1-(4-(*tert*-butyl)phenyl)-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl)acetamide (3d):**

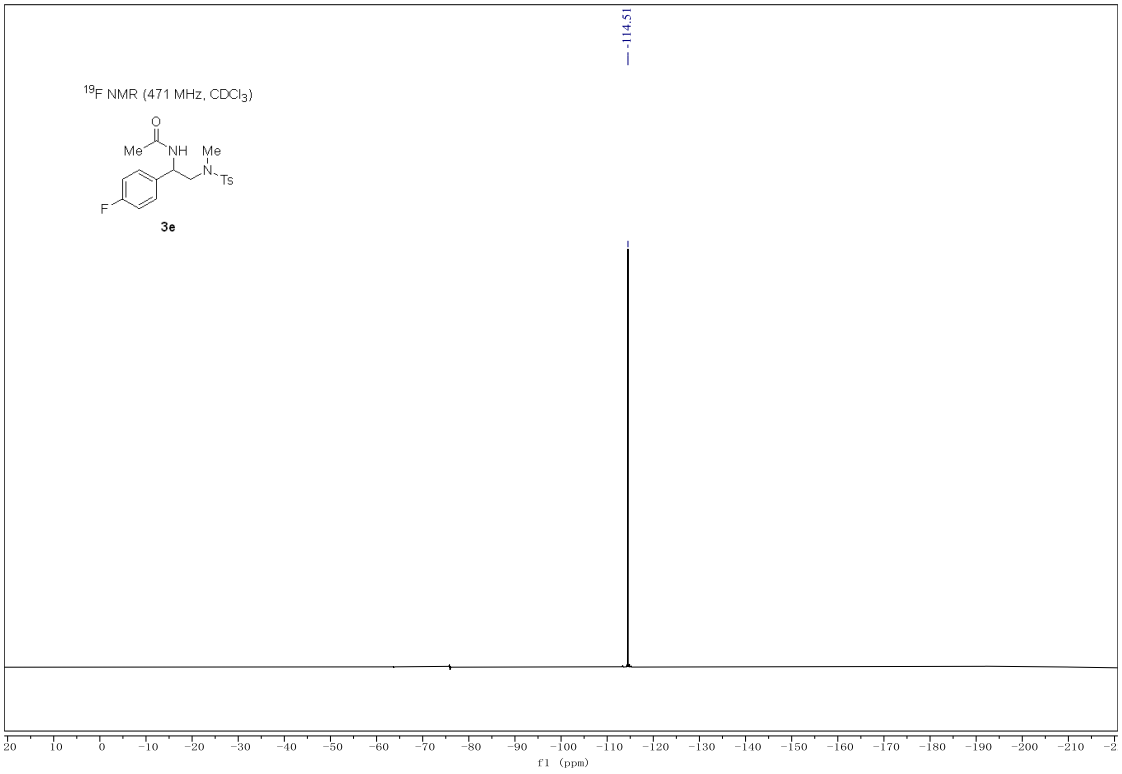




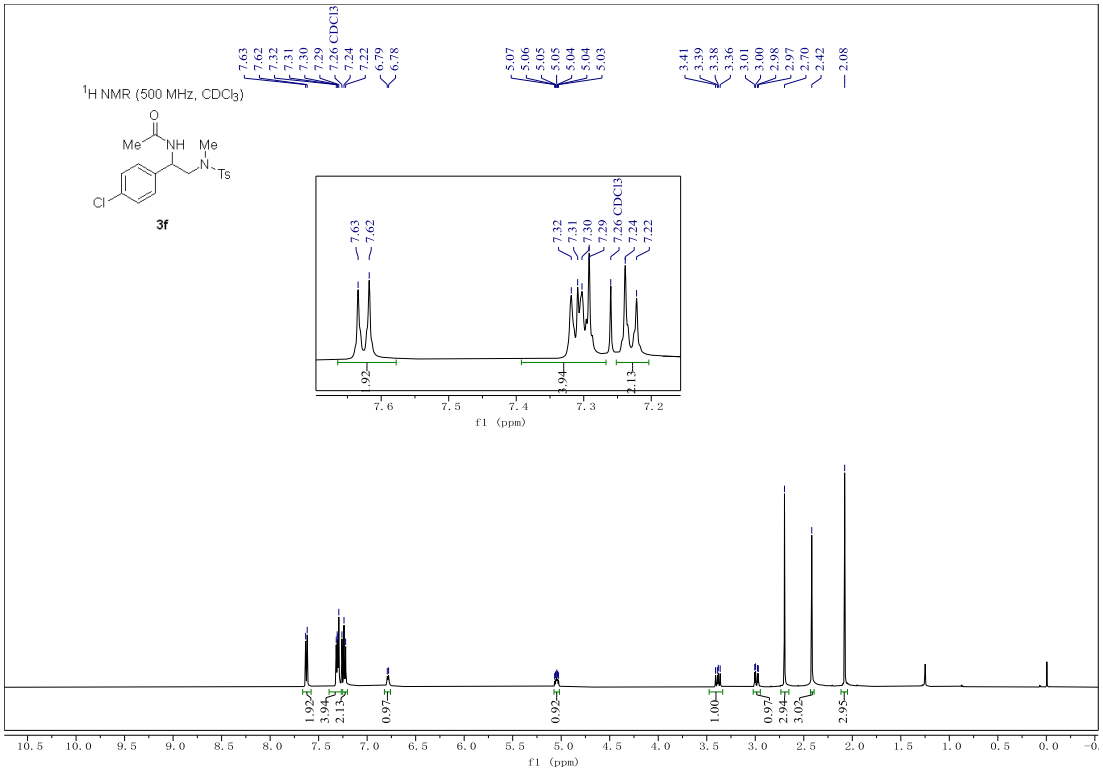
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(4-fluorophenyl)ethyl)acetamide (3e):**

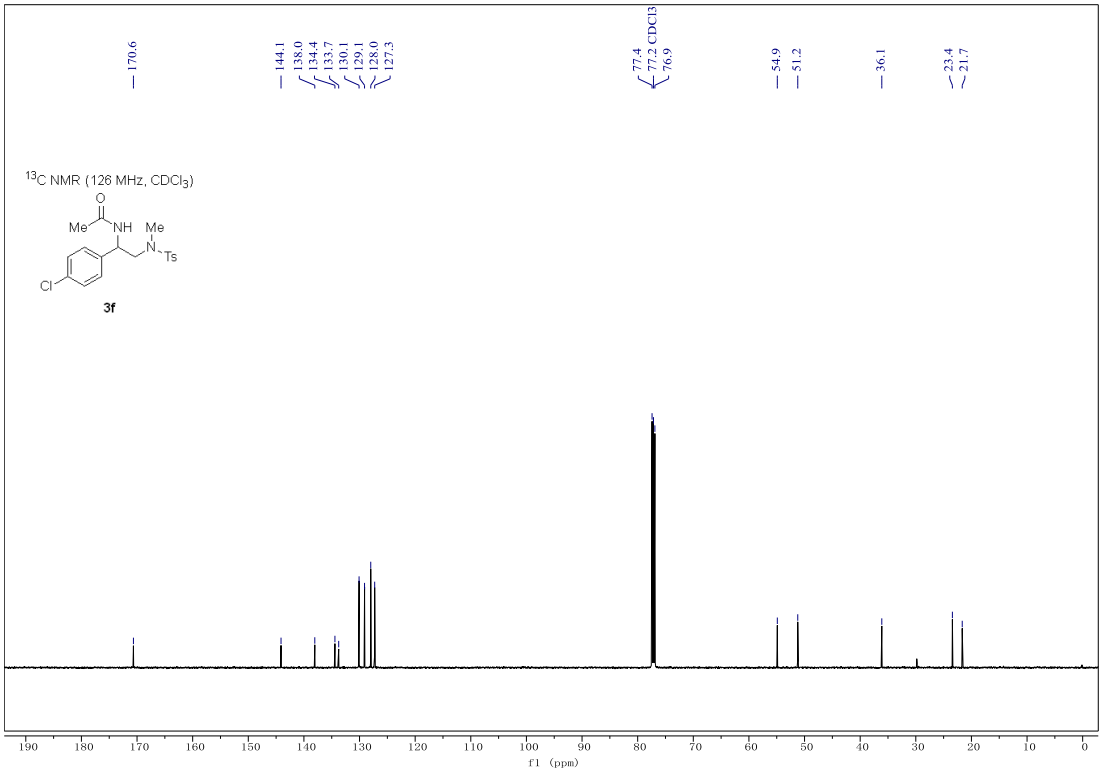




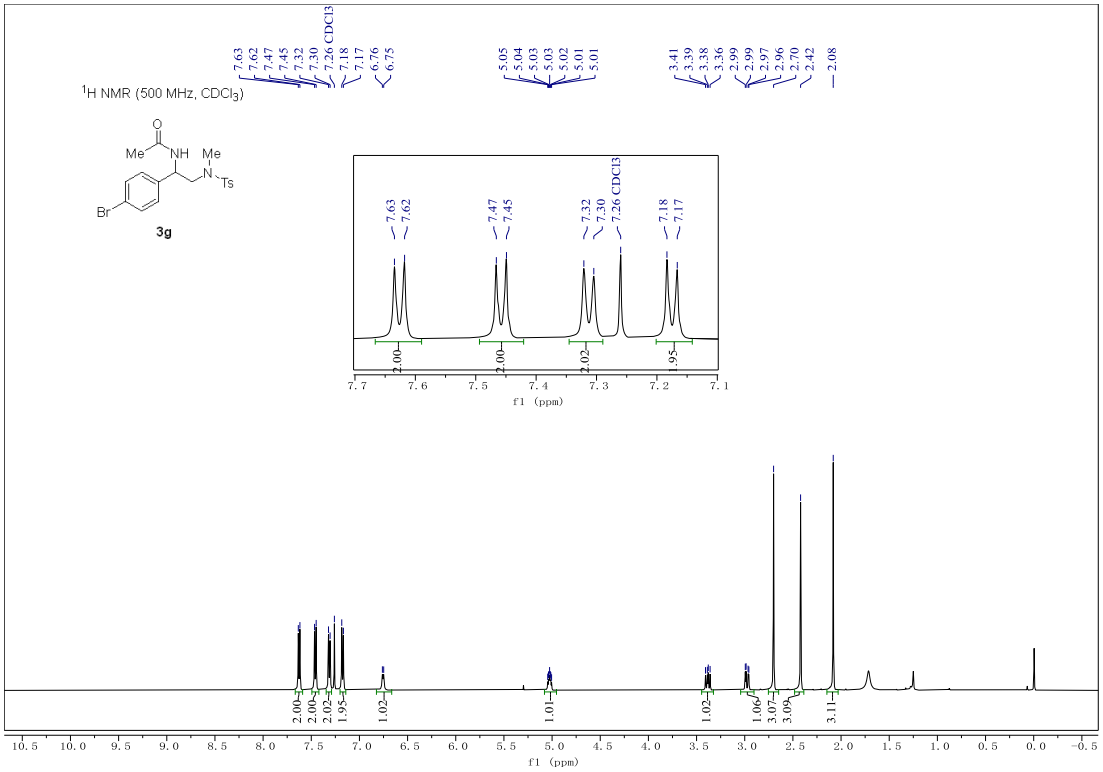


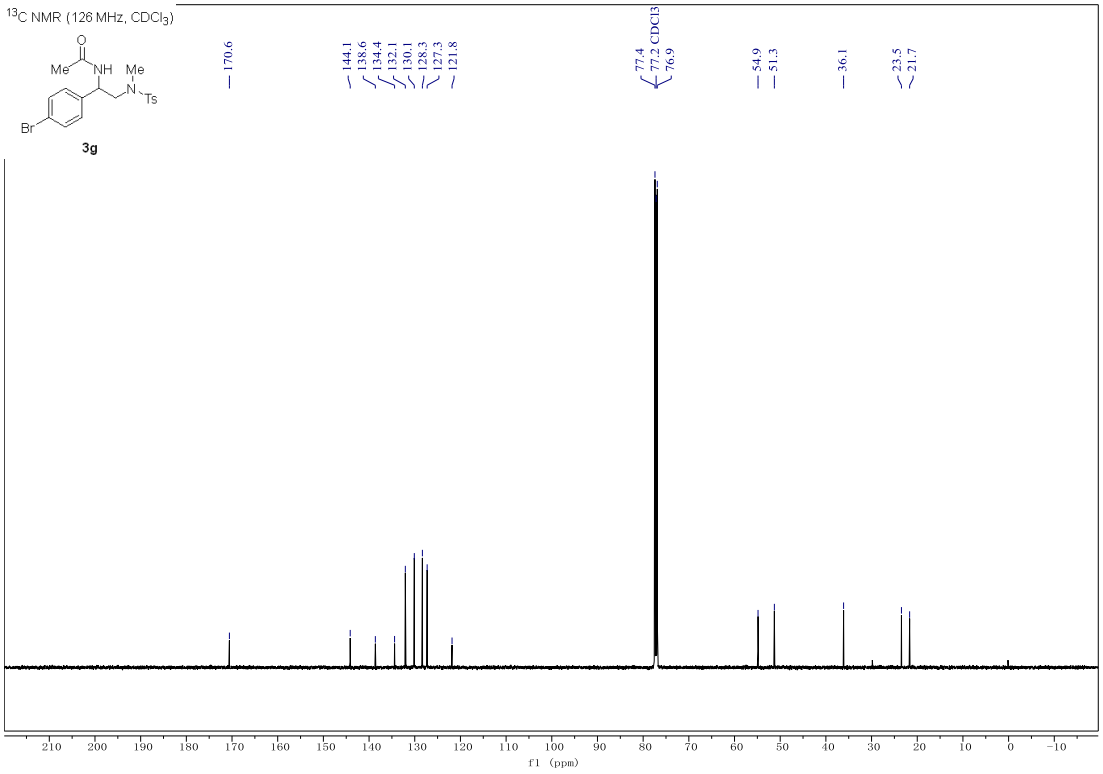
***N*-(1-(4-chlorophenyl)-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl)acetamide (3f):**



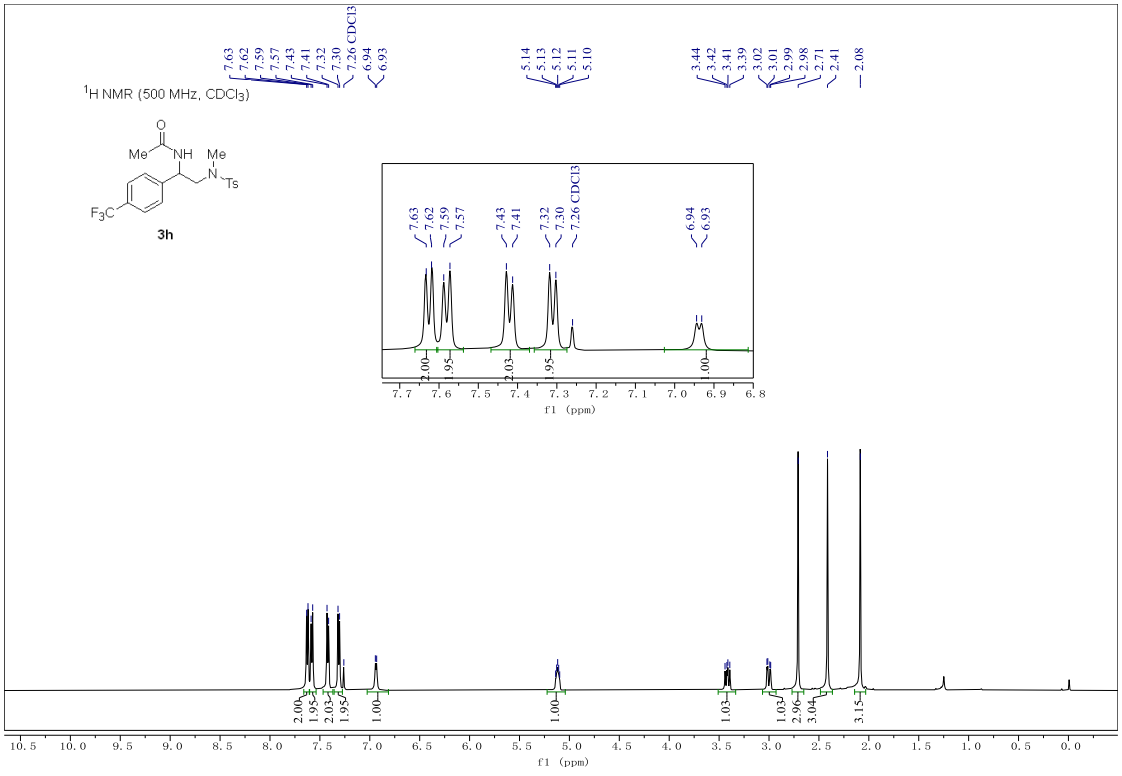


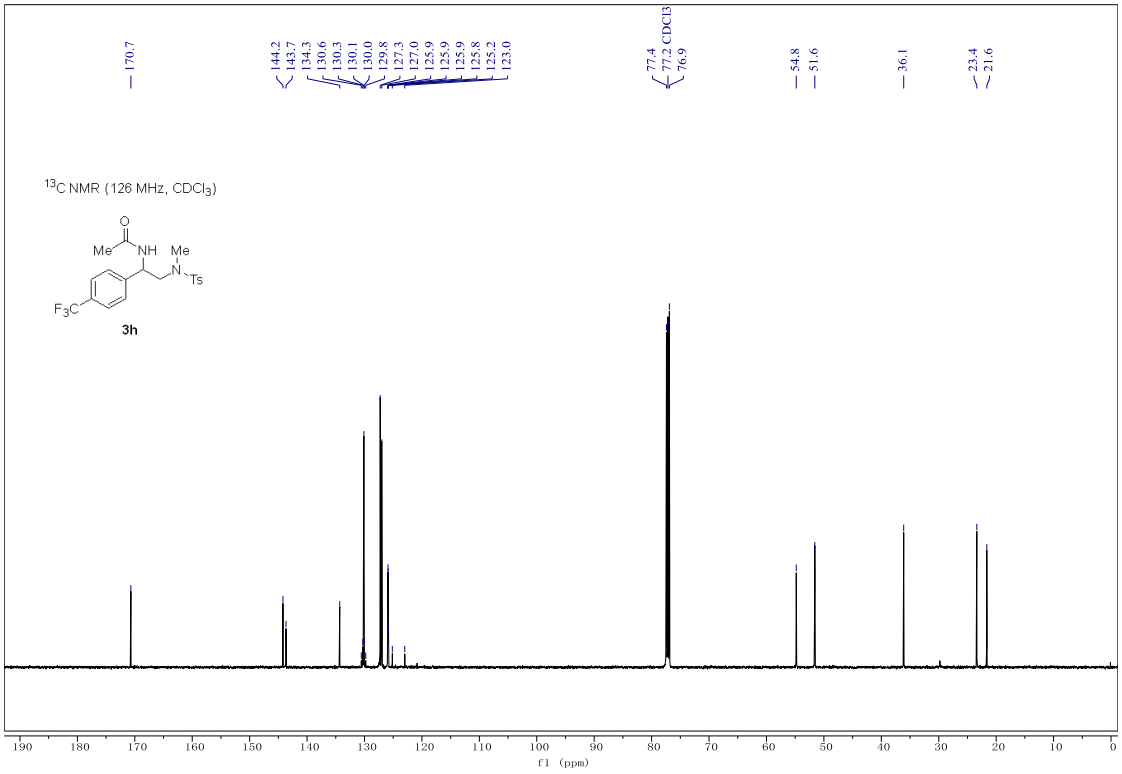
_N_-(1-(4-bromophenyl)-2-((_N_,4-dimethylphenyl)sulfonamido)ethyl)acetamide (3g):

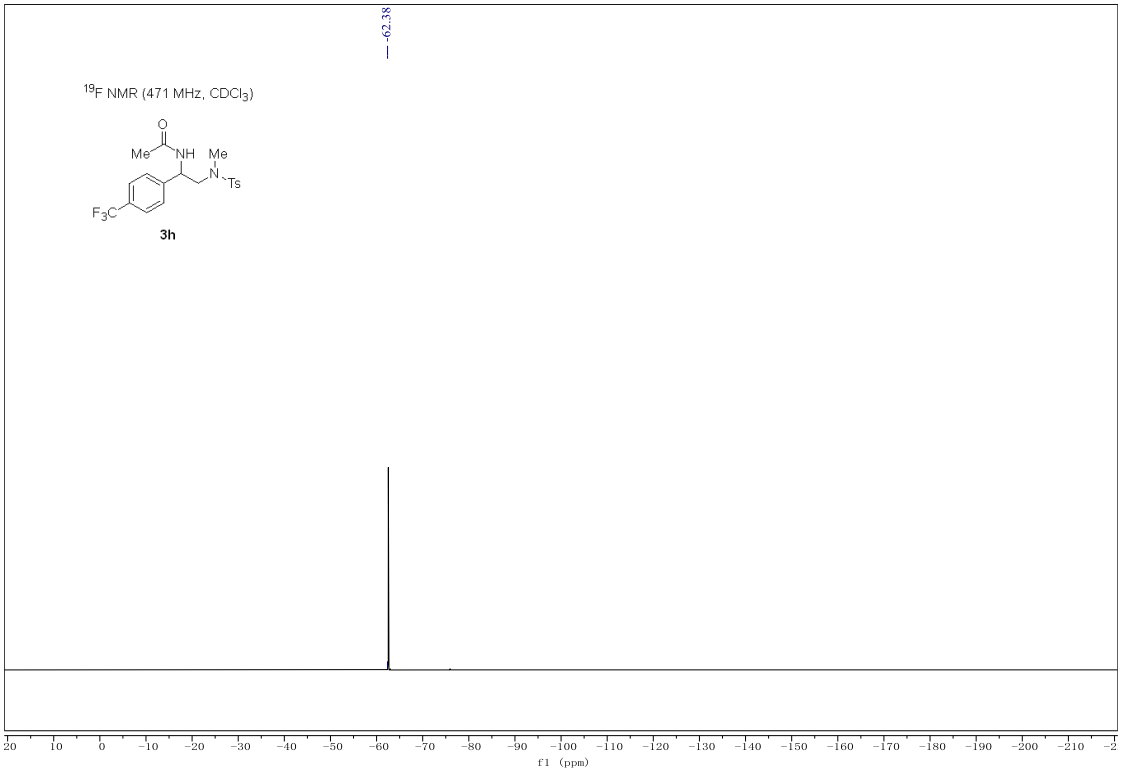




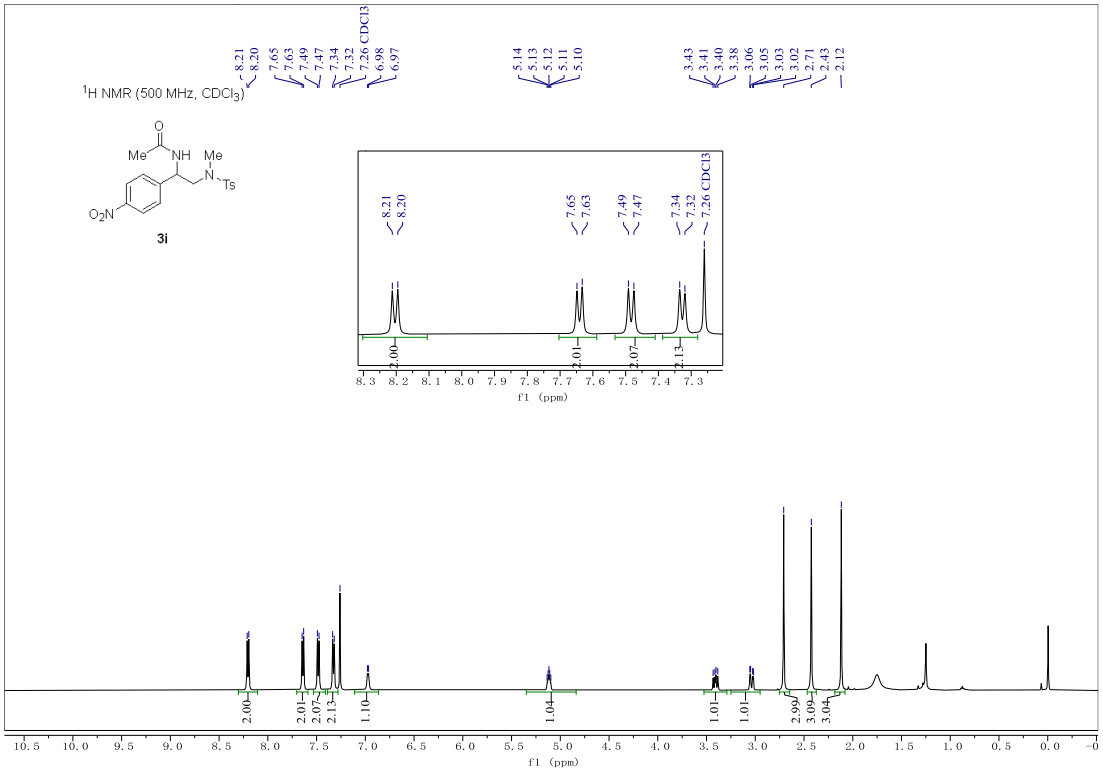
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(4-(trifluoromethyl)phenyl)ethyl)acetamide (3h):**

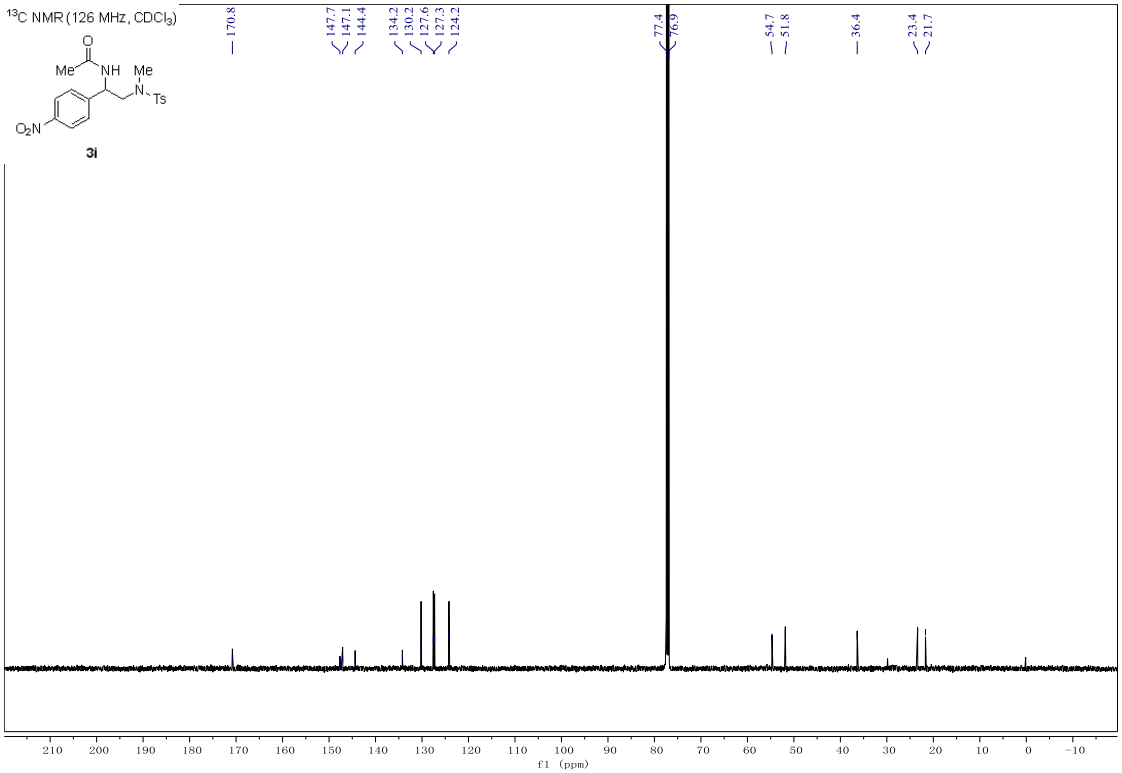



170.7
144.2
143.7
134.3
130.6
130.3
130.1
130.0
129.8
127.3
127.0
125.9
125.9
125.9
125.8
125.2
123.0
77.4
77.2 CDCl3
76.9
54.8
51.6
36.1
23.4
21.6
13C NMR (126 MHz, CDCl3)
Me
O
NH
Me
N
Ts
F3C
3h
f1 (ppm)

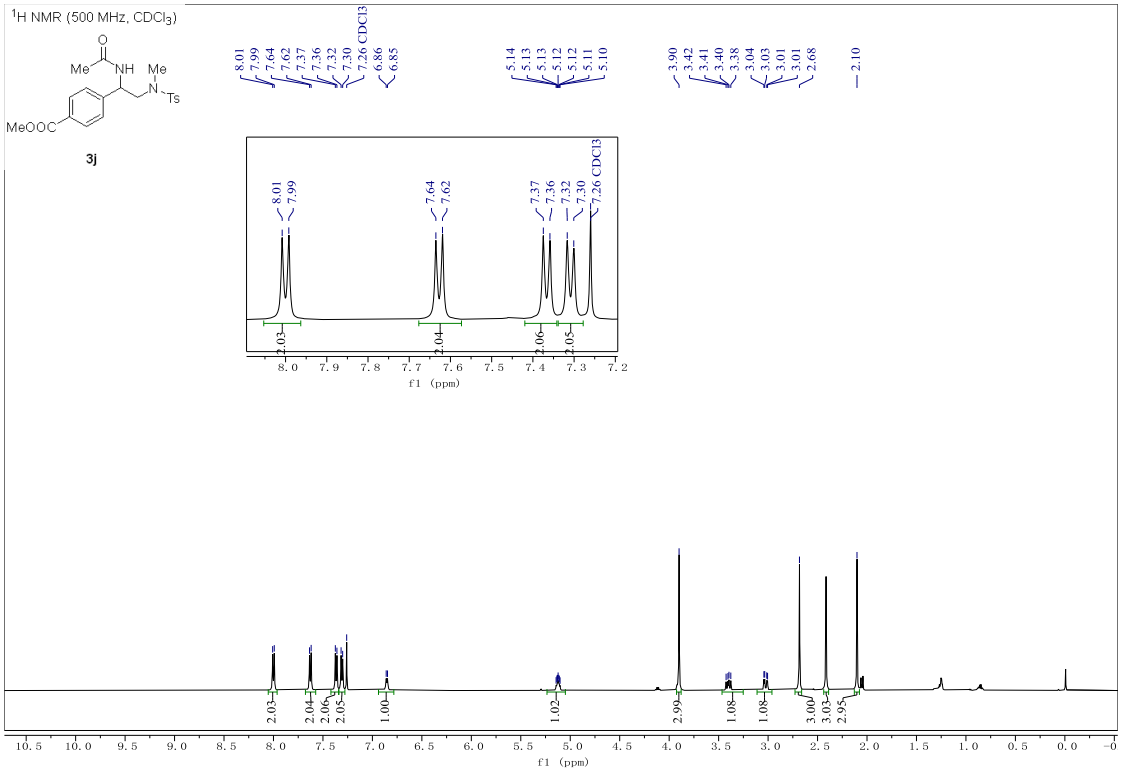

-62.38
19F NMR (471 MHz, CDCl3)
Me
O
NH
Me
N
Ts
F3C
3h
f1 (ppm)

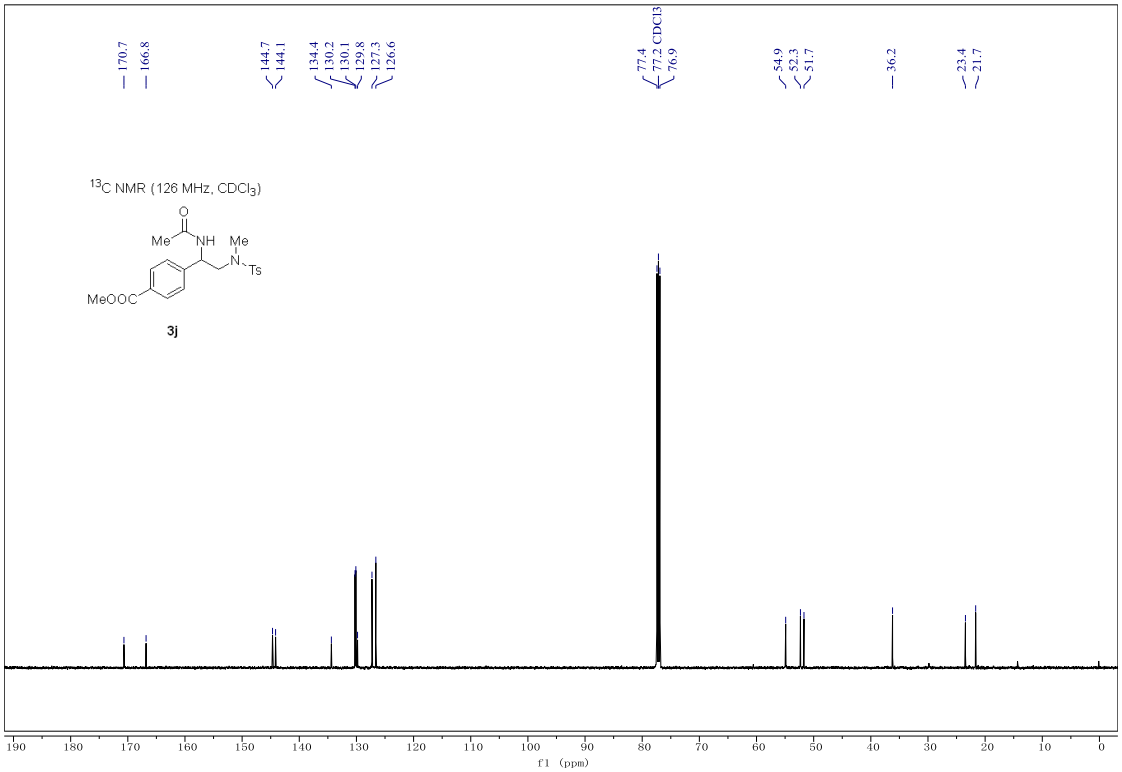
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(4-nitrophenyl)ethyl)acetamide (3i):**



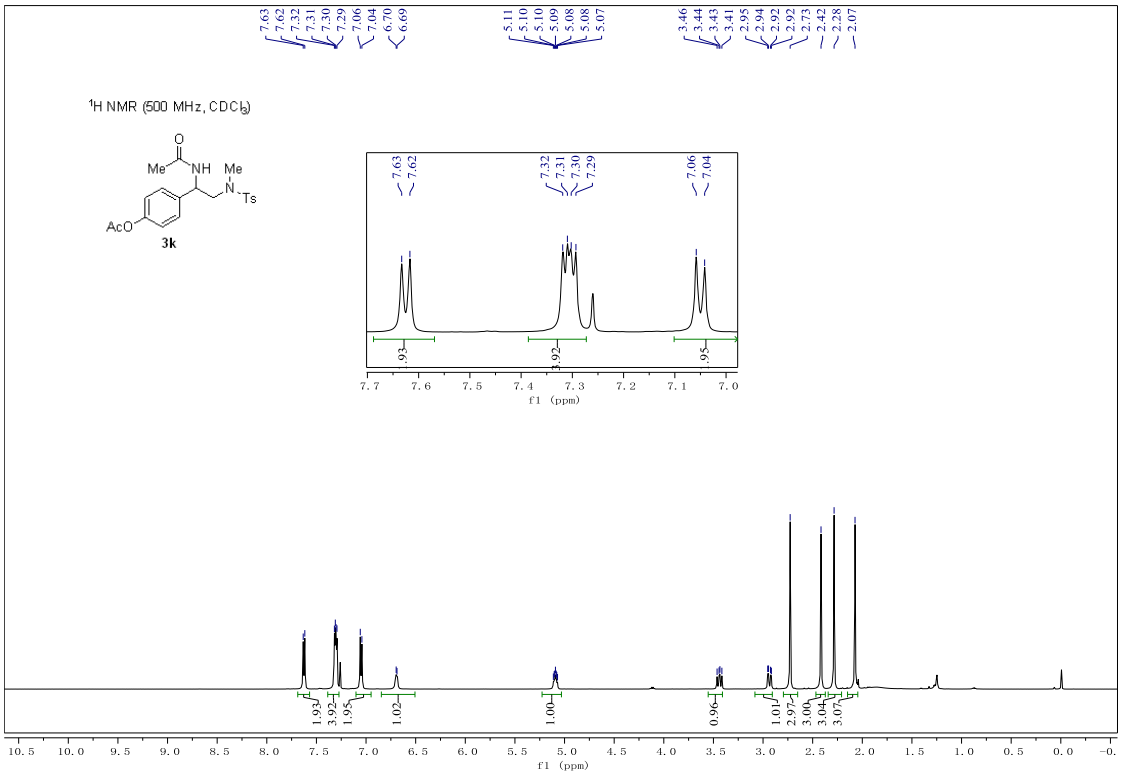


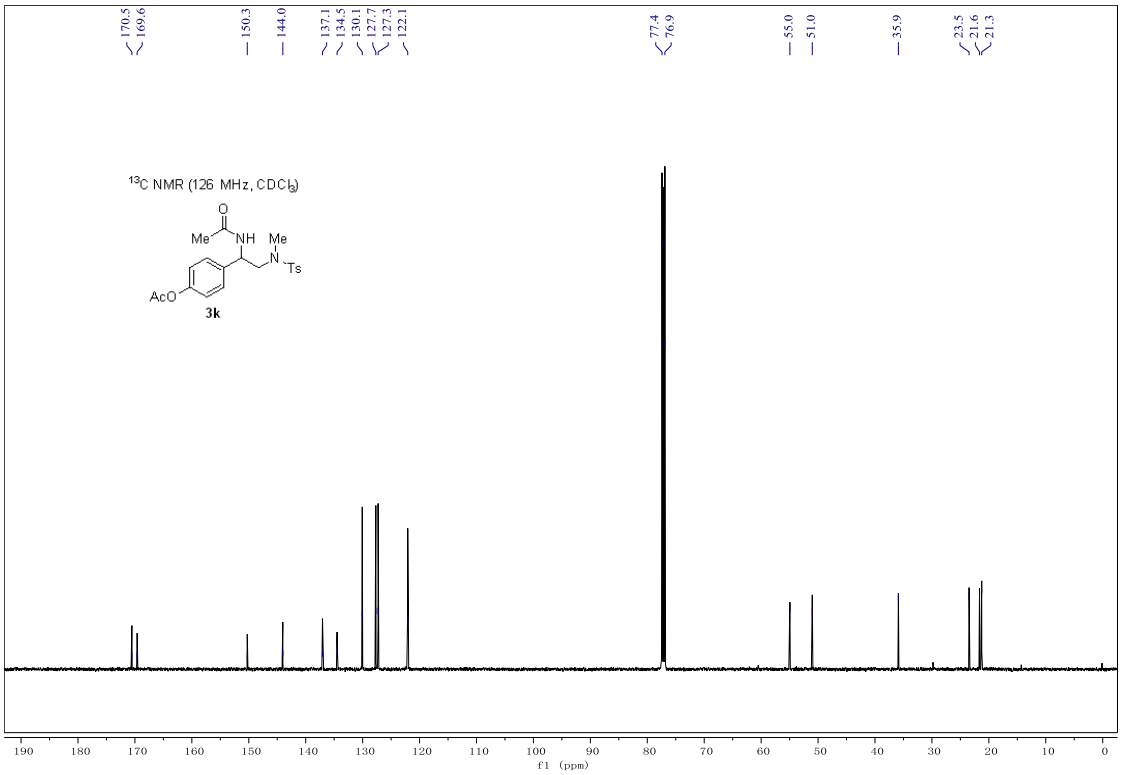
Methyl-4-(1-acetamido-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl)benzoate (3j):



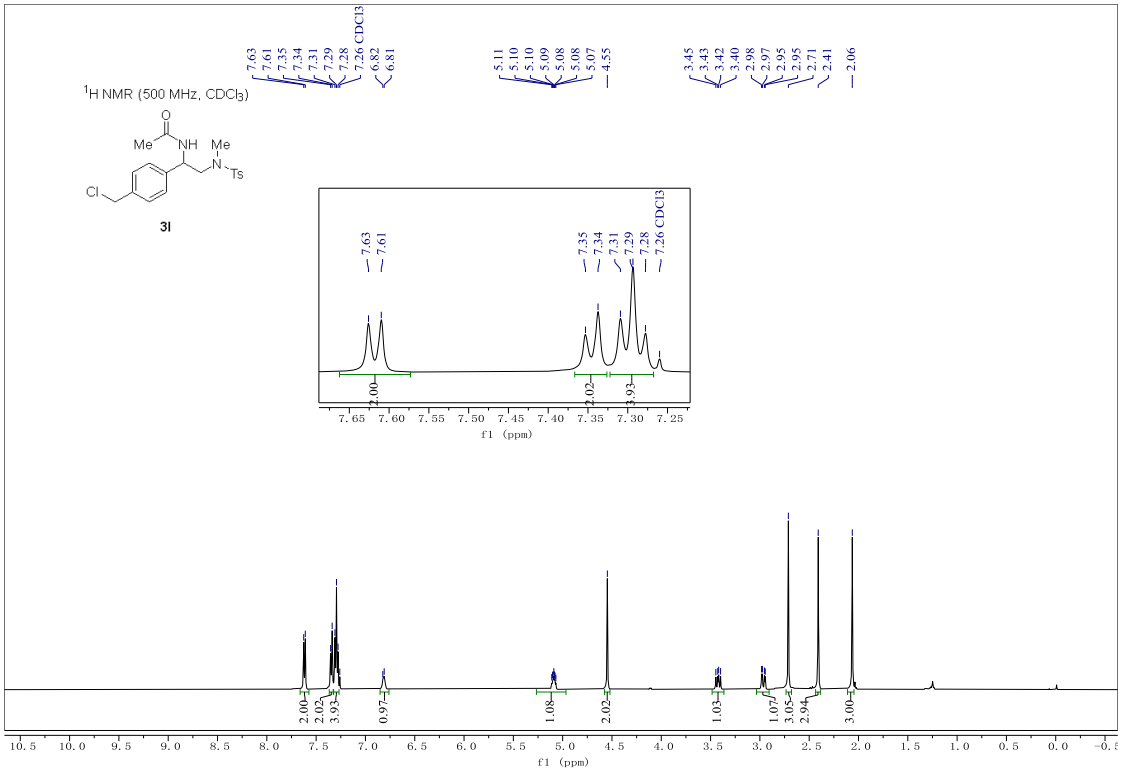


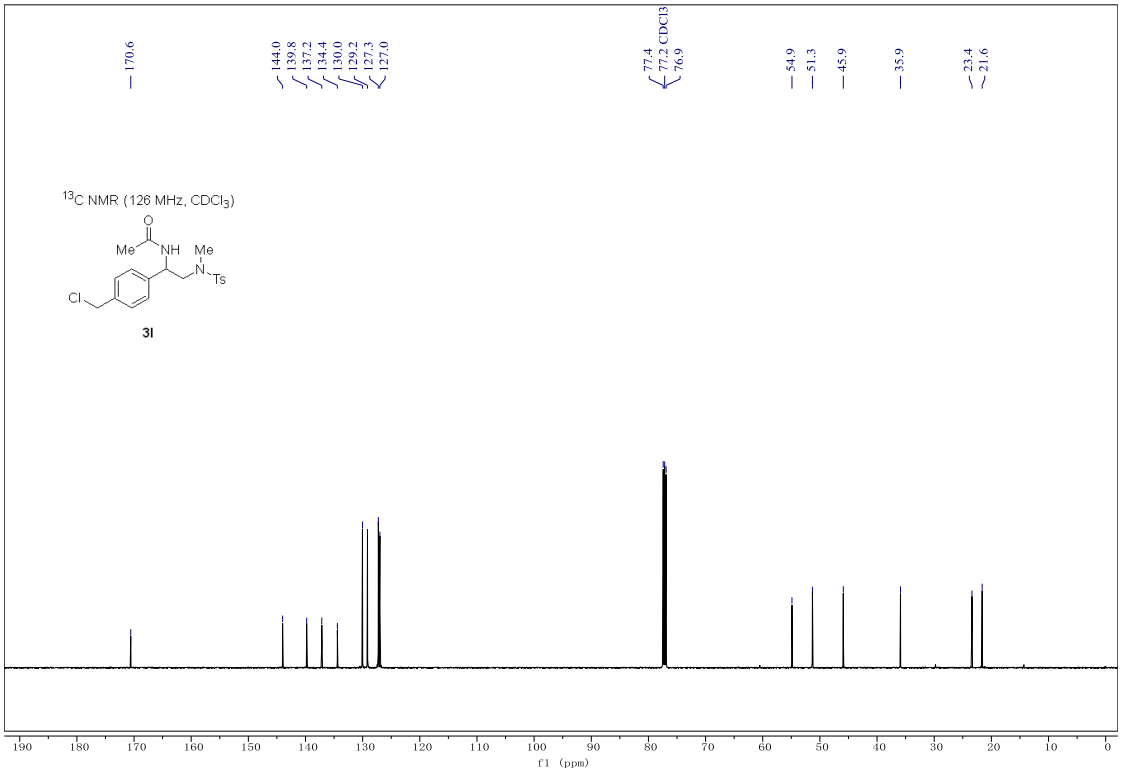
4-(1-acetamido-2-((N,4-dimethylphenyl)sulfonamido)ethyl)phenyl acetate (3k):



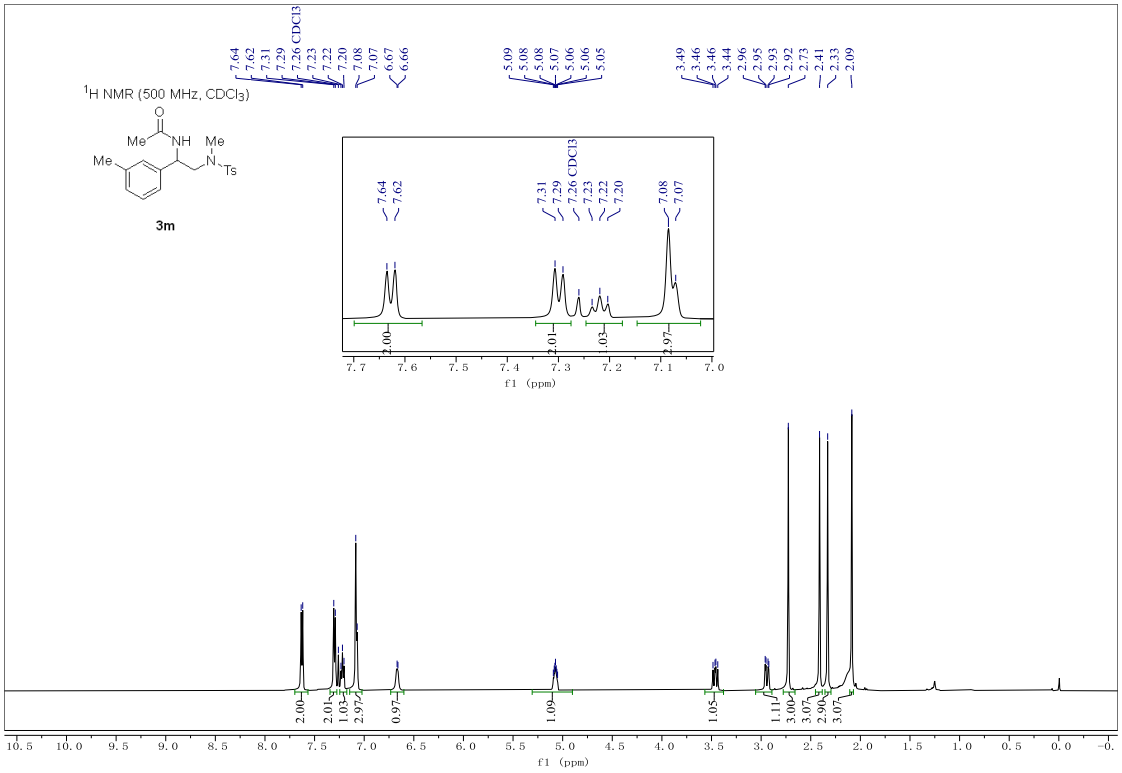


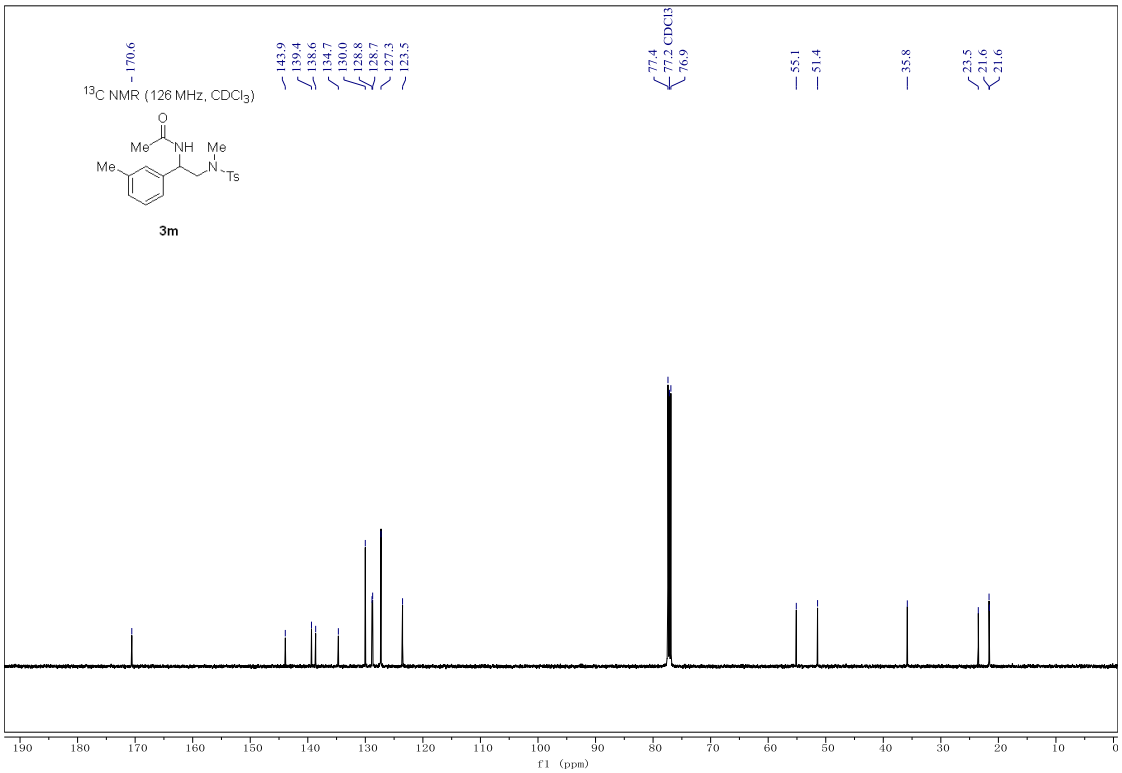
***N*-(1-(4-(chloromethyl)phenyl)-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl)acetamide (3l):**



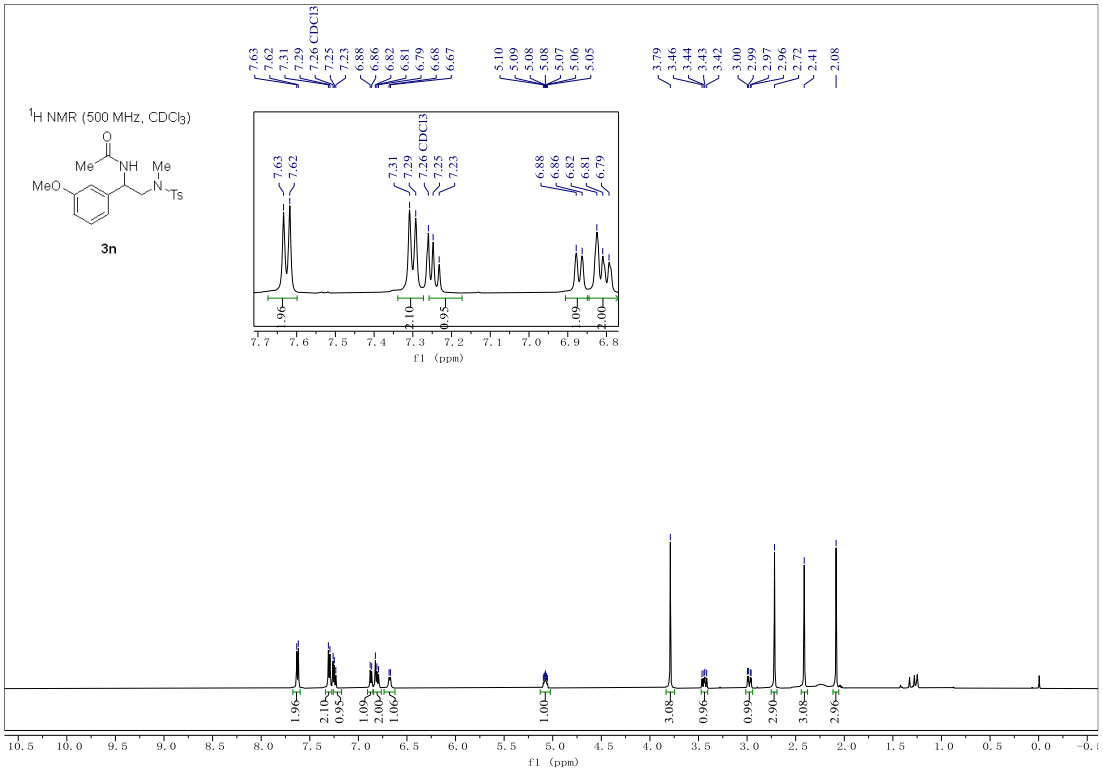


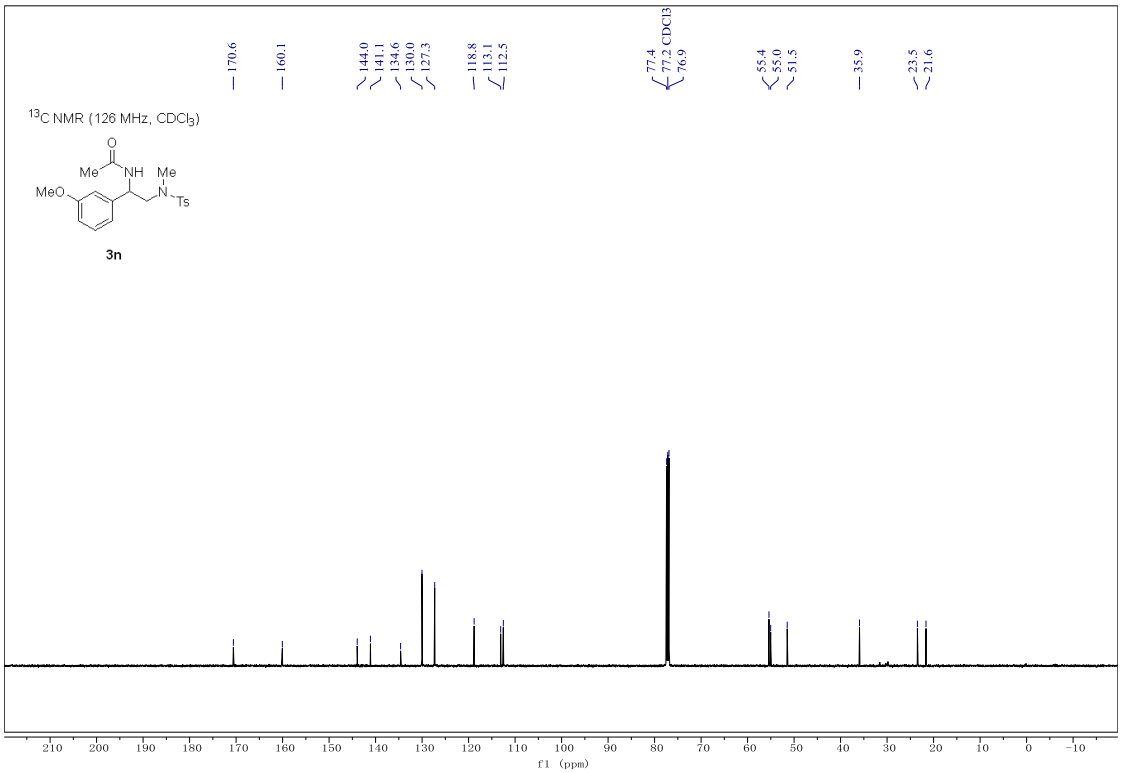
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(*m*-tolyl)ethyl)acetamide (3m):**



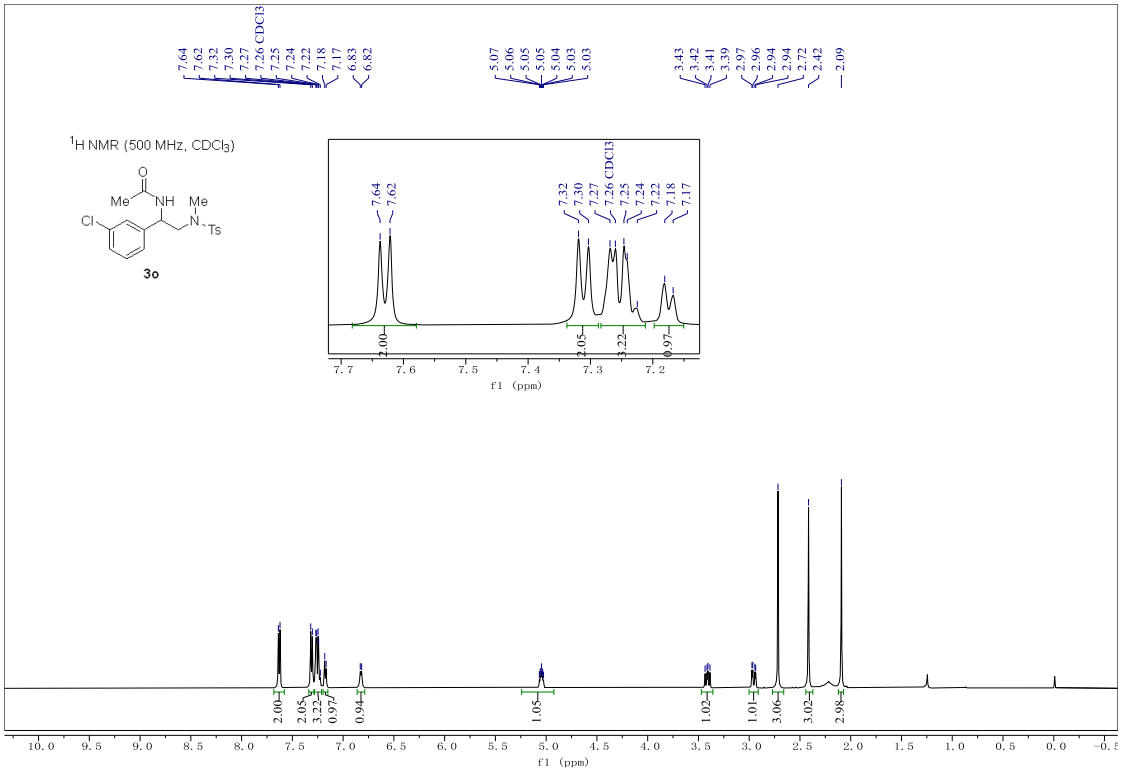


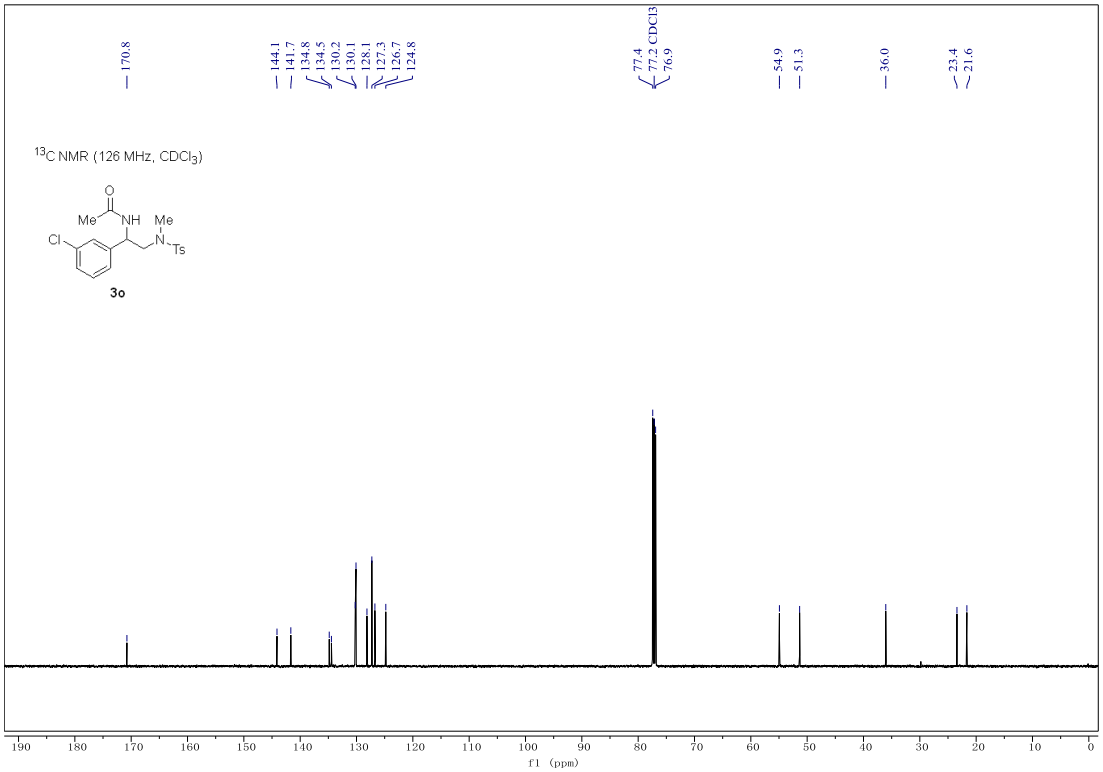
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(3-methoxyphenyl)ethyl)acetamide (3n):**



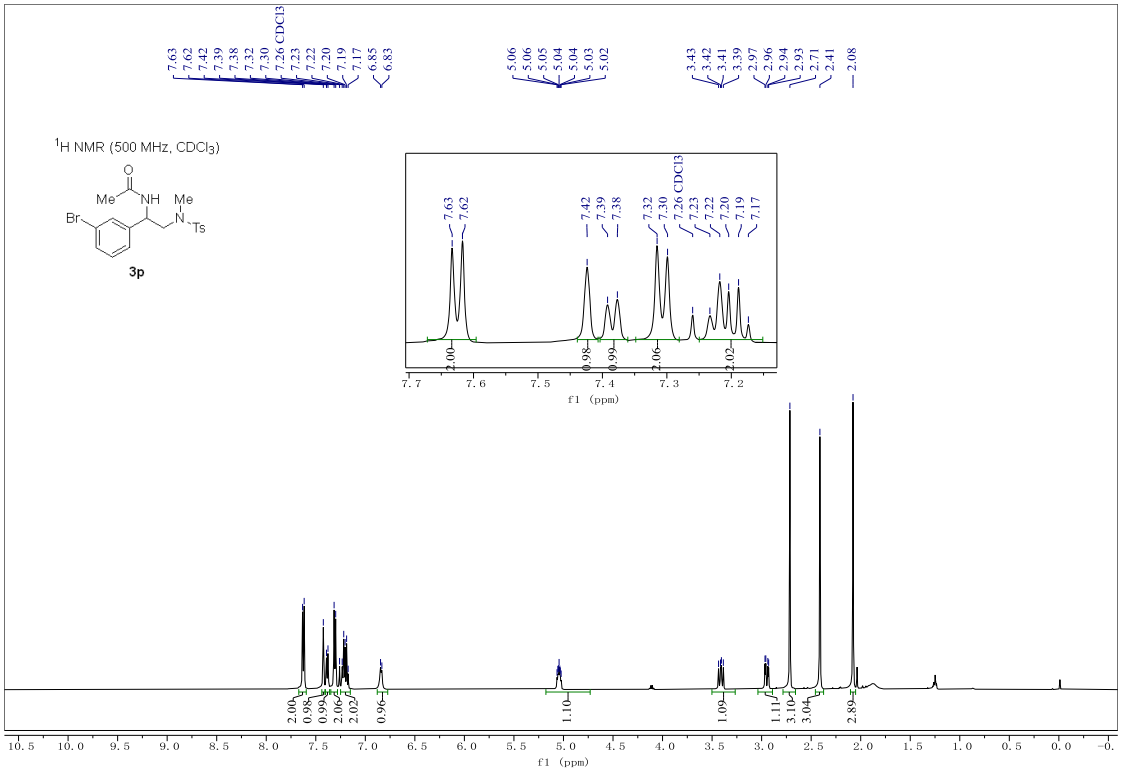


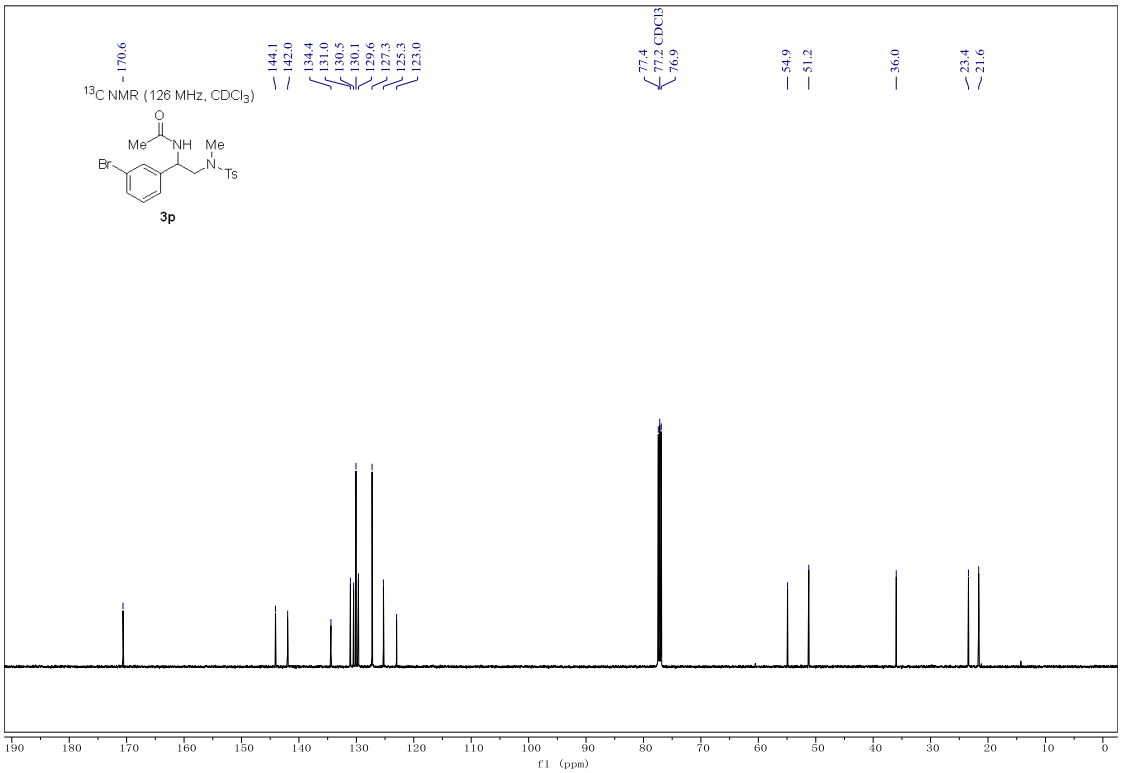
***N*-(1-(3-chlorophenyl)-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl)acetamide (3o):**



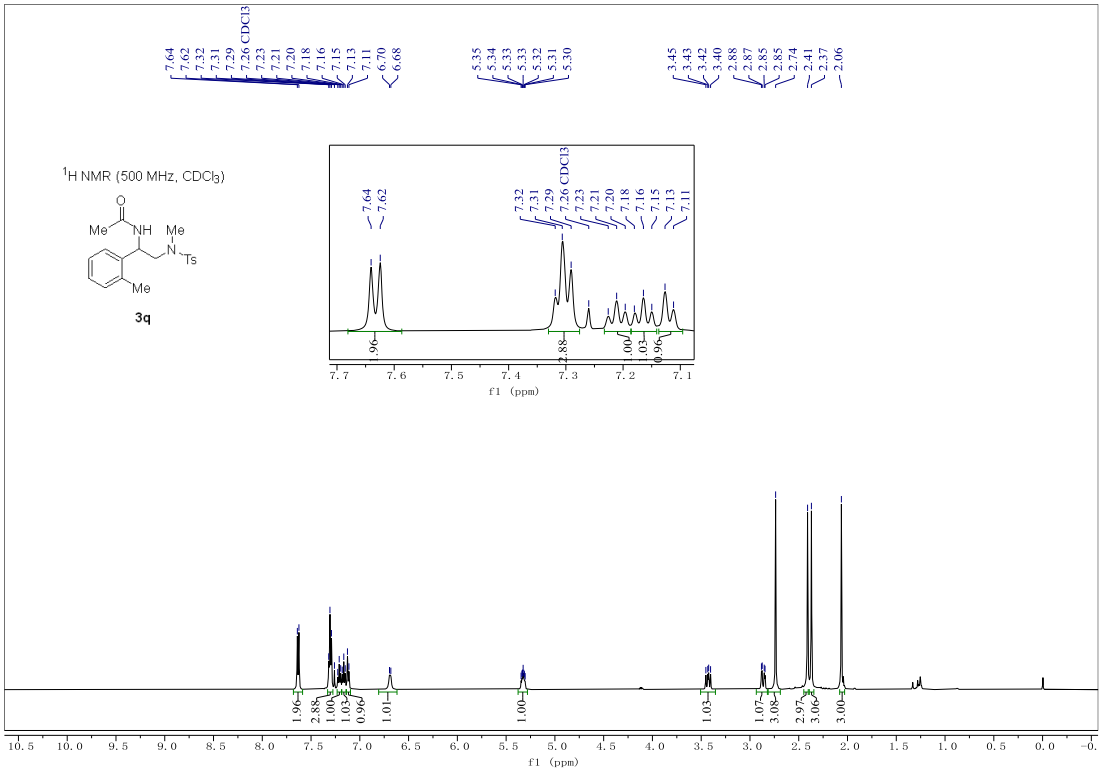


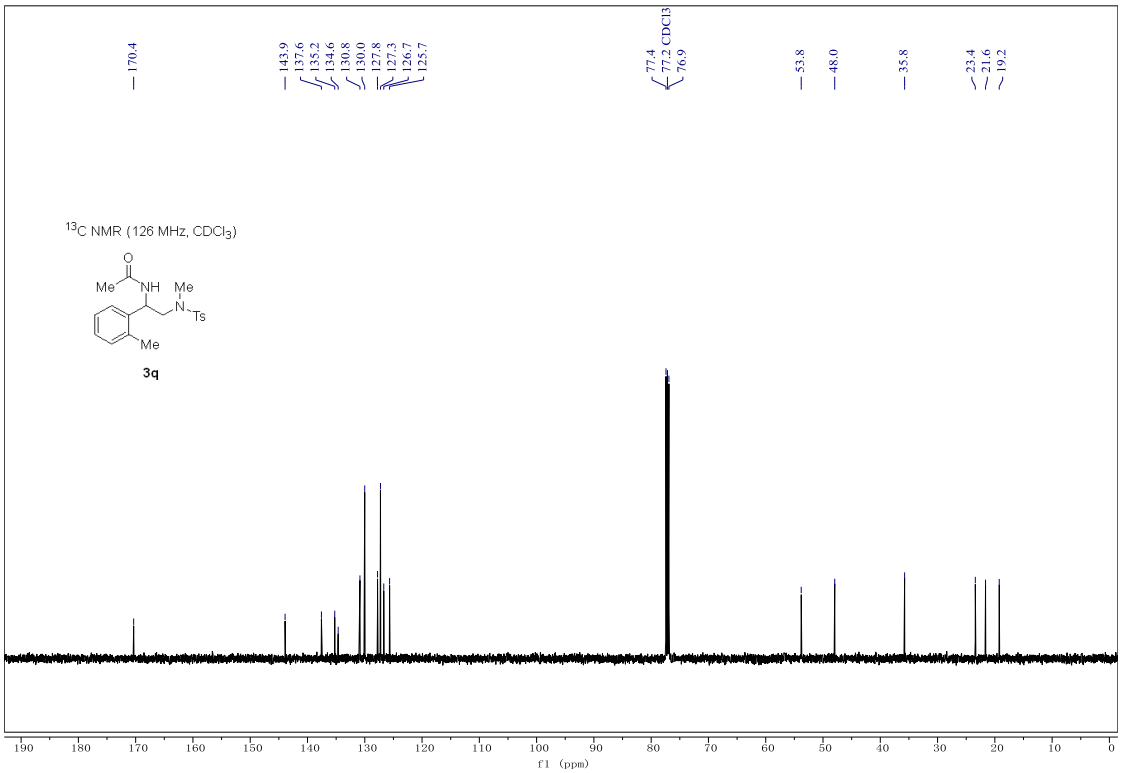
***N*-(1-(3-bromophenyl)-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl)acetamide (3p):**



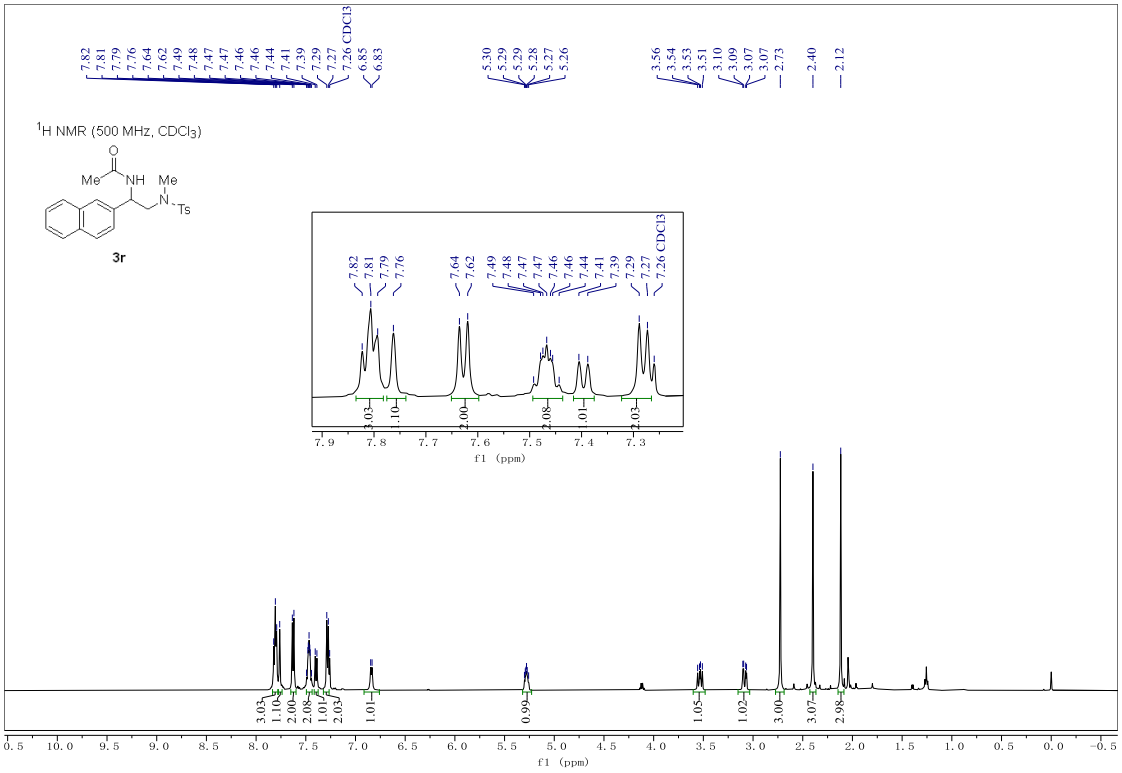


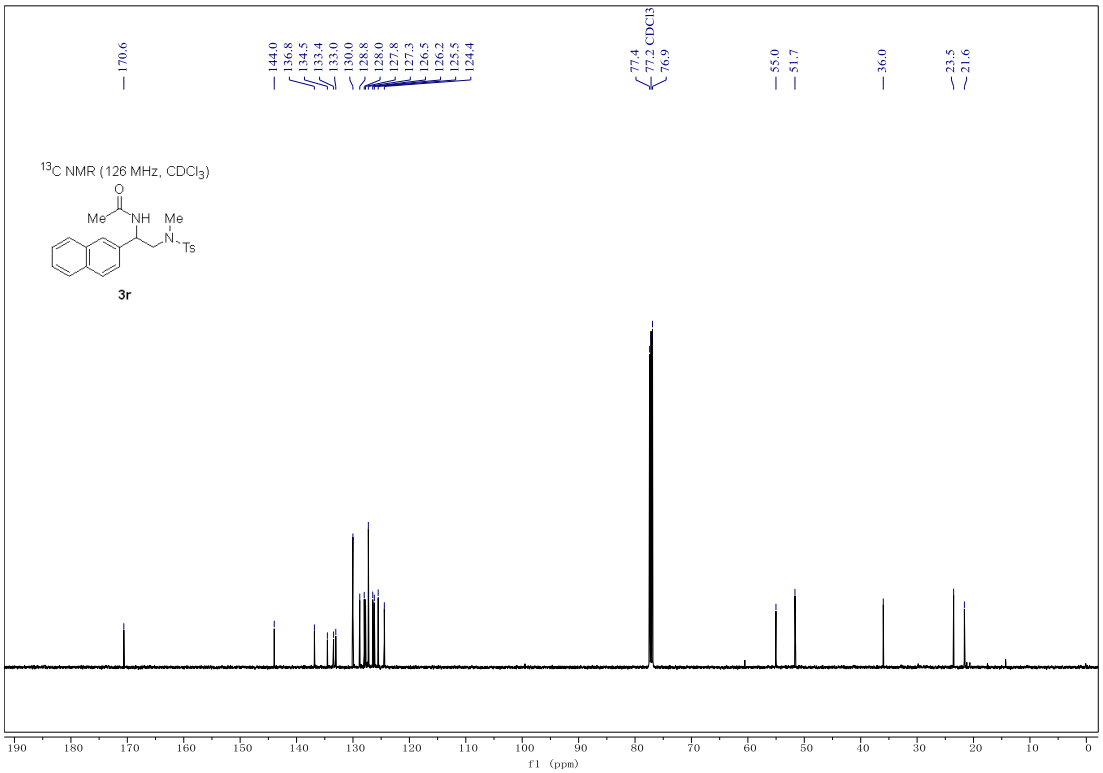
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(*o*-tolyl)ethyl)acetamide (3q):**



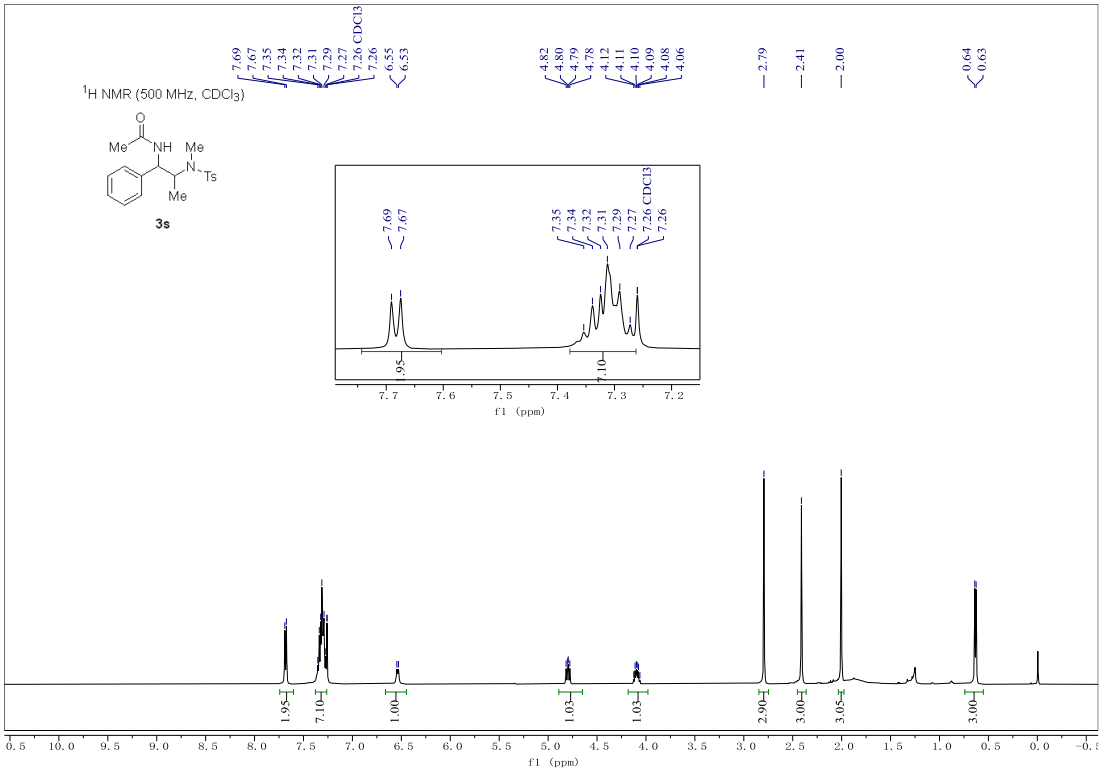


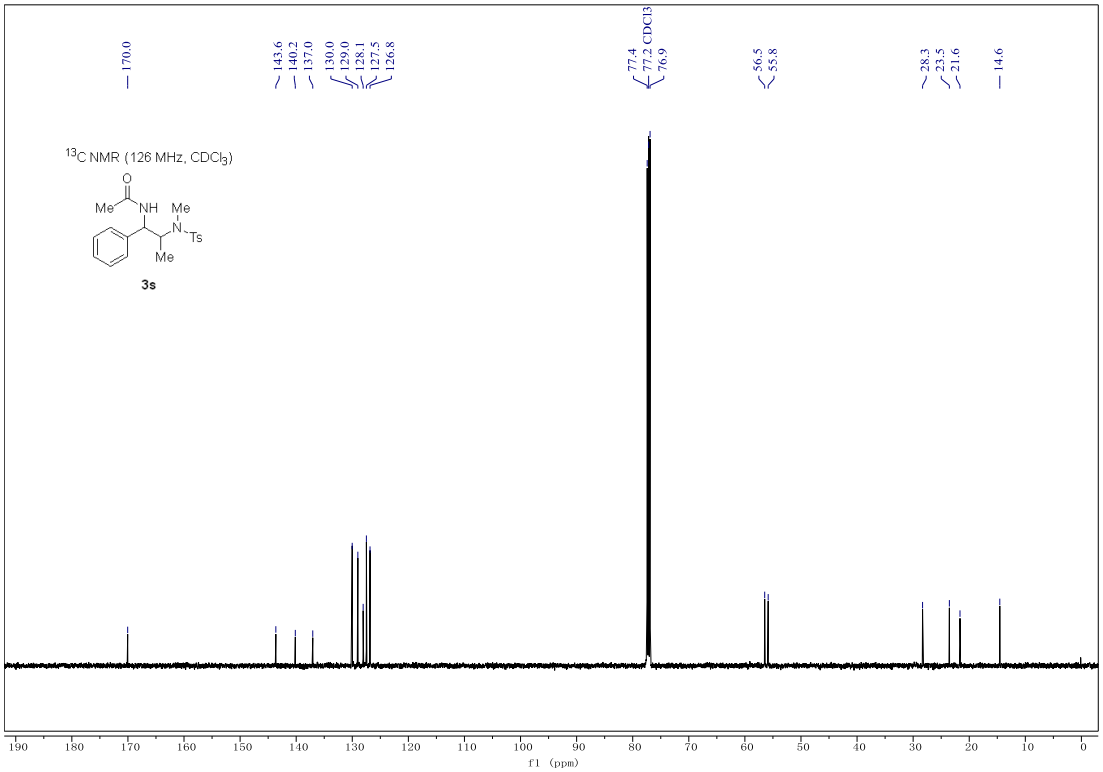
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(naphthalen-2-yl)ethyl)acetamide (3r):**



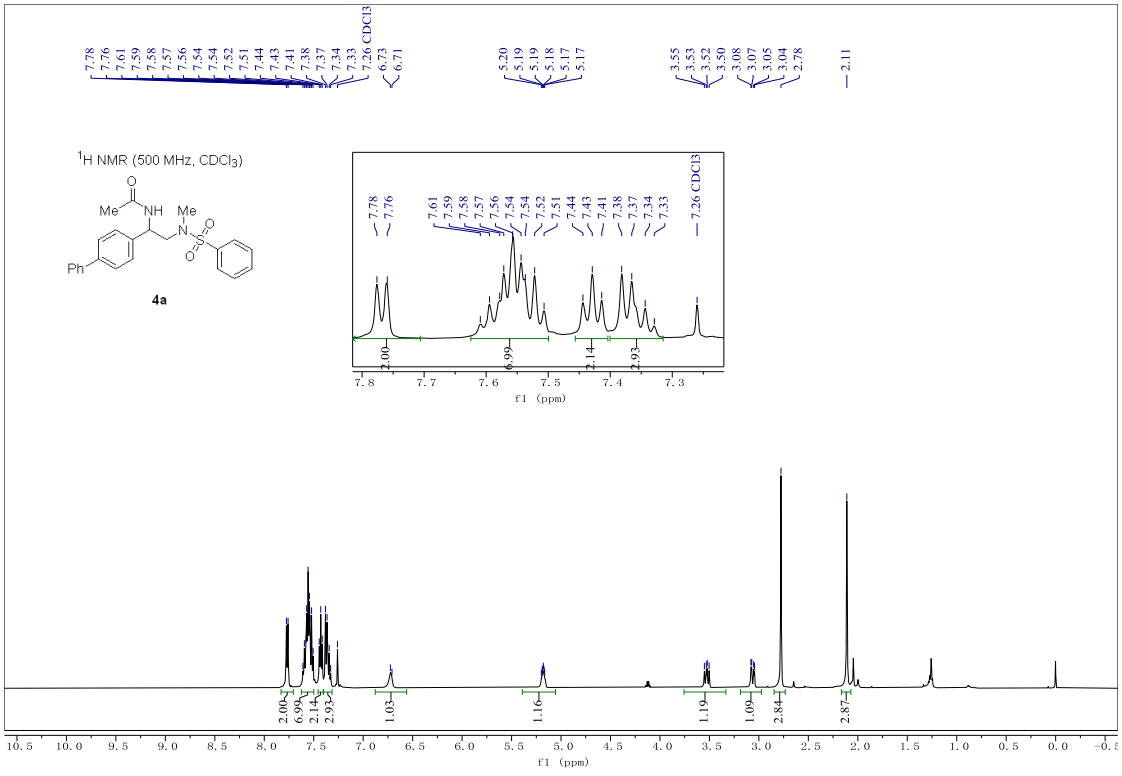


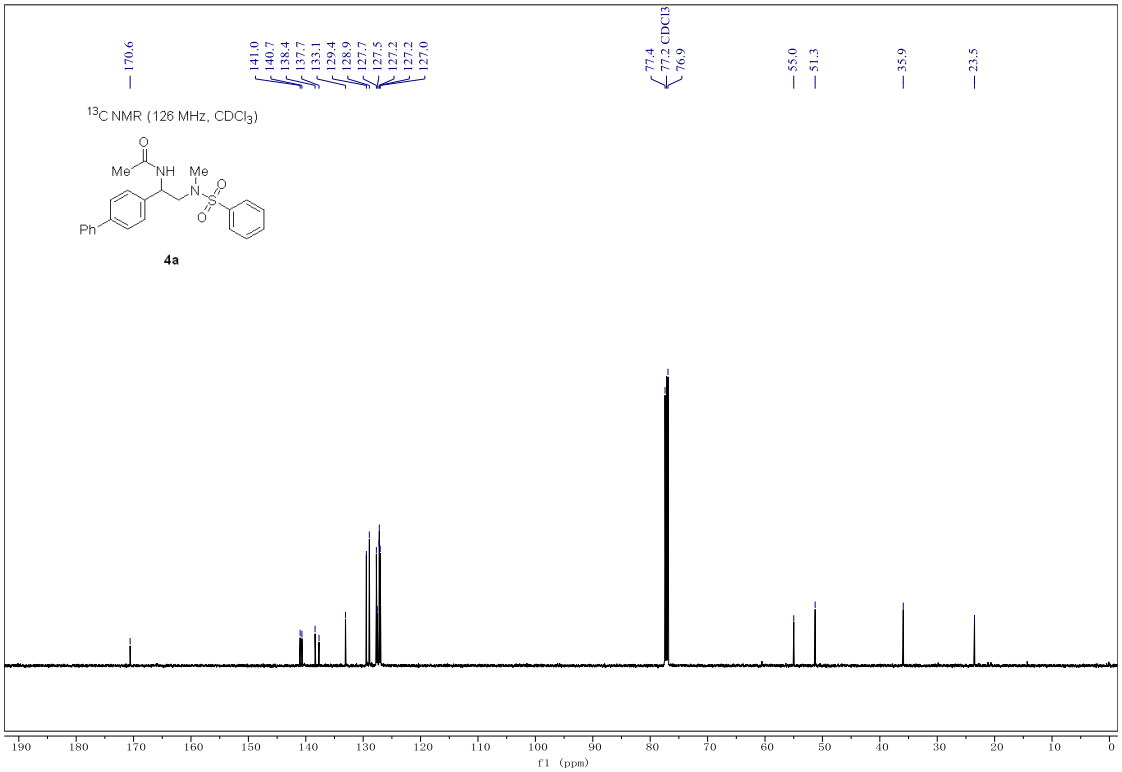
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylpropyl)acetamide (3s):**



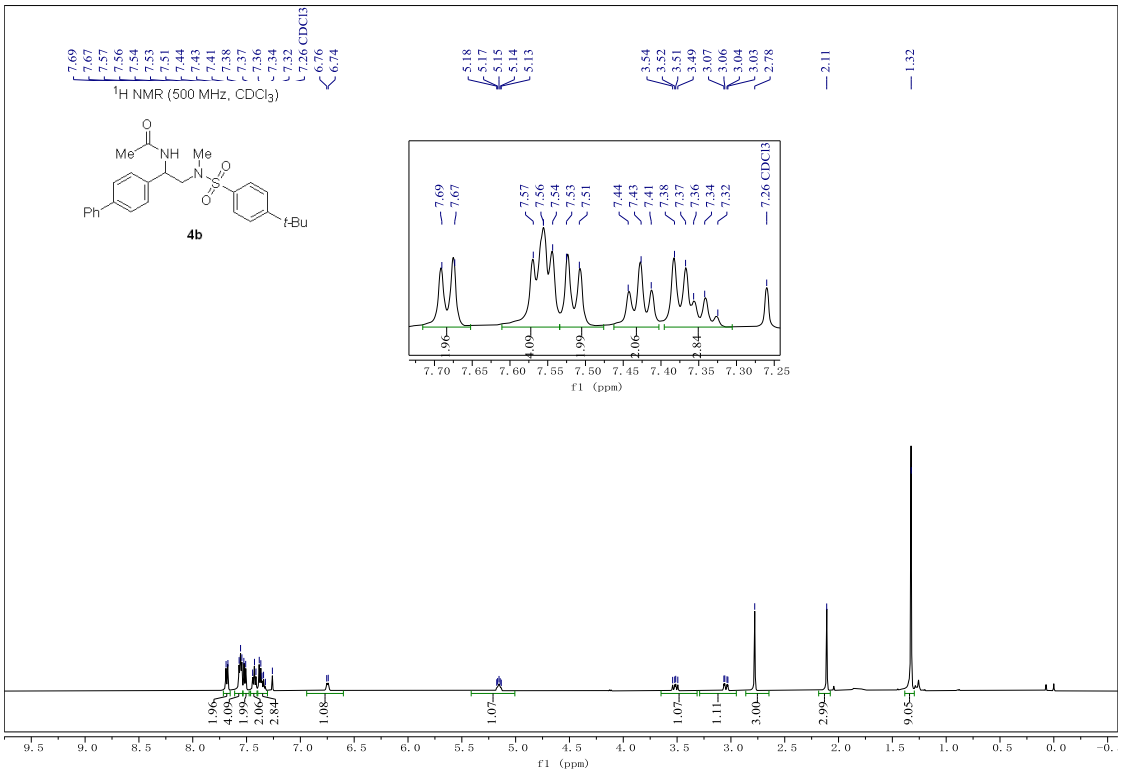


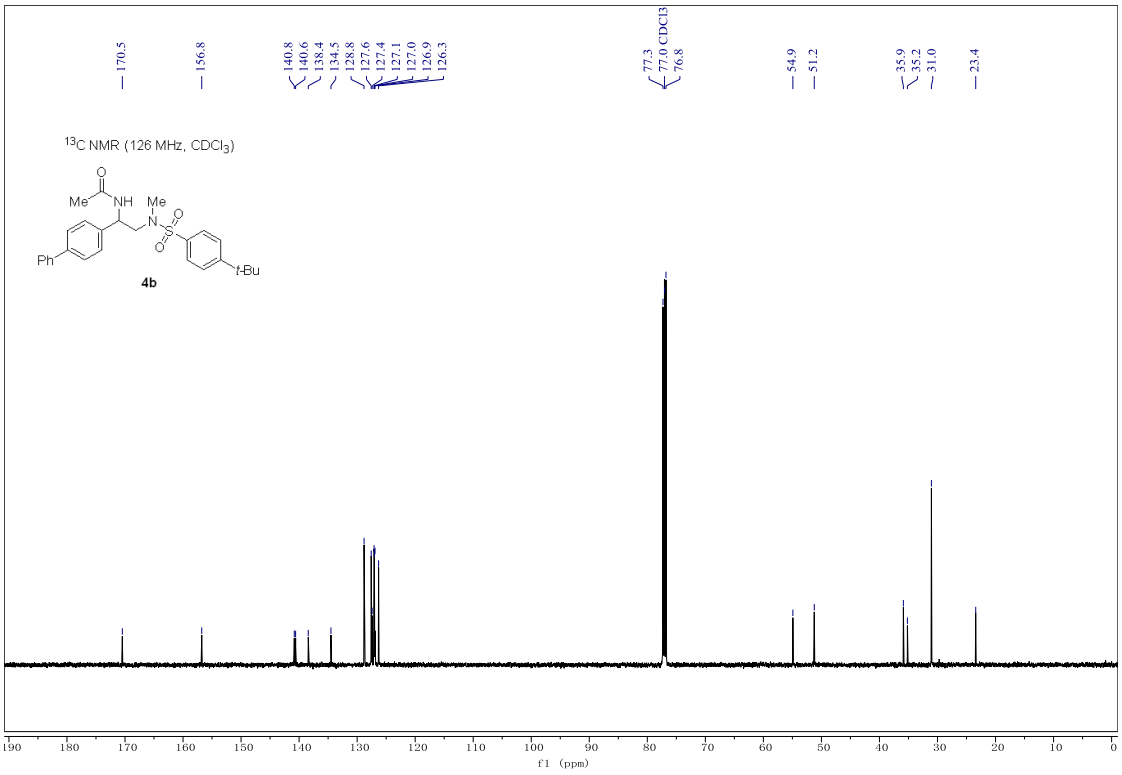
***N*-(1-([1,1'-biphenyl]-4-yl)-2-(*N*-methylphenylsulfonamido)ethyl)acetamide (4a):**



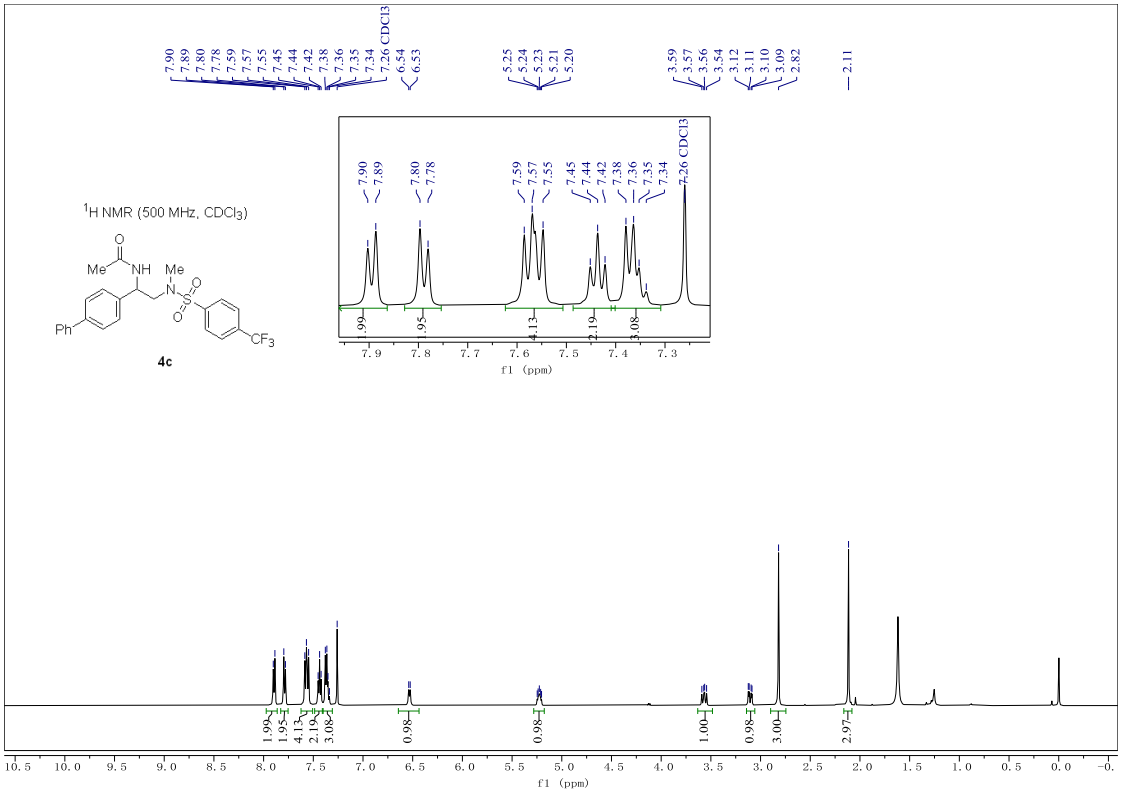


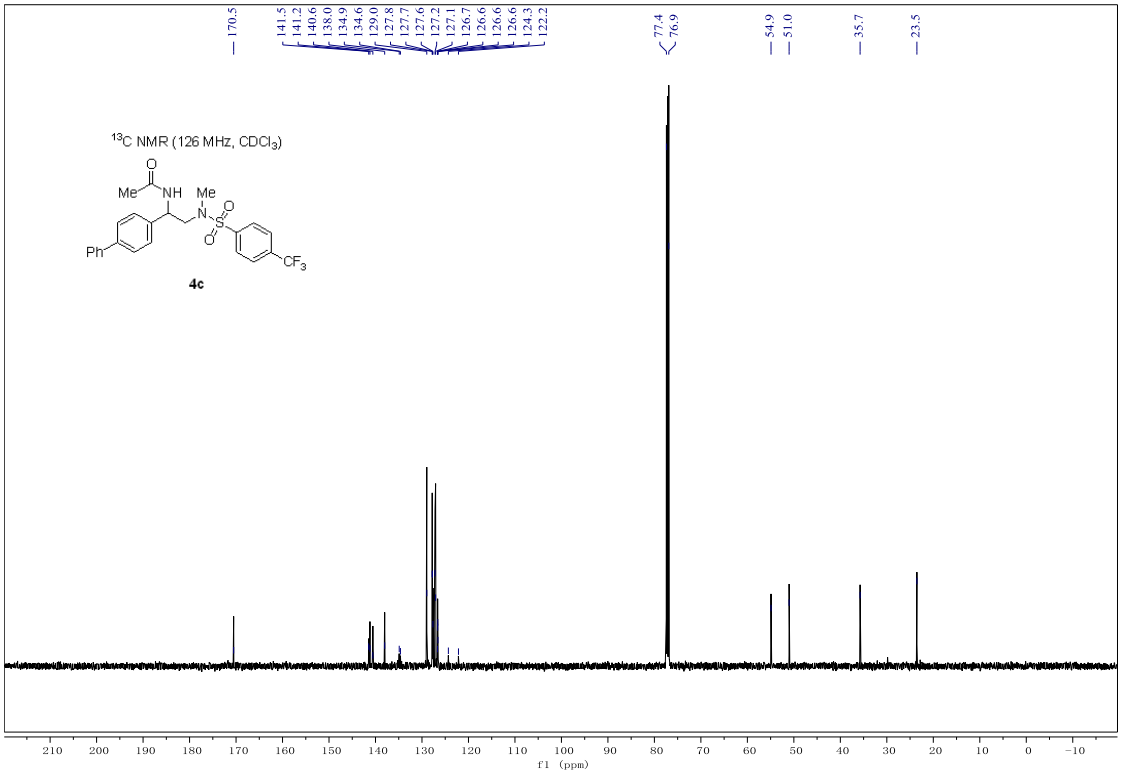
***N*-(1-([1,1'-biphenyl]-4-yl)-2-((4-(*tert*-butyl)-*N*-methylphenyl)sulfonamido)ethyl)acetamide (4b):**

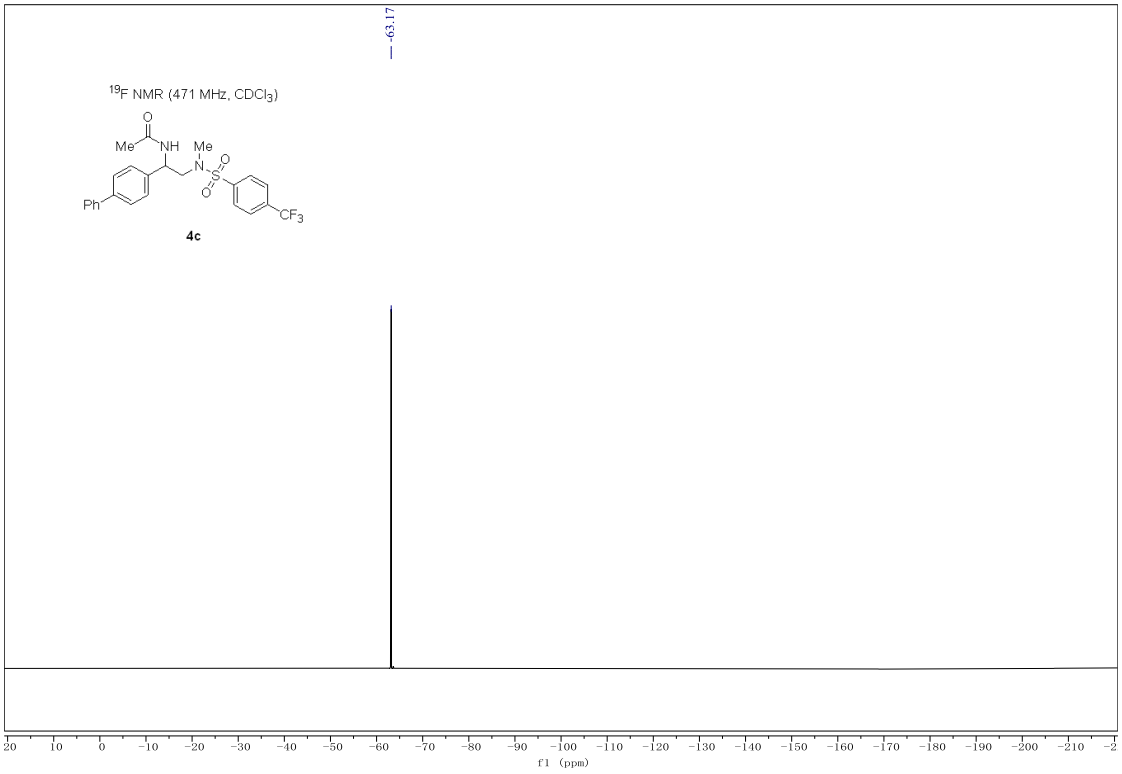




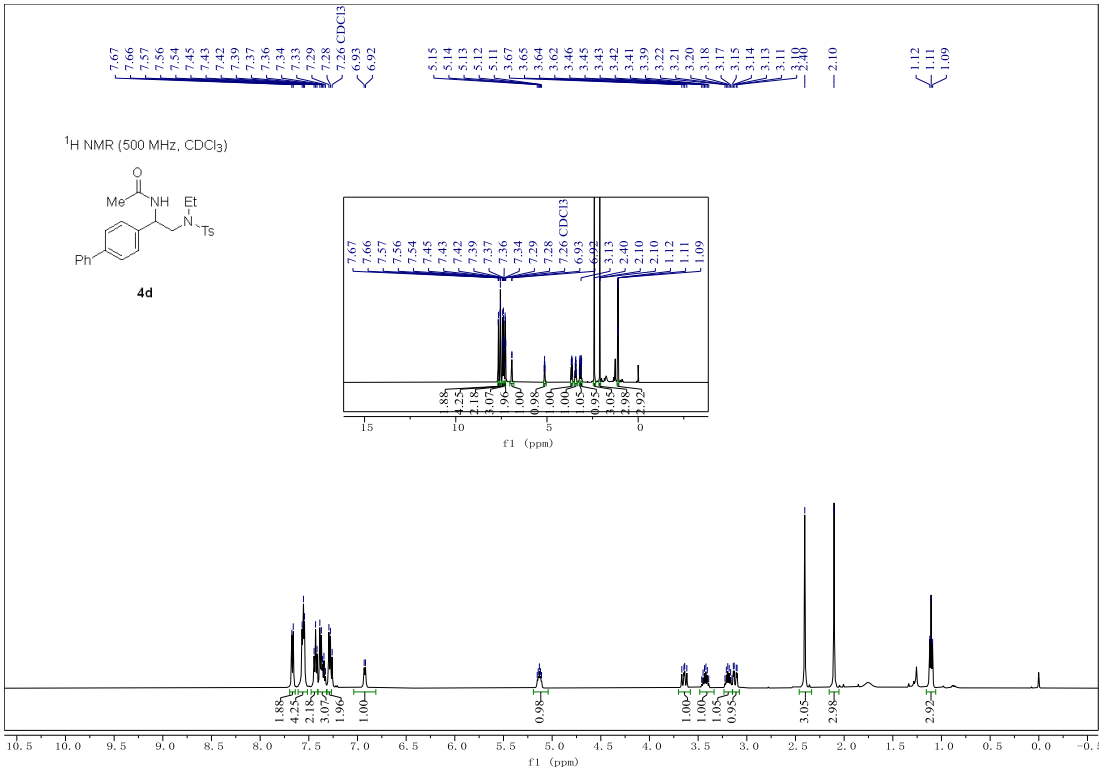
***N*-(1-([1,1'-biphenyl]-4-yl)-2-((*N*-methyl-4-(trifluoromethyl)phenyl)sulfonamido)ethyl) acetamide (4c):**

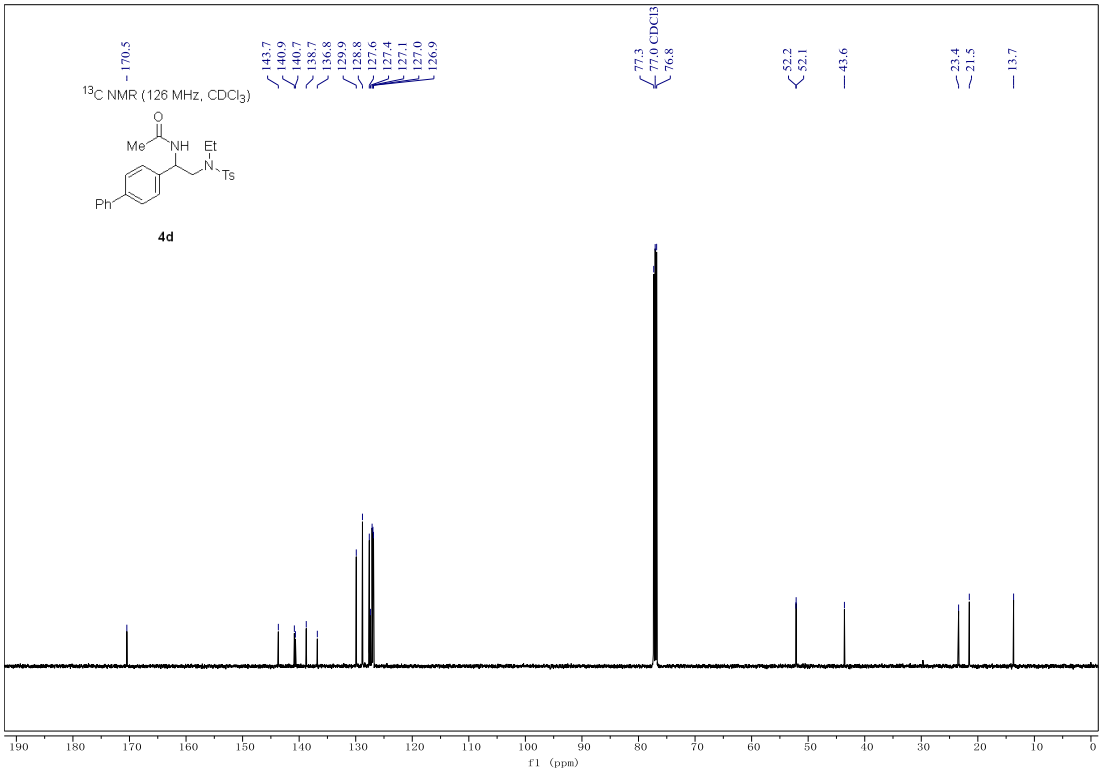




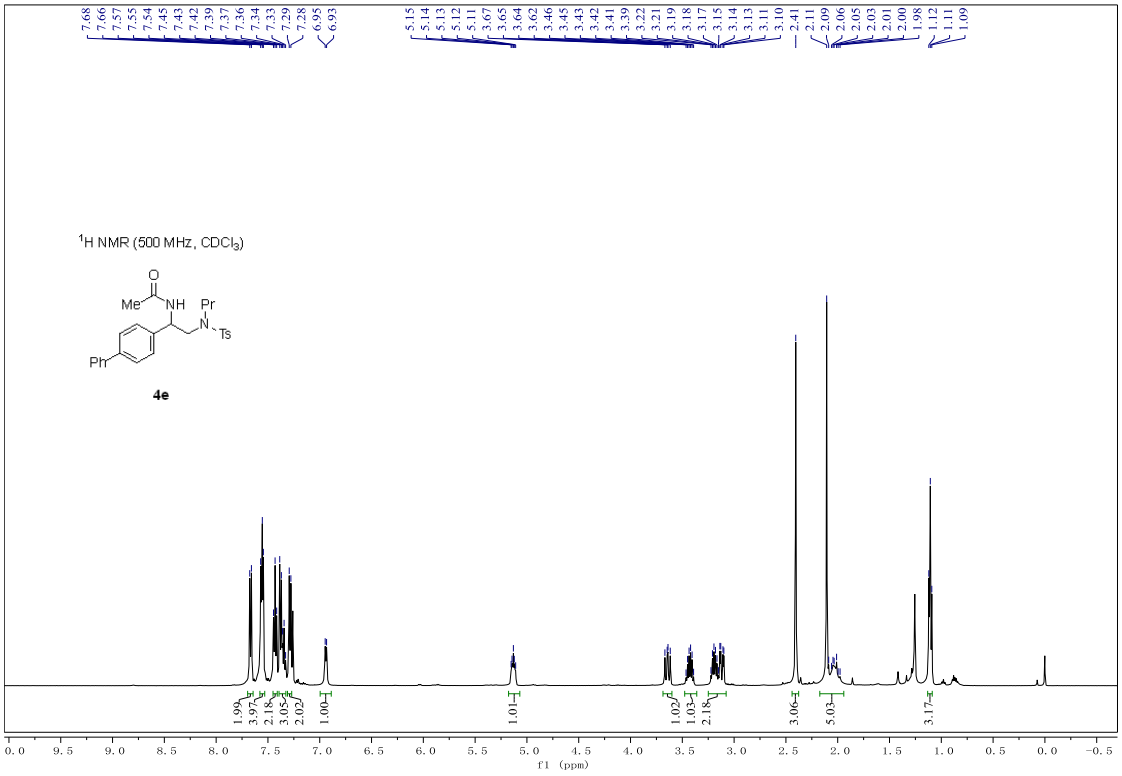


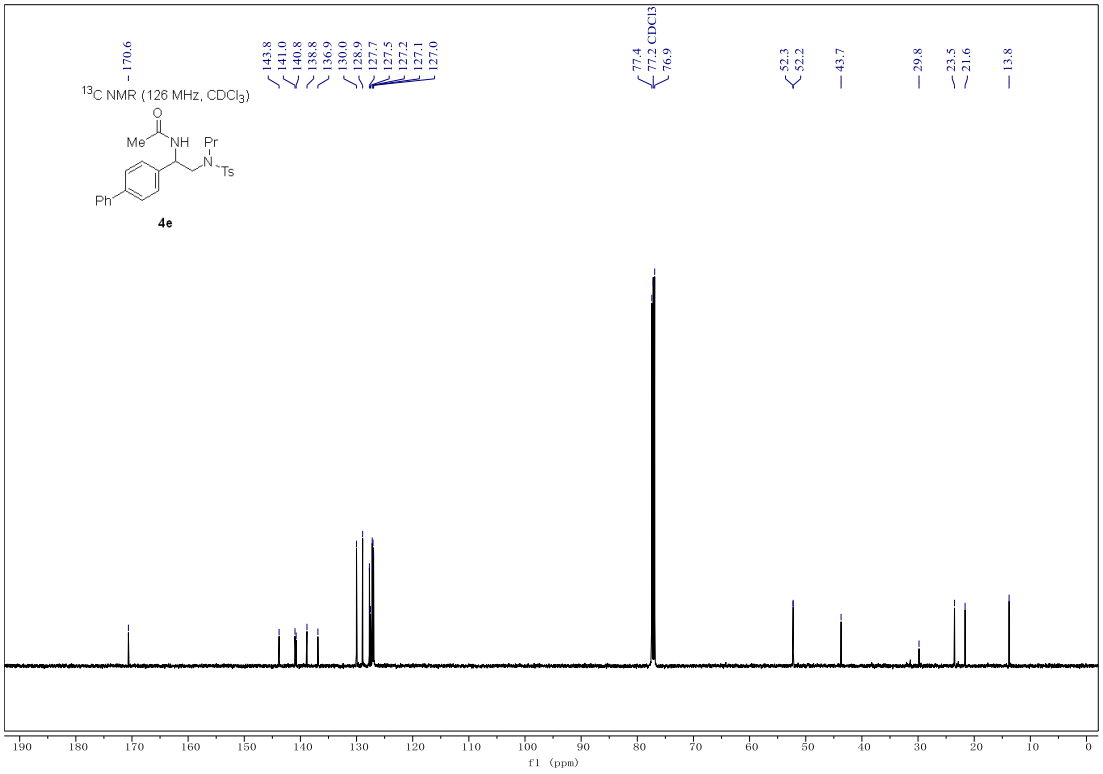
***N*-(1-([1,1'-biphenyl]-4-yl)-2-((*N*-ethyl-4-methylphenyl)sulfonamido)ethyl)acetamide (4d):**



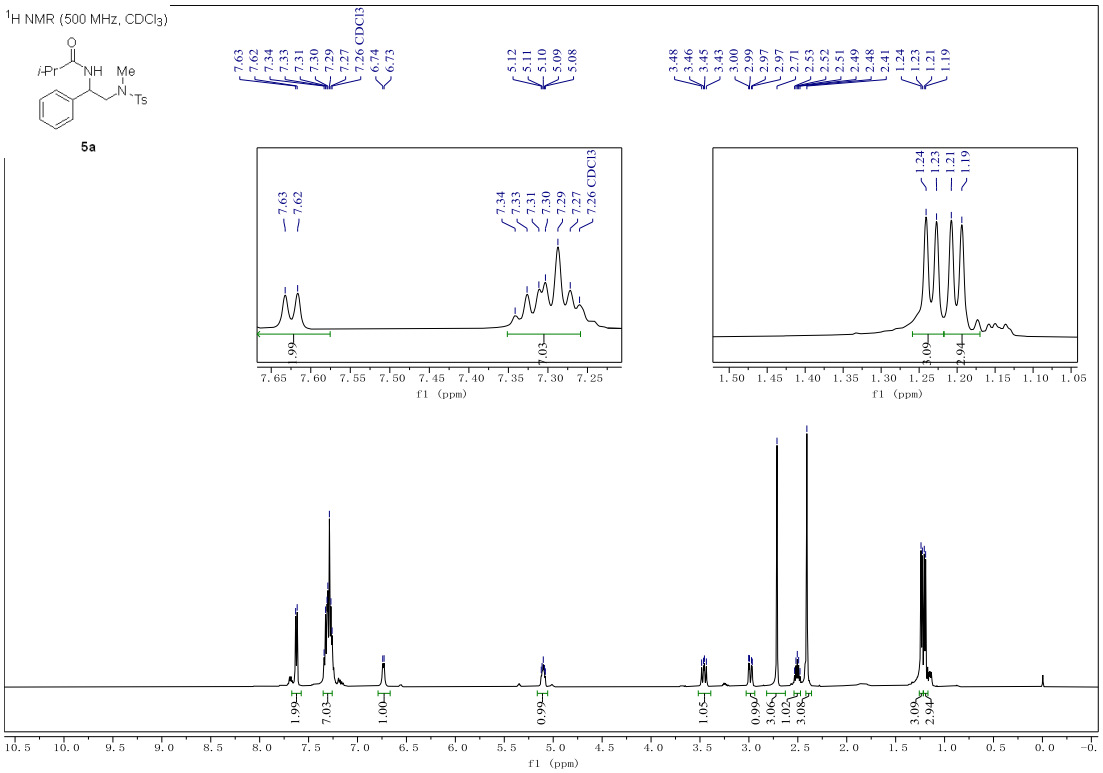


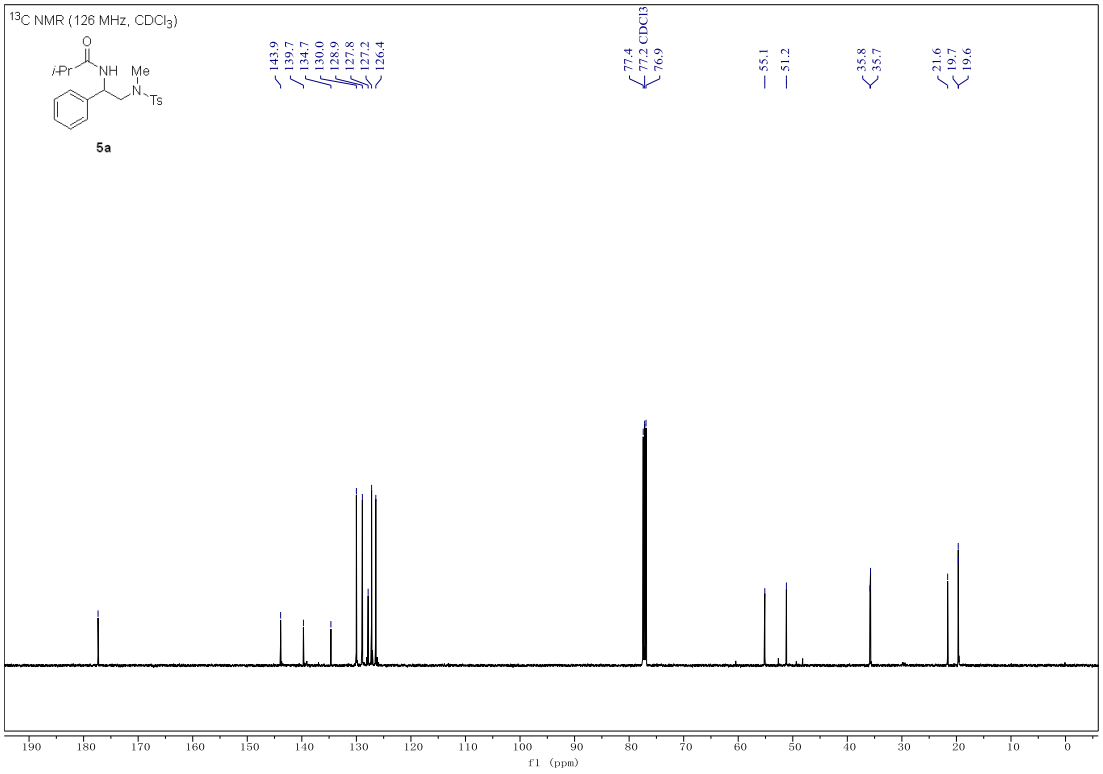
***N*-(1-([1,1'-biphenyl]-4-yl)-2-((4-methyl-*N*-propylphenyl)sulfonamido)ethyl)acetamide (4e):**



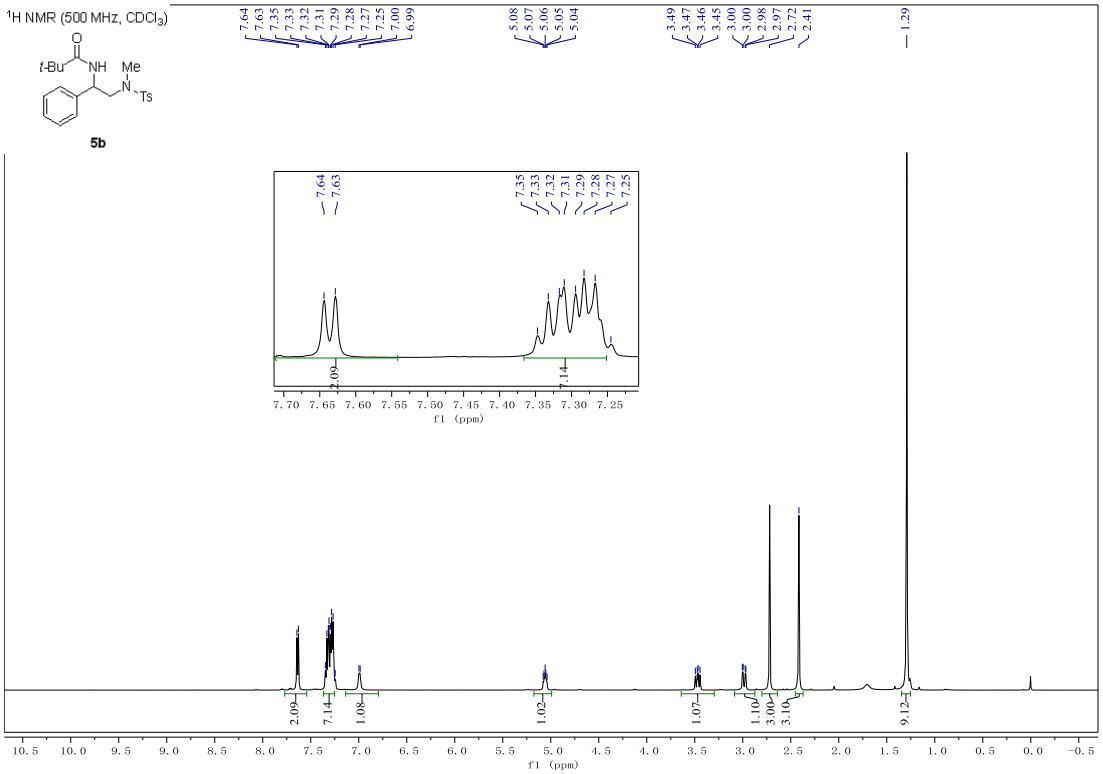


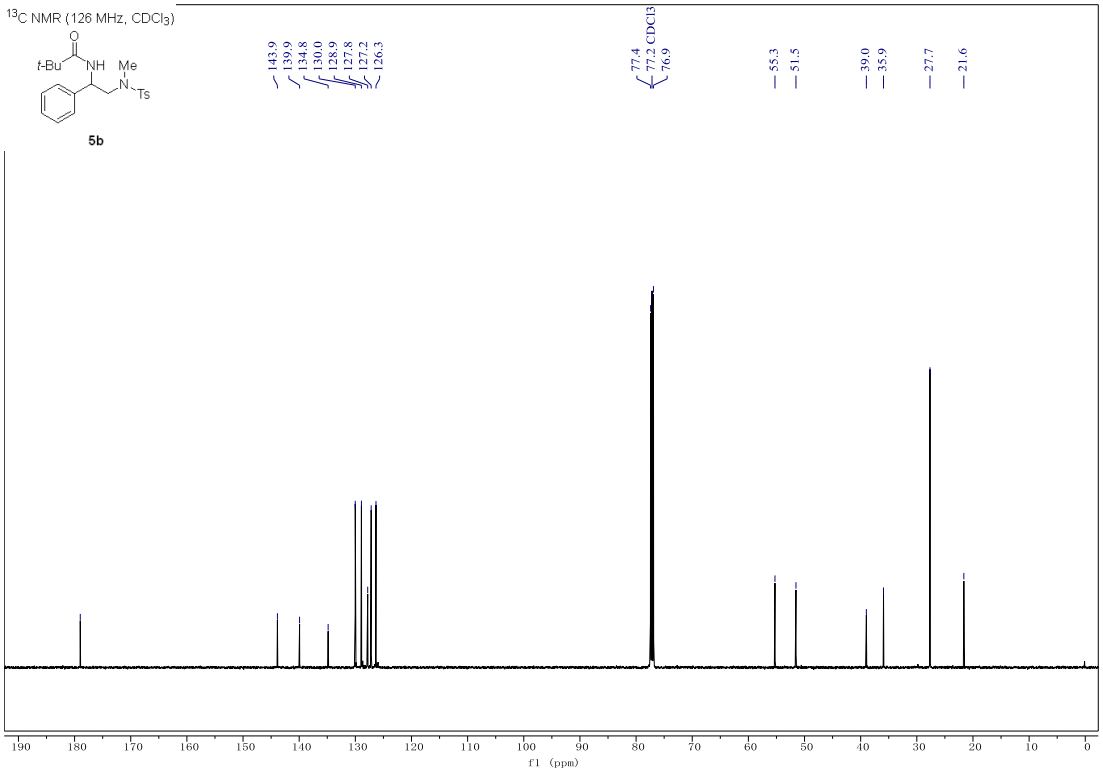
_N_-(2-((_N_,4-dimethylphenyl)sulfonamido)-1-phenylethyl)isobutyramide (5a):



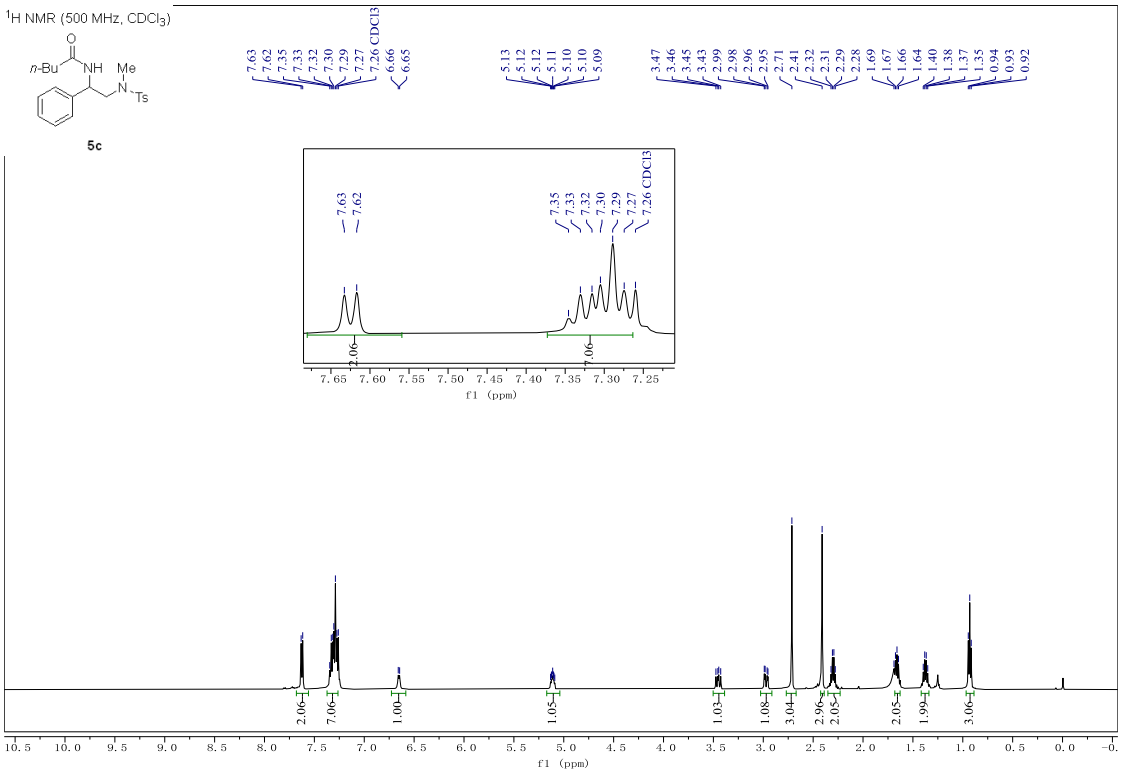


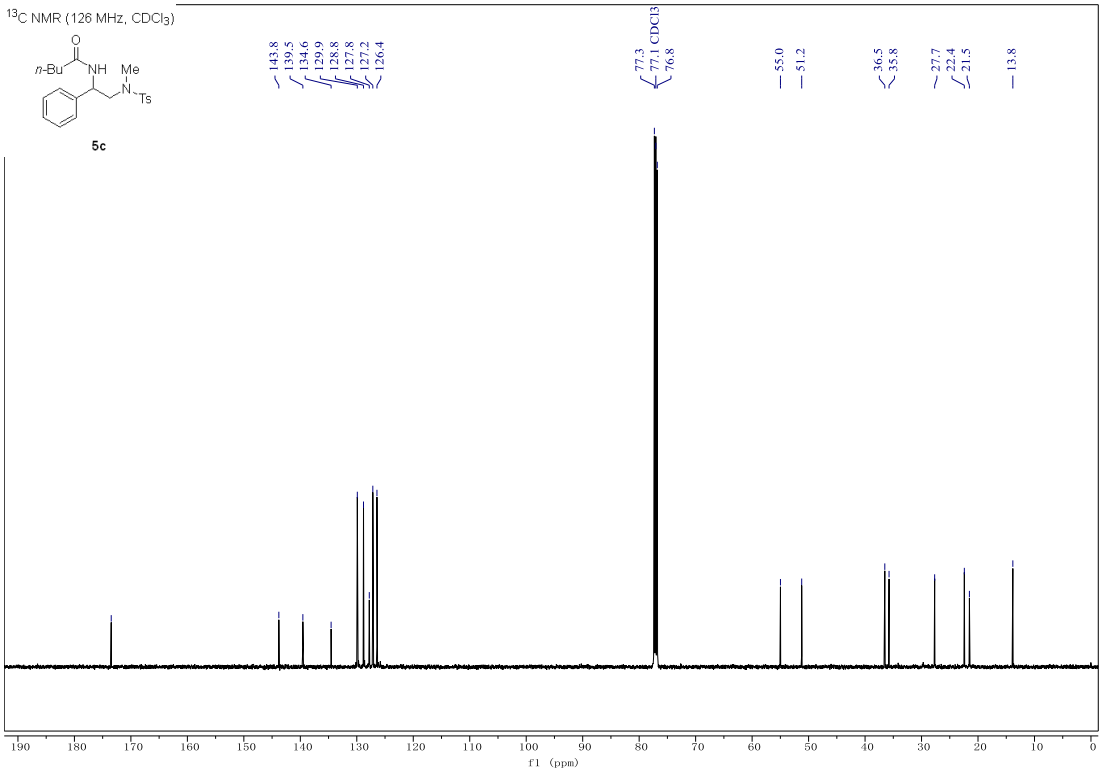
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylethyl)pivalamide (5b):**



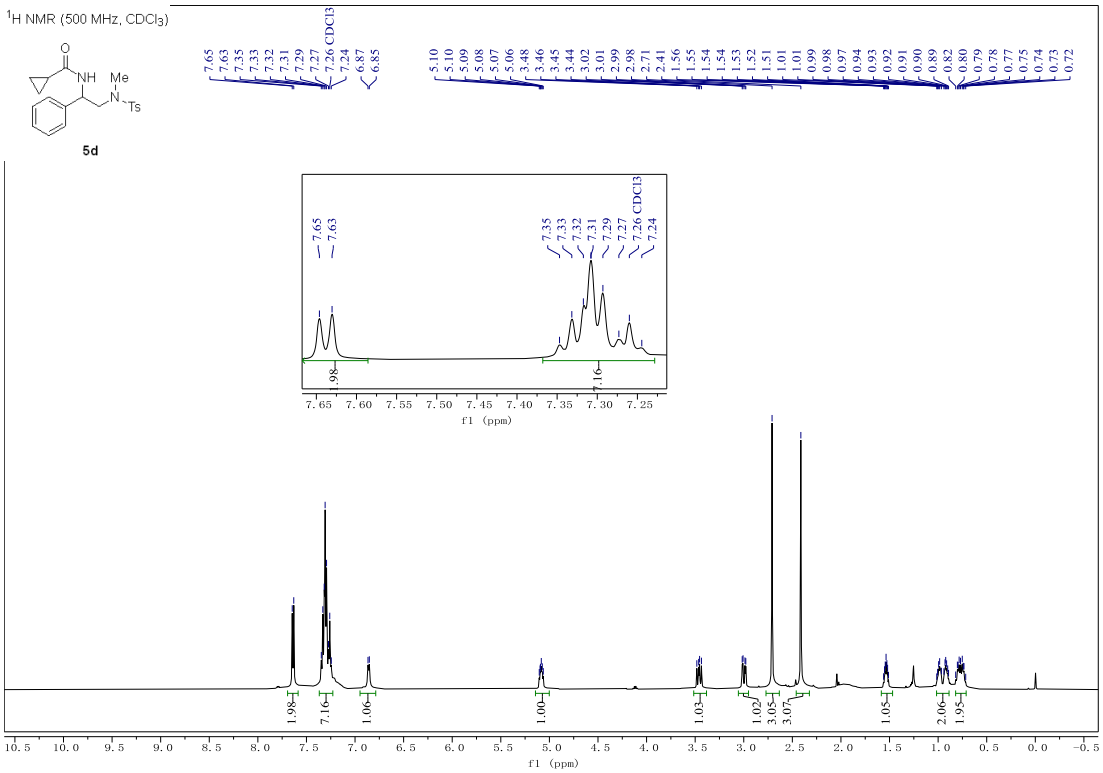


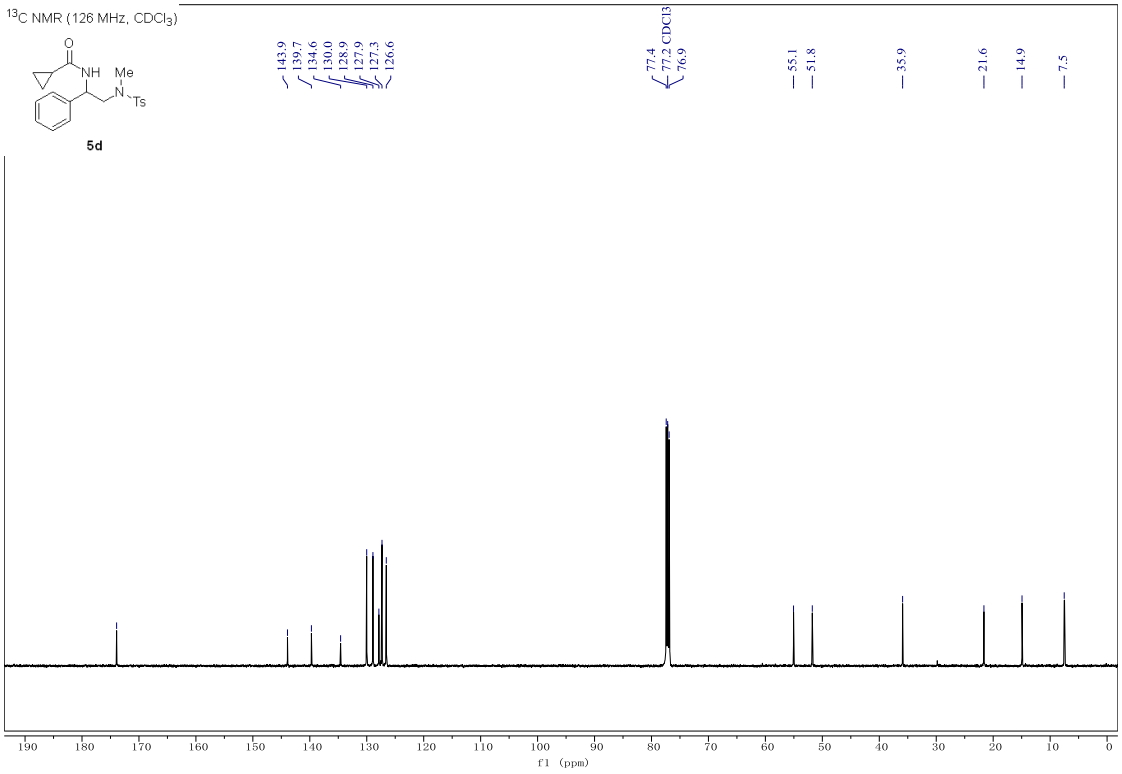
N-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylethyl)pentanamide (5c):



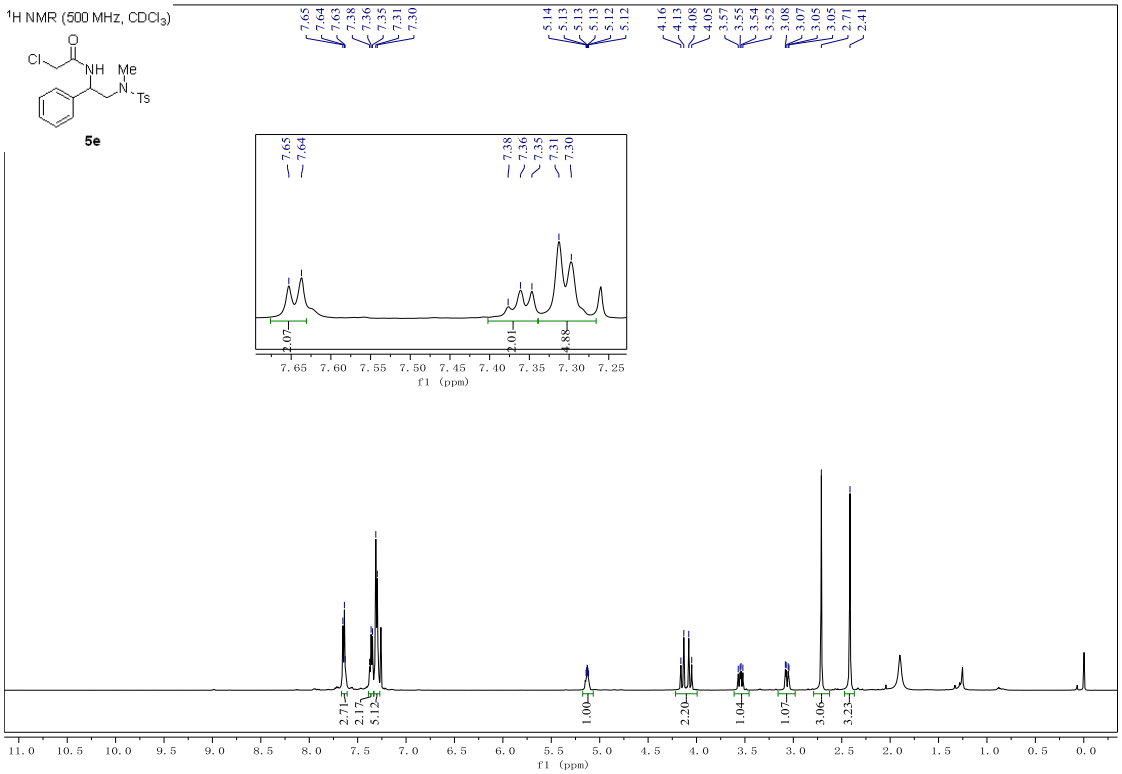


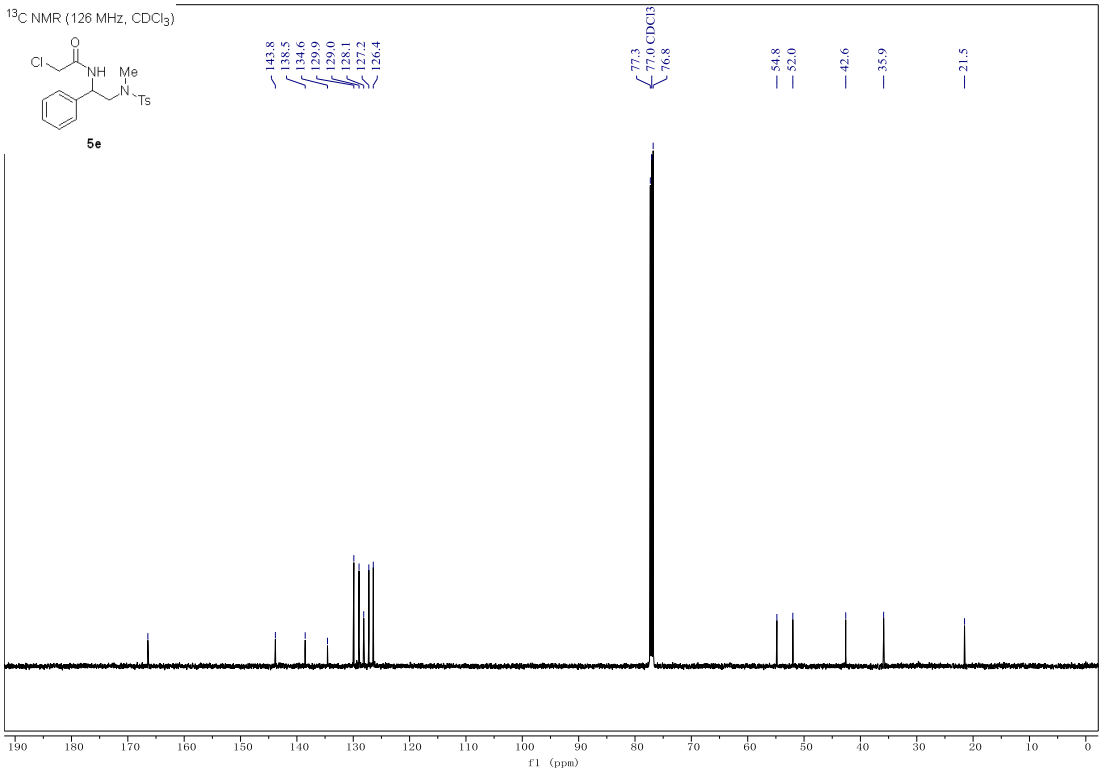
N-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylethyl)cyclopropanecarboxamide (5d):



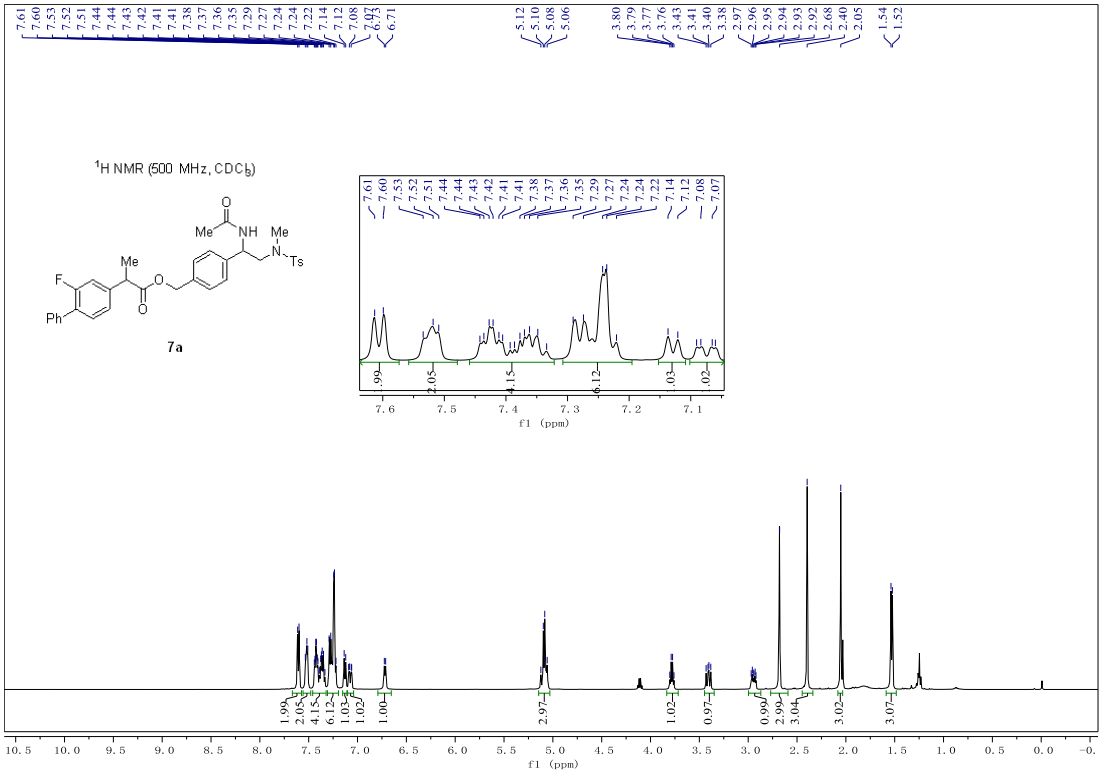


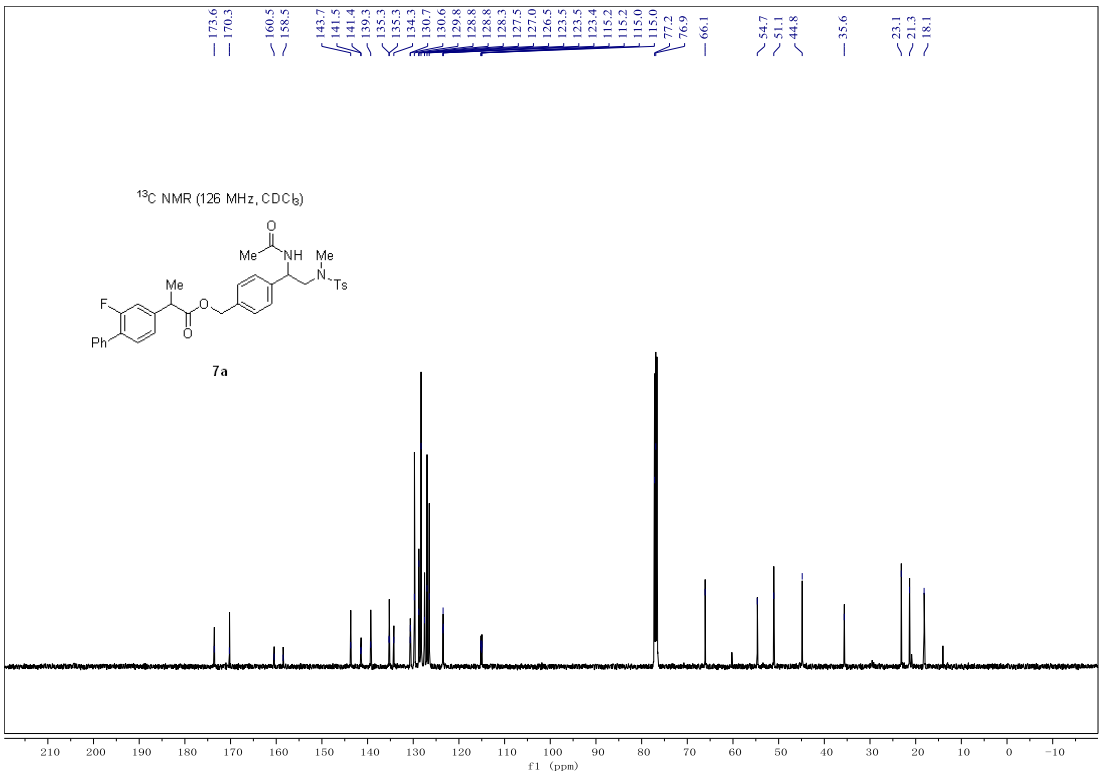
2-chloro-*N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-phenylethyl)acetamide (5e):

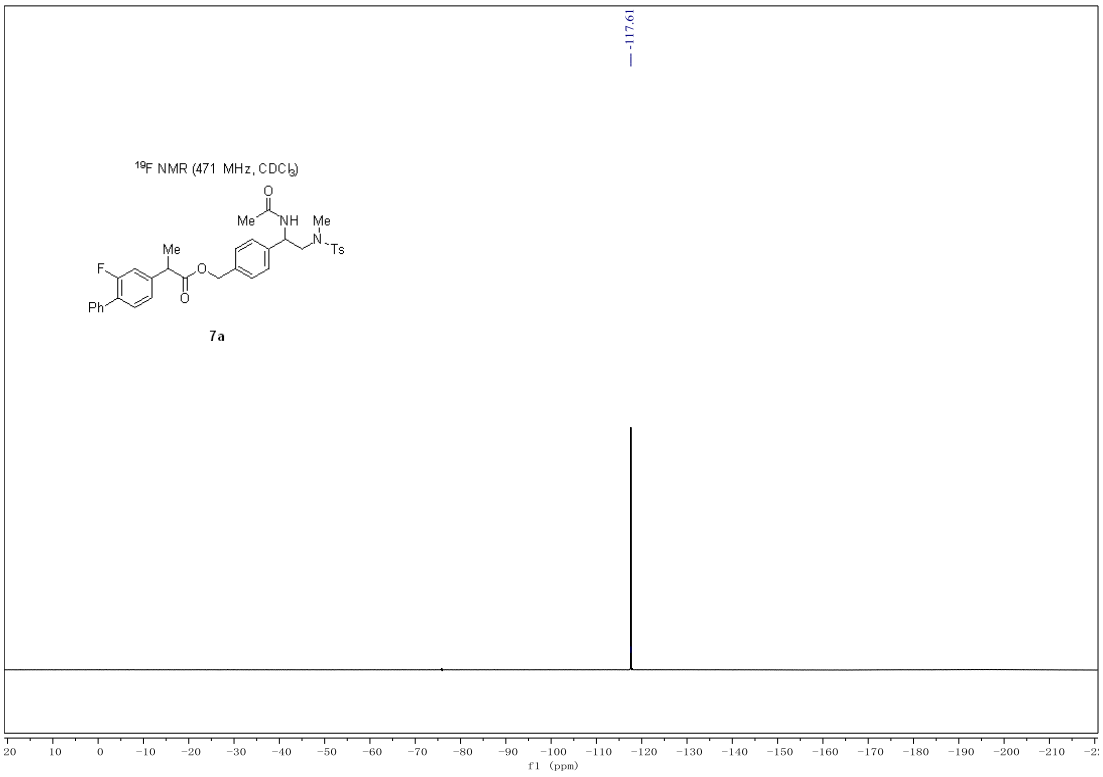




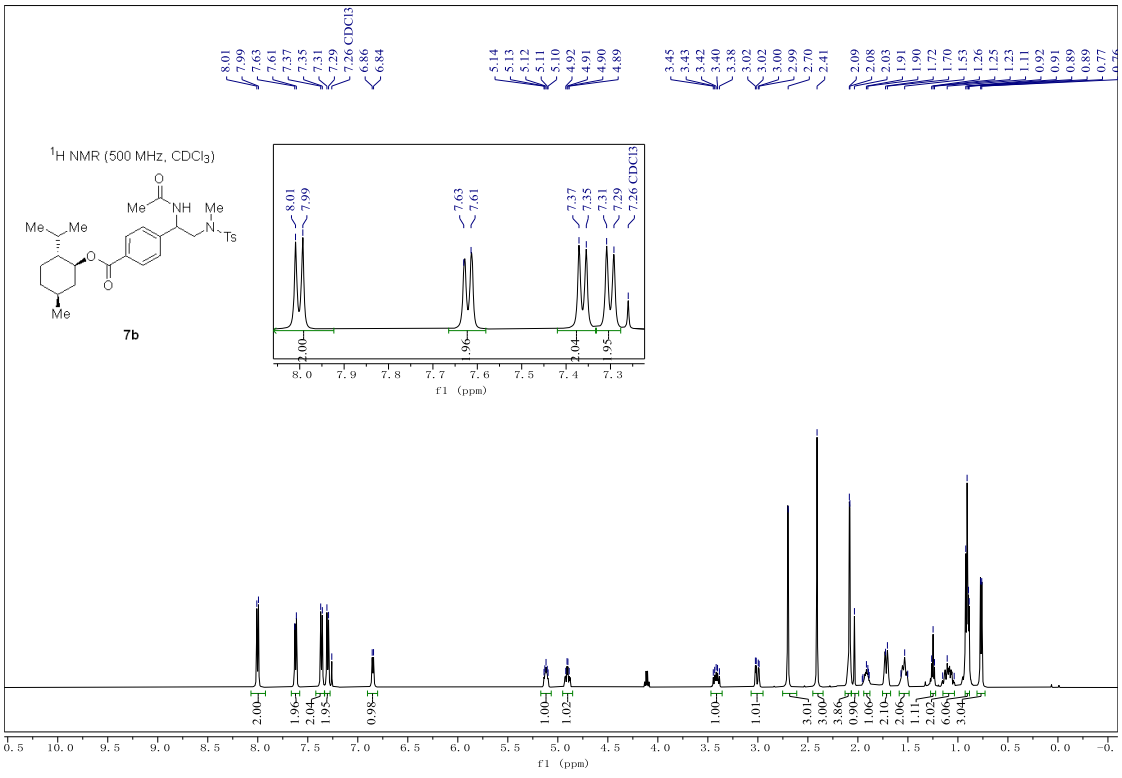
4-(1-acetamido-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl)benzyl-2-(2-fluoro-[1,1'-biphenyl]-4-yl)propanoate (7a):

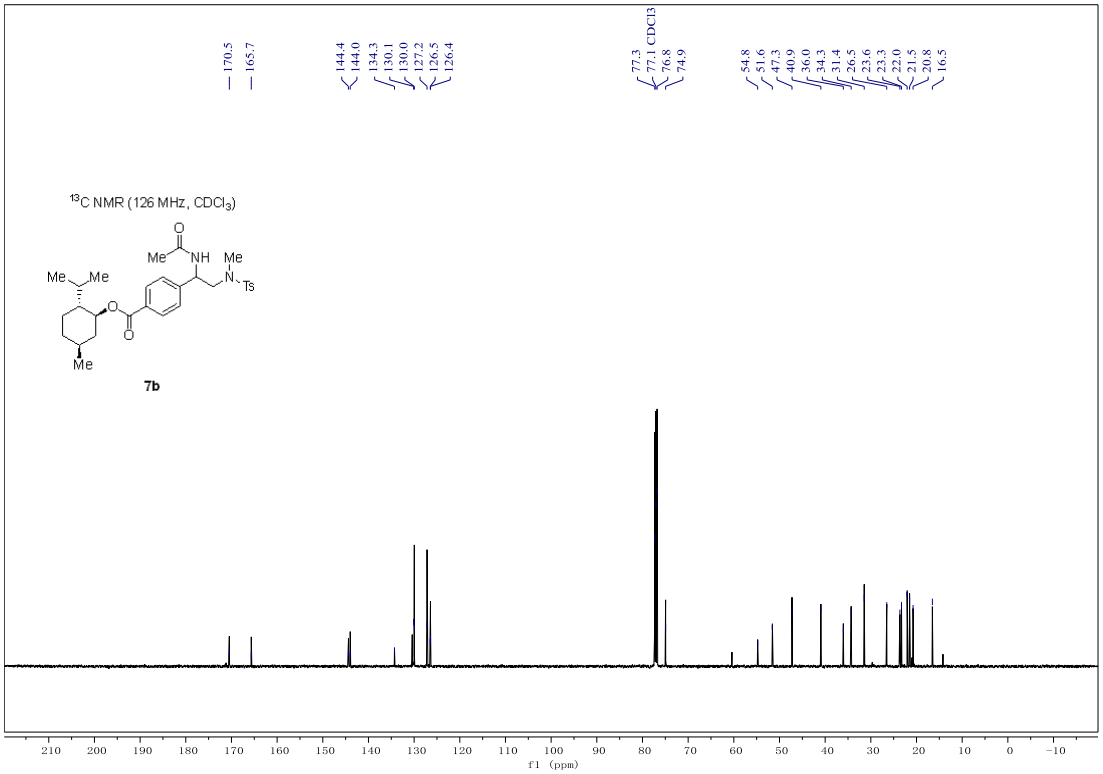



173.6
170.3
160.5
158.5
143.7
141.5
141.4
139.3
135.3
135.3
134.3
130.7
130.6
129.8
128.8
128.8
128.3
127.5
127.0
126.5
123.5
123.5
123.4
115.2
115.2
115.0
115.0
77.2
76.9
66.1
54.7
51.1
44.8
35.6
23.1
21.3
18.1
13C NMR (126 MHz, CDCl3)
Me
NH
Me
N
Ts
O
Me
F
O
O
Ph
7a
f1 (ppm)

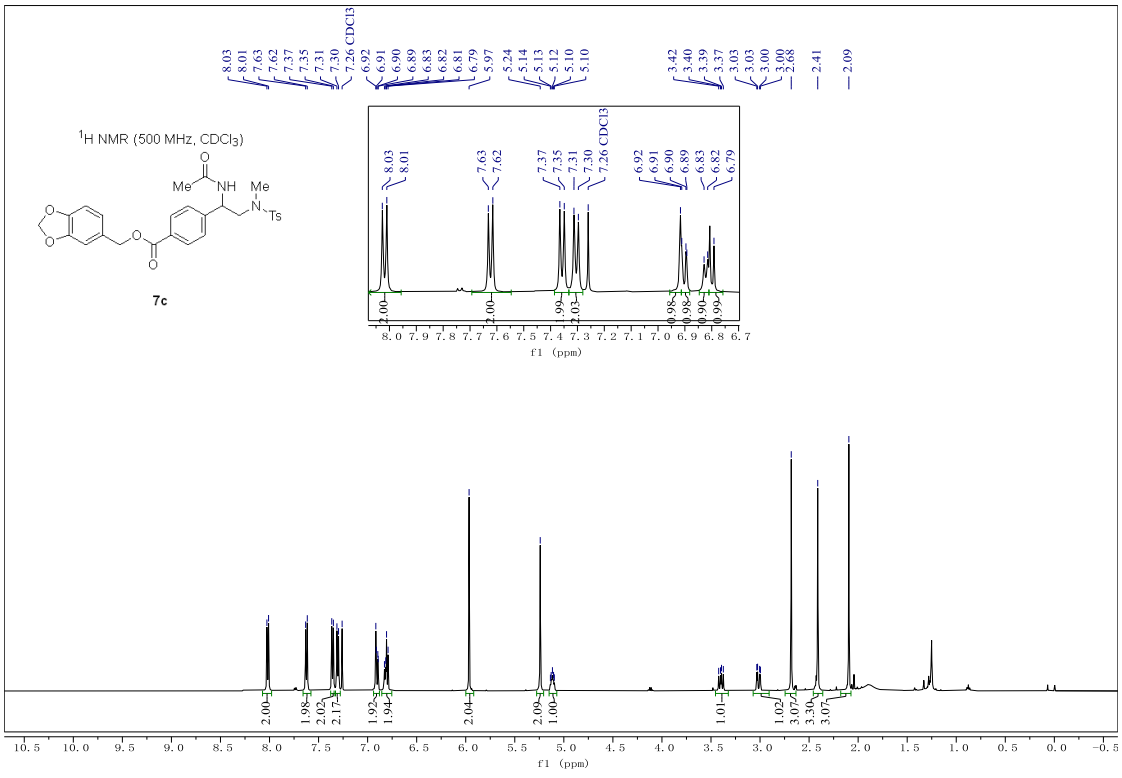

-117.61
19F NMR (471 MHz, CDCl3)
Me
NH
Me
N
Ts
O
Me
F
O
O
Ph
7a
f1 (ppm)

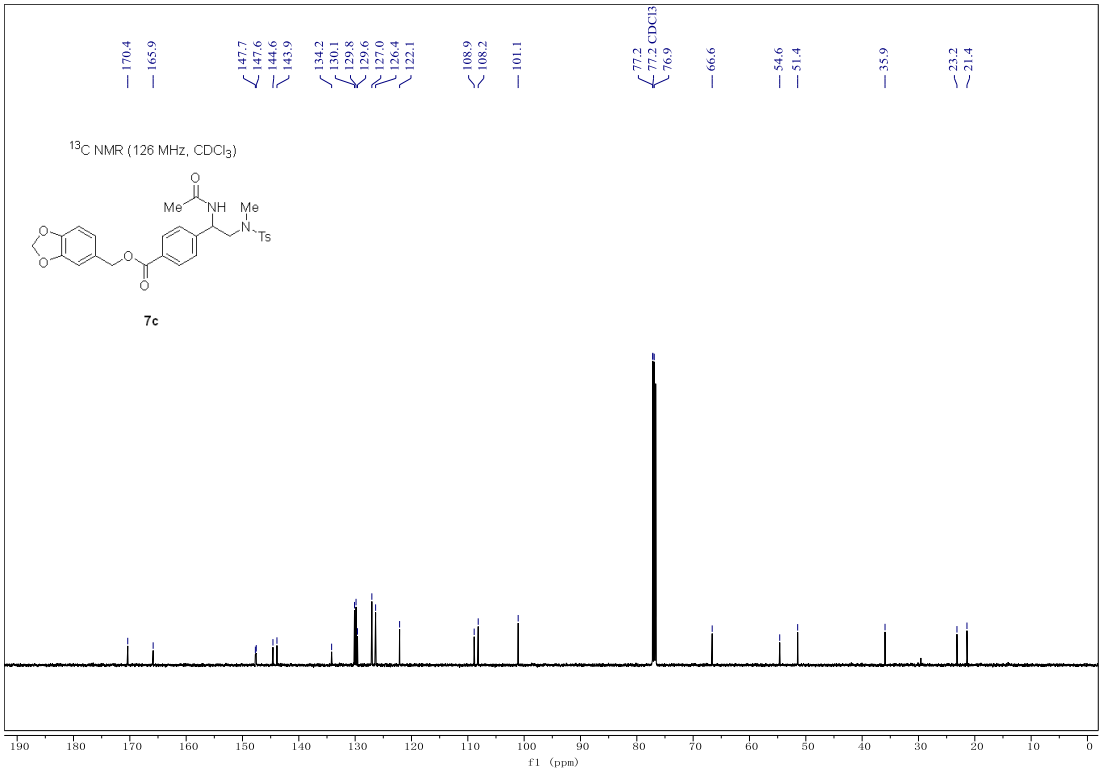
(1*S*,2*R*,5*S*)-2-isopropyl-5-methylcyclohexyl-4-(1-acetamido-2-((*N*,4-dimethylphenyl) sulfonamido) ethyl)benzoate(7b):



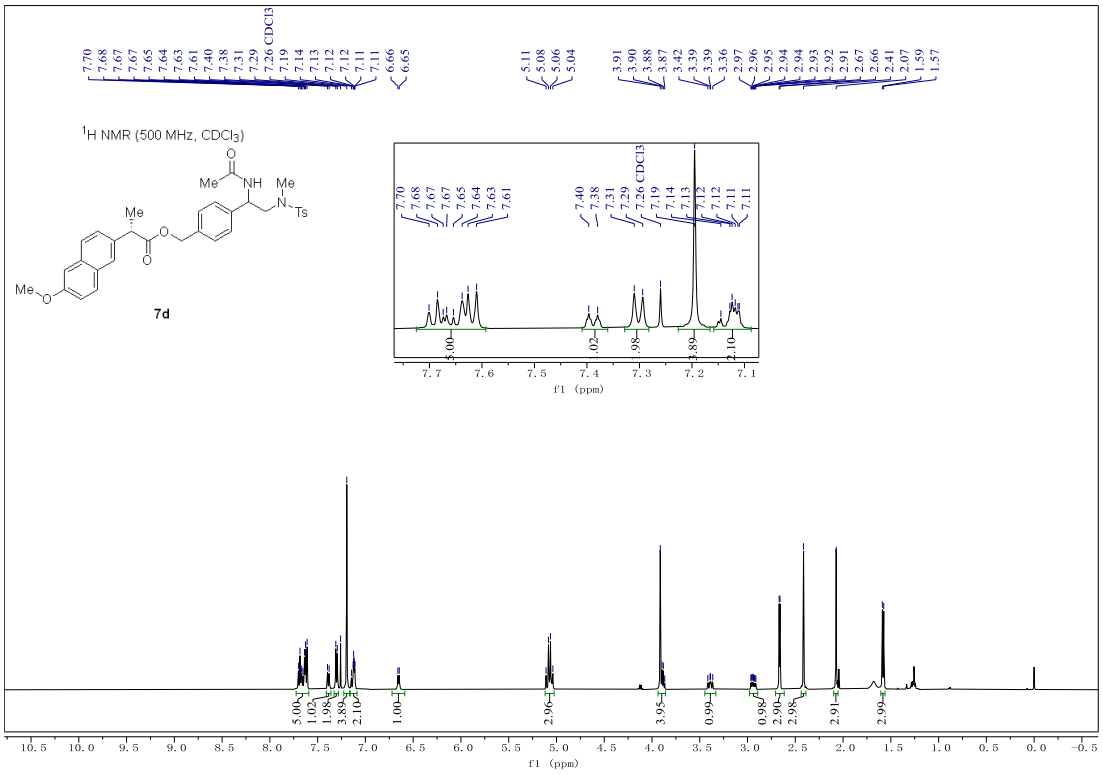


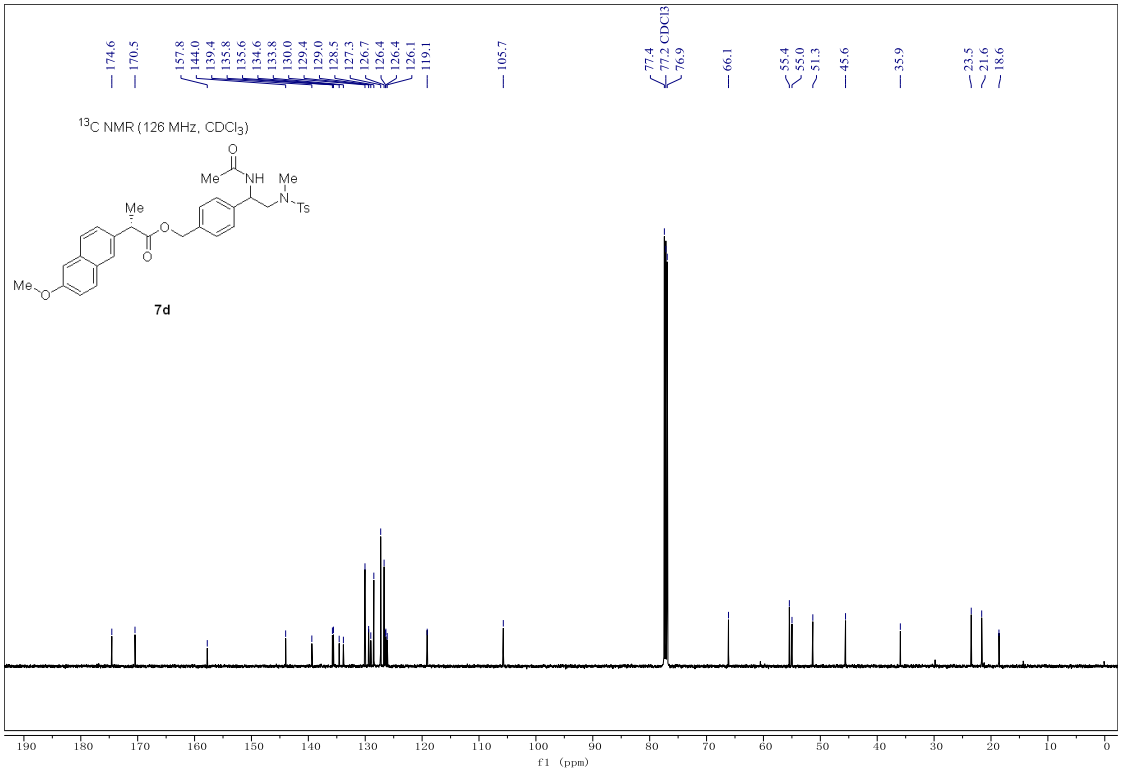
benzo[*d*][1,3]dioxol-5-ylmethyl-4-(1-acetamido-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl) benzoate(7c):



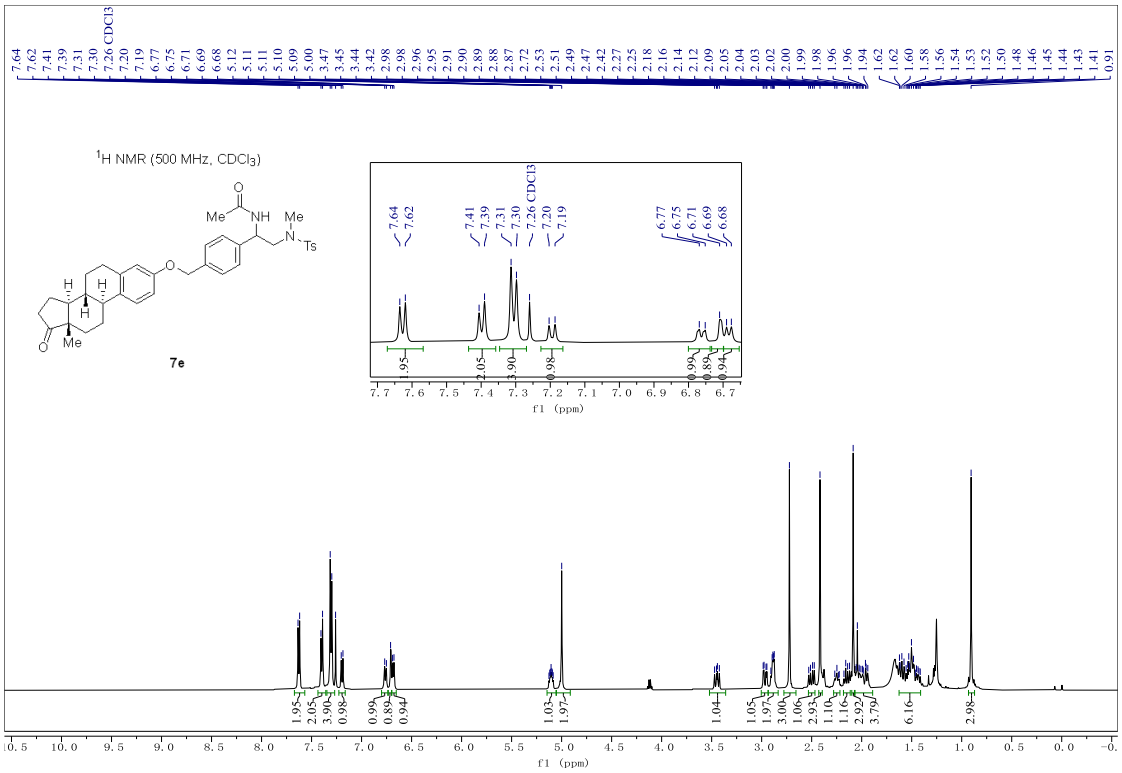


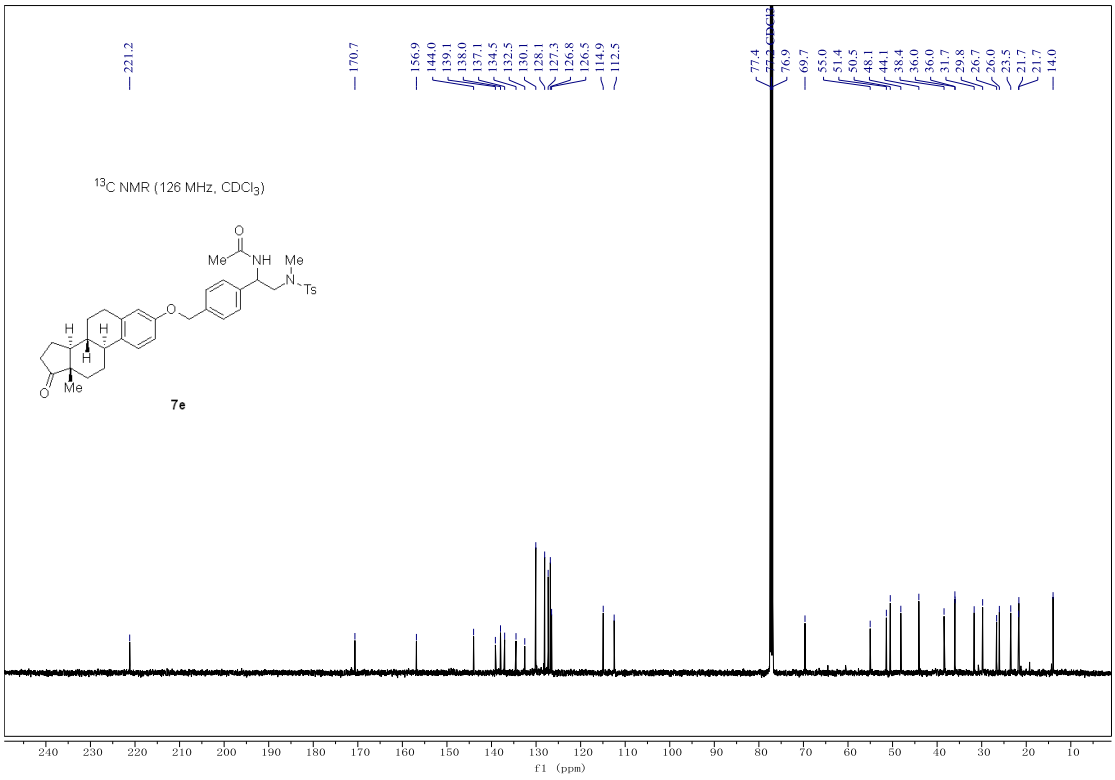
4-(1-acetamido-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl)benzyl-(2*S*)-2-(6-methoxynaphthalen-2-yl)propanoate (7d):



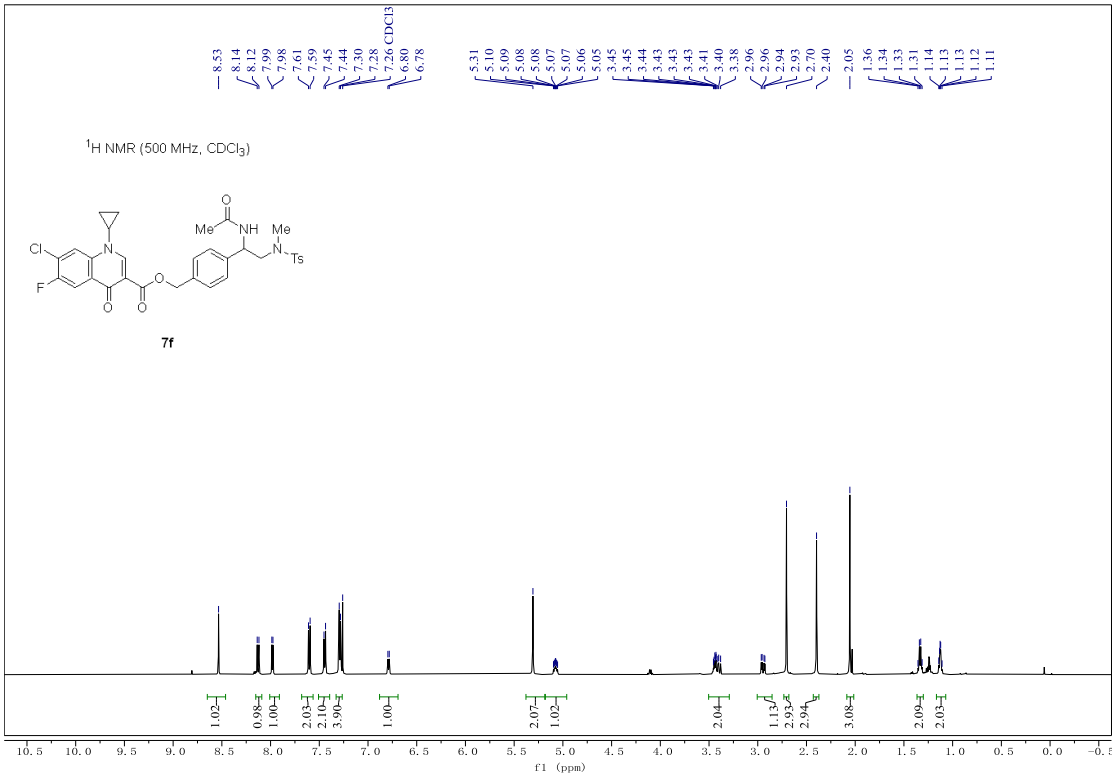


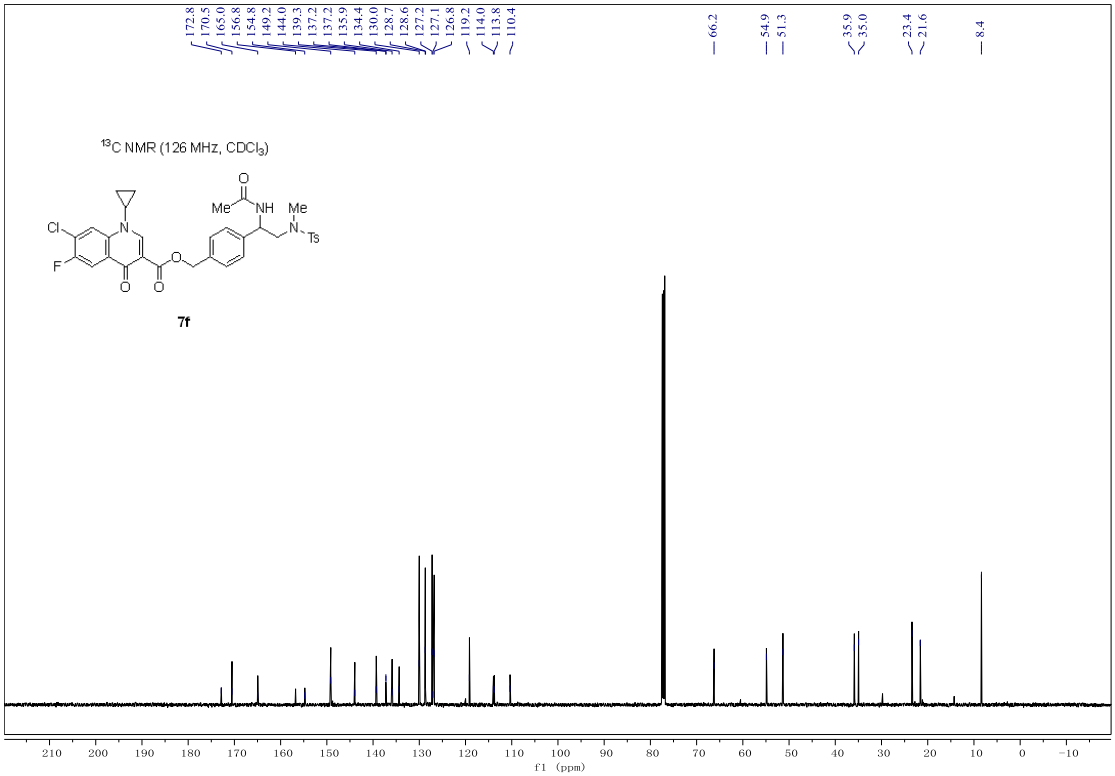
***N*-(2-((*N*,4-dimethylphenyl)sulfonamido)-1-(4-((((8*R*,9*S*,13*S*,14*S*)-13-methyl-17-oxo-7,8,9,11,12,13,14,15,16,17-decahydro-6*H*-cyclopenta[*a*]phenanthren-3-yl)oxy)methyl)phenyl)ethyl)acetamide(7e):**





4-(1-acetamido-2-((*N*,4-dimethylphenyl)sulfonamido)ethyl)benzyl-7-chloro-1-cyclopropyl-6-fluoro-4-oxo-1,4-dihydroquinoline-3-carboxylate (7f):





***N*-(2,2-diphenylvinyl)-*N*,4-dimethylbenzenesulfonamide (9)**