

Thomas J. Cogswell<sup>a</sup>, Craig S. Donald<sup>c</sup>, Rodolfo Marquez<sup>a,b\*</sup>

Department of Chemistry, Xi'an Jiaotong-Liverpool University,  
SIP Suzhou, 215123, China.

*[rudi.marquez@xjtlu.edu.cn](mailto:rudi.marquez@xjtlu.edu.cn)*

Supporting Information

Experimental Details

---

<sup>a</sup> Department of Chemistry, Xi'an Jiaotong-Liverpool University, SIP Suzhou, 215123, China. E-mail: [rudi.marquez@xjtlu.edu.cn](mailto:rudi.marquez@xjtlu.edu.cn);  
Tel: +86 (0)512 88161432.

<sup>b</sup> School of Chemistry, University of Glasgow, Glasgow, G12 8QQ, UK.

<sup>c</sup> Oncology iMed, AstraZeneca, Alderley Park, Macclesfield, Cheshire SK10 4TG, UK.

## Experimental

All reactions were performed in oven-dried glassware under an inert argon atmosphere unless otherwise stated. Tetrahydrofuran (THF), diethyl ether, toluene and dichloromethane (DCM) were purified through a solvent purification system. Petroleum ether refers to the fraction boiling between 40-60 °C. All reagents were used as received, unless otherwise stated. Solvents were evaporated under reduced pressure at 40 °C unless otherwise stated. IR spectra were recorded as thin films on NaCl plates using a Fourier Transform spectrometer. Only significant absorptions ( $\nu^{\text{max}}$ ) are reported in wavenumbers ( $\text{cm}^{-1}$ ). Proton magnetic resonance spectra ( $^1\text{H}$  NMR) were recorded at either 400 or 500 MHz. Fluorine magnetic resonance spectra ( $^{19}\text{F}$  NMR) were recorded at either 377 or 470 MHz. Carbon magnetic resonance spectra ( $^{13}\text{C}$  NMR) were recorded at either 100 or 125 MHz. Chemical shifts ( $\delta$ ) are reported in parts per million (ppm) and are referenced to the residual solvent peak. The order of citation in parentheses is (1) number of equivalent nuclei (by integration), (2) multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, quint = quintet, sext = sextet, sept = septet, m = multiplet, br = broad), (3) and coupling constant ( $J$ ) quoted in Hertz to the nearest 0.1 Hz. High resolution mass spectra were obtained by electrospray (EI) chemical ionisation (CI) mass spectrometry operating at a resolution of 15000 full widths at half height. Flash chromatography was performed using silica gel (40-63 micron) as the stationary phase. TLC was performed on aluminium sheets pre-coated with silica (Silica Gel 60 F254) unless otherwise stated. The plates were visualised by the quenching of UV fluorescence ( $\lambda_{\text{max}}254\text{nm}$ ) and/or by staining with either anisaldehyde, potassium permanganate, iodine or cerium ammonium molybdate followed by heating.

**General procedure A.**  $\text{Na}_2\text{SO}_4$  (1 g) was dried under vacuum in a round bottom flask for 10 min. Aldehyde (1 eq) was then added, followed by toluene (10 mL) and *tert*-butylsulfonamide (1.1 eq). The resulting reaction mixture was then heated to reflux for 4 h. The reaction was then cooled down to room temperature, and the solid residue filtered off. The solution was concentrated under vacuum and the residue was re-dissolved in anhydrous diethyl ether (10 mL). The solution was placed under argon and was cooled down to 0 °C. The solution was then treated dropwise with vinylmagnesium bromide (3 eq) and the resulting mixture was allowed to warm up to room temperature overnight. The reaction was quenched with water (20 mL) and extracted with diethyl ether (3 x 20 mL). The combined organic extracts were dried over sodium sulphate, and evaporated under reduced pressure. The crude residue was dissolved in MeOH (20 mL) before HCl (6M) was added dropwise until pH 1 was reached. The solution was stirred for 1 h following which the reaction was diluted with  $\text{H}_2\text{O}$  (20 mL) and the mixture was extracted with diethyl ether 3 x (20 mL). The aqueous phase was basified to pH 14 with 15% NaOH and then

extracted with CH<sub>2</sub>Cl<sub>2</sub> (3 x 20 mL). The resulting organics were dried (Na<sub>2</sub>SO<sub>4</sub>) and the solvent was removed to give the corresponding allylic amine without need for further purification.

**General procedure B.** Na<sub>2</sub>SO<sub>4</sub> (0.5 g) was dried under vacuum in a round bottom flask for 10 min. Amine (1 eq) was then added, followed by MeOH (6 mL) and aldehyde (1.05 eq). The resulting reaction mixture was then heated to reflux for 3 h. The reaction was then cooled down 0 °C, the solution was treated with NaBH<sub>4</sub> (1.5 eq) and the mixture was stirred for 1.5 h. Following this time, the reaction was quenched with H<sub>2</sub>O (20 mL) and extracted with diethyl ether (3 x 20 mL). The organics were combined and dried (Na<sub>2</sub>SO<sub>4</sub>) before the solvent was removed. The crude residue was purified by flash column chromatography to afford the corresponding secondary amine.

**General procedure C.** 2-Fluoroacrylic acid **6** (2 eq) and HBTU (2 eq) were dry mixed and then dissolved in CH<sub>2</sub>Cl<sub>2</sub> (10 mL). DIPEA (2 eq) was added followed by the corresponding amine (1 eq). The resulting solution was stirred and refluxed for 72 h. The reaction was cooled down to room temperature and the solvent was evaporated under reduced pressure. The crude material was purified by flash column chromatography.

**1-Phenyl-2-propenylamine, 4.** Following General Procedure A, benzaldehyde (0.95 mL, 9.4 mmol) reacted with *tert*-butylsulfonamide (1.28 g, 10.6 mmol) and vinylmagnesium bromide (28.5 mL 1.0 M in THF, 28.5 mmol). Following acid-base work up, amine **4** was obtained (1.06 g, 8.0 mmol, 85%) without need for further purification. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.38-7.36 (4H, m), 7.29–7.28 (1H, m), 6.05 (1H, ddd, *J*<sub>H</sub> = 17.1, 10.2, 6.1 Hz), 5.27 (1H, dt, *J*<sub>H</sub> = 16.8, 1.6 Hz), 5.14 (1H, dt, *J*<sub>H</sub> = 10.0, 1.6 Hz), 4.56 (1H, dt, *J*<sub>H</sub> = 6.1, 1.3 Hz), 1.59 (2H, br s). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 144.5, 142.3, 128.7 (2C), 127.1, 126.6 (2C), 113.6, 58.4. The spectral data is in agreement with the literature values.<sup>1</sup>

***N*-(4'-Methoxyphenylmethyl)-1-phenyl-2-propenylamine, 5.** Following General Procedure B, amine **4** (110 mg, 0.8 mmol) reacted with *p*-methoxybenzaldehyde (0.11 mL, 0.9 mmol) and NaBH<sub>4</sub> (50 mg, 1.2 mmol). The crude residue was purified by flash column chromatography (0-2.5% Et<sub>2</sub>O in petroleum ether) to yield the expected secondary amine **5** (160 mg, 0.7 mmol, 80%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.41-7.24 (7H, m), 6.88 (2H, d, *J*<sub>H</sub> = 8.4 Hz), 5.97 (1H, ddd, *J*<sub>H</sub> = 17.2, 10.4, 7.2 Hz), 5.25 (1H, appt dt, *J*<sub>H</sub> = 17.2, 1.2 Hz), 5.14 (1H, ddd, *J*<sub>H</sub> = 10.0, 1.6, 0.8 Hz), 4.24 (1H, d, *J*<sub>H</sub> = 7.2 Hz), 3.83 (3H, s), 3.71 (1H, d, *J*<sub>H</sub> = 13.6 Hz), 3.61 (1H, d, *J*<sub>H</sub> = 13.6 Hz), 1.60 (1H, s). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 158.6, 142.8, 141.0, 132.5, 129.4 (2C), 128.6 (2C), 127.4 (2C), 127.2, 115.2, 113.8 (2C), 65.0, 55.3, 50.7. The spectral data is in agreement with the literature values.<sup>2</sup>

**2-Fluoro-N-[(4''-methoxyphenyl)methyl]-N-[1'-phenylprop-2'-en-1'-yl]-prop-2-enamide, 7.** Amine **5** (120 mg, 0.5 mmol) was coupled with 2-fluoroacrylic acid **6** (90 mg, 1.0 mmol) using HBTU (350 mg, 1.0 mmol) and DIPEA (0.16 mL, 1.0 mmol) following General Procedure C. The crude product was purified by flash column chromatography (0-2.5% diethyl ether in petroleum ether) to yield the desired dialkene **7** (90 mg, 0.3 mmol, 61%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 500 MHz) δ: 7.27-7.19 (5H, m), 6.92 (2H, d, *J*<sub>H</sub> = 8.2 Hz), 6.69 (2H, *J*<sub>H</sub> = 8.2 Hz), 6.03 (1H, ddd, *J*<sub>H</sub> = 17.0, 10.0, 7.0 Hz), 5.72 (1H, d, *J*<sub>H</sub> = 7.2 Hz), 5.27-5.17 (3H, m), 5.01 (1H, dd, *J*<sub>F</sub> = 16.5 Hz, *J*<sub>H</sub> = 2.5 Hz), 4.50 (1H, d, *J*<sub>H</sub> = 16.0 Hz), 4.27 (1H, d, *J*<sub>H</sub> = 16.0 Hz), 3.71 (3H, s). <sup>19</sup>F NMR (CDCl<sub>3</sub>, 470 MHz) δ: -103.0, -105.5. <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 163.2 (d, *J*<sub>F</sub> = 27.3 Hz), 158.7, 157.9 (d, *J*<sub>F</sub> = 272.4 Hz), 138.2, 134.6, 129.4, 128.8 (2C), 128.6 (2C), 128.0 (2C), 127.9, 119.2, 113.7 (2C) 99.4, 63.3, 55.2, 40.1. *m/z* [ESI (+ve)] 348.1 [M+Na]<sup>+</sup>, HRMS found [M+Na]<sup>+</sup> 348.1356, C<sub>20</sub>H<sub>20</sub>FNO<sub>2</sub>Na requires 348.1359. IR (thin film) *v*<sub>max</sub> = 2956, 1639, 1612, 1512, 1413, 1246, 1176 cm<sup>-1</sup>.

**N-(1-Phenyl-2-propenyl)benzylamine, 14a.** Following General Procedure B, amine **4** (400 mg, 3.0 mmol) reacted with benzaldehyde (0.32 mL, 3.1 mmol) and NaBH<sub>4</sub> (170 mg, 4.5 mmol). The crude residue was purified by flash column chromatography (0-2.5% Et<sub>2</sub>O in petroleum ether) to yield the expected secondary amine **14a** (500 mg, 2.2 mmol, 74%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.41-7.34 (7H, m), 7.31-7.26 (3H, m), 5.98 (1H, ddd, *J*<sub>H</sub> = 17.2, 10.2, 7.2 Hz), 5.25 (1H, dt, *J*<sub>H</sub> = 17.2, 1.2 Hz), 5.15 (1H, dt, *J*<sub>H</sub> = 10.0, 1.2 Hz), 4.26 (1H, d, *J*<sub>H</sub> = 7.2 Hz), 3.78 (1H, d, *J*<sub>H</sub> = 13.2 Hz), 3.74 (1H, d, *J*<sub>H</sub> = 13.2 Hz), 1.62 (1H, s). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 142.8, 141.0, 140.5, 128.6 (2C), 128.4 (2C), 128.2 (2C), 127.4 (2C), 127.2, 126.9, 115.2, 65.1, 51.3. The spectral data is in agreement with the literature values.<sup>3</sup>

**N-(4'-Bromophenylmethyl)-1-phenyl-2-propenylamine, 14b.** Following General Procedure B, amine **4** (260 mg, 1.9 mmol) was reacted with 4-bromobenzaldehyde (400 mg, 2.2 mmol) and NaBH<sub>4</sub> (110 mg, 2.9 mmol). The crude residue was purified by flash column chromatography (0-2.5% Et<sub>2</sub>O in petroleum ether) to yield the expected secondary amine **14b** (460 mg, 1.5 mmol, 81%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.46 (2H, d, *J*<sub>H</sub> = 8.4 Hz), 7.40-7.27 (5H, m), 7.23 (2H, d, *J*<sub>H</sub> = 8.4 Hz), 5.96 (1H, ddd, *J*<sub>H</sub> = 17.2, 10.4, 7.2 Hz), 5.25 (1H, appt dt, *J*<sub>H</sub> = 17.2, 1.2 Hz), 5.16 (1H, ddd, *J*<sub>H</sub> = 10.4, 1.6, 1.2 Hz), 4.22 (1H, d, *J*<sub>H</sub> = 6.8 Hz), 3.73 (1H, d, *J*<sub>H</sub> = 13.6 Hz), 3.68 (1H, d, *J*<sub>H</sub> = 13.6 Hz), 1.63 (1H, s). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 142.6, 140.8, 139.5, 131.4 (2C), 129.9 (2C), 128.6 (2C), 127.3 (2C), 127.3, 120.6, 115.3, 65.0, 50.6. *m/z* [EI (+ve)] 302.1 [M]<sup>+</sup>, HRMS found [M]<sup>+</sup> 301.0469, C<sub>16</sub>H<sub>16</sub>BrN requires 301.0466. IR (thin film) *v*<sub>max</sub> = 3026, 2831, 1487, 1452, 1099, 1070 cm<sup>-1</sup>.

**N-(Cyclohexylmethyl)-1-phenyl-2-propenylamine, 14c.** Following General Procedure B, amine **4** (270 mg, 2.0 mmol) was reacted with cyclohexanecarboxaldehyde (0.27 mL, 2.2 mmol) and NaBH<sub>4</sub> (110 mg, 3.0

mmol). The crude residue was purified by flash column chromatography (0-2.5% Et<sub>2</sub>O in petroleum ether) to yield the expected secondary amine **14c** (370 mg, 1.6 mmol, 82% yield) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.27-7.15 (5H, m), 5.84 (1H, ddd, *J*<sub>H</sub> = 17.2, 10.2, 7.2 Hz), 5.12 (1H, dd, *J*<sub>H</sub> = 17.1, 1.1 Hz), 5.00 (1H, appt d, *J*<sub>H</sub> = 10.2 Hz), 4.05 (1H, d, *J*<sub>H</sub> = 7.2 Hz), 2.35 (1H, dd, *J*<sub>H</sub> = 11.5, 6.5 Hz), 2.24 (1H, dd, *J*<sub>H</sub> = 11.5, 6.9 Hz), 1.69-1.55 (5H, m), 1.42-1.33 (1H, m), 1.15-1.01 (3H, m), 0.87-0.76 (3H, m). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 143.3, 141.5, 128.5 (2C), 127.4 (2C), 127.0, 114.7, 66.3, 54.4, 38.2, 31.5, 31.4, 26.7, 26.1, 26.0. *m/z* [EI (+ve)] 229.2 [M]<sup>+</sup>, HRMS found [M]<sup>+</sup> 229.1827, C<sub>16</sub>H<sub>23</sub>N requires 229.1830. IR (thin film) *v*<sub>max</sub> = 2920, 2850, 1448, 1269, 1118 cm<sup>-1</sup>.

***N*-[(1'-Methyl-1*H*-pyrrol-2'-yl)methyl]-1-phenyl-2-propenylamine, 14d.** Following General Procedure B, amine **4** (140 mg, 1.0 mmol) was reacted with 1-methylpyrrole-2-carboxaldehyde (0.12 mL, 1.1 mmol) and NaBH<sub>4</sub> (60 mg, 1.5 mmol). The crude residue was purified by flash column chromatography (0-2.5% Et<sub>2</sub>O in petroleum ether) to yield the expected secondary amine **14d** (160 mg, 0.7 mmol, 71%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.42-7.35 (4H, m), 7.31-7.26 (1H, m), 6.01 (1H, dd, *J*<sub>H</sub> = 2.4, 2.0 Hz), 6.01 (1H, m), 6.00 (2H, dd, *J*<sub>H</sub> = 3.6, 2.0 Hz), 5.95 (1H, ddd, *J*<sub>H</sub> = 17.2, 10.4, 7.2 Hz), 5.27 (1H, dt, *J*<sub>H</sub> = 17.2, 1.2 Hz), 5.15 (1H, ddd, *J*<sub>H</sub> = 10.4, 1.6, 1.2 Hz), 4.27 (1H, d, *J*<sub>H</sub> = 7.1 Hz), 3.72 (1H, d, *J*<sub>H</sub> = 13.6 Hz), 3.65 (3H, s), 3.62 (1H, d, *J*<sub>H</sub> = 13.6 Hz, 1H), 1.43 (1H, s). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 142.9, 141.0, 131.20, 128.5 (2C), 127.3 (2C), 127.2, 122.3, 115.1, 107.8, 106.4, 65.4, 43.2, 33.8. *m/z* [EI (+ve)] 226.2 [M]<sup>+</sup>, HRMS found [M]<sup>+</sup> 226.1469, C<sub>15</sub>H<sub>18</sub>N<sub>2</sub> requires 226.1470. IR (thin film) *v*<sub>max</sub> = 2935, 2818, 1492, 1452, 1300, 1087 cm<sup>-1</sup>.

***N*-Benzyl-2-fluoro-*N*-(1'-phenylprop-2'-en-1'-yl)-prop-2-enamide, 15a.** Amine **14a** (300 mg, 1.3 mmol) was coupled with 2-fluoroacrylic acid (240 mg, 2.6 mmol) using HBTU (1.0 g, 2.6 mmol) and DIPEA (0.46 mL, 2.6 mmol) following General Procedure C. The crude product was purified by flash column chromatography (0-2.5% diethyl ether in petroleum ether) to yield the desired dialkene **15a** (290 mg, 1.0 mmol, 74%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.26-7.10 (8H, m), 7.01-6.98 (2H, m), 6.02 (1H, ddd, *J*<sub>H</sub> = 17.2, 10.4, 7.2 Hz), 5.77 (1H, d, *J*<sub>H</sub> = 7.2 Hz), 5.30-5.18 (3H, m), 4.26 (1H, dd, *J*<sub>F</sub> = 16.8 Hz, *J*<sub>H</sub> = 2.8 Hz), 4.57 (1H, d, *J*<sub>H</sub> = 16.1 Hz), 4.35 (1H, d, *J*<sub>H</sub> = 16.1 Hz). <sup>19</sup>F NMR (CDCl<sub>3</sub>, 470 MHz) δ: -103.1, -105.5. <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 163.3 (d, *J*<sub>F</sub> = 29.6 Hz), 157.8 (d, *J*<sub>F</sub> = 273.3 Hz), 138.1, 137.4, 134.6, 128.6 (2C), 128.3 (2C), 128.0 (2C), 127.9, 127.3 (2C), 126.9, 119.3, 99.6, 63.5, 48.9. *m/z* [EI (+ve)] 294.9 [M]<sup>+</sup>, HRMS found [M]<sup>+</sup> 295.1375, C<sub>19</sub>H<sub>18</sub>FNO requires 295.1372. IR (thin film) *v*<sub>max</sub> = 3030, 2251, 1635, 1450, 1417, 1153 cm<sup>-1</sup>.

**2-Fluoro-*N*-[(4''-bromophenyl)methyl]-*N*-(1'-phenylprop-2'-en-1'-yl)-prop-2-enamide, 15b.** Amine **14b** (280 mg, 0.9 mmol) was coupled with 2-fluoroacrylic acid **6** (170 mg, 1.8 mmol) using HBTU (710 mg, 1.8

mmol) and DIPEA (0.32 mL, 1.8 mmol) following General Procedure C. The crude product was purified by flash column chromatography (0-2.5% diethyl ether in petroleum ether) to yield the desired dialkene **15b** (250 mg, 0.7 mmol, 71%) as a pale yellow oil.  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 500 MHz)  $\delta$ : 7.26-7.17 (7H, m), 6.82 (2H, d,  $J_{\text{H}} = 7.3$  Hz), 5.99 (1H, ddd,  $J_{\text{H}} = 17.0, 10.0, 7.0$  Hz), 5.80 (1H, br s), 5.31-5.21 (3H, m), 5.05 (1H, appt d,  $J_{\text{F}} = 16.3$  Hz), 4.44 (1H, d,  $J_{\text{H}} = 15.8$  Hz), 4.32 (1H, d,  $J_{\text{H}} = 15.8$  Hz).  $^{19}\text{F}$  NMR ( $\text{CDCl}_3$ , 470 MHz)  $\delta$ : -103.2, -106.4.  $^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 125 MHz)  $\delta$ : 163.2 (d,  $J_{\text{F}} = 33.0$  Hz), 157.7 (d,  $J_{\text{F}} = 275.0$  Hz), 137.8, 136.5, 134.4, 131.3 (2C), 129.1 (2C), 128.7 (2C), 128.1, 128.0 (2C), 120.9, 119.4, 99.8, 63.4, 53.6.  $m/z$  [ESI (+ve)] 396.0  $[\text{M}+\text{Na}]^+$ , HRMS found  $[\text{M}+\text{Na}]^+$  396.0351,  $\text{C}_{19}\text{H}_{17}\text{BrFNONa}$  requires 396.0370. IR (thin film)  $\nu_{\text{max}} = 3030, 1641, 1489, 1404, 1209, 1072, 1010$   $\text{cm}^{-1}$ .

**2-Fluoro-N-[cyclohexylmethyl]-N-[1'-phenylprop-2'-en-1'-yl]-prop-2-enamide, 15c.** Amine **14c** (270 mg, 1.2 mmol) was coupled with 2-fluoroacrylic acid **6** (210 mg, 2.3 mmol) using HBTU (890 mg, 2.3 mmol) and DIPEA (0.40 mL, 2.3 mmol) following General Procedure C. The crude product was purified by flash column chromatography (0-2.5% diethyl ether in petroleum ether) to yield the desired dialkene **15c** (300 mg, 1.0 mmol, 86%) as a pale yellow oil.  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz)  $\delta$ : 7.39-7.28 (5H, m), 6.23 (1H, br s), 5.74 (1H, br s), 5.44-5.21 (3H, m), 5.12 (1H, dd,  $J_{\text{F}} = 17.2$  Hz,  $J_{\text{H}} = 3.5$  Hz), 3.16 (2H, br s), 1.66-1.58 (4H, m), 1.48-1.39 (1H, m), 1.35-1.25 (1H, m), 1.06-0.98 (3H, m), 0.90-0.74 (2H, m).  $^{19}\text{F}$  NMR ( $\text{CDCl}_3$ , 470 MHz)  $\delta$ : -102.3, -104.2.  $^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 125 MHz)  $\delta$ : 163.7, 158.2 (d,  $J_{\text{F}} = 272.0$  Hz), 138.6, 135.0, 128.6 (3C), 127.9 (2C), 118.9, 98.8, 63.6, 40.9, 36.9, 31.1, 30.8, 26.3, 25.9 (2C).  $m/z$  [ESI (+ve)] 324.2  $[\text{M}+\text{Na}]^+$ , HRMS found  $[\text{M}+\text{Na}]^+$  324.1740,  $\text{C}_{19}\text{H}_{24}\text{FNONa}$  requires 324.1735. IR (thin film)  $\nu_{\text{max}} = 2924, 2850, 1639, 1448, 1415, 1313, 1203, 1130$   $\text{cm}^{-1}$ .

**2-Fluoro-N-[(1''-methyl-1H-pyrrol-2'')-yl)methyl]-N-[1'-phenylprop-2'-en-1'-yl]-prop-2-enamide, 15d.** Amine **14d** (110 mg, 0.5 mmol) was coupled with 2-fluoroacrylic acid **6** (90 mg, 1.0 mmol) using HBTU (380 mg, 1.0 mmol) and DIPEA (0.17 mL, 1.0 mmol) following General Procedure C. The crude product was purified by flash column chromatography (0-2.5% diethyl ether in petroleum ether) to yield the desired dialkene **15d** (90 mg, 0.3 mmol, 58%) as a pale yellow oil.  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz)  $\delta$ : 7.30-7.15 (5H, m), 6.45 (1H, appt t,  $J_{\text{H}} = 2.4$  Hz), 5.91 (1H, dd,  $J_{\text{H}} = 3.2, 2.8$  Hz), 5.79 (1H, m), 5.70 (1H, br s), 5.63 (1H, d,  $J_{\text{H}} = 7.8$  Hz), 5.25-5.09 (3H, m), 5.03 (1H, dd,  $J_{\text{F}} = 17.2$  Hz,  $J_{\text{H}} = 3.6$  Hz), 4.69 (1H, d,  $J_{\text{H}} = 15.6$  Hz), 4.17 (1H, br s), 3.37 (3H, s).  $^{19}\text{F}$  NMR ( $\text{CDCl}_3$ , 470 MHz)  $\delta$ : -103.2.  $^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 125 MHz)  $\delta$ : 163.0 (d,  $J_{\text{F}} = 30.3$  Hz), 157.8 (d,  $J_{\text{F}} = 271.8$  Hz), 138.1, 134.4, 128.6 (2C), 127.8, 127.7 (2C), 127.4, 122.7, 119.5, 110.0, 107.0, 99.0 (d,  $J_{\text{F}} = 15.3$  Hz), 63.1, 40.1, 38.9.  $m/z$  [EI (+ve)] 298.2  $[\text{M}]^+$ , HRMS found  $[\text{M}]^+$  298.1478,  $\text{C}_{18}\text{H}_{19}\text{FN}_2\text{O}$  requires 298.1481. IR (thin film)  $\nu_{\text{max}} = 2362, 1643, 1494, 1415, 1303, 1195$   $\text{cm}^{-1}$ .

**1-(4'-Methoxyphenyl)prop-2-en-1-amine, 18a.** Following General Procedure A, 4-methoxybenzaldehyde (0.42 mL, 3.6 mmol) reacted with *tert*-butylsulfonamide (480 mg, 4.0 mmol) and vinylmagnesium bromide (10.8 mL 1.0 M in THF, 10.8 mmol). Following acid-base work up, amine **18a** was obtained (420 mg, 2.6 mmol, 71%) without need for further purification. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.30 (2H, d, *J*<sub>H</sub> = 8.4 Hz), 6.91 (2H, d, *J*<sub>H</sub> = 8.4 Hz), 6.03 (1H, ddd, *J*<sub>H</sub> = 17.1, 10.2, 6.1 Hz), 5.24 (1H, dt, *J*<sub>H</sub> = 17.2, 1.6 Hz), 5.12 (1H, dt, *J*<sub>H</sub> = 10.4, 1.6 Hz), 4.51 (1H, d, *J*<sub>H</sub> = 6.0 Hz), 3.83 (3H, s), 1.55 (2H, s). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 158.7, 142.6, 136.7, 127.7 (2C), 114.0 (2C), 113.4, 57.8, 55.3. The spectral data is in agreement with the literature values.<sup>4</sup>

**1-(4'-(Trifluoromethyl)phenyl)prop-2-en-1-amine, 18b.** Following General Procedure A, 4-(trifluoromethyl)benzaldehyde (0.39 mL, 2.9 mmol) reacted with *tert*-butylsulfonamide (380 mg, 3.1 mmol) and vinylmagnesium bromide (8.6 mL 1.0 M in THF, 8.6 mmol). Following acid-base work up, amine **18b** was obtained (350 mg, 1.7 mmol, 61%) without need for further purification. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.53 (2H, d, *J*<sub>H</sub> = 8.0 Hz), 7.42 (2H, d, *J*<sub>H</sub> = 8.0 Hz), 5.91 (1H, ddd, *J*<sub>H</sub> = 17.1, 10.2, 6.3 Hz), 5.19 (1H, dt, *J*<sub>H</sub> = 17.2, 1.2 Hz), 5.08 (1H, dt, *J*<sub>H</sub> = 10.4, 1.2 Hz), 4.52 (1H, d, *J*<sub>H</sub> = 6.4 Hz), 1.51 (2H, s). <sup>19</sup>F NMR (CDCl<sub>3</sub>, 470 MHz) δ: -62.4. <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 148.3, 141.5, 129.4 (q, *J*<sub>F</sub> = 32.3 Hz), 127.1 (2C), 125.5 (2C), 122.8, 114.6, 58.1. The spectral data is in agreement with the literature values.<sup>5</sup>

**1-(4'-Bromophenyl)-2-propenylamine, 18c.** Following General Procedure A, 4-bromobenzaldehyde (500 mg, 2.7 mmol) reacted with *tert*-butylsulfonamide (350 mg, 2.9 mmol) and vinylmagnesium bromide (8.1 mL 1.0 M in THF, 8.1 mmol). Following acid-base work up, amine **18c** was obtained (430 mg, 2.0 mmol, 75%) without need for further purification. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.46 (2H, d, *J*<sub>H</sub> = 8.4 Hz), 7.25 (2H, d, *J*<sub>H</sub> = 8.4 Hz), 5.99 (1H, ddd, *J*<sub>H</sub> = 17.1, 10.2, 6.2 Hz), 5.24 (1H, dt, *J*<sub>H</sub> = 16.8, 1.2 Hz), 5.14 (1H, dt, *J*<sub>H</sub> = 10.0, 1.2 Hz), 4.51 (1H, d, *J*<sub>H</sub> = 6.0 Hz), 1.54 (2H, s). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 153.4, 141.8, 131.6 (2C), 128.5 (2C), 120.9, 114.2, 57.9. The spectral data is in agreement with the literature values.<sup>4</sup>

**1-Cyclohexylprop-2-en-1-amine, 18d.** Following General Procedure A, cyclohexanecarboxaldehyde (0.53 mL, 4.4 mmol) reacted with *tert*-butylsulfonamide (590 mg, 4.8 mmol) and vinylmagnesium bromide (13.3 mL 1.0 M in THF, 13.3 mmol). Following acid-base work up, amine **18d** was obtained (310 mg, 2.2 mmol, 50%) without need for further purification. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 5.72 (1H, ddd, *J*<sub>H</sub> = 17.3, 10.3, 7.1 Hz), 5.04-4.95 (2H, m), 2.98 (1H, dd, *J*<sub>H</sub> = 7.2, 6.4 Hz), 1.72-1.57 (6H, m), 1.25-1.00 (5H, m), 0.95-0.85 (2H, m). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 142.1, 114.0, 59.6, 43.7, 29.3, 29.0, 26.6, 26.4, 26.3. The spectral data is in agreement with the literature values.<sup>4</sup>

**5-Phenylpent-1-en-3-amine, 18e.** Following General Procedure A, 3-phenylpropionaldehyde (0.46 mL, 3.7 mmol) reacted with *tert*-butylsulfonamide (490 mg, 4.1 mmol) and vinylmagnesium bromide (11.1 mL 1.0 M in THF, 11.1 mmol). Following acid-base work up, amine **18e** was obtained (330 mg, 2.1 mmol, 58%) without need for further purification. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.23-7.18 (2H, m), 7.13–7.09 (3H, m), 5.75 (1H, ddd, *J*<sub>H</sub> = 17.1, 10.3, 6.8 Hz), 5.04 (1H, dt, *J*<sub>H</sub> = 17.2, 1.6 Hz), 4.98 (1H, dt, *J*<sub>H</sub> = 10.4, 1.6 Hz), 3.27-3.22 (1H, m), 2.62-2.58 (2H, m), 1.71-1.65 (2H, m), 1.14 (2H, s). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 143.3, 142.1, 128.4 (2C), 128.3 (2C), 125.8, 113.7, 54.1, 39.2, 32.4. The spectral data is in agreement with the literature values.<sup>4</sup>

***N*-[1-(4'-Methoxyphenyl)-2-propenyl]benzylamine, 19a.** Following General Procedure B, amine **18a** (300 mg, 1.8 mmol) reacted with benzaldehyde (0.19 mL, 1.9 mmol) and NaBH<sub>4</sub> (110 mg, 2.7 mmol). The crude residue was purified by flash column chromatography (0-2.5% Et<sub>2</sub>O in petroleum ether) to yield the expected secondary amine **19a** (360 mg, 1.4 mmol, 79%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.29-7.17 (7H, m), 6.80 (2H, d, *J*<sub>H</sub> = 8.8 Hz), 5.86 (1H, ddd, *J*<sub>H</sub> = 17.2, 10.2, 7.1 Hz), 5.13 (1H, dt, *J*<sub>H</sub> = 17.2, 1.2 Hz), 5.03 (1H, dt, *J*<sub>H</sub> = 10.0, 1.2 Hz), 4.09 (1H, d, *J*<sub>H</sub> = 7.2 Hz), 3.72 (3H, s), 3.66 (1H, d, *J*<sub>H</sub> = 13.6 Hz), 3.62 (1H, d, *J*<sub>H</sub> = 13.6 Hz), 1.64 (1H, s). <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 158.8, 141.2, 140.5, 134.9, 128.4 (2C), 128.2 (2C), 127.0, 126.9 (2C), 114.8, 113.9 (2C), 64.4, 55.3, 51.3. The spectral data is in agreement with the literature values.<sup>2</sup>

***N*-[1-(4'-(Trifluoromethyl)phenyl)-2-propenyl]benzylamine, 19b.** Following General Procedure B, amine **18b** (260 mg, 1.3 mmol) reacted with benzaldehyde (0.14 mL, 1.4 mmol) and NaBH<sub>4</sub> (70 mg, 1.9 mmol). The crude residue was purified by flash column chromatography (0-2.5% Et<sub>2</sub>O in petroleum ether) to yield the expected secondary amine **19b** (300 mg, 1.0 mmol, 80%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.53 (2H, d, *J*<sub>H</sub> = 8.4 Hz), 7.44 (2H, d, *J*<sub>H</sub> = 8.4 Hz), 7.28-7.16 (5H, m), 5.83 (1H, ddd, *J*<sub>H</sub> = 17.3, 10.2, 7.2 Hz), 5.09 (1H, dt, *J*<sub>H</sub> = 17.2, 1.2 Hz), 5.08 (1H, dt, *J*<sub>H</sub> = 10.4, 1.2 Hz), 4.22 (1H, d, *J*<sub>H</sub> = 7.2 Hz), 3.67 (1H, d, *J*<sub>H</sub> = 13.6 Hz), 3.61 (1H, d, *J*<sub>H</sub> = 13.6 Hz), 1.56 (1H, s). <sup>19</sup>F NMR (CDCl<sub>3</sub>, 470 MHz) δ: -62.4. <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 146.9, 140.2, 140.0, 129.6 (q, *J*<sub>F</sub> = 32.3 Hz), 128.5 (2C), 128.1 (2C), 127.7 (2C), 127.1, 125.5 (2C), 122.9, 116.0, 64.8, 51.3. The spectral data is in agreement with the literature values.<sup>6</sup>

***N*-[1-(4'-Bromophenyl)-2-propenyl]benzylamine, 19c.** Following General Procedure B, amine **18c** (300 mg, 1.4 mmol) reacted with benzaldehyde (0.15 mL, 1.5 mmol) and NaBH<sub>4</sub> (80 mg, 2.1 mmol). The crude residue was purified by flash column chromatography (0-2.5% Et<sub>2</sub>O in petroleum ether) to yield the expected secondary amine **19c** (360 mg, 1.2 mmol, 84%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.49 (2H, d, *J*<sub>H</sub> = 8.0 Hz), 7.38-7.26 (7H, m), 5.92 (1H, ddd, *J*<sub>H</sub> = 17.2, 10.2, 7.1 Hz), 5.24 (1H, dt, *J*<sub>H</sub> = 17.2,



1.2 Hz), 5.16 (1H, dt,  $J_H = 10.4, 1.2$  Hz), 4.23 (1H, d,  $J_H = 7.2$  Hz), 3.76 (1H, d,  $J_H = 13.2$  Hz), 3.71 (1H, d,  $J_H = 13.2$  Hz), 1.62 (1H, s).  $^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 125 MHz)  $\delta$ : 141.9, 140.5, 140.2, 131.6 (2C), 129.1 (2C), 128.5 (2C), 128.1 (2C), 127.0, 121.0, 115.6, 64.5, 51.3. The spectral data is in agreement with the literature values.<sup>7</sup>

***N*-[1-Cyclohexyl-2-propenyl]benzylamine, 19d.** Following General Procedure B, amine **18d** (220 mg, 1.5 mmol) reacted with benzaldehyde (0.17 g, 1.7 mmol) and  $\text{NaBH}_4$  (90 mg, 2.4 mmol). The crude residue was purified by flash column chromatography (0-2.5%  $\text{Et}_2\text{O}$  in petroleum ether) to yield the expected secondary amine **19d** (240 mg, 1.0 mmol, 70%) as a pale yellow oil.  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz)  $\delta$ : 7.32-7.15 (5H, m), 5.54 (1H, ddd,  $J_H = 14.0, 8.0, 7.2$  Hz), 5.11-5.09 (1H, m), 4.99-4.96 (1H, m), 3.76 (1H, d,  $J_H = 10.8$  Hz), 3.52 (1H, d,  $J_H = 10.8$  Hz), 2.69 (1H, dd,  $J_H = 6.8, 5.2$  Hz), 1.73-1.55 (5H, m), 1.31-1.25 (2H, m), 1.12-1.00 (3H, m), 0.95-0.85 (2H, m).  $^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 125 MHz)  $\delta$ : 140.9, 139.6, 128.3 (2C), 128.2 (2C), 126.7, 116.7, 66.3, 51.3, 42.3, 30.0, 29.2, 26.7, 26.4, 26.3.  $m/z$  [EI (+ve)] 229.3 [M]<sup>+</sup>, HRMS found [M]<sup>+</sup> 229.1832,  $\text{C}_{16}\text{H}_{23}\text{N}$  requires 229.1830. IR (thin film)  $\nu_{\text{max}} = 2922, 2850, 1450, 1028$   $\text{cm}^{-1}$ .

***N*-[5-Phenylpent-1-3-yl]benzylamine, 19e.** Following General Procedure B, amine **18e** (240 mg, 1.5 mmol) reacted with benzaldehyde (0.16 mL, 1.6 mmol) and  $\text{NaBH}_4$  (90 mg, 2.3 mmol). The crude residue was purified by flash column chromatography (0-2.5%  $\text{Et}_2\text{O}$  in petroleum ether) to yield the expected secondary amine **19e** (330 mg, 1.3 mmol, 88%) as a pale yellow oil.  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz)  $\delta$ : 7.30-7.23 (4H, m), 7.21-7.07 (6H, m), 5.61 (1H, ddd,  $J_H = 17.2, 10.0, 8.4$  Hz), 5.15-5.05 (2H, m), 3.75 (1H, d,  $J_H = 13.2$  Hz), 3.56 (1H, d,  $J_H = 13.2$  Hz), 3.03-2.97 (1H, m), 2.64-2.52 (2H, m), 1.81-1.63 (2H, m).  $^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 125 MHz)  $\delta$ : 142.2, 141.0, 140.6, 128.4 (2C), 128.4 (2C), 128.3 (2C), 128.2 (2C), 127.0, 126.9, 116.6, 60.8, 51.2, 37.3, 32.2. The spectral data is in agreement with the literature values.<sup>8</sup>

***N*-Benzyl-2-fluoro-*N*-[1'-(4''-methoxyphenyl)prop-2'-en-1'-yl]-prop-2-enamide, 20a.** Amine **19a** (200 mg, 0.8 mmol) was coupled with 2-fluoroacrylic acid **6** (140 mg, 1.6 mmol) using HBTU (600 mg, 1.6 mmol) and DIPEA (0.28 mL, 1.6 mmol) following General Procedure C. The crude product was purified by flash column chromatography (0-5% diethyl ether in petroleum ether) to yield the desired dialkene **20a** (160 mg, 0.5 mmol, 60%) as a pale yellow oil.  $^1\text{H}$  NMR ( $\text{CDCl}_3$ , 400 MHz)  $\delta$ : 7.29-7.16 (5H, m), 7.09-7.07 (2H, m), 6.85 (2H,  $J_H = 8.8$  Hz), 6.09 (1H, ddd,  $J_H = 17.2, 10.4, 7.2$  Hz), 5.84 (1H, d,  $J_H = 6.8$  Hz), 5.41-5.22 (3H, m), 5.11 (1H, dd,  $J_F = 16.8$  Hz,  $J_H = 2.4$  Hz), 4.61 (1H, d,  $J_H = 16.0$  Hz), 4.45 (1H, d,  $J_H = 16.0$  Hz), 3.81 (3H, s).  $^{19}\text{F}$  NMR ( $\text{CDCl}_3$ , 470 MHz)  $\delta$ : -102.9, -105.5.  $^{13}\text{C}$  NMR ( $\text{CDCl}_3$ , 125 MHz)  $\delta$ : 163.3 (d,  $J_F = 31.0$  Hz), 159.2, 157.9 (d,  $J_F = 272.0$  Hz), 137.5, 134.9, 130.0, 129.4 (2C), 128.2 (2C), 127.3 (2C), 127.0, 118.8, 114.0 (2C), 99.3, 62.9, 55.3, 48.4.  $m/z$  [EI (+ve)] 325.1 [M]<sup>+</sup>, HRMS found [M]<sup>+</sup> 325.1476,  $\text{C}_{20}\text{H}_{20}\text{FNO}_2$  requires 325.1478. IR (thin film)  $\nu_{\text{max}} = 2252, 1633, 1421, 1249, 1178$   $\text{cm}^{-1}$ .

**N-Benzyl-2-fluoro-N-[1'-(4''-trifluoromethanophenyl)prop-2'-en-1'-yl]-prop-2-enamide, 20b.** Amine **19b** (220 mg, 0.8 mmol) was coupled with 2-fluoroacrylic acid **6** (150 mg, 1.7 mmol) using HBTU (70 mg, 1.7 mmol) and DIPEA (0.28 mL, 1.7 mmol) following General Procedure C. The crude product was purified by flash column chromatography (0-2.5% diethyl ether in petroleum ether) to yield the desired dialkene **20b** (130 mg, 0.4 mmol, 45%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.47 (2H, *J*<sub>H</sub> = 8.2 Hz), 7.28 (2H, *J*<sub>H</sub> = 8.2 Hz), 7.23-7.11 (3H, m), 7.08-7.00 (2H, m), 6.12-6.00 (1H, m), 5.64 (1H, appt s), 5.34-5.19 (3H, m), 5.05 (1H, dd, *J*<sub>F</sub> = 13.6 Hz, *J*<sub>H</sub> = 2.4 Hz), 4.58 (1H, d, *J*<sub>H</sub> = 16.0 Hz), 4.43 (1H, d, *J*<sub>H</sub> = 16.0 Hz). <sup>19</sup>F NMR (CDCl<sub>3</sub>, 470 MHz) δ: -62.6, -103.3, -105.7. <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 163.1 (d, *J*<sub>F</sub> = 30.4 Hz), 157.6 (d, *J*<sub>F</sub> = 272.6 Hz), 142.3, 140.2, 140.1, 136.9, 133.7, 128.5 (2C), 128.1, 128.1 (2C), 127.4 (2C), 125.5 (2C), 120.3, 100.3, 63.1, 51.3. *m/z* [EI (+ve)] 363.1 [M]<sup>+</sup>, HRMS found [M]<sup>+</sup> 363.1245, C<sub>20</sub>H<sub>17</sub>F<sub>4</sub>NO requires 363.1246. IR (thin film) *v*<sub>max</sub> = 3020, 1639, 1417, 1325, 1166, 1126, 1068 cm<sup>-1</sup>.

**N-Benzyl-2-fluoro-N-[1'-(4''-bromophenyl)prop-2'-en-1'-yl]-prop-2-enamide, 20c.** Amine **19c** (240 mg, 0.8 mmol) was coupled with 2-fluoroacrylic acid **6** (140 mg, 1.5 mmol) using HBTU (600 mg, 1.5 mmol) and DIPEA (0.28 mL, 1.5 mmol) following General Procedure C. The crude product was purified by flash column chromatography (0-5% diethyl ether in petroleum ether) to yield the desired dialkene **20c** (180 mg, 0.5 mmol, 62%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.44 (2H, *J*<sub>H</sub> = 8.5 Hz), 7.29-7.23 (3H, m), 7.16-7.11 (4H, m), 6.10 (1H, ddd, *J*<sub>H</sub> = 17.2, 10.4, 7.2 Hz), 5.72 (1H, d, *J*<sub>H</sub> = 7.2 Hz), 5.42-5.26 (3H, m), 5.13 (1H, dd, *J*<sub>F</sub> = 16.8 Hz, *J*<sub>H</sub> = 3.4 Hz), 4.64 (1H, d, *J*<sub>H</sub> = 16.3 Hz), 4.47 (1H, d, *J*<sub>H</sub> = 16.2 Hz). <sup>19</sup>F NMR (CDCl<sub>3</sub>, 470 MHz) δ: -103.2, -105.8. <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 163.2 (d, *J*<sub>F</sub> = 30.3 Hz), 157.7 (d, *J*<sub>F</sub> = 272.5 Hz), 140.5, 137.2, 137.1, 134.0, 131.7 (2C), 129.6 (3C), 128.4 (2C), 127.3 (2C), 119.8, 100.0, 62.9, 51.2. *m/z* [EI (+ve)] 373.2 [M]<sup>+</sup>, HRMS found [M]<sup>+</sup> 373.0478, C<sub>19</sub>H<sub>17</sub>BrFNO requires 373.0478. IR (thin film) *v*<sub>max</sub> = 3030, 1639, 1487, 1415, 1209, 1074, 1010 cm<sup>-1</sup>.

**N-Benzyl-2-fluoro-N-[1'-cyclohexylprop-2'-en-1'-yl]-prop-2-enamide, 20d.** Amine **19d** (180 mg, 0.8 mmol) was coupled with 2-fluoroacrylic acid **6** (140 mg, 1.5 mmol) using HBTU (600 mg, 1.5 mmol) and DIPEA (0.26 mL, 1.5 mmol) following General Procedure C. The crude product was purified by flash column chromatography (0-2.5% diethyl ether in petroleum ether) to yield the desired dialkene **20d** (180 mg, 0.6 mmol, 76%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz) δ: 7.39-7.23 (5H, m), 6.00-5.68 (1H, m), 5.34-4.94 (3H, m), 4.82-4.58 (1H, m), 4.55-4.30 (1H, m), 4.14-3.80 (1H, m), 2.04-1.51 (6H, m), 1.38-1.03 (3H, m), 0.97-0.68 (3H, m). <sup>19</sup>F NMR (CDCl<sub>3</sub>, 470 MHz) δ: -102.5, -104.6. <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz) δ: 163.2 (d, *J*<sub>F</sub> = 33.7 Hz), 158.0 (d, *J*<sub>F</sub> = 274.5 Hz), 137.7, 135.2, 128.3 (2C), 127.3 (2C), 126.9, 119.3, 98.9, 67.2, 51.5, 39.3,

30.7, 29.9, 26.2, 26.0, 25.9.  $m/z$  [ESI (+ve)] 373.2 [M+Na]<sup>+</sup>, HRMS found [M+Na]<sup>+</sup> 373.1719, C<sub>19</sub>H<sub>24</sub>FNONa requires 373.1719. IR (thin film)  $\nu_{\max}$  = 2928, 2852, 1637, 1446, 1417, 1192 cm<sup>-1</sup>.

**N-Benzyl-2-fluoro-N-[5'-phenylpent-1'-en-3'-yl]-prop-2-enamide, 20e.** Amine **19e** (240 mg, 1.0 mmol) was coupled with 2-fluoroacrylic acid **6** (170 mg, 1.9 mmol) using HBTU (730 mg, 1.9 mmol) and DIPEA (0.33 mL, 1.9 mmol) following General Procedure C. The crude product was purified by flash column chromatography (0-2.5% diethyl ether in petroleum ether) to yield the desired dialkene **20e** (230 mg, 0.7 mmol, 75%) as a pale yellow oil. <sup>1</sup>H NMR (CDCl<sub>3</sub>, 400 MHz)  $\delta$ : 7.34-7.20 (8H, m), 7.12-6.88 (2H, m), 6.02-5.84 (1H, m), 5.34-5.14 (3H, m), 5.09 (1H, dd,  $J_F$  = 17.1 Hz,  $J_H$  = 3.5 Hz), 4.81-4.31 (3H, m), 2.59-2.44 (2H, m), 2.07-1.93 (2H, m). <sup>19</sup>F NMR (CDCl<sub>3</sub>, 470 MHz)  $\delta$ : -103.1, -104.7. <sup>13</sup>C NMR (CDCl<sub>3</sub>, 125 MHz)  $\delta$ : 163.6 (d,  $J_F$  = 32.8 Hz), 158.0 (d,  $J_F$  = 270.9 Hz), 141.1, 137.8, 136.2, 128.5 (2C), 128.4 (2C), 128.3 (2C), 127.8, 127.4, 126.1 (2C), 118.2, 99.1, 60.4, 40.9, 32.8, 32.6.  $m/z$  [EI (+ve)] 323.2 [M]<sup>+</sup>, HRMS found [M]<sup>+</sup> 323.1683, C<sub>21</sub>H<sub>22</sub>FNO requires 323.1685. IR (thin film)  $\nu_{\max}$  = 2931, 1635, 1417, 1359, 1178, 1153 cm<sup>-1</sup>.

## References

- 1 C. Grison, A. Thomas, F. Coutrot, P. Coutrot, *Tetrahedron*, 2003, **59**, 2101-2123.
- 2 T. Ohmura, J. F. Hartwig, *J. Am. Chem. Soc.* 2002, **124**, 15164-15165.
- 3 S. G. Davies, J. F. Fox, S. Jones, A. J. Price, M. A. Sanz, T. G. R. Sellers, A. D. Smith, F. C. Teixeira, *J. Chem. Soc. Perkin Trans. 1* 2002, **15**, 1757-1765.
- 4 A. R. Ickes, S. C. Ensign, A. K. Gupta, K. L. Hull, *J. Am. Chem. Soc.* 2014, **136**, 11256-11259.
- 5 M. J. Pouy, L. M. Stanley, J. F. Hartwig, *J. Am. Chem. Soc.* 2009, **131**, 11312-11313.
- 6 Atallah, T.; Blankespoor, R. L.; Homan, P.; Hulderman, C.; Samas, B. M.; Van Allsburg, K.; Vrieze, D. *C. Tetrahedron Lett.* **2013**, *54*, 5795-5798.
- 7 K. Ye, Z. Zhao, Z. Lai, L. Dai, S. You, *Synthesis* 2013, **45**, 2109-2114.
- 8 C. Welter, A. Dahnz, B. Brunner, S. Streiff, P. Dubon, G. Helmchen, *Org. Lett.* **2005**, *7*, 1239-1242.