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Supporting Information

A new multicomponent reaction: Unexpected formation of derivatizable cyclic α-alkoxy isothioureas

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Experimental procedures

General Methods

Synthetic procedures conducted under argon atmosphere were performed on a vacuum line using standard Schlenk techniques. Preparative column chromatography was carried out using GRACE SiO_2 (0.035–0.070 mm, type KG 60). All eluents for column chromatography were treated with Et_3N (1 % w/w). TLC was performed on MACHERY-NAGEL SiO_2 F254 plates on aluminum sheets. Melting points were obtained on a melting point apparatus of LABORATORY DEVICES and are uncorrected. ^{1}H NMR spectra of the crude products were recorded with a BRUKER AM 300 (measuring frequency: ^{1}H NMR = 300.1 MHz). ^{1}H and ^{13}C NMR spectra of the isolated products were recorded with a BRUKER AMX R 500 (measuring frequency: ^{1}H NMR = 500.1 MHz, ^{13}C NMR = 125.8 MHz) or a BRUKER Avance III 500 (measuring frequency: ^{1}H NMR = 499.9 MHz, ^{13}C NMR = 125.7 MHz) spectrometer in $CDCl_3$ or DMSO-d_6 solution. Chemical shifts are referenced to the residual peaks of the solvent [$CDCl_3$: 7.26 ppm (^{1}H NMR), 77.16 ppm (^{13}C NMR); DMSO-d_6: 2.50 ppm (^{1}H NMR), 39.53 ppm (^{13}C NMR)].[S1] Assignments of the signals were supported by measurements applying DEPT and COSY techniques. Isomer ratios were determined by integrals of cleanly separated signals in the ^{1}H NMR (300 MHz) spectra of the crude product. The structures of regioisomers were assigned by using HMBC (^{1}H-^{13}C) spectra. In the ^{1}H NMR spectra of compounds **4a**, **4b**, **4c**, **4g**, **4h**, **4i**, and **4j**, the signal, which belongs to NH, is missing. In the ^{13}C NMR spectra of compounds **4** often three very broad peaks, which probably belong to C=N*C*H$_2$, S*C*CH and NCH, are observed. The shifts of the signals are given if possible. Due to isomerization of compounds **5**, the NMR spectra may exhibits signals of solvents or of the respective regioisomer (compounds **6**). Mass spectra were obtained on a WATERS Q-TOF Premier (ESI) and a Finnigan MAT 95 (EI, CI) spectrometer. The IR spectra were recorded with a BRUKER Tensor 27 spectrometer equipped with a "Golden Gate" diamond-ATR (attenuated total reflection) unit. 2,2,5,5-Tetramethyl-2,5-dihydrothiazole (**1a**),[S2] 5,5-diethyl-2,2-dimethyl-2,5-dihydrothiazole (**1b**),[S3] 2,2-dimethyl-1-thia-3-azaspiro[4.5]dec-3-ene (**1c**),[S4] 2,2-dimethyl-1-thia-4-azaspiro[4.5]dec-3-en (**1d**),[S2] and 2,2,5,5-tetramethyl-2,5-dihydro-thiazole-1-oxide (**2a**)[S5] were prepared according to published procedures. CH_2Cl_2 was refluxed with CaH and freshly distilled prior to use.

General Procedure (GP A)

The respective 3-thiazoline (1.0 equiv.) was dissolved in a mixture of a saturated aqueous $NaHCO_3$-solution and CH_2Cl_2 (3:1; 5.0 mL per mmol 3-thiazoline). *m*CPBA (*meta*-chloroperbenzoic acid, 77 %; 1.3 equiv.), dissolved in CH_2Cl_2 (2.5 mL per mmol 3-thiazoline), was added dropwise at 0 °C. The reaction mixture was vigorously stirred for 17 h at r. t.. The layers were separated. The aqueous layer was extracted with CH_2Cl_2 (2 × 3.0 mL per mmol 3-thiazoline) and the combined organic layers were dried ($MgSO_4$). The solvent was removed on a rotary evaporator and the crude product was purified by column chromatography on silica gel.

5,5-Diethyl-2,2-dimethyl-2,5-dihydro-thiazol-1-oxide (2b): According to **GP A**, 3-thiazoline **1b** (500 mg, 2.92 mmol) and *m*CPBA (77 %; 849 mg, 3.79 mmol) were reacted. Purification by column chromatography (EtOAc, R_f = 0.37) afforded **2b** (524 mg, 96 %) as a colorless oil; IR (ATR): $\tilde{\nu}$ 2970, 2931, 2880, 1645, 1457, 1381, 1297, 1046 cm^{-1}; ^{1}H NMR (499.9 MHz, $CDCl_3$): δ 1.04 (3 H, t, ^3J = 7.3 Hz, CH_2CH_3), 1.06 (3 H, t, ^3J = 7.4 Hz, CH_2CH_3), 1.52, 1.56 [6 H, 2 s, $C(CH_3)_2$] , 1.68–1.80 (2 H, m, CH_2CH_3) , 1.82–1.93 (2 H, m, CH_2CH_3), 7.13 (1 H, s, CH) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 9.10, 9.39 (2 CH_2CH_3), 20.80 (CH_2CH_3), 21.60 [$C(CH_3)_2$], 26.30 (CH_2CH_3), 26.84 [$C(CH_3)_2$], 81.15 [$C(CH_2)_2$], 95.38 [$C(CH_3)_2$], 163.66 (CH) ppm; MS (ESI-TOF): m/z 210.0 (M+Na$^+$, 100%); HRMS (ESI-TOF): Found 210.0935; Calc. for $C_9H_{17}NNaOS$ [M+Na]$^+$ 210.0929.

2,2-Dimethyl-1-thia-3-azaspiro[4.5]dec-3-en-1-oxide (2c): According to **GP A**, 3-thiazoline **1c** (1.000 g, 5.46 mmol) and *m*CPBA (77 %; 1.591 g, 7.10 mmol) were reacted. Purification by column chromatography (EtOAc, R_f = 0.29) afforded **2c** (1.066 g, 98 %) as a colorless solid, mp 87–89 °C (from CH_2Cl_2/*n*-hexane); IR (ATR): $\tilde{\nu}$ 2974, 2934, 2927, 2857, 1649, 1643, 1449, 1362, 1327, 1139, 1027 cm^{-1}; ^{1}H NMR (500.1 MHz, $CDCl_3$):

δ 1.31–1.41 (1 H, m, $CH_{2,Cy}$), 1.52–1.84 (8 H, m, $CH_{2,Cy}$), 1.54, 1.57 [6 H, 2 s, $C(CH_3)_2$], 2.15–2.20 (1 H, m, $CH_{2,Cy}$), 6.96 (1 H, s, CH) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 21.53 [$C(CH_3)_2$], 22.95, 23.90, 24.62, 26.21 (4 $CH_{2,Cy}$), 27.10 [$C(CH_3)_2$], 31.53 ($CH_{2,Cy}$), 78.65 [$C(CH_2)_2$], 95.97 [$C(CH_3)_2$], 164.39 (CH) ppm; MS (ESI-TOF): m/z 222.1 ($M+Na^+$, 100%); HRMS (ESI-TOF): Found 222.0926; Calc. for $C_{10}H_{17}NNaOS$ $[M+Na]^+$ 222.0929.

2,2-Dimethyl-1-thia-4-azaspiro[4.5]dec-3-en-1-oxide (2d): According to **GP A**, 3-thiazoline **1d** (367 mg, 2.00 mmol) and *m*CPBA (77 %; 449 mg, 2.60 mmol) were reacted. Purification by column chromatography (EtOAc, R_f = 0.16) afforded **2d** (315 mg, 79 %) as a colorless solid, mp 95–96 °C (from CH_2Cl_2/*n*-hexane); IR (ATR): $\tilde{\nu}$ 2933, 2863, 1710, 1643, 1448, 1365, 1309, 1221, 1193, 1045 cm^{-1}; ^{1}H NMR (500.1 MHz, $CDCl_3$): δ 1.41 [6 H, s, $C(CH_3)_2$], 1.40–1.45 (1 H, m, $CH_{2,Cy}$), 1.54–1.62 (2 H, m, 2 $CH_{2,Cy}$), 1.63–1.71 (2 H, m, 2 $CH_{2,Cy}$), 1.76–1.91 (4 H, m, 4 $CH_{2,Cy}$), 2.10–2.15 (1 H, m, $CH_{2,Cy}$), 7.02 (1 H, s, CH) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 17.52 [$C(CH_3)_2$] , 23.06 ($CH_{2,Cy}$), 23.65 [$C(CH_3)_2$], 23.98, 24.71, 30.01, 35.40 (4 $CH_{2,Cy}$), 71.91 [$C(CH_3)_2$], 100.73 [$C(CH_2)_2$], 164.75 (CH) ppm; MS (ESI-TOF): m/z 222.1 ($M+Na^+$, 100%); HRMS (ESI-TOF): Found 222.0935; Calc. for $C_{10}H_{17}NNaOS$ $[M+Na]^+$ 222.0929.

General Procedure (GP B)

The respective sulfoxide (1.0 equiv.) was dissolved in the respective alcohol (2 mL per mmol sulfoxide). The respective isocyanide (1.0 equiv.), dissolved in the respective alcohol (2 mL per mmol sulfoxide), and benzoic acid (1.0 equiv.), dissolved in the respective alcohol (2 mL per mmol sulfoxide), were added dropwise. The reaction mixture was vigorously stirred for 72 h at r. t.. The solvent was removed on a rotary evaporator and the crude product was purified by column chromatography on silica gel.

(*RS*)-3-Benzoyl-4-(*N*-(4-chlorophenyl)carbamoyl)-2,2,5,5-tetramethyl-1,3-thiazolidine (3): According to **GP B**, 1,3-thiazoline **1a** (300 mg, 2.09 mmol) instead of a sulfoxide, 1-chloro-4-isocyanobenzene (289 mg, 2.09 mmol) and benzoic acid (256 mg, 2.09 mmol) were reacted in MeOH. Purification by crystallization from MeOH/*n*-hexane afforded **3** (685 mg, 81 %) as a light yellow crystalline solid, mp 325 °C; IR (ATR): $\tilde{\nu}$ 3316, 3198, 3121, 3068, 2979, 2932, 2867, 1702, 1619, 1600, 1491, 1444, 1396, 1368, 1305, 1290, 1248, 1190, 1091, 838, 811, 778, 749, 697, 628 cm^{-1}; ^{1}H NMR (500.1 MHz, DMSO-d_6): δ 1.27, 1.69, 2.04, 2.09 [12 H, 4 s, 2 $C(CH_3)_2$], 4.46 (1 H, s, NCH), 7.18–7.20 [2 H, m, 2 *o*-CH_{Ar}(C=O)], 7.30–7.39 (7 H, m, 7 CH_{Ar}), 9.53 (1 H, s, NH) ppm; ^{13}C NMR (125.8 MHz, DMSO-d_6): δ 24.60, 28.21, 31.76, 32.85 [2 $C(CH_3)_2$], 49.96 [S$C(CH_3)_2$CH], 72.50 [S$C(CH_3)_2$N], 77.58 (NCH), 120.94 [2 *o*-CH_{Ar}(NH)], 124.72 [2 *o*-CH_{Ar}(C=O)], 127.07 (ClC_{Ar}), 128.09, 128.29 (4 CH_{Ar}), 128.37 (*p*-CH_{Ar}), 136.70 (NC_{Ar}), 138.59 [C(=O)C_{Ar}], 167.38 (CHC=O), 168.74 ($C_{Ar}C$=O) ppm; MS (ESI-TOF): m/z 425.1 ($M+Na^+$, 100 %); HRMS (ESI-TOF): Found 425.1060; Calc. for $C_{21}H_{23}ClN_2NaO_2S$ $[M+Na]^+$ 425.1066.

(*RS*)-(*Z*)-2-(4-Chlorophenylimino)-4-methoxy-5,5-dimethyl-1,3-thiazolidine (4a): According to **GP B**, sulfoxide **2a** (717 mg, 4.50 mmol), 1-chloro-4-isocyanobenzene (619 mg, 4.50 mmol) and benzoic acid (550 mg, 4.50 mmol) were reacted in MeOH. Purification by column chromatography (EtOAc, R_f = 0.63) afforded **4a** (902 mg, 74 %) as a colorless solid, mp 115–117 °C (from CH_2Cl_2/*n*-hexane); IR (ATR): $\tilde{\nu}$ 3111, 3051, 2960, 2897, 2827, 1636, 1584,3 1484, 1437, 1368, 1341, 1158, 1144, 1063, 843, 824 cm^{-1}; ^{1}H NMR (500.1 MHz, $CDCl_3$): δ 1.46, 1.52 [6 H, 2 s, $C(CH_3)_2$], 3.29 (3 H, s, OCH_3), 4.34 (1 H, s, NCH), 6.94–6.95 [2 H, m, 2 *m*-CH_{Ar}(Cl)], 7.22–7.24 [2 H, m, 2 *o*-CH_{Ar}(Cl)] ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 22.61, 30.66 [$C(CH_3)_2$], 55.30 (OCH_3), 57.04 [$C(CH_3)_2$], 95.10 (NCH), 123.48 [2 *m*-CH_{Ar}(Cl)], 128.88 (ClC_{Ar}), 129.12 [2 *o*-CH_{Ar}(Cl)], 148.41 (NC_{Ar}), 162.82 (C=N) ppm; MS (CI-sector): m/z 271.2 ($M+H^+$, 100 %); HRMS (CI-sector): Found 271.0673; Calc. for $C_{12}H_{16}ClN_2OS$ $[M+H]^+$ 271.0672.

(*RS*)-(*Z*)-4-Methoxy-5,5-dimethyl-*2*-(phenylimino)-1,3-thiazolidine (4b): According to **GP B**, sulfoxide **2a** (741 mg, 4.65 mmol), isocyanobenzene (480 mg, 4.65 mmol) and benzoic acid (568 mg, 4.65 mmol) were reacted in MeOH. Purification by column chromatography ($CHCl_3$/Et_2O 3:2, R_f = 0.10) afforded **4b** (716 mg, 65 %) as an

orange solid, mp 112–114 °C (from CH_2Cl_2/*n*-hexane); IR (ATR): $\tilde{\nu}$ 3157, 3102, 3053, 2960, 2918, 2876, 2832, 1643, 1589, 1488, 1456, 1336, 1219, 1174, 1142, 1082, 1064, 969, 920, 859, 776, 699, 657 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 1.45, 1.52 [6 H, 2 s, $C(CH_3)_2$], 3.28 (3 H, s, OCH_3), 4.34 (1 H, s, NCH), 7.02–7.07 (3 H, m, 2 *o*-CH_{Ar}, *p*-CH_{Ar}), 7.26–7.29 (2 H, m, 2 *m*-CH_{Ar}) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 22.61, 30.66 [$C(CH_3)_2$], 55.15 (OCH_3), 56.73 [$C(CH_3)_2$], 95.27 (NCH), 122.14 (2 *o*-CH_{Ar}), 123.58 (*p*-CH_{Ar}), 128.98 (2 *m*-CH_{Ar}), 149.87 (NC_{Ar}), 162.55 (C=N) ppm; MS (EI, 70 eV): m/z 236 ($M+H^+$, 100 %); HRMS (EI, 70 eV): Found 236.1064; Calc. for $C_{12}H_{17}N_2OS$ $[M+H]^+$ 236.1062.

(*RS*)-(*Z*)-2-(Benzylimino)-4-methoxy-5,5-dimethyl-1,3-thiazolidine (4c): According to **GP B**, sulfoxide **2a** (729 mg, 4.58 mmol), benzyl isocyanide (536 mg, 4.58 mmol) and benzoic acid (559 mg, 4.58 mmol) were reacted in MeOH. Purification by column chromatography (Et_2O/MTBE 1:1, R_f = 0.30) afforded **4c** (795 mg, 69 %) as a yellow oil; IR (ATR): $\tilde{\nu}$ 3059, 3030, 2959, 2924, 2894, 2823, 1646, 1601, 1495, 1454, 1384, 1362, 1345, 1250, 1142, 1073, 918, 730, 696, 650, 611 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 1.49, 1.52 [6 H, 2 s, $C(CH_3)_2$], 3.46 (3 H, s, OCH_3), 4.45 (1 H, d, ^2J = 15.2 Hz, CH_2), 4.50 (1 H, d, ^2J = 15.2 Hz, CH_2), 4.68 (1 H, s, NCH), 7.27–7.38 (5 H, m, 5 CH_{Ar}) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 1.49, 1.52 [6 H, 2 s, $C(CH_3)_2$], 3.46 (3 H, s, OCH_3), 4.45 (1 H, d, ^2J = 15.2 Hz, CH_2), 4.50 (1 H, d, ^2J = 15.2 Hz, CH_2), 4.68 (1 H, s, NCH), 7.27–7.38 (5 H, m, 5 CH_{Ar}) ppm; MS (ESI-TOF): m/z 251 ($M+H^+$, 100 %); HRMS (ESI-TOF): Found 251.1212; Calc. for $C_{13}H_{19}N_2OS$ $[M+H]^+$ 251.1218.

(*RS*)-(*Z*)-2-(Allylimino)-4-methoxy-5,5-dimethyl-1,3-thiazolidine (4d): According to **GP B**, sulfoxide **2a** (400 mg, 2.51 mmol), allylisocyanide (168 mg, 2.51 mmol) and benzoic acid (307 mg, 2.51 mmol) were reacted in MeOH. Purification by column chromatography (EtOAc/*n*-hexane 9:1, R_f = 0.09) afforded **4d** (279 mg, 55 %) as a colorless oil; IR (ATR): $\tilde{\nu}$ 3241, 2967, 2927, 2864, 2821, 1643, 1559, 1460, 1383, 1324, 1242, 1184, 993, 915 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 1.42, 1.44 [6 H, 2 s, $C(CH_3)_2$], 3.40 (3 H, s, OCH_3), 3.82–3.83 (2 H, m, NCH_2), 4.58 (1 H, s, NCH), 5.06–5.08 (1 H, m, CH=CH_2), 5.15–5.18 (1 H, m, CH=CH_2), 5.61 (1 H, bs, NH), 5.80–5.87 (1 H, m, C*H*=CH_2) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 22.57, 29.59 [$C(CH_3)_2$], 48.42 (NCH_2), 56.24 (OCH_3), 61.24 [$C(CH_3)_2$], 105.22 (NCH), 116.20 (CH=CH_2), 134.68 (*C*H=CH_2), 163.54 (C=N) ppm; MS (ESI-TOF): m/z 201.1 ($M+H^+$, 100 %); HRMS (ESI-TOF): Found 201.1056; Calc. for $C_9H_{17}N_2OS$ $[M+H]^+$ 201.1062.

(*RS*)-(*Z*)-4-Methoxy-2-(2-methoxy-2-oxoethylimino)-5,5-dimethyl-1,3-thiazolidine (4e): According to **GP B**, sulfoxide **2a** (300 mg, 1.88 mmol), methyl 2-isocyanoacetate (186 mg, 1.88 mmol) and benzoic acid (230 mg, 1.88 mmol) were reacted in MeOH. Purification by column chromatography (EtOAc, R_f = 0.25) afforded **4e** (320 mg, 73 %) as a colorless oil; IR (ATR): $\tilde{\nu}$ 2930, 1866, 1752, 1638, 1599, 1573, 1460, 1439, 1403, 1365, 1173, 1142, 1080, 968 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 1.45, 1.49 [6 H, 2 s, $C(CH_3)_2$], 3.43 (3 H, s, CHOCH_3), 3.74 [3 H, s, C(=O)OCH_3], 4.08 (2 H, s, CH_2C=O), 4.63 (1 H, s, NCH), 5.35 (1 H, bs, NH) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 22.69, 29.44 [$C(CH_3)_2$], 47.41 (*C*H_2C=O), 52.39 [C(=O)O*C*H_3], 56.42 (CHO*C*H_3), 61.82 [$C(CH_3)_2$], 104.64 (NCH), 162.88 (C=N), 170.77 (C=O) ppm; MS (ESI-TOF): m/z 233.1 ($M+H^+$, 100 %); HRMS (ESI-TOF): Found 233.0955; Calc. for $C_9H_{17}N_2O_3S$ $[M+H]^+$ 233.0960.

(*RS*)-(*Z*)-2-(4-Ethoxy-4-oxobutylimino)-4-methoxy-5,5-dimethyl-1,3-thiazolidine (4f): According to **GP B**, sulfoxide **2a** (228 mg, 1.43 mmol), ethyl 4-isocyanobutanoate (202 mg, 1.43 mmol) and benzoic acid (175 mg, 1.43 mmol) were reacted in MeOH. Purification by column chromatography (*n*-hexane/acetone 3:2, R_f = 0.08) afforded **4f** (215 mg, 55 %) as a colorless oil; IR (ATR): $\tilde{\nu}$ 3369, 2978, 2931, 2870, 2826, 1734, 1600, 1572, 1447, 1369, 1347, 1310, 1177, 1085, 967, 855 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 1.22 (3 H, t, ^3J = 7.2 Hz, CH_2CH_3), 1.43, 1.46 [6 H, 2 s, $C(CH_3)_2$], 1.84–1.89 (2 H, m, $CH_2CH_2CH_2$), 2.34 (2 H, t, ^3J = 7.2 Hz, CH_2C=O), 3.25–3.32 (2 H, m, NCH_2), 3.43 (3 H, s, OCH_3), 4.10 (2 H, q, ^3J = 7.1 Hz, CH_2CH_3), 4.62 (1 H, s, NCH), 4.97 (1 H, bs, NH) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 14.31 (CH_2CH_3), 22.68 [$C(CH_3)_2$], 25.14 ($CH_2CH_2CH_2$), 29.55 [$C(CH_3)_2$], 31.79 (*C*H_2C=O), 45.03 (NCH_2), 56.44 (OCH_3), 60.57 (*C*H_2CH$_3$), 61.57 [$C(CH_3)_2$], 105.97 (NCH), 162.94 (C=N), 173.41 (C=O) ppm; MS (ESI-TOF): m/z 275.1 ($M+H^+$, 100 %); HRMS (ESI-TOF): Found 275.1423; Calc. for $C_{12}H_{23}N_2O_3S$ $[M+H]^+$ 275.1429.

(*RS*)-(*Z*)-2-(4-Chlorophenylimino)-4-ethoxy-5,5-dimethyl-1,3-thiazolidine (4g): According to **GP B**, sulfoxide **2a** (299 mg, 1.88 mmol), 1-chloro-4-isocyanobenzene (259 mg, 1.88 mmol) and benzoic acid (230 mg, 1.88 mmol) were reacted in EtOH. Purification by column chromatography (*n*-hexane/MTBE 1:1, R_f = 0.19) afforded **4g** (324 mg, 61 %) as a colorless solid, mp 108–109 °C (from CH_2Cl_2/*n*-hexane).

According to **GP B**, sulfoxide **2d** (375 mg, 1.88 mmol), 1-chloro-4-isocyanobenzene (259 mg, 1.88 mmol) and benzoic acid (230 mg, 1.88 mmol) were reacted in EtOH. Purification by column chromatography (*n*-hexane/MTBE 1:1, R_f = 0.19) afforded **4g** (182 mg, 34 %) as a colorless solid, mp 108–109 °C (from CH_2Cl_2/*n*-hexane).

IR (ATR): $\tilde{\nu}$ 3092, 3045, 2976, 2897, 1634, 1583, 1485, 1465, 1377, 1342, 1159, 1144, 1054, 862, 822, 641 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 1.23 (3 H, dd, ^3J = 7.0 Hz, ^3J = 6.9 Hz, OCH_2CH_3), 1.47, 1.53 [6 H, 2 s, $C(CH_3)_2$], 3.41–3.47, 3.69–3.73 (2 H, 2 m, OCH_2CH_3), 4.50 (1 H, s, NCH), 6.95–6.97 [2 H, m, 2 *m*-CH_{Ar}(Cl)], 7.22–7.24 [2 H, m, 2 *o*-CH_{Ar}(Cl)] ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 15.27 (OCH_2CH_3), 22.85, 30.54 [$C(CH_3)_2$], 57.20 [$C(CH_3)_2$], 63.82 (OCH_2CH_3), 94.23 (NCH), 123.29 [2 *m*-CH_{Ar}(Cl)], 128.81 (ClC_{Ar}), 129.08 [2 *o*-CH_{Ar}(Cl)], 147.76 (NC_{Ar}), 161.44 (C=N) ppm; MS (CI-sector): m/z 285.4 ($M+H^+$, 100 %); HRMS (CI-sector): Found 285.0827; Calc. for $C_{13}H_{18}ClN_2OS$ $[M+H]^+$ 285.0828.

(*RS*)-(*Z*)-2-(Allylimino)-4-allyloxy-5,5-dimethyl-1,3-thiazolidine (4h): According to **GP B**, sulfoxide **2a** (299 mg, 1.88 mmol), allyl ioscyanide (126 mg, 1.88 mmol) and benzoic acid (230 mg, 1.88 mmol) were reacted in allyl alcohol. Purification by twofold column chromatography (1. *n*-hexane/THF 3:2; 2. EtOAc, R_f = 0.37) afforded **4h** (326 mg, 77 %) as a colorless oil; IR (ATR): $\tilde{\nu}$ 3168, 2984, 2962, 2930, 2898, 2853, 1645, 1579, 1562, 1539, 1460, 1408, 1338, 1310, 1083, 1063, 997, 974, 932, 919, 700 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 1.49 [6 H, 2 s, $C(CH_3)_2$], 3.89–3.90 (2 H, m, NCH_2), 4.04–4.08 (1 H, m, OCH_2), 4.27–4.31 (1 H, m, OCH_2), 4.81 (1 H, s, NCH), 5.11–5.16 (2 H, m, 2 $CH=CH_2$), 5.19–5.23 (1 H, m, $CH=CH_2$), 5.27–5.32 (1 H, m, $CH=CH_2$), 5.84–5.97 (2 H, m, 2 $CH=CH_2$) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 22.91, 29.39 [$C(CH_3)_2$], 47.87 (NCH_2), 62.01 [$C(CH_3)_2$], 69.50 (OCH_2), 104.40 (NCH), 116.47, 116.49 (2 $CH=CH_2$), 134.62 ($NCH_2CH=CH_2$), 135.18 ($OCH_2CH=CH_2$), 162.84 (C=N) ppm; MS (ESI-TOF): m/z 227.1 ($M+H^+$, 100 %); HRMS (ESI-TOF): Found 227.1213; Calc. for $C_{11}H_{19}N_2OS$ $[M+H]^+$ 227.1218.

(*RS*)-(*Z*)-4-Methoxy-2-(2-methoxy-2-oxoethylimino)-5,5-diethyl-1,3-thiazolidine (4i): According to **GP B**, sulfoxide **2b** (1.000 g, 5.34 mmol), methyl 2-isocyanoacetate (529 mg, 5.34 mmol) and benzoic acid (652 mg, 5.34 mmol) were reacted in MeOH. Purification by twofold column chromatography (1. EtOAc/*n*-hexane 7:3; 2. Et_2O/acetone/$CHCl_3$/*n*-hexane 5:2:2:1, R_f = 0.27) afforded **4i** (871 mg, 63 %) as a yellow solid, mp 68–70 °C (from CH_2Cl_2/*n*-hexane); IR (ATR): $\tilde{\nu}$ 3209, 2966, 2937, 2878, 2825, 1753, 1582, 1566, 1415, 1367, 1177, 1086, 777 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 0.93 (3 H, t, ^3J = 7.4 Hz, CH_2CH_3), 0.95 (3 H, t, ^3J = 7.4 Hz, CH_2CH_3), 1.69–1.83 (2 H, m, CH_2CH_3), 1.83–1.97 (2 H, m, CH_2CH_3), 3.43 (3 H, s, $CHOCH_3$), 3.76 [3 H, s, $C(=O)OCH_3$], 4.09 (2 H, s, $CH_2C=O$), 4.73 (1 H, s, NCH) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 9.53, 10.56 (2 CH_2CH_3), 24.80, 30.29 (2 CH_2CH_3), 47.55 ($CH_2C=O$), 52.32 [$C(=O)OCH_3$], 56.00 ($CHOCH_3$), 71.03 [$C(CH_3)_2$], 102.08 (NCH), 162.92 (C=N), 170.93 (C=O) ppm; MS (ESI-TOF): m/z 261.1 ($M+H^+$, 100 %); HRMS (ESI-TOF): Found 261.1277; Calc. for $C_{11}H_{21}N_2O_3S$ $[M+H]^+$ 261.1273.

(*RS*)-(*Z*)-2-(4-Chlorophenylimino)-4-methoxy-1-thia-3-azaspiro[4.5]decane (4j): According to **GP B**, sulfoxide **2c** (2.806 g, 14.08 mmol), 1-chloro-4-isocyanobenzene (1.937 g, 14.08 mmol) and benzoic acid (1.719 g, 14.08 mmol) were reacted in MeOH. Purification by column chromatography (*n*-hexane/EtOAc 1:1, R_f = 0.38) afforded **4j** (3.542 g, 81 %) as a colorless solid, mp 168 °C (from CH_2Cl_2/*n*-hexane); IR (ATR): $\tilde{\nu}$ 3285, 3111, 3058, 2917, 2886, 2851, 1637, 1581, 1484, 1445, 1399, 1338, 1265, 1248, 1177, 1158, 1143, 1059, 893, 845, 721, 692, 618 cm^{-1}; ^1H NMR (499.9 MHz, $CDCl_3$): δ 1.25–1.33 (2 H, m, 2 $CH_{2,Cy}$), 1.58–1.68 (5 H, m, 4 $CH_{2,Cy}$), 1.74–1.77, 1.88–1.90, 2.03–2.05 (3 H, 3 m, 3 $CH_{2,Cy}$), 3.32 (3 H, s, OCH_3), 4.43 (1 H, s, NCH), 6.95–6.97 [2 H, m, 2 *m*-CH_{Ar}(Cl)], 7.22–7.24 [2 H, m, 2 *o*-CH_{Ar}(Cl)] ppm; ^{13}C NMR (125.7 MHz, $CDCl_3$): δ 23.50, 24.61, 25.55, 32.33, 38.41 (5 $CH_{2,Cy}$), 55.30 (OCH_3), 63.65 [$C(CH_2)_2$], 94.51 (NCH), 123.46 [2 *m*-CH_{Ar}(Cl)], 128.78 (ClC_{Ar}), 129.11 [2

o-CH_{Ar}(Cl)], 148.40 (NC_{Ar}), 161.73 (C=N) ppm; MS (ESI-TOF): m/z 311.2 ($M+H^+$, 100 %); HRMS (ESI-TOF): Found 311.0992; Calc. for $C_{15}H_{20}ClN_2OS$ $[M+H]^+$ 311.0985.

(*RS*)-(*Z*)-2-(Allylimino)-4-methoxy-1-thia-3-azaspiro[4.5]decane (4k): According to **GP B**, sulfoxide **2c** (1.500 g, 7.53 mmol), allyl isocyanide (505 mg, 7.53 mmol) and benzoic acid (920 mg, 7.53 mmol) were reacted in MeOH. Purification by column chromatography (acetone/*n*-hexane 3:2, R_f = 0.31) afforded **4k** (1.328 g, 73 %) as a colorless oil; IR (ATR): $\tilde{\nu}$ 3302, 3278, 3077, 3008, 2981, 2927, 2854, 1645, 1597, 1568, 1520, 1337, 1267, 1247, 1183, 1143, 1099, 1075, 1038, 913, 731, 645 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 1.22–1.28 (2 H, m, 2 $CH_{2,Cy}$), 1.46–1.54 (1 H, m, $CH_{2,Cy}$), 1.57–1.62 (2 H, m, 2 $CH_{2,Cy}$), 1.64–1.74 (3 H, m, 3 $CH_{2,Cy}$), 1.77–1.81, 1.98–2.00 (2 H, 2 m, 2 $CH_{2,Cy}$), 3.40 (3 H, s, OCH_3), 3.85–3.87 (2 H, m, NCH_2), 4.67 (1 H, s, NCH), 4.93 (1 H, bs, NH), 5.07–5.10 (1 H, m, CH=CH_2), 5.15–5.20 (1 H, m, CH=CH_2), 5.81–5.89 (1 H, m, CH=CH_2) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 24.50, 25.53, 25.68, 31.93, 38.12 (5 $CH_{2,Cy}$), 48.17 (NCH_2), 56.16 (OCH_3), 68.69 [$C(CH_2)_2$], 104.87 (NCH), 116.24 (CH=CH_2), 134.69 (CH=CH_2), 163.34 (C=N) ppm; MS (ESI-TOF): m/z 241.1 ($M+H^+$, 100 %); HRMS (ESI-TOF): Found 241.1368; Calc. for $C_{12}H_{21}N_2OS$ $[M+H]^+$ 241.1375.

(*RS*)-(*Z*)-2-(Butylimino)-4-methoxy-1-thia-3-azaspiro[4.5]decane (4l): According to **GP B**, sulfoxide **2c** (1.500 g, 7.53 mmol), *n*-butyl isocyanide (626 mg, 7.53 mmol) and benzoic acid (920 mg, 7.53 mmol) were reacted in MeOH. Purification by column chromatography (EtOAc/CH_2Cl_2 9:1, R_f = 0.13) afforded **4l** (1.364 g, 71 %) as a colorless oil; IR (ATR): $\tilde{\nu}$ 3211, 2926, 2855, 1594, 1567, 1377, 1343, 1309, 1182, 1122, 1076, 976, 891 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 0.89 (3 H, t, ^3J = 7.3 Hz, CH_2CH_3), 1.22–1.27 (2 H, m, 2 $CH_{2,Cy}$), 1.29–1.37 (2 H, m, CH_2CH_3), 1.47–1.53 (3 H, m, $CH_{2,Cy}$, NCH_2CH_2), 1.57–1.62 (2 H, m, 2 $CH_{2,Cy}$), 1.66–1.75 (3 H, m, 3 $CH_{2,Cy}$), 1.78–1.81, 1.98–2.01 (2 H, 2 m, 2 $CH_{2,Cy}$), 3.18–3.30 (2 H, m, NCH_2), 3.42 (3 H, s, OCH_3), 4.70 (1 H, s, NCH), 4.81 (1 H, bs, NH) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 13.87 (CH_2CH_3), 20.41 (CH_2CH_3), 24.62, 25.69, 25.75, 31.98 (4 $CH_{2,Cy}$), 32.05 (NCH_2CH_2), 38.20 ($CH_{2,Cy}$), 45.05 (NCH_2), 56.27 (OCH_3), 69.02 [$C(CH_2)_2$], 106.04 (NCH), 163.45 (C=N) ppm; MS (ESI-TOF): m/z 257.3 ($M+H^+$, 100 %); HRMS (ESI-TOF): Found 257.1678; Calc. for $C_{13}H_{25}N_2OS$ $[M+H]^+$ 257.1688.

(*RS*)-(*Z*)-4-Methoxy-2-(2-methoxy-2-oxoethylimino)-1-thia-3-azaspiro[4.5]decane (4m): According to **GP B**, sulfoxide **2c** (1.200 g, 6.02 mmol), methyl 2-isocyanoacetate (597 mg, 6.02 mmol) and benzoic acid (735 mg, 6.02 mmol) were reacted in MeOH. Purification by column chromatography (EtOAc, R_f = 0.29) afforded **4m** (1.419 g, 87 %) as a colorless oil; IR (ATR): $\tilde{\nu}$ 3203, 2927, 2853, 1751, 1647, 1604, 1530, 1437, 1409, 1366, 1200, 1177, 1102, 1077, 1053, 891 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 1.23–1.32 (2 H, m, 2 $CH_{2,Cy}$), 1.47–1.55 (1 H, m, $CH_{2,Cy}$), 1.60–1.66 (2 H, m, 2 $CH_{2,Cy}$), 1.68–1.77 (3 H, m, 3 $CH_{2,Cy}$), 1.83–1.85, 2.00–2.03 (2 H, 2 m, 2 $CH_{2,Cy}$), 3.43 (3 H, s, CHOCH_3), 3.75 [3 H, s, C(=O)OCH_3], 4.09 (2 H, s, CH_2C=O), 4.69 (1 H, s, NCH), 4.94 (1 H, bs, NH) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 24.61, 25.42, 25.71, 31.93, 38.06 (5 $CH_{2,Cy}$), 47.09 (CH_2C=O), 52.41 [C(=O)OCH_3], 56.33 (CHOCH_3), 60.52 [$C(CH_2)_2$], 104.25 (NCH), 162.86 (C=N), 170.78 (C=O) ppm; MS (ESI-TOF): m/z 273.1 ($M+H^+$, 100 %); HRMS (ESI-TOF): Found 273.1275; Calc. for $C_{12}H_{21}N_2O_3S$ $[M+H]^+$ 273.1273.

(*RS*)-(*Z*)-4-Methoxy-2-(3-methoxy-3-oxopropylimino)-1-thia-3-azaspiro[4.5]decane (4n): According to **GP B**, sulfoxide **2c** (1.001 g, 5.02 mmol), methyl 3-isocyanopropanoate (568 mg, 5.02 mmol) and benzoic acid (613 mg, 5.02 mmol) were reacted in MeOH. Purification by column chromatography ($CHCl_3$/MeOH 19:1, R_f = 0.21) afforded **4n** (926 mg, 64 %) as a colorless oil; IR (ATR): $\tilde{\nu}$ 3368, 2929, 2855, 1737, 1642, 1603, 1440, 1410, 1366, 1316, 1269, 1177, 1082, 981, 919 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 1.07–1.15 (2 H, m, 2 $CH_{2,Cy}$), 1.33–1.66 (7 H, m, 5 $CH_{2,Cy}$), 1.82–1.85 (1 H, m, $CH_{2,Cy}$), 2.45–2.47 (2 H, m, CH_2C=O), 3.26 (3 H, s, CHOCH_3), 3.34–3.42 (2 H, m, NCH_2), 3.51 [3 H, s, C(=O)OCH_3], 4.53 (1 H, s, NCH), 5.71 (1 H, bs, NH) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 24.12, 25.17, 25.35, 31.61 (4 $CH_{2,Cy}$), 33.95 (CH_2C=O), 37.79 ($CH_{2,Cy}$), 40.98 (NCH_2), 51.40 [C(=O)OCH_3], 55.69 (CHOCH_3), 67.87 [$C(CH_2)_2$], 104.16 (NCH), 162.84 (C=N), 172.42 (C=O) ppm; MS (ESI-TOF): m/z 287.2 ($M+H^+$, 100 %); HRMS (ESI-TOF): Found 287.1429; Calc. for $C_{13}H_{23}N_2O_3S$ $[M+H]^+$ 287.1429.

(*RS*)-(*Z*)-4-Methoxy-2-(4-methoxy-4-oxobutylimino)-1-thia-3-azaspiro[4.5]decane (4o): According to **GP B**, sulfoxide **2c** (4.160 g, 20.87 mmol), methyl 4-isocyanobutanoate (2.653 g, 20.87 mmol) and benzoic acid

(2.549 g, 20.87 mmol) were reacted in MeOH. Purification by column chromatography (MTBE/EtOH 19:1, R_f = 0.46) afforded **4o** (4.273 g, 68 %) as a colorless oil; IR (ATR): $\tilde{\nu}$ 3352, 2927, 2854, 1735, 1602, 1566, 1437, 1361, 1310, 1246, 1171, 1102, 1078, 1043, 981, 891 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 1.19–1.26 (2 H, m, 2 $CH_{2,Cy}$), 1.45–1.52 (1 H, m, $CH_{2,Cy}$), 1.56–1.62 (2 H, m, 2 $CH_{2,Cy}$), 1.65–1.74 (3 H, m, 3 $CH_{2,Cy}$), 1.77–1.80 (1 H, m, $CH_{2,Cy}$), 1.83–1.89 (2 H, m, $CH_2CH_2CH_2$), 1.96–1.99 (1 H, m, $CH_{2,Cy}$), 2.35 (2 H, t, ^3J = 7.2 Hz, CH_2C=O), 3.23–3.35 (2 H, m, NCH_2), 3.40 (3 H, s, $CHOCH_3$), 3.64 [3 H, s, C(=O)OCH_3], 4.38 (1 H, bs, NH), 4.66 (1 H, s, NCH) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 24.53 ($CH_{2,Cy}$), 25.11 ($CH_2CH_2CH_2$), 25.55, 25.69 (2 $CH_{2,Cy}$), 31.51 (CH_2C=O), 31.96, 38.13 (2 $CH_{2,Cy}$), 45.04 (NCH_2), 51.74 [C(=O)OCH_3], 56.21 ($CHOCH_3$), 68.69 [$C(CH_2)_2$], 105.03 (NCH), 163.24 (C=N), 173.87 (C=O) ppm; MS (ESI-TOF): m/z 301.1 ($M+H^+$, 100 %); HRMS (ESI-TOF): Found 301.1581; Calc. for $C_{14}H_{25}N_2O_3S$ $[M+H]^+$ 301.1586.

General Procedure (GP C)

Under argon atmosphere the respective isothiourea (1.0 equiv.) and the respective acid (1.2 equiv.) were dissolved in dry CH_2Cl_2 (6 mL per mmol isothiourea). After addition of 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide (EDC; 1.3 equiv.), dissolved in dry CH_2Cl_2 (2 ml per mmol isothiourea), the solution was stirred for 10 h at r. t.. The reaction mixture was quenched with aqueous HCl-solution (1 % w/w; 3 mL per mmol isothiourea) and the layers were separated. The organic layer was washed with HCl-solution (1 % w/w; 3 × 10 mL per mmol isothiourea), saturated aqueous $NaHCO_3$-solution (2 × 50 mL per mmol isothiourea) and brine (10 mL per mmol isothiourea). The organic layer was dried ($MgSO_4$) and the solvent was removed. The crude product was purified by column chromatography on silica gel.

General Procedure (GP D)

Under argon atmosphere the respective isothiourea (1.0 equiv.) and the respective acid (1.2 equiv.) were dissolved in dry CH_2Cl_2 (6 mL per mmol isothiourea). After addition of 1-ethyl-3-(3-dimethylaminopropyl)carbodiimide (EDC; 1.3 equiv.) and 1-hydroxybenzotriazole monohydrate ($HOBt{\cdot}H_2O$; 1.3 equiv.), dissolved in dry CH_2Cl_2 (2 ml per mmol isothiourea), the solution was stirred for 2 h at r. t.. The reaction mixture was quenched with aqueous HCl-solution (1 % w/w; 3 mL per mmol isothiourea) and the layers were separated. The organic layer was washed with HCl-solution (1 % w/w; 3 × 10 mL per mmol isothiourea), saturated aqueous $NaHCO_3$-solution (2 × 50 mL per mmol isothiourea) and brine (10 mL per mmol isothiourea). The organic layer was dried ($MgSO_4$) and the solvent was removed. The crude product was purified by column chromatography on silica gel.

(*RS*)-2-[*N*-(4-Chlorophenyl)-*N*-(2-phenylacetyl)amino]-4-methoxy-1-thia-3-azaspiro[4.5]dec-2-ene (5a) and (*RS*)-(*Z*)-2-(4-chlorophenylimino)-4-methoxy-3-(2-phenylacetyl)-1-thia-3-azaspiro[4.5]decane (6a): According to **GP C**, isothiourea **4j** (200 mg, 0.64 mmol), phenylacetic acid (105 mg, 0.77 mmol) and EDC (129 mg, 0.83 mmol) were reacted. Analysis of the crude product by ^1H NMR spectroscopy revealed the formation of both title compounds in a ratio of 75:25 (**5a**:**6a**). Purification by column chromatography (*n*-hexane/EtOAc 5:1, R_f (**5a**) = 0.30, R_f (**6a**) = 0.46) afforded **5a** (56 mg, 20 %) as a colorless oil and **6a** (149 mg, 55 %) as a colorless oil; Overall yield 205 mg, 75 %.

According to **GP D**, isothiourea **4j** (200 mg, 0.64 mmol), phenylacetic acid (105 mg, 0.77 mmol), EDC (129 mg, 0.83 mmol) and $HOBt{\cdot}H_2O$ (127 mg, 0.83 mmol) were reacted. Analysis of the crude product by ^1H NMR spectroscopy revealed the formation of only one title compound (**6a**). Purification by column chromatography (*n*-hexane/EtOAc 5:1, R_f = 0.46) afforded **6a** (228 mg, 83 %) as a colorless oil.

5a: IR (ATR): $\tilde{\nu}$ 3063, 3030, 2929, 2854, 1691, 1632, 1585, 1486, 1449, 1402, 1344, 1301, 1250, 1187, 1149, 1087, 1051, 894, 832, 722, 709, 696 cm^{-1}; ^1H NMR (500.1 MHz, $CDCl_3$): δ 1.17–1.21, 1.27–1.34 (2 H, 2 m, 2 $CH_{2,Cy}$), 1.39–1.56 (3 H, m, 3 $CH_{2,Cy}$), 1.60–1.72 (4 H, m, 4 $CH_{2,Cy}$), 1.82–1.85 (1 H, m, $CH_{2,Cy}$), 3.29 (3 H, s, OCH_3), 3.57 (1 H, d, ^2J = 15.5 Hz, CH_2C=O), 3.62 (1 H, d, ^2J = 15.5 Hz, CH_2C=O), 4.67 (1 H, s, NCH), 6.98–7.00

[2 H, m, 2 *o*-C*H*$_{Ar}$(CH$_2$)], 7.02–7.05 [2 H, m, 2 *m*-CH$_{Ar}$(Cl)], 7.16–7.21 [3 H, m, 2 *m*-C*H*$_{Ar}$(CH$_2$), *p*-CH$_{Ar}$], 7.31–7.34 [2 H, m, 2 *o*-CH$_{Ar}$(Cl)] ppm; ^{13}C NMR (125.8 MHz, CDCl$_3$): δ 24.77, 24.94, 25.73, 31.07, 37.45 (5 CH$_{2,Cy}$), 43.19 (*C*H$_2$C=O), 57.06 (OCH$_3$), 65.74 [*C*(CH$_2$)$_2$], 104.88 (NCH), 127.27, 128.64 [2 *m*-*C*H$_{Ar}$(CH$_2$), *p*-CH$_{Ar}$], 129.40 [2 *o*-*C*H$_{Ar}$(CH$_2$)], 129.92 [2 *o*-CH$_{Ar}$(Cl)], 130.48 [2 *m*-CH$_{Ar}$(Cl)], 133.52 (CH$_2$*C*$_{Ar}$), 135.00 (ClC$_{Ar}$), 138.41 (NC$_{Ar}$), 162.28 (C=N), 171.77 (C=O) ppm; MS (ESI-TOF): m/z 451.0 (M+Na$^+$, 100 %); HRMS (ESI-TOF): Found 451.1220; Calc. for $C_{23}H_{25}ClN_2NaO_2S$ [M+Na]$^+$ 451.1223.

6a: IR (ATR): $\tilde{\nu}$ 3087, 3061, 3030, 2932, 2854, 1686, 1629, 1587, 1484, 1450, 1400, 1343, 1297, 1252, 1188, 1161, 1085, 1029, 987, 831, 718 cm^{-1}; ^{1}H NMR (500.1 MHz, CDCl$_3$): δ 1.13–1.29 (2 H, m, 2 CH$_{2,Cy}$), 1.50–1.60 (5 H, m, 3 CH$_{2,Cy}$), 1.64–1.71 (2 H, m, 2 CH$_{2,Cy}$), 1.99–2.01 (1 H, m, CH$_{2,Cy}$), 3.54 (3 H, s, OCH$_3$), 4.32 (1 H, d, ^2J = 15.3 Hz, CH$_2$C=O), 4.60 (1 H, d, ^2J = 15.3 Hz, CH$_2$C=O), 5.61 (1 H, s, NCH), 6.85–6.86 [2 H, m, *m*-CH$_{Ar}$(Cl)], 7.25–7.33 (7 H, m, 7 CH$_{Ar}$) ppm; ^{13}C NMR (125.8 MHz, CDCl$_3$): δ 22.61, 24.22, 25.21, 31.83, 37.79 (5 CH$_{2,Cy}$), 43.26 (*C*H$_2$C=O), 57.81 (OCH$_3$), 59.51 [*C*(CH$_2$)$_2$], 93.64 (NCH), 122.39 [2 *m*-CH$_{Ar}$(Cl)], 127.09, 128.56, 129.27, 129.66 (7 CH$_{Ar}$), 129.83 (ClC$_{Ar}$), 134.64 (CH$_2$*C*$_{Ar}$), 148.14 (NC$_{Ar}$), 155.34 (C=N), 172.54 (C=O) ppm; MS (ESI-TOF): m/z 451.1 (M+Na$^+$, 100 %); HRMS (ESI-TOF): Found 451.1216; Calc. for $C_{23}H_{25}ClN_2NaO_2S$ [M+Na]$^+$ 451.1223.

(*RS*)-(*Z*)-2-(4-Chlorophenylimino)-4-methoxy-5,5-dimethyl-3-(2-phenylacetyl)-1,3-thiazolidine (6b): According to **GP D**, isothiourea **4a** (100 mg, 0.37 mmol), phenylacetic acid (60 mg, 0.44 mmol), EDC (75 mg, 0.48 mmol) and HOBt·H$_2$O (73 mg, 0.48 mmol) were reacted. Purification by column chromatography (*n*-hexane/EtOAc 5:1, R$_f$ = 0.43) afforded **6b** (127 mg, 88 %) as a colorless solid, mp 94–96 °C (from CH$_2$Cl$_2$/*n*-hexane); IR (ATR): $\tilde{\nu}$ 3064, 3033, 2967, 2934, 2859, 1693, 1627, 1587, 1486, 1462, 1438, 1392, 1370, 1353, 1333, 1235, 1197, 1141, 1085, 919, 833, 755, 715, 704, 693, 642 cm^{-1}; ^{1}H NMR (500.1 MHz, CDCl$_3$): δ 1.32, 1.42 [6 H, 2 s, C(CH$_3$)$_2$], 3.56 (3 H, s, OCH$_3$), 4.29 (1 H, d, ^2J = 15.2 Hz, CH$_2$), 4.68 (1 H, d, ^2J = 15.1 Hz, CH$_2$), 5.52 (1 H, s, NCH), 6.82–6.85 [2 H, m, 2 *m*-CH$_{Ar}$(Cl)], 7.25–7.35 (7 H, m, 7 CH$_{Ar}$) ppm; ^{13}C NMR (125.8 MHz, CDCl$_3$): δ 22.13, 30.36 [C(*C*H$_3$)$_2$], 43.41 (*C*H$_2$C=O), 53.29 [*C*(CH$_3$)$_2$], 57.88 (OCH$_3$), 94.69 (NCH), 122.38 [2 *m*-CH$_{Ar}$(Cl)], 127.17, 128.64, 129.29, 129.66 (7 CH$_{Ar}$), 129.93 (ClC$_{Ar}$), 134.63 (CH$_2$*C*$_{Ar}$), 148.21 (NC$_{Ar}$), 155.73 (C=N), 172.52 (C=O) ppm; MS (ESI-TOF): m/z 411.2 (M+Na$^+$, 100 %); HRMS (ESI-TOF): Found 411.0896; Calc. for $C_{20}H_{21}ClN_2NaO_2S$ [M+Na]$^+$ 411.0896.

(*RS*)-(*Z*)-2-(4-Chlorophenylimino)-4-methoxy-5,5-dimethyl-3-propionyl-1,3-thiazolidine (6c): According to **GP D**, isothiourea **4a** (100 mg, 0.37 mmol), propionic acid (33 mg, 0.44 mmol), EDC (75 mg, 0.48 mmol) and HOBt·H$_2$O (73 mg, 0.48 mmol) were reacted. Purification by column chromatography (*n*-hexane/EtOAc 3:1, R$_f$ = 0.57) afforded **6c** (96 mg, 78 %) as a colorless solid, mp 149–150 °C (from CH$_2$Cl$_2$/*n*-hexane); IR (ATR): $\tilde{\nu}$ 3079, 3061, 2996, 2985, 2966, 2937, 2846, 1690, 1635, 1586, 1483, 1461, 1445, 1393, 1369, 1354, 1340, 1230, 1202, 1174, 1141, 1083, 916, 874, 842, 833, 862 cm^{-1}; ^{1}H NMR (500.1 MHz, CDCl$_3$): δ 1.21 (3 H, dd, ^3J = 7.4 Hz, ^3J = 7.4 Hz, CH$_2$C*H*$_3$), 1.44 [6 H, s, C(C*H*$_3$)$_2$], 3.00 (1 H, dq, ^2J = 17.4 Hz, ^3J = 7.4 Hz, CH$_2$), 3.19 (1 H, dq ^2J = 17.4 Hz, ^3J = 7.4 Hz, CH$_2$) , 3.54 (3 H, s, OCH$_3$), 5.54 (1 H, s, NCH), 6.86–6.89 [2 H, m, 2 *m*-CH$_{Ar}$(Cl)], 7.27–7.29 [2 H, m, 2 *o*-CH$_{Ar}$(Cl)] ppm; ^{13}C NMR (500.1 MHz, CDCl$_3$): δ 9.14 (CH$_2$*C*H$_3$), 22.08, 30.49 [C(*C*H$_3$)$_2$], 30.84 (CH$_2$), 53.03 [*C*(CH$_3$)$_2$], 57.79 (OCH$_3$), 94.54 (NCH), 122.22 [2 *m*-CH$_{Ar}$(Cl)], 129.29 [2 *o*-CH$_{Ar}$(Cl)], 129.80 (ClC$_{Ar}$), 148.51 (NC$_{Ar}$), 155.80 (C=N), 175.54 (C=O) ppm; MS (ESI-TOF): m/z 349.1 (M+Na$^+$, 100 %); HRMS (ESI-TOF): Found 349.0749; Calc. for $C_{15}H_{19}ClN_2NaO_2S$ [M+Na]$^+$ 349.0753.

(*RS*)-2-[*N*-Butyl-*N*-(2-phenylacetyl)amino]-4-methoxy-1-thia-3-azaspiro[4.5]dec-2-ene (5d) and (*RS*)-(*Z*)-2-(butylimino)-4-methoxy-3-(2-phenylacetyl)-1-thia-3-azaspiro[4.5]decane (6d): According to **GP C**, isothiourea **4l** (250 mg, 0.98 mmol), phenylacetic acid (161 mg, 1.18 mmol) and EDC (197 mg, 1.27 mmol) were reacted. Analysis of the crude product by ^{1}H NMR spectroscopy revealed the formation of both title compounds in a ratio of 40:60 (**5d**:**6d**). Purification by column chromatography (*n*-hexane/MTBE 4:1, R$_f$ (**5d**) = 0.39, R$_f$ (**6d**) = 0.50) afforded **5d** (82 mg, 22 %) as a colorless oil and **6d** (149 mg, 41 %) as a colorless oil; Overall yield 231 mg, 63 %.

According to **GP D**, isothiourea **4l** (100 mg, 0.39 mmol), phenylacetic acid (64 mg, 0.47 mmol), EDC (79 mg, 0.51 mmol) and HOBt·H_2O (78 mg, 0.51 mmol) were reacted. Analysis of the crude product by ^{1}H NMR spectroscopy revealed the formation of both title compounds in a ratio of 40:60 (**5d**:**6d**). Purification by column chromatography (*n*-hexane/MTBE 4:1, R_f (**5d**) = 0.39, R_f (**6d**) = 0.50) afforded **5d** as a colorless gum (42 mg, 28 %) and **6d** as a colorless gum (82 mg, 56 %); Overall yield 124 mg, 85 %.

5d: IR (ATR): $\tilde{\nu}$ 2957, 2930, 2857, 1683, 1592, 1573, 1451, 1393, 1371, 1248, 1220, 1120, 1080, 1032, 884, 722, 697 cm^{-1}; ^{1}H NMR (500.1 MHz, $CDCl_3$): δ 0.92 (3 H, t, ^3J = 7.2 Hz, CH_2CH_3), 1.23–1.28 (2 H, m, 2 $CH_{2,Cy}$), 1.30–1.36 (2 H, m, CH_2CH_3), 1.39–1.46 (2 H, m, 2 $CH_{2,Cy}$), 1.56–1.66 (4 H, m, 2 $CH_{2,Cy}$, NCH_2CH_2), 1.68–1.76 (2 H, m, 2 $CH_{2,Cy}$), 1.78–1.86 (2 H, m, 2 $CH_{2,Cy}$), 3.53 (3 H, s, OCH_3), 3.75–3.86 (2 H, m, NCH_2), 3.97 (1 H, d, ^2J = 15.5 Hz, CH_2C=O), 4.03 (1 H, d, ^2J = 15.5 Hz, CH_2C=O), 4.77 (1 H, s, NCH), 7.22–7.26 (3 H, m, 2 *o*-CH_{Ar}, *p*-CH_{Ar}), 7.29–7.32 (2 H, m, 2 *m*-CH_{Ar}) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 13.89 (CH_2CH_3), 20.18 (CH_2CH_3), 24.59, 25.36, 25.81 (3 $CH_{2,Cy}$), 30.81 (NCH_2CH_2), 31.02, 37.17 (2 $CH_{2,Cy}$), 42.66 (CH_2C=O), 47.55 (NCH_2), 57.68 (OCH_3), 66.34 [$C(CH_2)_2$], 106.20 (NCH), 127.08 (*p*-CH_{Ar}), 128.68 (2 *m*-CH_{Ar}), 129.42 (2 *o*-CH_{Ar}), 134.47 (C_{Ar}), 161.04 (C=N), 172.03 (C=O) ppm; MS (ESI-TOF): m/z 375.3 (M+H$^+$, 100 %); HRMS (ESI-TOF): Found 375.2104; Calc. for $C_{21}H_{31}N_2O_2S$ [M+H]$^+$ 375.2106.

6d: IR (ATR): $\tilde{\nu}$ 2931, 2858, 1683, 1652, 1452, 1344, 1305, 1182, 1153, 1104, 1090, 1033, 1029, 922, 899, 711, 697, 614 cm^{-1}; ^{1}H NMR (500.1 MHz, $CDCl_3$): δ 0.95 (3 H, t, ^3J = 7.4 Hz, CH_2CH_3), 1.25–1.29 (2 H, m, 2 $CH_{2,Cy}$), 1.41–1.45 (4 H, m, 2 $CH_{2,Cy}$, CH_2CH_3), 1.56–1.58 (3 H, m, 3 $CH_{2,Cy}$), 1.66–1.72 (4 H, m, 2 $CH_{2,Cy}$, NCH_2CH_2), 2.03–2.05 (1 H, m, $CH_{2,Cy}$), 3.21–3.27 (2 H, m, NCH_2), 3.45 (3 H, s, OCH_3), 4.28 (1 H, d, ^2J = 15.4 Hz, CH_2C=O), 4.42 (1 H, d, ^2J = 15.4 Hz, CH_2C=O), 5.53 (1 H, s, NCH), 7.21–7.25 (3 H, m, 2 *o*-CH_{Ar}, *p*-CH_{Ar}), 7.28–7.31 (2 H, m, 2 *m*-CH_{Ar}) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 14.02 (CH_2CH_3), 20.89 (CH_2CH_3), 22.59, 24.31, 25.30, 32.09 (4 $CH_{2,Cy}$), 32.90 (NCH_2CH_2), 37.72 ($CH_{2,Cy}$), 42.43 (CH_2C=O), 54.97 (NCH_2), 57.13 (OCH_3), 59.12 [$C(CH_2)_2$], 92.62 (NCH), 126.85 (*p*-CH_{Ar}), 128.41 (2 *m*-CH_{Ar}), 129.69 (2 *o*-CH_{Ar}), 135.19 (C_{Ar}), 152.11 (C=N), 172.57 (C=O) ppm; MS (ESI-TOF): m/z 375.3 (M+H$^+$, 100 %); HRMS (ESI-TOF): Found 375.2108; Calc. for $C_{21}H_{31}N_2O_2S$ [M+H]$^+$ 375.2106.

(*RS*)-4-Methoxy-2-[*N*-(3-methoxy-3-oxopropyl)-*N*-(*N*-{[(9*H*-fluoren-9-yl)meth-1-yl-oxy]carbonyl}-*N*-phenylglycyl)amino]-1-thia-3-azaspiro[4.5]dec-2-ene (5e) and (*RS*)-(*Z*)-3-(*N*-{[(9*H*-fluoren-9-yl)meth-1-yl-oxy]carbonyl}-*N*-phenylglycyl)-4-methoxy-2-(3-methoxy-3-oxopropyl)imino-1-thia-3-azaspiro[4.5]decane (6e): According to **GP C**, isothiourea **4n** (134 mg, 0.47 mmol), *N*-{[(9*H*-fluoren-9-yl)meth-1-yl-oxy]carbonyl}-*N*-phenylglycin (209 mg, 0.56 mmol) and EDC (95 mg, 0.61 mmol) were reacted. Analysis of the crude product by ^{1}H NMR spectroscopy revealed the formation of both title compounds in a ratio of 41:59 (**5e**:**6e**). Purification by column chromatography (*n*-hexane/EtOAc/CH_2Cl_2 3:1:1, R_f (**5e**) = 0.29, R_f (**6e**) = 0.47) afforded **5e** (54 mg, 18 %) as a colorless oil and **6e** (63 mg, 21 %) as a colorless oil; Overall yield 117 mg, 39 %.

According to **GP D**, isothiourea **4n** (134 mg, 0.47 mmol), *N*-{[(9*H*-fluoren-9-yl)meth-1-yl-oxy]carbonyl}-*N*-phenylglycin (209 mg, 0.56 mmol), EDC (95 mg, 0.61 mmol) and HOBt·H_2O (93 mg, 0.61 mmol) were reacted. Analysis of the crude product by ^{1}H NMR spectroscopy revealed the formation of both title compounds in a ratio of 43:57 (**5e**:**6e**). Purification by column chromatography (*n*-hexane/EtOAc/CH_2Cl_2 3:1:1, R_f (**5e**) = 0.29, R_f (**6e**) = 0.47) afforded **5e** as a colorless gum (70 mg, 23 %) and **6e** as a colorless gum (84 mg, 28 %); Overall yield 154 mg, 51 %.

5e: IR (ATR): $\tilde{\nu}$ 3064, 3042, 3019, 2990, 2903, 2854, 2827, 1696, 1597, 1576, 1496, 1448, 1392, 1358, 1319, 1236, 1212, 1159, 1096, 1075, 1042, 1023, 909, 759, 739, 729, 698, 621 cm^{-1}; ^{1}H NMR (500.1 MHz, $CDCl_3$): δ 1.23–1.30 (1 H, m, $CH_{2,Cy}$), 1.37–1.48 (2 H, m, 2 $CH_{2,Cy}$), 1.65–1.69 (2 H, m, 2 $CH_{2,Cy}$), 1.72–1.79 (3 H, m, 3 $CH_{2,Cy}$), 1.86–1.88 (2 H, m, 2 $CH_{2,Cy}$), 2.73–2.76 [2 H, m, CH_2C(=O)OCH_3], 3.53 (3 H, s, $CHOCH_3$), 3.66 [3 H, s, C(=O)OCH_3], 4.03–4.13 (3 H, m, NCH_2CH_2, $CHCH_2$), 4.31–4.37 (2 H, m, $CHCH_2$), 4.77–4.90 [2 H, m, CH_2C(=O)N], 4.82 (1 H, s, NCH), 7.16–7.17 (3 H, m, 3 CH_{Ar}), 7.33–7.41 (8 H, m, 8 CH_{Ar}), 7.69–7.70 (2 H, m, 2 CH_{Ar}) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 24.69, 25.38, 25.70, 31.08 (4 $CH_{2,Cy}$), 32.96 [CH_2C(=O)OCH_3],

37.23 ($CH_{2,Cy}$), 43.35 (N*C*H_2CH_2), 47.03 (*C*HCH_2), 51.96 [C(=O)O*C*H_3], 55.42 [*C*H_2C(=O)N], 57.77 (CHO*C*H_3), 67.64 [*C*$(CH_2)_2$], 68.10 (CH*C*H_2), 106.75 (NCH), 119.91, 125.38, 127.00, 127.45, 127.66, 127.99, 129.17 (13 CH_{Ar}), 141.30 (2 $CHC_{Ar}C_{Ar}$), 142.18 (NC_{Ar}), 143.84 (2 CHC_{Ar}), 155.68 [NC(=O)O], 160.50 (C=N), 169.77 [CH_2C(=O)N], 171.54 [*C*(=O)OCH_3] ppm; MS (ESI-TOF): m/z 664.5 ($M+Na^+$, 100 %); HRMS (ESI-TOF): Found 664.2437; Calc. for $C_{36}H_{39}N_3NaO_6S$ $[M+H]^+$ 644.2457.

6e: IR (ATR): $\tilde{\nu}$ 3065, 3041, 3005, 2992, 2933, 2899, 2854, 1736, 1692, 1650, 1598, 1497, 1478, 1449, 1407, 1353, 1318, 1305, 1224, 1047, 1007, 911, 758, 729, 697, 614 cm^{-1}; ^{1}H NMR (500.1 MHz, $CDCl_3$): δ 1.25–1.29 (2 H, m, 2 $CH_{2,Cy}$), 1.59–1.71 (7 H, m, 5 $CH_{2,Cy}$), 2.06–2.09 (1 H, m, $CH_{2,Cy}$), 2.60–2.70 [2 H, m, C*H*$_2$C(=O)OCH_3], 3.43–3.50 (2 H, m, NC*H*$_2CH_2$), 3.47 (3 H, s, CHOC*H*$_3$), 3.65 [3 H, s, C(=O)OCH_3], 4.07 (1 H, t, ^3J = 7.7 Hz, C*H*CH_2), 4.28–4.38 (2 H, m, CHC*H*$_2$), 4.85–4.85 [2 H, m, CH_2C(=O)N], 5.56 (1 H, s, NCH), 7.14–7.17 (3 H, m, 3 CH_{Ar}), 7.33–7.41 (8 H, m, 8 CH_{Ar}), 7.68–7.70 (2 H, m, 2 CH_{Ar}) ppm; ^{13}C NMR (125.8 MHz, $CDCl_3$): δ 22.62, 24.32, 25.33, 31.99 (4 $CH_{2,Cy}$), 35.61 [*C*H_2C(=O)OCH_3], 37.57 ($CH_{2,Cy}$), 47.02 (*C*HCH_2), 50.34 (N*C*H_2CH_2), 51.76 [C(=O)O*C*H_3], 55.96 [*C*H_2C(=O)N], 57.53 (CHO*C*H_3), 60.19 [*C*$(CH_2)_2$], 67.99 (CH*C*H_2), 92.85 (NCH), 119.89, 125.37, 125.42, 126.97, 127.23, 127.64, 127.82, 129.12 (13 CH_{Ar}), 141.27, 141.30 (2 $CHC_{Ar}C_{Ar}$), 142.51 (NC_{Ar}), 143.77, 143.91 (2 CHC_{Ar}), 153.58 (C=N), 155.56 [NC(=O)O], 170.30 [CH_2C(=O)N], 172.70 [*C*(=O)OCH_3] ppm; MS (ESI-TOF): m/z 664.5 ($M+Na^+$, 100 %); HRMS (ESI-TOF): Found 664.2436; Calc. for $C_{36}H_{39}N_3NaO_6S$ $[M+H]^+$ 644.2457.

Reaction monitoring

All experiments were conducted in $CDCl_3$ at room temperature without convection.

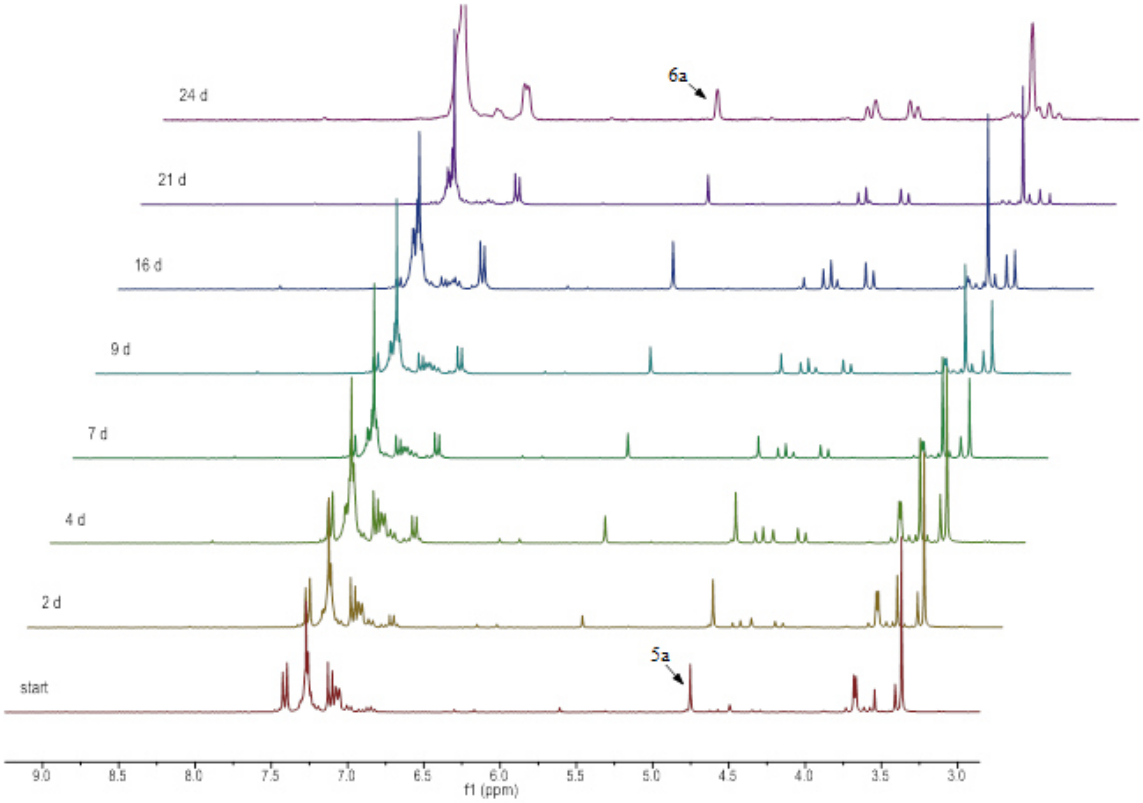


Figure S1. Selected ^{1}H NMR spectra (stacked) of the rearrangement of 5a.

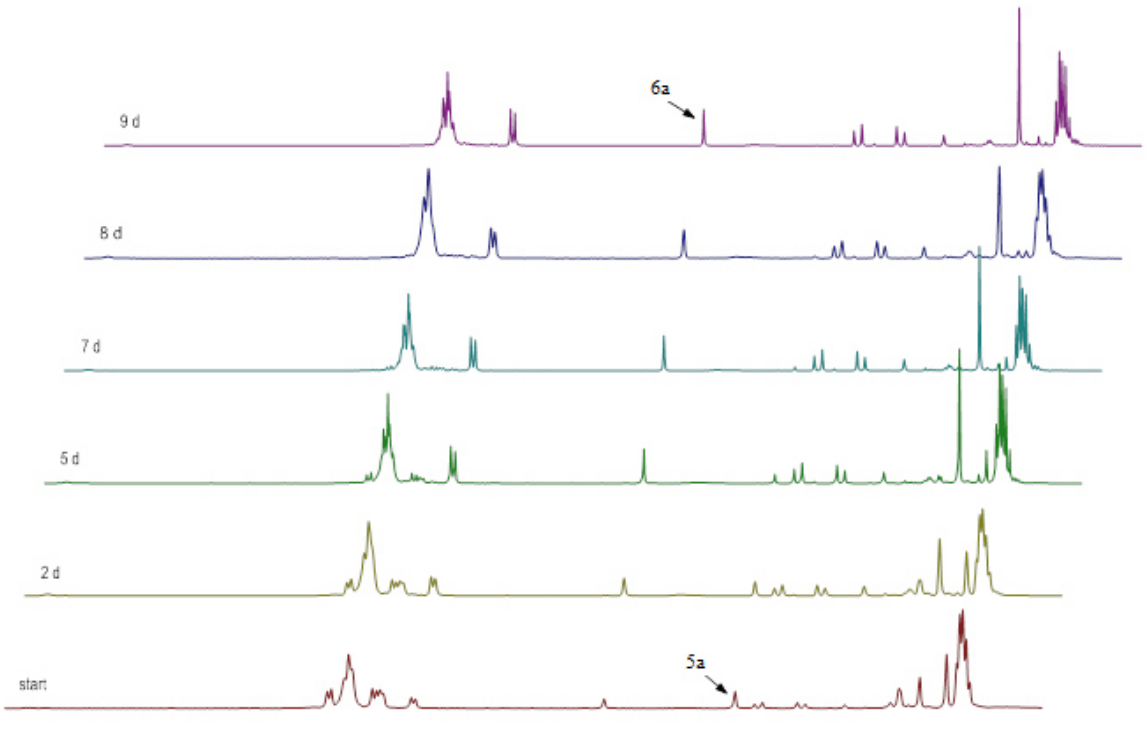


Figure S2. Selected ^{1}H NMR spectra of the rearrangement of 5a under presence of EDC.

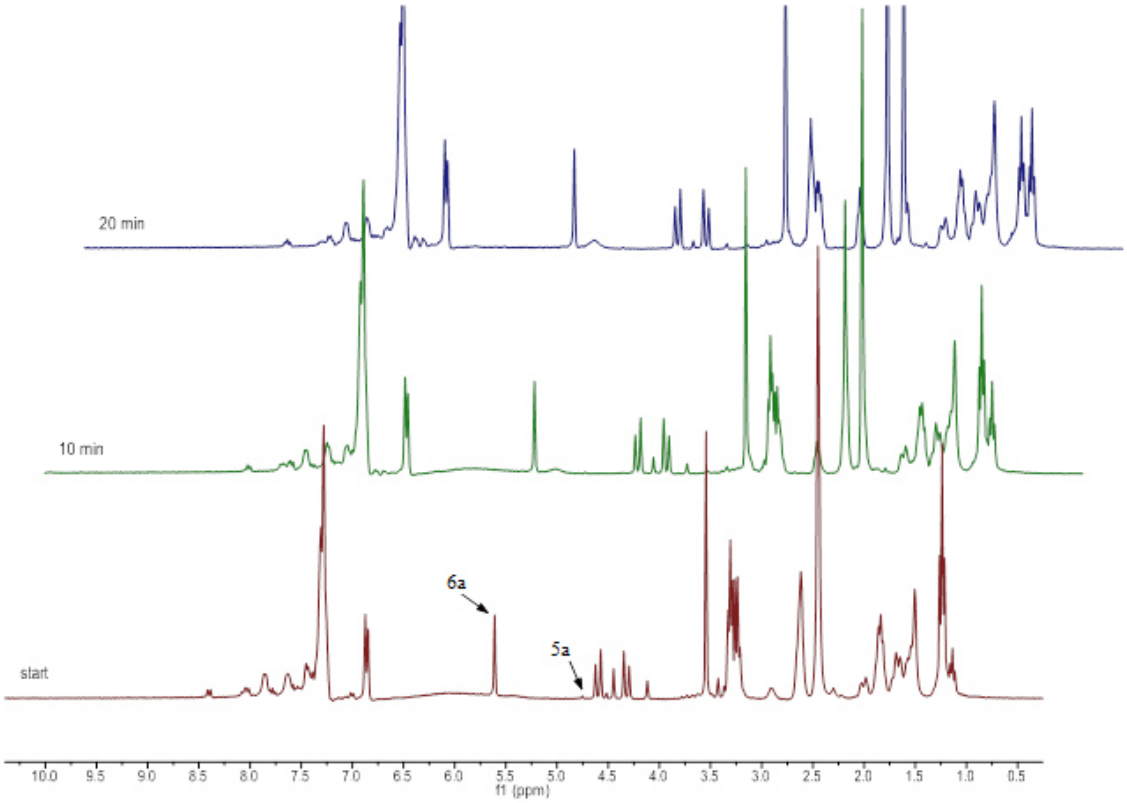


Figure S3. Selected ^{1}H NMR spectra of the rearrangement of 5a under presence of EDC and HOBt.

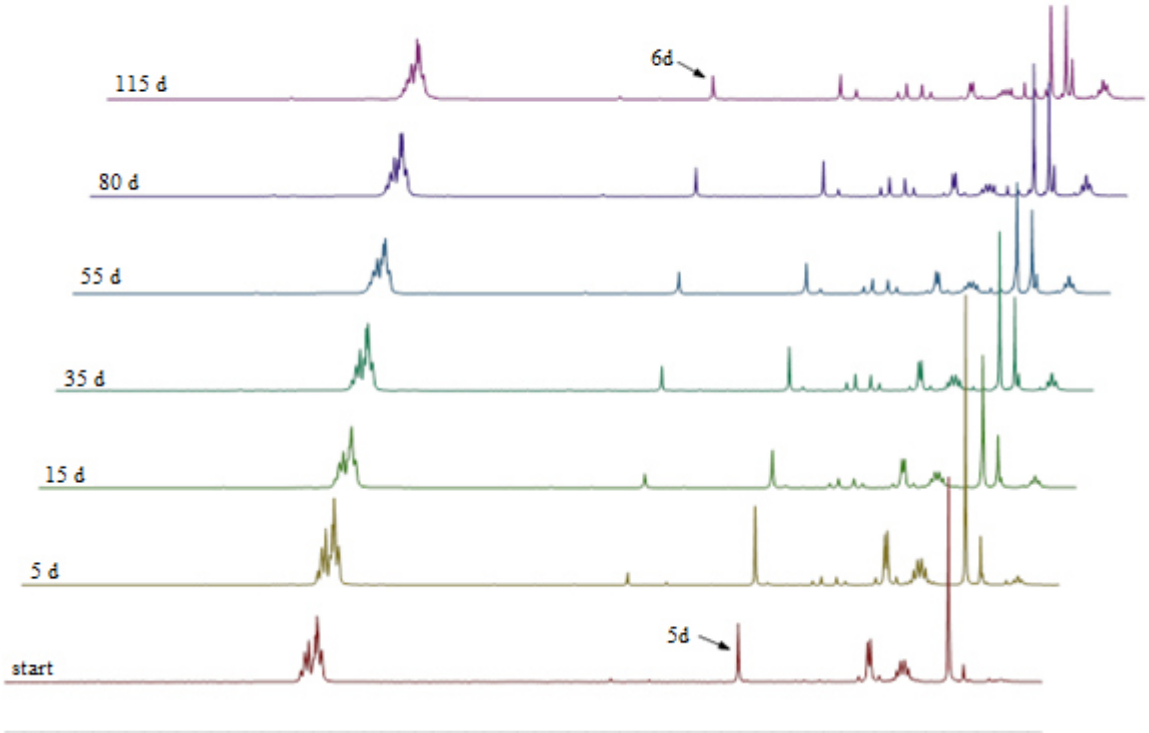
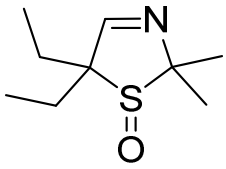


Figure S4. Selected ^{1}H NMR spectra (stacked) of the rearrangement of 5d.

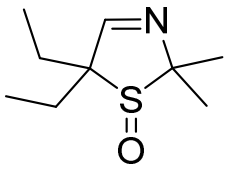
NMR spectra

^{1}H ($CDCl_3$, 500 MHz)



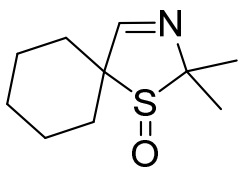
2b

^{13}C ($CDCl_3$, 126 MHz)



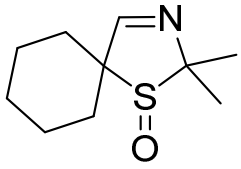
2b

^{1}H ($CDCl_3$, 500 MHz)

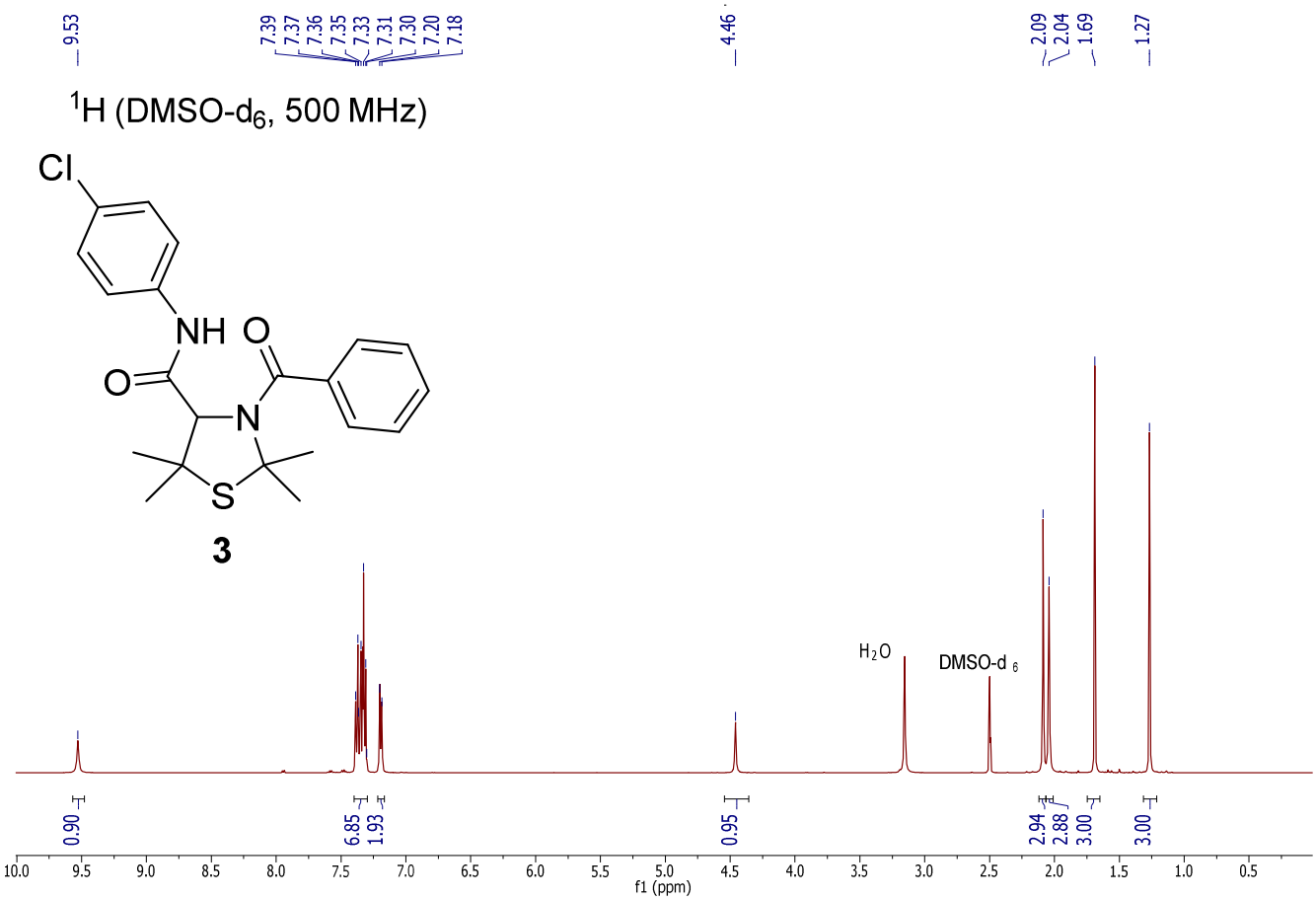


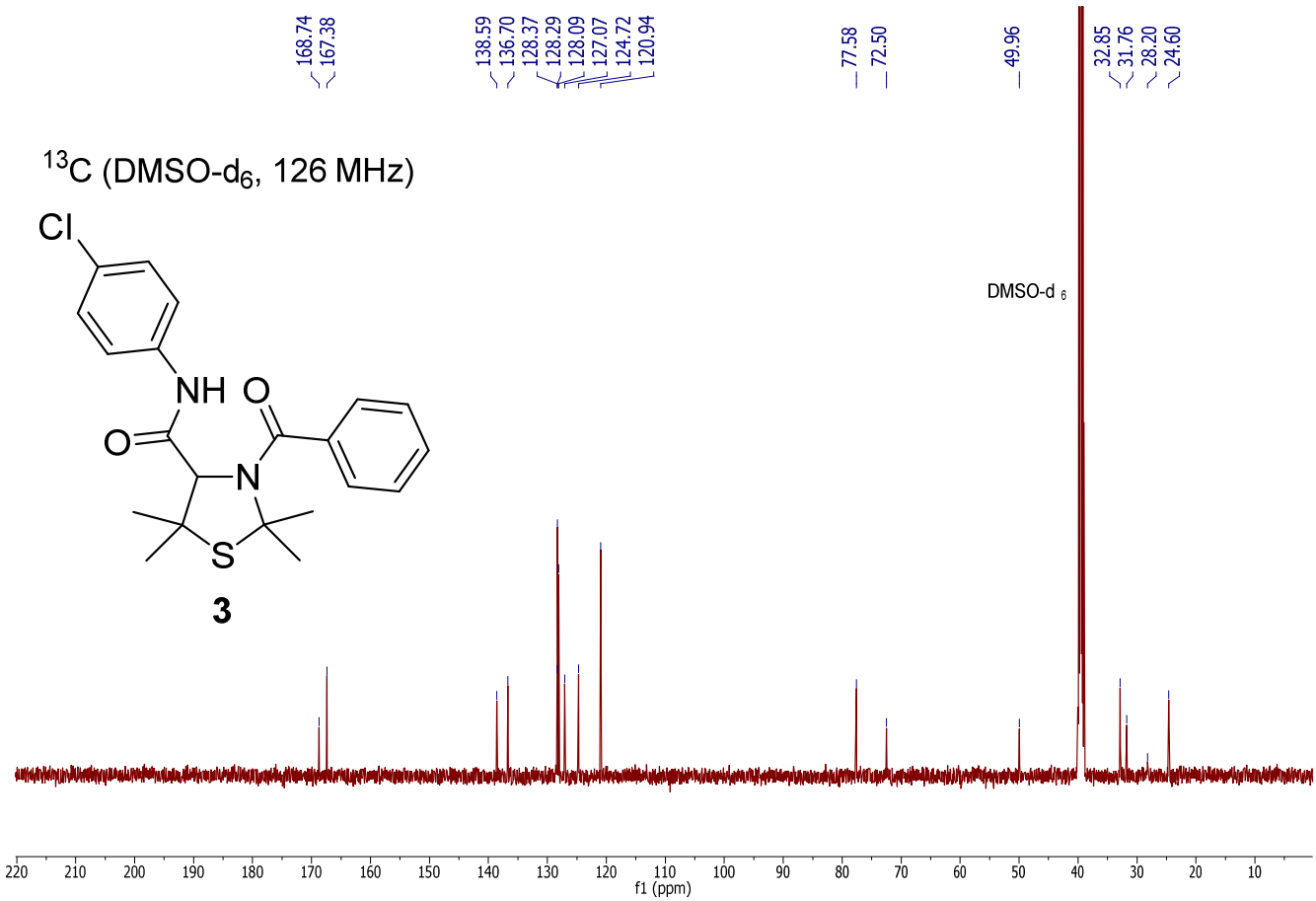
2c

^{13}C ($CDCl_3$, 126 MHz)

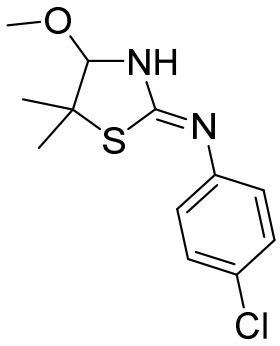


2c


9.53
7.39
7.37
7.36
7.35
7.33
7.31
7.30
7.20
7.18
4.46
2.09
2.04
1.69
1.27
^{1}H (DMSO-d$_6$, 500 MHz)
Cl
NH
O
O
N
S
3
H$_2$O
DMSO-d$_6$
0.90
6.85
1.93
0.95
2.94
2.88
3.00
3.00
f1 (ppm)

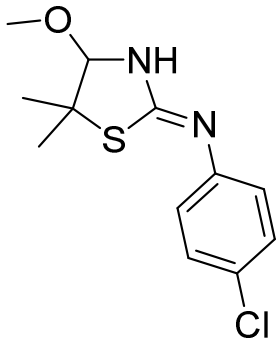

168.74
167.38
138.59
136.70
128.37
128.29
128.09
127.07
124.72
120.94
77.58
72.50
49.96
32.85
31.76
28.20
24.60
^{13}C (DMSO-d$_6$, 126 MHz)
Cl
NH
O
O
N
S
3
DMSO-d$_6$
f1 (ppm)

^{1}H ($CDCl_3$, 500 MHz)



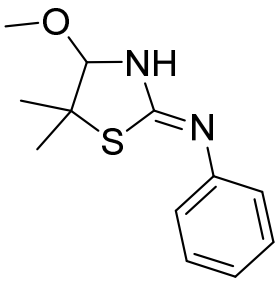
4a

^{13}C ($CDCl_3$, 126 MHz)



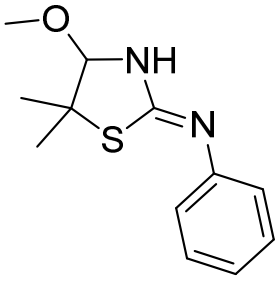
4a

^{1}H ($CDCl_3$, 500 MHz)



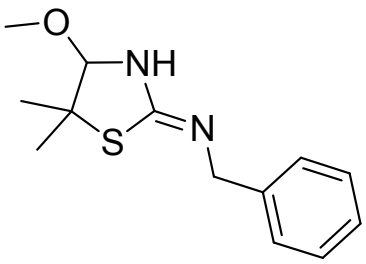
4b

^{13}C ($CDCl_3$, 126 MHz)



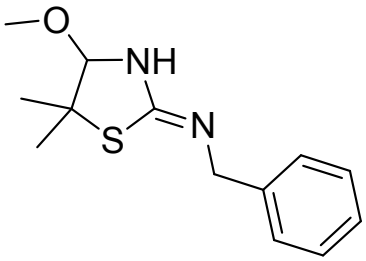
4b

^{1}H ($CDCl_3$, 500 MHz)



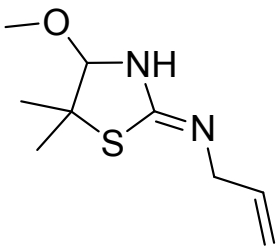
4c

^{13}C ($CDCl_3$, 126 MHz)



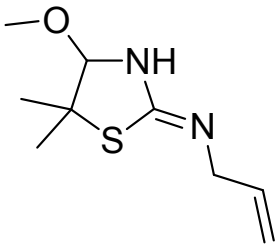
4c

^{1}H ($CDCl_3$, 500 MHz)



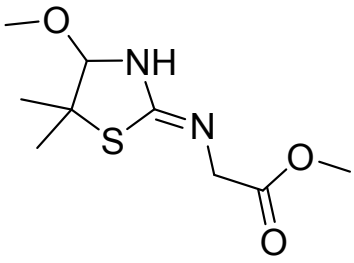
4d

^{13}C ($CDCl_3$, 126 MHz)



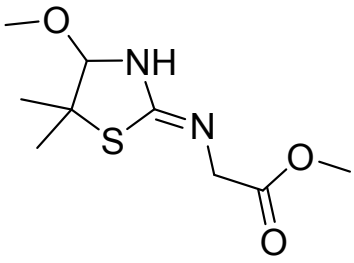
4d

^{1}H ($CDCl_3$, 500 MHz)



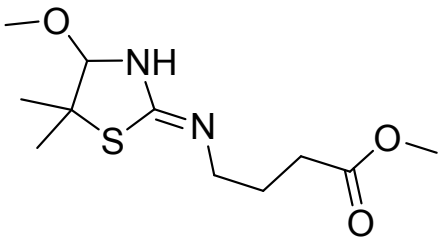
4e

^{13}C ($CDCl_3$, 126 MHz)



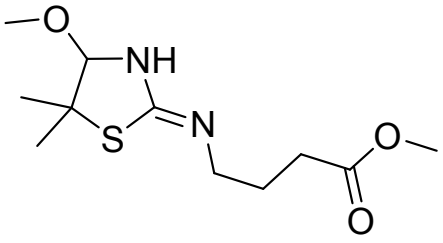
4e

^{1}H ($CDCl_3$, 500 MHz)

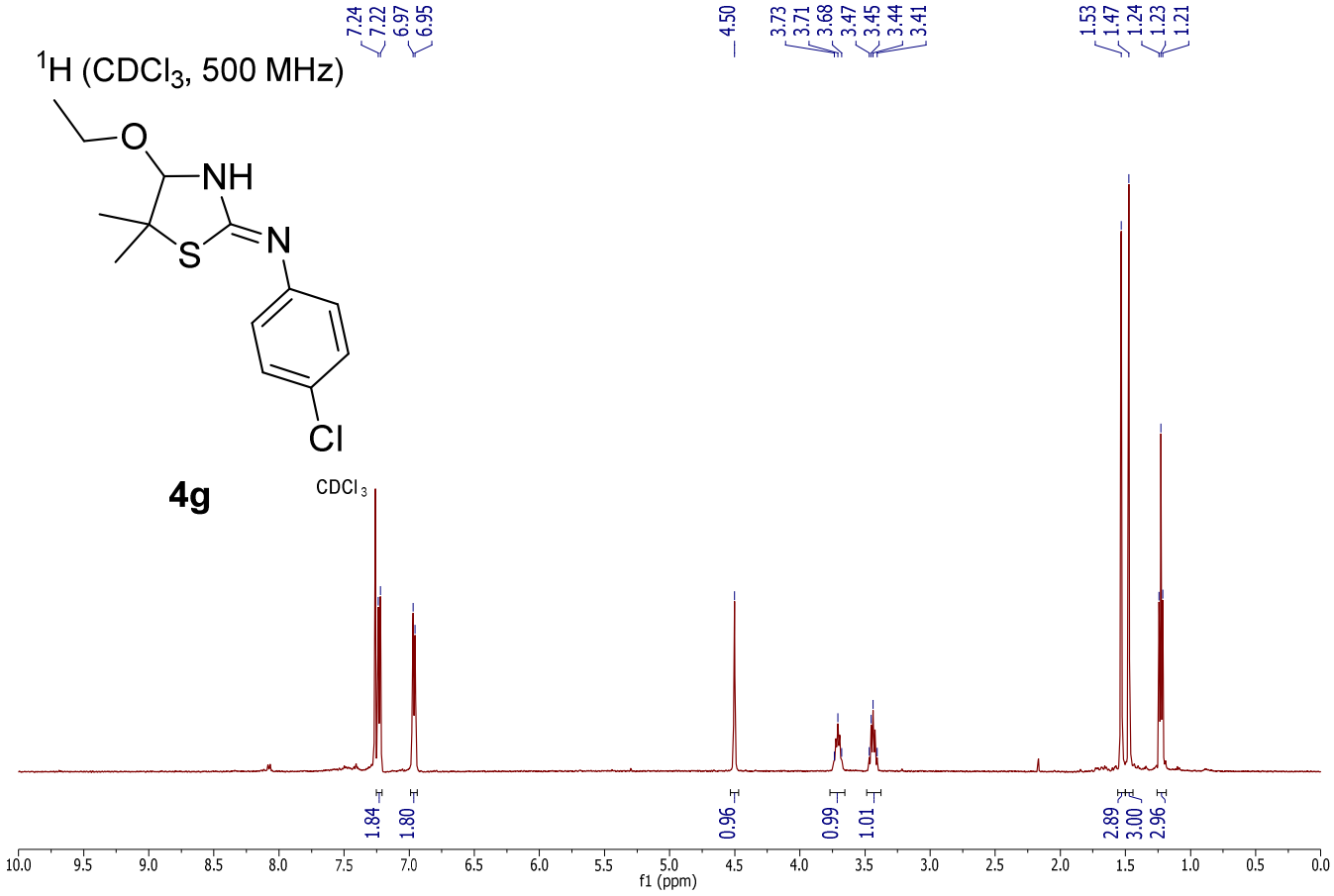


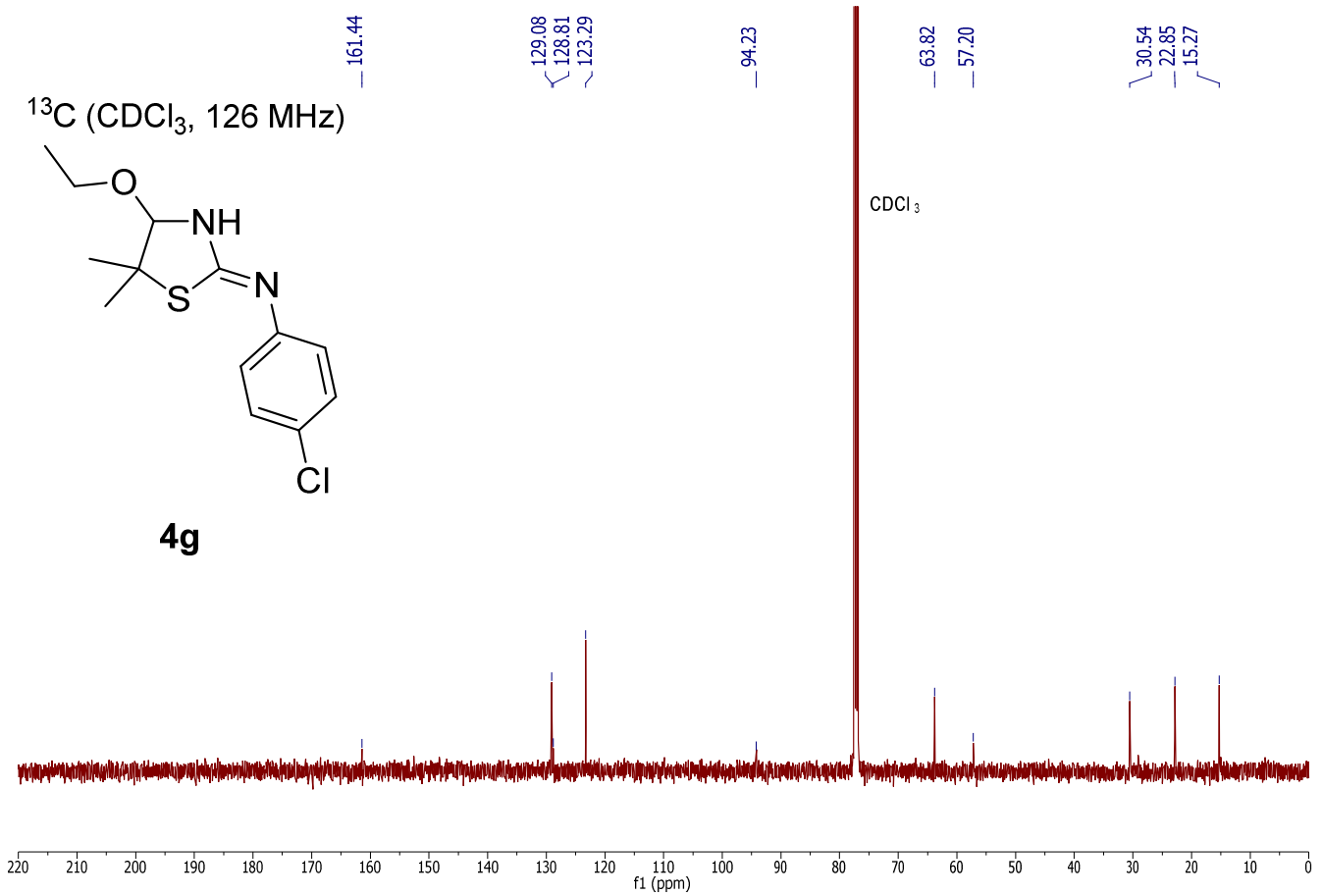
4f

^{13}C ($CDCl_3$, 126 MHz)

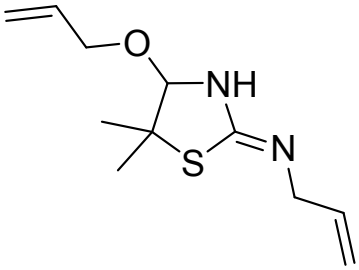


4f


7.24
7.22
6.97
6.95
4.50
3.73
3.71
3.68
3.47
3.45
3.44
3.41
1.53
1.47
1.24
1.23
1.21
^{1}H (CDCl$_3$, 500 MHz)
O
NH
S
N
Cl
4g
CDCl$_3$
1.84
1.80
0.96
0.99
1.01
2.89
3.00
2.96
f1 (ppm)

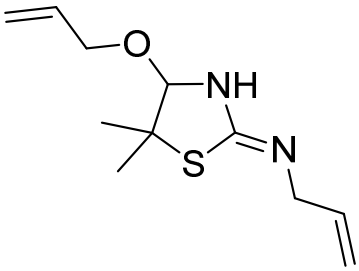

161.44
129.08
128.81
123.29
94.23
63.82
57.20
30.54
22.85
15.27
^{13}C (CDCl$_3$, 126 MHz)
O
NH
S
N
Cl
4g
CDCl$_3$
f1 (ppm)

^{1}H ($CDCl_3$, 500 MHz)



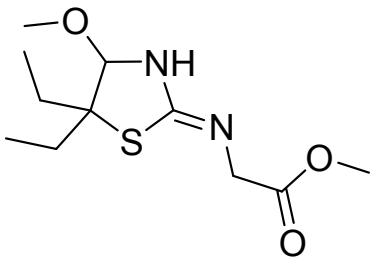
4h

^{13}C ($CDCl_3$, 126 MHz)



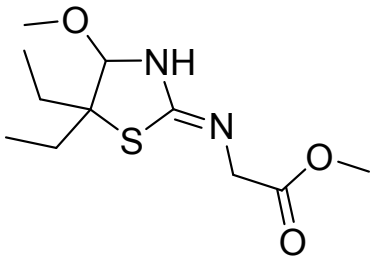
4h

^{1}H ($CDCl_3$, 500 MHz)



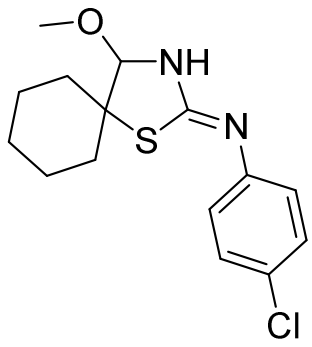
4i

^{13}C ($CDCl_3$, 126 MHz)



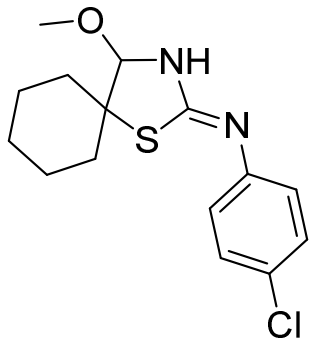
4i

^{1}H ($CDCl_3$, 500 MHz)



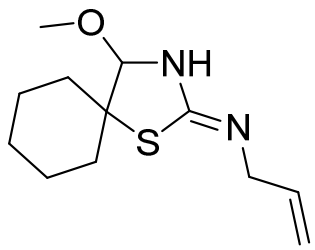
4j

^{13}C ($CDCl_3$, 126 MHz)



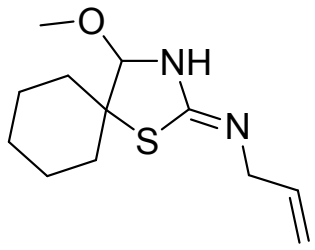
4j

^{1}H ($CDCl_3$, 500 MHz)



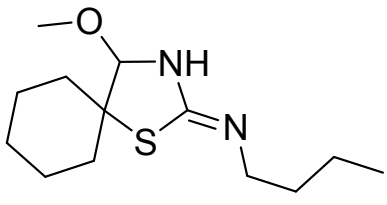
4k

^{13}C ($CDCl_3$, 126 MHz)



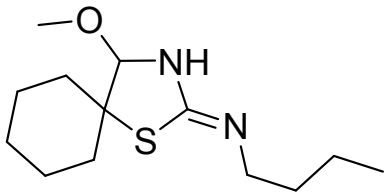
4k

^{1}H ($CDCl_3$, 500 MHz)



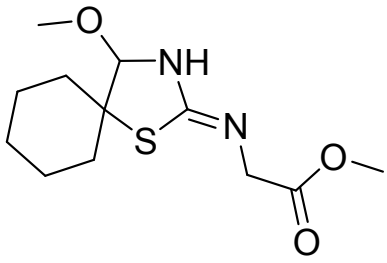
4l

^{13}C ($CDCl_3$, 126 MHz)



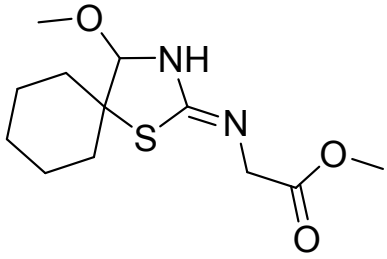
4l

^{1}H ($CDCl_3$, 500 MHz)



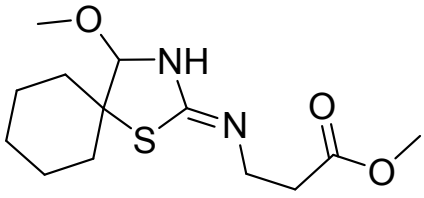
4m

^{13}C ($CDCl_3$, 126 MHz)

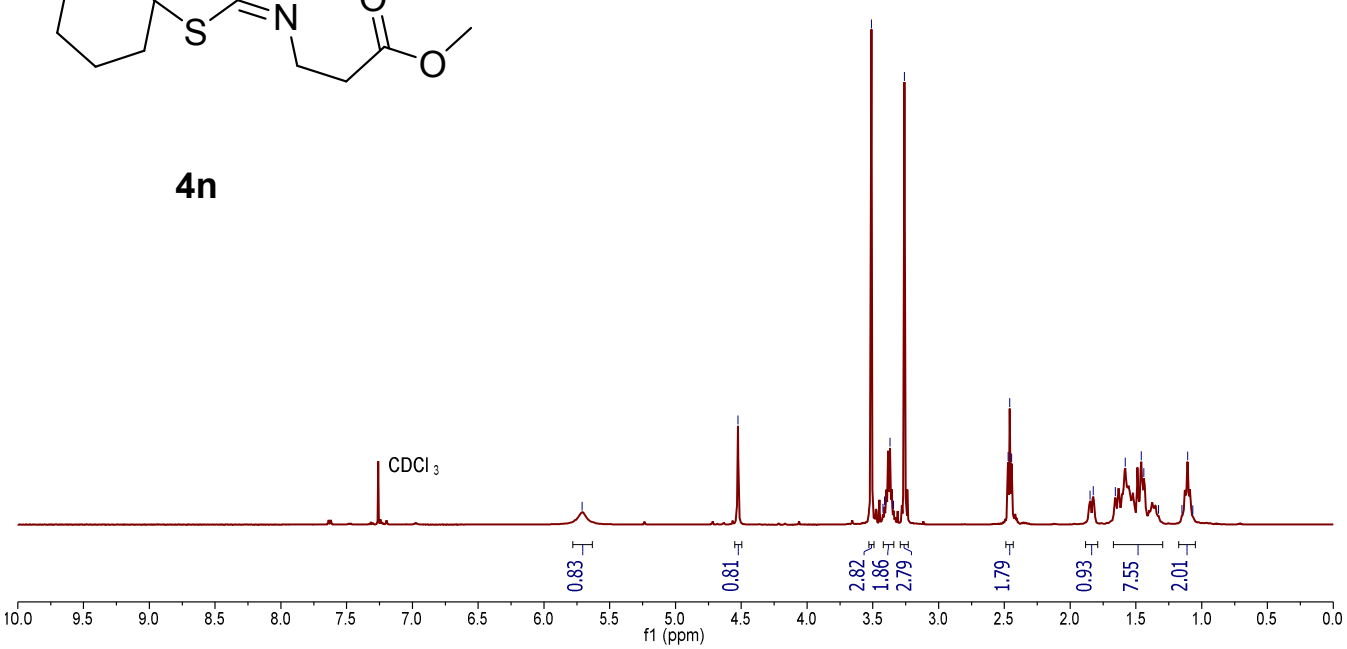


4m

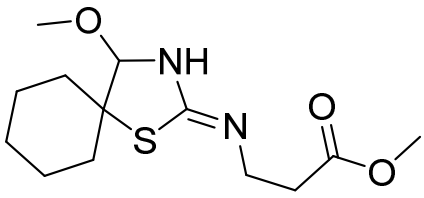
^{1}H ($CDCl_3$, 500 MHz)



4n

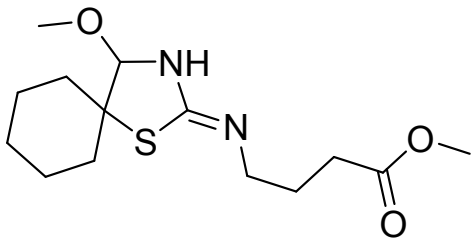


^{13}C ($CDCl_3$, 126 MHz)



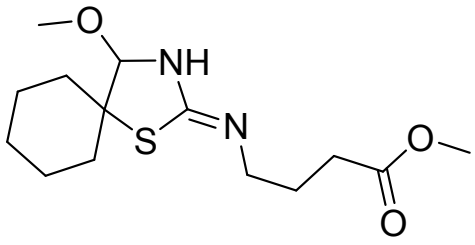
4n

^{1}H ($CDCl_3$, 500 MHz)

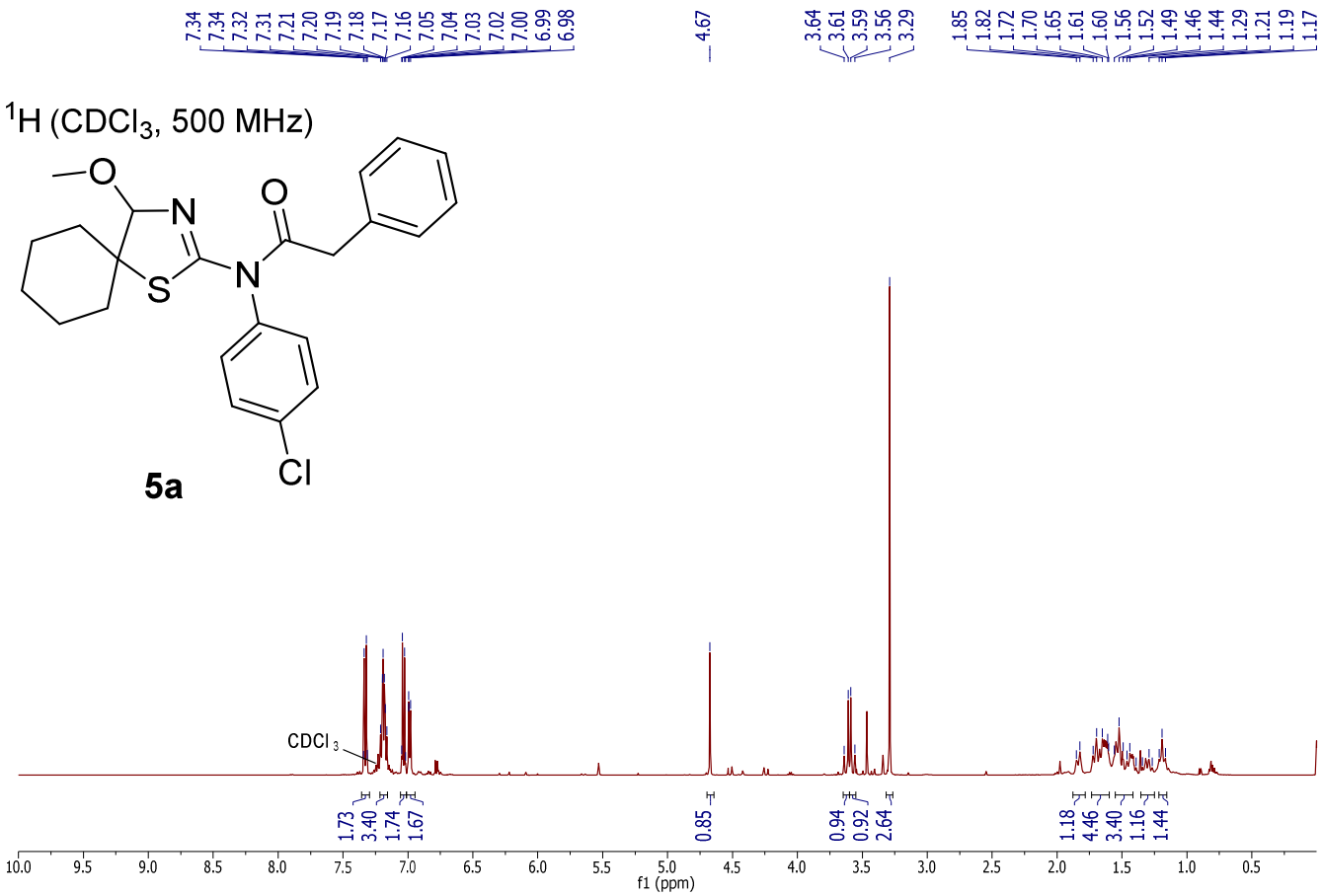


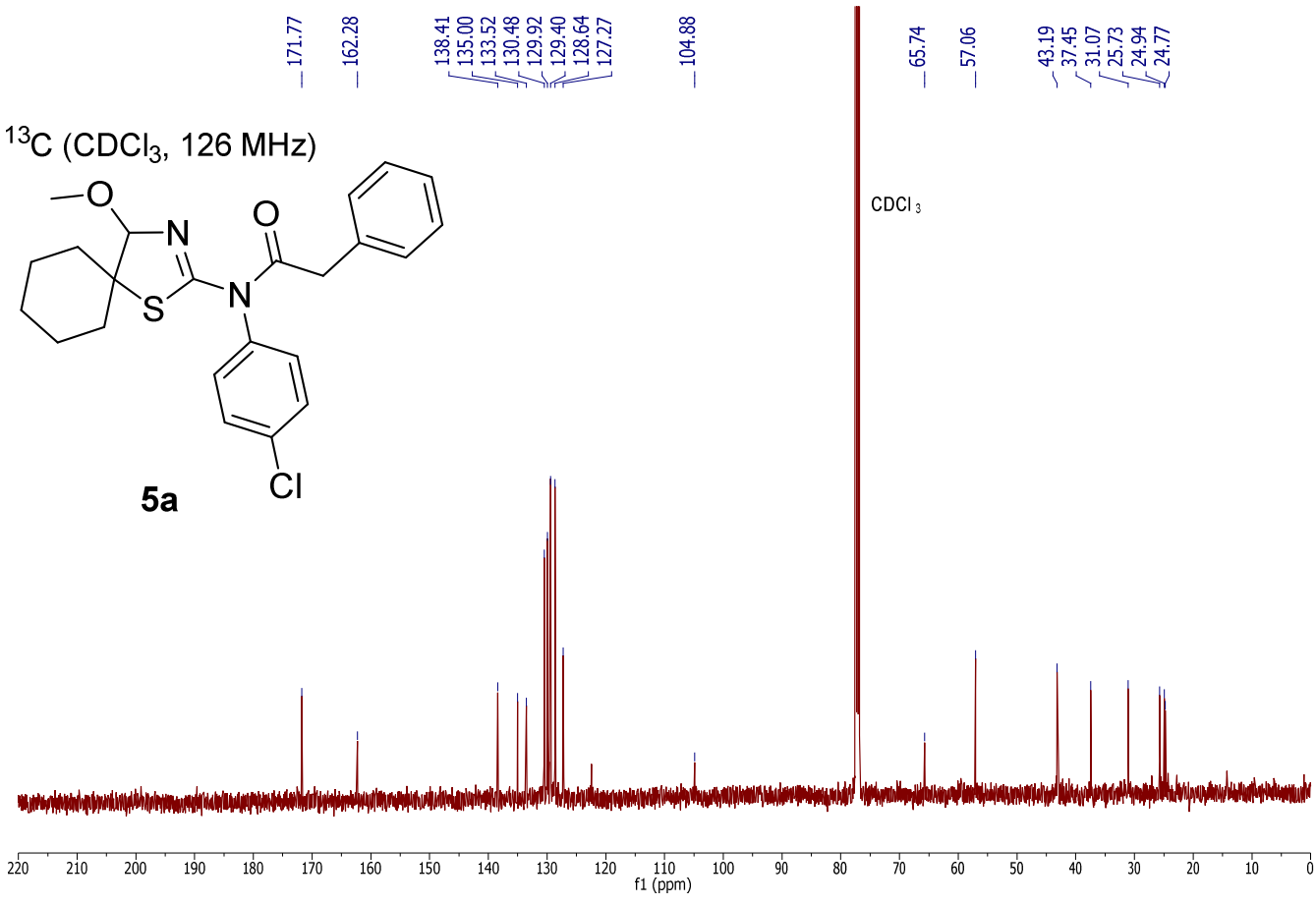
4o

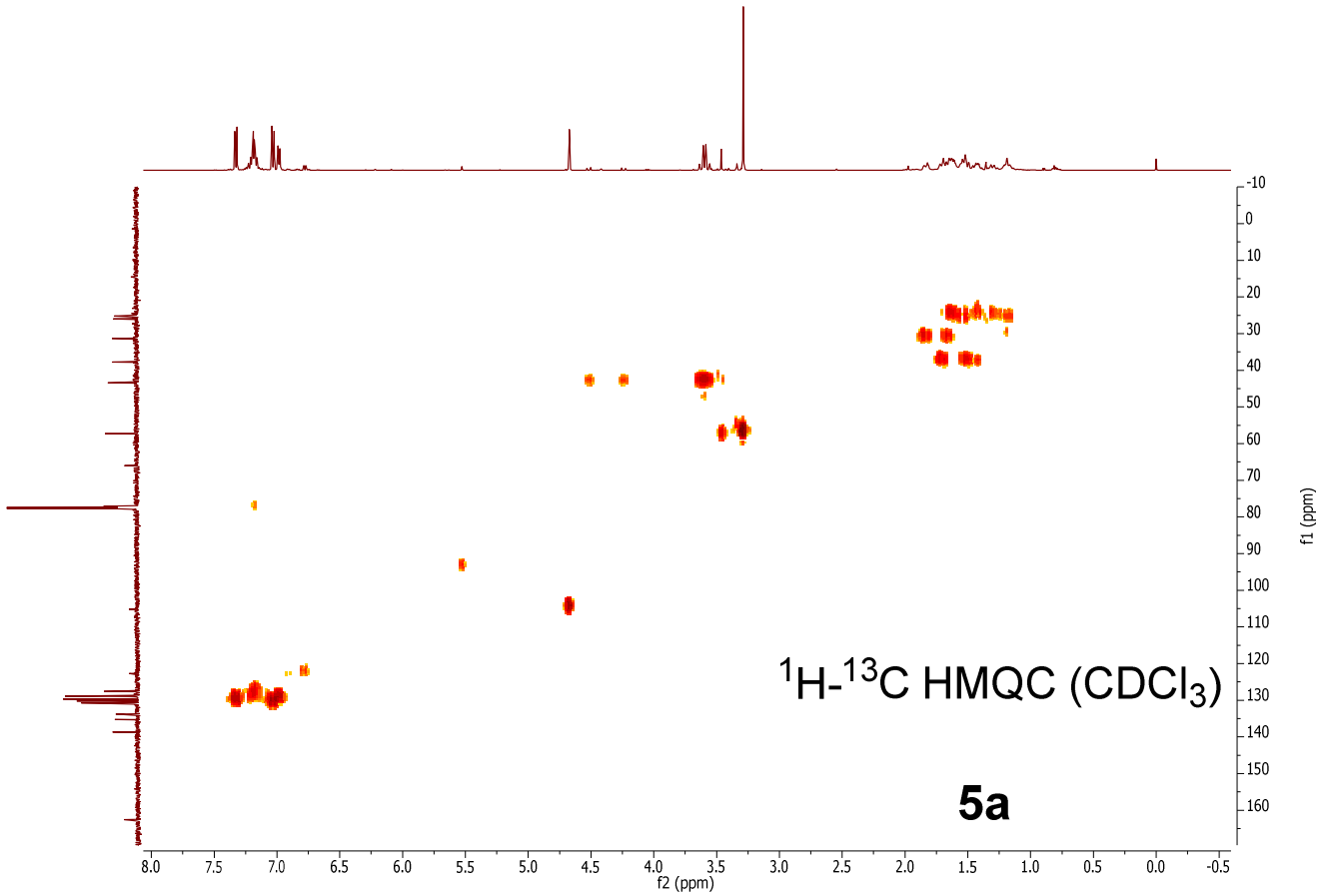
^{13}C ($CDCl_3$, 126 MHz)

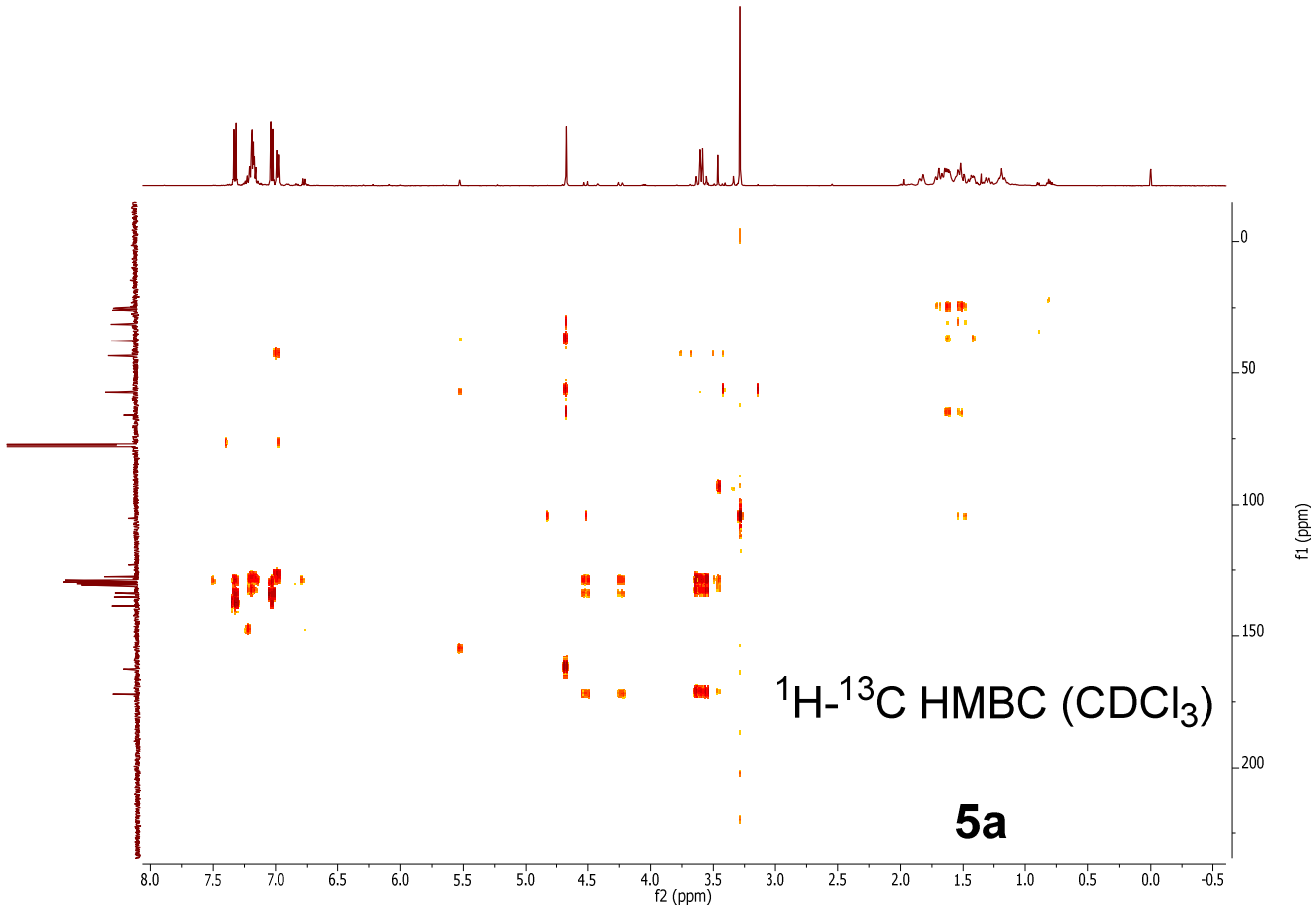


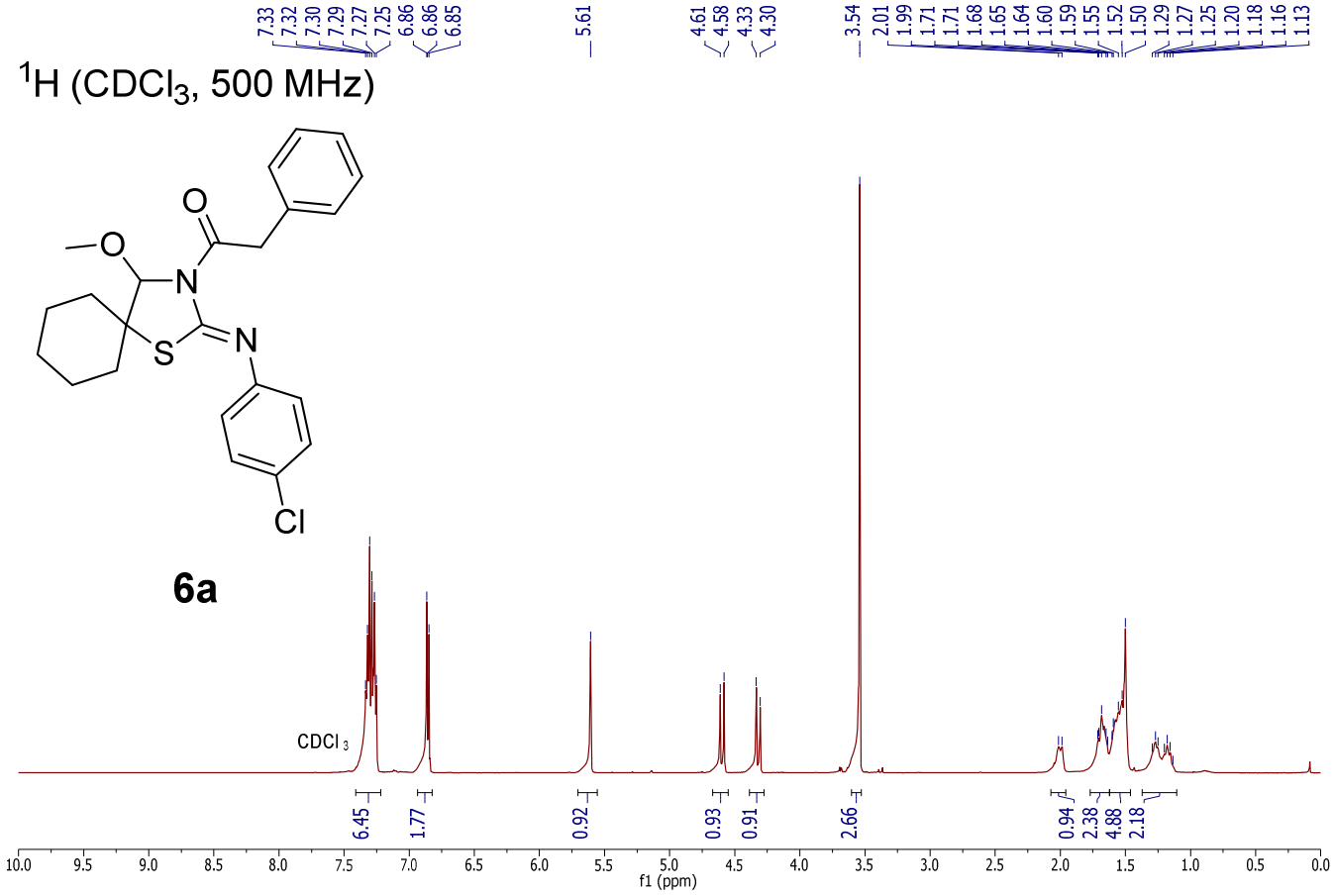
4o

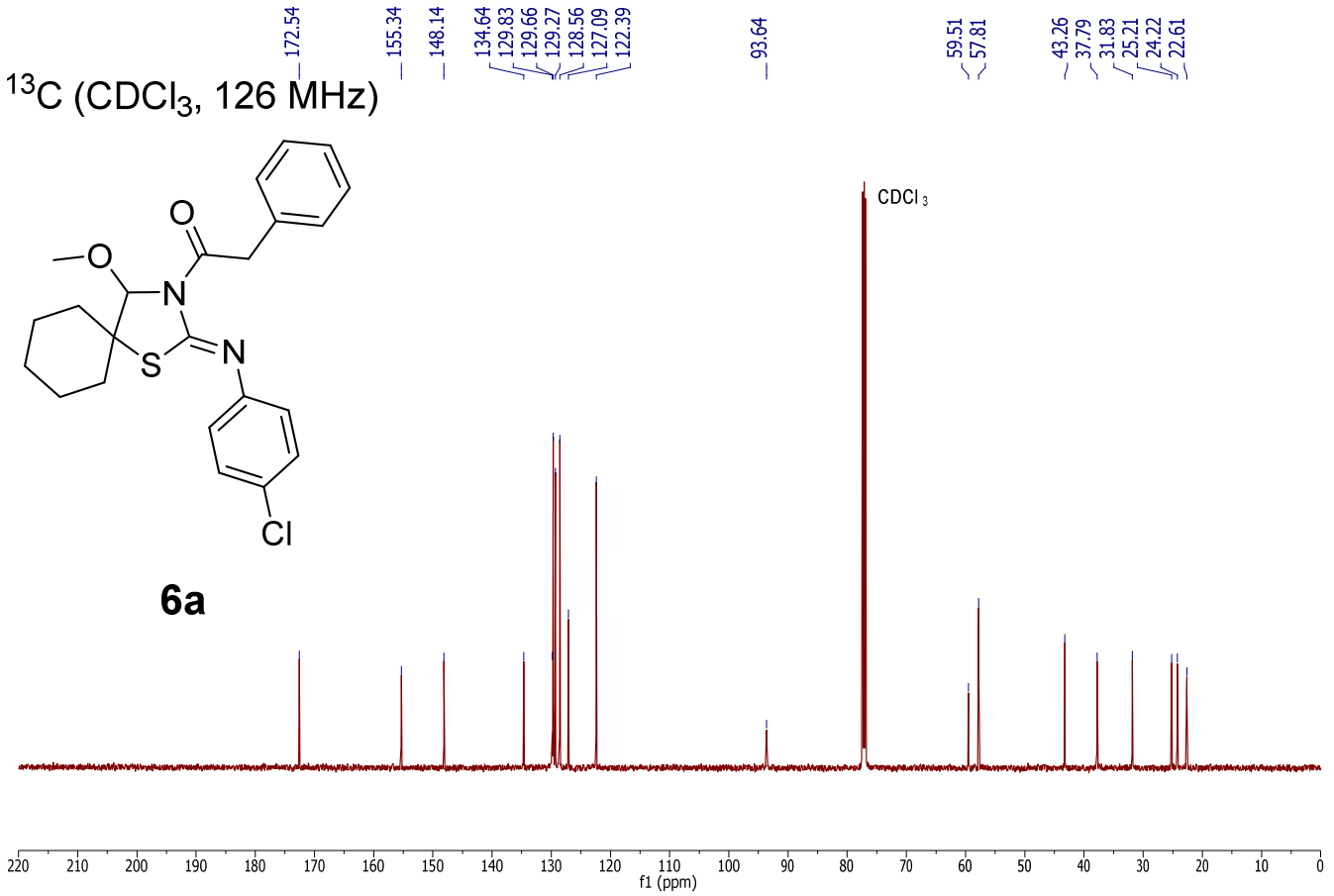

7.34
7.34
7.32
7.31
7.21
7.20
7.19
7.18
7.17
7.16
7.05
7.04
7.03
7.02
7.00
6.99
6.98
4.67
3.64
3.61
3.59
3.56
3.29
1.85
1.82
1.72
1.70
1.65
1.61
1.60
1.56
1.52
1.49
1.46
1.44
1.29
1.21
1.19
1.17
1H (CDCl3, 500 MHz)
O
N
O
S
N
Cl
5a
CDCl3
1.73
3.40
1.74
1.67
0.85
0.94
0.92
2.64
1.18
4.46
3.40
1.16
1.44
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
f1 (ppm)

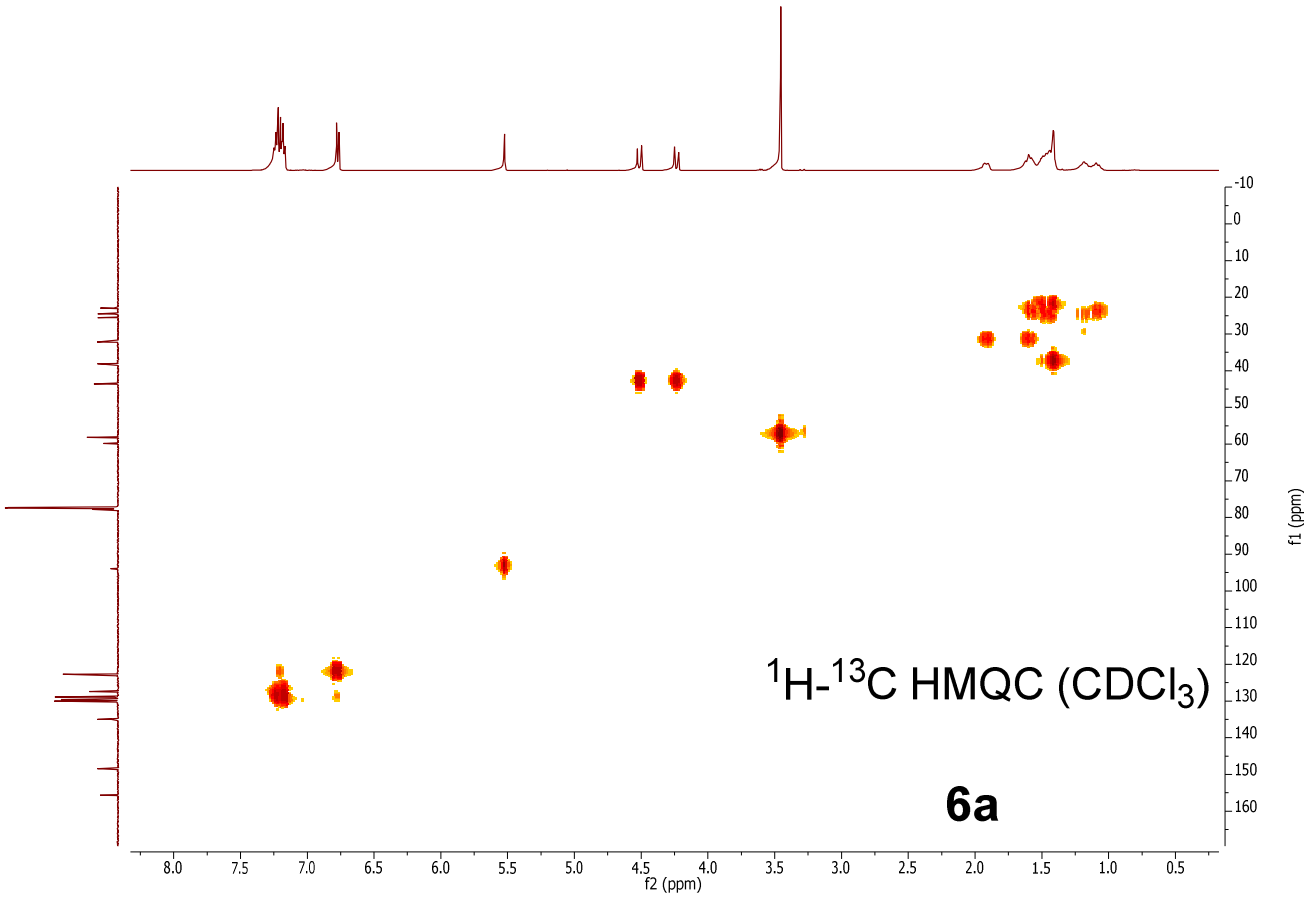

171.77
162.28
138.41
135.00
133.52
130.48
129.92
129.40
128.64
127.27
104.88
65.74
57.06
43.19
37.45
31.07
25.73
24.94
24.77
13C (CDCl3, 126 MHz)
O
N
O
S
N
Cl
5a
CDCl3
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)

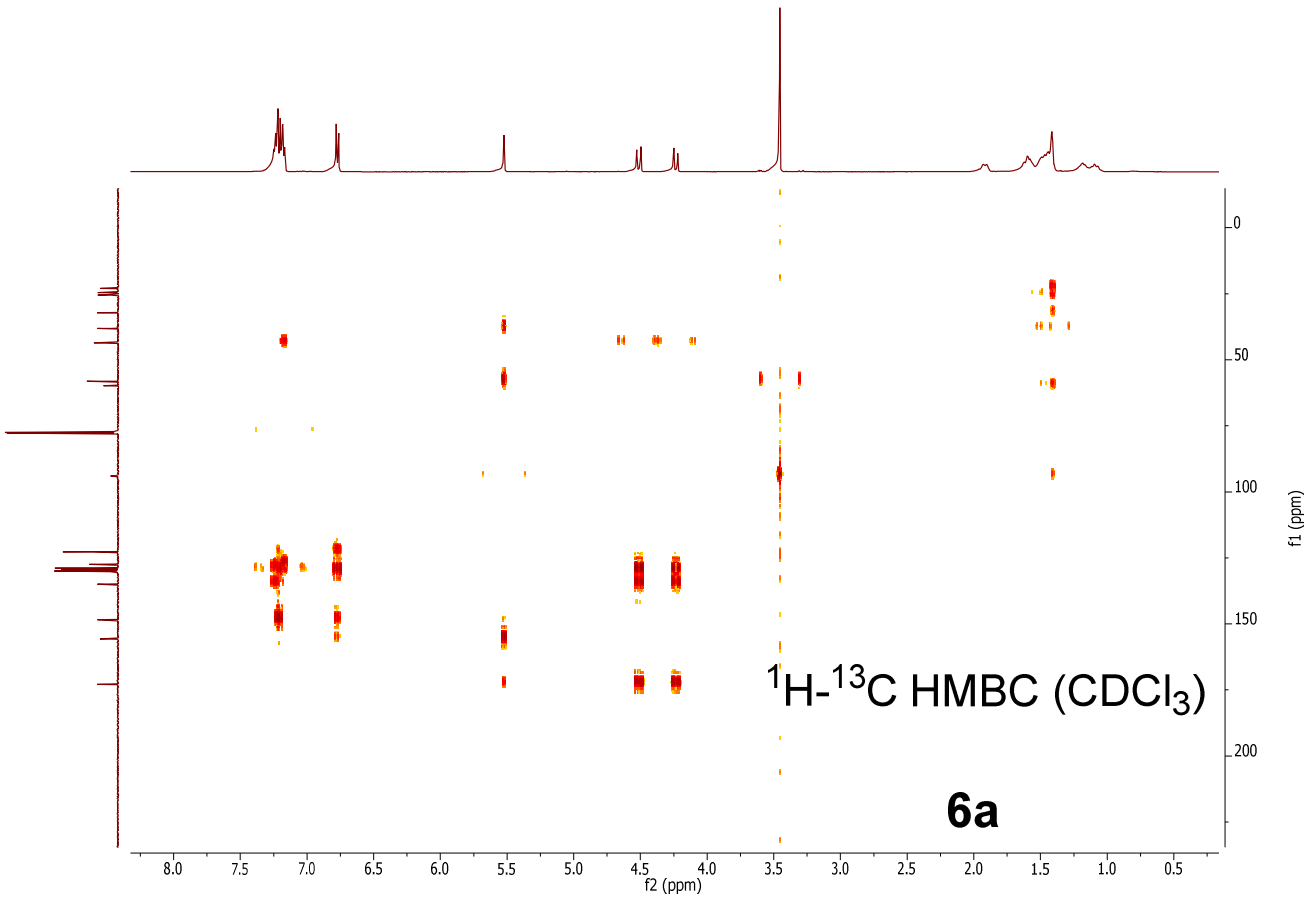

^{1}H-^{13}C HMQC ($CDCl_3$)
5a
f2 (ppm)
f1 (ppm)

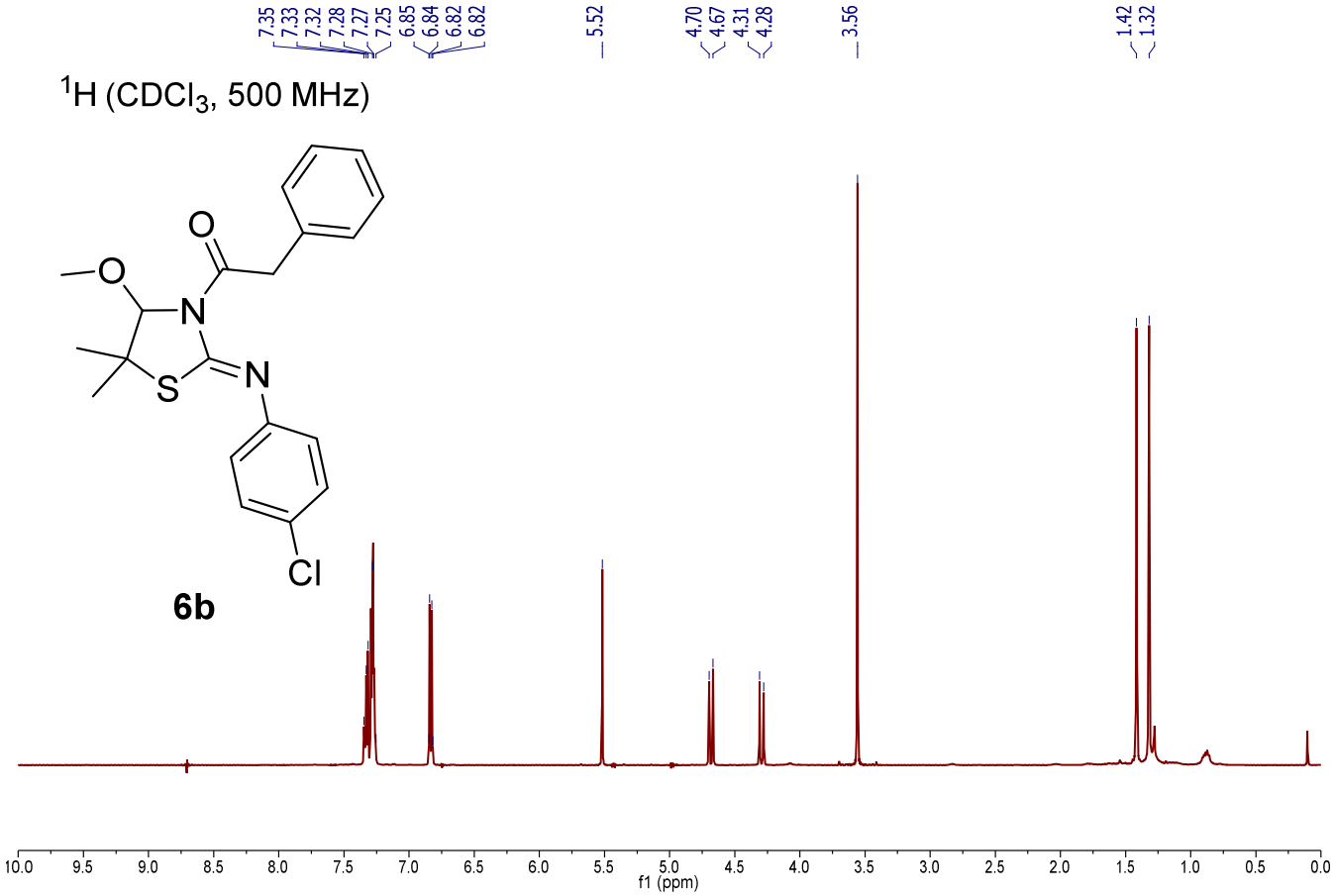

^{1}H-^{13}C HMBC ($CDCl_3$)
5a
f2 (ppm)
f1 (ppm)

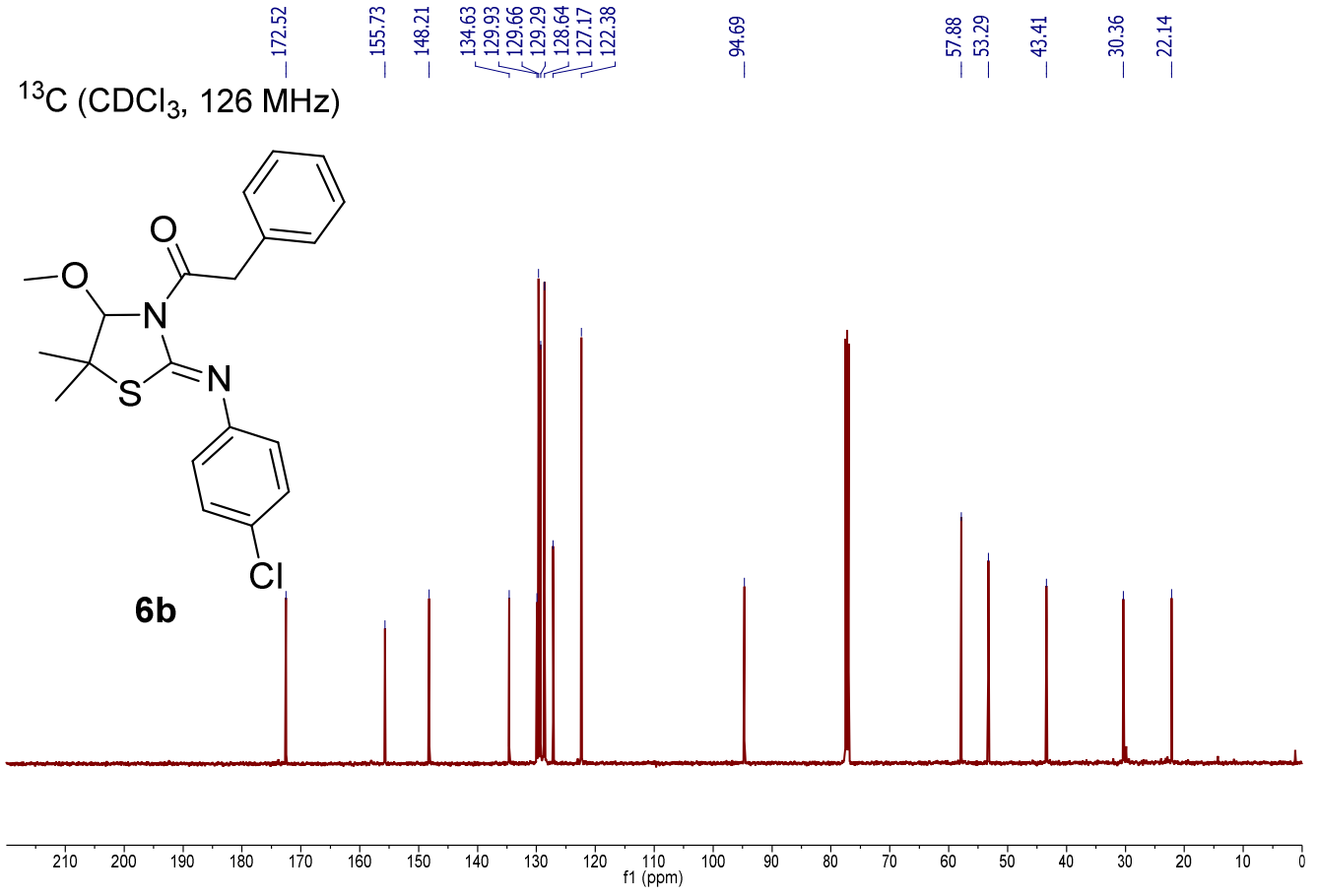

7.33
7.32
7.30
7.29
7.27
7.25
6.86
6.85
5.61
4.61
4.58
4.33
4.30
3.54
2.01
1.99
1.71
1.71
1.68
1.65
1.64
1.60
1.59
1.55
1.52
1.50
1.29
1.27
1.25
1.20
1.18
1.16
1.13
1H (CDCl3, 500 MHz)
O
O
N
S
N
Cl
6a
CDCl3
6.45
1.77
0.92
0.93
0.91
2.66
0.94
2.38
4.88
2.18
f1 (ppm)

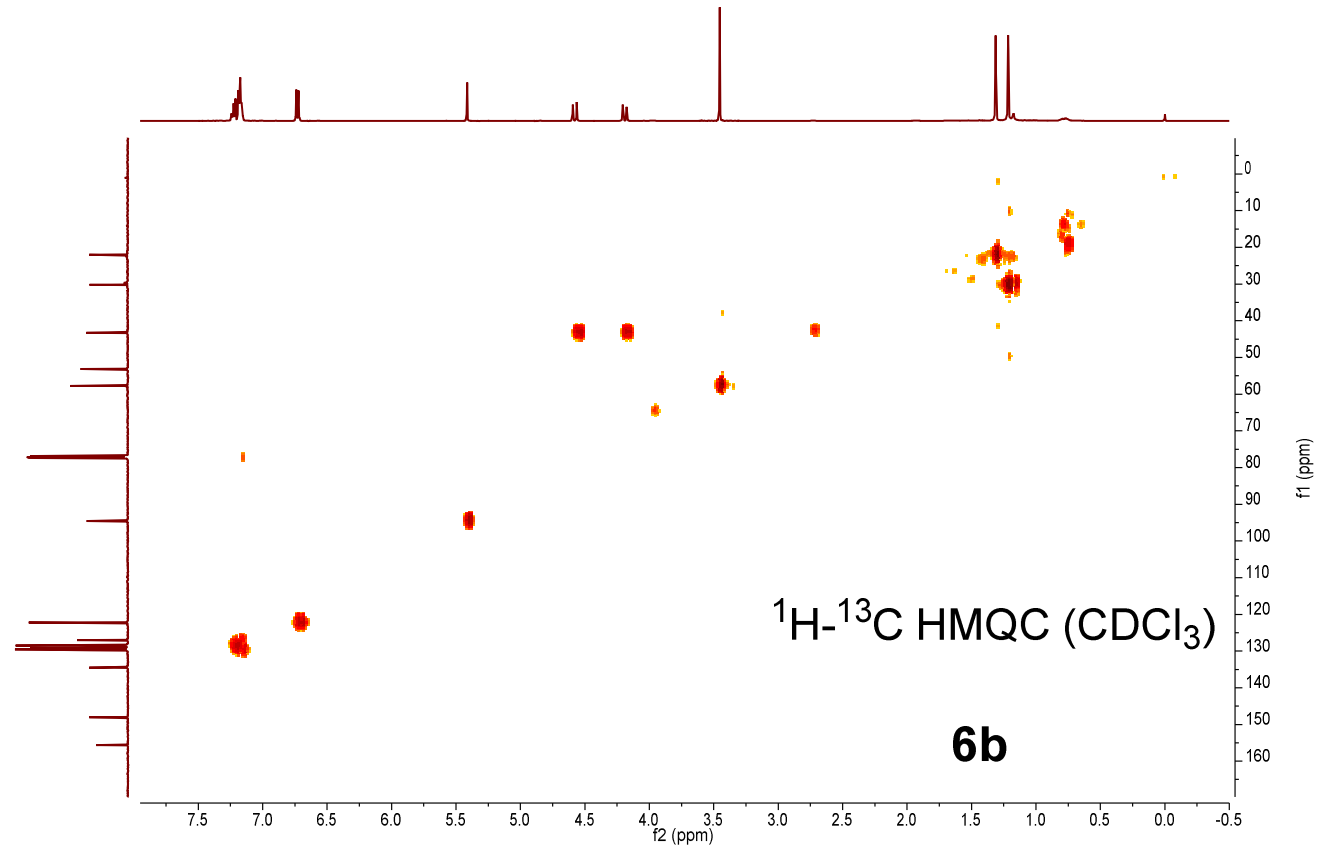

172.54
155.34
148.14
134.64
129.83
129.66
129.27
128.56
127.09
122.39
93.64
59.51
57.81
43.26
37.79
31.83
25.21
24.22
22.61
13C (CDCl3, 126 MHz)
O
O
N
S
N
Cl
6a
CDCl3
f1 (ppm)

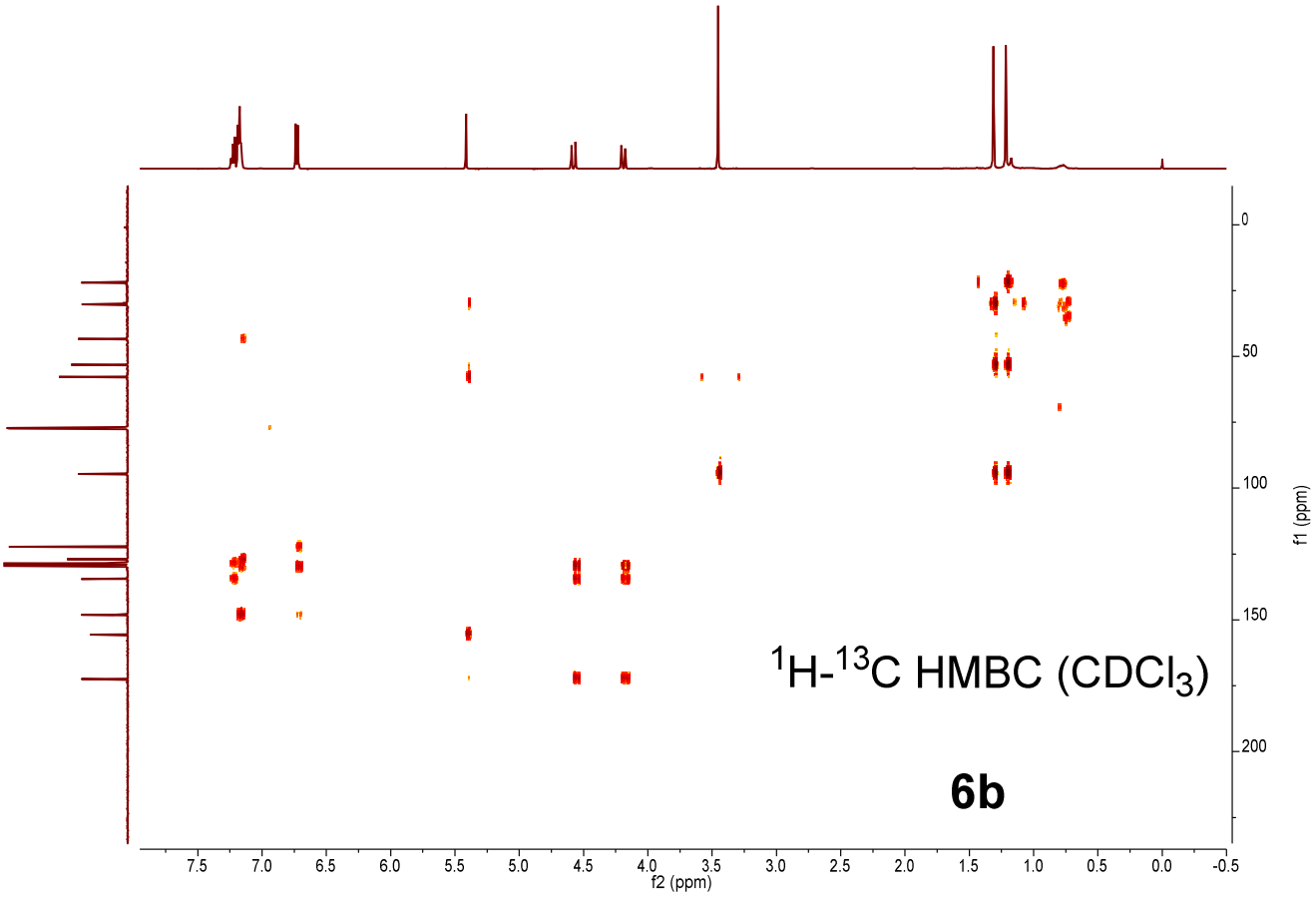

^{1}H-^{13}C HMQC ($CDCl_3$)
6a
f2 (ppm)
f1 (ppm)


^{1}H-^{13}C HMBC ($CDCl_3$)
6a
f2 (ppm)
f1 (ppm)

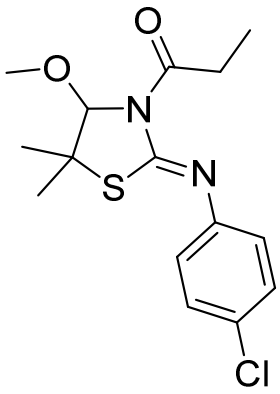

7.35
7.33
7.32
7.28
7.27
7.25
6.85
6.84
6.82
6.82
5.52
4.70
4.67
4.31
4.28
3.56
1.42
1.32
1H (CDCl3, 500 MHz)
O
O
N
S
N
Cl
6b
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
f1 (ppm)


172.52
155.73
148.21
134.63
129.93
129.66
129.29
128.64
127.17
122.38
94.69
57.88
53.29
43.41
30.36
22.14
13C (CDCl3, 126 MHz)
O
O
N
S
N
Cl
6b
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
f1 (ppm)


^{1}H-^{13}C HMQC ($CDCl_3$)
6b
f2 (ppm)
f1 (ppm)

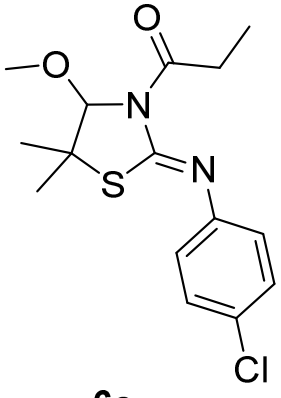

^{1}H-^{13}C HMBC ($CDCl_3$)
6b
f2 (ppm)
f1 (ppm)

^{1}H ($CDCl_3$, 500 MHz)

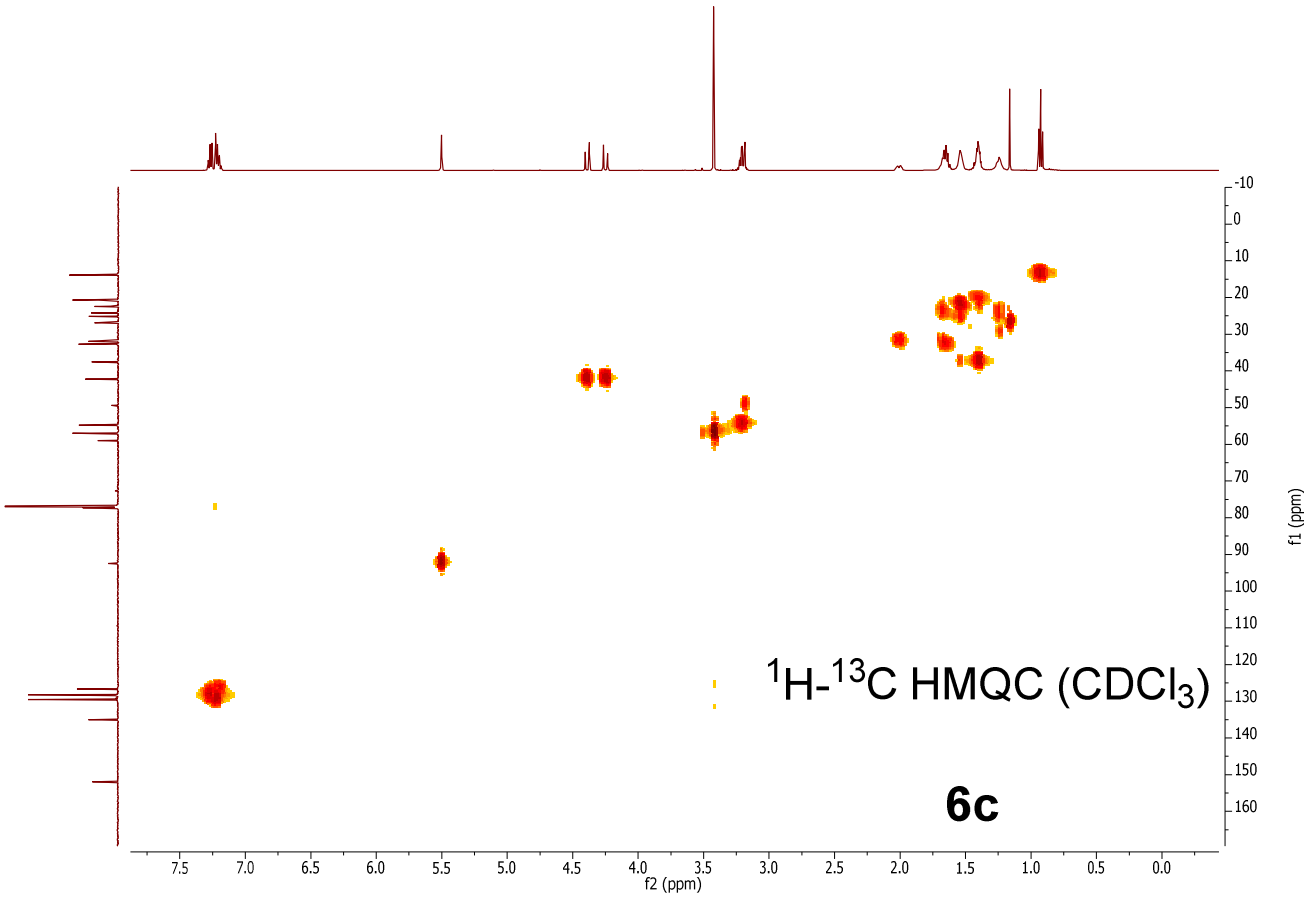


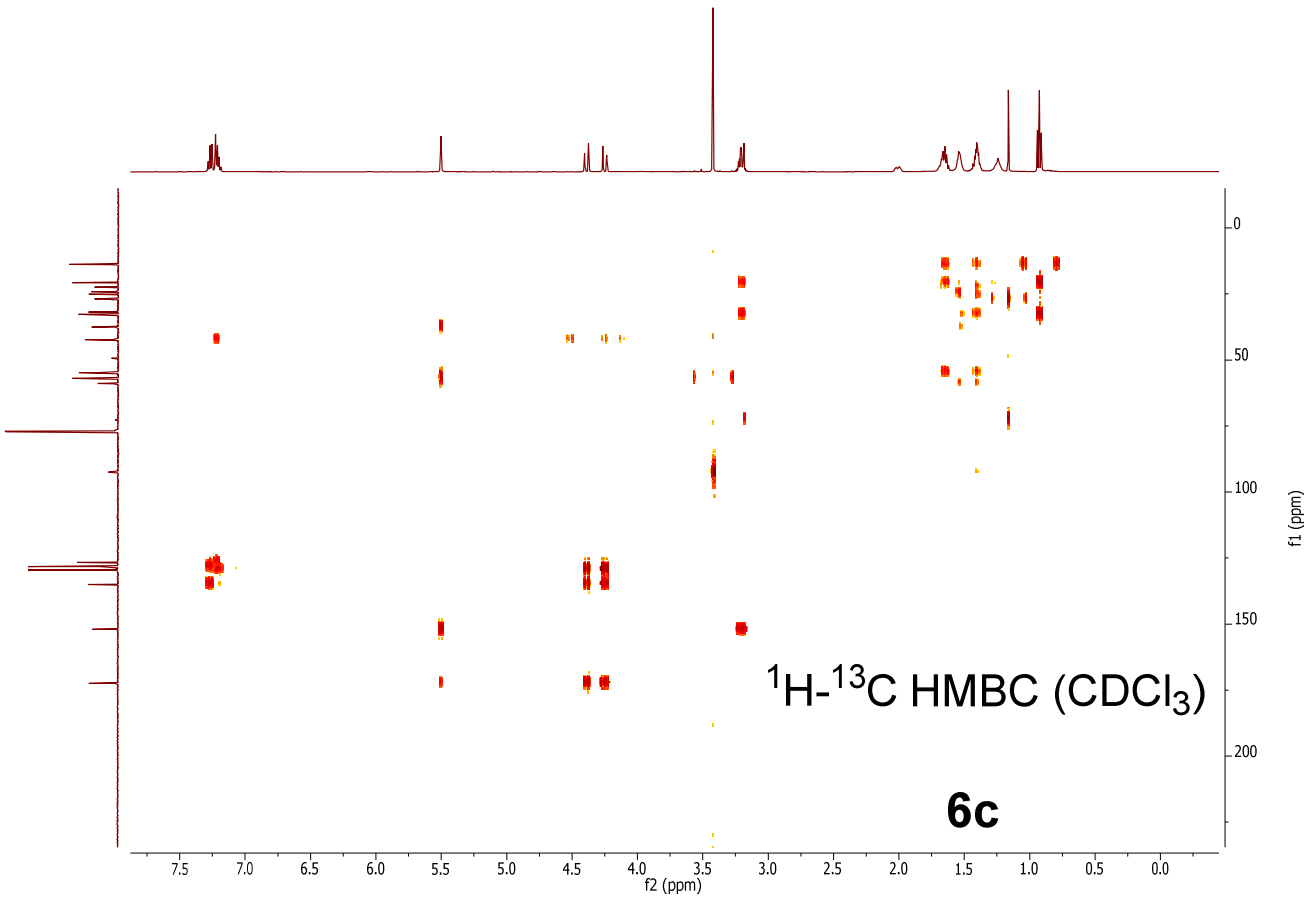
6c

^{13}C ($CDCl_3$, 126 MHz)

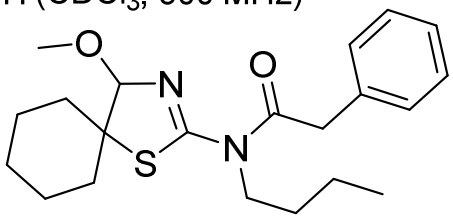


6c

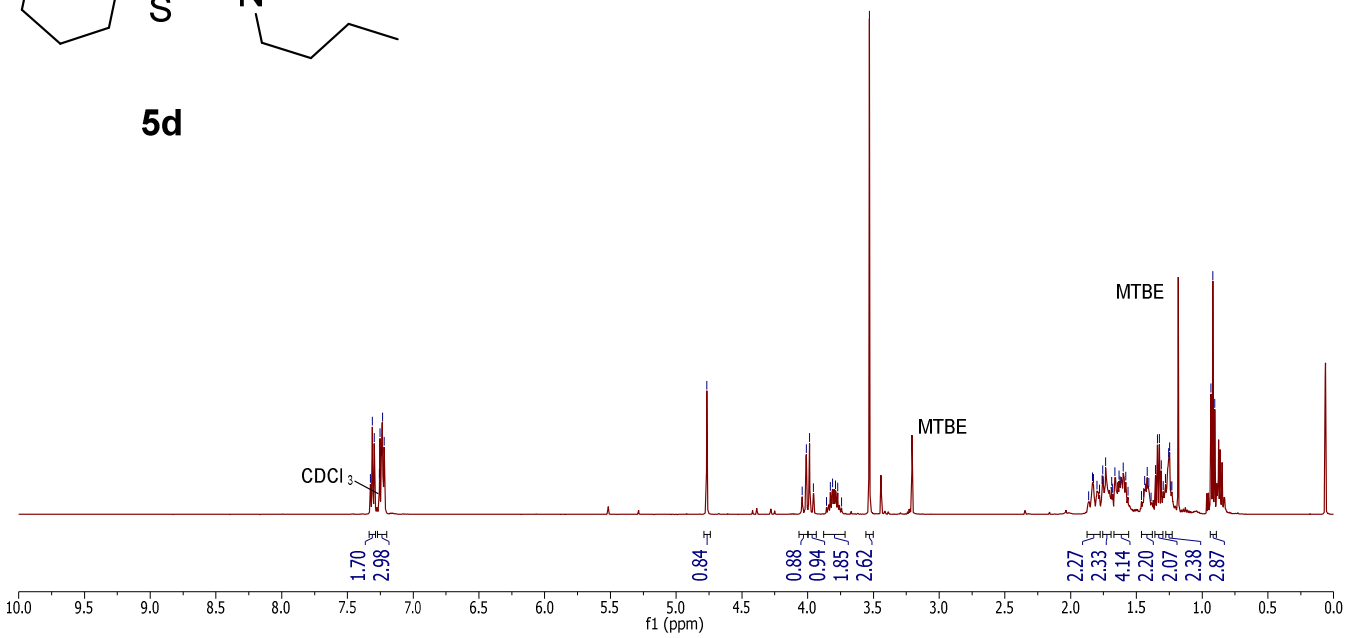

^{1}H-^{13}C HMQC ($CDCl_3$)
6c
f2 (ppm)
f1 (ppm)


^{1}H-^{13}C HMBC ($CDCl_3$)
6c
f2 (ppm)
f1 (ppm)

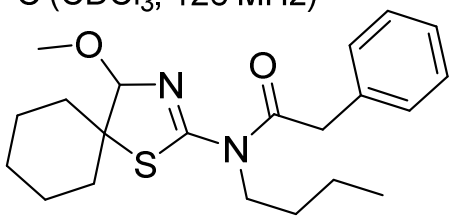
^{1}H ($CDCl_3$, 500 MHz)



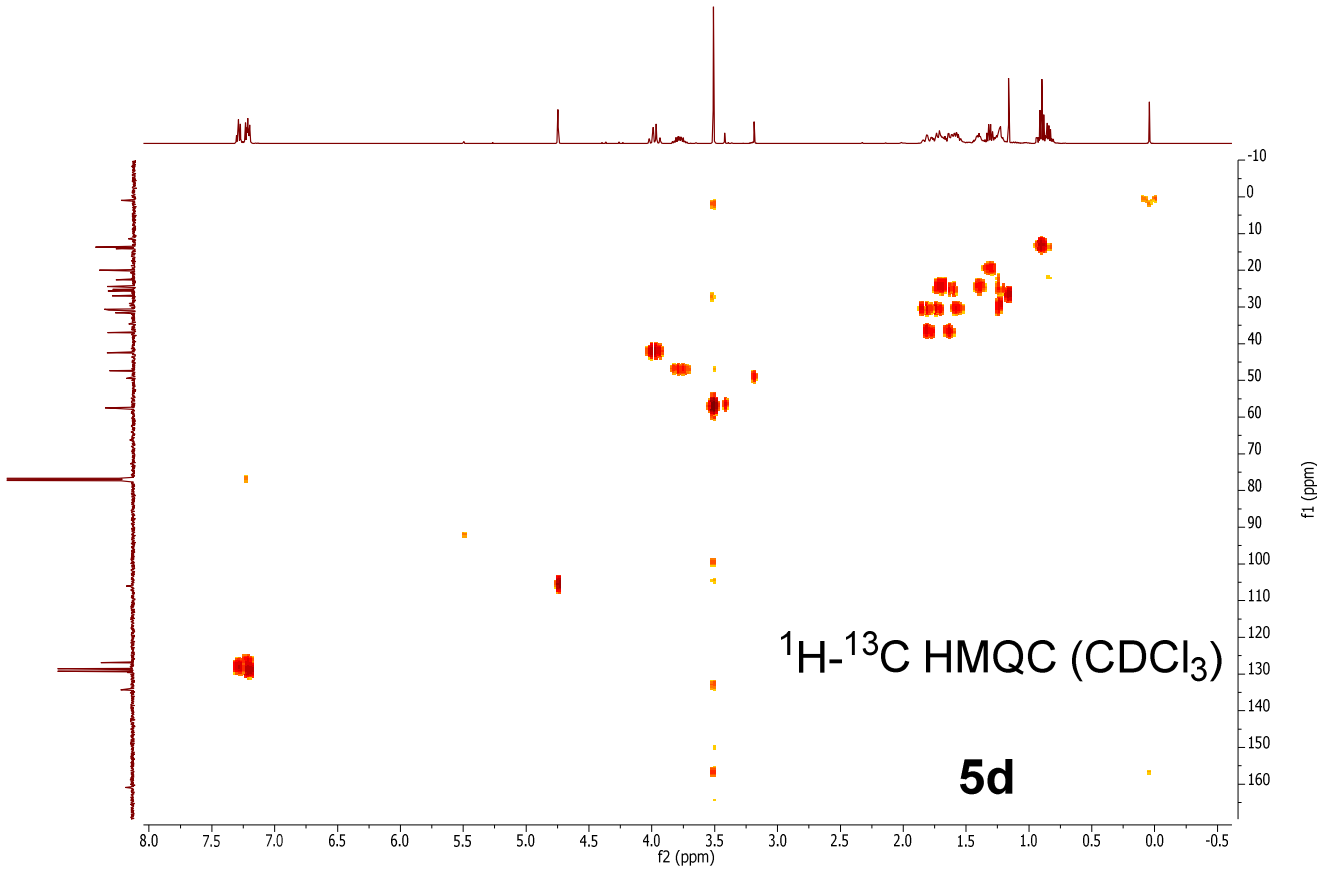
5d

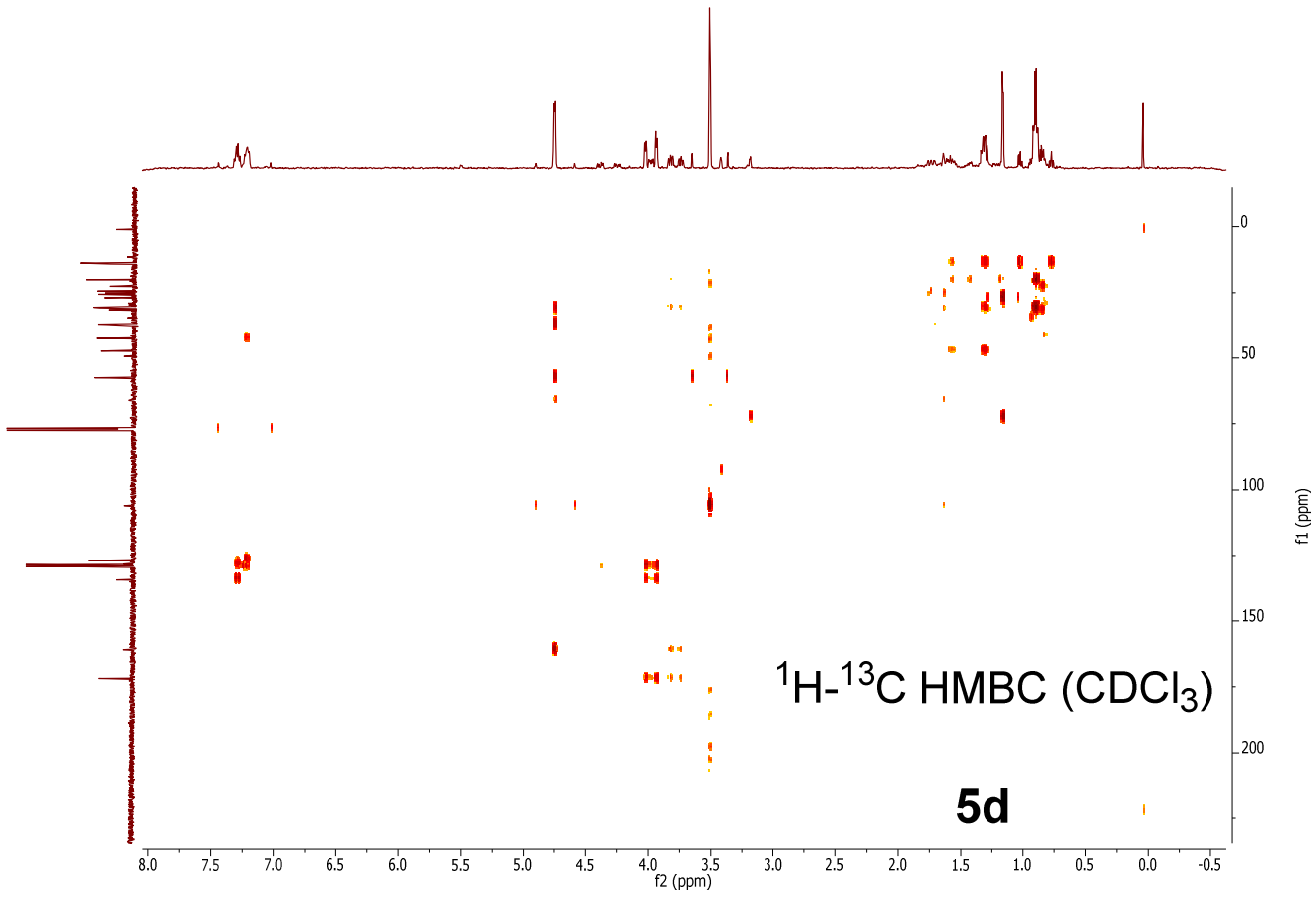


^{13}C ($CDCl_3$, 126 MHz)



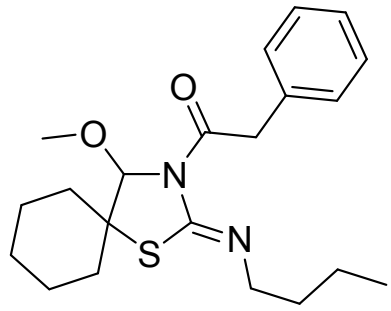
5d


^{1}H-^{13}C HMQC ($CDCl_3$)
5d
f2 (ppm)
f1 (ppm)


^{1}H-^{13}C HMBC ($CDCl_3$)
5d
f2 (ppm)
f1 (ppm)

7.31 7.30 7.28 7.25 7.24 7.23 7.21 5.53 4.43 4.40 4.29 4.26 3.45 3.25 3.24 3.23 3.22 3.22 3.21 1.69 1.68 1.66 1.58 1.57 1.56 1.44 1.43 1.42 1.27 1.26 0.97 0.95 0.94

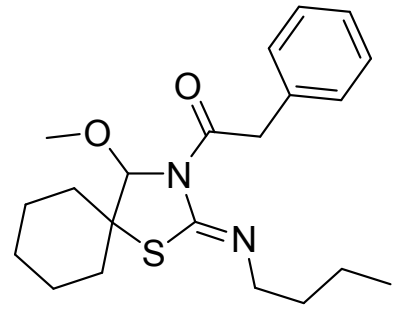
^{1}H ($CDCl_3$, 500 MHz)



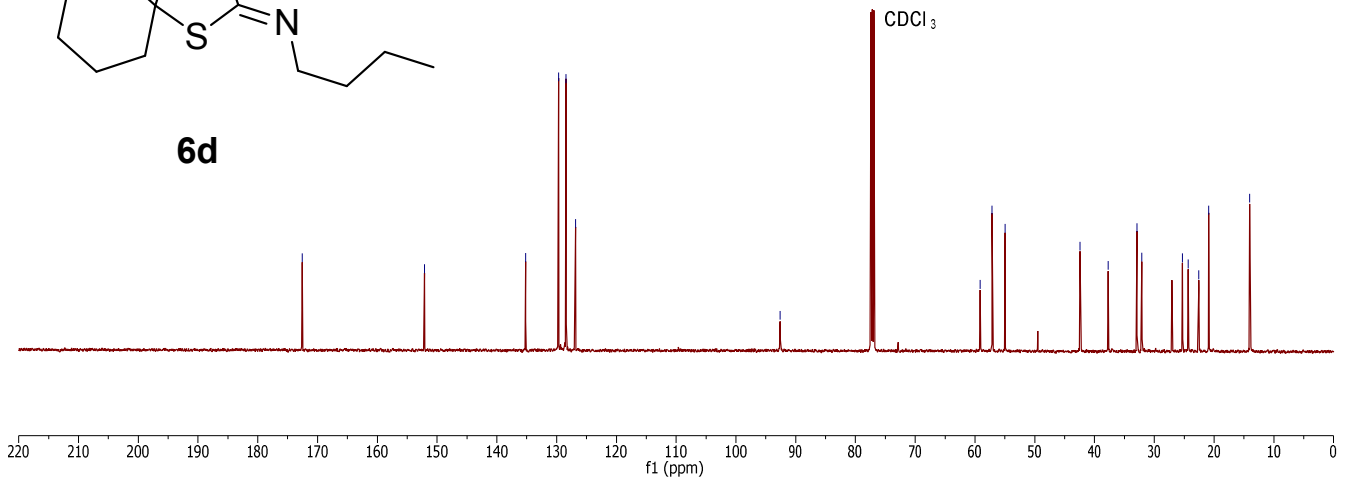
6d

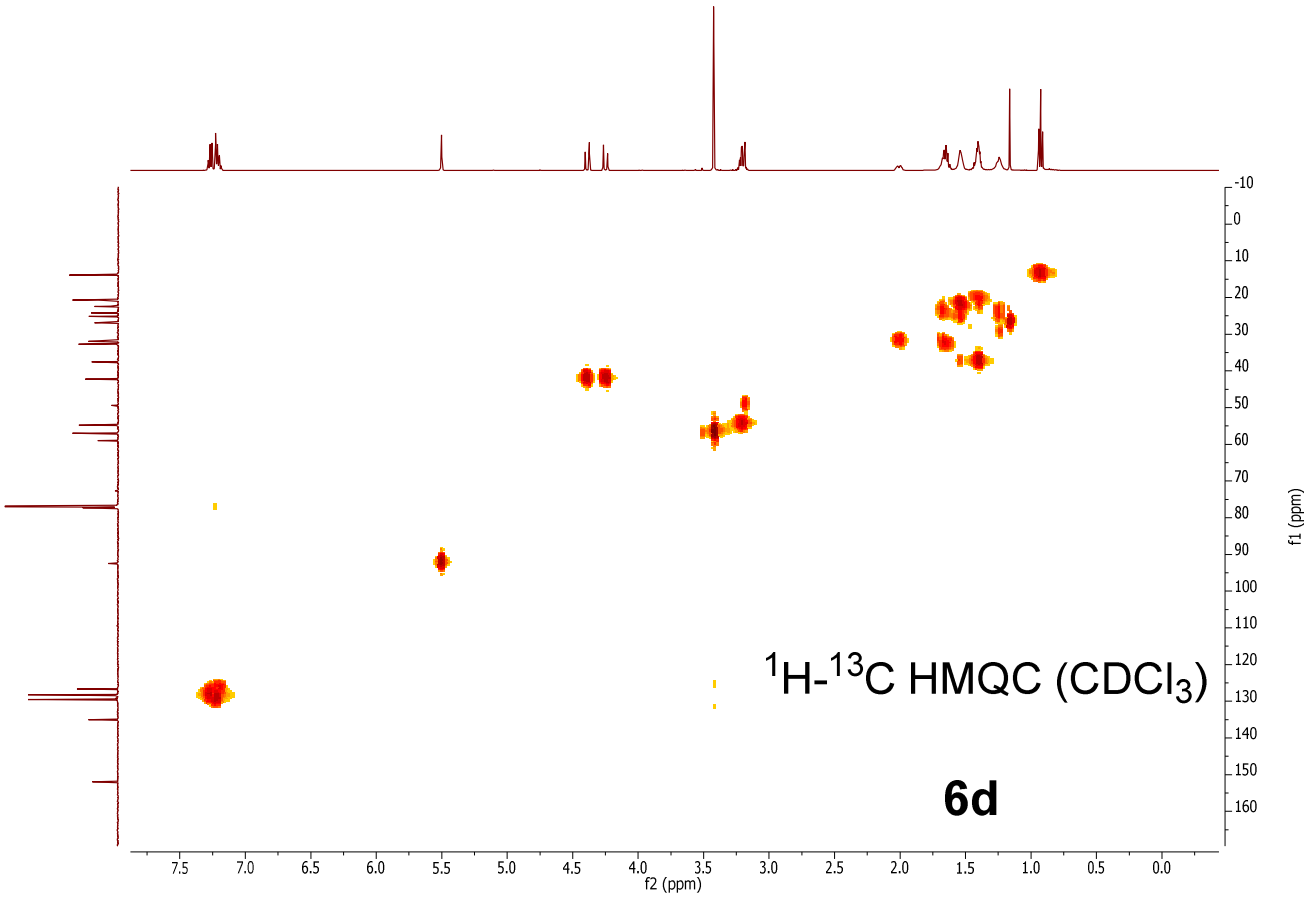
172.57 152.11 135.19 129.69 128.41 126.85 92.62 59.12 57.13 54.97 42.43 37.72 32.90 32.09 25.30 24.31 22.59 20.89 14.02

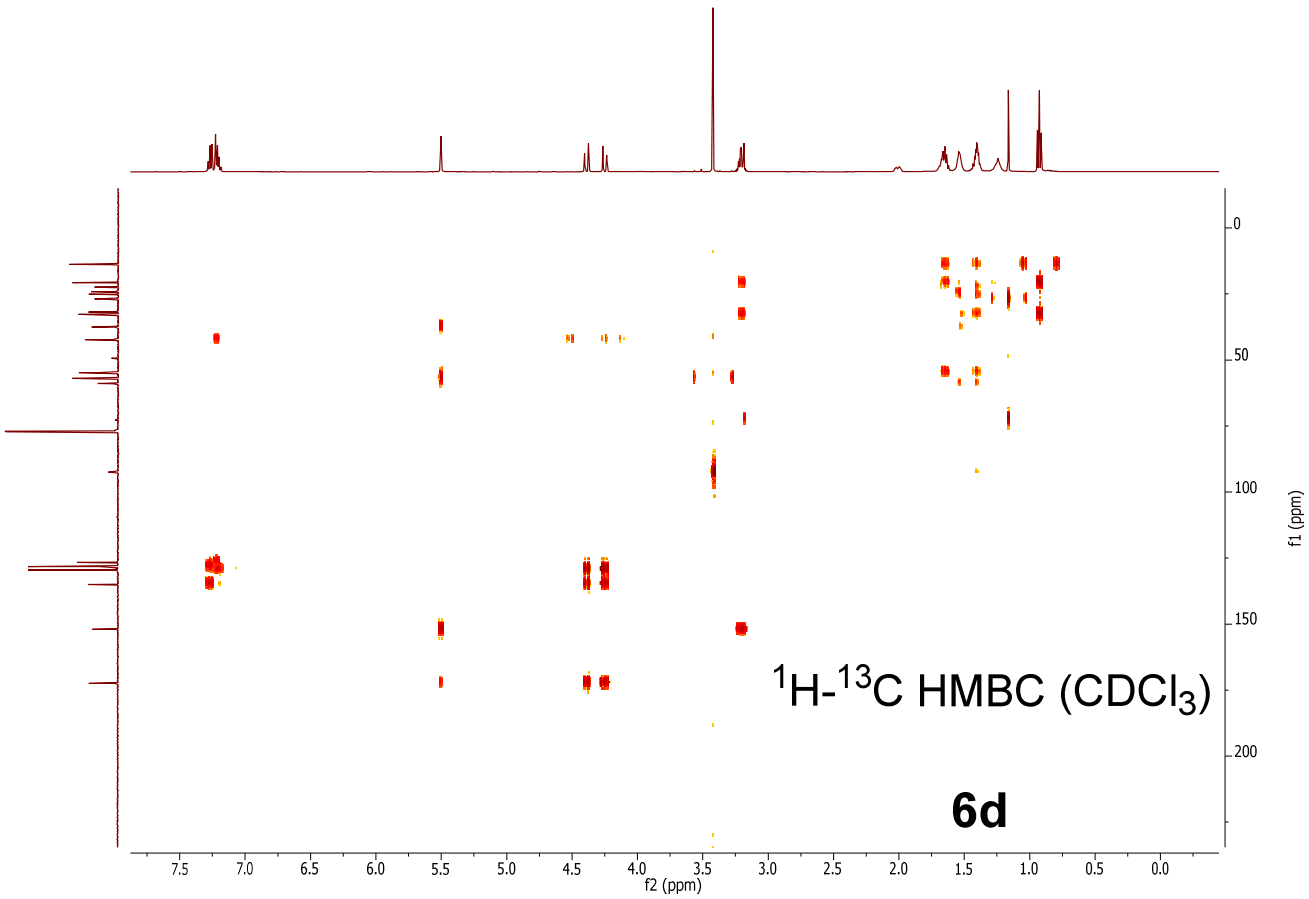
^{13}C ($CDCl_3$, 126 MHz)

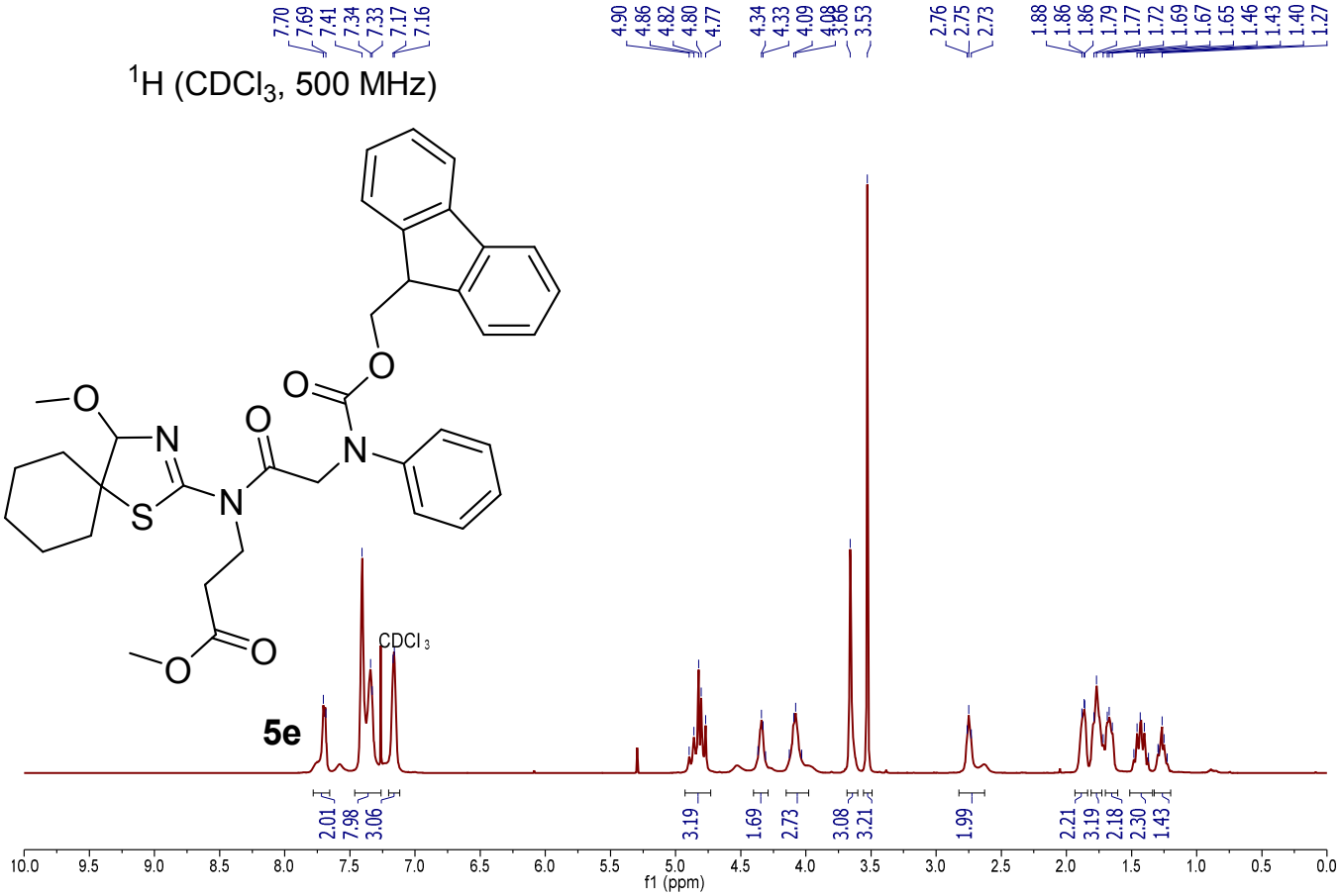


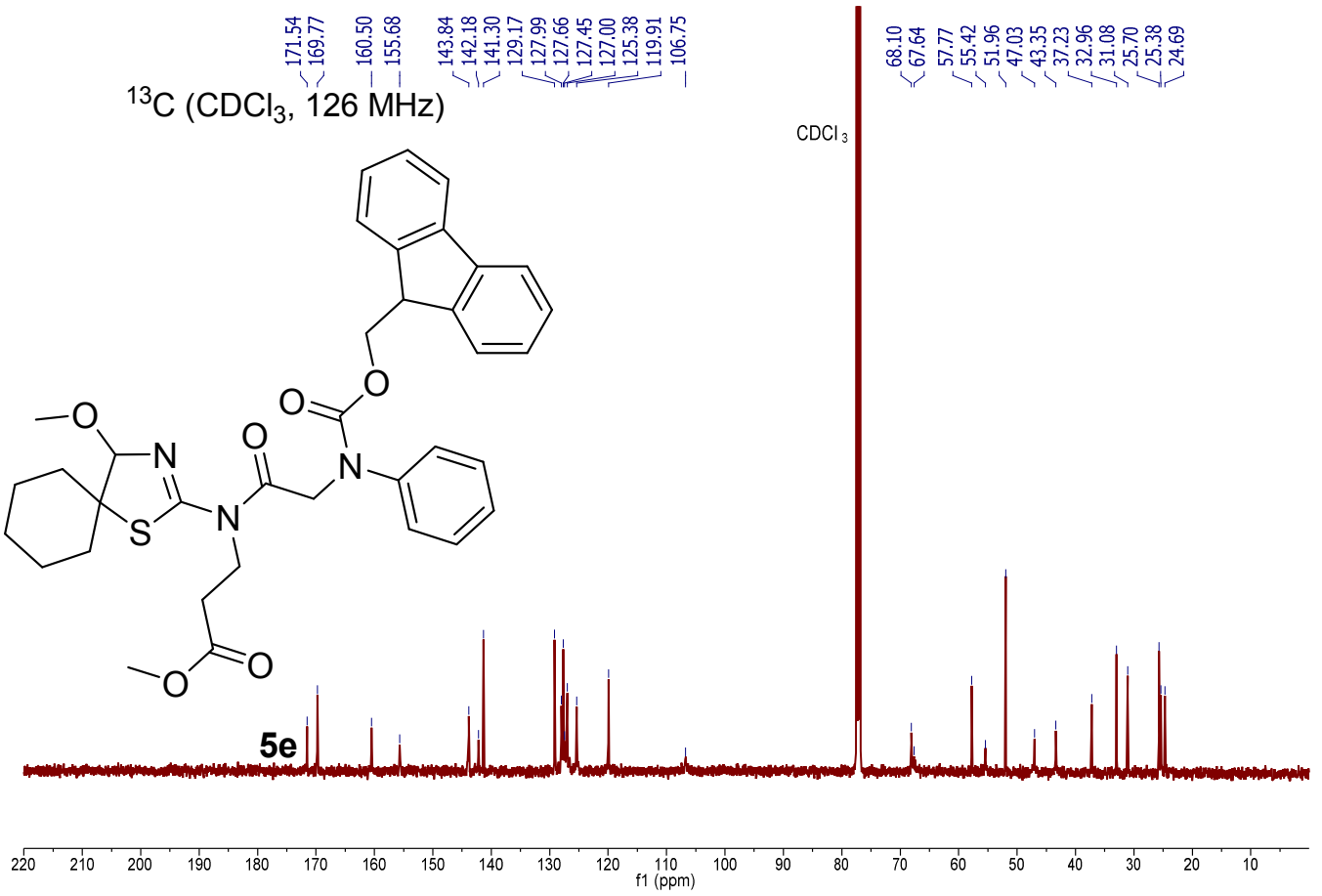
6d

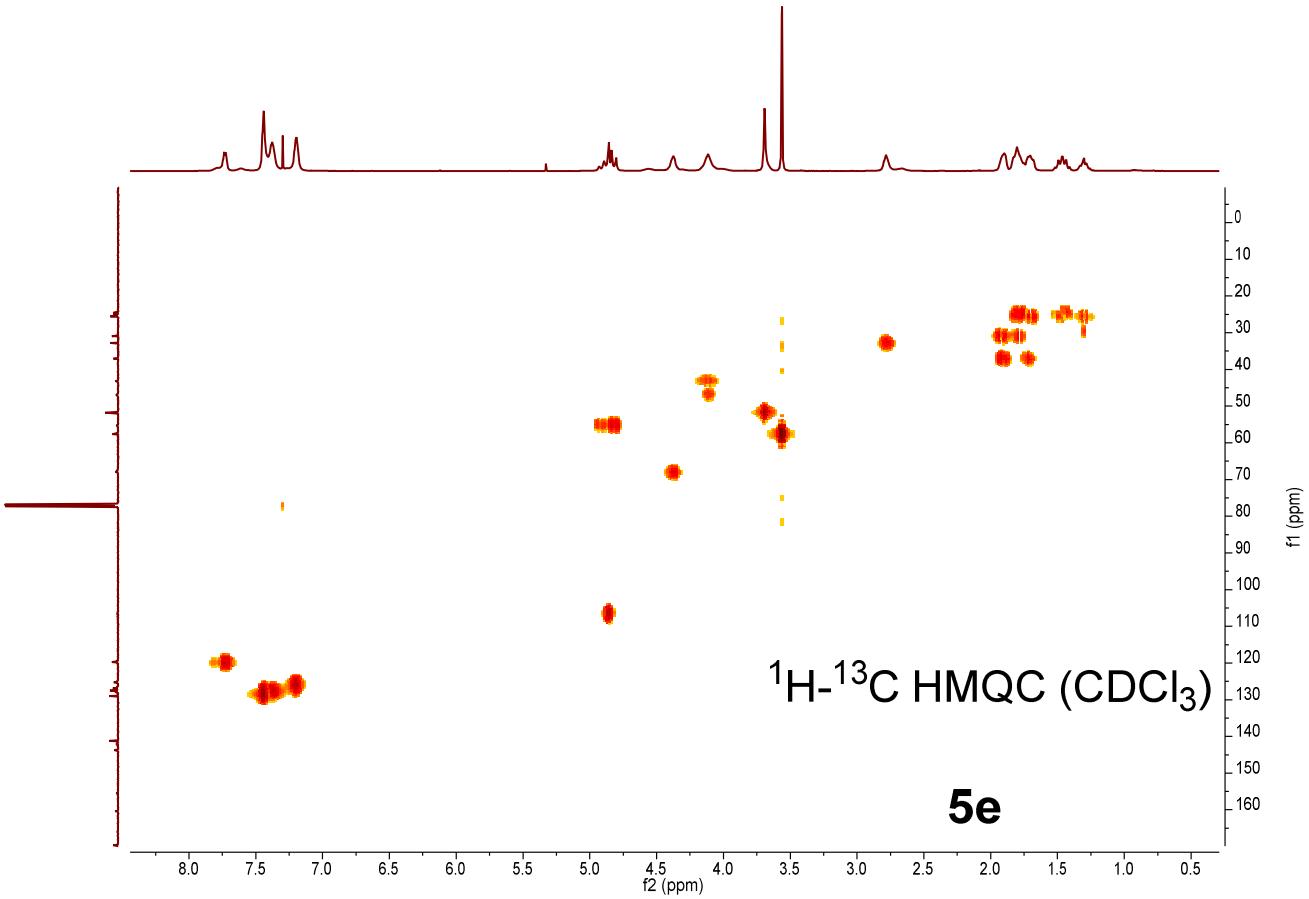


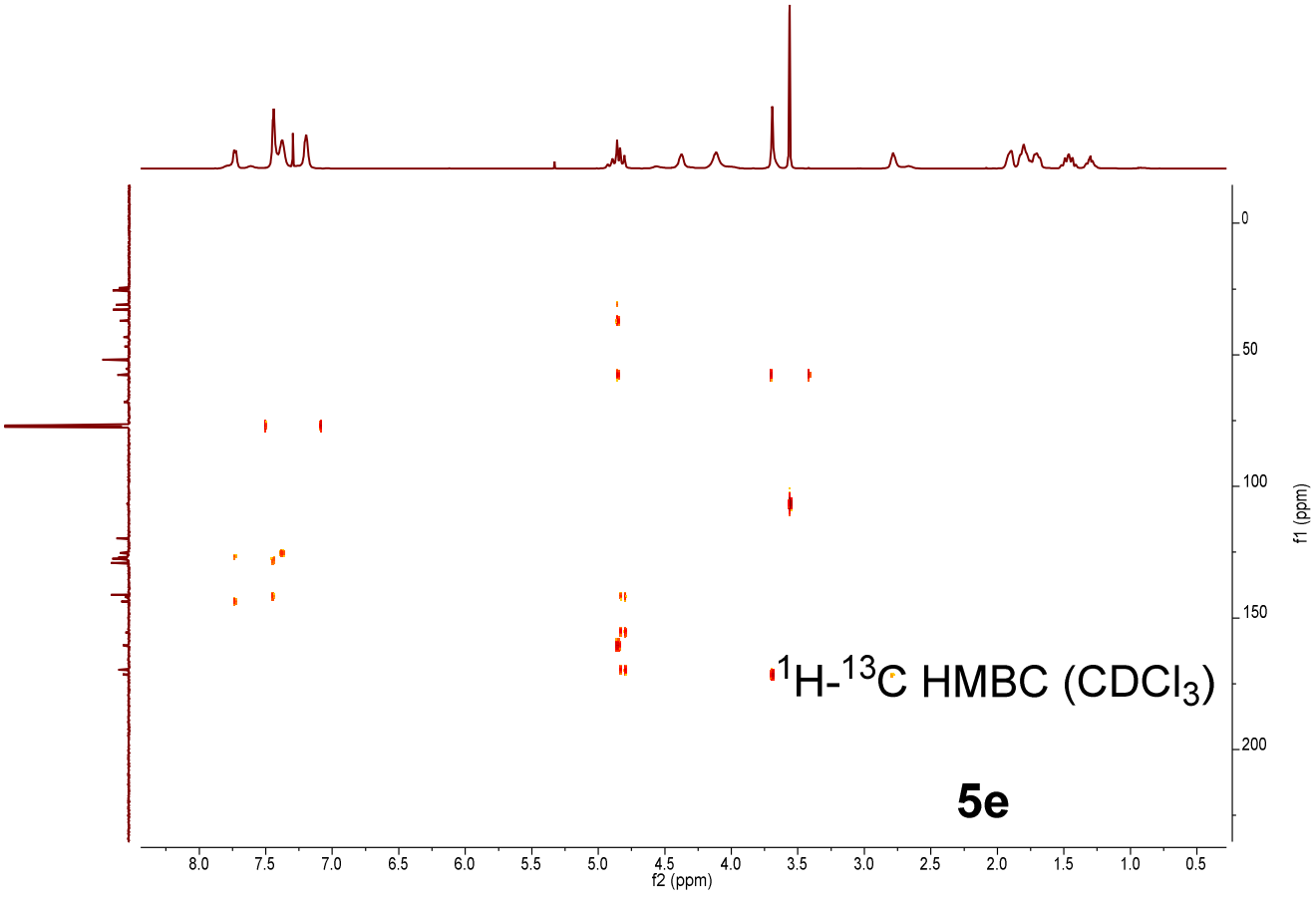

^{1}H-^{13}C HMQC ($CDCl_3$)
6d
f2 (ppm)
f1 (ppm)

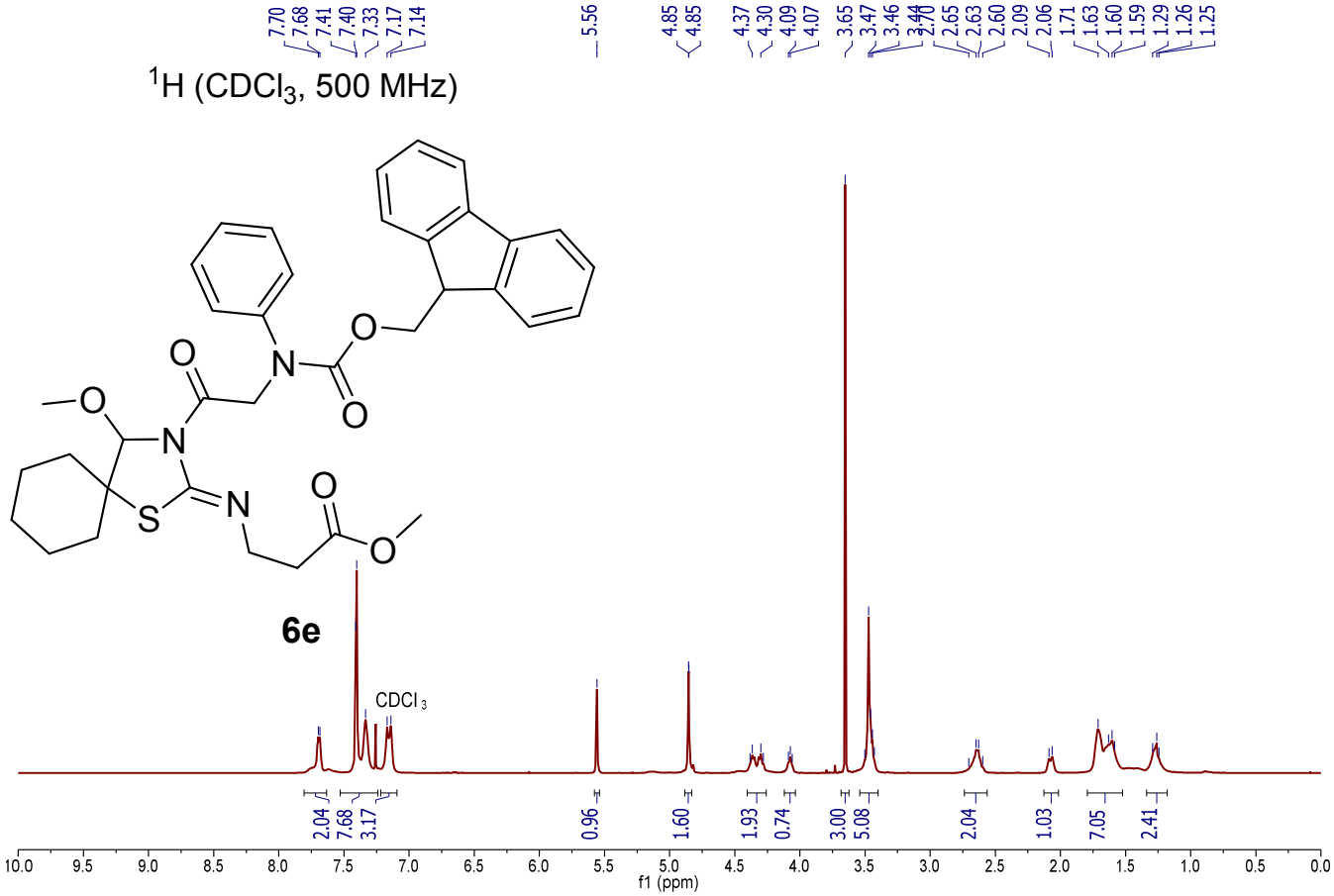

^{1}H-^{13}C HMBC ($CDCl_3$)
6d
f2 (ppm)
f1 (ppm)

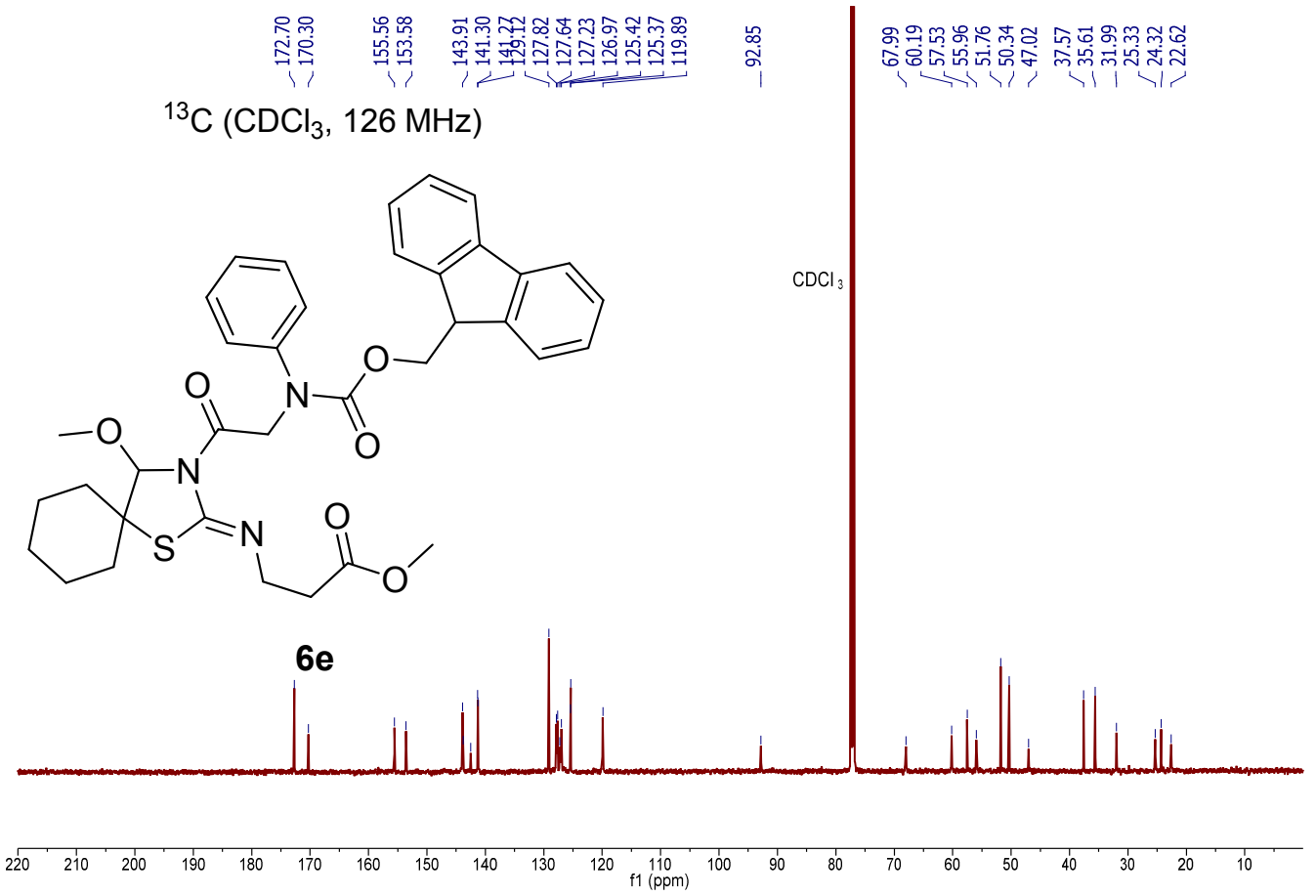

7.70
7.69
7.41
7.34
7.33
7.17
7.16
4.90
4.86
4.82
4.80
4.77
4.34
4.33
4.09
4.08
3.86
3.53
2.76
2.75
2.73
1.88
1.86
1.86
1.79
1.77
1.72
1.69
1.67
1.65
1.46
1.43
1.40
1.27
^{1}H ($CDCl_3$, 500 MHz)
CDCl3
5e
2.01
7.98
3.06
3.19
1.69
2.73
3.08
3.21
1.99
2.21
3.19
2.18
2.30
1.43
f1 (ppm)

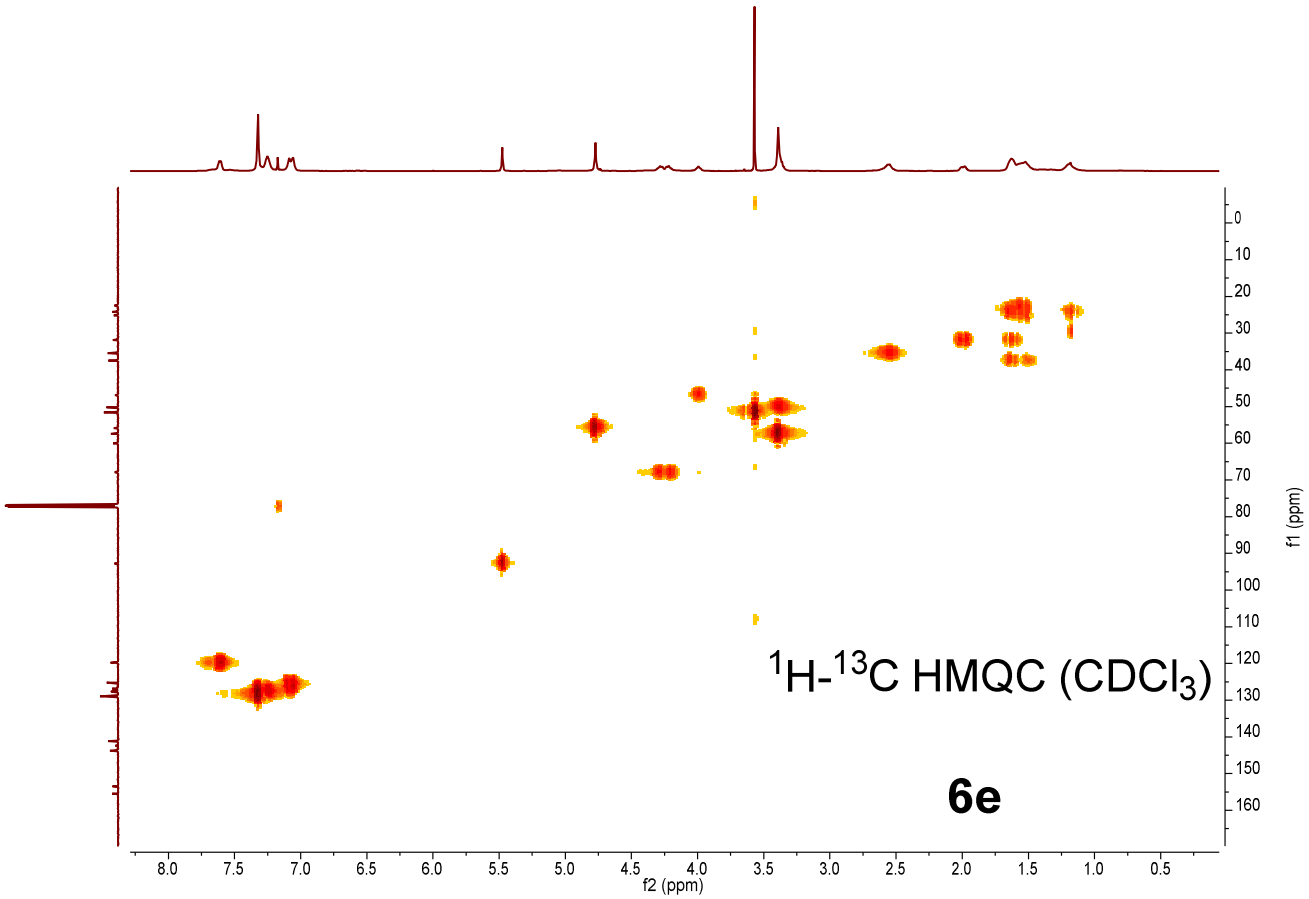

171.54
169.77
160.50
155.68
143.84
142.18
141.30
129.17
127.99
127.66
127.45
127.00
125.38
119.91
106.75
68.10
67.64
57.77
55.42
51.96
47.03
43.35
37.23
32.96
31.08
25.70
25.38
24.69
^{13}C ($CDCl_3$, 126 MHz)
CDCl3
5e
f1 (ppm)

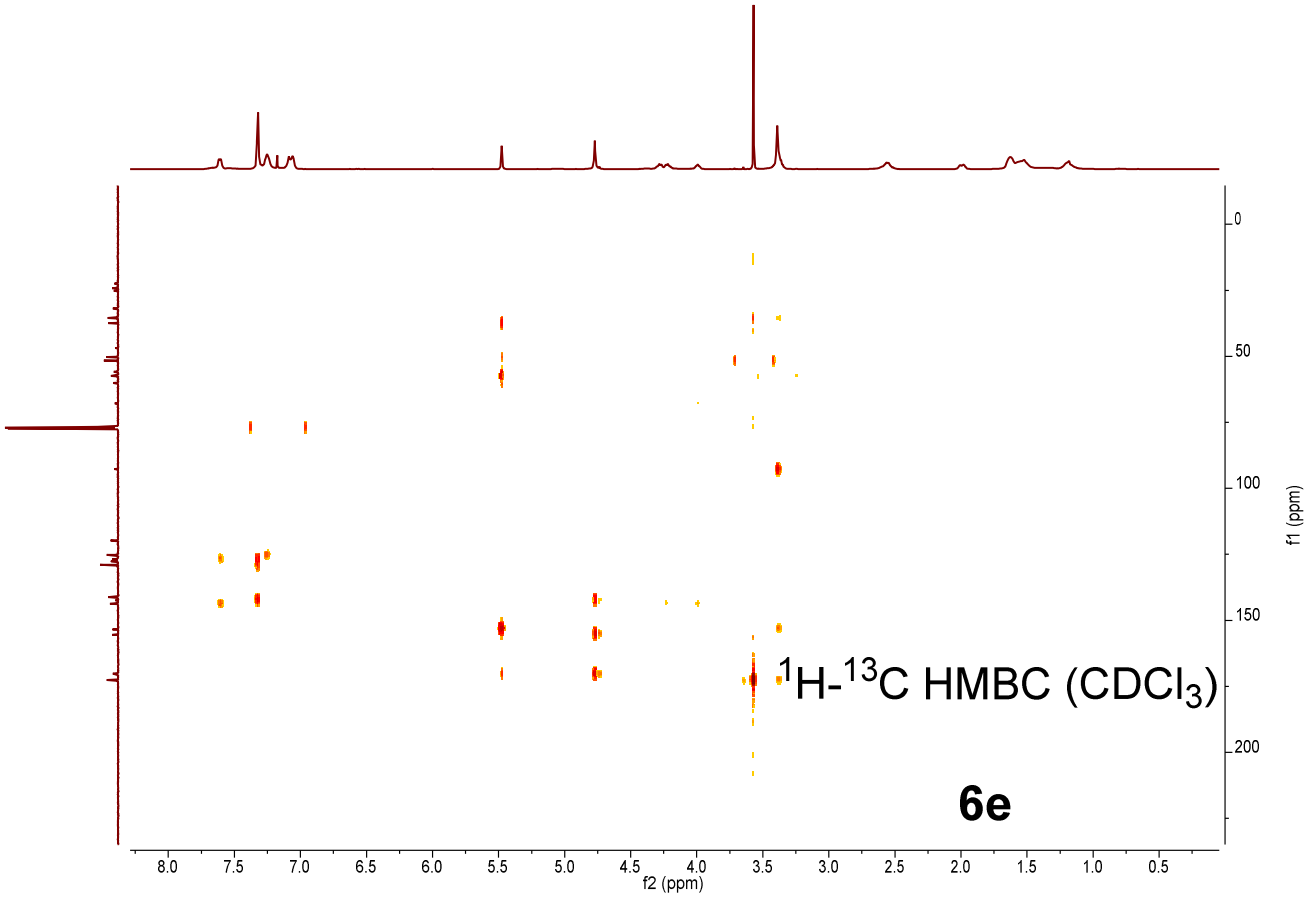

^{1}H-^{13}C HMQC ($CDCl_3$)
5e
f2 (ppm)
f1 (ppm)


^{1}H-^{13}C HMBC ($CDCl_3$)
5e
f2 (ppm)
f1 (ppm)


7.70
7.68
7.41
7.40
7.33
7.17
7.14
5.56
4.85
4.85
4.37
4.30
4.09
4.07
3.65
3.47
3.46
2.65
2.63
2.60
2.09
2.06
1.71
1.63
1.60
1.59
1.29
1.26
1.25
1H (CDCl3, 500 MHz)
6e
CDCl3
2.04
7.68
3.17
0.96
1.60
1.93
0.74
3.00
5.08
2.04
1.03
7.05
2.41
f1 (ppm)


172.70
170.30
155.56
153.58
143.91
141.30
127.82
127.64
127.23
126.97
125.42
125.37
119.89
92.85
67.99
60.19
57.53
55.96
51.76
50.34
47.02
37.57
35.61
31.99
25.33
24.32
22.62
13C (CDCl3, 126 MHz)
CDCl3
6e
f1 (ppm)


^{1}H-^{13}C HMQC ($CDCl_3$)
6e
f2 (ppm)
f1 (ppm)


^{1}H-^{13}C HMBC ($CDCl_3$)
6e
f2 (ppm)
f1 (ppm)

X-ray crystal structure

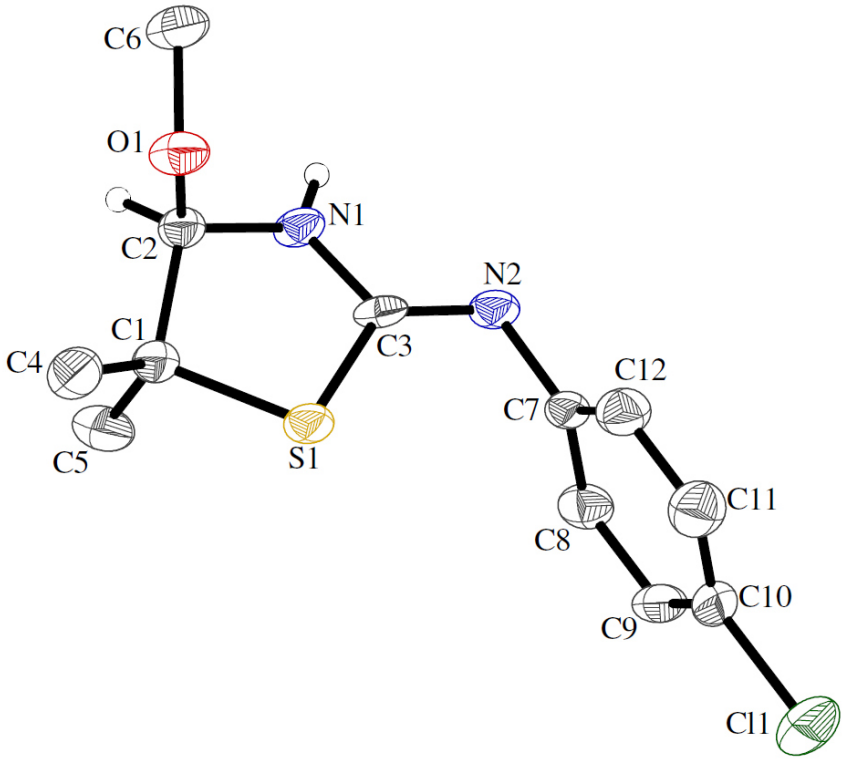


Figure S5. X-ray crystal structure of the racemic isothiourea 4a (only one enantiomer is shown).

Literature

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S2 R. Sail, J. Kopf, P. Köll, *Tetrahedron: Asymmetry* **2000**, *11*, 423–433.

S3 M. Hatam, D. Tehranfar, J. Martens, *Synth. Commun.* **1995**, *25*, 1677–1688.

S4 K. Drauz, H. G. Koban, J. Martens, W. Schwarze, *Liebigs Ann. Chem.* **1985**, 448–452.

S5 F. Brockmeyer, J. Martens, *Chem. Sus. Chem.* **2014**, *7*, 2441–2444.