Electronic Supplementary Material (ESI) for ChemComm.

Supporting Information

Solvent-dependent, rhodium catalysed rearrangement reactions of sulfur ylides

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General Information

Unless otherwise noted, all commercially available compounds were used as provided without further purification. Chemicals used in this manuscript were purchased from Sigma Aldrich, Alfa Aesar, Fluorochem and Carl Roth.

Solvents used in reactions were p.A. grade. Solvents for chromatography were technical grade and distilled prior to use. Analytical thin-layer chromatography (TLC) was performed on Macherey-Nagel silica gel aluminium plates with F-254 indicator, visualised by irradiation with UV light. Column chromatography was performed using silica gel Merck 60 (particle size 0.063 – 0.2 mm). Solvent mixtures are understood as volume/volume.

^{1}H-NMR, ^{19}F-NMR and ^{13}C-NMR were recorded on a Varian AV600/AV400 or an Agilent DD2 400 NMR spectrometer in $CDCl_3$. Data are reported in the following order: chemical shift (δ) in ppm; multiplicities are indicated br (broadened singlet), s (singlet), d (doublet), t (triplet), q (quartet), m (multiplet); coupling constants (J) are in Hertz (Hz).

HRMS data were recorded on a ThermoFisher Scientific LTQ Orbitrap XL using ESI ionization or on a Finnigan MAT 95 using EI ionization at 70 eV.

IR spectra were recorded on a Perkin Elmer-100 spectrometer and are reported in terms of frequency of absorption (cm^{-1}).

Important Safety Note

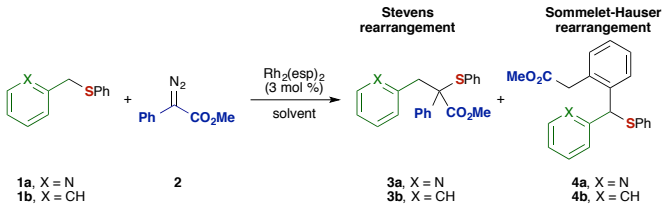
Handling of diazo compounds should only be done in a well-ventilated fume cupboard using an additional blast shield. No incidents occurred handling of diazoalkanes during the preparation of this manuscript, yet the reader should be aware of carcinogenicity and explosiveness of the herein described diazo compounds. General safety precautions when working with diazomethane and its derivatives should be followed. Any reactions described in this manuscript should not be performed without strict risk assessment and proper safety precautions.

Standard procedure for the Rh-catalyzed Sigmatropic reactions

To a solution of the sulfide (0.2 mmol, 1 eq.) and $Rh_2(esp)_2$ (3 mol-%) in 1 mL dry and degassed ethyl acetate or THF was added a solution of diazoalkanes (2 eq.) in 1 mL dry and degassed ethyl acetate or THF over 3 h at 0 °C. The reaction mixture was stirred overnight under argon atmosphere while slowly warming up to room temperature. The solvent was evaporated under reduced pressure, and the residue was purified by column chromatography on silica gel using *n*-hexane: ethyl acetate as eluent.

Optimization of the reaction conditions

Table S1. Reaction optimization.

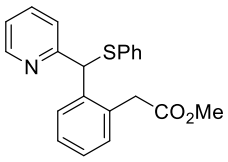


#[a]	catalyst	solvent	X	Yield 3	Yield 4
1	$Rh_2(OAc)_4$	toluene	N	*no reaction*	
2	$Rh_2(esp)_2$	toluene	N	-	50%
3	FeTPPCl			*no reaction*	
4	CuCl			*no reaction*	
5	Co(salen)			*no reaction*	
6	$Rh_2(esp)_2$	DCM	N	-	40%
7	$Rh_2(esp)_2$	*n*-hexane	N	-	42%
8	$Rh_2(esp)_2$	EtOAc	N	-	90%
9	hv (470 nm)	EtOAc	N	-	40%
10	$Rh_2(esp)_2$	1,4-dioxane	N	-	74%
11	$Rh_2(esp)_2$	Et_2O	N	-	52%
12	$Rh_2(esp)_2$	MTBE	N	-	45%
13	$Rh_2(esp)_2$	THF (dry)	N	78%	-
14	$Rh_2(esp)_2$	THF (wet)	N	35%	26%
15	hv (470 nm)	THF (dry)	N	*no reaction*	
16	$Rh_2(esp)_2$	THF	CH	>99%	-
17	$Rh_2(esp)_2$	EtOAc	CH	86%	-
18	$Rh_2(esp)_2$	DCM	CH	37%	-
19	$Rh_2(esp)_2$	toluene	CH	63%	-
20	Rh_2(*S*-BTPCP)$_4$	toluene	CH	55%	
				50 : 50 e.r.	

[a]*Reaction conditions*: To a solution of the **1** (0.2 mmol, 1 eq.) and catalyst (3 mol %) in 1 mL solvent was added a solution of **2** (2 eq.) in 1 ml solvent over 3 h at 0 °C. The reaction mixture was stirred overnight under argon atmosphere while slowly warming up to room temperature.

Physical Data of Products

methyl 2-(2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (4aa)



Compound **4aa** was prepared according to the general procedure and was obtained as light brown oil after column chromatography (*n*-pentane : diethyl ether : 4:1→ 2:1) in 90% yield (63 mg).

^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.57 (d, *J* = 4.7 Hz, 1H), 7.63 (d, *J* = 7.6 Hz, 1H), 7.57 (t, *J* = 7.7 Hz, 1H), 7.40 (d, *J* = 7.9 Hz, 1H), 7.28 – 7.21 (m, 3H), 7.21 – 7.08 (m, 6H), 5.96 (s, 1H), 3.73 (d, *J* = 15.6 Hz, 1H), 3.65 (d, *J* = 15.6 Hz, 1H), 3.58 (s, 3H) ppm.

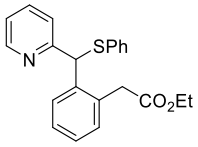
^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.7, 159.8, 149.3, 138.5, 136.6, 135.3, 132.5, 131.1, 131.0, 129.3,

128.7, 127.8, 127.7, 126.9, 123.1, 122.0, 55.2, 52.0, 38.5 ppm.

HRMS (ESI): mass found: 372.10303, calculated mass $C_{21}H_{19}O_2NNaS^+$: 372.10287.

IR (KBr): 3452, 3057, 2986, 2950, 2664, 2327, 1916, 1731, 1583, 1473, 1433, 1396, 1367, 1328, 1249, 1153, 1091, 1024, 895, 743, 692 cm^{-1}.

ethyl 2-(2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (4ab)



Compound **4ab** was prepared according to the general procedure and was obtained as light brown oil after column chromatography (*n*-pentane : diethyl ether : 4:1→ 2:1) in 78% yield (56 mg).

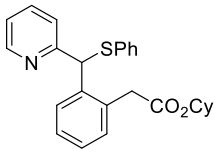
^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.58 – 8.55 (m, 1H), 7.60 (d, *J* = 7.2 Hz, 1H), 7.58 – 7.54 (m, 1H), 7.42 (d, *J* = 7.9 Hz, 1H), 7.28 – 7.08 (m, 9H), 5.99 (s, 1H), 4.14 – 3.96 (m, 2H), 3.72 (d, *J* = 15.5 Hz, 1H), 3.65 (d, *J* = 15.5 Hz, 1H), 1.16 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.3, 159.9, 149.3, 138.5, 136.5, 135.3, 132.7, 131.1, 130.9, 129.3, 128.7, 127.7, 127.6, 126.8, 123.2, 122.0, 60.9, 55.1, 38.7, 14.0 ppm.

HRMS (ESI): mass found: 386.11872, calculated mass $C_{22}H_{21}O_2NNaS^+$: 386.11852.

IR (KBr): 3447, 3059, 2938, 2281, 2187, 1729, 1624, 1428, 1411, 1379, 1222, 1186, 1085, 1076, 973, 820, 747, 697 cm^{-1}.

cyclohexyl 2-(2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (4ac)



Compound **4ac** was prepared according to the general procedure and was obtained as yellow oil after column chromatography (*n*-pentane : diethyl ether : 9:1→ 4:1) in 84% yield (68 mg).

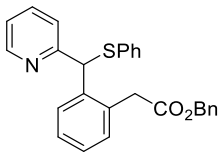
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.58 (dd, *J* = 5.0, 0.7 Hz, 1H), 7.59 – 7.156 (m, 2H), 7.43 (d, *J* = 7.9 Hz, 1H), 7.28 – 7.25 (m, 2H), 7.26 – 7.19 (m, 3H), 7.19 – 7.10 (m, 4H), 6.00 (s, 1H), 4.78 – 4.67 (m, 1H), 3.70 (d, *J* = 15.5 Hz, 1H), 3.67 (d, *J* = 15.5 Hz, 1H), 1.84 – 1.70 (m, 2H), 1.67 – 1.62 (m, 2H), 1.57 – 1.46 (m, 1H), 1.40 – 1.25 (m, 4H), 1.24 – 1.12 (m, 1H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 170.8, 159.9, 149.3, 138.4, 136.5, 135.4, 133.0, 131.0, 130.8, 129.2, 128.7, 127.68, 127.61, 126.8, 123.2, 122.0, 73.2, 54.9, 39.0, 31.46, 31.41, 25.3, 23.64, 23.62 ppm.

HRMS (ESI): mass found: 456.13971, calculated mass $C_{26}H_{27}O_2NKS^+$: 456.13941.

IR (KBr): 3446, 3059, 2934, 2858, 2662, 2328, 2084, 1724, 1583, 1472, 1435, 1329, 1252, 1152, 1087, 1015, 968, 901, 838, 743, 694 cm^{-1}.

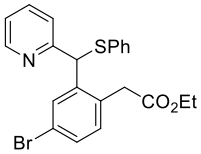
benzyl 2-(2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (4ad)



Compound **4ad** was prepared according to the general procedure and was obtained as light brown oil after column chromatography (*n*-pentane : diethyl ether : 9:1→ 4:1) in 91% yield (75 mg).

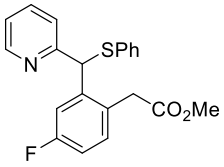
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.56 (d, *J* = 4.3 Hz, 1H), 7.59 (d, *J* = 7.6 Hz, 1H), 7.52 (td, *J* = 7.7, 1.8 Hz, 1H), 7.33 (d, *J* = 7.9 Hz, 1H), 7.31 – 7.28 (m, 3H), 7.28 – 7.25 (m, 3H), 7.25 – 7.22 (m, 3H), 7.21 (d, *J* = 4.1 Hz, 1H), 7.15 – 7.12 (m, 3H), 7.12 – 7.08 (m, 1H), 5.96 (s, 1H), 5.10 (d, *J* = 12.4 Hz, 1H), 5.04 (d, *J* = 12.4 Hz, 1H), 3.77 (d, *J* = 15.7 Hz, 1H), 3.74 (d, *J* = 15.7 Hz, 1H) ppm.
^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.2, 159.7, 149.3, 138.5, 136.5, 135.7, 135.2, 132.5, 131.1, 131.0, 129.3, 128.7, 128.4, 128.1, 127.8, 127.7, 126.8, 123.2, 122.0, 66.7, 55.0, 38.6 ppm.
HRMS (ESI): mass found: 464.10812, calculated mass $C_{27}H_{23}O_2NKS^+$: 464.10811.
IR (KBr): 3442, 3061, 3032, 2951, 2324, 2158, 1730, 1584, 1437, 1376, 1331, 1304, 1255, 1210, 1177, 1148, 1094, 1069, 1023, 984, 909, 853, 737, 693 cm^{-1}.

ethyl 2-(4-bromo-2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (4ae)



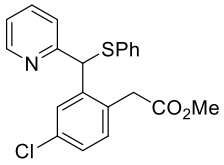
Compound **4ae** was prepared according to the general procedure and was obtained as light brown oil after column chromatography (*n*-pentane : diethyl ether : 4:1→ 2:1) in 94% yield (83 mg).
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.59 (dd, *J* = 4.9, 0.8 Hz, 1H), 7.78 (d, *J* = 2.1 Hz, 1H), 7.62 – 7.60 (m, 1H), 7.40 (d, *J* = 7.9 Hz, 1H), 7.32 (dd, *J* = 8.2, 2.2 Hz, 1H), 7.29 – 7.25 (m, 2H), 7.20 – 7.16 (m, 3H), 7.16 – 7.13 (m, 1H), 7.06 (d, *J* = 8.2 Hz, 1H), 5.89 (s, 1H), 4.11- 4.02 (m, 2H), 3.64 (d, *J* = 15.7 Hz, H), 3.58 (d, *J* = 15.7 Hz, H), 1.17 (t, *J* = 7.1 Hz, 3H) ppm.
^{13}C NMR (151 MHz, $CDCl_3$): δ = 170.8, 159.1, 149.5, 140.8, 136.8, 134.7, 132.5, 132.3, 131.7, 131.5, 130.7, 128.8, 127.3, 123.1, 122.3, 121.7, 61.1, 54.9, 38.2, 14.1 ppm.
HRMS (ESI): mass found: 464.02850, calculated mass $C_{22}H_{20}O_2NBrNaS^+$: 464.02903.
IR (KBr): 3450, 3056, 2982, 2664, 2331, 2086, 1893, 1729, 1584, 1474, 1433, 1394, 1367, 1326, 1245, 1153, 1094, 1026, 937, 895, 809, 742, 692 cm^{-1}.

methyl 2-(4-fluoro-2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (4af)



Compound **4af** was prepared according to the general procedure and was obtained as yellow gel after column chromatography (*n*-pentane : diethyl ether : 9:1→ 4:1) in 75% yield (55 mg).
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.60 (d, *J* = 4.3 Hz, 1H), 7.62 – 7.60 (m, 1H), 7.43 (dd, *J* = 10.3, 2.7 Hz, 1H), 7.39 (d, *J* = 7.9 Hz, 1H), 7.29 – 7.25 (m, 2H), 7.22 – 7.13 (m, 5H), 6.92 – 6.89 (m, 1H), 5.91 (s, 1H), 3.67 (d, *J* = 15.8 Hz, 1H), 3.61 (d, *J* =15.8 Hz, 1H), 3.60 (s, 3H) ppm.
^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.5, 162.1 (d, *J* = 246.0 Hz), 159.1, 149.5, 140.9 (d, *J* = 7.1 Hz), 136.7, 134.7, 132.5(d, *J* = 8.0 Hz), 131.4, 128.8, 128.3 (d, *J* = 3.3 Hz) 127.2, 123.1, 122.3, 116.3 (d, *J* = 23.2 Hz), 114.6 (d, *J* = 21.3 Hz), 55.1, 52.1, 37.8 ppm.
^{19}F NMR (564 MHz, $CDCl_3$): δ = -113.81 ppm.
HRMS (ESI): mass found: 390.09387, calculated mass $C_{21}H_{18}O_2NFNaS^+$: 390.09345.
IR (KBr): 3635, 3455, 3059, 3003, 2952, 2324, 2160, 1734, 1585, 1493, 1433, 1333, 1239, 1152, 1086, 1014, 972, 927, 889, 838, 810, 744, 692 cm^{-1}.

methyl 2-(4-chloro-2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (4ag)



Compound **4ag** was prepared according to the general procedure **II** and was obtained as yellow gel after column chromatography (*n*-pentane : diethyl ether : 9:1→ 4:1) in 68% yield (53 mg).

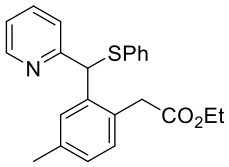
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.59 (d, *J* = 4.7 Hz, 1H), 7.66 (d, *J* = 2.1 Hz, 1H), 7.63 – 7.60 (m, 1H), 7.40 (d, *J* = 7.9 Hz, 1H), 7.30 – 7.24 (m, 2H), 7.21 – 7.15 (m, 5H), 7.12 (d, *J* = 8.2 Hz, 1H), 5.88 (s, 1H), 3.68 (d, *J* = 15.8 Hz, 1H), 3.61 (d, *J* = 15.8 Hz, 1H), 3.60 (s, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.3, 159.0, 149.5, 140.6, 136.8, 134.7, 133.7, 132.2, 131.5, 131.0, 129.4, 128.8, 127.8, 127.3, 123.1, 122.3, 55.0, 52.1, 37.9 ppm.

HRMS (ESI): mass found: 406.06418, calculated mass $C_{21}H_{18}O_2NClNaS^+$: 406.06390.

IR (KBr): 3633, 3455, 3057, 3004, 2951, 2327, 1734, 1584, 1476, 1433, 1332, 1252, 1203, 1155, 1109, 1002, 936, 901, 811, 744, 692 cm^{-1}.

ethyl 2-(4-methyl-2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (4ah)



Compound **4ah** was prepared according to the general procedure and was obtained as yellow gel after column chromatography (*n*-pentane : diethyl ether : 9:1→ 4:1) in 61% yield (46 mg).

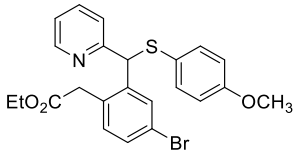
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.61 – 8.56 (m, 1H), 7.60 – 7.57 (m, 1H), 7.43 (d, *J* = 7.9 Hz, 1H), 7.39 (s, 1H), 7.27 – 7.26 (m, 2H), 7.21 – 7.11 (m, 4H), 7.09 (d, *J* = 7.7 Hz, 1H), 7.01 (d, *J* = 7.7 Hz, 1H), 5.95 (s, 1H), 4.15 – 3.98 (m, 2H), 3.68 (d, *J* = 15.5 Hz, 1H), 3.62 (d, *J* = 15.5 Hz, 1H), 2.28 (s, 3H), 1.18 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.5, 159.9, 149.3, 138.2, 137.4, 136.5, 135.4, 131.0, 130.8, 129.8, 129.6, 128.7, 128.5, 126.8, 123.1, 121.9, 60.9, 54.9, 38.3, 21.2, 14.1 ppm.

HRMS (ESI): mass found: 400. 13419, calculated mass $C_{23}H_{23}O_2NNaS^+$: 400.13417.

IR (KBr): 3451, 3053, 2980, 2926, 2164, 1729, 1583, 1469, 1434, 1367, 1300, 1238, 1152, 1089, 1026, 743, 692 cm^{-1}.

ethyl 2-(4-bromo-2-(((4-methoxyphenyl)thio)(pyridin-2-yl)methyl)phenyl)acetate (4ai)



Compound **4ai** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 9:1→4:1) as a yellow oil in 77% yield (73 mg).

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.59 (d, *J* = 4.0 Hz, 1H), 7.81 (d, *J* = 2.0 Hz, 1H), 7.59 (m, 1H), 7.35 – 7.27 (m, 2H), 7.22 (d, *J* = 8.8 Hz, 2H), 7.18 – 7.10 (m, 1H), 7.03 (d, *J* = 8.2 Hz, 1H), 6.72 (d, *J* = 8.7 Hz, 2H), 5.71 (s, 1H), 4.19 – 3.90 (m, 2H), 3.74 (s, 3H), 3.54(d, *J* = 15.7 Hz, 1H), 3.51(d, *J* = 15.7 Hz, 1H), 1.17 (t, *J* = 7.1 Hz, 3H) ppm.

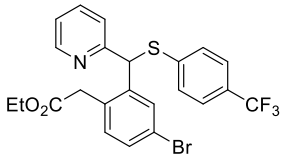
^{13}C NMR (151 MHz, $CDCl_3$): δ = 170.8, 159.7, 159.3, 149.3, 141.3, 136.6, 135.4, 132.4, 132.3, 131.7,

130.5, 124.5, 123.2, 122.2, 121.6, 114.3, 61.0, 56.3, 55.2, 38.1, 14.1 ppm.

HRMS (ESI): mass found: 494.03964, calculated mass for $C_{23}H_{22}BrNO_3SNa^+$: 494.03960.

IR (KBr): 3451, 3058, 2976, 2838, 2533, 2321, 2053, 1884, 1729, 1587, 1488, 1434, 1326, 1286, 1244, 1171, 1098, 1027, 937, 893, 826, 750, 700 cm^{-1}

ethyl 2-(4-bromo-2-(pyridin-2-yl((4-(trifluoromethyl)phenyl)thio)methyl)phenyl)acetate (4aj)



Compound **4aj** was prepared according to the general procedure and was obtained after column chromatography (pentane : diethyl ether 9:1→2:1) as a yellow oil in 53% yield (54 mg).

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.60 (d, *J* = 4.1 Hz, 1H), 7.75 (d, *J* = 2.0 Hz, 1H), 7.64 (m, 1H), 7.43 (d, *J* = 7.2 Hz, 3H), 7.36 (dd, *J* = 8.2, 2.1 Hz, 1H), 7.33 (d, *J* = 8.3 Hz, 2H), 7.21 – 7.17 (m, 1H), 7.11 (d, *J* = 8.2 Hz, 1H), 6.04 (s, 1H), 4.19 – 3.99 (m, 2H), 3.75 (d, *J* = 15.6 Hz, 1H), 3.64 (d, *J* = 15.6 Hz, 1H), 1.19 (t, *J* = 7.1 Hz, 3H) ppm.

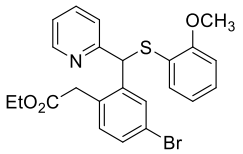
^{13}C NMR (151 MHz, $CDCl_3$): δ = 170.7, 158.4, 149.6, 140.4, 139.9, 137.1, 132.8, 132.0, 131.8, 131.1, 129.2, 128.5 (q, *J* = 32.5 Hz), 125.6 (q, *J* = 3.6 Hz), 123.96 (q, *J* = 272.0 Hz), 123.0, 122.6, 121.9, 61.2, 53.7, 38.3, 14.0 ppm.

^{19}F NMR (564 MHz, CDCl3) δ = -62.59 ppm.

HRMS (ESI): mass found: 532.01563, calculated mass for $C_{23}H_{19}BrF_3NO_2SNa^+$: 532.01642.

IR (KBr): 3455, 3060, 2981, 2931, 2653, 2329, 2076, 1914, 1730, 1589, 1476, 1434, 1398, 1369, 1323, 1244, 1163, 1122, 1063, 1015, 938, 895, 827, 751, 702 cm^{-1}.

ethyl 2-(4-bromo-2-(((2-methoxyphenyl)thio)(pyridin-2-yl)methyl)phenyl)acetate (4am)



Compound **4am** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 9:1→4:1) as a pink oil in 53% yield (50 mg).

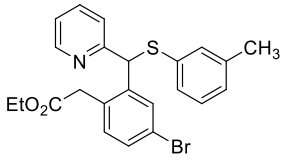
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.60 (d, *J* = 4.7 Hz, 1H), 7.77 (d, *J* = 2.0 Hz, 1H), 7.61 (m, 1H), 7.41 (d, *J* = 7.9 Hz, 1H), 7.33 (dd, *J* = 8.2, 2.1 Hz, 1H), 7.16 (dd, *J* = 7.2, 5.0 Hz, 1H), 7.13 – 7.03 (m, 2H), 6.88 (d, *J* = 7.7 Hz, 1H), 6.78 (t, *J* = 6.0 Hz, 1H), 6.72 (dd, *J* = 8.2, 2.4 Hz, 1H), 5.91 (s, 1H), 4.20 – 3.93 (m, 2H), 3.67 (s, 3H), 3.65 (d, *J* =15.7 Hz, 1H), 3.60 (d, *J* =15.7 Hz, 1H), 1.18 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 170.8, 159.5, 159.0, 149.5, 140.8, 136.8, 135.9, 132.5, 132.3, 131.8, 130.7, 129.6, 123.5, 123.1, 122.3, 121.7, 116.2, 113.5, 61.1, 55.1, 54.7, 38.2, 14.0 ppm.

HRMS (ESI): mass found: 494.03958, calculated mass for $C_{23}H_{22}BrNO_3SNa^+$: 494.03960.

IR (KBr): 3062, 3005, 2930, 2837, 2162, 2045, 1730, 1579, 1471, 1433, 1371, 1302, 1241, 1131, 1071, 1021, 896, 828, 789, 745, 711, 684 cm^{-1}.

ethyl 2-(4-bromo-2-(pyridin-2-yl(m-tolylthio)methyl)phenyl)acetate (4ao)



Compound **4ao** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 4:1→2:1) as a yellow oil in 79% yield (72 mg).

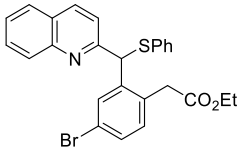
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.58 (d, *J* = 4.6 Hz, 1H), 7.76 (d, *J* = 2.1 Hz, 1H), 7.58 (m, 1H), 7.40 (d, *J* = 7.9 Hz, 1H), 7.30 (dd, *J* = 8.2, 2.2 Hz, 1H), 7.21 – 7.14 (m, 2H), 7.14 – 7.09 (m, 1H), 7.06 (d, *J* = 8.2 Hz, 1H), 6.80 (d, *J* = 7.7 Hz, 1H), 6.74 (m, 1H), 6.02 (s, 1H), 4.18 – 4.00 (m, 2H), 3.88 (s, 3H), 3.82 (d, *J* = 15.8 Hz, 1H), 3.67 (d, *J* = 15.8 Hz, 1H), 1.19 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.0, 159.2, 158.4, 149.4, 140.8, 136.5, 133.1, 132.3, 131.9, 130.6, 129.9, 128.8, 123.2, 122.4, 122.1, 121.5, 120.9, 110.4, 61.0, 55.7, 52.5, 38.0, 14.1 ppm.

HRMS (ESI): mass found: 494.04013, calculated mass for $C_{23}H_{22}BrNO_2SK^+$: 494.01862.

IR (KBr): 3633, 3450, 3062, 2973, 2486, 2325, 2165, 2028, 1904, 1729, 1583, 1472, 1433, 1394, 1243, 1155, 1098, 1070, 1025, 936, 894, 801, 749, 685 cm^{-1}.

ethyl 2-(4-bromo-2-((phenylthio)(quinolin-2-yl)methyl)phenyl)acetate (4ap)



Compound **4ap** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 4:1→2:1) as a yellow oil in 31% yield (30 mg).

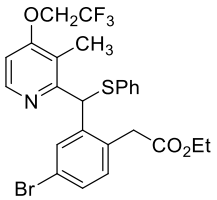
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.10 (d, *J* = 8.4 Hz, 1H), 8.07 (d, *J* = 8.5 Hz, 1H), 7.80 (d, *J* = 2.0 Hz, 1H), 7.77 (d, *J* = 8.0 Hz, 1H), 7.72 – 7.68 (m, 1H), 7.55 – 7.50 (m, 2H), 7.35 – 7.29 (m, 3H), 7.19 – 7.15 (m, 3H), 7.05 (d, *J* = 8.2 Hz, 1H), 6.05 (s, 1H), 4.10 – 3.91 (m, 2H), 3.73 (d, *J* = 15.8 Hz, 1H), 3.58 (d, *J* = 15.9 Hz, 1H), 1.13 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 170.8, 159.2, 147.5, 140.7, 136.9, 134.4, 132.6, 132.2, 132.1, 132.0, 130.8, 129.5, 129.4, 128.8, 127.44, 127.42, 127.0, 126.6, 121.6, 120.7, 61.0, 56.0, 38.0, 14.0 ppm.

HRMS (ESI): mass found: 514.04468, calculated mass for $C_{26}H_{22}BrNO_2SNa^+$: 514.04468.

IR (KBr): 3450, 3058, 2981, 2931, 2328, 2184, 1729, 1589, 1478, 1436, 1368, 1308, 1246, 1155, 1095, 1026, 913, 885, 831, 801, 739, 691 cm^{-1}.

2-(4-bromo-2-((3-methyl-4-(2,2,2-trifluoroethoxy)pyridin-2-yl)(phenylthio)methyl)phenyl)acetate (4aq)



Compound **4aq** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 9:1→4:1) as a yellow oil in 35% yield (32 mg).

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.45 (d, *J* = 5.6 Hz, 1H), 7.80 (d, *J* = 1.8 Hz, 1H), 7.34 (dd, *J* = 8.2, 2.0 Hz, 1H), 7.27 – 7.23 (m, 2H), 7.22 – 7.18 (m, 3H), 7.06 (d, *J* = 8.2 Hz, 1H), 6.63 (d, *J* = 5.6 Hz,

1H), 5.88 (s, 1H), 4.44 – 4.31 (m, 2H), 4.08 – 3.99 (m, 2H), 3.60 (d, *J* = 15.7 Hz, 1H), 3.32 (d, *J* = 15.7 Hz, 1H), 2.14 (s, 3H), 1.17 (t, *J* = 7.1 Hz, 3H) ppm.

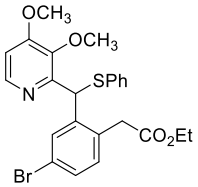
^{13}C NMR (151 MHz, $CDCl_3$): δ = 170.6, 161.4, 158.0, 148.2, 139.9, 135.0, 133.1, 132.4, 131.9, 131.5, 130.7, 128.8, 127.4, 121.5, 121.1, 105.2, 65.39 (q, *J* = 36.3 Hz), 61.0, 52.6, 37.9, 33.9, 25.6, 24.9, 14.0, 10.1 ppm.

^{19}F NMR (564 MHz, $CDCl_3$): δ = -73.83 ppm.

HRMS (ESI): mass found: 576.04236, calculated mass for $C_{25}H_{23}BrF_3NO_3SNa^+$: 576.04263.

IR (KBr): 3325, 3061, 2930, 2854, 2170, 1729, 1574, 1473, 1411, 1291, 1254, 1162, 1104, 1027, 971, 909, 808, 732, 693 cm^{-1}.

ethyl 2-(4-bromo-2-((3,4-dimethoxypyridin-2-yl)(phenylthio)methyl)phenyl)acetate (4ar)



Compound **4ar** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 4:1→2:1) as a yellow oil in 28% yield (28 mg).

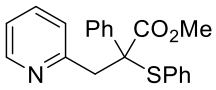
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.33 (d, *J* = 5.5 Hz, 1H), 7.93 (d, *J* = 2.0 Hz, 1H), 7.38 – 7.27 (m, 3H), 7.23 – 7.15 (m, 3H), 7.04 (d, *J* = 8.2 Hz, 1H), 6.76 (d, *J* = 5.5 Hz, 1H), 6.08 (s, 1H), 4.24 – 3.94 (m, 2H), 3.87 (s, 3H), 3.65 (s, 2H), 3.52 (s, 3H), 1.18 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 170.8, 158.4, 152.2, 145.9, 142.8, 140.7, 135.2, 132.8, 132.1, 132.0, 131.6, 130.5, 128.7, 127.3, 121.3, 106.8, 60.9, 60.5, 55.6, 49.2, 37.9, 14.1 ppm.

HRMS (ESI): mass found: 524.04993, calculated mass for $C_{24}H_{24}BrNO_4SNa+$: 524.05016.

IR (KBr): 3632, 3058, 2977, 2938, 2844, 2592, 2320, 2162, 1895, 1730, 1577, 1480, 1441, 1417, 1368, 1295, 1224, 1158, 1096, 1061, 1027, 997, 935, 888, 820, 741, 693 cm^{-1}.

methyl 2-phenyl-2-(phenylthio)-3-(pyridin-2-yl)propanoate (3aa)



Compound **3aa** was prepared according to the general procedure and was obtained as colorless gel after column chromatography (*n*-pentane : ether : 9:1→ 4:1) in 78 % yield (54 mg).

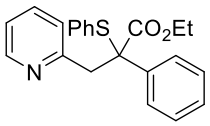
^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.49 (d, *J* = 4.4 Hz, 1H), 7.52 – 7.48 (m, 1H), 7.41 – 7.36 (m, 1H), 7.32 – 7.28 (m, 2H), 7.26 – 7.20 (m, 3H), 7.16 – 7.12 (m, 4H), 7.09 (dd, *J* = 7.2, 5.1 Hz, 1H), 6.98 (d, *J* = 7.9 Hz, 1H), 3.81 (d, *J* = 14.6 Hz, 1H), 3.71 (s, 3H), 3.58 (d, *J* = 14.6 Hz, 1H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 172.4, 156.8, 148.9, 139.9, 136.8, 135.6, 131.0, 129.0, 128.3, 127.9, 127.6, 127.4, 124.3, 121.5, 64.1, 52.6, 44.3 ppm.

HRMS (ESI): mass found: 372.10349, calculated mass $C_{21}H_{19}O_2NNaS^+$: 372.10287.

IR (KBr): 3064. 3503, 3059, 2950, 2160, 1731, 1586, 1473, 1436, 1174, 1094, 1063, 1026, 840, 748, 695 cm^{-1}

ethyl 2-phenyl-2-(phenylthio)-3-(pyridin-2-yl)propanoate (3ab)



Compound **3ab** was prepared according to the general procedure and was obtained as light brown gel after column chromatography (*n*-pentane : diethyl ether : 9:1→ 4:1) in 88% yield (61 mg).

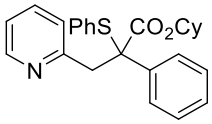
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.50 (d, *J* = 4.1 Hz, 1H), 7.53 – 7.51 (m, 1H), 7.37 – 7.32 (m, 2H), 7.29 – 7.20 (m, 4H), 7.19 – 7.13 (m, 4H), 7.10 (dd, *J* = 4.5, 2.8 Hz, 1H), 7.03 (d, *J* = 7.8 Hz, 1H), 4.26 – 4.14 (m, 2H), 3.84 (d, *J* = 14.6 Hz, 1H), 3.61 (d, *J* = 14.7 Hz, 1H), 1.16 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.8, 157.0, 148.8, 140.1, 136.7, 135.6, 131.2, 129.0, 128.3, 127.9, 127.7, 127.3, 124.3, 121.4, 63.9, 61.7, 44.3, 13.8 ppm.

HRMS (ESI): mass found: 386.11884, calculated mass $C_{22}H_{21}O_2NNaS^+$: 386.11852.

IR (KBr): 3447, 3058, 2980, 2184, 2038, 1726, 1587, 1472, 1437, 1367, 1298, 1231, 1186, 1095, 1029, 925, 856, 747, 695 cm^{-1}.

cyclohexyl 2-phenyl-2-(phenylthio)-3-(pyridin-2-yl)propanoate (3ac)



Compound **3ac** was prepared according to the general procedure and was obtained as light red gel after column chromatography (*n*-pentane : diethyl ether : 9:1→ 4:1) in 74% yield (63 mg).

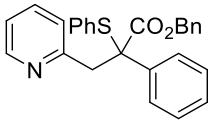
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.50 (d, *J* = 4.2 Hz, 1H), 7.53 – 7.51 (m, 1H), 7.34 (dd, *J* = 8.1, 1.3 Hz, 2H), 7.28 – 7.18 (m, 4H), 7.15 – 7.12 (m, 4H), 7.12 – 7.07 (m, 2H), 4.95 – 4.81 (m, 1H), 3.86 (d, *J* = 14.8 Hz, 1H), 3.60 (d, *J* = 14.8 Hz, 1H), 1.74 (d, *J* = 3.6 Hz, 2H), 1.66 – 1.52 (m, 2H), 1.50 – 1.42 (m, 1H), 1.41 – 1.26 (m, 4H), 1.23 – 1.17 (m, 1H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.2, 157.1, 148.7, 140.4, 136.6, 135.5, 131.4, 128.8, 128.2, 127.8, 127.6, 127.2, 124.2, 121.4, 74.0, 63.8, 44.1, 31.08, 31.03, 25.3, 23.47, 23.40 ppm.

HRMS (ESI): mass found: 440.16531, calculated mass $C_{26}H_{27}O_2NNaS^+$: 440.16547.

IR (KBr): 3499, 3059, 2934, 2858, 2662, 1723, 1588, 1473, 1440, 1334, 1186, 1120, 1095, 1012, 913, 839, 747, 696 cm^{-1}.

benzyl 2-phenyl-2-(phenylthio)-3-(pyridin-2-yl)propanoate (3ad)



Compound **3ad** was prepared according to the general procedure and was obtained as light brown gel after column chromatography (*n*-pentane : diethyl ether : 9:1→ 4:1) in 76% yield (65 mg).

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.45 (d, *J* = 4.0 Hz, 1H), 7.48 – 7.46 (m, 1H), 7.34 – 7.31 (m, 2H), 7.29 – 7.26 (m, 4H), 7.23 – 7.20 (m, 4H), 7.13 – 7.11 (m, 5H), 7.08 (dd, *J* = 7.1, 5.1 Hz, 1H), 6.97 (d, *J* = 7.8 Hz, 1H), 5.21 (d, *J* = 12.3 Hz, 1H), 5.16 (d, *J* = 12.3 Hz, 1H), 3.87 (d, *J* = 14.7 Hz, 1H), 3.61 (d, *J* = 14.7 Hz, 1H) ppm.

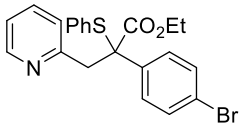
^{13}C NMR (151 MHz, $CDCl_3$) δ = 171.7, 156.8, 148.9, 139.8, 136.8, 135.6, 135.5, 131.0, 129.0, 128.34, 128.32, 128.30, 128.0, 127.9, 127.7, 127.3, 124.2, 121.4, 67.3, 63.9, 44.16 ppm.

HRMS (ESI): mass found: 448.13406, calculated mass $C_{27}H_{23}O_2NNaS^+$: 448.13417.

IR (KBr): 3443, 3060, 2929, 1814, 1728, 1589, 1474, 1444, 1390, 1254, 1207, 1178, 1097, 1066, 1018,

985, 910, 780, 727, 692 cm^{-1}.

ethyl 2-(4-bromophenyl)-2-(phenylthio)-3-(pyridin-2-yl)propanoate (3ae)



Compound **3ae** was prepared according to the general procedure and was obtained as light brown gel after column chromatography (*n*-pentane : diethyl ether : 9:1→ 4:1) in 87% yield (77 mg).

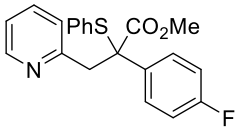
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.48 (d, *J* = 4.8 Hz, 1H), 7.55 – 7.52 (m, 1H), 7.37 – 7.32 (m, 2H), 7.32 – 7.26 (m, 1H), 7.25 – 7.22 (m, 2H), 7.20 – 7.16 (m, 4H), 7.10 (dd, *J* = 7.1, 5.1 Hz, 1H), 7.06 (d, *J* = 7.7 Hz, 1H), 4.23 – 4.11 (m, 2H), 3.79 (d, *J* = 14.7 Hz, 1H), 3.63 (d, *J* = 14.7 Hz, 1H), 1.13 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.3, 156.6, 148.9, 139.1, 136.7, 135.7, 130.9, 130.8, 129.7, 129.2, 128.4, 124.2, 121.5, 121.3, 63.3, 61.8, 44.3, 13.8 ppm.

HRMS (ESI): mass found: 464.02920, calculated mass $C_{22}H_{20}O_2NBrNaS^+$: 464.02903.

IR (KBr): 3440, 3036, 2927, 2564, 2231, 2017, 1882, 1712, 1464, 1433, 1392, 1361, 1314, 1126, 1048, 1026, 920, 875, 819, 745, 684 cm^{-1}.

methyl 2-(4-fluorophenyl)-2-phenyl-3-(pyridin-2-yl)propanoate (3af)



Compound **3af** was prepared according to the general procedure and was obtained as yellow gel after column chromatography (*n*-pentane : diethyl ether : 9:1→ 4:1) in 84% yield (56 mg).

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.49 (d, *J* = 4.3 Hz, 1H), 7.55 – 7.52 (m, 1H), 7.35 – 7.27 (m, 3H), 7.22 – 7.14 (m, 4H), 7.10 (dd, *J* = 7.0, 4.9 Hz, 1H), 7.01 (d, *J* = 7.8 Hz, 1H), 6.95 – 6.88 (m, 2H), 3.77 (d, *J* = 14.5 Hz, 1H), 3.72 (s, 3H), 3.60 (d, *J* = 14.5 Hz, 1H) ppm.

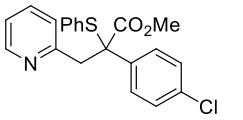
^{13}C NMR (151 MHz, $CDCl_3$): δ = 172.2, 161.7(d, *J* = 247.1 Hz), 156.6, 148.9, 136.8, 135.6 (d, *J* = 3.2 Hz), 135.6, 130.9, 129.6 (d, *J* = 8.0 Hz), 129.2, 128.4, 124.3, 121.6, 114.7 (d, *J* = 21.4 Hz), 63.4, 52.6, 44.6 ppm.

^{19}F NMR (564 MHz, $CDCl_3$): δ = -114.76 ppm.

HRMS (ESI): mass found: 368.11166, calculated mass $C_{21}H_{19}O_2NFS^+$: 368.11150.

IR (KBr): 3483, 3064, 3007, 2953, 2162, 1732, 1596, 1507, 1473, 1437, 1222, 1079, 1016, 833, 808, 748, 694 cm^{-1}.

methyl 2-(4-chlorophenyl)-2-(phenylthio)-3-(pyridin-2-yl)propanoate (3ag)



Compound **3ag** was prepared according to the general procedure and was obtained as yellow gel after column chromatography (*n*-pentane : diethyl ether : 9:1→ 4:1) in 88% yield (67 mg).

^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.50 – 8.45 (m, 1H), 7.54 – 7.49 (m, 1H), 7.30 – 7.22 (m, 3H), 7.22 – 7.13 (m, 6H), 7.09 (dd, *J* = 7.1, 5.4 Hz, 1H), 7.00 (d, *J* = 7.8 Hz, 1H), 3.75 (d, *J* = 14.6 Hz, 1H), 3.69 (s,

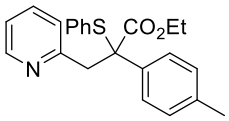
3H), 3.59 (d, *J* = 14.6 Hz, 1H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.9, 156.4, 148.9, 138.4, 136.7, 135.7, 133.2, 130.7, 129.32, 129.31, 128.4, 127.9, 124.3, 121.6, 63.4, 52.6, 44.5 ppm.

HRMS (ESI): mass found: 406.06424, calculated mass $C_{21}H_{18}O_2NClNaS^+$: 406.06390.

IR (KBr): 3487, 3060, 2951, 2160, 1731, 1585, 1487, 1437, 1406, 1231, 1090, 1012, 910, 823, 750, 695 cm^{-1}.

ethyl 2-(phenylthio)-3-(pyridin-2-yl)-2-(p-tolyl)propanoate (3ah)



Compound **3ah** was prepared according to the general procedure and was obtained as light brown gel after column chromatography (*n*-pentane : diethyl ether : 9:1→ 4:1) in 87% yield (64 mg).

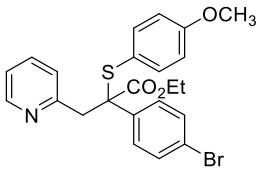
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.50 (d, *J* = 4.5 Hz, 1H), 7.53 – 7.50 (m, 1H), 7.29 – 7.25 (m, 1H), 7.22 (d, *J* = 8.2 Hz, 2H), 7.20 – 7.14 (m, 4H), 7.09 (dd, *J* = 7.1, 5.1 Hz, 1H), 7.05 (d, *J* = 8.1 Hz, 2H), 7.02 (d, *J* = 7.8 Hz, 1H), 4.25 – 4.10 (m, 2H), 3.83 (d, *J* = 14.7 Hz, 1H), 3.58 (d, *J* = 14.7 Hz, 1H), 2.32 (s, 3H), 1.15 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 172.0, 157.1, 148.8, 137.07, 137.02, 136.7, 135.5, 131.4, 128.9, 128.6, 128.2, 127.5, 124.3, 121.4, 63.7, 61.6, 44.3, 21.0, 13.8 ppm.

HRMS (ESI): mass found: 400.13440, calculated mass $C_{23}H_{23}O_2NNaS^+$: 400.13417.

IR (KBr): 3446, 3056, 2980, 2926, 2168, 1726, 1587, 1511, 1472, 1436, 1368, 1296, 1180, 1095, 1030, 931, 856, 817, 746, 694 cm^{-1}.

ethyl 2-(4-bromophenyl)-2-((4-methoxyphenyl)thio)-3-(pyridin-2-yl)propanoate (3ai)



Compound **3ai** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 9:1→4:1) as a colorless oil in 66% yield (62 mg).

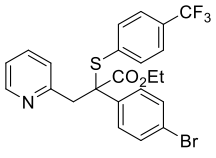
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.47 (d, *J* = 4.4 Hz, 1H), 7.53 (m, 1H), 7.35 (d, *J* = 8.6 Hz, 2H), 7.21 (d, *J* = 8.6 Hz, 2H), 7.16 – 7.04 (m, 4H), 6.72 (d, *J* = 8.7 Hz, 2H), 4.27 – 4.07 (m, 2H), 3.79 – 3.73 (m, 4H), 3.61 (d, *J* = 14.8 Hz, 1H), 1.15 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.4, 160.7, 156.8, 148.9, 139.1, 138.6, 135.7, 130.8, 129.7, 124.1, 121.5, 121.3, 121.2, 114.0, 63.1, 61.7, 55.2, 44.1, 13.8 ppm.

HRMS (ESI): mass found: 494.03940, calculated mass for $C_{23}H_{22}BrNO_3SNa^+$: 494.03960.

IR (KBr): 3631, 3446, 3063, 2936, 2839, 2326, 2191, 2046, 1893, 1725, 1589, 1489, 1438, 1396, 1366, 1286, 1244, 1175, 1096, 1029, 827, 750, 717 cm^{-1}.

ethyl 2-(4-bromophenyl)-3-(pyridin-2-yl)-2-((4-(trifluoromethyl)phenyl)thio)propanoate (3aj)



Compound **3aj** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 9:1→4:1) as a colorless oil in 68% yield (69 mg).

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.50 (d, *J* = 4.2 Hz, 1H), 7.54 (m, 1H), 7.41 – 7.38 (m, 4H), 7.27 – 7.24 (m, 4H), 7.12 (q, *J* = 5.0 Hz, 1H), 6.97 (d, *J* = 7.8 Hz, 1H), 4.26 – 4.14 (m, 2H), 3.83 (d, *J* = 14.6 Hz, 1H), 3.57 (d, *J* = 14.6 Hz, 1H), 1.15 (t, *J* = 7.1 Hz, 3H) ppm.

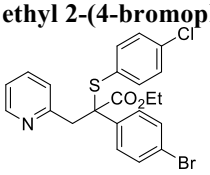
^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.0, 156.1, 148.9, 138.7, 136.2, 135.8, 131.1, 130.7 (q, *J* = 32.5 Hz), 129.6, 125.1 (q, *J* = 3.0 Hz), 124.1, 123.83 (q, *J* = 272.2 Hz), 121.78, 121.72, 63.7, 62.1, 44.5, 13.8 ppm.

^{19}F NMR (564 MHz, $CDCl_3$): δ = -62.80 ppm.

HRMS (ESI): mass found: 532.01648, calculated mass for $C_{23}H_{19}BrF_3NO_2SNa^+$: 532.01642.

IR (KBr): 3496, 3067, 2982, 2161, 2018, 1906, 1728, 1591, 1483, 1438, 1397, 1322, 1166, 1124, 1063, 1012, 832, 752, 706 cm^{-1}.

ethyl 2-(4-bromophenyl)-2-((4-chlorophenyl)thio)-3-(pyridin-2-yl)propanoate (3ak)



Compound **3ak** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 9:1→4:1) as a colorless oil in 71% yield (68 mg).

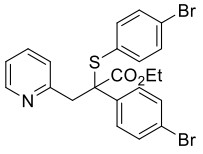
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.49 (d, *J* = 4.2 Hz, 1H), 7.54 (m, 1H), 7.37 (d, *J* = 8.6 Hz, 2H), 7.22 (d, *J* = 8.6 Hz, 2H), 7.15 (d, *J* = 8.4 Hz, 2H), 7.13 – 7.09 (m, 1H), 7.08 (d, *J* = 8.5 Hz, 2H), 7.01 (d, *J* = 7.6 Hz, 1H), 4.23 - 4.15 (m, 2H), 3.78 (d, *J* = 14.7 Hz, 1H), 3.55 (d, *J* = 14.7 Hz, 1H), 1.16 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.2, 156.3, 148.9, 139.0, 137.9, 135.8, 135.7, 131.0, 129.6, 129.4, 128.6, 124.1, 121.6, 121.5, 63.5, 61.9, 44.1, 13.8 ppm.

HRMS (ESI): mass found: 497.99023, calculated mass for $C_{22}H_{19}BrClNO_2SNa^+$: 497.99006.

IR (KBr): 3484, 3064, 2981, 2159, 1901, 1727, 1589, 1477, 1438, 1392, 1183, 1089, 1010, 823, 749, 716 cm^{-1}.

ethyl 2-(4-bromophenyl)-2-((4-bromophenyl)thio)-3-(pyridin-2-yl)propanoate (3al)



Compound **3al** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 9:1→4:1) as a colorless oil in 72% yield (75 mg).

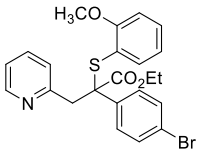
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.49 (d, *J* = 4.5 Hz, 1H), 7.53 (m, 1H), 7.37 (d, *J* = 8.7 Hz, 2H), 7.33 – 7.28 (m, 2H), 7.23 (d, *J* = 8.7 Hz, 2H), 7.11 (dd, *J* = 7.0, 5.1 Hz, 1H), 7.06 – 6.96 (m, 3H), 4.52 – 3.97 (m, 2H), 3.79 (d, *J* = 14.7 Hz, 1H), 3.55 (d, *J* = 14.7 Hz, 1H), 1.16 (t, *J* = 7.2 Hz, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.1, 156.3, 148.9, 139.0, 138.1, 135.8, 131.6, 131.0, 130.1, 129.6, 128.1, 124.1, 121.7, 121.5, 63.5, 62.0, 44.1, 13.8 ppm.

HRMS (ESI): mass found: 519.95776, calculated mass for $C_{22}H_{20}Br_2NO_2S^+$: 519.95760.

IR (KBr): 3494, 3062, 2979, 2324, 2159, 2039, 1904, 1727, 1588, 1474, 1438, 1391, 1183, 1071, 1008, 820, 751 cm^{-1}.

ethyl 2-(4-bromophenyl)-2-((2-methoxyphenyl)thio)-3-(pyridin-2-yl)propanoate (3am)



Compound **3am** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 4:1→2:1) as a yellow oil in 56% yield (53 mg).

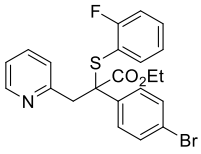
^{1}H NMR (400 MHz, CDCl3): δ = 8.39 (d, *J* = 4.8 Hz, 1H), 7.49 (m, 1H), 7.37 – 7.21 (m, 6H), 7.18 (d, *J* = 7.9 Hz, 1H), 7.09 – 6.98 (m, 1H), 6.79 – 6.74 (m, 2H), 4.23 – 4.03 (m, 2H), 3.77 (d, *J* = 14.9 Hz, 1H), 3.70 (d, *J* = 14.9 Hz, 1H), 3.59 (s, 3H), 1.11 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (101 MHz, CDCl3): δ = 171.2, 161.0, 157.0, 148.6, 139.3, 138.8, 135.6, 131.3, 130.4, 129.9, 124.1, 121.3, 121.0, 120.4, 118.7, 110.6, 62.6, 61.6, 55.3, 44.8, 13.7 ppm.

HRMS (ESI): mass found: 494.03964, calculated mass for $C_{23}H_{22}BrNO_3SNa^+$: 494.03960.

IR (KBr): 3632, 3063, 2972, 2934, 2343, 2157, 1909, 1726, 1584, 1472, 1434, 1393, 1367, 1273, 1243, 1182, 1069, 1023, 825, 798, 751, 685 cm^{-1}.

ethyl 2-(4-bromophenyl)-2-((2-fluorophenyl)thio)-3-(pyridin-2-yl)propanoate (3an)



Compound **3an** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 9:1→4:1) as a colorless oil in 62% yield (57 mg).

^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.42 (d, *J* = 4.8 Hz, 1H), 7.52 (m, 1H), 7.35 – 7.28 (m, 3H), 7.27 – 7.23 (m, 3H), 7.13 (d, *J* = 7.8 Hz, 1H), 7.07 (dd, *J* = 7.3, 4.9 Hz, 1H), 7.03 – 6.95 (m, 2H), 4.22 – 4.13 (m, 2H), 3.78 (d, *J* = 14.9 Hz, 1H), 3.74 (d, *J* = 14.9 Hz, 1H), 1.14 (t, *J* = 7.1 Hz, 3H) ppm.

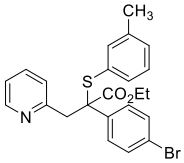
^{13}C NMR (151 MHz, CDCl3): δ = 171.0, 164.0 (d, *J* = 248.6 Hz), 156.5, 148.7, 139.4, 138.2, 135.7, 131.9 (d, *J* = 9.06 Hz), 130.7, 129.8, 124.18, 124.10 (d, *J* = 4.53 Hz), 121.5, 121.4, 115.7 (d, *J* = 22.65 Hz), 63.2, 61.9, 45.0, 13.7 ppm.

^{19}F NMR (564 MHz, CDCl3): δ = -104.24 ppm.

HRMS (ESI): mass found: 482.01935, calculated mass for $C_{22}H_{19}BrFNO_2SNa^+$: 482.01961.

IR (KBr): 3636, 3492, 3074, 2975, 2324, 2157, 1902, 1722, 1588, 1469, 1437, 1394, 1219, 1176, 1074, 1036, 1004, 944, 882, 860, 820, 760, 723, 682, 657 cm^{-1}.

ethyl 2-(4-bromophenyl)-3-(pyridin-2-yl)-2-(m-tolylthio)propanoate (3ao)



Compound **3ao** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 4:1→2:1) as a colorless oil in 75% yield (68 mg).

^{1}H NMR (400 MHz, $CDCl_3$): δ = 8.47 (d, *J* = 4.8 Hz, 1H), 7.52 (t, *J* = 7.7 Hz, 1H), 7.35 (d, *J* = 8.7 Hz, 2H), 7.23 (d, *J* = 8.0 Hz, 2H), 7.14 – 7.00 (m, 3H), 6.85 – 6.69 (m, 2H), 6.62 (s, 1H), 4.56 – 4.04 (m, 2H), 3.79 (d, *J* = 14.7 Hz, 1H), 3.71 – 3.49 (m, 4H), 1.14 (t, *J* = 7.1 Hz, 3H) ppm.

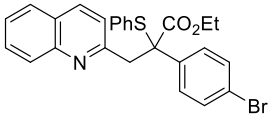
^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.2, 161.0, 157.0, 148.6, 139.3, 138.8, 135.6, 131.3, 130.4, 129.9,

124.1, 121.3, 121.0, 120.4, 118.7, 110.6, 62.6, 61.6, 55.3, 44.8, 13.7 ppm.

HRMS (ESI): mass found: 494.04083, calculated mass for $C_{23}H_{22}BrNO_2SK^+$: 494.01862.

IR (KBr): 3631, 3063, 2972, 2325, 2156, 2044, 1908, 1726, 1584, 1473, 1434, 1394, 1367, 1273, 1243, 1182, 1096, 1069, 1022, 825, 799, 751, 685 cm^{-1}.

ethyl 2-(4-bromophenyl)-2-(phenylthio)-3-(quinolin-2-yl)propanoate (3ap)



Compound **3ap** was prepared according to the general procedure and was obtained after column chromatography (*n*-pentane : diethyl ether 4:1→2:1) as a colorless oil in 51% yield (50 mg).

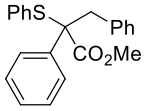
^{1}H NMR (600 MHz, $CDCl_3$): δ = 8.01 (d, *J* = 8.4 Hz, 1H), 7.94 (d, *J* = 8.5 Hz, 1H), 7.76 (d, *J* = 8.1 Hz, 1H), 7.70 – 7.62 (m, 1H), 7.51 – 7.46 (m, 1H), 7.37 – 7.32 (m, 4H), 7.32 – 7.28 (m, 1H), 7.22 – 7.17 (m, 4H), 7.14 (d, *J* = 8.5 Hz, 1H), 4.34 – 4.12 (m, 2H), 3.94 (d, *J* = 14.9 Hz, 1H), 3.78 (d, *J* = 14.9 Hz, 1H), 1.15 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.3, 156.8, 147.5, 139.3, 136.8, 135.7, 130.9, 130.8, 129.8, 129.3, 129.2, 129.0, 128.4, 127.4, 126.7, 126.0, 122.1, 121.3, 63.0, 61.8, 44.8, 13.9 ppm.

HRMS (ESI): mass found: 514.04437, calculated mass for $C_{26}H_{22}BrNO_2SNa^+$: 514.04468.

IR (KBr): 3446, 3057, 2980, 2931, 2161, 1901, 1725, 1598, 1488, 1430, 1393, 1369, 1299, 1208, 1177, 1074, 1033, 1010, 909, 824, 748, 694 cm^{-1}.

methyl 2,3-diphenyl-2-(phenylthio)propanoate (3ba)



Compound **3ba** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 40:1→20:1) in 99% yield (70 mg).

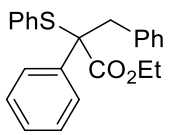
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.37 – 7.28 (m, 3H), 7.28 – 7.20 (m, 7H), 7.18 – 7.10 (m, 3H), 6.95 (dd, *J* = 7.6, 1.8 Hz, 2H), 3.61 (s, 3H), 3.58 (d, *J* = 13.7 Hz, 1H), 3.43 (d, *J* = 13.7 Hz, 1H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.9, 139.2, 136.3, 135.9, 131.3, 130.8, 129.1, 128.5, 128.2, 127.8, 127.6, 127.3, 126.7, 65.8, 52.2, 44.5 ppm.

HRMS (ESI): mass found: 371.10745, calculated mass $C_{22}H_{20}O_2NaS^+$: 371.10762.

IR (KBr): 3418, 3062, 3025, 2947, 2330, 2157, 1956, 1893, 1810, 1719, 1581, 1490, 1435, 1256, 1222, 1152, 1062, 1026, 1003, 958, 921, 846, 779, 748, 693 cm^{-1}.

ethyl 2,3-diphenyl-2-(phenylthio)propanoate (3bb)



Compound **3bb** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1→10:1) in 98% yield(71 mg).

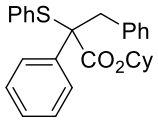
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.33 – 7.27 (m, 3H), 7.27 – 7.17 (m, 7H), 7.16 – 7.08 (m, 3H), 6.96 (dd, *J* = 7.6, 1.7 Hz, 2H), 4.17 – 3.96 (m, 2H), 3.58 (d, *J* = 13.7 Hz, 1H), 3.41 (d, *J* = 13.7 Hz, 1H), 1.09 (t, *J* = 7.1 Hz, 3H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.4, 139.4, 136.1, 136.0, 131.5, 130.8, 128.9, 128.4, 128.2, 127.7, 127.5, 127.2, 126.6, 65.5, 61.5, 44.4, 13.8 ppm.

HRMS (ESI): mass found: 385.12305, calculated mass $C_{23}H_{22}O_2NaS^+$: 385.12327.

IR (KBr): 3060, 3029, 2981, 2930, 2324, 1725, 1586, 1491, 1445, 1368, 1216, 1080, 1026, 856, 744, 695 cm^{-1}.

cyclohexyl 2,3-diphenyl-2-(phenylthio)propanoate (3bc)



Compound **3bc** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1) in 88% yield (73 mg).

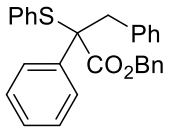
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.29 – 7.23 (m, 5H), 7.21 (dd, *J* = 6.8, 3.8 Hz, 4H), 7.18 – 7.10 (m, 4H), 7.01 (dd, *J* = 7.4, 2.0 Hz, 2H), 4.82 – 4.68 (m, 1H), 3.56 (d, *J* = 13.8 Hz, 1H), 3.43 (d, *J* = 13.8 Hz, 1H), 1.72 (m, 1H), 1.68 – 1.51 (m, 2H), 1.46 (m, 1H), 1.40 – 1.12 (m, 6H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 170.9, 139.8, 136.2, 135.8, 131.8, 130.8, 128.7, 128.3, 128.2, 127.6, 127.5, 127.1, 126.5, 74.2, 65.2, 43.9, 31.2, 31.0, 25.2, 23.6, 23.5 ppm.

HRMS (ESI): mass found: 439.17001, calculated mass $C_{27}H_{28}O_2NaS^+$: 439.17022.

IR (KBr): 3423, 3060, 3030, 2935, 2858, 2663, 2334, 2111, 1719, 1583, 1493, 1446, 1317, 1219, 1120, 1078, 1012, 909, 838, 739, 695 cm^{-1}.

benzyl 2,3-diphenyl-2-(phenylthio)propanoate (3bd)



Compound **3bd** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1) in 94% yield (80 mg).

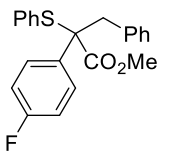
^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.33 – 7.30 (m, 3H), 7.29 – 7.19 (m, 10H), 7.19 – 7.14 (m, 3H), 7.10 (t, *J* = 7.5 Hz, 2H), 6.91 (d, *J* = 7.2 Hz, 2H), 5.11 (d, *J* = 12.3 Hz, 1H), 5.04 (d, *J* = 12.3 Hz, 1H), 3.59 (d, *J* = 13.8 Hz, 1H), 3.43 (d, *J* = 13.8 Hz, 1H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.3, 139.1, 136.2, 135.9, 135.1, 131.3, 130.8, 129.0, 128.5, 128.49, 128.40, 128.3, 128.2, 127.7, 127.5, 127.3, 126.6, 67.2, 65.4, 44.3 ppm.

HRMS (ESI): mass found: 447.13794, calculated mass $C_{28}H_{24}O_2NaS^+$: 447.13892.

IR (KBr): 3443, 3060, 3031, 2950, 1954, 1882, 1807, 1729, 1584, 1494, 1448, 1374, 1309, 1210, 1079, 1028, 999, 911, 745, 698, 633, 596, 496 cm^{-1}.

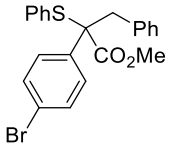
methyl 2-(4-fluorophenyl)-3-phenyl-2-(phenylthio)propanoate (3be)



Compound **3be** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1) in 86% yield (63 mg).

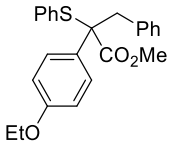
^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.36 – 7.31 (m, 3H), 7.28 – 7.19 (m, 4H), 7.19 – 7.12 (m, 3H), 6.96 – 6.89 (m, 4H), 3.62 (s, 3H), 3.60 (d, *J* = 13.7 Hz, 1H), 3.36 (d, *J* = 13.7 Hz, 1H) ppm.
^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.6, 161.8 (d, *J* = 247.2 Hz), 136.3, 135.7, 134.9 (d, *J* = 3.1 Hz), 130.7, 130.1 (d, *J* = 8.0 Hz), 129.3, 128.6, 127.7, 126.8, 114.69, 114.5, 65.1, 52.3, 44.8 ppm
^{19}F NMR (564 MHz, $CDCl_3$): δ = -114.43 ppm.
HRMS (ESI): mass found: 389.09794, calculated mass $C_{22}H_{19}O_2FNaS^+$: 389.09820.
IR (KBr): 3559, 3443, 3062, 3031, 2952, 2848, 1956, 1889, 1808, 1732, 1601, 1505, 1439, 1307, 1232, 1078, 1015, 953, 914, 830, 745, 697, 613, 530, 496 cm^{-1}.

methyl 2-(4-bromophenyl)-3-phenyl-2-(phenylthio)propanoate (3bf)



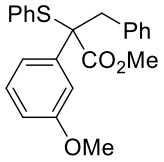
Compound **3bf** was prepared according to the general procedure and was obtained as a white solid after column chromatography (*n*-hexane : ethyl acetate 20:1→15:1) in 81% yield (69 mg).
m.p.: 92-93 ^oC.
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.37 – 7.28 (m, 5H), 7.26 – 7.18 (m, 2H), 7.17 – 7.09 (m, 5H), 6.91 (dd, *J* = 7.3, 1.8 Hz, 2H), 3.58 (s, 3H), 3.58 (d, *J* = 13.7 Hz, 1H), 3.34 (d, *J* = 13.7 Hz, 1H) ppm.
^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.3, 138.2, 136.2, 135.5, 130.9, 130.8, 130.7, 130.1, 129.3, 128.6, 127.7, 126.8, 121.4, 65.2, 52.3, 44.6 ppm.
HRMS (ESI): mass found: 449.01776, calculated mass $C_{22}H_{19}O_2BrNaS^+$: 449.01813.
IR (KBr): 3451, 3030, 2949, 2855, 2337, 2160, 1729, 1583, 1487, 1438, 1394, 1313, 1221, 1175, 1115, 1076, 1076, 1007, 918, 958, 818, 747, 696 cm^{-1}.

methyl 2-(4-ethoxyphenyl)-3-phenyl-2-(phenylthio)propanoate (3bg)



Compound **3bg** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1) in 85% yield (67mg).
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.32 – 7.28 (m, 3H), 7.23 (d, *J* = 7.6 Hz, 2H), 7.14 (dd, *J* = 5.4, 3.5 Hz, 5H), 6.93 (dd, *J* = 7.2, 2.2 Hz, 2H), 6.75 (d, *J* = 8.8 Hz, 2H), 4.00 (q, *J* = 7.0 Hz, 2H), 3.59 (s, 3H), 3.54 (d, *J* = 13.8 Hz, 1H), 3.38 (d, *J* = 13.8 Hz, 1H), 1.40 (t, *J* = 7.0 Hz, 3H) ppm.
^{13}C NMR (101 MHz, $CDCl_3$): δ = 172.0, 158.0, 136.2, 136.1, 131.5, 131.0, 130.8, 129.4, 129.0, 128.5, 127.5, 126.6, 113.6, 65.2, 63.4, 52.2, 44.5, 14.7 ppm.
HRMS (ESI): mass found: 431.10846, calculated mass $C_{24}H_{24}O_3KS^+$: 431.10777.
IR (KBr): 3033, 2932, 2160, 1729, 1606, 1506, 1442, 1394, 1295, 1239, 1179, 1043, 920, 826, 744, 695 cm^{-1}.

methyl 2-(3-methoxyphenyl)-3-phenyl-2-(phenylthio)propanoate (3bh)



Compound **3bh** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1) in 99% yield (75mg).

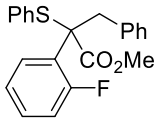
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.35 – 7.28 (m, 3H), 7.26 – 7.19 (m, 3H), 7.17 – 7.10 (m, 4H), 6.98 – 6.93 (m, 2H), 6.84 – 6.81 (m, 1H), 6.79 – 6.71 (m, 1H), 3.67 (s, 3H), 3.59 (s, 3H), 3.56 (d, *J* = 13.7 Hz, 1H), 3.40 (d, *J* = 13.7 Hz, 1H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.8, 159.0, 140.7, 136.3, 135.9, 131.3, 130.8, 129.1, 128.7, 128.5, 127.5, 126.7, 120.5, 114.1, 113.0, 65.7, 55.2, 52.2, 44.4 ppm.

HRMS (ESI): mass found: 417.09274, calculated mass $C_{23}H_{22}O_3KS^+$: 417.09212.

IR (KBr): 3446, 3060, 3027, 3002, 2949, 2840, 1734, 1689, 1597, 1488, 1437, 1253, 1154, 1042, 870, 742, 698, 545, 495 cm^{-1}.

methyl 2-(2-fluorophenyl)-3-phenyl-2-(phenylthio)propanoate (3bi)



Compound **3bi** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1→15:1) in 85% yield (62 mg).

^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.50 – 7.42 (m, 3H), 7.35 (t, *J* = 7.4 Hz, 1H), 7.27 (dd, *J* = 10.0, 5.5 Hz, 3H), 7.20 – 7.13 (m, 3H), 7.06 – 6.97 (m, 2H), 6.95 (d, *J* = 7.2 Hz, 2H), 3.58 (d, J = 13.8 Hz, 1H), 3.53 (d, J = 13.8 Hz, 1H), 3.46 (s, 3H) ppm.

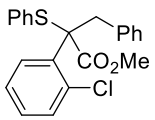
^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.1, 160.0 (d, *J* = 247.0 Hz), 136.8, 135.3, 130.9, 130.8, 129.9 (d, J = 3.1 Hz), 129.5, 129.4 (d, J = 8.9 Hz), 128.6, 127.5, 127.2 (d, *J* = 12.0 Hz), 126.8, 123.4 (d, J = 3.1 Hz), 115.4 (d, *J* = 22.7 Hz), 62.4, 52.2, 43.4 ppm.

^{19}F NMR (282 MHz, CDCl3): δ = -110.75 ppm.

HRMS (ESI): mass found: 405.07199, calculated mass $C_{22}H_{19}O_2FKS^+$: 405.07214.

IR (KBr): 3454, 3062, 3031, 2949, 1733, 1606, 1579, 1484, 1439, 1315, 1230, 1107, 1076, 1047, 1001, 928, 824, 749, 696 cm^{-1}.

methyl 2-(2-chlorophenyl)-3-phenyl-2-(phenylthio)propanoate (3bj)



Compound **3bj** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1) gel in 94% yield (72 mg).

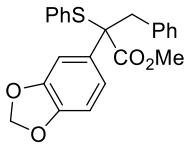
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.59 (d, *J* = 7.8 Hz, 1H), 7.43 (d, *J* = 7.3 Hz, 2H), 7.38 (dd, *J* = 7.9, 1.0 Hz, 1H), 7.32 (t, *J* = 7.4 Hz, 1H), 7.24 – 7.17(m, 3H), 7.17 – 7.05 (m, 4H), 6.91 (d, *J* = 7.0 Hz, 2H), 3.79 (d, *J* = 14.0 Hz, 1H), 3.63 (d, *J* = 14.0 Hz, 1H), 3.36 (s, 3H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 170.8, 136.6, 136.5, 135.3, 133.6, 131.3, 131.2, 131.0, 130.5, 129.4, 128.8, 128.6, 127.4, 126.7, 126.0, 65.6, 52.0, 41.9 ppm.

HRMS (ESI): mass found: 421.04303, calculated mass $C_{22}H_{19}O_2ClKS^+$: 421.04259.

IR (KBr): 3450, 3062, 3031, 2946, 1731, 1577, 1436, 1317, 1227, 1041, 911, 817, 740, 696 cm^{-1}.

methyl 2-(benzo[d][1,3]dioxol-5-yl)-3-phenyl-2-(phenylthio)propanoate (3bk)



Compound **3bk** was prepared according to the general procedure and was obtained as a yellow gel after column chromatography (*n*-hexane : ethyl acetate 20:1→10:1) in 79% yield (62 mg).

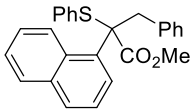
^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.38 – 7.30 (m, 3H), 7.26 (t, *J* = 7.6 Hz, 2H), 7.17 (dd, *J* = 4.9, 2.0 Hz, 3H), 6.98 (dd, *J* = 7.1, 2.0 Hz, 2H), 6.81 (d, *J* = 1.8 Hz, 1H), 6.72 (dd, *J* = 8.2, 1.9 Hz, 1H), 6.66 (d, *J* = 8.2 Hz, 1H), 5.95 (s, 2H), 3.61 (s, 3H), 3.53 (d, *J* = 13.7 Hz, 1H), 3.38 (d, *J* = 13.7 Hz, 1H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.8, 147.3, 146.7, 136.2, 135.9, 133.0, 131.3, 130.8, 129.2, 128.6, 127.6, 126.7, 121.8, 109.0, 107.3, 101.1, 65.5, 52.3, 44.6 ppm.

HRMS (ESI): mass found: 431.07175, calculated mass $C_{23}H_{20}O_4KS^+$: 431.07139.

IR (KBr): 3441, 3061, 3028, 2950, 2896, 2778, 2251, 1956, 1730, 1673, 1605, 1581, 1492, 1438, 1345, 1240, 1102, 1039, 1039, 933, 912, 866, 812, 738, 698, 651, 555, 495 cm^{-1}.

methyl 2-(naphthalen-1-yl)-3-phenyl-2-(phenylthio)propanoate (3bl)



Compound **3bl** was prepared according to the general procedure and was obtained as a white solid after column chromatography (*n*-hexane : ethyl acetate 20:1) in 99% yield (79 mg).

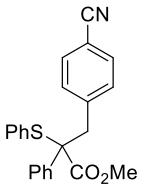
^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.99 (s, 1H), 7.94 – 7.88 (m, 1H), 7.80 (d, *J* = 8.2 Hz, 1H), 7.60 (s, 1H), 7.54 – 7.47 (m, 2H), 7.31 – 7.26 (m, 4H), 7.23 – 7.13 (m, 5H), 6.97 (s, 2H), 3.79 (d, *J* = 13.6 Hz, 1H), 3.78 (d, *J* = 13.6 Hz, 1H), 3.36 (s, 3H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 172.8, 136.7, 135.6, 134.8, 134.2, 131.4, 131.1, 131.0, 129.4, 129.3, 129.0, 128.4, 127.4, 127.1, 126.9, 126.1, 125.3, 124.4, 124.1, 65.9, 52.2, 43.4 ppm.

HRMS (ESI): mass found: 437.09833, calculated mass $C_{26}H_{22}O_2KS^+$: 437.09721.

IR (KBr): 3448, 3056, 2947, 2861, 1726, 1598, 1494, 1436, 1397, 1308, 1232, 1115, 1076, 1030, 991, 915, 838, 776, 746, 696 cm^{-1}.

methyl 3-(4-cyanophenyl)-2-phenyl-2-(phenylthio)propanoate (3bm)



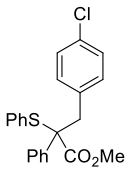
Compound **3bm** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 30:1→10:1) in 98% yield (73 mg).

^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.38 – 7.31 (m, 5H), 7.28 – 7.21 (m, 5H), 7.21 – 7.17 (m, 2H), 6.94 (d, *J* = 8.3 Hz, 2H), 3.61 (s, 3H), 3.57 (d, *J* = 13.6 Hz, 1H), 3.38 (d, *J* = 13.6 Hz, 1H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.6, 141.7, 138.2, 136.3, 131.5, 131.1, 130.7, 129.5, 128.8, 128.5, 128.0, 127.8, 118.8, 110.4, 65.0, 52.4, 45.0 ppm.

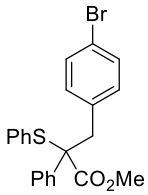
HRMS (ESI): mass found: 396.10291, calculated mass $C_{23}H_{19}O_2NNaS^+$: 396.10287.
IR (KBr): 3453, 3073, 2994, 2949, 2866, 2658, 2492, 2325, 2224, 2096, 1968, 1887, 1810, 1732, 1602, 1498, 1438, 1319, 1242, 1186, 1115, 1069, 1048, 997, 945, 916, 849, 819, 779, 743, 703 cm^{-1}.

methyl 3-(4-chlorophenyl)-2-phenyl-2-(phenylthio)propanoate (3bn)



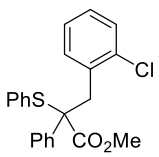
Compound **3bn** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1) in 74% yield (57 mg).
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.36 – 7.28 (m, 3H), 7.27 – 7.16 (m, 7H), 7.07 (d, *J* = 8.5 Hz, 2H), 6.80 (d, *J* = 8.4 Hz, 2H), 3.60 (s, 3H), 3.52 (d, *J* = 13.7 Hz, 1H), 3.33 (d, *J* = 13.7 Hz, 1H) ppm.
^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.7, 138.7, 136.3, 134.4, 132.6, 132.1, 131.0, 129.3, 128.6, 128.1, 127.9, 127.6, 127.5, 65.4, 52.2, 44.1 ppm.
HRMS (ESI): mass found: 295.07648, calculated mass $C_{16}H_{16}O_2NaS^+$: 295.07632.
IR (KBr): 3899, 3733, 3646, 3448, 2919, 2851, 2354, 2324, 1958, 1889, 1737, 1623, 1578, 1542, 1431, 1384, 1067, 832, 695, 666, 627, 495 cm^{-1}.

methyl 3-(4-bromophenyl)-2-phenyl-2-(phenylthio)propanoate (3bo)



Compound **3bo** was prepared according to the general procedure and was obtained as a white solid after column chromatography (*n*-hexane : ethyl acetate 20:1) in 76% yield (65 mg).
m.p.: 106-107 ^oC.
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.36 – 7.28 (m, 3H), 7.27 – 7.18 (m, 9H), 6.74 (d, *J* = 8.4 Hz, 2H), 3.60 (s, 3H), 3.51 (d, *J* = 13.7 Hz, 1H), 3.32 (d, *J* = 13.7 Hz, 1H) ppm.
^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.7, 138.7, 136.3, 134.9, 132.5, 131.0, 130.6, 129.3, 128.6, 128.1, 127.9, 127.5, 120.8, 65.3, 52.3, 44.1 ppm.
HRMS (ESI): mass found: 464.99304, calculated mass $C_{22}H_{19}O_2BrKS^+$: 464.99207.
IR (KBr): 3780, 3702, 3453, 2920, 2851, 2392, 1732, 1581, 1540, 1438, 1384, 1065, 843, 702, 554, 489 cm^{-1}.

methyl 3-(2-chlorophenyl)-2-phenyl-2-(phenylthio)propanoate (3bp)



Compound **3bp** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1) in 84% yield(64mg).
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.38 – 7.30 (m, 3H), 7.25 (dd, *J* = 10.5, 3.3 Hz, 7H), 7.15 – 7.09 (m,

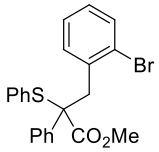
1H), 7.02 (t, *J* = 7.8 Hz, 1H), 6.86 (s, 1H), 6.77 (d, *J* = 7.7 Hz, 1H), 3.62 (s, 3H), 3.53 (d, *J* = 13.7 Hz, 1H), 3.34 (d, *J* = 13.7 Hz, 1H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.7, 138.7, 137.9, 136.3, 133.2, 132.7, 131.0, 130.9, 129.3, 129.0, 128.6, 128.1, 127.9, 127.6, 126.8, 65.3, 52.3, 44.3 ppm.

HRMS (ESI): mass found: 421.04330, calculated mass $C_{22}H_{19}O_2ClKS^+$: 421.04259.

IR (KBr): 3443, 3061, 3027, 2949, 2852, 1953, 1731, 1576, 1475, 1437, 1231, 1080, 1055, 1011, 965, 864, 786, 748, 695, 639, 570, 497 cm^{-1}.

methyl 3-(2-bromophenyl)-2-phenyl-2-(phenylthio)propanoate (3bq)



Compound **3bq** was prepared according to the general procedure and was obtained as a white solid after column chromatography (*n*-hexane : ethyl acetate 20:1) in 70% yield (60mg).

m.p.: 93-94 ^oC.

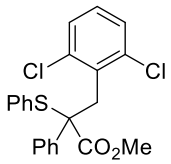
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.41 (t, *J* = 7.4 Hz, 2H), 7.31 – 7.26 (m, 5H), 7.24 – 7.19 (m, 5H), 7.14 (t, *J* = 7.5 Hz, 1H), 7.03 – 6.97 (m, 1H), 3.73 (s, 2H), 3.60 (s, 3H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 172.1, 138.3, 136.5, 136.0, 132.6, 131.2, 131.0, 129.4, 128.5, 128.3, 127.9, 127.7, 127.5, 126.7, 126.6, 64.2, 52.5, 42.0 ppm.

HRMS (ESI): mass found: 464.99292, calculated mass $C_{30}H_{36}O_2KS^+$: 464.99207.

IR (KBr): 3914, 3778, 3695, 3663, 3637, 3445, 3059m 2922, 2852, 2595, 2319, 2250, 1958, 1893, 1806, 1730, 1581, 1470, 1438, 1384, 1223, 1025, 913, 747, 695, 576, 500 cm^{-1}.

methyl 3-(2,6-dichlorophenyl)-2-phenyl-2-(phenylthio)propanoate (3br)



Compound **3br** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1) in 62% yield (52mg).

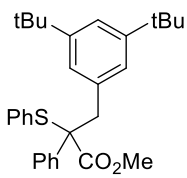
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.45 – 7.41 (m, 2H), 7.34 (dd, *J* = 8.3, 1.1 Hz, 2H), 7.26 – 7.21 (m, 1H), 7.19 – 7.14 (m, 2H), 7.12 – 7.06 (m, 5H), 6.99 – 6.92 (m, 1H), 4.27 (d, *J* = 14.7 Hz, 1H), 3.92 (d, *J* = 14.7 Hz, 1H), 3.58 (s, 3H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.9, 137.8, 137.1, 135.0, 133.9, 132.5, 129.2, 128.7, 128.4, 128.3, 127.9, 127.2, 127.0, 65.1, 52.4, 40.4 ppm.

HRMS (ESI): mass found: 455.00439, calculated mass $C_{22}H_{18}O_2Cl_2KS^+$: 455.00361.

IR (KBr): 3449, 3060, 2947, 2651, 1730, 1572, 1435, 1216, 1086, 1024, 963, 910, 843, 751, 695 cm^{-1}.

methyl 3-(3,5-di-tert-butylphenyl)-2-phenyl-2-(phenylthio)propanoate (3bs)



Compound **3bs** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1) in 72% yield (66mg).

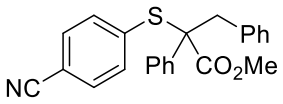
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.41 – 7.34 (m, 2H), 7.34 – 7.16 (m, 9H), 6.72 (d, *J* = 1.7 Hz, 2H), 3.62 (s, 3H), 3.59 (d, *J* = 13.6 Hz, 1H), 3.41 (d, *J* = 13.6 Hz, 1H), 1.21 (s, 18H) ppm.

^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.9, 149.6, 139.1, 136.1, 134.6, 131.7, 129.0, 128.5, 128.4, 127.7, 127.2, 125.2, 120.3, 65.8, 52.1, 45.3, 34.5, 31.3 ppm.

HRMS (ESI): mass found: 499.20645, calculated mass $C_{30}H_{36}O_2KS^+$: 499.20676.

IR (KBr): 3510, 3060, 3027, 2958, 2868, 1954, 1885, 1733, 1597, 1473, 1440, 1390, 1363, 1220, 1151, 1023, 898, 875, 746, 697, 592, 544, 497 cm^{-1}.

methyl 2-((4-cyanophenyl)thio)-2,3-diphenylpropanoate (3bt)



Compound **3bt** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 30:1→10:1) in 99% yield (74 mg).

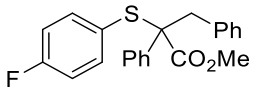
^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.41 (d, *J* = 8.4 Hz, 2H), 7.30 – 7.22 (m, 7H), 7.21 – 7.13 (m, 3H), 6.93 (d, *J* = 7.0 Hz, 2H), 3.67 (s, 3H), 3.59 (d, *J* =13.7 Hz, 1H), 3.54 (d, *J* =13.7 Hz, 1H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.5, 139.2, 138.4, 135.1, 134.3, 131.7, 130.7, 128.1, 128.0, 127.8, 127.8, 127.1, 118.4, 111.5, 66.2, 52.6, 44.7 ppm.

HRMS (ESI): mass found: 396.10211, calculated mass $C_{23}H_{19}O_2NNaS^+$: 396.10287.

IR (KBr): 3440, 3061, 3031, 2951, 2856, 2228, 1953, 1732, 1592, 1549, 1490, 1444, 1393, 1314, 1239, 1079, 1015, 911, 833, 733, 702, 632, 598, 550 cm^{-1}.

methyl 2-((4-fluorophenyl)thio)-2,3-diphenylpropanoate (3bu)



Compound **3bu** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1→15:1) in 87% yield (64 mg).

^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.30 – 7.22 (m, 5H), 7.22 – 7.14 (m, 5H), 6.99 (d, *J* = 6.4 Hz, 2H), 6.91 (t, *J* = 8.6 Hz, 2H), 3.63 (s, 3H), 3.58 (d, *J* = 13.7 Hz, 1H), 3.44 (d, *J* = 13.7 Hz, 1H) ppm.

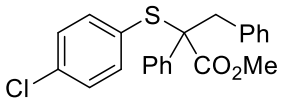
^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.7, 163.5 (d, *J* = 250.1 Hz), 139.1, 138.6 (d, *J* = 8.5 Hz), 135.8, 130.7, 128.1, 127.8, 127.7, 127.4, 126.8, 126.5, 115.6 (d, *J* = 21.7 Hz), 66.0, 52.3, 44.2 ppm.

^{19}F NMR (564 MHz, $CDCl_3$): δ = -111.25 ppm.

HRMS (ESI): mass found: 405.07208, calculated mass $C_{22}H_{19}O_2FKS^+$: 405.07214.

IR (KBr): 3450, 3062, 3031, 1728, 1588, 1488, 1442, 1396, 1317, 1223, 1156, 1081, 1011, 909, 832, 731, 698 cm^{-1}.

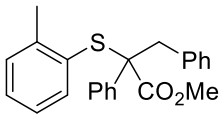
methyl 2-((4-chlorophenyl)thio)-2,3-diphenylpropanoate (3bv)



Compound **3bv** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1→10:1) in 94% yield (72 mg).

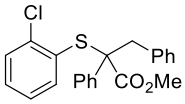
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.26 – 7.18 (m, 6H), 7.17 – 7.12 (m, 6H), 6.95 (dd, *J* = 7.5, 1.8 Hz, 2H), 3.62 (s, 3H), 3.55 (d, *J* = 13.7 Hz, 1H), 3.42 (d, *J* = 13.7 Hz, 1H) ppm.
^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.7, 139.0, 137.4, 135.6, 135.5, 130.7, 129.8, 128.6, 128.1, 127.9, 127.6, 127.5, 126.8, 66.0, 52.3, 44.3 ppm.
HRMS (ESI): mass found: 405.06857, calculated mass $C_{22}H_{19}O_2ClNaS^+$: 405.06865.
IR (KBr): 3445, 3061, 3030, 2949, 2849, 1954, 1899, 1805, 1731, 1600, 1574, 1475, 1444, 1387, 1316, 1230, 1089, 1012, 824, 748, 700, 631, 591, 502 cm^{-1}.

methyl 2,3-diphenyl-2-(o-tolylthio)propanoate (3bw)



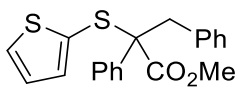
Compound **3bw** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 15:1→10:1) in 79% yield (57 mg).
^{1}H NMR (400 MHz, $CDCl_3$): δ = 7.36 (d, *J* = 7.5 Hz, 1H), 7.32 – 7.26 (m, 2H), 7.24 – 7.17 (m, 5H), 7.16 – 7.02 (m, 4H), 6.83 (d, *J* = 6.8 Hz, 2H), 3.67 (d, *J* = 13.6 Hz, 1H), 3.55 (s, 3H), 3.42 (d, *J* = 13.6 Hz, 1H), 2.32 (s, 3H) ppm.
^{13}C NMR (101 MHz, $CDCl_3$): δ = 171.8, 143.1, 139.1, 136.5, 136.0, 132.8, 130.7, 130.3, 129.0, 128.4, 127.6, 127.5, 127.3, 126.5, 125.9, 65.3, 52.1, 45.3, 21.0 ppm.
HRMS (ESI): mass found: 385.12256, calculated mass $C_{23}H_{22}O_2NaS^+$: 385.12327.
IR (KBr): 3443, 3059, 3029, 2949, 2924, 2852, 1955, 1729, 1594, 1493, 1446, 1382, 1224, 1078, 1034, 958, 909, 847, 750, 700, 632, 592, 504 cm^{-1}.

methyl 2-((2-chlorophenyl)thio)-2,3-diphenylpropanoate (3bx)



Compound **3bx** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 15:1→10:1) in 78% yield (60 mg).
^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.40 (d, *J* = 7.9 Hz, 1H), 7.32 (dd, *J* = 12.6, 5.9 Hz, 3H), 7.27 – 7.18 (m, 4H), 7.15 – 7.04 (m, 4H), 6.83 (d, *J* = 7.5 Hz, 2H), 3.70 (d, *J* = 13.6 Hz, 1H), 3.67 (s, 3H), 3.43 (d, *J* = 13.6 Hz, 1H) ppm.
^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.4, 138.9, 138.0, 136.9, 135.7, 131.2, 130.8, 129.8, 129.7, 128.6, 128.4, 127.7, 127.5, 126.69, 126.67, 65.4, 52.5, 45.4 ppm.
HRMS (ESI): mass found: 421.04266, calculated mass $C_{22}H_{19}O_2ClKS^+$: 421.04259.
IR (KBr): 3444, 3060, 3030, 2949, 2855, 1730, 1600, 1576, 1494, 1447, 1225, 1034, 752, 700, 632, 590 cm^{-1}.

methyl 2,3-diphenyl-2-(thiophen-2-ylthio)propanoate (3by)



Compound **3by** was prepared according to the general procedure and was obtained as a colorless gel after column chromatography (*n*-hexane : ethyl acetate 20:1→10:1) in 99% yield (70 mg).
^{1}H NMR (600 MHz, $CDCl_3$): δ = 7.40 (dd, *J* = 5.3, 1.0 Hz, 1H), 7.28 – 7.23 (m, 3H), 7.21 – 7.17 (m,

5H), 7.08 – 7.04 (m, 2H), 7.00 (dd, *J* = 3.5, 1.0 Hz, 1H), 6.95 (dd, *J* = 5.2, 3.6 Hz, 1H), 3.69 (s, 3H), 3.60 (d, *J* = 13.7 Hz, 1H), 3.48 (d, *J* = 13.7 Hz, 1H) ppm.

^{13}C NMR (151 MHz, $CDCl_3$): δ = 171.7, 139.1, 137.7, 135.7, 131.9, 130.9, 129.4, 127.9, 127.8, 127.7, 127.5, 127.3, 126.8, 67.3, 52.5, 43.2 ppm.

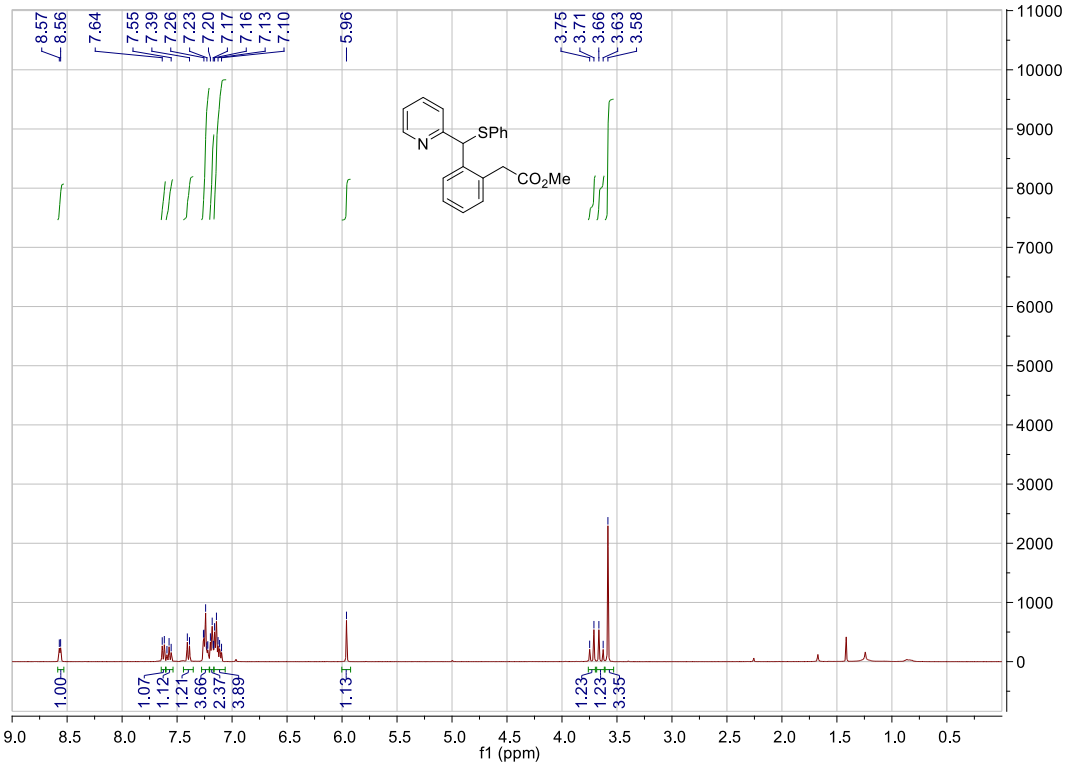
HRMS (ESI): mass found: 393.03812, calculated mass $C_{20}H_{18}O_2KS_2^+$: 393.03798.

IR (KBr): 3447, 3062, 3028, 2949, 2854, 1805, 1733, 1600, 1493, 1444, 1401, 1319, 1221, 1152, 1080, 1006, 846, 703, 496 cm^{-1}.

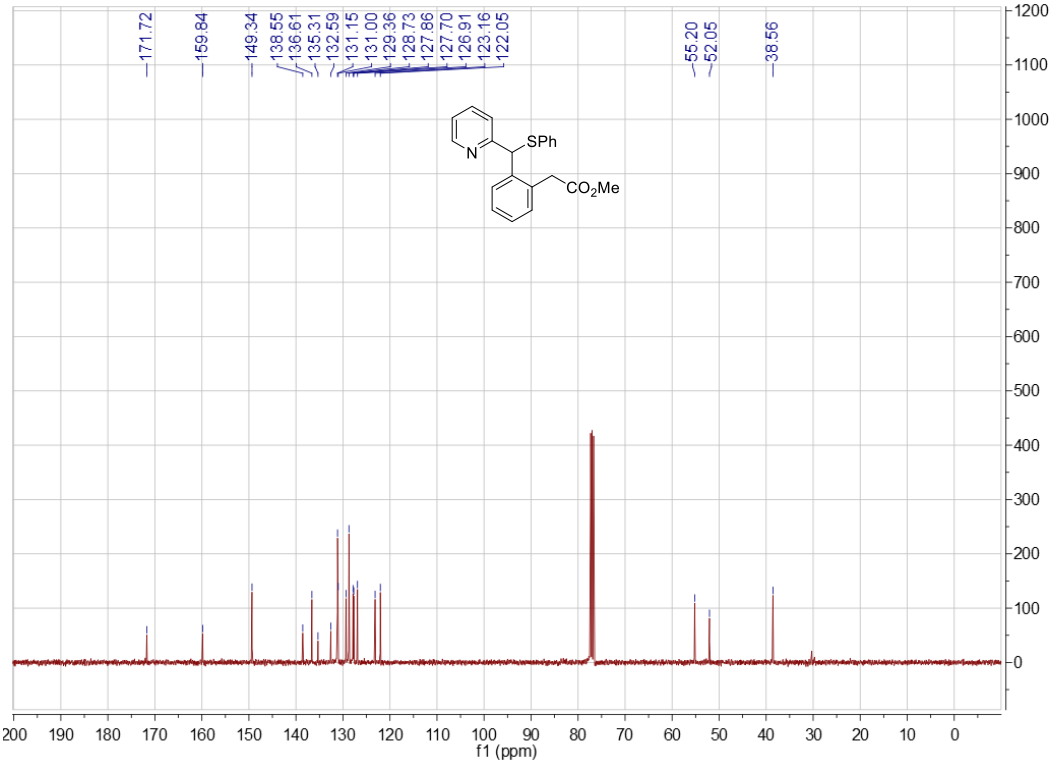
NMR Spectra

methyl 2-(2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (**4aa**)

^{1}H NMR (600 MHz, $CDCl_3$)

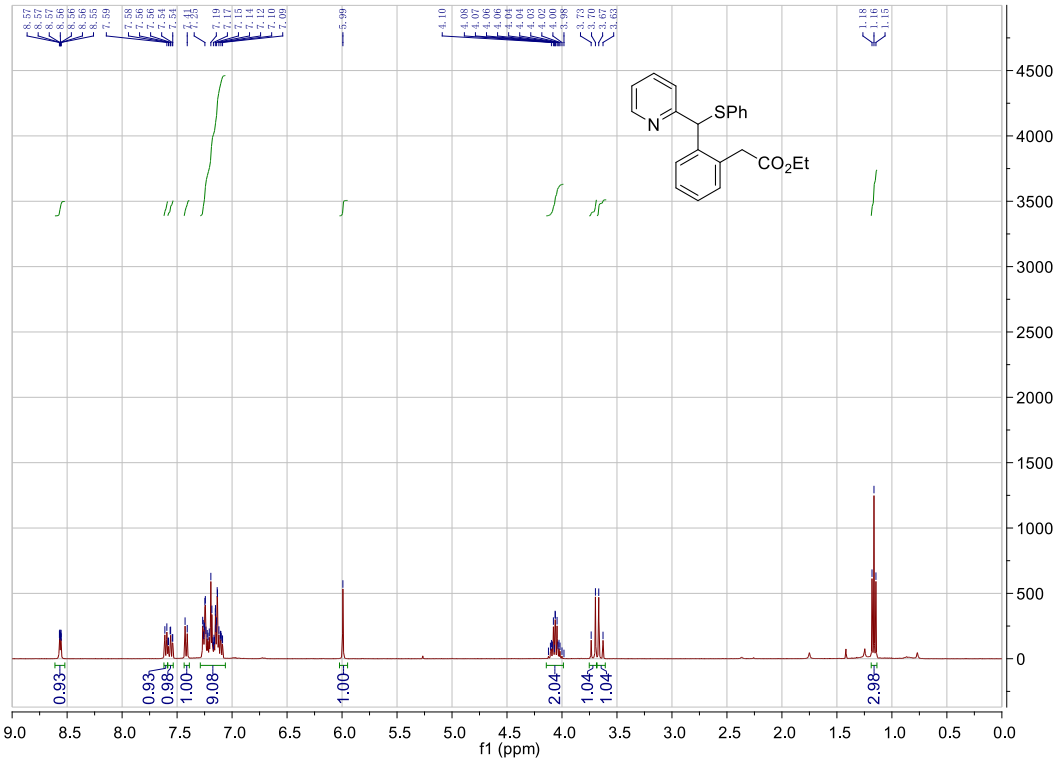


^{13}C NMR (151 MHz, $CDCl_3$)

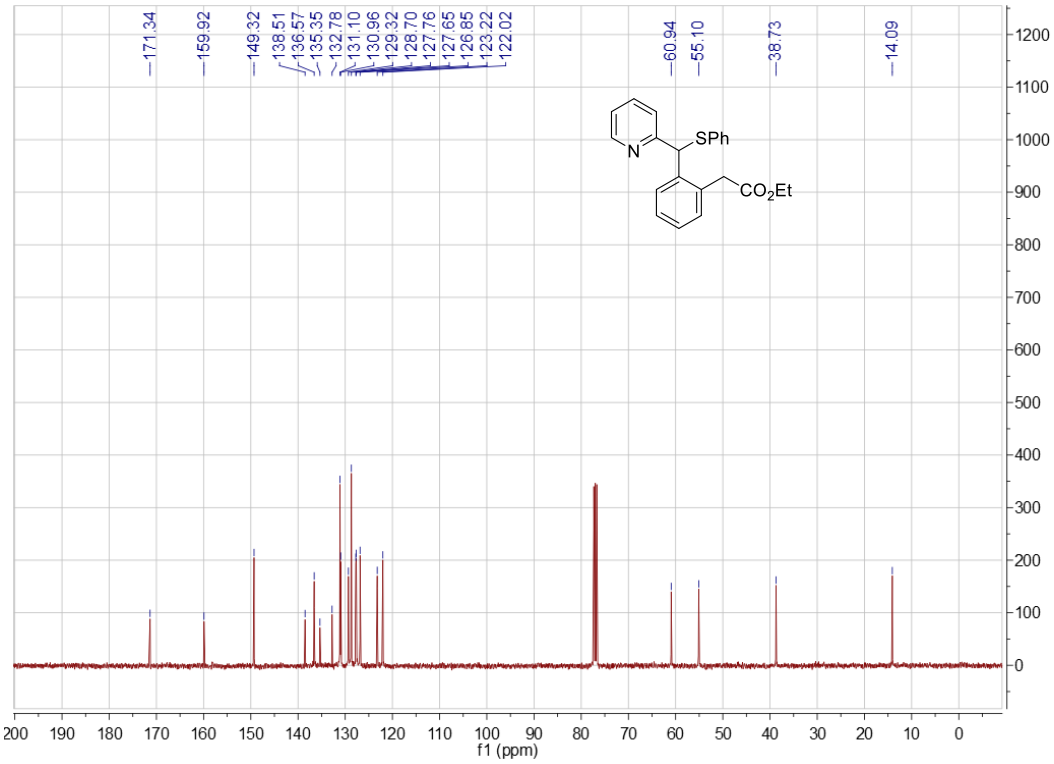


ethyl 2-(2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (**4ab**)

^{1}H NMR (600 MHz, $CDCl_3$)

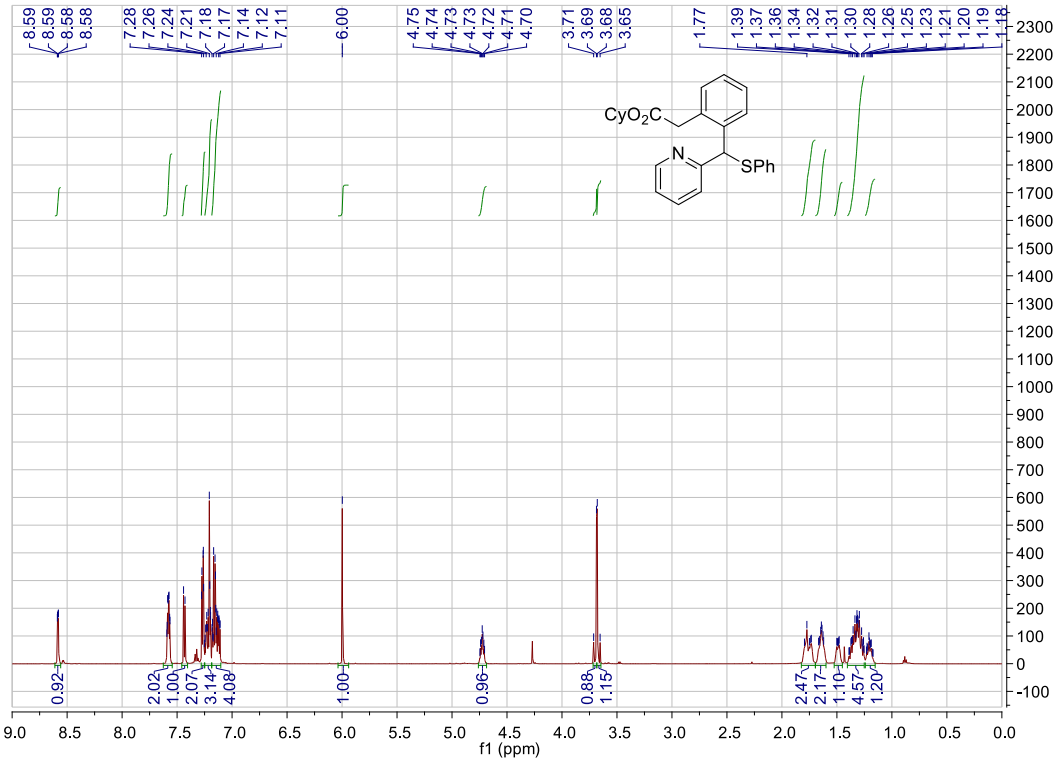


^{13}C NMR (151 MHz, $CDCl_3$)

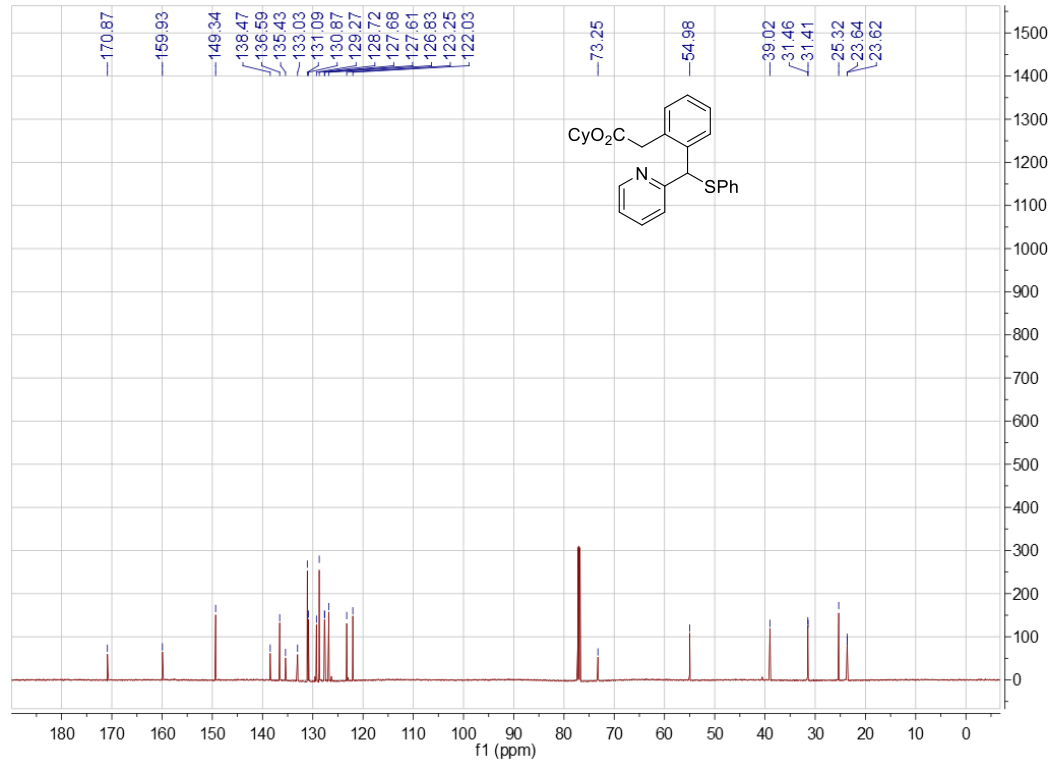


cyclohexyl 2-(2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (**4ac**)

^{1}H NMR (600 MHz, $CDCl_3$)

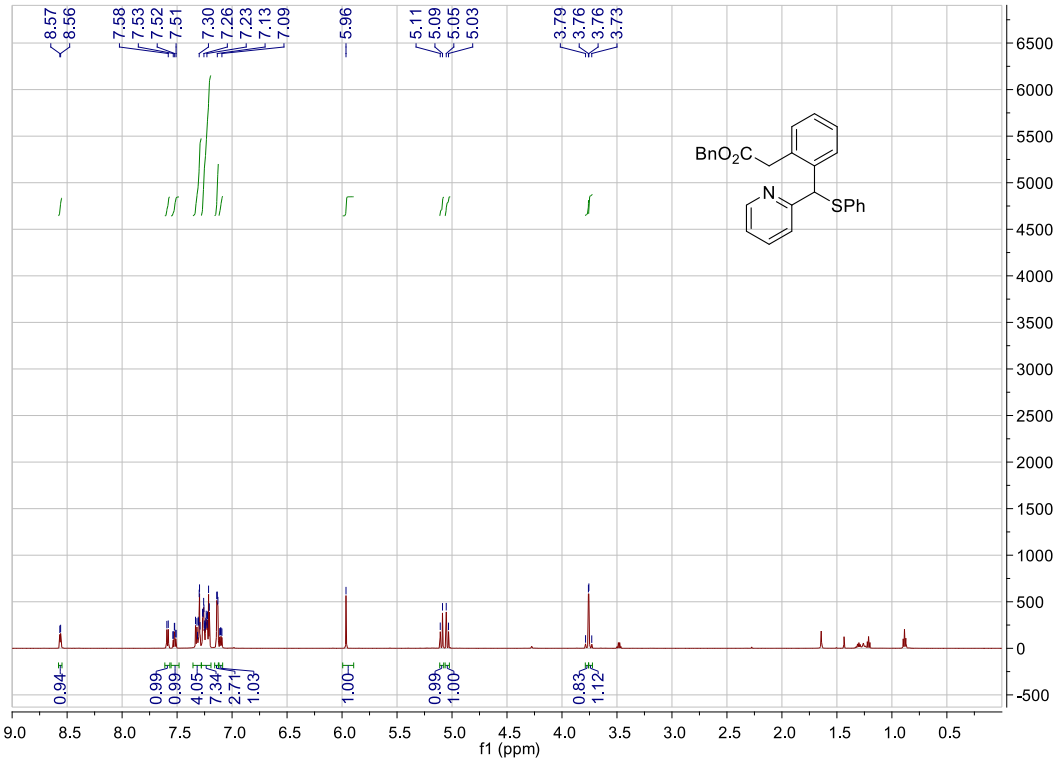


^{13}C NMR (151 MHz, $CDCl_3$)

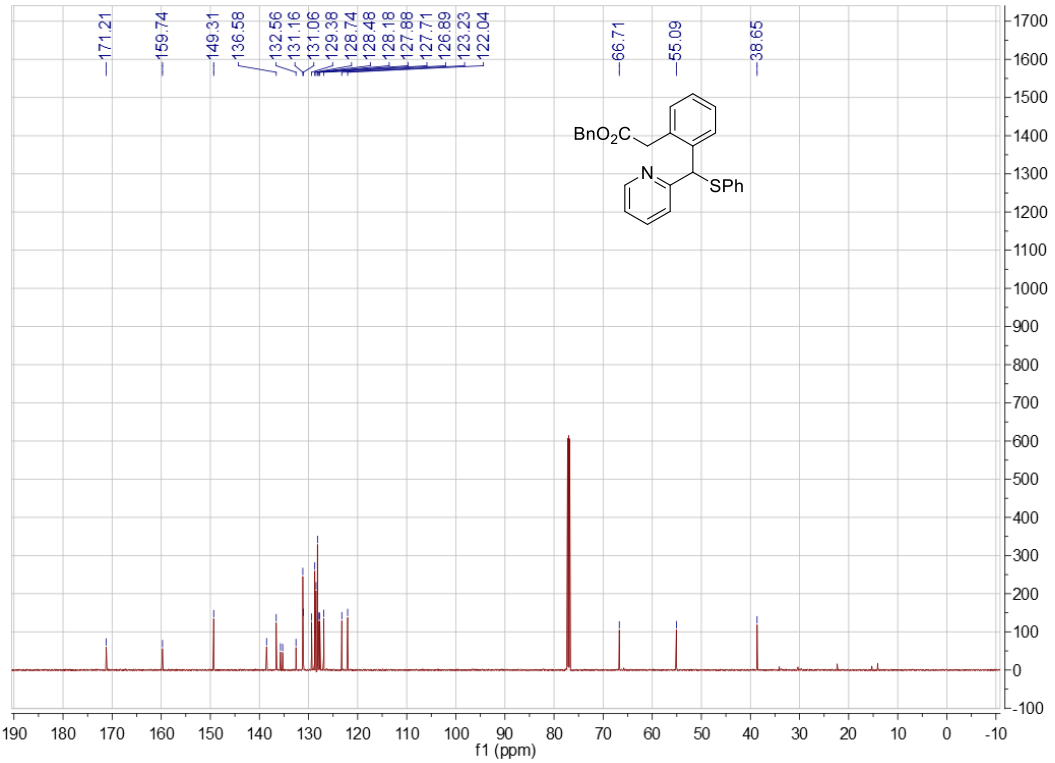


benzyl 2-(2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (**4ad**)

^{1}H NMR (600 MHz, $CDCl_3$)

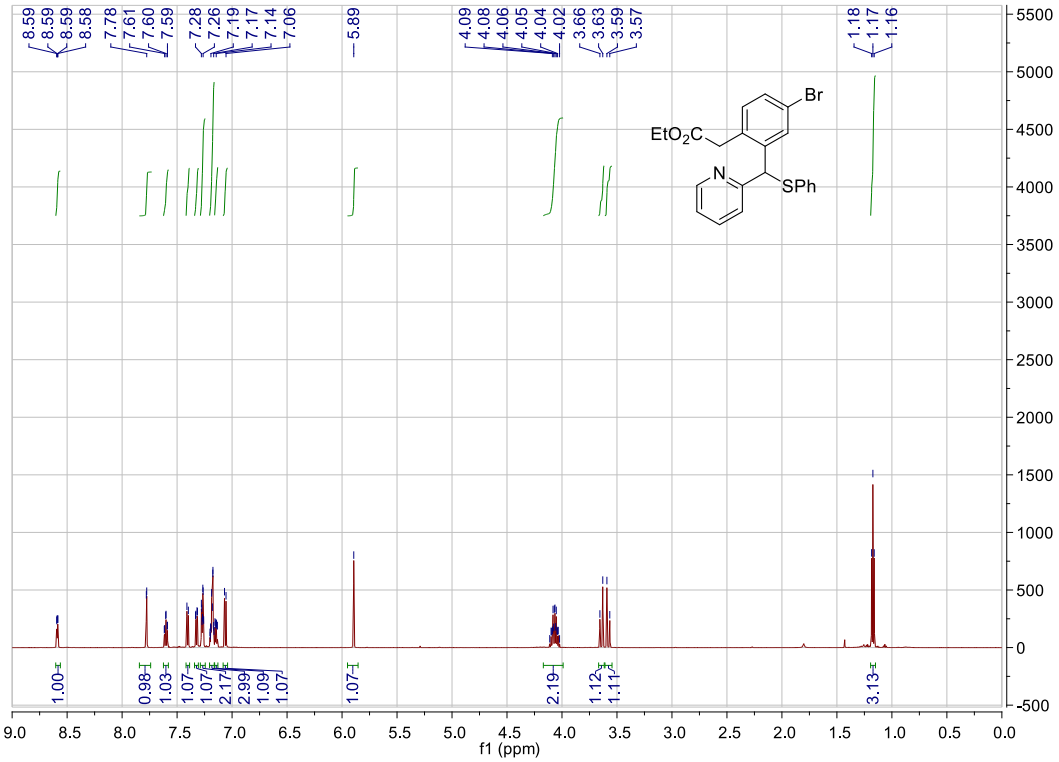


^{13}C NMR (151 MHz, $CDCl_3$)

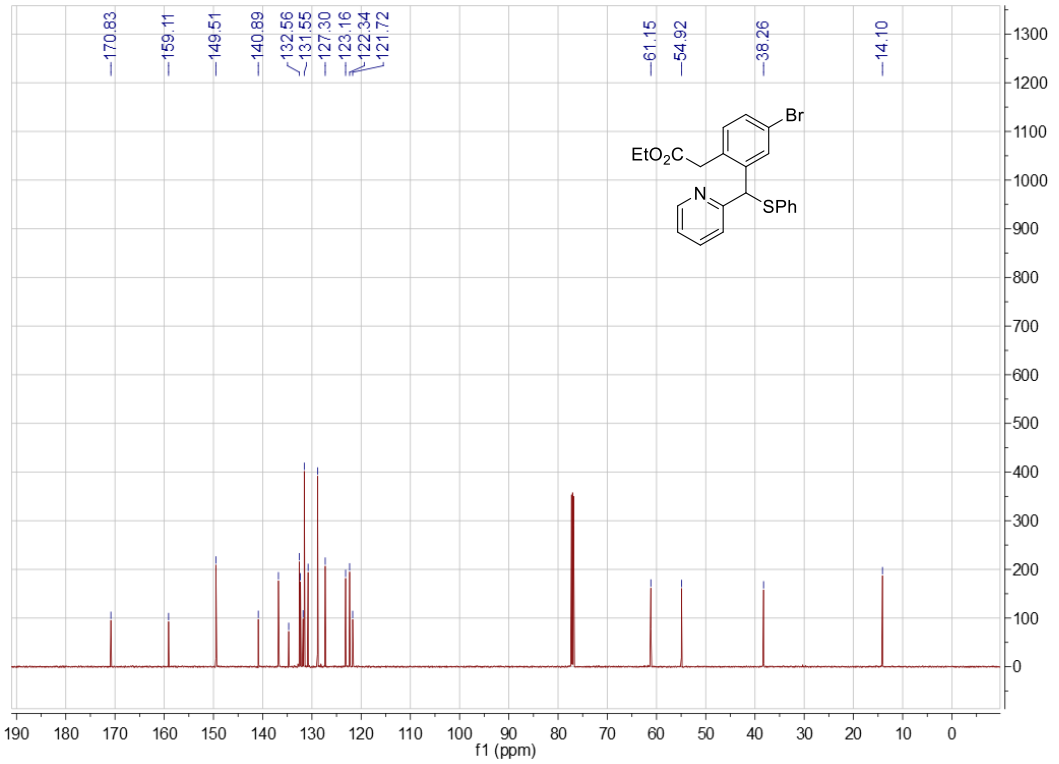


ethyl 2-(4-bromo-2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (**4ae**)

^{1}H NMR (600 MHz, $CDCl_3$)

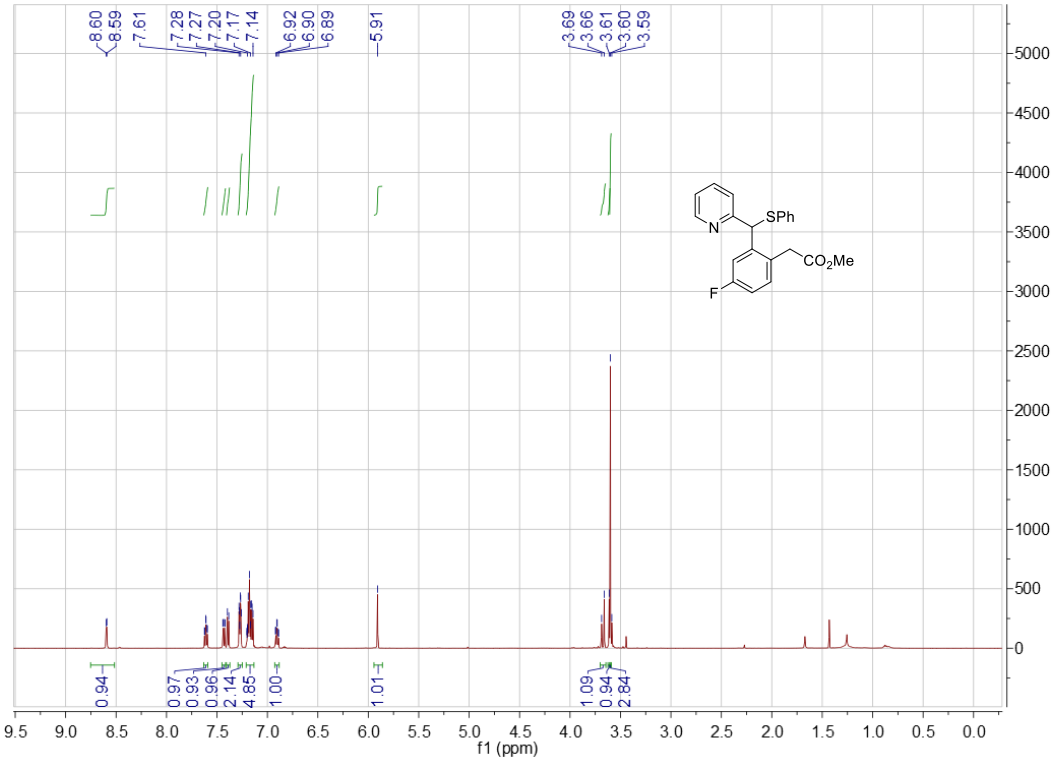


^{13}C NMR (151 MHz, $CDCl_3$)

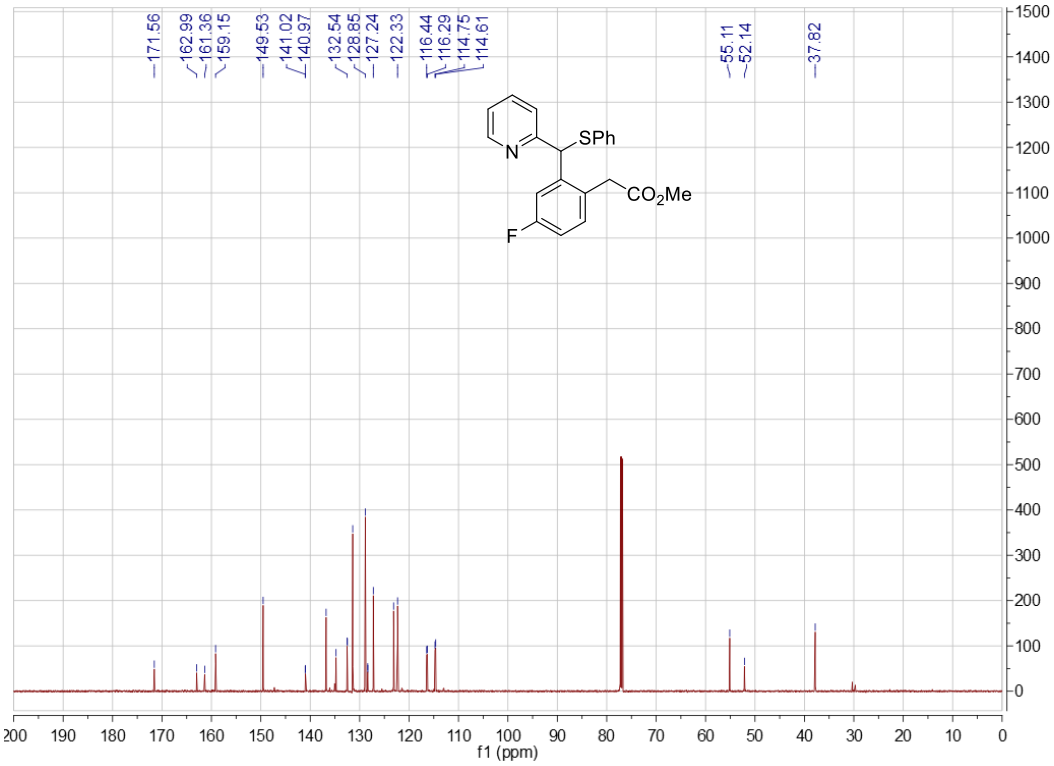


methyl 2-(4-fluoro-2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (**4af**)

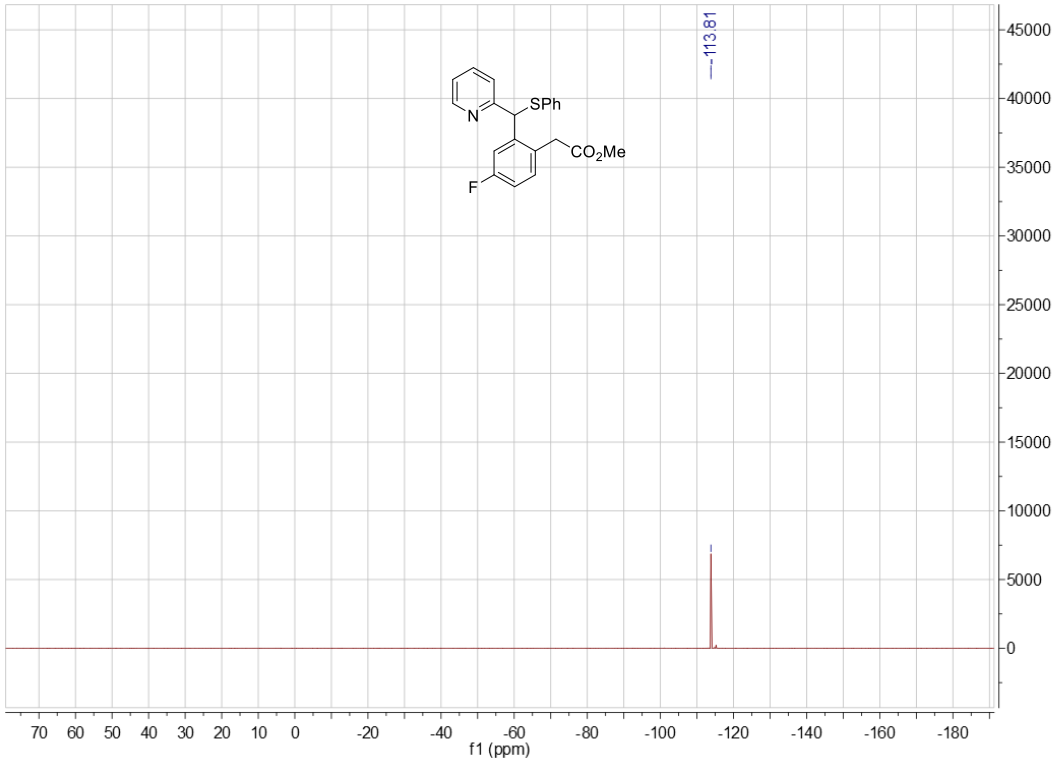
^{1}H NMR (600 MHz, $CDCl_3$)



^{13}C NMR (151 MHz, $CDCl_3$)

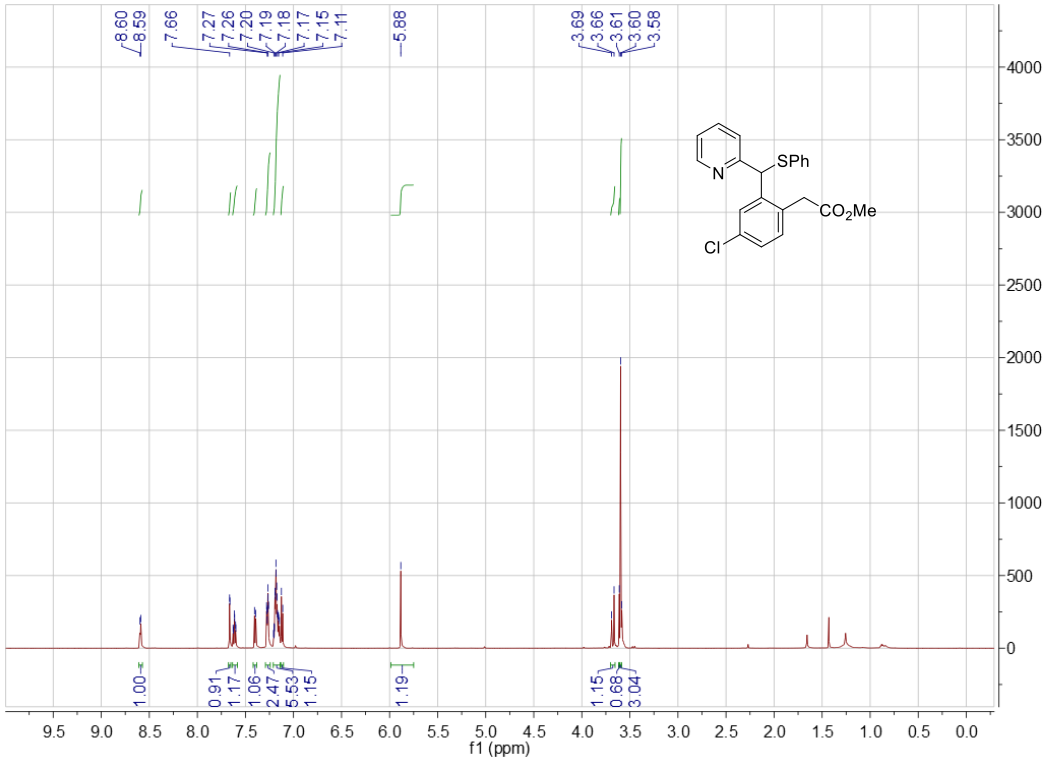


^{19}F NMR (564 MHz, $CDCl_3$)

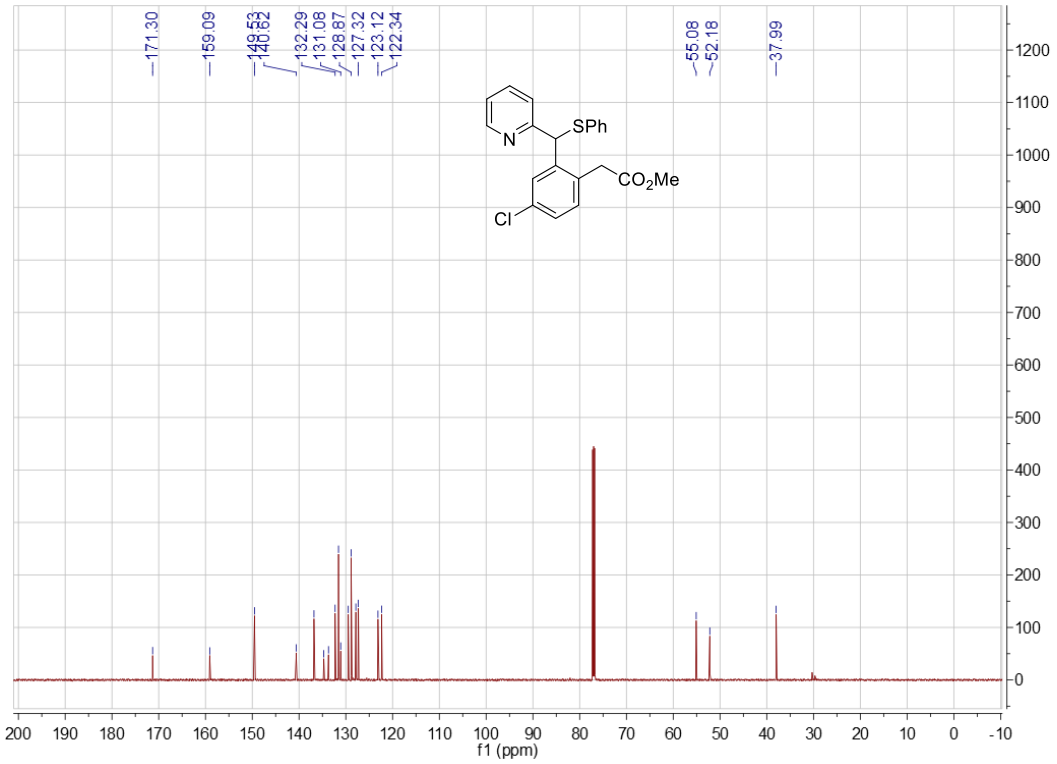


methyl 2-(4-chloro-2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (**4ag**)

^{1}H NMR (600 MHz, $CDCl_3$)

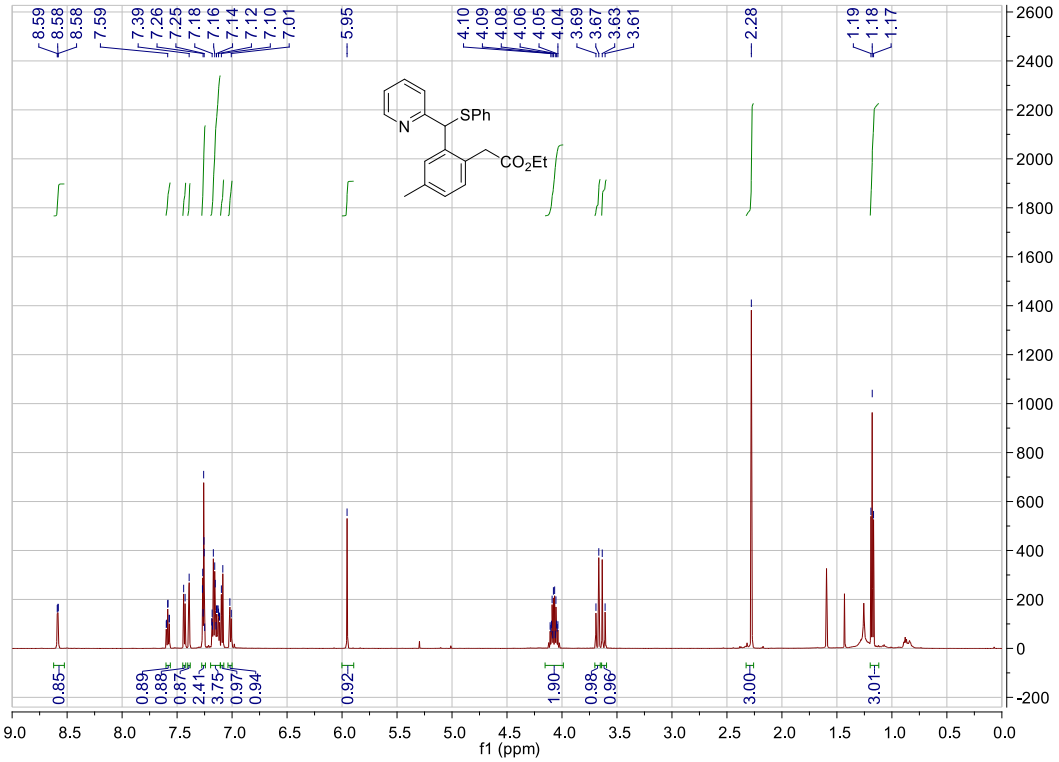


^{13}C NMR (151 MHz, $CDCl_3$)

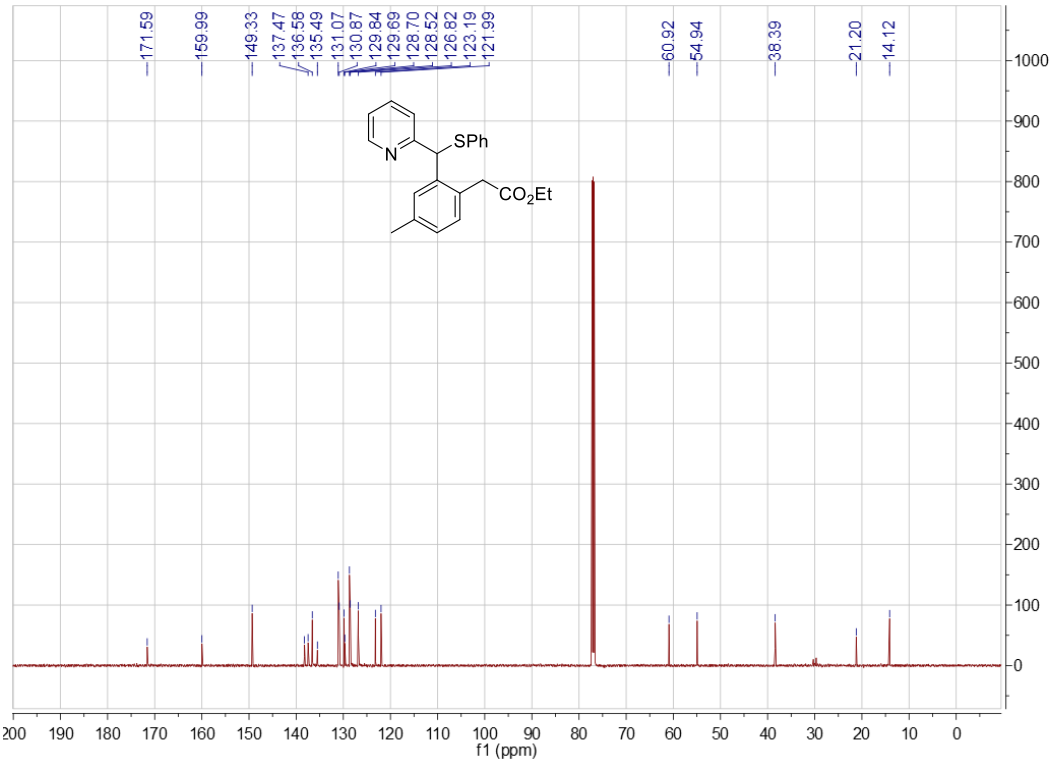


ethyl 2-(4-methyl-2-((phenylthio)(pyridin-2-yl)methyl)phenyl)acetate (**4ah**)

^{1}H NMR (600 MHz, $CDCl_3$)

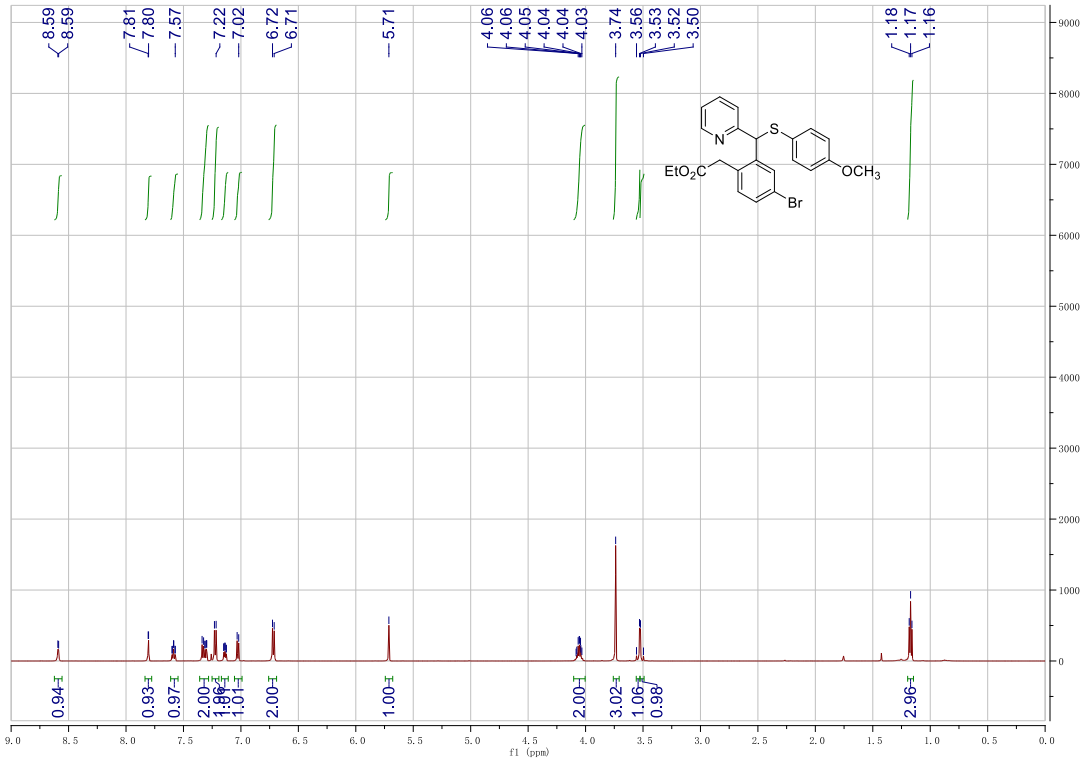


^{13}C NMR (151 MHz, $CDCl_3$)

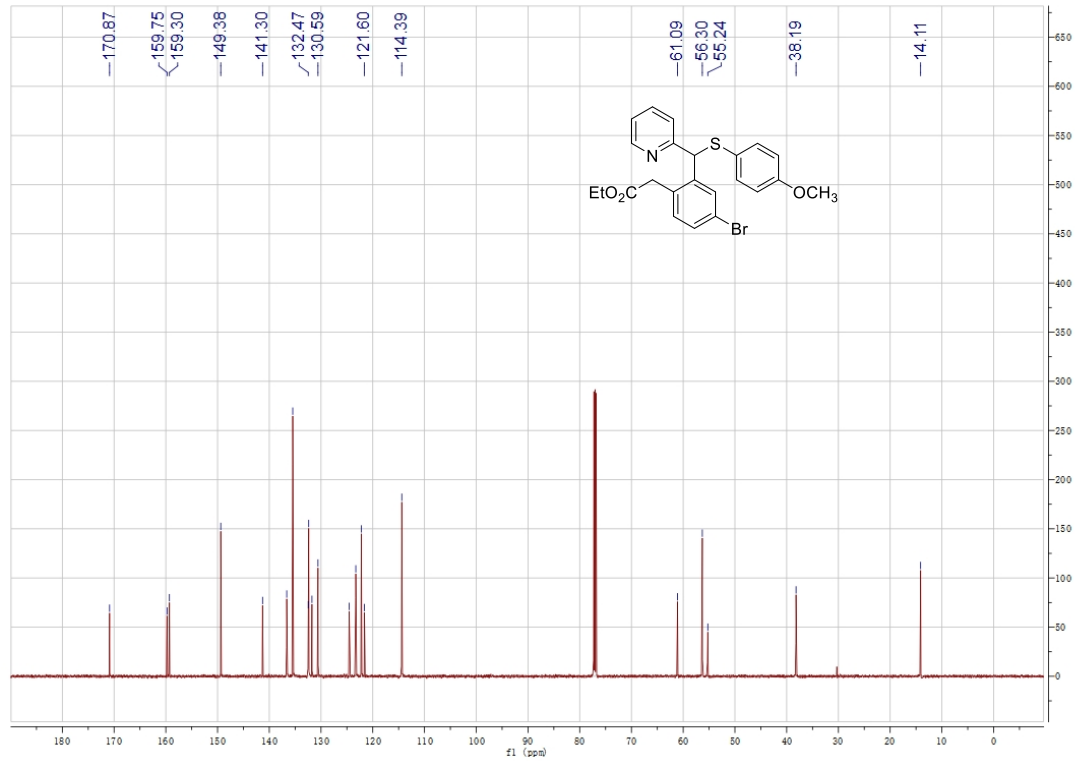


*ethyl 2-(4-bromo-2-(((4-methoxyphenyl)thio)(pyridin-2-yl)methyl)phenyl)acetate (**4ai**)*

^{1}H NMR (600 MHz, $CDCl_3$)

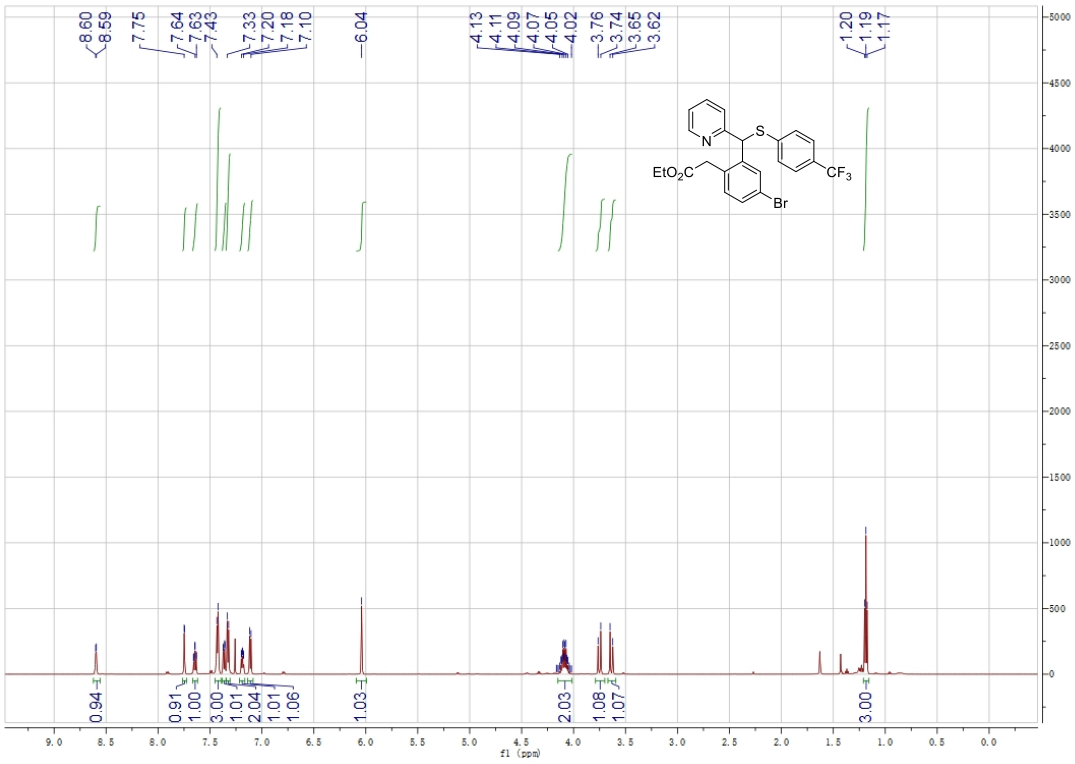


^{13}C NMR (151 MHz, $CDCl_3$)

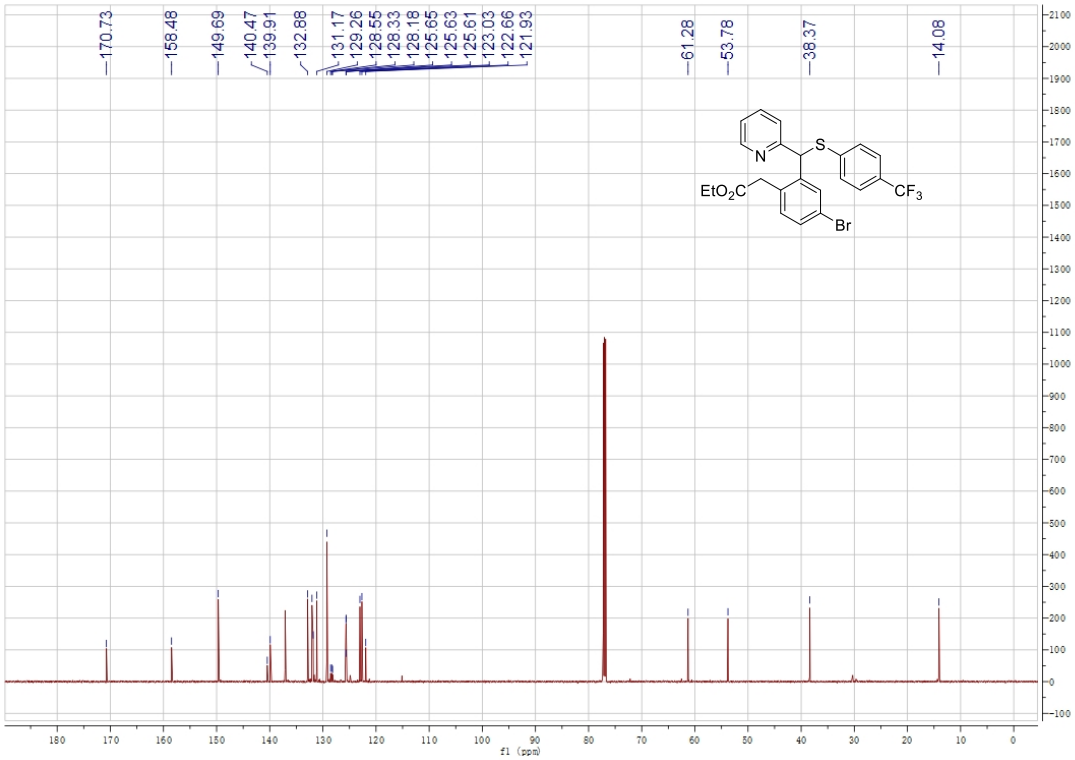


*Ethyl 2-(4-bromo-2-(pyridin-2-yl((4-(trifluoromethyl)phenyl)thio)methyl)phenyl)acetate (**4aj**)*

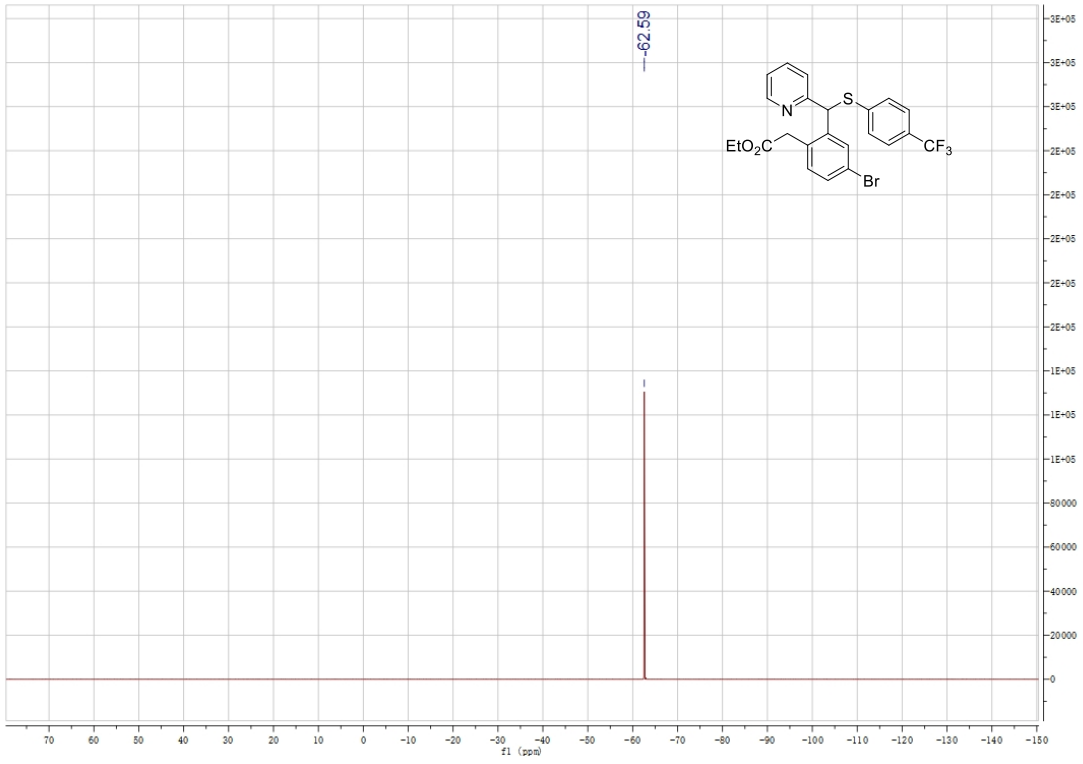
^{1}H NMR (600 MHz, $CDCl_3$)



^{13}C NMR (151 MHz, $CDCl_3$)

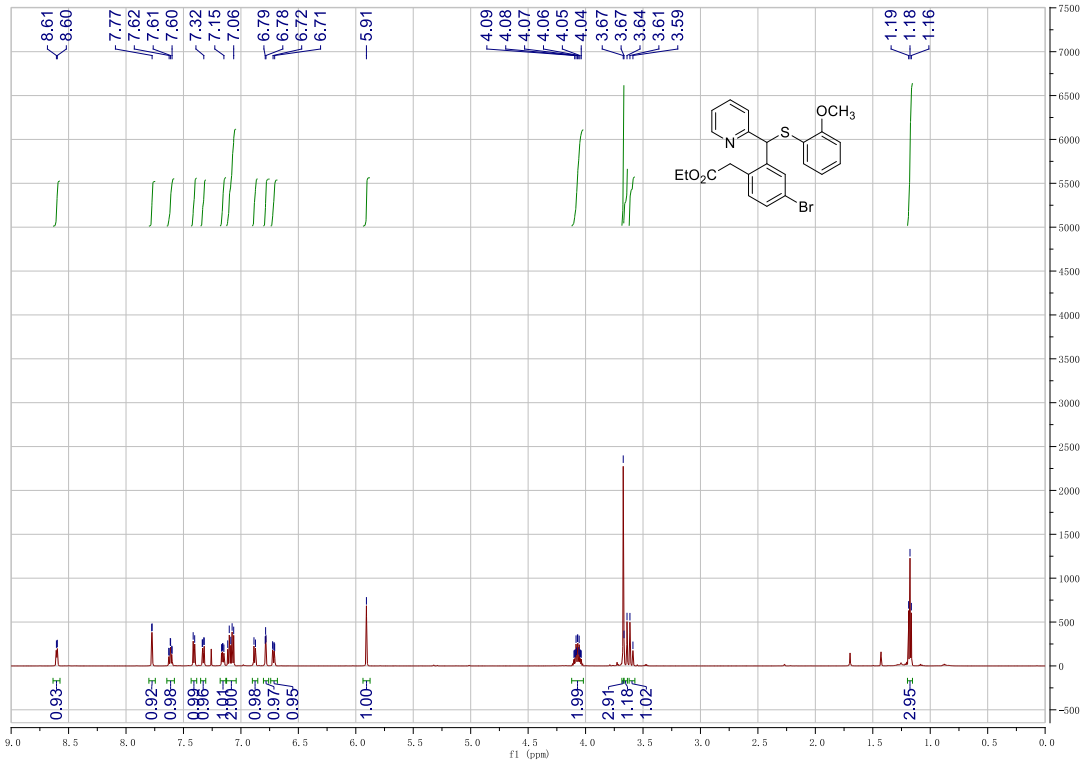


^{19}F NMR (564 MHz, $CDCl_3$)

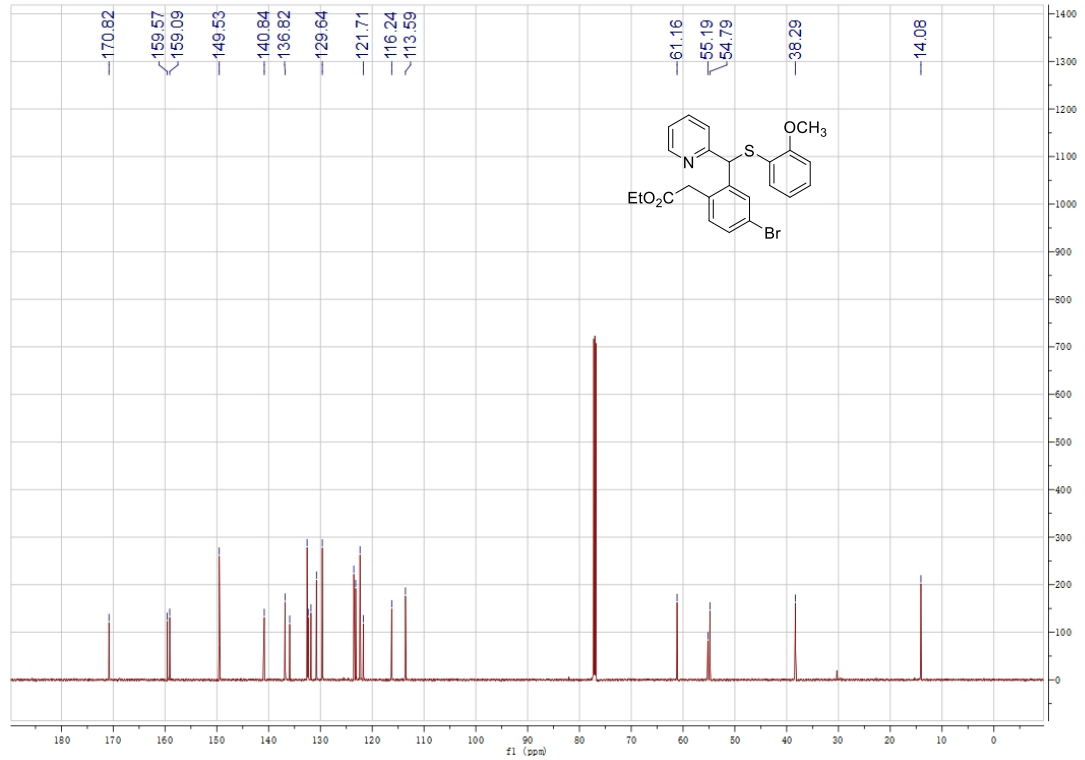


ethyl 2-(4-bromo-2-(((2-methoxyphenyl)thio)(pyridin-2-yl)methyl)phenyl)acetate ***(4am)***

^{1}H NMR (600 MHz, $CDCl_3$)

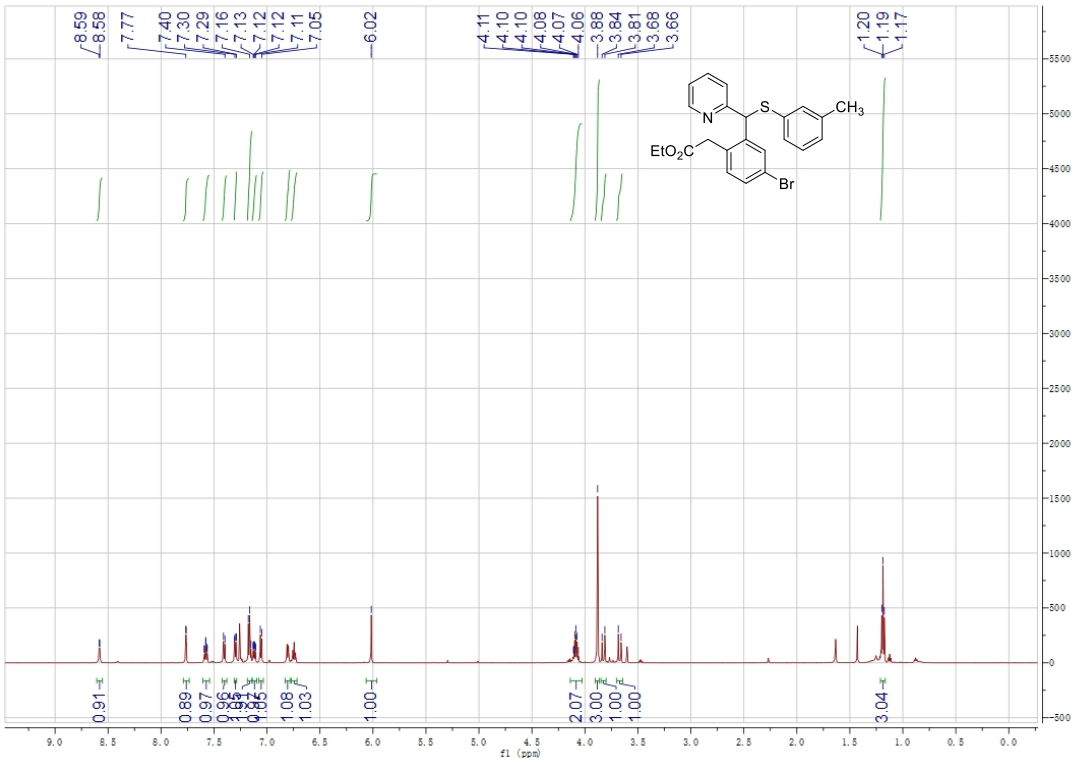


^{13}C NMR (151 MHz, $CDCl_3$)

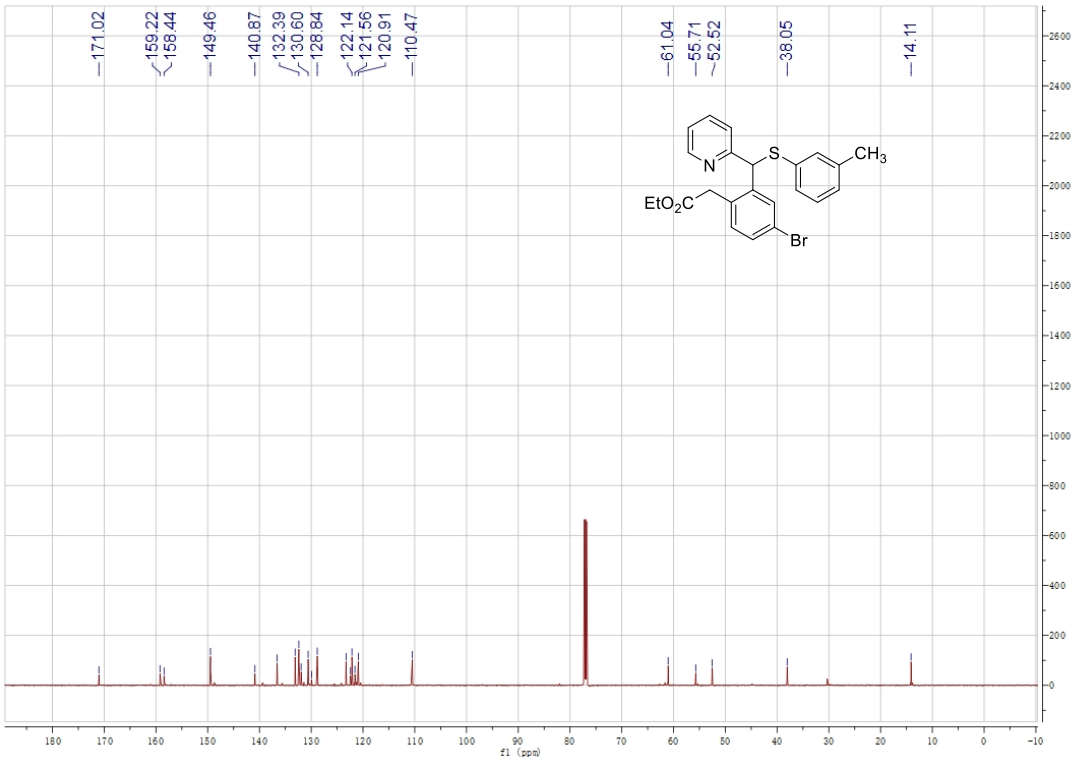


*ethyl 2-(4-bromo-2-(pyridin-2-yl(m-tolylthio)methyl)phenyl)acetate (**4ao**)*

^{1}H NMR (600 MHz, $CDCl_3$)

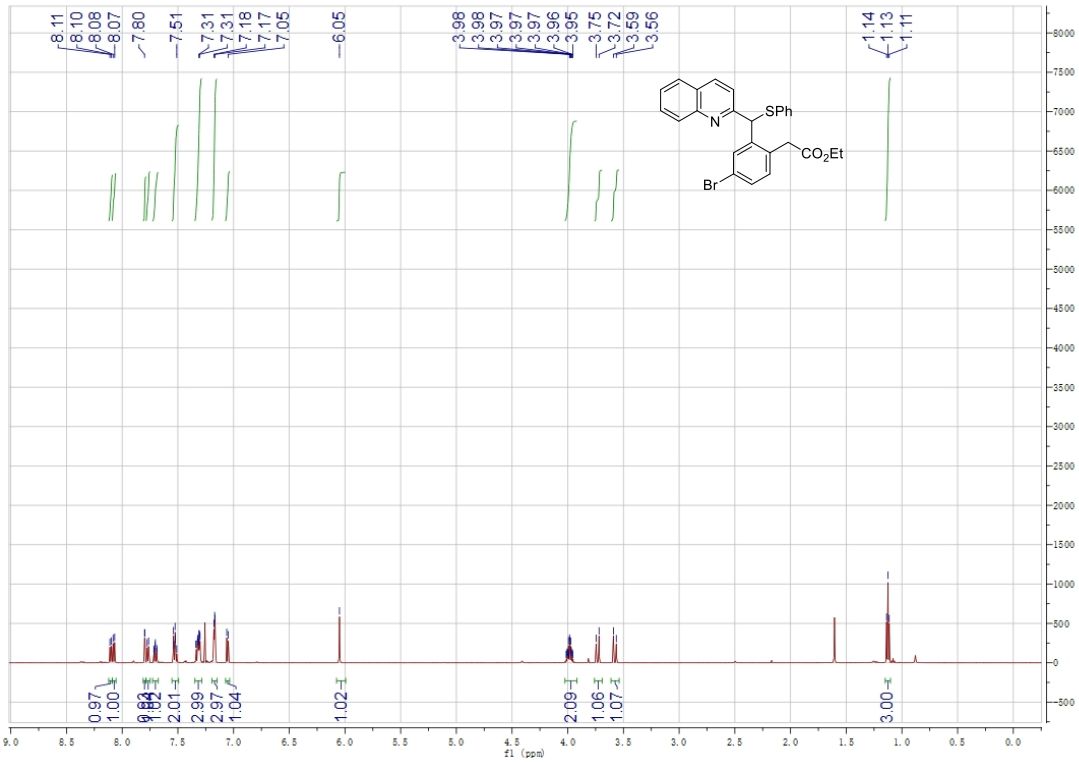


^{13}C NMR (151 MHz, $CDCl_3$)

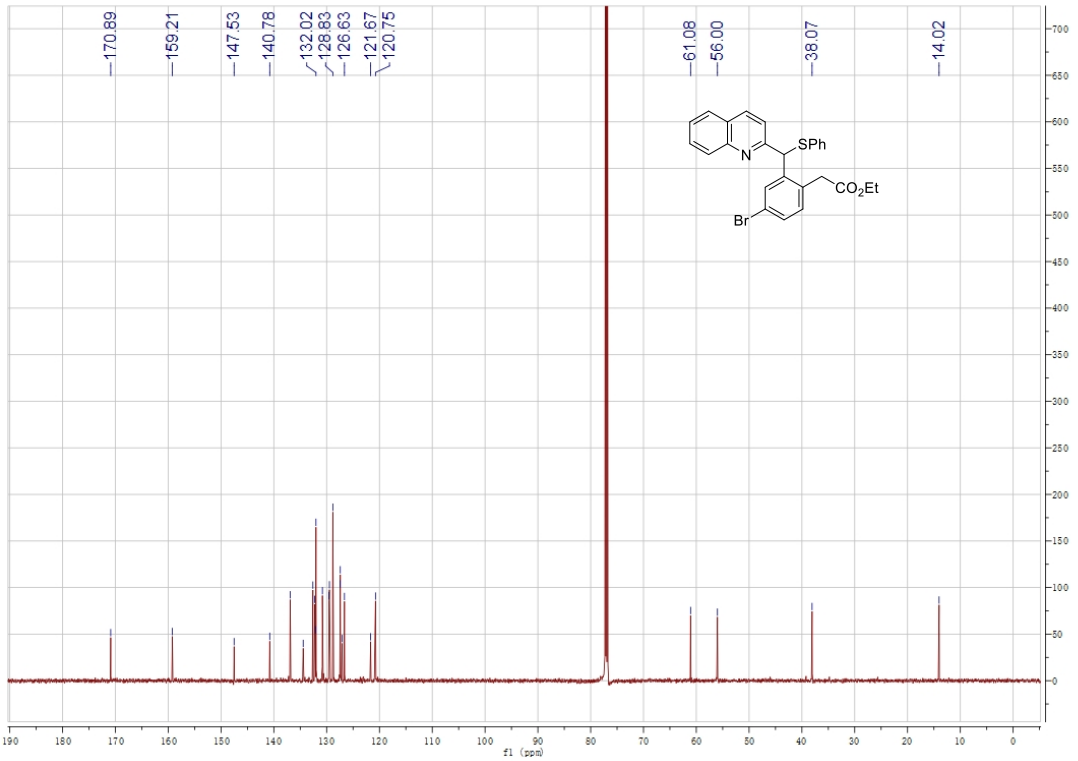


ethyl 2-(4-bromo-2-((phenylthio)(quinolin-2-yl)methyl)phenyl)acetate ***(4ap)***

^{1}H NMR (600 MHz, $CDCl_3$)

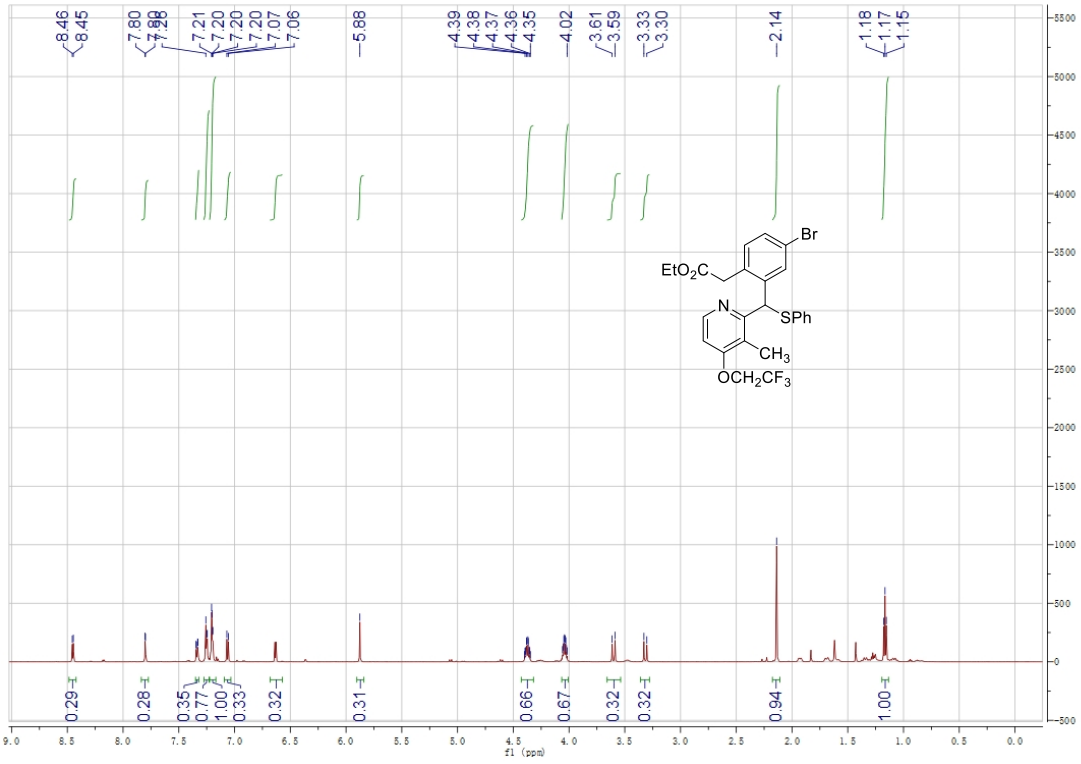


^{13}C NMR (151 MHz, $CDCl_3$)

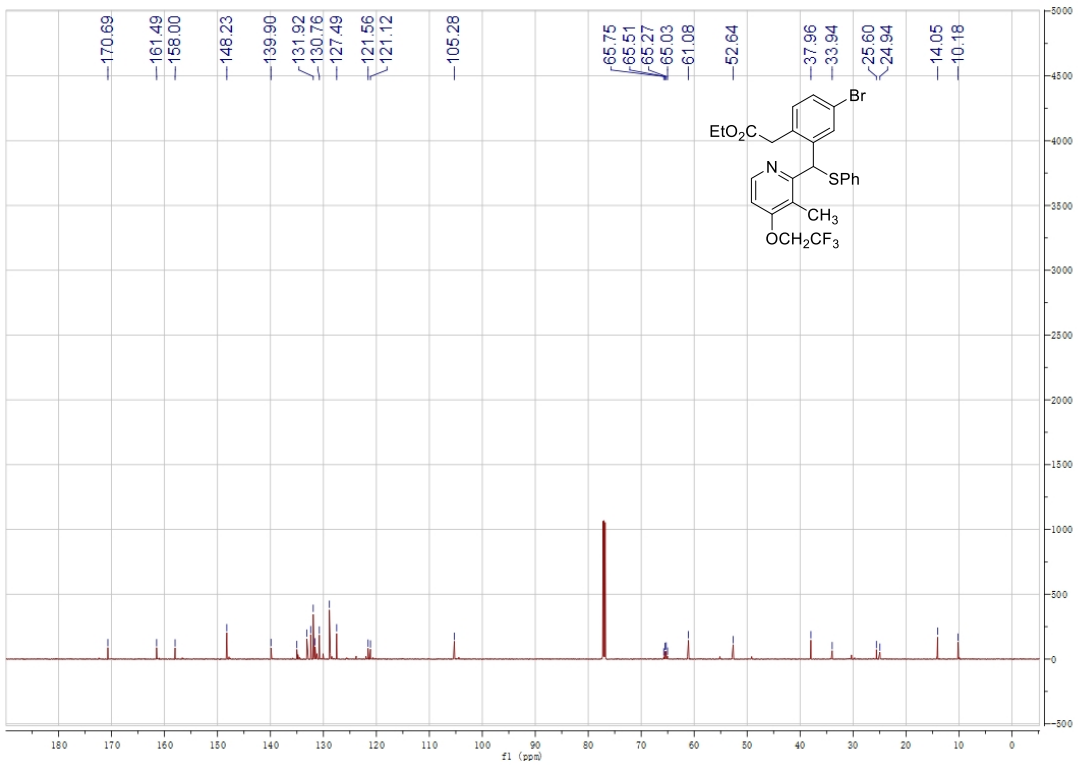


Ethyl 2-(4-bromo-2-((3-methyl-4-(2,2,2-trifluoroethoxy)pyridin-2-yl)(phenylthio)methyl)phenyl)acetate (**4aq**)

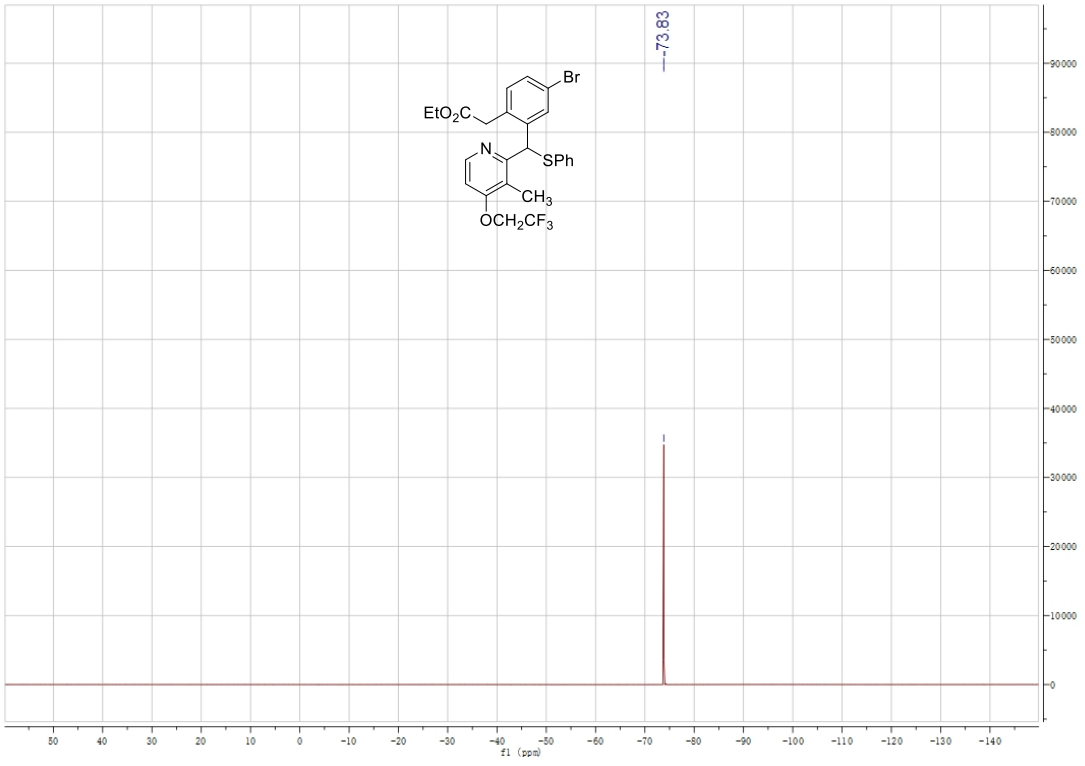
^{1}H NMR (600 MHz, $CDCl_3$)



^{13}C NMR (151 MHz, $CDCl_3$)

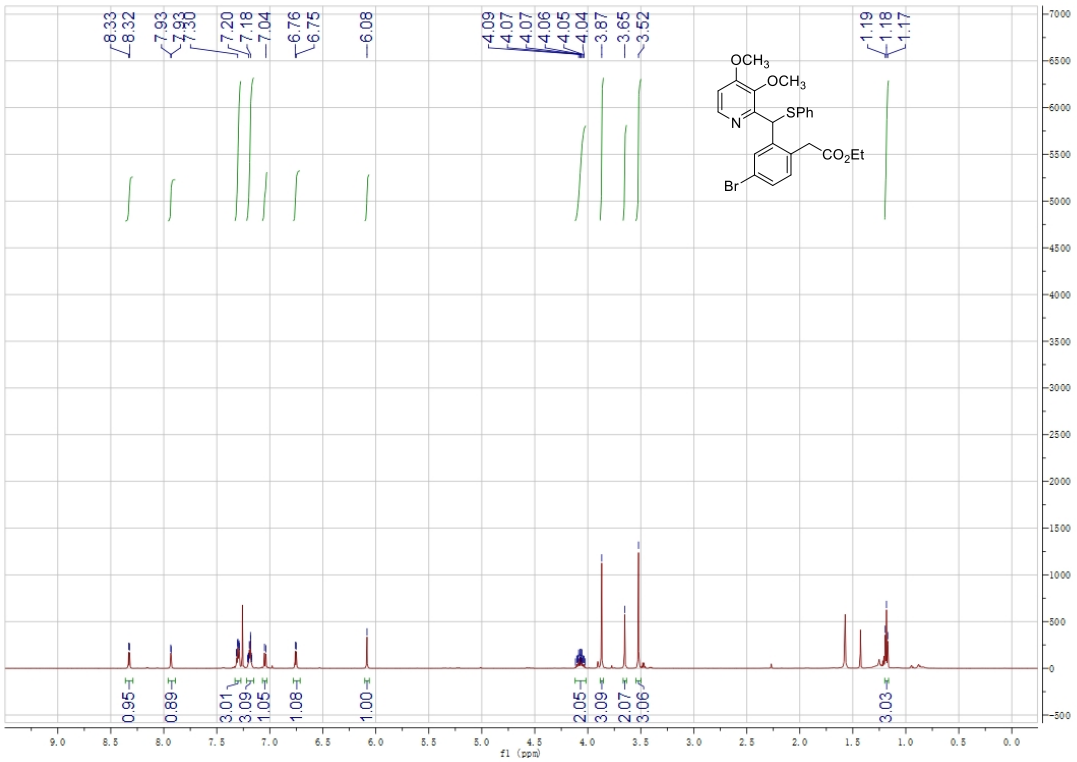


^{19}F NMR (564 MHz, $CDCl_3$)

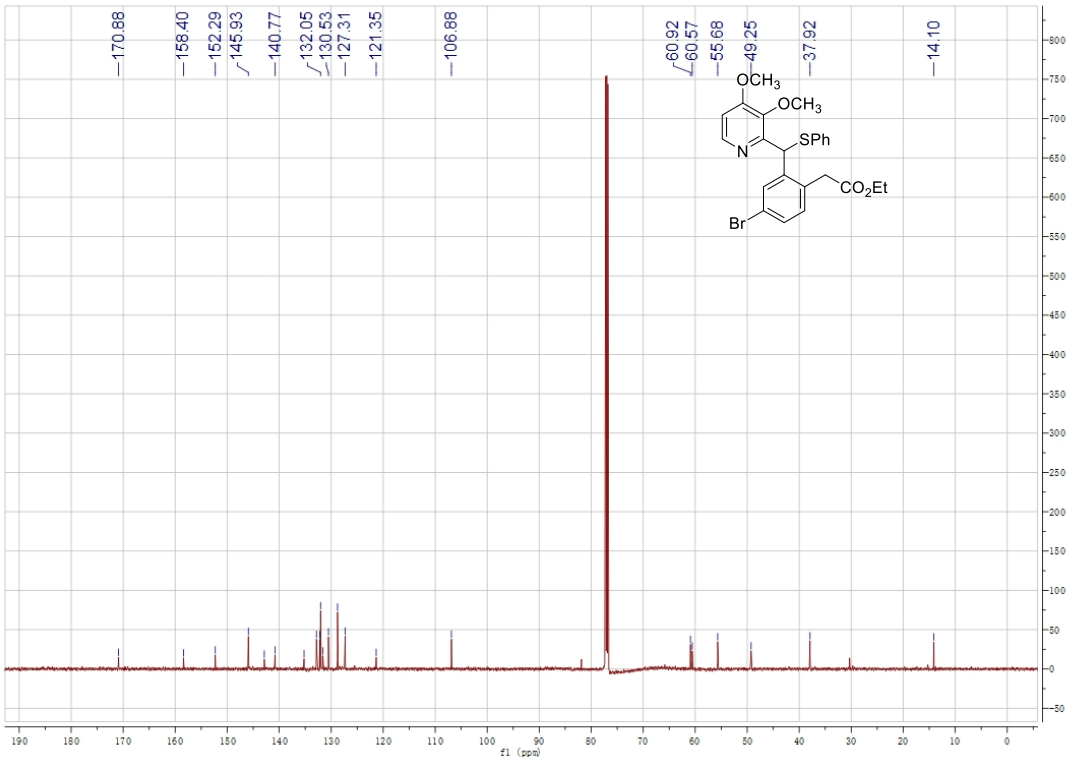


methyl 2-(4-bromo-2-((3,4-dimethoxypyridin-2-yl)(phenylthio)methyl)phenyl)acetate ***(4ar)***

^{1}H NMR (600 MHz, $CDCl_3$)

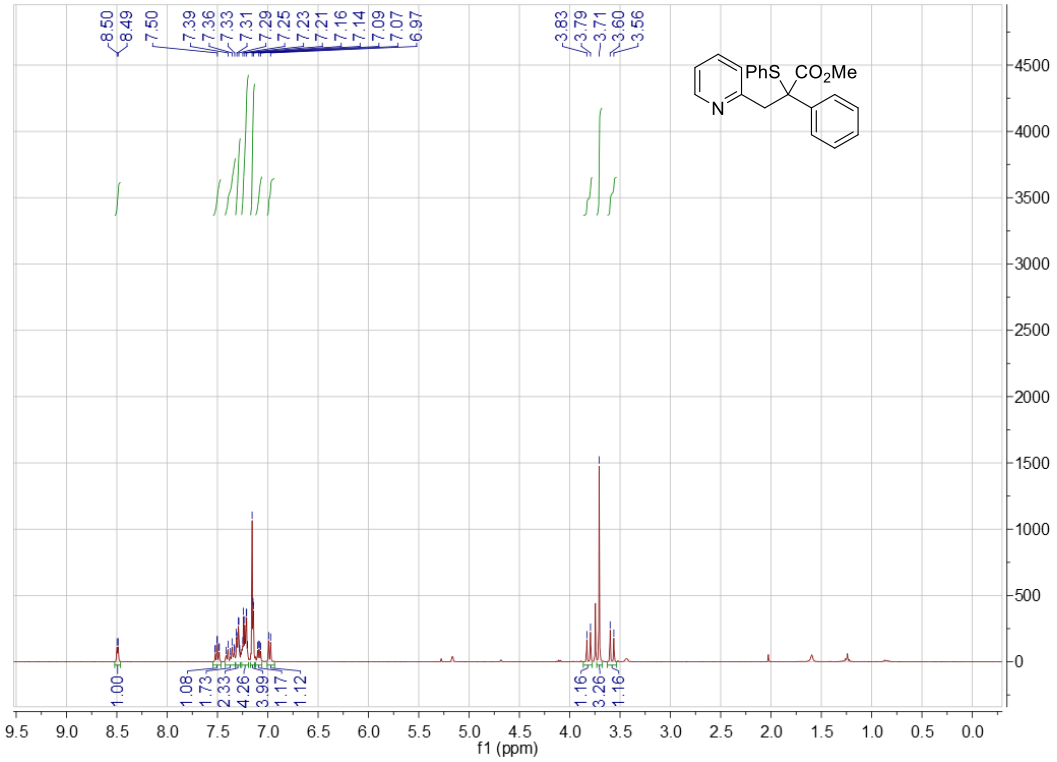


^{13}C NMR (151 MHz, $CDCl_3$)

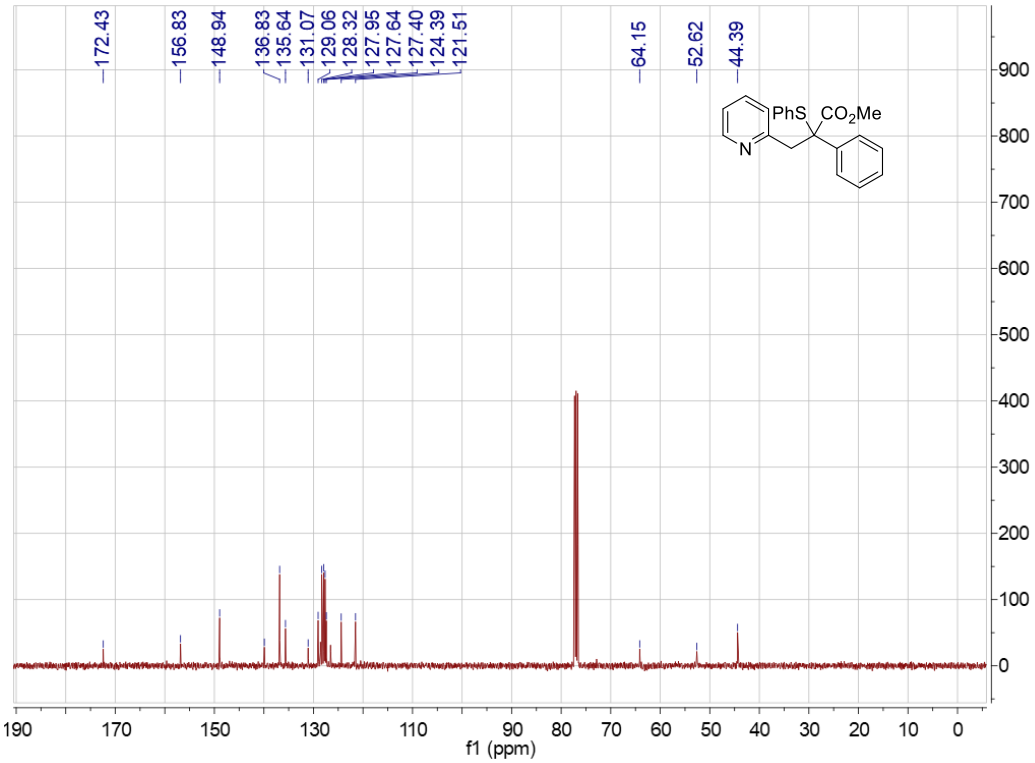


methyl 2-phenyl-2-(phenylthio)-3-(pyridin-2-yl)propanoate (**3aa**)

^{1}H NMR (600 MHz, $CDCl_3$)

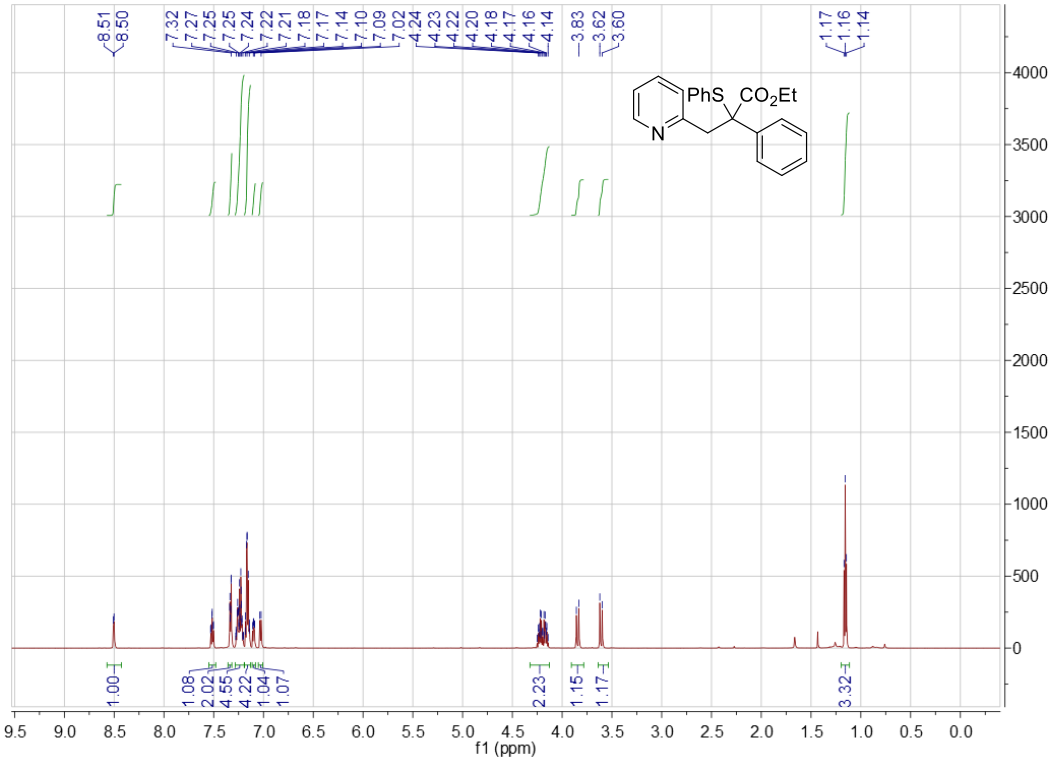


^{13}C NMR (151 MHz, $CDCl_3$)

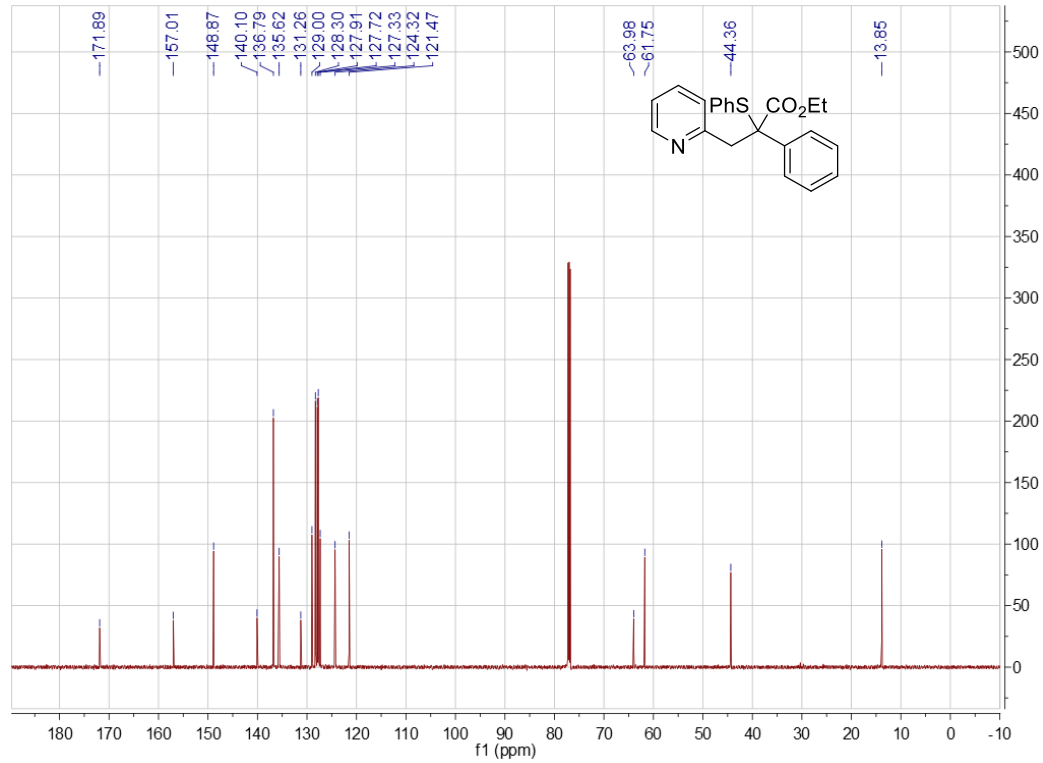


ethyl 2-phenyl-2-(phenylthio)-3-(pyridin-2-yl)propanoate (**3ab**)

^{1}H NMR (600 MHz, $CDCl_3$)

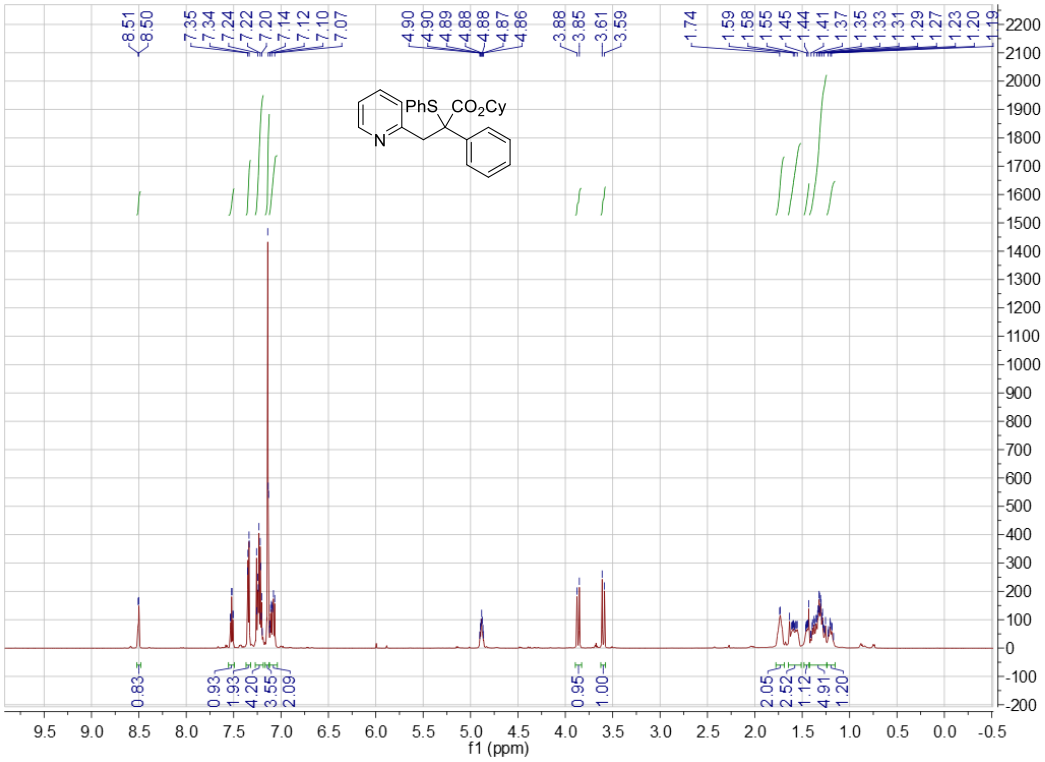


^{13}C NMR (151 MHz, $CDCl_3$)

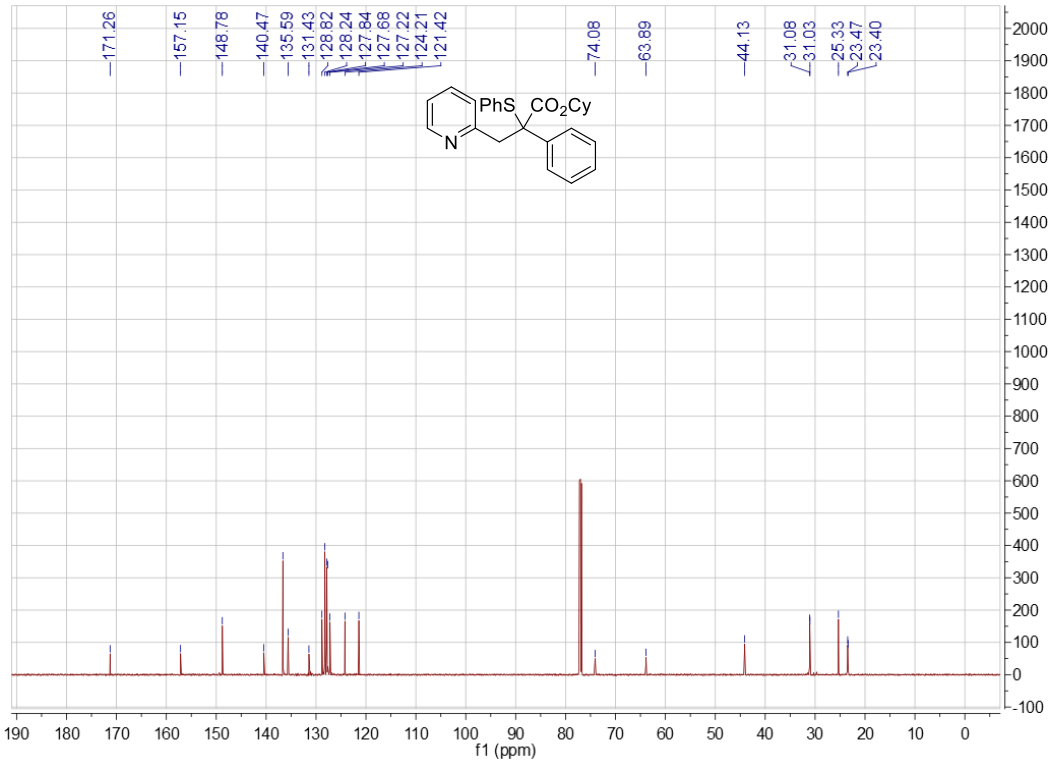


cyclohexyl 2-phenyl-2-(phenylthio)-3-(pyridin-2-yl)propanoate (**3ac**)

^{1}H NMR (600 MHz, $CDCl_3$)

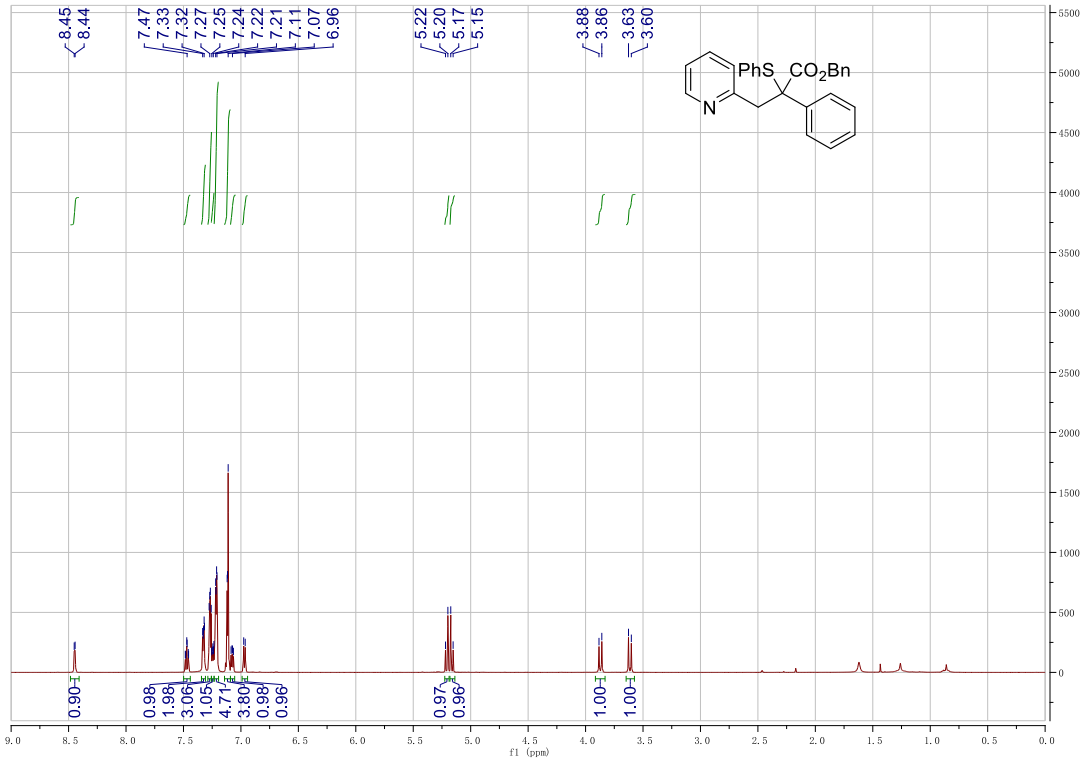


^{13}C NMR (151 MHz, $CDCl_3$)

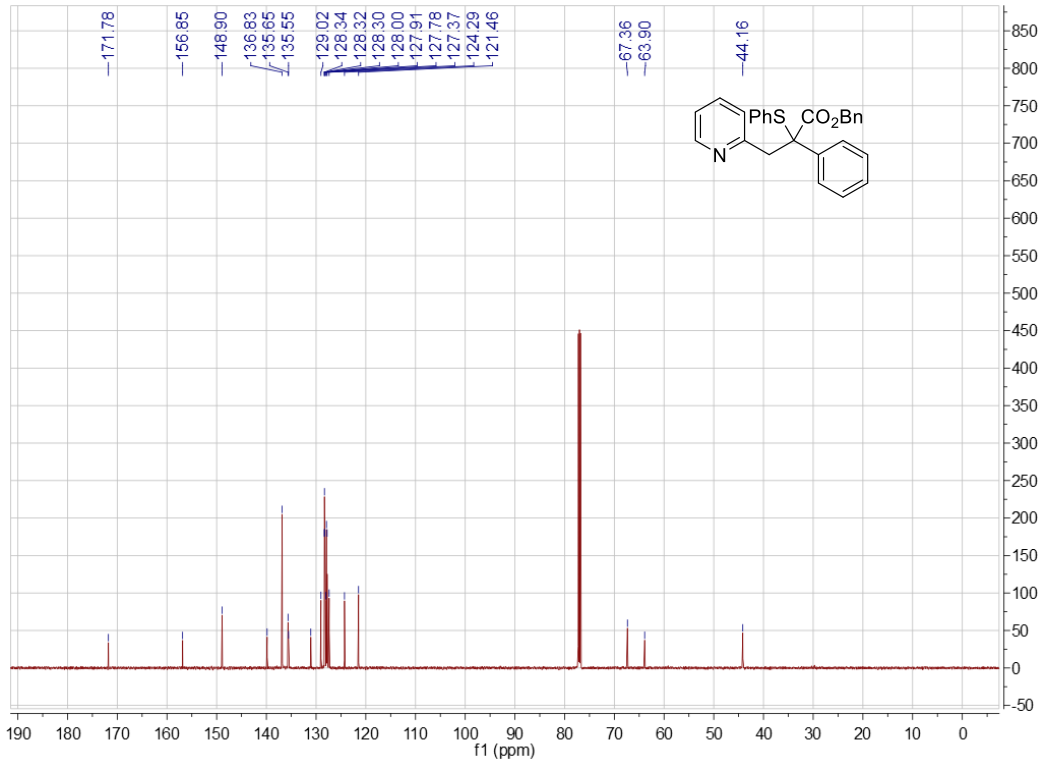


benzyl 2-phenyl-2-(phenylthio)-3-(pyridin-2-yl)propanoate (**3ad**)

^{1}H NMR (600 MHz, $CDCl_3$)

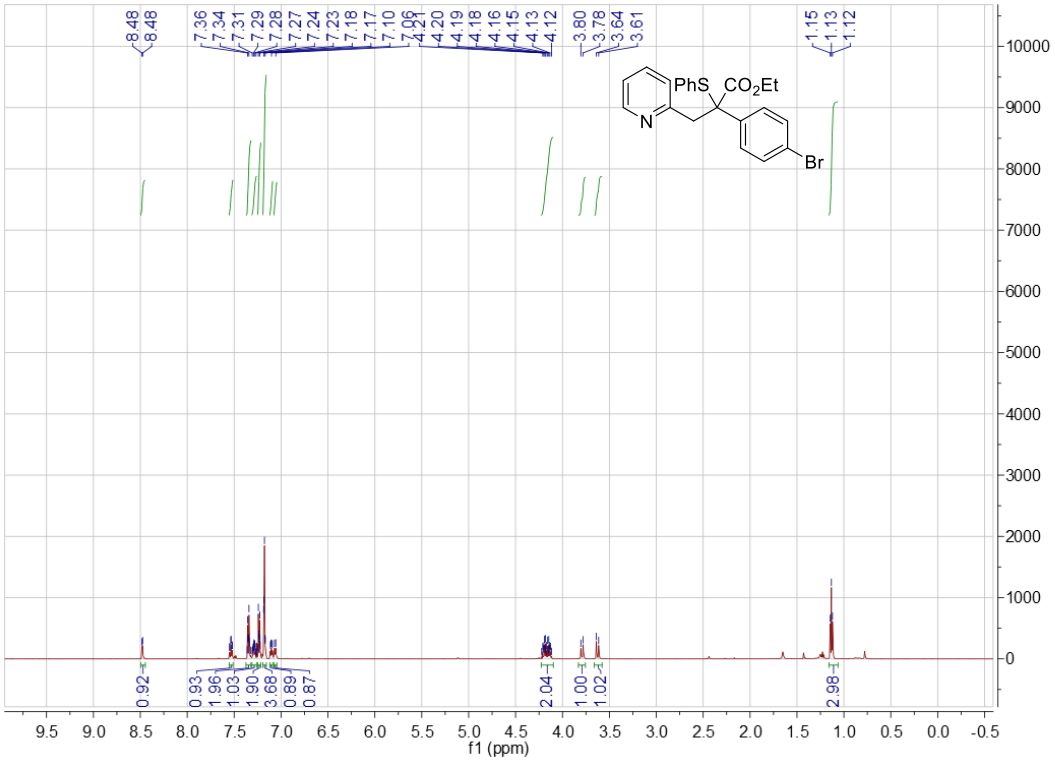


^{13}C NMR (151 MHz, $CDCl_3$)

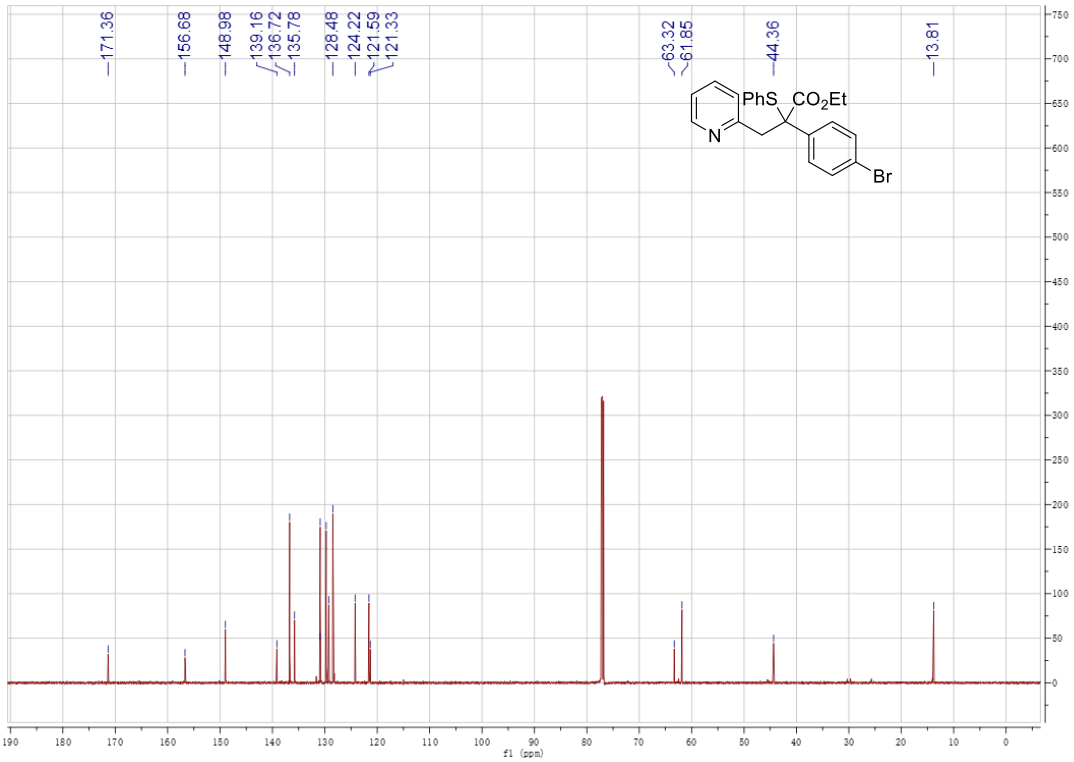


ethyl 2-(4-bromophenyl)-2-(phenylthio)-3-(pyridin-2-yl)propanoate (**3ae**)

^{1}H NMR (600 MHz, $CDCl_3$)

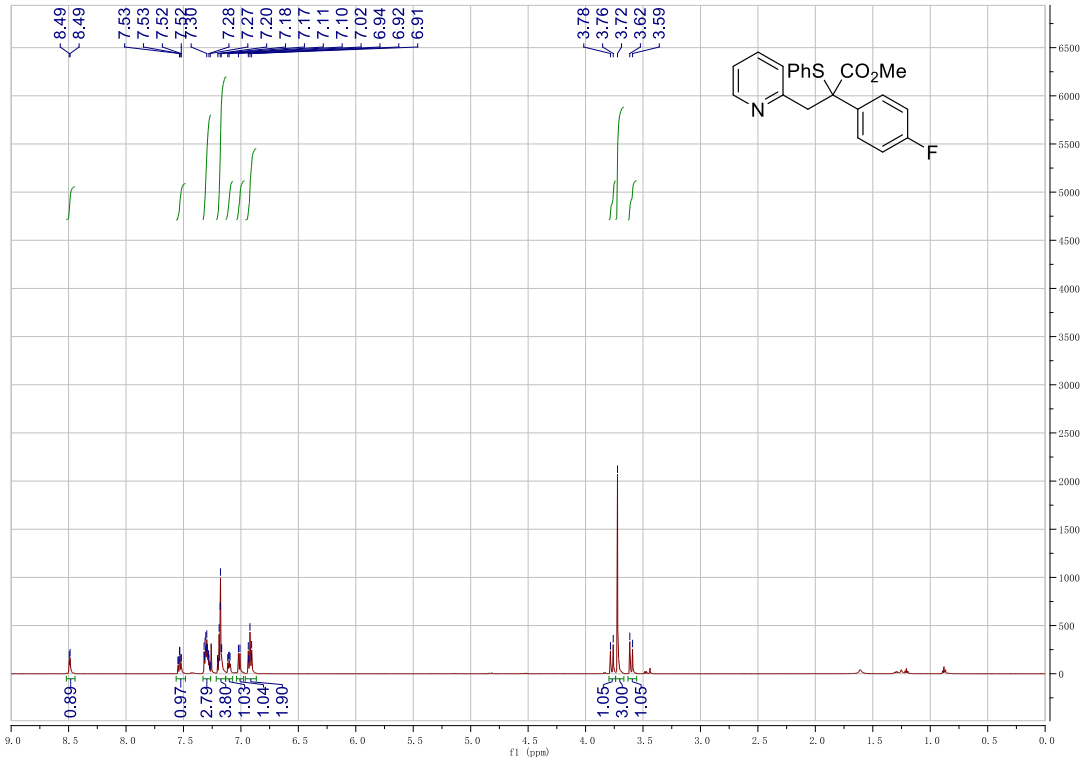


^{13}C NMR (151 MHz, $CDCl_3$)

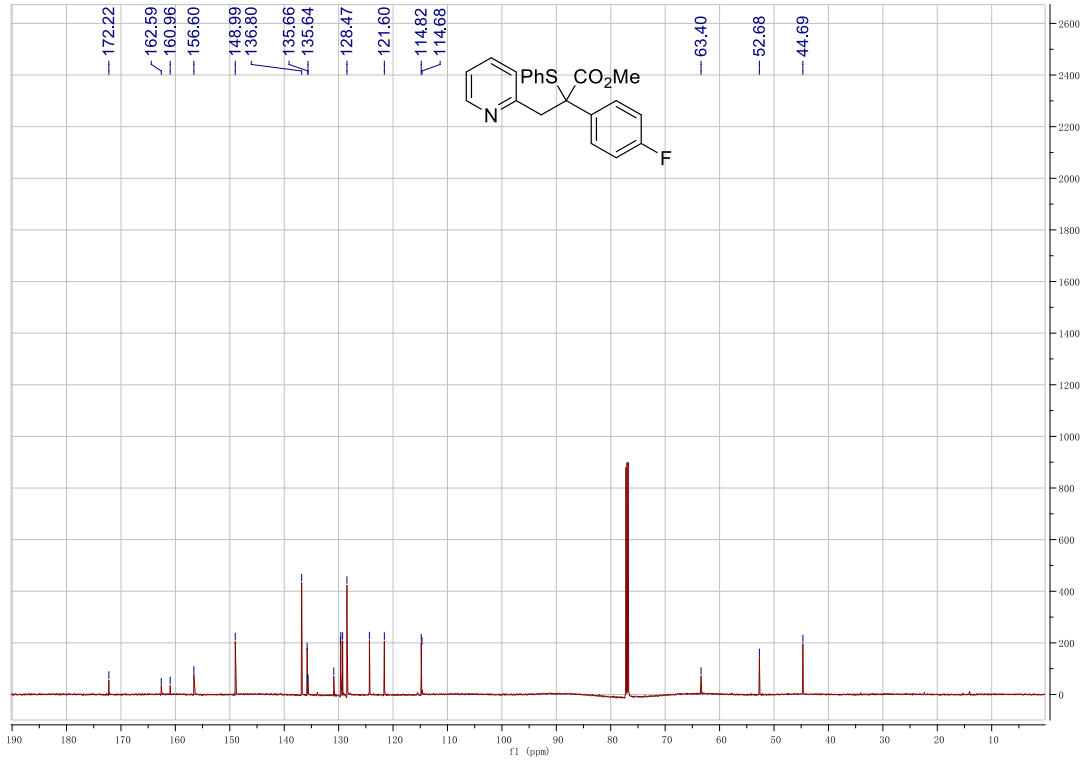


methyl 2-(4-fluorophenyl)-2-(phenylthio)-3-(pyridin-2-yl)propanoate(**3af**)

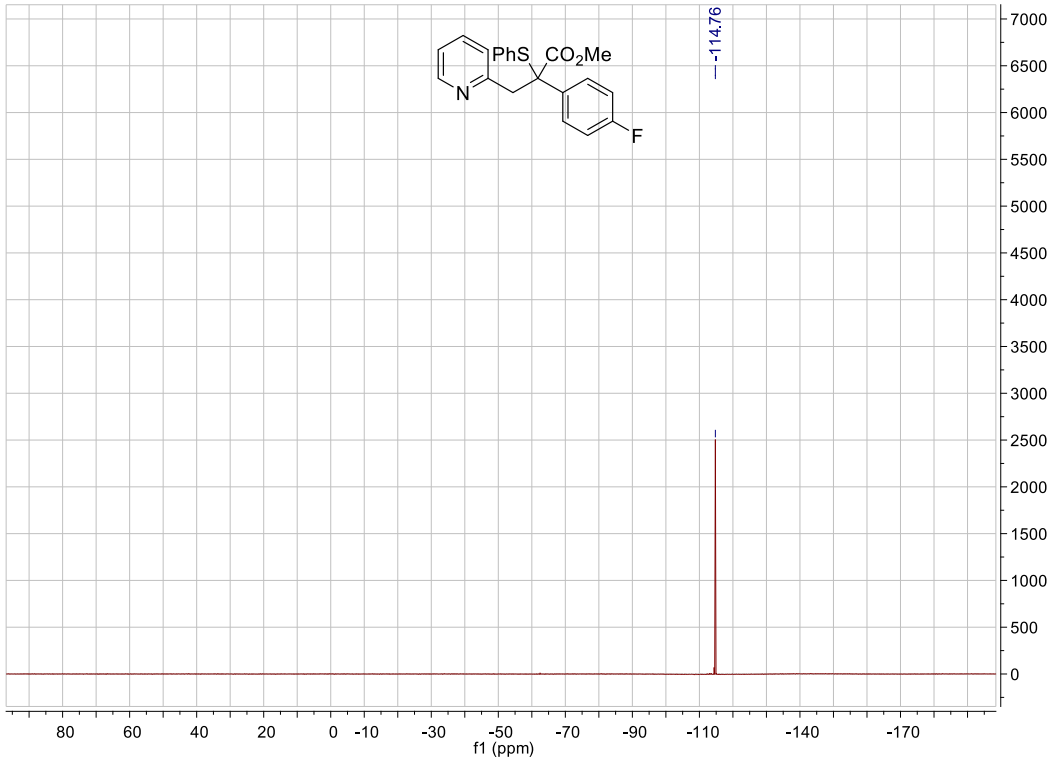
^{1}H NMR (600 MHz, $CDCl_3$)



^{13}C NMR (151 MHz, $CDCl_3$)

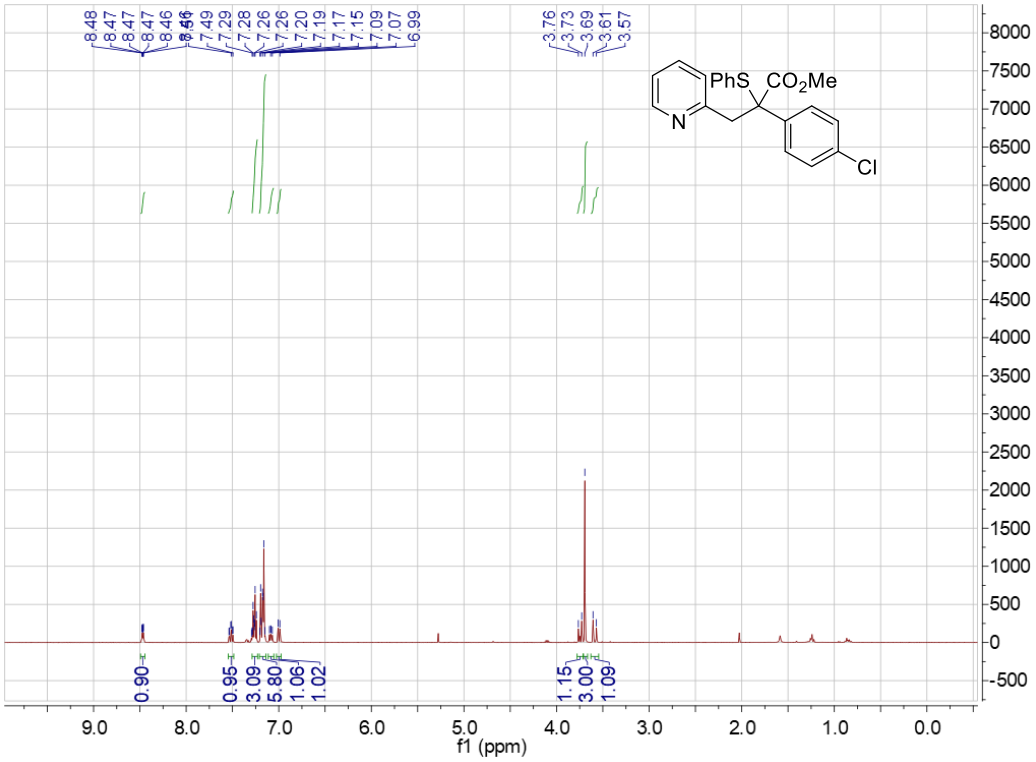


^{19}F NMR (564 MHz, $CDCl_3$)

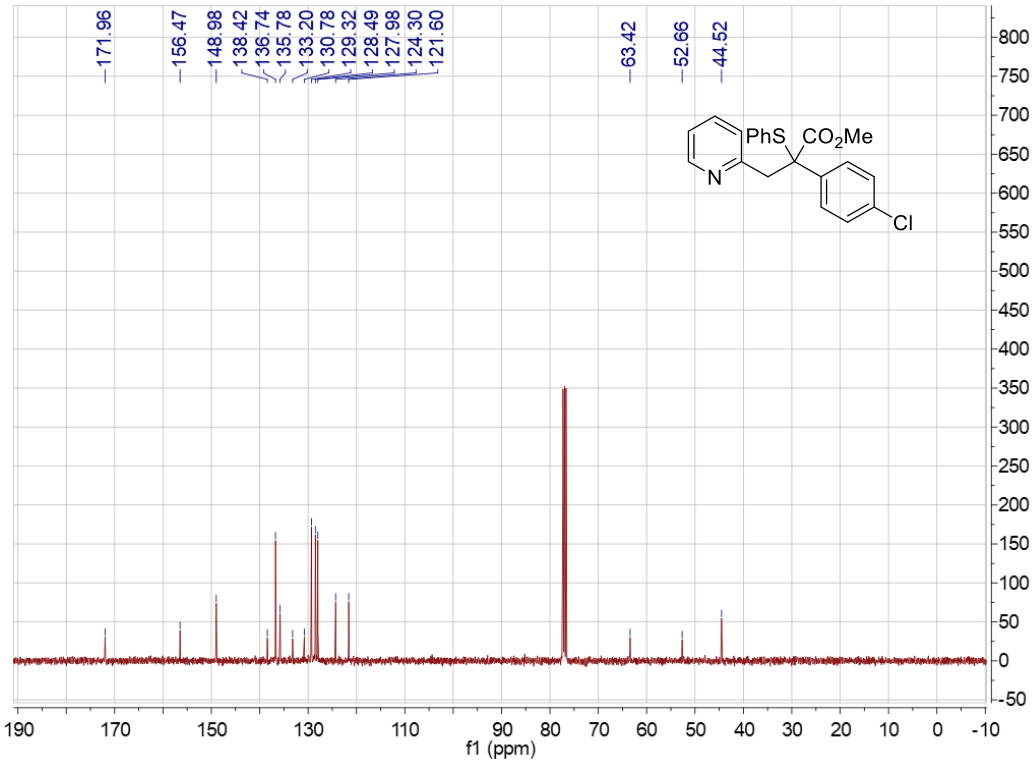


methyl 2-(4-chlorophenyl)-2-(phenylthio)-3-(pyridin-2-yl)propanoate (**3ag**)

^{1}H NMR (600 MHz, $CDCl_3$)

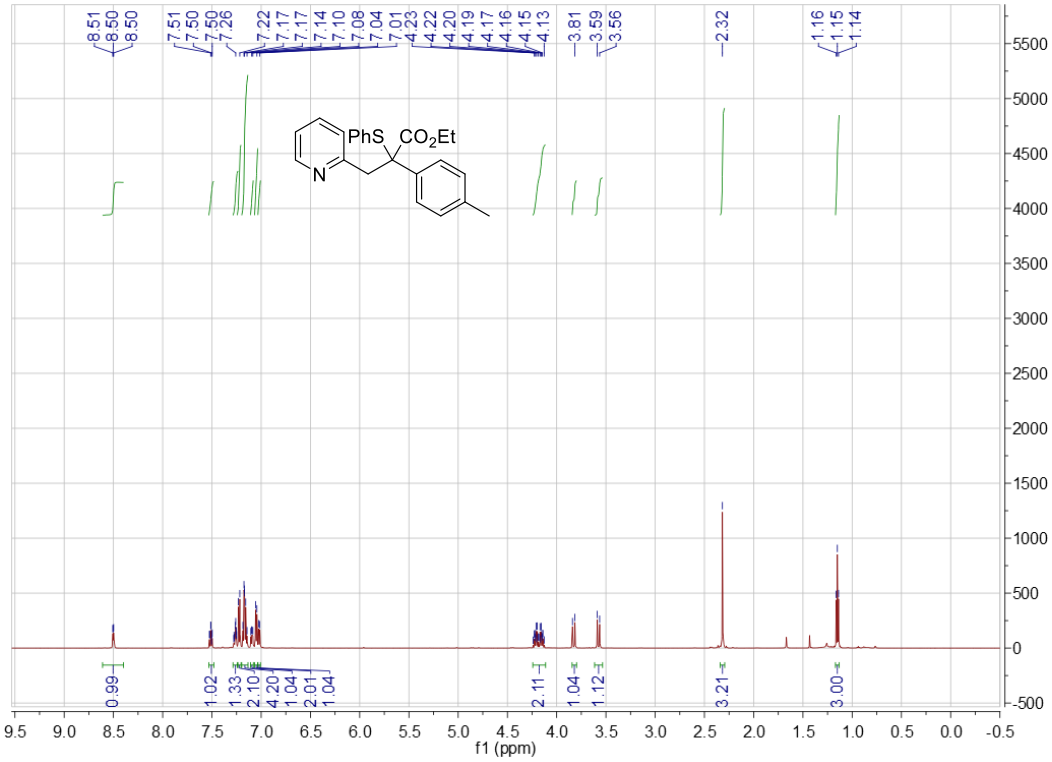


^{13}C NMR (151 MHz, $CDCl_3$)

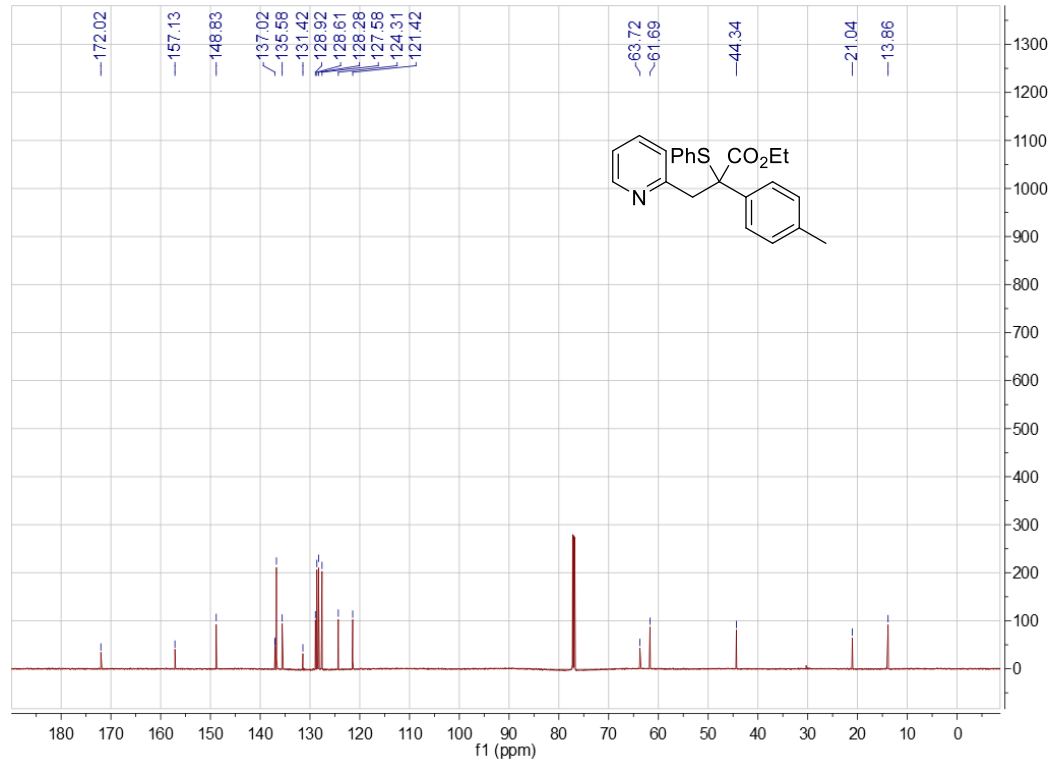


ethyl 2-(phenylthio)-3-(pyridin-2-yl)-2-(p-tolyl)propanoate (**3ah**)

^{1}H NMR (600 MHz, $CDCl_3$)

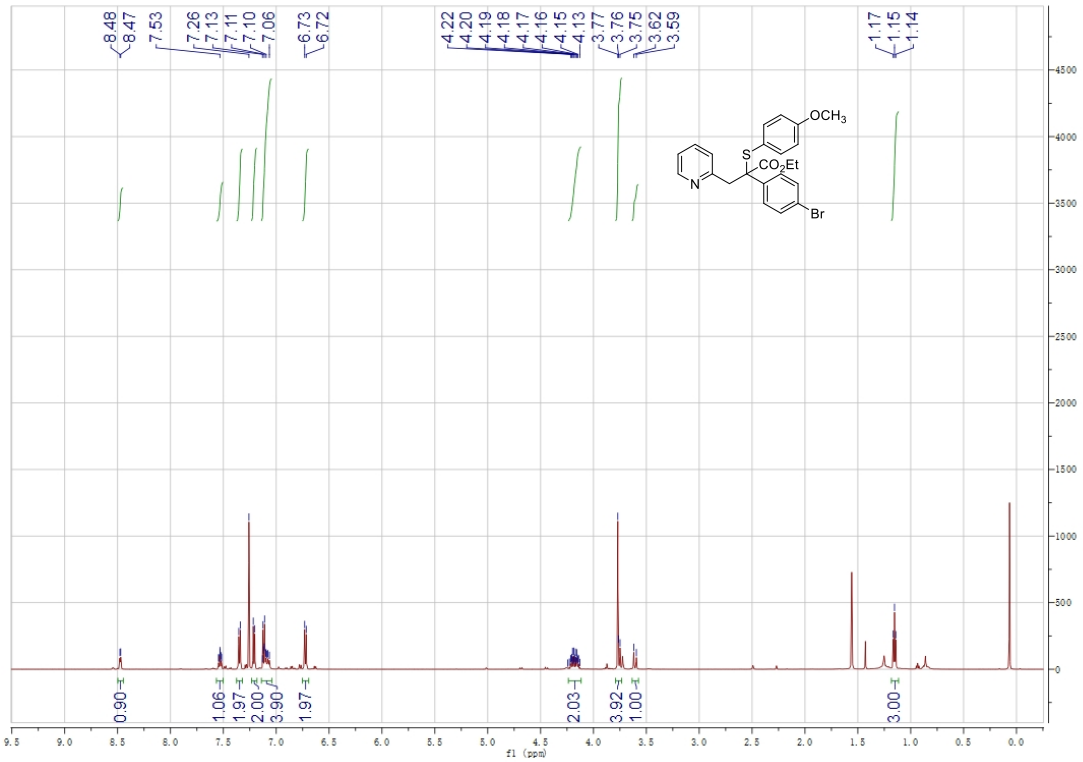


^{13}C NMR (151 MHz, $CDCl_3$)

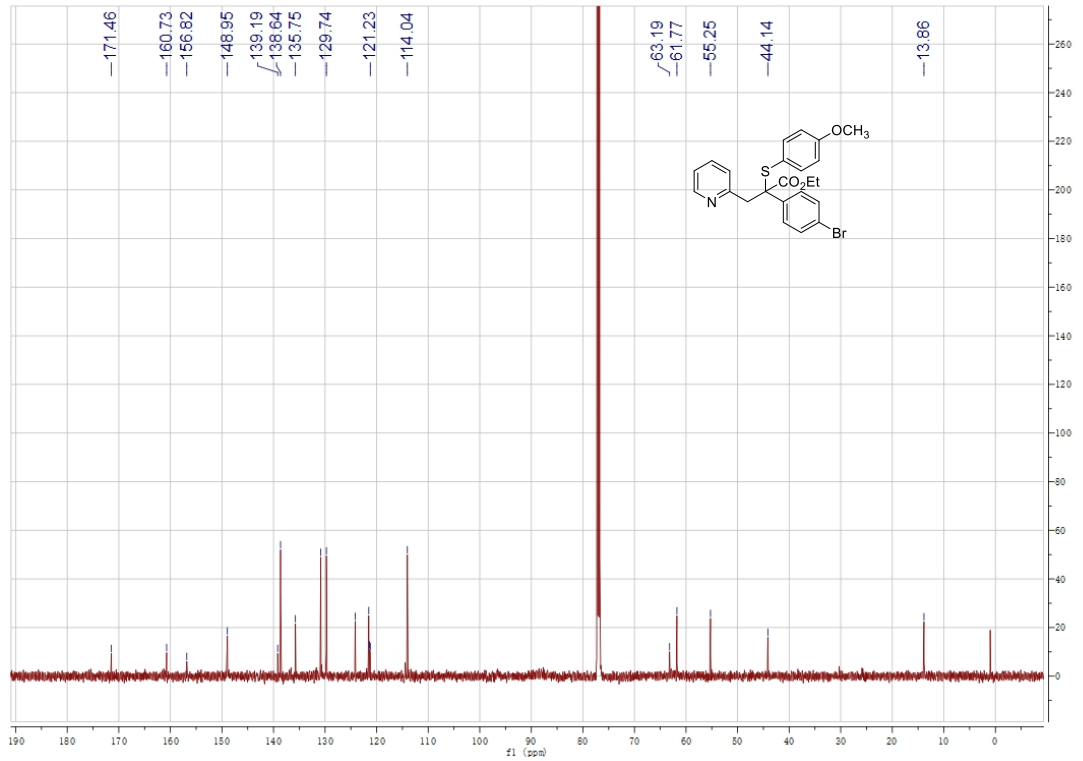


ethyl 2-(4-bromophenyl)-2-((4-methoxyphenyl)thio)-3-(pyridin-2-yl)propanoate (**3ai**)

^{1}H NMR (600 MHz, $CDCl_3$)

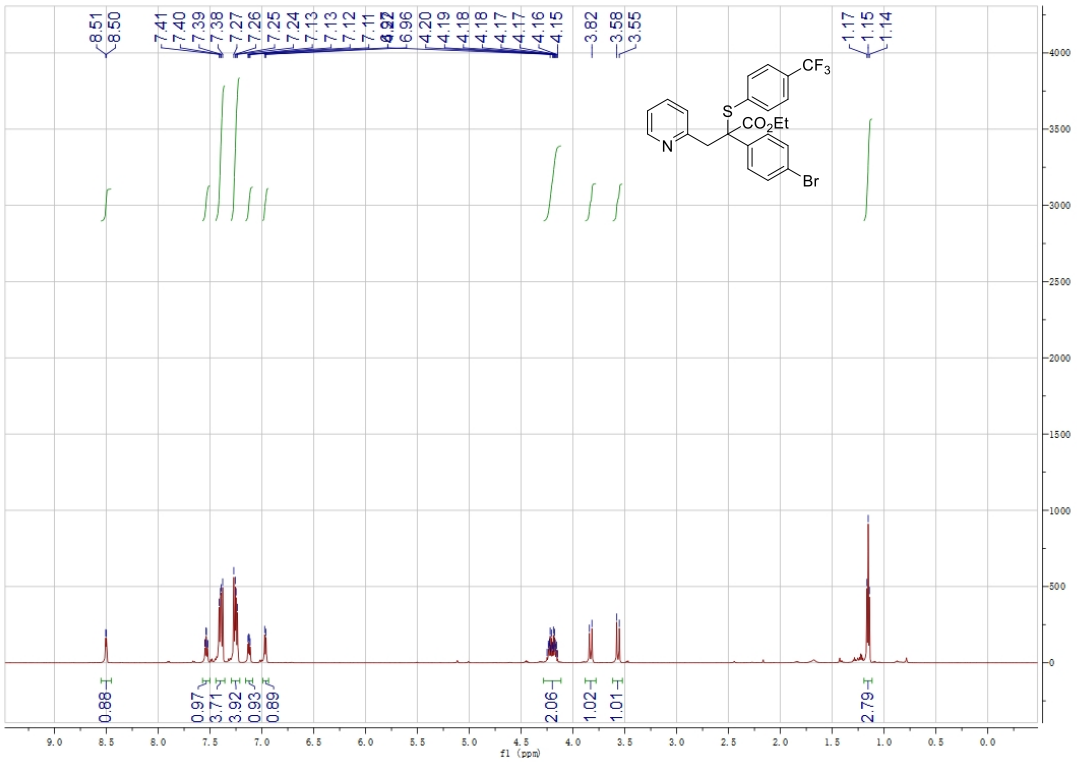


^{13}C NMR (151 MHz, $CDCl_3$)

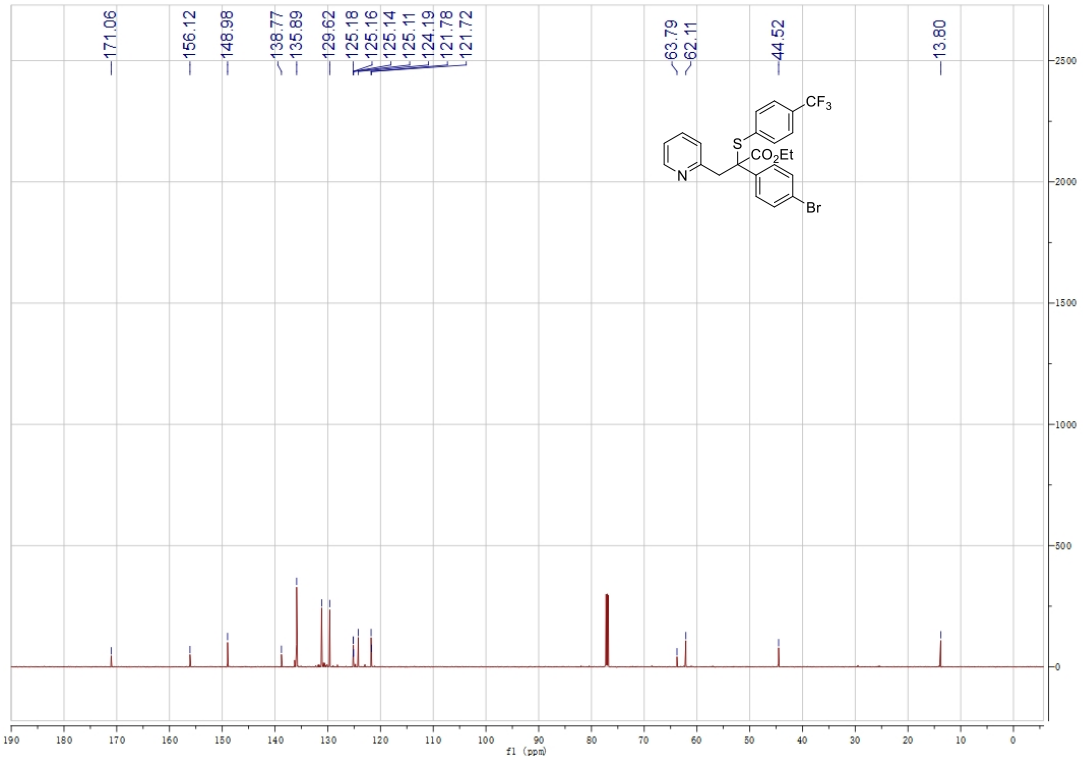


Ethyl 2-(4-bromophenyl)-3-(pyridin-2-yl)-2-((4-(trifluoromethyl)phenyl)thio)propanoate ***(3aj)***

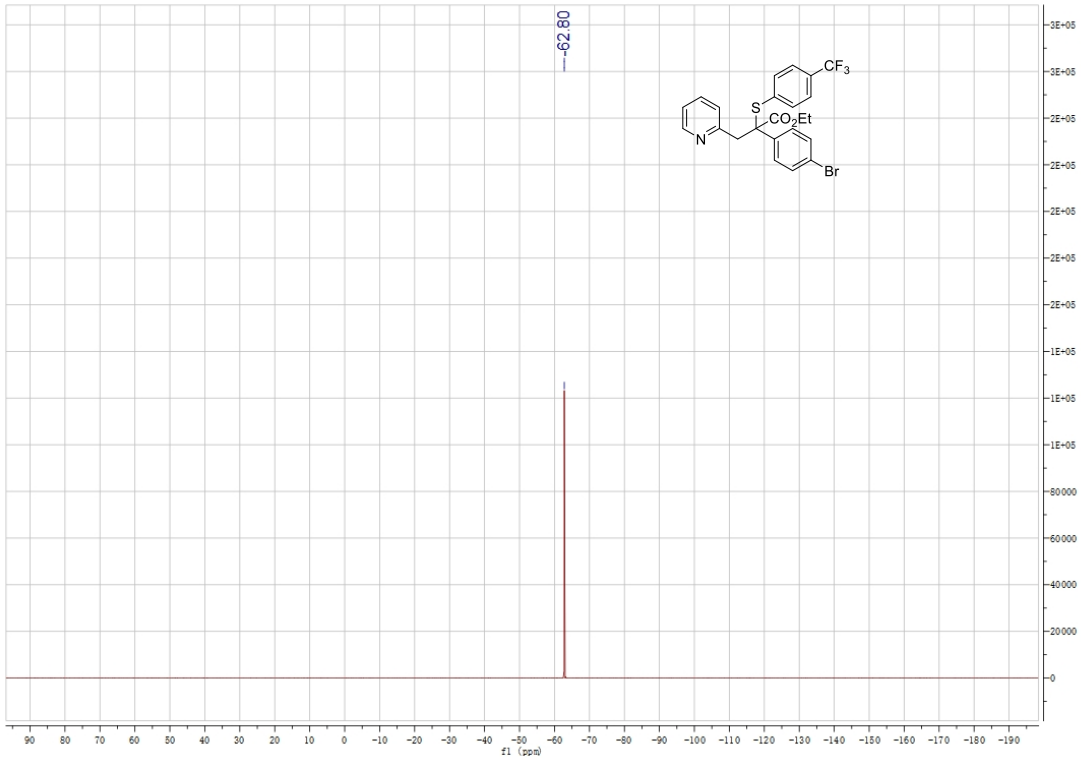
^{1}H NMR (600 MHz, $CDCl_3$)



^{13}C NMR (151 MHz, $CDCl_3$)

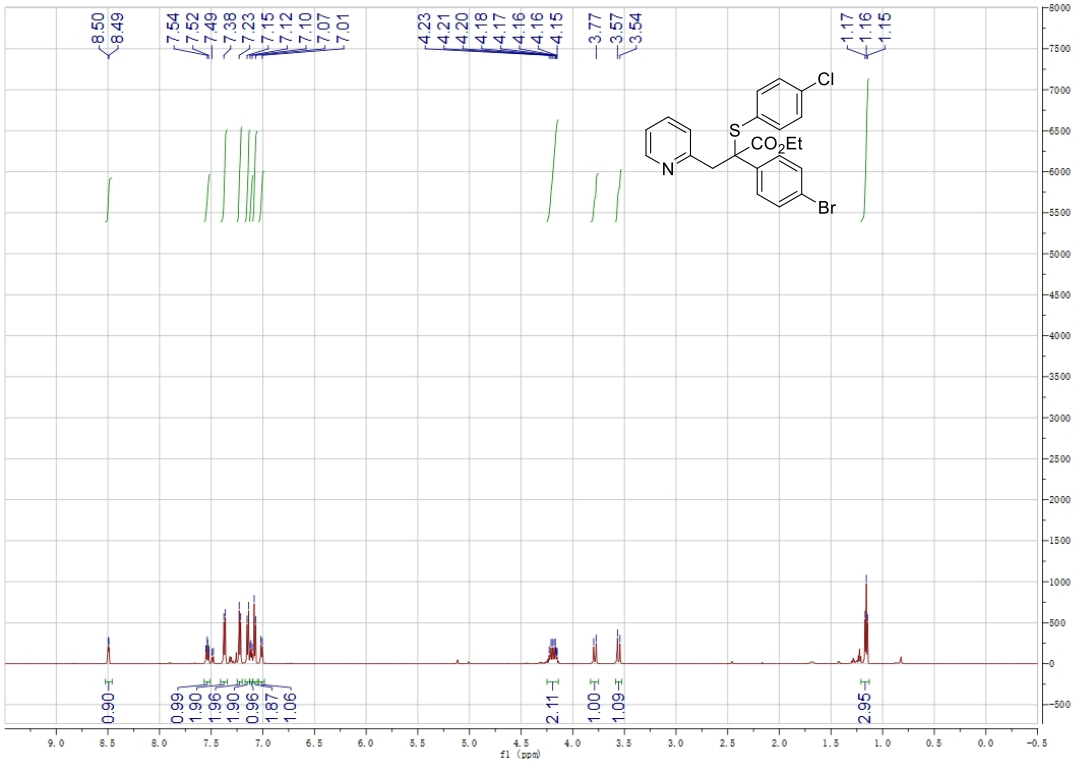


^{19}F NMR (564 MHz, $CDCl_3$)

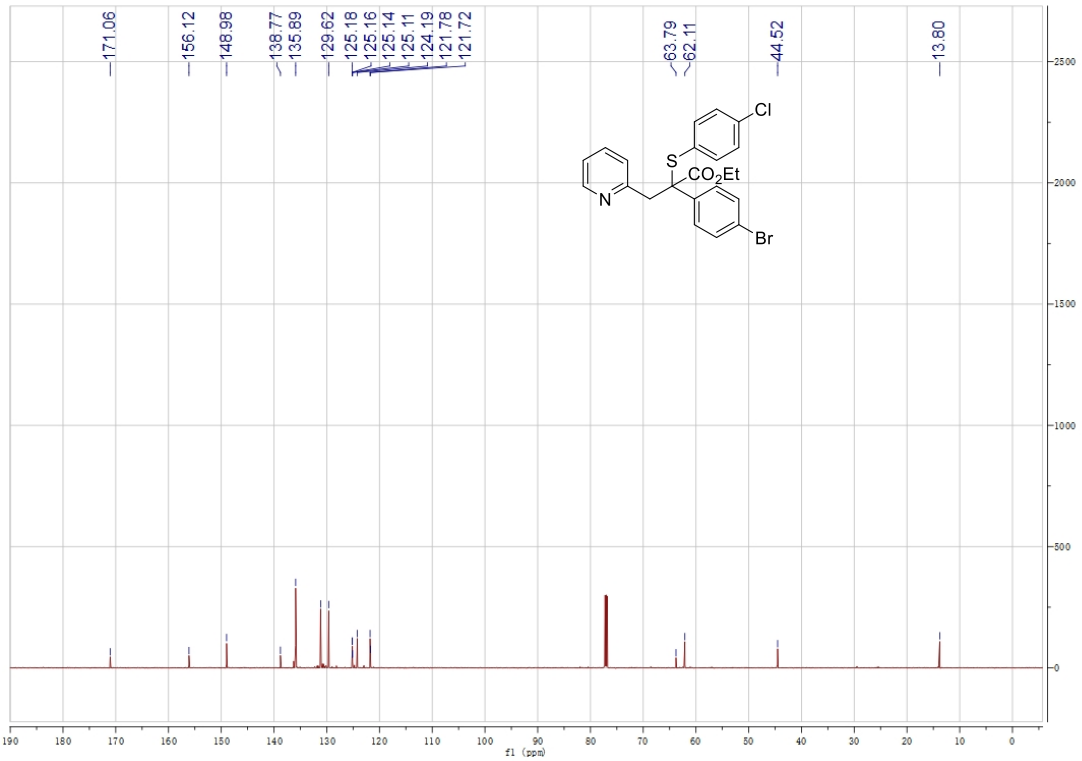


*ethyl 2-(4-bromophenyl)-2-((4-chlorophenyl)thio)-3-(pyridin-2-yl)propanoate (**3ak**)*

^{1}H NMR (600 MHz, $CDCl_3$)

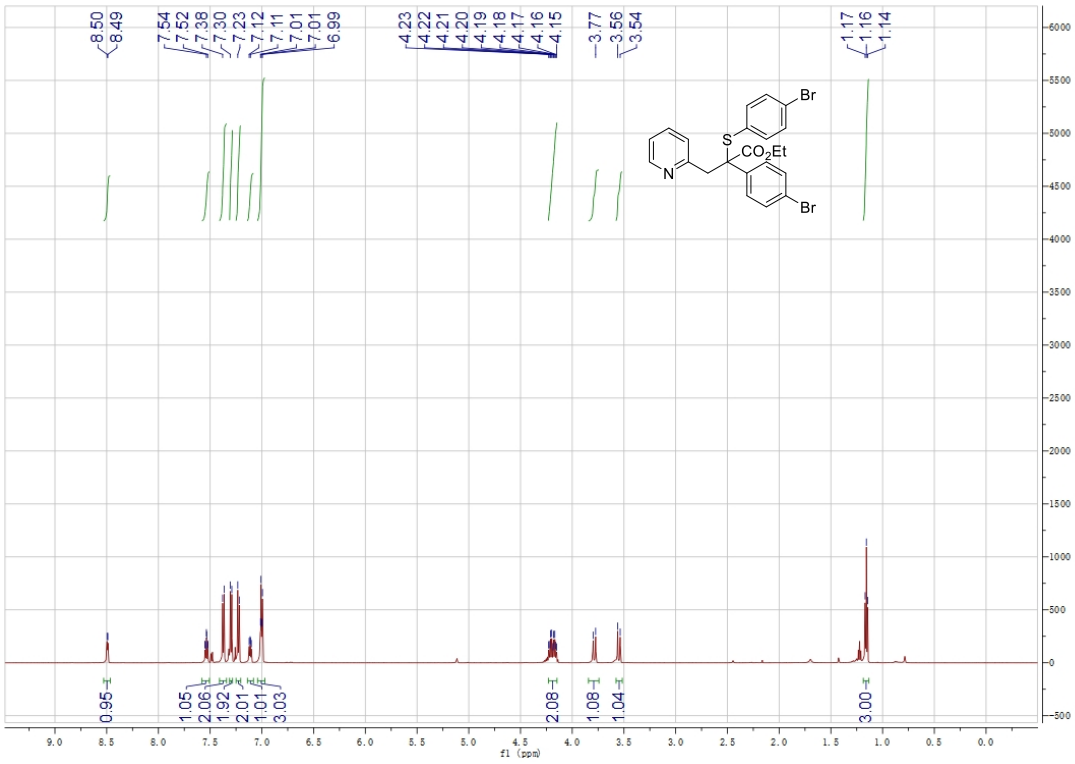


^{13}C NMR (151 MHz, $CDCl_3$)

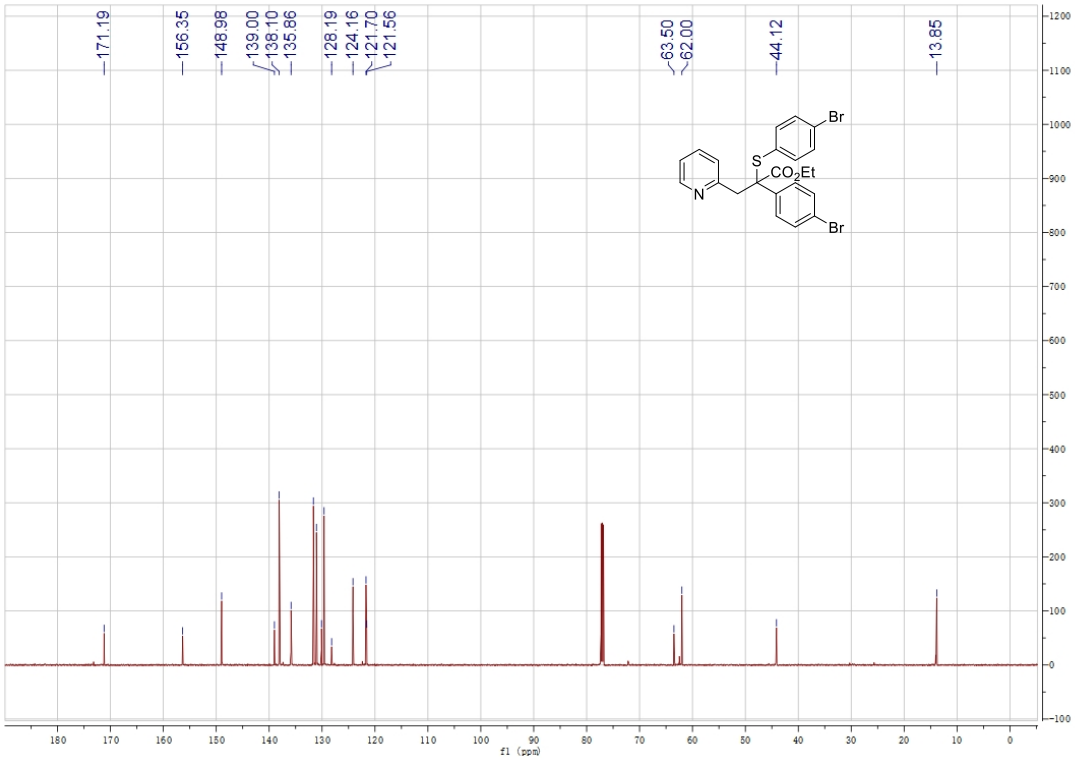


*ethyl 2-(4-bromophenyl)-2-((4-bromophenyl)thio)-3-(pyridin-2-yl)propanoate (**3al**)*

^{1}H NMR (600 MHz, $CDCl_3$)

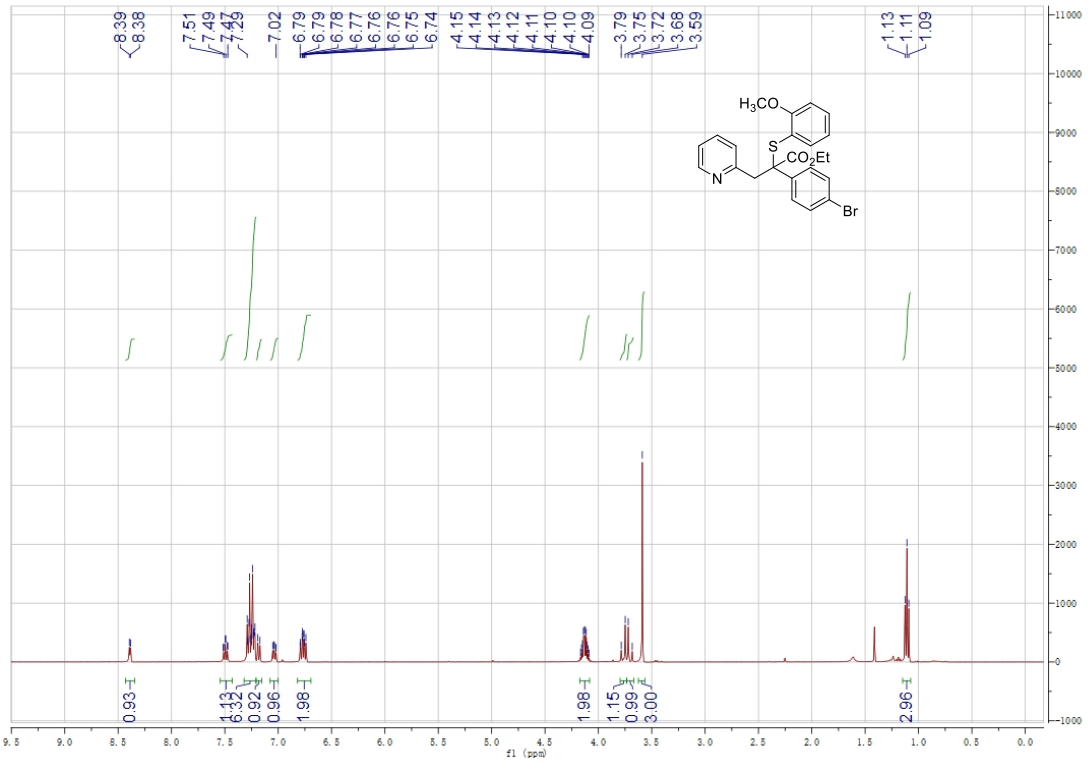


^{13}C NMR (151 MHz, $CDCl_3$)

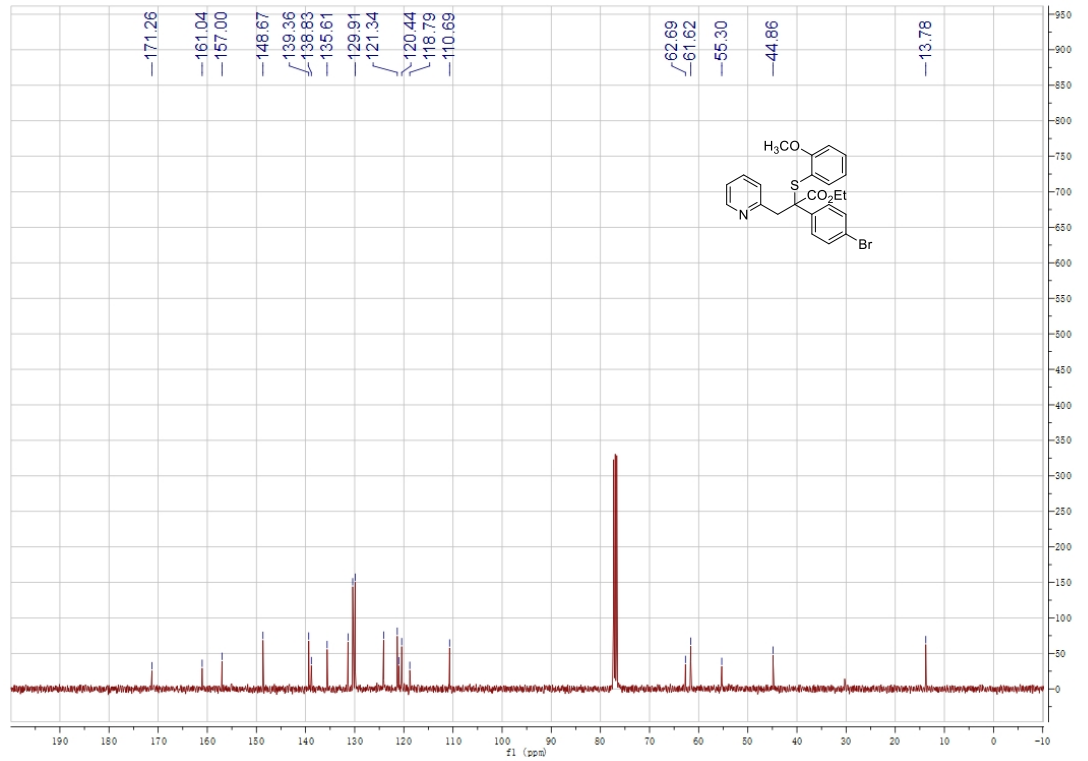


*ethyl 2-(4-bromophenyl)-2-((2-methoxyphenyl)thio)-3-(pyridin-2-yl)propanoate (**3am**)*

^{1}H NMR (400 MHz, $CDCl_3$)

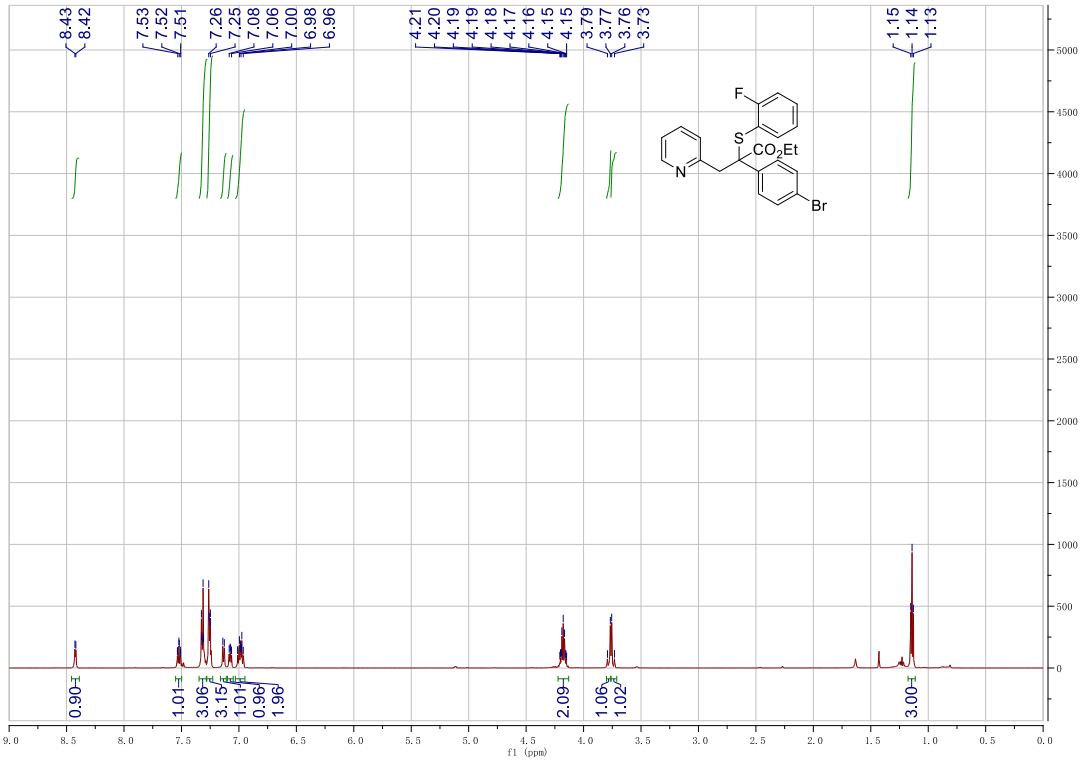


^{13}C NMR (101 MHz, $CDCl_3$)

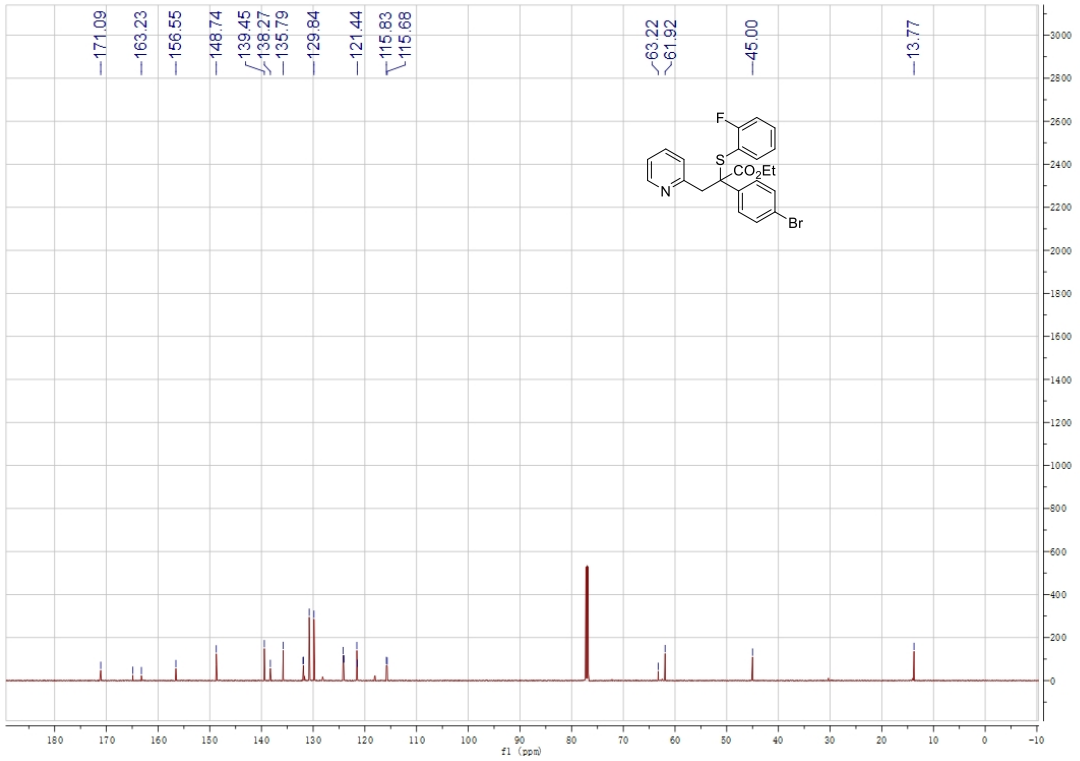


*ethyl 2-(4-bromophenyl)-2-((2-fluorophenyl)thio)-3-(pyridin-2-yl)propanoate (**3an**)*

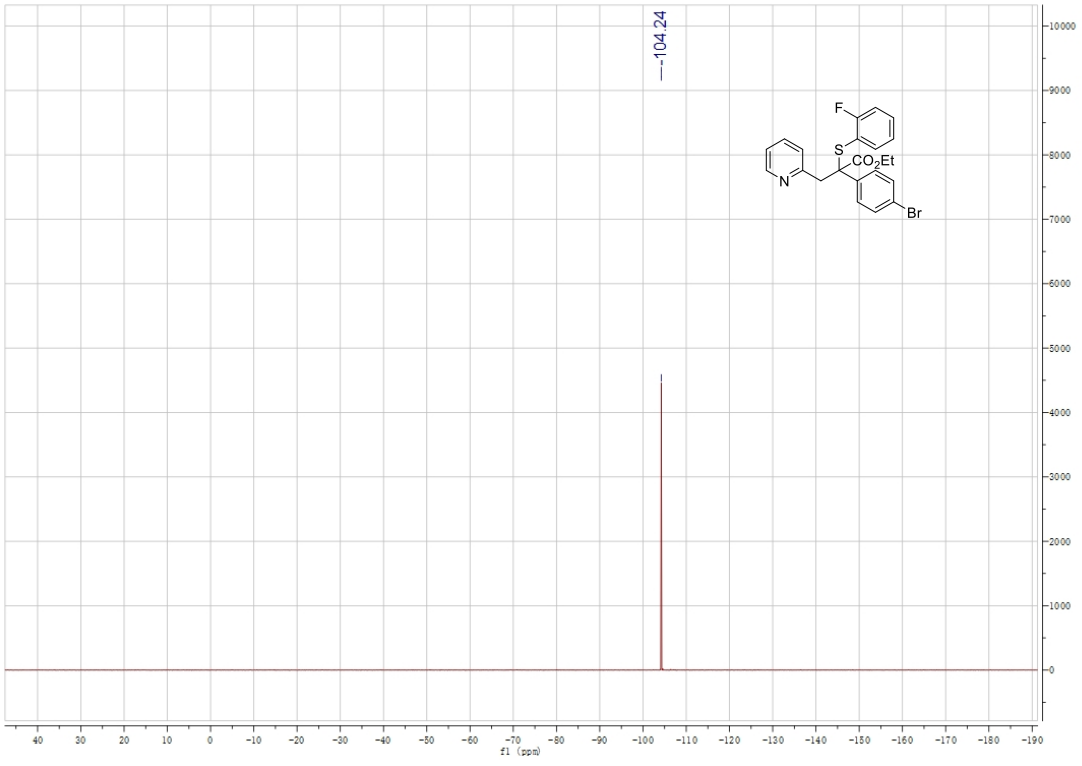
^{1}H NMR (600 MHz, $CDCl_3$)



^{13}C NMR (151 MHz, $CDCl_3$)

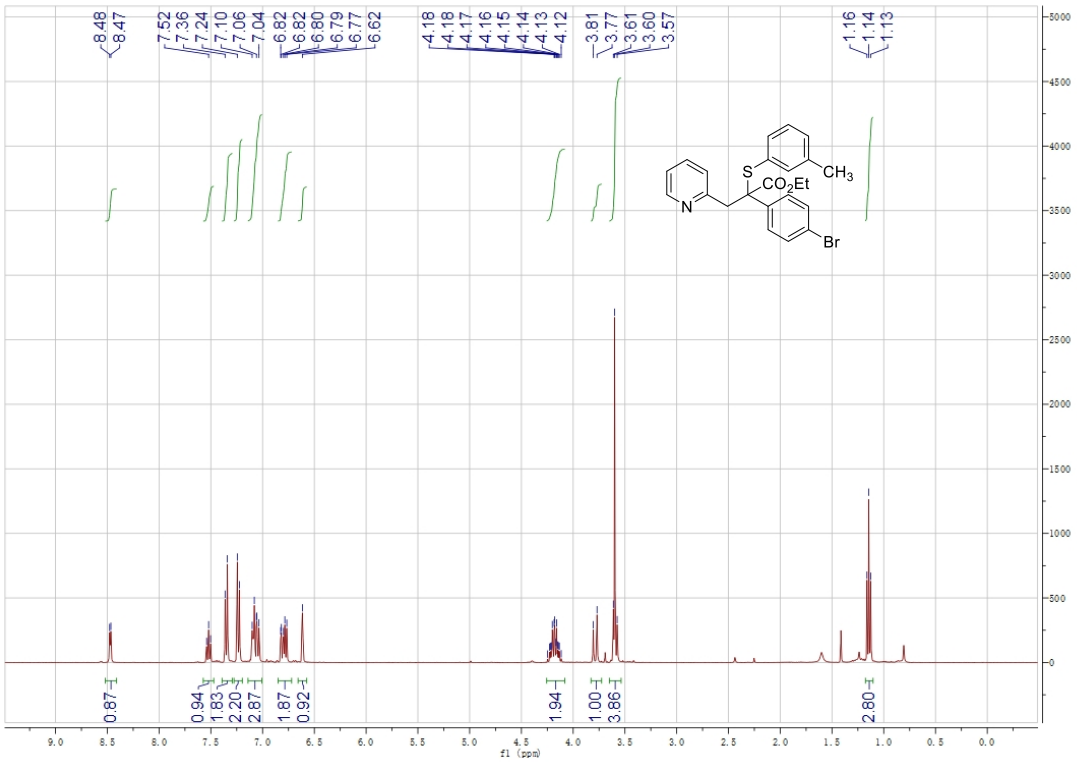


^{19}F NMR (564 MHz, $CDCl_3$)

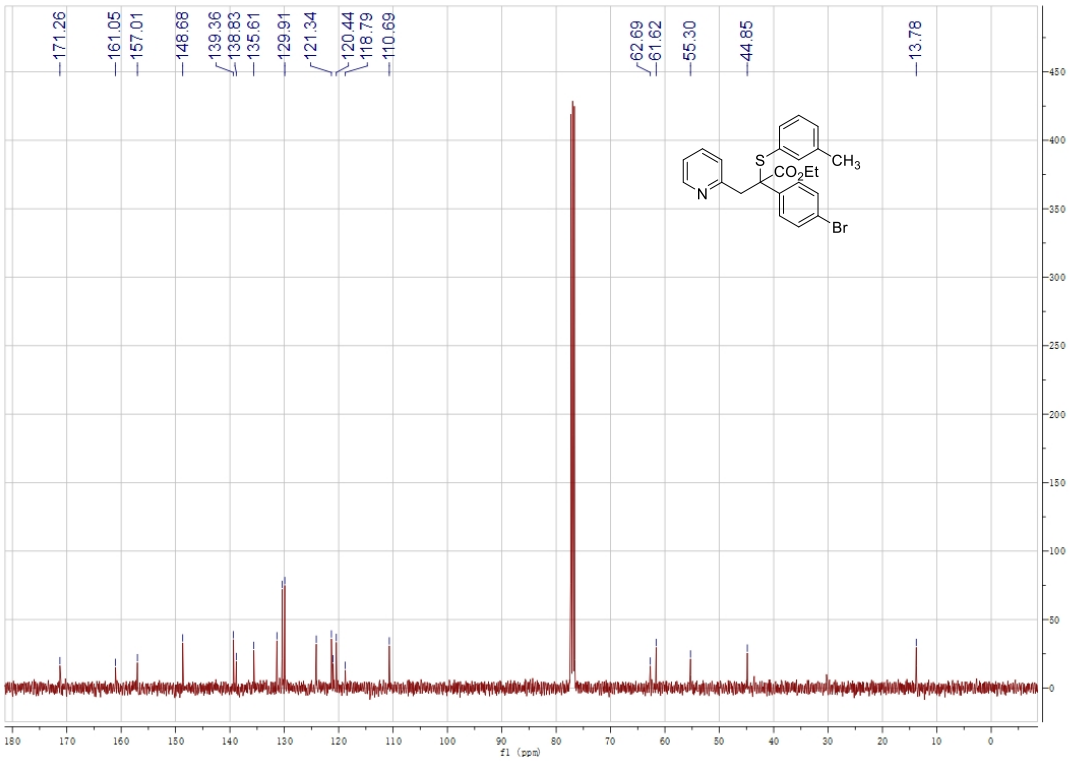


*ethyl 2-(4-bromophenyl)-3-(pyridin-2-yl)-2-(m-tolylthio)propanoate (**3ao**)*

^{1}H NMR (400 MHz, $CDCl_3$)

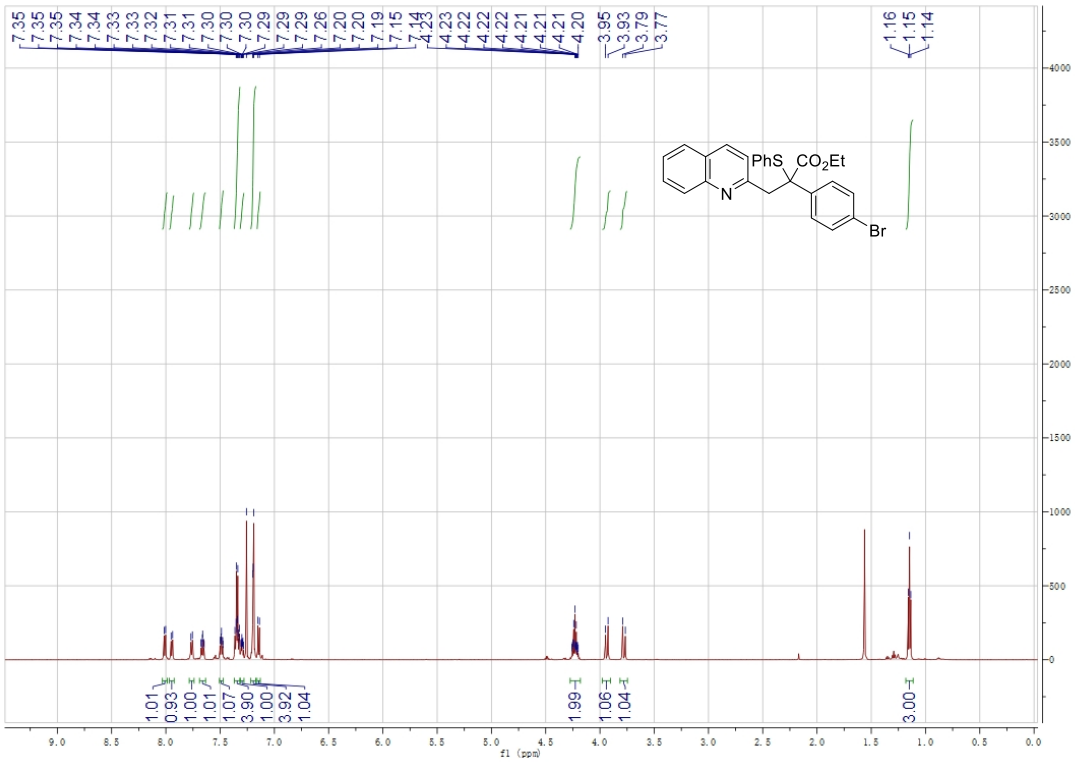


^{13}C NMR (101 MHz, $CDCl_3$)

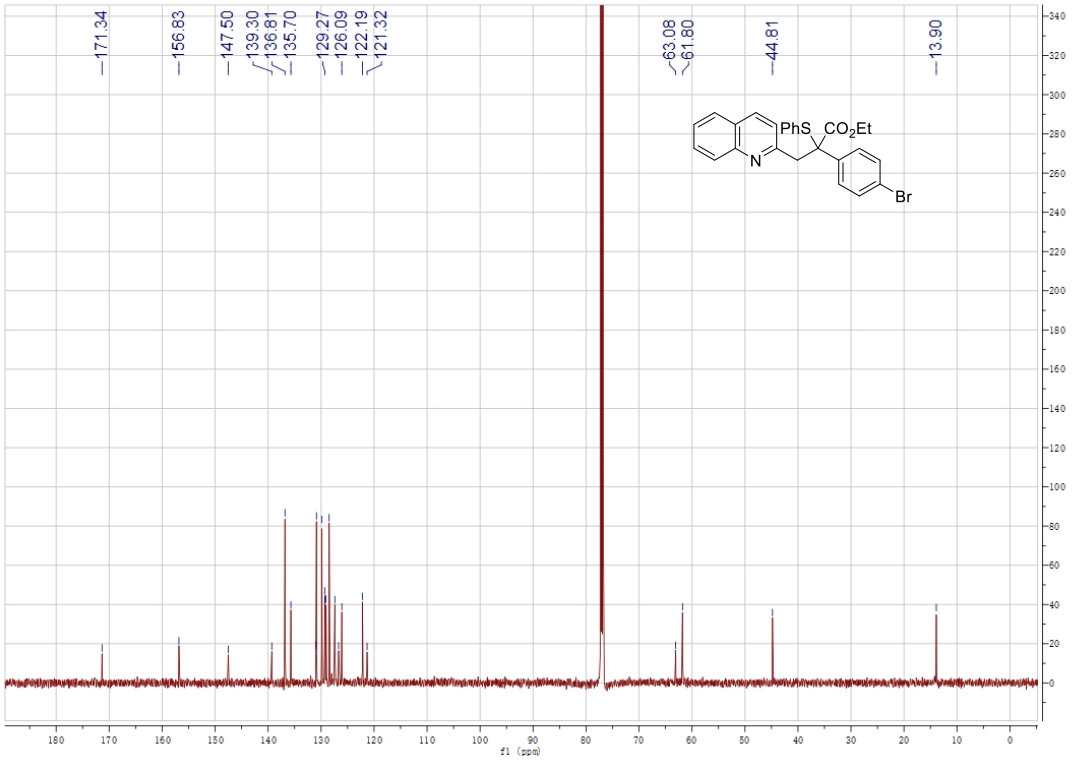


ethyl 2-(4-bromophenyl)-2-(phenylthio)-3-(quinolin-2-yl)propanoate (**3ap**)

^{1}H NMR (600 MHz, $CDCl_3$)

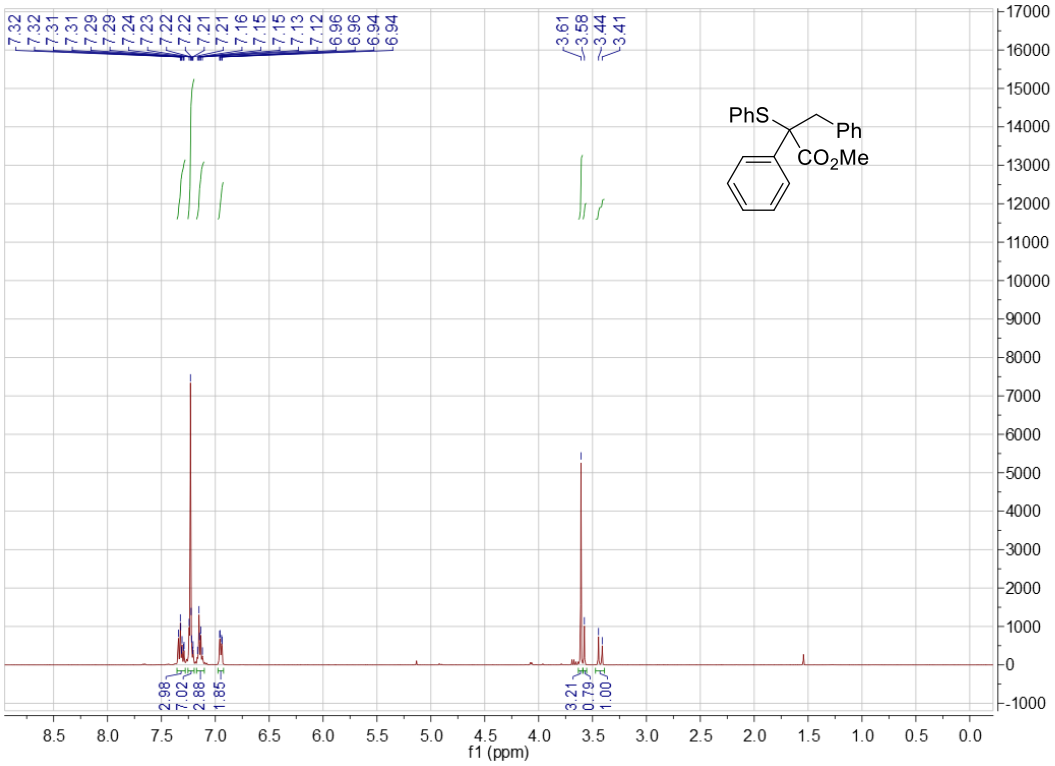


^{13}C NMR (151 MHz, $CDCl_3$)

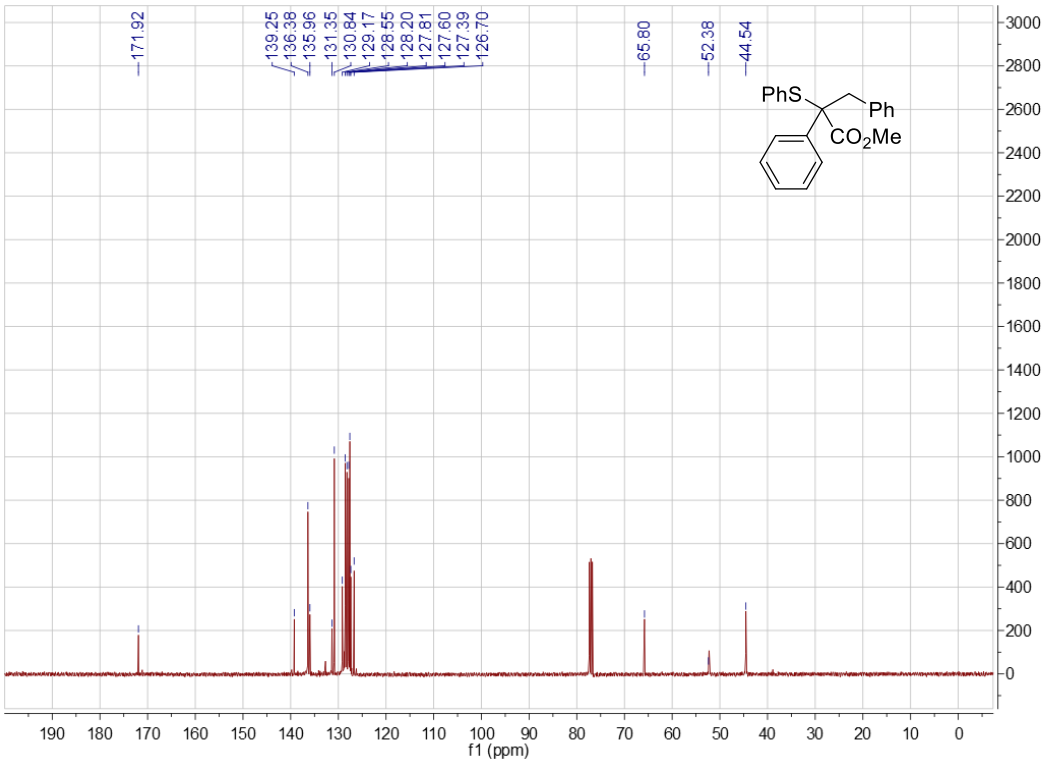


methyl 2,3-diphenyl-2-(phenylthio)propanoate (**3ba**)

^{1}H NMR (600 MHz, $CDCl_3$)

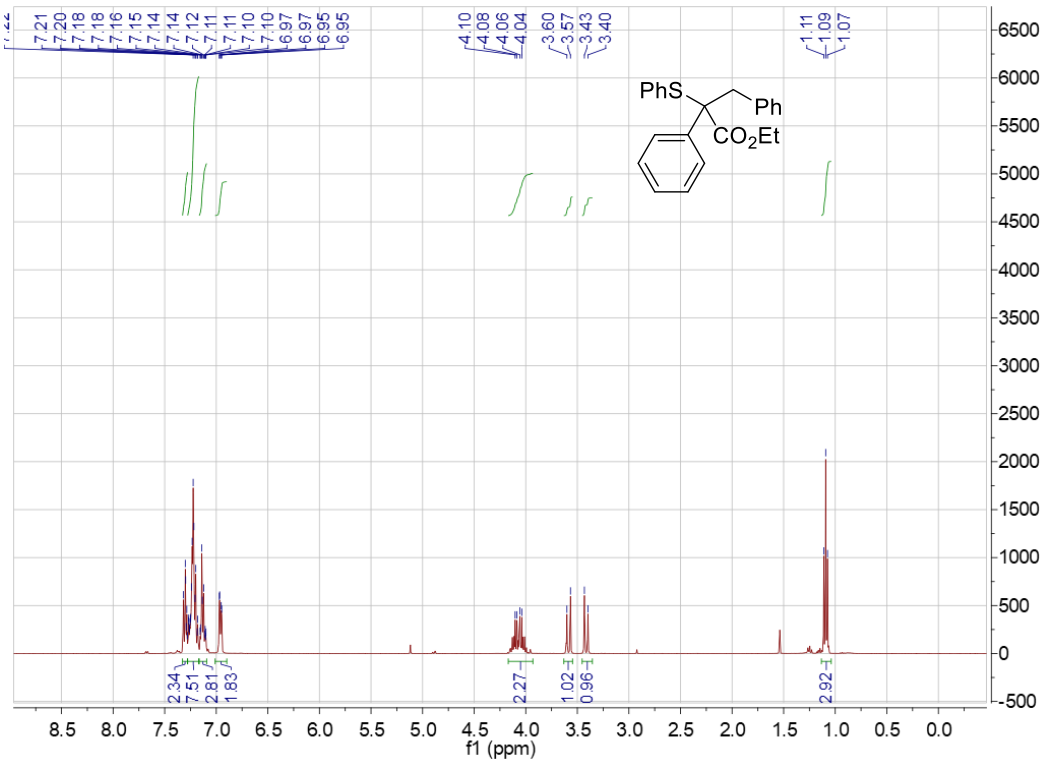


^{13}C NMR (151 MHz, $CDCl_3$)

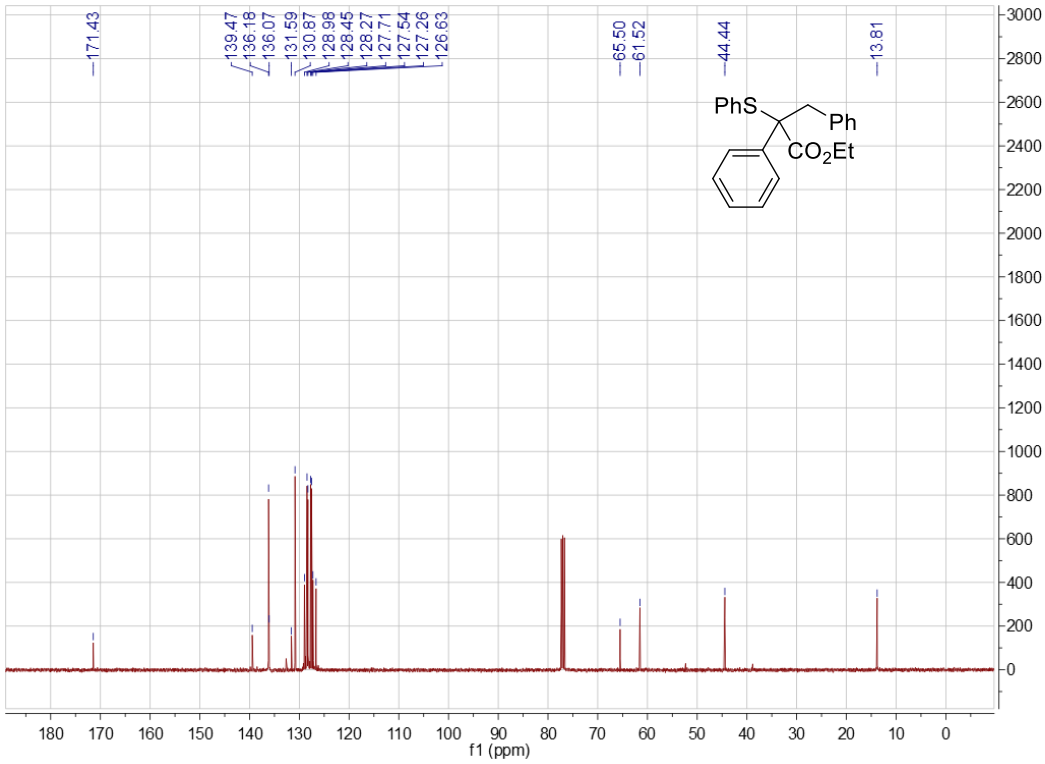


ethyl 2,3-diphenyl-2-(phenylthio)propanoate (**3bb**)

^{1}H NMR (600 MHz, $CDCl_3$)

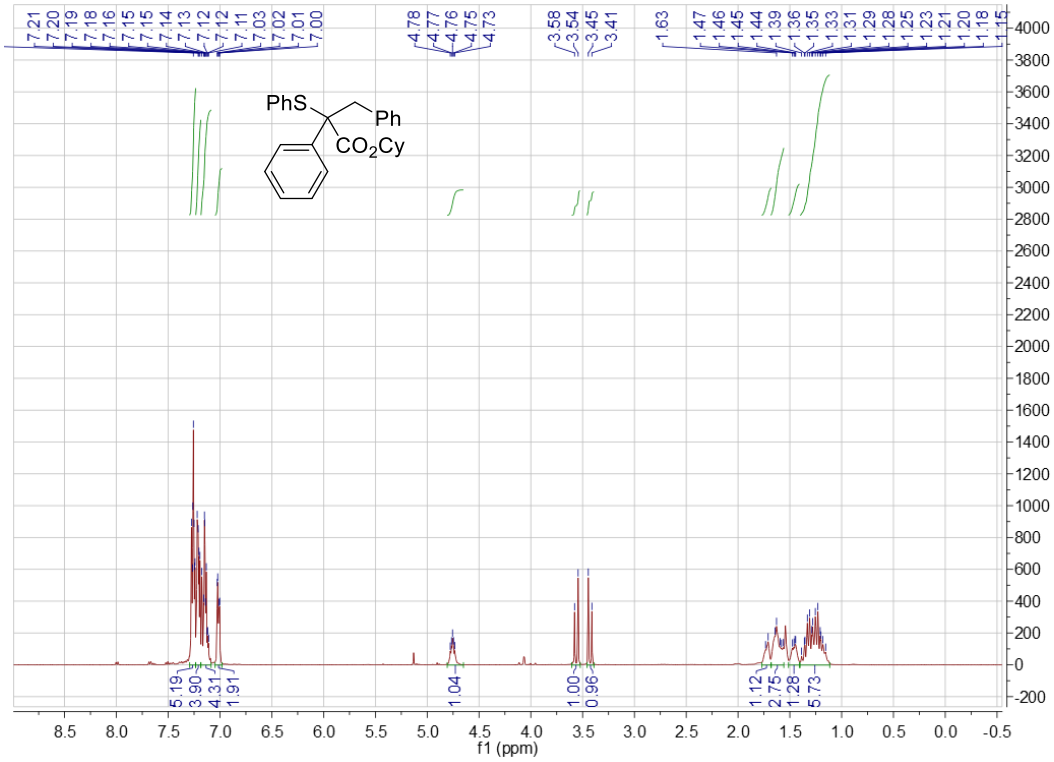


^{13}C NMR (151 MHz, $CDCl_3$)

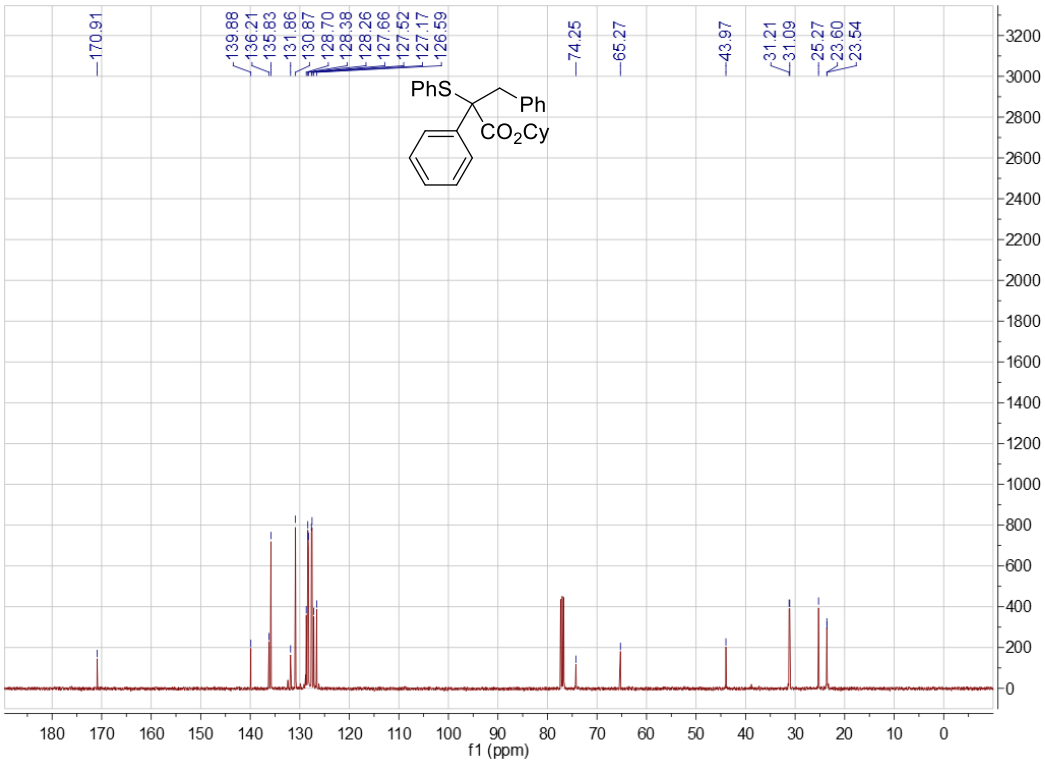


cyclohexyl 2,3-diphenyl-2-(phenylthio)propanoate (**3bc**)

^{1}H NMR (600 MHz, $CDCl_3$)

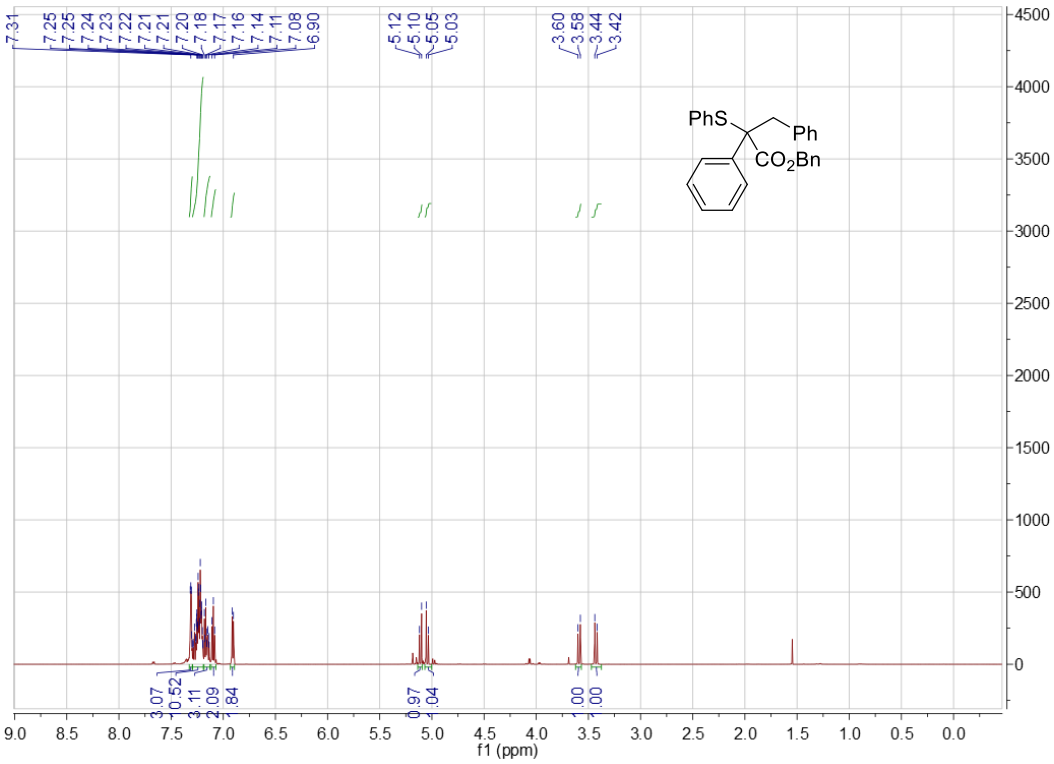


^{13}C NMR (151 MHz, $CDCl_3$)

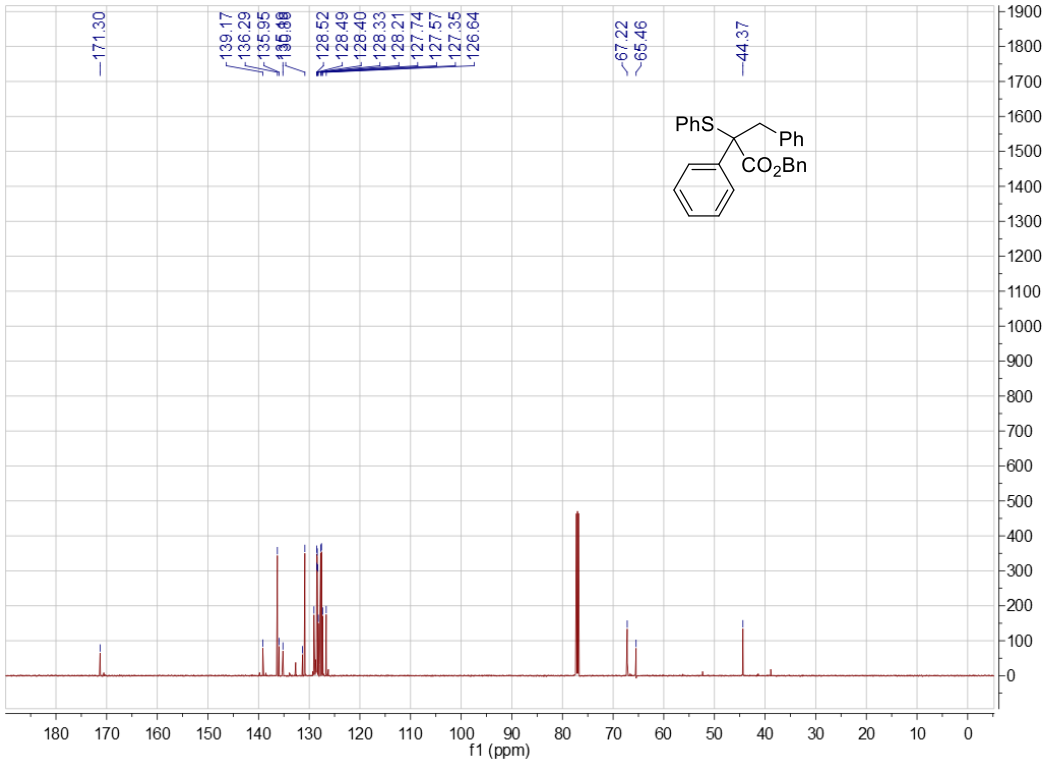


benzyl 2,3-diphenyl-2-(phenylthio)propanoate (**3bd**)

^{1}H NMR (600 MHz, $CDCl_3$)

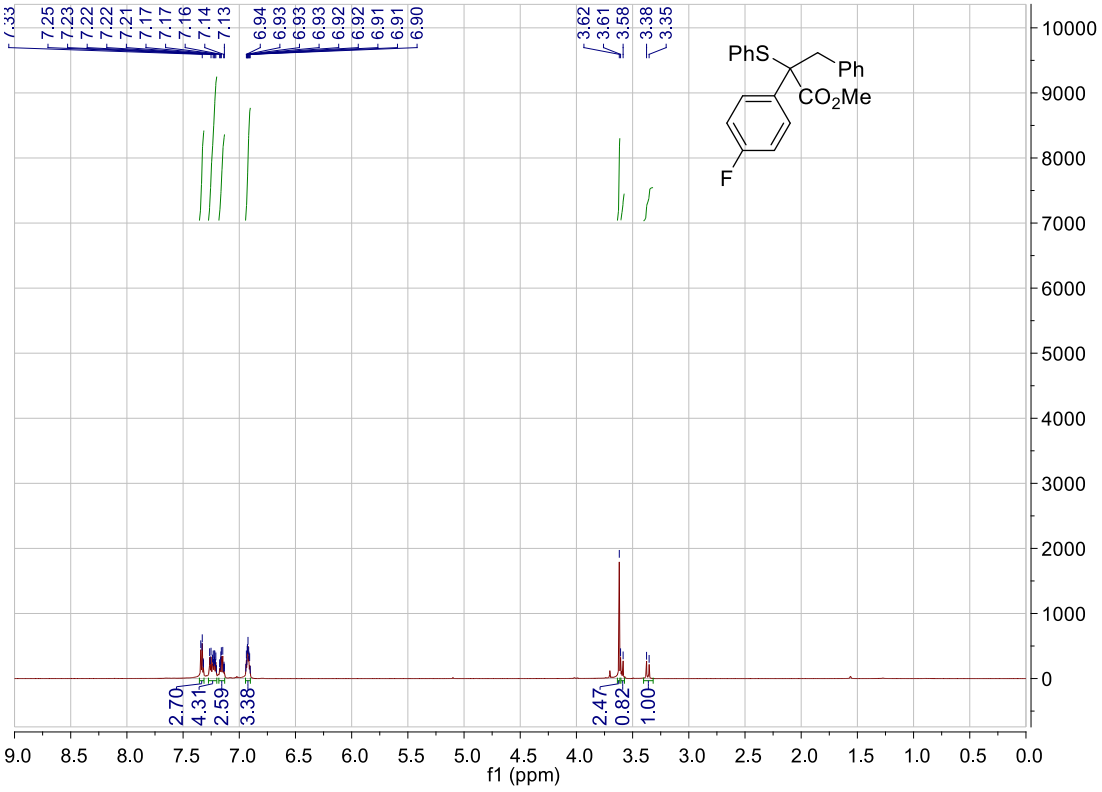


^{13}C NMR (151 MHz, $CDCl_3$)

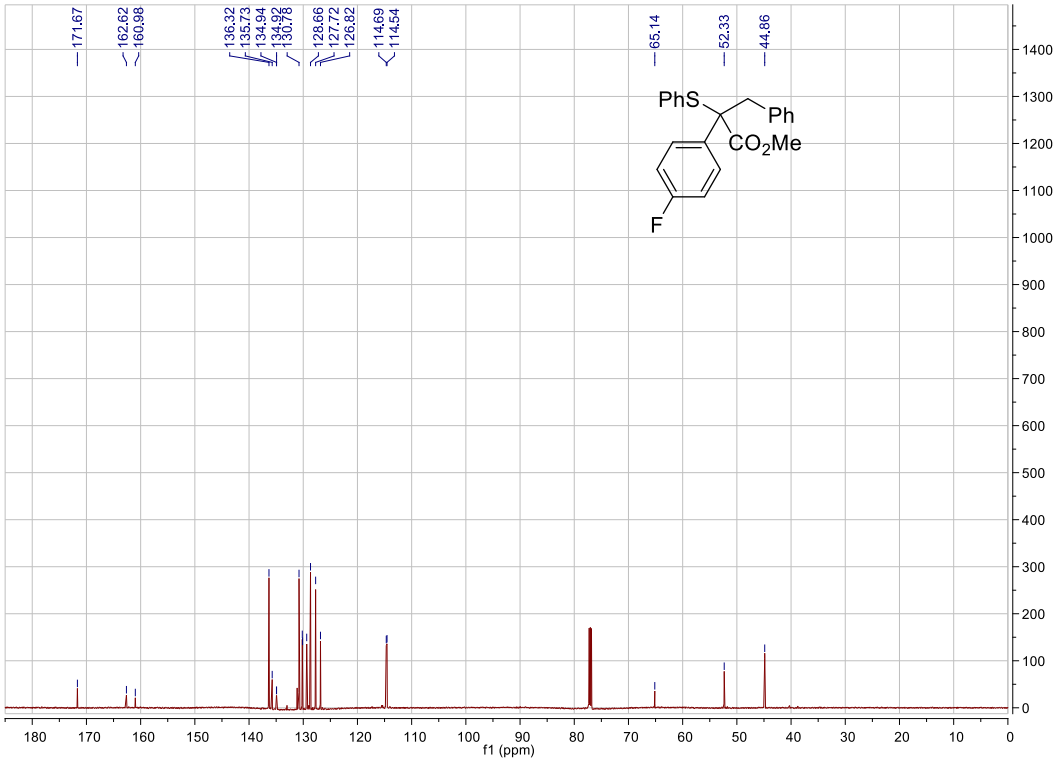


methyl 2-(4-fluorophenyl)-3-phenyl-2-(phenylthio)propanoate (**3be**)

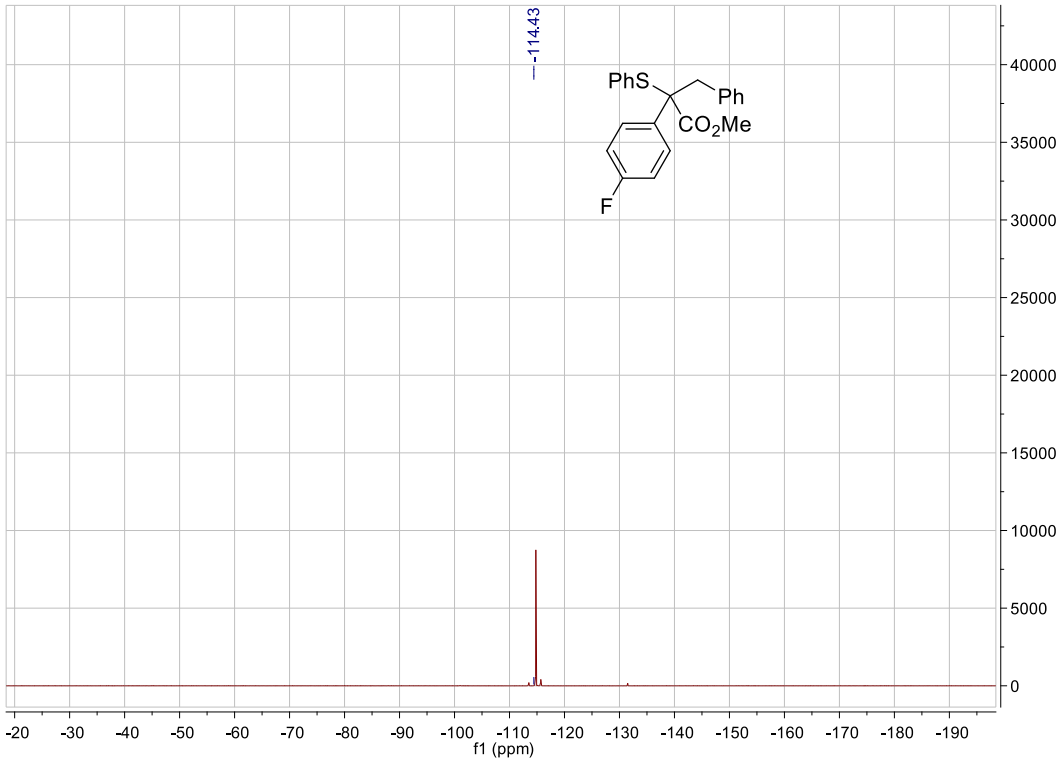
^{1}H NMR (600 MHz, $CDCl_3$)



^{13}C NMR (151 MHz, $CDCl_3$)

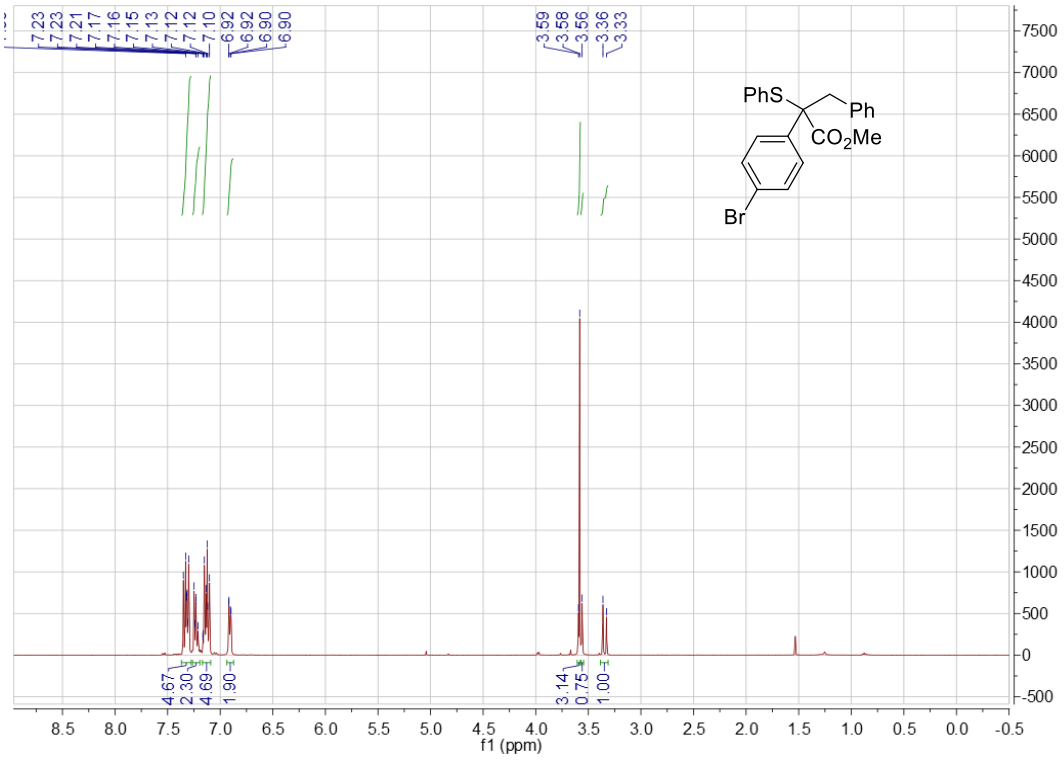


^{19}F NMR (564 MHz, $CDCl_3$)

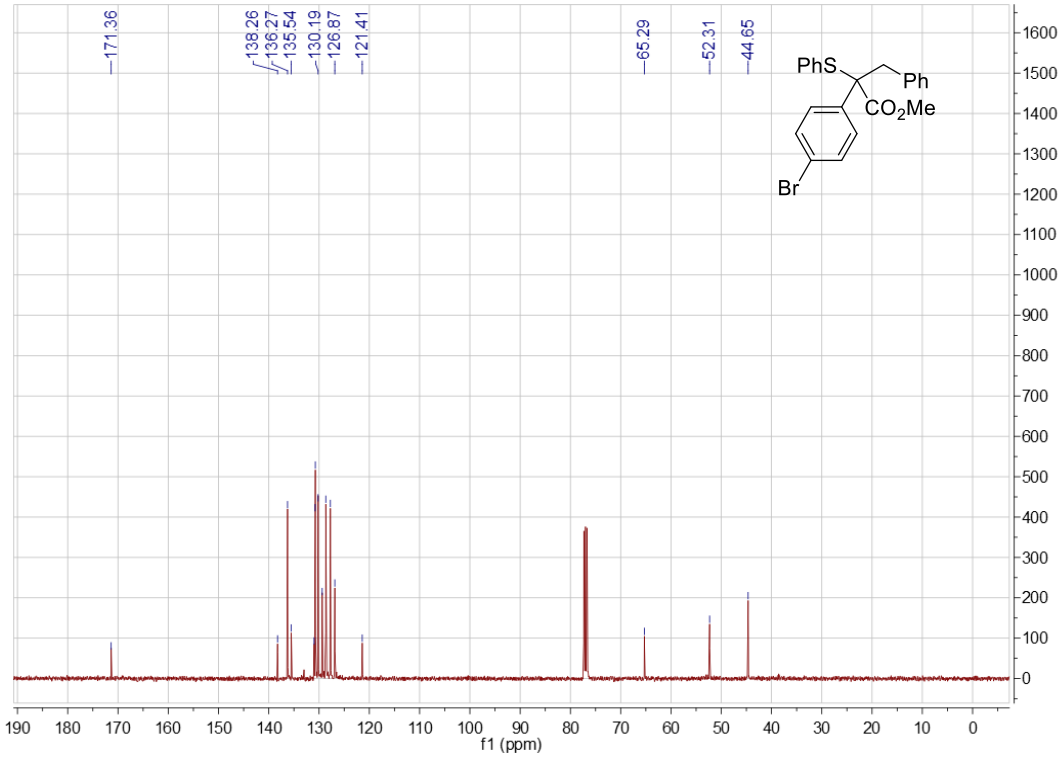


methyl 2-(4-bromophenyl)-3-phenyl-2-(phenylthio)propanoate (**3bf**)

^{1}H NMR (600 MHz, $CDCl_3$)

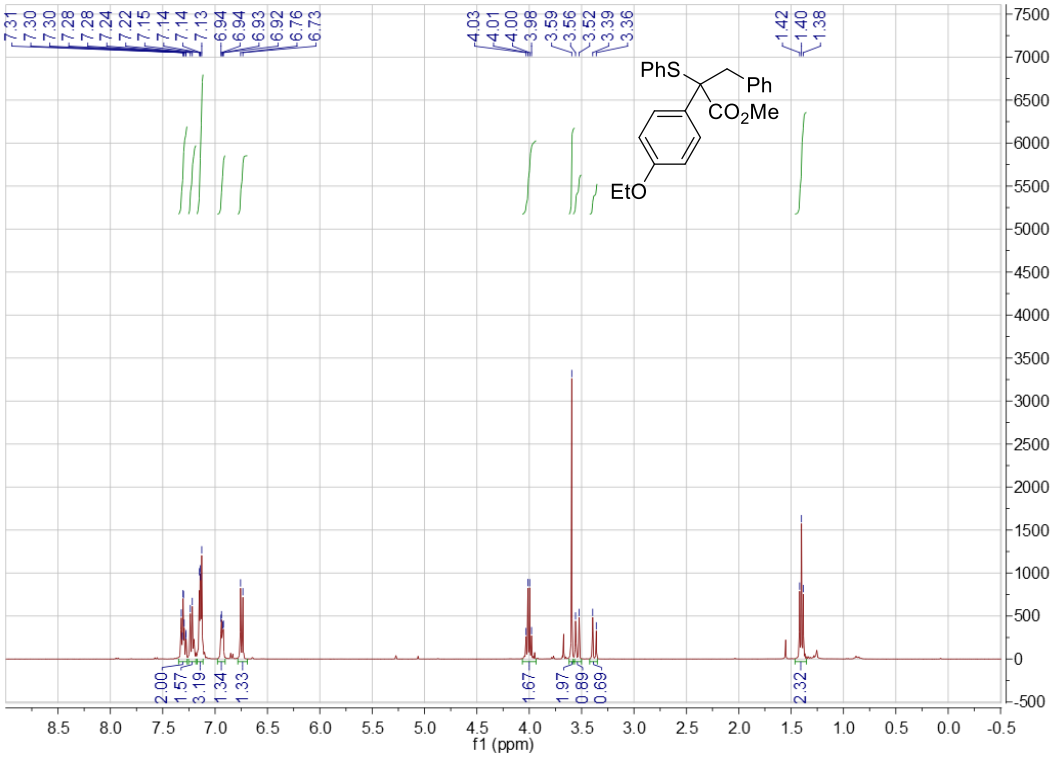


^{13}C NMR (151 MHz, $CDCl_3$)

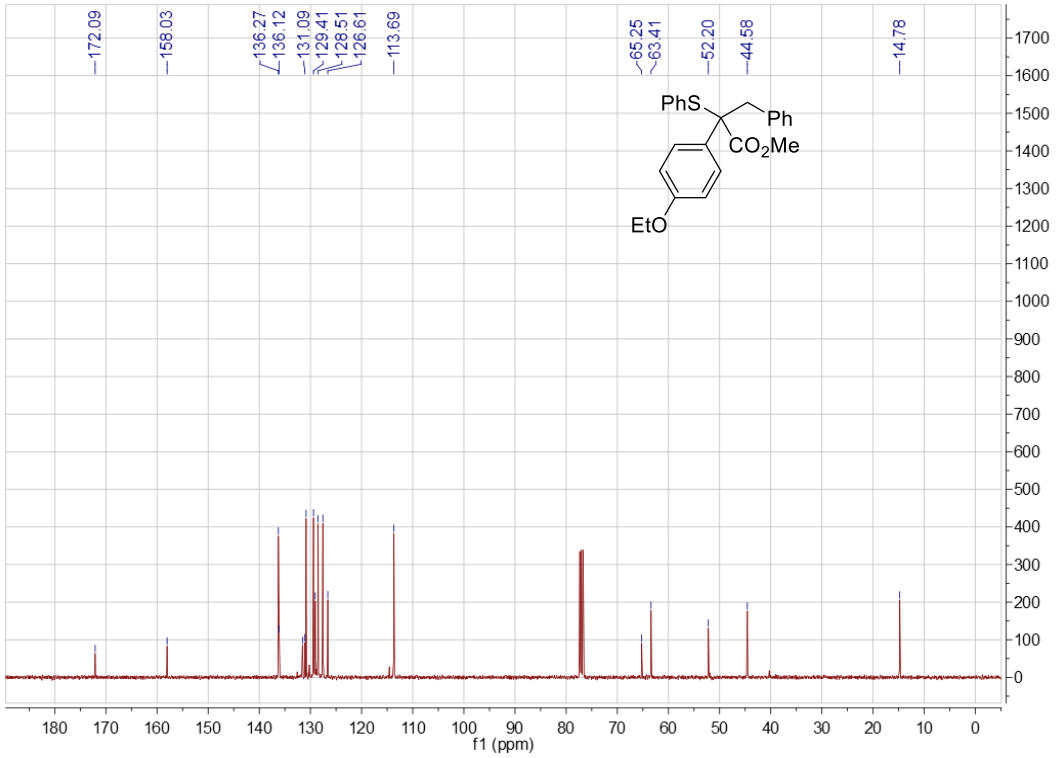


methyl 2-(4-ethoxyphenyl)-3-phenyl-2-(phenylthio)propanoate (**3bg**)

^{1}H NMR (600 MHz, $CDCl_3$)

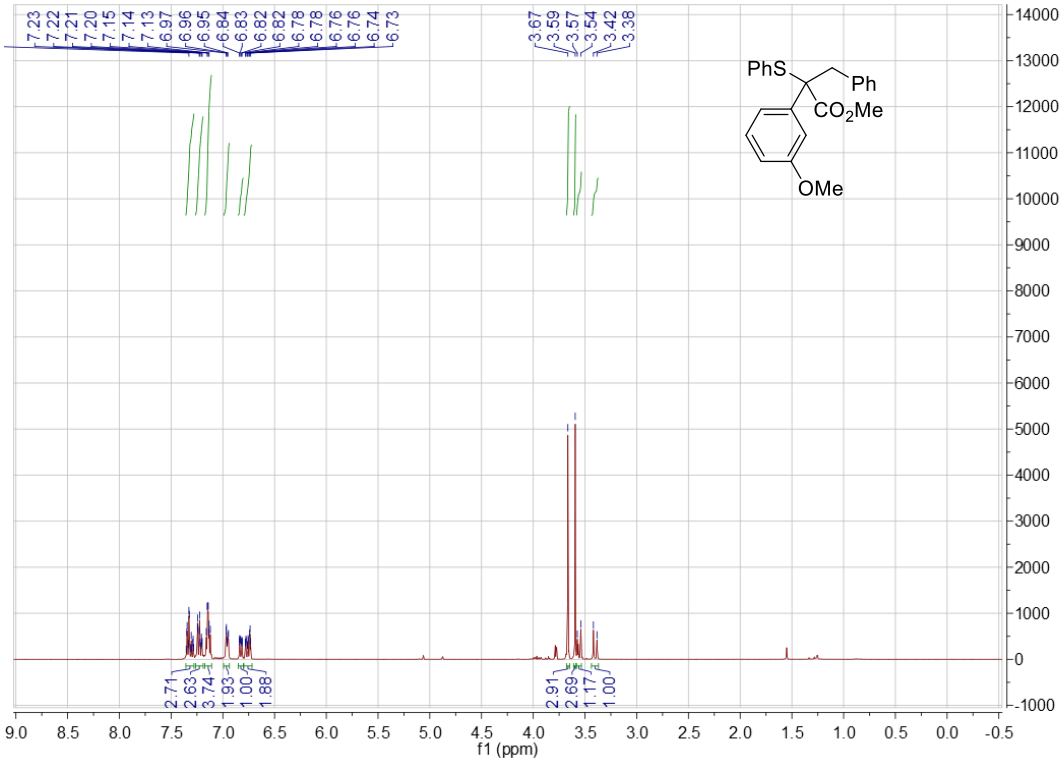


^{13}C NMR (151 MHz, $CDCl_3$)

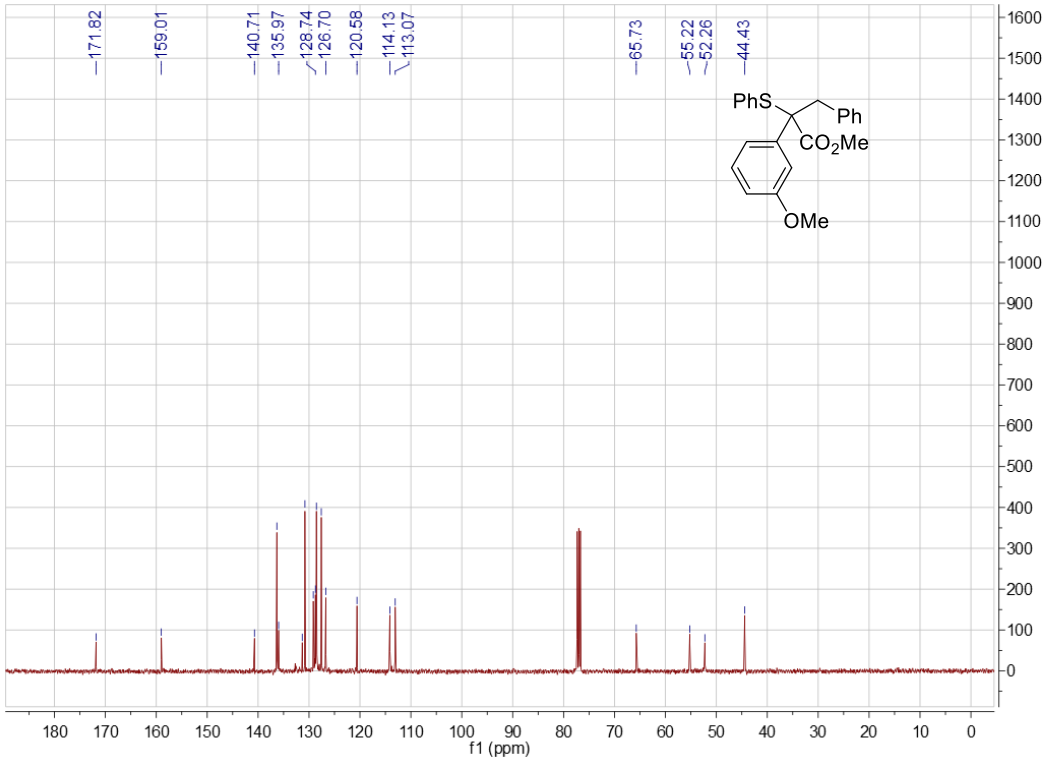


methyl 2-(3-methoxyphenyl)-3-phenyl-2-(phenylthio)propanoate (**3bh**)

^{1}H NMR (600 MHz, $CDCl_3$)

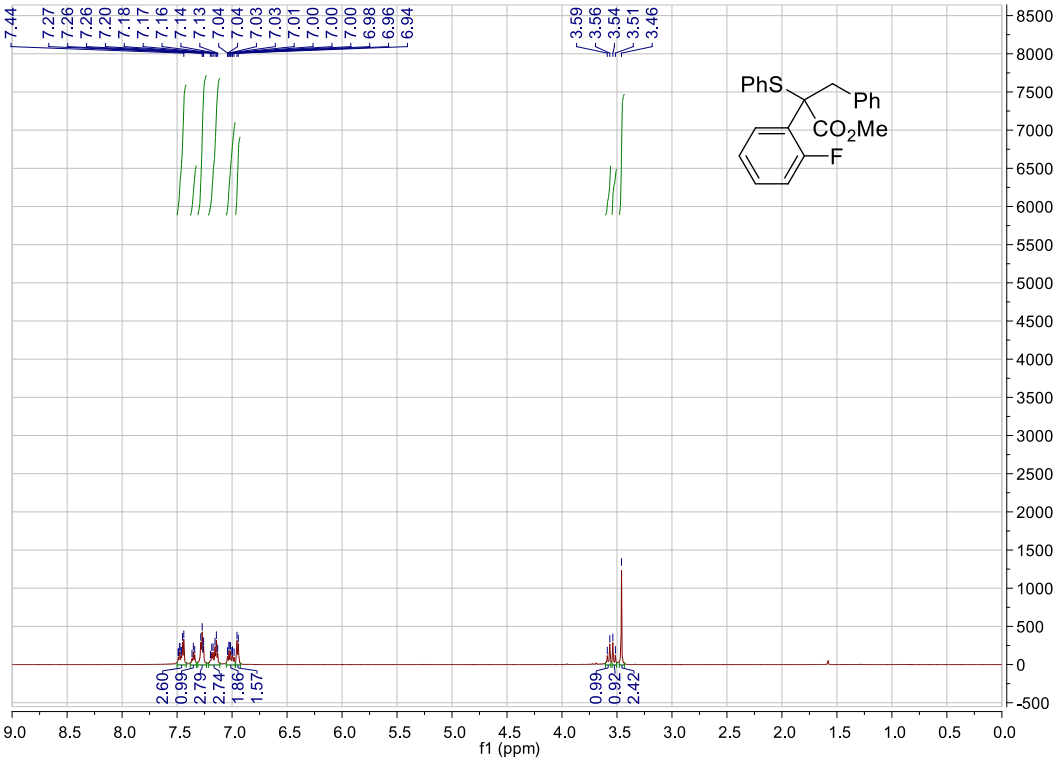


^{13}C NMR (151 MHz, $CDCl_3$)

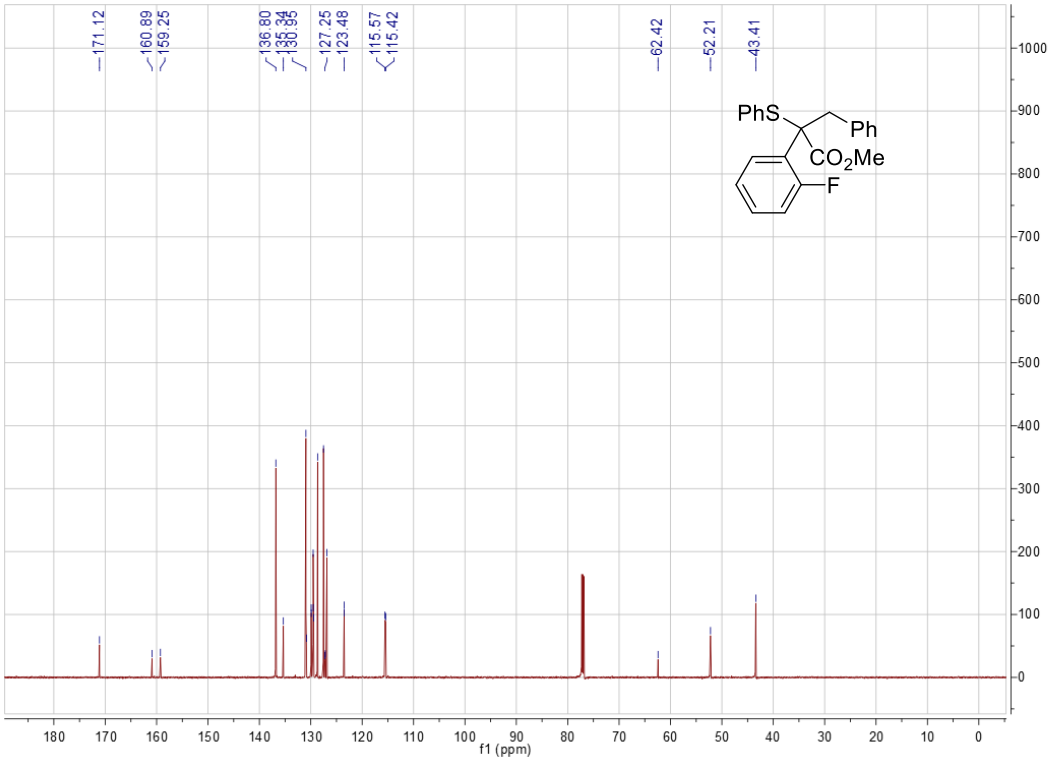


methyl 2-(2-fluorophenyl)-3-phenyl-2-(phenylthio)propanoate (**3bi**)

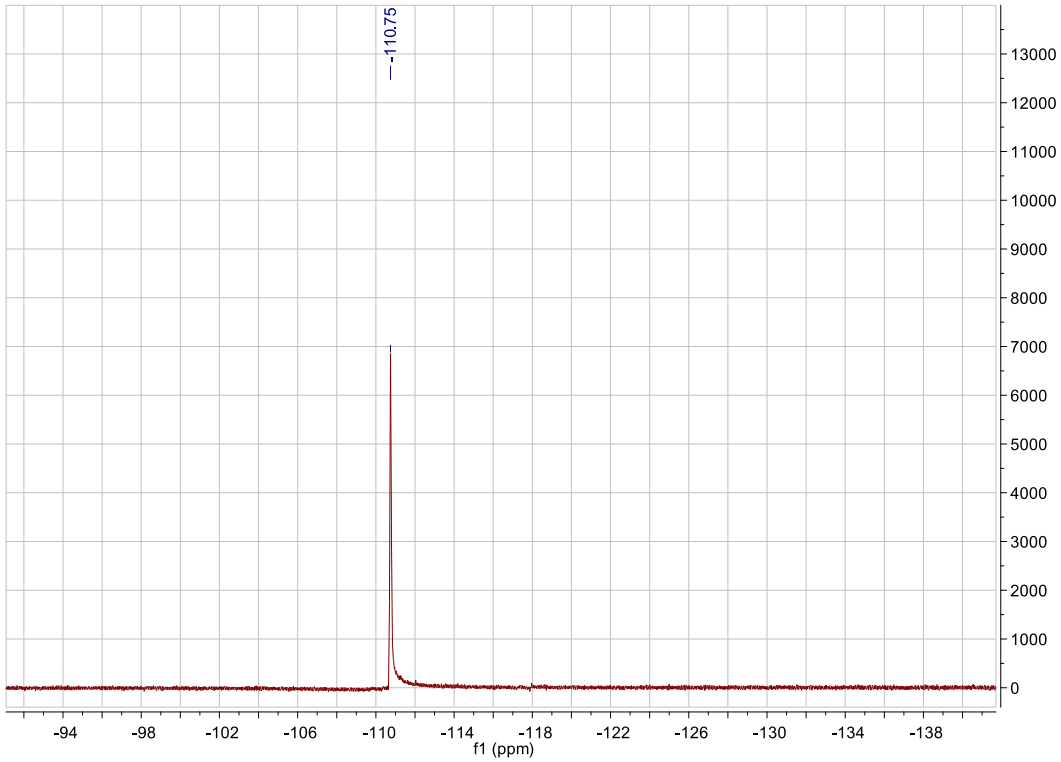
^{1}H NMR (600 MHz, $CDCl_3$)



^{13}C NMR (151 MHz, $CDCl_3$)

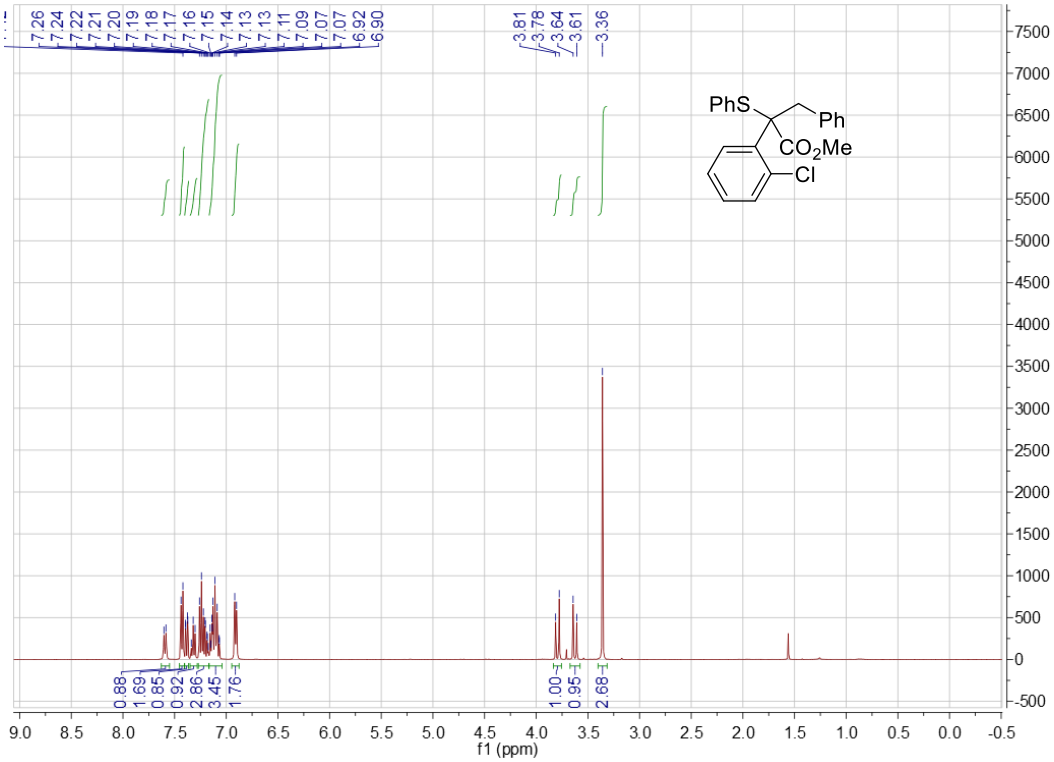


^{19}F NMR (564 MHz, $CDCl_3$)

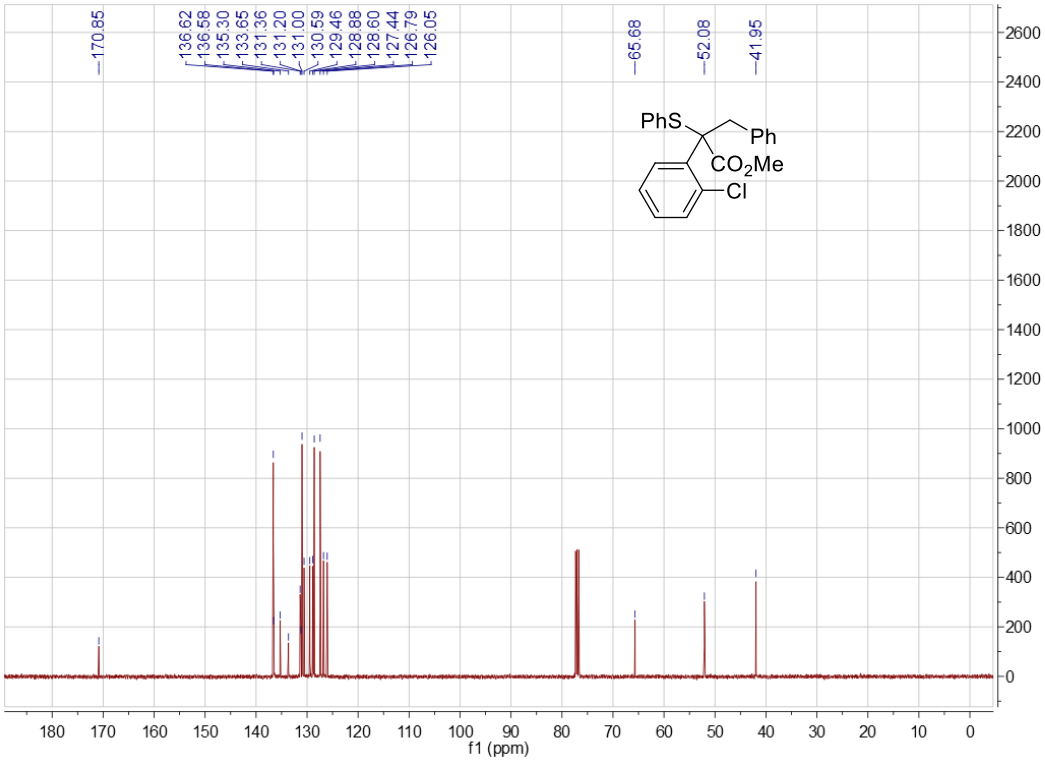


methyl 2-(2-chlorophenyl)-3-phenyl-2-(phenylthio)propanoate (**3bj**)

^{1}H NMR (600 MHz, $CDCl_3$)

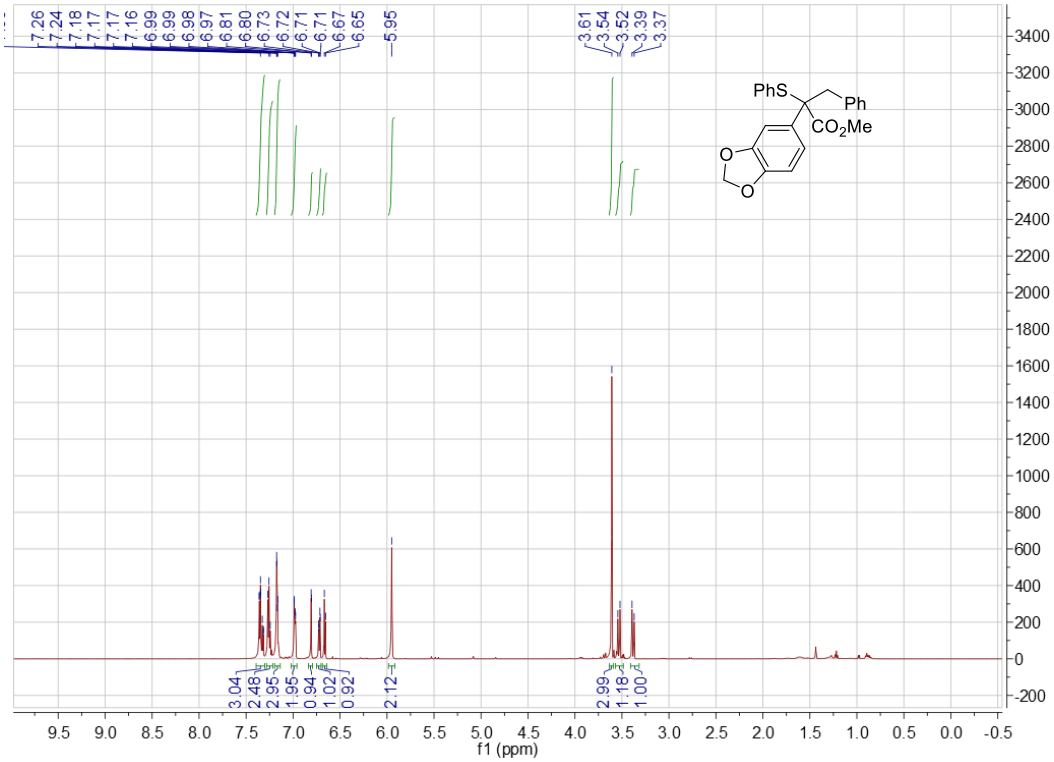


^{13}C NMR (151 MHz, $CDCl_3$)

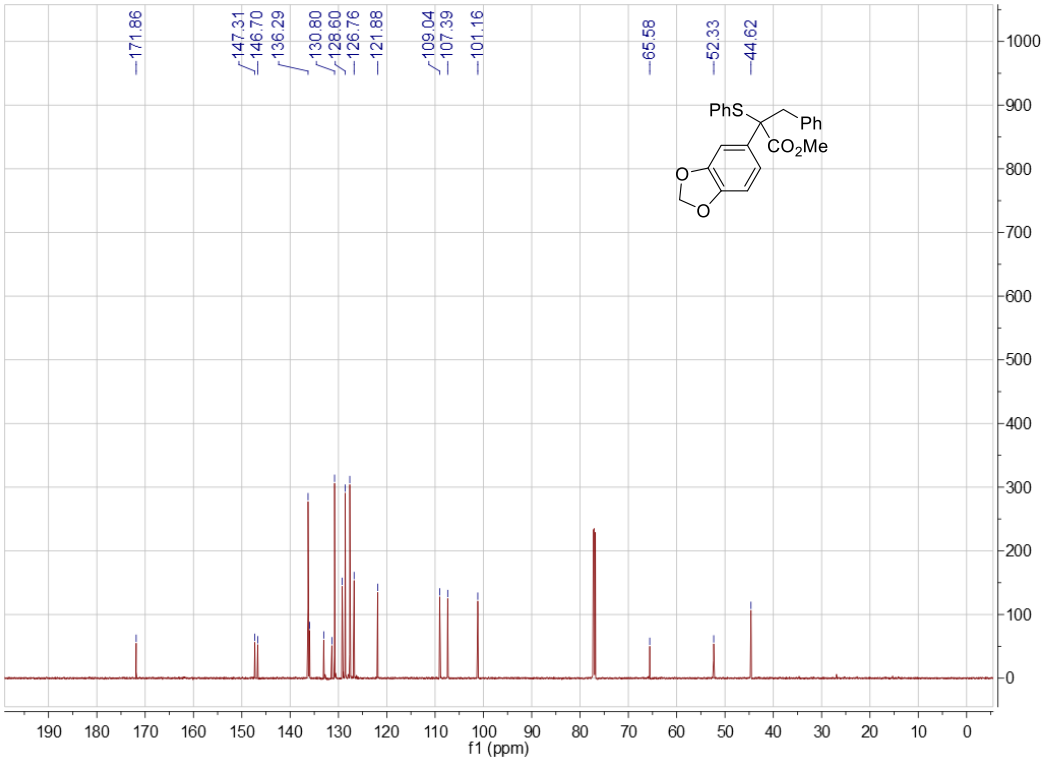


methyl 2-(benzo[d][1,3]dioxol-5-yl)-3-phenyl-2-(phenylthio)propanoate (**3bk**)

^{1}H NMR (600 MHz, $CDCl_3$)

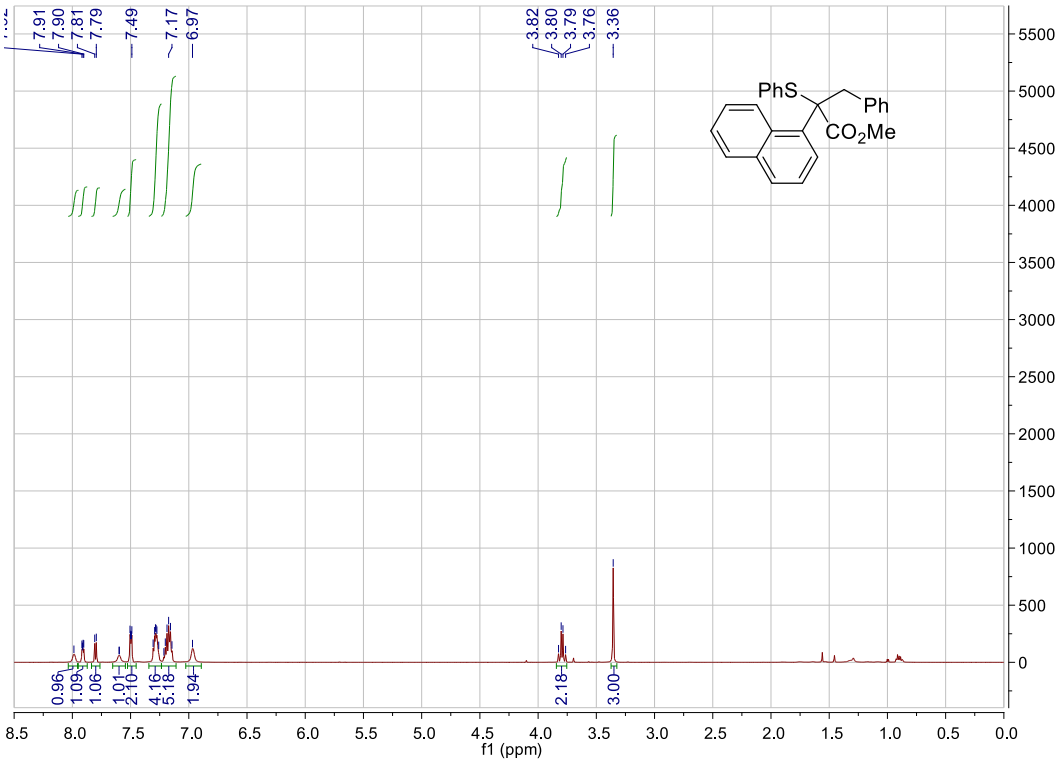


^{13}C NMR (151 MHz, $CDCl_3$)

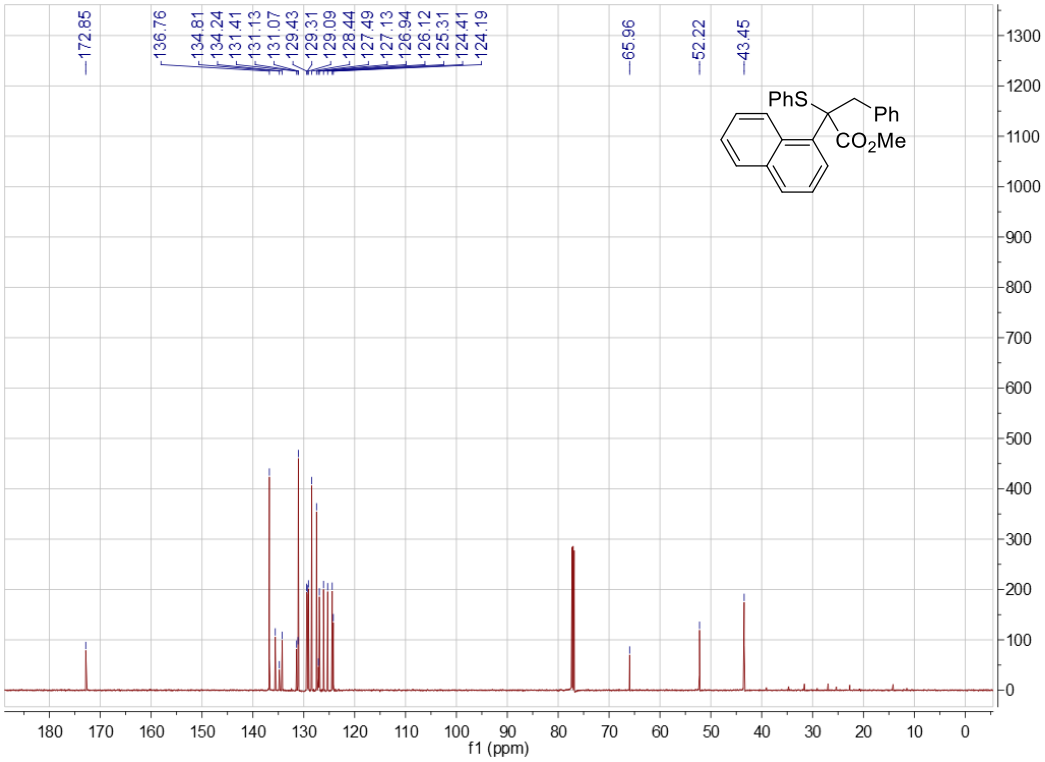


methyl 2-(naphthalen-1-yl)-3-phenyl-2-(phenylthio)propanoate (**3bl**)

^{1}H NMR (600 MHz, $CDCl_3$)

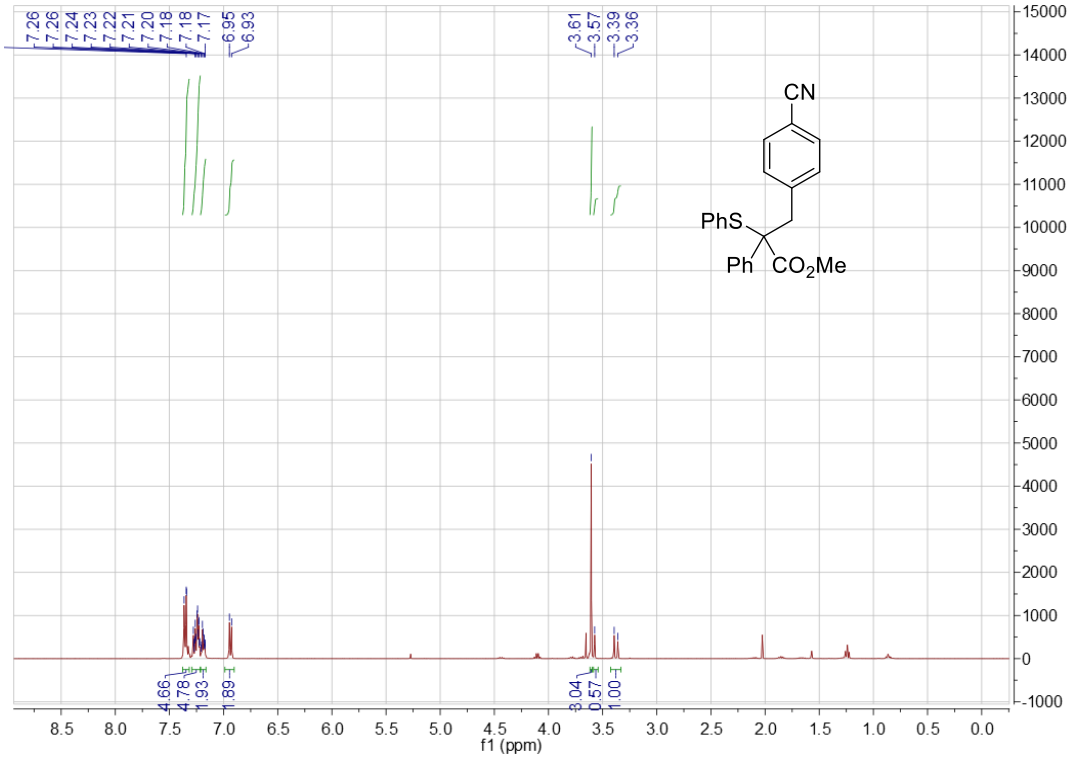


^{13}C NMR (151 MHz, $CDCl_3$)

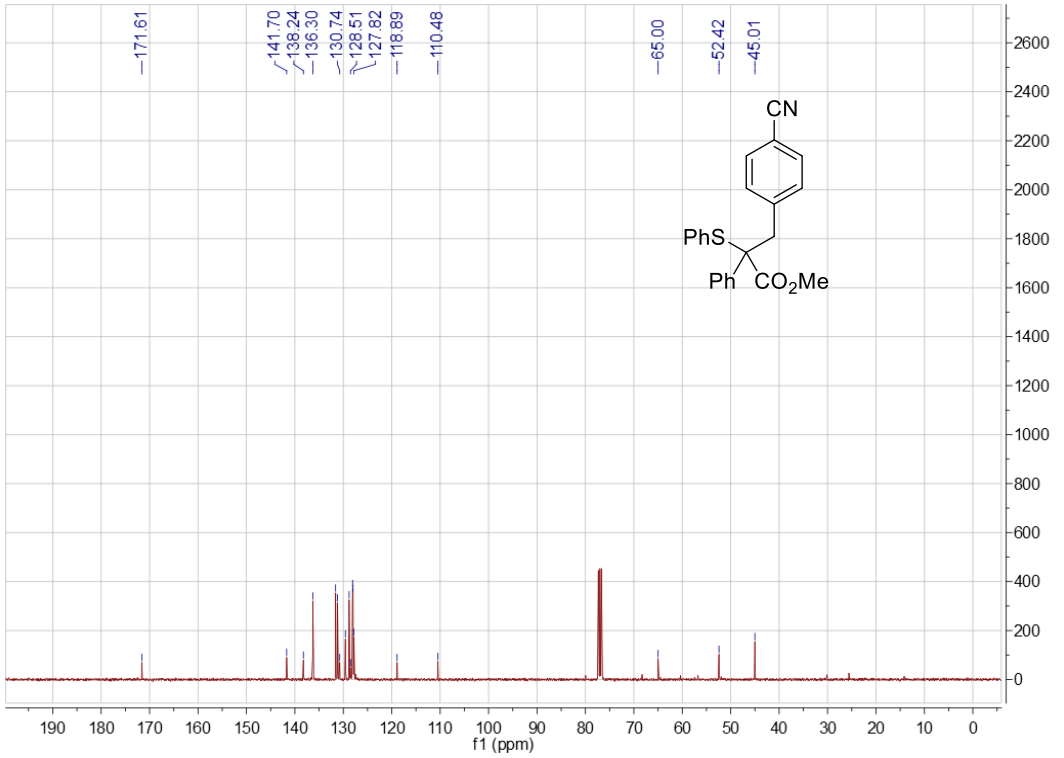


dimethyl 2-(4-cyanobenzyl)-2-(phenylthio)malonate (**3bm**)

^{1}H NMR (600 MHz, $CDCl_3$)

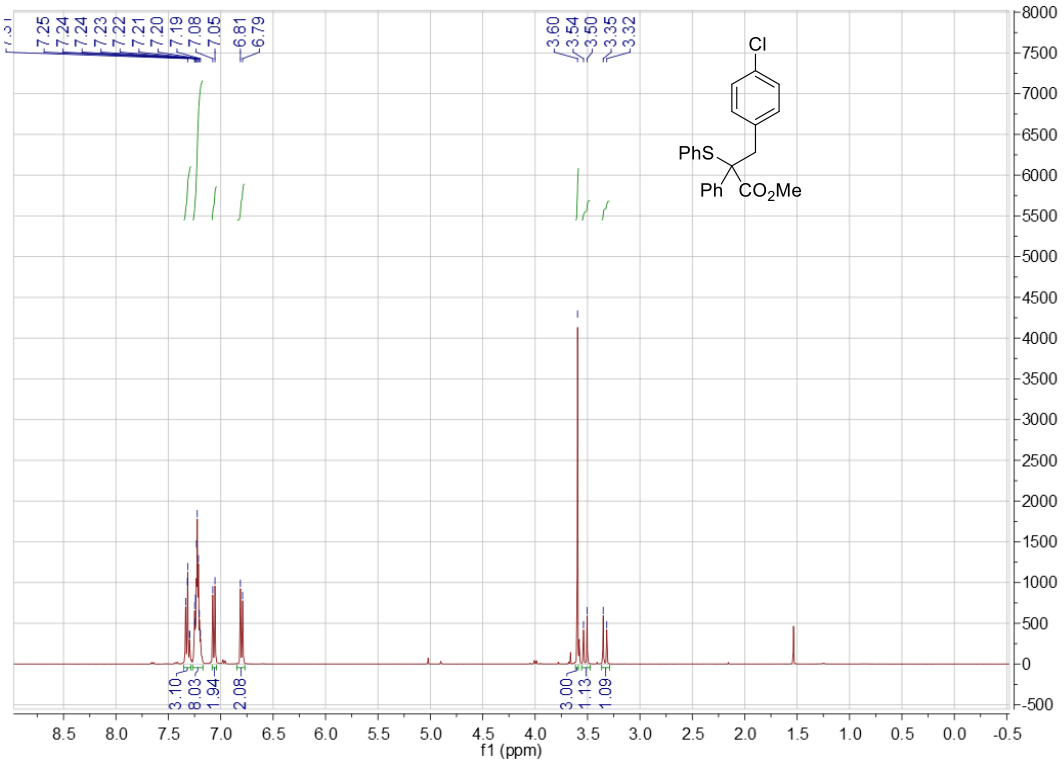


^{13}C NMR (151 MHz, $CDCl_3$)

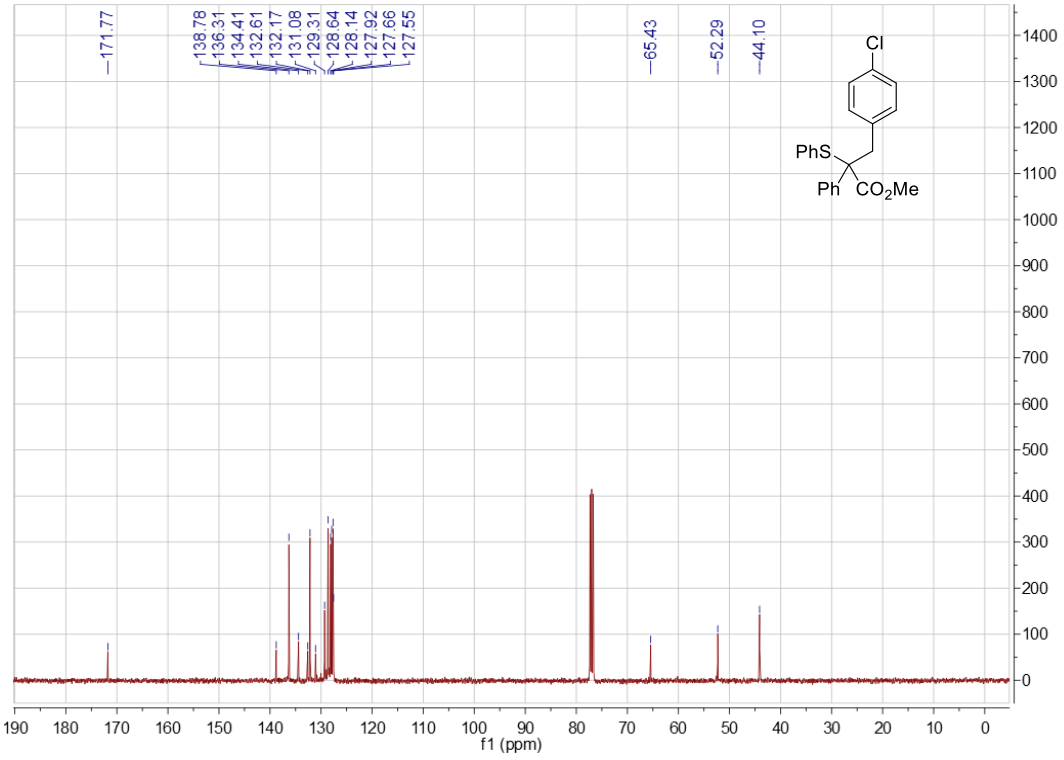


dimethyl 2-(4-chlorobenzyl)-2-(phenylthio)malonate (**3bn**)

^{1}H NMR (600 MHz, $CDCl_3$)

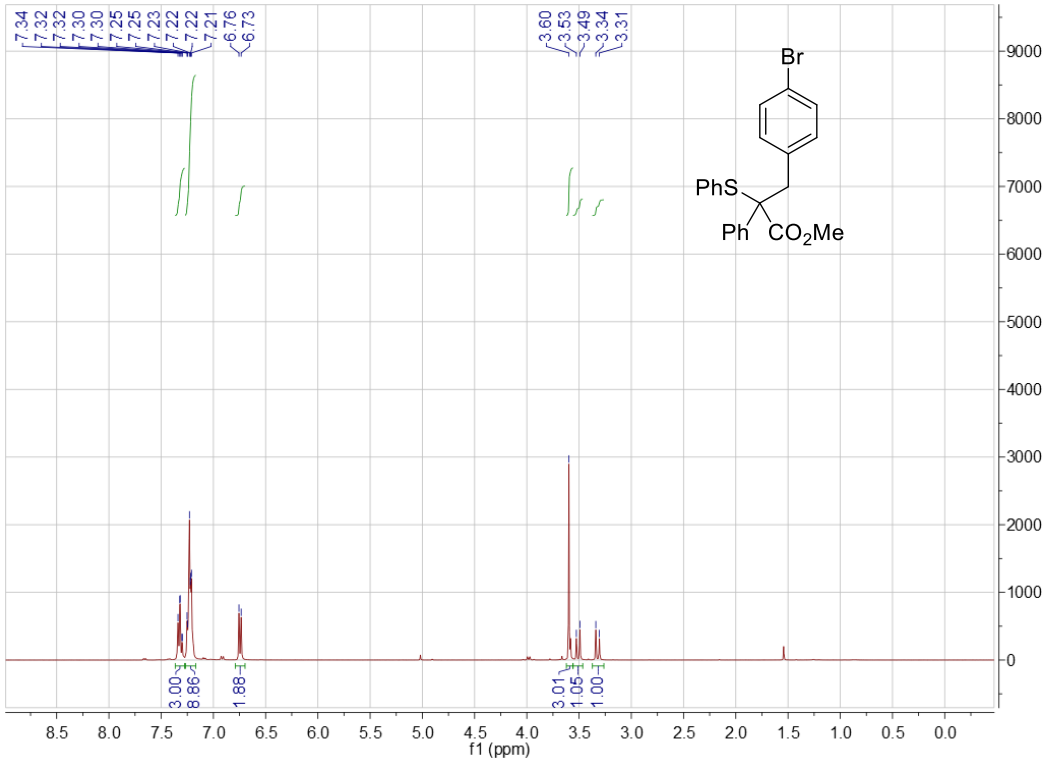


^{13}C NMR (151 MHz, $CDCl_3$)

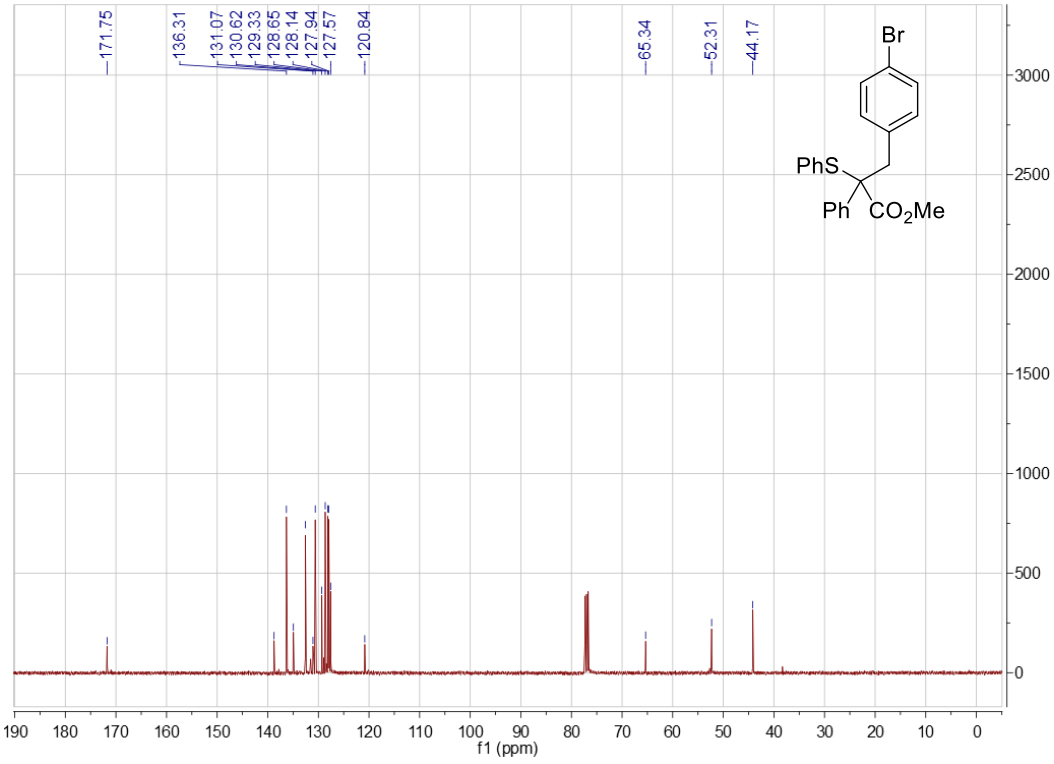


dimethyl 2-(4-bromobenzyl)-2-(phenylthio)malonate (**3bo**)

^{1}H NMR (600 MHz, $CDCl_3$)

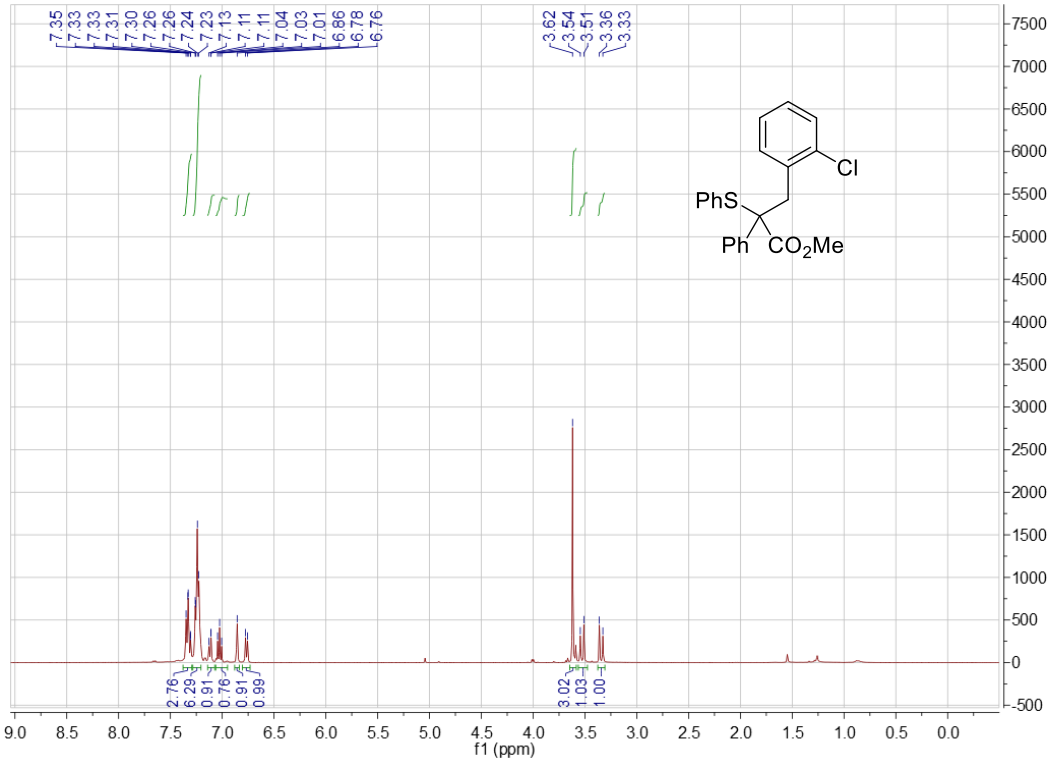


^{13}C NMR (151 MHz, $CDCl_3$)

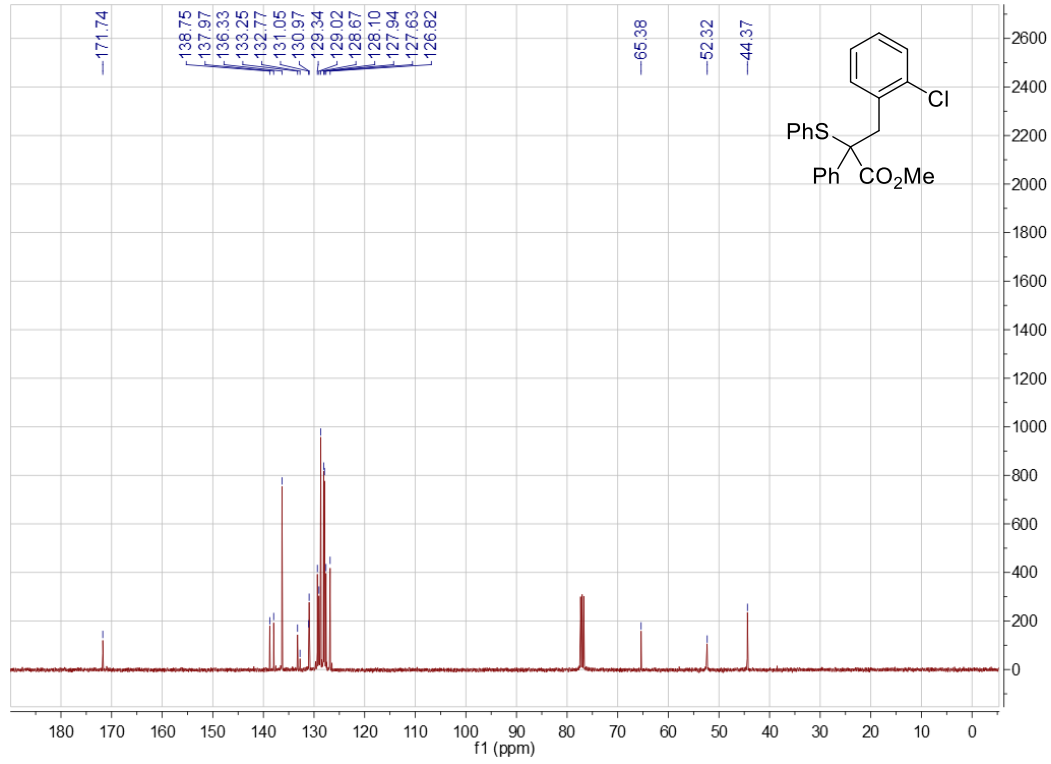


dimethyl 2-(2-chlorobenzyl)-2-(phenylthio)malonate (**3bp**)

^{1}H NMR (600 MHz, $CDCl_3$)

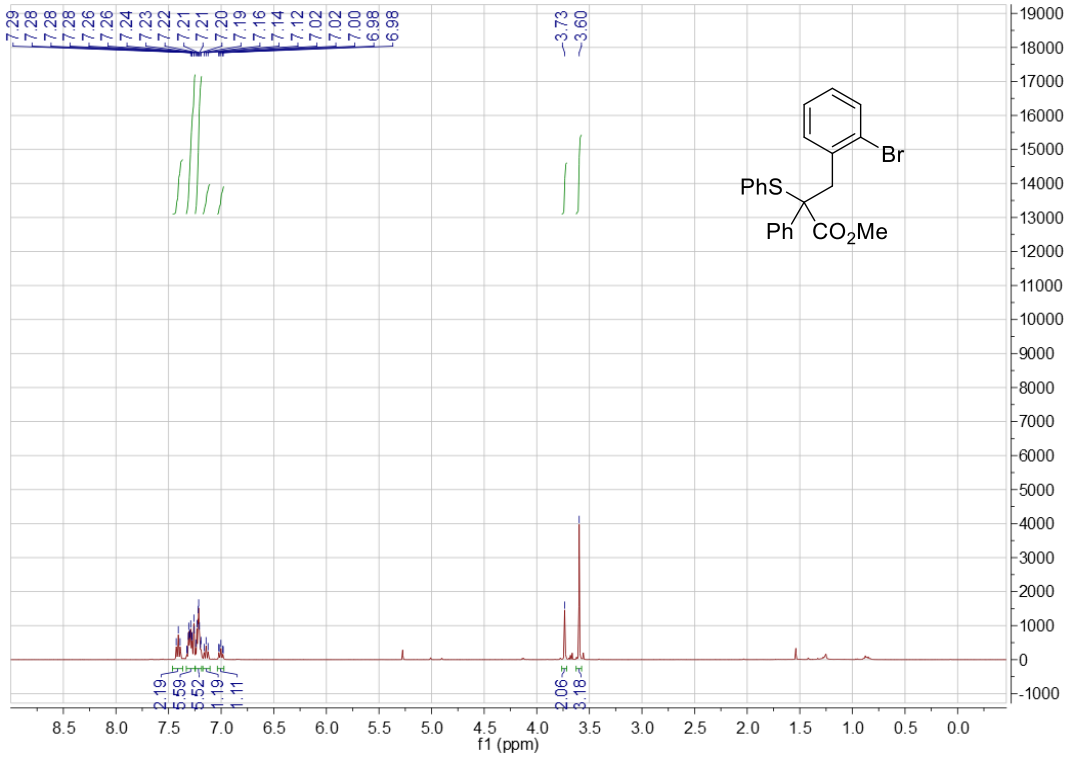


^{13}C NMR (151 MHz, $CDCl_3$)

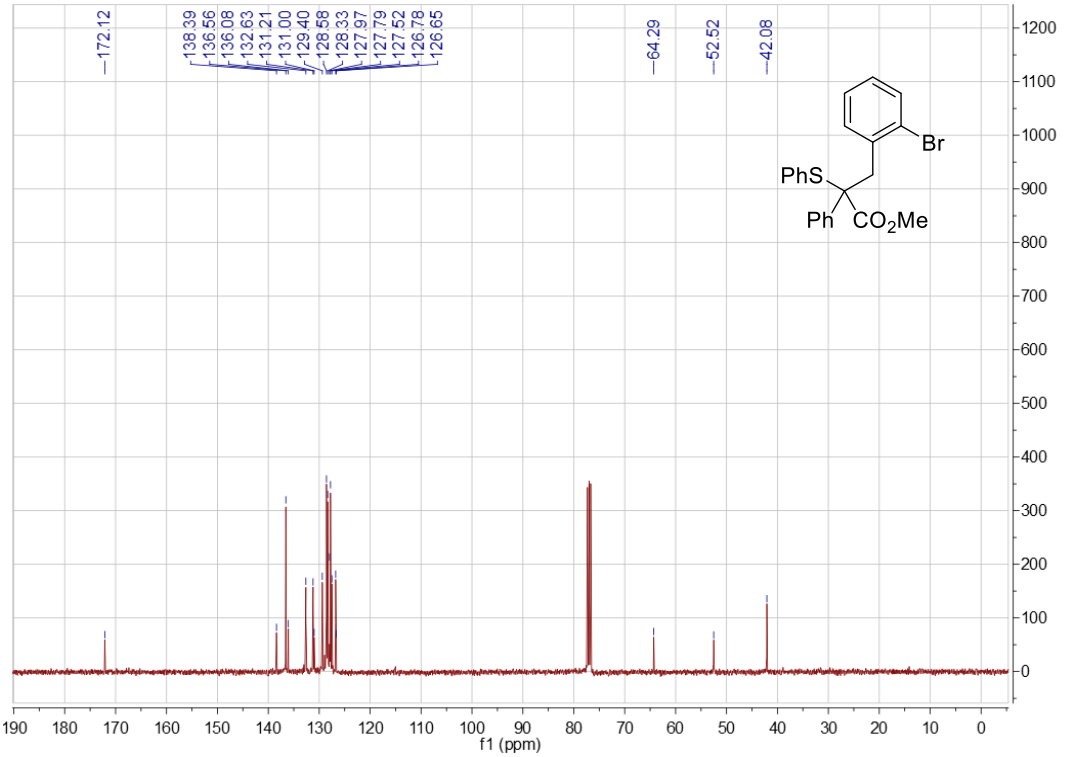


dimethyl 2-(2-bromobenzyl)-2-(phenylthio)malonate (**3bq**)

^{1}H NMR (600 MHz, $CDCl_3$)

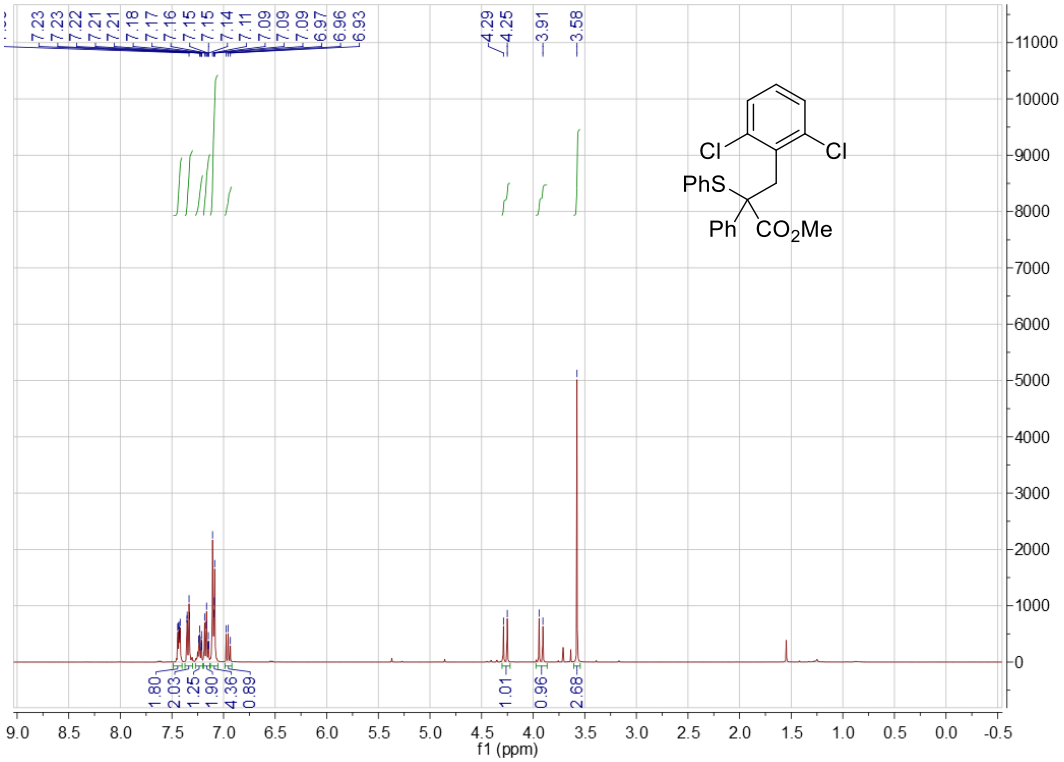


^{13}C NMR (151 MHz, $CDCl_3$)

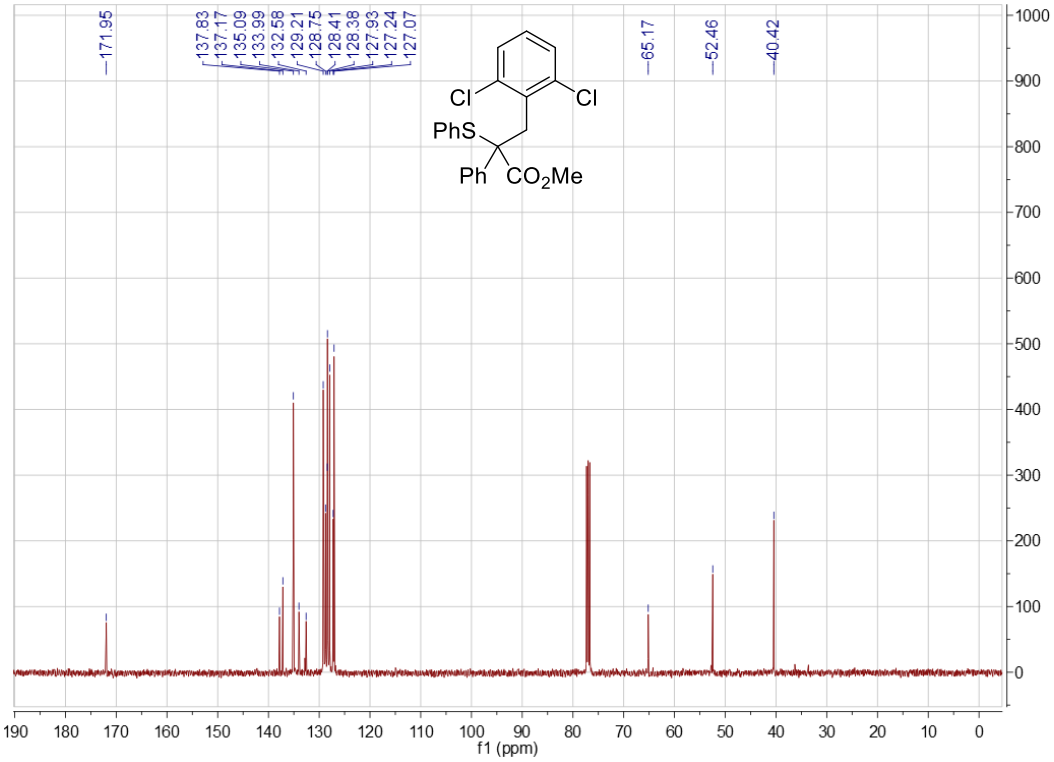


dimethyl 2-(2,6-dichlorobenzyl)-2-(phenylthio)malonate (**3br**)

^{1}H NMR (600 MHz, $CDCl_3$)

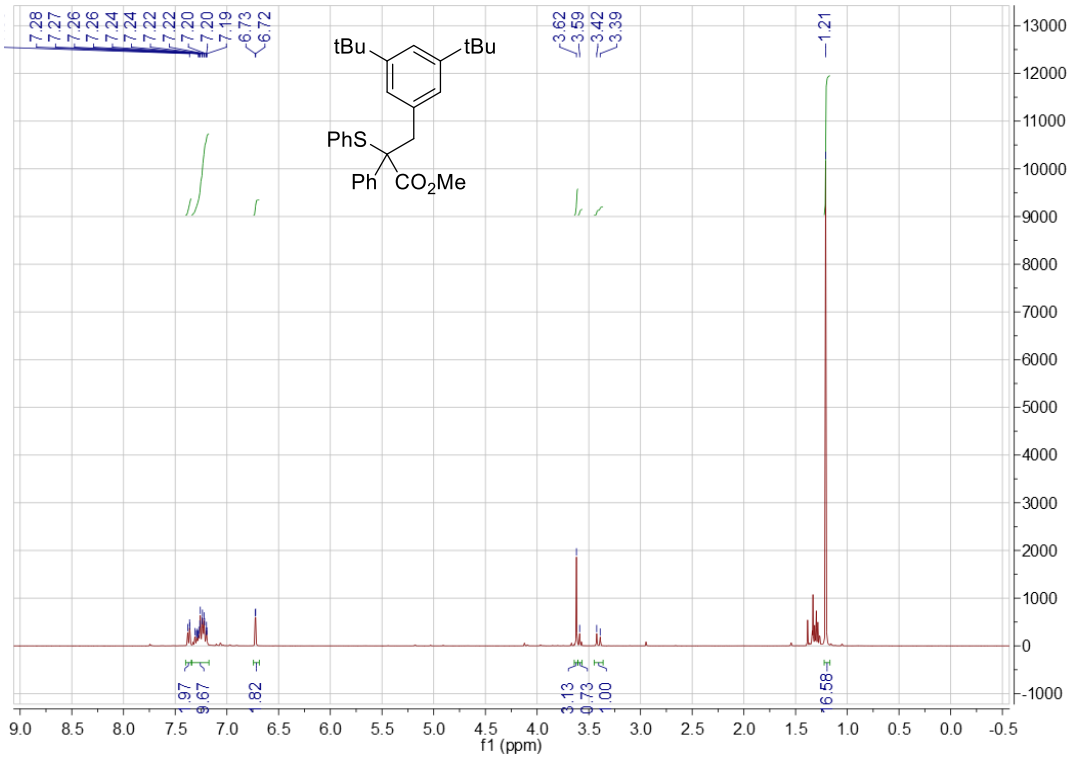


^{13}C NMR (151 MHz, $CDCl_3$)

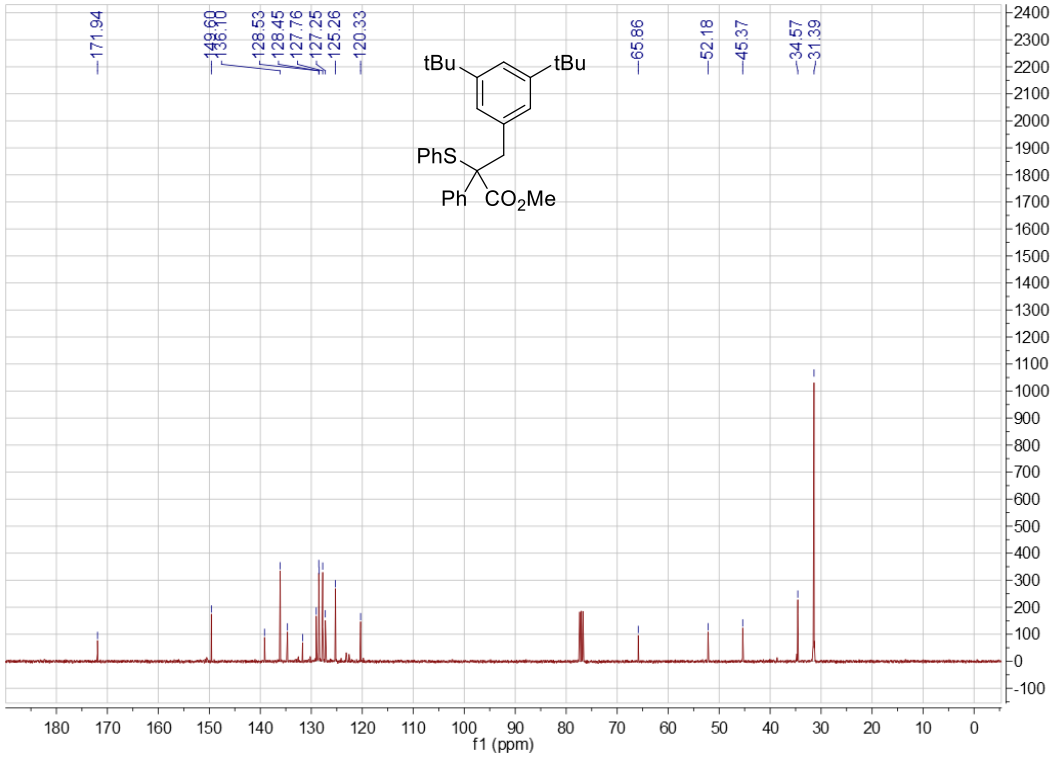


*dimethyl 2-(3,5-di-tert-butylbenzyl)-2-(phenylthio)malonate (**3bs**)*

^{1}H NMR (600 MHz, $CDCl_3$)

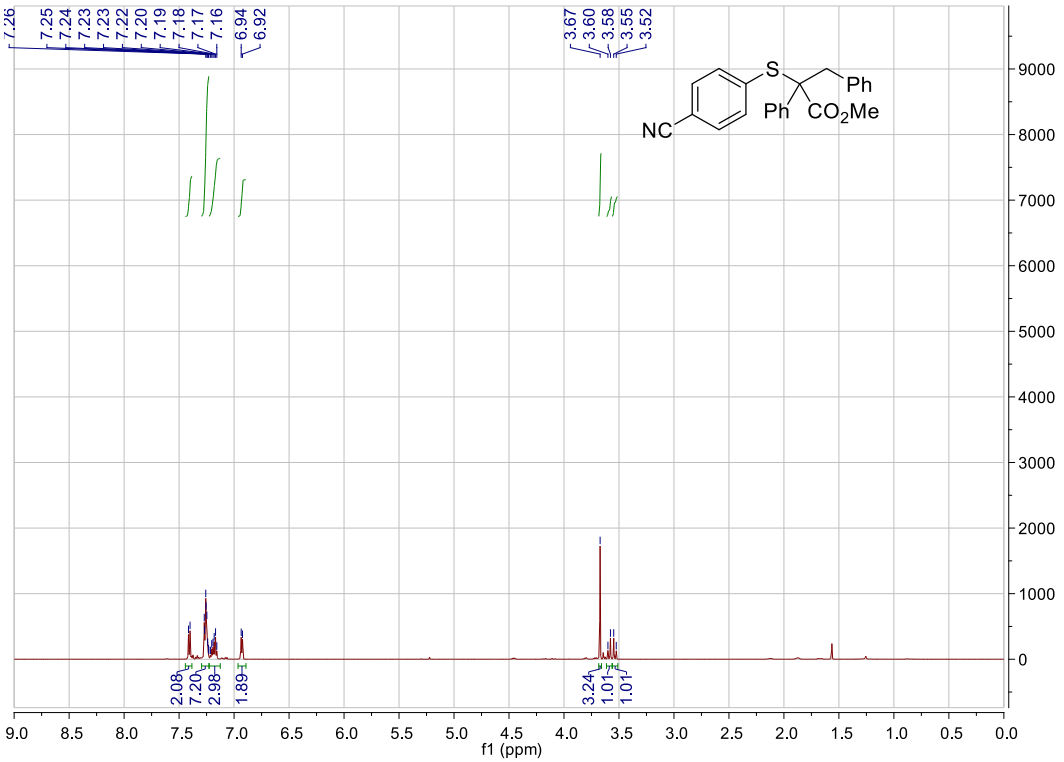


^{13}C NMR (151 MHz, $CDCl_3$)

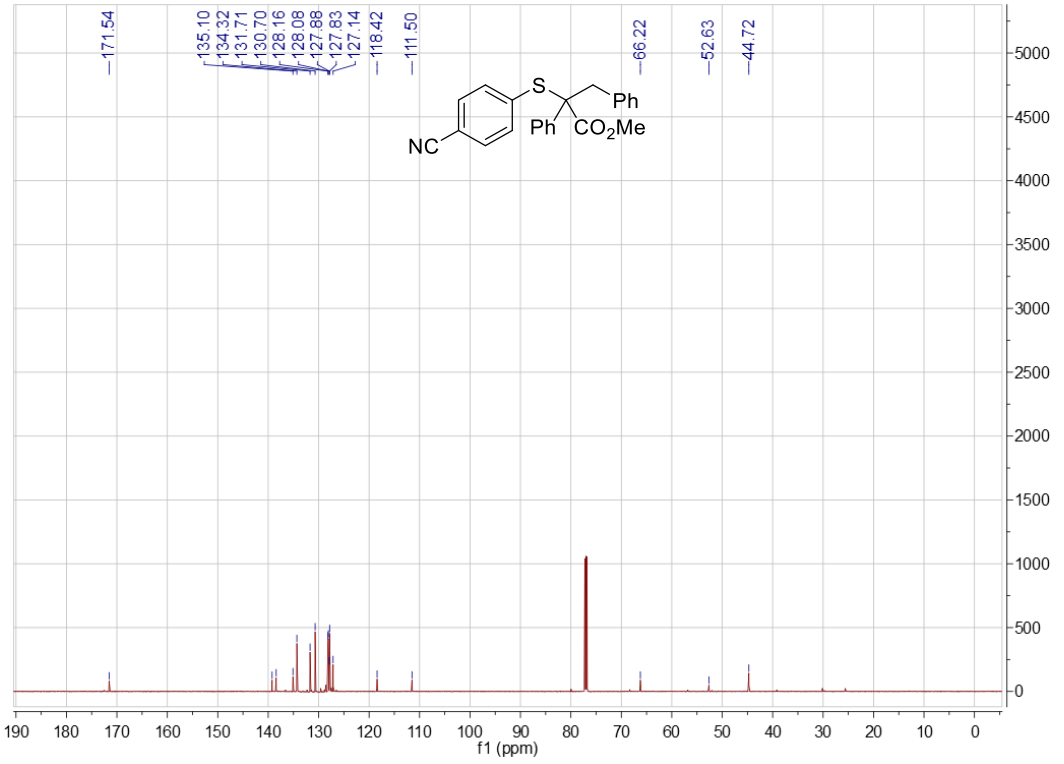


methyl 2-((4-cyanophenyl)thio)-2,3-diphenylpropanoate (**3bt**)

^{1}H NMR (600 MHz, $CDCl_3$)

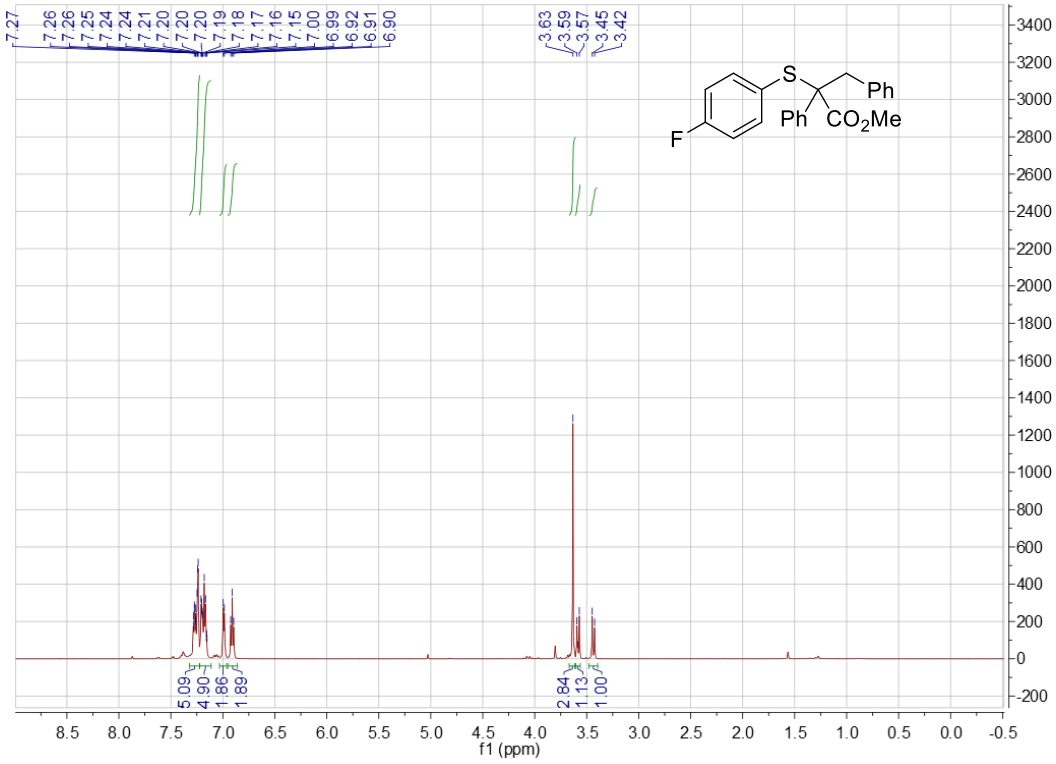


^{13}C NMR (151 MHz, $CDCl_3$)

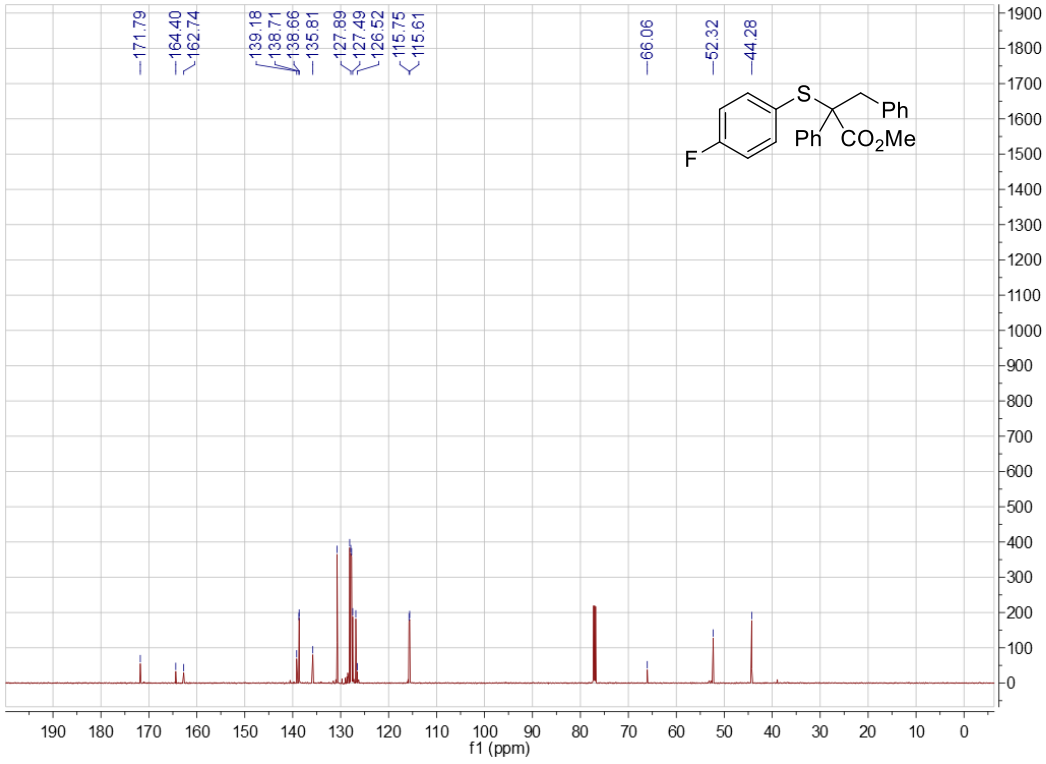


methyl 2-((4-fluorophenyl)thio)-2,3-diphenylpropanoate (**3bu**)

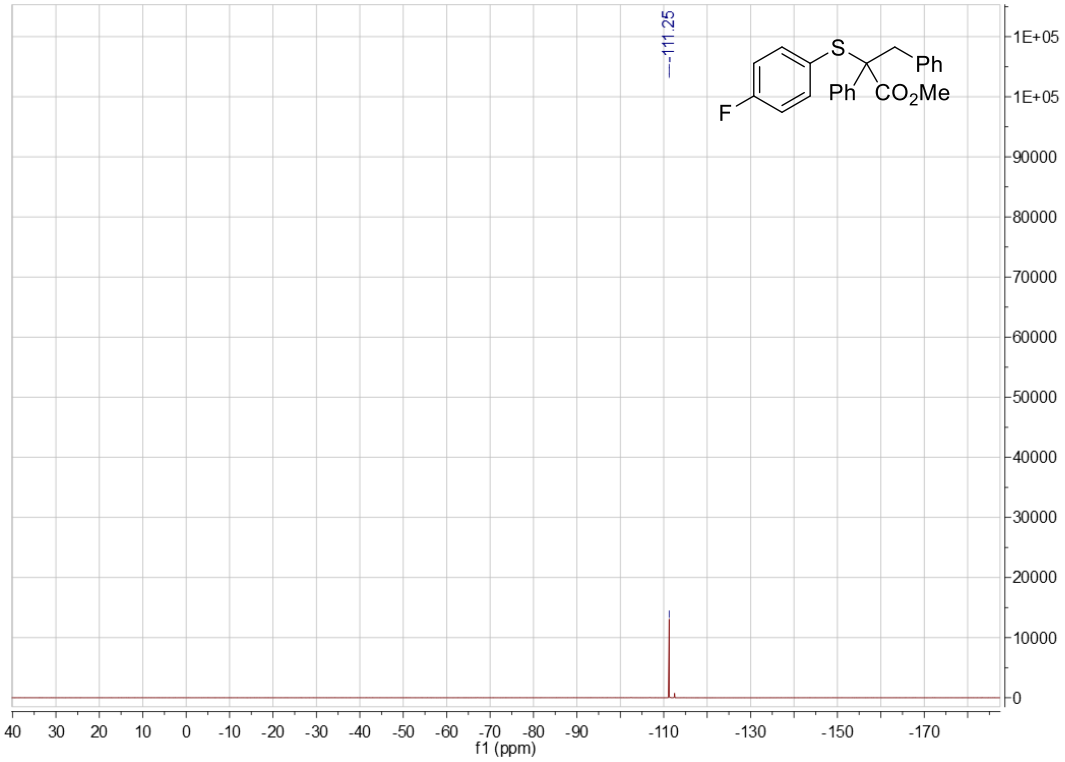
^{1}H NMR (600 MHz, $CDCl_3$)



^{13}C NMR (151 MHz, $CDCl_3$)

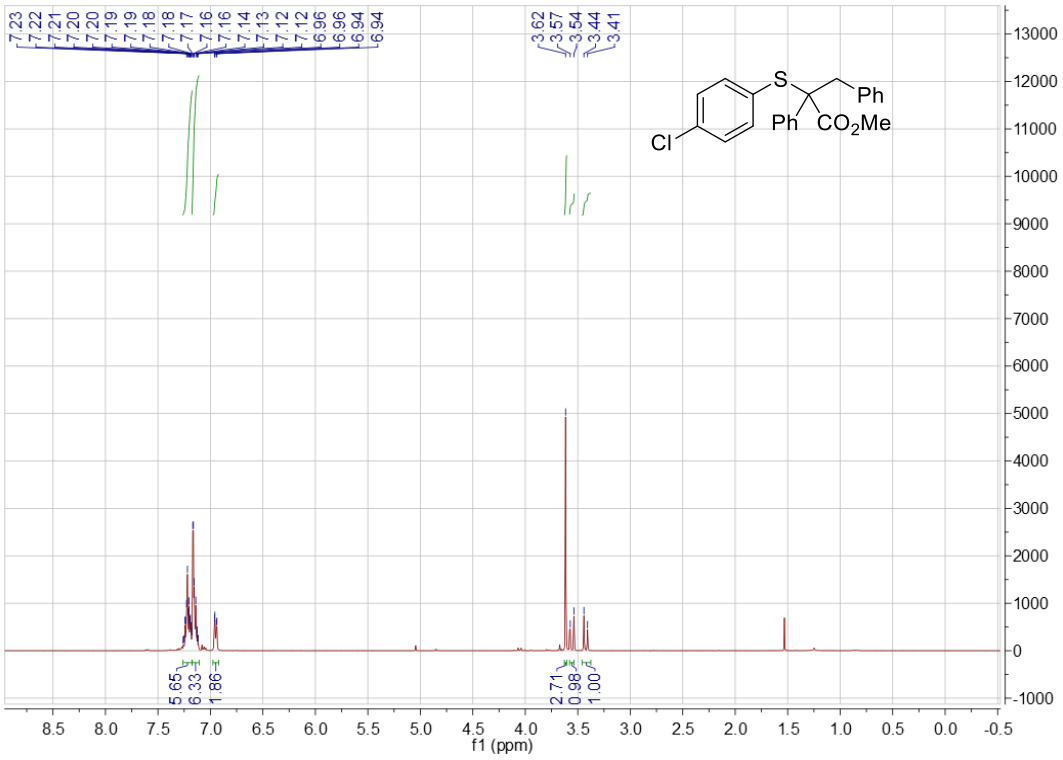


^{19}F NMR (564 MHz, $CDCl_3$)

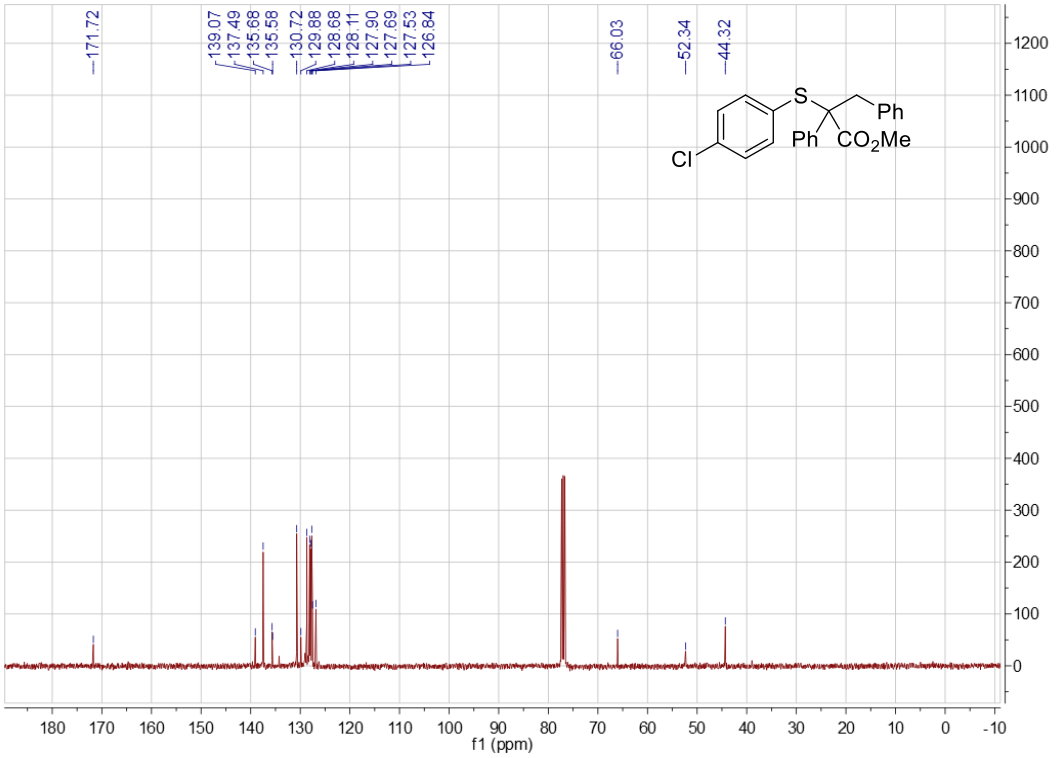


methyl 2-((4-chlorophenyl)thio)-2,3-diphenylpropanoate (**3bv**)

^{1}H NMR (600 MHz, $CDCl_3$)

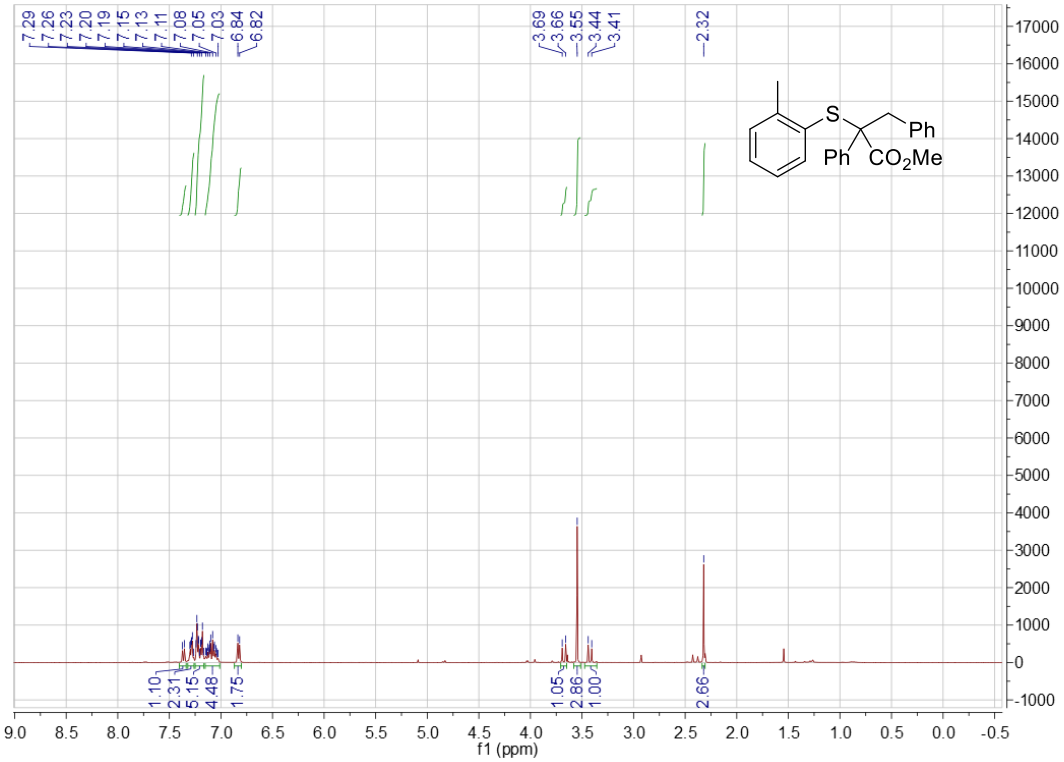


^{13}C NMR (151 MHz, $CDCl_3$)

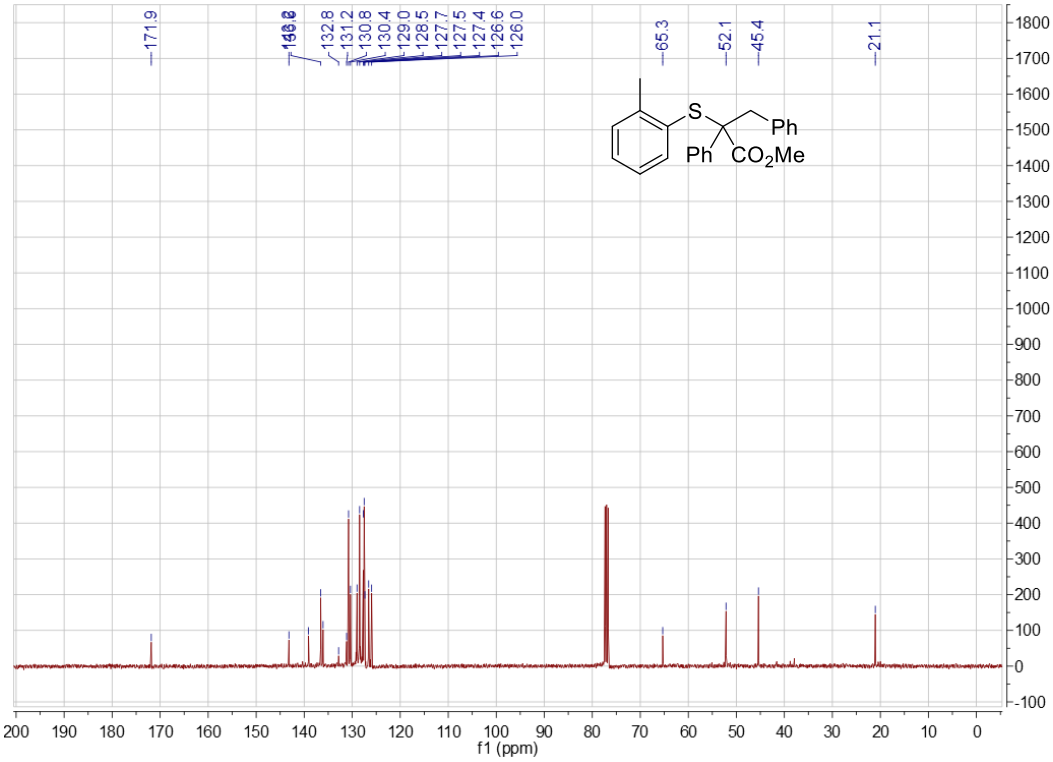


methyl 2,3-diphenyl-2-(o-tolylthio)propanoate (**3bw**)

^{1}H NMR (600 MHz, $CDCl_3$)

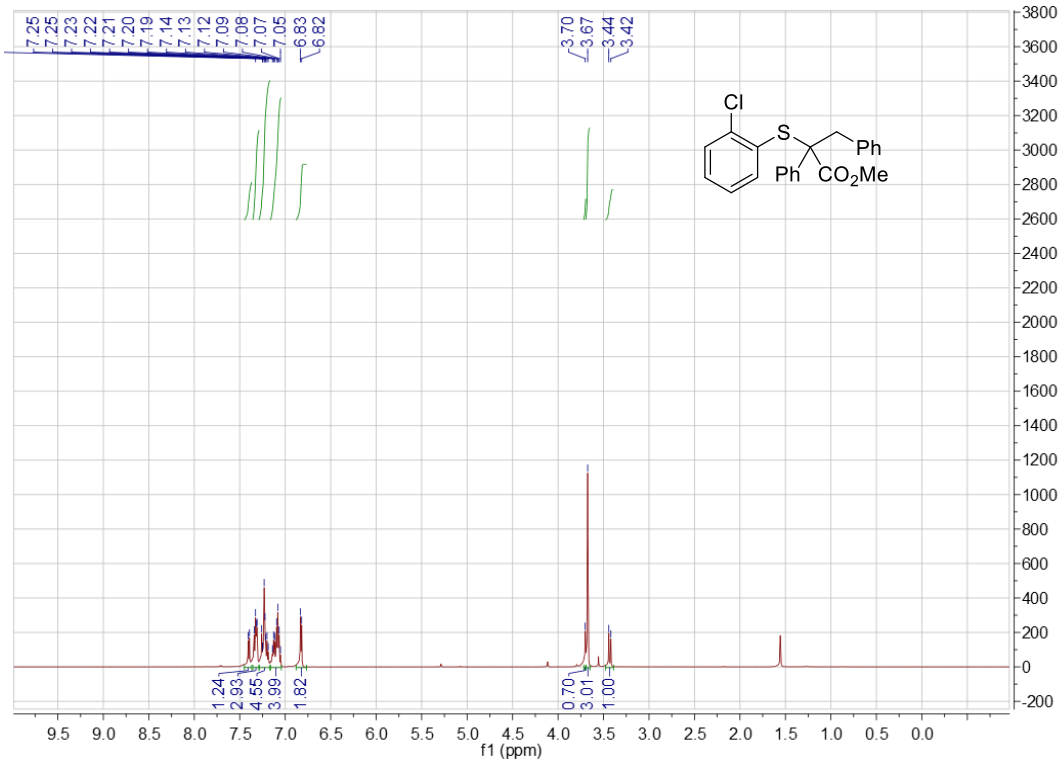


^{13}C NMR (151 MHz, $CDCl_3$)

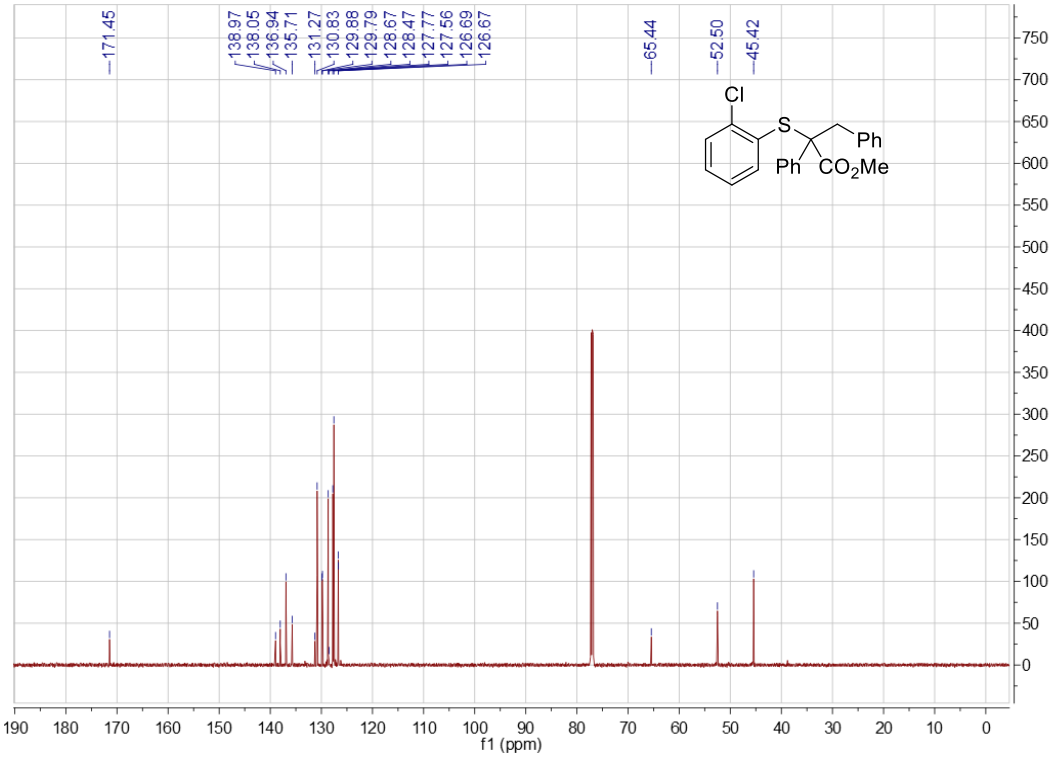


methyl 2-((2-chlorophenyl)thio)-2,3-diphenylpropanoate (**3bx**)

^{1}H NMR (600 MHz, $CDCl_3$)

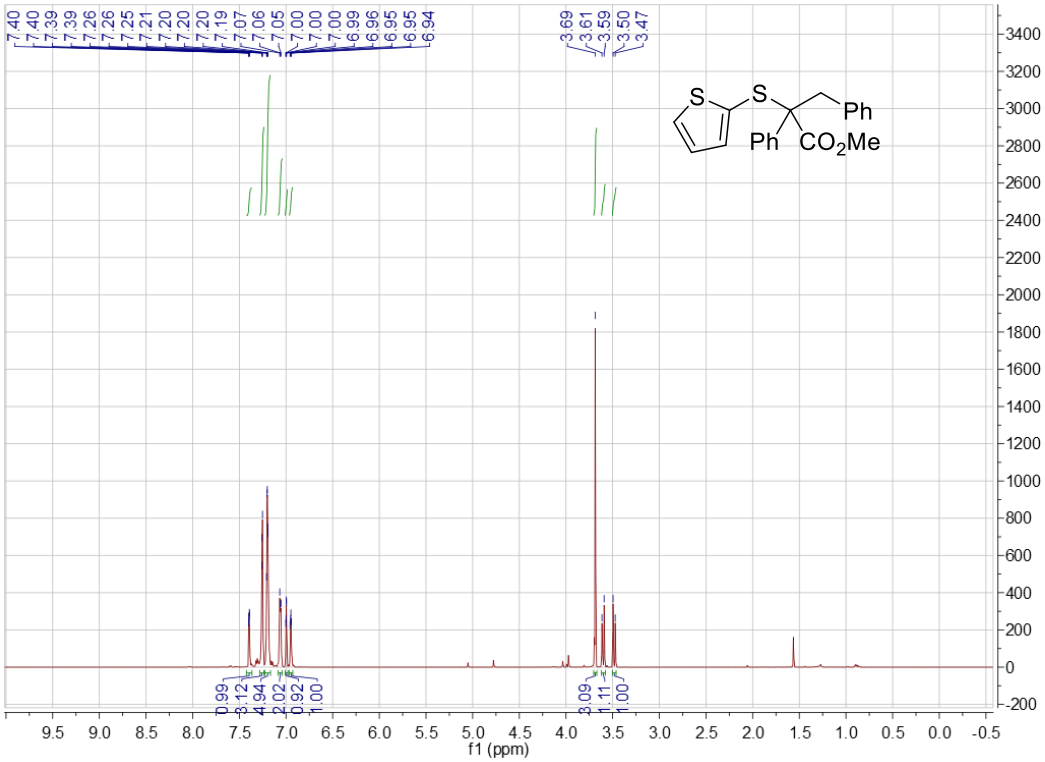


^{13}C NMR (151 MHz, $CDCl_3$)



methyl 2,3-diphenyl-2-(thiophen-2-ylthio)propanoate (**3by**)

^{1}H NMR (600 MHz, $CDCl_3$)



^{13}C NMR (151 MHz, $CDCl_3$)