Supporting Information For

Copper(I)-Catalyzed Tandem Synthesis of 4,5-Functionalized Oxazoles from Isocyanoacetate and Aldehydes

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1. Supplementary Methods

All reactions were carried out under an atmosphere of dry oxygen. Anhydrous DMF was purchased from J&K and used as solvent without further purification. Unless otherwise stated, reagents were commercially available and used as purchased. Chemicals were obtained from Sigma-Aldrich, Acros, Innochem, Energy Chemical, TCI China or Alfa Aesar. The progress of the reactions was monitored by thin-layer chromatography using TLC plates and visualized by short-wave ultraviolet light. Flash chromatography was performed with Qingdao Haiyang flash silica gel (200–300 mesh). The NMR spectra were obtained using a Brüker 400 MHz Fourier-transform NMR spectrometer. Chemical shifts were reported in units of parts per million (ppm) downfield from tetramethylsilane (TMS), and all coupling constants were reported in hertz. High resolution mass spectrometry (HRMS) data were obtained on a Waters LC-TOF mass spectrometer (Xevo G2-XS QTof) using electrospray ionization (ESI) in positive or negative mode. Melting points were measured using a WRS-1C Melt-Temp apparatus and were uncorrected.

2. General procedure for the cyclization.

\[
\begin{align*}
\text{CHO} & \quad \text{CN}\text{CO}_2\text{C}_2\text{H}_5 \\
1 \ (1 \text{ mmol}) & \quad 2 \ (1 \text{ mmol}) \\
\text{CuBr} \ (0.25 \text{ mmol}) & \quad \text{DABCO} \ (0.5 \text{ mmol}) \\
\text{O}_2 \ (\text{balloon}) & \quad \text{dry DMF, 50 }^\circ\text{C, 12 h} \\
\text{3a} \ (80\%, 173.8 \text{ mg}) & \quad \\
\end{align*}
\]

Benzaldehyde (106.1 mg, 1 mmol, 1 equiv), DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanooacetate (113.1 mg, 1 mmol, 1 equiv) was added in 50 mL glass tube with rubber stopper. A vacuum pump fitted with a hose and a needle was pierced through the rubber stopper and the glass tube subjected to vacuum and refilled with a balloon of O\textsubscript{2} fitted onto a hose and secured to a needle. This process was repeated two more times to remove as much air as possible. Next, the reaction glass tube was placed in an oil bath at 50 °C with stirring for 12 h. The resulting dark brown solution was removed from the oil bath, cooled to rt, quenched by addition of 5 drops water through the rubber stopper via syringe, and then the glass tube opened to air. After, the reaction mixture was quenched with water (10 mL) and extracted with EtOAc (10 mL × 3). The combined organic layer was dried with anhydrous Na\textsubscript{2}SO\textsubscript{4} and then filtered. The solvent was removed by rotary evaporator. The crude product was purified over a column of silica gel (eluant: EA:PE = 1:4) to afford the desired product 3a with 80%
yield (173.8 mg).

Compounds 3b-3z were synthesized according to the above procedure.

3. Spectral data

_Ethyl 5-phenyloxazole-4-carboxylate (3a)_

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), benzaldehyde (1a) (106.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (173.8 mg, 80% yield) as a light yellow liquid. R_f = 0.45 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data[1].

_Ethyl 5-(o-tolyl)oxazole-4-carboxylate (3b)_

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 2-methylbenzaldehyde (1b) (120.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (106.4 mg, 46% yield) as a light yellow liquid. R_f = 0.47 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data[1].

_Ethyl 5-(m-tolyl)oxazole-4-carboxylate (3c)_

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), m-tolualdehyde (1c) (120.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (127.2 mg, 55% yield) as a light yellow liquid. R_f = 0.47 (petroleum ether:EtOAc = 4:1). 1H NMR (400 MHz, CDCl₃): δ 7.89(s, 1H), 7.86(d, J = 6.2 Hz, 2H), 7.38-7.34(m, 1H), 7.28(s, 1H), 4.41(q, J =
7.1 Hz, 2H), 2.42 (s, 3H), 1.40 (t, J = 7.1 Hz, 3H). $^{13}$C NMR (101 MHz, CDCl$_3$): δ 161.94, 155.70, 148.96, 138.11, 131.28, 128.98, 128.32, 126.63, 126.51, 125.71, 61.38, 21.45, 14.25. HRMS (ESI): calcd for C$_{13}$H$_{16}$NO$_3$ [M+H]$^+$ 232.0974, found 232.0981.

**Ethyl 5-(p-tolyl)oxazole-4-carboxylate (3d)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), p-tolualdehyde (1d) (120.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O$_2$. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (141.1 mg, 61% yield) as a white solid. m.p. 84-85°C (EtOAc). $R_f = 0.50$ (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data.$^{[1]}$

**Ethyl 5-(4-ethyphenyl)oxazole-4-carboxylate (3e)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 4-ethylbenzaldehyde (1e) (134.2 mg, 1 mmol, 1 equiv) under a balloon pressure of O$_2$. The crude product was purified by flash chromatography on silica gel (eluted with Petroleum ether:EtOAc = 4:1) to give the product (142.3 mg, 58% yield) as a white solid, m.p. 39-40°C (EtOAc). $R_f = 0.50$ (petroleum ether:EtOAc = 4:1). $^1$H NMR (400 MHz, CDCl$_3$): δ 7.99 (d, J = 8.3 Hz, 2H), 7.88 (s, 1H), 7.31 (d, J = 8.3 Hz, 2H), 4.42 (q, J = 7.1 Hz, 2H), 2.71 (q, J = 7.6 Hz, 2H), 1.41 (t, J = 7.1 Hz, 3H), 1.26 (d, J = 7.6 Hz, 3H). $^{13}$C NMR (101 MHz, CDCl$_3$): δ 162.02, 155.85, 148.70, 147.11, 128.49, 127.94, 126.07, 124.09, 61.32, 28.82, 15.25, 14.24. HRMS (ESI): calcd for C$_{14}$H$_{16}$NO$_3$ [M+H]$^+$ 246.1130, found 246.1137.
**Ethyl 5-(4-methoxyphenyl)oxazole-4-carboxylate (3f)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), p-methoxybenzaldehyde (1f) (136.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (160.7 mg, 65% yield) as a white solid, m.p. 68-69 °C (EtOAc). R₇ = 0.45 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data[1].

**Ethyl 5-(4-chlorophenyl)oxazole-4-carboxylate (3g)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 4-chlorobenzaldehyde (1g) (140.6 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (208.9 mg, 83% yield) as a white solid, m.p. 101-103 °C (EtOAc). R₇ = 0.50 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data[1].

**Ethyl 5-(2-chlorophenyl)oxazole-4-carboxylate (3h)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 2-chlorobenzaldehyde (1h) (140.6 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (153.5 mg, 61% yield) as a light yellow liquid. R₇ = 0.49 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data[1].
**Ethyl 5-(2,4-dichlorophenyl)oxazole-4-carboxylate (3i)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 2,4-dichlorobenzaldehyde (1i) (175.0 mg, 1 mmol, 1 equiv) under a balloon pressure of O\(_2\). The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (203.1 mg, 71% yield) as a white solid, m.p. 103-104 °C (EtOAc). R\(_f\) = 0.47 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data\(^2\).

**Ethyl 5-(4-fluorophenyl)oxazole-4-carboxylate (3j)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), p-fluorobenzaldehyde (1j) (124.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O\(_2\). The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (183.5 mg, 78% yield) as a light yellow solid, m.p. 45-46 °C (EtOAc). R\(_f\) = 0.49 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data\(^3\).

**Ethyl 5-(2-fluorophenyl)oxazole-4-carboxylate (3k)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 2-fluorobenzaldehyde (1k) (124.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O\(_2\). The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (148.2 mg, 63% yield) as a light yellow liquid. R\(_f\) = 0.50 (petroleum ether:EtOAc = 4:1).\(^1\)H NMR (400 MHz, CDCl\(_3\)): \(\delta\) 7.98 (s, 1H), 7.67-7.63 (m, 1H), 7.52-7.46 (m, 1H), 7.28 (d, \(J = 5.0\) Hz, 1H), 7.19 (t, \(J = 9.2\) Hz, 1H), 4.35 (q, \(J = 7.1\) Hz, 2H), 1.31 (t, \(J = 7.1\) Hz, 3H).\(^13\)C NMR (101 MHz, CDCl\(_3\)): \(\delta\) 161.24, 159.90 (d, \(J_{CF} = 253.9\) Hz), 150.26, 131.26, 131.25, 129.18, 123.92, 123.89, 116.05 (d, \(J_{CF} = 21.5\) Hz), 115.38 (d, \(J_{CF} = 13.7\) Hz), 61.31, 14.03.\(^19\)F NMR (376 MHz, CDCl\(_3\)) \(\delta\) -110.93.
HRMS (ESI): calcd for C_{12}H_{11}FNO_3 [M+H]^+ 236.0723, found 236.0716.

**Ethyl 5-(4-bromophenyl)oxazole-4-carboxylate (3l)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanatoacetate (113.1 mg, 1 mmol, 1 equiv), 4-bromobenzaldehyde (1l) (185.0 mg, 1 mmol, 1 equiv) under a balloon pressure of O_2. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (219.1 mg, 74% yield) as a white solid, m.p. 110-111°C (EtOAc). R_f = 0.51 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data^1.

**Ethyl 5-(3-nitrophenyl)oxazole-4-carboxylate (3m)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanatoacetate (113.1 mg, 1 mmol, 1 equiv), 3-nitrobenzaldehyde (1m) (151.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O_2. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (152.1 mg, 58% yield) as a white solid, m.p. 87-89°C (EtOAc). R_f = 0.50 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data^2.

**Ethyl 5-(4-nitrophenyl)oxazole-4-carboxylate (3n)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanatoacetate (113.1 mg, 1 mmol, 1 equiv), 4-nitrobenzaldehyde (1n) (151.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O_2. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (159.9 mg, 61% yield) as a Light yellow solid, m.p.119-120°C (EtOAc). R_f = 0.51 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data^3.
**Ethyl 5-(4-cyanophenyl)oxazole-4-carboxylate (3o)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 4-cyanobenzaldehyde (1o) (131.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (186.5 mg, 77% yield) as a white solid, m.p. 146-147°C (EtOAc). Rf = 0.52 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data[4].

**Ethyl 5-(4-(trifluoromethyl)phenyl)oxazole-4-carboxylate (3p)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 4-(trifluoromethyl)benzaldehyde (1p) (174.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (188.2 mg, 66% yield) as a light yellow solid, m.p. 99-100°C (EtOAc). Rf = 0.55 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data[1].

**2-(4-(Ethoxycarbonyl)oxazol-5-yl)benzoic acid (3q)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 2-carboxybenzaldehyde (1q) (150.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 1:1) to give the product (175.0 mg, 67% yield) as a white solid. m.p.150-151°C (EtOAc). Rf = 0.51 (petroleum ether:EtOAc = 1:1). ¹H NMR (400 MHz, CDCl₃): δ 9.51 (s, 1H), 8.43 (d, J = 8.0 Hz, 1H), 7.73-7.62 (m, 2H), 7.62-7.54 (m, 1H), 7.35 (s, 1H), 4.43 (q, J = 7.1 Hz, 2H), 1.42 (t, J = 7.1 Hz, 3H). ¹³C NMR (101 MHz, CDCl₃): δ
161.84, 161.63, 135.95, 132.92, 129.19, 128.16, 128.03, 127.79, 111.07, 62.46, 14.14, two resonance were not observed due to overlapping resonances. HRMS (ESI): calcd for C_{13}H_{12}NO_{5} [M+H]^+ 262.0715, found 262.0713.

**Ethyl 5-(naphthalen-2-yl)oxazole-4-carboxylate (3r)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanacetate (113.1 mg, 1 mmol, 1 equiv), 2-naphthaldehyde (1r) (156.2 mg, 1 mmol, 1 equiv) under a balloon pressure of O$_2$. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (195.1 mg, 73% yield) as a white solid, m.p.94–96°C (EtOAc). R$_f$ = 0.53 (petroleum ether:EtOAc = 4:1). The spectroscopic data for this product match the literature data$^{[1]}$.

**Ethyl 5-((1,1'-biphenyl)-4-yl)oxazole-4-carboxylate (3s)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanacetate (113.1 mg, 1 mmol, 1 equiv), 4-biphenylcarboxaldehyde (1s) (182.2 mg, 1 mmol, 1 equiv) under a balloon pressure of O$_2$. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (164.2 mg, 56% yield) as a white solid, m.p.91-92°C (EtOAc). R$_f$ = 0.49 (petroleum ether:EtOAc = 4:1). $^1$H NMR (400 MHz, CDCl$_3$): δ 8.18 (d, $J$ = 8.4 Hz, 2H), 7.93 (s, 1H), 7.71 (d, $J$ = 8.4 Hz, 2H), 7.64 (d, $J$ = 7.4 Hz, 2H), 7.47 (t, $J$ = 7.4 Hz, 2H), 7.39 (t, $J$ = 7.3 Hz, 1H), 4.45 (q, $J$ = 7.1 Hz, 2H), 1.43 (t, $J$ = 7.1 Hz, 3H). $^{13}$C NMR (101 MHz, CDCl$_3$): δ 162.00, 155.35, 148.94, 143.13, 140.03, 128.88, 128.85, 127.92, 127.09, 127.04, 126.62, 125.50, 61.45, 14.25. HRMS (ESI): calcd for C$_{18}$H$_{16}$NO$_3$ [M+H]^+ 294.1130, found 294.1126.

**Ethyl 5-(quinolin-4-yl)oxazole-4-carboxylate (3t)**
The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 4-quinolinecarboxaldehyde (1t) (157.2 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtoAc = 4:1) to give the product (169.0 mg, 63% yield) as a light yellow liquid. 

\[ \text{RF} = 0.43 \text{ (petroleum ether:EtoAc = 4:1)} \]

$^1$H NMR (400 MHz, CDCl₃): \[ \delta 9.02 (d, J = 4.4 \text{ Hz}, 1H), 8.19 (d, J = 8.5 \text{ Hz}, 1H), 8.12 (s, 1H), 7.79-7.68 (m, 2H), 7.62 (d, J = 4.4 \text{ Hz}, 1H), 7.58-7.52 (m, 1H), 4.22 (q, J = 7.1 \text{ Hz}, 2H), 1.10 (t, J = 7.1 \text{ Hz}, 3H). \]

$^{13}$C NMR (101 MHz, CDCl₃): \[ \delta 160.71, 152.01, 150.86, 149.31, 148.35, 132.68, 130.41, 130.03, 129.81, 127.49, 125.54, 124.89, 122.90, 61.40, 13.73. \]

HRMS (ESI): calcd for C₁₅H₁₃N₂O₃ [M+H]^+ 269.0926, found 269.0929

**Ethyl 5-(thiophen-2-yl)oxazole-4-carboxylate (3u)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 2-thiophenecarboxaldehyde (1u) (112.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtoAc = 3:1) to give the product (122.8 mg, 55% yield) as a light yellow liquid. 

\[ \text{RF} = 0.51 \text{ (petroleum ether:EtoAc = 3:1)} \]

The spectroscopic data for this product match the literature data\[^{[1]}\].

**Ethyl 5-(furan-2-yl)oxazole-4-carboxylate (3v)**

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 2-furaldehyde (1v) (96.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtoAc = 3:1) to give the product (64.2 mg, 31% yield) as a white solid, m.p. 90-91°C (EtOAc). 

\[ \text{RF} = 0.50 \text{ (petroleum ether:EtoAc = 3:1)} \]

The spectroscopic data for this product match the literature data\[^{[2]}\].
Ethyl 5-(thiazol-2-yl)oxazole-4-carboxylate (3w)

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanocetate (113.1 mg, 1 mmol, 1 equiv), 2-thiazolecarbaldehyde (1w) (113.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 4:1) to give the product (139.0 mg, 62% yield) as a white solid, m.p.171-172°C (EtOAc). R_f = 0.47 (petroleum ether:EtOAc = 4:1). ¹H NMR (400 MHz, CDCl₃): δ 8.05 (d, J = 3.0 Hz, 1H), 7.99 (s, 1H), 7.62 (d, J = 3.0 Hz, 1H), 4.49 (q, J = 7.1 Hz, 2H), 1.45 (t, J = 7.1 Hz, 3H). ¹³C NMR (101 MHz, CDCl₃): δ 161.54, 152.64, 149.92, 149.61, 143.92, 128.29, 123.11, 61.96, 14.23. HRMS (ESI): calcd for C₉H₉N₂O₃S [M+H]^+ 225.0334, found 225.0335.

Ethyl 5-(1H-pyrrol-2-yl)oxazole-4-carboxylate (3x)

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanocetate (113.1 mg, 1 mmol, 1 equiv), 2-pyrrocarbaldehyde (1x) (95.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 3:1) to give the product (92.8 mg, 45% yield) as a light yellow liquid. R_f = 0.42 (petroleum ether:EtOAc = 3:1). ¹H NMR (400 MHz, CDCl₃): δ 8.82 (s, 1H), 8.20 (s, 1H), 7.51 (d, J = 2.5 Hz, 1H), 7.01 – 6.91 (m, 1H), 6.74 (d, J = 3.8 Hz, 1H), 4.42 (q, J = 7.1 Hz, 2H), 1.41 (t, J = 7.1 Hz, 3H). ¹³C NMR (101 MHz, CDCl₃): δ 165.08, 137.76, 130.58, 130.53, 117.78, 117.73, 113.35, 105.05, 61.41, 14.36. HRMS (ESI): calcd for C₁₀H₁₁N₂O₃ [M+H]^+ 207.0770, found 207.0774.

Ethyl 5-(pyridin-3-yl)oxazole-4-carboxylate (3y)

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanocetate (113.1 mg, 1 mmol, 1 equiv), 3-pyridinecarboxaldehyde (1y)
(107.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 3:1) to give the product (100.4 mg, 46% yield) as a white solid, m.p. 66-67°C (EtOAc). Rᵢ = 0.45 (petroleum ether:EtOAc = 3:1). The spectroscopic data for this product match the literature data[^5].

*Ethyl 5-(pyridin-4-yl)oxazole-4-carboxylate (3z)*

The reaction was performed following the General Procedure with DABCO (56.1 mg, 0.5 mmol, 0.5 equiv), CuBr (35.9 mg, 0.25 mmol, 0.25 equiv), dry DMF (2 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv), 4-pyridinecarboxaldehyde (1z) (107.1 mg, 1 mmol, 1 equiv) under a balloon pressure of O₂. The crude product was purified by flash chromatography on silica gel (eluted with petroleum ether:EtOAc = 3:1) to give the product (91.6 mg, 42% yield) as a white solid, m.p. 46-47°C (EtOAc). Rᵢ = 0.46 (petroleum ether:EtOAc = 3:1). The spectroscopic data for this product match the literature data[^5].
4. NMR spectra for 3

Ethyl 5-phenyloxazole-4-carboxylate (3a)

Supplementary Figure 1. $^1$H (400 MHz) and $^{13}$C (1H) (101 MHz) NMR Spectrum of 3a in CDCl$_3$
Supplementary Figure 2. $^1$H (400 MHz) and $^{13}$C {1H} (101 MHz) NMR Spectrum of 3b in CDCl$_3$
Supplementary Figure 3. $^1$H (400 MHz) and $^{13}$C {$^1$H} (101 MHz) NMR Spectrum of 3c in CDCl$_3$
Ethyl 5-(p-tolyl)oxazole-4-carboxylate (3d)

Supplementary Figure 4. $^1$H (400 MHz) and $^{13}$C {1H} (101 MHz) NMR Spectrum of 3d in CDCl$_3$
Ethyl 5-(4-ethylphenyl)oxazole-4-carboxylate (3e)

Supplementary Figure 5. $^1$H (400 MHz) and $^{13}$C (1H) (101 MHz) NMR Spectrum of 3e in CDCl$_3$
Ethyl 5-(4-methoxyphenyl)oxazole-4-carboxylate (3f)

Supplementary Figure 6. $^1$H (400 MHz) and $^{13}$C (1H) (101 MHz) NMR Spectrum of 3f in CDCl$_3$
Supplementary Figure 7. $^1$H (400 MHz) and $^{13}$C ($^1$H) (101 MHz) NMR Spectrum of 3g in CDCl$_3$
Supplementary Figure 8. $^1$H (400 MHz) and $^{13}$C {$^1$H} (101 MHz) NMR Spectrum of 3h in CDCl$_3$
Supplementary Figure 9. \(^1\)H (400 MHz) and \(^{13}\)C (1H) (101 MHz) NMR Spectrum of 3i in CDCl\(_3\)
Ethyl 5-(4-fluorophenyl)oxazole-4-carboxylate (3j)
Supplementary Figure 10. $^1$H (400 MHz) $^{13}$C ($^1$H) (101 MHz) and $^{19}$F ($^1$H) (376 MHz) NMR Spectrum of 3j in CDCl$_3$
Ethyl 5-(2-fluorophenyl)oxazole-4-carboxylate (3k)
Supplementary Figure 11. $^1$H (400 MHz) $^{13}$C {1H} (101 MHz) and $^{19}$F {1H} (376 MHz) NMR Spectrum of 3k in CDCl$_3$
**Supplementary Figure 12.** $^1$H (400 MHz) and $^{13}$C {$^1$H} (101 MHz) NMR Spectrum of 3l in CDCl$_3$
Supplementary Figure 13. $^1$H (400 MHz) and $^{13}$C {$^1$H} (101 MHz) NMR Spectrum of 3m in CDCl$_3$
Supplementary Figure 14. $^1$H (400 MHz) and $^{13}$C {1H} (101 MHz) NMR Spectrum of 3n in CDCl$_3$
Ethyl 5-(4-cyanophenyl)oxazole-4-carboxylate (3o)

Supplementary Figure 15. $^1$H (400 MHz) and $^{13}$C ($^1$H) (101 MHz) NMR Spectrum of 3o in CDCl$_3$
Ethyl 5-(4-(trifluoromethyl)phenyl)oxazole-4-carboxylate (3p)
Supplementary Figure 16. $^1$H (400 MHz) $^{13}$C {1H} (101 MHz) and $^{19}$F {1H} (376 MHz) NMR Spectrum of 3p in CDCl$_3$
2-(4-(Ethoxycarbonyl)oxazol-5-yl)benzoic acid (3q)

Supplementary Figure 17. $^1$H (400 MHz) and $^{13}$C ($^1$H) (101 MHz) NMR Spectrum of 3q in CDCl$_3$
Supplementary Figure 18. $^1$H (400 MHz) and $^{13}$C ($^1$H) (101 MHz) NMR Spectrum of 3r in CDCl$_3$
Supplementary Figure 19. $^1$H (400 MHz) and $^{13}$C ($^1$H) (101 MHz) NMR Spectrum of 3s in CDCl$_3$
Supplementary Figure 20. $^1$H (400 MHz) and $^{13}$C {1H} (101 MHz) NMR Spectrum of 3t in CDCl$_3$
$\text{Ethyl 5-(thiophen-2-yl)oxazole-4-carboxylate (3u)}$

Supplementary Figure 21. $^1$H (400 MHz) and $^{13}$C ($^1$H) (101 MHz) NMR Spectrum of 3u in CDCl$_3$
*Ethyl 5-(furan-2-yl)oxazole-4-carboxylate (3v)*

Supplementary Figure 22. $^1$H (400 MHz) and $^{13}$C {1H} (101 MHz) NMR Spectrum of 3v in CDCl$_3$
Supplementary Figure 23. $^1$H (400 MHz) and $^{13}$C {1H} (101 MHz) NMR Spectrum of 3w in CDCl$_3$
Supplementary Figure 24. $^1$H (400 MHz) and $^{13}$C (1H) (101 MHz) NMR Spectrum of 3x in CDCl$_3$
Supplementary Figure 25. $^1$H (400 MHz) and $^{13}$C {$^1$H} (101 MHz) NMR Spectrum of 3y in CDCl$_3$
Supplementary Figure 26. $^1$H (400 MHz) and $^{13}$C {$^1$H} (101 MHz) NMR Spectrum of 3z in CDCl$_3$
5. HRMS spectra

*Ethyl 5-\{(m-tolyl)oxazole-4-carboxylate (3c)*

Supplementary Figure 27. HRMS Spectrum of 3c in MeOH

*Ethyl 5-\{(4-ethylphenyl)oxazole-4-carboxylate (3e)*

Supplementary Figure 28. HRMS Spectrum of 3e in MeOH

*Ethyl 5-\{(2-fluorophenyl)oxazole-4-carboxylate (3k)*

Supplementary Figure 29. HRMS Spectrum of 3k in MeOH
2-(4-(Ethoxycarbonyl)oxazol-5-yl)benzoic acid (3q)

Supplementary Figure 30. HRMS Spectrum of 3q in MeOH

Ethyl 5-([1,1'-biphenyl]-4-yl)oxazole-4-carboxylate (3s)

Supplementary Figure 31. HRMS Spectrum of 3s in MeOH

Ethyl 5-(quinolin-4-yl)oxazole-4-carboxylate (3t)

Supplementary Figure 32. HRMS Spectrum of 3t in MeOH
**Ethyl 5-(thiazol-2-yl)oxazole-4-carboxylate (3w)**

**Supplementary Figure 33. HRMS Spectrum of 3w in MeOH**

**Ethyl 5-(1H-pyrrol-2-yl)oxazole-4-carboxylate (3x)**

**Supplementary Figure 34. HRMS Spectrum of 3x in MeOH**
6. Synthesis of oxazoline intermediate\[^{[6]}\]

\[
\begin{align*}
\text{CHO} & \quad \text{CO}_2\text{C}_2\text{H}_5 \\
\text{Cl} & \quad \text{NC} & \quad \text{Cl} \\
1g & \quad \underbrace{\text{DIEA}}_{\text{DCM}} \quad \underbrace{\text{PPH}_3}_{\text{Cul}}
\end{align*}
\]

Into a 10 mL Schlenk tube with rubber stopper was added triphenylphosphine (26.2 mg, 0.1 mmol, 0.1 equiv), Cul (9.5 mg, 0.05 mmol, 0.05 equiv) and \(\rho\)-chlorobenzaldehyde (140.6 mg, 1 mmol, 1 equiv). A vacuum pump fitted with a hose and a needle was pierced through the rubber stopper and the Schlenk tube subjected to vacuum and refilled with a balloon of \(N_2\) fitted onto a hose and secured to a needle. This process was repeated three more times to remove as much air as possible. Then, DCM (2.0 mL), ethyl isocyanoacetate (113.1 mg, 1 mmol, 1 equiv) and DIEA (12.9 mg, 0.1 mmol, 0.1 equiv) were injected into the tube by a hypodermic syringe. The mixture was stirred at room temperature for 6 h. Then the Schlenk tube opened to air and the solvent was removed by rotary evaporator, the reaction mixture was quenched with water (10 mL) and extracted with EtOAc (10 mL×3). The combined organic layer was dried with anhydrous \(\text{Na}_2\text{SO}_4\) and then filtered. And the solvent was removed by rotary evaporator. The crude product was purified by silica gel column chromatography (eluant: EA:PE=1:4) to afford the desired product with 55% yield (139.5 mg).

7. References.