Supporting Information

Hypervalent Organochalcogenanes as Inhibitors of Protein Tyrosine Phosphatases

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EXPERIMENTAL CONSIDERATIONS

Unless otherwise noted, commercially available materials were used without further purification. Lipase from *Candida antarctica* (lipase B, CAL-B) immobilized and commercially available as Novozym® 435 was purchased from Sigma-Aldrich Brasil Ltda. Solvents used for moisture sensitive operations were distilled from drying reagents under a nitrogen atmosphere: THF was distilled from Na/benzophenone.

Analytical thin-layer chromatography (TLC) was performed by using aluminum-backed silica plates coated with a 0.25 mm thickness of silica gel 60 F_{254} (Merck), visualized with an ultraviolet light (λ= 254 nm), followed by exposure vanillin solution and heating.

Standard chromatographic purification procedures were followed using 35-70 mm (240-400 mesh) silica gel purchased from Acros Organics®.

Nuclear magnetic resonance (NMR) spectra were recorded on a *Bruker DRX 300* spectrometer at operating frequencies of 300 MHz (^{1}H NMR) or 125 MHz (^{13}C NMR) or 94.7 MHZ (^{125}Te). The ^{1}H NMR chemical shifts are reported in *ppm* relative to TMS peak. Data are reported as follows: chemical shift (δ), multiplicity (s = singlet, d = doublet, t = triplet, qd = quadruplet, qt = quintet, st = sextuplet, m = multiplet), and coupling constant (*J*) in Hertz and integrated intensity. The ^{13}C NMR chemical shifts are reported in *ppm* relative to $CDCl_3$ signal. The ^{125}Te NMR spectra were obtained on a *Bruker DRX 300* spectrometer with the appropriate decoupling accessories. All ^{125}Te chemical shifts were referenced to internal standard PhTeTePh (420 *ppm*).

Infrared spectra were recorded from a thin film between NaCl plates on a Bomem Michelson model 101 FTIR spectrometer with internal referencing. Absorption maxima (ν_{max}) are reported in wavenumbers (cm^{-1}).

High-resolution mass spectra (HRMS) were acquired using a Bruker Daltonics MicroTOF instrument, operating in the electrospray ionization (ESI) mode.

Optical rotations were measured on a Perkin Elmer-343 digital polarimeter in a 1 mL cuvette with a 1 dm pathlength. All values are reported in the following format: $[\alpha]_D$(temperature of measurement) = specific rotation (concentration of the solution reported in units of 10 mg sample per 1 mL solvent used).

Enzymatic kinetic resolution of 1-phenyletanol (1g)

To a one-necked round-bottomed flask (100 mL), 1-phenylethanol (*RS*)-**1e** (2,440 g; 20 mmol) was solubilized in hexane (40 mL) and then, CAL-B (Novozym 435; 1.5 g) and vinyl acetate (5,160 g; 60 mmol) were added. The mixture was stirred in an orbital shaker at 32 ^{o}C for 7 h (160 rpm). After that, the enzyme was filtered off and washed with dichloromethane (3 x 30 mL). The solvent was removed under reduced pressure and the residue was purified by flash chromatography using a mixture of *n*-hexane and ethyl acetate (9:1) as eluent to afford (*S*)-**1g** (e.e. > 99 %) and (*R*)-**1h** (e.e. > 99%) in 45% yield each one.

(*S*)-1-phenylethanol (1g): Isolated yield: 45%; Enantiomeric excess > 99 %; $[\alpha]_D^{22}$ = -56.7 (*c* = 0.96; $CHCl_3$);^{1}H NMR (200 MHz, $CDCl_3$);δ (ppm): 7.29 (m, 5H), 4.8 (qd, 1H, *J* 6.4 Hz), 2.6 (s, 1H), 1.48 (d, 2H, *J* 6.4 Hz).^{13}C NMR (50 MHz, $CDCl_3$); δ (ppm): 145.9, 128.5, 127.4, 125.5, 70.3, 25.2. IR (film), cm^{-1}: 3362, 2973, 1451, 1204, 1077, 699. HRMS (ESI), $[M+Na]^+$:calculated for $C_8H_{10}NaO$ = 145.0629. Found 145.0636.

(*R*)-1-phenylethyl acetate (1h):Isolated yield: 45%; Enantiomeric excess > 99 %; $[\alpha]_D^{22}$ = +108.6 (*c* = 1.00; $CHCl_3$);^{1}H NMR (200 MHz, $CDCl_3$);δ (ppm): 7.38 (m, 5H), 5.93 (qd, 1H, *J* 6.6 Hz), 2.12 (s, 3H), 1.58 (d, 3H, *J* 6.6 Hz). ^{13}C NMR (50 MHz, $CDCl_3$); δ (ppm): 170.2, 141.6, 128.4, 127.7, 126.0, 72.2, 22.1,21.2. IR (film), cm^{-1}: 2982, 1741, 1372, 1242, 1065, 699. HRMS (ESI), $[M+Na]^+$:calculated for $C_{10}H_{12}NaO_2$ = 187.0735. Found 187.0726.

***ortho*-lithiation/dichalcogenide anion capture sequence**

To a three-necked round flask (100 mL), (*S*)- or (*R*)-1-phenylethanol (0.610 g, 5 mmol) and TMEDA (3mL, 10 mmol) were dissolved in dry-pentane (25 mL) and cooled to 0 ^{o}C. To this solution, *n*-BuLi 1.5 mol L^{-1} (7 mL, 10.5 mmol) was carefully added dropwise and the resulting solution was refluxed for 24 h. After that, the mixture was cooled to 0 ^{o}C and dibutylditelluride (1,850 g, 5 mmol) was added and the mixture was stirred for 3h at room temperature. The reaction was quenched with brine (20 mL), the organic phase was diluted with diethyl ether (50 mL) and washed with brine (2 x 20 mL). The organic phase was separated, dried over anhydrous magnesium sulphate and filtered. The solvent was removed under reduced pressure and the residue was purified by flash chromatography using a misture of *n*-hexane and ethyl acetate (9:1) as eluent to afford the telluro-alcohols [(*S*)-**1i** or (*R*)-**1i**]**.**

1-(2-(butyltellanyl)phenyl)ethanol (1i): (*S*)-**1i**: Isolated yield: 47%; Enantiomeric excess > 99%; $[\alpha]_D^{22}$ = - 10.1 (*c* = 1.00; $CHCl_3$); (*R*)-**1i**: Isolated yield: 46%; Enantiomeric excess > 99%; $[\alpha]_D^{22}$ = + 12.1 (*c* = 0.93; $CHCl_3$); ^{1}H NMR (300 MHz, $CDCl_3$);δ (ppm): 7.68 (1H, dd, *J* 1.32 Hz), 7.49 (1H, dd, *J* 1.56 Hz), 7.28 (1H, m), 7.08 (1H, td, *J* 1.56 Hz), 5.11 (1H, qd, *J* 6.42 Hz), 2.87 (2H, t, *J* 7.65 Hz), 1.77 (2H, qt, *J* 7.60 Hz), 1.48 (3H, d, *J* 6.45 Hz), 1.41 (2H, st, *J* 7.50 Hz), 0.90 (3H, t, *J* 7.32 Hz). ^{13}C NMR (75 MHz, $CDCl_3$); δ (ppm): 149.2, 137.7, 128.3, 128.1, 125.4, 113.9, 73.2, 33.7, 25.3, 24.3, 13.6, 8.79. ^{125}Te NMR (94,73 MHz, $CDCl_3$); δ (ppm): 341.5; IR (film), cm^{-1}: 3.370, 3.053, 2.961, 2.925, 2.866, 1.459, 1.084, 755. HRMS (ESI), $[M+Na]^+$:calculated for $C_{12}H_{18}NaOTe$ =331.0318. Found 331.0314.

General procedure for *o*-methylation reactions (1j)

To a two-necked round-bottomed flask (25 mL), the appropriate alcohol [(*S*)-**1g** or (*R*)-**1g**] (1 mmol) was solubilized in dry THF (10 mL) and then sodium hydride (48 mg; 2 mmol) was added at 0 ^{o}C. This mixture was stirred for 30 min, and then iodomethane (280 mg; 2 mmol) was added. The mixture was stirred for 2h at room temperature. After that, ammonium chloride saturated solution (10 mL) was added, and the organic phase was diluted with ethyl acetate (20 mL) and washed with brine (3 x 10 mL). The organic phase was separated, dried over anhydrous magnesium sulphate and filtered. The solvent was removed under reduced pressure and the residue was purified by flash chromatography using a mixture of *n*-hexane and ethyl acetate (9:1) as eluent to afford the ethers [(*S*)-**1j** or (*R*)-**1j**].

Butyl(2-(1-methoxyethyl)phenyl)tellane (1j):

(*S*)-**1j**: Isolated yield: 87%; Enantiomeric excess > 99%; $[\alpha]_D^{22}$ = - 30.6 (*c* = 1.00; $CHCl_3$); (*R*)-**1j**: Isolated yield: 86%; Enantiomeric excess > 99%; $[\alpha]_D^{22}$ = + 32.9 (*c* = 1.1; $CHCl_3$); ^{1}H NMR (300 MHz, $CDCl_3$);δ (ppm): 7.67 (1H, d, *J* 7.7 Hz); 7.37(1H, dd, *J* 1.40 Hz;); (1H, d, *J* 7.20 Hz); (1H, ddd, *J* 1.5 Hz;); 4.60 (1H, qd, *J* 6.42 Hz); 3.25 (3H, s), 2.88 (2H, st, *J* 3.5 Hz); 1.79 (2H, qt, *J* 7.5 Hz); 1.44 (5H, m); 0.90 (3H, t, *J* 7.4 Hz). ^{13}C NMR (75 MHz, $CDCl_3$); δ (ppm): 147.0; 137.4; 128.3; 128.0; 126.2; 114.4; 82.5; 56.6; 33.8; 25.4; 22.8; 13.6. ^{125}Te NMR (94,73 MHz, $CDCl_3$); δ (ppm): 345,3. IR (film), cm^{-1}: 3.053, 2.958, 2.927, 2.871, 2.819, 1.462, 1.110, 756.

Procedure for a Br/Li exchange reaction

To an oven-dried two necked round-bottomed flask (25 mL), the 1-bromo-2-(methoxymethyl)benzene (**1a**) (187mg; 1 mmol) was solubilized in dry THF (10 mL). The mixture was cooled to -78 ^{o}C by using dry-ice/acetone bath and then *tert*-butylitium (0.8 mL of a solution 1,4M; 1.1 mmol) was added dropwise. After that, the mixture was stirred at 0 ^{o}C for 30 min and dibutyldiselenide (301mg; 1.1 mmol) was added and the mixture was stirred for 2 h at room temperature. The reaction was quenched by addition of ammonium chloride saturated solution (10 mL), the organic phase was diluted with ethyl acetate (20 mL) and washed with brine (3 x 10 mL). The organic phase was separated, dried over anhydrous magnesium sulphate and filtered. The solvent was removed under reduced pressure and the residue was purified by flash chromatography using a mixture of *n*-hexane and ethyl acetate (9:1) as eluent to afford **1c** in 90% yield.

Butyl(2-(methoxymethyl)phenyl)tellane (1c): Isolated yield**:** 79%**;** ^{1}H NMR (300 MHz, $CDCl_3$);δ (ppm): 7.68 (1H, d, *J* 7.53 Hz); 7.31 (1H, m); 7.22 (1H, ddd, J_A 1.59 Hz; J_B 1.56 Hz; J_C 1.47 Hz); 4.48 (2H, s); 3.37 (3H, s); 2.86 (3H, t, *J* 7.5 Hz), 1.77 (2H, qt, *J* 7,6 Hz); 1.39 (2H, sext., *J* 7.5 Hz); 0.90 (3H, t, *J* 7.35 Hz). ^{13}C NMR (75 MHz, $CDCl_3$); δ (ppm): 141.6; 136.6; 128.3; 127.5; 126.9; 116.6; 78.0; 57.5; 33.6; 25.1; 13.4; 7.49; ^{125}Te NMR (94.73 MHz, $CDCl_3$); δ (ppm): 362.4; IR (film), cm^{-1}: 3.055, 2.956, 2.925, 2.871, 2.818, 1.460, 1.097, 747. HRMS (ESI), $[M+Na]^+$:calculated for $C_{12}H_{18}NaOTe$= 331.0318. Found 331.0315.

General procedure for oxidation of tellurides to telluranes

To a one-necked round-bottomed flask (25 mL), the appropriate telluride [**1c**, (*S*)-**1j** or (*R*)-**1j**] (1 mmol) was solubilized in dry THF (5 mL). The mixture was cooled at 0 ^{o}C and then, a cooled solution of sulfuryl chloride (1 mmol) or bromine (1 mmol) dissolved in THF (2 mL) was added dropwise. The resulting mixture was stirred at 0 ^{o}C for 20 minutes and then the solvent was removed under reduced pressure. The organotelluranes **1-6** were purified by recristallization from a mixture of diethyl ether and hexane in quantitative yields.

1-[butyl(dichloro)-λ^4-tellanyl]-2-(methoxymethyl)benzene (tellurane 3): Isolated yield: > 99%; ^{1}H NMR (300 MHz, $CDCl_3$);δ (ppm): 7,94 (1H, m); 7.47 (2H, m); 7.27 (1H, m); 4.87 (2H, s); 3.62 (2H, t, *J* 7.7 Hz); 3.52 (3H, s); 2.22 (2H, qt, *J* 7.7 Hz); 1.62 (2H, st, *J* 7,38); 1.05 (3H, t, *J* 7.32 Hz). ^{13}C NMR (50 MHz, $CDCl_3$); δ (ppm): 139.2; 133.9; 132.0; 131.2; 129.8; 128.6; 73.9; 58.2; 47.3; 26.9; 24.6; 13.7. ^{125}Te NMR (94.73 MHz, $CDCl_3$); δ (ppm): 881.2. IR (film), cm^{-1}: 3.434, 2.957, 2.930, 2.860, 2.823, 1.462, 1.434, 1.292, 1.200, 1.180, 1.084, 909, 757, 611. Elemental analysis: calculated for $C_{12}H_{18}Cl_2OTe$: C: 38.25; H: 4.82; Cl: 18.82. Found: C: 38.30; H: 4.87; Cl: 18.86.

1-[dibromo(butyl)-λ^4-tellanyl]-2-(methoxymethyl)benzene (tellurane 4): Isolated yield: > 99%; ^{1}H NMR (300 MHz, $CDCl_3$);δ (ppm): 7.92 (1H, m); 7.48 (m, 2H); 4.88 (2H, s); 3.73 (2H, t, *J* 4.75 Hz); 3.54 (3H, s); 2.23 (2H, qt, *J* 4.75 Hz); 1.64 (2H, st, *J* 4.50); 1.06 (3H, t, *J* 4.40 Hz). ^{13}C NMR (75 MHz, $CDCl_3$); δ (ppm): 139.4; 132.7; 131.4; 130.2; 130.0; 128.9; 74.1; 58.6; 45.4; 27.1; 24.7; 13.8. ^{125}Te NMR (94.73 MHz, CDCl3); δ (ppm): 823.0.IR (film), cm^{-1}: 3.428, 2.954, 2.926, 2.861, 2.821, 1.458, 1.431, 1.198, 1.179, 1.083, 908, 754, 609. Elemental analysis: calculated for $C_{12}H_{18}Br_2OTe$: C: 30.95; H: 3.90; Br: 34.32. Found: C: 30.97; H: 4.79; Br: 34.35.

1-[butyl(dichloro)-λ^4-tellanyl]-2-(1-methoxyethyl)benzene (telluranes 11 and 12):

(*S*)-**11**: Isolated yield: 99 %; Enantiomeric excess > 99 %; $[\alpha]_D^{22}$ = +38.2 (*c* = 1.92; $CHCl_3$); (*R*)-**12**: Isolated yield: 99 %; Enantiomeric excess > 99 %; $[\alpha]_D^{22}$ = - 34.3(*c* =1.80; $CHCl_3$); ^{1}H NMR (300 MHz, $CDCl_3$);δ (ppm): 7.92 (1H, dd, *J* 0.72 Hz), 7.48 (2H, m), 7.39 (1H, dd, *J* 0.72 Hz), 4.90 (1H, qd, *J* 4.0 Hz), 3.67-3.56 (2H, m), 3.51 (3H, s), 2.23 (2H, qt, *J* 4.65 Hz), 1.64 (6H, m), 1.06 (3H, t, *J* 4.41Hz); ^{13}C NMR (75 MHz, CDCl3); δ (ppm): 143.5, 133.4, 131.6, 131.4, 129.7, 128.0, 78.9, 56.5, 47.9, 26.9, 24.8, 20.6, 13.8. ^{125}Te NMR (94,73 MHz, CDCl3); δ (ppm): 881.1.IR (film), cm^{-1}: 3.435, 2.960, 2.929, 2.870, 2.824, 1.459, 1.376, 1.213, 1.106, 1.089, 1.049, 999, 862, 764.Elemental analysis: calculated for $C_{13}H_{20}Cl_2OTe$: C: 39.95; H: 5.16; Cl: 18.14. Found: C: 40,00; H: 5.20; Cl: 18.16.

1-[dibromo(butyl)-λ^4-tellanyl]-2-(1-methoxyethyl)benzene (telluranes 7 and 8):

(*S*)-**7** Isolated yield: 99%; Enantiomeric excess > 99 %; $[\alpha]_D^{22}$ = +43.5 (*c* = 1.00; $CHCl_3$); (*R*)-**8**: Isolated yield: 99%; Enantiomeric excess > 99 %; $[\alpha]_D^{22}$ = - 44.0 (*c* = 1.00; $CHCl_3$); ^{1}H NMR (300 MHz, $CDCl_3$);δ (ppm): 7,88 (1H, d, *J* 7.9 Hz); 7.49 (2H, m); 7.36 (1H, m); 4.98 (1H, qd, *J* 6.58 Hz); 3,71 (2H, qt, *J* 7.02 Hz); 3.54 (3H, s); 2.22 (2H, qt, *J* 7.46 Hz); 1.62 (5H, m); 1.07 (3H, t, *J* 7.5 Hz); ^{13}C NMR (75 MHz, CDCl3); δ ppm): 143.5; 131.8; 131.5; 129.8; 129.2; 127.8; 78.7; 56.5; 45.9; 26.8; 24.7; 20.1; 13.8. ^{125}Te NMR (94,73 MHz, CDCl3); δ (ppm): 823.0. IR (film), cm^{-1}: 3.441, 2.958, 2.926, 2.869, 2.822, 1.459, 1.440, 1.373, 1.212, 1.171, 1.105, 1.048, 998, 862, 769. Elemental analysis: calculated for $C_{13}H_{20}Br_2OTe$: C: 32.55; H: 4.20; Br: 33.31. Found: C: 32.56; H: 4.18; Br: 33.37.

^{1}H, ^{13}C, ^{125}Te NMR, IR and HRMS Spectra

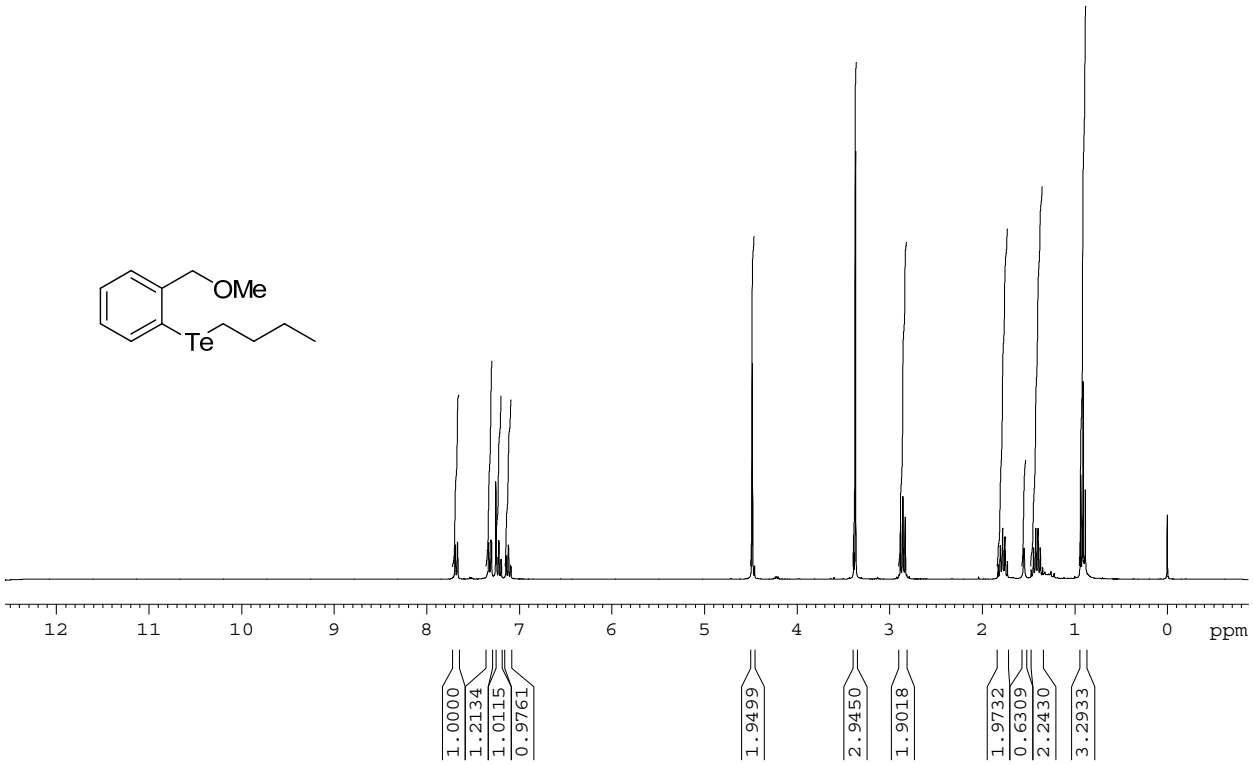


Figure S 1 - ^{1}H NMR (300 MHz, $CDCl_3$) spectrum of butyl(2-(methoxymethyl)phenyl)tellane (**1c)**.

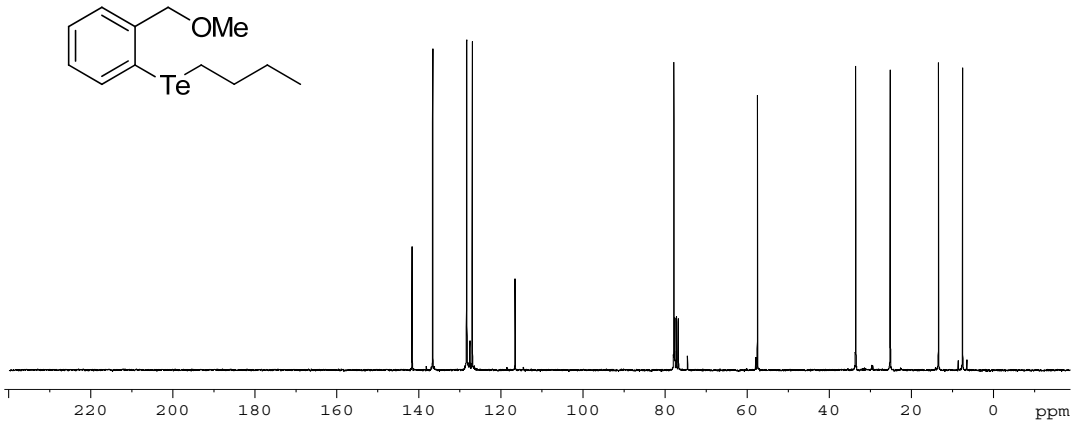


Figure S 2 - ^{13}C NMR (75 MHz, $CDCl_3$) spectrum of butyl(2-(methoxymethyl)phenyl)tellane (**1c**).

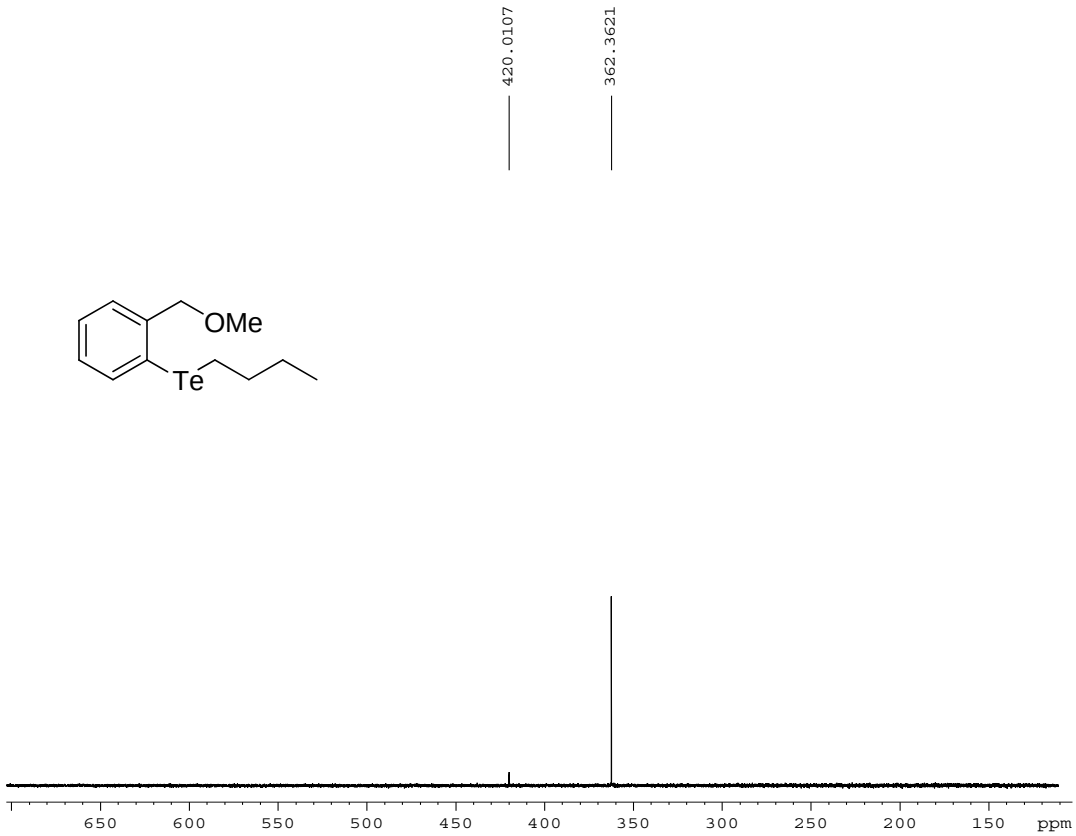


Figure S 3 - ^{125}Te NMR (94,73 MHz, $CDCl_3$) spectrum of butyl(2-(methoxymethyl)phenyl)tellane (**1c**).

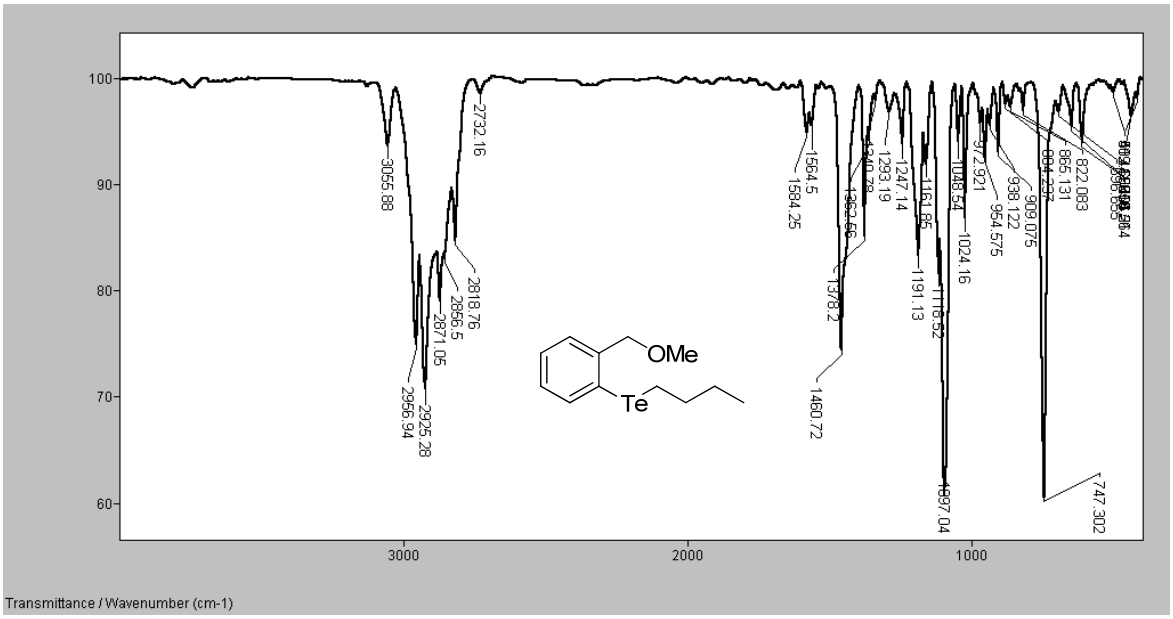


Figure S 4 - Infrared spectrum of butyl(2-(methoxymethyl)phenyl)tellane (**1c**).

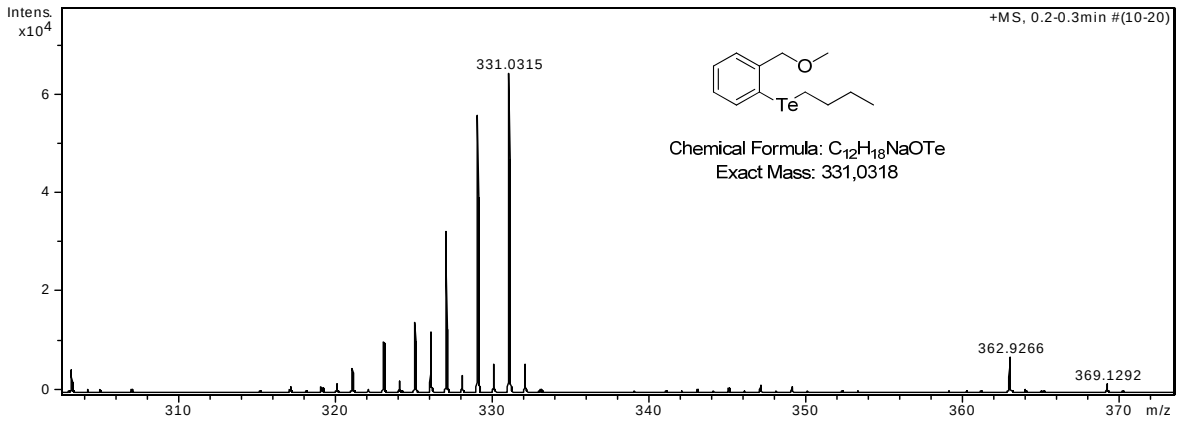


Figure S 5 – High resolution spectrum of butyl(2-(methoxymethyl)phenyl)tellane (**1c**).

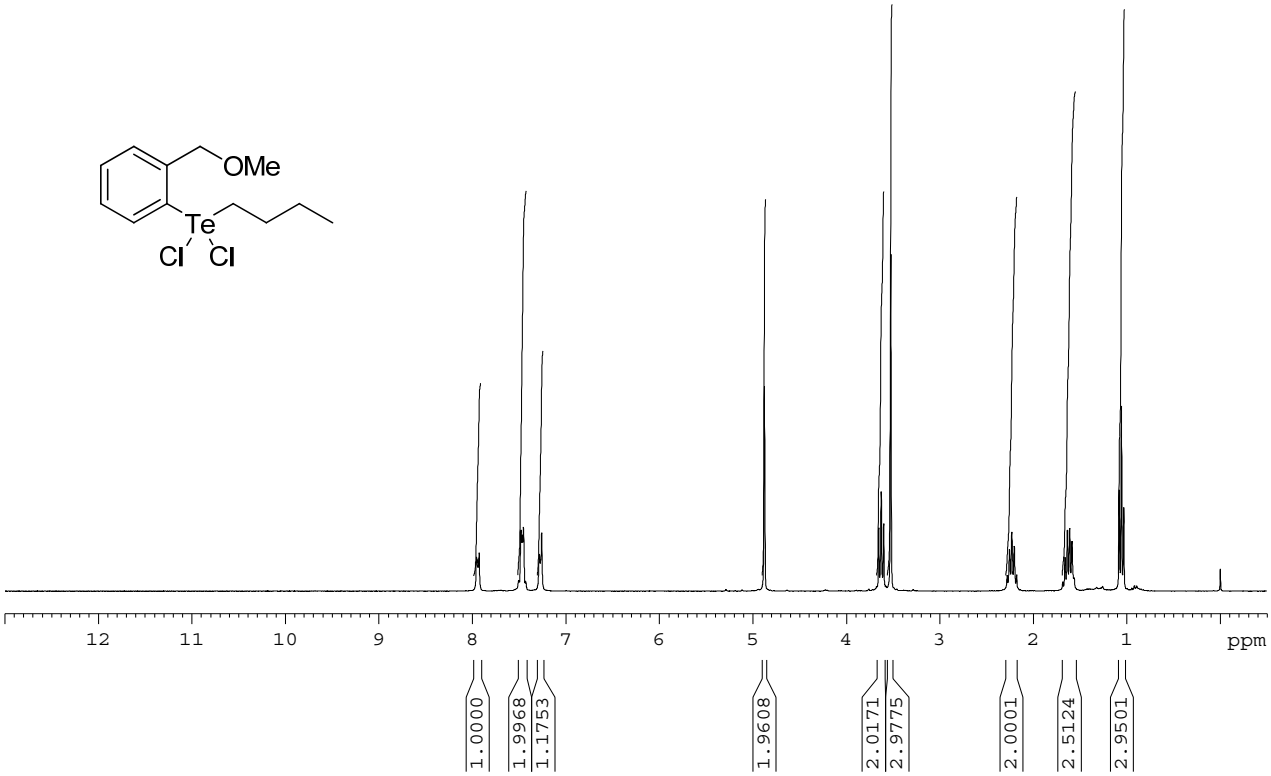


Figure S 6 - ^{1}H NMR (300 MHz, $CDCl_3$) spectrum of tellurane **3**.

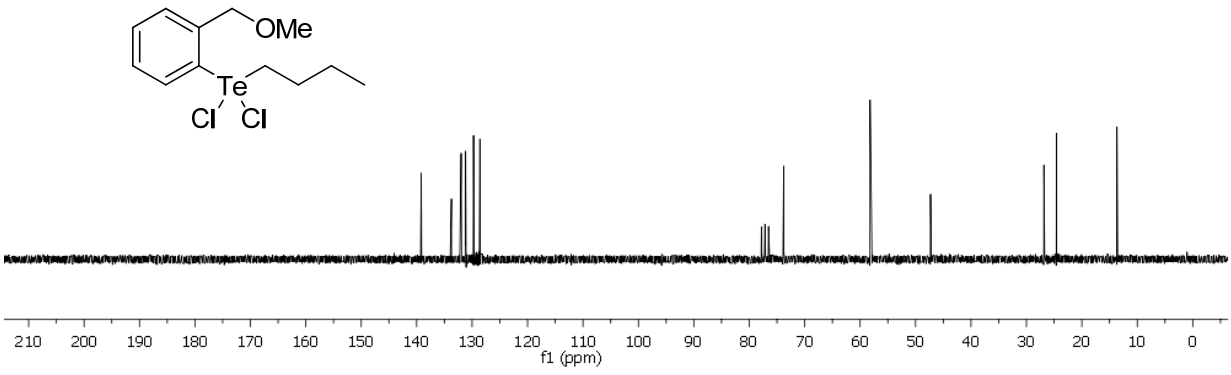


Figure S 7 - ^{13}C NMR (50 MHz, $CDCl_3$) spectrum of tellurane **3**.

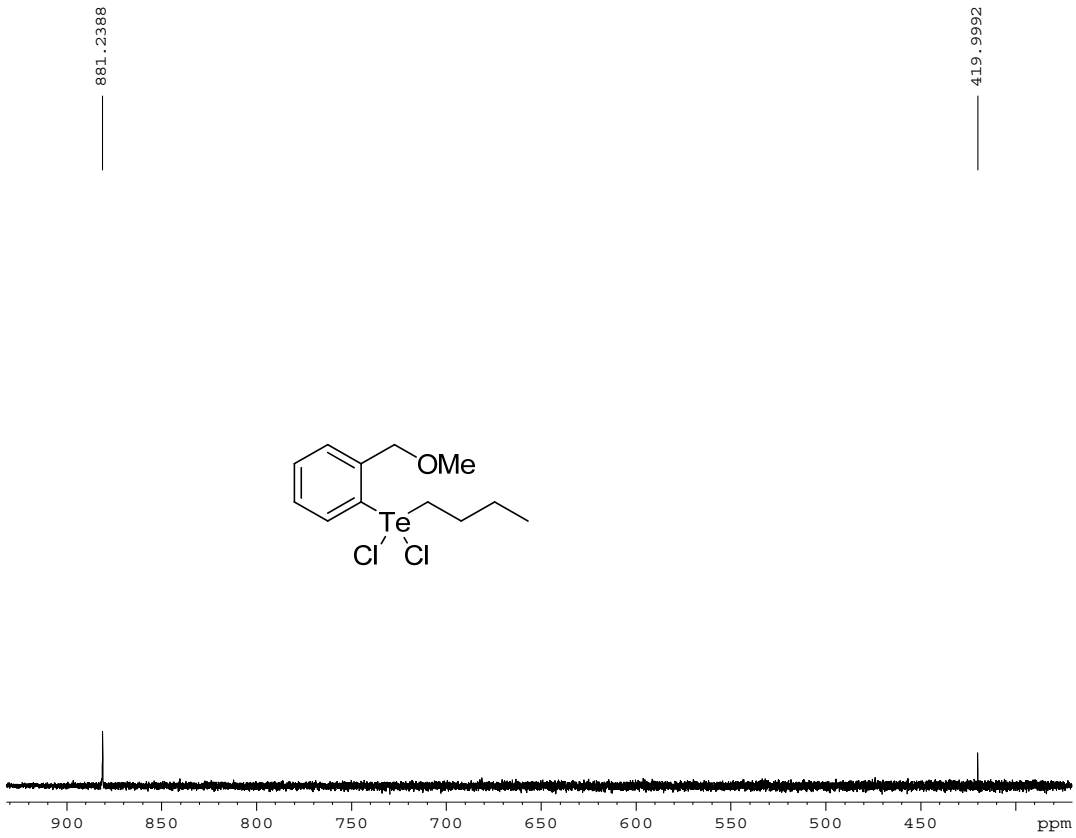


Figure S 8 - ^{125}Te NMR (94.7 MHz, $CDCl_3$) spectrum of tellurane **3**.

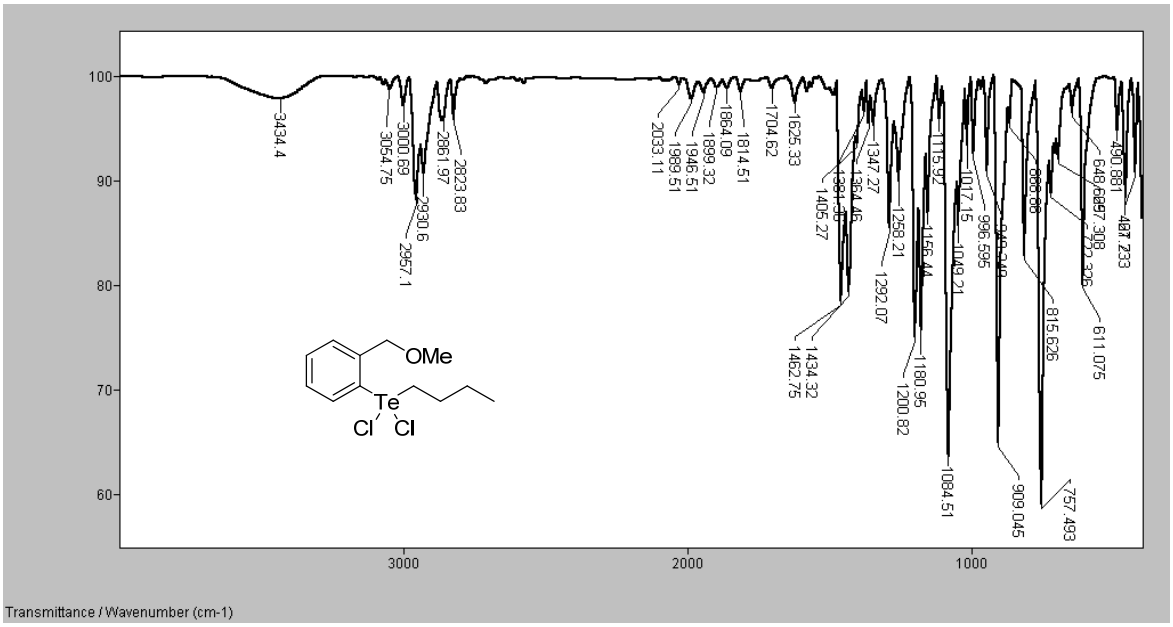


Figure S 9 – Infrared spectrum of tellurane **3.**

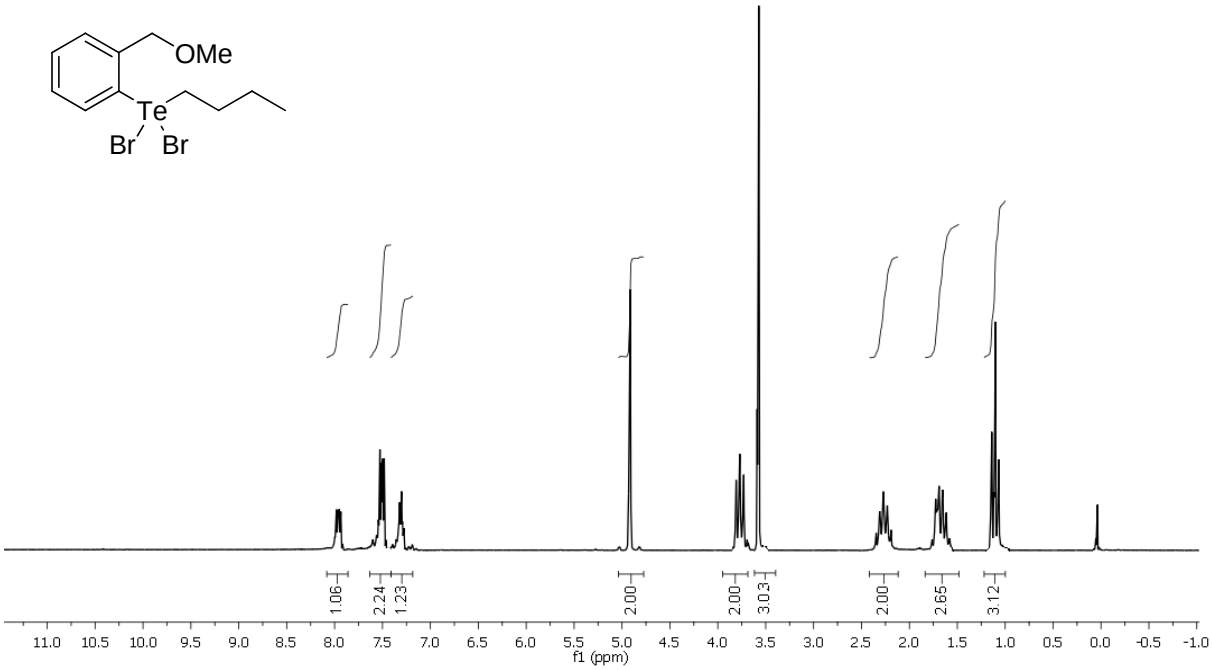


Figure S 10 - ^{1}H NMR (300 MHz, $CDCl_3$) spectrum of tellurane **4**.

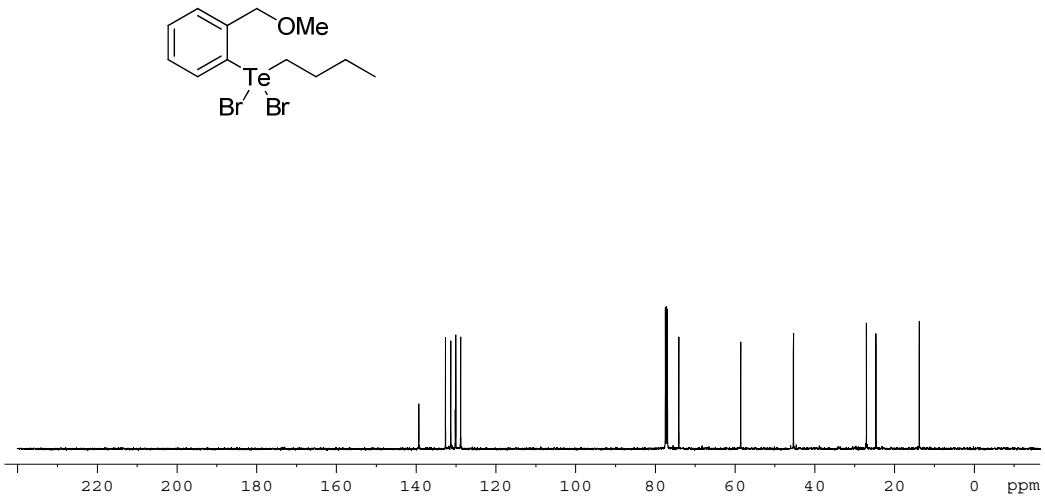


Figure S 11 - ^{13}C NMR (75 MHz, $CDCl_3$) spectrum of tellurane **4**.

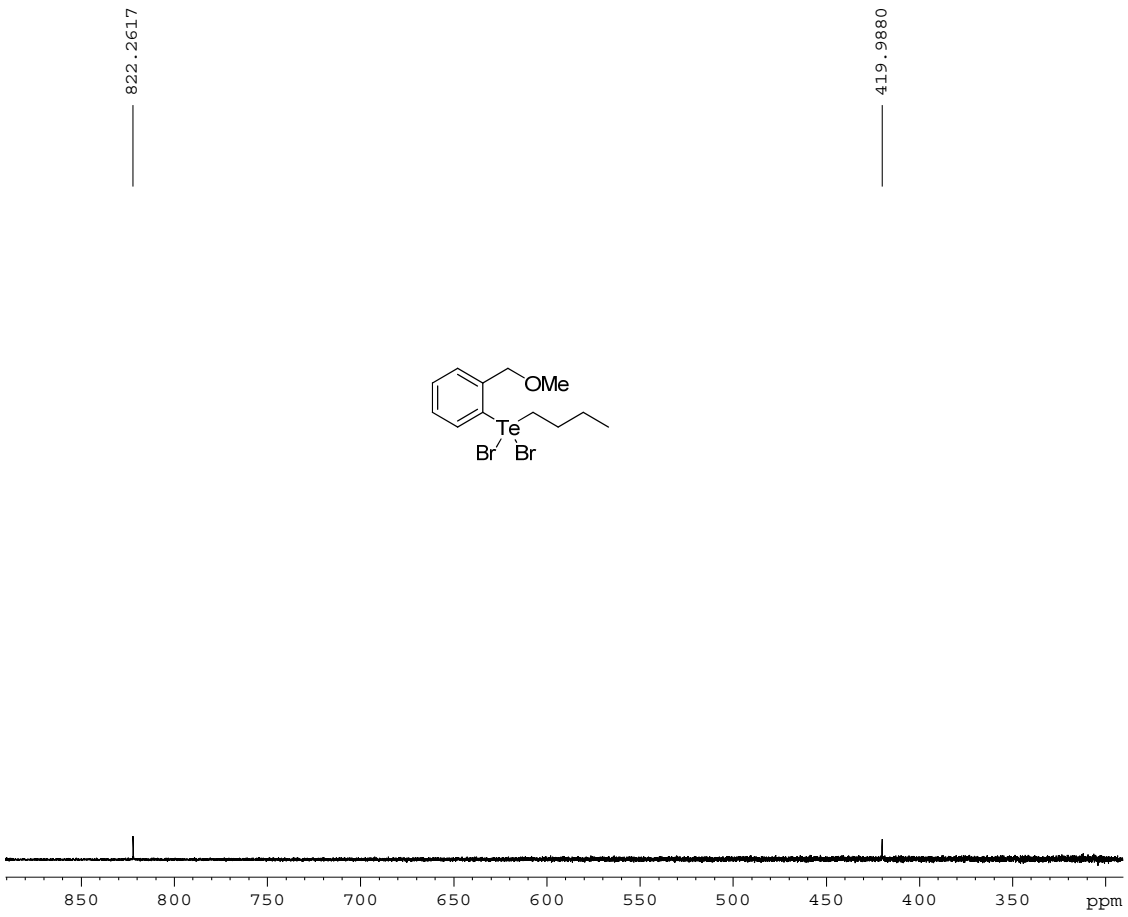


Figure S 12 - ^{125}Te NMR (94.7 MHz, $CDCl_3$) spectrum of tellurane **4**.

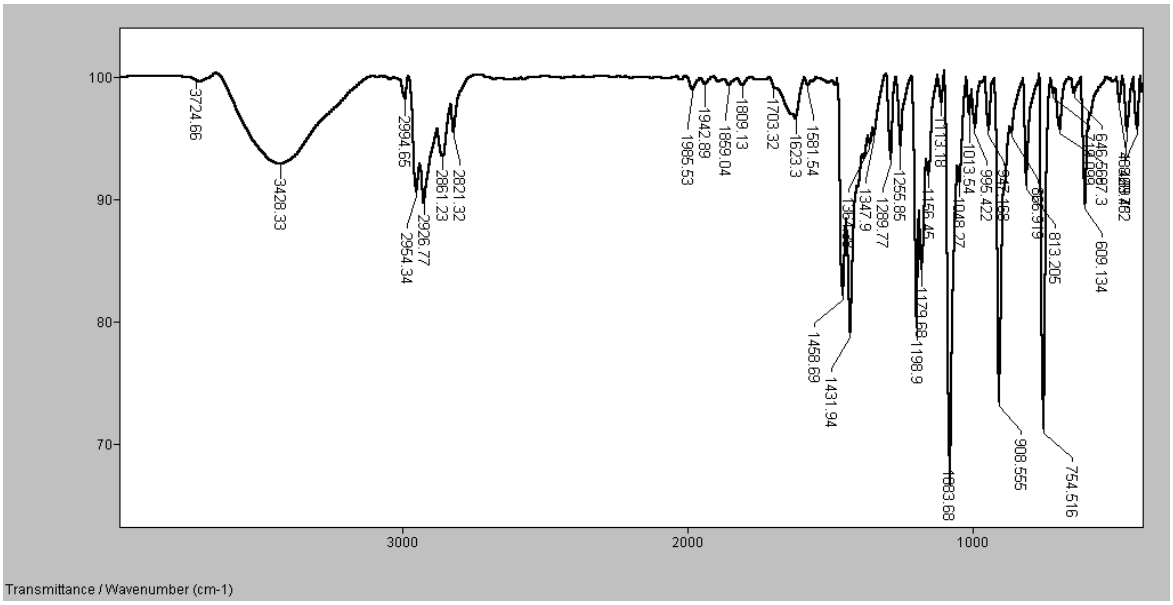


Figure S 13 - Infrared spectrum of tellurane **4**.

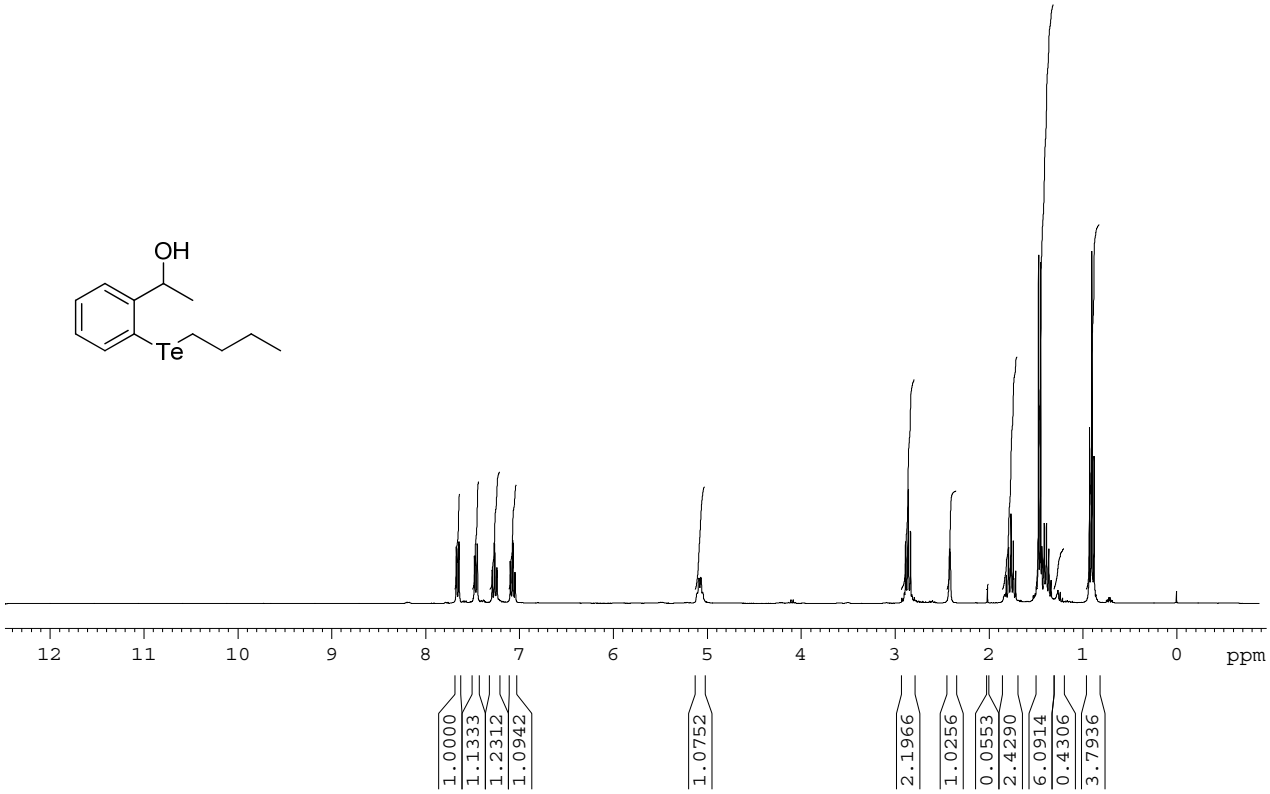


Figure S 14 - ^{1}H NMR (300 MHz, $CDCl_3$) spectrum of 1-(2-(butyltellanyl)phenyl)ethanol (**1i**).

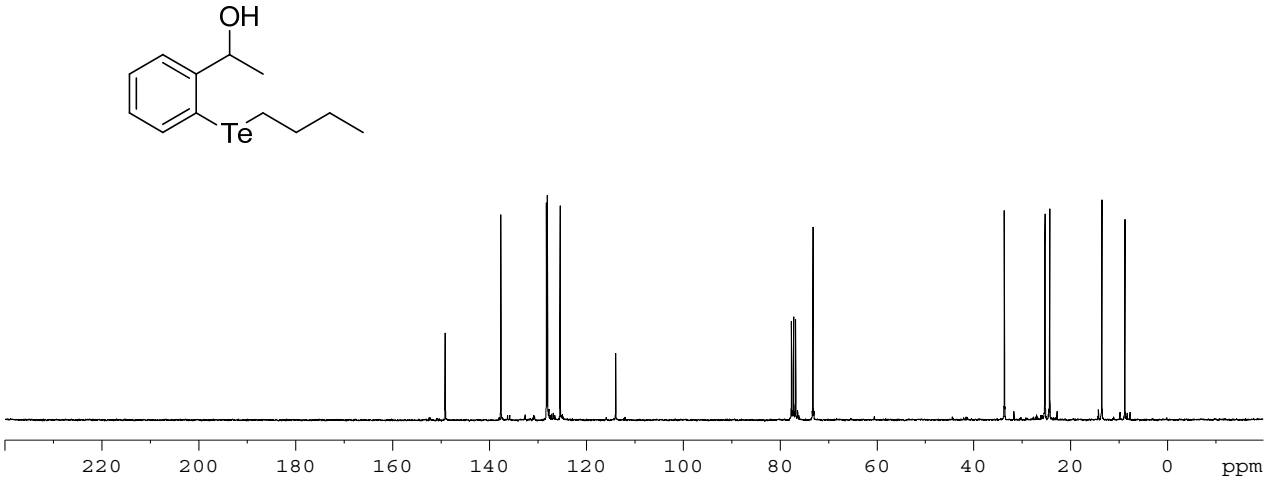


Figure S 15 - ^{13}C NMR (75 MHz, $CDCl_3$) spectrum of 1-(2-(butyltellanyl)phenyl)ethanol (**1i**).

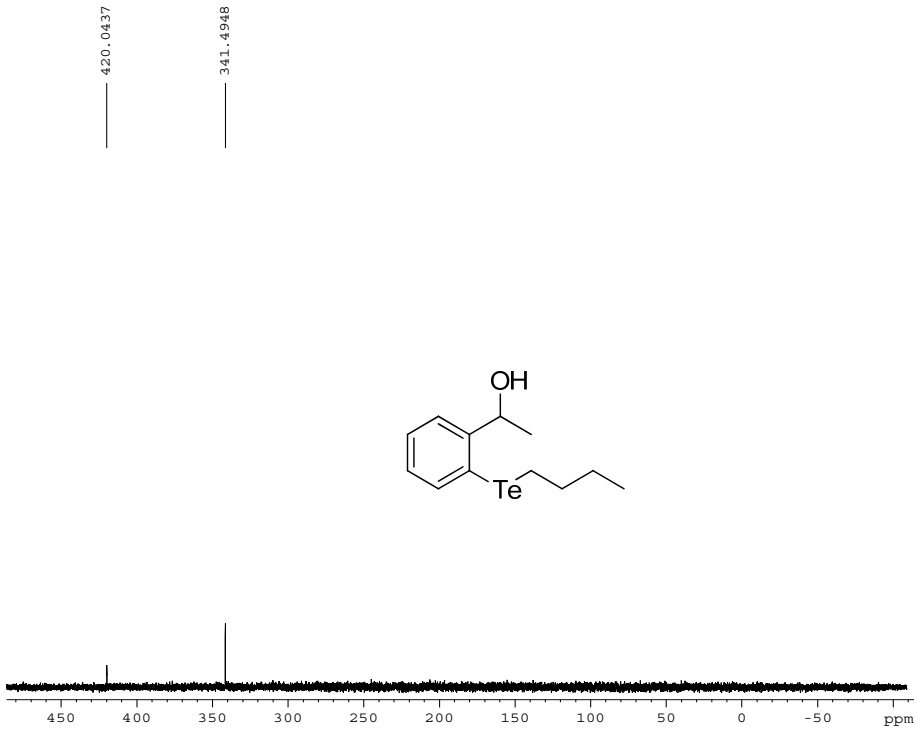


Figure S 16 - ^{125}Te NMR (94.7 MHz, $CDCl_3$) spectrum of 1-(2-(butyltellanyl)phenyl)ethanol (**1i**).

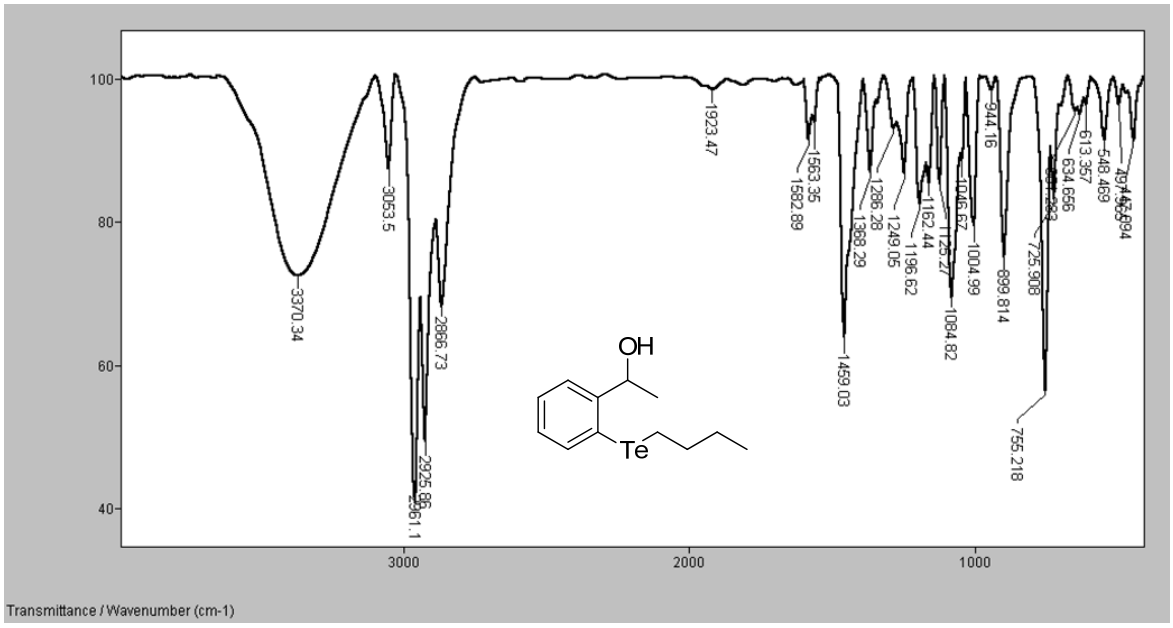


Figure S 17 - Infrared spectrum of 1-(2-(butyltellanyl)phenyl)ethanol (**1i**).

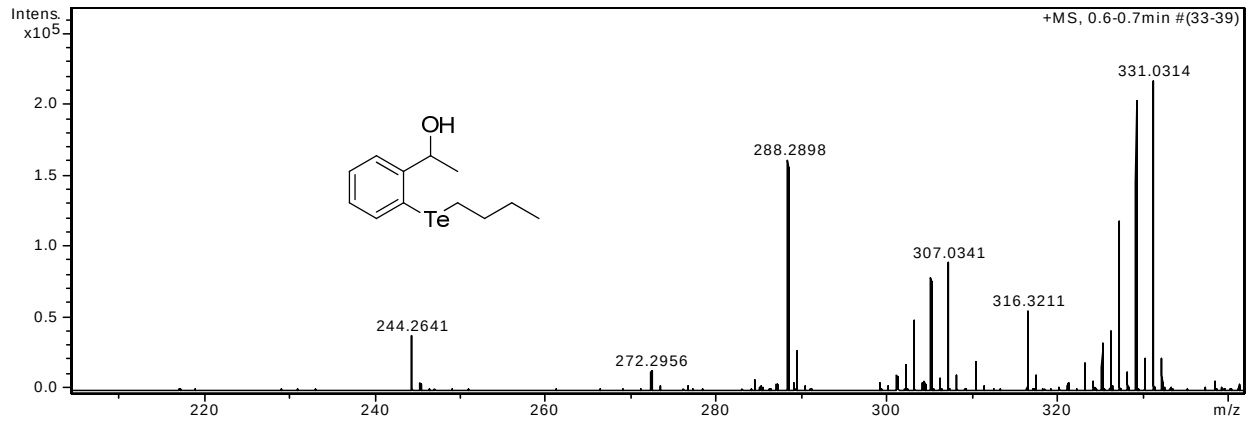


Figure S 18 - High resolution mass spectrum of 1-(2-(butyltellanyl)phenyl)ethanol (**1i**).

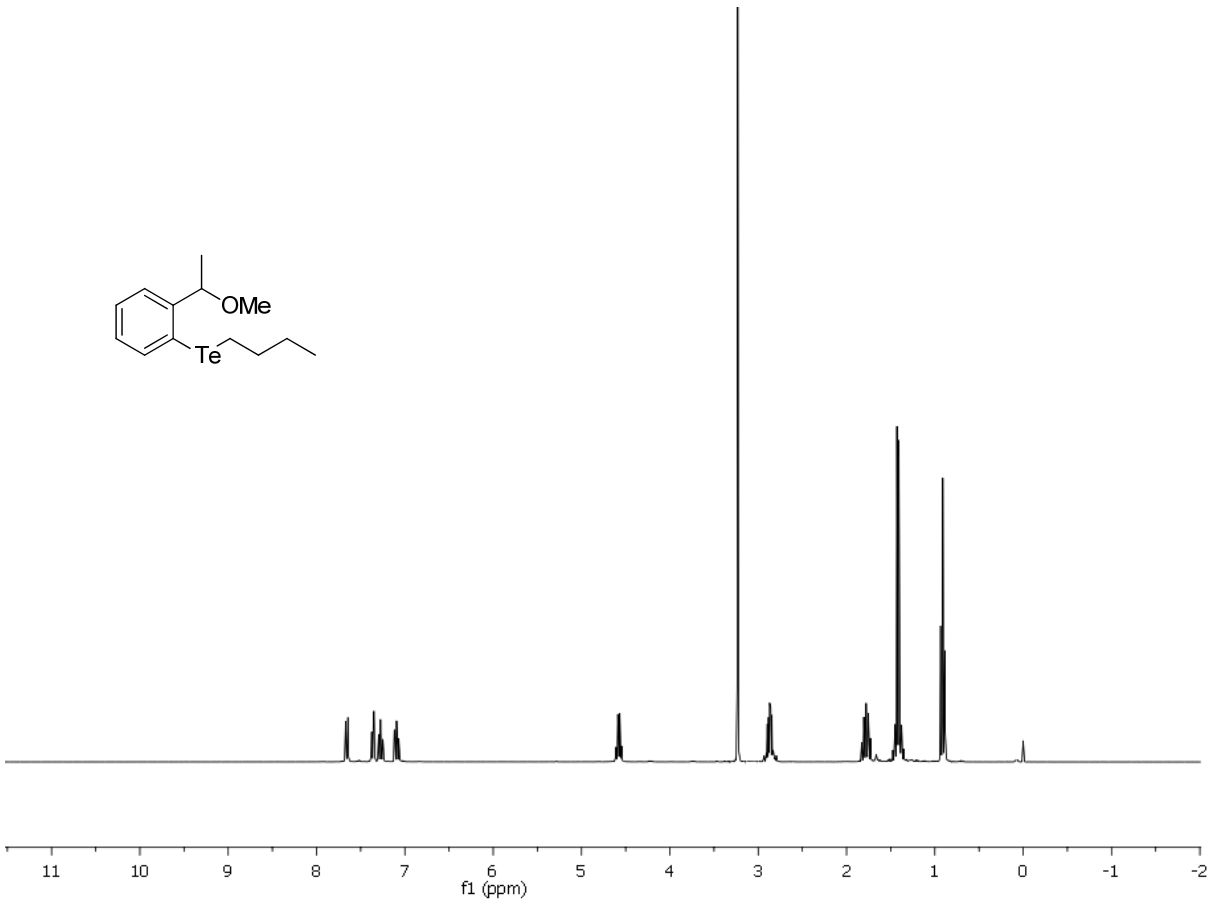


Figure S 19 - ^{1}H NMR (300 MHz, $CDCl_3$) spectrum of butyl(2-(1-methoxyethyl)phenyl)tellane (**1j**).

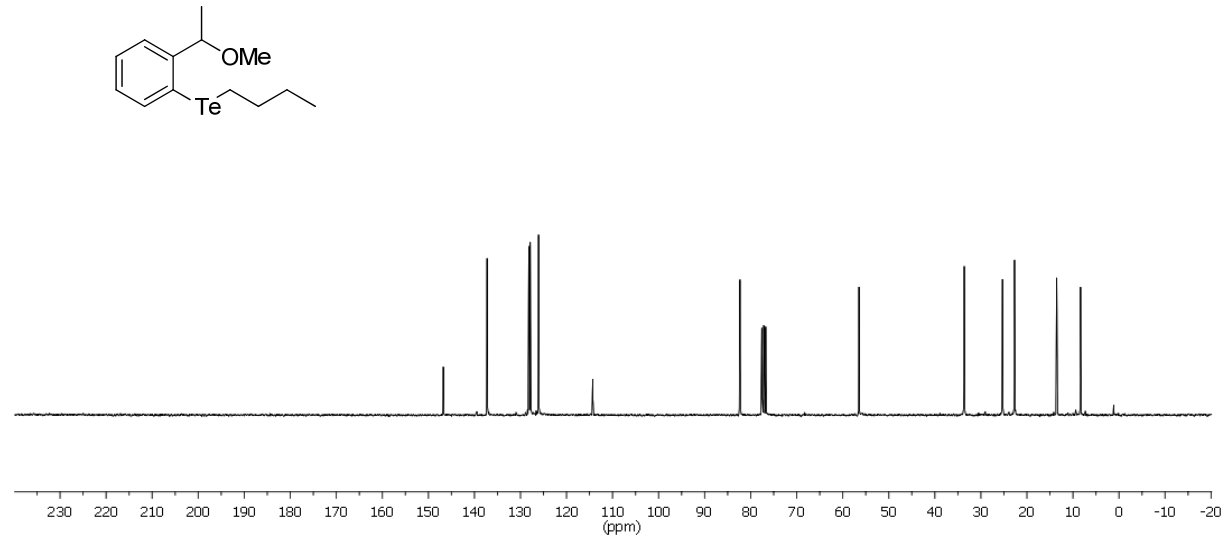


Figure S 20 - ^{13}C NMR (75 MHz, $CDCl_3$) spectrum of butyl(2-(1-methoxyethyl)phenyl)tellane (**1j**).

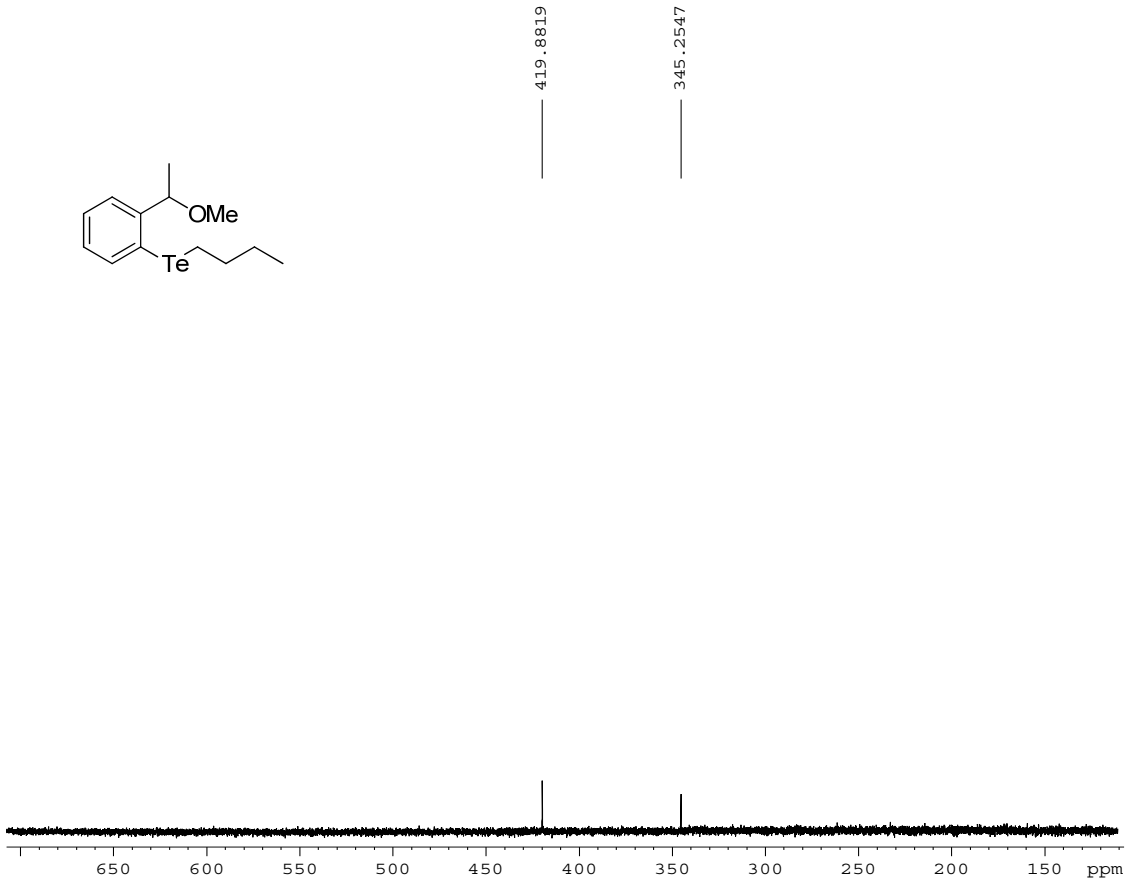


Figure S 21 - ^{125}Te NMR (94.7 MHz, $CDCl_3$) spectrum of butyl(2-(1-methoxyethyl)phenyl)tellane (**1j**).

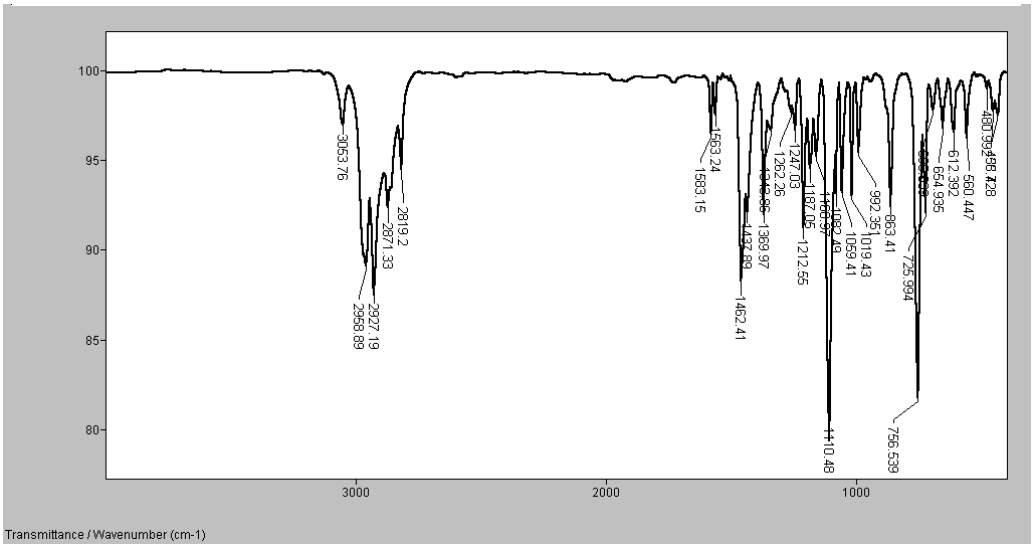


Figure S 22 – Infrared spectrum of butyl(2-(1-methoxyethyl)phenyl)tellane (**1j**).

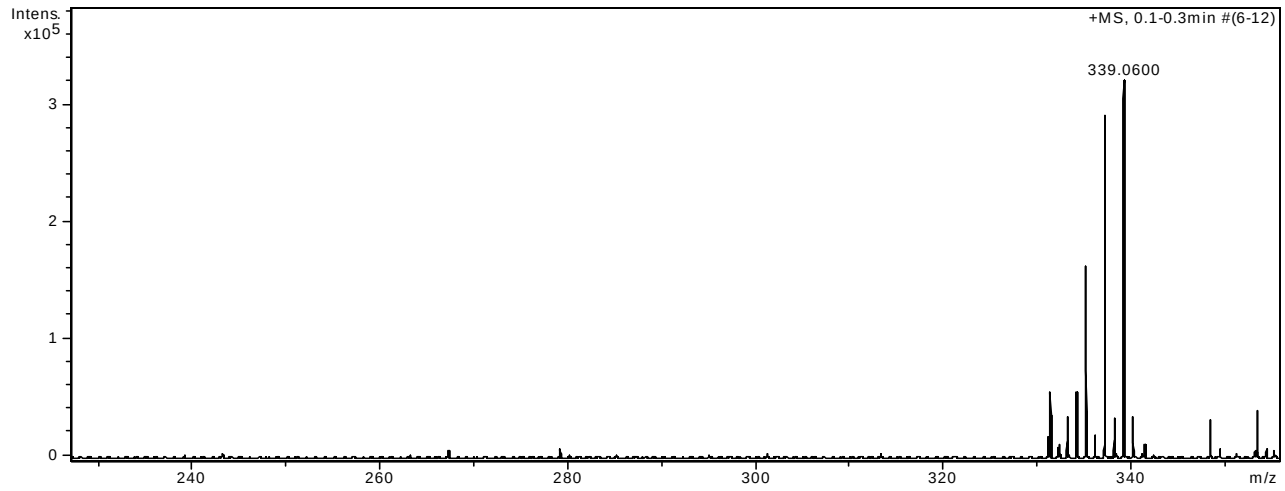


Figure S 23 - High resolution mass spectrum of butyl(2-(1-methoxyethyl)phenyl)tellane (**1j**).

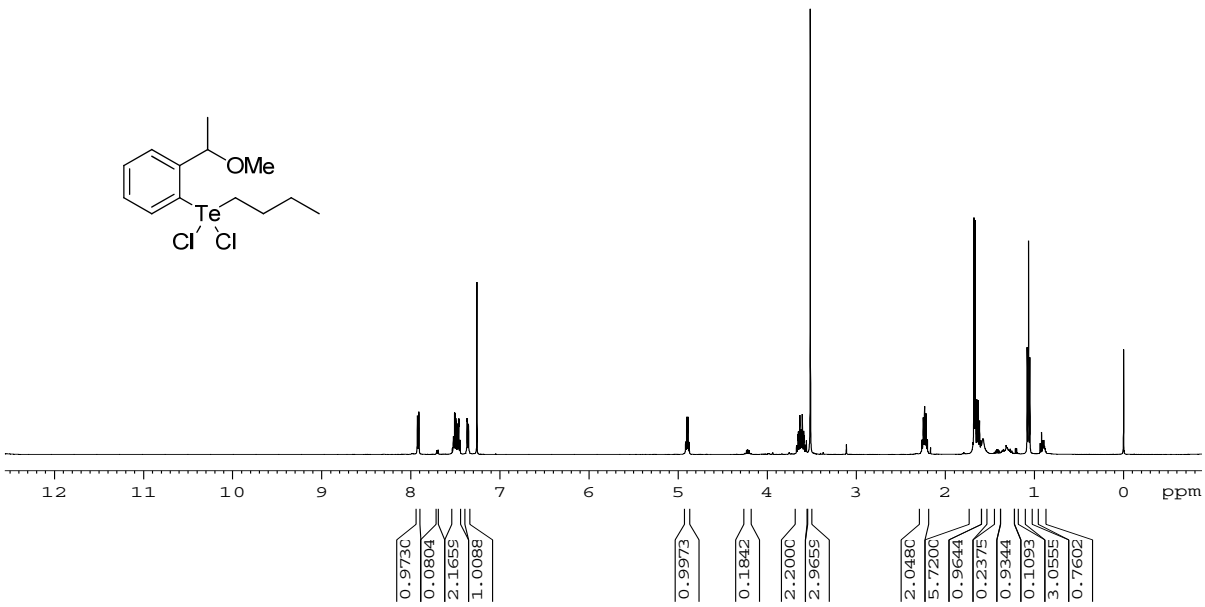


Figure S 24 - ^{1}H NMR (300 MHz, $CDCl_3$) spectrum of tellurane **11** (or **12**).

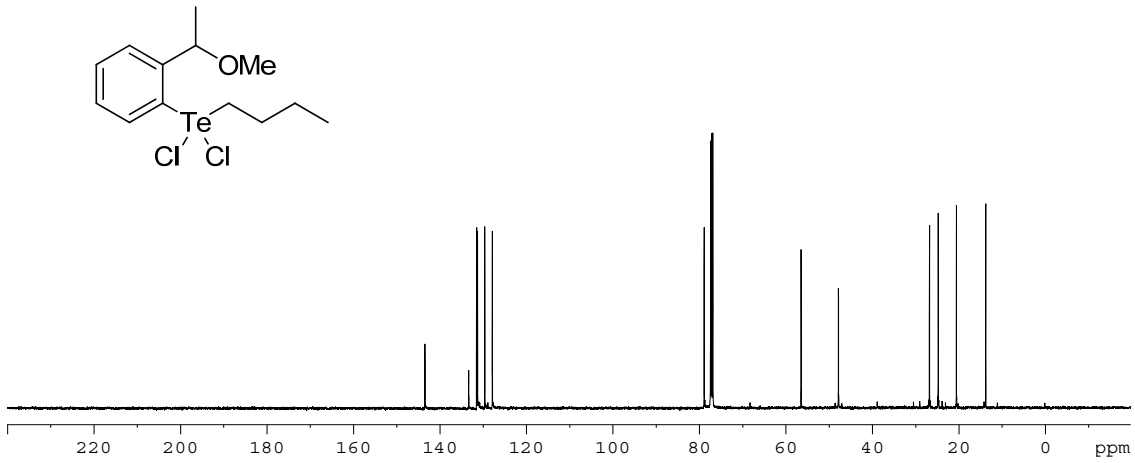


Figure S 25 - ^{13}C NMR (75 MHz, $CDCl_3$) spectrum of tellurane **11** (or **12**).

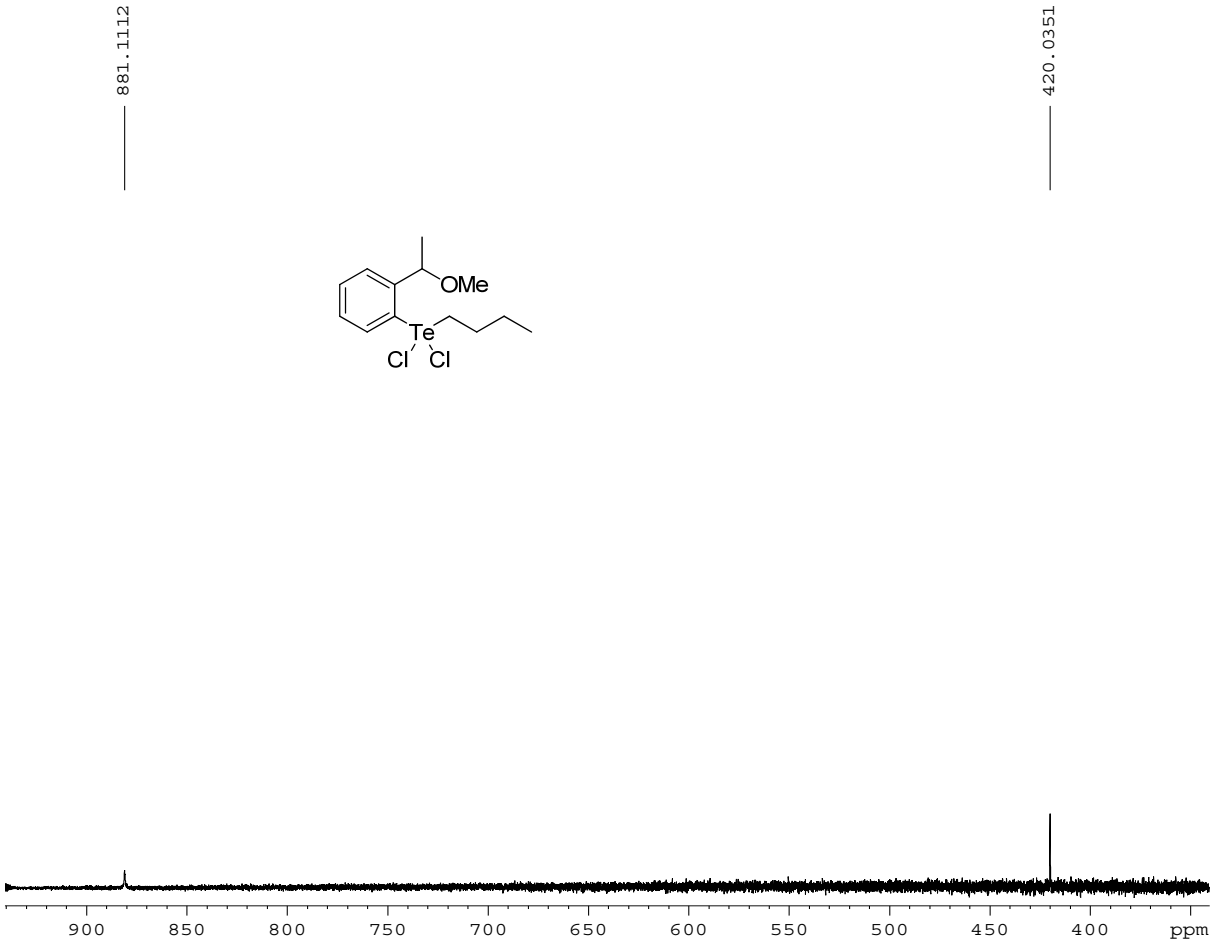


Figure S 26 - ^{125}Te NMR (94.7 MHz, $CDCl_3$) spectrum of tellurane **11** (or **12**).

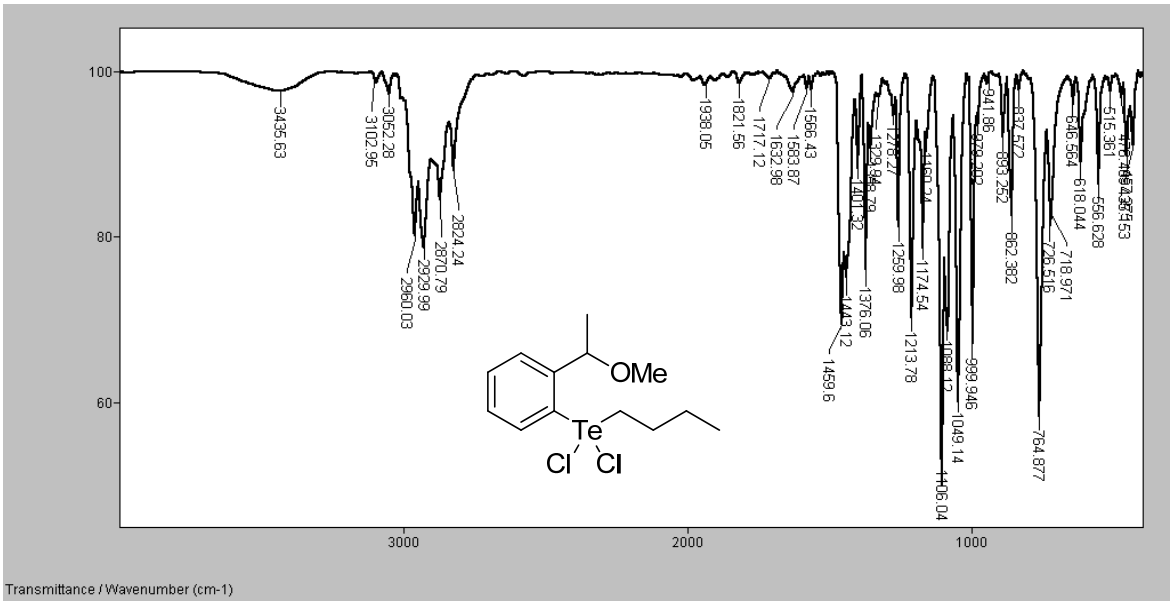


Figure S 27 – Infrared spectrum of tellurane **11** (or **12**).

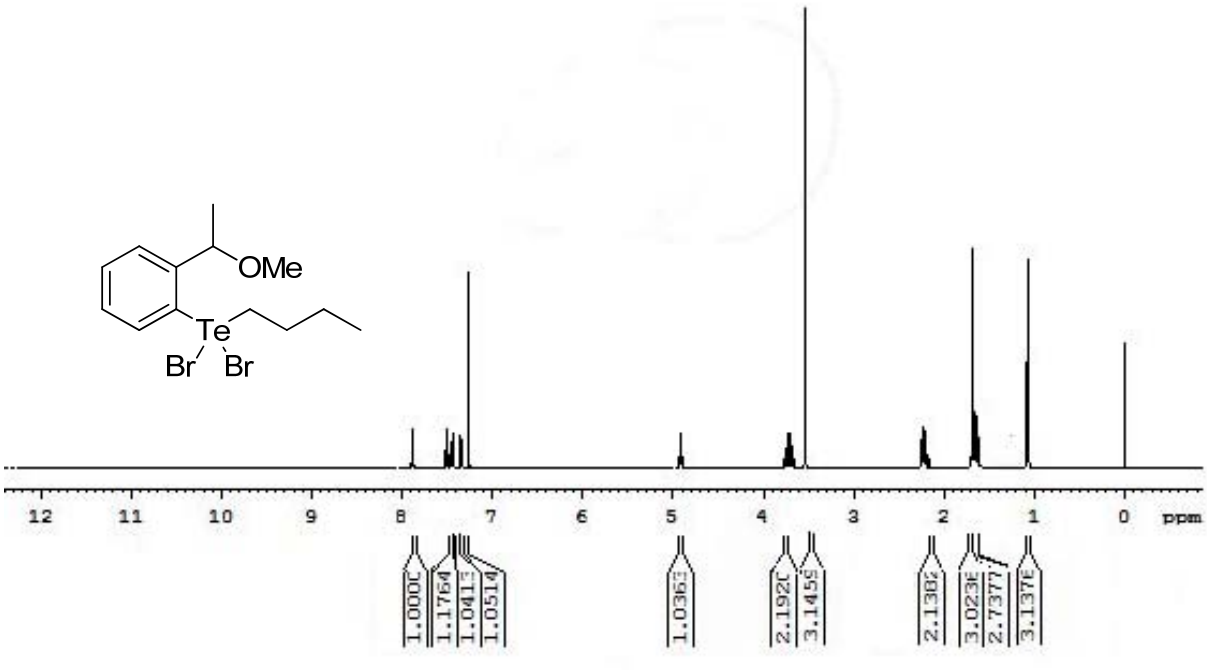


Figure S 28 - ^{1}H NMR (300 MHz, $CDCl_3$) spectrum of tellurane **7** (or **8**).

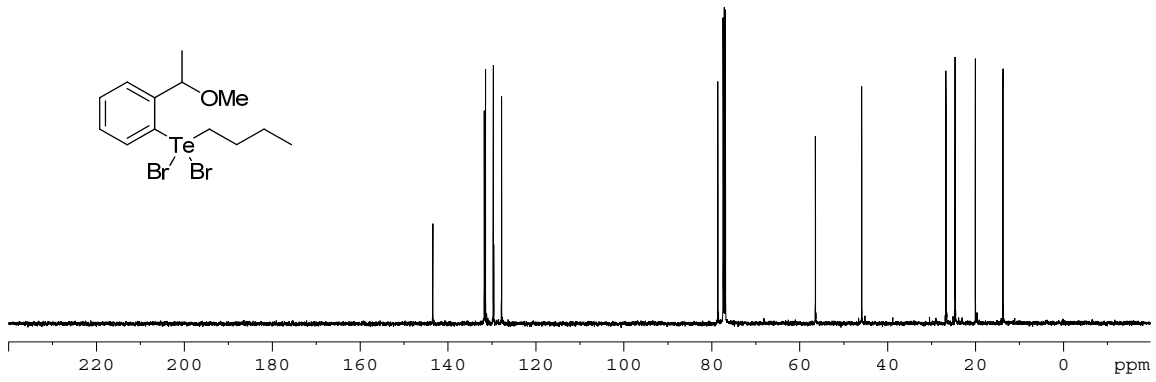
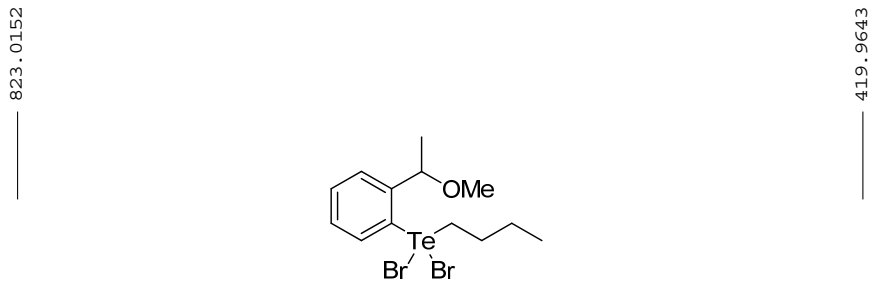


Figure S 29 - ^{13}C NMR (75 MHz, $CDCl_3$) spectrum of tellurane **7** (or **8**).



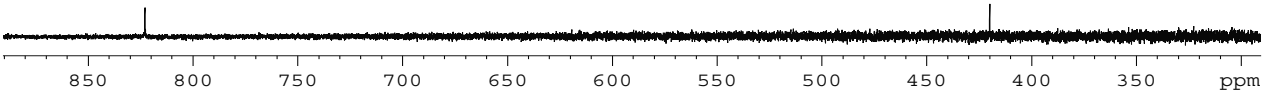


Figure S 30 - ^{125}Te NMR (94.7 MHz, $CDCl_3$) spectrum of tellurane **7** (or **8**).

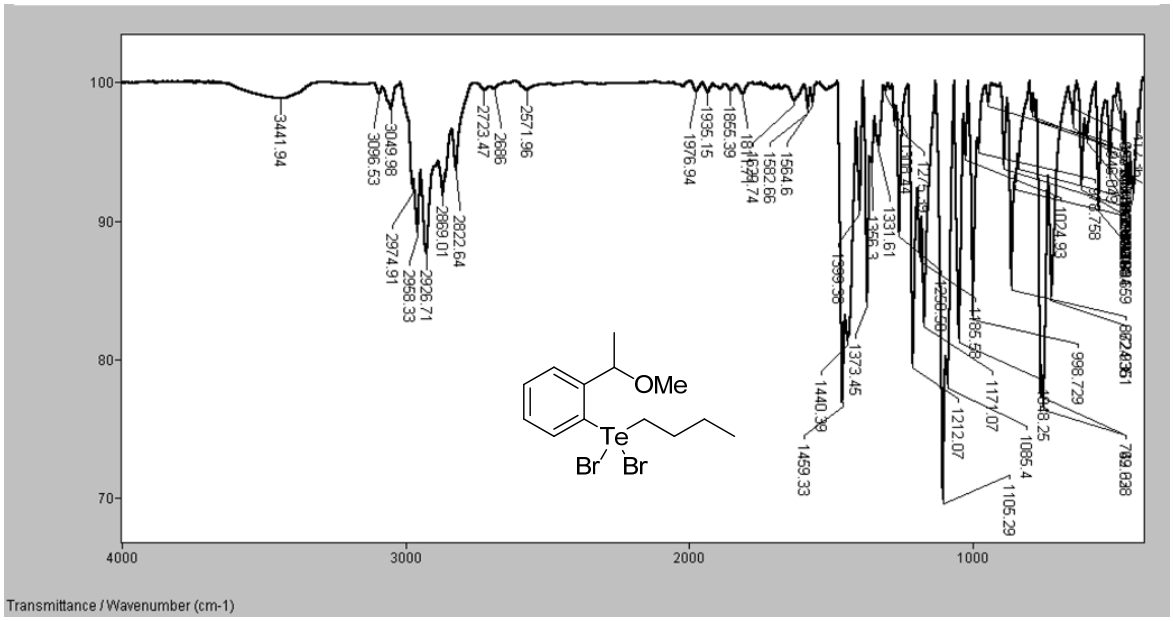


Figure S 31 – Infrared spectrum of tellurane **7** (or **8**).

Enzyme Assays.

PTP1B and VHR were expressed and purified as described previously (Shen et al., 2001). DTT was removed from the PTP stocks by dialysis against a pH 7.0 buffer containing 50 mM mM 3,3-dimethylglutarate, 150 mM NaCl at 4°C by using a spin concentrator. The dialyzed PTPs were made to 20% glycerol and stored at -80°C. Organoselenanes and organotelluranes (compounds 1-12) were dissolved in DMSO to 20 mM concentration and stored at -20 °C. PTP inactivation by each compound was studied at room temperature in pH7.0 buffer (50mM 3,3-dimethylglutarate, 150 mM NaCl, and 1 mM EDTA). The inactivation reaction was initiated by the addition of a 5-µl aliquot of the PTP stock to a 45-µL solution containing each compound at appropriate concentrations. At appropriate time intervals, aliquots of 2 µL were removed from the reaction and added to a 200-µL solution containing 20 mM *p*-nitrophenyl phosphate (*p*NPP) in pH 7.0 buffer at room temperature. The reaction was quenched by addition of 1 N NaOH. Phosphatase activity was determined by measuring the amount of *p*-nitrophenol produced from the absorbance at 405 nm using a molar extinction coefficient of 18,000 M^{-1} cm^{-1}. The nonenzymatic hydrolysis of the substrate was corrected by measuring the control without the addition of the enzyme. The kinetic parameters of the inactivation reaction were obtained by fitting the data to the following equations:

$$\frac{A_t}{A_0} = \frac{A_\infty}{A_0} - \left(\frac{A_0 - A_\infty}{A_0} \right) e^{-k_{obs} \cdot t} \qquad \text{(equation 1)}$$

$$k_{obs} = \frac{k_i \times [I]}{K_I + [I]} \qquad \text{(equation 2)}$$

Shen, K.; Keng, Y.-F.; Wu, L.; Guo, X.-L.; Lawrence, D. S.; Zhang, Z.-Y. *J. Biol. Chem.* **2001**, *276*, 47311–47319.