Supporting Information

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A: General Information and Starting Materials

**General Information.** Proton nuclear magnetic resonance (\(^1\)H NMR) spectra and carbon nuclear magnetic resonance (\(^{13}\)C NMR) spectra were recorded on a Bruker ACF300 spectrometer (500 MHz and 126 MHz). Chemical shifts for protons are reported in parts per million downfield from tetramethylsilane and are referenced to residual protium in the NMR solvent (CDCl\(_3\): \(\delta\) 7.26, (CD\(_3\))\(_2\)SO: \(\delta\) 2.50). Chemical shifts for carbon are reported in parts per million downfield from tetramethylsilane and are referenced to the carbon resonances of the solvent (CDCl\(_3\): \(\delta\) 77.16, (CD\(_3\))\(_2\)SO: \(\delta\) 39.50). Data are represented as follows: chemical shift, integration, multiplicity (br = broad, s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constants in Hertz (Hz). All high resolution mass spectra were obtained on a Finnigan/MAT 95XL-T mass spectrometer. Optical Rotation was measured on a Rudolph Autopol I polarimeter. For thin layer chromatography (TLC), Merck pre-coated TLC plates (Merck 60 F254) were used, and compounds were visualized with a UV light at 254 nm. Flash chromatography separations were performed on Merck 60 (0.040-0.063 mm) mesh silica gel.

**Starting Materials.** All solvents, inorganic reagents were from commercial sources and used without purification unless otherwise noted. The propargylic alcohol and was prepared following the literature procedures.\(^{1-2}\)

B: General Procedure

![Chemical reactions](image)

To a solution of CHCl\(_3\) (0.5 mL) were added \(\alpha\)-indolyl propargylic alcohols 1 (0.05 mmol), coumarins 2 (0.06 mmol) and C3 (0.0025 mmol). The reaction mixture was stirred at 60 °C for 16 h, then the solvent was removed under vacuum. The residue was purified by silica gel chromatography to yield the desired product (+/-)-3.
To a solution of CCl₄ (0.3 mL) were added α-indolyl propargylic alcohols 1 (0.05 mmol), 1,3-cyclohexanediones 4 (0.06 mmol) and C₃ (0.005 mmol). The reaction mixture was stirred at 30 °C for 24 h, then the solvent was removed under vacuum. The residue was purified by silica gel chromatography to yield the desired product (+/-)-5.
C: The optimization of 1a and 4a

![Diagram of chemical reaction]

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<th>Entry</th>
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<td>DCM</td>
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</table>

<sup>a</sup> Reaction conditions: a mixture of 1a (0.05 mmol), 4a (0.06 mmol) and catalyst (10 mol%) in the solvent (0.3 mL) was stirred at room temperature for 24 h. <sup>b</sup> Isolated yield. <sup>c</sup> The reaction was stirred at 30 °C for 24 h. <sup>d</sup> The reaction was stirred at 50 °C for 6 h. <sup>e</sup> 5 mol% of C3 was used at 60 °C for 16 h.
D: Characterization Data

2-(1H-indol-6-yl)-2,4-diphenylpyrano[3,2-c]chromen-5(2H)-one (3aa)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 22.8 mg, 98% yield. Mp 188.6-191.6 °C. 1H NMR ((CD₃)₂SO, 500 MHz): □ (ppm) 11.23 (s, 1H), 8.22-8.20 (m, 1H), 7.76 (t, J = 10.0 Hz, 1H), 7.66-7.64 (m, 3H), 7.58-7.52 (m, 4H), 7.46-7.38 (m, 8H), 7.20-7.18 (d, J = 10.0 Hz, 1H), 6.44 (s, 1H), 6.35 (s, 1H). 13C NMR ((CD₃)₂SO, 126 MHz): □ (ppm) 160.1, 158.0, 153.4, 144.2, 138.2, 136.0, 135.7, 133.7, 133.3, 128.9, 128.4, 128.1, 128.0, 127.8, 127.3, 127.1, 126.6, 125.2, 123.7, 120.7, 118.3, 116.9, 115.3, 110.4, 102.9, 101.4, 86.4. HRMS (ESI): exact mass calculated for [M+H]+ (C₂₂H₂₂NO₃) requires m/z 468.1594, found m/z 468.1596.

4-(4-Fluorophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3ba)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 23.0 mg, 95% yield. Mp 179.4-181.3 °C. 1H NMR ((CD₃)₂SO, 500 MHz): □ (ppm) 11.17 (s, 1H), 8.15-8.13 (m, 1H), 7.69 (m, 1H), 7.60-7.58 (m, 3H), 7.54-7.50 (m, 3H), 7.47-7.44 (m, 1H), 7.41-7.36 (m, 4H), 7.33-7.30 (m, 1H), 7.20-7.16 (m, 2H), 7.14-7.12 (m, 1H), 6.39 (s, 1H), 6.32 (s, 1H). 13C NMR ((CD₃)₂SO, 126 MHz): □ (ppm) 162.3 (d, J = 244.4 Hz), 160.1, 158.1, 153.4, 144.1, 135.8 (d, J = 40.0 Hz), 134.5, 133.7, 132.3, 130.3 (d, J = 8.8 Hz), 128.9, 128.3, 127.8, 127.3, 127.1, 126.6, 125.2, 123.7, 120.6, 118.3, 116.9, 115.3, 114.9 (d, J = 21.3 Hz), 110.4, 102.7, 101.4, 86.3. HRMS (ESI): exact mass calculated for [M+H]+ (C₂₂H₂₁FNO₃) requires m/z 486.1500, found m/z 486.1499.

4-(4-Chlorophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3ca)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 23.7 mg, 95% yield. Mp 179.3-181.4 °C. 1H NMR ((CD₃)₂SO, 500 MHz): □ (ppm) 11.16 (s, 1H), 8.15-8.14 (m, 1H), 7.72-7.68 (m, 1H), 7.59-7.57 (m, 3H), 7.52-7.50 (m, 3H), 7.48-7.45 (m, 1H), 7.42-7.36 (m, 6H), 7.32-7.30 (m, 1H), 7.13-7.11 (m, 1H), 6.39-6.38 (m, 1H), 6.36 (s, 1H). 13C NMR ((CD₃)₂SO, 126 MHz): □ (ppm) 160.2, 158.1, 153.4, 144.0, 137.0, 135.9, 135.6, 133.8, 132.7, 132.1, 130.0, 128.9, 128.4, 128.0, 127.8, 127.7, 127.1, 126.6, 125.2, 123.7, 120.7, 118.3, 116.9, 115.3, 110.3, 102.6, 101.4, 86.4. HRMS (ESI): exact mass calculated for [M+H]+ (C₂₂H₂₁ClNO₃)
requires m/z 502.1204, found m/z 502.1205.

4-(4-Bromophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3da)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 25.8 mg, 95% yield. Mp 170.1-172.9 °C. ¹H NMR (CDCl₃, 500 MHz): δ (ppm) 8.29 (s, 1H), 8.05-8.03 (m, 1H), 7.60 (d, J = 10.0 Hz, 1H), 7.55-7.54 (m, 1H), 7.52-7.47 (m, 5H), 7.38-7.29 (m, 6H), 7.25 (d, J = 10.0 Hz, 1H), 7.21-7.18 (m, 2H), 6.52 (s, 1H), 6.02 (s, 1H). ¹³C NMR (CDCl₃, 126 MHz): δ (ppm) 160.6, 158.8, 153.6, 143.7, 137.0, 136.3, 135.2, 132.8, 132.7, 131.0, 129.3, 128.4, 128.1, 127.8, 126.8, 126.4, 125.6, 124.1, 123.3, 121.9, 120.9, 119.4, 116.7, 115.5, 110.4, 102.5, 102.2, 86.7. HRMS (ESI): exact mass calculated for [M+H]⁺ (C₁₂H₂₁BrNO₃) requires m/z 546.0699, found m/z 546.0703.

2-(1H-indol-6-yl)-2-phenyl-4-(p-tolyl)pyrano[3,2-c]chromen-5(2H)-one (3ea)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 21.8 mg, 91% yield. Mp 176.8-178.1 °C. ¹H NMR (CDCl₃, 500 MHz): δ (ppm) 8.26 (s, 1H), 8.04-8.03 (m, 1H), 7.59-7.50 (m, 5H), 7.36-7.27 (m, 5H), 7.26-7.15 (m, 6H), 6.51 (s, 1H), 6.01 (s, 1H), 2.38 (s, 3H). ¹³C NMR (CDCl₃, 126 MHz): δ (ppm) 160.4, 158.8, 153.6, 144.0, 137.6, 136.6, 135.1, 135.0, 133.6, 132.4, 128.7, 128.3, 128.0, 127.7, 127.4, 126.9, 125.7, 125.5, 124.0, 123.3, 120.8, 119.5, 116.6, 115.7, 110.5, 102.7, 102.5, 86.7, 21.3. HRMS (ESI): exact mass calculated for [M+H]⁺ (C₁₃H₂₄NO₃) requires m/z 482.1751, found m/z 482.1753.

2-(1H-indol-6-yl)-4-(4-methoxyphenyl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3fa)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 12:1. White solid, 21.3 mg, 86% yield. Mp 198.1-201.9 °C. ¹H NMR ((CD₃)₂SO, 500 MHz): δ (ppm) 11.21 (s, 1H), 8.14 (d, J = 10.0 Hz, 1H), 7.70-7.67 (m, 1H), 7.58-7.56 (m, 3H), 7.50 (d, J = 10.0 Hz, 1H), 7.47-7.44 (m, 1H), 7.40-7.35 (m, 6H), 7.32-7.29 (m, 1H), 7.12 (d, J = 10.0 Hz, 1H), 6.91-6.90 (m, 2H), 6.38 (s, 1H), 6.21 (s, 1H), 3.77 (s, 3H). ¹³C NMR ((CD₃)₂SO, 126 MHz): δ (ppm) 160.1, 159.3, 158.0, 153.4, 144.3, 136.0, 135.6, 133.6, 132.9, 130.3, 129.3, 128.8, 128.3, 127.8, 127.0, 126.5, 126.2, 125.1, 123.6, 120.6, 118.3, 116.8, 115.8, 115.5, 113.5, 110.3, 103.0, 101.4, 86.3, 55.6. HRMS (ESI): exact mass calculated for [M+H]⁺ (C₁₃H₂₄NO₃) requires m/z 498.1700, found m/z 498.1704.
4-(3-Fluorophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3ga)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 21.3 mg, 88% yield. Mp 164.1-167.6 °C. $^1$H NMR (CDCl$_3$, 500 MHz): $\delta$ (ppm) 8.27 (s, 1H), 8.06-8.04 (m, 1H), 7.60 (d, $J$ = 10.0 Hz, 1H), 7.57 (s, 1H), 7.56-7.53 (m, 1H), 7.51-7.50 (m, 2H), 7.39-7.28 (m, 6H), 7.25-7.24 (m, 1H), 7.22-7.18 (m, 2H), 7.17-7.15 (m, 1H), 7.06-7.02 (m, 1H), 6.54 (s, 1H), 6.05 (s, 1H). $^{13}$C NMR (CDCl$_3$, 126 MHz): $\delta$ (ppm) 162.4 (d, $J$ = 244.4 Hz), 160.5, 158.7, 153.6, 143.7, 140.2 (d, $J$ = 8.8 Hz), 136.3, 135.1, 132.8, 132.7, 129.3 (d, $J$ = 8.8 Hz), 128.4, 128.1, 127.8, 126.8, 126.7, 125.5, 124.1, 123.4, 123.3, 120.9, 119.4, 116.7, 115.5, 114.8 (d, $J$ = 7.5 Hz), 114.6 (d, $J$ = 6.3 Hz), 110.3, 102.6, 102.3, 86.7. HRMS (ESI): exact mass calculated for [M+H]$^+$ (C$_{32}$H$_{21}$FNO$_3$) requires m/z 486.1500, found m/z 486.1501.

4-(3-Chlorophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3ha)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 21.3 mg, 88% yield. Mp 166.6-167.9 °C. $^1$H NMR ((CD)$_3$SO, 500 MHz): $\delta$ (ppm) 11.17 (s, 1H), 8.16-8.14 (m, 1H), 7.71-7.68 (m, 1H), 7.60-7.59 (m, 4H), 7.51 (d, $J$ = 10.0 Hz, 1H), 7.48-7.47 (m, 1H), 7.45-7.43 (m, 2H), 7.40-7.36 (m, 5H), 7.33-7.30 (m, 1H), 7.14-7.12 (m, 1H), 6.40 (s, 1H), 6.39-6.38 (m, 1H). $^{13}$C NMR ((CD)$_3$SO, 126 MHz): $\delta$ (ppm) 160.2, 158.1, 153.4, 143.9, 140.3, 135.8, 135.6, 133.8, 132.9, 131.9, 129.9, 128.9, 128.8, 128.4, 128.2, 127.9, 127.8, 127.1, 126.9, 126.6, 125.2, 123.7, 120.7, 118.3, 116.9, 115.3, 110.3, 102.6, 101.4, 86.4. HRMS (ESI): exact mass calculated for [M+H]$^+$ (C$_{32}$H$_{21}$ClNO$_3$) requires m/z 502.1024, found m/z 502.1026.

4-(3-Bromophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3ia)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 23.3 mg, 85% yield. Mp 131.4-134.3 °C. $^1$H NMR (CDCl$_3$, 500 MHz): $\delta$ (ppm) 8.30 (s, 1H), 8.07-8.05 (m, 1H), 7.63-7.61 (m, 2H), 7.58-7.54 (m, 2H), 7.52-7.48 (m, 3H), 7.40-7.33 (m, 5H), 7.32-7.28 (m, 2H), 7.25-7.23 (m, 1H), 7.21-7.19 (m, 1H), 6.55 (s, 1H), 6.04 (s, 1H). $^{13}$C NMR (CDCl$_3$, 126 MHz): $\delta$ (ppm) 160.6, 158.7, 153.6, 143.6, 140.1, 136.2, 135.1, 132.7, 132.5, 130.8, 130.4, 129.3, 128.4, 128.1, 127.8, 126.9, 126.8, 126.4, 125.6, 124.1, 123.3, 122.0, 120.9, 119.4, 116.7, 115.5, 110.4, 102.5, 102.2, 86.7. HRMS (ESI): exact mass calculated for [M+H]$^+$ (C$_{32}$H$_{21}$BrNO$_3$) requires m/z 546.0699, found m/z 546.0701.
2-(1H-indol-6-yl)-2-phenyl-4-(m-toly)pyrano[3,2-c]chromen-5(2H)-one (3ja)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 20.4 mg, 85% yield. Mp 186.2-191.0 °C. $^1$H NMR ((CD$_3$)$_2$SO, 500 MHz): □ (ppm) 11.17 (s, 1H), 8.14 (d, $J = 10.0$ Hz, 1H), 7.70-7.67 (m, 1H), 7.59-7.57 (m, 3H), 7.51 (d, $J = 10.0$ Hz, 1H), 7.47-7.44 (m, 1H), 7.41-7.36 (m, 4H), 7.32-7.30 (m, 2H), 7.23-7.22 (m, 2H), 7.13-7.12 (m, 2H), 6.38 (s, 1H), 6.25 (s, 1H), 2.33 (s, 3H). $^{13}$C NMR ((CD$_3$)$_2$SO, 126 MHz): □ (ppm) 160.1, 158.0, 153.4, 144.2, 138.1, 137.2, 135.9, 135.6, 133.7, 133.4, 128.9, 128.7, 128.5, 128.0, 127.8, 127.1, 127.0, 126.6, 125.2, 125.1, 123.6, 120.6, 118.3, 116.8, 115.3, 110.4, 103.0, 101.4, 86.4, 21.4. HRMS (ESI): exact mass calculated for [M+H]$^+$ (C$_{33}$H$_{24}$NO$_3$) requires m/z 482.1751, found m/z 482.1751.

2-(1H-indol-6-yl)-4-(3-methoxyphenyl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3ka)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 12:1. White solid, 21.6 mg, 87% yield. Mp 139.1-141.9 °C. $^1$H NMR (CDCl$_3$, 500 MHz): □ (ppm) 8.28 (s, 1H), 8.04 (d, $J = 10.0$ Hz, 1H), 7.59-7.57 (m, 2H), 7.53-7.49 (m, 3H), 7.36-7.33 (m, 2H), 7.32-7.28 (m, 3H), 7.25 (s, 1H), 7.22-7.21 (m, 1H), 7.19-7.18 (m, 1H), 7.03-7.01 (m, 1H), 6.98 (s, 1H), 6.88-6.86 (m, 1H), 6.51 (s, 1H), 6.04 (s, 1H), 3.80 (s, 3H). $^{13}$C NMR (CDCl$_3$, 126 MHz): □ (ppm) 160.4, 159.1, 158.7, 153.6, 143.9, 139.5, 136.4, 135.1, 133.6, 132.5, 128.9, 128.3, 128.0, 127.7, 126.8, 126.2, 125.5, 124.3, 120.3, 120.8, 120.2, 119.4, 116.6, 115.6, 113.1, 110.5, 102.7, 102.4, 86.7, 55.3. HRMS (ESI): exact mass calculated for [M+H]$^+$ (C$_{33}$H$_{24}$NO$_4$) requires m/z 498.1700, found m/z 498.1700.

4-(2-Fluorophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3la)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 20.6 mg, 85% yield. Mp 171.8-173.5 °C. $^1$H NMR (CDCl$_3$, 500 MHz): □ (ppm) 8.39 (s, 1H), 8.06-8.05 (m, 1H), 7.66-7.64 (m, 2H), 7.57-7.49 (m, 4H), 7.41-7.28 (m, 7H), 7.23-7.18 (m, 2H), 7.12-7.10 (m, 1H), 6.56 (s, 1H), 6.11 (s, 1H). $^{13}$C NMR (CDCl$_3$, 126 MHz): □ (ppm) 160.1 (d, $J = 234.4$ Hz), 159.1, 153.4, 143.8, 136.4, 135.2, 132.4, 129.9, 129.8, 129.6 (d, $J = 8.8$ Hz), 128.4, 128.2, 128.1, 127.7, 127.4, 126.9, 126.3 (d, $J = 15.0$ Hz), 125.6, 124.0, 123.9 (d, $J = 3.8$ Hz), 123.3, 120.8, 119.3, 116.6, 115.6, 115.1 (d, $J = 21.4$ Hz), 110.5, 102.7, 102.4, 86.4. HRMS (ESI): exact mass calculated for [M+H]$^+$ (C$_{32}$H$_{21}$FNO$_3$) requires m/z 486.1500, found m/z S8
2-(1H-indol-6-yl)-2-phenyl-4-(o-tolyl)pyrano[3,2-c]chromen-5(2H)-one (3ma)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 20.9 mg, 87% yield.
Mp 196.8-199.1 °C. 1H NMR (CDCl3, 500 MHz): δ (ppm) 8.29 (s, 1H), 8.04 (d, J = 10.0 Hz, 1H), 7.63-7.48 (m, 5H), 7.39-7.28 (m, 5H), 7.23-7.16 (m, 6H), 6.53 (s, 1H), 5.95 (s, 1H), 2.25 (s, 3H). 13C NMR (CDCl3, 126 MHz): δ (ppm) 159.0, 158.8, 153.5, 138.6, 137.6, 135.9, 135.2, 132.9, 132.4, 129.5, 128.4, 128.3, 128.2, 127.9, 127.7, 126.7, 126.0, 125.5, 124.0, 123.3, 121.0, 119.4, 86.5. HRMS (ESI): exact mass calculated for [M+H]+ (C33H24NO3) requires m/z 482.1751, found m/z 482.1753.

2-(1H-indol-6-yl)-2-phenyl-4-(thiophen-3-yl)pyrano[3,2-c]chromen-5(2H)-one (3na)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 21.5 mg, 91% yield.
Mp 164.1-169.2 °C. 1H NMR (CDCl3, 500 MHz): δ (ppm) 8.24 (s, 1H), 7.99 (d, J = 10.0 Hz, 1H), 7.56-7.54 (m, 2H), 7.50-7.45 (m, 3H), 7.37 (s, 1H), 7.33-7.27 (m, 4H), 7.24-7.21 (m, 2H), 7.19-7.18 (m, 1H), 7.15 (d, J = 10.0 Hz, 1H), 7.11-7.10 (m, 1H), 6.48 (s, 1H), 6.06 (s, 1H). 13C NMR (CDCl3, 126 MHz): δ (ppm) 160.3, 158.8, 153.5, 143.8, 138.3, 136.4, 135.1, 132.5, 128.7, 128.3, 128.0, 127.9, 127.7, 126.9, 125.5, 124.6, 124.0, 123.3, 122.5, 120.8, 119.5, 116.6, 115.6, 110.5, 102.6, 102.5, 86.5. HRMS (ESI): exact mass calculated for [M+H]+ (C30H20NO3S) requires m/z 474.1158, found m/z 474.1161.

4-Cyclopropyl-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3oa)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 10:1. White solid, 15.3 mg, 71% yield.
Mp 126.5-129.8 °C. 1H NMR (CDCl3, 500 MHz): δ (ppm) 8.27 (s, 1H), 7.96 (d, J = 10.0 Hz, 1H), 7.57-7.56 (m, 1H), 7.50-7.47 (m, 1H), 7.45 (s, 1H), 7.41-7.39 (m, 2H), 7.35-7.29 (m, 3H), 7.25-7.22 (m, 3H), 7.09-7.07 (m, 1H), 6.52 (s, 1H), 5.64 (s, 1H), 2.52-2.50 (m, 1H), 0.91-0.87 (m, 2H), 0.64-0.57 (m, 2H). 13C NMR (CDCl3, 126 MHz): δ (ppm) 159.7, 159.1, 153.4, 144.4, 137.4, 135.1, 134.6, 132.2, 128.2, 127.8, 127.5, 125.3, 129.3, 137.9, 123.3, 120.7, 119.7, 119.4, 116.4, 115.5, 110.2, 103.6, 102.5, 86.3, 13.1, 7.3, 7.1. HRMS (ESI): exact mass calculated for [M+H]+ (C29H22NO3) requires m/z 432.1594, found m/z 432.1594.
4-Butyl-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3pa)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 16:1. White solid, 16.3 mg, 73% yield. Mp 63.2-65.0 °C. 1H NMR (CDCl3, 500 MHz): ∆ (ppm) 8.27 (s, 1H), 7.98 (d, J = 10.0 Hz, 1H), 7.59 (d, J = 10.0 Hz, 1H), 7.51-7.248 (m, 2H), 7.46-7.44 (m, 2H), 7.37-7.31 (m, 3H), 7.28-7.27 (s, 1H), 7.25-7.23 (m, 2H), 7.15-7.13 (m, 1H), 6.53 (s, 1H), 5.81 (s, 1H), 2.90-2.76 (m, 2H), 1.56-1.52 (m, 2H), 1.46-1.40 (m, 2H), 0.94 (t, J = 10.0 Hz, 3H). 13C NMR (CDCl3, 126 MHz): ∆ (ppm) 159.7, 153.3, 144.5, 137.4, 135.1, 133.1, 132.1, 128.6, 128.2, 127.8, 127.5, 126.8, 125.3, 123.9, 123.2, 122.6, 120.7, 119.4, 116.4, 115.6, 110.3, 102.9, 102.5, 86.3, 32.8, 31.4, 22.6, 14.1. HRMS (ESI): exact mass calculated for [M+H]+ (C30H26NO3) requires m/z 448.1907, found m/z 448.1904.

2-(4-Chlorophenyl)-2-(1H-indol-6-yl)-4-phenylpyrano[3,2-c]chromen-5(2H)-one (3qa)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 23.8 mg, 95% yield. Mp 175.1-179.4 °C. 1H NMR ((CD3)2SO, 500 MHz): ∆ (ppm) 11.18 (s, 1H), 8.15-8.13 (m, 1H), 7.71-7.68 (m, 1H), 7.61-7.59 (m, 3H), 7.52 (d, J = 10.0 Hz, 1H), 7.48-7.44 (m, 5H), 7.40-7.34 (m, 5H), 7.12-7.10 (m, 1H), 6.39-6.38 (m, 1H), 6.25 (s, 1H). 13C NMR ((CD3)2SO, 126 MHz): ∆ (ppm) 159.9, 157.9, 153.4, 143.1, 138.0, 135.6, 135.5, 133.8, 133.6, 133.1, 128.9, 128.6, 128.1, 128.0, 127.9, 127.2, 126.8, 125.2, 123.7, 120.8, 118.2, 116.9, 115.2, 110.4, 102.9, 101.5, 85.9. HRMS (ESI): exact mass calculated for [M+H]+ (C32H21ClNO3) requires m/z 502.1204, found m/z 502.1205.

2-(1H-indol-6-yl)-4-phenyl-2-(p-tolyl)pyrano[3,2-c]chromen-5(2H)-one (3ra)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 23.1 mg, 96% yield. Mp 185.2-189.9 °C. 1H NMR (CDCl3, 500 MHz): ∆ (ppm) 8.26 (s, 1H), 8.03 (d, J = 10.0 Hz, 1H), 7.60-7.58 (m, 2H), 7.53-7.50 (m, 1H), 7.44-7.33 (m, 8H), 7.30-7.27 (m, 1H), 7.22-7.15 (m, 4H), 6.52 (s, 1H), 6.01 (s, 1H), 2.34 (s, 3H). 13C NMR (CDCl3, 126 MHz): ∆ (ppm) 160.5, 158.9, 153.6, 140.9, 138.4, 137.9, 136.7, 135.2, 133.6, 132.4, 129.0, 127.9, 127.8, 127.6, 127.5, 126.9, 126.3, 125.4, 124.0, 123.3, 120.8, 119.4, 116.6, 115.7, 110.4, 102.6, 102.4, 86.7, 21.1. HRMS (ESI): exact mass calculated for [M+H]+ (C33H24NO3) requires m/z 482.1751, found m/z 482.1752.

2-(3-Chlorophenyl)-2-(1H-indol-6-yl)-4-phenylpyrano[3,2-c]chromen-5(2H)-one (3sa)
Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 21.3 mg, 85% yield. Mp 170.1-172.2 °C. $^1$H NMR ((CD$_3$)$_2$SO, 500 MHz): □ (ppm) 11.20 (s, 1H), 8.18-8.17 (m, 1H), 7.71-7.67 (m, 1H), 7.64 (s, 1H), 7.61-7.60 (m, 1H), 7.58-7.56 (m, 1H), 7.53-7.52 (m, 1H), 7.50-7.42 (m, 4H), 7.40-7.33 (m, 6H), 7.15-7.13 (m, 1H), 6.40-6.39 (m, 1H), 6.34 (s, 1H). $^{13}$C NMR ((CD$_3$)$_2$SO, 126 MHz): □ (ppm) 159.9, 157.9, 153.4, 146.7, 137.9, 135.6, 135.2, 133.8, 133.7, 133.7, 130.9, 128.4, 128.2, 128.1, 128.0, 127.9, 127.3, 126.7, 126.4, 125.3, 125.2, 123.7, 120.8, 118.2, 116.9, 115.2, 110.4, 102.9, 101.5, 85.8. HRMS (ESI): exact mass calculated for [M+H]$^+$ (C$_{32}$H$_{21}$ClNO$_3$) requires m/z 502.1204, found m/z 502.1204.

2-(1H-indol-6-yl)-4-phenyl-2-(o-tolyl)pyrano[3,2-c]chromen-5(2H)-one (3ta)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 21.6 mg, 90% yield. Mp 199.4-200.6 °C. $^1$H NMR ((CD$_3$)$_2$SO, 500 MHz): □ (ppm) 11.14 (s, 1H), 8.09 (d, $J$ = 10.0 Hz, 1H), 7.69-7.65 (m, 1H), 7.57-7.53 (m, 2H), 7.50 (s, 1H), 7.45-7.33 (m, 8H), 7.28-7.26 (m, 2H), 7.21-7.19 (m, 1H), 7.06-7.04 (m, 1H), 6.41 (s, 1H), 6.00 (s, 1H), 2.16 (s, 3H). $^{13}$C NMR ((CD$_3$)$_2$SO, 126 MHz): □ (ppm) 160.2, 158.0, 153.4, 140.5, 138.1, 136.9, 135.8, 135.4, 133.7, 133.0, 129.0, 128.2, 128.1, 127.9, 127.8, 127.1, 126.2, 126.0, 125.1, 123.4, 120.7, 118.2, 117.0, 115.2, 110.4, 102.4, 101.5, 87.6, 21.6. HRMS (ESI): exact mass calculated for [M+H]$^+$ (C$_{33}$H$_{24}$NO$_3$) requires m/z 482.1751, found m/z 482.1751.

2-Ethyl-2-(1H-indol-6-yl)-4-phenylpyrano[3,2-c]chromen-5(2H)-one (3ua)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 14:1. White solid, 14.6 mg, 70% yield. Mp 82.4-86.3 °C. $^1$H NMR (CDCl$_3$, 500 MHz): □ (ppm) 8.21 (s, 1H), 8.07 (d, $J$ = 12.0 Hz, 1H), 7.61 (d, $J$ = 12.0 Hz, 1H), 7.56-7.52 (m, 2H), 7.40-7.33 (m, 6H), 7.31-7.27 (m, 2H), 7.21-7.20 (m, 1H), 6.52 (s, 1H), 5.96 (s, 1H), 2.41-2.27 (m, 2H), 1.02 (t, $J$ = 10.0 Hz, 3H). $^{13}$C NMR (CDCl$_3$, 126 MHz): □ (ppm) 161.2, 158.8, 153.5, 138.4, 136.4, 135.2, 134.3, 132.3, 127.8, 127.7, 127.6, 125.1, 125.0, 123.9, 123.1, 120.8, 117.3, 116.6, 115.7, 108.6, 102.7, 102.4, 85.9, 35.5, 8.7. HRMS (ESI): exact mass calculated for [M+H]$^+$ (C$_{28}$H$_{22}$NO$_3$) requires m/z 420.1594, found m/z 420.1594.

9-Chloro-2-(1H-indol-6-yl)-2,4-diphenylpyrano[3,2-c]chromen-5(2H)-one (3ab)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 23.1 mg, 92% yield. Mp 144.0-150.5 °C. $^1$H NMR (CDCl$_3$, 500 MHz): □ (ppm) 8.27 (s, 1H), 7.97 (s, 1H), 7.61 (d, $J$ = 10.0 Hz, 1H), 7.56 (s, 1H), 7.50-7.49 (m, 1H),
2-(1H-indol-6-yl)-9-methyl-2,4-diphenylpyrano[3,2-c]chromen-5(2H)-one (3ac)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 21.8 mg, 91% yield. Mp 122.6-127.6 °C. 1H NMR (CDCl₃, 500 MHz): δ (ppm) 8.28 (s, 1H), 7.80 (s, 1H), 7.60-7.58 (m, 2H), 7.51 (d, J = 10.0 Hz, 2H), 7.44-7.43 (m, 2H), 7.38-7.31 (m, 7H), 7.22-7.20 (m, 2H), 7.16-7.14 (d, J = 10.0 Hz, 1H), 6.52 (s, 1H), 6.01 (s, 1H), 2.44 (s, 3H). 13C NMR (CDCl₃, 126 MHz): δ (ppm) 160.4, 159.0, 151.8, 143.9, 138.1, 136.5, 135.1, 133.9, 133.8, 133.6, 128.3, 128.0, 127.9, 127.8, 127.7, 127.6, 126.9, 126.0, 126.5, 122.8, 120.8, 119.5, 116.4, 115.3, 110.6, 102.5, 102.4, 86.7, 21.0. HRMS (ESI): exact mass calculated for [M+H]+ (C₃₂H₂₁ClNO₃) requires m/z 502.1204, found m/z 502.1206.

8-Chloro-2-(1H-indol-6-yl)-2,4-diphenylpyrano[3,2-c]chromen-5(2H)-one (3ad)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 21.7 mg, 87% yield. Mp 150.2-156.9 °C. 1H NMR (CDCl₃, 500 MHz): δ (ppm) 8.25 (s, 1H), 7.95 (d, J = 10.0 Hz, 1H), 7.59 (d, J = 10.0 Hz, 1H), 7.55 (s, 1H), 7.49-7.48 (m, 2H), 7.44-7.42 (m, 2H), 7.39-7.27 (m, 8H), 7.21 (t, J = 10.0 Hz, 1H), 7.19-7.17 (m, 1H), 6.52 (s, 1H), 6.04 (s, 1H). 13C NMR (CDCl₃, 126 MHz): δ (ppm) 159.9, 158.3, 153.8, 143.7, 138.4, 137.7, 136.2, 135.1, 133.5, 128.3, 128.1, 128.0, 127.9, 127.8, 127.6, 126.8, 126.4, 125.6, 124.7, 124.3, 120.9, 119.4, 116.9, 114.3, 110.5, 102.6, 102.5, 87.0. HRMS (ESI): exact mass calculated for [M+H]+ (C₃₂H₂₁ClNO₃) requires m/z 502.1204, found m/z 502.1206.

2-(1H-indol-6-yl)-8-methyl-2,4-diphenylpyrano[3,2-c]chromen-5(2H)-one (3ae)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 15:1. White solid, 23.0 mg, 96% yield. Mp 163.5-168.6 °C. 1H NMR (CDCl₃, 500 MHz): δ (ppm) 8.25 (s, 1H), 7.92 (d, J = 5.0 Hz, 1H), 7.59-7.57 (m, 2H), 7.51 (d, J = 5.0 Hz, 2H), 7.44-7.43 (m, 2H), 7.38-7.30 (m, 6H), 7.20-7.18 (m, 2H), 7.11 (d, J = 10.0 Hz, 1H).
Hz, 1H), 7.06 (s, 1H), 6.51 (s, 1H), 6.00 (s, 1H), 2.43 (s, 3H). $^{13}$C NMR (CDCl$_3$, 126 MHz): □ (ppm) 160.7, 159.1, 153.8, 144.0, 143.9, 138.1, 136.5, 135.1, 133.9, 128.2, 127.9, 127.8, 127.7, 127.6, 127.5, 126.8, 125.8, 125.5, 125.3, 123.1, 120.8, 119.5, 116.8, 113.1, 110.5, 102.4, 101.8, 86.6, 21.9. HRMS (ESI): exact mass calculated for [M+H]$^+$ (C$_{33}$H$_{24}$NO$_3$) requires m/z 482.1751, found m/z 482.1753.

2-(1H-indol-6-yl)-2,4-diphenyl-7,8-dihydro-2H-chromen-5(6H)-one (5aa)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 7:1. White solid, 18.9 mg, 91% yield.
Mp 192.3-194.4 °C. $^1$H NMR ((CD$_3$)$_2$SO, 500 MHz): □ (ppm) 11.11 (s, 1H), 7.50 (d, $J = 10.0$ Hz, 1H), 7.46-7.44 (m, 3H), 7.38-7.35 (m, 3H), 7.31-7.25 (m, 6H), 7.02-7.00 (m, 1H), 6.39 (s, 1H), 5.94 (s, 1H), 2.70-2.54 (m, 2H), 2.18-2.15 (m, 2H), 1.95-1.93 (m, 2H). $^{13}$C NMR ((CD$_3$)$_2$SO, 126 MHz): □ (ppm) 193.0, 173.3, 145.0, 139.7, 136.9, 135.7, 133.9, 128.6, 128.0, 127.9, 127.6, 127.4, 126.8, 126.5, 124.0, 120.4, 118.4, 113.6, 110.3, 101.4, 85.4, 37.5, 29.2, 19.9. HRMS (ESI): exact mass calculated for [M+H]$^+$ (C$_{20}$H$_{24}$NO$_2$) requires m/z 418.1802, found m/z 418.1801.

4-(4-Chlorophenyl)-2-(1H-indol-6-yl)-2-phenyl-7,8-dihydro-2H-chromen-5(6H)-one (5ca)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 8:1. White solid, 20.2 mg, 90% yield.
Mp 205.7-207.5 °C. $^1$H NMR (CDCl$_3$, 500 MHz): □ (ppm) 8.25 (s, 1H), 7.60 (d, $J = 5.0$ Hz, 1H), 7.47 (s, 1H), 7.42-7.40 (m, 2H), 7.35-7.27 (m, 6H), 7.23-7.22 (m, 1H), 7.12-7.10 (m, 1H), 6.54 (s, 1H), 5.74 (s, 1H), 2.65-2.46 (m, 2H), 2.33-2.19 (m, 2H), 2.04-1.97 (m, 2H). $^{13}$C NMR (CDCl$_3$, 126 MHz): □ (ppm) 193.7, 173.4, 144.3, 137.9, 136.9, 135.2, 133.3, 132.9, 128.5, 128.2, 127.9, 127.7, 127.5, 126.7, 125.3, 123.5, 120.7, 119.5, 113.6, 110.3, 102.4, 86.0, 37.3, 29.4, 19.9. HRMS (ESI): exact mass calculated for [M+H]$^+$ (C$_{20}$H$_{23}$ClNO$_2$) requires m/z 452.1412, found m/z 452.1414.

2-(1H-indol-6-yl)-2-phenyl-4-(p-tolyl)-7,8-dihydro-2H-chromen-5(6H)-one (5ea)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 8:1. White solid, 20.3 mg, 94% yield.
Mp 135.1-137.5 °C. $^1$H NMR (CDCl$_3$, 500 MHz): □ (ppm) 8.22 (s, 1H), 7.57 (d, $J = 5.0$ Hz, 1H), 7.48 (s, 1H), 7.42-7.40 (m, 2H), 7.33-7.27 (m, 3H), 7.22-7.19 (m, 3H), 7.13-7.10 (m, 3H), 6.52 (s, 1H), 5.72 (s, 1H), 2.63-2.44 (m, 2H), 2.34 (s, 3H), 2.27-2.18 (m, 2H), 2.03-1.96 (m, 2H). $^{13}$C NMR (CDCl$_3$, 126 MHz): □ (ppm) 193.8, 173.0, 144.6, 137.2, 136.9, 136.5, 135.1, 134.2, 128.5, 128.1, 127.6, 127.4, 126.9, 126.8, 125.2, 122.7, 120.6, 119.7, 114.1,
110.5, 102.3, 86.0, 37.4, 29.4, 21.3, 20.0. HRMS (ESI): exact mass calculated for [M+H]\(^+\)\((C_{30}H_{28}NO_2)\) requires m/z 432.1958, found m/z 432.1963.

4-(3-Chlorophenyl)-2-(1H-indol-6-yl)-2-phenyl-7,8-dihydro-2H-chromen-5(6H)-one (5ha)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 8:1. White solid, 18.9 mg, 84% yield. Mp 98.8-100.7 °C. \(^1\)H NMR (CDCl\(_3\), 500 MHz): \(\delta\) (ppm) 8.25 (s, 1H), 7.59 (d, \(J = 5.0\) Hz, 1H), 7.46 (s, 1H), 7.41-7.39 (m, 2H), 7.34-7.27 (m, 4H), 7.24-7.15 (m, 3H), 7.17-7.15 (m, 1H), 7.10-7.09 (m, 1H), 6.53 (s, 1H), 5.74 (s, 1H), 2.63-2.45 (m, 2H), 2.33-2.18 (m, 2H), 2.05-1.97 (m, 2H). \(^13\)C NMR (CDCl\(_3\), 126 MHz): \(\delta\) (ppm) 193.6, 173.4, 144.2, 141.4, 136.8, 135.2, 133.6, 133.2, 128.8, 128.2, 127.7, 127.6, 127.3, 127.2, 126.7, 125.5, 125.3, 124.0, 120.7, 119.5, 113.6, 110.4, 102.4, 86.0, 37.3, 29.4, 19.9. HRMS (ESI): exact mass calculated for [M+H]\(^+\)\((C_{29}H_{22}ClNO_2)\) requires m/z 452.1412, found m/z 452.1416.

2-(1H-indol-6-yl)-4-(3-methoxyphenyl)-2-phenyl-7,8-dihydro-2H-chromen-5(6H)-one (5ka)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 6:1. White solid, 19.4 mg, 87% yield. Mp 71.1-73.8 °C. \(^1\)H NMR (CDCl\(_3\), 500 MHz): \(\delta\) (ppm) 8.23 (s, 1H), 7.57 (d, \(J = 10.0\) Hz, 1H), 7.50 (s, 1H), 7.41-7.40 (m, 2H), 7.33-7.27 (m, 3H), 7.23-7.21 (m, 2H), 7.11-7.09 (m, 1H), 6.90-6.88 (m, 2H), 6.83-6.82 (m, 1H), 6.52 (s, 1H), 5.76 (s, 1H), 3.81 (s, 3H), 2.62-2.45 (m, 2H), 2.31-2.19 (m, 2H), 2.03-1.96 (m, 2H). \(^13\)C NMR (CDCl\(_3\), 126 MHz): \(\delta\) (ppm) 193.5, 172.9, 159.1, 144.4, 140.9, 137.1, 135.2, 134.2, 128.6, 128.1, 127.6, 127.5, 126.7, 125.2, 123.3, 120.6, 119.9, 119.6, 114.1, 113.4, 112.2, 110.4, 102.4, 86.0, 55.2, 37.3, 29.4, 19.9. HRMS (ESI): exact mass calculated for [M+H]\(^+\)\((C_{30}H_{26}NO_3)\) requires m/z 448.1907, found m/z 448.1911.

2-(1H-indol-6-yl)-2-phenyl-4-(o-tolyl)-7,8-dihydro-2H-chromen-5(6H)-one (5ma)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 8:1. White solid, 20.0 mg, 93% yield. Mp 114.0-117.3 °C. \(^1\)H NMR ((CD\(_3\))\(_2\)SO, 500 MHz): \(\delta\) (ppm) 11.15 (s, 1H), 7.53 (d, \(J = 10.0\) Hz, 1H), 7.44-7.37 (m, 6H), 7.32-7.29 (m, 1H), 7.15-7.08 (m, 4H), 7.05-7.03 (m, 1H), 6.41 (s, 1H), 5.75 (s, 1H), 2.71-2.60 (m, 2H), 2.13 (s, 5H), 1.92-1.87 (m, 2H). \(^13\)C NMR (CDCl\(_3\), 126 MHz): \(\delta\) (ppm) 193.2, 171.8, 140.7, 135.8, 135.2, 133.2, 129.6, 128.7, 128.4, 127.9, 127.5, 126.9, 126.8, 126.5, 125.6, 123.7, 120.4, 118.4, 113.6, 110.2, 109.9, 101.4, 85.2, 37.4, 29.1, 20.4, 20.3. HRMS (ESI):
exact mass calculated for [M+H]^+ (C_{30}H_{26}NO_2) requires m/z 432.1958, found m/z 432.1964.

2-(1H-indol-6-yl)-2-phenyl-4-(thiophen-3-yl)-7,8-dihydro-2H-chromen-5(6H)-one (5na)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 8:1. White solid, 17.3 mg, 82% yield. Mp 208.6-212.0 °C. ^1H NMR ((CD_3)_2SO, 500 MHz): □ (ppm) 11.11 (s, 1H), 7.50 (d, J = 10.0 Hz, 1H), 7.46-7.43 (m, 4H), 7.39-7.35 (m, 4H), 7.31-7.28 (m, 1H), 7.04-7.00 (m, 2H), 6.40 (s, 1H), 6.06 (s, 1H), 2.68-2.53 (m, 2H), 2.19-2.16 (m, 2H), 1.94-1.92 (m, 2H). ^13C NMR (CDCl_3, 126 MHz): □ (ppm) 193.2, 173.0, 144.9, 140.0, 136.9, 135.7, 128.7, 128.6, 128.5, 128.0, 127.6, 126.8, 126.6, 124.6, 123.1, 122.1, 120.3, 118.4, 113.9, 110.3, 101.4, 85.3, 37.5, 29.2, 19.9. HRMS (ESI): exact mass calculated for [M+H]^+ (C_{27}H_{22}NO_2S) requires m/z 424.1366, found m/z 424.1371.

2-(4-Fluorophenyl)-2-(1H-indol-6-yl)-4-phenyl-7,8-dihydro-2H-chromen-5(6H)-one (5va)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 8:1. White solid, 19.3 mg, 89% yield. Mp 155.5-158.7 °C. ^1H NMR (CDCl_3, 500 MHz): □ (ppm) 8.28 (s, 1H), 7.59 (d, J = 10.0 Hz, 1H), 7.46 (s, 1H), 7.39-7.36 (m, 2H), 7.32-7.31 (m, 4H), 7.29-7.28 (m, 1H), 7.21-7.19 (m, 1H), 7.08 (d, J = 10.0 Hz, 1H), 7.01-6.98 (m, 2H), 6.52 (s, 1H), 5.70 (s, 1H), 2.60-2.44 (m, 2H), 2.32-2.17 (m, 2H), 2.03-1.98 (m, 2H). ^13C NMR (CDCl_3, 126 MHz): □ (ppm) 193.8, 173.0, 162.1 (d, J = 246.9 Hz), 140.31, 139.3, 136.8, 135.2, 134.5, 128.7 (d, J = 7.6 Hz), 127.8, 127.5, 127.4, 127.1, 125.4, 122.9, 120.7, 119.4, 114.9 (d, J = 21.4 Hz), 114.1, 110.4, 102.3, 85.6, 37.3, 29.4, 19.9. HRMS (ESI): exact mass calculated for [M+H]^+ (C_{29}H_{23}FNO_2) requires m/z 436.1707, found m/z 436.1714.

2-(1H-indol-6-yl)-2-(4-methoxyphenyl)-4-phenyl-7,8-dihydro-2H-chromen-5(6H)-one (5wa)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 6:1. White solid, 19.8 mg, 89% yield. Mp 73.5-75.7 °C. ^1H NMR (CDCl_3, 500 MHz): □ (ppm) 8.26 (s, 1H), 7.58 (d, J = 10.0 Hz, 1H), 7.46 (s, 1H), 7.33-7.28 (m, 7H), 7.20-7.19 (m, 1H), 7.12-7.10 (m, 1H), 6.85-6.82 (m, 2H), 6.52 (s, 1H), 5.72 (s, 1H), 3.79 (s, 3H), 2.55-2.50 (m, 2H), 2.28-2.23 (m, 2H), 2.00-1.98 (m, 2H). ^13C NMR (CDCl_3, 126 MHz): □ (ppm) 193.8, 173.2, 159.0, 139.5, 137.4, 136.5, 135.2,
134.1, 128.3, 127.7, 127.4, 127.2, 127.1, 125.2, 123.4, 120.5, 119.5, 113.9, 113.4, 110.3, 102.3, 85.9, 55.3, 37.4, 29.4, 20.0. HRMS (ESI): exact mass calculated for \([M+H]^+\) (C\textsubscript{30}H\textsubscript{26}NO\textsubscript{3}) requires m/z 448.1907, found m/z 448.14913.

2-(1H-indol-6-yl)-7,7-dimethyl-2,4-diphenyl-7,8-dihydro-2\(H\)-chromen-5(6\(H\))-one (5ab)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 8:1. White solid, 11.6 mg, 52% yield. Mp 58.2-60.2 °C. \(^1\)H NMR (CDCl\textsubscript{3}, 500 MHz): □ (ppm) 8.21 (s, 1H), 7.58 (d, \(J = 10.0 \) Hz, 1H), 7.23 (s, 1H), 7.44-7.43 (m, 2H), 7.35-7.28 (m, 8H), 7.25-7.24 (m, 1H), 7.12 (d, \(J = 10.0 \) Hz, 1H), 6.54 (s, 1H), 5.75 (s, 1H), 2.51-2.39 (m, 2H), 2.17-2.16 (m, 2H), 1.12 (s, 3H), 1.04 (s, 3H). \(^{13}\)C NMR (CDCl\textsubscript{3}, 126 MHz): □ (ppm) 193.6, 171.6, 144.5, 139.5, 137.2, 135.1, 134.4, 128.1, 127.7, 127.6, 127.5, 127.3, 127.2, 126.7, 125.2, 123.1, 120.6, 119.6, 110.3, 102.4, 85.9, 51.4, 42.9, 31.7, 28.6, 28.0. HRMS (ESI): exact mass calculated for \([M+H]^+\) (C\textsubscript{31}H\textsubscript{28}N\textsubscript{2}O\textsubscript{2}) requires m/z 446.2115, found m/z 446.2108.
E: Large Scale Reaction

\[ \text{To a solution of CHCl}_3 (12.0 \text{ mL}) were added 1a (387.6 mg, 1.2 mmol), 2a (233.3 mg, 1.4 mmol) and C3 (3.6 mg, 0.06 mmol). The reaction mixture was stirred at 60 °C for 16 h. The solvent was evaporated to give the crude product, which was purified by silica gel chromatography (PE/EA = 4:1) to provide the desired product (+/-)-3aa as a white solid (513.7 mg, 92% yield).} \]

F: Control Experiments

\[ \text{o a solution of CHCl}_3 (0.5 \text{ mL}) were added 1x (16.85 mg, 0.05 mmol), 2a (11.58 mg, 0.06 mmol) C3 (0.15 mg, 0.0025 mmol). The reaction mixture was stirred at 60 °C for 16 h. The solvent was evaporated to give the crude product, which was purified by silica gel chromatography (PE/EA = 18:1) to provide the desired product (+/-)-3xa as a white solid (19.6 mg, 81% yield).} \]

2-(1-Methyl-1H-indol-6-yl)-2,4-diphenylpyrano[3,2-c]chromen-5(2H)-one (3xa)

Eluent for flash column chromatography: petroleum ether/ethyl acetate = 18:1. White solid, 19.6 mg, 81% yield. Mp 108.7-110.1 °C. \(^1\)H NMR (CDCl\(_3\), 500 MHz): \(\delta\) (ppm) 8.09 (d, \(J = 10.0\) Hz, 1H), 7.59 (d, \(J = 10.0\) Hz, 1H), 7.55-7.53 (m, 4H), 7.48-7.47 (m, 2H), 7.42-7.31 (m, 7H), 7.27 (d, \(J = 10.0\) Hz, 1H), 7.20 (d, \(J = 10.0\) Hz, 1H), 7.10-7.09 (m, 1H), 6.48-6.47 (m, 1H), 6.09 (s, 1H), 3.77 (s, 3H). \(^1\)C NMR (CDCl\(_3\), 126 MHz): \(\delta\) (ppm) 160.4, 158.7, 153.6, 143.9, 138.1, 136.2, 136.0, 133.8, 132.5, 130.1, 128.3, 128.1, 127.9, 127.9, 127.6, 126.9, 126.3, 124.0, 123.3, 120.9, 118.9, 116.7, 115.7, 108.3, 102.8, 100.9, 86.8, 32.9. HRMS (ESI): exact mass calculated for [M+H]+ (C\(_{33}\)H\(_{24}\)N\(_2\)O\(_3\)) requires m/z 482.1751, found m/z
482.1747.

2-(1-Methyl-1H-indol-6-yl)-2,4-diphenylpyrano[3,2-c]chromen-5(2H)-one (3xa)
To a solution of CHCl$_3$ (0.5 mL) were added 1a (16.15 mg, 0.05 mmol), 2f (10.56 mg, 0.06 mmol) C3 (0.15 mg, 0.0025 mmol). The reaction mixture was stirred at 60 °C for 16 h. We found the reaction didn't occur.

To a solution of CHCl$_3$ (0.5 mL) were added 1a (16.15 mg, 0.05 mmol), 2g-i (0.06 mmol), C3 (0.15 mg, 0.0025 mmol). The reaction mixture was stirred at 60 °C for 16 h. We found the reaction didn't occur.
G: ESI-MS Studies

a) ESI(+)−MS spectra for the reaction of catalyst C3 and propargylic alcohol 1a for 2 h; b) ESI(+)−MS spectra for the 1,10-conjugate addition of propargylic alcohol 1a catalyzed by catalyst C3 for 12 h. Other unidentified ions are likely to correspond to either impurities or side-reaction products.

a)

b)
H: NMR Analysis
2-(1H-indol-6-yl)-2,4-diphenylpyrano[3,2-c]chromen-5(2H)-one (3aa)
4-(4-Fluorophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3ba)
4-(4-Chlorophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3ca)
4-(4-Bromophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3da)
2-(1H-indol-6-yl)-2-phenyl-4-(p-tolyl)pyrano[3,2-c]chromen-5(2H)-one (3ea)
2-(1H-indol-6-yl)-4-(4-methoxyphenyl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3fa)
4-(3-Fluorophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3ga)
4-(3-Chlorophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3ha)
4-(3-Bromophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3ia)
2-(1H-indol-6-yl)-2-phenyl-4-(m-tolyl)pyrano[3,2-c]chromen-5(2H)-one (3ja)
2-(1H-indol-6-yl)-4-(3-methoxyphenyl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3ka)
4-(2-Fluorophenyl)-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (3la)
2-(1H-indol-6-yl)-2-phenyl-4-(o-tolyl)pyrano[3,2-c]chromen-5(2H)-one (3ma)
2-(1H-indol-6-yl)-2-phenyl-4-(thiophen-3-yl)pyrano[3,2-c]chromen-5(2H)-one (3na)
4-Cyclopropyl-2-(1H-indol-6-yl)-2-phenylpyrano[3,2-c]chromen-5(2H)-one (30a)
4-Butyl-2-(1H-indol-6-yl)-2-phenylpyran[3,2-c]chromen-5(2H)-one (3pa)
2-(4-Chlorophenyl)-2-(1H-indol-6-yl)-4-phenylpyrano[3,2-c]chromen-5(2H)-one (3qa)
2-(1H-indol-6-yl)-4-phenyl-2-(p-tolyl)pyrano[3,2-c]chromen-5(2H)-one (3ra)
2-(3-Chlorophenyl)-2-(1H-indol-6-yl)-4-phenylpyrano[3,2-c]chromen-5(2H)-one (3sa)
2-(1H-indol-6-yl)-4-phenyl-2-(o-tolyl)pyrano[3,2-c]chromen-5(2H)-one (3ta)
2-Ethyl-2-(1H-indol-6-yl)-4-phenylpyrano[3,2-c]chromen-5(2H)-one (3ua)
9-Chloro-2-(1H-indol-6-yl)-2,4-diphenylpyrano[3,2-c]chromen-5(2H)-one (3ab)
2-(1H-indol-6-yl)-9-methyl-2,4-diphenylpyrano[3,2-c]chromen-5(2H)-one (3ac)
8-Chloro-2-(1H-indol-6-yl)-2,4-diphenylpyrano[3,2-c]chromen-5(2H)-one (3ad)
2-(1H-indol-6-yl)-8-methyl-2,4-diphenylpyrano[3,2-c]chromen-5(2H)-one (3ae)

![Chemical Structure Diagram]

S45
2-(1H-indol-6-yl)-2,4-diphenyl-7,8-dihydro-2H-chromen-5(6H)-one (5aa)
4-(4-Chlorophenyl)-2-(1H-indol-6-yl)-2-phenyl-7,8-dihydro-2H-chromen-5(6H)-one (5ca)
2-((1H-indol-6-yl)-2-phenyl-4-(p-tolyl)-7,8-dihydro-2H-chromen-5(6H)-one (5ea)
4-(3-Chlorophenyl)-2-(1H-indol-6-yl)-2-phenyl-7,8-dihydro-2H-chromen-5(6H)-one (5ha)
2-(1H-indol-6-yl)-4-(3-methoxyphenyl)-2-phenyl-7,8-dihydro-2H-chromen-5(6H)-one (5ka)
2-(1H-indol-6-yl)-2-phenyl-4-(o-tolyl)-7,8-dihydro-2H-chromen-5(6H)-one (5ma)
2-(1H-indol-6-yl)-2-phenyl-4-(thiophen-3-yl)-7,8-dihydro-2H-chromen-5(6H)-one (5na)
2-(4-Fluorophenyl)-2-(1H-indol-6-yl)-4-phenyl-7,8-dihydro-2H-chromen-5(6H)-one (5va)
2-(1H-indol-6-yl)-2-(4-methoxyphenyl)-4-phenyl-7,8-dihydro-2H-chromen-5(6H)-one (5wa)
2-(1H-indol-6-yl)-7,7-dimethyl-2,4-diphenyl-7,8-dihydro-2H-chromen-5(6H)-one (5ab)
I: X-Ray Analysis Data
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J: Reference
