Supplementary Information

Copper-catalyzed *N*-thioetherification of sulfoximines using disulfides

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1. General Considerations

Unless otherwise noted, all chemicals were purchased from commercial suppliers and used without further purification. ^{1}H NMR and ^{13}C NMR spectra were recorded at ambient temperature on a 300 or 400 MHz NMR spectrometer (75 or 100 MHz for ^{13}C). NMR experiments are reported in δ units, parts per million (ppm), and were referenced to $CDCl_3$ as the internal standard. The coupling constants *J* are given in Hz. Column chromatography was performed using EM Silica gel 60 (300-400 mesh).

2. Experimental Procedures

General procedure for the CuI-catalyzed *N*-thioetherification of sulfoximines using disulfides

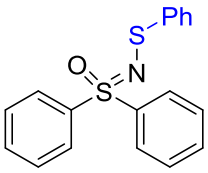
A 20 mL Schlenk tube equipped with a stir bar was charged with sulfoximine **1** (0.1 mmol), disulfide **2** (0.1 mmol, 1 equiv), CuI (3.8 mg, 0.02 mmol), sodium acetate (24.6 mg, 3 equiv), DMSO (2.0 mL). The tube was sealed with a Teflon cap. The reaction mixture was stirred at 60 ℃ for 15 h in oil bath. After the completion of the reaction, the reaction mixture was concentrated in vacuum and the residue was purified by flash column chromatography on silica gel with petroleum ether-EtOAc as the eluent to give the desired products.

General procedure for the synthesis of sulfoximines[1]

To a 25 mL over-dried round bottom flask equipped with a magnetic stir bar and reflux condenser, sulfoxide (4.0 mmol), sodium azide (1.2 equiv) and $CHCl_3$ (8.0 mL) were added at 0 ℃. Then 1.6 mL conc. H_2SO_4 was added dropwise over 10 min at 0 ℃. The flask was placed into an oil bath and heated to 45 ℃ for overnight. After complete consumption of sulfoxide, the reaction flask was cooled to room temperature, quenched by water and extracted with $CHCl_3$. The combined organic extracts were washed with brine, dried over Na_2SO_4 and concentrated under reduced pressure. The crude residue was purified using column chromatography on silica gel to afford the desired sulfoximine in good yield.

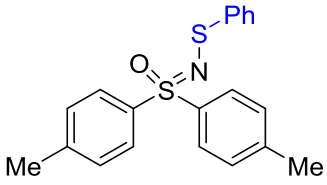
3. Characterization Data for the Products

***S*,*S*-diphenyl-*N*-phenylthiosulfoximine (3aa)**



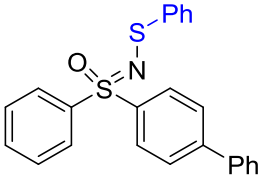
Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3aa** (28.6 mg, 88% yield) as a white solid. Mp. 105-107 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 8.10-8.00 (m, 4H), 7.60-7.45 (m, 8H), 7.28 (t, J = 7.8 Hz, 2H), 7.10 (t, J = 7.3 Hz, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ 142.1, 139.9, 133.2, 129.3, 128.5, 128.4, 125.0, 123.9; HRMS (ESI) *m/z* calcd for $C_{18}H_{16}NOS_2(M+H)^+$ 326.0668, found 326.0666.

_S,S_-di(4-methylphenyl)-_N_-phenylthiosulfoximine (3ba)



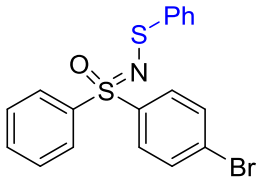
Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3ba** (24.7 mg, 70% yield) as a white solid. Mp. 108-110 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.94-7.87 (m, 4H), 7.46-7.44 (m, 2H), 7.32-7.25 (m, 6H), 7.10-7.07 (m, 1H), 2.41 (s, 6H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ 144.0, 142.4, 137.2, 129.9, 128.4, 128.3, 124.8, 123.7, 21.5; HRMS (ESI) *m/z* calcd for $C_{20}H_{20}NOS_2(M+H)^+$ 354.0981, found 354.0983.

_S_-phenyl-_S_-(1,1'-biphenyl)-_N_-phenylthiosulfoximine (3ca)



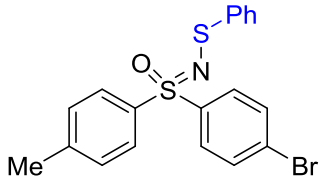
Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3ca** (35.6mg, 89% yield) as a yellow solid. Mp. 122-124 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 8.11-8.09 (m, 4H), 7.73 (d, J = 8.4 Hz, 2H), 7.62-7.41 (m, 10H), 7.30 (t, J = 7.9 Hz, 2H), 7.12 (t, J = 7.3 Hz, 1H); ^{13}C NMR ($CDCl_3$, 75 MHz): δ 146.1, 142.1, 140.0, 139.0, 138.3, 133.2, 129.3, 129.1, 129.0, 128.5, 128.4, 128.3, 127.9, 127.3, 125.0, 123.9; HRMS (ESI) *m/z* calcd for $C_{24}H_{20}NOS_2(M+H)^+$ 402.0981, found 402.0983.

***S*-phenyl-*S*-(4-bromophenyl)-*N*-phenylthiosulfoximine (3da)**



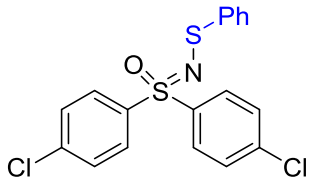
Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3da** (28.2 mg, 70% yield) as a yellow oil. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 8.06-8.02 (m, 2H), 7.89-7.86 (m, 2H), 7.67-7.52 (m, 5H), 7.45-7.39 (m, 2H), 7.28 (t, J = 7.8 Hz, 2H), 7.11 (t, J = 7.3 Hz, 1H); ^{13}C NMR ($CDCl_3$, 75 MHz): δ 141.7, 139.5, 139.0, 133.4, 132.6, 130.0, 129.4, 128.5, 128.4, 128.3, 125.2, 124.0; HRMS (ESI) *m/z* calcd for $C_{18}H_{15}BrNOS_2(M+H)^+$ 403.9773, found 403.9771.

***S*-(4-methylphenyl)-*S*-(4-bromophenyl)-*N*-phenylthiosulfoximine (3ea)**



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3ea** (36.6 mg, 88% yield) as a yellow solid. Mp. 124-125 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 7.92-7.85 (m, 4H), 7.63 (d, J = 8.6 Hz, 2H), 7.43 (d, J = 7.6 Hz, 2H), 7.34-7.26 (m, 4H), 7.10 (t, J = 7.3 Hz, 1H), 2.42 (s, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ 144.6, 141.9, 139.4, 136.3, 132.5, 130.1, 129.8, 128.5, 128.4, 128.3, 125.1, 123.9, 21.5; HRMS (ESI) *m/z* calcd for $C_{19}H_{17}BrNOS_2(M+H)^+$ 417.9929, found 417.9932.

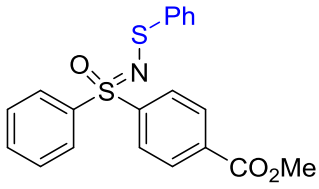
***S,S*-di(4-chlorophenyl)-*N*-phenylthiosulfoximine (3fa)**



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3fa** (31.8 mg, 81% yield) as a yellow solid. Mp. 120-122 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz):

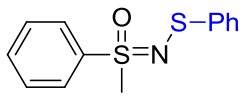
δ 7.95-7.92 (m, 4H), 7.51-7.42 (m, 6H), 7.31-7.27 (m, 2H), 7.13 (t, J = 7.3 Hz, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ 141.4, 140.2, 138.1, 129.9, 129.7, 128.5, 125.4, 124.2; HRMS (ESI) *m/z* calcd for $C_{18}H_{14}Cl_2NOS_2(M+H)^+$ 393.9888, found 393.9891.

_S_-phenyl-_S_-(4-methoxycarbonylphenyl)-_N_-phenylthiosulfoximine (3ga)



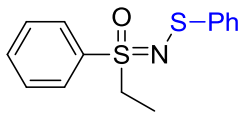
Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 5) give **3ga** (23.3 mg, 61% yield) as a yellow oil. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 8.17-8.04 (m, 6H), 7.64-7.53 (m, 3H), 7.43 (d, J = 7.7 Hz, 2H), 7.28 (t, J = 7.8 Hz, 2H), 7.11 (t, J = 7.3 Hz, 1H), 3.95 (s, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ 165.5, 144.1, 141.7, 139.2, 134.2, 133.6, 130.4, 129.5, 128.6, 128.5, 128.4, 125.2, 124.1, 52.6; HRMS (ESI) *m/z* calcd for $C_{20}H_{18}NO_3S_2(M+H)^+$ 384.0723, found 384.0725.

_S_-methyl-_S_-phenyl-_N_-phenylthiosulfoximine (3ha)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 6) give **3ha** (13.4 mg, 51% yield) as a yellow oil. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 8.01-7.96 (m, 2H), 7.70-7.58 (m, 3H), 7.42-7.37 (m, 2H), 7.30-7.24 (m, 2H), 7.10 (t, J = 7.3 Hz, 1H), 3.30 (s, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ 142.1, 133.7, 133.6, 129.5, 128.5, 128.4, 125.1, 123.8, 43.7; HRMS (ESI) *m/z* calcd for $C_{13}H_{14}NOS_2(M+H)^+$ 264.0511, found 264.0515.

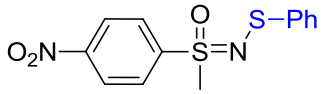
_S_-ethyl-_S_-phenyl-_N_-phenylthiosulfoximine (3ia)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3ia** (11.9 mg, 43% yield) as a yellow oil. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.98-7.88 (m,

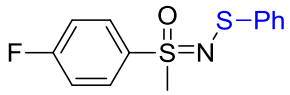
2H), 7.69-7.55 (m, 3H), 7.43-7.38 (m, 2H), 7.30-7.25 (m, 2H), 7.12-7.05 (m, 1H), 3.58-3.32(m, 2H), 1.33(t, J = 7.4 Hz, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ 142.4, 136.8, 133.6, 129.4, 129.2, 128.4, 125.0, 123.9, 50.3, 7.8; HRMS (ESI) *m/z* calcd for $C_{14}H_{16}NOS_2(M+H)^+$ 278.0668, found 278.0665.

_S_-methyl-_S_-(4-nitrophenyl)-_N_-phenylthiosulfoximine (3ja)



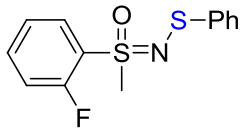
Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 4) give **3ja** (16.9 mg, 55% yield) as a yellow oil. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 8.33-8.29 (m, 2H), 8.07-8.02 (m, 2H), 7.30-7.17 (m, 4H), 7.07-7.02 (m, 1H), 3.27 (s, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ 150.8, 144.8, 141.0, 129.9, 128.6, 125.7, 124.5, 124.3, 43.6; HRMS (ESI) *m/z* calcd for $C_{13}H_{12}N_2NaO_3S_2(M+Na)^+$ 331.0182, found 331.0182.

_S_-methyl-_S_-(4-fluorophenyl)-_N_-phenylthiosulfoximine (3ka)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3ka** (22.2 mg, 79% yield) as a yellow oil. ^{1}H NMR ($CDCl_3$, 300 MHz): δ 7.98-7.93 (m, 2H), 7.40-7.36 (m, 2H), 7.30-7.22 (m, 4H), 7.13-7.07 (m, 1H), 3.29 (s, 3H); ^{13}C NMR ($CDCl_3$, 75 MHz): δ 165.8 (d, $J_{C\text{-}F}$ = 255.0 Hz), 141.8, 134.4 (d, $J_{C\text{-}F}$ = 3.8 Hz), 131.3 (d, $J_{C\text{-}F}$ = 9.0 Hz), 128.5, 125.2, 123.9, 116.8 (d, $J_{C\text{-}F}$ = 22.5 Hz), 43.9; HRMS (ESI) *m/z* calcd for $C_{13}H_{13}FNOS_2(M+H)^+$ 282.0417, found 282.0420.

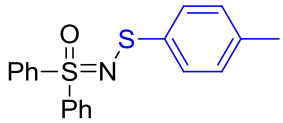
_S_-methyl-_S_-(2-fluorophenyl)-_N_-phenylthiosulfoximine (3la)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3la** (23.8 mg, 85% yield) as a yellow oil. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 8.04-7.98 (m, 1H), 7.69-7.60 (m, 1H), 7.38-7.32 (m, 3H), 7.28-7.16 (m, 3H), 7.08(t, J = 7.3 Hz, 1H),

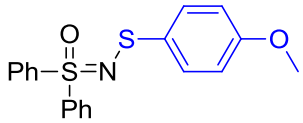
2.47 (s, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ 158.5 (d, $J_{C\text{-}F}$ = 253.0 Hz), 141.4, 136.1 (d, $J_{C\text{-}F}$ = 9.0 Hz), 131.6, 128.4, 125.2, 124.7 (d, $J_{C\text{-}F}$ = 4.0 Hz), 124.1, 117.1 (d, $J_{C\text{-}F}$ = 22.0 Hz), 42.8; HRMS (ESI) *m/z* calcd for $C_{13}H_{13}FNOS_2(M+H)^+$ 282.0417, found 282.0414.

_S,S_-diphenyl-_N_-(4-methylphenylthio)sulfoximine (3ab)[2]



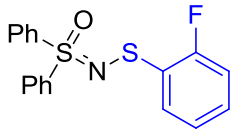
Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3ab** (20.8 mg, 61% yield) as a yellow solid. Mp. 110-112 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 8.06-8.00 (m, 4H), 7.58-7.48 (m, 6H), 7.35 (d, J = 8.2 Hz, 2H), 7.07 (d, J = 8.0 Hz, 2H), 2.29 (s, 3H); ^{13}C NMR ($CDCl_3$, 75 MHz): δ 139.9, 138.2, 135.2, 133.1, 129.3, 129.2, 128.5, 125.1, 21.0.

_S,S_-diphenyl-_N_-(4-methoxyphenylthio)sulfoximine (3ac)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3ac** (26.7mg, 75% yield) as a yellow oil. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 8.02-7.97 (m, 4H), 7.57-7.46 (m, 8H), 6.84-6.80 (m, 2H), 3.77 (m, 3H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ158.6, 140.1, 133.0, 129.5, 129.2, 128.5(2), 114.2, 55.3; HRMS (ESI) *m/z* calcd for $C_{19}H_{18}NO_2S_2(M+H)^+$ 356.0773, found 356.0770.

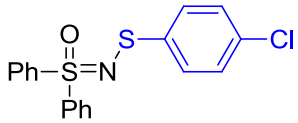
_S,S_-diphenyl-_N_-(2-fluorophenylthio)sulfoximine (3ad)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 15) give **3ad** (25.1 mg, 73% yield) as a white solid. Mp. 107-109 ^{o}C. ^{1}H NMR ($CDCl_3$, 400 MHz): δ 8.03-7.98 (m, 4H), 7.76-7.70 (m, 1H), 7.59-7.50 (m, 6H), 7.14-7.03 (m, 2H), 6.90 (t, J = 9.6 Hz, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ 157.0 (d, $J_{C\text{-}F}$ = 241.0 Hz), 139.7, 133.3,

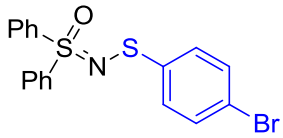
129.4, 128.4, 126.0 (d, $J_{C\text{-}F}$ = 7.0 Hz), 124.4 (d, $J_{C\text{-}F}$ = 3.0 Hz), 114.4 (d, $J_{C\text{-}F}$ = 21.0 Hz); HRMS (ESI) *m/z* calcd for $C_{18}H_{15}FNOS_2(M+H)^+$ 344.0574, found 344.0571.

S,S-diphenyl-*N*-(4-chlorophenylthio)sulfoximine (3ae)



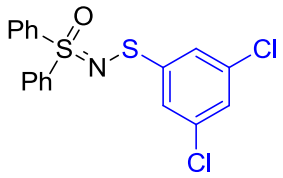
Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3ae** (31.4mg, 87% yield) as a white solid. Mp. 121-123 ^oC. ^1H NMR ($CDCl_3$, 300 MHz): δ 8.03-7.99 (m, 4H), 7.61-7.49 (m, 6H), 7.39-7.33 (m, 2H), 7.23-7.19 (m, 2H); ^{13}C NMR ($CDCl_3$, 75 MHz): δ140.9, 139.7, 133.3, 130.5, 129.4, 128.5, 128.4, 125.2; HRMS (ESI) *m/z* calcd for $C_{18}H_{15}ClNOS_2(M+H)^+$ 360.0278, found 360.0283.

S,S-diphenyl-*N*-(4-bromophenylthio)sulfoximine (3af)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3af** (33.9 mg, 84% yield) as a white solid. Mp. 122-123 ^oC. ^1H NMR ($CDCl_3$, 300 MHz): δ 7.95-7.91 (m, 4H), 7.52-7.40 (m, 6H), 7.29-7.18 (m, 4H); ^{13}C NMR ($CDCl_3$, 75 MHz): δ 141.6, 139.6, 133.3, 131.3, 129.4, 128.4, 125.3, 118.2; HRMS (ESI) *m/z* calcd for $C_{18}H_{15}BrNOS_2(M+H)^+$ 403.9773, found 403.9775.

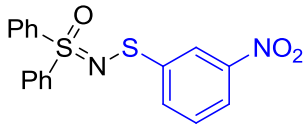
S,S-diphenyl-*N*-(3,5-dichlorophenylthio)sulfoximine (3ag)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 15) give **3ag** (27.8 mg, 71% yield) as a yellow solid. Mp. 111-113 ^oC. ^1H NMR ($CDCl_3$, 400 MHz): δ 8.03 (d, J = 7.5 Hz, 4H), 7.64-7.54 (m, 6H), 7.28-7.23 (m, 2H), 7.04 (s, 1H); ^{13}C

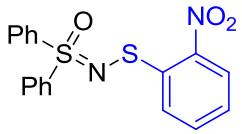
NMR ($CDCl_3$, 100 MHz): δ 146.7, 139.5, 134.9, 133.5, 129.5, 128.4, 124.6, 121.0; HRMS (ESI) *m/z* calcd for $C_{18}H_{14}Cl_2NOS_2(M+H)^+$ 393.9888, found 393.9888.

_S,S_-diphenyl-_N_-(3-nitrophenylthio)sulfoximine (3ah)



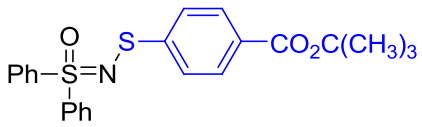
Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3ah** (22.9 mg, 62% yield) as a yellow solid. Mp. 156-157 ^oC. ^1H NMR ($CDCl_3$, 400 MHz): δ 8.28-8.22 (m, 1H), 8.05-8.01 (m, 4H), 7.90-7.85 (m, 1H), 7.70-7.67 (m, 1H), 7.61-7.53 (m, 6H), 7.41-7.35 (m, 1H); ^{13}C NMR ($CDCl_3$, 75 MHz): δ 148.5, 145.9, 139.4, 133.5, 129.5, 129.0, 128.7, 128.4, 119.5, 117.8; HRMS (ESI): Calcd. for $C_{18}H_{15}N_2O_3S_2(M+H)^+$ 371.0519, found 371.0515.

_S,S_-diphenyl-_N_-(2-nitrophenylthio)sulfoximine (3ai)[2]



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3ai** (32.8 mg, 89% yield) as a yellow solid. Mp. 161-162 ^oC. ^1H NMR ($CDCl_3$, 400 MHz): δ 8.31-8.22 (m, 2H), 8.05 (d, J = 7.2 Hz, 4H), 7.62-7.53 (m, 7H), 7.19 (t, J = 8.1 Hz, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ 146.4, 141.9, 139.8, 133.8, 133.4, 129.5, 128.2, 125.5, 125.3, 124.1.

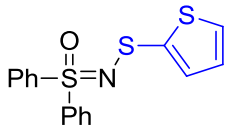
_S,S_-diphenyl-_N_-(pivalatephenylthio)sulfoximine (3aj)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3aj** (31.8 mg, 75% yield) as a yellow solid. Mp. 127-128 ^oC. ^1H NMR ($CDCl_3$, 400 MHz): δ 8.05-7.98 (m, 4H), 7.58-7.41 (m, 8H), 6.95 (d, J = 8.6 Hz, 2H), 1.33 (s, 9H); ^{13}C NMR

($CDCl_3$, 100 MHz): δ 177.0, 148.9, 139.8, 138.9, 133.2, 129.3, 128.4, 125.7, 121.5, 39.0, 27.1; HRMS (ESI): Calcd. for $C_{23}H_{24}NO_3S_2(M+H)^+$ 426.1192, found 426.1195.

_S,S_-diphenyl-_N_-(2-thiophenethio)sulfoximine (3ak)



Flash column chromatography on a silica gel (ethyl acetate: petroleum ether, 1: 10) give **3ak** (24.6 mg, 74% yield) as a yellow oil. ^1H NMR ($CDCl_3$, 400 MHz): δ 8.09-8.02 (m, 4H), 7.69-7.58 (m, 7H), 7.54-7.48 (m, 1H), 7.06-6.98 (m, 1H); ^{13}C NMR ($CDCl_3$, 100 MHz): δ 139.8, 133.7, 133.0, 130.9, 129.2, 128.4, 127.8, 127.1; HRMS (ESI): Calcd. for $C_{16}H_{14}NOS_3(M+H)^+$ 332.0232, found 332.0230.

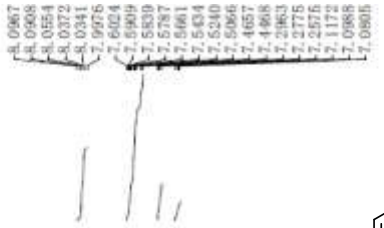
4. References

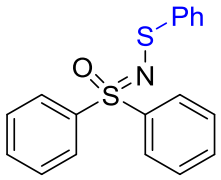
1. M. R. Yadav, R. K. Rit and A. K. Sahoo, *Chem. Eur. J.,* 2012, **18**, 5541.

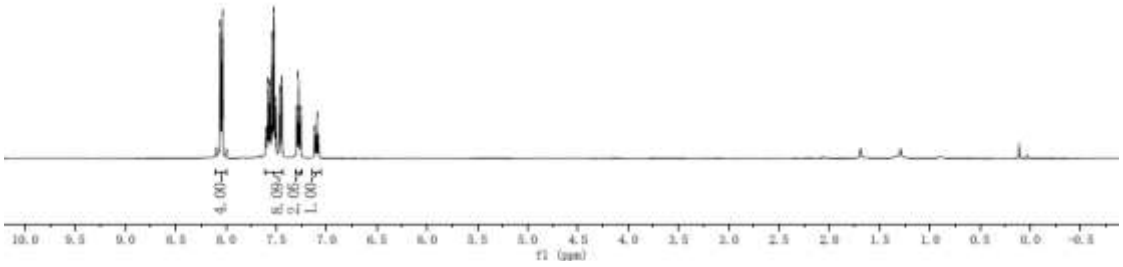
2. K. Akutagawa, N. Furukawa and S. Oae, *Bull. Chem. Soc. Jpn.,* 1984, **57,** 518.

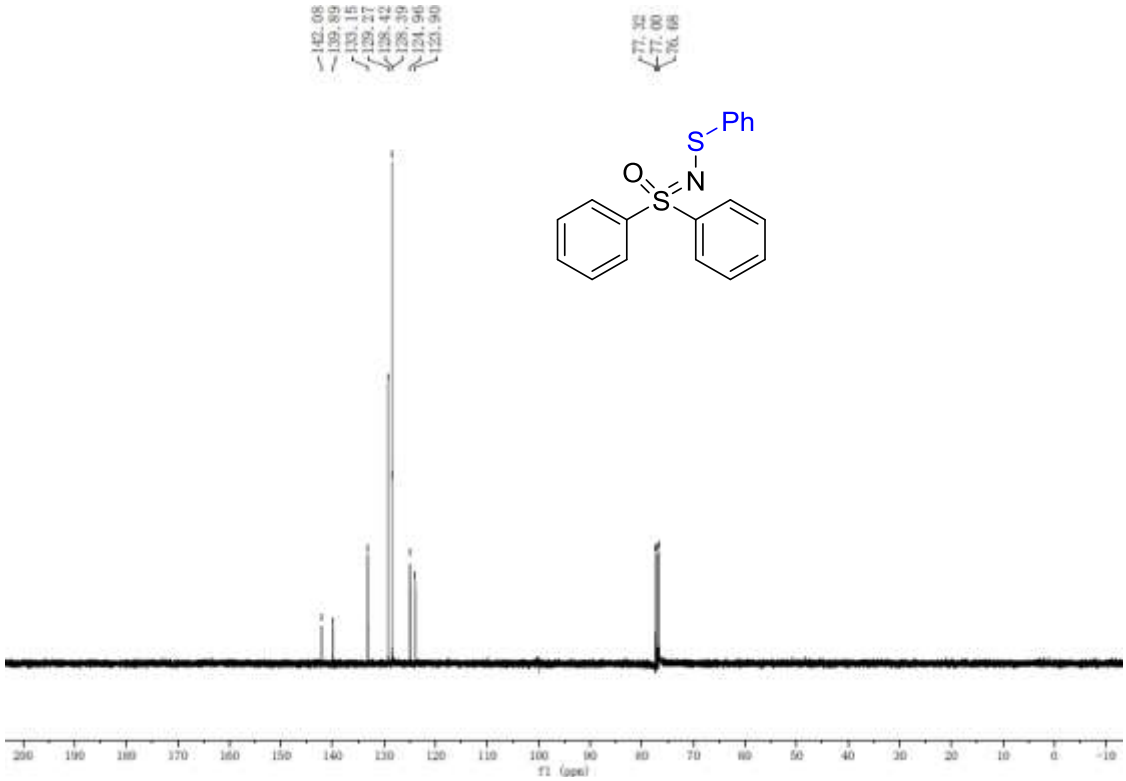
5. Copies of the ^{1}H NMR and ^{13}C NMR spectra

S,S-diphenyl-*N*-phenylthiosulfoximine (3aa)

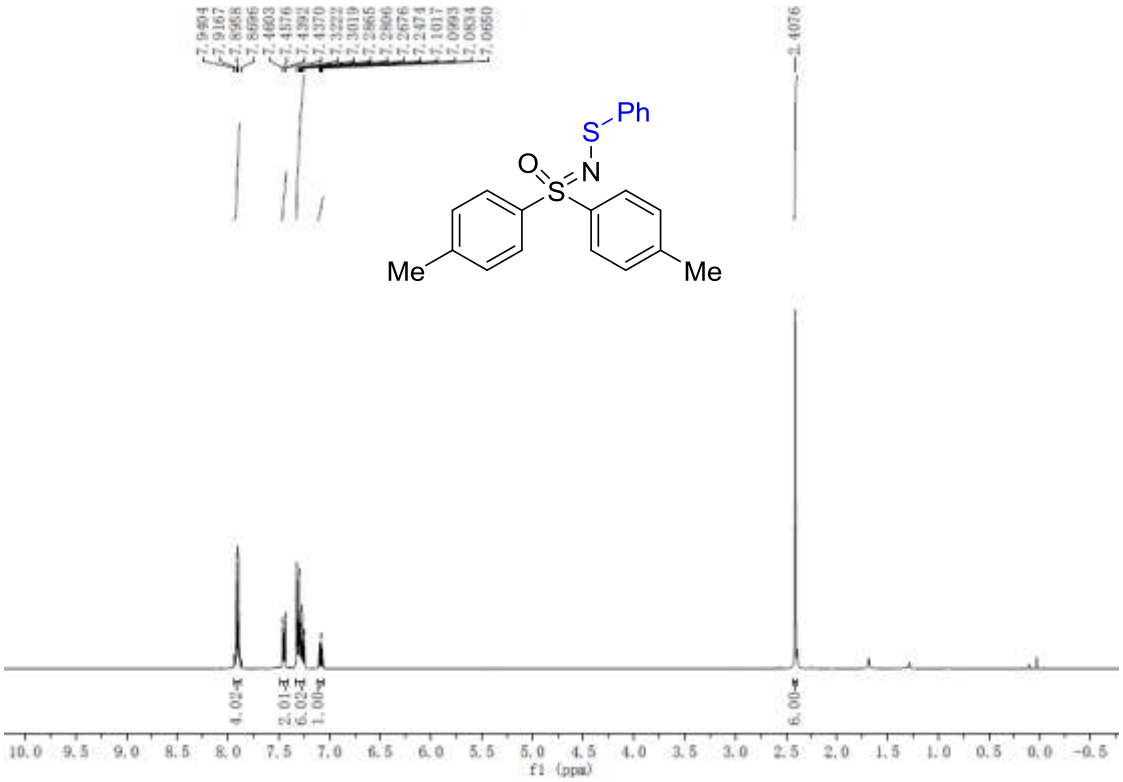


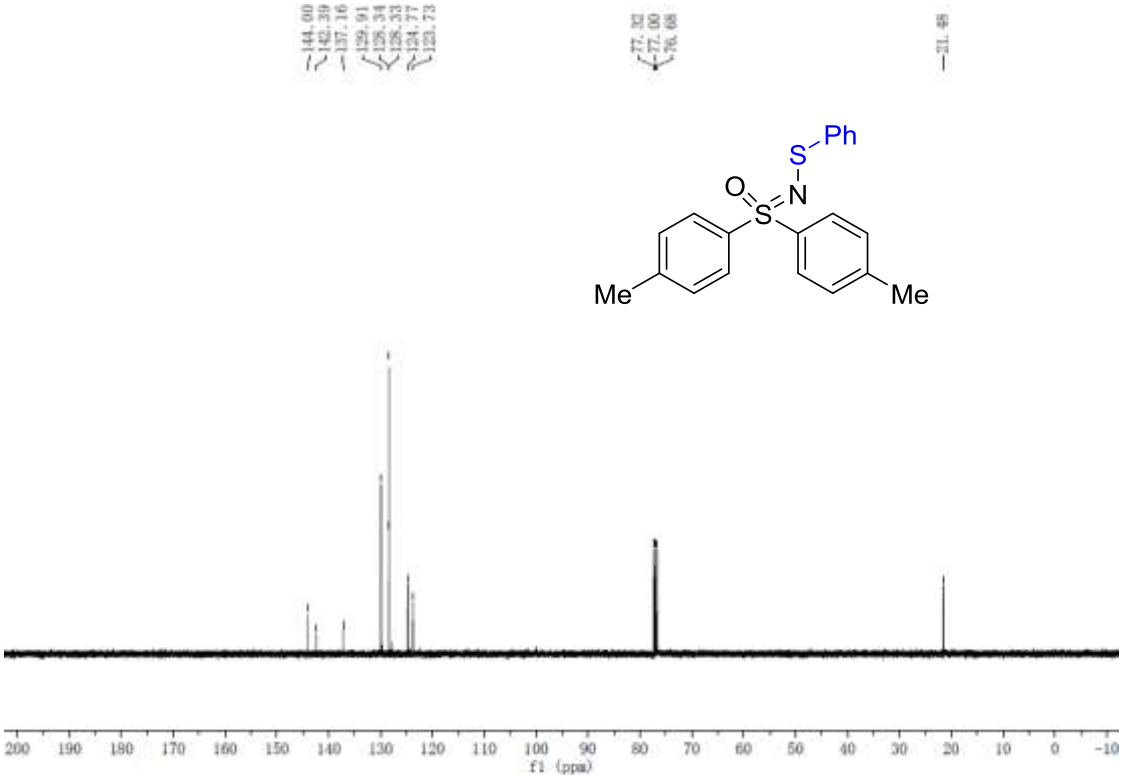




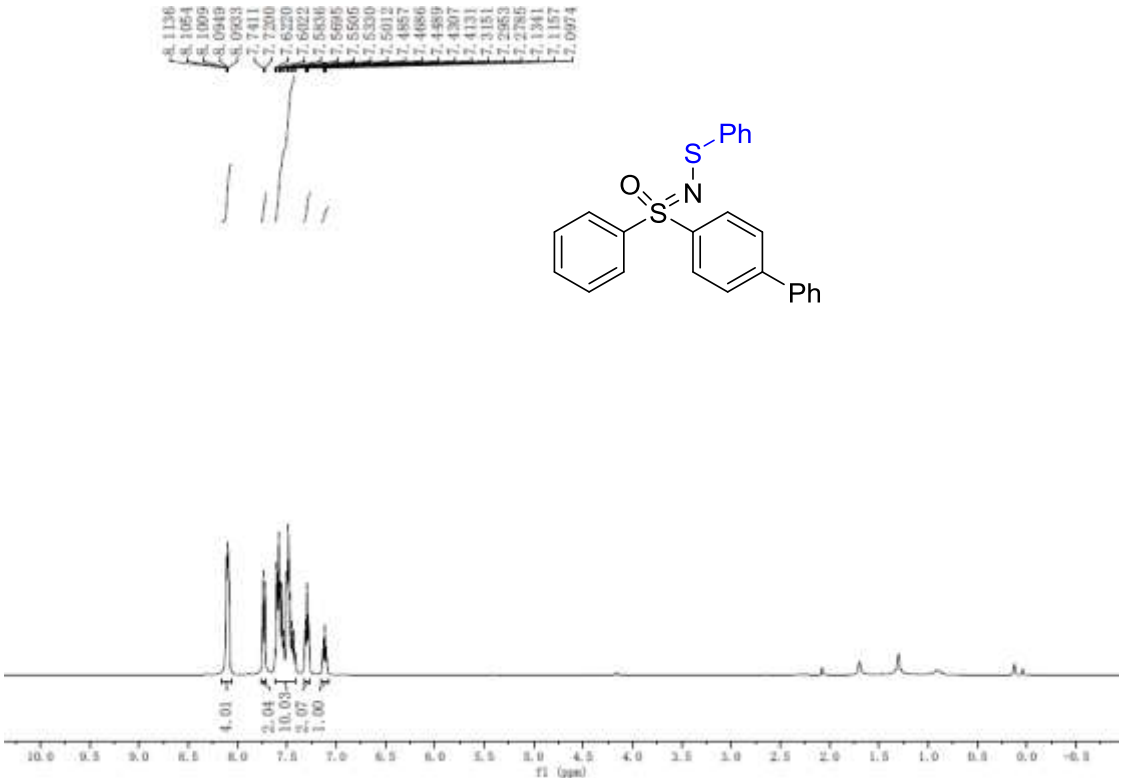


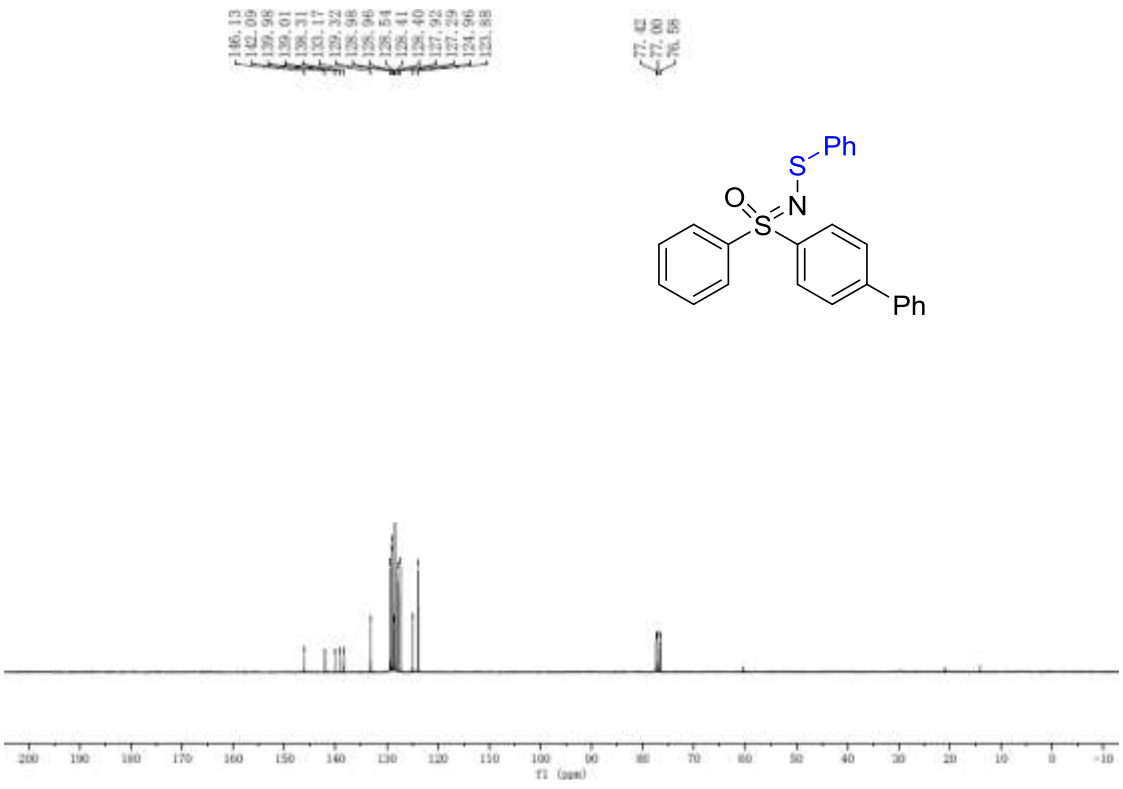
S,S-di(4-methylphenyl)-*N*-phenylthiosulfoximine (3ba)



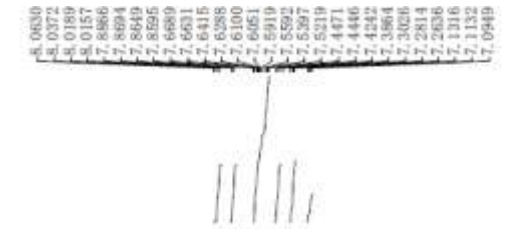


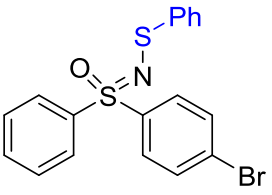
_S_-phenyl-_S_-(1,1'-biphenyl)-_N_-phenylthiosulfoximine (3ca)

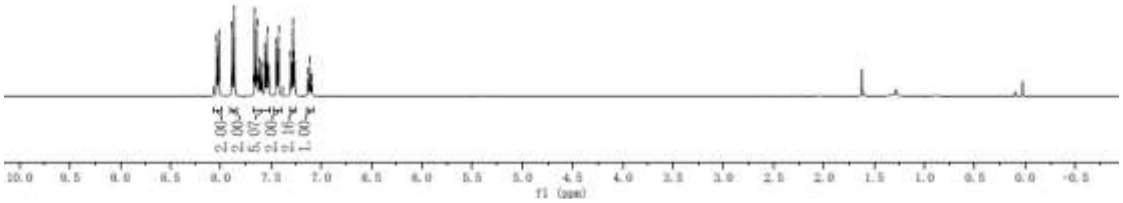


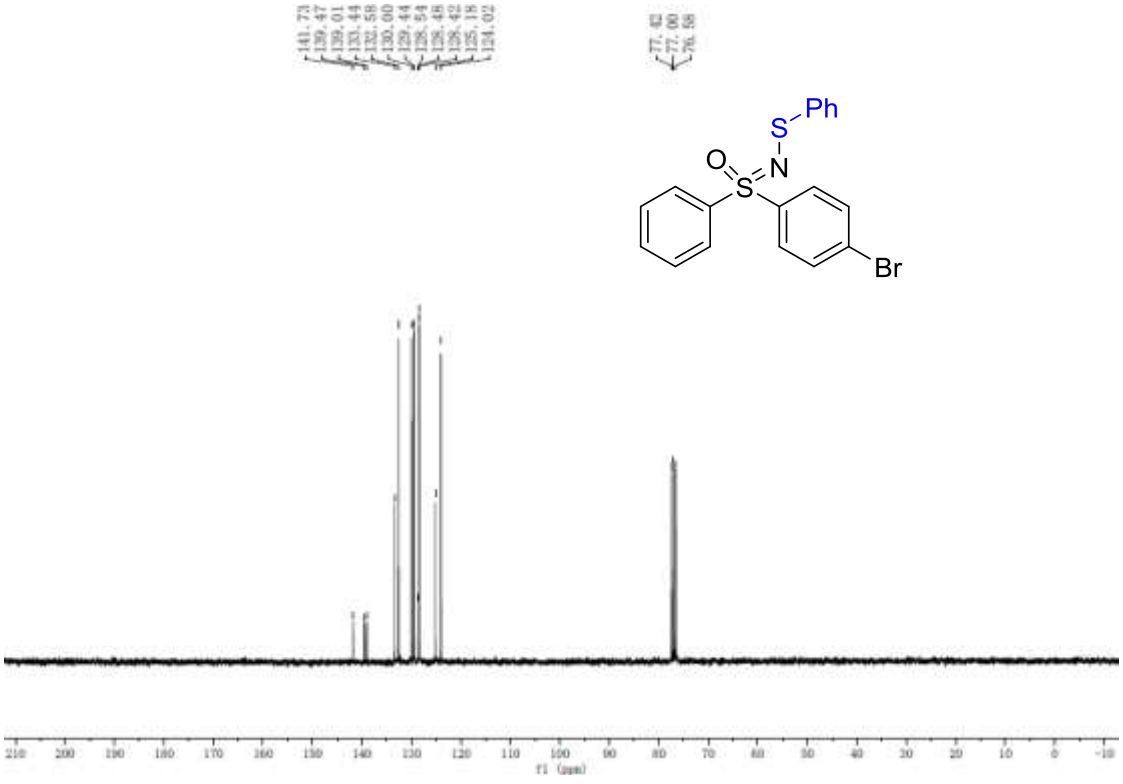


_S_-phenyl-_S_-(4-bromophenyl)-_N_-phenylthiosulfoximine (3da)

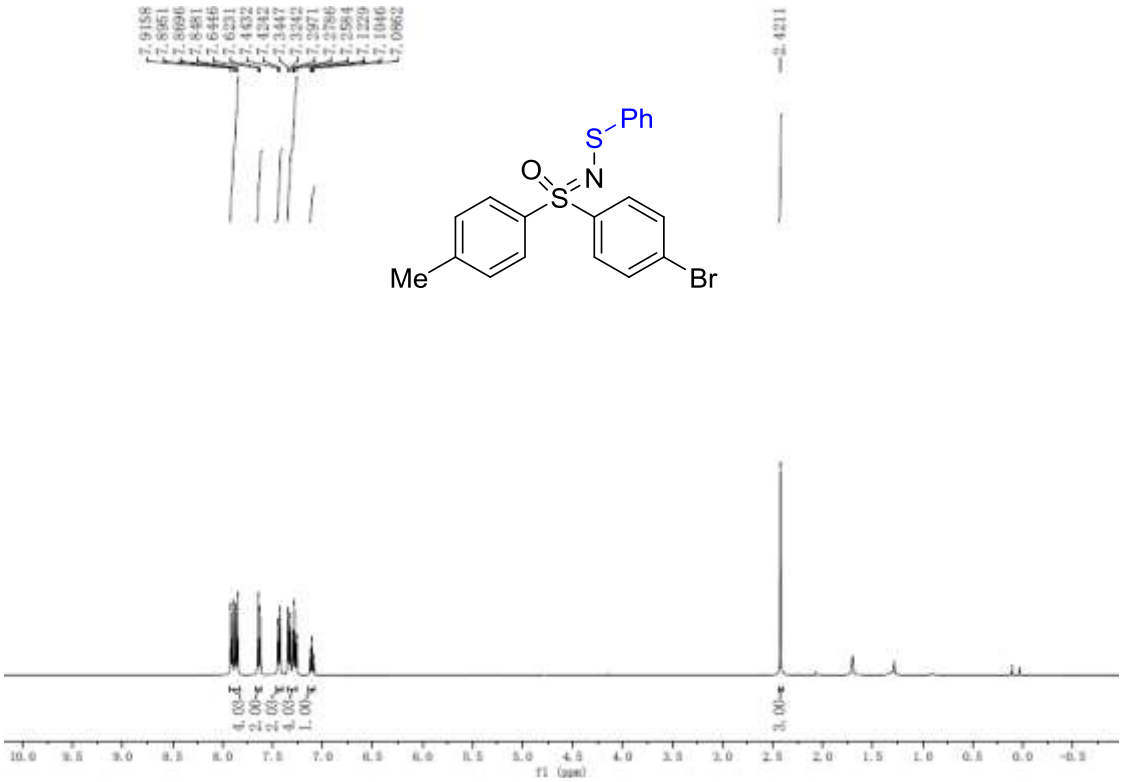


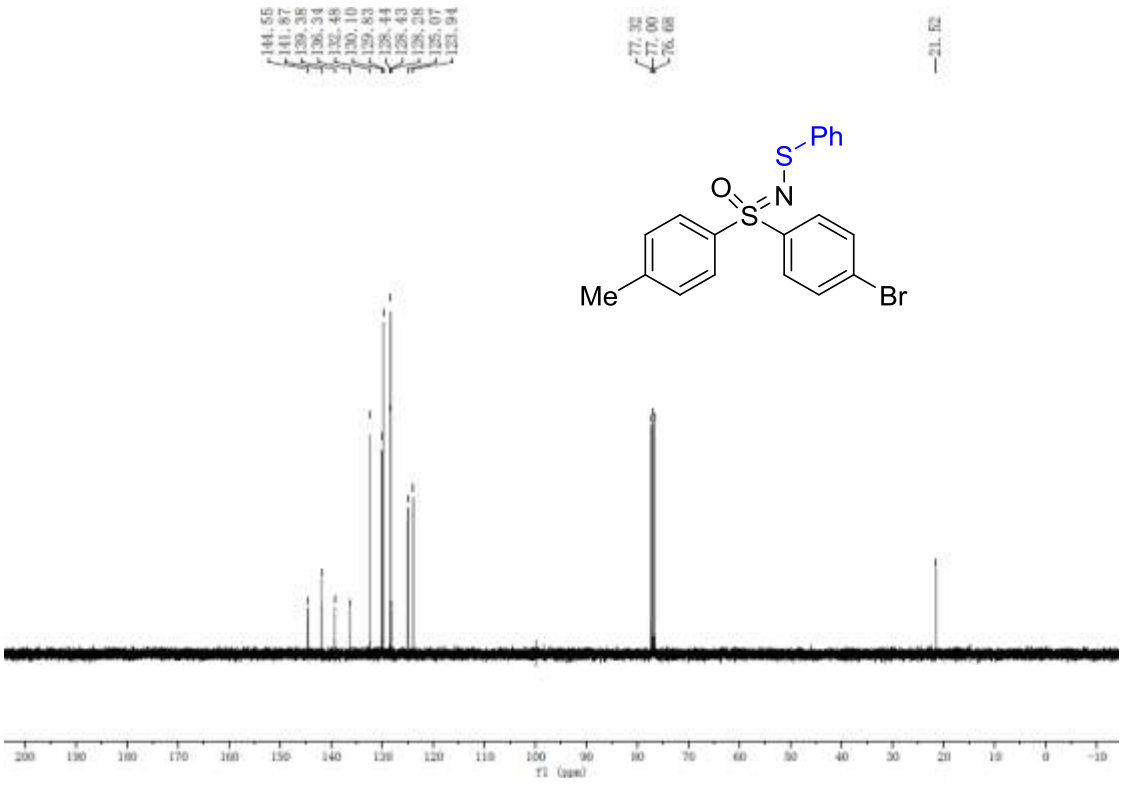




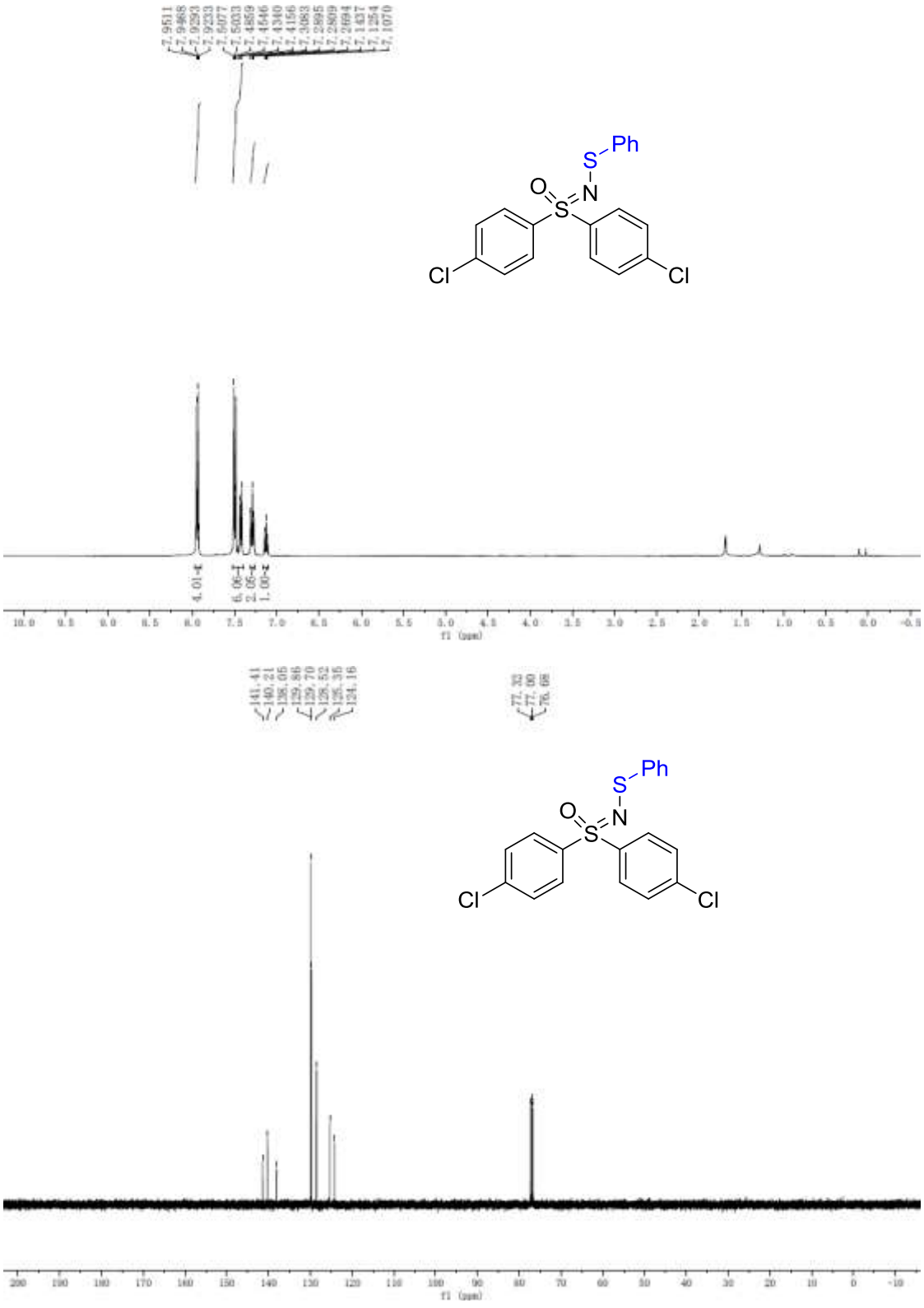


***S*-(4-methylphenyl)-*S*-(4-bromophenyl)-*N*-phenylthiosulfoximine (3ea)**

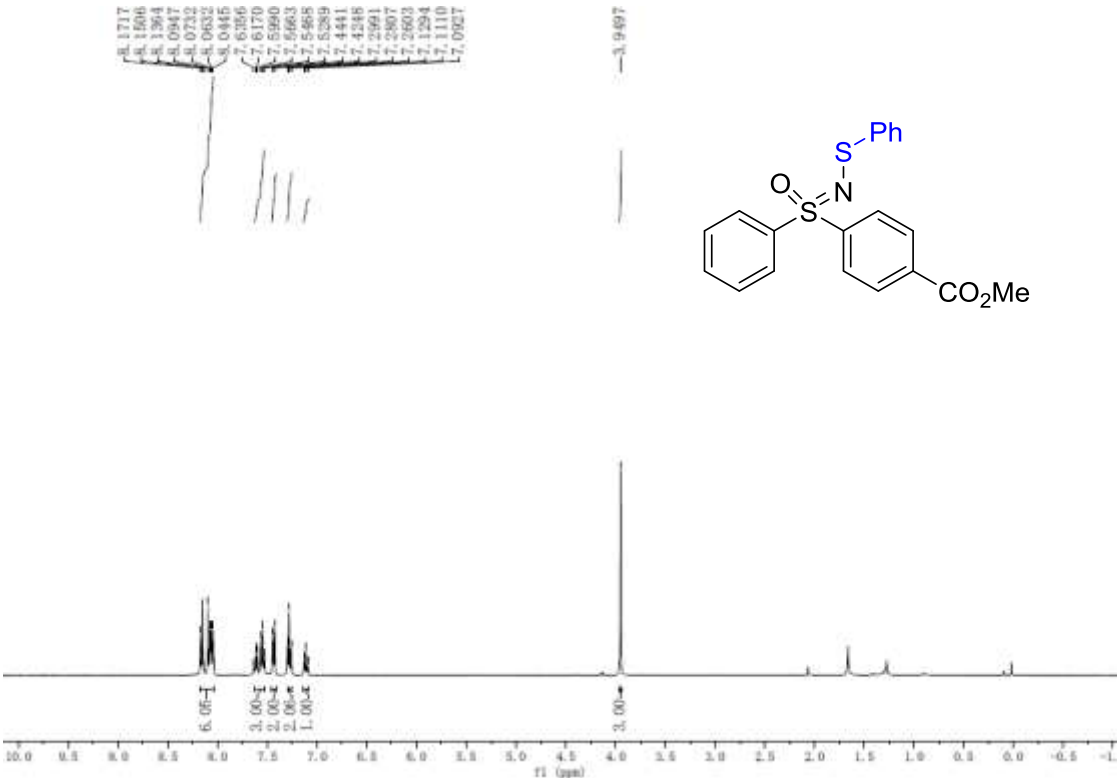


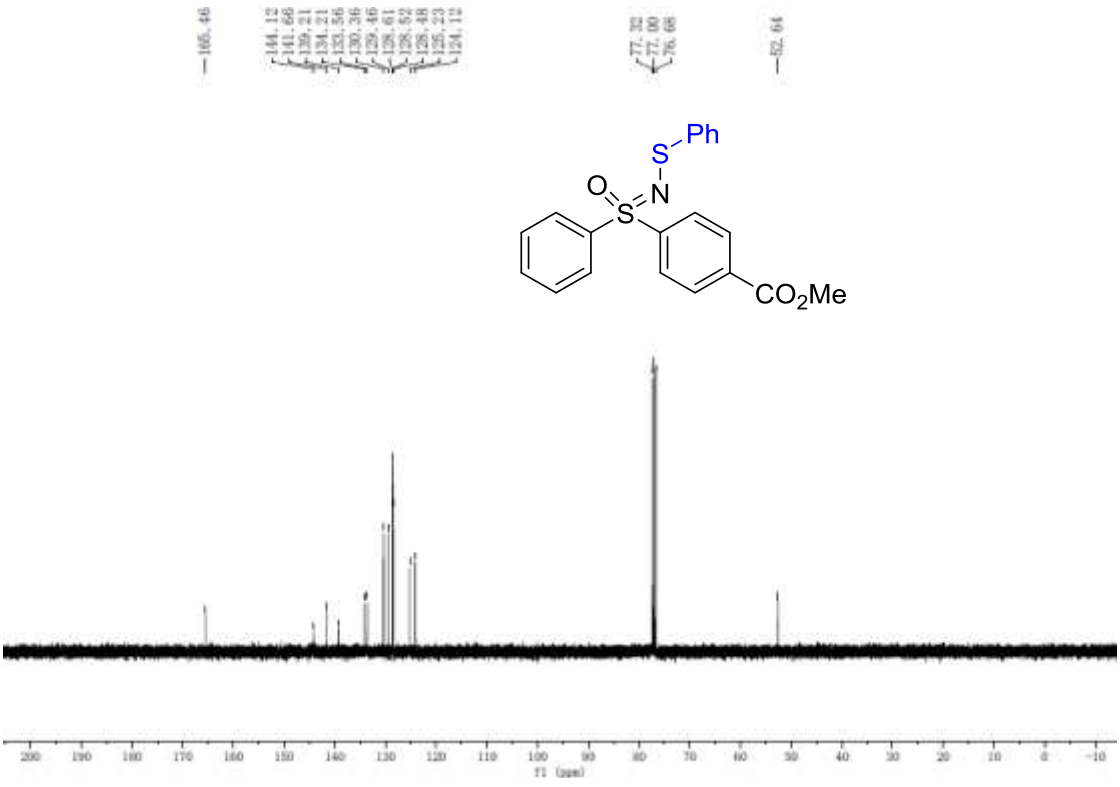


S,S-di(4-chlorophenyl)-*N*-phenylthiosulfoximine (3fa)

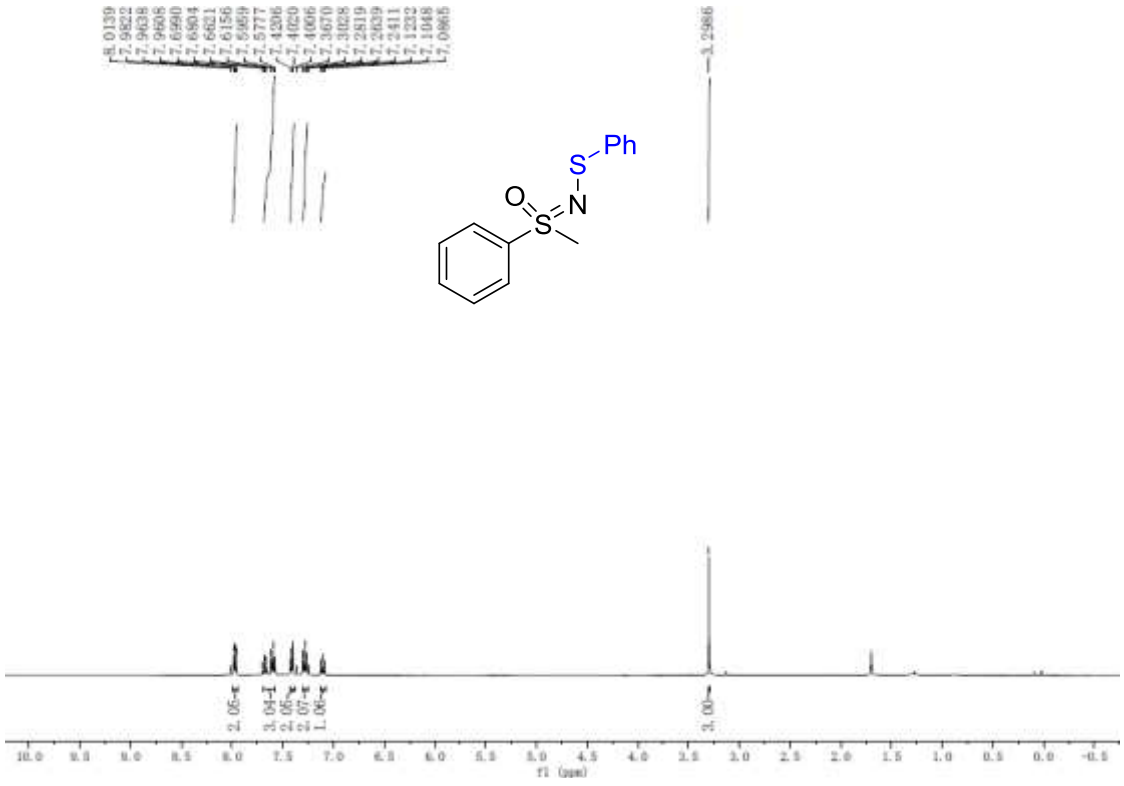


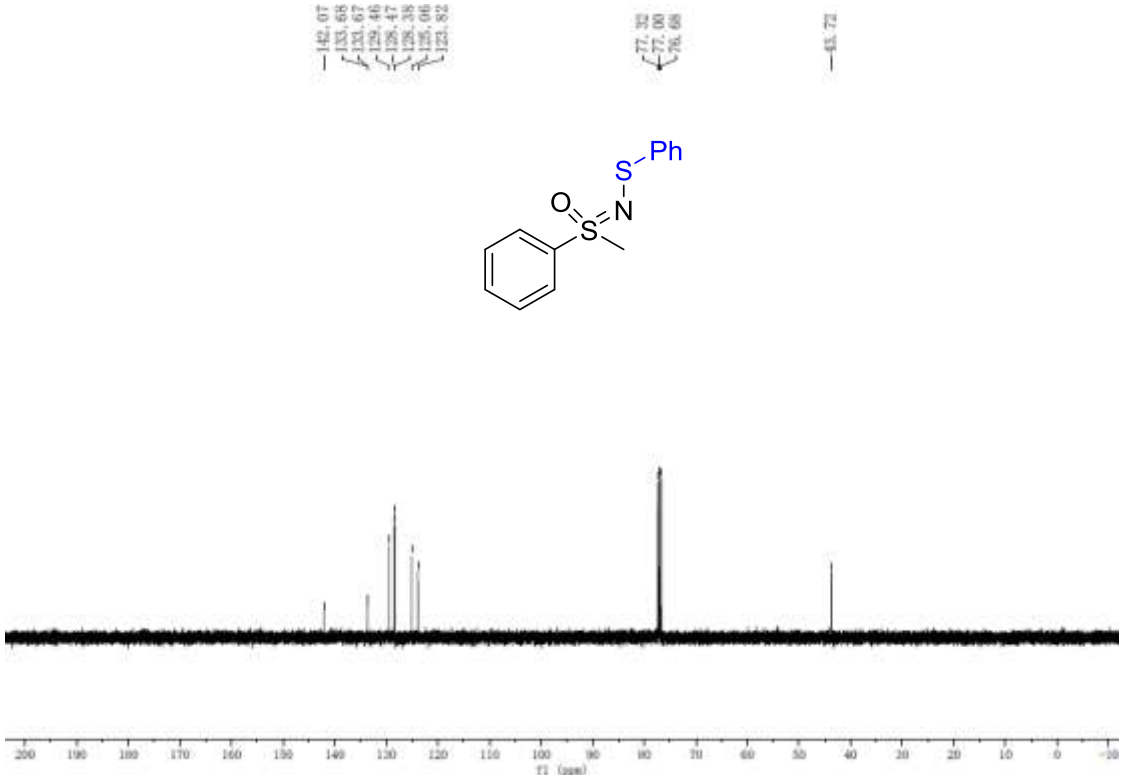
_S_-phenyl-_S_-(4-methoxycarbonylphenyl)-_N_-phenylthiosulfoximine (3ga)



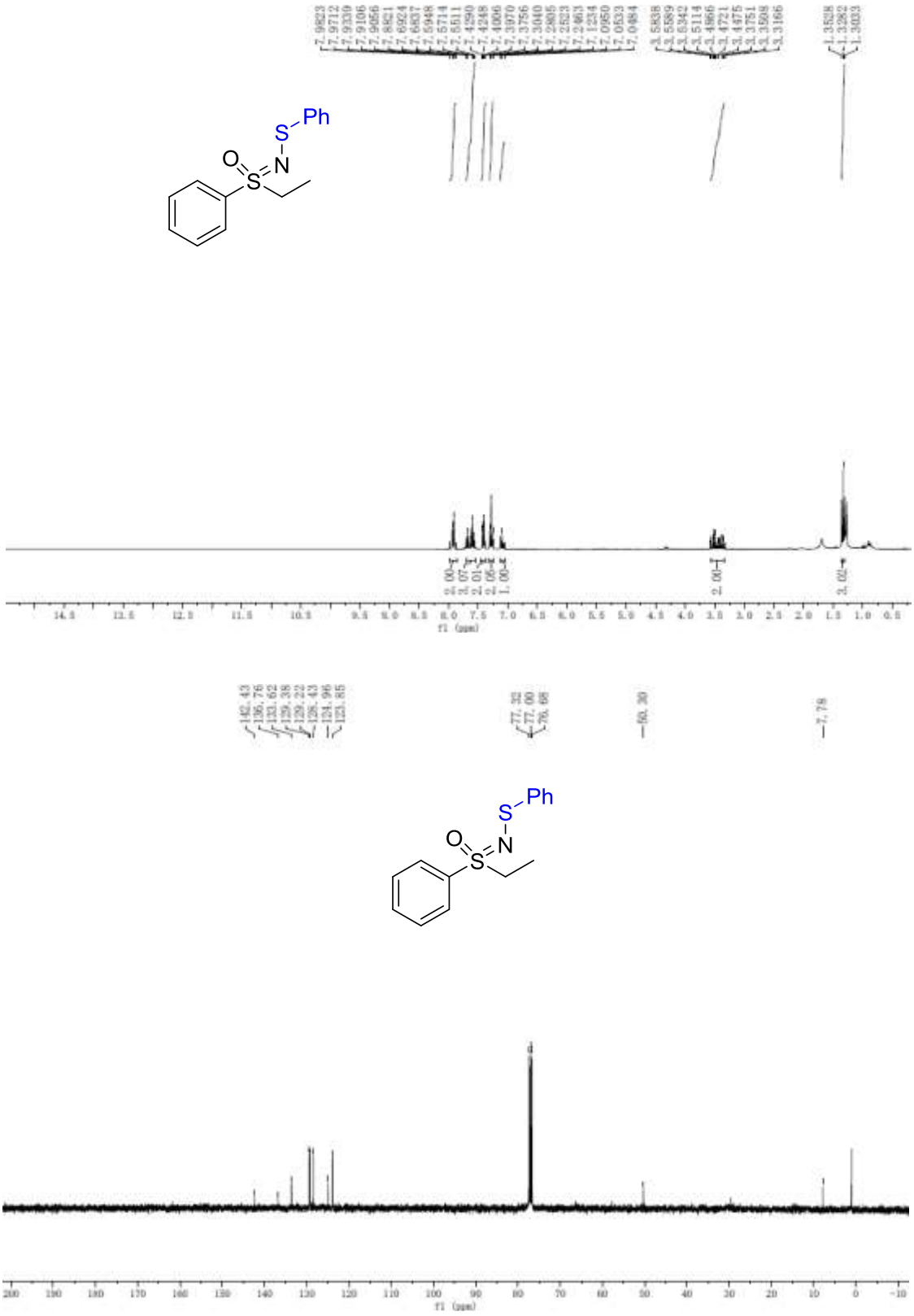


_S_-methyl-_S_-phenyl-_N_-phenylthiosulfoximine (3ha)

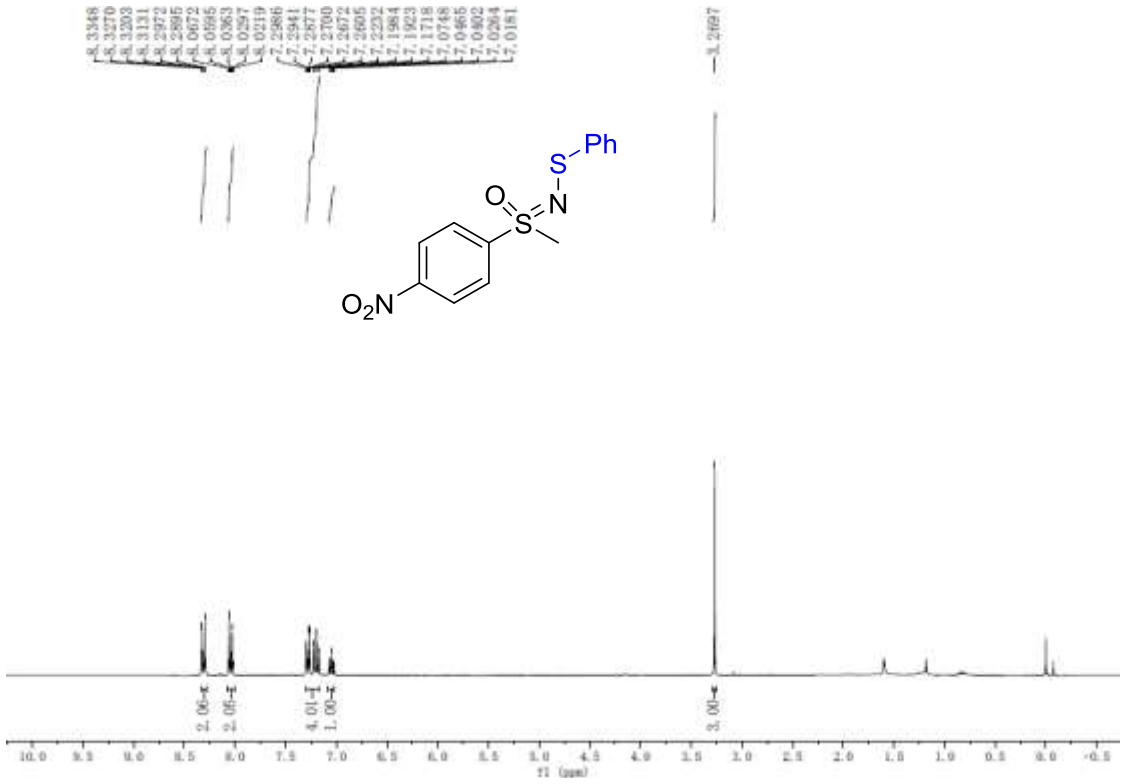


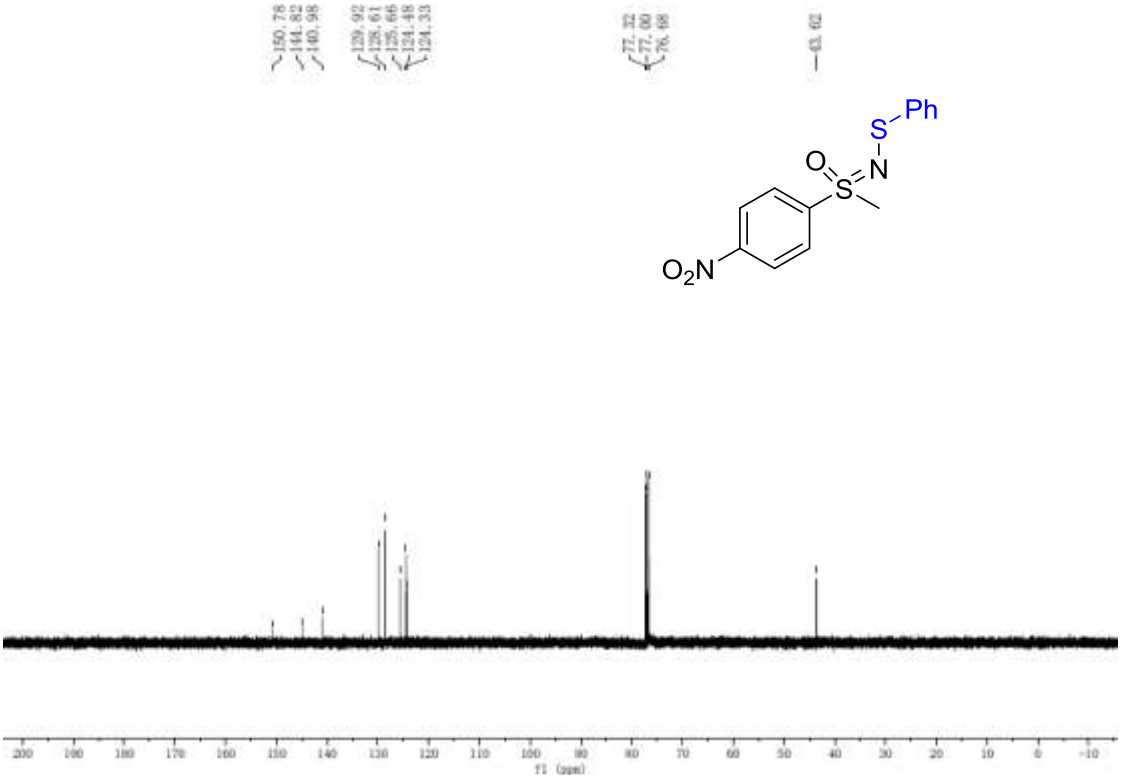


_S_-ethyl-_S_-phenyl-_N_-phenylthiosulfoximine (3ia)

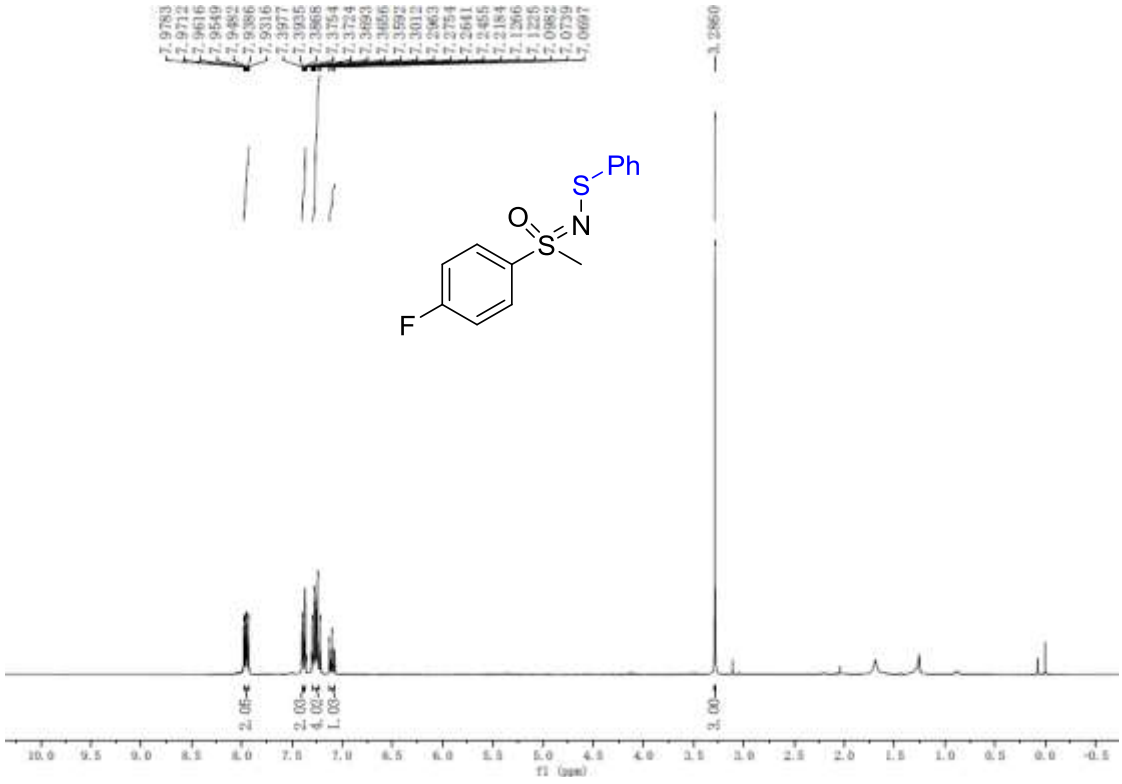


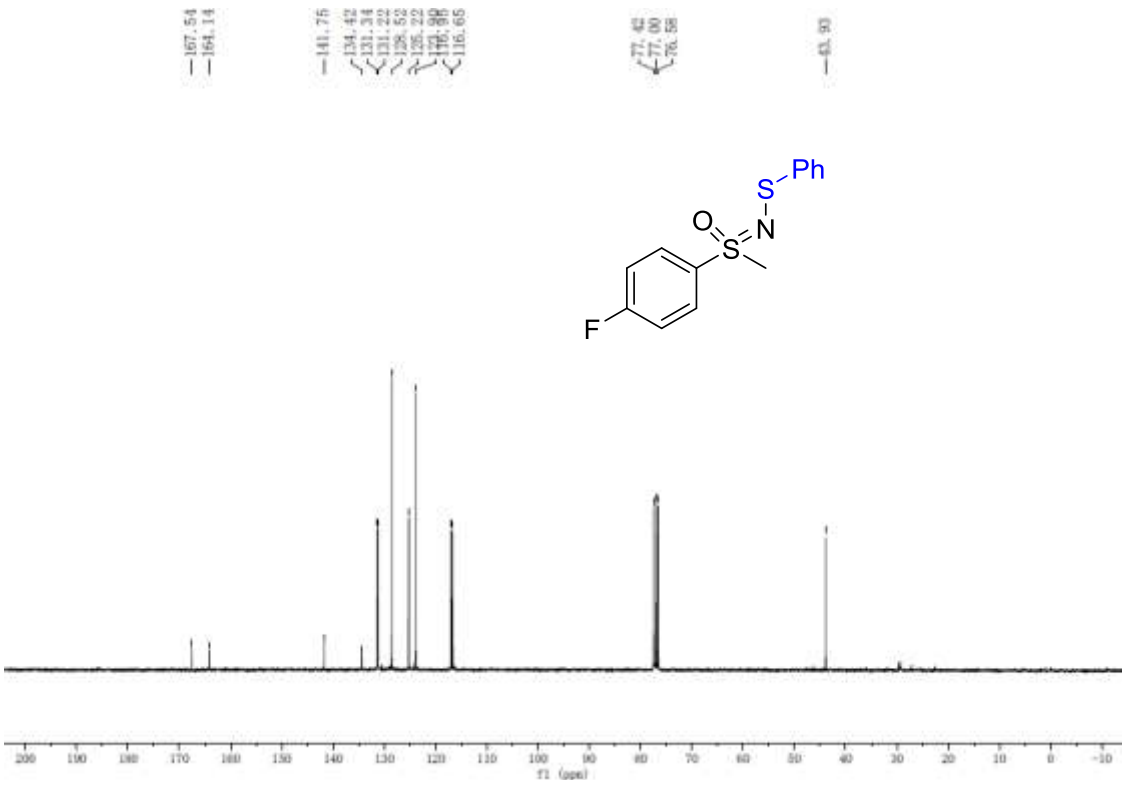
_S_-methyl-_S_-(4-nitrophenyl)-_N_-phenylthiosulfoximine (3ja)



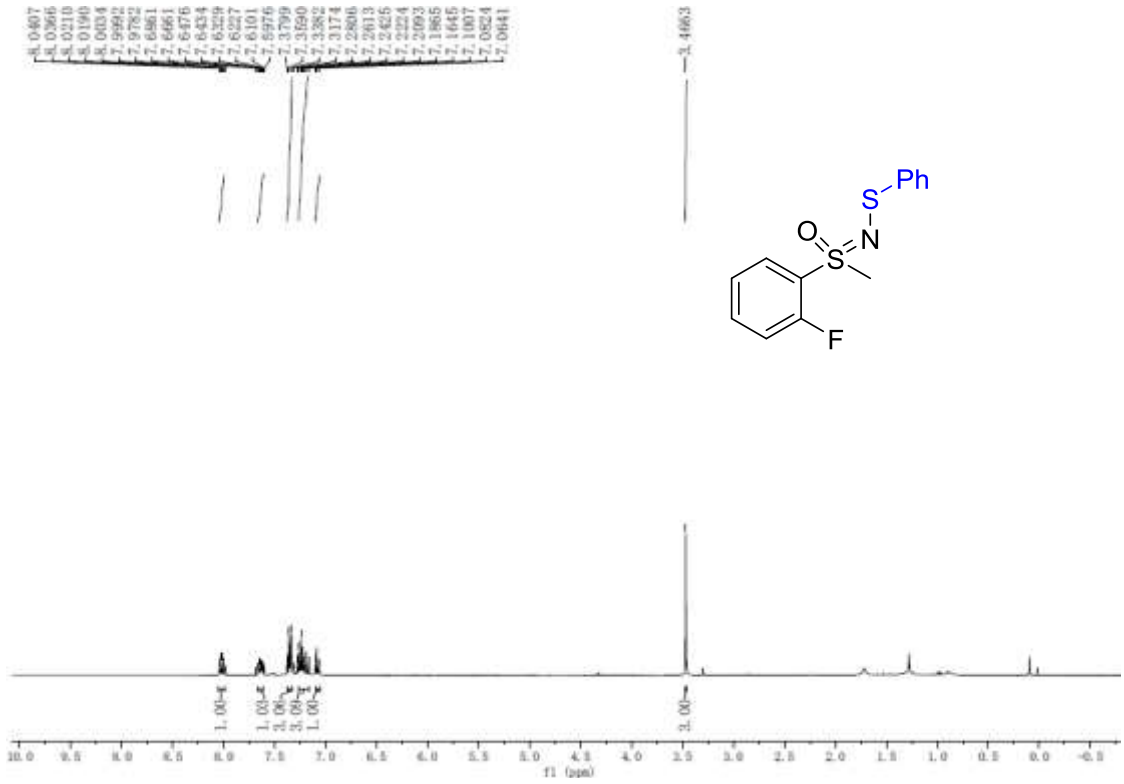


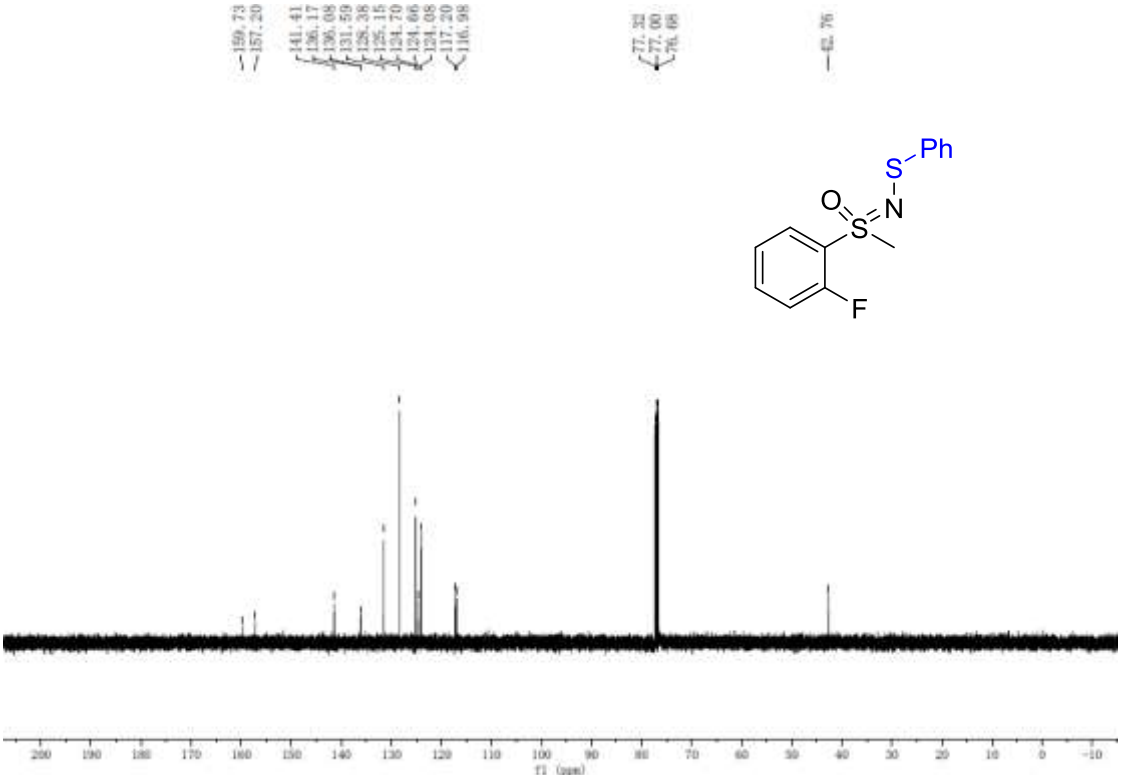
_S_-methyl-_S_-(4-fluorophenyl)-_N_-phenylthiosulfoximine (3ka)



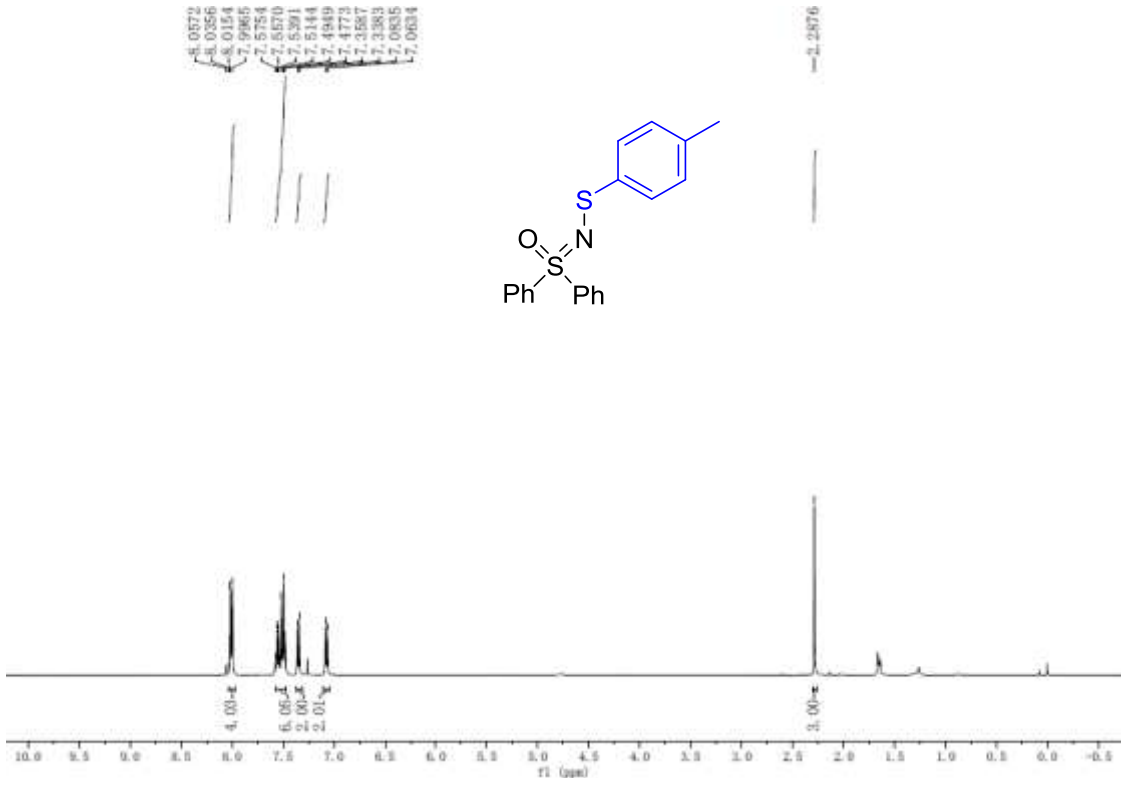


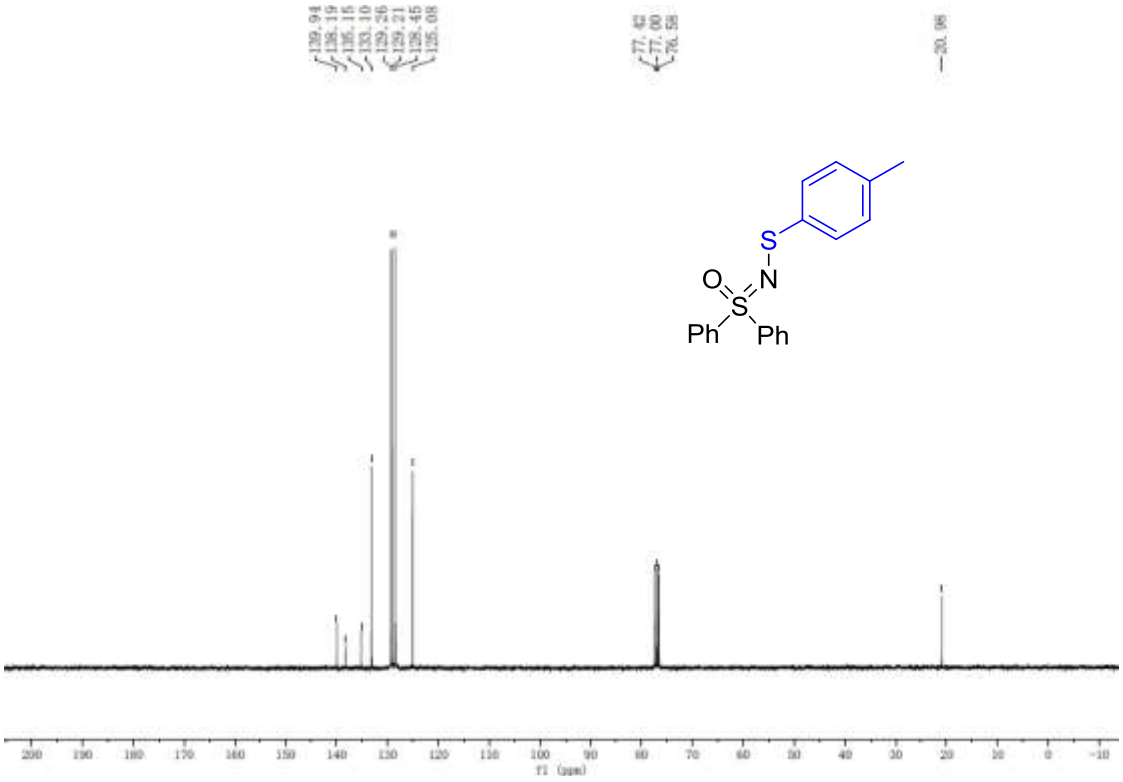
_S_-methyl-_S_-(2-fluorophenyl)-_N_-phenylthiosulfoximine (3la)



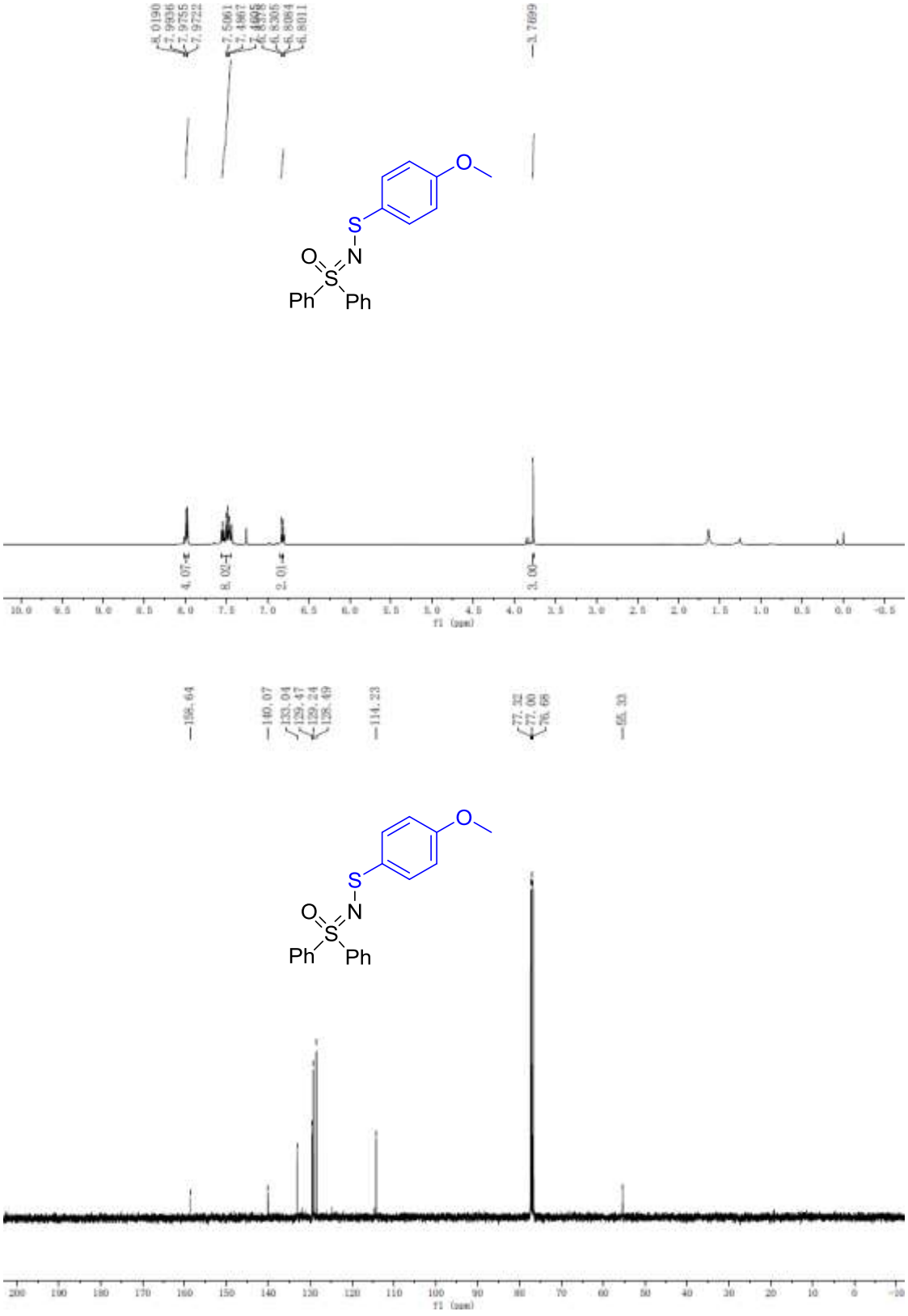


S,S-diphenyl-*N*-(4-methylphenylthio)sulfoximine (3ab)

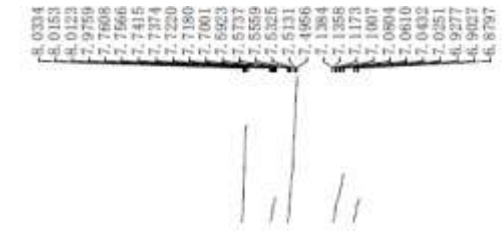


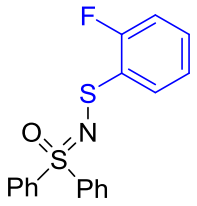


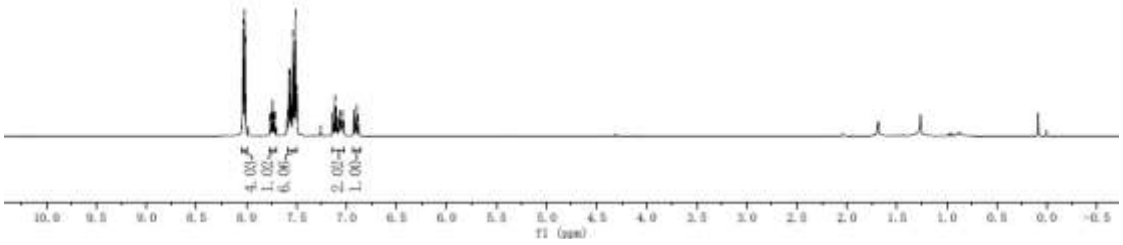
_S,S_-diphenyl-_N_-(4-methoxyphenylthio)sulfoximine (3ac)

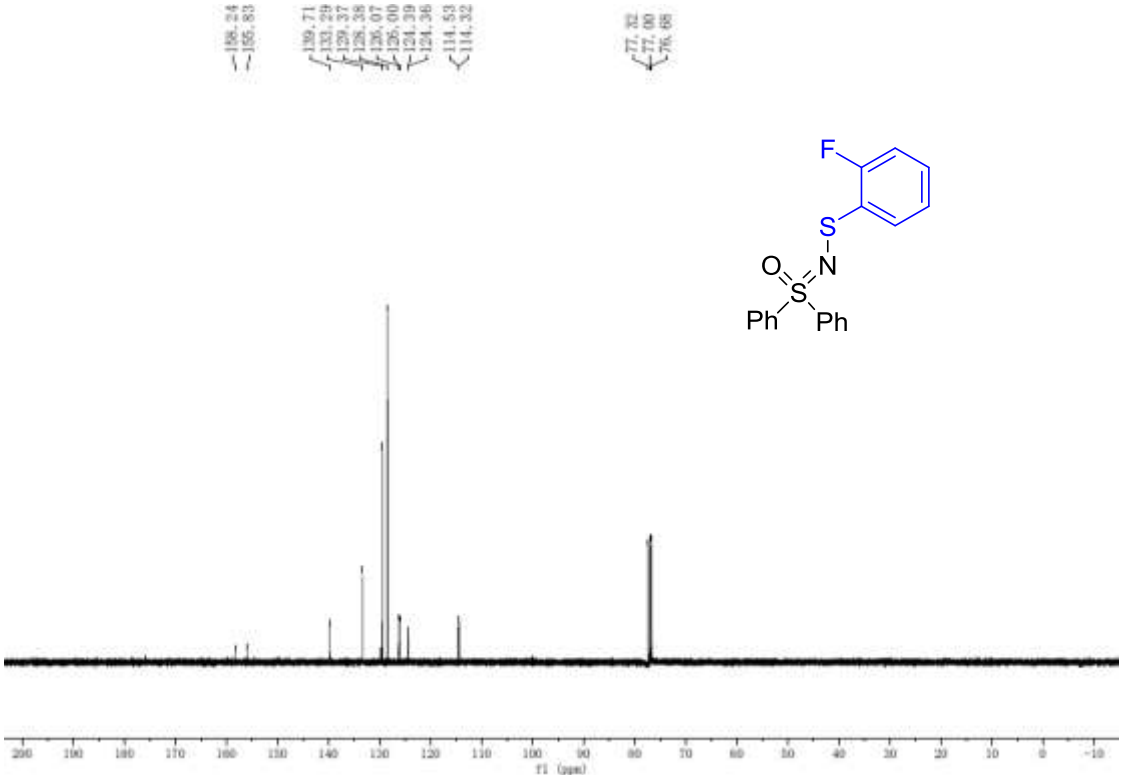


S,S-diphenyl-*N*-(2-fluorophenylthio)sulfoximine (3ad)

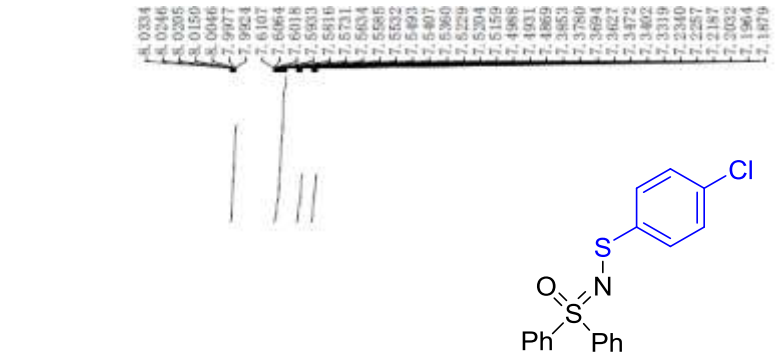


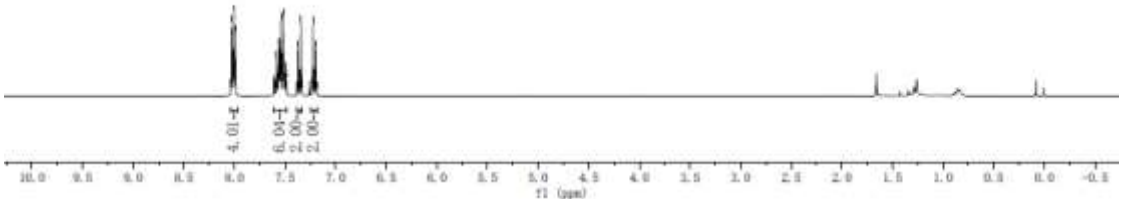


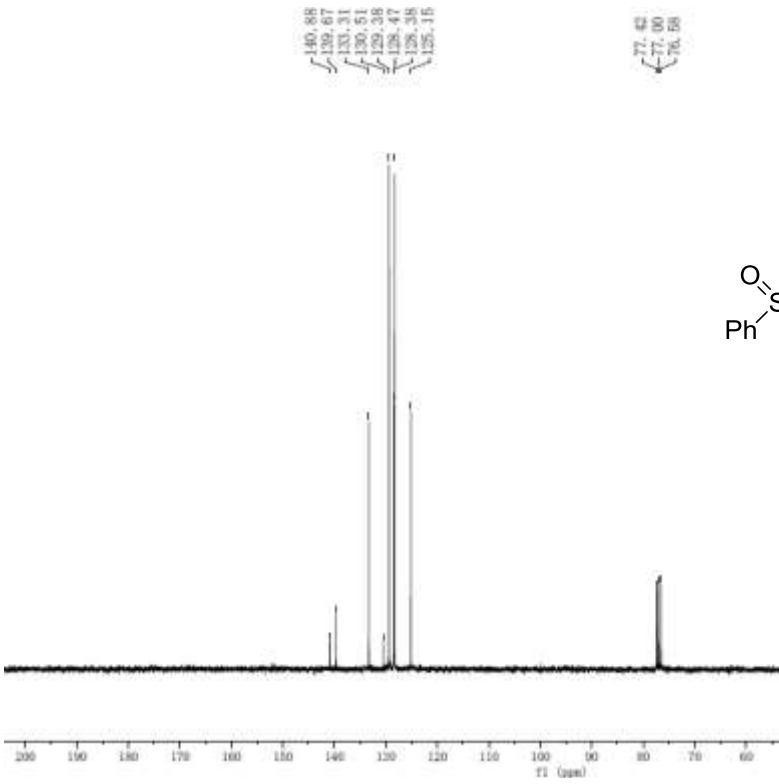


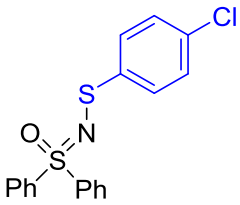


S,S-diphenyl-*N*-(4-chlorophenylthio)sulfoximine (3ae)

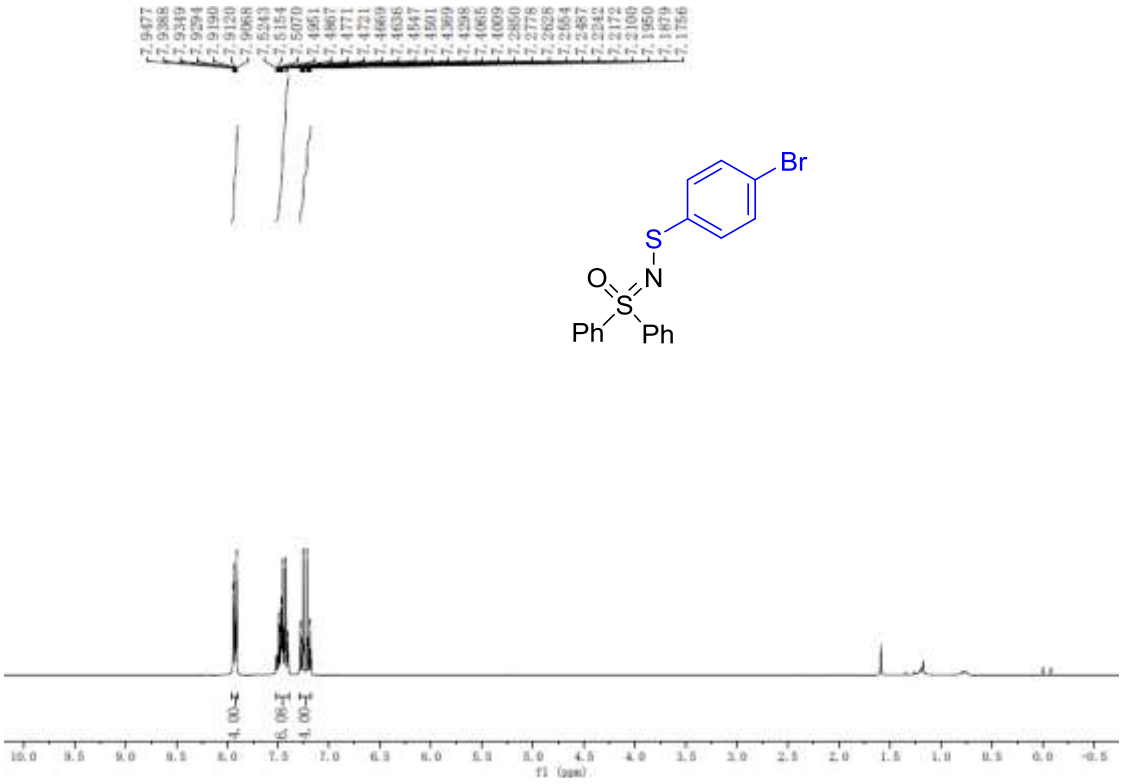


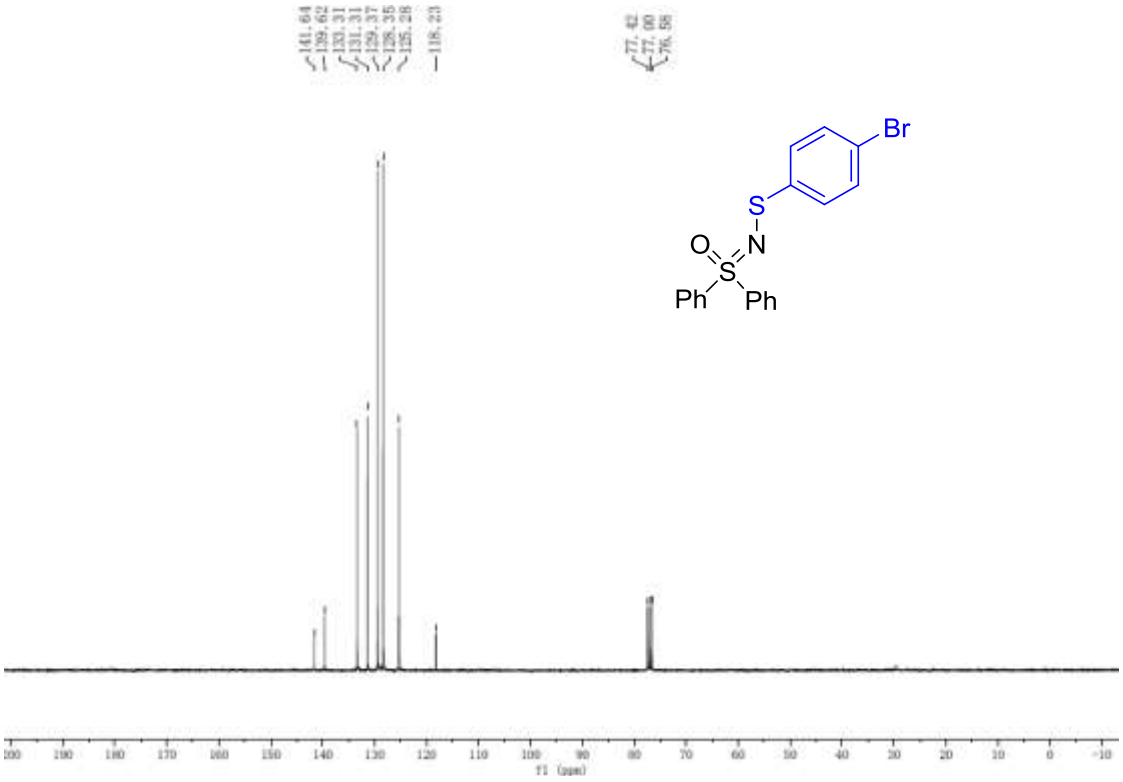




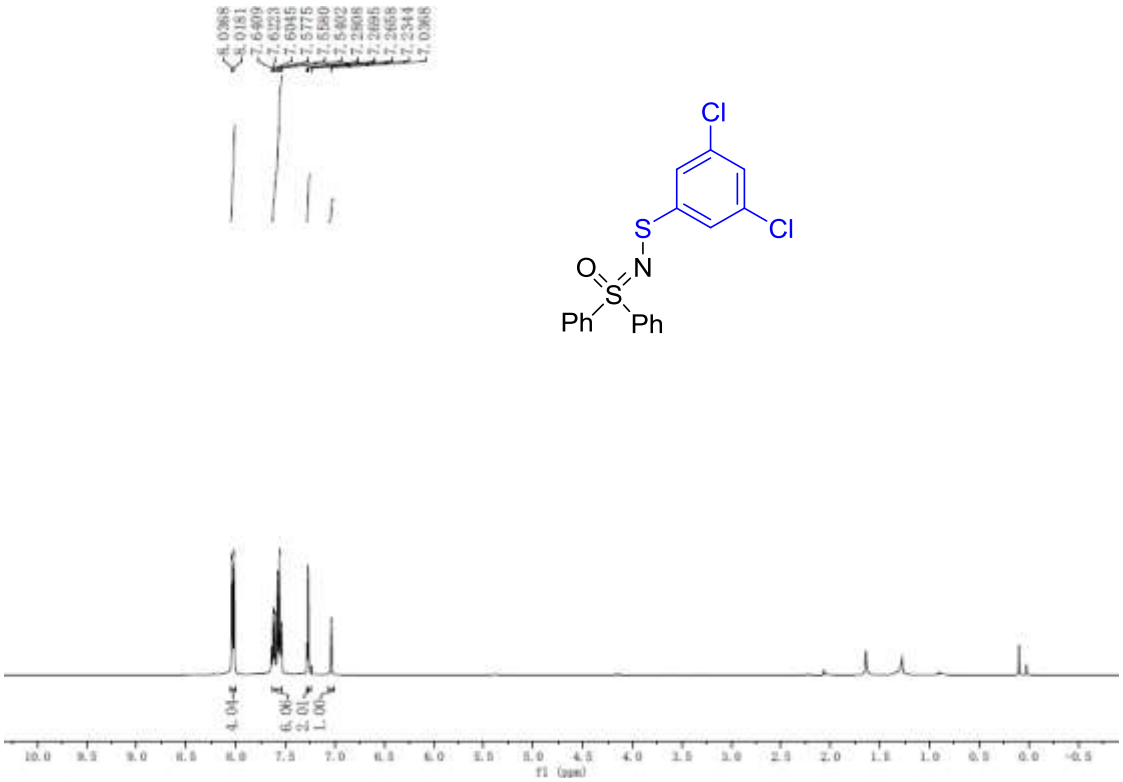


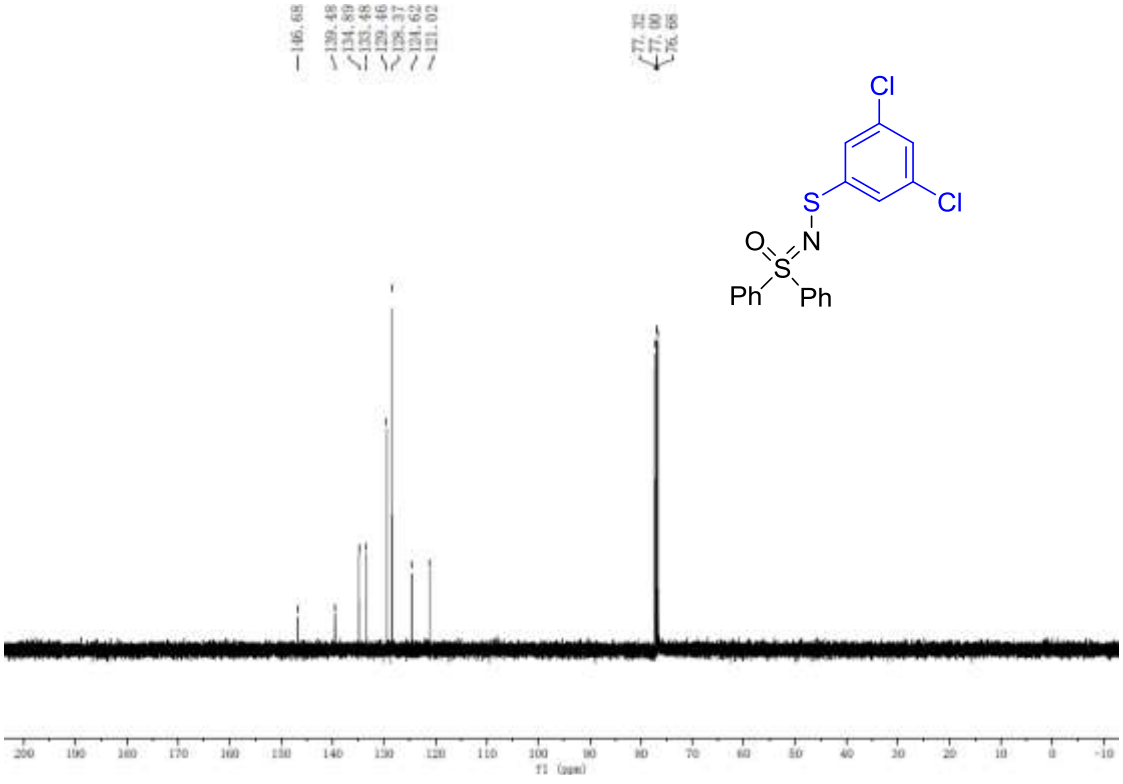
S,S-diphenyl-*N*-(4-bromophenylthio)sulfoximine (3af)



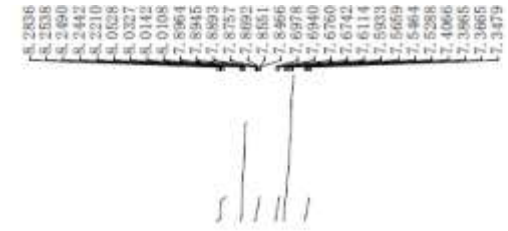


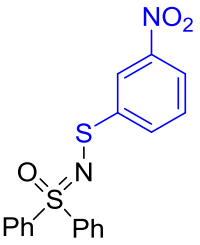
S,S-diphenyl-*N*-(3,5-dichlorophenylthio)sulfoximine (3ag)

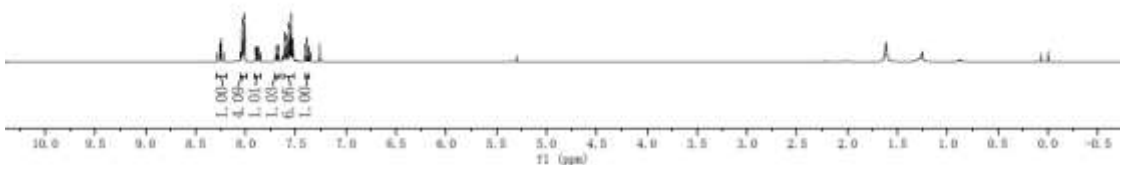


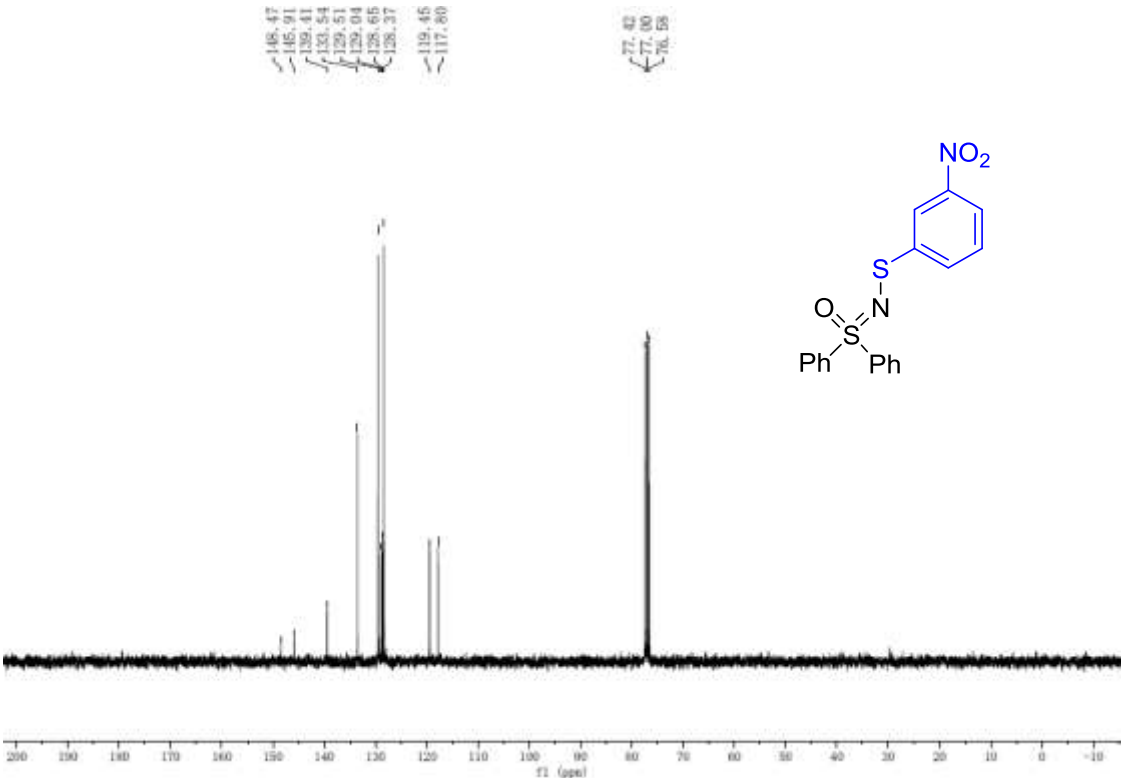


S,S-diphenyl-*N*-(3-nitrophenylthio)sulfoximine (3ah)

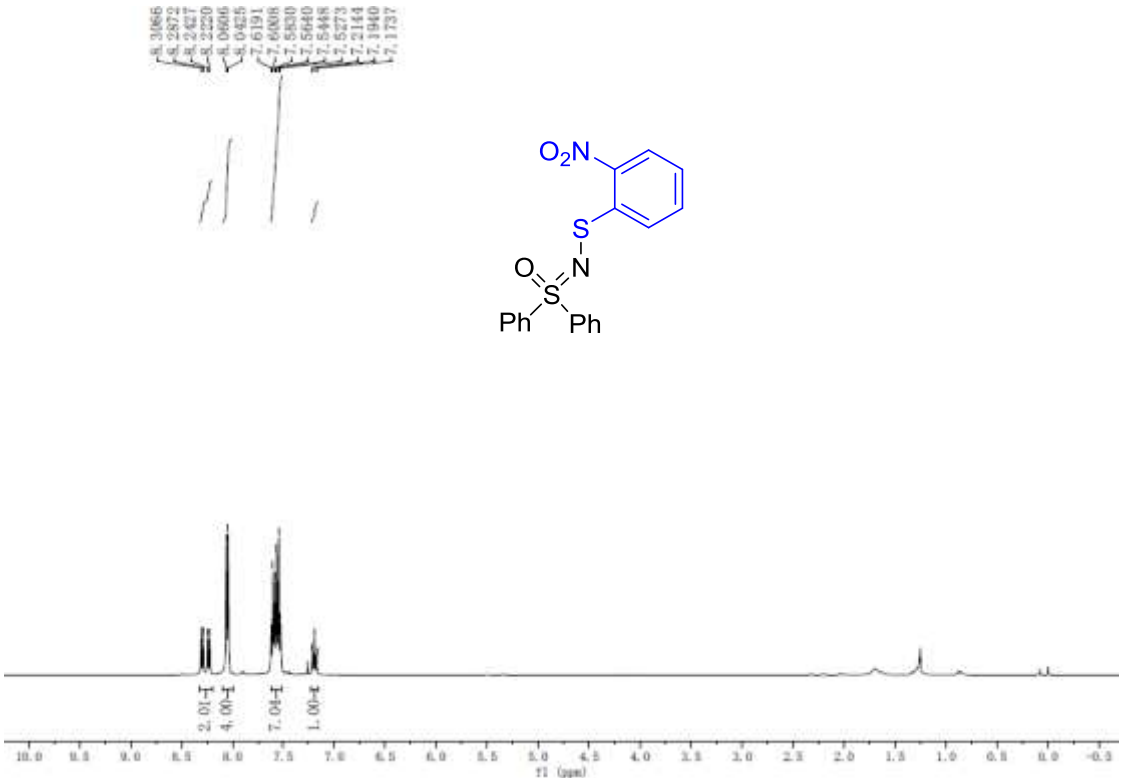


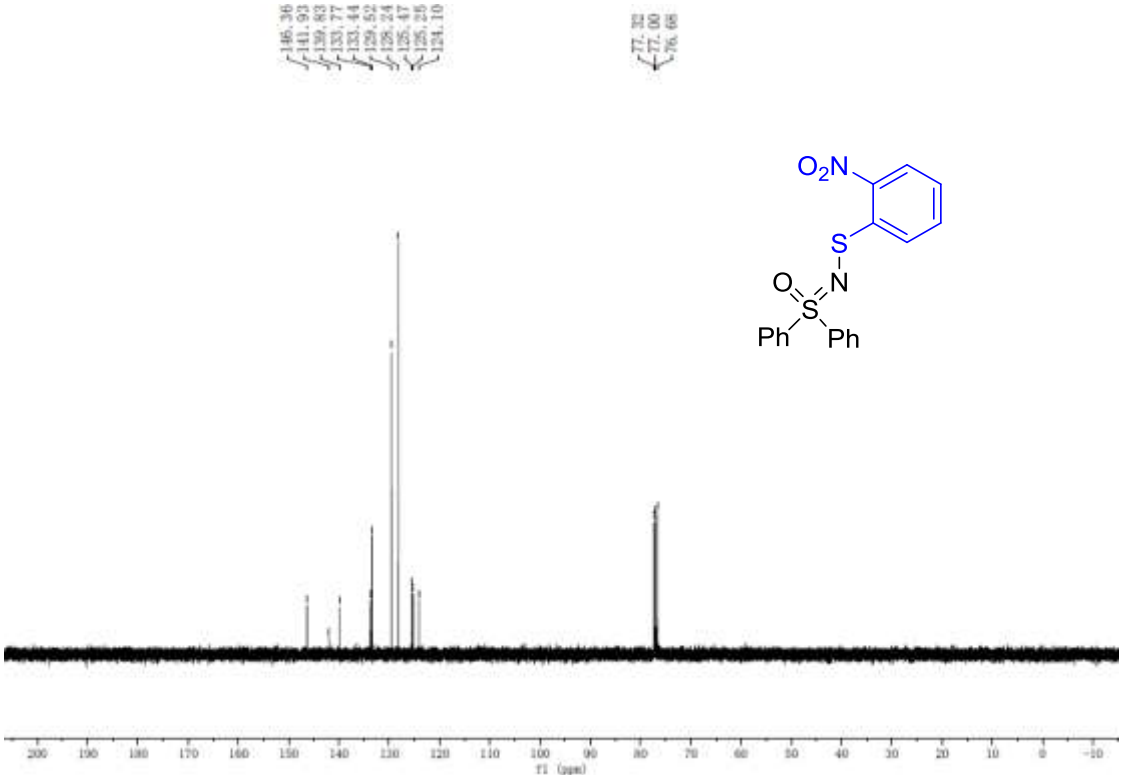




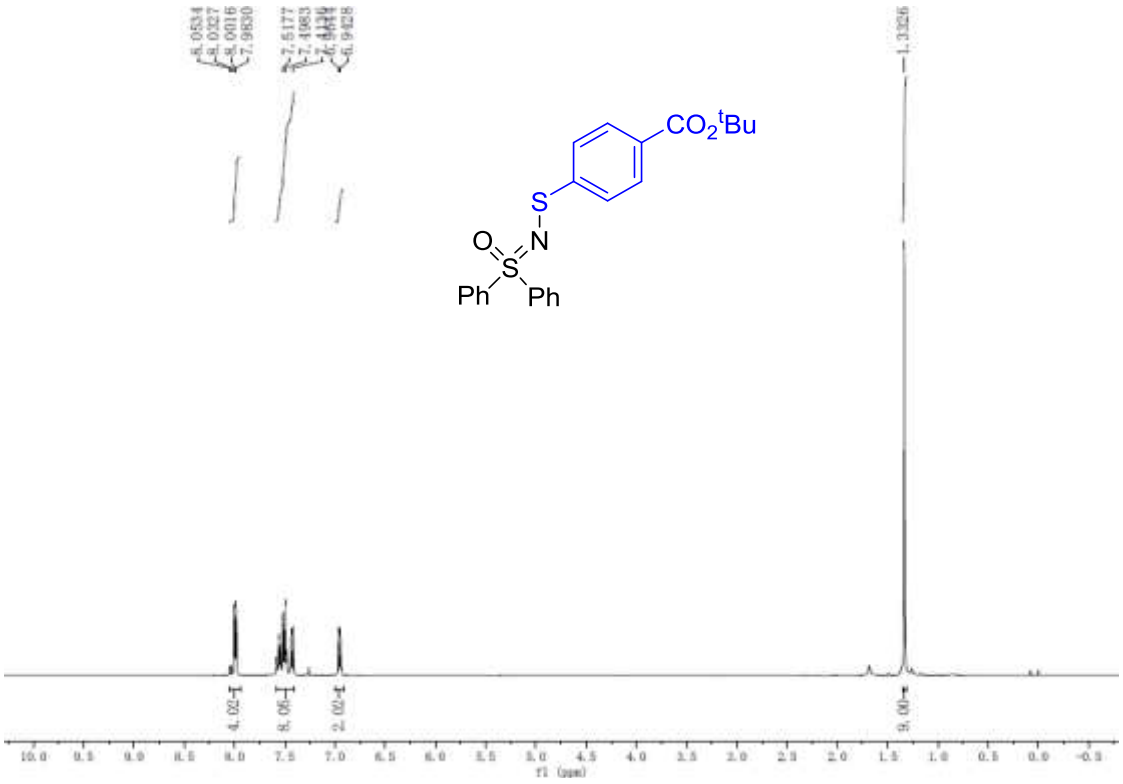


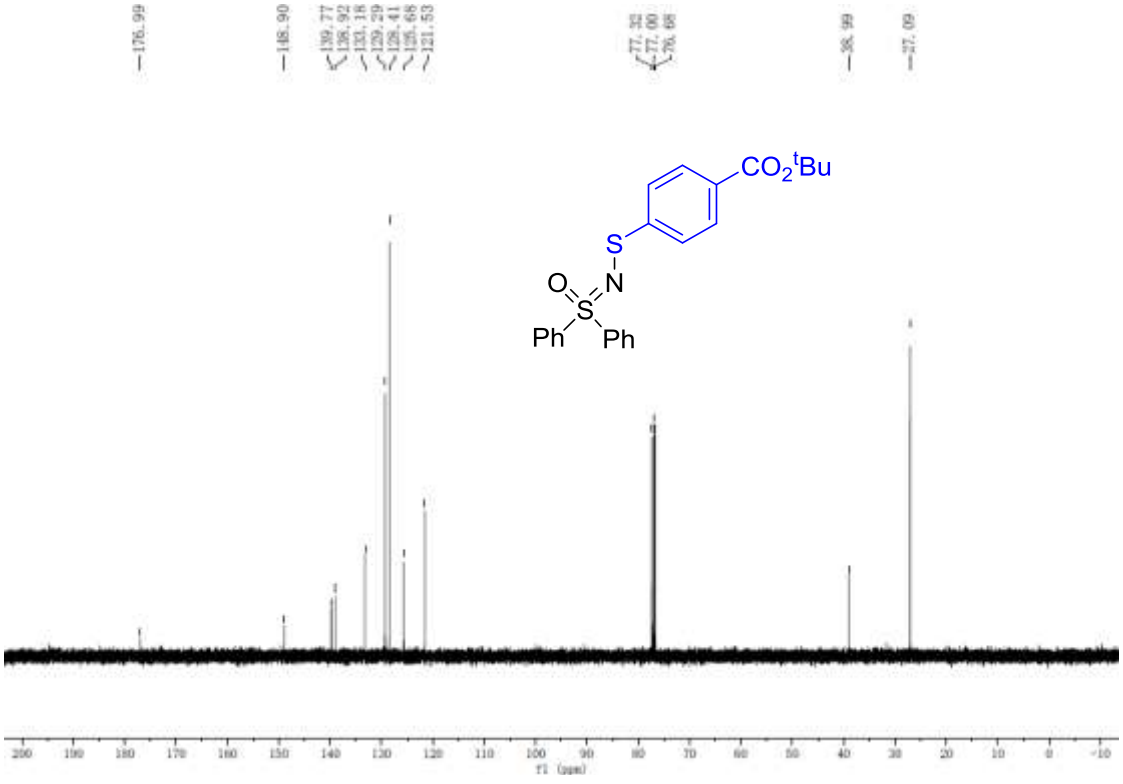
S,S-diphenyl-*N*-(2-nitrophenylthio)sulfoximine (3ai)





S,S-diphenyl-*N*-(pivalatephenylthio)sulfoximine (3aj)





S,S-diphenyl-*N*-(2-thiophenethio)sulfoximine (3ak)