Supporting Information

The dual alkylation of the C(sp^3)-H bond of the cyclic α-methyl-*N*-sulfonyl imines via sequential condensation/hydride transfer/ cyclization process

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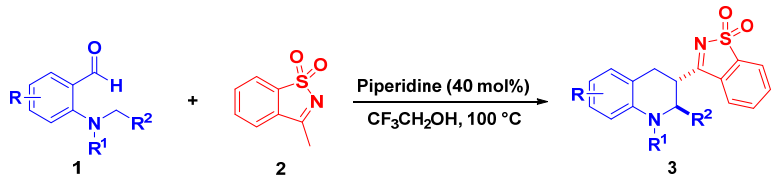
Table of Contents

1. General Information

Unless otherwise noted, all reagents and solvents were purchased from the commercial sources and used as received. Thin layer chromatography (TLC) was used to monitor the reaction on Merck 60 F254 precoated silica gel plate (0.2 mm thickness). TLC spots were visualized by UV-light irradiation on Spectroline Model ENF-24061/F 254 nm. The products were purified by flash column chromatography (200-300 mesh silica gel) eluted with the gradient of petroleum ether and ethyl acetate. Proton nuclear magnetic resonance spectra (^{1}H NMR) were recorded on a Bruker 500 MHz NMR spectrometer ($CDCl_3$ or DMSO-d_6 solvent). The chemical shifts were reported in parts per million (ppm), downfield from $SiMe_4$ (δ 0.0) and relative to the signal of chloroform-d (δ 7.26, singlet) or dimethyl sulfoxide-d_6 (δ 2.54, singlet). Multiplicities were afforded as: s (singlet); d (doublet); t (triplet); q (quartet); dd (doublets of doublet) or m (multiplets). The number of protons for a given resonance is indicated by nH. Coupling constants were reported as a *J* value in Hz. Carbon nuclear magnetic resonance spectra (^{13}C NMR) was referenced to the appropriate residual solvent peak. High resolution mass spectral analysis (HRMS) was performed on Waters XEVO G2 Q-TOF. All substituted 1-(2-hydroxyphenyl)ethan-1-one and 2-fluorobenzaldehydes, benzo[*d*]isothiazol-3(2H)-one 1,1-dioxide (saccharin), all compounds were purchased from adamas-beta. All *o*-aminobenzaldehydes[1] and substituted six-membered cyclic 1-azadienes [2] were prepared according to literature, respectively.

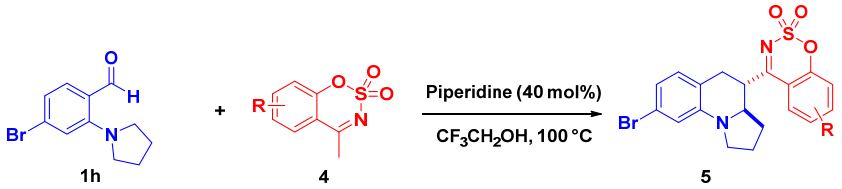
2. General Procedure

2.1 General Procedure for the Synthesis of 3-Cyclic *N*-sulfonyl Imine Substituted Tetrahydroquinoline 3.



A reaction tube was charged with *o*-aminobenzaldehyde **1** (0.45 mmol), the cyclic α-methyl-*N*-sulfonyl imines **2** (0.3 mmol), piperidine (40 mol%) and CF_3CH_2OH (3.0 mL). The mixture was stirred at 100 °C under an air atmosphere. Upon completion of the reaction as indicated by TLC analysis, the mixture was concentrated in vacuum and the residue was directly purified by flash column chromatography on silica gel (eluent: ethyl acetate/petroleum ether, 1:10) to afford the desired 3-cyclic *N*-sulfonyl imine substituted tetrahydroquinoline **3**.

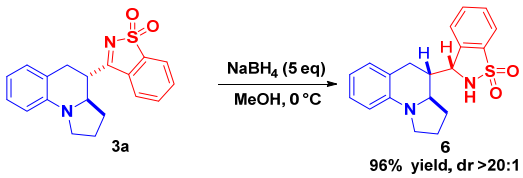
2.2 General Procedure for the Synthesis of 3-Cyclic *N*-sulfonyl Imine Substituted Tetrahydroquinoline 5



A reaction tube was charged with *o*-aminobenzaldehyde **1h** (0.45 mmol), six-membered cyclic *N*-sulfonyl imine **4** (0.3 mmol), piperidine (40 mol%) and CF_3CH_2OH (3.0 mL). The mixture was stirred at 100 °C under an air atmosphere. Upon completion of the reaction as indicated by TLC

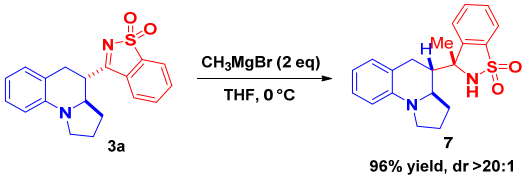
analysis, the mixture was concentrated in vacuum and the residue was directly purified by flash column chromatography on silica gel (eluent: ethyl acetate/petroleum ether, 1:10) to afford the desired 3-cyclic *N*-sulfonyl imine substituted tetrahydroquinoline **5**.

2.3 General Procedure for the Preparation of 3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-2,3-dihydrobenzo[*d*]isothiazole 1,1-dioxide 6



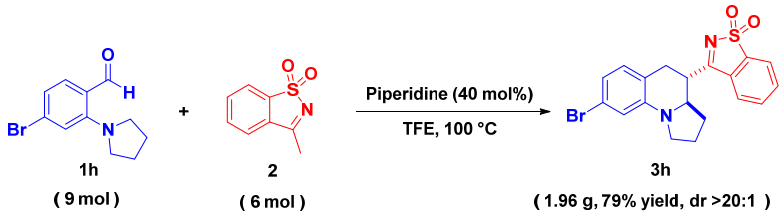
$NaBH_4$ (5 equiv.) was added to a solution of **3a** (0.3mmol, 101.4mg) in MeOH (3 mL) at 0 °C. The resulting suspension was stirred for 1 h at room temperature and then concentrated under reduced pressure. The residue was purified by flash chromatography on silica gel (eluent: ethyl acetate/petroleum ether, 1:1) to afford **6** in 96% yield.

2.4 General Procedure for the Preparation of 3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-3-methyl-2,3-dihydrobenzo[*d*]isothiazole 1,1-dioxide 7



A reaction tube was charged with 3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*] quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide **3a** (0.3 mmol), THF (3 mL) under an atmosphere of nitrogen at 0 °C. And a 1 N aqueous solution of CH_3MgBr (2 equiv) was added to this mixture. The tube was sealed and stirred at 0 °C for 4 h, diluted with water, and extracted three times with ethyl acetate. The combined extracts were dried over Na_2SO_4, concentrated, and purified by flash chromatography on silica gel (eluent: ethyl acetate/petroleum ether, 1:1) to afford the desired **7** (106.3 mg, 96%) as a white solid.

2.5 Gram-scale Synthesis of 3-(8-Bromo-1,2,3,3a,4,5-hexahydropyrrolo-[1,2-*a*] quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide 3h

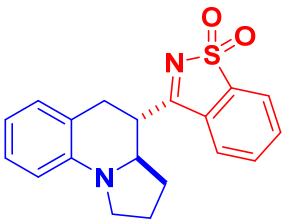


A reaction tube was charged with *o*-aminobenzaldehyde **1h** (9 mmol), the cyclic α-methyl-*N*-sulfonyl imines **2** (6 mmol), piperidine (40 mol%) and CF_3CH_2OH (15.0 mL). The mixture was stirred at 100 °C under an air atmosphere. Upon completion of the reaction as indicated by TLC analysis, the mixture was concentrated in vacuum and the residue was directly purified by flash

column chromatography on silica gel (eluent: ethyl acetate/petroleum ether, 1:10) to afford the desired 3-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide **3h** in 79% yield (1.96 g).

3. Characterization of Products

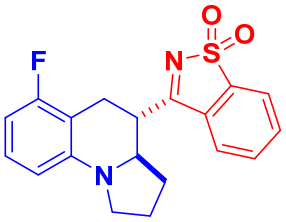
3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3a)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the product (98.4 mg, 97% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.96 (d, *J* = 7.3 Hz, 1H), 7.75 (ddd, *J* = 24.8, 16.0, 7.3 Hz, 3H), 7.18 (t, *J* = 7.6 Hz, 1H), 7.06 (d, *J* = 7.2 Hz, 1H), 6.65 (t, *J* = 7.3 Hz, 1H), 6.55 (d, *J* = 8.1 Hz, 1H), 3.86 (td, *J* = 9.8, 5.1 Hz, 1H), 3.51 (t, *J* = 8.8 Hz, 1H), 3.30 (dd, *J* = 17.1, 8.8 Hz, 1H), 3.26 – 3.16 (m, 1H), 3.13 – 2.99 (m, 2H), 2.23 (dt, *J* = 11.3, 5.6 Hz, 1H), 2.13 – 1.94 (m, 2H), 1.48 – 1.37 (m, 1H); **^{13}C NMR** (126 MHz, $CDCl_3$) δ 178.3, 143.6, 139.8, 134.0, 133.9, 131.1, 128.6, 128.2, 124.0, 123.0, 119.3, 115.6, 110.6, 61.1, 47.2, 39.3, 34.3, 31.7, 23.8. **HRMS (ESI):** calcd. for $C_{19}H_{18}N_2O_2S$ $[M+H]^+$: 339.1162, found: 339.1160.

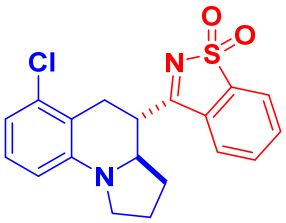
3-(6-fluoro-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3b)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the product (90.8 mg, 85% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.92 (d, *J* = 7.2 Hz, 1H), 7.80 – 7.67 (m, 3H), 7.07 (dd, *J* = 15.1, 7.8 Hz, 1H), 6.35 (t, *J* = 8.7 Hz, 1H), 6.29 (d, *J* = 8.2 Hz, 1H), 3.78 (td, *J* = 9.9, 5.1 Hz, 1H), 3.47 (t, *J* = 8.9 Hz, 1H), 3.36 – 3.25 (m, 2H), 3.01 – 2.94 (m, 1H), 2.87 (dd, *J* = 15.8, 12.3 Hz, 1H), 2.23 (dt, *J* = 11.6, 5.8 Hz, 1H), 2.10 – 1.92 (m, 2H), 1.42 (ddd, *J* = 22.0, 11.6, 7.8 Hz, 1H); **^{13}C NMR** (126 MHz, $CDCl_3$) δ 177.8, 161.8, 159.8, 145.0 (d, *J* = 7.6 Hz), 139.7, 134.1 (d, *J* = 10.1 Hz), 130.9, 128.5 (d, *J* = 10.1 Hz), 124.1, 123.0, 106.4 (d, *J* = 20.1 Hz), 106.3 (d, *J* = 2.1 Hz), 102.3 (d, *J* = 1.3 Hz), 60.4, 47.5, 38.7, 31.7, 26.8 (d, *J* = 5.0 Hz), 23.7. **HRMS (ESI):** calcd. for $C_{19}H_{17}FN_2O_2S$ $[M+H]^+$: 357.1068, found: 357.1071

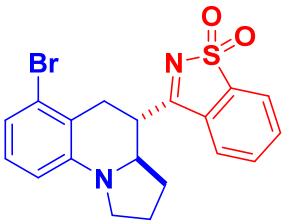
3-(6-chloro-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3c)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the product (90.4 mg, 81% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.97 (d, *J* = 7.3 Hz, 1H), 7.83 – 7.70 (m, 3H), 7.08 (t, *J* = 8.0 Hz, 1H), 6.71 (d, *J* = 7.9 Hz, 1H), 6.44 (d, *J* = 8.2 Hz, 1H), 3.80 (td, *J* = 9.6, 5.2 Hz, 1H), 3.47 (dd, *J* = 17.8, 5.9 Hz, 2H), 3.32 (dd, *J* = 17.1, 8.6 Hz, 1H), 3.02 (ddd, *J* = 41.3, 20.0, 7.5 Hz, 2H), 2.26 (dt, *J* = 11.5, 5.7 Hz, 1H), 2.15 – 1.96 (m, 2H), 1.50 – 1.38 (m, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 177.8, 144.9, 139.8, 134.1, 134.1, 134.0, 130.9, 128.4, 124.0, 123.0, 117.1, 116.3, 109.8, 60.5, 47.4, 39.5, 31.6, 31.6, 23.8. **HRMS (ESI):** calcd. for $C_{19}H_{17}ClN_2O_2S$ $[M+H]^+$: 373.0767, found: 373.0769.

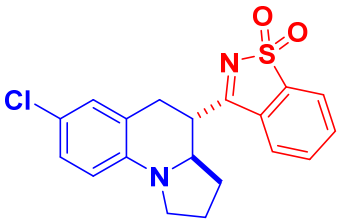
3-(6-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3d)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the product (112.3 mg, 90% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.98 (d, *J* = 7.2 Hz, 1H), 7.82 – 7.71 (m, 3H), 7.01 (t, *J* = 8.0 Hz, 1H), 6.89 (d, *J* = 7.8 Hz, 1H), 6.48 (d, *J* = 8.1 Hz, 1H), 3.81 (td, *J* = 9.7, 5.1 Hz, 1H), 3.47 (ddd, *J* = 18.7, 12.4, 2.3 Hz, 2H), 3.32 (dd, *J* = 16.7, 9.2 Hz, 1H), 3.08 – 2.93 (m, 2H), 2.26 (dt, *J* = 11.5, 5.7 Hz, 1H), 2.05 (dddd, *J* = 12.4, 9.9, 9.1, 5.4 Hz, 2H), 1.45 (ddd, *J* = 22.1, 11.8, 7.5 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 177.7, 145.0, 139.8, 134.1, 134.0, 130.9, 128.8, 124.9, 124.0, 123.0, 119.6, 118.7, 109.7, 60.5, 47.3, 39.5, 34.5, 31.6, 23.8. **HRMS (ESI)**: calcd. for $C_{19}H_{17}BrN_2O_2S$ $[M+H]^+$: 417.0627, found: 417.0630.

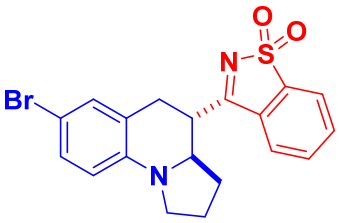
3-(7-chloro-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3e)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the product (100.4 mg, 90% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.97 (d, *J* = 7.3 Hz, 1H), 7.76 (ddd, *J* = 28.9, 18.0, 7.4 Hz, 3H), 7.11 (d, *J* = 8.5 Hz, 1H), 7.03 (s, 1H), 6.45 (d, *J* = 8.6 Hz, 1H), 3.88 – 3.79 (m, 1H), 3.48 (t, *J* = 8.8 Hz, 1H), 3.26 (dt, *J* = 14.5, 7.2 Hz, 1H), 3.19 (d, *J* = 14.8 Hz, 1H), 3.10 – 2.98 (m, 2H), 2.23 (dd, *J* = 11.4, 5.5 Hz, 1H), 2.14 – 1.97 (m, 2H), 1.48 – 1.36 (m, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 177.8, 142.2, 139.8, 134.0, 130.9, 128.2, 127.8, 124.0, 123.9, 123.0, 120.7, 120.2, 111.6, 61.1, 47.4, 39.0, 34.0, 31.7, 23.8. **HRMS (ESI):** calcd. for $C_{19}H_{17}ClN_2O_2S$ $[M+H]^+$: 373.0772, found: 373.0770.

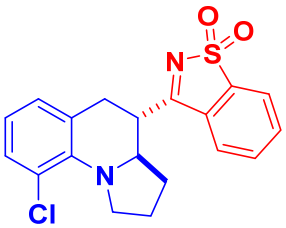
3-(7-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3f)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the product (99.9 mg, 80% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.96 (d, *J* = 7.3 Hz, 1H), 7.80 (t, *J* = 7.4 Hz, 1H), 7.76 (t, *J* = 7.4 Hz, 1H), 7.70 (d, *J* = 7.5 Hz, 1H), 7.27 – 7.22 (m, 1H), 6.40 (d, *J* = 8.6 Hz, 1H), 3.83 (td, *J* = 9.9, 5.0 Hz, 1H), 3.48 (t, *J* = 8.9 Hz, 1H), 3.29 – 3.15 (m, 2H), 3.08 – 2.99 (m, 2H), 2.23 (dt, *J* = 11.5, 5.6 Hz, 1H), 2.14 – 2.07 (m, 1H), 2.06 – 1.97 (m, 1H), 1.48 – 1.37 (m, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 177.8, 142.6, 139.8, 134.1, 134.0, 130.9, 130.9, 130.7, 123.9, 123.0, 121.2, 112.1, 107.2, 61.1, 47.3, 39.0, 33.9, 31.7, 23.8. **HRMS (ESI):** calcd. for $C_{19}H_{17}BrN_2O_2S$ $[M+H]^+$: 417.0267, found: 417.0262.

3-(9-chloro-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3g)

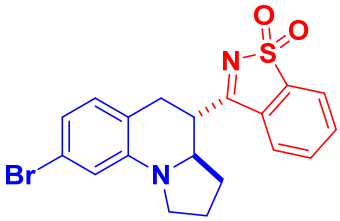


Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the product (89.3 mg, 80% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.97 (d, *J* = 7.0 Hz, 1H), 7.82 – 7.74 (m, 2H), 7.71 (d, *J* = 7.1 Hz, 1H), 7.24 (d, *J* = 8.1 Hz, 1H), 6.98 (d, *J* = 7.2 Hz, 1H), 6.79 (t, *J* = 7.6 Hz, 1H), 4.26 (dd, *J* = 17.1, 8.1 Hz, 1H), 3.82 (t, *J* = 8.0 Hz, 1H), 3.36 – 3.25 (m, 1H), 3.22 – 3.09 (m, 3H), 2.30 – 2.17 (m, 1H), 2.07 – 1.95 (m, 1H), 1.93 – 1.83 (m, 1H), 1.71 (d, *J* = 9.9 Hz, 1H).**^{13}C NMR** (126 MHz, $CDCl_3$) δ 178.5, 142.8, 140.0, 134.0, 133.9, 131.4, 129.5, 127.4, 125.4, 124.4, 123.7, 123.0, 120.6, 62.1, 53.0, 35.1, 34.1, 29.5, 23.3. **HRMS (ESI):** calcd. for $C_{19}H_{17}ClN_2O_2S$ $[M+H]^+$: 373.0772 , found: 373.0770.

3-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-

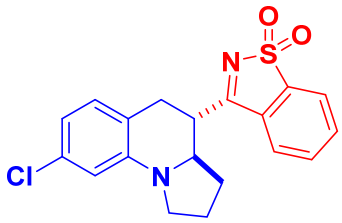
dioxide (3h)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the product (119.8 mg, 96% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.97 (d, *J* = 7.3 Hz, 1H), 7.76 (ddd, *J* = 29.2, 18.3, 7.4 Hz, 3H), 6.90 (d, *J* = 7.9 Hz, 1H), 6.74 (d, *J* = 7.9 Hz, 1H), 6.65 (s, 1H), 3.84 (td, *J* = 9.9, 5.0 Hz, 1H), 3.48 (t, *J* = 8.9 Hz, 1H), 3.26 (dd, *J* = 16.9, 9.3 Hz, 1H), 3.19 – 3.09 (m, 1H), 3.09 – 2.97 (m, 2H), 2.27 – 2.20 (m, 1H), 2.15 – 2.08 (m, 1H), 2.01 (dd, *J* = 15.9, 9.2 Hz, 1H), 1.42 (dt, *J* = 19.1, 11.7 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 177.8, 144.7, 139.8, 134.1, 134.0, 130.9, 129.7, 123.9, 123.0, 121.8, 118.2, 118.1, 113.1, 61.0, 47.2, 39.0, 33.8, 31.7, 23.8. **HRMS (ESI):** calcd. for $C_{19}H_{17}BrN_2O_2S$ $[M+H]^+$: 417.0267, found: 417.0262.

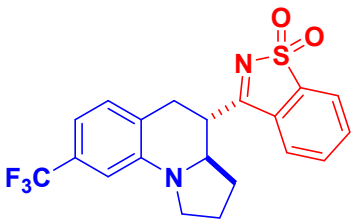
3-(8-chloro-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3i)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the product (100.5 mg, 90% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.97 (d, *J* = 7.4 Hz, 1H), 7.78 (dt, *J* = 22.5, 7.3 Hz, 2H), 7.71 (d, *J* = 7.5 Hz, 1H), 6.95 (d, *J* = 7.9 Hz, 1H), 6.59 (dd, *J* = 7.9, 1.7 Hz, 1H), 6.50 (d, *J* = 1.6 Hz, 1H), 3.85 (td, *J* = 9.9, 5.0 Hz, 1H), 3.48 (t, *J* = 8.8 Hz, 1H), 3.27 (dd, *J* = 16.8, 9.4 Hz, 1H), 3.16 (dd, *J* = 15.5, 12.2 Hz, 1H), 3.10 – 2.99 (m, 2H), 2.27 – 2.20 (m, 1H), 2.15 – 2.08 (m, 1H), 2.03 – 1.96 (m, 1H), 1.43 (ddd, *J* = 22.4, 11.8, 7.4 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 177.8, 144.4, 139.8, 134.1, 134.0, 133.7, 130.9, 129.4, 123.9, 123.0, 117.7, 115.2, 110.3, 61.0, 47.2, 39.1, 33.8, 31.7, 23.8. **HRMS (ESI):** calcd. for $C_{19}H_{17}ClN_2O_2S$ $[M+H]^+$: 373.0772, found: 373.0770.

3-(8-(trifluoromethyl)-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3j)

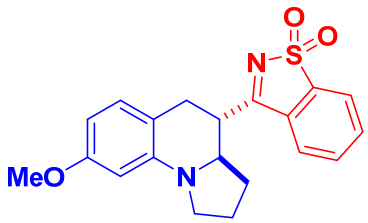


Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the

product (99.9 mg, 82% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.93 (d, *J* = 7.2 Hz, 1H), 7.82 – 7.70 (m, 3H), 7.12 (d, *J* = 7.7 Hz, 1H), 6.85 (d, *J* = 7.6 Hz, 1H), 6.71 (s, 1H), 3.85 (td, *J* = 9.9, 5.0 Hz, 1H), 3.54 (t, *J* = 8.9 Hz, 1H), 3.32 (dd, *J* = 16.9, 9.2 Hz, 1H), 3.25 – 3.12 (m, 2H), 3.09 – 3.02 (m, 1H), 2.23 (dt, *J* = 11.5, 5.6 Hz, 1H), 2.18 – 2.10 (m, 1H), 2.02 (dtd, *J* = 24.7, 12.5, 9.4 Hz, 1H), 1.47 (ddd, *J* = 22.4, 11.7, 7.5 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 177.9, 143.7, 139.7, 134.2 (d, *J* = 2.5 Hz), 130.8, 130.4 (q, *J* = 31.5 Hz), 128.8, 124.5 (q, *J* = 273.4 Hz), 124.1, 123.0, 122.8, 111.9 (q, *J* = 3.8 Hz), 106.7 (q, *J* = 3.8 Hz), 61.2, 47.2, 38.7, 34.0, 31.7, 23.8. **HRMS (ESI):** calcd. for $C_{20}H_{17}F_3N_2O_2S$ $[M+H]^+$: 407.1036, found: 407.1035.

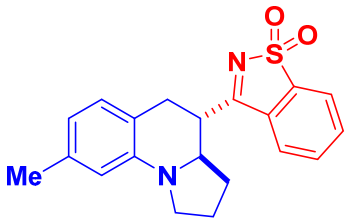
3-(8-methoxy-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3k)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the product (89.5 mg, 81% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.96 (d, *J* = 7.3 Hz, 1H), 7.75 (ddd, *J* = 24.1, 15.7, 7.3 Hz, 3H), 6.97 (d, *J* = 8.2 Hz, 1H), 6.22 (dd, *J* = 8.2, 2.4 Hz, 1H), 6.11 (d, *J* = 2.3 Hz, 1H), 3.88 – 3.82 (m, 1H), 3.81 (s, 3H), 3.48 (t, *J* = 8.4 Hz, 1H), 3.29 (dt, *J* = 16.7, 8.4 Hz, 1H), 3.18 – 3.10 (m, 1H), 2.24 (dt, *J* = 11.3, 5.5 Hz, 1H), 2.12 – 1.95 (m, 2H), 1.47 – 1.35 (m, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 178.2, 160.0, 144.6, 139.7, 134.0, 133.9, 131.0, 129.1, 124.0, 122.9, 112.2, 100.3, 97.0, 61.0, 55.3, 47.2, 39.8, 33.8, 31.7, 23.8. **HRMS (ESI):** calcd. for $C_{20}H_{20}N_2O_3S$ $[M+H]^+$: 369.1267, found: 369.1265.

3-(8-methyl-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3l)

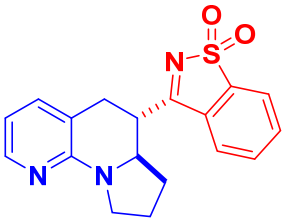


Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the product (82.4 mg, 76% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.95 (d, *J* = 7.3 Hz, 1H), 7.85 – 7.71 (m, 2H), 7.69 (d, *J* = 7.4 Hz, 1H), 6.95 (d, *J* = 7.5 Hz, 1H), 6.48 (d, *J* = 7.4 Hz, 1H), 6.37 (s, 1H), 3.84 (td, *J* = 10.0, 5.0 Hz, 1H), 3.50 (td, *J* = 8.9, 1.3 Hz, 1H), 3.29 (dd, *J* = 16.7, 9.3 Hz, 1H), 3.22 – 3.14 (m, 1H), 3.10 – 3.00 (m, 2H), 2.33 (s, 3H), 2.23 (dt, *J* = 11.5, 5.6 Hz, 1H), 2.09 (dt, *J* = 14.2, 7.2 Hz, 1H), 1.99 (tdd, *J* = 12.3, 6.2, 2.7 Hz, 1H), 1.41 (ddd, *J* = 22.1, 11.8, 7.4 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 178.3,

143.5, 139.8, 138.0, 134.0, 133.9, 131.1, 128.5, 124.0, 122.9, 116.4, 116.4, 111.3, 61.1, 47.2, 39.6, 34.1, 31.7, 23.9, 21.6. **HRMS (ESI):** calcd. for $C_{20}H_{20}N_2O_2S$ $[M+H]^+$: 353.1318, found: 353.1317.

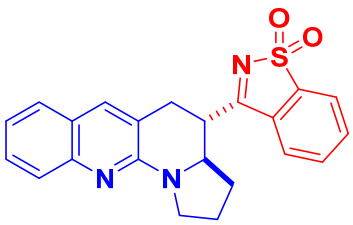
3-(5,6,6a,7,8,9-hexahydropyrrolo[1,2-*a*][1,6]naphthyridin-6-yl)benzo[*d*]isothiazole 1,1-dioxide (3m)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 2:1) afforded the product (67.1 mg, 66% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 8.09 (d, *J* = 4.9 Hz, 1H), 7.98 (d, *J* = 7.2 Hz, 1H), 7.86 – 7.68 (m, 3H), 7.25 (s, 1H), 6.53 (dd, *J* = 7.1, 5.1 Hz, 1H), 3.96 (td, *J* = 10.0, 5.0 Hz, 1H), 3.81 (t, *J* = 9.2 Hz, 1H), 3.59 (td, *J* = 10.5, 7.2 Hz, 1H), 3.22 (dd, *J* = 16.0, 12.7 Hz, 1H), 3.07 (ddd, *J* = 13.6, 7.8, 3.6 Hz, 2H), 2.29 – 2.20 (m, 1H), 2.13 – 2.06 (m, 1H), 2.03 – 1.95 (m, 1H), 1.49 (ddd, *J* = 22.5, 12.0, 7.2 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 177.4, 153.9, 146.8, 139.8, 135.3, 134.1 134.0, 130.8, 123.9, 123.1, 114.9, 111.9, 61.1, 46.4, 38.8, 33.7, 32.1, 23.7. **HRMS (ESI):** calcd. for $C_{18}H_{17}N_3O_2S$ $[M+H]^+$: 340.1114, found: 340.1110.

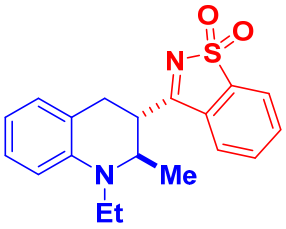
3-(7,8,8a,9,10,11-hexahydrobenzo[*h*]pyrrolo[1,2-*a*][1,6]naphthyridin-8-yl)benzo[*d*]isothiazole 1,1-dioxide (3n)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 2:1) afforded the product (65.4 mg, 56% yield) as a russet solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.98 (d, *J* = 7.4 Hz, 1H), 7.84 – 7.72 (m, 4H), 7.60 (d, *J* = 13.0 Hz, 1H), 7.56 – 7.47 (m, 2H), 7.19 (t, *J* = 7.4 Hz, 1H), 4.06 (td, *J* = 10.1, 4.9 Hz, 1H), 3.95 (t, *J* = 10.0 Hz, 1H), 3.79 (td, *J* = 10.7, 7.6 Hz, 1H), 3.36 – 3.28 (m, 1H), 3.27 – 3.15 (m, 2H), 2.28 (dt, *J* = 11.4, 5.6 Hz, 1H), 2.17 – 2.09 (m, 1H), 2.06 – 1.95 (m, 1H), 1.52 (ddd, *J* = 22.8, 11.8, 7.2 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 176.8, 152.7, 139.8, 134.4, 134.2, 134.1, 130.7, 129.3, 127.0, 125.7, 124.0, 123.1, 122.8, 122.0, 118.0, 77.3, 61.3, 46.8, 39.4, 34.0, 32.2, 23.4. **HRMS (ESI):** calcd. for $C_{22}H_{19}N_3O_2S$ $[M+H]^+$: 390.1271, found: 390.1265.

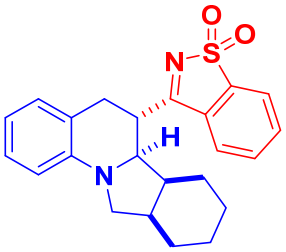
3-(1-ethyl-2-methyl-1,2,3,4-tetrahydroquinolin-3-yl)benzo[*d*]isothiazole 1,1-dioxide (3o)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:15) afforded the product (66.3 mg, 65% yield, dr 4:1) as a red solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.94 – 7.85 (m, 1H), 7.78 – 7.71 (m, 3H), 7.12 (t, *J* = 8.3 Hz, 1H), 6.98 (d, *J* = 7.2 Hz, 1H), 6.69 (t, *J* = 8.3 Hz, 1H), 6.63 (t, *J* = 7.3 Hz, 1H), 3.90 (p, *J* = 6.2 Hz, 1H), 3.52 – 3.38 (m, 2H), 3.26 (dq, *J* = 14.4, 7.1 Hz, 1H), 3.19 – 3.08 (m, 2H), 1.29 (d, *J* = 6.4 Hz, 3H), 1.13 (t, *J* = 7.1 Hz, 3H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 176.6, 144.0, 140.1, 134.0, 133.6, 130.8, 128.6, 127.8, 123.9, 122.8, 119.9, 116.4, 112.1, 54.9, 43.59, 4.12, 29.5, 2.67, 13.2. **HRMS (ESI):** calcd. for $C_{19}H_{20}N_2O_2S$ $[M+H]^+$: 341.1318, found: 341.1315.

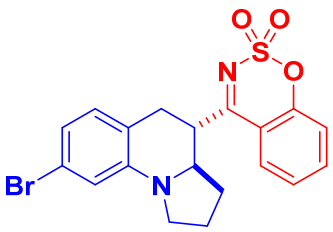
3-(5,6,6a,6b,7,8,9,10,10a,11-decahydroisoindolo[2,1-*a*]quinolin-6-yl)benzo[*d*]isothiazole 1,1-dioxide (3p)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:10) afforded the product (80.0 mg, 68% yield) as a red solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.96 (d, *J* = 7.3 Hz, 1H), 7.79 (td, *J* = 7.4, 0.9 Hz, 1H), 7.74 (td, *J* = 7.5, 0.9 Hz, 1H), 7.69 (d, *J* = 7.5 Hz, 1H), 7.18 (t, *J* = 7.7 Hz, 1H), 7.06 (d, *J* = 7.3 Hz, 1H), 6.64 (t, *J* = 7.3 Hz, 1H), 6.56 (d, *J* = 8.1 Hz, 1H), 4.04 (t, *J* = 9.4 Hz, 1H), 3.35 (dd, *J* = 9.1, 6.0 Hz, 1H), 3.29 (dd, *J* = 16.6, 11.1 Hz, 2H), 3.04 (dd, *J* = 15.7, 3.4 Hz, 1H), 3.00 – 2.93 (m, 1H), 2.19 (td, *J* = 10.6, 5.1 Hz, 1H), 2.00 (dd, *J* = 8.8, 4.6 Hz, 1H), 1.73 – 1.66 (m, 2H), 1.49 – 1.33 (m, 4H), 1.26 – 1.16 (m, 2H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 179.2, 144.0, 139.8, 134.1, 134.0, 131.4, 128.5, 128.1, 123.8, 123.1, 119.4, 115.4, 110.7, 61.9, 53.9, 44.3, 38.3, 37.5, 35.0, 28.4, 25.8, 24.9, 21.0. **HRMS (ESI):** calcd. for $C_{23}H_{24}N_2O_2S$ $[M+H]^+$: 393.1631, found: 393.1628.

4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5a)

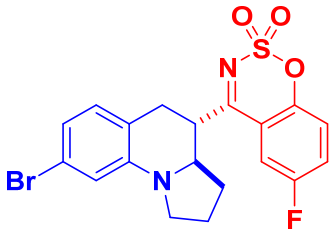


Flash column chromatography on a silica gel (ethyl acetate: cyclohexane, 1:15) afforded the product

(114.1 mg, 88% yield) as a russet solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.83 (dd, *J* = 8.0, 1.0 Hz, 1H), 7.79 – 7.72 (m, 1H), 7.44 – 7.38 (m, 1H), 7.35 (d, *J* = 8.3 Hz, 1H), 6.88 (d, *J* = 7.9 Hz, 1H), 6.72 (dd, *J* = 7.9, 1.8 Hz, 1H), 6.64 (d, *J* = 1.7 Hz, 1H), 3.80 (td, *J* = 9.8, 5.0 Hz, 1H), 3.47 (dd, *J* = 8.9, 7.9 Hz, 1H), 3.26 (dt, *J* = 16.8, 8.4 Hz, 1H), 3.20 – 3.07 (m, 2H), 2.99 (dd, *J* = 14.8, 2.8 Hz, 1H), 2.21 (dt, *J* = 11.5, 5.7 Hz, 1H), 2.11 (dt, *J* = 14.1, 7.9 Hz, 1H), 2.05 – 1.95 (m, 1H), 1.38 (ddd, *J* = 22.3, 11.9, 7.4 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 182.2, 153.8, 144.6, 137.4, 129.7, 127.9, 126.1, 121.7, 119.7, 118.5, 118.1, 116.3, 113.1, 61.1, 47.2, 42.0, 34.6, 31.4, 23.8. **HRMS (ESI):** calcd. for $C_{19}H_{17}BrN_2O_3S$ $[M+H]^+$: 433.0216, found: 433.0211.

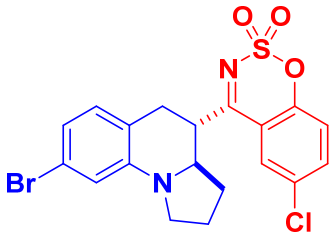
4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-6-fluorobenzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5b)



Flash column chromatography on a silica gel (ethyl acetate: cyclohexane, 1:15) afforded the product (121.5 mg, 90% yield) as a red solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.48 (ddd, *J* = 16.2, 8.9, 4.1 Hz, 2H), 7.35 (dd, *J* = 9.0, 4.3 Hz, 1H), 6.88 (d, *J* = 7.9 Hz, 1H), 6.71 (d, *J* = 7.7 Hz, 1H), 6.63 (s, 1H), 3.76 (dd, *J* = 13.4, 9.2 Hz, 1H), 3.46 (t, *J* = 8.8 Hz, 1H), 3.26 (dd, *J* = 16.8, 9.2 Hz, 1H), 3.04 (ddd, *J* = 31.0, 22.3, 11.8 Hz, 3H), 2.19 (dt, *J* = 11.3, 5.5 Hz, 1H), 2.11 (dd, *J* = 12.9, 6.5 Hz, 1H), 2.01 (ddd, *J* = 15.6, 12.1, 6.2 Hz, 1H), 1.39 (td, *J* = 19.1, 11.5 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 181.4, 160.2, 158.2, 149.8, 144.5, 129.7, 124.7, 124.5, 121.8, 121.5 (d, *J* = 7.9 Hz), 118.2 (d, *J* = 15.3 Hz), 117.0 (d, *J* = 7.5 Hz), 114.2, 114.0, 113.2, 61.2, 47.2, 42.2, 34.6, 31.4, 23.7. **HRMS (ESI):** calcd. for $C_{19}H_{16}BrFN_2O_3S$ $[M+H]^+$: 451.0122, found: 451.0120.

4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-6-chlorobenzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5c)

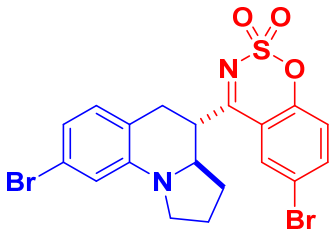


Flash column chromatography on a silica gel (ethyl acetate: cyclohexane, 1:15) afforded the product (104.9 mg, 75% yield) as a russet solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.79 (d, *J* = 1.3 Hz, 1H), 7.73 – 7.65 (m, 1H), 7.31 (d, *J* = 8.8 Hz, 1H), 6.89 (d, *J* = 7.8 Hz, 1H), 6.73 (d, *J* = 7.6 Hz, 1H), 6.65 (s, 1H), 3.78 (dt, *J* = 14.0, 4.8 Hz, 1H), 3.47 (t, *J* = 8.8 Hz, 1H), 3.27 (dd, *J* = 16.9, 9.1 Hz, 1H), 3.11 – 2.96 (m, 3H), 2.20 (dt, *J* = 11.2, 5.4 Hz, 1H), 2.15 – 2.08 (m, 1H), 2.06 – 1.96 (m, 1H), 1.39 (td, *J* = 19.2, 11.5 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 181.3, 152.1, 144.5, 137.2, 131.8, 129.7, 127.4, 121.8, 121.2, 118.3, 118.2, 117.2,

113.2, 61.2, 47.3, 42.1, 34.7, 31.4, 23.8. **HRMS (ESI):** calcd. for $C_{19}H_{16}BrClN_2O_3S$ $[M+H]^+$: 466.9826, found: 466.9823.

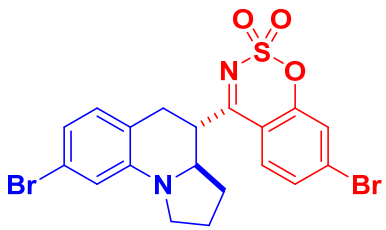
6-bromo-4-(8-bromo-1,2,3,3a,4,5,5a,6-octahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5d)



Flash column chromatography on a silica gel (ethyl acetate: cyclohexane, 1:15) afforded the product (105.6 mg, 69% yield) as a fuchsia solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.93 (d, *J* = 2.1 Hz, 1H), 7.84 (dd, *J* = 8.8, 2.1 Hz, 1H), 7.25 (d, *J* = 8.8 Hz, 1H), 6.90 (d, *J* = 7.9 Hz, 1H), 6.74 (dd, *J* = 7.9, 1.6 Hz, 1H), 6.65 (d, *J* = 1.5 Hz, 1H), 3.79 (td, *J* = 9.7, 4.9 Hz, 1H), 3.48 (t, *J* = 8.7 Hz, 1H), 3.27 (dd, *J* = 16.8, 9.4 Hz, 1H), 3.15 – 2.93 (m, 3H), 2.20 (dt, *J* = 11.5, 5.7 Hz, 1H), 2.16 – 2.09 (m, 1H), 2.06 – 1.96 (m, 1H), 1.42 – 1.33 (m, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 181.2, 152.7, 144.5, 140.0, 130.4, 129.7, 121.8, 121.4, 119.0, 118.3, 118.2, 117.6, 113.2, 61.2, 47.2, 42.1, 34.7, 31.4, 23.7. **HRMS (ESI):** calcd. for $C_{19}H_{16}Br_2N_2O_3S$ $[M+H]^+$: 510.9321, found: 510.9316.

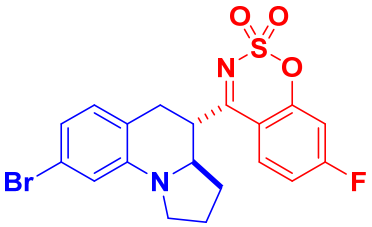
7-bromo-4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5e)



Flash column chromatography on a silica gel (ethyl acetate: cyclohexane, 1:15) afforded the product (107.1 mg, 70% yield) as a red solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.68 (d, *J* = 8.4 Hz, 1H), 7.57 – 7.50 (m, 2H), 6.87 (d, *J* = 7.9 Hz, 1H), 6.71 (dd, *J* = 7.9, 1.7 Hz, 1H), 6.62 (d, *J* = 1.4 Hz, 1H), 3.75 (dd, *J* = 14.2, 9.5 Hz, 1H), 3.46 (t, *J* = 8.8 Hz, 1H), 3.25 (dt, *J* = 16.7, 8.5 Hz, 1H), 3.11 – 3.02 (m, 2H), 3.01 – 2.91 (m, 1H), 2.18 (dt, *J* = 11.5, 5.7 Hz, 1H), 2.14 – 2.07 (m, 1H), 2.00 (dddd, *J* = 12.1, 9.3, 6.3, 2.7 Hz, 1H), 1.37 (ddd, *J* = 22.3, 11.8, 7.4 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 181.7, 153.9, 144.5, 132.0, 129.7, 129.7, 128.8, 123.0, 121.8, 118.4, 118.1, 115.1, 113.2, 61.2, 47.2, 42.1, 34.6, 31.4, 23.7. **HRMS (ESI):** calcd. for $C_{19}H_{16}Br_2N_2O_3S$ $[M+H]^+$: 510.9321, found: 510.9316.

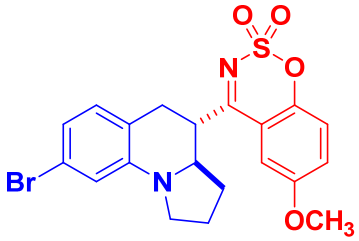
4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-7-fluorobenzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5f)



Flash column chromatography on a silica gel (ethyl acetate: cyclohexane, 1:15) afforded the product (82.4 mg, 61% yield) as a red solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.87 (dd, *J* = 8.9, 5.7 Hz, 1H), 7.15 – 7.08 (m, 1H), 7.07 (dd, *J* = 8.2, 2.3 Hz, 1H), 6.87 (d, *J* = 7.9 Hz, 1H), 6.71 (dd, *J* = 7.9, 1.5 Hz, 1H), 6.63 (d, *J* = 1.3 Hz, 1H), 3.83 – 3.72 (m, 1H), 3.46 (t, *J* = 8.7 Hz, 1H), 3.25 (dd, *J* = 16.8, 9.3 Hz, 1H), 3.14 – 3.04 (m, 2H), 3.02 – 2.93 (m, 1H), 2.19 (dt, *J* = 11.5, 5.6 Hz, 1H), 2.13 – 2.06 (m, 1H), 2.07 – 1.94 (m, 1H), 1.37 (qd, *J* = 11.7, 7.5 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 181.4, 168.3, 166.2, 155.7 (d, *J* = 13.9, Hz), 144.5, 130.4 (d, *J* = 11.3, Hz), 129.7, 121.7, 118.4, 118.1, 114.2 (d, *J* = 22.7, Hz), 113.2 (d, *J* = 3.8, Hz), 107.6 (d, *J* = 24.5, Hz), 61.1, 47.2, 42.3, 34.6, 31.4, 23.7. **HRMS (ESI):** calcd. for $C_{19}H_{16}BrFN_2O_3S$ $[M+H]^+$: 451.0122, found: 451.0120.

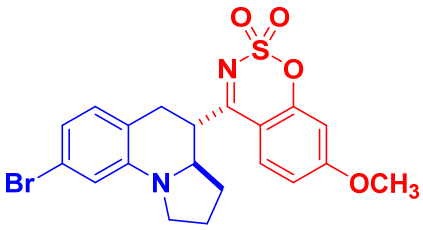
4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-6-methoxybenzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5g)



Flash column chromatography on a silica gel (ethyl acetate: cyclohexane, 1:15) afforded the product (130.3 mg, 94% yield) as a red solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.28 (d, *J* = 1.2 Hz, 2H), 7.21 (s, 1H), 6.89 (d, *J* = 7.9 Hz, 1H), 6.72 (dd, *J* = 7.9, 1.7 Hz, 1H), 6.64 (d, *J* = 1.5 Hz, 1H), 3.84 (s, 3H), 3.82 – 3.73 (m, 1H), 3.46 (t, *J* = 8.7 Hz, 1H), 3.26 (dd, *J* = 16.8, 9.4 Hz, 1H), 3.14 – 3.04 (m, 2H), 2.99 (dt, *J* = 12.7, 10.1 Hz, 1H), 2.19 (dt, *J* = 11.5, 5.6 Hz, 1H), 2.14 – 2.06 (m, 1H), 2.05 – 1.95 (m, 1H), 1.38 (ddd, *J* = 22.4, 11.8, 7.4 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 182.0, 157.1, 147.5, 144.6, 129.7, 123.5, 121.7, 120.6, 118.6, 118.1, 116.8, 113.1, 111.5, 61.3, 56.3, 47.2, 41.9, 34.5, 31.4, 23.8. **HRMS (ESI):** calcd. for $C_{20}H_{19}BrN_2O_4S$ $[M+H]^+$: 463.0322, found: 463.0320.

4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-7-methoxybenzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5h)

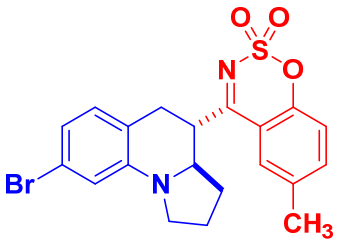


Flash column chromatography on a silica gel (ethyl acetate: cyclohexane, 1:15) afforded the product

(68.4 mg, 63% yield) as a russet solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.73 (d, *J* = 9.0 Hz, 1H), 6.90 – 6.84 (m, 2H), 6.78 (d, *J* = 2.5 Hz, 1H), 6.70 (dd, *J* = 7.9, 1.8 Hz, 1H), 6.62 (d, *J* = 1.7 Hz, 1H), 3.94 (s, 3H), 3.76 (td, *J* = 9.9, 5.1 Hz, 1H), 3.45 (t, *J* = 8.6 Hz, 1H), 3.24 (dt, *J* = 16.8, 8.5 Hz, 1H), 3.14 – 3.03 (m, 2H), 2.94 (d, *J* = 11.8 Hz, 1H), 2.18 (dt, *J* = 11.5, 5.6 Hz, 1H), 2.12 – 2.04 (m, 1H), 2.04 – 1.92 (m, 1H), 1.37 (ddd, *J* = 22.3, 11.9, 7.3 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 181.3, 166.9, 156.4, 144.6, 129.7, 129.6, 121.6, 118.7, 117.9, 113.6, 113.0, 109.8, 103.5, 61.1, 56.5, 47.2, 41.8, 34.5, 3.39, 23.8. **HRMS (ESI):** calcd. for $C_{20}H_{19}BrN_2O_4S$ $[M+H]^+$: 463.0322, found: 463.0320.

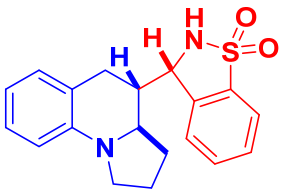
4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-6-methylbenzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5i)



Flash column chromatography on a silica gel (ethyl acetate: cyclohexane, 1:15) afforded the product (87.0 mg, 65% yield) as a russet solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.59 (s, 1H), 7.54 (dd, *J* = 8.5, 1.4 Hz, 1H), 7.23 (d, *J* = 8.4 Hz, 1H), 6.89 (d, *J* = 7.9 Hz, 1H), 6.72 (dd, *J* = 7.9, 1.7 Hz, 1H), 6.64 (d, *J* = 1.6 Hz, 1H), 3.80 (td, *J* = 9.8, 5.0 Hz, 1H), 3.47 (t, *J* = 8.5 Hz, 1H), 3.26 (dd, *J* = 16.8, 9.4 Hz, 1H), 3.19 – 3.04 (m, 2H), 2.98 (dd, *J* = 15.0, 3.1 Hz, 1H), 2.20 (dt, *J* = 11.5, 5.7 Hz, 1H), 2.10 (dt, *J* = 14.0, 7.2 Hz, 1H), 2.00 (tdd, *J* = 12.4, 6.2, 2.8 Hz, 1H), 1.38 (ddd, *J* = 22.4, 11.9, 7.4 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 182.3, 151.8, 144.6, 138.2, 136.3, 129.7, 127.8, 121.7, 119.4, 118.6, 118.0, 116.0, 113.1, 61.1, 47.3, 41.8, 34.7, 31.4, 23.8, 21.0. **HRMS (ESI):** calcd. for $C_{20}H_{19}BrN_2O_3S$ $[M+H]^+$: 447.0373, found: 447.0376.

3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-2,3-dihydrobenzo[*d*]isothiazole 1,1-dioxide (6)

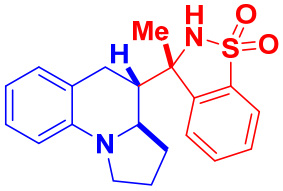


Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:1) afforded the product (98.0 mg, 96% yield) as a yellow solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.82 (d, *J* = 7.7 Hz, 1H), 7.60 (dt, *J* = 26.1, 7.4 Hz, 2H), 7.42 (d, *J* = 7.7 Hz, 1H), 7.08 (t, *J* = 7.6 Hz, 1H), 7.00 (d, *J* = 7.3 Hz, 1H), 6.57 (t, *J* = 7.3 Hz, 1H), 6.38 (d, *J* = 8.0 Hz, 1H), 5.08 (d, *J* = 5.1 Hz, 1H), 4.98 (d, *J* = 4.0 Hz, 1H), 3.49 (td, *J* = 10.2, 4.7 Hz, 1H), 3.21 (t, *J* = 8.6 Hz, 1H), 3.11 (dd, *J* = 17.0, 9.0 Hz, 1H), 2.88 – 2.75 (m, 2H), 2.17 (ddd, *J* = 9.7, 6.0, 2.3 Hz, 1H), 1.87 (dq, *J* = 15.1, 7.7 Hz, 1H), 1.78 (tdd, *J* = 16.1, 9.6, 6.5 Hz, 1H), 1.48 (dt, *J* = 11.2, 5.6 Hz, 1H), 0.93 (tt, *J* = 21.9, 10.9 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 144.0, 138.5, 135.7,

133.0, 129.8, 128.4, 127.7, 124.8, 121.8, 120.0, 115.1, 109.9, 60.5, 58.5, 46.2, 41.9, 32.7, 32.0, 24.0. **HRMS (ESI):** calcd. for $C_{19}H_{20}N_2O_2S$ $[M+H]^+$: 341.1318, found: 341.1316.

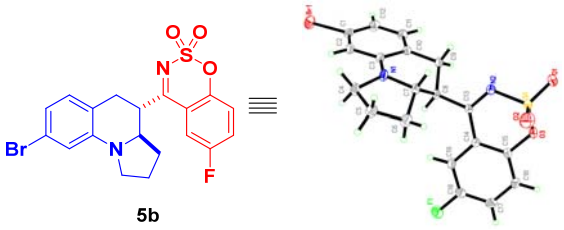
3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-3-methyl-2,3-dihydrobenzo[*d*]isothiazole 1,1-dioxide (7)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1:1) afforded the product (102.0 mg, 96% yield) as an off white solid.

^{1}H NMR (500 MHz, $CDCl_3$) δ 7.79 (d, *J* = 7.7 Hz, 1H), 7.65 (t, *J* = 7.4 Hz, 1H), 7.58 (t, *J* = 7.5 Hz, 1H), 7.40 (d, *J* = 7.6 Hz, 1H), 7.09 (t, *J* = 7.5 Hz, 1H), 7.04 (d, *J* = 7.3 Hz, 1H), 6.58 (t, *J* = 7.3 Hz, 1H), 6.37 (d, *J* = 7.9 Hz, 1H), 4.52 (s, 1H), 3.45 (td, *J* = 10.1, 4.3 Hz, 1H), 3.18 – 2.96 (m, 3H), 2.88 – 2.76 (m, 1H), 2.12 (t, *J* = 9.0 Hz, 1H), 1.81 – 1.62 (m, 5H), 1.16 – 1.06 (m, 1H), 0.76 (td, *J* = 19.4, 11.4 Hz, 1H). **^{13}C NMR** (126 MHz, $CDCl_3$) δ 144.9, 144.1, 134.5, 133.1, 129.8, 128.4, 127.7, 124.0, 121.7, 119.8, 118.0, 109.7, 65.0, 59.5, 46.0, 45.1, 32.6, 30.5, 28.3, 23.9. **HRMS (ESI):** calcd. for $C_{20}H_{22}N_2O_2S$ $[M+H]^+$: 355.1475, found: 355.1470.

4. X-ray Crystallography of 5b



5b

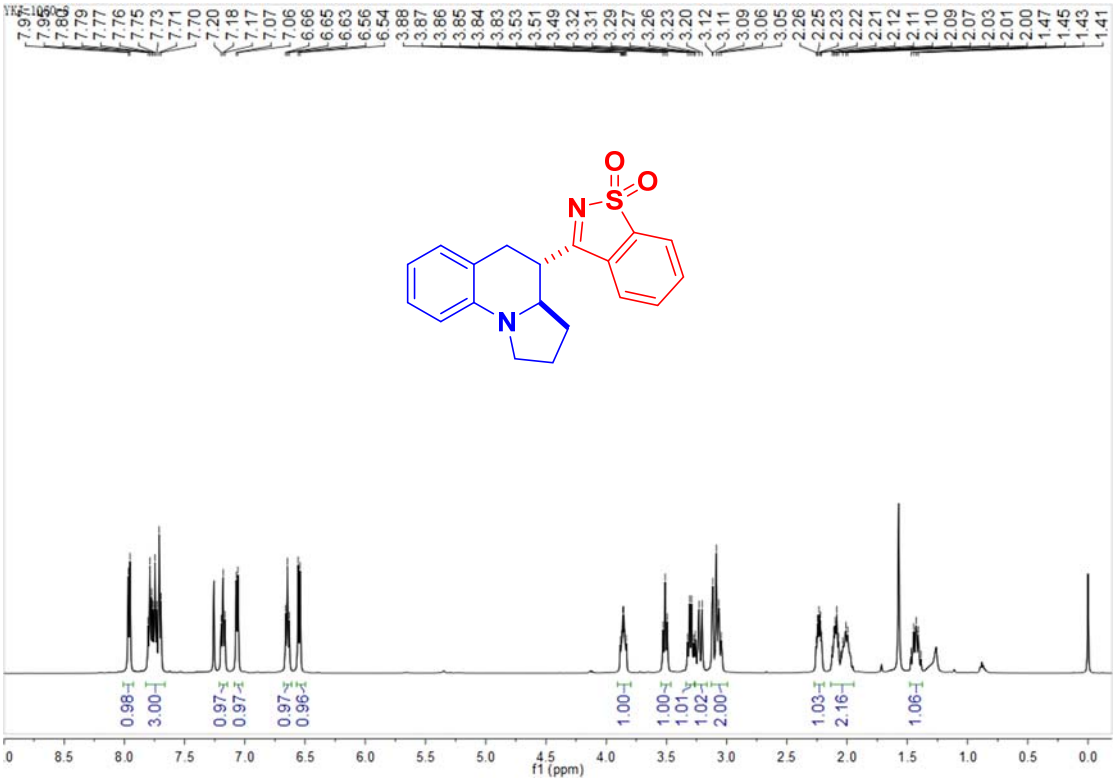
5b, CCDC: 2022448

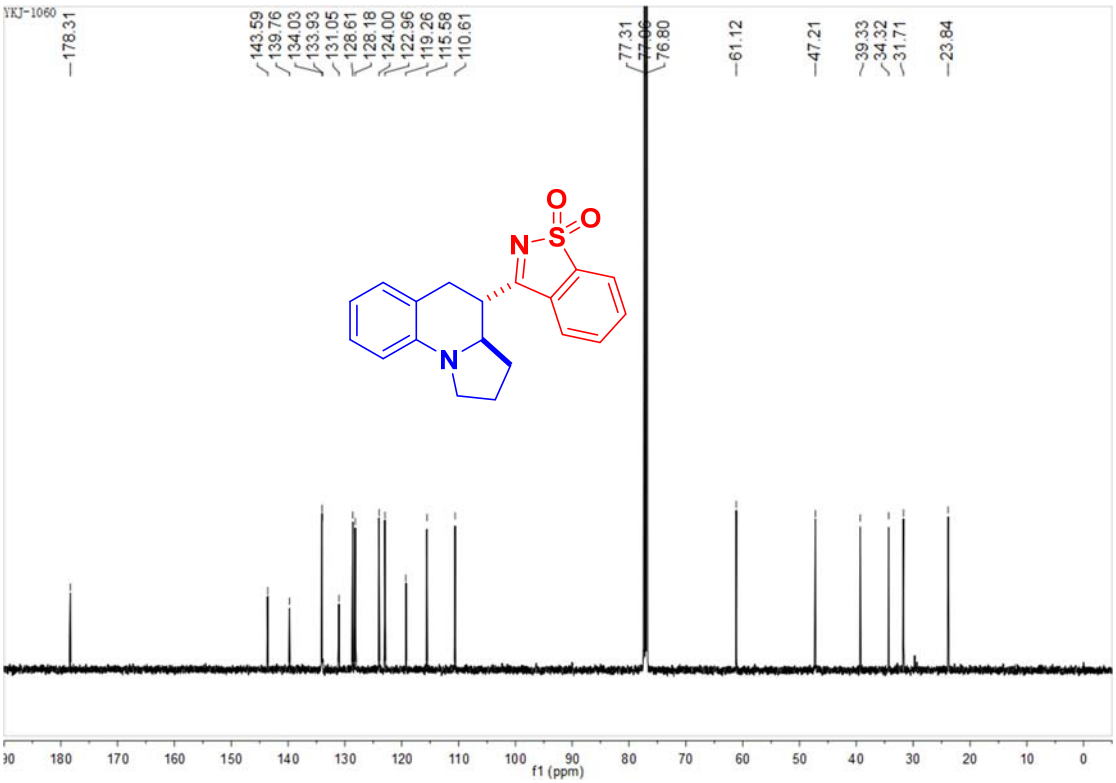
Table 1. Crystal data and structure refinement for 5b.

Identification code	**5b**
Empirical formula	$C_{19}H_{16}BrFN_2O_3S$
Formula weight	451.31
Temperature	293(2) K
Wavelength	1.54184 A
Crystal system, space group	Monoclinic, P21/c
Unit cell dimensions	a = 15.5459(4) A alpha = 90 deg.
	b = 8.94958(15) A beta = 118.747(3) deg.
	c = 14.9499(4) A gamma = 90 deg.
Volume	1823.62(7) A^3
Z, Calculated density	4, 1.644 Mg/m^3
Absorption coefficient	4.441 mm^-1
F(000)	912
Crystal size	0.12 x 0.12 x 0.11 mm
Theta range for data collection	3.24 to 67.24 deg.
Limiting indices	-18<=h<=16, -10<=k<=10, 0<=l<=17
Reflections collected / unique	3267 / 3267 [R(int) = 0.0000]
Completeness to theta = 67.24	100.0 %
Max. and min. transmission	0.6408 and 0.6178
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	3267 / 0 / 246
Goodness-of-fit on F^2	0.972
Final R indices [I>2sigma(I)]	R1 = 0.0398, wR2 = 0.1116
R indices (all data)	R1 = 0.0404, wR2 = 0.1127
Extinction coefficient	0.0029(3)
Largest diff. peak and hole	0.696 and -0.917 e.A^-3

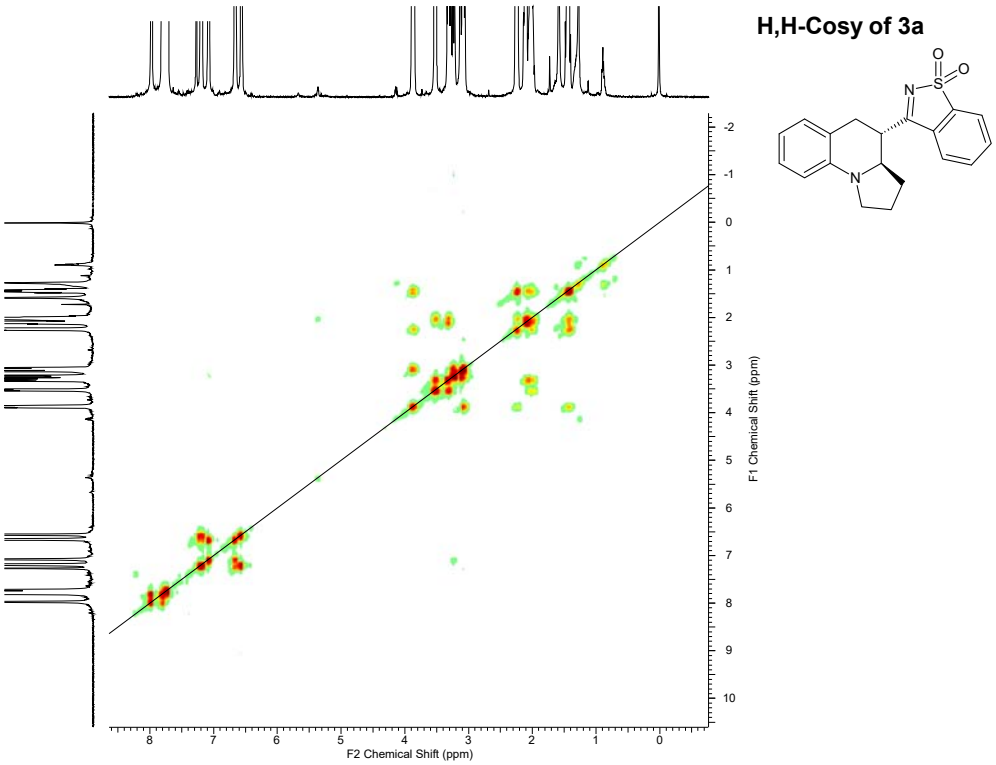
5. ^{1}H and ^{13}C NMR Spectra as well as H,H-Cosy, NOESY of 3a, 6 and 7

3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3a)

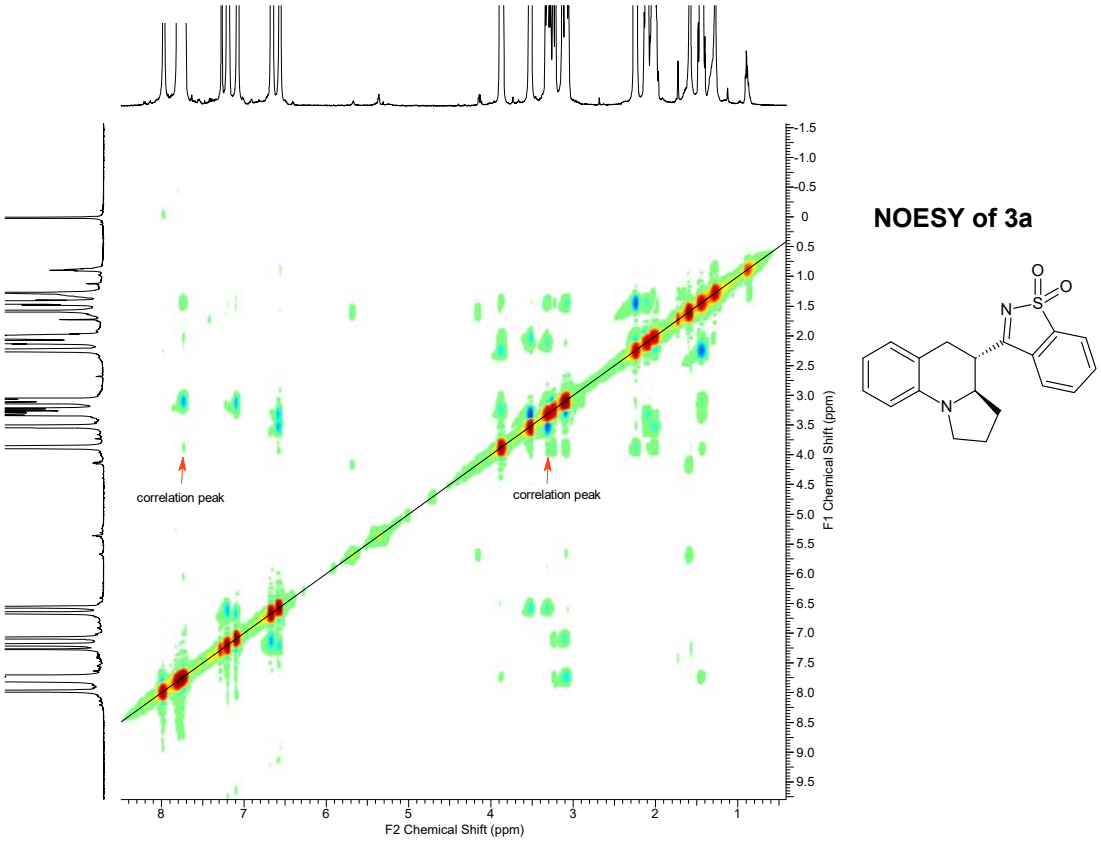




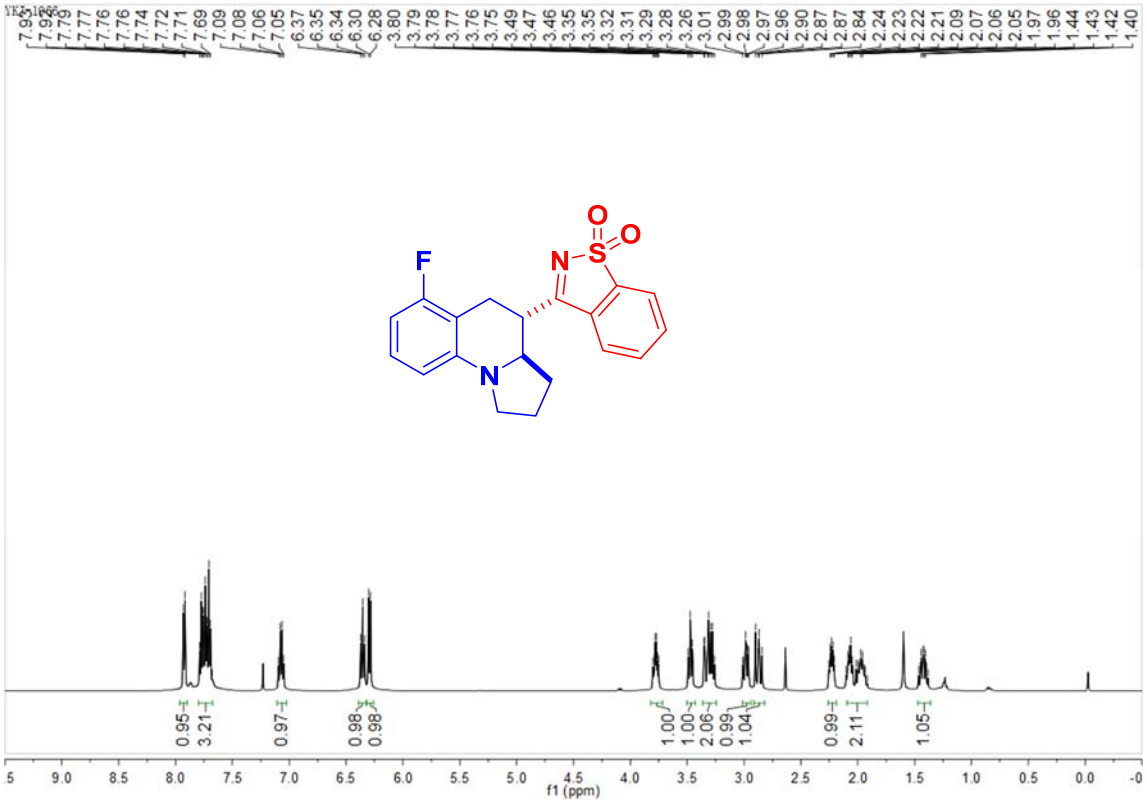
H,H-Cosy of 3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*] isothiazole 1,1-dioxide (3a)

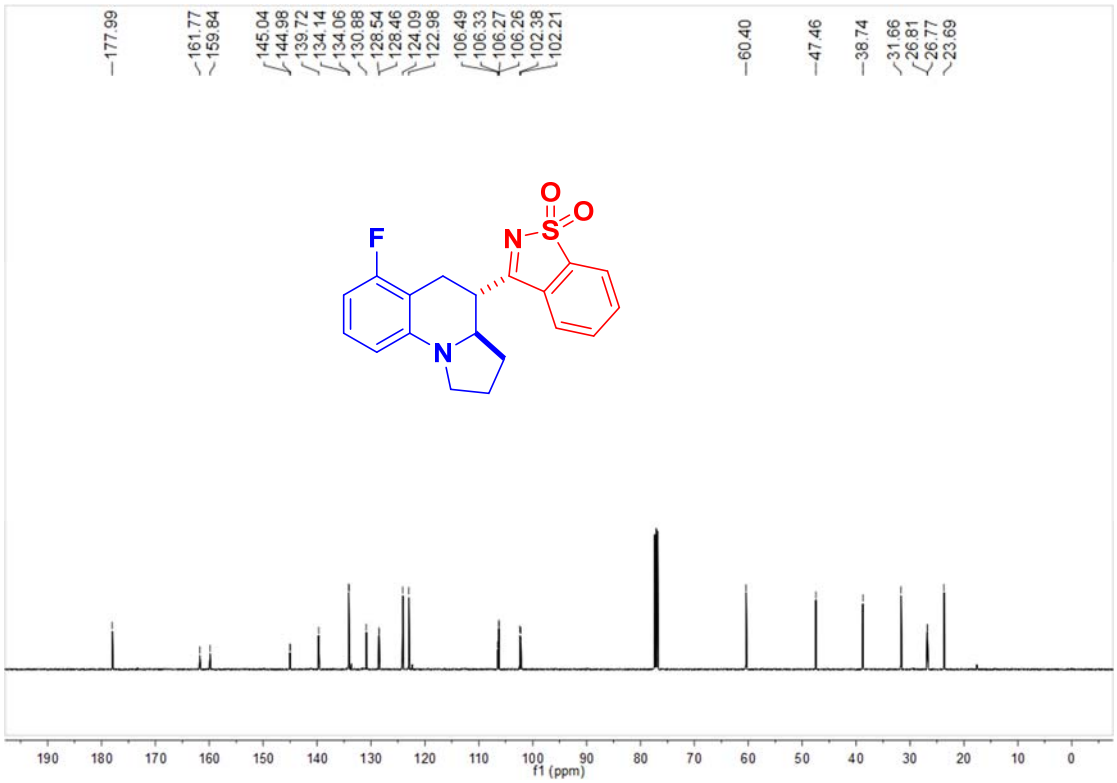


NOESY of 3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3a)

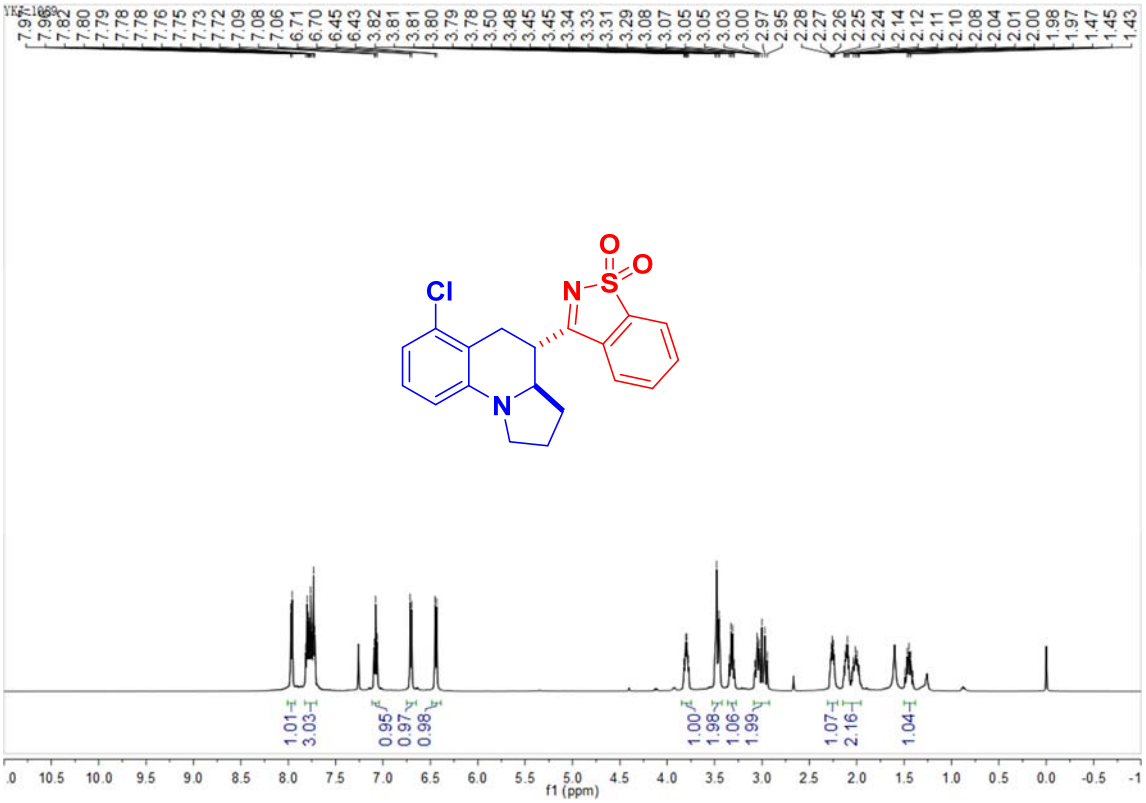


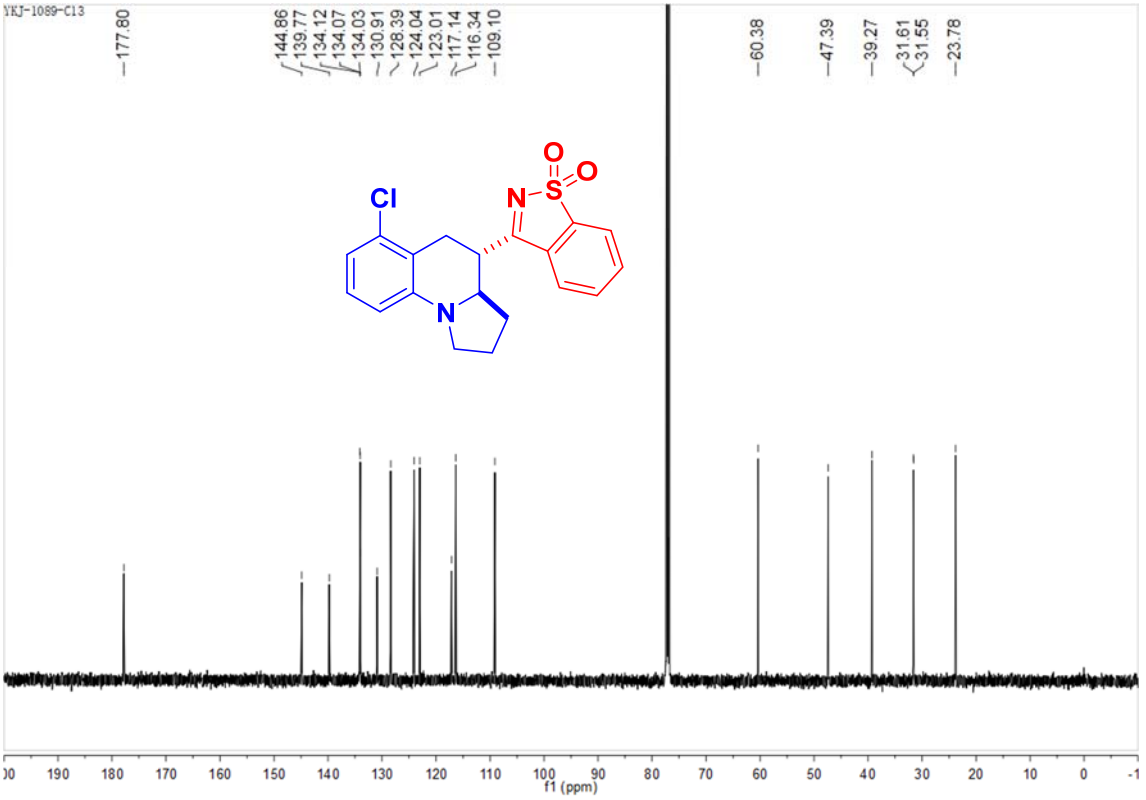
3-(6-fluoro-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3b)



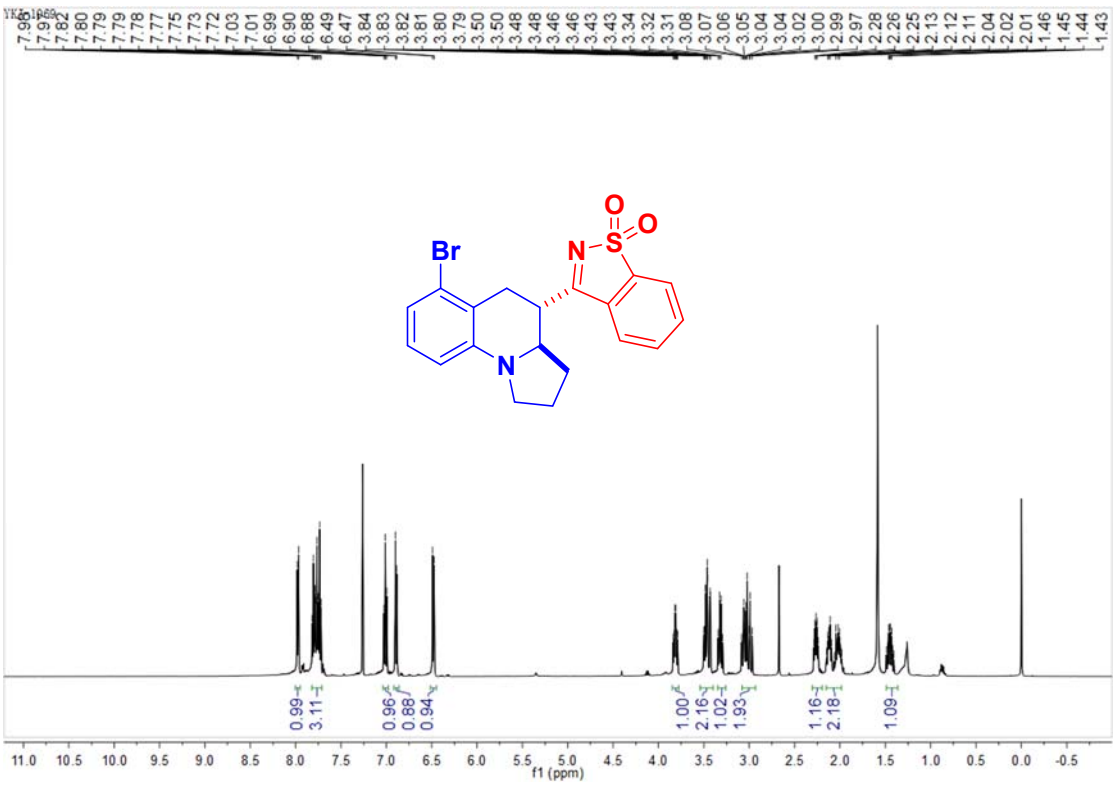


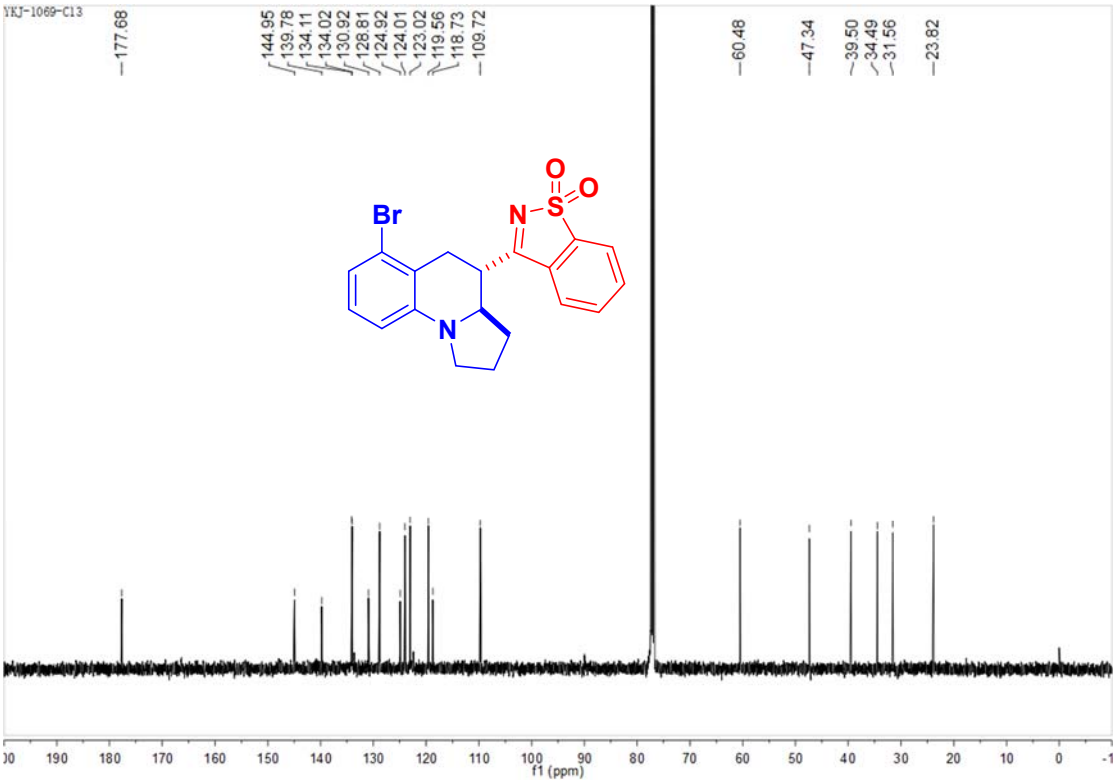
3-(6-chloro-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3c)



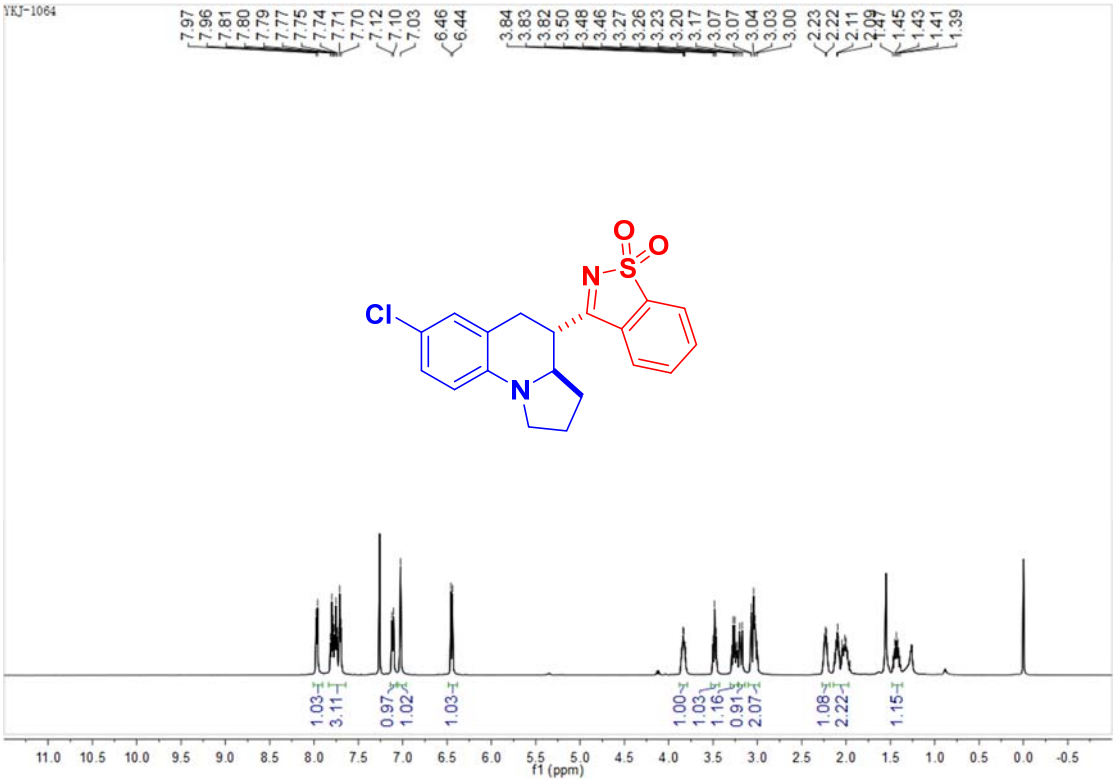


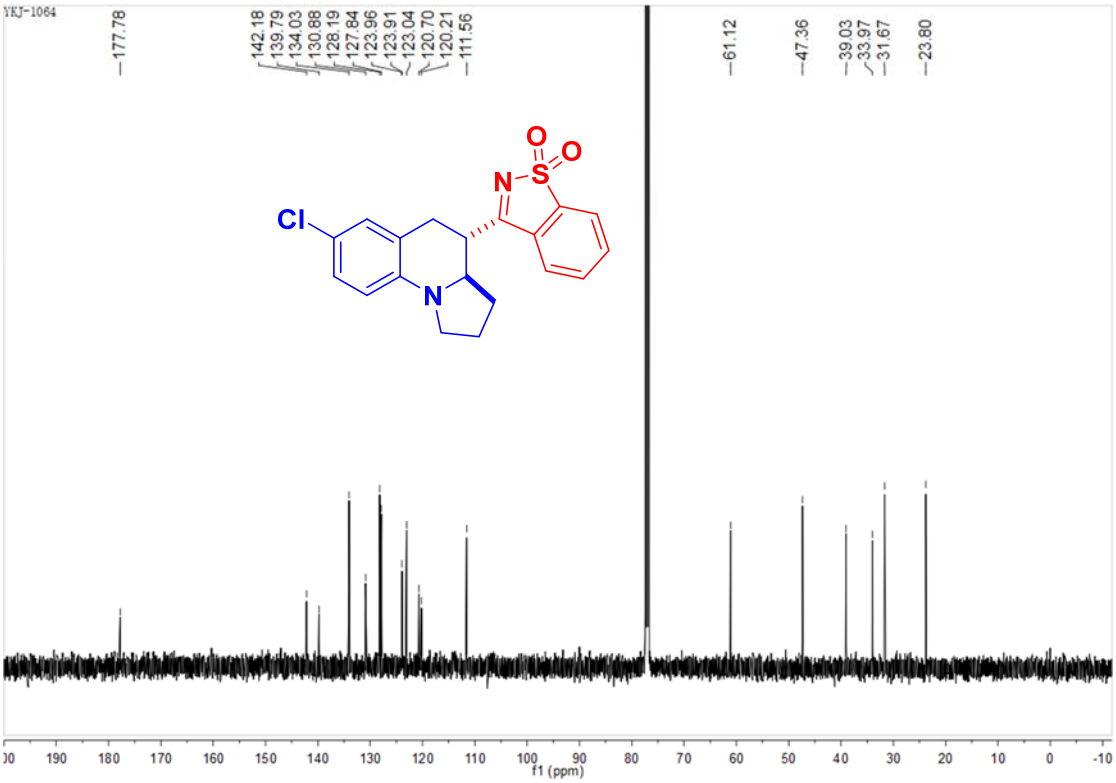
3-(6-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3d)



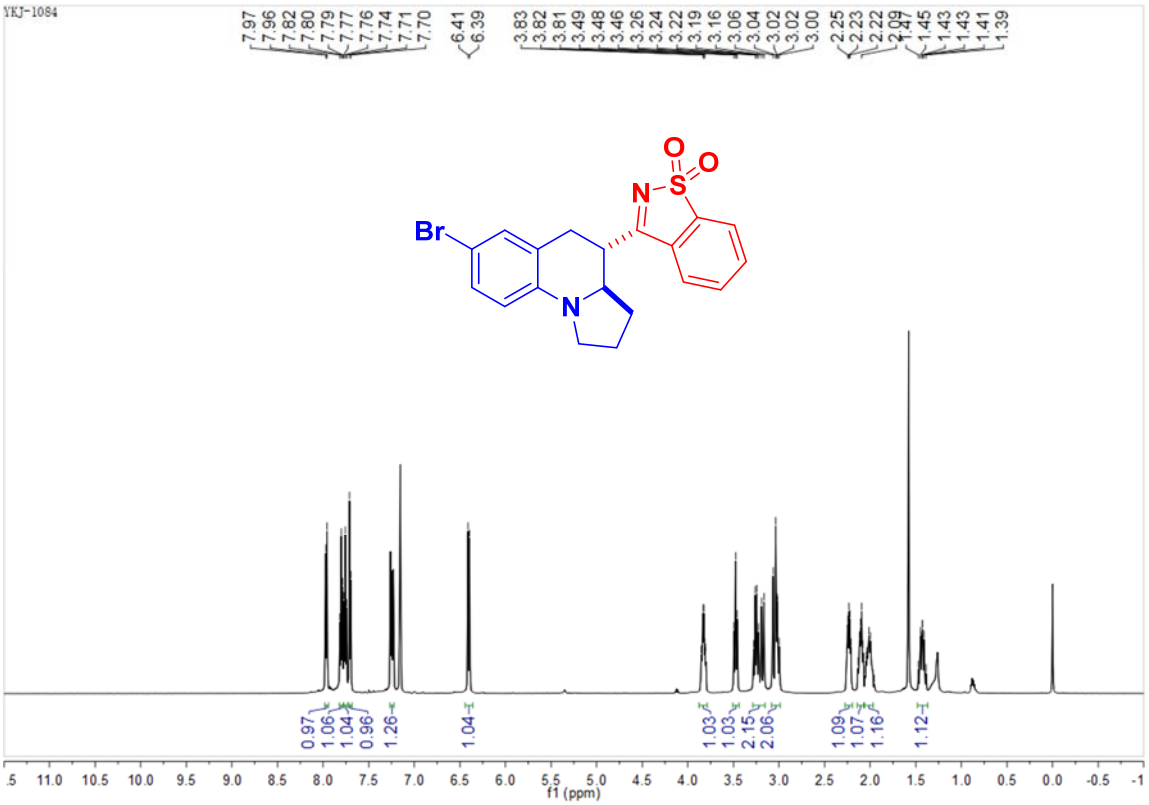


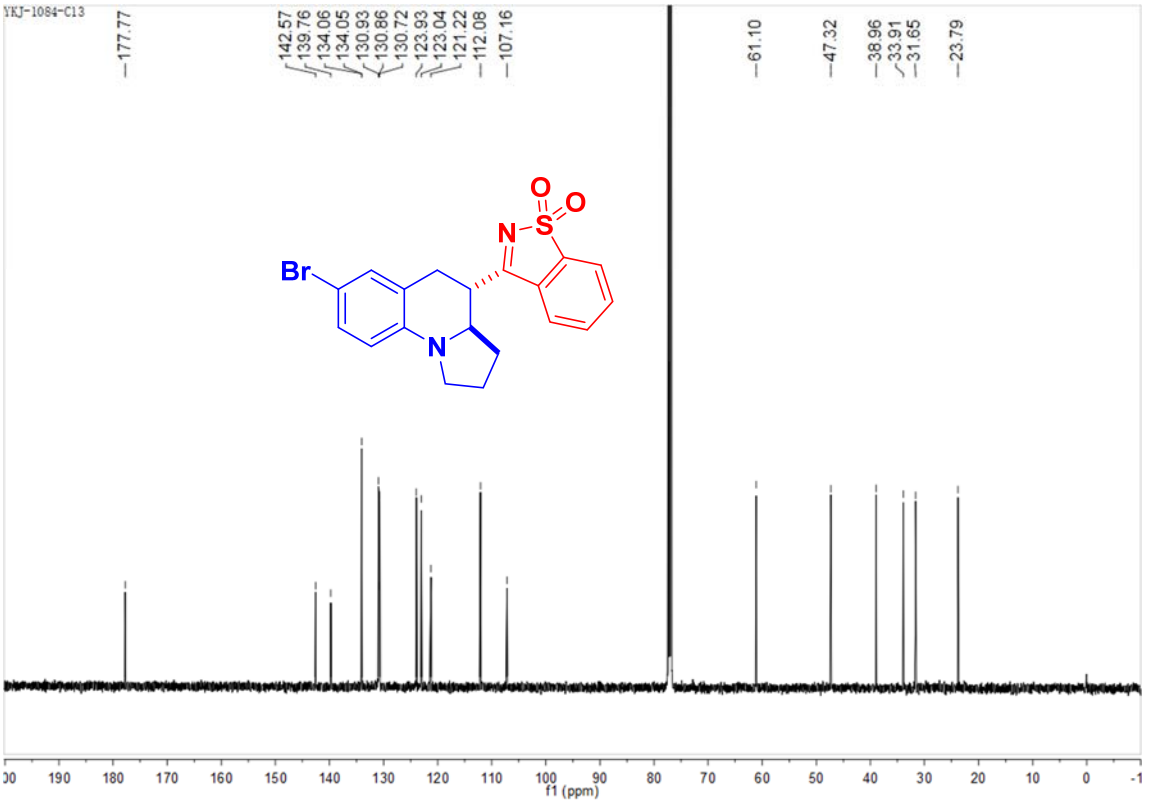
3-(7-chloro-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3e)



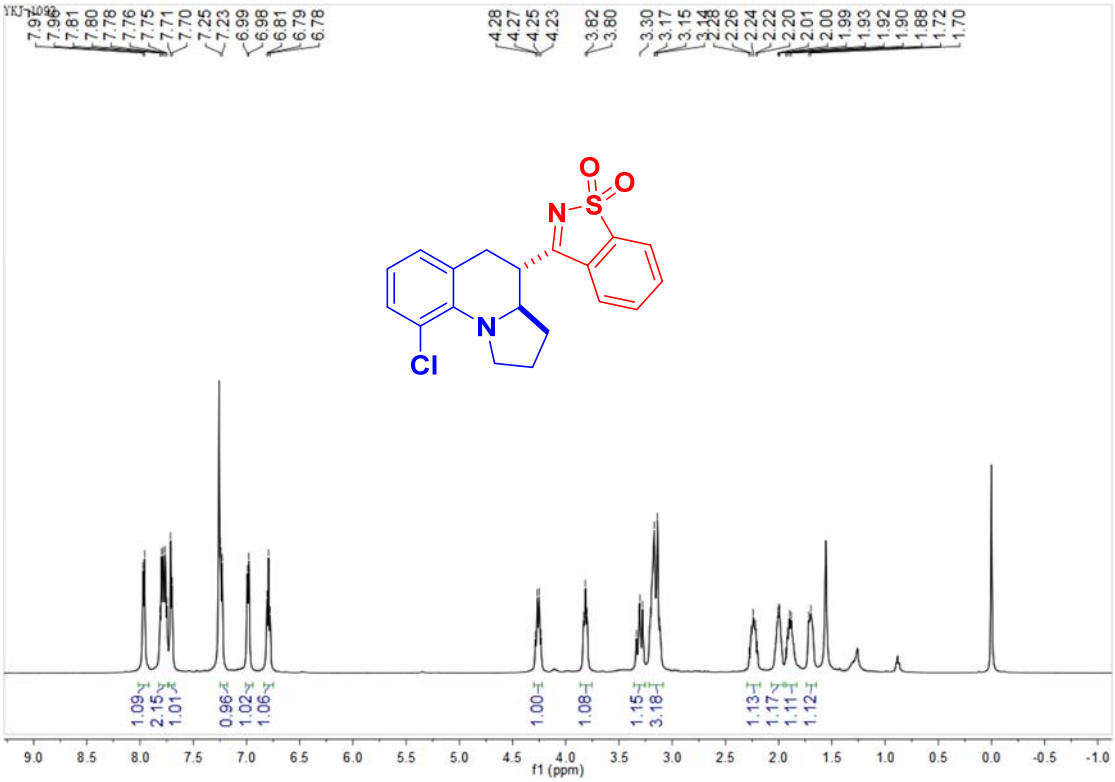


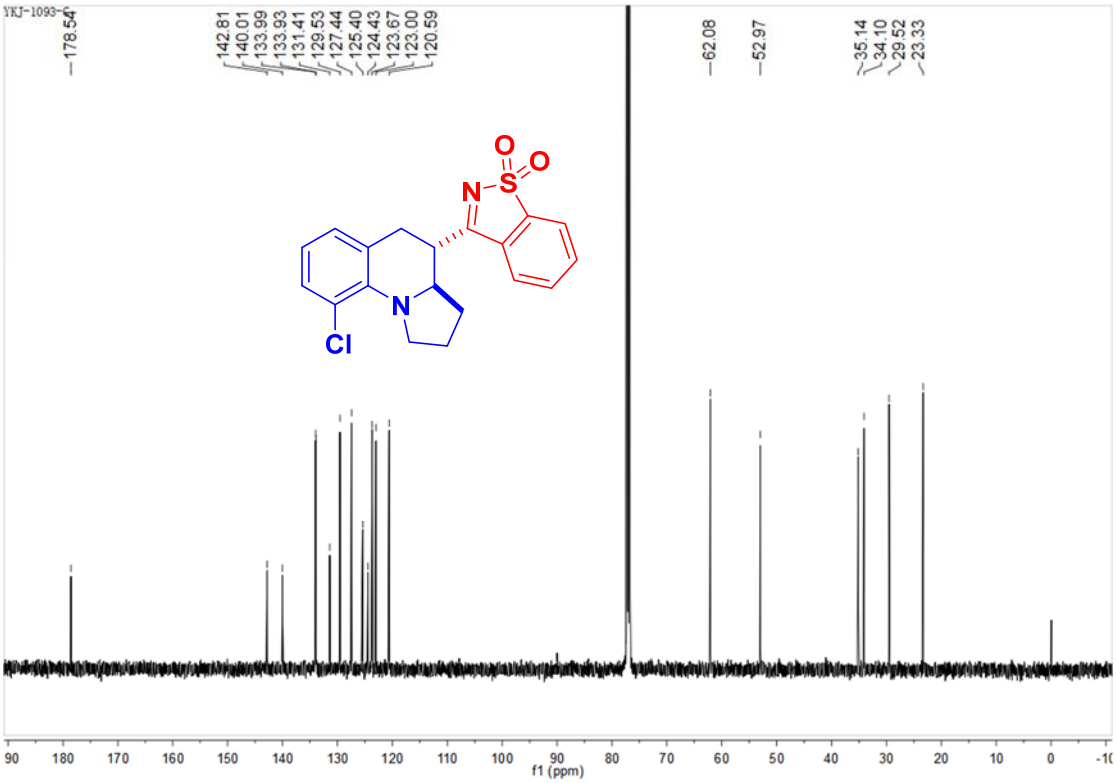
3-(7-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3f)



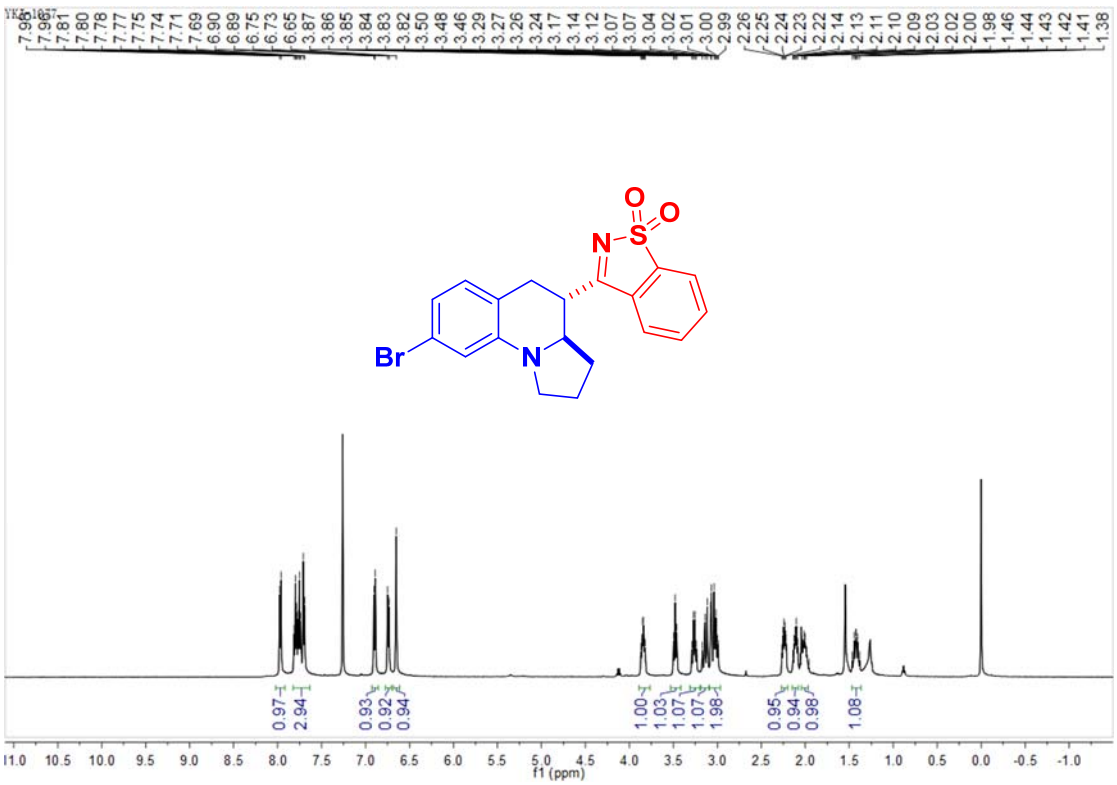


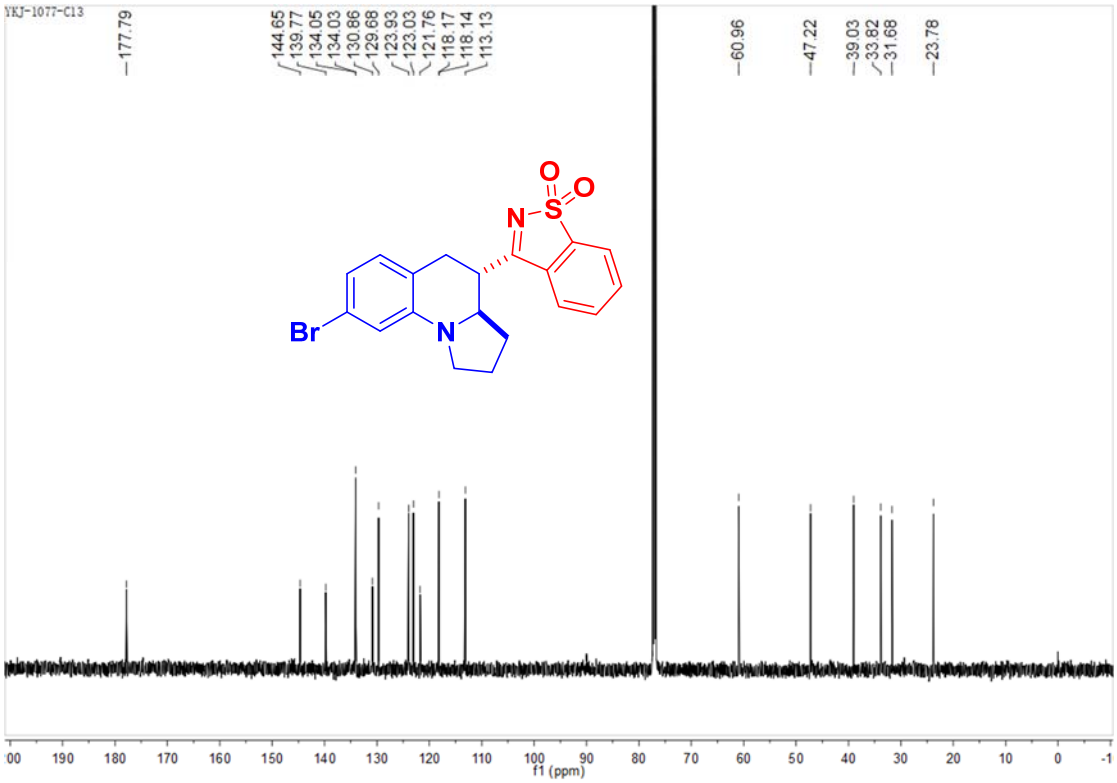
3-(9-chloro-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3g)



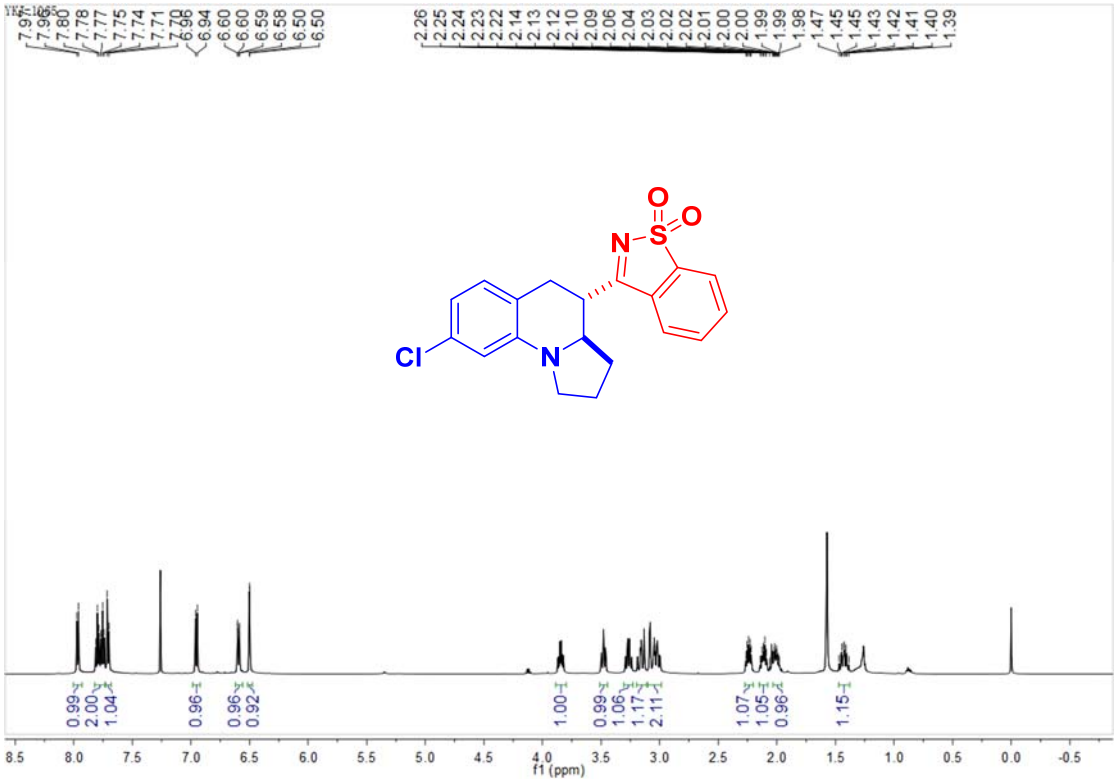


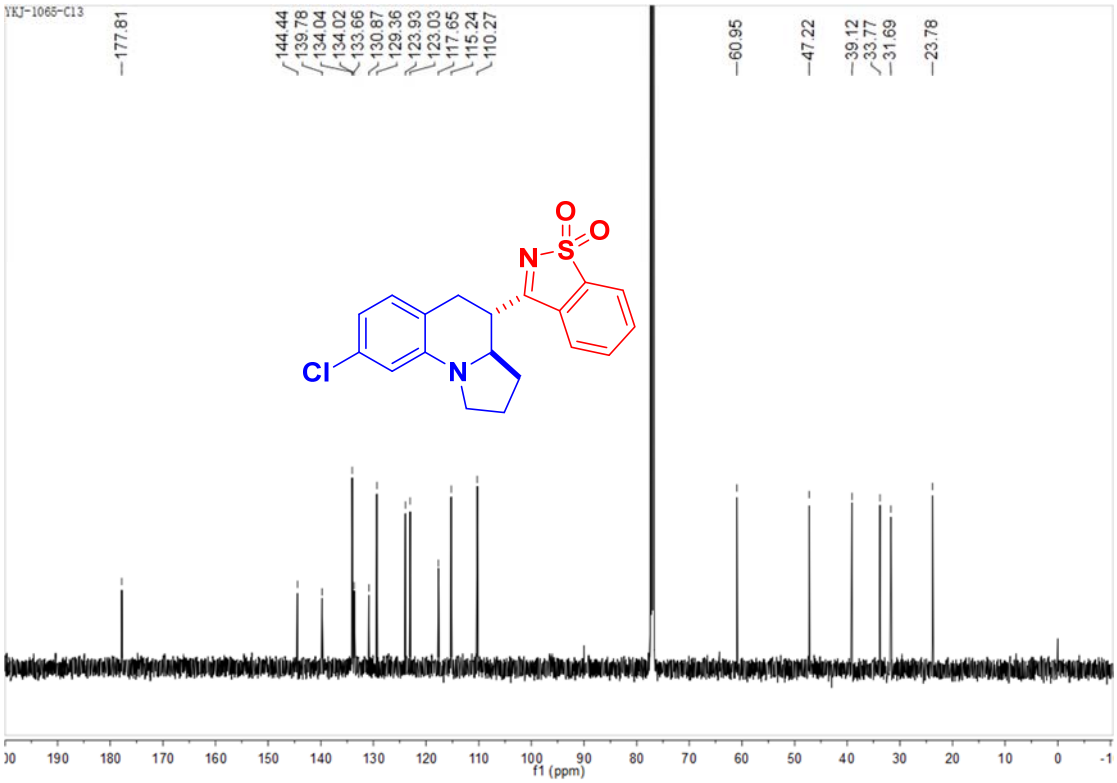
3-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3h)



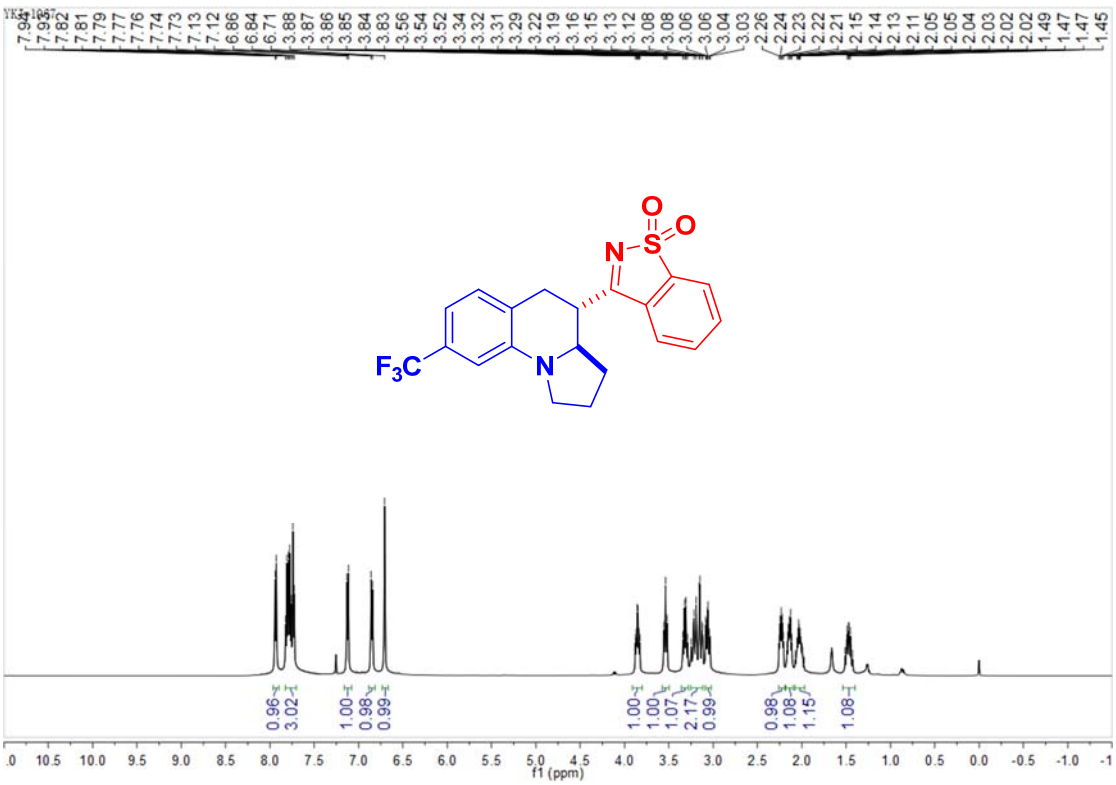


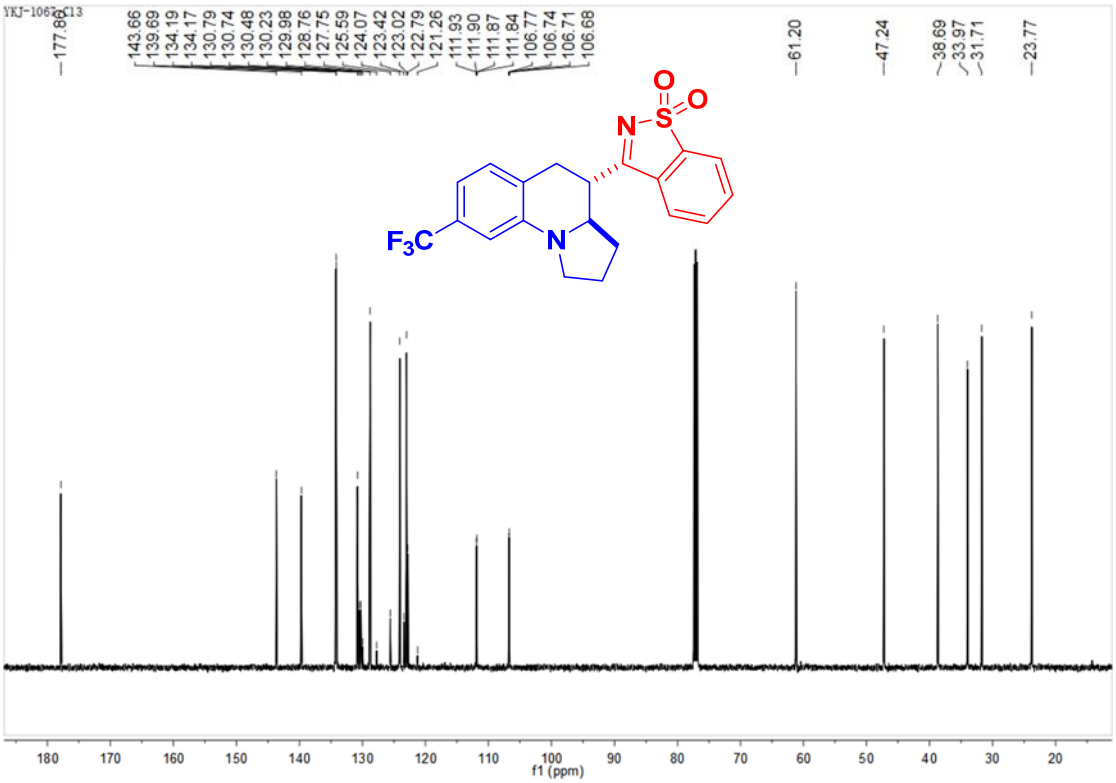
3-(8-chloro-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3i)



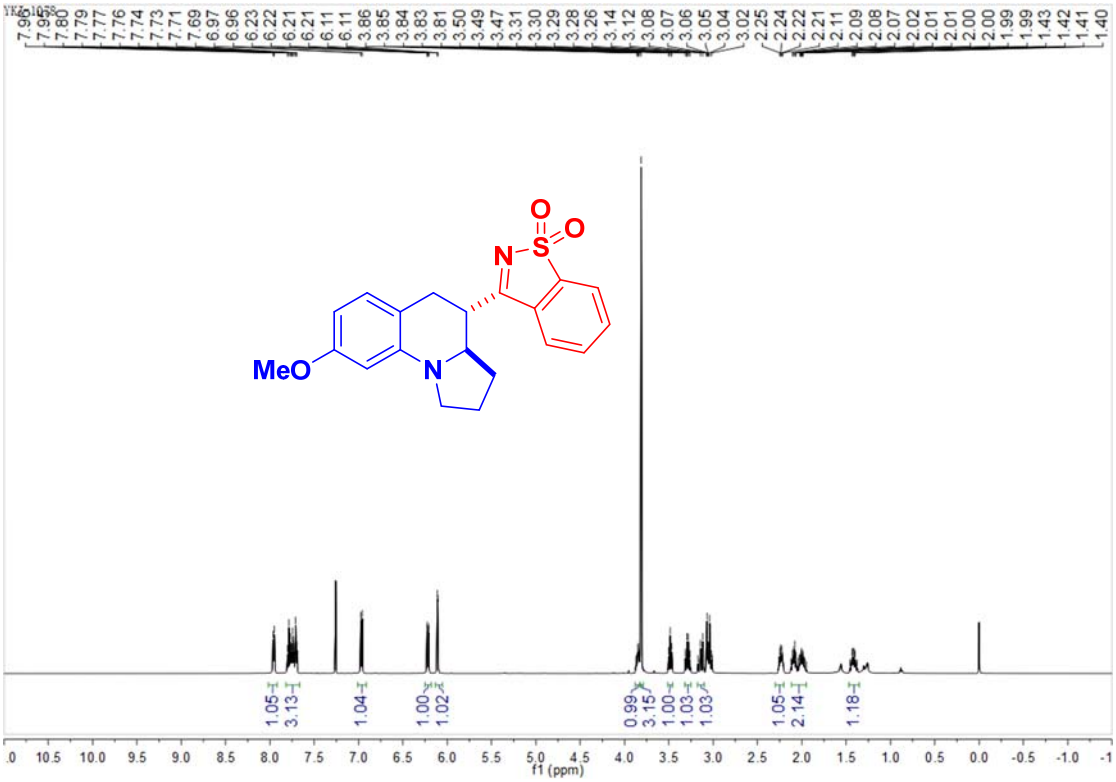


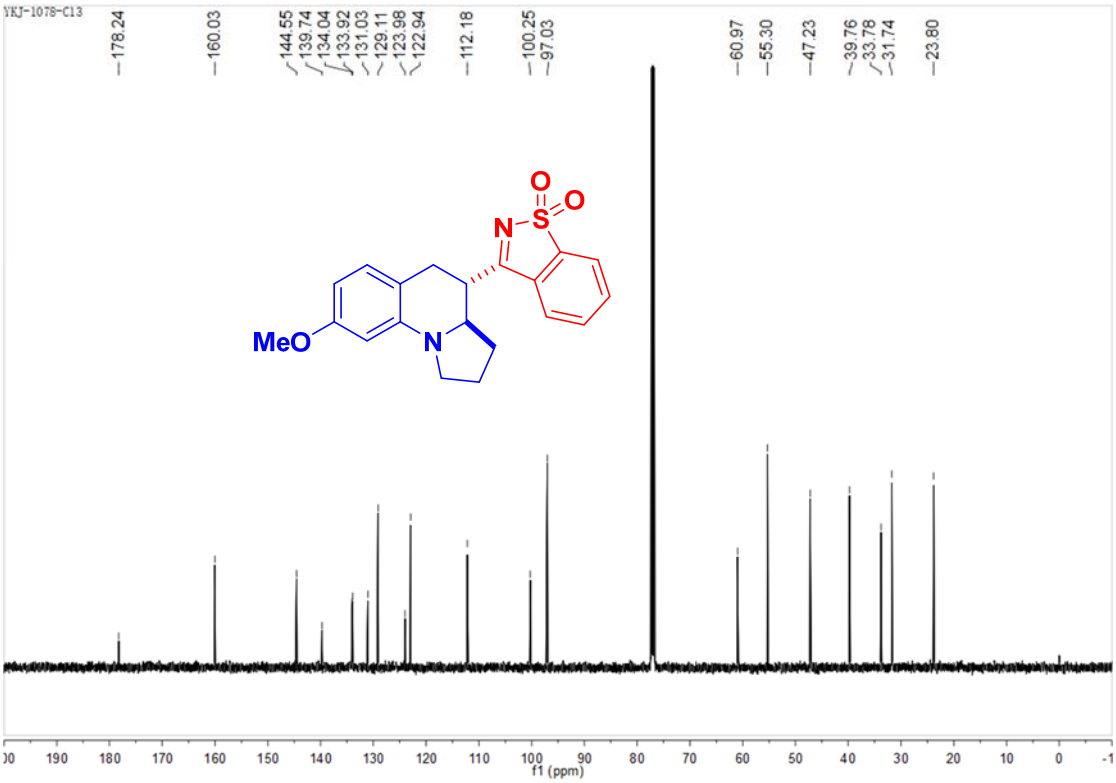
3-(8-(trifluoromethyl)-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3j)



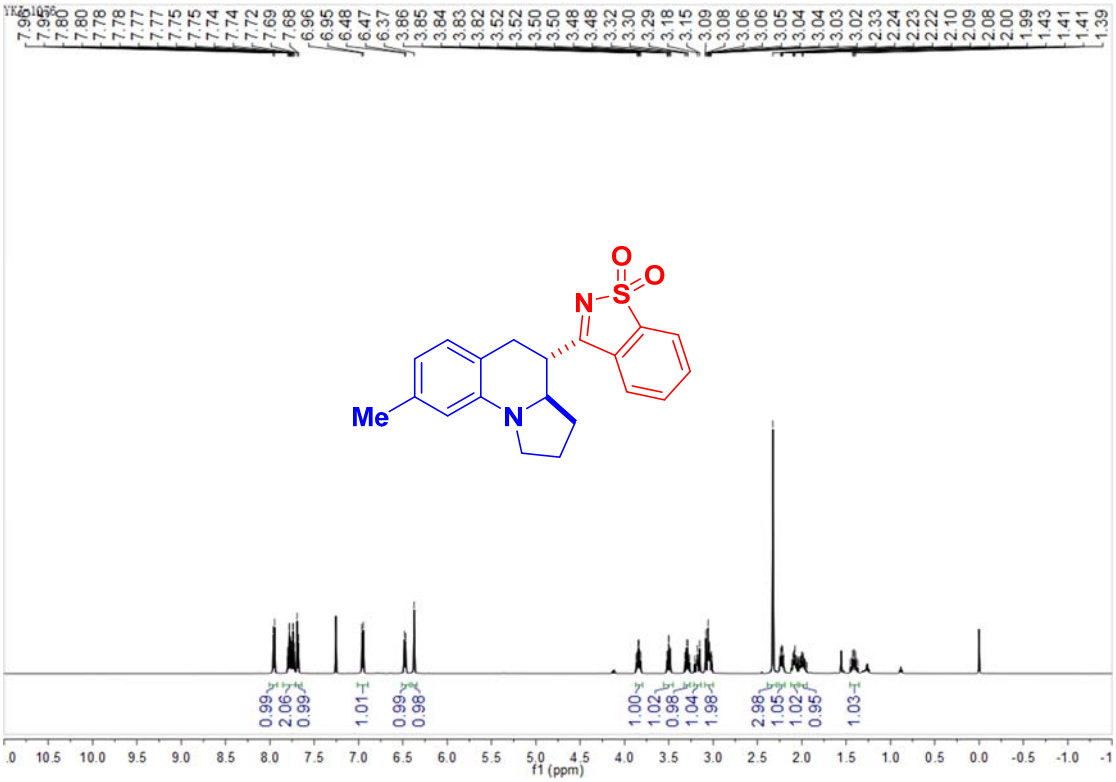


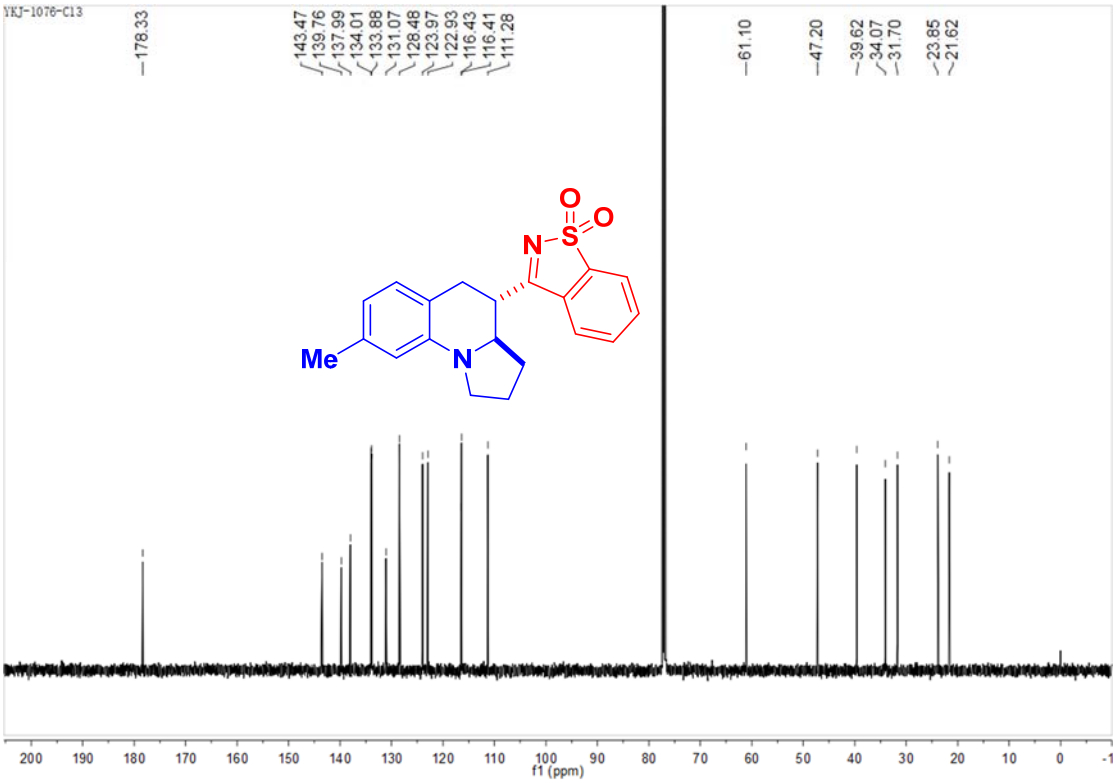
3-(8-methoxy-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3k)



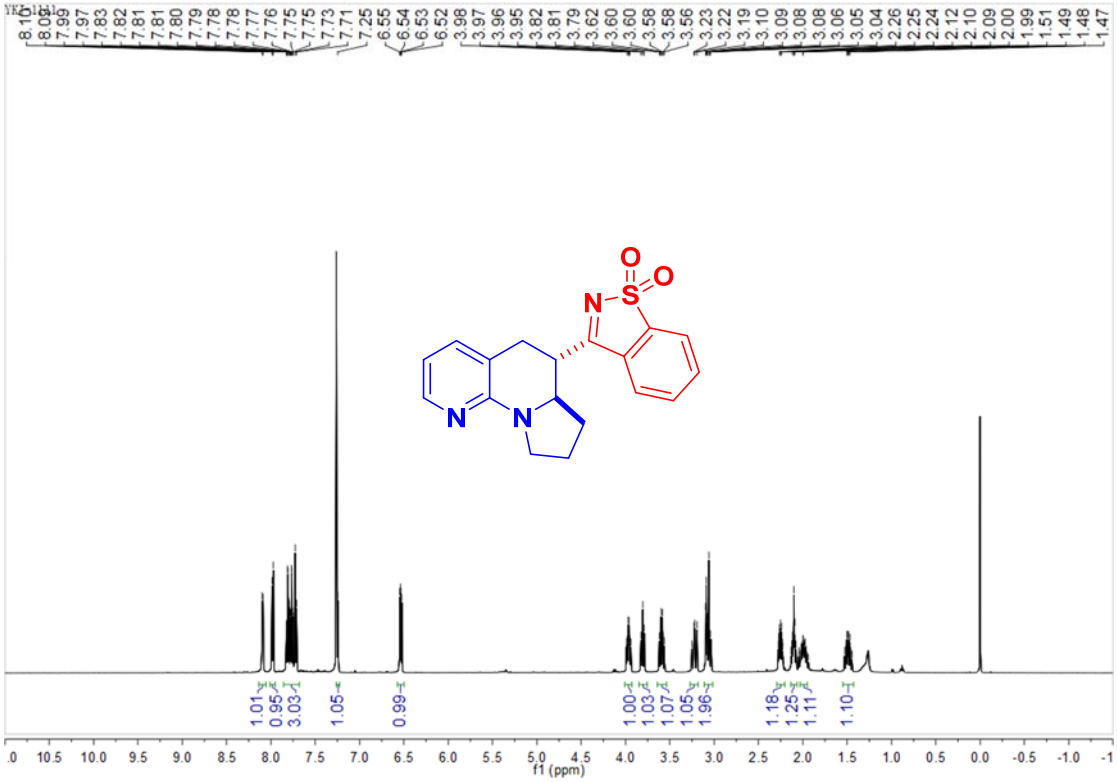


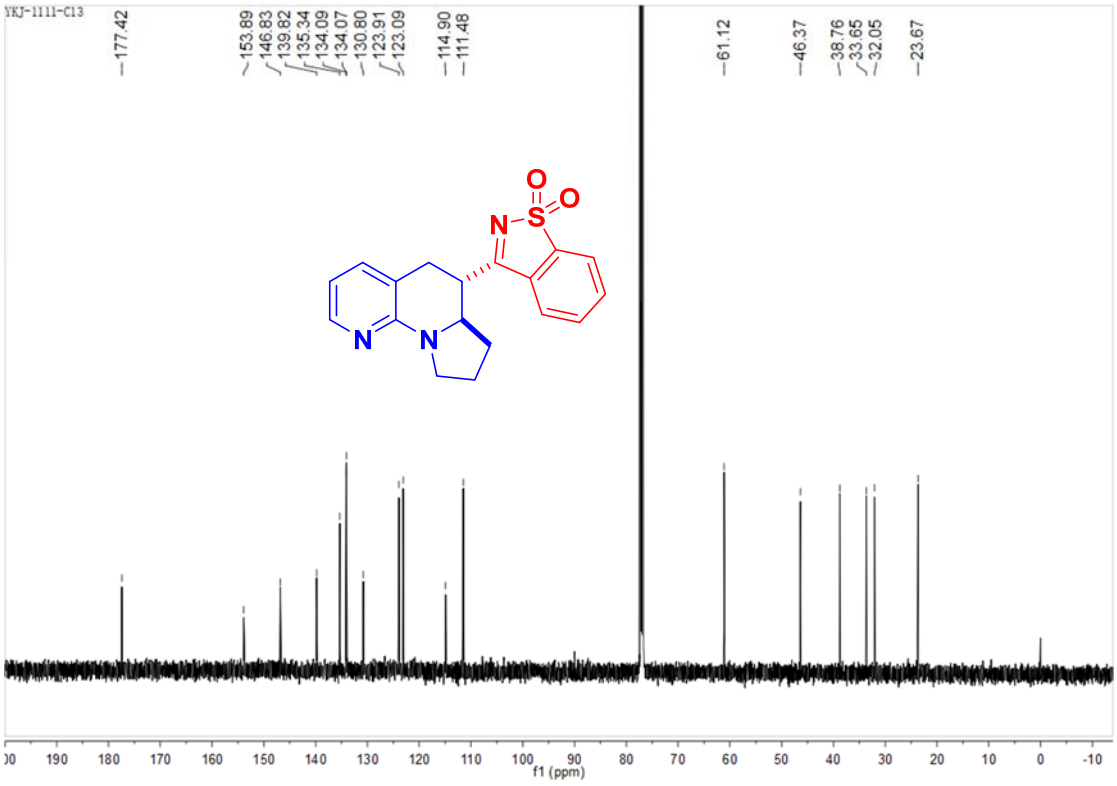
3-(8-methyl-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*d*]isothiazole 1,1-dioxide (3l)



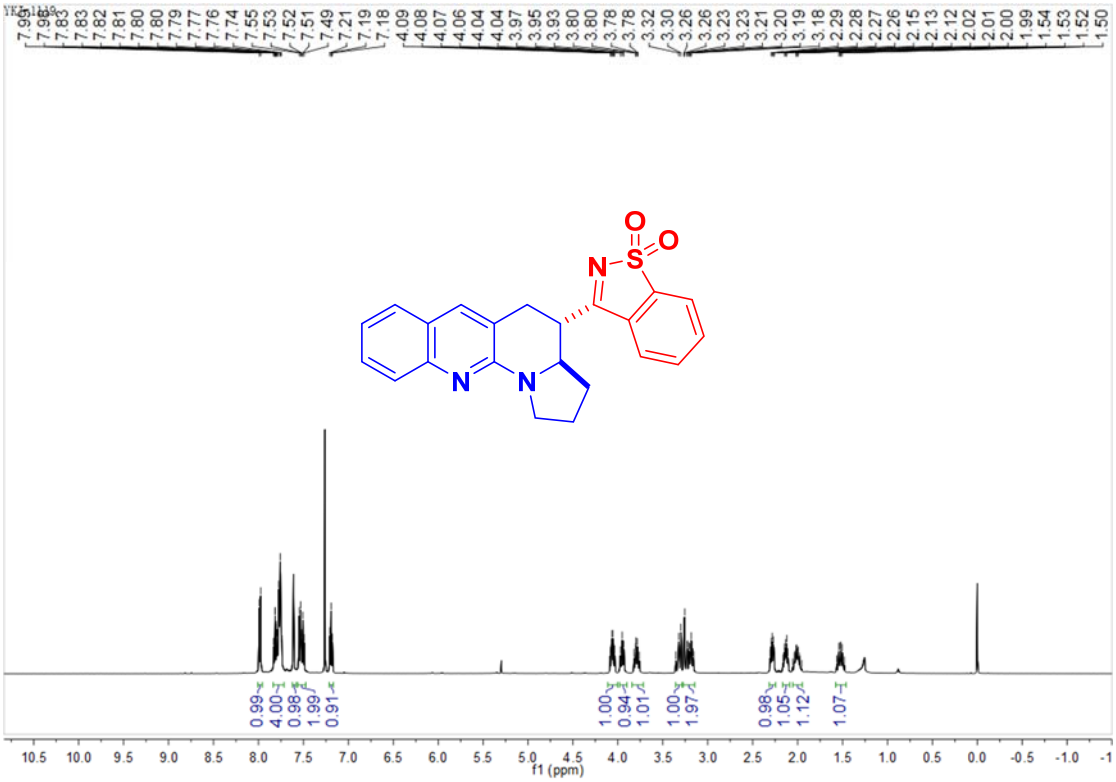


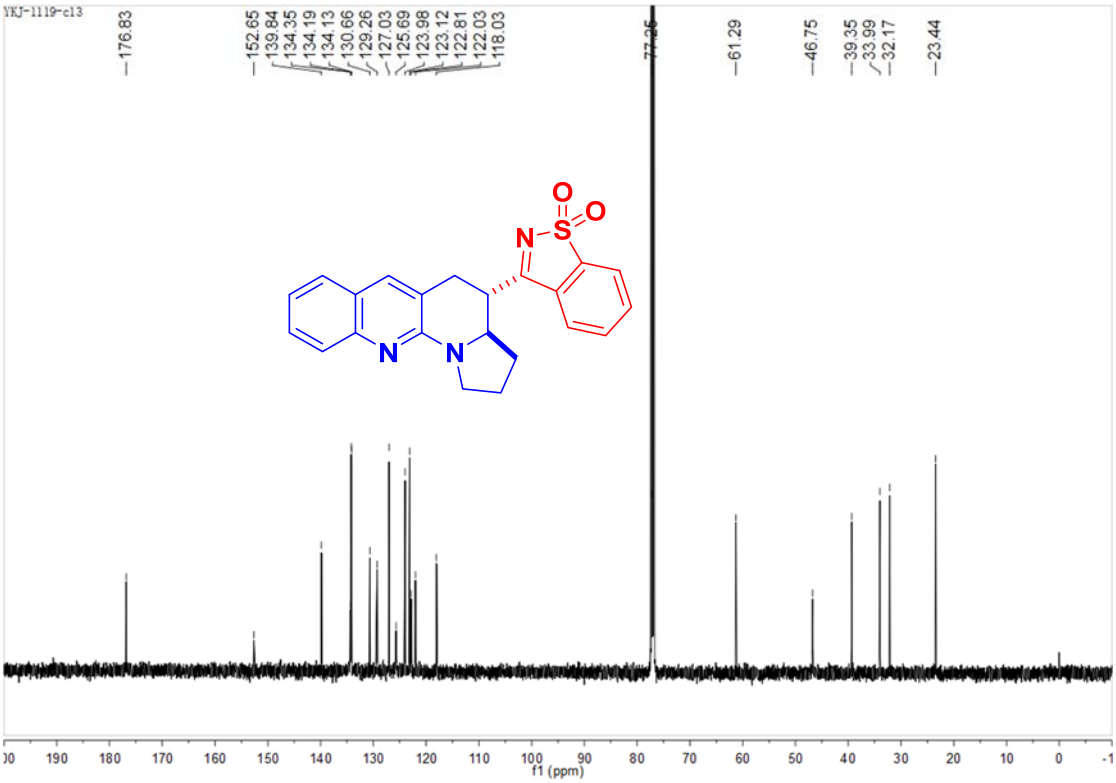
3-(5,6,6a,7,8,9-hexahydropyrrolo[1,2-*a*][1,6]naphthyridin-6-yl)benzo[*d*]isothiazole 1,1-dioxide (3m)



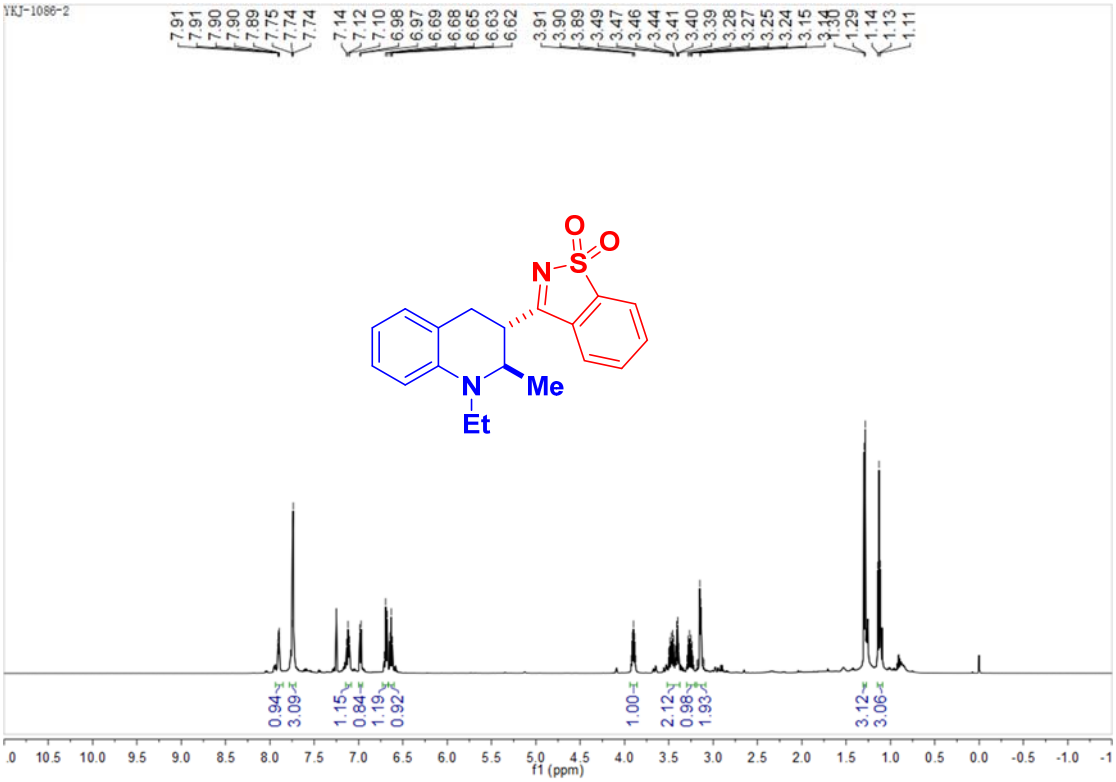


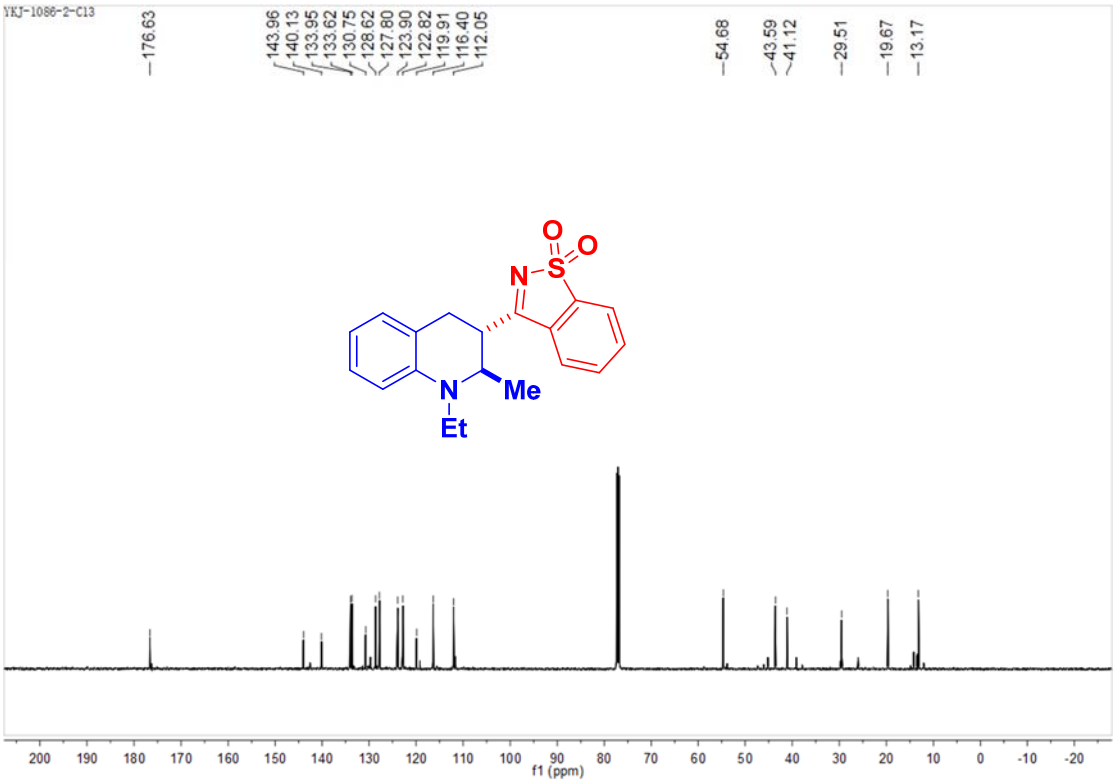
3-(7,8,8a,9,10,11-hexahydrobenzo[h]pyrrolo[1,2-*a*][1,6]naphthyridin-8-yl)benzo[*d*]isothiazole 1,1-dioxide (3n)



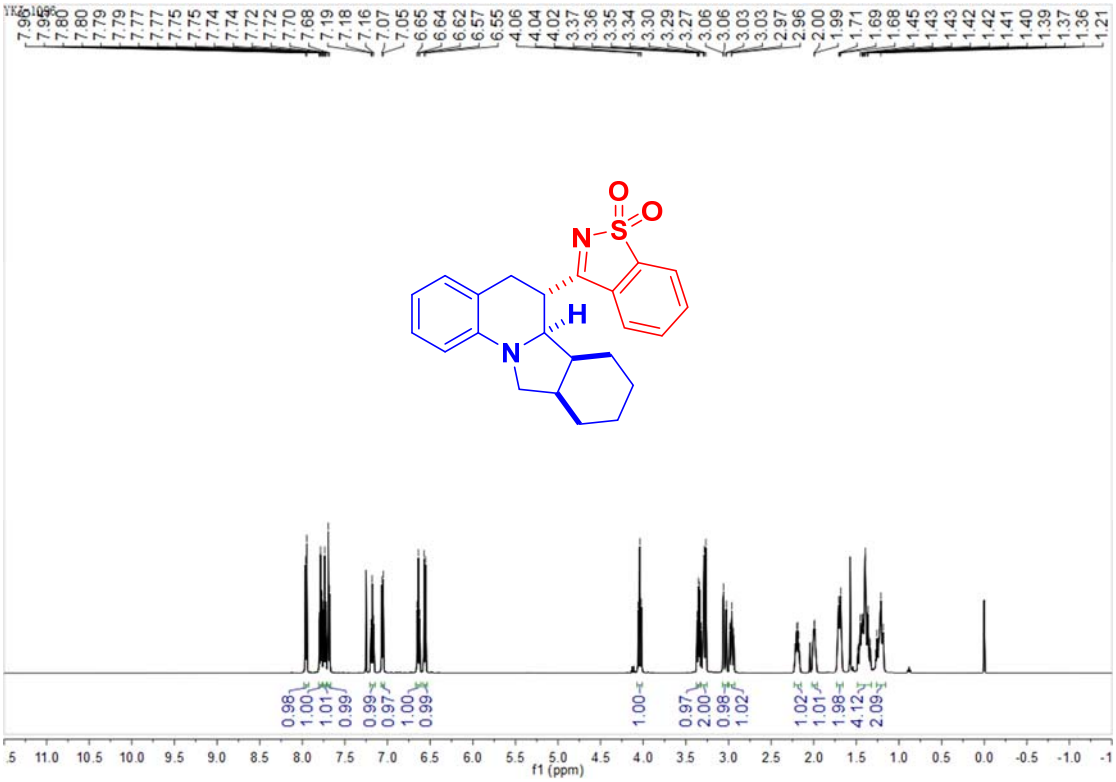


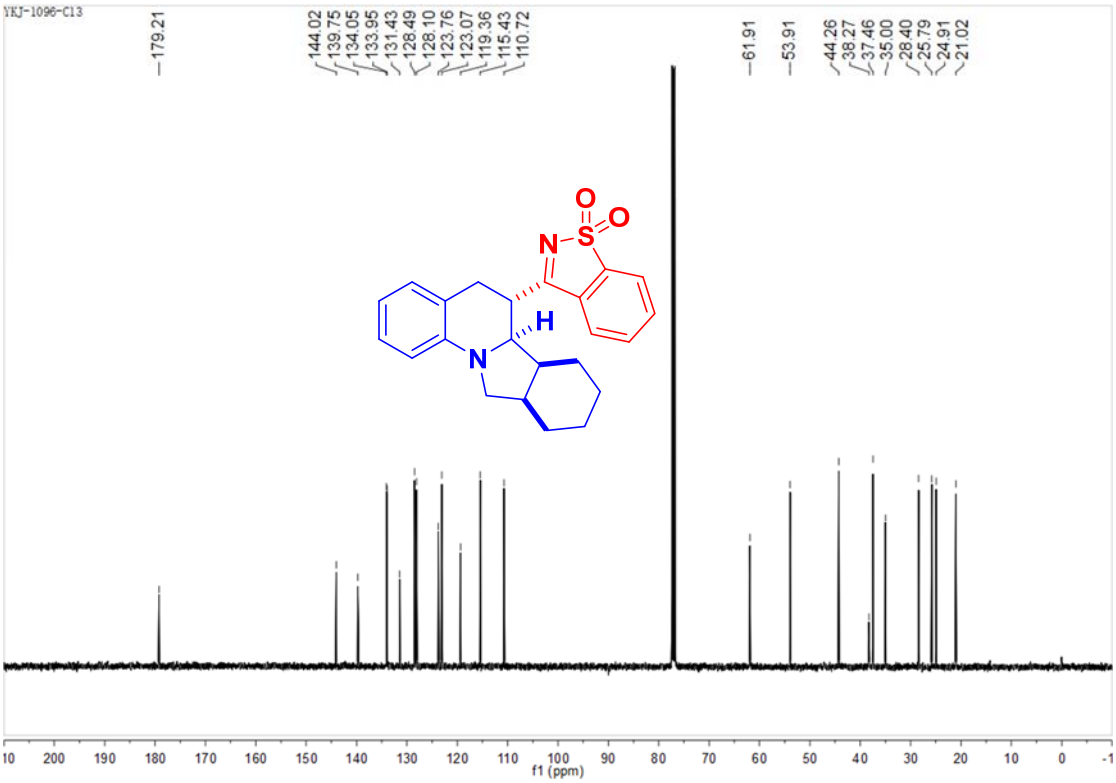
3-(1-ethyl-2-methyl-1,2,3,4-tetrahydroquinolin-3-yl)benzo[*d*]isothiazole 1,1-dioxide (3p)



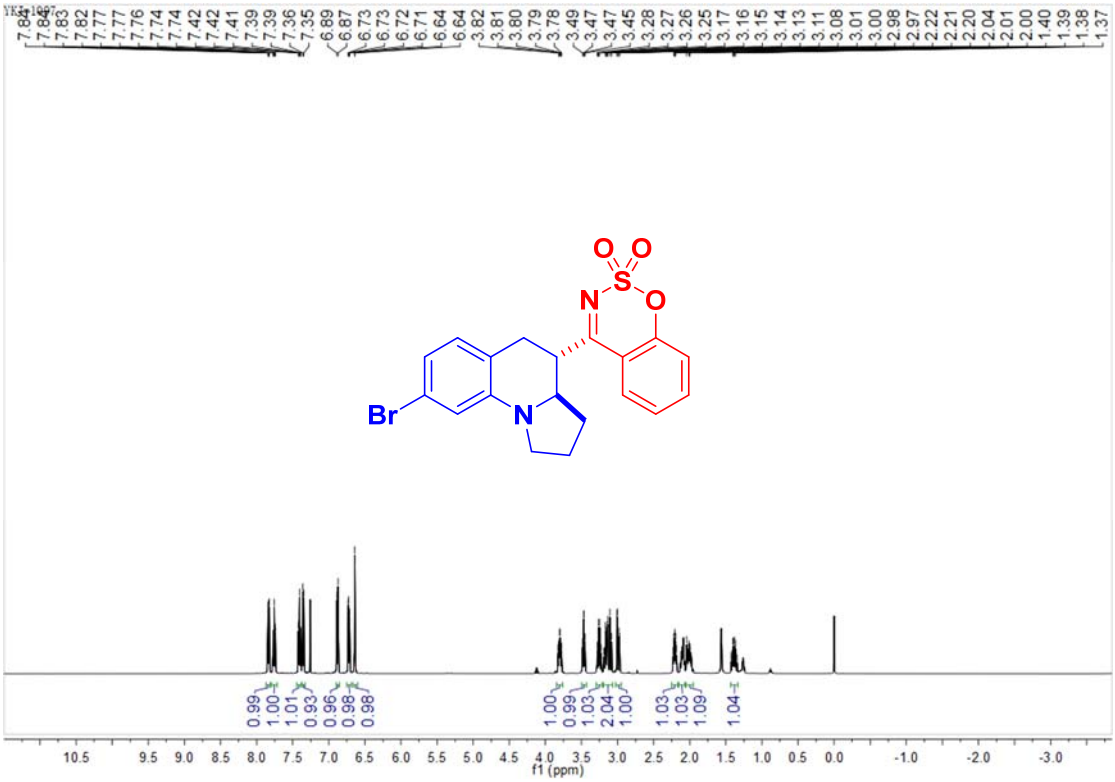


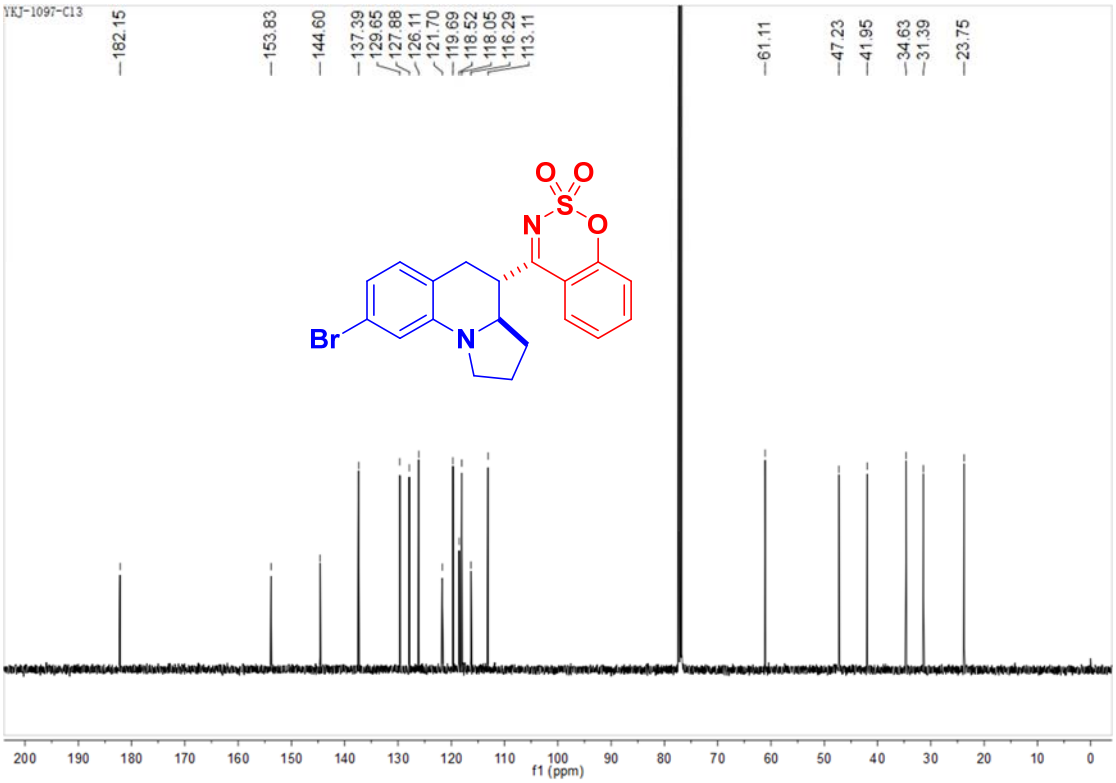
3-(5,6,6a,6b,7,8,9,10,10a,11-decahydroisoindolo[2,1-*a*]quinolin-6-yl)benzo[*d*]isothiazole 1,1-dioxide (3q)



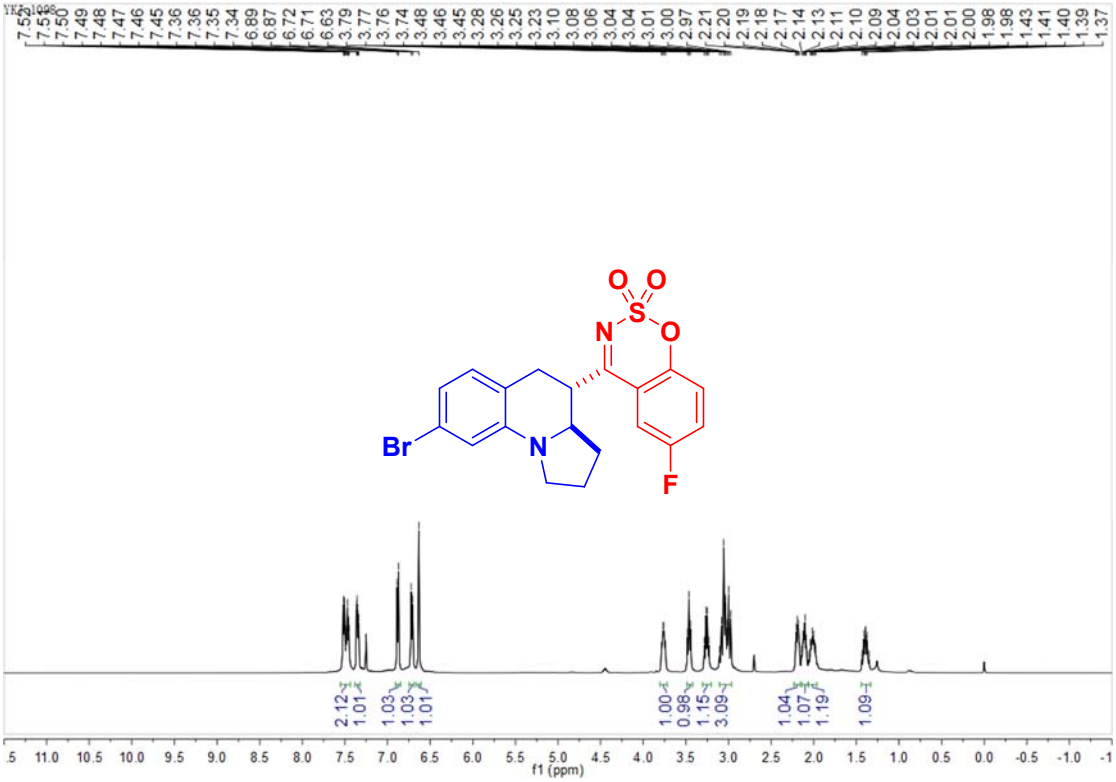


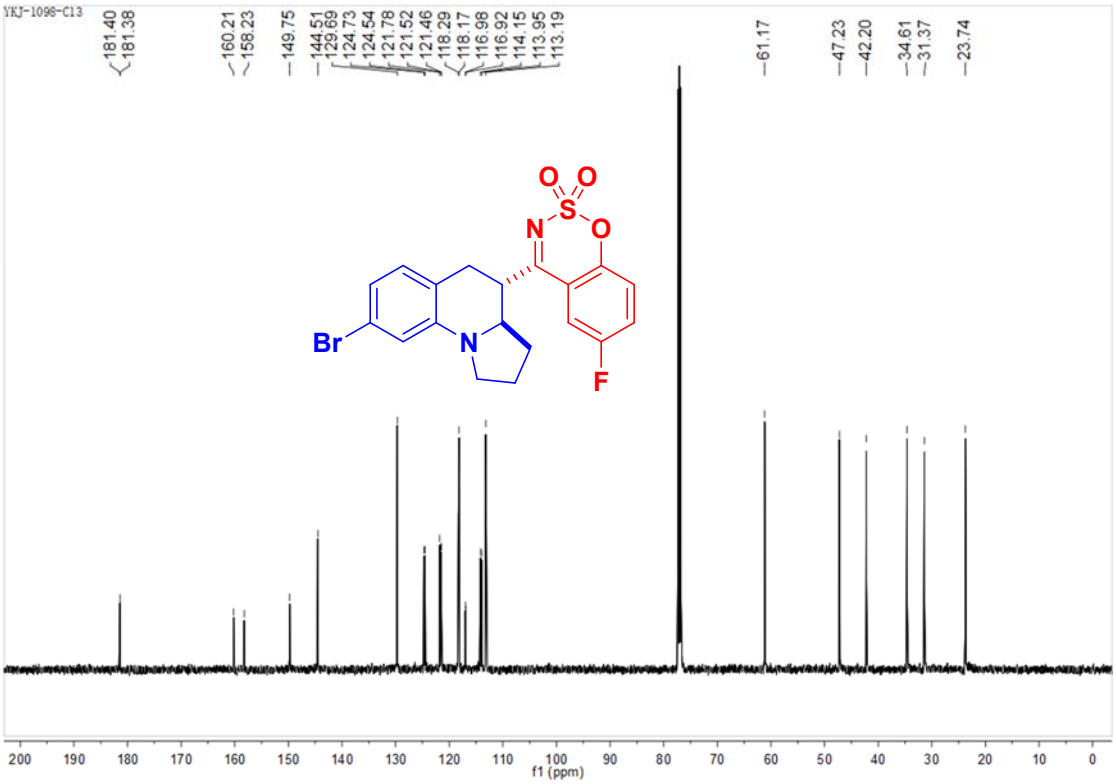
4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5a)



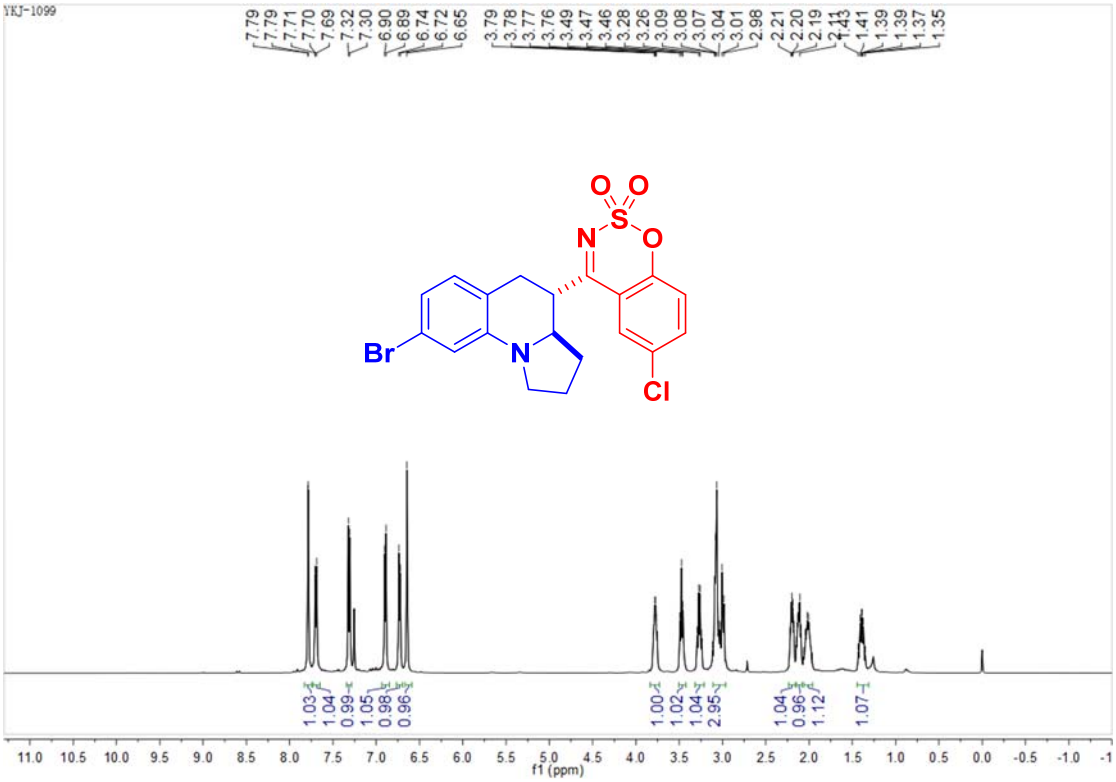


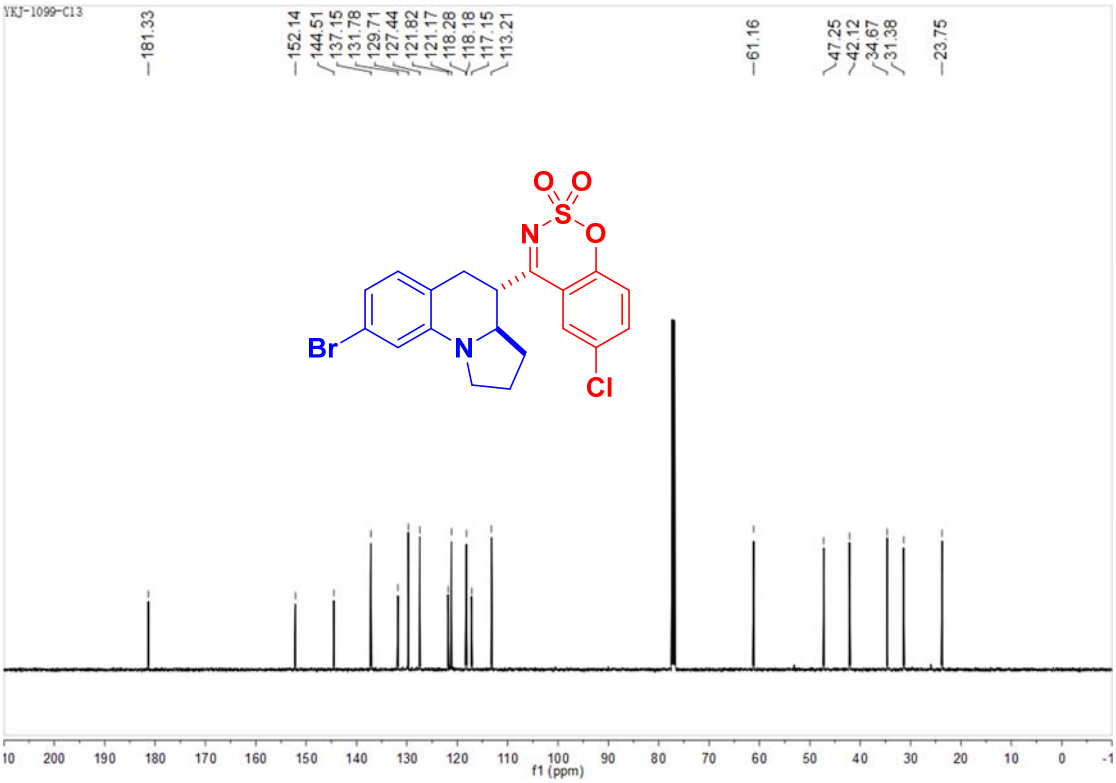
4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-6-fluorobenzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5b)



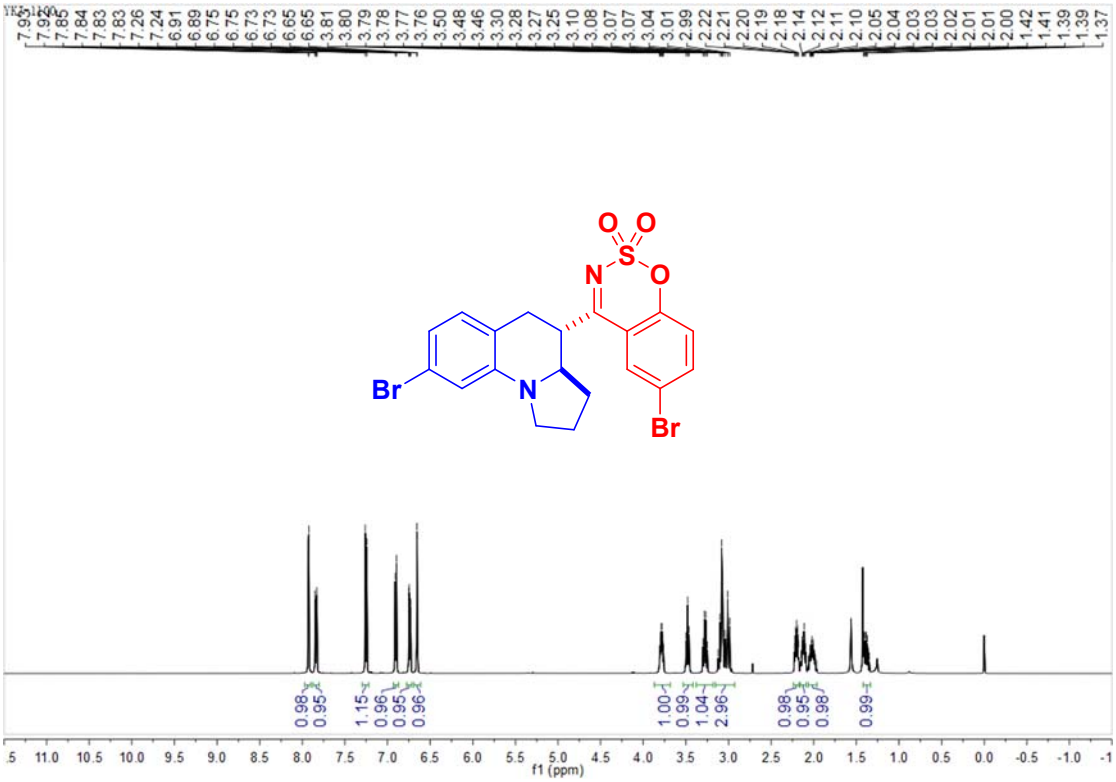


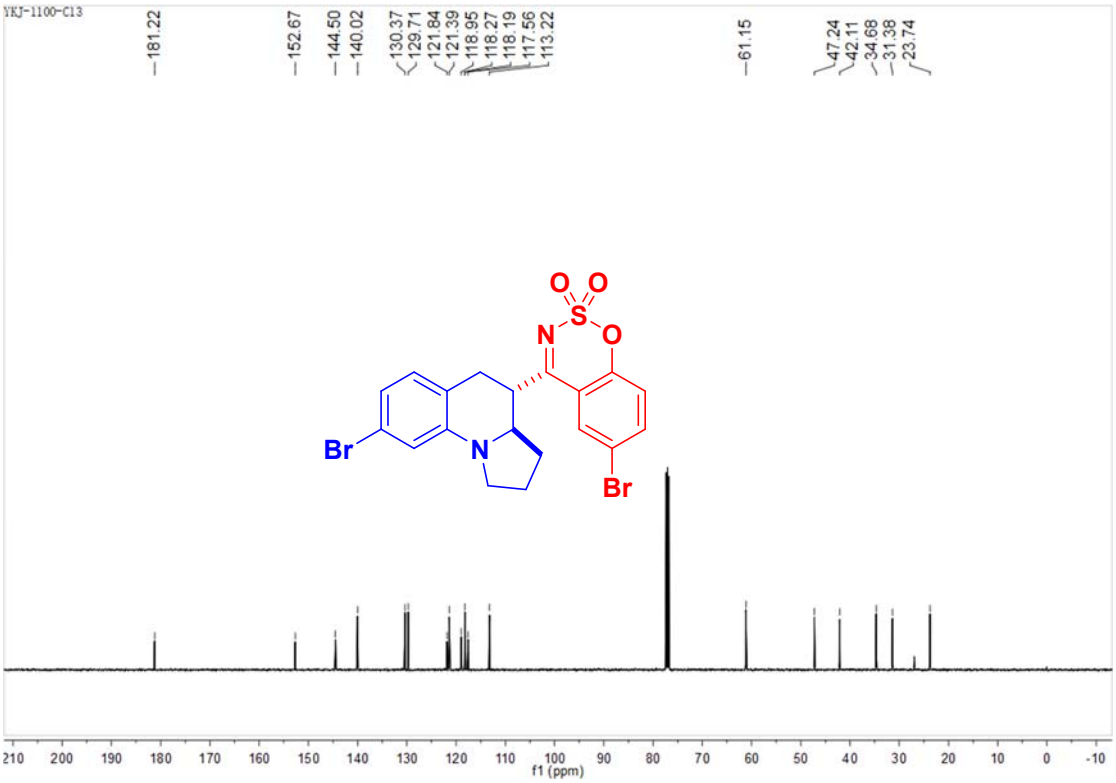
4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-6-chlorobenzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5c)



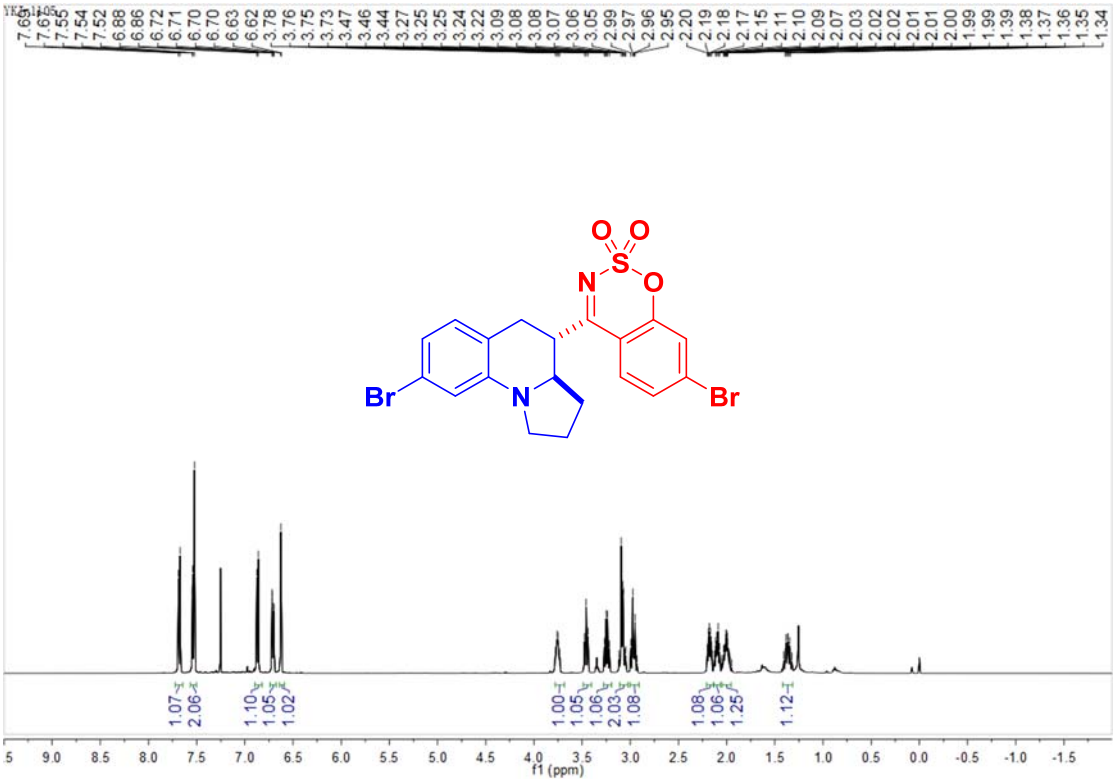


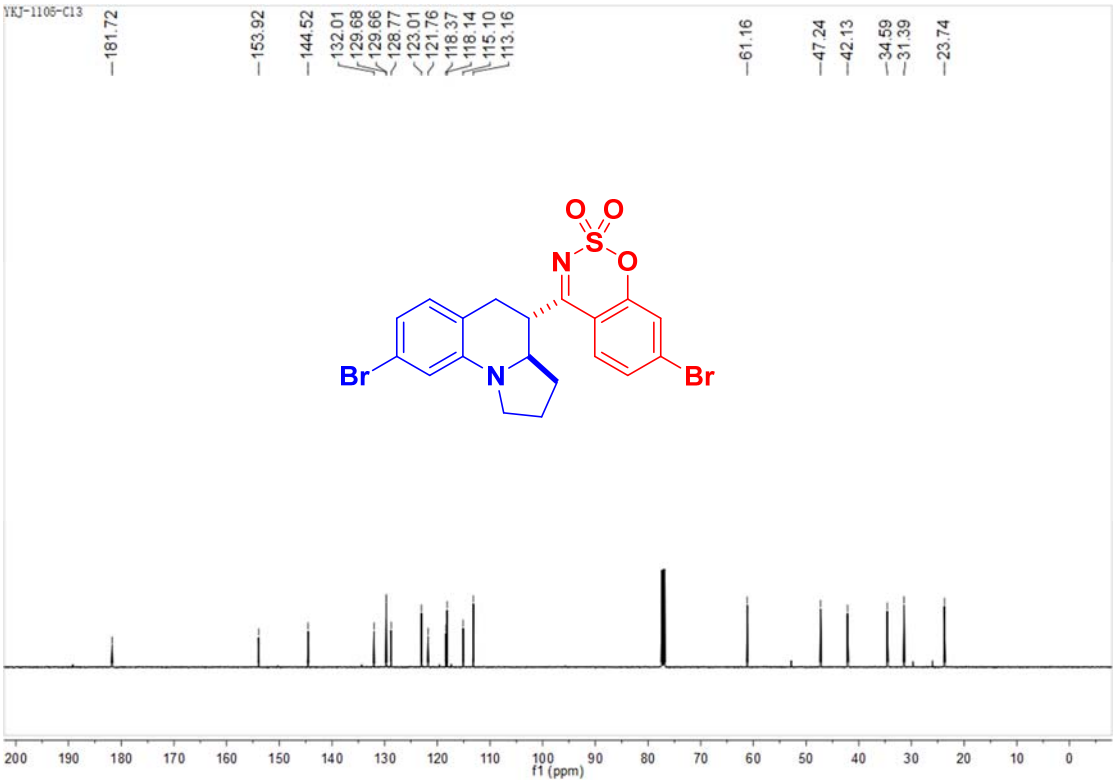
6-bromo-4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5d)



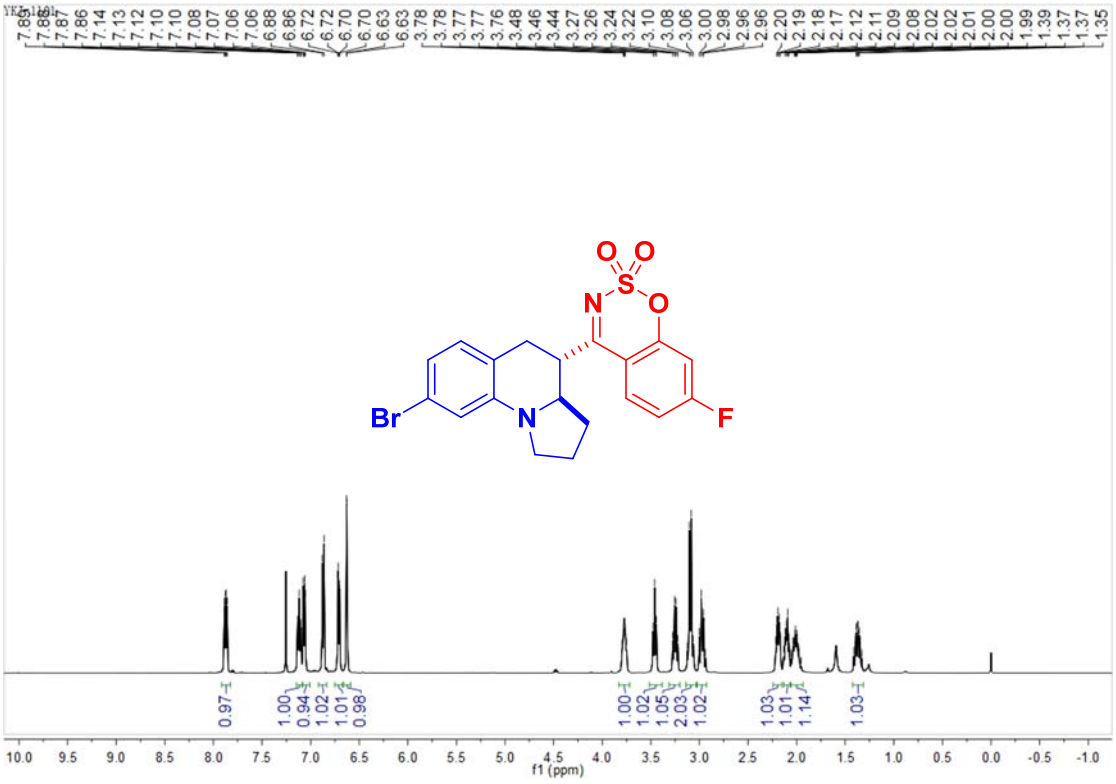


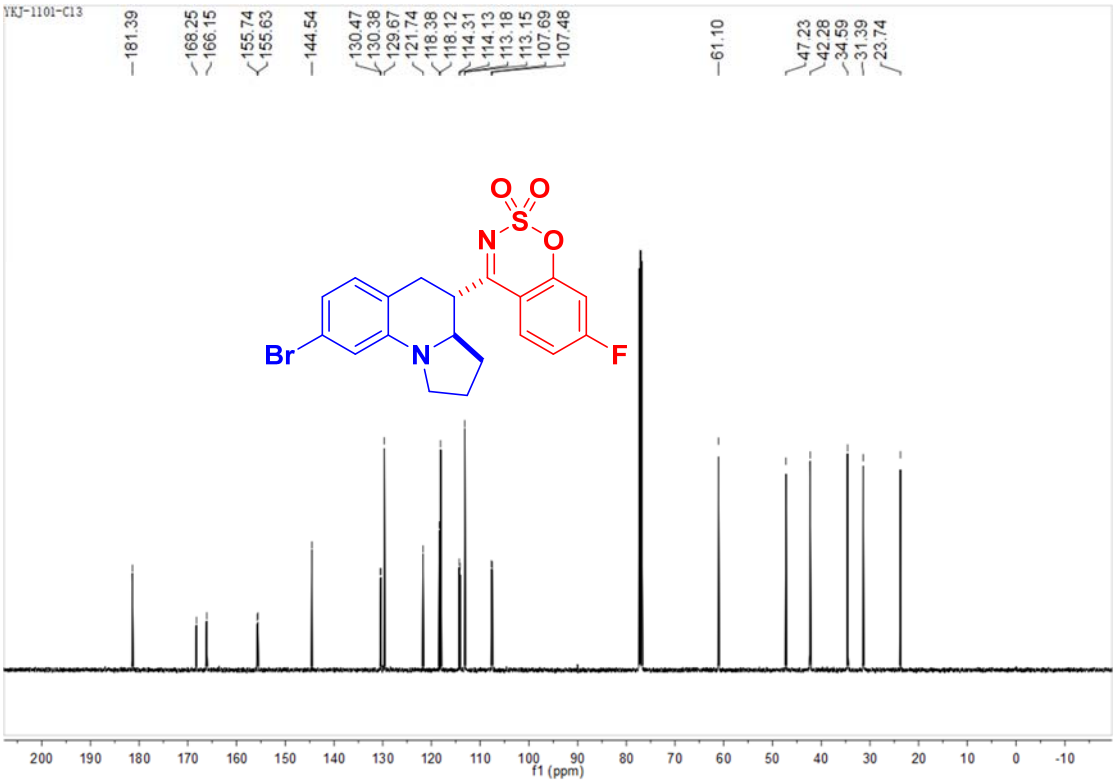
7-bromo-4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)benzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5e)



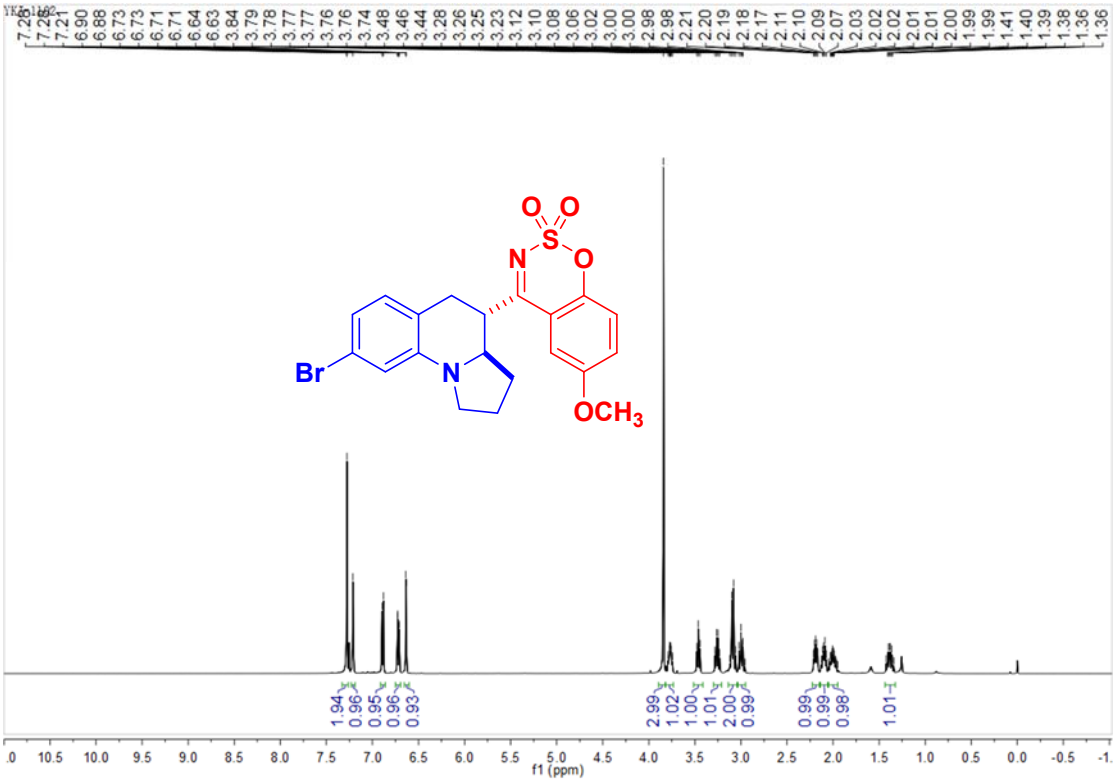


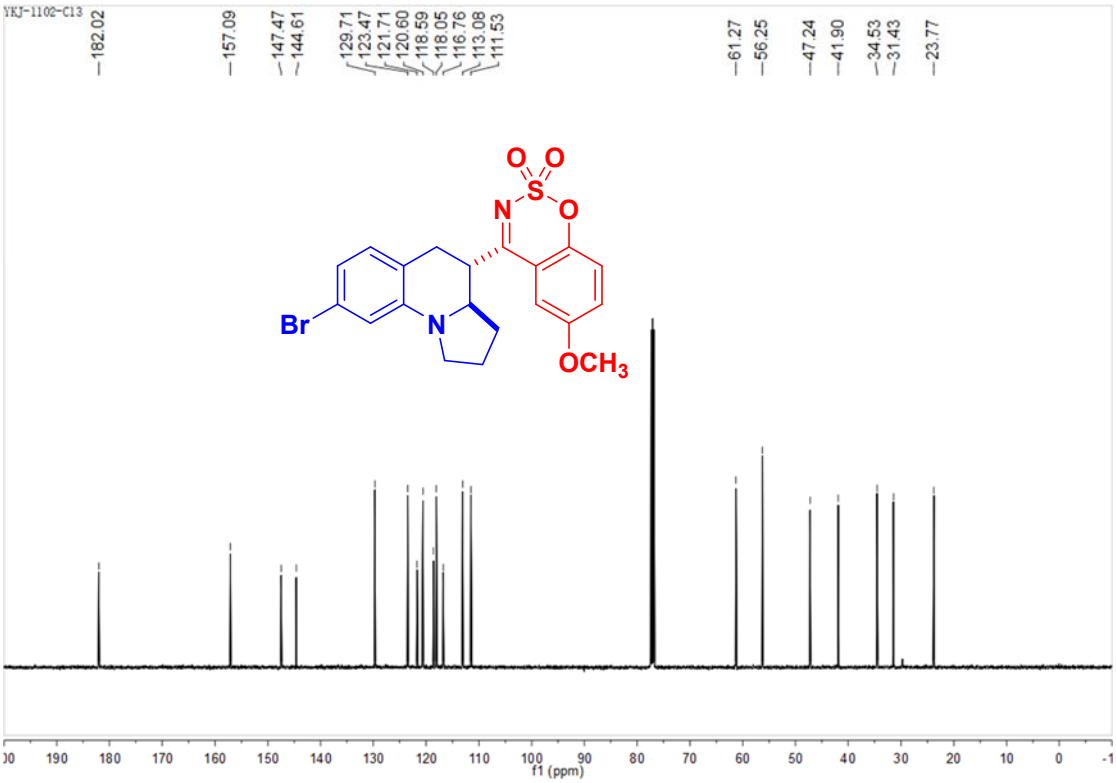
4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-7-fluorobenzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5f)



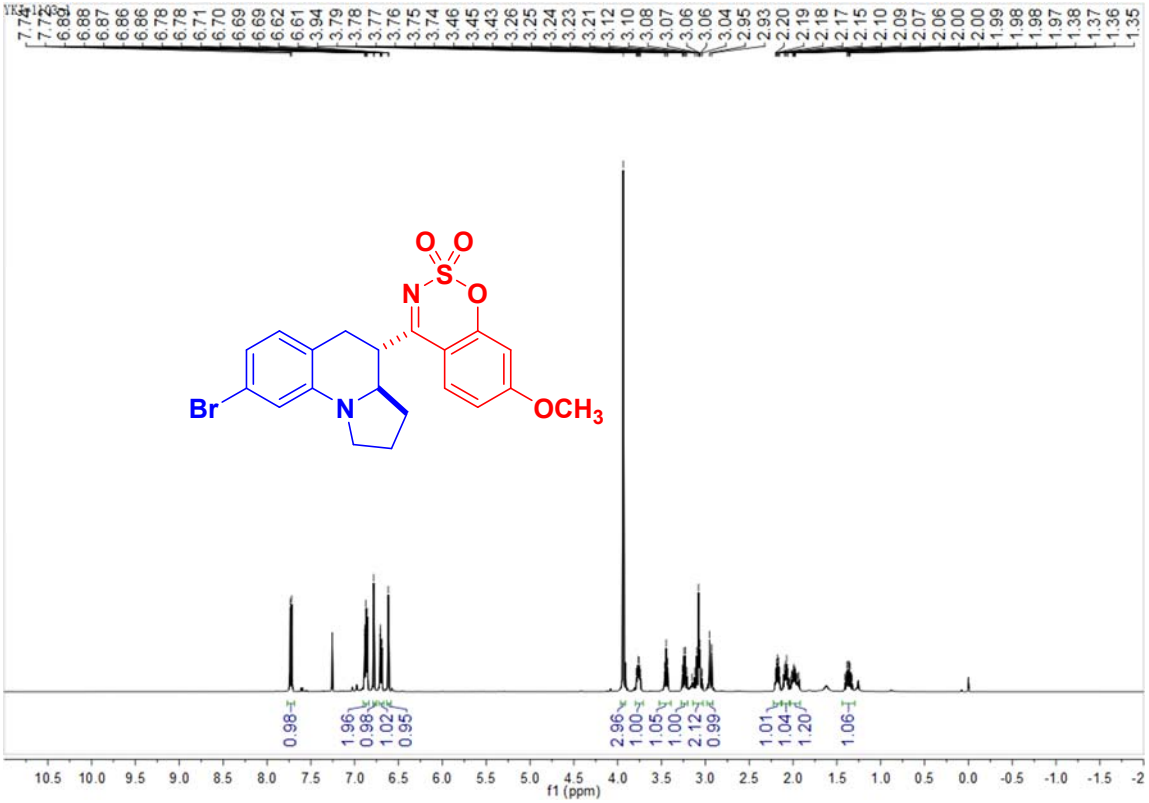


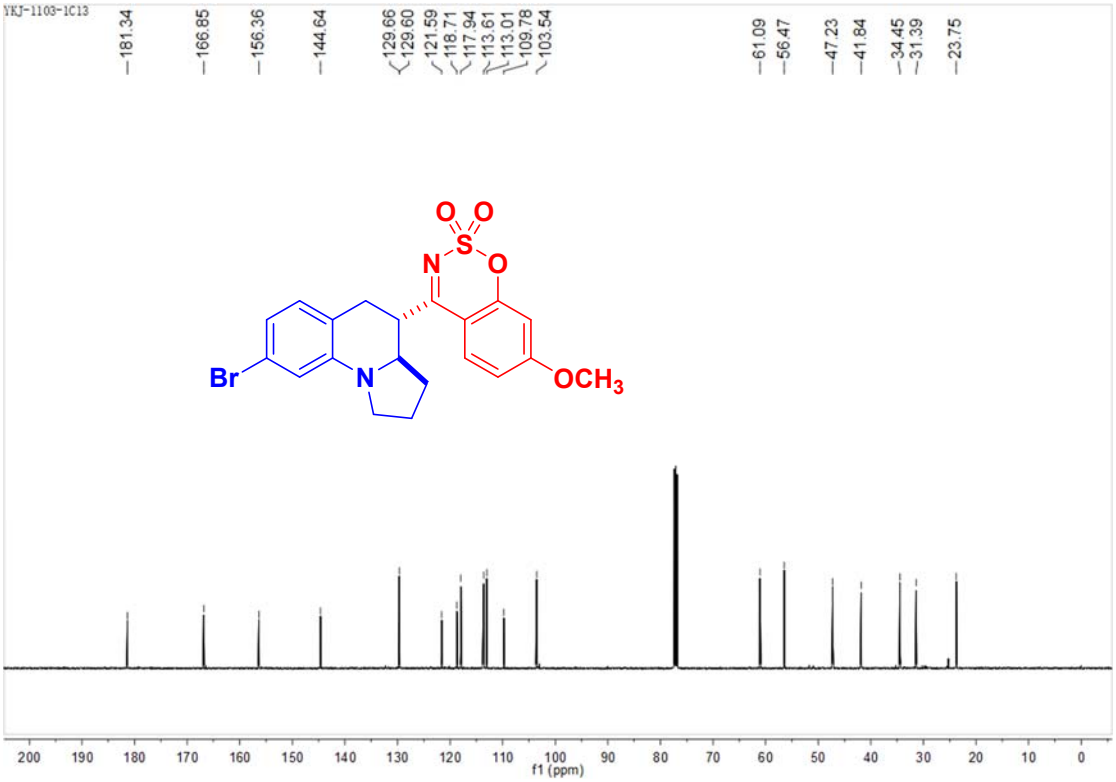
4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-6-methoxybenzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5g)



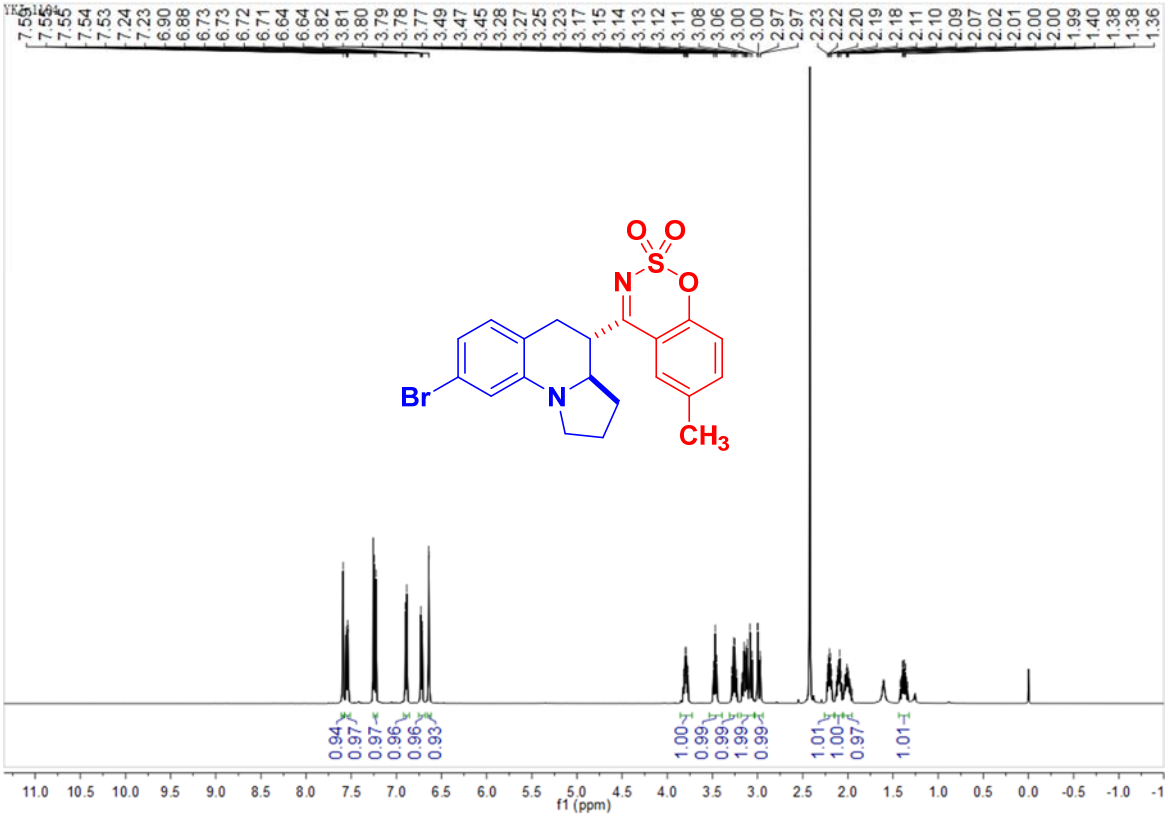


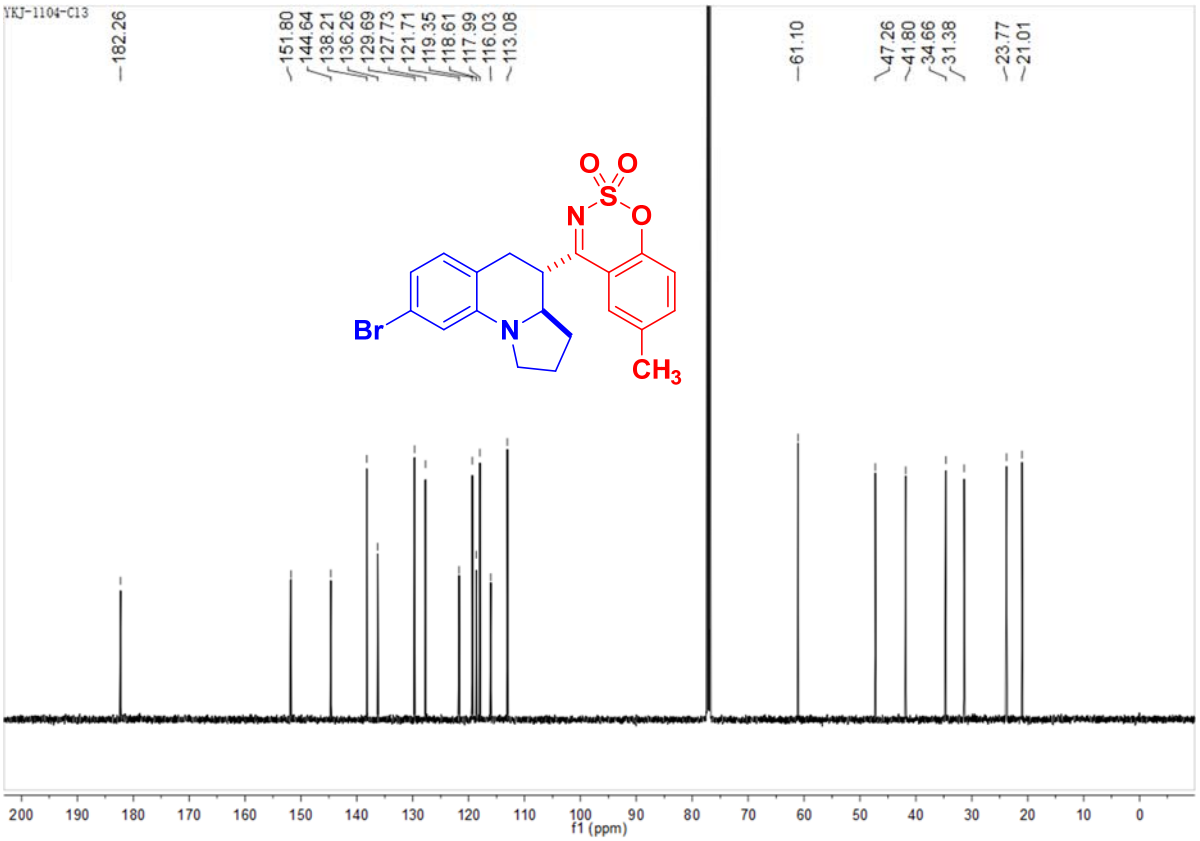
4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-7-methoxybenzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5h)



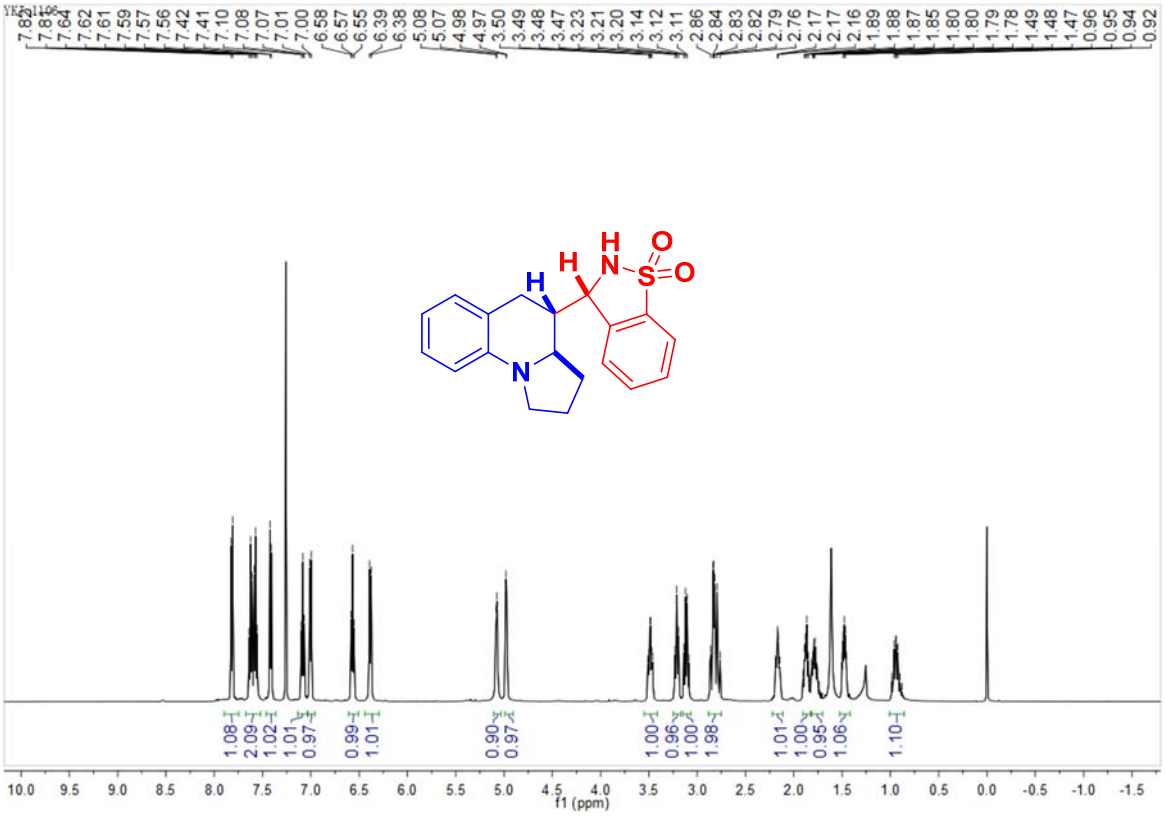


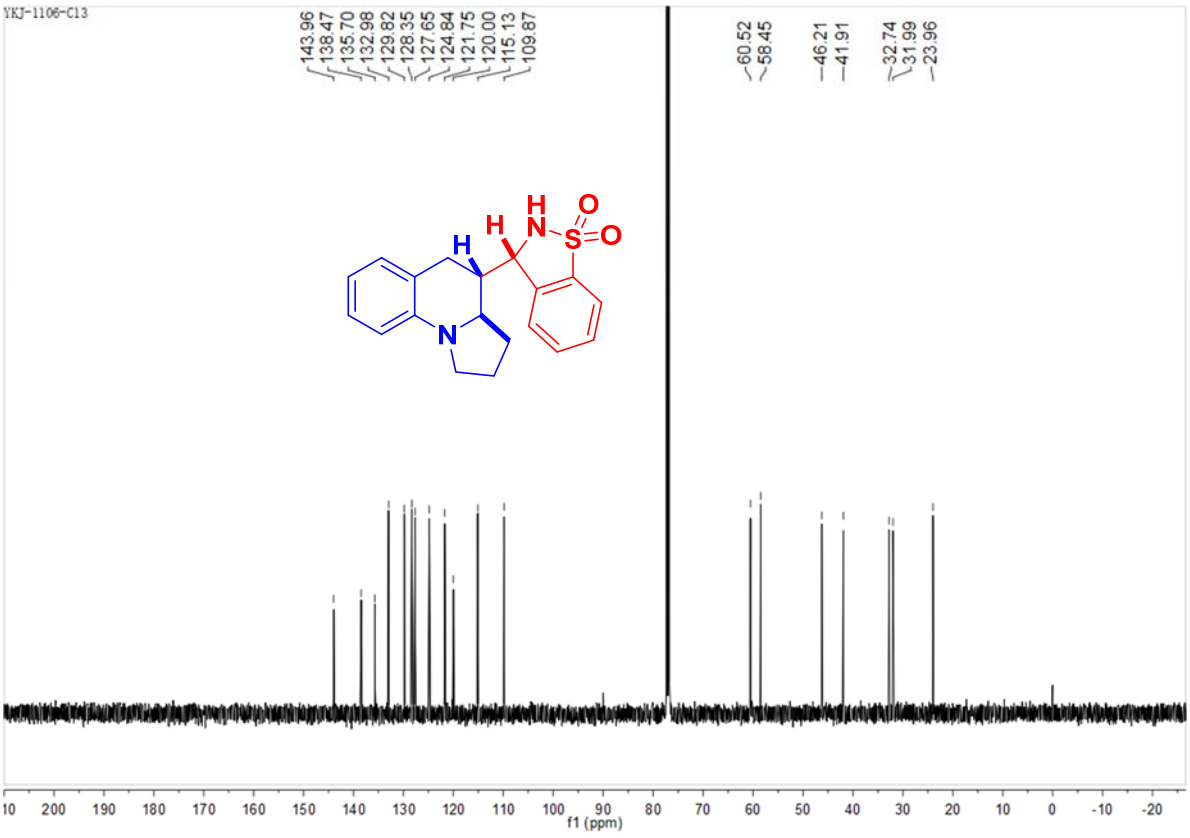
4-(8-bromo-1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-6-methylbenzo[*e*][1,2,3]oxathiazine 2,2-dioxide (5i)



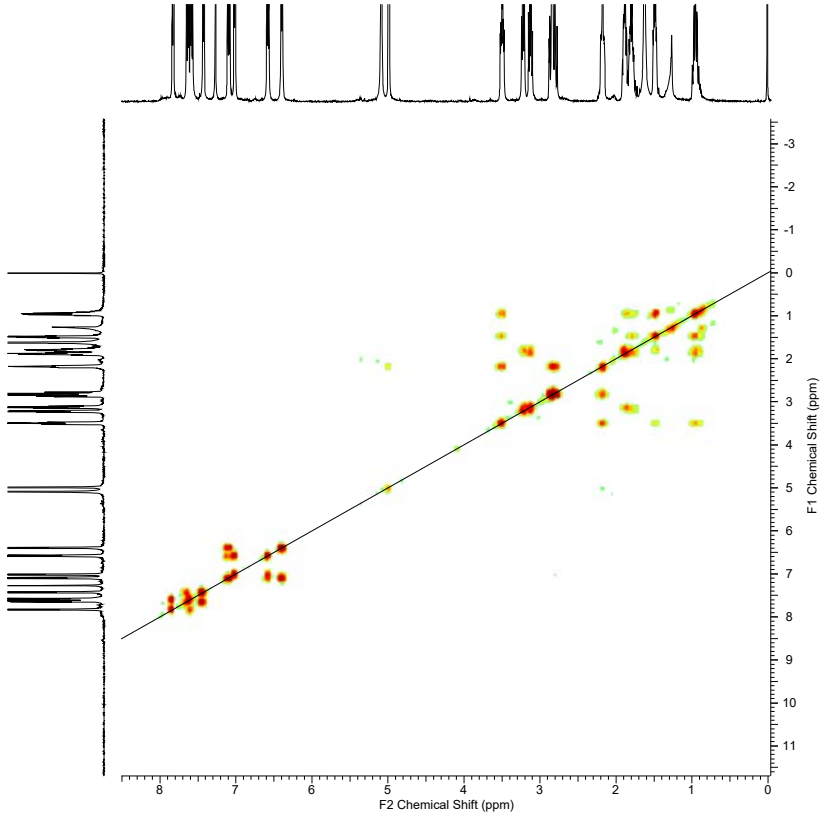


3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-2,3-dihydrobenzo[*d*]isothiazole 1,1-dioxide (6)

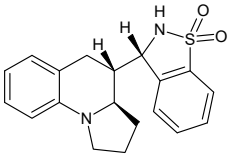




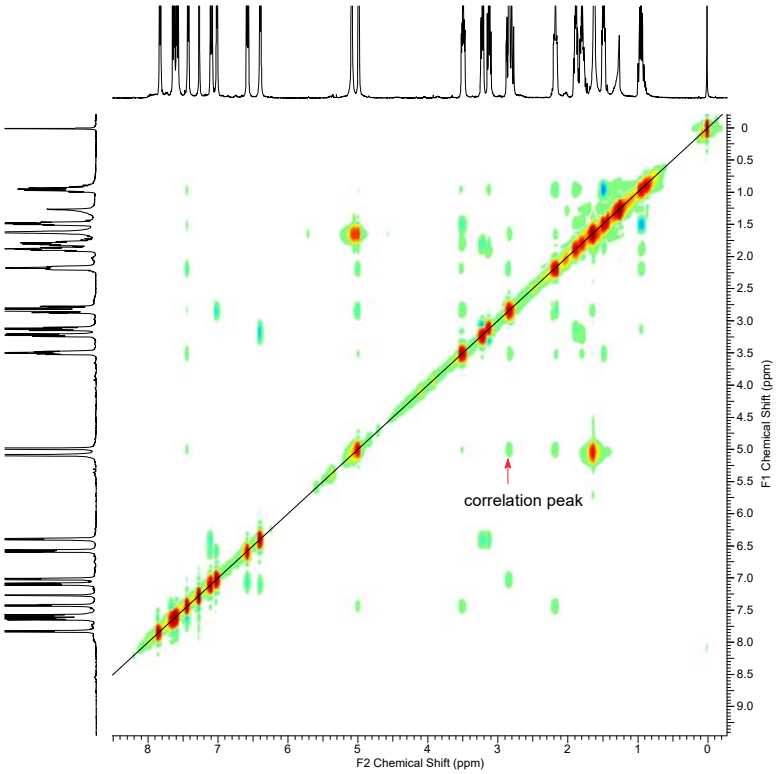
H, H-Cosy of 3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-2,3-dihydrobenzo[*d*] isothiazole 1,1-dioxide (6)



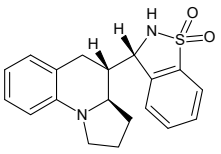
H,H-Cosy of 6



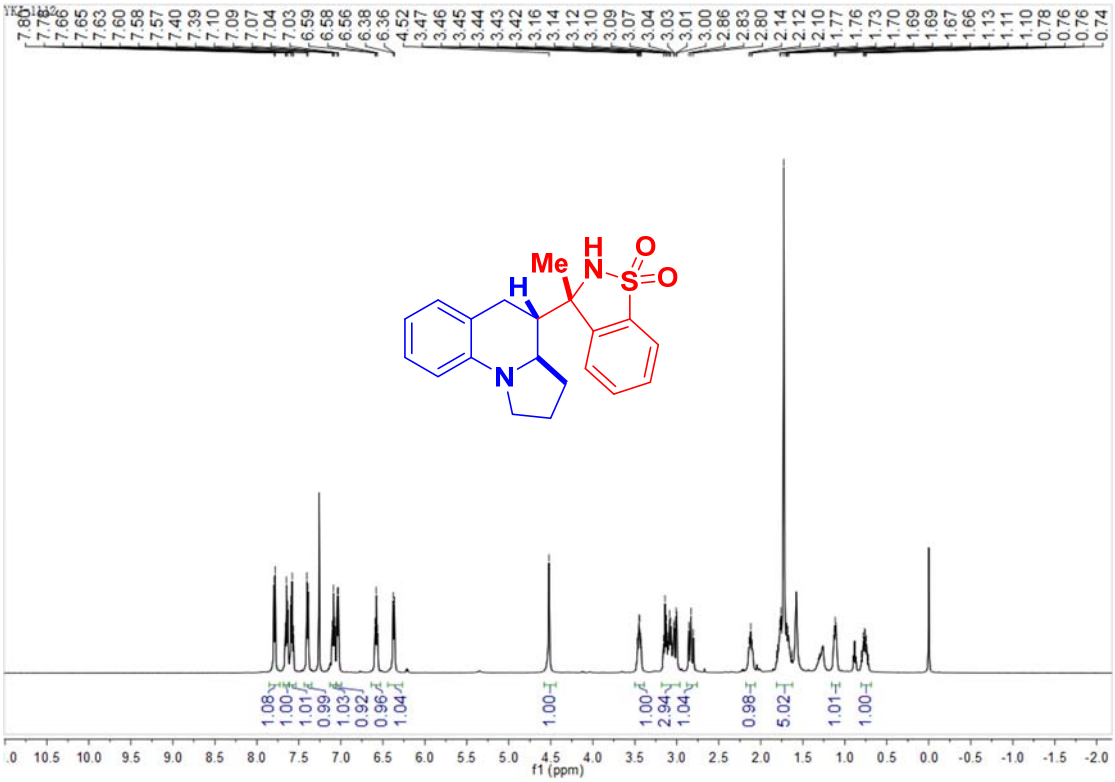
NOESY of 3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-2,3-dihydro- benzo[*d*] isothiazole 1,1-dioxide (6)

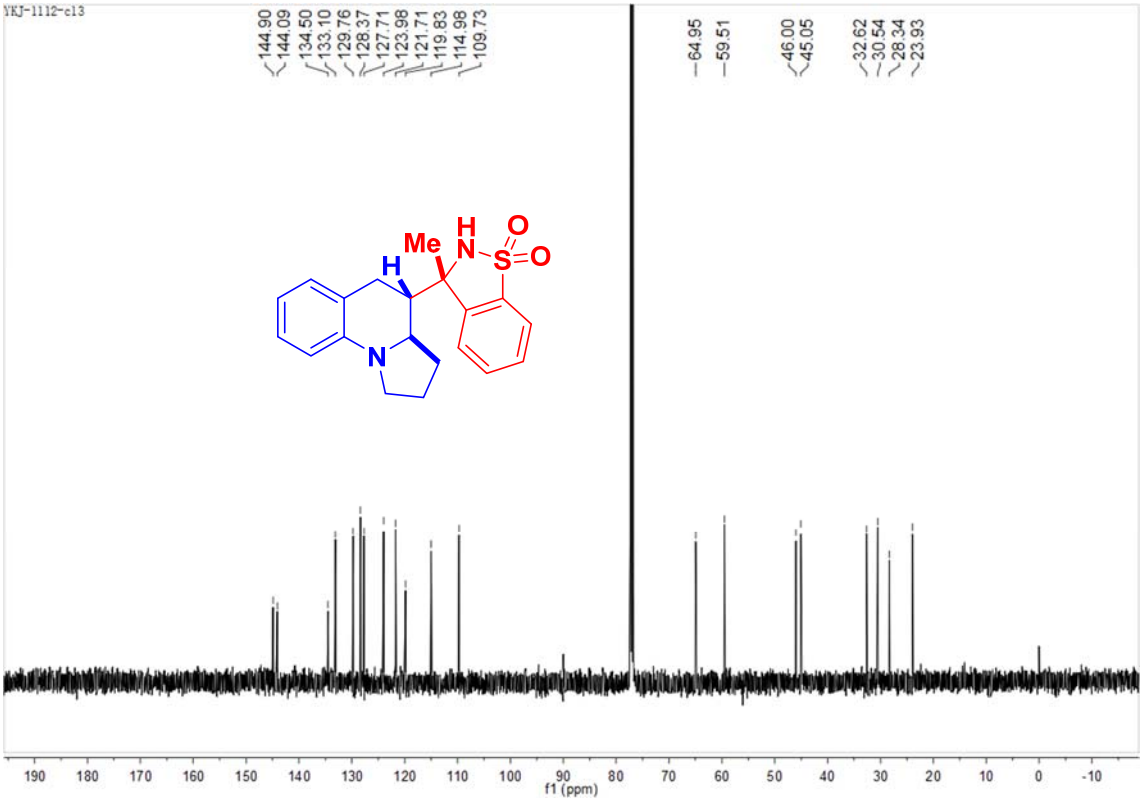


NOESY of 6

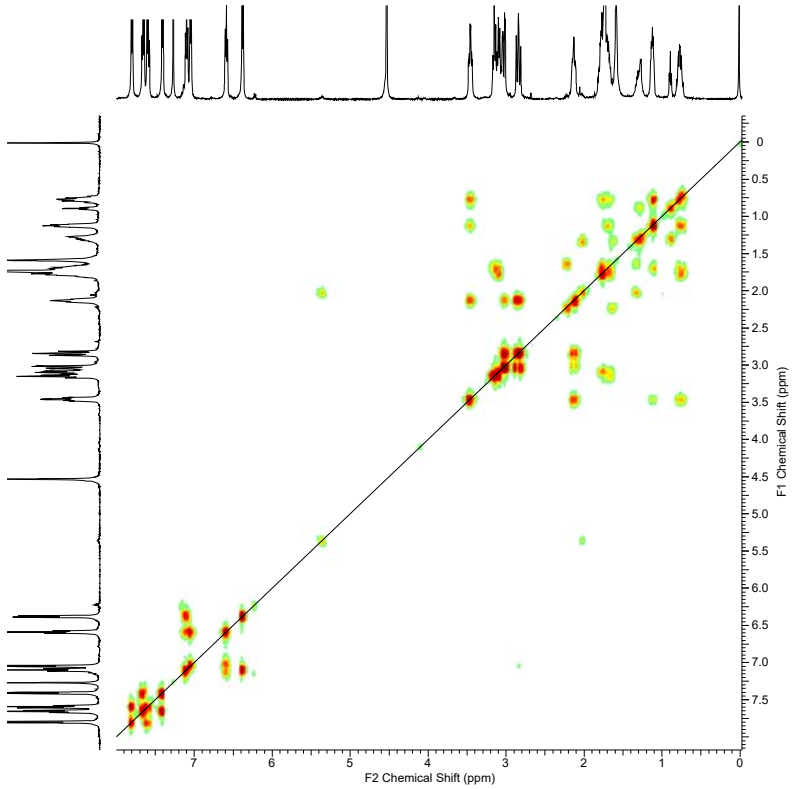


3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-3-methyl-2,3-dihydrobenzo[*d*]isothiazole 1,1-dioxide (7)

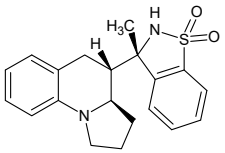




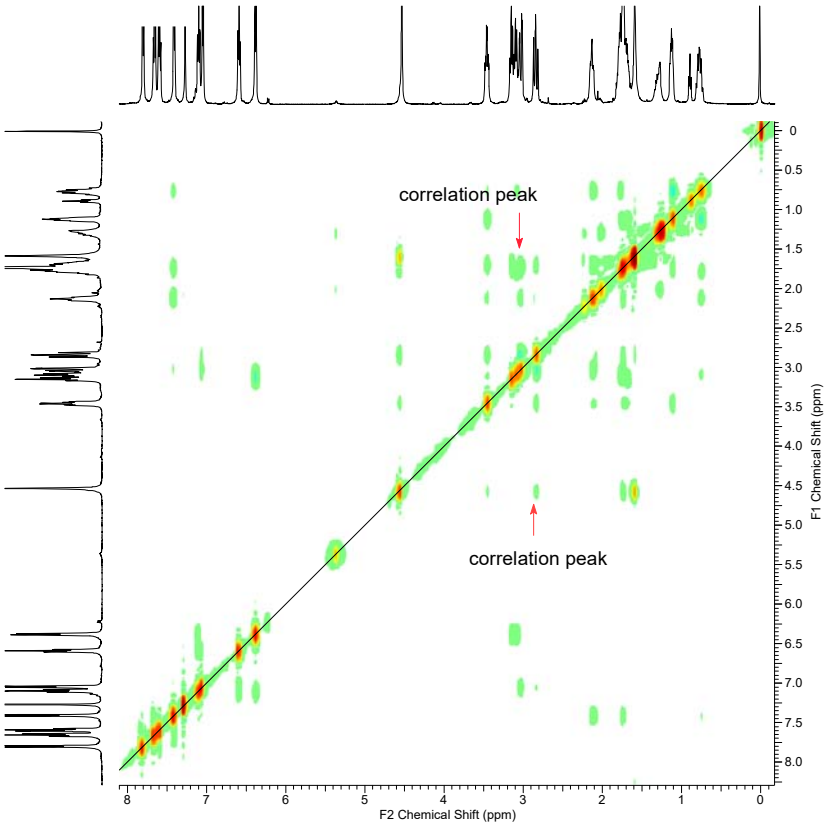
H,H-Cosy of 3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-3-methyl-2,3-dihydrobenzo[*d*]isothiazole 1,1-dioxide (7)



H,H-Cosy of 7



NOESY of 3-(1,2,3,3a,4,5-hexahydropyrrolo[1,2-*a*]quinolin-4-yl)-3-methyl- 2,3- dihydro-benzo[*d*]isothiazole 1,1-dioxide (7)



NOESY of 7