

Design, Synthesis, and Antitumor Activity of a Series of Novel 4-(Aromatic Sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-ones

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¹H-NMR and ¹³C-NMR Spectra

N-(2-Phenoxyethyl)morpholine-4-sulfonamide (1a)

N-(2-(2-Chlorophenoxy)ethyl)morpholine-4-sulfonamide (1b)

N-(2-(3-Chlorophenoxy)ethyl)morpholine-4-sulfonamide (1c)

N-(2-(Naphthalen-1-yloxy)ethyl)morpholine-4-sulfonamide (1d)

N-(2-Phenoxyethyl)thiophene-2-sulfonamide (1e)

N-(2-(2-Bromophenoxy)ethyl)thiophene-2-sulfonamide (1f)

N-(2-Phenoxyethyl)-6-chloropyridine-3-sulfonamide (1g)

5-Ethynyl-N-(2-phenoxyethyl)thiophene-2-sulfonamide (5a)

5-Ethynyl-N-(2-(2-fluorophenoxy)ethyl)thiophene-2-sulfonamide (5b)

5-Ethynyl-N-(2-(o-tolyloxy)ethyl)thiophene-2-sulfonamide (5c)

N-(2-(2-Bromophenoxy)ethyl)-5-ethynylthiophene-2-sulfonamide (5d)

N-(2-(2-Chlorophenoxy)ethyl)-5-ethynylthiophene-2-sulfonamide (5e)

N-(2-(3-Chlorophenoxy)ethyl)-5-ethynylthiophene-2-sulfonamide (5f)

N-(2-(2,3-Dimethylphenoxy)ethyl)-5-ethynylthiophene-2-sulfonamide (5g)

5-Ethynyl-N-(2-(naphthalen-1-yloxy)ethyl)thiophene-2-sulfonamide (5h)

N-(2-Phenoxyethyl)-6-((trimethylsilyl)ethynyl)pyridine-3-sulfonamide (5i)

4-(Morpholinosulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (2a)

6-Chloro-4-(morpholinosulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (2b)

7-Chloro-4-(morpholinosulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (2c)

3'-(Morpholinosulfonyl)-4H-spiro[naphthalene-1,2'-oxazolidin]-4-one (2d)

4-(Thiophen-2-ylsulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (2e)

6-Bromo-4-(thiophen-2-ylsulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (2f)

4-((5-Ethynylthiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6a)

4-((5-Ethynylthiophen-2-yl)sulfonyl)-6-fluoro-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6b)

4-((5-Ethynylthiophen-2-yl)sulfonyl)-6-methyl-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6c)

6-Bromo-4-((5-ethynylthiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6d)

6-Chloro-4-((5-ethynylthiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6e)

7-Chloro-4-((5-ethynylthiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6f)

4-((5-Ethynylthiophen-2-yl)sulfonyl)-6,7-dimethyl-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6g)

3'-((5-Ethynylthiophen-2-yl)sulfonyl)-4H-spiro[naphthalene-1,2'-oxazolidin]-4-one (6h)

4-((6-((Trimethylsilyl)ethynyl)pyridin-3-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6i)

(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1*H*-1,2,3-triazol-1-yl)tetrahydro-2*H*-pyran-3,4,5-triyl triacetate (7a)

(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((6-fluoro-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1*H*-1,2,3-triazol-1-yl)tetrahydro-2*H*-pyran-3,4,5-triyl triacetate (7b)

(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((6-methyl-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1*H*-1,2,3-triazol-1-yl)tetrahydro-2*H*-pyran-3,4,5-triyl triacetate (7c)

(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((6-bromo-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1*H*-1,2,3-triazol-1-yl)tetrahydro-2*H*-pyran-3,4,5-triyl triacetate (7d)

(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((6-chloro-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1*H*-1,2,3-triazol-1-yl)tetrahydro-2*H*-pyran-3,4,5-triyl triacetate (7e)

(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((7-chloro-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1*H*-1,2,3-triazol-1-yl)tetrahydro-2*H*-pyran-3,4,5-triyl triacetate (7f)

(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((6,7-dimethyl-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1*H*-1,2,3-triazol-1-yl)tetrahydro-2*H*-pyran-3,4,5-triyl triacetate (7g)

(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((4-oxo-4*H*-spiro[naphthalene-1,2'-oxazolidin]-3'-yl)sulfonyl)thiophen-2-yl)-1*H*-1,2,3-triazol-1-yl)tetrahydro-2*H*-pyran-3,4,5-triyl triacetate (7h)

(2R,3R,4S,5S,6S)-2-(Acetoxymethyl)-6-(4-(5-((8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1*H*-1,2,3-triazol-1-yl)tetrahydro-2*H*-pyran-3,4,5-triyl triacetate (7i)

(2R,3R,4S,5S,6S)-2-(Acetoxymethyl)-6-(4-(5-((7-chloro-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-

yl)sulfonyl)thiophen-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7j)

(2R,3R,4S,5S,6S)-2-(Acetoxymethyl)-6-(4-(5-((4-oxo-4H-spiro[naphthalene-1,2'-oxazolidin]-3'-yl)sulfonyl)thiophen-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7k)

(2R,3R,4S,5S,6S)-2-(Acetoxymethyl)-6-(4-(5-((8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)pyridin-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7l)

(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)pyridin-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7m)

4-((5-(1-((2R,3R,4S,5S,6R)-3,4,5-Trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)thiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (8a)

7-Chloro-4-((5-(1-((2R,3R,4S,5S,6R)-3,4,5-trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)thiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (8b)

3'-((5-(1-((2R,3R,4S,5S,6R)-3,4,5-Trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)thiophen-2-yl)sulfonyl)-4H-spiro[naphthalene-1,2'-oxazolidin]-4-one (8c)

4-((5-(1-((2R,3S,4S,5S,6R)-3,4,5-Trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)thiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (8d)

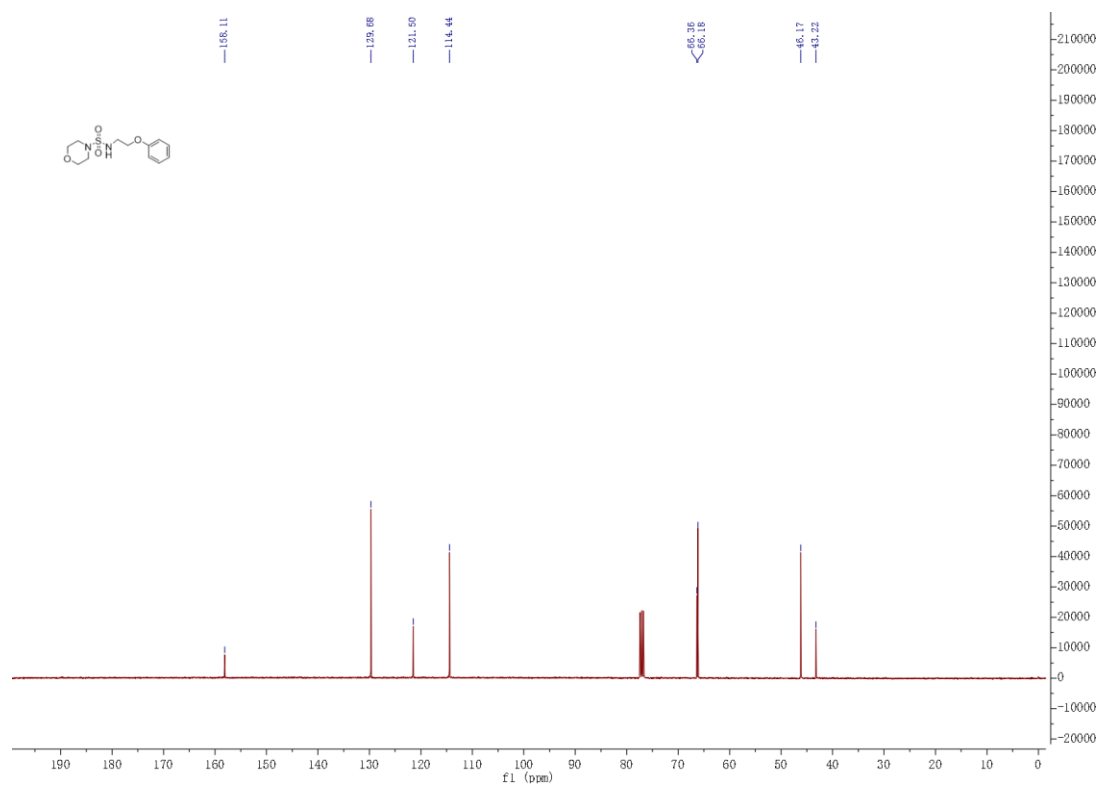
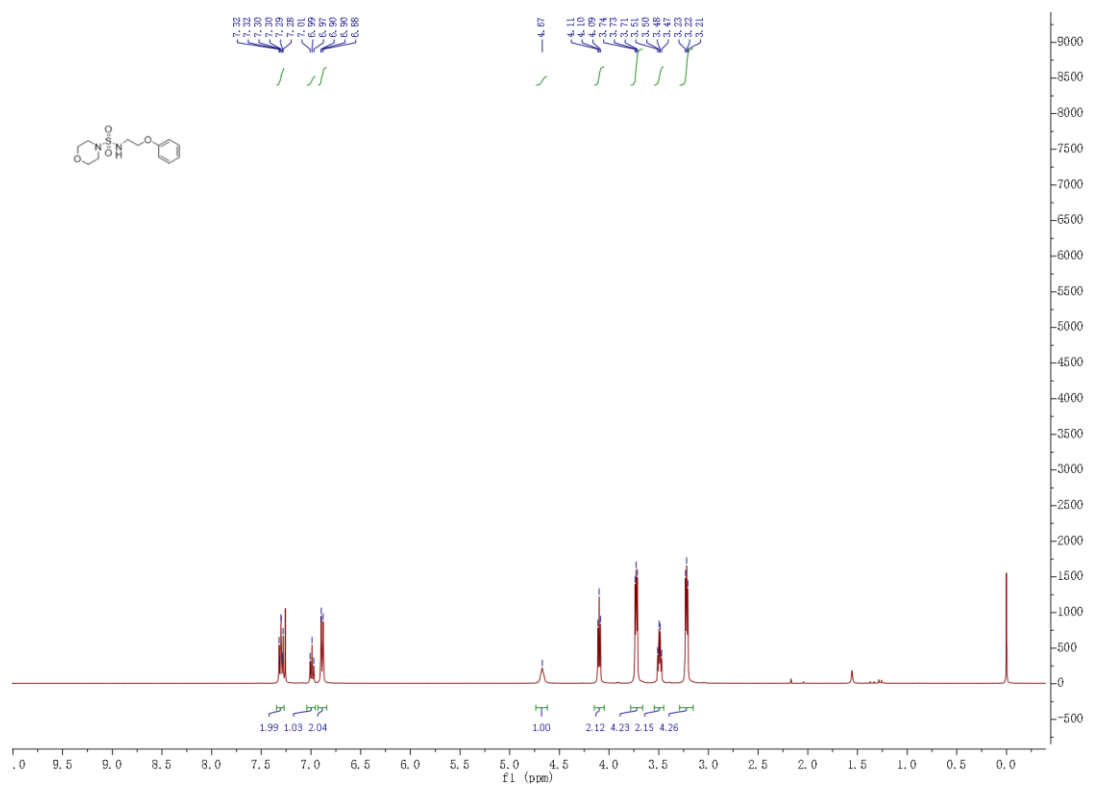
7-Chloro-4-((5-(1-((2R,3S,4S,5S,6R)-3,4,5-trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)thiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (8e)

3'-((5-(1-((2R,3S,4S,5S,6R)-3,4,5-Trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)thiophen-2-yl)sulfonyl)-4H-spiro[naphthalene-1,2'-oxazolidin]-4-one (8f)

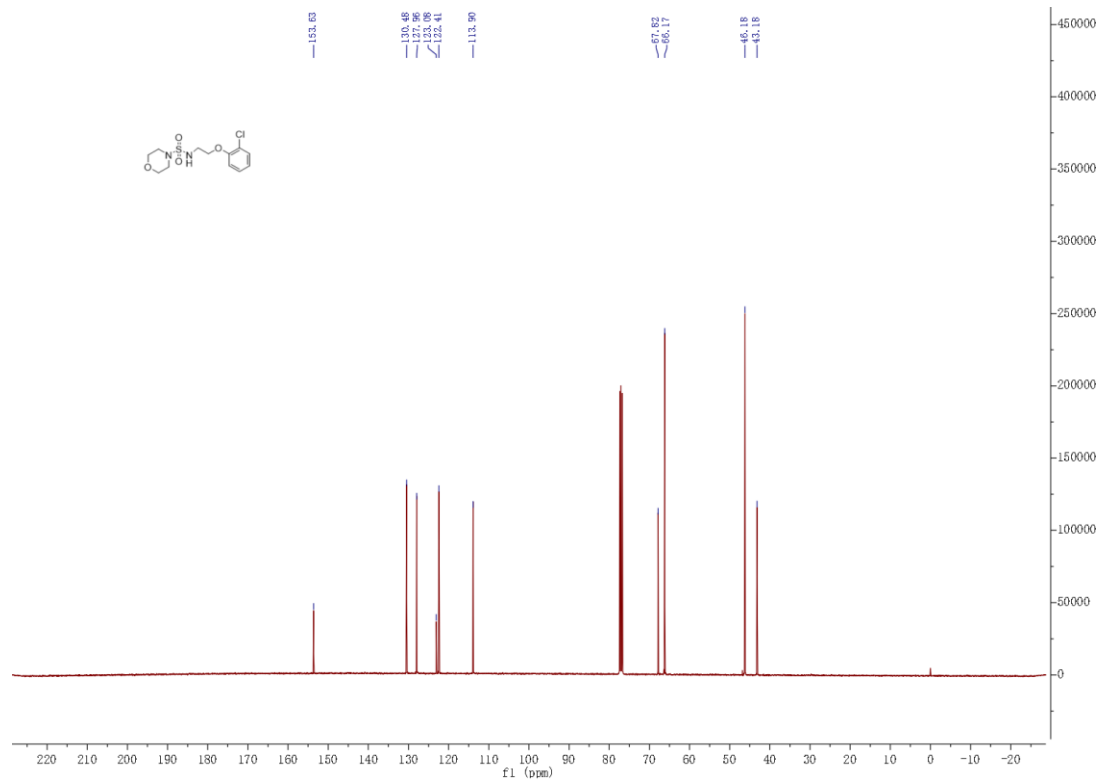
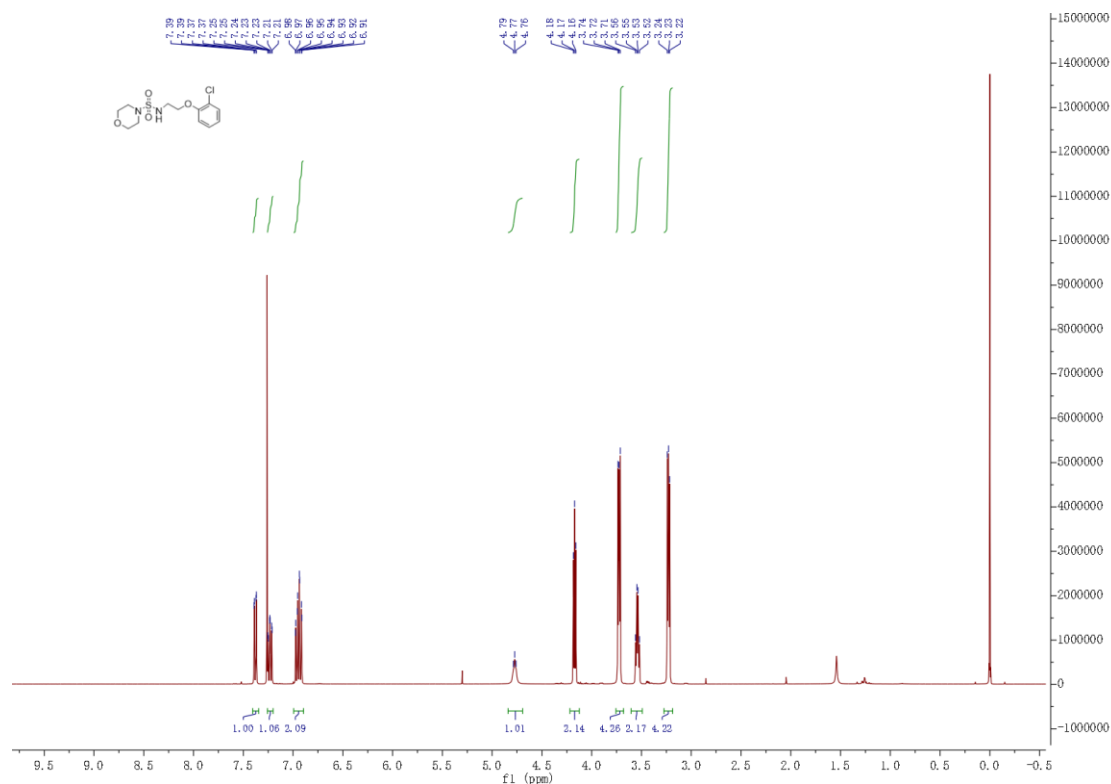
4-((6-(1-((2R,3R,4S,5S,6R)-3,4,5-Trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)pyridin-3-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (8g)

4-((6-(1-((2R,3S,4S,5S,6R)-3,4,5-Trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)pyridin-3-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (8h)

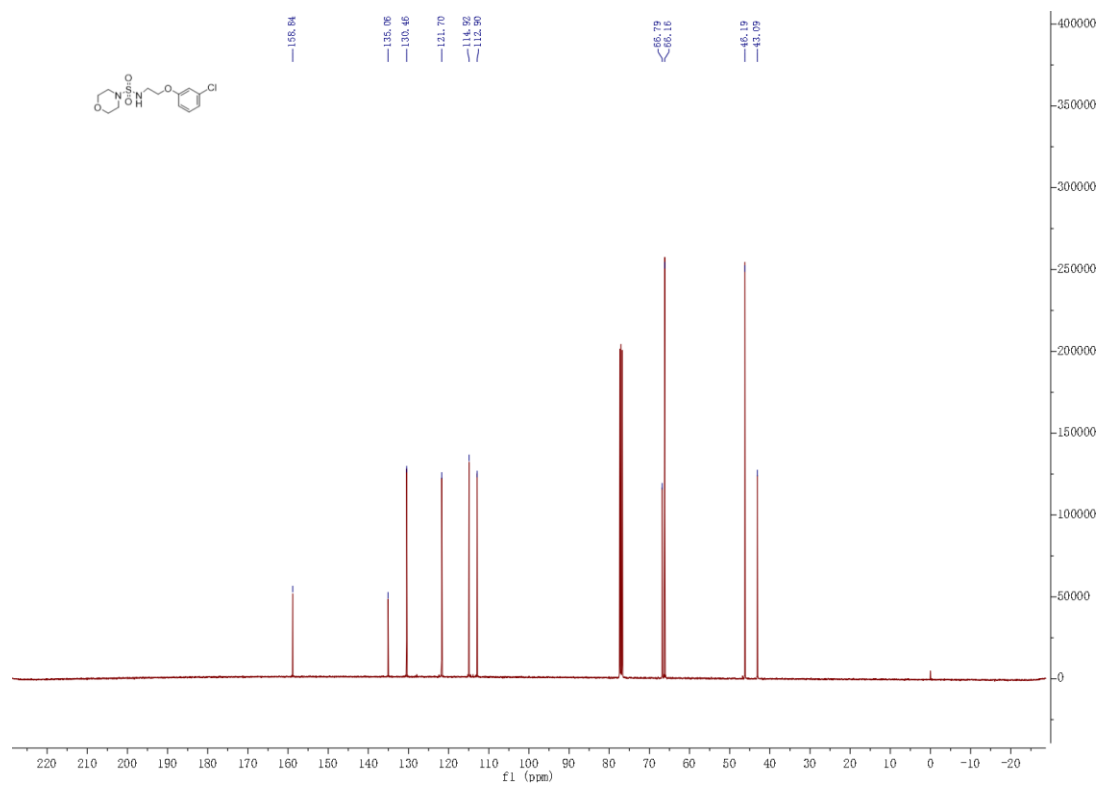
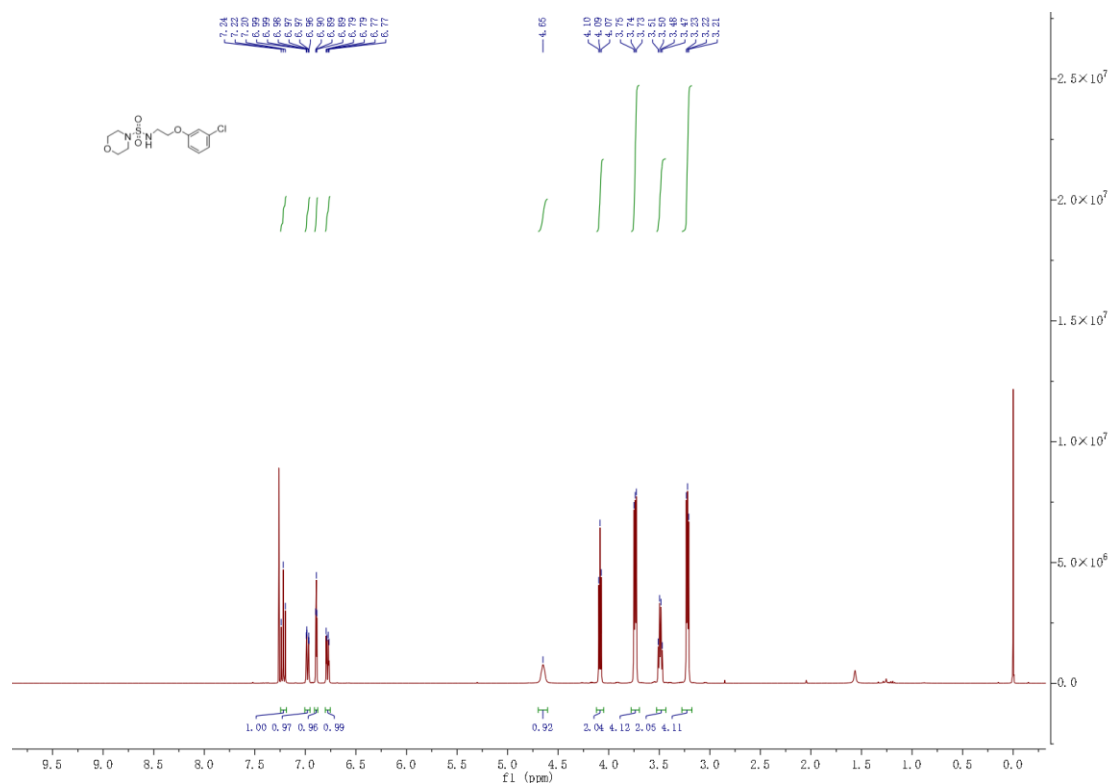
N-(2-Phenoxyethyl)morpholine-4-sulfonamide (1a)



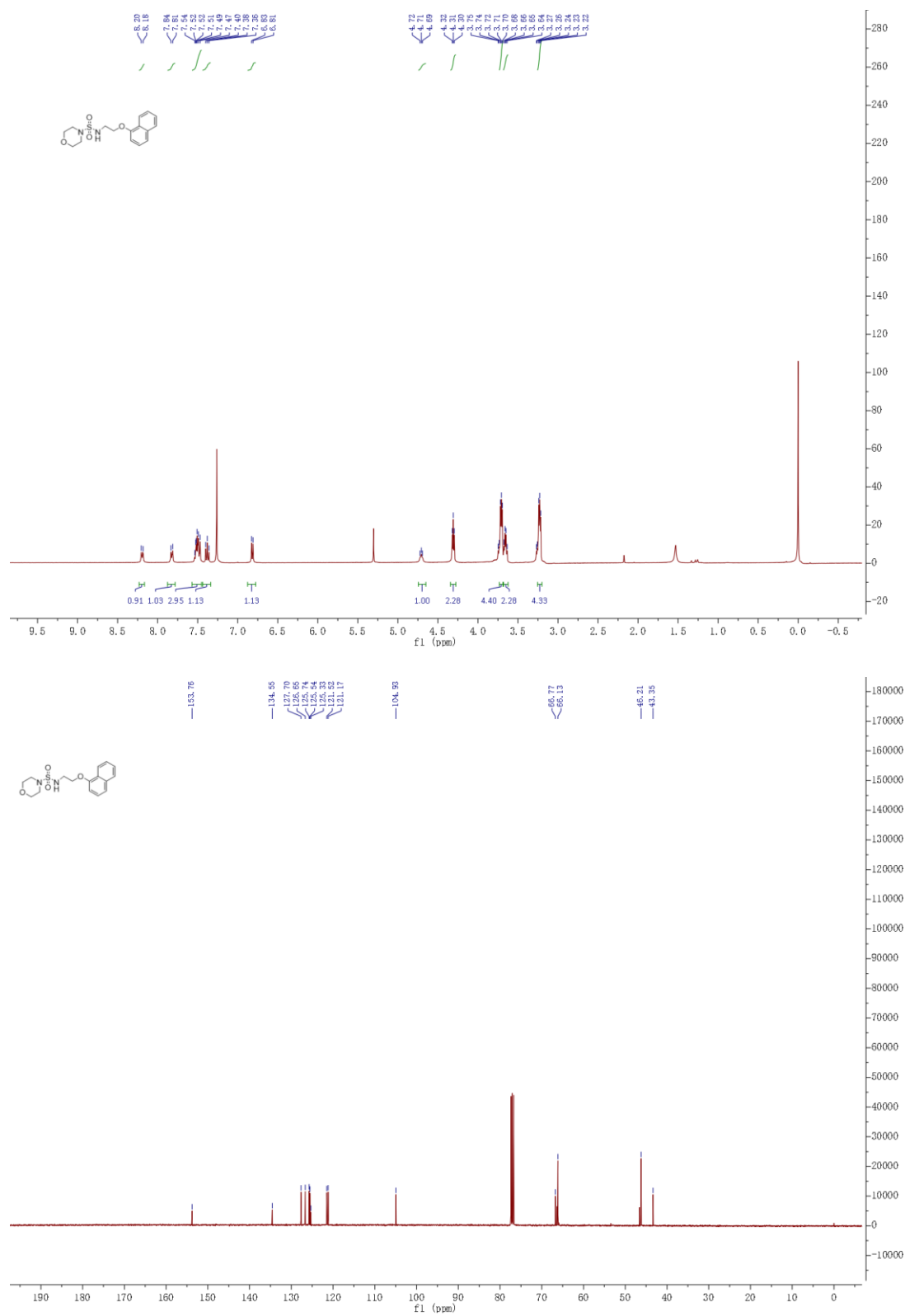
N-(2-(2-Chlorophenoxy)ethyl)morpholine-4-sulfonamide (1b)



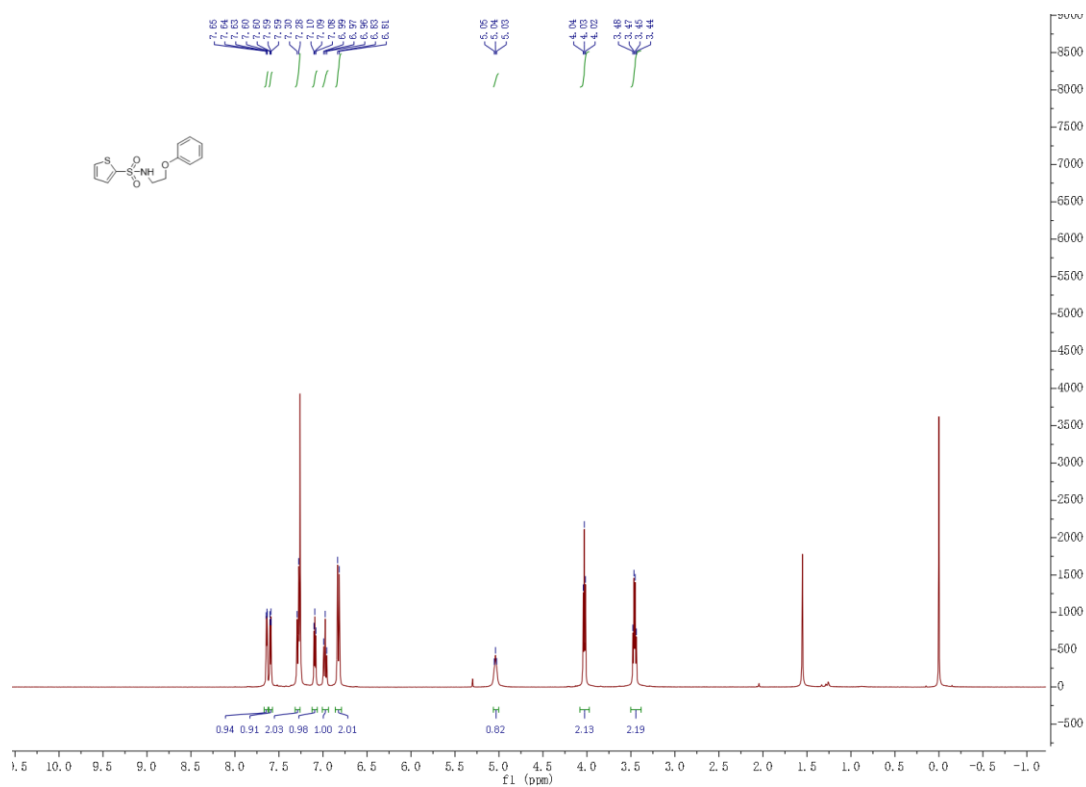
N-(2-(3-Chlorophenoxy)ethyl)morpholine-4-sulfonamide (1c)

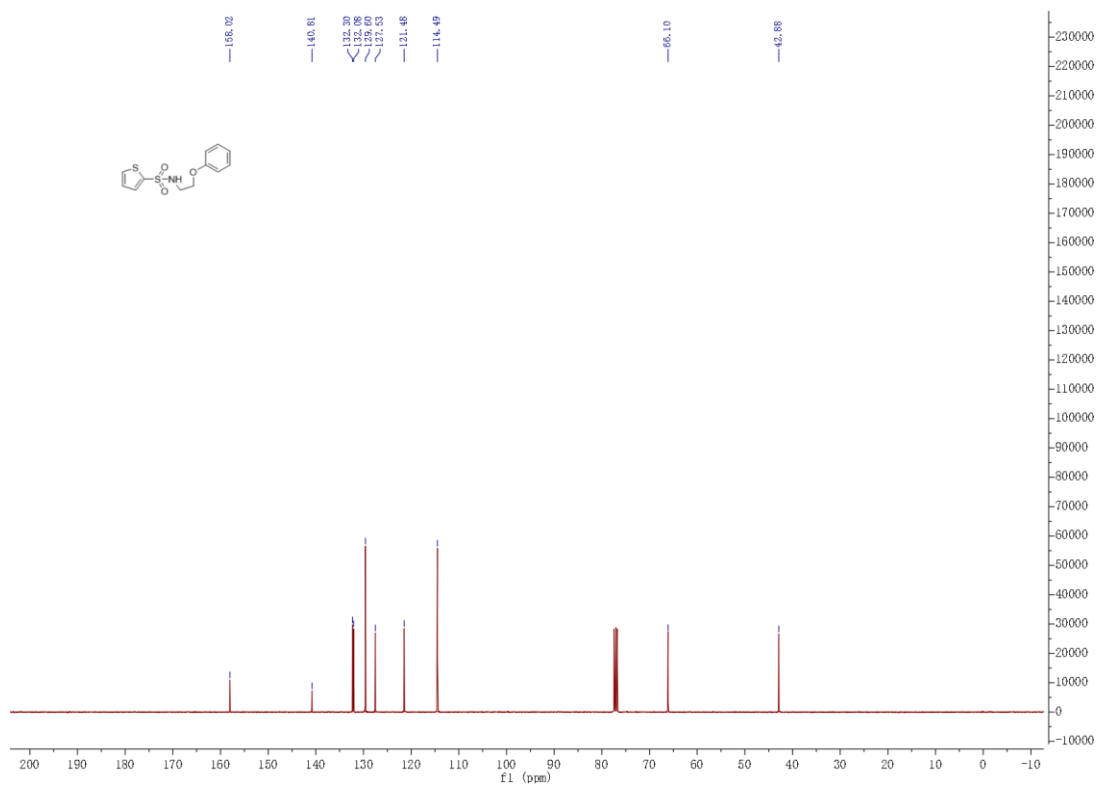


N-(2-(Naphthalen-1-yloxy)ethyl)morpholine-4-sulfonamide (1d)

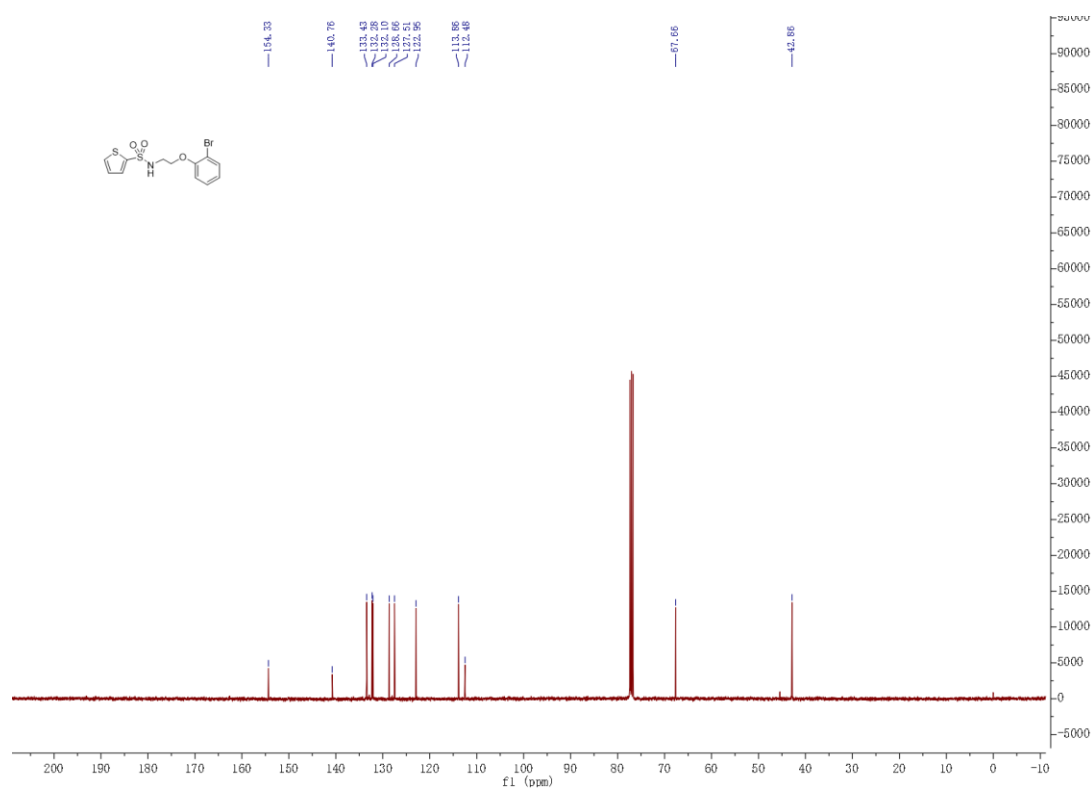
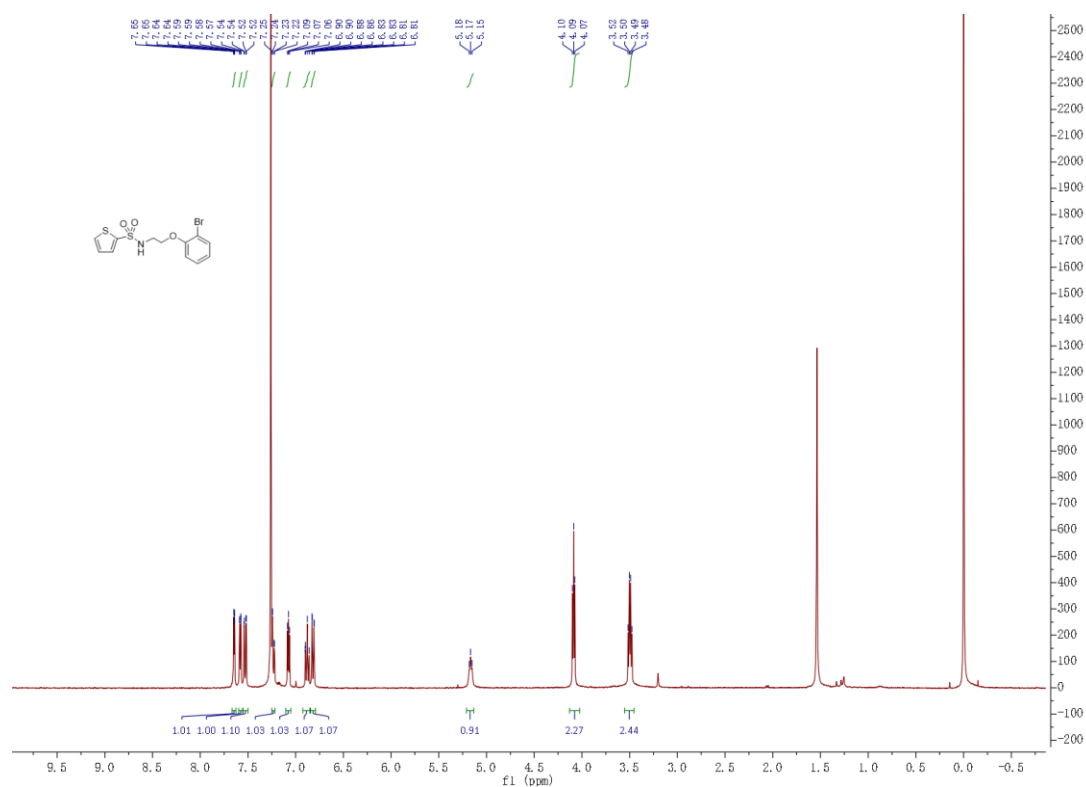


N-(2-Phenoxyethyl)thiophene-2-sulfonamide (1e)

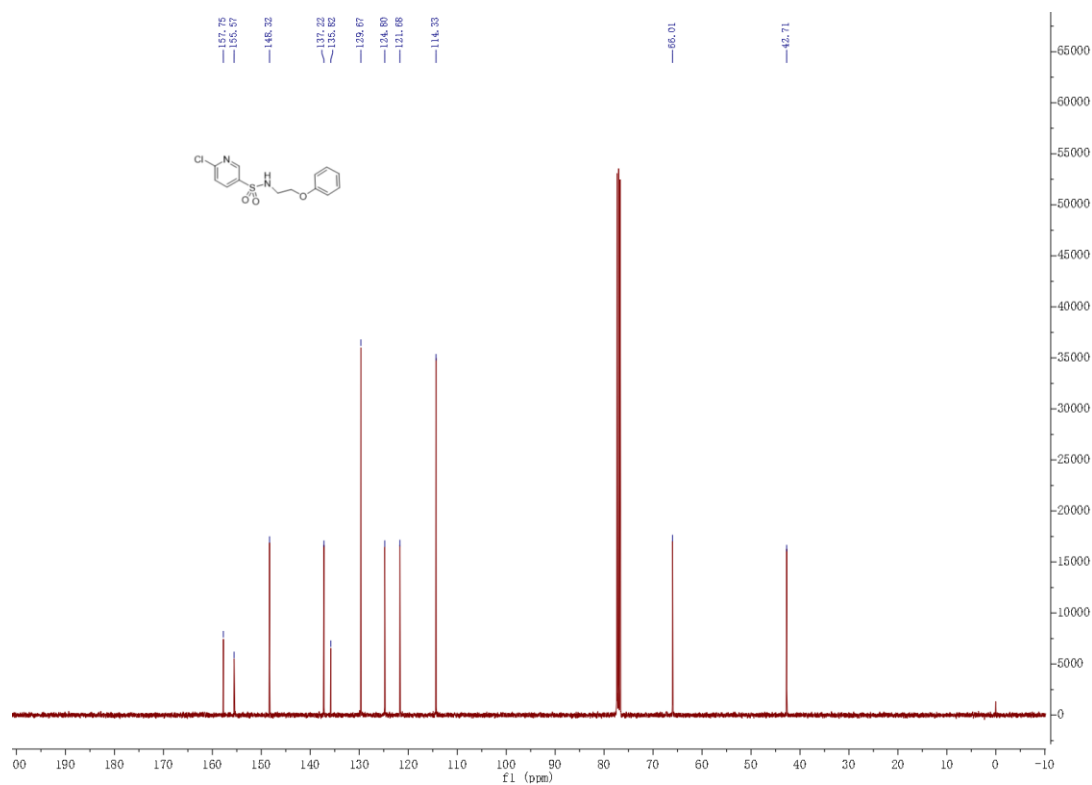
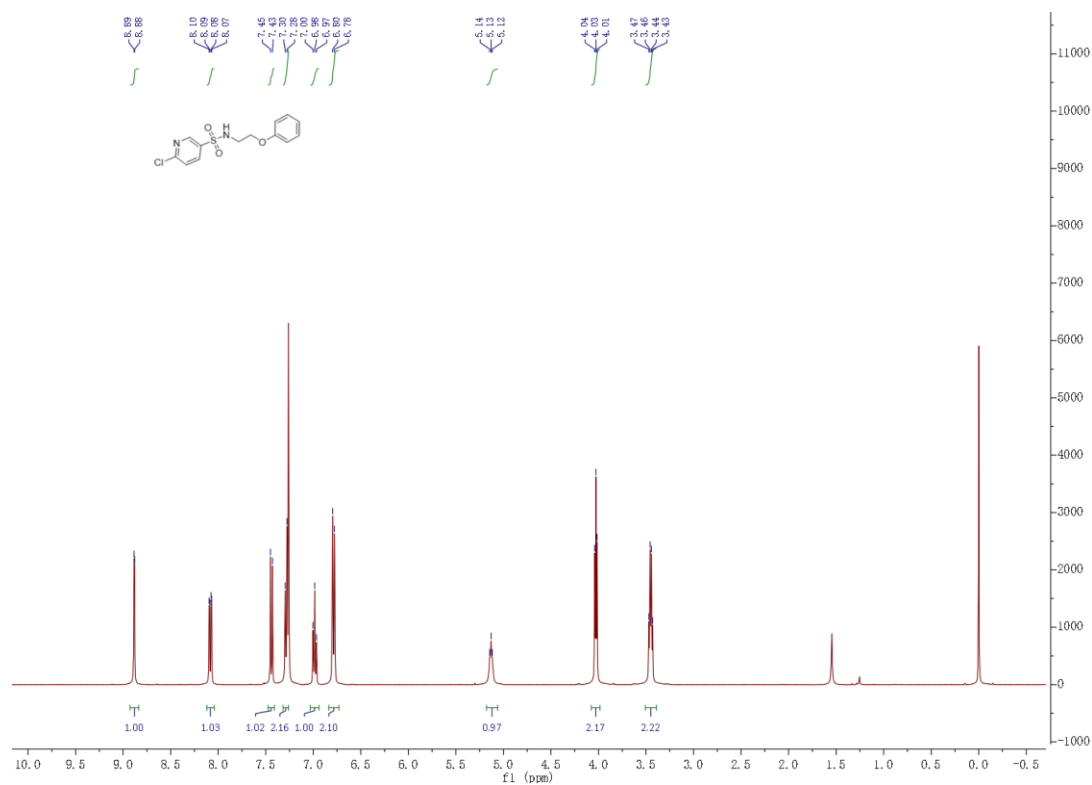




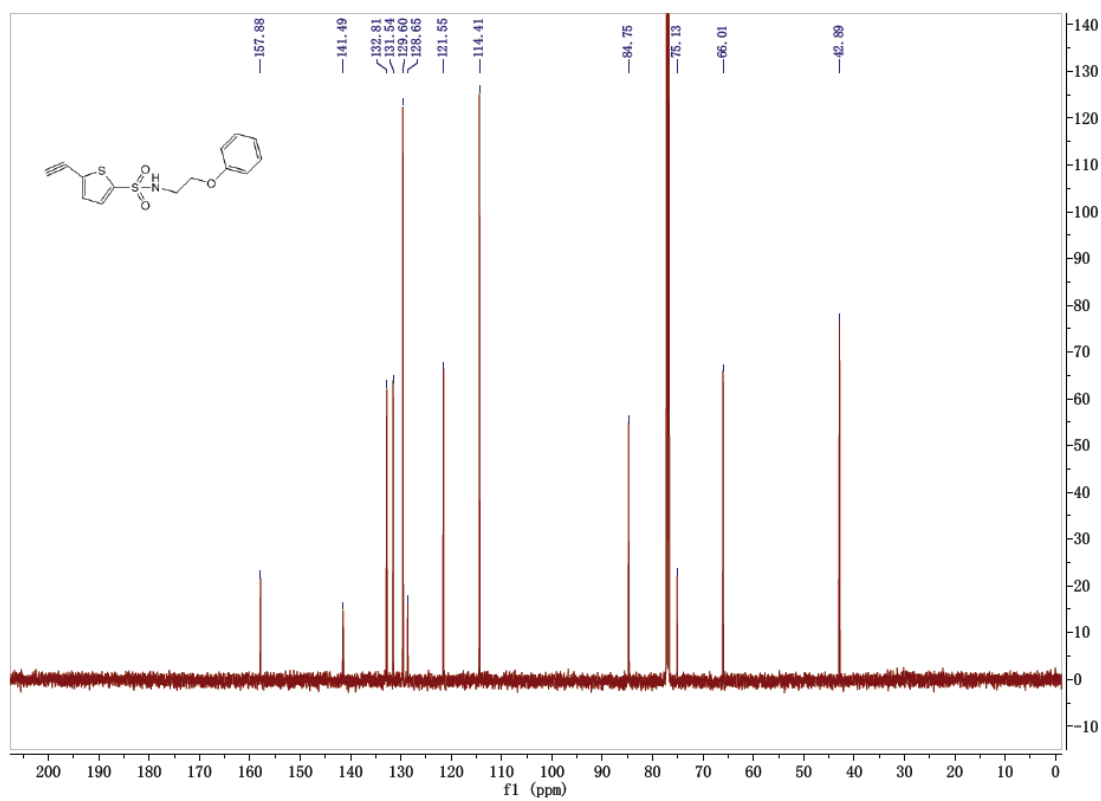
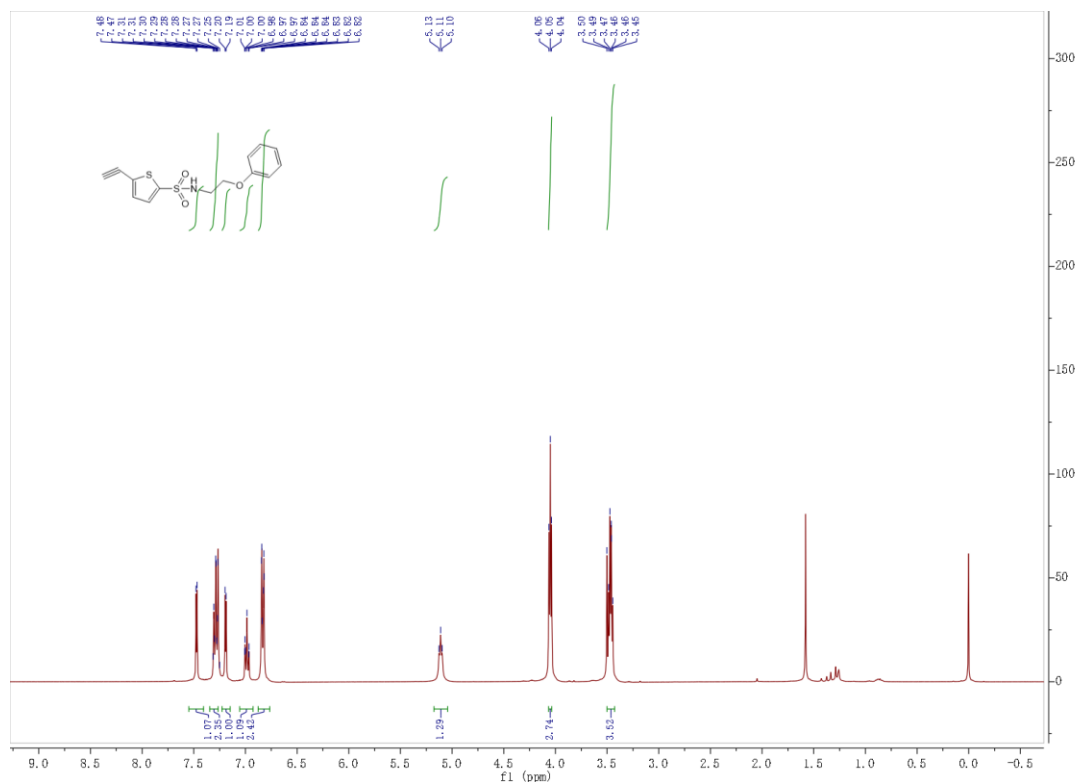
N-(2-(2-Bromophenoxy)ethyl)thiophene-2-sulfonamide (1f)



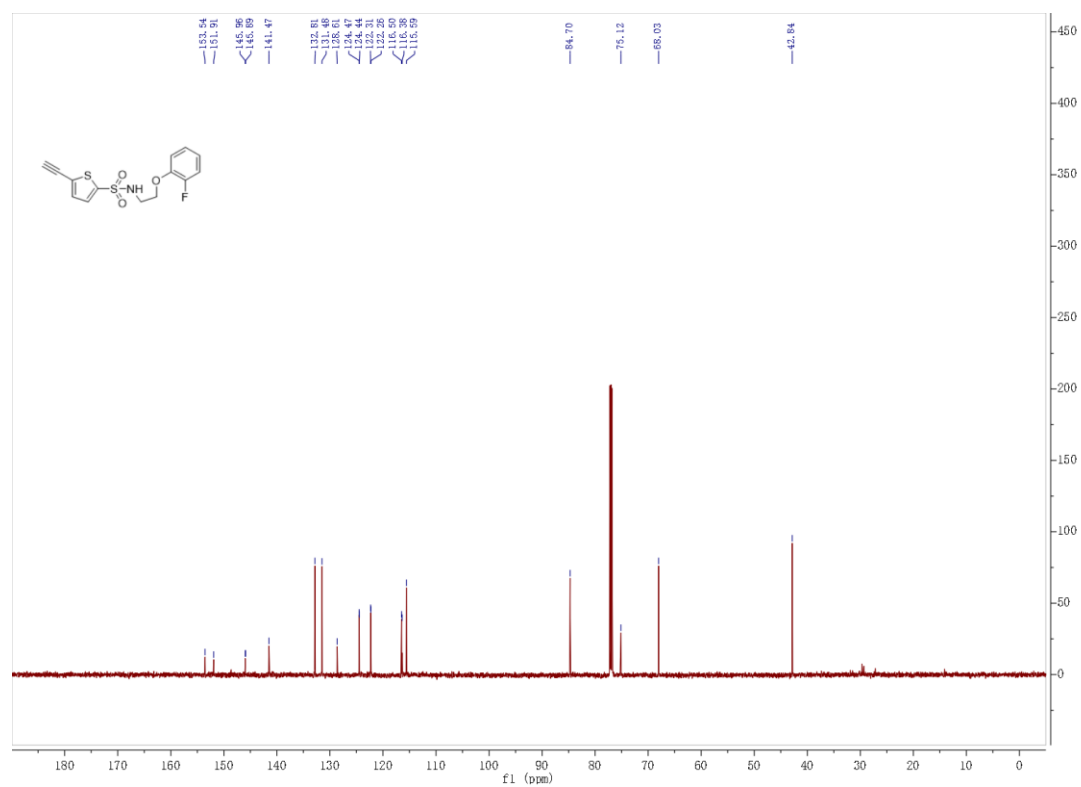
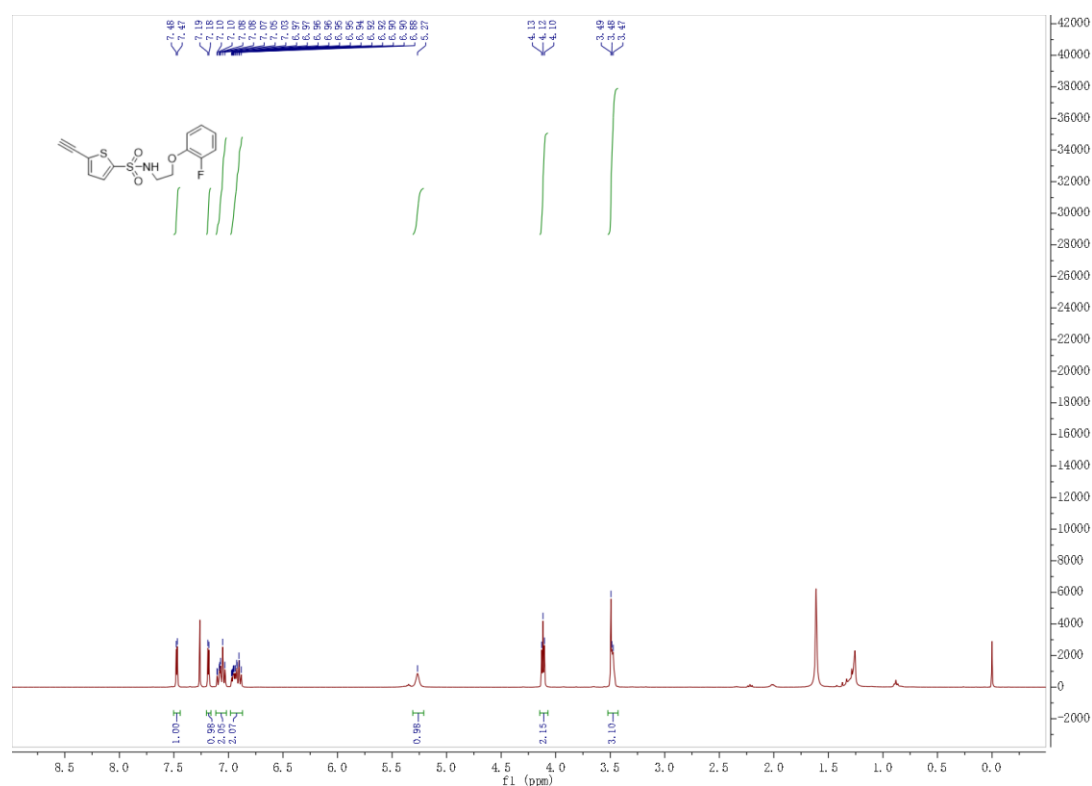
N-(2-Phenoxyethyl)-6-chloropyridine-3-sulfonamide (1g)



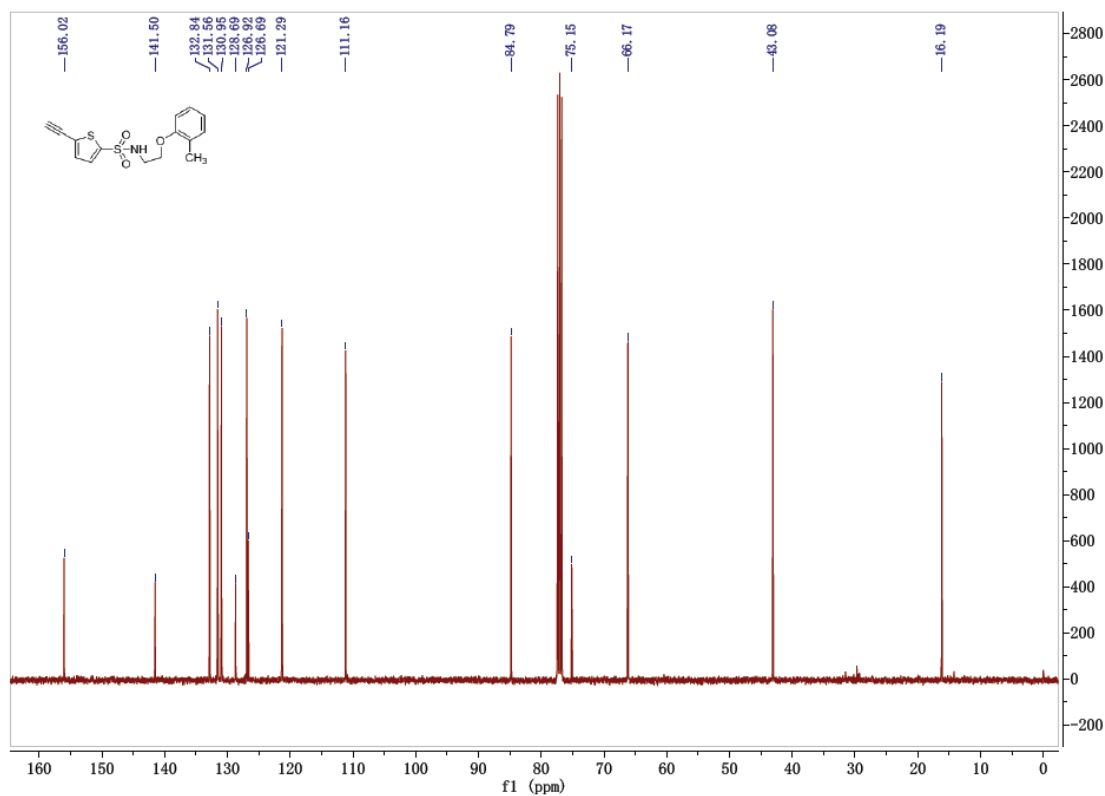
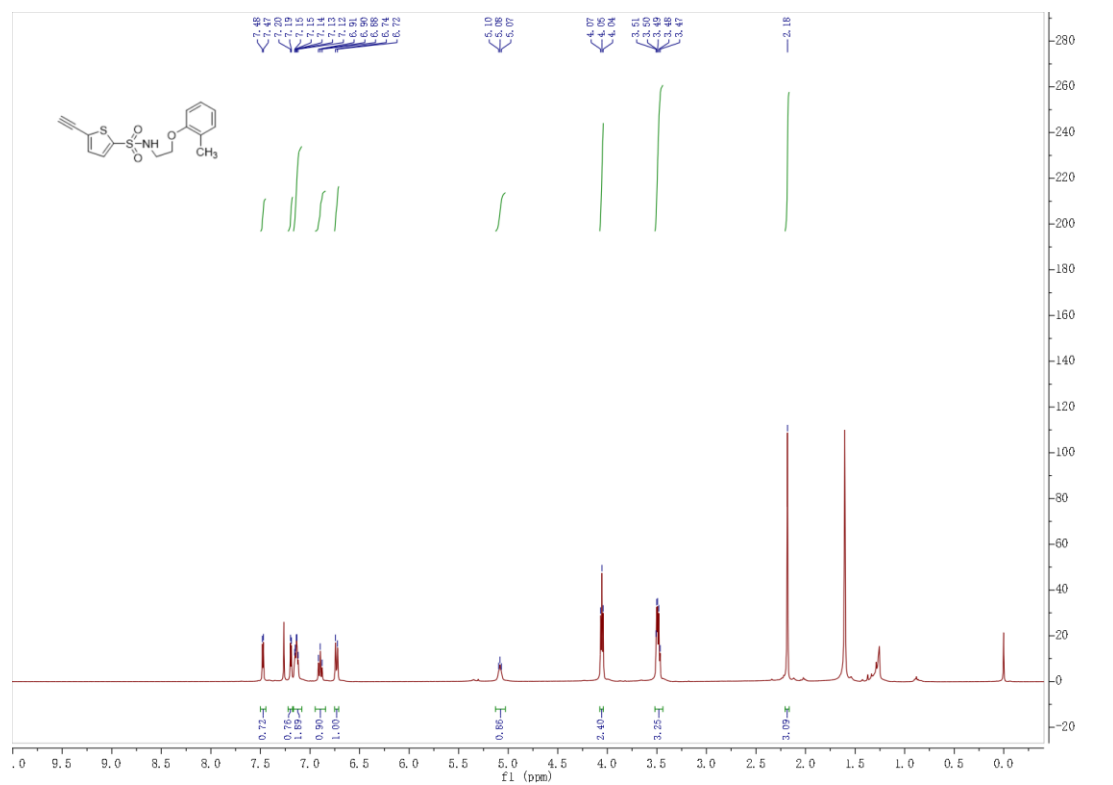
5-Ethynyl-N-(2-phenoxyethyl)thiophene-2-sulfonamide (5a)



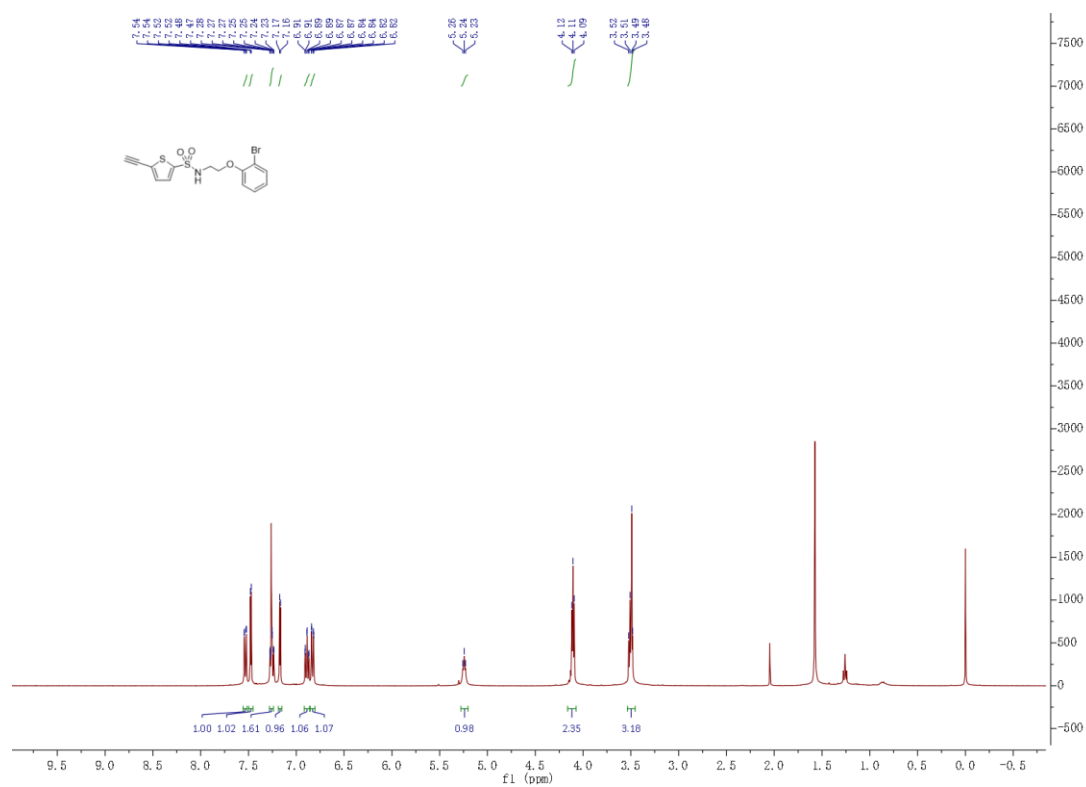
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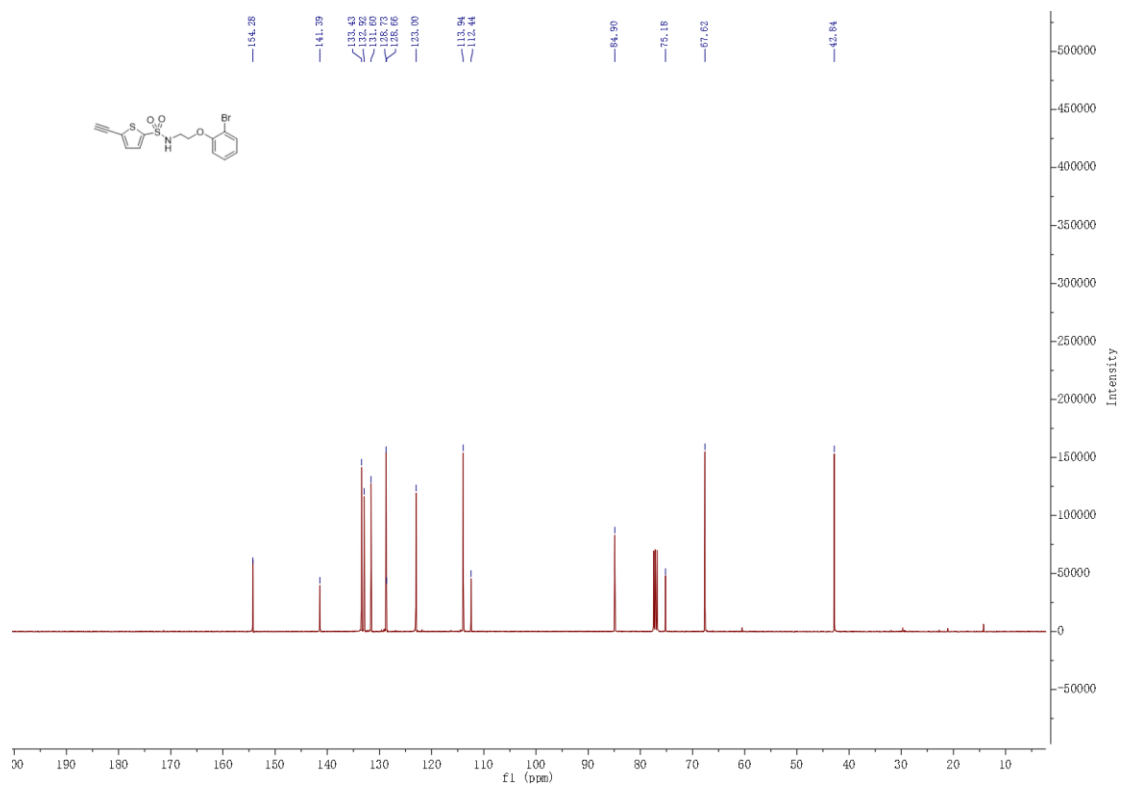


5-Ethynyl-N-(2-(o-tolyloxy)ethyl)thiophene-2-sulfonamide (5c)

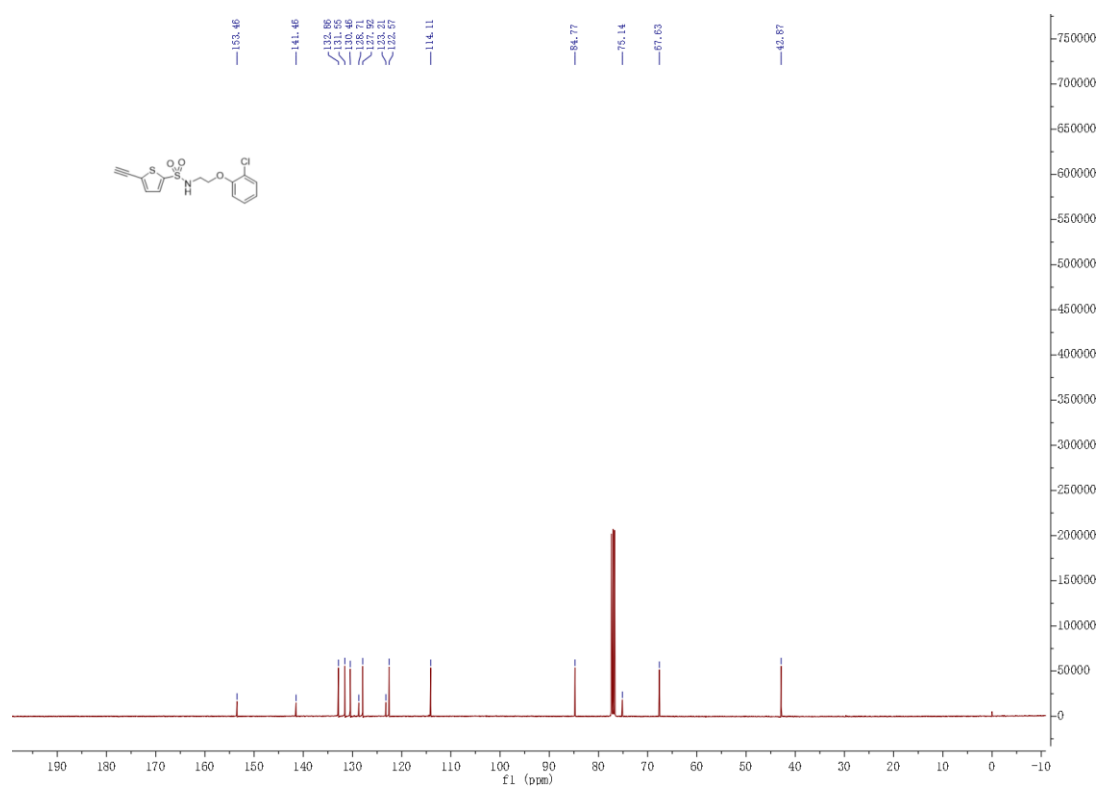
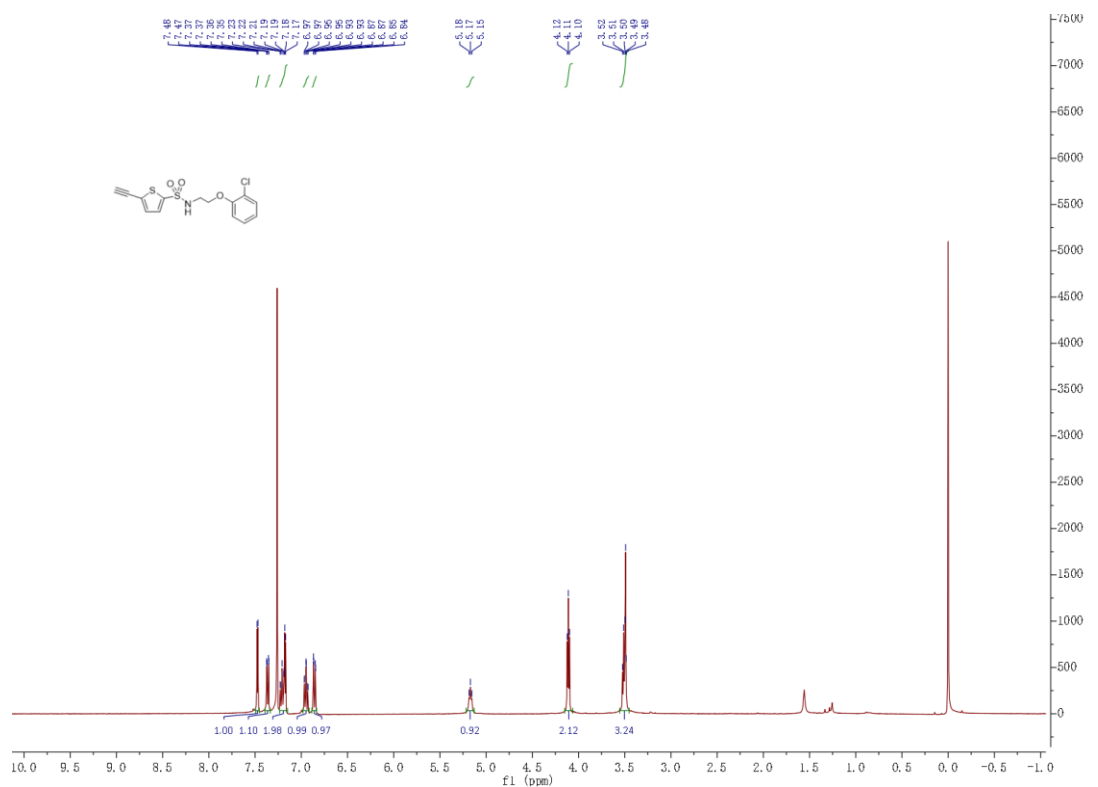


N-(2-(2-Bromophenoxy)ethyl)-5-ethynylthiophene-2-sulfonamide (5d)

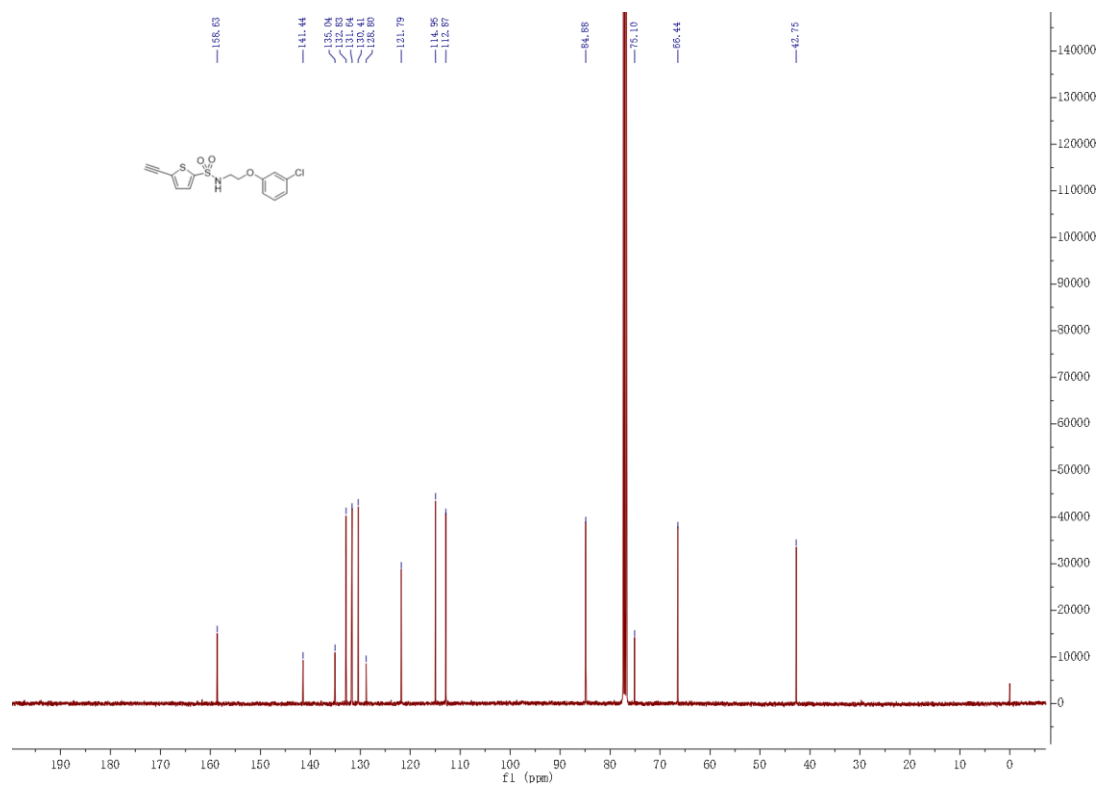
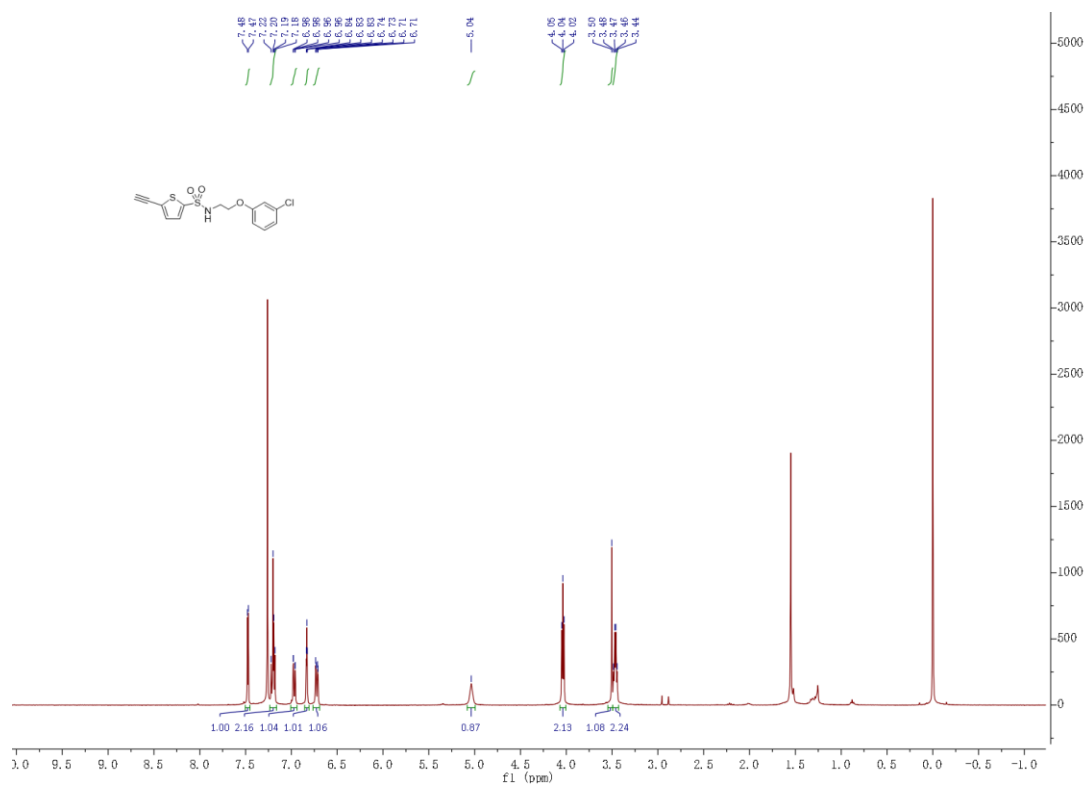




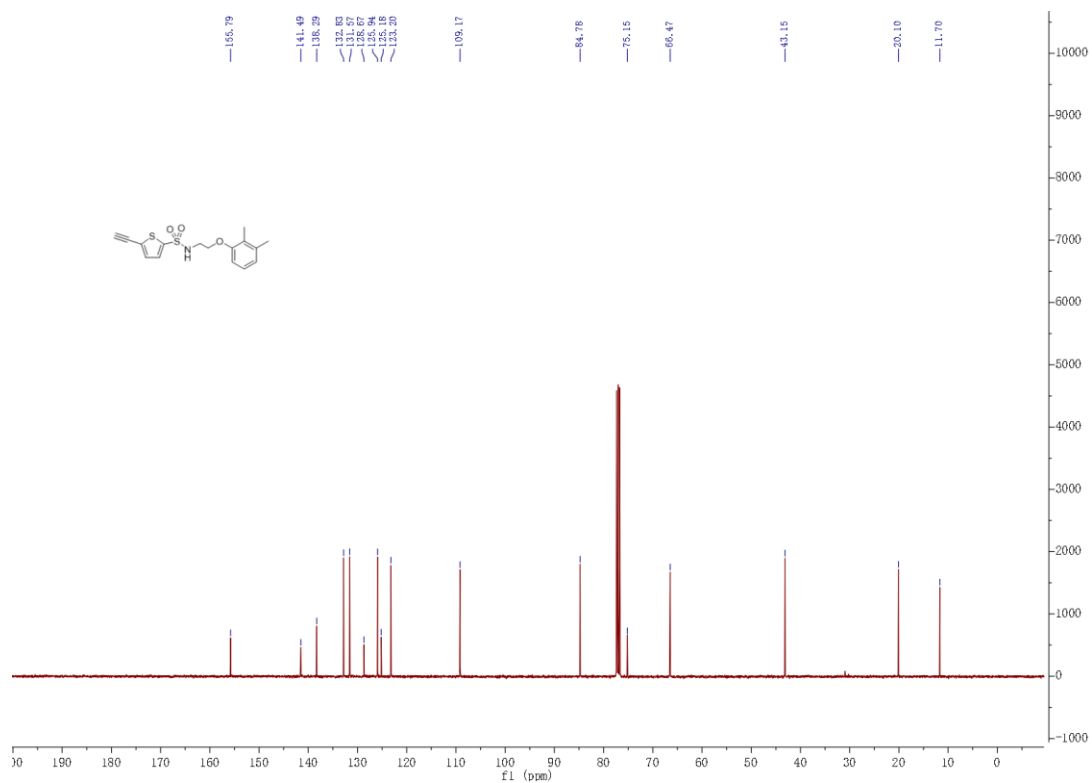
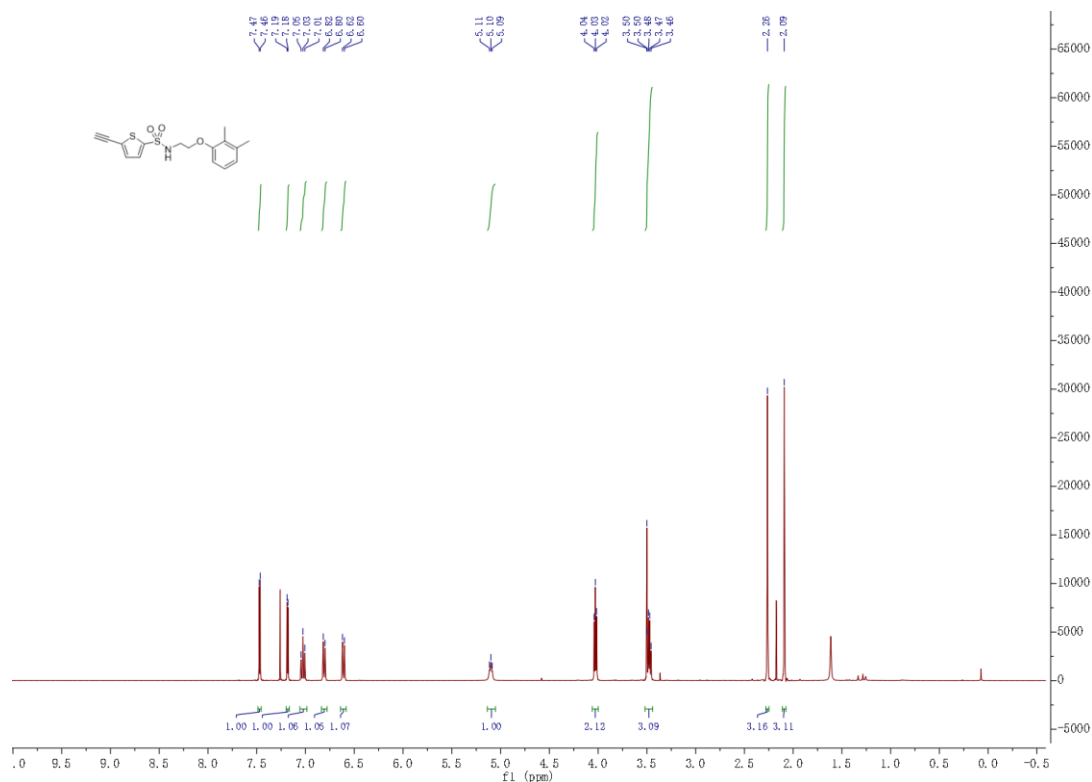
N-(2-(2-Chlorophenoxy)ethyl)-5-ethynylthiophene-2-sulfonamide (5e)



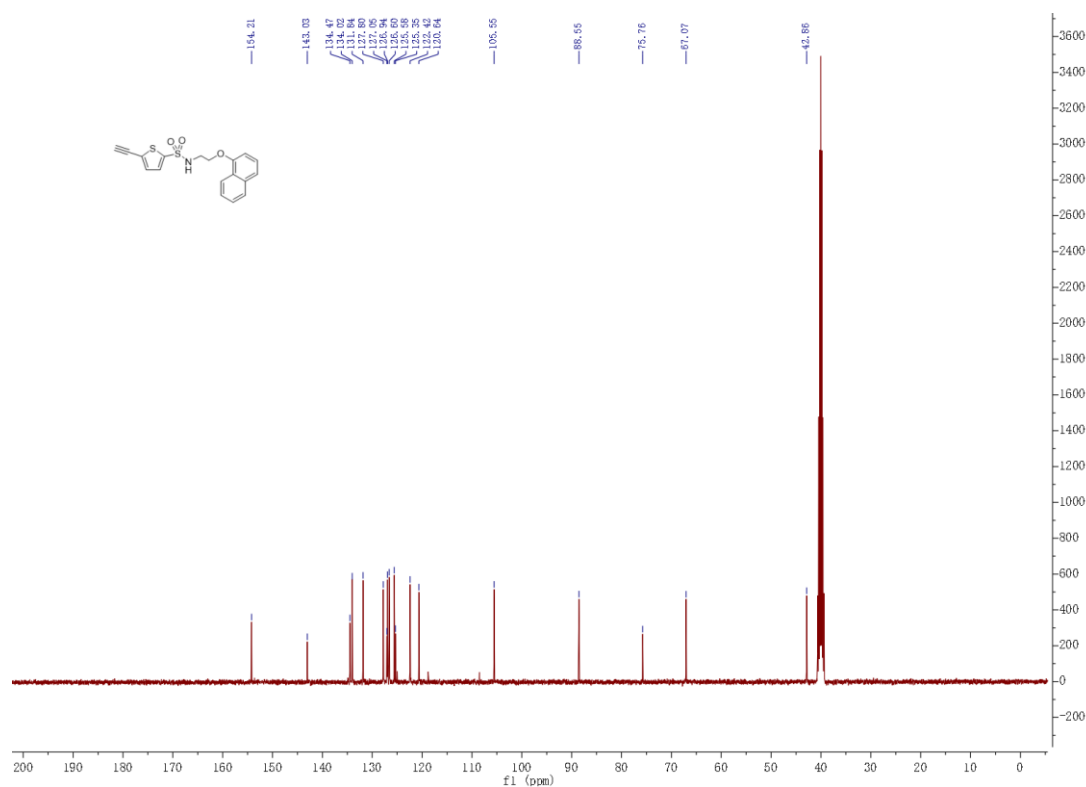
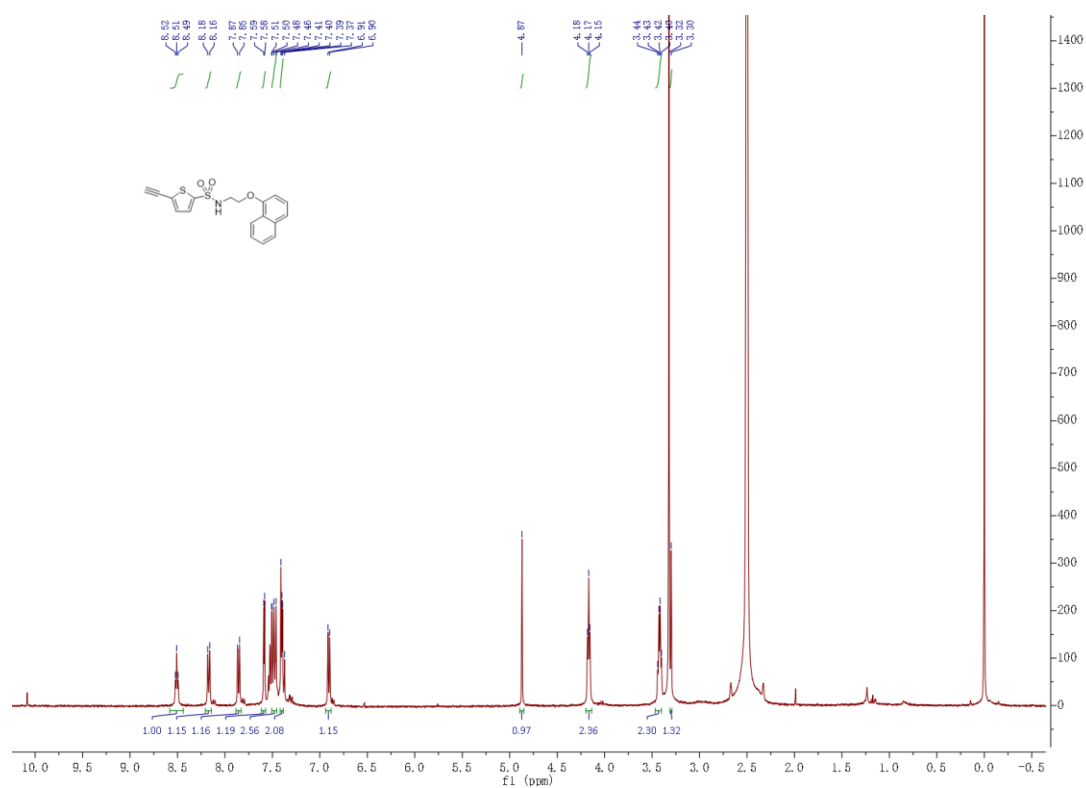
N-(2-(3-Chlorophenoxy)ethyl)-5-ethynylthiophene-2-sulfonamide (5f)



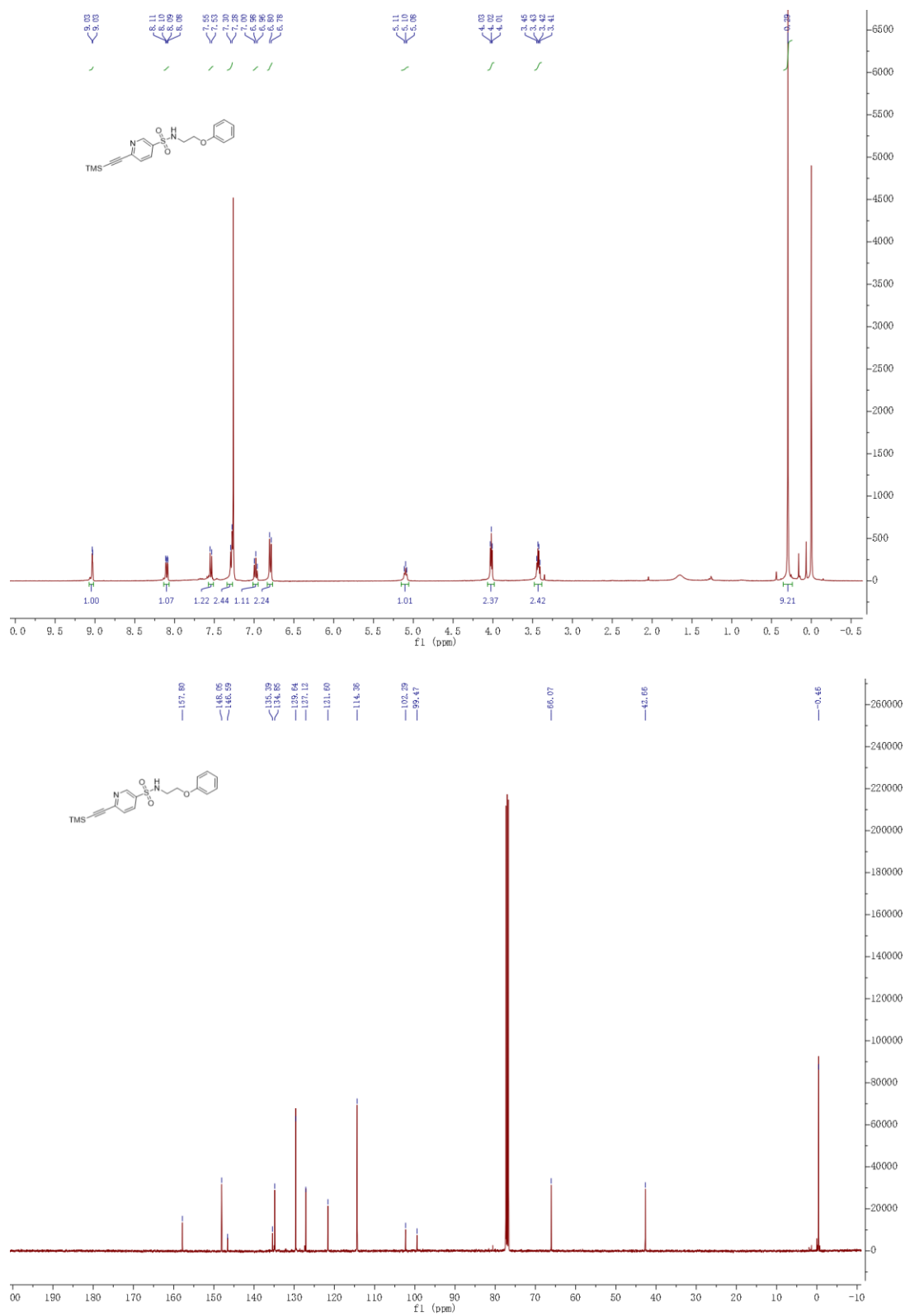
N-(2-(2,3-Dimethylphenoxy)ethyl)-5-ethynylthiophene-2-sulfonamide (5g)



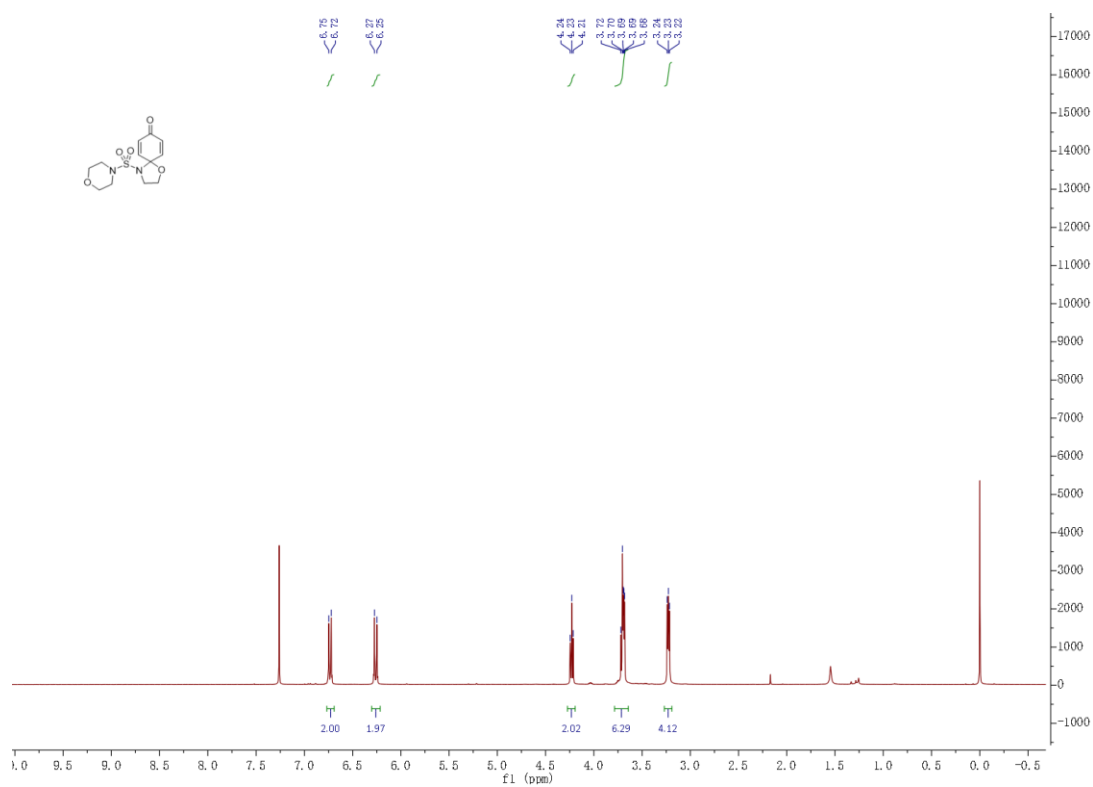
5-Ethynyl-N-(2-(naphthalen-1-yloxy)ethyl)thiophene-2-sulfonamide (5h)

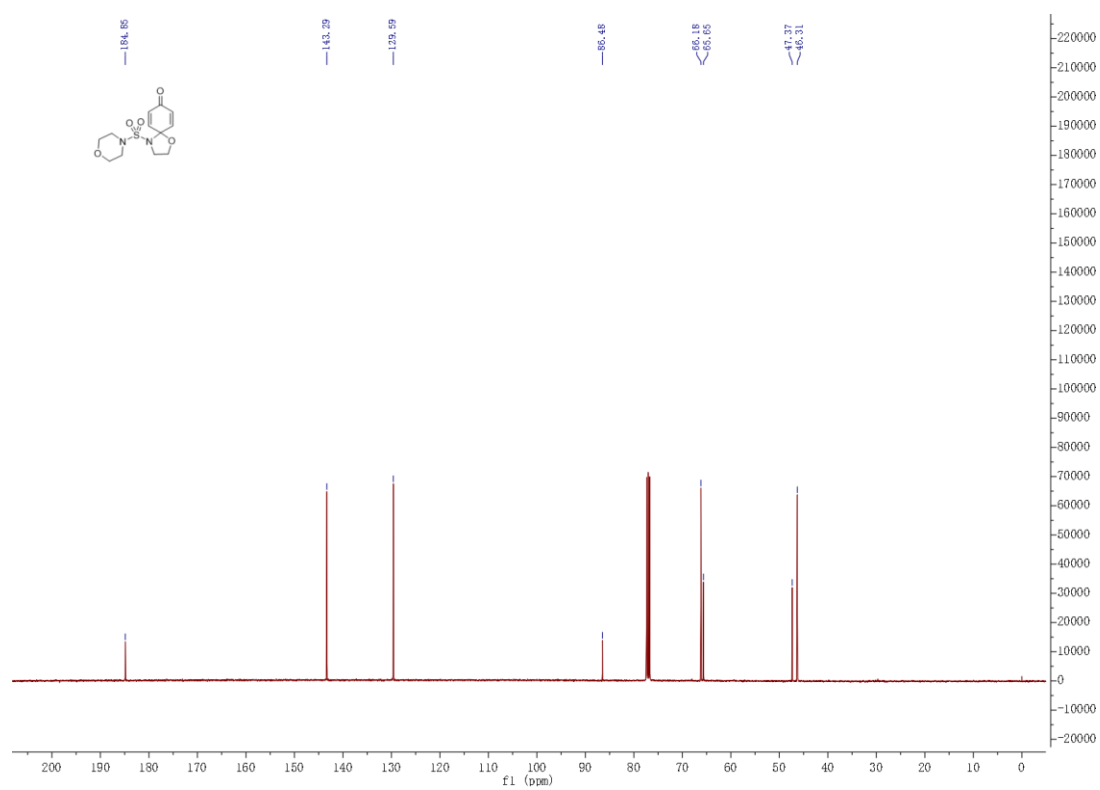


N-(2-Phenoxyethyl)-6-((trimethylsilyl)ethynyl)pyridine-3-sulfonamide (5i)

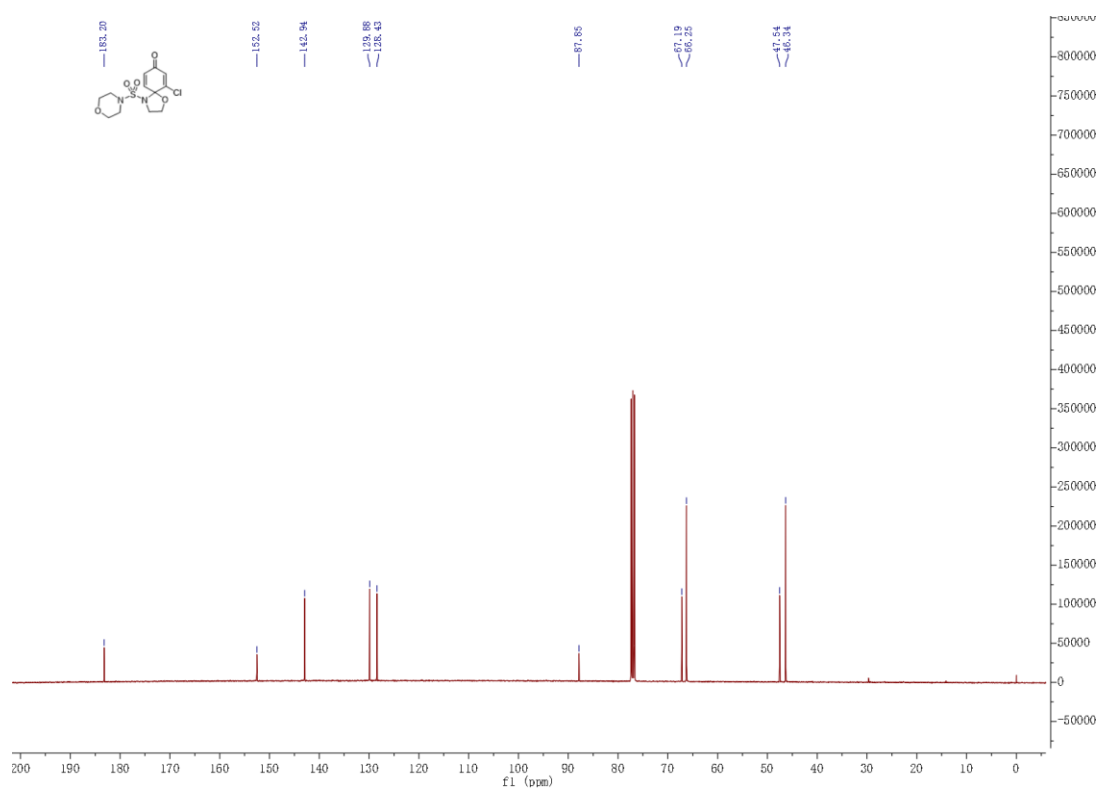
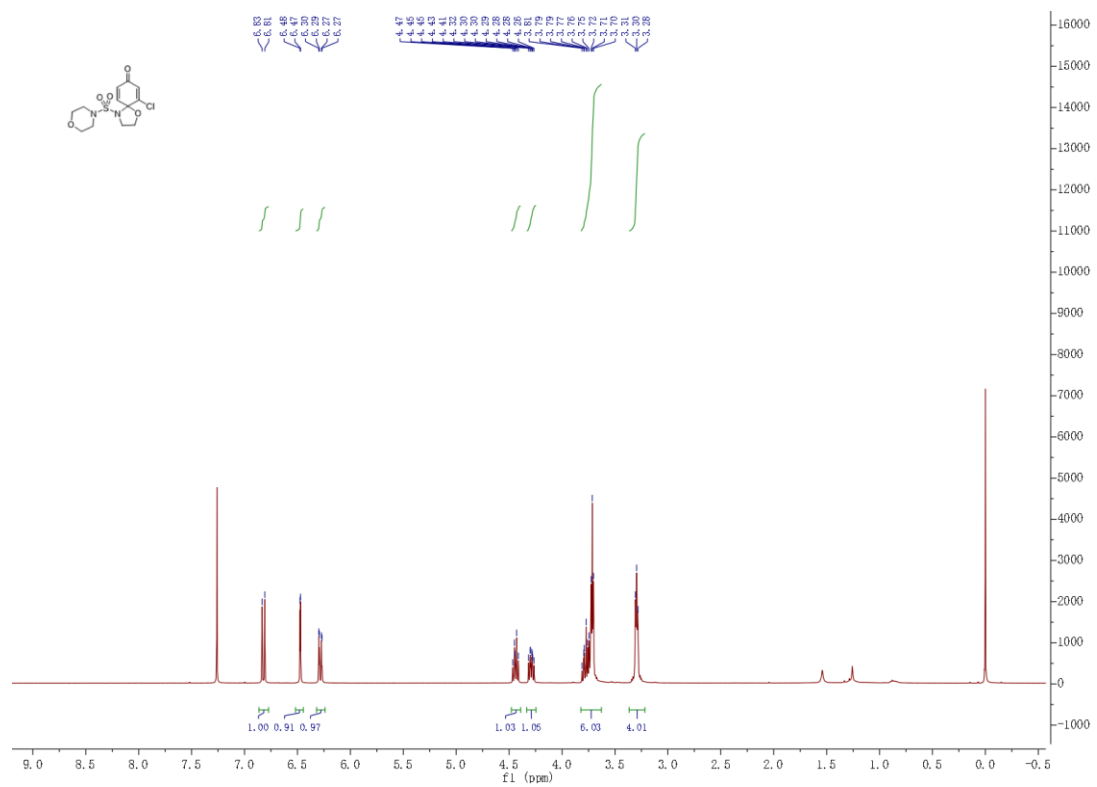


4-(Morpholinofonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (2a)

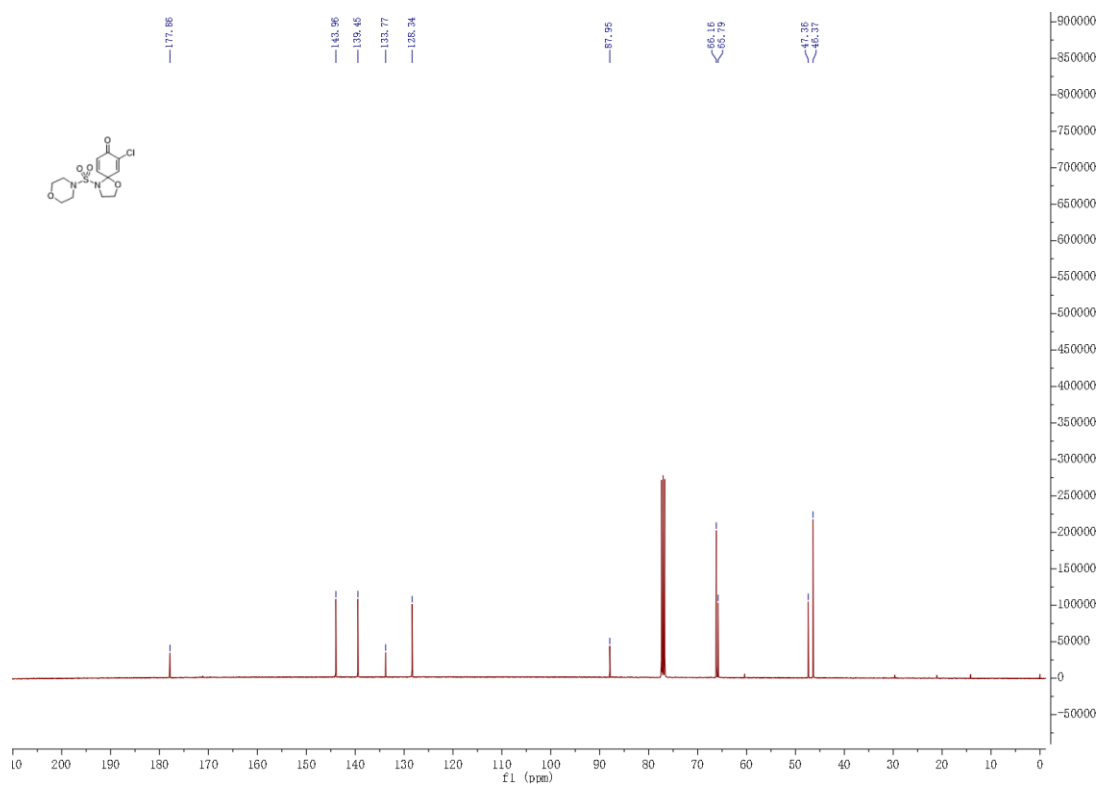
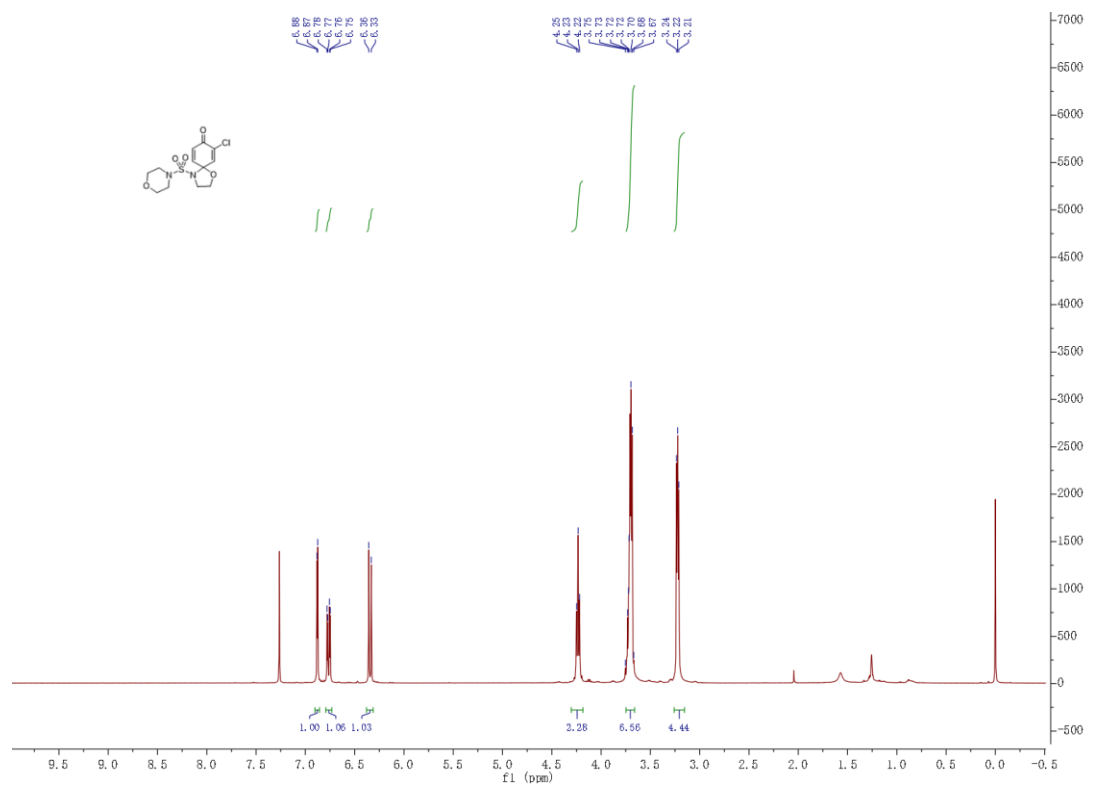




6-Chloro-4-(morpholinosulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (2b)



7-Chloro-4-(morpholinosulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (2c)

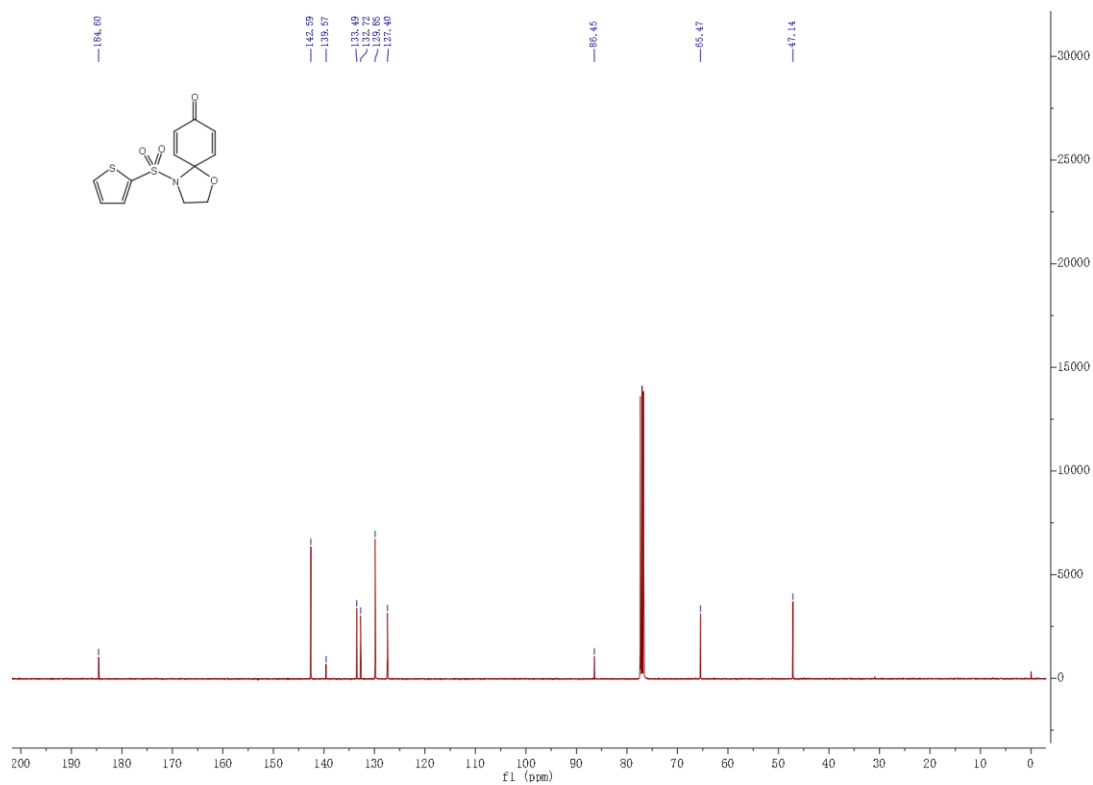
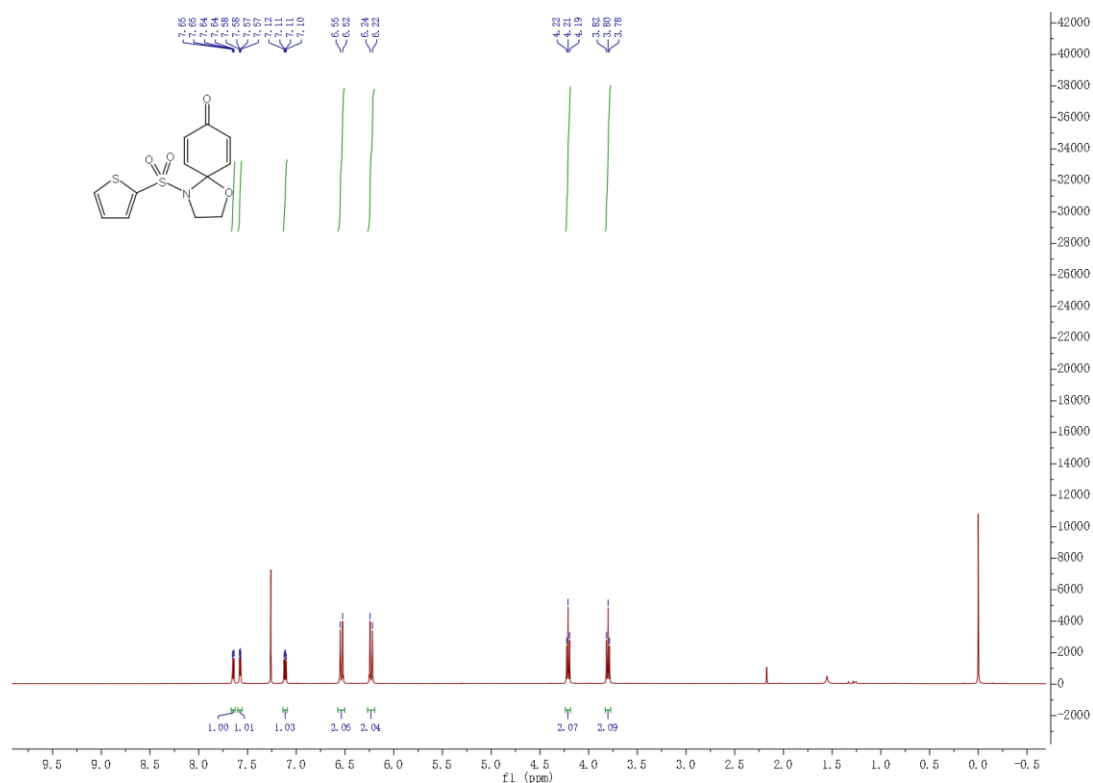


The figure displays two NMR spectra for compound 10, which is a 1,4-bis(morpholin-4-yl)pyrrolidine derivative. The chemical structure is shown in the top left corner of the ¹H NMR spectrum and the bottom left corner of the ¹³C NMR spectrum.

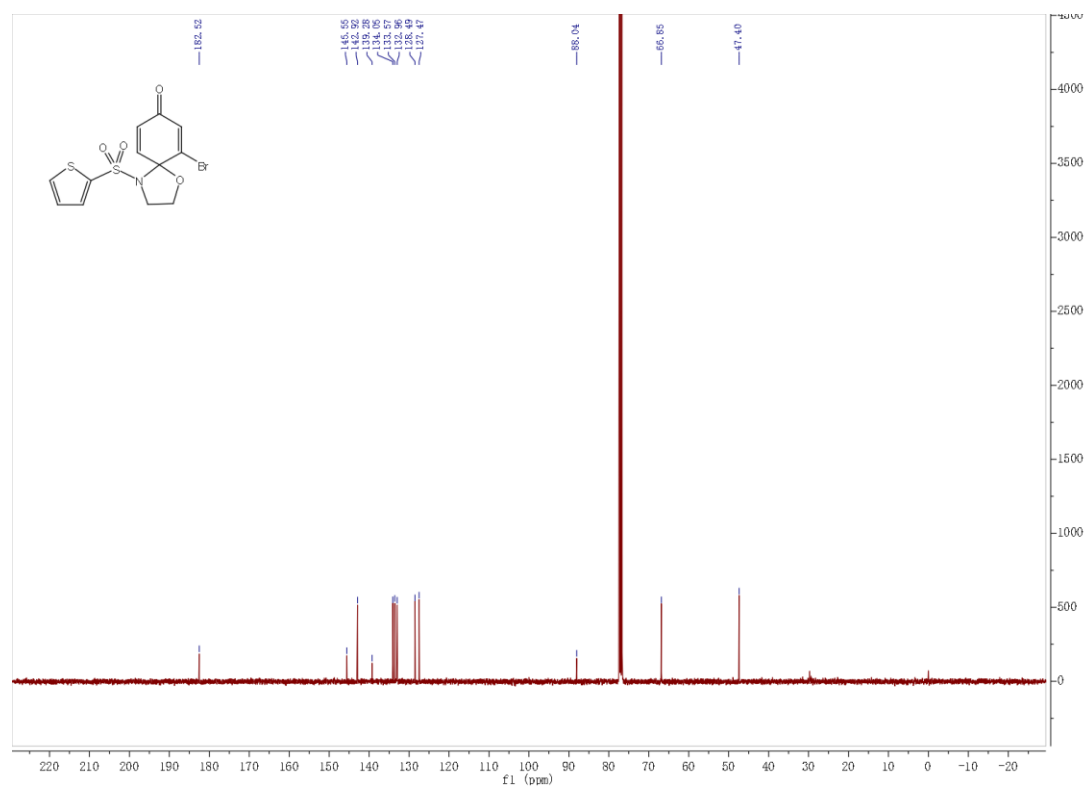
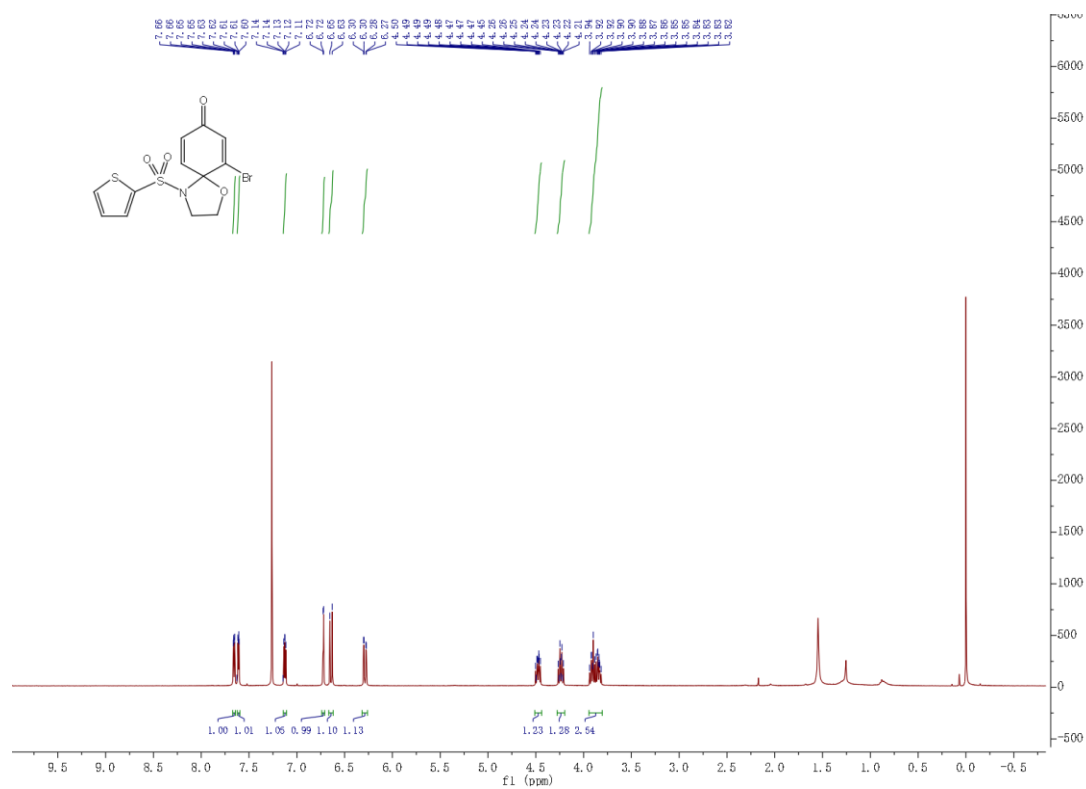
¹H NMR Spectrum (Top): The spectrum shows peaks in the aromatic region (6.5-8.0 ppm) and the aliphatic region (2.5-4.5 ppm). Integration values are provided below the peaks: 1.00, 1.93, 1.08, 1.03, 0.95, 2.27, 2.41, 4.14, and 4.17. The x-axis is labeled 'f1 (ppm)' and ranges from -0.5 to 9.5. The y-axis represents intensity, ranging from 0 to 4500.

¹³C NMR Spectrum (Bottom): The spectrum shows peaks in the aromatic region (125-145 ppm) and the aliphatic region (45-85 ppm). The x-axis is labeled 'f1 (ppm)' and ranges from 0 to 200. The y-axis represents intensity, ranging from -20000 to 380000.

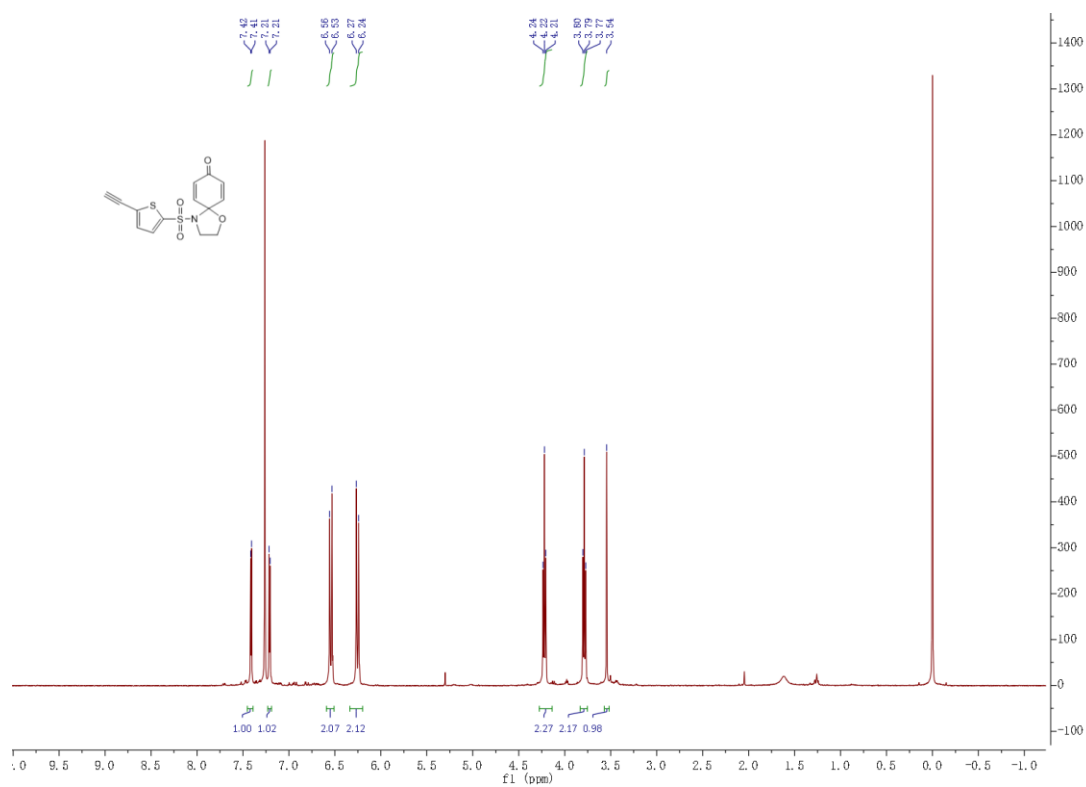
4-(Thiophen-2-ylsulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (2e)

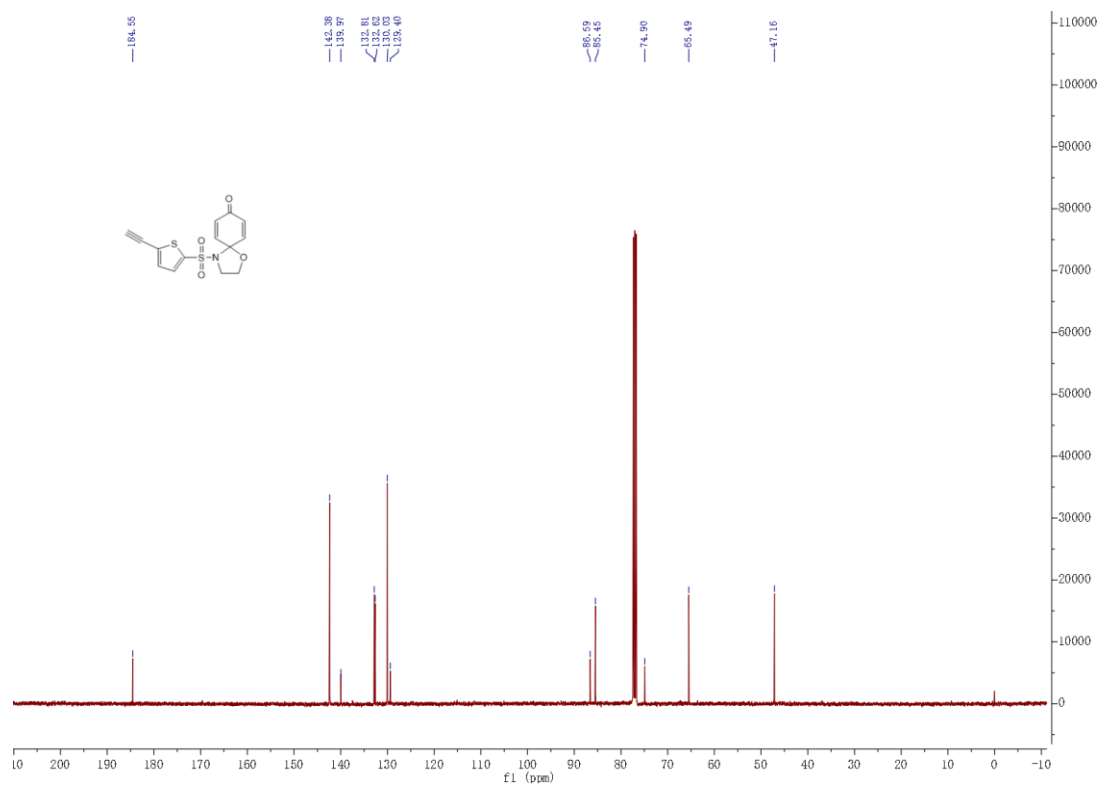


6-Bromo-4-(thiophen-2-ylsulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (2f)

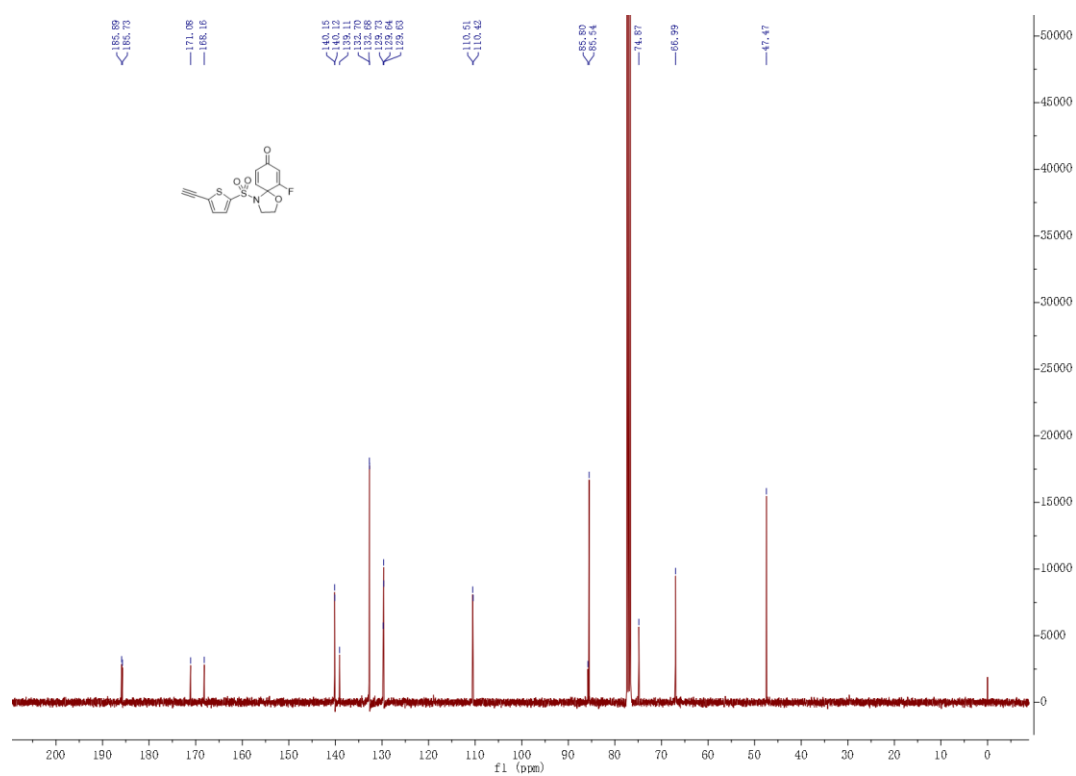
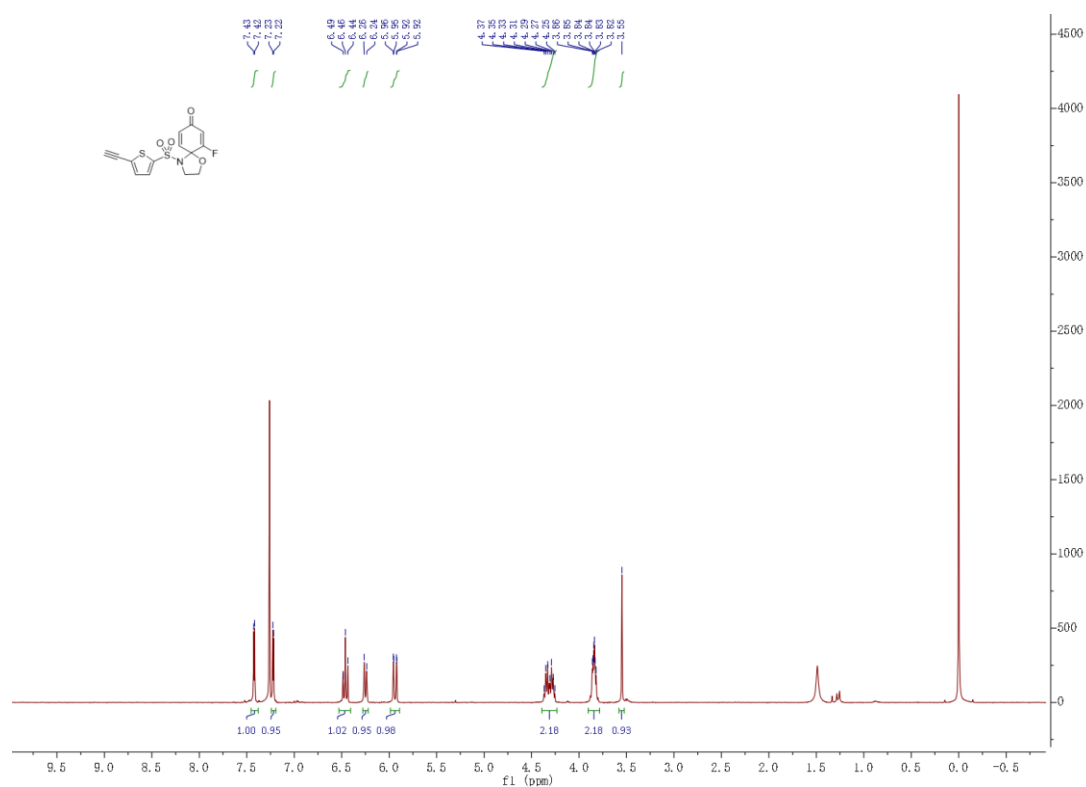


4-((5-Ethynylthiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6a)

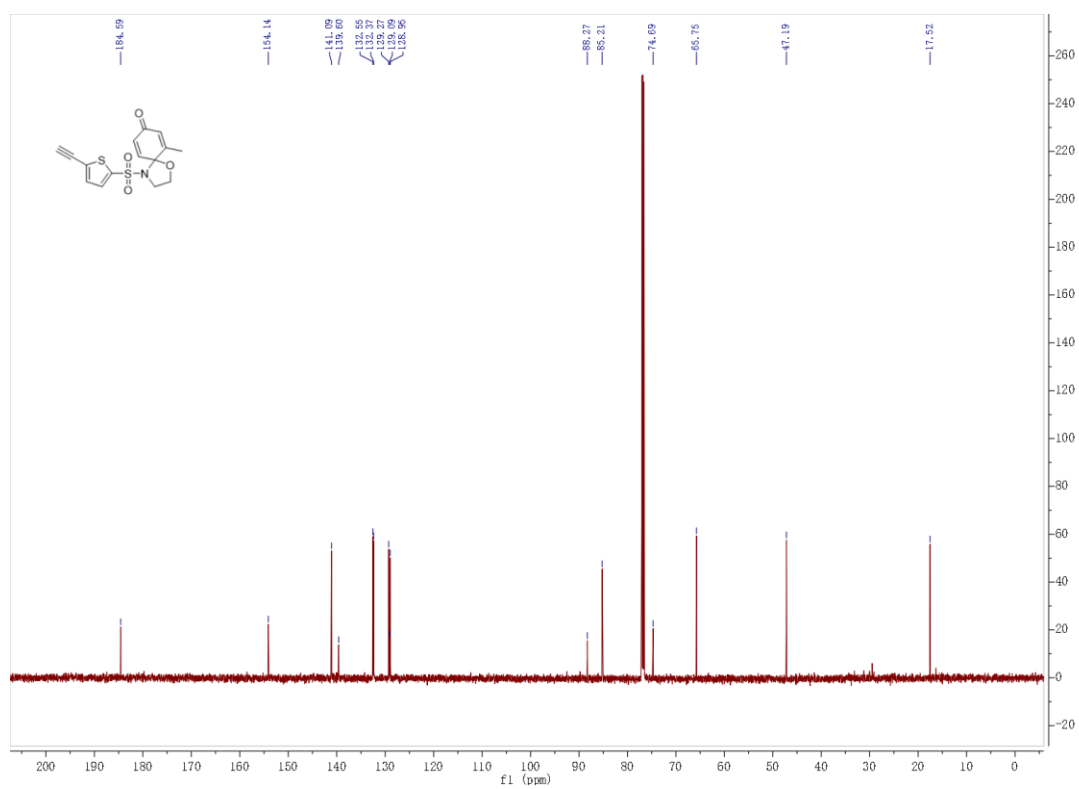
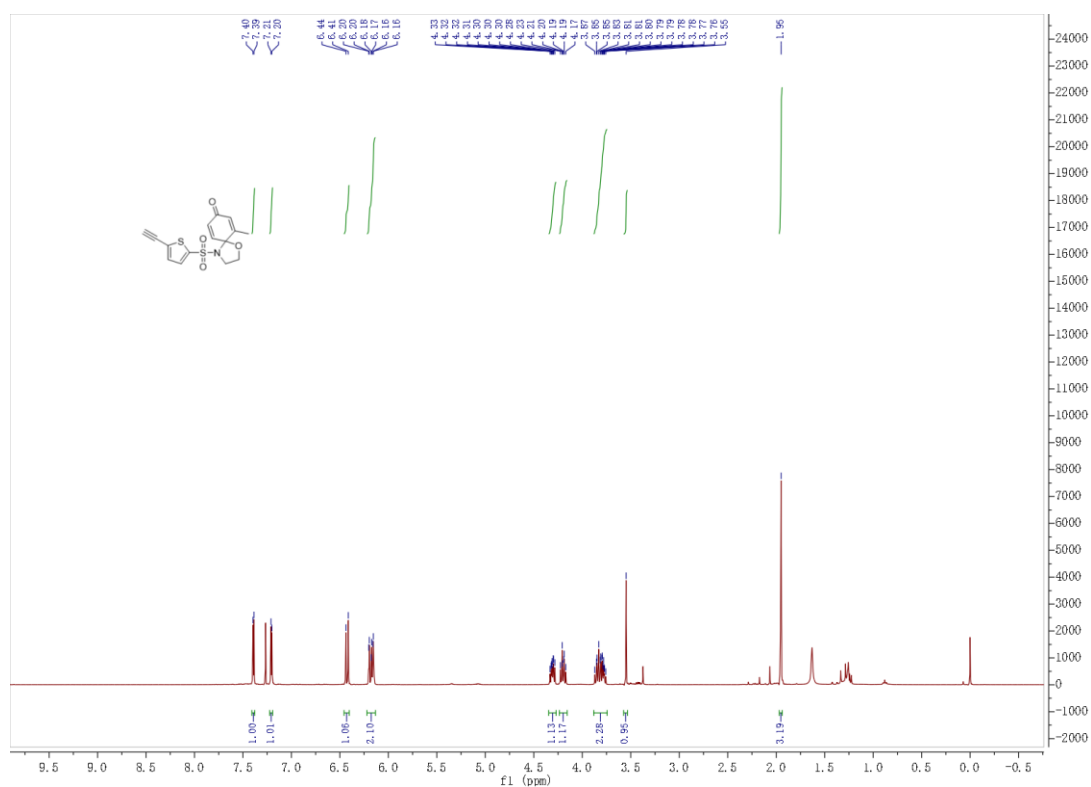




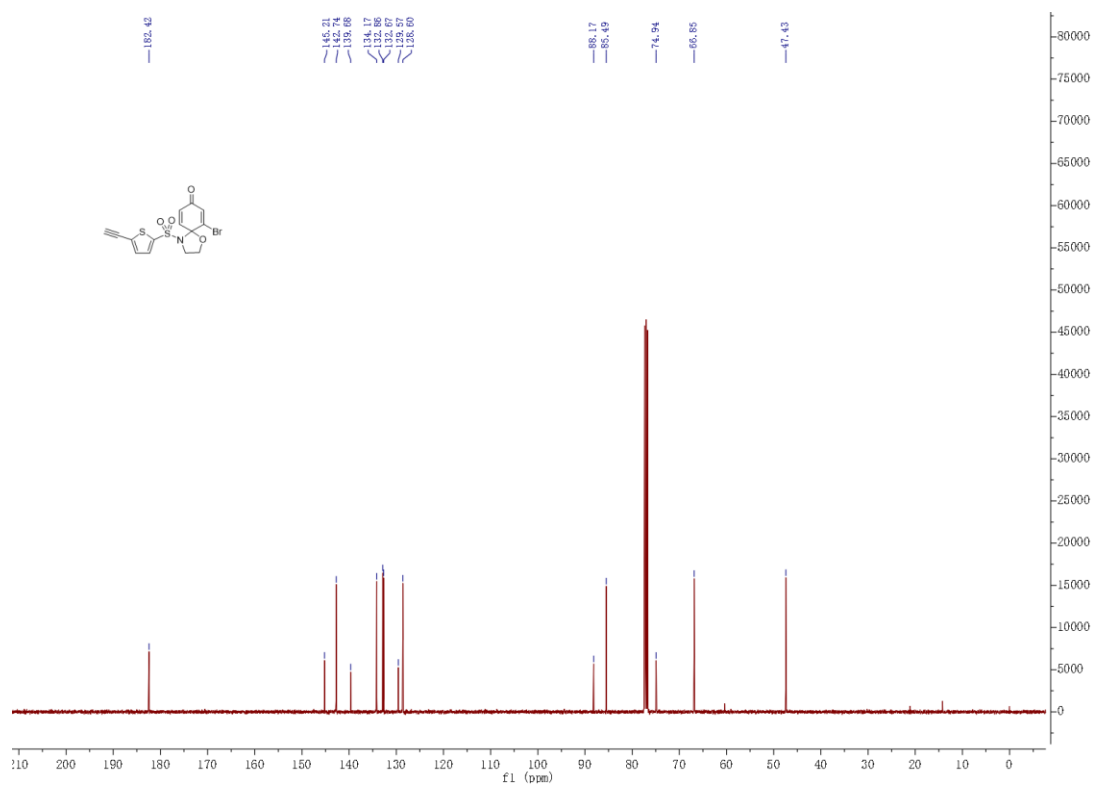
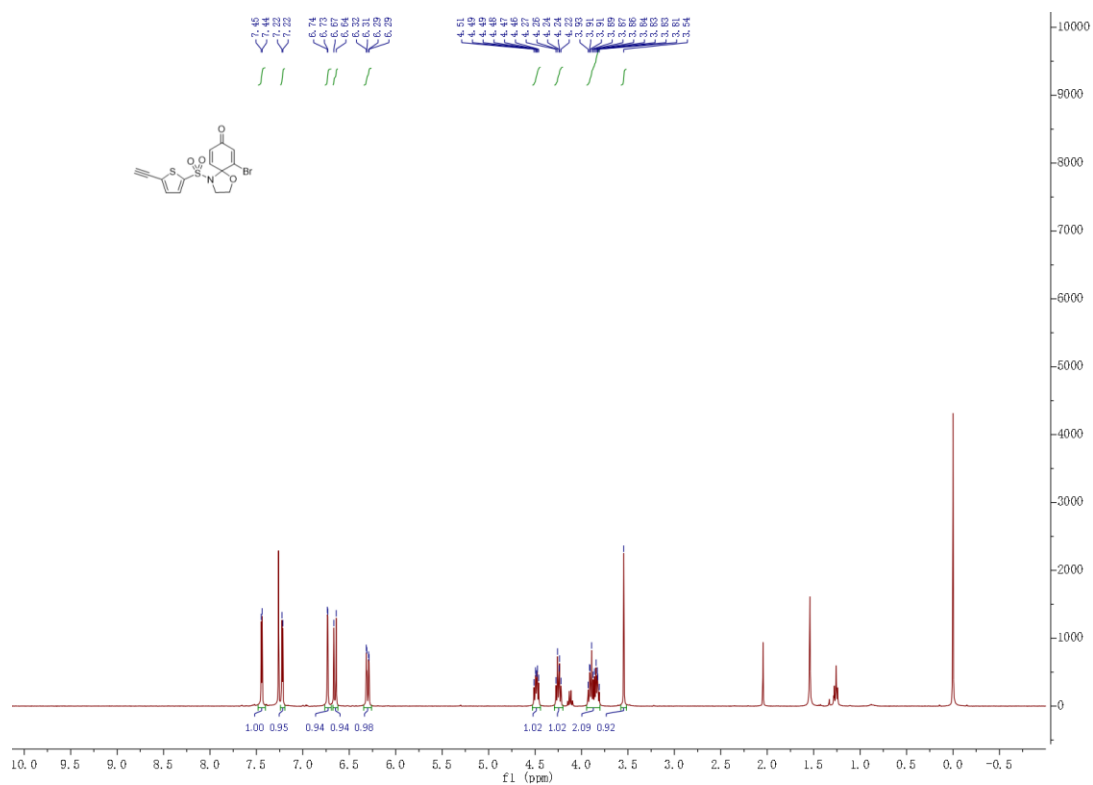
4-((5-Ethynylthiophen-2-yl)sulfonyl)-6-fluoro-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6b)



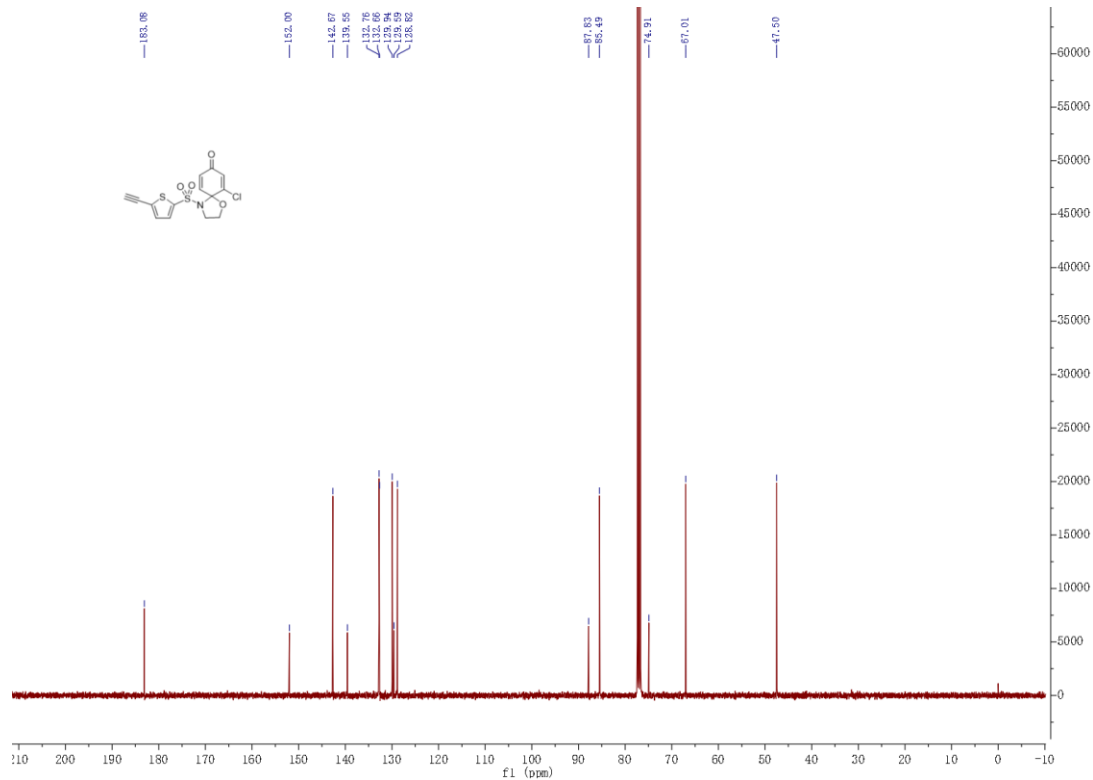
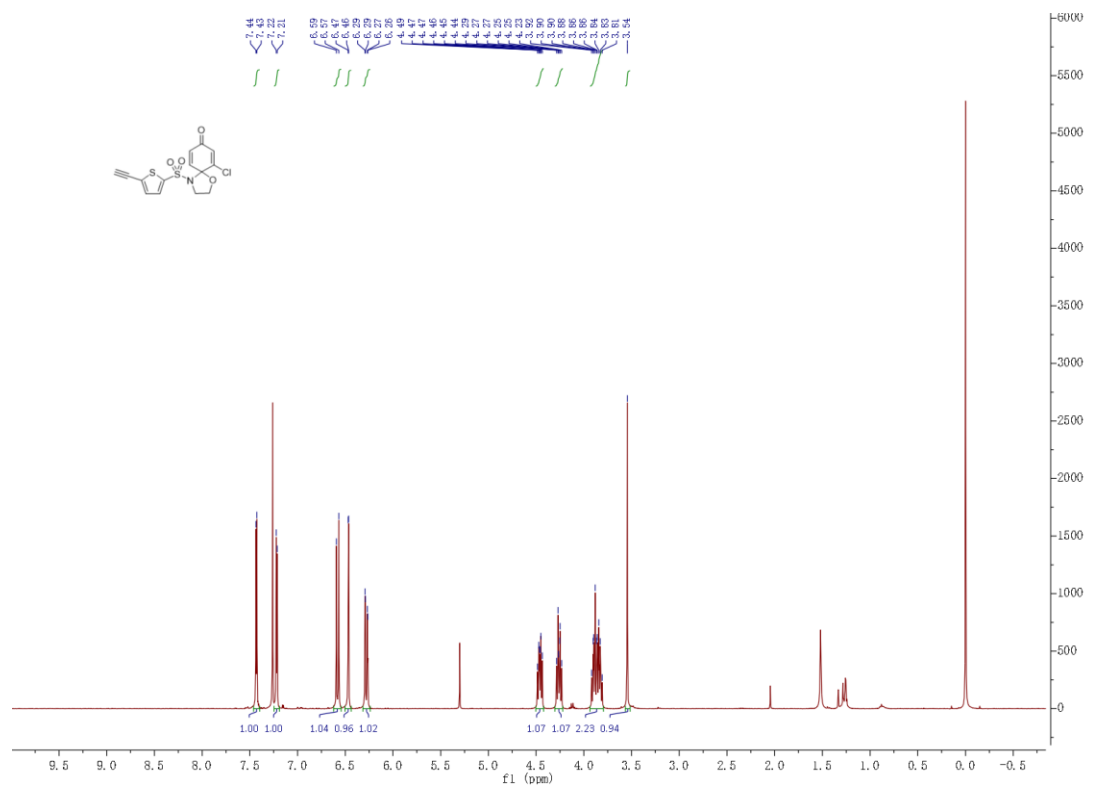
4-((5-Ethynylthiophen-2-yl)sulfonyl)-6-methyl-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6c)



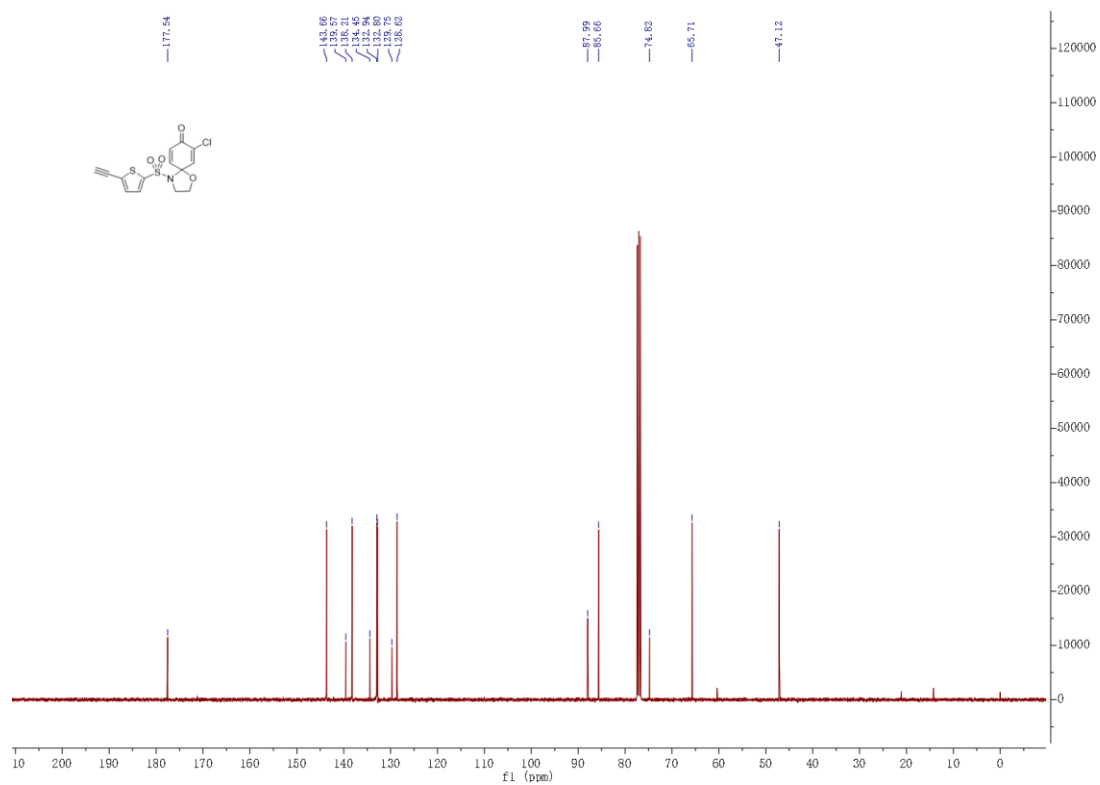
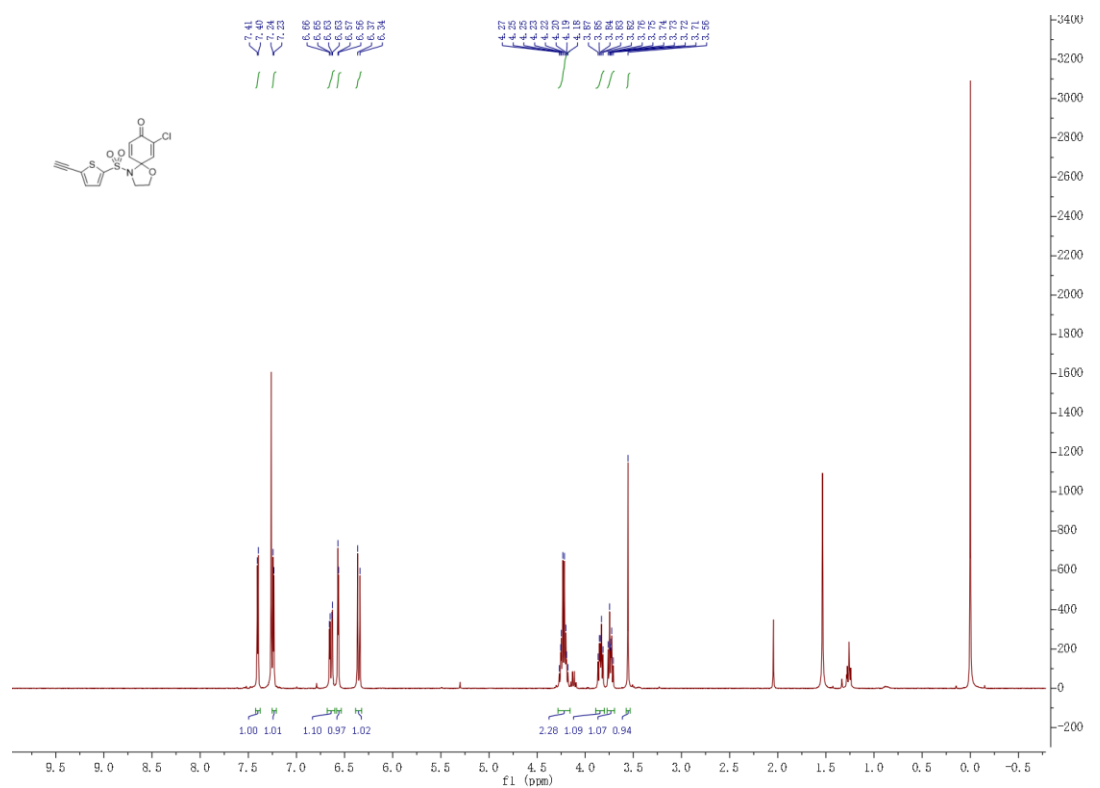
6-Bromo-4-((5-ethynylthiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6d)



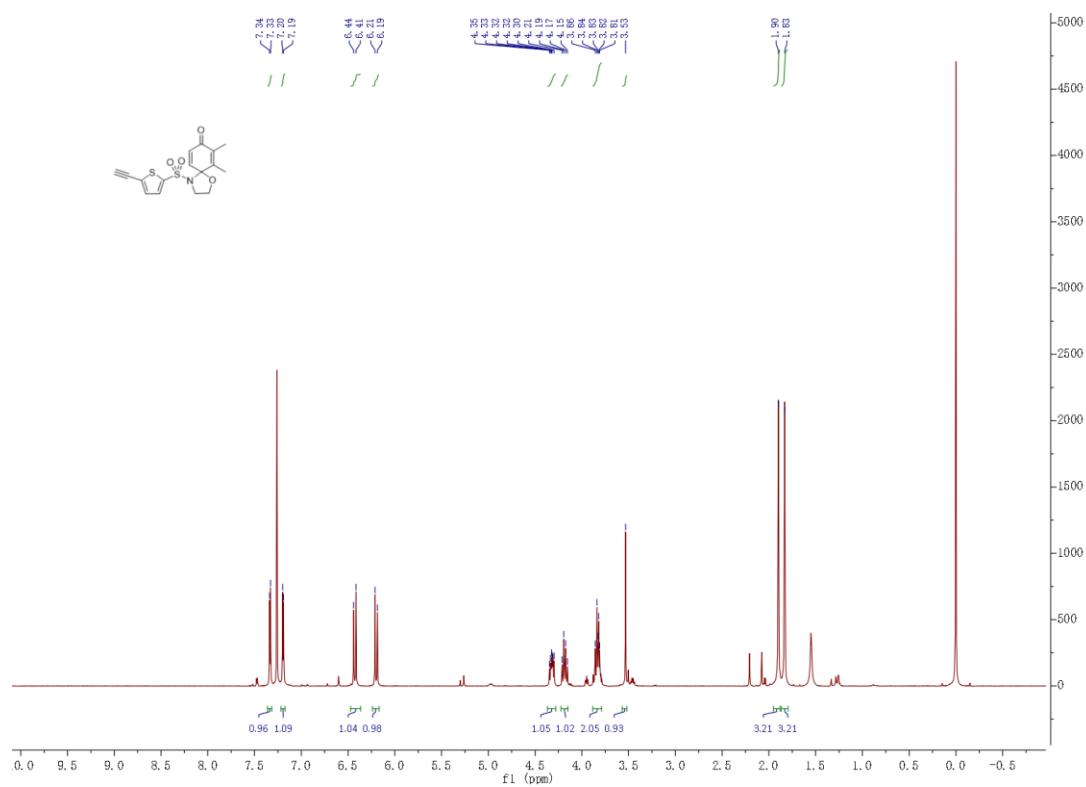
6-Chloro-4-((5-ethynylthiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6e)

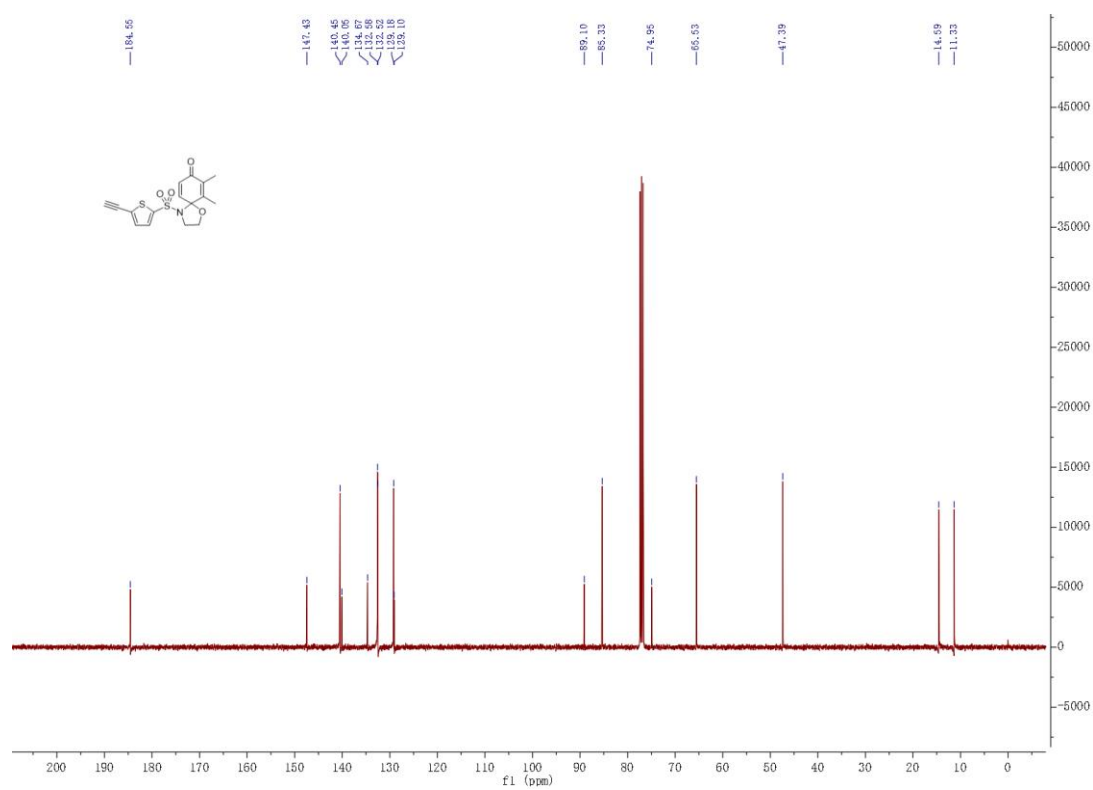


7-Chloro-4-((5-ethynylthiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (6f)

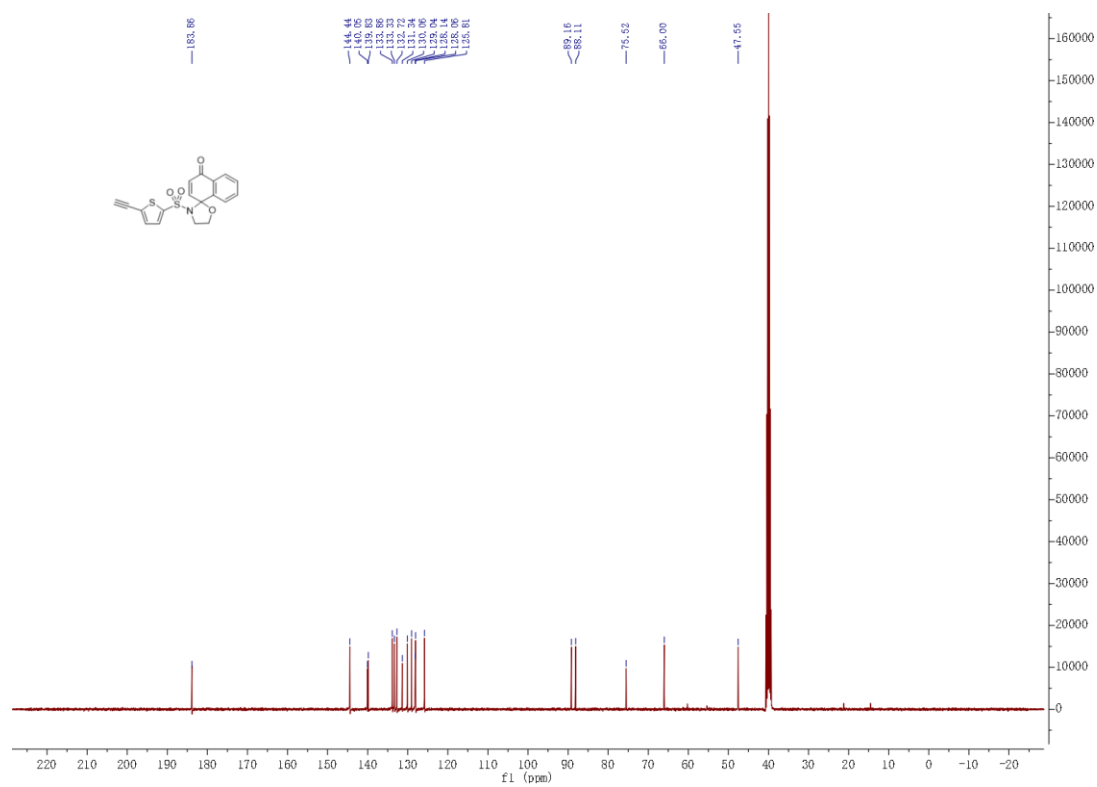
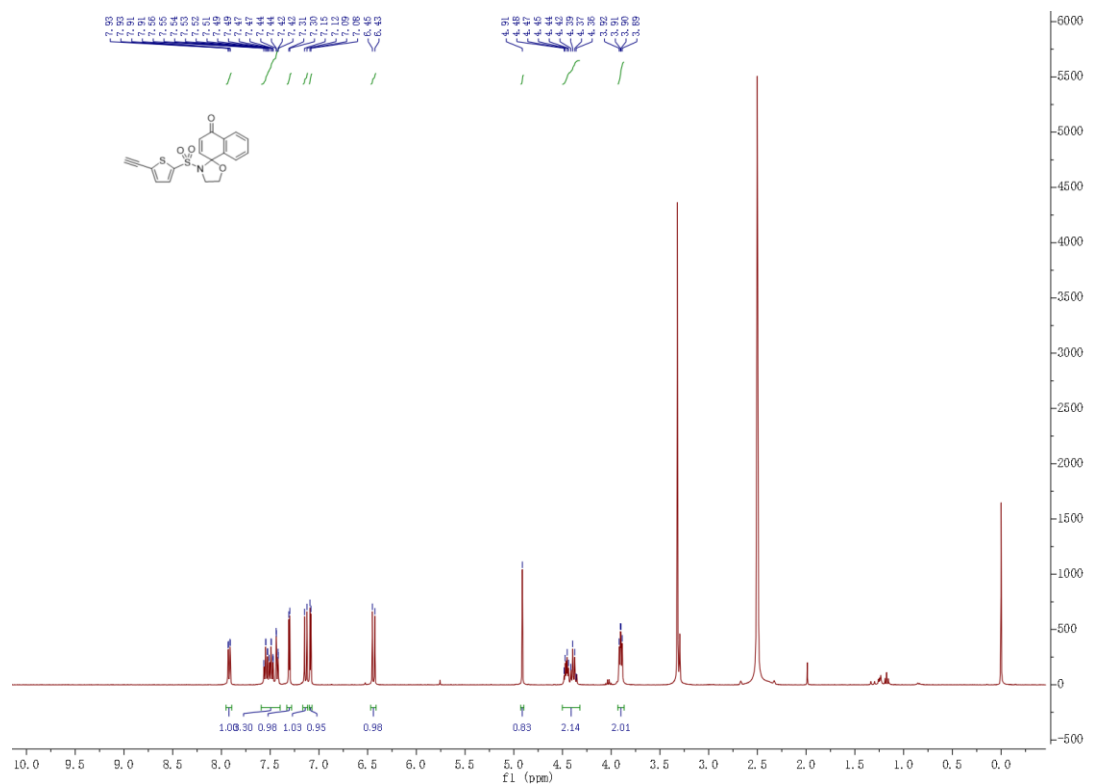


**4-((5-Ethynylthiophen-2-yl)sulfonyl)-6,7-dimethyl-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one
(6g)**

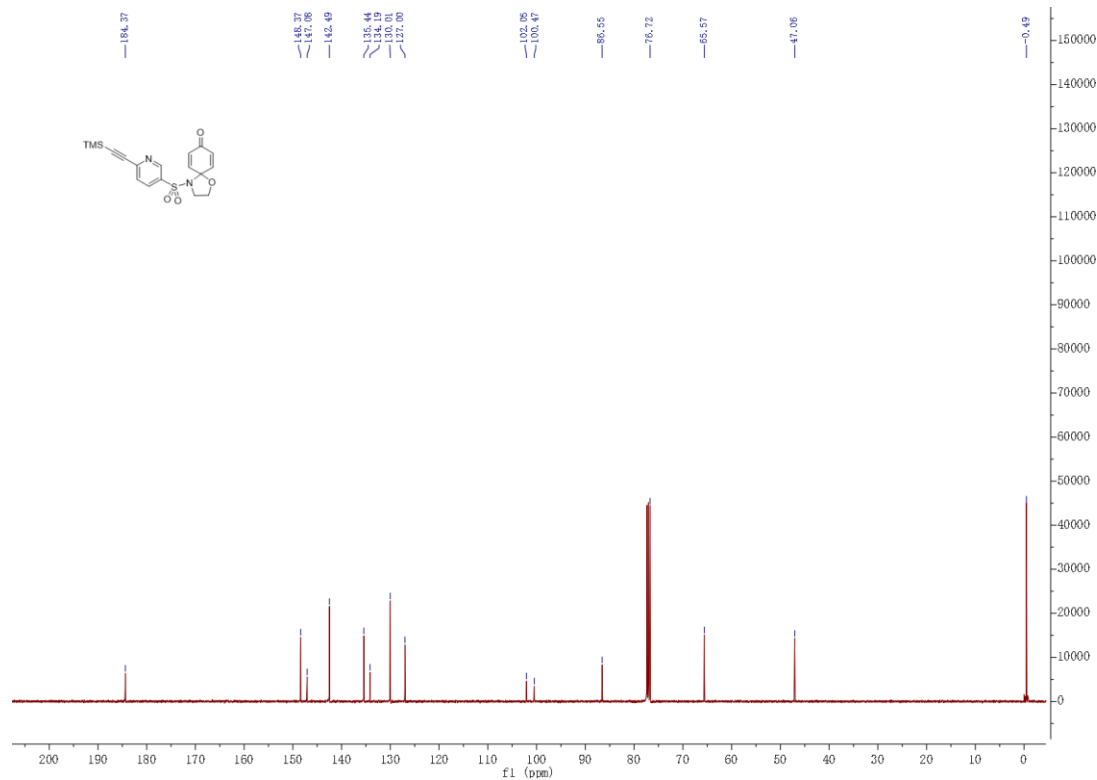
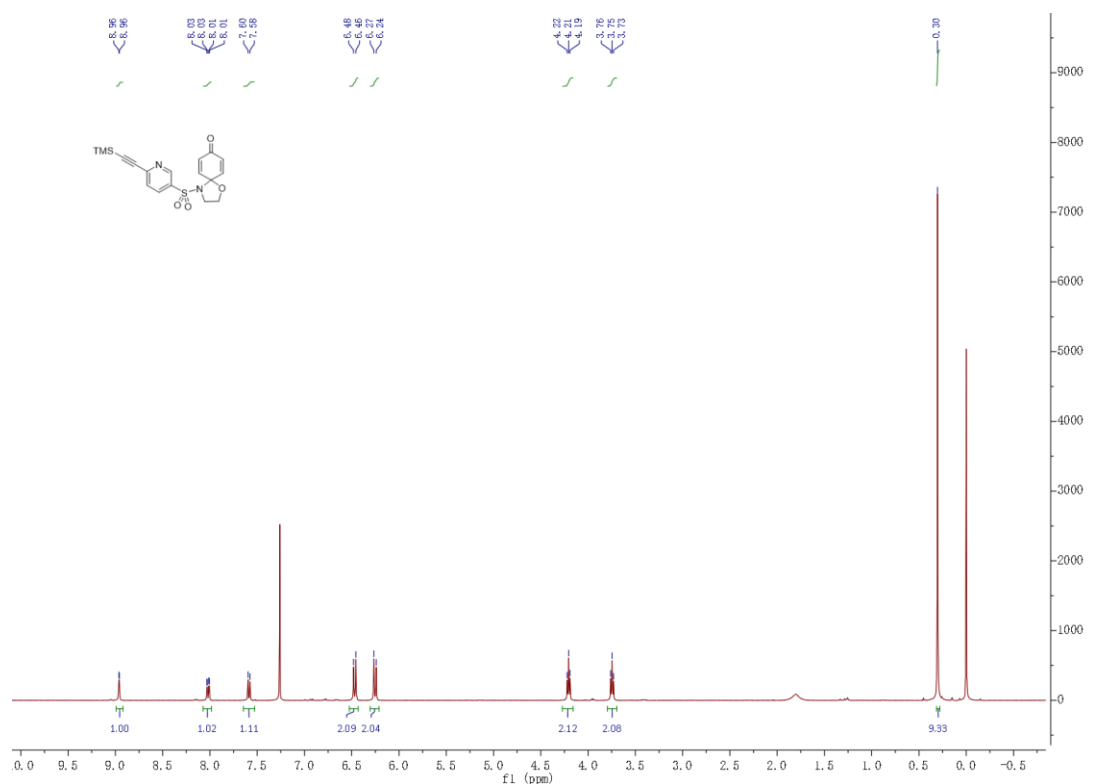




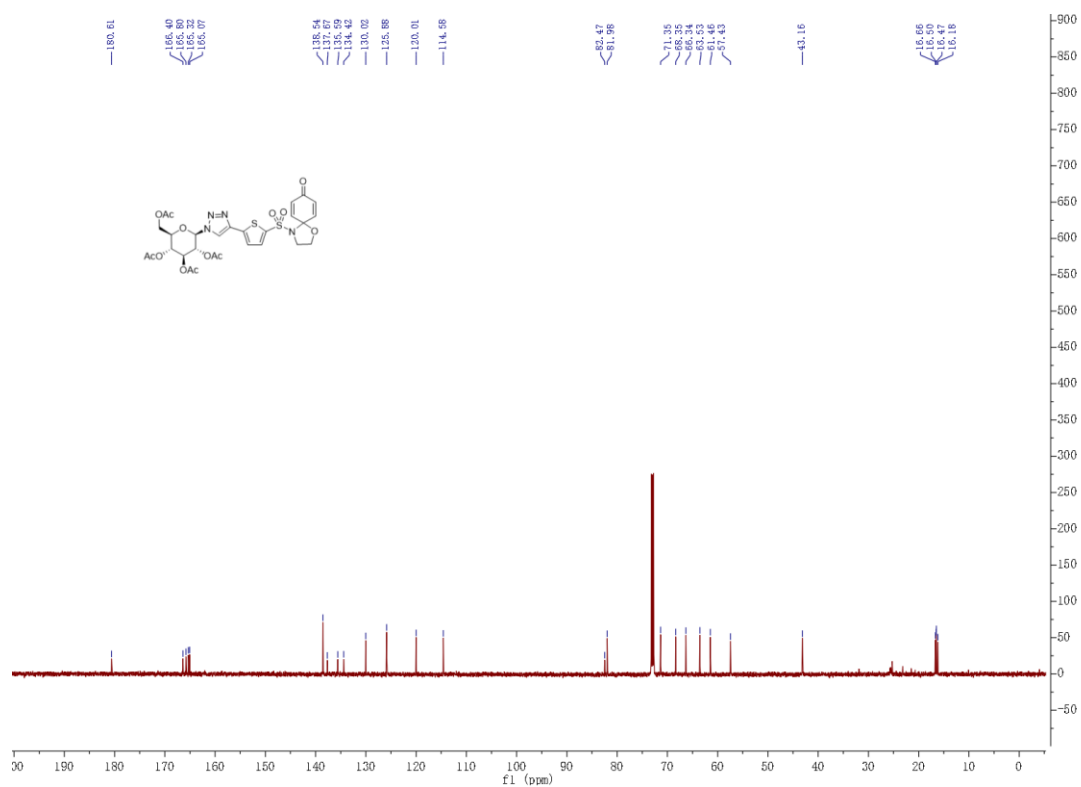
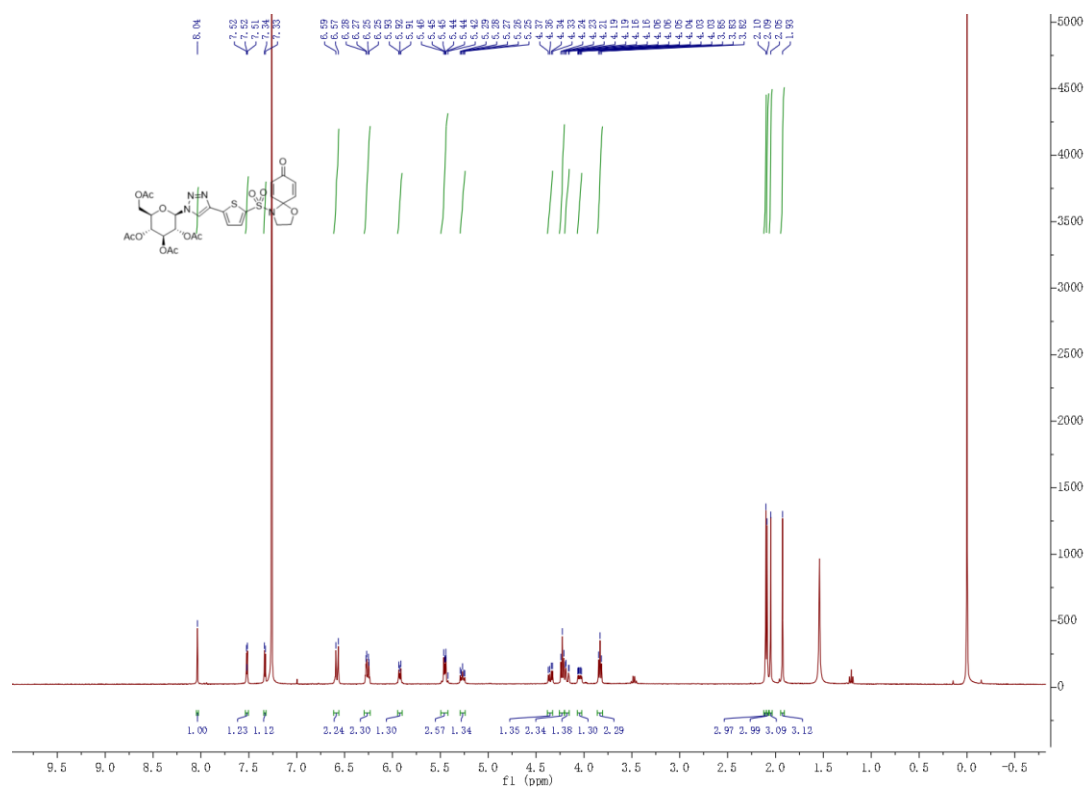
3'-((5-Ethynylthiophen-2-yl)sulfonyl)-4H-spiro[naphthalene-1,2'-oxazolidin]-4-one (6h)



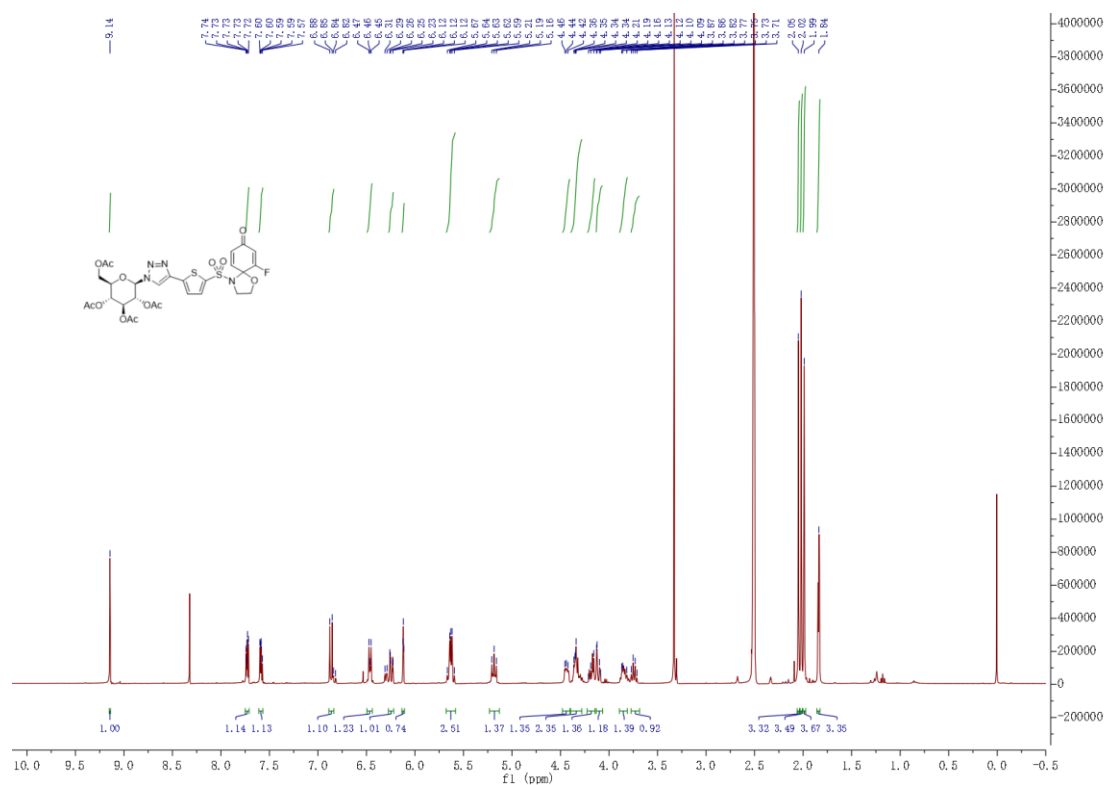
**4-((6-((Trimethylsilyl)ethynyl)pyridin-3-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one
(6i)**

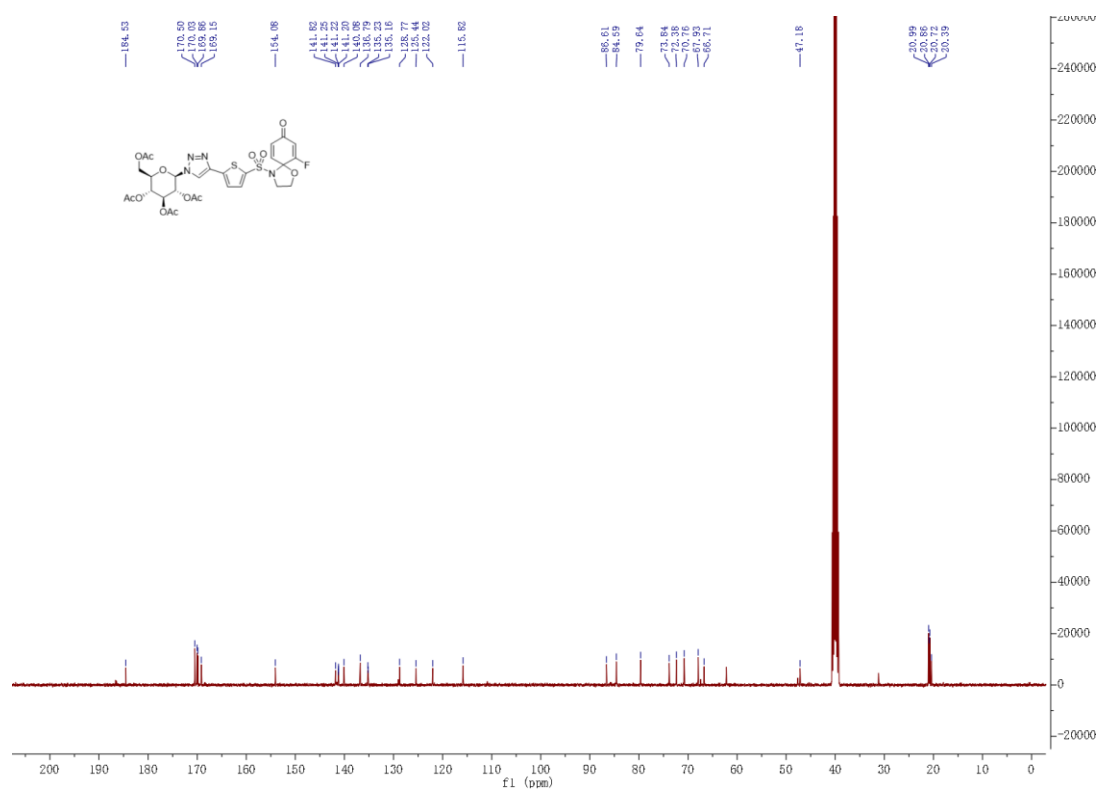


(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7a)

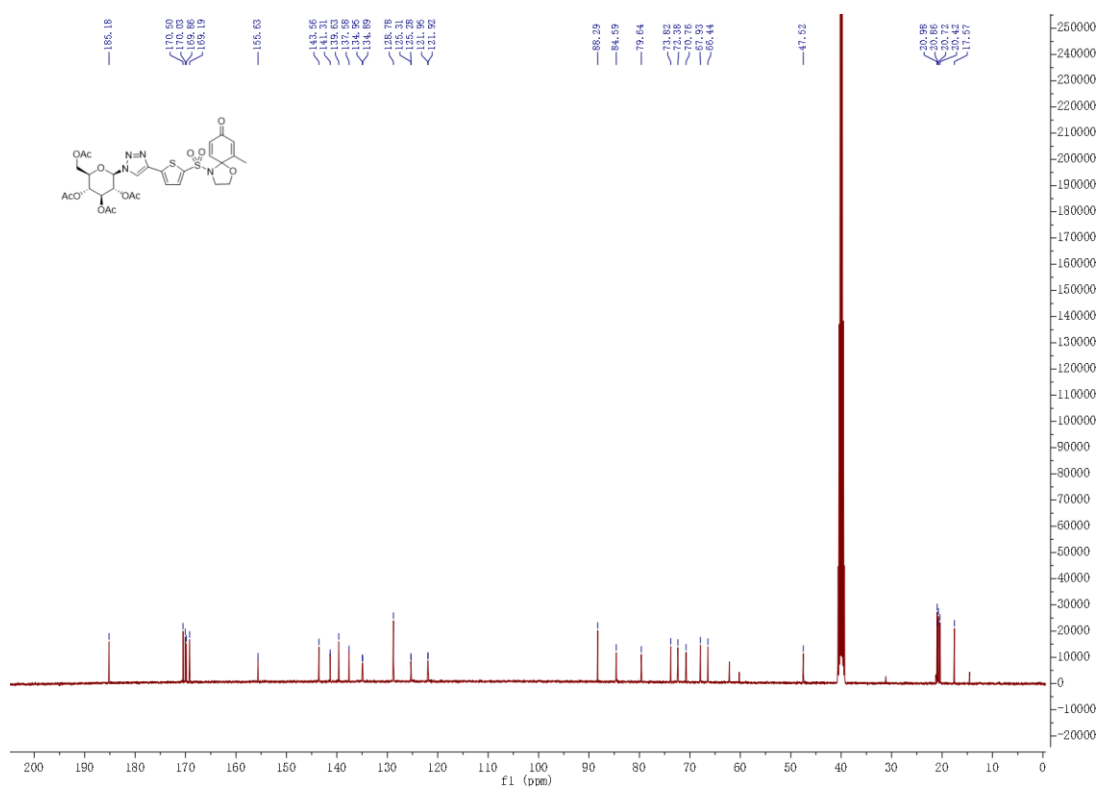
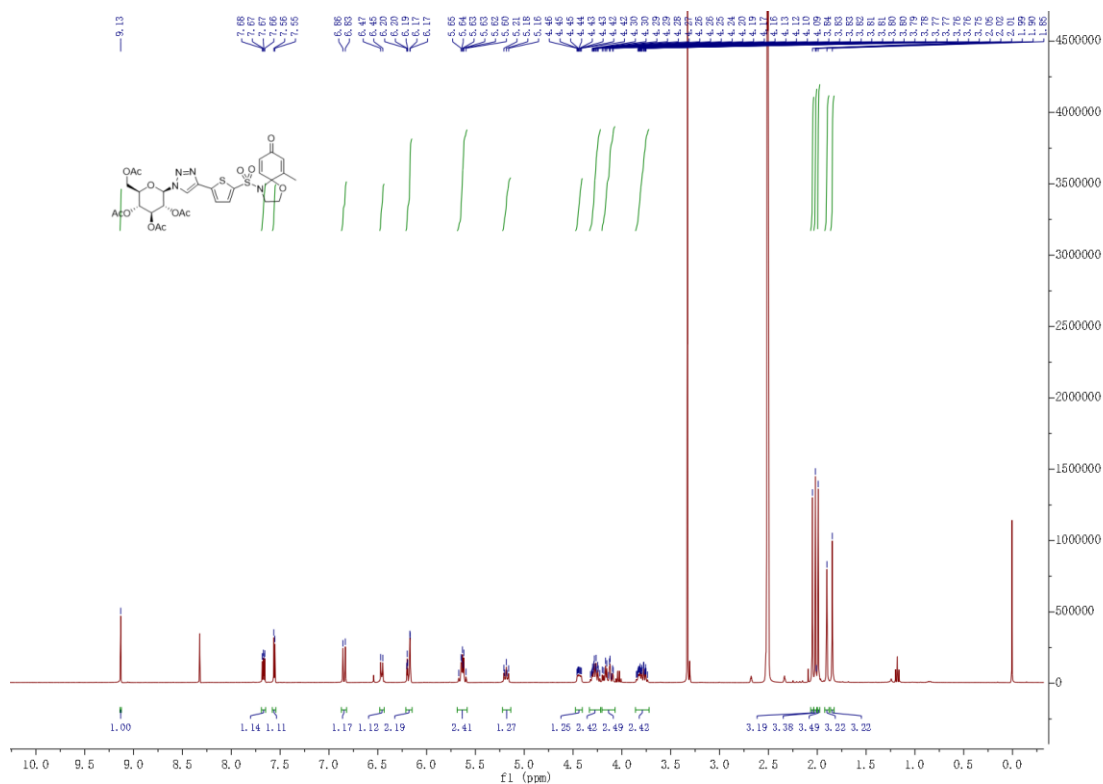


(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((6-fluoro-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7b)



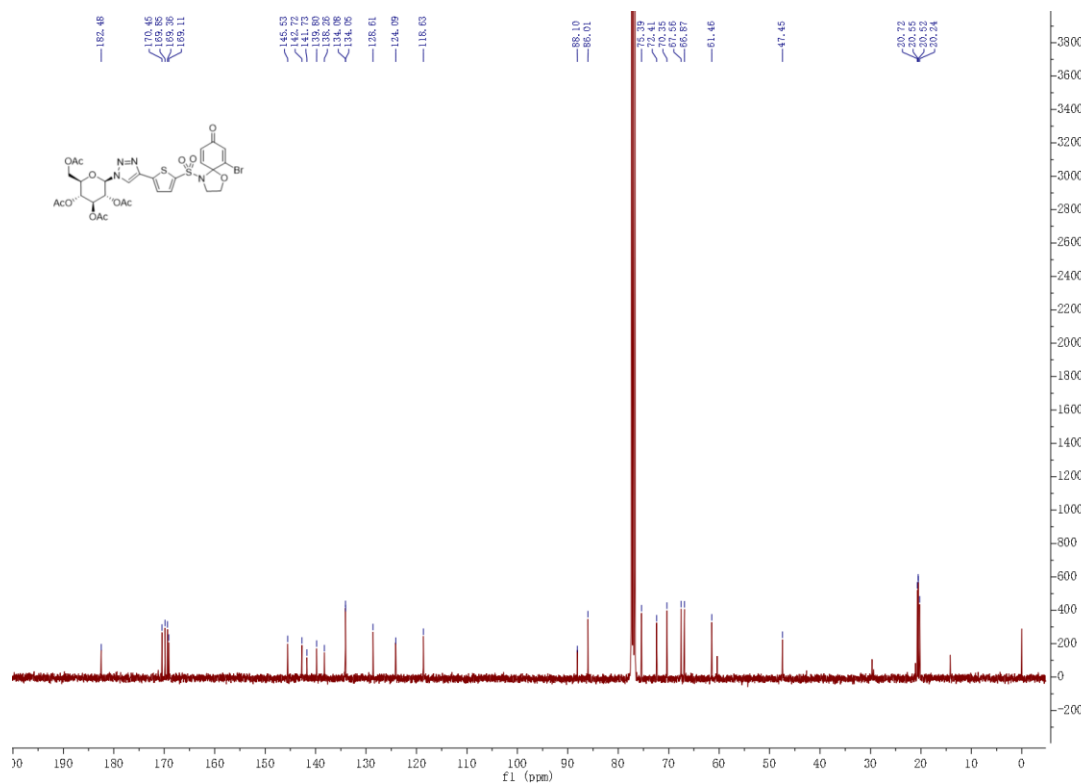
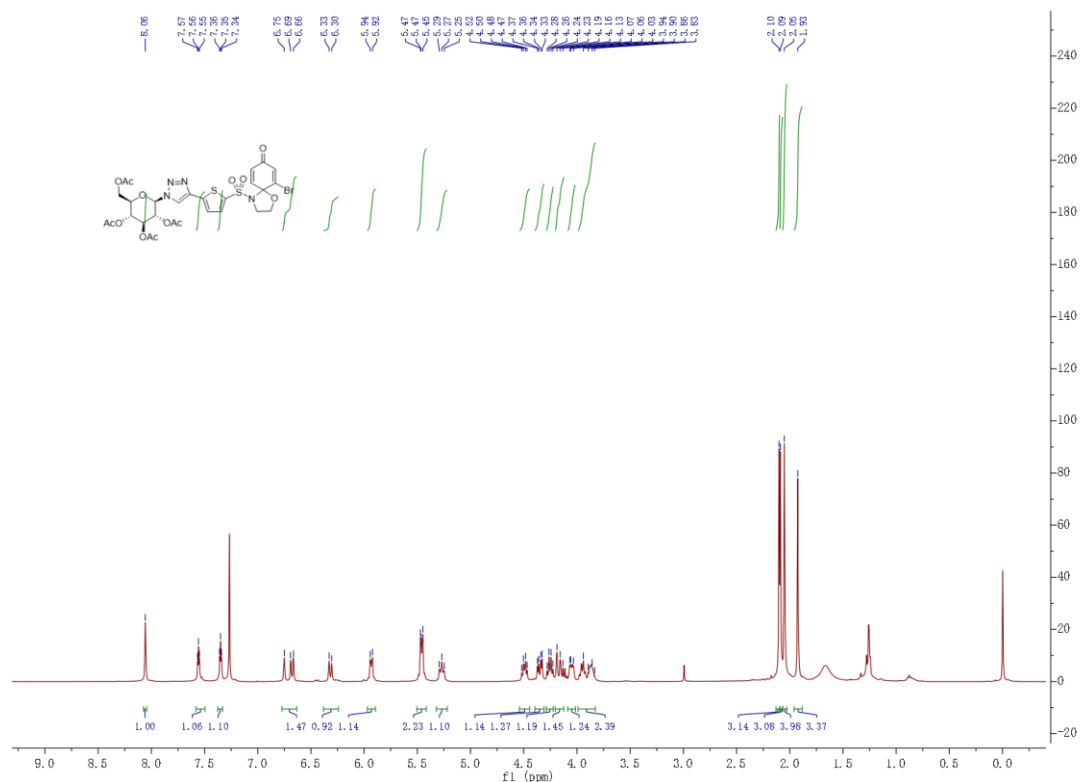


(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((6-methyl-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7c)

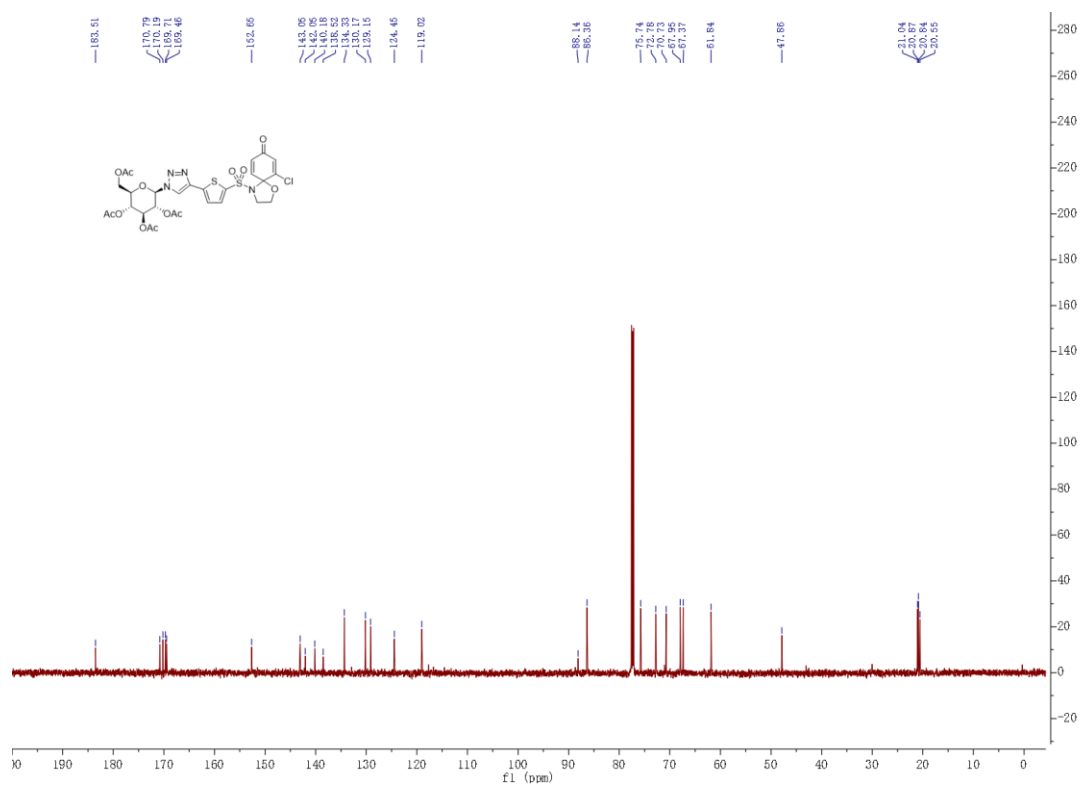
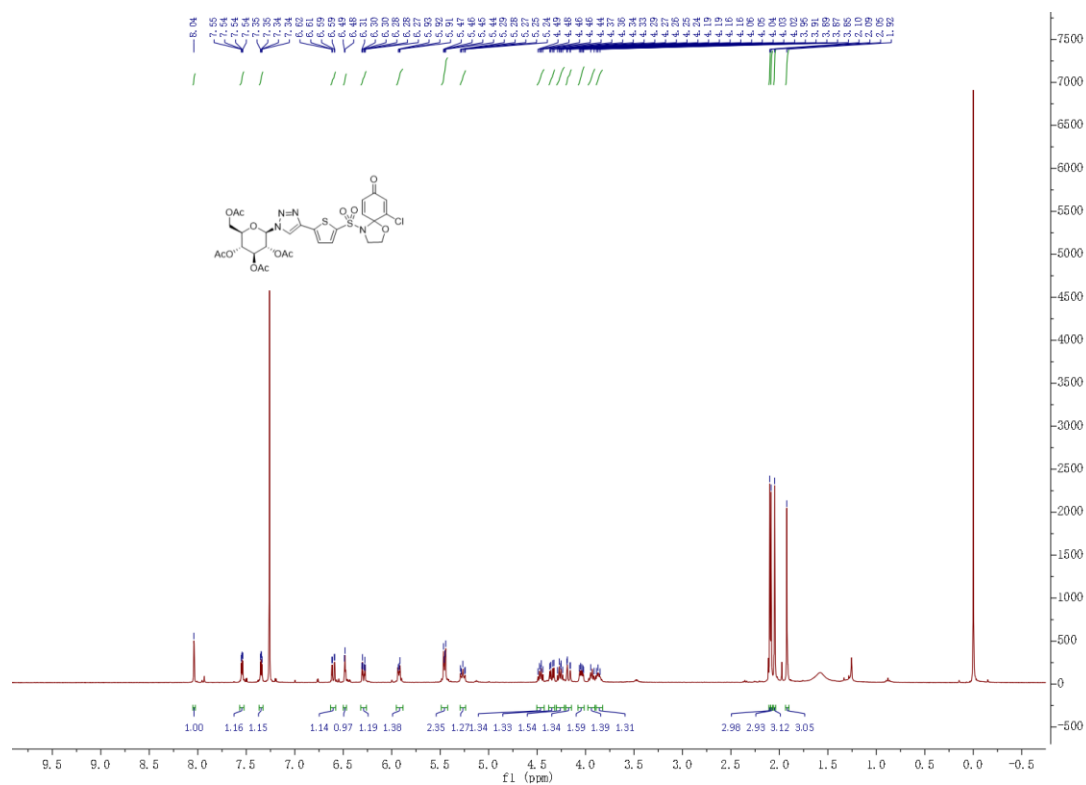


(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((6-bromo-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien

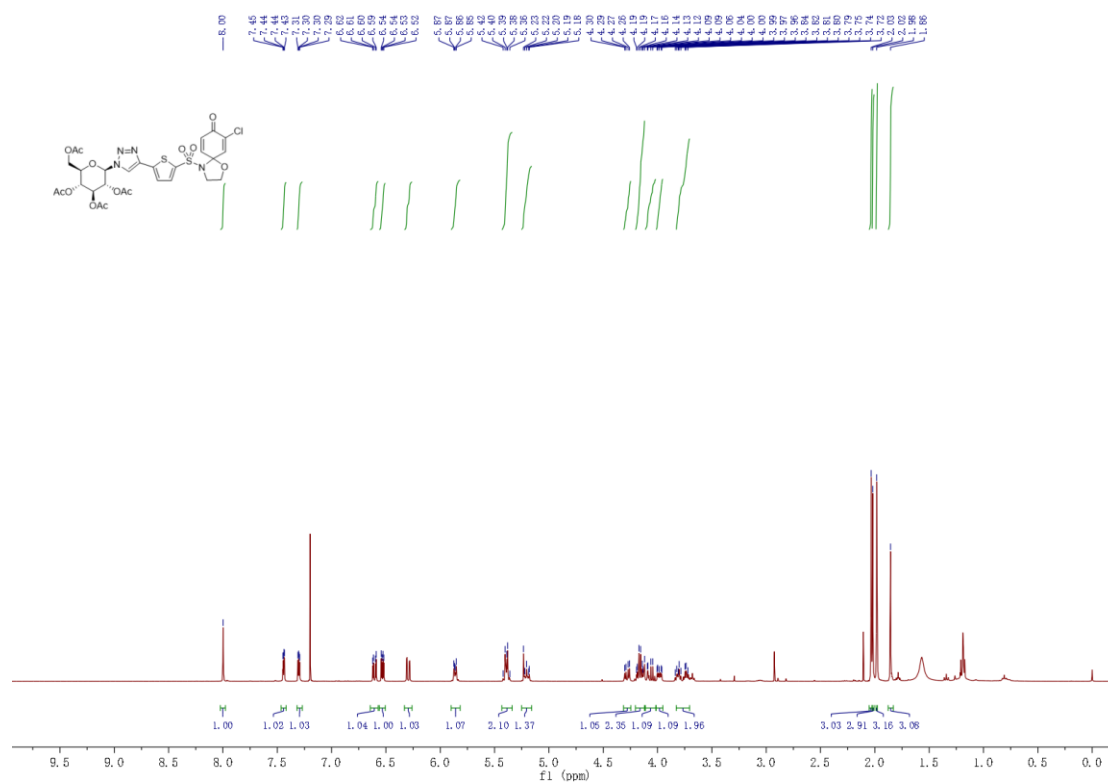
**-4-yl)sulfonyl)thiophen-2-yl)-1*H*-1,2,3-triazol-1-yl)tetrahydro-2*H*-pyran-3,4,5-triyl triacetate
(7d)**

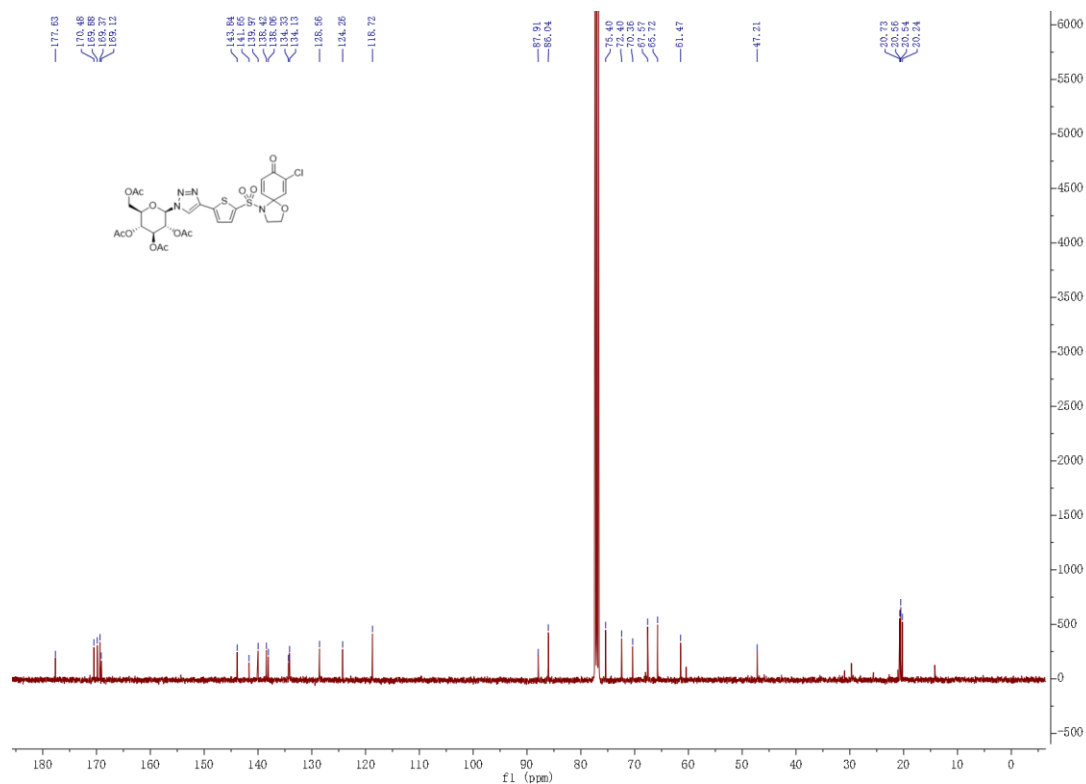


(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-(((6-chloro-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7e)

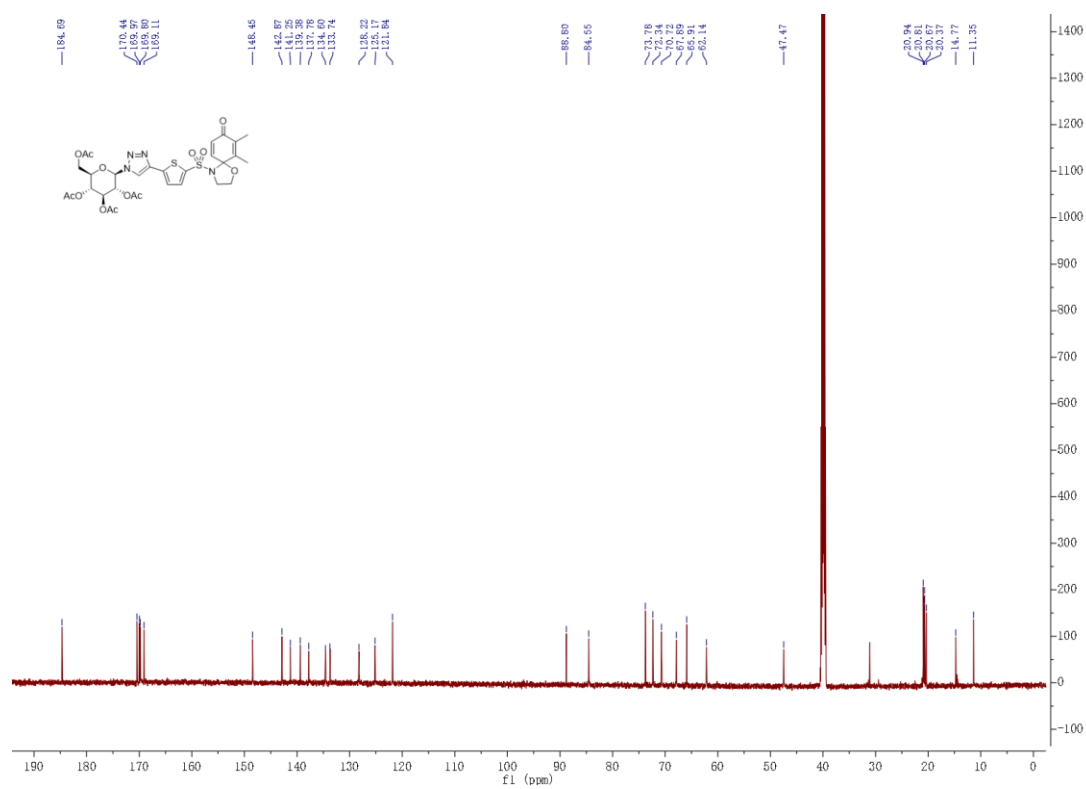
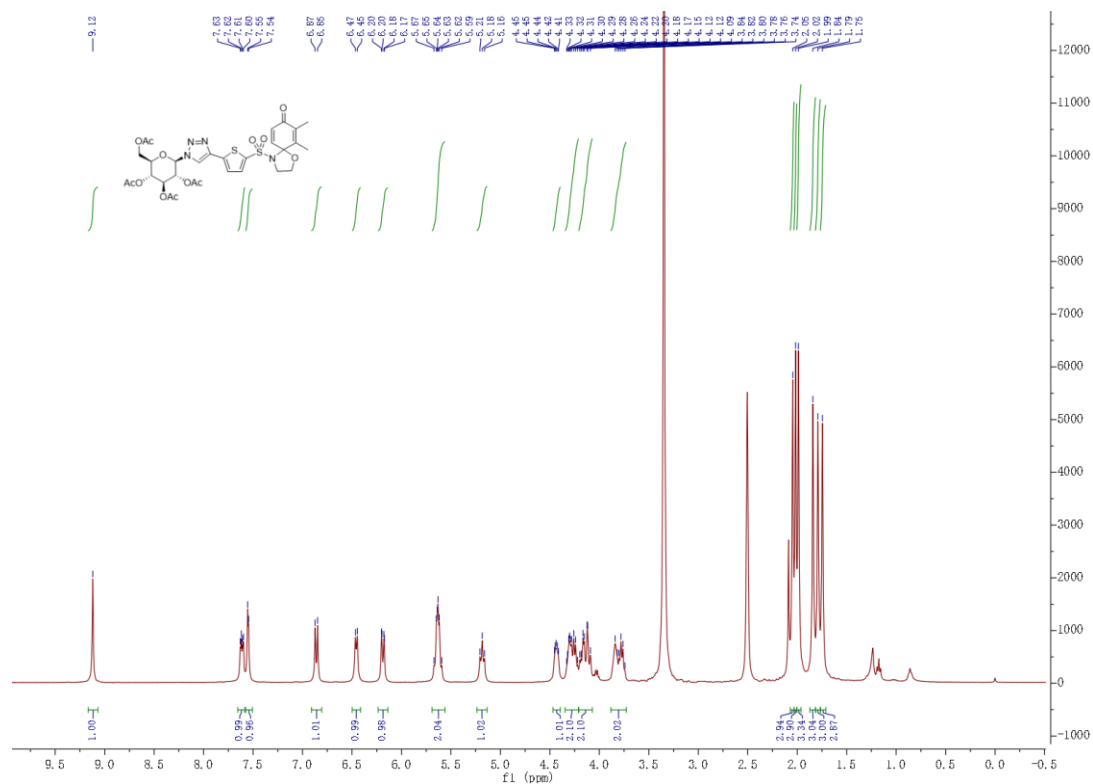


(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((7-chloro-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7f)



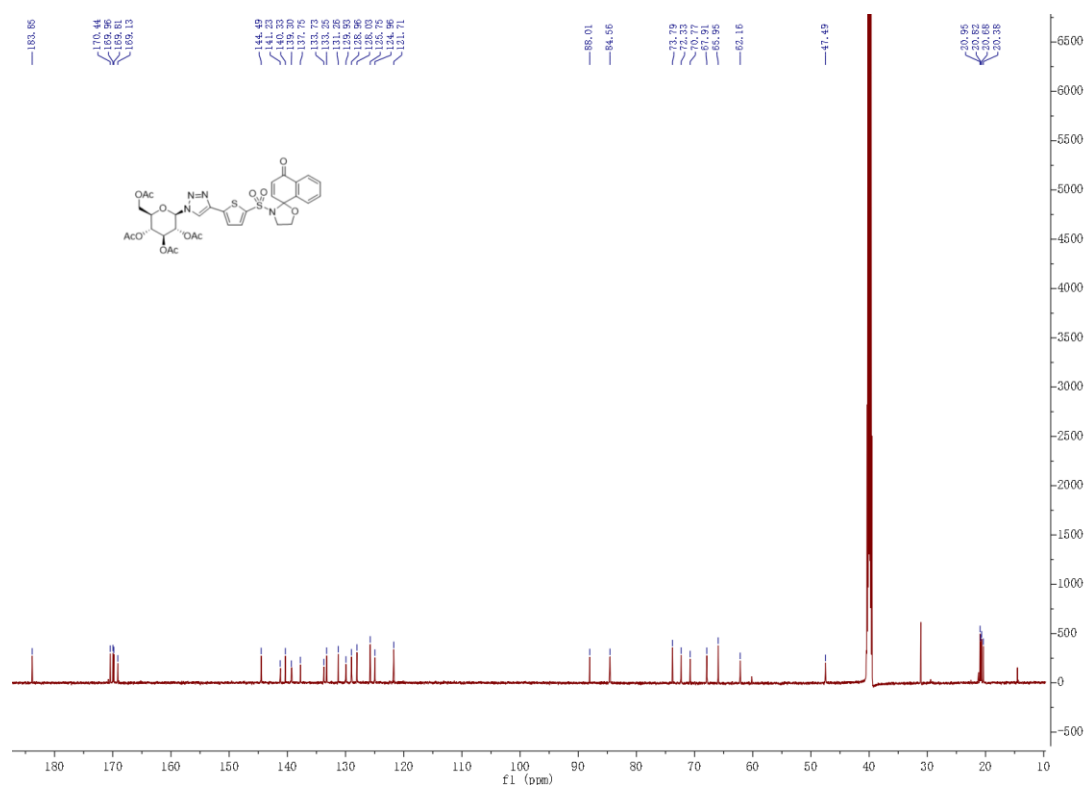
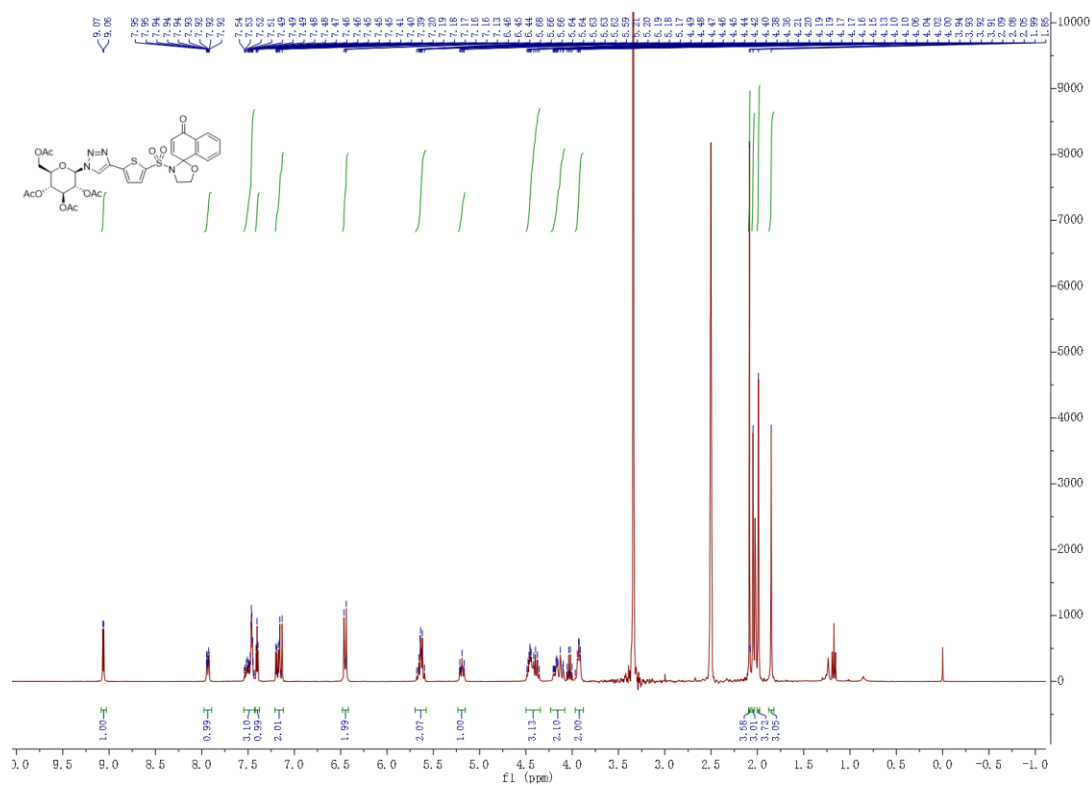


(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((6,7-dimethyl-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7g)

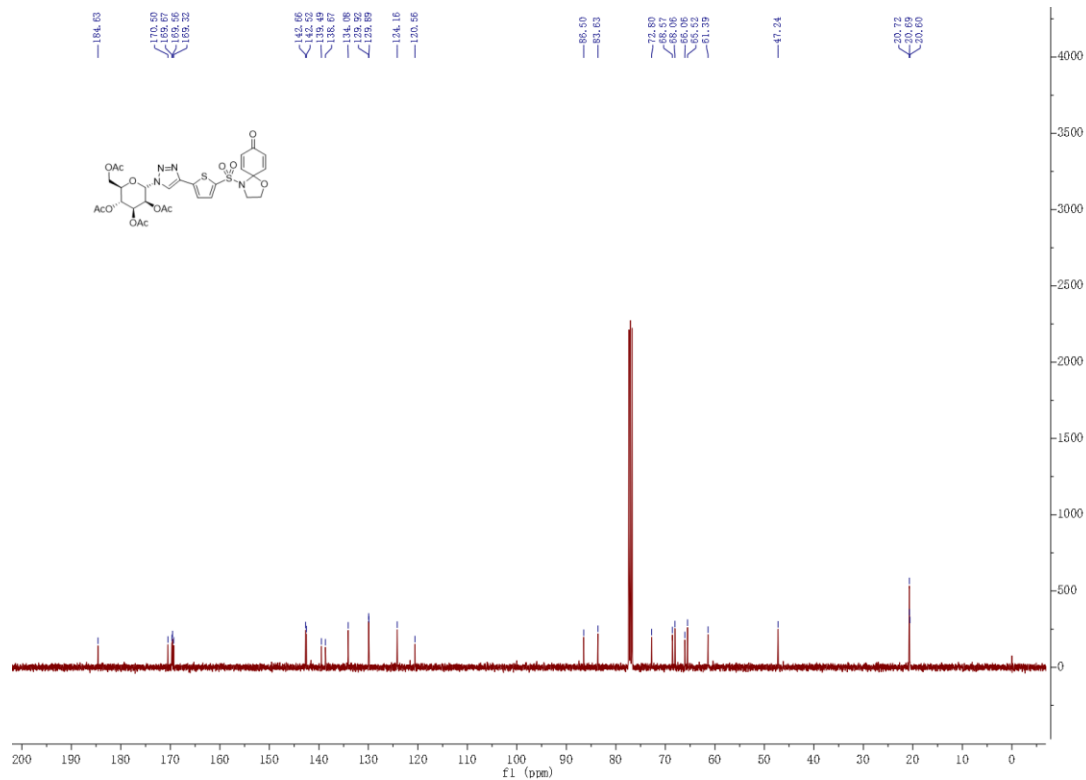
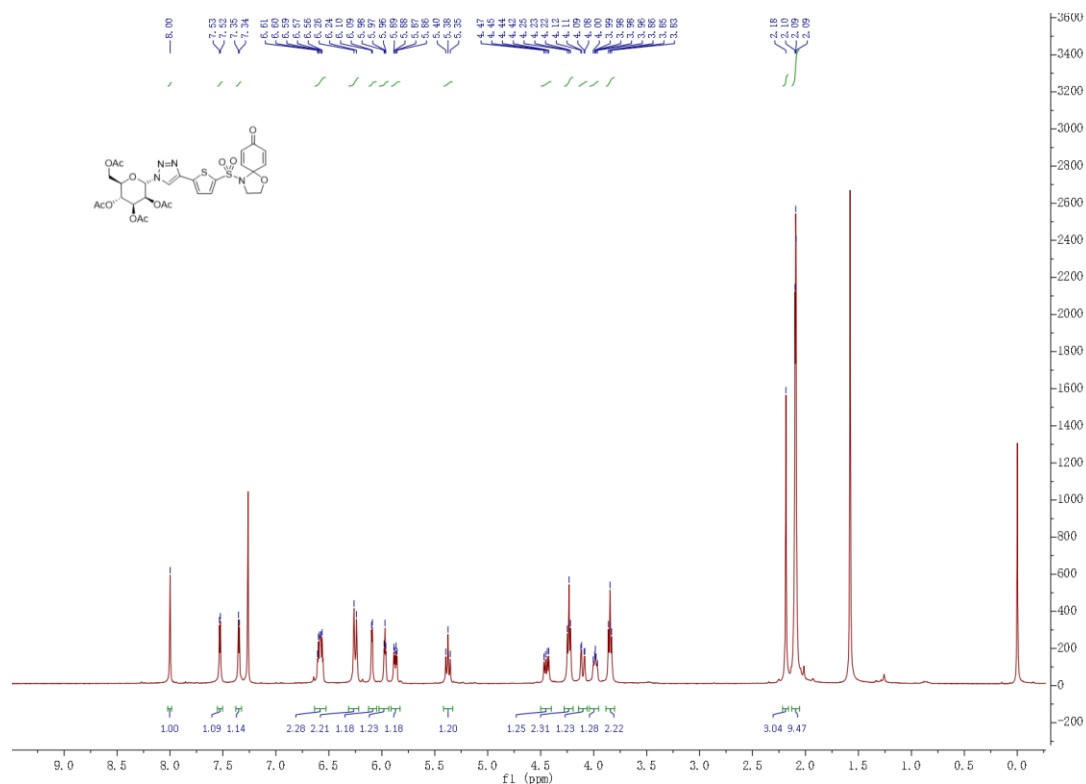


(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((4-oxo-4H-spiro[naphthalene-1,2'-oxazolidin]-3'-yl

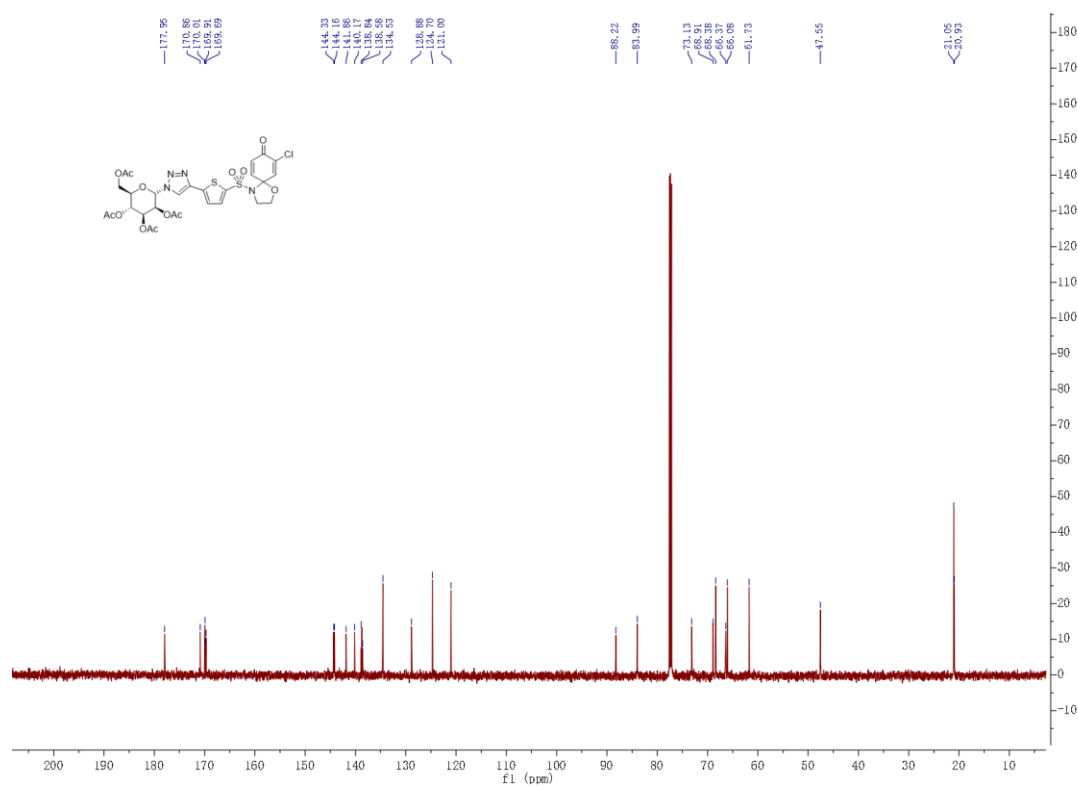
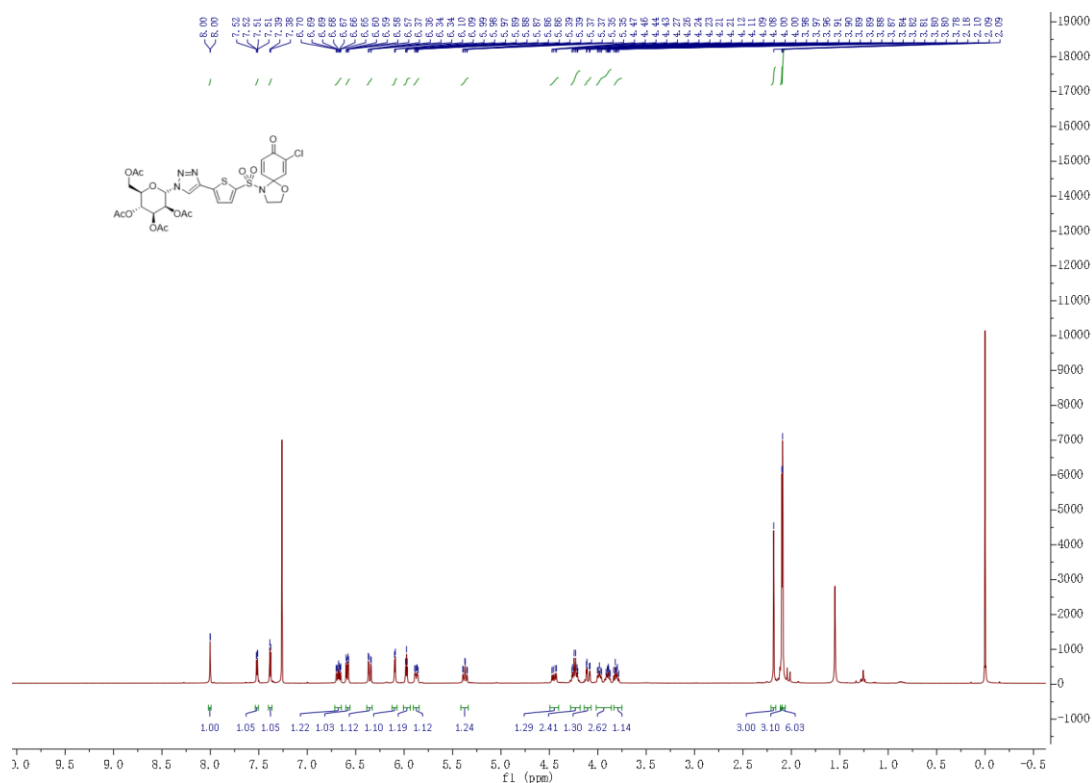
)sulfonyl)thiophen-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7h)



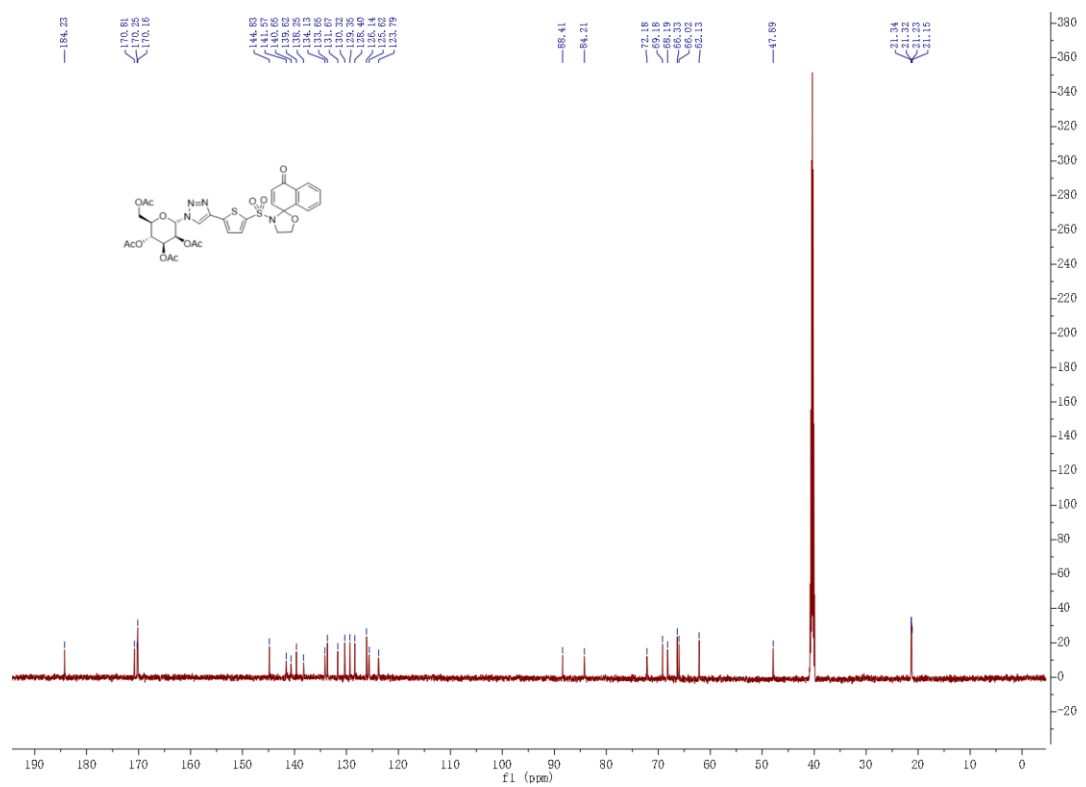
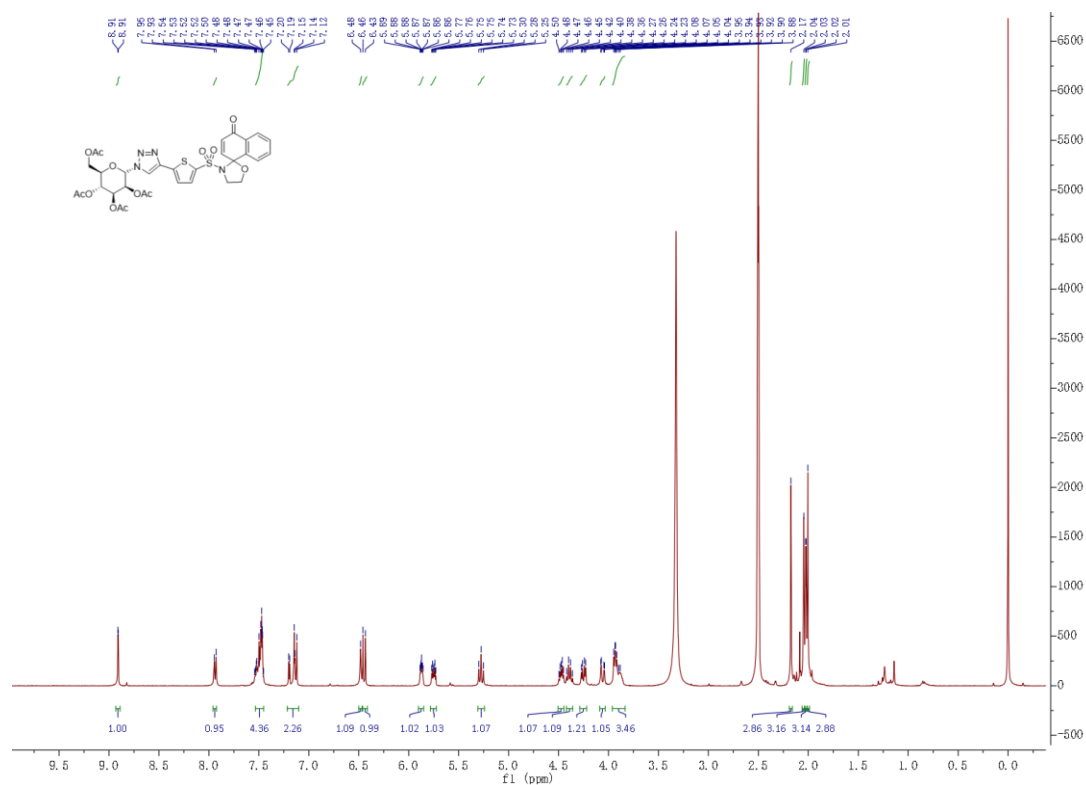
(2R,3R,4S,5S,6S)-2-(Acetoxymethyl)-6-(4-(5-((8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7i)



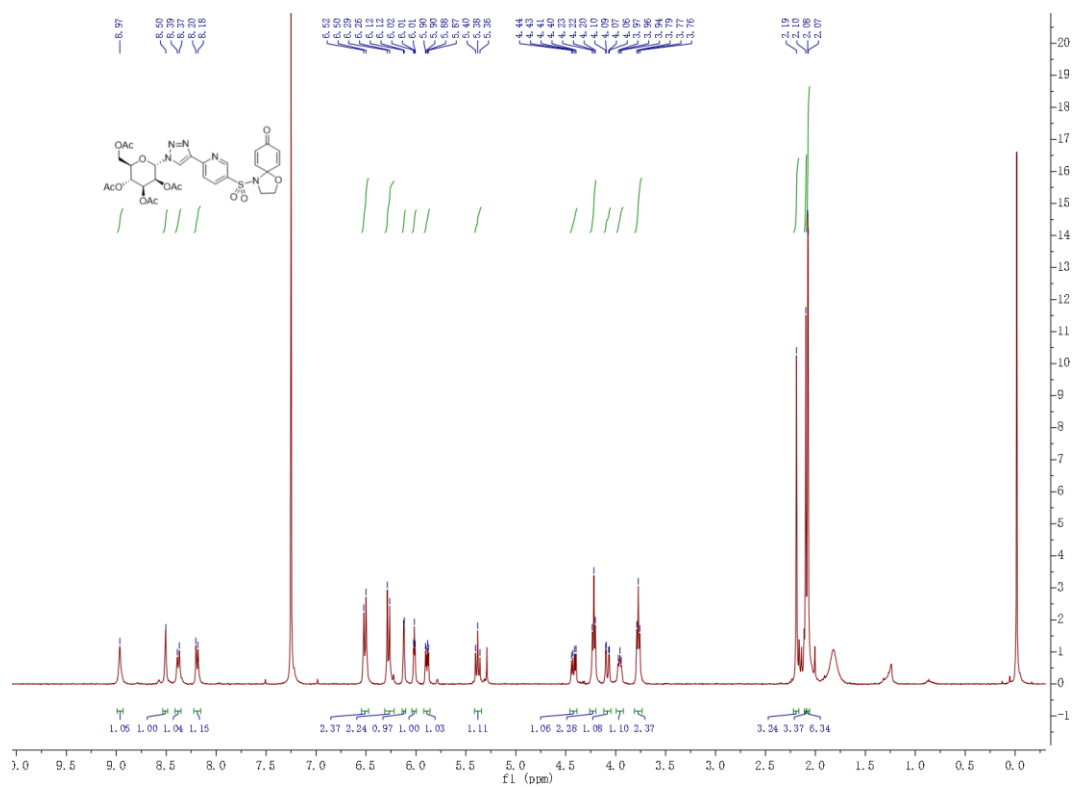
(2R,3R,4S,5S,6S)-2-(Acetoxymethyl)-6-(4-(5-((7-chloro-8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)thiophen-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7j)

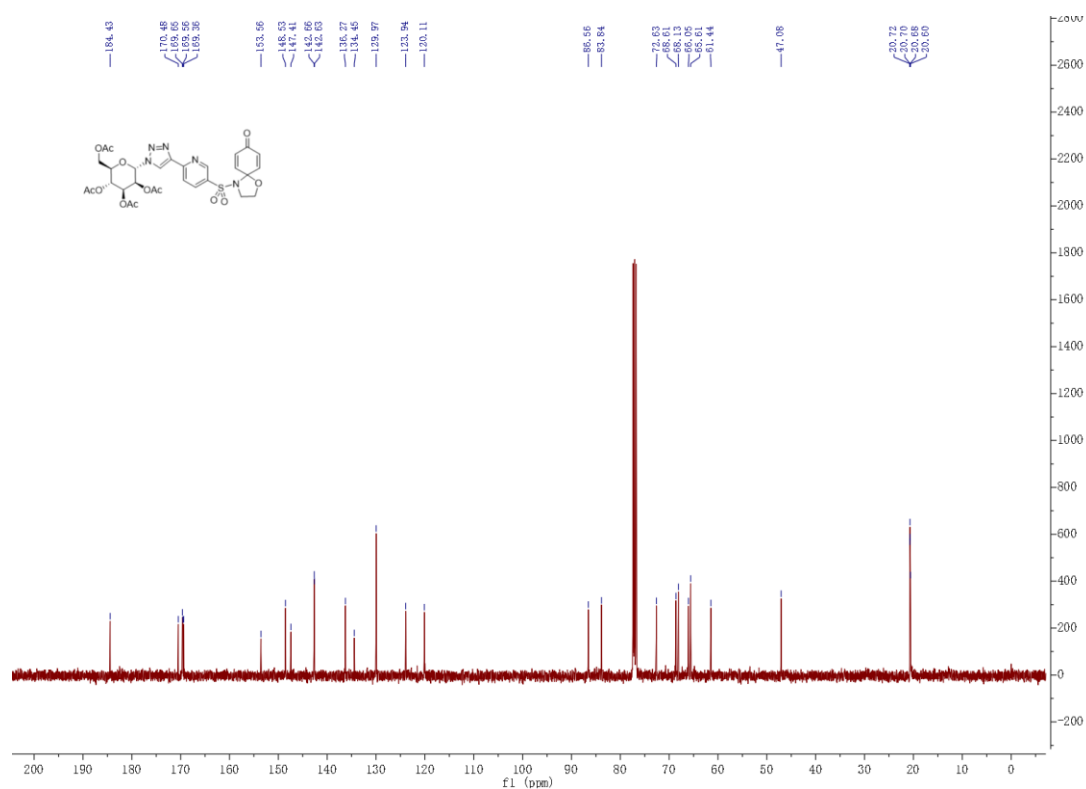


(2R,3R,4S,5S,6S)-2-(Acetoxymethyl)-6-(4-(5-((4-oxo-4H-spiro[naphthalene-1,2'-oxazolidin]-3'-yl)sulfonyl)thiophen-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7k)

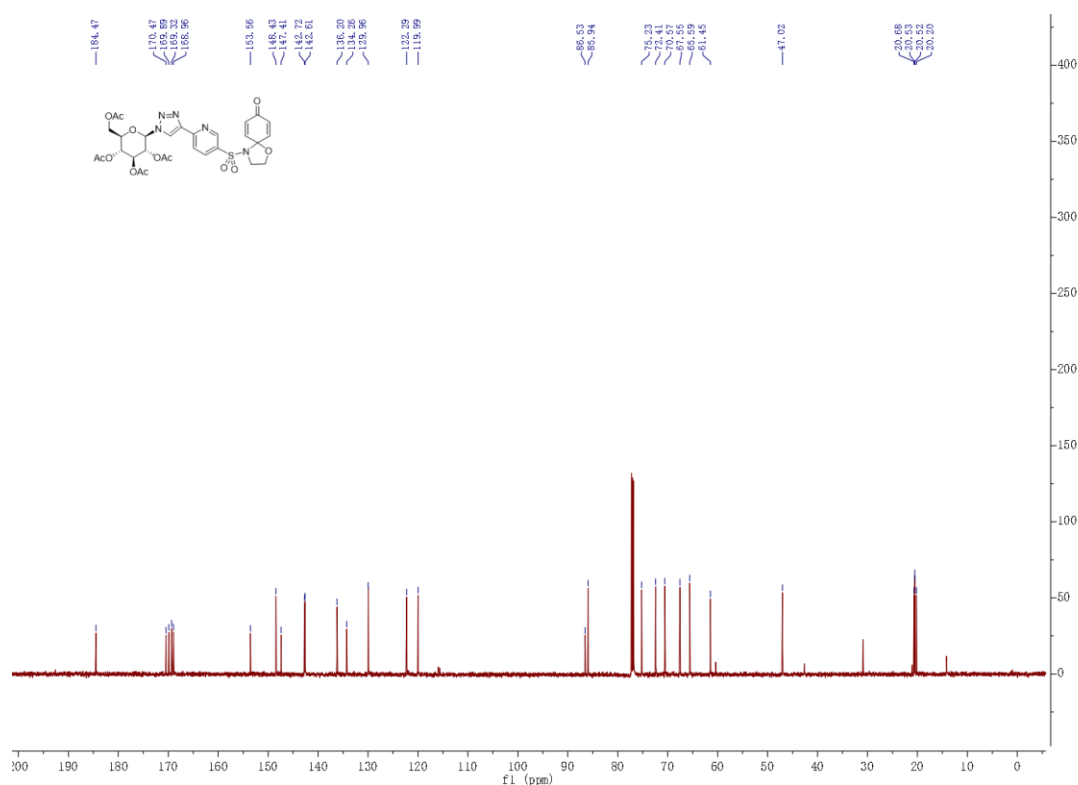
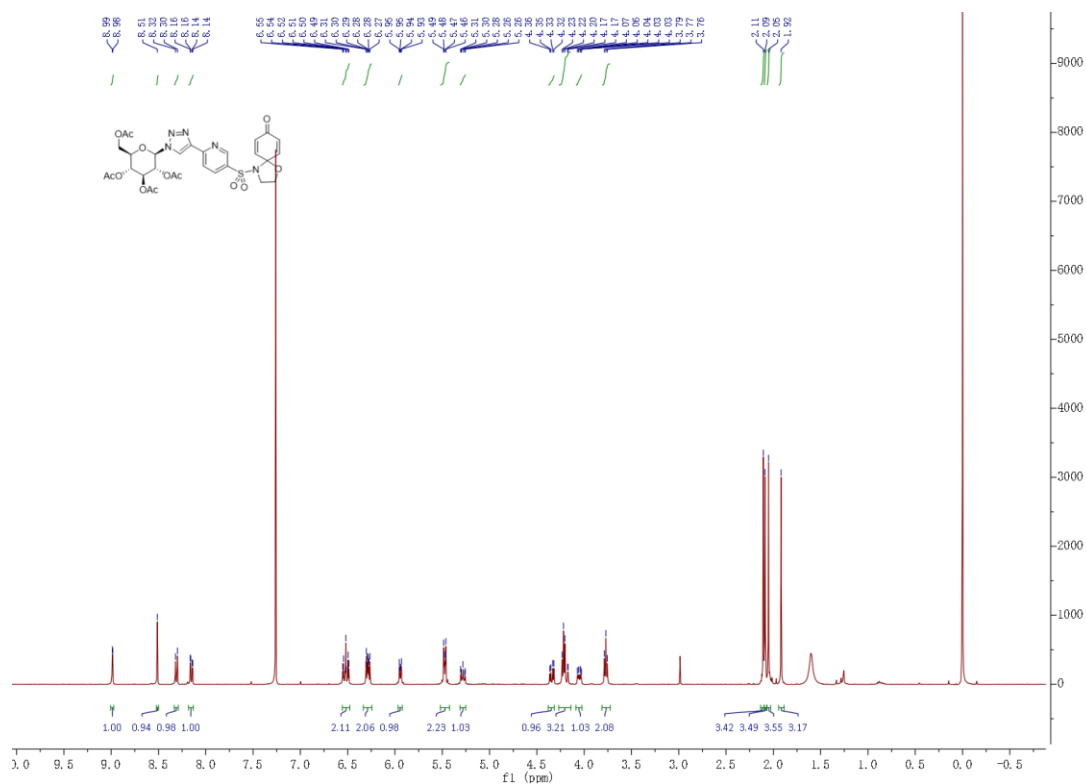


(2R,3R,4S,5S,6S)-2-(Acetoxymethyl)-6-(4-(5-((8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)pyridin-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7l)

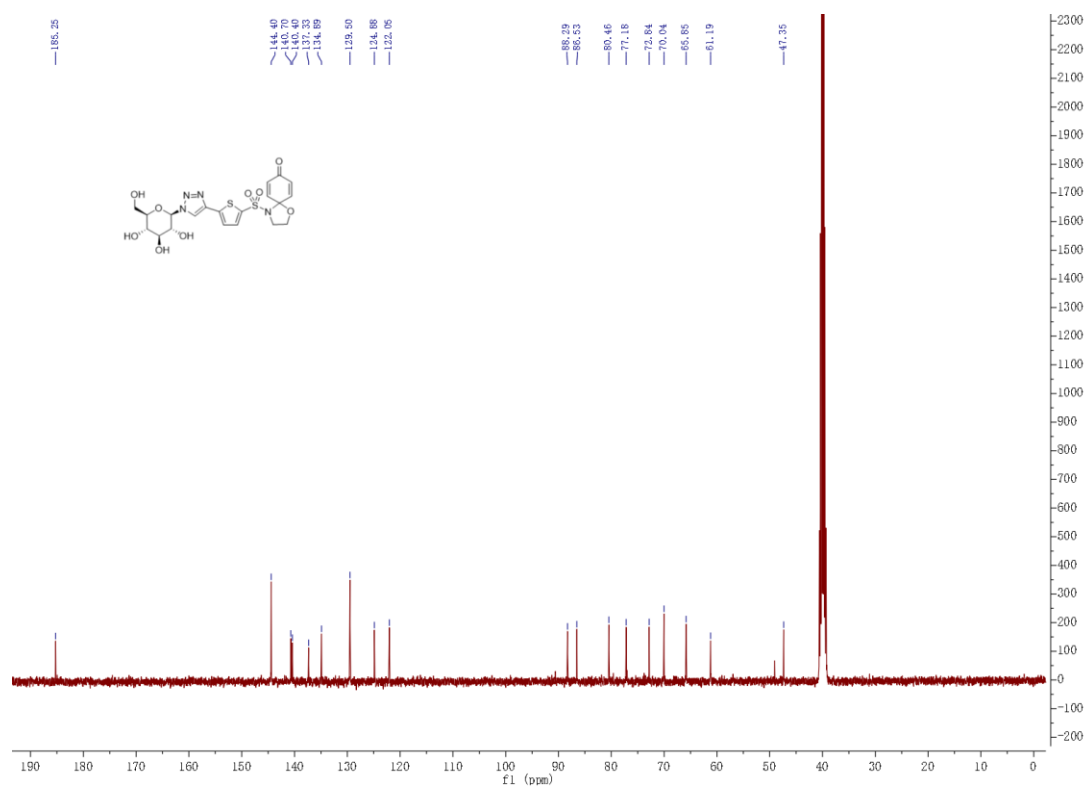
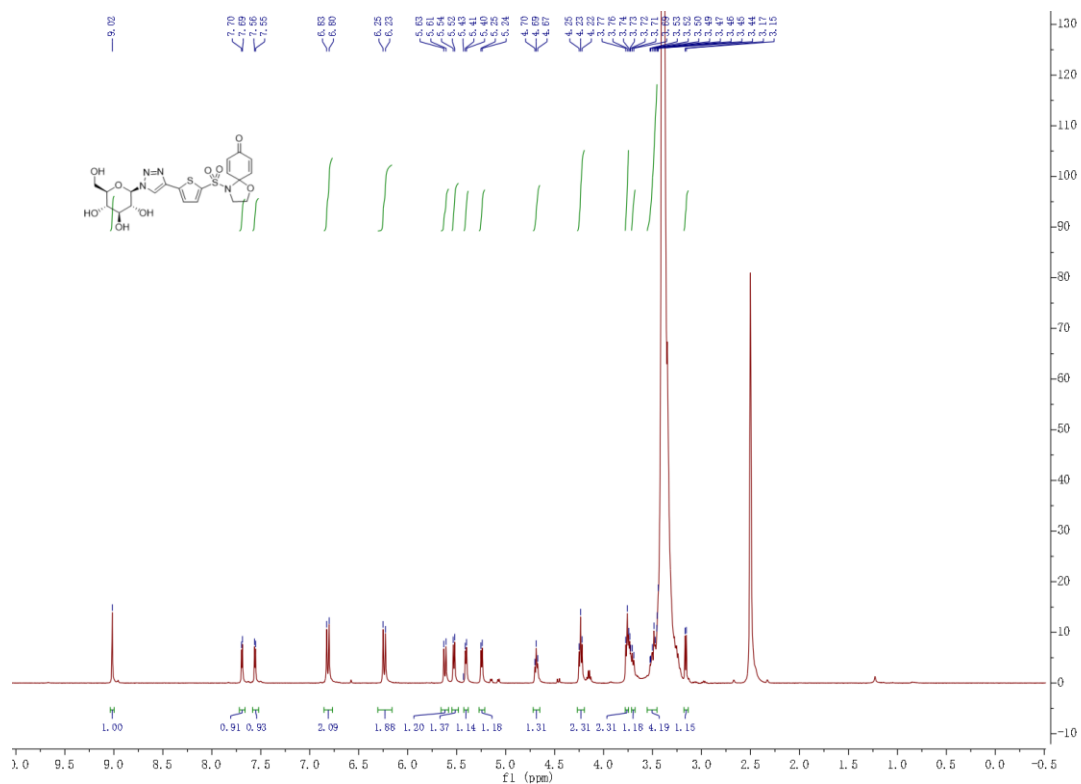




(2R,3R,4S,5R,6R)-2-(Acetoxymethyl)-6-(4-(5-((8-oxo-1-oxa-4-azaspiro[4.5]deca-6,9-dien-4-yl)sulfonyl)pyridin-2-yl)-1H-1,2,3-triazol-1-yl)tetrahydro-2H-pyran-3,4,5-triyl triacetate (7m)

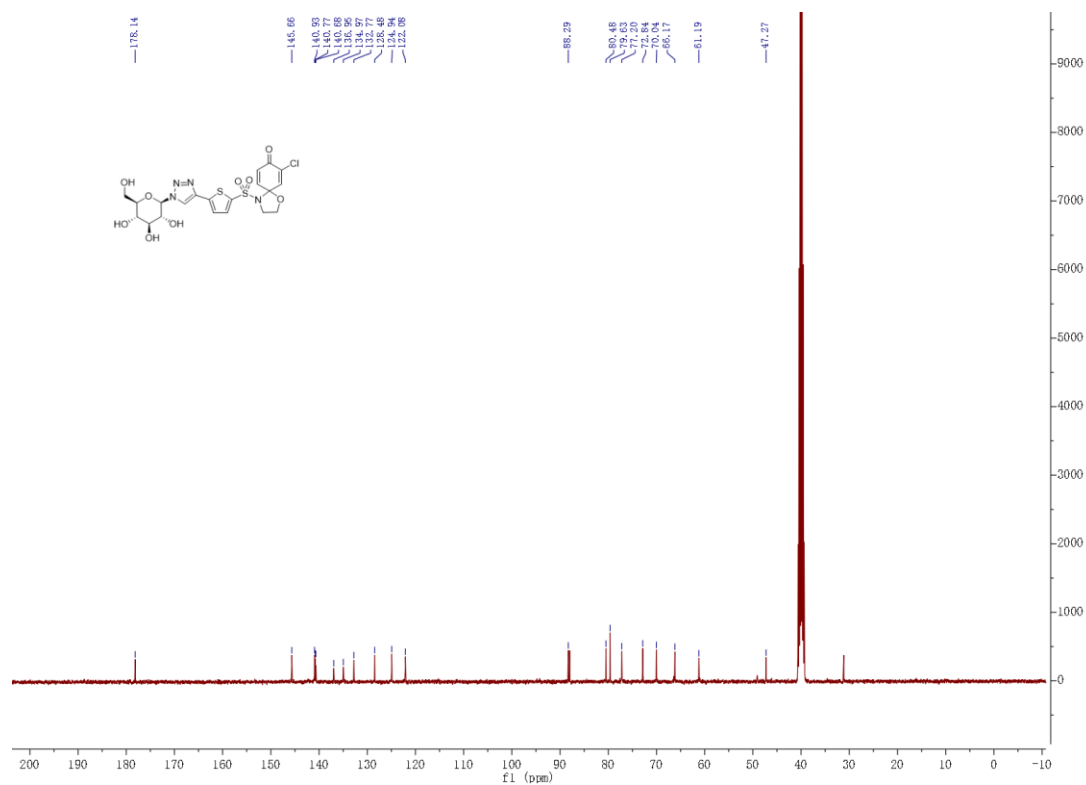
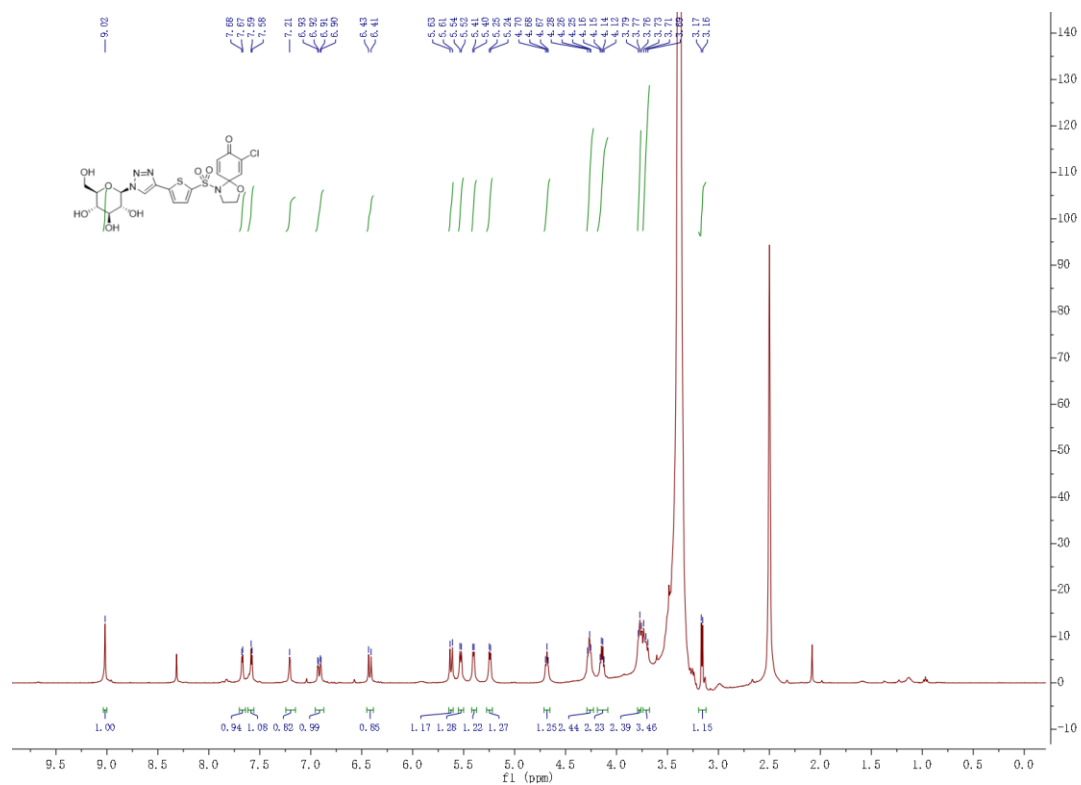


4-((5-(1-((2R,3R,4S,5S,6R)-3,4,5-Trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)thiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (8a)

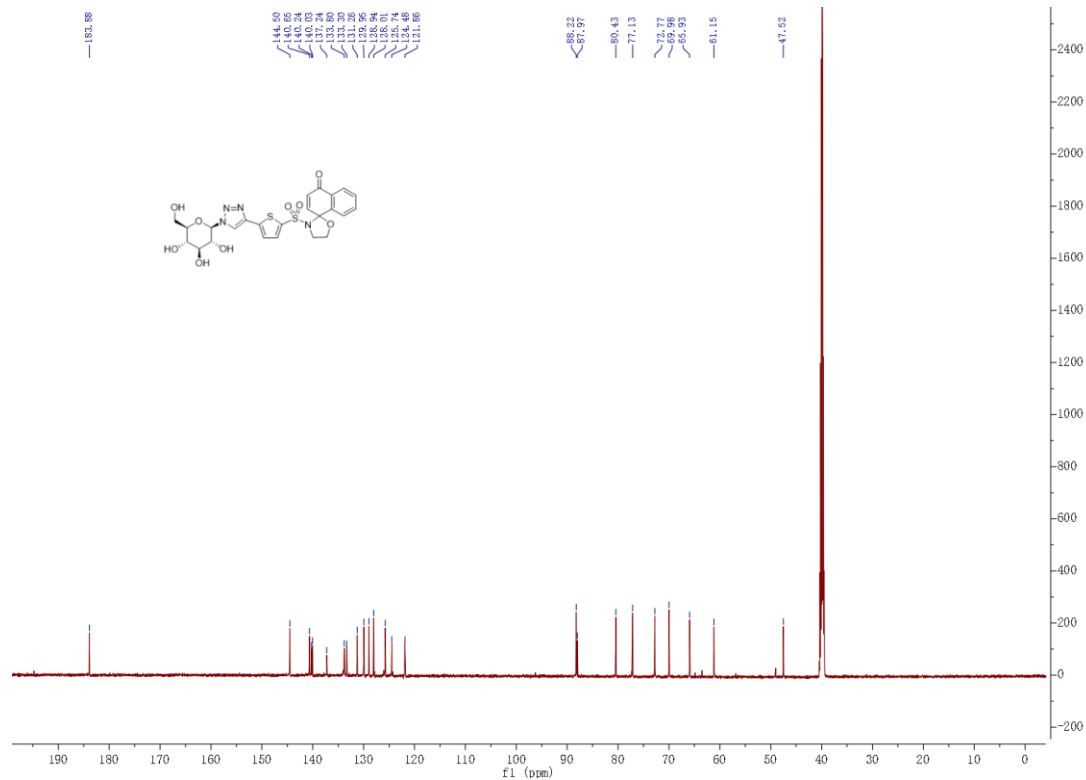
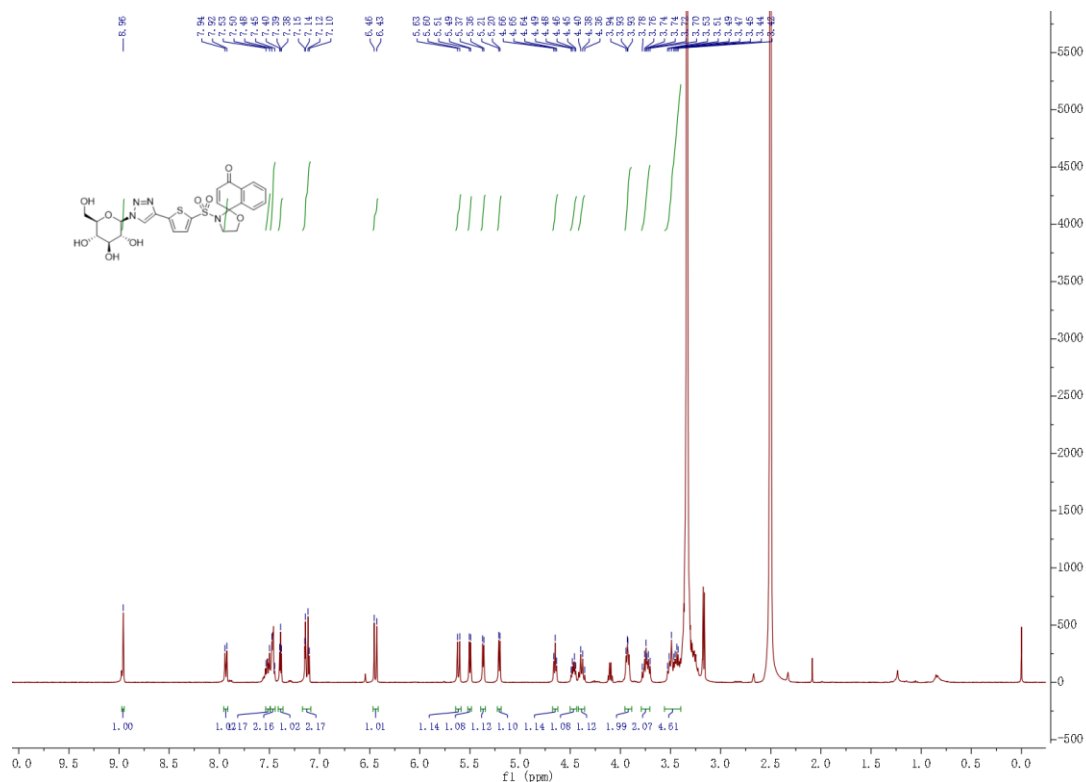


7-Chloro-4-((5-(1-((2R,3R,4S,5S,6R)-3,4,5-trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-

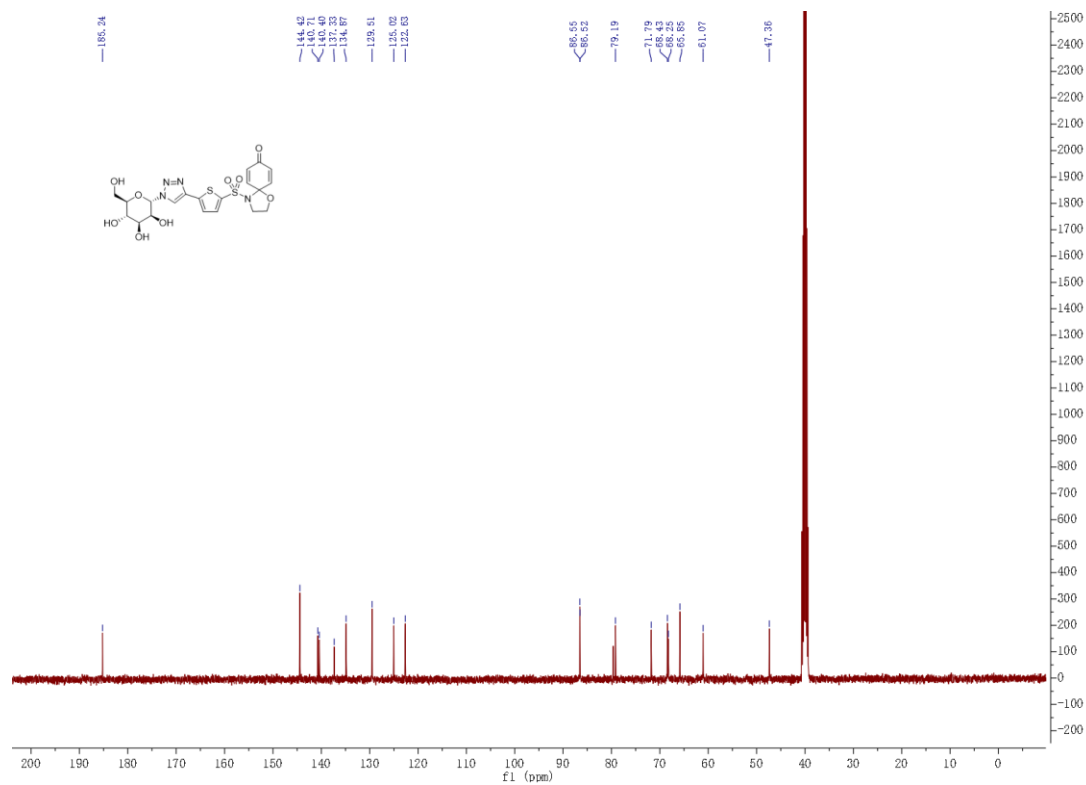
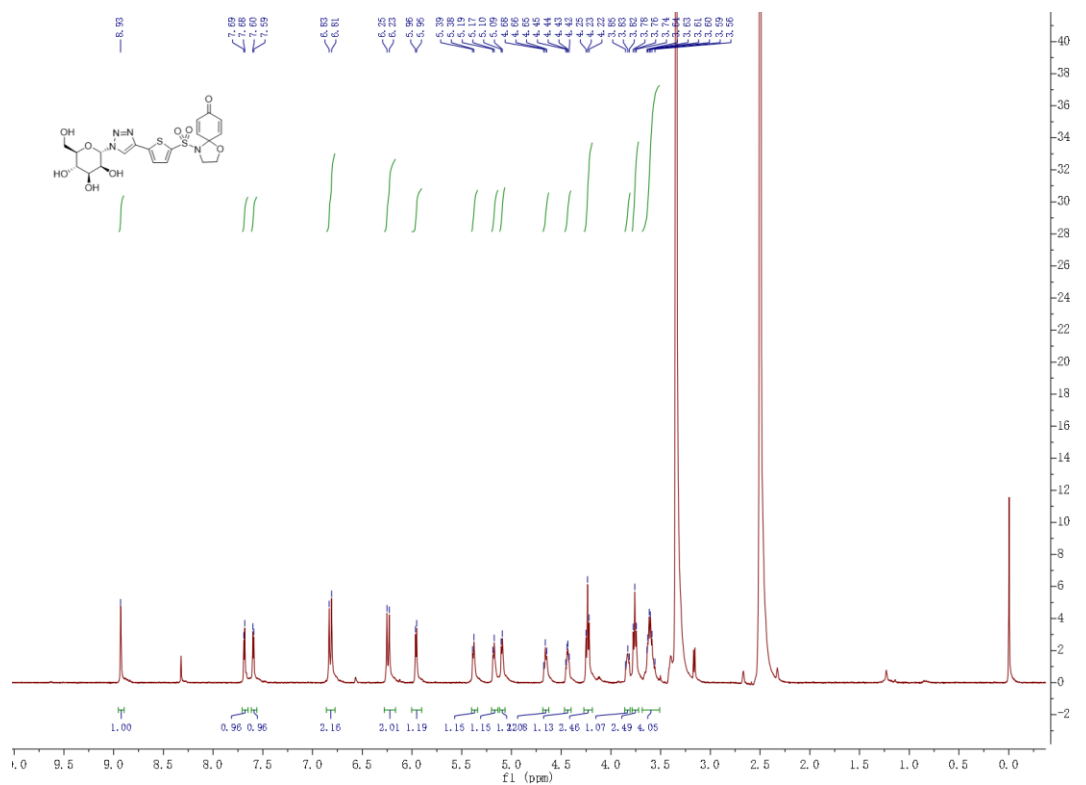
yl)-1*H*-1,2,3-triazol-4-yl)thiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (8b)



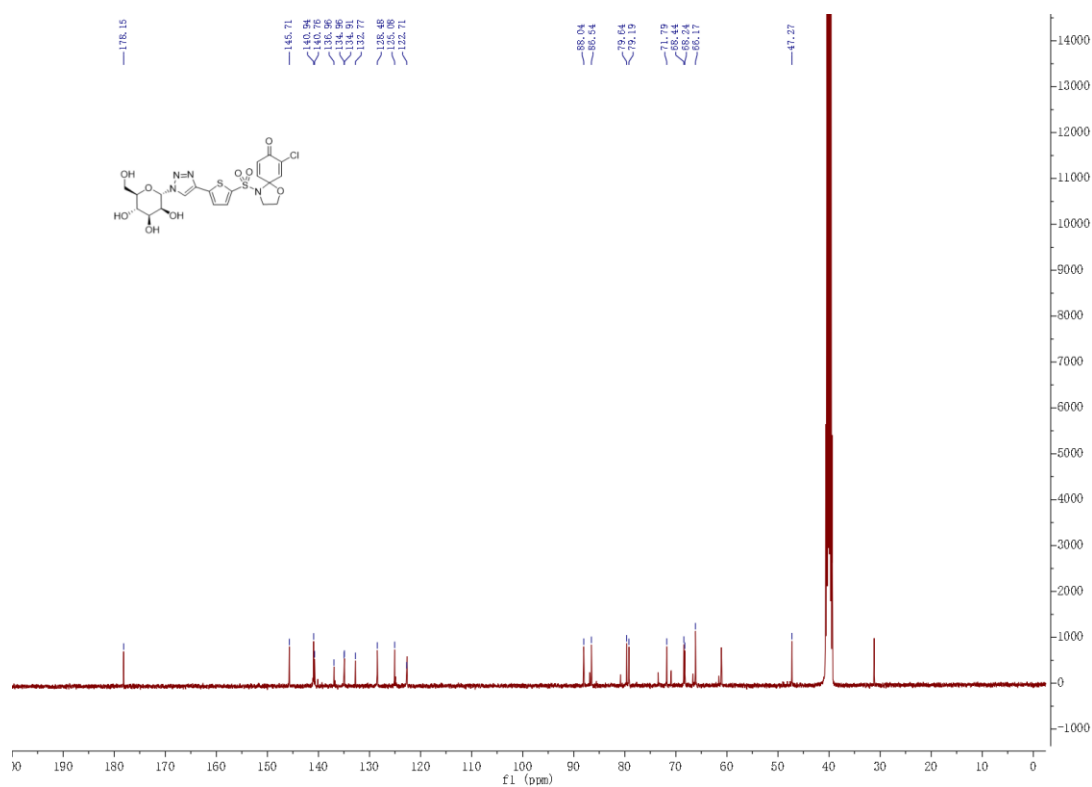
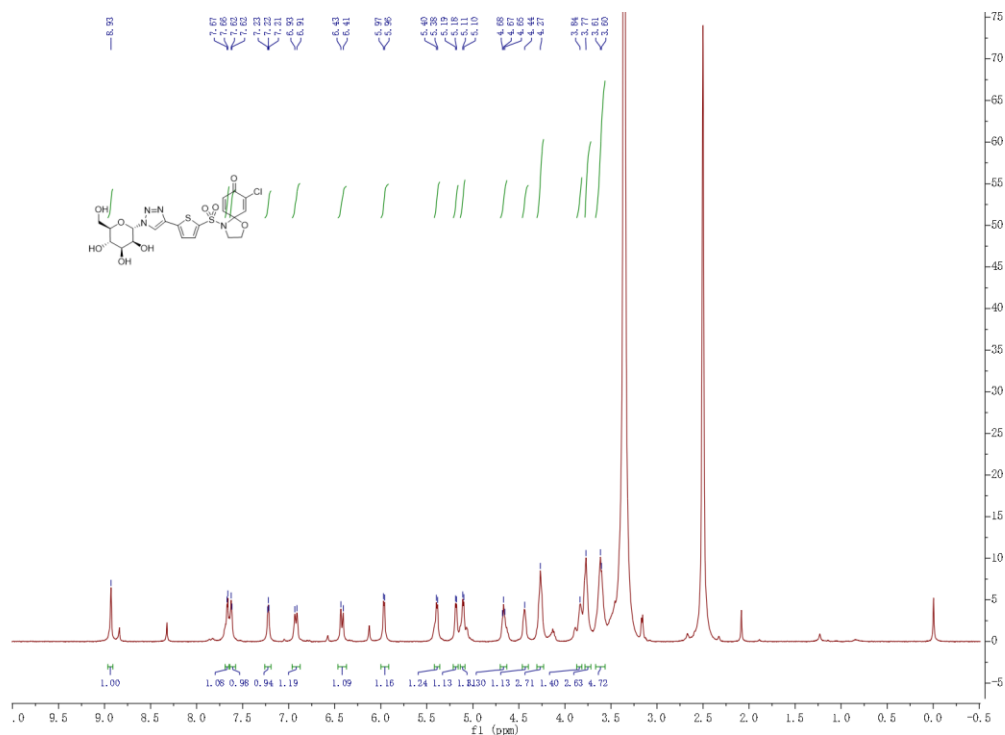
3'-((5-(1-((2R,3R,4S,5S,6R)-3,4,5-Trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)thiophen-2-yl)sulfonyl)-4H-spiro[naphthalene-1,2'-oxazolidin]-4-one (8c)



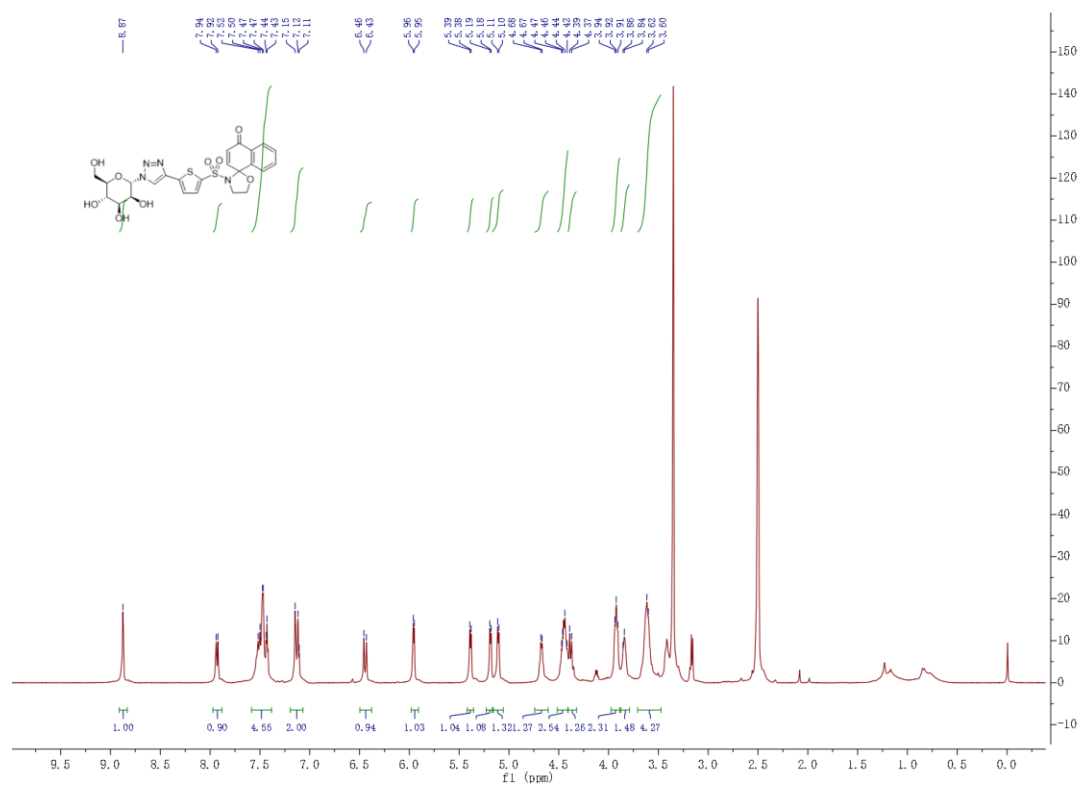
4-((5-(1-((2R,3S,4S,5S,6R)-3,4,5-Trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)thiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (8d)

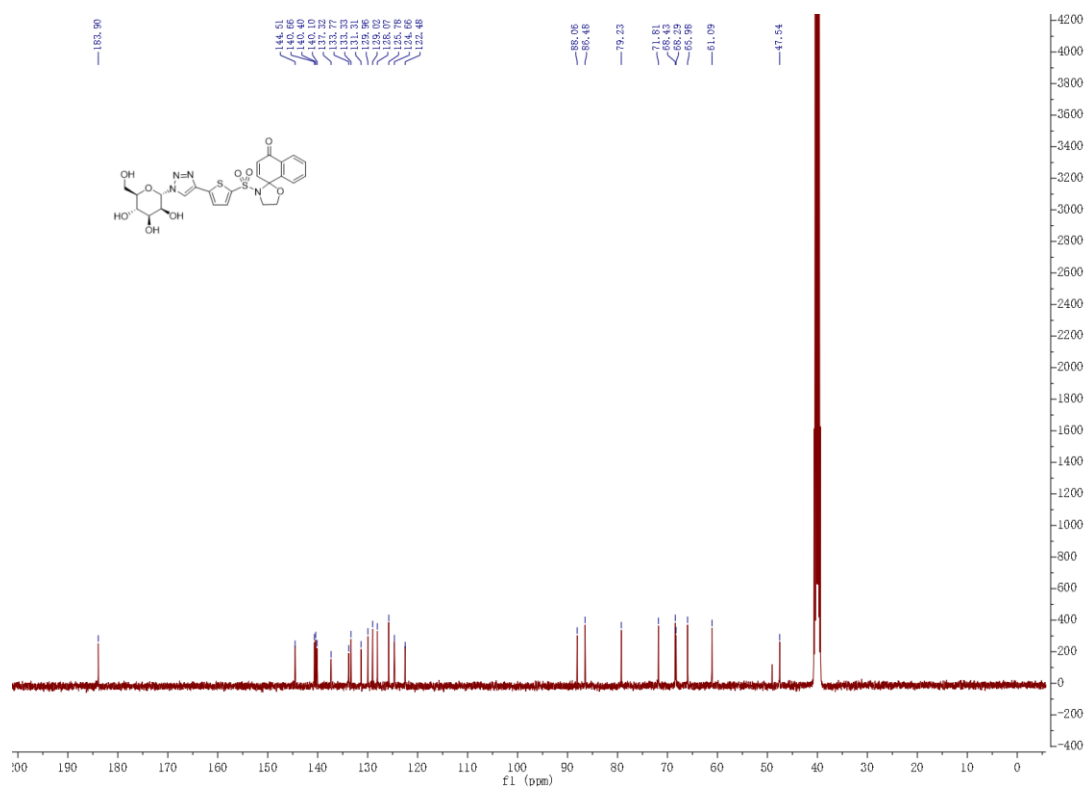


7-Chloro-4-((5-(1-((2R,3S,4S,5S,6R)-3,4,5-trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)thiophen-2-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (8e)

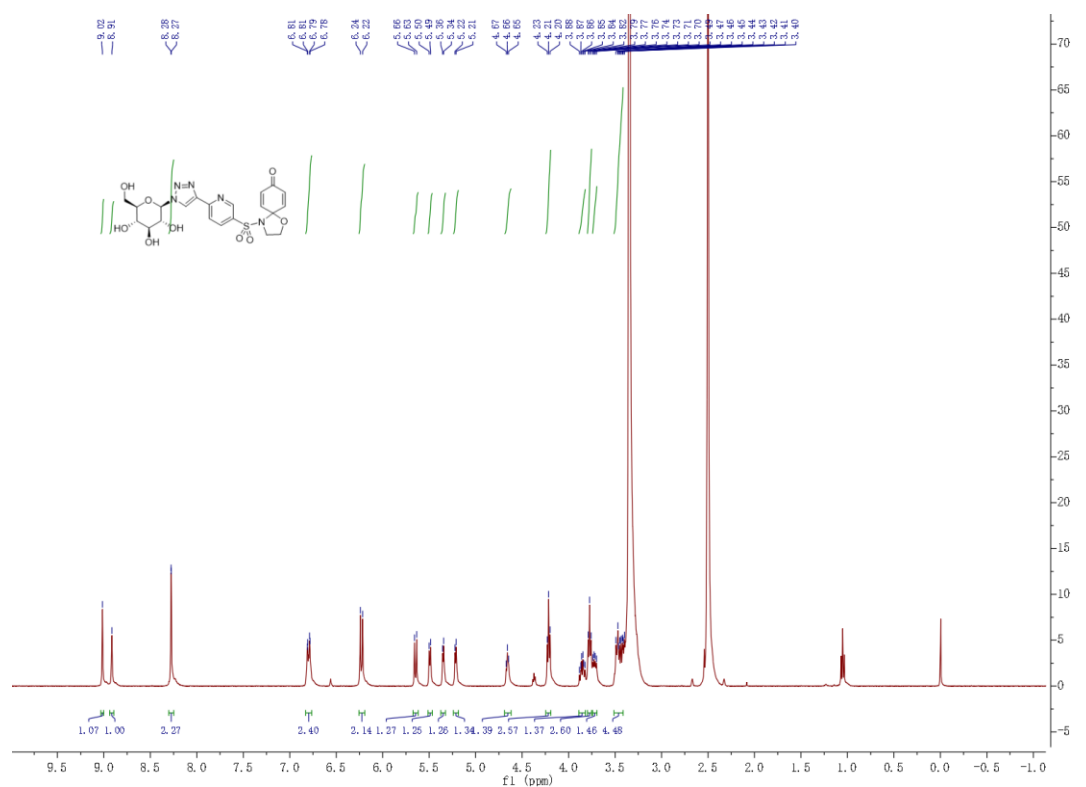


3'-((5-(1-((2R,3S,4S,5S,6R)-3,4,5-Trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)thiophen-2-yl)sulfonyl)-4H-spiro[naphthalene-1,2'-oxazolidin]-4-one (8f)





4-((6-((1-((2R,3R,4S,5S,6R)-3,4,5-Trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-2-yl)-1H-1,2,3-triazol-4-yl)pyridin-3-yl)sulfonyl)-1-oxa-4-azaspiro[4.5]deca-6,9-dien-8-one (8g)



Chemical Structure of Compound 10:

Oc1c(O)c(O)c(O)c1O/C=N/c2ccc(S(=O)(=O)N3C=CC(=O)OC3=O)cc2

¹H NMR Spectrum (DMSO-d₆):

Chemical Shift (ppm)	Integration
~8.2 (broad)	0.84
~8.2 (sharp)	1.00
~8.2 (broad)	2.19
~6.8	2.26
~6.2	2.07
~6.0	1.19
~5.8	2.27
~5.5	1.33
~5.2	1.34
~4.8	1.25
~4.2	1.23
~4.0	2.49
~3.8	1.26
~3.6	2.56
~3.4	1.23
~3.2	3.28
~3.3 (solvent)	-
~2.5	-

