Versatile Cross-Dehydrogenative Coupling of Quinaldine with Usual Ethers
Catalyzed by Ag Using Selectfluor as Oxidant

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General information

Commercial reagents and solvents were used as received, unless otherwise stated. Organic solution was concentrated under reduced pressure on an Eyela rotary evaporator. Analytical thin layer chromatography (TLC) was performed on 0.25 mm silica gel plates (Qingdao Haiyang Chemical China), and the compounds were visualized with a UV light at 254 nm. Flash chromatography was performed on silica gel 200–300 mesh (purchased from Qingdao Haiyang Chemical China) with commercial solvents. The $^1$H and $^{13}$C NMR spectra were recorded on a Bruker AM 600 Spectrometer (600 and 150 MHz for $^1$H and $^{13}$C NMR, respectively) and are internally referenced to residual solvent signals (note: CDCl$_3$ referenced at 7.26 and 77.00 ppm in $^1$H and $^{13}$C NMR, respectively). Multiplicities were given as s (singlet), d (doublet), t (triplet), dd (double of doublet), and m (multiplets). Coupling constants were reported in Hertz (Hz). Data for $^{13}$C NMR are reported in terms of chemical shift. High-resolution mass spectrometry (HRMS) was recorded on Agilent Q-TOF spectrometer.
The spectral data of products

6-Fluoro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3a)$^{31}$

According to the general procedure, tetrahydrofuran (7.5 mL), 6-fluoro-2-methyl quinoline (161 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (15% ethyl acetate/petroleum ether) to provide the title compound as a white solid (201 mg, 87% yield). $^1$H NMR (600 MHz, CDCl$_3$) δ 8.01 (dd, $J$ = 9.1, 5.6 Hz, 1H), 7.45 - 7.39 (m, 3H), 5.42 (t, $J$ = 7.2 Hz, 1H), 4.21 (td, $J$ = 7.7, 5.7 Hz, 1H), 4.02 (dd, $J$ = 15.3, 7.2 Hz, 1H), 2.70 (s, 3H), 2.57 (dt, $J$ = 14.1, 7.7 Hz, 1H), 2.11 - 2.04 (m, 1H), 2.03 - 1.96 (m, 1H), 1.84 - 1.77 (m, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 159.71 (d, $J$ = 246.4 Hz), 158.31 (d, $J$ = 2.6 Hz), 148.69 (d, $J$ = 5.5 Hz), 144.96, 131.66 (d, $J$ = 9.1 Hz), 124.40 (d, $J$ = 9.3 Hz), 118.82 (d, $J$ = 25.3 Hz), 117.93, 106.83 (d, $J$ = 22.6 Hz), 76.73, 68.94, 33.57, 25.91, 25.31; $^{19}$F NMR (565 MHz, CDCl$_3$) δ -113.79 (dd, $J$ = 14.7, 8.6 Hz); HRMS(ESI) Calcd. for C$_{14}$H$_{15}$FNO [(M+H)$^+$] 232.1132, found 232.1132.

6-Chloro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3b)

According to the general procedure, tetrahydrofuran (7.5 mL), 6-chloro-2-methylquinoline (177 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv., and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (15% ethyl
acetate/petroleum ether) to provide the title compound as a white solid (210 mg, 85% yield). \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.93 (d, \(J = 9.0\) Hz, 1H), 7.77 (d, \(J = 2.3\) Hz, 1H), 7.55 (dd, \(J = 9.0, 2.3\) Hz, 1H), 7.41 (s, 1H), 5.42 (t, \(J = 7.3\) Hz, 1H), 4.18 (dd, \(J = 13.6, 7.6\) Hz, 1H), 4.00 (dd, \(J = 15.3, 7.2\) Hz, 1H), 2.68 (s, 3H), 2.56 (dt, \(J = 14.0, 7.7\) Hz, 1H), 2.10 - 2.02 (m, 1H), 2.01 - 1.93 (m, 1H), 1.78 (dt, \(J = 14.9, 6.9\) Hz, 1H); \(^{13}\)C NMR (151 MHz, CDCl\(_3\)) \(\delta\) 159.30, 148.46, 146.12, 131.12, 130.80, 129.65, 124.49, 122.07, 117.98, 76.47, 68.87, 33.71, 25.88, 25.32; HRMS(ESI) Calcd. for C\(_{14}\)H\(_{15}\)ClNO [(M+H)\(^+\)] 248.0837, found 248.0837.

6-Bromo-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3c)

According to the general procedure, tetrahydrofuran (7.5 mL), 6-bromo-2-methylquinoline (220 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO\(_3\) (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H\(_2\)O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (20% ethyl acetate/petroleum ether) to provide the title compound as a white solid (242 mg, 83% yield). \(^1\)H NMR (600 MHz, CDCl\(_3\)) \(\delta\) 7.97 (d, \(J = 2.1\) Hz, 1H), 7.90 (d, \(J = 8.9\) Hz, 1H), 7.72 (dd, \(J = 8.9, 2.2\) Hz, 1H), 7.44 (d, \(J = 0.8\) Hz, 1H), 5.46 (t, \(J = 7.2\) Hz, 1H), 4.22-4.19 (m, 1H), 4.03 (dd, \(J = 15.4, 7.1\) Hz, 1H), 2.71 (s, 3H), 2.60 (ddt, \(J = 12.5, 7.8, 6.3\) Hz, 1H), 2.09 (tt, \(J = 12.5, 7.2\) Hz, 1H), 2.05 - 1.97 (m, 1H), 1.81 (ddt, \(J = 12.5, 8.2, 6.8\) Hz, 1H); \(^{13}\)C NMR (151 MHz, CDCl\(_3\)) \(\delta\) 159.55, 148.46, 146.12, 131.12, 130.80, 129.65, 124.49, 122.07, 117.98, 76.47, 68.87, 33.71, 25.88, 25.32; HRMS(ESI) Calcd. for C\(_{14}\)H\(_{15}\)BrNO [(M+H)\(^+\)] 292.0332, found 292.0333.

6-Iodo-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3d)
According to the general procedure, tetrahydrofuran (7.5 mL), 6-iodo-2-methylquinoline (268 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (20% ethyl acetate/petroleum ether) to provide the title compound as a white solid (275 mg, 81% yield). ¹H NMR (600 MHz, CDCl₃) δ 8.20 (d, J = 1.7 Hz, 1H), 7.89 (dd, J = 8.8, 1.8 Hz, 1H), 7.77 (d, J = 8.8 Hz, 1H), 7.44 (s, 1H), 5.46 (t, J = 7.2 Hz, 1H), 4.21 (td, J = 7.6, 5.8 Hz, 1H), 4.03 (dd, J = 15.3, 7.2 Hz, 1H), 2.71 (s, 3H), 2.60 (dt, J = 14.0, 7.0 Hz, 1H), 2.12 - 2.08 (m, 1H), 2.04 - 1.99 (m, 1H), 1.84 - 1.79 (m, 1H); ¹³C NMR (151 MHz, CDCl₃) δ 159.74, 148.42, 146.67, 137.71, 132.09, 130.99, 125.80, 117.90, 91.11, 76.48, 68.98, 33.91, 26.00, 25.46; HRMS(ESI) Calcd. for C₁₄H₁₅INO [(M+H)+] 340.0193, found 340.0193.

2-Methyl-4-(tetrahydrofuran-2-yl)-6-(trifluoromethyl)quinoline (3e)

According to the general procedure, tetrahydrofuran (7.5 mL), 2-methyl-6-trifluoromethylquinoline (211 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (15% ethyl acetate/petroleum ether) to provide the title compound as a white solid (242 mg, 81% yield). ¹H NMR (600MHz, CDCl₃) δ 8.16 (d, J = 9.8 Hz, 1H), 8.15 (s, 1H), 7.84 (dd, J = 8.8, 1.8 Hz, 1H), 7.54 (s, 1H), 5.55 (t, J = 7.3 Hz, 1H), 4.23 (td, J = 7.7, 5.9 Hz, 1H), 4.06 (dd, J = 15.3, 7.2 Hz, 1H), 2.77 (s, 3H), 2.66 - 2.61 (m, 1H), 2.14 - 2.09 (m, 1H), 2.04 (dt, J = 12.6, 6.6 Hz, 1H), 1.86 - 1.80 (m, 1H); ¹³C NMR (151 MHz, CDCl₃) δ 161.57, 150.38, 148.75, 130.36, 127.29 (q, J = 32.4 Hz), 124.80 (q, J = 2.8 Hz), 124.11 (q, J = 272.2 Hz), 123.03, 120.97 (q, J = 4.4 Hz), 118.54, 76.53, 69.02,
According to the general procedure, tetrahydrofuran (7.5 mL), 2-methylquinoline (143 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (20% ethyl acetate/petroleum ether) to provide the title compound as a colorless oil (143 mg, 67% yield). \(^1\)H NMR (600MHz, CDCl₃) δ 8.05 (d, \(J = 8.4\) Hz, 1H), 7.84 (d, \(J = 9.0\) Hz, 1H), 7.66 (ddd, \(J = 8.3, 6.9, 1.3\) Hz, 1H), 7.49 - 7.46 (m, 1H), 7.44 (s, 1H), 5.57 (t, \(J = 7.2\) Hz, 1H), 4.22 (td, \(J = 7.6, 5.7\) Hz, 1H), 4.03 (dd, \(J = 15.4, 7.2\) Hz, 1H), 2.73 (s, 3H), 2.60 (dtd, \(J = 12.5, 7.8, 6.6\) Hz, 1H), 2.09 - 2.04 (m, 1H), 2.03 - 1.98 (m, 1H), 1.83 (ddd, \(J = 14.8, 13.1, 6.7\) Hz, 1H); \(^{13}\)C NMR (151 MHz, CDCl₃) δ 159.01, 149.38, 147.73, 129.25, 128.95, 125.47, 123.81, 122.95, 117.15, 76.72, 68.94, 33.85, 25.94, 25.43; HRMS(ESI) Calcd. for C₁₄H₁₆NO [(M+H)⁺] 214.1226, found 214.1226.

According to the general procedure, tetrahydrofuran (7.5 mL), 2,6-dimethylquinoline (157 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (25% ethyl acetate/petroleum ether) to provide the title compound as a colourless oil (130 mg, 57% yield). \(^1\)H NMR
(600MHz, CDCl₃) δ 7.94 (d, J = 8.6 Hz, 1H), 7.57 (s, 1H), 7.48 (dd, J =8.0, 1.7 Hz, 1H), 7.40 (s, 1H), 5.54 (t, J = 7.2 Hz, 1H), 4.23 - 4.20 (m, 1H), 4.03 (dd, J = 15.4, 7.2 Hz, 1H), 2.71 (s, 3H), 2.63 - 2.57 (m, 1H), 2.52 (s, 3H), 2.10 - 2.05 (m, 1H), 2.03 - 1.96 (m, 1H), 1.85-1.79 (m, 1H); ¹³C NMR (151 MHz, CDCl₃) δ 158.09, 148.74, 146.14, 135.16, 131.08, 128.99, 123.80, 121.94, 117.06, 76.67, 68.90, 33.79, 25.92, 25.27, 21.84.; HRMS(ESI) Calcd. for C₁₅H₁₈NO [(M+H)⁺] 228.1383, found 228.1385.

6-Methoxy-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3h)

According to the general procedure, tetrahydrofuran (7.5 mL), 6-methoxy-2-methyl quinoline (173 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (25% ethyl acetate/petroleum ether) to provide the title compound as a white solid (155 mg, 64% yield). ¹H NMR (600MHz, CDCl₃) δ 7.98 (d, J = 9.1 Hz, 1H), 7.40 (s, 1H), 7.34 (dd, J = 9.2, 2.7 Hz, 1H), 7.09 (d, J =2.7 Hz, 1H), 5.49 (t, J = 7.2 Hz, 1H), 4.23 (dd, J = 11.5, 9.6 Hz, 1H), 4.06 - 4.01 (m, 1H), 3.92 (s, 3H), 2.71(s, 3H), 2.63 - 2.57 (m, 1H), 2.12 - 2.06 (m, 1H), 2.05 - 1.98 (m, 1H), 1.89 - 1.83 (m, 1H); ¹³C NMR (151 MHz, CDCl₃) δ 156.94, 156.30, 148.21, 143.52, 130.60, 124.61, 120.75, 117.52, 102.04, 76.89, 68.98, 55.53, 33.43, 26.00, 25.07; HRMS(ESI) Calcd. for C₁₅H₁₈NO [(M+H)⁺] 244.1332, found 244.1333.

7-Fluoro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3i)

According to the general procedure, tetrahydrofuran (7.5 mL),
7-fluoro-2-methylquinoline (161 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (20% ethyl acetate/petroleum ether) to provide the title compound as a colourless oil (176 mg, 76% yield). H NMR (600 MHz, CDCl₃) δ 7.85 (dd, J = 9.2, 6.0 Hz, 1H), 7.69 (dd, J =10.2, 2.5 Hz, 1H), 7.40 (s, 1H), 7.28 - 7.25 (m, 1H), 5.52 (t, J = 7.2 Hz, 1H), 4.23 - 4.20 (m, 1H), 4.04 (dd, J = 15.4, 7.1 Hz, 1H), 2.73 (s, 3H), 2.62 - 2.56 (m, 1H), 2.12 - 2.07 (m,1H), 2.05 - 1.98 (m, 1H), 1.85 - 1.80 (m, 1H); C NMR (151 MHz, CDCl₃) δ 162.72 (d, J = 249.5 Hz), 160.35, 149.73, 148.88 (d, J = 7.6 Hz), 125.08 (d, J = 9.8 Hz), 120.87(d, J = 1.1 Hz), 116.71(d, J = 2.3 Hz), 115.73 (d, J = 24.9 Hz), 112.88 (d, J = 20.1 Hz), 76.74, 69.00, 33.91, 25.97, 25.35; HRMS(ESI) Calcd. for C₁₄H₁₅FNO [(M+H)+] 232.1132, found 232.1132.

7-Chloro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3j)

According to the general procedure, tetrahydrofuran (7.5 mL), 7-chloro-2-methyl quinoline (177 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (10% ethyl acetate/petroleum ether) to provide the title compound as a white solid (220 mg, 89% yield). H NMR (600 MHz, CDCl₃) δ 8.03 (d, J = 2.1 Hz, 1H), 7.77 (d, J = 8.9 Hz, 1H), 7.44 - 7.42 (m, 2H), 5.49 (t, J = 7.2 Hz, 1H), 4.20 (dd, J = 14.6, 6.7 Hz, 1H), 4.02 (dd, J = 15.4, 7.1Hz, 1H), 2.71 (s, 3H), 2.60 - 2.54 (m, 1H), 2.11 - 2.04 (m,1H), 2.03 - 1.96 (m, 1H), 1.83 - 1.77 (m, 1H); C NMR (151 MHz, CDCl₃) δ 160.32, 149.42, 148.33, 134.77, 128.28, 126.36, 124.33, 122.25, 117.44, 76.61, 68.96, 33.85, 25.94, 25.44; HRMS(ESI) Calcd. for C₁₄H₁₅ClNO [(M+H)+] 248.0837, found 248.0837.
8-Fluoro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3k)

According to the general procedure, tetrahydrofuran (7.5 mL), 8-fluoro-2-methylquinoline (161 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (25% ethyl acetate/petroleum ether) to provide the title compound as a white solid (217 mg, 94% yield). $^1$H NMR (600 MHz, CDCl$_3$) δ 7.60 (d, $J = 8.4$ Hz, 1H), 7.49 (s, 1H), 7.39 (td, $J = 8.0$, 5.3 Hz, 1H), 7.36 - 7.33 (m, 1H), 5.52 (t, $J = 7.2$ Hz, 1H), 4.21 (dd, $J = 13.5$, 7.7 Hz, 1H), 4.03 (dd, $J = 15.2$, 7.3 Hz, 1H), 2.77 (s, 3H), 2.62 - 2.56 (m, 1H), 2.10 - 2.04 (m, 1H), 2.03 - 1.97 (m, 1H), 1.84 - 1.79 (m, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 159.58 (d, $J = 1.3$ Hz), 157.97 (d, $J = 255.3$ Hz), 149.32 (d, $J = 2.5$ Hz), 138.10 (d, $J = 10.8$ Hz), 125.61 (d, $J = 2.1$ Hz), 125.10 (d, $J = 8.3$ Hz), 118.72 (d, $J = 4.6$ Hz), 118.18, 113.10 (d, $J = 19.3$ Hz), 76.72, 68.99, 33.82, 25.91, 25.67; $^{19}$F NMR (565 MHz, CDCl$_3$) δ -124.31 (dd, $J = 10.6$, 5.2 Hz); HRMS(ESI) Calcd. for C$_{14}$H$_{15}$FNO [(M+H)$^+$] 232.1132, found 232.1134.

8-Chloro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3l)

According to the general procedure, tetrahydrofuran (7.5 mL), 8-chloro-2-methylquinoline (177 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (15% ethyl...
acetate/petroleum ether) to provide the title compound as a white solid (220 mg, 89% yield). $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 7.77 (t, $J$ = 7.5 Hz, 2H), 7.50 (s, 1H), 7.38 (t, $J$ = 7.9 Hz, 1H), 5.54 (t, $J$ = 7.2 Hz, 1H), 4.22 (q, $J$ = 7.5 Hz, 1H), 4.04 (q, $J$ = 7.5 Hz, 1H), 2.81 (s, 3H), 2.60 (ddd, $J$ = 14.2, 12.5, 7.8 Hz, 1H), 2.07 (dt, $J$ = 12.9, 6.7 Hz, 1H), 2.00 (dt, $J$ = 13.8, 7.4 Hz, 1H), 1.81 (ddd, $J$ = 14.8, 13.0, 6.7 Hz, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) $\delta$ 160.20, 149.82, 144.13, 133.46, 129.14, 125.26, 125.21, 122.08, 118.12, 76.71, 69.00, 33.94, 25.94, 25.89; HRMS(ESI) Calcd. for C$_{14}$H$_{15}$ClNO [(M+H)$^+$] 248.0387, found 248.0837.

8-Bromo-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3m)

According to the general procedure, tetrahydrofuran (7.5 mL), 8-bromo-2-methyl quinoline (220 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (10% ethyl acetate/petroleum ether) to provide the title compound as a white (242 mg, 83% yield). $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 8.00 (d, $J$ = 7.5 Hz, 1H), 7.81 (d, $J$ = 8.4 Hz, 1H), 7.49 (s,1H), 7.31 (t, $J$ = 7.9 Hz, 1H), 5.54 (t, $J$ = 7.2 Hz, 1H), 4.22 (dd, $J$ = 14.1, 7.0 Hz, 1H), 4.03 (q, $J$ = 7.1 Hz, 1H), 2.80 (s, 3H), 2.62 - 2.56 (m, 1H), 2.10 - 2.05 (m, 1H), 2.02 - 1.97 (m, 1H), 1.83 - 1.78 (m, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) $\delta$ 160.42, 149.79, 144.89, 132.66, 125.70, 125.20, 125.07, 122.83, 118.09, 76.64, 68.99, 33.94, 25.92, 25.88; HRMS(ESI) Calcd. for C$_{14}$H$_{15}$BrNO [(M+H)$^+$] 292.0332, found 292.0331.
8-Iodo-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3n)

According to the general procedure, tetrahydrofuran (7.5 mL), 8-iodo-2-methylquinoline (268 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 24 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (10% ethyl acetate/petroleum ether) to provide the title compound as a white solid (95 mg, 28% yield). 

1H NMR (600 MHz, CDCl₃) δ 8.31 (dd, J = 7.4, 1.1 Hz, 1H), 7.85 (dd, J = 8.3, 1.1 Hz, 1H), 7.48 (s, 1H), 7.19 (dd, J = 8.1, 7.6 Hz, 1H), 5.56 (t, J = 7.2 Hz, 1H), 4.25 - 4.21 (m, 1H), 4.04 (dd, J = 15.4, 7.2 Hz, 1H), 2.81 (s, 3H), 2.60 (dd, J = 14.2, 12.5, 7.8 Hz, 1H), 2.10 - 2.05 (m, 1H), 2.01 (dt, J = 12.3, 7.0 Hz, 1H), 1.80 (ddt, J = 13.0, 8.1, 6.7 Hz, 1H); 13C NMR (151 MHz, CDCl₃) δ 160.60, 149.97, 146.45, 139.62, 126.53, 124.37, 123.80, 118.14, 104.14, 76.51, 69.02, 34.02, 25.95, 25.72; HRMS(ESI) Calcd. for C₁₄H₁₅INO [(M+H)+] 340.0193, found 340.0196.

2,8-Dimethyl-4-(tetrahydrofuran-2-yl)quinoline (3o)

According to the general procedure, tetrahydrofuran (7.5 mL), 2,8-dimethylquinoline (157 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (20% ethyl acetate/petroleum ether) to provide the title compound as a colourless oil (115 mg, 51% yield). 

1H NMR (600 MHz, CDCl₃) δ 7.69 (d, J = 8.3 Hz, 1H), 7.52 (d, J = 7.0 Hz, 1H), 7.44 (s, 1H), 7.37 (t,
J = 9.0 Hz, 1H), 5.58 (t, J = 7.2 Hz, 1H), 4.25 - 4.22 (m, 1H), 4.04 (dd, J = 15.4, 7.2 Hz, 1H), 2.82 (s, 3H), 2.75 (s, 3H), 2.63 - 2.57 (m, 1H), 2.10 - 2.03 (m, 1H), 2.02 - 1.95 (m,1H), 1.85 - 1.80 (m, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 157.85, 149.25, 146.86, 137.15, 129.12, 125.01, 123.63, 120.82, 116.75, 76.89, 68.94, 33.96, 25.94, 25.78, 18.53; HRMS(ESI) Calcd. for C$_{15}$H$_{18}$NO [(M+H)$^+$] 228.1383, found 228.1385.

6,8-Difluoro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3p)

According to the general procedure, tetrahydrofuran (7.5 mL), 6,8-difluoro-2-methylquinoline (179 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (25% ethyl acetate/petroleum ether) to provide the title compound as a white solid (229 mg, 92% yield). $^1$H NMR (600 MHz, CDCl$_3$) δ 8.05 (d, J = 8.4 Hz, 1H), 8.01 (d, J = 7.3 Hz, 1H), 7.52 (s, 1H), 7.50 (d, J =7.8 Hz, 1H), 5.56 (t, J = 7.2 Hz, 1H), 4.25 - 4.21 (m, 1H), 4.04 (dd, J=15.4, 7.2Hz, 1H), 2.77 (s, 3H), 2.63 - 2.57 (m, 1H), 2.11 - 2.06 (m,1H), 2.04 - 1.98 (m, 1H), 1.84 - 1.78 (m, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 158.63 (dd, J = 247.6, 12.0 Hz), 158.74, 158.37 (dd, J = 258.2, 13.5 Hz), 148.65 (dd, J = 5.7, 2.7 Hz), 135.42 (d, J = 10.7 Hz), 125.23 (dd, J = 10.6, 3.2 Hz), 119.14, 104.42 (dd, J = 29.2, 23.1 Hz), 102.73 (dd, J = 22.3, 4.9 Hz), 76.59, 68.89, 33.45, 25.81, 25.39; $^{19}$F NMR (565 MHz, CDCl$_3$) δ -111.07 (d, J = 8.3 Hz, 1F), -118.98 - -119.06 (m, 1F); HRMS(ESI) Calcd. for C$_{14}$H$_{14}$F$_{2}$NO [(M+H)$^+$] 250.1038, found 250.1041.
7,8-Difluoro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3q)

According to the general procedure, tetrahydrofuran (7.5 mL), 7,8-difluoro-2-methylquinoline (157 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (20% ethyl acetate/petroleum ether) to provide the title compound as a white solid (209 mg, 84% yield). ¹H NMR (600 MHz, CDCl₃) δ 7.57 (ddd, J = 9.3, 5.1, 2.0 Hz, 1H), 7.44 (s, 1H), 7.31 (td, J = 9.5, 7.3 Hz, 1H), 5.46 (t, J = 7.2 Hz, 1H), 4.19 (td, J = 7.7, 5.8 Hz, 1H), 4.01 (dd, J = 15.3, 7.2 Hz, 1H), 2.75 (s, 1H), 2.56 (dt, J = 14.1, 7.8 Hz, 1H), 2.10 - 2.04 (m, 1H), 2.03 - 1.95 (m, 1H), 1.81 - 1.76 (m, 1H); ¹³C NMR (151 MHz, CDCl₃) δ 160.80 (d, J = 1.3 Hz), 149.52, 149.11 (dd, J = 250.6, 12.1 Hz), 144.61 (dd, J = 255.2, 12.1 Hz), 139.27 (dd, J = 7.8, 3.7 Hz), 121.68, 118.77 (dd, J = 8.1, 5.8 Hz), 117.55 (d, J = 2.2 Hz), 115.81 (d, J = 20.5 Hz), 76.56, 68.98, 33.82, 25.89, 25.58; ¹⁹F NMR (565 MHz, CDCl₃) δ -136.74 (ddd, J = 19.5, 10.3, 5.4 Hz, 1F), -150.53 (dd, J = 20.6, 8.1 Hz, 1F); HRMS(ESI) Calcd. for C₁₄H₁₄F₂NO [(M+H)⁺] 250.1038, found 250.1038.

5,8-Difluoro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3r)

According to the general procedure, tetrahydrofuran (7.5 mL), 5,8-difluoro-2-methylquinoline (179 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol
outlined in the general procedure and purified by flash chromatography (20% ethyl acetate/petroleum ether) to provide the title compound as a white solid (144 mg, 58% yield). $^1$H NMR (600 MHz, CDCl$_3$) δ 7.61 (s, 1H), 7.28 - 7.24 (m, 1H), 7.04 (ddd, $J = 12.3, 8.6, 4.0$ Hz, 1H), 5.74 - 5.70 (m, 1H), 4.21 (td, $J = 7.8, 5.0$ Hz, 1H), 4.00 (dd, $J = 15.1, 7.8$ Hz, 1H), 2.76 (s, 3H), 2.63 - 2.55 (m, 1H), 2.04 - 1.94 (m, 1H), 1.93 - 1.84 (m, 1H), 1.77 (tdd, $J = 8.0, 5.5, 3.0$ Hz, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 160.49, 154.24 (dd, $J = 250.7, 3.9$ Hz), 154.09 (dd, $J = 250.7, 3.7$ Hz), 149.52 (dd, $J = 6.6, 1.9$ Hz), 138.86 (dd, $J = 12.1, 4.4$ Hz), 119.07 (d, $J = 1.7$ Hz), 115.62 (dd, $J = 15.9, 1.6$ Hz), 112.28 (dd, $J = 22.3, 9.9$ Hz), 109.72 (dd, $J = 25.9, 8.3$ Hz), 77.90 (d, $J = 12.4$ Hz), 69.20, 34.20 (d, $J = 4.3$ Hz), 25.60, 25.29; $^{19}$F NMR (565 MHz, CDCl$_3$) δ -111.68 - -117.73 (m, 1F), -127.99 (dd, $J = 21.8, 10.4, 4.0$ Hz, 1F); HRMS(ESI) Calcd. for C$_{14}$H$_{14}$F$_2$NO [(M+H)$^+$] 250.1038, found 250.1038.

8-Bromo-5-fluoro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3s)

According to the general procedure, tetrahydrofuran (7.5 mL), 8-bromo-5-fluoro-2-methylquinoline (238 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (10% ethyl acetate/petroleum ether) to provide the title compound as a white solid (65 mg, 21% yield). $^1$H NMR (600 MHz, CDCl$_3$) δ 7.92 (dd, $J = 8.4, 5.3$ Hz, 1H), 7.63 (s, 1H), 7.04 (dd, $J = 11.9, 8.4$ Hz, 1H), 5.78 - 5.73 (m, 1H), 4.23 (td, $J = 7.8, 5.0$ Hz, 1H), 4.02 (dd, $J = 15.2, 7.7$ Hz, 1H), 2.80 (s, 3H), 2.60 (dd, $J = 12.8, 7.0$ Hz, 1H), 2.00 (ddd, $J = 11.4, 7.1, 1.9$ Hz, 1H), 1.89 (dt, $J = 12.2, 7.7$ Hz, 1H), 1.77 (ttdd, $J = 11.1, 5.4, 3.2$ Hz, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 161.28, 158.06 (d, $J = 255.2$ Hz), 150.09 (d, $J = 6.0$ Hz), 146.01 (d, $J = 3.2$ Hz), 131.81 (d, $J = 9.0$ Hz), 119.60 (d, $J = 4.5$ Hz), 119.06 (d, $J = 2.2$ Hz), 115.87 (d, $J = 13.2$ Hz), 111.38 (d, $J = 24.2$ Hz), 78.10 (d, $J =$
13.6 Hz), 69.22, 34.28 (d, $J = 4.5$ Hz), 25.78, 25.29; $^{19}$F NMR (565 MHz, CDCl$_3$) $\delta$ -109.61 (d, $J = 8.2$ Hz); HRMS(ESI) Calcd. for C$_{14}$H$_{14}$BrFNO [(M+H)$^+$] 310.0237, found 310.0237.

**5,6,7-Trifluoro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3t)**

![Chemical structure](image)

According to the general procedure, tetrahydrofuran (7.5 mL), 5,6,7-trifluoro-2-methylquinoline (197 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (10% ethyl acetate/petroleum ether) to provide the title compound as a white solid (150 mg, 56% yield). $^1$H NMR (600 MHz, CDCl$_3$) $\delta$ 7.60 (ddd, $J = 10.7$, 7.2, 2.3 Hz, 1H), 7.54 (s, 1H), 5.69 - 5.66 (m, 1H), 4.22 (td, $J = 7.8$, 4.9 Hz, 1H), 4.01 (dd, $J = 15.0$, 7.9 Hz, 1H), 2.69 (s, 3H), 2.64 - 2.56 (m, 1H), 2.06 - 1.98 (m, 1H), 1.91 (dt, $J = 12.3$, 7.7 Hz, 1H), 1.77 (tttd, $J = 11.1$, 5.6, 3.1 Hz, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) $\delta$ 160.52, 151.62 (ddd, $J = 252.7$, 12.3, 4.4 Hz), 149.30 (t, $J = 5.3$ Hz), 146.26 (ddd, $J = 256.8$, 11.6, 4.9 Hz), 143.73 (dd, $J = 12.0$, 2.2 Hz), 138.38 (dt, $J = 251.4$, 17.1 Hz), 118.10, 111.97 (dd, $J = 10.7$, 1.6 Hz), 110.81 (dd, $J = 16.7$, 4.0 Hz), 77.66 (d, $J = 11.2$ Hz), 69.24, 34.25 (d, $J = 3.9$ Hz), 25.36, 25.32; HRMS(ESI) Calcd. for C$_{14}$H$_{13}$F$_3$NO [(M+H)$^+$] 268.0944, found 268.0946.

**5,6,8-Trifluoro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3u)**

![Chemical structure](image)

According to the general procedure, tetrahydrofuran (7.5 mL), 5,6,8-trifluoro-2-methylquinoline (177 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g,
4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (10% ethyl acetate/petroleum ether) to provide the title compound as a white solid (115 mg, 43% yield). ¹H NMR (600 MHz, CDCl₃) δ 7.65 (s, 1H), 7.30 (td, J = 9.9, 6.9 Hz, 1H), 5.74 - 5.68 (m, 1H), 4.23 (td, J = 7.8, 4.9 Hz, 1H), 4.02 (dd, J = 15.0, 7.9 Hz, 1H), 2.75 (s, 3H), 2.65 - 2.58 (m, 1H), 2.03 (tdd, J = 12.4, 7.3, 5.2 Hz, 1H), 1.92 (dt, J = 12.2, 7.7 Hz, 1H), 1.79 (ttd, J = 11.1, 5.5, 3.1 Hz, 1H); ¹³C NMR (151 MHz, CDCl₃) δ 159.76, 153.62 (ddd, J = 254.6, 10.5, 3.4 Hz), 149.25 (td, J = 6.5, 2.0 Hz), 145.95 (ddd, J = 247.5, 15.4, 12.0 Hz), 141.52 (ddd, J = 251.6, 14.2, 5.3 Hz), 135.15 (d, J = 11.6 Hz), 119.87, 115.92 (d, J = 11.6 Hz), 104.68 (t, J = 24.8 Hz), 77.71 (d, J = 11.6 Hz), 69.30, 34.24 (d, J = 4.1 Hz), 25.49, 25.35; HRMS(ESI) Calcd. for C₁₄H₁₃F₃NO [(M+H)⁺] 268.0944, found 268.0945.

8-Bromo-5,6-difluoro-2-methyl-4-(tetrahydrofuran-2-yl)quinoline (3v)

According to the general procedure, tetrahydrofuran (7.5 mL), 2,6-dimethylquinoline (256 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 24 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (10% ethyl acetate/petroleum ether) to provide the title compound as a white solid (43 mg, 13% yield). ¹H NMR (600 MHz, CDCl₃) δ 7.92 (t, J = 9.6 Hz, 1H), 7.64 (s, 1H), 5.75 - 5.71 (m, 1H), 4.24 (dd, J = 7.8, 4.8 Hz, 1H), 4.02 (dd, J = 15.0, 8.0 Hz, 1H), 2.78 (s, 3H), 2.61 (dd, J = 12.5, 7.5 Hz, 1H), 2.03 (dt, J = 12.3, 7.0 Hz, 1H), 1.90 (dt, J = 12.2, 7.7 Hz, 1H), 1.78 (ddd, J = 11.1, 5.5, 3.3 Hz, 1H); ¹³C NMR (151 MHz, CDCl₃) δ 160.46, 149.80 (t, J = 6.4 Hz), 146.48 (dd, J = 249.3, 14.8 Hz), 144.62 (dd, J = 156.4, 13.9 Hz), 142.12, 122.60, 122.45, 119.52, 115.99 (d, J = 10.6 Hz), 77.84 (d, J = 12.3 Hz), 69.27, 34.29 (d, J =
According to the general procedure, tetrahydrofuran (7.5 mL), 6,7,8-trifluoro-2-methylquinoline (197 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (10% ethyl acetate/petroleum ether) to provide the title compound as a whiter solid (171 mg, 64% yield). ¹H NMR (600 MHz, CDCl₃) δ 7.48 (s, 1H), 7.39 (ddd, J = 10.9, 7.6, 2.2 Hz, 1H), 5.36 (t, J = 7.3 Hz, 1H), 4.24 - 4.18 (m, 1H), 4.03 (dd, J = 15.4, 7.1 Hz, 1H), 2.75 (s, 3H), 2.56 (dtd, J = 12.5, 7.8, 6.3 Hz, 1H), 2.10 (ddt, J = 19.9, 13.5, 6.7 Hz, 1H), 2.02 (dt, J = 13.3, 7.3 Hz, 1H), 1.84 - 1.76 (m, 1H); ¹³C NMR (151 MHz, CDCl₃) δ 160.10 (m), 149.18 (ddd, J = 250.7, 12.1, 1.1 Hz), 148.73 (m), 145.86 (ddd, J = 257.8, 9.1, 4.7 Hz), 140.21 (ddd, J = 254.6, 18.2, 13.7 Hz), 136.21 (d, J = 8.1 Hz), 119.92 (d, J = 8.6 Hz), 118.79 (d, J = 1.9 Hz), 103.61 (dd, J = 18.3, 5.0 Hz), 76.65, 69.02, 33.59, 25.91, 25.55; HRMS(ESI) Calcd. for C₁₄H₁₃F₃NO [(M+H)+] 268.0944, found 268.0945.

4-methyl-2-(tetrahydrofuran-2-yl)quinoline (3x)

According to the general procedure, tetrahydrofuran (7.5 mL), 4-methylquinoline (143 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃
(42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (eluent: ethyl acetate/petroleum ether: 1/3) to provide the title compound as a white solid (151 mg, 71% yield). $^1$H NMR (600 MHz, CDCl$_3$) δ 8.06 (d, J = 8.4 Hz, 1H), 7.96 (dd, J = 8.3, 0.7 Hz, 1H), 7.68 (ddd, J = 8.3, 6.9, 1.3 Hz, 1H), 7.52 (ddd, J = 8.1, 6.9, 1.1 Hz, 1H), 7.44 (s, 1H), 5.14 (dd, J = 8.7, 5.3 Hz, 1H), 4.17 (dt, J = 11.4, 6.7 Hz, 1H), 4.03 (dt, J = 8.1, 6.7 Hz, 1H), 2.70 (s, 3H), 2.55 - 2.47 (m, 1H), 2.11 - 1.98 (m, 3H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 163.02, 147.17, 145.04, 129.42, 129.14, 127.41, 125.81, 118.54, 81.97, 69.23, 33.30, 25.94, 18.87; HRMS(ESI) Calcd. for C$_{14}$H$_{16}$NO [(M+H)$^+$] 214.1226, found 214.1226.

1-(tetrahydrofuran-2-yl)isoquinoline(3y)

![Structure](image)

According to the general procedure, tetrahydrofuran (7.5 mL), isoquinoline (129 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (eluent: ethyl acetate/petroleum ether: 1/3) to provide the title compound as a white solid (170 mg, 85% yield). $^1$H NMR (600 MHz, CDCl$_3$) δ 8.50 (d, J = 5.7 Hz, 1H), 8.34 (d, J = 8.4 Hz, 1H), 7.83 (d, J = 8.2 Hz, 1H), 7.74 - 7.64 (m, 1H), 7.60 (ddd, J = 11.5, 8.8, 5.8 Hz, 2H), 5.72 (t, J = 7.1 Hz, 1H), 4.20 (dd, J = 14.4, 7.5 Hz, 1H), 4.04 (td, J = 7.9, 6.3 Hz, 1H), 2.51 (ddd, J = 15.7, 12.5, 7.3 Hz, 1H), 2.44 - 2.34 (m, 1H), 2.18 (ddd, J = 7.9, 4.5, 1.4 Hz, 1H), 2.11 (ddd, J = 12.1, 11.1, 6.1 Hz, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 159.57, 141.35, 136.53, 129.90, 127.30, 127.14, 126.52, 125.25, 120.59, 79.00, 68.99, 30.80, 26.11; HRMS(ESI) Calcd. for C$_{13}$H$_{14}$NO [(M+H)$^+$] 200.1070, found 200.1068.
4-(1,4-Dioxan-2-yl)-6-fluoro-2-methylquinoline(4a)

According to the general procedure, 1,4-dioxane (7.5 mL), 6-fluoro-2-methylquinoline (161 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (25% ethyl acetate/petroleum ether) to provide the title compound as a white solid (222 mg, 90% yield). \(^1\)H NMR (600 MHz, CDCl₃) δ 8.01 (dd, \(J = 9.2, 5.6\) Hz, 1H), 7.55 (dd, \(J = 10.0, 2.7\) Hz, 1H), 7.46 (s, 1H), 7.41 (ddd, \(J = 9.2, 8.1, 2.8\) Hz, 1H), 5.17 (dd, \(J = 9.9, 2.4\) Hz, 1H), 4.02 (tdd, \(J = 14.6, 11.9, 2.6\) Hz, 3H), 3.88 - 3.85 (m, 1H), 3.77 (ddd, \(J = 11.8, 10.2, 4.2\) Hz, 1H), 3.45 (dd, \(J = 11.9, 9.9\) Hz, 1H), 2.70 (s, 3H); \(^{13}\)C NMR (151 MHz, CDCl₃) δ 160.01 (d, \(J = 247.1\) Hz), 158.22 (d, \(J = 2.5\) Hz), 144.89, 142.92 (d, \(J = 5.5\) Hz), 131.88 (d, \(J = 9.2\) Hz), 124.13 (d, \(J = 9.4\) Hz), 119.80, 119.12 (d, \(J = 25.4\) Hz), 106.30 (d, \(J = 23.0\) Hz), 74.21, 71.55, 67.21, 66.49, 25.19; HRMS(ESI) Calcd. for C₁₄H₁₅FNO₂ [(M+H)⁺] 248.1081, found 248.1082.

6-Chloro-4-(1,4-dioxan-2-yl)-2-methylquinoline(4b)

According to the general procedure, 1,4-dioxane (7.5 mL), 6-chloro-2-methylquinoline (177 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (20% ethyl acetate/petroleum ether) to provide the title compound as a white solid (210 mg, 80%
yield. $^1$H NMR (600MHz, CDCl$_3$) δ 7.95 (d, $J = 9.0$ Hz, 1H), 7.90 (d, $J = 2.2$ Hz, 1H), 7.58 (dd, $J = 9.0$, 2.3 Hz, 1H), 7.47 (s, 1H), 5.21 (dd, $J = 9.9$, 2.3 Hz, 1H), 4.11 - 3.98 (m, 3H), 3.90 - 3.84 (m, 1H), 3.78 (ddd, $J = 11.8$, 9.6, 4.8 Hz, 1H), 3.44 (dd, $J = 11.9$, 9.9 Hz, 1H), 2.71 (s, 3H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 159.31, 146.14, 142.70, 131.76, 131.08, 139.98, 124.20, 121.52, 119.90, 73.97, 71.73, 67.22, 66.51, 25.32; HRMS(ESI) Calcd. for C$_{14}$H$_{15}$ClNO$_2$ [(M+H)$^+$] 264.0786, found 264.0786.

6-Bromo-4-(1,4-dioxan-2-yl)-2-methylquinoline(4c)$^{82}$

According to the general procedure, 1,4-dioxane (7.5 mL), 6-bromo-2-methylquinoline (220 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (15% ethyl acetate/petroleum ether) to provide the title compound as a white solid (212 mg, 69% yield). $^1$H N NMR (600 MHz, CDCl$_3$) δ 8.08 (d, $J = 2.1$ Hz, 1H), 7.89 (d, $J = 9.0$ Hz, 1H), 7.72 (dd, $J = 8.9$, 2.1 Hz, 1H), 7.48 (s, 1H), 5.23 (dd, $J = 9.9$, 2.4 Hz, 1H), 4.05 (ddt, $J = 19.0$, 14.5, 7.3 Hz, 3H), 3.91 - 3.85 (m, 1H), 3.78 (ddd, $J = 11.8$, 9.6, 4.8 Hz, 1H), 3.44 (dd, $J = 11.9$, 9.9 Hz, 1H), 2.71 (s, 3H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 159.50, 146.34, 142.64, 132.57, 131.23, 124.79, 124.75, 119.95, 119.89, 73.92, 71.78, 67.23, 66.52, 25.38; HRMS(ESI) Calcd. for C$_{14}$H$_{15}$BrNO$_2$ [(M+H)$^+$] 308.0281, found 308.0280.

4-(1,4-Dioxan-2-yl)-6-iodo-2-methylquinoline(4d)

According to the general procedure, 1,4-dioxane (7.5 mL), 6-iodo-2-methylquinoline
(268 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (15% ethyl acetate/petroleum ether) to provide the title compound as a white solid (249 mg, 70% yield). ¹H NMR (600 MHz, CDCl₃) δ 8.29 (d, J = 1.8 Hz, 1H), 7.89 (dd, J = 8.8, 1.9 Hz, 1H), 7.74 (d, J = 8.8 Hz, 1H), 7.47 (s, 1H), 6.32 (dd, J = 9.9, 2.4 Hz, 1H), 4.10 - 4.00 (m, 3H), 3.91 - 3.86 (m, 1H), 3.79 (ddd, J = 11.8, 9.1, 5.3 Hz, 1H), 3.46 (dd, J = 11.9, 9.9 Hz, 1H), 3.43 (dd, J = 11.9, 9.9 Hz, 1H), 2.71 (s, 3H); ¹³C NMR (151 MHz, CDCl₃) δ 159.69, 146.69, 142.36, 137.85, 131.30, 131.23, 125.33, 119.71, 91.56, 73.81, 71.84, 67.22, 66.52, 25.44; HRMS(ESI) Calcd. for C₁₄H₁₅INO₂ [(M+H)⁺] 356.0142, found 356.0140.

4-(1,4-Dioxan-2-yl)-7-fluoro-2-methylquinoline(4e)

According to the general procedure, 1,4-dioxane (7.5 mL), 7-fluoro-2-methylquinoline (161 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (25% ethyl acetate/petroleum ether) to provide the title compound as a white solid (210 mg, 85% yield). ¹H NMR (600 MHz, CDCl₃) δ 7.94 (dd, J = 9.2, 5.9 Hz, 1H), 7.64 (dd, J = 10.1, 2.6 Hz, 1H), 7.43 (s, 1H), 7.30 - 7.26 (m, 1H), 5.27 (dd, J = 9.9, 2.4 Hz, 1H), 4.10 - 3.98 (m, 3H), 3.87 (dd, J = 11.3, 1.9 Hz, 1H), 3.79 (ddd, J = 11.8, 10.4, 4.0 Hz, 1H), 3.46 (dd, J = 11.9, 9.9 Hz, 1H), 2.72 (s, 3H); ¹³C NMR (151 MHz, CDCl₃) δ 162.70 (d, J = 249.9 Hz), 160.37, 149.06 (d, J = 12.4 Hz), 143.60, 124.49 (d, J = 9.9 Hz), 120.53 (d, J = 1.0 Hz), 118.51 (d, J = 2.4 Hz), 116.10 (d, J = 25.1 Hz), 113.22 (d, J = 20.0 Hz), 74.22, 71.84, 67.24, 66.53, 25.39; HRMS(ESI) Calcd. for C₁₄H₁₅FNO₂ [(M+H)⁺] 248.1081, found 248.1081.
7-Chloro-4-(1,4-dioxan-2-yl)-2-methylquinoline(4f)

According to the general procedure, 1,4-dioxane (7.5 mL), 6-chloro-2-methylquinoline (177 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (15% ethyl acetate/petroleum ether) to provide the title compound as a white solid (203 mg, 77% yield). ¹H NMR (600 MHz, CDCl₃) δ 8.02 (d, J = 2.1 Hz, 1H), 7.85 (d, J = 9.0 Hz, 1H), 7.45 (s, 1H), 7.42 (dd, J = 8.9, 2.2 Hz, 1H), 5.25 (dd, J = 9.9, 2.4 Hz, 1H), 4.06 - 3.96 (m, 3H), 3.86 (dd, J = 11.4, 1.9 Hz, 1H), 3.77 (ddd, J = 11.8, 10.5, 3.9 Hz, 1H), 3.43 (dd, J = 11.9, 9.9 Hz, 1H), 2.71 (s, 3H); ¹³C NMR (151 MHz, CDCl₃) δ 160.27, 148.24, 143.54, 134.98, 128.48, 126.77, 123.70, 121.91, 119.27, 74.04, 71.78, 67.20, 66.49, 25.35; HRMS(ESI) Calcd. for C₁₄H₁₅ClNO₂ [(M+H)⁺] 264.0786, found 264.0788.

6-Fluoro-2-methyl-4-(tetrahydro-2H-pyran-2-yl)quinoline(4g)

According to the general procedure, tetrahydro-2H-pyran (7.5 mL), 6-fluoro-2-methylquinoline (161 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (25% ethyl acetate/petroleum ether) to provide the title compound as a white solid (165 mg, 67% yield). ¹H NMR (600 MHz, CDCl₃) δ 8.03 (dd, J = 9.0, 5.7 Hz, 1H), 7.55 (dd, J =
10.2, 2.3 Hz, 1H), 7.46 - 7.39 (m, 2H), 4.87 (d, J = 11.3 Hz, 1H), 4.25 (dd, J = 11.5, 1.9 Hz, 1H), 3.73 (dd, J = 16.5, 6.6 Hz, 1H), 2.72 (s, 3H), 2.01 (d, J = 11.9 Hz, 2H), 1.78 (dd, J = 15.0, 6.0 Hz, 2H), 1.68 (d, J = 8.2 Hz, 1H), 1.61 (t, J = 11.7 Hz, 1H); 13C NMR (151 MHz, CDCl3) δ 159.85 (d, J = 246.1 Hz), 158.32 (d, J = 2.4 Hz), 148.13, 144.89, 131.61 (d, J = 9.1 Hz), 124.27 (d, J = 9.4 Hz), 118.99, 118.94 (d, J = 25.6 Hz), 106.79 (d, J = 22.8 Hz), 76.26, 69.25, 33.23, 25.83, 25.17, 23.92.; HRMS(ESI) Calcd. for C15H17FNO [(M+H)+] 246.1294, found 246.1292.

6-Chloro-2-methyl-4-(tetrahydro-2H-pyran-2-yl)quinoline(4h)

According to the general procedure, tetrahydro-2H-pyran (7.5 mL), 6-chloro-2-methylquinoline (177 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO3 (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H2O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (25% ethyl acetate/petroleum ether) to provide the title compound as a white solid (157 mg, 60% yield). 1H NMR (600 MHz, CDCl3) δ 7.98 (d, J = 8.9 Hz, 1H), 7.89 (d, J = 2.1 Hz, 1H), 7.59 (dd, J = 8.9, 2.1 Hz, 1H), 7.46 (s, 1H), 4.91 (d, J = 10.3 Hz, 1H), 4.28 - 4.22 (m, 1H), 3.74 (td, J = 11.7, 2.1 Hz, 1H), 2.72 (s, 3H), 2.02 (d, J = 11.7 Hz, 2H), 1.86 - 1.73 (m, 2H), 1.69 (d, J = 10.7 Hz, 1H), 1.64 - 1.56 (m, 1H); 13C NMR (151 MHz, CDCl3) δ 159.42, 147.90, 146.21, 131.30, 130.92, 129.77, 124.34, 122.00, 119.10, 75.94, 69.22, 33.49, 25.82, 25.30, 23.91; HRMS(ESI) Calcd. for C15H17ClNO [(M+H)+] 262.0999, found 262.0997.

6-bromo-2-methyl-4-(tetrahydro-2H-pyran-2-yl)quinoline(4i)
According to the general procedure, tetrahydro-2H-pyran (7.5 mL), 6-bromo-2-methylquinoline (220 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (20% ethyl acetate/petroleum ether) to provide the title compound as a white solid (150 mg, 49% yield). $^1$H NMR (600 MHz, CDCl$_3$) δ 8.05 (d, $J = 2.1$ Hz, 1H), 7.89 (d, $J = 8.9$ Hz, 1H), 7.70 (dd, $J = 8.9$, 2.1 Hz, 1H), 7.45 (s, 1H), 4.90 (dd, $J = 11.2$, 1.4 Hz, 1H), 4.27 - 4.20 (m, 1H), 3.73 (td, $J = 11.8$, 2.4 Hz, 1H), 2.70 (s, 3H), 2.04 - 1.95 (m, 2H), 1.87 - 1.72 (m, 2H), 1.68 (d, $J = 10.7$ Hz, 1H), 1.63 - 1.53 (m, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 159.56, 147.78, 146.40, 132.28, 131.07, 125.25, 124.85, 119.48, 119.05, 75.83, 69.18, 33.50, 25.79, 25.34, 23.88; HRMS(ESI) Calcd. for C$_{15}$H$_{17}$BrNO [(M+H)$^+$] 306.0494, found 306.0496.

6-Iodo-2-methyl-4-(tetrahydro-2H-pyran-2-yl)quinoline(4j)

According to the general procedure, tetrahydro-2H-pyran (7.5 mL), 6-iodo-2-methylquinoline (268 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (20% ethyl acetate/petroleum ether) to provide the title compound as a white solid (163 mg, 46% yield). $^1$H NMR (600 MHz, CDCl$_3$) δ 8.27 (d, $J = 1.8$ Hz, 1H), 7.89 (dd, $J = 8.8$, 1.8 Hz, 1H), 7.78 (d, $J = 8.8$ Hz, 1H), 7.45 (s, 1H), 4.92 (d, $J = 10.0$ Hz, 1H), 4.29 - 4.21 (m, 1H), 3.75 (td, $J = 11.7$, 2.3 Hz, 1H), 2.72 (s, 3H), 2.01 (dd, $J = 8.6$, 7.2 Hz, 2H), 1.83 - 1.78 (m, 2H), 1.71 - 1.66 (m, 1H), 1.59 (ddd, $J = 13.9$, 8.6, 2.8 Hz, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 159.75, 147.84, 146.48, 137.75, 131.88, 130.97, 125.50, 118.97, 91.28, 75.75, 69.21, 33.63, 25.82, 25.30, 23.92; HRMS(ESI) Calcd. for
According to the general procedure, tetrahydro-2H-pyran (7.5 mL), 7-fluoro-2-methylquinoline (161 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (20% ethyl acetate/petroleum ether) to provide the title compound as a white solid (157 mg, 64% yield). ¹H NMR (600 MHz, CDCl₃) δ 7.94 (dd, J = 9.1, 6.1 Hz, 1H), 7.64 (dd, J = 10.2, 2.1 Hz, 1H), 7.39 (s, 1H), 7.30 - 7.22 (m, 1H), 4.95 (d, J = 11.0 Hz, 1H), 4.24 (dd, J = 11.5, 1.9 Hz, 1H), 3.78 - 3.70 (m, 1H), 2.71 (s, 3H), 2.00 (d, J = 10.3 Hz, 2H), 1.83 - 1.72 (m, 2H), 1.72 - 1.57 (m, 2H); ¹³C NMR (151 MHz, CDCl₃) δ 162.65 (d, J = 249.3 Hz), 160.42, 149.10 (d, J = 12.2 Hz), 148.73, 125.06 (d, J = 9.7 Hz), 120.63 (d, J = 1.0 Hz), 117.70 (d, J = 2.3 Hz), 115.66 (d, J = 24.9 Hz), 112.97 (d, J = 20.0 Hz), 76.27, 69.23, 33.54, 25.83, 25.36, 23.96; HRMS(ESI) Calcd. for C₁₅H₁₇FNO [(M+H)⁺] 246.1294, found 246.1292.

According to the general procedure, tetrahydro-2H-pyran (7.5 mL), 6-chloro-2-methylquinoline (177 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (20% ethyl acetate/petroleum ether) to provide the title compound as a white solid (177 mg, 68% yield). ¹H NMR (600 MHz, CDCl₃) δ 8.10 (dd, J = 8.9, 4.8 Hz, 1H), 7.50 (dd, J = 9.2, 1.1 Hz, 1H), 7.20 - 7.12 (m, 1H), 4.38 (dd, J = 11.2, 2.0 Hz, 1H), 3.66 - 3.58 (m, 1H), 2.69 (s, 3H), 2.00 (d, J = 10.7 Hz, 2H), 1.85 - 1.73 (m, 2H), 1.71 - 1.55 (m, 2H); ¹³C NMR (151 MHz, CDCl₃) δ 162.61 (d, J = 249.9 Hz), 160.46, 149.12 (d, J = 12.2 Hz), 148.74, 125.08 (d, J = 9.7 Hz), 120.67 (d, J = 1.0 Hz), 117.70 (d, J = 2.3 Hz), 115.66 (d, J = 24.9 Hz), 112.97 (d, J = 20.0 Hz), 76.27, 69.22, 33.54, 25.83, 25.36, 23.96; HRMS(ESI) Calcd. for C₁₅H₁₇ClNO [(M+H)⁺] 250.0824, found 250.0820.
acetate/petroleum ether) to provide the title compound as a white solid (146 mg, 56% yield). $^1$H NMR (600 MHz, CDCl$_3$) δ 8.02 (s, 1H), 7.86 (dd, $J$ = 8.9, 0.9 Hz, 1H), 7.41 (dd, $J$ = 9.7, 2.7 Hz, 2H), 4.93 (d, $J$ = 11.2 Hz, 1H), 4.24 (dd, $J$ = 11.3, 2.0 Hz, 1H), 3.80 - 3.68 (m, 1H), 2.71 (s, 3H), 2.00 (d, $J$ = 10.0 Hz, 2H), 1.79 - 1.74 (m, 3H), 1.68 (d, $J$ = 9.2 Hz, 1H), 1.60 (dd, $J$ = 11.0, 10.0 Hz, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 160.37, 148.64, 148.42, 134.72, 128.37, 126.36, 124.29, 122.03, 118.46, 76.09, 69.21, 33.55, 25.82, 25.39, 23.94; HRMS(ESI) Calcd. for C$_{15}$H$_{17}$ClNO [(M+H)$^+$] 262.0999, found 262.0999.

6-Chloro-4-((2-methoxyethoxy)methyl)-2-methylquinoline(4m)

According to the general procedure, 1,2-dimethoxyethane (7.5 mL), 6-chloro-2-methylquinoline (177 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO$_3$ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H$_2$O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (25% ethyl acetate/petroleum ether) to provide the title compound as a white solid (117 mg, 44% yield). $^1$H NMR (600 MHz, CDCl$_3$) δ 7.99 (d, $J$ = 8.8 Hz, 1H), 7.94 (d, $J$ = 2.3 Hz, 1H), 7.61 (dd, $J$ = 9.0, 2.3 Hz, 1H), 7.41 (s, 1H), 4.96 (d, $J$ = 0.4 Hz, 2H), 3.80 - 3.73 (m, 2H), 3.68 - 3.61 (m, 2H), 3.43 (s, 3H), 2.73 (s, 3H); $^{13}$C NMR (151 MHz, CDCl$_3$) δ 159.14, 145.91, 142.98, 131.68, 130.54, 130.17, 125.26, 122.34, 121.21, 71.93, 70.36, 69.85, 59.14, 25.18; HRMS(ESI) Calcd. for C$_{14}$H$_{17}$ClNO$_2$ [(M+H)$^+$] 266.0948, found 266.0946.

7-chloro-4-((2-methoxyethoxy)methyl)-2-methylquinoline(4n)
According to the general procedure, 1,2-dimethoxyethane (7.5 mL), 6-chloro-2-methylquinoline (177 mg, 1.0 mmol, 1.0 equiv), selectfluor (1.40 g, 4.0 mmol, 4.0 equiv), AgNO₃ (42.5 mg, 0.25 mmol, 0.25 equiv), and 2.5 mL of H₂O were used. After 3 hours, the reaction mixture was subjected to the workup protocol outlined in the general procedure and purified by flash chromatography (25% ethyl acetate/petroleum ether) to provide the title compound as a white solid (135 mg, 51% yield). ¹H NMR (600 MHz, CDCl₃) δ 8.06 (d, J = 1.4 Hz, 1H), 7.89 (d, J = 8.9 Hz, 1H), 7.45 (dd, J = 8.9, 2.1 Hz, 1H), 7.38 (s, 1H), 4.98 (d, J = 0.6 Hz, 2H), 3.79 - 3.71 (m, 2H), 3.67 - 3.59 (m, 2H), 3.41 (s, 3H), 2.73 (s, 3H); ¹³C NMR (151 MHz, CDCl₃) δ 160.12, 148.13, 143.72, 135.18, 128.02, 126.75, 124.53, 122.98, 120.67, 71.92, 70.27, 69.93, 59.13, 25.24; HRMS(ESI) Calcd. for C₁₄H₁₇ClNO₂ [(M+H)+] 266.0948, found 266.0948.

References
$^1\text{H}, ^{19}\text{F}, ^{13}\text{C}$ NMR Spectra of Corresponding Compounds