Supporting Information

Domino Cyclization and Oxidation Approach for One-Pot Access to Thiazoles and Benzothiazoles

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I. **General Methods.**

All reactions were carried out in schlenk tubes. The reactions were monitored by thin-layer chromatography on silica gel 60-F254 coated 0.2 mm plates. Visualization was accomplished by UV light (254 nm). The crude products were purified by flash column chromatography using silica gel (normal phase, 200-300 mesh). \(^1\)H NMR spectra were recorded on a 400 MHz spectrometer at ambient temperature. Data were reported as follows: (1) chemical shift in parts per million (δ, ppm) from CDCl\(_3\) (7.26 ppm), DMSO-\(d_6\) (2.50 ppm); (2) multiplicity (s = singlet, br = broad, d = doublet, t = triplet, q = quartet, and m = multiplet); (3) coupling constants (Hz). \(^{13}\)C NMR spectra were recorded on a 100 MHz spectrometer at ambient temperature. Chemical shifts were reported in ppm from CDCl\(_3\) (77.10 ppm), DMSO-\(d_6\) (39.52 ppm). Melting points were obtained on a melting point apparatus and the data are uncorrected. HR-MS analyses were carried out using a time-of-flight (TOF)-MS instrument with an electrospray ionization (ESI) source. All commercial materials were used as received unless otherwise noted. 4Å molecular sieves (powder) were activated at 100 °C

II. **Analytical Characterization Data of Products**

1) **General procedure A:**

\[
\begin{align*}
\text{HS} & \quad \text{NH}_2\text{HCl} \\
\text{OEt} & \quad \text{Ar} \\
\text{H} & \quad \text{OEt} \\
\text{NH} & \quad \text{H} \\
\text{Ar} & \quad \text{H}
\end{align*}
\]

A mixture of L-cysteine ethyl ester hydrochloride (1a, 0.8 mmol, 0.1486 g, 4.0 equiv.), benzaldehyde (0.2 mmol, 0.0212 g, 1.0 equiv.), K\(_2\)CO\(_3\) (0.6 mmol, 0.0828 g, 3.0 equiv.), I\(_2\) (0.06 mmol, 0.0152 g, 0.3 equiv.), 4Å molecular sieve (0.4 g) was charged in a schlenk tube and purged with nitrogen gas for three times. 1,4-Dioxane (1 mL), and TBHP (70% in cyclohexane, 0.8 mmol, 0.1029 g, 4 equiv.) were then added slowly to the mixture at room temperature. The mixture was stirred at 70 °C for 12 hours. The resultant solution was quenched with aqueous saturated sodium
thiosulfate solution (4 mL) and extracted with ethyl acetate (3×30 mL). The organic phase was combined and washed with brine (3×30 mL), dried over anhydrous sodium sulfate, filtered and concentrated in vacuo. The crude product was further purified by silica gel flash chromatography (petroleum ether (PE) and ethyl acetate (EA) as the eluent).

**Ethyl 2-phenylthiazole-4-carboxylate (3a)**

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=25:1 as the eluent) to give 3a (88% yield) as a yellow oil. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.15 (s, 1H), 8.01-7.99 (m, 2H), 7.44-7.43 (m, 3H), 4.44 (q, $J = 7.1$ Hz, 2H), 1.43 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 168.9, 161.5, 148.1, 132.8, 130.7, 128.9, 127.1, 127.0, 61.5, 14.4. HRMS (ESI): Calcd for C$_{12}$H$_{12}$NO$_2$S$^+$ [M+H]$^+$ 234.0583, found 234.0582.

**Ethyl 2-(p-tolyl)thiazole-4-carboxylate (3b)**

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=25:1 as the eluent) to give 3b (79% yield) as a yellow oil. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.11 (s, 1H), 7.89 (d, $J = 8.2$ Hz, 2H), 7.24 (d, $J = 8.0$ Hz, 2H), 4.44 (q, $J = 7.1$ Hz, 2H), 2.39 (s, 3H), 1.42 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 169.1, 161.5, 147.9, 141.1, 130.2, 129.6, 126.9, 126.7, 61.5, 21.5, 14.4. HRMS (ESI): Calcd for C$_{13}$H$_{14}$NO$_2$S$^+$ [M+H]$^+$ 248.0740, found 248.0739.

**Ethyl 2-(m-tolyl)thiazole-4-carboxylate (3c)**

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=25:1 as the eluent) to
give 3c (73% yield) as a yellow oil. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.14 (s, 1H), 7.86 (s, 1H), 7.77 (d, $J$ = 7.6 Hz, 1H), 7.32 (t, $J$ = 7.9 Hz, 1H), 7.25 (d, $J$ = 7.6 Hz, 1H), 4.45 (q, $J$ = 7.1 Hz, 2H), 2.41 (s, 3H), 1.43 (t, $J$ = 7.1 Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 169.1, 161.5, 141.6, 138.8, 132.7, 131.5, 128.8, 127.5, 112.9, 124.2, 61.5, 21.3, 14.4. HRMS (ESI): Calcd for C$_{13}$H$_{14}$NO$_2$S$^+$ [M+H]$^+$ 248.0740, found 248.0740.

**Ethyl 2-(o-tolyl)thiazole-4-carboxylate (3d)**

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=20:1 as the eluent) to give 3d (83% yield) as a yellow oil. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.23 (s, 1H), 7.69(d, $J$ = 7.52 Hz, 1H), 7.36-7.25 (m, 3H), 4.44 (q, $J$ = 7.1 Hz, 2H), 2.58 (s, 3H), 1.42 (t, $J$ = 7.1 Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 169.1, 161.5, 141.6, 138.8, 132.7, 131.5, 129.9, 127.7, 126.1, 61.4, 21.3, 14.4. HRMS (ESI): Calcd for C$_{13}$H$_{14}$NO$_2$S$^+$ [M+H]$^+$ 248.0740, found 248.0740.

**Ethyl 2-(3-methoxyphenyl)thiazole-4-carboxylate (3e)**

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3e (95% yield) as a white solid. Mp 58 °C. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.15 (s, 1H), 7.58-7.53 (m, 2H), 7.34 (t, $J$ = 8.0 Hz, 1H), 7.00-6.98 (m, 1H), 4.44 (q, $J$ = 7.1 Hz, 2H), 3.88 (s, 3H), 1.43 (t, $J$ = 7.1 Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 168.7, 161.4, 160.0, 147.9, 134.0, 129.9, 127.2, 119.6, 117.0, 111.6, 61.5, 55.5, 14.4. HRMS (ESI): Calcd for C$_{13}$H$_{14}$NO$_3$S$^+$ [M+H]$^+$ 264.0689, found 264.0690.

**Ethyl 2-(4-methoxyphenyl)thiazole-4-carboxylate (3f)**
Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3f (85% yield) as a white solid. Mp 96 °C. ¹H NMR (400 MHz, CDCl₃): δ 8.08 (s, 1H), 7.95-7.93 (m, 2H), 6.95 (d, J = 8.8 Hz, 2H), 4.44 (q, J = 7.1 Hz, 2H), 3.85 (s, 3H), 1.42 (t, J = 7.1 Hz, 3H). ¹³C NMR (100 MHz, CDCl₃): δ 168.7, 161.6, 161.5, 147.8, 128.5, 126.3, 125.7, 114.3, 61.4, 55.4, 14.4. HRMS (ESI): Calcd for C₁₃H₁₄NO₃S⁺ [M+H]⁺ 264.0689; found 264.0689.

### Ethyl 2-(2-methoxyphenyl)thiazole-4-carboxylate (3g)

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3g (89% yield) as a yellow oil. ¹H NMR (400 MHz, CDCl₃): δ 8.52 (dd, J = 7.8, 1.4 Hz, 1H), 8.20 (s, 1H), 7.44-7.39 (m, 1H), 7.09 (t, J = 7.6 Hz, 1H), 7.03 (d, J = 8.3 Hz, 1H), 4.45 (q, J = 7.1 Hz, 2H), 4.03 (s, 3H), 1.43 (t, J = 7.1 Hz, 3H). ¹³C NMR (100 MHz, CDCl₃): δ 163.0, 161.9, 156.52, 146.1, 131.3, 129.1, 127.9, 121.6, 121.1, 111.2, 61.3, 55.6, 14.4. HRMS (ESI): Calcd for C₁₃H₁₄NO₃S⁺ [M+H]⁺ 264.0689, found 264.0688.

### Ethyl 2-(2-bromophenyl)thiazole-4-carboxylate (3h)

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=20:1 as the eluent) to give 3h (66% yield) as a yellow oil. ¹H NMR (400 MHz, CDCl₃): δ 8.30 (s, 1H), 8.11 (dd, J = 7.8, 1.7 Hz, 1H), 7.69 (dd, J = 8.0, 1.0 Hz, 1H), 7.42 (td, J = 7.8, 1.2 Hz, 1H), 7.30 (td, J = 7.8, 1.5 Hz, 1H), 4.46 (q, J = 7.1 Hz, 2H), 1.43 (t, J = 7.1 Hz, 3H). ¹³C NMR (100 MHz, CDCl₃): δ 165.7, 161.5, 146.9, 133.9, 133.5, 132.1, 131.1, 128.5, 127.7, 121.8, 61.5, 14.4. HRMS (ESI): Calcd for C₁₂H₁₁BrNO₂S⁺ [M+H]⁺ 311.9688, found 311.9691.
2-(3-bromophenyl)-4-(ethylperoxy)thiazole (3i)

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=20:1 as the eluent) to give 3i (56% yield) as a white solid. Mp 72 °C. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.20 (t, $J = 1.8$ Hz, 1H), 8.18 (s, 1H), 7.93-7.88 (m, 1H), 7.58 (ddd, $J = 8.0$, 1.8, 0.9 Hz, 1H), 7.33 (t, $J = 7.9$ Hz, 1H), 4.46 (q, $J = 7.1$ Hz, 2H), 1.44 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 166.9, 161.3, 148.3, 134.6, 133.6, 130.5, 129.8, 127.5, 125.6, 123.2, 61.6, 14.4. HRMS (ESI): Calcd for C$_{12}$H$_{11}$BrNO$_2$S$^+$ [M+H]$^+$ 311.9688, found 311.9690.

Ethyl 2-(4-bromophenyl)thiazole-4-carboxylate (3j)

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=20:1 as the eluent) to give 3j (81% yield) as a yellow solid. Mp 99 °C. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.18 (s, 1H), 7.90-7.88 (m, 2H), 7.61-7.58 (m, 2H), 4.46 (q, $J = 7.1$ Hz, 2H), 1.44 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 167.6, 161.3, 148.3, 132.2, 131.7, 128.4, 127.2, 125.1, 61.6, 14.4. HRMS (ESI): Calcd for C$_{12}$H$_{11}$BrNO$_2$S$^+$ [M+H]$^+$ 311.9688, found 311.9690.

Ethyl 2-(4-chlorophenyl)thiazole-4-carboxylate (3k)

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3k (72% yield) as a white solid. Mp 90 °C. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.16 (s, 1H), 7.95 (d, $J = 8.5$ Hz, 2H), 7.43 (d, $J = 8.5$ Hz, 2H), 4.45 (q, $J = 7.1$ Hz, 2H), 1.43 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz,

**Ethyl 2-(3-chlorophenyl)thiazole-4-carboxylate (3l)**

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3l (75% yield) as a yellow solid. Mp 66 $^\circ$C. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.18 (s, 1H), 8.04 (t, $J = 1.6$ Hz, 1H), 7.86 (dt, $J = 7.3$, 1.5 Hz, 1H), 7.44-7.36 (m, 2H), 4.46 (q, $J = 7.1$ Hz, 2H), 1.44 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 167.1, 161.3, 148.3, 135.2, 134.4, 130.6, 130.2, 127.5, 126.9, 125.1, 61.6, 14.4. HRMS (ESI): Calcd for C$_{12}$H$_{11}$ClNO$_2$S$^+$ [M+H]$^+$ 268.0194, found 268.0197.

**Ethyl 2-(2-fluorophenyl)thiazole-4-carboxylate (3m)**

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3m (65% yield) as a yellow oil. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.41 (td, $J = 7.7$, 1.4 Hz, 1H), 8.27 (s, 1H), 7.45-7.39 (m, 1H), 7.29-7.24 (m, 1H), 7.20 (dd, $J = 11.1$, 9Hz, 1H), 4.456 (q, $J = 7.1$ Hz, 2H), 1.43 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 161.5, 161.2 (d, $J = 4.9$ Hz), 160.1 (d, $J = 250.4$ Hz), 146.94, 131.83 (d, $J = 8.6$ Hz), 129.39, 128.25 (d, $J = 9.1$ Hz), 124.69 (d, $J = 3.0$ Hz), 120.63 (d, $J = 11.2$ Hz), 116.02 (d, $J = 21.5$ Hz), 61.50, 14.37. HRMS (ESI): Calcd for C$_{12}$H$_{11}$FNO$_2$S$^+$ [M+H]$^+$ 252.0489, found 252.0489.

**Ethyl 2-(3-fluorophenyl)thiazole-4-carboxylate (3n)**
Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3n (62% yield) as a yellow oil. \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta\) 8.18 (s, 1H), 7.76 (d, \(J = 7.3\) Hz, 2H), 7.42 (dd, \(J = 13.9, 7.7\) Hz, 1H), 7.20-7.08 (m, 1H), 4.45 (q, \(J = 7.1\) Hz, 2H), 1.43 (t, \(J = 7.1\) Hz, 3H). \(^{13}\)C NMR (100 MHz, CDCl\(_3\)): \(\delta\) 167.3, 163.0 (d, \(J = 245.8\) Hz), 161.3, 148.3, 134.78 (d, \(J = 8.1\) Hz), 130.6 (d, \(J = 8.2\) Hz), 127.5, 122.7 (d, \(J = 2.0\) Hz), 117.6 (d, \(J = 2.2\) Hz), 113.9 (d, \(J = 24.0\) Hz), 61.60, 14.36. HRMS (ESI): Calcd for C\(_{12}\)H\(_{11}\)FNO\(_2\)S \([\text{M+H}]^+\) 252.0489, found 252.0492.

**Ethyl 2-(4-nitrophenyl)thiazole-4-carboxylate (3o)**

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3o (49% yield) as a white solid. Mp 143 °C. \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta\) 8.33 (d, \(J = 8.9\) Hz, 2H), 8.28 (s, 1H), 8.20 (d, \(J = 8.9\) Hz, 2H), 4.47 (q, \(J = 7.1\) Hz, 2H), 1.45 (t, \(J = 7.1\) Hz, 3H). \(^{13}\)C NMR (100 MHz, CDCl\(_3\)): \(\delta\) 165.8, 161.1, 148.9, 148.9, 138.2, 128.6, 127.7, 124.4, 61.8, 14.4. HRMS (ESI): Calcd for C\(_{12}\)H\(_{11}\)N\(_2\)O\(_4\)S \([\text{M+H}]^+\) 279.0434, found 279.0435.

**Ethyl 2-(4-(trifluoromethyl)phenyl)thiazole-4-carboxylate (3p)**

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3p (44% yield) as a white solid. Mp 99 °C. \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta\) 8.23 (s, 1H), 8.14 (d, \(J = 8.1\) Hz, 2H), 7.72 (d, \(J = 8.2\) Hz, 2H), 4.47 (q, \(J = 7.1\) Hz, 2H), 1.44 (t, \(J = 7.1\) Hz, 3H). \(^{13}\)C NMR (100 MHz, CDCl\(_3\)): \(\delta\) 166.9, 161.2, 148.6, 135.9, 132.5, 132.2, 127.9, 127.3, 126.0 (d, \(J = 4.0\))
Hz), 61.7, 14.4. HRMS (ESI): Calcd for C_{13}H_{11}F_{3}NO_{2}S^+ [M+H]^+ 302.0457, found 302.0454.

**Ethyl 2-(4-(methylthio)phenyl)-4,5-dihydrothiazole-4-carboxylate (3q)**

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give **3q** (78% yield) as a yellow solid. Mp 80 °C. 

$^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.11 (s, 1H), 7.91 (dd, $J$ = 6.8, 1.7 Hz, 2H), 7.27 (d, $J$ = 8.5 Hz, 2H), 4.44 (q, $J$ = 7.1 Hz, 2H), 2.52 (s, 3H), 1.43 (t, $J$ = 7.1 Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 168.4, 161.5, 148.0, 142.4, 129.4, 127.2, 126.6, 125.9, 61.5, 15.2, 14.4. HRMS (ESI): Calcd for C$_{12}$H$_{15}$NO$_2$S$_2^+$ [M+H]$^+$ 280.0460, found 280.0460.

**Ethyl (E)-2-(1-phenylprop-1-en-2-yl)thiazole-4-carboxylate (3r)**

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give **3r** (49% yield) as a yellow oil. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.08 (s, 1H), 7.54 (s, 1H), 7.43-7.38 (m, 4H), 7.31-7.28 (m, 1H), 4.43 (q, $J$ = 7.1 Hz, 2H), 2.45 (s, 3H), 1.42 (t, $J$ = 7.1 Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 171.3, 160.5, 146.6, 135.3, 131.3, 129.7, 128.5, 127.4, 126.8, 125.4, 60.4, 15.7, 13.3. HRMS (ESI): Calcd for C$_{15}$H$_{16}$NO$_2$S$^+$ [M+H]$^+$ 274.0896, found 274.0898.

**Ethyl (E)-2-styrylthiazole-4-carboxylate (3s)**

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as
the eluent) to give 3s (58% yield) as a yellow oil. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.08 (s, 1H), 7.52 (d, $J = 7.0$ Hz, 2H), 7.41-7.35 (m, 5H), 7.32-7.31 (m, 1H), 4.44 (q, $J = 7.1$ Hz, 2H), 1.43 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 167.7, 161.4, 147.8, 136.3, 135.3, 129.4, 128.9, 127.2, 126.4, 121.2, 61.6, 14.4. HRMS (ESI): Calcd for C$_{14}$H$_{14}$NO$_2$S$^+$/[M+H]$^+$ 260.0740, found 260.0741.

Ethyl 2-(naphthalen-1-yl)thiazole-4-carboxylate (3t)

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=25:1 as the eluent) to give 3t (64% yield) as a yellow oil. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.74 (d, $J = 8.3$ Hz, 1H), 8.32 (s, 1H), 7.98 (d, $J = 8.2$ Hz, 1H), 7.93 (d, $J = 8.3$ Hz, 1H), 7.84 (dd, $J = 7.1$, 0.7 Hz, 1H), 7.64-7.52 (m, 3H), 4.51 (q, $J = 7.1$ Hz, 2H), 1.47 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 168.0, 161.60, 147.9, 133.9, 131.0, 130.6, 130.1, 128.9, 128.4, 128.0, 127.7, 126.5, 125.6, 124.9, 61.5, 14.4. HRMS (ESI): Calcd for C$_{16}$H$_{14}$NO$_2$S$^+$/[M+H]$^+$ 284.0740, found 284.0739.

Ethyl 2-(naphthalen-2-yl)thiazole-4-carboxylate (3u)

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3u (83% yield) as a yellow solid. Mp 75 $^\circ$C. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.52 (s, 1H), 8.19 (s, 1H), 8.10 (dd, $J = 8.5$, 1.28 Hz, 1H), 7.95-7.85 (m, 3H), 7.55-7.52 (m, 2H), 4.47 (q, $J = 7.1$ Hz, 2H), 1.45 (t, $J = 7.1$ Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 168.9, 161.5, 148.2, 134.4, 133.1, 130.1, 128.8, 128.7, 127.9, 127.4, 127.2, 126.9, 126.7, 124.1, 61.6, 14.4. HRMS (ESI): Calcd for C$_{16}$H$_{14}$NO$_2$S$^+$/[M+H]$^+$ 284.0740, found 284.0740.
Ethyl 2-(anthracen-9-yl)thiazole-4-carboxylate (3v)

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3v (91% yield) as a yellow oil. $^1$H NMR (400 MHz, CDCl$_3$): δ 8.59 (s, 1H), 8.55 (s, 1H), 8.03 (d, $J$ = 7.9 Hz, 2H), 7.68 (d, $J$ = 8.4, 2H), 7.49-7.42 (m, 4H), 4.49 (q, $J$ = 7.1 Hz, 2H), 1.44 (t, $J$ = 7.1 Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): δ 165.9, 161.6, 148.0, 131.3, 130.9, 129.8, 128.5, 126.9, 126.2, 125.5, 125.4, 61.6, 14.4. HRMS (ESI): Calcd for C$_{20}$H$_{16}$N$_1$O$_2$S$^+$ [M+H]$^+$ 334.0896, found 334.0898.

Ethyl 2-(thiophen-2-yl)thiazole-4-carboxylate (3w)

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3w (66% yield) as a yellow oil. $^1$H NMR (400 MHz, CDCl$_3$): δ 8.07 (s, 1H), 7.58 (d, $J$ = 3.6 Hz, 1H), 7.44 (d, $J$ = 5.0 Hz, 1H), 7.09 (t, $J$ = 4.3 Hz, 1H), 4.43 (q, $J$ = 7.1 Hz, 2H), 1.42 (t, $J$ = 7.1 Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): δ 162.4, 161.2, 147.8, 136.3, 128.7, 127.9, 127.68, 126.3, 61.5, 14.3. HRMS (ESI): Calcd for C$_{10}$H$_{10}$NO$_2$S$^+$ [M+H]$^+$ 240.0147, found 240.0154.

Ethyl 2-(pyridin-2-yl)thiazole-4-carboxylate (3x)

Following the general procedure A, the crude product was purified by silica gel flash chromatography (PE: EA=15:1 as the eluent) to give 3x (30% yield) as a yellow oil. $^1$H NMR (400 MHz, CDCl$_3$): δ 8.62 (d, $J$ = 4.6 Hz, 1H), 8.33 (d, $J$ = 7.9 Hz, 1H), 8.25 (s, 1H), 7.82 (td, $J$ = 7.6, 1.24 Hz, 1H), 7.36 (td, $J$ = 6.6, 1.4 Hz, 1H), 4.45 (t, $J$ = 7.1 Hz, 2H), 1.42 (t, $J$ = 7.1 Hz, 3H). $^{13}$C NMR (100 MHz, CDCl$_3$): δ 169.9, 161.5, 150.5, 149.4, 148.3,
137.1, 129.5, 125.1, 120.3, 61.5, 14.4. HRMS (ESI): Calcd for C_{11}H_{11}N_{2}O_{2}S^{+} [M+H]^+ 235.0536, found 235.0536.

2) General procedure B:

\[
\begin{align*}
\text{SH} & \quad + \quad \text{O} \quad \rightarrow \quad \text{N} \quad \text{Ar} \\
\text{4a} & \quad \text{2} & \quad \text{I}_{2}/\text{DTBP, K}_{2}\text{CO}_{3}, \text{DMF} & \quad \text{4Å} \text{MS, 120 °C, 12 h} & \quad \text{5}
\end{align*}
\]

A mixture of 2-aminothiophenol (4a, 0.8 mmol, 0.108 g, 4.0 equiv.), benzaldehyde (0.2 mmol, 0.0212 g, 1.0 equiv.), potassium carbonate (K_{2}CO_{3}, 0.6 mmol, 0.0828 g, 3.0 equiv.), iodine (I_{2}, 0.06 mmol, 0.0152 g, 0.3 equiv.), 4Å molecular sieve (0.4 g) was charged with DMF (0.2 mL) in a pressure bottle, di-tert-butyl peroxide (DTBP, 0.8 mmol, 0.1169 g, 4 equiv.) was then added slowly to the mixture at room temperature. The mixture was stirred at 120 °C for 12 hours. The resultant solution was quenched with aqueous saturated sodium thiosulfate solution (4 mL) and extracted with ethyl acetate (3×30 mL). The organic phase was combined and washed with brine (3×30 mL), dried over anhydrous sodium sulfate, filtered and concentrated in vacuo. The crude product was further purified by silica gel flash chromatography (petroleum ether (PE) and ethyl acetate (EA) as the eluent).

2-phenylbenzo[d]thiazole (5a)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=40:1 as the eluent) to give 5a (99% yield) as a purple solid. Mp 112 °C. \textsuperscript{1}H NMR (400 MHz, CDCl\textsubscript{3}): δ 8.09-8.06 (m, 3H), 7.88 (d, J = 8.0 Hz, 1H), 7.50-7.47 (m, 4H), 7.36 (t, J = 7.5 Hz, 1H). \textsuperscript{13}C NMR (100 MHz, CDCl\textsubscript{3}): δ 167.0, 153.1, 134.0, 132.6, 129.9, 127.9,
126.5, 125.3, 124.1, 122.2, 120.6. HRMS (ESI): Calcd for C_{13}H_{10}NS^+ [M+H]^+ 212.0528, found 212.0528.

**2-(p-tolyl)benzo[d]thiazole (5b)**

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=30:1 as the eluent) to give 5b (98% yield) as a purple solid. Mp 84 °C. \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta\) 8.05 (d, \(J = 8.2\) Hz, 1H), 7.97 (d, \(J = 8.2\) Hz, 2H), 7.86 (dd, \(J = 8.0, 0.4\) Hz, 1H), 7.48-7.44 (m, 1H), 7.37-7.33 (m, 1H), 7.27 (d, \(J = 7.9\) Hz, 2H), 2.40 (s, 3H). \(^{13}\)C NMR (100 MHz, CDCl\(_3\)): \(\delta\) 167.2, 153.1, 140.4, 133.9, 129.9, 128.7, 126.4, 125.2, 123.9, 122.0, 120.5, 20.5. HRMS (ESI): Calcd for C_{14}H_{12}NS^+ [M+H]^+ 226.0685, found 226.0685.

**2-(m-tolyl)benzo[d]thiazole (5c)**

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=50:1 as the eluent) to give 5c (98% yield) as a white solid. Mp 60 °C. \(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta\) 8.10 (d, \(J = 8.2\) Hz, 1H), 7.90-7.88 (m, 1H), 7.75 (dd, \(J = 7.5, 0.8\) Hz, 1H), 7.51-7.26 (m, 1H), 7.40-7.26 (m, 4H), 2.65 (s, 3H). \(^{13}\)C NMR (100 MHz, CDCl\(_3\)): \(\delta\) 166.9, 152.8, 136.2, 134.5, 132.0, 130.5, 129.5, 128.9, 125.1, 125.0, 124.0, 122.3, 120.3, 20.3. HRMS (ESI): Calcd for C_{14}H_{12}NS^+ [M+H]^+ 226.0685, found 226.0684.

**2-(o-tolyl)benzo[d]thiazole (5d)**

...
Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=40:1 as the eluent) to give 5d (99% yield) as an orange solid. Mp 56 °C. 1H NMR (400 MHz, CDCl$_3$): $\delta$ 8.06 (d, $J$ = 8.1 Hz, 1H), 7.92 (s, 1H), 7.85 (t, $J$ = 7.1 Hz, 2H), 7.49-7.44 (m, 1H), 7.35 (t, $J$ = 7.7 Hz, 2H), 7.27 (d, $J$ = 7.6 Hz, 1H), 2.43 (s, 3H). 13C NMR (100 MHz, CDCl$_3$): $\delta$ 167.2, 153.1, 137.8, 134.0, 132.5, 130.7, 127.9, 126.9, 125.2, 124.0, 123.8, 122.1, 120.5, 20.3. HRMS (ESI): Calcd for C$_{14}$H$_{12}$NS $^+$ [M+H]$^+$ 226.0685, found 226.0685.

2-(4-(methylthio)phenyl)benzo[d]thiazole (5e)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=40:1 as the eluent) to give 5e (77% yield) as a yellow oil. 1H NMR (400 MHz, CDCl$_3$): $\delta$ 8.08 (d, $J$ = 8.1 Hz, 1H), 8.02-7.99 (m, 2H), 7.89 (d, $J$ = 8.1 Hz, 1H), 7.52-7.48 (m, 1H), 7.40-7.36 (m, 1H), 7.33 (d, $J$ = 8.4 Hz, 2H), 2.54 (s, 3H). 13C NMR (100 MHz, CDCl$_3$): $\delta$ 167.6, 154.2, 142.8, 134.9, 130.1, 127.8, 126.34, 125.9, 125.2, 123.1, 121.6, 15.2. HRMS (ESI): Calcd for C$_{14}$H$_{12}$NS$^2$ $^+$ [M+H]$^+$ 258.0406, found 258.0413.

2-(4-fluorophenyl)benzo[d]thiazole (5f)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=40:1 as the eluent) to give 5f (45% yield) as a yellow oil. 1H NMR (400 MHz, CDCl$_3$): $\delta$ 8.07-8.04 (m, 3H), 7.86 (dd, $J$ = 8.0, 0.4 Hz, 1H), 7.49-7.45 (m, 1H), 7.38-7.33 (m, 1H), 7.17-7.12 (m, 2H). 13C NMR (100 MHz, CDCl$_3$): $\delta$ 166.73, 164.47 (d, $J$ = 251 Hz), 154.12, 135.08, 129.97 (d, $J$ = 3.3 Hz), 129.53 (d, $J$ = 8.0 Hz), 126.43, 125.26,
123.22, 121.63, 116.16 (d, J = 22.0 Hz). HRMS (ESI): Calcd for C\textsubscript{13}H\textsubscript{9}FNS\textsuperscript{+} [M+H]\textsuperscript{+} 230.0434, found 230.0437.

2-(3-chlorophenyl)benzo[d]thiazole (5g)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=40:1 as the eluent) to give 5g (59\% yield) as a yellow solid. Mp 95 °C. \textsuperscript{1}H NMR (400 MHz, CDCl\textsubscript{3}): \(\delta\) 8.08-8.04 (m, 2H), 7.89-7.83 (m, 2H), 7.49-7.45 (m, 1H), 7.42-7.34 (m, 3H). \textsuperscript{13}C NMR (100 MHz, CDCl\textsubscript{3}): \(\delta\) 166.2, 154.0, 135.3, 135.2, 135.1, 130.8, 130.2, 127.4, 126.5, 125.7, 125.6, 123.5, 121.7. HRMS (ESI): Calcd for C\textsubscript{13}H\textsubscript{9}ClNS\textsuperscript{+} [M+H]\textsuperscript{+} 246.0139, found 246.0135.

2-(4-chlorophenyl)benzo[d]thiazole (5h)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=40:1 as the eluent) to give 5h (83\% yield) as a yellow solid. Mp 120 °C. \textsuperscript{1}H NMR (400 MHz, CDCl\textsubscript{3}): \(\delta\) 8.06 (d, J = 8.2 Hz, 1H), 8.01 (d, J = 8.5 Hz, 2H), 7.88 (d, J = 8.0 Hz, 1H), 7.51-7.44 (m, 3H), 7.38 (t, J = 7.6 Hz, 1H). \textsuperscript{13}C NMR (100 MHz, CDCl\textsubscript{3}): \(\delta\) 166.60, 154.1, 137.0, 135.1, 132.2, 129.3, 128.7, 126.5, 125.4, 123.3, 121.7. HRMS (ESI): Calcd for C\textsubscript{13}H\textsubscript{9}ClNS\textsuperscript{+} [M+H]\textsuperscript{+} 246.0139, found 246.0135.

2-(3-bromophenyl)benzo[d]thiazole (5i)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=50:1 as the eluent) to give 5i (79\% yield) as a white solid. Mp 100 °C. \textsuperscript{1}H NMR (400 MHz, CDCl\textsubscript{3}): \(\delta\) 8.25 (t, J = 1.7 Hz, 1H), 8.06 (d, J = 8.1 Hz, 1H), 7.95
(d, $J = 7.8$, Hz, 1H), 7.87 (d, $J = 7.7$ Hz, 1H), 7.58 (ddd, $J = 8.0$, 1.7, 0.8 Hz, 1H), 7.50-7.46 (m, 1H), 7.40 (m, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 165.0, 152.9, 134.4, 134.0, 132.7, 129.4, 129.2, 125.5, 125.1, 124.5, 122.4, 122.1, 120.6. HRMS (ESI): Calcd for C$_{13}$H$_9$BrNS$^+ [M+H]^+$ 289.9634, found 289.9627.

4-(benzo[d]thiazol-2-yl)benzonitrile (5j)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=30:1 as the eluent) to give 5j (54% yield) as a white solid. $^1$H NMR $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 9.01 (s, 1H), 8.21 (d, $J = 8.4$ Hz, 1H), 8.15 (d, $J = 8.2$ Hz, 1H), 8.12 (d, $J = 8.2$ Hz, 1H), 7.99-7.94 (m, 1H), 7.79 (d, $J = 8.4$ Hz, 1H), 7.56-7.51 (m, 1H), 7.45 (t, $J = 7.5$ Hz, 1H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 153.9, 132.8, 127.9, 126.9, 126.2, 126.1, 125.6, 123.8, 123.7, 121.9, 121.8. HR-MS (ESI): Calcd for C$_{14}$H$_9$N$_2$S$^+ [M+H]^+$ requires 237.0481; found 237.0485.

2-(6-methoxynaphthalen-2-yl)benzo[d]thiazole (5k)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=30:1 as the eluent) to give 5k (94% yield) as a white solid. $^1$H NMR (400 MHz, DMSO-$d_6$): $\delta$ 8.61 (s, 1H), 8.17-8.15 (m, 2H), 8.07 (d, $J = 8.5$ Hz, 2H), 7.98 (d, $J = 8.6$ Hz, 1H), 7.55 (t, $J = 7.3$ Hz, 1H), 7.46 (t, $J = 7.7$ Hz, 1H), 7.42 (s, 1H), 7.27 (dd, $J = 8.9$, 1.6 Hz, 1H), 3.91 (s, 3H). $^{13}$C NMR (100 MHz, DMSO-$d_6$): $\delta$ 167.5, 158.8, 153.7, 135.8, 134.4, 130.5, 128.2, 128.1, 127.8, 127.2, 126.6, 125.4, 124.5, 122.7, 122.3, 119.7, 106.2, 55.4. HRMS (ESI): Calcd for C$_{18}$H$_{14}$NOS$^+ [M+H]^+$ 292.0791, found 292.0789.
2-(naphthalen-2-yl)benzo[d]thiazole (5l)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=30:1 as the eluent) to give 5l (87% yield) as a white solid. Mp 126 °C. 

$^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.55 (s, 1H), 8.20 (dd, $J = 8.5, 1.6$ Hz, 1H), 8.11 (d, $J = 8.1$ Hz, 1H), 7.96-7.85 (m, 4H), 7.54-7.48 (m, 3H), 7.38 (t, $J = 7.3$ Hz, 1H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 167.1, 153.2, 134.1, 133.6, 132.1, 129.9, 127.8, 127.8, 126.8, 126.5, 126.4, 125.8, 125.3, 124.2, 123.4, 122.2, 120.6. HRMS (ESI): Calcd for C$_{17}$H$_{12}$NS$^+$ [M+H]$^+$ 262.0685, found 262.0684.

2-(thiophen-2-yl)benzo[d]thiazole (5m)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=40:1 as the eluent) to give 5m (75% yield) as a white solid. Mp 99 °C. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 8.02 (d, $J = 8.2$ Hz, 1H), 7.83 (d, $J = 7.9$ Hz, 1H), 7.64 (d, $J = 3.7$ Hz, 1H), 7.47 (dd, $J = 13.4, 5.1$ Hz, 2H), 7.35 (t, $J = 7.9$ Hz, 1H), 7.13-7.11 (m, 1H). $^{13}$C NMR (100 MHz, CDCl$_3$): $\delta$ 161.4, 153.7, 137.4, 134.7, 129.3, 128.6, 128.0, 126.4, 125.2, 123.0, 121.5. HRMS (ESI): Calcd for C$_{11}$H$_8$NS$_2$$^+$ [M+H]$^+$ 218.0093, found 218.0089

2-isopropylbenzo[d]thiazole (5n)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=40:1 as the eluent) to give 5n (90% yield) as a colorless oil. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 7.98 (d, $J = 8.1$ Hz, 1H), 7.83 (d, $J = 8.0$ Hz, 1H), 7.44 (t, $J = 7.4$ Hz, 1H), 7.32 (t, $J = 7.4$ Hz, 1H), 3.47-3.36 (m, 1H), 1.48 (d, $J = 6.9$ Hz, 6H). $^{13}$C NMR (100
MHz, CDCl$_3$): $\delta$ 178.6, 153.2, 134.7, 125.8, 124.6, 122.6, 121.6, 34.1, 22.9. HRMS (ESI): Calcd for C$_{10}$H$_{12}$NS$^+ [M+H]^+$ 178.0685, found 178.0685

2-cyclohexylbenzo[d]thiazole (5o)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=30:1 as the eluent) to give 5o (91% yield) as a colorless oil. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 7.97 (d, $J = 8.1$ Hz, 1H), 7.83 (d, $J = 7.9$ Hz, 1H), 7.43 (td, $J = 8.0$, 0.64 Hz, 1H), 7.31 (t, $J = 7.9$ Hz, 1H), 3.10 (tt, $J = 11.6$, 3.4 Hz, 1H), 2.19 (d, $J = 11.8$ Hz, 2H), 1.89 (dt, $J = 13$, 2.9 Hz, 2H), 1.77-1.74 (m, 1H), 1.64 (qd, $J = 12.36$, 2.9 Hz, 2H) 1.44 (qt, $J = 12.8$, 3.2 Hz, 2H), 1.31 (qt, $J = 12.4$, 2.8 Hz, 1H) $^{13}$C NMR (400 MHz, CDCl$_3$): $\delta$ 177.6, 153.1, 134.6, 125.8, 124.5, 122.6, 121.6, 43.5, 33.4, 26.1, 25.8. HRMS (ESI): Calcd for C$_{14}$H$_{18}$NS$^+ [M+H]^+$ 218.0998, found 218.0998.

2-benzylbenzo[d]thiazole (5p)

Following the general procedure B, the crude product was purified by silica gel flash chromatography (PE: EA=30:1 as the eluent) to give 5p (84% yield) as a colorless oil. $^1$H NMR (400 MHz, CDCl$_3$): $\delta$ 7.99 (d, $J = 8.16$ Hz, 1H), 7.76 (d, $J = 7.96$ Hz, 1H), 7.43 (t, $J = 7.6$ Hz, 1H), 7.37-7.27 (m, 6H), 7.42 (s, 2H). $^{13}$C NMR (400 MHz, CDCl$_3$): $\delta$ 171.2, 153.3, 137.2, 135.7, 129.2, 128.9, 127.4, 126.0, 124.8, 122.8, 121. 6, 40.7. HRMS (ESI): Calcd for C$_{14}$H$_{12}$NOS$^+ [M+H]^+$ 226.0685, found 226.0686.
III. Scale-up Synthesis and Synthetic Applications

a) Scale-up Synthesis

\[
\text{HS} \quad \text{OEt} \quad \text{NH}_2 \quad \text{HCl} \quad \xrightarrow{\text{I}_2/\text{TBHP}, \text{K}_2\text{CO}_3, \text{1,4-dioxane}, 12 \text{ h}, \text{N}_2} \quad \text{Ph} \quad \text{H} \quad \text{N} \quad \text{COOEt} \\
1a \quad \text{2a (1 mmol)} \quad \xrightarrow{4 \text{ Å MS, 70° C}} \quad 3a \quad \text{Yield 85%, 0.20g}
\]

\[
\text{O} \quad \text{H} \quad \text{Ph} \quad \text{COOEt} \quad \text{SH} \quad \text{NH}_2 \quad \text{Ph} \quad \text{I}_2 \quad \text{DTBP}, \text{K}_2\text{CO}_3 \quad \text{DMF, 4 Å MS} \quad \text{Ph} \quad \text{N} \quad \text{COOEt} \\
4a \quad \text{5a (1 mmol)} \quad \xrightarrow{120 \text{° C}, 12 \text{ h}} \quad 5a \quad \text{Yield 98%, 0.21g}
\]

A mixture of L-cysteine ethyl ester hydrochloride (4 mmol, 0.743 g, 4.0 equiv.), benzaldehyde (1 mmol, 0.106 g, 1.0 equiv.), potassium carbonate (Na\textsubscript{2}CO\textsubscript{3}, 3 mmol, 0.414 g, 3.0 equiv.), iodine (I\textsubscript{2}, 0.3 mmol, 0.076 g, 0.3 equiv.), and molecular sieve (MS, 2 g) in 5 mL 1,4-dioxane in a schlenk tube, tert-butyl hydroperoxide (TBHP, 70% in cyclohexane, 4 mmol, 0.5145 g, 4 equiv.) was added slowly to the mixture at room temperature under nitrogen atmosphere, then the mixture was stirred at 70 °C for 12 hours. The resultant solution was quenched with saturated sodium thiosulfate (4 mL) and extracted with ethyl acetate (3×30 mL), the organic phase was combined and washed with brine (3×30 mL), dried over anhydrous sodium sulfate, filtered and concentrated in vacuo. The crude product was purified by silica gel flash chromatography (PE: EA=25:1 as the eluent) to give 3a (85% yield) as a yellow oil.

A mixture of 2-aminothiophenol (4 mmol, 0.54 g, 4.0 equiv.), benzaldehyde (1 mmol, 0.053 g, 1.0 equiv.), potassium carbonate (K\textsubscript{2}CO\textsubscript{3}, 3 mmol, 0.414 g, 3.0 equiv.), iodine (0.3 mmol, 0.076 g, 0.3 equiv.), and molecular sieve (2 g) in 1 mL N, N-dimethylformamide (DMF) in a pressure bottle, di-t-butyl peroxide (DTBP, 4 mmol, 0.5845 g, 4 equiv.) was added slowly to the mixture at room temperature, then the mixture was stirred at 120 °C for 12 hours. The resultant solution was quenched with saturated sodium thiosulfate (4 mL) and extracted with ethyl acetate (3×30 mL), the organic phase was combined and washed with brine (3×30 mL), dried over anhydrous sodium sulfate, filtered and concentrated in vacuo. The crude product was further purified by silica gel flash chromatography (petroleum ether (PE) and ethyl acetate...
(EA) as the eluent). The crude product was purified by silica gel flash chromatography (PE: EA=40:1 as the eluent) to give 5a (98% yield) as a purple solid.

b) Synthetic Applications

\[
\begin{align*}
\text{EtO} & \quad \text{NaOH, MeOH/H}_2\text{O} & \quad \text{r.t. 5 h} & \quad \text{HO} \\
\text{3a} & \quad \text{6, Yield 80%} \\
\end{align*}
\]

To a solution of 3a (0.2 mmol, 47 mg, 1 equiv.) in methanol (0.5 mL), sodium hydroxide solution (2 mol/L, 0.2 ml, 2 equiv.) was added at room temperature. The mixture was kept stirring for 5 h. The methanol was removed in vacuo. The resultant mixture was adjusted to pH=5-6 with hydrochloric acid solution (1 mol/L). The solid was filtered and dried to give the product 6 (80%) as a yellow solid. $^1$H NMR (400 MHz, DMSO) $\delta$ 13.16 (s, 1H), 8.51 (s, 1H), 8.02-7.96 (m, 2H), 7.59-7.51 (m, 3H). $^{13}$C NMR (100 MHz, DMSO-$d_6$) $\delta$ 167.88, 162.56, 148.67, 132.97, 131.23, 129.81, 129.23, 126.87. For characterization data, also see: S. N. Thore, S. V. Gupta and K. G. Baheti, Med. Chem. Res., 2013, 22, 3802.

\[
\begin{align*}
\text{EtO} & \quad \text{NH}_2\text{NH}_2\text{·H}_2\text{O, ethanol reflux overnight} & \quad \text{H}_2\text{NH} & \quad \text{7, Yield 76%} \\
\text{3a} & \quad \text{7, Yild 76%} \\
\end{align*}
\]

To a solution of 3a (0.5 mmol, 117 mg, 1 equiv.) in ethanol (2 mL), hydrazine hydrate ($\text{NH}_2\text{NH}_2\cdot\text{H}_2\text{O}$, 1.5 mmol, 89 mg, 3 equiv.) was added at room temperature. The mixture was refluxed overnight. The solvent was removed in vacuo, and the crude solid was recrystallized from dichloromethane/ethanol (4:1) to give the product 7 (76%) as a pale yellow solid. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.55 (s, 1H), 8.14 (s, 1H), 7.99-7.94 (m, 2H), 7.58-7.45 (m, 3H), 4.14 (s, 2H). $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 168.65, 161.83, 149.04, 132.72, 130.77, 129.12, 126.64, 123.13.
To a solution of 3a (1 mmol, 0.23 g, 1 equiv.) in acetonitrile (3 mL), N-bromosuccinimide was added (NBS, 2 mmol, 0.36g, 2 equiv.) at room temperature. The mixture was refluxed for 8 h. The reaction was quenched with saturated sodium bicarbonate solution and extracted with ethyl acetate, dried over sodium sulfate, filtered and concentrated in vacuo. The crude product was purified by silica gel flash chromatography (PE:EA=30:1 as the eluent) to give product 8 (79%) as a yellow oil. 

\[ ^1H \text{ NMR (400 MHz, CDCl}_3) \delta 7.90-7.96 (m, 2H), 7.53-7.45 (m, 3H), 4.49 (q, J = 7.1 Hz, 2H), 1.47 (t, J = 7.1 Hz, 3H). \]

\[ ^13C \text{ NMR (100 MHz, CDCl}_3) \delta 167.88, 161.13, 144.38, 132.29, 131.08, 129.10, 126.68, 116.35, 61.83, 14.32. \]

Lithium aluminium hydride (0.2 mmol, 77 mg, 1 equiv.) was dissolved in minimum amount of THF in a schlenk tube and cooled to 0 °C under N\textsubscript{2} atmosphere. To this was added drop-wise a solution of 3a (0.14 mmol, 0.032g, 1.4 equiv.) in THF and stirred the reaction mixture for an hour. After completion of reaction, the reaction mixture was quenched with 10% sodium carbonate solution at 0 °C and extracted with ethyl acetate. Organic layers were collected, dried over sodium sulphate and concentrated. The crude product was purified by silica gel flash chromatography (PE:EA=2:1 as the eluent) to give product 9 (72%) as a colorless oil. 

\[ ^1H \text{ NMR (400 MHz, CDCl}_3) \delta 7.93-7.91 (m, 2H), 7.43-7.41 (m, 3H), 7.17 (s, 1H), 4.82 (s, 1H), 2.90 (br, 1H). \]

\[ ^13C \text{ NMR (100 MHz, CDCl}_3) \delta 168.9, 157.3, 133.5, 130.2, 129.0, 126.6, 114.6, 61.2. \]

IV. Mechanistic Experiments
A mixture of L-cysteine ethyl ester hydrochloride (1a, 0.8 mmol, 0.1486 g, 4.0 equiv.), benzaldehyde (0.2 mmol, 0.0212 g, 1.0 equiv.), potassium carbonate (Na₂CO₃, 0.6 mmol, 0.0828 g, 3.0 equiv.) in 1 mL 1,4-dioxane in a schlenk tube under nitrogen atmosphere, then the mixture was stirred at 70 °C for 1.5 hours. The resultant solution was extracted with ethyl acetate (3×30 mL), the organic phase was combined and washed with brine (3×30 mL), dried over anhydrous sodium sulfate, filtered and concentrated in vacuo. The crude product was purified by silica gel flash chromatography (PE:EA=10:1 as the eluent) to give product C (99%) as a yellow oil. For characterization data of compound C, see: C. Saiz, P. Wiof, E. Manta and G. Mahler, *Org. Lett.*, 2009, *11*, 3170.
V. Spectrum