

# Selective Cross-Dehydrogenative C(*sp*<sup>3</sup>)-H Arylation with Arenes

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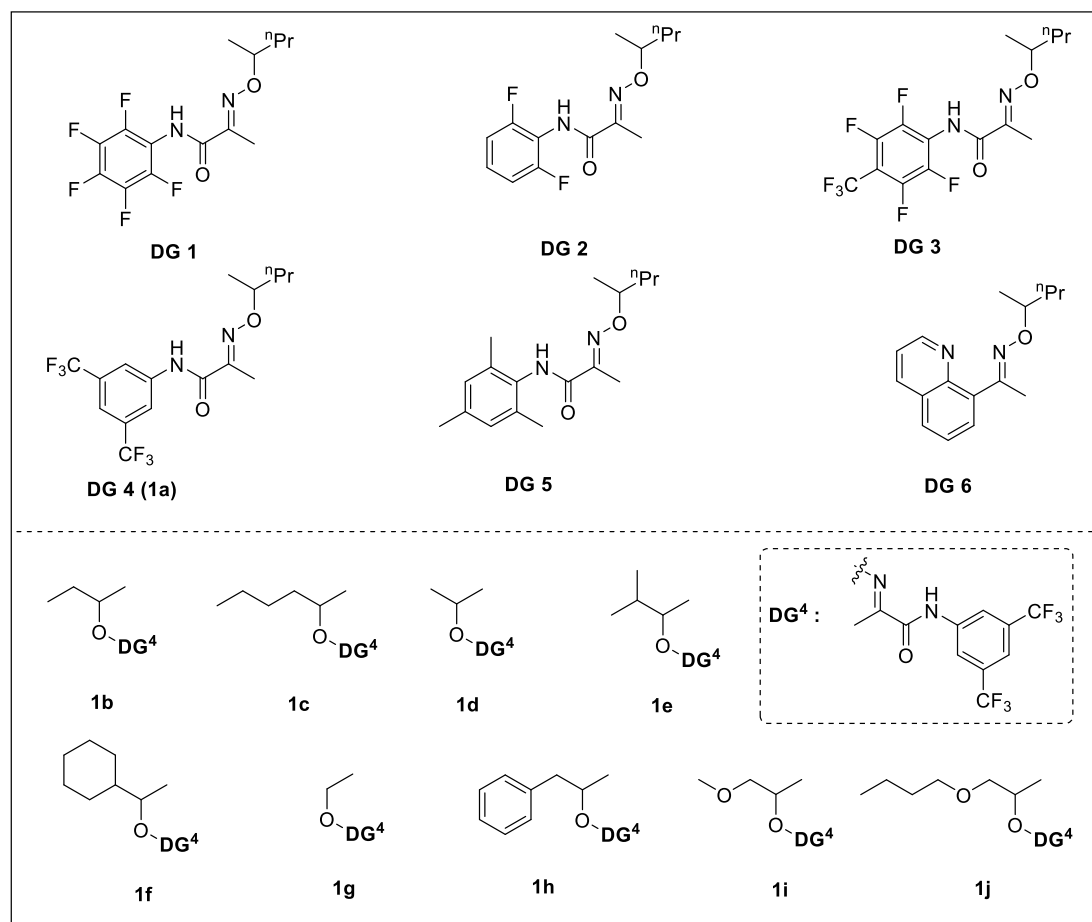
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## I. General

Unless otherwise stated, all experiments were carried out under air atmosphere. The reagents and solvents were purchased from commercial suppliers and used without further purification unless noted.  $^1\text{H}$  NMR and  $^{13}\text{C}$  NMR spectra were obtained on a Bruker AVANCE III 500 instrument in  $\text{CDCl}_3$  using TMS as an internal standard, operating at 500 MHz and 126 MHz, respectively. Chemical shifts ( $\delta$ ) are expressed in ppm and coupling constants  $J$  are given in Hz. For  $\text{CDCl}_3$  or  $\text{DMSO}-d_6$  solutions the chemical shifts are reported as parts per million (ppm) to residual protium or carbon of the solvents;  $\text{CHCl}_3$   $\delta\text{H}$  (7.28 ppm) and  $\text{CDCl}_3$   $\delta\text{C}$  (77.03 ppm);  $\text{DMSO}$   $\delta\text{H}$  (2.51 ppm) and  $\text{DMSO}-d_6$   $\delta\text{C}$  (39.52 ppm).  $^{19}\text{F}$  NMR were recorded on a Bruker AVANCE III or Ascend400. Multiplicities are reported using the following abbreviations: s = singlet, d = doublet, t = triplet, q = quartet, dd = doublet of doublets, td = triplet of doublets, ddd = doublet of doublet of doublets, m = multiplet, br = broad resonance. GC experiments were carried out using Agilent 7890B GC. GC-MS experiments that used dodecane as an internal standard were performed with a Thermo DSQ II, Trace GC Ultra. High resolution mass spectra (HRMS (ESI-TOF)) were obtained on an Agilent 6545 Q-TOF LCMS spectrometer equipped with an ESI source. Enantiomeric excess was determined by a JASCO LC-2000 Plus system, or an Agilent 1260 chromatography, using chiralpak OD-H columns with hexane and *i*-PrOH as solvents. The chiralpak OD-H column was purchased from Daicel Chemical Industries (Shanghai, China).

## II. Preparation and characterization of substrates for the intermolecular arylation

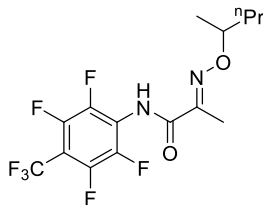


**Figure S1.** Substrates used in this study for the intermolecular  $\text{C}(\text{sp}^3)\text{-H}$  arylation

### A. Preparation of substrates for the intermolecular arylation

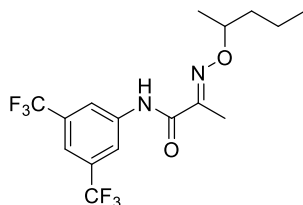
The C(sp<sup>3</sup>)-H arylation substrates were synthesized according to our previous work<sup>1</sup>. All the new substrates were characterized as below.

### B. Characterization of new substrates used in the intermolecular arylation



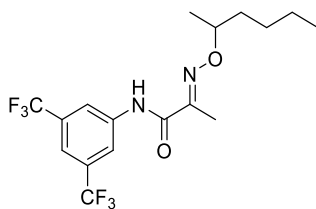
#### (E)-2-((pentan-2-yloxy)imino)-N-(2,3,5,6-tetrafluoro-4-(trifluoromethyl)phenyl)propanamide

**(DG 3):** Colorless oil; yield 41% (517 mg);  $R_f$  = 0.61 (petroleum ether-EtOAc = 20:1); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>):  $\delta$  = 8.42 (s, 1H), 4.42 (h,  $J$  = 6.3 Hz, 1H), 2.11 (s, 3H), 1.79-1.69 (m, 1H), 1.61-1.53 (m, 1H), 1.49-1.38 (m, 2H), 1.33 (d,  $J$  = 6.3 Hz, 3H), 0.97 (t,  $J$  = 7.3 Hz, 3H) ppm; <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>):  $\delta$  = 160.8, 148.7, 145.5 (dd,  $J_1$  = 10.3 Hz,  $J_2$  = 5.2 Hz), 143.7-143.3 (m), 143.3-142.9 (m), 141.4-141.0 (m), 122.4-119.3 (m), 120.7-120.1 (m), 107.4-106.6 (m), 81.9, 37.8, 19.9, 18.6, 14.1, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ : [M + Na]<sup>+</sup> Calcd. for C<sub>15</sub>H<sub>15</sub>F<sub>7</sub>N<sub>2</sub>O<sub>2</sub>Na 411.0914; found: 411.0913.



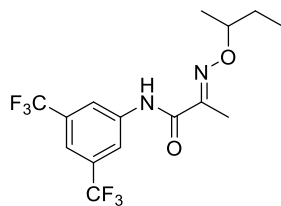
#### (E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-((pentan-2-yloxy)imino)propanamide (DG 4 / 1a):

Colorless solid; m.p. = 59-62 °C; yield 64% (812 mg);  $R_f$  = 0.43 (petroleum ether-EtOAc = 20:1); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta$  = 8.87 (s, 1H), 8.13 (s, 2H), 7.62 (s, 1H), 4.43 (q,  $J$  = 6.3 Hz, 1H), 2.11 (s, 3H), 1.83-1.67 (m, 1H), 1.60-1.51 (m, 1H), 1.51-1.37 (m, 2H), 1.34 (d,  $J$  = 6.3 Hz, 3H), 0.98 (t,  $J$  = 7.3 Hz, 3H) ppm; <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>)  $\delta$  = 161.5, 149.5, 139.0, 132.4 (q,  $J$  = 33.5 Hz, 2C), 123.1 (q,  $J$  = 272.5 Hz, 2C), 119.3 (d,  $J$  = 4.2 Hz, 2C), 117.1 (p,  $J$  = 3.9 Hz), 81.7, 37.8, 20.0, 18.7, 14.1, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ : [M + Na]<sup>+</sup> Calcd. for C<sub>16</sub>H<sub>18</sub>F<sub>6</sub>N<sub>2</sub>O<sub>2</sub>Na 407.1165 found: 407.1160.

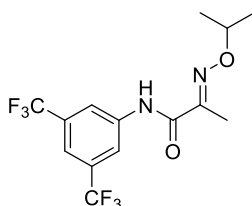


#### (E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-((hexan-2-yloxy)imino)propanamide (1b):

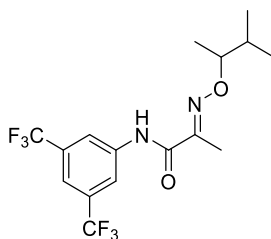
Colorless solid; m.p. = 66-68 °C; yield 61% (816 mg);  $R_f$  = 0.43 (petroleum ether-EtOAc = 20:1); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta$  = 8.87 (s, 1H), 8.13 (s, 2H), 7.62 (s, 1H), 4.42 (q,  $J$  = 6.3 Hz, 1H), 2.11 (s, 3H), 1.75 (ddd,  $J_1$  = 13.8 Hz,  $J_2$  = 6.9 Hz,  $J_3$  = 5.1 Hz, 1H), 1.59 (s, 1H), 1.44-1.36 (m, 4H), 1.34 (d,  $J$  = 6.3 Hz, 3H), 0.95 (t,  $J$  = 6.9 Hz, 3H) ppm; <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>)  $\delta$  = 161.5, 149.5, 139.0, 132.5 (q,  $J$  = 33.4 Hz, 2C), 123.1 (q,  $J$  = 272.7 Hz, 2C), 119.3 (d,  $J$  = 4.2 Hz, 2C), 117.3 (t,  $J$  = 3.9 Hz), 81.9, 35.3, 27.6, 22.7, 20.0, 14.0, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ : [M + Na]<sup>+</sup> Calcd. for C<sub>17</sub>H<sub>20</sub>F<sub>6</sub>N<sub>2</sub>O<sub>2</sub>Na 421.1321; found: 421.1324.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(sec-butoxyimino)propanamide (1c):** Colorless solid; m.p. = 60-62 °C; yield 60% (770 mg);  $R_f$  = 0.40 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.87 (s, 1H), 8.13 (s, 2H), 7.62 (s, 1H), 4.36 (q,  $J$  = 6.3 Hz, 1H), 2.12 (s, 3H), 1.84 -1.73 (m, 1H), 1.71-1.61 (m, 1H), 1.34 (d,  $J$  = 6.4 Hz, 3H), 0.99 (t,  $J$  = 7.5 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.5, 149.6, 139.0, 132.4 (q,  $J$  = 33.4 Hz, 2C), 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.3 (d,  $J$  = 4.1 Hz, 2C), 117.4-117.3 (m), 83.0, 28.5, 19.4, 9.6, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{15}\text{H}_{16}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  393.1008; found: 393.1010.

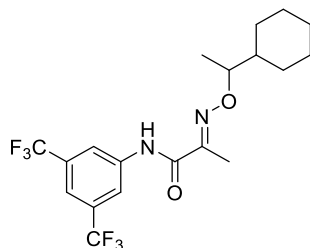


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(isopropoxyimino)propanamide (1d):** Colorless solid; m.p. = 64-66 °C; yield 65% (764 mg);  $R_f$  = 0.35 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.87 (s, 1H), 8.13 (s, 2H), 7.62 (s, 1H), 4.36 (q,  $J$  = 6.3 Hz, 1H), 2.12 (s, 3H), 1.84 -1.73 (m, 1H), 1.71-1.61 (m, 1H), 1.34 (d,  $J$  = 6.4 Hz, 3H), 0.99 (t,  $J$  = 7.5 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.5, 149.6, 139.0, 132.4 (q,  $J$  = 33.4 Hz, 2C), 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.3 (d,  $J$  = 4.2 Hz, 2C), 117.5-117.3 (m), 83.0, 28.5, 19.3, 9.6, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{14}\text{H}_{14}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  379.0852; found: 379.0850.

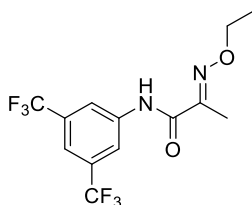


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((3-methylbutan-2-yl)oxy)imino)propanamide (1e):** Colorless solid; m.p. = 76-78 °C; yield 62% (787 mg);  $R_f$  = 0.43 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ ):  $\delta$  = 8.86 (s, 1H), 8.13 (s, 2H), 7.62 (s, 1H), 4.29-4.19 (m, 1H), 2.12 (s, 3H), 2.02-1.96 (m, 1H), 1.29 (d,  $J$  = 6.5 Hz, 3H), 1.00 (d,  $J$  = 6.9 Hz, 3H), 0.97 (d,  $J$  = 6.8 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ ):  $\delta$  = 161.5, 149.5, 139.0, 132.4 (q,  $J$  = 33.5 Hz, 2C), 123.1 (q,  $J$  = 273.2 Hz, 2C), 119.3 (d,  $J$  = 3.3 Hz, 2C), 118.1-117.1 (m), 86.4, 32.4, 18.4, 17.6, 16.2, 9.4 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{16}\text{H}_{18}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  407.1165; found: 407.1158.

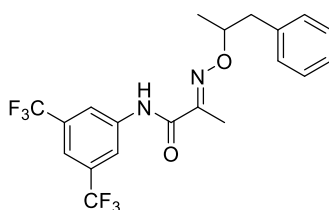




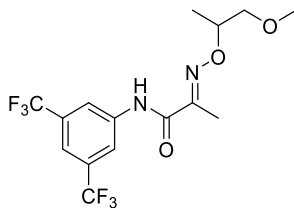
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-((1-cyclohexylethoxy)imino)propanamide (1f):** Colorless solid; m.p. = 124-126 °C; yield 43% (593 mg);  $R_f$  = 0.43 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.87 (s, 1H), 8.13 (s, 2H), 7.62 (s, 1H), 4.22 (p,  $J$  = 6.4 Hz, 1H), 2.11 (s, 3H), 1.86 (d,  $J$  = 12.7 Hz, 1H), 1.79 (d,  $J$  = 13.0 Hz, 2H), 1.75-1.68 (m, 2H), 1.66-1.60 (m, 1H), 1.59 (s, 1H), 1.30 (d,  $J$  = 6.5 Hz, 3H), 1.26 (dd,  $J_1$  = 12.6 Hz,  $J_2$  = 3.3 Hz, 1H), 1.23-1.17 (m, 1H), 1.16-1.01 (m, 2H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.6, 149.4, 139.0, 132.4 (q,  $J$  = 33.5 Hz, 2C), 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.3 (d,  $J$  = 2.8 Hz, 2C), 117.6-116.6 (m), 86.1, 42.5, 28.9, 28.3, 26.5, 26.1 (s, 2C), 17.0, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{19}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  447.1478; found: 447.1480.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(ethoxyimino)propanamide (1g):** Colorless solid; m.p. = 78-80 °C; yield 60% (667 mg);  $R_f$  = 0.28 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.87 (s, 1H), 8.14 (s, 2H), 7.62 (s, 1H), 4.35 (q,  $J$  = 7.1 Hz, 2H), 2.12 (s, 3H), 1.39 (t,  $J$  = 7.1 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.3, 145.0, 138.9, 132.5 (q,  $J$  = 33.7 Hz, 2C), 123.1 (q,  $J$  = 272.8 Hz, 2C), 119.3 (d,  $J$  = 4.1 Hz, 2C), 117.5-117.3 (m), 71.5, 14.6, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{13}\text{H}_{12}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  365.0695; found: 365.0694.

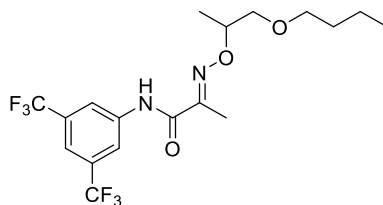


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-phenylpropan-2-yl)oxy)imino)propanamide (1h):** Colorless solid; m.p. = 46-48 °C; yield 57% (801 mg);  $R_f$  = 0.30 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.46 (s, 1H), 8.04 (s, 2H), 7.61 (s, 1H), 7.34-7.30 (m, 2H), 7.24 (d,  $J$  = 7.8 Hz, 3H), 4.69 (dd,  $J_1$  = 12.6 Hz,  $J_2$  = 6.4 Hz, 1H), 3.05-2.92 (m, 2H), 2.09 (s, 3H), 1.40 (d,  $J$  = 6.4 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 149.5, 138.8, 138.3, 132.4 (q,  $J$  = 33.4 Hz, 2C), 129.6 (s, 2C), 128.4 (s, 2C), 126.4, 123.1 (q,  $J$  = 273.4 Hz, 2C), 119.3 (d,  $J$  = 3.1 Hz, 2C), 117.3 (dt,  $J_1$  = 7.7 Hz,  $J_2$  = 3.9 Hz), 82.4, 42.8, 19.8, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{20}\text{H}_{18}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  455.1665; found: 455.1168.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-methoxypropan-2-yl)oxy)imino)propanamide (1i):**

Colorless solid; m.p. = 62-64 °C; yield 56% (703 mg);  $R_f$  = 0.40 (petroleum ether-EtOAc = 5:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.85 (s, 1H), 8.13 (s, 2H), 7.63 (s, 1H), 4.68-4.56 (m, 1H), 3.62 (dd,  $J_1$  = 10.6 Hz,  $J_2$  = 6.2 Hz, 1H), 3.53 (dd,  $J_1$  = 10.6 Hz,  $J_2$  = 4.0 Hz, 1H), 3.43 (s, 3H), 2.14 (s, 3H), 1.37 (d,  $J$  = 6.6 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.3, 150.4, 138.9, 132.5 (q,  $J$  = 33.7 Hz, 2C), 123.1 (q,  $J$  = 272.9 Hz, 2C), 119.3 (d,  $J$  = 2.9 Hz, 2C), 117.5-117.4(m), 80.7, 75.1, 59.4, 16.8, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{15}\text{H}_{16}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  409.0957; found: 409.0957.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-butoxypropan-2-yl)oxy)imino)propanamide (1j):**

Colorless oil; yield 58% (807 mg);  $R_f$  = 0.60 (petroleum ether-EtOAc = 5:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.90 (s, 1H), 8.13 (s, 2H), 7.61 (s, 1H), 4.66-4.55 (m, 1H), 3.64 (dd,  $J_1$  = 10.7 Hz,  $J_2$  = 6.2 Hz, 1H), 3.55 (dd,  $J_1$  = 10.7 Hz,  $J_2$  = 4.3 Hz, 1H), 3.50 (q,  $J$  = 6.7 Hz, 2H), 2.12 (s, 3H), 1.63-1.53 (m, 2H), 1.37 (dd,  $J_1$  = 11.9 Hz,  $J_2$  = 7.0 Hz, 5H), 0.92 (t,  $J$  = 7.4 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 150.1, 138.9, 132.5 (q,  $J$  = 33.5 Hz, 2C), 123.1 (q,  $J$  = 272.8 Hz, 2C), 119.3 (d,  $J$  = 4.0 Hz, 2C), 117.8-116.5 (m), 80.8, 73.3, 71.5, 31.7, 19.3, 16.9, 13.8, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{18}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  451.1427; found: 451.1428.

### III Preparation and characterization of substrates for the intramolecular arylation

#### A. Preparation of substrates for the intramolecular arylation

The alcohols used in this paper were prepared based on the following synthetic routes.

The alcohols related to substrates **3a-3n** were prepared according to the *synthetic route a*.<sup>2</sup>

The alcohols related to substrates **3s-3ac** were prepared according to the *synthetic route b*.

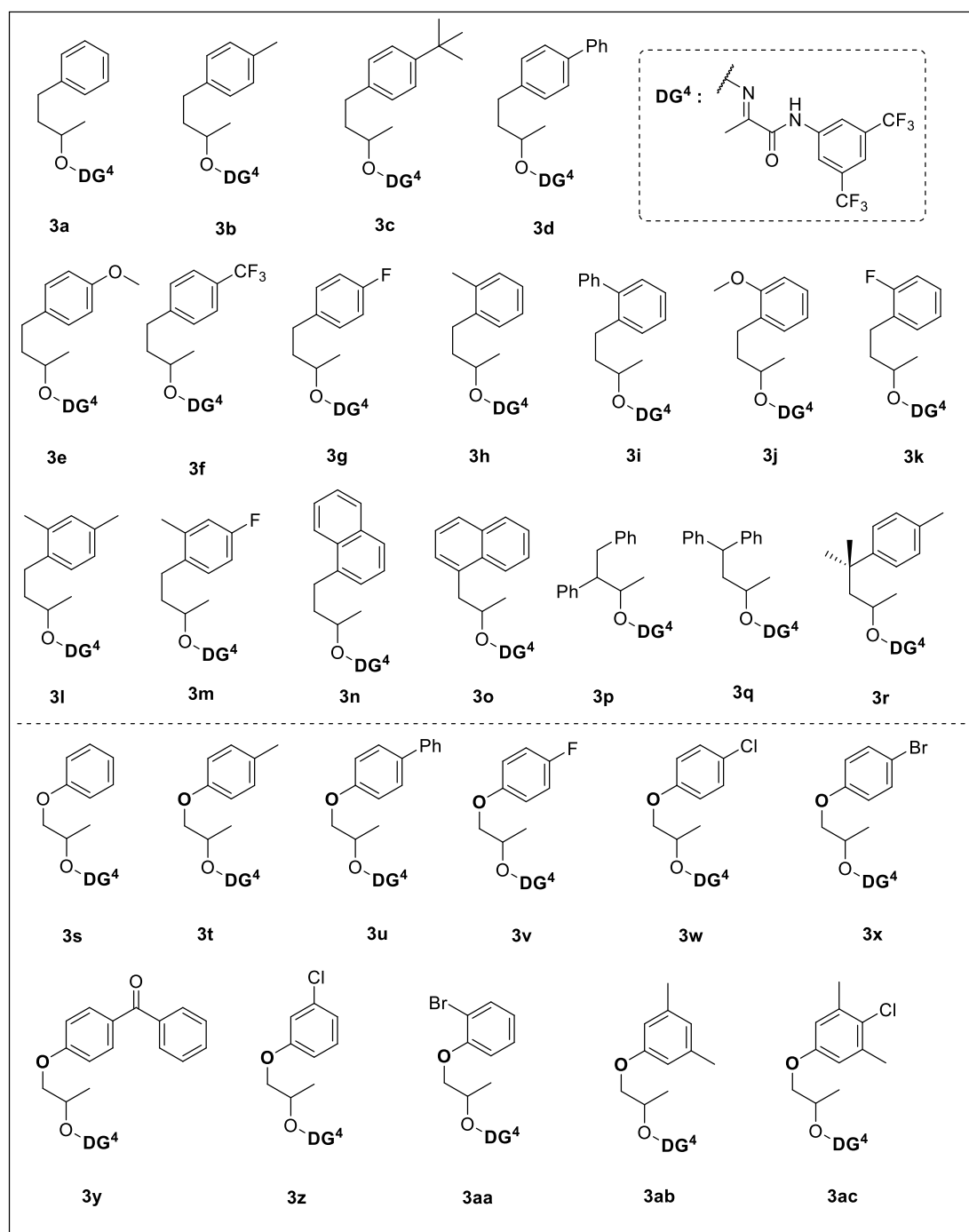
The alcohol related to substrate **3o** was prepared according to the *synthetic route c*.<sup>3</sup>

The alcohol related to substrate **3p** was prepared according to the *synthetic route d*.<sup>4</sup>

The alcohol related to substrate **3q** was prepared according to the *synthetic route e*.<sup>5,6</sup>

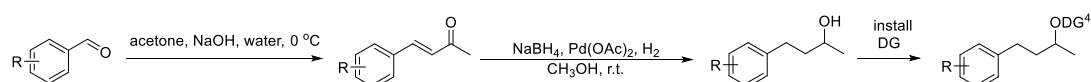
The alcohol related to substrate **3r** was prepared according to the *synthetic route f*.

The installation of the directing group was based on our previous procedures.<sup>1</sup>



**Figure S2.** Substrates used in this study for the intramolecular C( $sp^3$ )-H arylation

**a) General synthetic route a**

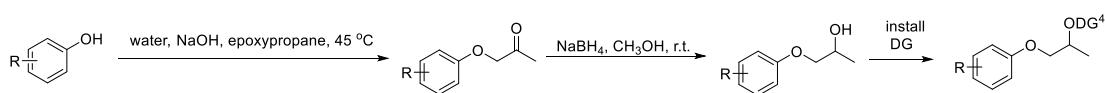


**Aldol reaction:** Benzaldehyde (36 mmol, 1.0 equiv.) was suspended in a mixture of acetone/water (5mL/5 mL). A 1% aqueous solution of sodium hydroxide (10 mL) was slowly added to the reaction mixture. The reaction mixture was heated to 65 °C and stirred until no benzaldehyde was detected by TLC. The reaction mixture was cooled to ambient temperature, water (20 mL) and toluene (20mL) were

added to the flask. The organic phase was separated, washed with brine. The combined organic layer was dried with  $\text{MgSO}_4$  and concentrated to dryness, and the residue was purified by flash chromatography on silica gel to give the product (96% yield).

**Reduction:** The substrate (5 mmol, 1.0 *equiv.*),  $\text{NaBH}_4$  (5 mmol, 1.0 *equiv.*), and  $\text{Pd}(\text{OAc})_2$  (5 mol%) were combined in a round-bottom flask equipped with a magnetic stirrer and capped with a rubber septum that had a deflated balloon attached to it. Methanol (5 mL) was slowly added into the flask through a syringe. The mixture was stirred at room temperature until the reaction was completed, based on TLC monitoring. The undissolved solid was filtered, and methanol was evaporated using rotary evaporator. Brine solution was added, and the product was extracted with  $\text{CH}_2\text{Cl}_2$ . The organic layer was dried with  $\text{MgSO}_4$ , filtered, and concentrated using a rotary evaporator. The crude compound can be used in the next step of directing group installation without further purification.

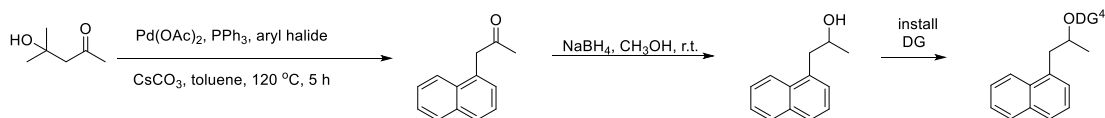
### b) General synthetic route b



**Etherification:** The phenol (20 mmol, 1 *equiv.*) was added in water (50 mL) and was stirred well with mechanical stirrer, then sodium hydroxide (40 mmol, 2.0 *equiv.*) was slowly added, stirred well, and then epoxyp propane (40 mmol, 2.0 *equiv.*) was added dropwise to the mixture. The reaction mixture was stirred and heated in air at 45 °C for 8 h. After the mixture was cooled to 0 °C, filtered, and the filtrate was extracted with ethyl acetate (3×15 mL). The combined organic layers were then washed with brine. After the extract was dried  $\text{MgSO}_4$  and concentrated at reduced pressure, the crude compound can be used in the next step without further purification. The desired product was obtained as a colorless oil.

**Reduction:** To a solution of 1-phenoxypropan-2-one (5.0 mmol, 1.0 *equiv.*) in  $\text{CH}_3\text{OH}$  (30 mL) was slowly added  $\text{NaBH}_4$  (15 mmol, 3.0 *equiv.*) at room temperature. After the reaction completed (monitored by TLC and usually finished within 1 h), the methanol was removed under reduced pressure and the residue was dissolved in  $\text{CH}_2\text{Cl}_2$  (30 mL), extracted by water (3×15 mL), dried  $\text{MgSO}_4$  and concentrated to give the 1-phenoxypropan-2-ol. The crude products can be used directly in the next step of directing group installation without further purification.

### c) Synthetic route c

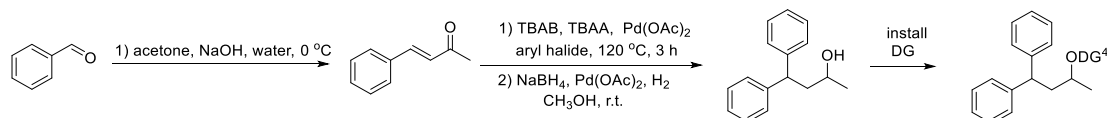


Palladium acetate (5 mol%),  $\text{PPh}_3$  (0.1 mmol, 0.2 *equiv.*), 1-iodonaphthalene (0.5 mmol, 1.0 *equiv.*), and cesium carbonate (0.75 mmol, 1.5 *equiv.*) were added to an oven-dried Schlenk tube equipped with a stir bar. The tube was then sealed, evacuated, and backfilled with nitrogen three times using standard Schlenk techniques. Toluene (3.0 mL) and 4-hydroxy-4-methyl-2-pentanone (3.0 mmol, 6.0 *equiv.*) were sequentially added by syringe at ambient temperature. The resulting mixture was vigorously stirred and heated at 120 °C (oil bath) for 5 h. After the mixture was cooled to room temperature, water (20 mL) was added. The resulting mixture was extracted with ethyl acetate (3×5 mL). The combined organic layers were then washed with brine, dried over  $\text{Na}_2\text{SO}_4$ , and concentrated in vacuum. The residue was purified by column chromatography on silica gel to afford the desired product (80% yield).

**Reduction:** To a solution of 1-(naphthalen-1-yl)propan-2-one (5 mmol, 1.0 *equiv.*) in  $\text{CH}_3\text{OH}$  (30 mL)

was slowly added NaBH<sub>4</sub> (15 mmol, 3.0 *equiv.*) at room temperature. After the reaction completed (monitored by TLC and usually finished within 1 h), the methanol was removed under reduced pressure and the residue was dissolved in CH<sub>2</sub>Cl<sub>2</sub> (30 mL), extracted by water (3×30 mL), dried MgSO<sub>4</sub> and concentrated to give the 1-(naphthalen-1-yl)propan-2-ol. The product can be used directly in the next step of directing group installation.

#### d) Synthetic route d

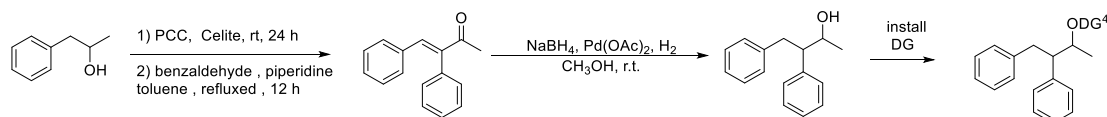


**Aldol reaction:** Benzaldehyde (36 mmol, 1.0 *equiv.*) was suspended in a mixture of acetone/water (5mL/5 mL). A 1% aqueous solution of sodium hydroxide (10 mL) was slowly added to the reaction mixture. The reaction mixture was heated to 65 °C and stirred until no benzaldehyde was detected by TLC. The reaction mixture was cooled to ambient temperature, water (20 mL) and toluene (20mL) were added to the flask. The organic phase was separated, washed with brine. The combined organic layer was dried with MgSO<sub>4</sub> and concentrated to dryness, and the residue was purified by flash chromatography on silica gel to give the product (96% yield).

**Coupling reaction:** A stirred solution of TBAB (3 mmol, 6.0 *equiv.*), tetrabutylammonium acetate (1.5 mmol, 3.0 *equiv.*), Pd(OAc)<sub>2</sub> (1.5 mol%), benzalacetone (0.5 mmol, 1.0 *equiv.*) and chlorobenzene (1 mmol, 2.0 *equiv.*) were heated in air at 120 °C for 3 h. The residue was purified by flash chromatography on silica gel to give the product (95% yield).

**Reduction:** The substrate (5 mmol, 1.0 *equiv.*), NaBH<sub>4</sub> (5 mmol, 1.0 *equiv.*), and Pd(OAc)<sub>2</sub> (5 mol%) were combined in a round-bottom flask equipped with a magnetic stirrer and capped with a rubber septum that had a deflated balloon attached to it. Methanol (5 mL) was slowly added into the flask through a syringe. The mixture was stirred at room temperature until the reaction was completed, based on TLC monitoring. The undissolved solid was filtered, and methanol was evaporated using rotary evaporator. Brine solution was added, and the product was extracted with CH<sub>2</sub>Cl<sub>2</sub>. The organic layer was dried with MgSO<sub>4</sub>, filtered, and concentrated using a rotary evaporator. The crude compound can be used in the next step of directing group installation without further purification.

#### e) Synthetic route e

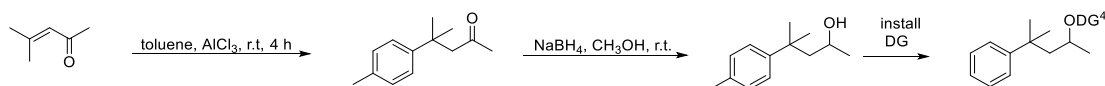


**Oxidation:** A mixture composed of 1-phenyl-2-propanol (21.5 mmol, 1.0 *equiv.*), PCC (25.8 mmol, 1.2 *equiv.*), and Celite (5.0 g) in anhydrous CH<sub>2</sub>Cl<sub>2</sub> (150 mL) was stirred at ambient temperature under nitrogen protection for 24 h. Upon completion, solvents were removed in vacuo, and the residue was suspended in *n*-hexane and filtered. The filtrate was concentrated under reduced pressure and used in the next step as such, without further purification.

**Aldol reaction:** A mixture of phenylacetone (3 mmol, 1.0 *equiv.*), benzaldehyde (3 mmol, 1.0 *equiv.*) and piperidine (0.08 mmol, 2.7 mol%) in toluene (5 mL) were reflux for 12 h using Dean-Stark apparatus. Then the reaction mixture was concentrated *in vacuo* and the residue was purified by silica gel flash column chromatography to obtain the pure product (86% yield).

**Reduction:** The substrate (5 mmol, 1.0 *equiv.*), NaBH<sub>4</sub> (5 mmol, 1.0 *equiv.*), and Pd(OAc)<sub>2</sub> (5 mol%) were combined in a round-bottom flask equipped with a magnetic stirrer and capped with a rubber septum that had a deflated balloon attached to it. Methanol (5 mL) was slowly added into the flask through a syringe. The mixture was stirred at room temperature until the reaction was completed, based on TLC monitoring. The undissolved solid was filtered, and methanol was evaporated using rotary evaporator. Brine solution was added, and the product was extracted with CH<sub>2</sub>Cl<sub>2</sub>. The organic layer was dried with MgSO<sub>4</sub>, filtered, and concentrated using a rotary evaporator. The crude compound can be used in the next step of directing group installation without further purification.

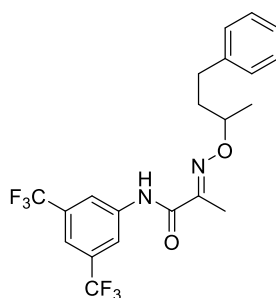
**f) Synthetic route f**



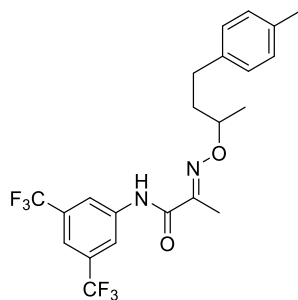
**FC reaction:** Mesityl oxide (6.02 mmol, 1.0 *equiv.*) was added dropwise to a solution of aluminum chloride (7.74 mmol, 1.3 *equiv.*) in 10 mL toluene at 0 °C. After stirring and warming up to room temperature for 4 h, the mixture was poured to 100 mL of ice-water mixture, extracted with diethyl ether (3×15 mL), and washed with saturated sodium bicarbonate (1×15 mL) and brine (1×15 mL). After the extract was dried MgSO<sub>4</sub> and concentrated at reduced pressure, high-vacuum distillation of the crude product afforded the title compound as a colorless oil (74% yield).

**Reduction:** To a solution of 4-methyl-4-(p-tolyl)pentan-2-one (5 mmol, 1.0 *equiv.*) in CH<sub>3</sub>OH (30 mL) was slowly added NaBH<sub>4</sub> (15 mmol, 3.0 *equiv.*) at room temperature. After the reaction completed (monitored by TLC and usually finished within 1 hour), the methanol was removed under reduced pressure and the residue was dissolved in CH<sub>2</sub>Cl<sub>2</sub> (30 mL), extracted by water (3×15 mL), dried MgSO<sub>4</sub> and concentrated to give the 4-methyl-4-(p-tolyl)pentan-2-ol (96% yield). The product can be used directly in the next step of directing group installation.

**B. Characterization of new substrates used in the intramolecular arylation**

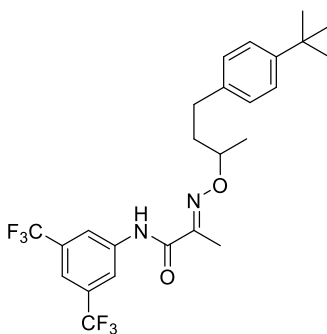


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(cyclohexa-2,4-dien-1-yl)butan-2-yl)oxy)imino)propanamide (3a):** Colorless; yield 51% (683 mg); *R*<sub>f</sub> = 0.71 (petroleum ether-EtOAc = 10:1); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ = 8.82 (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.42-7.28 (m, 2H), 7.23 (d, *J* = 7.8 Hz, 3H), 4.49-4.42 (m, 1H), 2.82-2.72 (m, 2H), 2.13 (s, 4H), 2.02-1.87 (m, 1H), 1.40 (d, *J* = 6.3 Hz, 3H) ppm; <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>) δ = 161.4, 149.7, 141.5, 138.9, 132.4 (q, *J* = 33.4 Hz, 2C), 128.5 (s, 2C), 128.4 (s, 2C), 126.0, 123.1 (q, *J* = 272.8 Hz, 2C), 119.3 (d, *J* = 4.0 Hz, 2C), 117.5-117.2 (m), 81.0, 37.0, 31.6, 20.0, 9.5 ppm; HRMS (ESI-TOF) *m/z*: [M + Na]<sup>+</sup> Calcd. for C<sub>21</sub>H<sub>20</sub>F<sub>6</sub>N<sub>2</sub>O<sub>2</sub>Na 469.1321; found: 469.1338.

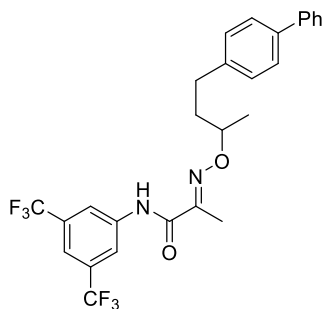


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(p-tolyl)butan-2-yl)oxy)imino)propanamide (3b):**

Colorless; yield 52% (718 mg);  $R_f$  = 0.66 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.83 (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.18-7.07 (m, 4H), 4.47-4.40 (m, 1H), 2.78-2.66 (m, 2H), 2.34 (s, 3H), 2.13 (s, 3H), 2.11-2.05 (m, 1H), 1.96-1.89 (m, 1H), 1.39 (d,  $J$  = 6.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 149.7, 138.9, 138.4, 135.6, 132.5 (q,  $J$  = 33.5 Hz, 2C), 129.2 (s, 2C), 128.3 (s, 2C), 123.1 (q,  $J$  = 273.0 Hz, 2C), 119.3 (d,  $J$  = 3.0 Hz, 2C), 117.4 (dd,  $J_1$  = 7.6 Hz,  $J_2$  = 3.8 Hz), 81.0, 37.2, 31.1, 21.0, 20.0, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  483.1478; found: 483.1499.

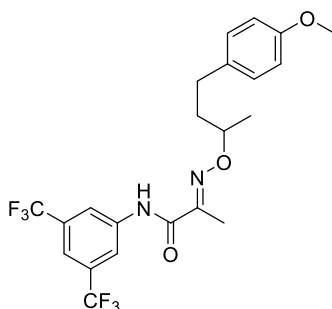


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(4-(tert-butyl)phenyl)butan-2-yl)oxy)imino)propanamide (3c):** yield 48% (724 mg); Colorless oil;  $R_f$  = 0.71 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.85 (s, 1H), 8.14 (s, 2H), 7.63 (s, 1H), 7.34 (d,  $J$  = 8.3 Hz, 2H), 7.16 (d,  $J$  = 8.2 Hz, 2H), 4.48 (dt,  $J_1$  = 12.7 Hz,  $J_2$  = 6.3 Hz, 1H), 2.80-2.69 (m, 2H), 2.12 (s, 4H), 1.99-1.92 (m, 1H), 1.40 (d,  $J$  = 6.3 Hz, 3H), 1.33 (s, 9H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 149.8, 148.9, 138.9, 138.5, 132.5 (q,  $J$  = 33.7 Hz, 2C), 128.0 (s, 2C), 125.4 (s, 2C), 123.1 (q,  $J$  = 272.8 Hz, 2C), 119.3 (d,  $J$  = 3.8 Hz, 2C), 117.8-116.9 (m), 81.1, 37.0, 34.4, 31.4 (s, 3C), 31.1, 20.0, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{25}\text{H}_{28}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  525.1947; found: 525.1947.



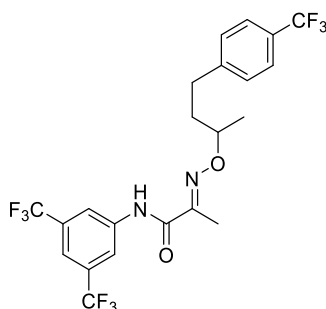
**(E)-2-(((4-([1,1'-biphenyl]-4-yl)butan-2-yl)oxy)imino)-N-(3,5-bis(trifluoromethyl)phenyl)propanamide (3d):** Colorless solid; m.p. = 80-82 °C; yield 47% (737 mg);  $R_f$  = 0.54 (petroleum ether-EtOAc =

10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.84 (s, 1H), 8.13 (s, 2H), 7.63 (s, 1H), 7.59 (dd,  $J_1$  = 8.3 Hz,  $J_2$  = 1.2 Hz, 2H), 7.55 (d,  $J$  = 8.2 Hz, 2H), 7.45 (t,  $J$  = 7.7 Hz, 2H), 7.35 (t,  $J$  = 7.4 Hz, 1H), 7.30 (d,  $J$  = 8.2 Hz, 2H), 4.52-4.45 (m, 1H), 2.89-2.74 (m, 2H), 2.14 (s, 4H), 2.03-1.95 (m, 1H), 1.42 (d,  $J$  = 6.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 149.8, 140.9, 140.6, 139.1, 138.9, 132.4 (q,  $J$  = 33.6 Hz, 2C), 128.8 (s, 2C), 128.7 (s, 2C), 127.2 (s, 2C), 127.1, 126.9 (s, 2C), 123.1 (q,  $J$  = 273.4 Hz, 2C), 119.3 (d,  $J$  = 2.3 Hz, 2C), 117.7-116.9 (m), 81.0, 37.0, 31.3, 20.1, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{27}\text{H}_{24}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  545.1634; found: 545.1658.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(4-methoxyphenyl)butan-2-yl)oxy)imino)propanamide (3e):**

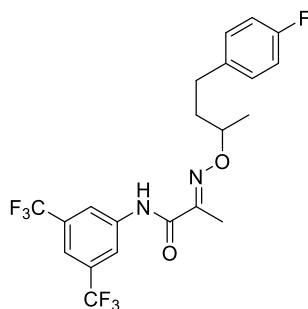
yield 44% (629 mg); Colorless oil;  $R_f$  = 0.51; (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.83 (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.15-7.11 (m, 2H), 6.88-6.84 (m, 2H), 4.46-4.40 (m, 1H), 3.80 (s, 3H), 2.77-2.64 (m, 2H), 2.13 (s, 3H), 2.11-2.03 (m, 1H), 1.94-1.87 (m, 1H), 1.38 (d,  $J$  = 6.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 158.0, 149.7, 138.9, 133.5, 132.5 (q,  $J$  = 33.4 Hz, 2C), 129.3 (s, 2C), 123.1 (q,  $J$  = 272.8 Hz, 2C), 119.3 (d,  $J$  = 3.4 Hz, 2C), 117.6-117.2 (m), 113.9 (s, 2C), 81.0, 55.3, 37.3, 30.7, 20.1, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  499.1427; found: 499.1440.



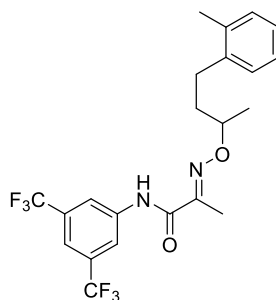
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(4-(trifluoromethyl)phenyl)butan-2-yl)oxy)imino)propanamide (3f):**

yield 52% (803 mg); Colorless oil;  $R_f$  = 0.63 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.80 (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.57 (d,  $J$  = 8.0 Hz, 2H), 7.33 (d,  $J$  = 8.0 Hz, 2H), 4.48-4.42 (m, 1H), 2.89-2.73 (m, 2H), 2.12 (s, 4H), 2.00-1.93 (m, 1H), 1.40 (d,  $J$  = 6.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.3, 150.1, 145.7, 138.9, 132.5 (q,  $J$  = 33.6 Hz, 2C), 128.7 (s, 2C), 128.5 (q,  $J$  = 32.2 Hz), 125.4 (q,  $J$  = 3.9 Hz, 2C), 124.3 (q,  $J$  = 272.7 Hz), 123.1 (q,  $J$  = 272.9 Hz, 2C), 119.3 (d,  $J$  = 3.1 Hz, 2C), 117.8-117.3 (m), 80.8, 36.8, 31.5, 20.1, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{19}\text{F}_9\text{N}_2\text{O}_2\text{Na}$  537.1195; found: 537.1217.

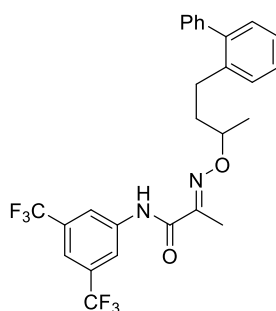




**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(4-fluorophenyl)butan-2-yl)oxy)imino)propanamide (3g):** Colorless solid; m.p. = 55-57 °C; yield 54% (752 mg);  $R_f$  = 0.54 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.81 (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.16 (dd,  $J_1$  = 8.5 Hz,  $J_2$  = 5.5 Hz, 2H), 6.99 (t,  $J$  = 8.7 Hz, 2H), 4.46-4.40 (m, 1H), 2.83-2.64 (m, 2H), 2.12 (s, 3H), 2.13-2.01 (m, 1H), 1.95-1.88 (m, 1H), 1.39 (d,  $J$  = 6.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.3 (d,  $J$  = 243.9 Hz), 161.3, 149.9, 138.8, 137.1 (d,  $J$  = 3.1 Hz), 132.5 (q,  $J$  = 33.6 Hz, 2C), 129.7 (d,  $J$  = 7.8 Hz, 2C), 123.1 (q,  $J$  = 272.9 Hz, 2C), 119.3 (d,  $J$  = 3.4 Hz, 2C), 117.6-117.1 (m), 115.2 (d,  $J$  = 21.2 Hz, 2C), 80.8, 37.2, 30.8, 20.0, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{21}\text{H}_{19}\text{F}_7\text{N}_2\text{O}_2\text{Na}$  487.1227; found: 487.1244.

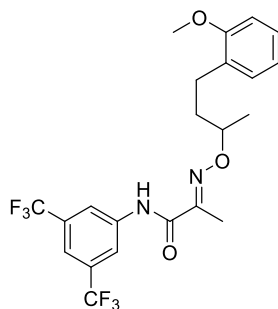


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(o-tolyl)butan-2-yl)oxy)imino)propanamide (3h):** Colorless oil; yield 46% (635 mg);  $R_f$  = 0.63 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.83 (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.23-7.12 (m, 4H), 4.52-4.46 (m, 1H), 2.83-2.67 (m, 2H), 2.34 (s, 3H), 2.14 (s, 3H), 2.08-2.01 (m, 1H), 1.95-1.87 (m, 1H), 1.42 (d,  $J$  = 6.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 149.8, 139.8, 138.9, 135.8, 132.5 (q,  $J$  = 33.4 Hz, 2C), 130.4, 128.7, 126.2, 126.1, 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.3 (d,  $J$  = 3.9 Hz, 2C), 117.6-116.7 (m), 81.2, 36.0, 28.9, 20.0, 19.2, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  483.1478; found: 483.1492.

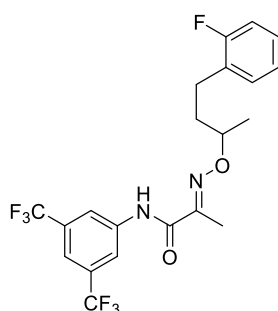


**(E)-2-(((4-([1,1'-biphenyl]-2-yl)butan-2-yl)oxy)imino)-N-(3,5-bis(trifluoromethyl)phenyl)propana**

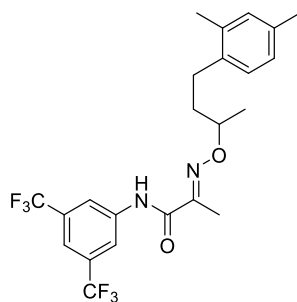
**mid e (3i):** Colorless solid; m.p. = 75-77 °C; yield 42% (658 mg);  $R_f$  = 0.63 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.72 (s, 1H), 8.11 (s, 2H), 7.63 (s, 1H), 7.37 (t,  $J$  = 7.1 Hz, 2H), 7.34-7.31 (m, 4H), 7.30 (d,  $J$  = 1.5 Hz, 1H), 7.27 (d,  $J$  = 2.9 Hz, 1H), 7.23 (d,  $J$  = 7.3 Hz, 1H), 4.32-4.25 (m, 1H), 2.84-2.66 (m, 2H), 1.97 (s, 3H), 1.93-1.81 (m, 1H), 1.82-1.71 (m, 1H), 1.23 (d,  $J$  = 6.4 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.3, 149.6, 141.9, 141.7, 139.0, 138.9, 132.4 (q,  $J$  = 33.6 Hz, 2C), 130.2, 129.2, 129.1 (s, 2C), 128.0 (s, 2C), 127.5, 126.9, 126.0, 123.1 (q,  $J$  = 273.4 Hz, 2C), 119.2 (d,  $J$  = 3.8 Hz, 2C), 117.5-117.3 (m), 80.9, 37.1, 28.7, 19.7, 9.3 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{27}\text{H}_{24}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  545.1634; found: 545.1651.



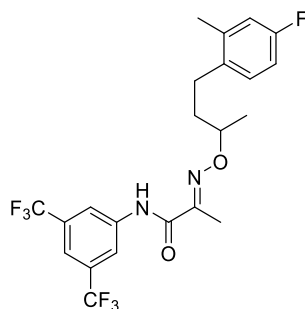
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(2-methoxyphenyl)butan-2-yl)oxy)imino)propanamide (3j):** Colorless solid; m.p. = 62-64 °C; yield 41% (586 mg);  $R_f$  = 0.57 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.85 (s, 1H), 8.12 (s, 2H), 7.62 (s, 1H), 7.25-7.12 (m, 2H), 6.95-6.85 (m, 2H), 4.44 (dq,  $J_1$  = 12.7 Hz,  $J_2$  = 6.3 Hz, 1H), 3.83 (s, 3H), 2.83-2.67 (m, 2H), 2.12 (s, 3H), 2.10-2.01 (m, 1H), 1.97-1.88 (m, 1H), 1.40 (d,  $J$  = 6.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.5, 157.5, 149.5, 139.0, 132.4 (q,  $J$  = 33.4 Hz, 2C), 130.0, 129.8, 127.3, 123.1 (q,  $J$  = 273.3 Hz, 2C), 120.5, 119.2 (d,  $J$  = 3.5 Hz, 2C), 117.4-117.1 (m), 110.4, 81.4, 55.3, 35.5, 26.1, 20.0, 9.4 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  499.1427; found: 499.1442.



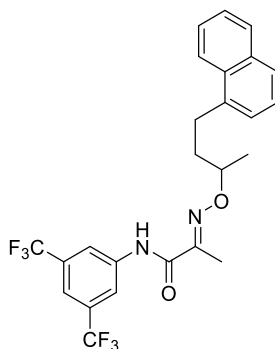
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(2-fluorophenyl)butan-2-yl)oxy)imino)propanamide (3k):** Colorless solid; m.p. = 74-76 °C; yield 55% (766 mg);  $R_f$  = 0.60 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.84 (s, 1H), 8.13 (s, 2H), 7.63 (s, 1H), 7.25-7.17 (m, 2H), 7.12-6.99 (m, 2H), 4.48-4.41 (m, 1H), 2.78 (td,  $J_1$  = 14.5 Hz,  $J_2$  = 14.1 Hz,  $J_3$  = 7.1 Hz, 2H), 2.11 (s, 4H), 2.00-1.93 (m, 1H), 1.40 (d,  $J$  = 6.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 161.2 (d,  $J$  = 244.4 Hz), 149.9, 138.9, 132.5 (q,  $J$  = 33.5 Hz, 2C), 130.6 (d,  $J$  = 5.1 Hz), 128.4 (d,  $J$  = 15.8 Hz), 127.8 (d,  $J$  = 8.1 Hz), 124.1 (d,  $J$  = 3.6 Hz), 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.3 (d,  $J$  = 2.7 Hz, 2C), 117.7-116.8 (m), 115.3 (d,  $J$  = 22.1 Hz), 81.0, 35.8, 25.1, 20.0, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{21}\text{H}_{19}\text{F}_7\text{N}_2\text{O}_2\text{Na}$  487.1227; found: 487.1247.



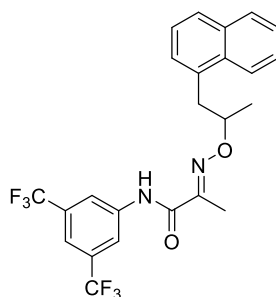
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(2,4-dimethylphenyl)butan-2-yl)oxy)imino)propanamide (3l):** Colorless oil; yield 43% (612 mg);  $R_f$  = 0.71 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.84 (s, 1H), 8.13 (s, 2H), 7.63 (s, 1H), 7.10 - 6.95 (m, 3H), 4.51-4.45 (m, 1H), 2.80-2.63 (m, 2H), 2.30 (d,  $J$  = 3.3 Hz, 6H), 2.14 (s, 3H), 2.06-1.99 (m, 1H), 1.92-1.85 (m, 1H), 1.41 (d,  $J$  = 6.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 149.8, 138.9, 136.7, 135.7, 135.6, 132.5 (q,  $J$  = 33.5 Hz, 2C), 131.2, 128.7, 126.7, 123.1 (q,  $J$  = 273.4 Hz, 2C), 119.3 (d,  $J$  = 2.8 Hz, 2C), 117.6-116.7 (m), 81.2, 36.0, 28.5, 20.9, 20.1, 19.2, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{23}\text{H}_{24}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  497.1634; found: 497.1640.



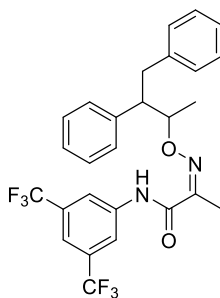
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(4-fluoro-2-methylphenyl)butan-2-yl)oxy)imino)propanamide (3m):** Colorless solid; m.p. = 99-101 °C; yield 49% (703 mg);  $R_f$  = 0.57 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.83 (s, 1H), 8.13 (s, 2H), 7.63 (s, 1H), 7.09 (dd,  $J_1$  = 8.4 Hz,  $J_2$  = 5.9 Hz, 1H), 6.92-6.79 (m, 2H), 4.47 (dq,  $J_1$  = 12.6 Hz,  $J_2$  = 6.4 Hz, 1H), 2.79-2.62 (m, 2H), 2.32 (s, 3H), 2.14 (s, 3H), 2.04-1.94 (m, 1H), 1.91-1.82 (m, 1H), 1.41 (d,  $J$  = 6.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 161.2 (d,  $J$  = 243.5 Hz), 150.0, 138.9, 137.9 (d,  $J$  = 7.4 Hz), 135.3 (d,  $J$  = 3.2 Hz), 132.5 (q,  $J$  = 33.6 Hz, 2C), 129.9 (d,  $J$  = 8.1 Hz), 123.1 (q,  $J$  = 272.7 Hz, 2C), 119.3 (d,  $J$  = 4.0 Hz, 2C), 117.8-117.3 (m), 116.9 (d,  $J$  = 20.8 Hz), 112.6 (d,  $J$  = 20.8 Hz), 81.1, 36.1, 28.2, 20.1, 19.3 (d,  $J$  = 1.7 Hz), 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{21}\text{F}_7\text{N}_2\text{O}_2\text{Na}$  501.1383; found: 501.1401.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(naphthalen-1-yl)butan-2-yl)oxy)imino)propanamide (3n):** Colorless solid; m.p. = 102-104 °C; yield 39% (678 mg);  $R_f$  = 0.57 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.74 (s, 1H), 8.09 (s, 2H), 8.05 (d,  $J$  = 8.4 Hz, 1H), 7.87 (d,  $J$  = 7.8 Hz, 1H), 7.75 (d,  $J$  = 8.1 Hz, 1H), 7.64 (s, 1H), 7.55-7.44 (m, 2H), 7.46-7.39 (m, 1H), 7.37 (d,  $J$  = 5.8 Hz, 1H), 4.56-4.50 (m, 1H), 3.32-3.16 (m, 2H), 2.30-2.21 (m, 1H), 2.16 (s, 3H), 2.15-2.06 (m, 1H), 1.44 (d,  $J$  = 6.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 149.8, 138.8, 137.7, 134.0, 132.4 (q,  $J$  = 33.5 Hz, 2C), 131.7, 128.9, 126.9, 126.0, 125.8, 125.6 (s, 2C), 123.5, 123.1 (q,  $J$  = 273.2 Hz, 2C), 119.3 (d,  $J$  = 4.0 Hz, 2C), 117.5-117.3 (m), 81.2, 36.4, 28.6, 20.0, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{25}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  519.1478; found: 519.1496.

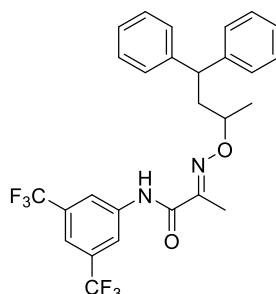


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(naphthalen-1-yl)propan-2-yl)oxy)imino)propanamide (3o):** Colorless solid; m.p. = 106-108 °C; yield 41% (593 mg);  $R_f$  = 0.58 (petroleum ether-EtOAc = 10:1); Major isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.08 (s, 1H), 7.92 (s, 1H), 7.84 (s, 2H), 7.82 (d,  $J$  = 8.7 Hz, 1H), 7.71 (d,  $J$  = 8.0 Hz, 1H), 7.61-7.53 (m, 2H), 7.54-7.47 (m, 1H), 7.44-7.31 (m, 2H), 4.92-4.86 (m, 1H), 3.49-3.38 (m, 2H), 2.01 (s, 3H), 1.53 (d,  $J$  = 6.4 Hz, 3H) ppm; Major isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.1, 148.9, 138.7, 134.8, 133.7, 132.2 (q,  $J$  = 33.5 Hz, 2C), 132.2, 128.9, 127.9, 127.2, 126.1, 125.8, 125.5, 123.9, 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.1 (d,  $J$  = 3.7 Hz, 2C), 117.2-117.1 (m), 82.1, 40.6, 20.4, 9.5 ppm; Minor isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.10 (s, 1H), 7.92 (s, 1H), 7.84 (s, 2H), 7.82 (d,  $J$  = 8.7 Hz, 1H), 7.71 (d,  $J$  = 8.0 Hz, 1H), 7.61-7.53 (m, 2H), 7.54-7.47 (m, 1H), 7.44-7.31 (m, 2H), 4.92-4.86 (m, 1H), 3.49-3.38 (m, 2H), 2.01 (s, 3H), 1.53 (d,  $J$  = 6.4 Hz, 3H) ppm; Minor isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.1, 148.9, 138.7, 134.8, 133.7, 132.2 (q,  $J$  = 33.5 Hz, 2C), 132.2, 128.9, 127.9, 127.2, 126.1, 125.8, 125.5, 123.9, 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.1 (d,  $J$  = 3.7 Hz, 2C), 117.2-117.1 (m), 82.1, 40.6, 20.4, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{24}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  505.1321; found: 505.1337.

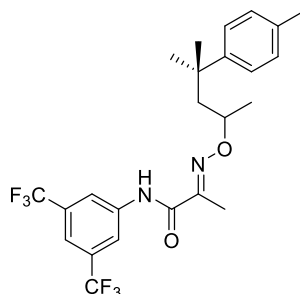


**(Z)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((3,4-diphenylbutan-2-yl)oxy)imino)propanamide (3p):** Colorless oil; yield 45% (588 mg);  $R_f$  = 0.67 (petroleum ether-EtOAc = 10:1); Major isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.75 (s, 1H), 8.11 (s, 2H), 7.64 (s, 1H), 7.30 (ddd,  $J_1$  = 10.9 Hz,  $J_2$  = 8.6 Hz,  $J_3$  =

5.7 Hz, 3H), 7.28-7.19 (m, 3H), 7.22-7.15 (m, 1H), 7.13 (dd,  $J_1 = 13.3$  Hz,  $J_2 = 6.8$  Hz, 2H), 7.07 (d,  $J = 6.8$  Hz, 1H), 4.73-4.63 (m, 1H), 3.32-3.14 (m, 2H), 3.06 (ddd,  $J_1 = 25.8$  Hz,  $J_2 = 12.8$  Hz,  $J_3 = 7.4$  Hz, 1H), 2.14 (s, 3H), 1.30 (d,  $J = 6.5$  Hz, 3H) ppm; Major isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.3$ , 150.0, 140.7, 140.1, 138.9, 132.4 (q,  $J = 33.5$  Hz, 2C), 129.1 (s, 2C), 129.0 (s, 2C), 128.3 (s, 2C), 128.2 (s, 2C), 126.8, 126.0, 123.1 (q,  $J = 272.7$  Hz, 2C), 119.3 (d,  $J = 3.3$  Hz, 2C), 117.7-117.3 (m), 84.3, 52.4, 38.2, 17.7, 9.7 ppm; Minor isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.67$  (s, 1H), 8.11 (s, 2H), 7.64 (s, 1H), 7.30 (ddd,  $J_1 = 10.9$  Hz,  $J_2 = 8.6$  Hz,  $J_3 = 5.7$  Hz, 3H), 7.28-7.19 (m, 3H), 7.22 - 7.15 (m, 1H), 7.13 (dd,  $J_1 = 13.3$  Hz,  $J_2 = 6.8$  Hz, 2H), 7.07 (d,  $J = 6.8$  Hz, 1H), 4.73-4.63 (m, 1H), 3.32-3.14 (m, 2H), 3.06 (ddd,  $J_1 = 25.8$  Hz,  $J_2 = 12.8$  Hz,  $J_3 = 7.4$  Hz, 1H), 2.14 (s, 3H), 1.24 (d,  $J = 6.4$  Hz, 3H) ppm; Minor isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.3$ , 149.8, 140.6, 140.0, 138.9, 132.4 (q,  $J = 33.5$  Hz, 2C), 129.2 (s, 2C), 128.8 (s, 2C), 128.3 (s, 2C), 128.2 (s, 2C), 126.8, 126.1, 123.1 (q,  $J = 272.7$  Hz, 2C), 119.3 (d,  $J = 3.3$  Hz, 2C), 117.6-117.0 (m), 83.1, 52.8, 38.2, 18.4, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{27}\text{H}_{24}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  545.1634; found: 545.1657.

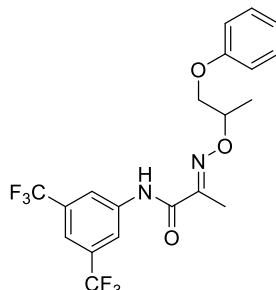


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4,4-diphenylbutan-2-yl)oxy)imino)propanamide (3q):** Colorless oil; yield 44% (575 mg);  $R_f = 0.60$  (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.69$  (s, 1H), 8.08 (s, 2H), 7.63 (s, 1H), 7.35-7.24 (m, 8H), 7.22 (dt,  $J_1 = 8.9$  Hz,  $J_2 = 7.1$  Hz, 2H), 4.41-4.30 (m, 1H), 4.15 (dd,  $J_1 = 9.3$  Hz,  $J_2 = 6.5$  Hz, 1H), 2.51 (ddd,  $J_1 = 15.0$  Hz,  $J_2 = 8.4$ ,  $J_3 = 6.5$  Hz, 1H), 2.36 (ddd,  $J_1 = 14.1$  Hz,  $J_2 = 9.3$  Hz,  $J_3 = 4.8$  Hz, 1H), 2.11 (s, 3H), 1.39 (d,  $J = 6.4$  Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.3$ , 149.6, 144.6, 144.0, 139.0, 132.4 (q,  $J = 33.6$  Hz, 2C), 128.7 (s, 2C), 128.6 (s, 2C), 128.0 (s, 2C), 127.7 (s, 2C), 126.5, 126.4, 123.1 (q,  $J = 273.3$  Hz, 2C), 119.2 (d,  $J = 3.9$  Hz, 2C), 117.4-117.2 (m), 80.1, 47.6, 41.8, 20.5, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{27}\text{H}_{24}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  545.1634; found: 545.1649.

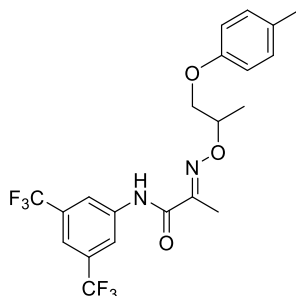


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-methyl-4-(p-tolyl)pentan-2-yl)oxy)imino)propanamide (3r):** yield 43% (525 mg); Colorless oil;  $R_f = 0.55$  (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.77$  (s, 1H), 8.13 (s, 2H), 7.64 (s, 1H), 7.28 (d,  $J = 8.3$  Hz, 2H), 7.15 (d,  $J = 7.9$  Hz, 2H), 4.39-4.30 (m, 1H), 2.34 (s, 3H), 2.20 (dd,  $J_1 = 15.0$  Hz,  $J_2 = 8.1$  Hz, 1H), 1.96 (s, 3H), 1.91 (dd,  $J_1 = 15.0$

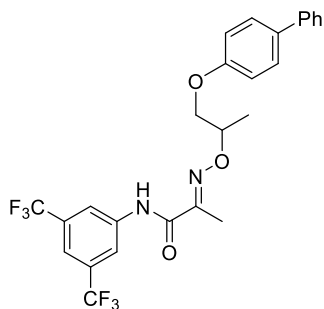
Hz,  $J_2 = 3.1$  Hz, 1H), 1.41 (d,  $J = 4.4$  Hz, 6H), 1.26 (d,  $J = 6.4$  Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.5, 149.2, 145.8, 139.0, 135.1, 132.4$  (q,  $J = 33.5$  Hz, 2C), 128.8 (s, 2C), 125.8 (s, 2C), 123.1 (q,  $J = 272.7$  Hz, 2C), 119.2 (d,  $J = 4.1$  Hz, 2C), 117.2 (p,  $J = 3.9$  Hz), 80.1, 49.7, 36.9, 30.2, 29.2, 22.1, 20.7, 9.3 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{24}\text{H}_{26}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  511.1791; found: 511.1808.



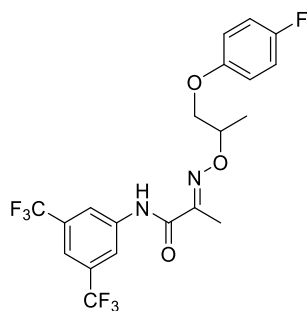
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(cyclohexa-2,4-dien-1-yloxy)propan-2-yl)oxy)imino)propanamide (3s):** Colorless solid; m.p. = 63-65 °C; yield 46% (567 mg);  $R_f = 0.46$  (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.79$  (s, 1H), 8.09 (s, 2H), 7.63 (s, 1H), 7.32 (dd,  $J_1 = 8.7$  Hz,  $J_2 = 7.3$  Hz, 2H), 7.00 (t,  $J = 7.4$  Hz, 1H), 6.95 (dd,  $J_1 = 8.8$  Hz,  $J_2 = 1.0$  Hz, 2H), 4.93-4.78 (m, 1H), 4.21 (dd,  $J_1 = 10.5$  Hz,  $J_2 = 6.1$  Hz, 1H), 4.13 (dd,  $J_1 = 10.5$  Hz,  $J_2 = 4.3$  Hz, 1H), 2.13 (s, 3H), 1.50 (d,  $J = 6.6$  Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.2, 158.6, 150.6, 138.8, 132.4$  (q,  $J = 33.3$  Hz, 2C), 129.6 (s, 2C), 123.1 (q,  $J = 272.8$  Hz, 2C), 121.2, 119.3 (d,  $J = 4.0$  Hz, 2C), 117.6-117.3 (m), 114.6 (s, 2C), 79.7, 70.3, 16.7, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{20}\text{H}_{18}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  471.1114; found: 471.1120.



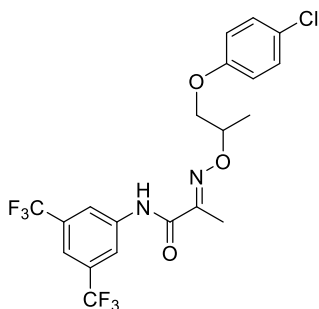
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(p-tolyloxy)propan-2-yl)oxy)imino)propanamide (3t):** Colorless solid; m.p. = 66-68 °C; yield 43% (547 mg);  $R_f = 0.46$  (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.79$  (s, 1H), 8.10 (s, 2H), 7.62 (s, 1H), 7.11 (d,  $J = 8.0$  Hz, 2H), 6.84 (d,  $J = 8.6$  Hz, 2H), 4.86-4.76 (m, 1H), 4.17 (dd,  $J_1 = 10.5$  Hz,  $J_2 = 6.1$  Hz, 1H), 4.09 (dd,  $J_1 = 10.5$  Hz,  $J_2 = 4.4$  Hz, 1H), 2.30 (s, 3H), 2.12 (s, 3H), 1.48 (d,  $J = 6.5$  Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.2, 156.5, 150.5, 138.8, 132.5$  (q,  $J = 33.6$  Hz, 2C), 130.6, 130.0 (s, 2C), 123.1 (q,  $J = 273.2$  Hz, 2C), 119.3 (d,  $J = 2.9$ , 2C), 117.6-117.3 (m), 114.5 (s, 2C), 79.8, 70.5, 20.4, 16.8, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{21}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  485.1270; found: 485.1271.



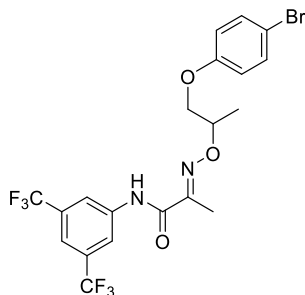
**(E)-2-(((1-([1,1'-biphenyl]-4-yloxy)propan-2-yl)oxy)imino)-N-(3,5-bis(trifluoromethyl)phenyl)propanamide (3u):** Colorless solid; m.p. = 89-91 °C; yield 39% (562 mg);  $R_f$  = 0.37 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.82 (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.55 (d,  $J$  = 8.6 Hz, 4H), 7.43 (t,  $J$  = 7.7 Hz, 2H), 7.33 (t,  $J$  = 7.3 Hz, 1H), 7.02 (d,  $J$  = 8.8 Hz, 2H), 4.90-4.80 (m, 1H), 4.25 (dd,  $J_1$  = 10.3 Hz,  $J_2$  = 5.9 Hz, 1H), 4.16 (dd,  $J_1$  = 10.3 Hz,  $J_2$  = 4.4 Hz, 1H), 2.14 (s, 3H), 1.52 (d,  $J$  = 6.6 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.2, 158.2, 150.7, 140.6, 138.8, 134.4, 132.5 (q,  $J$  = 33.4 Hz, 2C), 128.8 (s, 2C), 128.3 (s, 2C), 126.8, 126.7 (s, 2C), 123.1 (q,  $J$  = 273.4 Hz, 2C), 119.4 (d,  $J$  = 4.0 Hz, 2C), 117.6-117.4 (m), 114.9 (s, 2C), 79.8, 70.4, 16.8, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{26}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  547.1427; found: 547.1424.



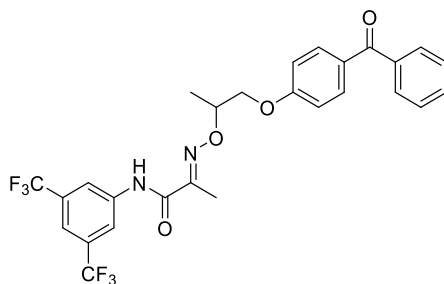
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(4-fluorophenoxy)propan-2-yl)oxy)imino)propanamide (3v):** Colorless solid; m.p. = 64-66 °C; yield 41% (526 mg);  $R_f$  = 0.37 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.80 (s, 1H), 8.11 (s, 2H), 7.63 (s, 1H), 7.04-6.96 (m, 2H), 6.88 (dd,  $J_1$  = 9.2 Hz,  $J_2$  = 4.3 Hz, 2H), 4.88-4.73 (m, 1H), 4.16 (dd,  $J_1$  = 10.3 Hz,  $J_2$  = 6.0 Hz, 1H), 4.07 (dd,  $J_1$  = 10.3 Hz,  $J_2$  = 4.3 Hz, 1H), 2.13 (s, 3H), 1.49 (d,  $J$  = 6.6 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.1, 157.5 (d,  $J$  = 239.1 Hz), 154.8 (d,  $J$  = 2.3 Hz), 150.7, 138.8, 132.5 (q,  $J$  = 33.4 Hz, 2C), 123.1 (q,  $J$  = 272.7 Hz, 2C), 119.3 (d,  $J$  = 3.6 Hz, 2C), 117.8-117.3 (m), 116.0 (d,  $J$  = 23.2 Hz, 2C), 115.7 (d,  $J$  = 8.0 Hz, 2C), 79.8, 71.0, 16.8, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{20}\text{H}_{17}\text{F}_7\text{N}_2\text{O}_3\text{Na}$  489.1020; found: 489.1020.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(4-chlorophenoxy)propan-2-yl)oxy)imino)propanamide (3w):** Colorless solid; m.p. = 62-64 °C; yield 41% (544 mg);  $R_f$  = 0.37 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.79 (s, 1H), 8.11 (s, 2H), 7.63 (s, 1H), 7.29-7.23 (m, 2H), 6.87 (d,  $J$  = 9.0 Hz, 2H), 4.85-4.75 (m, 1H), 4.16 (dd,  $J_1$  = 10.3 Hz,  $J_2$  = 6.0 Hz, 1H), 4.08 (dd,  $J_1$  = 10.3 Hz,  $J_2$  = 4.4 Hz, 1H), 2.13 (s, 3H), 1.49 (d,  $J$  = 6.6 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.1, 157.3, 150.8, 138.8, 132.5 (q,  $J$  = 33.3 Hz, 2C), 129.5 (s, 2C), 126.2 (s, 2C), 123.1 (q,  $J$  = 273.0 Hz, 2C), 119.4 (d,  $J$  = 3.4 Hz, 2C), 117.9-117.0 (m), 116.0, 79.7, 70.5, 16.8, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{20}\text{H}_{17}\text{ClF}_6\text{N}_2\text{O}_3\text{Na}$  505.0724; found: 505.0727.

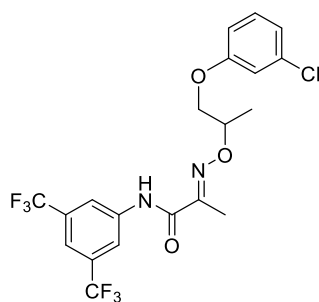


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(4-bromophenoxy)propan-2-yl)oxy)imino)propanamide (3x):** Colorless solid; m.p. = 59-61 °C; yield 40% (580 mg);  $R_f$  = 0.37 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.79 (s, 1H), 8.11 (s, 2H), 7.63 (s, 1H), 7.43-7.37 (m, 2H), 6.86-6.80 (m, 2H), 4.85-4.75 (m, 1H), 4.16 (dd,  $J_1$  = 10.3 Hz,  $J_2$  = 5.9 Hz, 1H), 4.07 (dd,  $J_1$  = 10.2 Hz,  $J_2$  = 4.4 Hz, 1H), 2.13 (s, 3H), 1.49 (d,  $J$  = 6.6 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.1, 157.7, 150.9, 138.8, 132.5 (q,  $J$  = 33.5 Hz, 2C), 132.1 (s, 2C), 123.1 (q,  $J$  = 273.4 Hz, 2C), 119.3 (d,  $J$  = 3.1 Hz, 2C), 117.7-117.4 (m), 116.5 (s, 2C), 113.4, 79.7, 70.5, 16.8, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{20}\text{H}_{17}\text{BrF}_6\text{N}_2\text{O}_3\text{Na}$  549.0219; found: 549.0218.

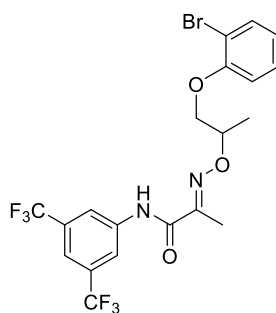


**(E)-2-(((1-(4-benzoylphenoxy)propan-2-yl)oxy)imino)-N-(3,5-bis(trifluoromethyl)phenyl)propanamide (3y):** Colorless solid; m.p. = 126-128 °C; yield 34% (517 mg);  $R_f$  = 0.21 (petroleum ether-EtOAc = 5:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.82 (s, 1H), 8.12 (s, 2H), 7.85 (d,  $J$  = 9.1 Hz, 2H), 7.76 (d,  $J$  = 7.1 Hz, 2H), 7.63 (s, 1H), 7.59 (t,  $J$  = 7.4 Hz, 1H), 7.49 (t,  $J$  = 7.6 Hz, 2H), 7.01 (d,  $J$  = 8.8 Hz, 2H), 4.84 (dt,  $J_1$  = 12.7 Hz,  $J_2$  = 6.3 Hz, 1H), 4.28 (dd,  $J_1$  = 10.3 Hz,  $J_2$  = 5.9 Hz, 1H), 4.19 (dd,  $J_1$  = 10.2 Hz,  $J_2$  = 4.3 Hz, 1H), 2.14 (s, 3H), 1.53 (d,  $J$  = 6.6 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 195.4, 162.2, 161.1, 151.0, 138.8, 138.1, 132.9, 132.6, 132.5 (q,  $J$  = 33.6 Hz, 2C), 132.0, 130.7, 129.7 (s, 2C), 128.2 (s, 2C), 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.4 (d,  $J$  = 3.8 Hz, 2C), 117.6 (t,  $J$  = 4.1 Hz), 114.1 (s, 2C), 79.6, 70.3, 16.8, 9.8 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{27}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_4\text{Na}$  575.1376; found: 575.1376.

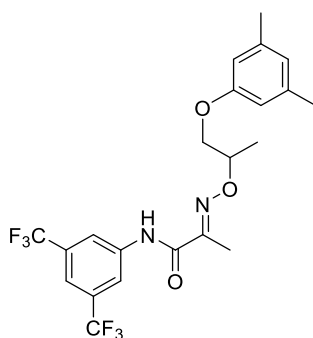




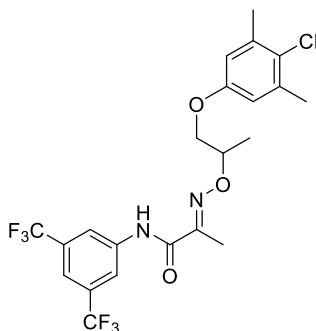
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(3-chlorophenoxy)propan-2-yl)oxy)imino)propanamide (3z):** Colorless solid; m.p. = 83-85 °C; yield 42% (558 mg);  $R_f$  = 0.40 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.77 (s, 1H), 8.11 (s, 2H), 7.63 (s, 1H), 7.22 (t,  $J$  = 8.1 Hz, 1H), 6.97 (d,  $J$  = 7.0 Hz, 1H), 6.95 (t,  $J$  = 2.2 Hz, 1H), 6.84 (ddd,  $J_1$  = 8.4 Hz,  $J_2$  = 2.5 Hz,  $J_3$  = 0.9 Hz, 1H), 4.86-4.76 (m, 1H), 4.18 (dd,  $J_1$  = 10.4 Hz,  $J_2$  = 6.0 Hz, 1H), 4.10 (dd,  $J_1$  = 10.4 Hz,  $J_2$  = 4.4 Hz, 1H), 2.13 (s, 3H), 1.49 (d,  $J$  = 6.6 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.1, 159.3, 150.9, 138.8, 135.0, 132.5 (q,  $J$  = 33.4 Hz, 2C), 130.4, 123.1 (q,  $J$  = 273.3 Hz, 2C), 121.4, 119.4 (d,  $J$  = 3.2 Hz, 2C), 117.8-117.3 (m), 115.0, 113.3, 79.5, 70.4, 16.7, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{20}\text{H}_{17}\text{ClF}_6\text{N}_2\text{O}_3\text{Na}$  505.0724; found: 505.0729.



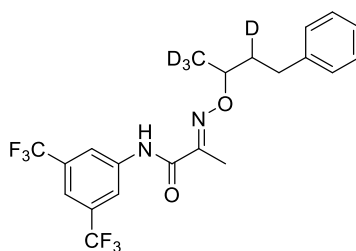
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(2-bromophenoxy)propan-2-yl)oxy)imino)propanamide (3aa):** Colorless oil; yield 44% (638 mg);  $R_f$  = 0.37 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.82 (s, 1H), 8.10 (s, 2H), 7.62 (s, 1H), 7.54 (dd,  $J_1$  = 7.9 Hz,  $J_2$  = 1.6 Hz, 1H), 7.28 (ddd,  $J_1$  = 8.2 Hz,  $J_2$  = 7.4 Hz,  $J_3$  = 1.6 Hz, 1H), 6.94 (dd,  $J_1$  = 8.3 Hz,  $J_2$  = 1.4 Hz, 1H), 6.87 (td,  $J_1$  = 7.7 Hz,  $J_2$  = 1.4 Hz, 1H), 4.95-4.85 (m, 1H), 4.25 (dd,  $J_1$  = 10.4 Hz,  $J_2$  = 6.2 Hz, 1H), 4.19 (dd,  $J_1$  = 10.4 Hz,  $J_2$  = 4.2 Hz, 1H), 2.12 (s, 3H), 1.54 (d,  $J$  = 6.6 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.2, 155.0, 150.6, 138.8, 133.6, 132.4 (q,  $J$  = 33.5 Hz, 2C), 128.5, 123.1 (q,  $J$  = 273.3 Hz, 2C), 122.4, 119.4 (d,  $J$  = 4.1 Hz, 2C), 117.9-116.7 (m), 113.5, 112.4, 79.5, 71.6, 16.6, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{20}\text{H}_{17}\text{BrF}_6\text{N}_2\text{O}_3\text{Na}$  549.0219; found: 549.0219.



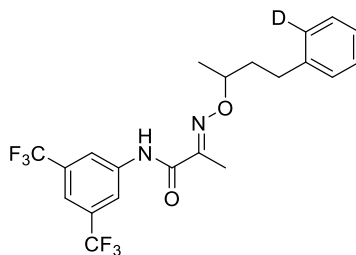
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(3,5-dimethylphenoxy)propan-2-yl)oxy)imino)propanamide (3ab):** Colorless oil; yield 36% (472 mg);  $R_f = 0.49$  (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.79$  (s, 1H), 8.09 (s, 2H), 7.63 (s, 1H), 6.64 (s, 1H), 6.58 (s, 2H), 4.88-4.77 (m, 1H), 4.17 (dd,  $J_1 = 10.4$  Hz,  $J_2 = 6.2$  Hz, 1H), 4.09 (dd,  $J_1 = 10.4$  Hz,  $J_2 = 4.4$  Hz, 1H), 2.29 (s, 6H), 2.13 (s, 3H), 1.49 (d,  $J = 6.5$  Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.3$ , 158.6, 150.4, 139.4 (s, 2C), 138.8, 132.4 (q,  $J = 33.5$  Hz, 2C), 123.1 (q,  $J = 273.4$  Hz, 2C), 123.0, 119.3 (d,  $J = 4.3$  Hz, 2C), 117.7-117.2 (m), 112.4 (s, 2C), 79.8, 70.2, 21.4 (s, 2C), 16.8, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  499.1427; found: 499.1433.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(4-chloro-3,5-dimethylphenoxy)propan-2-yl)oxy)imino)propanamide (3ac):** Colorless oil; yield 35% (492 mg);  $R_f = 0.43$  (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.81$  (s, 1H), 8.11 (s, 2H), 7.63 (s, 1H), 6.68 (s, 2H), 4.88-4.74 (m, 1H), 4.14 (dd,  $J_1 = 10.2$  Hz,  $J_2 = 5.9$  Hz, 1H), 4.05 (dd,  $J_1 = 10.3$  Hz,  $J_2 = 4.4$  Hz, 1H), 2.35 (s, 6H), 2.13 (s, 3H), 1.49 (d,  $J = 6.6$  Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.2$ , 156.4, 150.7, 138.8, 137.3 (s, 2C), 132.5 (q,  $J = 33.6$  Hz, 2C), 126.8, 123.1 (q,  $J = 273.3$  Hz, 2C), 119.3 (d,  $J = 273.3$  Hz, 2C), 117.6-117.4 (m), 114.6 (s, 2C), 79.8, 70.4, 20.9 (s, 2C), 16.8, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{21}\text{ClF}_6\text{N}_2\text{O}_3\text{Na}$  533.1037; found: 533.1037.

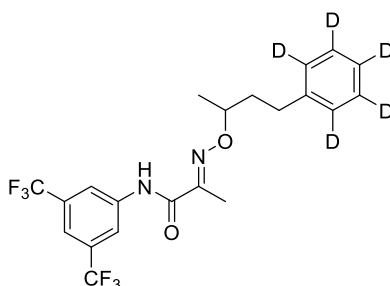


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-phenylbutan-2-yl-1,1,1,3-d4)oxy)imino)propanamide (3a-d<sub>4</sub>):** Colorless solid; yield 46% (518 mg);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.82$  (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.35-7.30 (m, 2H), 7.23 (t,  $J = 7.3$  Hz, 3H), 4.43 (d,  $J = 6.4$  Hz, 1H), 2.83-2.69 (m, 2H), 2.12-1.19 (m, 4H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.4$ , 149.7, 141.5, 138.9, 132.4 (q,  $J = 33.5$  Hz, 2C), 128.5 (s, 2C), 128.4 (s, 2C), 126.0, 123.1 (q,  $J = 272.8$  Hz, 2C), 119.3 (d,  $J = 4.1$  Hz, 2C), 118.0-116.4 (m), 80.8, 36.7-36.4 (m, 1C), 31.5, 19.3-19.0 (m, 1C), 9.5 ppm.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(phenyl-2-d)butan-2-yl)oxy)imino)propanamide**

**(3a-d<sub>1</sub>):** Colorless solid; yield 41% (459 mg); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta$  = 8.82 (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.32 (td,  $J_1$  = 6.7,  $J_2$  = 5.9,  $J_3$  = 1.5 Hz, 2H), 7.23 (t,  $J$  = 7.1 Hz, 2H), 4.48-4.42 (m,  $J$  = 6.3 Hz, 1H), 2.77 (dq,  $J_1$  = 14.7,  $J_2$  = 7.4,  $J_3$  = 7.0 Hz, 2H), 2.15-2.08 (m, 4H), 1.96 (dddd,  $1J$  = 14.2,  $J_2$  = 9.0,  $J_3$  = 7.0, 5.3 Hz, 1H), 1.40 (d,  $J$  = 6.3 Hz, 3H) ppm; <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>)  $\delta$  = 161.4, 149.7, 141.5, 138.9, 132.4 (q,  $J$  = 33.3 Hz, 2C), 128.5, 128.4 (s, 2C), 128.3-127.9 (m, 1 C), 126.0, 123.1 (q,  $J$  = 272.8 Hz, 2C), 119.3 (d,  $J$  = 4.2 Hz, 2C), 117.7-117.2 (m), 81.0, 37.0, 31.6, 20.0, 9.5 ppm.

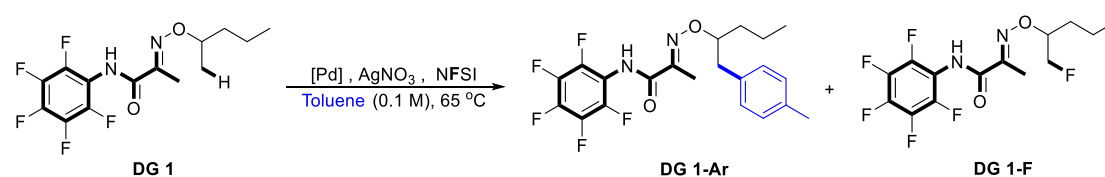


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-(phenyl-d<sub>5</sub>)butan-2-yl)oxy)imino)propanamide**

**(3a-d<sub>5</sub>):** Colorless solid; yield 33% (298 mg); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta$  = 8.83 (s, 1H), 8.13 (s, 2H), 7.63 (s, 1H), 4.46 (m, 4.49-4.23, 1H), 2.92-2.69 (m, 2H), 2.13-2.08 (m, 4H), 2.01-1.92 (m, 1H), 1.41 (d,  $J$  = 6.3 Hz, 3H) ppm; <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>)  $\delta$  = 161.4, 149.7, 141.3, 138.9, 132.3 (q,  $J$  = 33.5 Hz, 2C), 128.1-127.7 (m, 4C), 125.7-125.3 (m, 1C), 123.1 (q,  $J$  = 272.8 Hz, 2C), 119.3 (d,  $J$  = 4.2 Hz, 2C), 117.3 (p,  $J$  = 3.9 Hz), 80.9, 78.4-74.5 (m), 37.0, 31.5, 19.9, 9.5 ppm.

#### IV. Screening of the intermolecular arylation conditions

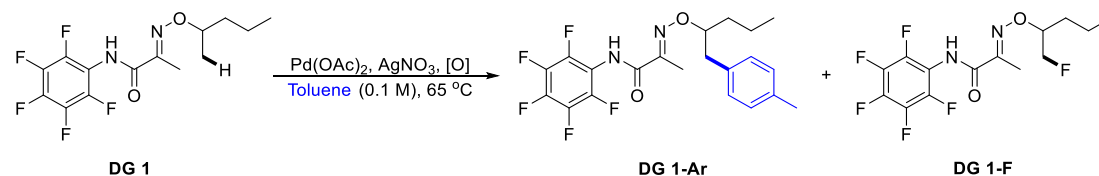
**Table S1.** Screening of catalysts<sup>a</sup>



Entry	[Pd]	Conv. of DG 1 (%)	Yield of DG 1-Ar (%)	Yield of DG 1-F (%)
1	Pd(OAc) <sub>2</sub>	70	53	6
2	Pd(TFA) <sub>2</sub>	56	30	26
3	PdCl <sub>2</sub>	trace	--	--
4	Pd(allyl) <sub>2</sub> Cl <sub>2</sub>	trace	--	--
5	Pd(dppf)Cl <sub>2</sub>	trace	--	--
6	PdCl <sub>2</sub> (cod)	trace	--	--
7	Pd(PPh <sub>3</sub> ) <sub>4</sub>	6	trace	trace
8	Pd(dba) <sub>2</sub>	trace	--	--

<sup>a</sup>Reaction conditions: **DG 1** (0.1 mmol), [Pd] (0.01 mmol), NFSI = N-fluorobenzenesulfonimide (2.0 equiv.), AgNO<sub>3</sub> (1.0 equiv.), toluene (1.0 mL), 65 °C for 24 h. Yields were determined by GC-MS analysis using dodecane as an internal standard.

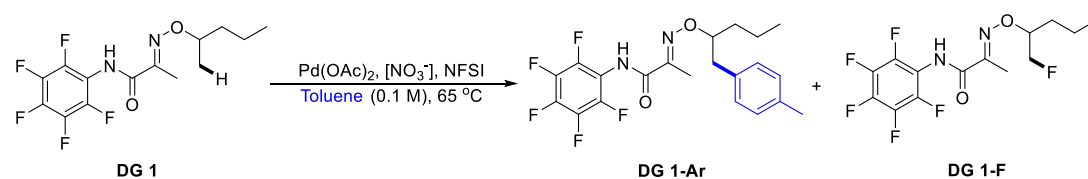
**Table S2.** Screening of oxidants<sup>a</sup>



Entry	[O]	Conv. of DG 1 (%)	Yield of DG 1-Ar (%)	Yield of DG 1-F (%)
1	PhI(OAc) <sub>2</sub>	trace	--	--
2	(NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	trace	--	--
3	Na <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	5	trace	trace
4	K <sub>2</sub> S <sub>2</sub> O <sub>8</sub>	trace	--	--
5	Oxone	trace	--	--
6	TBHP	trace	--	--
7	BQ	trace	--	--
8	Selectfluor	trace	--	--
9	NFSI	70	53	6

<sup>a</sup>Reaction conditions: **DG 1** (0.1 mmol), Pd(OAc)<sub>2</sub> (0.01 mmol), [O] (2.0 equiv.), AgNO<sub>3</sub> (1.0 equiv.), toluene (1.0 mL), 65 °C for 24 h. Yields were determined by GC-MS analysis using dodecane as an internal standard.

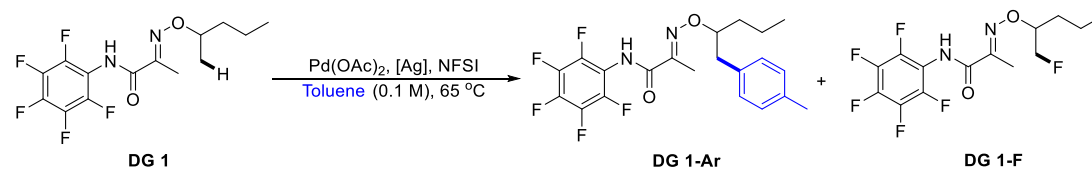
**Table S3.** Screening of  $[\text{NO}_3^-]^a$



Entry	$[\text{NO}_3^-]$	Conv. of DG 1 (%)	Yield of DG 1-Ar (%)	Yield of DG 1-F (%)
1	$\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$	42	29	5
2	$\text{Cu}(\text{NO}_3)_2 \cdot 2\text{H}_2\text{O}$	34	21	11
<b>3</b>	<b><math>\text{AgNO}_3</math></b>	<b>70</b>	<b>53</b>	<b>6</b>
4	$\text{Fe}(\text{NO}_3)_2$	65	46	18
5	$\text{Ca}(\text{NO}_3)_2$	41	30	5
6	$\text{Mg}(\text{NO}_3)_2$	34	22	3
7	$\text{LiNO}_3$	56	40	7
8	$\text{KNO}_3$	87	47	37
9	$\text{CsNO}_3$	64	33	30

<sup>a</sup>Reaction conditions: **DG 1** (0.1 mmol),  $\text{Pd}(\text{OAc})_2$  (0.01 mmol), NFSI (2.0 equiv.),  $[\text{NO}_3^-]$  (1.0 equiv.), toluene (1.0 mL), 65 °C for 24 h. Yields were determined by GC-MS analysis using dodecane as an internal standard.

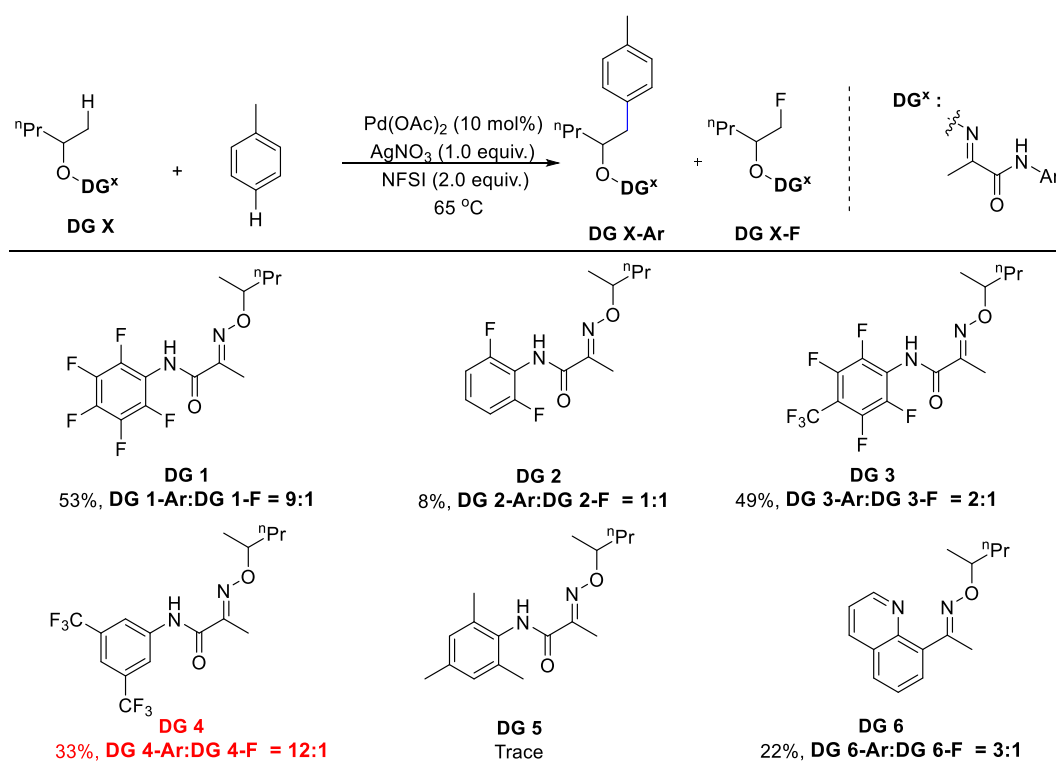
**Table S4.** Screening of  $[\text{Ag}]^a$



Entry	$[\text{Ag}]$	Conv. of DG 1 (%)	Yield of DG 1-Ar (%)	Yield of DG 1-F (%)
1	$\text{Ag}_2\text{CO}_3$	92	5	50
2	$\text{AgOAc}$	55	20	29
3	$\text{Ag}(\text{CF}_3\text{CO}_2)$	trace	--	--
4	$\text{Ag}(\text{CF}_3\text{SO}_3)$	22	13	7
5	$\text{Ag}_2\text{SO}_4$	55	27	23
6	$\text{AgNO}_2$	53	32	6
<b>7</b>	<b><math>\text{AgNO}_3</math></b>	<b>70</b>	<b>53</b>	<b>6</b>

<sup>a</sup>Reaction conditions: **DG 1** (0.1 mmol),  $\text{Pd}(\text{OAc})_2$  (0.01 mmol), NFSI (2.0 equiv.), Ag salt (1.0 equiv.), toluene (1.0 mL), at 65 °C for 24 h. Yields were determined by GC-MS analysis using dodecane as an internal standard.

**Table S5.** Screening of directing groups<sup>a</sup>



<sup>a</sup>Reaction conditions: **DG X** (0.1 mmol),  $\text{Pd}(\text{OAc})_2$  (0.01 mmol), NFSI (2.0 equiv.),  $\text{AgNO}_3$  (1.0 equiv.), toluene (1.0 mL), 65 °C for 24 h. Yields were determined by GC-MS analysis using dodecane as an internal standard.

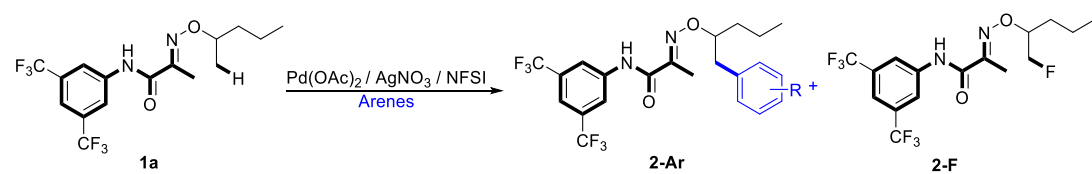
**Table S6.** Screening of reaction temperatures<sup>a</sup>

Reaction scheme showing the screening of reaction temperatures for the synthesis of **2a-Ar** (DG 4-Ar) and **2a-F** (DG 4-F) from **1a** (DG 4). The reaction conditions are:  $\text{Pd}(\text{OAc})_2$  /  $\text{AgNO}_3$  / NFSI, Toluene (0.1 M).

Entry	[T. °C]	Conv. of <b>1a</b> (%)	Yield of <b>2a-Ar</b> (%)	Yield of <b>2a-F</b> (%)
1	45	n.r.	--	--
2	65	40	33	3
3	90	98	75	6
4 <sup>b</sup>	90	95	79	4
5 <sup>c</sup>	90	80	73	4
6 <sup>b, d</sup>	90	94	80	4
7 <sup>b, d, f</sup>	90	95	34	48
8 <sup>b, e</sup>	90	89	79	8

<sup>a</sup>Reaction conditions: **1a** (0.1 mmol),  $\text{Pd}(\text{OAc})_2$  (0.01 mmol), NFSI (2.0 equiv.),  $\text{AgNO}_3$  (1.0 equiv.), toluene (1.0 mL) were added to a test tube, the mixture was stirred at indicated temperatures for 24 h. Yields were determined by GC-MS analysis using dodecane as an internal standard. <sup>b</sup> NFSI (1.5 equiv.) instead of NFSI (2.0 equiv.), <sup>c</sup> NFSI (1.0 equiv.) instead of NFSI (2.0 equiv.), <sup>d</sup>  $\text{AgNO}_3$  (0.2 equiv.) instead of  $\text{AgNO}_3$  (1.0 equiv.), <sup>e</sup> Reaction without  $\text{AgNO}_3$ , <sup>f</sup> **DG 1** as directing group.

**Table S7.** Screening of the amount of arenes<sup>a</sup>

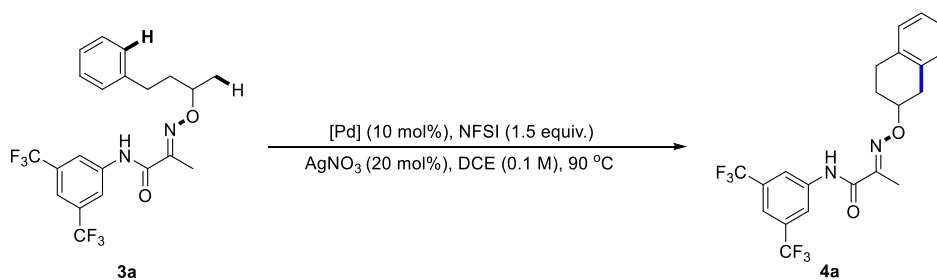


Entry	Arenes	Equiv.	Conv. of <b>1a</b> (%)	Yield of <b>2-Ar</b> (%)	Yield of <b>2-F</b> (%)
1	Toluene	5	59	36	23
2	Toluene	10	72	53	19
3	Toluene	20	87	77	10
4	2-chloro-anisole	5	81	22	59
5	2-chloro-anisole	10	83	29	54
6	2-chloro-anisole	20	88	35	52
7	Cyclohexylbenzene	5	60	29	31
8	Cyclohexylbenzene	10	60	44	16
9	Cyclohexylbenzene	20	62	52	10
10	Phenetole	5	47	26	21
11	Phenetole	10	83	63	20
12	Phenetole	20	83	71	12

<sup>a</sup>Reaction conditions: **1a** (0.1 mmol),  $\text{Pd}(\text{OAc})_2$  (10 mol%), NFSI = N-fluorobenzenesulfonylimide (1.5 equiv.),  $\text{AgNO}_3$  (50 mol%), arenes, under air, at 90 °C for 24 h, GC-MS yields using dodecane as an internal standard.

## V. Screening of the intramolecular arylation conditions

**Table S8.** Screening of catalysts (for the synthesis of tetrahydronaphthalen-2-ol derivatives)<sup>a</sup>



Entry	[Pd]	Conv. of <b>3a</b> (%)	Yield of <b>4a</b> (%)
1	$\text{Pd}(\text{PPh}_3)_4$	63	37
2	$\text{PdCl}_2$	n.r.	n.r.
3	$\text{Pd}(\text{allyl})_2\text{Cl}_2$	49	47
4	$\text{Pd}(\text{dba})_2$	82	80
5	$\text{PdTFA}$	68	60
<b>6</b>	<b><math>\text{Pd}(\text{OAc})_2</math></b>	<b>97</b>	<b>93</b>
<b>7<sup>b</sup></b>	<b><math>\text{Pd}(\text{OAc})_2</math></b>	<b>96</b>	<b>93</b>

<sup>a</sup>Reaction conditions: **3a** (0.1 mmol),  $[\text{Pd}]$  (10 mol%), NFSI = N-fluorobenzenesulfonylimide (1.5 equiv.),  $\text{AgNO}_3$  (20 mol%), DCE (1.0 mL), under air, at 90 °C for 24 h. Yields were determined by GC-MS analysis using dodecane as an internal standard. <sup>b</sup>Reaction without  $\text{AgNO}_3$ , at 90 °C for 9 h.

**Table S9.** Screening of solvents (for the synthesis of tetrahydronaphthalen-2-ol derivatives)<sup>a</sup>

CC(=O)N(Cc1ccc(C(F)(F)F)cc1)C(=O)OCCc2ccccc2
 $\xrightarrow[\text{AgNO}_3 (20 \text{ mol\%}), \text{solvents (0.1 M)}, 90 \text{ }^\circ\text{C}]{\text{Pd(OAc)}_2 (10 \text{ mol\%}), \text{NFSI (1.5 equiv.)}}$ 
CC(=O)N(Cc1ccc(C(F)(F)F)cc1)C(=O)OCCc2c3ccccc3ccc2

**3a** **4a**

Entry	Solvents	Conv. of 3a (%)	Yield of 4a (%)
1	Toluene	96	54
2	PhCF <sub>3</sub>	86	79
3	PhCl	97	80
4	Xylene	88	66
5	CH <sub>3</sub> NO <sub>2</sub>	94	91
6	CH <sub>3</sub> COOH	>99	49
7	EtOAc	94	67
<b>8</b>	<b>DCE</b>	<b>97</b>	<b>93</b>
9	CH <sub>3</sub> CN	<5	<5
10	CHCl <sub>3</sub>	98	89
11	THF	79	78
12	1,4-dioxane	96	78
13	n-Hexane	49	39
14	t-AmylOH	44	18
15	DMF	<5	<5

<sup>a</sup>Reaction conditions: **3a** (0.1 mmol), Pd(OAc)<sub>2</sub> (10 mol%), NFSI = N-fluorobenzenesulfonimide (1.5 equiv.), AgNO<sub>3</sub> (20 mol%), solvents (1.0 mL), under air, at 90 °C for 24 h. Yields were determined by GC-MS analysis using dodecane as an internal standard.



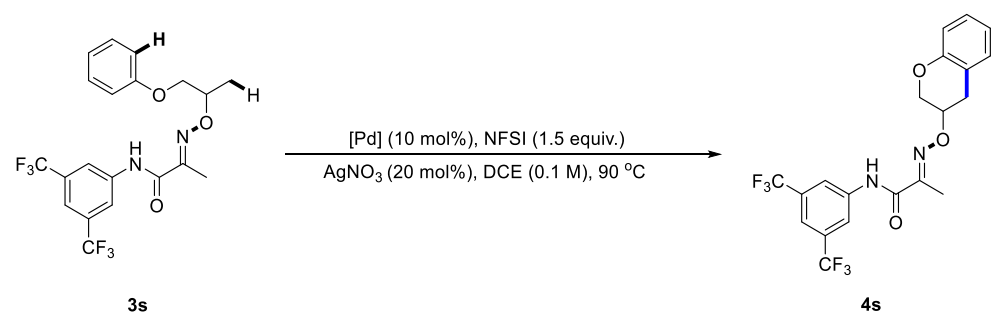
**Table S10.** Screening of solvents (for the synthesis of benzopyran-3-ol derivatives)<sup>a</sup>

Reaction scheme: **3s**  $\xrightarrow[\text{AgNO}_3 (20 \text{ mol\%}), \text{solvents (0.1 M)}, 90^\circ\text{C}]{\text{Pd(OAc)}_2 (10 \text{ mol\%}), \text{NFSI (1.5 equiv.)}}$  **4s**

Entry	Solvents	Conv. of <b>3s</b> (%)	Yield of <b>4s</b> (%)
1	Toluene	67	66
2	PhCF <sub>3</sub>	35	35
3	PhCl	71	70
4	Xylene	70	69
5	CH <sub>3</sub> COOH	56	55
6	CH <sub>3</sub> NO <sub>2</sub>	n.r.	n.r.
7	EtOAc	71	70
<b>8</b>	<b>DCE</b>	<b>75</b>	<b>74</b>
9	CH <sub>3</sub> CN	<5	<5
10	CHCl <sub>3</sub>	73	72
11	THF	10	10
12	1,4-dioxane	68	68
13	n-Hexane	10	9
14	DMF	<5	<5

<sup>a</sup>Reaction conditions: **3s** (0.1 mmol), Pd(OAc)<sub>2</sub> (10 mol%), NFSI = N-fluorobenzenesulfonylimide (1.5 equiv.), AgNO<sub>3</sub> (20 mol%), solvents (1.0 mL), under air, at 90 °C for 24 h. Yields were determined by GC-MS analysis using dodecane as an internal standard.

**Table S11.** Screening of catalysts (for the synthesis of benzopyran-3-ol derivatives) <sup>a</sup>

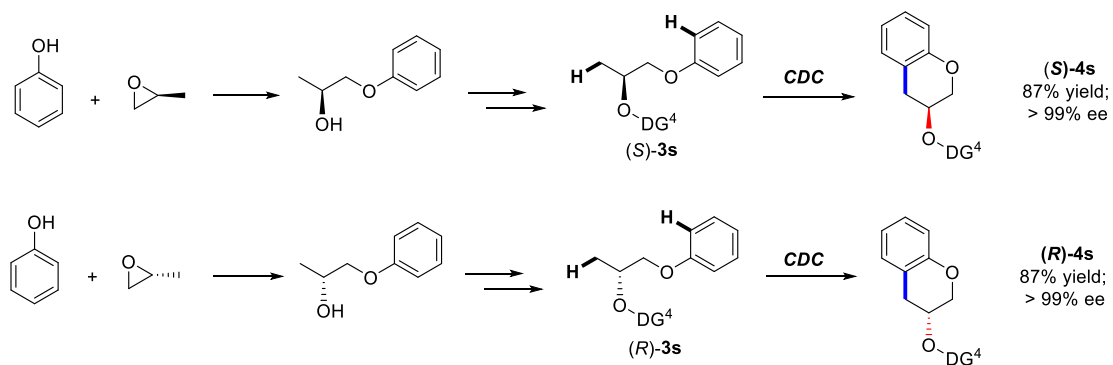


Entry	[Pd]	Conv. of 3s (%)	Yield of 4s (%)
1	Pd(PPh <sub>3</sub> ) <sub>4</sub>	10	6
2	PdCl <sub>2</sub>	10	10
3	Pd(allyl) <sub>2</sub> Cl <sub>2</sub>	10	10
4	Pd(dba) <sub>2</sub>	29	28
5	Pd <sub>2</sub> (dba) <sub>3</sub>	70	69
<b>6</b>	<b>Pd(OAc)<sub>2</sub></b>	<b>75</b>	<b>74</b>
<b>7<sup>b</sup></b>	<b>Pd(OAc)<sub>2</sub></b>	<b>75</b>	<b>74</b>

<sup>a</sup>Reaction conditions: **3s** (0.1 mmol), [Pd] (0.01 mmol), NFSI = N-fluorobenzenesulfonylimide (1.5 equiv.), AgNO<sub>3</sub> (20 mol%), DCE (1.0 mL), under air, at 90 °C for 24 h. Yields were determined by GC-MS analysis using dodecane as an internal standard. <sup>b</sup> Reaction without AgNO<sub>3</sub>.

## VI. Further transformations & discussion

### A. Construction of stereodivergent chiral products



### B. HPLC chromatograms of 3s and 4s.

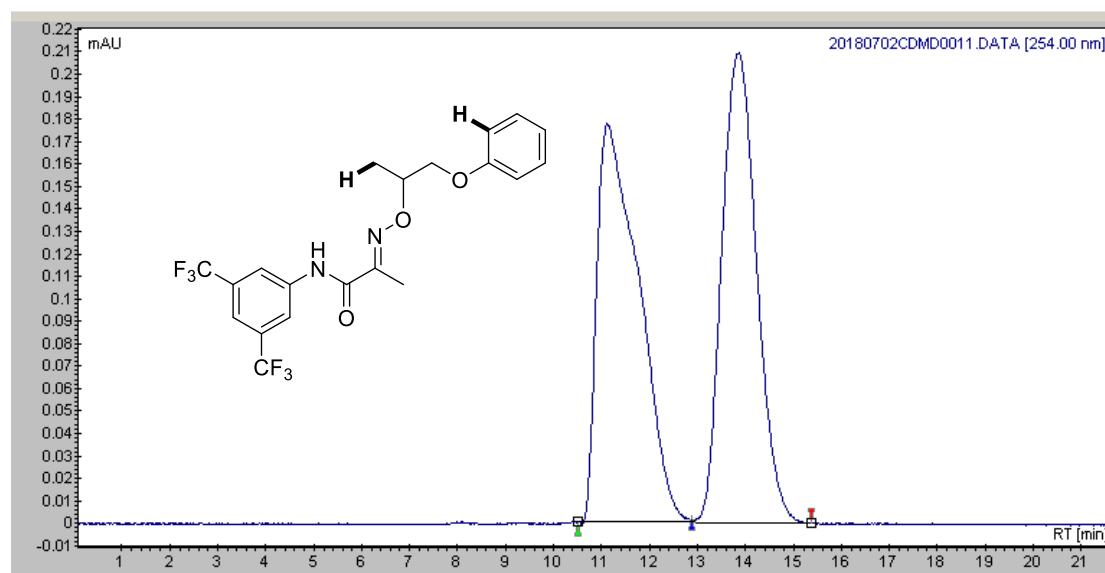
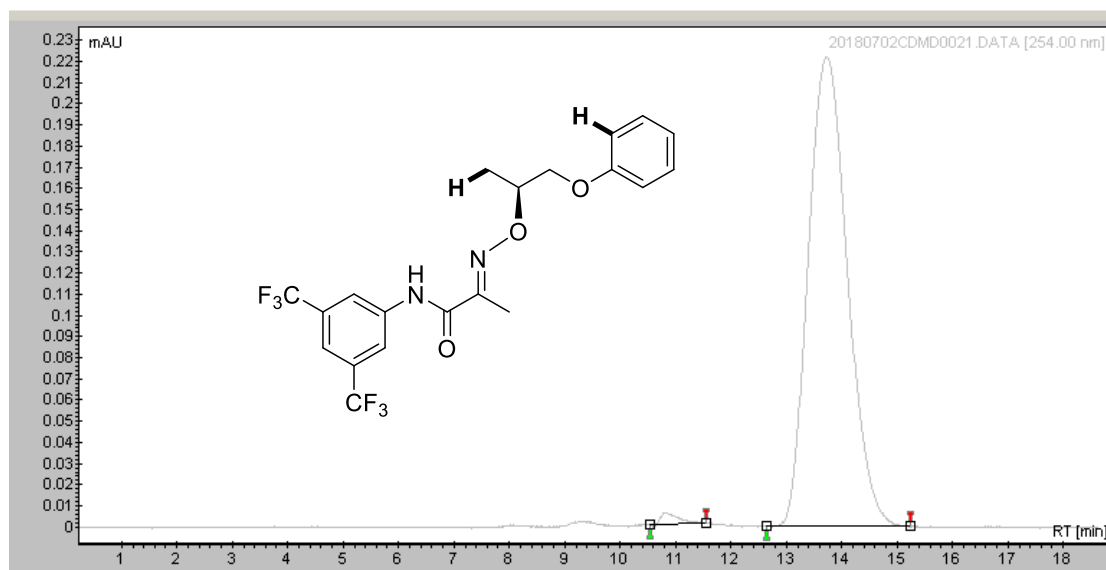


Figure S3. HPLC chromatogram of racemic substrate (±)-3s

Peak #	Time [Min]	High [mAU]	Wide [Min]	Area %
1	11.133	0.2	2.372	50.502
2	13.852	0.2	2.492	49.498

Chiral HPLC conditions: Daicel Chiralpak OD-H, *n*-hexane/*i*-PrOH = 85/15, flow rate = 0.5 mL/min, wavelength = 254 nm.

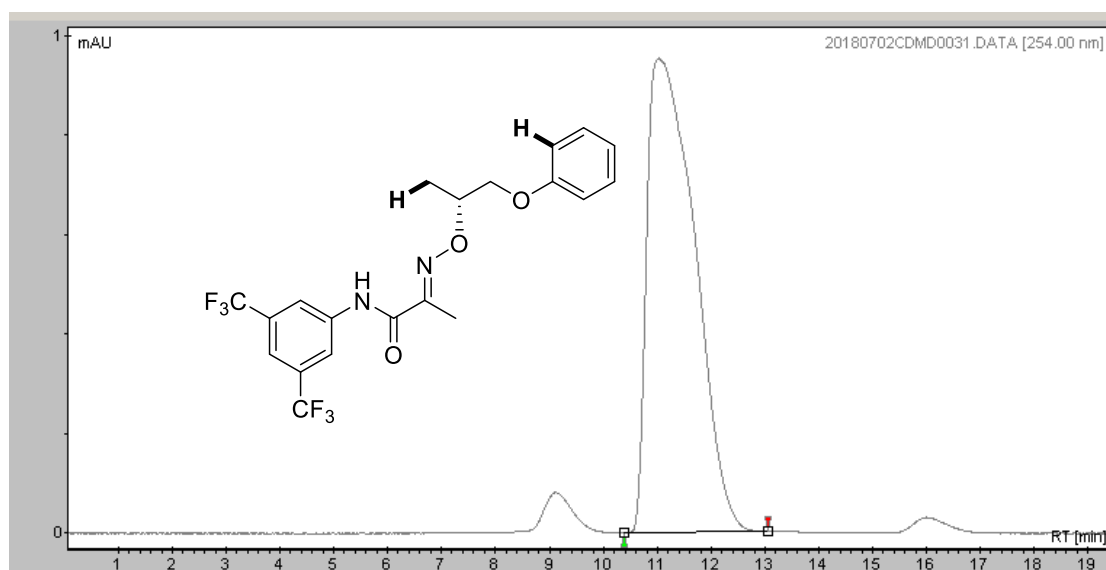


**Figure S4.** HPLC chromatogram of chiral substrate (*S*)-**3s**

Peak #	Time [Min]	High [mAU]	Wide [Min]	Area %
1	10.826	0.0	1.013	1.108
2	13.719	0.2	2.596	98.892

Optical rotation:  $[\alpha]_D^{27} = +39.000$  ( $c = 1.00$ ,  $\text{CH}_2\text{Cl}_2$ ).

Chiral HPLC conditions: Daicel Chiralpak OD-H, *n*-hexane/*i*-PrOH = 85/15, 0.5 mL/min, 254 nm.

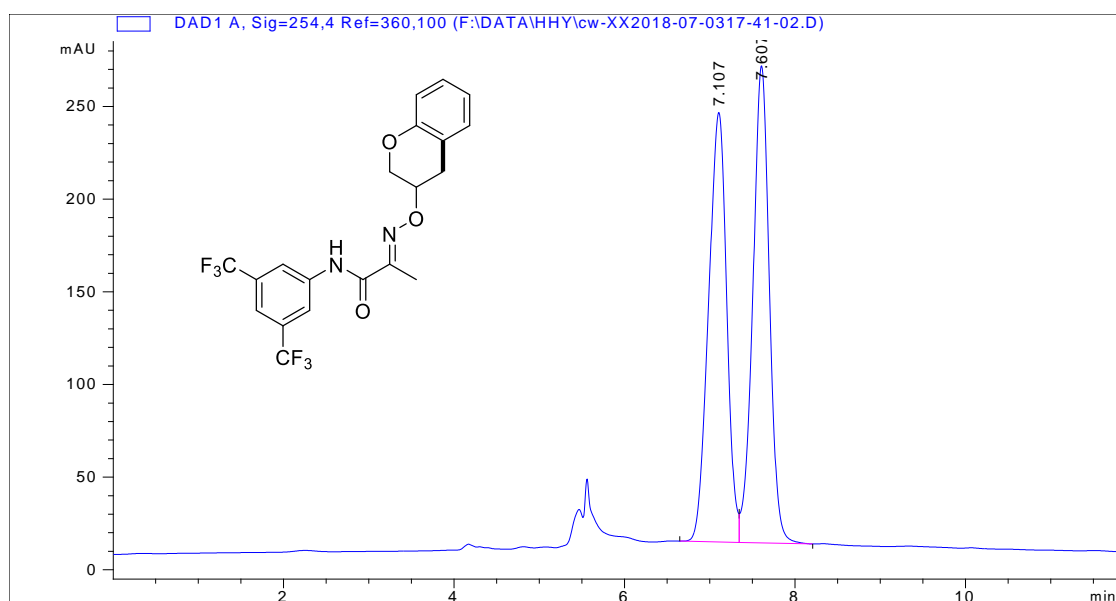


**Figure S5.** HPLC chromatogram of chiral substrate (*R*)-**3s**

Peak #	Time [Min]	High [mAU]	Wide [Min]	Area %
2	11.026	1.0	2.671	100.000

Optical rotation:  $[\alpha]_D^{27} = -42.000$  ( $c = 1.00$ ,  $\text{CH}_2\text{Cl}_2$ ).

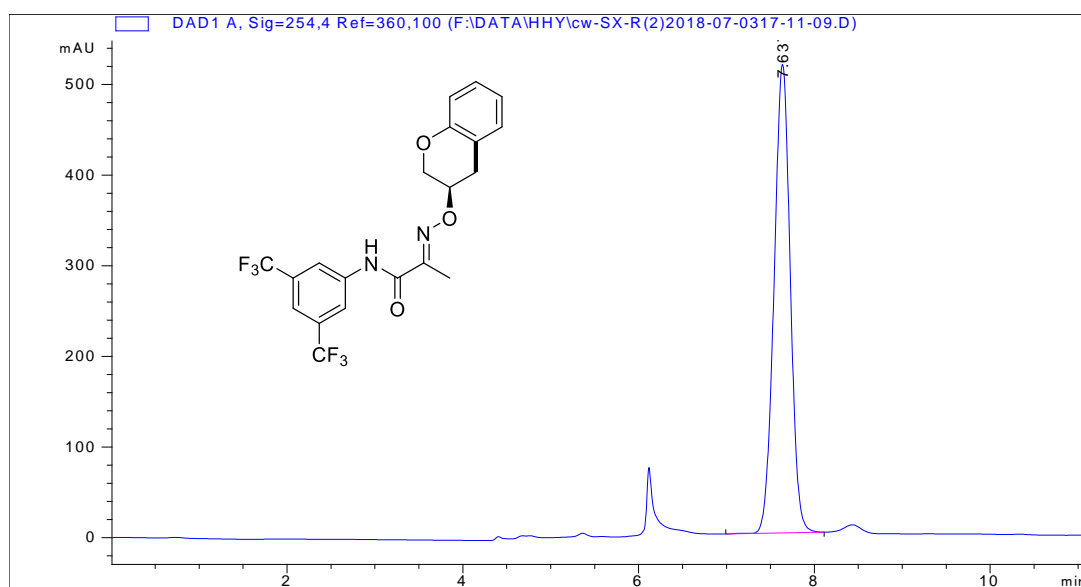
Chiral HPLC conditions: Daicel Chiralpak OD-H, *n*-hexane/*i*-PrOH = 85/15, 0.5 mL/min, 254 nm.



**Figure S6.** HPLC chromatogram of racemic product (±)-4s

Peak #	Time [Min]	High [mAU]	Wide [Min]	Area %
1	7.107	231.8	0.2312	49.751
2	7.607	257.5	0.2054	50.249

Chiral HPLC conditions: Daicel Chiralpak OD-H, *n*-hexane/*i*-PrOH = 90/10-85/15 (30 min), 0.7 mL/min, 254 nm.



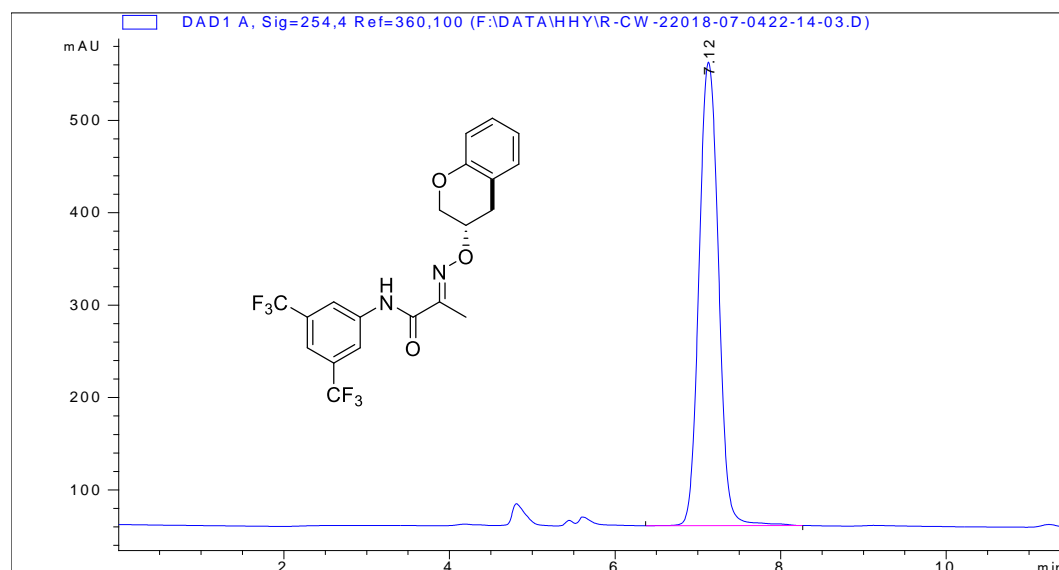
**Figure S7.** HPLC chromatogram of chiral product (S)-4s

Peak #	Time [Min]	High [mAU]	Wide [Min]	Area %
1	7.637	516.9	0.1969	100.000

Optical rotation:  $[\alpha]_D^{20} = +21.3$  (*c* = 1.22, CHCl<sub>3</sub>).

Chiral HPLC conditions: Daicel Chiralpak OD-H, *n*-hexane/*i*-PrOH = 90/10-85/15 (30 min), 0.7 mL/min,

254 nm.



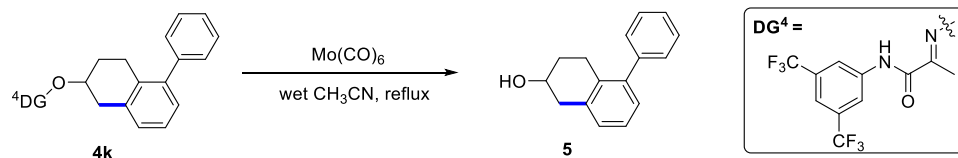
**Figure S8.** HPLC chromatogram of chiral product (**R**)-**4s**

Peak #	Time [Min]	High [mAU]	Wide [Min]	Area %
1	7.128	500.6	0.2682	100.000

Optical rotation:  $[\alpha]_D^{20} = -24.0$  ( $c = 1.00$ ,  $\text{CHCl}_3$ ).

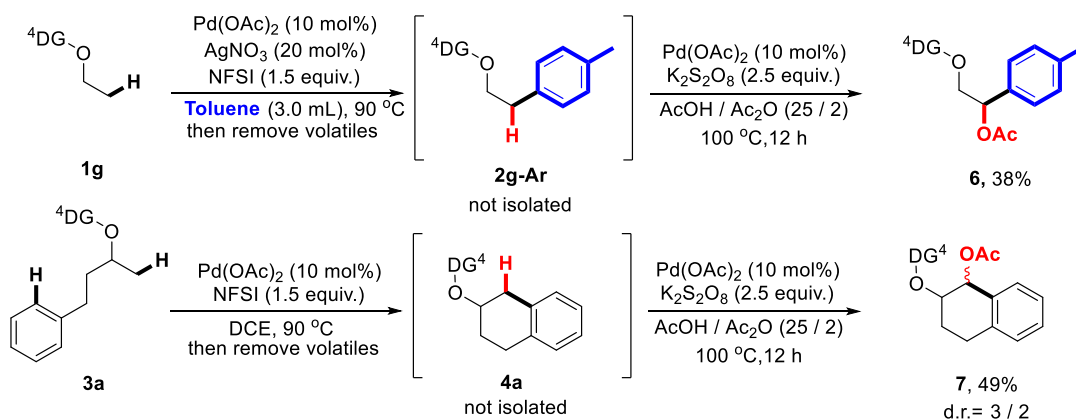
Chiral HPLC conditions: Daicel Chiralpak OD-H, n-hexane/i-PrOH = 90/10-85/15 (30 min), 0.7 mL/min, 254 nm.

### C. Removing the directing group installed in alkyl alcohols



Following the literature procedure<sup>1</sup>. A 25 mL Schlenk tube was charged with (E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((5-phenyl-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (**4k**) (52 mg, 0.1 mmol, 1.0 equiv.),  $\text{Mo(CO)}_6$  (33 mg, 1.25 equiv.),  $\text{CH}_3\text{CN}$  (2.0 mL), and  $\text{H}_2\text{O}$  (4 drops). The tube was sealed with a Teflon-lined screw cap, refrigerated with liquid nitrogen, evacuated the air and filled with nitrogen by the schlenk line for 3 times. Then the tube was heated at 90 °C for 12 h under stirring. Next, the tube was allowed to cool to room temperature. The solvent was then removed in *vacuo* and the residue was purified through flash column chromatography on silica gel (petroleum ether/EtOAc = 3:1) to give the corresponding product **5** as a Colorless solid (18 mg, 80% yield).

### D. $\beta$ -selective C-H bond arylation and acetoxylation



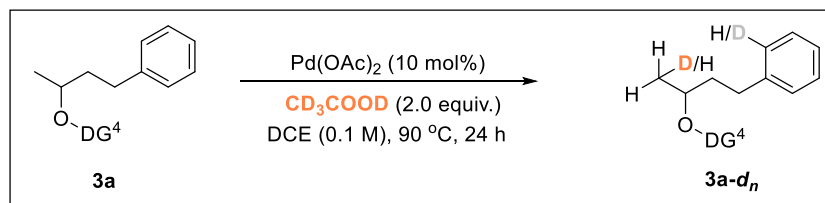
In a 10 mL test tube equipped with a stir bar, aromatic alcohol derivatives **1g** (106.8 mg, 0.3 mmol), Pd(OAc)<sub>2</sub> (6.8 mg, 0.03 mmol), NFSI (141.8 mg, 0.45 mmol), AgNO<sub>3</sub> (10.2 mg, 0.06 mmol) and toluene (3.0 mL) were added successively. Then the tube was sealed and heated at 90 °C for 24 h under stirring. Upon completion, removal of the solvent under vacuum. Then Pd(OAc)<sub>2</sub> (6.8 mg, 0.03 mmol), K<sub>2</sub>S<sub>2</sub>O<sub>8</sub> (202.5 mg, 0.75 mmol) and AcOH/Ac<sub>2</sub>O = 25:2 were added successively. The tube was sealed and heated at 100 °C for 12 h under stirring. Purification using silica gel chromatography (petroleum ether/acetate = 20:1) gave the product **6**.

In a 10 mL test tube equipped with a stir bar, aromatic alcohol derivatives **3a** (133.8 mg, 0.3 mmol), Pd(OAc)<sub>2</sub> (6.8 mg, 0.03 mmol), NFSI (141.8 mg, 0.45 mmol) and DCE (3.0 mL) were added successively. Then the tube was sealed and heated at 90 °C for 24 h under stirring. Upon completion, removal of the solvent under vacuum. The Pd(OAc)<sub>2</sub> (6.8 mg, 0.03 mmol), K<sub>2</sub>SO<sub>4</sub> (130.7 mg, 0.75 mmol) and AcOH/Ac<sub>2</sub>O = 25:2 were added successively. Then the tube was sealed and heated at 100 °C for 12 h under stirring. Purification using silica gel chromatography (petroleum ether/acetate = 30:1) gave the product **7**.

## VII. Preliminary mechanistic studies

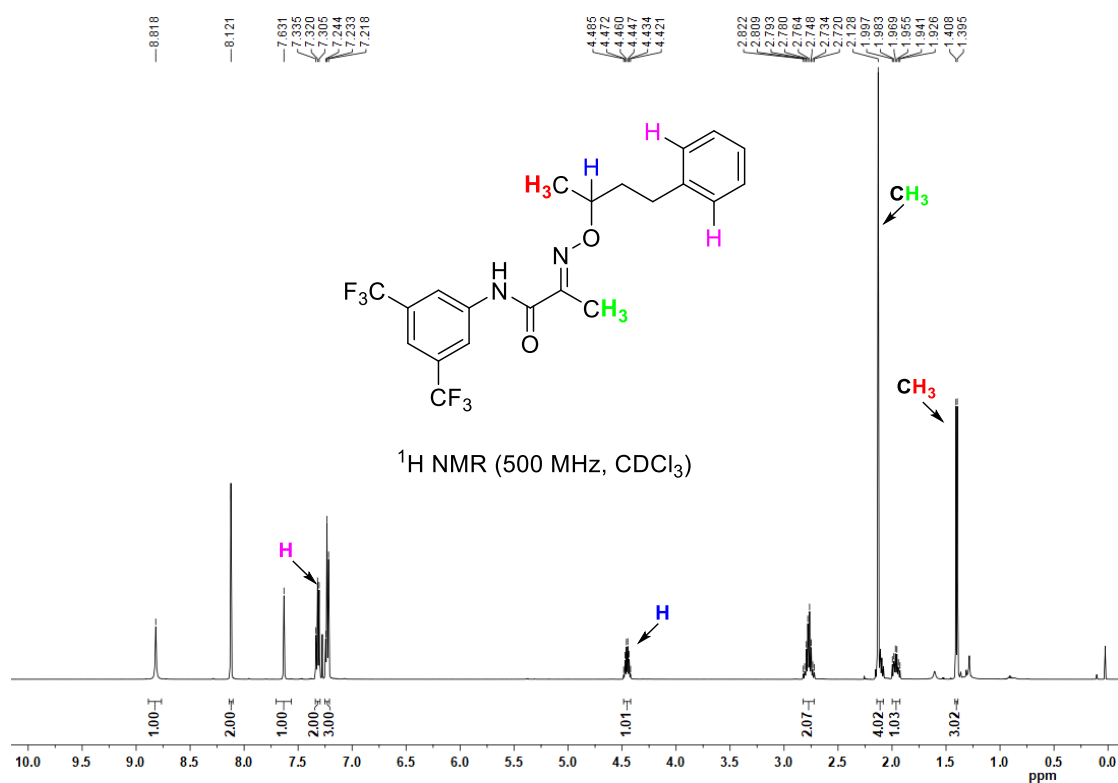
### A. Deuterated experiments

#### a) Deuterium experiment in the absence of NFSI

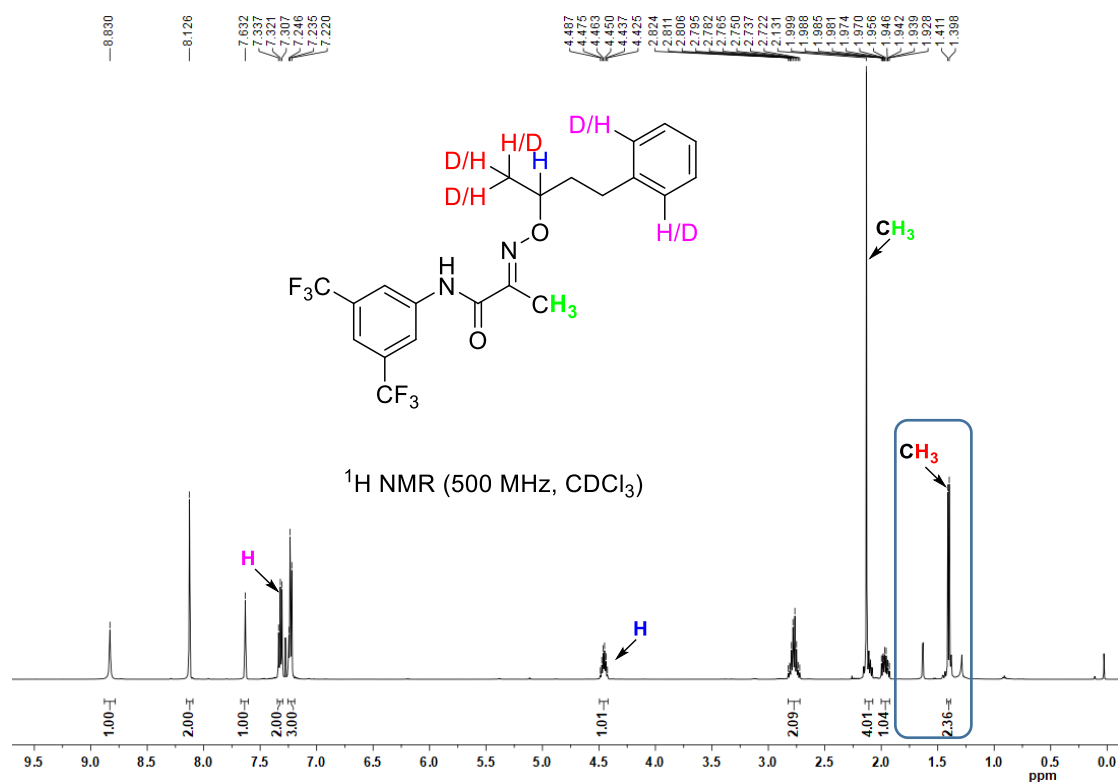


In a 10 mL test tube equipped with a stir bar, compound **3a** (133.8 mg, 0.3 mmol), Pd(OAc)<sub>2</sub> (6.8 mg, 0.03 mmol), CD<sub>3</sub>COOD (38.4 mg, 0.6 mmol), and DCE (3.0 mL) were added successively. Then the tube was sealed and stirred at 90 °C for 24 h. Upon completion, the resulting mixture was cooled to room temperature, diluted with CH<sub>2</sub>Cl<sub>2</sub> and concentrated under reduced pressure. Then the residue was purified by silica gel chromatography (petroleum ether/EtOAc = 50:1) to afford the mixture of starting substrate **3a** and deuterated substrate **3a-d<sub>n</sub>** (120.0 mg, ~90% recovered).

The deuterium ratio of **3a-d<sub>n</sub>** was determined on the basis of <sup>1</sup>H NMR analysis. Based on the integrations related to different hydrogen resonances, the percentage of deuterated β-methyl hydrogen of **3a** is calculated to be 20%, suggesting that the C-H cleavage step is reversible in the absence of NFSI (*Figure S9-S10*).



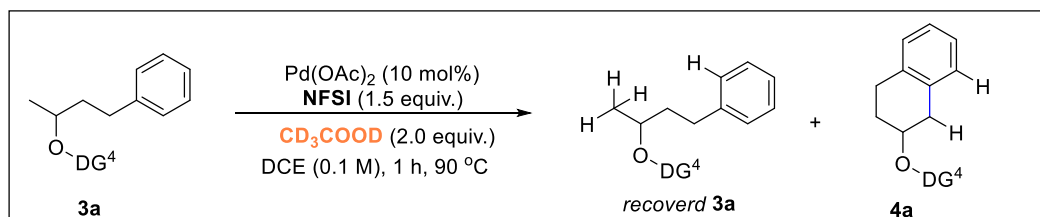
**Figure S9.** The <sup>1</sup>H NMR spectrum of **3a** (CDCl<sub>3</sub>)



**Figure S10.** The <sup>1</sup>H NMR spectrum of **3a** and **3a-d<sub>n</sub>** (CDCl<sub>3</sub>)

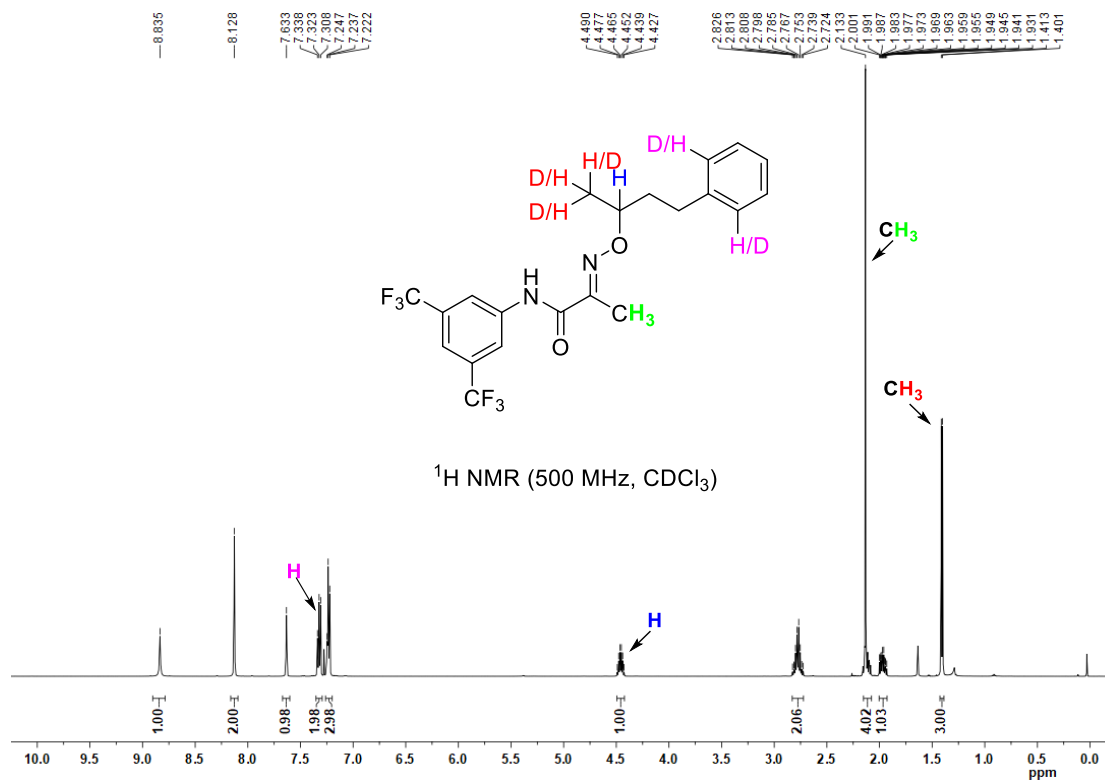


**b) Deuterium experiment in the presence of NFSI**



In a 10 mL test tube equipped with a stir bar, compound **3a** (133.8 mg, 0.3 mmol),  $\text{Pd}(\text{OAc})_2$  (6.8 mg, 0.03 mmol), NFSI (141.8 mg, 0.45 mmol),  $\text{CD}_3\text{COOD}$  (38.4 mg, 0.6 mmol), and DCE (3.0 mL) were added successively. Then the tube was sealed and stirred at 90 °C for 1 h. Upon completion, the resulting mixture was cooled to room temperature, diluted with  $\text{CH}_2\text{Cl}_2$  and concentrated under reduced pressure. Then the residue was purified by silica gel chromatography (petroleum ether/EtOAc = 50:1) to afford the substrate **3a** (81.6 mg) and the arylation product **4a** (26.6 mg, 20% yield).

The deuteration percentage of **3a** and **4a** was determined on the basis of  $^1\text{H}$  NMR analysis. Based on the integrations related to different hydrogen resonances, neither  $\beta\text{-H}$  of **3a** or **4a** was deuterated during the arylation process (**Figure S11** and **Figure S12**).



**Figure S11.** The  $^1\text{H}$  NMR spectrum of recovered **3a** ( $\text{CDCl}_3$ )

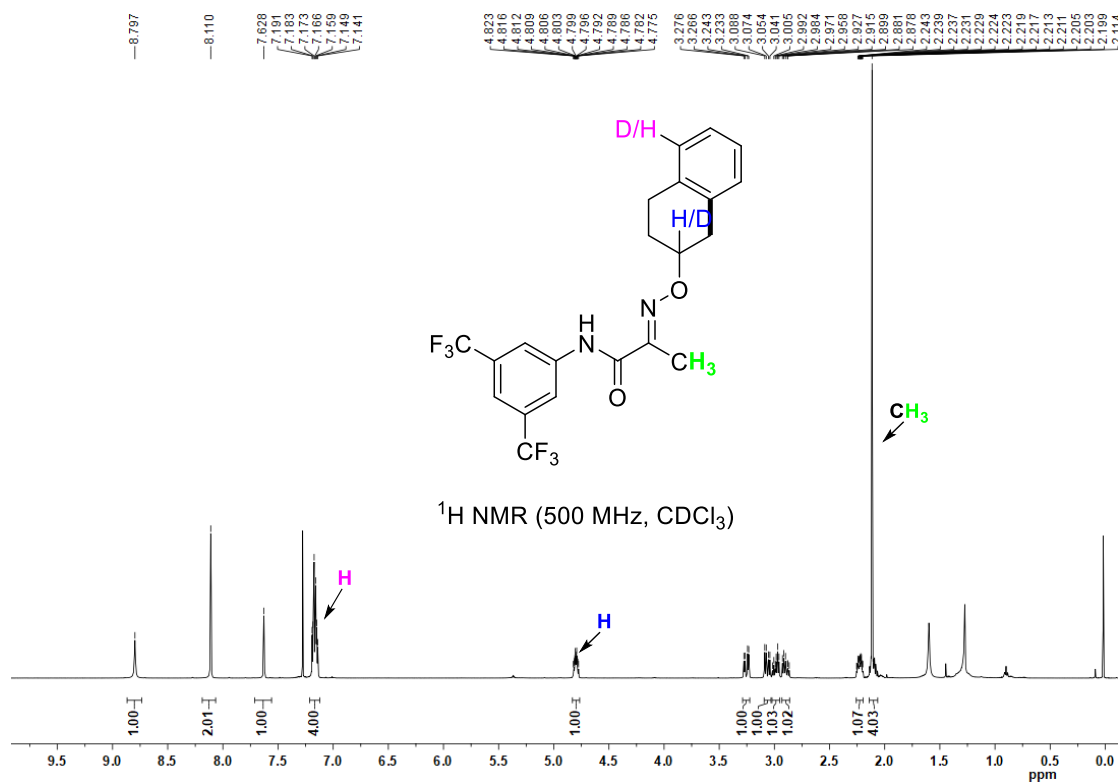
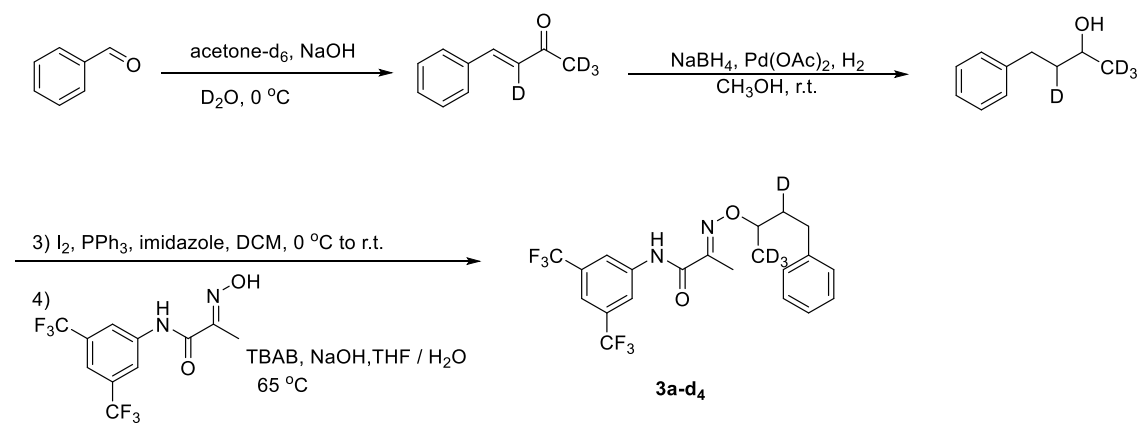


Figure S12. The <sup>1</sup>H NMR spectrum of arylation product **4a** (CDCl<sub>3</sub>)

c) Kinetic isotope effect experiment

Competing experiments between C(sp<sup>3</sup>)-H and C(sp<sup>3</sup>)-D



Scheme S1. Synthetic route to the C(sp<sup>3</sup>)-deuterated substrate **3a-d<sub>4</sub>**

**3a-d<sub>4</sub>** was prepared according to the previous general procedure, except the using of actone-d<sub>6</sub> and D<sub>2</sub>O in the first step. **3a-d<sub>4</sub>** was characterized as below (Figure S13).

180105  
HHY-6-CD CDCl<sub>3</sub> 0105

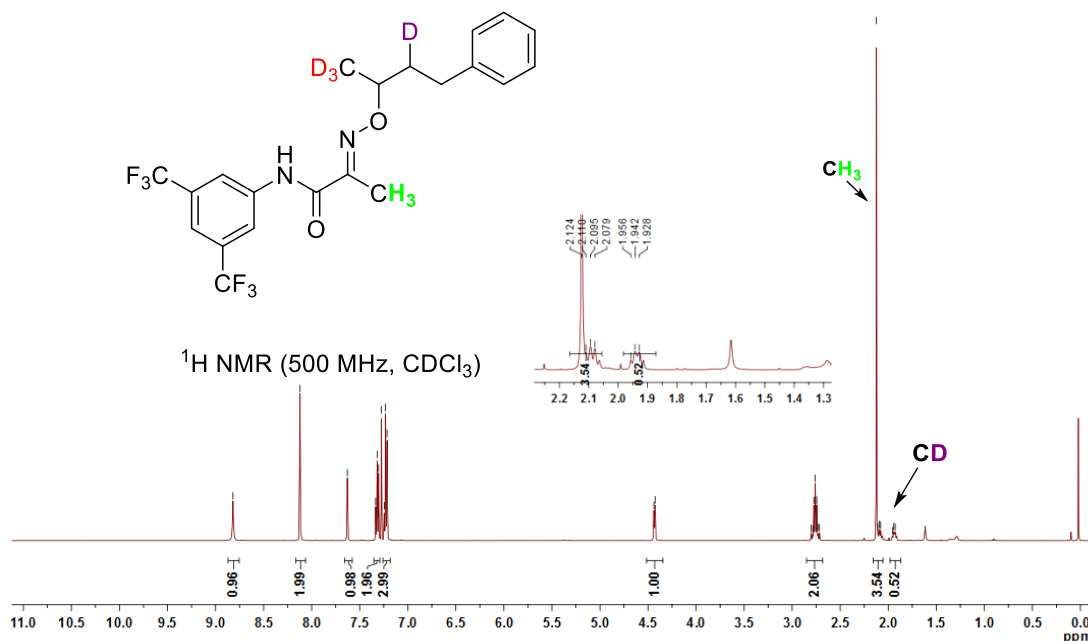
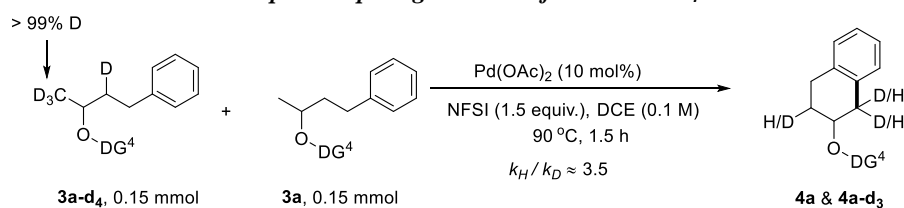


Figure S13. The <sup>1</sup>H NMR spectrum of **3a-d<sub>4</sub>**

**One-pot competing reaction of **3a** and **3a-d<sub>4</sub>****



In a 10 mL test tube equipped with a stir bar, compound **3a-d<sub>4</sub>** (67.5 mg, 0.15 mmol), **3a** (66.9 mg, 0.15 mmol), Pd(OAc)<sub>2</sub> (6.8 mg, 0.03 mmol), NFSI (141.8 mg, 0.45 mmol), and DCE (3.0 mL) were added successively. Then the tube was sealed and stirred at 90 °C for 1.5 h. Upon completion, the resulting mixture was cooled to room temperature, diluted with CH<sub>2</sub>Cl<sub>2</sub> and concentrated under reduced pressure. Then the residue was purified by silica gel chromatography (petroleum ether/EtOAc = 50:1) to afford the mixture of arylation products **4a** and **4a-d<sub>3</sub>** (46.8 mg, ~35% yield).

Based on the integrations between **4a** and **4a-d<sub>3</sub>**, the KIE is calculated to be 3.5 (Figure S14).

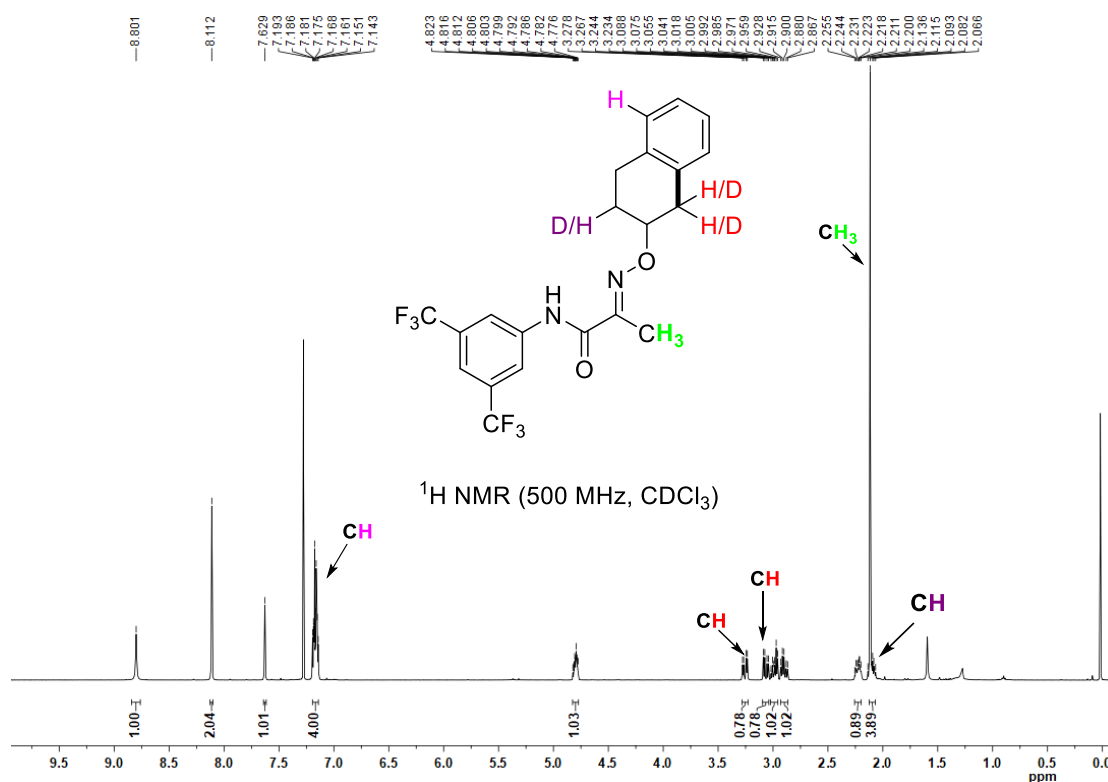
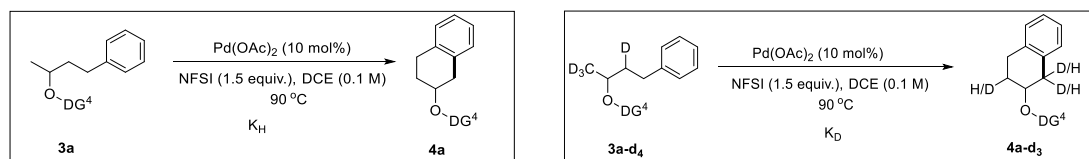


Figure S14. The <sup>1</sup>H NMR spectrum of **4a** and **4a-d<sub>3</sub>**

#### Side-by-side reactions of **3a** and **3a-d<sub>4</sub>**

In a 10 mL test tube equipped with a stir bar, compound **3a** or **3a-d<sub>4</sub>** (0.1 mmol), Pd(OAc)<sub>2</sub> (2.3 mg, 0.01 mmol), NFSI (47.3 mg, 0.15 mmol), and DCE (1.0 mL) were added successively. Then the tube was sealed and stirred at 90 °C. Upon an indicated time, the resulting mixture was cooled to room temperature, diluted with CH<sub>2</sub>Cl<sub>2</sub> and concentrated under reduced pressure. Then the residue was purified by silica gel chromatography (petroleum ether/EtOAc = 50:1) to afford the mixture of intramolecular arylation products **4a** and **4a-d<sub>3</sub>**, the KIE is calculated to be 3.3 (Figure S15).



$$k_H / k_D = 2.828 / 0.851 \approx 3.3$$

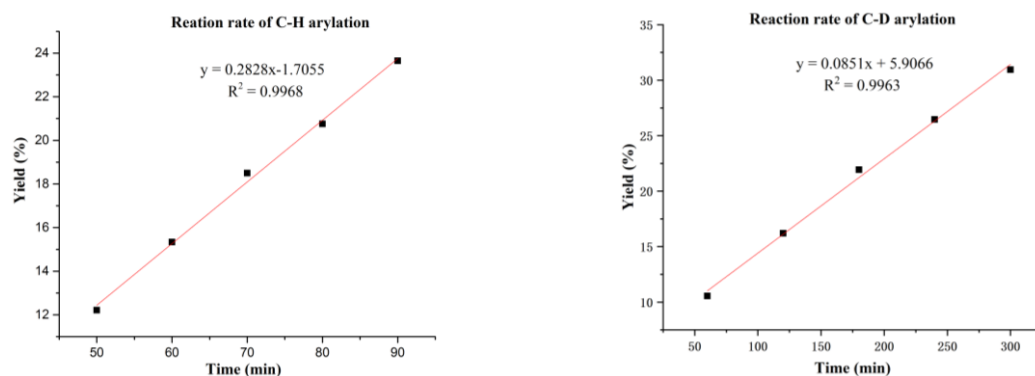
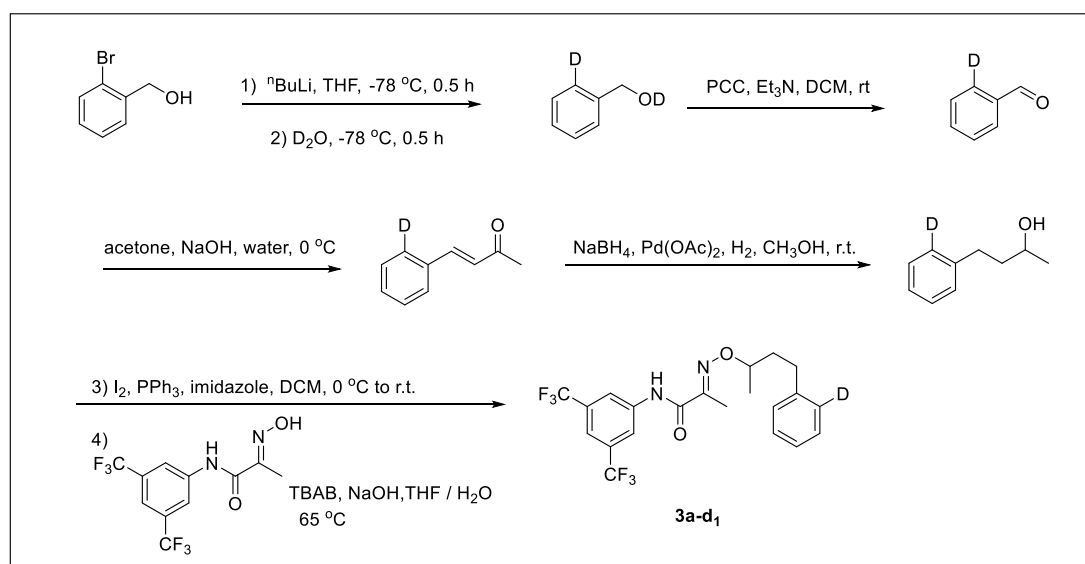


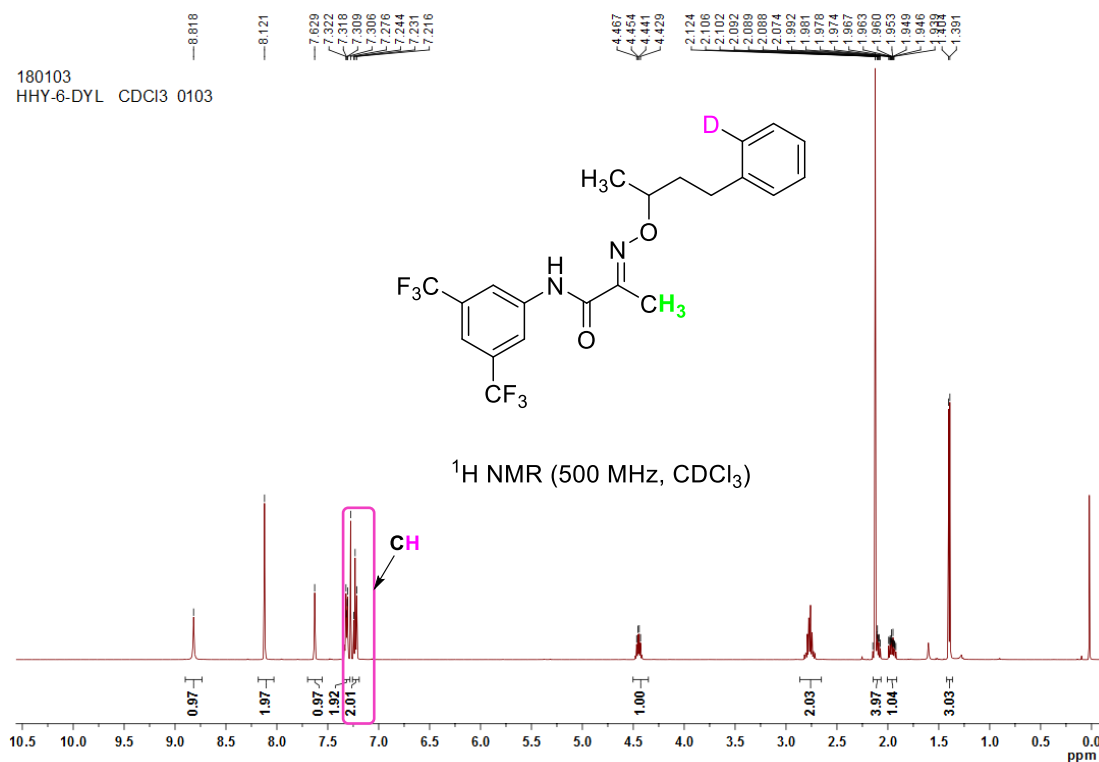
Figure S15. Time-yield curves of **4a** and **4a-d<sub>3</sub>**

*Competing experiments between C(sp<sup>2</sup>)-H and C(sp<sup>2</sup>)-D*



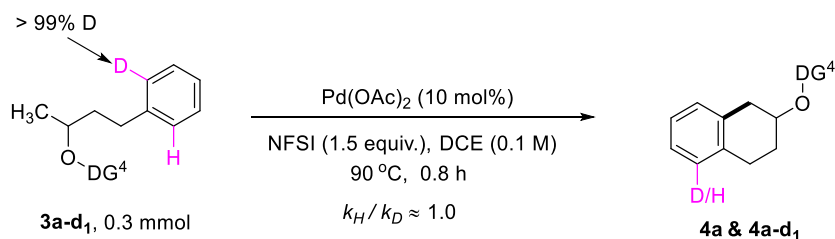
Scheme S2. Synthetic route to the deuterated substrates **3a-d<sub>1</sub>**

To a dried and degassed Schlenk round bottom flask was charged with 2-bromobenzyl alcohol (1.87 g, 10.0 mmol, 1.0 *equiv.*) and anhydrous THF (20 mL). After cooling down the resulting mixture to -78 °C, <sup>n</sup>BuLi (40 mmol, 4.0 *equiv.*) was added dropwise over 0.5 h, the mixture was stirred at the same temperature for another 1.0 h. The reaction was quenched by dropwise addition of D<sub>2</sub>O (40.0 *equiv.*) at -78 °C, and stirred for another 0.5 h. The reaction mixture was warmed to room temperature, extracted with Et<sub>2</sub>O (3 × 30 mL), dried with Na<sub>2</sub>SO<sub>4</sub>, and evaporated in vacuum. The crude residue was further purified by flash chromatography on silica gel with (petroleum ether/Et<sub>2</sub>O = 10:1) to afford the deuterium-labelled alcohol. After that alcohol was oxidized to the 2-deuteriobenzaldehyde by PCC, and purified by flash chromatography on silica gel with (pentane/Et<sub>2</sub>O = 5:1) to furnish pure 2-deuteriobenzaldehyde. The next steps were conducted following the previous synthetic route. **3a-d<sub>1</sub>** was characterized as below (Figure S16).



**Figure S16.** The <sup>1</sup>H NMR spectrum of **3a-d<sub>1</sub>**

**Intramolecular competing reaction of 3a-d<sub>1</sub>**



In a 10 mL test tube equipped with a stir bar, compound **3a-d<sub>1</sub>** (134.1 mg, 0.3 mmol), Pd(OAc)<sub>2</sub> (6.8 mg, 0.03 mmol), NFSI (141.8 mg, 0.45 mmol), and DCE (3.0 mL) were added successively. Then the tube was sealed and stirred at 90 °C for 0.8 h. Upon completion, the resulting mixture was cooled to room temperature, diluted with CH<sub>2</sub>Cl<sub>2</sub> and concentrated under reduced pressure. Then the residue was purified by silica gel chromatography (petroleum ether/EtOAc = 50:1) to afford the mixture of intramolecular arylation products **4a** and **4a-d<sub>1</sub>** (39.9 mg, ~30% yield).

Based on the integrations between **4a** and **4a-d<sub>1</sub>**, the KIE is calculated to be 1.0 (**Figure S17**).

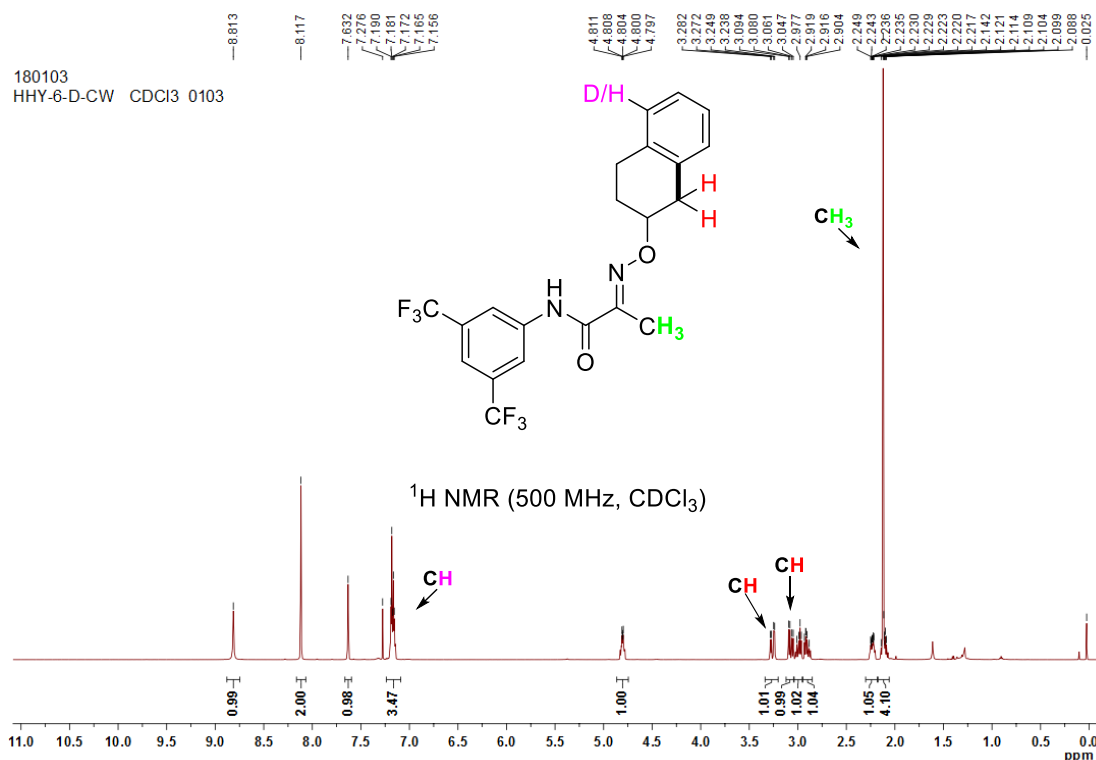
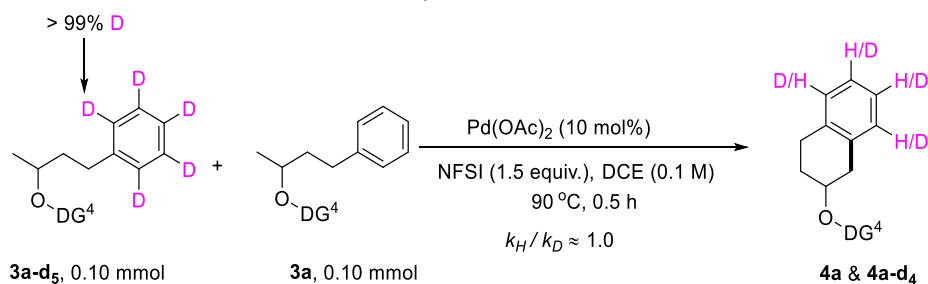


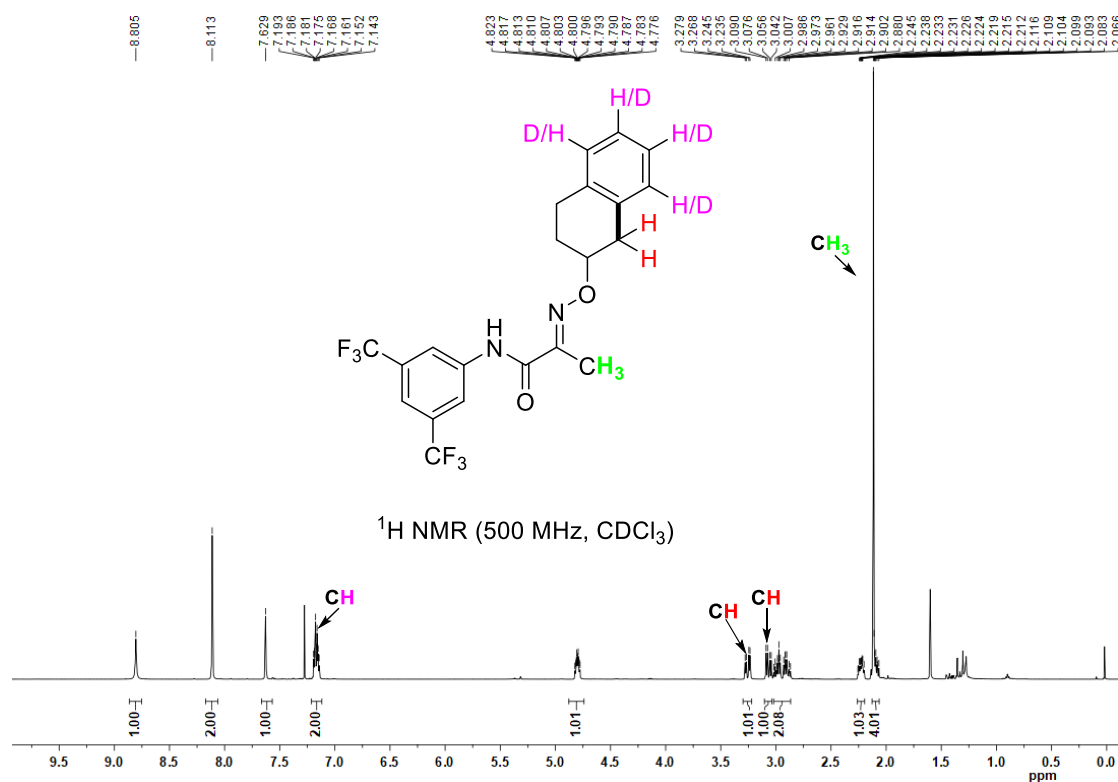
Figure S17. The <sup>1</sup>H NMR spectrum of **4a** and **4a-d<sub>1</sub>**

**One-pot competing reaction of **3a** and **3a-d<sub>5</sub>****

In a 10 mL test tube equipped with a stir bar, compound **3a** (44.6 mg, 0.1 mmol), **3a-d<sub>5</sub>** (45.1 mg, 0.1 mmol), Pd(OAc)<sub>2</sub> (4.5 mg, 0.02 mmol), NFSI (94.5 mg, 0.3 mmol), and DCE (2.0 mL) were added successively. Then the tube was sealed and stirred at 90 °C for 0.5 h. Upon completion, the resulting mixture was cooled to room temperature, diluted with CH<sub>2</sub>Cl<sub>2</sub> and concentrated under reduced pressure. Then the residue was purified by silica gel chromatography (petroleum ether/EtOAc = 50:1) to afford the mixture of intramolecular arylation products **4a** and **4a-d<sub>4</sub>** (22.8 mg, ~26% yield).

Based on the integrations between **4a** and **4a-d<sub>4</sub>**, the KIE is calculated to be 1.0 (Figure S18).

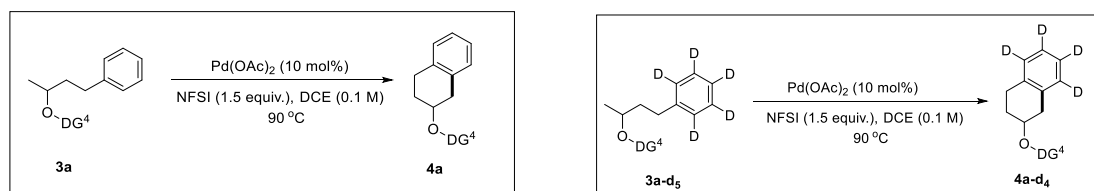




**Figure S18** The  $^1\text{H}$  NMR spectrum of **4a** and **4a-d<sub>4</sub>**

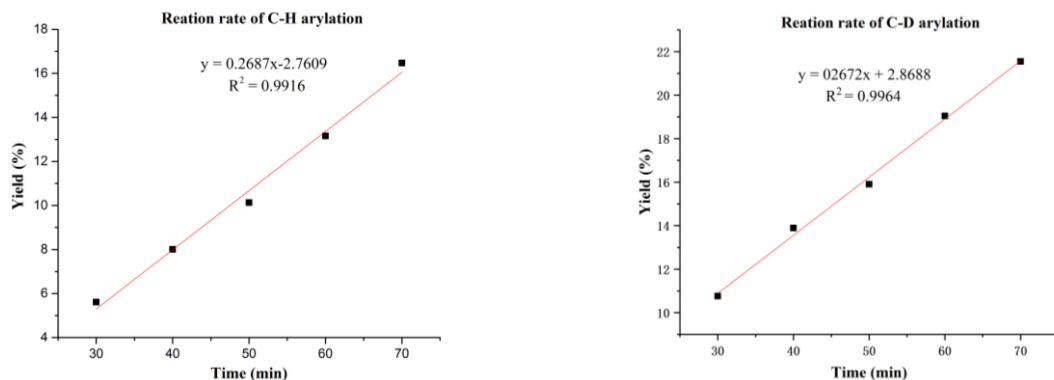
#### *Reaction rates of side-by-side arylation of **3a** and **3a-d<sub>5</sub>***

In a 10 mL test tube equipped with a stir bar, compound **3a** or **3a-d<sub>5</sub>** (0.1 mmol),  $\text{Pd}(\text{OAc})_2$  (2.3 mg, 0.01 mmol), NFSI (47.3 mg, 0.15 mmol), and DCE (1.0 mL) were added successively. Then the tube was sealed and stirred at 90 °C. Upon an indicated time, the resulting mixture was cooled to room temperature, diluted with  $\text{CH}_2\text{Cl}_2$  and concentrated under reduced pressure. Then the residue was purified by silica gel chromatography (petroleum ether/EtOAc = 50:1) to afford the mixture of intramolecular arylation products **4a** and **4a-d<sub>4</sub>**, the KIE is calculated to be 1.0 (**Figure S19**).

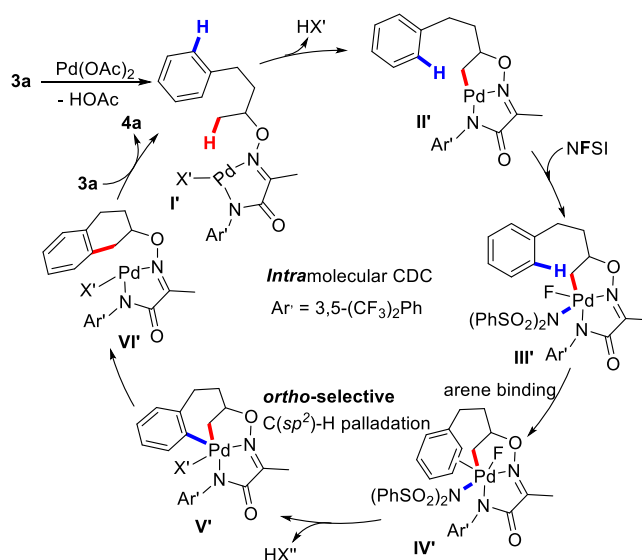


$$k_H / k_D = 2.687/2.672 \approx 1.0$$





**Figure S19.** Time-yield curves of **4a** and **4a-d<sub>4</sub>**



**Figure S20.** Proposed mechanism of the intramolecular arylation

As shown in Figure S20, a Pd(II) complex **I'** is formed firstly by the deprotonation coordination of substrates **3a** with palladium acetate. The first C(sp<sup>3</sup>)-H bond activation of **I'** via a CMD (concerted metalation-deprotonation) process takes place to give a bicyclic palladacycle **II'**, which is subsequently oxidized by NFSI to form a highly reactive high-valent Pd species **III'**. Then a *ortho*-selective second aromatic C-H bond activation of arenes at Pd<sup>IV</sup> center occurs via an electrophilic palladation to give Pd(IV)-Ar species **V'**. Notably, the intramolecular *ortho*-selective second C(sp<sup>2</sup>)-H bond palladation should be much faster than the competing C-F bond formation from Pd(IV) intermediate by using the bidentate auxiliary. Finally, intermediate **V'** undergoes the C-Ar reductive elimination to providing the CDC cyclization product **4a** exclusively and regenerate the catalyst by ligand exchange with another starting substrate **3a**.

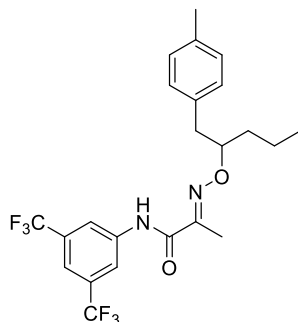
## VIII. Characterization of intermolecular arylation products

### A. General conditions for the intermolecular arylation substrate scope research

In a 10 mL test tube equipped with a stir bar, aromatic alcohol derivatives **1** (0.3 mmol), Pd(OAc)<sub>2</sub> (6.8 mg, 0.03 mmol), NFSI (141.8 mg, 0.45 mmol), AgNO<sub>3</sub> (10.2 mg, 0.06 mmol) and toluene (3.0 mL)

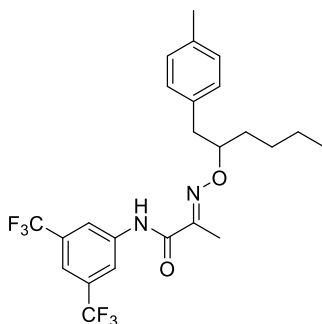
were added successively. Then the tube was sealed and the tube was heated at 90 °C for 24 h under stirring. Upon completion, the residue was purified by silica gel chromatography (petroleum ether/EtOAc = 50:1) to afford the desired products **2**.

## B. Characterization of intermolecular arylation products



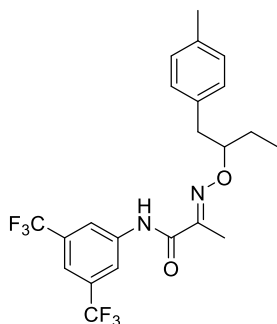
### (E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(p-tolyl)pentan-2-yl)oxy)imino)propanamide (**2a**):

Colorless solid; m.p. = 67-69 °C; yield 70% (99.6 mg);  $R_f$  = 0.58 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.38 (s, 1H), 8.03 (s, 2H), 7.61 (s, 1H), 7.11 (s, 4H), 4.57-4.51 (m, 1H), 2.99-2.87 (m, 2H), 2.22 (s, 3H), 2.07 (s, 3H), 1.78-1.71 (m, 1H), 1.69-1.61 (m, 1H), 1.57-1.49 (m, 1H), 1.49-1.43 (m, 1H), 0.98 (t,  $J$  = 7.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.5, 149.1, 138.9, 135.9, 135.4, 132.4 (q,  $J$  = 33.7 Hz, 2C), 129.5 (s, 2C), 129.0 (s, 2C), 123.1 (q,  $J$  = 272.6 Hz, 2C), 119.2 (d,  $J$  = 3.9 Hz, 2C), 117.2 (dd,  $J_1$  = 7.4 Hz,  $J_2$  = 3.8 Hz), 86.5, 41.1, 35.9, 20.9, 18.8, 14.1, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{23}\text{H}_{24}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  497.1634; found: 497.1634.



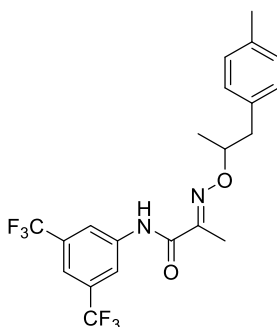
### (E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(p-tolyl)hexan-2-yl)oxy)imino)propanamide (**2b**):

Colorless solid; m.p. = 99-101 °C; yield 65% (95.3 mg);  $R_f$  = 0.58 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.40 (s, 1H), 8.04 (s, 2H), 7.61 (d,  $J$  = 0.8 Hz, 1H), 7.12 (s, 4H), 4.56-4.51 (m, 1H), 3.01-2.87 (m, 2H), 2.23 (s, 3H), 2.08 (s, 3H), 1.81-1.72 (m, 1H), 1.75-1.66 (m, 1H), 1.54-1.46 (m, 1H), 1.45-1.34 (m, 3H), 0.95 (t,  $J$  = 7.2 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.5, 149.0, 138.9, 135.9, 135.4, 132.4 (q,  $J$  = 33.5 Hz, 2C), 129.5 (s, 2C), 129.0 (s, 2C), 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.2 (d,  $J$  = 4.2 Hz, 2C), 117.2 (p,  $J$  = 4.0 Hz), 86.7, 41.0, 33.4, 27.7, 22.6, 20.8, 14.0, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{24}\text{H}_{26}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  511.1791; found: 511.1789.



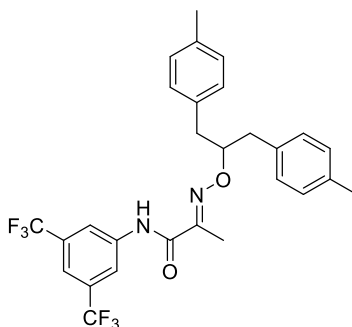
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(p-tolyl)butan-2-yl)oxy)imino)propanamide (2c):**

Colorless solid; m.p. = 53-55 °C; yield 60% (82.9 mg);  $R_f$  = 0.53 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.42 (s, 1H), 8.04 (s, 2H), 7.61 (s, 1H), 7.12 (s, 4H), 4.53-4.43 (m, 1H), 2.99-2.89 (m, 2H), 2.24 (s, 3H), 2.09 (s, 3H), 1.80-1.72 (m, 2H), 1.04 (t,  $J$  = 7.4 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.5, 149.2, 138.9, 135.9, 135.4, 132.4 (q,  $J$  = 33.5 Hz, 2C), 129.4 (s, 2C), 129.0 (s, 2C), 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.2 (d,  $J$  = 4.0 Hz, 2C), 117.2 (p,  $J$  = 3.9 Hz), 87.9, 40.4, 26.7, 20.9, 9.9, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  483.1478; found: 483.1479.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(p-tolyl)propan-2-yl)oxy)imino)propanamide (2d-1):**

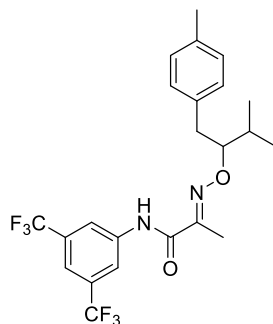
Colorless solid; m.p. = 56-58 °C; yield 31% (41.5 mg);  $R_f$  = 0.43 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.52 (s, 1H), 8.06 (s, 2H), 7.61 (s, 1H), 7.12 (s, 4H), 4.70-4.63 (m, 1H), 2.98 (dd,  $J_1$  = 14.0 Hz,  $J_2$  = 7.4 Hz, 1H), 2.90 (dd,  $J_1$  = 14.0 Hz,  $J_2$  = 5.3 Hz, 1H), 2.26 (s, 3H), 2.09 (s, 3H), 1.39 (d,  $J$  = 6.4 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 149.4, 138.9, 136.0, 135.1, 132.4 (q,  $J$  = 33.3 Hz, 2C), 129.4 (s, 2C), 129.0 (s, 2C), 123.1 (q,  $J$  = 272.9 Hz, 2C), 119.2 (d,  $J$  = 3.3 Hz, 2C), 117.6-116.9 (m), 82.6, 42.4, 20.9, 19.7, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{21}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  469.1321; found: 469.1318.



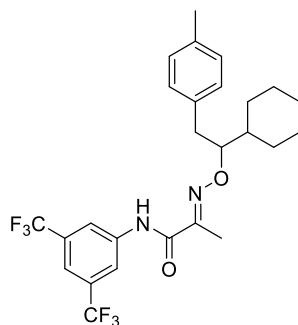
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1,3-di-p-tolylpropan-2-yl)oxy)imino)propanamide**

**(2d-2):** Colorless solid; m.p. = 84-86 °C; yield 30% (48.3 mg);  $R_f$  = 0.43 (petroleum ether-EtOAc = 20:1);

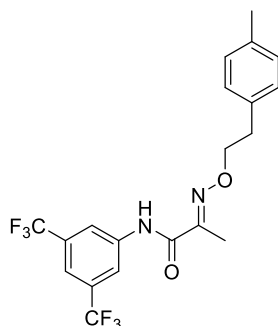
$^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.13 (s, 1H), 7.97 (s, 2H), 7.60 (s, 1H), 7.12 (s, 8H), 4.79-4.74 (m, 1H), 3.01-2.95 (m, 4H), 2.26 (s, 6H), 2.04 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.3, 149.0, 138.8, 136.0 (s, 2C), 135.1 (s, 2C), 132.3 (q,  $J$  = 33.5 Hz, 2C), 129.4 (s, 4C), 129.1 (s, 4C), 123.1 (q,  $J$  = 273.0 Hz, 2C), 119.1 (d,  $J$  = 3.5 Hz, 2C), 117.6-116.9 (m), 87.4, 40.5 (s, 2C), 20.9 (s, 2C), 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{28}\text{H}_{26}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  559.1791; found: 559.1791.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((3-methyl-1-(p-tolyl)butan-2-yl)oxy)imino)propanamide (2e):** Colorless solid; m.p. = 73-75 °C; yield 68% (96.8 mg);  $R_f$  = 0.55 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.29 (s, 1H), 8.01 (s, 2H), 7.61 (s, 1H), 7.17-7.08 (m, 4H), 4.36 (ddd,  $J_1$  = 9.0 Hz,  $J_2$  = 5.3 Hz,  $J_3$  = 3.5 Hz, 1H), 2.98 (dd,  $J_1$  = 14.3 Hz,  $J_2$  = 3.5 Hz, 1H), 2.87 (dd,  $J_1$  = 14.3 Hz,  $J_2$  = 9.2 Hz, 1H), 2.21 (s, 3H), 2.08 (s, 4H), 1.09 (dd,  $J_1$  = 6.8 Hz,  $J_2$  = 4.2 Hz, 6H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.5, 148.8, 138.9, 136.1, 135.8, 132.3 (q,  $J$  = 33.4 Hz, 2C), 129.4 (s, 2C), 129.0 (s, 2C), 123.1 (q,  $J$  = 272.8 Hz, 2C), 119.1 (d,  $J$  = 4.1 Hz, 2C), 117.5-115.3 (m), 91.6, 37.8, 31.5, 20.8, 18.6, 17.9, 9.3 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{23}\text{H}_{24}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  497.1634; found: 497.1634.

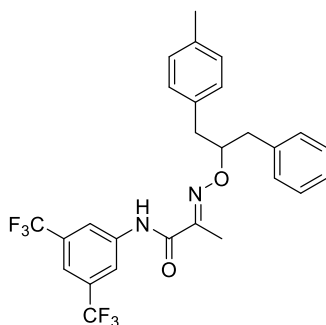


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-cyclohexyl-2-(p-tolyl)ethoxy)imino)propanamide (2f):** Colorless solid; m.p. = 128-130 °C; yield 60% (92.6 mg);  $R_f$  = 0.60 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.26 (s, 1H), 8.01 (s, 2H), 7.61 (s, 1H), 7.11 (s, 4H), 4.35 (ddd,  $J_1$  = 9.2 Hz,  $J_2$  = 5.6 Hz,  $J_3$  = 3.5 Hz, 1H), 3.00 (dd,  $J_1$  = 14.3 Hz,  $J_2$  = 3.5 Hz, 1H), 2.87 (dd,  $J_1$  = 14.3 Hz,  $J_2$  = 9.3 Hz, 1H), 2.20 (s, 3H), 2.07 (s, 3H), 1.94 (d,  $J$  = 10.6 Hz, 1H), 1.83 (d,  $J$  = 11.7 Hz, 2H), 1.74 (d,  $J$  = 11.4 Hz, 2H), 1.34-1.16 (m, 6H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.5, 148.6, 138.9, 136.2, 135.7, 132.3 (q,  $J$  = 33.5 Hz, 2C), 129.4 (s, 2C), 128.9 (s, 2C), 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.1 (d,  $J$  = 4.1 Hz, 2C), 117.4-116.9 (m), 91.2, 41.5, 38.1, 29.3, 28.4, 26.5, 26.2, 26.2, 20.8, 9.4 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{26}\text{H}_{28}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  537.1947; found: 537.1947.

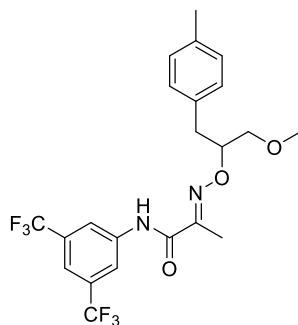


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-((4-methylphenethoxy)imino)propanamide (2g):**

Colorless solid; m.p. = 68-70 °C; yield 51% (66.2 mg);  $R_f$  = 0.35 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.61 (s, 1H), 8.09 (s, 2H), 7.62 (s, 1H), 7.15 (s, 4H), 4.52 (t,  $J$  = 6.6 Hz, 2H), 3.04 (t,  $J$  = 6.7 Hz, 2H), 2.30 (s, 3H), 2.10 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.2, 150.0, 138.8, 136.1, 135.1, 132.4 (q,  $J$  = 33.5 Hz, 2C), 129.2 (s, 2C), 128.9 (s, 2C), 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.3 (d,  $J$  = 4.2 Hz, 2C), 117.8-117.2 (m,  $J$  = 3.8 Hz), 76.4, 35.7, 21.0, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{20}\text{H}_{18}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  455.1165; found: 455.1162.

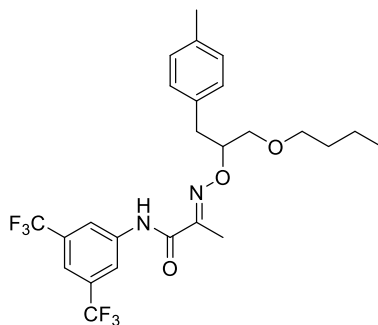


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-phenyl-3-(p-tolyl)propan-2-yl)oxy)imino)propanamide (2h):** Colorless solid; m.p. = 47-49 °C; yield 61% (95.6 mg);  $R_f$  = 0.40 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.09 (s, 1H), 7.95 (s, 2H), 7.60 (s, 1H), 7.35-7.28 (m, 2H), 7.24 (d,  $J$  = 7.3 Hz, 3H), 7.13 (s, 4H), 4.83-4.74 (m, 1H), 3.06-2.97 (m, 4H), 2.27 (s, 3H), 2.04 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.3, 149.2, 138.7, 138.3, 136.1, 135.0, 132.3 (q,  $J$  = 33.4 Hz, 2C), 129.5 (s, 2C), 129.4 (s, 2C), 129.1 (s, 2C), 128.4 (s, 2C), 126.5, 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.2 (d,  $J$  = 3.1 Hz, 2C), 117.3-117.0 (m), 87.3, 40.9, 40.5, 20.9, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{27}\text{H}_{24}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  545.1634; found: 545.1634.

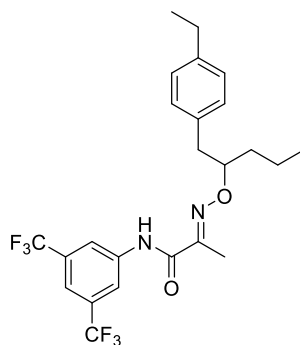


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-methoxy-3-(p-tolyl)propan-2-yl)oxy)imino)propana**

**mide (2i):** Colorless solid; m.p. = 73-75 °C; yield 39% (55.7 mg);  $R_f$  = 0.33 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.51 (s, 1H), 8.05 (s, 2H), 7.62 (s, 1H), 7.13 (s, 4H), 4.74-4.62 (m, 1H), 3.61 (d,  $J$  = 4.9 Hz, 2H), 3.43 (s, 3H), 3.04 (dd,  $J_1$  = 14.2 Hz,  $J_2$  = 5.3 Hz, 1H), 2.97 (dd,  $J_1$  = 14.2 Hz,  $J_2$  = 7.8 Hz, 1H), 2.26 (s, 3H), 2.11 (s, 3H) ppm.  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.2, 150.1, 138.8, 136.1, 134.5, 132.4 (q,  $J$  = 33.5 Hz, 2C), 129.4 (s, 2C), 129.1 (s, 2C), 123.1 (q,  $J$  = 272.9 Hz, 2C), 119.2 (q,  $J$  = 3.6 Hz, 2C), 117.7-117.0 (m), 85.4, 73.2, 59.4, 37.4, 20.9, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  499.1427; found: 499.1429.

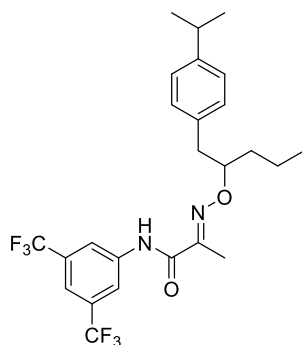


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-butoxy-3-(p-tolyl)propan-2-yl)oxy)imino)propanamide (2j):** Colorless oil; yield 53% (82.4 mg);  $R_f$  = 0.33 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.53 (s, 1H), 8.05 (s, 2H), 7.61 (s, 1H), 7.17-7.09 (m, 4H), 4.70-4.65 (m, 1H), 3.68-3.58 (m, 2H), 3.54-3.45 (m, 2H), 3.05 (dd,  $J_1$  = 14.2 Hz,  $J_2$  = 5.0 Hz, 1H), 2.96 (dd,  $J_1$  = 14.2 Hz,  $J_2$  = 7.9 Hz, 1H), 2.27 (s, 3H), 2.10 (s, 3H), 1.64-1.56 (m, 2H), 1.45-1.37 (m, 2H), 0.94 (t,  $J$  = 7.4 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.3, 149.9, 138.9, 136.1, 134.7, 132.4 (q,  $J$  = 33.4 Hz, 2C), 129.4 (s, 2C), 129.1 (s, 2C), 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.2 (d,  $J$  = 4.0 Hz, 2C), 117.4-117.2 (m), 85.5, 71.5, 71.4, 37.5, 31.8, 20.9, 19.3, 13.9, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{25}\text{H}_{28}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  541.1896; found: 541.1898.

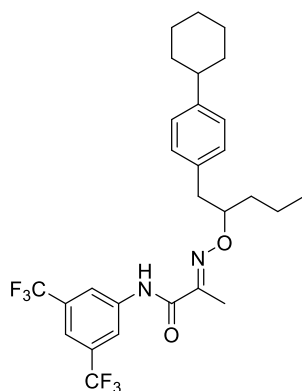


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(4-ethylphenyl)pentan-2-yl)oxy)imino)propanamide (2k):** Colorless solid; m.p. = 54-56 °C; yield 58% (85.0 mg);  $R_f$  = 0.55 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.46 (s, 1H), 8.05 (s, 2H), 7.62 (s, 1H), 7.14 (s, 4H), 4.56-4.53 (m, 1H), 2.95 (dd,  $J_1$  = 6.3 Hz,  $J_2$  = 2.4 Hz, 2H), 2.58-2.51 (m, 2H), 2.08 (s, 3H), 1.80-1.69 (m, 1H), 1.72-1.61 (m, 1H), 1.59-1.50 (m, 1H), 1.48 (dd,  $J_1$  = 9.3 Hz,  $J_2$  = 6.6 Hz, 1H), 1.16 (t,  $J$  = 7.6 Hz, 3H), 0.98 (t,  $J$  = 7.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 149.1, 142.3, 138.9, 135.5, 132.4 (q,  $J$  = 33.5 Hz, 2C), 129.9 (s, 2C), 127.8 (s, 2C), 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.2 (d,  $J$  = 3.9 Hz, 2C), 117.6-116.7 (m), 86.5, 40.9, 35.8, 28.3, 18.8, 15.4, 14.1, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for

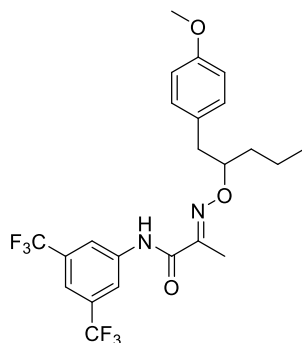
C<sub>24</sub>H<sub>26</sub>F<sub>6</sub>N<sub>2</sub>O<sub>2</sub>Na 511.1791; found: 511.1791.



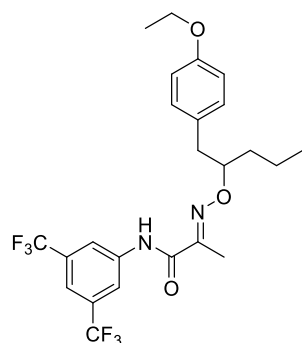
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(4-isopropylphenyl)pentan-2-yl)oxy)imino)propanamide (2l):** Colorless solid; m.p. = 55-57 °C; yield 43% (64.8 mg);  $R_f$  = 0.55 (petroleum ether-EtOAc = 20:1); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta$  = 8.53 (s, 1H), 8.06 (s, 2H), 7.61 (s, 1H), 7.21-7.07 (m, 4H), 4.60-4.51 (m, 1H), 2.94 (d,  $J$  = 6.3 Hz, 2H), 2.82 (p,  $J$  = 6.9 Hz, 1H), 2.08 (s, 3H), 1.78-1.68 (m, 1H), 1.68-1.63 (m, 1H), 1.58-1.48 (m, 1H), 1.50-1.40 (m, 1H), 1.16 (dd,  $J_1$  = 10.8 Hz,  $J_2$  = 6.9 Hz, 6H), 0.98 (t,  $J$  = 7.4 Hz, 3H) ppm; <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>)  $\delta$  = 161.4, 149.2, 147.0, 138.9, 135.5, 132.4 (q,  $J$  = 33.5 Hz, 2C), 129.4 (s, 2C), 126.3 (s, 2C), 123.1 (q,  $J$  = 273.2 Hz, 2C), 119.3 (d,  $J$  = 3.5 Hz, 2C), 117.6-117.2 (m), 86.4, 40.7, 35.8, 33.6, 24.1, 23.7, 18.8, 14.1, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ : [M + Na]<sup>+</sup> Calcd. for C<sub>25</sub>H<sub>28</sub>F<sub>6</sub>N<sub>2</sub>O<sub>2</sub>Na 525.1947; found: 525.1946.



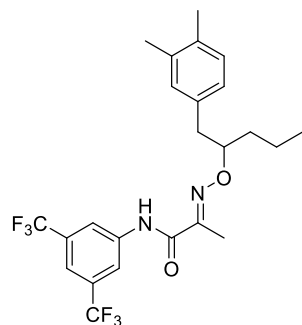
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(4-cyclohexylphenyl)pentan-2-yl)oxy)imino)propanamide (2m):** Colorless oil; yield 75% (112.1 mg);  $R_f$  = 0.58 (petroleum ether-EtOAc = 20:1); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta$  = 8.48 (s, 1H), 8.05 (s, 2H), 7.62 (s, 1H), 7.14 (s, 4H), 4.62-4.53 (m, 1H), 2.99-2.91 (m, 2H), 2.41-2.35 (m, 1H), 2.08 (s, 3H), 1.76-1.63 (m, 6H), 1.58-1.52 (m, 1H), 1.50-1.44 (m, 1H), 1.40-1.16 (m, 6H), 0.99 (t,  $J$  = 7.4 Hz, 3H). ppm; <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>)  $\delta$  = 161.4, 149.0, 146.3, 138.9, 135.6, 132.4 (q,  $J$  = 33.6 Hz, 2C), 129.4 (s, 2C), 126.7 (s, 2C), 123.2 (q,  $J$  = 273.0 Hz, 2C), 119.3 (d,  $J$  = 3.9 Hz, 2C), 117.2 (t,  $J$  = 3.8 Hz), 86.5, 44.1, 41.0, 35.9, 34.8, 34.1, 26.9, 26.8, 26.1, 18.8, 14.0, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ : [M + Na]<sup>+</sup> Calcd. for C<sub>28</sub>H<sub>32</sub>F<sub>6</sub>N<sub>2</sub>O<sub>2</sub>Na 565.2260; found: 565.2262.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(4-methoxyphenyl)pentan-2-yl)oxy)imino)propanamide (2n):** Colorless solid; m.p. = 64-66 °C; yield 53% (78.0 mg);  $R_f$  = 0.40 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.44 (s, 1H), 8.04 (s, 2H), 7.61 (s, 1H), 7.12 (d,  $J$  = 8.5 Hz, 2H), 6.84 (d,  $J$  = 8.5 Hz, 2H), 4.53-4.48 (m, 1H), 3.70 (s, 3H), 2.97-2.85 (m, 2H), 2.08 (s, 3H), 1.76-1.69 (m, 1H), 1.68-1.62 (m, 1H), 1.56-1.49 (m, 1H), 1.48-1.41 (m, 1H), 0.97 (t,  $J$  = 7.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.5, 158.2, 149.2, 138.8, 132.4 (q,  $J$  = 33.4 Hz, 2C), 130.5 (s, 2C), 130.4, 123.1 (q,  $J$  = 272.9 Hz, 2C), 119.3 (d,  $J$  = 4.0 Hz, 2C), 117.4-117.2 (m), 113.7 (s, 2C), 86.5, 55.1, 40.4, 35.8, 18.8, 14.1, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{23}\text{H}_{24}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  513.1583; found: 513.1581.

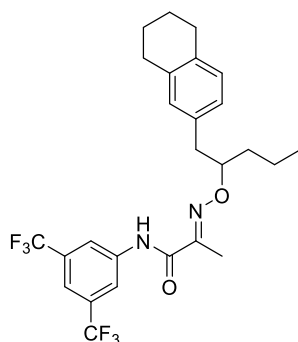


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(4-ethoxyphenyl)pentan-2-yl)oxy)imino)propanamide (2o):** Colorless solid; m.p. = 56-58 °C; yield 78% (118.1 mg);  $R_f$  = 0.45 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.45 (s, 1H), 8.05 (s, 2H), 7.61 (d,  $J$  = 0.8 Hz, 1H), 7.11 (d,  $J$  = 8.5 Hz, 2H), 6.83 (d,  $J$  = 8.6 Hz, 2H), 4.53-4.48 (m, 1H), 4.00-3.84 (m, 2H), 3.03-2.83 (m, 2H), 2.08 (s, 3H), 1.78-1.67 (m, 1H), 1.69-1.59 (m, 1H), 1.58-1.47 (m, 1H), 1.45 (ddd,  $J_1$  = 14.7 Hz,  $J_2$  = 9.9 Hz,  $J_3$  = 6.7 Hz, 1H), 1.32 (t,  $J$  = 7.0 Hz, 3H), 0.97 (t,  $J$  = 7.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.5, 157.6, 149.1, 138.8, 132.4 (q,  $J$  = 33.5 Hz, 2C), 130.5, 130.2 (s, 2C), 123.1 (d,  $J$  = 273.2 Hz, 2C), 119.3 (d,  $J$  = 4.0 Hz, 2C), 117.3 (t,  $J$  = 3.8 Hz), 114.2 (s, 2C), 86.6, 63.3, 40.4, 35.7, 18.8, 14.7, 14.1, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{24}\text{H}_{26}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  527.1740; found: 527.1742.

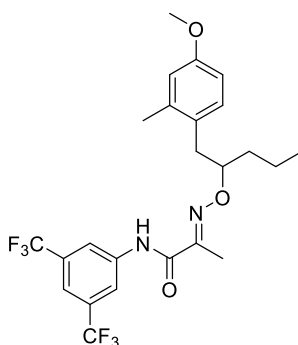




**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(3,4-dimethylphenyl)pentan-2-yl)oxy)imino)propanamide (2p):** Colorless solid; m.p. = 90-92 °C; yield 59% (86.5 mg);  $R_f$  = 0.55 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.44 (s, 1H), 8.04 (s, 2H), 7.62 (s, 1H), 7.08 (d,  $J$  = 7.4 Hz, 1H), 6.97 (d,  $J$  = 7.8 Hz, 2H), 4.54 (dt,  $J_1$  = 12.5 Hz,  $J_2$  = 6.2 Hz, 1H), 2.91 (d,  $J$  = 6.2 Hz, 2H), 2.23 (s, 3H), 2.15 (s, 3H), 2.09 (s, 3H), 1.78-1.70 (m, 1H), 1.70-1.63 (m, 1H), 1.57-1.50 (m, 1H), 1.46 (ddd,  $J_1$  = 14.5 Hz,  $J_2$  = 9.8 Hz,  $J_3$  = 6.6 Hz, 1H), 0.98 (t,  $J$  = 7.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.5, 149.1, 138.9, 136.4, 135.8, 134.5, 132.4 (q,  $J$  = 33.5 Hz, 2C), 131.0, 129.5, 126.8, 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.2 (d,  $J$  = 4.1 Hz, 2C), 117.2 (dd,  $J_1$  = 7.9 Hz,  $J_2$  = 4.0 Hz), 86.5, 40.9, 35.8, 19.7, 19.2, 18.8, 14.1, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{24}\text{H}_{26}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  511.1791; found: 511.1790.

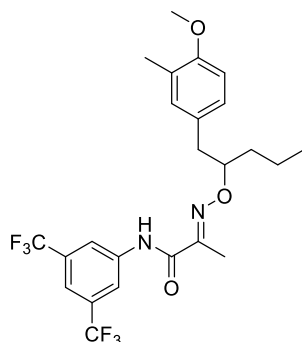


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(5,6,7,8-tetrahydronaphthalen-2-yl)pentan-2-yl)oxy)imino)propanamide (2q):** Colorless solid; m.p. = 64-66 °C; yield 41% (63.3 mg);  $R_f$  = 0.56 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.52 (s, 1H), 8.06 (s, 2H), 7.62 (s, 1H), 7.04-6.94 (m, 2H), 6.88 (s, 1H), 4.54 (dt,  $J_1$  = 12.7 Hz,  $J_2$  = 6.3 Hz, 1H), 2.90 (d,  $J$  = 6.3 Hz, 2H), 2.75-2.57 (m, 4H), 2.10 (s, 3H), 1.73 (t,  $J$  = 5.7 Hz, 4H), 1.71-1.62 (m, 2H), 1.57-1.42 (m, 2H), 0.98 (t,  $J$  = 7.3 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.5, 149.1, 138.9, 137.0, 135.3, 135.2, 132.4 (q,  $J$  = 33.5 Hz, 2C), 130.4, 129.0, 126.5, 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.2 (d,  $J$  = 4.0 Hz, 2C), 117.3 (t,  $J$  = 3.8 Hz), 86.5, 40.9, 35.8, 29.4, 28.9, 23.1 (d,  $J$  = 1.9 Hz, 2C), 18.8, 14.1, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{26}\text{H}_{28}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  537.1947; found: 537.1946.

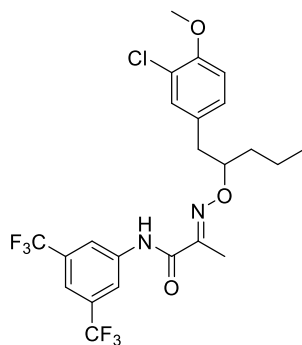


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(4-methoxy-2-methylphenyl)pentan-2-yl)oxy)imino)propanamide (2r):** Colorless oil; yield 68% (102.9 mg);  $R_f$  = 0.53 (petroleum ether-EtOAc = 20:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.35 (s, 1H), 8.02 (s, 2H), 7.60 (s, 1H), 7.00 (d,  $J$  = 7.8 Hz, 1H), 6.69 (d,  $J$  = 4.8 Hz, 2H), 4.58 (ddd,  $J_1$  = 12.6 Hz,  $J_2$  = 8.1 Hz,  $J_3$  = 4.5 Hz, 1H), 3.85 (s, 3H), 2.97 (dd,  $J_1$  = 13.9 Hz,  $J_2$  = 4.3 Hz, 1H), 2.89 (dd,  $J_1$  = 13.9 Hz,  $J_2$  = 8.3 Hz, 1H), 2.20 (s, 3H), 2.05 (s, 3H), 1.81-1.71 (m, 1H), 1.73-1.63 (m, 1H), 1.59-1.51 (m, 1H), 1.51-1.44 (m, 1H), 0.99 (t,  $J$  = 7.4 Hz, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.6, 157.7, 148.4, 139.0, 137.6, 132.3 (q,  $J$  = 33.4 Hz, 2C), 131.2, 124.2, 123.2 (q,  $J$

= 273.2 Hz, 2C), 120.9, 119.0 (d,  $J$  = 4.1 Hz, 2C), 117.6-116.3 (m), 111.1, 85.5, 55.3, 36.1, 35.9, 21.3, 18.9, 14.1, 9.3 ppm; HRMS (ESI-TOF)  $m/z$ :  $[M + Na]^+$  Calcd. for  $C_{24}H_{26}F_6N_2O_3Na$  527.1740; found: 527.1743.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(4-methoxy-3-methylphenyl)pentan-2-yl)oxy)imino)propanamide (2s):** Colorless solid; m.p. = 85-87 °C; yield 62% (93.8 mg);  $R_f$  = 0.48 (petroleum ether-EtOAc = 20:1);  $^1H$  NMR (500 MHz,  $CDCl_3$ )  $\delta$  = 8.46 (s, 1H), 8.03 (s, 2H), 7.62 (s, 1H), 6.98 (d,  $J$  = 11.4 Hz, 2H), 6.73 (d,  $J$  = 8.1 Hz, 1H), 4.50 (dt,  $J_1$  = 12.4 Hz,  $J_2$  = 6.2 Hz, 1H), 3.73 (s, 3H), 2.88 (d,  $J$  = 6.2 Hz, 2H), 2.21 (s, 3H), 2.10 (s, 3H), 1.76-1.68 (m, 1H), 1.68-1.63 (m, 1H), 1.58-1.50 (m, 1H), 1.45 (ddd,  $J_1$  = 14.5 Hz,  $J_2$  = 9.8 Hz,  $J_3$  = 6.6 Hz, 1H), 0.98 (t,  $J$  = 7.3 Hz, 3H) ppm;  $^{13}C$  NMR (126 MHz,  $CDCl_3$ )  $\delta$  = 161.5, 156.3, 149.1, 138.9, 132.4 (q,  $J$  = 33.5 Hz, 2C), 131.9, 129.9, 127.7, 126.4, 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.3 (d,  $J$  = 4.0 Hz, 2C), 117.8-116.4 (m), 109.6, 86.6, 55.2, 40.4, 35.7, 18.8, 16.1, 14.1, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[M + Na]^+$  Calcd. for  $C_{24}H_{26}F_6N_2O_3Na$  527.1740; found: 527.1740.



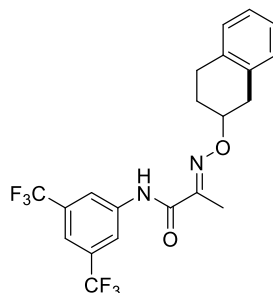
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1-(3-chloro-4-methoxyphenyl)pentan-2-yl)oxy)imino)propanamide (2t):** Colorless solid; m.p. = 82-84 °C; yield 60% (94.5 mg);  $R_f$  = 0.55 (petroleum ether-EtOAc = 20:1);  $^1H$  NMR (500 MHz,  $CDCl_3$ )  $\delta$  = 8.53 (s, 1H), 8.07 (s, 2H), 7.62 (s, 1H), 7.24 (d,  $J$  = 2.2 Hz, 1H), 7.04 (dd,  $J_1$  = 8.4 Hz,  $J_2$  = 2.2 Hz, 1H), 6.84 (d,  $J$  = 8.4 Hz, 1H), 4.52-1.47 (m, 1H), 3.82 (s, 3H), 2.96-2.82 (m, 2H), 2.09 (s, 3H), 1.75-1.68 (m, 1H), 1.67-1.59 (m, 1H), 1.57-1.47 (m, 1H), 1.49-1.39 (m, 1H), 0.98 (t,  $J$  = 7.3 Hz, 3H) ppm;  $^{13}C$  NMR (126 MHz,  $CDCl_3$ )  $\delta$  = 161.3, 153.6, 149.7, 138.8, 132.4 (q,  $J$  = 33.6 Hz, 2C), 131.3, 131.2, 128.7, 123.1 (q,  $J$  = 272.9 Hz, 2C), 122.2, 119.3 (d,  $J$  = 4.0 Hz, 2C), 117.4 (dt,  $J_1$  = 8.1 Hz,  $J_2$  = 3.8 Hz), 111.9, 86.1, 56.1, 39.8, 35.7, 18.7, 14.1, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[M + Na]^+$  Calcd. for  $C_{23}H_{23}ClF_6N_2O_3Na$  547.1194; found: 547.1195.

## IX. Characterization of the intramolecular arylation products

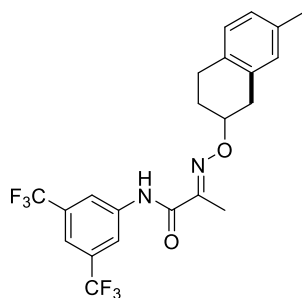
### A. General conditions for the intramolecular arylation substrate scope research

In a 10 mL test tube equipped with a stir bar, aromatic alcohol derivatives **3** (0.3 mmol), Pd(OAc)<sub>2</sub> (6.8 mg, 0.03 mmol), NFSI (141.8 mg, 0.45 mmol) and DCE (3.0 mL) were added successively. Then the tube was sealed and heated at 90 °C for 6-24 h under stirring. Upon completion, the residue was purified by silica gel chromatography (petroleum ether/EtOAc = 50:1) to afford the desired products **4**.

### B. Characterization of the intramolecular arylation products

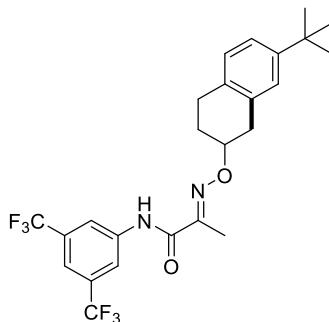


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (4a):** Colorless solid; m.p. = 113-115 °C; yield 87% (116.0 mg);  $R_f$  = 0.43 (petroleum ether-EtOAc = 10:1); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta$  = 8.81 (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.20-7.15 (m, 4H), 4.83-4.78 (m, 1H), 3.26 (dd,  $J_1$  = 17.2 Hz,  $J_2$  = 5.3 Hz, 1H), 3.07 (dd,  $J_1$  = 16.7 Hz,  $J_2$  = 6.9 Hz, 1H), 2.99 (dt,  $J_1$  = 16.8 Hz,  $J_2$  = 6.3 Hz, 1H), 2.95-2.85 (m, 1H), 2.26-2.21 (m, 1H), 2.12 (s, 4H) ppm; <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>)  $\delta$  = 161.3, 150.3, 138.9, 135.8, 133.7, 132.4 (q,  $J$  = 33.5 Hz, 2C), 129.3, 128.6, 126.1, 126.1, 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.4 (d,  $J$  = 3.9 Hz, 2C), 117.4 (p,  $J$  = 4.1 Hz), 79.8, 34.5, 28.0, 26.5, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ : [M + Na]<sup>+</sup> Calcd. for C<sub>21</sub>H<sub>18</sub>F<sub>6</sub>N<sub>2</sub>O<sub>2</sub>Na 467.1165; found: 467.1147.

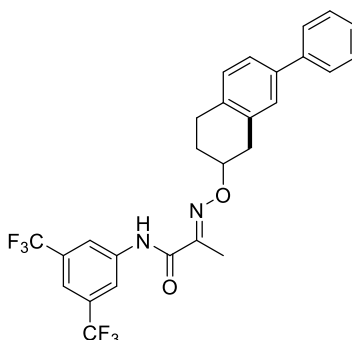


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((7-methyl-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (4b):** Colorless solid; m.p. = 76-78 °C; yield 81% (111.4 mg);  $R_f$  = 0.46 (petroleum ether-EtOAc = 10:1); Major isomer: <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta$  = 8.83 (s, 1H), 8.13 (s, 2H), 7.64 (s, 1H), 7.05 (d,  $J$  = 7.7 Hz, 1H), 7.00 (d,  $J$  = 17.5 Hz, 2H), 4.83-4.73 (m, 1H), 3.22 (dd,  $J_1$  = 16.7 Hz,  $J_2$  = 5.3 Hz, 1H), 3.03 (dd,  $J_1$  = 16.8 Hz,  $J_2$  = 6.9 Hz, 1H), 2.96 (dt,  $J_1$  = 16.6 Hz,  $J_2$  = 6.3 Hz, 1H), 2.91-2.81 (m, 1H), 2.33 (s, 3H), 2.27-2.18 (m, 1H), 2.13 (s, 3H), 2.12-2.06 (m, 1H) ppm; Major isomer: <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>)  $\delta$  = 161.4, 150.3, 138.9, 135.6, 133.5, 132.7, 132.4 (q,  $J$  = 33.5 Hz, 2C), 129.8, 128.5, 127.0, 123.1 (q,  $J$  = 272.9 Hz, 2C), 119.3 (d,  $J$  = 3.4 Hz, 2C), 117.5-117.3 (m), 80.0, 34.4, 28.1, 26.1, 20.9, 9.6 ppm; Minor isomer: <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>)  $\delta$  = 8.85 (s, 1H), 8.13 (s, 2H), 7.64 (s, 1H), 7.05 (d,  $J$  = 7.7 Hz, 1H), 7.00 (d,  $J$  = 17.5 Hz, 2H), 4.83-4.73 (m, 1H), 3.22 (dd,  $J_1$  = 16.7 Hz,  $J_2$  = 5.3 Hz,

1H), 3.03 (dd,  $J_1 = 16.8$  Hz,  $J_2 = 6.9$  Hz, 1H), 2.96 (dt,  $J_1 = 16.6$  Hz,  $J_2 = 6.3$  Hz, 1H), 2.91-2.81 (m, 1H), 2.33 (s, 3H), 2.27-2.18 (m, 1H), 2.13 (s, 3H), 2.12-2.06 (m, 1H) ppm; Minor isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.4, 150.3, 138.9, 135.7, 135.6, 132.4$  (q,  $J = 33.5$  Hz, 2C), 130.5, 129.2, 129.2, 126.9, 123.1 (q,  $J = 272.9$  Hz, 2C), 119.3 (d,  $J = 3.4$  Hz, 2C), 117.5-117.3 (m), 80.1, 34.1, 28.1, 26.5, 20.9, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  481.1321; found: 481.1321.

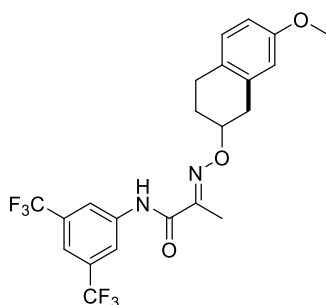


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((7-(tert-butyl)-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (4c):** Colorless solid; m.p. = 123-125 °C; yield 84% (126.1 mg);  $R_f = 0.51$  (petroleum ether-EtOAc = 10:1); Major isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.89$  (s, 1H), 8.15 (s, 2H), 7.64 (s, 1H), 7.23 (d,  $J = 7.4$  Hz, 1H), 7.17 (s, 1H), 7.11 (d,  $J = 8.0$  Hz, 1H), 4.82-4.73 (m, 1H), 3.25 (td,  $J_1 = 15.9$  Hz,  $J_2 = 5.4$  Hz, 1H), 3.06 (dd,  $J_1 = 14.1$  Hz,  $J_2 = 7.5$  Hz, 1H), 3.02-2.83 (m, 2H), 2.30-2.19 (m, 1H), 2.14 (d,  $J = 1.1$  Hz, 3H), 2.14-2.03 (m, 1H), 1.34 (d,  $J = 2.2$  Hz, 9H) ppm; Major isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.4, 150.3, 149.1, 138.9, 135.2, 132.8, 132.5$  (q,  $J = 33.4$  Hz, 2C), 129.0, 125.4, 123.3, 123.1 (q,  $J = 272.7$  Hz, 2C), 119.4 (d,  $J = 4.2$  Hz, 2C), 117.6-117.3 (m), 80.3, 34.8, 34.0, 31.4 (s, 3C), 28.2, 27.0, 9.7 ppm; Minor isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.87$  (s, 1H), 8.15 (s, 2H), 7.64 (s, 1H), 7.23 (d,  $J = 7.4$  Hz, 1H), 7.17 (s, 1H), 7.11 (d,  $J = 8.0$  Hz, 1H), 4.82-4.73 (m, 1H), 3.25 (td,  $J_1 = 15.9$  Hz,  $J_2 = 5.4$  Hz, 1H), 3.06 (dd,  $J_1 = 14.1$  Hz,  $J_2 = 7.5$  Hz, 1H), 3.02-2.83 (m, 2H), 2.30-2.19 (m, 1H), 2.14 (d,  $J = 1.1$  Hz, 3H), 2.14-2.03 (m, 1H), 1.34 (d,  $J = 2.2$  Hz, 9H) ppm; Minor isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.4, 150.3, 149.1, 138.9, 133.1, 132.5$  (q,  $J = 33.4$  Hz, 2C), 130.6, 128.3, 126.1, 123.4, 123.1 (q,  $J = 272.7$  Hz, 2C), 119.4 (d,  $J = 4.2$  Hz, 2C), 117.6-117.3 (m), 80.2, 34.4, 34.4, 31.4 (s, 3C), 28.1, 26.2, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{25}\text{H}_{26}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  523.1791; found: 523.1787.

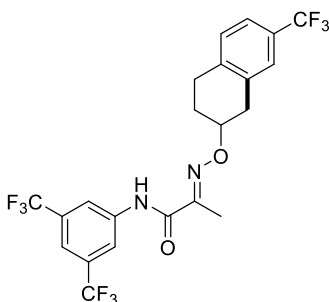


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((7-phenyl-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (4d):** Colorless solid; m.p. = 60-62 °C; yield 79% (123.4 mg);  $R_f = 0.38$  (petroleum ether-EtOAc = 10:1); Major isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.88$  (s, 1H), 8.16 (s, 2H), 7.64 (s, 1H), 7.63-7.57 (m, 2H), 7.49-7.40 (m, 3H), 7.41-7.33 (m, 2H), 7.24 (d,  $J = 7.9$  Hz, 1H), 4.86-4.81 (m,

1H), 3.31 (ddd,  $J_1 = 17.2$  Hz,  $J_2 = 12.3$  Hz,  $J_3 = 5.2$  Hz, 1H), 3.18-3.06 (m, 1H), 3.06-2.91 (m, 2H), 2.29-2.25 (m, 1H), 2.14 (s, 4H) ppm; Major isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.3, 150.5, 140.9, 139.2, 138.9, 136.1, 134.0, 132.7, 132.5$  (q,  $J = 33.5$  Hz, 2C), 129.8, 128.8 (s, 2C), 128.0, 127.2, 127.0, 125.0, 123.1 (q,  $J = 272.8$  Hz, 2C), 119.4 (d,  $J = 3.2$  Hz, 2C), 117.7-117.4 (m), 79.9, 34.2, 28.0, 26.7, 9.7 ppm; Minor isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.87$  (s, 1H), 8.15 (s, 2H), 7.64 (s, 1H), 7.63-7.57 (m, 2H), 7.49-7.40 (m, 3H), 7.41-7.33 (m, 2H), 7.24 (d,  $J = 7.9$  Hz, 1H), 4.86-4.81 (m, 1H), 3.31 (ddd,  $J_1 = 17.2$  Hz,  $J_2 = 12.3$  Hz,  $J_3 = 5.2$  Hz, 1H), 3.18-3.06 (m, 1H), 3.06-2.91 (m, 2H), 2.29-2.25 (m, 1H), 2.14 (s, 4H) ppm; Minor isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.3, 150.5, 140.9, 139.2, 138.9, 134.9, 134.0, 132.7, 132.5$  (q,  $J = 33.5$  Hz, 2C), 129.1, 128.8 (s, 2C), 128.0, 127.3, 127.0, 125.0, 123.1 (q,  $J = 272.8$  Hz, 2C), 119.4 (d,  $J = 3.2$  Hz, 2C), 117.7-117.4 (m), 79.9, 34.6, 28.0, 26.2, 9.7; ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{27}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  534.1478; found: 543.1476.

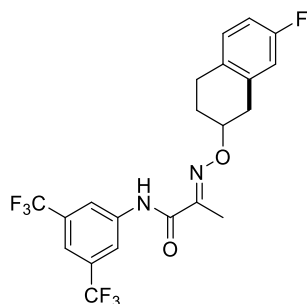


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((7-methoxy-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (4e):** Colorless solid; m.p. = 81-83 °C; yield 84% (119.5 mg);  $R_f = 0.29$  (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.86$  (s, 1H), 8.14 (s, 2H), 7.63 (s, 1H), 7.06 (d,  $J = 8.4$  Hz, 1H), 6.76 (dd,  $J_1 = 8.5$  Hz,  $J_2 = 2.5$  Hz, 1H), 6.69 (d,  $J = 2.7$  Hz, 1H), 4.79-4.74 (m, 1H), 3.81 (s, 3H), 3.21 (td,  $J_1 = 16.9$  Hz,  $J_2 = 5.3$  Hz, 1H), 3.07-2.93 (m, 2H), 2.92-2.84 (m, 1H), 2.27-2.16 (m, 1H), 2.12 (s, 3H), 2.12-2.03 (m, 1H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.4, 158.0, 150.3, 138.9, 136.9, 132.4$  (q,  $J = 33.5$  Hz, 2C), 130.2, 125.6, 123.1 (q,  $J = 272.9$  Hz, 2C), 119.4 (d,  $J = 4.0$  Hz, 2C), 118.2-116.9 (m), 113.3, 112.4, 80.2, 55.3, 33.7, 27.9, 26.9, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  497.1270; found: 497.1268.

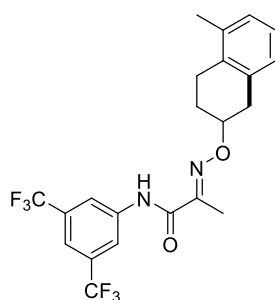


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((7-(trifluoromethyl)-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (4f):** Colorless oil; yield 86% (132.2 mg);  $R_f = 0.43$  (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.83$  (s, 1H), 8.13 (s, 2H), 7.64 (s, 1H), 7.41 (d,  $J = 8.0$  Hz, 2H), 7.25 (d,  $J = 7.8$  Hz, 1H), 4.87-4.78 (m, 1H), 3.28 (dd,  $J_1 = 17.0$  Hz,  $J_2 = 5.1$  Hz, 1H), 3.11 (dd,  $J_1 = 17.0$  Hz,  $J_2 = 6.4$  Hz, 1H), 3.07-2.99 (m, 1H), 2.98-2.88 (m, 1H), 2.25-2.14 (m, 2H), 2.11 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.2, 150.8, 139.9, 138.8, 134.3, 132.5$  (q,  $J = 33.5$  Hz, 2C), 129.1, 128.5 (q,  $J$

= 32.5 Hz), 126.2 (q,  $J$  = 3.7 Hz), 124.3 (q,  $J$  = 272.0 Hz), 123.1 (q,  $J$  = 273.1 Hz, 2C), 122.9 (q,  $J$  = 3.8 Hz), 119.4 (t,  $J$  = 4.2 Hz, 2C), 117.8-117.3 (m), 79.0, 34.3, 27.4, 26.1, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[M + Na]^+$  Calcd. for  $C_{22}H_{17}F_9N_2O_2Na$  535.1039; found: 535.1024.

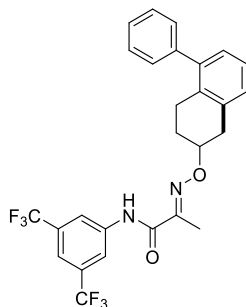


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((7-fluoro-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (4g):** Colorless solid; m.p. = 103-105 °C; yield 83% (115.1 mg);  $R_f$  = 0.31 (petroleum ether-EtOAc = 10:1); Major isomer:  $^1H$  NMR (500 MHz,  $CDCl_3$ )  $\delta$  = 8.82 (s, 1H), 8.13 (s, 2H), 7.63 (s, 1H), 7.14-7.06 (m, 1H), 6.95-6.81 (m, 2H), 4.81-4.76 (m, 1H), 3.21 (ddd,  $J_1$  = 15.2 Hz,  $J_2$  = 9.5 Hz,  $J_3$  = 5.2 Hz, 1H), 3.03 (td,  $J_1$  = 17.2 Hz,  $J_2$  = 6.8 Hz, 1H), 2.96-2.81 (m, 2H), 2.23-2.17 (m, 1H), 2.11 (s, 4H) ppm; Major isomer:  $^{13}C$  NMR (126 MHz,  $CDCl_3$ )  $\delta$  = 161.2, 161.2 (d,  $J$  = 241.2 Hz, 1C), 150.6, 138.8, 137.7 (d,  $J$  = 7.5 Hz), 132.5 (q,  $J$  = 33.5 Hz, 2C), 130.6 (d,  $J$  = 8.0 Hz), 129.9 (d,  $J$  = 8.0 Hz), 123.1 (q,  $J$  = 272.6 Hz, 2C), 119.3 (d,  $J$  = 4.0 Hz, 2C), 118.0-116.9 (m), 115.2 (d,  $J$  = 94.3 Hz), 113.2 (d,  $J$  = 20.4 Hz), 79.3, 33.8, 27.9, 25.6, 9.6 ppm; Minor isomer:  $^1H$  NMR (500 MHz,  $CDCl_3$ )  $\delta$  = 8.83 (s, 1H), 8.13 (s, 2H), 7.63 (s, 1H), 7.14-7.06 (m, 1H), 6.95-6.81 (m, 2H), 4.81-4.76 (m, 1H), 3.21 (ddd,  $J_1$  = 15.2 Hz,  $J_2$  = 9.5 Hz,  $J_3$  = 5.2 Hz, 1H), 3.03 (td,  $J_1$  = 17.2 Hz,  $J_2$  = 6.8 Hz, 1H), 2.96-2.81 (m, 2H), 2.23-2.17 (m, 1H), 2.11 (s, 4H) ppm; Minor isomer:  $^{13}C$  NMR (126 MHz,  $CDCl_3$ )  $\delta$  = 161.2, 161.2 (d,  $J$  = 241.3 Hz, 1C), 150.6, 138.8, 135.5 (d,  $J$  = 7.3 Hz), 132.5 (q,  $J$  = 33.5 Hz, 2C), 131.3 (d,  $J$  = 2.9 Hz), 129.0 (d,  $J$  = 2.8 Hz), 123.1 (q,  $J$  = 272.6 Hz, 2C), 119.3 (d,  $J$  = 4.0 Hz, 2C), 118.0-116.9 (m), 115.2 (d,  $J$  = 52.9 Hz), 113.2 (d,  $J$  = 22.1 Hz), 79.6, 34.5, 27.5, 26.5, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[M + Na]^+$  Calcd. for  $C_{21}H_{17}F_7N_2O_2Na$  485.1070; found: 485.1070.

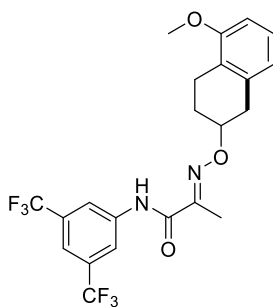


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((5-methyl-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (4h):** Colorless solid; m.p. = 99-101 °C; yield 86% (118.3 mg);  $R_f$  = 0.46 (petroleum ether-EtOAc = 10:1); Major isomer:  $^1H$  NMR (500 MHz,  $CDCl_3$ )  $\delta$  = 8.82 (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.11 (t,  $J$  = 7.4 Hz, 1H), 7.04 (dd,  $J_1$  = 22.5 Hz,  $J_2$  = 7.8 Hz, 2H), 4.79-4.74 (m, 1H), 3.32-2.95 (m, 2H), 2.94-2.71 (m, 2H), 2.28 (d,  $J$  = 4.8 Hz, 4H), 2.13 (d,  $J$  = 9.8 Hz, 4H) ppm; Major isomer:  $^{13}C$  NMR (126 MHz,  $CDCl_3$ )  $\delta$  = 161.4, 150.3, 138.9, 136.3, 134.3, 133.6, 132.5 (q,  $J$  = 33.5 Hz, 2C), 127.7, 127.1, 125.9, 123.1 (q,  $J$  = 273.4 Hz, 2C), 119.4 (d,  $J$  = 2.5 Hz, 2C), 117.4-117.4 (m), 79.7, 35.0, 28.0,

24.2, 19.6, 9.6 ppm; Minor isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.82 (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.11 (t,  $J$  = 7.4 Hz, 1H), 7.04 (dd,  $J_1$  = 22.5 Hz,  $J_2$  = 7.8 Hz, 2H), 4.87-4.80 (m, 1H), 3.32-2.95 (m, 2H), 2.94-2.71 (m, 2H), 2.28 (d,  $J$  = 4.8 Hz, 4H), 2.13 (d,  $J$  = 9.8 Hz, 4H) ppm; Minor isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 150.3, 138.9, 136.8, 135.7, 132.5 (q,  $J$  = 33.5 Hz, 2C), 132.3, 127.6, 126.4, 125.8, 123.1 (q,  $J$  = 273.4 Hz, 2C), 119.4 (d,  $J$  = 2.5 Hz, 2C), 117.4-117.4 (m), 80.4, 32.1, 27.8, 26.9, 19.6, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  481.1321; found: 481.1319.

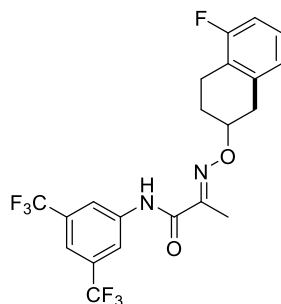


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((5-phenyl-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)iminopropanamide (4i):** Colorless solid; m.p. = 121-123 °C; yield 80% (124.9 mg);  $R_f$  = 0.29 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.84 (s, 1H), 8.13 (s, 2H), 7.64 (s, 1H), 7.44 (t,  $J$  = 7.3 Hz, 2H), 7.38 (t,  $J$  = 7.4 Hz, 1H), 7.32 (d,  $J$  = 7.0 Hz, 2H), 7.27 (t,  $J$  = 7.5 Hz, 1H), 7.19 (d,  $J$  = 7.4 Hz, 1H), 7.15 (d,  $J$  = 7.3 Hz, 1H), 4.82 (q,  $J$  = 8.5 Hz, 1H), 3.35 (dd,  $J_1$  = 16.8 Hz,  $J_2$  = 5.4 Hz, 1H), 3.16 (dd,  $J_1$  = 16.8 Hz,  $J_2$  = 6.9 Hz, 1H), 2.87-2.68 (m, 2H), 2.15 (s, 4H), 2.01 (td,  $J_1$  = 13.6 Hz,  $J_2$  = 8.1 Hz, 1H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.3, 150.4, 141.9, 141.6, 138.9, 134.2, 133.6, 132.4 (q,  $J$  = 33.5 Hz, 2C), 129.1 (s, 2C), 128.5, 128.1 (s, 2C), 127.7, 127.0, 126.0, 123.1 (q,  $J$  = 272.7 Hz, 2C), 119.3 (d,  $J$  = 3.9 Hz, 2C), 117.9-116.8 (m), 79.7, 35.0, 28.3, 25.2, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{27}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  543.1478; found: 543.1473.

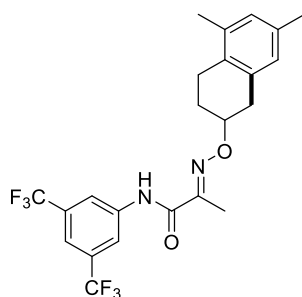


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((5-methoxy-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)iminopropanamide (4j):** Colorless solid; m.p. = 57-59 °C; yield 85% (121.0 mg);  $R_f$  = 0.43 (petroleum ether-EtOAc = 10:1); Major isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.85 (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.16 (t,  $J$  = 7.9 Hz, 1H), 6.78 (dd,  $J_1$  = 7.6 Hz,  $J_2$  = 3.7 Hz, 1H), 6.73 (d,  $J$  = 8.1 Hz, 1H), 4.82-4.76 (m, 1H), 3.86 (d,  $J$  = 3.1 Hz, 3H), 3.21 (ddd,  $J_1$  = 23.7 Hz,  $J_2$  = 17.2 Hz,  $J_3$  = 5.2 Hz, 1H), 3.10-2.94 (m, 1H), 2.93-2.74 (m, 2H), 2.26-2.14 (m, 1H), 2.12 (d,  $J$  = 2.7 Hz, 3H), 2.10-2.03 (m, 1H) ppm; Major isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 157.5, 150.2, 138.9, 137.1, 132.4 (q,  $J$  = 33.7 Hz, 2C), 126.5, 123.1 (q,  $J$  = 272.8 Hz, 2C), 122.6, 120.8, 119.4 (s, 2C), 117.6-117.1 (m), 107.2, 79.9, 55.3, 28.7, 27.6, 26.5, 9.6 ppm; Minor isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.83 (s, 1H), 8.12 (s, 2H), 7.63 (s,

1H), 7.16 (t,  $J = 7.9$  Hz, 1H), 6.78 (dd,  $J_1 = 7.6$  Hz,  $J_2 = 3.7$  Hz, 1H), 6.73 (d,  $J = 8.1$  Hz, 1H), 4.82-4.76 (m, 1H), 3.86 (d,  $J = 3.1$  Hz, 3H), 3.21 (ddd,  $J_1 = 23.7$  Hz,  $J_2 = 17.2$  Hz,  $J_3 = 5.2$  Hz, 1H), 3.10-2.94 (m, 1H), 2.93-2.74 (m, 2H), 2.26-2.14 (m, 1H), 2.12 (d,  $J = 2.7$  Hz, 3H), 2.10-2.03 (m, 1H) ppm; Minor isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.4, 157.1, 150.2, 138.9, 135.0, 132.4$  (q,  $J = 33.7$  Hz, 2C), 126.6, 124.7, 123.1 (q,  $J = 272.8$  Hz, 2C), 121.4, 119.4 (s, 2C), 117.6-117.1 (m), 107.4, 79.7, 55.3, 34.6, 27.5, 20.6, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  497.1270; found: 497.1270.



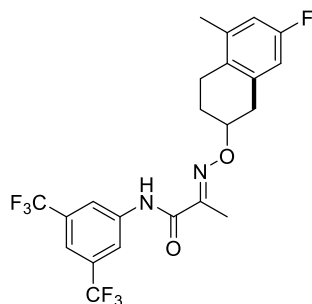
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((5-fluoro-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (4k):** Colorless solid; m.p. = 111-113 °C; yield 72% (99.9 mg);  $R_f = 0.41$  (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.82$  (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.19-7.10 (m, 1H), 6.97-6.86 (m, 2H), 4.83-4.74 (m, 1H), 3.30-3.18 (m, 1H), 3.11-2.99 (m, 1H), 3.01-2.80 (m, 2H), 2.25-2.18 (m, 1H), 2.11 (d,  $J = 3.5$  Hz, 4H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.2, 160.7$  (d,  $J = 244.4$  Hz), 150.6, 138.8, 136.2 (d,  $J = 4.9$  Hz), 132.5 (q,  $J = 33.5$  Hz, 2C), 127.0 (d,  $J = 8.7$  Hz), 124.7 (d,  $J = 3.2$  Hz), 123.4 (d,  $J = 17.9$  Hz), 123.1 (q,  $J = 273.3$  Hz, 2C), 119.4 (d,  $J = 3.0$  Hz, 2C), 118.1-117.1 (m), 112.5 (d,  $J = 21.9$  Hz), 79.2, 34.1, 26.9, 19.3, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{21}\text{H}_{17}\text{F}_7\text{N}_2\text{O}_2\text{Na}$  485.1070; found: 485.1070.



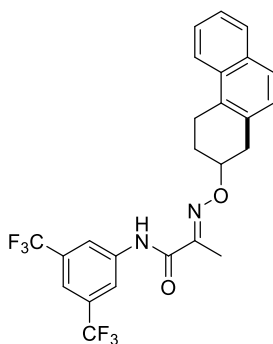
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((5,7-dimethyl-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (4l):** Colorless solid; m.p. = 80-82 °C; yield 82% (116.2 mg);  $R_f = 0.46$  (petroleum ether-EtOAc = 10:1); Major isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.85$  (s, 1H), 8.13 (s, 2H), 7.64 (s, 1H), 6.90 (s, 1H), 6.84 (d,  $J = 4.8$  Hz, 1H), 4.84-4.78 (m, 1H), 3.15 (ddd,  $J_1 = 55.5$  Hz,  $J_2 = 16.8$  Hz,  $J_3 = 5.5$  Hz, 1H), 3.06-2.91 (m, 1H), 2.90-2.69 (m, 2H), 2.30 (s, 3H), 2.25 (s, 3H), 2.19 (d,  $J = 3.7$  Hz, 1H), 2.14 (s, 3H), 2.12-1.99 (m, 1H) ppm; Major isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.4, 150.3, 138.9, 136.7, 135.6, 135.3, 132.5$  (q,  $J = 33.8$  Hz, 2C), 129.2, 128.6, 126.9, 123.1 (q,  $J = 272.7$  Hz, 2C), 119.3 (s, 2C), 118.0-117.3 (m), 80.7, 31.8, 27.9, 26.9, 20.8, 19.5, 9.7 ppm; Minor isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.82$  (s, 1H), 8.12 (s, 2H), 7.64 (s, 1H), 6.90 (s, 1H), 6.84 (d,  $J = 4.8$  Hz, 1H), 4.77-4.72 (m, 1H), 3.15 (ddd,  $J_1 = 55.5$  Hz,  $J_2 = 16.8$  Hz,  $J_3 = 5.5$  Hz, 1H), 3.06-2.91 (m, 1H), 2.90-2.69



(m, 2H), 2.30 (s, 3H), 2.24 (s, 3H), 2.19 (d,  $J = 3.7$  Hz, 1H), 2.12 (s, 3H), 2.12-1.99 (m, 1H) ppm; Minor isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.4, 150.3, 138.9, 136.1, 135.4, 133.4, 132.5$  (q,  $J = 33.8$  Hz, 2C), 131.1, 128.7, 127.6, 123.1 (q,  $J = 272.7$  Hz, 2C), 119.3 (s, 2C), 118.0-117.3 (m), 79.8, 34.9, 28.2, 26.9, 23.9, 19.5, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{23}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  495.1478; found: 495.1475.

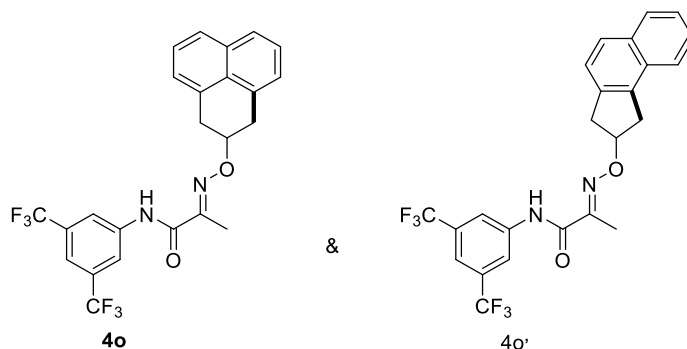


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((7-fluoro-5-methyl-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (4m):** Colorless solid; m.p. = 60-62 °C; yield 82% (117.2 mg);  $R_f = 0.38$  (petroleum ether-EtOAc = 10:1); Major isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.85$  (s, 1H), 8.13 (s, 2H), 7.63 (s, 1H), 6.99-6.55 (m, 2H), 4.85-4.78 (m, 1H), 3.26-2.90 (m, 2H), 2.91-2.66 (m, 2H), 2.26 (s, 3H), 2.25-2.16 (m, 1H), 2.13 (s, 3H), 2.10-2.03 (m, 1H) ppm; Major isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.3, 160.9$  (d,  $J = 243.7$  Hz), 150.5, 138.9 (d,  $J = 7.6$  Hz), 138.8, 137.6 (d,  $J = 7.6$  Hz), 132.5 (q,  $J = 33.5$  Hz, 2C), 127.6 (d,  $J = 2.9$  Hz), 123.1 (q,  $J = 272.8$  Hz, 2C), 119.3 (d,  $J = 4.0$  Hz, 2C), 117.5-117.4 (m), 114.6 (d,  $J = 20.9$  Hz), 112.4 (d,  $J = 20.3$  Hz), 80.2, 31.6, 27.5, 23.5, 19.7, 9.7 ppm; Minor isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.83$  (s, 1H), 8.13 (s, 2H), 7.63 (s, 1H), 6.99-6.55 (m, 2H), 4.78-4.73 (m, 1H), 3.26-2.90 (m, 2H), 2.91-2.66 (m, 2H), 2.26 (s, 3H), 2.25-2.16 (m, 1H), 2.11 (s, 3H), 2.10-2.03 (m, 1H) ppm; Minor isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.3, 160.9$  (d,  $J = 243.7$  Hz), 150.5, 138.8, 138.4 (d,  $J = 8.1$  Hz), 135.3 (d,  $J = 7.7$  Hz), 132.5 (q,  $J = 33.5$  Hz, 2C), 129.7 (d,  $J = 2.9$  Hz), 123.1 (q,  $J = 272.8$  Hz, 2C), 119.3 (d,  $J = 4.0$  Hz, 2C), 117.5-117.4 (m), 114.6 (d,  $J = 20.8$  Hz), 113.1 (d,  $J = 20.3$  Hz), 79.2, 35.0, 27.8, 27.0, 19.7, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{19}\text{F}_7\text{N}_2\text{O}_2\text{Na}$  499.1227; found: 499.1227.



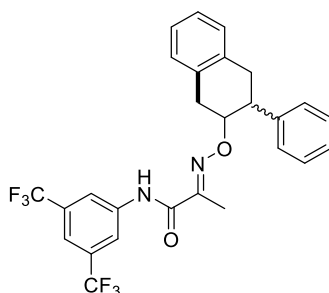
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((1,2,3,4-tetrahydrophenanthren-2-yl)oxy)imino)propanamide (4n):** Colorless solid; m.p. = 99-101 °C; yield 80% (118.7 mg);  $R_f = 0.34$  (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.87$  (s, 1H), 8.14 (d,  $J = 8.0$  Hz, 2H), 8.00 (d,  $J = 8.5$  Hz, 1H), 7.85 (d,  $J = 7.6$  Hz, 1H), 7.71 (d,  $J = 8.4$  Hz, 1H), 7.64 (s, 1H), 7.56 (ddd,  $J_1 = 8.4$  Hz,  $J_2 = 6.8$  Hz,  $J_3 = 1.4$  Hz, 1H), 7.49 (t,  $J = 6.9$  Hz, 1H), 7.30-7.24 (m, 1H), 4.91-4.86 (m, 1H), 3.38 (td,  $J_1 = 17.2$

Hz,  $J_2 = 16.7$  Hz,  $J_3 = 5.6$  Hz, 2H), 3.25 (ddd,  $J_1 = 24.3$  Hz,  $J_2 = 15.8$  Hz,  $J_3 = 7.0$  Hz, 2H), 2.49-2.21 (m, 2H), 2.13 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.3, 150.5, 138.9, 132.6, 132.5$  (q,  $J = 33.5$  Hz, 2C), 132.0, 130.7, 130.5, 128.5, 127.9, 126.6, 126.2, 125.2, 123.1 (q,  $J = 273.3$  Hz, 2C), 122.9, 119.4 (d,  $J = 4.0$  Hz, 2C), 117.4 (d,  $J = 5.2$  Hz), 79.6, 35.3, 27.8, 23.3, 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{25}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  517.1321; found: 517.1318.



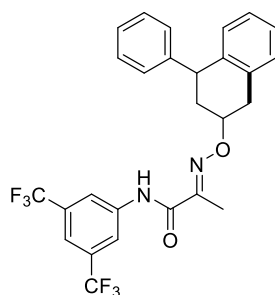
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((2,3-dihydro-1H-phenalen-2-yl)oxy)imino)propanamide (4o):** Colorless solid; m.p. = 114-116°C; yield 54% (77.8 mg);  $R_f = 0.43$  (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.73$  (s, 1H), 8.11 (s, 2H), 7.75 (d,  $J = 8.2$  Hz, 2H), 7.64 (s, 1H), 7.47-7.43 (m, 2H), 7.33 (d,  $J = 7.0$  Hz, 2H), 5.04-4.99 (m, 1H), 3.58 (dd,  $J_1 = 15.7$  Hz,  $J_2 = 4.1$  Hz, 2H), 3.40 (dd,  $J_1 = 15.6$  Hz,  $J_2 = 8.7$  Hz, 2H), 2.08 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.2, 150.7, 138.8, 132.7$  (s, 2C), 132.4 (q,  $J = 33.5$  Hz, 2C), 130.1, 129.7, 128.7, 127.5, 126.5 (s, 2C), 125.9 (s, 2C), 125.0 (s, 2C), 123.1 (q,  $J = 272.8$  Hz, 2C), 119.4 (d,  $J = 3.6$  Hz, 2C), 117.5-117.4 (m), 78.8, 36.2 (s, 2C), 9.6 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{24}\text{H}_{18}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  503.1165; found: 503.1164.

**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((2,3-dihydro-1H-cyclopenta[a]naphthalen-2-yl)oxy)imino)propanamide (4o):** Colorless solid; m.p. = 114-116°C; yield 21% (30.3 mg);  $R_f = 0.43$  (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.59$  (s, 1H), 7.95 (s, 2H), 7.92 (d,  $J = 8.1$  Hz, 1H), 7.82 (dd,  $J_1 = 14.5$  Hz,  $J_2 = 8.3$  Hz, 2H), 7.61 (s, 1H), 7.58-7.51 (m, 1H), 7.52-7.45 (m, 2H), 5.78-5.44 (m, 1H), 3.75-3.61 (m, 2H), 3.43 (d,  $J = 4.7$  Hz, 2H), 2.07 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 161.1, 150.7, 137.7, 136.3, 133.4, 132.4$  (q,  $J = 33.6$  Hz, 2C), 130.1 (s, 2C), 129.7 (s, 2C), 126.4, 125.3, 124.0, 122.9, 123.1 (q,  $J = 272.8$  Hz, 2C), 119.2 (d,  $J = 3.4$  Hz, 2C), 117.4-117.3 (m), 84.7, 40.6, 38.2, 9.5 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{24}\text{H}_{18}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  503.1165; found: 503.1164.



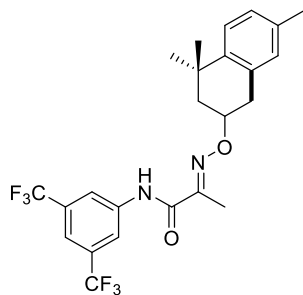
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((3-phenyl-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imin**

**o)propanamide (4p):** Colorless solid; m.p. =113-115 °C; yield 77% (120.2 mg);  $R_f$  = 0.49 (petroleum ether-EtOAc = 10:1); Major isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.29 (s, 1H), 7.99 (s, 2H), 7.64 (s, 1H), 7.41-7.32 (m, 4H), 7.30 (dt,  $J_1$  = 8.9 Hz,  $J_2$  = 3.2 Hz, 1H), 7.29-7.20 (m, 4H), 5.12-4.89 (m, 1H), 3.48 (d,  $J$  = 14.8 Hz, 1H), 3.45-3.30 (m, 2H), 3.26-3.09 (m, 2H), 2.05 (s, 3H) ppm; Major isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.1, 150.0, 142.3, 138.7, 135.7, 132.9, 132.3 (q,  $J$  = 33.9 Hz, 2C), 129.1, 128.8, 128.4 (s, 2C), 128.2, 128.1 (s, 2C), 126.8, 126.4, 126.2, 123.1 (q,  $J$  = 272.9 Hz, 2C), 119.3 (d,  $J$  = 4.0 Hz, 2C), 117.4-117.1 (m), 82.6, 43.5, 34.7, 30.4, 9.6 ppm; Minor isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.38 (s, 1H), 8.07 (s, 2H), 7.64 (s, 1H), 7.41-7.32 (m, 4H), 7.30 (dt,  $J_1$  = 8.9 Hz,  $J_2$  = 3.2 Hz, 1H), 7.29-7.20 (m, 4H), 5.12-4.89 (m, 1H), 3.48 (d,  $J$  = 14.8 Hz, 1H), 3.45-3.30 (m, 2H), 3.26-3.09 (m, 2H), 1.98 (s, 3H) ppm; Minor isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.1, 150.0, 142.7, 138.8, 135.6, 133.9, 132.3 (q,  $J$  = 33.5 Hz, 2C), 129.2, 128.9, 128.5 (s, 2C), 128.5, 127.9 (s, 2C), 126.8, 126.4, 126.3, 123.1 (q,  $J$  = 272.9 Hz, 2C), 119.3 (d,  $J$  = 4.0 Hz, 2C), 117.4-117.1 (m), 84.6, 46.2, 35.9, 34.8, 9.4 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{27}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  543.1478; found: 543.1473.

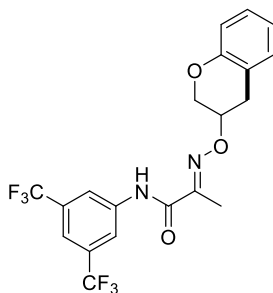


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4-phenyl-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imin)**

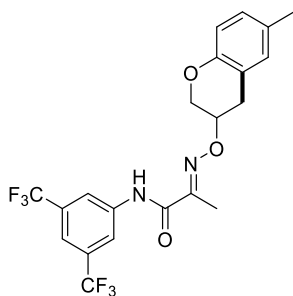
**o)propanamide (4q):** Colorless solid; m.p. = 43-45 °C; yield 78% (121.8 mg);  $R_f$  = 0.43 (petroleum ether-EtOAc = 10:1); Major isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.83 (s, 1H), 8.16 (s, 2H), 7.65 (s, 1H), 7.38-7.34 (m, 2H), 7.32-7.20 (m, 4H), 7.16 (dd,  $J_1$  = 7.4 Hz,  $J_2$  = 2.2 Hz, 2H), 6.91 (dd,  $J_1$  = 48.9 Hz,  $J_2$  = 7.7 Hz, 1H), 4.93-4.81 (m, 1H), 4.46-4.24 (m, 1H), 3.52-3.31 (m, 1H), 3.25-3.10 (m, 1H), 2.72-2.46 (m, 1H), 2.37-2.10 (m, 4H) ppm; Major isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.2, 150.4, 146.0, 138.8, 138.2, 134.1, 132.4 (q,  $J$  = 33.5 Hz, 2C), 129.7, 129.2, 128.7 (s, 2C), 128.5 (s, 2C), 126.6, 126.5, 126.4, 123.1 (q,  $J$  = 272.8 Hz, 2C), 119.3 (d,  $J$  = 4.0 Hz, 2C), 117.5-117.3 (m), 77.8, 42.7, 37.0, 34.7, 9.6 ppm; Minor isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.77 (s, 1H), 8.09 (s, 2H), 7.64 (s, 1H), 7.38-7.34 (m, 2H), 7.32-7.20 (m, 4H), 7.16 (dd,  $J_1$  = 7.4 Hz,  $J_2$  = 2.2 Hz, 2H), 6.91 (dd,  $J_1$  = 48.9 Hz,  $J_2$  = 7.7 Hz, 1H), 4.93-4.81 (m, 1H), 4.46-4.24 (m, 1H), 3.52-3.31 (m, 1H), 3.25-3.10 (m, 1H), 2.72-2.46 (m, 1H), 2.37-2.10 (m, 4H) ppm; Minor isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.2, 150.6, 145.5, 138.9, 138.2, 134.2, 132.4 (q,  $J$  = 33.5 Hz, 2C), 129.3, 129.3, 128.7 (s, 2C), 128.7 (s, 2C), 126.7, 126.6, 126.4, 123.1 (q,  $J$  = 272.8 Hz, 2C), 119.4 (d,  $J$  = 4.0 Hz, 2C), 117.6-117.4 (m), 80.2, 45.6, 38.9, 35.7, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{27}\text{H}_{22}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  543.1478; found: 543.1473.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((4,4,7-trimethyl-1,2,3,4-tetrahydronaphthalen-2-yl)oxy)imino)propanamide (4r):** Colorless solid; m.p. = 100-102 °C; yield 86% (125.5 mg);  $R_f$  = 0.57 (petroleum ether-EtOAc = 10:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.89 (s, 1H), 8.16 (s, 2H), 7.64 (s, 1H), 7.28 (d,  $J$  = 8.0 Hz, 1H), 7.10-7.03 (m, 1H), 6.99 (d,  $J$  = 19.6 Hz, 1H), 4.84-4.78 (m, 1H), 3.29 (dd,  $J_1$  = 15.9 Hz,  $J_2$  = 3.6 Hz, 1H), 2.95 (dd,  $J_1$  = 15.9 Hz,  $J_2$  = 9.7 Hz, 1H), 2.34 (s, 3H), 2.16 (s, 4H), 1.95-1.87 (m, 1H), 1.44 (s, 3H), 1.38 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.4, 150.3, 141.6, 138.9, 135.7, 132.5 (q,  $J$  = 33.6 Hz, 2C), 132.4, 129.9, 127.6, 126.1, 123.1 (q,  $J$  = 272.7 Hz, 2C), 119.4 (d,  $J$  = 3.0 Hz, 2C), 117.7-117.2 (m), 78.8, 44.0, 36.5, 35.6, 32.9, 32.0, 20.8, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{24}\text{H}_{24}\text{F}_6\text{N}_2\text{O}_2\text{Na}$  509.1634; found: 509.1633.

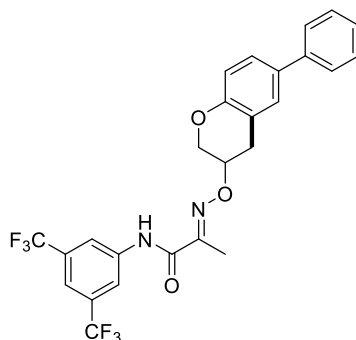


**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-((chroman-3-yloxy)imino)propanamide (4s):** Colorless solid; m.p. = 82-84 °C; yield 64% (85.7 mg);  $R_f$  = 0.53 (petroleum ether-EtOAc = 5:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.61 (s, 1H), 8.04 (s, 2H), 7.62 (s, 1H), 7.21-7.11 (m, 2H), 6.96 (td,  $J_1$  = 7.4 Hz,  $J_2$  = 1.2 Hz, 1H), 6.89 (dd,  $J_1$  = 8.2 Hz,  $J_2$  = 1.2 Hz, 1H), 4.88-4.84 (m, 1H), 4.39 (ddd,  $J_1$  = 11.6 Hz,  $J_2$  = 4.8 Hz,  $J_3$  = 1.9 Hz, 1H), 4.30 (d,  $J$  = 11.7 Hz, 1H), 3.34-3.25 (m, 1H), 3.15-3.07 (m, 1H), 2.11 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.0, 154.2, 151.4, 138.7, 132.4 (q,  $J$  = 33.5 Hz, 2C), 129.8, 127.7, 123.1 (q,  $J$  = 273.3 Hz, 2C), 121.2, 119.4 (s, 2C), 119.4, 117.5 (dt,  $J_1$  = 7.7 Hz,  $J_2$  = 3.9 Hz), 116.6, 75.3, 67.1, 29.8, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{20}\text{H}_{16}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  469.0957; found: 469.0955.



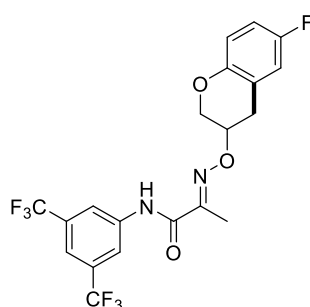
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((6-methylchroman-3-yl)oxy)imino)propanamide (4t):**

Colorless solid; m.p. = 83-85 °C; yield 83% (114.6 mg);  $R_f$  = 0.57 (petroleum ether-EtOAc = 5:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.64 (s, 1H), 8.05 (s, 2H), 7.63 (s, 1H), 6.99-6.92 (m, 2H), 6.79 (d,  $J$  = 8.2 Hz, 1H), 4.85-4.82 (m, 1H), 4.35 (ddd,  $J_1$  = 11.5 Hz,  $J_2$  = 4.9 Hz,  $J_3$  = 1.9 Hz, 1H), 4.27 (d,  $J$  = 11.6 Hz, 1H), 3.25 (dd,  $J_1$  = 17.1 Hz,  $J_2$  = 5.6 Hz, 1H), 3.06 (dd,  $J_1$  = 16.8 Hz,  $J_2$  = 3.6 Hz, 1H), 2.29 (s, 3H), 2.11 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.0, 152.0, 151.4, 138.8, 132.4 (q,  $J$  = 33.5 Hz, 2C), 130.5, 130.2, 128.3, 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.4 (d,  $J$  = 3.7 Hz, 2C), 119.0, 118.1-117.0 (m), 116.3, 75.5, 67.1, 29.8, 20.5, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{21}\text{H}_{18}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  483.1114; found: 483.1113.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((6-phenylchroman-3-yl)oxy)imino)propanamide (4u):**

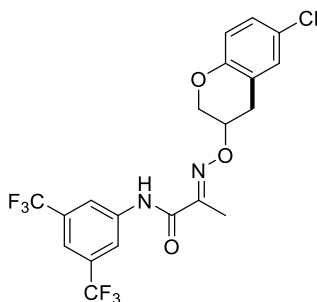
Colorless solid; m.p. = 121-123 °C; yield 86% (134.8 mg);  $R_f$  = 0.29 (petroleum ether-EtOAc = 5:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.75 (s, 1H), 8.11 (s, 2H), 7.64 (s, 1H), 7.56 (d,  $J$  = 7.0 Hz, 2H), 7.47-7.39 (m, 3H), 7.36 (d,  $J$  = 2.3 Hz, 1H), 7.33 (t,  $J$  = 7.4 Hz, 1H), 6.97 (d,  $J$  = 8.4 Hz, 1H), 4.91-4.87 (m, 1H), 4.43 (ddd,  $J_1$  = 11.5 Hz,  $J_2$  = 5.0 Hz,  $J_3$  = 1.7 Hz, 1H), 4.35 (d,  $J$  = 11.2 Hz, 1H), 3.35 (dd,  $J_1$  = 16.9 Hz,  $J_2$  = 5.3 Hz, 1H), 3.17 (dd,  $J_1$  = 17.0 Hz,  $J_2$  = 4.7 Hz, 1H), 2.13 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 160.9, 153.6, 151.7, 140.6, 138.7, 134.4, 132.5 (q,  $J$  = 33.6 Hz, 2C), 128.8 (s, 2C), 128.5, 126.8, 126.7 (s, 2C), 126.5, 123.1 (q,  $J$  = 273.4 Hz, 2C), 119.4 (d,  $J$  = 3.8 Hz, 2C), 119.2, 117.6 (t,  $J$  = 3.9 Hz), 117.0, 75.4, 67.0, 29.9, 9.8 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{26}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  545.1270; found: 545.1270.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((6-fluorochroman-3-yl)oxy)imino)propanamide (4v):**

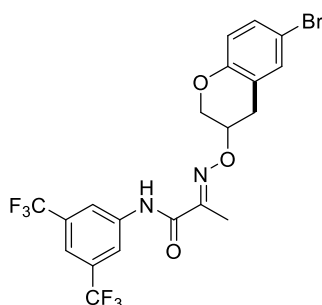
Colorless solid; m.p. = 111-113 °C; yield 82% (114.2 mg);  $R_f$  = 0.48 (petroleum ether-EtOAc = 5:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.69 (s, 1H), 8.08 (s, 2H), 7.63 (s, 1H), 6.88-6.81 (m, 3H), 4.85-4.82 (m, 1H), 4.38 (ddd,  $J_1$  = 11.6 Hz,  $J_2$  = 4.8 Hz,  $J_3$  = 1.9 Hz, 1H), 4.26 (d,  $J$  = 11.6 Hz, 1H), 3.26 (dd,  $J_1$  = 17.0 Hz,  $J_2$  = 5.4 Hz, 1H), 3.08 (dd,  $J_1$  = 17.1 Hz,  $J_2$  = 4.2 Hz, 1H), 2.10 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 160.9, 157.2 (d,  $J$  = 239.2 Hz), 151.8, 150.1 (d,  $J$  = 2.2 Hz), 138.7, 132.5 (q,  $J$  = 33.5 Hz, 2C), 123.1 (q,  $J$  = 273.3 Hz, 2C), 120.3 (d,  $J$  = 7.6 Hz), 119.4 (d,  $J$  = 4.0 Hz, 2C), 117.7-117.5 (m), 117.5, 115.7 (d,  $J$  = 23.0 Hz), 114.5 (d,  $J$  = 23.2 Hz), 75.0, 66.9, 29.9, 9.8 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} +$

Na]<sup>+</sup> Calcd. for C<sub>20</sub>H<sub>15</sub>F<sub>7</sub>N<sub>2</sub>O<sub>3</sub>Na 487.0863; found: 487.0863.



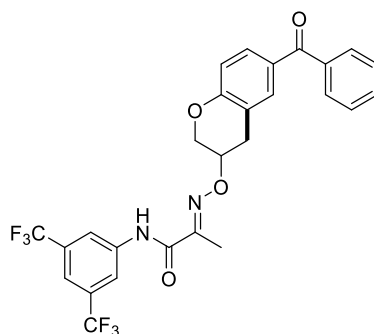
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((6-chlorochroman-3-yl)oxy)imino)propanamide (4w) :**

Colorless solid; m.p. = 125-127 °C; yield 84% (121.2 mg); *R<sub>f</sub>* = 0.45 (petroleum ether-EtOAc = 5:1); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ = 8.69 (s, 1H), 8.09 (s, 2H), 7.64 (s, 1H), 7.11 (dd, *J*<sub>1</sub> = 10.2 Hz, *J*<sub>2</sub> = 1.7 Hz, 2H), 6.81 (d, *J* = 8.4 Hz, 1H), 4.85-4.82 (m, 1H), 4.40 (ddd, *J*<sub>1</sub> = 11.7 Hz, *J*<sub>2</sub> = 4.7 Hz, *J*<sub>3</sub> = 2.0 Hz, 1H), 4.27 (d, *J* = 11.5 Hz, 1H), 3.24 (dd, *J*<sub>1</sub> = 17.7 Hz, *J*<sub>2</sub> = 4.8 Hz, 1H), 3.07 (dd, *J*<sub>1</sub> = 17.3 Hz, *J*<sub>2</sub> = 2.8 Hz, 1H), 2.10 (s, 3H) ppm; <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>) δ = 160.8, 152.7, 151.9, 138.8, 132.5 (q, *J* = 33.6 Hz, 2C), 129.4, 127.8, 125.9, 123.1 (q, *J* = 273.4 Hz, 2C), 120.6, 119.4 (d, *J* = 4.1 Hz, 2C), 117.9, 117.8-117.2 (m), 74.8, 66.9, 29.6, 9.8 ppm; HRMS (ESI-TOF) *m/z*: [M + Na]<sup>+</sup> Calcd. for C<sub>20</sub>H<sub>15</sub>ClF<sub>6</sub>N<sub>2</sub>O<sub>3</sub>Na 503.0568; found: 503.0565.



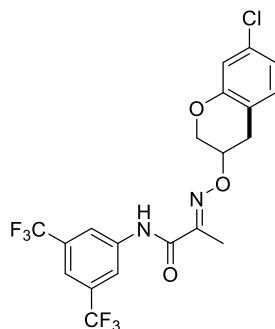
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((6-bromochroman-3-yl)oxy)imino)propanamide (4x):**

Colorless solid; m.p. = 136-138 °C; yield 80% (126.0 mg); *R<sub>f</sub>* = 0.47 (petroleum ether-EtOAc = 5:1); <sup>1</sup>H NMR (500 MHz, CDCl<sub>3</sub>) δ = 8.69 (s, 1H), 8.09 (s, 2H), 7.64 (s, 1H), 7.25 (d, *J* = 7.6 Hz, 2H), 6.77 (d, *J* = 9.3 Hz, 1H), 4.83 (d, *J* = 3.8 Hz, 1H), 4.47-4.35 (m, 1H), 4.27 (d, *J* = 11.6 Hz, 1H), 3.25 (dd, *J*<sub>1</sub> = 17.2 Hz, *J*<sub>2</sub> = 5.3 Hz, 1H), 3.07 (dd, *J*<sub>1</sub> = 16.7 Hz, *J*<sub>2</sub> = 3.3 Hz, 1H), 2.10 (s, 3H) ppm; <sup>13</sup>C NMR (126 MHz, CDCl<sub>3</sub>) δ = 160.8, 153.2, 151.9, 138.7, 132.5 (q, *J* = 33.3 Hz, 2C), 132.4, 130.6, 123.1 (q, *J* = 273.4 Hz, 2C), 121.1, 119.4 (d, *J* = 4.0 Hz, 2C), 118.4, 117.9-117.3 (m), 113.1, 74.8, 66.8, 29.5, 9.8 ppm; HRMS (ESI-TOF) *m/z*: [M + Na]<sup>+</sup> Calcd. for C<sub>20</sub>H<sub>15</sub>BrF<sub>6</sub>N<sub>2</sub>O<sub>3</sub>Na 547.0062; found: 547.0057.



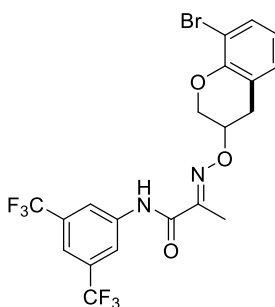
**(E)-2-(((6-benzoylchroman-3-yl)oxy)imino)-N-(3,5-bis(trifluoromethyl)phenyl)propanamide (4y):**

Colorless solid; m.p. = 103-105 °C; yield 85% (140.4 mg);  $R_f$  = 0.53 (petroleum ether-EtOAc = 5:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.84 (s, 1H), 8.12 (s, 2H), 7.76 (d,  $J$  = 7.0 Hz, 2H), 7.69 (d,  $J$  = 2.0 Hz, 1H), 7.64 (d,  $J$  = 8.3 Hz, 2H), 7.58 (t,  $J$  = 7.5 Hz, 1H), 7.48 (t,  $J$  = 7.6 Hz, 2H), 6.92 (d,  $J$  = 8.5 Hz, 1H), 4.88 (dd,  $J_1$  = 4.7 Hz,  $J_2$  = 2.2 Hz, 1H), 4.50 (ddd,  $J_1$  = 11.7 Hz,  $J_2$  = 4.7,  $J_3$  = 2.0 Hz, 1H), 4.35 (d,  $J$  = 11.7 Hz, 1H), 3.29 (dd,  $J_1$  = 17.0 Hz,  $J_2$  = 5.0 Hz, 1H), 3.15 (dd,  $J_1$  = 17.1 Hz,  $J_2$  = 3.1 Hz, 1H), 2.09 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 195.6, 160.8, 157.9, 152.0, 138.7, 138.1, 132.8, 132.4 (q,  $J$  = 33.6 Hz, 2C), 132.0, 130.7, 130.6, 129.7 (s, 2C), 128.2 (s, 2C), 123.0 (q,  $J$  = 273.3 Hz, 2C), 119.4 (d,  $J$  = 3.7 Hz, 2C), 118.9, 118.0-117.4 (m), 116.3, 74.7, 67.1, 29.6, 9.9 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{27}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_4\text{Na}$  573.1219; found: 573.1221.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((7-chlorochroman-3-yl)oxy)imino)propanamide (4z):**

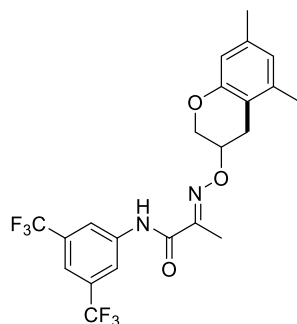
Colorless solid; m.p. = 92-94 °C; yield 82% (118.3 mg);  $R_f$  = 0.53 (petroleum ether-EtOAc = 5:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.65 (s, 1H), 8.07 (s, 2H), 7.63 (s, 1H), 7.12 (t,  $J$  = 8.1 Hz, 1H), 7.04 (d,  $J$  = 8.0 Hz, 1H), 6.83 (d,  $J$  = 8.3 Hz, 1H), 4.93-4.86 (m, 1H), 4.40 (ddd,  $J_1$  = 11.7 Hz,  $J_2$  = 4.7 Hz,  $J_3$  = 1.8 Hz, 1H), 4.25 (d,  $J$  = 11.7 Hz, 1H), 3.22 (dd,  $J_1$  = 17.9 Hz,  $J_2$  = 5.7 Hz, 1H), 3.14 (dd,  $J_1$  = 17.8 Hz,  $J_2$  = 2.6 Hz, 1H), 2.12 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 160.8, 155.3, 151.8, 138.7, 134.7, 132.5 (q,  $J$  = 33.6 Hz, 2C), 127.9, 123.1 (q,  $J$  = 273.2 Hz, 2C), 121.8, 119.4 (d,  $J$  = 4.1 Hz, 2C), 118.3, 118.0-117.1 (m), 115.3, 74.9, 66.7, 28.3, 9.8 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{20}\text{H}_{15}\text{ClF}_6\text{N}_2\text{O}_3\text{Na}$  503.0568; found: 503.0568.



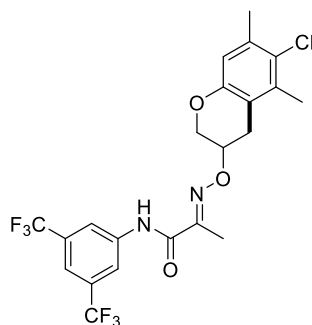
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((8-bromochroman-3-yl)oxy)imino)propanamide (4aa):**

Colorless solid; m.p. = 128-130 °C; yield 81% (127.6 mg);  $R_f$  = 0.43 (petroleum ether-EtOAc = 5:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.64 (s, 1H), 8.07 (s, 2H), 7.63 (s, 1H), 7.42 (d,  $J$  = 8.0 Hz, 1H), 7.07 (d,  $J$  = 7.6 Hz, 1H), 6.82 (t,  $J$  = 7.7 Hz, 1H), 4.88-4.85 (m, 1H), 4.52 (ddd,  $J_1$  = 11.7 Hz,  $J_2$  = 4.8 Hz,  $J_3$  = 1.9 Hz, 1H), 4.39 (d,  $J$  = 11.2 Hz, 1H), 3.30 (dd,  $J_1$  = 17.3 Hz,  $J_2$  = 4.6 Hz, 1H), 3.12 (dd,  $J_1$  = 17.0 Hz,  $J_2$  = 3.3 Hz, 1H), 2.10 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 160.8, 151.8, 150.7, 138.7, 132.5 (q,  $J$  = 33.5 Hz, 2C), 131.5, 129.0, 123.1 (q,  $J$  = 273.4 Hz, 2C), 121.9, 120.9, 119.4 (d,  $J$  = 3.8 Hz, 2C), 117.8-117.3 (m), 110.7, 74.9, 67.7, 30.0, 9.8 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{20}\text{H}_{15}\text{BrF}_6\text{N}_2\text{O}_3\text{Na}$

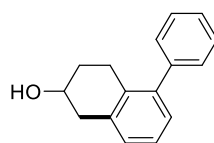
547.0062; found: 547.0059.



**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((5,7-dimethylchroman-3-yl)oxy)imino)propanamide (4ab):** Colorless solid; m.p. = 125-127 °C; yield 81% (115.3 mg);  $R_f$  = 0.30 (petroleum ether-EtOAc = 5:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.69 (s, 1H), 8.08 (s, 2H), 7.63 (s, 1H), 6.69 (s, 1H), 6.59 (s, 1H), 4.89-4.85 (m, 1H), 4.32-4.23 (m, 2H), 3.09 (dd,  $J_1$  = 17.1 Hz,  $J_2$  = 6.0 Hz, 1H), 2.90 (dd,  $J_1$  = 17.1 Hz,  $J_2$  = 4.9 Hz, 1H), 2.27 (s, 3H), 2.24 (s, 3H), 2.13 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 161.0, 154.1, 151.3, 138.8, 137.4, 137.1, 132.5 (q,  $J$  = 33.6 Hz, 2C), 123.7, 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.4 (d,  $J$  = 4.0 Hz, 2C), 118.0-117.0 (m), 115.1, 114.8, 75.9, 66.6, 27.7, 20.9, 19.0, 9.8 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_3\text{Na}$  497.1270; found: 497.1269.



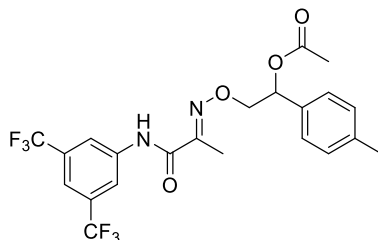
**(E)-N-(3,5-bis(trifluoromethyl)phenyl)-2-(((6-chloro-5,7-dimethylchroman-3-yl)oxy)imino)propanamide (4ac):** Colorless solid; m.p. = 131-133 °C; yield 85% (129.7 mg);  $R_f$  = 0.53 (petroleum ether-EtOAc = 5:1);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 8.75 (s, 1H), 8.11 (s, 2H), 7.64 (s, 1H), 6.68 (s, 1H), 4.88-4.85 (m, 1H), 4.30 (ddd,  $J_1$  = 11.3 Hz,  $J_2$  = 5.3 Hz,  $J_3$  = 1.6 Hz, 1H), 4.22 (dd,  $J_1$  = 11.3 Hz,  $J_2$  = 1.4 Hz, 1H), 3.12 (dd,  $J_1$  = 17.1 Hz,  $J_2$  = 5.8 Hz, 1H), 2.94 (dd,  $J_1$  = 17.1 Hz,  $J_2$  = 4.8 Hz, 1H), 2.34 (d,  $J$  = 6.1 Hz, 6H), 2.12 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta$  = 160.9, 152.2, 151.8, 138.7, 135.4, 135.2, 132.5 (q,  $J$  = 33.6 Hz, 2C), 127.1, 123.1 (q,  $J$  = 273.3 Hz, 2C), 119.4 (d,  $J$  = 4.1 Hz, 2C), 118.4-117.4 (m), 116.7, 116.4, 75.6, 66.2, 28.8, 20.8, 16.3, 9.9 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{19}\text{ClF}_6\text{N}_2\text{O}_3\text{Na}$  531.0881; found: 531.0875.



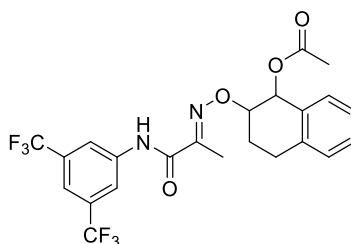
**5-phenyl-1,2,3,4-tetrahydronaphthalen-2-ol (5):** Colorless oil;  $R_f$  = 0.66 (petroleum ether-EtOAc = 1:1); yield 80% (17.9 mg);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta$  = 7.43 (t,  $J$  = 7.3 Hz, 2H), 7.36 (t,  $J$  = 7.4 Hz, 1H), 7.33-7.30 (m, 2H), 7.22 (t,  $J$  = 7.5 Hz, 1H), 7.14 (d,  $J$  = 7.5 Hz, 1H), 7.09 (d,  $J$  = 7.4 Hz, 1H),



4.24-4.18 (m, 1H), 3.21 (dd,  $J_1 = 16.3$  Hz,  $J_2 = 4.9$  Hz, 1H), 2.88 (dd,  $J_1 = 16.3$  Hz,  $J_2 = 7.8$  Hz, 1H), 2.80 (dt,  $J_1 = 17.3$  Hz,  $J_2 = 5.7$  Hz, 1H), 2.72-2.65 (m, 1H), 2.04-1.98 (m, 1H), 1.79-1.71 (m, 1H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 141.8, 141.8, 134.7, 133.4, 129.1$  (s, 2C), 128.8, 128.1 (s, 2C), 127.6, 126.8, 125.8, 67.0, 38.9, 31.8, 25.8 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{16}\text{H}_{16}\text{ONa}$  247.1093; found: 247.1087.



**(E)-2-(((1-((3,5-bis(trifluoromethyl)phenyl)amino)-1-oxopropan-2-ylidene)amino)oxy)-1-(p-tolyl)ethyl acetate (6):** Colorless oil; yield 38% (55.9 mg);  $R_f = 0.33$  (petroleum ether-EtOAc = 10:1); yield % (mg);  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 8.68$  (s, 1H), 8.12 (s, 2H), 7.63 (s, 1H), 7.31 (d,  $J = 8.0$  Hz, 2H), 7.22 (d,  $J = 7.9$  Hz, 2H), 6.18 (dd,  $J_1 = 7.6$  Hz,  $J_2 = 4.4$  Hz, 1H), 4.56 (dd,  $J_1 = 11.9$  Hz,  $J_2 = 7.7$  Hz, 1H), 4.47 (dd,  $J_1 = 11.9$  Hz,  $J_2 = 4.4$  Hz, 1H), 2.33 (s, 3H), 2.14 (s, 3H), 2.10 (s, 3H) ppm;  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 170.1, 161.0, 151.2, 138.8, 138.6, 133.8, 132.5$  (q,  $J = 33.8$  Hz, 2C), 129.4 (s, 2C), 126.9 (s, 2C), 123.1 (q,  $J = 272.7$  Hz, 2C), 119.4 (d,  $J = 3.7$  Hz), 117.7-117.4 (m), 77.4, 73.3, 21.2, 21.1, 9.7 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{22}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_4\text{Na}$  513.1219; found: 513.1229.



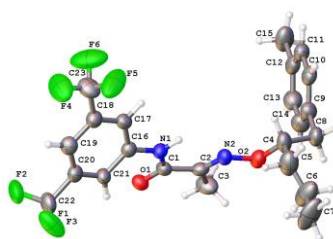
**(E)-2-(((1-((3,5-bis(trifluoromethyl)phenyl)amino)-1-oxopropan-2-ylidene)amino)oxy)-1,2,3,4-tetrahydronaphthalen-1-yl acetate (7):** Colorless oil; yield 49% (57.3 mg);  $R_f = 0.42$  (petroleum ether-EtOAc = 10:1); Major isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 9.19$  (s, 1H), 8.24 (s, 2H), 7.62 (s, 1H), 7.45-7.24 (m, 3H), 7.22 (t,  $J = 7.8$  Hz, 1H), 6.34 (d,  $J = 4.4$  Hz, 1H), 4.70 (dt,  $J_1 = 8.1$  Hz,  $J_2 = 4.4$  Hz, 1H), 3.18-2.88 (m, 2H), 2.37-2.21 (m, 2H), 2.19 (s, 3H), 2.08 (s, 3H) ppm; Major isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 170.8, 161.3, 151.0, 139.2, 137.0, 132.4$  (q,  $J = 33.5$  Hz, 2C), 129.3, 129.1, 128.6, 126.7, 123.2 (q,  $J = 272.4$  Hz, 2C), 119.3 (d,  $J = 3.5$  Hz, 2C), 117.3 (dd,  $J_1 = 7.1$  Hz,  $J_2 = 3.6$  Hz), 82.2, 70.7, 27.7, 25.4, 23.0, 21.3, 9.6 ppm; Minor isomer:  $^1\text{H}$  NMR (500 MHz,  $\text{CDCl}_3$ )  $\delta = 9.03$  (s, 1H), 8.23 (s, 2H), 7.63 (s, 1H), 7.45-7.24 (m, 3H), 7.22 (t,  $J = 7.8$  Hz, 1H), 6.62 (d,  $J = 3.3$  Hz, 1H), 4.70 (dt,  $J_1 = 8.1$  Hz,  $J_2 = 4.4$  Hz, 1H), 3.18-2.88 (m, 2H), 2.37-2.21 (m, 2H), 2.13 (s, 3H), 2.08 (s, 3H) ppm; Minor isomer:  $^{13}\text{C}$  NMR (126 MHz,  $\text{CDCl}_3$ )  $\delta = 170.9, 161.5, 151.1, 139.2, 136.7, 132.6$  (q,  $J = 35.9$  Hz, 2C), 130.7, 128.8, 128.4, 126.7, 123.2 (q,  $J = 272.4$  Hz, 2C), 119.6-119.4 (m, 2C), 117.4 (dd,  $J_1 = 6.7$  Hz,  $J_2 = 2.8$  Hz), 80.8, 68.7, 27.7, 25.2, 23.0, 21.3, 9.8 ppm; HRMS (ESI-TOF)  $m/z$ :  $[\text{M} + \text{Na}]^+$  Calcd. for  $\text{C}_{23}\text{H}_{20}\text{F}_6\text{N}_2\text{O}_4\text{Na}$  525.1219; found: 525.1241.

## X. X-Ray data for 2a, 2t, 4a, 4n, 4aa

All single crystals for X-ray diffraction study were obtained from the solution of compounds in DCM/EtOH (1 mL, 1:5 v/v) for several days at room temperature.

The single-crystal X-ray diffraction data were collected at 170 K for **2a** and **4aa** on a Bruker D8 Venture with GaK $\alpha$  radiation ( $\lambda = 1.34139$  Å), 173 K for **2t** on a Bruker APEX-II CCD with GaK $\alpha$  radiation ( $\lambda = 1.34139$  Å), 170 K for **4n** on a Bruker APEX-II CCD with GaK $\alpha$  radiation ( $\lambda = 1.34139$  Å), and at 300 K for **4a** on a Bruker APEX-II CCD using MoK $\alpha$  radiation ( $\lambda = 0.71073$  Å). The structures were solved using ShelXT for **2a**, **4a**, **4n**, **4aa** and using SHELXS-97 for **2t**.

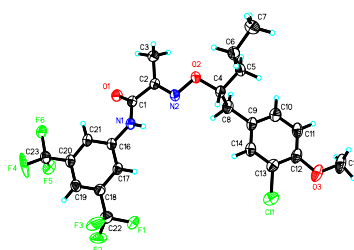
**X-ray for 2a** (Displacement ellipsoids are drawn at the 50% probability level).



Identification code	wmj18186_0m_4	
Empirical formula	C23 H24 F6 N2 O2	
Formula weight	474.44	
Temperature	169.98 K	
Wavelength	1.34139 Å	
Crystal system	Monoclinic	
Space group	P 1 21/c 1	
Unit cell dimensions	a = 9.6268(15) Å	$\alpha = 90^\circ$
	b = 19.650(3) Å	$\beta = 93.175(9)^\circ$
	c = 25.052(4) Å	$\gamma = 90^\circ$
Volume	4731.6(13) Å <sup>3</sup>	
Z	8	
Density (calculated)	1.332 Mg/m <sup>3</sup>	
Absorption coefficient	0.652 mm <sup>-1</sup>	
F(000)	1968	
Crystal size	0.1 x 0.03 x 0.01 mm <sup>3</sup>	
Theta range for data collection	3.074 to 55.052 °	
Index ranges	?<=h<=?, ?<=k<=?, ?<=l<=?	
Reflections collected	8548	
Independent reflections	8548 [R(int) = 0.1576]	
Completeness to theta = 53.594 °	94.8 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	0.7508 and 0.2472	
Refinement method	Full-matrix least-squares on F <sup>2</sup>	

Data / restraints / parameters	8548 / 0 / 601
Goodness-of-fit on $F^2$	0.750
Final R indices [ $I > 2\sigma(I)$ ]	$R1 = 0.1162$ , $wR2 = 0.2459$
R indices (all data)	$R1 = 0.2590$ , $wR2 = 0.3319$
Extinction coefficient	n/a
Largest diff. peak and hole	0.299 and -0.253 e. $\text{\AA}^{-3}$

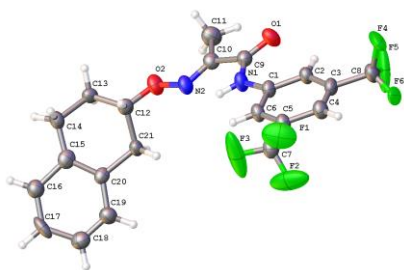
**X-ray for 2t** (Displacement ellipsoids are drawn at the 50% probability level).



Identification code	mjl18641	
Empirical formula	C <sub>23</sub> H <sub>23</sub> Cl F <sub>6</sub> N <sub>2</sub> O <sub>3</sub>	
Formula weight	524.88	
Temperature	173(2) K	
Wavelength	1.34139 Å	
Crystal system	Orthorhombic	
Space group	P b c n	
Unit cell dimensions	$a = 48.657(3)$ Å	$\alpha = 90^\circ$
	$b = 11.3003(7)$ Å	$\beta = 90^\circ$
	$c = 9.0677(6)$ Å	$\gamma = 90^\circ$
Volume	4985.8(5) Å <sup>3</sup>	
Z	8	
Density (calculated)	1.399 Mg/m <sup>3</sup>	
Absorption coefficient	1.315 mm <sup>-1</sup>	
F(000)	2160	
Crystal size	0.190 x 0.100 x 0.060 mm <sup>3</sup>	
Theta range for data collection	3.493 to 55.354 °	
Index ranges	-58 ≤ h ≤ 59, -13 ≤ k ≤ 13, -11 ≤ l ≤ 10	
Reflections collected	31095	
Independent reflections	4710 [ $R(\text{int}) = 0.0939$ ]	
Completeness to $\theta = 53.594^\circ$	98.9 %	
Absorption correction	Semi-empirical from equivalents	
Max. and min. transmission	0.7508 and 0.4422	

Refinement method	Full-matrix least-squares on $F^2$
Data / restraints / parameters	4710 / 72 / 377
Goodness-of-fit on $F^2$	1.059
Final R indices [ $I > 2\sigma(I)$ ]	$R1 = 0.0649$ , $wR2 = 0.1562$
R indices (all data)	$R1 = 0.1017$ , $wR2 = 0.1817$
Extinction coefficient	n/a
Largest diff. peak and hole	0.244 and $-0.288 \text{ e.}\text{\AA}^{-3}$

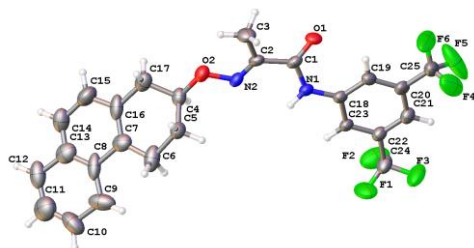
**X-ray for 4a** (Displacement ellipsoids are drawn at the 50% probability level).



Identification code	d8v17483
Empirical formula	$C_{21}H_{18}F_6N_2O_2$
Formula weight	444.37
Temperature	300.14 K
Wavelength	$0.71073 \text{ \AA}$
Crystal system	Orthorhombic
Space group	$Pca2_1$
Unit cell dimensions	$a = 16.5023(9) \text{ \AA}$ $\alpha = 90^\circ$ $b = 8.2471(5) \text{ \AA}$ $\beta = 90^\circ$ $c = 14.8151(11) \text{ \AA}$ $\gamma = 90^\circ$
Volume	$2016.3(2) \text{ \AA}^3$
Z	4
Density (calculated)	$1.464 \text{ Mg/m}^3$
Absorption coefficient	$0.132 \text{ mm}^{-1}$
$F(000)$	912
Crystal size	$0.15 \times 0.08 \times 0.05 \text{ mm}^3$
Theta range for data collection	$2.468$ to $27.504^\circ$
Index ranges	$-19 \leq h \leq 21$ , $-8 \leq k \leq 10$ , $-19 \leq l \leq 12$
Reflections collected	11041
Independent reflections	4046 [ $R(\text{int}) = 0.0506$ ]
Completeness to $\theta = 25.242^\circ$	99.5 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.7456 and 0.6709

Refinement method	Full-matrix least-squares on $F^2$
Data / restraints / parameters	4046 / 10 / 377
Goodness-of-fit on $F^2$	1.050
Final R indices [ $I > 2\sigma(I)$ ]	$R1 = 0.0749$ , $wR2 = 0.1964$
R indices (all data)	$R1 = 0.1065$ , $wR2 = 0.2239$
Absolute structure parameter	0.2(5)
Extinction coefficient	n/a
Largest diff. peak and hole	0.327 and -0.296 e. $\text{\AA}^{-3}$

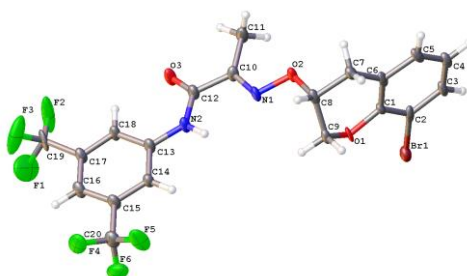
**X-ray for 4n** (Displacement ellipsoids are drawn at the 50% probability level).



Identification code	wmj18187_0m
Empirical formula	$C_{25}H_{20}F_6N_2O_2$
Formula weight	494.43
Temperature	169.98 K
Wavelength	1.34139 $\text{\AA}$
Crystal system	Monoclinic
Space group	$P 1 21/c 1$
Unit cell dimensions	$a = 15.3988(11) \text{\AA}$ $b = 14.5528(12) \text{\AA}$ $c = 10.2022(8) \text{\AA}$
Volume	$2253.3(3) \text{\AA}^3$
Z	4
Density (calculated)	1.457 $\text{Mg/m}^3$
Absorption coefficient	0.705 $\text{mm}^{-1}$
$F(000)$	1016
Crystal size	0.12 x 0.08 x 0.05 $\text{mm}^3$
Theta range for data collection	4.650 to 55.271 $^\circ$
Index ranges	$-14 \leq h \leq 18$ , $-17 \leq k \leq 17$ , $-12 \leq l \leq 11$
Reflections collected	14539
Independent reflections	4150 [ $R(\text{int}) = 0.1119$ ]
Completeness to $\theta = 53.594^\circ$	96.1 %
Absorption correction	Semi-empirical from equivalents

Max. and min. transmission	0.7508 and 0.2693
Refinement method	Full-matrix least-squares on F <sup>2</sup>
Data / restraints / parameters	4150 / 0 / 317
Goodness-of-fit on F <sup>2</sup>	0.928
Final R indices [I>2sigma(I)]	R1 = 0.1242, wR2 = 0.2448
R indices (all data)	R1 = 0.2164, wR2 = 0.2991
Extinction coefficient	n/a
Largest diff. peak and hole	0.378 and -0.290 e.Å <sup>-3</sup>

**X-ray for 4aa** (Displacement ellipsoids are drawn at the 50% probability level).



Identification code	wmj18188_0m
Empirical formula	C <sub>20</sub> H <sub>15</sub> Br F <sub>6</sub> N <sub>2</sub> O <sub>3</sub>
Formula weight	525.25
Temperature	169.99 K
Wavelength	1.34139 Å
Crystal system	Triclinic
Space group	P-1
Unit cell dimensions	a = 9.4489(3) Å      α = 91.228(3) ° b = 10.7122(4) Å      β = 99.504(3) ° c = 20.9067(9) Å      γ = 90.386(2) °
Volume	2086.51(14) Å <sup>3</sup>
Z	4
Density (calculated)	1.672 Mg/m <sup>3</sup>
Absorption coefficient	2.313 mm <sup>-1</sup>
F(000)	1048
Crystal size	0.08 x 0.05 x 0.03 mm <sup>3</sup>
Theta range for data collection	3.731 to 55.117 °
Index ranges	-11 ≤ h ≤ 11, -13 ≤ k ≤ 12, -24 ≤ l ≤ 25
Reflections collected	18377
Independent reflections	7733 [R(int) = 0.1074]
Completeness to theta = 53.594 °	97.2 %

Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.7508 and 0.2790
Refinement method	Full-matrix least-squares on F <sup>2</sup>
Data / restraints / parameters	7733 / 222 / 628
Goodness-of-fit on F <sup>2</sup>	1.003
Final R indices [I>2sigma(I)]	R1 = 0.1185, wR2 = 0.2576
R indices (all data)	R1 = 0.1648, wR2 = 0.2851
Extinction coefficient	0.0031(5)
Largest diff. peak and hole	1.382 and -1.155 e.Å <sup>-3</sup>

## XI. References

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## XII. NMR Spectra

