Preparation of 1-bromo-1,1-difluoro-3-phenyl-prop-2-yne 2a

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\begin{align*}
\text{CF}_2\text{Br} &  \\
1 \equiv 2 \equiv 3
\end{align*}
\]

\(n\)-Butyllithium (250.0 mmol, 156.5 mL of a 1.6 N solution in hexanes) was added dropwise to a cold (-78 °C) solution of phenylacetylene (250 mmol, 27.5 mL) in THF (500 mL). After completion of the addition a white precipitate formed and the suspension was stirred at 0 °C for 15 minutes and recooled to -78 °C. A cold (-70 °C) solution of dibromodifluoromethane (275 mmol, 25 mL) in THF (250 mL) was added dropwise through a cold jacketed dropping funnel over 1 hour. After completion of the addition, the brown solution was stirred at -78 °C for 1 hour and at 0 °C for 1 hour. The reaction mixture was quenched with ammonium chloride (500 mL of a saturated aqueous solution). The layers were separated and the aqueous layer further extracted with diethyl ether (3 x 500 mL). The combined organic extracts were washed with brine (250 mL), dried (MgSO₄), filtered and concentrated under reduced pressure to leave a brown oil (52.23 g). Distillation under reduced pressure afforded the desired alkyne 2a as pale yellow oil (47.37 g, 82 %, 96 % by GC). Bp 60 °C/1.5 mmHg (Lit. 91 50 °C/1.0 mmHg); \(\nu_{\text{max}}\) (film)/cm⁻¹ 3060 w (Ar-H); 2253 s (C≡C \(\delta_H\)); 7.57-7.37 (m, -C₆H₅); 132.3 (t, \(J_{C-F} 2.3\)), 130.9, 128.7, 118.8 (t, \(J_{C-F} 2.3\)), 102.1 (t, \(J_{C-F} 289.4\)), 90.0 (t, \(J_{C-F} 5.7\)), 81.0 (t, \(J_{C-F} 38.4\)); \(\delta_F\) (282 MHz, CDCl₃) -45.4 (s); \(m/z\) (EI) 232 (27 %, M⁺[81Br]), 230 (27, M⁺[79Br]), 213 (17), 211 (18), 151 (80). The spectral data were in agreement with those reported by Wakselman et al. (I. Rico, D. Cantacuzene, and C. Wakselman, J. Chem. Soc. Perkin Trans. 1, 1982, 1063.)

Preparation of 3,3-difluoro-5-phenyl-pent-4-yne-1,2-diol 1

\[
\begin{align*}
\text{OH} &  \\
\text{OH} &  \\
\text{FF} &  \\
1 \equiv 2 \equiv 3 \equiv 4 \equiv 5
\end{align*}
\]

A mixture of sodium iodide (89.0 mmol, 13.3 g), mercury (II) acetate (4.4 mmol, 1.4 g), glycolaldehyde dimer (89.0 mmol, 10.7 g) and zinc powder (89.0 mmol, 5.79 g) was added in one portion to a solution of alkyne 75 (89.0 mmol, 20.5 g) in THF (350 mL). Upon addition, a gentle reflux was observed and the solution was stirred at room temperature for 18 hours. The reaction mixture was quenched with HCl (350 mL of a
2N solution) and extracted with ethyl acetate (3 x 250 mL). The combined organic extracts were washed with sodium sulfite (200 mL of a saturated aqueous solution), brine (200 mL), dried (MgSO4), filtered and concentrated under reduced pressure to afford a brown oil (18.90 g). Purification by column chromatography (40 % ethyl acetate in light petroleum) afforded the desired diol 1 as a yellow oil, which solidified on standing (12.98 g, 69 %, 100 % by GC). Rf (40 % ethyl acetate in light petroleum) 0.25; Mp 35-36 °C; (Found C, 62.35; H, 4.85; C11H10F2O2 requires: C, 62.26; H, 4.75 %); νmax (KBr)/cm⁻¹ 3370s br (O-H), 2944m (Ar-H), 2241s (C≡C); δH (250 MHz, CDCl3) 7.43-7.20 (5H, m, -C₆H₅), 4.08-3.96 (1H, m, H-2), 3.87 (1H, dd, J_gem 11.8, J 3.3, H-1a), 3.79 (1H, dd, J_gem 11.8, J 7.6, H-1b), 3.53 (2H, br s, 2 x -OH); δC (63 MHz, CDCl3) 132.7, 130.6, 128.9, 120.0 (t, 4JC-F 2.8), 113.9 (t, 1JC-F 237.0), 89.6 (t, 3JC-F 6.9), 79.5 (t, 2JC-F 38.9), 74.8 (t, 2JC-F 27.7), 61.9; δF (235 MHz, CDCl3) -94.0 (1H, dd, first half of an AB quartet, J_gem 279.3, 3JF-H 8.6), -94.8 (1H, dd, second half of an AB quartet, J_gem 279.3, 3JF-H 9.9; m/z (ES) 235 (100 %, [M+Na]+).

Measured rotations from polarimetry

7a  [α]D (c 1.08 in MeOH) +10.9
7b  [α]D (c 1.11 in MeOH) +3.6
7c  [α]D (c 0.91 in MeOH) -11.9
7d  [α]D (c 1.01 in MeOH) -4.6
Chiral Chromatography

Chiral HPLC was run on a Perkin Elmer 200 series HPLC with Peltier oven column selector fitted with a Chiralcel OJ column. Pre-mixed iPrOH/hexane (0.5:99.5) was used as the eluent. We should also point out that there were co-elution issues with the pseudo-racemate made from 7a and 7b but that the separation of the enantiomers was...
clear when injected as single compounds and as the pseudo-racemate.

The following spectra are attached:

$^1$H NMR (600 MHz, D$_2$O) of 14

$^{19}$F NMR (282 MHz, D$_2$O) of 14

$^{13}$C NMR (? MHz, D$_2$O) of 14

dqfCOSY (600MHz, D$_2$O) of 14

HMQC (D$_2$O) of 14

HMBC (D$_2$O) of 14

Electrospray MS of 14
$^1$H NMR (600 MHz, D$_2$O) of 14
$^{19}$F NMR (282 MHz, D$_2$O) of 14
$^{13}$C NMR (? MHz, D$_2$O) of 14
dqfCOSY (600MHz, D$_2$O) of 14
HMQC (D₂O) of 14
HMBC (D$_2$O) of 14
Electrospray MS of 14