Electronic Supplementary Information

for

Diasteroselective synthesis of functionalized indolines *via in situ* generated allyl boronic species

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General

Starting materials, reagents and solvents were obtained from commercial sources and used as received unless otherwise specified. Flash chromatography purifications were performed with silica gel 60, 220-440 mesh, Sigma-Aldrich. $^1$H NMR spectra were recorded on Bruker Avance DPX 600 (600 MHz), and are reported relative to residual solvent: CHCl$_3$ (δ 7.26) or DCM (δ 5.32). $^{13}$C NMR spectra were recorded on the same instrument and are reported relative to CHCl$_3$ (δ 77.16) or DCM(δ 53.84). Data for $^1$H NMR are reported as follows: chemical shift (multiplicity, coupling constant in Hz, integration). Multiplicities are reported as follows: s = singlet, d = doublet, t = triplet, q = quartet, quint. = quintet, sext = sextet, dd = doublet of doublets, ddd = doublet of doublets of doublets, apppt = apparent triplet, m = multiplet, bs = broad signal. FTIR spectra were recorded on a Perking-Elmer Spectrum RX One FT-IR ATR (Attenuated Total Reflectance) with the intensities of the characteristic signals being reported as weak (w, <30% of tallest signal), medium (m, 31–70% of tallest signal) or strong (s, >71% of tallest signal). Absorption maxima ($\lambda_{\text{Max}}$) are reported in wavenumbers (cm$^{-1}$).

High-resolution mass spectrometry data was acquired using either a Waters Micromass LCT Premier spectrometer using positive electrospray ionisation (ESI+) or performed by the Mass Spectrometry Service for the Chemistry Department at the University of Cambridge. All m/z values are reported to 4 decimal places and are within ± 5 ppm of theoretical values. Melting points were recorded on a Stanford Research Systems OptiMeltAutomated Melting Point System. IUPAC names of the compounds were generated using ChemBioDraw Ultra 13.0.

General procedure for homoallylation of indolines

A microwave vial was charged with the indole (0.25 mmol, 1 eq.) and the corresponding vinyl boronic acid (0.625 mmol, 2.5 eq.). The flask was flushed with argon and sealed. The degassed solvent was added (2.5 mL) followed by the addition of water (3 mmol, 1.2 eq.). Next, a 2 M TMSCHN$_2$ solution in n-hexanes was added (1.25 mmol, 5 eq.) under vigorous agitation. The final mixture was heated at 60 °C for 8 h in a Biotage Initiator microwave reactor, or in a sand-bath at 60 °C when specified. The reactions were monitored by TLC analysis and quenched in methanol when the reaction was completed or when no more conversion was observed. The volatiles were removed under reduced
pressure and the residue obtained was purified by flash column chromatography using petroleum ether/ethyl acetate.

5-methoxy-2-(1-phenylallyl)indoline (4a)

Prepared according to the general procedure under microwave irradiation in 87% yield, obtained as a light-yellow oil. The reaction carried out in a sand-bath afforded the product in 98% yield (measured with $^1$H NMR analysis using 1,4-dinitrobenzene as internal standard). $^1$H NMR (600 MHz, CDCl$_3$): $\delta$ 7.31–7.36 (m, 2H), 7.23–7.26 (m, 1H), 7.20–7.23 (m, 2H), 6.63–6.66 (m, 1H), 6.58–6.61 (m, 1H), 6.54–6.58 (m, 1H), 6.03–6.11 (m, 1H), 6.01–6.13 (m, 1H), 5.16–5.21 (m, 2H), 4.07 (td, $J = 8.9$, 6.9 Hz, 1H), 3.73 (s, 3H), 3.33 (t, $J = 9.0$ Hz, 1H), 2.84 (dd, $J = 15.8$, 8.6 Hz, 1H), 2.66 (dd, $J = 15.9$, 6.7 Hz, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$): $\delta$ 153.6, 144.4, 141.9, 139.7, 130.1, 129.0, 128.2, 126.9, 117.1, 112.3, 112.0, 109.8, 63.4, 56.2, 56.1, 34.8; IR (ATR, cm$^{-1}$): 3366 (w), 3061 (w), 3028 (w), 2939 (w), 1635 (w), 1599 (m), 1489 (s), 1466 (m), 1451 (s), 1433 (s), 1398 (w), 1359 (w), 1293 (w), 1229 (s, br), 1138 (s), 1138 (s), 1032 (s), 992 (w), 919 (m), 886 (w), 835 (m), 800 (m), 735 (m), 700 (s), 678 (m); HRMS (ESI +): m/z calculated for C$_{18}$H$_{19}$NO$^+$ [M+H]$^+$ 266.1545; found 266.1547.

5-methoxy-2-(1-(4-(trifluoromethyl)phenyl)allyl)indoline (4b)

Prepared according to the general procedure under microwave irradiation in 96% yield, obtained as a light-yellow oil. $^1$H NMR (600 MHz, CDCl$_3$): $\delta$ 7.61 (d, $J = 8.2$ Hz, 2H), 7.34 (d, $J = 8.2$ Hz, 2H), 6.64–6.68 (m, 1H), 6.59–6.62 (m, 1H), 6.55–6.58 (m, 1H), 6.05 (ddd, $J = 17.0$, 10.3, 8.9 Hz, 1H), 5.18–5.26 (m, 1H), 4.09 (td, $J = 8.8$, 7.1 Hz, 1H), 3.96 (br. s, 3H), 3.73 (s, 17H), 3.42 (t, $J = 9.0$ Hz, 1H), 2.85 (dd, $J = 16.1$, 8.6 Hz, 1H), 2.63 (dd, $J = 16.1$, 6.9 Hz, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$): $\delta$ 153.5, 145.8 (q, $J = 1.2$ Hz), 144.0, 138.5, 129.5, 129.0 (q, $J = 32.7$ Hz), 128.3, 125.7 (q, $J = 3.7$ Hz), 124.1 (q, $J = 271.7$ Hz), 117.8, 112.2, 111.8, 109.6, 63.1, 55.9, 55.8, 34.6; IR (ATR, cm$^{-1}$): 3360 (w), 2943 (w), 2830 (w), 1637 (w), 1616 (w), 1600 (m), 1490 (s), 1467 (m), 1453 (w), 1413 (w), 1323 (s), 1297 (w), 1232 (m), 1162 (s), 1117 (s, br), 1066 (s) 1032 (m), 1017 (m), 992 (w), 956 (w), 922 (m), 888 (w), 834 (m), 800 (m), 732 (m), 687 (m).
2-(1-(4-fluorophenyl)allyl)-5-methoxyindoline (4c)
Prepared according to the general procedure under conventional heating on a sand-bath in 89% yield, obtained as a colourless oil. $^1$H NMR (600 MHz, CDCl$_3$): $\delta$ 7.18 (dd, $J = 8.1, 5.8$ Hz, 2H), 7.04 (t, $J = 8.6$ Hz, 2H), 6.66 (s, 1H), 6.58–6.64 (m, 1H), 6.53–6.58 (m, 1H), 5.99–6.09 (m, 1H), 5.14–5.24 (m, 2H), 3.99–4.07 (m, 1H), 3.95 (br. s, 1H), 3.73 (s, 3H), 3.34 (t, $J = 8.9$ Hz, 1H), 2.84 (dd, $J = 15.8, 8.6$ Hz, 1H), 2.65 (dd, $J = 15.8, 6.9$ Hz, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$): $\delta$ 161.6 (d, $J = 245.0$ Hz), 153.4, 144.1, 139.3, 137.4 (d, $J = 3.1$ Hz), 129.7, 129.3 (d, $J = 8.1$ Hz), 117.0, 115.5 (d, $J = 21.1$ Hz), 112.1, 111.7, 109.5, 63.3, 55.9, 55.1, 34.6; IR (ATR, cm$^{-1}$): 3422 (m), 3079 (w), 3028 (w), 3003 (w), 2894 (w), 2831 (w), 2949 (w), 2831 (w), 1638 (w), 1598 (m), 1507 (m) 1489 (s), 1450 (s), 1434 (s), 1410 (w), 1359 (w), 1294 (s), 1265 (w), 1234 (m), 1209 (s), 1191 (s), 1160 (m), 1136 (m), 1095 (m), 1032 (m), 923 (w), 885 (w), 865 (w), 838 (s), 817 (m), 802 (s), 735 (m), 700 (s), 726 (m), 698 (m); HRMS (ESI +): m/z calculated for C$_{19}$H$_{22}$NO$_2$ $[^{[M+H]^+}$ 296.1652; found 296.1651.

5-methoxy-2-methyl-2-(1-phenylallyl)indoline (4d).
Prepared according to the general procedure under conventional heating on a sand-bath in 32% yield, obtained as a colourless oil. $^1$H NMR (600 MHz, CD$_2$Cl$_2$): $\delta$ 7.28–7.35 (m, 4H), 7.22–7.26 (m, 6H), 6.65–6.67 (m, 1H), 6.55 (dd, $J = 8.2, 2.3$ Hz, 1H), 6.48 (d, $J = 8.2$ Hz, 1H), 6.36 (ddd, $J = 17.1, 10.2, 9.9$ Hz, 1H), 5.16 (dd, $J = 10.2, 2.0$ Hz, 1H), 5.12 (ddd, $J = 16.9, 2.1, 0.8$ Hz, 1H), 3.70 (s, 13H), 3.59 (br. s, 1H), 3.36 (d, $J = 9.9$ Hz, 1H), 3.15 (d, $J = 15.8$ Hz, 1H), 2.56 (d, $J = 15.8$ Hz, 1H), 1.16 (s, 3H); $^{13}$C NMR (151 MHz, CD$_2$Cl$_2$): $\delta$ 153.8, 144.7, 142.4, 139.2, 130.3, 129.6, 128.8, 127.1, 117.7, 112.6, 112.3, 109.9, 66.9, 59.7, 56.3, 42.1, 25.8; IR (ATR, cm$^{-1}$): 3405(w), 3026 (w), 2956 (w), 2831 (w), 1677 (w), 1664 (w) 1598 (m), 1489 (s), 1451 (m), 1434 (m), 1373 (w), 1309 (w), 1245 (m), 1227 (m), 1168 (m), 1138 (s), 1032 (m), 996 (m), 968 (m), 921 (w), 836 (m), 799 (m), 748 (m), 700 (s); HRMS (ESI +): m/z calculated for C$_{19}$H$_{22}$N$_1$O$_1$ $[^{[M+H]^+}$ 280.1703; found 280.1701.
2-(1-cyclohexylallyl)-5-methoxyindoline (4e)
Prepared according to the general procedure under conventional heating on a sand-bath in 77% yield, obtained as an yellow oil. $^1$H NMR (600 MHz, CDCl$_3$): δ 6.71 (d, $J = 2.3$ Hz, 1H), 6.56 (dd, $J = 8.6$, 2.6 Hz, 1H), 6.52 (d, $J = 8.2$ Hz, 1H), 5.70 (dt, $J = 16.9$, 10.1 Hz, 1H), 5.17 (dd, $J = 10.2$, 2.3 Hz, 1H), 5.07 (dd, $J = 17.1$, 2.0 Hz, 1H), 3.91 (ddd, $J = 9.0$, 8.6, 8.2 Hz, 1H), 3.73 (s, 3H), 3.03 (dd, $J = 15.5$, 8.2 Hz, 1H), 2.81 (dd, $J = 15.6$, 9.0 Hz, 1H), 2.00 (ddd, $J = 10.1$, 8.6, 4.9 Hz, 1H), 1.64–1.78 (m, 4 H), 1.57 (d, $J = 12.8$ Hz, 1H), 1.45–1.52 (m, 1H), 1.23–1.32 (m, 1H), 1.17–1.23 (m, 1H), 1.07–1.16 (m, 2H), 1.01 (qd, $J = 12.4$, 3.5 Hz, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$): δ 153.1, 144.6, 137.6, 130.6, 118.1, 111.8, 111.6, 109.4, 60.6, 55.9, 55.5, 38.7, 34.6, 32.1, 28.3, 26.6, 26.6, 26.5; IR (ATR, cm$^{-1}$): 3368 (w), 2923 (s), 2851 (s), 1635 (w), 1599 (m), 1491 (s), 1465 (m), 1448 (m), 1343 (m), 1295 (w), 1233 (s, br), 1138 (s), 1034 (s), 1000 (m), 992 (w), 912 (m), 886 (w), 832 (m), 797 (m), 729 (m); HRMS (ESI +): m/z calculated for C$_{18}$H$_{28}$N$_1$O$_1$ [M+H]$^+$ 272.2018; found 272.2014.

2-(hex-1-en-3-yl)-5-methoxyindoline (4f).
Prepared according to the general procedure under conventional heating on a sand-bath in 74% yield, obtained as a light-yellow oil. $^1$H NMR (600 MHz, CDCl$_3$): δ6.69–6.73 (m, 1H), 6.57 (dd, $J = 8.2$, 2.6 Hz, 1H), 6.52 (d, $J = 8.2$ Hz, 1H), 5.58 (dt, $J = 17.1$, 9.9 Hz, 1H), 5.14 (dd, $J = 10.4$, 2.1 Hz, 1H), 5.10 (dd, $J = 17.3$, 1.8 Hz, 1H), 3.73 (s, 3H), 3.64 (q, $J = 8.4$ Hz, 1H), 3.05 (dd, $J = 15.5$, 8.6 Hz, 1H), 2.79 (dd, $J = 15.5$, 8.6 Hz, 1H), 2.09–2.16 (m, 1H), 1.36–1.50 (m, 2H), 1.19–1.29 (m, 2H), 0.86–0.94 (m, 3H); $^{13}$C NMR (151 MHz, CDCl$_3$): δ152.9, 144.3, 139.9, 130.2, 117.1, 111.6, 111.4, 109.1, 63.3, 55.7, 49.6, 34.4, 33.3, 20.1, 13.9; IR (ATR, cm$^{-1}$): 3365 (w), 3074 (w), 2955 (m), 2930 (m), 2871 (m), 2831 (w), 1638 (w), 1599 (m), 1490 (s), 1465 (m), 1453 (s), 1433 (m), 1377 (w), 1293 (m), 1233 (s, br), 1138 (s), 1033 (s), 998 (w), 913 (m), 861 (w), 841 (m), 797 (m), 734 (m), 676 (m); HRMS (ESI +): m/z calculated for C$_{18}$H$_{28}$N$_1$O$_1$ [M+H]$^+$ 274.2172; found 274.2171.
5-methoxy-2-(2-methylenecyclopentyl)indoline (4g)
Prepared according to the general procedure under conventional heating on a sand-bath in 11%, obtained as a light-yellow oil. \(^{1}\)H NMR (600 MHz, CD\(_2\)Cl\(_2\)): \(\delta\) 6.67–6.69 (m, 1H), 6.54 (dd, \(J = 8.2, 2.6\) Hz, 1H), 6.48 (d, \(J = 8.2\) Hz, 1H), 4.97–4.99 (m, 1H), 4.90–4.92 (m, 1H), 3.89–4.08 (m, 1H), 3.70 (s, 3H), 3.60–3.66 (m, 1H), 3.05 (dd, \(J = 15.6, 8.4\) Hz, 1H), 2.68 (dd, \(J = 15.6, 7.7\) Hz, 1H), 2.49–2.55 (m, 1H), 2.30–2.35 (m, 2H), 1.84–1.91 (m, 1H), 1.70–1.78 (m, 1H), 1.57–1.64 (m, 1H), 1.48–1.54 (m, 1H); \(^{13}\)C NMR (151 MHz, CD\(_2\)Cl\(_2\)): \(\delta\) 155.3, 153.7, 145.6, 130.7, 112.4, 112.1, 109.5, 107.1, 63.1, 56.4, 49.6, 35.3, 33.9, 29.8, 24.8; IR (ATR, cm\(^{-1}\)): 3366 (w), 2984 (m), 1650 (w), 1598 (w), 1491 (s), 1433 (w), 1230 (m), 1139 (m), 1034 (s), 883 (w), 919 (m), 863 (w), 763 (m); HRMS (ESI +): \(m/z\) calculated for C\(_{15}\)H\(_{20}\)N\(_{1}\)O\(_{1}\) \([M+H]^+\) 228.1393; found 228.1388.

5-methoxy-2-(non-1-en-3-yl)indoline (4h)
Prepared according to the general procedure under conventional heating on a sand-bath in 62%, obtained as a light-yellow oil. \(^{1}\)H NMR (600 MHz, CD\(_2\)Cl\(_2\)): \(\delta\) 6.69–6.73 (m, 1H), 6.55 (dd, \(J = 8.6, 2.6\) Hz, 1H), 6.48 (d, \(J = 8.2\) Hz, 1H), 5.64 (ddd, \(J = 17.1, 10.4, 10.2\) Hz, 1H), 5.16 (dd, \(J = 10.4, 2.1\) Hz, 1H), 5.11 (ddd, \(J = 17.1, 2.3, 0.7\) Hz, 1H), 3.77 (br. s, 1H), 3.73 (s, 3H), 3.66–3.71 (m, 1H), 3.05 (dd, \(J = 15.8, 8.6\) Hz, 1H), 2.78 (dd, \(J = 15.6, 8.7\) Hz, 1H), 2.10–2.16 (m, 1H), 1.50–1.56 (m, 1H), 1.22–1.43 (m, 10H), 0.92 (t, \(J = 7.1\) Hz, 3H); \(^{13}\)C NMR (151 MHz, CD\(_2\)Cl\(_2\)): \(\delta\) 153.6, 145.6, 141.0, 131.0, 117.3, 112.4, 109.4, 64.1, 56.4, 50.7, 35.1, 32.4, 31.9, 29.9, 27.7, 23.2, 14.4; IR (ATR, cm\(^{-1}\)): 3370 (w), 2924 (w), 2855 (w), 1638 (w), 1599 (m), 1490 (s), 1466 (m), 1453 (s), 1433 (s), 1377 (w), 1293 (m), 1229 (s, br), 1138 (s), 1034 (s), 998 (w), 912 (m), 861 (w), 839 (w), 796 (m), 733 (m), 675 (m); HRMS (ESI +): \(m/z\) calculated for C\(_{18}\)H\(_{28}\)N\(_{1}\)O\(_{1}\) \([M+H]^+\) 274.2172; found 224.2171.

2-(1-(3-fluorophenyl)allyl)-5-methoxyindoline (4i)
Prepared according to the general procedure under conventional heating on a sand-bath in 70% yield, obtained as a colourless oil. \(^{1}\)H NMR (600 MHz, CD\(_2\)Cl\(_2\)): \(\delta\) 7.29–7.35 (m, 1H), 7.03 (dd, \(J = 7.6, 0.7\) Hz, 1H), 6.93–6.99 (m, 2H), 6.63 (s, 1H), 6.53–6.58 (m, 1H), 6.49–6.53 (m, 1H), 6.05 (ddd, \(J = 17.1, 9.5, 8.6\) Hz, 1H), 5.16–5.23 (m, 2H), 4.05 (ddd, \(J = 8.9, 8.4, 7.1\) Hz, 1H), 3.95 (br. s, 1H), 3.69 (s, 3H), 3.35 (dd, \(J = 8.9\) Hz, 1H), 2.83 (dd, \(J = 15.9, 8.4\) Hz, 1H), 2.63 (dd, \(J = 15.9, 7.1\) Hz, 1H); \(^{13}\)C NMR (151 MHz, CD\(_2\)Cl\(_2\)): \(\delta\) 163.6 (d, \(J = 245.6\) Hz), 153.9, 145.2 (d, \(J = 6.8\) Hz), 144.95–144.99 (m), 139.5, 130.8 (d, \(J = 8.7\) Hz).
Hz), 130.3, 124.4 (d, \( J = 2.5 \) Hz), 117.6, 115.3 (d, \( J = 21.7 \) Hz), 114.0 (d, \( J = 21.1 \) Hz), 112.6, 112.2, 109.8, 63.8, 56.3, 56.3, 35.1; \( \text{IR (ATR, cm}^{-1}\) \): 3365 (w), 3061 (w), 3028 (w), 2939 (w), 2832 (w), 1637 (w), 1612 (m) 1586 (m), 1447 (s), 1434 (s), 1398 (w), 1359 (w), 1294 (w), 1230 (s, br), 1138 (s), 1032 (s), 992 (w), 968; \( \text{HRMS (ESI +)} \) \): \( m/z \) calculated for \( \text{C}_{18}\text{H}_{19}\text{N}_{1}\text{O}_{1}\text{F}_{1}^+ \) 284.1452; found 280.1451.

2-\((1-(4\text{-chlorophenyl} \text{allyl)})-5\text{-methoxyindoline (4j)}\)
Prepared according to the general procedure under conventional heating on a sand-bath in 69% yield, obtained as a white solid. \( \text{M.p.} = 94.7–95.3^\circ\text{C} \); \( \text{\( ^1\text{H NMR (600 MHz, CD}_{2}\text{Cl}_2 \)} \): \( \delta \) 7.32 (d, \( J = 8.2 \) Hz, 2H), 7.18 (d, \( J = 8.2 \) Hz, 2H), 6.62 (s, 1H), 6.53–6.58 (m, 1H), 6.49–6.52 (m, 1H), 6.04 (ddd, \( J = 17.1, 10.2, 8.8 \) Hz, 1H), 5.15–5.21 (m, 2H), 4.04 (ddd, \( J = 8.8, 8.6, 7.4 \) Hz, 1H), 3.94 (br. s, 1H), 3.69 (s, 3H), 3.33 (t, \( J = 8.9 \) Hz, 1H), 2.81 (dd, \( J = 15.8, 8.6 \) Hz, 1H), 2.60 (dd, \( J = 15.9, 7.4 \) Hz, 1H); \( \text{\( ^{13}\text{C NMR (151 MHz, CD}_{2}\text{Cl}_2 \)} \): \( \delta \) 153.3, 144.4, 140.5, 139.1, 132.2, 129.7, 129.4, 128.7, 116.9, 112.0, 111.6, 109.2, 63.3, 55.7, 55.4, 34.6; \( \text{IR (ATR, cm}^{-1}\) \): 3381 (w), 3077 (w), 2994 (w), 2955 (w), 2833 (w), 1635 (w), 1595 (m), 1487 (s), 1449 (m), 1432 (m), 1398 (w), 1364 (w), 1298 (w), 1262 (w), 1237 (m), 1218 (m), 1191 (m), 1181 (m), 1137 (m), 1108 (m), 1014 (m), 1033 (m), 1014 (m), 994 (m), 967 (m), 894 (w), 883 (m), 867 (w), 822 (m), 744 (m), 696 (w).

5\text{-methoxy-2-((1-(4-methoxyphenyl)allyl)indoline (4k)}\)
Prepared according to the general procedure under conventional heating on a sand-bath in 30% yield, using 2.4 eq. of an equimolar mixture of MeOH/H\(_2\)O, obtained as a yellow oil. \( \text{\( ^1\text{H NMR (600 MHz, CD}_{2}\text{Cl}_2 \)} \): \( \delta \) 7.12–7.17 (m, 2H), 6.86–6.91 (m, 2H), 6.63 (d, \( J = 1.8 \) Hz, 1H), 6.49–6.59 (m, 2H), 5.99–6.11 (m, 1H), 5.12–5.19 (m, 2H), 4.03 (ddd, \( J = 9.0, 8.4, 7.1 \) Hz, 1H), 3.79 (s, 3H), 3.69 (s, 3H), 3.28 (t, \( J = 9.0 \) Hz, 1H), 2.80 (dd, \( J = 16.1, 8.4 \) Hz, 1H), 2.63 (dd, \( J = 15.9, 7.1 \) Hz, 1H); \( \text{\( ^{13}\text{C NMR (151 MHz, CD}_{2}\text{Cl}_2 \)} \): \( \delta \) 159.0, 153.9, 145.0, 140.5, 134.4, 130.5, 129.4, 116.7, 114.6, 112.5, 112.2, 109.8, 64.0, 56.3, 55.8, 55.7, 35.2; \( \text{IR (ATR, cm}^{-1}\) \): 3360 (w), 2996 (w), 2936 (w), 2833 (w), 1609 (m), 1582 (m), 1510 (s) 1489 (s), 1464 (m), 1451 (s), 1435 (m), 1354 (w), 1297 (w), 1234 (s, br), 1177 (s), 1138 (s), 1031 (s), 993 (w), 919 (m), 827 (m), 805 (m), 751 (m), 725 (m); \( \text{HRMS (ESI +)} \) \): \( m/z \) calculated for \( \text{C}_{19}\text{H}_{22}\text{NO}_{2}^+ \) [M+H]\(^+\) 296.1652; found 296.1651.
5-methoxy-2-(1-phenylbut-3-en-2-yl)indoline (4l)
Prepared according to the general procedure under conventional heating on a sand-bath in 82% yield, obtained as a light-yellow solid. M.p. = 76.8–77.3 °C; 1H NMR (600 MHz, CD2Cl2): δ 7.26–7.30 (m, 2H), 7.16–7.21 (m, 3H), 6.69–6.72 (m, 1H), 6.54–6.57 (m, 1H), 6.48–6.51 (m, 1H), 5.69 (ddd, J = 17.1, 10.5, 9.2 Hz, 1H), 5.05 (dd, J = 10.5, 2.0 Hz, 1H), 4.93 (ddd, J = 17.1, 2.0, 0.7 Hz, 1H), 3.80 (ddd, J = 8.9, 8.8, 7.1 Hz, 1H), 3.10 (dd, J = 15.8, 8.9 Hz, 1H), 2.92 (dd, J = 13.5, 4.6 Hz, 1H), 2.87 (dd, J = 15.6, 8.7 Hz, 1H), 2.60 (dd, J = 13.6, 9.7 Hz, 1H), 2.49 (ddd, J = 9.7, 9.2, 7.1, 4.6 Hz, 1H); 13C NMR (151 MHz, CD2Cl2): δ 153.8, 145.5, 140.7, 139.8, 130.9, 129.8, 128.7, 126.4, 117.8, 112.5, 112.0, 109.6, 63.4, 56.3, 52.2, 38.8, 35.2; IR (ATR, cm⁻¹): 3376 (m), 3355 (m), 3072 (w), 3024 (w), 2998 (w), 2946 (w), 2885 (w), 2833 (w), 1639 (w), 1597 (m), 1487 (s), 1453 (s), 1434 (s), 1367 (w), 1300 (m), 1236 (s), 1218 (m), 1191 (m), 1135 (m), 1029 (s), 998 (w), 987 (m), 912 (m), 886 (w), 856 (m), 799 (m), 753 (m), 729 (m), 697 (s), 675 (m); HRMS (ESI +): m/z calculated for C19H22N1O1+ [M+H]+ 280.1701; found 280.1701.

2-(1-[(1,1'-biphenyl]-4-yl)allyl)-5-methoxyindoline (4m)
Prepared according to the general procedure under conventional heating on a sand-bath in 31% yield, using 2.4 eq. of an equimolar mixture of MeOH/H2O, obtained as a yellow oil. 1H NMR (600 MHz, CD2Cl2): δ 7.61–7.67 (m, 4H), 7.47–7.51 (m, 2H), 7.36–7.41 (m, 1H), 7.34 (s, 2H), 6.67–6.69 (m, 1H), 6.60 (dd, J = 8.2, 2.6 Hz, 1H), 6.56 (d, J = 8.2 Hz, 1H), 6.11–6.19 (m, 1H), 5.22–5.27 (m, 2H), 4.15 (ddd, J = 9.0, 8.7, 7.2 Hz, 1H), 4.03 (br. s, 1H), 3.73 (s, 3H), 3.42 (t, J = 9.0 Hz, 1H), 2.89 (dd, J = 15.8, 8.6 Hz, 1H), 2.72 (dd, J = 16.1, 7.2 Hz, 1H); 13C NMR (151 MHz, CD2Cl2): δ 153.9, 145.1, 141.6, 141.3, 140.1, 140.0, 130.4, 129.3, 129.0, 127.9, 127.8, 127.5, 117.2, 112.6, 112.2, 109.8, 63.9, 56.3 (2xC, OMe + CH), 35.2; IR (ATR, cm⁻¹): 3369 (w), 3027 (w), 2935 (w), 2831 (w), 1635 (w), 1599 (w), 1487 (s), 1465 (m), 1449 (s), 1433 (s), 1405 (w), 1355 (w), 1293 (w), 1230 (m, br), 1138 (m), 1075 (m), 1032 (s), 1007 (m), 994 (w), 919 (m), 888 (w), 834 (m), 801 (m), 764 (m), 696 (s), 662 (m).
5-fluoro-2-(1-phenylallyl)indoline (4n)

Prepared according to the general procedure under conventional heating on a sand-bath in 54% yield, obtained as a light-yellow oil. $^1$H NMR (600 MHz, CDCl$_3$): $\delta$ 7.38 (t, $J$ = 7.9 Hz, 1H), 7.27–7.33 (m, 7H), 7.24 (d, $J$ = 8.2, 4.3 Hz, 5H), 6.04–6.13 (m, 1H), 5.20–5.27 (m, 2H), 4.12 (ddd, $J$ = 8.9, 8.6, 6.9 Hz, 1H), 3.35 (dd, $J$ = 8.9, 8.8 Hz, 1H), 2.87 (dd, $J$ = 16.1, 8.6 Hz, 1H), 2.70 (dd, $J$ = 16.1, 6.9 Hz, 1H); $^{13}$C NMR (151 MHz, CDCl$_3$): $\delta$ 157.0 (d, $J$ = 235.1 Hz), 146.5, 141.5, 139.4, 130.1 (d, $J$ = 8.7 Hz), 129.0, 128.1, 127.0, 117.3, 113.4 (d, $J$ = 22.9 Hz), 112.4 (d, $J$ = 23.6 Hz), 109.3 (d, $J$ = 8.7 Hz), 65.5, 56.2, 34.5; IR (ATR, cm$^{-1}$): 3382 (w), 3061 (w), 3027 (w), 2924 (w), 2830 (w), 1636 (w), 1600 (m), 1486 (s), 1448 (m), 1400 (w), 1359 (w), 1287 (w), 1225 (m), 1102 (s), 1090 (w), 1032 (w), 992 (w), 939 (w), 920 (m), 858 (w), 804 (m), 700 (m), 676 (m); HRMS (ESI +): m/z calculated for C$_{17}$H$_{17}$F$_1$N$^+$ [M+H]$^+$ 254.1351; found 245.1345.

5-fluoro-2-(1-(3-fluorophenyl)allyl)indoline (4o)

Prepared according to the general procedure under conventional heating on a sand-bath in 54% yield, using 2.4 eq. of an equimolar mixture of MeOH/H$_2$O, obtained as a light-yellow oil. $^1$H NMR (600 MHz, CD$_2$Cl$_2$): $\delta$ 7.36–7.30 (m, 1H), 7.04 (d, $J$ = 7.6 Hz, 1H), 7.00–6.94 (m, 2H), 6.76–6.72 (m, 1H), 6.70 (ddd, $J$ = 9.4, 8.7, 2.7 Hz, 1H), 6.51 (dd, $J$ = 8.4, 4.4 Hz, 1H), 6.05 (ddd, $J$ = 16.9, 10.3, 9.0 Hz, 1H), 5.25–5.17 (m, 2H), 4.10 (dd, $J$ = 16.2, 8.7 Hz, 1H), 3.36 (t, $J$ = 8.9 Hz, 1H), 2.85 (dd, $J$ = 16.1, 8.7 Hz, 1H), 2.70 (dd, $J$ = 16.1, 7.3 Hz, 1H); $^{13}$C NMR (151 MHz, CD$_2$Cl$_2$): $\delta$ 163.6 (d, $J$ = 245.4 Hz), 157.4 (d, $J$ = 233.9 Hz), 147.2, 144.9 (d, $J$ = 6.9 Hz), 139.2, 130.9 (d, $J$ = 8.3 Hz), 130.5 (d, $J$ = 8.2 Hz), 124.4 (d, $J$ = 2.8 Hz), 117.9, 115.3 (d, $J$ = 21.4 Hz), 114.1 (d, $J$ = 21.1 Hz), 113.6 (d, $J$ = 23.2 Hz), 112.5 (d, $J$ = 23.9 Hz), 109.5 (d, $J$ = 8.3 Hz); IR (ATR, cm$^{-1}$): 3389 (w), 3061 (w), 3028 (w), 2901 (w), 2830 (w), 1613 (m), 1587 (s), 1487 (s), 1448 (m), 1359 (w), 1288 (w), 1252 (m), 1228 (m), 1186 (s), 1139 (s), 1125 (w), 992 (w), 925 (m), 886 (w), 807 (m), 784 (m), 735 (m), 700 (s), 678 (m), 671 (m), 696 (m); HRMS (ESI +): m/z calculated for C$_{17}$H$_{16}$F$_2$N$^+$ [M+H]$^+$ 272.1252; found 272.1251.
5-fluoro-2-(hex-1-en-3-yl)indoline (4p)
Prepared according to the general procedure under conventional heating on a sand-bath in 51% yield, obtained as a colourless oil. \(^1\)H NMR (600 MHz, CD\textsubscript{2}Cl\textsubscript{2}): \(\delta\) 6.75–6.80 (m, 1H), 6.63–6.69 (m, 1H), 6.44 (dd, \(J = 8.4, 4.4\) Hz, 1H), 5.60 (ddd, \(J = 17.1, 10.5, 9.7\) Hz, 1H), 5.14 (dd, \(J = 10.4, 2.1\) Hz, 1H), 5.09 (dd, \(J = 17.1, 2.1\) Hz, 1H), 3.87 (br. s, 1H), 3.70 (q, \(J = 8.7\) Hz, 1H), 3.05 (dd, \(J = 15.9, 8.7\) Hz, 1H), 2.78 (dd, \(J = 15.9, 8.7\) Hz, 1H), 2.09–2.17 (m, 1H), 1.37–1.49 (m, 2H), 1.20–1.31 (m, 2H), 0.88–0.94 (m, 3H); \(^{13}\)C NMR (151 MHz, CD\textsubscript{2}Cl\textsubscript{2}): \(\delta\) 157.1 (d, \(J = 233.8\) Hz), 147.8, 147.8, 140.7, 131.1 (d, \(J = 8.1\) Hz), 117.5, 113.4 (d, \(J = 23.6\) Hz), 112.4 (d, \(J = 24.2\) Hz), 109.0 (d, \(J = 8.1\) Hz), 64.2, 50.5, 34.87, 34.86, 34.0, 20.9, 14.4; IR (ATR, cm\(^{-1}\)): 3391 (w), 3074 (w), 2957 (w), 2930 (w), 2872 (w), 1638 (w), 1611 (w), 1487 (s), 1448 (m), 1421 (w), 1408 (w), 1378 (w), 1363 (w), 1358 (w), 1287 (w), 1278 (w), 1272 (w), 1252, 1189, 117.3, 109.3, 63.3, 56.7, 34.7; HRMS (ESI +): m/z calculated for C\textsubscript{14}H\textsubscript{19}N\textsubscript{1}F\textsubscript{1} [M+H]\textsuperscript{+} 220.1499; found 220.1502.

2-(1-phenylallyl)indoline (4q)
Prepared according to the general procedure under conventional heating on a sand-bath in 76% yield, using 2.4 eq. of an equimolar mixture of MeOH/H\textsubscript{2}O, obtained as a colourless oil. \(^1\)H NMR (600 MHz, CD\textsubscript{2}Cl\textsubscript{2}): \(\delta\) 7.38 (t, \(J = 7.6\) Hz, 1H), 7.31–7.24 (m, 2H), 7.01 (t, \(J = 7.1\) Hz, 1H), 7.00 (t, \(J = 7.1\) Hz, 1H), 6.67 (t, \(J = 7.4\) Hz, 1H), 6.62 (d, \(J = 7.9\) Hz, 1H), 6.17–6.06 (m, 1H), 5.27–5.19 (m, 1H), 4.49–4.21 (m, 1H), 4.14 (td, \(J = 8.9, 7.1\) Hz, 1H), 3.37 (t, \(J = 9.1\) Hz, 1H), 2.87 (dd, \(J = 15.8, 8.7\) Hz, 1H), 2.69 (dd, \(J = 15.8, 7.0\) Hz, 1H); \(^{13}\)C NMR (151 MHz, CD\textsubscript{2}Cl\textsubscript{2}): \(\delta\) 151.1, 142.4, 140.2, 129.3, 128.8, 128.6, 127.8, 127.2, 125.2, 118.9, 117.2, 109.3, 63.3, 56.7, 34.7; IR (ATR, cm\(^{-1}\)): 3375 (w), 3074 (m), 3058 (m), 2957 (w), 2872 (w), 1636 (w), 1605 (m), 1608 (m), 1484 (s), 1465 (m), 1452 (w), 1399 (w), 1358 (m), 1320 (w), 1242 (m), 1152 (w), 1073 (w), 1051 (w), 992 (m), 917 (m), 887 (w), 847 (w), 803 (w), 744 (s), 676 (m); HRMS (ESI +): m/z calculated for C\textsubscript{17}H\textsubscript{18}N\textsubscript{1}F\textsubscript{1} [M+H]\textsuperscript{+} 236.1445; found 236.1439.
2-(1-(3-fluorophenyl)allyl)indoline (4r)

Prepared according to the general procedure under conventional heating on a sand-bath in 65% yield, using 2.4 eq. of an equimolar mixture of MeOH/H2O, obtained as a colourless oil. ¹H NMR (600 MHz, CDCl₃): δ 7.29–7.35 (m, 1H), 6.99–7.06 (m, 3H), 6.64 (d, J = 7.6 Hz, 1H), 6.03 (ddd, J = 16.8, 10.2, 9.2 Hz, 1H), 5.19–5.26 (m, 2H), 4.07 (ddd, J = 9.2, 8.6, 6.9 Hz, 1H), 3.34 (t, J = 9.0 Hz, 1H), 2.90 (dd, J = 15.8, 8.6 Hz, 1H), 2.68 (dd, J = 16.1, 6.6 Hz, 1H); ¹³C NMR (151 MHz, CDCl₃): δ 162.9, 150.1, 144.1, 138.7, 130.2, 127.9, 127.4, 124.8, 123.6, 118.6, 117.5, 114.7, 113.6, 109.0, 62.4, 55.7, 55.7, 34.0; IR (ATR, cm⁻¹): 3377 (w), 3050 (w), 2901 (w), 1636 (m), 1609 (s), 1587 (s), 1484 (s), 1466 (m), 1358 (w), 1320 (w), 1139 (m), 1054 (w), 1018 (w), 991 (w), 920 (m), 869 (m), 782 (m), 746 (s), 710 (m), 695 (w), 671 (w); HRMS (ESI +): m/z calculated for C₁₇H₁₇N₁F₁⁺ [M+H]⁺ 254.1349; found 254.1345.

2-(hex-1-en-3-yl)indoline (4s)

Prepared according to the general procedure under conventional heating on a sand-bath in 56% yield, obtained as a colourless oil. ¹H NMR (600 MHz, CD₂Cl₂): δ 7.04 (d, J = 7.2 Hz, 1H), 6.95 (t, J = 8.2 Hz, 1H), 6.62 (t, J = 7.4 Hz, 1H), 6.53 (d, J = 7.9 Hz, 1H), 5.58–5.66 (m, 1H), 5.15 (dd, J = 10.4, 2.1 Hz, 1H), 5.10 (dd, J = 17.1, 2.0 Hz, 1H), 3.98 (br. s, 1H), 3.66–3.71 (m, 1H), 3.07 (dd, J = 15.5, 8.9 Hz, 1H), 2.79 (dd, J = 15.5, 8.6 Hz, 1H), 2.10–2.17 (m, 1H), 1.37–1.52 (m, 2H), 1.22–1.32 (m, 2H), 0.90–0.95 (m, 3H); ¹³C NMR (151 MHz, CD₂Cl₂): δ 151.7, 140.9, 129.3, 127.7, 125.0, 118.5, 117.4, 108.9, 63.6, 50.6, 34.6, 34.0, 20.9, 14.5; IR (ATR, cm⁻¹): 3387 (w), 3075 (w), 3052 (w), 2956 (w), 2929 (w), 2871 (w), 1639 (w), 1609 (m), 1484 (s), 1464 (s), 1420 (w), 1401 (m), 1378 (w), 1319 (w), 1245 (m), 1151 (m), 1032 (w), 1018 (w), 997 (w), 913 (m), 881 (w), 843 (w), 743 (w), 708 (w), 677 (w); HRMS (ESI +): m/z calculated for C₁₄H₂₀N₁⁺ [M+H]⁺ 202.1595; found 202.1596.

2-(1-(4-(trifluoromethyl)phenyl)allyl)indoline (4t)

Prepared according to the general procedure under conventional heating on a sand-bath in 53%, obtained as a colourless oil. ¹H NMR (600 MHz, CDCl₃): δ 7.62 (d, J = 8.2 Hz, 2H), 7.36 (s, 2H), 7.00–7.07 (m, 2H), 6.71 (t, J = 7.4 Hz, 1H), 6.65 (s, 1H), 6.06 (ddd, J = 17.4, 10.2, 8.9 Hz, 1H), 5.25 (d, J = 10.2 Hz, 1H), 5.24 (d, J = 17.4 Hz, 1H), 4.17 (br. s, 1H), 4.12 (td, J = 8.9, 7.2 Hz, 1H), 3.44 (t, J = 8.9 Hz, 1H), 2.90 (dd, J = 15.8, 8.6 Hz, 1H), 2.67 (dd, J = 15.8, 6.9 Hz, 1H); ¹³C NMR (151 MHz, CDCl₃): δ 150.2, 145.7 (q, J = 1.2 Hz),
138.5, 129.0 (q, $J = 32.9$ Hz), 128.3, 127.8, 127.4, 125.7 (q, $J = 3.7$ Hz), 124.7-124.8 (m), 124.1 (q, $J = 271.7$ Hz), 118.7, 117.8, 109.1, 62.5, 55.9, 34.1; $\text{IR (ATR, cm}^{-1})$: 3394 (w), 3053 (w), 1609 (m), 1484 (m), 1465 (w), 1412 (w), 1324 (s), 1244 (w), 1163 (m), 1119 (m), 1067 (m), 1017 (m), 992 (w), 954 (w), 922 (w), 832 (m), 746 (m), 710 (w), 686 (w); $\text{HRMS (ESI +)}$: m/z calculated for $C_{18}H_{17}N_1F_3^+$ [M+H]$^+$ 304.1315; found 304.1313.

5-methyl-2-(1-phenylallyl)indoline (4v)

Prepared according to the general procedure under conventional heating on a sand-bath in 66%, obtained as a colourless oil. $^1H\text{NMR (600 MHz, CD}_2\text{Cl}_2$): $\delta$ 7.4 (t, $J = 7.6$ Hz, 1H), 7.29–7.21 (m, 2H), 6.85–6.78 (m, 1H), 6.50 (d, $J = 7.8$ Hz, 1H), 6.14–6.04 (m, 1H), 5.23–5.15 (m, 1H), 4.19 (br. s, 1H), 4.08 (td, $J = 8.8$, 7.1 Hz, 1H), 3.33 (t, $J = 9.1$ Hz, 1H), 2.80 (dd, $J = 15.8$, 8.6 Hz, 1H), 2.63 (dd, $J = 15.8$, 7.0 Hz, 1H), 2.22 (s, 2H); $^{13}C\text{NMR (151 MHz, CD}_2\text{Cl}_2$): $\delta$ 148.8, 142.5, 140.3, 129.3, 129.1, 128.6, 128.2, 128.0, 127.2, 126.0, 117.1, 109.3, 63.5, 56.7, 34.7, 21; $\text{IR (ATR, cm}^{-1})$: 3373 (w), 3026 (w), 2915 (w), 2864 (w), 1600 (m), 1619 (m), 1493 (m) 1451 (m), 1397 (w), 1359 (w), 1246 (m), 1156 (w), 1052 (s), 1030 (w), 991 (w), 917 (m), 888 (w), 804 (m), 699 (m), 677 (m).

5-methyl-2-(1-(4-(trifluoromethyl)phenyl)allyl)indoline (4w)

Prepared according to the general procedure under conventional heating on a sand-bath in 83%, obtained as a light-yellow oil. $^1H\text{NMR (600 MHz, CD}_2\text{Cl}_2$): $\delta$ 7.61 (d, $J = 8.1$ Hz, 1H), 7.38 (d, $J = 8.1$ Hz, 1H), 6.84–6.78 (m, 1H), 6.51 (d, $J = 7.8$ Hz, 1H), 6.08 (ddd, $J = 17.0$, 10.3, 8.9 Hz, 1H), 5.22 (ddd, $J = 13.6$, 8.9, 1.1 Hz, 1H), 4.10 (ddd, $J = 8.9$, 8.6, 7.2 Hz, 1H), 3.43 (t, $J = 8.9$ Hz, 1H), 2.81 (dd, $J = 15.8$, 8.6 Hz, 1H), 2.59 (dd, $J = 15.8$, 7.2 Hz, 1H); $^{13}C\text{NMR (151 MHz, CD}_2\text{Cl}_2$): $\delta$ 147.9, 146.21, 138.6, 128.6 (q, $J = 32.2$ Hz), 128.5, 128.3, 127.9, 127.6, 125.5 (q, $J = 3.8$ Hz), 125.4, 124.3 (q, $J = 271.8$ Hz), 108.8, 62.8, 55.8, 34.1, 20.4; $\text{IR (ATR, cm}^{-1})$: 3386 (w), 2921 (w), 2830 (w), 1617 (m), 1495 (s), 1413 (w), 1325 (w), 1246 (w), 1163 (w), 1122 (m), 1068 (m), 1018 (w), 994 (w), 923 (w), 833 (w), 806 (w), 768 (w), 687 (w); $\text{HRMS (ESI +)}$: m/z calculated for $C_{19}H_{19}N_1F_3^+$ [M+H]$^+$ 318.1476; found 318.1470.
2-(hex-1-en-3-yl)-5-methylindoline (4y)
Prepared according to the general procedure under conventional heating on a sand-bath in 62%, obtained as light-yellow oil. 

$^{1}H$ NMR (600 MHz, CD$_2$Cl$_2$): $\delta$ 6.87 (s, 1H), 6.77 (d, $J = 7.8$ Hz, 1H), 6.44 (d, $J = 7.8$ Hz, 1H), 5.66–5.57 (m, 1H), 5.11 (ddd, $J = 19.3$, 13.7, 2.1 Hz, 2H), 3.90 (s, 1H), 3.66 (q, $J = 8.5$ Hz, 1H), 3.02 (dd, $J = 15.5$, 8.7 Hz, 1H), 2.75 (dd, $J = 15.5$, 8.6 Hz, 1H), 2.22 (s, 3H), 2.13 (qd, $J = 10.2$, 3.3 Hz, 1H), 1.52–1.36 (m, 2H), 0.91 (ddd, $J = 13.7$, 6.8 Hz, 3H); $^{13}C$ NMR (151 MHz, CD$_2$Cl$_2$): $\delta$ 148.6, 140.3, 129.0, 127.3 (d, $J = 9.2$ Hz), 125.2, 116.7, 108.4, 63.2, 49.9, 34.1, 33.5, 20.4 (d, $J = 19.2$ Hz), 13.9; IR (ATR, cm$^{-1}$): 3386 (w), 3012 (w), 2956 (m), 2870 (w), 2638 (w), 1620 (m), 1457 (w), 1420 (w), 1400 (m), 1378 (w), 1298 (w), 1247 (w), 1131 (w), 1034 (w), 996 (m), 912 (m), 882 (w), 803 (s), 739 (m), 673 (m); HRMS (ESI +): $m/z$ calculated for C$_{14}$H$_{20}$N$_{1}$ [M+H]$^+$ 202.1595; found 202.1596.
Figure S1: $^1$H-NMR spectrum (600 MHz, CDCl$_3$) of product 4a.

Figure S2: $^{13}$C-NMR spectrum (150 MHz, CDCl$_3$) of product 4a.
Figure S3: $^1$H-NMR spectrum (600 MHz, CDCl$_3$) of product 4b.

Figure S4: $^{13}$C-NMR spectrum (150 MHz, CDCl$_3$) of product 4b.
Figure S5: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4c.

Figure S6: $^{13}$C-NMR spectrum (150 MHz, CDCl$_3$) of product 4c.
Figure S7: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4d.

Figure S8: $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4d.
Figure S9: $^1$H-NMR spectrum (600 MHz, CDCl$_3$) of product 4e.

Figure S10: $^{13}$C-NMR spectrum (150 MHz, CDCl$_3$) of product 4e.
Figure S11: $^1$H-NMR spectrum (600 MHz, CDCl$_3$) of product 4f.

Figure S12: $^{13}$C-NMR spectrum (150 MHz, CDCl$_3$) of product 4f.
**Figure S13:** $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4g.

**Figure S14:** $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4g.
Figure S15: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4h.

Figure S16: $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4h.
Figure S17: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4i.

Figure S18: $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4i.
Figure S19: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4j.

Figure S20: $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4j.
**Figure S21**: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4k.

**Figure S22**: $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4k.
Figure S23: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4l.

Figure S24: $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4l.
Figure S25: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4m.

Figure S26: $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4m.
**Figure S27:** $^1$H-NMR spectrum (600 MHz, CDCl$_3$) of product 4n.

**Figure S28:** $^{13}$C-NMR spectrum (150 MHz, CDCl$_3$) of product 4n.
Figure S29: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4o.

Figure S30: $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4o.
Figure S31: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4p.

Figure S32: $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4p.
**Figure S33:** $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4q.

**Figure S34:** $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4q.
Figure S35: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4r.

Figure S36: $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4r.
Figure S37: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4s.

Figure S38: $^{13}$C-NMR spectrum (150 MHz, CD$_2$Cl$_2$) of product 4s.
Figure S39: $^1$H-NMR spectrum (600 MHz, CDCl$_3$) of product 4t.

Figure S40: $^{13}$C-NMR spectrum (150 MHz, CDCl$_3$) of product 4t.
**Figure S41:** $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4v.

**Figure S42:** $^{13}$C-NMR spectrum (150 MHz, CDCl$_3$) of product 4v.
Figure S43: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4w.

Figure S44: $^{13}$C-NMR spectrum (150 MHz, CDCl$_3$) of product 4w.
Figure S45: $^1$H-NMR spectrum (600 MHz, CD$_2$Cl$_2$) of product 4y.

Figure S46: $^{13}$C-NMR spectrum (150 MHz, CDCl$_3$) of product 4y.