# Supporting Information

Palladium-Catalyzed Intramolecular Heck Dearomative gem-Difluorovinylation of Indoles

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1. General information

General. $^1$H, $^{13}$C, and $^{19}$F NMR spectra were recorded on Varian 400 MHz or Bruker 400 MHz spectrometers. $^1$H and $^{13}$C NMR chemical shifts were determined relative to internal standard TMS at δ 0.0, CDCl$_3$ (δ($^1$H), 7.26 ppm; δ($^{13}$C), 77.16 ppm), DMSO-$d_6$ (δ($^1$H), 2.50 ppm; δ($^{13}$C), 39.51 ppm). Chemical shifts (δ) are reported in ppm, and coupling constants (J) are in Hertz (Hz). The following abbreviations are used to explain the multiplicities: s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet. The HRMS analysis was obtained on an Agilent 6540 UHD Q-TOF mass spectrometer. The melting point was recorded on BÜCHI (M-560) and uncorrected. The X-ray single crystal diffraction data were collected on a Bruker D8 VENTURE. Analytical thin layer chromatography (TLC) was performed on 0.25 mm silica gel 60 F254 plates and viewed by UV light (254 nm). Column chromatographic purification was performed using 200-300 mesh silica gel.

Materials. All the chemical reagents were purchased from commercial sources and used as received unless otherwise indicated. Substrates 1 were prepared according to the known method.$^1$

2. Experimental procedures

2.1 General procedure for synthesis of products (taking 3a as an example)

To a Schlenk tube was added Pd(OAc)$_2$ (10 mol%), DPEphos (12 mol%), 1a (0.2 mmol), K$_2$CO$_3$ (0.6 mmol), 4Å MS (100 mg), and 2a (0.4 mmol) under N$_2$, after which 3.0 mL DCE was added into the reaction mixture by a syringe and the tube was sealed with Teflon cap. The mixture was stirred at 120 °C for 12 hours. When the reaction was completed, the solvent was removed under vacuum and the residue was purified by column chromatography on silica gel to afford the product 3a in 79% yield.
2.2 Gram-scale reaction

To a Schlenk tube was added Pd(OAc)$_2$ (10 mol%), DPEphos (12 mol%), 1a (8 mmol), K$_2$CO$_3$ (24 mmol), 4Å MS (4000 mg), and 2a (16 mmol) under N$_2$, after which 40 mL DCE was added into the reaction mixture by a syringe and the tube was sealed with Teflon cap. The mixture was stirred at 120 °C for 15 hours. When the reaction was completed, the solvent was removed under vacuum and the residue was purified by column chromatography on silica gel to afford the product 3a in 45% yield.

2.3 Synthetic transformations of product 3a
2.3.1 Procedure for synthesis of 4a

The synthesis of 4a was conducted according to a reported procedure.$^2$ To a 25 mL Schlenk flask was charged with gem-difluoroalkene 3a (0.2 mmol, 1.0 equiv.), 4-methylbenzenethiol (0.4 mmol, 2.0 equiv.), and EtOH/H$_2$O (2.0 mL, v/v = 2:1). The flask was then evacuated and backfilled with O$_2$ three times and sealed with a Teflon cap. The resulting solution was stirred at room temperature for 12 h. Upon completion of the reaction, CH$_2$Cl$_2$ (10 mL) was added. The organic layer was washed with H$_2$O (10 mL × 2) and brine (10 mL × 1), and the combined aqueous layers was extracted with CH$_2$Cl$_2$ (10 mL × 2) twice. The combine organic layers were dried over anhydrous Na$_2$SO$_4$. Then the solvents were removed via rotary evaporator and the residue was purified by column chromatography on silica gel to afford alcohol product 4a in 66% yield.
yield.

2.3.2 Procedure for synthesis of 4b

The synthesis of 4b was conducted according to a reported procedure. To a 10 mL Schlenk tube was charged with gem-difluoroalkene 3a (0.2 mmol, 1.0 equiv.), 4-methylbenzenethiol (0.24 mmol, 1.2 equiv.), and dry DCE (40 μL). The reaction mixture was placed in a preheated metal block and stirred at 80 °C for 15 min. The solvent was evaporated under reduced pressure and the residue was purified by column chromatography on silica gel to afford product 4b in 85% yield.

2.3.3 Procedure for synthesis of 4c

The synthesis of 4c was conducted according to a reported procedure. An oven-dried 10 mL Schlenk tube was charged with Cs₂CO₃ (0.03 mmol), TMSCN (0.9 mmol, 3 equiv.), 3a (0.3 mmol, 1.0 equiv.), and dry MeCN (1.0 mL). The reaction mixture was stirred at room temperature for 2 h. The solvent was evaporated under reduced pressure and the residue was purified by column chromatography on silica gel to afford product 4c in 83% yield.

2.3.4 Procedure for synthesis of 4d
The reduction was conducted according to a reported procedure.\(^5\) A solution of imidazole (0.5 mmol, 1.0 equiv.) in DMF (0.5 mL) was added dropwise to a mixture of gem-difluoroalkene 3a (0.6 mmol, 1.2 equiv.) and K\(_3\)PO\(_4\) (1 mmol, 2 equiv.) in DMF (0.5 mL) via syringe and then stirred at room temperature for 12 h (monitored by TLC). After completion of the reaction, the mixture was quenched with H\(_2\)O (20 mL). The aqueous phase was extracted with CH\(_2\)Cl\(_2\) (3 × 10 mL). The organic layer was dried over MgSO\(_4\) and filtered, and the filtrate was concentrated in vacuo. The crude product was purified by column chromatography on silica gel to afford product 4d in 85\% yield.

2.3.5 Procedure for synthesis of 4e

\[
\begin{align*}
\text{3a} + \text{benzoyl hydrazide} \rightarrow \text{4e, 79\%}
\end{align*}
\]

The reduction was conducted according to a reported procedure.\(^6\) A 25 mL of dried round-bottom flask was charged with gem-difluoroalkene 3a (0.2 mmol, 1.0 equiv.), benzoyl hydrazide (0.24 mmol, 1.2 equiv.), Cs\(_2\)CO\(_3\) (0.4 mmol, 2 equiv.), and dry DMSO (1 mL) under N\(_2\) atmosphere. The mixture was stirred at 80 °C for 6 h (monitored by TLC). After the reaction completed, the reaction mixture was quenched with H\(_2\)O (20 mL) and extracted with EtOAc (3×10 mL). The combined organic layer was washed with brine (3×10 mL), dried over Na\(_2\)SO\(_4\), and concentrated under reduced pressure. The crude product was purified by column chromatography on silica gel to afford product 4e in 79\% yield.

2.3.6 Procedure for synthesis of 4f

\[
\begin{align*}
\text{3a} + \text{MeOH} \rightarrow \text{4f, 77\%}
\end{align*}
\]

The reduction was conducted according to a reported procedure.\(^7\) Selectfluor (0.3
mmol, 1.5 equiv.), and *gem*-difluoroalkene 3a (0.2 mmol, 1 equiv.) were added in turn to an oven-dried 10 mL Schlenk tube equipped with a stir bar under a nitrogen atmosphere. The reactants were dissolved in dry CH$_3$CN (0.8 mL), followed by the addition of dry MeOH (1 mmol, 5 equiv.). The reaction mixture was stirred at 40 °C for 4 h. The reaction mixture was diluted with ethyl acetate (20.0 mL) and transferred to a flask. The solvent was evaporated under vacuum. The residue was purified by column chromatography on silica gel to afford product 4f in 77% yield.

### 2.3.7 Procedure for synthesis of 4g

![Chemical structure of 3a and 4g]

The reduction was conducted according to a reported procedure. Selectfluor (0.3 mmol, 1.5 equiv.), and *gem*-difluoroalkene 3a (0.2 mmol, 1 equiv.) were added in turn to an oven-dried 10 mL Schlenk tube equipped with a stir bar under a nitrogen atmosphere. The reactants were dissolved in dry CH$_3$CN (0.8 mL), followed by the addition of H$_2$O (1.6 mmol, 8 equiv.). The reaction mixture was stirred at 40 °C for 4 h. The reaction mixture was diluted with ethyl acetate (20.0 mL) and transferred to a flask. The solvent was evaporated under vacuum. The residue was purified by column chromatography on silica gel to afford product 4g in 95% yield.

### 2.3.8 Procedure for synthesis of 4h

![Chemical structure of 3a and 4h]

The reduction was conducted according to a reported procedure. A solution of tBuOK (0.6 mmol, 3 equiv.) and dibuthylamine (0.4 mmol, 2 equiv.) in DMSO (1.2 mL) was stirred at 100 °C under a nitrogen atmosphere for about 10 minutes, and then H$_2$O (0.02 mL) was added via a syringe. Twenty minutes later, *gem*-difluoroalkene 3a (0.2
mmol, 1 equiv.) was added to the mixture under N₂. Stirring was continued at 100 °C for 12 h. After the completion of reaction, the reaction mixture was quenched with H₂O (20 mL) and extracted with ethyl acetate (10 mL × 3). The organic layer was separated and dried over Na₂SO₄, filtered and evaporated under vacuum. The residue was purified by column chromatography on silica gel to afford product 4h in 43% yield.

3. References
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4. Crystallographic data and molecular structure of compounds 3a, 3t, and 4h

![Figure S1. X-ray crystal structure of 3a](image)

**Figure S1.** X-ray crystal structure of 3a

**Table S1.** Crystal data and structure refinement details for 3a.

| Compound   | 3a         |
|------------|------------|
| Empirical formula | C₁₇H₁₁F₂NO |
| Formula weight   | 283.27     |
| Temperature/K    | 296.15     |
| Crystal system   | monoclinic |
| Space group      | P2₁/n      |
| a/Å              | 13.160(4)  |
| Property                  | Value                  |
|--------------------------|------------------------|
| b/Å                      | 7.282(2)               |
| c/Å                      | 14.200(4)              |
| α/°                      | 90                     |
| β/°                      | 99.631(6)              |
| γ/°                      | 90                     |
| Volume/Å³                | 1341.6(7)              |
| Z                        | 4                      |
| ρ calc g/cm³             | 1.402                  |
| μ/mm⁻¹                   | 0.107                  |
| F(000)                   | 584.0                  |
| Radiation                | MoKα (λ = 0.71073)     |
| 2θ range for data collection/° | 5.82 to 49.986 |
| Index ranges             | -15 ≤ h ≤ 15, -6 ≤ k ≤ 8, -16 ≤ l ≤ 16 |
| Reflections collected    | 6537                   |
| Independent reflections  | 2358 [R_{int} = 0.0836, R_{sigma} = 0.0903] |
| Data/restraints/parameters | 2358/0/191           |
| Goodness-of-fit on F²    | 0.974                  |
| Final R indexes [I>=2σ (I)] | R₁ = 0.0488, wR₂ = 0.0836 |
| Final R indexes [all data] | R₁ = 0.1363, wR₂ = 0.1102 |
| Largest diff. peak/hole / e Å⁻³ | 0.14/-0.16 |

**Figure S2.** X-ray crystal structure of 3t
Table S2. Crystal data and structure refinement details for 3t.

| Compound                  | 3t                  |
|---------------------------|---------------------|
| Empirical formula         | C\textsubscript{22}H\textsubscript{13}F\textsubscript{2}NO     |
| Formula weight            | 345.33              |
| Temperature/K             | 150.00              |
| Crystal system            | monoclinic          |
| Space group               | C\textsubscript{2}/c  |
| a/Å                       | 24.1916(17)         |
| b/Å                       | 9.9649(5)           |
| c/Å                       | 14.5436(11)         |
| α/°                       | 90.00               |
| β/°                       | 112.784(3)          |
| γ/°                       | 90.00               |
| Volume/Å\textsuperscript{3} | 3232.4(4)          |
| Z                         | 8                   |
| ρ\textsubscript{calc}/cm\textsuperscript{3} | 1.419              |
| μ:mm\textsuperscript{-1}  | 0.103               |
| F(000)                    | 1424.0              |
| Crystal size/mm\textsuperscript{3} | 0.2 × 0.15 × 0.12 |
| Radiation                 | MoKα (λ = 0.71073) |
| 2Θ range for data collection/° | 4.476 to 52.93 |
| Index ranges              | -30 ≤ h ≤ 30, -12 ≤ k ≤ 12, -18 ≤ l ≤ 18 |
| Reflections collected     | 28476               |
| Independent reflections   | 3311 [R\textsubscript{int} = 0.0705, R\textsubscript{sigma} = 0.0334] |
| Data/restraints/parameters | 3311/0/235          |
| Goodness-of-fit on F\textsuperscript{2} | 1.105               |
| Final R indexes [I≥2σ (I)] | R\textsubscript{1} = 0.0425, wR\textsubscript{2} = 0.1029 |
Final R indexes [all data]  
R<sub>1</sub> = 0.0563, wR<sub>2</sub> = 0.1139

Largest diff. peak/hole / e Å<sup>-3</sup>  
0.24/-0.18

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![X-ray crystal structure of 4h](image)

**Figure S3.** X-ray crystal structure of 4h

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**Table S3.** Crystal data and structure refinement details for 4h.

| Compound | 4h |
|----------|----|
| Empirical formula | C<sub>25</sub>H<sub>30</sub>N<sub>2</sub>O<sub>2</sub> |
| Formula weight | 390.51 |
| Temperature/K | 296.15 |
| Crystal system | tetragonal |
| Space group | P-42<sub>1</sub>/c |
| a/Å | 20.1920(8) |
| b/Å | 20.1920(8) |
| c/Å | 11.0430(5) |
| α/° | 90.00 |
| β/° | 90.00 |
| γ/° | 90.00 |
| Volume/Å<sup>3</sup> | 4502.4(4) |
| Z | 8 |
| ρ<sub>calc</sub>g/cm<sup>3</sup> | 1.152 |
| μ/mm<sup>-1</sup> | 0.073 |
| F(000) | 1680.0 |
Radiation
MoKα (λ = 0.71073)
2Θ range for data collection/°
5.468 to 49.998
Index ranges
-23 ≤ h ≤ 23, -17 ≤ k ≤ 24, -13 ≤ l ≤ 13
Reflections collected
21458
Independent reflections
3966 [Rint = 0.1637, Rsigma = 0.1123]
Data/restraints/parameters
3966/0/265
Goodness-of-fit on F²
0.952
Final R indexes [I>=2σ (I)]
R₁ = 0.0709, wR₂ = 0.1481
Final R indexes [all data]
R₁ = 0.1518, wR₂ = 0.1737
Largest diff. peak/hole / e Å⁻³
0.14/-0.14
Flack parameter
-1.4(10)

5. Analytical data

\[
\begin{align*}
\text{11-}(\text{difluoromethylene})-10\text{b}-\text{methyl}-10\text{b},11-\text{dihydro-6H-isoindolo[2,1-} \alpha \text{]indol-6-one (3a):}\text{ New compound. 44.7 mg, 79% yield. White solid. m.p.}: 98.5-99.1^\circ\text{C. }^{1}\text{H NMR (400 MHz, CDCl}_3\text{): }\delta \text{ 7.86 (d, J = 7.7 Hz, 1H), 7.78-7.69 (m, 2H), 7.65 (td, J = 7.5, 1.2 Hz, 1H), 7.51 (td, J = 7.4, 1.1 Hz, 1H), 7.41 (d, J = 7.7 Hz, 1H), 7.35 (td, J = 7.7, 1.3 Hz, 1H), 7.16 (td, J = 7.6, 1.1 Hz, 1H), 1.79 (s, 3H); }^{13}\text{C NMR (100 MHz, CDCl}_3\text{): }\delta \text{ 169.8, 152.2 (dd, J = 295.1, 288.5 Hz), 148.7, 140.2 (d, J = 5.4 Hz), 133.7 (d, J = 1.7 Hz), 132.0, 129.4, 129.3, 127.6 (dd, J = 6.0, 3.9 Hz), 125.3, 125.2, 123.9 (dd, J = 9.5, 2.2 Hz), 123.7 (d, J = 9.5 Hz), 117.5, 96.7 (dd, J = 25.1, 18.5 Hz), 71.7 (dd, J = 5.0, 3.5 Hz), 28.0 (t, J = 2.9 Hz); }^{19}\text{F NMR (376 MHz, CDCl}_3\text{): }\delta \text{ -84.30 (d, J = 45.2 Hz), -85.00 (d, J = 45.3 Hz). HRMS (ESI) m/z Calcd for C}_{17}\text{H}_{12}\text{F}_2\text{NO [M+H: }^+\text{]: 284.0882; Found: 284.0880.}
\end{align*}
\]
3-chloro-11-((difluoromethylene)-10b-methyl-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3b): New compound. 25.4 mg, 40% yield. Light yellow solid. m.p.: 149.7-150.7 °C. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.88 (d, $J = 7.6$ Hz, 1H), 7.74 (d, $J = 2.1$ Hz, 1H), 7.73-7.63 (m, 2H), 7.53 (td, $J = 7.5, 1.5$ Hz, 1H), 7.31 (d, $J = 8.3$ Hz, 1H), 7.14 (dd, $J = 8.3, 2.0$ Hz, 1H), 1.79 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 169.7, 152.3 (dd, $J = 293.5, 287.6$ Hz), 148.6, 141.1 (d, $J = 6.6$ Hz), 135.0 (t, $J = 2.9$ Hz), 134.0 (d, $J = 1.8$ Hz), 131.5, 129.5, 126.2 (dd, $J = 5.9, 3.7$ Hz), 125.5, 125.4, 124.5 (dd, $J = 9.5, 2.6$ Hz), 123.7 (d, $J = 9.2$ Hz), 117.9, 96.2 (dd, $J = 25.7, 18.7$ Hz), 72.2 (dd, $J = 4.8, 3.3$ Hz), 28.1 (t, $J = 2.8$ Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) $\delta$ -83.86 (d, $J = 44.3$ Hz), -84.20 (d, $J = 44.3$ Hz). HRMS (ESI) m/z Calcd for C$_{17}$H$_{11}$ClF$_2$NO [M+H]$^+$: 318.0492; Found: 318.0489.

2-chloro-11-((difluoromethylene)-10b-methyl-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3c): New compound. 22.2 mg, 35% yield. Light yellow oil. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.87 (d, $J = 7.7$ Hz, 1H), 7.73-7.62 (m, 3H), 7.54 (t, $J = 8.1$ Hz, 1H), 7.38 (d, $J = 2.6$ Hz, 1H), 7.32 (dd, $J = 8.4, 2.3$ Hz, 1H), 1.79 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 169.8, 152.4 (dd, $J = 294.6, 288.4$ Hz), 148.5, 138.8 (d, $J = 5.5$ Hz), 133.9 (d, $J = 1.8$ Hz), 131.6, 130.8, 129.6, 129.4 (t, $J = 2.4$ Hz), 125.4, 124.0 (dd, $J = 9.9, 2.6$ Hz), 123.7, 123.6, 118.3, 96.3 (dd, $J = 26.0, 18.3$ Hz), 72.1 (dd, $J = 4.3, 3.3$ Hz), 28.0 (t, $J = 2.9$ Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) $\delta$ -83.86 (d, $J = 44.3$ Hz), -84.20 (d, $J = 44.3$ Hz). HRMS (ESI) m/z Calcd for C$_{17}$H$_{11}$ClF$_2$NO [M+H]$^+$: 318.0492; Found: 318.0490.
11-(difluoromethylene)-2-fluoro-10b-methyl-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3d): New compound. 17.1 mg, 28% yield. Light yellow oil. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.87 (d, $J = 7.6$ Hz, 1H), 7.73-7.63 (m, 3H), 7.53 (td, $J = 7.3$, 1.4 Hz, 1H), 7.12 (dd, $J = 8.5$, 1.6 Hz, 1H), 7.05 (td, $J = 8.8$, 2.6 Hz, 1H), 1.80 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 170.0, 160.6 (d, $J = 243.2$ Hz), 152.4 (dd, $J = 296.6$, 289.8 Hz), 148.5, 136.4 (d, $J = 5.8$ Hz), 133.8, 131.8, 129.5, 129.2 (dd, $J = 9.8$, 5.3 Hz), 125.3, 123.6 (d, $J = 9.2$ Hz), 118.4 (d, $J = 8.8$ Hz), 116.1 (d, $J = 23.8$ Hz), 111.2 (dd, $J = 25.9$, 9.4 Hz), 96.8 (dd, $J = 27.1$, 16.6 Hz), 72.3 (t, $J = 4.0$ Hz), 27.9 (t, $J = 2.9$ Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) $\delta$ -83.09 (dd, $J = 41.8$, 1.4 Hz), -83.54 (d, $J = 42.0$ Hz), -116.95 (d, $J = 1.6$ Hz). HRMS (ESI) m/z Calcd for C$_{17}$H$_{13}$F$_3$NO [M+H]$^+$: 302.0787; Found: 302.0784.

11-(difluoromethylene)-2,10b-dimethyl-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3e): New compound. 44.5 mg, 75% yield. Light yellow oil. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.85 (d, $J = 7.6$ Hz, 1H), 7.70 (dd, $J = 7.8$, 4.2 Hz, 1H), 7.63 (t, $J = 8.6$ Hz, 2H), 7.49 (t, $J = 7.4$ Hz, 1H), 7.24 (d, $J = 13.0$ Hz, 1H), 7.16 (d, $J = 8.3$ Hz, 1H), 2.35 (s, 3H), 2.07 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 169.9, 152.1 (dd, $J = 295.3$, 288.3 Hz), 148.7, 137.9 (d, $J = 5.5$ Hz), 135.1, 133.5 (d, $J = 2.2$ Hz), 132.0, 130.0 (t, $J = 2.4$ Hz), 129.3, 127.7 (dd, $J = 6.2$, 4.0 Hz), 125.1, 124.4 (dd, $J = 9.4$, 2.4 Hz), 123.6 (d, $J = 9.5$ Hz), 117.2, 96.7 (dd, $J = 24.9$, 18.3 Hz), 71.9 (dd, $J = 5.1$, 3.3 Hz), 27.9 (t, $J = 2.8$ Hz), 21.4; $^{19}$F NMR (376 MHz, CDCl$_3$) $\delta$ -84.41 (d, $J = 45.6$ Hz), -85.24 (d, $J = 46.3$ Hz). HRMS (ESI) m/z Calcd for C$_{18}$H$_{14}$F$_2$NO [M+H]$^+$: 298.1038; Found: 298.1033.
11-(difluoromethylene)-2-methoxy-10b-methyl-10b,11-dihydro-6H-isoindolo[2,1-
α]indol-6-one (3f): New compound. 36.2 mg, 58% yield. Light yellow oil. $^1$H NMR
(400 MHz, CDCl$_3$) δ 7.85 (d, $J = 7.6$ Hz, 1H), 7.70 (dd, $J = 7.8$, 4.3 Hz, 1H), 7.67-7.60
(m, 2H), 7.51 (t, $J = 7.4$ Hz, 1H), 6.96 (s, 1H), 6.90 (dd, $J = 8.6$, 2.6 Hz, 1H), 3.81 (s, 3H), 1.78 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 170.0, 157.7, 152.2 ($dd$, $J = 293.8$
, 287.3 Hz), 148.6, 133.9 (d, $J = 5.5$ Hz), 133.5 (d, $J = 1.8$ Hz), 132.1, 129.3, 128.9 (dd,
$J = 5.9$, 4.0 Hz), 125.1, 123.6 (d, $J = 9.5$ Hz), 118.1, 114.8 (t, $J = 2.4$ Hz), 109.7 (dd, $J$
= 9.4, 2.0 Hz), 97.0 (dd, $J = 25.1$, 17.8 Hz), 72.1 (dd, $J = 5.1$, 3.3 Hz), 55.9, 27.8 (t, $J =$
2.8 Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) δ -83.91 (d, $J = 45.0$ Hz), -84.75 (d, $J = 44.3$ Hz).
HRMS (ESI) m/z Calcd for C$_{18}$H$_{14}$F$_2$NO$_2$ [M+H]$^+$: 314.0987; Found: 314.0982.

9-chloro-11-(difluoromethylene)-10b-methyl-10b,11-dihydro-6H-isoindolo[2,1-
α]indol-6-one (3g): New compound. 35.4 mg, 56% yield. White solid. m.p.: 170.5-
171.5 ℃. $^1$H NMR (400 MHz, CDCl$_3$) δ 7.80 (d, $J = 8.2$ Hz, 1H), 7.72 (d, $J = 7.8$
Hz, 1H), 7.69 (dd, $J = 3.8$, 1.7 Hz, 1H), 7.50 (dd, $J = 8.2$, 1.7 Hz, 1H), 7.42 (d, $J = 7.7$
Hz, 1H), 7.36 (td, $J = 7.7$, 1.3 Hz, 1H), 7.18 (td, $J = 7.6$, 1.2 Hz, 1H), 1.79 (s, 3H); $^{13}$C
NMR (100 MHz, CDCl$_3$) δ 168.7, 152.2 (dd, $J = 294.2$, 286.6 Hz), 150.2, 140.1 (d, $J$
= 1.8 Hz), 140.0 (d, $J = 4.4$ Hz), 130.5, 130.0, 129.5 (t, $J = 2.6$ Hz), 127.3 (dd, $J = 6.1$
, 3.9 Hz), 126.4, 125.6, 124.2 (d, $J = 9.9$ Hz), 124.0 (dd, $J = 9.2$, 2.2 Hz), 117.5, 96.4 (dd,
$J = 24.9$, 19.1 Hz), 71.4 (dd, $J = 5.1$, 3.7 Hz), 27.9 (t, $J = 2.9$ Hz); $^{19}$F NMR (376 MHz,
CDCl$_3$) δ -83.88 (d, $J = 45.6$ Hz), -84.60 (d, $J = 45.6$ Hz). HRMS (ESI) m/z Calcd for
C$_{17}$H$_{11}$ClF$_2$NO [M+H]$^+$: 318.0492; Found: 318.0490.
8-chloro-11-(difluoromethylene)-10b-methyl-10b,11-dihydro-6H-isoindolo[2,1-
a]indol-6-one (3h): New compound. 33.6 mg, 53% yield. Colorless oil. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.83 (d, $J = 1.7$ Hz, 1H), 7.72 (d, $J = 7.8$ Hz, 1H), 7.68-7.57 (m, 2H), 7.42 (d, $J = 7.7$ Hz, 1H), 7.37 (td, $J = 7.7$, 1.3 Hz, 1H), 7.19 (td, $J = 7.6$, 1.2 Hz, 1H), 1.79 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 168.3, 152.2 (dd, $J = 295.6$, 288.3 Hz), 146.8, 139.9 (d, $J = 4.0$ Hz), 135.7, 133.9, 133.7 (d, $J = 1.8$ Hz), 129.5 (t, $J = 2.5$ Hz), 127.5 (dd, $J = 5.9$, 3.7 Hz), 125.6, 125.1, 125.0 (d, $J = 9.5$ Hz), 124.0 (dd, $J = 9.2$, 2.2 Hz), 117.5, 96.5 (dd, $J = 25.3$, 18.7 Hz), 71.5 (dd, $J = 5.1$, 3.3 Hz), 27.9 (t, $J = 2.8$ Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) $\delta$ -84.27 (d, $J = 45.6$ Hz), -84.76 (d, $J = 45.6$ Hz). HRMS (ESI) m/z Calcd for C$_{17}$H$_{11}$ClF$_2$NO [M+H]$^+$: 318.0492; Found: 318.0490.

7-chloro-11-(difluoromethylene)-10b-methyl-10b,11-dihydro-6H-isoindolo[2,1-
a]indol-6-one (3i): New compound. 30.6 mg, 48% yield. White solid. m.p.: 131.4-
132.2 $^\circ$C. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.75 (d, $J = 7.1$ Hz, 1H), 7.63 (ddd, $J = 7.7$, 4.0, 1.1 Hz, 1H), 7.57 (t, $J = 7.8$ Hz, 1H), 7.45 (d, $J = 7.8$ Hz, 1H), 7.41 (d, $J = 7.7$ Hz, 1H), 7.36 (td, $J = 7.8$, 1.3 Hz, 1H), 7.18 (td, $J = 7.6$, 1.2 Hz, 1H), 1.79 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) 167.5, 152.2 (dd, $J = 295.6$, 288.7 Hz), 151.1, 140.2 (d, $J = 4.8$ Hz), 134.3 (d, $J = 1.8$ Hz), 132.8, 131.0, 129.5 (t, $J = 2.6$ Hz), 128.0, 127.4 (dd, $J = 6.1$, 3.9 Hz), 125.6, 123.9 (dd, $J = 9.5$, 2.2 Hz), 122.2 (d, $J = 10.3$ Hz), 117.7, 96.7 (dd, $J = 4.8$, 18.9 Hz), 70.4 (dd, $J = 5.1$, 3.3 Hz), 28.1 (t, $J = 2.8$ Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) $\delta$ -83.93 (d, $J = 45.0$ Hz), -84.51 (d, $J = 45.6$ Hz). HRMS (ESI) m/z Calcd for C$_{17}$H$_{11}$ClF$_2$NO [M+H]$^+$: 318.0492; Found: 318.0489.
11-[(difluoromethylene)]-8-fluoro-10b-methyl-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3j): New compound. 21.0 mg, 35% yield. Light yellow oil. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.73 (d, $J$ = 7.9 Hz, 1H), 7.68 (dt, $J$ = 8.4, 4.2 Hz, 1H), 7.52 (dd, $J$ = 7.4, 2.5 Hz, 1H), 7.42 (d, $J$ = 7.7 Hz, 1H), 7.39-7.30 (m, 2H), 7.19 (td, $J$ = 7.6, 1.2 Hz, 1H), 1.79 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 168.5 (d, $J$ = 3.3 Hz), 163.4 (d, $J$ = 249.7 Hz), 152.2 (dd, $J$ = 295.4, 288.2 Hz), 144.2 (d, $J$ = 2.4 Hz), 139.9 (d, $J$ = 4.4 Hz), 134.4 (d, $J$ = 8.5 Hz), 129.5 (t, $J$ = 2.3 Hz), 127.6 (dd, $J$ = 5.8, 3.7 Hz), 125.6, 125.4 (t, $J$ = 8.9 Hz), 124.0 (dd, $J$ = 9.2, 2.2 Hz), 121.1 (dd, $J$ = 23.6, 1.6 Hz), 117.5, 111.7 (d, $J$ = 23.3 Hz), 96.7 (dd, $J$ = 25.0, 18.5 Hz), 71.5 (dd, $J$ = 4.9, 3.3 Hz), 28.0 (t, $J$ = 2.6 Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) $\delta$ -84.52 (dd, $J$ = 45.7, 4.0 Hz), -84.94 (d, $J$ = 45.6 Hz), -111.37 (td, $J$ = 8.0, 4.2 Hz). HRMS (ESI) m/z Calcd for C$_{17}$H$_{11}$F$_3$NO $[M+H]^+$: 302.0787; Found: 302.0783.

11-[(difluoromethylene)]-10b-methyl-8-(trifluoromethyl)-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3k): New compound. 29.6 mg, 42% yield. Light yellow oil. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 8.14 (s, 1H), 7.92 (dd, $J$ = 8.2, 1.7 Hz, 1H), 7.86 (dd, $J$ = 8.1, 3.9 Hz, 1H), 7.75 (d, $J$ = 7.9 Hz, 1H), 7.43 (d, $J$ = 7.7 Hz, 1H), 7.38 (td, $J$ = 7.7, 1.2 Hz, 1H), 7.21 (td, $J$ = 7.6, 1.1 Hz, 1H), 1.83 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 168.2, 152.2 (dd, $J$ = 295.8, 288.2 Hz), 151.7, 139.8 (d, $J$ = 5.5 Hz), 133.1, 132.2 (q, $J$ = 33.3 Hz), 130.4 (dd, $J$ = 3.5, 1.7 Hz), 129.6 (t, $J$ = 2.3 Hz), 127.4 (dd, $J$ = 5.9, 3.7 Hz), 125.8, 124.5 (d, $J$ = 9.9 Hz), 124.1 (dd, $J$ = 9.3, 2.1 Hz), 123.6 (q, $J$ = 272.8 Hz), 122.5 (q, $J$ = 3.9 Hz), 117.6, 96.4 (dd, $J$ = 25.0, 19.1 Hz), 71.8 (dd, $J$ = 4.8,
11-(difluoromethylene)-9-fluoro-8,10b-dimethyl-10b,11-dihydro-6H-
isoindolo[2,1-a]indol-6-one (3l): New compound. 44.7 mg, 71% yield. White solid.
m.p.: 120.2-122.2 °C. $^1$H NMR (400 MHz, CDCl$_3$) δ 7.70 (dd, $J = 6.6$, 5.0 Hz, 2H),
7.41 (d, $J = 7.7$ Hz, 1H), 7.38-7.29 (m, 2H), 7.17 (td, $J = 7.6$, 1.1 Hz, 1H), 2.35 (d, $J =
2.2$ Hz, 3H), 1.77 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 169.2, 164.9 (dd, $J = 253.4$
, 1.2 Hz), 152.2 (dd, $J = 295.5$, 288.1 Hz), 148.6 (d, $J = 9.8$ Hz), 140.3 (d, $J = 5.4$ Hz),
129.5 (t, $J = 2.3$ Hz), 128.1 (d, $J = 6.9$ Hz), 127.6 (d, $J = 2.5$ Hz), 127.3 (d, $J = 5.8$
, 3.7 Hz), 127.3 (d, $J = 19.2$ Hz), 125.4, 124.0 (dd, $J = 9.2$, 2.2 Hz), 117.4, 110.7 (dd, $J$
= 25.8, 9.4 Hz), 96.6 (dd, $J = 25.0$, 18.6 Hz), 71.1 (ddd, $J = 5.1$, 3.3, 2.9 Hz), 27.9 (t, $J$
= 2.7 Hz), 14.9 (d, $J = 4.0$ Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) δ -84.52 (d, $J = 46.3$ Hz),
-84.97 (d, $J = 46.3$ Hz). HRMS (ESI) m/z Calcd for C$_{18}$H$_{13}$F$_3$NO [M+H]$^+$: 316.0944;
Found: 316.0940.

11-(difluoromethylene)-8,10b-dimethyl-10b,11-dihydro-6H-isoindolo[2,1-a]indol-
6-one (3m): New compound. 41.8 mg, 70% yield. Light yellow oil. $^1$H NMR (400
MHz, CDCl$_3$) δ 7.73 (d, $J = 7.9$ Hz, 1H), 7.66 (s, 1H), 7.59 (dd, $J = 7.9$, 4.4 Hz, 1H),
7.47 (d, $J = 7.8$ Hz, 1H), 7.41 (d, $J = 7.7$ Hz, 1H), 7.35 (t, $J = 7.8$ Hz, 1H), 7.17 (t, $J$
= 7.6 Hz, 1H), 2.45 (s, 3H), 1.77 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 170.1, 152.2
(dd, $J = 293.4$, 286.8 Hz), 146.1, 140.3 (d, $J = 5.4$ Hz), 139.6, 134.7 (d, $J = 1.4$ Hz),
132.1, 129.3 (t, J = 2.3 Hz), 127.7 (dd, J = 5.9, 3.9 Hz), 125.3, 125.3, 123.9 (dd, J = 9.3, 2.1 Hz), 123.4 (d, J = 9.1 Hz), 117.5, 96.8 (dd, J = 25.2, 18.2 Hz), 71.6 (dd, J = 5.0, 3.5 Hz), 28.0 (t, J = 2.9 Hz), 21.4; 19F NMR (376 MHz, CDCl$_3$) δ -84.55 (d, J = 45.6 Hz), -85.23 (d, J = 45.6 Hz).

HRMS (ESI) m/z Calcd for C$_{18}$H$_{14}$F$_2$NO [M+H]$^+$: 298.1038; Found: 298.1035.

11-(difluoromethylene)-7,10b-dimethyl-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3n): New compound. 49.9 mg, 84% yield. Light yellow oil. $^1$H NMR (400 MHz, CDCl$_3$) δ 7.73 (d, J = 7.9 Hz, 1H), 7.57-7.47 (m, 2H), 7.40 (d, J = 7.7 Hz, 1H), 7.34 (t, J = 7.8 Hz, 1H), 7.24 (d, J = 7.5 Hz, 1H), 7.15 (t, J = 7.6 Hz, 1H), 2.70 (s, 3H), 1.77 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 170.9, 152.3 (dd, J = 294.9, 288.7 Hz), 149.4, 140.6 (d, J = 5.4 Hz), 139.6, 133.2 (d, J = 1.6 Hz), 131.3, 129.3 (t, J = 2.5 Hz), 128.8, 127.6 (dd, J = 6.0, 3.9 Hz), 125.2, 123.9 (dd, J = 9.6, 2.3 Hz), 121.1 (d, J = 9.7 Hz), 117.5, 97.0 (dd, J = 24.8, 18.3 Hz), 70.8 (dd, J = 5.0, 3.7 Hz), 28.1 (t, J = 2.8 Hz), 17.8; $^{19}$F NMR (376 MHz, CDCl$_3$) δ -84.26 (d, J = 45.9 Hz), -84.97 (d, J = 45.8 Hz). HRMS (ESI) m/z Calcd for C$_{18}$H$_{14}$F$_2$NO [M+H]$^+$: 298.1038; Found: 298.1036.

11-(difluoromethylene)-10,10b-dimethyl-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3o): New compound. 10.2 mg, 17% yield. White solid. m.p.: 92.0-94.5 °C. $^1$H NMR (400 MHz, CDCl$_3$) δ 7.78-7.68 (m, 2H), 7.49-7.41 (m, 3H), 7.37 (td, J = 7.8, 1.3 Hz, 1H), 7.20 (td, J = 7.7, 1.1 Hz, 1H), 2.61 (d, J = 5.1 Hz, 3H), 1.90 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 169.2, 151.1 (dd, J = 291.3, 289.2 Hz), 144.0, 139.0 (d, J = 5.3 Hz), 136.5, 135.1, 133.2, 129.6, 129.4 (t, J = 4.8 Hz), 129.2 (t, J = 1.9 Hz).
Hz), 125.5, 124.3 (dd, J = 10.3, 1.8 Hz), 122.9, 118.4, 97.1 (dd, J = 23.9, 19.1 Hz), 73.1 (dd, J = 4.9, 2.8 Hz), 26.2 (t, J = 2.7 Hz), 19.8 (d, J = 16.2 Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) δ -81.56 (d, J = 43.0 Hz), -85.46 (d, J = 42.9 Hz). HRMS (ESI) m/z Calcd for C$_{18}$H$_{14}$F$_2$NO [M+H]$^+$: 298.1038; Found: 298.1035.

$^{1}$H NMR (400 MHz, CDCl$_3$) δ 7.74 (dd, J = 7.0, 2.1 Hz, 1H), 7.64 (d, J = 8.3 Hz, 1H), 7.49-7.42 (m, 2H), 7.40 (t, J = 1.8 Hz, 1H), 7.34 (dd, J = 8.4, 2.1 Hz, 1H), 2.60 (d, J = 5.1 Hz, 3H), 1.89 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 169.2, 151.4 (dd, J = 294.3, 292.5 Hz), 143.8, 137.6 (d, J = 5.3 Hz), 136.8, 135.2, 132.9, 131.1 (t, J = 5.0 Hz), 131.0, 129.8, 129.2 (t, J = 1.9 Hz), 124.3 (dd, J = 11.0, 1.8 Hz), 123.0, 119.2, 96.7 (dd, J = 24.9, 18.8 Hz), 73.4 (dd, J = 4.6, 2.8 Hz), 26.2 (t, J = 2.6 Hz), 19.7 (d, J = 16.0 Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) δ -80.09 (d, J = 39.1 Hz), -83.68 (d, J = 39.3 Hz). HRMS (ESI) m/z Calcd for C$_{18}$H$_{14}$ClF$_2$NO [M+H]$^+$: 332.0648; Found: 332.0645.

$^{1}$H NMR (400 MHz, CDCl$_3$) δ 8.32 (t, J = 9.0 Hz, 1H), 8.05-7.99 (m, 2H), 7.90 (d, J = 8.3 Hz, 1H), 7.77 (d, J = 7.0 Hz, 1H), 7.71-7.63 (m, 2H), 7.47 (d, J = 7.7 Hz, 1H), 7.40 (td, J = 7.7, 1.3 Hz, 1H), 7.21 (td, J = 7.6, 1.1 Hz, 1H), 2.10 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 169.3, 152.1 (t, J = 293.2 Hz), 145.0, 138.9 (d, J = 5.4 Hz), 136.9, 131.5, 131.0, 129.7, 129.4 (dd, J = 5.3, 4.4 Hz), 129.3 (t, J = 1.8 Hz), 128.5, 128.0, 124.3 (dd, J = 10.3, 1.8 Hz), 122.9, 118.4, 97.1 (dd, J = 23.9, 19.1 Hz), 73.1 (dd, J = 4.9, 2.8 Hz), 26.2 (t, J = 2.7 Hz), 19.8 (d, J = 16.2 Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) δ -81.56 (d, J = 43.0 Hz), -85.46 (d, J = 42.9 Hz). HRMS (ESI) m/z Calcd for C$_{18}$H$_{14}$ClF$_2$NO [M+H]$^+$: 332.0648; Found: 332.0645.
128.1, 126.9 (d, J = 1.3 Hz), 125.9 (d, J = 14.5 Hz), 125.5, 124.4 (dd, J = 10.6, 1.7 Hz), 120.5, 118.2, 97.1 (dd, J = 23.6, 19.7 Hz), 73.5 (dd, J = 4.9, 2.5 Hz), 27.7 (t, J = 2.6 Hz); \(^{19}F\) NMR (376 MHz, CDCl\(_3\)) \(\delta\) -77.47 (d, J = 41.3 Hz), -84.18 (d, J = 41.1 Hz).

HRMS (ESI) m/z Calcd for C\(_{21}\)H\(_{14}\)F\(_2\)NO [M+H]\(^+\): 334.1038; Found: 334.1033.

11-(difluoromethylene)-10b-phenyl-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3t): New compound. 23.4 mg, 34% yield. White solid. m.p.: 141.4-142.5 °C. \(^1H\) NMR (400 MHz, CDCl\(_3\)) \(\delta\) 7.92 (d, J = 7.6 Hz, 1H), 7.73 (d, J = 7.9 Hz, 1H), 7.60 (d, J = 4.6 Hz, 2H), 7.55-7.49 (m, 1H), 7.44 (dd, J = 14.4, 7.0 Hz, 3H), 7.36-7.26 (m, 4H), 7.17 (t, J = 7.6 Hz, 1H); \(^{13}C\) NMR (100 MHz, CDCl\(_3\)) \(\delta\) 169.9, 152.8 (dd, J = 295.4, 289.7 Hz), 147.8, 140.7 (t, J = 2.8 Hz), 140.1 (d, J = 5.3 Hz), 133.7 (d, J = 1.3 Hz), 132.2, 129.5, 129.0, 128.5, 128.6, 125.6, 125.6, 125.3 (d, J = 9.2 Hz), 125.1, 123.9 (dd, J = 9.3, 1.8 Hz), 117.8, 95.9 (dd, J = 23.9, 20.0 Hz); \(^{19}F\) NMR (376 MHz, CDCl\(_3\)) \(\delta\) -80.96 (d, J = 41.4 Hz), -84.67 (d, J = 41.2 Hz). HRMS (ESI) m/z Calcd for C\(_{22}\)H\(_{14}\)F\(_2\)NO [M+H]\(^+\): 346.1038; Found: 346.1034.

11-(difluoromethylene)-10b-(4-fluorophenyl)-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3u): New compound. 37.0 mg, 51% yield. Light yellow oil. \(^1H\) NMR (400 MHz, CDCl\(_3\)) \(\delta\) 7.92 (d, J = 7.6 Hz, 1H), 7.73 (d, J = 7.8 Hz, 1H), 7.65-7.51 (m, 3H), 7.46 (d, J = 7.7 Hz, 1H), 7.41-7.32 (m, 3H), 7.18 (td, J = 7.6, 1.1 Hz, 1H), 7.03-6.92 (m, 2H); \(^{13}C\) NMR (100 MHz, CDCl\(_3\)) \(\delta\) 169.8, 162.8 (d, J = 248.3 Hz), 152.7 (dd, J = 295.8, 289.8 Hz), 147.6, 140.0 (d, J = 5.3 Hz), 136.4 (q, J = 3.0 Hz), 133.9 (d, J = 1.4 Hz), 132.1, 129.7, 129.6 (t, J = 2.1 Hz), 128.4 (dd, J = 5.7, 3.8 Hz), 127.6 (d, J =
8.4 Hz), 125.7, 125.2 (t, J = 4.7 Hz), 123.9 (dd, J = 9.3, 1.9 Hz), 117.8, 115.9 (d, J = 21.7 Hz), 96.0 (dd, J = 23.8, 19.9 Hz), 76.4 (dd, J = 5.3, 3.9 Hz); 19F NMR (376 MHz, CDCl3) δ -80.79 (d, J = 40.8 Hz), -84.41 (d, J = 40.8 Hz), -113.36.

HRMS (ESI) m/z Calcd for C22H13F3NO [M+H]+: 364.0944; Found: 364.0939.

10b-(3-chlorophenyl)-11-(difluoromethylene)-10b,11-dihydro-6H-isindololo[2,1-alindol-6-one (3v): New compound. 21.3 mg, 28% yield. Light yellow oil. 1H NMR (400 MHz, CDCl3) δ 7.92 (d, J = 7.6 Hz, 1H), 7.74 (d, J = 7.9 Hz, 1H), 7.63 (td, J = 7.4, 1.3 Hz, 1H), 7.60-7.56 (m, 1H), 7.54 (td, J = 7.2, 1.5 Hz, 1H), 7.45 (d, J = 7.7 Hz, 1H), 7.39-7.30 (m, 3H), 7.26-7.23 (m, 2H), 7.18 (td, J = 7.7, 1.2 Hz, 1H); 13C NMR (100 MHz, CDCl3) δ 169.8, 152.8 (dd, J = 296.1, 290.0 Hz), 147.1, 142.8 (t, J = 2.9 Hz), 140.0 (d, J = 5.2 Hz), 135.0, 133.9 (d, J = 1.3 Hz), 132.1, 130.3, 129.8, 129.7 (t, J = 2.0 Hz), 128.9, 128.3 (dd, J = 5.7, 3.8 Hz), 125.8 (d, J = 12.9 Hz), 125.3, 125.3, 125.2, 124.0 (d, J = 1.7 Hz), 123.9, 117.9, 95.8 (dd, J = 23.7, 20.2 Hz), 76.4 (dd, J = 5.5, 3.8 Hz); 19F NMR (376 MHz, CDCl3) δ -80.57 (d, J = 40.3, 4.8 Hz), -84.06 (d, J = 40.1 Hz). HRMS (ESI) m/z Calcd for C22H13ClF2NO [M+H]+: 380.0648; Found: 380.0643.

11-(difluoromethylene)-10b-(3-methoxyphenyl)-10b,11-dihydro-6H-isindololo[2,1-alindol-6-one (3w): New compound. 22.2 mg, 30% yield. White solid. m.p.: 161.1-162.7 °C. 1H NMR (400 MHz, CDCl3) δ 7.90 (d, J = 7.6 Hz, 1H), 7.73 (d, J = 7.9 Hz, 1H), 7.64-7.57 (m, 2H), 7.53-7.48 (m, 1H), 7.44 (d, J = 7.7 Hz, 1H), 7.33 (t, J = 7.8 Hz, 1H), 7.22 (t, J = 8.1 Hz, 1H), 7.16 (t, J = 7.6 Hz, 1H), 7.02 (d, J = 7.8 Hz, 1H), 6.96 (t, J = 2.3 Hz, 1H), 6.79 (dd, J = 8.3, 2.5 Hz, 1H), 3.72 (s, 3H); 13C NMR (100 MHz,
CDCl$_3$ δ 169.9, 160.0, 152.7 (dd, $J = 295.4$, 289.7 Hz), 147.6, 142.4 (t, $J = 2.9$ Hz), 140.1 (d, $J = 5.1$ Hz), 133.7 (d, $J = 1.4$ Hz), 132.2, 130.1, 129.5, 129.5 (t, $J = 2.1$ Hz), 128.6 (dd, $J = 5.7$, 3.9 Hz), 125.6, 125.3 (d, $J = 9.2$ Hz), 125.1, 123.9 (dd, $J = 9.3$, 1.8 Hz), 118.0 (d, $J = 1.1$ Hz), 117.8, 113.2, 112.3, 96.0 (dd, $J = 23.8$, 20.0 Hz), 55.4; $^{19}$F NMR (376 MHz, CDCl$_3$) δ -81.00 (dd, $J = 41.3$, 4.1 Hz), -84.66 (d, $J = 41.1$ Hz).

HRMS (ESI) m/z Calcd for C$_{23}$H$_{16}$F$_2$NO$_2$ [M+H]$^+$: 376.1144; Found: 376.1139.

11-(difluoromethylene)-8-methoxy-10b-methyl-10b-dihydro-6H-isoinindol-2,1-aldindol-6-one (3x): New compound. 51.0 mg, 81% yield. Light yellow oil. $^1$H NMR (400 MHz, CDCl$_3$) δ 7.73 (d, $J = 7.9$ Hz, 1H), 7.59 (dd, $J = 8.4$, 4.3 Hz, 1H), 7.41 (d, $J = 7.7$ Hz, 1H), 7.35 (td, $J = 7.7$, 1.3 Hz, 1H), 7.32 (d, $J = 2.6$ Hz, 1H), 7.22-7.14 (m, 2H), 3.87 (s, 3H), 1.77 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 169.8, 160.8, 152.2 (dd, $J = 295.0$, 288.2 Hz), 141.1, 140.1 (d, $J = 5.4$ Hz), 133.4, 129.3 (t, $J = 2.4$ Hz), 127.7 (dd, $J = 5.9$, 3.8 Hz), 125.3, 124.5 (d, $J = 9.2$ Hz), 124.0 (dd, $J = 9.4$, 2.2 Hz), 121.9 (d, $J = 1.8$ Hz), 117.5, 107.5, 96.8 (dd, $J = 25.3$, 18.0 Hz), 71.4 (dd, $J = 5.1$, 3.4 Hz), 55.8, 27.9 (t, $J = 2.8$ Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) δ -84.79 (d, $J = 45.8$ Hz), -85.37 (d, $J = 45.8$ Hz). HRMS (ESI) m/z Calcd for C$_{18}$H$_{14}$F$_2$NO$_2$ [M+H]$^+$: 314.0987; Found: 314.0984.

11-(difluoromethylene)-8-methoxy-2,10b-dimethyl-10b,11-dihydro-6H-isoinindol-2,1-aldindol-6-one (3y): New compound. 55.6 mg, 85% yield. Light yellow oil. $^1$H NMR (400 MHz, CDCl$_3$) δ 7.63-7.54 (m, 2H), 7.32 (d, $J = 2.6$ Hz, 1H), 7.22 (s, 1H), 7.19 (dd, $J = 8.5$, 2.5 Hz, 1H), 7.16 (d, $J = 8.1$ Hz, 1H), 3.86 (s, 3H), 2.36 (s, 3H), 2.05 (s, 3H).
11-(difluoromethylene)-2,8-dimethoxy-10b-methyl-10b,11-dihydro-6H-
isoindolo[2,1-a]indol-6-one (3z): New compound. 47.3 mg, 69% yield. Light yellow oil. 1H NMR (400 MHz, CDCl3) δ 7.63 (d, J = 8.6 Hz, 1H), 7.57 (dd, J = 8.5, 4.4 Hz, 1H), 7.31 (d, J = 2.5 Hz, 1H), 7.18 (dd, J = 8.5, 2.5 Hz, 1H), 6.95 (d, J = 2.6 Hz, 1H), 6.89 (dd, J = 8.6, 2.6 Hz, 1H), 3.85 (s, 3H), 3.80 (s, 3H), 1.75 (s, 3H); 13C NMR (100 MHz, CDCl3) δ 169.9, 160.8, 157.7, 152.1 (dd, J = 294.4, 287.7 Hz), 140.9, 133.9 (d, J = 5.4 Hz), 133.5, 129.0 (dd, J = 5.2, 4.4 Hz), 124.5 (d, J = 9.2 Hz), 121.7, 118.1, 114.7, 109.7 (d, J = 9.2 Hz), 107.5, 97.1 (dd, J = 25.3, 17.3 Hz), 71.8 (dd, J = 4.6, 3.6 Hz), 55.8, 55.8, 27.7 (t, J = 2.7 Hz); 19F NMR (376 MHz, CDCl3) δ -84.42 (d, J = 45.6 Hz), -85.11 (d, J = 45.0 Hz). HRMS (ESI) m/z Calcd for C19H16F2NO3 [M+H]⁺: 344.1093; Found: 344.1090.

11-(difluoromethylene)-2-fluoro-8-methoxy-10b-methyl-10b,11-dihydro-6H-
isoindolo[2,1-a]indol-6-one (3aa): New compound. 27.2 mg, 41% yield. Light yellow oil. 1H NMR (400 MHz, CDCl3) δ 7.66 (dd, J = 8.6, 4.7 Hz, 1H), 7.58 (dd, J = 8.5, 4.2 Hz, 1H), 7.32 (d, J = 2.5 Hz, 1H), 7.21 (dd, J = 8.5, 2.5 Hz, 1H), 7.11 (dd, J = 8.6, 2.6 Hz, 3H); 13C NMR (100 MHz, CDCl3) δ 169.9, 160.8, 157.7, 152.1 (dd, J = 294.4, 287.7 Hz), 140.9, 133.9 (d, J = 5.4 Hz), 133.5, 129.0 (dd, J = 5.2, 4.4 Hz), 124.5 (d, J = 9.2 Hz), 121.7, 118.1, 114.7, 109.7 (d, J = 9.2 Hz), 107.5, 97.1 (dd, J = 25.3, 17.3 Hz), 71.8 (dd, J = 4.6, 3.6 Hz), 55.8, 55.8, 27.7 (t, J = 2.7 Hz); 19F NMR (376 MHz, CDCl3) δ -84.42 (d, J = 45.6 Hz), -85.11 (d, J = 45.0 Hz). HRMS (ESI) m/z Calcd for C19H16F2NO3 [M+H]⁺: 344.1093; Found: 344.1090.
Hz, 1H), 7.05 (td, J = 8.9, 2.7 Hz, 1H), 3.87 (s, 3H), 1.77 (s, 3H); $^{13}\text{C NMR}$ (100 MHz, CDCl$_3$) δ 170.0, 160.9, 160.6 (d, J = 242.9 Hz), 152.3 (dd, J = 295.4, 290.4 Hz), 140.9, 136.3 (d, J = 6.9 Hz), 133.2, 129.4 (ddd, J = 9.6, 5.5, 4.0 Hz), 124.5 (d, J = 8.7 Hz), 122.1 (d, J = 1.5 Hz), 118.4 (d, J = 8.9 Hz), 116.0 (dt, J = 23.8, 2.3 Hz), 111.2 (ddd, J = 26.0, 9.1, 2.2 Hz), 107.6, 96.9 (ddd, J = 25.9, 17.6, 2.8 Hz), 71.9 (dd, J = 4.4, 3.3 Hz), 55.9, 27.8 (t, J = 2.7 Hz); $^{19}\text{F NMR}$ (376 MHz, CDCl$_3$) δ -83.61 (dd, J = 42.3, 2.5 Hz), -83.93 (dd, J = 42.2, 1.8 Hz), -116.96 (t, J = 2.0 Hz). HRMS (ESI) m/z Calcd for C$_{18}$H$_{13}$F$_3$NO$_2$ [M+H]$^+$: 332.0893; Found: 332.0889.

2-chloro-11-(difluoromethylene)-8-methoxy-10b-methyl-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3ab): New compound. 38.4 mg, 55% yield. White solid. m.p.: 138.4-138.9 °C. $^1\text{H NMR}$ (400 MHz, CDCl$_3$) δ 7.64 (d, J = 8.4 Hz, 1H), 7.58 (dd, J = 8.5, 4.1 Hz, 1H), 7.37 (s, 1H), 7.32 (d, J = 6.4 Hz, 2H), 7.22 (d, J = 8.4 Hz, 1H), 3.87 (s, 3H), 1.76 (s, 3H); $^{13}\text{C NMR}$ (100 MHz, CDCl$_3$) δ 169.8, 160.9, 152.4 (dd, J = 296.0, 290.2 Hz), 140.9, 138.8 (d, J = 4.9 Hz), 133.1, 130.7, 129.4 (dd, J = 5.1, 4.0 Hz), 129.3 (t, J = 2.4 Hz), 124.5 (d, J = 8.5 Hz), 124.0 (dd, J = 9.2, 2.4 Hz), 122.2, 118.3, 107.6, 96.5 (ddd, J = 25.6, 18.1 Hz), 71.7 (t, J = 3.7 Hz), 55.9, 28.0 (t, J = 2.8 Hz); $^{19}\text{F NMR}$ (376 MHz, CDCl$_3$) δ -83.39 (d, J = 41.9 Hz), -83.62 (d, J = 42.0 Hz). HRMS (ESI) m/z Calcd for C$_{18}$H$_{13}$ClF$_2$NO$_2$ [M+H]$^+$: 348.0597; Found: 348.0593.

11-(difluoromethylene)-9-methoxy-10b-methyl-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3ad): New compound. 45.2 mg, 72% yield. White solid. m.p.: 126.0-127.4 °C. $^1\text{H NMR}$ (400 MHz, CDCl$_3$) δ 7.77 (d, J = 8.4 Hz, 1H), 7.72 (d, J = 7.9 Hz,
1H), 7.40 (d, J = 7.7 Hz, 1H), 7.34 (td, J = 7.7, 1.2 Hz, 1H), 7.19-7.12 (m, 2H), 7.01 (dd, J = 8.5, 2.2 Hz, 1H), 3.91 (s, 3H), 1.78 (s, 3H); 13C NMR (100 MHz, CDCl3) δ 169.9, 164.4 (d, J = 1.5 Hz), 152.2 (dd, J = 295.1, 288.0 Hz), 151.2, 140.7 (d, J = 5.3 Hz), 129.3 (t, J = 2.4 Hz), 127.2 (dd, J = 5.9, 3.8 Hz), 126.7, 125.1, 124.1, 123.8 (dd, J = 9.5, 2.2 Hz), 117.3, 115.7, 108.7 (d, J = 9.9 Hz), 96.8 (dd, J = 24.9, 18.4 Hz), 71.2 (dd, J = 5.1, 3.4 Hz), 55.9, 27.9 (t, J = 2.9 Hz); 19F NMR (376 MHz, CDCl3) δ -84.40 (d, J = 46.5 Hz), -84.97 (d, J = 46.9 Hz). HRMS (ESI) m/z Calcd for C18H14F2NO2 [M+H]+: 314.0987; Found: 314.0983.

11-(difluoromethylene)-8,9-dimethoxy-10b-methyl-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3ae): New compound. 43.9 mg, 64% yield. Light yellow solid. m.p.: 183.5-184.5 °C. 1H NMR (400 MHz, CDCl3) δ 7.71 (d, J = 7.9 Hz, 1H), 7.40 (d, J = 7.7 Hz, 1H), 7.35 (t, J = 7.8 Hz, 1H), 7.28 (s, 1H), 7.18-7.11 (m, 2H), 4.02 (s, 3H), 3.94 (s, 3H), 1.79 (s, 3H); 13C NMR (100 MHz, CDCl3) δ 170.4, 154.3 (d, J = 1.4 Hz), 152.3 (dd, J = 294.7, 287.4 Hz), 150.6, 143.1, 140.7 (dd, J = 5.1, 1.2 Hz), 129.4 (t, J = 2.4 Hz), 127.4 (dd, J = 5.3, 3.3 Hz), 125.1, 123.9 (dd, J = 9.0, 2.8 Hz), 123.9, 117.4, 106.0, 105.4 (d, J = 9.3 Hz), 96.9 (dd, J = 24.7, 18.5 Hz), 71.3 (dd, J = 4.3, 2.9 Hz), 56.4, 56.4, 27.8 (t, J = 2.9 Hz); 19F NMR (376 MHz, CDCl3) δ -85.15 (d, J = 47.9 Hz), -85.39 (d, J = 48.2 Hz). HRMS (ESI) m/z Calcd for C19H16F2NO3 [M+H]+: 344.1093; Found: 344.1088.

11-(difluoromethylene)-10b-ethyl-8-methoxy-10b,11-dihydro-6H-isoindolo[2,1-a]indol-6-one (3af): New compound. 48.6 mg, 74% yield. Light yellow oil. 1H NMR
(400 MHz, CDCl$_3$) $\delta$ 7.72 (d, $J = 7.8$ Hz, 1H), 7.54 (dd, $J = 8.5, 4.2$ Hz, 1H), 7.40 (d, $J = 7.8$ Hz, 1H), 7.36-7.30 (m, 2H), 7.20 (dd, $J = 8.5, 2.5$ Hz, 1H), 7.15 (t, $J = 7.6$ Hz, 1H), 3.86 (s, 3H), 2.17 (dq, $J = 14.5, 7.3$ Hz, 1H), 2.05 (dq, $J = 14.3, 7.3$ Hz, 1H), 0.69 (t, $J = 7.3$ Hz, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 170.4, 160.8, 152.3 (dd, $J = 294.9, 288.3$ Hz), 140.8 (d, $J = 4.6$ Hz), 139.7, 134.3, 129.2 (t, $J = 2.3$ Hz), 128.3 (dd, $J = 5.8, 4.0$ Hz), 125.2, 124.6 (d, $J = 9.3$ Hz), 123.8 (dd, $J = 9.4, 2.2$ Hz), 121.8 (d, $J = 1.6$ Hz), 117.2, 107.4, 96.1 (dd, $J = 25.0, 18.0$ Hz), 74.7 (dd, $J = 4.7, 3.7$ Hz), 55.8, 33.3 (t, $J = 2.6$ Hz), 8.1; $^{19}$F NMR (376 MHz, CDCl$_3$) $\delta$ -84.59 (dd, $J = 46.3, 4.2$ Hz), -85.12 (d, $J = 46.1$ Hz). HRMS (ESI) m/z Calcd for C$_{19}$H$_{16}$F$_2$NO$_2$ [M+H]$^+$: 328.1144; Found: 328.1140.

11-(difluoromethylene)-8-methoxy-10b-phenyl-10b-dihydro-6H-isoindolo[2,1-a]indol-6-one (3ag): New compound. 43.6 mg, 58% yield. Colorless oil. $^1$H NMR (400 MHz, CDCl$_3$) 7.72 (d, $J = 7.8$ Hz, 1H), 7.49-7.42 (m, 2H), 7.42-7.37 (m, 2H), 7.36 (d, $J = 2.6$ Hz, 1H), 7.34-7.22 (m, 4H), 7.19-7.12 (m, 2H), 3.87 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 169.9, 160.9, 152.8 (dd, $J = 295.5, 289.4$ Hz), 140.8 (t, $J = 2.8$ Hz), 140.2, 140.1 (d, $J = 5.2$ Hz), 133.7, 129.4 (t, $J = 2.2$ Hz), 128.9, 128.7 (dd, $J = 5.8, 3.8$ Hz), 128.6, 126.1 (d, $J = 9.1$ Hz), 125.6, 125.6, 123.9 (dd, $J = 9.2, 2.0$ Hz), 122.0 (d, $J = 1.7$ Hz), 117.7, 107.3, 96.0 (dd, $J = 24.1, 19.5$ Hz), 76.5 (dd, $J = 5.5, 3.5$ Hz), 55.9; $^{19}$F NMR (376 MHz, CDCl$_3$) $\delta$ -81.44 (d, $J = 41.5$ Hz), -85.02 (d, $J = 41.5$ Hz). HRMS (ESI) m/z Calcd for C$_{23}$H$_{16}$F$_2$NO$_2$ [M+H]$^+$: 376.1144; Found: 376.1138.
11-(difluoro(p-tolylthio)methyl)-11-hydroxy-10b-methyl-10b,11-dihydro-6H-isooindolo[2,1-a]indol-6-one (4a): New compound. 55.6 mg, 66% yield. White solid. m.p.: 234.0-234.5 °C. $^1$H NMR (400 MHz, DMSO-$d_6$) δ 8.03 (d, $J = 7.6$ Hz, 1H), 7.80-7.72 (m, 3H), 7.64 (t, $J = 8.5$ Hz, 3H), 7.61-7.56 (m, 1H), 7.54 (td, $J = 7.6, 1.3$ Hz, 1H), 7.36-7.28 (m, 3H), 6.79 (s, 1H), 2.38 (s, 3H), 1.55 (s, 3H); $^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 166.8, 146.9, 140.3, 139.1, 136.7, 135.1 (d, $J = 3.9$ Hz), 132.9, 131.0 (t, $J = 287.2$ Hz), 130.5, 130.1, 129.0, 126.2, 124.6, 124.4 (d, $J = 5.1$ Hz), 123.8, 122.2, 117.4, 83.9 (t, $J = 26.3$ Hz), 78.8, 22.7, 20.8; $^{19}$F NMR (376 MHz, DMSO-$d_6$) δ -71.59 (d, $J = 209.8$ Hz), -74.25 (d, $J = 210.1$ Hz). HRMS (ESI) m/z Calcd for C$_{24}$H$_{20}$F$_2$NO$_2$S $[M+H]^+$: 424.1177; Found: 424.1174.

11-(difluoro(p-tolylthio)methyl)-10b-methyl-10b,11-dihydro-6H-isooindolo[2,1-a]indol-6-one (4b): New compound. 69.4 mg, 85% yield. White solid. m.p.: 190.0-190.9 °C. $^1$H NMR (400 MHz, CDCl$_3$) δ 7.85 (dd, $J = 7.7, 3.8$ Hz, 2H), 7.68 (d, $J = 7.9$ Hz, 2H), 7.60 (t, $J = 7.5$ Hz, 1H), 7.56 (d, $J = 8.1$ Hz, 2H), 7.48 (t, $J = 7.5$ Hz, 1H), 7.39 (t, $J = 7.7$ Hz, 1H), 7.24-7.15 (m, 3H), 4.02 (dd, $J = 21.6, 4.4$ Hz, 1H), 2.36 (s, 3H), 1.74 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) δ 166.7, 149.7, 141.0, 139.4, 136.6, 133.1, 132.7, 132.2 (d, $J = 3.5$ Hz), 130.2, 129.2, 129.1, 129.1 (t, $J = 281.7$ Hz), 126.3, 125.0, 124.9, 123.7 (d, $J = 6.1$ Hz), 122.3 (d, $J = 3.2$ Hz), 117.8, 75.1 (d, $J = 1.9$ Hz), 57.0 (dd, $J = 25.9, 23.2$ Hz), 23.1 (d, $J = 3.0$ Hz), 21.4; $^{19}$F NMR (376 MHz, CDCl$_3$) δ -63.42 (d,
$J = 213.5$ Hz, $-78.20$ (d, $J = 213.5$ Hz). **HRMS** (ESI) m/z Calcd for C$_{24}$H$_{20}$F$_2$NOS [M+H]$^+$: 408.1228; Found: 408.1227.

2-fluoro-2-(10b-methyl-6-oxo-6,10b-dihydro-11H-isouindolo[2,1-α]indol-11-ylidene)acetonitrile (4c): New compound. 72.0 mg, 83% yield. White solid. m.p.: 140.0–141.8 °C. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.96 (d, $J = 7.9$ Hz, 1H), 7.89–7.80 (m, 3H), 7.70 (td, $J = 7.5$, 1.2 Hz, 1H), 7.55 (td, $J = 7.2$, 3.9 Hz, 2H), 7.26 (t, $J = 7.2$ Hz, 1H), 1.86 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 168.9, 147.1, 143.7 (d, $J = 4.7$ Hz), 138.2 (d, $J = 19.6$ Hz), 134.2 (d, $J = 2.3$ Hz), 133.4 (d, $J = 2.9$ Hz), 131.8, 129.8, 128.2 (d, $J = 15.1$ Hz), 126.1 (d, $J = 237.0$ Hz), 125.6, 125.3, 124.8 (d, $J = 13.5$ Hz), 123.9 (d, $J = 2.5$ Hz), 117.9, 112.5 (d, $J = 46.2$ Hz), 75.2 (d, $J = 3.7$ Hz), 27.7 (d, $J = 2.7$ Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) $\delta$ -129.15. **HRMS** (ESI) m/z Calcd for C$_{18}$H$_{12}$FN$_2$O [M+H]$^+$: 291.0928; Found: 291.0926.

11-(fluoro(1H-imidazol-1-yl)methylene)-10b-methyl-10b,11-dihydro-6H-isouindolo[2,1-α]indol-6-one (4d): New compound. 141.1 mg, 85% yield. Yellow solid. m.p.: 68.7–71.2 °C. $^1$H NMR (400 MHz, CDCl$_3$) $\delta$ 7.90 (d, $J = 7.1$ Hz, 2H), 7.77 (d, $J = 7.9$ Hz, 1H), 7.70 (s, 2H), 7.56 (t, $J = 7.6$ Hz, 1H), 7.38–7.29 (m, 2H), 7.14 (s, 1H), 6.95 (t, $J = 7.8$ Hz, 1H), 6.02 (d, $J = 7.9$ Hz, 1H), 1.93 (s, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 169.2, 148.1, 141.6 (d, $J = 5.1$ Hz), 139.1 (d, $J = 265.6$ Hz), 137.1, 133.8 (d, $J = 2.0$ Hz), 132.0, 131.2, 130.9 (d, $J = 2.7$ Hz), 129.4, 126.7 (d, $J = 2.5$ Hz), 125.4, 125.0, 124.5 (d, $J = 12.6$ Hz), 122.8 (d, $J = 2.6$ Hz), 119.8 (d, $J = 30.9$ Hz), 118.6, 117.7, 73.5 (d, $J = 4.6$ Hz), 27.8 (d, $J = 2.8$ Hz); $^{19}$F NMR (376 MHz, CDCl$_3$) $\delta$ -81.25. **HRMS**
10b-methyl-11-(5-phenyl-1,3,4-oxadiazol-2-yl)-10b,11-dihydro-6H-isindolo[2,1-a]indol-6-one (4e): New compound. 59.8 mg, 79% yield. White solid. m.p.: 180.8-183.7 °C. $^1H$ NMR (400 MHz, CDCl$_3$) $\delta$ 7.84 (t, $J = 7.8$ Hz, 2H), 7.47 (t, $J = 6.8$ Hz, 3H), 7.41 (d, $J = 7.5$ Hz, 1H), 7.38-7.26 (m, 6H), 7.16 (t, $J = 7.5$ Hz, 1H), 4.92 (s, 1H), 1.85 (s, 3H); $^{13}C$ NMR (100 MHz, CDCl$_3$) $\delta$ 168.6, 165.2, 163.9, 147.0, 139.8, 133.2, 132.9, 131.8, 130.3, 129.5, 128.9, 126.6, 126.5, 125.4, 124.7, 123.0, 122.5, 118.3, 74.5, 47.8, 27.4. HRMS (ESI) m/z Calcd for C$_{24}$H$_{18}$N$_3$O$_2$ [M+H]$^+$: 380.1394; Found: 380.1392.

11-methoxy-10b-methyl-11-(trifluoromethyl)-10b,11-dihydro-6H-isindolo[2,1-a]indol-6-one (4f): New compound. 51.6 mg, 77% yield. White solid. m.p.: 115.4-117.0 °C. $^1H$ NMR (400 MHz, CDCl$_3$) $\delta$ 7.88 (d, $J = 7.6$ Hz, 1H), 7.80 (d, $J = 7.9$ Hz, 1H), 7.66 (t, $J = 7.5$ Hz, 1H), 7.62-7.51 (m, 4H), 7.27 (t, $J = 7.6$ Hz, 1H), 2.70 (s, 3H), 1.63 (d, $J = 2.6$ Hz, 3H); $^{13}C$ NMR (100 MHz, CDCl$_3$) $\delta$ 167.6, 146.8, 140.5, 133.1, 133.0, 132.1, 129.2, 128.1, 127.6, 125.5 (q, $J = 285.9$ Hz), 124.8, 124.6, 123.5 (q, $J = 1.9$ Hz), 118.6, 86.0 (q, $J = 29.1$ Hz), 78.7, 54.2 (d, $J = 1.7$ Hz), 23.1 (q, $J = 3.4$ Hz); $^{19}F$ NMR (376 MHz, CDCl$_3$) $\delta$ -69.17. HRMS (ESI) m/z Calcd for C$_{18}$H$_{15}$F$_3$NO$_2$ [M+H]$^+$: 334.1049; Found: 334.1054.
11-hydroxy-10b-methyl-11-(trifluoromethyl)-10,11-dihydro-6H-isooindolo[2,1-a]indol-6-one (4g): New compound. 60.8 mg, 95% yield. White solid. m.p.: 259.2-259.8 °C. $^1H$ NMR (400 MHz, DMSO-$d_6$) $\delta$ 7.82-7.73 (m, 2H), 7.66-7.50 (m, 5H), 7.30 (t, $J = 7.6$ Hz, 1H), 6.94 (s, 1H), 1.55 (d, $J = 2.6$ Hz, 3H); $^{13}$C NMR (100 MHz, DMSO-$d_6$) $\delta$ 167.3, 146.5, 139.1, 133.3, 133.2, 132.4, 131.1, 129.2, 125.3 (q, $J = 284.3$ Hz), 125.3, 125.0, 124.0, 123.6, 117.6, 80.6 (q, $J = 29.5$ Hz), 77.2, 22.2 (d, $J = 3.2$ Hz); $^{19}$F NMR (376 MHz, DMSO-$d_6$) $\delta$ -70.16. HRMS (ESI) m/z Calcd for C$_{17}$H$_{13}$F$_3$NO$_2$ [M+H]$^+$: 320.0893; Found: 320.0897.

![Chemical Structure](image)

$N,N$-dibutyl-10b-methyl-6-oxo-10,11-dihydro-6H-isooindolo[2,1-a]indole-11-carboxamide (4h): New compound. 33.8 mg, 43% yield. Light yellow solid. m.p.: 138.4-139.2 °C. $^1H$ NMR (400 MHz, CDCl$_3$) $\delta$ 7.86 (d, $J = 7.5$ Hz, 1H), 7.75 (d, $J = 7.1$ Hz, 1H), 7.53 (td, $J = 7.5$, 1.2 Hz, 1H), 7.45 (t, $J = 7.5$ Hz, 1H), 7.35 (q, $J = 7.4$ Hz, 2H), 7.18 (d, $J = 6.5$ Hz, 1H), 7.10 (td, $J = 7.5$, 1.1 Hz, 1H), 4.27 (s, 1H), 3.75-3.00 (m, 3H), 2.85-2.62 (m, 1H), 1.67 (s, 5H), 1.43 (s, 2H), 1.07-1.02 (m, 3H), 1.01-0.77 (m, 4H), 0.70 (t, $J = 7.1$ Hz, 3H); $^{13}$C NMR (100 MHz, CDCl$_3$) $\delta$ 168.5, 148.0, 140.7, 135.8, 133.8, 132.3, 129.0, 128.8, 125.1, 124.6, 121.6, 117.8, 74.4, 52.2, 48.3, 46.3, 32.5, 29.5, 28.1, 20.2, 20.1, 14.0, 13.8. HRMS (ESI) m/z Calcd for C$_{25}$H$_{31}$N$_2$O$_2$ [M+H]$^+$: 391.2380; Found: 391.2385.
6. Copies of NMR spectra

$^1$H NMR of product 3a in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 3a in CDCl$_3$ (100 MHz)
$^{19}$F NMR of product 3a in CDCl$_3$ (376 MHz)

$^1$H NMR of product 3b in CDCl$_3$ (400 MHz)
\(^{13}\)C NMR of product 3b in CDCl\(_3\) (100 MHz)

\(^{19}\)F NMR of product 3b in CDCl\(_3\) (376 MHz)
$^{1}$$H$ NMR of product 3c in CDCl$_3$ (400 MHz)

$^{13}$$C$ NMR of product 3c in CDCl$_3$ (100 MHz)
$^{19}\text{F NMR of product 3c in CDCl}_3$ (376 MHz)

$^1\text{H NMR of product 3d in CDCl}_3$ (400 MHz)
$^{13}$C NMR of product 3d in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3d in CDCl$_3$ (376 MHz)
$^1$H NMR of product 3e in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 3e in CDCl$_3$ (100 MHz)
$^{19}$F NMR of product 3e in CDCl$_3$ (376 MHz)

$^1$H NMR of product 3f in CDCl$_3$ (400 MHz)
$^{13}$C NMR of product 3f in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3f in CDCl$_3$ (376 MHz)
$^1$H NMR of product 3g in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 3g in CDCl$_3$ (100 MHz)
$^{19}$F NMR of product 3g in CDCl$_3$ (376 MHz)

$^1$H NMR of product 3h in CDCl$_3$ (400 MHz)
$^{13}$C NMR of product 3h in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3h in CDCl$_3$ (376 MHz)
$^1$H NMR of product 3i in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 3i in CDCl$_3$ (100 MHz)
$^{19}$F NMR of product 3i in CDCl$_3$ (376 MHz)

$^1$H NMR of product 3j in CDCl$_3$ (400 MHz)
$^{13}$C NMR of product 3j in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3j in CDCl$_3$ (376 MHz)
$^1$H NMR of product 3k in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 3k in CDCl$_3$ (100 MHz)
$^{19}$F NMR of product 3k in CDCl$_3$ (376 MHz)

$^{1}$H NMR of product 3l in CDCl$_3$ (400 MHz)
$^{13}$C NMR of product 3l in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3l in CDCl$_3$ (376 MHz)
$^1$H NMR of product 3m in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 3m in CDCl$_3$ (100 MHz)
$^{19}$F NMR of product 3m in CDCl$_3$ (376 MHz)

$^1$H NMR of product 3n in CDCl$_3$ (400 MHz)
$^{13}$C NMR of product 3$n$ in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3$n$ in CDCl$_3$ (376 MHz)
$^1$H NMR of product 3o in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 3o in CDCl$_3$ (100 MHz)
$^{19}$F NMR of product 3o in CDCl$_3$ (376 MHz)

$^1$H NMR of product 3p in CDCl$_3$ (400 MHz)
$^{13}$C NMR of product 3p in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3p in CDCl$_3$ (376 MHz)
$^1$H NMR of product 3q in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 3q in CDCl$_3$ (100 MHz)
$^{19}$F NMR of product 3q in CDCl$_3$ (376 MHz)

$^1$H NMR of product 3t in CDCl$_3$ (400 MHz)
$^{13}$C NMR of product 3t in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3t in CDCl$_3$ (376 MHz)
$^1$H NMR of product 3u in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 3u in CDCl$_3$ (100 MHz)
$^{19}$F NMR of product 3u in CDCl$_3$ (376 MHz)

$^1$H NMR of product 3v in CDCl$_3$ (400 MHz)
$^{13}$C NMR of product 3v in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3v in CDCl$_3$ (376 MHz)
$^1$H NMR of product 3w in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 3w in CDCl$_3$ (100 MHz)
$^{19}$F NMR of product 3w in CDCl$_3$ (376 MHz)

$^1$H NMR of product 3x in CDCl$_3$ (400 MHz)
\[ \text{\(^{13}\text{C} NMR\) of product 3x in CDCl}_3 (100 MHz)} \]

\[ \text{\(^{19}\text{F} NMR\) of product 3x in CDCl}_3 (376 MHz)} \]
$^1$H NMR of product 3y in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 3y in CDCl$_3$ (100 MHz)
$^{19}\text{F NMR of product 3y in CDCl}_3$ (376 MHz)

$^1\text{H NMR of product 3z in CDCl}_3$ (400 MHz)
$^{13}$C NMR of product 3z in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3z in CDCl$_3$ (376 MHz)
$^1$H NMR of product 3aa in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 3aa in CDCl$_3$ (100 MHz)
$^{19}$F NMR of product 3aa in CDCl₃ (376 MHz)

$^1$H NMR of product 3ab in CDCl₃ (400 MHz)
$^{13}$C NMR of product 3ab in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3ab in CDCl$_3$ (376 MHz)
<span style="font-weight: bold; font-size: 12pt;"&gt;\(^{1}\text{H} \text{NMR of product 3ad in CDCl}_3 \text{ (400 MHz)}\)

![1H NMR spectrum](image1)

\[^{13}\text{C} \text{NMR of product 3ad in CDCl}_3 \text{ (100 MHz)}\)

![13C NMR spectrum](image2)

S70
$^{19}$F NMR of product 3ad in CDCl₃ (376 MHz)

$^1$H NMR of product 3ae in CDCl₃ (400 MHz)
$^{13}$C NMR of product 3ae in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3ae in CDCl$_3$ (376 MHz)
**1H NMR of product 3af in CDCl₃ (400 MHz)**

**13C NMR of product 3af in CDCl₃ (100 MHz)**
$^{19}$F NMR of product 3af in CDCl$_3$ (376 MHz)

$^1$H NMR of product 3ag in CDCl$_3$ (400 MHz)
$^{13}$C NMR of product 3ag in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 3ag in CDCl$_3$ (376 MHz)
$^1$H NMR of product 4a in DMSO-$d_6$ (400 MHz)

$^{13}$C NMR of product 4a in DMSO-$d_6$ (100 MHz)
$^{19}$F NMR of product 4a in DMSO-$d_6$ (376 MHz)

$^1$H NMR of product 4b in CDCl$_3$ (400 MHz)
$^{13}$C NMR of product 4b in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 4b in CDCl$_3$ (376 MHz)
$^{19}\text{F NMR of product 4c in CDCl}_3$ (376 MHz)

$^{1}\text{H NMR of product 4d in CDCl}_3$ (400 MHz)
$^{13}$C NMR of product 4d in CDCl$_3$ (100 MHz)

$^{19}$F NMR of product 4d in CDCl$_3$ (376 MHz)
$^1$H NMR of product 4e in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 4e in CDCl$_3$ (100 MHz)
$^{1}H$ NMR of product 4f in CDCl$_3$ (400 MHz)

$^{13}C$ NMR of product 4f in CDCl$_3$ (100 MHz)
$^{19}$F NMR of product 4f in CDCl$_3$ (376 MHz)

$^1$H NMR of product 4g in DMSO-$d_6$ (400 MHz)
$^{13}\text{C NMR of product 4g in DMSO-}$d$_6$ (100 MHz)

$^{19}\text{F NMR of product 4g in DMSO-d}_6$ (376 MHz)
$^1$H NMR of product 4h in CDCl$_3$ (400 MHz)

$^{13}$C NMR of product 4h in CDCl$_3$ (100 MHz)