Supporting Information

Rh(III)-Catalyzed C–H Amidation of 2-Arylindoles with Dioxazolones: A Route to Indolo[1,2-c]quinazolines

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1. **General Information**

Unless otherwise noted, all reagents were obtained commercially and used without further purification. Unless otherwise specified, all other reagents were purchased from Aldrich, Fisher or TCI and used without further purification. The NMR spectra were recorded on a Bruker MERCURY plus-400 (400 MHz, $^1$H; 100 MHz, $^{13}$C) spectrometer with chemical shifts reported in ppm relative to the residual deuterated solvent and the internal standard tetramethylsilane. Data for $^1$H NMR are recorded as follows: chemical shift (δ, ppm), multiplicity (s = singlet, d = doublet, t = triplet, m = multiplet or unresolved, br = broad singlet, coupling constant(s) in Hz, integration). Chromatography was carried out with silica gel (200-300 mesh) or neutral alumina (200-300 mesh) using mixtures of petroleum ether (PE) and ethyl acetate (EA) as eluents. High resolution mass spectra (HRMS) were measured with a Waters Micromass GCT instrument and accurate masses were reported for the molecular ion [M+H]$^+$. 2-Aryl-1H-indoles and their derivatives$^1$ and dioxazolones$^2$ were prepared following literature reports.

2. **General C–H Amidation Procedure**

![Chemical reaction diagram]

A pressure tube (capacity: 15.0 mL, outside diameter: 26.0 mm, length: 70.0 mm,) was charged with [Cp*RhCl$_2$]$_2$ (3 mg, 0.005 mmol), AgSbF$_6$ (8.5 mg, 0.025 mmol), LiOAc (2.6 mg, 0.025 mmol), 2-aryl-1H-indole (1, 0.10 mmol) and dioxazolone (2, 0.12 mmol). DCE (0.10 M) was added and the mixture was stirred at 140 °C for 24 h. After cooling to room temperature, the solvent was evaporated and the crude product was purified by column chromatography to afford the desired compound 3.
3. Representative Procedure of C–H Amidation at 1 mmol Scale

A pressure tube (capacity: 150.0 mL, outside diameter: 57.0 mm, length: 140.0 mm, ) was charged with [Cp*RhCl₂]₂ (30 mg, 0.05 mmol), AgSbF₅ (85 mg, 0.25 mmol), LiOAc (26 mg, 0.25 mmol), 2-aryl-1H-indole (1a, 1 mmol) and dioxazolone (2a, 1.2 mmol). DCE (0.10 M) was added and the mixture was stirred at 140 °C for 24 h. After cooling to room temperature, the solvent was evaporated and the crude product was purified by column chromatography to afford the desired compound 3aa.

4. Mechanistic Studies

A pressure tube (capacity: 15.0 mL, outside diameter: 26.0 mm, length: 70.0 mm, ) was charged with [Cp*RhCl₂]₂ (3 mg, 0.005 mmol), AgSbF₅ (8.5 mg, 0.025 mmol), LiOAc (2.6 mg, 0.025 mmol), 2-aryl-1H-indole (1d, 0.10 mmol), 2-aryl-1H-indole (1g, 0.10 mmol) and dioxazolone (2a, 0.12 mmol). DCE (0.10 M) was added and the mixture was stirred at 140 °C for 24 h. After cooling to room temperature, the solvent was evaporated and the crude product was purified by column chromatography to afford the desired compound 3da and 3ga.
charged with \([\text{Cp}^*\text{RhCl}_2]_2\) (3 mg, 0.005 mmol), AgSbF₆ (8.5 mg, 0.025 mmol), LiOAc (2.6 mg, 0.025 mmol), 2-aryl-1H-indole (1\text{a}, 0.10 mmol), 2-aryl-1H-indole (1\text{o}, 0.10 mmol) and dioxazolone (2\text{a}, 0.12 mmol). DCE (0.10 M) was added and the mixture was stirred at 140 °C for 24 h. After cooling to room temperature, the solvent was evaporated and the crude product was purified by column chromatography to afford the desired compound 3\text{na} and 3\text{oa}.

A pressure tube (capacity: 15.0 mL, outside diameter: 26.0 mm, length: 70.0 mm) was charged with \([\text{Cp}^*\text{RhCl}_2]_2\) (3 mg, 0.005 mmol), AgSbF₆ (8.5 mg, 0.025 mmol), LiOAc (2.6 mg, 0.025 mmol), 2-aryl-1H-indole (1\text{a}, 0.10 mmol), dioxazolone (2\text{d}, 0.12 mmol) and dioxazolone (2\text{g}, 0.12 mmol). DCE (0.10 M) was added and the mixture was stirred at 140 °C for 24 h. After cooling to room temperature, the solvent was evaporated and the crude product was purified by column chromatography to afford the desired compound 3\text{ad} and 3\text{ag}.

A pressure tube (capacity: 15.0 mL, outside diameter: 26.0 mm, length: 70.0 mm) was charged with \([\text{Cp}^*\text{RhCl}_2]_2\) (3 mg, 0.005 mmol), AgSbF₆ (17 mg, 0.025 mmol), LiOAc (2.6 mg, 0.025 mmol), 2-aryl-1H-indole (1\text{a}, 0.10 mmol), dioxazolone (2\text{a}, 0.12 mmol) and TEMPO (0.10 mmol) or BHT (0.10 mmol). DCE (0.10 M) was added and the mixture was stirred at 140 °C for 24 h. After cooling to room temperature, the solvent was evaporated and the crude product was purified by column chromatography to afford the desired compound 3\text{aa}.
5. MTT Assay

PC3 cells, A549 cells and MCF-7 cells were all cultured in Dulbecco’s modified Eagle’s medium (DMEM) supplemented with 10% fetal bovine serum (FBS). The cells were cultured in a humidified atmosphere of 5% CO₂/95% air at 37 °C. Cells were cultured in 35 mm glass bottom dishes (Φ = 20 mm) for 24 h and used for fluorescent imaging.

After diluting to 5 × 10⁴ cells mL⁻¹ with the complete medium, 100 μL of the cell suspension obtained was added to each well of 96-well culture plates. The subsequent incubation was performed at 37 °C, 5% CO₂ atmosphere for 24 h before the cytotoxicity assessments. Tested samples at preset concentrations were added to each well, and the cells were incubated for 48 h. The MTT solution (100 μL, 0.5 mg/mL) was added to each well, and the cells were incubated for another 4 h. The formazan crystals were dissolved in 150 μL of DMSO. Cell viability was assessed by measuring the absorbance at a 490 nm wavelength using a Thermo Multiskan FC microplate photometer (Thermo Fisher Scientific). The inhibition was calculated with the formula:

\[
\text{Inhibition \%} = \frac{(\text{OD}_c - \text{OD}_t)}{\text{OD}_c} \times 100\%
\]

ODₖ is the absorbance of negative control and ODₜ is the absorbance of tested drug.

**Full Table 2 Referred to from the Main Manuscript: Cytotoxicity of 3aa-3ak in Human Cancer Cells**

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6. References

7. Characterization Data

6-Phenylindolo[1,2-c]quinazoline, yellow solid (24.9 mg, 85% yield purified by silica gel chromatography using PE/EA 20:1), 3aa. $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.14 – 8.08 (m, 1H), 7.86 – 7.81 (m, 1H), 7.77 (d, $J = 7.9$ Hz, 1H), 7.69 – 7.58 (m, 5H), 7.58 – 7.48 (m, 2H), 7.33 – 7.26 (m, 2H), 6.98 (ddd, $J = 8.4$, 7.1, 1.1 Hz, 1H), 6.45 (d, $J = 8.6$ Hz, 1H). $^{13}$C NMR (101 MHz, Chloroform-d) $\delta$ 149.3, 139.2, 135.9, 135.2, 131.6, 130.3, 129.2, 129.0, 128.2, 127.8, 127.4, 123.4, 122.7, 121.4, 120.5, 120.4, 114.8, 95.7. HRMS: [M+H]$^+$ calculated for C$_{23}$H$_{18}$N$_2$: 325.1230, found: 325.1228.

3-Methyl-6-phenylindolo[1,2-c]quinazoline, yellow solid (23.4 mg, 76% yield purified by silica gel chromatography using PE/EA 10:1), 3ba. $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.03 (t, $J = 7.0$ Hz, 1H), 7.78 (t, $J = 6.7$ Hz, 1H), 7.68 (m, 6H), 7.38 (d, $J = 7.7$ Hz, 1H), 7.36 – 7.30 (t, $J = 8.0$ Hz, 1H), 7.28 – 7.23 (m, 1H), 6.99 (q, $J = 7.0$, 5.7 Hz, 1H), 6.50 – 6.43 (m, 1H), 2.53 (d, $J = 6.0$ Hz, 3H). $^{13}$C NMR (101 MHz, Chloroform-d) $\delta$ 149.5, 139.5, 135.3, 131.5, 130.5, 130.4, 129.3, 128.8, 128.2, 127.6, 123.5, 122.6, 121.3, 120.3, 117.9, 114.8, 99.9, 95.1, 21.7. HRMS: [M+H]$^+$ calculated for C$_{23}$H$_{19}$N$_2$: 309.1386, found: 309.1383.

3-Ethyl-6-phenylindolo[1,2-c]quinazoline, yellow solid (23.8 mg, 74% yield, purified by silica gel chromatography using PE/EA 20:1), 3ca. $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.06 (d, $J = 8.1$ Hz, 1H), 7.79 (d, $J = 7.9$ Hz, 1H), 7.73 (s, 1H), 7.72 – 7.62 (m, 5H), 7.40 (dd, $J = 8.1$, 1.5 Hz, 1H), 7.33 (t, $J = 7.5$ Hz, 1H), 7.26 (s, 1H), 7.00 (ddd, $J = 8.4$, 7.2, 1.1 Hz, 1H), 6.48 (d, $J = 8.6$ Hz, 1H), 2.84 (q, $J = 7.6$ Hz, 2H), 1.36 (t, $J = 7.6$ Hz, 3H). $^{13}$C NMR (101 MHz, Chloroform-d) $\delta$ 149.3, 145.7, 139.2, 136.0, 135.4, 131.5, 130.5, 130.3, 129.3, 128.2, 127.7, 126.5, 123.4, 122.6, 121.2, 120.3, 118.1, 114.8, 95.0, 28.9, 15.4. HRMS: [M+H]$^+$ calculated for C$_{25}$H$_{19}$N$_2$: 323.1543, found: 323.1541.
3-Methoxy-6-phenylindolo[1,2-c]quinazoline, yellow solid (30.7 mg, 95% yield, purified by silica gel chromatography using PE/EA 10:1), **3da.** $^1$H NMR (400 MHz, Chloroform-$d$) $\delta$ 8.05 (d, $J = 8.7$ Hz, 1H), 7.77 (d, $J = 7.9$ Hz, 1H), 7.75 – 7.61 (m, 5H), 7.40–7.31 (m, 2H), 7.16 (d, $J = 7.8$ Hz, 2H), 7.04 – 6.94 (m, 1H), 6.46 (d, $J = 8.6$ Hz, 1H), 3.94 (s, 3H). $^{13}$C NMR (101 MHz, Chloroform-$d$) $\delta$ 160.5, 149.9, 135.4, 131.4, 130.7, 130.4, 129.3, 128.1, 123.9, 123.5, 120.9, 120.1, 116.9, 114.8, 113.8, 109.4, 94.1, 55.6. HRMS: [M+H]$^+$ calculated for C$_{22}$H$_{17}$N$_2$O$^+$: 325.1335, found: 325.1331.

3-Chloro-6-phenylindolo[1,2-c]quinazoline, yellow solid (24.6 mg, 75% yield, purified by silica gel chromatography using PE/EA 10:1), **3ea.** $^1$H NMR (400 MHz, Chloroform-$d$) $\delta$ 8.06 (d, $J = 8.5$ Hz, 1H), 7.89 (s, 1H), 7.80 (d, $J = 7.9$ Hz, 1H), 7.69 (m, 5H), 7.50 (dd, $J = 8.5$, 2.0 Hz, 1H), 7.35 (t, $J = 7.5$ Hz, 1H), 7.30 (s, 1H), 7.03 (t, $J = 8.3$ Hz, 1H). $^{13}$C NMR (101 MHz, Chloroform-$d$) $\delta$ 150.5, 134.5, 134.3, 130.7, 130.4, 129.4, 128.1, 127.8, 127.2, 123.8, 121.9, 120.6, 119.0, 114.9, 96.5. HRMS: [M+H]$^+$ calculated for C$_{21}$H$_{15}$ClN$_2$+: 329.0840, found: 329.0838.

3-Trifluoromethoxy-6-phenylindolo[1,2-c]quinazoline, yellow solid (21.9 mg, 58% yield, purified by silica gel chromatography using PE/EA 20:1), **3fa.** $^1$H NMR (400 MHz, Chloroform-$d$) $\delta$ 8.15 (d, $J = 8.7$ Hz, 1H), 7.81 (d, $J = 7.7$ Hz, 1H), 7.77 – 7.62 (m, 6H), 7.41 – 7.33 (m, 2H), 7.31 (s, 1H), 7.09 – 7.00 (m, 1H), 6.50 (d, $J = 8.6$ Hz, 1H). $^{13}$C NMR (101 MHz, Chloroform-$d$) $\delta$ 150.6, 149.3, 140.2, 135.4, 134.2, 131.6, 130.7, 130.3, 129.4, 128.0, 124.1, 123.8, 121.9, 120.6, 120.3, 119.2 (q, $J = 20.0$ Hz), 114.9, 96.4. HRMS: [M+H]$^+$ calculated for C$_{22}$H$_{14}$F$_3$N$_2$O$^+$: 379.1053, found: 379.1048.
3-Triﬂuoromethyl-6-phenylindolo[1,2-c]quinazoline, yellow solid (19.5 mg, 54% yield, purified by silica gel chromatography using PE/EAs 10:1), 3ga. \(^1\)H NMR (400 MHz, Chloroform-d): \(^\delta\) 8.23 (d, \(J = 8.3\) Hz, 1H), 8.16 (s, 1H), 7.84 (d, \(J = 7.9\) Hz, 1H), 7.77 – 7.66 (m, 6H), 7.42 (s, 1H), 7.38 (t, \(J = 7.3\) Hz, 1H), 7.08 (ddd, \(J = 8.4, 7.2, 1.1\) Hz, 1H), 6.54 (d, \(J = 8.6\) Hz, 1H). \(^13\)C NMR (101 MHz, Chloroform-d): \(^\delta\) 150.6, 138.8, 135.2, 133.8, 131.8, 130.9, 130.8, 130.5, 130.1, 129.4, 128.1, 125.1 (d, \(J = 20\) Hz), 123.9, 123.6 (d, \(J = 16\) Hz), 123.3, 122.4, 120.9, 115.0, 97.8. HRMS: [M+H]\(^+\) calculated for C\(_{23}\)H\(_{16}\)F\(_3\)N\(_2\): 365.1104, found: 365.1101.

2-Methyl-6-phenylindolo[1,2-c]quinazoline, yellow solid (22.2 mg, 72% yield, purified by silica gel chromatography using PE/EAs 20:1), 3ha. \(^1\)H NMR (400 MHz, Chloroform-d): \(^\delta\) 7.95 (s, 1H), 7.91 – 7.76 (m, 3H), 7.76 – 7.60 (m, 5H), 7.40 (d, \(J = 8.1\) Hz, 1H), 7.36 – 7.30 (m, 1H), 7.10 – 6.96 (m, 1H), 6.48 (d, \(J = 8.6\) Hz, 1H), 2.58 (s, 3H). \(^13\)C NMR (101 MHz, Chloroform-d): \(^\delta\) 148.7, 137.5, 135.2, 131.6, 130.5, 130.4, 129.3, 128.3, 127.5, 123.4, 122.6, 121.4, 120.4, 120.2, 114.9, 95.6, 21.7. HRMS: [M+H]\(^+\) calculated for C\(_{23}\)H\(_{17}\)N\(_2\): 309.1386, found: 309.1382.

1-Methyl-6-phenylindolo[1,2-c]quinazoline, yellow solid (23.5 mg, 76% yield, purified by silica gel chromatography using PE/EAs 20:1), 3ia. \(^1\)H NMR (400 MHz, Chloroform-d): \(^\delta\) 7.82 (dd, \(J = 14.2, 7.8\) Hz, 2H), 7.68 (m, 5H), 7.51 – 7.46 (m, 1H), 7.46 – 7.39 (m, 2H), 7.38 – 7.32 (m, 1H), 7.10 – 6.98 (m, 1H), 6.46 (d, \(J = 8.6\) Hz, 1H), 2.94 (s, 3H). \(^13\)C NMR (101 MHz, Chloroform-d): \(^\delta\) 149.3, 134.8, 134.6, 130.7, 130.5, 130.4, 129.9, 129.4, 128.3, 128.2, 125.6, 123.4, 121.8, 120.6, 114.9, 101.4, 24.0. HRMS: [M+H]\(^+\) calculated for C\(_{23}\)H\(_{17}\)N\(_2\): 309.1386, found: 309.1382.
1-Methoxy-6-phenylindolo[1,2-c]quinazoline, yellow solid (28.2 mg, 87% yield, purified by silica gel chromatography using PE/EtOAc 20:1), 3ja. $^1$H NMR (400 MHz, Chloroform- $d$) δ 7.83 (d, $J = 7.9$ Hz, 1H), 7.73 (s, 1H), 7.72 – 7.62 (m, 5H), 7.52 (d, $J = 5.0$ Hz, 2H), 7.33 (t, $J = 7.5$ Hz, 1H), 7.11 – 7.04 (m, 1H), 7.00 (t, $J = 7.8$ Hz, 1H), 6.45 (d, $J = 8.6$ Hz, 1H), 4.18 (s, 3H). $^{13}$C NMR (101 MHz, Chloroform- $d$) δ 156.2, 149.9, 132.3, 130.9, 130.80, 130.4, 129.3, 128.8, 128.2, 123.3, 121.4, 120.6, 119.7, 114.7, 110.9, 108.3, 101.6, 55.9. HRMS: [M+H]$^+$ calculated for C$_{23}$H$_{27}$N$_3$O: 325.1335, found: 325.1333.

6-Phenylbenzo[g]indolo[1,2-c]quinazoline, yellow solid (29.2 mg, 85% yield, purified by silica gel chromatography using PE/EtOAc 20:1), 3ka. $^1$H NMR (400 MHz, Chloroform- $d$) δ 8.58 (s, 1H), 8.31 (s, 1H), 8.04 – 8.00 (m, 1H), 7.99 – 7.96 (m, 1H), 7.81 (d, $J = 7.9$ Hz, 1H), 7.76 – 7.72 (m, 2H), 7.71 – 7.63 (m, 3H), 7.56 (d, $J = 7.0$, 6.1, 3.8 Hz, 2H), 7.48 (s, 1H), 7.33 (t, $J = 7.5$ Hz, 1H), 7.06 – 7.00 (m, 1H), 6.45 (d, $J = 8.6$ Hz, 1H). $^{13}$C NMR (101 MHz, Chloroform- $d$) δ 149.2, 137.1, 135.8, 134.9, 133.8, 132.5, 132.3, 130.4, 130.1, 129.2, 128.33, 128.3, 127.7, 126.4, 126.3, 125.7, 123.3, 122.1, 121.4, 120.6, 119.7, 114.7, 98.1. HRMS: [M+H]$^+$ calculated for C$_{23}$H$_{27}$N$_3$: 345.1386, found: 345.1383.

9-Chloro-6-phenylindolo[1,2-c]quinazoline, yellow solid (20.0 mg, 61% yield, purified by silica gel chromatography using PE/EtOAc 20:1), 3la. $^1$H NMR (400 MHz, Chloroform- $d$) δ 8.13 (d, $J = 8.4$ Hz, 1H), 7.87 (d, $J = 7.6$ Hz, 1H), 7.74 – 7.64 (m, 5H), 7.57 (tq, $J = 10.3, 5.4, 3.5$ Hz, 2H), 7.32 – 7.24 (m, 3H), 6.37 (d, $J = 10.0$ Hz, 1H). $^{13}$C NMR (101 MHz, Chloroform- $d$) δ 148.9, 139.0, 135.8, 135.2, 131.7, 130.7, 129.5, 129.4, 128.7, 128.1, 128.0, 127.7, 127.0, 124.1, 122.7, 121.1, 120.4, 115.0, 95.5. HRMS: [M+H]$^+$ calculated for C$_{23}$H$_{24}$ClN$_3$: 329.0840, found: 329.0839.
10-Methyl-6-phenylindolo[1,2-c]quinazoline, yellow solid (24.9 mg, 81% yield, purified by silica gel chromatography using PE/EtOAc 20:1), 3ma. $^1$H NMR (400 MHz, Chloroform-d) δ 8.13 (dd, $J = 7.6, 1.6$ Hz, 1H), 7.88 (d, $J = 7.4$ Hz, 1H), 7.72 ~ 7.64 (m, 5H), 7.60 ~ 7.51 (m, 3H), 7.24 (s, 1H), 6.84 (dd, $J = 8.7, 1.5$ Hz, 1H), 6.35 (d, $J = 8.7$ Hz, 1H), 2.48 (s, 3H). $^{13}$C NMR (101 MHz, Chloroform-d) δ 149.4, 135.2, 133.2, 130.7, 130.4, 129.9, 129.3, 129.0, 128.2, 127.6, 127.4, 123.2, 122.7, 120.5, 120.1, 114.5, 95.5. HRMS: [M+H]$^+$ calculated for C$_{23}$H$_{17}$N$_2$: 309.1386, found: 309.1383.

10-Methoxy-6-phenylindolo[1,2-c]quinazoline, yellow solid (28.2 mg, 87% yield, purified by silica gel chromatography using PE/EtOAc 20:1), 3na. $^1$H NMR (400 MHz, Chloroform-d) δ 8.13 (d, $J = 7.5$ Hz, 1H), 7.87 (d, $J = 7.7$ Hz, 1H), 7.67 (m, 5H), 7.56 (dt, $J = 15.1, 7.2$ Hz, 2H), 7.24 (s, 1H), 7.20 (d, $J = 2.0$ Hz, 1H), 6.67 ~ 6.60 (m, 1H), 6.35 (d, $J = 9.3$ Hz, 1H), 3.89 (s, 3H). $^{13}$C NMR (101 MHz, Chloroform-d) δ 156.3, 149.0, 139.1, 135.8, 135.6, 131.4, 130.4, 129.3, 129.0, 128.2, 127.7, 127.3, 126.5, 122.7, 115.7, 111.4, 101.5, 95.5, 55.5. HRMS: [M+H]$^+$ calculated for C$_{23}$H$_{17}$N$_2$O: 325.1335, found: 325.1333.

10-Fluoro-6-phenylindolo[1,2-c]quinazoline, yellow solid (23.4 mg, 75% yield, purified by silica gel chromatography using PE/EtOAc 20:1), 3oa. $^1$H NMR (400 MHz, Chloroform-d) δ 8.16 ~ 8.10 (m, 1H), 7.88 (d, $J = 7.7$ Hz, 1H), 7.72 ~ 7.63 (m, 5H), 7.63 ~ 7.53 (m, 2H), 7.41 (dd, $J = 9.0, 2.5$ Hz, 1H), 7.26 (s, 1H), 6.74 (td, $J = 9.1, 2.5$ Hz, 1H), 6.39 (dd, $J = 9.3, 4.4$ Hz, 1H). $^{13}$C NMR (101 MHz, Chloroform-d) δ 160.7, 158.3, 148.9, 139.1, 136.7, 135.4, 131.3 (d, $J = 40$ Hz), 130.6, 129.5 (d, $J = 12$ Hz), 128.2 (d, $J = 12$ Hz), 127.8, 127.6, 122.8, 120.1, 115.9 (d, $J = 36$ Hz), 110.0 (d, $J = 104$ Hz), 105.3 (d, $J = 92$ Hz), 95.7 (d, $J = 16$ Hz). HRMS: [M+H]$^+$ calculated for C$_{23}$H$_{14}$FN$_2$: 313.1136, found: 313.1132.
10-Chloro-6-phenylindolo[1,2-c]quinazoline, yellow solid (27.2 mg, 83% yield, purified by silica gel chromatography using PE/EtOAc 20:1), 3pa. $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.16 – 8.10 (m, 1H), 7.89 (d, $J$ = 7.7 Hz, 1H), 7.75 (d, $J$ = 1.9 Hz, 1H), 7.71 – 7.53 (m, 7H), 7.24 (s, 1H), 6.95 (dd, $J$ = 9.1, 2.1 Hz, 1H), 6.36 (d, $J$ = 9.1 Hz, 1H). $^{13}$C NMR (101 MHz, Chloroform-d) $\delta$ 148.9, 139.0, 136.4, 135.3, 131.4, 130.7, 129.9, 129.6, 129.4, 129.2, 128.1, 127.9, 127.7, 122.8, 121.8, 120.1, 119.7, 115.8, 95.2. HRMS: [M+H]$^+$ calculated for C$_{32}$H$_{23}$ClN$_3$: 329.0840, found: 329.0936.

6-Methylindolo[1,2-c]quinazoline, yellow solid (20.6 mg, 89% yield, purified by silica gel chromatography using PE/EtOAc 10:1), 3ab. $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.09 (d, $J$ = 8.4 Hz, 1H), 8.05 (d, $J$ = 7.7 Hz, 1H), 7.84 (d, $J$ = 7.8 Hz, 1H), 7.74 (d, $J$ = 7.9 Hz, 1H), 7.58 – 7.51 (m, 1H), 7.51 – 7.42 (m, 2H), 7.42 – 7.36 (m, 1H), 7.20 (s, 1H), 3.13 (s, 3H). $^{13}$C NMR (101 MHz, Chloroform-d) $\delta$ 148.5, 138.8, 134.8, 131.6, 130.4, 129.0, 126.8, 123.4, 122.6, 122.0, 120.7, 120.2, 114.7, 95.4, 25.4. HRMS: [M+H]$^+$ calculated for C$_{30}$H$_{23}$N$_3$: 233.1073, found: 233.1071.

6-Heptylindolo[1,2-c]quinazoline, yellow solid (26.5 mg, 84% yield, purified by silica gel chromatography using PE/EtOAc 20:1), 3ac. $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 7.98 (d, $J$ = 7.8 Hz, 1H), 7.93 (d, $J$ = 8.3 Hz, 1H), 7.79 (t, $J$ = 8.4 Hz, 2H), 7.53 (t, $J$ = 7.6 Hz, 1H), 7.47 – 7.36 (m, 3H), 7.13 (s, 1H), 3.43 – 3.21 (m, 2H), 2.02 (p, $J$ = 7.9 Hz, 2H), 1.63 (p, $J$ = 7.8, 7.3 Hz, 2H), 1.51 – 1.43 (m, 2H), 1.44 – 1.34 (m, 4H), 0.97 (t, $J$ = 6.4 Hz, 3H). $^{13}$C NMR (101 MHz, Chloroform-d) $\delta$ 151.6, 138.6, 135.0, 131.1, 130.4, 128.8, 127.0, 126.7, 123.2, 122.5, 122.0, 120.7, 120.1, 114.9, 95.5, 36.8, 31.8, 29.5, 29.2, 26.1, 22.7, 14.2. HRMS: [M+H]$^+$ calculated for C$_{32}$H$_{35}$N$_3$: 317.2012, found: 317.2011.
6-(4-Methoxyphenyl)indolo[1,2-c]quinazoline, yellow solid (21.1 mg, 65% yield, purified by silica gel chromatography using PE/EA 10:1), 3ad. $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.19 – 8.10 (m, 1H), 7.88 (d, $J = 7.6$ Hz, 1H), 7.81 (d, $J = 7.9$ Hz, 1H), 7.65 (d, $J = 8.6$ Hz, 2H), 7.37 – 7.32 (m, 1H), 7.31 (s, 1H), 7.15 (d, $J = 8.6$ Hz, 2H), 7.05 (t, $J = 7.8$ Hz, 1H), 6.66 (d, $J = 8.6$ Hz, 1H), 3.98 (s, 3H). $^{13}$C NMR (101 MHz, Chloroform-d) $\delta$ 161.1, 149.3, 135.3, 131.7, 130.3, 129.8, 129.1, 127.7, 127.3, 123.4, 122.7, 121.4, 120.4, 115.1, 114.6, 95.7, 55.5. HRMS: [M+H]$^+$ calculated for C$_{23}$H$_{17}$N$_3$O$: 325.1335$, found: 325.1332.

6-(p-Tolyl)indolo[1,2-c]quinazoline, yellow solid (24.6 mg, 80% yield, purified by silica gel chromatography using PE/EA 10:1), 3ae. $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.13 (d, $J = 7.6$ Hz, 1H), 7.88 (d, $J = 7.9$ Hz, 1H), 7.81 (d, $J = 7.9$ Hz, 1H), 7.64 – 7.50 (m, 4H), 7.46 (d, $J = 7.9$ Hz, 2H), 7.35 (t, $J = 7.5$ Hz, 1H), 7.30 (s, 1H), 7.05 (t, $J = 7.8$ Hz, 1H), 2.57 (s, 3H). $^{13}$C NMR (101 MHz, Chloroform-d) $\delta$ 149.5, 140.5, 139.2, 135.3, 131.1, 131.7, 130.3, 129.9, 129.0, 128.1, 127.8, 127.3, 123.4, 122.7, 121.4, 120.5, 120.4, 115.0, 95.6, 21.7. HRMS: [M+H]$^+$ calculated for C$_{23}$H$_{17}$N$_3$: 309.1386, found: 309.1384.

6-(Naphthalene-2-yl)indolo[1,2-c]quinazoline, yellow solid (18.6 mg, 54% yield, purified by silica gel chromatography using PE/EA 20:1), 3af. $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.32 (s, 1H), 8.20 – 8.16 (m, 1H), 8.11 (d, $J = 8.4$ Hz, 1H), 8.00 (m, 3H), 7.82 (d, $J = 7.9$ Hz, 1H), 7.74 (d, $J = 8.4$ Hz, 1H), 7.71 – 7.53 (m, 5H), 7.37 (s, 1H), 7.33 (t, $J = 7.5$ Hz, 1H), 6.93 (t, $J = 7.8$ Hz, 1H), 6.54 (d, $J = 8.6$ Hz, 1H). $^{13}$C NMR (101 MHz, Chloroform-d) $\delta$ 149.5, 135.2, 134.0, 133.2, 131.6, 130.4, 129.2, 129.1, 128.8, 128.3, 128.0, 127.6, 127.5, 126.9, 125.1, 123.6, 122.8, 121.7, 120.5, 120.5, 115.1, 99.1. HRMS: [M+H]$^+$ calculated for C$_{23}$H$_{17}$N$_3$: 345.1386, found: 345.1383.
6-(4-(Trifluoromethyl)phenyl)indolo[1,2-c]quinazoline, yellow solid (26.1 mg, 72% yield), purified by silica gel chromatography using PE/EA 20:1, 3ag. $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.16 (d, $J = 7.3$, 1.8 Hz, 1H), 7.93 (d, $J = 8.0$ Hz, 2H), 7.85 (m, 4H), 7.62 – 7.54 (m, 2H), 7.39 (s, 1H), 7.35 (s, 1H), 7.07 (t, $J = 7.8$ Hz, 1H), 6.53 (d, $J = 8.6$ Hz, 1H). $^{13}$C NMR (101 MHz, Chloroform-d) $\delta$ 147.8, 139.2, 138.7, 135.1, 132.6, 132.3, 131.2, 130.4, 129.3, 128.9, 127.9, 126.4 (q, $J = 12$ Hz), 125.1, 123.7, 122.8, 122.4, 121.8, 120.8, 120.5, 114.4, 96.1. HRMS: [M+H]$^+$ calculated for C$_{21}$H$_{16}$F$_3$N$_2$: 363.1104, found: 363.1099.

6-(4-Fluorophenyl)indolo[1,2-c]quinazoline, yellow solid (23.4 mg, 75% yield), purified by silica gel chromatography using PE/EA 20:1, 3ah. $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.15 (d, $J = 7.4$ Hz, 1H), 7.88 (d, $J = 7.5$ Hz, 1H), 7.82 (d, $J = 7.9$ Hz, 1H), 7.77 – 7.68 (m, 2H), 7.57 (d, $J = 6.9$ Hz, 2H), 7.40 – 7.31 (m, 4H), 7.06 (t, $J = 7.8$ Hz, 1H), 6.55 (d, $J = 8.6$ Hz, 1H). $^{13}$C NMR (101 MHz, Chloroform-d) $\delta$ 165.2, 162.7, 148.5, 135.1, 131.5, 130.6, 130.5, 129.4, 129.2, 127.6, 123.7, 121.7, 120.7, 120.5, 116.7, 116.4, 114.7, 96.1. HRMS: [M+H]$^+$ calculated for C$_{21}$H$_{15}$F2N$_2$: 313.1136, found: 313.1131.

6-(4-Chlorophenyl)indolo[1,2-c]quinazoline, yellow solid (21.0 mg, 66% yield), purified by silica gel chromatography using PE/EA 20:1, 3ai. $^1$H NMR (400 MHz, Chloroform-d) $\delta$ 8.18 – 8.12 (m, 1H), 7.85 (d, $J = 7.7$ Hz, 1H), 7.81 (s, 0H), 7.70 – 7.62 (m, 4H), 7.57 (dd, $J = 14.1$, 7.2, 1.6 Hz, 2H), 7.37 (t, $J = 7.5$ Hz, 1H), 7.33 (s, 1H), 7.12 – 7.04 (m, 1H), 6.61 (d, $J = 8.6$ Hz, 1H). $^{13}$C NMR (101 MHz, Chloroform-d) $\delta$ 148.2, 136.6, 135.1, 134.1, 131.4, 130.4, 129.8, 129.6, 129.2, 127.7, 123.6, 122.7, 121.7, 120.7, 120.5, 114.7, 96.0. HRMS: [M+H]$^+$ calculated for C$_{21}$H$_{15}$ClN$_2$: 329.0840, found: 329.0837.
6-(4-Bromophenyl)indolo[1,2-c]quinazoline, yellow solid (26.4 mg, 71% yield, purified by silica gel chromatography using PE/EA 20:1), 3aj. $^1$H NMR (400 MHz, Chloroform-$d$) $\delta$ 8.16 – 8.12 (m, 1H), 7.85 (dd, $J$ = 9.6, 2.2 Hz, 2H), 7.79 (s, 1H), 7.62 (d, $J$ = 1.8 Hz, 1H), 7.55 (dd, $J$ = 7.1, 5.6 Hz, 1H), 7.39 – 7.34 (m, 1H), 7.32 (s, 1H), 7.08 (ddd, $J$ = 8.4, 7.1, 1.2 Hz, 1H), 6.62 (d, $J$ = 8.6 Hz, 1H). $^{13}$C NMR (101 MHz, Chloroform-$d$) $\delta$ 148.2, 135.1, 134.7, 132.5, 131.4, 130.4, 130.0, 129.2, 127.8, 127.6, 124.8, 123.6, 122.7, 121.7, 120.7, 120.5, 114.7, 96.0. HRMS: [M+H]$^+$ calculated for C$_{21}$H$_{16}$BrN$_2$: 373.0335, found: 373.0331.

6-(3,5-Dimethoxyphenyl)indolo[1,2-c]quinazoline, yellow solid (24.1 mg, 68% yield, purified by silica gel chromatography using PE/EA 10:1), 3ak. $^1$H NMR (400 MHz, Chloroform-$d$) $\delta$ 8.10 (d, $J$ = 7.4 Hz, 1H), 7.84 (d, $J$ = 7.7 Hz, 1H), 7.76 (d, $J$ = 7.9 Hz, 1H), 7.58 – 7.46 (m, 2H), 7.31 (t, $J$ = 7.5 Hz, 1H), 7.27 (s, 1H), 7.05 (t, $J$ = 7.8 Hz, 1H), 6.79 (d, $J$ = 2.2 Hz, 2H), 6.72 (t, $J$ = 2.1 Hz, 1H), 6.63 (d, $J$ = 8.6 Hz, 1H), 3.81 (s, 6H). $^{13}$C NMR (101 MHz, Chloroform-$d$) $\delta$ 161.6, 149.0, 139.0, 137.4, 135.1, 131.4, 130.3, 129.1, 127.9, 127.4, 123.5, 122.7, 121.7, 120.4, 115.1, 105.9, 103.0, 55.6. HRMS: [M+H]$^+$ calculated for C$_{21}$H$_{18}$N$_2$O$_2$: 355.1441, found: 355.1438.
8. NMR Spectra

$^1$H and $^{13}$C NMR of compound 3aa
$^1$H and $^{13}$C NMR of compound 3ba
$^1$H and $^{13}$C NMR of compound 3ca
$^1$H and $^{13}$C NMR of compound 3da
$^1$H and $^{13}$C NMR of compound 3ea
$^1$H and $^{13}$C NMR of compound 3fa
$^1$H and $^{13}$C NMR of compound 3ga
$^1$H and $^{13}$C NMR of compound 3ha
$^1$H and $^{13}$C NMR of compound 3ia
$^1$H and $^{13}$C NMR of compound 3ja
$^1$H and $^{13}$C NMR of compound 3ka
$^1$H and $^{13}$C NMR of compound 31a
$^1$H and $^{13}$C NMR of compound 3ma
$^1$H and $^{13}$C NMR of compound 3na
$^1$H and $^{13}$C NMR of compound 30a
$^1$H and $^{13}$C NMR of compound 3pa
$^1$H and $^{13}$C NMR of compound 3ab
$^1$H and $^{13}$C NMR of compound 3ac
$^1$H and $^{13}$C NMR of compound 3ad
$^1$H and $^{13}$C NMR of compound 3ae
$^1$H and $^{13}$C NMR of compound 3af
$^1$H and $^{13}$C NMR of compound 3ag
\(^1\)H and \(^13\)C NMR of compound 3ah
$^1$H and $^{13}$C NMR of compound 3ai
$^1$H and $^{13}$C NMR of compound 3aj
$^1$H and $^{13}$C NMR of compound 3ak