(Supporting Information)

The Tethered Animohydroxylation: Dramatic Improvements to the Process

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Experimental Section

General Details

All reagents, obtained from Acros, Aldrich, Avocado, Fluka, Lancaster Molekula and Fluorochem fine chemicals suppliers were used directly as supplied or purified according to the procedures described by Armarego *et al.* Triethylamine was distilled from calcium hydride and stored over calcium hydride and/or 4Å molecular sieves. Acid chlorides were purified by passing through dry potassium carbonate immediately before use. All non-aqueous reactions were performed in oven or flame dried apparatus under argon or nitrogen atmosphere using distilled dry solvents. Dichloromethane, toluene and MeCN were dried prior to use by passing through alumina columns.

Reactions were monitored by thin layer chromatography on pre-coated aluminium-backed plates (Merck Kieselgel 60 with fluorescent indicator UV_{254}). Spots were visualised either by quenching of UV fluorescence or by staining with potassium permanganate or vanillin dip solutions. Flash column chromatographies were performed according to the method described by Still, Khan and Mitra with silica gel 60 (0.040 – 0.063mm) (Aldrich, Merck or BDH) applying head pressure by means of hand-bellows.

^{1}H NMR spectra were recorded on a Bruker AVANCE DPX 200 (200 MHz), Bruker AVANCE AV400 (400 MHz) or a Bruker AMX 500 (500 MHz) spectrometer. Chemical shifts are given in ppm with the abbreviations s, d, dd, t, dt, td, q, brs, brd and m denoting singlet, doublet, doublet of doublets, triplet, doublet of triplets, quartet, broad singlet, broad doublet and multiplet. ^{1}H NMR coupling constants *J* are given in Hz and rounded to the nearest 0.1 Hz. ^{1}H NMR spectra were recorded using residual isotopic solvent ($CHCl_3$, δ_H at 7.27 ppm; MeOH, δ_H at 3.35 ppm; DMSO, δ_H at 2.52 ppm, $(CH_3)_2O$, δ_H at 2.09 ppm) as internal reference. ^{13}C NMR and ^{19}F NMR

spectra were recorded on the Bruker AVANCE AV 400 (400 MHz) spectrometer using the same solvents as internal reference.
Infra-red spectra were recorded on a Bruker Tensor 27 Ft-IR spectrometer with the sample being prepared as KBr disk or as thin film between NaCl plates. The following abbreviations have been used: s, strong; m, medium; w, weak; b, broad.

Nominal mass spectra (m/z) under the conditions of electrospray ionisation (ESI) were recorded on a Fisons Platform II. Accurate mass (HRMS) data were determined under conditions of ESI on Bruker MicrOTOF (resolution = 5000FWHM) using a lock-spray source. The lock-mass used for calibration was tetraoctylammonium bromide in positive ion and sodium dodecyl sulphate in negative ion mode. HRMS and m/z data were recorded under conditions of field ionisation (FI) on a Micromass GCT reflectron TOF mass spectrometer with medium-high (7,000) resolution (FWHM). The lock-mass used for calibration was chloropentafluorobenzene. Values are quoted as ratio of mass to charge in Daltons. Relative intensities of assignable peaks observed are quoted as a percentage value.
Melting points were obtained using a Griffin melting point apparatus (capillary tube) and are uncorrected.
Analytical high performance liquid chromatography (HPLC) was used for the determination of enantiomeric escess (*e.e.*), using a Waters 600E System Controller, a Waters 991 Photodiode Array detector and a Daices Chiralpak AD/OD column.
Petrol refers to the fraction boiling in the range of 40-60 degrees unless otherwise stated.

General Procedures

General Procedure I: *O*-derivatised hydroxycarbamates

N,*N*-Carbonyldiimidazole (3.81 g, 23.5 mmol) was added to cinnamyl alcohol (2.10 g 15.6 mmol) in pyridine (50 mL) at 40 °C. Hydroxylamine hydrochloride (2.71 g, 39.0 mmol) was added after complete adduct formation between the alcohol and the *N*,*N*-carbonyldiimidazole (~ 2 h) and the reaction was stirred for 24 h at 40 °C. The reaction was quenched with 1M hydrochloric acid (25 mL), partitioned, and the aqueous layer extracted with diethyl ether (35 mL) and ethyl acetate (3x 30 mL). The combined organic layers were then washed sequentially with water (30 mL) and brine (2x 30 mL) dried ($NaSO_4$), filtered and the solvent was azeotropically removed with toluene. The crude product was purified by flash column chromatography and used directly into next step. To an ice-cold solution of cinnamyl hydroxycarbamate (1.16 mg, 6.00 mmol) in Et_2O (4:1; 5 mL/mmol) was added Et_3N (575 mg, 5.70 mmol), before the addition of the acid chloride (5.70 mmol) in small portions. The reaction was quenched with HCl (1M aq. sol., 50 mL) and the aqueous layer was extracted with Et_2O (3 x 20 mL). The combined organic layers were washed sequentially with water (30 ml), $NaHCO_3$ (aq. sat. sol., 30 mL) and brine (30 mL), dried ($NaSO_4$), filtered and concentrated *in vacuo*. The crude product was purified by flash column chromatography using petrol and ethyl acetate in the quoted ratio to afford the respective title compound.

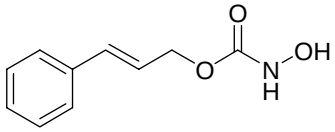
General Procedure II: The Tethered Aminohydroxylation (TA protocol C)

To a solution of *O*-substituted hydroxycarbamate (1.00 mmol) in *t*-butanol and water (3:1, 20 mL/mmol) was added dropwise a solution of potassium osmate dihydrate (4

mg, 1 mol%) in water (0.5 mL). The reaction was quenched by addition of sodium sulphite (200 mg/mmol) and the solvent azeotropically removed with toluene. The crude product was purified by flash column chromatography on silica gel to afford the respective title compound.

Experimental procedures

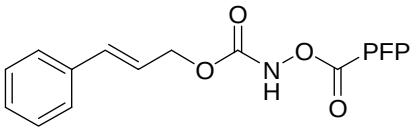
Cinnamyl hydroxycarbamate (6)



N,*N*-Carbonyldiimidazole (3.81 g, 23.5 mmol) was added to cinnamyl alcohol (2.10 g 15.6 mmol) in pyridine (50 mL) at 40 °C. Hydroxylamine hydrochloride (2.71 g, 39.0 mmol) was added after complete adduct formation between the alcohol and the *N*,*N*-carbonyldiimidazole (~ 2 h) and the reaction was stirred for 24 h at 40 °C. The reaction was quenched with 1M hydrochloric acid (25 mL), partitioned, and the aqueous layer extracted with diethyl ether (35 mL) and ethyl acetate (3x 30 mL). The combined organic layers were then washed sequentially with water (30 mL) and brine (2x 30 mL) dried ($NaSO_4$), filtered and the solvent was azeotropically removed with toluene. The crude product was purified by flash column chromatography (eluent: petrol/ethyl acetate in a 4:1 ratio) to yield the title compound (2.77 g, 14.4 mmol, 92%) as a white, crystalline solid. **m.p.** 81-82 ˚C; **IR ν_{max} (KBr-disk, cm^{-1})** 3253 (b), 1700 (b), 1516 (s), 1380 (w), 1306 (b), 1138 (s), 1029 (w), 771 (s), 694 (s), 561 (m); **^{1}H NMR (CDCl$_3$, ppm, 400 MHz) δ** 7.40–7.27 (6H, m), 7.03 (1H, brs), 6.65 (1H, brd, *J* = 15.9 Hz), 6.30 (1H, dt, *J* = 15.9 and 6.60 Hz), 4.82 (2H, dd, *J* = 6.6 and 1.2 Hz); **^{13}C NMR (CDCl$_3$, ppm, 100 MHz) δ** 159.1, 134.9, 134.8, 128.7, 128.4, 126.9, 122.6, 66.8; **LRMS (FI$^+$)** 193.1 ([M$^+$], 100%); **HRMS (FI$^+$)** Calcd for $C_{10}H_{11}NO_3$: 193.0739. Found: 193.0737.

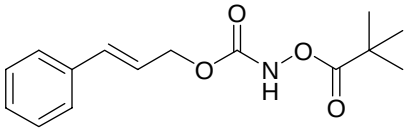
Formation of *O*-derivatised cinnamyl hydroxycarbamates

Cinnamyl perfluorooxycarbamate (7d)



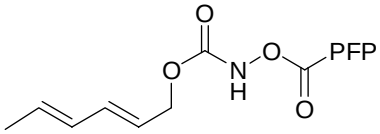
Following General Procedure I, the title compound (704 mg, 1.82 mmol, 95%) was obtained as a white, crystalline solid after purification by flash column chromatography (eluent: petrol/ethyl acetate in a 6:1 ratio.). **m.p.** 79-82 ˚C; **IR ν_{max} (KBr-disk, cm^{-1})** 3319 (s), 3240 (b), 1765 (s), 1529 (w), 1496 (b), 1422 (w), 1254 (s), 1190 (b), 973 (s), 910 (s), 806 (b), 756 (b); **^{1}H NMR (CDCl$_3$, ppm, 400 MHz) δ** 8.30 (1H, brs), 7.42-7.40 (2H, m), 7.37-7.27 (3H, m), 6.70 (1H, brd, *J* = 15.8 Hz), 6.32 (1H, dt, *J* = 15.8 and 6.5 Hz), 4.91 (2H, dd, *J* = 6.5 and 1.2 Hz); **^{13}C NMR (CDCl$_3$, ppm, 100 MHz) δ** 158.7, 155.8, 149.2, 146.8 (m), 144.7 (m), 138.8 (m), 135.7, 135.3, 128.6, 128.3, 126.6, 121.7, 67.7; **^{19}F NMR (CDCl$_3$, ppm, 376 MHz) δ** –135.03 (m), –144.9 (m), –159.0 (m); **LRMS (ESI$^-$)** 386.2 ([M-H$^+$], 10%), 206.08 (100%); **HRMS (ESI$^+$)** Calcd for $C_{17}H_{10}F_5NNaO_4$: 410.0422. Found: 410.0422.

Cinnamyl pivaloyloxycarbamate (9)



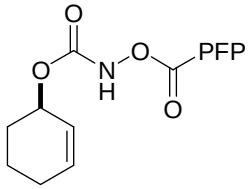
Following General Procedure I, the title compound was obtained as a clear, colourless oil (527 mg, 1.90 mmol, 94%) after purification by flash column chromatography (eluent: petrol/ethyl acetate in a 2.5:1 ratio.). **IR ν_{max} (cm^{-1})** 3283 (b), 2977 (s), 1749 (s), 1481 (s), 1247 (b), 1104 (s), 969 (m), 747 (w), 693 (w); **^{1}H NMR ($CDCl_3$, ppm, 400 MHz) δ** 8.33 (1H, brs), 7.40-7.38 (2H, m), 7.34-7.25 (3H, m), 6.69 (1H, brd, *J* = 15.8 Hz), 6.29 (1H, dt, *J* = 15.8 and 6.6 Hz,), 4.84 (2H, dd, *J* = 6.6 and 1.3 Hz), 1.32 (9H, s); **^{13}C NMR ($CDCl_3$, ppm, 100 MHz) δ** 177.6, 156.6, 136.0, 134.9, 128.7, 128.2, 126.7, 122.3, 67.0, 38.3, 26.9; **LRMS (ESI^-)** 276.2 ([M-H^+], 100%); **HRMS (ESI^+)** Calcd for $C_{15}H_{19}NNaO_4$: 300.1206. Found: 300.1206.

(±)-(2*E*,4*E*)-hexa-2,4-dienyl perfluorobenzoyloxycarbamate (15)



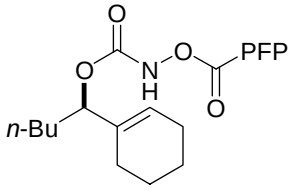
Following General Procedure I, the title compound (913 mg, 2.60 mmol, 69%) was obtained as a clear oil, after purification by flash column chromatography on silica gel (eluent: petrol/ethyl acetate in an 5:1 ratio). **IR ν_{max} (cm^{-1})** 3250 (b), 2944 (s), 1780 (b), 1740 (b), 1653 (m), 1320 (s), 1182 (s), 1100 (m); **^{1}H NMR ($CDCl_3$, ppm, 400 MHz) δ** 8.36 (1H, s), 6.30 (1H, dd, *J* = 15.2 and 10.4 Hz), 6.07 (1H, dddd, *J* = 15.1, 10.4, 3.3 and 2.3 Hz), 5.81 (1H, ddd, *J* = 15.6, 13.4 and 6.7 Hz), 5.63 (1H, dtddd, *J* = 15.2, 6.8, 2.9, 2.0 and 1.4 Hz), 4.73 (2H, d, *J* = 6.7 Hz), 1.78 (3H, dd, *J* = 6.8 and 1.6 Hz); **^{13}C NMR ($CDCl_3$, ppm, 100 MHz) δ** 158.5, 155.7, 148.9 (m), 147.2 (m), 145.6 (m), 143.0 (m), 136.2, 132.3, 130.1, 122.1, 67.8, 18.1; **^{19}F NMR ($CDCl_3$, ppm, 376 MHz) δ** –135.1 (s), –145.2 (s), –159.2 (s). **LRMS (ESI^-)** 350.1 ([M-H^+], 35%), 205.8 (100%); **HRMS (ESI^-)** Calcd for $C_{14}H_{10}F_5NO_4$: 351.0530. Found: 351.0530.

(±)- (*R)-cyclohex-2-enyl perfluorobenzoyloxycarbamate (16)**



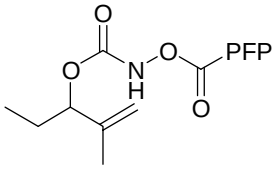
Following General Procedure I, the title compound (562 mg, 1.60 mmol, 78%) was obtained as a white, crystalline solid after purification by flash column chromatography on silica gel (eluent: petrol/ethyl acetate in an 11:1 ratio). **m.p.** 66 ˚C (decomposition); **IR ν_{max} (cm^{-1})** 3252 (b), 2944 (s), 1784 (b), 1741 (b), 1653 (m), 1525 (s), 1426 (m), 1329 (s), 1184 (s), 1102 (m), 1060 (w); **^{1}H NMR ($CDCl_3$, ppm, 400 MHz) δ** 8.39 (1H, brs), 6.03-5.99 (1H, m), 5.78.5.74 (1H, m), 5.33-5.30 (1H, m), 2.13-1.84 (4H, m), 1.72-1.63 (2H, m); **^{13}C NMR ($CDCl_3$, ppm, 100 MHz) δ** 158.6, 155.8, 147.0, 144.5 (m), 139.1 (m), 136.6 (m), 133.9, 124.5, 71.6, 28.1, 24.7, 18.4; **^{19}F NMR ($CDCl_3$, ppm, 376 MHz) δ** –135.4 (m), –145.4 (m), –159.3 (m); **LRMS (ESI^-)** 350.1 ([M-H^+], 25%), 205.8 (100%); **HRMS (ESI^-)** Calcd for $C_{14}H_{10}F_5NO_4$: 351.0530. Found: 351.0532.

(±)- (*R)-1-cyclohexenylpentyl perfluorobenzoyloxycarbamate (17)**



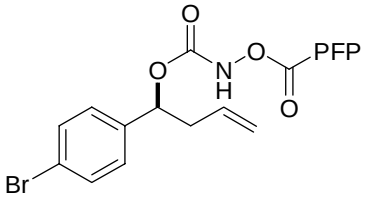
Following General Procedure I, the title compound (780 mg, 1.85 mmol, 78%) was obtained as colourless oil, after purification by flash column chromatography on silica gel (eluent: petrol/ethyl acetate in an 5:1 ratio). **IR ν_{max} (cm^{-1})** 3244 (b), 2955 (s), 1760 (s), 1503 (m), 1327 (m), 1185 (s), 1003 (m); **^{1}H NMR (CDCl$_3$, ppm, 400 MHz) δ** 8.32 (1H, s), 5.75 (1H, apps), 5.13 (1H, t, *J* = 7.1 Hz), 2.06-2.01 (2H, m), 1.96-1.94 (2H, m), 1.76-1.49 (6H, m), 1.35-1.18 (4H, m), 0.89 (3H, t, *J*= 7.1 Hz); **^{13}C NMR (CDCl$_3$, ppm, 100 MHz) δ** 158.6, 155.6, 147.0 (m) , 144.4 (m), 136.5 (m), 139.0 (m), 134.8, 126.6, 82.6, 31.9, 27.5, 24.9, 23.4, 22.4 x 2, 22.2, 13.9; **^{19} F NMR (CDCl$_3$, ppm, 376 MHz) δ** –135.4 (s), –145.4 (s), –159.3 (s); **LRMS (ESI$^-$)** 420.4 ([M-H], 10), 206.1 (100); **HRMS (ESI$^-$)** Calcd for $C_{19}H_{19}F_5NO_5$: 420.1214. Found: 420.1229.

(±)-2-methylpent-1-en-3-yl perfluorobenzoyloxycarbamate (18)



Following General Procedure I, the title compound (3.51 g, 9.94 mmol, 66%) was obtained as colourless oil, after purification by flash column chromatography on silica gel (eluent: petrol/ether in an 9:1 ratio). **IR ν_{max} (cm^{-1})** 3444 (b), 2977 (x), 1764 (s), 1651 (s), 1505 (s), 1329 (m), 1261 (m), 1183 (s); **^{1}H NMR (CDCl$_3$, ppm, 400 MHz) δ** 8.22 (1H, s), 5.14 (1H, t, *J* = 7.0 Hz), 5.02 (1H, s), 4.97 (1H, s), 1.73 (3H, s), 1.81-1.67 (2H, m), 0.91 (3H, t, *J* = 7.5 Hz); **^{13}C NMR (CDCl$_3$, ppm, 100 MHz) δ** 155.3, 146.9 (m), 144.8 (m), 143.2 (m), 141.6, 138.9 (m), 136.8 (m), 114.0, 82.4, 25.4, 17.7, 9.5; **^{19}F NMR (CDCl$_3$, ppm, 376 MHz) δ** –135.1 (2F, d, *J* = 19.0 Hz), –145.1 (1F, t, *J* = 19.0 Hz), –159.1 (2F, t, *J* = 19.0 Hz); **MS (ESI$^+$)** 376.1 (100 %, [M+Na]$^+$); **HRMS (ESI$^+$)** Calcd for $C_{14}H_{12}F_5NNaO_4$: 376.0579. Found: 376.0572.

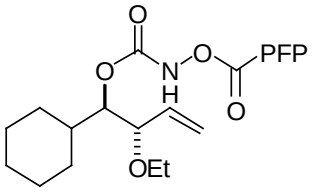
(±)-(*S)-1-(4-bromophenyl)but-3-enyl perfluorobenzoyloxycarbamate (25)**



Following General Procedure I, the title compound (1.65 g, 3.44 mmol, 89%) was obtained as a clear, colourless oil after purification by flash column chromatography on silica gel (eluent: petrol/ethyl acetate in an 9:1 ratio). **IR ν_{max} (cm^{-1})** 3276 (b), 2931 (w), 1748 (b), 1652 (s), 1505 (s), 1329 (m), 1251 (m), 1183 (s), 1104 (s), 1073 (w), 910 (s), 820 (m); **^{1}H NMR (CDCl$_3$, ppm, 400 MHz) δ** 8.70 (1H, brs), 7.49-7.46 (2H, m), 7.23-7.19 (2H, m), 5.78 (1H, m), 5.72-5.62 (1H, m), 5.11-5.07 (1H, m), 5.07

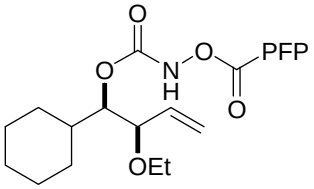
(1H, dd, *J* = 14.3 and 7.1 Hz), 2.73-2.55 (2H, m); **^{13}C NMR ($CDCl_3$, ppm, 100 MHz) δ** 171.7, 158.4, 155.3, 147.1, 144.7, 139.2, 137.8, 132.0, 131.7, 128.2, 122.4, 118.9, 76.9, 40.4; **^{19} F NMR ($CDCl_3$, ppm, 376 MHz) δ** –135.4 (m), –145.1 (m), –159.1 (m); **LRMS (ESI$^-$)** 478.1 ([M-H$^+$], 20%), 206.0 (100%); **HRMS (ESI$^-$)** Calcd for $C_{18}H_{11}BrF_5NNaO_4$: 501.9684. Found: 501.9684.

(±)-(1*R,2*S**)-1-cyclohexyl-2-ethoxybut-3-enyl perfluorobenzoyloxycarbamate (26a)**



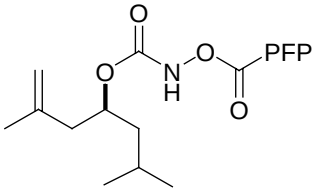
Following General Procedure I, the title compound (835 mg, 1.85 mmol, 84%) was obtained as colourless oil, after purification by flash column chromatography on silica gel (eluent: petrol/ethyl acetate in an 8:1 ratio). **IR ν_{max} (cm^{-1})** 3250 (b), 2932 (m), 2857 (m), 1748 (s), 1525 (m), 1329 (s), 1252 (s), 1105 (m), 1002 (s); **^{1}H NMR ($CDCl_3$, ppm, 400 MHz) δ** 8.39 (1H, s), 5.73 (1H, ddd, *J* = 18.4, 10.3 and 8.0 Hz), 5.29 (2H, m), 4.85 (1H, t, *J* = 5.9 Hz), 3.81 (1H, dd, *J* = 8.1 and 6.0 Hz), 3.54 (1H, dq, *J* = 9.2 and 7.1 Hz), 3.37 (1H, dq, *J* = 9.2 and 7.1 Hz), 1.78-1.70 (4H, m), 1.67-1.62 (2H, m), 1.27-1.09 (5H, m), 1.17 (3H, t, *J* = 7.1 Hz); **^{13}C NMR ($CDCl_3$, ppm, 100 MHz) δ** 158.5, 155.9, 149.8 (m), 149.8 (m), 148.8 (m), 144.1 (m), 130.3 (m), 134.9, 119.7, 81.2, 79.6, 64.1, 38.0, 29.4, 27.2, 26.2, 26.0, 25.9, 15.1; **^{19} F NMR ($CDCl_3$, ppm, 376 MHz) δ** –135.2 (s), –145.4 (s), –159.3 (s); **LRMS (ESI$^-$)** 450.4 ([M-H], 5), 206.1 (100); **HRMS (ESI$^-$)** Calcd for $C_{20}H_{22}F_5NaNO_5$: 474.1312. Found: 474.1310.

(±)-(1*R,2*R**)-1-cyclohexyl-2-ethoxybut-3-enyl perfluorobenzoyloxycarbamate (26b)**



Following General Procedure I, the title compound (560 mg, 1.24 mmol, 67%) was obtained as colourless oil, after purification by flash column chromatography on silica gel (eluent: petrol/ethyl acetate in an 8:1 ratio). **IR ν_{max} (cm^{-1})** 3251 (b), 2932 (m), 2857 (m), 1760 (s), 1506 (m), 1329 (s), 1105 (m), 1002 (s); **^{1}H NMR ($CDCl_3$, ppm, 400 MHz) δ** 8.45 (1H, s), 5.72 (1H, ddd, *J* = 17.4, 10.2 and 7.1 Hz), 5.50 (1H, ddd, *J* = 17.4, 1.6 and 1.0 Hz), 5.32 (1H, ddd, *J* = 10.3, 1.7 and 0.9 Hz), 4.75 (1H, dd, *J* = 6.6 and 5.1 Hz), 3.88 (1H, dddd, *J* = 7.2, 5.1, 1.0 and 0.9 Hz), 3.61 (1H, dq, *J* = 9.4 and 7.1 Hz), 3.31 (1H, dq, *J*= 9.4 and 7.1 Hz, 1.83-1.65 (6H, m), 1.29-1.06 (5H, m), 1.19 (3H, t, *J* = 7.1 Hz); **^{13}C NMR ($CDCl_3$, ppm, 100 MHz) δ** 156.1, 139.0, 134.5, 127.9, 118.9, 82.6, 79.6, 64.6, 37.9, 29.4, 27.5, 26.1, 26.0, 25.7, 15.1 (C-F were not observed); **^{19} F NMR ($CDCl_3$, ppm, 376 MHz) δ** –135.1 (s), –145.4 (s), –159.3 (s); **LRMS (ESI$^-$)** 450.4 ([M-H], 5), 206.1 (100); **HRMS (ESI$^+$)** Calcd for $C_{20}H_{22}F_5NNaO_5$: 474.1311. Found: 474.1310.

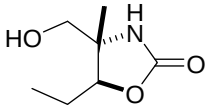
(±)-2,6-dimethylhept-1-en-4-yl perfluorobenzoyloxycarbamate (27)



Following General Procedure I, the title compound (154 mg, 0.390 mmol, 71%) was obtained as colourless oil, after purification by flash column chromatography on silica gel (eluent: petrol/ether in an 9:1 ratio). **IR ν_{max} (cm^{-1})** 3425 (b), 2962 (w), 2937 (w), 2874 (w), 1785 (s), 1742 (s), 1653 (s), 1507 (m), 1329 (s), 1264 (m), 1184 (m); **^{1}H NMR (CDCl$_3$, ppm, 400 MHz) δ** 8.18 (1H, s), 5.19-5.08 (1H, m), 4.83 (1H, t, *J* = 1.5 Hz), 4.75 (1H, d, *J* = 1.5 Hz), 2.37 (1H, dd, *J* = 14.0 and 7.5 Hz), 2.24 (1H, dd, *J* = 14.0 and 5.5 Hz), 1.77 (3H, s), 1.72-1.64 (1H, m), 1.62-1.54 (1H, m), 1.37 (1H, ddd, *J* = 14.0, 9.0 and 4.0 Hz), 0.94 (3H, d, *J* = 6.5 Hz), 0.93 (3H, d, *J* = 6.5 Hz); **^{13}C NMR (CDCl$_3$, ppm, 100 MHz) δ** 155.7, 140.9, 113.9, 74.7, 43.3, 43.0, 24.5, 23.1, 22.3, 21.9; **^{19}F NMR (CDCl$_3$, ppm, 376 MHz) δ** –135.1 (2F, d, *J* = 19.0 Hz), –145.1 (1F, t, *J* 19.0 Hz), –159.1 (2F, t, *J* = 19.0 Hz); **LRMS (ESI$^-$)** 394 (100 %, [M–H]$^+$); **HRMS (ESI$^+$)** Calcd for $C_{17}H_{18}F_5NNaO_4$: 418.1048. Found: 418.1044.

Formation of oxazolidinones

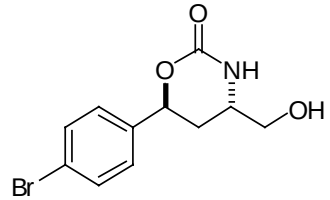
(±)-(4*S,5*S**)-5-Ethyl-4-(hydroxymethyl)-4-methyl-1,3-oxazolidin-2-one (21)**



Following General Procedure II, the title compound was obtained after column chromatography on silica gel (eluent: EtOAc:petrol, 4:1) as a glassy solid (62 mg, 0.391 mmol, 78%; *d.r.* ≈ 20:1 (^{1}H NMR)). **m.p.** 102 - 103 °C; **IR ν_{max} (cm^{-1})** 3423 (b), 1644 (s); **^{1}H NMR (CDCl$_3$, ppm, 400 MHz) δ** 4.34 (0.95H, dd, *J* = 10.0 and 3.8 Hz), 4.16 (0.05H, dd, *J* = 10 and 3.8 Hz), 3.48 (1H, d, *J* = 11.3 Hz), 3.42 (1H, d, *J* 11.3 Hz), 1.74-1.60 (2H, m), 1.18 (3H, s), 1.07 (3H, t, *J* = 7.3 Hz) (NH and OH not observed); **^{13}C NMR (CDCl$_3$, ppm, 100 MHz) δ** 161.3, 85.0, 68.7, 62.5, 24.7, 18.2, 11.2; **LRMS (CI$^+$)** 160 (100 %, MH$^+$); **HRMS (CI$^+$)** $C_7H_{14}NO_3$ (MH$^+$) required 160.0974. Found: 160.0973.

Formation of oxazinanones

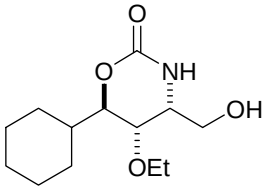
(±)-(4*S,6*S**)-6-(4-bromophenyl)-4-(hydroxymethyl)-1,3-oxazinan-2-one (4)**



Following General Procedure II, the title compound was obtained after column chromatography on silica gel (eluent: EtOAc) as an off-white, crystalline solid (435 mg, 1.53 mmol, 76%, *d.r.* ≈ 15:1 (^{1}H NMR)). **m.p.** 51-53 ˚C; **IR ν_{max} (KBr disk, cm^{-1})** 3286 (b), 2930 (b), 1698 (b), 1490 (s), 1434 (b), 1299 (s), 1072 (b), 818 (s), 766

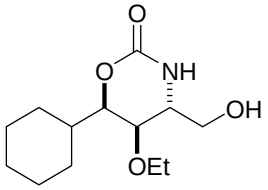
(m); **^{1}H NMR (MeOD, ppm, 400 MHz) δ** 7.58-7.56 (2H, m), 7.35-7.33 (2H, m), 5.51 (1H, dd, *J* = 9.5 and 3.3Hz), 3.63 (2H, m), 3.46 (1H, m), 2.14-2.10 (2H, m) (NH and OH were not observed); **^{13}C NMR ($CDCl_3$, ppm, 100 MHz) δ** 155.9, 139.1, 131.8, 127.7, 126.9, 75.7, 64.3, 50.07, 29.9; **LRMS (ESI$^+$)** 268.1 ([M+H$^+$], 100%]; **HRMS (ESI$^+$)** Calcd for $C_{11}H_{12}BrNNaO_3$: 306.9893. Found: 307.9893.

(±)- (4*R,5*S**,6*R**)-6-cyclohexyl-5-ethoxy-4-(hydroxymethyl)-1,3-oxazinan-2-one (28a)**



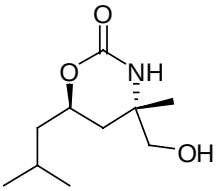
Following General procedure I, the title compound was obtained after column chromatography on silica gel (eluent: EtOAc) as a sticky colourless oil in a 4:1 ratio (270 mg, 1.05 mmol, 84%, *d.r.* ≈ 4:1 (^{1}H NMR)). **IR ν_{max} (cm^{-1})** 3362 (b), 2929 (m), 1696 (s), 1451 (m), 1100 (m); **^{1}H NMR ($CDCl_3$, ppm, 400 MHz) δ** 6.72 (1H, s), 4.10 (0.8 H, dd, *J* = 7.7 and 3.9 Hz), 3.93 (0.2H, dd, *J* = 9.7 and 1.9 Hz), 3.86-3.75 (2H, m), 3.71-3.62 (1.8H, m), 3.65 (1H, dq, *J* = 9.2 and 7.0 Hz), 3.48 (1H, dq, *J* = 9.2 and 7.0 Hz), 3.3 (0.2H, ddd, *J* = 8.1, 5.3 and 2.6 Hz), 2.00 (1H, d, *J* = 10.7 Hz), 1.82-1.53 (5H, m), 1.28-1.10 (6H, m), 1.20 (3H, t, *J* = 7.0 Hz); **^{13}C NMR ($CDCl_3$, ppm, 100 MHz) Major isomer δ** 154.2, 81.2, 69.9, 65.2, 62.6, 52.6, 39.1, 28.8, 28.3, 26.1, 25.7, 25.5, 15.2; **Minor isomer δ** 155.8, 83.0, 69.6, 68.3, 61.7, 57.9, 37.5, 29.9, 26.6, 26.1, 25.7, 25.1, 15.7; **LRMS (ESI$^-$)** 256.3 ([M-H], 100); **HRMS (ESI$^+$)** Calcd for $C_{13}H_{23}NNaO_4$: 280.1508. Found: 280.1519.

(±)- (4*R,5*R**,6*R**)-6-cyclohexyl-5-ethoxy-4-(hydroxymethyl)-1,3-oxazinan-2-one (28b)**



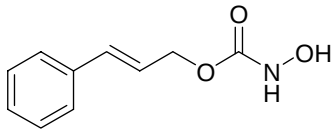
Following General procedure II, the title compound was obtained after column chromatography on silica gel (eluent: EtOAc) as a sticky colourless oil in a 4:1 ratio (145 mg, 0.564 mmol, 82%, *d.r.* > 20:1 (^{1}H NMR)). **IR ν_{max} (cm^{-1})** 3362 (b), 2929 (m), 1696 (s), 1451 (m), 1100 (m); **^{1}H NMR (MeOD, ppm, 400 MHz) δ** 4.05 (1H, dd, *J* = 9.5 and 1.5 Hz), 3.84 (1H, dd, *J* = 1.6 and 1.2 Hz), 3.80 (1H, dq, *J* = 9.2 and 7.1 Hz), 3.63 (1H, m), 3.62 (1H, dd, *J* = 12.2 and 4.6 Hz), 3.53 (1H, dq, *J* = 9.3 and 7.0 Hz), 3.51 (1H, dd, *J* = 12.2 and 8.9 Hz), 2.25 (1H, brd, *J* = 12.2 Hz), 1.96 (1H, tdt, *J* = 11.5, 9.5 and 3.6 Hz), 1.88-1.78 (4H, m), 1.46-1.25 (3H, m), 1.28 (3H, t, *J* = 7.1 Hz), 1.16-1.06 (2H, m); **^{13}C NMR (MeOD, ppm, 100 MHz) δ** 156.3, 81.1, 69.2, 64.9, 63.3, 54.5, 37.8, 29.5, 28.3, 26.5, 26.0, 25.8, 14.8; **LRMS (ESI$^-$)** 256.3 ([M-H], 100); **HRMS (ESI$^+$)** Calcd for $C_{13}H_{23}NNaO_4$: 280.1508. Found: 280.1515.

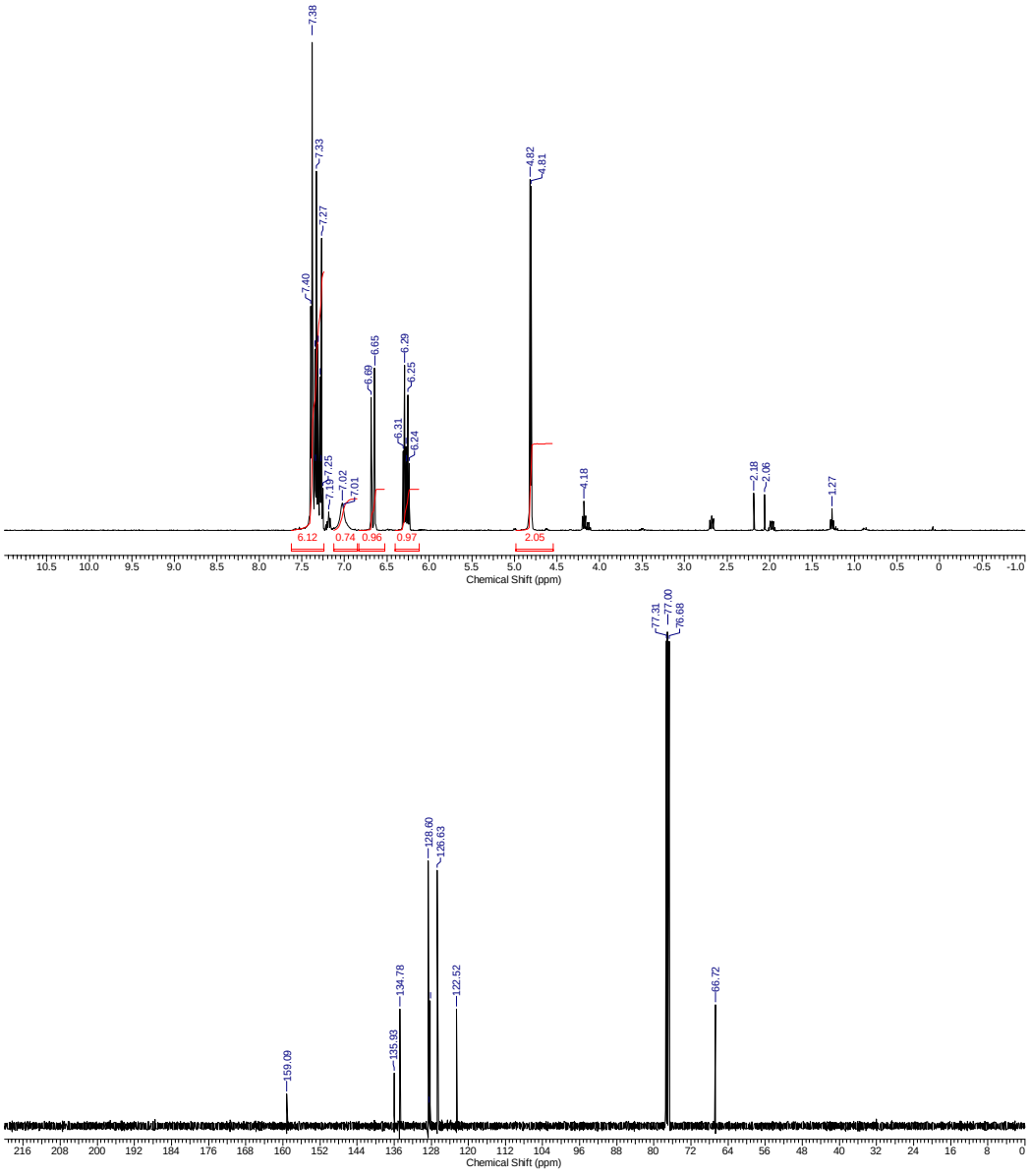
(±)-(4*R,6*S**)-4-(hydroxymethyl)-6-isobutyl-4-methyl-1,3-oxazinan-2-one (29)**



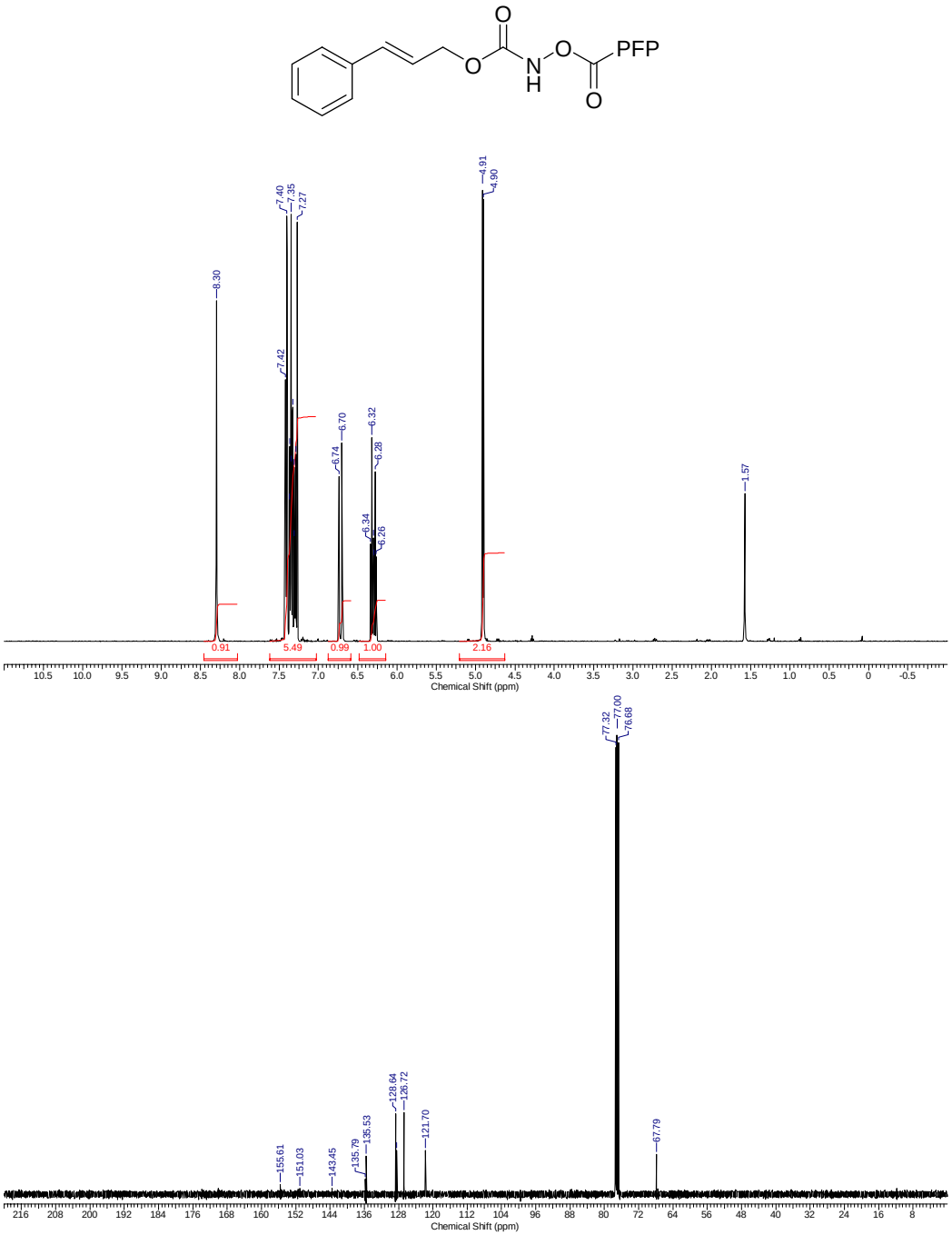
Following General procedure II, the title compound was obtained after column chromatography on silica gel (eluent: EtOAc) as a white solid (357 mg, 1.77 mmol, 71 %, *d.r.* ≈ 4:1 (^{1}H NMR)). **m.p.** 129-132 °C; **IR ν_{max} (cm^{-1})** 3566 (b), 3290 (b), 1643 (s), 1446 (s); **^{1}H NMR (MeOD, ppm, 400 MHz) δ** 4.54-4.45 (0.8H, m), 4.45-4.38 (0.2H, m), 3.49 (0.8H, d, *J* = 11.0 Hz), 3.40 (0.2H, d, *J* = 11.0 Hz), 3.36 (0.8H, d, *J* = 11.0 Hz), 3.34 (0.2H, d, *J* = 11.0 Hz), 2.09 (1H, dd, *J* = 14.0 and 2.5 Hz), 1.94-1.89 (1H, m), 1.66-1.52 (1H, m), 1.41 (1H, dd, *J* = 14.0 and 12.0 Hz), 1.39-1.30 (1H, m,), 1.21 (3H, s,), 0.95 (6H, d, *J* = 6.5 Hz) (NH and OH not observed); **^{13}C NMR ($CDCl_3$, ppm, 100 MHz) Major isomer δ** 157.6, 74.5, 69.3, 55.0, 45.7, 37.0, 26.2, 25.4, 23.6, 22.6; **Minor isomer δ** 157.9, 74.0, 70.4, 55.6, 45.4, 36.5, 25.4, 25.0, 23.6, 22.6; **LRMS (ESI$^+$)** 260 (100 %, M(MeCN)NH_4^+); **HRMS (ESI$^+$)** Calcd for $C_{10}H_{20}NO_3$: 202.1438. Found: 202.1436.

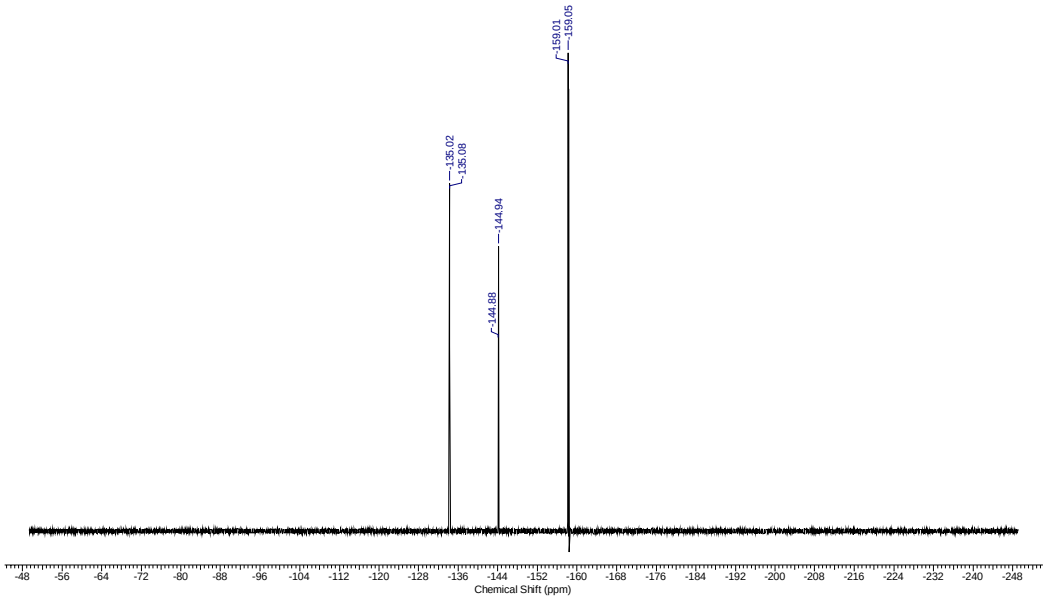
Cinnamyl hydroxycarbamate (6)



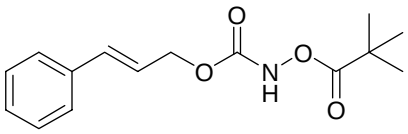


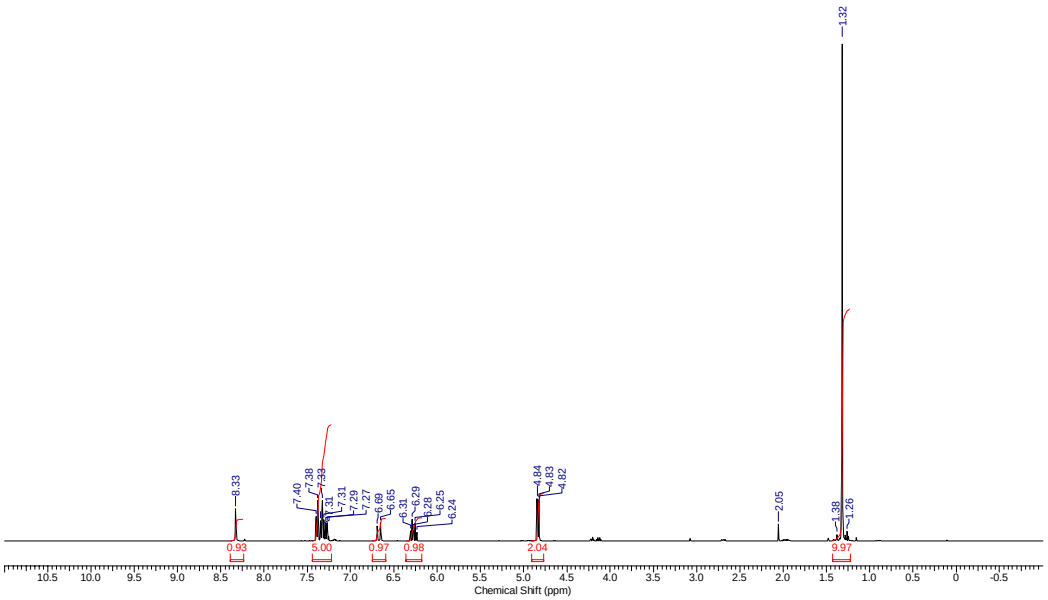
Cinnamyl perfluorooxycarbamate (7d)

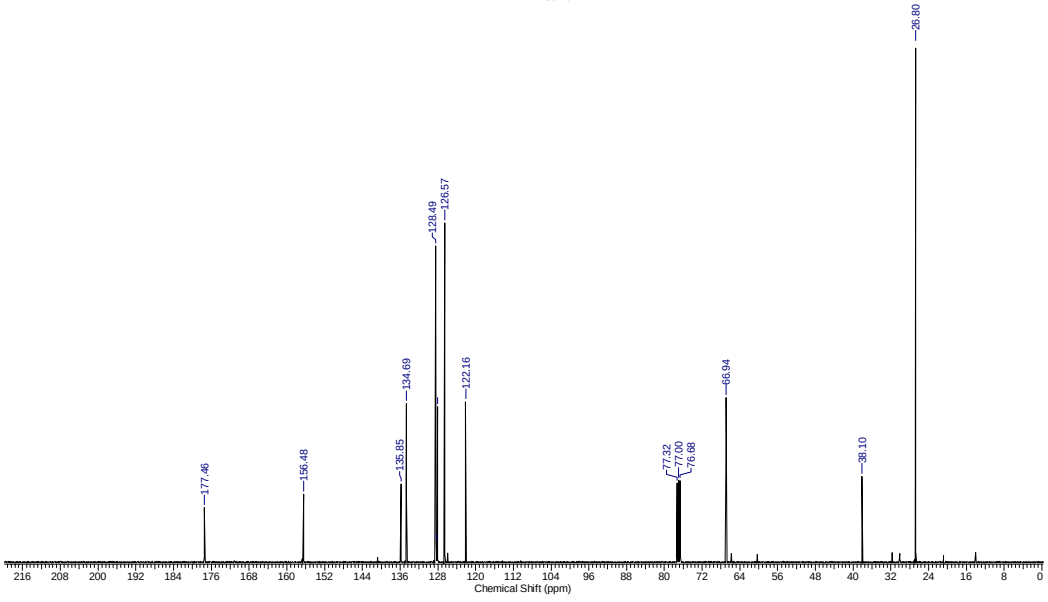



-135.02
-135.08
-144.94
-144.88
-159.01
-159.05
-48 -56 -64 -72 -80 -88 -96 -104 -112 -120 -128 -136 -144 -152 -160 -168 -176 -184 -192 -200 -208 -216 -224 -232 -240 -248
Chemical Shift (ppm)

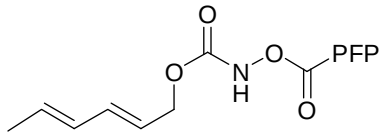
Cinnamyl pivaloyloxycarbamate (9)

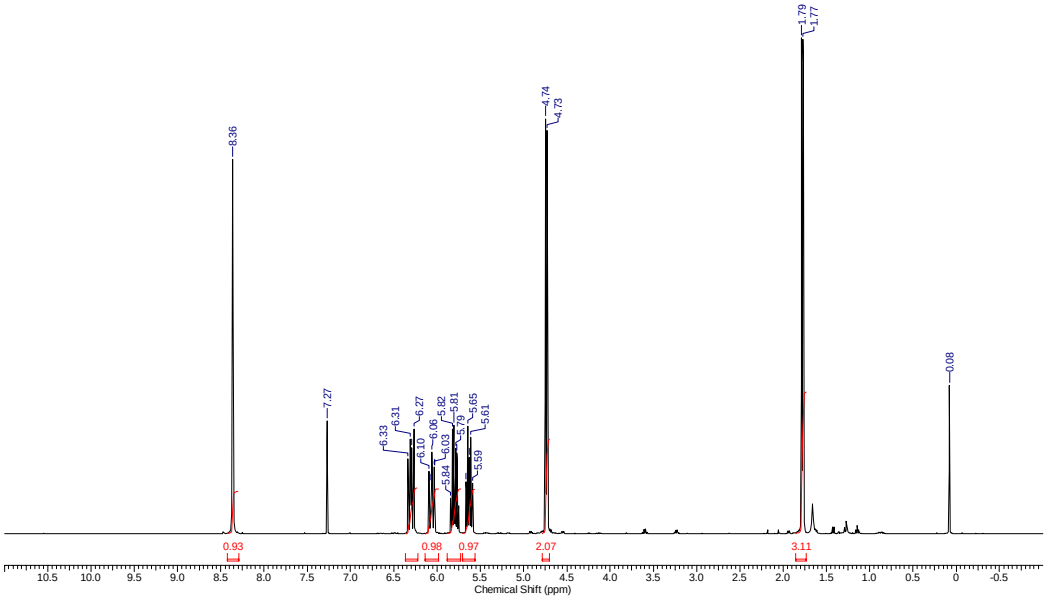


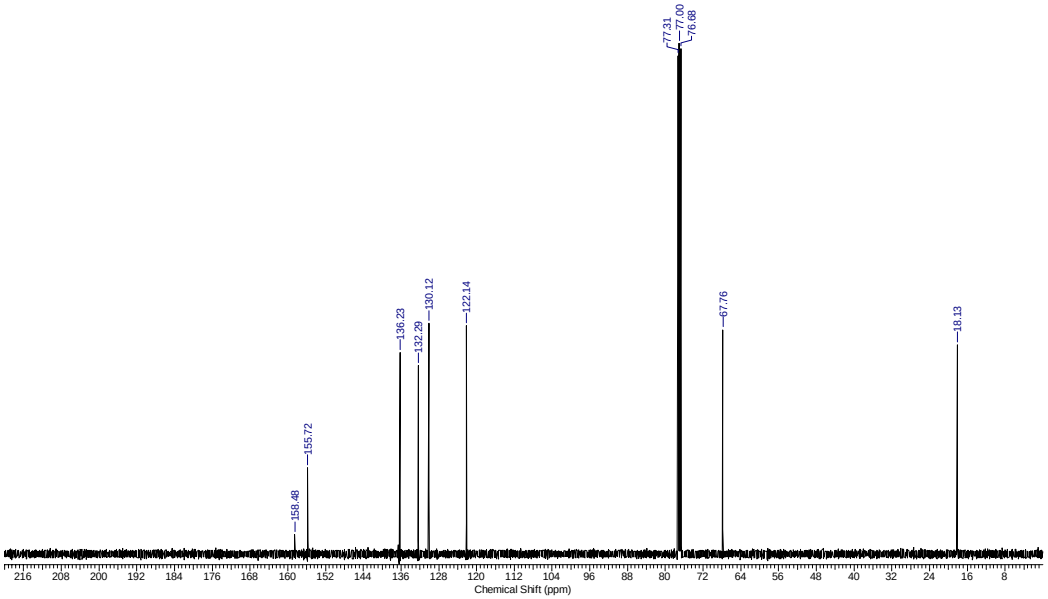


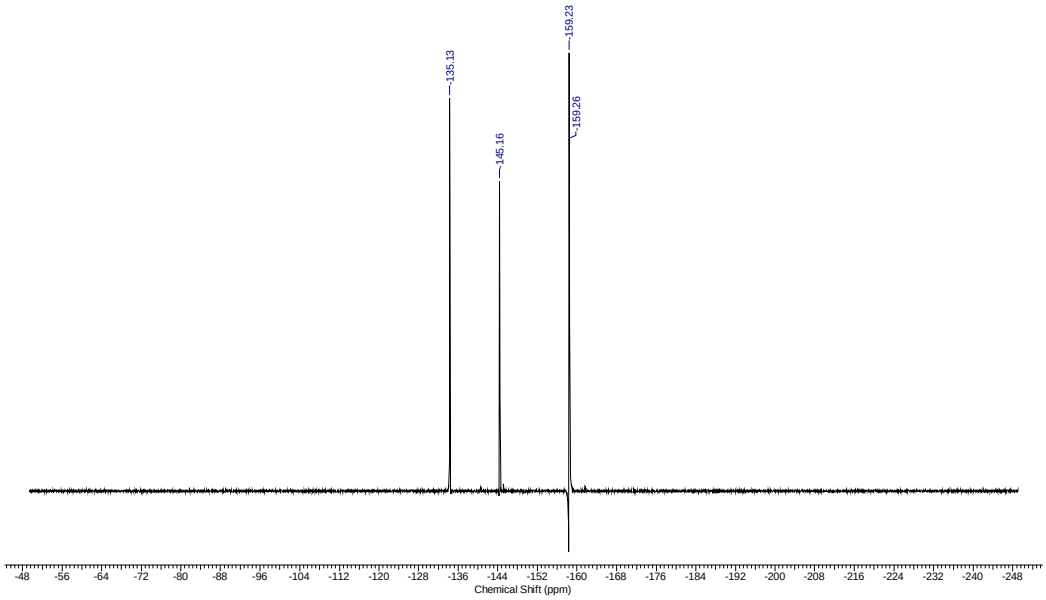


(±)-(2*E*,4*E*)-hexa-2,4-dienyl perfluorobenzoyloxycarbamate (15)

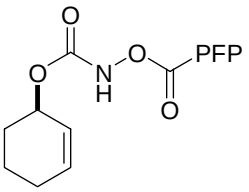


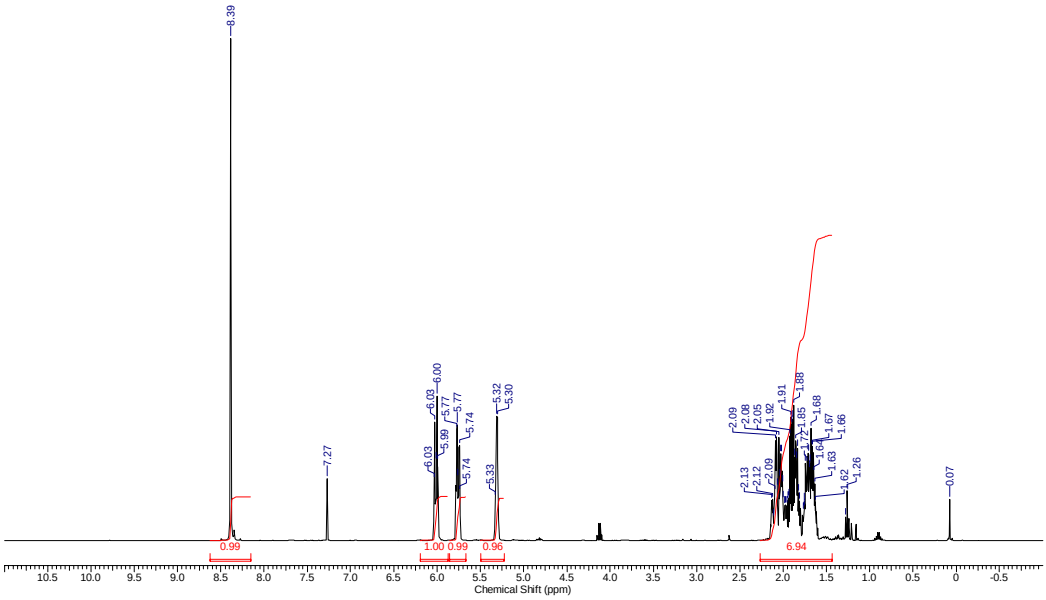


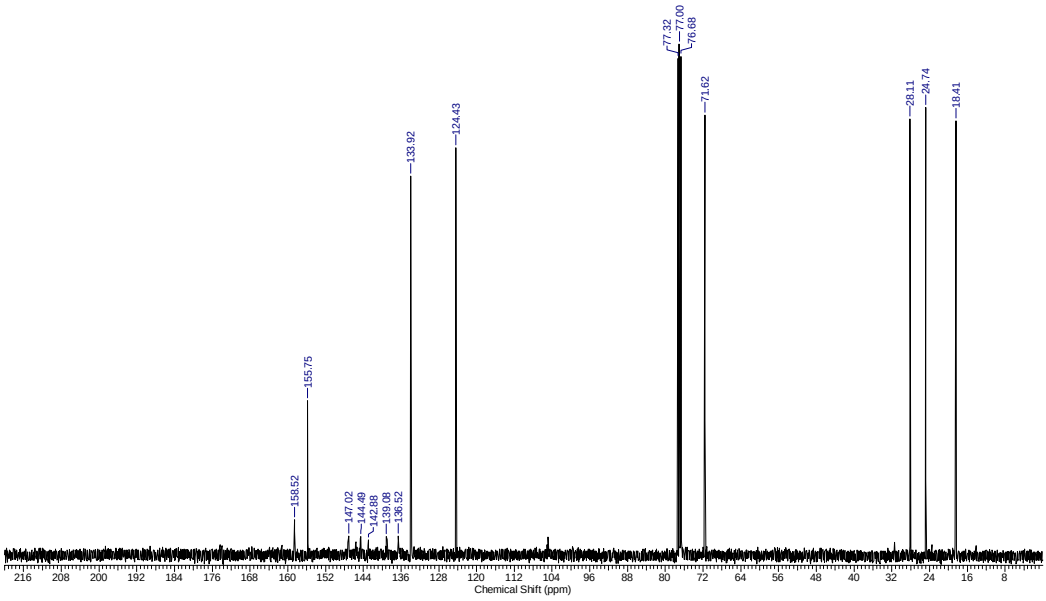


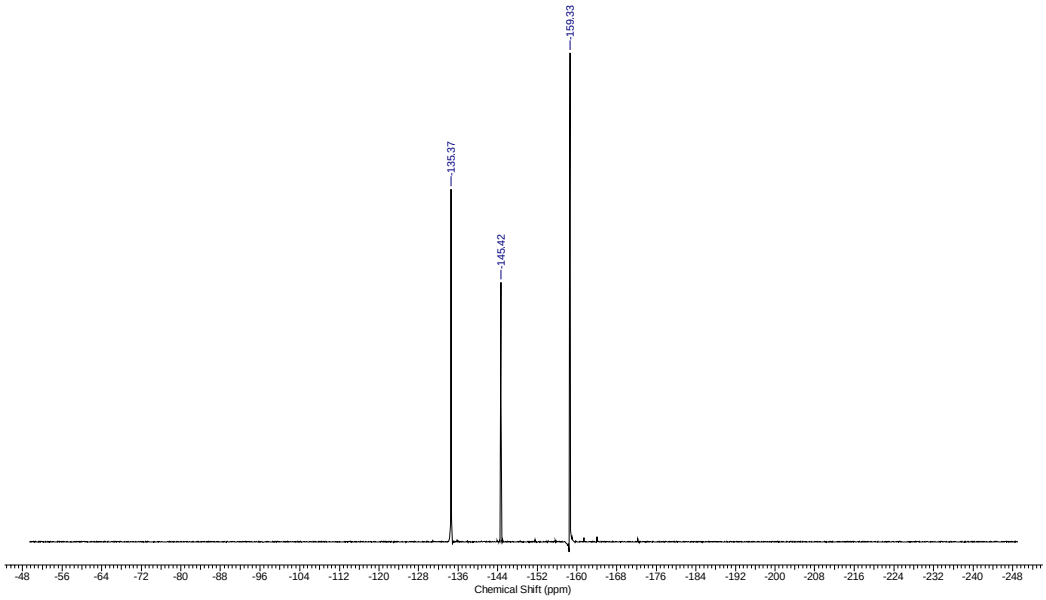

135.13
145.16
159.23
159.26
-48 -56 -64 -72 -80 -88 -96 -104 -112 -120 -128 -136 -144 -152 -160 -168 -176 -184 -192 -200 -208 -216 -224 -232 -240 -248
Chemical Shift (ppm)

(±)- (*R)-cyclohex-2-enyl perfluorobenzoyloxycarbamate (16)**

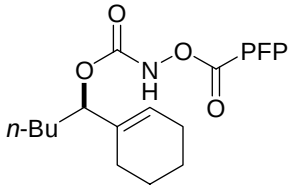


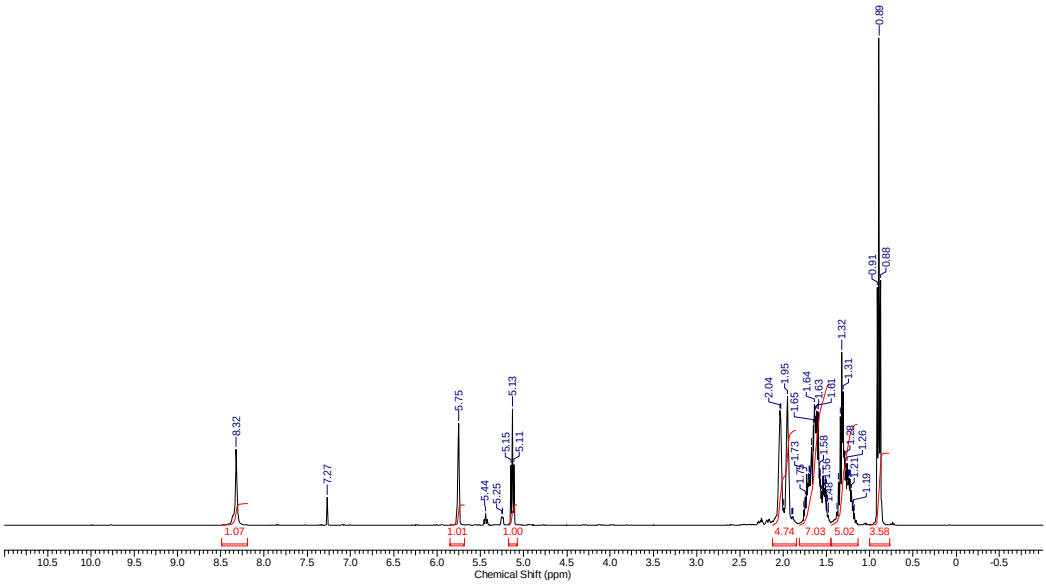


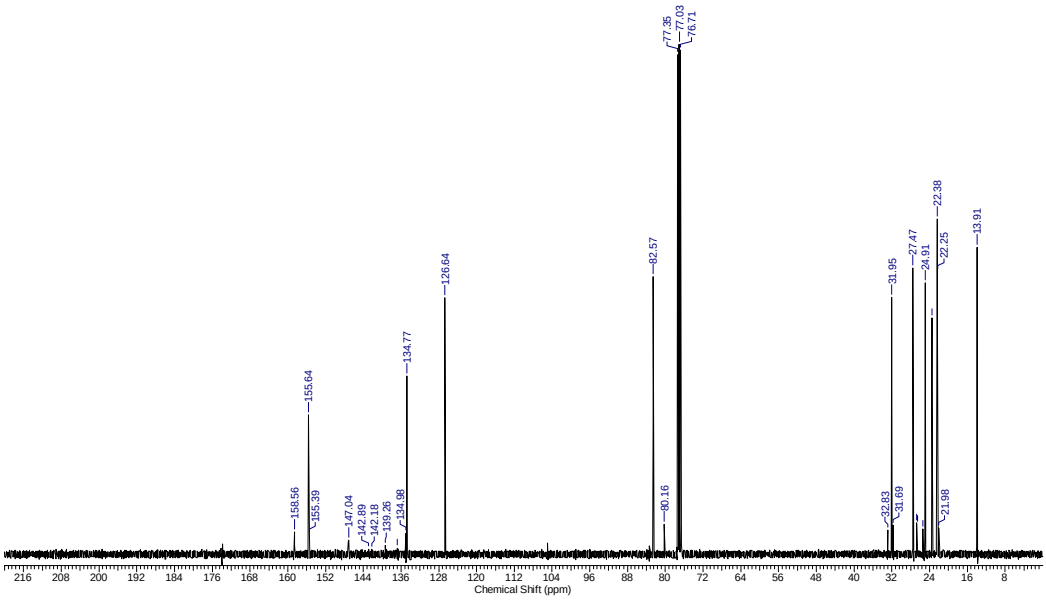


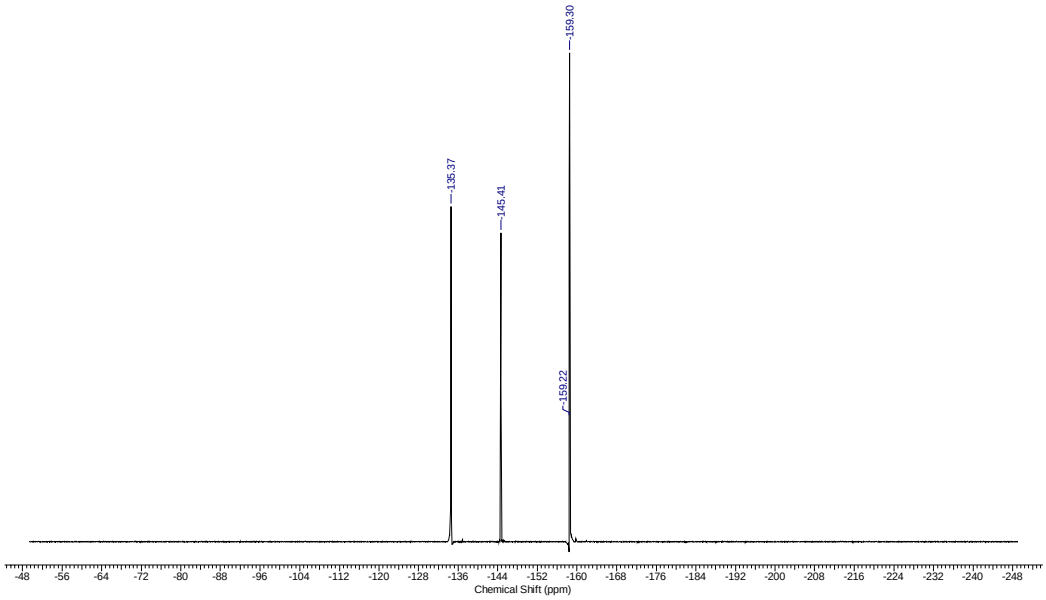

-135.37
-145.42
-159.33
-48 -56 -64 -72 -80 -88 -96 -104 -112 -120 -128 -136 -144 -152 -160 -168 -176 -184 -192 -200 -208 -216 -224 -232 -240 -248
Chemical Shift (ppm)

(±)- (*R)-1-cyclohexenylpentyl perfluorobenzoyloxycarbamate (17)**

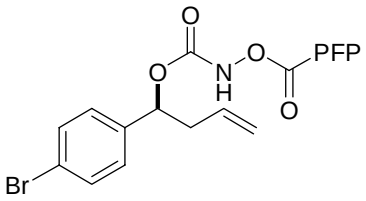


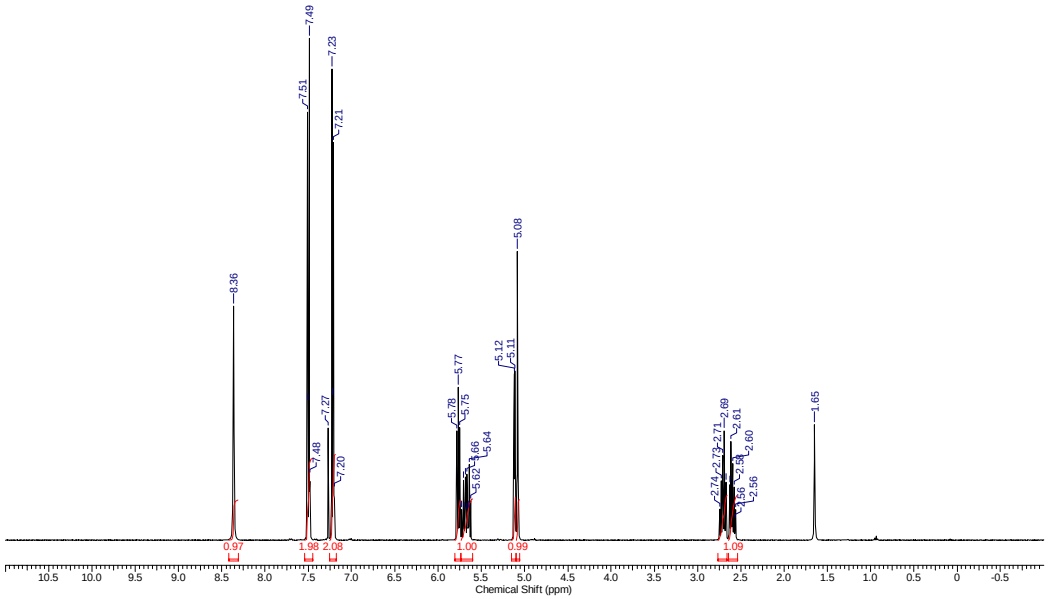


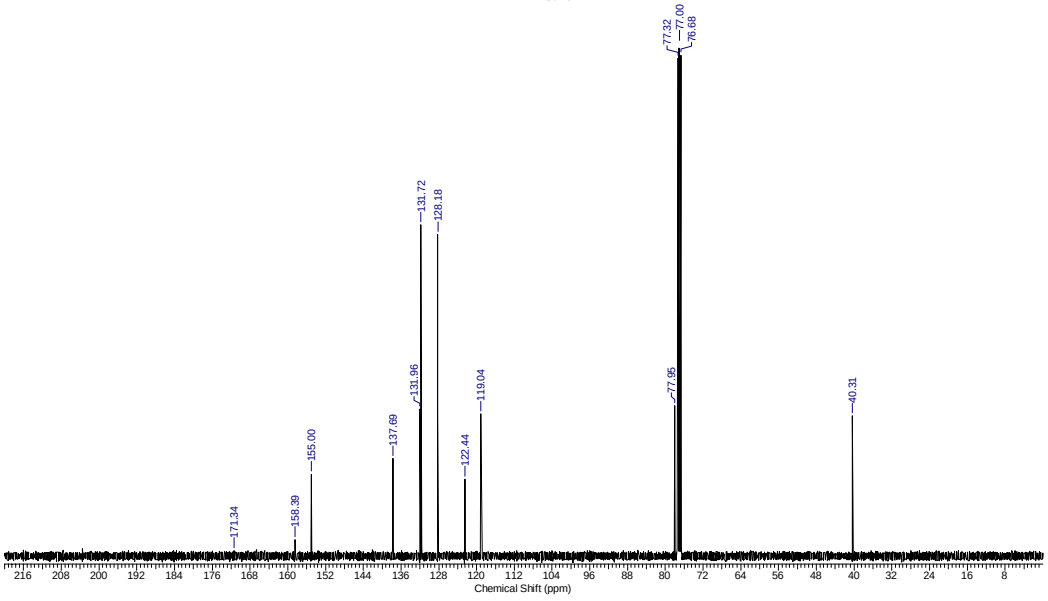


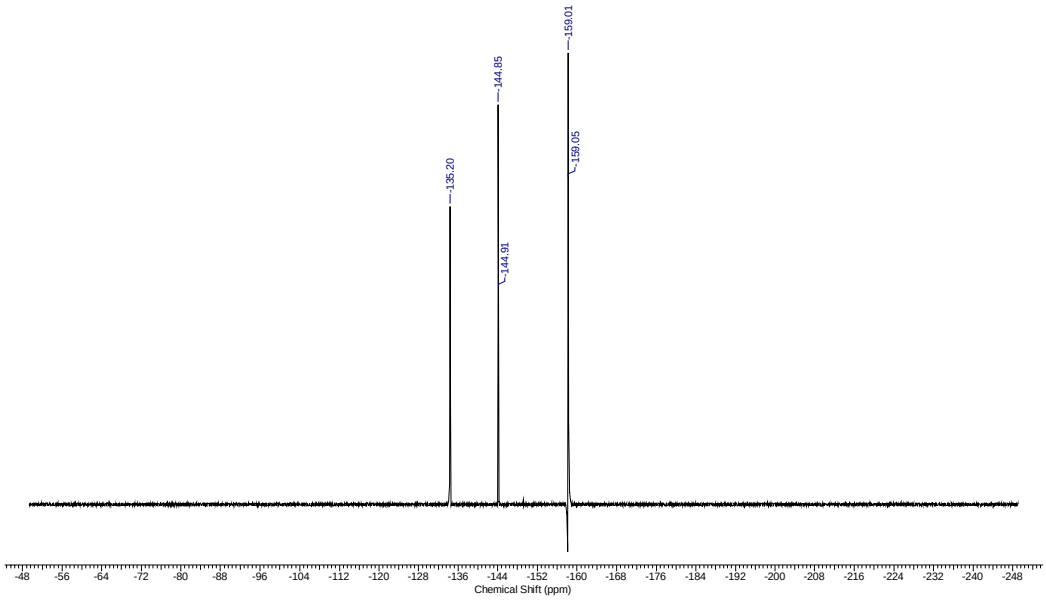

-135.37
-145.41
-159.30
-159.22
-48 -56 -64 -72 -80 -88 -96 -104 -112 -120 -128 -136 -144 -152 -160 -168 -176 -184 -192 -200 -208 -216 -224 -232 -240 -248
Chemical Shift (ppm)

(±)-(*S)-1-(4-bromophenyl)but-3-enyl perfluorobenzoyloxycarbamate (25)**

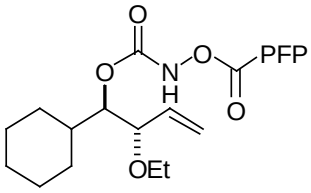


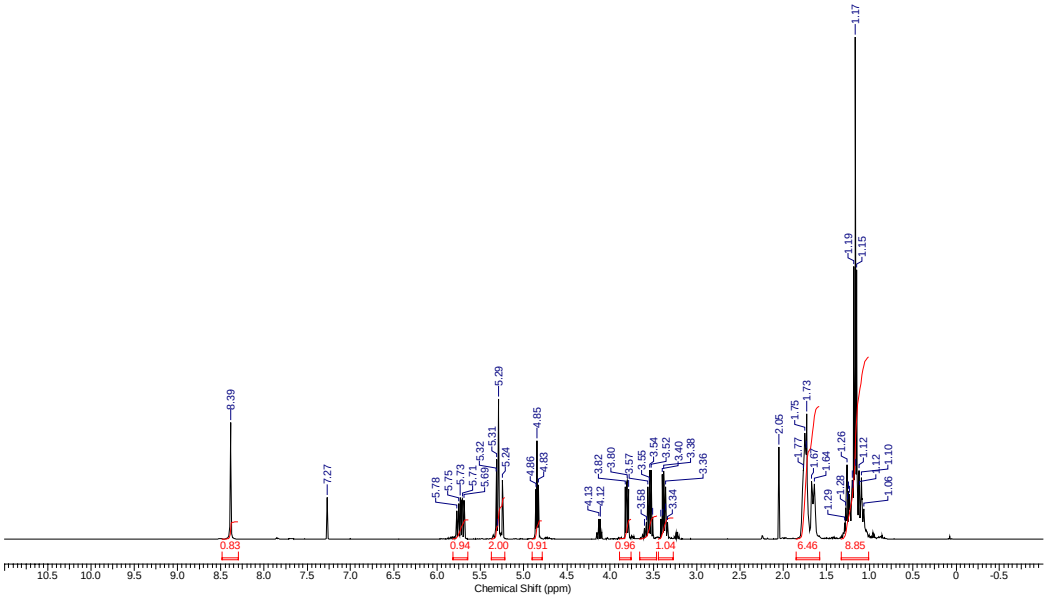


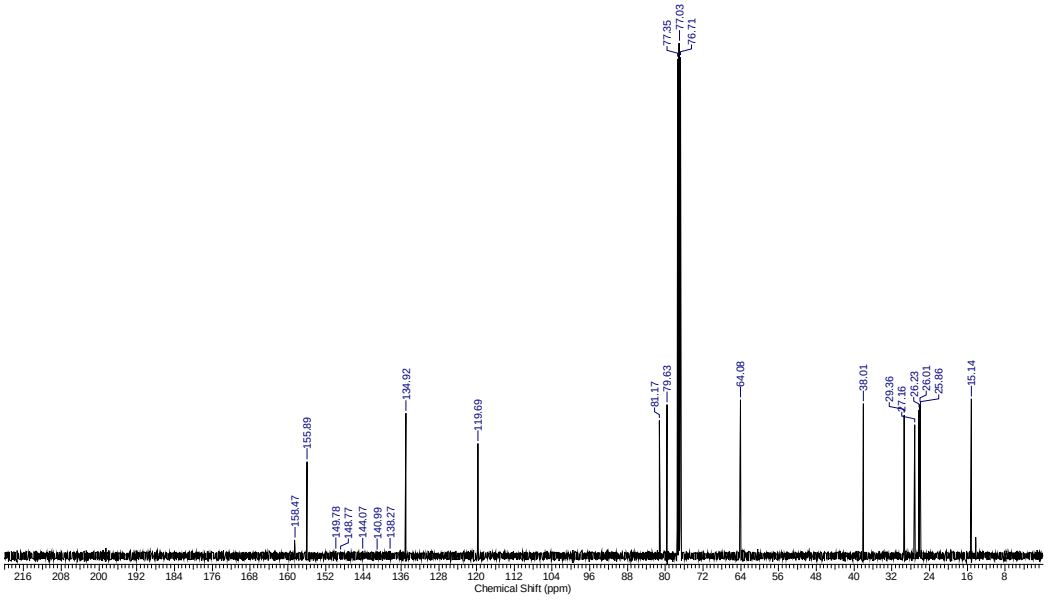


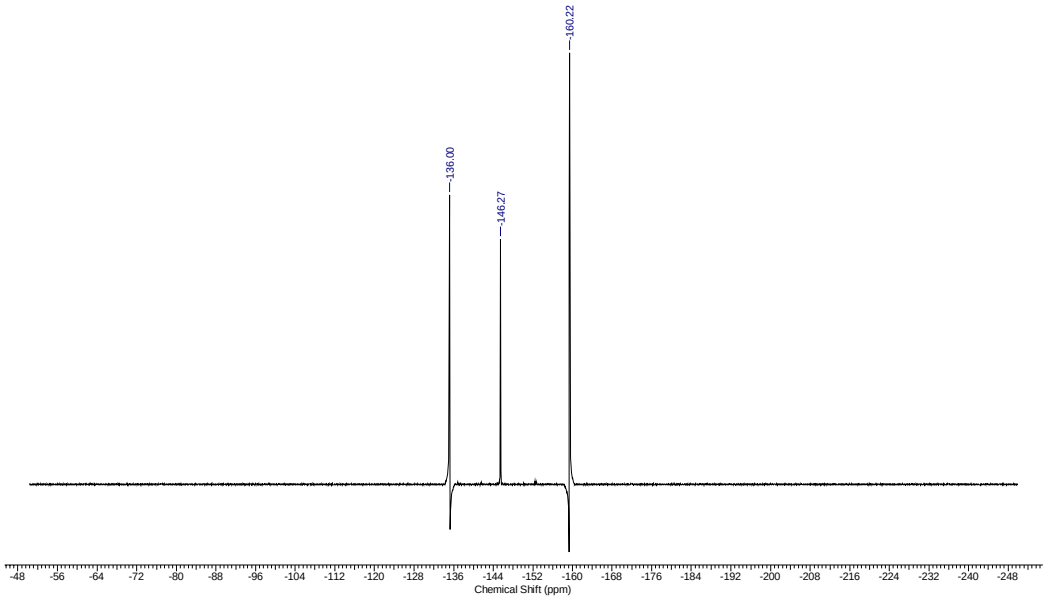

-135.20
-144.85
-144.91
-159.01
-159.05
-48 -56 -64 -72 -80 -88 -96 -104 -112 -120 -128 -136 -144 -152 -160 -168 -176 -184 -192 -200 -208 -216 -224 -232 -240 -248
Chemical Shift (ppm)

(±)-(1*R,2*S**)-1-cyclohexyl-2-ethoxybut-3-enyl perfluorobenzoyloxycarbamate (26a)**

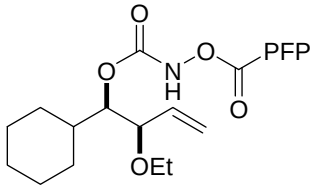


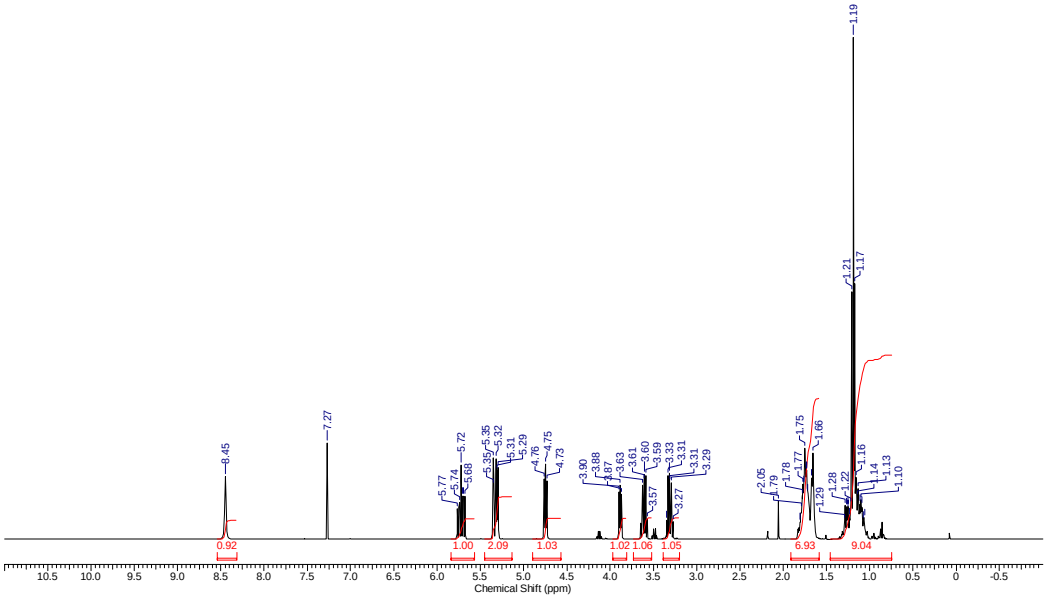


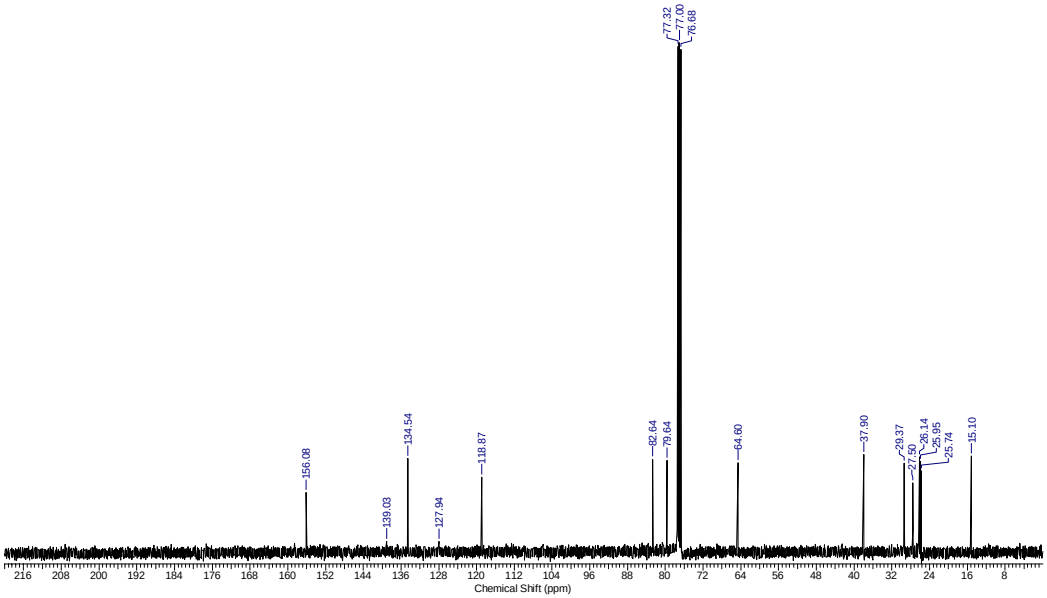


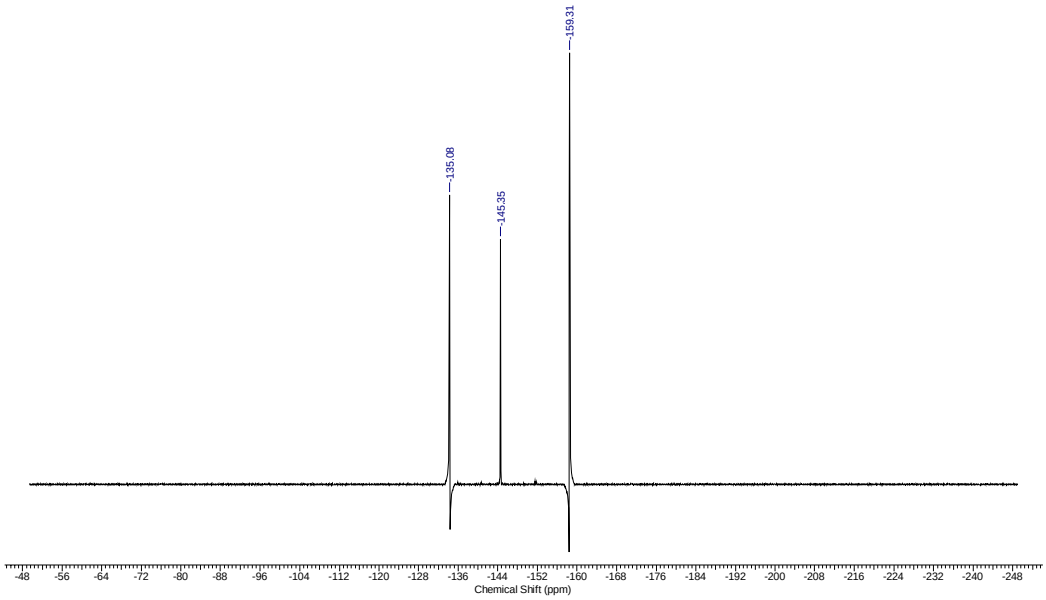

-160.22
-136.00
-146.27
-48 -56 -64 -72 -80 -88 -96 -104 -112 -120 -128 -136 -144 -152 -160 -168 -176 -184 -192 -200 -208 -216 -224 -232 -240 -248
Chemical Shift (ppm)

(±)-(1*R,2*R**)-1-cyclohexyl-2-ethoxybut-3-enyl perfluorobenzoyloxycarbamate (26b)**

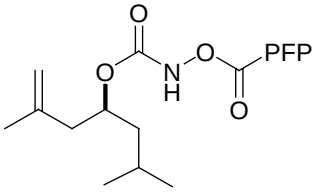


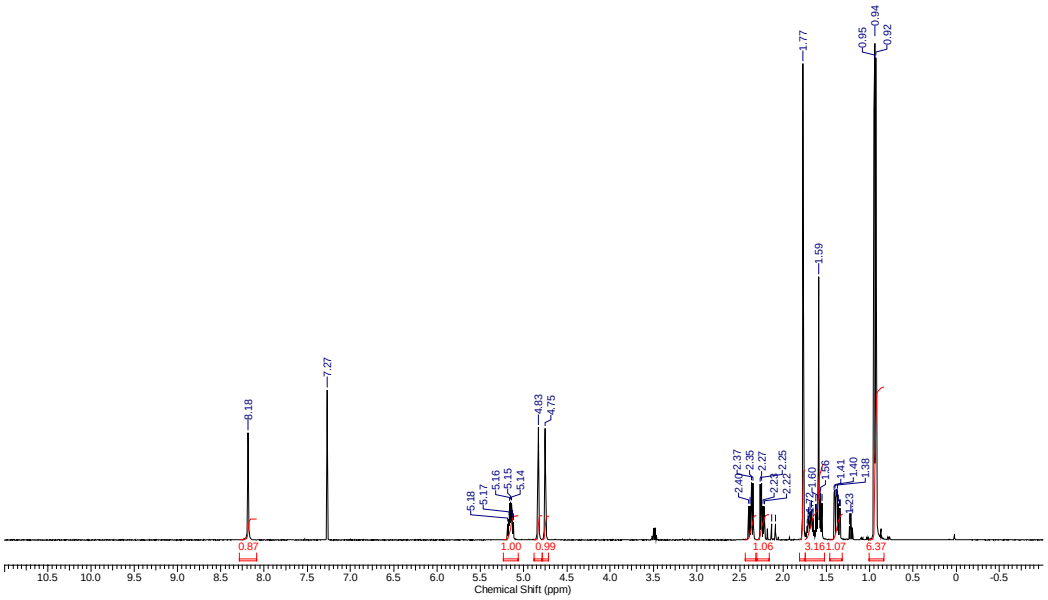


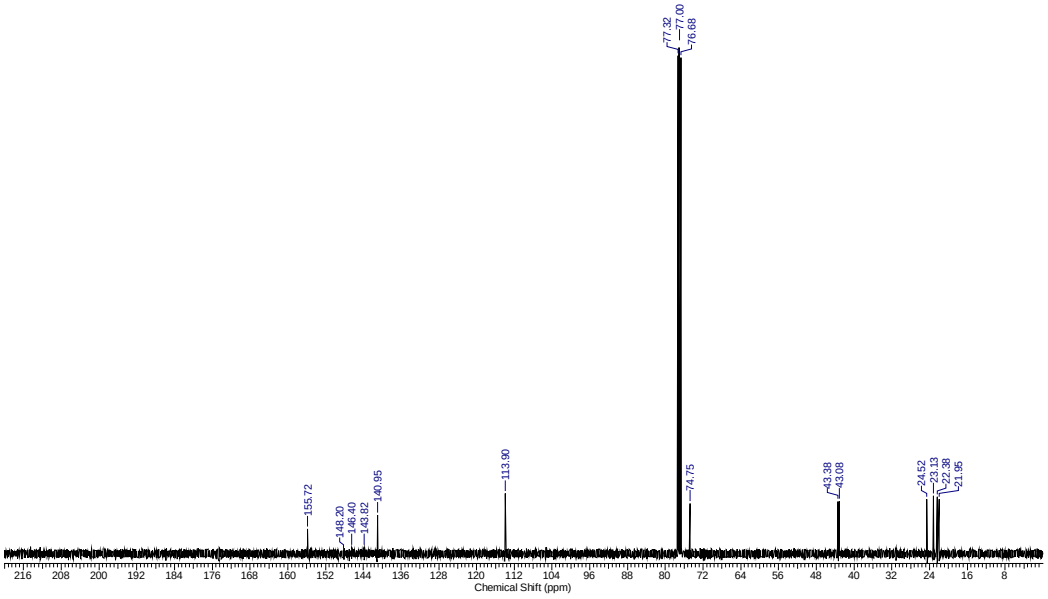


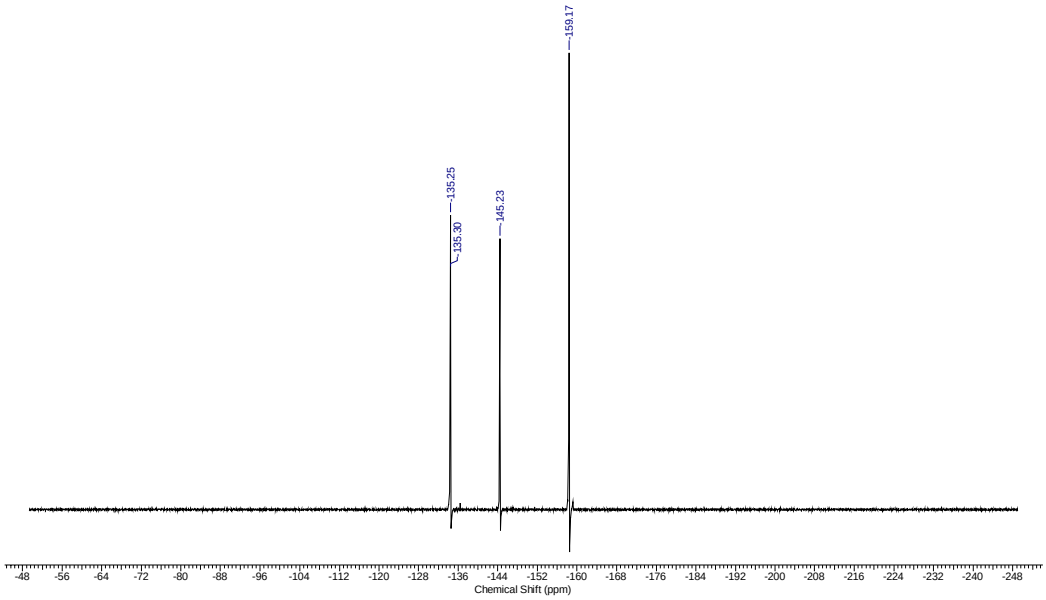

-135.08
-145.35
-159.31
-48 -56 -64 -72 -80 -88 -96 -104 -112 -120 -128 -136 -144 -152 -160 -168 -176 -184 -192 -200 -208 -216 -224 -232 -240 -248
Chemical Shift (ppm)

(±)-2,6-dimethylhept-1-en-4-yl perfluorobenzoyloxycarbamate (27)

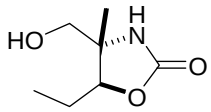


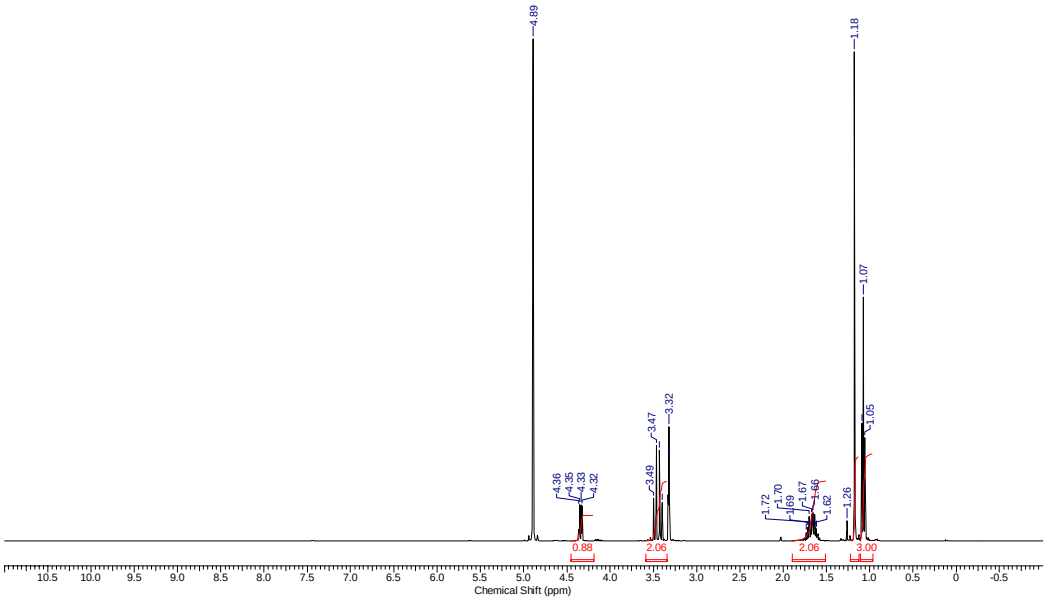


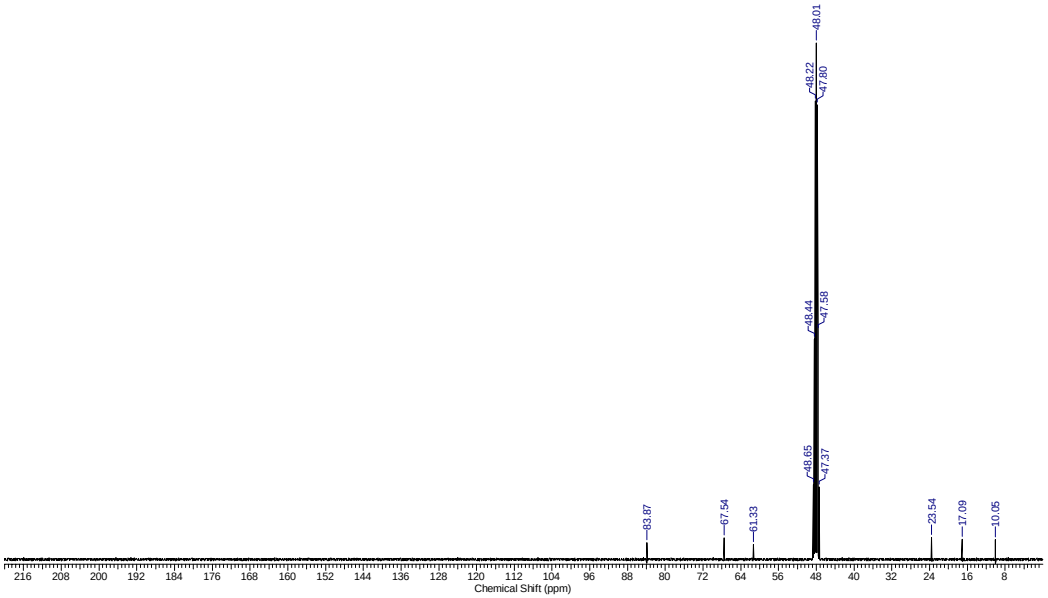



159.17
135.25
135.30
145.23
-48 -56 -64 -72 -80 -88 -96 -104 -112 -120 -128 -136 -144 -152 -160 -168 -176 -184 -192 -200 -208 -216 -224 -232 -240 -248
Chemical Shift (ppm)

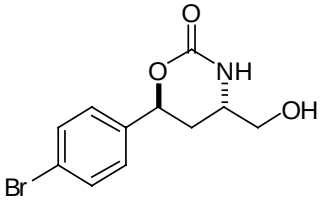
(±)-(4*S,5*S**)-5-Ethyl-4-(hydroxymethyl)-4-methyl-1,3-oxazolidin-2-one (21)**

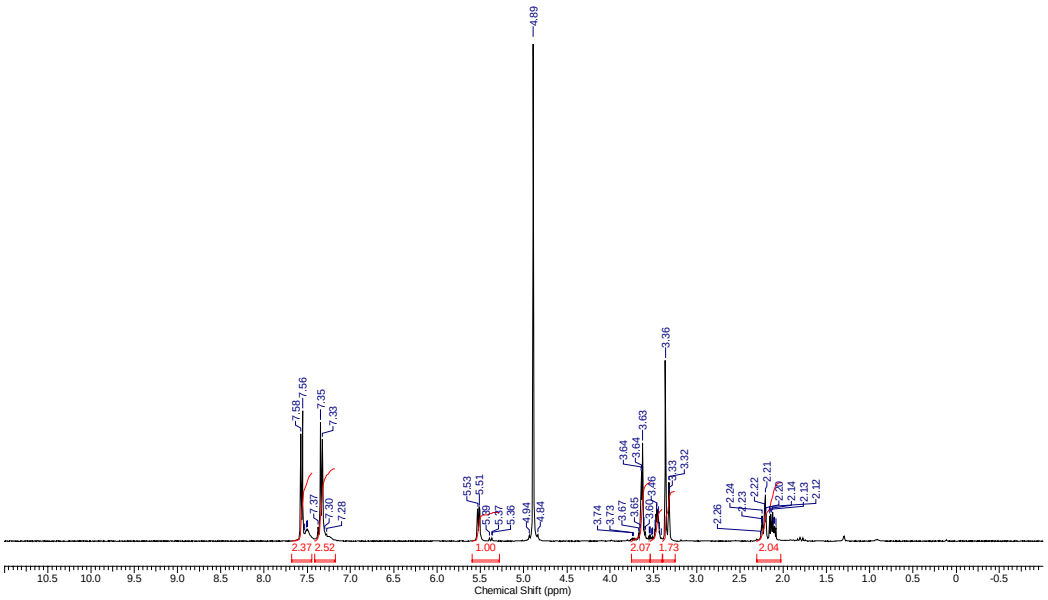


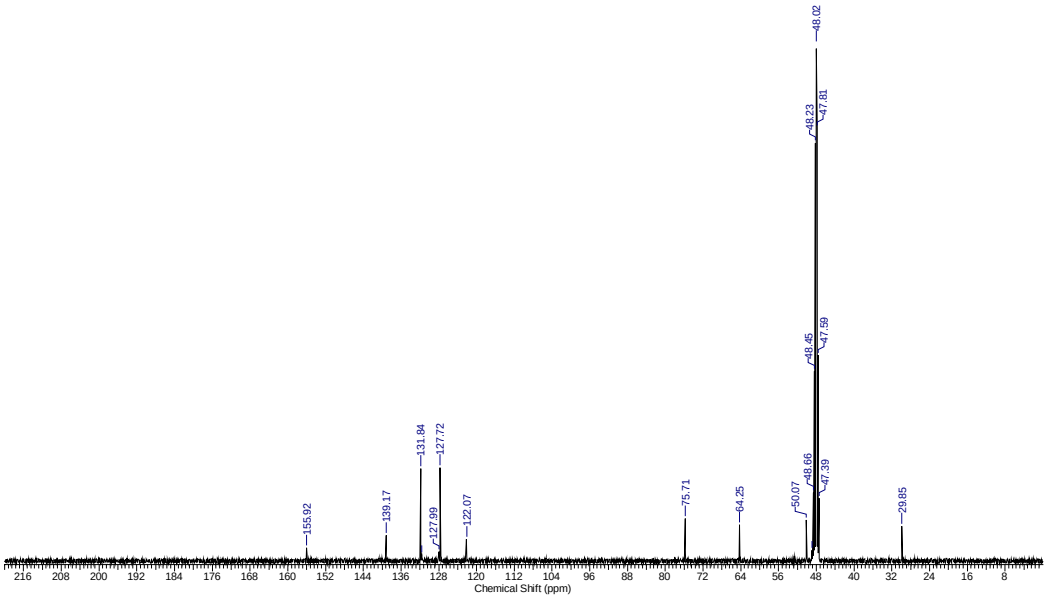




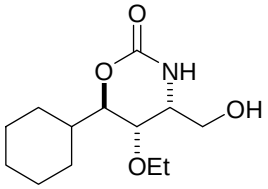
(±)-(4*S,6*S**)-6-(4-bromophenyl)-4-(hydroxymethyl)-1,3-oxazinan-2-one (4)**

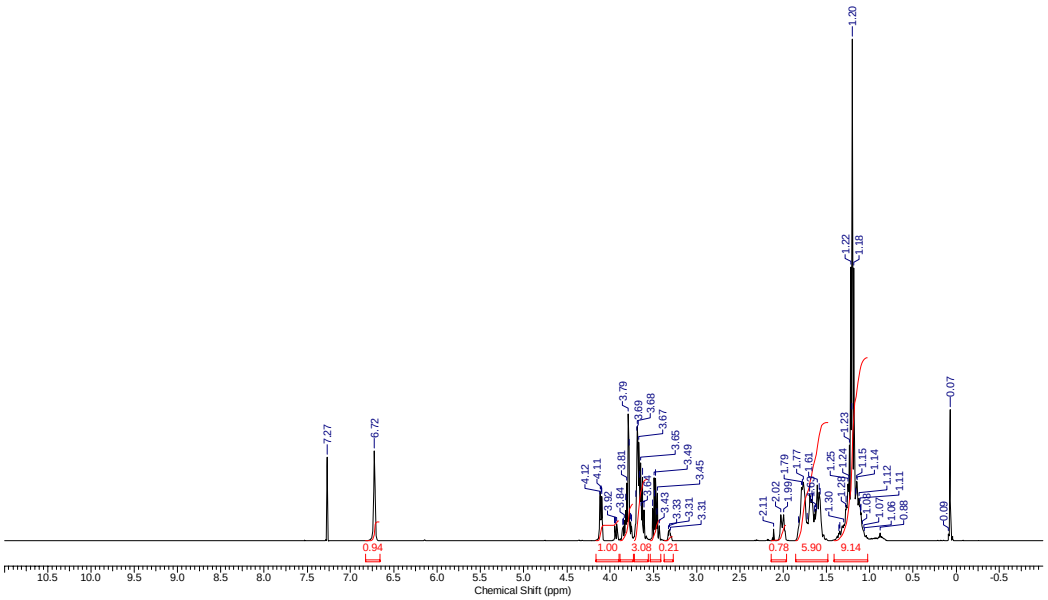


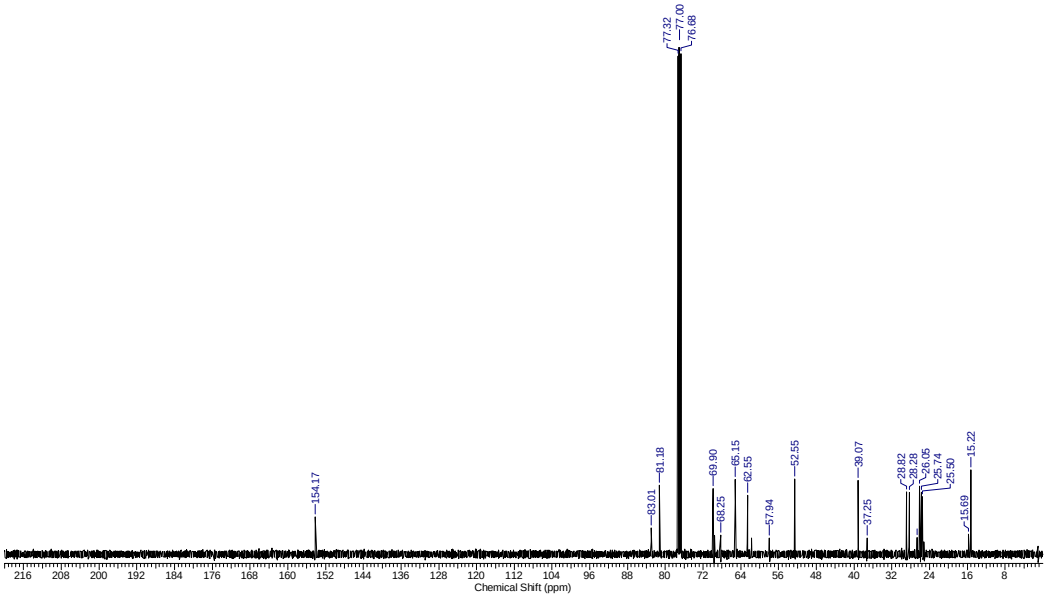




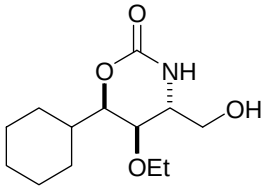
(±)- (4*R,5*S**,6*R**)-6-cyclohexyl-5-ethoxy-4-(hydroxymethyl)-1,3-oxazinan-2-one (28a)**

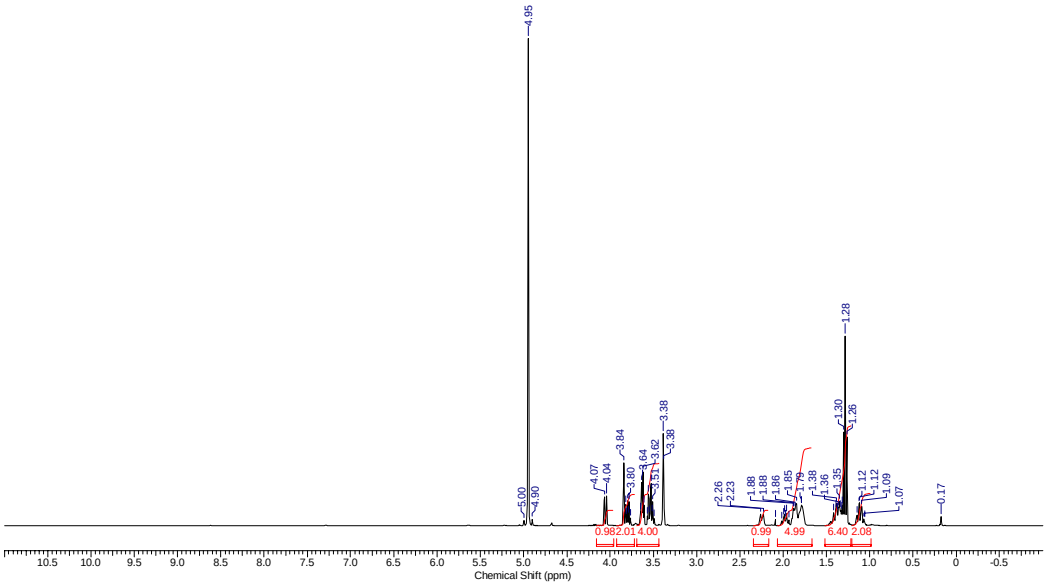


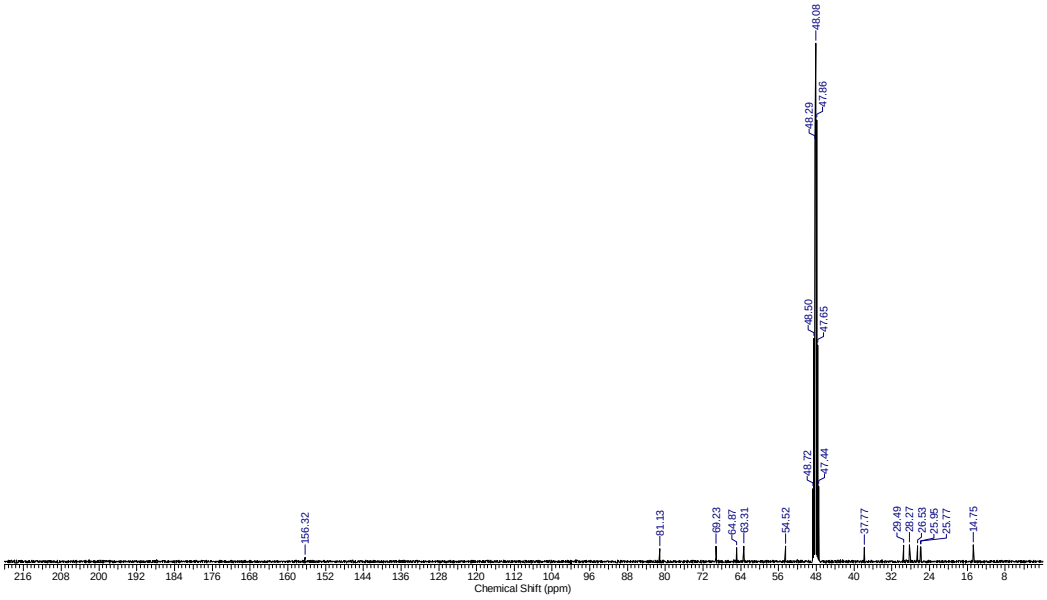




(±)- (4*R,5*R**,6*R**)-6-cyclohexyl-5-ethoxy-4-(hydroxymethyl)-1,3-oxazinan-2-one (28b)**







(±)-(4*R,6*S**)-4-(hydroxymethyl)-6-isobutyl-4-methyl-1,3-oxazinan-2-one (29)**