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General Information

Solvents & reagents

Reagents were purchased in the highest purity available from Acros Organics, Alfa Aesar, Fluorochem, TCI, Fisher Scientific or Sigma Aldrich. All solvents were purchased from commercial sources and used without purification (reagent grade). Metal salts and ligands were stored in a desiccator when not in use. Anhydrous solvent was prepared by storing solvent over activated 4Å MS for 72 hours. Standard vacuum line techniques were used and glassware was oven dried prior to use. Organic solvents were dried during workup using anhydrous Na₂SO₄. All reactions were performed using DrySyn heating mantles and pressure regulated vials or round bottom flasks.

Purification and chromatography.

Thin Layer Chromatography (TLC) was carried out using aluminium plates coated with 60 F254 silica gel. Plates were visualised using UV light (254 or 365 nm) and developed with iodine and basic permanganate solution. Flash chromatography was performed on VWR Silica gel 60, 40–63 microns RE as the stationary phase and the solvents employed were of reagent grade.

Characterisation.

¹H NMR spectroscopic data were obtained at 400 MHz (Bruker Ultrashield 400 Plus) and ¹³C and ¹H NMR data were obtained at 100 MHz (Bruker Ultrashield 400 Plus) at 298 K. The chemical shifts are reported in parts per million (δ) relative to residual CHCl₃ (δH = 7.26 ppm) and CDCl₃ (δC = 77.16 ppm, central line.) The assignment of the signals in the ¹H and ¹³C NMR spectra was achieved through 2D-NMR techniques: COSY, HSQC and HMBC. Coupling constants (J) are quoted in Hertz. Infrared spectra were recorded on an Agilent Technologies Cary 630 FTIR spectrometer. High resolution mass spectrometry data were recorded.
using electron spray ionization (ESI) or atmospheric pressure chemical ionization (ESI) on a Shimadzu LCMS-IT-TOF mass spectrometer.

**Synthesis of starting materials**

**General Procedure A – Grignard addition into phthalimides.**

![Chemical reaction diagram]

To an oven dried round bottom flask purged with nitrogen was added phthalimide (1.0 equiv) dissolved in DCM (0.25 M) and the flask cooled to 0°C. The Grignard reagent (3.0 equiv) was added dropwise and the reaction was warmed to room temperature and stirred until TLC analysis indicated full conversion. The reaction was then quenched with sat.aq. NH₄Cl and extracted with DCM (3 x 50 mL). The organic layers were dried over Na₂SO₄ filtered and concentrated *in vacuo*. The crude sample was purified using flash column chromatography, to result in the pure product.

**General Procedure B – Synthesis of grignard’s for addition into phthalimides.**

![Chemical reaction diagram]

To an oven dried round bottom flask purged with Nitrogen was added magnesium turnings (3.1 equiv) and suspended in THF (1.0 M). Dibromoethane (0.1 equiv) was added followed by the corresponding aryl halide (3.0 equiv) dropwise (initiation occurred following the first few drops) and stirred for approximately 60 mins.
In a separate oven dried round bottom flask purged with nitrogen was added phthalimide (1.0 equiv) dissolved in THF (0.25 M) and cooled to 0°C. The above Grignard reagent was then added dropwise and allowed to warm to room temperature, stirring until TLC analysis indicated completion. The mixture was quenched with sat.aq. NH₄Cl and extracted with DCM (3 x 50 mL). The organic layer was dried over Na₂SO₄ filtered and concentrated in vacuo. The crude sample was purified using flash column chromatography to afford the pure product.

**General Procedure C – Lithium-Bromine exchange for addition into phthalimides.**

In an oven dried round bottom flask purged with nitrogen was added the required aryl halide (4.0 equiv) and dissolved in anhydrous THF (0.5 M) The flask was cooled to -78°C and nBuLi (2.5 M) (3.5 equiv) was added dropwise and stirred for 60 minutes. Phthalimide (1.0 equiv) dissolved in THF (0.5 M) was added to the reaction in a single portion. The reaction was then warmed to room temperature until TLC analysis indicated completion. The mixture was quenched with sat.aq. NH₄Cl and extracted with Ethyl Acetate (3X50 mL). The organic layer was dried over Na₂SO₄ filtered and concentrated in vacuo. The crude sample was purified using flash column chromatography to afford the pure product.
3-hydroxy-3-phenyl-isoindolin-1-one, 1a

![Chemical structure of 3-hydroxy-3-phenyl-isoindolin-1-one, 1a]

1a was prepared according to general procedure A from phthalimide (500 mg, 3.40 mmol, in 0.25 M DCM) and Phenylmagnesium bromide (3.40 mL, 10.2 mmol) resulting in the desired crude product. Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (395 mg, 51%).

R_F (1:1 EtOAc:Hex) = 0.29

^1^H NMR (400 MHz, DMSO-D_6) \( \delta \) 9.23 (s, 1H), 7.64 (d, \( J = 7.2 \) Hz, 1H), 7.56 – 7.42 (m, 4H), 7.37 – 7.27 (m, 4H), 6.89 (s, 1H).

^1^3^C NMR (101 MHz, DMSO-D_6) \( \delta \) 168.3, 150.9, 142.1, 132.4, 130.6, 128.9, 128.2, 127.8, 125.5, 122.8, 122.6, 87.3.

Data in accordance with literature. ^2

3-hydroxy-3-(4-methoxyphenyl) isoindolin-1-one, 1b

![Chemical structure of 3-hydroxy-3-(4-methoxyphenyl) isoindolin-1-one, 1b]
**1b** was prepared according to general procedure B from phthalimide (500 mg, 3.00 mmol, in 0.25 M THF), magnesium turnings (252 mg, 10.5 mmol in 1.0M THF), dibromoethane (0.063 mL, 0.34 mmol) and 4-bromoanisole (1.28 mL, 10.2 mmol) resulting in the desired crude product. Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (144 mg, 17%).

R\textsubscript{F} (1:1 EtOAc:Hex) = 0.17

\(^1\)H NMR (400 MHz, DMSO-\textsubscript{D}\textsubscript{6}) \(\delta\) 9.17 (s, 1H), 7.62 (d, \(J = 6.9\) Hz, 1H), 7.52 (td, \(J = 7.4, 1.3\) Hz, 1H), 7.45 (td, \(J = 7.4, 1.1\) Hz, 1H), 7.38 (d, \(J = 9.0\) Hz, 2H), 7.29 (d, \(J = 7.4\) Hz, 1H), 6.89 (d, \(J = 9.0\) Hz, 2H), 6.80 (s, 1H), 3.72 (s, 3H).

\(^{13}\)C NMR (101 MHz, DMSO-\textsubscript{D}\textsubscript{6}) \(\delta\) 168.1, 158.6, 150.9, 133.7, 132.1, 130.3, 128.6, 126.5, 122.5, 122.3, 113.3, 86.9, 54.9.

Data in accordance with literature. \(^3\)

**3-hydroxy-3-[4-trifluoromethyl]phenyl]isoindolin-1one, 1c**

![Structure of 1c](image)

**1c** was prepared according to general procedure C from phthalimide (200 mg, 1.36 mmol, in 0.5 M THF), 4-bromobenzyltrifluoride (0.76 mL, 5.44 mmol in 0.5 M THF) and butyllithium (2.0 mL, 4.76 mmol) resulting in the desired crude product. Purification by column chromatography (3:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (194 mg, 49%).

R\textsubscript{F} (1:1 EtOAc:Hex) = 0.29
\(^1\)H NMR (400 MHz, DMSO-D\(_6\)) \(\delta\) 9.36 (s, 1H), 7.75 – 7.66 (m, 5H), 7.56 (td, \(J = 7.4, 1.4\) Hz, 1H), 7.51 (td, \(J = 7.4, 1.2\) Hz, 1H), 7.32 (d, \(J = 7.0\) Hz, 1H), 7.15 (s, 1H).

\(^{13}\)C NMR (101 MHz, D\(_6\)-DMSO) \(\delta\) 168.8, 150.6, 147.2, 133.1, 131.0, 129.7, 128.8 (q, \(J = 31.8\) Hz), 126.9, 125.7 (q, \(J = 3.6\) Hz), 123.2, 123.2, 87.4.

\(^{19}\)F NMR (376 MHz, DMSO-D\(_6\)) -60.9

Data in accordance with literature.\(^3\)

3-hydroxy-3-(3-methoxyphenyl)inden-1-one, 1d

\(1d\) was prepared according to general procedure C from phthalimide (200 mg, 1.36 mmol, in 0.5 M THF), 3-bromoanisole (0.70 mL, 5.44 mmol in 0.5 M THF) and butyllithium (1.90 mL, 4.76 mmol) resulting in the desired crude product. Purification by column chromatography (3:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (271 mg, 79%).

R\(_F\) (1:1 EtOAc:Hex) = 0.19

\(^1\)H NMR (400 MHz, DMSO-D\(_6\)) \(\delta\) 9.22 (s, 1H), 7.63 (d, \(J = 7.4\) Hz, 1H), 7.50 (dt, \(J = 24.9, 7.4, 1.2\) Hz, 2H), 7.33 (d, \(J = 7.4\) Hz, 1H), 7.24 (t, \(J = 8.0\) Hz, 1H), 7.10 – 7.06 (m, 1H), 6.98 – 6.93 (m, 1H), 6.90 (s, 1H), 6.86 (ddd, \(J = 8.2, 2.6, 0.9\) Hz, 1H), 3.74 (s, 3H)

\(^{13}\)C NMR (101 MHz, DMSO-D\(_6\)) \(\delta\) 168.8, 159.6, 151.1, 144.3, 132.8, 130.9, 129.8, 129.3, 123.2, 122.9, 118.1, 113.4, 111.8, 87.6, 55.5.
Data in accordance with literature.  

3-(2,4dimethoxyphenyl)-3hydroxy-indan-1one, 1e

![Chemical structure](image)

1e was prepared according to general procedure C from phthalimide (200 mg, 1.36 mmol, in 0.5 M THF), 1-bromo-2,4-dimethoxybenzene (0.70 mL, 5.44 mmol in 0.5 M THF) and butyllithium (1.90 mL, 4.76 mmol) resulting in the desired crude product. Purification by column chromatography (3:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (86 mg, 22%).

RF (1:1 EtOAc:Hex) = 0.14

IR v max (cm−1): 3278, 2939, 1682, 1621.

HRMS (APCI) m/z: [M + H]+ Calcd for C_{16}H_{16}NO_{4} 286.1074; Found 286.1071

$^1$H NMR (400 MHz, DMSO-D$_6$) δ 8.70 (s, 1H), 7.75 (d, J = 8.6 Hz, 1H), 7.59 (d, J = 5.2 Hz, 1H), 7.47 – 7.39 (m, 2H), 7.14 (d, J = 7.7 Hz, 1H), 6.55 (d, J = 6.6 Hz, 2H), 6.42 (d, J = 2.4 Hz, 1H), 3.74 (s, 3H), 3.30 (s, 3H).

$^{13}$C NMR (101 MHz, DMSO-D$_6$) δ 168.8, 160.6, 157.5, 131.6, 128.4, 128.2, 121.8, 121.8, 121.5, 104.2, 99.5, 85.2, 55.5, 55.2.

3-(1,3-benzodioxol-5-yl)-3hydroxy-indan-1one, 1f

![Chemical structure](image)
1f was prepared according to general procedure C from phthalimide (200 mg, 1.36 mmol, in 0.5 M THF), 5-bromo-1,3-benzodioxle (0.60 mL, 5.44 mmol in 0.5 M THF) and butyllithium (1.90 mL, 4.76 mmol) resulting in the desired crude product. Purification by column chromatography (3:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (165 mg, 45%).

R_F (1:1 EtOAc:Hex) = 0.15

^1^H NMR (400 MHz, DMSO-D_6) δ 9.17 (s, 1H), 7.61 (d, J = 7.0 Hz, 1H), 7.53 (td, J = 7.4, 1.3 Hz, 1H), 7.46 (td, J = 7.4, 1.1 Hz, 1H), 7.32 (d, J = 7.4 Hz, 1H), 6.98 (d, J = 1.6 Hz, 1H), 6.92 (d, J = 1.8 Hz, 1H), 6.90 (d, J = 1.8 Hz, 1H), 6.85 (s, 1H), 5.99 (dd, J = 4.3, 0.9 Hz, 2H)

^1^3^C NMR (101 MHz, DMSO-D_6) δ 168.3, 150.8, 147.2, 146.8, 136.1, 132.4, 130.5, 128.9, 122.7, 122.5, 118.8, 107.8, 106.2, 101.1, 87.2.

Data in accordance with literature. 5

3-hydroxy-3-[6-(trifluoromethyl)-2-pyridyl]isoindolin-1-one, 1g

1g was prepared according to general procedure C from phthalimide (150 mg, 1.02 mmol, in 0.5 M THF), 2-bromo-6-(trifluoromethyl)pyridine (900 mg, 4.06 mmol in 0.5 M THF) and butyllithium (1.40 mL, 3.57 mmol) resulting in the desired crude product. Purification by column chromatography (3:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (204 mg, 68%).

R_F (1:1 EtOAc:Hex) = 0.21

IR v_max (cm⁻¹): 3309, 1697, 1340, 1123.

HRMS (APCI) m/z: [M + H]^+ Calcd for C_{14}H_{16}F_{3}N_{2}O_{2} 295.0689; Found 295.0682
$^1$H NMR (400 MHz, DMSO-D$_6$) $\delta$ 8.46 (s, 1H), 7.41 – 7.30 (m, 2H), 7.00 (dd, $J = 7.3, 1.4$ Hz, 1H), 6.82 (ddd, $J = 7.1, 1.3, 0.8$ Hz, 1H), 6.74 – 6.62 (m, 2H), 6.60 – 6.51 (m, 1H), 6.43 (s, 1H).

$^{13}$C NMR (101 MHz, DMSO-D$_6$) $\delta$ 169.1, 161.6, 149.7, 149.1 (q, $J = 34.0$ Hz), 140.0, 132.7, 131.8, 129.7, 124.7, 123.4, 123.0, 121.8 (q, $J = 274.72$), 120.5, 88.0.

$^{19}$F NMR (376 MHz DMSO-D$_6$): -66.4

3-hydroxy-3-(6-methoxy-2-pyridyl)indan-1-one, 1h

$^{1}$H NMR (400 MHz, DMSO-D$_6$) $\delta$ 9.13 (s, 1H), 7.79 – 7.71 (m, 1H), 7.62 (d, $J = 7.4$ Hz, 1H), 7.52 (dd, $J = 7.4, 1.3$ Hz, 1H), 7.49 – 7.39 (m, 3H), 6.94 (s, 1H), 6.71 (dd, $J = 8.2, 0.7$ Hz, 1H), 3.64 (s, 3H).

$^{13}$C NMR (101 MHz, DMSO-D$_6$) $\delta$ 168.8, 162.7, 157.9, 149.8, 139.8, 132.0, 131.5, 128.9, 123.0, 122.3, 113.0, 109.6, 87.6, 52.7.

**Synthesis of 4,4’-dimethoxybenzil 2b**
Methyltriphenylphosphonium bromide (10.0g, 26.6 mmol, 2.4 equiv.) was dissolved in THF (0.2 M) and stirred at -78°C under an inert atmosphere and nBuLi (0.5 M in THF, 13.3 mL, 26.6 mmol, 2.4 equiv.) was added. After 15 mins Benzil (3.00g, 11.1 mmol) was added and the reaction warmed to room temperature. Once TLC analysis indicated completion, the reaction mixture was quenched with sat. NH₄Cl aq. and extracted with EtOAc. The organic layer as dried over MgSO₄ filtered then concentrated in vacuo. Purification by column chromatography (Hex) resulted in obtaining the pure product as a white solid (700 mg, 24%).

R_f (1:1 EtOAc:Hex) = 0.71

¹H NMR (400 MHz, CDCl₃) δ 7.54 – 7.28 (m, 4H), 6.89 – 6.66 (m, 4H), 5.47 (d, J = 1.8 Hz, 2H), 5.24 (d, J = 1.8 Hz, 2H), 3.77 (s, 6H).

¹³C NMR (101 MHz, CDCl₃) δ 159.2, 149.5, 132.8, 128.6, 114.5, 113.7, 55.4.

Data in accordance with literature.⁶
Synthesis of 2-phenyl-1,3-butadiene 4.\(^7\)

\[\text{iPr}_2\text{NH} (1.30 \text{ mL, 9.16 mmol}) \text{ was stirred at } -78^\circ\text{C under an inert atmosphere and } \text{n-BuLi (3.7 mL, 9.16 mmol) was added dropwise. After 15 min, ketone was added (980 } \mu\text{L, 8.32 mmol) dropwise. A further 30 mins later was added diethyl chlorophosphite (1.80 mL, 12.5 mmol) dropwise and stirred at } -78^\circ\text{C until TLC analysis indicated completion. The resulting mixture was quenched with ethanol at } -78^\circ\text{C, then sat. } \text{NH}_4\text{Cl aq. was added at } 0^\circ\text{C. The solution was extracted into diethyl ether (3X50 mL). The organic layer was dried over } \text{Na}_2\text{SO}_4 \text{ filtered and}\]

\[\text{Ni} (2.5\text{mol}%) \text{ at THF, rt}\]
concentrated in vacuo. The crude sample was purified using flash chromatography to afford the pure product.

\[(\text{dppe})\text{NiCl}_2\] (33.0 mg, 63.4 µmol) was dissolved in anhydrous THF (0.25 M) in a Schlenk and cooled to 0 °C and enol phosphate was added (650 mg, 2.54 mmol) to the solution. Vinyl grignard (2.66 mL, 2.66 mmol) was added dropwise. The reaction was warmed up to room temperature and stirred for 1h. The reaction was then quenched with sat. NH₄Cl aq. at 0 °C and extracted with diethyl ether. The organic layer was dried over Na₂SO₄ filtered and concentrated in vacuo. The crude sample was purified using flash chromatography (Pent, 1% NEt₃) resulted in obtaining the pure product as a white solid (192 mg, 58%).

\[\text{R}_F\ (\text{Pent}) = 0.77\]

\(^1\text{H}\) NMR (400 MHz, CDCl₃) δ 7.40 – 7.29 (m, 5H), 6.63 (dd, \(J = 17.3, 11.1 \text{ Hz,} \ 1\text{H})\), 5.35 – 5.27 (m, 1H), 5.26 – 5.13 (m, 3H).

\(^13\text{C}\) NMR (101 MHz, CDCl₃) δ 148.4, 139.9, 138.3, 128.4, 128.3, 127.6, 117.3, 117.0.

Data in accordance with literature.⁸

**Synthesis of Diels-Alder products and their synthetic applications**

**General Procedure I – Diels alder of functionalised Isoindolinones.**

3-hydroxy Isoindolinone (1.0 equiv.) was added to a pressure regulated vial with Calcium(II) bis(trifluoromethanesulfonimide) (5 mol%) and tetrabutylammonium hexafluorophosphate (5 mol%) and dissolved in DCE (0.2 M). 2,3-Dimethyl-1,3-butadiene (1.50 equiv.) was added to the solution and the reaction was stirred at
80°C until TLC analysis indicated completion. Concentration and purification by flash column chromatography afforded the pure product

**2,3-dimethyl-10b-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3a**

![Chemical structure of 3a](image)

3a was prepared according to general procedure I from 3-hydroxy-3-phenylisoindolin-1-one (40.0 mg, 178 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (5.00 mg, 8.88 µmol), tetrabutylammonium hexafluorophosphate (4.00 mg, 8.88 µmol) and 2,3-Dimethyl-1,3-butadiene (30.0 µL, 266 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (35 mg, 88%).

R<sub>F</sub> (1:1 EtOAc:Hex) = 0.66

IR ʋ<sub>max</sub> (cm<sup>-1</sup>): 2920, 2829, 1690, 1671, 1397, 1099

HRMS (APCI) m/z: [M + H]<sup>+</sup> Calcd for C<sub>20</sub>H<sub>20</sub>NO 290.1545; Found 290.1531

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 7.90 (ddd, J = 7.6, 3.7, 2.9 Hz, 1H), 7.48 – 7.39 (m, 2H), 7.32 – 7.27 (m, 2H), 7.23 (dt, J = 2.8, 1.9 Hz, 1H), 7.20 – 7.14 (m, 2H), 4.53 (d, J = 18.6 Hz, 1H), 3.29 (d, J = 17.5 Hz, 1H), 3.18 (d, J = 16.6 Hz, 1H), 2.32 (d, J = 16.2 Hz, 1H), 1.77 (s, 3H), 1.63 – 1.56 (m, 3H).

<sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) δ 166.9, 152.1, 139.1, 131.9, 130.9, 128.9, 128.1, 127.8, 125.9, 124.1, 123.1, 122.1, 121.8, 65.1, 42.2, 39.1, 19.2, 16.0.

**10b-(4-methoxyphenyl)-2,3-dimethyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3b**
3b was prepared according to general procedure I from 3-hydroxy-3-(4-methoxyphenyl)isoindolin-1-one (30.0 mg, 118 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (4.00 mg, 5.88 µmol), tetrabutylammonium hexafluorophosphate (3.00 mg, 5.88 µmol) and 2,3-Dimethyl-1,3-butadiene (20.0 µL, 176 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (30 mg, 79%).

R_F (1:1 EtOAc:Hex) = 0.58

IR ν_max (cm⁻¹): 2922, 2836, 1690, 1246, 1028.

HRMS (APCI) m/z: [M + H]^+ Calcd for C_{22}H_{22}NO_3 320.1635; Found 320.1635

^1^H NMR (400 MHz, CDCl_3) δ 7.97 – 7.83 (m, 1H), 7.42 (pd, J = 7.4, 1.4 Hz, 2H), 7.17 (dd, J = 6.2, 1.5 Hz, 1H), 7.06 (d, J = 8.9 Hz, 2H), 6.80 (d, J = 8.9 Hz, 2H), 4.51 (d, J = 18.0 Hz, 1H), 3.76 (s, 3H), 3.26 (d, J = 17.6 Hz, 1H), 3.12 (d, J = 16.7 Hz, 1H), 2.29 (d, J = 16.7 Hz, 1H), 1.76 (s, 3H), 1.59 (s, 3H).

^13^C NMR (101 MHz, CDCl_3) δ 166.8, 159.2, 152.6, 131.9, 131.0, 130.9, 128.2, 127.4, 124.1, 123.3, 122.2, 121.9, 114.4, 64.9, 55.5, 42.2, 39.4, 19.3, 16.2.

2,3-dimethyl-10b-[4-(trifluoromethyl)phenyl]-1,4-dihydropyridol[2,1-a]indol-6-one, 3c
**3c** was prepared according to general procedure I from 3-hydroxy-3-[4-trifluoromethyl]phenyl]isoindolin-1-one (50.0 mg, 171 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (5.00 mg, 8.53 µmol), tetrabutylammonium hexafluorophosphate (3.00 mg, 8.53 µmol) and 2,3-Dimethyl-1,3-butadiene (30.0 µL, 256 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (24 mg, 66%).

R$_F$ (1:1 EtOAc:Hex) = 0.74

IR $\nu_{\text{max}}$ (cm$^{-1}$): 2924, 2857, 1694, 1615, 1321, 717.

HRMS (APCI) m/z: [M + H]$^+$ Calcd for C$_{21}$H$_{19}$F$_3$NO$_3$ 358.1401; Found 358.1401

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.92 (ddd, $J = 3.4, 2.3, 0.7$ Hz, 1H), 7.55 (d, $J = 8.4$ Hz, 2H), 7.50 – 7.42 (m, 2H), 7.29 (d, $J = 8.2$ Hz, 2H), 7.18 – 7.09 (m, 1H), 4.56 (d, $J = 17.9$ Hz, 1H), 3.27 (d, $J = 17.9$ Hz, 1H), 3.18 (d, $J = 16.9$ Hz, 1H), 2.37 (d, $J = 16.9$ Hz, 1H), 1.77 (s, 3H), 1.60 (s, 3H).

$^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 166.9, 151.3, 143.5, 134.4, 132.1, 130.9, 130.14 (q, $J = 32.6$ Hz), 128.5, 126.0 (d, $J = 3.7$ Hz), 124.3, 124.0 (q, $J = 272.1$ Hz), 123.4, 121.9, 121.8, 64.9, 42.2, 39.1, 19.2, 16.0.

$^{19}$F NMR (376 MHz, CDCl$_3$): -62.65

10b-(3-methoxyphenyl)-2,3-dimethyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3d
3d was prepared according to general procedure I from 3-hydroxy-3-(3-methoxyphenyl)indan-1-one (50.0 mg, 196 µmol), calcium(ii) bis(trifluoromethanesulphonimide) (6.00 mg, 9.79 µmol), tetrabutylammonium hexafluorophosphate (4.00 mg, 9.79 µmol) and 2,3-Dimethyl-1,3-butadiene (30.0 µL, 294 µmol) in DCE (0.2 M). Purification by column chromatography (3:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (47 mg, 75%).

R_f (1:1 EtOAc:Hex) = 0.60

IR υ_max (cm⁻¹): 2963, 2853, 1686, 1669, 1399, 1034.

HRMS (APCI) m/z: [M + H]^+ Calcd for C_{21}H_{22}NO_3 320.1651; Found 320.1648

^1^H NMR (400 MHz, CDCl_3) δ 7.88 (dd, J = 8.0, 6.4 Hz, 1H), 7.43 (p, J = 7.2 Hz, 2H), 7.22 (dd, J = 9.2, 7.0 Hz, 2H), 6.85 – 6.63 (m, 3H), 4.54 (d, J = 17.8 Hz, 1H), 3.74 (s, 3H), 3.34 (d, J = 17.5 Hz, 1H), 3.14 (d, J = 16.7 Hz, 1H), 2.30 (d, J = 16.4 Hz, 1H), 1.75 (s, 3H), 1.58 (d, J = 9.7 Hz, 3H).

^13^C NMR (101 MHz, CDCl_3) δ 167.3, 160.4, 152.3, 141.2, 132.2, 131.2, 130.3, 128.5, 124.4, 123.4, 122.4, 122.1, 118.5, 112.9, 112.6, 65.5, 55.7, 42.6, 39.6, 19.5, 16.4.
10b-(2,4-dimethoxyphenyl)-2,3-dimethyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3e

3e was prepared according to general procedure I from 3-(2,4-dimethoxyphenyl)-3-hydroxy-indan-1-one (50.0 mg, 175 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (5.00 mg, 8.76 µmol), tetrabutylammonium hexafluorophosphate (3.00 mg, 8.76 µmol) and 2,3-Dimethyl-1,3-buta diene (30.0 µL, 263 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (22 mg, 60%).

Rf (1:1 EtOAc:Hex) = 0.42

IR υ max (cm⁻¹): 2920, 2851, 1690, 1669, 1466, 1028.

HRMS (APCI) m/z: [M + H]^+ Calcd for C_{22}H_{24}NO_{3} 350.1756; Found 350.1741

^1^H NMR (400 MHz, CDCl₃) δ 8.01 – 7.75 (m, 1H), 7.53 – 7.33 (m, 2H), 7.25 (s, 1H), 7.05 (t, J = 19.1 Hz, 1H), 6.52 – 6.27 (m, 2H), 4.49 (d, J = 17.6 Hz, 1H), 3.77 (s, 3H), 3.44 (s, 3H), 3.36 – 3.11 (m, 2H), 2.15 (d, J = 16.6 Hz, 1H), 1.76 (s, 3H), 1.59 (s, 3H).

^1^3^C NMR (101 MHz, CDCl₃) δ 166.8, 160.8, 159.5, 152.5, 132.1, 131.2, 129.2, 127.5, 123.5, 122.8, 122.3, 120.9, 118.5, 104.1, 100.1, 64.2, 55.5, 55.3, 42.3, 40.4, 18.9, 15.9.
10b-(1,3-benzodioxol-4-yl)-2,3-dimethyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3f

3f was prepared according to general procedure I from 3-(1,3-benzodioxol-5-yl)-3-hydroxy-indan-1-one (73.0 mg, 271 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (8.00 mg, 13.6 µmol), tetrabutylammonium hexafluorophosphate (5.00 mg, 13.6 µmol) and 2,3-Dimethyl-1,3-butadiene (30.0 µL, 256 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (60 mg, 67%).

R_F (1:1 EtOAc:Hex) = 0.42

IR υmax (cm⁻¹): 3047, 2853, 692, 1671, 1231, 1097.

HRMS (APCI) m/z: [M + H]^+ Calcd for C_{21}H_{20}NO_{3} 334.1443; Found 334.1433

^1^H NMR (400 MHz, CDCl₃) δ 7.98 – 7.83 (m, 1H), 7.44 (ddd, J = 7.8, 7.0, 1.3 Hz, 2H), 7.24 – 7.16 (m, 1H), 6.69 (dt, J = 8.2, 5.0 Hz, 2H), 6.57 (d, J = 1.7 Hz, 1H), 5.92 (dd, J = 7.6, 1.4 Hz, 2H), 4.51 (d, J = 17.8 Hz, 1H), 3.30 (d, J = 17.9 Hz, 1H), 3.07 (d, J = 16.8 Hz, 1H), 2.29 (d, J = 16.7 Hz, 1H), 1.75 (s, 3H), 1.61 (s, 3H).

^13^C NMR (101 MHz, CDCl₃) δ 166.8, 152.2, 148.3, 147.2, 132.9, 131.9, 130.8, 128.2, 124.1, 123.1, 122.0, 121.7, 119.4, 108.5, 106.7, 101.4, 65.0, 42.1, 39.4, 19.2, 16.1.
2,3-dimethyl-10b-[6-(trifluoromethyl)-2-pyridyl]-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3g

3g was prepared according to general procedure I from 3-hydroxy-3-[6-(trifluoromethyl)-2-pyridyl]isoindolin-1-one (50.0 mg, 170 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (5.00 mg, 8.50 µmol), tetrabutylammonium hexafluorophosphate (3.00 mg, 8.50 µmol) and 2,3-Dimethyl-1,3-butadiene (30.00 µL, 255 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (36 mg, 60%).

R_F (1:1 EtOAc:Hex) = 0.60

IR νmax (cm⁻¹): 2994, 2916, 1695, 1593, 1338, 1112, 993.

HRMS (APCI) m/z: [M + H]^+ Calcd for C_{20}H_{18}F_{3}N_{2}O 359.1371; Found 359.1369

^1H NMR (400 MHz, CDCl₃) δ 7.99 – 7.81 (m, 1H), 7.73 (ddd, J = 7.8, 3.4, 1.7 Hz, 1H), 7.54 (dt, J = 9.2, 4.6 Hz, 1H), 7.51 – 7.36 (m, 3H), 7.22 (d, J = 8.0 Hz, 1H), 4.64 (d, J = 18.0 Hz, 1H), 3.91 (dd, J = 33.3, 16.0 Hz, 1H), 3.54 (t, J = 14.8 Hz, 1H), 2.40 – 2.19 (m, 1H), 1.67 (s, 3H), 1.58 (s, 3H).

^13C NMR (101 MHz, CDCl₃) δ 167.7, 159.8, 149.6, 148.0 (d, J = 35.4 Hz), 138.4, 132.0, 130.3, 128.4, 123.9, 123.5 (q, J = 274.1 Hz), 123.3, 122.2, 122.0, 121.0, 119.1 (q, J = 2.6 Hz), 66.9, 42.7, 38.5, 19.0, 15.9.

^19F NMR (376 MHz, CDCl₃): -68.24
10b-(6-methoxy-2-pyridyl)-2,3-dimethyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3h

3h was prepared according to general procedure I from 3-hydroxy-3-(6-methoxy-2-pyridyl)indan-1-one (50.0 mg, 195 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (6.00 mg, 9.76 µmol), tetrabutylammonium hexafluorophosphate (4.00 mg, 9.76 µmol) and 2,3-Dimethyl-1,3-butadiene (30 µL, 293 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (22 mg, 37%).

R$_F$ (1:1 EtOAc:Hex) = 0.72

IR $\nu_{\text{max}}$ (cm$^{-1}$): 2976, 2853, 1694, 1464, 1320, 1023.

HRMS (APCI) m/z: [M + H]$^+$ Calcd for C$_{20}$H$_{21}$N$_2$O$_2$ 321.1603; Found 321.1608

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.97 – 7.82 (m, 1H), 7.58 – 7.36 (m, 4H), 6.65 (ddd, $J$ = 14.3, 7.8, 0.6 Hz, 2H), 4.62 (d, $J$ = 18.6 Hz, 1H), 4.05 (s, $J$ = 19.2 Hz, 3H), 3.79 (dd, $J$ = 20.1, 13.9 Hz, 1H), 3.59 (d, $J$ = 17.9 Hz, 1H), 2.23 (d, $J$ = 15.8 Hz, 1H), 1.71 (s, 3H), 1.62 (s, 3H).

$^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 168.0, 164.3, 156.7, 151.0, 139.9, 132.1, 130.9, 128.6, 124.3, 123.2, 122.3, 121.9, 112.2, 109.9, 67.2, 53.7, 43.1, 39.1, 19.6, 16.4.
2,3-dimethyl-10b-(2-thienyl)-1,4-dihydropyridol[2,1-a]isoindol-6-one, 3i

3i was prepared according to general procedure I from 3-hydroxy-3-(2-thienyl)isoindolin-1-one (25.0 mg, 108 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (3.00 mg, 5.40 µmol), tetrabutylammonium hexafluorophosphate (2.00 mg, 5.40 µmol) and 2,3-Dimethyl-1,3-butadiene (18.0 µL, 162 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (18 mg, 56%).

R_F (1:1 EtOAc:Hex) = 0.75

IR 𝜈_max (cm⁻¹): 2920, 2845, 1690, 1390.

HRMS (APCI) m/z: [M + H]^+ Calcd for C_{18}H_{18}NOS 296.1109 ; Found 296.1098

^1^H NMR (400 MHz, CDCl₃) δ 7.95 – 7.82 (m, 1H), 7.48 (dtd, J = 22.4, 7.4, 1.2 Hz, 2H), 7.39 – 7.34 (m, 1H), 7.17 (dd, J = 5.1, 1.2 Hz, 1H), 6.90 (dd, J = 5.1, 3.6 Hz, 1H), 6.84 (dd, J = 3.6, 1.2 Hz, 1H), 4.54 (d, J = 17.9 Hz, 1H), 3.50 (d, J = 17.9 Hz, 1H), 3.01 (d, J = 16.6 Hz, 1H), 2.40 (d, J = 17.1 Hz, 1H), 1.75 (s, 3H), 1.66 (s, 3H).

^13^C NMR (101 MHz, CDCl₃) δ 166.3, 151.2, 144.5, 131.9, 130.5, 128.5, 127.2, 125.1, 124.6, 124.1, 123.1, 121.9, 121.9, 63.3, 42.3, 41.9, 19.2, 16.1
2,3-bis(4-methoxyphenyl)-10b-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3j

3j was prepared according to general procedure I from 3-hydroxy-3-phenylisoindolin-1-one (80.0 mg, 355 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (11.0 mg, 17.8 µmol), tetrabutylammonium hexafluorophosphate (7.00 mg, 17.8 µmol) and 4,4-dimethoxydiphenylbuta-1,3-diene (142 mg, 533 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (148 mg, 88%).

R_f (3:1 EtOAc:Hex) = 0.63

IR \nu max (cm\textsuperscript{-1}): 2984, 2930, 1684, 1507, 1241.

HRMS (APCI) m/z: [M + H]\textsuperscript{+} Calcd for C\textsubscript{32}H\textsubscript{28}NO\textsubscript{3} 474.2069; Found 474.2052

\textsuperscript{1}H NMR (400 MHz, CDCl\textsubscript{3}) \delta 8.08 – 7.82 (m, 1H), 7.50 – 7.43 (m, 2H), 7.38 – 7.29 (m, 5H), 7.24 (d, J = 3.3 Hz, 1H), 6.96 (d, J = 8.7 Hz, 2H), 6.83 (d, J = 8.8 Hz, 2H), 6.72 (d, J = 8.8 Hz, 2H), 6.64 (d, J = 8.8 Hz, 2H), 5.06 (d, J = 18.2 Hz, 1H), 3.79 – 3.56 (m, 8H), 2.86 – 2.66 (m, 1H).
\[^{13}\text{C}\text{ NMR}\ (101\text{ MHz, CDCl}_3\text{)}\ \delta \ 167.0,\ 158.3,\ 158.2,\ 151.7,\ 138.6,\ 134.0,\ 131.9,\ 131.4,\ 130.9,\ 130.8,\ 130.1,\ 129.9,\ 129.6,\ 128.9,\ 128.2,\ 127.9,\ 125.9,\ 124.1,\ 121.9,\ 113.6,\ 113.4,\ 65.1,\ 55.2,\ 55.1,\ 42.2,\ 39.8.\]

\[2,3,10b\text{-tris(4-methoxyphenyl)}\text{-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3k}\]

\[\text{3k} \text{ was prepared according to general procedure I from 3-hydroxy-3-(4-methoxyphenyl)isoindolin-1-one (80.0 mg, 313 \mu\text{mol}), calcium(ii) bis(trifluoromethanesulfonimide) (9.00 mg, 14.7 \mu\text{mol}), tetrabutylammonium hexafluorophosphate (6.00 mg, 15.7 \mu\text{mol}) and 4,4-dimethoxydiphenylbuta-1,3-diene (125.0 mg, 470 \mu\text{mol}) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (138 mg, 88%).}\]

\[R_F\ (3:1\ EtOAc:Hex) = 0.56\]

\[\text{IR } \nu_{\text{max}} \ (\text{cm}^{-1}):\ 2929,\ 2834,\ 1684,\ 1604,\ 1243.\]

\[\text{HRMS (APCI) m/z: } [\text{M + H}]^+ \text{ Calcd for C}_{33}\text{H}_{30}\text{NO}_4\ 504.2175; \text{ Found 504.2162}\]

\[^{1}\text{H NMR (400 MHz, CDCl}_3\text{)}\ \delta \ 8.06 – 7.87 \ (m,\ 1\text{H}),\ 7.53 – 7.41 \ (m,\ 2\text{H}),\ 7.25 – 7.20 \ (m,\ 3\text{H}),\ 6.99 – 6.94 \ (m,\ 2\text{H}),\ 6.90 – 6.81 \ (m,\ 4\text{H}),\ 6.76 – 6.70 \ (m,\ 2\text{H}),\ 6.68 – 6.61 \ (m,\ 2\text{H}),\ 5.02 \ (dd,\ J = 18.4,\ 2.4\ Hz,\ 1\text{H}),\ 3.84 – 3.59 \ (m,\ 11\text{H}),\ 2.73 \ (d,\ J = 17.1\ Hz,\ 1\text{H}).\]
$^{13}$C NMR (101 MHz, CDCl$_3$) δ 166.8, 159.2, 158.3, 158.2, 152.0, 134.1, 131.9, 131.4, 130.9, 130.8, 130.4, 130.1, 129.9, 129.6, 128.2, 127.4, 124.0, 121.8, 114.3, 113.6, 113.4, 64.7, 55.3, 55.2, 55.1, 42.1, 39.9.

2,3-bis(4-methoxyphenyl)-10b-[4-(trifluoromethyl)phenyl]-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3f

3f was prepared according to general procedure I from 3-hydroxy-3-[4-trifluoromethyl]phenyl]isoindolin-1-one (80.0 mg, 273 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (8.00 mg, 13.6 µmol), tetrabutylammonium hexafluorophosphate (5.00 mg, 13.6 µmol) and 4,4-dimethoxydiphenylbuta-1,3-diene (109 mg, 409 µmol) in DCE (0.2M). Purification by column chromatography (1:3 EtOAc:Hex) resulted in obtaining the pure product as a pale red solid (32 mg, 22%).

R$_F$ (3:1 EtOAc:Hex) = 0.59

IR $\nu_{max}$ (cm$^{-1}$): 3003, 2834, 1659, 1593.

HRMS (APCI) m/z: [M + H]$^+$ Calcd for C$_{33}$H$_{27}$F$_3$NO$_3$ 542.1943 ; Found 542.1922

$^1$H NMR (400 MHz, CDCl$_3$) δ 8.02 – 7.97 (m, 1H), 7.64 (d, $J = 8.3$ Hz, 2H), 7.56 – 7.43 (m, 4H), 7.24 (d, $J = 4.4$ Hz, 1H), 7.01 – 6.94 (m, 2H), 6.89 – 6.82 (m, 2H),
6.78 – 6.71 (m, 2H), 6.70 – 6.63 (m, 2H), 5.09 (dd, J = 18.6, 2.5 Hz, 1H), 3.90 – 3.69 (m, 8H), 2.91 – 2.79 (m, 1H).

$^{13}$C NMR (101 MHz, CDCl$_3$) δ 167.0, 158.5, 158.3, 150.8, 143.0, 133.7, 132.3, 131.1, 131.0, 130.7, 130.0, 129.8, 129.2, 128.7, 126.5, 126.2(q, J=3.8Hz), 124.2, 121.8, 113.7, 113.5, 64.8, 55.2, 55.1, 42.3, 39.6.

$^{19}$F NMR (376 MHz, CDCl$_3$): -62.62

10b-(1,3-benzodioxol-5-yl)-2,3-bis(4-methoxyphenyl)-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3m

![Chemical Structure]

3m was prepared according to general procedure I from 3-(1,3-benzodioxol-5-yl)-3hydroxy-indan-1-one (50.0 mg, 186 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (6.00 mg, 9.28 µmol), tetrabutylammonium hexafluorophosphate (4.00 mg, 9.28 µmol) and 4,4-dimethoxydiphenylbuta-1,3-diene (74.0 mg, 279 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a pale orange solid (71 mg, 74%).

$R_F$ (1:1 EtOAc:Hex) = 0.60

IR $\nu$ max (cm$^{-1}$): 2959, 1690, 1570, 1120.

HRMS (APCI) m/z: [M + H]$^+$ Calcd for C$_{33}$H$_{28}$NO$_5$ 518.1967; Found 518.1942

$^1$H NMR (400 MHz, CDCl$_3$) δ 7.99 – 7.89 (m, 1H), 7.47 (td, J = 6.5, 1.4 Hz, 2H), 7.26 (d, $J = 1.8$ Hz, 1H), 7.01 – 6.93 (m, 2H), 6.92 – 6.84 (m, 3H), 6.78 (d, $J = 8.2$ Hz, 2H).
Hz, 1H), 6.74 – 6.69 (m, 3H), 6.68 – 6.63 (m, 2H), 5.94 (dd, J = 5.5, 1.4 Hz, 2H), 5.04 (dd, J = 18.4, 2.5 Hz, 1H), 3.86 – 3.53 (m, 8H), 2.72 (d, J = 17.1 Hz, 1H).

\[ ^{13}C \text{ NMR (101 MHz, CDCl}_3 \] \( \delta \) 166.9, 158.4, 158.2, 151.8, 148.4, 147.3, 133.9, 132.4, 132.0, 131.4, 130.9, 130.7, 130.1, 129.9, 129.5, 128.3, 124.1, 121.7, 119.4, 113.6, 113.5, 108.4, 106.6, 101.3, 64.9, 55.2, 55.1, 42.1, 39.9.

2,3-bis(4-methoxyphenyl)-10b-[6-(trifluoromethyl)-2-pyridyl]-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3n

![Chemical structure of 3n](image)

3n was prepared according to general procedure I from 3-hydroxy-3-[6-(trifluoromethyl)-2-pyridyl]isoindolin-1-one (50.0 mg, 170 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (5.00 mg, 8.50 µmol), tetrabutylammonium hexafluorophosphate (3.00 mg, 8.50 µmol) and 4,4-dimethoxydiphenylbuta-1,3-diene (68.0 mg, 255 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a pale orange solid (60 mg, 65%).

\( R_F \) (1:1 EtOAc:Hex) = 0.57

IR \( \nu_{\text{max}} \) (cm\(^{-1}\)):
2836, 1686, 1606, 1177.

HRMS (APCI) m/z: [M + H]\(^+\) Calculated for C\(_{32}\)H\(_{26}\)F\(_3\)N\(_2\)O\(_3\) 543.1896 ; Found 543.1882

\(^1\text{H NMR (400 MHz, CDCl}_3 \] \( \delta \) 7.99 – 7.94 (m, 1H), 7.80 – 7.72 (m, 1H), 7.63 (dd, J = 7.7, 0.7 Hz, 1H), 7.54 – 7.44 (m, 3H), 7.28 (s, 1H), 7.08 (d, J = 8.8 Hz, 2H), 6.79 (d, J = 8.9 Hz, 2H), 6.70 (d, J = 8.8 Hz, 2H), 6.62 (d, J = 8.9 Hz, 2H), 5.31
(dd, J = 18.5, 2.6 Hz, 1H), 4.51 (d, J = 16.7 Hz, 1H), 3.73 (dd, J = 12.7, 8.6 Hz, 7H), 2.55 (d, J = 16.8 Hz, 1H).

$^{13}$C NMR (101 MHz, CDCl$_3$) δ 167.8, 159.6, 158.3, 158.3, 149.3, 148.1 (q, J=34.8 Hz), 147.9, 138.7, 133.7, 132.3, 131.3, 131.2, 130.6, 130.4, 130.1, 129.00, 128.8, 124.1, 122.9, 122.9, 122.3, 119.4 (q, J=2.8 Hz), 113.4, 66.8, 55.1, 55.1, 42.6, 39.6.

$^{19}$F NMR (376 MHz, CDCl$_3$): -68.24

2,10b-diphenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5a

![Chemical Structure](image)

5a was prepared according to general procedure I from 3-hydroxy-3-phenylisoindolin-1-one (20.0 mg, 88.8 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (3.00 mg, 4.44 µmol), tetrabutylammonium hexafluorophosphate (2.00 mg, 4.44 µmol) and 2-phenyl-1,3-butadiene (23.0 µL, 133 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (29 mg, 97%).

$R_F$ (1:1 EtOAc:Hex) = 0.69

IR $\nu_{max}$ (cm$^{-1}$): 3052, 2838, 1686, 1388.

HRMS (APCI) m/z: [M + H]$^+$ Calcd for C$_{24}$H$_{20}$NO 338.1545 ; Found 338.1541

$^1$H NMR (400 MHz, CDCl$_3$) δ 8.04 – 7.85 (m, 1H), 7.48 (ddd, J = 6.5, 4.6, 1.5 Hz, 2H), 7.43 – 7.34 (m, 4H), 7.34 – 7.27 (m, 4H), 7.21 (ddd, J = 10.7, 5.5, 2.8 Hz, 3H), 6.01 (dt, J = 3.6, 2.7 Hz, 1H), 4.92 (dt, J = 19.2, 3.3 Hz, 1H), 3.78 (dd, J = 16.6, 1.3 Hz, 1H), 3.69 – 3.56 (m, 1H), 2.73 (dd, J = 16.6, 3.5 Hz, 1H).
\[ ^{13}C\text{NMR} \ (101 \text{ MHz, CDCl}_3) \delta 167.2, 151.9, 140.7, 138.5, 133.6, 132.2, 130.9, 129.1, 128.8, 128.4, 128.0, 127.8, 126.1, 125.4, 124.2, 121.9, 120.9, 65.1, 38.5, 35.9. \]

10b-(4-methoxyphenyl)-2-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5b

\[ \text{IR } \tilde{\nu}_{\text{max}} (\text{cm}^{-1}): 3050, 2836, 1682, 1388. \]

HRMS (APCI) m/z: [M + H]+ Calcd for C\text{25}H\text{22}NO\text{3} 368.1651 ; Found 368.1648

\[ ^1\text{H NMR} \ (400 \text{ MHz, CDCl}_3) \delta 8.01 – 7.89 (m, 1H), 7.52 – 7.43 (m, 2H), 7.39 (t, J = 4.4 \text{ Hz}, 4H), 7.31 (ddd, J = 5.7, 4.4, 1.9 \text{ Hz}, 1H), 7.26 – 7.22 (m, 1H), 7.09 (d, J = 8.9 \text{ Hz}, 2H), 6.79 (d, J = 8.9 \text{ Hz}, 2H), 6.01 (d, J = 3.7 \text{ Hz}, 1H), 4.90 (dt, J = 19.2, 3.3 \text{ Hz}, 1H), 3.81 – 3.67 (m, 4H), 3.65 – 3.49 (m, 1H), 2.70 (dd, J = 16.6, 3.4 \text{ Hz}, 1H). \]
$^{13}$C NMR (101 MHz, CDCl$_3$) δ 167.0, 159.2, 152.2, 140.7, 133.6, 132.1, 130.9, 130.3, 128.8, 128.3, 127.8, 127.4, 125.4, 124.1, 121.9, 120.9, 114.3, 64.7, 55.3, 38.4, 36.0.

2-phenyl-10b-[4-(trifluoromethyl)phenyl]-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5c

![Chemical structure of 5c](image)

5c was prepared according to general procedure I from from 3-hydroxy-3-[4-trifluoromethyl)phenyl]isoindolin-1-one (75.0 mg, 256 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (8.00 mg, 12.8 µmol), tetrabutylammonium hexafluorophosphate (5.00 mg, 12.8 µmol) and 2-phenyl-1,3-butadiene (68.0 µL, 384 µmol) in DCE (0.2 M). Purification by column chromatography (1:3 EtOAc:Hex) resulted in obtaining the pure product as a white solid (36 mg, 66%).

$R_F$ (1:1 EtOAc:Hex) = 0.76

IR $\nu_{\text{max}}$ (cm$^{-1}$): 2955, 2881, 1601, 1358.

HRMS (APCI) m/z: [M + H]$^+$ Calcd for C$_{25}$H$_{19}$F$_3$NO 406.1419 ; Found 406.1425

$^1$H NMR (400 MHz, CDCl$_3$) δ 8.02 – 7.88 (m, 1H), 7.59 – 7.44 (m, 4H), 7.39 (d, $J$ = 4.4 Hz, 4H), 7.33 (dd, $J$ = 7.1, 4.7 Hz, 3H), 7.25 – 7.22 (m, 1H), 6.03 (d, $J$ = 3.6 Hz, 1H), 4.94 (dt, $J$ = 19.3, 3.3 Hz, 1H), 3.78 (dd, $J$ = 16.6, 1.1 Hz, 1H), 3.62 (d, $J$ = 19.3 Hz, 1H), 2.78 (dd, $J$ = 16.6, 3.3 Hz, 1H).

$^{13}$C NMR (101 MHz, CDCl$_3$) δ 151.0, 142.9, 140.3, 133.4, 132.4, 130.8, 130.3 (q, $J$= 32.6Hz), 128.9, 128.8, 128.0, 126.1 (q, $J$= 3.7Hz), 125.4, 124.4, 121.9, 121.0, 64.9, 38.6, 35.9.
**19**F NMR (376 MHz, CDCl$_3$): -62.70

10b-(4-bromophenyl)-2-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5d

165d was prepared according to general procedure I from 3-hydroxy-3-(4-bromophenyl)-isoindolin-1-one (25.0 mg, 82.2 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (2.00 mg, 4.11 µmol), tetrabutylammonium hexafluorophosphate (2.00 mg, 4.11 µmol) and 2-phenyl-1,3-butadiene (22.0 µL, 123 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (25 mg, 72%).

R$_F$ (1:1 EtOAc:Hex) = 0.68

IR $\nu$max (cm$^{-1}$): 3022, 2924, 1682, 1388.

HRMS (APCI) m/z: [M + H]$^+$ Calcd for C$_{24}$H$_{19}$BrNO 416.0650; Found 416.0648

$^1$H NMR (400 MHz, CDCl$_3$) δ 7.95 (dd, $J$ = 6.9, 1.3 Hz, 1H), 7.57 – 7.46 (m, 2H), 7.39 (dd, $J$ = 8.0, 5.9 Hz, 6H), 7.22 (ddd, $J$ = 13.0, 5.2, 3.4 Hz, 2H), 7.05 (d, $J$ = 8.7 Hz, 2H), 6.02 (d, $J$ = 3.5 Hz, 1H), 4.91 (dt, $J$ = 19.2, 3.3 Hz, 1H), 3.80 – 3.55 (m, 2H), 2.73 (dd, $J$ = 16.6, 3.2 Hz, 1H).

$^{13}$C NMR (101 MHz, CDCl$_3$) δ 167.1, 151.3, 140.4, 137.8, 133.5, 132.3, 132.2, 128.8, 128.7, 127.9, 127.9, 125.4, 125.4, 124.3, 122.1, 121.8, 120.9, 64.7, 38.5, 35.9.
10b-(3-methoxyphenyl)-2-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5e

5e was prepared according to general procedure I from 3-hydroxy-3-(3-methoxyphenyl)indan-1-one (25.0 mg, 97.9 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (3.00 mg, 4.90 µmol), tetrabutylammonium hexafluorophosphate (2.00 mg, 4.90 µmol) and 2-phenyl-1,3-butadiene (26.0 µL, 147 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (25 mg, 69%).

R<sub>F</sub> (1:1 EtOAc:Hex) = 0.43

IR ʋ<sub>max</sub> (cm<sup>-1</sup>): 2922, 2849, 1681, 1451.

HRMS (APCI) m/z: [M + H]<sup>+</sup> Calcd for C<sub>25</sub>H<sub>22</sub>NO<sub>2</sub> 368.1651; Found 368.1649

<sup>1</sup>H NMR (400 MHz, CDCl<sub>3</sub>) δ 8.07 – 7.80 (m, 1H), 7.47 (td, J = 6.6, 1.4 Hz, 2H), 7.42 – 7.34 (m, 4H), 7.33 – 7.26 (m, 2H), 7.20 (t, J = 8.0 Hz, 1H), 6.95 – 6.60 (m, 3H), 6.00 (d, J = 3.7 Hz, 1H), 4.92 (dt, J = 19.2, 3.3 Hz, 1H), 3.85 – 3.57 (m, 5H), 2.70 (dd, J = 16.5, 3.3 Hz, 1H).

<sup>13</sup>C NMR (101 MHz, CDCl<sub>3</sub>) δ 167.3, 160.2, 151.7, 140.7, 140.3, 133.7, 132.1, 130.8, 130.1, 128.7, 128.4, 127.8, 125.4, 124.2, 121.9, 120.9, 118.3, 112.9, 112.3, 65.1, 55.3, 38.6, 36.2.
10b-(1,3-benzodioxol-5-yl)-2-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5f

5f was prepared according to general procedure I from 3-(1,3-benzodioxol-5-yl)-3-hydroxy-indan-1-one (25.0 mg, 92.8 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (3.00 mg, 4.64 µmol), tetrabutylammonium hexafluorophosphate (2.00 mg, 4.64 µmol) and 2-phenyl-1,3-butadiene (25.0 µL, 139 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (25 mg, 69%).

Rf (1:1 EtOAc:Hex) = 0.64

IR $\nu$ max (cm$^{-1}$): 2920, 2853, 1682, 1610.

HRMS (APCI) m/z: [M + H]$^+$ Calcd for C$_{25}$H$_{20}$NO$_3$ 382.1443 ; Found 382.1447

$^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.99 – 7.83 (m, 1H), 7.48 (ddd, J = 8.7, 7.1, 1.3 Hz, 2H), 7.42 – 7.29 (m, 6H), 6.77 – 6.65 (m, 2H), 6.59 (d, J = 1.5 Hz, 1H), 6.03 (d, J = 3.7 Hz, 1H), 5.90 (dd, J = 9.5, 1.4 Hz, 2H), 4.90 (dt, J = 19.1, 3.3 Hz, 1H), 3.72 – 3.59 (m, 2H), 2.78 – 2.62 (m, 1H).

$^{13}$C NMR (101 MHz, CDCl$_3$) $\delta$ 167.0, 151.9, 148.4, 147.4, 140.6, 133.6, 132.3, 132.2, 130.7, 128.8, 128.4, 127.8, 125.4, 124.2, 121.8, 120.9, 119.5, 108.5, 106.7, 101.4, 64.9, 38.5, 36.2.
2-phenyl-10b-(2-thienyl)-1,4-dihydropyrido[2,1-a]isoindol-6-one, **5g**

**5g** was prepared according to general procedure I from 3-hydroxy-3-(2-thienyl)isoindolin-1-one (25.0 mg, 108 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (3.00 mg, 5.40 µmol), tetrabutylammonium hexafluorophosphate (2.00 mg, 5.40 µmol) and 2-phenyl-1,3-butadiene (23.0 µL, 133 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a brown solid (17 mg, 45%).

R<sub>F</sub> (1:1 EtOAc:Hex) = 0.66

IR \( \nu \) max (cm<sup>-1</sup>): 2924, 2849, 1682, 1444, 1388.

HRMS (APCI) m/z: [M + H]<sup>+</sup> Calcd for C<sub>22</sub>H<sub>18</sub>NOS 344.1109; Found 344.1111

\(^1\)H NMR (400 MHz, CDCl<sub>3</sub>) \( \delta \) 7.93 (d, \( J = 7.2 \) Hz, 1H), 7.58 – 7.46 (m, 2H), 7.40 (tt, \( J = 9.3, 4.7 \) Hz, 2H), 7.31 (d, \( J = 6.8 \) Hz, 4H), 7.18 (dd, \( J = 5.0, 1.3 \) Hz, 1H), 6.91 (ddd, \( J = 8.6, 4.3, 2.5 \) Hz, 2H), 6.06 (dd, \( J = 6.4, 2.8 \) Hz, 1H), 4.93 (dt, \( J = 19.2, 3.3 \) Hz, 1H), 3.97 – 3.78 (m, 1H), 3.64 (dd, \( J = 16.6, 1.3 \) Hz, 1H), 2.78 (dd, \( J = 16.6, 3.3 \) Hz, 1H).

\(^{13}\)C NMR (101 MHz, CDCl<sub>3</sub>) \( \delta \) 166.7, 151.1, 143.9, 140.6, 133.4, 132.2, 130.3, 128.8, 128.7, 127.9, 127.3, 125.6, 125.4, 124.8, 124.3, 121.9, 120.9, 63.2, 38.7, 38.6.
2-phenyl-10b-[6-(trifluoromethyl)-2-pyridyl]-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5h

5h was prepared according to general procedure I from 3-hydroxy-3-[6-(trifluoromethyl)-2-pyridyl]isoindolin-1-one (25.0 mg, 85.0 µmol), calcium(ii) bis(trifluoromethanesulfonimide) (3.00 mg, 4.25 µmol), tetrabutylammonium hexafluorophosphate (2.00 mg, 4.25 µmol) and 2-phenyl-1,3-butadiene (23.0 µL, 127 µmol) in DCE (0.2 M). Purification by column chromatography (3:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (31 mg, 89%).

R_F (3:1 EtOAc:Hex) = 0.48

IR \( \nu \max (\text{cm}^{-1}) \): 2924, 2851, 1694, 1340.

HRMS (APCI) m/z: [M + H]^+ Calcd for C_{24}H_{18}F_{3}N_{2}O 407.1371; Found 407.1368

^1H NMR (400 MHz, CDCl_3) \( \delta \) 7.97 – 7.84 (m, 1H), 7.80 – 7.71 (m, 1H), 7.57 (dd, \( J = 7.7, 0.7 \text{ Hz}, 1\text{H} \)), 7.51 (ddd, \( J = 8.7, 5.3, 1.0 \text{ Hz}, 2\text{H} \)), 7.51 – 7.42 (m, 3H), 7.40 – 7.29 (m, 4H), 5.82 (d, \( J = 3.0 \text{ Hz}, 1\text{H} \)), 5.00 (dt, \( J = 19.3, 3.1 \text{ Hz}, 1\text{H} \)), 4.59 (dd, \( J = 16.3, 0.9 \text{ Hz}, 1\text{H} \)), 3.97 – 3.75 (m, 1H), 2.51 (dq, \( J = 16.2, 3.3 \text{ Hz}, 1\text{H} \)).

^13C NMR (101 MHz, CDCl_3) \( \delta \) 168.08, 159.51, 149.25, 148.3(q, \( J=34.9\text{Hz} \)), 140.80, 138.73, 135.40, 132.34, 130.30, 128.80, 128.43, 127.68, 126.04, 124.06, 122.27, 120.06, 119.5(q, \( J=2.7\text{Hz} \)), 67.12, 39.15, 36.11.

^19F NMR (376 MHz, CDCl_3): -68.05
10b-(6-methoxy-2-pyridyl)-2-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5i

5i was prepared according to general procedure I from 3-hydroxy-3-(6-methoxy-2-pyridyl)indan-1-one (25.0 mg, 97.6 µmol), calcium(II) bis(trifluoromethanesulfonimide) (3.00 mg, 4.88 µmol), tetrabutylammonium hexafluorophosphate (2.00 mg, 4.88 µmol) and 2-phenyl-1,3-butadiene (26.0 µL, 146 µmol) in DCE (0.2 M). Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a white solid (8 mg, 23%).

Rf (1:1 EtOAc:Hex) = 0.49

IR 𝜈 max (cm⁻¹): 2924, 2853, 1694, 1340.

HRMS (APCI) m/z: [M + H]+ Calcd for C$_{24}$H$_{21}$N$_2$O$_2$ 369.1603 ; Found 369.1599

$^1$H NMR (400 MHz, CDCl$_3$) δ 8.14 – 8.05 (m, 1H), 7.95 (ddd, J = 9.8, 4.9, 4.3 Hz, 1H), 7.51 (pd, J = 7.4, 1.4 Hz, 2H), 7.44 – 7.34 (m, 4H), 7.34 – 7.26 (m, 1H), 7.25 – 7.23 (m, 1H), 7.19 (dd, J = 8.8, 2.7 Hz, 1H), 6.72 – 6.54 (m, 1H), 6.06 (tt, J = 21.0, 10.5 Hz, 1H), 4.91 (dt, J = 19.3, 3.3 Hz, 1H), 3.88 (s, 3H), 3.79 – 3.65 (m, 1H), 3.62 – 3.50 (m, 1H), 2.72 (ddd, J = 16.6, 6.6, 3.1 Hz, 1H).

$^{13}$C NMR (101 MHz, CDCl$_3$) δ 166.7, 163.8, 151.3, 144.8, 140.0, 137.2, 133.3, 132.2, 130.8, 128.7, 128.6, 127.9, 126.7, 125.3, 124.2, 121.8, 120.8, 111.4, 63.2, 53.5, 38.2, 35.6.
Upjohn dihydroxylation to access 6.9

3a (100 mg, 346 µmol) was dissolved in a mixture of acetone, t-BuOH and water (18:1:1). To the solution was added a solution of 4% wt of OsO₄ in H₂O (22 µL, 3.46 µmol, 1 mol%) followed by the addition of N-methyl morpholine N-oxide (93 µL, 449 µmol, 1.3m equiv.) at rt and the reaction monitored by ¹H-NMR. Upon completion, the reaction was quenched and extracted with Et₂O and washed with brine. The organic layers were dried over Na₂SO₄ and concentrated in vacuo. Purification by column chromatography (1:3 EtOAc:Hex) resulted in obtaining the pure product as a white solid (77 mg, 69%).

RF (3:1 EtOAc:Hex) = 0.26

IR νmax (cm⁻¹): 3516, 3365, 2929, 1666, 1595.

HRMS (APCI) m/z: [M + H]⁺ Calcd for C₂₀H₂₂NO₃ 324.1600; Found 324.1585

¹H NMR (400 MHz, CDCl₃) δ 7.72 (d, J = 7.1 Hz, 1H), 7.41 (dd, J = 6.9, 1.4 Hz, 3H), 7.34 (ddd, J = 13.5, 6.0, 0.9 Hz, 5H), 4.50 (d, J = 14.3 Hz, 1H), 3.91 (s, 1H), 3.11 – 3.01 (m, 2H), 2.87 (d, J = 13.5 Hz, 1H), 2.16 (d, J = 13.6 Hz, 1H), 1.27 (s, 3H), 0.83 (s, 3H).

¹³C NMR (101 MHz, CDCl₃) δ 169.5, 152.0, 139.3, 132.3, 129.3, 128.9, 127.9, 127.8, 125.0, 124.3, 121.6, 72.9, 72.8, 68.2, 46.2, 44.3, 23.2, 20.3.
To an oven dried Schlenk flask under an inert atmosphere was added 3a (200 mg, 691 μmol), sodium hydrogen carbonate (76.0 mg, 898 μmol, 1.3 equiv.) dissolved in DCM (1 mL). The reaction was then cooled to 0°C and m-CPBA (204 mg, 828 μmol, 1.2 equiv.) in DCM (1 mL) and added dropwise to the reaction over 20 minutes. The reaction was stirred at 0 °C for 1 hour, then warmed to room temperature. Once TLC analysis indicated completion the reaction was quenched with Na₂S₂O₄ and extracted with DCM and washed with NaHCO₃ and brine. The organic layers were dried over Na₂SO₄ and concentrated in vacuo. Purification by column chromatography (1:1 EtOAc:Hex) resulted in obtaining the pure product as a yellow solid (200 mg, 95%).

Rₚ (1:1 EtOAc:Hex) = 0.38

IR νmax (cm⁻¹): 2955, 2909, 1682, 1466, 1397.

HRMS (APCI) m/z: [M + H]^+ Calcd for C₂₀H₂₀NO₂ 306.1494; Found 306.1481

¹H NMR (400 MHz, CDCl₃) δ 7.92 – 7.81 (m, 1H), 7.49 – 7.37 (m, 2H), 7.39 – 7.28 (m, 3H), 7.19 – 7.05 (m, 3H), 4.50 (d, J = 14.8 Hz, 1H), 3.05 (d, J = 15.4 Hz, 1H), 2.86 (d, J = 14.8 Hz, 1H), 2.14 (d, J = 15.4 Hz, 1H), 1.53 (s, 3H), 1.25 (s, 3H).

¹³C NMR (101 MHz, CDCl₃) δ 167.6, 152.0, 139.0, 132.5, 131.2, 129.6, 128.7, 128.6, 126.7, 124.5, 121.9, 64.4, 59.8, 59.7, 41.0, 39.1, 21.6, 17.1.
Amide reduction to access 8.\textsuperscript{11}

To an oven dried round bottom glass was added 3a (100 mg, 346 µmol) dissolved in THF (3.5 mL) and LiAlH₄ (2.4M in THF, 1.44mL, 3.46 mmol, 10.0 equiv) was added dropwise at 0 °C. The solution was then warmed to r.t. and stirred until TLC analysis indicated completion. The reaction mixture was quenched at 0 °C with H₂O and NaOH (1.0 M) and extracted with Et₂O. The organic layers were dried over Na₂SO₄ and concentrated in vacuo. Purification by column chromatography (1:3 EtOAc:Hex) resulted in obtaining the pure product as a yellow oil (52 mg, 54%).

R₍F₎ (1:1 EtOAc:Hex) = 0.91

IR 𝜈ₑₓₘₐₓ (cm⁻¹): 2888, 2829, 2758, 1444.

HRMS (APCI) m/z: [M + H]⁺ Calcd for C₂₀H₂₂N 276.1752; Found 276.1751

¹H NMR (400 MHz, CDCl₃) δ 7.36 – 7.31 (m, 2H), 7.29 – 7.23 (m, 3H), 7.22 – 7.12 (m, 2H), 7.10 (d, J = 7.3 Hz, 1H), 6.80 (d, J = 7.2 Hz, 1H), 4.26 (d, J = 12.3 Hz, 1H), 4.08 (d, J = 12.2 Hz, 1H), 3.22 – 3.01 (m, 2H), 2.56 (d, J = 17.3 Hz, 1H), 2.34 – 2.22 (m, 1H), 1.70 (s, 3H), 1.52 (s, 3H).

¹³C NMR (101 MHz, CDCl₃) δ 151.2 143.7, 139.4, 128.1, 127.8, 126.8, 126.8, 126.5, 124.2, 124.1, 122.7, 121.9, 68.0, 56.5, 50.2, 35.4, 19.2, 16.2.
3-hydroxy-3-phenyl-isindolin-1-one, 1a

$^1$H NMR (400 MHz, DMSO-D$_6$)

$^{13}$C NMR (101 MHz, DMSO-D$_6$)
3-hydroxy-3-(4-methoxyphenyl) isoindolin-1-one, 1b

$^1\text{H NMR}$ (400 MHz, DMSO-$d_6$)

$^{13}\text{C NMR}$ (101 MHz, DMSO-$d_6$)
3-hydroxy-3-[4-trifluoromethyl]phenyl]isoindolin-1-one, 1c

$^1$H NMR (400 MHz, DMSO-$d_6$)

$^{13}$C NMR (101 MHz, DMSO-$d_6$)
3-hydroxy-3-(3-methoxyphenyl)indan-1-one, 1d

$^1$H NMR (400 MHz, DMSO-D$_6$)

$^{13}$C NMR (101 MHz, DMSO-D$_6$)
3-(2,4dimethoxyphenyl)-3hydroxy-indan-1one, 1e

$^1$H NMR (400 MHz, DMSO-$D_6$)

$^{13}$C NMR (101 MHz, DMSO-$D_6$)
3-(1,3-benzodioxol-5-yl)-3-hydroxy-indan-1-one, 1f

$^1$H NMR (400 MHz, DMSO-D$_6$)

$^{13}$C NMR (101 MHz, DMSO-D$_6$)
3-hydroxy-3-[6-(trifluoromethyl)-2-pyridyl]isoindolin-1-one, 1g

$^1$H NMR (400 MHz, DMSO-$d_6$)

$^{13}$C NMR (101 MHz, DMSO-$d_6$)
3-hydroxy-3-(6-methoxy-2-pyridyl)indan-1-one, 1h

$^1$H NMR (400 MHz, DMSO-$D_6$)

$^{13}$C NMR (101 MHz, DMSO-$D_6$)
(4,4-dimethoxydiphenyl)buta-1,3-diene, 2b

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
2-phenyl-1,3-butadiene, 4

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
2,3-dimethyl-10b-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3a

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
10b-(4-methoxyphenyl)-2,3-dimethyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3b

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
2,3-dimethyl-10b-[4-(trifluoromethyl)phenyl]-1,4-dihydropyridol[2,1-a]indol-6-one, 3c

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
10b-(3-methoxyphenyl)-2,3-dimethyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3d

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
10b-(2,4-dimethoxyphenyl)-2,3-dimethyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3e

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
10b-(1,3-benzodioxol-4-yl)-2,3-dimethyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3f

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
2,3-dimethyl-10b-[6-(trifluoromethyl)-2-pyridyl]-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3g

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
10b-(6-methoxy-2-pyridyl)-2,3-dimethyl-1,4-dihydropyrido[2,1-α]isoindol-6-one, 3h

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
2,3-dimethyl-10b-(2-thienyl)-1,4-dihydropyridol[2,1-a]isoindol-6-one, 3i

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
2,3-bis(4-methoxyphenyl)-10b-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3j

$^{1}H$ NMR (400 MHz, CDCl$_3$)

$^{13}C$ NMR (101 MHz, CDCl$_3$)
2,3,10b-tris(4-methoxyphenyl)-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3k

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
2,3-bis(4-methoxyphenyl)-10b-[4-(trifluoromethyl)phenyl]-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3f

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
10b-(1,3-benzodioxol-5-yl)-2,3-bis(4-methoxyphenyl)-1,4-dihydropyrido[2,1-a]isoindol-6-one, 3m

$^{1}H$ NMR (400 MHz, CDCl$_3$)

$^{13}C$ NMR (101 MHz, CDCl$_3$)
2,3-bis(4-methoxyphenyl)-10b-[6-(trifluoromethyl)-2-pyridyl]-1,4-dihydropyrido[2,1-\(a\)]isoindol-6-one, 3n

\(^1\)H NMR (400 MHz, CDCl\(_3\))

\(^{13}\)C NMR (101 MHz, CDCl\(_3\))
2,10b-diphenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5a

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
2D NMR data for 2,10b-diphenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5a
10b-(4-methoxyphenyl)-2-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5b

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
2-phenyl-10b-[4-(trifluoromethyl)phenyl]-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5c

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
10b-(4-bromophenyl)-2-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5d

$^1$H NMR (400 MHz, CDCl$_3$).

$^{13}$C NMR (101 MHz, CDCl$_3$)
10b-(3-methoxyphenyl)-2-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5e

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
10b-(1,3-benzodioxol-5-yl)-2-phenyl-1,4-di hydropyrido[2,1-a]isoindol-6-one, 5f

$^{1}H$ NMR (400 MHz, CDCl$_3$)

$^{13}C$ NMR (101 MHz, CDCl$_3$)
2-phenyl-10b-(2-thienyl)-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5g

$^1$H NMR (400 MHz, CDCl$_3$).

$^{13}$C NMR (101 MHz, CDCl$_3$)
2-phenyl-10b-[6-(trifluoromethyl)-2-pyridyl]-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5h

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
10b-(6-methoxy-2-pyridyl)-2-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one, 5i

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
2-hydroxy-2,3,3-trimethyl-10b-phenyl-1,4-dihydropyrido[2,1-a]isoindol-6-one;hydrate, 6

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
2D NMR data for 2-hydroxy-2,3,3-trimethyl-10b-phenyl-1,4-dihydropyrido[2,1-α]isoindol-6-one;hydrate, 6
11,13-dimethyl-1-phenyl-12-oxa-9-azatetracyclotetradeca-2(7),3,5-trien-8-one, 7

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)
2D NMR data for 11,13-dimethyl-1-phenyl-12-oxa-9-azatetracyclotetradeca-2(7),3,5-trien-8-one, 7
2,3-dimethyl-10b-phenyl-4,6-dihydro-1H-pyrido[2,1-a]isoindole, 8

$^1$H NMR (400 MHz, CDCl$_3$)

$^{13}$C NMR (101 MHz, CDCl$_3$)