Supporting Information For
One-pot synthesis of quinolines via Co(III)-catalyzed C–H activation/carbonylation/cyclization of anilines

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General Methods and Materials

AgNTf₂ and HOTf were purchased from Energy Chemical and used without further purification. The cobalt catalyst Cp*Co(CO)I₂ was synthesized according to previously described methods.¹ Other chemicals were purchased from commercial suppliers, further dried and purified if necessary. The water used was re-distilled and ion-free. ¹H and ¹³C NMR spectra were achieved on a Bruker AVANCE 400 MHz spectrometer (¹H 400 MHz; ¹³C 100 MHz) in CDCl₃. Abbreviations for data quoted are s-singlet; brs-broad singlet; d-doublet; t-triplet; dd-doublet of doublets; m-multiplet. High-resolution mass spectra were measured on a Waters Micromass GCT facility. Thin-layer chromatographies were done on pre-coated silica gel 60F254 plates (Merck). Silica gel 60H (200-300 mesh) manufactured by Qingdao Haiyang Chemical Group Co. (China) was used for general chromatography.
General catalytic procedure for the synthesis of quinolines

A reaction kettle (25 mL) was charged with amine 1 (0.5 mmol, 1 equiv.), acetophenone 2 (0.5 mmol, 1.2 equiv.), [Cp*Co(CO)I₂] (5.0 mg, 5.0 mol%), AgNTf₂ (10 mg, 10.0 mol%), (HCHO)ₙ (2.5 mol, 2.5 equiv.), CH₃OH (2 mL), then the HOTf (0.5 mmol) was added. The mixture was stirred at 120 °C for 8 hours under an atmosphere of air. The mixture was quenched by sat. aq. NaHCO₃, and diluted with 20 mL dichloromethane and washed with 10 mL H₂O. The aqueous layer was extracted twice with dichloromethane (10 mL) and the combined organic phase was dried over Na₂SO₄. After evaporation of the solvents, the residue was purified by silica gel chromatography (hexane/AcOEt = 10 : 1) to afford quinoline products. All other compounds are synthesized in a similar manner, with the yields listed in the main text calculated from the isolated, pure products.
Control experiments

A reaction kettle (25 mL) was charged with \( p \)-tolylamine 1m (0.5 mmol, 1 equiv), Methyl 4-aminobenzoate 1p (0.5 mmol, 1 equiv), acetophenone 2 (0.5 mmol, 1.0 equiv), \([\text{Cp}^*\text{Co(CO)I}_2]\) (12.0 mg, 5.0 mol %), AgNTf₂ (20 mg, 10.0 mol %), \((\text{HCHO})_n\) (1.25 mol), CH₃OH (2 mL), then the HOTf (0.5 mmol) was added. The mixture was stirred at 120 °C for 8 hours under an atmosphere of air. The mixture was quenched by sat. aq. NaHCO₃, and diluted with 20 mL dichloromethane and washed with 10 mL H₂O. The aqueous layer was extracted twice with dichloromethane (10 mL) and the combined organic phase was dried over Na₂SO₄. After evaporation of the solvents, the residue was purified by silica gel chromatography (hexane/AcOEt = 10 : 1) to yield product 3m (27.4 mg, 25%) and 3p (22.4 mg, 17%).

A reaction kettle (25 mL) was charged with 2-styrylphenylamine (0.5 mmol, 1 equiv), \([\text{Cp}^*\text{Co(CO)I}_2]\) (12.0 mg, 5.0 mol %), AgNTf₂ (20 mg, 10.0 mol %), \((\text{HCHO})_n\) (1.25 mol), CH₃OH (2 mL), then the HOTf (0.5 mmol) was added. The mixture was stirred at 120 °C for 8 hours under an atmosphere of air. The mixture was quenched by sat. aq. NaHCO₃, and diluted with 20 mL dichloromethane and washed with 10 mL H₂O. The aqueous layer was extracted twice with dichloromethane (10 mL) and the combined organic phase was dried over Na₂SO₄. After evaporation of the solvents, the
residue was purified by silica gel chromatography (hexane/AcOEt = 10 : 1) to yield product 5 (23.6 mg, 23%).

3-Phenylquinoline (5): $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 9.19 (s, 1H), 8.30 (s, 1H), 8.15 - 8.13 (d, $J = 8.4$ Hz, 1H), 7.89 - 7.87 (d, $J = 8$ Hz, 1H), 7.74 - 7.71 (m, 3H), 7.60 - 7.51 (m, 3H), 7.46 - 7.42 (m, 1H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 149.9, 147.3, 137.9, 133.8, 133.2, 129.4, 129.2, 129.2, 128.10, 128.0, 127.4, 127.0; HRMS (ESI-TOF) m/z calcd for C$_{15}$H$_{12}$N [M + H]$^+$ 206.0964, found 206.0966.

\[
\begin{array}{c}
\text{1-p-tolylethanone (0.6 mmol)} \\
\text{standard conditions} \\
\end{array}
\]

A reaction kettle (25 mL) was charged with 9H-Carbazole (0.5 mmol, 1 equiv.), 1-p-tolylethanone (0.6 mmol, 1.2 equiv.), [Cp*Co(CO)$_2$I$_2$] (12.0 mg, 5.0 mol%), AgNTf$_2$ (20 mg, 10.0 mol %), CH$_3$OH (2 mL), then the HOTf (0.5 mmol) was added. The mixture was stirred at 120 °C for 8 hours under an atmosphere of air. The mixture was quenched by sat. aq. NaHCO$_3$, and diluted with 20 mL dichloromethane and washed with 10 mL H$_2$O. The aqueous layer was extracted twice with dichloromethane (10 mL) and the combined organic phase was dried over Na$_2$SO$_4$. After evaporation of the solvents, the residue was purified by silica gel chromatography (hexane/AcOEt = 20 : 1) to yield product 6 (59.0 mg, 42%).

4-p-Tolyl-pyrrolo[3,2,1-jk]carbazole (6): $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.27 (d, $J = 8.8$ Hz, 2H), 7.73 - 7.77 (m, 4H), 7.39 - 7.42 (m, 4H), 7.32 (d, $J = 8.0$ Hz, 2H), 2.52 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 148.8, 147.5, 128.2, 132.9, 130.4, 129.9, 129.6, 129.2, 127.0, 125.5, 125.3, 21.4; HRMS (ESI-TOF) m/z calcd for C$_{21}$H$_{16}$N [M + H]$^+$ 282.1283, found 282.1286.
A reaction kettle (25 mL) was charged with 2-styrylphenylamine (0.5 mmol, 1 equiv), [Cp*Co(CO)I₂] (12.0 mg, 5.0 mol %), AgNTf₂ (20 mg, 10.0 mol %), CH₃OH (2 mL), then the HOTf (0.5 mmol) was added. The reaction was sealed with a rubber septum and a CO atmosphere was injected in the flask with a balloon and a needle. The mixture was stirred at 120 °C for 8 hours under an atmosphere of CO. The mixture was quenched by sat. aq. NaHCO₃, and diluted with 20 mL dichloromethane and washed with 10 mL H₂O. The aqueous layer was extracted twice with dichloromethane (10 mL) and the combined organic phase was dried over Na₂SO₄. After evaporation of the solvents, the residue was purified by silica gel chromatography (hexane/AcOEt = 10 : 1) to yield product 5 (14.4 mg, 14%).

A reaction kettle (25 mL) was charged with N-phenylformamide (0.5 mmol, 1 equiv), acetophenone 2 (0.5 mmol, 1.2 equiv), [Cp*CoI₂(CO)] (12.0 mg, 5.0 mol %), AgNTf₂ (20 mg, 10.0 mol %), CH₃OH (2 mL), then the HOTf (0.5 mmol) was added. The mixture was stirred at 120 °C for 8 hours under an atmosphere of air. When the reaction finished, no product 3a was obtained.

A reaction kettle (25 mL) was charged with 1a (0.5 mmol, 1 equiv), [Cp*Co(CO)I₂] (5 mol%), AgNTf₂ (10 mol%), HOTf (100 mol%), CD₃OD, 120 °C, 2 h, to exchange H/D, to give 82% D.
A reaction kettle (25 mL) was charged with \( p \)-tolylamine **1m** (0.5 mmol, 1 equiv), \([\text{Cp}^*\text{Co(CO)}_2] \) (12.0 mg, 5.0 mol %), AgNTf\(_2\) (20 mg, 10.0 mol %), CD\(_3\)OD (2 mL), then the DOTf (0.5 mmol) was added. The mixture was stirred at 120 °C for 2 hours under an atmosphere of air. The mixture was quenched by sat. aq. NaHCO\(_3\), and diluted with 20 mL dichloromethane and washed with 10 mL H\(_2\)O. The aqueous layer was extracted twice with dichloromethane (10 mL) and the combined organic phase was dried over Na\(_2\)SO\(_4\). After evaporation of the solvents, the residue was purified by silica gel chromatography (hexane/AcOEt = 20 : 1) to yield product.
Characterization data for products

4-Phenylquinoline (3a): Obtained as a yellow liquid (64.9 mg, 63% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.93 (d, $J$ = 4.0 Hz, 1H), 8.18 (d, $J$ = 8.4 Hz, 1H), 7.91 (d, $J$ = 8.4 Hz, 1H), 7.68 - 7.72 (t, 1H), 7.45 - 7.52 (m, 6H), 7.31 (d, $J$ = 4.0 Hz, 1H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 150.0, 148.6, 148.4, 137.9, 129.7, 129.4, 129.2, 128.5, 128.3, 126.7, 126.5, 125.8, 121.2; HRMS (ESI-TOF) m/z calcd for C$_{15}$H$_{13}$N [M + H]$^+$ 206.0970, found 209.0976.

8-Methyl-4-phenylquinoline (3b): Obtained as a white solid (71.2 mg, 65% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.97 (d, $J$ = 4.4 Hz, 1H), 7.75 (d, $J$ = 8.4 Hz, 1H), 7.57 (d, $J$ = 6.8 Hz, 1H), 7.45 - 7.53 (m, 5H), 7.35 - 7.39 (t, 1H), 7.32 (d, $J$ = 4.4 Hz, 1H), 2.87 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 148.7, 147.7, 138.4, 137.3, 129.54, 129.49, 128.4, 128.2, 126.7, 126.2, 123.9, 120.1, 18.6; HRMS (ESI-TOF) m/z calcd for C$_{16}$H$_{14}$N [M + H]$^+$ 220.1126, found 220.1128.

8-tert-Butyl-4-phenylquinoline (3c): Obtained as a yellow liquid (80.9 mg, 62% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.93 (d, $J$ = 4.0 Hz, 1H), 7.73 (d, $J$ = 8.4 Hz, 1H), 7.67 (d, $J$ = 7.6 Hz, 1H), 7.40 - 7.50 (m, 5H), 7.34 - 7.38 (t, 1H), 7.24 (d, $J$ = 4.0 Hz, 1H), 7.14 - 7.18 (m, 1H), 7.00 - 7.04 (m, 1H), 4.06 (s, 2H), 1.50 - 1.60 (m, 2H), 0.90 - 0.94 (t, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 149.0, 147.7, 138.4, 137.3, 129.54, 129.49, 128.4, 128.2, 126.7, 126.2, 123.9, 120.1, 18.6; HRMS (ESI-TOF) m/z calcd for C$_{18}$H$_{16}$N [M + H]$^+$ 234.1280, found 234.1278.
1H), 1.72 (s, 9H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 148.6, 148.3, 147.8, 146.7, 139.0, 129.6, 128.4, 128.0, 127.7, 125.9, 124.6, 120.5, 36.7, 31.1; HRMS (ESI-TOF) m/z calcd for C$_{19}$H$_{20}$N [M + H]$^+$ 262.1596, found 262.1602.

8-Fluoro-4-phenylquinoline (3d): Obtained as yellow liquid (56.9 mg, 51% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.98 (d, $J = 4.0$ Hz, 1H), 7.68 - 7.70 (t, 1H), 7.45 - 7.54 (m, 5H), 7.38 - 7.52 (m, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 159.4, 156.9, 149.9, 148.3 (d, $J = 2.8$ Hz), 139.8 (d, $J = 11.3$ Hz), 137.5, 129.3, 128.5, 128.4 (d, $J = 1.5$ Hz), 126.1 (d, $J = 8.2$ Hz), 122.1, 121.5 (d, $J = 4.7$ Hz), 113.2 (d, $J = 18.9$ Hz); HRMS (ESI-TOF) m/z calcd for C$_{15}$H$_{11}$FN [M + H]$^+$ 224.0876, found 224.0878.

8-Bromo-4-phenylquinoline (3e): Obtained as a white solid (76.4 mg, 54% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 9.05 (d, $J = 4.4$ Hz, 1H), 8.04 (d, $J = 7.2$ Hz, 1H), 7.86 (d, $J = 8.8$ Hz, 1H), 7.44 - 7.53 (m, 5H), 7.37 (d, $J = 4.4$ Hz, 1H), 7.28 - 7.32 (t, 1H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 150.5, 149.0, 145.5, 137.4, 133.0, 129.4, 128.52, 128.50, 128.1, 126.7, 125.8, 125.1, 122.1; HRMS (ESI-TOF) m/z calcd for C$_{15}$H$_{15}$BrN [M + H]$^+$ 284.0075, found 284.0079.
7-Methyl-4-phenylquinoline (3f): Obtained as a white solid (78.8 mg, 72% yield);
\[1^1H\text{ NMR (400 MHz, CDCl}_3\] \(\delta\) ppm: 8.85 (d, \(J= 4.0\) Hz, 1H), 8.06 (d, \(J= 8.4\) Hz, 1H), 7.57 - 7.61 (t, 1H), 7.42 - 7.43 (m, 3H), 7.27 - 7.32 (m, 3H), 7.20 (d, \(J= 8.4\) Hz, 1H), 2.01 (s, 3H); \[1^{13}\text{C NMR (100 MHz, CDCl}_3\] \(\delta\) ppm: 149.7, 148.9, 148.6, 142.4, 135.6, 129.8, 128.9, 128.7, 127.9, 127.7, 126.2, 123.4, 24.4; \[\text{HRMS (ESI-TOF)} \text{ m/z calcd for C}_{16}H_{14}N [M + H]^+ 220.1128, found 220.1128.

7-Methoxy-4-phenylquinoline (3g): Obtained as a white solid (83.4 mg, 71% yield);
\[1^1H\text{ NMR (400 MHz, CDCl}_3\] \(\delta\) ppm: 8.78 (d, \(J= 4.4\) Hz, 1H), 8.07 (d, \(J= 9.2\) Hz, 1H), 7.46 - 7.53 (m, 5H), 7.35 - 7.38 (m, 1H), 7.25 (d, \(J= 4.4\) Hz, 1H), 7.18 (d, \(J= 2.0\) Hz, 1H), 3.76 (s, 3H); \[1^{13}\text{C NMR (100 MHz, CDCl}_3\] \(\delta\) ppm: 157.8, 147.4, 147.0, 144.7, 138.2, 131.2, 129.2, 128.6, 128.2, 127.6, 121.55, 103.6, 55.3; \[\text{HRMS (ESI-TOF)} \text{ m/z calcd for C}_{16}H_{14}NO [M + H]^+ 236.1079, found 236.1079.

7-Chloro-4-phenylquinoline (3h): Obtained as a white solid (80.1 mg, 67% yield);
\[1^1H\text{ NMR (400 MHz, CDCl}_3\] \(\delta\) ppm: 8.93 (d, \(J= 4.4\) Hz, 1H), 8.17 (d, \(J= 1.2\) Hz, 1H), 7.85 (d, \(J= 9.2\) Hz, 1H), 7.42 - 7.55 (m, 6H), 7.33 (d, \(J= 4.4\) Hz, 1H); \[1^{13}\text{C NMR (100 MHz, CDCl}_3\] \(\delta\) ppm: 151.0, 149.1, 148.6, 137.5, 135.2, 129.4, 128.70, 128.67, 127.6, 127.3, 125.2, 121.4; \[\text{HRMS (ESI-TOF)} \text{ m/z calcd for C}_{15}H_{11}NCl [M + H]^+ 240.0580, found 240.0584.
7-trifluoromethyl-4-phenylquinoline (3i): Obtained as a white solid (65.5 mg, 48% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.93 (d, $J = 4.4$ Hz, 1H), 8.17 (d, $J = 1.2$ Hz, 1H), 7.85 (d, $J = 9.2$ Hz, 1H), 7.42 - 7.55 (m, 6H), 7.33 (d, $J = 4.4$ Hz, 1H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 151.3, 148.6, 147.8, 137.2, 130.9, 129.5, 128.9, 128.8, 128.4, 127.7 (q, $J = 8.6$ Hz), 127.3, 122.9, 122.2 (q, $J = 6.2$ Hz); HRMS (ESI-TOF) m/z calcd for C$_{16}$H$_{11}$NF$_3$ [M + H]$^+$ 274.0844, found 274.0847.

6-Fluoro-4-phenylquinoline (3j): Obtained as a white solid (68.0 mg, 61% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.88 (d, $J = 4.4$ Hz, 1H), 8.16 (dd, $J = 8.8, 5.6$ Hz, 1H), 7.43 - 7.52 (m, 7H), 7.30 (d, $J = 4.4$ Hz, 1H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 161.7, 159.2, 149.0 (d, $J = 2.6$ Hz), 147.8 (d, $J = 5.6$ Hz), 145.6, 137.3, 132.2 (d, $J = 9.1$ Hz), 129.1, 128.6, 128.5, 127.4 (d, $J = 9.5$ Hz), 121.6, 119.4 (d, $J = 25.6$ Hz), 109.0 (d, $J = 22.9$ Hz); HRMS (ESI-TOF) m/z calcd for C$_{15}$H$_{11}$FN [M + H]$^+$ 224.0876, found 224.0878.

6-Chloro-4-phenylquinoline (3k): Obtained as a white solid (76.5 mg, 64% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.90 (d, $J = 4.0$ Hz, 1H), 8.09 (d, $J = 8.8$ Hz, 1H), 7.87 (s, 1H), 7.63 (d, $J = 8.8$ Hz, 1H), 7.44 - 7.52 (m, 5H), 7.31 - 7.32 (m, 1H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 150.0, 147.6, 147.0, 137.2, 132.5, 131.4, 130.1, 129.3, 128.7, 128.6, 127.3, 124.5, 121.9; HRMS (ESI-TOF) m/z calcd for C$_{15}$H$_{11}$NCl [M + H]$^+$ 240.0580, found 240.0584.
**6-Bromo-4-phenylquinoline (3l):** Obtained as a white solid (94.8 mg, 67% yield); 
\(^1H\) NMR (400 MHz, CDCl\(_3\)) δ ppm: 8.92 (d, \(J = 3.6\) Hz, 1H), 8.03 (d, \(J = 10.4\) Hz, 2H), 7.76 (d, \(J = 9.2\) Hz, 1H), 7.45 - 7.52 (m, 5H), 7.31 - 7.32 (m, 1H); \(^{13}C\) NMR (100 MHz, CDCl\(_3\)) δ ppm: 150.1, 147.5, 147.2, 137.1, 132.7, 131.5, 129.3, 128.7, 128.6, 127.9, 127.8, 121.9, 120.8; HRMS (ESI-TOF) m/z calcd for C\(_{15}\)H\(_{15}\)BrN [M + H] \(^+\) 284.0075, found 284.0079.

![6-Bromo-4-phenylquinoline (3l) structure](image)

**6-Methyl-4-phenylquinoline (3m):** Obtained as a white solid (85.4 mg, 78% yield); 
\(^1H\) NMR (400 MHz, CDCl\(_3\)) δ ppm: 8.86 (d, \(J = 4.4\) Hz, 1H), 8.07 (d, \(J = 8.4\) Hz, 1H), 7.66 (s, 1H), 7.48 - 7.56 (m, 6H), 7.27 (d, \(J = 4.4\) Hz, 1H), 2.46 (s, 3H); \(^{13}C\) NMR (100 MHz, CDCl\(_3\)) δ ppm: 149.1, 147.8, 147.3, 138.3, 136.5, 131.6, 129.59, 129.53, 128.6, 128.3, 126.7, 124.6, 121.4, 21.8; HRMS (ESI-TOF) m/z calcd for C\(_{16}\)H\(_{14}\)N [M + H] \(^+\) 220.1126, found 220.1128.

![6-Methyl-4-phenylquinoline (3m) structure](image)

**6-trifluoromethyl-4-phenylquinoline (3n):** Obtained as a yellow liquid (73.7 mg, 54% yield); \(^1H\) NMR (400 MHz, CDCl\(_3\)) δ ppm: 9.03 (d, \(J = 4.4\) Hz, 1H), 8.25 - 8.30 (m, 2H), 7.89 (d, \(J = 4.4\) Hz, 1H), 7.48 - 7.57 (m, 5H), 7.42 (d, \(J = 4.4\) Hz, 1H); \(^{13}C\) NMR (100 MHz, CDCl\(_3\)) δ ppm: 152.0, 149.7, 149.5, 137.0, 131.2, 129.4, 129.0, 128.9, 128.3 (q, \(J = 52.3\) Hz), 125.9, 125.0 (q, \(J = 5.5\) Hz), 123.9 (q, \(J = 8.9\) Hz), 122.4; HRMS (ESI-TOF) m/z calcd for C\(_{16}\)H\(_{11}\)NF\(_3\) [M + H] \(^+\) 274.0844, found 274.0849.

![6-trifluoromethyl-4-phenylquinoline (3n) structure](image)
6-Methylsulfanyl-4-phenylquinoline (3o): Obtained as a white solid (76.6 mg, 61% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.84 (d, $J = 4.4$ Hz, 1H), 8.06 (d, $J = 8.8$ Hz, 1H), 7.66 (d, $J = 1.2$ Hz, 1H), 7.60 (dd, $J = 8.8$, 1.6 Hz, 1H), 7.48 - 7.54 (m, 5H), 7.29 (d, $J = 4.4$ Hz, 1H), 2.44 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 149.1, 147.1, 147.0, 137.9, 137.5, 130.1, 129.4, 128.73, 128.67, 128.5, 127.1, 121.9, 121.1, 15.7; HRMS (ESI-TOF) m/z calcd for C$_{16}$H$_{14}$NS [M + H]$^+$ 252.0847, found 252.0852.

4-Phenylquinoline-6-carboxylic acid methyl ester (3p): Obtained as a yellow liquid (57.9 mg, 44% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.79 (d, $J = 4.4$ Hz, 1H), 8.18 (s, 1H), 7.49 - 7.56 (m, 5H), 7.27 (d, $J = 4.4$ Hz, 1H), 7.22 (s, 1H), 3.83 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 153.5, 148.6, 147.0, 144.5, 138.0, 130.7, 129.2, 128.8, 128.6, 127.5, 126.4, 121.8, 104.2, 56.2; HRMS (ESI-TOF) m/z calcd for C$_{16}$H$_{14}$NO$_2$ [M + H]$^+$ 264.1025, found 264.1032.

6,8-Dimethyl-4-phenylquinoline (3q): Obtained as a white solid (103.7 mg, 89% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.90 (d, $J = 4.4$ Hz, 1H), 7.48 - 7.54 (m, 6H), 7.43 (s, 1H), 7.28 (d, $J = 4.4$ Hz, 1H), 2.83 (s, 3H), 2.42 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 147.9, 147.8, 146.4, 138.7, 137.0, 136.0, 131.9, 129.6, 128.5, 128.1, 126.8, 122.6, 121.3, 21.8, 18.5; HRMS (ESI-TOF) m/z calcd for C$_{17}$H$_{16}$N [M + H]$^+$ 234.1283, found 234.1286.
7-Chloro-6-methoxy-4-phenylquinoline (3r): Obtained as a white solid (96.8 mg, 72% yield); $^1H$ NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 9.01 (d, $J = 4.0$ Hz, 1H), 8.69 (s, 1H), 8.30 (d, $J = 8.8$ Hz, 1H), 8.20 (d, $J = 8.8$ Hz, 1H), 7.50 - 7.57 (m, 5H), 7.39 (d, $J = 4.4$ Hz, 1H), 3.92 (s, 3H); $^{13}C$ NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 166.7, 152.0, 150.6, 149.9, 137.3, 130.2, 129.6, 129.1, 128.8, 128.7, 128.2, 126.0, 122.1, 52.4; HRMS (ESI-TOF) m/z calcd for C$_{16}$H$_{13}$ClNO [M + H]$^+$ 270.0686, found 270.0694.

4-Phenyl-benzo[h]quinoline (3s): Obtained as a white solid (75.2 mg, 59% yield); $^1H$ NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 9.01 (d, $J = 4.0$ Hz, 1H), 8.69 (s, 1H), 8.30 (d, $J = 8.8$ Hz, 1H), 8.20 (d, $J = 8.8$ Hz, 1H), 7.50 - 7.57 (m, 5H), 7.39 (d, $J = 4.4$ Hz, 1H), 3.92 (s, 3H); $^{13}C$ NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 166.7, 152.0, 150.6, 149.9, 137.3, 130.2, 129.6, 129.1, 128.8, 128.7, 128.2, 126.0, 122.1, 52.4; HRMS (ESI-TOF) m/z calcd for C$_{19}$H$_{14}$N [M + H]$^+$ 256.1126, found 256.1129.

6-piperidin-1-yl-4-Phenylquinoline (3t): Obtained as a white solid (87.8 mg, 61% yield); $^1H$ NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.69 (d, $J = 4.4$ Hz, 1H), 8.01 (d, $J = 9.2$ Hz, 1H), 7.45 - 7.51 (m, 6H), 7.19 (d, $J = 4.4$ Hz, 1H), 7.13 (d, $J = 2.0$ Hz, 1H), 3.13 - 3.15 (m, 4H), 1.63 - 1.70 (m, 4H), 1.51 - 1.57 (m, 2H); $^{13}C$ NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 150.3, 146.8, 146.6, 144.1, 138.7, 130.3, 129.4, 128.6, 128.2, 127.8, 122.9, 121.6, 107.3, 50.5, 25.7, 24.2; HRMS (ESI-TOF) m/z calcd for C$_{20}$H$_{21}$N$_2$ [M + H]$^+$ 289.1705, found 289.1707.
6-Morpholin-4-yl-4-phenyl-quinoline (3u): Obtained as a yellow solid (92.8 mg, 64% yield); $^1$H NMR (400 MHz, CDCl$_3$) δ ppm: 8.64 (d, $J$ = 4.4 Hz, 1H), 7.96 (d, $J$ = 9.2 Hz, 1H), 7.36 - 7.45 (m, 6H), 7.13 (d, $J$ = 4.4 Hz, 1H), 7.05 (d, $J$ = 2.0 Hz, 1H), 3.73 - 3.75 (m, 4H), 3.04 - 3.06 (m, 4H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ ppm: 149.4, 147.3, 146.9, 144.4, 138.5, 130.6, 129.3, 128.7, 128.3, 127.7, 121.8, 121.6, 107.1, 66.8, 49.2; HRMS (ESI-TOF) m/z calcd for C$_{19}$H$_{19}$N$_2$O [M + H]$^+$ 291.1497, found 291.1502.

4-(4-Chloro-phenyl)-6,8-dimethyl-quinoline (4a): Obtained as a yellow solid (108.1 mg, 81% yield); $^1$H NMR (400 MHz, CDCl$_3$) δ ppm: 8.86 (d, $J$ = 4.4 Hz, 1H), 7.35 - 7.46 (m, 6H), 7.19 (d, $J$ = 4.4 Hz, 1H), 2.81 (s, 3H), 2.39 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ ppm: 147.8, 146.6, 144.4, 138.5, 130.6, 129.3, 128.7, 128.3, 127.7, 121.8, 121.6, 107.1, 66.5, 22.3, 21.2, 21.8, 18.5; HRMS (ESI-TOF) m/z calcd for C$_{17}$H$_{15}$ClN [M + H]$^+$ 268.0893, found 268.0899.

4-(4-Bromo-phenyl)-6,8-dimethyl-quinoline (4b): Obtained as a yellow solid (127.5 mg, 82% yield); $^1$H NMR (400 MHz, CDCl$_3$) δ ppm: 8.88 (d, $J$ = 4.4 Hz, 1H), 7.64 (d, $J$ = 8.0 Hz, 2H), 7.42 (s, 2H), 7.34 (d, $J$ = 8.0 Hz, 2H), 7.23 (d, $J$ = 4.4 Hz, 1H), 2.82 (s,
3H), 2.42 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 147.8, 146.6, 146.4, 137.6, 137.2, 136.3, 132.0, 131.7, 131.2, 126.5, 122.5, 122.2, 121.2, 21.8, 18.5; HRMS (ESI-TOF) m/z calcd for C$_{17}$H$_{15}$BrN [M + H]$^+$ 312.0388, found 312.0393.

4-(4-Iodo-phenyl)-6,8-dimethyl-quinoline (4c): Obtained as a yellow solid (124.4 mg, 78% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.87 (d, $J$ = 4.4 Hz, 1H), 7.82 (d, $J$ = 8.0 Hz, 2H), 7.41 (s, 2H), 7.17 - 7.20 (t, 3H), 2.81 (s, 3H), 2.40 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 147.8, 146.6, 146.4, 137.6, 137.2, 136.3, 132.0, 131.7, 131.2, 126.5, 122.5, 122.2, 121.2, 21.8, 18.5; HRMS (ESI-TOF) m/z calcd for C$_{17}$H$_{15}$IN [M + H]$^+$ 360.0249, found 360.0251.

6,8-Dimethyl-4-(4-trifluoromethyl-phenyl)-quinoline (4d): Obtained as a yellow solid (103.8 mg, 69% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.91 (d, $J$ = 4.4 Hz, 1H), 7.78 (d, $J$ = 8.0 Hz, 2H), 7.59 (d, $J$ = 8.0 Hz, 2H), 7.44 (s, 1H), 7.38 (s, 1H), 7.25 (d, $J$ = 4.0 Hz, 1H), 2.83 (s, 3H), 2.42 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 147.7, 146.4, 146.3, 142.4, 137.3, 136.6, 132.2, 130.2 (d, $J$ = 32.3 Hz), 129.9, 126.3, 125.5 (d, $J$ = 7.4 Hz), 122.1, 121.1, 21.8, 18.5; HRMS (ESI-TOF) m/z calcd for C$_{18}$H$_{15}$F$_3$N [M + H]$^+$ 302.1157, found 302.1163.
**4-(6,8-Dimethyl-quinolin-4-yl)-phenyl]-dimethyl-amine (4e):** Obtained as a yellow solid (115.9 mg, 84% yield); $^1$H NMR (400 MHz, CDCl$_3$) δ ppm: 8.84 (d, $J$ = 4.4 Hz, 1H), 7.66 (s, 1H), 7.37 - 7.39 (m, 3H), 7.23 (d, $J$ = 4.4 Hz, 1H), 6.81 (d, $J$ = 8.8 Hz, 2H), 3.00 (s, 3H), 2.82 (s, 3H), 2.40 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ ppm: 150.4, 148.3, 147.9, 146.6, 136.8, 135.5, 131.7, 130.6, 127.1, 126.3, 123.1, 121.1, 112.1, 40.4, 21.8, 18.7; HRMS (ESI-TOF) m/z calcd for C$_{19}$H$_{21}$N$_2$ [M + H]$^+$ 277.1705, found 277.1712.

**4-(2-Fluoro-phenyl)-6,8-dimethyl-quinoline (4f):** Obtained as a yellow solid (90.4 mg, 72% yield); $^1$H NMR (400 MHz, CDCl$_3$) δ ppm: 8.92 (d, $J$ = 4.4 Hz, 1H), 7.42 - 7.47 (m, 2H), 7.36 (t, 1H), 7.21 - 7.30 (m, 4H), 2.83 (s, 3H), 2.40 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ ppm: 160.9, 158.5, 147.7, 146.2, 142.0, 137.0, 136.3, 132.1, 131.7 (d, $J$ = 3.2 Hz), 130.3 (d, $J$ = 7.9 Hz), 127.0, 126.1 (d, $J$ = 16.0 Hz), 124.2 (d, $J$ = 3.6 Hz), 122.3 (d, $J$ = 39.6 Hz), 116.0 (d, $J$ = 21.7 Hz), 21.8, 18.4; HRMS (ESI-TOF) m/z calcd for C$_{17}$H$_{15}$FN [M + H]$^+$ 252.1189, found 252.1191.
**6,8-Dimethyl-4-o-tolyl-quinoline (4g):** Obtained as a yellow solid (107.4 mg, 87% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.90 (d, $J = 4.4$ Hz, 1H), 7.29 - 7.40 (m, 4H), 7.18 - 7.20 (m, 2H), 7.07 (s, 1H), 2.84 (s, 3H), 2.37 (s, 3H), 2.03 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 147.91, 147.86, 146.2, 138.2, 136.9, 136.09, 136.06, 132.0, 130.1, 129.6, 128.2, 127.3, 125.7, 122.7, 121.4, 21.7, 20.0, 18.4; HRMS (ESI-TOF) m/z calcd for C$_{18}$H$_{18}$N [M + H]$^+$ 248.1439, found 248.1442.

![Diagram of 6,8-Dimethyl-4-o-tolyl-quinoline (4g)](image)

**4-(3-Fluoro-phenyl)-6,8-dimethyl-quinoline (4h):** Obtained as a yellow solid (85.3 mg, 68% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.90 (d, $J = 4.4$ Hz, 1H), 7.44 - 7.51 (m, 3H), 7.24 - 7.26 (m, 2H), 7.16 - 7.20 (t, 2H), 2.83 (s, 3H), 2.42 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 163.9, 161.5, 147.8, 146.5 (d, $J = 13.3$ Hz), 140.8 (d, $J = 7.6$ Hz), 137.1, 136.4, 132.0, 130.0 (d, $J = 8.3$ Hz), 126.5, 125.3 (d, $J = 2.9$ Hz), 122.3, 121.1, 116.7 (d, $J = 21.9$ Hz), 115.1 (d, $J = 20.9$ Hz), 21.8, 18.4; HRMS (ESI-TOF) m/z calcd for C$_{17}$H$_{15}$FN [M + H]$^+$ 252.1189, found 252.1191.

![Diagram of 4-(3-Fluoro-phenyl)-6,8-dimethyl-quinoline (4h)](image)

**6,8-Dimethyl-4-m-tolyl-quinoline (4i):** Obtained as a yellow solid (108.7 mg, 88% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.88 (d, $J = 4.4$ Hz, 1H), 7.50 (s, 1H), 7.38 - 7.42 (m, 2H), 7.25 - 7.29 (m, 4H), 2.83 (s, 3H), 2.45 (s, 3H), 2.41 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 148.1, 147.8, 146.4, 138.7, 138.2, 136.9, 135.9, 131.8, 130.2, 128.9, 128.3, 126.9, 126.7, 122.7, 121.2, 21.8, 21.5, 18.5; HRMS (ESI-TOF) m/z calcd for C$_{18}$H$_{18}$N [M + H]$^+$ 248.1439, found 248.1442.

![Diagram of 6,8-Dimethyl-4-m-tolyl-quinoline (4i)](image)
6,8-Dimethyl-2,3-dihydro-1H-cyclopenta[c]quinoline (4j): Obtained as a yellow solid (70.9 mg, 72% yield); $^1$H NMR (400 MHz, CDCl$_3$) δ ppm: 8.78 (s, 1H), 7.40 (s, 1H), 7.34 (s, 1H), 3.20 - 3.24 (t, 2H), 3.10 - 3.14 (t, 2H), 2.78 (s, 3H), 2.49 (s, 3H), 2.22 - 2.30 (m, 2H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ ppm: 149.3, 145.6, 144.7, 137.0, 136.4, 135.8, 130.8, 126.1, 121.1, 31.4, 31.1, 24.5, 21.7, 18.6; HRMS (ESI-TOF) m/z calcd for C$_{14}$H$_{16}$N [M + H]$^+$ 198.1283, found 198.1286.

2,4-Dimethyl-7,8,9,10-tetrahydro-phenanthridine (4k): Obtained as a yellow solid (84.4 mg, 80% yield); $^1$H NMR (400 MHz, CDCl$_3$) δ ppm: 8.55 (s, 1H), 7.49 (s, 1H), 7.29 (s, 1H), 3.00 - 3.03 (t, 2H), 2.82 - 2.85 (t, 2H), 2.75 (s, 3H), 2.47 (s, 3H), 1.80 - 1.94 (m, 4H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ ppm: 150.3, 144.0, 140.6, 137.0, 135.5, 130.5, 129.2, 127.5, 119.6, 27.2, 25.1, 22.6, 22.4, 21.9, 18.4; HRMS (ESI-TOF) m/z calcd for C$_{15}$H$_{18}$N [M + H]$^+$ 212.1439, found 212.1444.

2,4-Dimethyl-8,9,10,11-tetrahydro-7H-cyclohepta[c]quinoline (4l): Obtained as a yellow liquid (76.5 mg, 68% yield); $^1$H NMR (400 MHz, CDCl$_3$) δ ppm: 8.61 (s, 1H), 7.70 (s, 1H), 7.31 (s, 1H), 3.16 - 3.19 (t, 2H), 2.92 - 2.95 (t, 2H), 2.77 (s, 3H), 2.48 (s, 3H), 1.87 - 1.93 (m, 2H), 1.65 - 1.68 (m, 4H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ ppm: 149.4, 147.5, 145.1, 137.1, 135.3, 135.2, 130.6, 126.6, 120.1, 33.2, 32.5, 28.1, 27.5,
26.4, 22.0, 18.6; HRMS (ESI-TOF) m/z calcd for C_{16}H_{20}N [M + H]^+ 226.1596, found 226.1604.

4-Furan-2-yl-6,8-dimethyl-quinoline (4m): Obtained as a yellow solid (84.7 mg, 76% yield); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) ppm: 8.85 (d, \(J = 4.4\) Hz, 1H), 8.04 (s, 1H), 7.64 (s, 1H), 7.53 (d, \(J = 4.4\) Hz, 1H), 7.39 (s, 1H), 6.89 (d, \(J = 2.4\) Hz, 1H), 6.57 - 6.59 (m, 1H), 2.79 (s, 3H), 2.48 (s, 3H); \(^{13}\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) ppm: 151.5, 147.8, 146.8, 143.6, 137.1, 136.4, 135.2, 131.9, 124.6, 122.2, 118.7, 111.9, 111.8, 22.0, 18.7; HRMS (ESI-TOF) m/z calcd for C_{15}H_{14}NO [M + H]^+ 224.1075, found 224.1077.

6,8-Dimethyl-4-thiophen-2-yl-quinoline (4n): Obtained as a yellow liquid (88.4 mg, 74% yield); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) ppm: 8.84 (d, \(J = 4.4\) Hz, 1H), 7.87 (s, 1H), 7.46 (d, \(J = 5.2\) Hz, 1H), 7.41 (s, 1H), 7.36 (d, \(J = 4.4\) Hz, 1H), 7.31 - 7.32 (m, 1H), 7.17 - 7.19 (m, 1H), 2.81 (s, 3H), 2.44 (s, 3H); \(^{13}\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) ppm: 147.7, 146.6, 140.2, 139.5, 137.1, 136.5, 132.1, 128.4, 127.7, 126.9, 126.5, 122.4, 121.8, 21.9, 18.6; HRMS (ESI-TOF) m/z calcd for C_{15}H_{14}NS [M + H]^+ 240.0847, found 240.0849.
6,8-Dimethyl-4-pyridin-3-yl-quinoline (4o): Obtained as a yellow liquid (63.2 mg, 54% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.93 (d, $J = 4.4$ Hz, 1H), 8.73 - 8.75 (m, 2H), 7.82 (d, $J = 7.6$ Hz, 1H), 7.46 - 7.49 (m, 2H), 7.40 (s, 1H), 7.27 - 7.29 (m, 1H), 2.84 (s, 3H), 2.43 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 150.0, 149.5, 147.8, 146.4, 144.1, 137.3, 136.9, 136.7, 134.5, 132.2, 126.5, 123.3, 121.9, 121.5, 21.8, 18.5; HRMS (ESI-TOF) m/z calcd for C$_{16}$H$_{15}$N$_2$ [M + H]$^+$ 235.1235, found 235.1239.

4-(1H-Indol-3-yl)-6,8-dimethyl-quinoline (4p): Obtained as a yellow solid (121.0 mg, 89% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.90 (d, $J = 4.0$ Hz, 1H), 8.88 (s, 1H), 7.79 (s, 1H), 7.59 (d, $J = 8.0$ Hz, 1H), 7.44 - 7.51 (t, 4H), 7.27 - 7.31 (t, 1H), 7.15 - 7.19 (t, 1H), 2.86 (s, 3H), 2.40 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 148.0, 146.6, 141.5, 136.8, 136.3, 135.6, 131.9, 127.6, 127.0, 124.4, 123.2, 122.8, 121.8, 120.6, 120.1, 114.6, 111.5, 21.8, 18.7; HRMS (ESI-TOF) m/z calcd for C$_{19}$H$_{17}$N$_2$ [M + H]$^+$ 273.1392, found 273.1397.

6,8-Dimethyl-4-naphthalen-2-yl-quinoline (4q): Obtained as a yellow solid (111.7 mg, 79% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.92 (d, $J = 4.4$ Hz, 1H), 7.89 -
7.97 (m, 4H), 7.52 - 7.59 (m, 4H), 7.42 (s, 1H), 7.35 (d, J = 4.4 Hz, 1H), 2.85 (s, 3H), 2.38 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 147.93, 147.85, 146.5, 137.1, 136.3, 136.2, 133.3, 133.0, 131.9, 128.6, 128.3, 128.0, 127.8, 127.6, 127.0, 126.62, 126.58, 122.8, 121.6, 21.8, 18.6; HRMS (ESI-TOF) m/z calcd for C$_{21}$H$_{18}$N [M + H]$^+$ 284.1439, found 284.1442.

6,8-Dimethyl-4-naphthalen-1-yl-quinoline (4r): Obtained as a yellow solid (100.5 mg, 71% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.97 (d, J = 4.0 Hz, 1H), 7.94 - 7.99 (t, 2H), 7.57 - 7.61 (t, 1H), 7.47 - 7.51 (t, 1H), 7.41 - 7.45 (t, 2H), 7.29 - 7.36 (m, 3H), 7.03 (s, 1H), 2.87 (s, 3H), 2.26 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 147.8, 146.7, 146.2, 136.9, 136.3, 136.1, 133.5, 132.1, 132.0, 128.5, 128.3, 128.1, 127.3, 126.4, 126.1, 125.3, 123.1, 122.5, 21.7, 18.5; HRMS (ESI-TOF) m/z calcd for C$_{21}$H$_{18}$N [M + H]$^+$ 284.1439, found 284.1442.

2,4,8-Trimethyl-7,8-dihydro-benzo[k]phenanthridine (4s): Obtained as a yellow liquid (114.7 mg, 84% yield); $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ ppm: 8.76 (s, 1H), 8.12 (s, 1H), 7.98 - 8.00 (t, 1H), 7.38 - 7.41 (m, 4H), 2.98 - 3.05 (m, 2H), 2.82 (s, 3H), 2.66 - 2.73 (m, 2H), 2.50 (s, 3H), 1.27 (d, J = 6.4 Hz, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ ppm: 148.5, 146.7, 144.6, 138.4, 137.2, 135.9, 131.9, 130.7, 129.5, 129.1, 128.8, 126.2, 126.1, 124.4, 122.3, 34.3, 32.7, 22.0, 18.8, 18.4; HRMS (ESI-TOF) m/z calcd for C$_{20}$H$_{20}$N [M + H]$^+$ 274.1596, found 274.1603.
6,8-Dimethyl-3,4-diphenylquinoline (4t): Obtained as a yellow solid (112.8 mg, 73% yield); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) ppm: 8.96 (s, 1H), 7.40 (s, 1H), 7.27 - 7.32 (m, 4H), 7.14 - 7.21 (m, 7H), 2.86 (s, 3H), 2.37 (s, 3H); \(^{13}\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) ppm: 149.6, 145.3, 145.1, 138.6, 136.9, 136.7, 136.3, 132.9, 131.7, 130.6, 130.2, 128.1, 128.0, 127.5, 127.2, 126.9, 123.4, 21.9, 18.4; HRMS (ESI-TOF) m/z calcd for C\(_{23}\)H\(_{20}\)N [M + H]\(^+\) 310.1596, found 310.1602.

6,8-Dimethyl-4-styrylquinoline (4u): Obtained as a yellow solid (117.8 mg, 91% yield); \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) ppm: 8.83 (d, \(J = 4.4\) Hz, 1H), 7.75 - 7.79 (m, 2H), 7.60 (d, \(J = 7.2\) Hz, 2H), 7.51 (d, \(J = 4.4\) Hz, 1H), 7.39 - 7.43 (m, 3H), 7.31 - 7.35 (t, 1H), 7.25 (d, \(J = 16.4\) Hz, 1H), 2.79 (s, 3H), 2.51 (s, 3H); \(^{13}\)C NMR (100 MHz, CDCl\(_3\)) \(\delta\) ppm: 148.1, 146.4, 142.4, 137.2, 136.8, 135.9, 134.5, 131.9, 128.9, 128.6, 127.1, 126.4, 123.7, 120.4, 117.0, 21.9, 18.6; HRMS (ESI-TOF) m/z calcd for C\(_{19}\)H\(_{18}\)N [M + H]\(^+\) 260.1439, found 260.1443.

References:
Copies of $^1$H and $^{13}$C NMR spectra of products

3a
3c
3h
3p
3r
4n
4r