NHC-Catalyzed [3+3] Annulation of Thioamides and Modified Enals for the Enantioselective Synthesis of Functionalized Thiazinones

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Supporting Information

1. General Information S2
2. General Procedure for the Optimization of the Reaction Conditions S3
4. Kinetic Studies for the Determination of Reaction Order S6
5. X-Ray Data of 3x S9
7. 1H and 13C NMR Spectra of Functionalized Thiazinones S30
8. HPLC Data of Functionalized Thiazinones S62
1. General Information

Unless otherwise specified, all reactions were carried out under an atmosphere of argon in flame-dried reaction vessels with Teflon screw caps. Mesitylene was purchased from commercial sources and stored under argon over 4 Å molecular sieves. The 2- bromoenals were synthesized from the corresponding α,β-unsaturated aldehydes following the literature procedure. All the thioamide derivatives were prepared following the literature procedure. The triazolium salt C was synthesized following the literature procedure. K₂CO₃ was purchased from SD-Fine.

Analytical thin layer chromatography was performed on TLC Silica gel 60 F254. Visualization was accomplished with short wave UV light or KMnO₄ staining solutions followed by heating. Flash chromatography was performed on silica gel (230-400 mesh) by standard techniques eluting with Pet. Ether-EtOAc solvent system.

All compounds were fully characterized. ¹H and ¹³C NMR spectra were recorded on Bruker AV 400 and Bruker Ultra shield spectrometer in solvents as indicated. Chemical shifts (δ) are given in ppm. The residual solvent signals were used as references and the chemical shifts converted to the TMS scale (CDCl₃: δH = 7.26 ppm, δC = 77.16 ppm). Infrared (FT-IR) spectra were recorded on a Perkin Elmer Spectrum BX spectrophotometer, ν-max in cm⁻¹. Optical rotations were measured on JASCO P-2000 polarimeter at room temperature using 50 mm cell of 1 mL capacity. HRMS (ESI) data were recorded on a Micromass Q-TOF Micro instrument. HPLC analysis was performed on Agilent Technologies 1260 Infinity II with UV detector.

2. General Procedure for the Optimization of the Reaction Conditions

To an oven-dried Schlenk reaction vessel equipped with a magnetic stir bar was taken the (Z)-2-bromo-3-phenylacrylaldehyde \(2a\) (63.4 mg, 0.30 mmol, 1.2 equiv) and benzothioamide \(1a\) (34.3 mg, 0.25 mmol, 1.0 equiv) with triazolium salt (0.025 mmol, 10 mol %), additive (0.05 mmol, 20 mol %) and 4 Å MS (100 mg). The mixture was kept under argon atmosphere. To this mixture was added solvent (2.0 mL) under a positive pressure of argon and stirring the reaction mixture at 25 °C. To this stirring solution was added base (0.375 mmol, 1.5 equiv) and the resulting mixture was stirred at 25 °C for 72 h (the reaction temperature was maintained at 25 °C using a chiller having MeOH bath maintained at 25 °C for 72 h). Filtration and evaporation of the solvent to obtain the crude product, whose yield was determined by \(^1\)H NMR analysis using CH\(_2\)Br\(_2\) as the internal standard. The enantiomeric ratio was determined by HPLC analysis on a chiral column.
General reaction conditions: 1a (0.25 mmol), 2a (0.30 mmol), cat. (10 mol %), base (1.5 equiv), solvent (2.0 mL), 25 °C and 72 h. The yields were determined by $^1$H NMR analysis of crude product using CH$_2$Br$_2$ as the internal standard. The er value was determined by HPLC analysis on a chiral column. The reaction was performed at 30 °C. The reaction was carried out at 15 °C.

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3. General Procedure for the Enantioselective Synthesis of Functionalized Thiazinones

To an oven dried Schlenk reaction vessel equipped with a magnetic stir bar was taken the (Z)-2-bromoenal 2 (63.4 mg, 0.30 mmol, 1.2 equiv) and benzothioamide 1 (0.25 mmol, 1.0 equiv) with triazolium salt C (11.6 mg, 0.025 mmol, 10 mol %), lithium acetate dihydrate (5.1 mg, 0.05 mmol, 20 mol %) and 4 Å MS (100 mg). The mixture was kept under argon atmosphere. To this mixture was added mesitylene (2.0 mL) under a positive pressure of argon, and the mixture was stirred at 25 °C. To this stirring solution was added K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and the resulting mixture was stirred at 25 °C for 72 h (the reaction temperature was maintained at 25 °C using a chiller having MeOH bath maintained at 25 °C for 72 h). The reaction mixture was purified through silica gel flash column chromatography afforded the thiazinone derivative 3.

All racemic thiazinone derivatives were prepared using either N-phenyl triazolium-derived carbenes, N-mesityl triazolium-derived carbenes, or N-mesityl imidazolium-derived carbenes.

**Procedure for the 1 mmol scale experiment**

To an oven dried Schlenk reaction vessel equipped with a magnetic stir bar was taken the (Z)-2-bromo-3-phenylacrylaldehyde 2a (253.3 mg, 1.2 mmol, 1.2 equiv) and benzothioamide 1a
(137.2 mg, 1.0 mmol, 1.0 equiv) with triazolium salt C (46.4 mg, 0.10 mmol, 10 mol %), lithium acetate dihydrate (20.4 mg, 0.20 mmol, 20 mol %) and 4 Å MS (400 mg). The mixture was kept under argon atmosphere. To this mixture was added mesitylene (8.0 mL) under a positive pressure of argon, and the mixture was stirred at 25 °C. To this stirring solution was added K$_2$CO$_3$ (207.3 mg, 1.5 mmol, 1.5 equiv) and the resulting mixture was stirred at 25 °C for 72 h (the reaction temperature was maintained at 25 °C using a chiller having MeOH bath maintained at 25 °C for 72 h). The reaction mixture was purified through silica gel flash column chromatography afforded (S)-2,6-diphenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3a as a pale yellow solid (187 mg, 70% yield, 92:8 er).

4. **Kinetic Studies for the Determination of Reaction Order**$^4$

To an oven-dried Schlenk tube was charged with a magnetic stir-bar, (Z)-2-bromo-3-phenylacrylaldehyde 2a and benzothioamide 1a with triazolium salt C, lithium acetate dihydrate, 4Å MS (200 mg). Then mesitylene (4.0 mL) solvent, followed by K$_2$CO$_3$ was added and stirring the reaction mixture at 25 °C. After a defined time-interval, 100 µL of the reaction mixture was taken out from the mixture, filtered and concentrated to obtain crude residue, which was analysed using $^1$H NMR using equivalent amount of 100 µL a standard solution of CH$_2$Br$_2$ as an external standard.


56
Run 1:

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Run 1: 1a (0.50 mmol), 2a (0.60 mmol), C (0.05 mmol), LiOAc.2H2O (0.10 mmol), K2CO3 (0.75 mmol); Run 2: 1a (1.0 mmol), 2a (0.60 mmol), C (0.05 mmol), LiOAc.2H2O (0.10 mmol), K2CO3 (0.75 mmol); Run 3: 1a (0.50 mmol), 2a (1.20 mmol), C (0.05 mmol), LiOAc.2H2O (0.10 mmol), K2CO3 (1.50 mmol).
Run 3

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\[
\text{Run 1:}
\]

\[
\text{Rate}_{\text{Run1}} = \frac{dy}{dx} = \frac{(y_2-y_1)}{(x_2-x_1)} = 1.57857
\]

\[
\text{Rate}_{\text{Run1}} = 1.57857 = k \ [\text{Thioamide}]^m[\text{Bromoenal}]^n \quad \ldots \ldots \ (i)
\]

\[
\text{Run 2:}
\]

\[
\text{Rate}_{\text{Run2}} = \frac{dy}{dx} = \frac{(y_2-y_1)}{(x_2-x_1)} = 1.09286
\]

\[
\text{Rate}_{\text{Run2}} = 1.09286 = k \ [\text{Thioamide}]^m[\text{Bromoenal}]^n \quad \ldots \ldots \ (ii)
\]

\[
\text{Run 3:}
\]

\[
\text{Rate}_{\text{Run3}} = \frac{dy}{dx} = \frac{(y_2-y_1)}{(x_2-x_1)} = 1.75
\]

\[
\text{Rate}_{\text{Run3}} = 1.75 = k \ [\text{Thioamide}]^m[\text{Bromoenal}]^n \quad \ldots \ldots \ (iii)
\]

Hence from equation (i) and (ii)
\[
\frac{\text{Rate}_{\text{Run2}}}{\text{Rate}_{\text{Run1}}} = k [1.00]^m / k [0.50]^m \\
(1.09286 / 1.57857) = 2^m \\
\log (1.09286 / 1.57857) = m \log 2 \\
m = -0.53 \sim 0.5
\]

**Order with respect to substrate Thioamide (2a) is (-0.5)**

From equation (i) and (iii)

\[
\frac{\text{Rate}_{\text{Run3}}}{\text{Rate}_{\text{Run1}}} = k [1.00]^n / k [0.50]^n \\
(1.75 / 1.57857) = 2^n \\
\log (1.75 / 1.57857) = n \log 2 \\
n = -0.14 \sim 0
\]

**Order with respect to substrate bromoenal (2a) is zero.**

5. **X-Ray Data of 3x**

Single crystal of 3x (recrystallized from CH\(_2\)Cl\(_2\)/n-hexane at 25 °C) was mounted and the diffraction data was collected at 296 K on a Bruker APEX-II CCD diffractometer using SMART/SAINT software. Intensity data were collected using MoK\(\alpha\) radiation (\(\lambda\)=0.71073 Å). The single crystal was affixed to a Hampton Research cryoloop using Paratone-N oil. Data collection and reduction was performed using Bruker APEX2 and Bruker SAINT, respectively. The structure was solved by direct methods using the SHELX-97 and refined by full-matrix least-squares on F2. Empirical absorption corrections were applied with SADABS. All Non-hydrogen atoms were refined anisotropically and hydrogen atoms were included in geometric positions. Structure was drawn using Olex-2 and Mercury-3. CCDC 1950784 (3x) contains the supplementary crystallographic data for this paper. These data can be obtained free of charge from Data Centre via [www.ccdc.cam.ac.uk/data_request/cif](http://www.ccdc.cam.ac.uk/data_request/cif). The crystallographic refinement parameters are given below:
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**Figure S1.** Crystal structure of 3x (thermal ellipsoids are shown with 50% probability).
6. Synthesis and Characterization of Functionalized Thiazinones

(S)-2,6-Diphenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3a)

Following the general procedure, treatment of (Z)-2-bromo-3-phenylacrylaldehyde 2a (63.4 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K2CO3 (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-2,6-diphenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3a as a pale yellow solid (45 mg, 67% yield).

Rf (Pet. ether/EtOAc = 60/30): 0.57; er = 92:8, [α]D25 = +136.9 (c 0.1, CHCl3). HPLC (Chiralpak IF, 80:20 Hexane / i-PrOH, 1.0 mL/min, 254 nm) Minor: 18.4 min, Major: 21.7 min. 1H NMR (400 MHz, CDCl3) δ 8.11-8.08 (m, 2H), 7.58-7.56 (m, 1H), 7.47-7.35 (m, 7H), 4.83 (dd, J1 = 12.8 Hz, J2 = 4.4 Hz, 1H), 3.06 (dd, J1 = 14.2 Hz, J2 = 4.0 Hz, 1H), 3.02 (dd, J1 = 14.1 Hz, J2 = 12.7 Hz, 1H). 13C NMR (100 MHz, CDCl3) δ 179.28, 179.26, 137.05, 136.43, 133.77, 129.46, 129.11, 128.84, 127.85, 127.62, 45.10, 37.03. HRMS (ESI) calculated [M+H] for C16H14NOS: 268.0796, found: 268.0795. FTIR (cm⁻¹) 3063, 3028, 2922, 2852, 1713, 1657, 1484, 1378, 1245, 1149, 1077, 905.

(S)-6-(4-Methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3b)

Following the general procedure, treatment of (Z)-2-bromo-3-(4-methoxyphenyl)acrylaldehyde 2b (72.3 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K2CO3 (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-6-(4-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3b as a pale yellow solid (56 mg, 75% yield).

Rf (Pet. ether/EtOAc = 60/40): 0.51; er = 91:9, [α]D25 = -68.3 (c 0.1, CHCl3). HPLC (Chiralpak IF, 75:25 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 27.1 min, Major: 39.2 min. 1H NMR (400 MHz, CDCl3) δ 8.09-8.07 (m, 2H), 7.58 (t, J = 7.4 Hz, 1H), 7.47-7.43 (m, 2H), 7.31-7.29 (m, 2H), 6.94-6.92 (m, 2H), 4.80 (dd, J1 = 12.7 Hz, J2 = 4.1 Hz, 1H), 3.82 (s, 3H), 3.06 (dd, J1 = 14.2 Hz, J2 = 4.0 Hz, 1H), 3.02 (dd, J1 = 14.1 Hz, J2 = 12.7 Hz, 1H).
14.2 Hz, $J_2 = 4.0$ Hz, 1H), 2.95 (dd, $J_1 = 14.1$ Hz, $J_2 = 12.9$ Hz, 1H). $^{13}$C NMR (100 MHz, CDCl$_3$) δ 179.56, 179.54, 160.13, 136.51, 133.74, 128.85, 127.86, 114.82, 55.53, 44.70, 37.34. HRMS (ESI) calculated [M+H] for C$_{17}$H$_{16}$NO$_2$S: 298.0902, found: 298.0902. FTIR (cm$^{-1}$) 2959, 2923, 2840, 1744, 1713, 1662, 1607, 1511, 1452, 1376, 1249, 1179, 1073.

(S)-2-Phenyl-6-(p-tolyl)-5,6-dihydro-4H-1,3-thiazin-4-one (3c)

Following the general procedure, treatment of (Z)-2-bromo-3-(p-tolyl)acrylaldehyde 2c (67.5 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-2-phenyl-6-(p-tolyl)-5,6-dihydro-4H-1,3-thiazin-4-one 3c as a yellow oil (46 mg, 64% yield).

$R_f$(Pet. ether/EtOAc = 70/30): 0.55; er = 87:13, $[\alpha]_D^{25}$ = -88.4 (c 0.1, CHCl$_3$). HPLC (ChiralpakIF, 80:20 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 24.9 min, Major: 31.2 min.

$^1$H NMR (400 MHz, CDCl$_3$) δ 8.10-8.07 (m, 2H), 7.60-7.56 (m, 1H), 7.47-7.43 (m, 2H), 7.28-7.21 (m, 4H), 4.81(dd, $J_1 = 12.7$ Hz, $J_2 = 4.1$ Hz, 1H), 3.04 (dd, $J_1 = 14.2$ Hz, $J_2 = 4.2$ Hz, 1H), 2.95 (dd, $J_1 = 14.2$ Hz, $J_2 = 12.6$ Hz, 1H), 2.37 (s, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$) δ 179.48, 139.11, 136.46, 133.97, 130.11, 128.83, 127.84, 127.49, 44.89, 37.13, 21.28. HRMS (ESI) calculated [M+H] for C$_{17}$H$_{16}$NOS: 282.0953, found: 282.0953.

(S)-6-(4-Bromophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3d)

Following the general procedure, treatment of (Z)-2-bromo-3-(4-bromophenyl)acrylaldehyde 2d (87 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-6-(4-bromophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3d as a pale yellow solid (72 mg, 83% yield).
R_f (Pet. ether /EtOAc = 70/30): 0.61; er = 94:6, [α]_D^{25} = -59.6 (c 0.1, CHCl_3). HPLC (Chiralpak IF, 80:20 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 26.9 min, Major: 51.1 min. ^1H NMR (400 MHz, CDCl_3) δ 8.09-8.07 (m, 2H), 7.62-7.58 (m, 1H), 7.56-7.52 (m, 2H), 7.48-7.44 (m, 2H), 7.28-7.25 (m, 2H), 4.82 (dd, J_1 = 12.3 Hz, J_2 = 4.2 Hz, 1H), 3.04 (dd, J_1 = 14.0 Hz, J_2 = 4.3 Hz, 1H), 2.93 (dd, J_1 = 14.0 Hz, J_2 = 12.2 Hz, 1H). ^13C NMR (100 MHz, CDCl_3) δ 178.78, 178.69, 136.20, 136.16, 133.86, 132.58, 129.25, 128.84, 127.79, 123.06, 44.38, 36.76. HRMS (ESI) calculated [M+H] for C_{16}H_{13}NBrOS: 345.9901, found: 345.9904. FTIR (cm⁻¹) 2923, 2852, 1713, 1658, 1569, 1484, 1405, 1373, 1243, 1150, 1072, 903.

(S)-6-(4-Chlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3e)

Following the general procedure, treatment of (Z)-2-bromo-3-(4-chlorophenyl)acrylaldehyde 2e (72.3 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K_2CO_3 (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-6-(4-chlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3e as a pale yellow solid (56 mg, 74% yield). R_f (Pet. ether /EtOAc = 80:20): 0.51; er = 93:7, [α]_D^{25} = -59.3 (c 0.1, CHCl_3). HPLC (Chiralpak IF, 80:20 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 26.3 min, Major: 45.0 min. ^1H NMR (400 MHz, CDCl_3) δ 8.07-8.05 (m, 2H), 7.60-7.56 (m, 1H), 7.46-7.42 (m, 2H), 7.38-7.35 (m, 2H), 7.31-7.29 (m, 2H), 4.81 (dd, J_1 = 12.3 Hz, J_2 = 4.1 Hz, 1H), 3.0-3.06 (m, 1H), 2.95-2.88 (m, 1H). ^13C NMR (100 MHz, CDCl_3) δ 178.83, 178.75, 136.23, 135.64, 134.94, 133.91, 129.61, 128.97, 128.85, 127.80, 44.33, 36.85. HRMS (ESI) calculated [M+H] for C_{17}H_{12}ClNOS: 302.0406, found: 302.0403. FTIR (cm⁻¹) 3063, 2960, 2922, 2851, 1714, 1700, 1603, 1490, 1409, 1375, 1243, 1093.

(S)-6-(4-Fluorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3f)

Following the general procedure, treatment of (Z)-2-bromo-3-(4-fluorophenyl)acrylaldehyde 2f (68.7 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K_2CO_3 (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the
reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-6-(4-fluorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3f as a yellow oil (44 mg, 61% yield).

**Rf** (Pet. ether /EtOAc = 70:30): 0.56; er = 94:6, [α]_D^25 = -84.3 (c 0.1, CHCl_3). **HPLC** (Chiralpak IF, 80:20 Hexane / i-PrOH, 0.7 mL/min, 254 nm) *Minor*: 23.8 min, *Major*: 34.1 min. **^1^H NMR** (400 MHz, CDCl_3) δ 8.08-8.07 (m, 2H), 7.58 (t, 1H), 7.45 (t, J = 7.3 Hz, 2H), 7.37-7.34 (m, 2H), 7.12-7.07 (m, 2H), 4.82 (dd, J_1 = 12.4 Hz, J_2 = 4.1 Hz, 1H), 3.04 (dd, J_1 = 14.1 Hz, J_2 = 4.1 Hz, 1H), 2.93 (dd, J_1 = 14.0 Hz, J_2 = 12.4 Hz, 1H). **^13^C NMR** (100 MHz, CDCl_3) δ 178.91, 162.95 (J = 249 Hz), 136.37, 133.85, 133.03, 129.43 (J = 8.3 Hz), 128.88, 127.86, 116.48 (J = 21.8 Hz), 44.40, 37.19. **HRMS (ESI)** calculated [M+H] for C_16H_12FNOS: 286.0702, found: 286.0701. **FTIR** (cm⁻¹) 2960, 2923, 2852, 1714, 1655, 1603, 1509, 1475, 1227, 1157, 1099, 905.

(S)-2-Phenyl-6-(4-(trifluoromethyl)phenyl)-5,6-dihydro-4H-1,3-thiazin-4-one (3g)

Following the general procedure, treatment of (Z)-2-bromo-3-(4-(trifluoromethyl)phenyl)acrylaldehyde 2g (83.7 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K_2CO_3 (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-2-phenyl-6-(4-(trifluoromethyl)phenyl)-5,6-dihydro-4H-1,3-thiazin-4-one 3g as a pale yellow solid (52 mg, 58% yield).

**Rf** (Pet. ether /EtOAc = 80:20): 0.57; er = 92:8, [α]_D^25 = +99.8 (c 0.1, CHCl_3). **HPLC** (Chiralpak IF, 80:20 Hexane / i-PrOH, 0.7 mL/min, 254 nm) *Minor*: 17.8 min, *Major*: 26.4 min. **^1^H NMR** (400 MHz, CDCl_3) δ 8.07 (d, J = 7.6 Hz, 2H), 7.66 (d, J = 8.0 Hz, 2H), 7.59 (t, J = 7.4 Hz, 1H), 7.52-7.43 (m, 4H), 4.91 (dd, J_1 = 11.9 Hz, J_2 = 4.4 Hz, 1H), 3.06 (dd, J_1 = 14.0 Hz, J_2 = 4.3 Hz, 1H), 2.95 (dd, J_1 = 14.1 Hz, J_2 = 12.1 Hz, 1H). **^13^C NMR** (100 MHz, CDCl_3) δ 178.53, 178.40, 141.26, 136.18, 134.05, 133.90, 131.22 (q, J = 31.7 Hz), 128.94, 128.90, 128.16, 128.06, 127.85, 127.62, 126.52, 126.33, 125.14, 122.44, 44.46, 36.63. **HRMS (ESI)** calculated [M+H] for C_{17}H_{13}F_{3}NOS: 336.0670, found: 336.0667. **FTIR** (cm⁻¹) 2925, 1715, 1679, 1615, 1509, 1474, 1418, 1376, 1326, 1244, 1167, 1119, 1068.
(S)-6-(4-Nitrophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3h)

Following the general procedure, treatment of (Z)-2-bromo-3-(4-nitrophenyl)acrylaldehyde 2h (76.8 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-6-(4-nitrophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3h as a brown sticky liquid (41 mg, 52% yield).

$R_f$(Pet. ether/EtOAc = 70/30): 0.38; $[\alpha]_D^{20} = -88.0$ (c 0.1, CHCl$_3$). **HPLC** (Chiralpak IA, 65:35 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 25.7 min, Major: 35.8 min.**H NMR** (400 MHz, CDCl$_3$) δ 8.28-8.25 (m, 2H), 8.09-8.07 (m, 2H), 7.63-7.57 (m, 3H), 7.49-7.46 (m, 2H), 4.96 (dd, $J_1 = 11.5$ Hz, $J_2 = 4.4$ Hz, 1H), 3.09 (dd, $J_1 = 14.1$ Hz, $J_2 = 4.4$ Hz, 1H), 2.97 (dd, $J_1 = 14.0$ Hz, $J_2 = 11.4$ Hz, 1H).**C NMR** (100 MHz, CDCl$_3$) δ 178.04, 177.88, 148.20, 144.45, 136.05, 134.19, 129.01, 128.77, 127.90, 124.70, 44.27, 36.47.**HRMS** (ESI) calculated [M+H] for C$_{16}$H$_{13}$N$_2$O$_3$S: 313.0647, found: 313.0645. **FTIR** (cm$^{-1}$) 2921, 2852, 1713, 1670, 1602, 1519, 1472, 1392, 1346, 1245, 1152, 904.

(S)-6-(3-Bromophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3i)

Following the general procedure, treatment of (Z)-2-bromo-3-(3-bromophenyl)acrylaldehyde 2i (86.9 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-6-(3-bromophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3i as a yellow oil (64 mg, 74% yield).

$R_f$(Pet. ether/EtOAc = 70/30): 0.58; $[\alpha]_D^{25} = -76.9$ (c 0.1, CHCl$_3$). **HPLC** (Chiralpak IC, 70:30 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 47.5 min, Major: 36.5 min.**H NMR** (400 MHz, CDCl$_3$) δ 8.09-8.07 (m, 2H), 7.63-7.44 (m, 5H), 7.33-7.28 (m, 2H), 4.80 (dd, $J_1 = 12.4$ Hz, $J_2 = 4.1$ Hz, 1H), 3.04 (dd, $J_1 = 14.0$ Hz, $J_2 = 4.2$ Hz, 1H), 2.92 (dd, $J_1 = 14.1$ Hz, $J_2 = 12.5$ Hz, 1H).**C NMR** (100 MHz, CDCl$_3$) δ 178.58, 177.86, 139.39, 136.25, 133.92, 132.26, 130.97,
130.77, 130.65, 128.85, 127.83, 126.28, 123.30, 44.43, 36.77. **HRMS (ESI)** calculated [M+H] for C16H13BrNOS: 345.9901, found: 345.9911. **FTIR (cm⁻¹)** 2960, 2921, 1713, 1603, 1567, 1475, 1417, 1377, 1244, 1150, 1072, 904.

**{(S)}-6-(3-Chlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3j)**

Following the general procedure, treatment of (Z)-2-bromo-3-(3-chlorophenyl)acrylaldehyde 2j (72.3 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K₂CO₃ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-6-(3-chlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3j as a pale yellow solid (57 mg, 75% yield).

Rᶠ (Pet. ether /EtOAc = 70/30): 0.62; [α]D²⁰ = -88.0 (c 0.1, CHCl₃). **HPLC** (Chiralpak IC, 70:30 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 48.3 min, Major: 35.8 min. **¹H NMR** (400 MHz, CDCl₃) δ 8.11-8.09 (m, 2H), 7.64-7.60 (m, 1H), 7.50-7.46 (m, 2H), 7.40-7.34 (m, 3H), 7.31-7.27 (m, 1H), 4.83 (dd, J₁ = 12.5 Hz, J₂ = 4.2 Hz, 1H), 3.07 (dd, J₁ = 14.0 Hz, J₂ = 4.1 Hz, 1H), 2.95 (dd, J₁ = 14.0 Hz, J₂ = 12.5 Hz, 1H). **¹³C NMR** (100 MHz, CDCl₃) δ 178.73, 178.67, 139.13, 136.24, 135.25, 133.92, 130.75, 129.32, 128.89, 127.85, 125.85, 44.50, 36.78. **HRMS (ESI)** calculated [M+H] for C16H13ClNOS: 302.0406, found: 302.0405. **FTIR (cm⁻¹)** 3063, 2959, 2922, 1713, 1653, 1602, 1570, 1477, 1401, 1243, 1151, 1080, 904.

**{(S)}-6-(3-Nitrophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3k)**

Following the general procedure, treatment of (Z)-2-bromo-3-(3-nitrophenyl)acrylaldehyde 2k (76.8 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K₂CO₃ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-6-(3-nitrophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3k as a pale yellow solid (44 mg, 56% yield).
RF (Pet. ether/EtOAc = 60/40): 0.57; er = 94:6, [α]D²⁰ = -122.0 (c 0.1, CHCl₃). HPLC (Chiralpak IF, 70:30 Hexane/i-PrOH, 0.7 mL/min, 254 nm) Minor: 36.3 min, Major: 39.4 min. H NMR (400 MHz, CDCl₃) δ 8.28 (s, 1H), 8.24-8.22 (m, 1H), 8.07 (d, J = 8.0 Hz, 2H), 7.73 (d, J = 7.9 Hz, 1H), 7.63-7.58 (m, 2H), 7.47 (t, J = 7.6 Hz, 2H), 4.98 (dd, J₁ = 11.7 Hz, J₂ = 4.3 Hz, 1H), 3.10 (dd, J₁ = 14.0 Hz, J₂ = 4.4 Hz, 1H), 3.00 (dd, J₁ = 13.9 Hz, J₂ = 11.8 Hz, 1H). C NMR (100 MHz, CDCl₃) δ 178.01, 177.96, 148.83, 139.58, 136.11, 134.09, 133.72, 130.65, 128.98, 127.89, 124.04, 122.81, 44.26, 36.65. HRMS (ESI) calculated [M+H] for C₁₆H₁₃N₂O₃S: 313.0647, found: 313.0647. FTIR (cm⁻¹) 3067, 2923, 1724, 1713, 1655, 1605, 1569, 1528, 1479, 1406, 1350, 1245, 1153, 1097.

(S)-6-(2-Methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3l)

Following the general procedure, treatment of (Z)-2-bromo-3-(2-methoxyphenyl)acrylaldehyde 2l (72.3 mg, 0.30 mmole) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K₂CO₃ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether/EtOAc: 85:15) to afford (S)-6-(2-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3l a pale yellow solid (50 mg, 67% yield). RF (Pet. ether/EtOAc = 70/30): 0.41; er = 85:15, [α]D²⁵ = +11.0 (c 0.1, CHCl₃). HPLC (Chiralpak IF, 70:30 Hexane/i-PrOH, 0.7 mL/min, 254 nm) Minor: 16.1 min, Major: 18.1 min. H NMR (400 MHz, CDCl₃) δ 8.08 (d, J = 7.8 Hz, 2H), 7.56 (t, J = 7.2 Hz, 1H), 7.43 (t, J = 7.5 Hz, 2H), 7.36-7.30 (m, 2H), 6.98 (t, J = 7.9 Hz, 1H), 6.92 (d, J = 8.2 Hz, 1H), 5.31 (dd, J₁ = 10.0 Hz, J₂ = 5.4 Hz, 1H), 3.86 (s, 3H), 3.05-2.95 (m, 2H). C NMR (100 MHz, CDCl₃) δ 179.93, 179.42, 156.87, 136.80, 133.48, 129.99, 128.72, 127.81, 127.76, 125.29, 121.16, 111.04, 55.61, 38.54, 35.39. HRMS (ESI) calculated [M+H] for C₁₇H₁₅N₂O₃S: 298.0902, found: 298.0901. FTIR (cm⁻¹) 2937, 2838, 1716, 1654, 1605, 1499, 1461, 1247, 1182, 1111, 1025, 905.
(S)-6-(2-Bromophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3m)

Following the general procedure, treatment of (Z)-2-bromo-3-phenylacrylaldehyde 2m (86.9 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-6-(2-bromophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3m as a yellow oil (78 mg, 90% yield).

$R_f$ (Pet. ether /EtOAc = 70/30): 0.65; er = 91:9, $[\alpha]_D^{25}$ = -13.3 (c 0.1, CHCl$_3$). HPLC (ChiralpakIF, 80:20 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 25.4 min, Major: 28.7 min. $^1$H NMR (400 MHz, CDCl$_3$) δ 8.08-8.06 (m, 2H), 7.61-7.55 (m, 2H), 7.45-7.41 (m, 3H), 7.35-7.32 (m, 1H), 7.21-7.17 (m, 1H), 5.34 (dd, $J_1$ = 9.5 Hz, $J_2$ = 5.4 Hz, 1H), 3.05-2.94 (m, 2H).

$^{13}$C NMR (100 MHz, CDCl$_3$) δ 178.91, 178.37, 136.32, 133.74, 130.29, 128.79, 128.48, 127.76, 123.92, 43.74, 35.41. HRMS (ESI) calculated [M+H] for C$_{16}$H$_{13}$BrNOS: 345.9901, found: 345.9900. FTIR (cm$^{-1}$) 2922, 2851, 1713, 1606, 1509, 1472, 1376, 1308, 1243, 1194, 1024, 898.

(S)-6-(2-Chlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3n)

Following the general procedure, treatment of (Z)-2-bromo-3-(2-chlorophenyl)acrylaldehyde 2n (72.3 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-6-(2-chlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3n as a pale yellow sticky liquid (53 mg, 70% yield).

$R_f$ (Pet. ether /EtOAc = 70/30): 0.62; er = 92:8, $[\alpha]_D^{25}$ = -73.6 (c 0.1, CHCl$_3$). HPLC (ChiralpakIC, 70:30 Hexane / i-PrOH, 1.0 mL/min, 254 nm) Minor: 23.2 min, Major: 21.8 min. $^1$H NMR (400 MHz, CDCl$_3$) δ 8.09 (d, $J$ = 7.6 Hz, 2H), 7.59 (t, $J$ = 7.2 Hz, 1H), 7.48-7.42 (m, 4H), 7.32-7.29 (m, 2H), 5.38 (dd, $J_1$ = 9.1 Hz, $J_2$ = 5.8 Hz, 1H), 3.06-2.97 (m, 2H).$^{13}$C NMR (100 MHz, CDCl$_3$) δ 179.08, 178.50, 136.32, 133.74, 130.29, 128.93, 128.81, 128.60, 128.07, 123.92, 43.74, 35.41.
127.87, 127.65, 41.13, 35.36. **HRMS (ESI)** calculated [M+H] for C_{16}H_{13}ClNOS: 302.0406, found: 302.0404. **FTIR (cm^{-1})** 2959, 2923, 1714, 1677, 1573, 1509, 1474, 1375, 1243, 1153, 1035, 908.

**(S)-6-(3,4-Dichlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3o)**

Following the general procedure, treatment of (Z)-2-bromo-3-(3,4-dichlorophenyl)acrylaldehyde 2o (83.9 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K_{2}CO_{3} (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-6-(3,4-dichlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3o as a pale yellow solid (30 mg, 36% yield).

**R_{f}** (Pet. ether/EtOAc = 70/30): 0.61. **er = 92:8, [α]D^{25} = +50.2 (c 0.1, CHCl_{3}). HPLC** (Chiralpak IF, 80:20 Hexane/i-PrOH, 0.7 mL/min, 254 nm) Minor: 24.9 min, Major: 26.5 min. **^{1}H NMR (400 MHz, CDCl_{3})** δ 8.08 (d, J = 8.2 Hz, 2H), 7.61 (t, J = 7.3 Hz 1H), 7.50-7.45 (m, 4H), 7.24-7.21 (m, 1H), 4.80 (dd, J_{1} = 12.2 Hz, J_{2} = 4.1 Hz, 1H), 3.04 (dd, J_{1} = 14.1 Hz, J_{2} = 4.2 Hz, 1H), 2.95-2.88 (m, 1H). **^{13}C NMR (100 MHz, CDCl_{3})** δ 178.45, 178.37, 137.38, 136.15, 134.07, 133.65, 133.43, 131.47, 129.74, 128.97, 127.90, 126.96, 44.00, 36.75. **HRMS (ESI)** calculated [M+H] for C_{16}H_{12}Cl_{2}NOS: 336.0017, found: 336.0000. **FTIR (cm^{-1})** 2959, 2922, 1682, 1519, 1472, 1399, 1374, 1243, 1213, 1131, 1030, 944.

**(S)-6-(3-Bromo-4-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3p)**

Following the general procedure, treatment of (Z)-2-bromo-3-(3-bromo-4-methoxyphenyl)acrylaldehyde 2p (96 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K_{2}CO_{3} (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-6-(3-Bromo-4-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3p as a yellow solid (45 mg, 48% yield).
R_f (Pet. ether /EtOAc = 70/30): 0.56; er = 90:10, [α]_D^{20} = -82.0 (c 0.05, CHCl_3). HPLC (Chiralpak IC, 70:30 Hexane / i-PrOH, 1.0 mL/min, 254 nm) Minor: 42.4 min, Major: 33.6 min. \[ ^1H \text{ NMR (}400 \text{ MHz, CDCl}_3\] δ 8.08-8.07 (m, 2H), 7.59-7.57 (m, 2H), 7.46 (t, J = 7.8 Hz, 2H), 7.30-7.27(m, 1H), 6.91(d, J = 8.6 Hz, 1H), 4.70 (dd, J_1 = 12.7 Hz, J_2 = 4.0 Hz, 1H), 3.91 (s, 3H), 3.73 (dd, J_1 = 11.3 Hz, J_2 = 6.4 Hz, 1H), 2.92(m, 1H). \[ ^13C \text{ NMR (}100 \text{ MHz, CDCl}_3\] δ 179.12, 179.10, 156.44, 136.31, 133.99, 132.60, 132.46, 130.35, 128.91, 127.91, 127.11, 112.48, 112.34, 110.68, 44.07, 37.16..

HRMS (ESI) calculated [M+H] for C_{18}H_{18}BrNO_3: 406.0113, found: 406.0124. FTIR (cm^{-1}) 2962, 2925, 2845, 1737, 1714, 1700, 1560, 1465, 1389, 1318, 1261, 1182, 1026.

(S)-6-(2-Bromo-4,5-dimethoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3q)

Following the general procedure, treatment of \((Z)-2\)-bromo-3-(2-bromo-4,5-dimethoxyphenyl)acrylaldehyde 2q (81.3 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K_2CO_3 (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-6-(2-bromo-4,5-dimethoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3q as a pale yellow solid (48 mg, 47% yield).

R_f (Pet. ether /EtOAc = 70/30): 0.5; er = 82:18, [α]_D^{25} = -11.5 (c 0.1, CHCl_3). HPLC (Chiralpak IF, 70:30 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 25.3 min, Major: 51.1 min. \[ ^1H \text{ NMR (}400 \text{ MHz, CDCl}_3\] δ 8.10-8.07 (m, 2H), 7.61-7.57 (m, 1H), 7.48-7.44 (m, 2H), 7.05 (s, 1H), 6.93 (s, 1H), 5.30 (dd, J_1 = 9.8 Hz, J_2 = 5.2 Hz, 1H), 3.88 (s, 3H), 3.84 (s, 3H), 3.05-2.94 (m, 2H). \[ ^13C \text{ NMR (}100 \text{ MHz, CDCl}_3\] δ 179.25, 178.82, 149.88, 149.16, 136.44, 133.90, 128.87, 128.10, 115.93, 114.20, 110.68, 56.39, 56.35, 43.88, 35.83.

HRMS (ESI) calculated [M+H] for C_{18}H_{18}BrNO_3S: 406.0113, found: 406.0124. FTIR (cm^{-1}) 2962, 2925, 2845, 1737, 1714, 1660, 1506, 1465, 1389, 1318, 1261, 1162, 1026.

(S)-6-(Furan-2-yl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3r)

Following the general procedure, treatment of \((Z)-2\)-bromo-3-(furan-2-yl)acrylaldehyde 2a (60.3 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate
dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-6-(Furan-2-yl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3r as a pale yellow solid (28 mg, 41% yield).

$R_f$ (Pet. ether /EtOAc = 80/20): 0.48; er = 89:11, $[\alpha]_D^{25} = -136.9$ (c 0.1, CHCl$_3$). 

HPLC (Chiralpak IC, 70:30 Hexane / i-PrOH, 1.0 mL/min, 254 nm) Minor: 22.3 min, Major: 23.9 min. 

$^1$H NMR (400 MHz, CDCl$_3$) δ 8.07 (d, $J = 7.9$ Hz, 2H), 7.59 (t, $J = 7.1$ Hz, 1H), 7.47-7.43 (m, 3H), 6.36 (s, 2H), 4.95 (dd, $J_1 = 9.0$ Hz, $J_2 = 5.3$ Hz, 1H), 3.15-3.04 (m, 2H).

$^{13}$C NMR (100 MHz, CDCl$_3$) δ 178.59, 178.07, 150.02, 143.57, 136.54, 133.86, 132.08, 128.88, 128.59, 127.88, 127.87, 127.06, 110.95, 105.50, 38.06, 34.00. 

HRMS (ESI) calculated [M+H] for C$_{14}$H$_{12}$NO$_2$S: 258.0589, found: 258.0591.

FTIR (cm$^{-1}$) 2959, 2921, 1687, 1624, 1516, 1449, 1379, 1327, 1222, 1128.

(S)-2-Phenyl-6-(thiophen-2-yl)-5,6-dihydro-4H-1,3-thiazin-4-one (3s)

Following the general procedure, treatment of (Z)-2-bromo-3-(thiophen-2-yl)acrylaldehyde 2s (65.1 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-2-phenyl-6-(thiophen-2-yl)-5,6-dihydro-4H-1,3-thiazin-4-one 3s as a brown oil (44 mg, 64% yield).

$R_f$ (Pet. ether /EtOAc = 70/30): 0.5; er = 91:9, $[\alpha]_D^{20} = -116.0$ (c 0.1, CHCl$_3$). 

HPLC (Chiralpak IC, 70:30 Hexane / i-PrOH, 1.0 mL/min, 254 nm) Minor: 29.1 min, Major: 26.8 min. 

$^1$H NMR (400 MHz, CDCl$_3$) δ 8.09-8.06 (m, 2H), 7.61-7.57 (m, 1H), 7.48-7.44 (m, 2H), 7.43-7.32 (m, 1H), 7.10 (d, $J = 3.5$ Hz, 1H), 7.00 (dd, $J_1 = 5.1$ Hz, $J_2 = 3.6$ Hz, 1H), 5.13 (dd, $J_1 = 11.9$ Hz, $J_2 = 4.0$ Hz, 1H), 3.17 (dd, $J_1 = 14.3$ Hz, $J_2 = 4.0$ Hz, 1H), 3.01 (dd, $J_1 = 14.3$ Hz, $J_2 = 11.9$ Hz, 1H). 

$^{13}$C NMR (100 MHz, CDCl$_3$) δ 178.77, 178.46, 140.44, 136.37, 133.89, 128.89, 127.93, 127.50, 126.57, 126.48, 40.51, 38.14. 

HRMS (ESI) calculated [M+H] for C$_{14}$H$_{12}$NO$_2$S: 274.0360, found: 274.0364.

FTIR (cm$^{-1}$) 3064, 2960, 2923, 2852, 1714, 1678, 1605, 1508, 1475, 1373, 1245, 1105, 1025.
(R)-6-Methyl-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3t)

Following the general procedure, treatment of (Z)-2-bromobut-2-enal 2t (44.7 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (R)-6-methyl-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3t as a yellow oil (28 mg, 54 % yield).

$R_f$ (Pet. ether /EtOAc = 80:20): 0.41; er = 88:12, $[\alpha]_{D}^{25}$ = +13.0 (c 0.1, CHCl$_3$). HPLC (Chiralpak IF, 80:20 Hexane / i-ProOH, 0.7 mL/min, 254 nm) Minor: 18.9 min, Major: 20.5 min. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.05-8.03 (m, 2H), 7.58-7.54 (m, 1H), 7.45-7.41 (m, 2H), 3.79-3.70 (m, 1H), 2.84 (dd, $J_1$ = 14.0 Hz, $J_2$ = 4.2 Hz, 1H), 2.58 (dd, $J_1$ = 14.0 Hz, $J_2$ = 10.4 Hz, 1H). 13C NMR (100 MHz, CDCl$_3$) $\delta$ 179.05, 178.95, 136.67, 133.55, 128.75, 127.75, 37.73, 36.08, 21.05. HRMS (ESI) calculated [M+H] for C$_{11}$H$_{12}$NOS: 206.0640, found: 206.0637. FTIR (cm$^{-1}$) 3063, 3028, 2922, 2852, 1713, 1657, 1484, 1378, 1245, 1149, 1077, 905.

(R)-6-Ethyl-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3u)

Following the general procedure, treatment of (Z)-2-bromopent-2-enal 2u (48.9 mg, 0.30 mmol) and benzothioamide 1a (34.3 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (R)-6-ethyl-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3u as a pale yellow liquid (41 mg, 75 % yield).

$R_f$ (Pet. ether /EtOAc = 70:30): 0.65; er = 89:11, $[\alpha]_{D}^{20}$ = -50.0 (c 0.05, CHCl$_3$). HPLC (Chiralcel OJ-H, 85:15 Hexane / i-PrOH, 1.0 mL/min, 254 nm) Minor: 16.2 min, Major: 19.6 min. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.06-8.04 (m, 2H), 7.57-7.53 (m, 1H), 7.45-7.41 (m, 2H), 2.84 (dd, $J_1$ = 14.0 Hz, $J_2$ = 4.2 Hz, 1H), 2.58 (dd, $J_1$ = 14.0 Hz, $J_2$ = 10.1 Hz, 1H). 13C NMR (100 MHz, CDCl$_3$) $\delta$ 179.18, 178.88, 136.78, 133.55, 128.75, 127.75, 37.73, 36.08, 21.05. HRMS (ESI) calculated [M+H] for C$_{13}$H$_{14}$NOS:
220.0796, found: 220.0800. **FTIR (cm\(^{-1}\))** 2967, 2927, 1712, 1679, 1574, 1511, 1475, 1378, 1240, 1155, 1073, 910.

(S)-2-(4-Methoxyphenyl)-6-phenyl-5,6-dihydro-4\(H\)-1,3-thiazin-4-one (3v)

Following the general procedure, treatment of (Z)-2-bromo-3-phenylacrylaldehyde 1a (63.4 mg, 0.30 mmol) and 4-methoxybenzothioamide 2v (41.8 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K\(_2\)CO\(_3\) (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-2-(4-methoxyphenyl)-6-phenyl-5,6-dihydro-4\(H\)-1,3-thiazin-4-one 3v as a pale yellow solid (41 mg, 55% yield).

**R\(_f\)** (Pet. ether /EtOAc = 70/30): 0.54; er = 92:8, [\(\alpha\)]\(_D\)\(^{22}\) = -60.7 (c 0.1, CHCl\(_3\)). **HPLC** (Chiralpak IF, 75:25 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 36.8 min, Major: 44.0 min. **\(^1\)H NMR** (400 MHz, CDCl\(_3\)) \(\delta\) 8.11-8.09 (m, 2H), 7.43-7.35 (m, 5H), 6.95-6.93 (m, 2H), 4.80 (dd, \(J_1 = 12.6\) Hz, \(J_2 = 3.9\) Hz, 1H), 3.88 (s, 3H), 3.06 (dd, \(J_1 = 14.3\) Hz, \(J_2 = 4.0\) Hz, 1H), 2.95 (dd, \(J_1 = 14.4\) Hz, \(J_2 = 12.8\) Hz, 1H). **\(^{13}\)C NMR** (100 MHz, CDCl\(_3\)) \(\delta\) 179.38, 178.43, 164.49, 137.31, 130.09, 129.46, 129.07, 128.88, 127.67, 114.20, 55.73, 37.31. **HRMS (ESI)** calculated [M+H] for C\(_{17}\)H\(_{16}\)NO\(_2\)S: 298.0902, found: 298.0902. **FTIR (cm\(^{-1}\))** 2962, 2843, 1711, 1673, 1603, 1488, 1377, 1312, 1251, 1175, 1025, 910, 844.

(S)-6-Phenyl-2-(p-tolyl)-5,6-dihydro-4\(H\)-1,3-thiazin-4-one (3w)

Following the general procedure, treatment of (Z)-2-bromo-3-phenylacrylaldehyde 2s (63.4 mg, 0.30 mmol) and 4-methylbenzothioamide 1w (37.8 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K\(_2\)CO\(_3\) (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford(S)-6-phenyl-2-(p-tolyl)-5,6-dihydro-4\(H\)-1,3-thiazin-4-one 3w as a pale yellow solid (40 mg, 57% yield).
\( R_f (\text{Pet. ether/EtOAc} = 70/30): 0.64; \) er = 93:7, \([\alpha]_D^{25} = -73.8 \) (c 0.1, CHCl₃). **HPLC** (Chiralpak IC, 70:30 Hexane / i-PrOH, 1.0 mL/min, 254 nm) *Minor: 37.2 min, Major: 33.9 min.*

**\(^1\)H NMR (400 MHz, CDCl₃)** \( \delta 7.99 (d, J = 8.2 \text{ Hz}, 2H), 7.42-7.38 (m, 5H), 7.27 (d, J = 7.9 \text{ Hz}, 2H), 4.82 \) (dd, \( J_1 = 12.7 \text{ Hz}, J_2 = 4.1 \text{ Hz}, 1H), 3.07 \) (dd, \( J_1 = 14.2 \text{ Hz}, J_2 = 4.2 \text{ Hz}, 1H), 3.01-2.94 \) (m, 1H), 2.43 (s, 3H).

**\(^{13}\)C NMR (100 MHz, CDCl₃)** \( \delta 179.39, 179.20, 144.92, 137.18, 133.74, 129.58, 127.96, 127.67, 44.99, 37.14, 21.82.


**FTIR (cm\(^{-1}\))** 2958, 2921, 2853, 1713, 1659, 1609, 1488, 1376, 1248, 1185, 1083, 910.

\((S)-2-(4-Iodophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3x)\)

Following the general procedure, treatment of \((Z)-2-bromo-3-phenylacrylaldehyde 2a\) (63.4 mg, 0.30 mmol) and 4-iodobenzothioamide 1x (65.8 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K\(_2\)CO\(_3\) (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford \((S)-2-(4-iodophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3x\) as a pale yellow solid (68 mg, 69% yield).

\( R_f (\text{Pet. ether/EtOAc} = 70/30): 0.56; \) er = 94:6, \([\alpha]_D^{25} = +191.24 \) (c 0.1, CHCl₃). **HPLC** (Chiralpak IF, 80:20 Hexane / i-PrOH, 0.7 mL/min, 254 nm) *Minor: 36.3 min, Major: 38.7 min.*

**\(^1\)H NMR (400 MHz, CDCl₃)** \( \delta 7.81-7.76 \) (m, 4H), 7.43-7.34 (m, 5H), 4.84 (dd, \( J_1 = 12.7 \text{ Hz}, J_2 = 4.0 \text{ Hz}, 1H)\), 3.05 (dd, \( J_1 = 14.3 \text{ Hz}, J_2 = 4.1 \text{ Hz}, 1H)\), 2.95 (dd, \( J_1 = 14.1 \text{ Hz}, J_2 = 12.7 \text{ Hz}, 1H)\).

**\(^{13}\)C NMR (100 MHz, CDCl₃)** \( \delta 179.03, 178.31, 138.06, 136.75, 135.76, 129.46, 129.17, 129.05, 127.57, 101.60, 45.12, 36.85.** **HRMS (ESI)** calculated [M+H] for C\(_{16}\)H\(_{13}\)INOS: 393.9763, found: 393.9760. **FTIR (cm\(^{-1}\))** 2922, 2852, 1696, 1576, 1518, 1389, 1308, 1213, 1178, 1127, 1004, 963, 936.

\((S)-2-(4-Bromophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3y)\)

Following the general procedure, treatment of \((Z)-2-bromo-3-phenylacrylaldehyde 2a\) (63.4 mg, 0.30 mmol) and 4-bromobenzothioamide 1y (54.0 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K\(_2\)CO\(_3\) (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for
72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-2-(4-bromophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3y as a pale yellow solid (60 mg, 69% yield).

\[ R_f (\text{Pet. ether/EtOAc} = 80/20): 0.5; \text{cr} = 92.8, [\alpha]_D^{25} = -92.4 \text{ (c 0.1, CHCl}_3) \]. \text{HPLC} (Chiralpak IC, 70:30 Hexane / i-PrOH, 0.7 mL/min, 254 nm) \text{Minor}: 40.0 min, \text{Major}: 36.0 min. \text{^1H NMR (400 MHz, CDCl}_3) \delta 7.94 (d, \text{ J} = 8.3 \text{ Hz, 2H}), 7.58 (d, \text{ J} = 8.3 \text{ Hz, 2H}), 7.14-7.36 (m, 5H), 4.84 (dd, \text{ J} _1 = 12.9 \text{ Hz, J} _2 = 4.0 \text{ Hz, 1H}), 3.05 (dd, \text{ J} _1 = 14.2 \text{ Hz, J} _2 = 4.1 \text{ Hz, 1H}), 2.96 (t, \text{ J} = 13.2 \text{ Hz, 1H}).

\text{^13C NMR (100 MHz, CDCl}_3) \delta 179.03, 178.04, 136.77, 135.21, 132.18, 132.05, 129.48, 129.21, 128.85, 127.58, 45.18, 36.87. \text{HRMS (ESI)} calculated [M+H] for C\textsubscript{16}H\textsubscript{13}BrNOS: 345.9901, found: 345.9902.

\text{FTIR (cm}^{-1}) 3028, 2959, 2922, 2851, 1712, 1661, 1589, 1478, 1407, 1250, 1186, 1070, 1009, 907.

\[ \text{(S)-2-(3-Methoxyphenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3z)} \]

Following the general procedure, treatment of (Z)-2-bromo-3-phenylacrylaldehyde 2a (63.4 mg, 0.30 mmol) and 3-methoxybenzothioamide 1z (41.8 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K\textsubscript{2}CO\textsubscript{3} (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-2-(3-methoxyphenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3z as a yellow oil (53 mg, 72% yield).

\[ R_f (\text{Pet. ether/EtOAc} = 60/40): 0.57; \text{cr} = 92.8, [\alpha]_D^{20} = -60.0 \text{ (c 0.05, CHCl}_3) \]. \text{HPLC} (Chiralpak IF, 70:30 Hexane / i-PrOH, 0.7 mL/min, 254 nm) \text{Minor}: 26.1 min, \text{Major}: 27.4 min. \text{^1H NMR (400 MHz, CDCl}_3) \delta 7.66-7.62 (m, 2H), 7.43-7.32 (m, 6H), 7.14-7.11 (m, 1H), 4.82 (dd, \text{ J} _1 = 12.6 \text{ Hz, J} _2 = 4.1 \text{ Hz, 1H}), 3.85 (s, 3H), 3.06 (dd, \text{ J} _1 = 14.2 \text{ Hz, J} _2 = 5.0 \text{ Hz, 1H}), 2.98 (dd, \text{ J} _1 = 14.0 \text{ Hz, J} _2 = 12.6 \text{ Hz, 1H}). \text{^13C NMR (100 MHz, CDCl}_3) \delta 179.32, 178.04, 159.93, 137.78, 137.00, 129.77, 129.46, 129.11, 127.61, 120.58, 111.75, 55.64, 45.10, 37.03. \text{HRMS (ESI)} calculated [M+H] for C\textsubscript{17}H\textsubscript{16}NO\textsubscript{2}S: 298.0902, found: 298.0902. \text{FTIR (cm}^{-1}) 2932, 2836, 1711, 1673, 1589, 1478, 1407, 1250, 1186, 1070, 1009, 907.
(S)-6-Phenyl-2-(m-tolyl)-5,6-dihydro-4H-1,3-thiazin-4-one (3aa)

Following the general procedure, treatment of (Z)-2-bromo-3-phenylacrylaldehyde 2a (63.4 mg, 0.30 mmol) and 3-methylbenzothioamide 1aa (37.8 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-6-phenyl-2-(m-tolyl)-5,6-dihydro-4H-1,3-thiazin-4-one 3aa as a yellow oil (36 mg, 51% yield).

R$_f$ (Pet. ether /EtOAc = 80/20): 0.51; er = 92:8, [α]$_{D}^{25}$ = +62.6 (c 0.1, CHCl$_3$). HPLC (Chiralpak IC, 70:30 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 43.3 min, Major: 39.3 min. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.93-7.86 (m, 2H), 7.43-7.32 (m, 7H), 4.82 (dd, $J_1$ = 12.6 Hz, $J_2$ = 4.1 Hz, 1H), 3.06 (dd, $J_1$ = 14.3 Hz, $J_2$ = 4.0 Hz, 1H), 2.97 (dd, $J_1$ = 14.0 Hz, $J_2$ = 12.9 Hz, 1H), 2.40 (s, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 179.58, 179.33, 138.80, 137.09, 136.39, 134.65, 129.46, 129.10, 128.71, 127.62, 45.08, 37.05, 21.39. HRMS (ESI) calculated [M+H] for C$_{17}$H$_{17}$NO$_5$: 282.0953, found: 282.0951. FTIR (cm$^{-1}$) 3029, 2959, 2922, 2854, 2363, 2329, 1713, 1659, 1606, 1498, 1376, 1266,1193, 1148.

(S)-2-(3-Bromophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3ab)

Following the general procedure, treatment of (Z)-2-bromo-3-phenylacrylaldehyde 2ab (63.4 mg, 0.30 mmol) and 3-bromobenzothioamide C (54.0 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-2-(3-bromophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3ab as a pale yellow solid (70 mg, 81% yield).

R$_f$ (Pet. ether /EtOAc = 70/30): 0.58; er = 92:8, [α]$_{D}^{25}$ = +60.8 (c 0.1, CHCl$_3$). HPLC (Chiralpak IC, 70:30 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 39.3 min, Major: 35.8 min. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.93-7.86 (m, 2H), 7.43-7.32 (m, 7H), 4.82 (dd, $J_1$ = 1.4 Hz, 1H), 7.98-7.96 (m, 1H), 2.97 (dd, $J_1$ = 14.2 Hz, $J_2$ = 4.1 Hz, 1H), 2.40 (s, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 178.93, 177.68, 138.18, 136.18.
Following the general procedure, treatment of (Z)-2-bromo-3-phenylacrylaldehyde 2a (63.4 mg, 0.30 mmol) and 3-nitrobenzothioamide 1ac (45.5 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-2-(3-nitrophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3ac as a pale yellow solid (39 mg, 50% yield). 

\[ R_f \text{(Pet. ether /EtOAc = 70/30): 0.53; } \text{er} = 92:8, [\alpha]_{D}^{20} = -62.0 (c 0.05, CHCl}_3). \text{ HPLC (ChiralpakIF, 70:30 Hexane / i-PrOH, 0.7 mL/min, 254 nm) } \text{Minor: 50.7 min, Major: 57.4 min.} \]

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.32-8.23 (m, 4H), 7.44-7.38 (m, 5H), 4.92 (dd, $J_1 = 12.6$ Hz, $J_2 = 4.1$ Hz, 1H), 3.11 (dd, $J_1 = 14.2$ Hz, $J_2 = 4.3$ Hz, 1H), 3.05-2.98 (m, 1H).$^{13}$C NMR (100 MHz, CDCl$_3$) 178.71, 176.81, 150.76, 141.71, 136.34, 129.67, 129.48, 128.85, 127.62, 124.00, 45.74, 36.67. HRMS (ESI) calculated [M+H] for C$_{16}$H$_{13}$N$_2$O$_3$S: 313.0647, found: 313.0647. FTIR (cm$^{-1}$) 2961, 2923, 2854, 1716, 1603, 1525, 1383, 1347, 1249, 1186, 1107, 916.

(S)-2-(2-Fluorophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3ad)

Following the general procedure, treatment of (Z)-2-bromo-3-phenylacrylaldehyde 2a (63.4 mg, 0.30 mmol) and 2-fluorobenzothioamide 1ad (38.8 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 85:15) to afford (S)-2-(2-fluorophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3ad as a pale yellow solid (46 mg, 65% yield). 

\[ R_f \text{(Pet. ether /EtOAc = 80/20): 0.52; } \text{er} = 90:10, [\alpha]_{D}^{25} = +136.9 (c 0.1, CHCl}_3). \text{ HPLC (Chiralpak IA, 80:20 Hexane / i-PrOH, 0.7 mL/min, 254 nm) } \text{Minor: 15.9 min, Major: 14.2 min.} \]

$^1$H NMR
(400 MHz, CDCl$_3$) δ 7.98-7.94 (m, 1H), 7.54-7.49 (m, 1H), 7.41-7.37 (m, 5H), 7.26-7.22 (m, 1H), 7.18-7.14 (m, 1H), 4.86 (dd, $J_1 = 12.2$ Hz, $J_2 = 4.6$ Hz, 1H), 3.10-2.98 (m, 2H).

$^{13}$C NMR (100 MHz, CDCl$_3$) δ 178.48, 176.17 (d, $J = 4.3$ Hz), 160.8 (d, $J = 257$ Hz), 136.72, 134.21 (d, $J = 9.2$ Hz), 130.68, 130.33, 129.49, 129.16, 127.65, 124.90, 124.55, 124.52, 116.96 (d, $J = 22.2$ Hz), 109.37, 77.48, 77.16, 76.84, 45.82 (d, $J = 3.5$ Hz).

HRMS (ESI) calculated [M+H] for C$_{16}$H$_{13}$FNOS: 286.0702, found: 286.0702.

FTIR (cm$^{-1}$) 2922, 2852, 1645, 1521, 1485, 1451, 1373, 1277, 1225, 1153, 1022.

**1H NMR**

(400 MHz, CDCl$_3$) δ 8.54 (d, $J = 8.4$ Hz, 1H), 7.99 (d, $J = 8.1$ Hz, 1H), 7.89-7.82 (m, 2H), 7.52-7.47 (m, 2H), 7.42-7.37 (m, 5H), 4.91 (dd, $J_1 = 11.8$ Hz, $J_2 = 5.1$ Hz, 1H), 3.16-3.05 (m, 2H).

$^{13}$C NMR (100 MHz, CDCl$_3$) δ 181.30, 178.66, 140.32, 136.85, 134.48, 133.90, 133.60, 132.62, 129.52, 129.09, 128.59, 127.58, 126.82, 125.18, 125.14, 124.66, 124.58, 45.88, 36.62.

HRMS (ESI) calculated [M+H] for C$_{20}$H$_{16}$NOS: 318.0953, found: 318.0958.

FTIR (cm$^{-1}$) 3057, 2922, 2852, 1709, 1649, 1507, 1453, 1413, 1374, 1247, 1194, 1149, 1029.

**3ae**

Following the general procedure, treatment of (Z)-2-bromo-3-phenylacrylaldehyde 1a (63.4 mg, 0.30 mmol) and naphthalene-1-carbothioamide 2ae (46.8 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-2-(naphthalen-1-yl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3ae as a pale yellow solid (50 mg, 63% yield).

$R_f$ (Pet. ether /EtOAc = 70/30): 0.63; er = 91:9, $[a]_D^{25} = -54.4$ (c 0.1, CHCl$_3$). HPLC (Chiralpak IC, 60:40 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 39.2 min, Major: 34.5 min. 1H NMR (400 MHz, CDCl$_3$) δ 7.62-7.54 (m, 2H), 7.52-7.47 (m, 1H), 7.42-7.37 (m, 5H), 4.91 (dd, $J_1 = 11.8$ Hz, $J_2 = 5.1$ Hz, 1H), 3.16-3.05 (m, 2H).

**3af**

Following the general procedure, treatment of (Z)-2-bromo-3-phenylacrylaldehyde 2a (63.4 mg, 0.30 mmol) and thiophene-2-carbothioamide 1af (35.8 mg, 0.25 mmol) with triazolium salt C (11.6 mg, 0.025 mmol), lithium acetate dihydrate (5.1 mg, 0.05 mmol), K$_2$CO$_3$ (52.0 mg, 0.375 mmol) and 4 Å MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-2-((thiophen-2-yl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one 3af as a pale yellow solid (50 mg, 63% yield).

$R_f$ (Pet. ether /EtOAc = 70/30): 0.63; er = 91:9, $[a]_D^{25} = -54.4$ (c 0.1, CHCl$_3$). HPLC (Chiralpak IC, 60:40 Hexane / i-PrOH, 0.7 mL/min, 254 nm) Minor: 39.2 min, Major: 34.5 min. 1H NMR (400 MHz, CDCl$_3$) δ 7.62-7.54 (m, 2H), 7.52-7.47 (m, 1H), 7.42-7.37 (m, 5H), 4.91 (dd, $J_1 = 11.8$ Hz, $J_2 = 5.1$ Hz, 1H), 3.16-3.05 (m, 2H).
MS (100 mg) in mesitylene (2.0 mL) and stirring the reaction mixture at 25 °C for 72 h followed by flash column chromatography (Pet. ether-EtOAc: 80:20) to afford (S)-6-phenyl-2-(thiophen-2-yl)-5,6-dihydro-4H-1,3-thiazin-4-one 3af as a yellow oil (34 mg, 49 % yield).

\[ R_f \] (Pet. ether /EtOAc = 80/20): 0.41; \( \alpha \) = 86:14, \( [\alpha]_D^{25} = -42.6 \) (c 0.1, CHCl₃). HPLC (Chiralpak IC, 70:30 Hexane / i-PrOH, 0.7 mL/min, 254 nm) \( \text{Minor: 57.5 min, Major: 53.4 min.} \)

\(^1\)H NMR (400 MHz, CDCl₃) \( \delta 7.86-7.85 (m, 1H), 7.69-7.67 (m, 1H), 7.43-7.35 (m, 5H), 7.15-7.13 (m, 1H), 4.84 (dd, \( J_1 = 12.5 \) Hz, \( J_2 = 4.0 \) Hz, 1H), 3.08 (dd, \( J_1 = 14.5 \) Hz, \( J_2 = 4.0 \) Hz, 1H), 2.98 (dd, \( J_1 = 14.7 \) Hz, \( J_2 = 12.5 \) Hz, 1H). \(^1\)C NMR (100 MHz, CDCl₃) \( \delta 178.77, 172.33, 141.51, 136.96, 131.81, 129.47, 129.15, 128.59, 128.54, 127.61, 45.23, 37.67. \)

HRMS (ESI) calculated [M+H] for \( \text{C}_{14}\text{H}_{12}\text{NO S} \): 274.0360, found: 274.0359.

FTIR (cm\(^{-1}\)) 2960, 2923, 2852, 1711, 1651, 1523, 1489, 1419, 1260, 1149, 728, 697.

529
7. $^1$H and $^{13}$C NMR Spectra of Functionalized Thiazinones

(S)-2,6-Diphenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3a)
(S)-6-(4-Methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3b)
(S)-2-Phenyl-6-(p-tolyl)-5,6-dihydro-4H-1,3-thiazin-4-one (3c)
(S)-6-(4-Bromophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3d)
(S)-6-(4-Chlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3e)
(S)-6-(4-Fluorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3f)
(S)-2-Phenyl-6-(4-(trifluoromethyl)phenyl)-5,6-dihydro-4H-1,3-thiazin-4-one (3g)
(S)-6-(4-Nitrophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3h)
(S)-6-(3-Bromophenyl)-2-phenyl-5,6-dihydro-4\(^{H}\)-1,3-thiazin-4-one (3i)
(S)-6-(3-Chlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3j)
(S)-6-(3-Nitrophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3k)
(S)-6-(2-Methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3l)
(S)-6-(2-Bromophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3m)
(S)-6-(2-Chlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3n)
(S)-6-(3,4-Dichlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3o)
(S)-6-(3-Bromo-4-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3p)
(S)-6-(2-Bromo-4,5-dimethoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3q)
(S)-6-(Furan-2-yl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3r)
(S)-2-Phenyl-6-(thiophen-2-yl)-5,6-dihydro-4H-1,3-thiazin-4-one (3s)
(R)-6-Methyl-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3t)
(R)-6-Ethyl-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one(3u)

\[
\begin{align*}
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\text{O} & \quad \text{O}
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\]

\[
\begin{align*}
\text{N} & \quad \text{S} \\
\text{O} & \quad \text{O}
\end{align*}
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(S)-2-(4-Methoxyphenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3v)
(S)-6-Phenyl-2-(p-tolyl)-5,6-dihydro-4H-1,3-thiazin-4-one (3w)
(S)-2-(4-Iodophenyl)-6-phenyl-5,6-dihydro-4\(\text{H}\)-1,3-thiazin-4-one (3x)
(S)-2-(4-Bromophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3y)
(S)-2-(3-Methoxyphenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3z)
(S)-6-Phenyl-2-(m-tolyl)-5,6-dihydro-4H-1,3-thiazin-4-one (3aa)
(S)-2-(3-Bromophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3ab)
(S)-2-(3-Nitrophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3ac)
(S)-2-(2-Fluorophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3ad)
(S)-2-(Naphthalen-1-yl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3ae)
(S)-6-Phenyl-2-(thiophen-2-yl)-5,6-dihydro-4\textit{H}-1,3-thiazin-4-one (3af)
8. HPLC Data of Functionalized Thiazinones

(S)-2,6-Diphenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3a)

![HPLC data of racemate 3a](image1)

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(S)-6-(4-Methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3b)

Sample Info : CHIRALPAK IF, 25%IPA-Hexane, .7 mL/min, 254 nm
(S)-2-Phenyl-6-(p-tolyl)-5,6-dihydro-4H-1,3-thiazin-4-one (3c)

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Sample Info: CHIRALPAK IF, 20%IPA-Hexane, 0.7 mL/min, 254 nm
(S)-6-(4-Bromophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3d)

Peaks for racemic-3d:
- RetTime: 27.125 min
- Width: 0.5292 min
- Area: 3497.82446 mAU·s
- Height: 100.71378 mAU
- Area %: 49.5602%

Peaks for chiral-3c:
- RetTime: 26.956 min
- Width: 0.5613 min
- Area: 1803.91162 mAU·s
- Height: 53.56414 mAU
- Area %: 6.1275%

Sample Info: CHIRALPAK IP, 20% IFA-Hexane, .7 mL/min, 254 nm
(S)-6-(4-Chlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3e)

**Graph 1:**
- **Title:** racemic-3e
- **Data:**
  - Peak RetTime: 25.128 min
  - Width: 0.4782
  - Area: 4653.45898
  - Height: 147.83717
  - Area %: 49.7170

**Graph 2:**
- **Title:** chiral-3e
- **Data:**
  - Peak RetTime: 46.206 min
  - Width: 1.2022
  - Area: 4706.43799
  - Height: 55.56314
  - Area %: 50.2830

**Additional information:**
- Sample Info: CHIRALPAK IF, 20%IPA-Hexane, .70 mL/min, 254 nm
(S)-6-(4-Fluorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3f)

Sample Info : CHIRALPAK IF, 20% IPA-Hexane, .7 mL/min, 254 nm
(S)-2-Phenyl-6-(4-(trifluoromethyl)phenyl)-5,6-dihydro-4H-1,3-thiazin-4-one (3g)

Peak RetTime Type Width Area Height Area %
1 17.924 BB 0.3615 1913.22070 80.72743 49.8136
2 27.272 BB 0.6323 1927.53894 45.96814 50.1064

Sample Info : CHIRALPAK IF, 20%IPA-Hexane, .7 mL/min, 254 nm
(S)-6-(4-Nitrophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3h)

Sample Info: CHIRALPAK IA, 35%IPA-Hexane, .7 mL/min, 254 nm
(S)-6-(3-Bromophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3i)

Peak RetTime Type Width Area Height Area %
--- | ------ | ---- | ------------ | ------------ | ---- | ---- | ---- |
1 36.238 BB 0.7712 5255.15381 105.85538 48.8037
2 46.674 BB 0.9903 5296.57715 82.80404 50.1963

Peak RetTime Type Width Area Height Area %
--- | ------ | ---- | ------------ | ------------ | ---- | ---- | ---- |
1 36.514 BB 0.8168 2.17527e4 411.44904 93.2277
2 47.581 MM 1.0883 1580.16467 24.19853 6.7723

Sample Info: CHIRALPAK IC, 30%IPA-Hexane, .7 mL/min, 254 nm
(S)-6-(3-Chlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3j)
(S)-6-(3-Nitrophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3k)
(S)-6-(2-Methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3l)

racemic-3l

Peak RetTime Type Width Area Height Area %
# [min] [min] [mAU*s] [mAU]
1 16.351 BB 0.3380 3237.87866 145.27248 49.8034
2 18.444 BB 0.3599 3263.44238 137.98129 50.1966

chiral-3l

Peak RetTime Type Width Area Height Area %
# [min] [min] [mAU*s] [mAU]
1 16.195 MM 0.3556 1276.05286 59.80689 14.8947
2 18.190 MM 0.3879 7291.07959 313.30234 85.1053

Sample Info : CHIRALPAK IF, 30%IPA-Hexane, .7 mL/min, 254 nm
(S)-6-(2-Bromophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3m)

racemic-3m

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chirai-3m

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Sample Info : CHIRALPAK IF, 20%IPA-Hexane, .7 mL/min, 254 nm
(S)-6-(3,4-Dichlorophenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3o)
(S)-6-(3-Bromo-4-methoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3p)
(S)-6-(2-Bromo-4,5-dimethoxyphenyl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3q)

racemic-3q

chiral-3q

Peak RetTime Type Width Area Height Area
# [min] [min] [mAU*s] [mAU] %
---|-----|-----|-----|-----|-----|
1  25.405 BB 0.5836 6333.69629 163.25160 50.7532
2  51.339 BB 1.1387 6145.71240 83.11047 49.2468
(S)-6-(Furan-2-yl)-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3r)

**racemic-3r**

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**chiral-3r**

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Sample Info: CHIRALPAK IC, 30% IPA-HEXANE, 1 mL -min, 254 nm
(S)-2-Phenyl-6-(thiophen-2-yl)-5,6-dihydro-4H-1,3-thiazin-4-one (3s)
(R)-6-Methyl-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3t)
(R)-6-Ethyl-2-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3u)

racemic-3u

chiral-3u

Sample Info : CHIRALCEL OJ-H, 15% IPA-HEXANE, 1 mL/min, 254 nm
(S)-2-(4-Methoxyphenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3v)

![Diagram of molecule](image1)

**Chemical Structure:**
- **Formula:** S83
- **Molecule:** racemic-3v
- **Structure:**
  - MeO
  - chiral-3v

**Chromatogram:**
- **Wavelength:** 254 nm
- **Sample Info:** CHIRALPAK IF, 25% IPA-Hexane, 0.7 mL/min, 254 nm

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(S)-6-Phenyl-2-(p-tolyl)-5,6-dihydro-4H-1,3-thiazin-4-one (3w)

**Peak RetTime Type Width Area Height Area %**

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Sample Info: CHIRALPAK IC, 30%IPA-Hexane, 1.0 mL/min, 254 nm
(S)-2-(4-Iodophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3x)

**Racemic 3x**

**Chiral 3x**

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Sample Info: CHIRALPAK IF, 20%IPA-Hexane, .7 mL/min, 254 nm
(S)-2-(4-Bromophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3y)

**Sample Info**: CHIRALPAK IC, 30%IPA-Hexane, .7mL/min, 254 nm
(S)-2-(3-Methoxyphenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3z)

![Molecular Structure](image1)

**racemic-3z**

**Chiral HPLC chromatograms**

- **Top chromatogram**
  - Peak RetTime: [26.424, 29.063] min
  - Type: BB
  - Width: [0.5709, 0.8272] min
  - Area: [1217.37878, 1178.62769] mAU
  - Height: [32.28959, 20.73383] mAU
  - Area %: [50.8087, 49.1913]

- **Bottom chromatogram**
  - Peak RetTime: [26.184, 27.477] min
  - Type: MM
  - Width: [0.5342, 1.1118] min
  - Area: [1517.69873, 1.69927e4] mAU
  - Height: [47.35447, 254.73312] mAU
  - Area %: [8.1992, 91.8008]

**Sample Info**: CHIRALPAK IF, 30%IPA-Hexane, .7mL/min, 254 nm
(S)-6-Phenyl-2-(m-tolyl)-5,6-dihydro-4H-1,3-thiazin-4-one (3aa)
(S)-2-(3-Bromophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3ab)

racemic-3ab

![Chromatogram of racemic-3ab](image1)

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chiral-3ab

![Chromatogram of chiral-3ab](image2)

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Sample Info: CHIRALPAK IC, 30% IPA-Hexane, .7mL/min, 254 nm
(S)-2-(3-Nitrophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3ac)

**Peak RetTime Type Width Area Height Area %**

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**Sample Info**: CHIRALPAK IF, 30%IPA-Hexane, .7 mL/min, 254 nm
(S)-2-(2-Fluorophenyl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3ad)

Sample Info: CHIRALPAK IA, 20%IPA-Hexane, .7 mL/min, 254 nm
(S)-2-(Naphthalen-1-yl)-6-phenyl-5,6-dihydro-4H-1,3-thiazin-4-one (3ae)

**Peak RetTime Type Width Area Height Area %**

1  34.443 MM  0.8490  3696.67944  72.57103  49.9607
2  38.949 MM  0.9705  3702.49975  63.59062  50.0393

**Peak RetTime Type Width Area Height Area %**

1  34.561 MM  0.8651  1.20363e4  231.87981  90.9428
2  39.211 MM  0.9743  1198.71143  20.50633  9.0572

Sample Info: CHIRALPAK IC, 40%IPA-Hexane, .7mL/min, 254 nm
(S)-6-Phenyl-2-(thiophen-2-yl)-5,6-dihydro-4H-1,3-thiazin-4-one (3af)

racemic-3af

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chiral-3af

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Sample Info : CHIRALPAK IC, 30%IPA-Hexane, .7mL/min, 254 nm