Supporting Information

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General information

Proton (\(^1\)H NMR) and carbon (\(^{13}\)C NMR) nuclear magnetic resonance spectra were recorded at 400 or 500 MHz and 101 or 126 MHz, respectively. The chemical shifts are given in parts per million (ppm) on the delta (\(\delta\)) scale. The solvent peak was used as a reference value, for \(^1\)H NMR: CDCl\(_3\) = 7.27 ppm; for \(^{13}\)C NMR: CDCl\(_3\) = 77.23 ppm. Analytical TLC was performed on precoated silica gel GF254 plates. Column chromatography was carried out on silica gel (200–300 mesh). HRMS were carried out on an Orbitrap analyzer.

General procedure

Procedure A for the synthesis of 1-phenylisochroman (1a)

A solution of isochroman-1-one (0.74 g, 5.0 mmol, 1.0 equiv) and THF (10 mL) was cooled to –78 °C. PhLi (2.5 M in n-hexane 2.4 mL, 6.0 mmol, 1.2 equiv) was added dropwise. After being stirred for 1 h. Cold water (10 mL) was added, and the aqueous phase was extracted with ethyl acetate (3 × 10 mL). The combined organic layers were washed with sat. brine (10 mL), dried (MgSO\(_4\)), filtered and concentrated. The resulting pale yellow oil was purified by silica gel chromatography (hexane-EtOAc, 4:1) to give hemiketal S1 as an oil, which was directly used in the next step.

To a hemiketal S1 in anhyd. CH\(_2\)Cl\(_2\) (10 mL) at 0°C was added TFA (0.37 mL, 5 mmol) dropwise and the mixture was stirred for 15 min. Et\(_3\)SiH (0.75 mL, 5 mmol) was added dropwise to the reaction mixture at 0 °C and the mixture was stirred for 2 h then warmed to r.t. The reaction mixture was quenched with ice water (10 mL) and extracted with CH\(_2\)Cl\(_2\) (3 × 10 mL). The combined organic extracts were washed with
sat. brine (10 mL) and dried (anhyd MgSO₄). After concentration, the residue was purified by flash chromatography (hexane-EtOAc, 9:1) to give compound 1a.

**Procedure B for the synthesis of 6-methoxy-1-phenylisochroman (1b)**

![Chemical structure of 1b]

General Procedure to get **6-methoxy-1-phenylisochroman (1b)** from 2-(3-methoxyphenyl)ethanol (2 mmol 1.0 eq) and H₂SO₄ (0.2 eq) were added successively to a solution of aldehyde (1.2 eq) in toluene (5 mL). The reaction mixture stirred for 2 h. The reaction mixture was quenched with water (2 mL) and extracted with EtOAc (3×10 mL). The combined organic extracts were washed with sat. brine (10 mL) and dried (anhyd. MgSO₄). After concentration, the residue was purified by flash chromatography (hexane-EtOAc, 9:1) to give compound 1b.

**Procedure C for the synthesis of 1-phenyl-1-(phenylethynyl)isochroman (3a)**

![Chemical structure of 3a]

General Procedure to get **1-phenyl-1-(phenylethynyl)isochroman (3a)**

To a solution of 1a (0.10 mmol, 1.0 eq) in CH₂Cl₂ (1 mL) was added 2a (0.15 mmol, 1.5 eq), DDQ (0.12 mmol, 1.2 eq) and LiBF₄ (0.10 mmol, 1.0 eq) at room temperature for 12h. The reaction was quenched by saturated aqueous NaHCO₃, extracted with DCM (3×5 mL), and the combined organic layer was dried over MgSO₄, filtered and evaporated under vacuum. The residue was purified by flash column chromatography to give the desired product 3a.
Analytical data for products

6-Methoxy-1-phenylisochroman (1b)
It was prepared following the general procedure B and purified by flashchromatography on silica gel by using hexane-EtOAc (9:1) as eluent to afford 1b (393 mg, 82%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 7.40–7.28 (m, 5H), 6.71 (d, $J = 1.0$ Hz, 1H), 6.68–6.63 (m, 2H), 5.69 (s, 1H), 4.21–4.15 (m, 1H), 3.97–3.91 (m, 1H), 3.79 (s, 3H), 3.24–3.06 (m, 1H), 2.83–2.74 (m, 1H). $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 158.3, 142.6, 135.3, 129.9, 129.0, 128.6, 128.3, 128.2, 113.4, 112.5, 79.6, 64.0, 55.4, 29.4. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{16}$H$_{17}$O$_2$: 241.1223, found: 241.1226.

6,7-Dimethoxy-1-(4-methoxyphenyl)isochroman (1c)
It was prepared following the general procedure B and purified by flashchromatography on silica gel by using hexane-EtOAc (4:1) as eluent to afford 1c (482 mg, 80%). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.25–7.19 (m, 2H), 6.90–6.84 (m, 2H), 6.65 (s, 1H), 6.24 (s, 1H), 5.64 (s, 1H), 4.15–4.08 (m, 1H), 3.91–3.83 (m, 1H), 3.80 (s, 3H), 3.66 (s, 3H), 3.10–2.95 (m, 1H), 2.76–2.68 (m, 1H). $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 159.6, 147.9, 147.4, 134.7, 130.3, 129.4, 126.3, 113.9, 111.3, 109.9, 78.8, 63.6, 56.1, 56.1, 55.5, 28.6. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{18}$H$_{21}$O$_4$: 301.1434 found: 301.1431.
7-Bromo-1-(4-methoxyphenyl)isochroman (1d)
It was prepared following the general procedure A and purified by flashchromatography on silica gel by using hexane-EtOAc (9:1) as eluent to afford 1d (630 mg, 41%). \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\) 7.29 (dd, \(J = 8.2, 1.7\) Hz, 1H), 7.21 (d, \(J = 8.6\) Hz, 2H), 7.04 (d, \(J = 8.2\) Hz, 1H), 6.95–6.84 (m, 3H), 5.63 (s, 1H), 4.21–4.12 (m, 1H), 3.95–3.85 (m, 1H), 3.82 (s, 3H), 3.18–2.94 (m, 1H), 2.81–2.69 (m, 1H). \(^{13}\)C NMR (126 MHz, CDCl\(_3\)) \(\delta\) 159.8, 140.1, 133.8, 133.1, 130.6, 130.3, 129.9, 119.7, 114.2, 78.9, 63.8, 55.5, 28.5. HRMS (EI) m/z [M + H]^+ calculated for C\(_{16}\)H\(_{16}\)BrO\(_2\): 319.0328, found: 319.0331.

6-Methoxy-1-(4-methoxyphenyl)isochroman (1e)
It was prepared following the general procedure B and purified by flashchromatography on silica gel by using hexane-EtOAc (9:1) as eluent to afford 1e (405 mg, 75%). \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\) 7.24–7.19 (m, 2H), 6.90–6.83 (m, 2H), 6.72–6.60 (m, 3H), 5.65 (s, 1H), 4.19–4.11 (m, 1H), 3.95–3.85 (m, 1H), 3.80 (s, 3H), 3.79 (s, 3H), 3.14–3.07 (m, 1H), 2.81–2.72 (m, 1H). \(^{13}\)C NMR (126 MHz, CDCl\(_3\)) \(\delta\) 159.6, 158.3, 135.4, 134.9, 130.3, 130.2, 128.3, 113.9, 113.3, 128.5, 79.1, 63.9, 55.5, 55.4, 29.4. HRMS (EI) m/z [M + H]^+ calculated for C\(_{17}\)H\(_{19}\)O\(_3\): 271.1329, found: 271.1331.
6-Methoxy-1-(3-methoxyphenyl)isochroman (1f)

It was prepared following the general procedure B and purified by flash chromatography on silica gel by using hexane-EtOAc (9:1) as eluent to afford 1f (412 mg, 76%). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.33–7.23 (m, 1H), 6.92 (d, $J = 7.7$ Hz, 1H), 6.90–6.83 (m, 2H), 6.68–6.68 (m, 3H), 5.68 (s, 1H), 4.22–4.13 (m, 1H), 3.98–3.87 (m, 1H), 3.80 (s, 3H), 3.79 (s, 3H), 3.19–3.07 (m, 1H), 2.84–2.76 (m, 1H).

$^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 159.8, 158.3, 144.1, 135.2, 129.7, 129.5, 128.2, 121.4, 114.4, 113.8, 113.3, 112.5, 79.5, 63.9, 55.4, 29.3. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{17}$H$_{19}$O$_3$: 271.1329, found: 271.1325.

6-Methoxy-1-(2-methoxyphenyl)isochroman (1g)

It was prepared following the general procedure B and purified by flash chromatography on silica gel by using hexane-EtOAc (9:1) as eluent to afford 1g (424 mg, 78%). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.33–7.23 (m, 1H), 7.08 (dd, $J = 7.6$, 1.6 Hz, 1H), 6.95 (d, $J = 8.2$ Hz, 1H), 6.89 (t, $J = 7.5$ Hz, 1H), 6.73–6.60 (m, 3H), 6.23(s, 1H), 4.19–4.12(m, 1H), 3.99–3.86 (m, 4H), 3.79 (s, 3H), 3.17–3.05 (m, 1H), 2.83–2.76 (m, 1H).

$^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 158.1, 157.6, 135.6, 131.1, 130.2, 129.9, 129.2, 127.9, 120.8, 113.2, 112.5, 110.9, 72.3, 63.7, 55.9, 55.4, 29.4. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{17}$H$_{19}$O$_3$: 271.1329, found: 271.1326.
1-(4-Bromophenyl)-6-methoxyisochroman (1h)
It was prepared following the general procedure B and purified by flashchromatography on silica gel by using hexane-EtOAc (9:1) as eluent to afford 1h (522 mg, 80%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 7.47 (d, $J = 8.4$ Hz, 2H), 7.19 (d, $J = 8.4$ Hz, 2H), 6.69 (d, $J = 2.1$ Hz, 1H), 6.68–6.62 (m, 2H), 5.64 (s, 1H), 4.19–4.10 (m, 1H), 3.93–3.83 (m, 1H), 3.79 (s, 3H), 3.19–2.99 (m, 1H), 2.85–2.75 (m, 1H). $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 158.5, 141.7, 135.3, 131.7, 130.7, 129.2, 128.1, 122.3, 113.5, 112.6, 78.9, 63.9, 55.4, 29.3. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{16}$H$_{16}$BrO$_2$: 319.0328, found: 319.0331.

1-(3-Chlorophenyl)-6-methoxyisochroman (1i)
It was prepared following the general procedure B and purified by flashchromatography on silica gel by using hexane-EtOAc (9:1) as eluent to afford 1i (427 mg, 78%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 7.31–7.24 (m, 3H), 7.23–7.18 (m, 1H), 6.72–6.62 (m, 3H), 5.65 (s, 1H), 4.18–4.10 (m, 1H), 3.95–3.85 (m, 1H), 3.79 (s, 3H), 3.21–3.03 (m, 1H), 2.85–2.68 (m, 1H).$^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 158.5, 144.7, 135.3, 134.5, 129.8, 129.1, 129.0, 128.4, 128.1, 127.2, 113.5, 112.7, 78.9, 64.0, 55.4, 29.2. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{16}$H$_{16}$ClO$_2$: 275.0833, found: 275.0836.
1-(Thiophen-2-yl)isochroman (1j)
It was prepared following the general procedure A and purified by flashchromatography on silica gel by using hexane-EtOAc (9:1) as eluent to afford 1j (411 mg, 39%). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.33–7.29 (m, 1H), 7.24–7.01 (m, 3H), 6.99–6.96 (m, 3H), 6.06 (s, 1H), 4.19–4.10 (m, 1H), 3.98–3.89 (m, 1H), 3.01–2.86 (m, 2H). $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 146.2, 136.5, 133.7, 129.0, 127.4, 127.2, 127.1, 126.5, 126.4, 126.1, 74.1, 62.6, 28.7. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{13}$H$_{13}$OS: 217.0682, found: 217.0684.

1-(4-Methoxyphenyl)isochroman (1k)
It was prepared following the general procedure A and purified by flashchromatography on silica gel by using hexane-EtOAc (9:1) as eluent to afford 1k (732 mg, 62%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 7.24–7.20 (m, 2H), 7.20–7.13 (m, 2H), 7.11–7.04 (m, 1H), 6.91–6.84 (m, 2H), 6.76 (d, J = 7.7 Hz, 1H), 5.69 (s, 1H), 4.19–4.12 (m, 1H), 3.94–3.91 (m, 1H), 3.80 (s, 3H), 3.20–3.04 (m, 1H), 2.84–2.76 (m, 1H). $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 159.6, 137.9, 134.8, 134.1, 130.3, 128.9, 127.2, 126.75, 126.1, 113.9, 79.3, 63.9, 55.5, 29.1. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{16}$H$_{17}$O$_2$: 241.1223, found: 241.1220.
1-Phenyl-1-(phenylethynyl)isochroman (3a)

Colorless oil. Yield: 28.9 mg (93%). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.68 (dd, $J =$ 8.1, 1.4 Hz, 2H), 7.55–7.46 (m, 2H), 7.41–7.29 (m, 6H), 7.24–7.16 (m, 2H), 7.16–7.09 (m, 1H), 7.04 (d, $J =$ 7.9 Hz, 1H), 4.48–4.41 (m, 1H), 4.22–4.15 (m, 1H), 3.27–3.20 (m, 1H), 2.87–2.81 (m, 1H). $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 143.9, 139.3, 133.1, 132.0, 128.9, 128.7, 128.5, 128.4, 128.3, 128.0, 127.2, 126.5, 122.9, 90.5, 88.8, 77.9, 62.1, 28.8. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{23}$H$_{19}$O: 311.1430, found: 311.1433.

6-Methoxy-1-phenyl-1-(phenylethynyl)isochroman (3b)

Colorless oil. Yield: 31.9 mg (94%). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.71–7.60 (m, 2H), 7.55–7.46 (m, 2H), 7.39–7.28 (m, 6H), 6.98–6.88 (m, 1H), 6.75–6.60 (m, 2H), 4.44–4.36 (m, 1H), 4.18–4.11 (m, 1H), 3.79 (s, 3H), 3.22–3.15 (m, 1H), 2.81–2.76 (m, 1H). $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 158.5, 144.1, 134.5, 132.0, 131.6, 129.7, 128.7, 128.4, 128.4, 127.9, 122.9, 113.2, 113.1, 90.7, 88.5, 77.7, 61.9, 55.4, 29.1. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{24}$H$_{21}$O$_2$: 341.1536, found: 341.1533.
6,7-Dimethoxy-1-(4-methoxyphenyl)-1-(phenylethynyl)isochroman (3c)

Colorless oil. Yield: 36.5 mg (91%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 7.57–7.52 (m, 2H), 7.52–7.47 (m, 2H), 7.35–7.29 (m, 3H), 6.90–6.83 (m, 2H), 6.63 (s, 1H), 6.50 (s, 1H), 4.41–4.22 (m, 1H), 4.17–4.00 (m, 1H), 3.89 (s, 3H), 3.81 (s, 3H), 3.70 (s, 3H), 3.15–3.02 (m, 1H), 2.80–2.67 (m, 1H). $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 159.7, 148.5, 147.8, 136.3, 132.0, 131.0, 129.4, 128.7, 128.5, 125.7, 123.0, 113.7, 111.1, 111.0, 100.2, 90.9, 88.1, 61.9, 56.2, 56.1, 55.5, 28.4. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{26}$H$_{25}$O$_4$: 401.1747, found: 401.1744.

7-Bromo-1-(4-methoxyphenyl)-1-(phenylethynyl)isochroman (3d)

Colorless oil. Yield: 38.1 mg (91%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 7.57–7.52 (m, 2H), 7.52–7.48 (m, 2H), 7.37–7.29 (m, 4H), 7.15 (d, $J = 2.0$ Hz, 1H), 7.04 (d, $J = 8.2$ Hz, 1H), 6.95–6.84 (m, 2H), 4.47–4.31 (m, 1H), 4.20–4.04 (m, 1H), 3.82 (s, 3H), 3.21–3.06 (m, 1H), 2.85–2.71 (m, 1H). $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 159.9, 141.7, 135.5, 132.2, 132.0, 131.2, 130.7, 130.4, 129.3, 128.9 128.5, 122.6, 119.9, 113.8, 89.9, 89.2, 77.4, 61.8, 55.5, 28.3. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{24}$H$_{20}$BrO$_2$: 419.0641, found: 419.0644.
6-Methoxy-1-(4-methoxyphenyl)-1-(phenylethynyl)isochroman (3e)
Colorless oil. Yield: 33.5 mg (90%). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.57–7.53 (m, 2H), 7.50–7.46 (m, 2H), 7.32–7.29 (m, 3H), 6.94 (d, $J = 8.4$ Hz, 1H), 6.91–6.82 (m, 2H), 6.74–6.62 (m, 2H), 4.41–4.32 (m, 1H), 4.21–4.10 (m, 1H), 3.81 (s, 3H), 3.80 (s, 3H), 3.23–3.11 (m, 1H), 2.83–2.75 (m, 1H). $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 159.6, 158.5, 136.5, 134.6, 131.9, 131.8, 129.7, 129.3, 128.6, 123.0, 113.6, 113.2, 113.1, 90.9, 88.3, 77.3, 61.9, 55.5, 55.4, 29.2. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{25}$H$_{23}$O$_3$: 371.1642, found: 371.1644.

6-Methoxy-1-(3-methoxyphenyl)-1-(phenylethynyl)isochroman (3f)
Colorless oil. Yield: 32.7 mg (88%). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.55–7.46 (m, 2H), 7.37–7.19 (m, 6H), 6.99 (d, $J = 8.5$ Hz, 1H), 6.87–6.85 (m, 1H), 6.77–6.65 (m, 2H), 4.46–4.33 (m, 1H), 4.22–4.11 (m, 1H), 3.82 (s, 3H), 3.81 (s, 3H), 3.24–3.14 (m, 5.8 Hz, 1H), 2.85–2.74 (m, 1H). $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 159.6, 158.6, 145.7, 134.4, 132.0, 131.4, 129.6, 129.3, 128.7, 128.4, 122.9, 120.5, 114.0, 113.6, 113.2, 113.1, 90.7, 88.4, 77.6, 61.9, 55.5, 55.4, 29.1. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{25}$H$_{23}$O$_3$: 371.1642, found: 371.1645.
6-Methoxy-1-(2-methoxyphenyl)-1-(phenylethynyl)isochroman (3g)

Colorless oil. Yield: 26.2 mg (70%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 8.04 (dd, $J = 7.7$, 1.7 Hz, 1H), 7.55–7.45 (m, 2H), 7.36–7.28 (m, 4H), 7.06–6.95 (m, 1H), 6.91–6.79 (m, 2H), 6.70–6.57 (m, 2H), 4.47–4.29 (m, 1H), 4.27–4.13 (m, 1H), 3.79 (s, 3H), 3.47 (s, 3H), 3.32–3.15 (m, 1H), 2.81–2.60 (m, 1H). $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 158.1, 157.9, 134.9, 132.3, 131.9, 131.9, 130.2, 130.0, 128.5, 128.4, 127.7, 123.2, 120.3, 113.9, 112.7, 112.5, 90.7, 89.2, 77.3, 62.3, 56.3, 55.4, 29.0. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{25}$H$_{23}$O$_3$: 371.1642, found: 371.1640.

1-(4-Bromophenyl)-6-methoxy-1-(phenylethynyl)isochroman (3h)

Colorless oil. Yield: 36.6 mg (86%). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.57–7.52 (m, 2H), 7.49–7.45 (m, 4H), 7.34–7.30 (m, 3H), 6.91–6.88 (m, 1H), 6.75–6.63 (m, 2H), 4.46–4.33 (m, 1H), 4.21–4.10 (m, 1H), 3.80 (s, 3H), 3.23–3.15 (m, 1H), 2.83–2.74 (m, 1H). $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 158.7, 143.3, 134.4, 131.9, 131.4, 131.1, 129.8, 129.5, 128.8, 128.5, 122.7, 122.5, 113.3, 113.2, 90.0, 88.8, 77.3, 61.9, 55.4, 29.0. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{24}$H$_{20}$BrO$_2$: 419.0644, found: 419.0644.
1-(3-Chlorophenyl)-6-methoxy-1-(phenylethynyl)isochroman (3i)

Colorless oil. Yield: 31.4 mg (82%). \( ^1H \) NMR (500 MHz, CDCl\(_3\)) \( \delta \) 7.57 – 7.53 (m, 1H), 7.51 – 7.45 (m, 1H), 7.43 – 7.36 (m, 2H), 7.27 – 7.17 (m, 5H), 6.83 (d, \( J = 8.5 \) Hz, 1H), 6.68 – 6.55 (m, 2H), 4.38 – 4.24 (m, 1H), 4.14 – 3.99 (m, 1H), 3.70 (s, 3H), 3.26 – 3.02 (m, 1H), 2.82 – 2.60 (m, 1H). \( ^{13}C \) NMR (126 MHz, CDCl\(_3\)) \( \delta \) 158.7, 146.2, 134.4, 134.3, 132.0, 130.9, 129.6, 129.5, 128.8, 128.5, 128.2, 126.2, 122.6, 113.4, 113.2, 89.9, 88.9, 77.3, 62.0, 55.4, 29.0. HRMS (EI) m/z [M + H]\(^+\) calculated for C\(_{24}\)H\(_{20}\)ClO\(_2\): 375.1146, found: 375.1149.

1-(Phenylethynyl)-1-(thiophen-2-yl)isochroman (3j)

Colorless oil. Yield: 28.9 mg (83%). \( ^1H \) NMR (500 MHz, CDCl\(_3\)) \( \delta \) 7.53 – 7.45 (m, 2H), 7.35 – 7.27 (m, 5H), 7.25 – 7.20 (m, 2H), 7.17 (t, \( J = 8.4 \) Hz, 2H), 6.95 (dd, \( J = 5.0, 3.6 \) Hz, 1H), 4.39 – 4.28 (m, 1H), 4.20 – 4.08 (m, 1H), 3.19 – 3.07 (m, 1H), 2.94 – 2.80 (m, 1H). \( ^{13}C \) NMR (126 MHz, CDCl\(_3\)) \( \delta \) 149.0, 138.5, 132.8, 132.1, 129.0, 128.9, 128.5, 128.3, 127.7, 127.3, 126.8, 126.5, 126.2, 122.6, 90.7, 87.0, 74.6, 61.9, 28.6. HRMS (EI) m/z [M + H]\(^+\) calculated for C\(_{21}\)H\(_{17}\)OS: 317.0995, found: 317.0997.
6-Methoxy-1-methyl-1-(p-tolyethyl)isochroman (3k)

Colorless oil. Yield: 15.1 mg (51%). ¹H NMR (500 MHz, CDCl₃) δ 7.31–7.23 (m, 3H), 7.07 (d, J = 7.9 Hz, 2H), 6.83–6.76 (m, 1H), 6.63 (d, J = 2.5 Hz, 1H), 4.27–4.17 (m, 1H), 4.14–4.04 (m, 1H), 3.80 (s, 3H), 3.15–2.97 (m, 1H), 2.74–2.52 (m, 1H), 2.32 (s, 3H), 1.86 (s, 3H). ¹³C NMR (126 MHz, CDCl₃) δ 158.4, 138.4, 134.1, 132.5, 131.8, 129.0, 127.3, 119.9, 113.3, 113.1, 91.8, 84.6, 71.8, 61.5, 55.4, 31.0, 29.3, 21.6. HRMS (EI) m/z [M + H]⁺ calculated for C₂₀H₂₁O₂: 293.1536, found: 293.1539.

1-(Phenylethynyl)isochroman (3l)

Colorless oil. Yield: 15.2 mg (65%). ¹H NMR (500 MHz, CDCl₃) δ 7.49–7.45 (m, 2H), 7.40–7.35 (m, 1H), 7.35–7.28 (m, 3H), 7.26–7.21 (m, 2H), 7.19–7.13 (m, 1H), 5.80 (s, 1H), 4.32–4.27 (m, 1H), 4.09–4.00 (m, 1H), 3.01–2.84 (m, 2H); ¹³C NMR (126 MHz, CDCl₃) δ 135.1, 133.0, 132.1, 129.2, 128.7, 128.4, 127.4, 126.6, 126.2, 122.7, 88.3, 85.9, 67.5, 62.9, 28.2; HRMS (EI) m/z [M + H]⁺ calculated for C₁₇H₁₅O: 235.1117, found: 235.1115.
1-(4-Methoxyphenyl)-1-(phenylethynyl)isochroman (4a)

Colorless oil. Yield: 31.2 mg (91%). \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 7.60–7.53 (m, 2H), 7.52–7.45 (m, 2H), 7.36–7.27 (m, 3H), 7.23–7.09 (m, 3H), 7.04 (d, \(J = 7.9\) Hz, 1H), 6.94–6.78 (m, 2H), 4.46–4.35 (m, 1H), 4.20–4.11 (m, 1H), 3.81 (s, 3H), 3.23–3.17 (m, 1H), 2.87–2.78 (m, 1H). \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 159.7, 139.5, 136.3, 133.2, 131.9, 129.4, 128.9, 128.7, 128.5, 128.4, 127.2, 126.5, 122.9, 113.6, 90.8, 88.5, 77.5, 62.0, 55.5, 28.8. HRMS (EI) m/z [M + H]\(^+\) calculated for C\(_{24}\)H\(_{21}\)O\(_2\): 341.1536, found: 341.1539.

1-(4-Methoxyphenyl)-1-(p-tolylethynyl)isochroman (4b)

Colorless oil. Yield: 32.6 mg (92%). \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 7.59–7.52 (m, 2H), 7.38 (d, \(J = 8.1\) Hz, 2H), 7.22–7.08 (m, 5H), 7.03 (d, \(J = 7.7\) Hz, 1H), 6.93–6.81 (m, 2H), 4.43–4.36 (m, 1H), 4.18–4.09(m, 1H), 3.80 (s, 3H), 3.25–3.16 (m, 1H), 2.86–2.77 (m, 1H), 2.35 (s, 3H). \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 159.6, 139.6, 138.8, 136.4, 133.2, 131.9, 129.4, 129.2, 128.9, 128.6, 127.1, 126.5, 119.8, 113.6, 90.0, 88.7, 77.4, 61.9, 55.5, 28.8, 21.7. HRMS (EI) m/z [M + H]\(^+\) calculated for C\(_{25}\)H\(_{23}\)O\(_2\): 355.1693, found: 355.1695.
1-(4-Methoxyphenyl)-1-((4-methoxyphenyl)ethynyl)isochroman (4c)
Colorless oil. Yield: 35.2 mg (95%). $^1$H NMR (400 MHz, CDCl$_3$) δ 7.61–7.51 (m, 2H), 7.48–7.35 (m, 2H), 7.22–7.08 (m, 3H), 7.03 (d, $J$ = 7.5 Hz, 1H), 6.91–6.79 (m, 4H), 4.45–4.34 (m, 1H), 4.18–4.09 (m, 1H), 3.81 (s, 3H), 3.80 (s, 3H), 3.24–3.15 (m, 1H), 2.86–2.77 (m, 1H). $^{13}$C NMR (101 MHz, CDCl$_3$) δ 159.9, 159.6, 139.7, 136.5, 133.5, 133.2, 129.4, 128.9, 128.6, 127.1, 126.5, 115.1, 114.0, 113.6, 89.4, 88.4, 77.2, 61.9, 55.5, 28.8. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{25}$H$_{23}$O$_3$: 371.1642, found: 371.1645.

1-(4-Methoxyphenyl)-1-(m-tolylethynyl)isochroman (4d)
Colorless oil. Yield: 32.9 mg (93%). $^1$H NMR (400 MHz, CDCl$_3$) δ 7.63–7.48 (m, 2H), 7.31 (dd, $J$ = 6.2, 5.3 Hz, 2H), 7.25–7.08 (m, 5H), 7.06–6.97 (m, 1H), 6.92–6.79 (m, 2H), 4.46–4.36 (m, 1H), 4.19–4.12 (m, 1H), 3.81 (s, 3H), 3.26–3.20 (m, 1H), 2.86–2.78 (m, 1H), 2.33 (s, 3H). $^{13}$C NMR (101 MHz, CDCl$_3$) δ 159.6, 139.6, 138.1, 136.4, 133.2, 132.6, 129.5, 129.34, 129.1, 128.9, 128.5, 128.3, 127.1, 126.5, 122.7, 113.6, 90.4, 88.7, 77.4, 62.0, 55.5, 28.8, 21.4. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{25}$H$_{23}$O$_2$: 355.1693, found: 355.1696.
1-((4-Chlorophenyl)ethynyl)-1-(4-methoxyphenyl)isochroman (4e)
Colorless oil. Yield: 33.7 mg (90%). \(^1\)H NMR (400 MHz, CDCl\(_3\)) \(\delta\) 7.58–7.50 (m, 2H), 7.47–7.37 (m, 2H), 7.34–7.27 (m, 2H), 7.24–7.07 (m, 3H), 7.03 (d, \(J = 7.8\) Hz, 1H), 6.93–6.81 (m, 2H), 4.43–4.31 (m, 1H), 4.18–4.09 (m, 1H), 3.80 (s, 3H), 3.24–3.18 (m, 1H), 2.86–2.77 (m, 1H). \(^{13}\)C NMR (101 MHz, CDCl\(_3\)) \(\delta\) 159.7, 139.2, 136.1, 134.7, 133.2, 129.3, 129.0, 128.8, 128.5, 127.3, 126.5, 121.4, 113.7, 91.8, 87.3, 77.5, 62.0, 55.5, 28.8. HRMS (EI) m/z [M + H]^+ calculated for C\(_{24}\)H\(_{20}\)ClO\(_2\): 375.1146 found: 375.1142.

1-((3-Fluorophenyl)ethynyl)-1-(4-methoxyphenyl)isochroman (4f)
Colorless oil. Yield: 32.9 mg (92%). \(^1\)H NMR (500 MHz, CDCl\(_3\)) \(\delta\) 7.58–7.48 (m, 2H), 7.34–7.24 (m, 2H), 7.24–7.08 (m, 4H), 7.08–6.96 (m, 2H), 6.95–6.77 (m, 2H), 4.43–4.29 (m, 1H), 4.19–4.10 (m, 1H), 3.81 (s, 3H), 3.24–3.17 (m, 1H), 2.87–2.78 (m, 1H). \(^{13}\)C NMR (126 MHz, CDCl\(_3\)) \(\delta\) 163.5 (d, \(J_{C-F} = 246.6\) Hz), 159.7, 139.2, 136.1, 133.3, 130.1 (d, \(J_{C-F} = 8.6\) Hz), 129.3, 129.0, 128.5, 127.9 (d, \(J_{C-F} = 3.1\) Hz), 127.3, 126.6, 124.8 (d, \(J_{C-F} = 9.4\) Hz), 118.9 (d, \(J_{C-F} = 22.8\) Hz), 116.1 (d, \(J_{C-F} = 21.1\) Hz), 113.7, 91.8, 87.2, 77.5, 62.1, 55.5, 28.8. HRMS (EI) m/z [M + H]^+ calculated for C\(_{24}\)H\(_{20}\)FO\(_2\): 359.1442, found: 359.1445.
1-(4-Methoxyphenyl)-1-(thiophen-2-ylethynyl)isochroman (4g)
Colorless oil. Yield: 30.5 mg (88%). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.56–7.46 (m, 2H), 7.29–7.24 (m, 2H), 7.22–7.08 (m, 3H), 7.04–6.95 (m, 2H), 6.91–6.82 (m, 2H), 4.42–4.31 (m, 1H), 4.18–4.09 (m, 1H), 3.80 (s, 3H), 3.24–3.18 (m, 1H), 2.86–2.77 (m, 1H). $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 159.7, 139.1, 136.1, 133.3, 132.6, 129.3, 129.0, 128.6, 127.6, 127.3, 127.1, 126.6, 122.8, 113.7, 94.5, 81.7, 77.7, 62.1, 55.5, 28.8. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{22}$H$_{19}$O$_2$S: 347.1100, found: 347.1103.

1-(Hex-1-yn-1-yl)-1-(4-methoxyphenyl)isochroman (4h)
Colorless oil. Yield: 26.7 mg (83%). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.55–7.42 (m, 2H), 7.20–7.04 (m, 3H), 6.94 (d, $J$ = 7.8 Hz, 1H), 6.88–6.77 (m, 2H), 4.37–4.26 (m, 1H), 4.11–4.02 (m, 1H), 3.79 (s, 3H), 3.20–3.11 (m, 1H), 2.82–2.74(m, 1H), 2.35–2.28 (m, 2H), 1.62–1.50 (m, 2H), 1.47–1.37 (m, 2H), 0.91 (t, $J$ = 7.3 Hz, 3H). $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 159.5, 140.2, 136.8, 133.0, 129.3, 128.9, 128.4, 126.9, 126.3, 113.5, 89.5, 81.7, 77.2, 61.6, 55.5, 30.9, 28.8, 22.3, 18.9, 13.8. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{22}$H$_{24}$O$_2$: 321.1849, found: 321.1846.
1-(4-Methoxyphenyl)-1-(oct-1-yn-1-yl)isochroman (4i)

Colorless oil. Yield: 29.9 mg (86%). $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.53–7.42 (m, 2H), 7.21–7.04 (m, 3H), 6.94 (d, $J = 7.7$ Hz, 1H), 6.87–6.76 (m, 2H), 4.36–4.23 (m, 1H), 4.11–4.02 (m, 1H), 3.79 (s, 3H), 3.19–3.10 (m, 1H), 2.82–2.73 (m, 1H), 2.31 (t, $J = 7.1$ Hz, 2H), 1.62–1.51 (m, 2H), 1.49–1.37 (m, 2H), 1.34–1.23 (m, 4H), 0.88 (t, $J = 6.9$ Hz, 3H). $^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 159.5, 140.2, 136.8, 133.0, 129.4, 128.8, 128.4, 126.9, 126.3, 113.5, 89.6, 81.8, 77.2, 61.6, 55.5, 31.5, 28.8, 28.8, 22.8, 19.2, 14.2. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{24}$H$_{29}$O$_2$: 349.2162, found: 349.2159.

1-(4-Methoxyphenyl)-1-(4-methylphenethyl)isochroman (5)

Colorless oil. Yield: 28.7 mg (90%). $^1$H NMR (500 MHz, CDCl$_3$) $\delta$ 7.33–7.16 (m, 6H), 7.12–6.94 (m, 4H), 6.87–6.73 (m, 2H), 3.94–3.83 (m, 1H), 3.78 (s, 3H), 3.70–3.58 (m, 1H), 3.21–3.02 (m, 1H), 2.88–2.72 (m, 1H), 2.71–2.60 (m, 1H), 2.59–2.44 (m, 1H), 2.42–2.19 (m, 5H). $^{13}$C NMR (126 MHz, CDCl$_3$) $\delta$ 158.8, 139.9, 138.4, 138.2, 135.2, 135.2, 129.5, 129.2, 128.8, 128.5, 127.6, 126.7, 125.9, 113.4, 80.9, 59.9, 55.4, 45.4, 30.5, 29.3, 21.2. HRMS (EI) m/z [M + H]$^+$ calculated for C$_{25}$H$_{27}$O$_2$: 359.2006, found: 359.2002.
Reference:


$^1$H and $^{13}$C NMR spectra

[Images of NMR spectra and chemical structures]