

Supporting information for:

An Enantioselective Approach to the Preparation of Chiral Sulfones by Ir-Catalyzed Asymmetric Hydrogenation.

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1. General methods

All reactions were conducted under dry nitrogen atmosphere using magnetic stirring. CH_2Cl_2 was freshly distilled from CaH_2 under nitrogen. THF was distilled from sodium-benzophenone under nitrogen prior to use. All reagents were purchased from commercial suppliers and used without further purification.

Chromatographic separations were performed on Kiesel gel 60 H silica gel (particle size: 0.063-0.100 mm). Thin layer chromatography (TLC) was performed on aluminum plates coated with Kieselgel 60 (0.20 mm, UV254) and visualized under ultraviolet light ($\lambda = 254 \text{ nm}$), or by staining with ethanolic phosphomolybdic acid and heating.

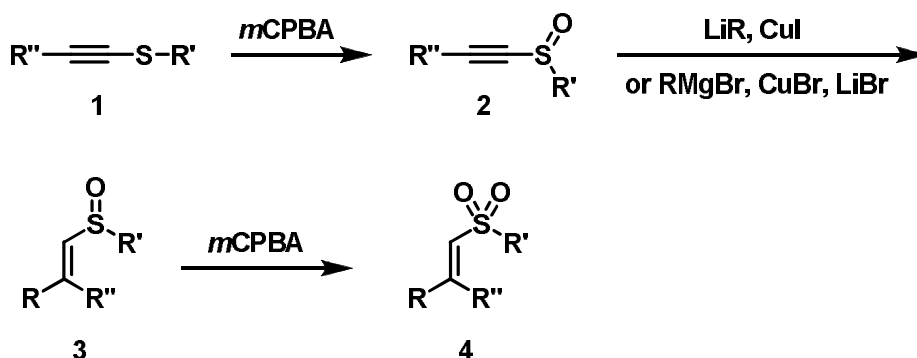
^1H NMR spectra were recorded at 500, 400 or 300 MHz in CDCl_3 at 25°C and referenced internally to the residual CHCl_3 peak (7.26 ppm). ^{13}C NMR spectra were recorded at 125, 100 or 75 MHz in CDCl_3 at 25°C and referenced to the central peak of CDCl_3 (77.16 ppm). Chemical shifts are reported in ppm (δ scale).

Optical rotations were recorded on a thermostated polarimeter using a sodium lamp (589 nm) and a 1.0 dm cell.

IR spectra were measured using an FT-IR apparatus.

Enantiomeric excesses were determined using GC and chiral HPLC (see data for individual compounds for details) with a diode array detector at 220 and 254 nm. The columns were thermostated at 20°C unless otherwise stated. Racemic compounds were used for comparison.

2. Preparation of Unsaturated Vinyl Sulfones



Sulfides **1** were prepared according to reported procedures.

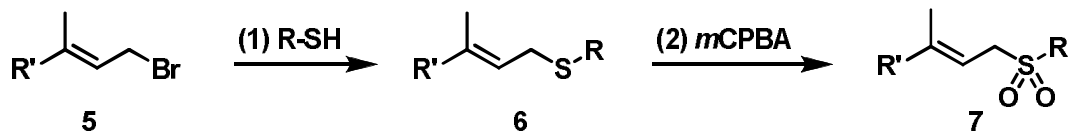
To a solution of sulfides **1** (1.0 equiv) in dry DCM (20 mL/mmol sulfide **1**) was added 3-chloroperbenzoic acid (1.0 equiv) in one portion at 0 °C and the reaction mixture was stirred at 0 °C for 2 h. The reaction was quenched with 30% aqueous Na₂SO₃ and extracted with DCM. The combined organic extracts were washed with saturated aqueous NaHCO₃ and brine, and dried with MgSO₄. The solvent was removed under reduced pressure and the residue was purified by flash column chromatography using pentane and ethyl acetate as the eluent to afford sulfoxide **2**.

When organolithium (RLi) species were used, CuI was employed in the reaction. When organomagnesium (RMgX) reagents were used, a mixture of CuBr and LiBr was employed in the reaction. The following general procedure describes the preparation of the vinyl sulfoxide compounds.

To a dry flask, CuX (1.28 eqv to sulfoxide **2**) was added under a stream of argon. THF (4 mL/mmol to CuX) was added and the mixture was cooled to -20 °C. If CuX = CuBr, then LiBr (1.28 eqv to sulfoxide **2**) in THF (0.8 mL/mmol to LiBr) was added dropwise, followed by stirring for 10 min. *No salts were added when CuI was employed.* The RLi (1.25 eqv to sulfoxide) (CuI used) or RMgX (1.25 eqv to sulfoxide **2**) (CuBr/LiBr used) reagent was added then added dropwise at -20 °C, followed by stirring for 15 min. The mixture was then cooled to -78 °C and a solution of sulfoxide **2** (1 eqv) in THF (4 mL/mmol to sulfoxide) was added dropwise. The reaction was stirred at -78 °C and monitored by TLC for the consumption of the sulfoxide (typically 1 – 4 hours). Upon completion, an excess of precooled MeOH was added to the reaction, thereafter, the reaction was poured into a saturated solution of NH₄Cl and extracted 3 times with DCM. The combined organic extracts were washed with water, followed by brine and then dried over MgSO₄ powder. The solvent was removed under *vacuo* to afford the crude vinyl sulfoxide compounds **3**, which were used in next reaction without purification.

Oxidation of sulfoxide **3** by mCPBA afforded Vinyl sulfones **4**. The procedure was the same as described for preparation **2**.

3. Preparation of Allylic Sulfones

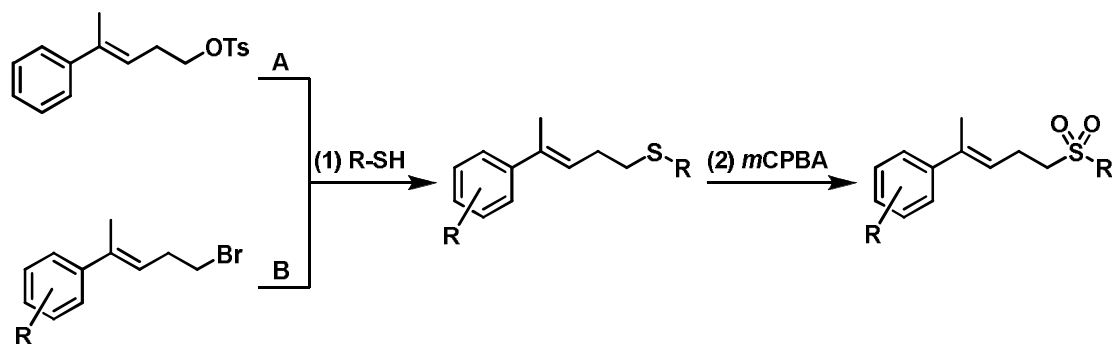


(*E*)-Allylic bromide was prepared according to reported procedures.

To a solution of thiol compounds (10 mmol, 1.0 equiv) in THF (25 mL) was added sodium methoxide (11 mmol 1.1 equiv) at 0 °C. Allylic bromide **5** (10 mmol, 1.0 equiv) was added dropwise at 0 °C. The reaction mixture was stirred at r.t. overnight. The reaction was diluted with EtOAc and then washed with water and brine. The solvent was removed under reduced pressure and used in next reaction without purification.

Oxidation of sulfides **6** by mCPBA (2.1 equiv) afforded allylic sulfones **7**. The procedure was the same as described for preparation **2**.

4. Preparation of Homoallylic Sulfones



Method A:

To a suspension of thiol compound (7.4 mmol, 1.0 equiv.) and K₂CO₃ (13.5 mmol, 1.8 equiv.) in CH₃CN (34 mL) at 0°C, a solution of **5** (6.8 mmol, 0.9 equiv.) in CH₃CN (17 mL) was added dropwise. The reaction mixture was allowed to warm to room temperature and stirred for 4 days. Then it was hydrolyzed with ice-water and extracted with diethyl ether. The combined extracts, which contain water because of CH₃CN, were concentrated in *vacuo* until phase separation. Diethyl ether was added, and the aqueous phase was separated. The organic phase was dried over MaSO₄ and concentrated in *vacuo*. The residue was purified by flash column chromatography to afford **6** (1.59 g, 5.92 mmol) as a colorless oil³.

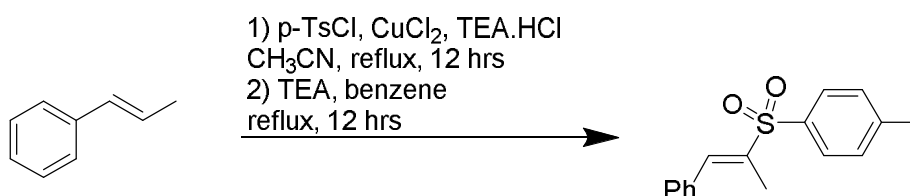
Method B:

To a solution of thiol compounds (10 mmol, 1.0 equiv) in THF (25 mL) was added sodium methoxide (11 mmol 1.1 equiv) at 0 °C. Allylic bromide **5** (10 mmol, 1.0

equiv) was added dropwise at 0 °C. The reaction mixture was stirred at r.t. overnight. The reaction was diluted with EtOAc and then washed with water and brine. The solvent was removed under reduced pressure and used in next reaction without purification.

Oxidation of sulfides **6** by mCPBA (2.1 equiv) afforded allylic sulfones **7**. The procedure was the same as described for preparation **2**.

5 Preparation alpha-substituted unsaturated sulfone

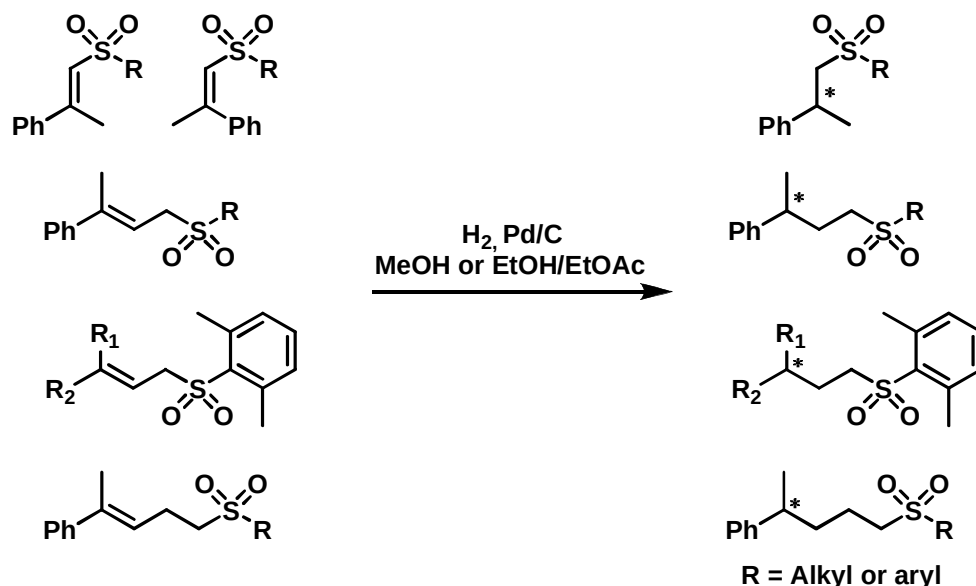


This substrate was prepared using a modified procedure by Doomes and Overton.¹³ 1-phenylpropene (1.0 eqv, 1 g, 8.462 mmols), *para*-toluenesulfonyl chloride (1.0 eqv., 1.61 g), anhydrous cupric chloride (CuCl₂ – 1.0 eqv., 1.14 g), triethylamine hydrochloride (1.5 eqv., 1.75 g) and acetonitrile (HPLC grade, 4g per mmol 1-phenylpropene, 44 mL) were mixed heated to reflux on an oil bath *ca* 12 hours under argon. The reaction was then cooled to room temperature and then 80 mL of 1M HCl was added followed by 80 mL of CH₂Cl₂ and the organic layer separated. The aqueous layer was extracted 2x more with 60 mL CH₂Cl₂. The combined organic was washed with brine and dried using anhydrous Na₂SO₄. The solvent was removed under reduced pressure to obtain 2.2 grams of brown crude material.

The crude material (2.2 g) was taken up in benzene (reagent grade, 5 mL/mmol 1-phenylpropene, 42 mL), and triethylamine (10 eqv., 11.8 mL) was added in one shot at room temperature. The mixture was refluxed *ca* 12 hours. The reaction was cooled to room temperature and then filtered through a 2 cm pad of celite, and then treated with 200 mL of 5 % HCl. The benzene layers was separated and washed with brine and then dried over anhydrous Na₂SO₄. The benzene was removed under reduced pressure and the crude material purified by flash chromatography (20 cm x 2 cm) on silica gel, pentane:ethyl acetate – 9:1. To afford the pure alpha-substituted unsaturated sulfone in 17 % yield.

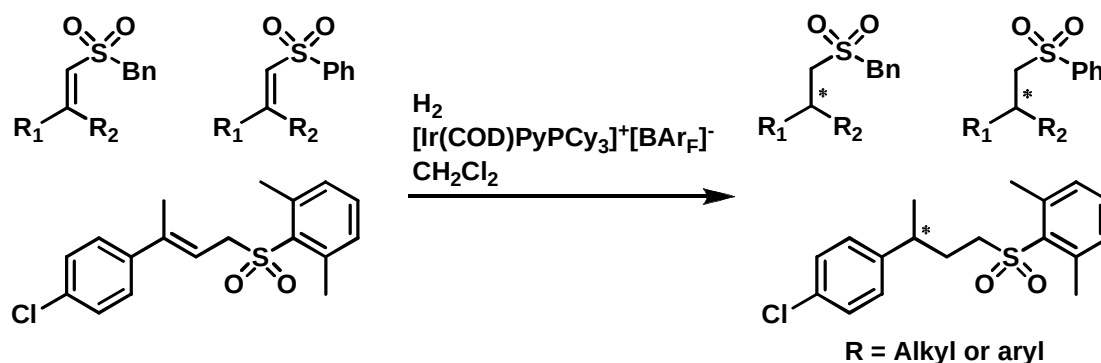
6. General Procedures for Preparation of Racemates

Method A



Unsaturated sulfones (1.0 equiv) and Pd/C (10wt%, 50 mg/mmol) was suspended in HPLC grade methanol (5 mL/mmol). The suspension was placed in a low-pressure hydrogenation apparatus, purged three times with argon then pressurized to two bars with H_2 . After stirring over night the solvent was removed in vacuo and the product re-dissolved in ethyl acetate. Filtration through a plug of celite followed by evaporation of solvent afforded crude material that was purified by column chromatography.

Method B

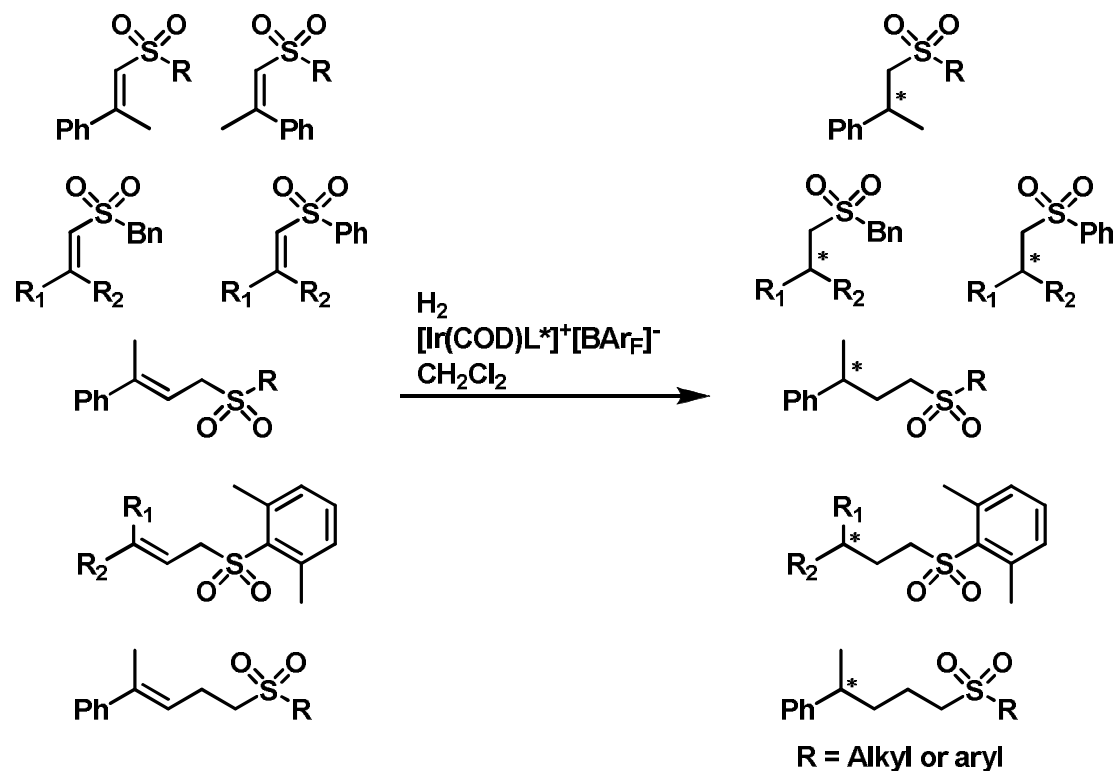


$[\text{Ir}(\text{COD})\text{PyPCy}_3]^+ [\text{BAR}_\text{F}]^-$ (Crabtree- BAR_F catalyst) was synthesized according to previously reported procedures.¹⁰

Alkene (1.0 equiv) and Crabtree- BAR_F catalyst (10 mol%) was dissolved in dry CH_2Cl_2 (5 mL/mmol). The solution was placed in a low-pressure hydrogenation apparatus, purged three times with argon then pressurized to two bar with H_2 . After

stirring over night the solvent was evaporated yielding crude product that was purified by column chromatography.

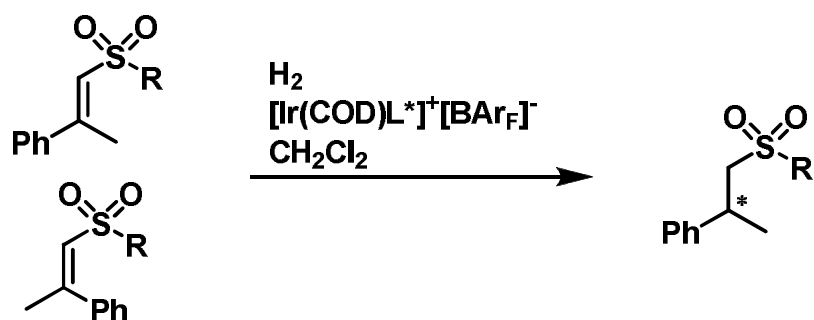
7. General Procedure for Asymmetric Hydrogenation



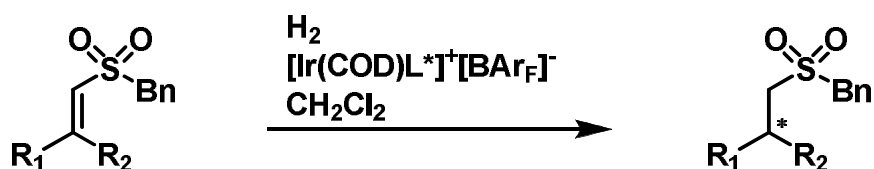
Ir-complexes were prepared according to previously reported procedures.¹⁻⁶

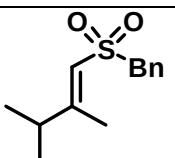
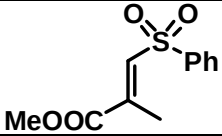
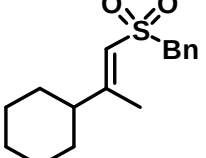
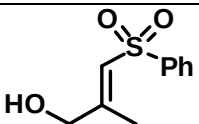
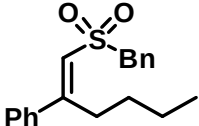
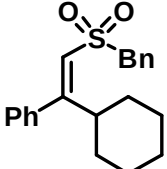
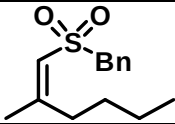
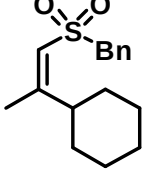
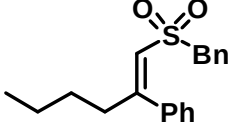
A vial was charged with substrate (0.25 mmol) and Ir-complex (0.5 mol %). Dry, distilled, CH_2Cl_2 (2 mL) was added and the vial was placed in a high-pressure hydrogenation apparatus. The reactor was purged three times with H_2 , then filled to the 50 bar pressure with H_2 . The reaction was stirred at room temperature for 17 hours before the H_2 pressure was released and the solvent was removed in vacuo. The crude product was filtered through on a short plug of silica. Conversions were determined by ^1H NMR spectroscopy and *ee* values were determined using chiral HPLC or GC.

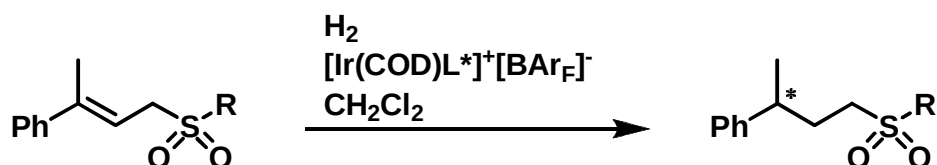
One gram hydrogenation of 6c: To 40 mL glass hydrogenation tube was charged substrate (1 g, 3.68 mmol) and Ir-complex (0.5 mol %, 30 mg). Dry, distilled, CH_2Cl_2 (6 mL/mmol, 22 mL) was added and the vial was placed in a high-pressure hydrogenation apparatus (Parr MRS 5000). The reactor was purged three times with Ar (6 bar) and then three times with H_2 , then filled to the 50 bar pressure with H_2 . The reaction was stirred a set temperature of 25 °C for 17 hours before the H_2 pressure was released and the solvent was removed in vacuo. NMR of the crude revealed full conversion of the starting material, and the hydrogenated species to be the only compound. The crude product was purified by gravity chromatography on silica gel (10 cm x 2 cm) using pentane:diethyl ether – 1:1 to afford the product as a white solid (990 mg, 98 % yield). The *ee* values were determined using chiral HPLC.

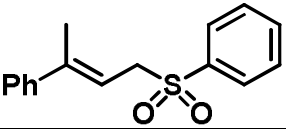
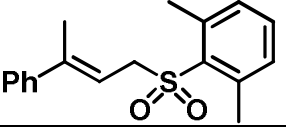
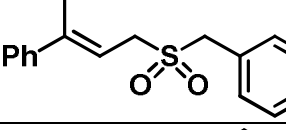
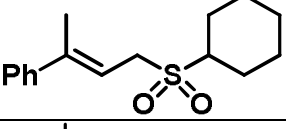
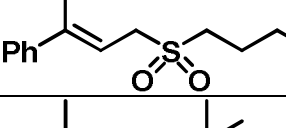
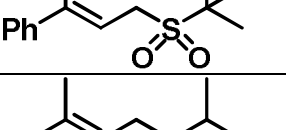
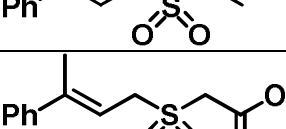
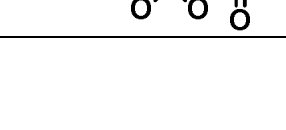


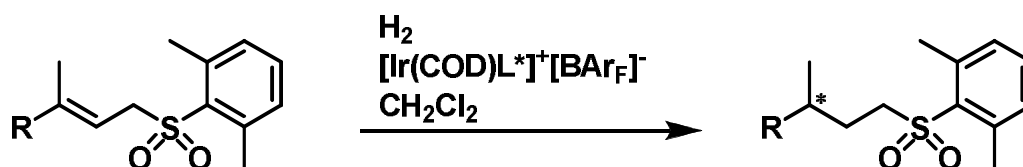
Entry	Substrate	T _{R1} (min)	T _{R2} (min)	Separation method
1		46.45(-) major	54.97(+) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
2		49.44(+) minor	82.98(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
3		22.67(+)- (R) minor	23.99(-)-(S) major	HPLC: chiralpak IA column; 220 nm, 20 °C; n-hexane:2-PrOH 90:10, 0.5mL/min.
4		22.41(-) major	25.25(+) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
5		50.23(-) minor	54.80(+) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
6		48.54(+) major	89.77(-) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
7		28.29(-)-(R) major	31.48 (+)-(S) minor	HPLC: chiralpak IA column; 220 nm, 20 °C; n-hexane:2-PrOH 90:10, 0.5mL/min.
8		33.04(+) major	36.07(-) minor	HPLC: chiralpak IA column; 220 nm, 20 °C; n-hexane:2-PrOH 95:5, 0.5mL/min.



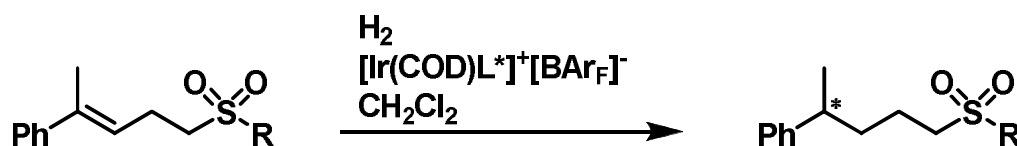
Entry	Substrate	T _{R1} (min)	T _{R2} (min)	Separation method
1		33.20(+) major	41.60(-) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
2		71.41(+) major	77.14(-) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
3		75.65(+) major	114.82(-) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 95:5, 0.5mL/min.
4		67.03(+) minor	125.84(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
5		92.07(+) major	148.63(-) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 95:5, 0.5mL/min.
6		48.54(-) major	89.77(+) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
7		70.78(+) minor	77.81(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 95:5, 0.5mL/min.
8		33.54(-) major	49.67(+) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
9		39.45(+) minor	55.86(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.



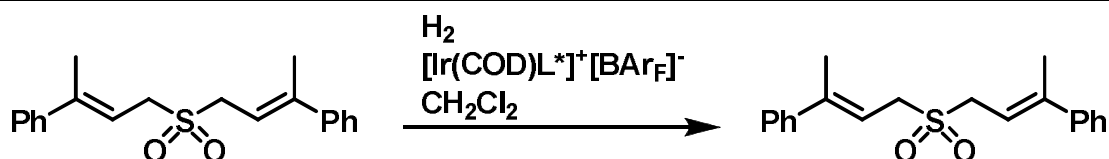
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1		22.88(-) major	25.08(+) minor	HPLC: chiralpak IA column; 220 nm, 20 °C; n-hexane:2-PrOH 90:10, 0.5mL/min.
2		22.77(+) minor	29.16(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
3 ¹		71.82(+) minor	92.57(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
4		65.30(+) minor	85.84(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
5		60.07(+) minor	71.69(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
6		19.15(+) minor	21.55(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
7		37.29(+) minor	53.96(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
8		59.43(+) minor	72.61(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 80:20, 0.5mL/min.

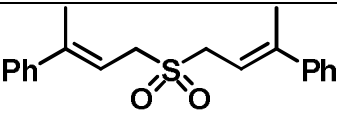


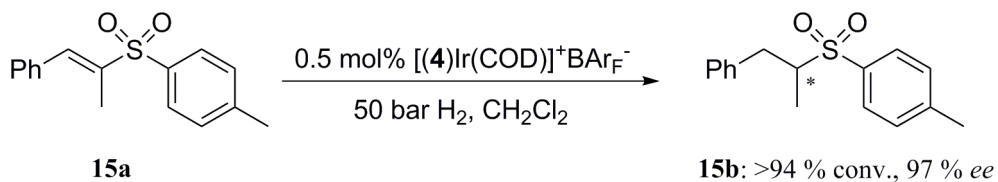
Entry	Substrate	T _{R1} (min)	T _{R2} (min)	Separation method
1		17.44(-) major	28.57(+) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
2		22.67(+) minor	35.20(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.
3		92.81(-) major	116.94(+) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 99:1, 0.5mL/min.
5		19.81(+) minor	21.38(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 95:5, 0.5mL/min.
6		15.62(-) minor	16.93(+) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 97:3, 0.5mL/min.

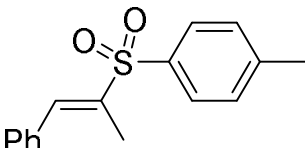


Entry	Substrate	T _{R1} (min)	T _{R2} (min)	Separation method
1		64.59(-) major	78.70(+) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 80:20, 0.5mL/min.
2		22.01(-) major	25.71(+) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 80:20, 0.5mL/min.

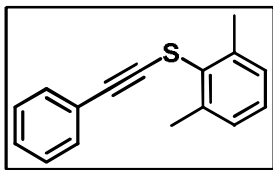


Entry	Substrate	T _{R1} (min)	T _{R2} (min)	Separation method
1		100.06(+) minor	125.48(-) major	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 85:15, 0.5mL/min.



Entry	Substrate	T _{R1} (min)	T _{R2} (min)	Separation method
1		41.38(+) major	45.00(-) minor	HPLC: chiracel AS-H column; 220 nm, 20 °C; n-hexane:2-PrOH 90:10, 0.5mL/min.

8. Characterization of new compounds



(2,6-dimethylphenyl)(phenylethynyl)sulfane

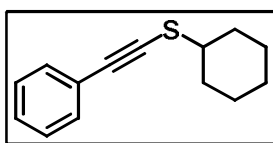
Colorless oil; yield: 70%; $R_f = 0.52$ (EtOAc/Pentane = 1/49).

^1H NMR (CDCl_3 , 500 MHz): δ 7.48-7.45 (m, 2H), 7.36-7.34 (m, 3H), 7.29-7.22 (m, 3H), 2.73 (s, 6H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 142.1, 131.6, 129.9, 129.2, 128.7, 128.3, 128.1, 123.6, 90.9, 78.7, 22.1.

IR (neat, cm^{-1}): 2954, 2925, 2167, 1595, 1487, 1460, 1441, 1027, 771, 753, 689.

HRMS-CI calcd for $\text{C}_{16}\text{H}_{14}\text{S}$ $[\text{M}]^+$: 238.0816, found 238.0815.



cyclohexyl(phenylethynyl)sulfane

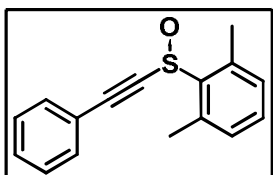
Colorless oil; yield: %; $R_f = 0.62$ (EtOAc/Pentane = 1/49).

^1H NMR (CDCl_3 , 400 MHz): δ 7.43-7.40 (m, 2H), 7.31-7.28 (m, 3H), 3.00 (tt, $J = 11.2, 3.6$ Hz, 1H), 2.14-2.08 (m, 2H), 1.85-1.80 (m, 2H), 1.67-1.52 (m, 3H), 1.42-1.21 (m, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 131.5, 128.4, 128.0, 123.9, 94.7, 78.7, 47.8, 33.2, 26.2, 25.6.

IR (neat, cm^{-1}): 2928, 2853, 2164, 1595, 1487, 1448, 1262, 1200, 995, 751, 688.

HRMS-CI calcd for $\text{C}_{14}\text{H}_{16}\text{S}$ $[\text{M}]^+$: 216.0973, found 216.0974.



1,3-dimethyl-2-(phenylethynylsulfinyl)benzene

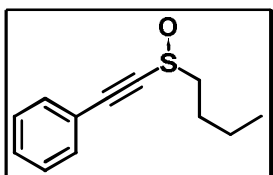
Colorless oil; yield: 71 %; $R_f = 0.43$ (EtOAc/Pentane = 1/5).

^1H NMR (CDCl_3 , 300 MHz): δ 7.50 (d, $J = 7.9$ Hz, 2H), 7.45-7.33 (m, 3H), 7.30 (t, $J = 7.5$ Hz, 1H), 7.14 (d, $J = 7.6$ Hz, 2H), 2.77 (s, 6H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 19.6, 103.1, 120.3, 128.7, 130.1, 130.5, 131.9, 132.3, 138.9, 140.1.

IR (neat, cm^{-1}): 3058, 2157, 1582, 1488, 1462, 1442, 1381, 1118, 1069, 1035, 831, 776, 757, 689.

HRMS-CI calcd for $\text{C}_{16}\text{H}_{14}\text{OS}$ $[\text{M}+\text{H}]^+$: 255.0844, found 255.0844



(butylsulfinylethynyl)benzene

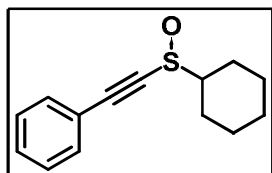
Colorless oil; yield: 70%; $R_f = 0.20$ (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 500 MHz): δ 7.54-7.52 (m, 2H), 7.47-7.43 (m, 1H), 7.40-7.36 (m, 2H), 3.22-3.11 (m, 2H), 2.01-1.83 (m, 2H), 1.61-1.48 (m, 2H), 1.00 (t, $J = 7.6$ Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 132.4, 130.7, 128.8, 120.0, 102.2, 85.4, 56.3, 24.61, 21.9, 13.9.

IR (neat, cm^{-1}): 2959, 2931, 2163, 1666, 1488, 1443, 1243, 1072, 1045, 830, 756, 688.

HRMS-CI calcd for $\text{C}_{12}\text{H}_{15}\text{OS}$ $[\text{M}+\text{H}]^+$: 207.0844, found 207.0846.



(cyclohexylsulfinylethynyl)benzene

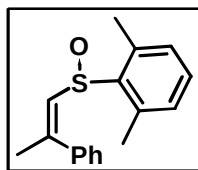
White solid; mp = 79.0-80.0 $^{\circ}\text{C}$; yield: 81 %; $R_f = 0.20$ (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 400 MHz): δ 7.55-7.53 (m, 2H), 7.467.35 (m, 3H), 3.04 (tt, $J = 11.6$, 3.6 Hz, 1H), 2.67-2.19 (m, 2H), 1.99-1.93 (m, 2H), 1.78-1.73 (m, 1H), 1.64-1.54 (m, 2H), 1.48-1.24 (m, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 132.4, 130.6, 128.7, 120.2, 102.9, 84.3, 63.8, 25.9, 25.7, 25.6, 25.5.

IR (neat, cm^{-1}): 2930, 2855, 2161, 1488, 1443, 1057, 829, 755, 688.

HRMS-CI calcd for $\text{C}_{14}\text{H}_{17}\text{OS}$ $[\text{M}+\text{H}]^+$: 233.1000, found 233.1001.



(Z)-1,3-dimethyl-2-(2-phenylprop-1-enylsulfinyl)benzene

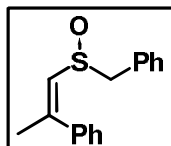
Colorless oil; yield: 99 %; $R_f = 0.45$ (EtOAc/Pentane = 2/1).

^1H NMR (CDCl_3 , 300 MHz): δ 7.33-7.26 (m, 5H), 7.09 (t, $J = 7.6$ Hz, 1H), 6.90 (d, $J = 7.5$ Hz, 2H), 6.80 (d, $J = 1.5$ Hz, 1H), 2.30 (s, 6H), 2.11 (d, $J = 1.2$ Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 151.2, 140.0, 138.7, 138.2, 130.7, 130.3, 130.0, 128.6, 128.5, 128.3, 127.6, 26.0, 19.3.

IR (neat, cm^{-1}): 2972, 1594, 1573, 1491, 1459, 1435, 1379, 1025, 761, 699

HRMS-CI calcd for $\text{C}_{17}\text{H}_{18}\text{OS}$ $[\text{M}+\text{H}]^+$: 271.1157, found 271.1158



(Z)-1-(benzylsulfinyl)prop-1-en-2-ylbenzene

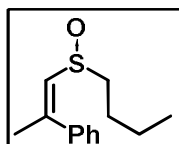
White solid; mp = 88.6-89.7 $^{\circ}\text{C}$; yield: 49 %; $R_f = 0.16$ (EtOAc/DCM = 1/4).

^1H NMR (CDCl_3 , 400 MHz): δ 7.39-7.35 (m, 3H), 7.33-7.24 (m, 6H), 6.88-6.85 (m, 2H), 6.25 (q, $J = 1.2$ Hz, 1H), 4.14 (d, $J = 12.4$ Hz, 1H), 3.99 (d, $J = 12.4$, 1H), 2.22 (d, $J = 1.2$ Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 152.6, 138.5, 131.2, 130.5, 130.1, 128.9, 128.7, 128.4, 128.3, 127.6, 60.6, 25.9.

IR (neat, cm^{-1}): 2937, 1492, 1430, 1073, 1017, 996, 834, 759, 694.

HRMS-CI calcd for $\text{C}_{16}\text{H}_{16}\text{OS}$ $[\text{M}]^+$: 256.0922, found 256.0920.



(Z)-1-(butylsulfinyl)prop-1-en-2-ylbenzene

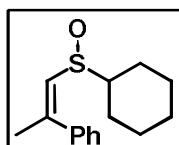
Colorless oil; yield: quantitative; $R_f = 0.16$ (EtOAc/DCM = 1/4).

^1H NMR (CDCl_3 , 400 MHz): δ 7.38-7.36 (m, 3H), 7.28-7.25 (m, 2H), 6.31 (q, $J = 1.2$ Hz, 1H), 2.88-2.81 (m, 1H), 2.71-2.64 (m, 1H), 2.26 (d, $J = 1.6$ Hz, 3H), 1.69-1.62 (m, 2H), 1.49-1.34 (m, 2H), 0.92 (t, $J = 7.2$ Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 151.8, 138.7, 131.9, 128.9, 128.5, 127.8, 54.1, 25.9, 24.8, 22.1, 13.8.

IR (neat, cm^{-1}): 2927, 2853, 1492, 1444, 1022, 998, 762, 699.

HRMS-Cl calcd for $\text{C}_{13}\text{H}_{18}\text{OS}$ $[\text{M}]^+$: 222.1078, found 222.1089.



(Z)-1-(cyclohexylsulfinyl)prop-1-en-2-ylbenzene

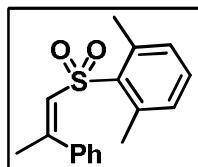
Colorless oil; yield: 90%; $R_f = 0.13$ (EtOAc/DCM = 1/4).

^1H NMR (CDCl_3 , 500 MHz): δ 7.37-7.34 (m, 3H), 7.28-7.26 (m, 2H), 6.26 (q, $J = 1.2$ Hz, 1H), 2.63-2.56 (m, 1H), 2.27 (d, $J = 1.6$ Hz, 3H), 2.16-2.11 (m, 1H), 1.89-1.75 (m, 3H), 1.68-1.65 (m, 1H), 1.45-1.20 (m, 5H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 153.1, 138.9, 130.1, 128.7, 128.4, 127.9, 61.3, 26.2, 26.2, 25.8, 25.7, 25.5, 25.3.

IR (neat, cm^{-1}): 2958, 2931, 1437, 1022, 762, 699.

HRMS-Cl calcd for $\text{C}_{15}\text{H}_{21}\text{OS}$ $[\text{M}+\text{H}]^+$: 249.1313, found 249.1316.



(Z)-1,3-dimethyl-2-(2-phenylprop-1-en-1-ylsulfonyl)benzene

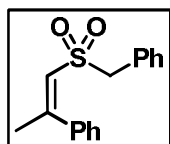
White solid; mp = 82.8-83.1 $^{\circ}\text{C}$; yield: 68 %; $R_f = 0.86$ (EtOAc/DCM = 1/4).

^1H NMR (CDCl_3 , 400 MHz): δ 7.23-7.14 (m, 4H), 6.97-6.92 (m, 4H), 6.61 (t, $J = 1.5$ Hz, 1H), 2.43 (s, 6H), 2.17 (d, $J = 1.5$ Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 153.1, 139.5, 138.5, 137.6, 132.1, 131.3, 131.1, 128.3, 128.1, 126.8, 27.8, 22.7.

IR (neat, cm^{-1}): 3048, 1459, 1440, 1304, 1144, 1117, 841, 761, 699.

HRMS-Cl calcd for $\text{C}_{17}\text{H}_{19}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 287.1106, found 287.1107.



(Z)-1-(benzylsulfonyl)prop-1-en-2-ylbenzene

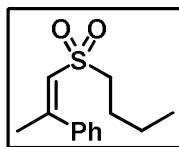
White solid; mp = 83.8-85.5 $^{\circ}\text{C}$; yield: 75%; $R_f = 0$. (EtOAc/Pentane = 1/7).

^1H NMR (CDCl_3 , 300 MHz): δ 7.42-7.32 (m, 6H), 7.26-7.14 (m, 4H), 6.24 (q, $J = 1.5$ Hz, 1H), 3.98 (s, 2H), 2.20 (d, $J = 1.5$ Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 156.2, 137.5, 131.1, 129.0, 128.9, 128.9, 128.2, 127.4, 125.4, 61.3, 27.9.

IR (neat, cm^{-1}): 3033, 1596, 1493, 1303, 1116, 696.

HRMS-CI calcd for $\text{C}_{16}\text{H}_{17}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 273.0949, found 273.0950.



(Z)-1-(butylsulfonyl)prop-1-en-2-ylbenzene

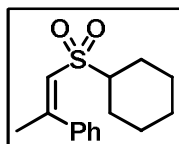
White solid; mp = 52.8-53.7 °C; yield: 60 %; R_f = 0.69 (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 400 MHz): δ 7.40-7.36 (m, 3H), 7.35-7.33 (m, 2H), 6.32 (q, J = 1.6 Hz, 1H), 2.63-2.58 (m, 2H), 2.24 (d, J = 1.20 Hz, 3H), 1.67-1.59 (m, 2H), 1.27 (sext, J = 7.20 Hz, 2H), 0.82 (t, J = 7.60 Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 154.5, 137.6, 129.0, 128.3, 127.3, 126.8, 54.4, 27.6, 24.3, 21.5, 13.5.

IR (neat, cm^{-1}): 2961, 2875, 1620, 1597, 1437, 1288, 1272, 1117, 854, 787, 764, 698.

HRMS-CI calcd for $\text{C}_{13}\text{H}_{19}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 239.1106, found 239.1105.



(Z)-1-(cyclohexylsulfonyl)prop-1-en-2-ylbenzene

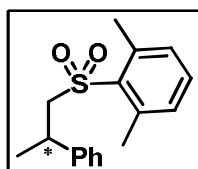
White solid; mp = 41.0-42.0 °C; yield: 65 %; R_f = 0.73 (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 400 MHz): δ 7.38-7.35 (m, 3H), 7.32-7.29 (m, 2H), 6.24 (q, J = 1.36 Hz, 1H), 2.38 (tt, J = 12.12, 3.36 Hz, 1H), 2.24 (d, J = 1.44 Hz, 3H), 2.03-1.99 (m, 2H), 1.84-1.80 (m, 2H), 1.64-1.61 (m, 1H), 1.45-1.35 (m, 2H), 1.19-1.07 (m, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 155.2, 138.0, 128.8, 128.1, 127.3, 124.5, 61.9, 28.0, 25.2, 25.2, 24.9.

IR (neat, cm^{-1}): 2935, 2858, 1619, 1598, 1493, 1444, 1295, 1265, 1129, 1116, 857, 763, 698.

HRMS-CI calcd for $\text{C}_{15}\text{H}_{21}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 265.1262, found 265.1262.



1,3-dimethyl-2-(2-phenylpropylsulfonyl)benzene

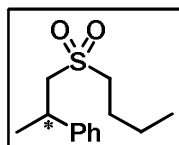
Pale yellow oil; R_f = 0.21 (EtOAc/Pentane = 1/24).

^1H NMR (CDCl_3 , 300 MHz): δ 7.17-7.31 (m, 4H), 7.09-7.16 (m, 4H), 3.50-3.57 (m, 1H), 3.46 (dd, J = 13.9, 4.6 Hz, 1H), 3.34 (dd, J = 13.8, 8.1 Hz, 1H), 2.68 (s, 6H), 1.50 (d, J = 6.9 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 144.5, 139.9 $\times$ 2, 137.0, 132.7, 131.7 $\times$ 2, 128.9 $\times$ 2, 127.0, 126.7 $\times$ 2, 63.4, 34.7, 23.1 $\times$ 2, 22.4.

IR (neat, cm^{-1}): 2973, 2937, 1458, 1305, 1150, 1122, 775, 700.

HRMS-CI calcd for $\text{C}_{17}\text{H}_{21}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 289.1262, found 289.1263.



(1-(butylsulfonyl)propan-2-yl)benzene

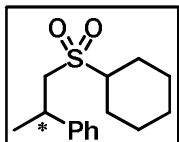
Colorless oil; yield: ; R_f = 0.69 (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 500 MHz): δ 7.37-7.32 (m, 2H), 7.29-7.24 (m, 3H), 3.53-3.43 (m, 1H), 3.31 (dd, $J = 14.3, 7.3$ Hz, 1H), 3.13 (dd, $J = 14.3, 6.4$ Hz, 1H), 2.58-2.44 (m, 2H), 1.74-1.63 (m, 1H), 1.62-1.51 (m, 1H), 1.47 (d, $J = 7.1$ Hz, 3H), 1.33-1.18 (m, 2H), 0.80 (t, $J = 7.4$ Hz, 3H),

^{13}C NMR (CDCl_3 , 75 MHz): δ 144.0, 129.1, 127.4, 127.1, 60.2, 53.8, 35.2, 24.0, 22.6, 21.7, 13.5.

IR (neat, cm^{-1}): 2963, 1454, 1294, 1127, 768, 701.

HRMS-CI calcd for $\text{C}_{13}\text{H}_{21}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 241.1274, found 241.1268.



(1-(cyclohexylsulfonyl)propan-2-yl)benzene

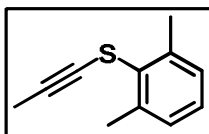
Colorless oil; yield: 75%; $R_f = 0.73$ (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 500 MHz): δ 7.36-7.31 (m, 2H), 7.29-7.24 (m, 3H), 3.57-3.45 (m, 1H), 3.29 (dd, $J = 14.0, 6.6$ Hz, 1H), 3.04 (dd, $J = 14.0, 7.1$ Hz, 1H), 2.31 (qq, $J = 12.2, 3.4$ Hz, 1H), 2.14-2.05 (m, 1H), 1.94-1.82 (m, 3H), 1.81-1.74 (m, 1H), 1.68-1.58 (m, 1H), 1.49 (d, $J = 7.1$ Hz, 3H), 1.46-1.36 (m, 1H), 1.18-1.06 (m, 2H), 1.03-0.90 (m, 1H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 144.4, 129.0, 127.3, 127.1, 61.7, 56.9, 34.7, 26.0, 25.3, 25.2, 25.1, 24.0, 22.5.

IR (neat, cm^{-1}): 2934, 1453, 1297, 1126, 768, 701.

HRMS-CI calcd for $\text{C}_{15}\text{H}_{23}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 267.1419, found 267.1423.



(2,6-dimethylphenyl)(prop-1-ynyl)sulfane

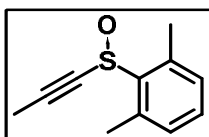
White solid; mp = 46.8-47.8 $^{\circ}\text{C}$; $R_f = 0.55$ (Pentane).

^1H NMR (CDCl_3 , 300 MHz): δ 7.19-7.10 (m, 3H), 2.59 (s, 6H), 1.91 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 142.1, 130.5, 129.0, 128.5, 87.6, 66.7, 22.0, 5.1.

IR (neat, cm^{-1}): 2951, 2914, 2072, 2031, 1998, 1988, 1461, 1436, 1378, 1170, 780.

HRMS-CI calcd for $\text{C}_{11}\text{H}_{12}\text{S}$ $[\text{M}]^+$: 176.0660, found 176.0660.



1,3-dimethyl-2-(prop-1-ynylsulfinyl)benzene

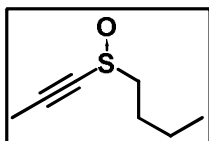
White solid; mp = 53.1-53.7 $^{\circ}\text{C}$; yield: 81 %; $R_f = 0.65$ (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 400 MHz): δ 7.28 (t, $J = 7.96$ Hz, 1H), 7.11 (d, $J = 7.56$ Hz, 2H), 2.71 (s, 6H), 2.10 (s, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 139.9, 138.6 $\times$ 2, 131.7, 130.0 $\times$ 2, 102.4, 76.0, 19.4 $\times$ 2, 5.2.

IR (neat, cm^{-1}): 2920, 2183, 1580, 1459, 1061, 1031, 770.

HRMS-CI calcd for $\text{C}_{11}\text{H}_{12}\text{OS}$ $[\text{M}]^+$: 192.0687, found 192.0690.



1-(prop-1-ynylsulfinyl)butane

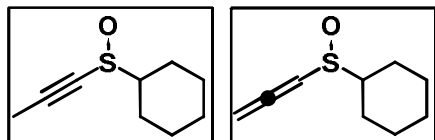
Colorless oil; yield: 78%; $R_f = 0.32$ (EtOAc/Pentane = 1/2).

^1H NMR (CDCl_3 , 400 MHz): δ 3.01 (t, $J = 8.3$ Hz, 2H), 2.91 (s, 3H), 1.91-1.75 (m, 2H), 1.55-1.43 (m, 2H), 0.99-0.94 (m, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 101.4, 56.2, 24.4, 21.8, 13.7, 4.9.

IR (neat, cm^{-1}): 2960, 2190, 1739, 1464, 1044, 730.

HRMS-Cl calcd for $\text{C}_7\text{H}_{13}\text{OS}$ $[\text{M}+\text{H}]^+$: 145.0674, found 145.0676.



(prop-1-ynylsulfinyl)cyclohexane and (propa-1,2-dienylsulfinyl)cyclohexane (2:1)

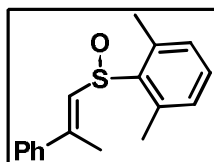
Colorless oil; yield: %; $R_f = 0.24$ (EtOAc/Pentane = 3/7).

^1H NMR (CDCl_3 , 300 MHz): δ 5.99 (t, $J = 6.0$ Hz, 1H), 5.39 (d, $J = 6.0$ Hz, 2H), 2.82 (ddt, $J = 21.0, 12.0, 3.0$ Hz, 1H), 2.12 (d, $J = 12.0$ Hz, 2H), 2.03 (s, 3H), 1.82-1.85 (m, 2H), 1.65 (d, $J = 12.0$ Hz, 1H), 1.35-1.48 (m, 2H), 1.10-1.33 (m, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 211.4, 102.2, 95.7, 83.3, 75.5, 64.1, 63.4, 25.8, 25.8, 25.7, 25.6, 25.6, 25.5, 25.3, 25.3, 5.1.

IR (neat, cm^{-1}): 2931, 2856, 2190, 1964, 1941, 1451, 1311, 1133, 1055, 1030, 996, 851, 824, 790, 766.

HRMS-Cl calcd for $\text{C}_9\text{H}_{14}\text{OS}$ $[\text{M}+\text{H}]^+$: 171.0844 found 171.0847.



(E)-1,3-dimethyl-2-(2-phenylprop-1-enylsulfinyl)benzene

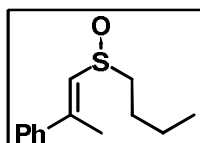
White solid; mp = 89.5-91.9 °C yield: 83 %; $R_f = 0.27$ (EtOAc/Pentane = 1/2).

^1H NMR (CDCl_3 , 300 MHz): δ 7.44-7.41 (m, 2H), 7.38-7.34 (m, 3H), 7.24 (t, $J = 8.1$ Hz, 1H), 7.07 (d, $J = 7.5$ Hz, 2H), 7.01 (d, $J = 1.2$ Hz, 1H), 2.67 (s, 6H), 2.49 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 148.5, 140.3, 139.8, 138.6, 131.2, 130.4, 129.5, 128.9, 126.4, 19.8, 17.9.

IR (neat, cm^{-1}): 2929, 1600, 1458, 1440, 1377, 1024, 751.

HRMS-Cl calcd for $\text{C}_{17}\text{H}_{19}\text{OS}$ $[\text{M}+\text{H}]^+$: 271.1157, found 271.1159.



(E)-(1-(butylsulfinyl)prop-1-en-2-yl)benzene

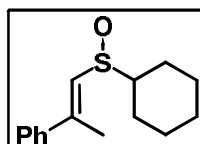
Yellow oil; yield: 33 %; $R_f = 0.12$ (EtOAc/Pentane = 1/2).

^1H NMR (CDCl_3 , 300 MHz): δ 7.49-7.47 (m, 2H), 7.41-7.38 (m, 3H), 6.51 (s, 1H), 2.96 (ddd, $J = 9.0, 4.5, 3.0$ Hz, 1H), 2.76 (ddd, $J = 9.0, 6.0, 6.0$ Hz, 1H), 2.39 (s, 3H), 1.72 (quin, $J = 4.5$ Hz, 2H), 1.58-1.43 (m, 2H), 0.97 (t, $J = 3.0$ Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 148.7, 139.7, 131.5, 129.5, 128.8, 126.3, 54.2, 24.7, 22.2, 18.3, 13.9.

IR (neat, cm^{-1}): 3460, 2930, 2854, 145, 1378, 1266, 1028, 754.

HRMS-Cl calcd for $\text{C}_{13}\text{H}_{19}\text{OS}$ $[\text{M}+\text{H}]^+$: 223.1157, found 223.1160.



(E)-(1-(cyclohexylsulfinyl)prop-1-en-2-yl)benzene

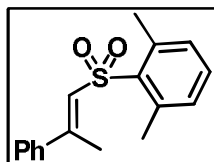
Yellow oil; yield: 59 %; R_f = 0.68(EtOAc/Pentane = 1/5).

^1H NMR (CDCl_3 , 500 MHz): δ 7.50-7.47 (m, 2H), 7.39-7.37 (m, 3H), 6.45 (s, 1H), 2.77-2.69 (m, 1H), 2.36 (s, 3H), 2.22 (d, J = 12.0 Hz, 1H), 1.99-1.85 (m, 4H), 1.72-1.69 (m, 1H), 1.58-1.32 (m, 4H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 149.5, 139.8, 129.8, 129.4, 128.8, 126.3, 61.6, 26.0, 25.8, 25.7, 25.5, 25.3, 18.6.

IR (neat, cm^{-1}): 2934, 1608, 1445, 1297, 1123, 830, 752, 694.

HRMS-CI calcd for $\text{C}_{15}\text{H}_{21}\text{OS}$ $[\text{M}+\text{H}]^+$: 249.1313, found 249.1315.

**(E)-1,3-dimethyl-2-(2-phenylprop-1-enylsulfonyl)benzene**

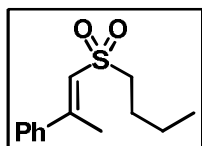
White solid; mp = 103.7-104.9°C; yield: 73 %; R_f = 0.55 (EtOAc/Pentane = 1/5).

^1H NMR (CDCl_3 , 300 MHz): δ 7.42-7.34 (m, 5H), 7.29 (t, J = 8.4 Hz, 1H), 7.15 (d, J = 7.5 Hz, 2H), 6.65 (d, J = 0.6 Hz, 1H), 2.75 (s, 6H), 2.42 (d, J = 0.6 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 151.6, 140.3, 139.6 $\times$, 138.7, 132.5, 131.6 $\times$ 3, 129.9, 128.9 $\times$ 2, 126.4 $\times$ 2, 22.9 $\times$ 2, 17.4.

IR (neat, cm^{-1}): 3418, 2990, 1603, 1459, 1299, 1144, 1115, 1048, 827, 783, 748.

HRMS-CI calcd for $\text{C}_{17}\text{H}_{19}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 287.1106, found 287.1105.

**(E)-(1-(butylsulfonyl)prop-1-en-2-yl)benzene**

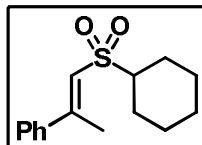
White solid; mp = 71.0-72.0 °C; yield: 83 %; R_f = 0.69 (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 400 MHz): δ 7.40-7.36 (m, 3H), 7.35-7.33 (m, 2H), 6.32 (q, J = 1.6 Hz, 1H), 2.63-2.58 (m, 2H), 2.24 (d, J = 1.2 Hz, 3H), 1.67-1.59 (m, 2H), 1.27 (sext, J = 7.2 Hz, 2H), 0.82 (t, J = 7.6 Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 154.5, 137.6, 129.0, 128.3, 127.3, 126.8, 54.4, 27.6, 24.3, 21.5, 13.5.

IR (neat, cm^{-1}): 2960, 2934, 1609, 1444, 1293, 1122, 746.

HRMS-CI calcd for $\text{C}_{13}\text{H}_{19}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 239.1106, found 239.1109.

**(E)-(1-(cyclohexylsulfonyl)prop-1-en-2-yl)benzene**

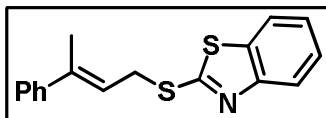
White solid; mp = 61.0-62.0 °C; yield: 85 %; R_f = 0.73 (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 400 MHz): δ 7.38-7.35 (m, 3H), 7.32-7.29 (m, 2H), 6.24 (q, J = 1.36 Hz, 1H), 2.38 (tt, J = 12.12, 3.36 Hz, 1H), 2.24 (d, J = 1.44 Hz, 3H), 2.03-1.99 (m, 2H), 1.84-1.80 (m, 2H), 1.64-1.61 (m, 1H), 1.45-1.35 (m, 2H), 1.19-1.07 (m, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 155.2, 138.0, 128.8, 128.1, 127.3, 124.5, 61.9, 28.0, 25.2, 25.2, 24.9.

IR (neat, cm^{-1}): 2934, 2857, 1608, 1444, 1296, 1122, 752.

HRMS-CI calcd for $\text{C}_{15}\text{H}_{21}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 265.1262, found 265.1261.



(E)-2-(3-phenylbut-2-enylthio)benzo[d]thiazole

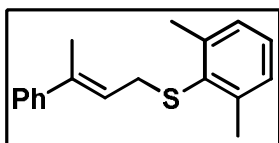
White solid; mp = 71.5-72.4°C; yield: 65%; R_f = 0.45(EtOAc/Pentane = 1/20).

^1H NMR (CDCl_3 , 300 MHz): δ 7.89 (d, J = 6.0 Hz, 1H), 7.76 (d, J = 6.0 Hz, 1H), 7.44-7.40 (m, 3H), 7.33-7.27 (m, 4H), 6.02 (td, J = 4.5, 1.5 Hz, 1H), 4.22 (d, J = 6.0 Hz, 2H), 2.20 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 166.8, 153.3, 142.8, 140.6, 135.5, 128.4, 127.6, 126.2, 126.0, 124.4, 121.7, 121.1, 32.4, 16.3.

IR (neat, cm^{-1}): 2908, 1471, 1327, 1311, 1141, 773, 698.

HRMS-Cl calcd for $\text{C}_{17}\text{H}_{15}\text{NS}_2$ $[\text{M}]^+$: 297.0653, found 297.0652.



(E)-(2,6-dimethylphenyl)(3-phenylbut-2-enyl)sulfane

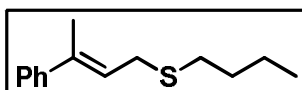
Colorless oil; yield: 70%; R_f = 0.48(EtOAc/Pentane = 1/49).

^1H NMR (CDCl_3 , 400 MHz): δ 7.30-7.18 (m, 5H), 7.13-7.06 (m, 3H), 5.81 (td, J = 8.2, 1.2 Hz, 1H), 3.46 (d, J = 8.4 Hz, 2H), 2.55 (s, 6H), 1.74 (s, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 143.7, 143.4, 137.9, 133.1, 128.6, 128.3, 128.1, 127.1, 125.8, 123.2, 33.6, 22.3, 15.3.

IR (neat, cm^{-1}): 2921, 1494, 1459, 1445, 1375, 1057, 1027, 759, 696.

HRMS-Cl calcd for $\text{C}_{18}\text{H}_{20}\text{S}$ $[\text{M}]^+$: 268.1286, found 268.1281.



(E)-butyl(3-phenylbut-2-enyl)sulfane

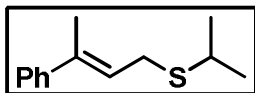
Colorless oil; yield: 22 %; R_f = 0.41 (Pentane).

^1H NMR (CDCl_3 , 400 MHz): δ 7.43-7.41 (m, 2H), 7.38-7.33 (m, 2H), 7.30-7.23 (m, 1H), 5.88 (qt, J = 1.2, 8.0 Hz, 1H), 3.36 (d, J = 8.0 Hz, 2H), 2.54 (t, J = 7.6 Hz, 2H), 2.09 (s, 3H), 1.64-1.55 (m, 2H), 1.47-1.38 (m, 2H), 0.93 (t, J = 7.2 Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 143.3, 137.4, 128.4, 127.2, 125.9, 124.4, 32.0, 31.1, 30.1, 22.2, 16.0, 13.8.

IR (neat, cm^{-1}): 2956, 2927, 1494, 1445, 1379, 1218, 1027, 759, 694.

HRMS-Cl calcd for $\text{C}_{14}\text{H}_{20}\text{S}$ $[\text{M}]^+$: 220.1286, found 220.1288.



(E)-isopropyl(3-phenylbut-2-enyl)sulfane

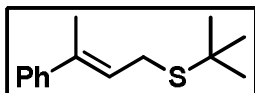
Colorless oil; yield: 70%; R_f = 0.81 (EtOAc/Pentane = 1/24).

^1H NMR (CDCl_3 , 500 MHz): δ 7.41-7.38 (m, 2H), 7.34-7.23 (m, 2H), 7.26-7.22 (m, 1H), 5.88 (qq, J = 9.7, 1.9 Hz, 1H), 3.38 (d, J = 9.7 Hz, 1H), 2.95 (quin, J = 6.7 Hz, 1H), 2.10 (s, 3H), 1.52 (s, 1H), 1.31 (s, 3H), 1.29 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 143.2, 137.2, 128.3, 127.1, 125.8, 124.5, 34.6, 29.1, 23.6, 15.9.

IR (neat, cm^{-1}): 2963, 1664, 1494, 1445, 1381, 1154, 1051, 1025, 915, 872, 759.

HRMS-Cl calcd for $\text{C}_{13}\text{H}_{18}\text{S}$ $[\text{M}]^+$: 206.1129, found 206.1129.



(E)-tert-butyl(3-phenylbut-2-enyl)sulfane

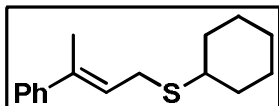
Colorless oil; yield: 70%; $R_f = 0.34$ (EtOAc/Pentane = 1/49).

^1H NMR (CDCl_3 , 400 MHz): δ 7.32-7.29 (m, 2H), 7.25-7.20 (m, 2H), 7.18-7.13 (m, 1H), 5.80 (qt, $J = 8.6, 1.2$ Hz, 1H), 3.31 (d, $J = 7.6$ Hz, 2H), 3.03 (s, 3H), 1.30 (s, 9H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 143.3, 137.3, 128.3, 127.1, 125.9, 124.2, 42.6, 31.1, 27.3, 15.9.

IR (neat, cm^{-1}): 2959, 1494, 1445, 1363, 1201, 1161, 1026, 865, 759, 694.

HRMS-CI calcd for $\text{C}_{14}\text{H}_{20}\text{S}$ $[\text{M}]^+$: 220.1286, found 220.1285.



(E)-cyclohexyl(3-phenylbut-2-enyl)sulfane

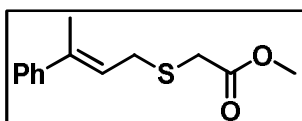
Colorless oil; yield: 50 %; $R_f = 0.36$ (Pentane).

^1H NMR (CDCl_3 , 400 MHz): δ 7.42-7.38 (m, 2H), 7.35-7.30 (m, 2H), 7.27-7.22 (m, 1H), 5.89 (qt, $J = 1.2, 8.0$ Hz, 1H), 3.38 (d, $J = 8.0$ Hz, 2H), 2.72-2.64 (m, 1H), 2.10 (d, $J = 1.2$ Hz, 3H), 2.04-1.97 (m, 2H), 1.81-1.76 (m, 2H), 1.65-1.56 (m, 1H), 1.43-1.21 (m, 5H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 143.3, 137.1, 128.4, 127.1, 125.9, 124.7, 43.2, 33.9, 28.6, 26.3, 26.0, 15.9.

IR (neat, cm^{-1}): 2926, 2851, 1494, 1445, 1379, 1263, 1201, 1026, 999, 759, 694.

HRMS-CI calcd for $\text{C}_{16}\text{H}_{22}\text{S}$ $[\text{M}]^+$: 246.1442, found 246.1439.



(E)-methyl 2-(3-phenylbut-2-enylthio)acetate

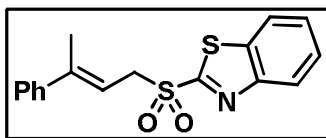
Colorless oil; yield: 78 %; $R_f = 0$. (EtOAc/Pentane =).

^1H NMR (CDCl_3 , 300 MHz): δ 7.43 (d, $J = 7.5$ Hz, 2H), 7.35 (t, $J = 7.5$ Hz, 2H), 7.28 (d, $J = 9.0$ Hz, 1H), 5.86 (td, $J = 7.5, 1.5$ Hz, 1H), 3.74 (s, 3H), 3.51 (d, $J = 6.0$ Hz, 2H), 3.25 (s, 2H), 2.12 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 171.1, 142.8, 139.0, 128.3, 128.2, 127.9, 127.3, 125.8, 122.6, 52.4, 32.3, 30.6, 15.8.

IR (neat, cm^{-1}): 2951, 1733, 1494, 1273, 1194, 1128, 1008, 760, 696.

HRMS-CI calcd for $\text{C}_{13}\text{H}_{16}\text{O}_2\text{S}$ $[\text{M}]^+$: 236.0871, found 236.0871.



(E)-2-(3-phenylbut-2-enylsulfonyl)benzo[d]thiazole

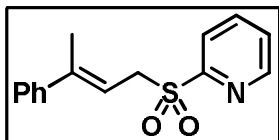
Yellow solid; mp = 71.5-72.4 °C; yield: 52 %; $R_f = 0.50$ (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 400 MHz): δ 8.26-8.22 (m, 1H), 8.15-7.97 (m, 1H), 7.67-7.56 (m, 2H), 7.35-7.20 (m, 5H), 5.79 (qt, $J = 1.2, 8.0$ Hz, 1H), 4.45 (d, $J = 8.0$ Hz, 2H), 1.97 (d, $J = 1.2$ Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 165.8, 152.9, 146.4, 142.2, 137.2, 128.5, 128.2, 128.1, 127.8, 126.1, 125.6, 122.5, 111.5, 55.4, 16.7.

IR (neat, cm^{-1}): 2908, 1471, 1327, 1311, 1141, 773, 698.

HRMS-CI calcd for $\text{C}_{17}\text{H}_{15}\text{NO}_2\text{S}_2$ $[\text{M}]^+$: 329.0544, found 329.0533.



(E)-2-(3-phenylbut-2-enylsulfonyl)pyridine

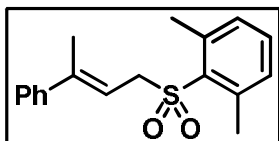
White solid; mp = 60.5-61.5 °C; yield: 69 %; R_f = 0.52 (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 400 MHz): δ 8.78 (d, J = 4.8 Hz, 1H), 8.05 (d, J = 8.0 Hz, 1H), 7.95-7.89 (m, 2H), 7.56-7.51 (m, 1H), 7.32-7.19 (m, 5H), 5.70 (qt, J = 1.2, 8.0 Hz, 1H), 4.33 (d, J = 8.0 Hz, 2H), 1.93 (s, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 157.1, 150.4, 144.9, 142.3, 138.1, 128.4, 127.9, 127.5, 125.9, 122.9, 112.5, 52.8, 16.5.

IR (neat, cm^{-1}): 1426, 1300, 1158, 1112, 781, 752, 744, 695.

HRMS-Cl calcd for $\text{C}_{15}\text{H}_{15}\text{NO}_2\text{S}$ $[\text{M}]^+$: 273.0824, found 273.0827.



(E)-1,3-dimethyl-2-(3-phenylbut-2-enylsulfonyl)benzene

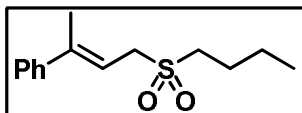
Colorless oil; yield: 48 %; R_f = 0.60 (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 400 MHz): δ 7.40-7.23 (m, 6H), 7.21-7.11 (m, 2H), 5.73 (qt, J = 1.2, 8.0 Hz, 1H), 4.07 (d, J = 8.0 Hz, 2H), 2.72 (s, 6H), 1.80 (d, J = 1.2 Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 144.7, 142.4, 140.6, 135.9, 132.9, 131.7, 128.5, 128.0, 125.9, 113.1, 56.5, 23.3, 16.2.

IR (neat, cm^{-1}): 2980, 1457, 1308, 1144, 1119, 774, 761, 736, 697.

HRMS-Cl calcd for $\text{C}_{18}\text{H}_{20}\text{O}_2\text{S}$ $[\text{M}]^+$: 300.1184, found 300.1175.



(E)-4-(butylsulfonyl)but-2-en-2-ylbenzene

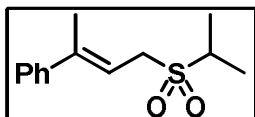
Colorless oil; yield: 81%; R_f = 0.86 (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 400 MHz): δ 7.48-7.38 (m, 2H), 7.38-7.29 (m, 3H), 5.89-5.85 (m, 1H), 3.91 (d, J = 6.4 Hz, 2H), 3.00-2.91 (m, 2H), 2.17 (s, 3H), 1.88-1.79 (m, 2H), 1.51-1.42 (m, 2H), 0.96 (t, J = 6.0 Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 144.3, 142.1, 128.6, 128.2, 126.1, 113.3, 53.6, 51.7, 23.9, 21.9, 16.8, 13.7.

IR (neat, cm^{-1}): 2960, 1297, 1121, 756, 696.

HRMS-Cl calcd for $\text{C}_{14}\text{H}_{20}\text{O}_2\text{S}$ $[\text{M}]^+$: 252.1184, found 252.1180.



(E)-4-(isopropylsulfonyl)but-2-en-2-ylbenzene

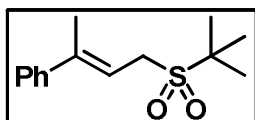
Colorless oil; yield: 78 %; R_f = 0.52 (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 400 MHz): δ 7.47-7.38 (m, 2H), 7.36-7.25 (m, 3H), 5.94-5.88 (m, 1H), 3.93 (d, J = 6.4 Hz, 2H), 2.16 (s, 3H), 1.47 (s, 9H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 143.6, 142.4, 128.5, 127.9, 126.1, 113.1, 60.0, 47.9, 23.9, 16.9.

IR (neat, cm^{-1}): 2982, 1445, 1300, 1117, 1050, 751, 696.

HRMS-Cl calcd for $\text{C}_{13}\text{H}_{18}\text{O}_2\text{S}$ $[\text{M}]^+$: 238.1028, found 238.1029



(E)-4-(4-(tert-butylsulfonyl)but-2-en-2-yl)benzene

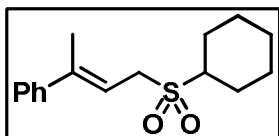
Colorless oil; yield: 25 %; R_f = 0.82 (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 400 MHz): δ 7.44-7.39 (m, 2H), 7.38-7.26 (m, 3H), 5.86 (qt, J = 1.2, 6.4 Hz, 1H), 3.92 (d, J = 6.4 Hz, 2H), 3.18 (sep, J = 5.6 Hz, 1H), 2.17 (s, 3H), 1.41 (d, J = 5.6 Hz, 6H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 144.0, 142.2, 128.5, 128.1, 126.0, 113.1, 113.0, 52.1, 52.0, 50.8, 16.8, 15.4.

IR (neat, cm^{-1}): 2985, 1294, 1113, 762, 697, 660.

HRMS-Cl calcd for $\text{C}_{14}\text{H}_{20}\text{O}_2\text{S}$ $[\text{M}]^+$: 252.1184, found 252.1181



(E)-4-(4-(cyclohexylsulfonyl)but-2-en-2-yl)benzene

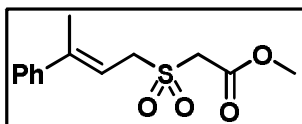
White solid; mp = 83.3-84.1°C; yield: 73 %; R_f = 0.43 (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 400 MHz): δ 7.42-7.38 (m, 2H), 7.38-7.27 (m, 3H), 5.85 (qt, J = 1.2, 7.6 Hz, 1H), 3.89 (d, J = 7.6 Hz, 2H), 2.90 (tt, J = 3.6, 12.0 Hz, 1H), 2.16 (d, J = 1.2 Hz, 3H), 2.21-2.12 (m, 2H), 1.99-1.90 (m, 2H), 1.78-1.69 (m, 1H), 1.67-1.52 (m, 2H), 1.37-1.18 (m, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 144.0, 142.3, 128.6, 128.1, 126.1, 113.2, 60.2, 50.5, 25.3, 25.2 $\times$ 2, 16.9.

IR (neat, cm^{-1}): 2940, 1298, 1285, 1104, 758, 695.

HRMS-Cl calcd for $\text{C}_{16}\text{H}_{22}\text{O}_2\text{S}$ $[\text{M}]^+$: 278.1341, found 278.1339



(E)-methyl 2-(3-phenylbut-2-enylsulfonyl)acetate

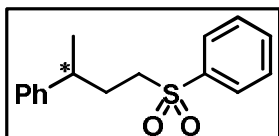
Pale yellow oil; yield: 57 %; R_f = 0.78 (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 400 MHz): δ 7.45-7.40 (m, 2H), 7.39-7.28 (m, 3H), 5.88 (qt, J = 1.2, 8 Hz, 1H), 4.21 (d, J = 8 Hz, 2H), 3.96 (s, 2H), 3.83 (s, 3H), 2.21 (s, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 163.7, 145.8, 142.0, 128.5, 128.3, 126.1, 112.3, 55.8, 54.2, 53.4, 16.8.

IR (neat, cm^{-1}): 3000, 1740, 1437, 1319, 1135, 1112, 761.

HRMS-Cl calcd for $\text{C}_{13}\text{H}_{16}\text{O}_4\text{S}$ $[\text{M}+\text{H}]^+$: 269.0848, found 269.0857.



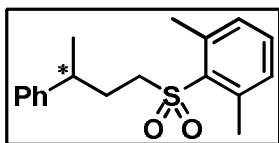
(3-phenylbutylsulfonyl)benzene

Colorless oil; R_f = 0.40 (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 300 MHz): δ 7.86 (d, J = 9.0 Hz, 2H), 7.67 (t, J = 7.5 Hz, 1H), 7.56 (t, J = 7.5 Hz, 2H), 7.31-7.26 (m, 2H), 7.22 (d, J = 6.0 Hz, 1H), 7.09 (d, J = 7.5 Hz, 2H), 3.06-2.84 (m, 2H), 2.83-2.71 (m, 1H), 2.12-1.91 (m, 2H), 1.27 (d, J = 6.0 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 144.9, 139.3, 133.7, 129.4, 128.9, 128.1, 126.9, 126.8, 54.8, 39.0, 30.6, 22.5.

IR (neat, cm^{-1}): 2963, 2929, 1494, 1447, 1306, 1144, 1087, 764, 747, 702, 689.
HRMS-Cl calcd for $\text{C}_{16}\text{H}_{17}\text{O}_2\text{S}$ $[\text{M}]^+$: 274.1028, found 274.1033.



1,3-dimethyl-2-(3-phenylbutylsulfonyl)benzene

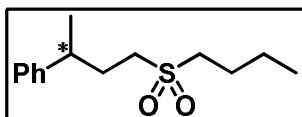
Colorless oil; $R_f = 0.41$ (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 500 MHz): δ 7.41-7.28 (m, 3H), 7.27-7.21 (m, 1H), 7.18-7.10 (m, 4H), 3.07-2.98 (m, 1H), 2.97-2.89 (m, 1H), 2.87-2.77 (m, 1H), 2.64 (s, 6H), 2.22-2.11 (m, 1H), 2.09-1.98 (m, 1H), 1.31 (d, $J = 7.0\text{ Hz}$, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 145.0, 140.2, 132.7, 131.7, 128.9, 127.0, 126.8, 54.4, 39.0, 29.8, 23.0, 22.7.

IR (neat, cm^{-1}): 2932, 1458, 1310, 1153, 1122, 774, 701.

HRMS-Cl calcd for $\text{C}_{18}\text{H}_{21}\text{O}_2\text{S}$ $[\text{M}]^+$: 302.1341, found 302.1345.



4-(butylsulfonyl)butan-2-ylbenzene

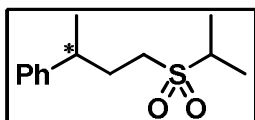
Colorless oil; $R_f = 0.86$ (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 500 MHz): δ 7.36-7.28 (m, 2H), 7.26-7.15 (m, 3H), 2.91-2.78 (m, 4H), 2.77-2.67 (m, 1H), 2.23-2.11 (m, 1H), 2.10-1.99 (m, 1H), 1.80-1.65 (m, 2H), 1.49-1.36 (m, 2H), 1.32 (d, $J = 7.1\text{ Hz}$, 3H), 0.92 (t, $J = 7.3\text{ Hz}$, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 144.9, 128.9, 127.0, 126.9, 52.6, 51.2, 39.2, 30.0, 24.0, 22.4, 21.8, 13.6.

IR (neat, cm^{-1}): 3028, 2961, 1453, 1288, 1272, 1127, 701.

HRMS-Cl calcd for $\text{C}_{14}\text{H}_{21}\text{O}_2\text{S}$ $[\text{M}]^+$: 254.1341, found 254.1346.



4-(isopropylsulfonyl)butan-2-ylbenzene

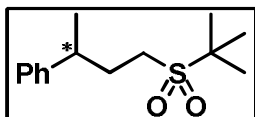
Colorless oil; $R_f = 0.52$ (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 300 MHz): δ 7.40-7.35 (m, 2H), 7.28-7.22 (m, 3H), 3.10-3.06 (m, 1H), 2.88-2.82 (m, 2H), 2.78-2.74 (m, 1H), 2.24-2.20 (m, 1H), 2.13-2.08 (m, 1H), 1.37 (d, $J = 3.0\text{ Hz}$, 3H), 1.36 (d, $J = 3.0\text{ Hz}$, 3H), 1.33 (d, $J = 6.0\text{ Hz}$, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 145.0, 128.9, 127.0, 126.9, 52.8, 47.8, 39.3, 29.5, 22.5, 15.5, 15.2.

IR (neat, cm^{-1}): 2964, 1454, 1305, 1260, 1124, 763, 702.

HRMS-Cl calcd for $\text{C}_{13}\text{H}_{19}\text{O}_2\text{S}$ $[\text{M}]^+$: 240.1184, found 240.1180.



4-(tert-butylsulfonyl)butan-2-ylbenzene

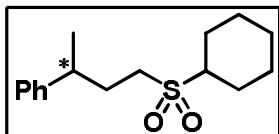
Colorless oil; $R_f = 0.82$ (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 500 MHz): δ 7.34-7.28 (m, 2H), 7.24-7.16 (m, 3H), 2.90-2.82 (m, 1H), 2.77 (ddd, $J = 13.0, 10.6, 5.9\text{ Hz}$, 1H), 2.71 (ddd, $J = 13.0, 10.5, 5.3\text{ Hz}$, 1H), 2.27-2.19 (m, 1H), 2.17-2.08 (m, 1H), 1.33 (s, 9H), 1.32 (d, $J = 6.9\text{ Hz}$, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 145.2, 128.8, 127.1, 126.7, 59.1, 44.1, 39.4, 28.6, 23.6, 22.7.

IR (neat, cm^{-1}): 2964, 1454, 1305, 1260, 1124, 763, 702.

HRMS-Cl calcd for $\text{C}_{14}\text{H}_{21}\text{O}_2\text{S}$ $[\text{M}]^+$: 254.1341, found 254.1337.



(4-(cyclohexylsulfonyl)butan-2-yl)benzene

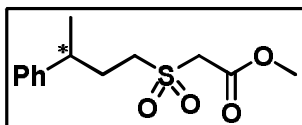
Colorless oil; R_f = 0.43 (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 500 MHz): δ 7.34-7.29 (m, 2H), 7.24-7.16 (m, 3H), 2.89-2.60 (m, 4H), 2.21-2.12 (m, 1H), 2.11-1.96 (m, 3H), 1.94-1.83 (m, 2H), 1.80-1.62 (m, 1H), 1.57-1.38 (m, 2H), 1.32 (d, J = 7.1 Hz, 3H), 1.28-1.11 (m, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 145.0, 128.9, 127.1, 126.8, 60.9, 47.9, 39.3, 29.4, 25.3, 25.2, 24.9, 22.6.

IR (neat, cm^{-1}): 2934, 2858, 1453, 1305, 1128, 763, 702.

HRMS-Cl calcd for $\text{C}_{16}\text{H}_{23}\text{O}_2\text{S}$ $[\text{M}]^+$: 280.1497, found 280.1494



methyl 2-(3-phenylbutylsulfonyl)acetate

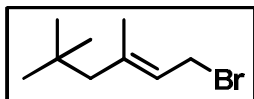
Colorless oil; R_f = 0.78 (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 500 MHz): δ 7.35-7.30 (m, 2H), 7.25-7.21 (m, 1H), 7.20-7.16 (m, 2H), 3.90 (s, 2H), 3.76 (s, 3H), 3.16 (ddd, J = 13.9, 11.1, 5.3 Hz, 1H), 3.03 (ddd, J = 13.9, 11.1, 5.1 Hz, 1H), 2.90-2.81 (m, 1H), 2.23-2.05 (m, 2H), 1.33 (d, J = 7.0 Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 145.0, 128.9, 127.0, 126.9, 52.8, 47.8, 39.3, 29.5, 22.5, 15.5, 15.2.

IR (neat, cm^{-1}): 959, 1743, 1453, 1437, 1321, 1139, 1110, 703.

HRMS-Cl calcd for $\text{C}_{13}\text{H}_{17}\text{O}_4\text{S}$ $[\text{M}]^+$: , found



(E)-1-bromo-3,5,5-trimethylhex-2-ene

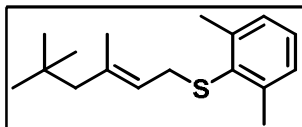
Pale yellow oil; R_f = 0.58 (Pentane).

^1H NMR (CDCl_3 , 300 MHz): δ 5.50 (t, J = 8.4 Hz, 1H), 4.03 (d, J = 8.4 Hz, 2H), 1.96 (s, 2H), 1.79 (s, 3H), 0.91 (s, 9H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 142.4, 124.3, 53.5, 32.3, 30.3, 30.0 $\times$ 3, 18.9.

IR (neat, cm^{-1}): 2953, 1649, 1476, 1364, 1199, 859.

HRMS-Cl calcd for $\text{C}_9\text{H}_{17}\text{Br}$ $[\text{M}]^+$: 204.0514, found 204.0527.



(E)-(2,6-dimethylphenyl)(3,5,5-trimethylhex-2-enyl)sulfane

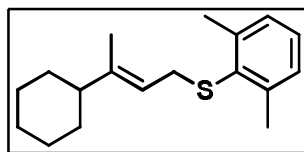
Colorless oil; R_f = 0.44 (Pentane).

^1H NMR (CDCl_3 , 300 MHz): δ 7.10-7.08 (m, 3H), 5.22 (t, J = 7.8 Hz, 1H), 3.32 (d, J = 7.8 Hz, 2H), 2.57 (s, 6H), 1.86 (s, 2H), 1.54 (s, 3H), 0.85 (s, 9H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 143.4 $\times$ 2, 137.7, 133.7, 128.2, 128.1 $\times$ 2, 123.5, 53.5, 33.4, 31.8, 30.1 $\times$ 3, 22.2 $\times$ 2, 18.5.

IR (neat, cm^{-1}): 2952, 2866, 1460, 1364, 1235, 1056, 860, 769.

HRMS-Cl calcd for $\text{C}_{17}\text{H}_{26}\text{S}$ $[\text{M}]^+$: 262.1755, found 262.1754.



(E)-(3-cyclohexylbut-2-enyl)(2,6-dimethylphenyl)sulfane

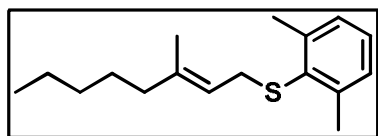
Colorless oil; yield: 74 %; R_f = 0.70 (EtOAc/Pentane = 1/80).

^1H NMR (CDCl_3 , 300 MHz): δ 7.10-7.07 (m, 3H), 5.25 (t, J = 8.0 Hz, 1H), 3.30 (d, J = 8.1 Hz, 2H), 2.56 (s, 6H), 1.81-1.56 (m, 6H), 1.35 (s, 3H), 1.27-1.06 (m, 5H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 144.6, 143.8 $\times$ 2, 133.5, 128.4, 128.1 $\times$ 2, 118.0, 47.6, 33.1, 31.8 $\times$ 2, 26.9 $\times$ 2, 26.6, 22.5 $\times$ 2, 14.0.

IR (neat, cm^{-1}): 2923, 2851, 1655, 1459, 1448, 1374, 1220, 1056, 1031, 847, 767.

HRMS-Cl calcd for $\text{C}_{18}\text{H}_{26}\text{S}$ $[\text{M}]^+$: 274.1755, found 274.1757.



(E)-(2,6-dimethylphenyl)(3-methyloct-2-enyl)sulfane

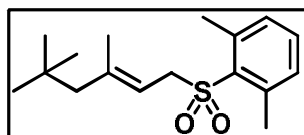
Colorless oil; yield: 33 %; R_f = 0.46 (Pentane).

^1H NMR (CDCl_3 , 300 MHz): δ 7.12-7.05 (m, 3H), 5.25 (td, J = 8.0, 1.2 Hz, 1H), 3.29 (d, J = 8.1 Hz, 2H), 2.56 (s, 6H), 1.91 (t, J = 7.2 Hz, 2H), 1.38 (s, 3H), 1.34-1.16 (m, 6H), 0.88 (t, J = 7.0 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 143.6 $\times$ 2, 139.7, 133.5, 128.3, 128.0 $\times$ 2, 119.5, 39.7, 33.1, 31.6, 27.5, 22.7, 22.3 $\times$ 2, 15.5, 14.2.

IR (neat, cm^{-1}): 2956, 2927, 2858, 1460, 1376, 769.

HRMS-Cl calcd for $\text{C}_{17}\text{H}_{26}\text{S}$ $[\text{M}]^+$: 262.1755, found 262.1757.



(E)-1,3-dimethyl-2-(3,5,5-trimethylhex-2-enylsulfonyl)benzene

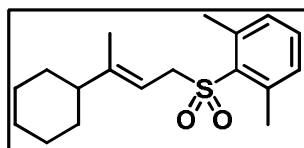
Colorless oil; R_f = 0.60 (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 300 MHz): δ 7.29 (t, J = 7.5 Hz, 1H), 7.13 (d, J = 7.8 Hz, 2H), 5.17 (t, J = 7.5 Hz, 1H), 3.88 (d, J = 8.1 Hz, 2H), 2.71 (s, 6H), 1.91 (s, 2H), 1.50 (s, 3H), 0.83 (s, 9H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 144.9, 140.4 $\times$ 2, 136.2, 132.7, 131.6 $\times$ 2, 113.4, 56.2, 53.6, 31.9, 30.1 $\times$ 3, 23.3 $\times$ 2, 19.1.

IR (neat, cm^{-1}): 2951, 1458, 1312, 1151, 1121, 774, 732.

HRMS-Cl calcd for $\text{C}_{17}\text{H}_{26}\text{O}_2\text{S}$ $[\text{M}]^+$: 294.1654, found 294.1653.



(E)-2-(3-cyclohexylbut-2-enylsulfonyl)-1,3-dimethylbenzene

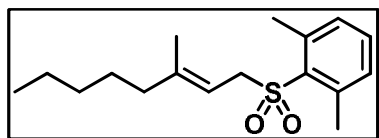
White solid; mp = 88.0-89.0 $^{\circ}\text{C}$; yield: 41 %; R_f = 0.50 (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 300 MHz): δ 7.27 (t, J = 7.5 Hz, 1H), 7.11 (d, J = 7.5 Hz, 2H), 5.18 (t, J = 8.0 Hz, 1H), 3.83 (d, J = 7.8 Hz, 2H), 2.68 (s, 6H), 1.51-1.85 (m, 7H), 1.28 (s, 3H), 0.96-1.23 (m, 4H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 151.4, 140.5 $\times$ 2, 135.8, 132.7, 131.5 $\times$ 2, 108.4, 55.9, 47.6, 31.4 $\times$ 2, 26.6 $\times$ 2, 26.3, 23.4 $\times$ 2, 14.6.

IR (neat, cm^{-1}): 2926, 2853, 1583, 1458, 1312, 1152, 1121, 776, 741.

HRMS-CI calcd for $\text{C}_{18}\text{H}_{26}\text{O}_2\text{S}$ $[\text{M}]^+$: 306.1654, found 306.1655.



(E)-1,3-dimethyl-2-(3-methyloct-2-enylsulfonyl)benzene

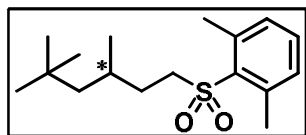
Colorless oil; yield: 45 %; R_f = 0.55 (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 300 MHz): δ 7.30 (t, J = 7.5 Hz, 1H), 7.12 (d, J = 7.5 Hz, 2H), 5.20 (t, J = 8.0 Hz, 1H), 3.83 (d, J = 8.1 Hz, 2H), 2.69 (s, 6H), 1.95 (t, J = 7.5 Hz, 2H), 1.34 (s, 3H), 1.32-1.13 (m, 6H), 0.86 (t, J = 7.2 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 146.9, 140.5, 135.9, 132.7, 131.5, 109.8, 55.9, 39.8, 31.5, 27.1, 23.3, 22.6, 16.2, 14.1.

IR (neat, cm^{-1}): 2931, 1458, 1313, 1152, 1120, 774, 740.

HRMS-CI calcd for $\text{C}_{17}\text{H}_{26}\text{O}_2\text{S}$ $[\text{M} + \text{H}]^+$: 295.1732, found 295.1724.



1,3-dimethyl-2-(3,5,5-trimethylhexylsulfonyl)benzene

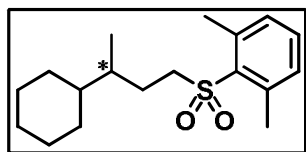
Colorless oil; yield: %; R_f = 0.63 (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 300 MHz): δ 7.19-7.22 (m, 1H), 7.06 (d, J = 7.5 Hz, 2H), 3.02 (dd, J = 5.7, 4.2 Hz, 1H), 2.98 (dd, J = 6.0, 3.6 Hz, 1H), 2.61 (s, 6H), 1.43-1.70 (m, 3H), 1.05 (dd, J = 13.9, 3.4 Hz, 1H), 0.96 (dd, J = 13.8, 6.0 Hz, 1H), 0.81 (d, J = 6.3 Hz, 3H), 0.76 (s, 9H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 140.1, 136.2, 132.7, 131.7, 54.4, 50.6, 31.1, 30.7, 30.0, 28.6, 23.2, 22.2.

IR (neat, cm^{-1}): 2953, 2868, 1584, 1458, 1312, 1151, 1122, 775.

HRMS-CI calcd for $\text{C}_{17}\text{H}_{27}\text{O}_2\text{S}$ $[\text{M}]^+$: , found



2-(3-cyclohexylbutylsulfonyl)-1,3-dimethylbenzene

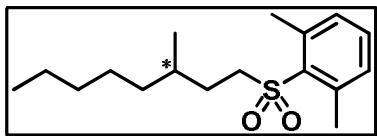
Pale yellow oil; yield: %; R_f = 0.60 (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 300 MHz): δ 7.33 (t, J = 7.5 Hz, 1H), 7.16 (d, J = 7.5 Hz, 2H), 3.17-3.01 (m, 2H), 2.71 (s, 6H), 1.89-1.54 (m, 7H), 1.36-0.85 (m, 7H), 0.82 (d, J = 6.9 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 140.1 $\times$ 2, 136.3, 132.7, 131.7 $\times$ 2, 54.7, 42.4, 37.2, 30.6, 28.6, 26.8, 26.7 $\times$ 2, 25.9, 23.2 $\times$ 2, 16.0.

IR (neat, cm^{-1}): 2925, 2852, 1584, 1458, 1314, 1152, 1122, 774.

HRMS-CI calcd for $\text{C}_{18}\text{H}_{27}\text{O}_2\text{S}$ $[\text{M} + \text{H}]^+$: 309.1888, found 309.1888.



1,3-dimethyl-2-(3-methyloctylsulfonyl)benzene

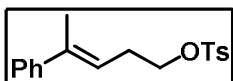
Colorless oil; yield: %; $R_f = 0.67$ (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 300 MHz): δ 7.32 (t, $J = 7.6$ Hz, 1H), 7.16 (d, $J = 7.8$ Hz, 2H), 3.18-3.02 (m, 2H), 2.71 (s, 6H), 1.84-1.73 (m, 1H), 1.65-1.50 (m, 2H), 1.35-1.05 (m, 8H), 0.87 (t, $J = 6.8$ Hz, 3H), 0.86 (d, $J = 6.6$ Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 140.2 $\times$ 2, 136.3, 132.7, 131.7 $\times$ 2, 54.3, 36.5, 32.1, 32.0, 28.5, 26.5, 23.2 $\times$ 2, 22.7, 19.4, 14.2.

IR (neat, cm^{-1}): 2956, 2929, 1459, 1315, 1152, 1123, 776.

HRMS-Cl calcd for $\text{C}_{17}\text{H}_{27}\text{O}_2\text{S}$ $[\text{M} + \text{H}]^+$: 297.1888, found 297.1888.



(E)-4-Phenylpent-3-enyl 4-methylbenzenesulfonate

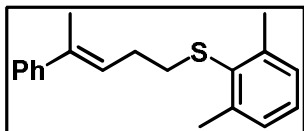
Viscous liquid; yield: 83%; $R_f = 0.58$ (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 300 MHz): δ 7.82 (d, $J = 8.1$ Hz, 2H), 7.40-7.26 (m, 7H), 5.61 (td, $J = 7.2, 1.2$ Hz, 1H), 4.15 (t, $J = 6.9$ Hz, 2H), 2.58 (q, $J = 6.9$ Hz, 2H), 2.43 (s, 3H), 2.01 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 145.1, 143.4, 138.6, 133.4, 130.2 $\times$ 2, 128.5 $\times$ 2, 128.1 $\times$ 2, 127.3, 125.9 $\times$ 2, 121.7, 70.1, 28.8, 21.9, 16.2.

IR (neat, cm^{-1}): 2959, 1598, 1494, 1445, 1356, 1188, 1173, 1096, 962, 909, 814, 758, 698, 662.

HRMS-Cl calcd for $\text{C}_{18}\text{H}_{20}\text{O}_3\text{S}$ $[\text{M}]^+$: 316.1133, found 316.1133.



(E)-(2,6-Dimethylphenyl)(4-phenylpent-3-enyl)sulfane

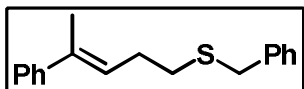
Colorless oil; yield: 80%; $R_f = 0.18$ (Pentane).

^1H NMR (CDCl_3 , 300 MHz): δ 7.53-7.33 (m, 5H), 7.26 (brs, 3H), 5.95 (td, $J = 7.2, 1.5$ Hz, 1H), 2.74 (s, 6H), 2.93 (t, $J = 7.5$ Hz, 2H), 2.58 (q, $J = 7.5$ Hz, 2H), 2.12 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 144.0, 143.5 $\times$ 2, 136.7, 134.0, 128.6 $\times$ 2, 128.5 $\times$ 3, 127.2, 126.6, 126.1 $\times$ 2, 35.3, 29.7, 22.6, 16.3.

IR (neat, cm^{-1}): 2922, 1493, 1459, 1445, 1375, 1166, 1056, 1028, 767, 698.

HRMS-Cl calcd for $\text{C}_{19}\text{H}_{22}\text{S}$ $[\text{M}]^+$: 282.1442, found 282.1441.



(E)-Benzyl(4-phenylpent-3-enyl)sulfane

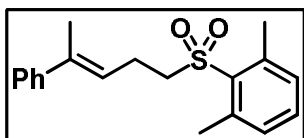
Colorless oil; yield: 88%; $R_f = 0.30$ (EtOAc/Pentane = 1/99).

^1H NMR (CDCl_3 , 300 MHz): δ 7.54-7.34 (m, 10H), 5.91 (td, $J = 6.9, 0.9$ Hz, 1H), 3.89 (s, 2H), 2.68-2.56 (m, 4H), 2.16 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 143.9, 139.0, 136.5, 129.3 $\times$ 2, 128.9 $\times$ 2, 128.6 $\times$ 2, 127.4, 127.2, 126.1 $\times$ 2, 126.5, 36.8, 31.5, 29.2, 16.4.

IR (neat, cm^{-1}): 2914, 1600, 1493, 1453, 1444, 1379, 1070, 1027, 755, 694.

HRMS-Cl calcd for $\text{C}_{18}\text{H}_{20}\text{S}$ $[\text{M}]^+$: 268.1286, found 268.1284.



(E)-1,3-dimethyl-2-(4-phenylpent-3-enylsulfonyl)benzene

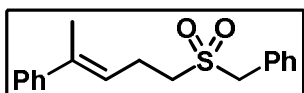
White solid; mp = 84.0-85.0°C; yield: 37%; R_f = 0.61 (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 300 MHz): δ 7.38-7.23 (m, 6H), 7.19 (d, J = 7.8 Hz, 2H), 5.67 (t, J = 7.2 Hz, 1H), 3.29-3.24 (m, 2H), 2.77 (s, 6H), 2.74-2.68 (m, 2H), 2.03 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 143.2, 140.4 $\times$ 2, 138.1, 136.2, 133.0, 131.9 $\times$ 2, 128.5 $\times$ 2, 127.4, 125.9 $\times$ 2, 123.2, 55.8, 23.3 $\times$ 2, 22.0, 16.1.

IR (neat, cm^{-1}): 2980, 1458, 1443, 1300, 1265, 1153, 1141, 1119, 1030, 752, 696.

HRMS-Cl calcd for $\text{C}_{19}\text{H}_{22}\text{SO}_2$ [$\text{M} + \text{H}$] $^+$: 315.1419, found 315.1419.



(E)-(5-(benzylsulfonyl)pent-2-en-2-yl)benzene

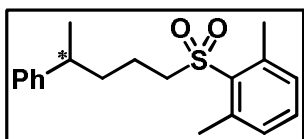
White solid; mp = 107.1-108.0 °C; yield: 37%; R_f = 0.55 (EtOAc/Pentane = 3/7).

^1H NMR (CDCl_3 , 300 MHz): δ 7.51-7.26 (m, 10H), 5.69 (td, J = 7.2, 0.9 Hz, 1H), 4.28 (s, 2H), 3.01-2.96 (m, 2H), 2.74 (q, J = 7.6 Hz, 2H), 2.08 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 143.2, 138.4, 130.9 $\times$ 2, 129.4 $\times$ 3, 128.6 $\times$ 2, 128.4, 127.5, 126.0 $\times$ 2, 123.1, 60.1, 50.9, 21.7, 16.3

IR (neat, cm^{-1}): 2975, 2923, 1496, 1309, 1256, 1115, 887, 791, 762, 730, 696.

HRMS-Cl calcd for $\text{C}_{18}\text{H}_{20}\text{SO}_2$ [M] $^+$: 300.1184, found 300.1184.



1,3-Dimethyl-2-(4-phenylpentylsulfonyl)benzene

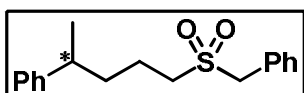
Colorless oil; yield: >99%; R_f = 0.61 (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 300 MHz): δ 7.35-7.26 (m, 3H), 7.21-7.11 (m, 5H), 3.11-3.03 (m, 2H), 2.67 (s, 6H), 2.71-2.64 (m, 1H), 1.80-1.61 (m, 4H), 1.25 (d, J = 6.9 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 146.5, 140.2 $\times$ 2, 136.3, 132.8, 131.8 $\times$ 2, 128.8 $\times$ 2, 127.1 $\times$ 2, 126.5, 56.3, 39.9, 37.2, 23.3 $\times$ 2, 22.3, 20.5.

IR (neat, cm^{-1}): 2960, 1494, 1458, 1311, 1153, 1122, 775, 702.

HRMS-Cl calcd for $\text{C}_{19}\text{H}_{24}\text{SO}_2$ [M] $^+$: 316.1497, found 316.1502.



(5-(benzylsulfonyl)pentan-2-yl)benzene

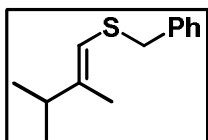
White solid; mp = 81.0-82.0 °C; yield: >99%; R_f = 0.55 (EtOAc/Pentane = 3/7).

^1H NMR (CDCl_3 , 300 MHz): δ 7.40-7.15 (m, 10H), 4.14 (s, 2H), 2.78-2.65 (m, 3H), 1.80-1.61 (m, 4H), 1.26 (d, J = 6.9 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 146.5, 130.7 $\times$ 2, 129.3 $\times$ 2, 129.2, 128.8 $\times$ 2, 128.4, 127.1 $\times$ 2, 126.6, 59.6, 51.3, 39.9, 37.2, 22.5, 20.4.

IR (neat, cm^{-1}): 2960, 1494, 1455, 1309, 1117, 765, 700.

HRMS-Cl calcd for $\text{C}_{18}\text{H}_{22}\text{SO}_2$ [M] $^+$: 302.1341, found 302.1342.



(E)-benzyl(2,3-dimethylbut-1-enyl)sulfane

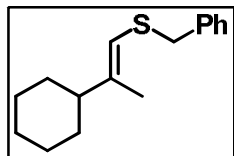
Yellow oil; yield: 98 %; R_f = 0.59 (EtOAc/Pentane = 1/19).

^1H NMR (CDCl_3 , 400 MHz): δ 7.32-7.11 (m, 5H), 5.62 (s, 1H), 3.77 (s, 2H), 2.33 (sep, J = 6.8 Hz 1H), 1.61 (s, 3H), 0.93 (d, J = 6.8 Hz, 6H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 144.1, 138.5, 128.9, 128.5, 127.0, 115.5, 38.3, 36.8, 21.3, 15.5.

IR (neat, cm^{-1}): 2960, 1494, 1453, 1078, 808, 764, 696.

HRMS-CI calcd for $\text{C}_{13}\text{H}_{18}\text{S}$ $[\text{M}]^+$: 206.1131, found 206.1131.

**(E)-benzyl(2-cyclohexylprop-1-enyl)sulfane**

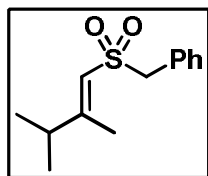
Colorless oil; yield: 33 %; R_f = 0.35 (Pentane).

^1H NMR (CDCl_3 , 400 MHz): δ 7.37-7.11 (m, 5H), 5.64 (s, 1H), 3.81 (s, 2H), 1.90 (t, J = 9.2 Hz, 1H), 1.81-1.70 (m, 2H), 1.70-1.62 (m, 6H), 1.35-1.20 (m, 2H), 1.20-1.05 (m, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 143.6, 138.6, 128.9, 128.6, 128.5, 127.1, 115.8, 47.3, 38.5, 31.4, 26.7, 26.4, 16.5.

IR (neat, cm^{-1}): 2922, 2850, 1494, 1449, 1239, 1070, 1029, 762, 695.

HRMS-CI calcd for $\text{C}_{16}\text{H}_{22}\text{S}$ $[\text{M}]^+$: 246.1442, found 246.1443.

**(E)-((2,3-dimethylbut-1-enylsulfonyl)methyl)benzene**

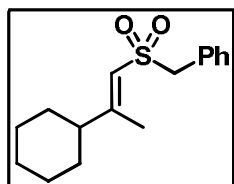
White solid; mp = 32.0-33.0 °C; yield: 90 %; R_f = 0.67 (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 400 MHz): δ 7.31-7.29 (m, 5H), 5.87 (s, 1H), 4.30 (s, 2H), 2.30 (sep, J = 6.8 Hz 1H), 1.74 (s, 3H), 1.00 (d, J = 6.8 Hz, 6H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 166.5, 131.2, 128.9, 128.8, 128.7, 120.6, 62.4, 38.4, 20.8, 15.2.

IR (neat, cm^{-1}): 2967, 1623, 1456, 1306, 1144, 1113, 817, 775, 696.

HRMS-CI calcd for $\text{C}_{13}\text{H}_{18}\text{O}_2\text{S}$ $[\text{M} + \text{H}]^+$: 239.1106, found 239.1105.

**(E)-((2-cyclohexylprop-1-enylsulfonyl)methyl)benzene**

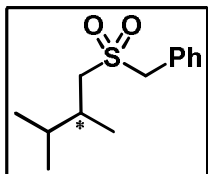
White solid; mp = 114.0-114.7 °C; yield: 70%; R_f = 0.42 (EtOAc/Pentane = 1/5).

^1H NMR (CDCl_3 , 500 MHz): δ 7.35-7.27 (m, 5H), 5.84-5.80 (m, 1H), 4.16 (s, 2H), 1.89 (qq, J = 11.8, 3.0 Hz, 1H), 1.79-1.72 (m, 2H), 1.70 (s, 3H), 1.68-1.59 (m, 3H), 1.28-1.16 (m, 2H), 1.16-1.02 (m, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 165.6, 131.0, 128.7, 128.6, 128.5, 120.7, 62.1, 48.5, 31.1, 26.1, 25.8, 15.9.

IR (neat, cm^{-1}): 2926, 2852, 1620, 1449, 1305, 1112, 695.

HRMS-CI calcd for $\text{C}_{16}\text{H}_{22}\text{O}_2\text{S}$ $[\text{M} + \text{H}]^+$: 279.1419, found 279.1411.



((2,3-dimethylbutylsulfonyl)methyl)benzene

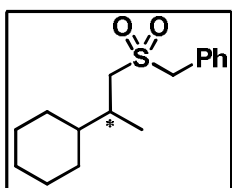
Colorless oil; yield: %; R_f = 0.67 (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 300 MHz): δ 7.41 (brs, 5H), 4.22 (s, 2H), 2.87 (dd, J = 13.5, 4.5 Hz, 1H), 2.62 (dd, J = 15.0, 9.0 Hz, 1H), 2.12 (m, 1H), 1.70 (m, 1H), 1.05 (d, J = 6.0 Hz, 3H), 0.85 (d, J = 6.0 Hz, 3H), 0.79 (d, J = 6.0 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 130.7, 129.2, 129.1, 128.4, 60.9, 55.5, 33.2, 32.5, 19.6, 17.8, 15.8.

IR (neat, cm^{-1}): 2962, 1496, 1456, 1305, 1258, 1118, 790, 698.

HRMS-CI calcd for $\text{C}_{13}\text{H}_{19}\text{O}_2\text{S}$ $[\text{M}]^+$: 240.1184, found 240.1183.



((2-cyclohexylpropylsulfonyl)methyl)benzene

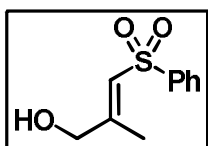
Colorless oil; yield: %; R_f = 0.42 (EtOAc/Pentane = 1/5).

^1H NMR (CDCl_3 , 500 MHz): δ 7.46-7.36 (m, 5H), 4.21 (s, 2H), 2.91 (dd, J = 13.7, 3.6 Hz, 1H), 2.63 (dd, J = 13.7, 9.1 Hz, 1H), 2.13-2.05 (m, 1H), 1.79-1.69 (m, 2H), 1.68-1.61 (m, 1H), 1.54-1.45 (m, 1H), 1.36-1.13 (m, 4H), 1.12-1.01 (m, 4H), 1.00-0.86 (m, 2H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 130.8, 129.2, 129.1, 128.3, 60.9, 55.7, 43.0, 32.8, 30.2, 28.4, 26.6, 26.6, 26.5, 16.6.

IR (neat, cm^{-1}): 2927, 1596, 1455, 1303, 1117, 697.

HRMS-CI calcd for $\text{C}_{16}\text{H}_{23}\text{O}_2\text{S}$ $[\text{M} + \text{H}]^+$: 281.1575, found 281.1573.



(E)-2-methyl-3-(phenylsulfonyl)prop-2-en-1-ol

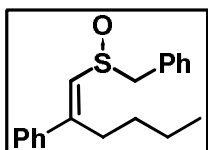
White solid; mp = 49.0-50.0 $^{\circ}\text{C}$; R_f = 0.24 (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 300 MHz): δ 7.87-7.84 (m, 2H), 7.60-7.47 (m, 3H), 6.52 (s, 1H), 4.05 (s, 2H), 3.09 (s, 1H), 1.99 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 156.8, 141.9, 129.3 $\times$ 2, 127.0 $\times$ 2, 123.6, 133.3, 66.0, 14.4.

IR (neat, cm^{-1}): 3392, 1633, 1451, 1309, 1288, 1138, 1082, 1071, 894, 797, 757.

HRMS-CI calcd for $\text{C}_{10}\text{H}_{12}\text{O}_3\text{S}$ $[\text{M}]^+$: 212.0507, found 212.0503.



(E)-(1-(benzylsulfinyl)hex-1-en-2-yl)benzene

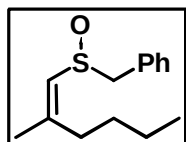
White solid; mp = 61.5-62.5 $^{\circ}\text{C}$; yield: 91%; R_f = 0.53 (EtOAc/Pentane = 1/1).

^1H NMR (CDCl_3 , 300 MHz): δ 7.56-7.19 (m, 10H), 6.29 (s, 1H), 4.26 (d, J = 12.0 Hz, 1H), 4.02 (d, J = 11.7 Hz, 1H), 2.56-2.48 (m, 2H), 1.34-1.11 (m, 4H), 0.98-0.83 (m, 2H), 0.78 (t, J = 7.0 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 155.9, 139.1, 134.6, 130.8, 129.3, 129.0, 128.8, 128.6, 126.8, 125.9, 61.7, 38.6, 31.8, 30.2, 30.6, 29.8, 22.7, 22.5, 14.0, 13.8.

IR (neat, cm^{-1}): 2957, 2870, 1599, 1495, 1455, 1038, 753, 697.

HRMS-CI calcd for $\text{C}_{19}\text{H}_{22}\text{OS}$ [$\text{M}+\text{H}$] $^+$: 299.1470, found 299.1468



(Z)-((2-methylhex-1-en-1-yl)sulfinyl)methylbenzene

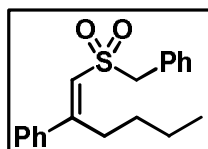
Colorless oil; yield: 85 %; R_f = 0.27 (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 400 MHz): δ 7.39-7.28 (m, 3H), 7.28-7.20 (m, 2H), 5.91 (s, 1H), 4.14 (d, J = 12.4 Hz, 1H), 3.88 (d, J = 12.4 Hz, 1H), 2.10-2.00 (m, 2H), 1.82 (s, 3H), 1.34-1.20 (m, 1H), 1.19-1.08 (m, 2H), 0.93-0.82 (m, 1H), 0.79 (t, J = 7.2 Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 154.5, 130.5, 130.0, 129.1, 128.8, 128.3, 60.6, 33.8, 30.0, 23.3, 22.4, 13.9.

IR (neat, cm^{-1}): 2956, 2930, 1626, 1496, 1454, 1027, 771, 698.

HRMS-CI calcd for $\text{C}_{14}\text{H}_{20}\text{OS}$ [M] $^+$: 236.1235, found 236.1236.



(E)-((1-(benzylsulfonyl)hex-1-en-2-yl)methyl)benzene

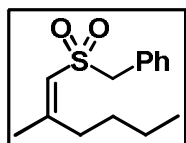
White solid; mp = 60.0-60.9°C; yield: 80 %; R_f = 0.67 (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 400 MHz): δ 7.45-7.35 (m, 8H), 7.28-7.20 (m, 2H), 6.15 (s, 1H), 4.30 (s, 2H), 2.80 (dd, J = 6.8, 7.6 Hz, 2H), 1.28-1.11 (m, 4H), 0.78 (t, J = 7.2 Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 162.0, 139.6, 131.2, 129.7, 129.0, 128.9, 128.8, 126.7, 123.6, 62.7, 30.8, 29.9, 22.7, 13.8.

IR (neat, cm^{-1}): 2957, 2930, 1602, 1307, 1144, 1116, 697.

HRMS-CI calcd for $\text{C}_{19}\text{H}_{22}\text{O}_2\text{S}$ [$\text{M} + \text{H}$] $^+$: 315.1419, found 315.1421.



(Z)-((2-methylhex-1-en-1-yl)sulfonyl)methylbenzene

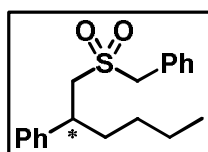
White solid; mp = 46.0-47.0°C; yield: 85 %; R_f = 0.70 (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 400 MHz): δ 7.35 (s, 5H), 5.86 (s, 1H), 4.18 (s, 2H), 2.26 (t, J = 10.0 Hz, 2H), 1.85 (s, 3H), 1.31-1.20 (m, 4H), 0.83 (t, J = 9.2 Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 161.3, 131.1, 128.8, 128.7, 128.6, 122.2, 62.4, 32.0, 30.2, 24.6, 22.8, 13.9.

IR (neat, cm^{-1}): 2957, 2930, 1623, 1455, 1300, 1114, 792, 696.

HRMS-CI calcd for $\text{C}_{14}\text{H}_{20}\text{O}_2\text{S}$ [M] $^+$: 252.1184, found 252.1185.



(1-(benzylsulfonyl)hexan-2-yl)methylbenzene

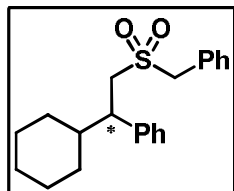
Colorless oil; yield: %; $R_f = 0.70$ (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 400 MHz): δ 7.48-7.20 (m, 8H), 7.17-7.09 (m, 2H), 3.72 (s, 2H), 3.38-3.15 (m, 2H), 3.15-3.00 (m, 1H), 1.91-1.79 (m, 1H), 1.79-1.55 (m, 1H), 1.39-0.99 (m, 4H), 0.82 (t, $J = 9.6$ Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 142.3, 130.8, 129.1, 129.0, 128.9, 128.1, 127.7, 127.5, 60.4, 58.6, 40.7, 36.1, 29.4, 22.4, 14.0.

IR (neat, cm^{-1}): 2926, 2856, 1494, 1296, 1114, 696.

HRMS-CI calcd for $\text{C}_{19}\text{H}_{23}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 317.1575, found 317.1575.



(2-(benzylsulfonyl)-1-cyclohexylethyl)benzene

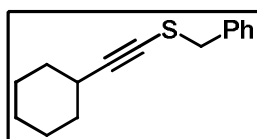
White solid; mp = 100.0-101.0 °C; yield: %; $R_f = 0.24$ (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 300 MHz): δ 7.33-7.27 (m, 2H), 7.22-7.17 (m, 4H), 7.15-7.11 (m, 2H), 6.95-6.98 (m, 2H), 3.48 (s, 2H), 3.19(d, $J = 7.5$ Hz, 2H), 2.96-3.03 (m, 1H), 1.78-1.74 (m, 1H), 1.68-1.63 (m, 1H), 1.55-1.42 (m, 3H), 1.34-1.30 (m, 1H), 1.20-0.94 (m, 3H), 0.85 (ddd, $J = 24.0, 12.0, 3.3$ Hz, 1H), 0.72 (ddd, $J = 24.3, 12.0, 3.3$ Hz, 1H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 141.3, 130.9 $\times 2$, 129.0, 128.9 $\times 2$, 128.8 $\times 2$, 128.4 $\times 2$, 127.6, 127.4, 60.1, 56.4, 46.8, 42.7, 31.3, 30.4, 26.3 $\times 3$.

IR (neat, cm^{-1}): 2924, 2852, 1603, 1495, 1454, 1307, 1116, 768, 698.

HRMS-CI calcd for $\text{C}_{21}\text{H}_{25}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 343.1732, found 343.1732.



benzyl(cyclohexylethynyl)sulfane

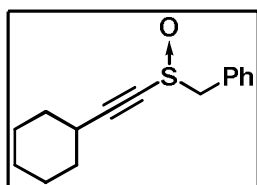
White solid; mp = 71.6-72.9 °C; yield: 75 %; $R_f = 0.33$ (Pentane).

^1H NMR (CDCl_3 , 300 MHz): δ 7.34-7.27 (m, 5H), 3.88 (s, 2H), 2.47-2.41 (m, 1H), 1.77-1.60 (m, 4H), 1.53-1.23 (m, 6H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 137.2, 129.2 $\times 2$, 128.6 $\times 2$, 127.6, 100.2, 68.1, 40.4, 32.7 $\times 2$, 30.5, 26.0 $\times 2$, 24.9.

IR (neat, cm^{-1}): 2930, 2852, 1492, 1446, 1235, 1204, 1070, 889, 767, 697.

HRMS-CI calcd for $\text{C}_{15}\text{H}_{18}\text{S}$ $[\text{M}]^+$: 230.1129, found 230.1128.



((cyclohexylethynylsulfinyl)methyl)benzene

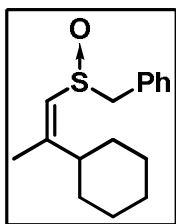
White solid; mp = 48.0-49.0 °C; yield: 85 %; $R_f = 0.60$ (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 300 MHz): δ 7.39-7.26 (m, 5H), 4.22 (s, 2H), 2.57-2.49 (m, 1H), 1.76-1.60 (m, 4H), 1.49-1.24 (m, 6H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 130.5, 129.2, 128.6, 110.0, 76.7, 62.8, 31.4, 29.7, 25.5, 24.5.

IR (neat, cm^{-1}): 2926, 2851, 2178, 2140, 1494, 1201, 1054, 1028, 900, 888, 769.

HRMS-CI calcd for $\text{C}_{15}\text{H}_{18}\text{OS}$ $[\text{M}]^+$: 246.1078, found 246.1075.



(Z)-((2-cyclohexylprop-1-enylsulfinyl)methyl)benzene

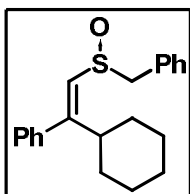
White solid; mp = 97.0-98.0 °C; yield: 64 %; R_f = 0.14 (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 300 MHz): δ 7.35-7.24 (m, 5H), 5.82 (s, 1H), 4.19 (d, J = 12.0 Hz, 1H, AB), 3.87 (d, J = 11.7 Hz, 1H, AB), 2.56-2.44 (m, 1H), 1.75 (s, 3H), 1.71-1.51 (m, 4H), 1.28-1.14 (m, 2H), 1.10-0.98 (m, 3H), 0.49-0.44 (m, 1H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 158.9, 130.5, 130.0, 128.8, 128.3, 61.1, 42.5, 30.8, 30.6, 26.0, 25.9, 25.8, 19.6.

IR (neat, cm^{-1}): 2924, 2851, 1619, 1496, 1449, 1369, 1016, 1034, 772, 699.

HRMS-Cl calcd for $\text{C}_{16}\text{H}_{22}\text{OS}$ $[\text{M}]^+$: 262.1391, found 262.1392.



(E)-(2-(benzylsulfinyl)-1-cyclohexylvinyl)benzene

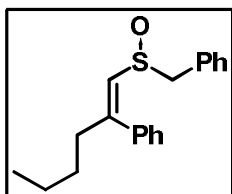
Yellow solid; mp = 111.8-112.3 °C; yield: 71 %; R_f = 0.19 (EtOAc/Pentane = 1/4).

^1H NMR (CDCl_3 , 400 MHz): δ 7.49-7.21 (m, 8H), 7.10-6.98 (m, 2H), 5.94 (s, 1H), 4.31 (d, J = 12.4 Hz, 1H), 3.94 (d, J = 12.4 Hz, 1H), 2.64 (tt, J = 3.2, 12.0 Hz, 1H), 1.71-1.60 (m, 2H), 1.58-1.47 (m, 2H), 1.29-1.15 (m, 1H), 1.10-0.88 (m, 4H), 0.68-0.60 (m, 1H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 161.2, 139.6, 131.6, 130.6, 129.8, 128.9, 128.5, 128.0, 127.9, 127.7, 61.3, 43.3, 31.5, 31.3, 26.1, 25.6.

IR (neat, cm^{-1}): 2928, 2853, 1595, 1495, 1451, 1037, 753, 699.

HRMS-Cl calcd for $\text{C}_{21}\text{H}_{24}\text{OS}$ $[\text{M}]^+$: 324.1548, found 324.1542.



(Z)-(1-(benzylsulfinyl)hex-1-en-2-yl)benzene

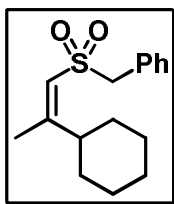
White solid; mp = 70.5-71.3 °C; yield: 48 %; R_f = 0.35 (EtOAc/Pentane = 4/1).

^1H NMR (CDCl_3 , 400 MHz): δ 7.42-7.15 (m, 9H), 6.79-6.70 (m, 1H), 6.19 (s, 1H), 4.14 (d, J = 2.5 Hz, 1H), 3.96 (d, J = 2.5 Hz, 1H), 2.48-2.42 (m, 2H), 1.36-1.22 (m, 4H), 0.86 (t, J = 5.6 Hz, 3H).

^{13}C NMR (CDCl_3 , 100 MHz): δ 137.9, 130.6, 130.5, 130.0, 129.0, 128.9, 128.5, 128.4, 128.2, 127.9, 60.6, 39.1, 29.4, 22.2, 13.9.

IR (neat, cm^{-1}): 2948, 2925, 2857, 1596, 1494, 1455, 1376, 1015, 841, 760, 733, 695.

HRMS-Cl calcd for $\text{C}_{19}\text{H}_{22}\text{OS}$ $[\text{M}]^+$: 298.1391, found 298.1392.



(Z)-((2-cyclohexylprop-1-enylsulfonyl)methyl)benzene

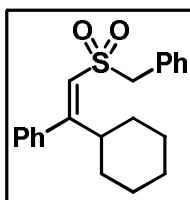
White solid; mp = 79.0-80.0 °C; yield: 61 %; R_f = 0.50 (EtOAc/Pentane = 1/5).

^1H NMR (CDCl_3 , 300 MHz): δ 7.42-7.26 (m, 5H), 5.80 (s, 1H), 4.19 (s, 2H), 3.09-3.00 (m, 1H), 1.77 (s, 3H), 1.70-1.56 (m, 3H), 1.32-1.00 (m, 7H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 165.8, 131.2 $\times$ 2, 128.9 $\times$ 4, 121.6, 62.7, 40.1, 30.9 $\times$ 2, 26.1, 26.0 $\times$ 2, 20.6.

IR (neat, cm^{-1}): 2934, 2854, 1610, 1449, 1295, 1146, 1109, 893, 784, 696.

HRMS-Cl calcd for $\text{C}_{16}\text{H}_{22}\text{O}_2\text{S}$ $[\text{M} + \text{H}]^+$: 279.1419, found 279.1422.



(E)-((2-benzylsulfonyl)-1-cyclohexylvinyl)benzene

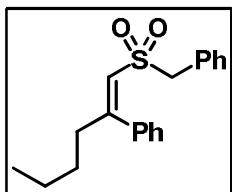
White solid; mp = 137.5-138.2 °C; yield: 60 %; R_f = 0.67 (EtOAc/Pentane = 1/5).

^1H NMR (CDCl_3 , 300 MHz): δ 7.46-7.40 (m, 5H), 7.34-7.33 (m, 3H), 7.05-7.02 (m, 2H), 5.87 (s, 1H), 4.31 (s, 2H), 3.28 (tt, J = 12.0, 3.0 Hz, 1H), 1.65-1.56 (m, 3H), 1.42 (d, J = 12.0 Hz, 2H), 1.29-1.16 (m, 2H), 1.09-0.86 (m, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 167.2, 139.0, 131.1, 128.9, 128.8, 128.6, 128.0, 127.9, 127.3, 124.4, 62.5, 40.0, 31.1, 25.8, 25.6.

IR (neat, cm^{-1}): 2926, 2854, 1595, 1492, 1450, 1295, 1144, 1115, 831, 778, 732, 696.

HRMS-Cl calcd for $\text{C}_{21}\text{H}_{24}\text{O}_2\text{S}$ $[\text{M}]^+$: 340.1497, found 340.1502.



(Z)-((1-benzylsulfonyl)hex-1-en-2-yl)benzene

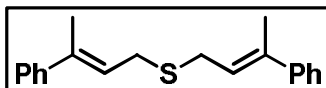
Colorless oil; yield: 62 %; R_f = 0.67 (EtOAc/Pentane = 1/5).

^1H NMR (CDCl_3 , 300 MHz): δ 7.41-7.34 (m, 6H), 7.31-7.24 (m, 2H), 7.15-7.09 (m, 2H), 6.22 (s, 1H), 3.99 (s, 2H), 2.47-2.43 (m, 2H), 1.37-1.30 (m, 4H), 0.93-0.83 (t, J = 7.0 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 160.4, 136.7, 131.1 $\times$ 2, 128.8 $\times$ 2, 128.7 $\times$ 2, 128.2, 128.0 $\times$ 2, 127.6 $\times$ 2, 124.8, 61.4, 40.8, 29.2, 22.1, 13.8.

IR (neat, cm^{-1}): 2956, 2930, 1596, 1455, 1302, 1115, 695.

HRMS-Cl calcd for $\text{C}_{19}\text{H}_{22}\text{O}_2\text{S}$ $[\text{M} + \text{H}]^+$: 315.1419, found 315.1419.

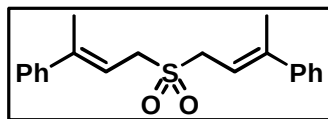


bis((E)-3-phenylbut-2-enyl)sulfane

Colorless oil; yield: 94 %, crude; R_f = 0.15 (Pentane).

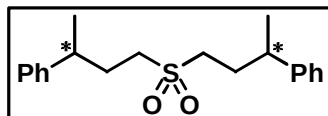
^1H NMR (CDCl_3 , 300 MHz): δ 7.42-7.23 (m, 10H), 5.92 (t, J = 6.0 Hz, 2H), 3.39 (d, J = 6.0 Hz, 4H), 2.09 (s, 6H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 143.2, 137.8, 128.4, 127.2, 125.9, 124.3, 29.8, 16.0.
 IR (neat, cm^{-1}): 2917, 1598, 1493, 1444, 1378, 1214, 1026, 862, 758, 693.
 HRMS-CI calcd for $\text{C}_{20}\text{H}_{22}\text{S}$ $[\text{M}]^+$: 294.1442, found 294.1447.



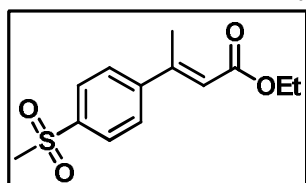
(2E,2'E)-4,4'-sulfonylbis(but-2-ene-4,2-diyl)dibenzene

White solid; mp = 97.0-98.0 $^{\circ}\text{C}$; yield: 35 %; R_f = 0.74 (EtOAc/Pentane = 2/3).
 ^1H NMR (CDCl_3 , 300 MHz): δ 7.43-7.28 (m, 10H), 5.90 (td, J = 7.8, 1.2 Hz, 2H), 3.93 (d, J = 7.8 Hz, 4H), 2.15 (s, 6H).
 ^{13}C NMR (CDCl_3 , 75 MHz): δ 144.6, 142.2, 128.7, 128.3, 126.2, 113.2, 53.2, 17.0.
 IR (neat, cm^{-1}): 2988, 1636, 1493, 1444, 1295, 1272, 1126, 1024, 859, 761, 721, 694.
 HRMS-CI calcd for $\text{C}_{20}\text{H}_{22}\text{O}_2\text{S}$ $[\text{M}]^+$: 326.1341, found 326.1336.



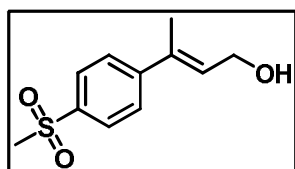
4,4'-sulfonylbis(butane-4,2-diyl)dibenzene

Colorless oil; R_f = 0.18 (EtOAc/Pentane = 1/9).
 ^1H NMR (CDCl_3 , 300 MHz): δ 7.33-7.28 (m, 4H), 7.24-7.20 (m, 2H), 7.16-7.13 (m, 4H), 2.81-2.61 (m, 5H), 2.12-1.92 (m, 4H), 1.29 (d, J = 7.2 Hz, 6H), 1.27 (d, J = 5.1 Hz, 6H), 0.90-0.84 (m, 1H).
 ^{13}C NMR (CDCl_3 , 75 MHz): δ 144.8, 128.9, 127.0, 126.9, 51.2, 39.1, 29.9 $\times$ 2, 22.4.
 IR (neat, cm^{-1}): 2961, 2927, 1494, 1453, 1307, 1287, 1126, 764, 701.
 HRMS-CI calcd for $\text{C}_{20}\text{H}_{24}\text{O}_2\text{S}$ $[\text{M}]^+$: 330.1654, found 330.1653.



(E)-ethyl 3-(4-(methylsulfonyl)phenyl)but-2-enoate

Colorless oil; yield: 85%; R_f = 0.71 (EtOAc/Pentane = 1/2).
 ^1H NMR (CDCl_3 , 300 MHz): δ 7.94 (d, J = 8.5 Hz, 2H), 7.63 (d, J = 8.5 Hz, 2H), 6.15 (d, J = 1.3 Hz, 1H), 4.23 (q, J = 7.2 Hz, 2H), 3.06 (s, 3H), 2.57 (d, J = 1.2 Hz, 3H), 1.32 (t, J = 7.2 Hz, 3H).
 ^{13}C NMR (CDCl_3 , 75 MHz): δ 166.3, 153.2, 147.9, 140.7, 127.8, 127.4, 120.0, 60.4, 44.6, 18.1, 14.4.
 IR (neat, cm^{-1}): 2928, 1710, 1630, 1310, 1272, 1174, 1150, 1094, 1041, 958, 838, 788.
 HRMS-CI calcd for $\text{C}_{13}\text{H}_{16}\text{O}_4\text{S}$ $[\text{M}+\text{H}]^+$: 269.0848, found 269.0849.

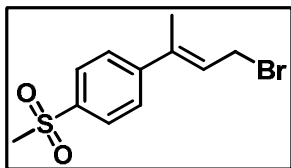


(E)-3-(4-(methylsulfonyl)phenyl)but-2-en-1-ol

Colorless oil; yield: 98%; R_f = 0.23 (EtOAc/Pentane = 1/1).
 ^1H NMR (CDCl_3 , 300 MHz): δ 7.77 (d, J = 8.6 Hz, 2H), 7.44 (d, J = 8.4 Hz, 2H), 5.97 (t, J = 5.4 Hz, 1H), 4.29 (d, J = 6.0 Hz, 2H), 2.96 (s, 3H), 1.96 (s, 3H).
 ^{13}C NMR (CDCl_3 , 75 MHz): δ 148.4, 138.6, 130.4, 128.3, 127.3, 126.6, 59.7, 44.5, 15.9.

IR (neat, cm^{-1}): 3505, 2927, 2255, 1594, 1404, 1300, 1146, 1092, 1010, 956, 909, 781, 726.

HRMS-Cl calcd for $\text{C}_{11}\text{H}_{14}\text{O}_3\text{S}$ $[\text{M}+\text{H}]^+$: 227.0742, found 227.0745.



(E)-1-(4-bromobut-2-en-2-yl)-4-(methylsulfonyl)benzene

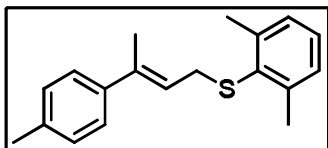
White solid; mp = 77.2-77.8 $^{\circ}\text{C}$; yield: 99%; R_f = 0.24(EtOAc/Pentane = 1/3).

^1H NMR (CDCl_3 , 300 MHz): δ 7.91 (d, J = 8.4 Hz, 2H), 7.57 (d, J = 8.5 Hz, 2H), 6.18 (t, J = 8.4 Hz, 1H), 4.18 (d, J = 8.5 Hz, 2H), 3.05 (s, 3H), 2.17 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 147.9, 139.7, 139.6, 127.7, 127.0, 126.1, 44.7, 28.2, 15.7.

IR (neat, cm^{-1}): 2923, 1593, 1405, 1305, 1147, 1066, 956, 832, 779, 744.

HRMS-Cl calcd for $\text{C}_{11}\text{H}_{13}\text{BrO}_2\text{S}$ $[\text{M}+\text{H}]^+$: 288.9898, found 288.9890.



(E)-(2,6-dimethylphenyl)(3-p-tolylbut-2-enyl)sulfane

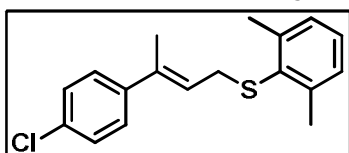
Colorless oil; yield: 41 %; R_f = 0.35(Pentane).

^1H NMR (d_6 -Acetone, 300 MHz): δ 7.26-7.06 (m, 7H), 5.84 (td, J = 1.2, 8.2 Hz, 1H), 3.54 (d, J = 8.2 Hz, 2H), 2.57 (s, 6H), 2.37 (s, 3H), 1.73 (s, 3H).

^{13}C NMR (d_6 -Acetone, 75 MHz): δ 144.4, 141.2, 138.4, 137.5, 133.7, 129.8, 129.5, 128.9, 126.3, 123.1, 33.9, 22.4, 21.1.

IR (neat, cm^{-1}): 2988, 2973, 2902, 1407, 1394, 1380, 1250, 1229, 1066, 1057, 813, 771.

HRMS-Cl calcd for $\text{C}_{19}\text{H}_{22}\text{S}$ $[\text{M}+\text{H}]^+$: 282.1442, found 282.1443.



(E)-(3-(4-chlorophenyl)but-2-enyl)(2,6-dimethylphenyl)sulfane

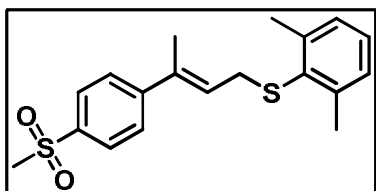
Colorless oil; yield: 88%; R_f = 0.44(EtOAc/Pentane = 1/99).

^1H NMR (CDCl_3 , 300 MHz): δ 7.32 (d, J = 8.7 Hz, 2H), 7.25 (d, J = 8.7 Hz, 2H), 7.22-7.14 (m, 3H), 5.89 (t, J = 7.8 Hz, 1H), 3.53 (d, J = 8.4 Hz, 2H), 2.64 (s, 6H), 1.78 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 143.7 $\times$ 2, 141.7, 136.6 $\times$ 2, 132.8, 128.6, 128.4 $\times$ 2, 128.1 $\times$ 2, 126.9 $\times$ 2, 123.7, 33.4, 22.2 $\times$ 2, 15.1.

IR (neat, cm^{-1}): 2920, 1493, 1459, 1375, 1091, 1011, 821, 769, 755.

HRMS-Cl calcd for $\text{C}_{18}\text{H}_{19}\text{ClS}$ $[\text{M}]^+$: 302.0896, found 302.0896.



(E)-(2,6-dimethylphenyl)(3-(4-(methylsulfonyl)phenyl)but-2-enyl)sulfane

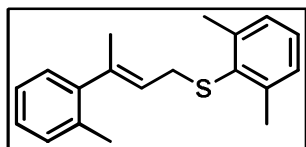
Pale yellow oil; R_f = 0.65 (EtOAc/Pentane = 2/3).

^1H NMR (CDCl_3 , 300 MHz): δ 7.75 (d, J = 8.4 Hz, 2H), 7.31 (d, J = 8.4 Hz, 2H), 7.07-9.97 (m, 3H), 5.83 (td, J = 8.4, 1.2 Hz, 1H), 3.38 (d, J = 8.1 Hz, 2H), 2.95 (s, 3H), 2.45 (s, 6H), 1.62 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 148.8, 143.7, 138.7, 136.2, 132.5, 128.8, 128.4, 128.2, 127.5, 126.5, 44.6, 33.3, 22.2, 15.1.

IR (neat, cm^{-1}): 2924, 1592, 1460, 1308, 1147, 1093, 955, 834, 777.

HRMS-CI calcd for $\text{C}_{19}\text{H}_{22}\text{O}_2\text{S}_2[\text{M}]^+$: 346.1061, found 346.1063.



(E)-(2,6-dimethylphenyl)(3-o-tolylbut-2-enyl)sulfane

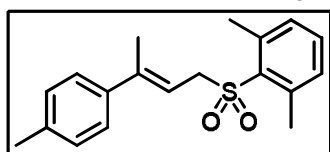
Colorless oil; yield: 50 %; R_f = 0.31 (Pentane).

^1H NMR (CDCl_3 , 300 MHz): δ 7.15-7.08 (m, 6H), 6.92-6.88 (m, 1H), 5.38 (tq, J = 8.1, 1.5 Hz, 1H), 3.47 (d, J = 8.1 Hz, 2H), 2.59 (s, 6H), 2.14 (s, 3H), 1.69 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 145.0, 143.6 $\times$ 2, 139.6, 134.8, 133.2, 130.1, 128.5, 128.2 $\times$ 2, 128.1, 126.8, 125.6, 124.6, 33.0, 22.4 $\times$ 2, 19.7, 17.6.

IR (neat, cm^{-1}): 2951, 2923, 1486, 1459, 1375, 1218, 1044, 760, 728.

HRMS-CI calcd for $\text{C}_{19}\text{H}_{22}\text{S} [\text{M}]^+$: 282.1442, found 282.1432.



(E)-1,3-dimethyl-2-(3-p-tolylbut-2-enylsulfonyl)benzene

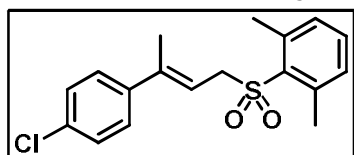
White solid; mp = 73.5-74.6 $^{\circ}\text{C}$; yield: 70 %; R_f = 0.34 (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 300 MHz): δ 7.32 (t, J = 7.6 Hz, 1H), 7.18-7.10 (m, 6H), 5.70 (td, J = 8.2, 1.4 Hz, 1H), 4.04 (d, J = 8.4 Hz, 2H), 2.71 (s, 6H), 2.34 (s, 3H), 1.75 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 144.4, 140.6 $\times$ 2, 139.4, 137.8, 135.9, 132.9, 131.6 $\times$ 2, 129.1 $\times$ 2, 125.7 $\times$ 2, 112.1, 56.4, 23.3 $\times$ 2, 21.2, 16.0.

IR (neat, cm^{-1}): 2980, 2937, 1583, 1458, 1310, 1146, 1121, 815, 774, 740.

HRMS-CI calcd for $\text{C}_{19}\text{H}_{22}\text{O}_2\text{S} [\text{M}]^+$: 314.1341, found 314.1343.



(E)-2-(3-(4-chlorophenyl)but-2-enylsulfonyl)-1,3-dimethylbenzene

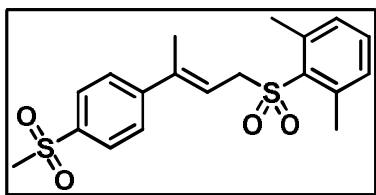
White solid; mp = 80.0-81.0 $^{\circ}\text{C}$; yield: 81%; R_f = 0.31 (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 300 MHz): δ 7.38-7.12 (m, 7H), 5.72 (t, J = 8.2 Hz, 1H), 4.03 (d, J = 8.2 Hz, 2H), 2.70 (s, 6H), 1.77 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 143.5, 140.7, 140.6, 135.9, 133.8, 133.0, 131.7, 128.6, 127.1, 113.6, 56.4, 23.3, 16.1.

IR (neat, cm^{-1}): 2981, 2937, 1583, 1488, 1458, 1402, 1311, 1146, 1121, 1092, 1011, 825, 775.

HRMS-CI calcd for $\text{C}_{18}\text{H}_{19}\text{ClO}_2\text{S} [\text{M}]^+$: 334.0794, found 334.0791.



(E)-1,3-dimethyl-2-(3-(4-(methylsulfonyl)phenyl)but-2-enylsulfonyl)benzene

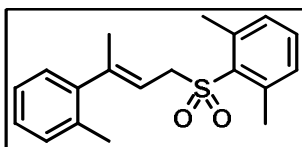
White solid; mp = 132.1-133.2 °C; R_f = 0.48(EtOAc/Pentane = 3/2).

^1H NMR (CDCl_3 , 300 MHz): δ 7.83 (d, J = 8.4 Hz, 2H), 7.40 (d, J = 8.4 Hz, 2H), 7.31 (t, J = 7.6 Hz, 1H), 7.12 (d, J = 7.6 Hz, 2H), 5.79 (t, J = 7.8 Hz, 1H), 4.03 (d, J = 8.2 Hz, 1H), 3.09 (s, 3H), 2.65 (s, 6H), 1.80 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 147.6, 143.0, 140.3, 139.5, 135.6, 133.1, 131.6, 127.5, 126.6, 116.1, 56.1, 44.4, 23.1, 16.0.

IR (neat, cm^{-1}): 2931, 1594, 1458, 1401, 1304, 1144, 1120, 1092, 955, 912, 834, 774, 728.

HRMS-Cl calcd for $\text{C}_{19}\text{H}_{22}\text{O}_4\text{S}_2[\text{M}+\text{H}]^+$: 379.1038, found 379.1039.



(E)-1,3-dimethyl-2-(3-o-tolylbut-2-enylsulfonyl)benzene

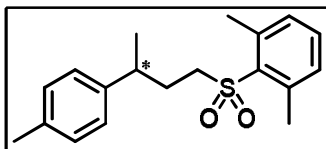
White solid; mp = 87.2-88.0 °C; yield: 78 %; R_f = 0. (EtOAc/Pentane =).

^1H NMR (CDCl_3 , 300 MHz): δ 7.34 (t, J = 7.5 Hz, 1H), 7.19-7.10 (m, 5H), 6.88 (d, J = 6.0 Hz, 1H), 5.36 (td, J = 9.0, 3.0 Hz, 1H), 4.04 (d, J = 6.0 Hz, 2H), 2.75 (s, 6H), 2.13 (s, 3H), 1.74 (s, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 146.7, 143.9, 140.5, 136.0, 134.5, 132.9, 131.7, 130.3, 127.6, 127.4, 125.8, 114.8, 56.3, 23.4, 19.7, 18.5.

IR (neat, cm^{-1}): 2980, 1582, 1458, 1306, 1146, 1119, 776, 764, 743, 729.

HRMS-Cl calcd for $\text{C}_{19}\text{H}_{22}\text{O}_2\text{S} [\text{M}]^+$: 314.1341, found 314.1336.



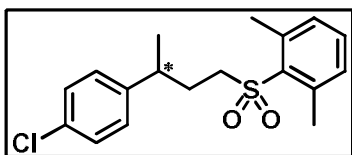
1,3-dimethyl-2-(3-p-tolylbutylsulfonyl)benzene

White solid; mp = 135.0-136.0 °C; R_f = 0.34 (EtOAc/Pentane = 1/9). ^1H NMR (CDCl_3 , 300 MHz): δ 7.29 (m, 1H), 7.17-7.05 (m, 4H), 7.01-6.94 (m, 2H), 3.05-2.83 (m, 2H), 3.54 (d, J = 8.2 Hz, 2H), 2.75 (m, 1H), 2.61 (s, 6H), 2.31 (s, 3H), 2.20-1.88 (m, 2H), 1.24 (d, J = 6.9 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 141.9, 140.2, 136.3, 136.2, 132.7, 131.7, 129.5, 126.8, 54.4, 38.6, 29.8, 23.1, 22.8, 21.1.

IR (neat, cm^{-1}): 2961, 2936, 1515, 1458, 1309, 1154, 1122, 818, 776.

HRMS-Cl calcd for $\text{C}_{19}\text{H}_{23}\text{O}_2\text{S} [\text{M}]^+$: 316.1497, found 316.1497.



2-(3-(4-chlorophenyl)butylsulfonyl)-1,3-dimethylbenzene

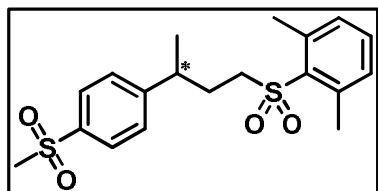
Colorless oil; R_f = 0.31(EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 300 MHz): δ 7.39-6.98 (m, 7H), 3.05-2.73 (m, 3H), 2.61 (s, 6H), 2.14 (m, 1H), 1.99 (m, 1H), 1.25 (d, J = 6.9 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 143.5, 140.1, 136.1, 132.8, 132.4, 131.7, 129.0, 128.4, 54.1, 38.4, 29.7, 23.1, 22.6.

IR (neat, cm^{-1}): 2965, 2937, 1583, 1493, 1458, 1312, 1154, 1122, 1097, 1013, 829, 775.

HRMS-Cl calcd for $\text{C}_{18}\text{H}_{20}\text{ClO}_2\text{S}$ $[\text{M}]^+$: 336.0951, found 336.0942.



1,3-dimethyl-2-(3-(4-(methylsulfonyl)phenyl)butylsulfonyl)benzene

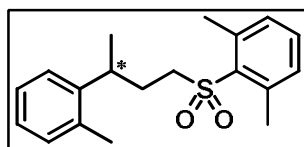
Colorless oil; R_f = 0.48 (EtOAc/Pentane = 3/2).

^1H NMR (CDCl_3 , 300 MHz): δ 7.86 (d, J = 8.2 Hz, 2H), 7.43-7.28 (m, 3H), 3.04 (s, 3H), 3.02 – 2.80 (m, 3H), 2.61 (s, 6H), 2.28-1.98 (m, 2H), 1.30 (d, J = 6.7 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 151.7, 140.1, 139.1, 135.9, 132.9, 131.8, 128.1, 128.0, 53.9, 44.6, 38.9, 29.6, 23.1, 22.3.

IR (neat, cm^{-1}): 2967, 2933, 1458, 1304, 1147, 1122, 1089, 956, 841, 778, 728.

HRMS-Cl calcd for $\text{C}_{19}\text{H}_{23}\text{O}_4\text{S}_2$ $[\text{M}]^+$: 380.1116, found 380.1114.



1,3-dimethyl-2-(3-o-tolylbutylsulfonyl)benzene

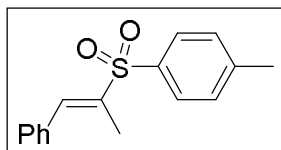
Colorless oil; R_f = 0. (EtOAc/Pentane = 3/2).

^1H NMR (CDCl_3 , 300 MHz): δ 7.31 (m, 1H), 7.22-6.94 (m, 6H), 3.10 (m, 1H), 3.02-2.90 (m, 2H), 2.60 (s, 6H), 2.26 (s, 3H), 2.16-2.01 (m, 2H), 1.21 (d, J = 6.9 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 143.0, 140.2, 136.0, 135.7, 132.7, 131.7, 130.7, 126.7, 126.3, 124.9, 54.2, 33.6, 28.9, 23.0, 22.1, 19.6.

IR (neat, cm^{-1}): 2964, 1458, 1313, 1150, 1122, 775, 760, 730.

HRMS-Cl calcd for $\text{C}_{19}\text{H}_{23}\text{O}_2\text{S}$ $[\text{M}]^+$: 316.1497, found 316.1496.



(E)-1-methyl-4-((1-phenylprop-1-en-2-yl)sulfonyl)benzene

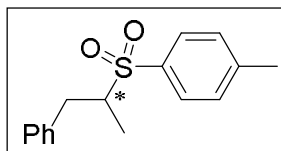
White solid; R_f = 0.3, Yield = 17 % (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 400 MHz): δ 7.83-7.78 (m, 3H), 7.44-7.32 (m, 7H), 2.44 (s, 3H), 2.11 (d, J = 1.46 Hz, 3H).

^{13}C NMR (CDCl_3 , 75 MHz): δ 144.4, 137.7, 137.2, 136.3, 134.1, 130.0, 129.7, 129.4, 128.8, 128.4, 21.8, 13.3.

IR (neat, cm^{-1}): 3031, 2858, 1443, 1287, 1150, 794, 760

HRMS-ESI calcd for $\text{C}_{16}\text{H}_{17}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 273.0949, found 273.0961.



1-methyl-4-((1-phenylpropan-2-yl)sulfonyl)benzene

Colourless Oil; R_f = 0.25, (EtOAc/Pentane = 1/9).

^1H NMR (CDCl_3 , 400 MHz): δ 7.83-7.79 (m, 2H), 7.41-7.35 (m, 2H), 7.31-7.18 (m, 3H), 7.12-7.06 (m, 2H), 3.42 (dd, J = 3.07, 13.34 Hz, 1H), 3.24 (m, 1H), 2.48 (dd, J = 11.51, 13.34, 1H), 2.47 (s, 3H), 1.15 (d, J = 6.81, 3H)

^{13}C NMR (CDCl_3 , 75 MHz): 144.9, 137.2, 134.3, 130.0, 129.2, 129.2, 128.8, 127.0, 61.8, 35.6, 21.8, 12.8.

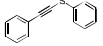
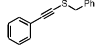
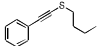
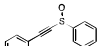
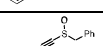
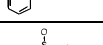
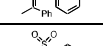
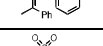
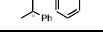
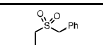
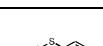
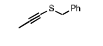
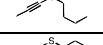
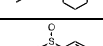
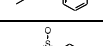
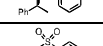
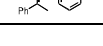
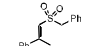
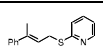
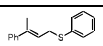
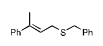
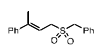
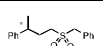
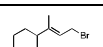
IR (neat, cm^{-1}): 2927, 2871, 1301, 1144, 1085, 725, 630.

HRMS-ESI calcd for $\text{C}_{16}\text{H}_{19}\text{O}_2\text{S}$ $[\text{M}+\text{H}]^+$: 275.1100, found: 275.1100.

9.1. References

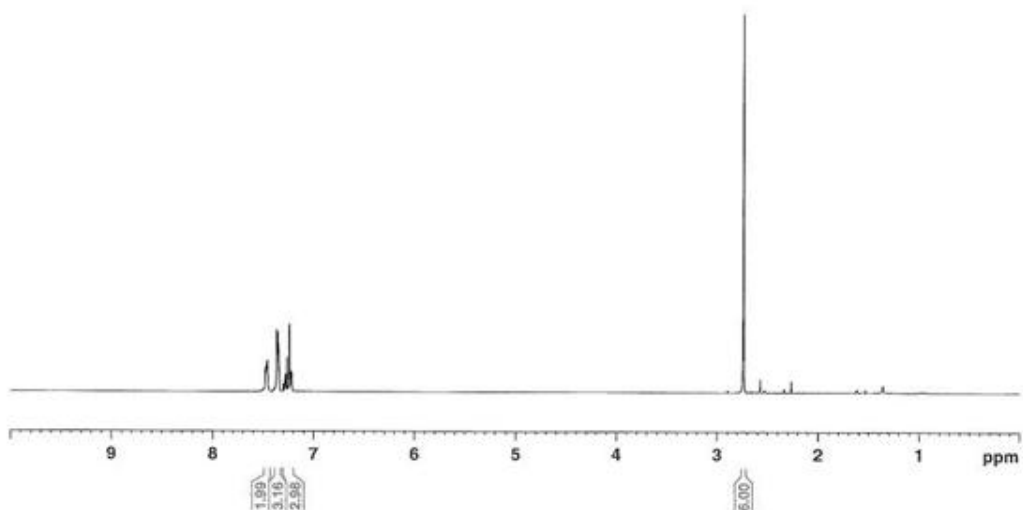
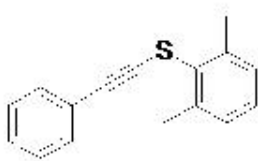
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9.2. Table of references for some prepared compounds

No.	Compound	Reference
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5		Sandrinelli, F.; Boudou, C.; Caupene, C.; Averbuch-Pouchot, M.-T.; Perrio, S.; Metzner, P. <i>Synlett</i> 2006 , 3289.
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7		1) Ager, D. J. <i>J. Chem. Soc., Chem. Commun.</i> 1984 , 486. 2) Ager, D. J. <i>J. Chem. Soc., Perkin Trans.</i> 11986 , 183.
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17		Zhou, T.; Peters, B.; Maldonado, M. F.; Govender, T.; Andersson, P. G. <i>J. Am. Chem. Soc.</i> 2012 , 134, 13592.
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25		Zhou, T.; Peters, B.; Maldonado, M. F.; Govender, T.; Andersson, P. G. <i>J. Am. Chem. Soc.</i> 2012 , 134, 13592.

26		Zhou, T.; Peters, B.; Maldonado, M. F.; Govender, T.; Andersson, P. G. <i>J. Am. Chem. Soc.</i> 2012 , <i>134</i> , 13592.
27		Zhou, T.; Peters, B.; Maldonado, M. F.; Govender, T.; Andersson, P. G. <i>J. Am. Chem. Soc.</i> 2012 , <i>134</i> , 13592.
28		Zhou, W.; Zhang, L.; Xu, X.; Zhang, Z. <i>Wuji Huaxue Xuebao</i> 1992 , <i>8</i> , 88.
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30		Zheng, W.; Zheng, F.; Hong, Y.; Hu, L. <i>Heteroat. Chem.</i> 2012 , <i>23</i> , 105.
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32		Katrun, P.; Chiampanichayakul, S.; Korworapan, K.; Pohmakotr, M.; Reutrakul, V.; Jaipetch, T.; Kuhakarn, C. <i>European Journal of Organic Chemistry</i> 2010 , <i>2010</i> , 5633.

BP4-29B 260413

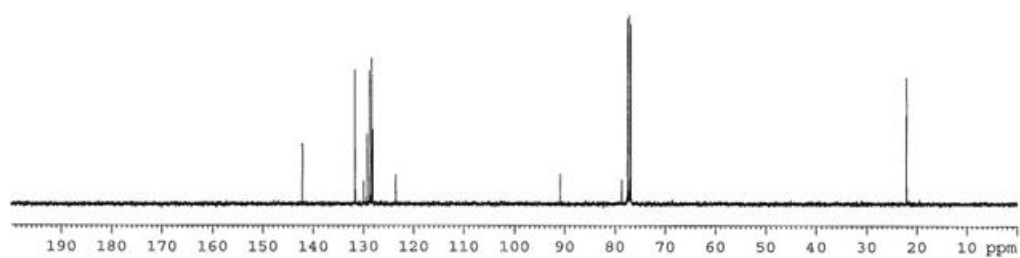


BP4-29B 260413 13C

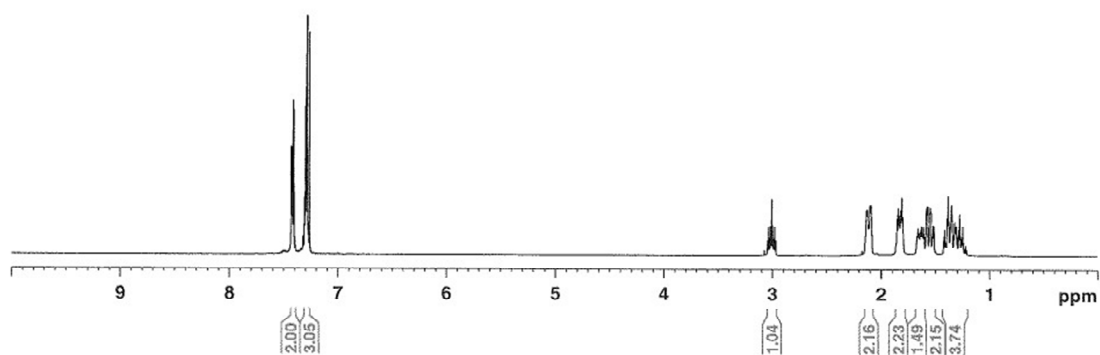
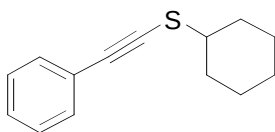
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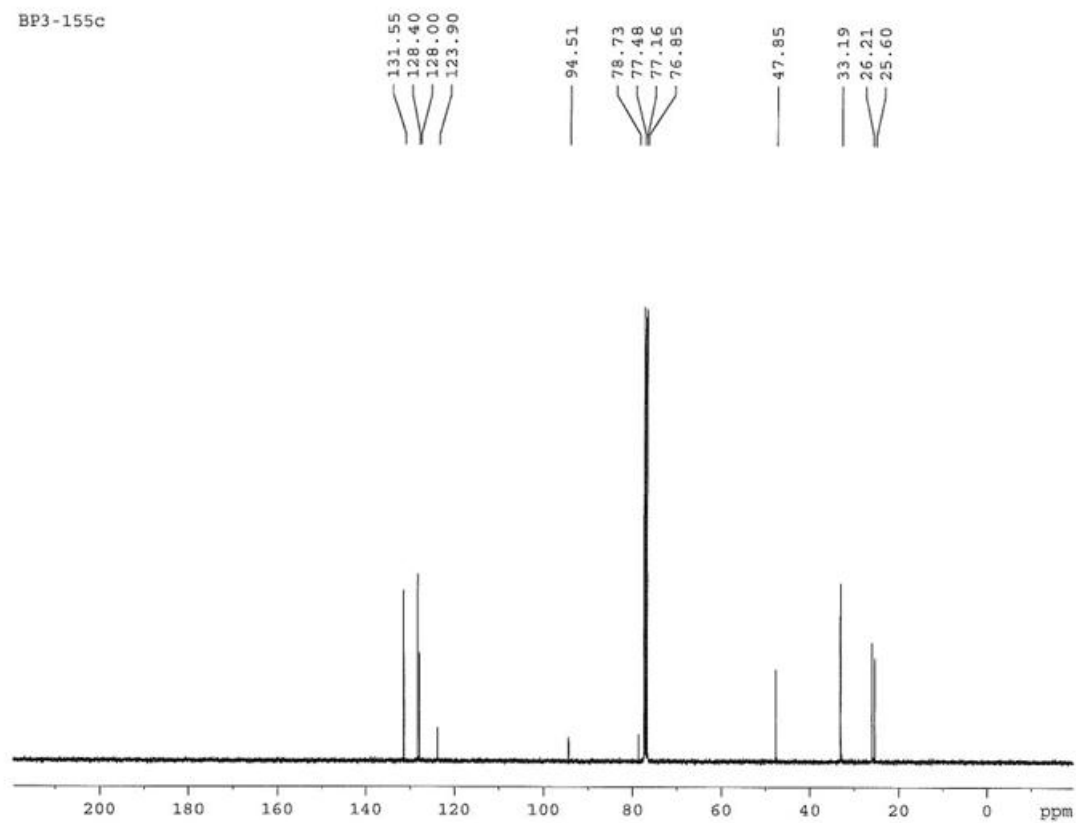
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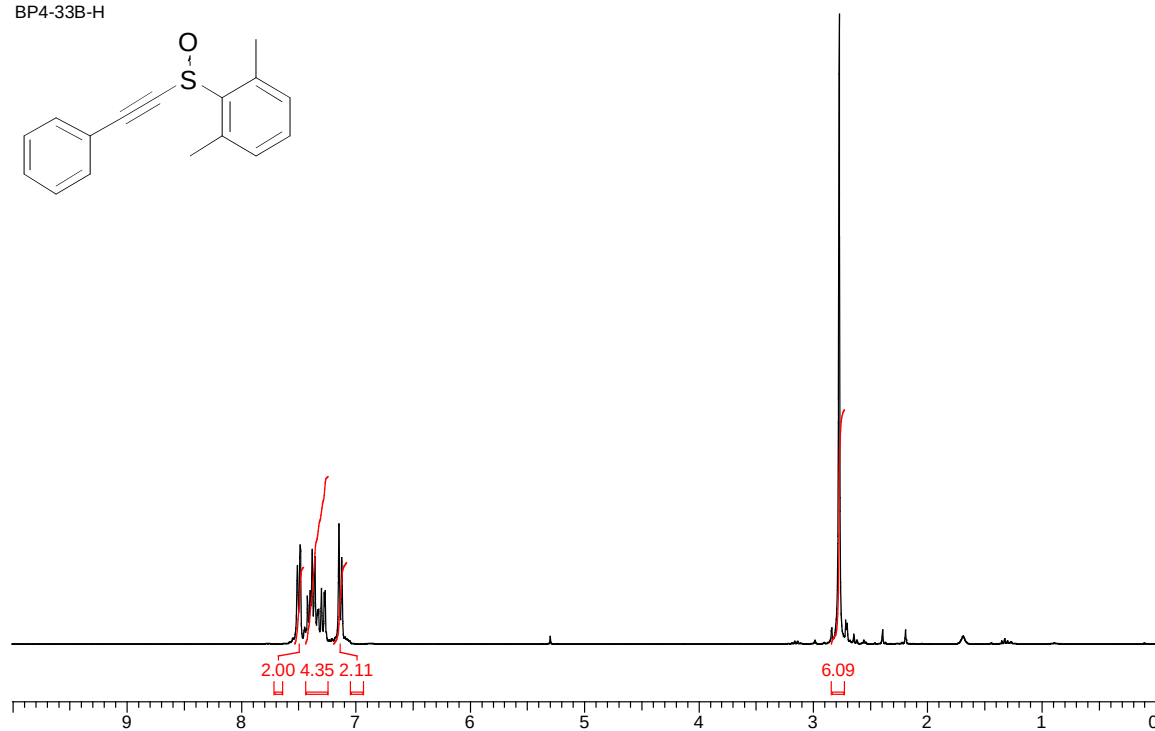
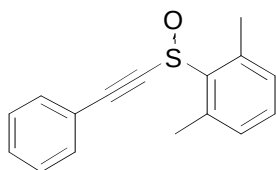
BP3-155 C



BP3-155c

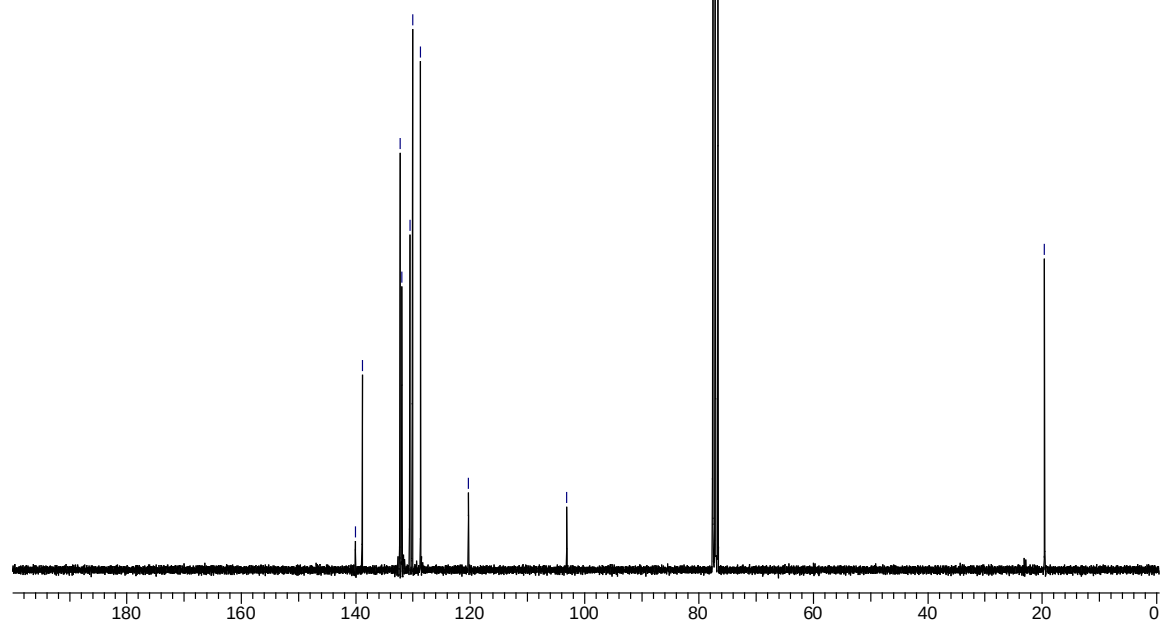


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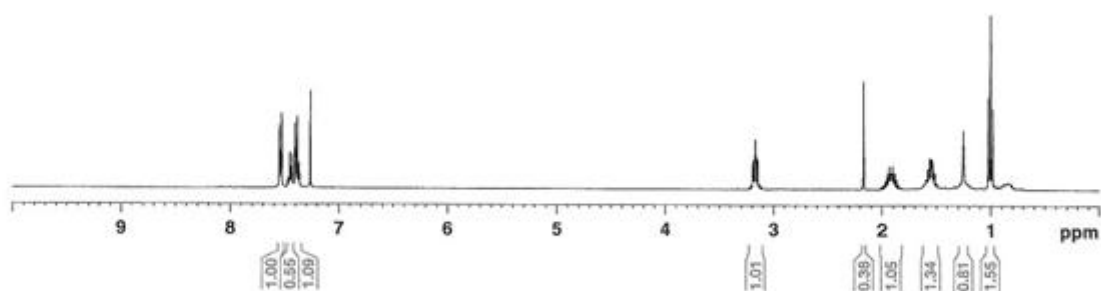
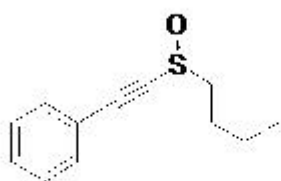


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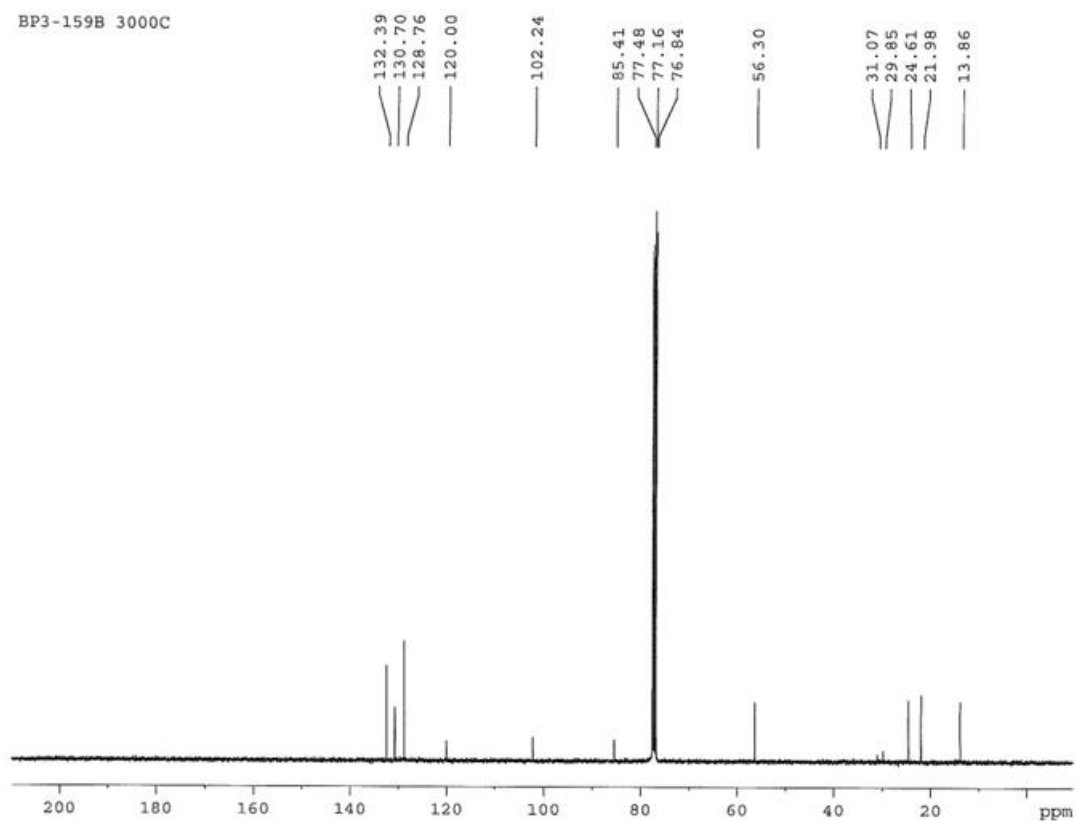
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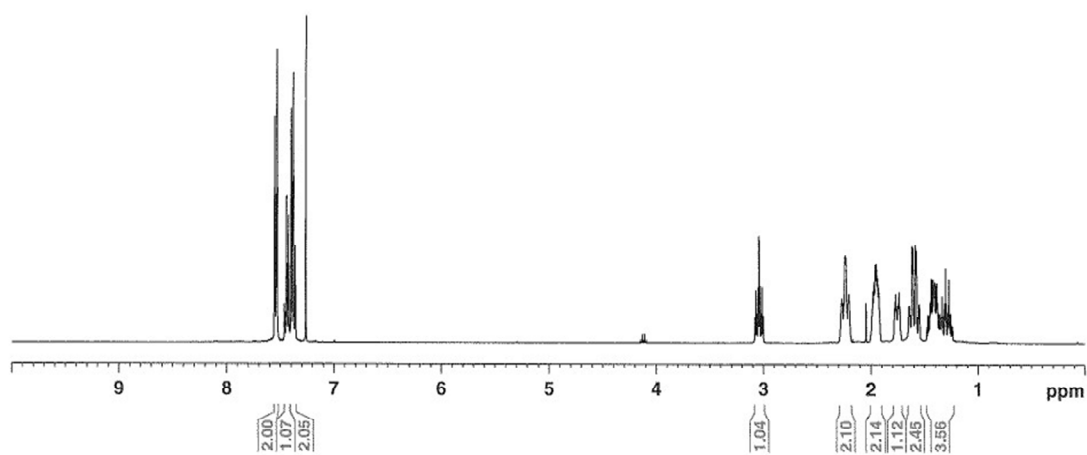
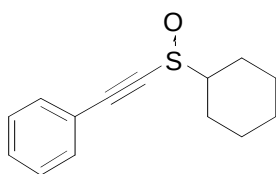
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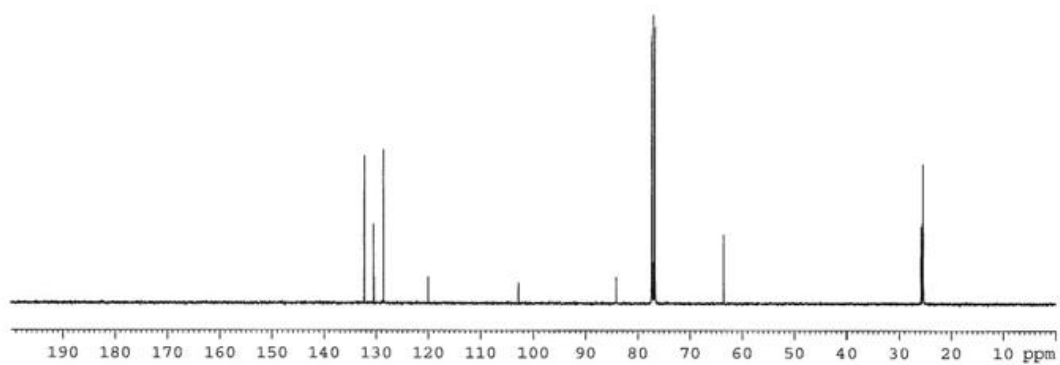
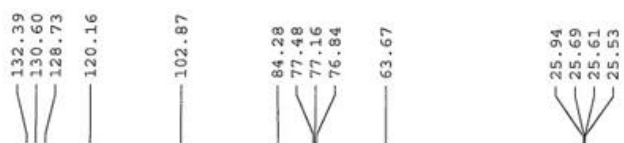
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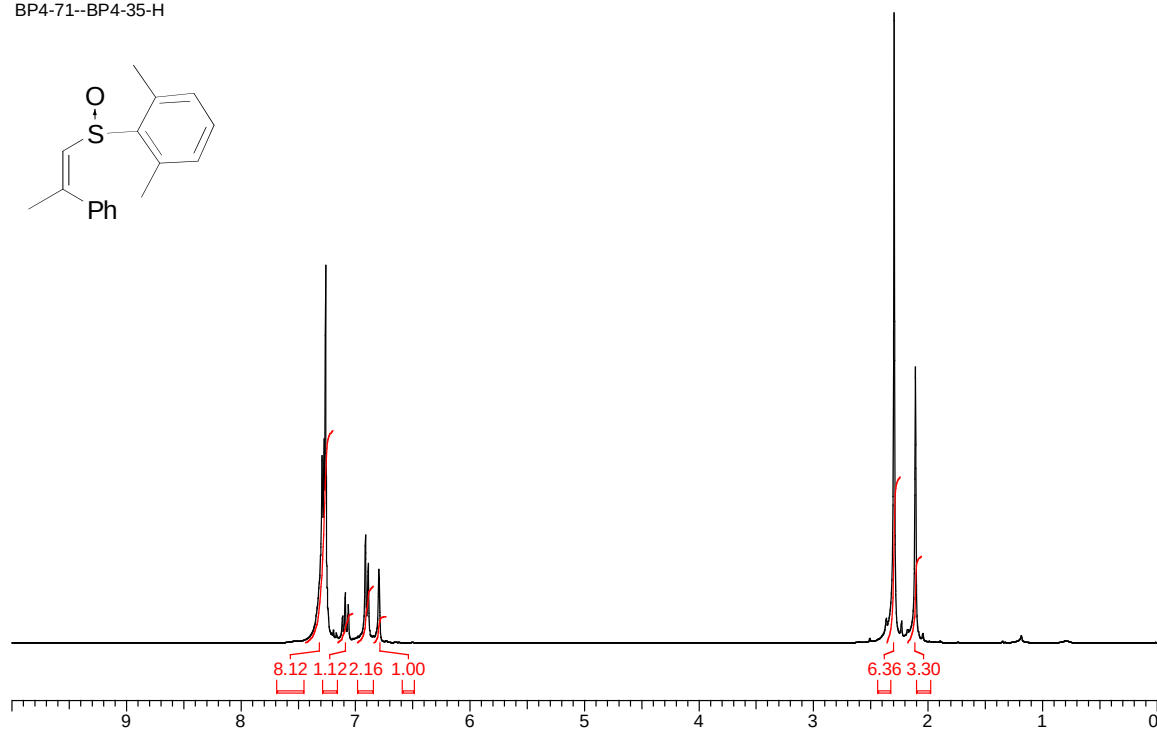
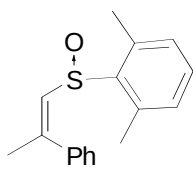
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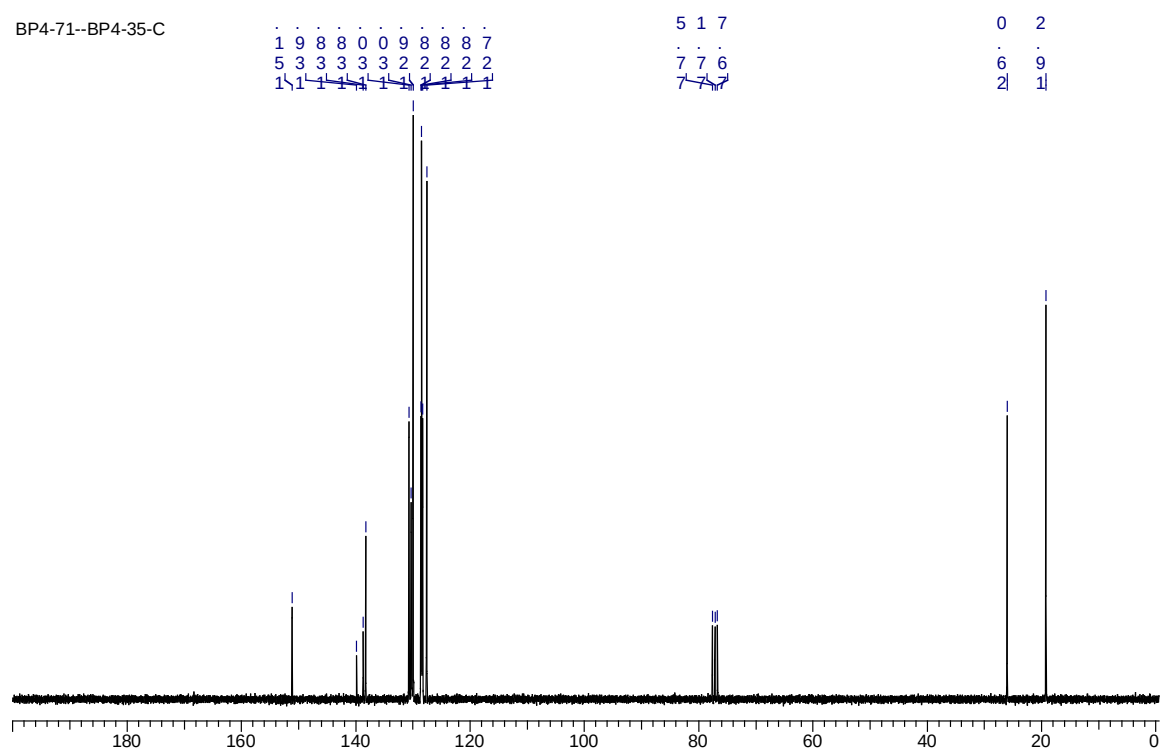
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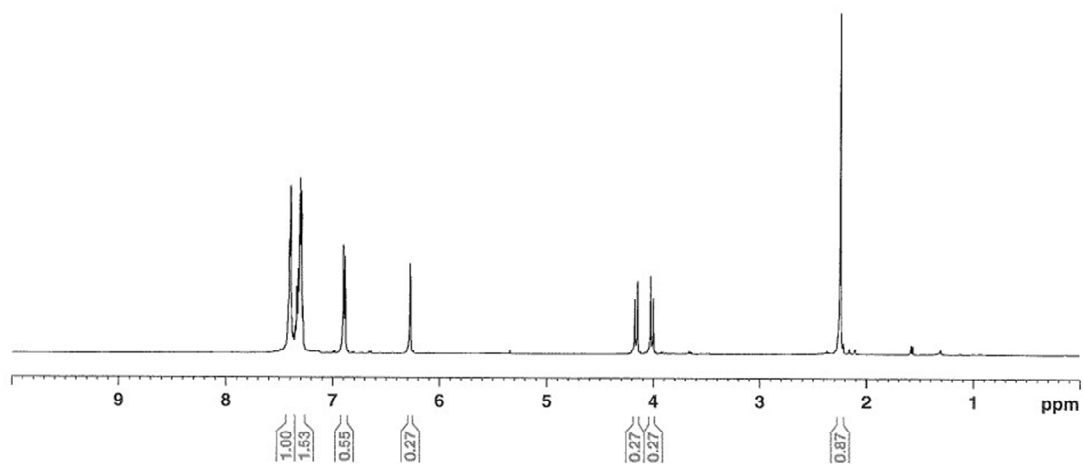
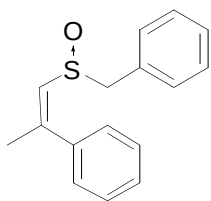
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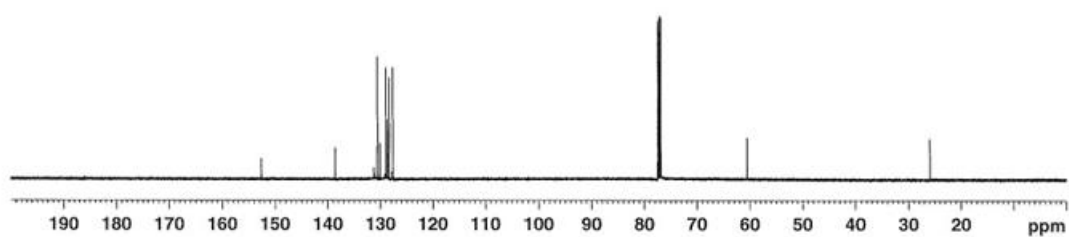
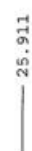
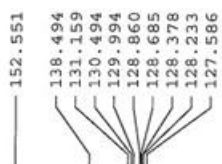
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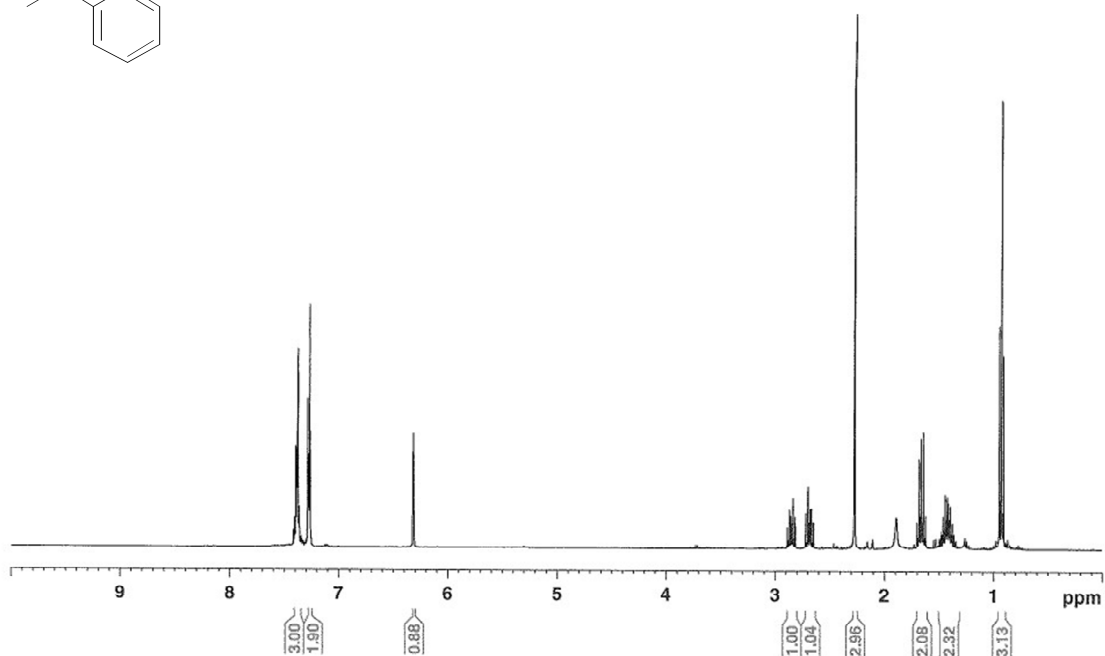
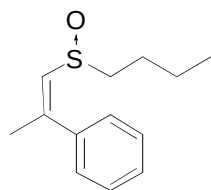
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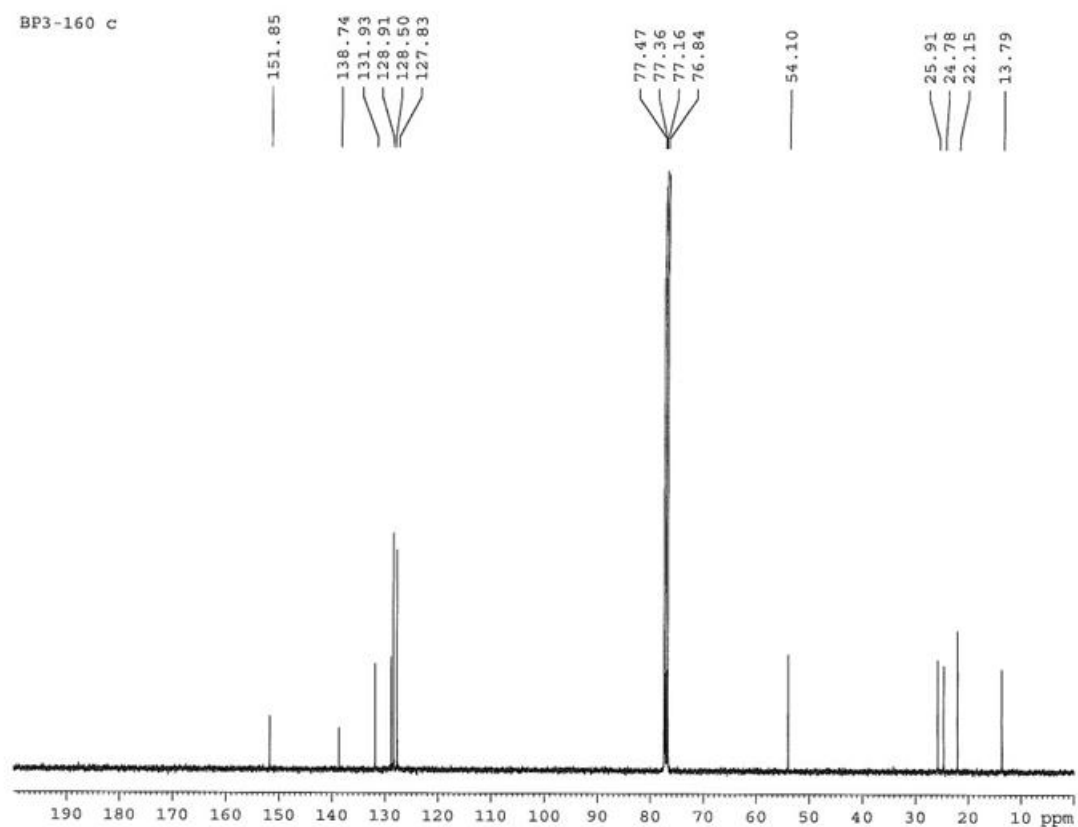
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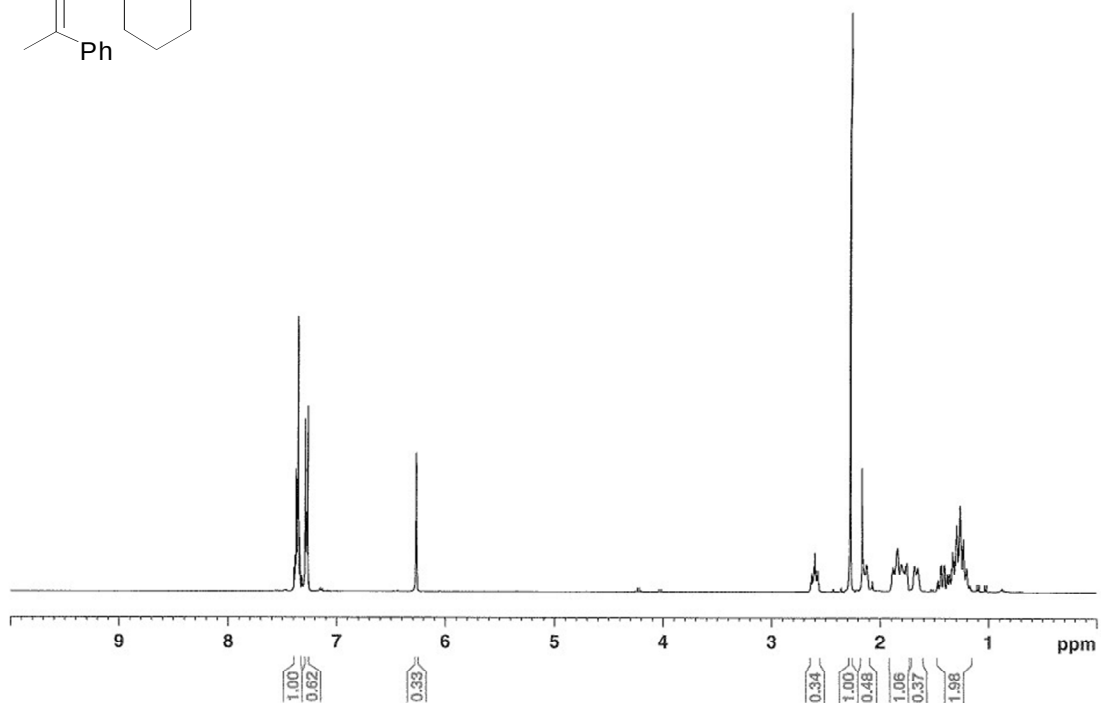
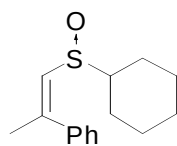
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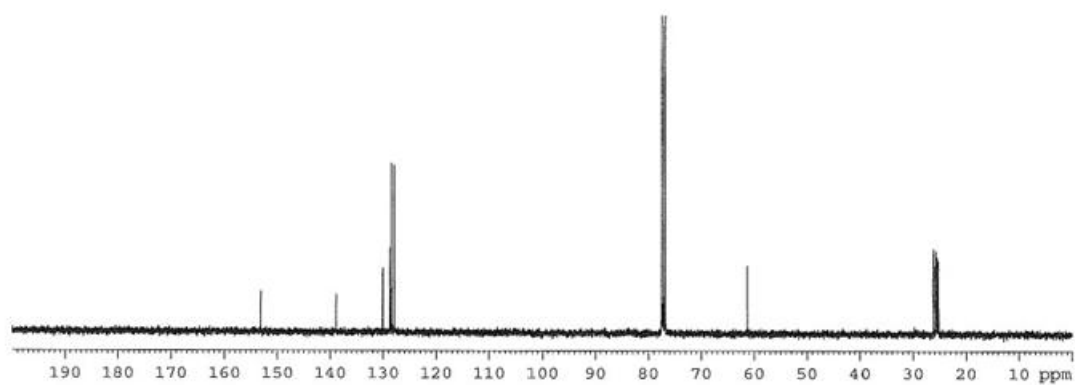
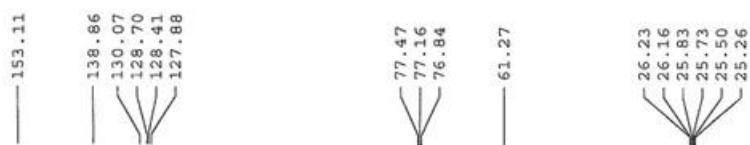
BP3-160 c



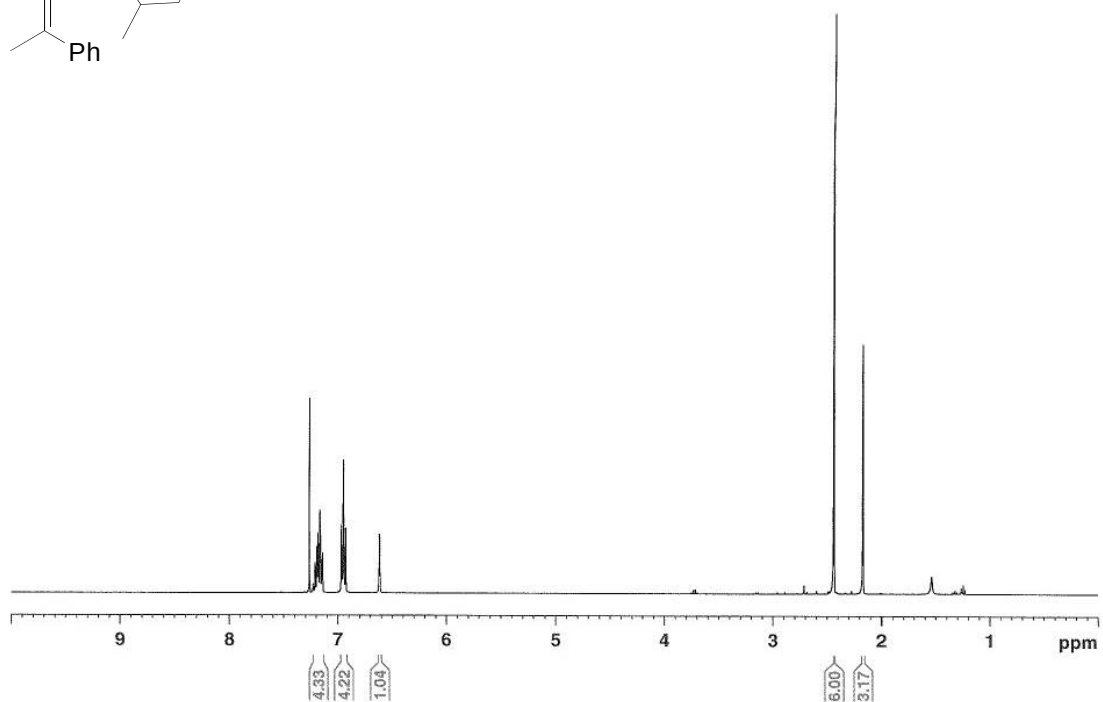
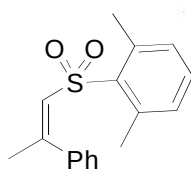
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BP3-160B-260413-C



C14-BP4-38

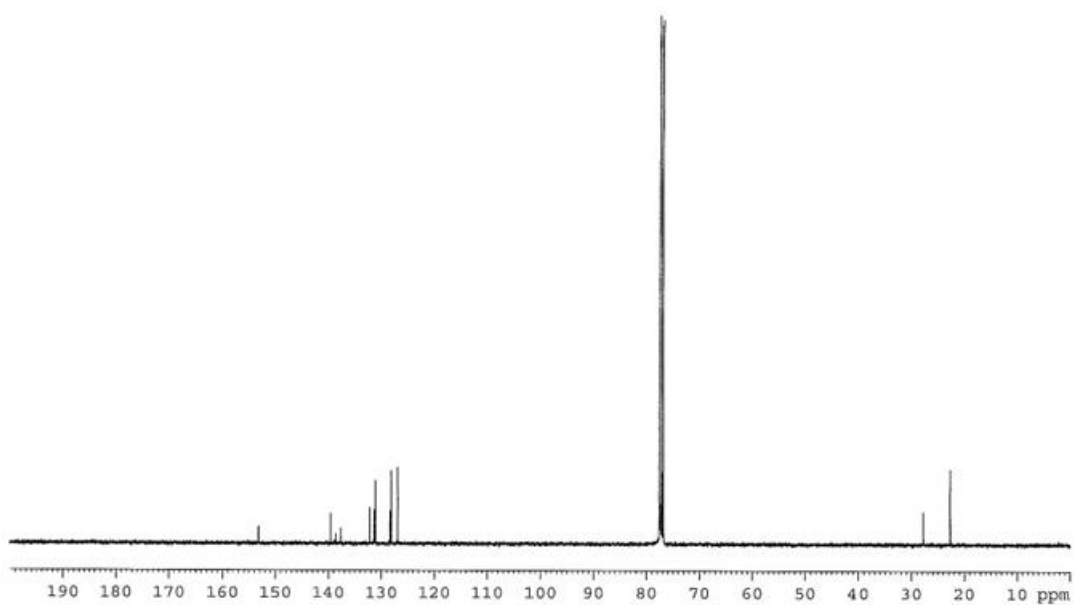


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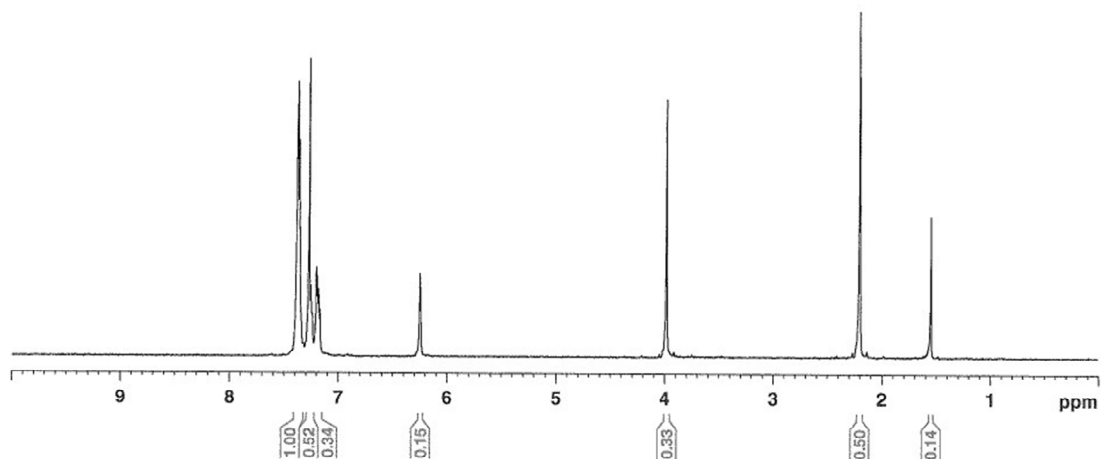
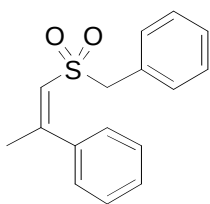
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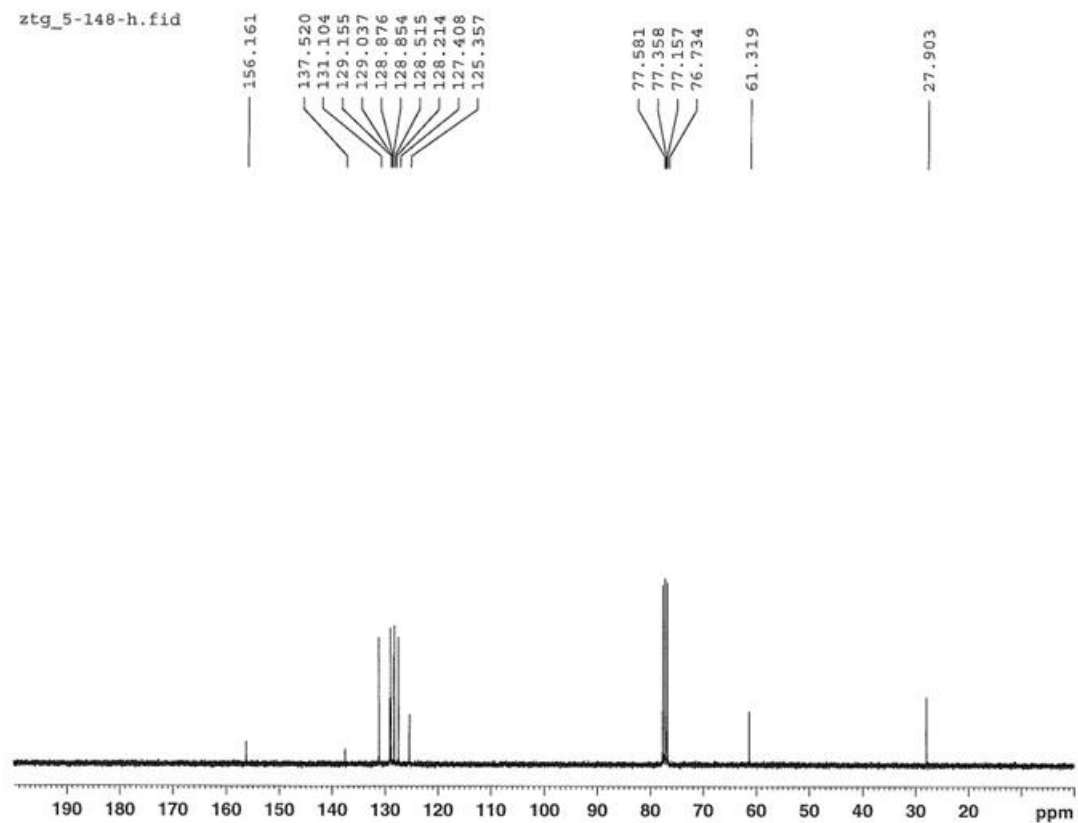
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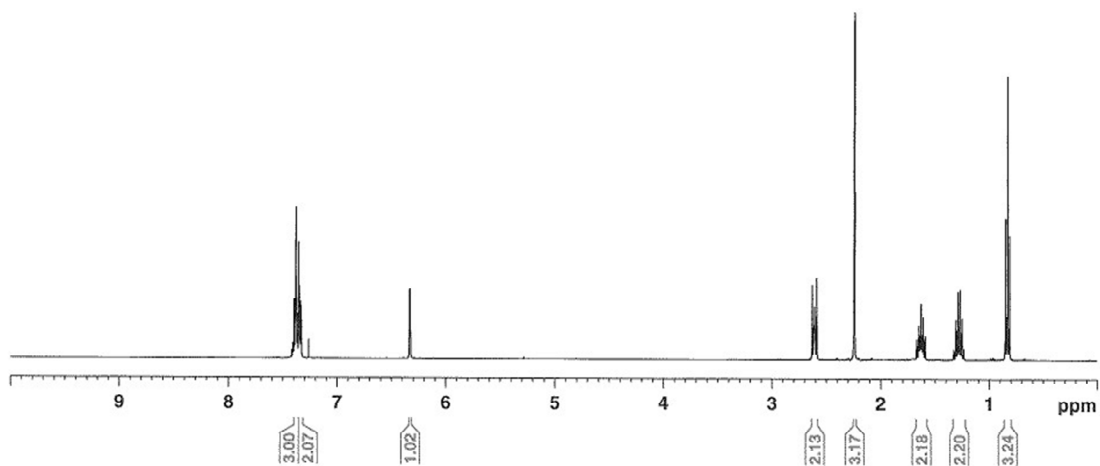
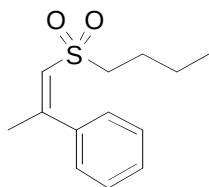
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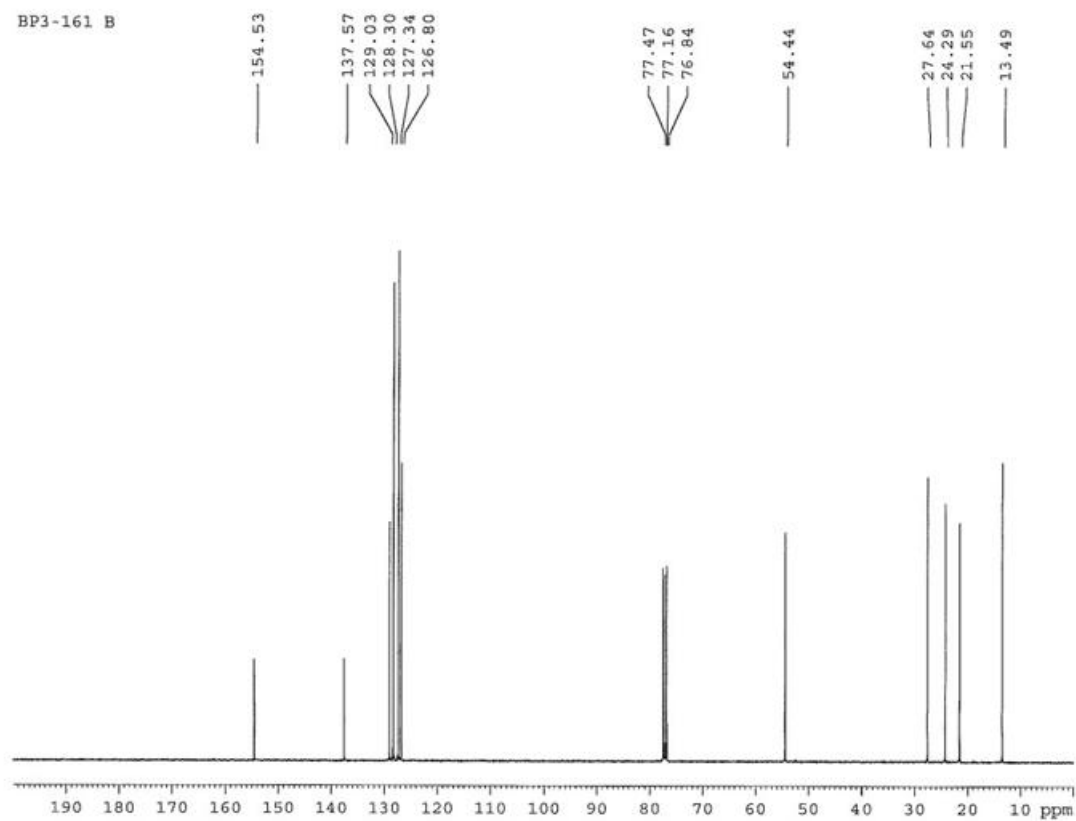
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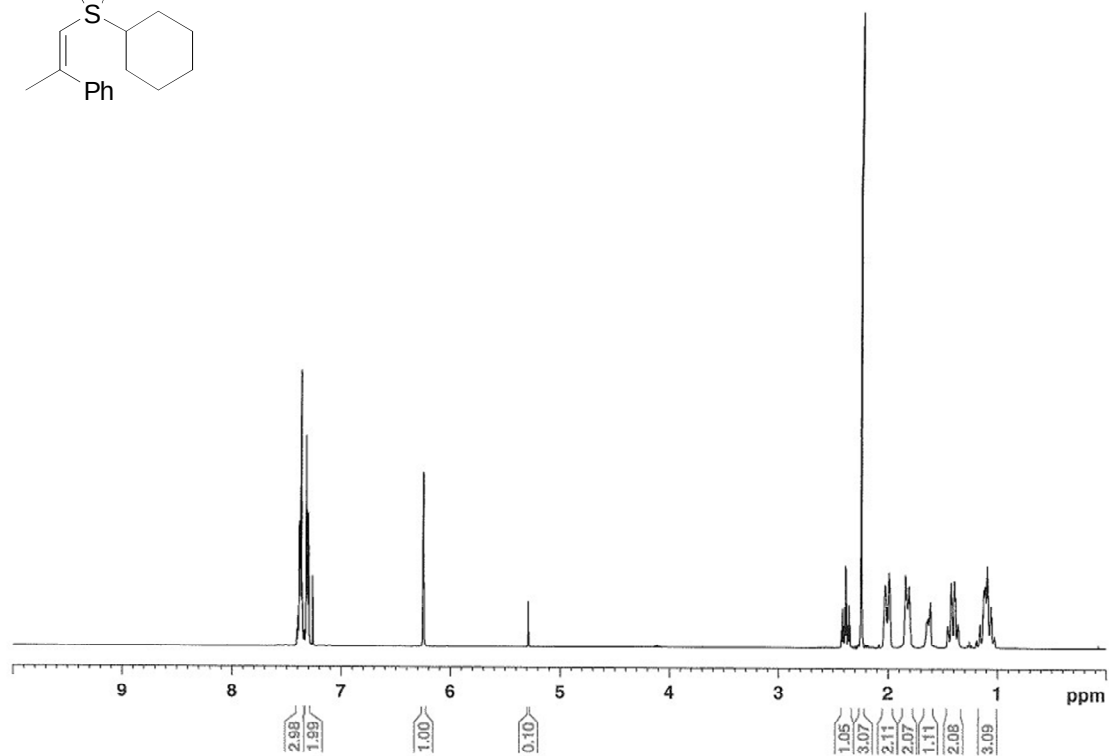
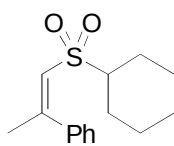
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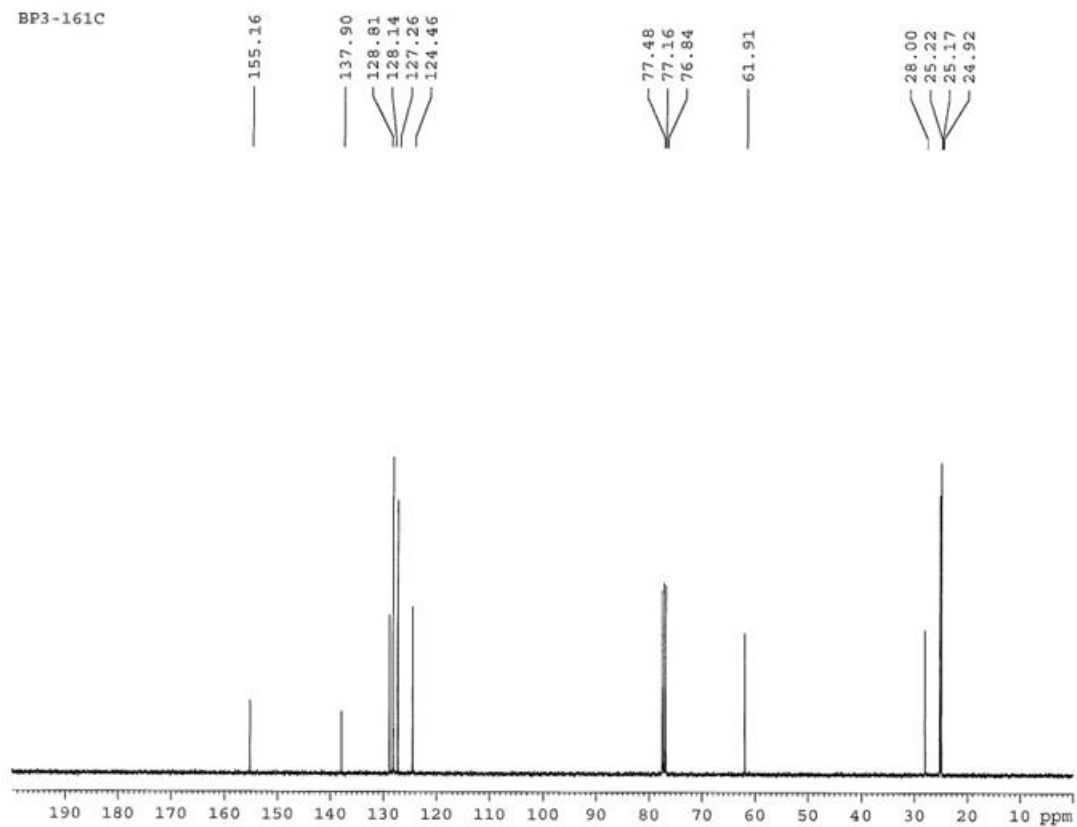
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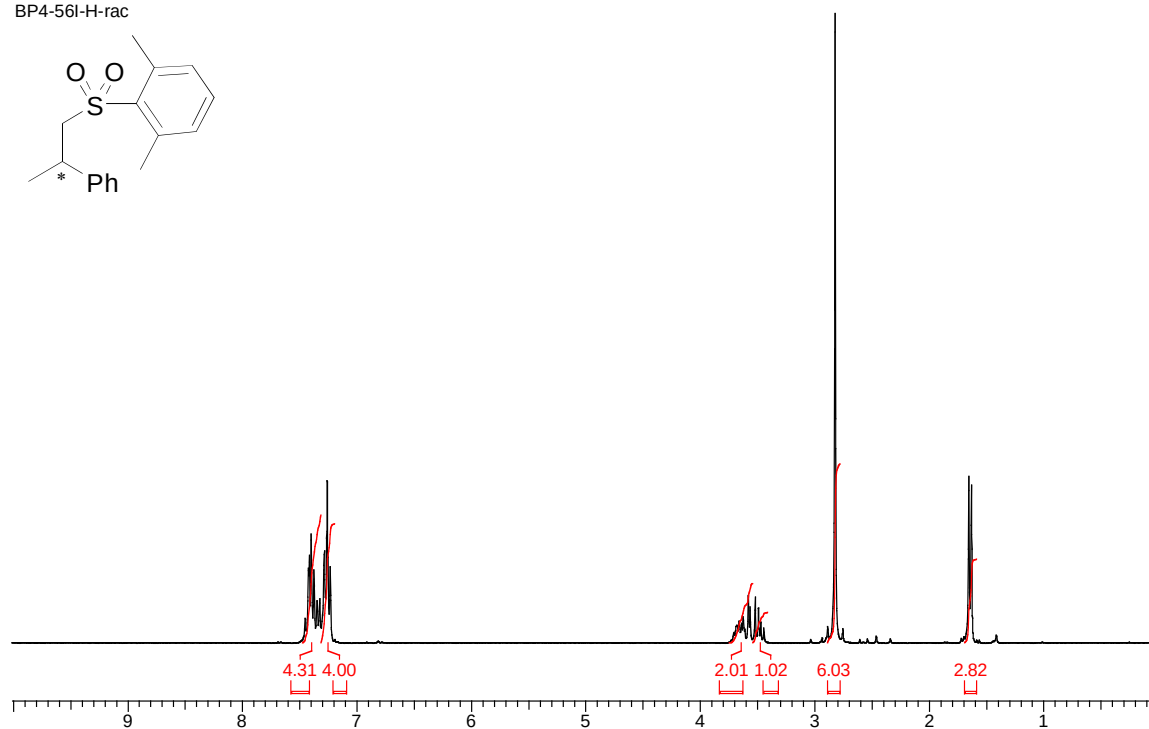
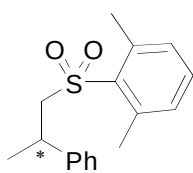
BP3-161C



BP3-161C



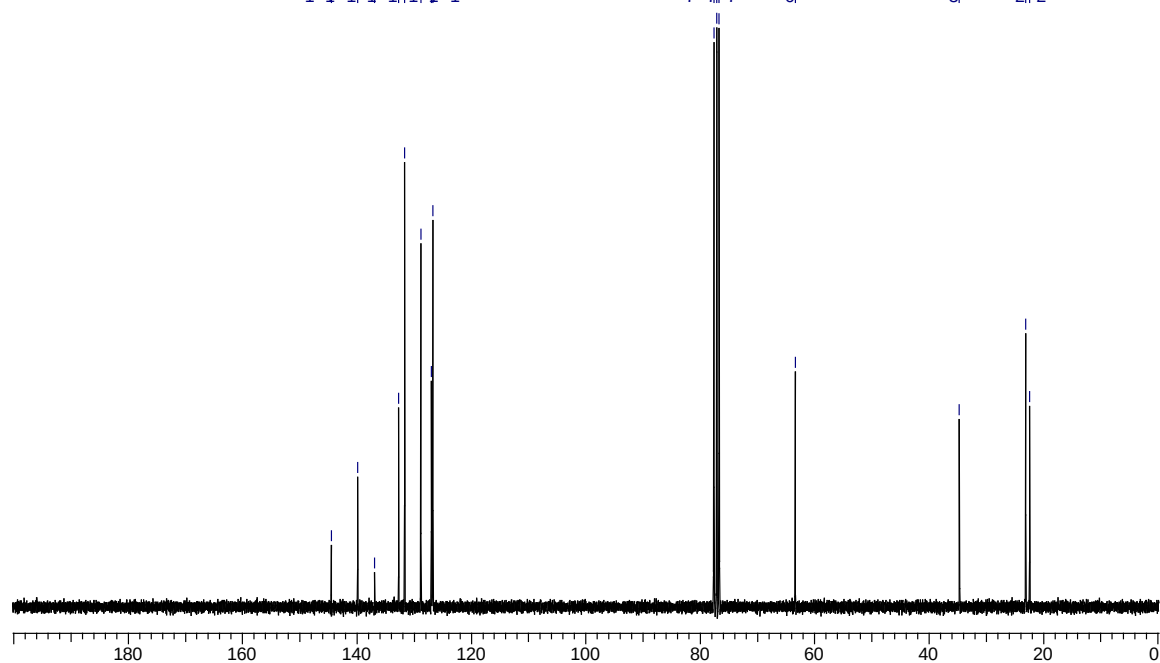
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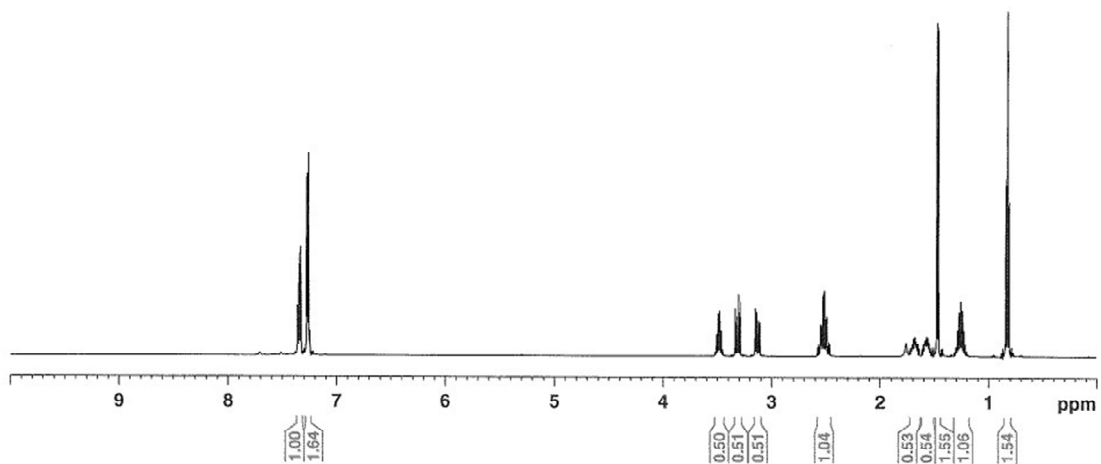
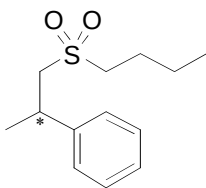
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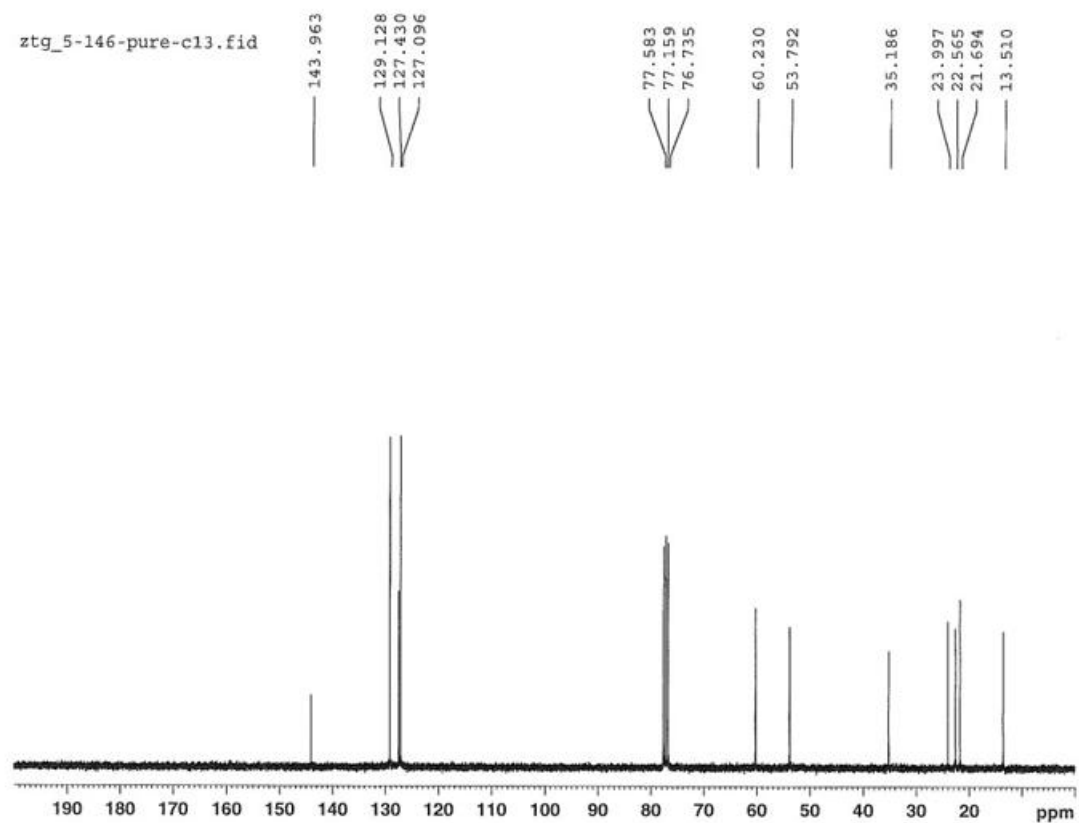
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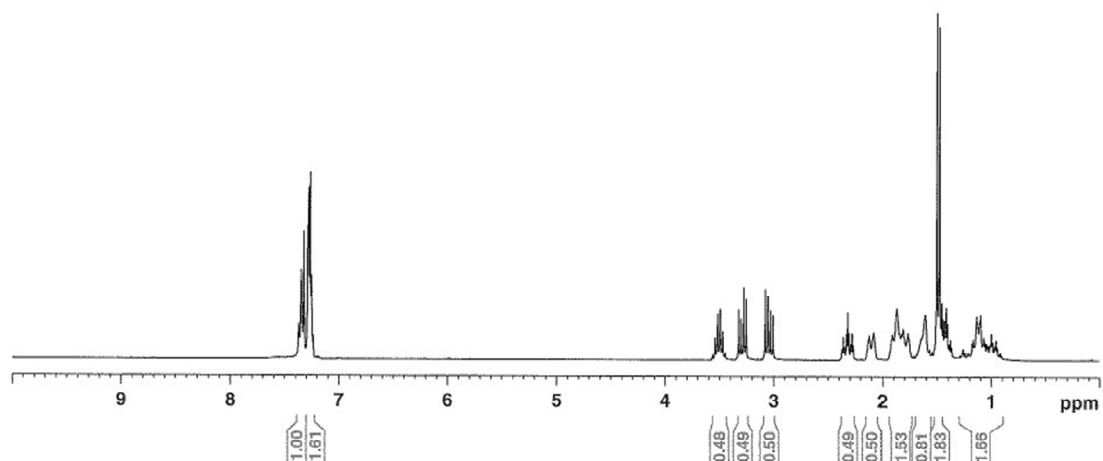
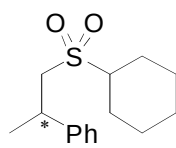
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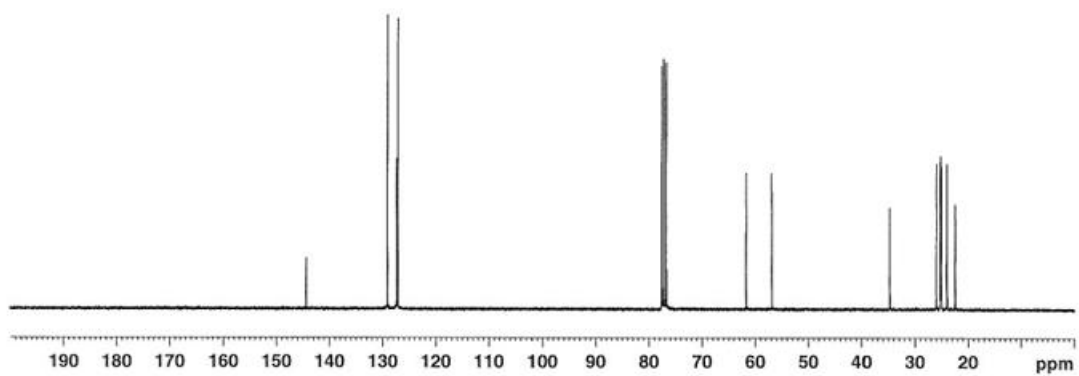
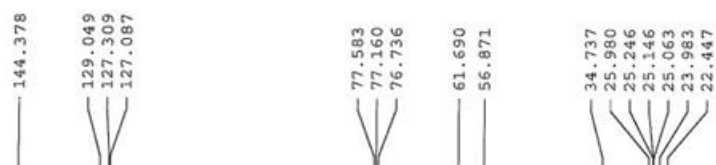
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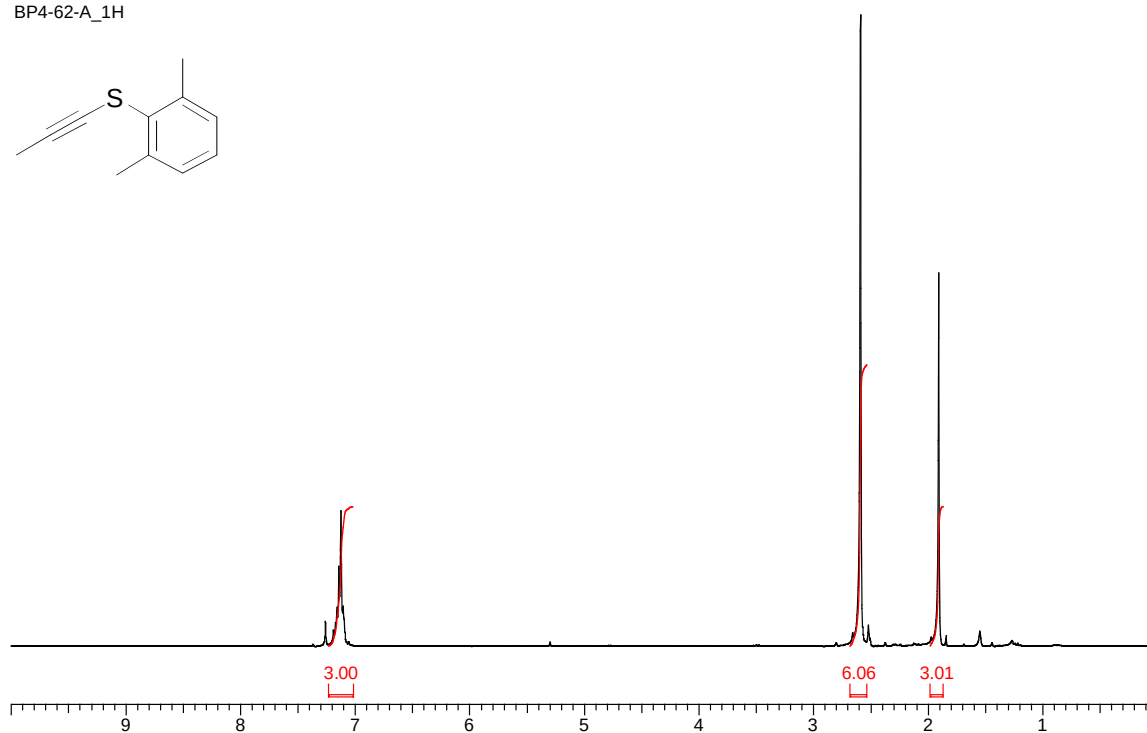
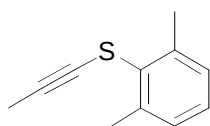
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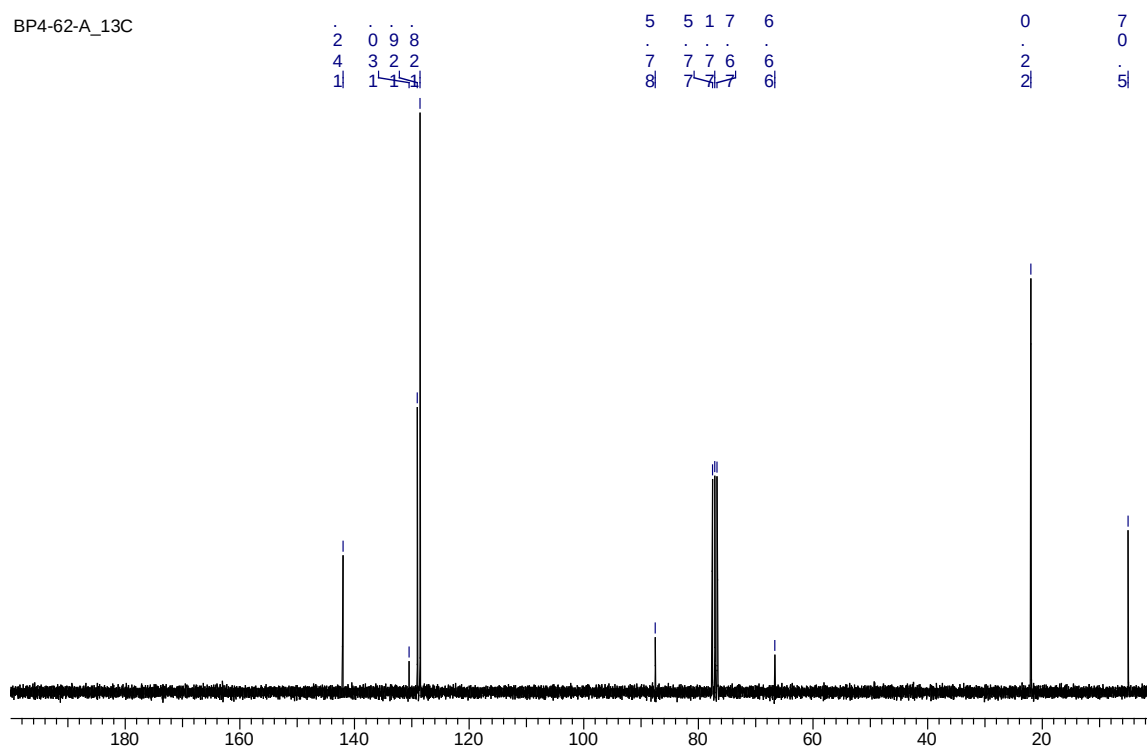
¹³C ztg -5-135



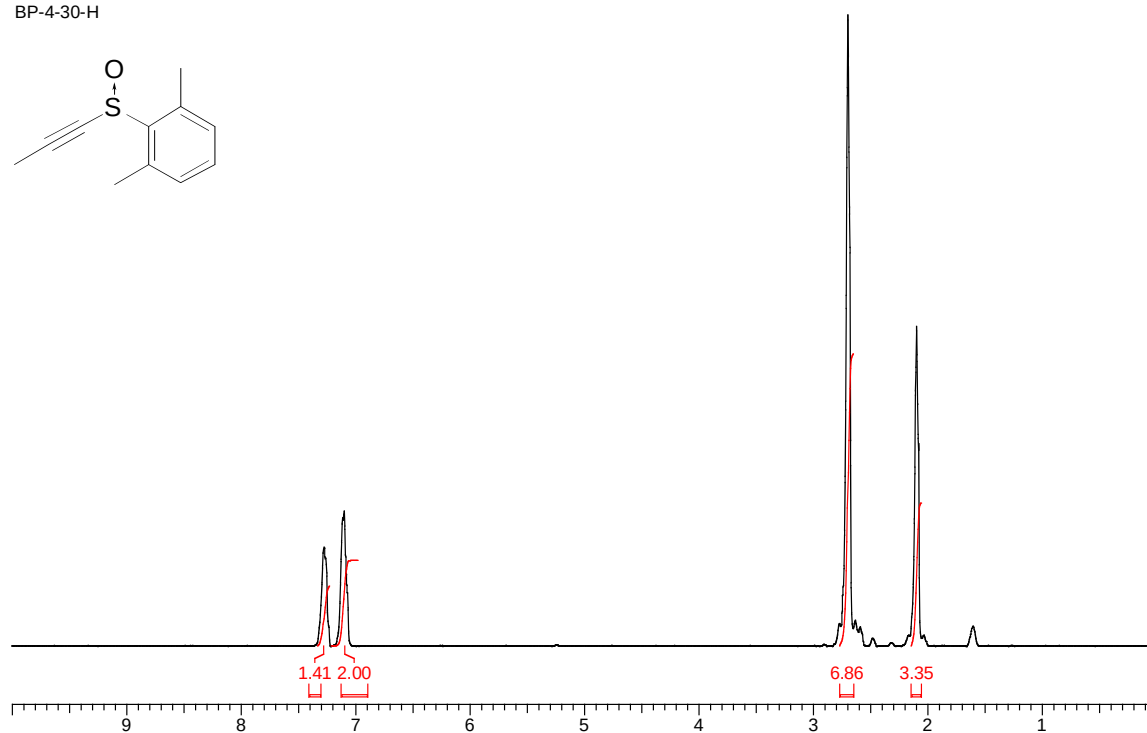
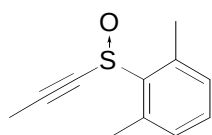
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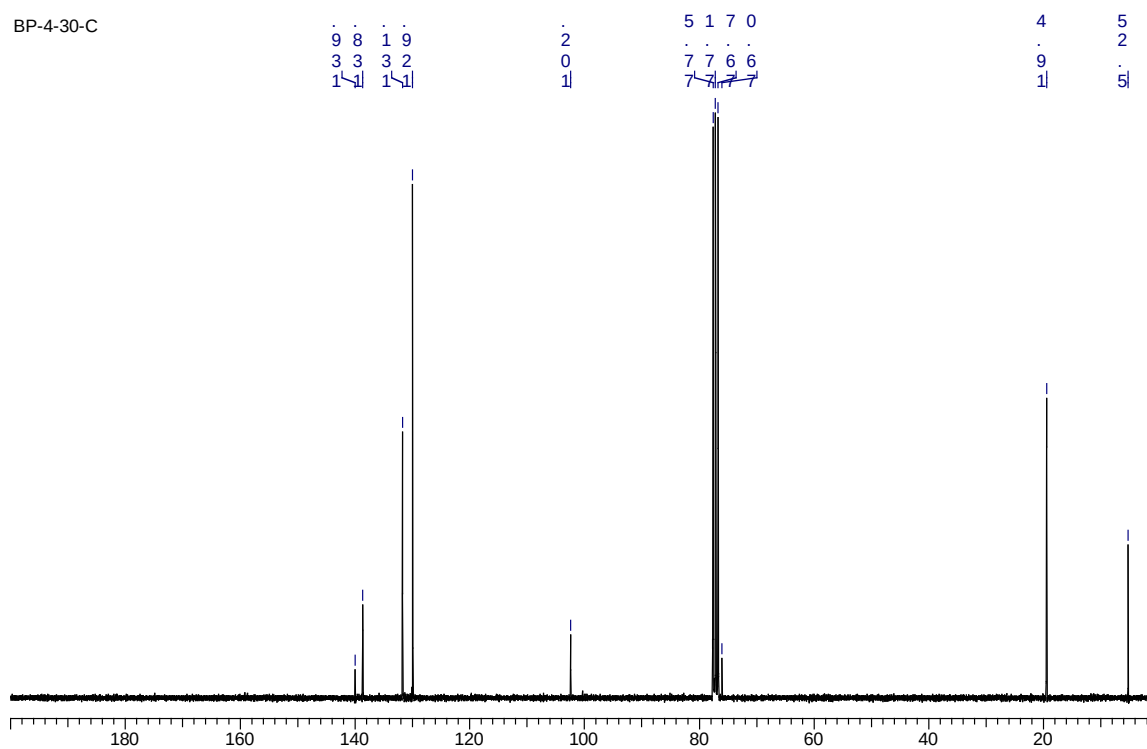
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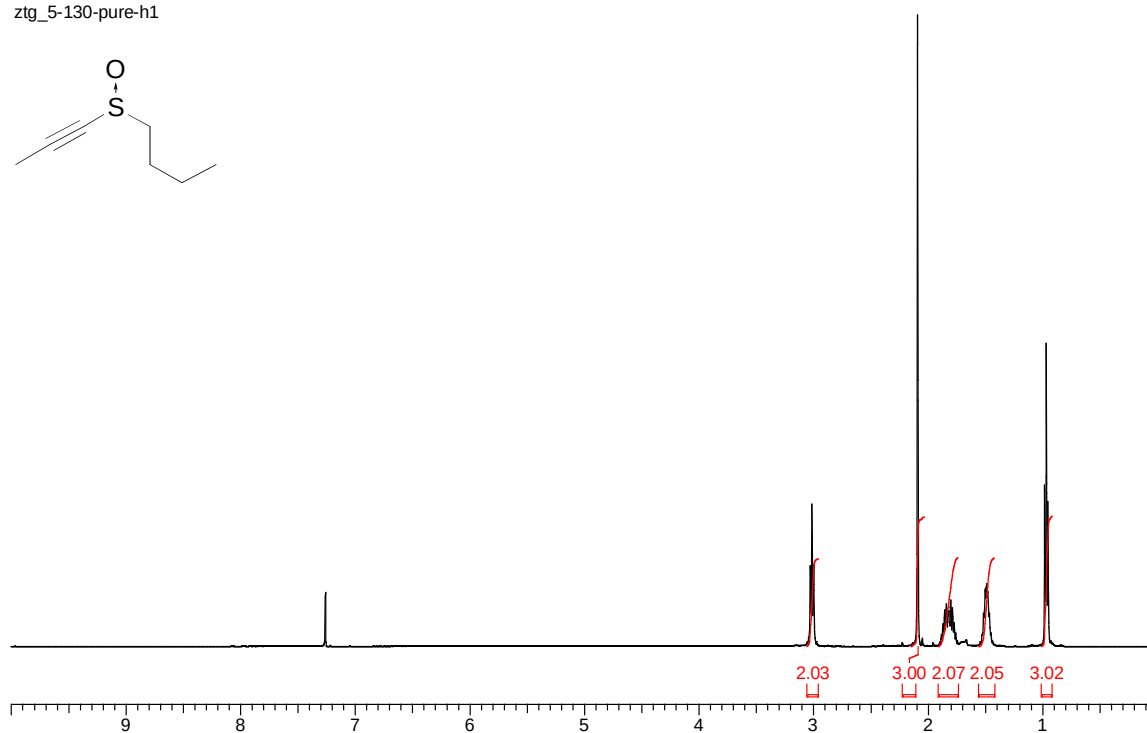
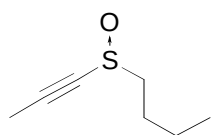
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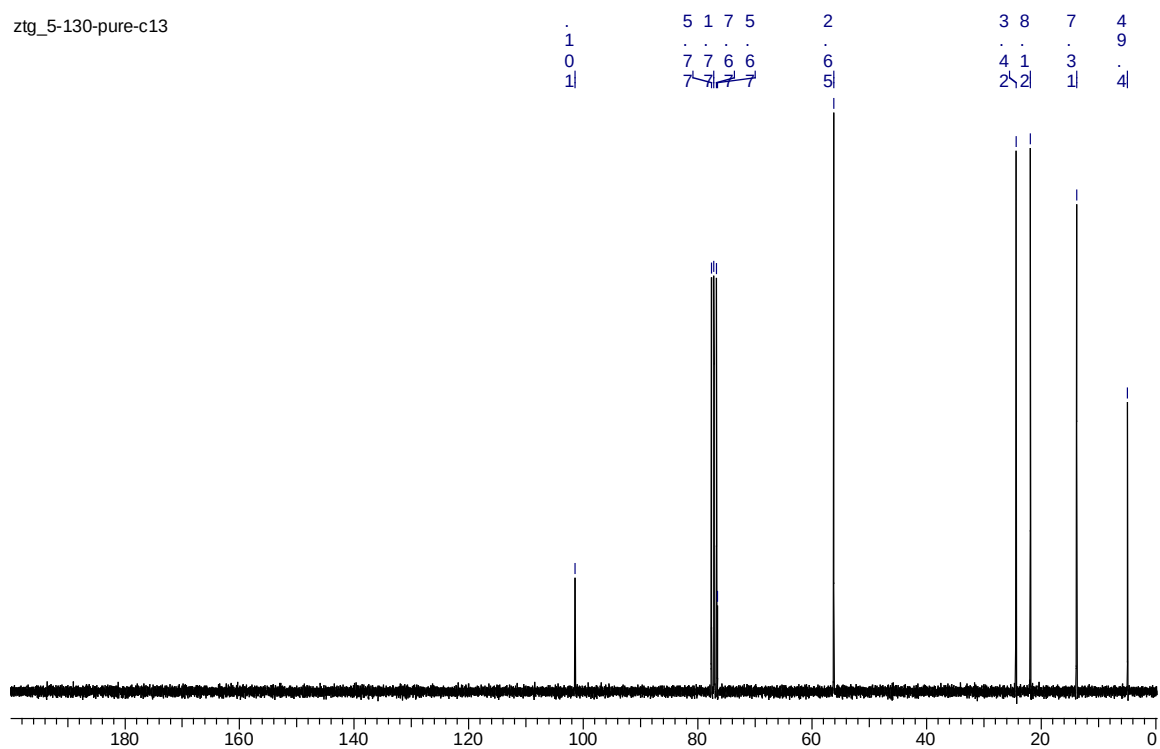
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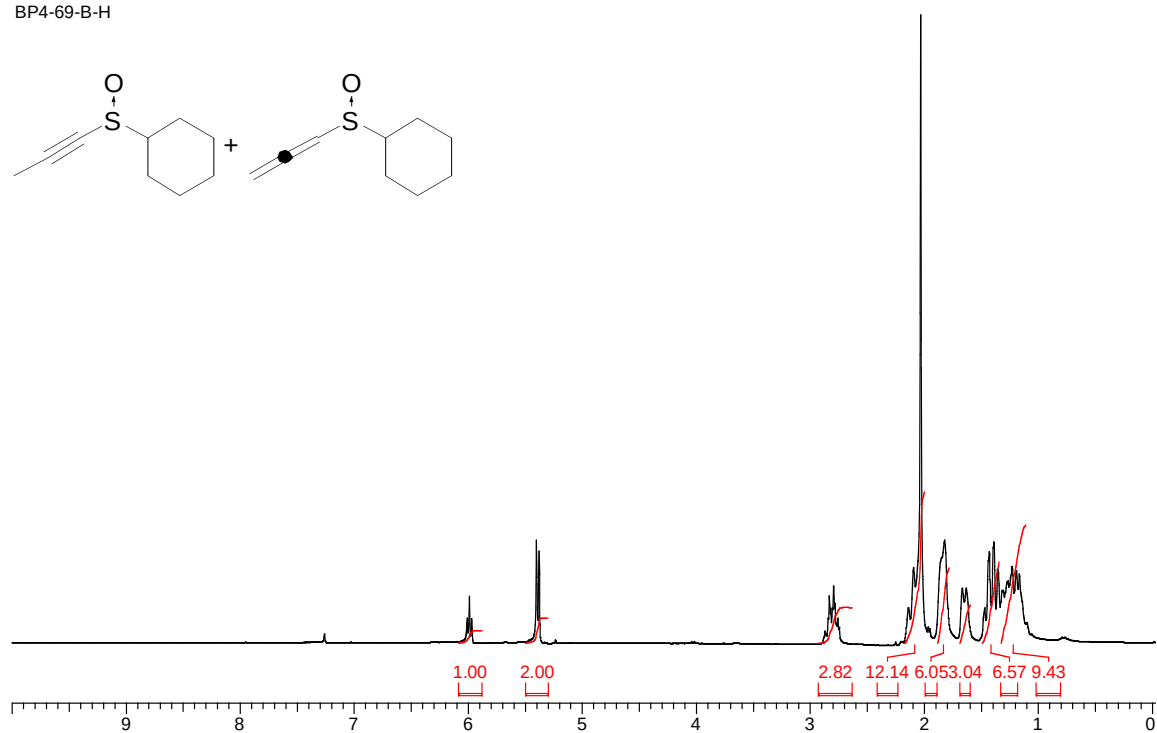
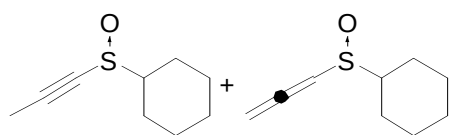
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ztg_5-130-pure-c13



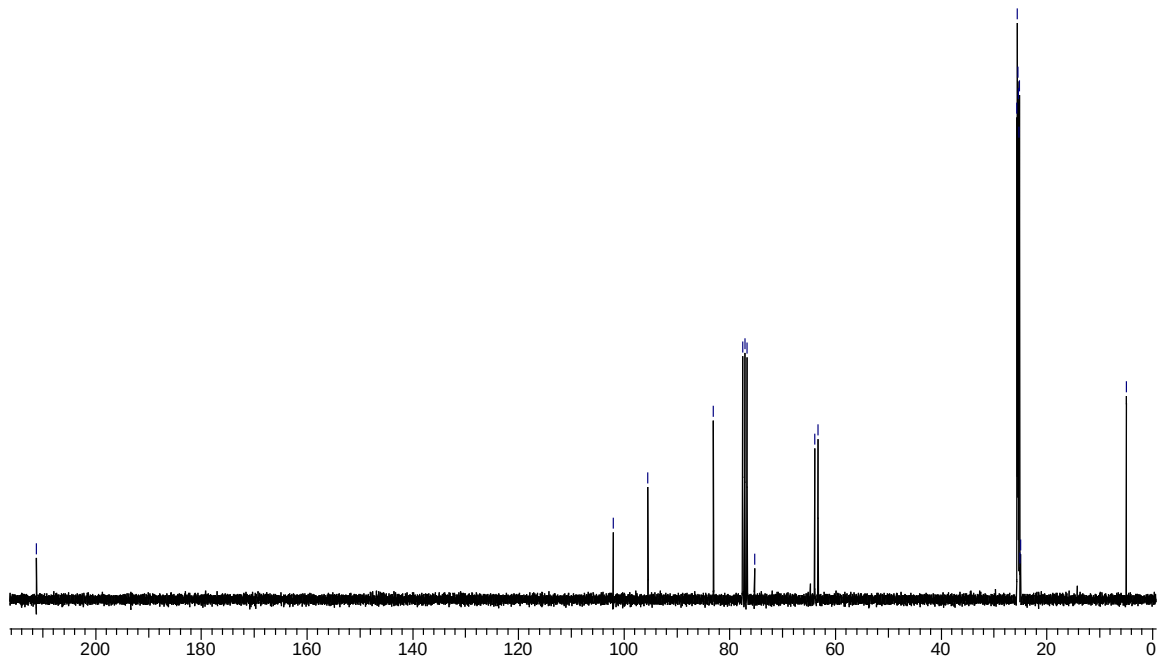
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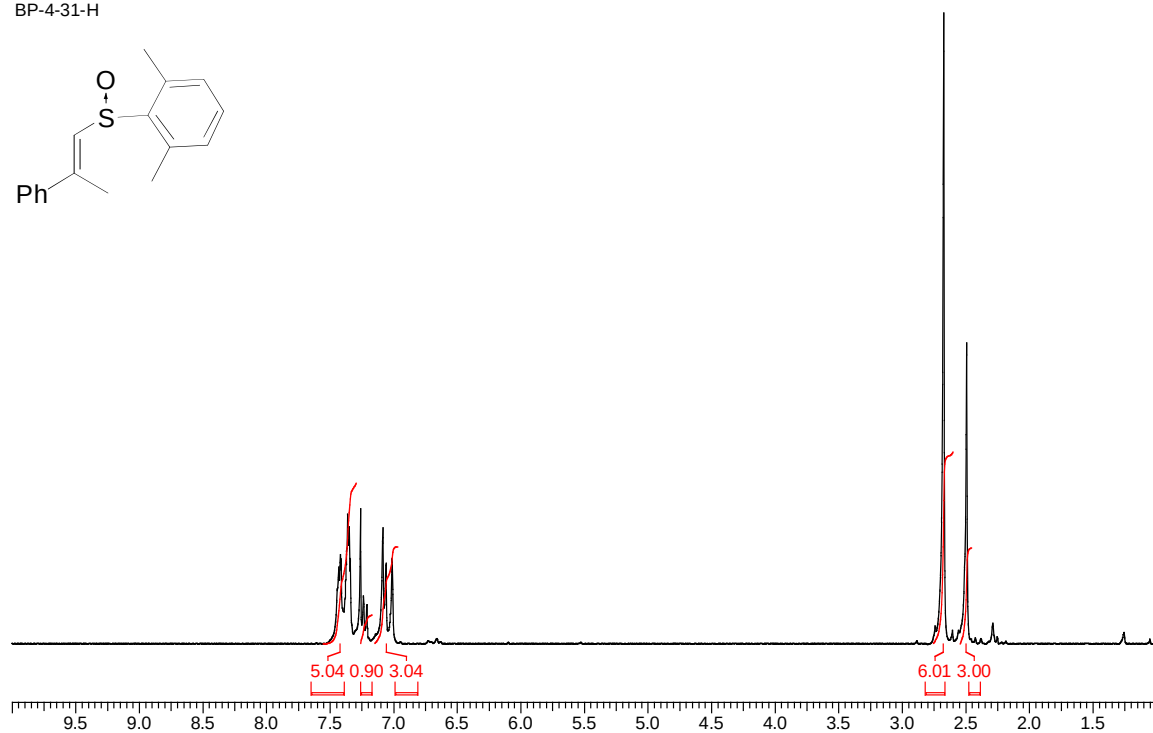
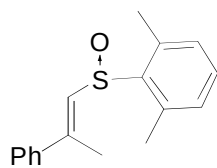
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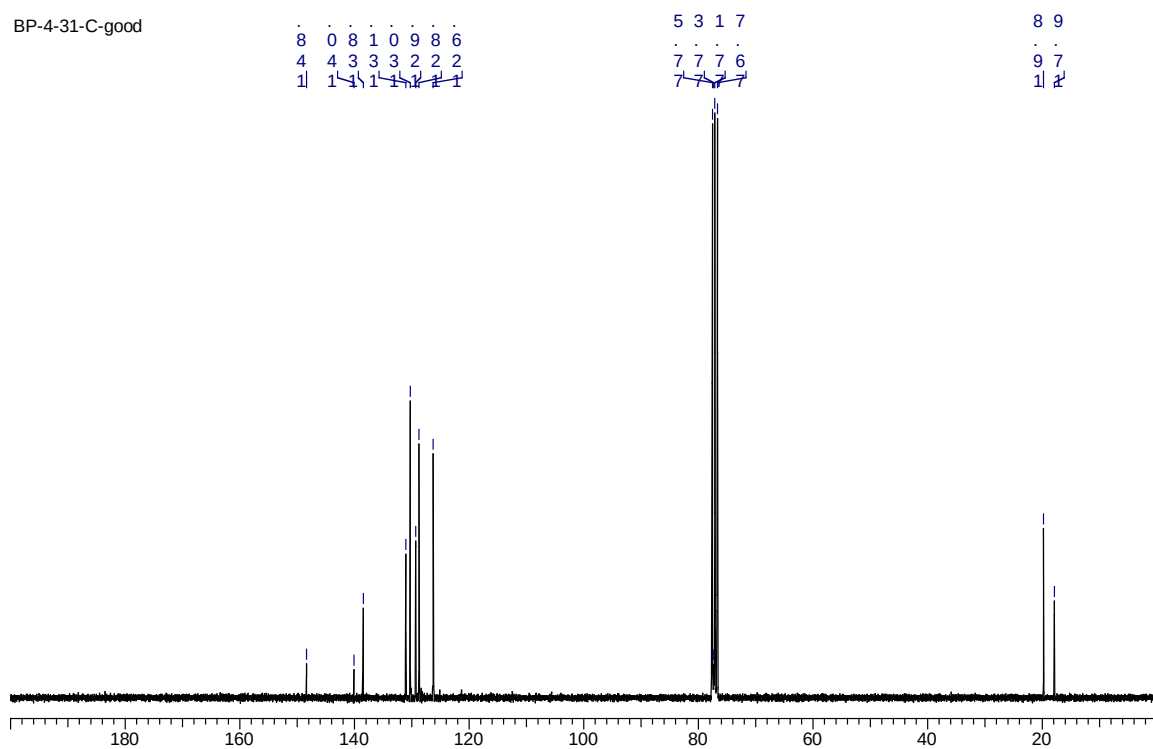
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0	5	3	7	7	6	5	3	3	5	5	5	5	5	5	.
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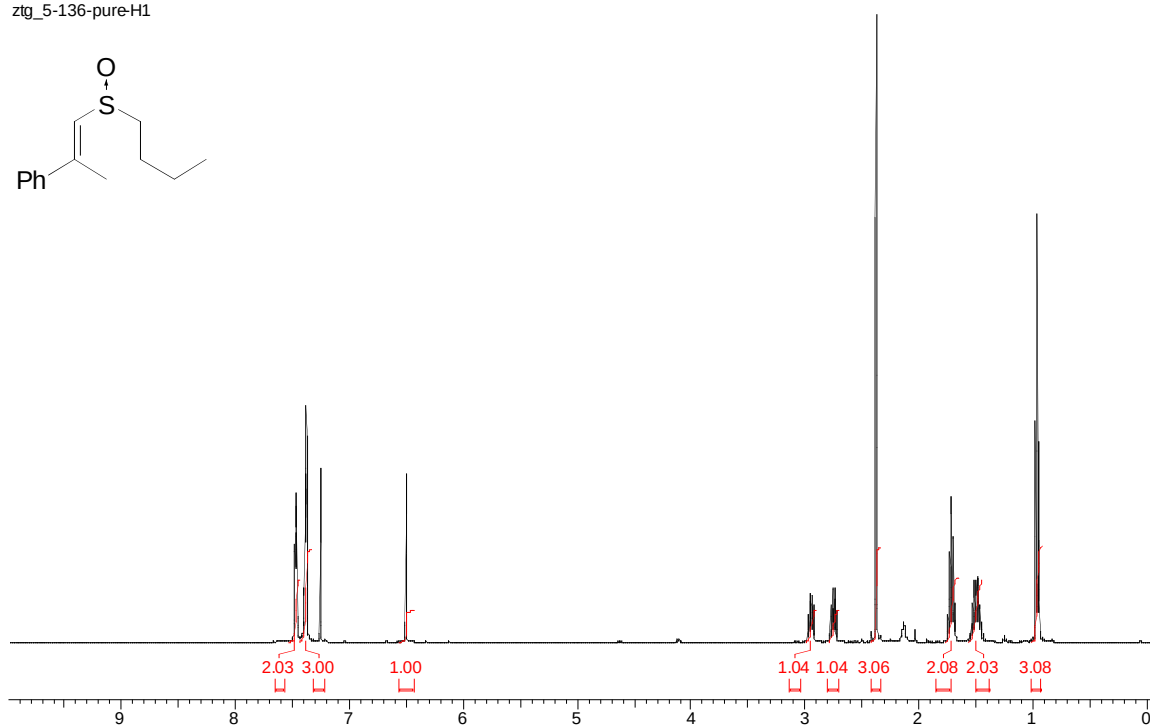
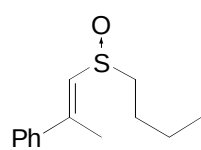
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BP-4-31-C-good

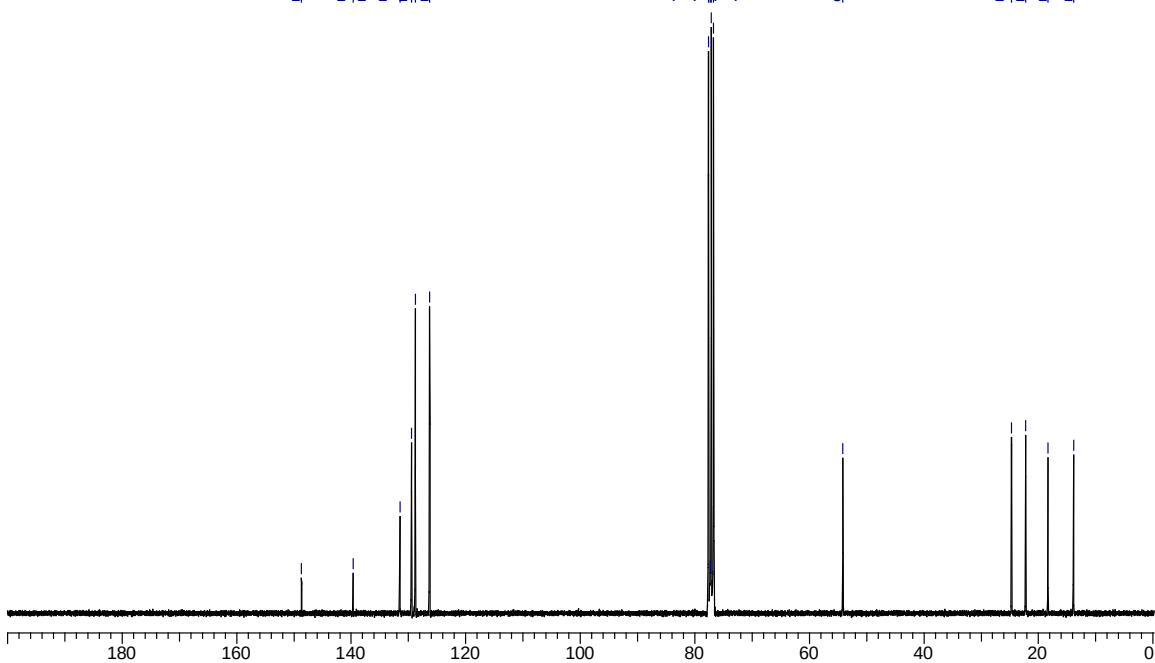


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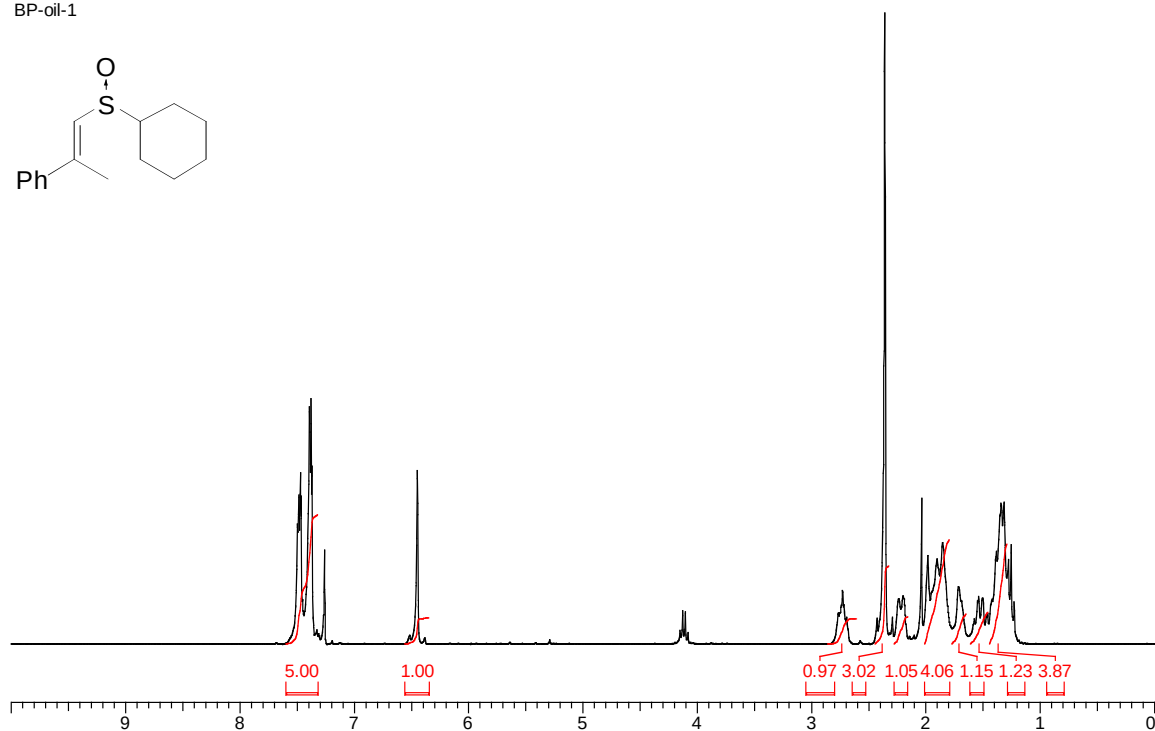
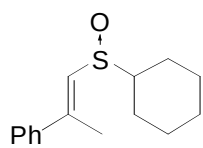


ztg-5-136-pure-c13

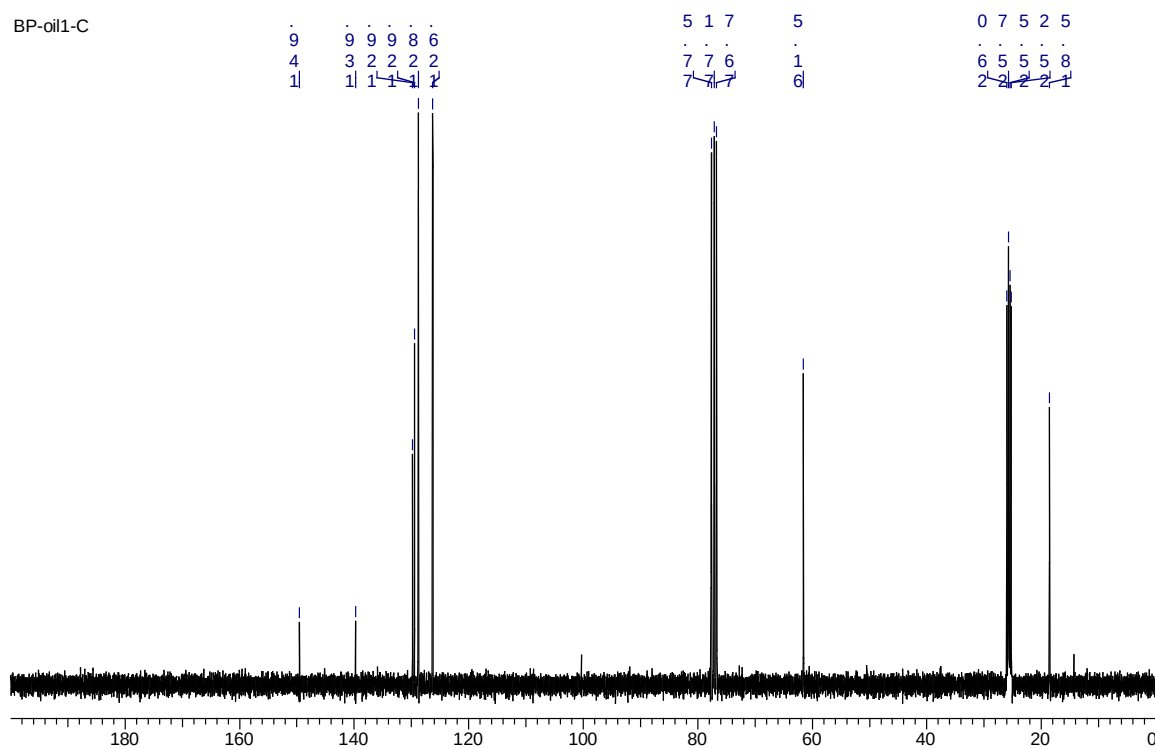
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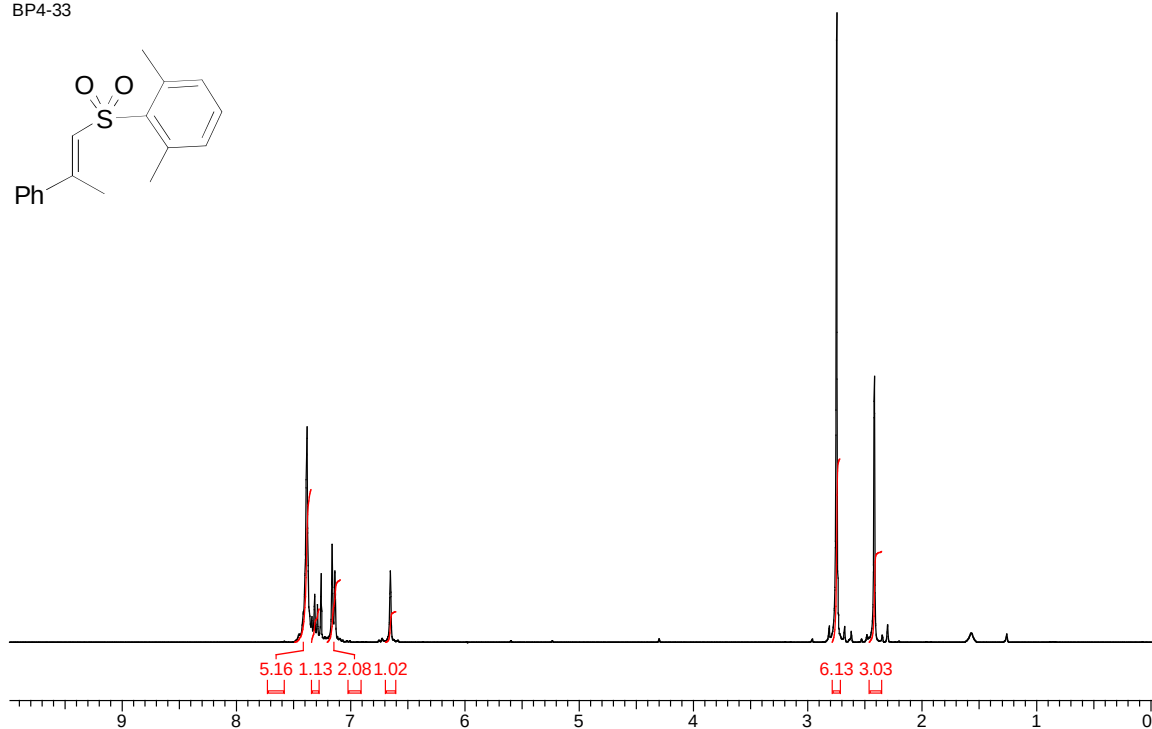
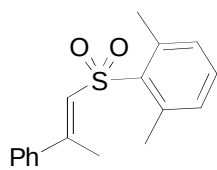
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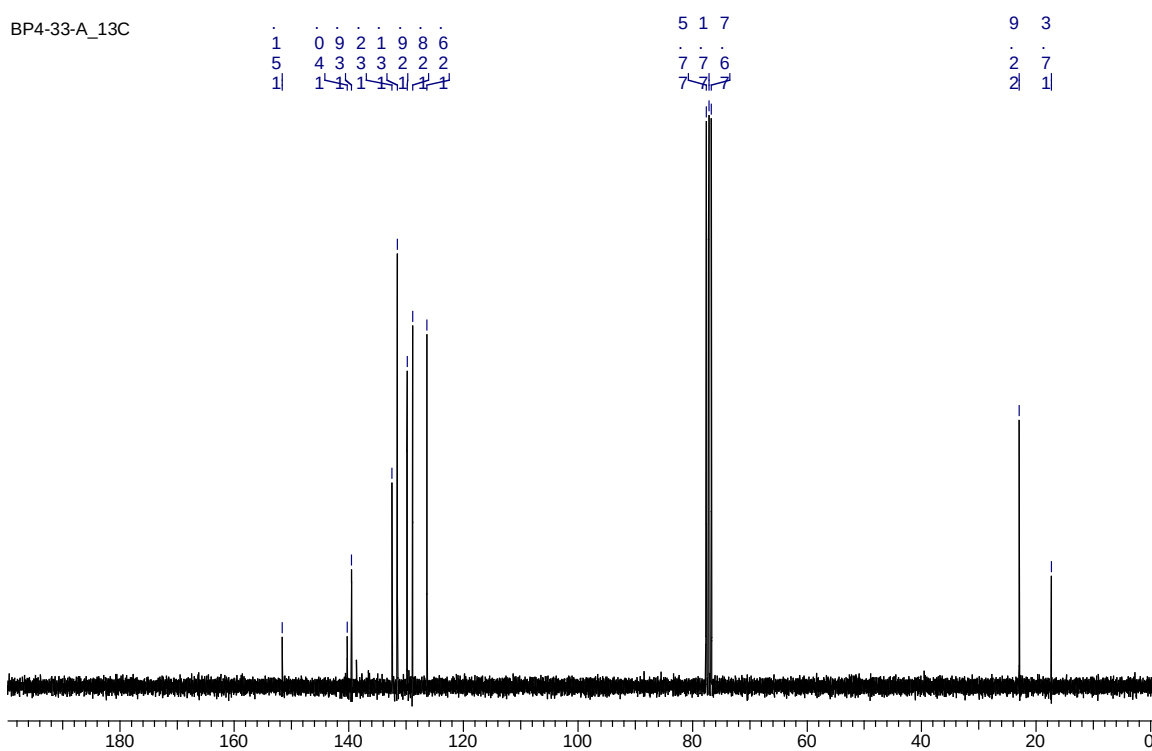
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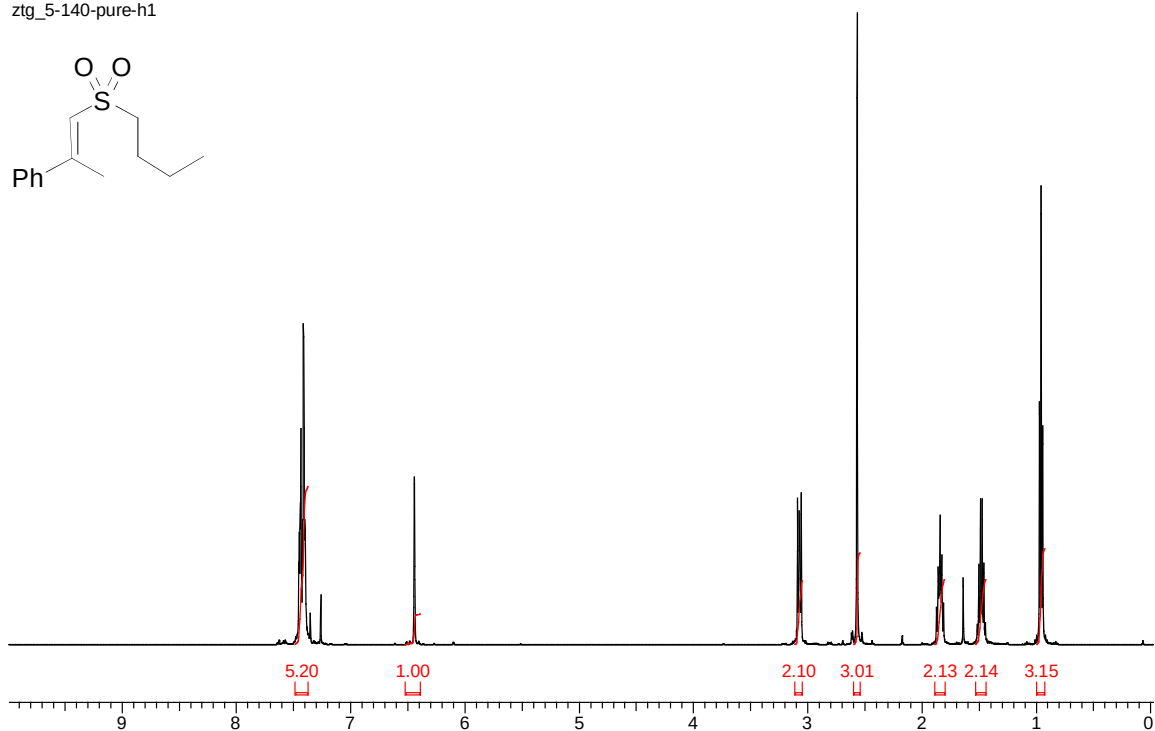
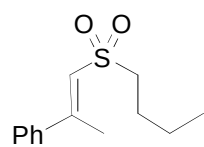
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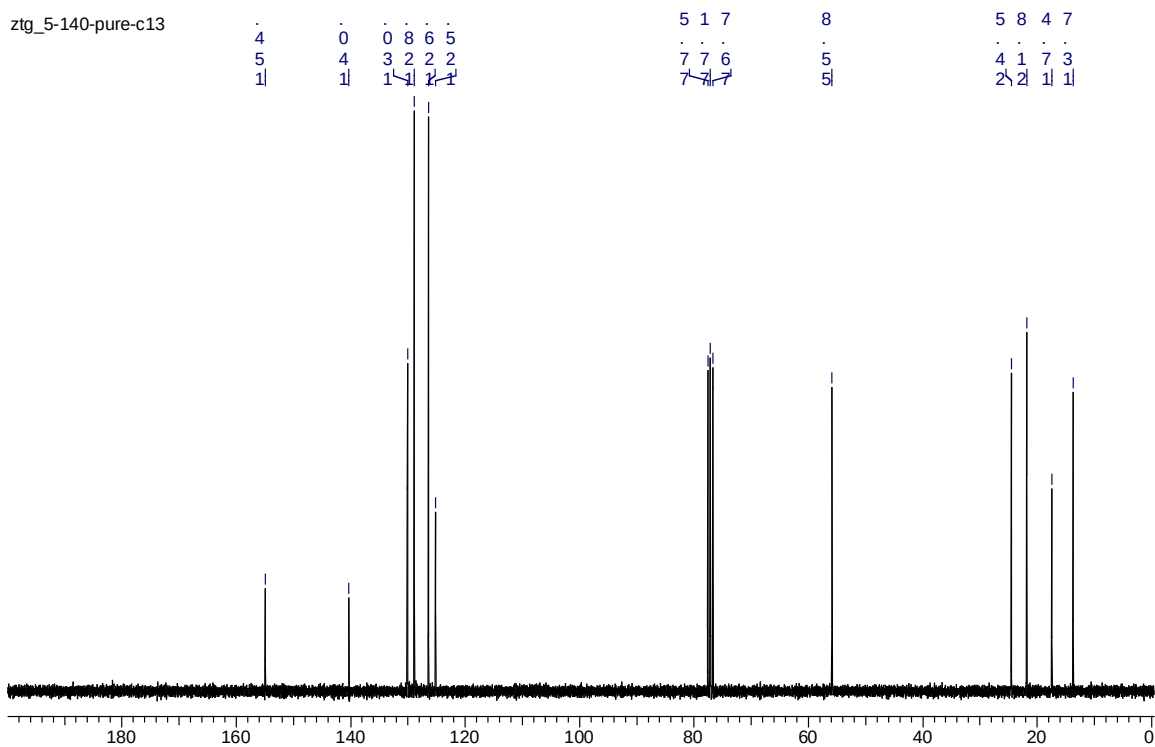
BP4-33-A_13C



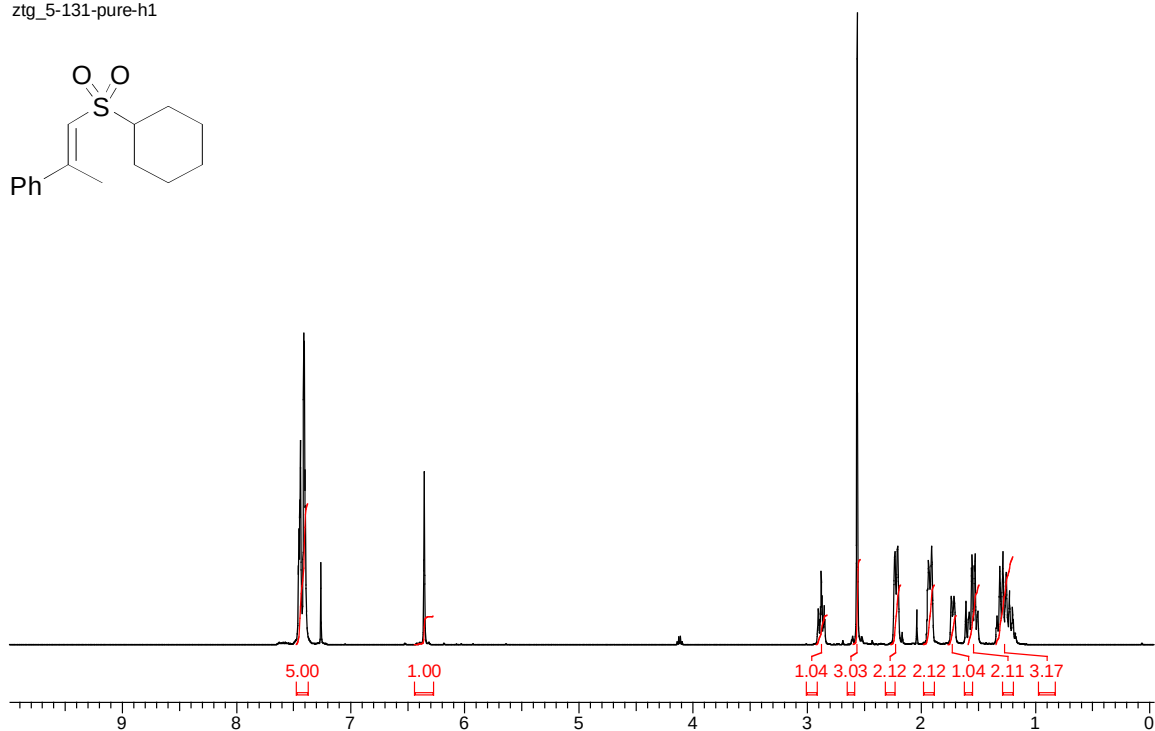
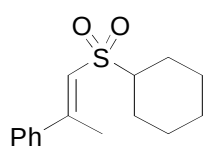
ztg_5-140-pure-h1



ztg_5-140-pure-c13

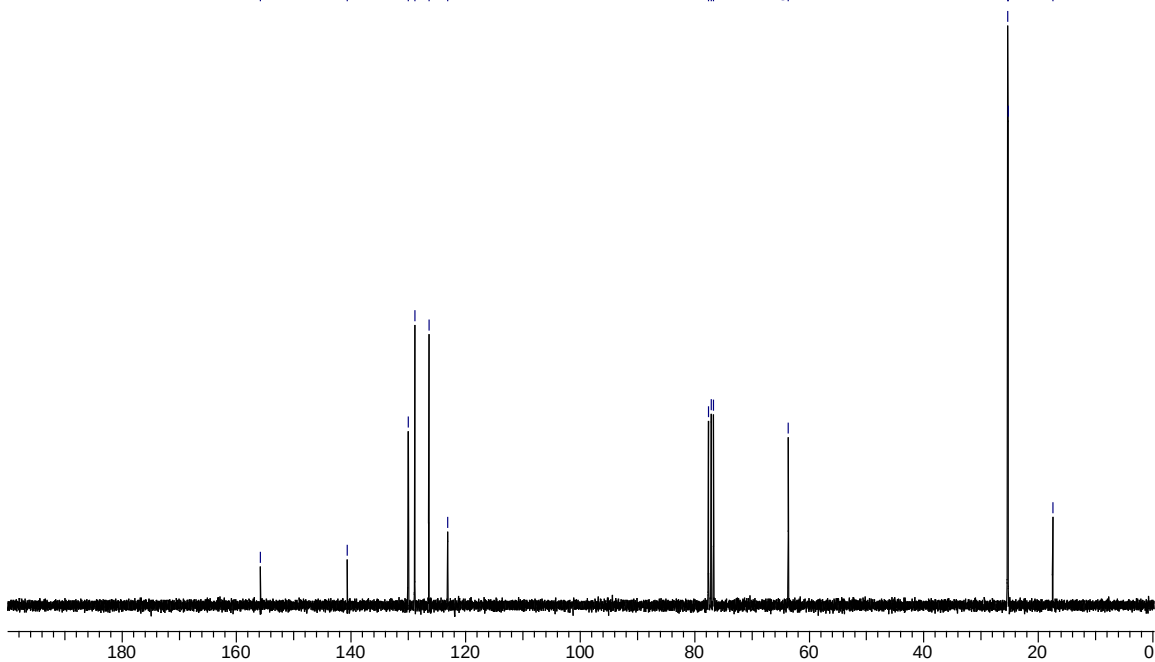


ztg_5-131-pure-h1

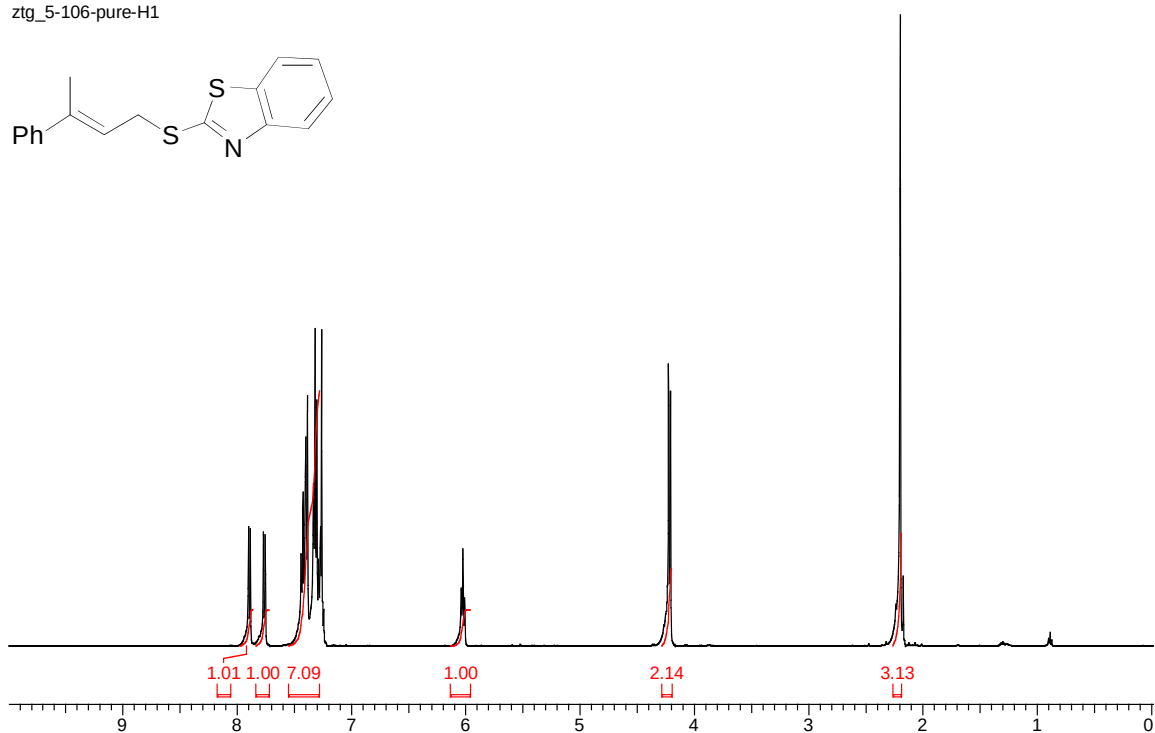
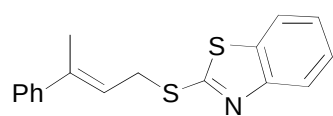


ZTG-5-131-13C

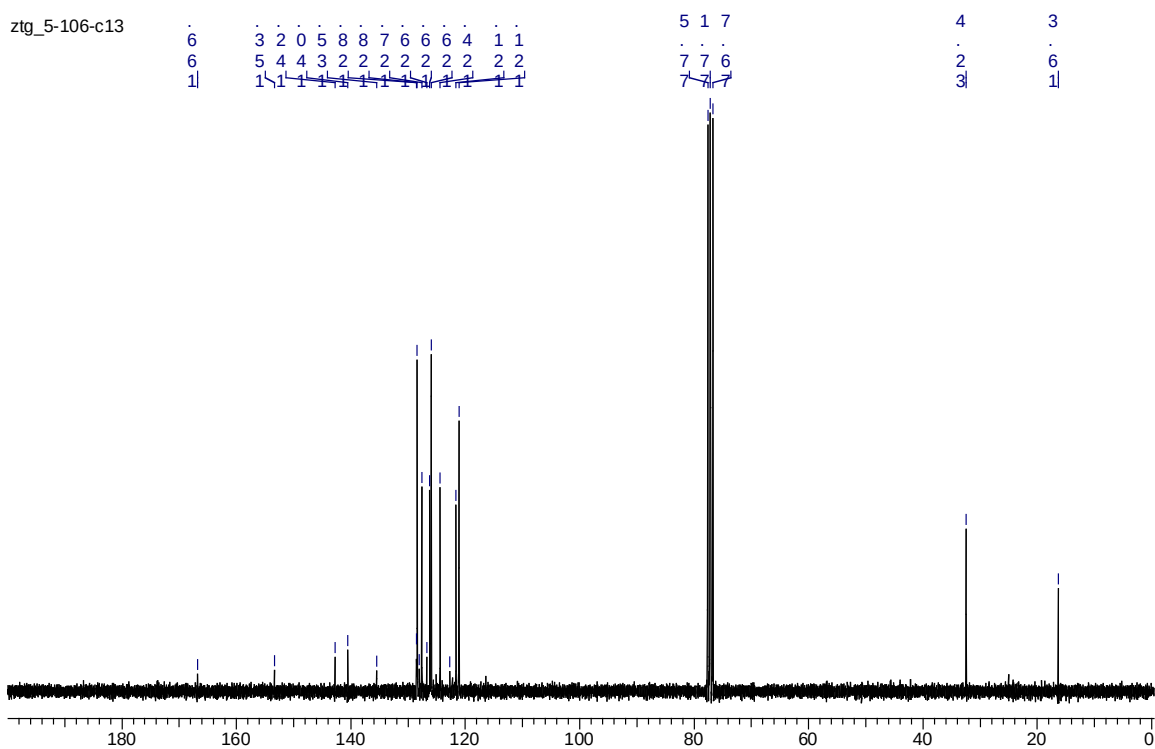
5	0	0	8	6	3	5	1	7	6	3	2	4
5	4	3	2	2	2	7	7	6	3	5	5	7
1	1	1	1	1	1	7	1	7	6	2	2	1



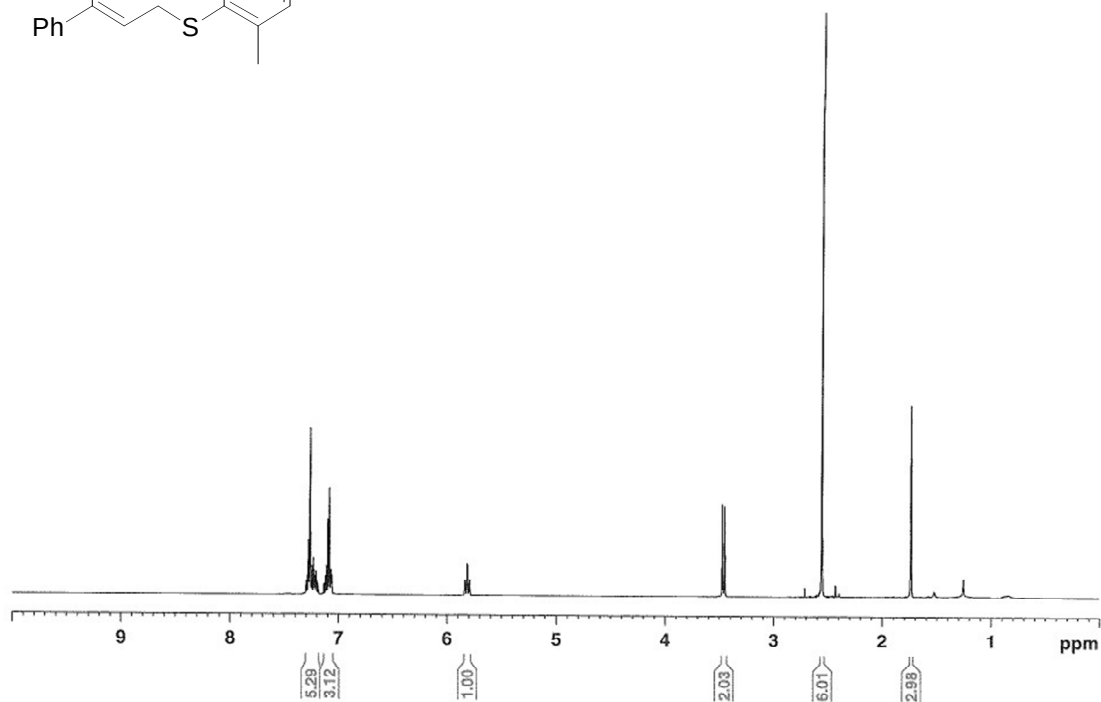
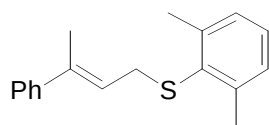
ztg_5-106-pure-H1



ztg_5-106-c13



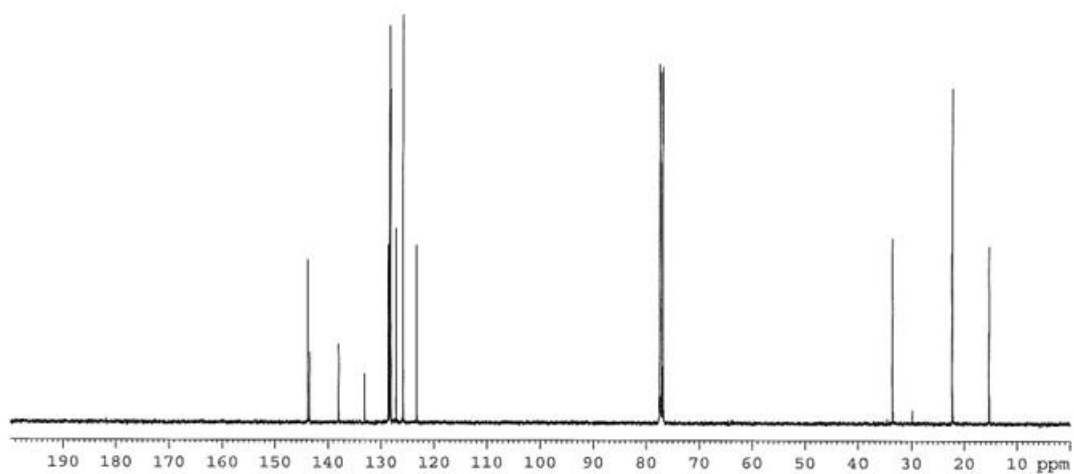
WR-A-E12BF2



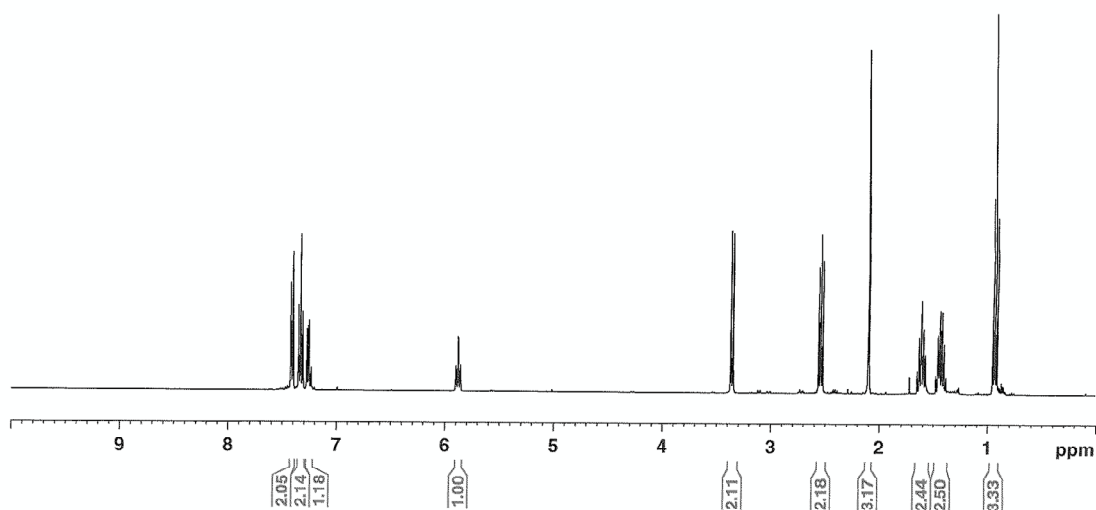
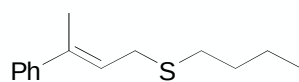
WR-A-E12B-F2

143.75
143.43
137.97
133.06
128.58
128.32
128.14
127.10
125.79
123.23

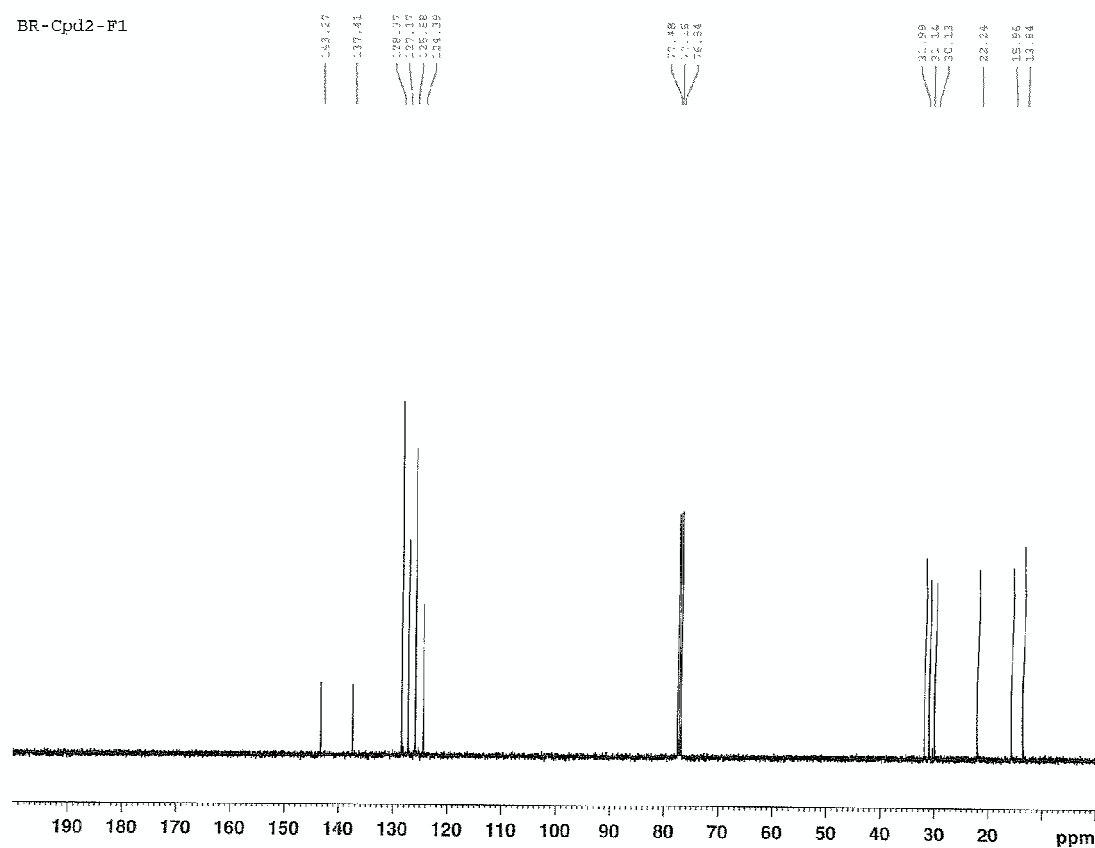
33.57
22.29
15.34



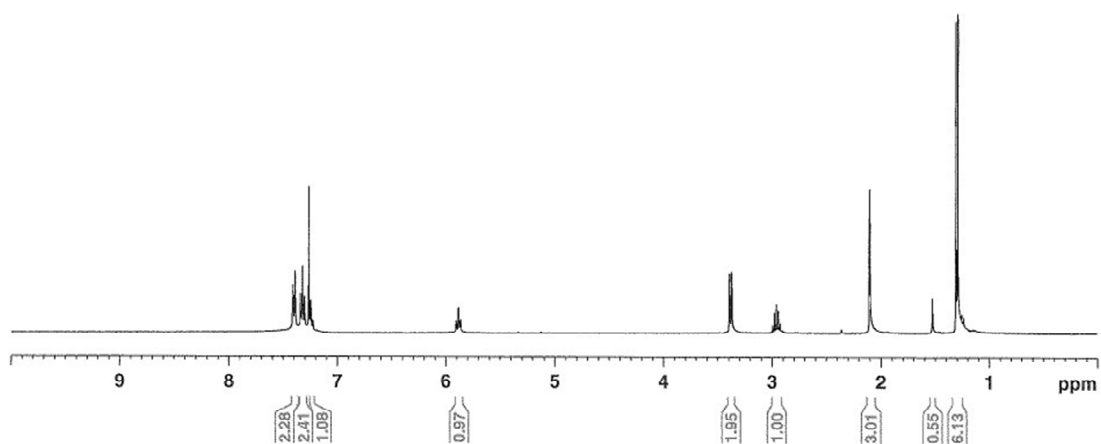
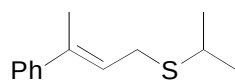
BR-Cpd2-F1



BR-Cpd2-F1



ztg-108C:/Bruker/TOPSPIN

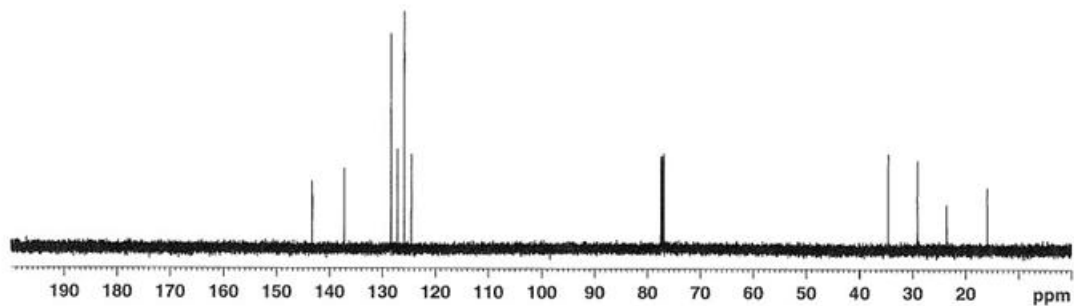


ztg-5-108

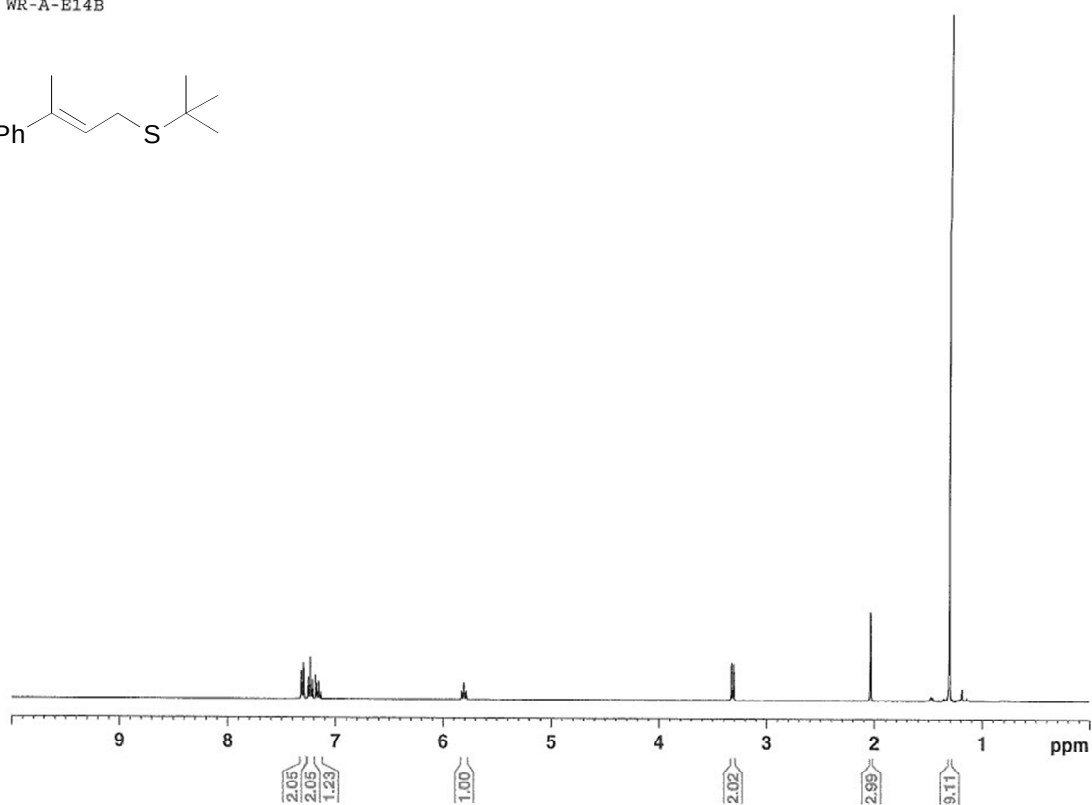
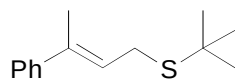
143.231
137.168
128.336
127.134
125.856
124.496

77.416
77.162
76.905

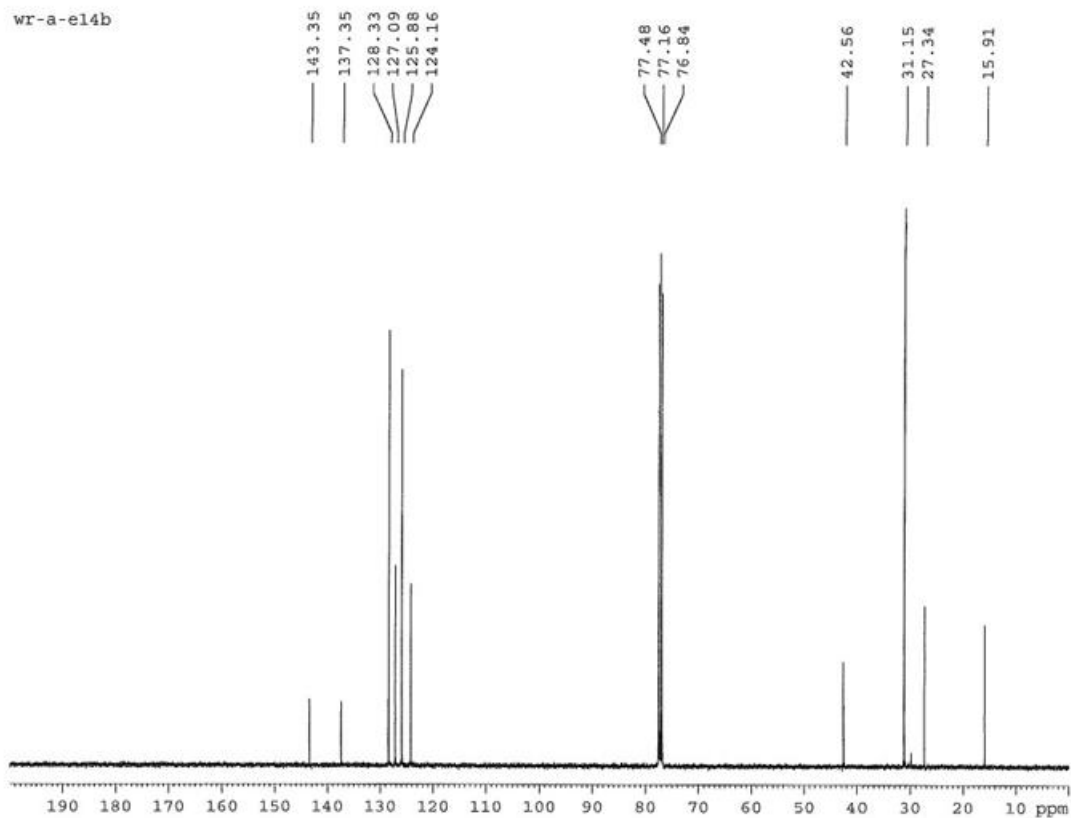
34.620
29.095
23.589
15.920



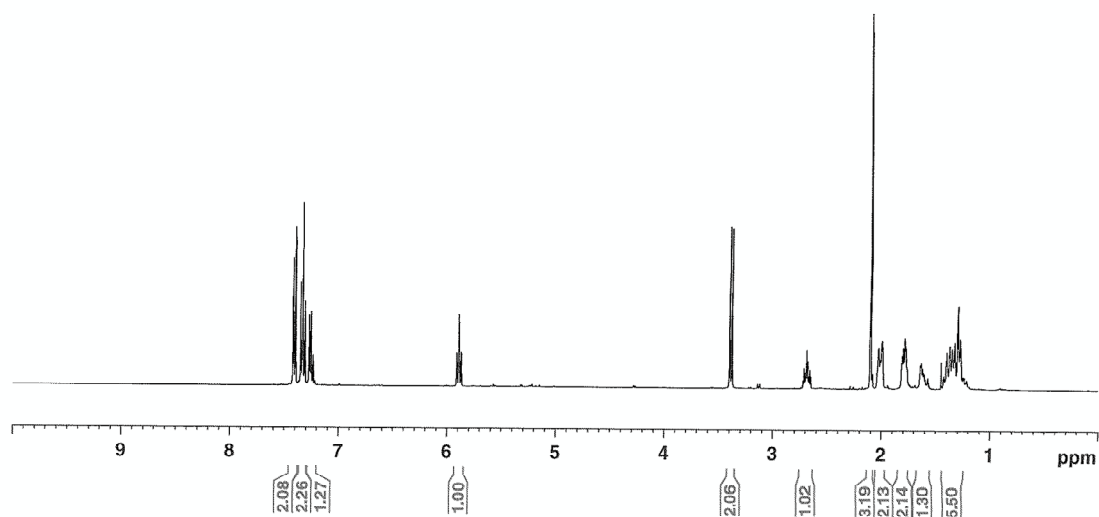
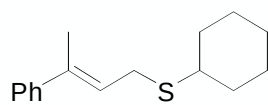
WR-A-E14B



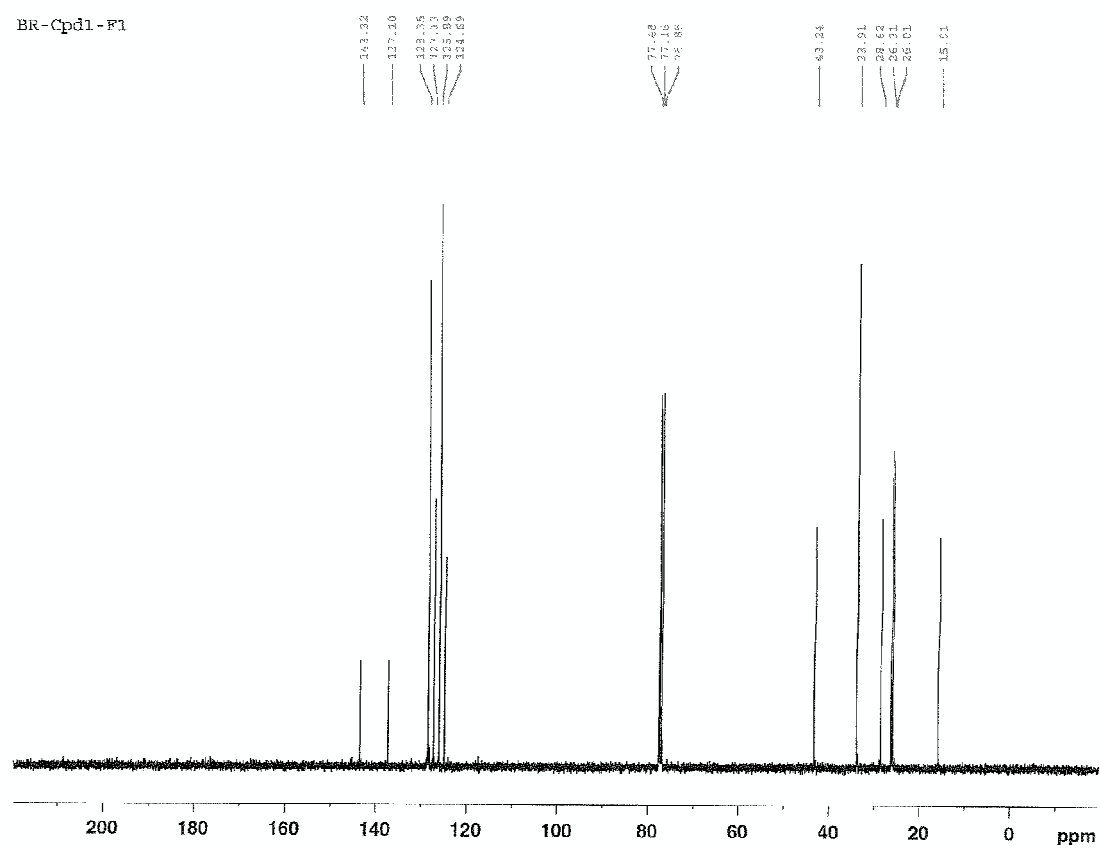
wr-a-e14b

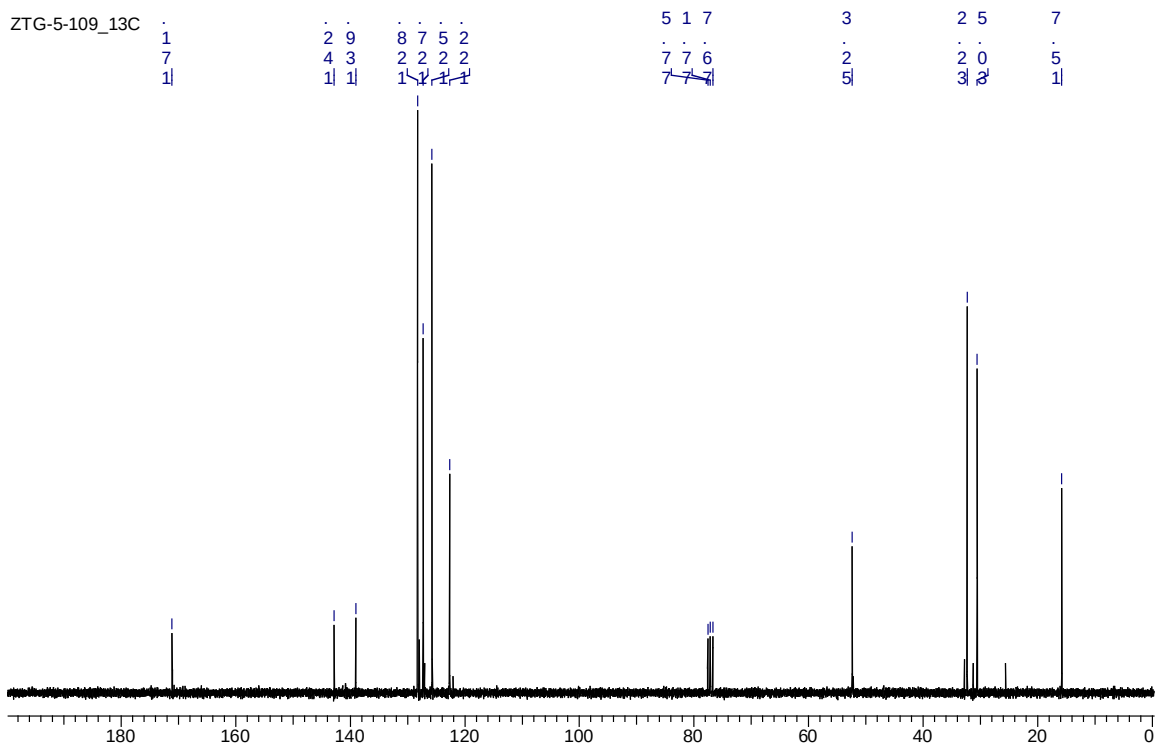


BR-Cpd1-F1

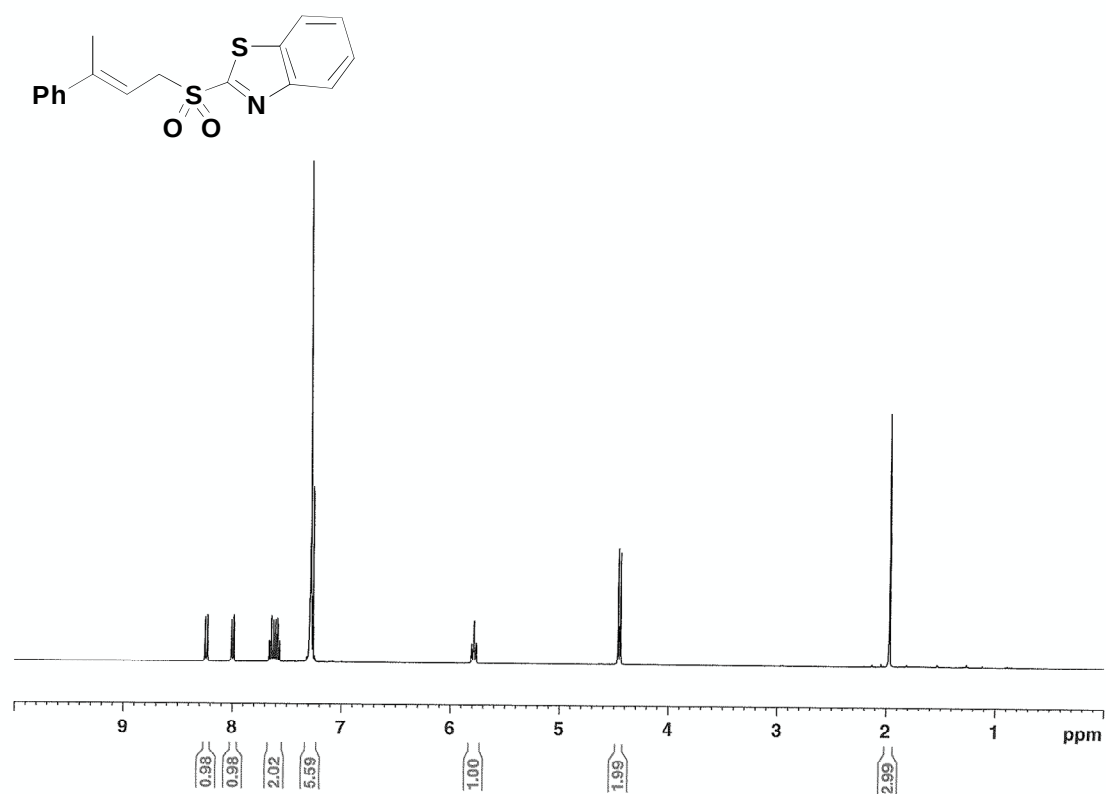


BR-Cpd1-F1

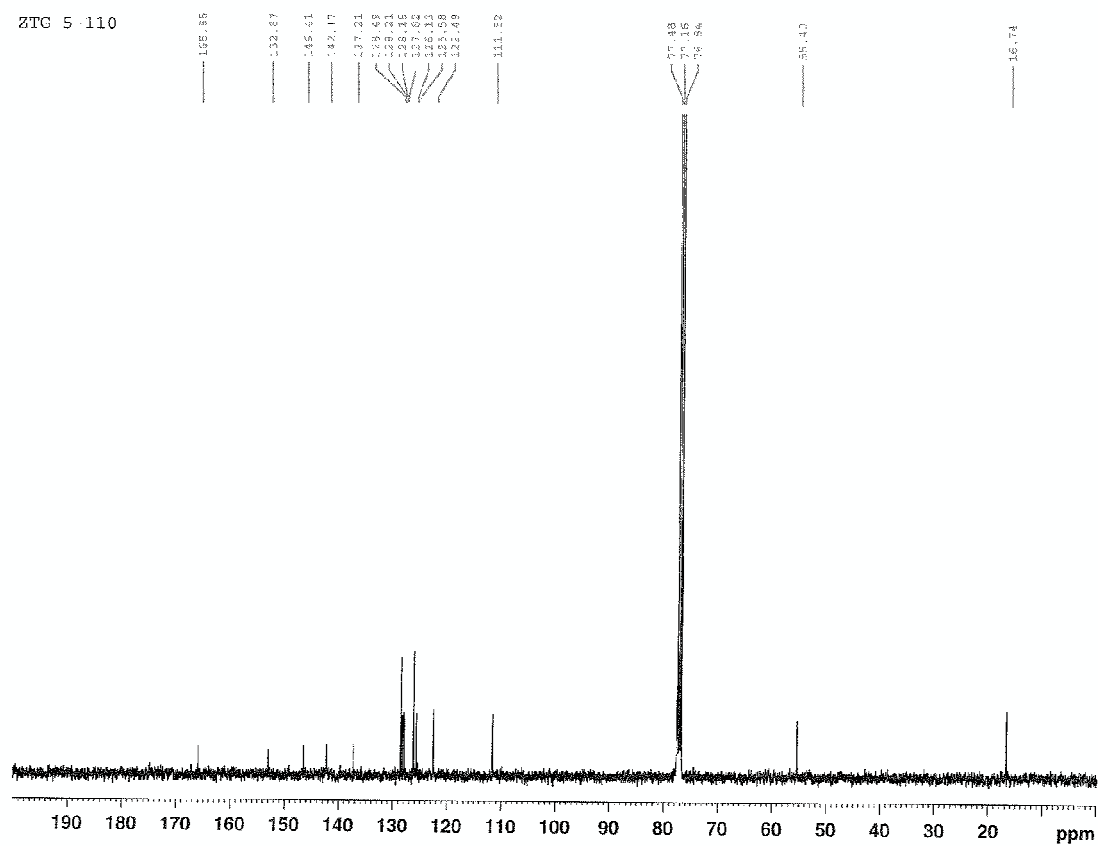


CC(=C(C)CSCC(=O)OC)C1=CC=CC=C1

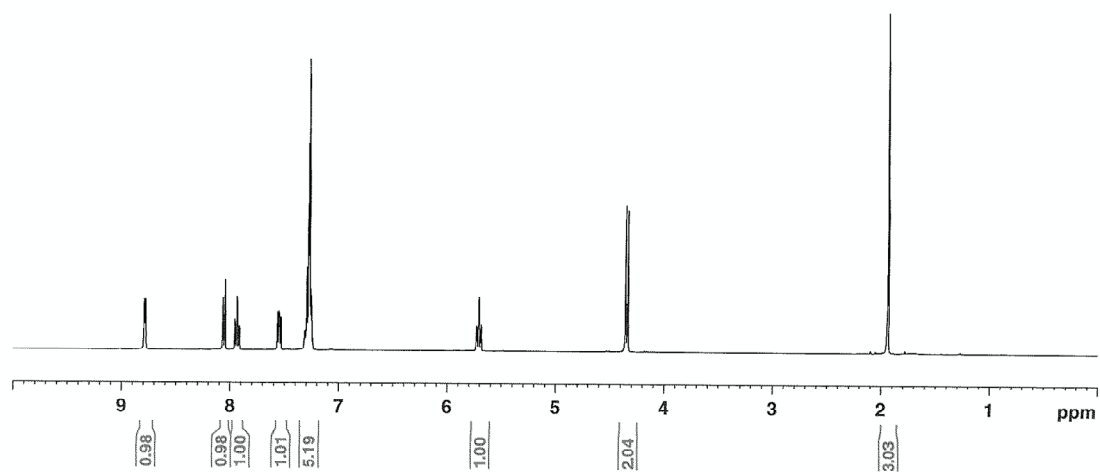
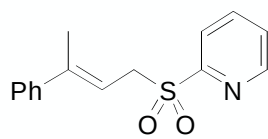
ZTG-5-110



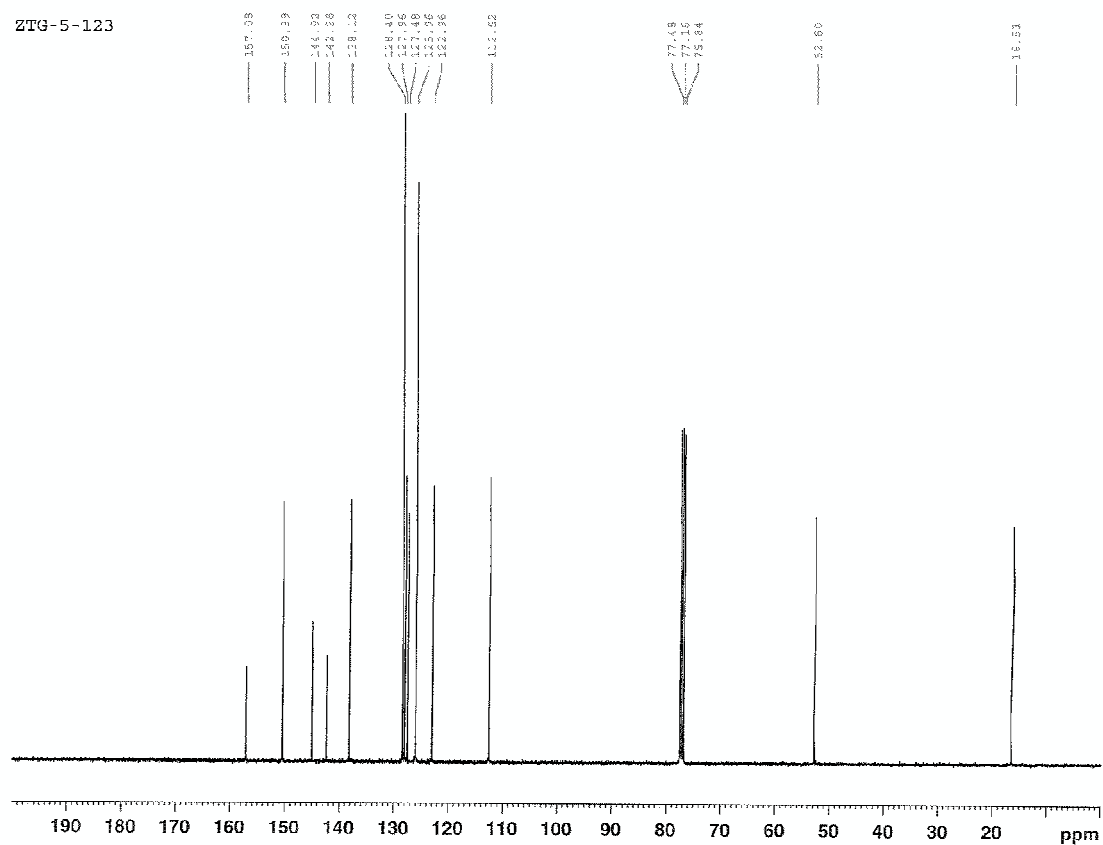
ZTG 5-110



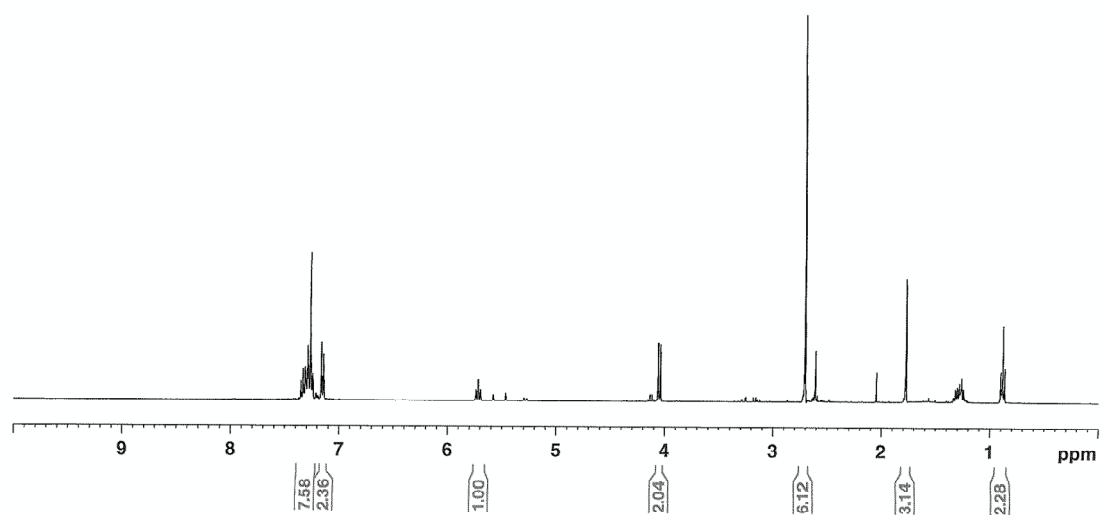
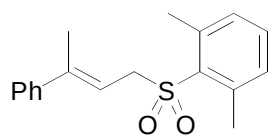
ZTG-5-123



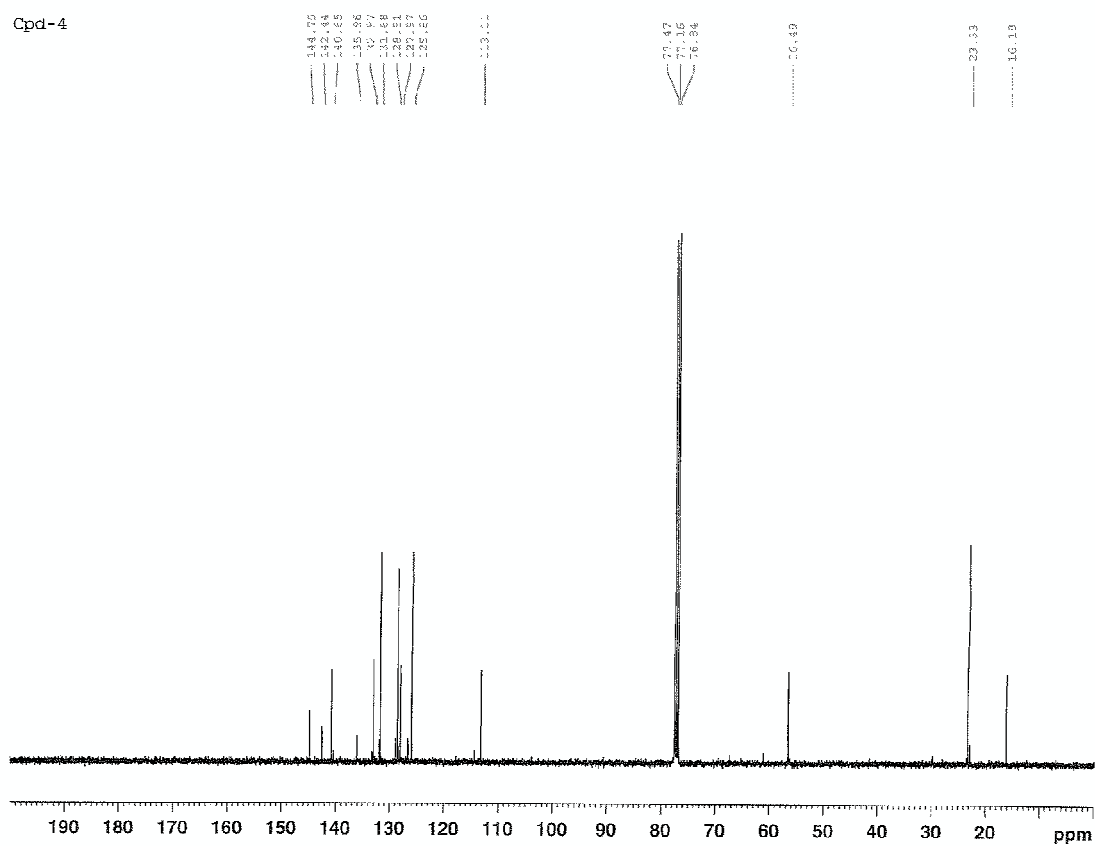
ZTG-5-123



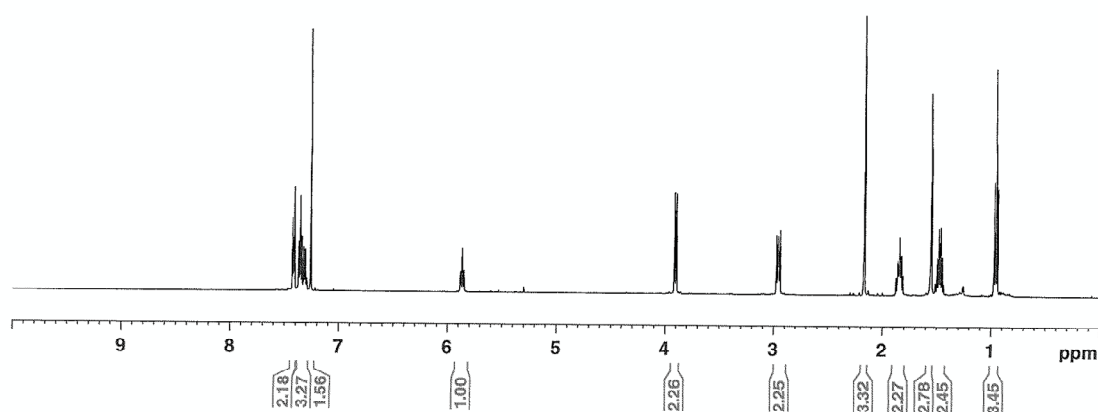
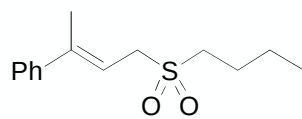
compound 4



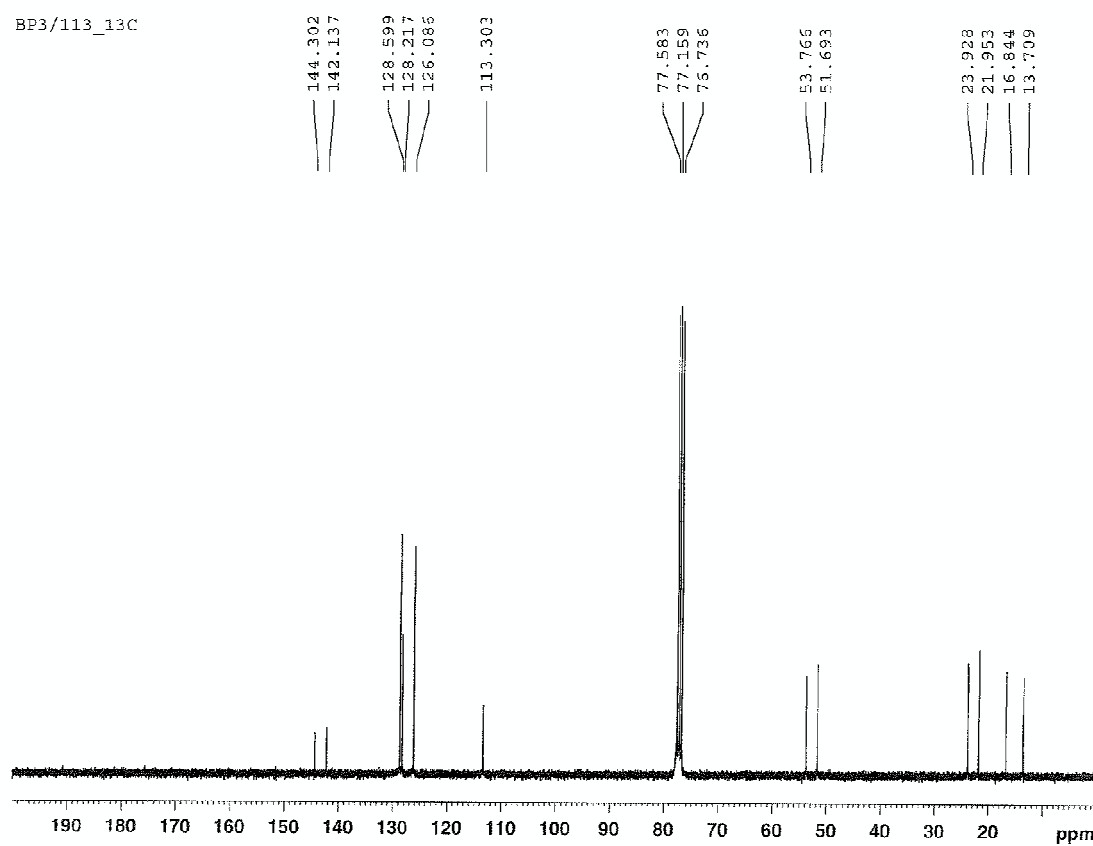
Cpd-4



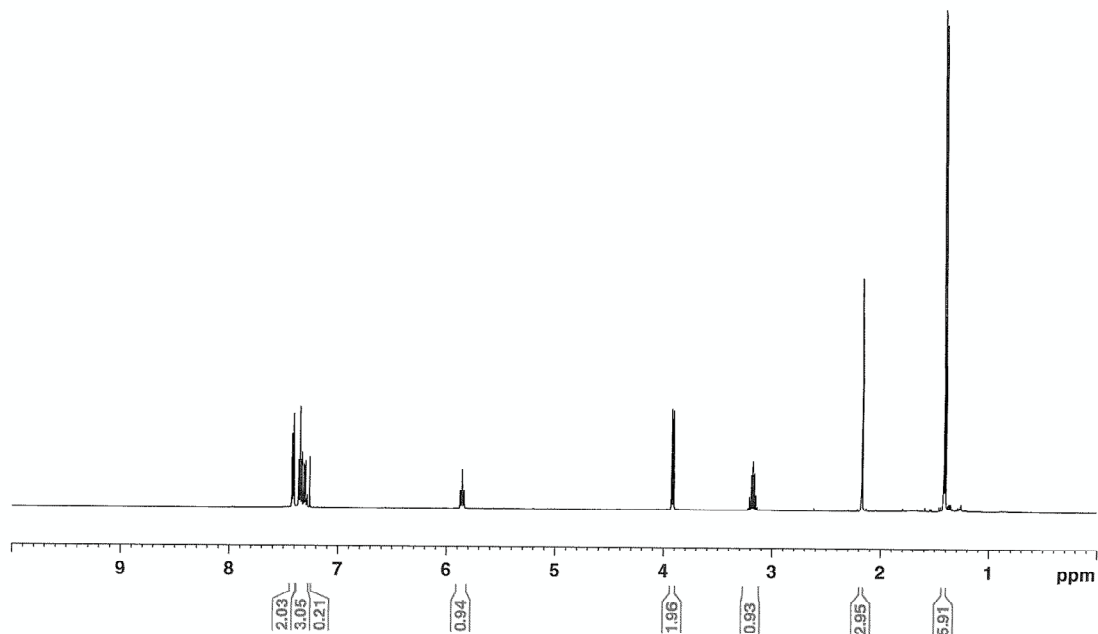
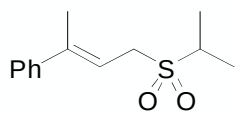
BP3/113_col



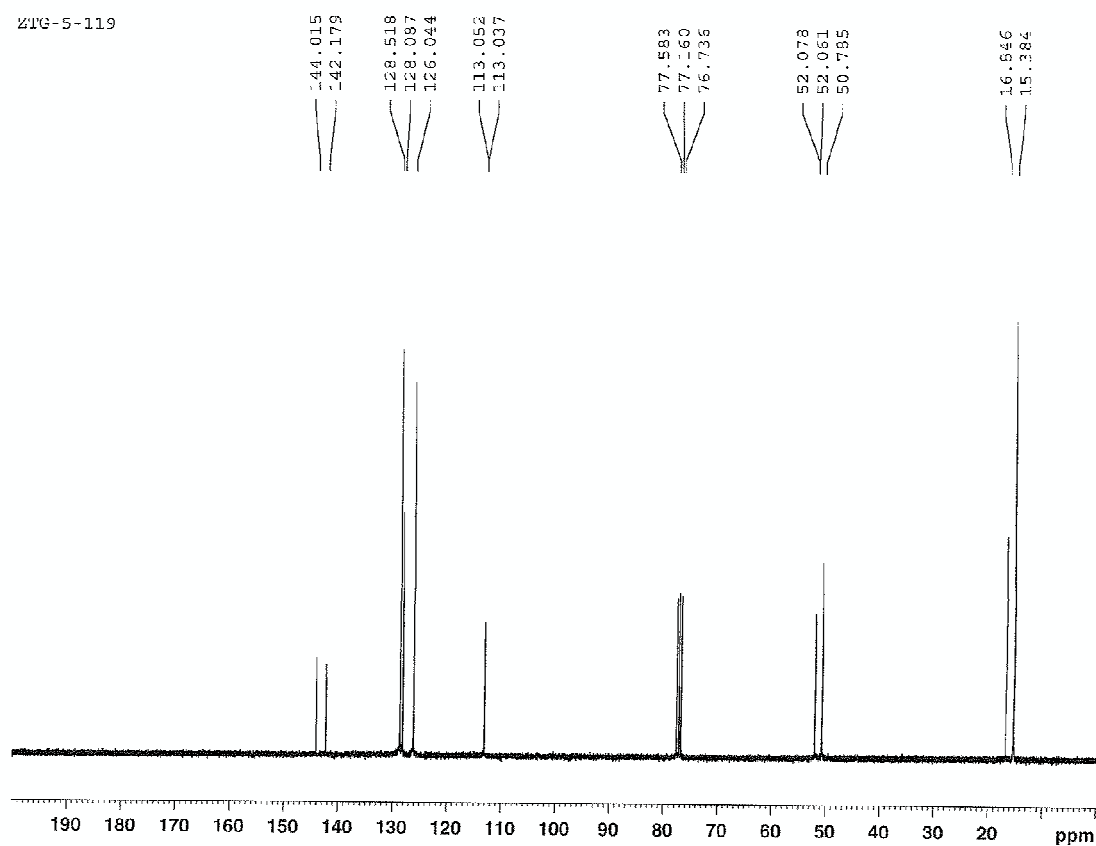
BP3/113_13C



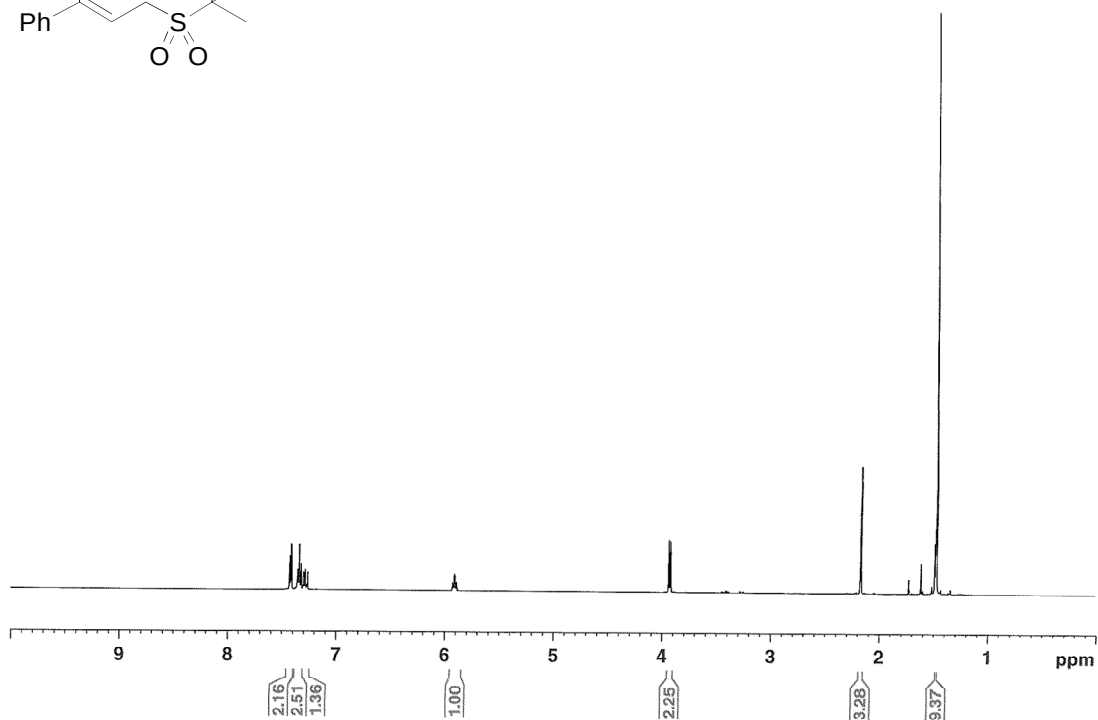
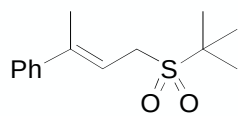
ZTG-5-119



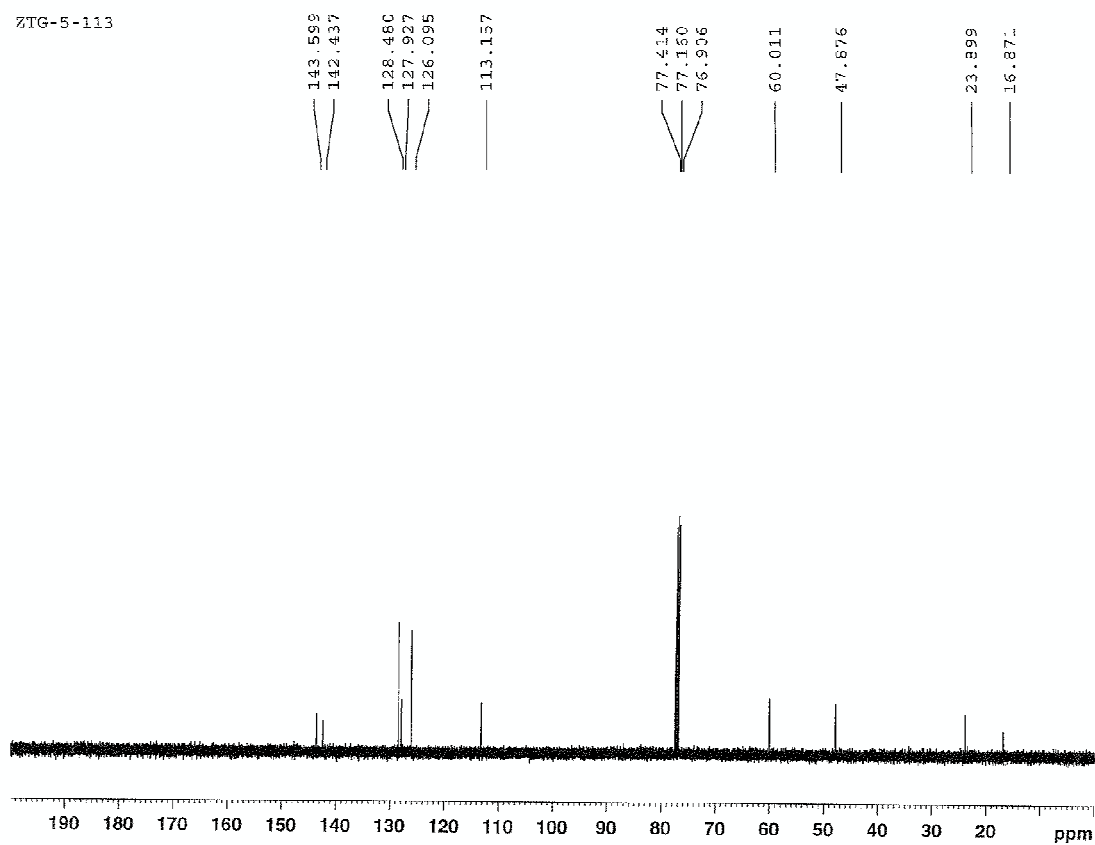
ZTG-5-119



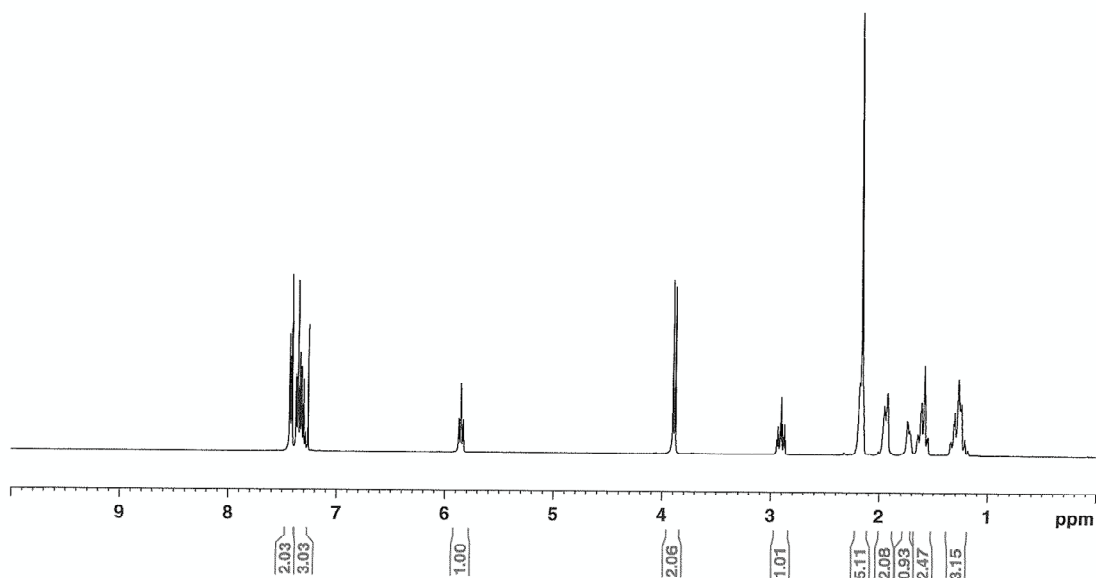
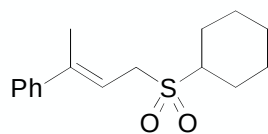
ZTG-5-113



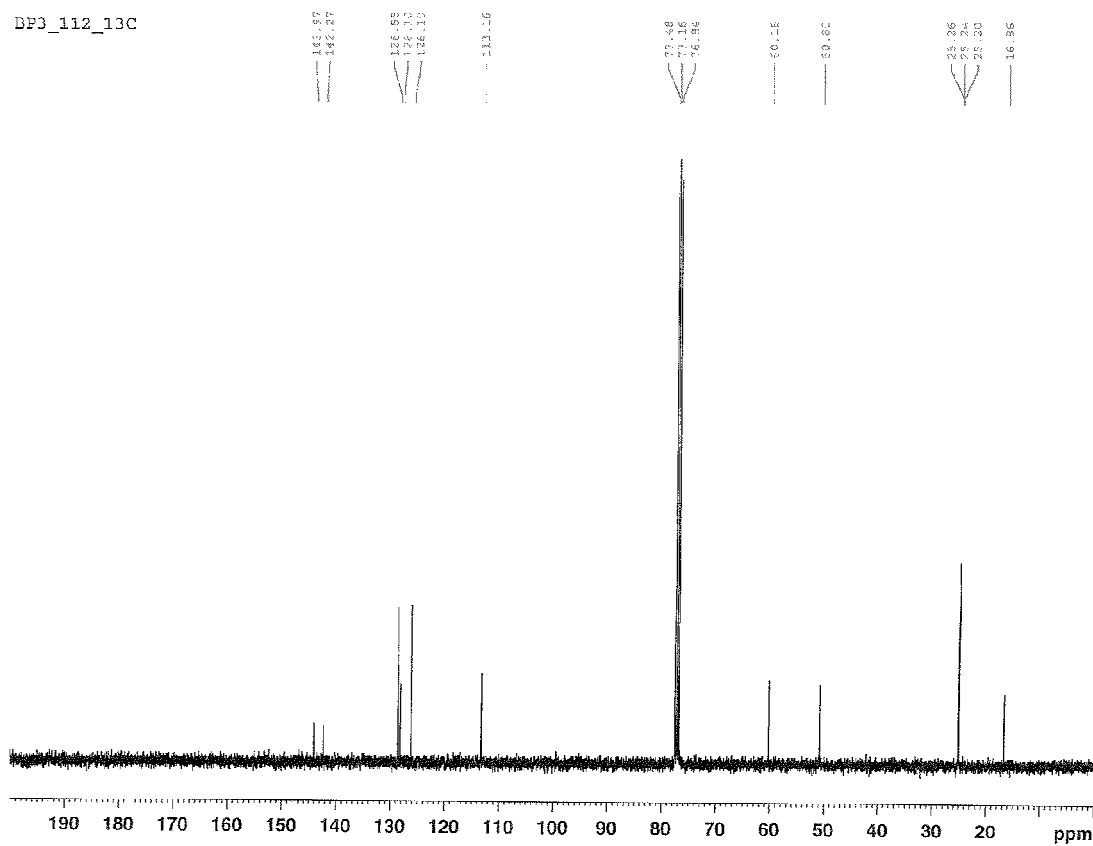
ZTG-5-113



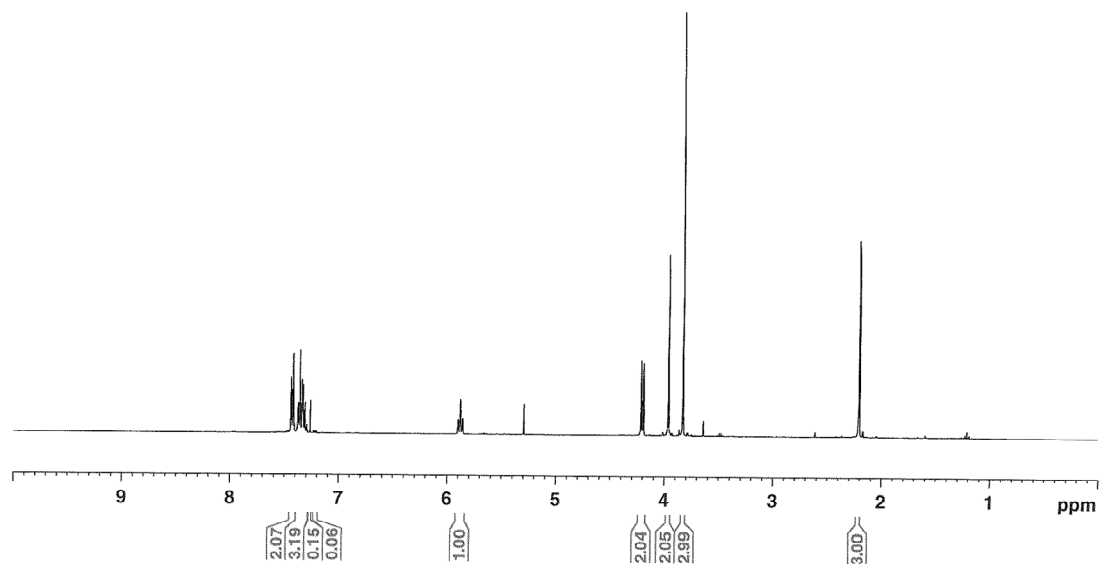
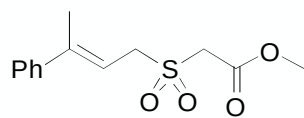
BP3_112



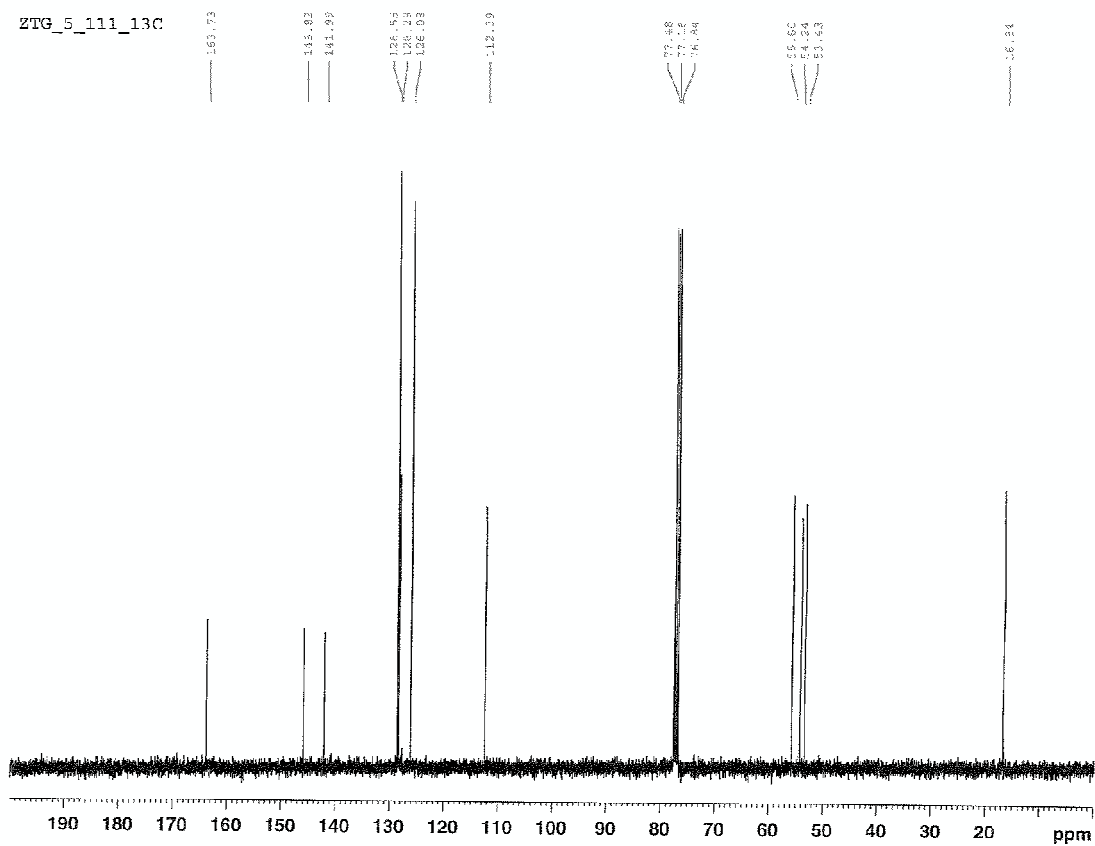
BP3_112_13C



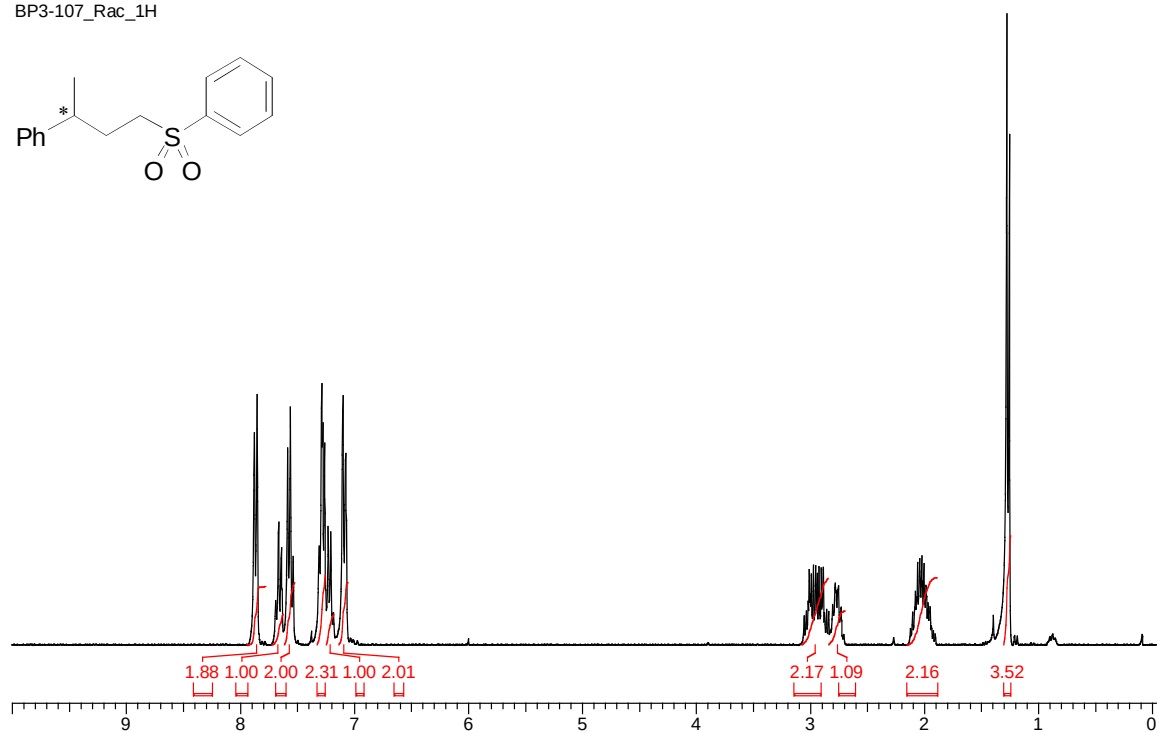
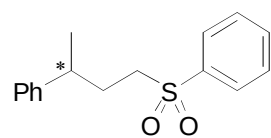
ZTG-5-111



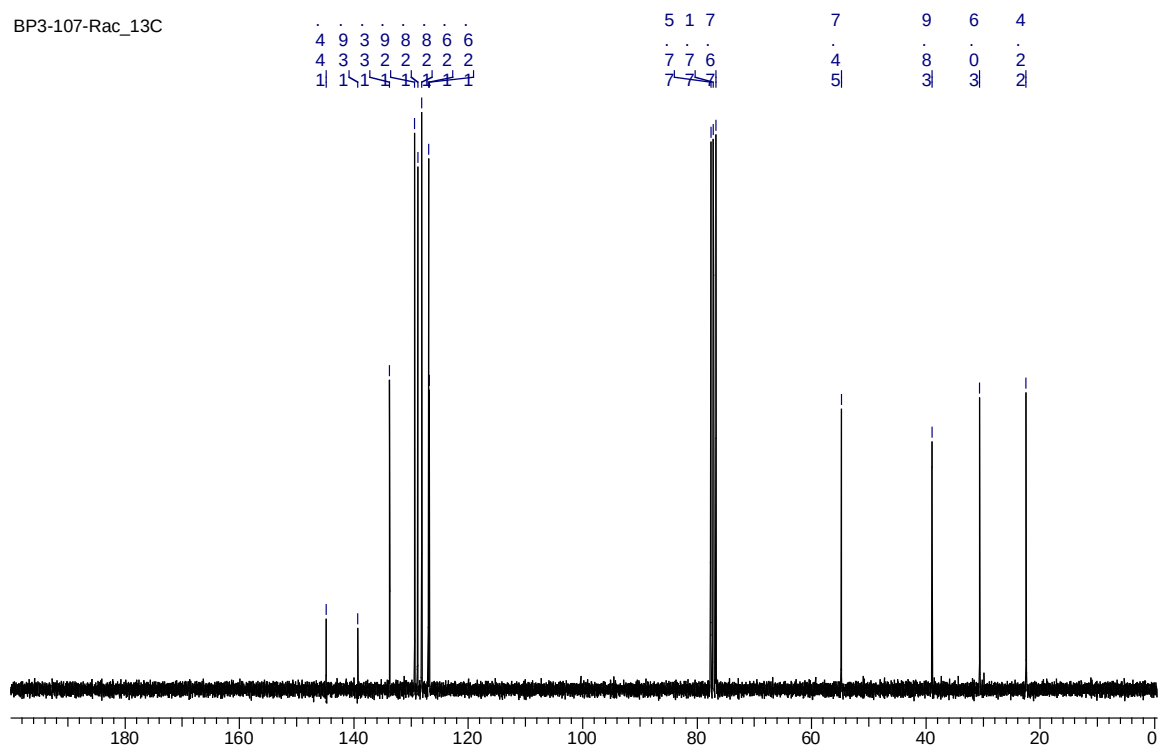
ZTG_5_111_13C



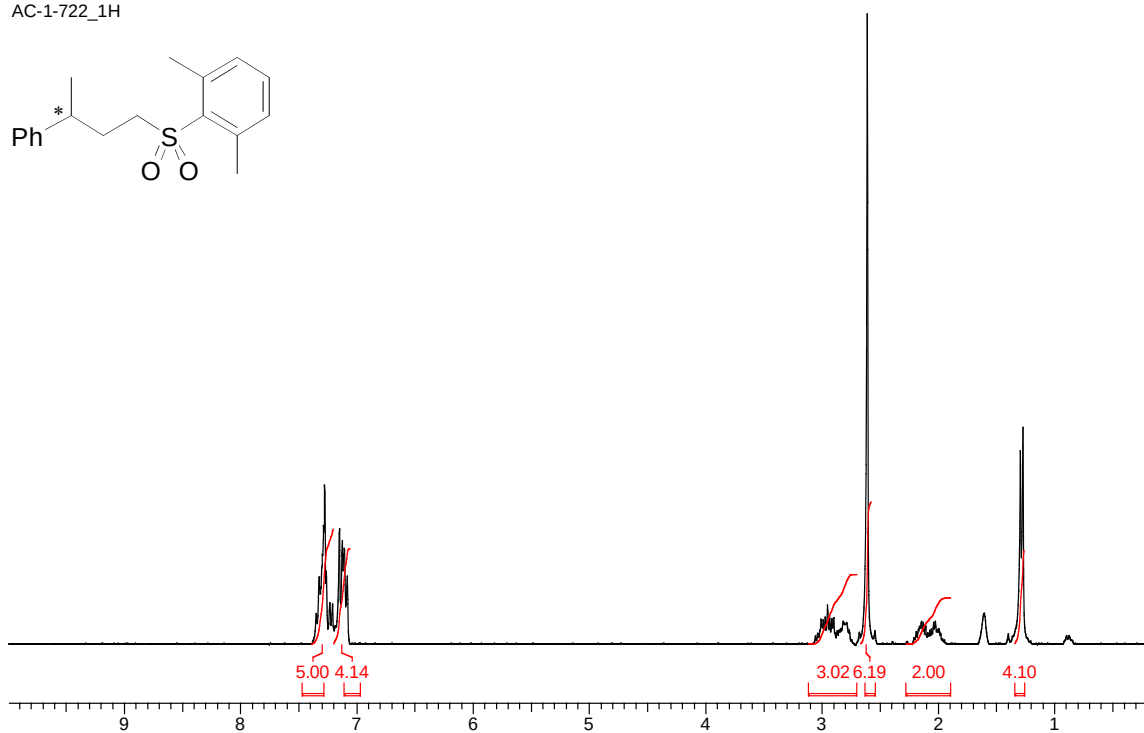
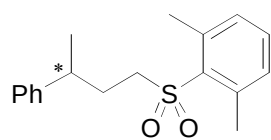
BP3-107_Rac_1H



BP3-107-Rac_13C

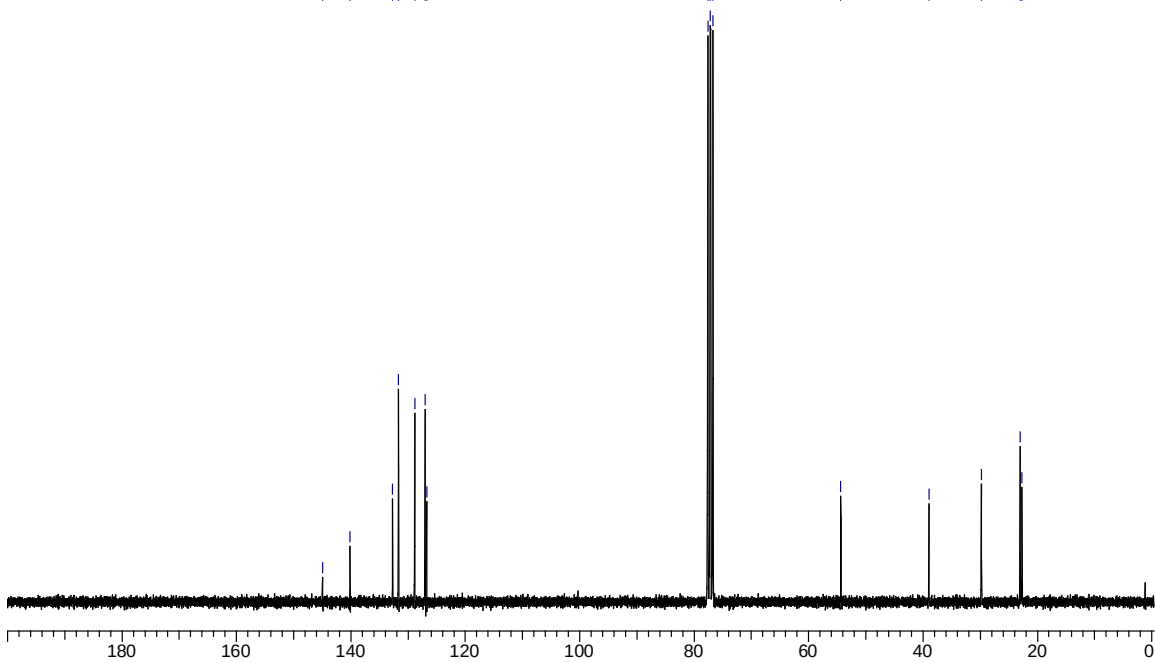


AC-1-722_1H

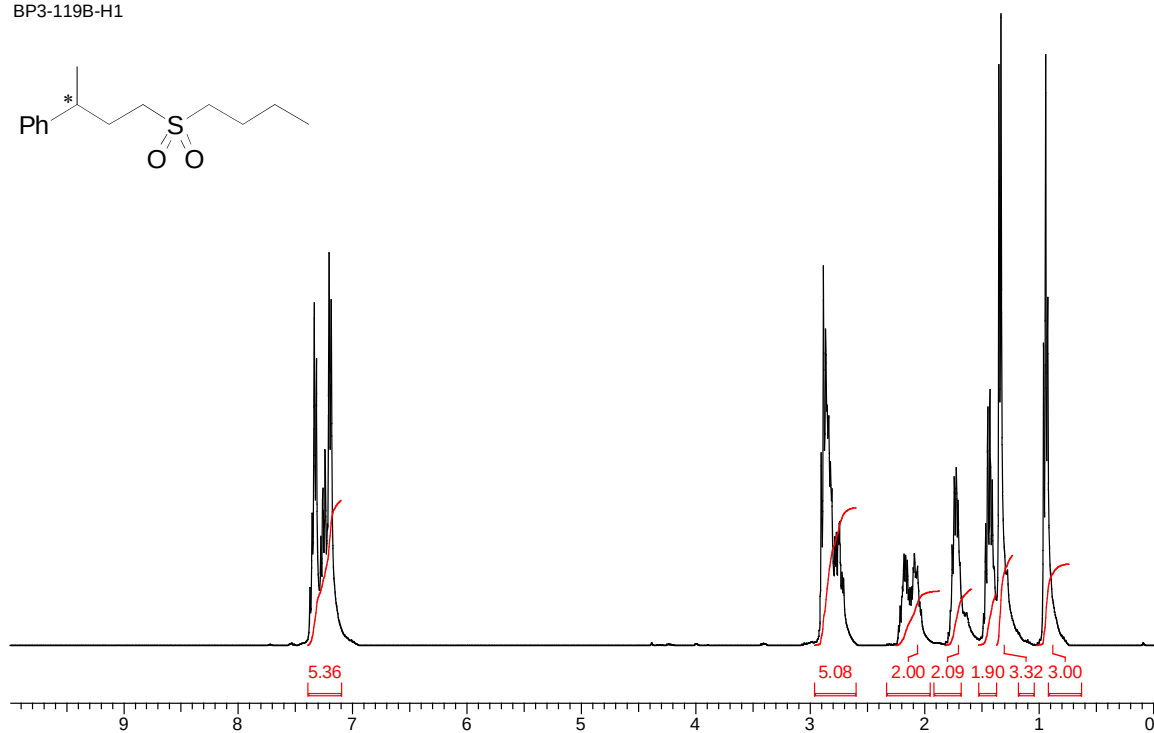
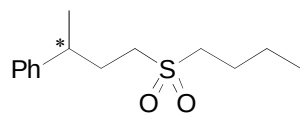


AC_1-722_13C

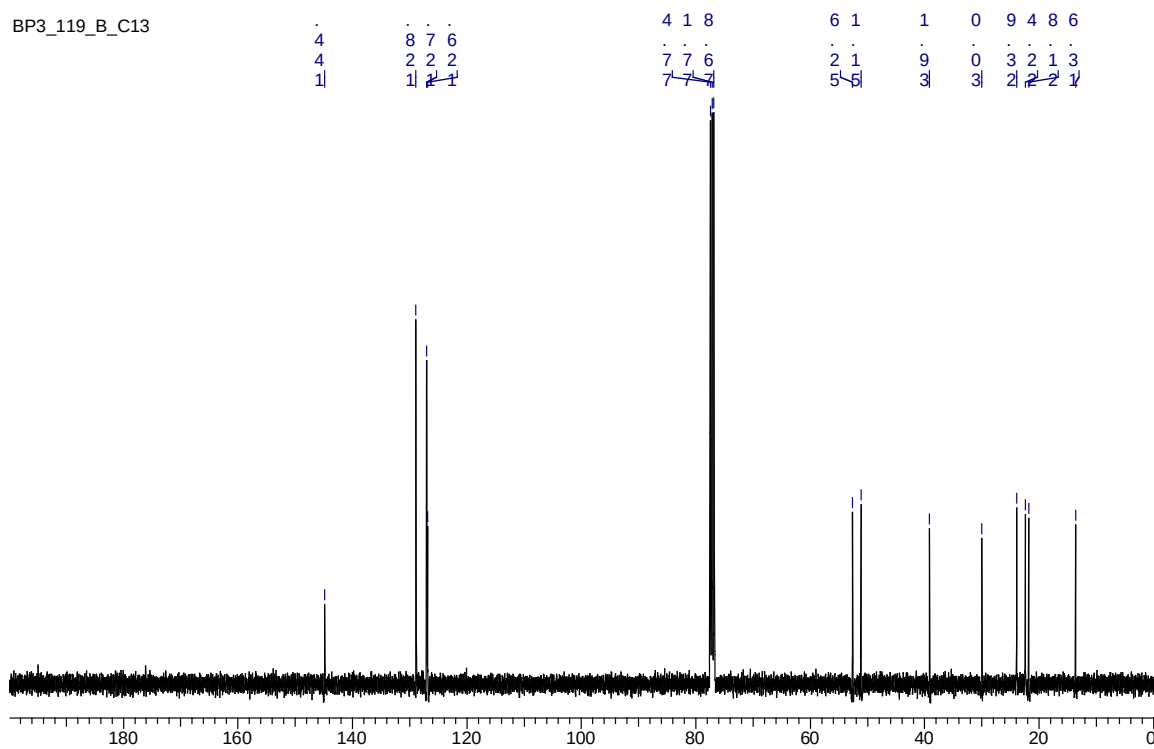
4	0	2	1	8	6	6	5	1	7	3	9	8	0	6
4	4	3	3	2	2	2	7	7	6	4	8	9	3	2
1	1	1	1	1	1	1	7	7	7	5	3	2	2	2



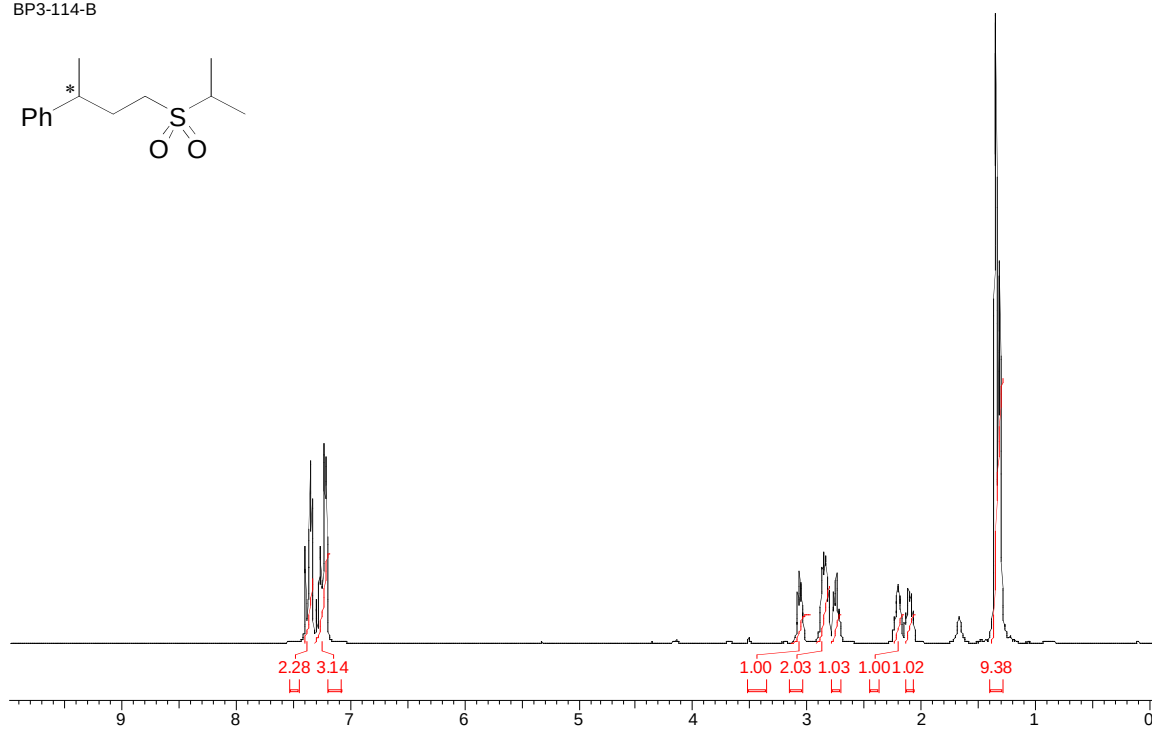
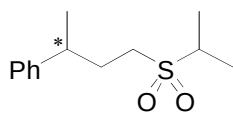
BP3-119B-H1



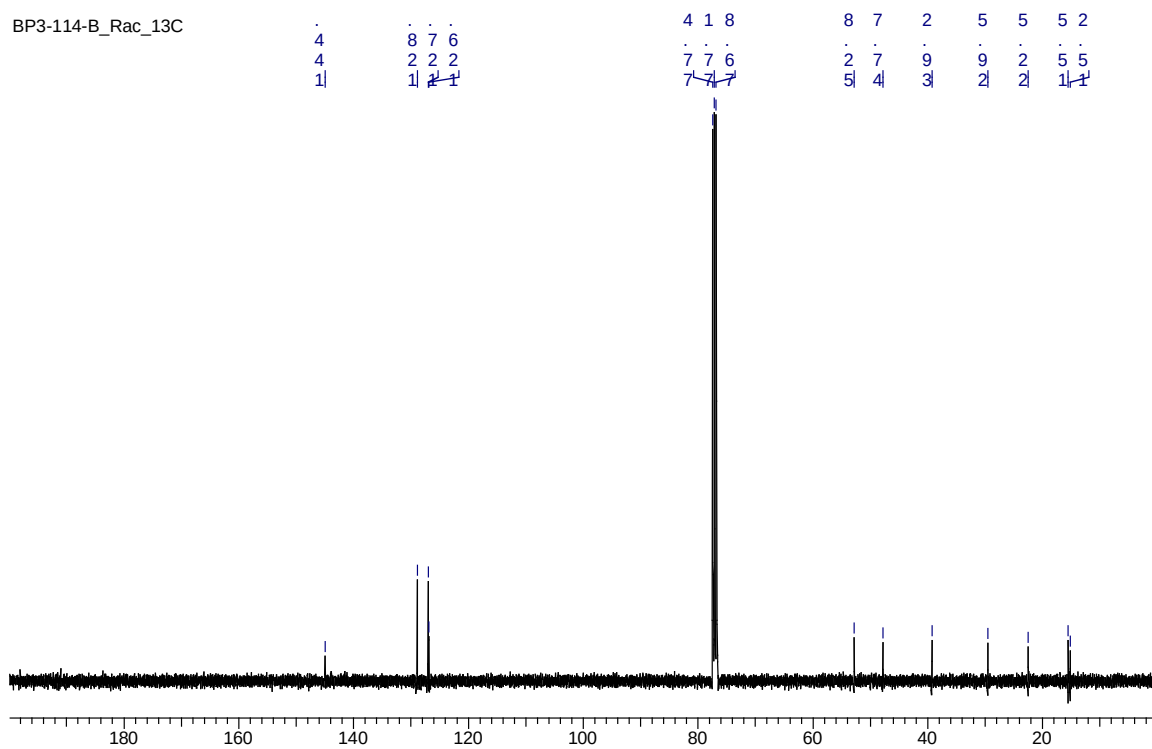
BP3_119_B_C13



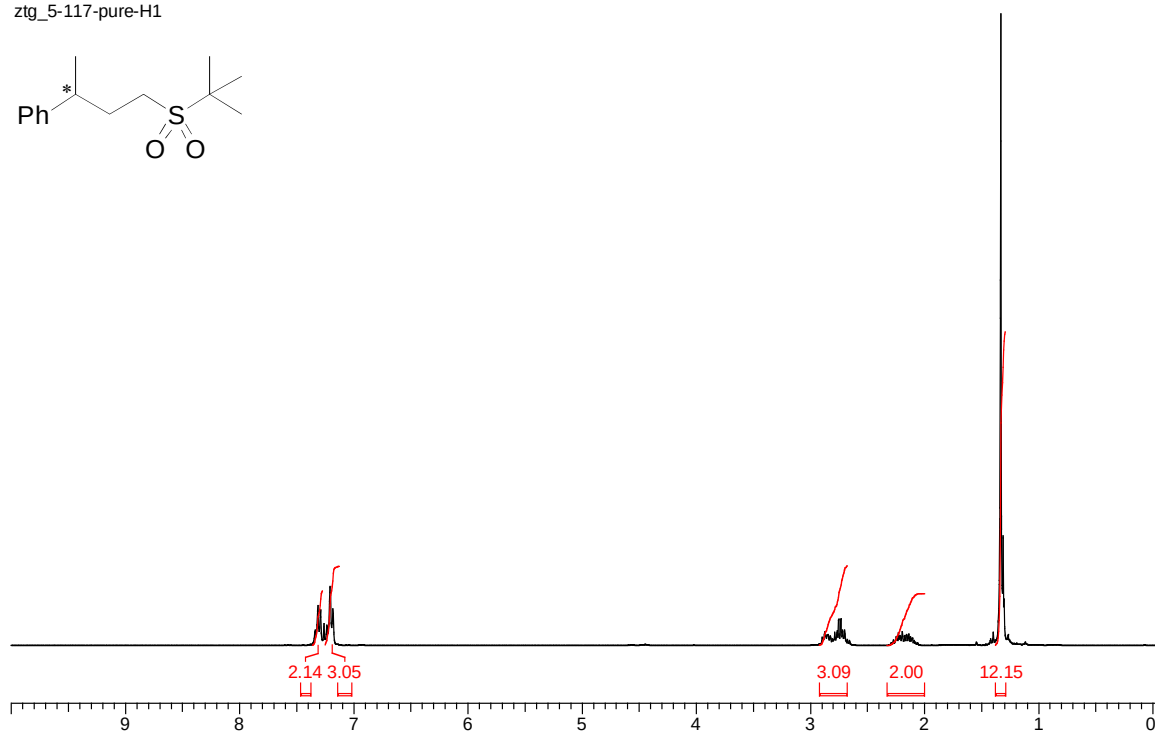
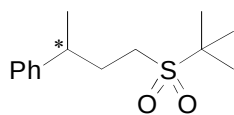
BP3-114-B



BP3-114-B_Rac_13C

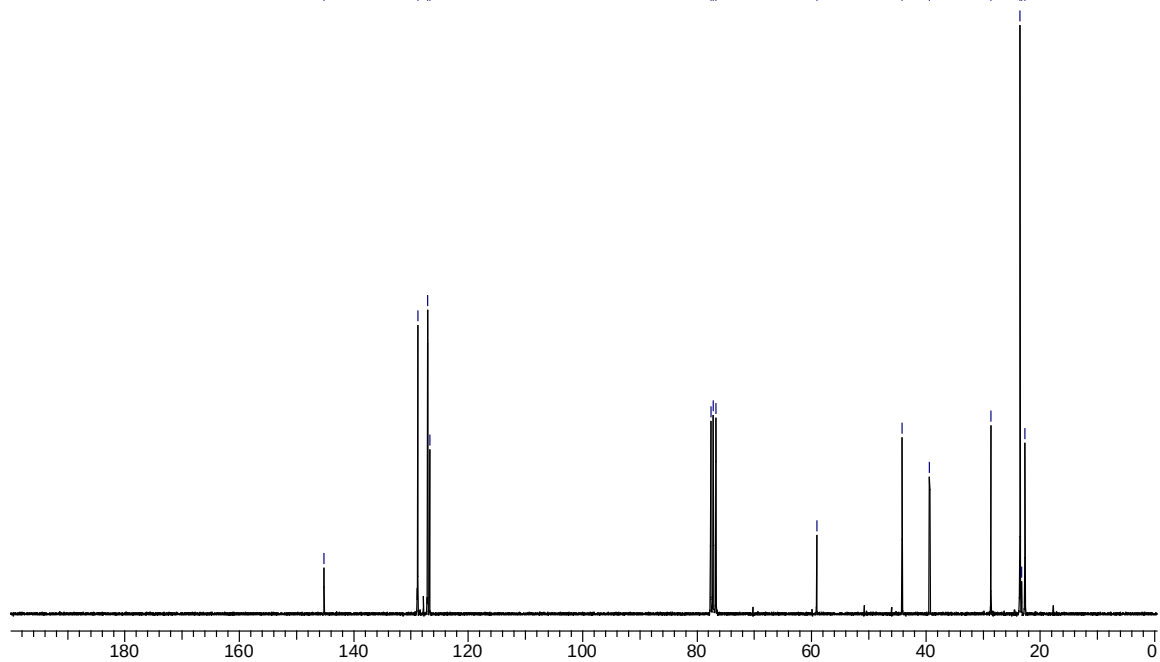


ztg_5-117-pure-H1

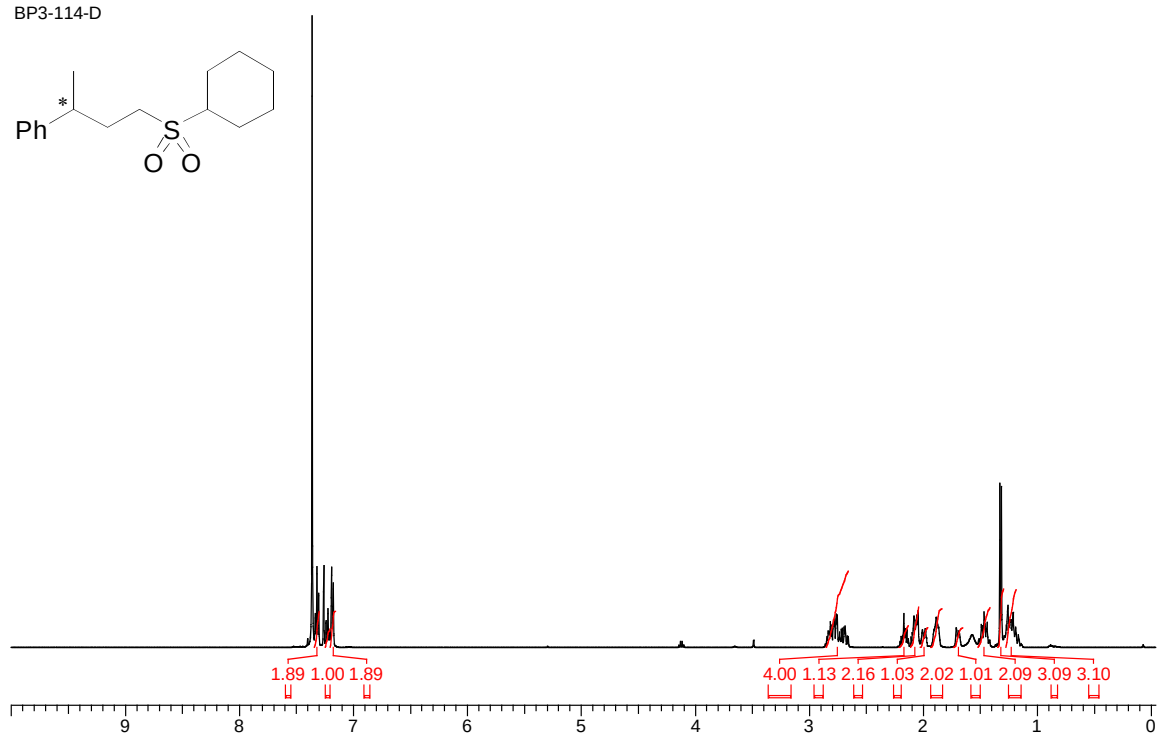
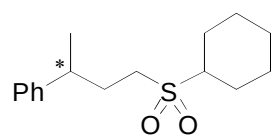


ztg_5-117-pure-c13

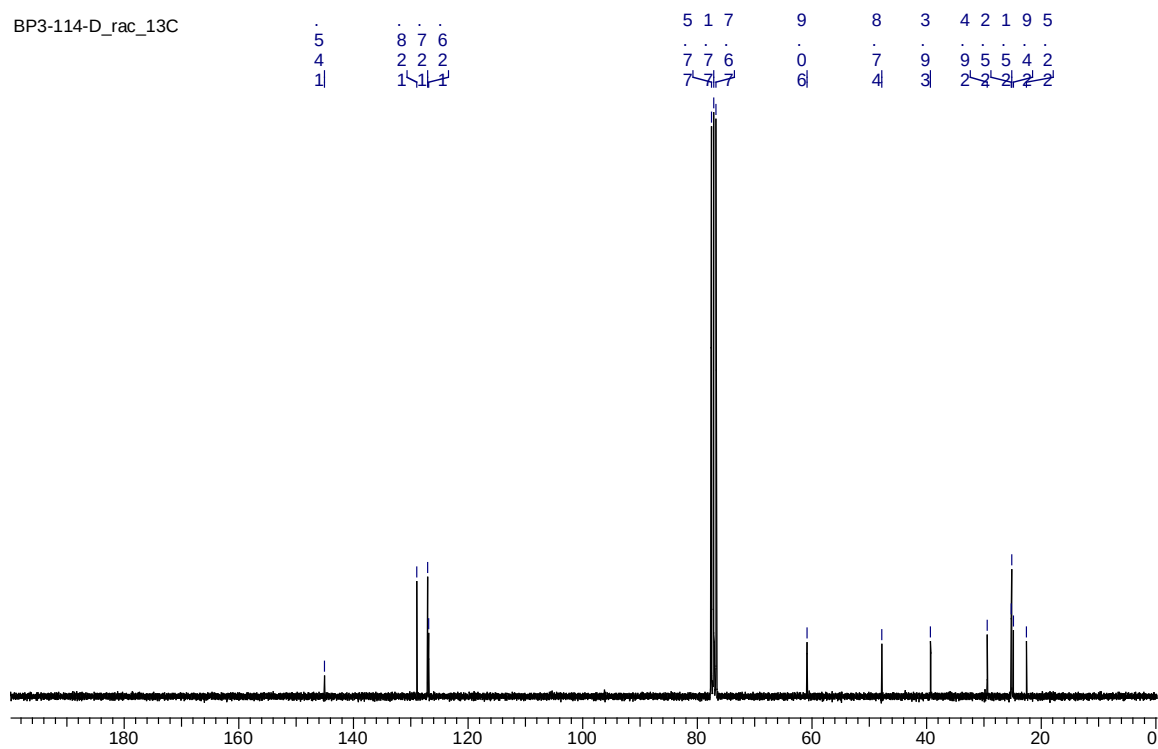
.	.	.	5	1	7	0	1	3	6	5	2	7
4	8	7	7	7	6	9	4	9	8	3	3	2
1	2	2	7	7	7	5	4	3	2	2	2	2



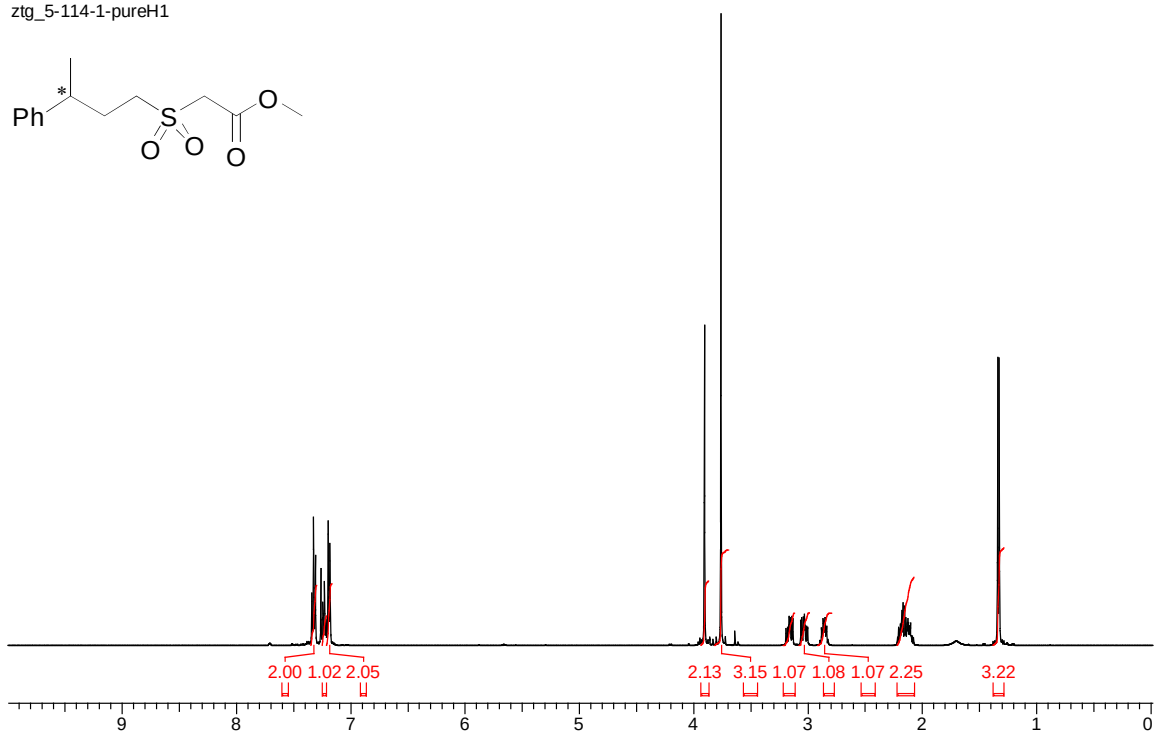
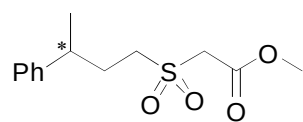
BP3-114-D



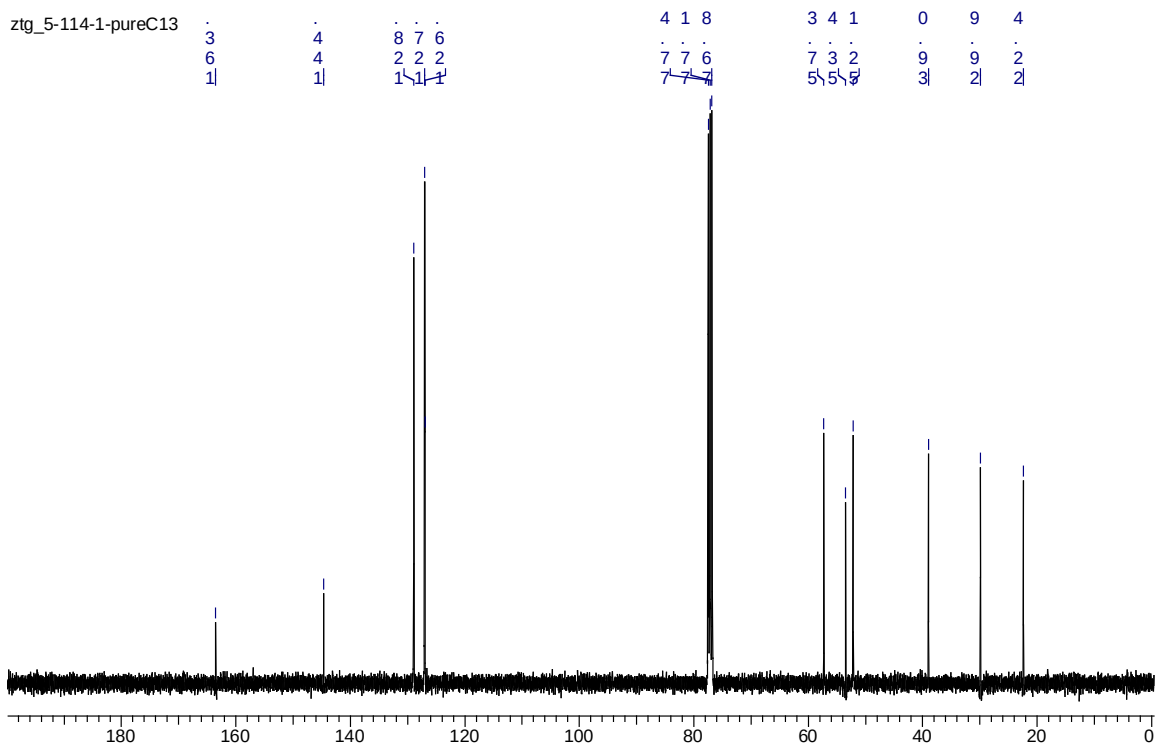
BP3-114-D_rac_13C



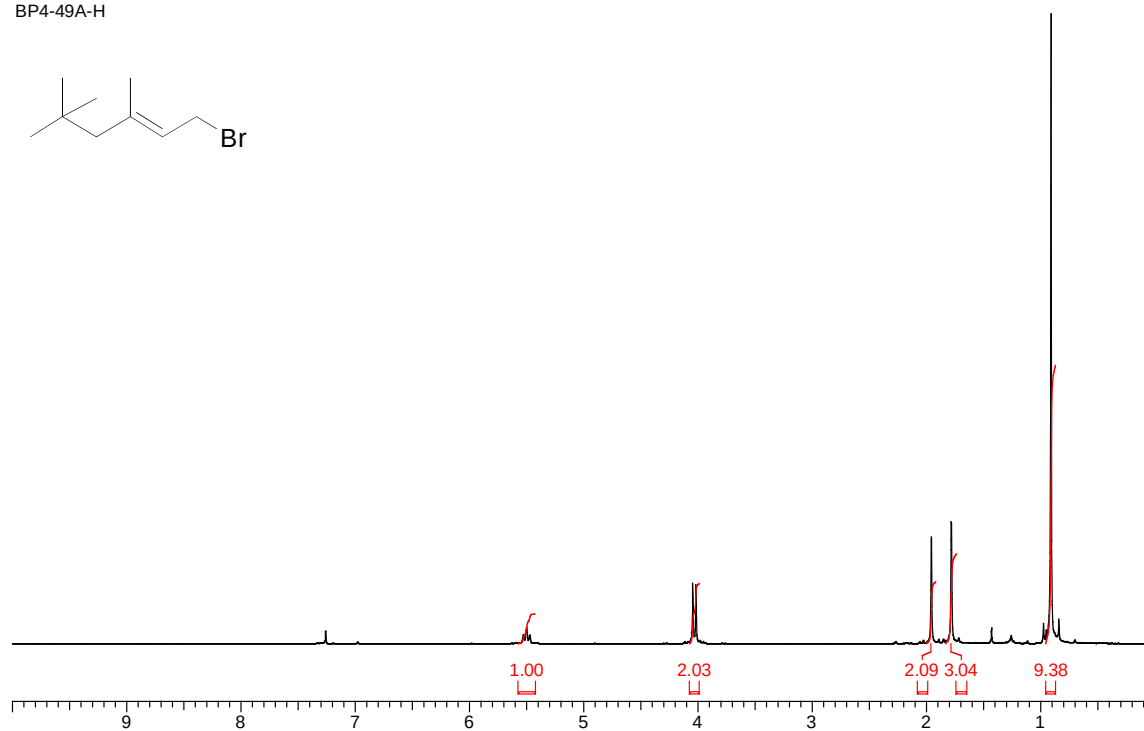
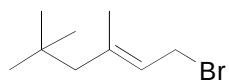
ztg_5-114-1-pureH1



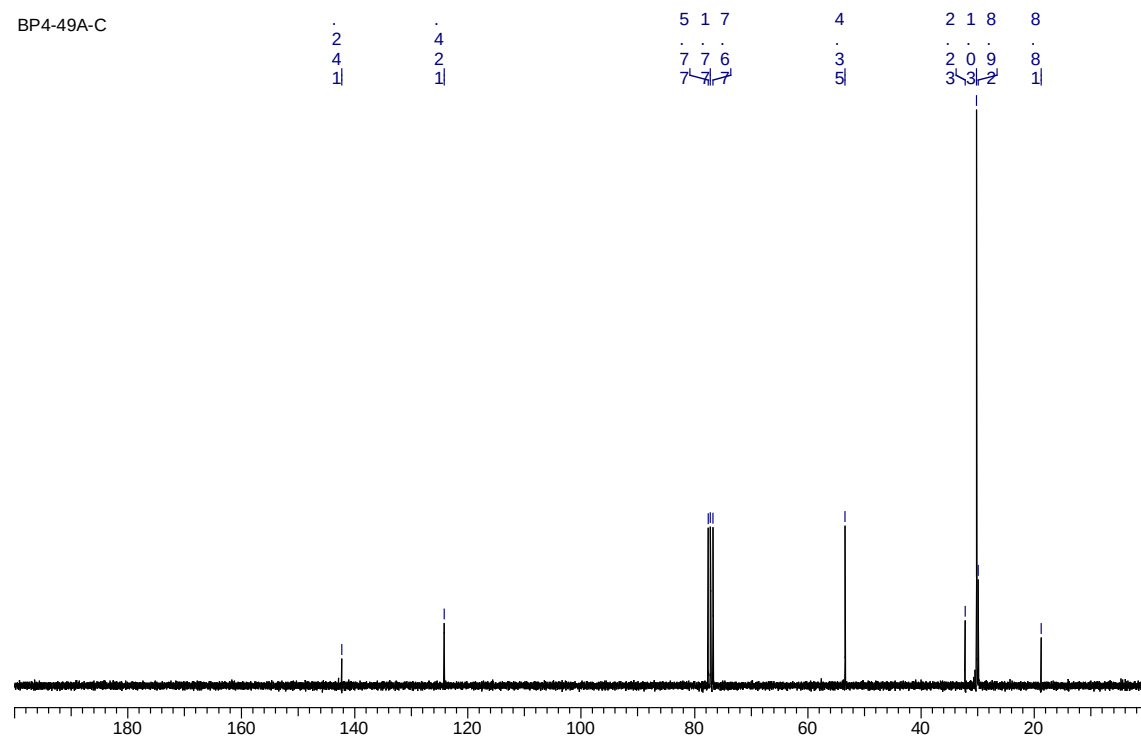
ztg_5-114-1-pureC13



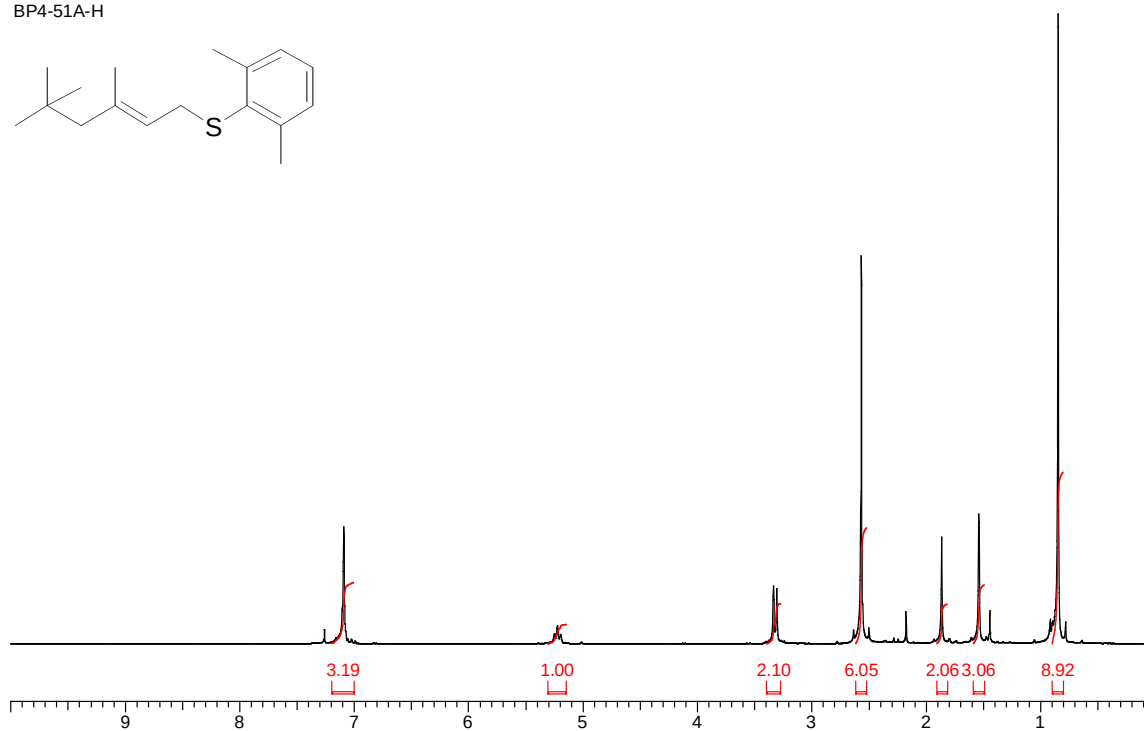
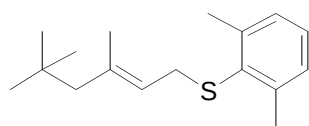
BP4-49A-H



BP4-49A-C



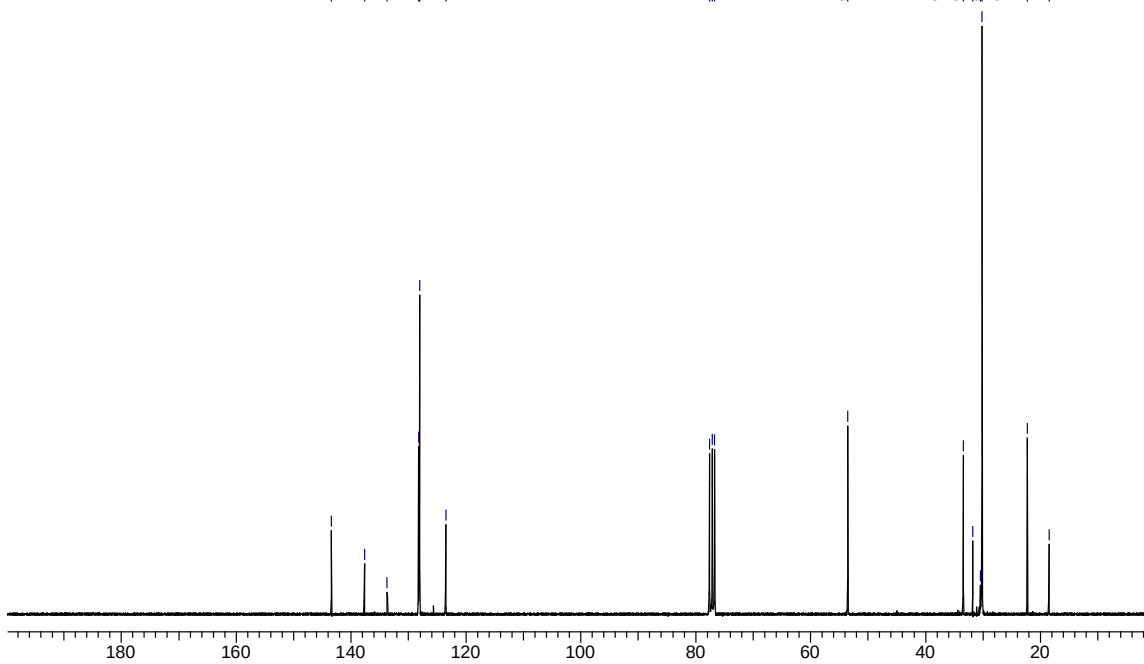
BP4-51A-H



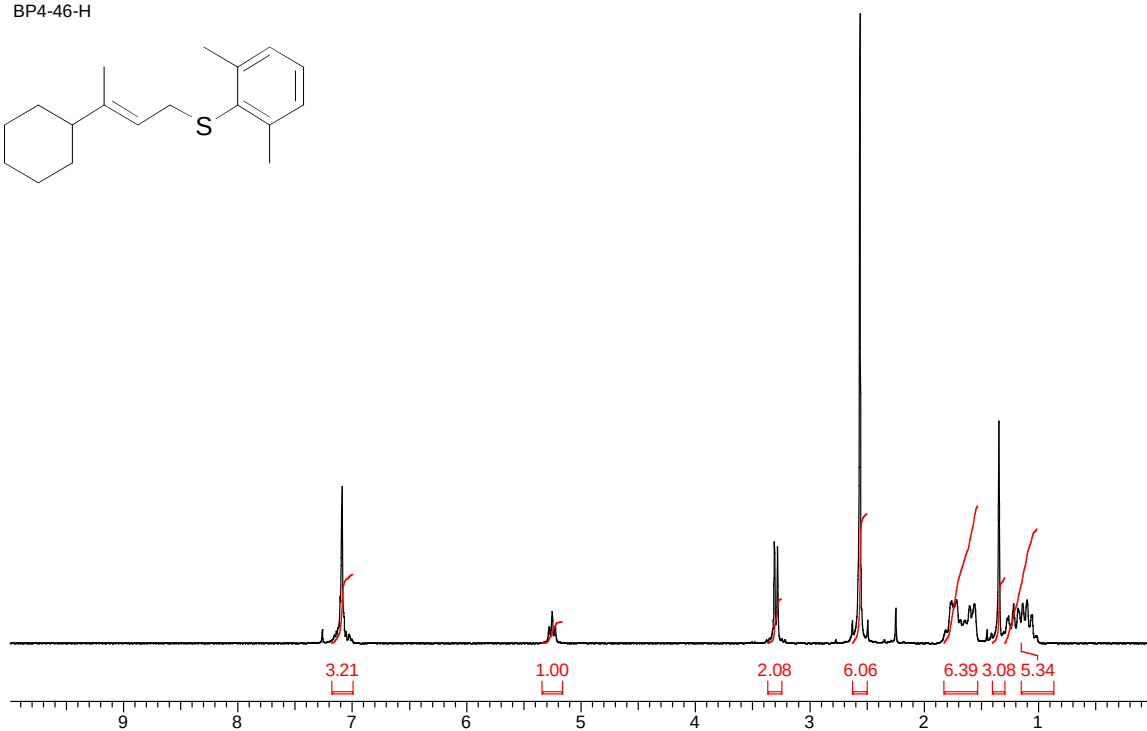
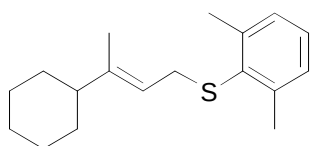
BP4-51A-C

¹³C NMR spectrum (CDCl₃) of BP4-51A-C. The spectrum shows several peaks with the following chemical shifts (ppm) and integrations:

Chemical Shift (ppm)	Integration
145	3
140	7
135	3
130	8
125	8
120	3
115	4
110	2
105	2
100	1
77	5
75	1
73	7
71	1
69	7
67	6
65	3
55	5
45	4
40	8
35	4
30	1
25	2
20	5

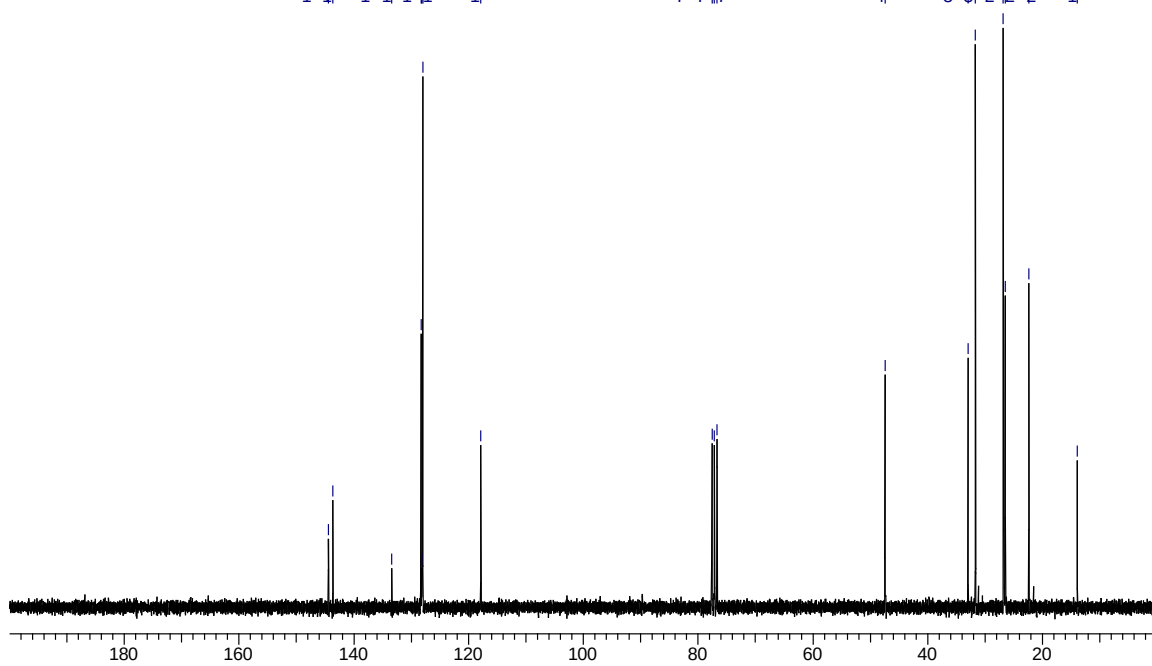


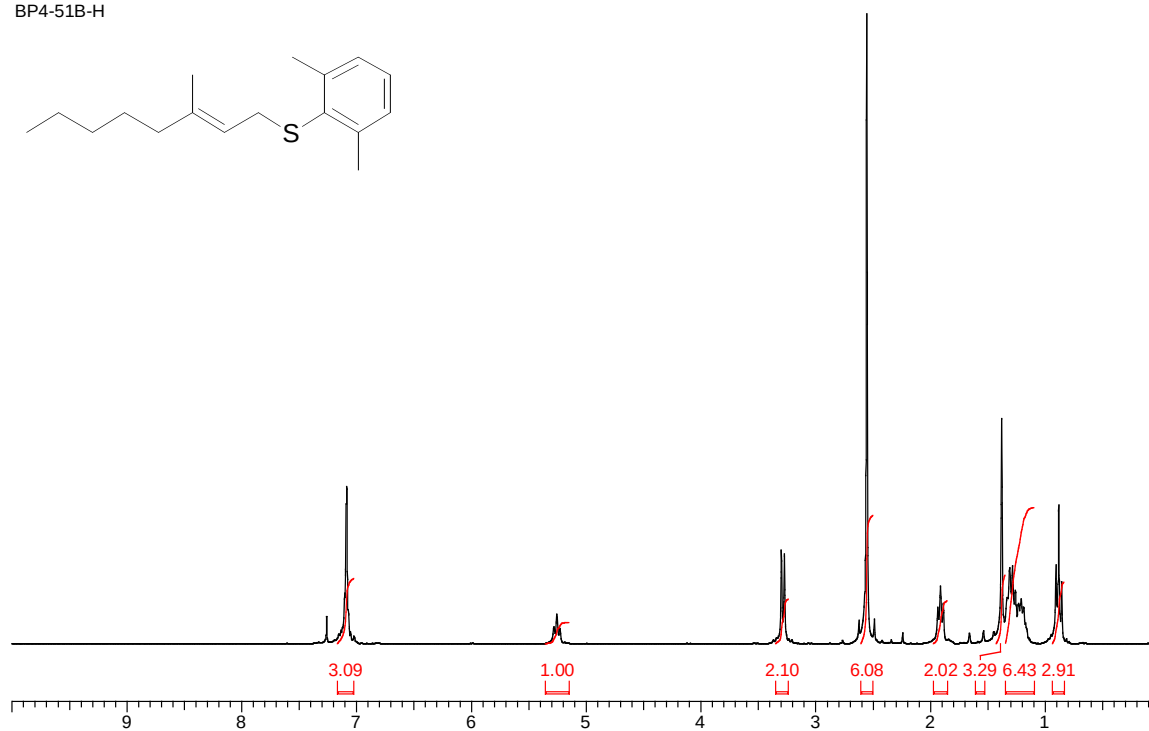
BP4-46-H



BP4-46-C

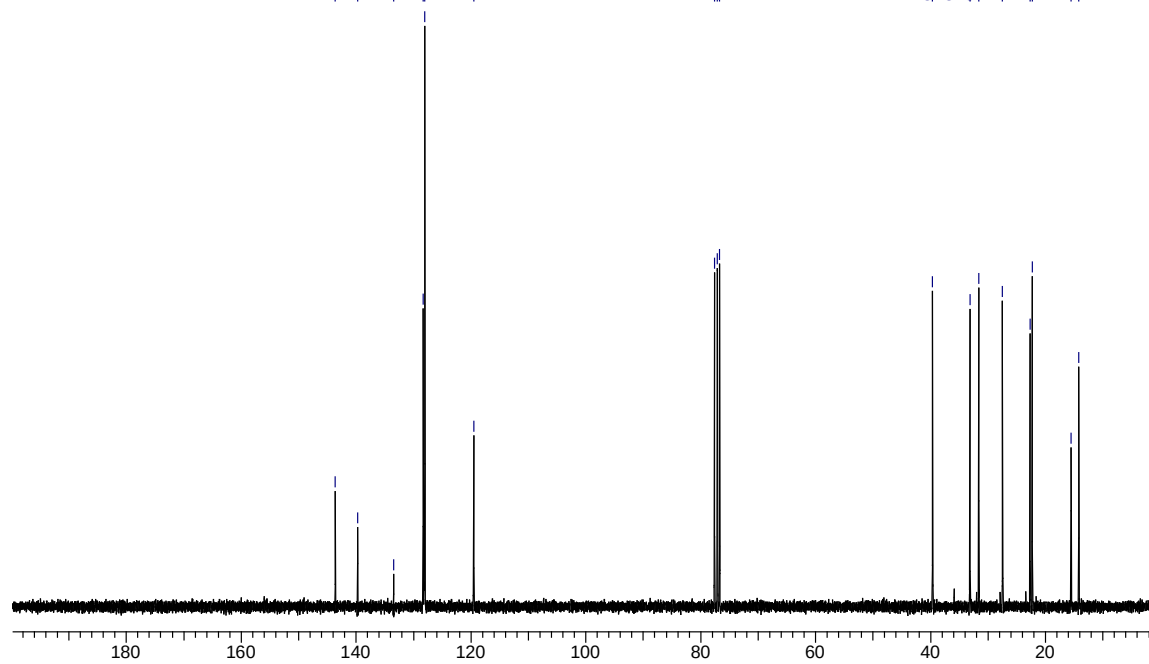
4	3	3	8	8	7	7	5	1	7	4	9	7	8	4	3	9
4	4	3	2	2	2	1	7	7	6	7	2	1	6	6	2	3
1	4	1	4	1	4	1	7	7	7	4	3	3	2	2	2	1



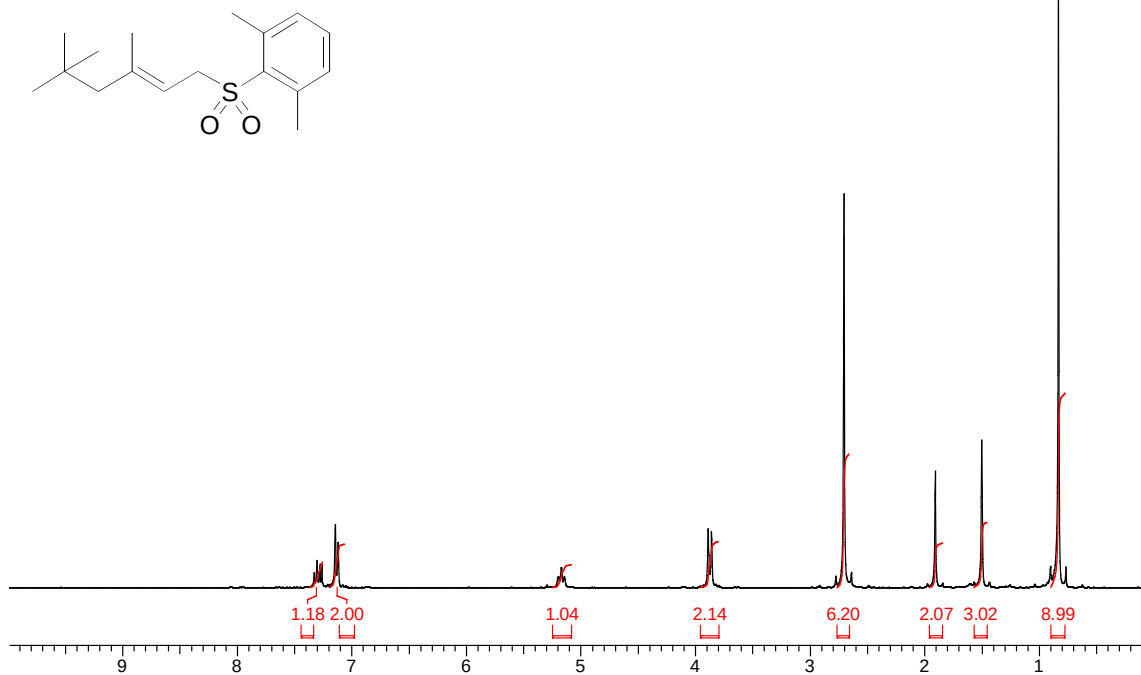
CCCCC/C=C/CSc1cc(C)cc(C)c1
$$\begin{array}{ccccc} \cdot & \cdot & \cdot & \cdot & \cdot \\ 3 & 9 & 3 & 8 & 8 & 9 \\ 4 & 3 & 3 & 2 & 2 & 1 \\ 1| & 1| & 1| & 1| & 1| & 1| \end{array}$$
$$\begin{array}{r} 5 \ 1 \ 7 \\ \cdot \quad \cdot \quad \cdot \\ 7 \ 7 \ 6 \\ \hline 7 \ 7 \ 7 \end{array}$$

6 1 6 4 6 2 5 1

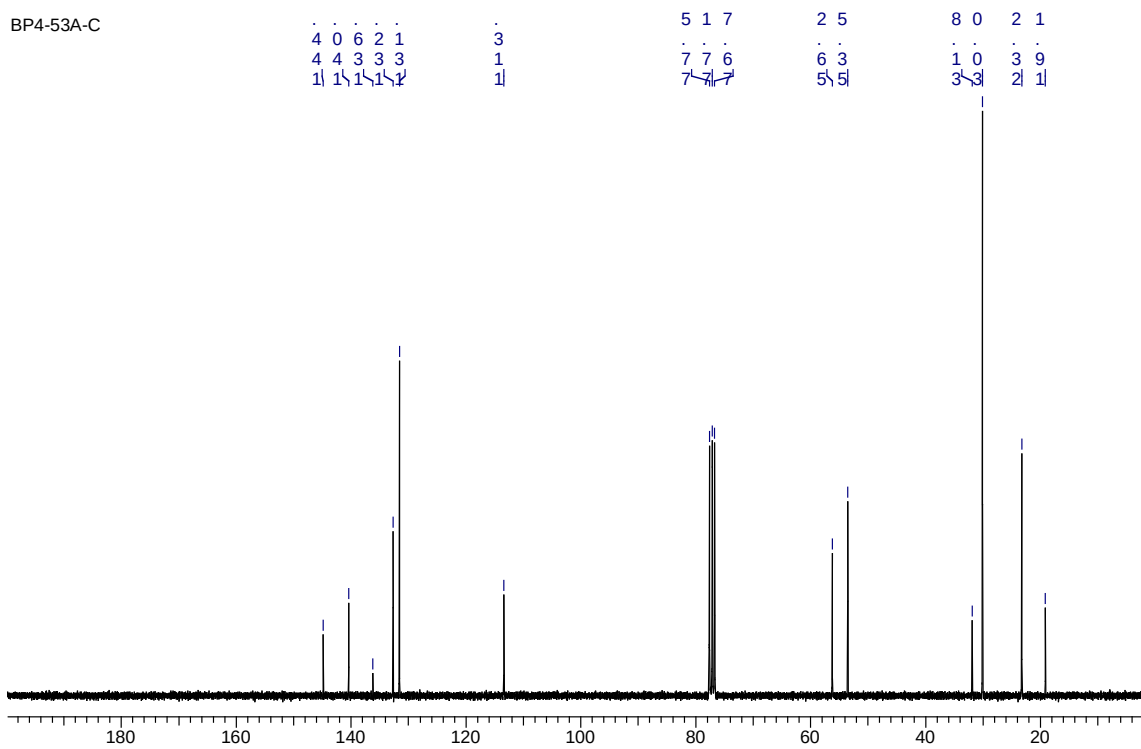
 9 3 1 7 2 2 5 4
 3| 3 3 2 2 2 1 1



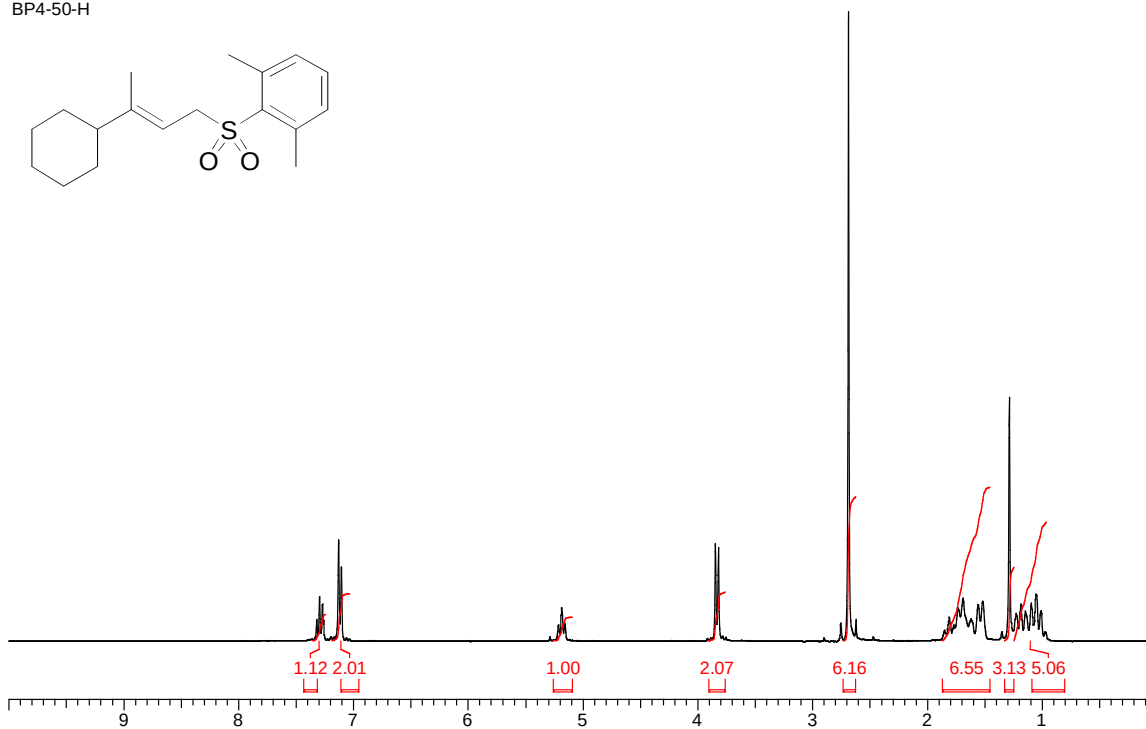
BP4-53A-H



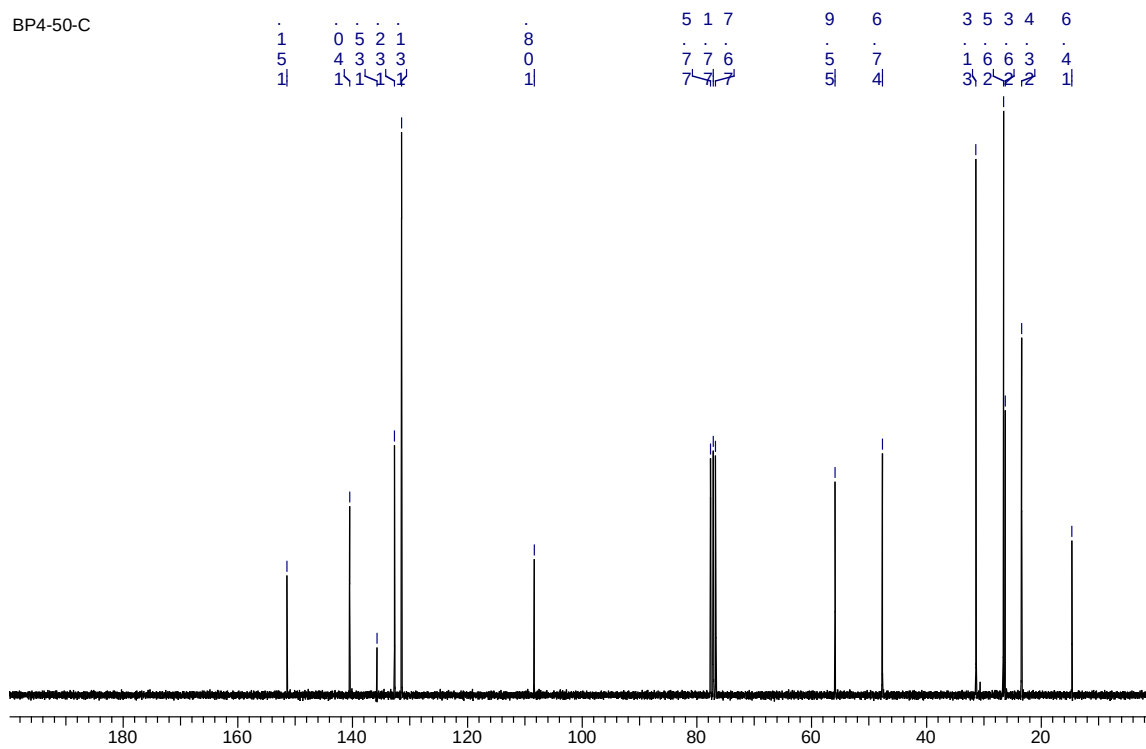
BP4-53A-C



BP4-50-H



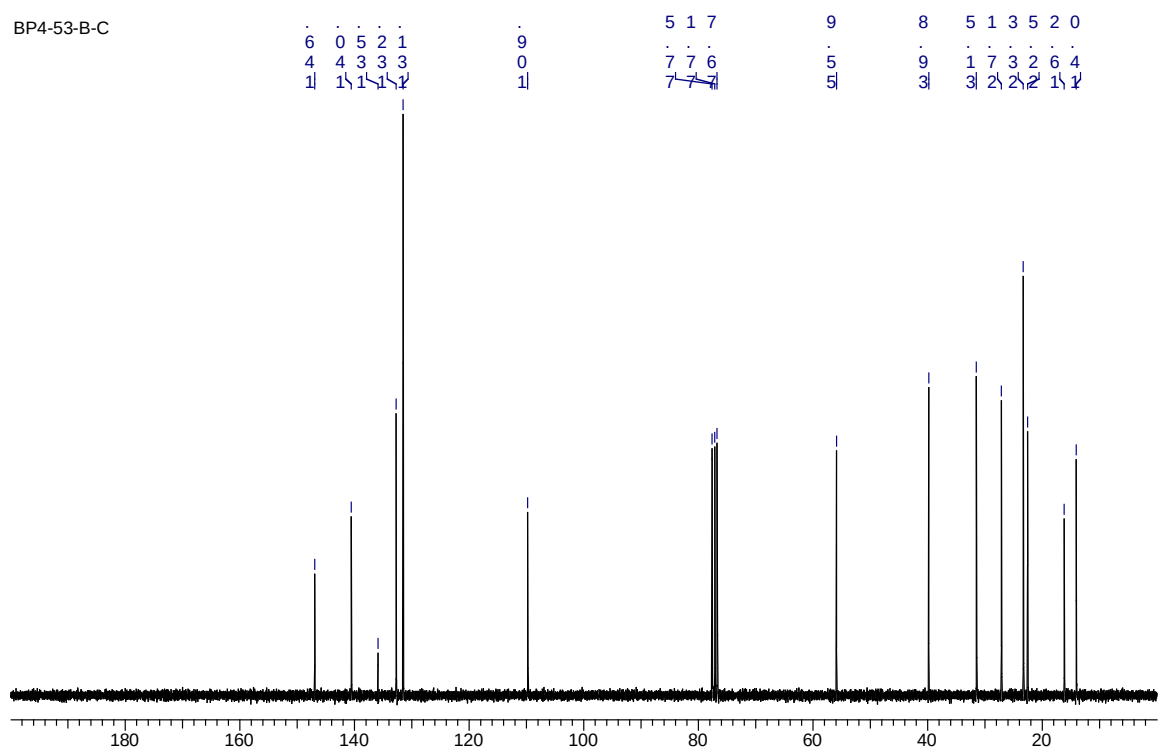
BP4-50-C



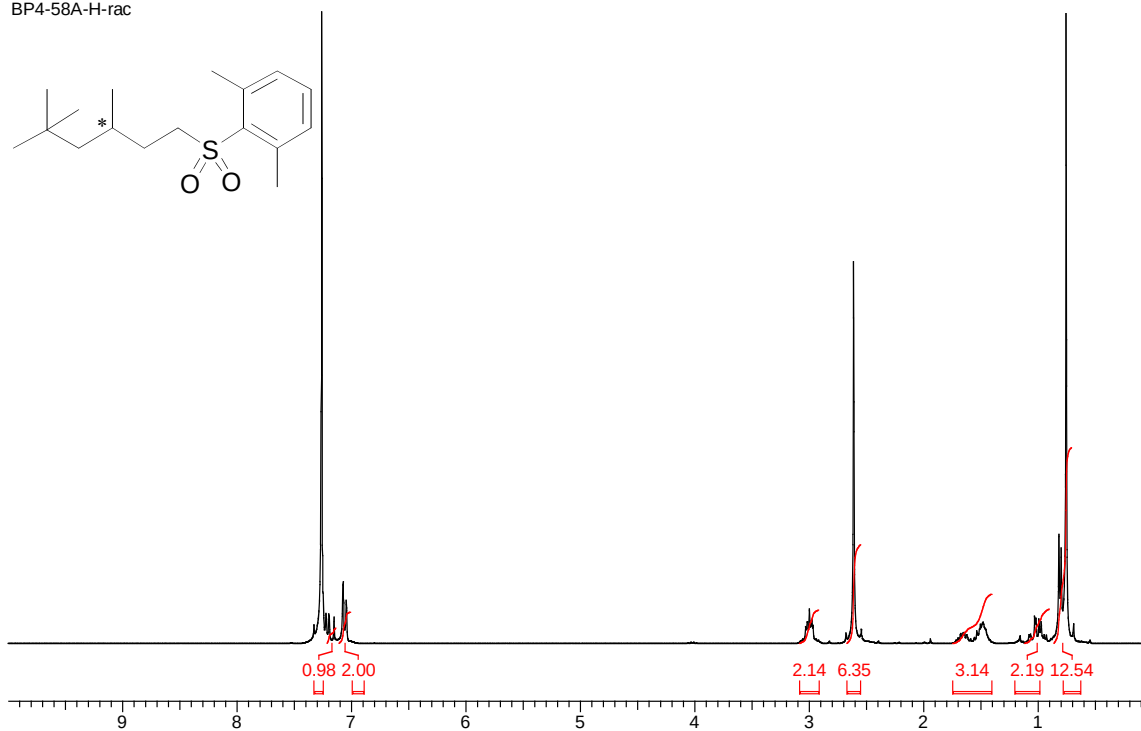
BP4-53-B-H

Chemical structure of BP4-53-B-H is shown above the spectrum. The spectrum displays peaks in the aromatic region (7.0-7.5 ppm), a methine proton (5.2 ppm), an alkene/methylene region (3.8 ppm), a solvent peak (2.5 ppm), and aliphatic regions (1.2-2.0 ppm). Integration values are provided below the peaks.

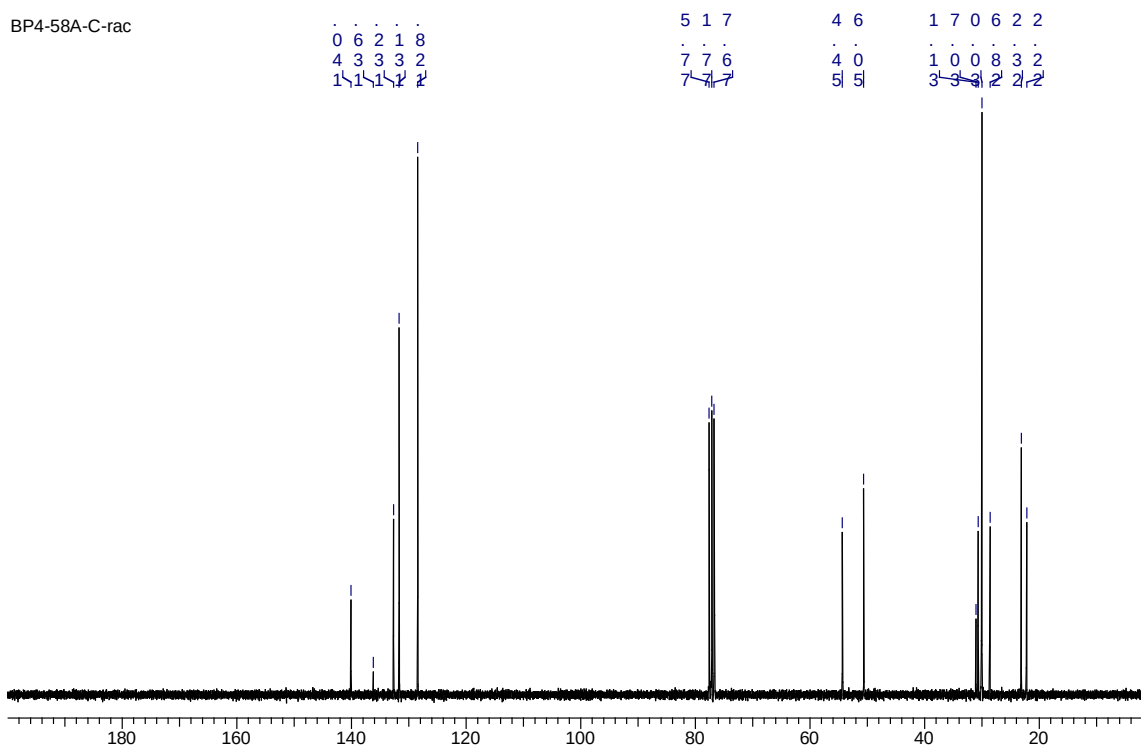
Chemical Shift (ppm)	Integration
7.2-7.4	1.14
7.1-7.3	2.00
5.2	1.01
3.8	2.06
2.5	6.25
2.0	2.05
1.2-1.4	9.51
0.8-1.0	3.14



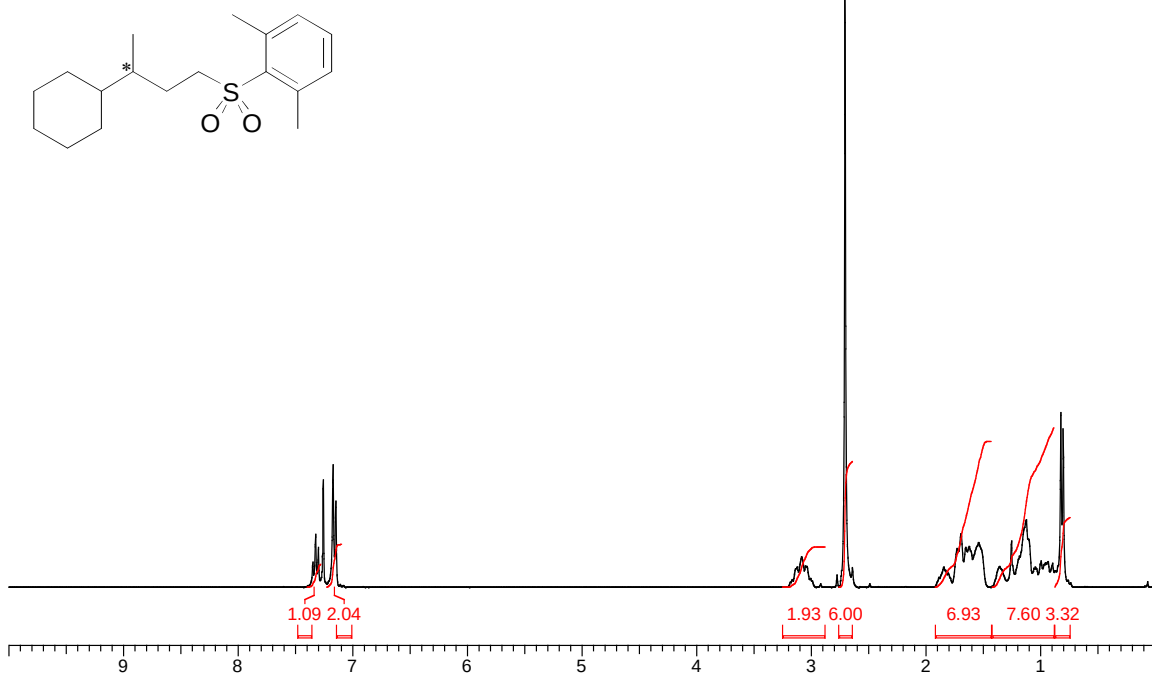
BP4-58A-H-rac



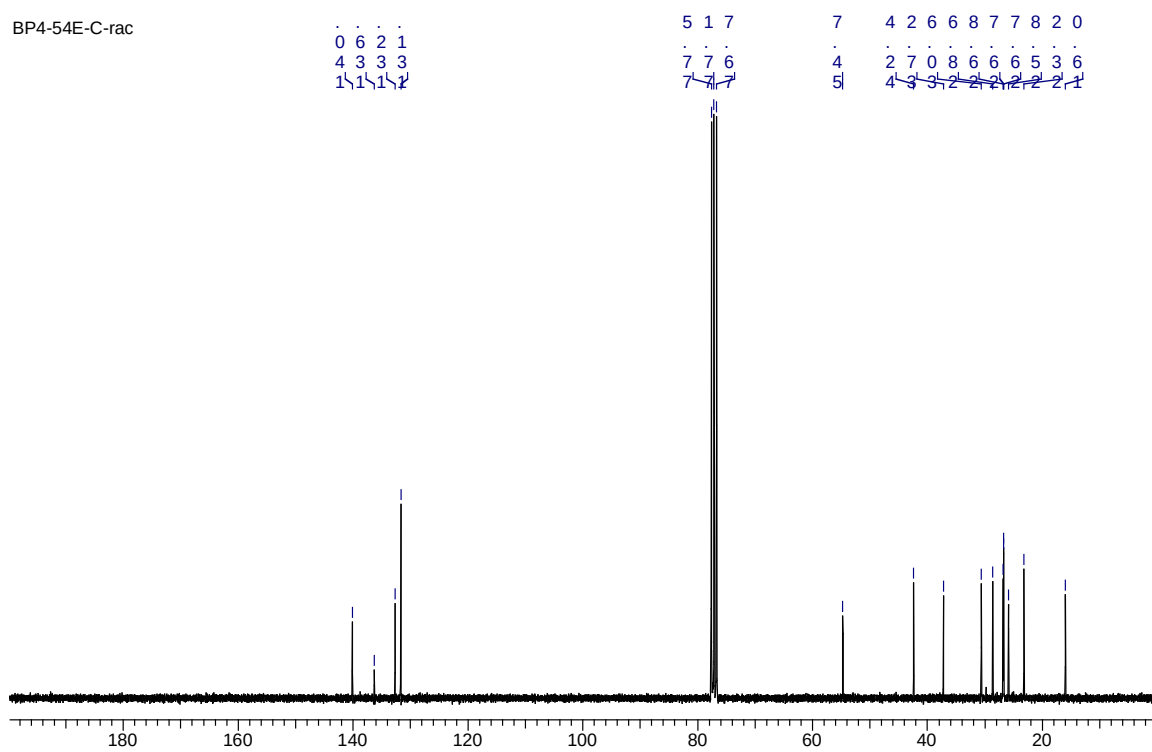
BP4-58A-C-rac



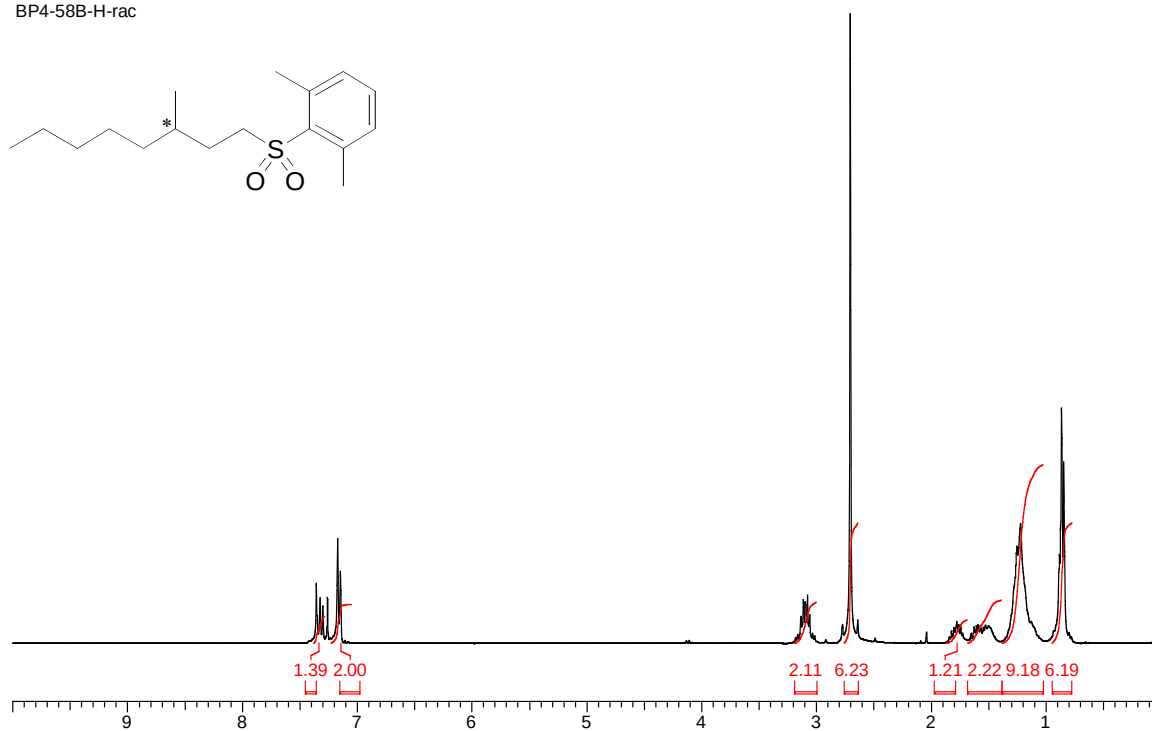
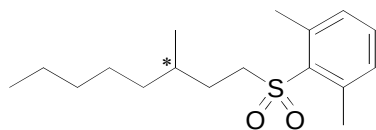
BP4-54-E_1H_dry



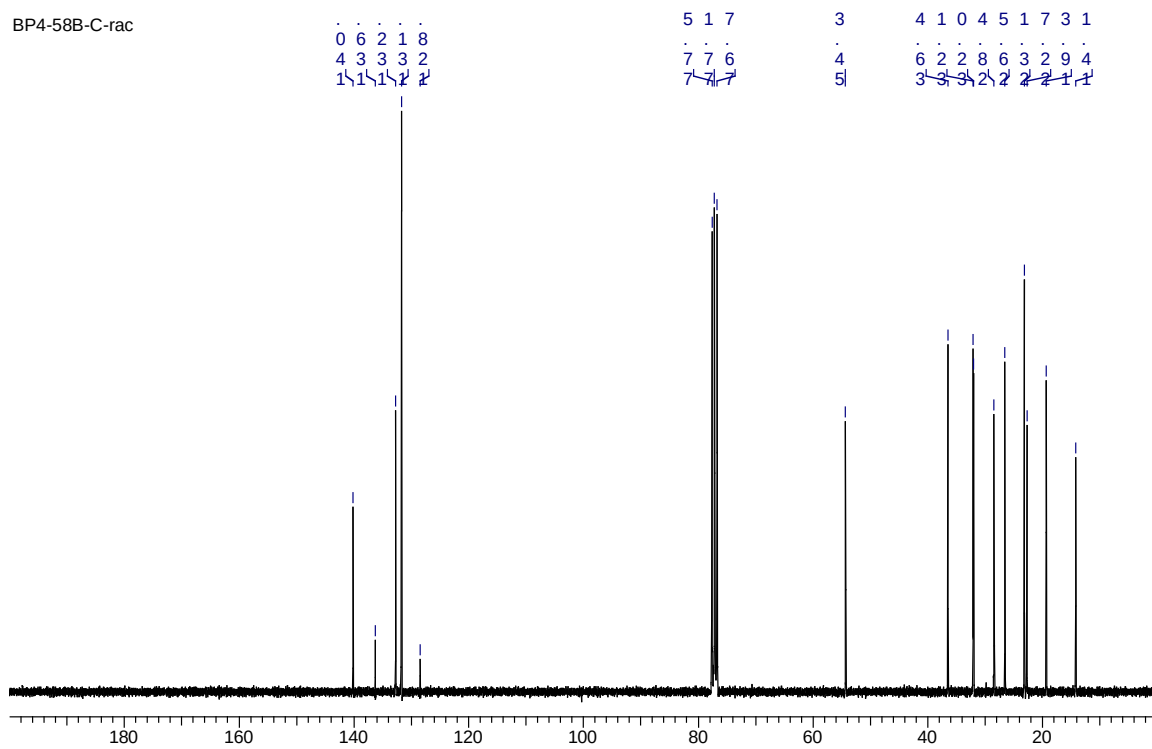
BP4-54E-C-rac



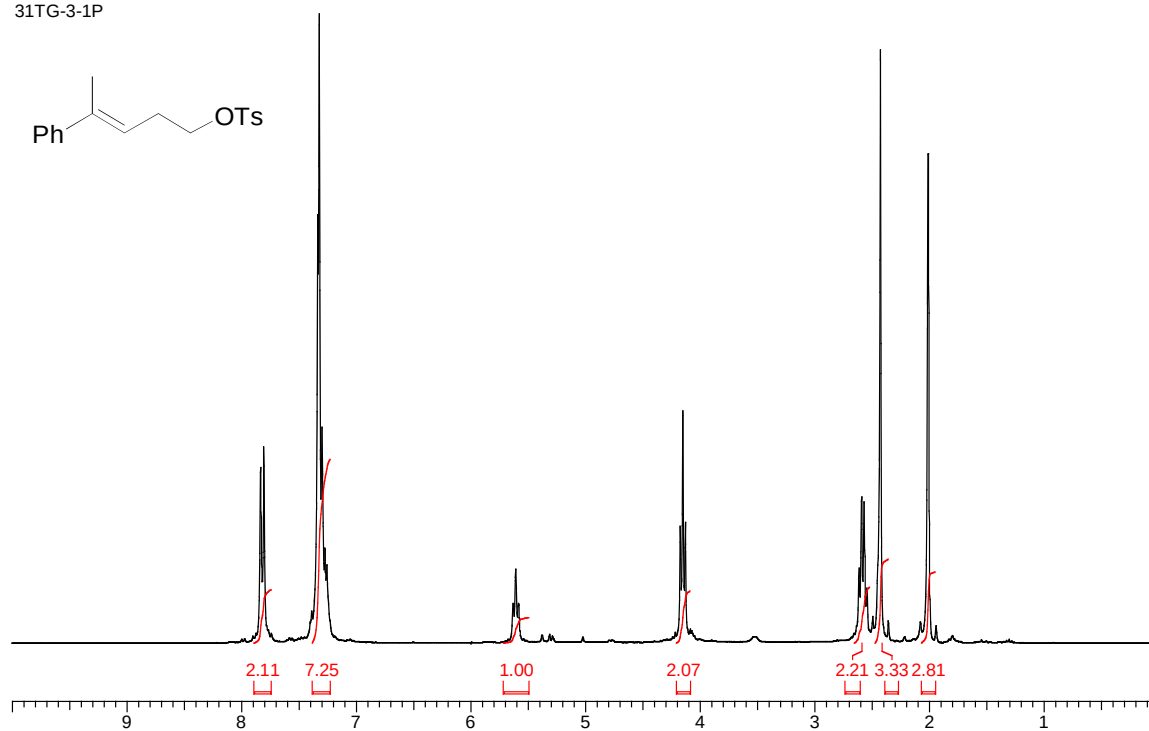
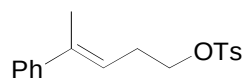
BP4-58B-H-rac



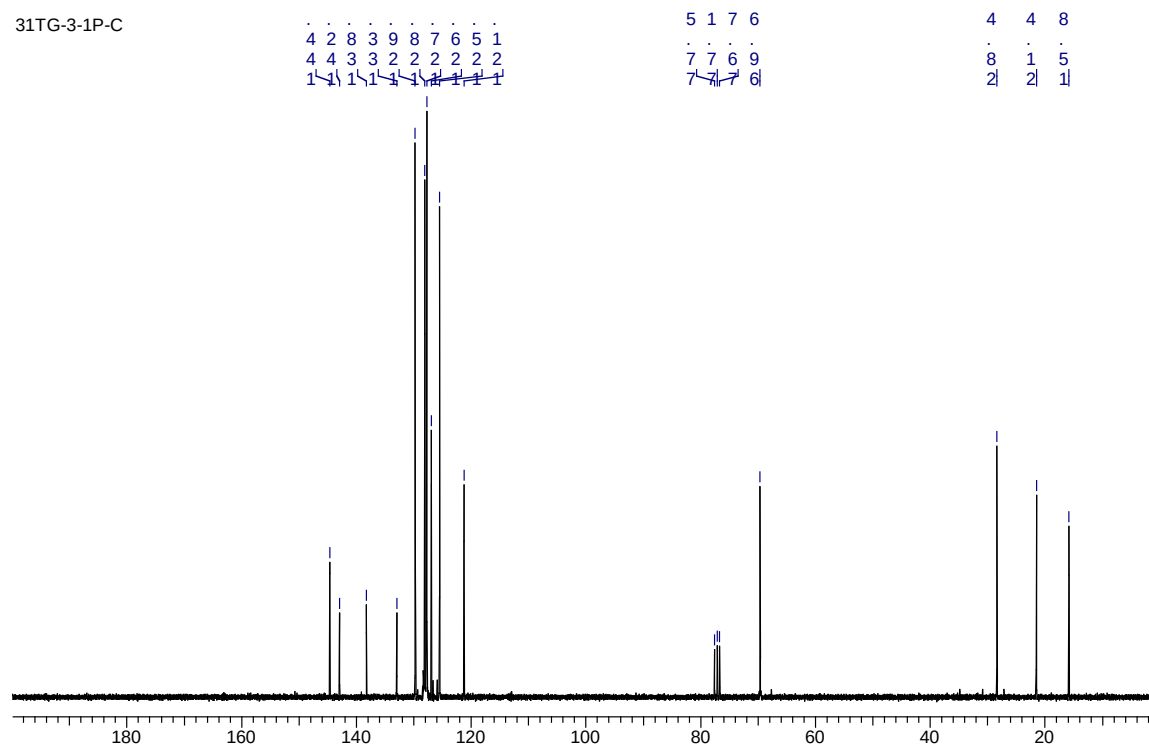
BP4-58B-C-rac



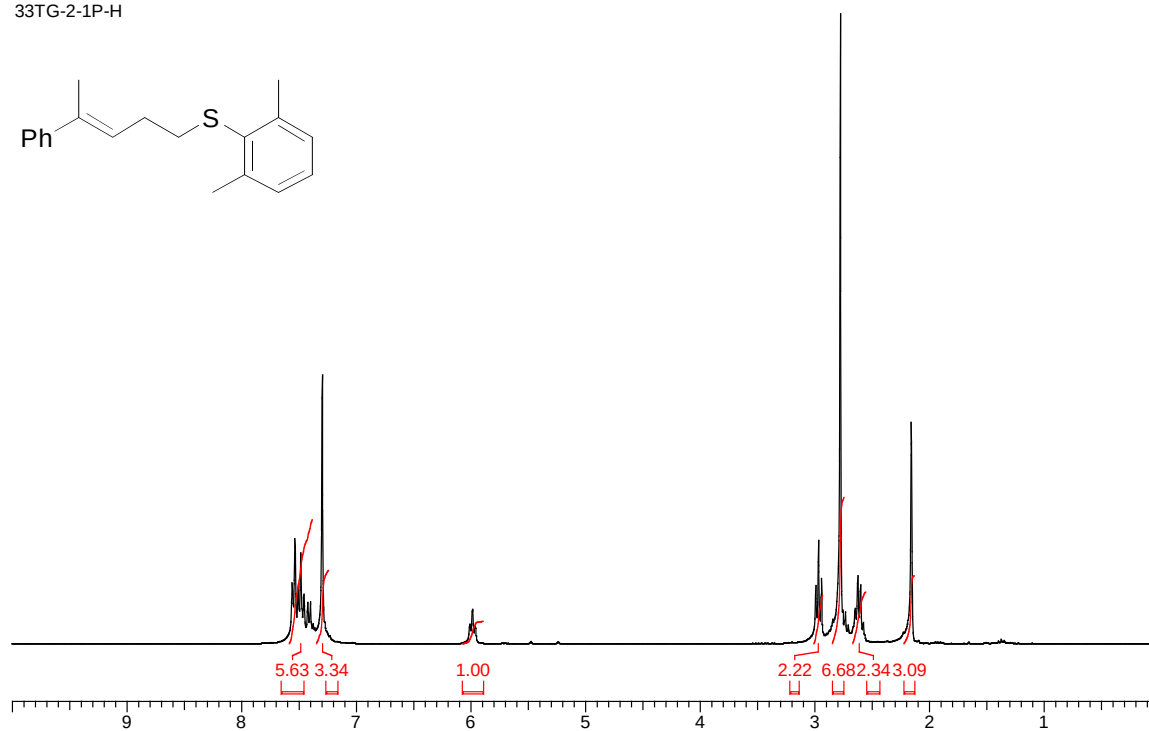
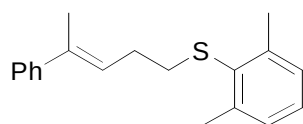
31TG-3-1P



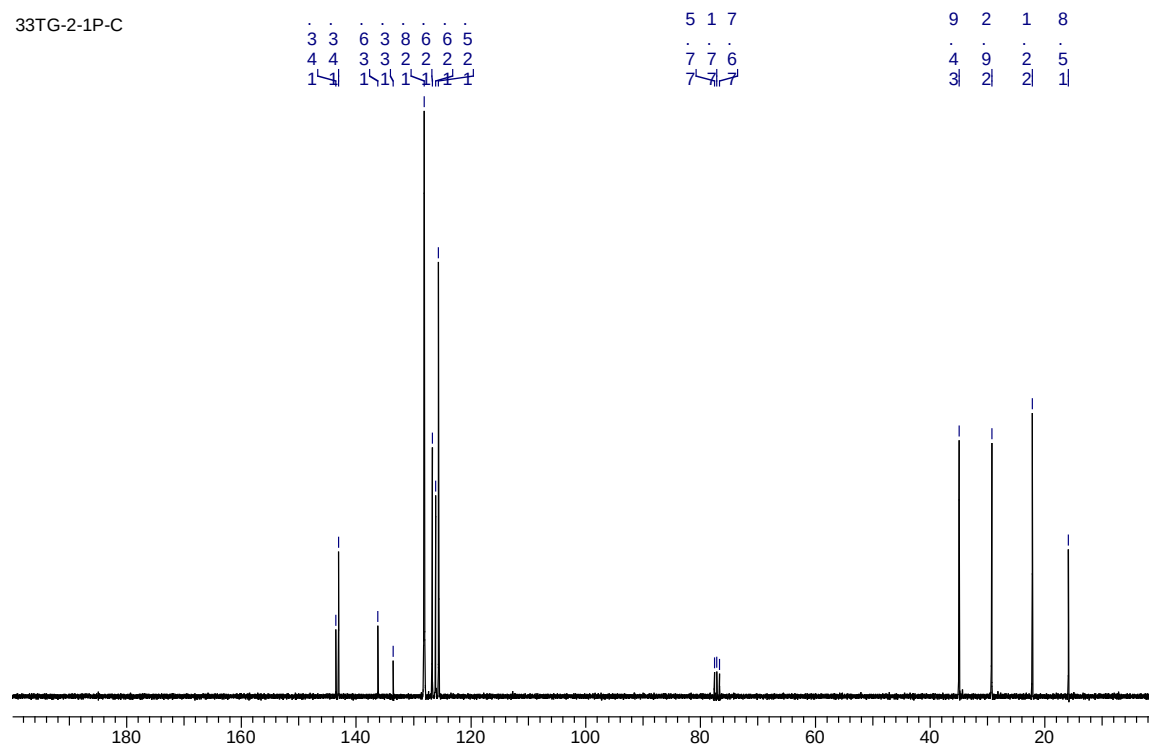
31TG-3-1P-C

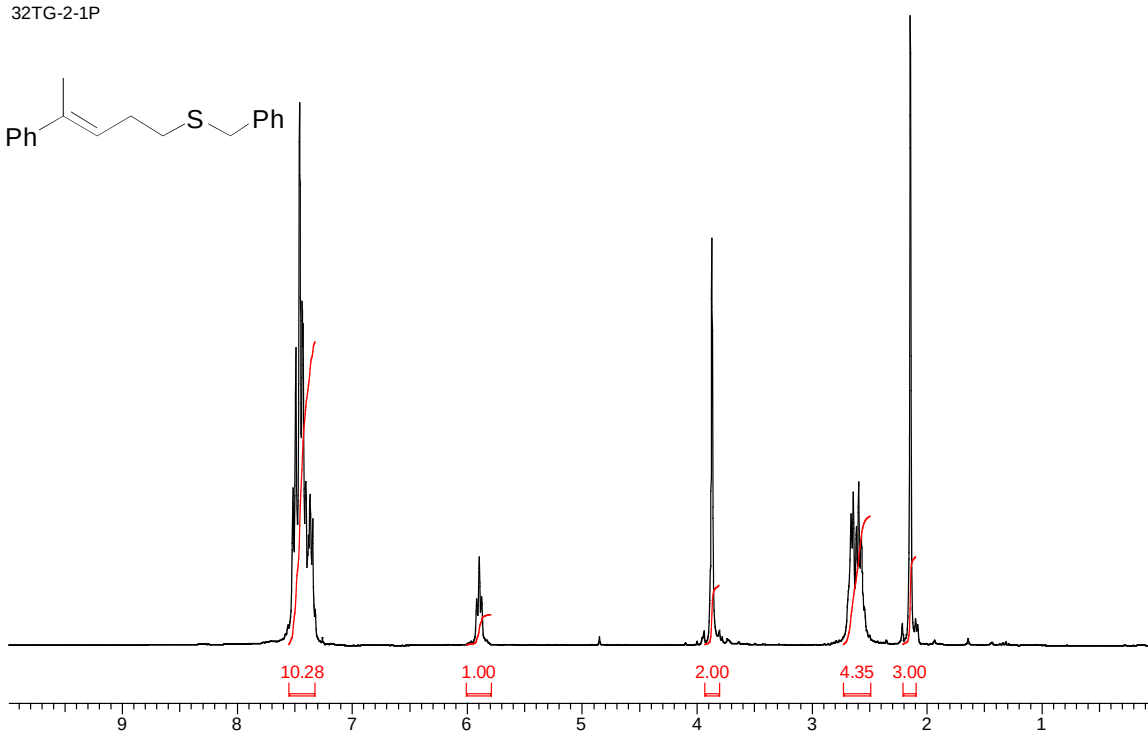


33TG-2-1P-H



33TG-2-1P-C

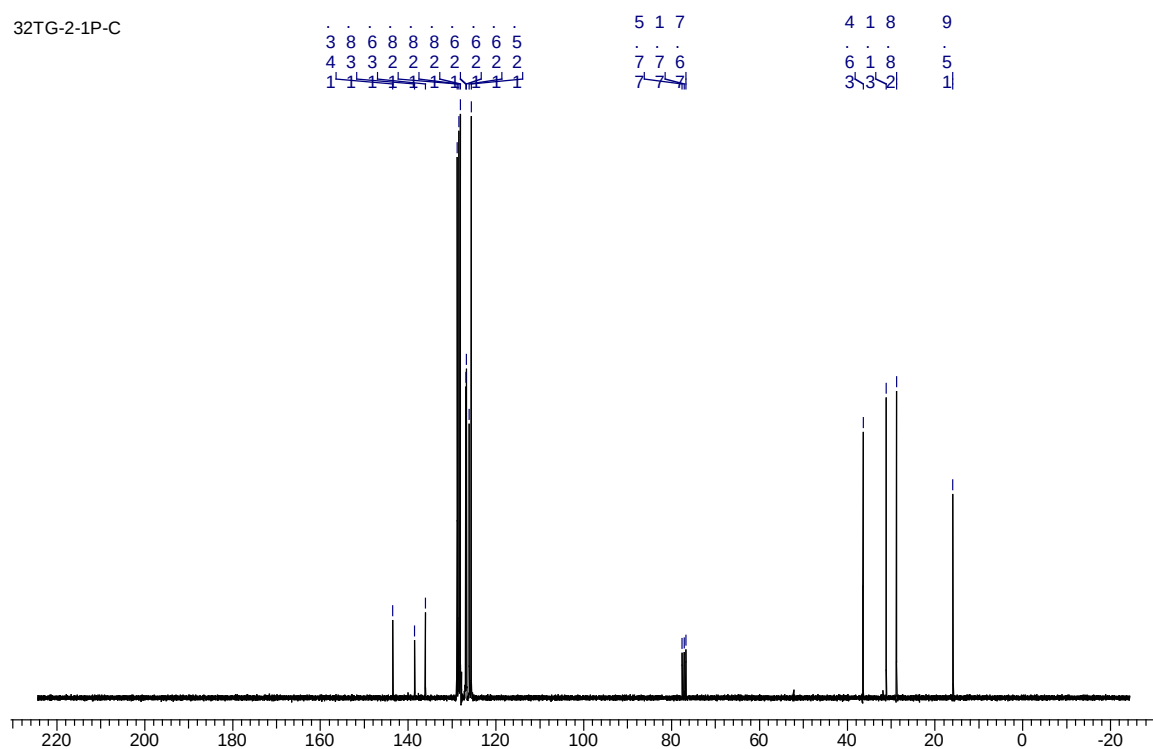


CC(=C(C1=CC=CC=C1)CCSCC2=CC=CC=C2)C

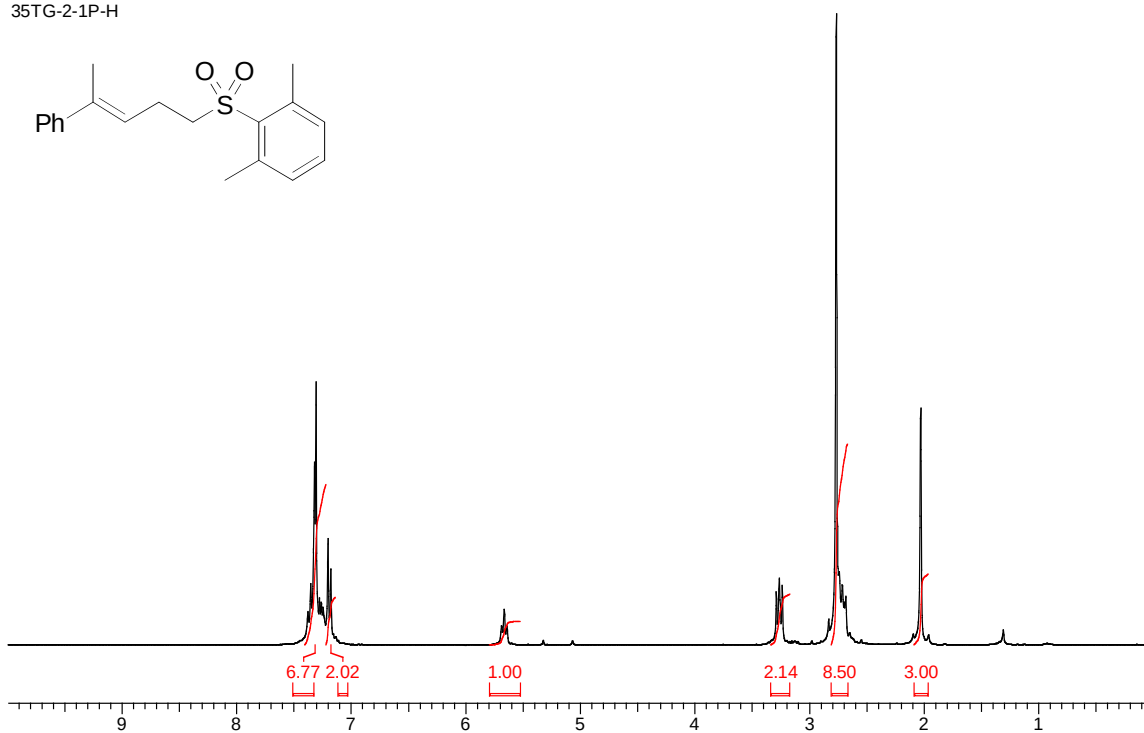
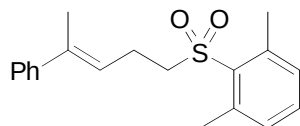
3 8 6 8 8 8 6 6 6 5
4 3 3 2 2 2 2 2 2 2
1 1 1 1 1 1 1 1 1 1

$$\begin{array}{r} 5 \ 1 \ 7 \\ \cdot \quad \cdot \quad \cdot \\ 7 \ 7 \ 6 \\ \hline 7 \ 7 \ 7 \end{array}$$
$$\begin{array}{r} 4 \ 1 \ 8 \qquad 9 \\ \cdot \ \cdot \ \cdot \qquad \cdot \\ 6 \ 1 \ 8 \qquad 5 \\ 3 \setminus 3 \setminus 2 \mid \qquad 1 \mid \end{array}$$

9

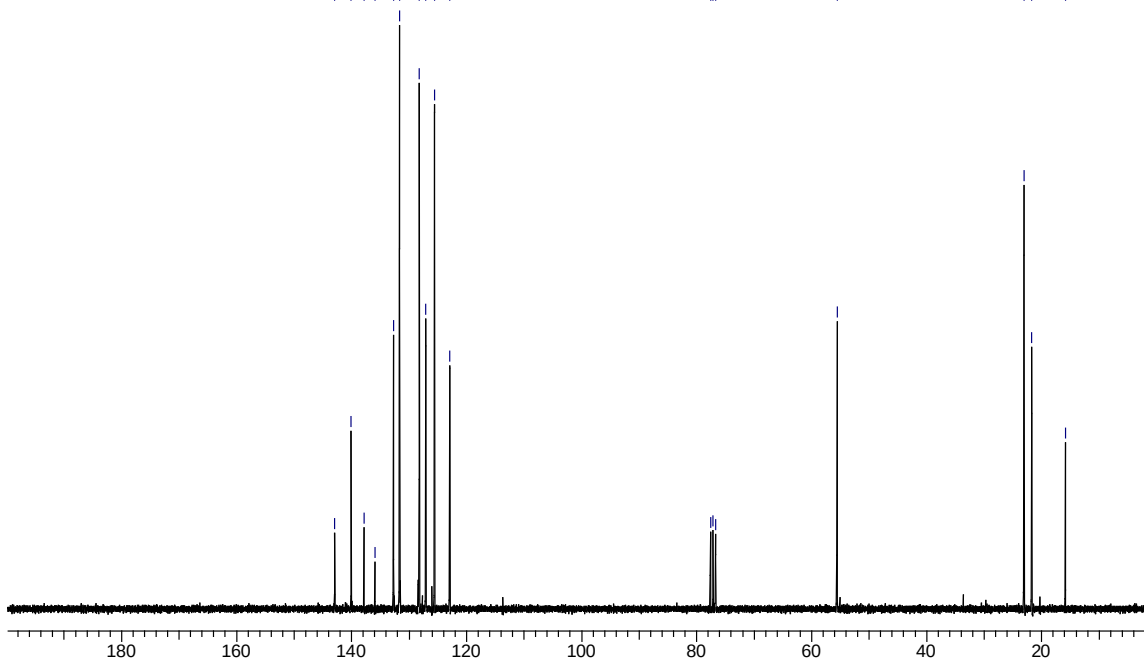


35TG-2-1P-H

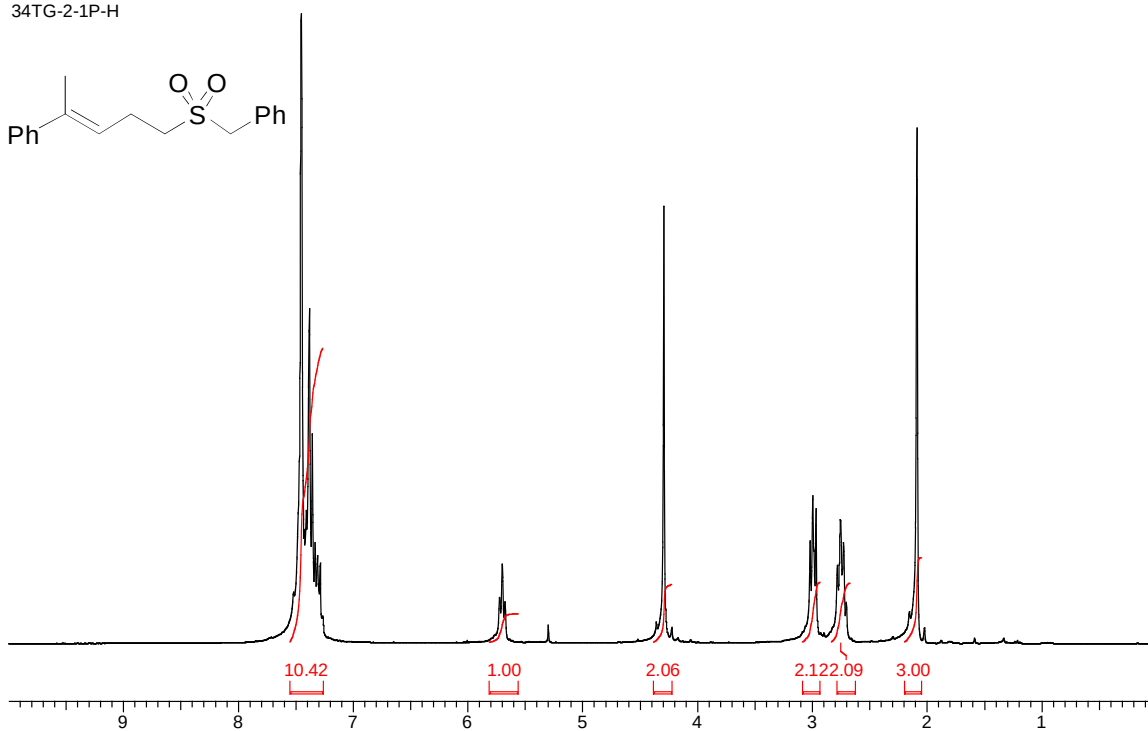
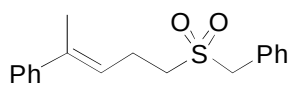


35TG-2-1P-C

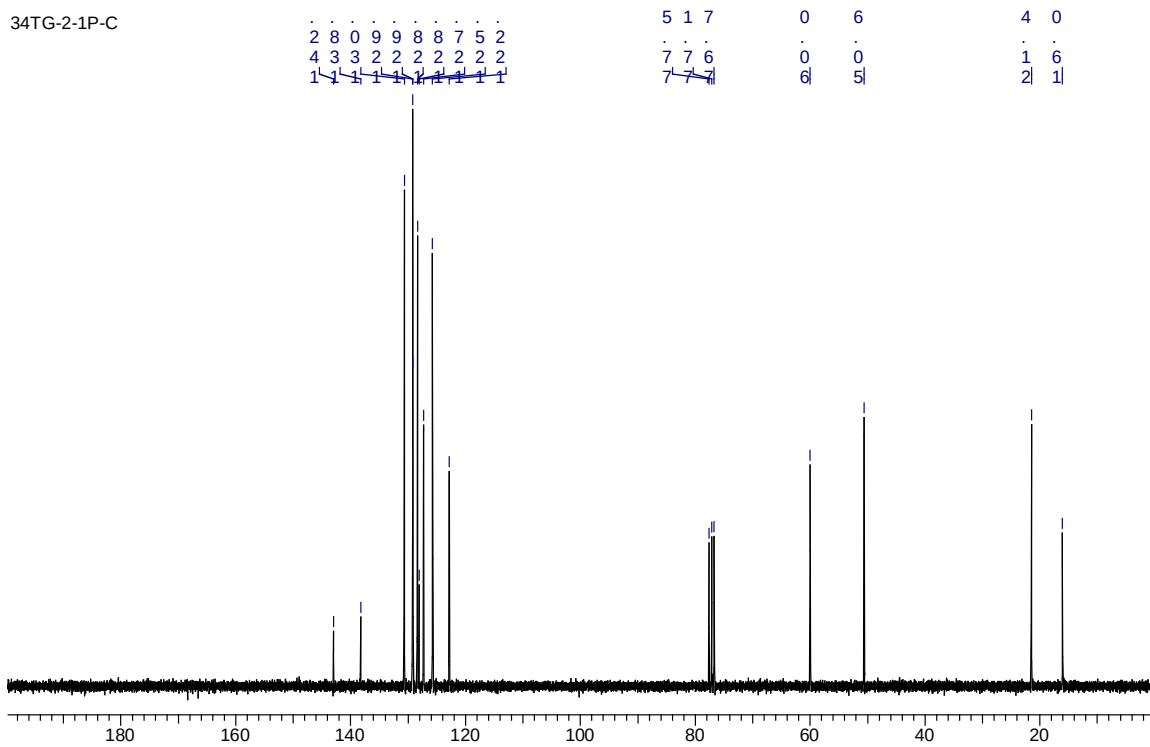
2	0	7	5	2	1	8	7	5	2	5	1	7	5	0	6	8
4	4	3	3	3	3	2	2	2	2	7	7	6	5	3	1	5
1	1	1	1	1	1	1	1	1	1	7	7	7	5	2	2	1



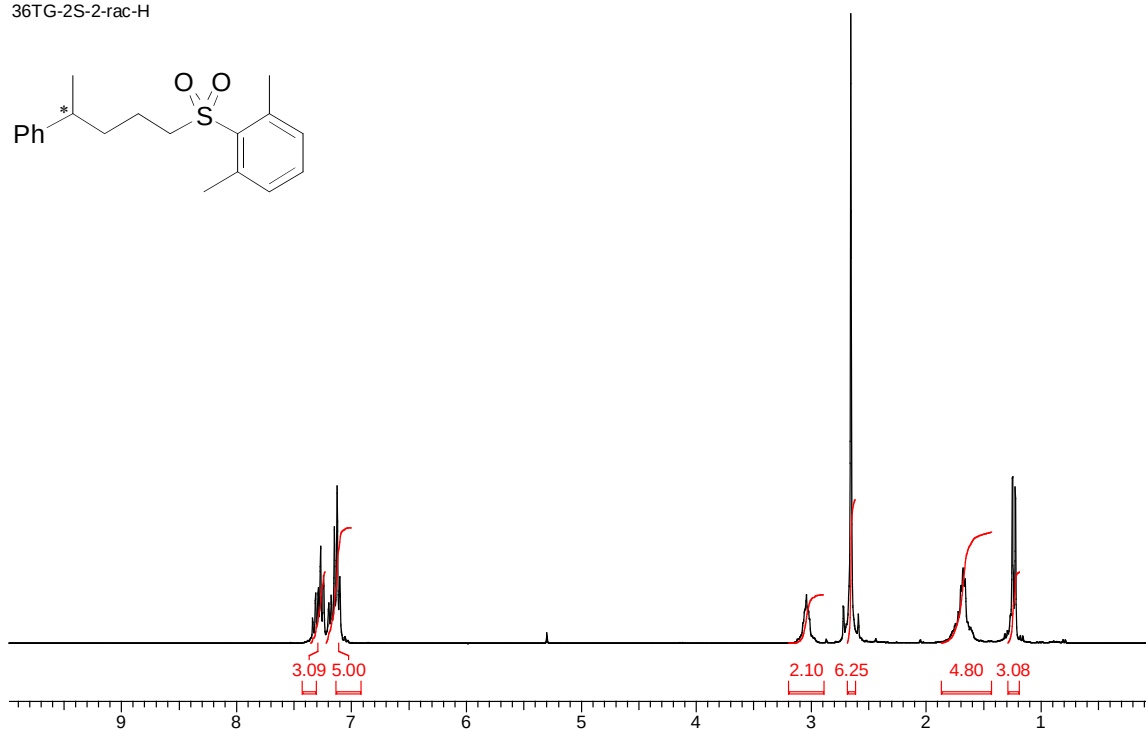
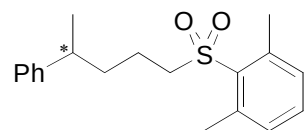
34TG-2-1P-H



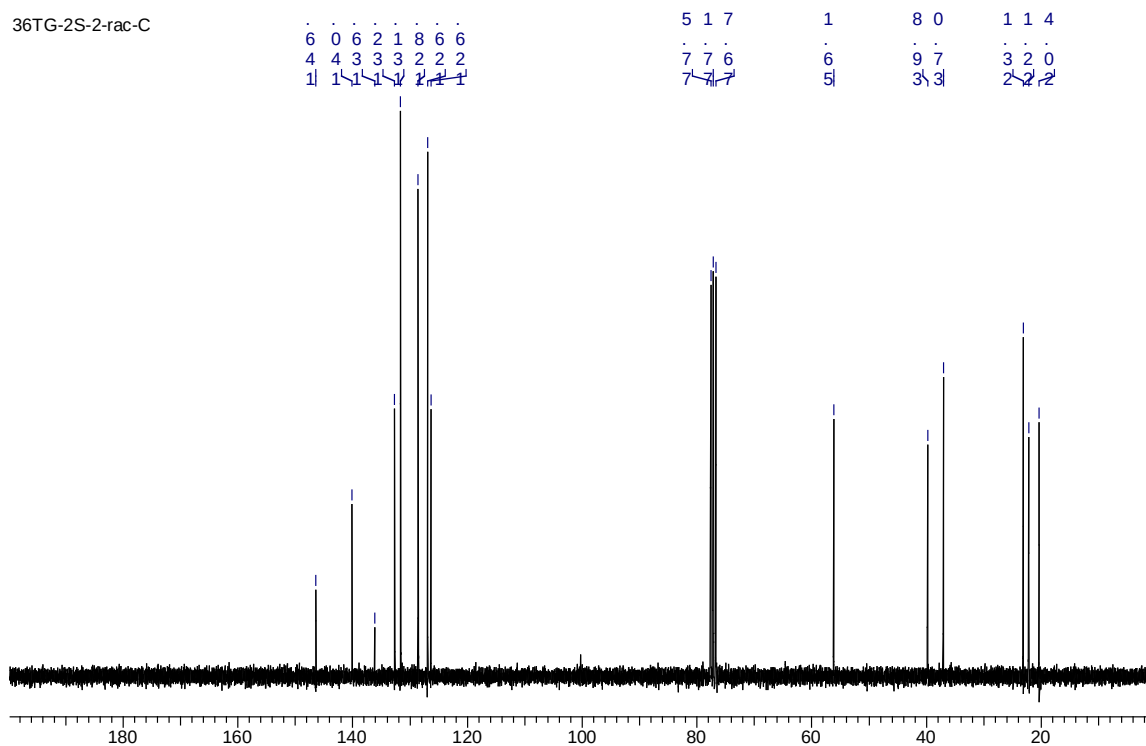
34TG-2-1P-C



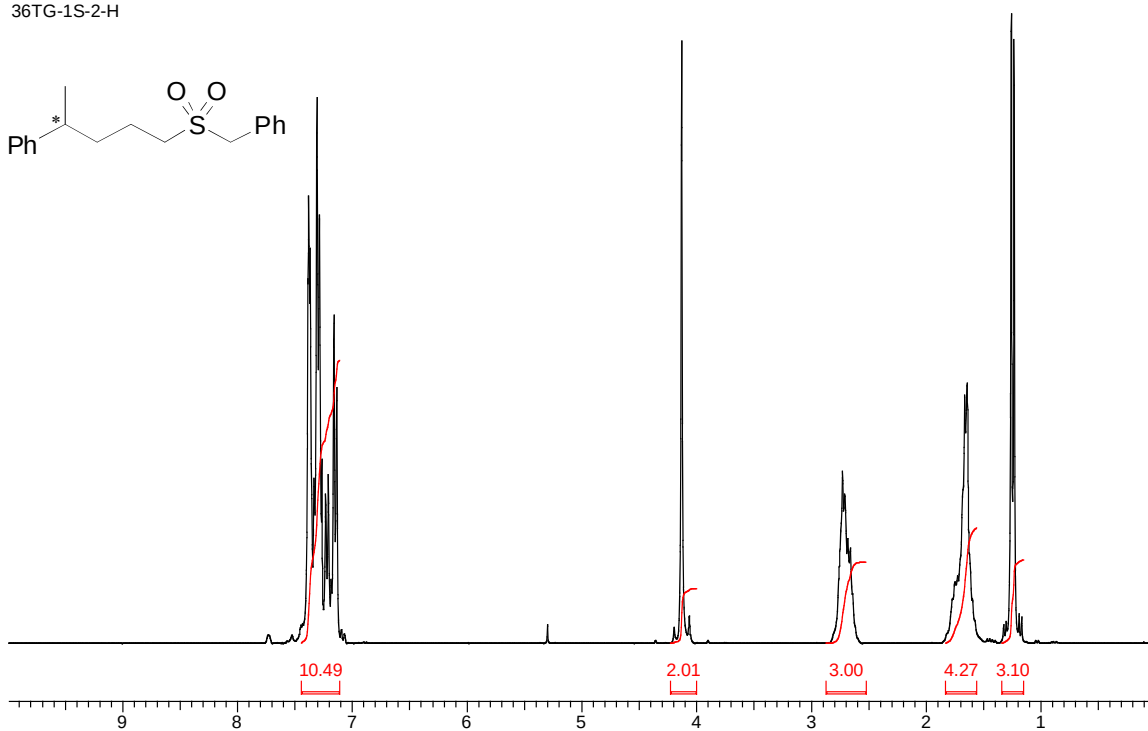
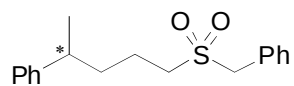
36TG-2S-2-rac-H



36TG-2S-2-rac-C



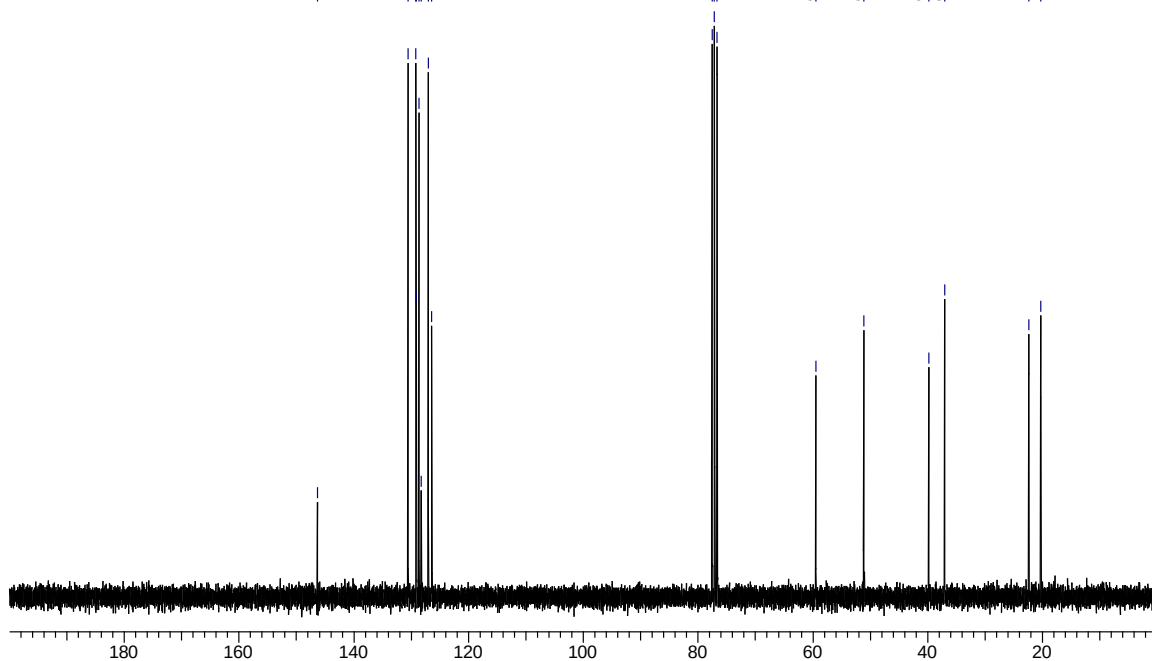
36TG-1S-2-H



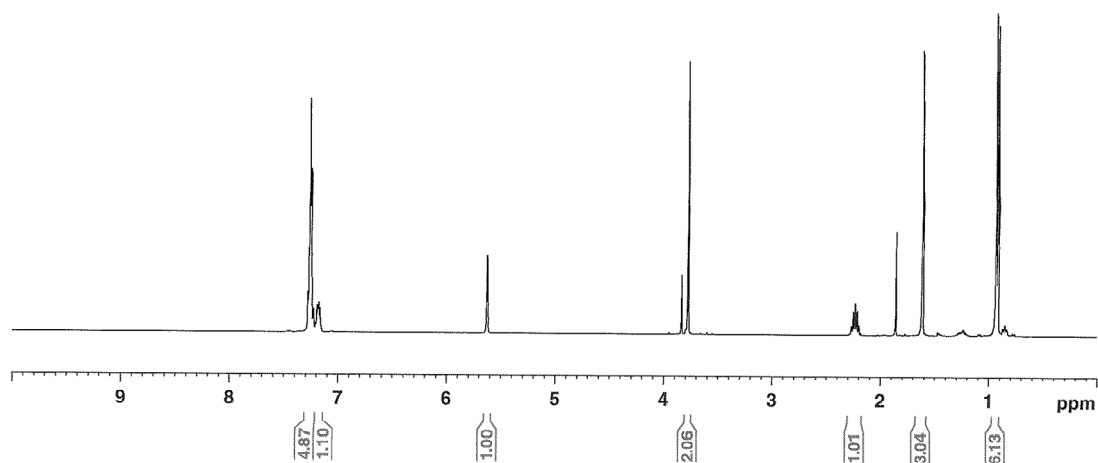
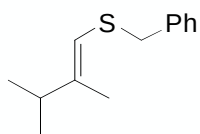
36TG-1S-2-rac-C

6 0 9 9 8 8 7 6
4 3 2 2 2 2 2 2
1 1 1 1 1 1 1 1

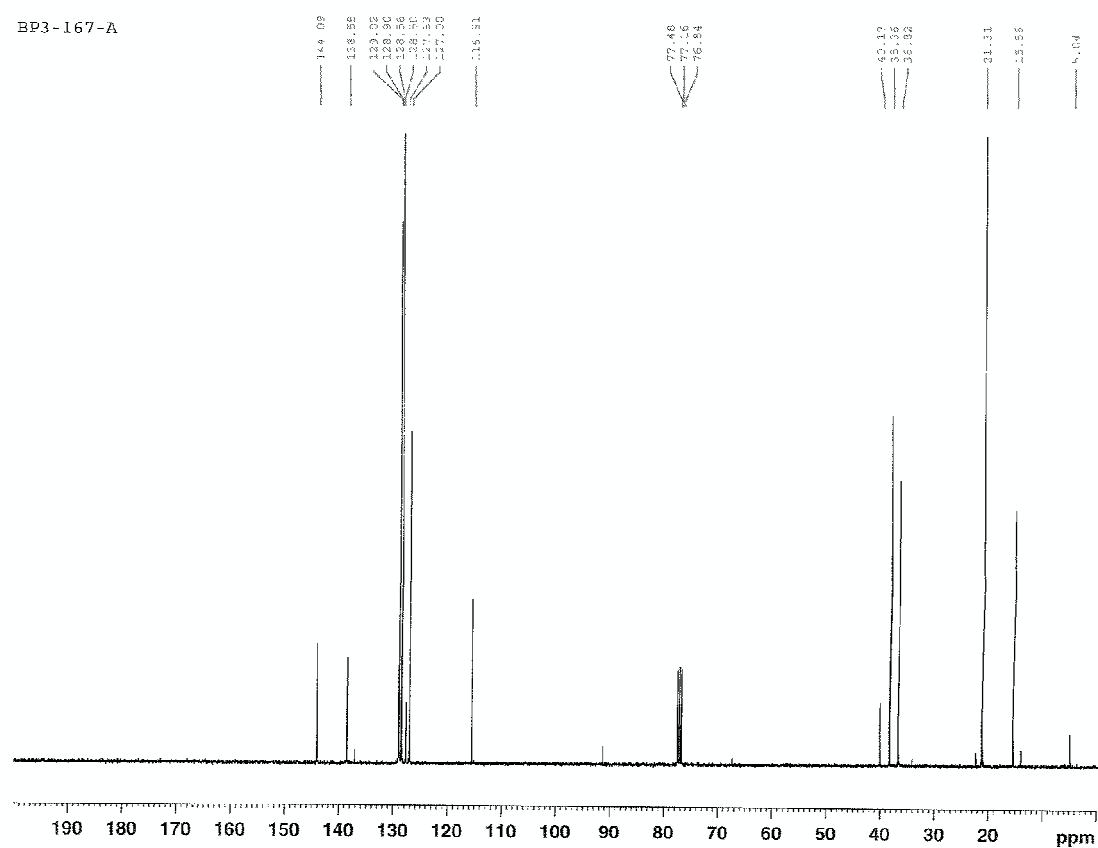
5 1 7 5 1 8 0 3 3
7 7 6 9 1 9 7 2 0
7 7 7 5 5 3 3 2 2



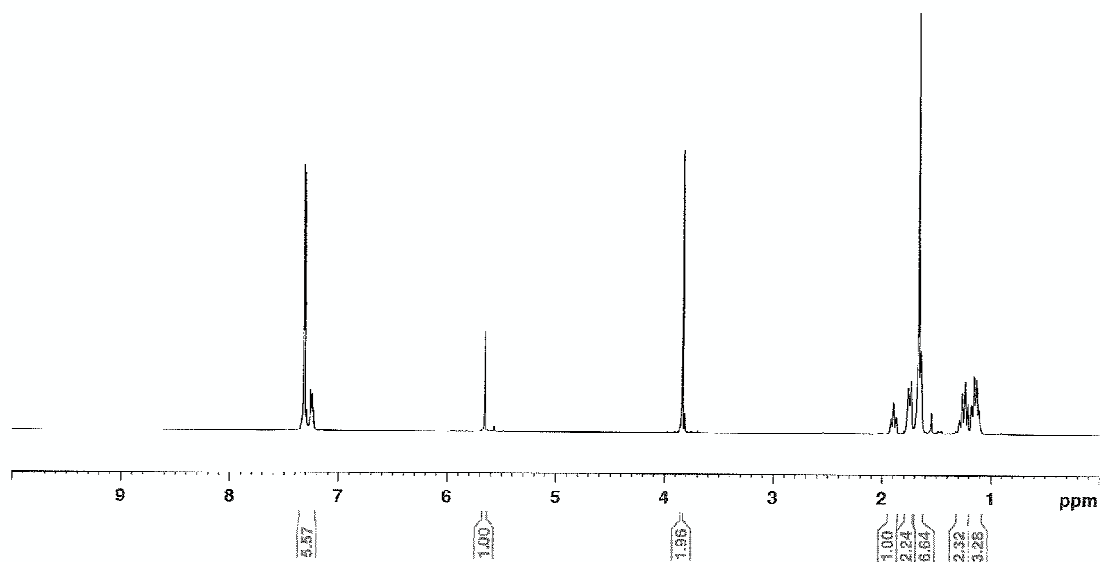
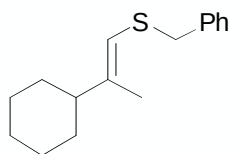
BP3-167-A



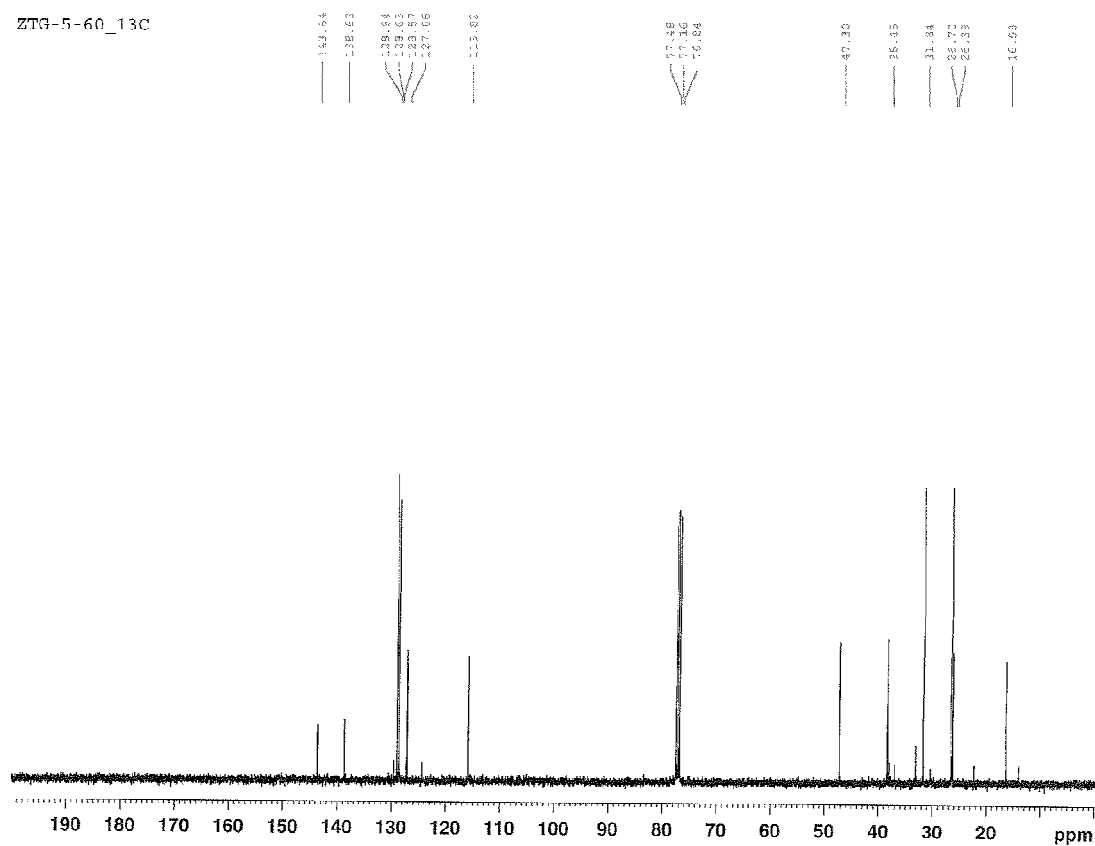
BP3-167-A



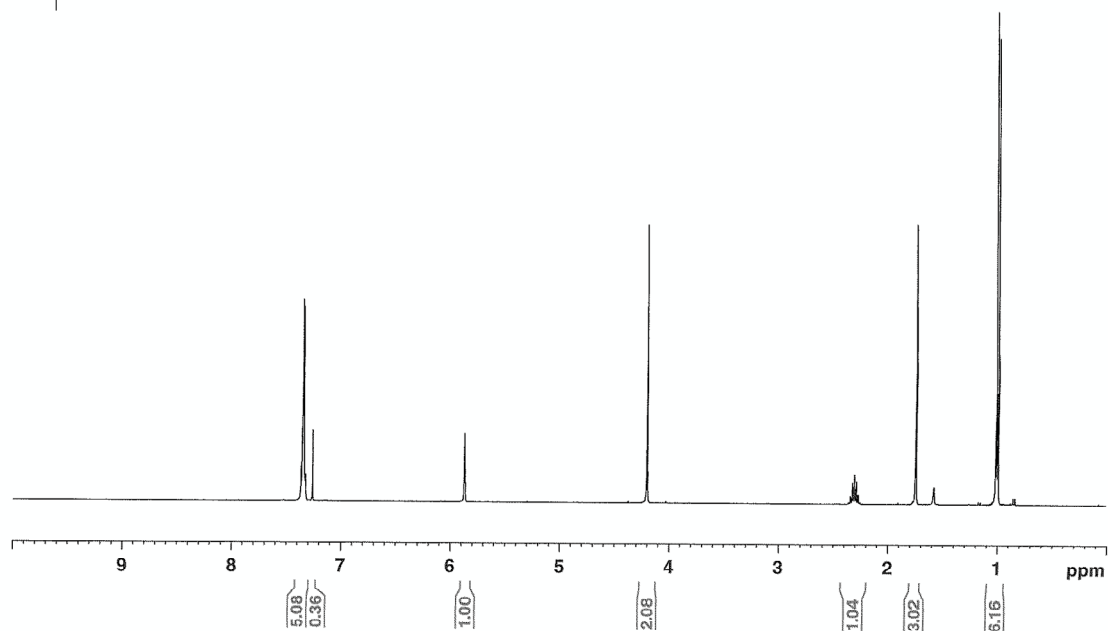
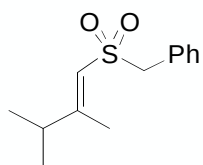
ZTG-5-60



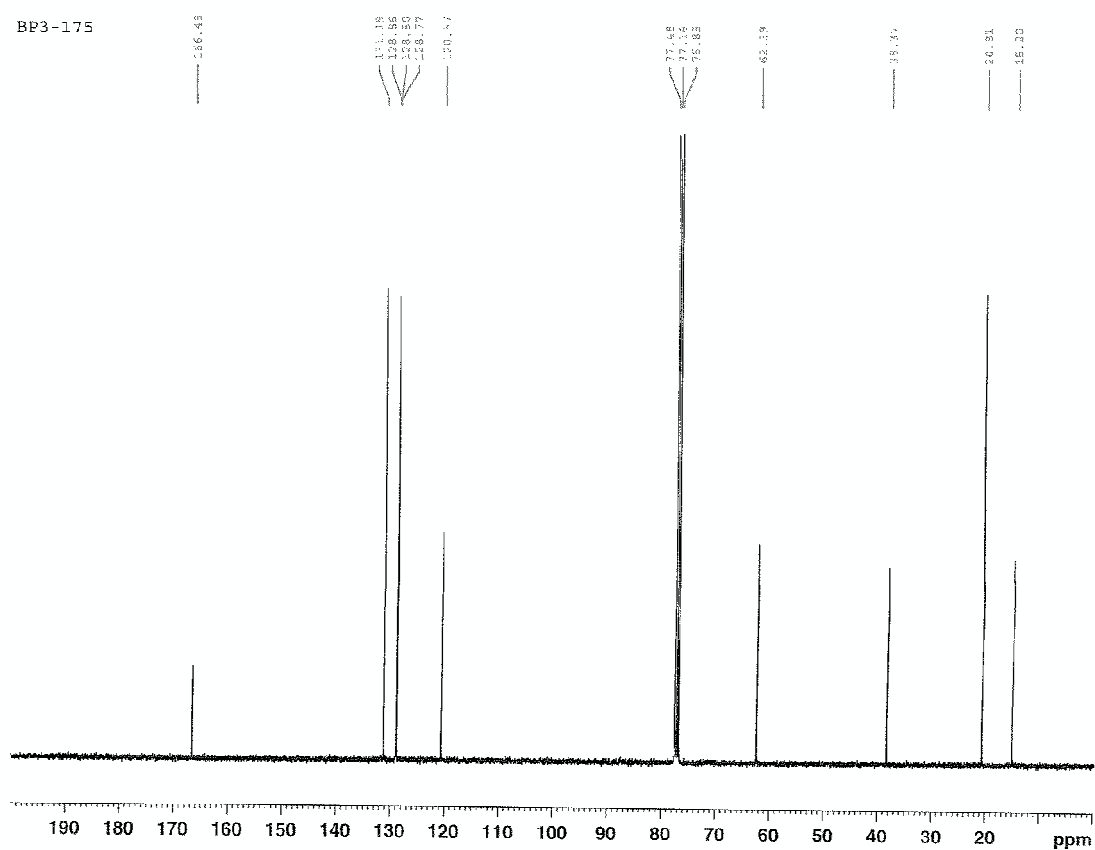
ZTG-5-60_13C



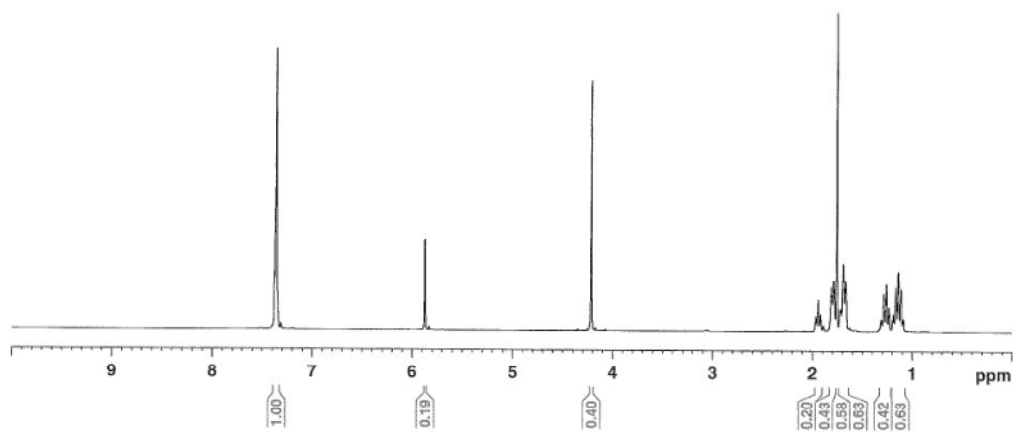
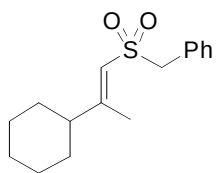
BP3-175



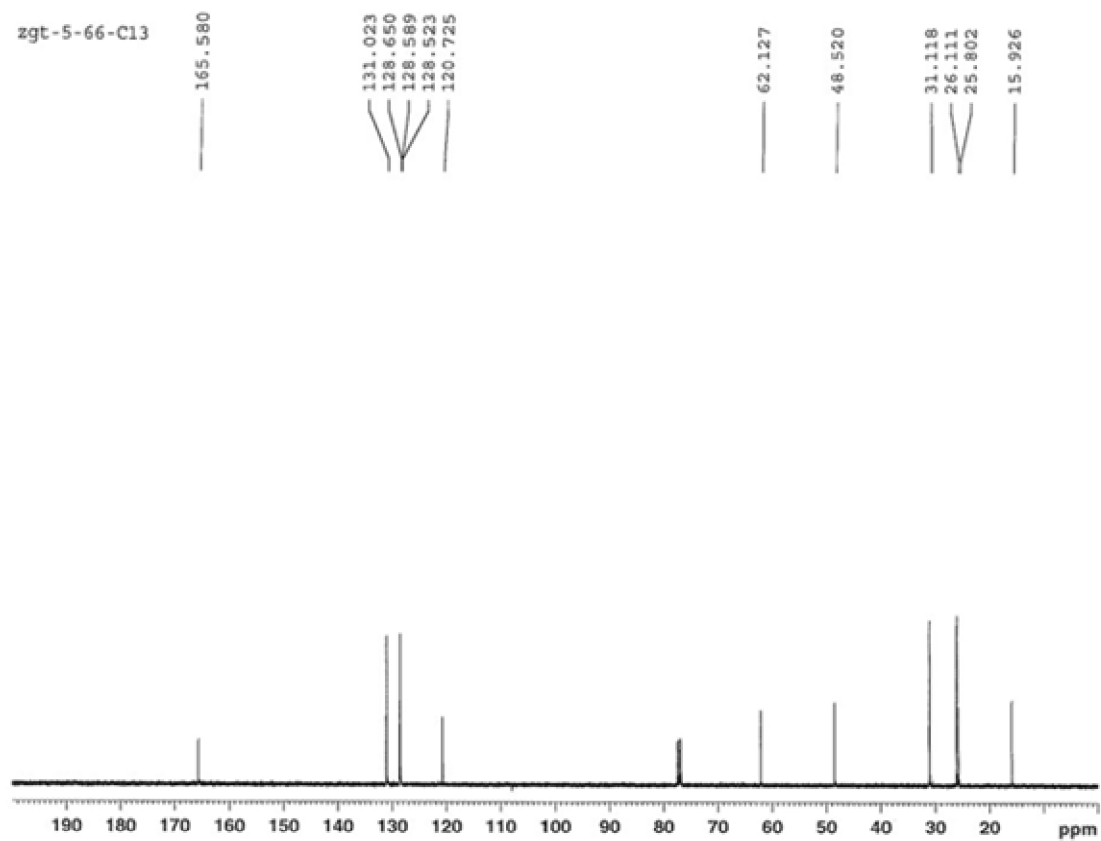
BP3-175



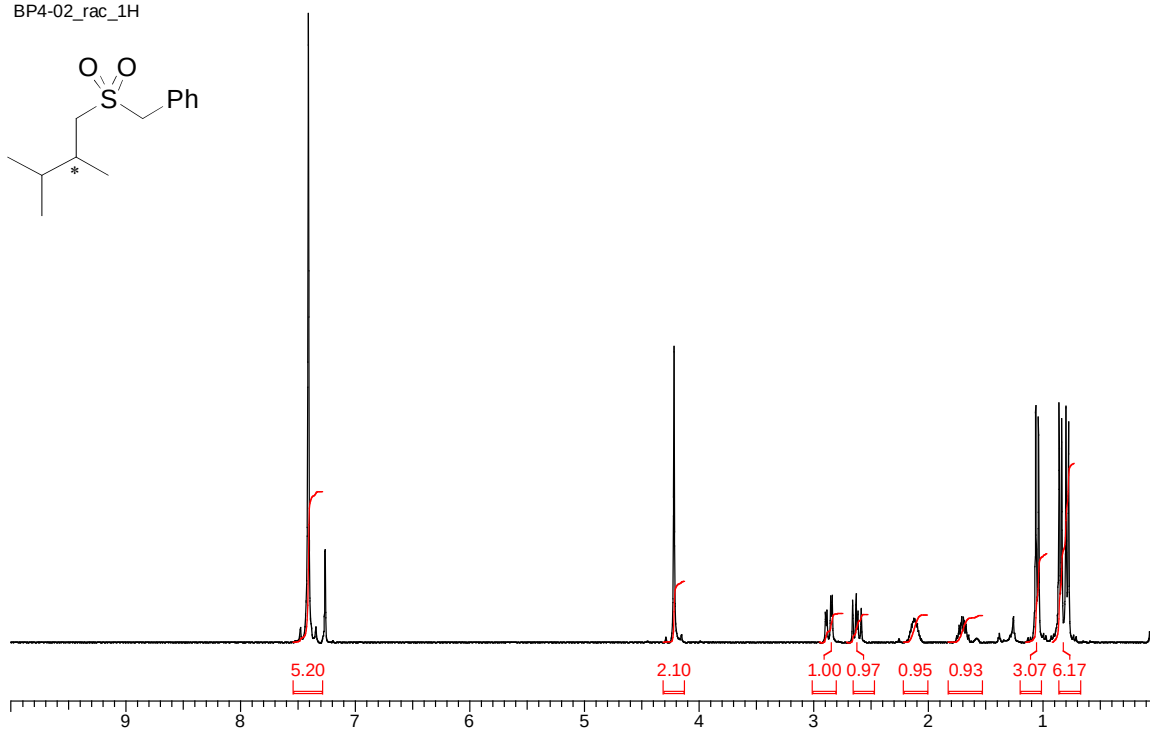
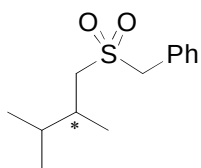
ztg_5-66-h1.fid



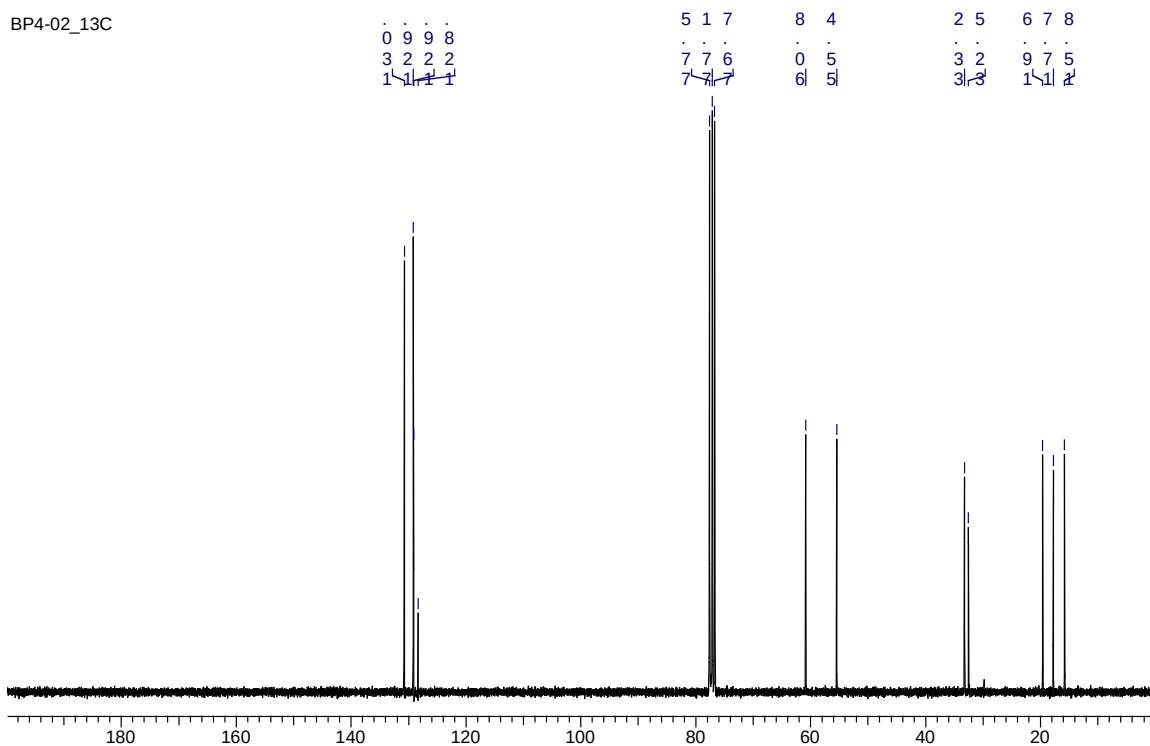
zgt-5-66-C13



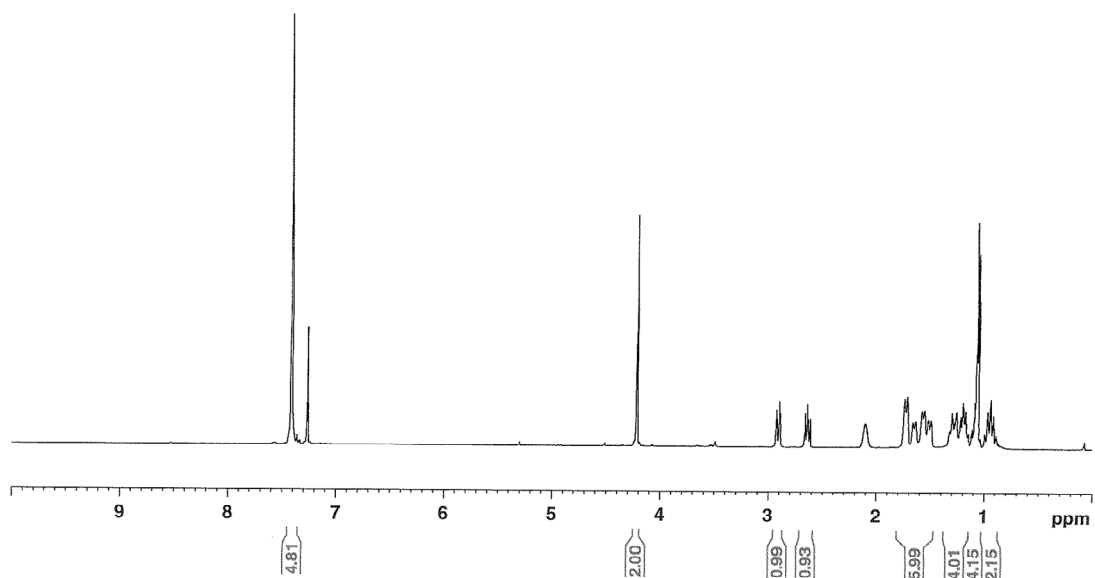
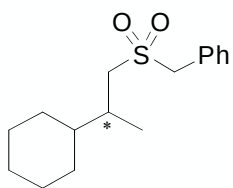
BP4-02_rac_1H



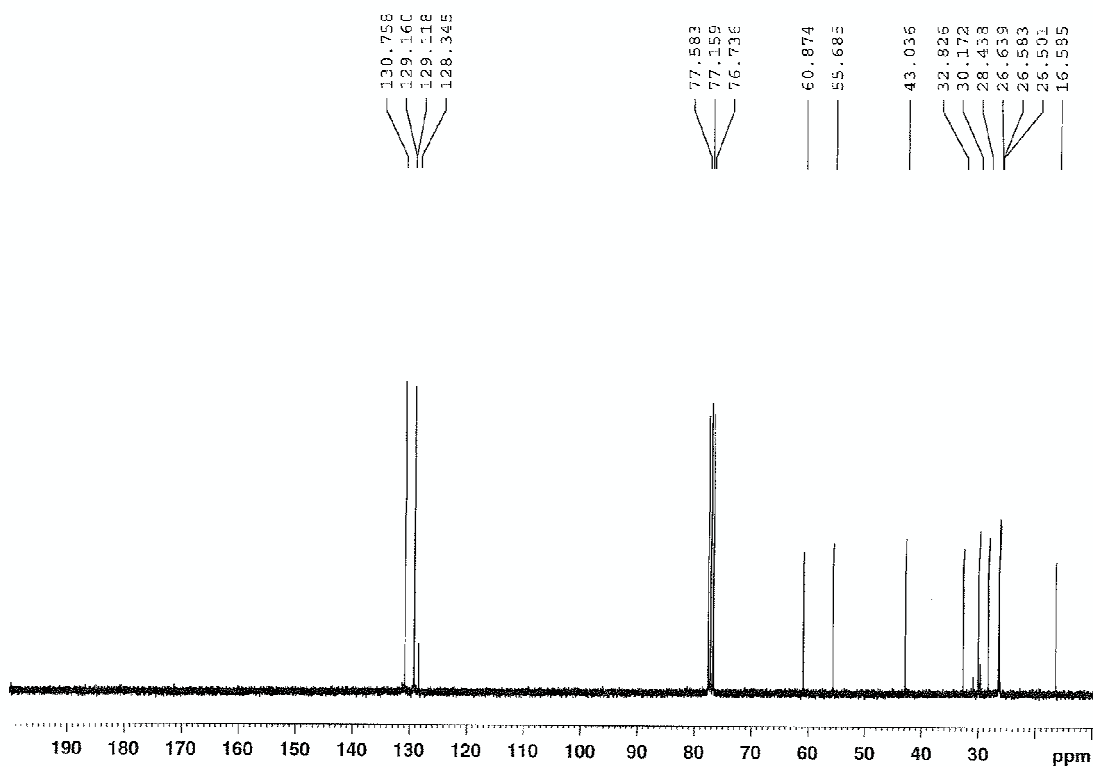
BP4-02_13C



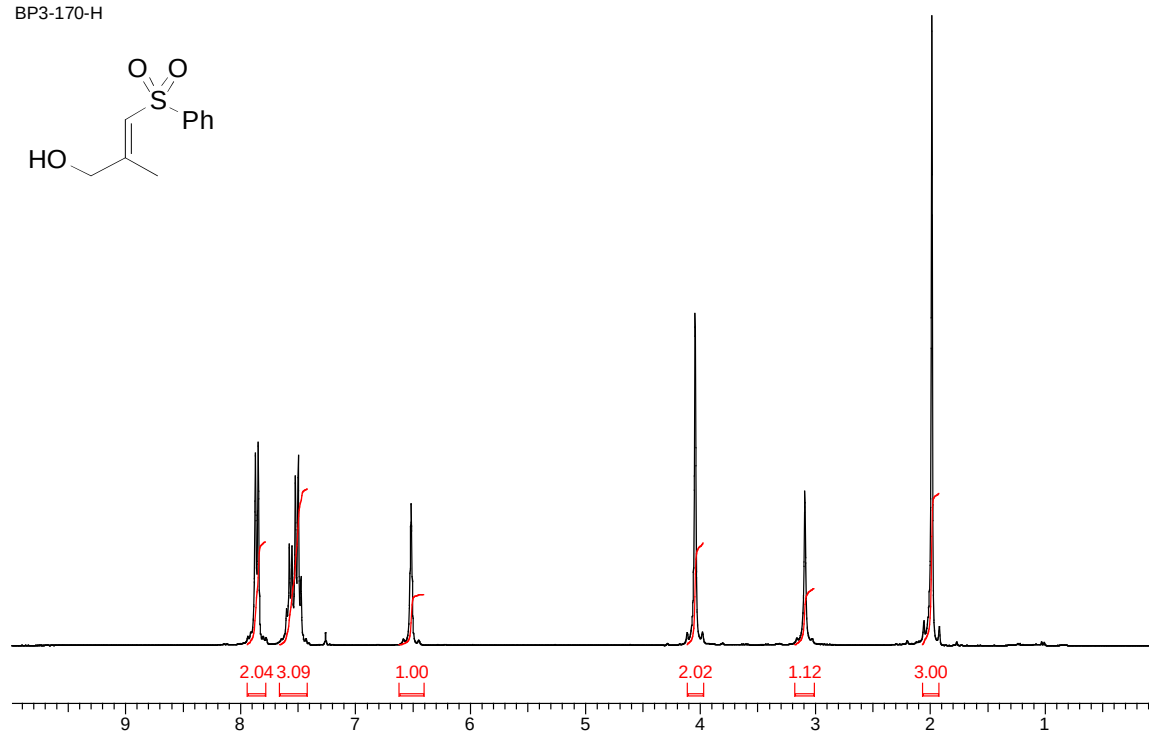
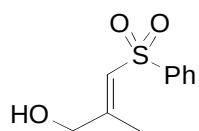
BP4-16-B



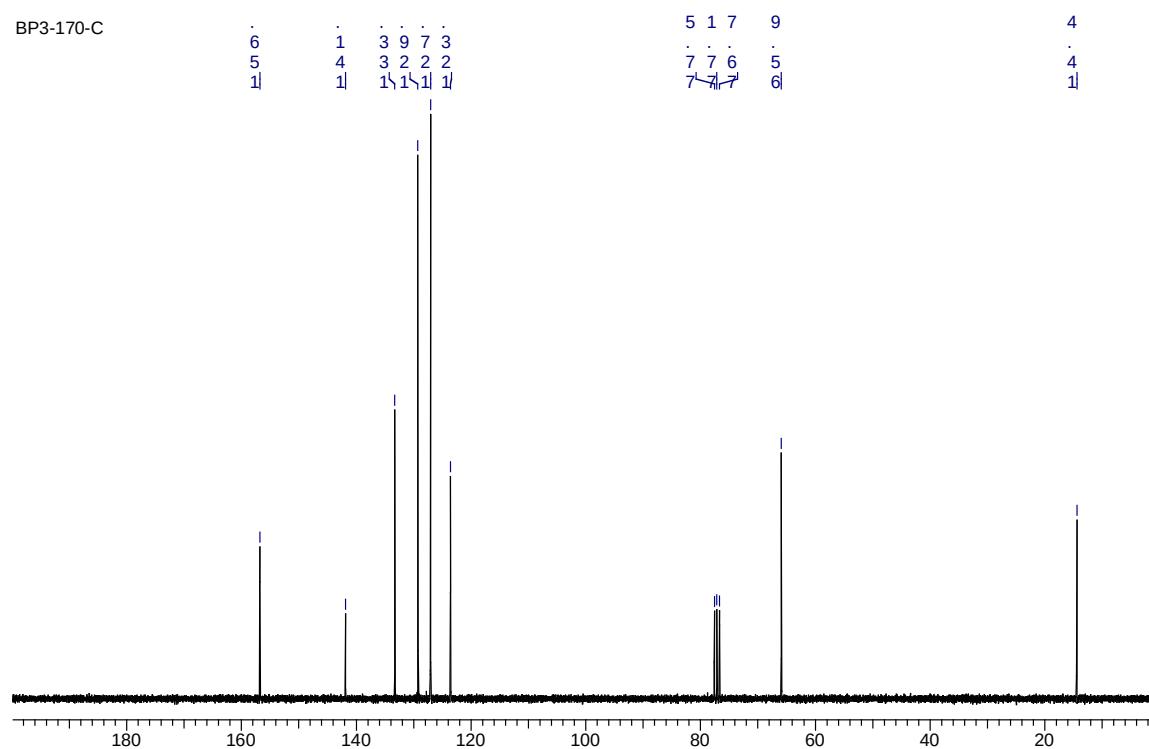
BP4-16-B



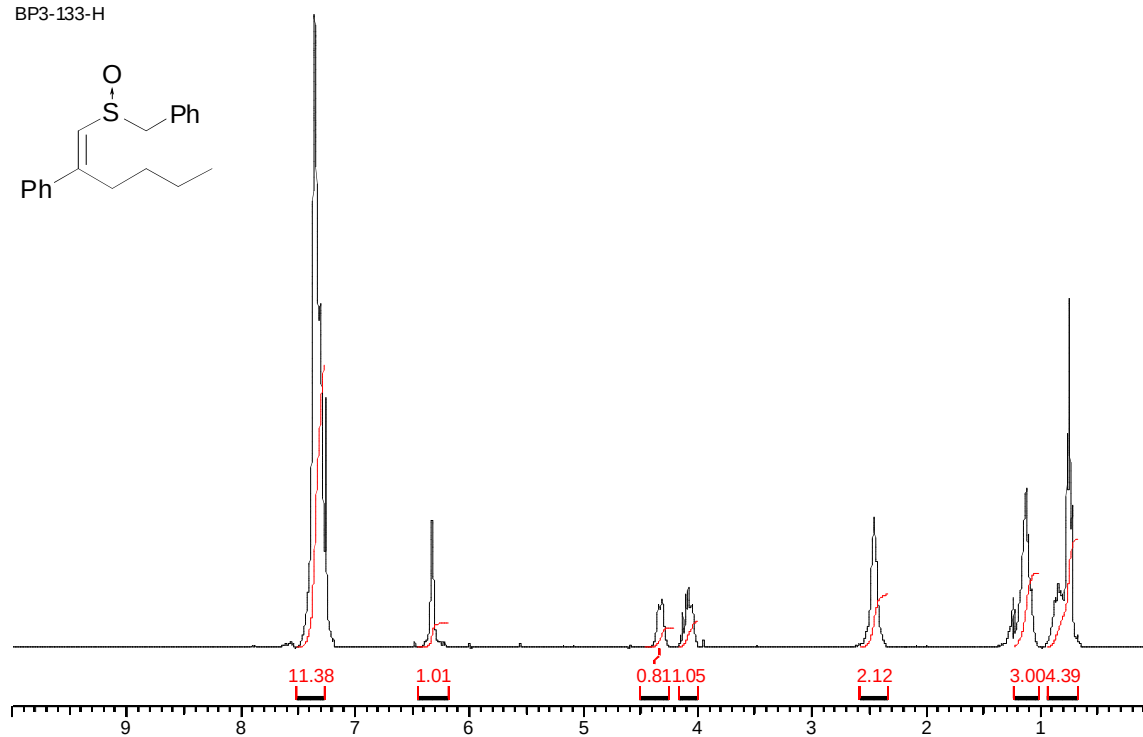
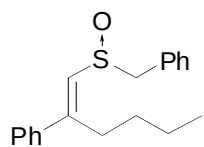
BP3-170-H



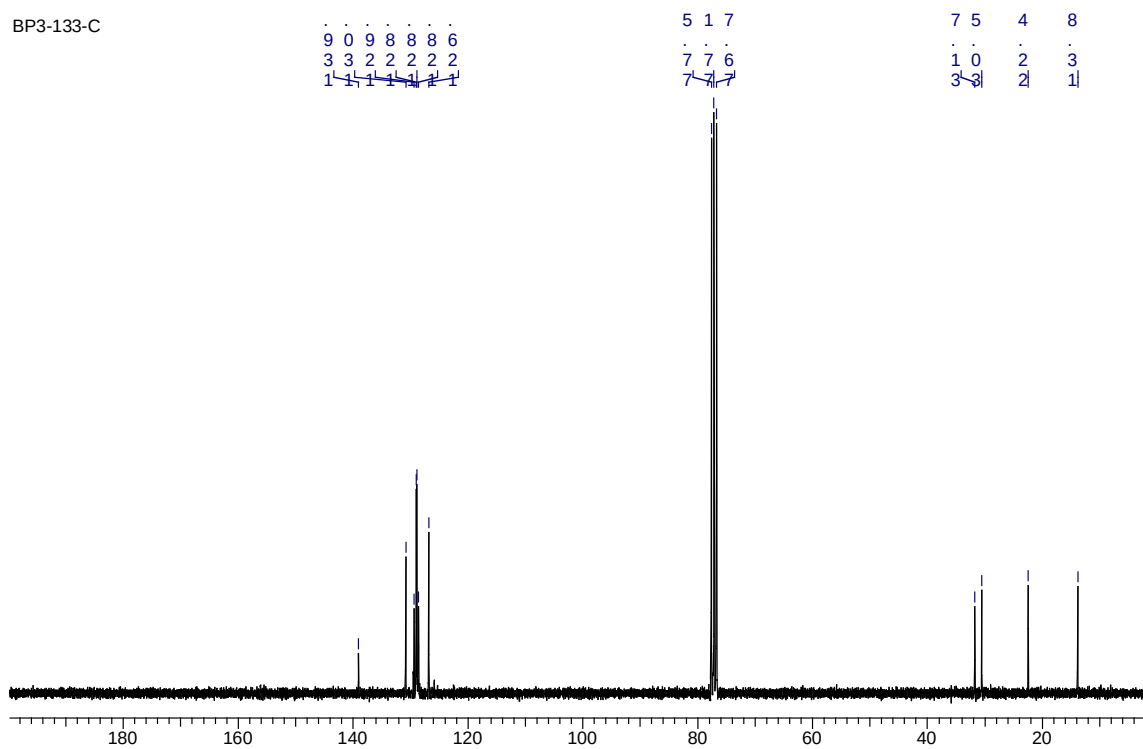
BP3-170-C



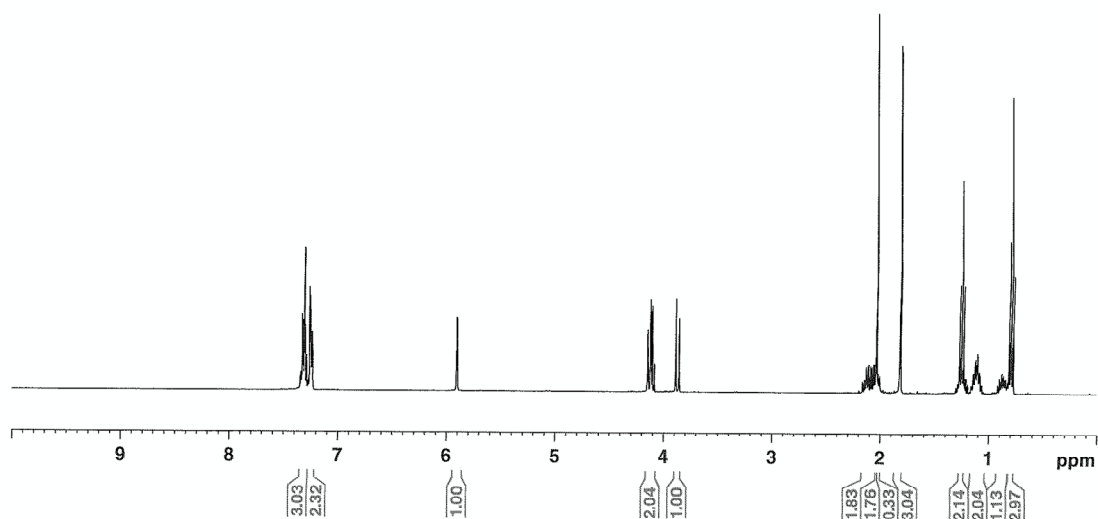
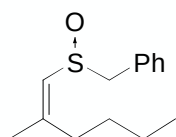
BP3-133-H



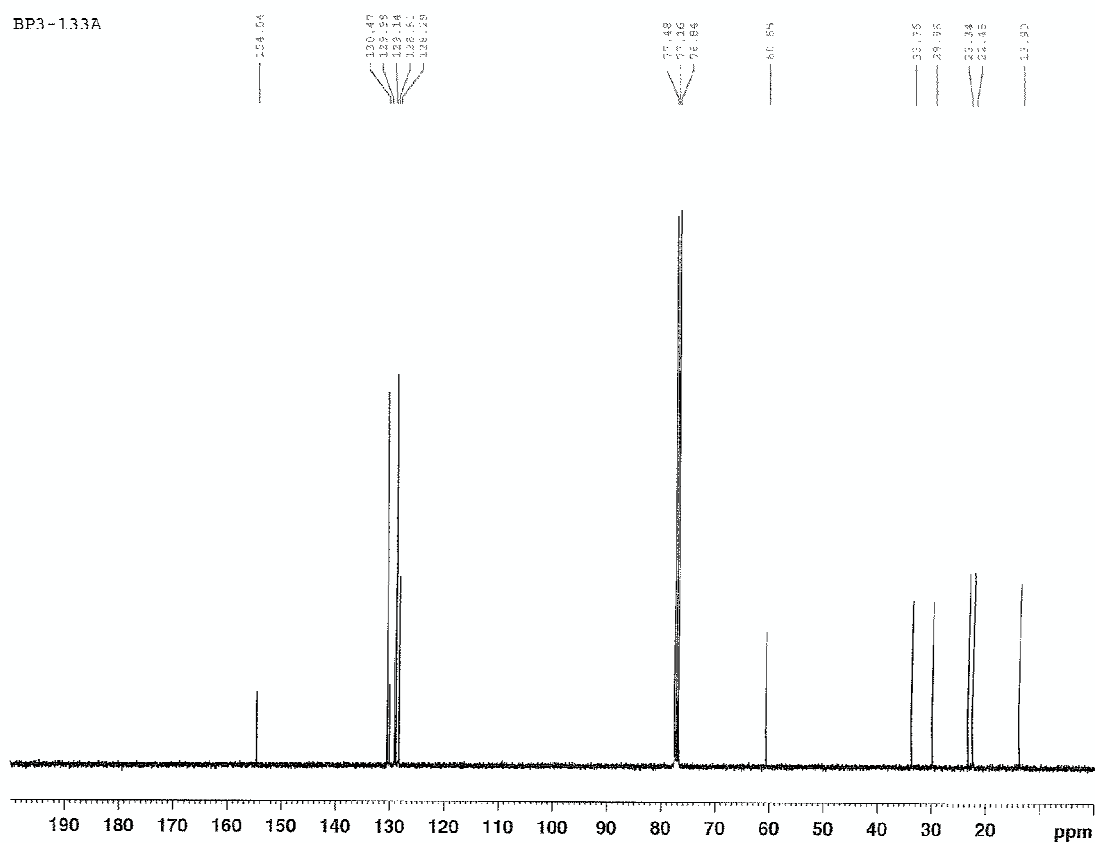
BP3-133-C



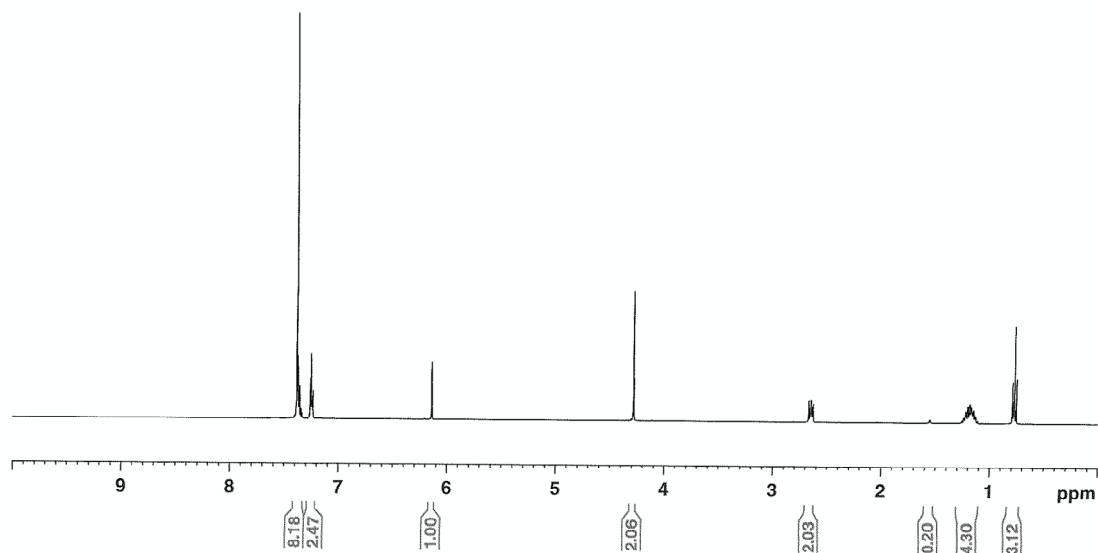
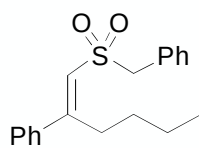
BP3-133-A



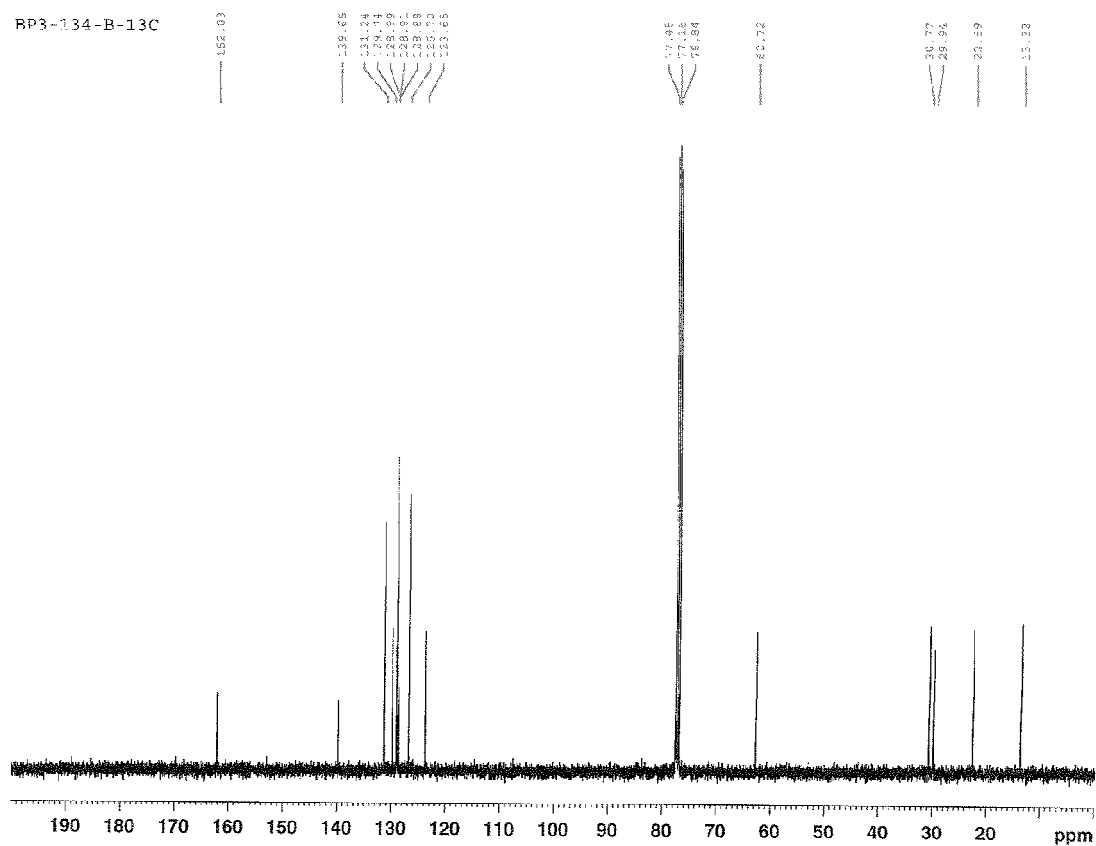
BP3-1.33A



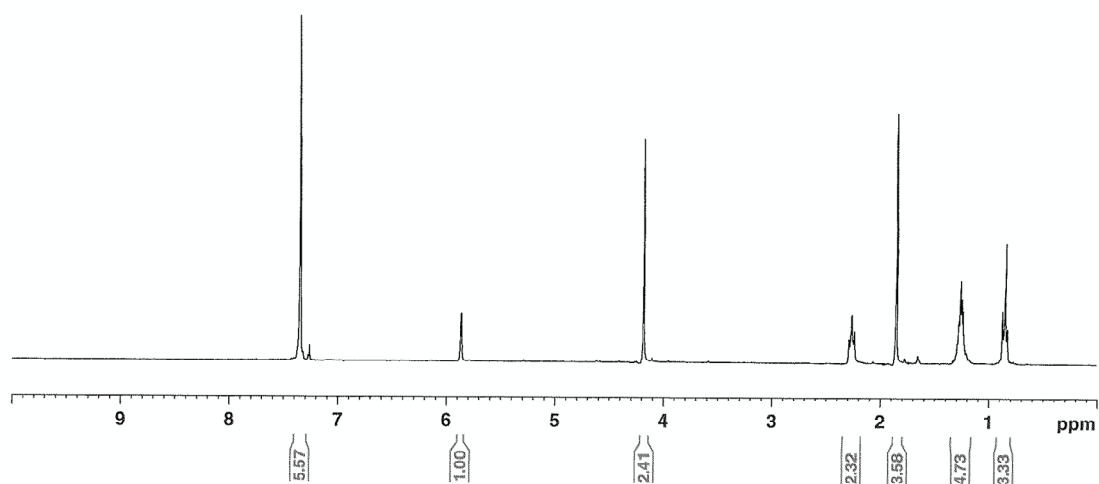
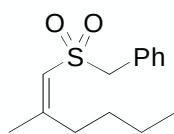
BP3-134-B



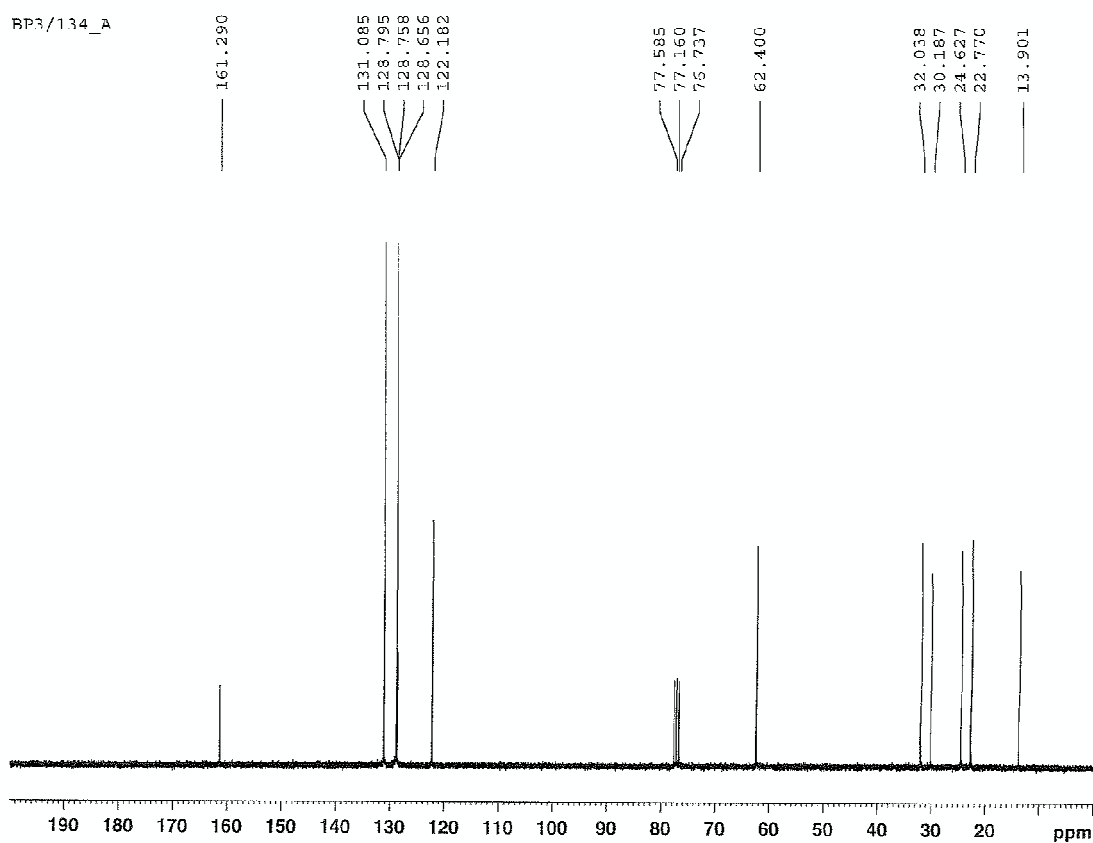
BP3-134-B-13C



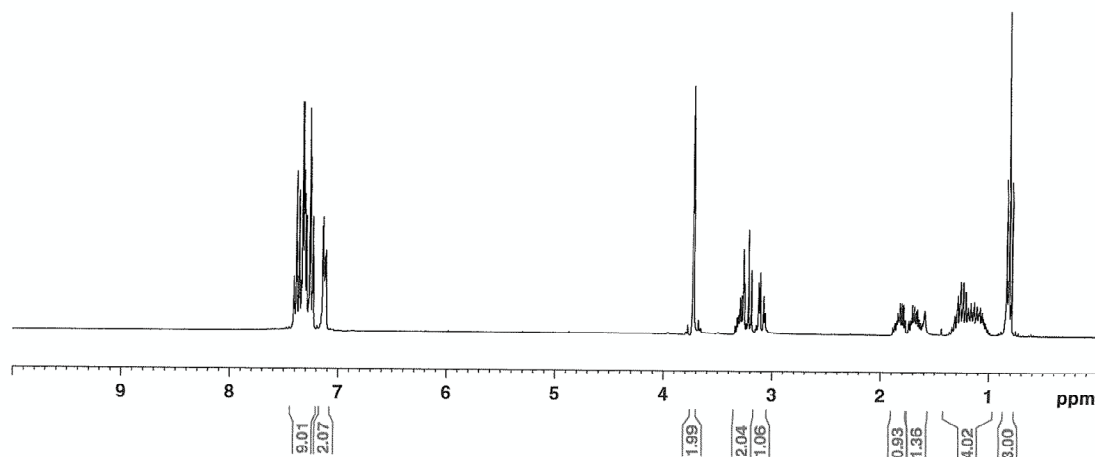
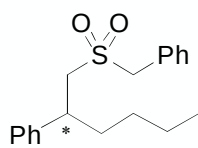
BP3-134-A



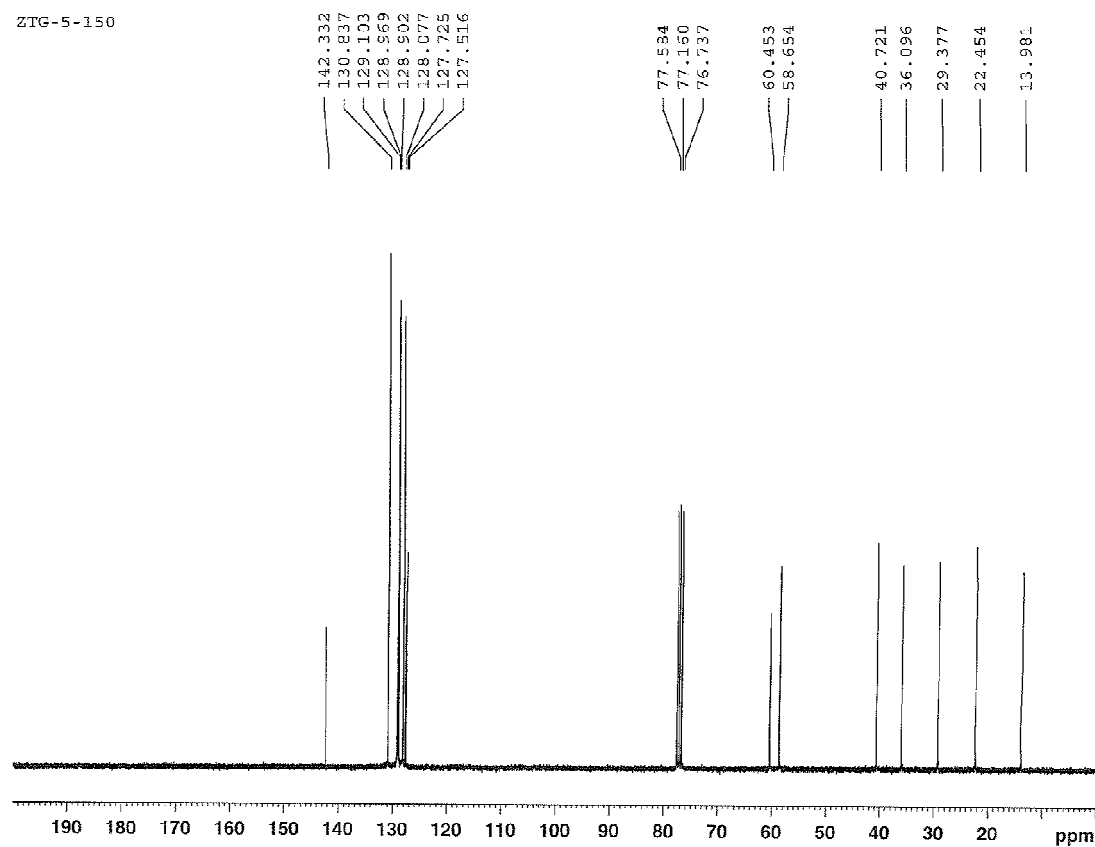
BP3/134_A



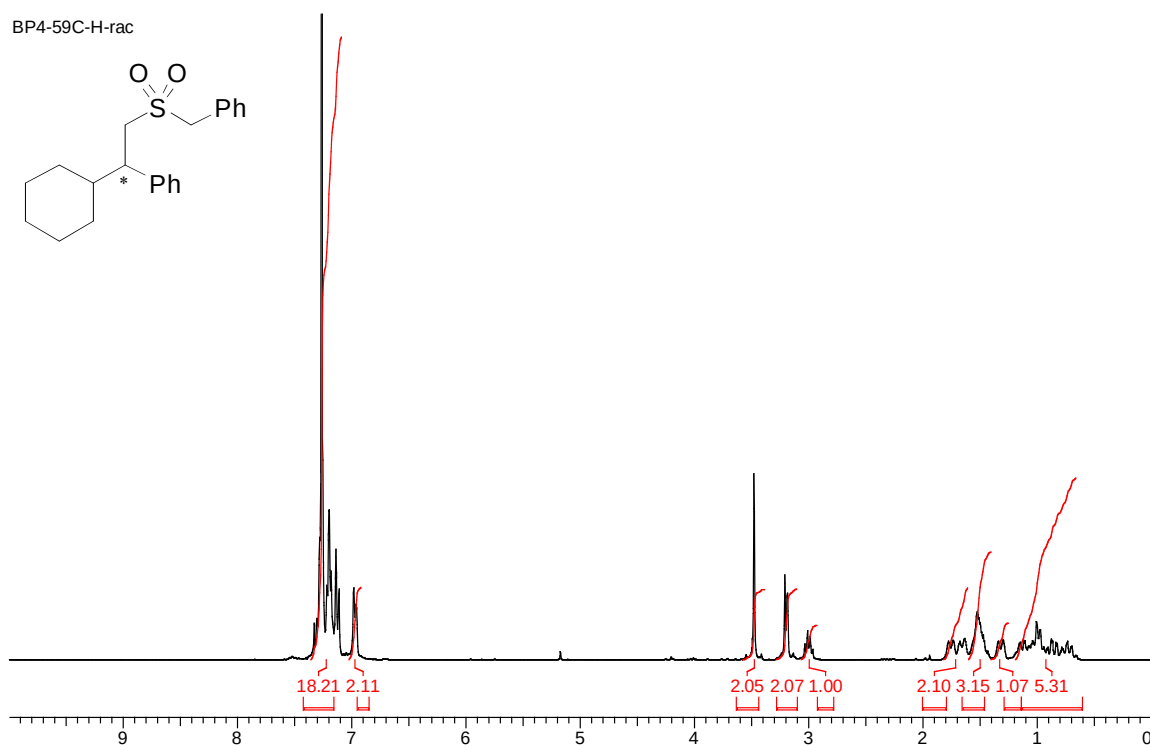
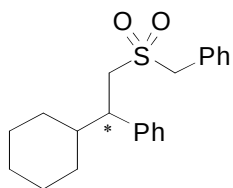
ZTG-5-150



ZTG-5-150



BP4-59C-H-rac



BP4-59C-C-rac

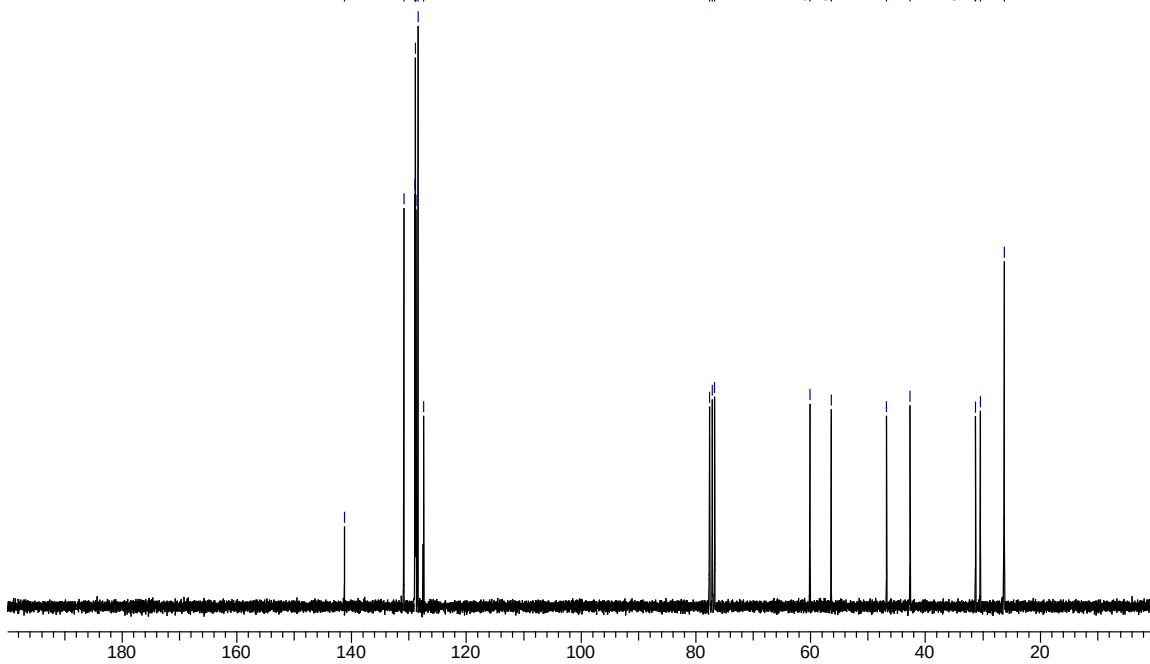
1 0 8 8 8 8 7
4 3 2 2 2 2 2
1 1 1 1 1 1 1

5 1 7
7 7 6
7 7 7

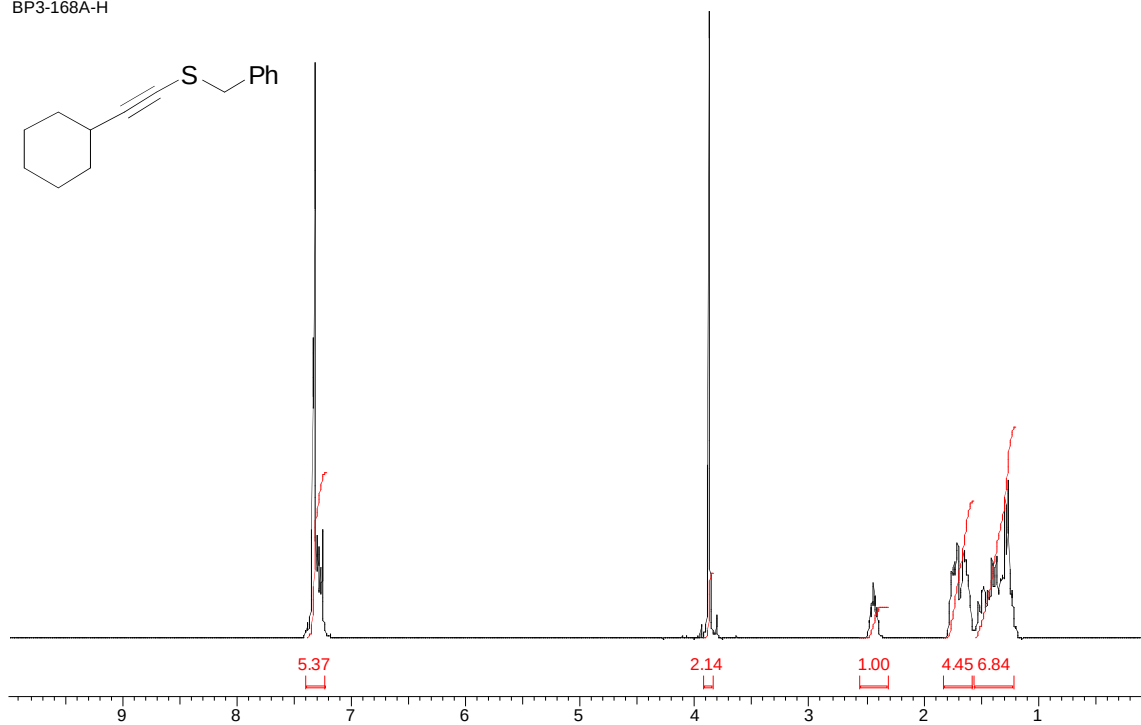
1 4
0 6
6 5

8 7
6 2
4 4

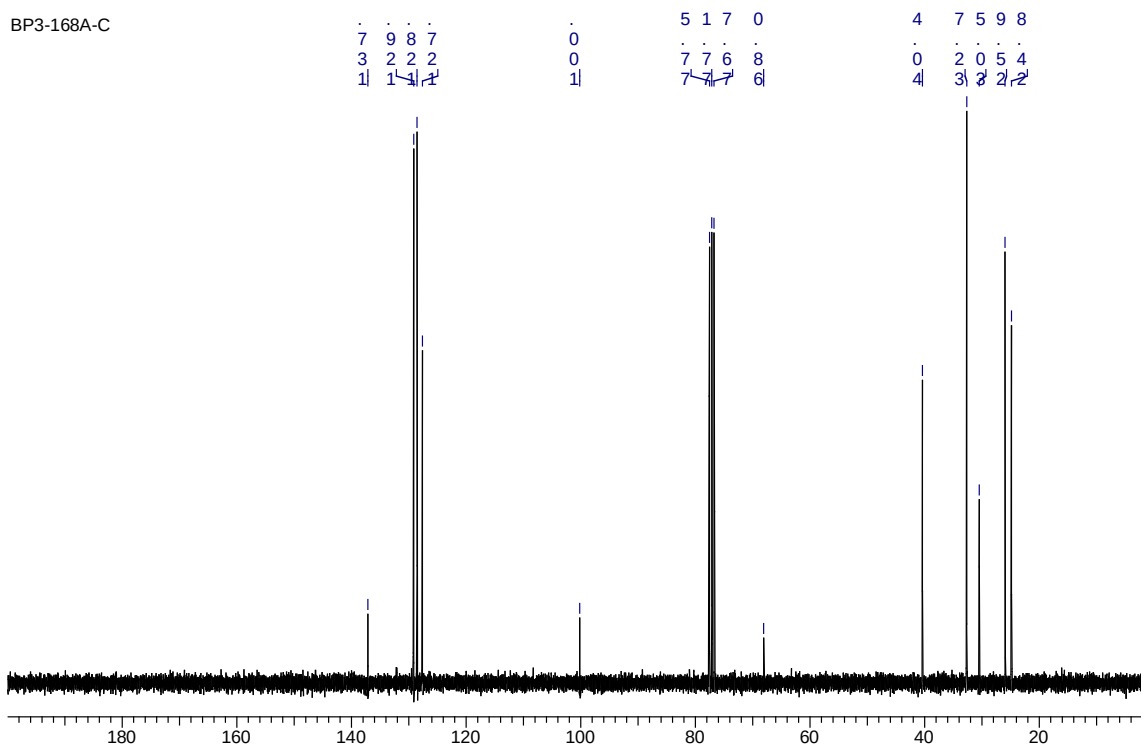
2 4 2
1 0 6
3 3 2

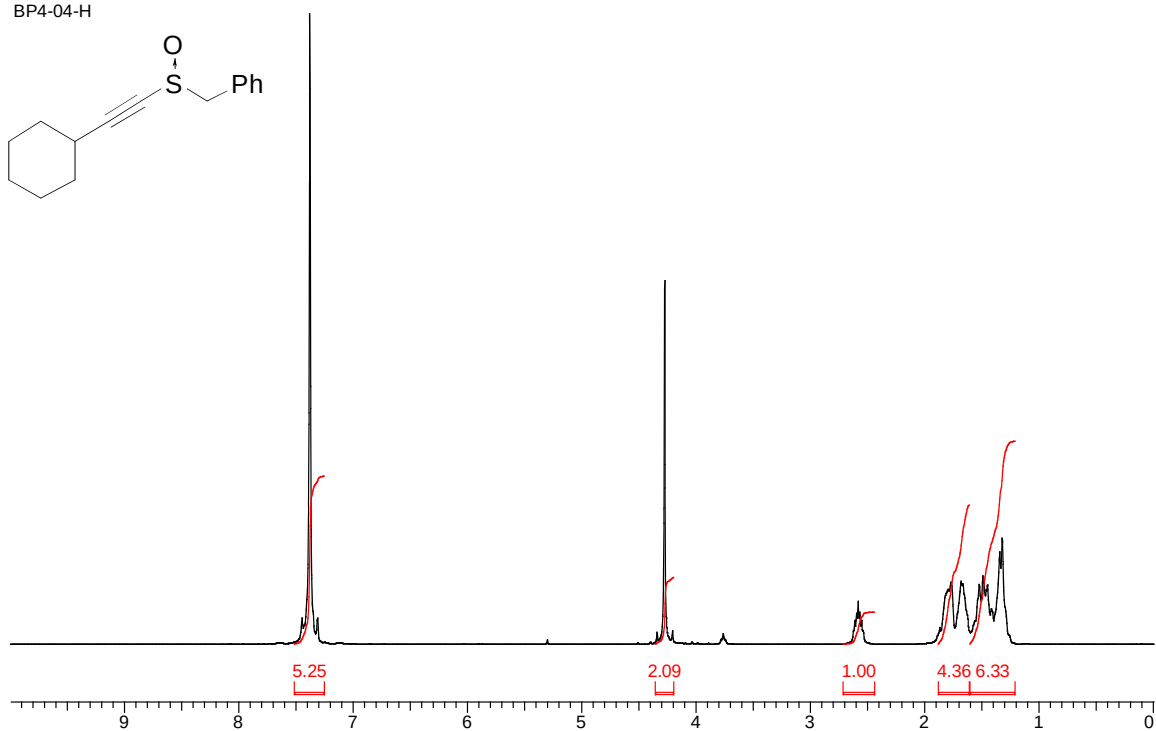


BP3-168A-H

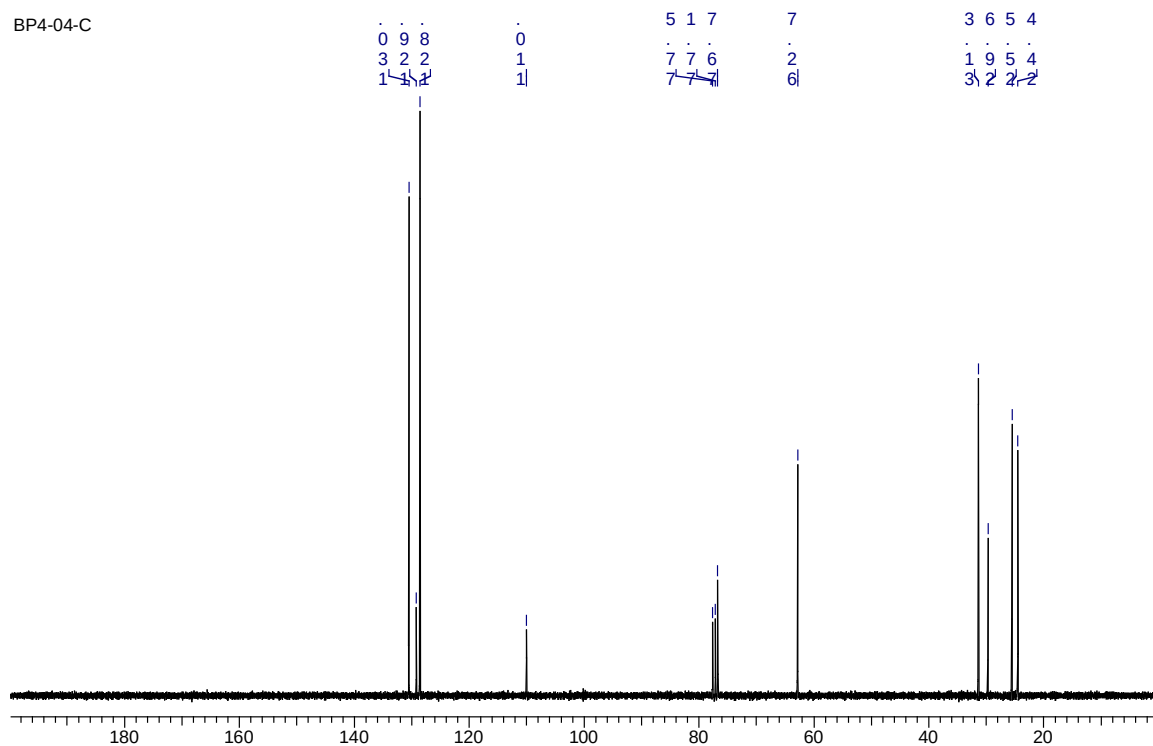


BP3-168A-C

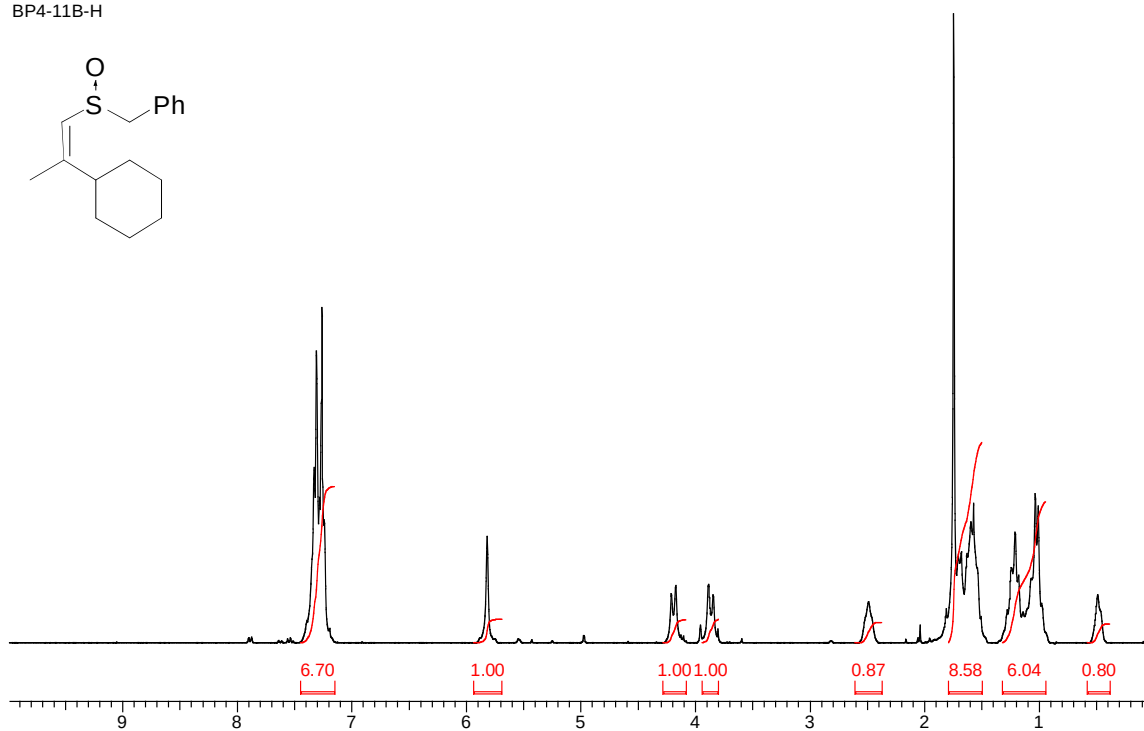
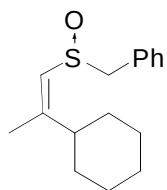


C1=CC=C(C=C1)SC#CC2=CCCCC2

.	.	.	.	5	1	7	7	3	6	5	4
0	9	8	0	.	.	.	.	.	.	.	.
3	2	2	1	7	7	6	2	1	9	5	4
1	1	1	1	7	7	1	6	3	2	2	2

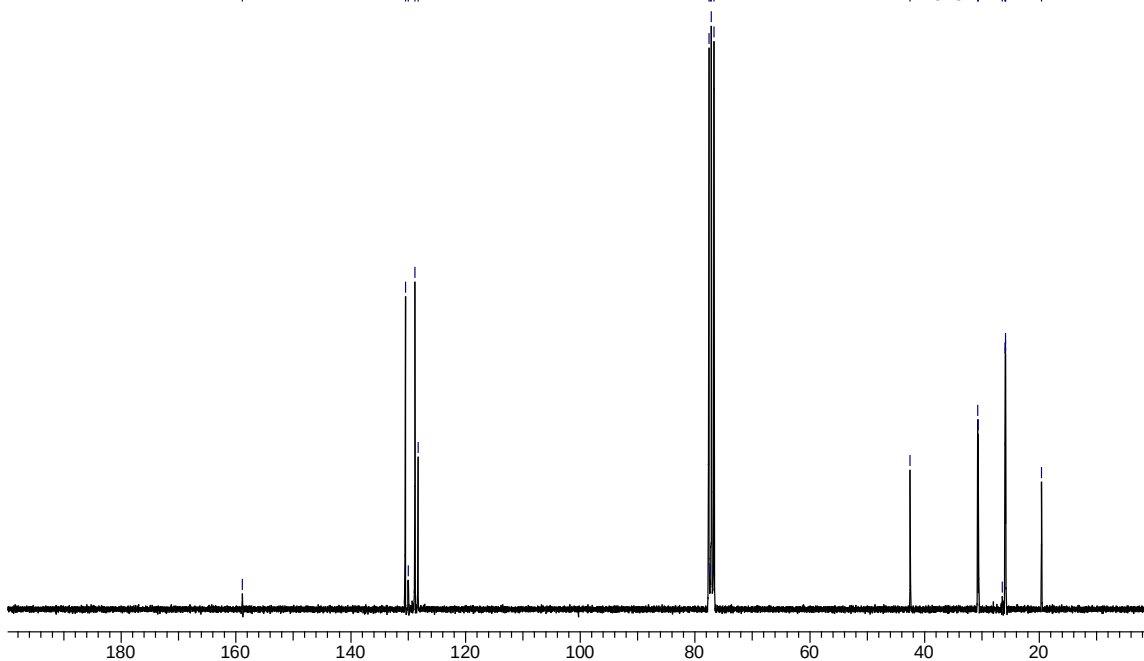


BP4-11B-H

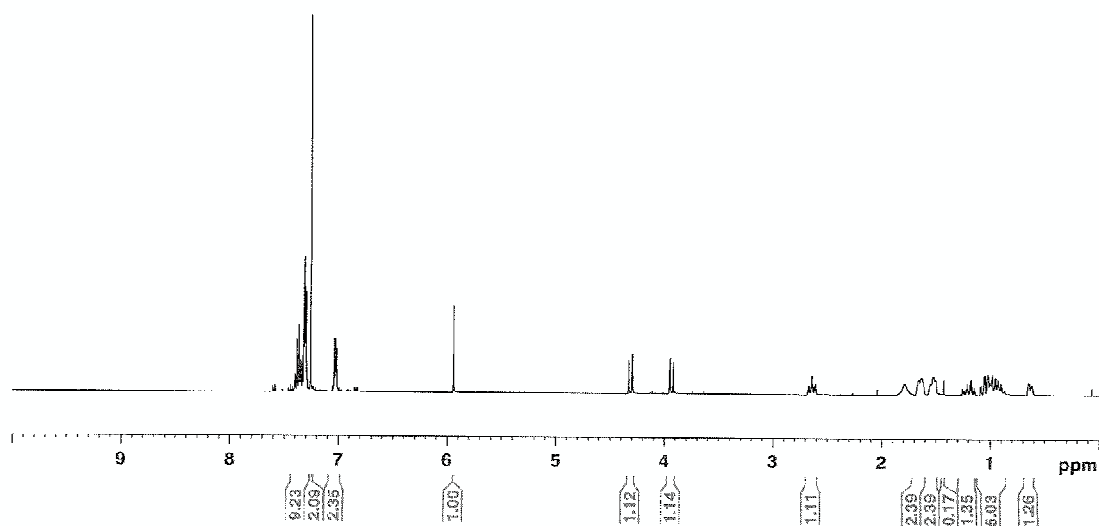
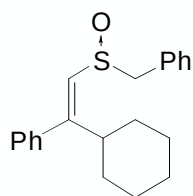


BP4-11B-C

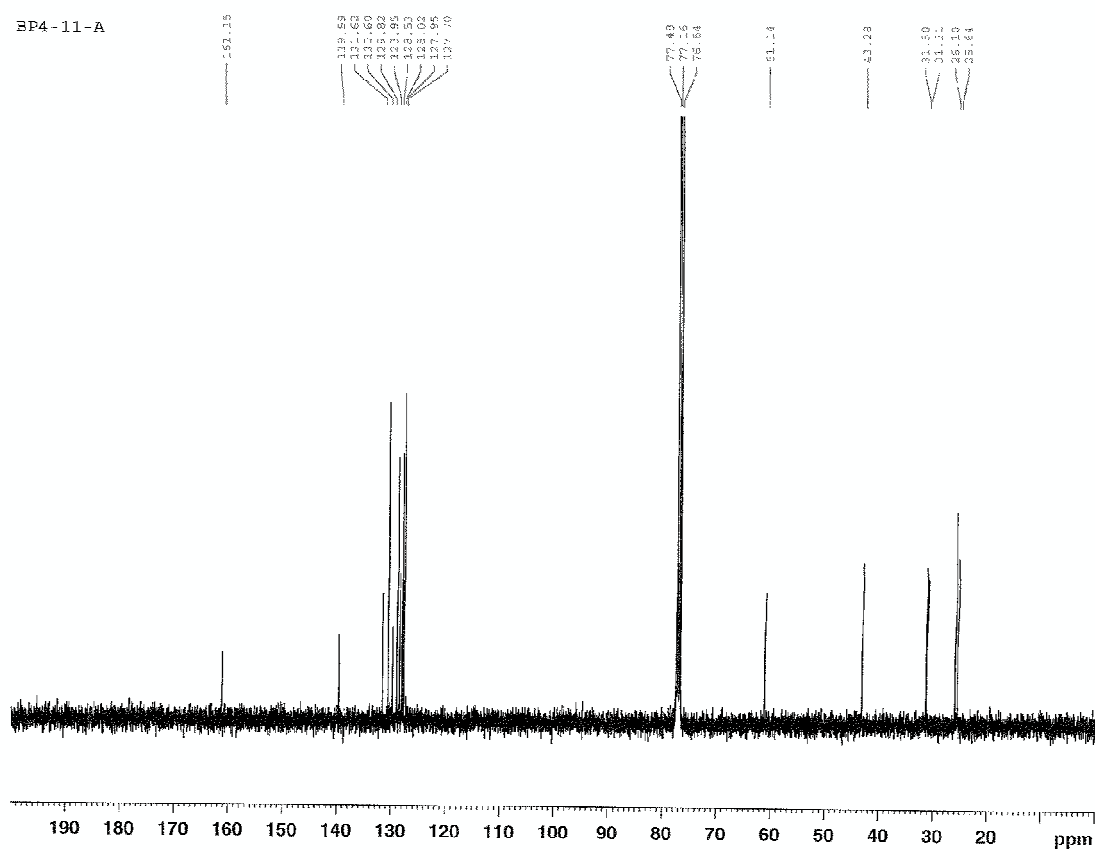
8	0	0	8	8	5	3	1	7	5	7	6	4	9	9	8	6
5	3	3	2	2	7	7	7	6	2	0	0	6	5	5	5	9
1	1	1	1	1	7	7	7	7	4	3	3	2	2	2	2	1



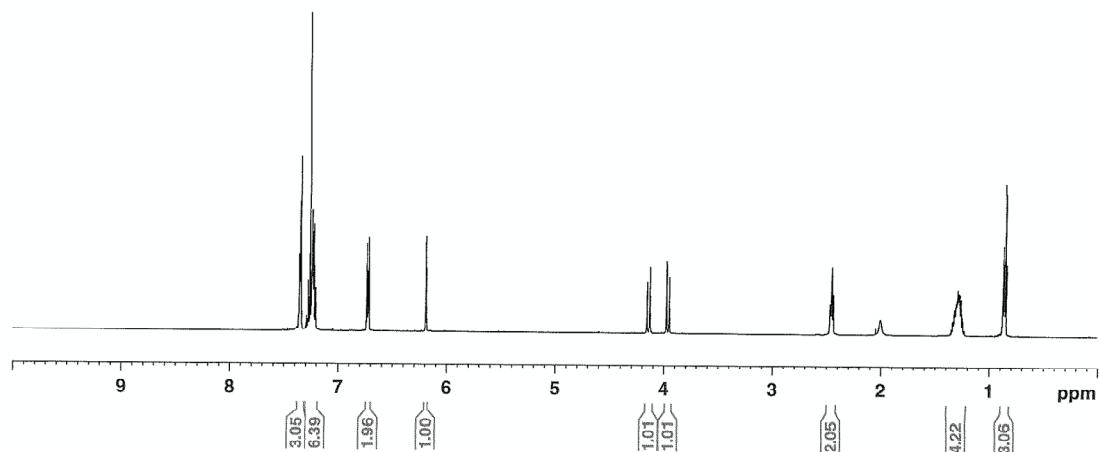
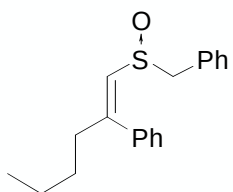
BP4-11-A



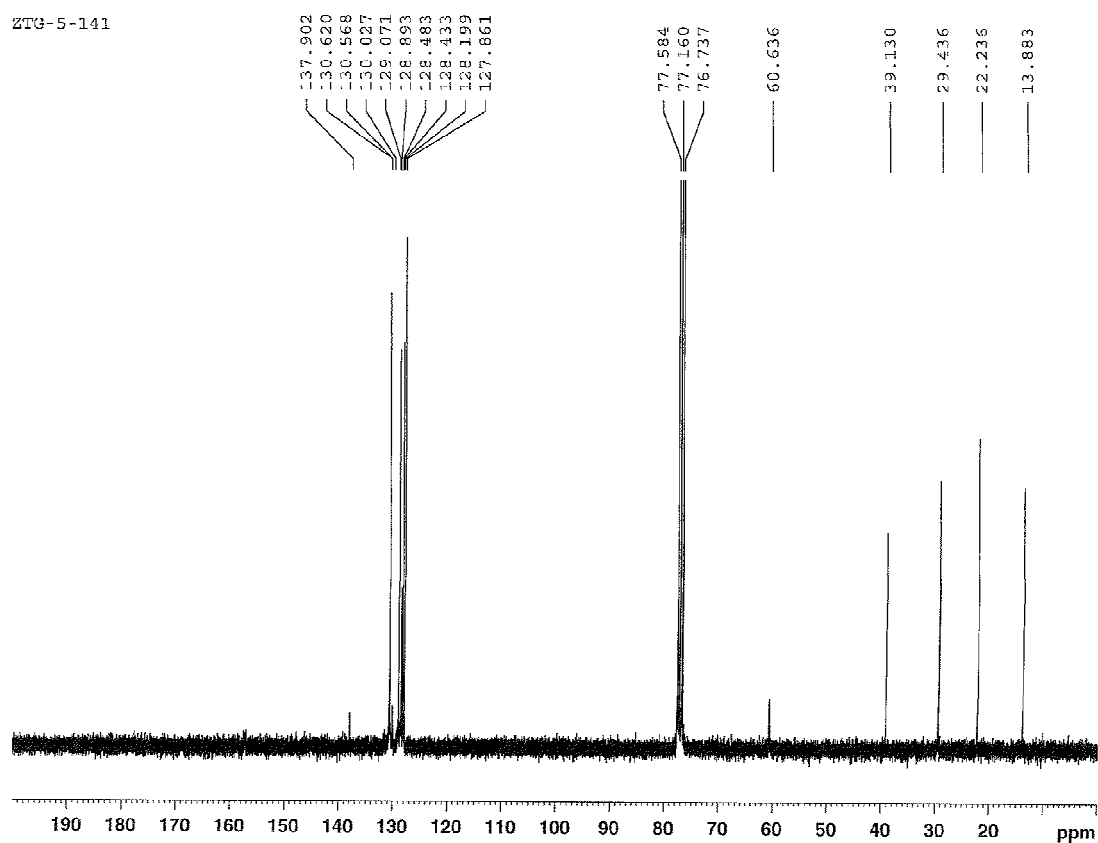
BP4-11-A



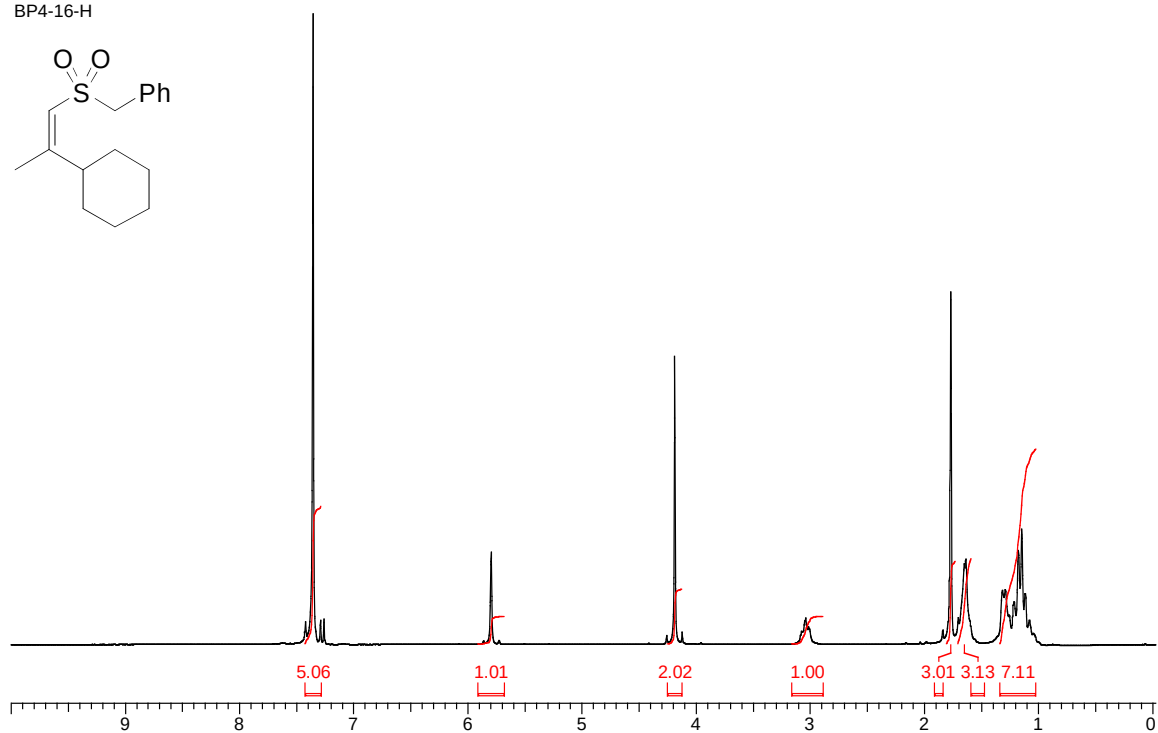
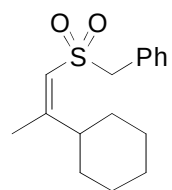
ZTG-5-141



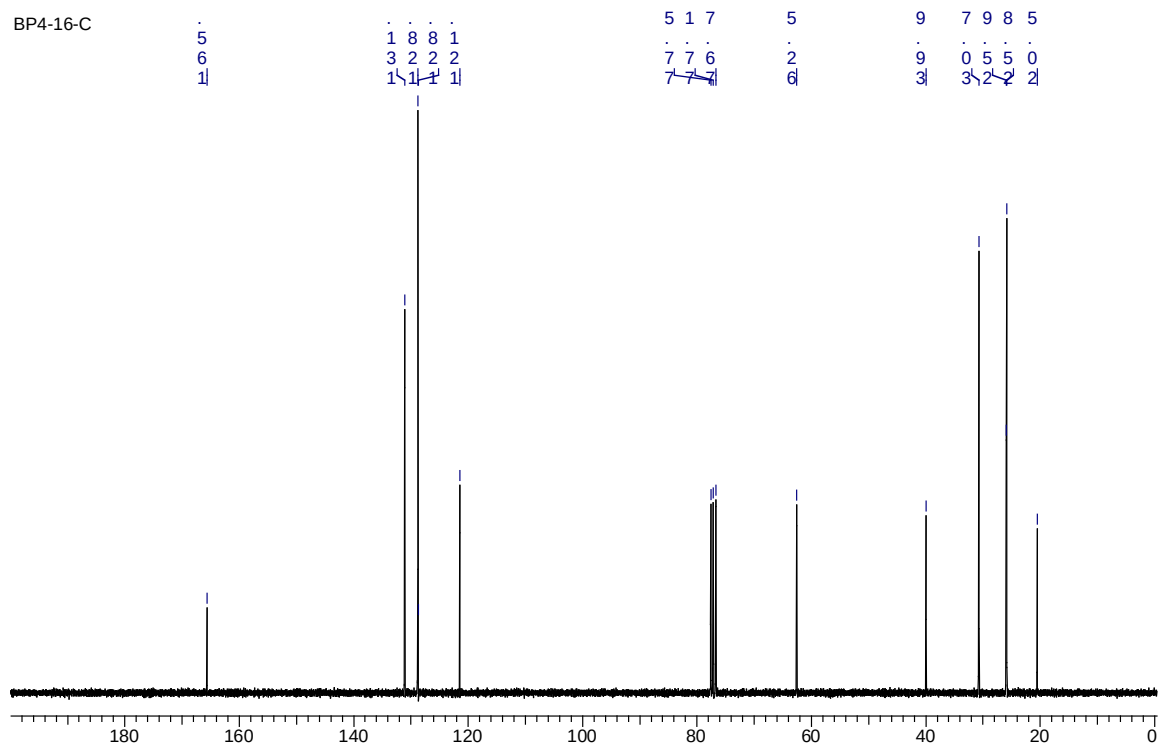
ZTG-5-141



BP4-16-H



BP4-16-C



BP4-16A-H

c1ccccc1C(=C(c2ccccc2)S(=O)(=O)Cc3ccccc3)C4CCCCC4

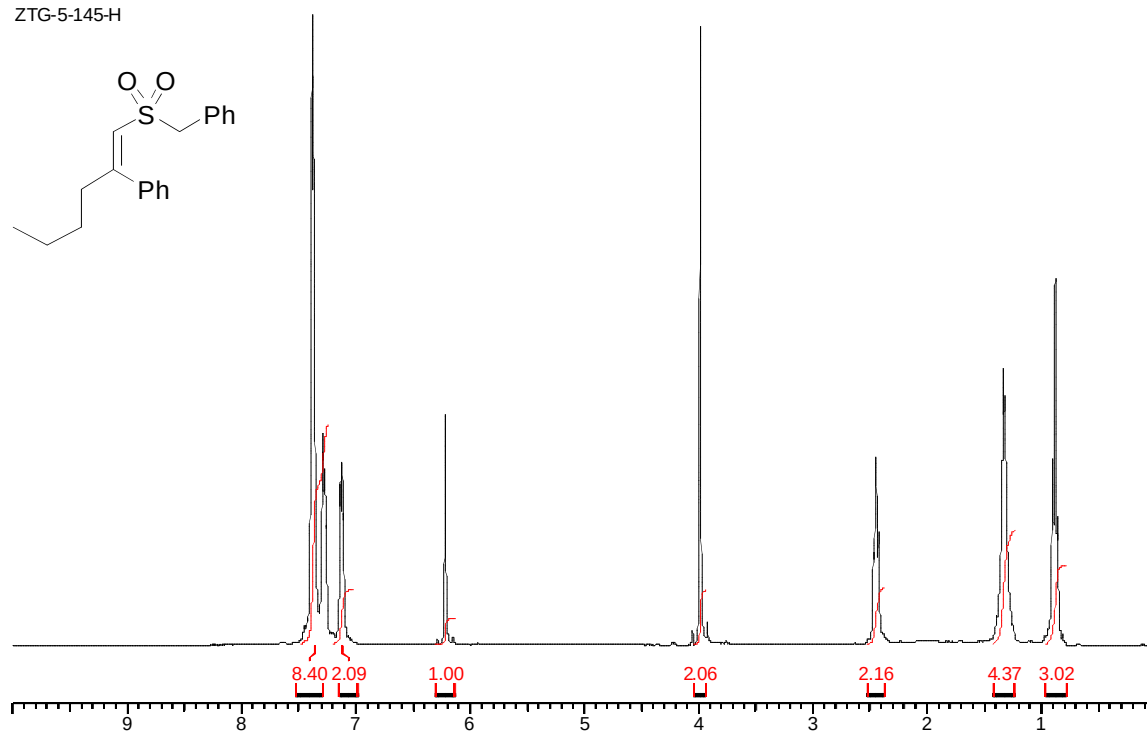
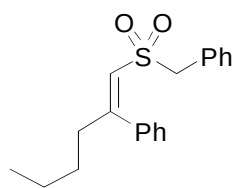
5.12 3.10 2.07 1.00 2.15 1.06 3.36 2.21 2.23 3.12

BP4-16A-C

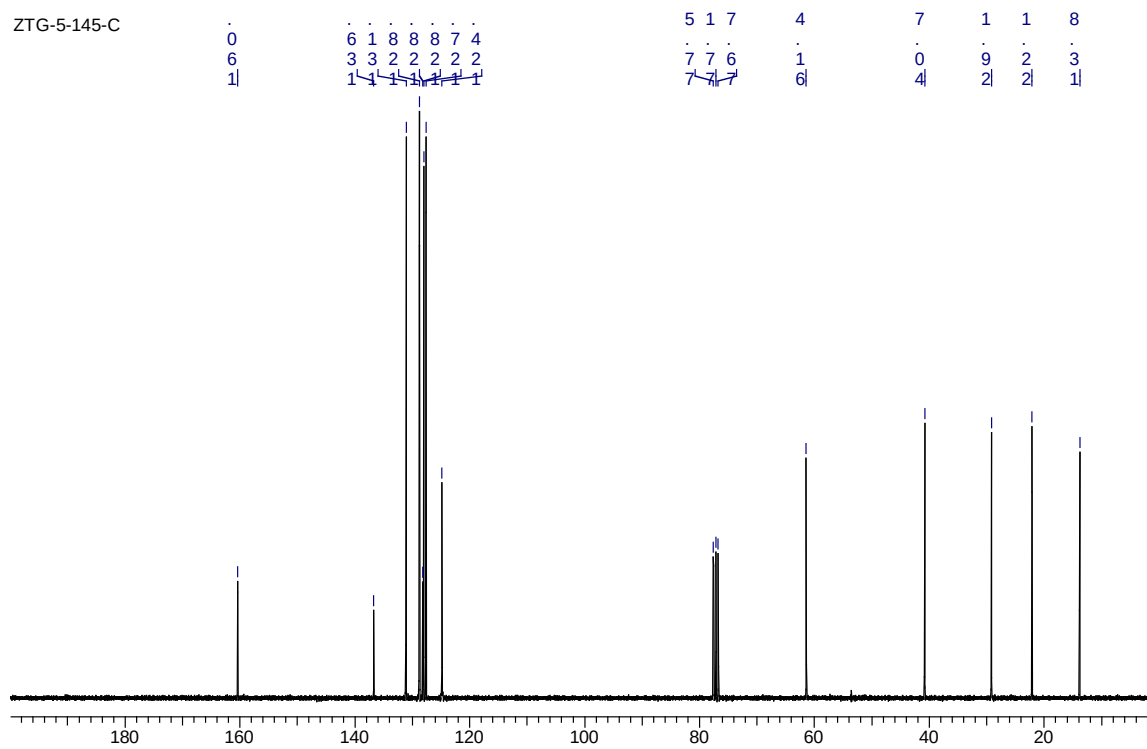
Mass spectrum showing relative intensity (0 to 100) versus m/z (180 to 0). The spectrum displays several peaks, with the base peak at m/z 129. Other labeled peaks include m/z 170, 141, 77, 61, 41, 31, and 29.

m/z	Relative Intensity (%)
170	~10
141	~10
129	100
127	~10
77	~10
61	~10
41	~10
31	~10
29	~10

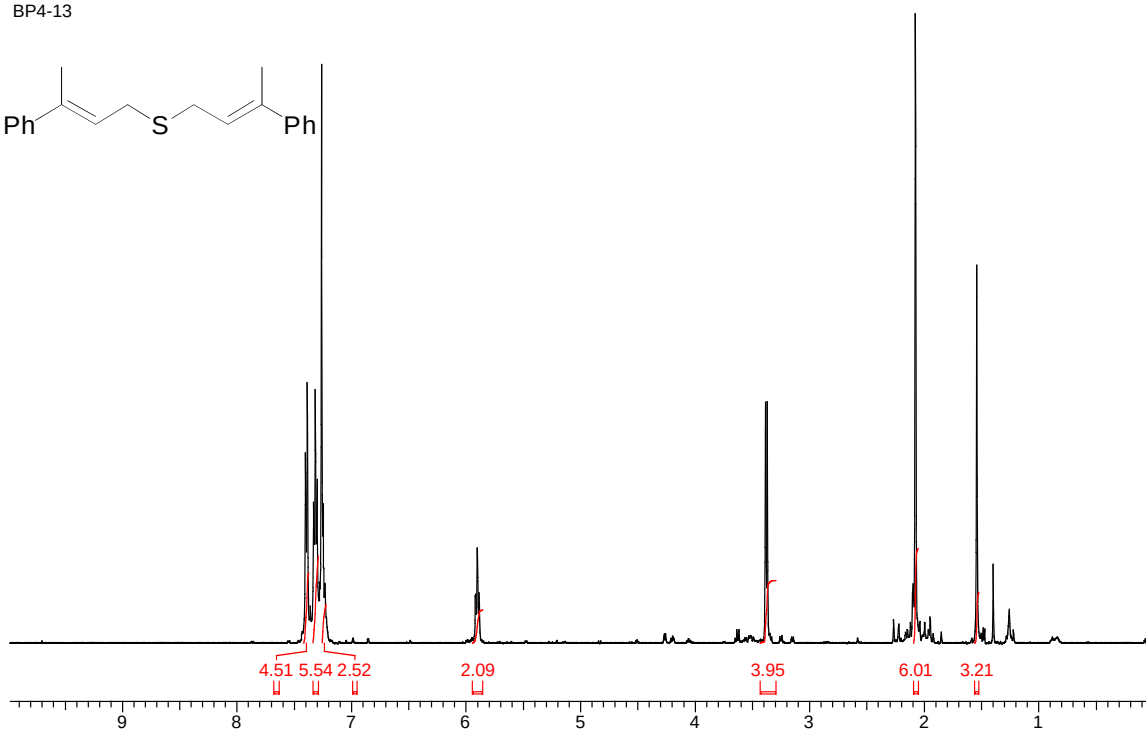
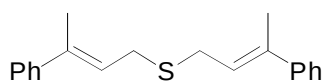
ZTG-5-145-H



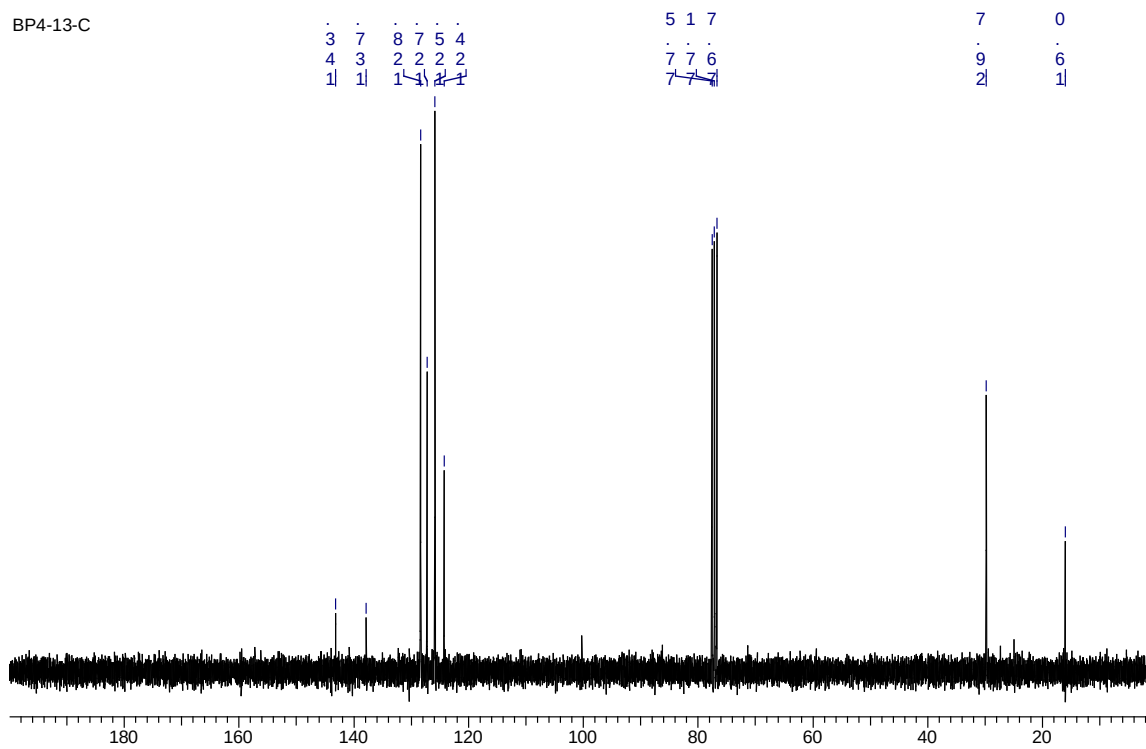
ZTG-5-145-C



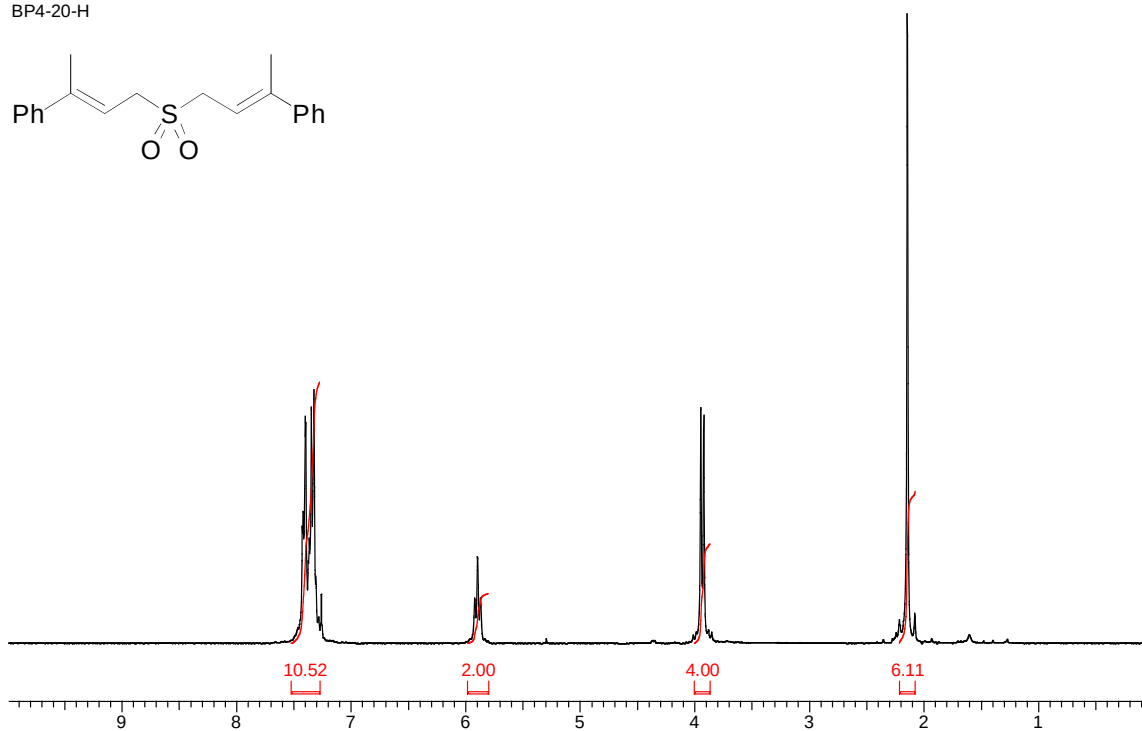
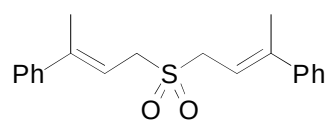
BP4-13



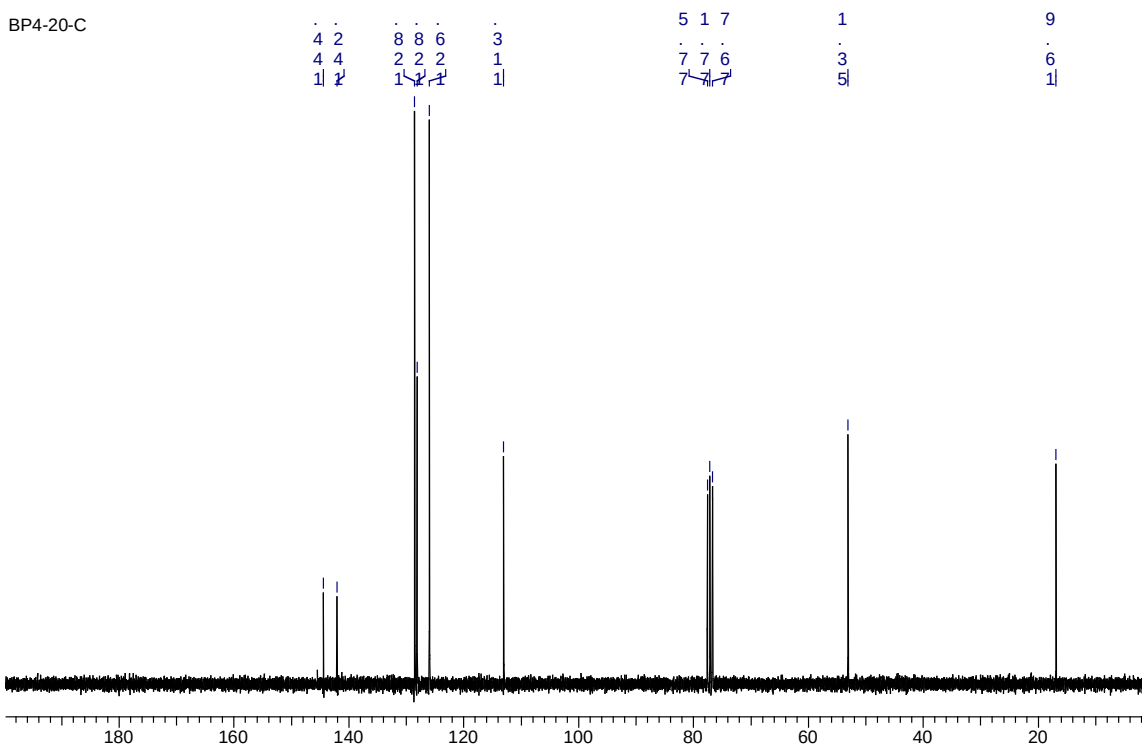
BP4-13-C



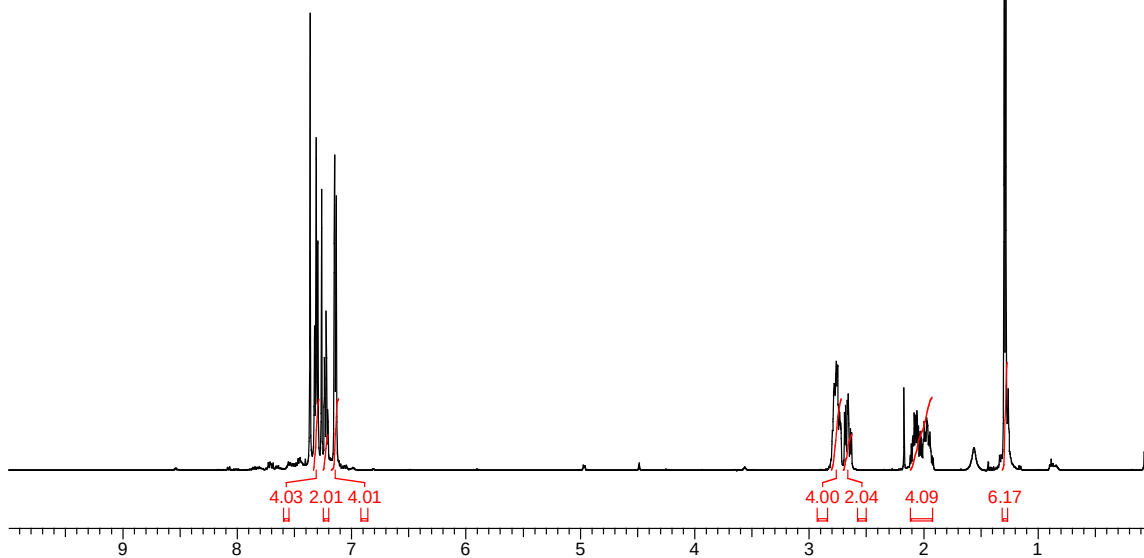
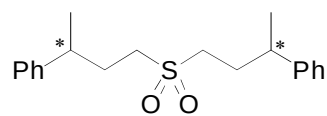
BP4-20-H



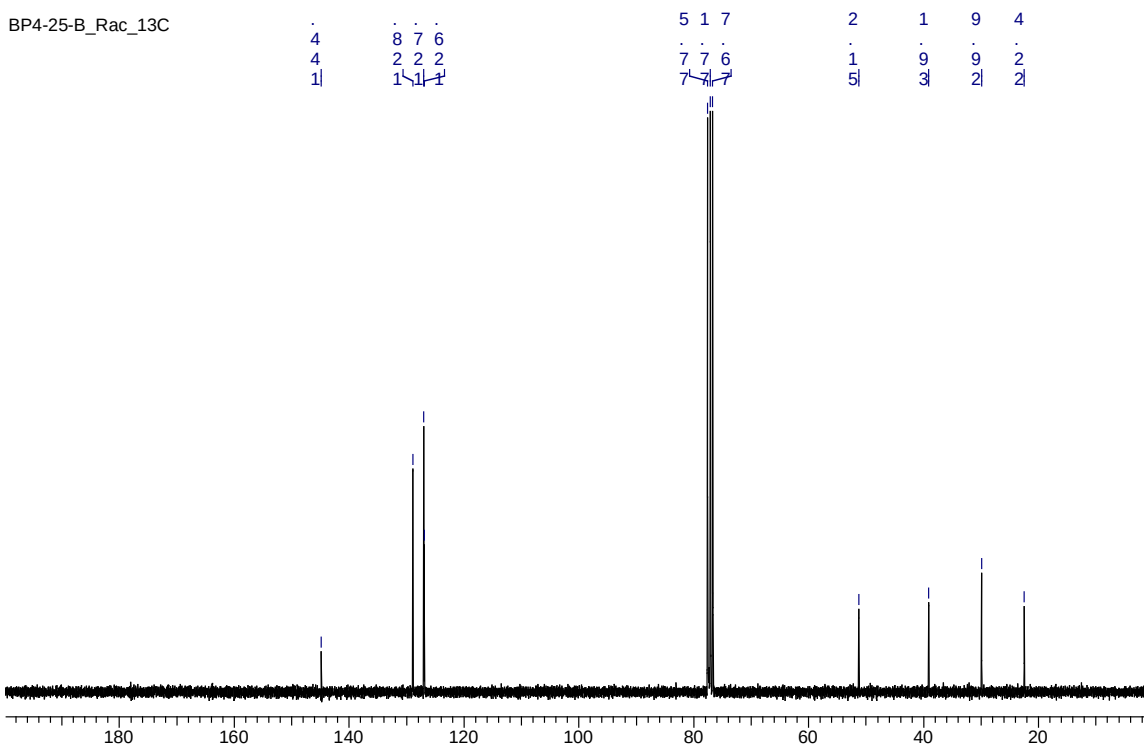
BP4-20-C



BP4-25-B-Rac



BP4-25-B_Rac_13C



AC-2-763_1H.esp

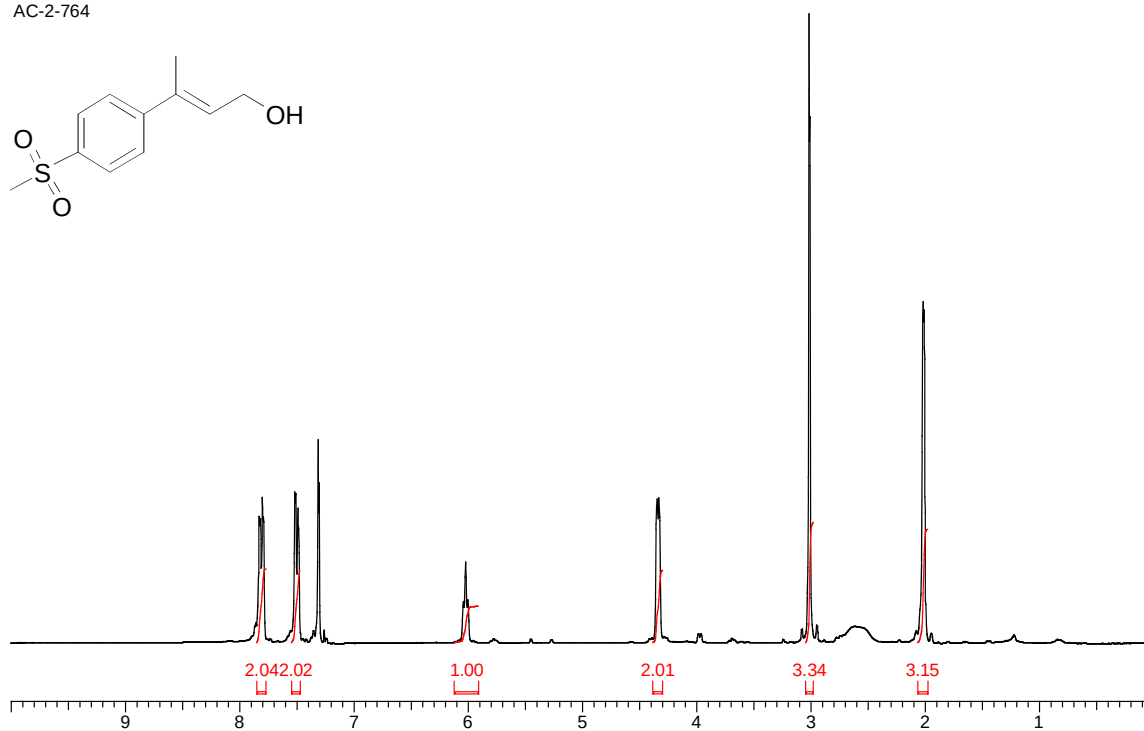
CC(=C(C)C(=O)OCC)c1ccc(cc1)S(=O)(=O)C

1H NMR spectrum (400 MHz, CDCl₃) showing peaks at approximately 8.0, 7.7, 7.5, 6.1, 4.7, 3.1, 2.4, and 1.4 ppm. Integration values are provided below the baseline: 2.13, 2.00, 0.91, 2.00, 3.30, 2.99, and 3.22.

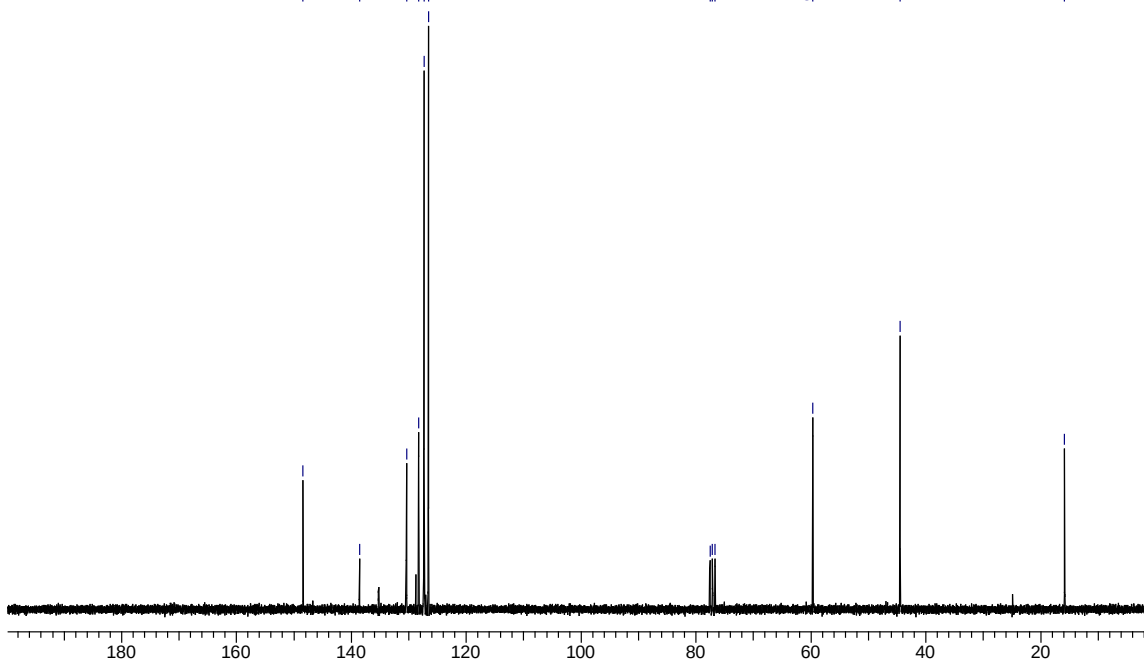
AC-2-763_13C.esp

13C NMR spectrum (CDCl₃) of compound 13c. The x-axis represents the chemical shift in ppm, ranging from 0 to 180. The spectrum shows several peaks with their corresponding integrations:

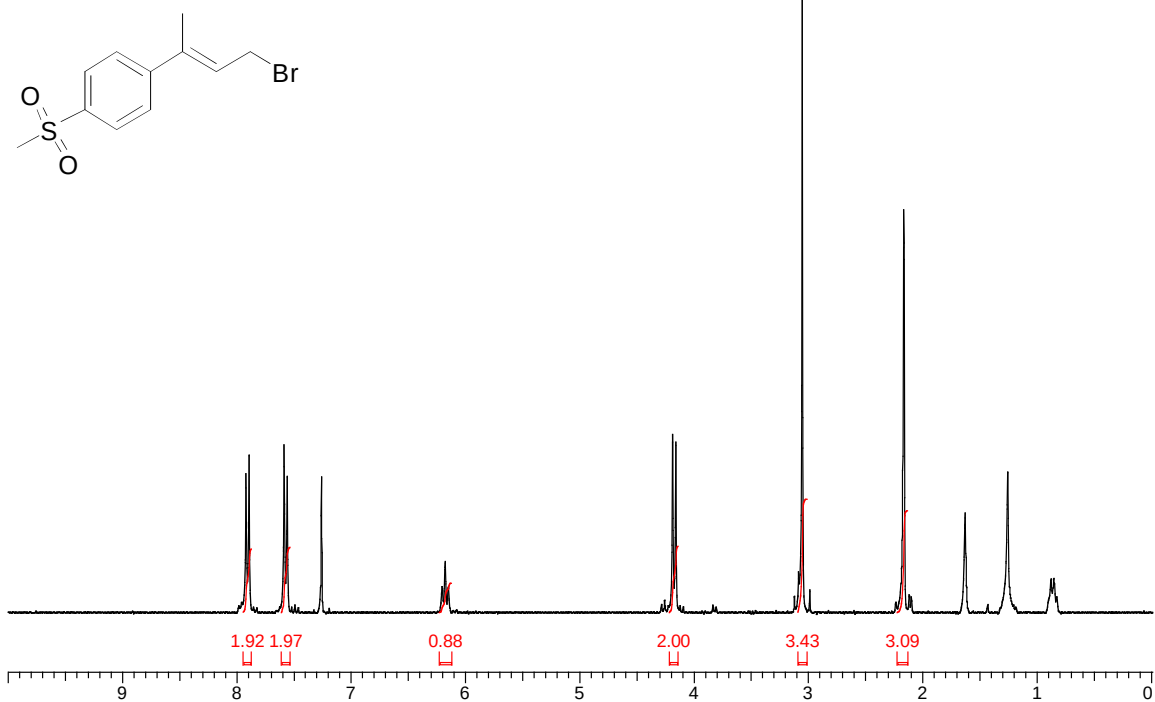
Chemical Shift (ppm)	Integration
~168	6
~155	3
~152	7
~145	0
~142	4
~128	8
~126	7
~124	7
~122	9
~120	2
~118	2
~116	2
~114	1
~78	5
~76	1
~74	7
~60	3
~58	0
~48	6
~42	4
~22	0
~20	4
~12	1
~10	1

CC(=C)Cc1ccc(cc1)S(=O)(=O)C

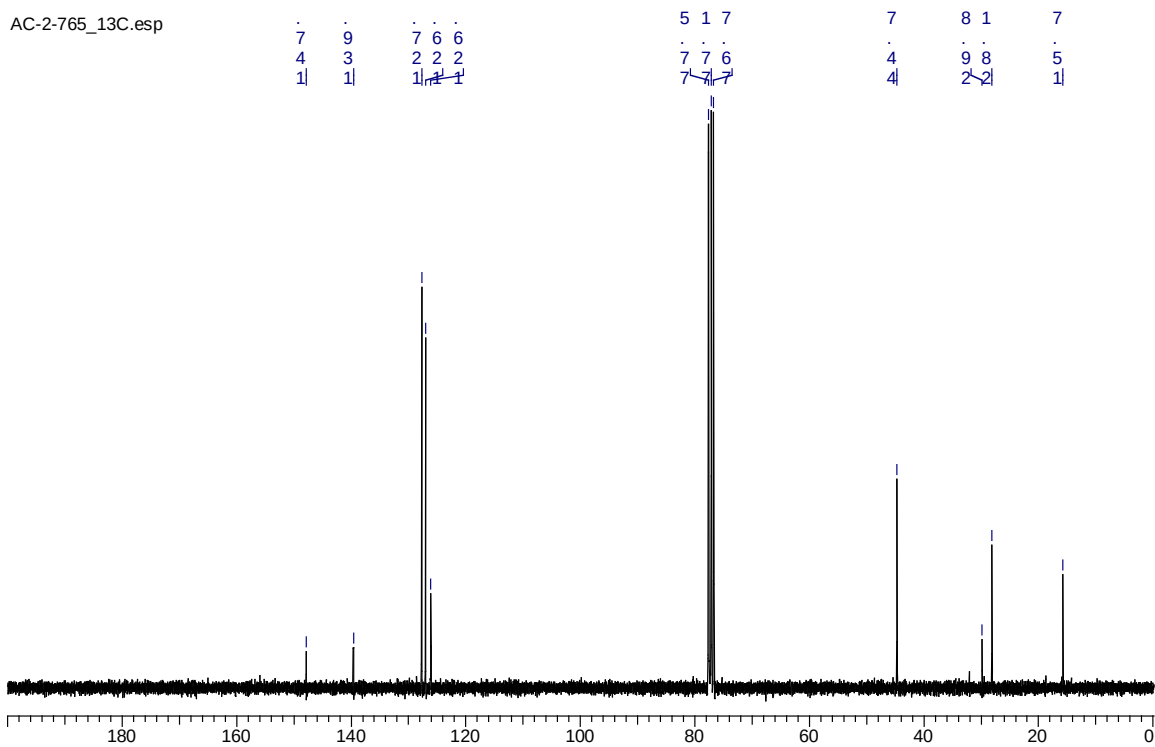
.	.	.	.	.	5	1	7	6	4	8
8	8	0	8	7	6	.	.	.	.	.
4	3	3	2	2	2	7	7	6	9	5
1	1	1	1	1	1	7	7	7	5	4



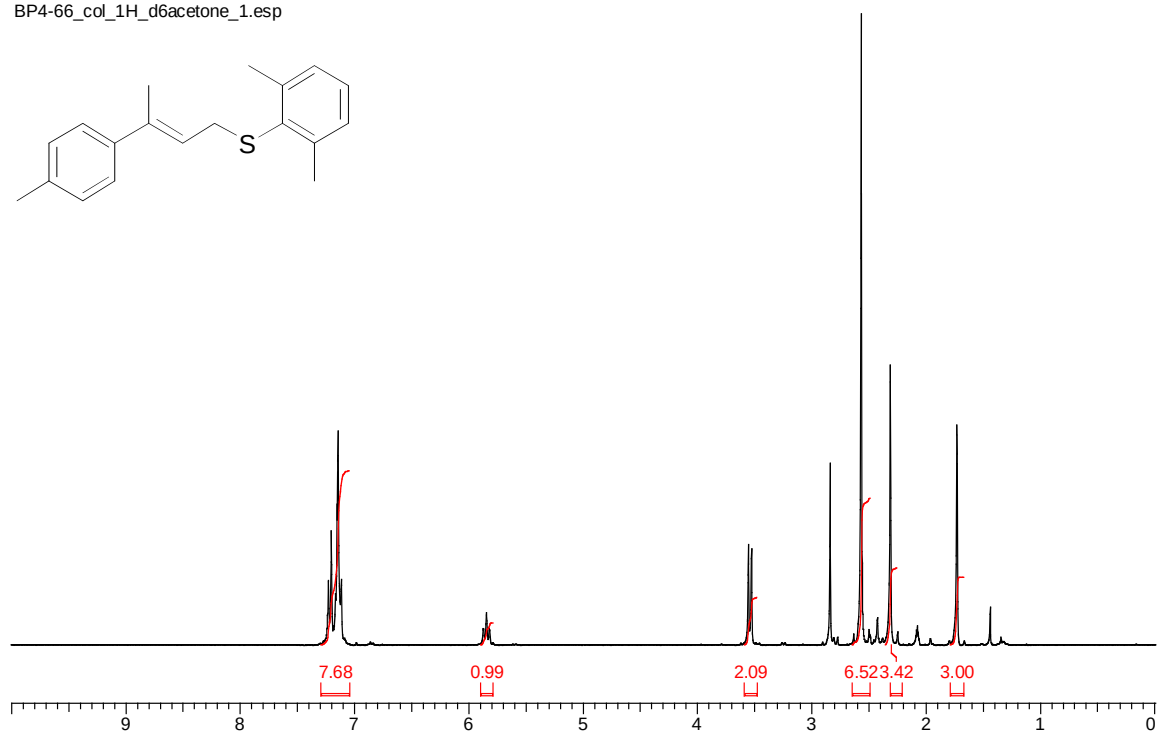
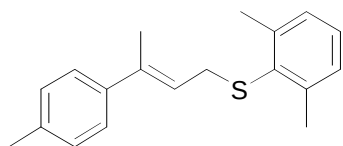
AC-2-765_1H.esp



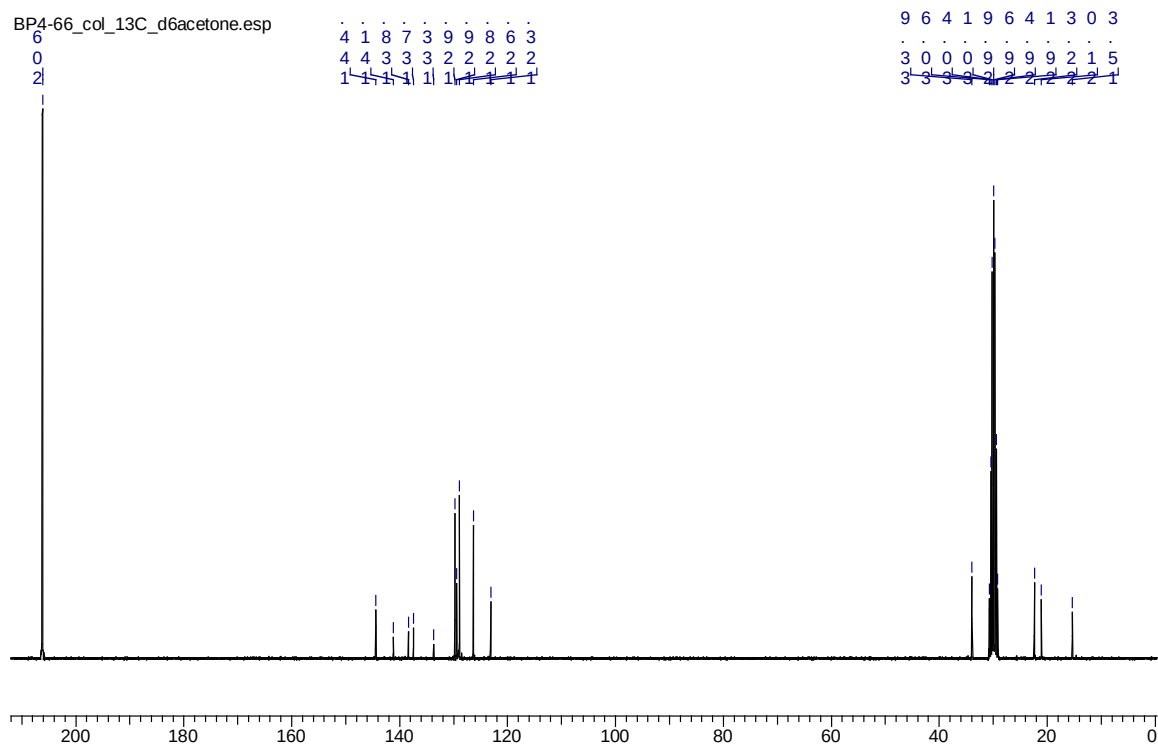
AC-2-765_13C.esp



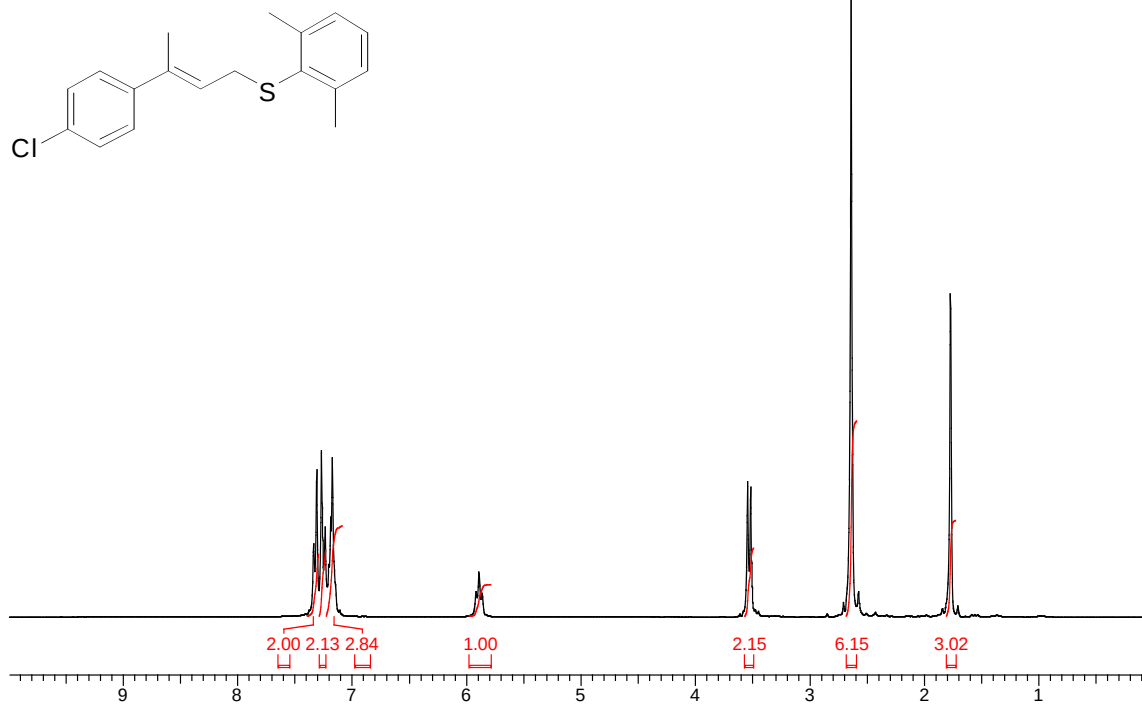
BP4-66_col_1H_d6acetone_1.esp



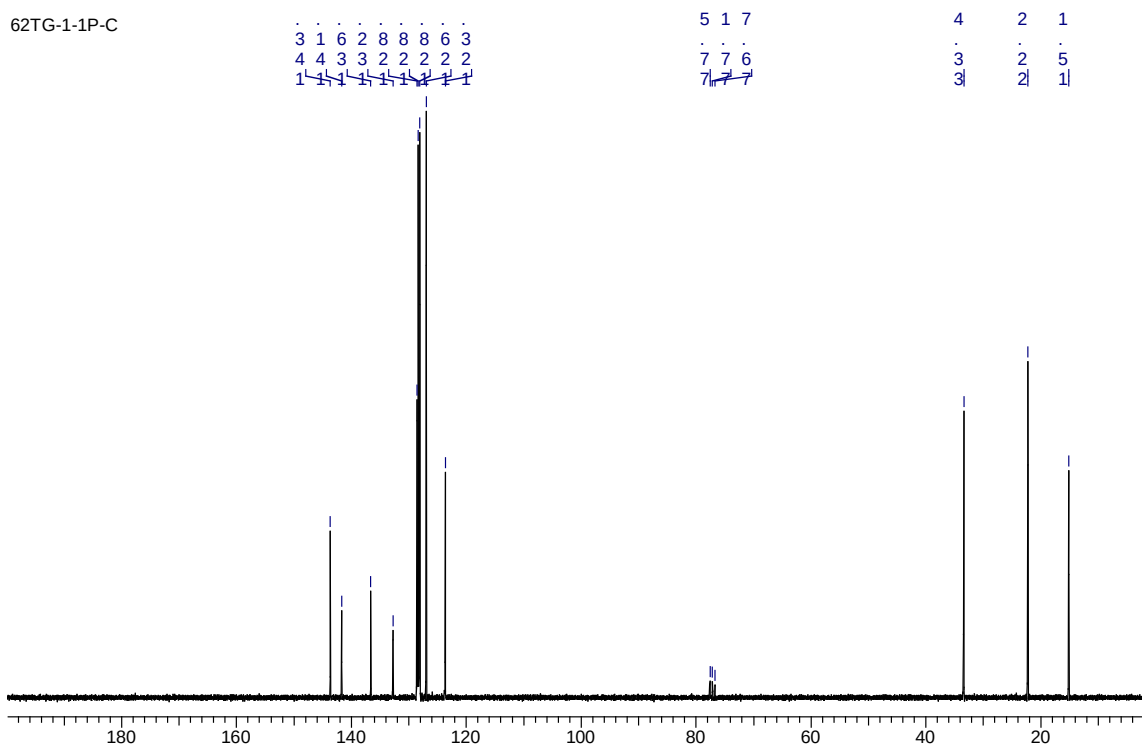
BP4-66_col_13C_d6acetone.esp



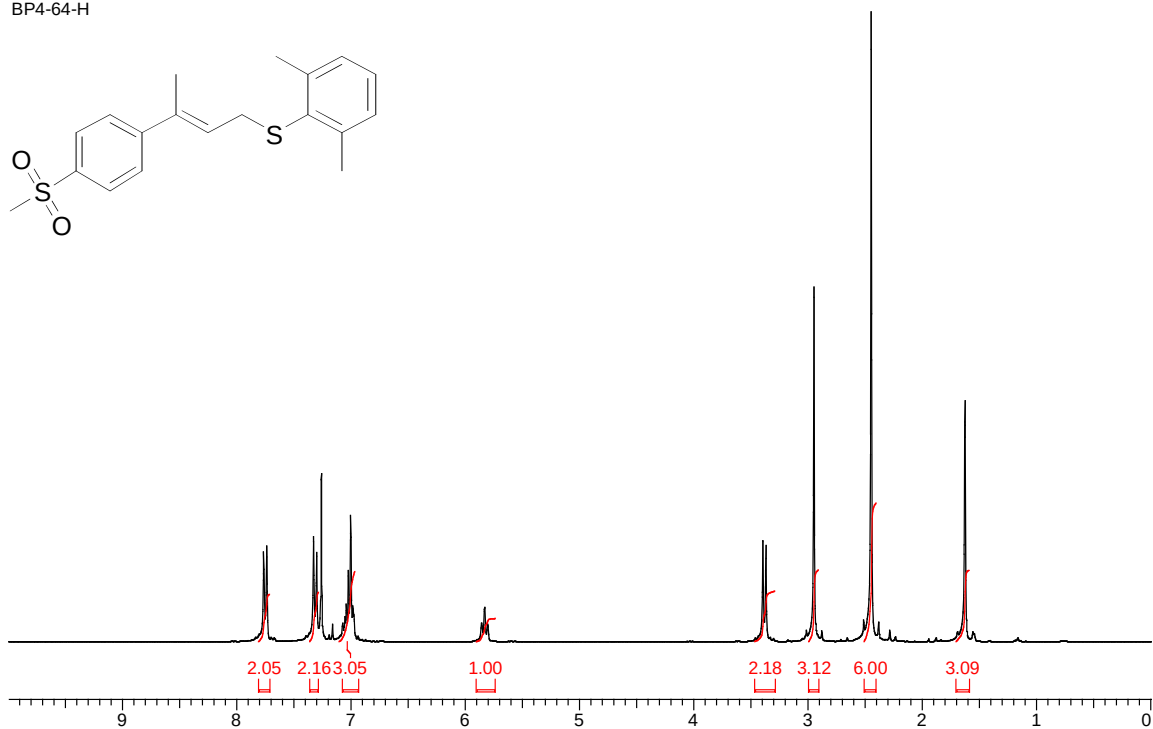
62TG-1-1P-H



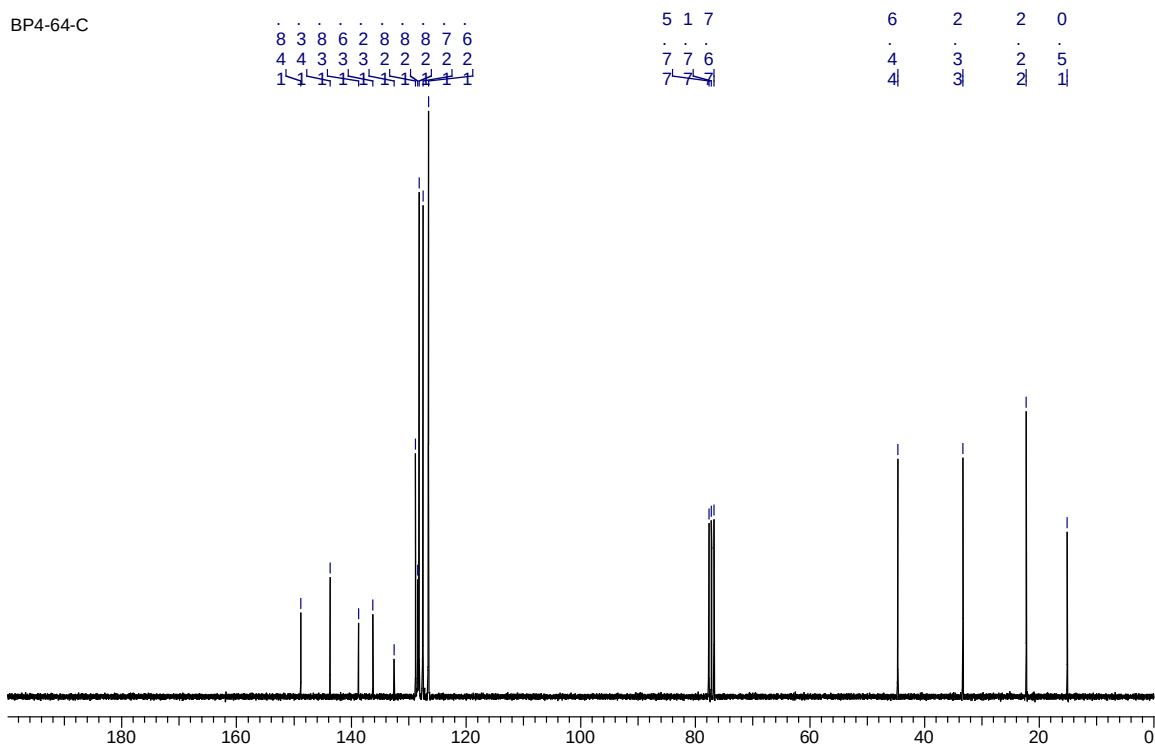
62TG-1-1P-C

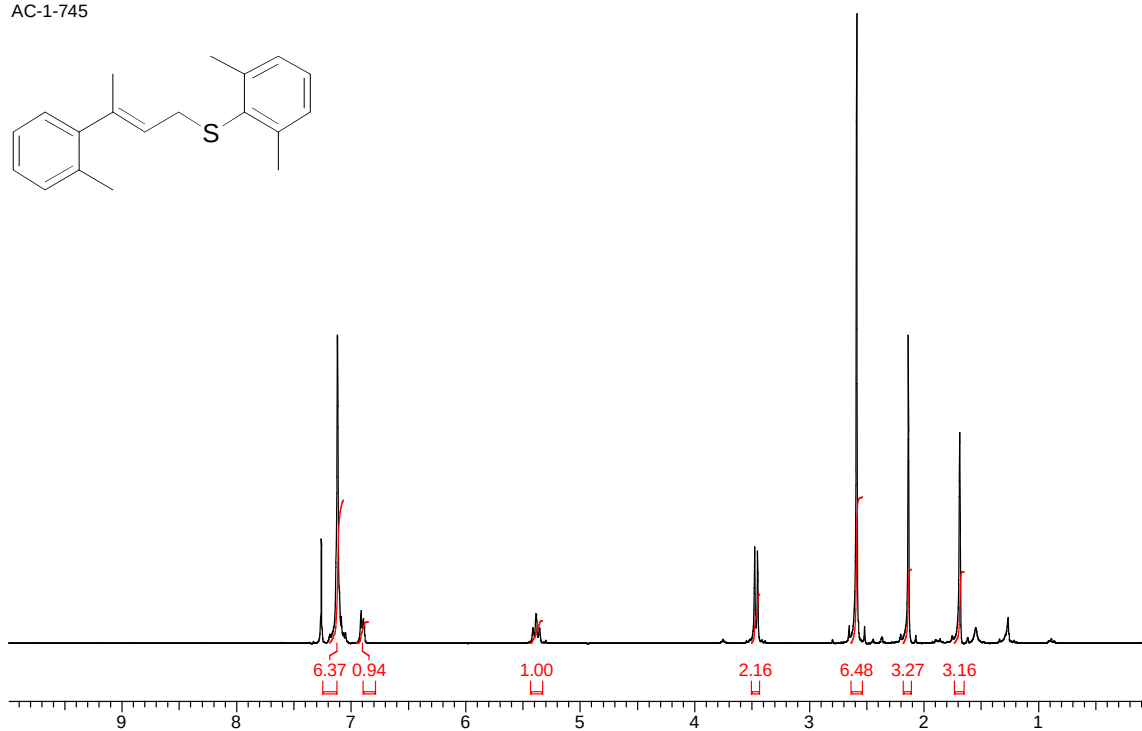


BP4-64-H



BP4-64-C

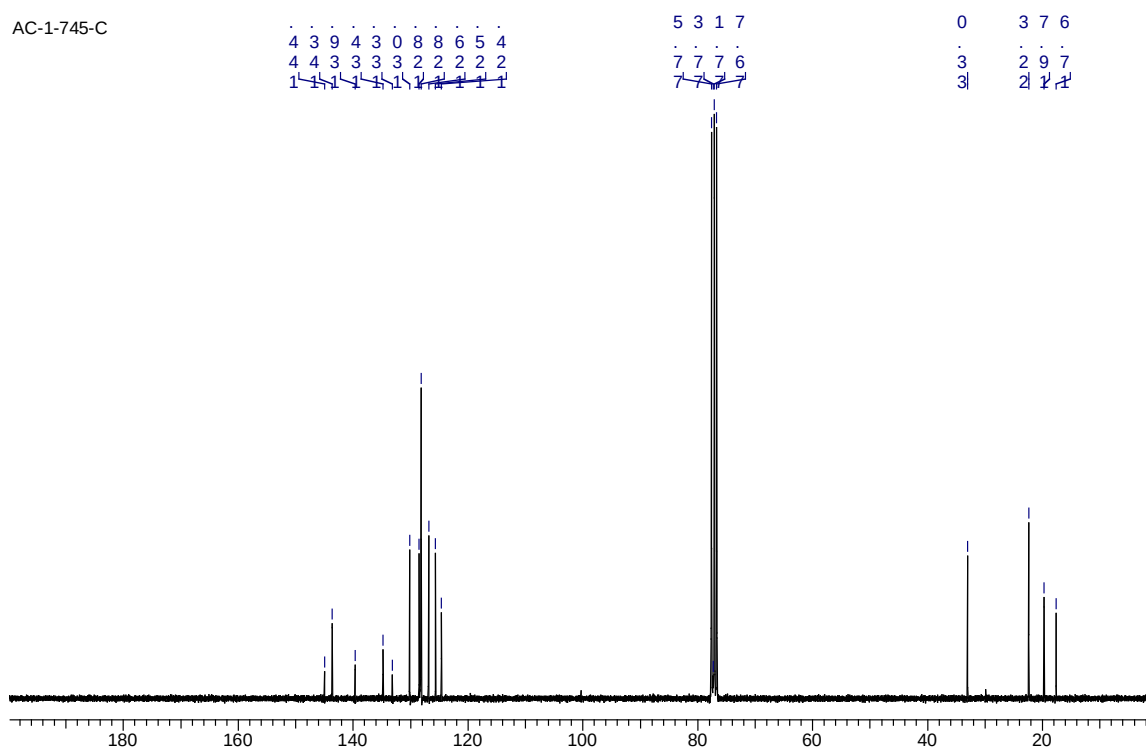




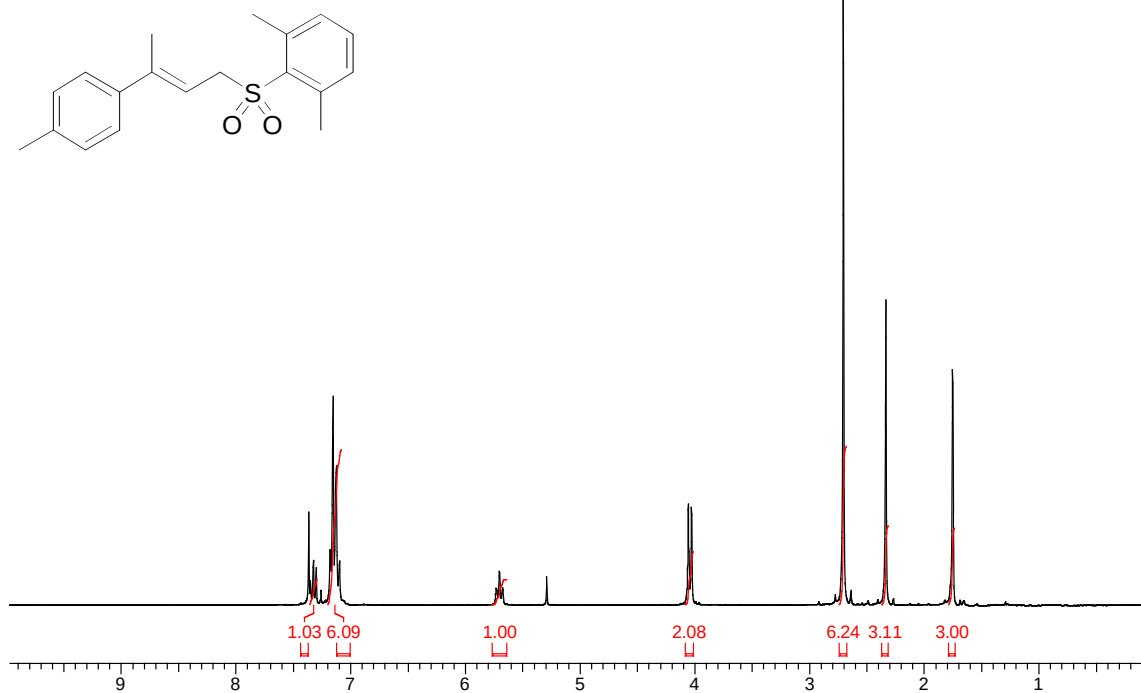
4 3 9 4 3 0 8 6 5 4
4 4 3 3 3 3 2 2 2 2
1 1 1 1 1 1 1 1 1 1

$$\begin{array}{cccc} 5 & 3 & 1 & 7 \\ \cdot & \cdot & \cdot & \cdot \\ 7 & 7 & 7 & 6 \\ \hline 7 & 7 & 7 & 7 \end{array}$$

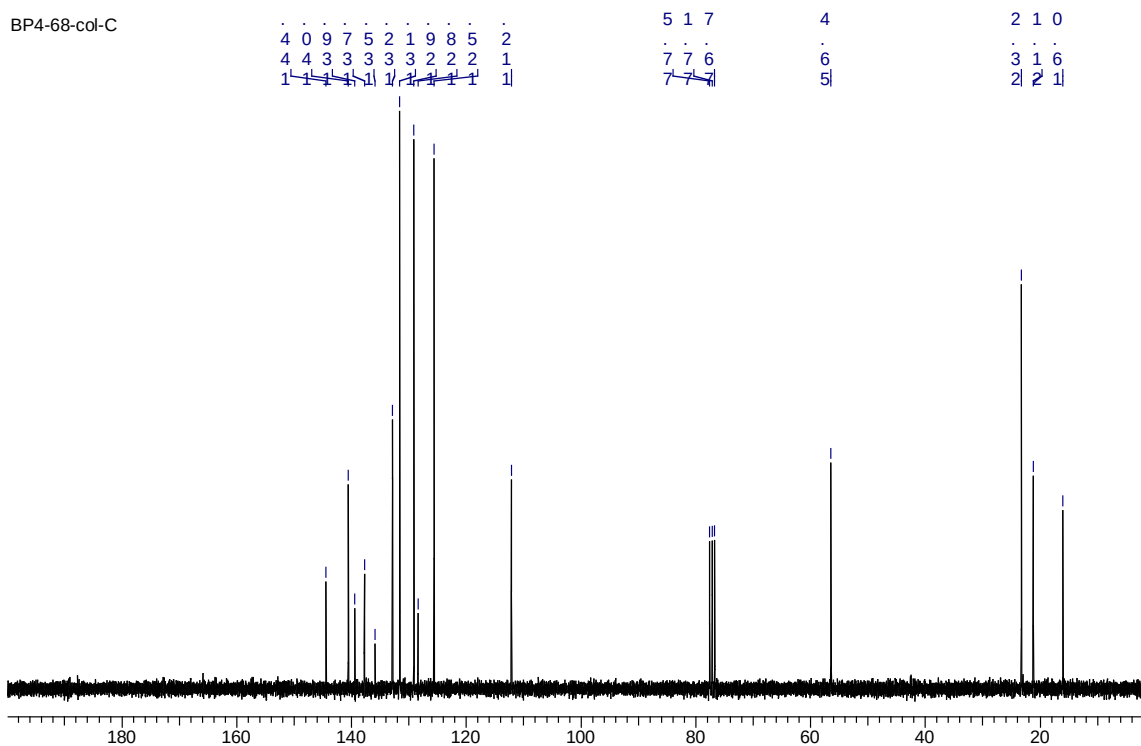
0	3	7	6
.	.	.	.
3	2	9	7
3	2	1	1



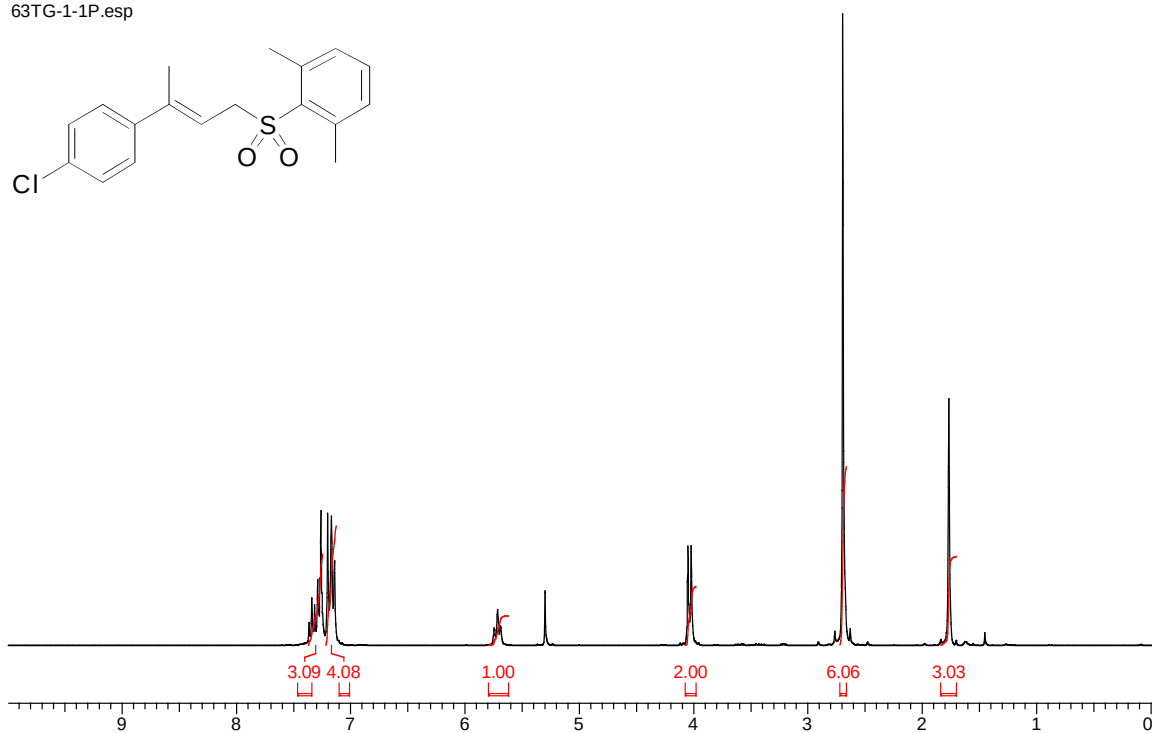
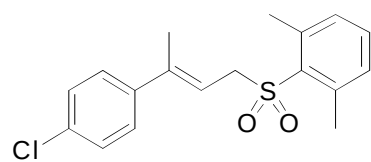
BP4-68-col-H



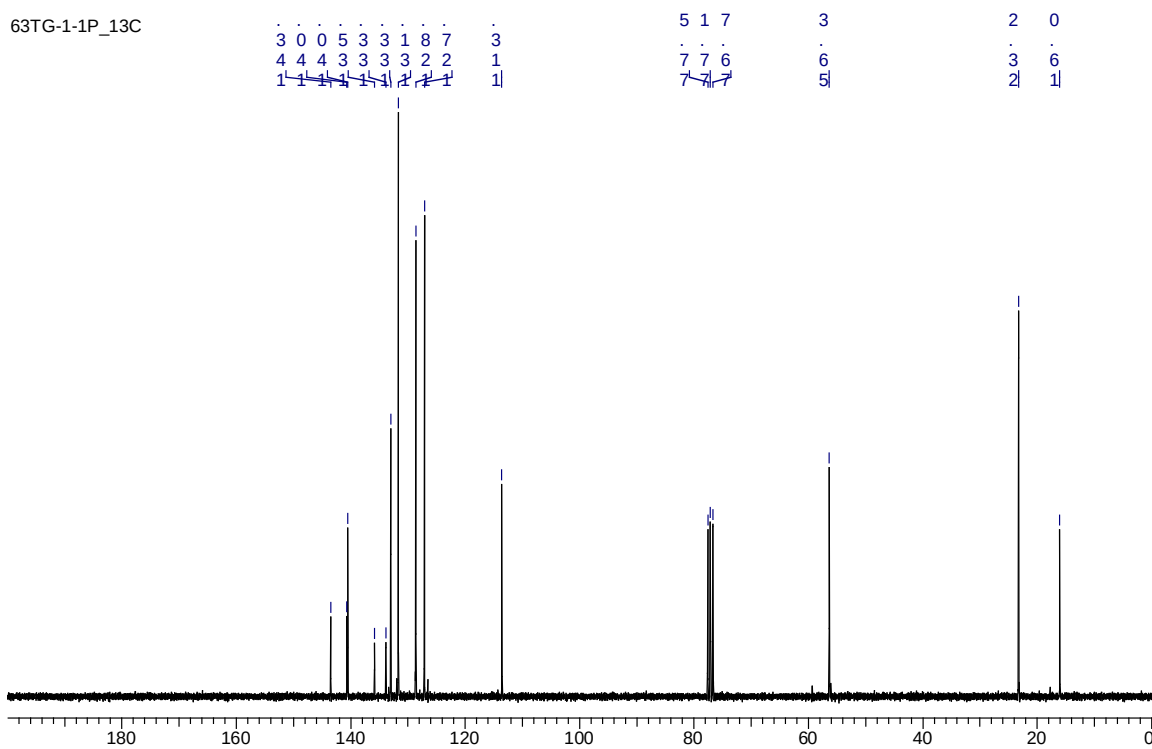
BP4-68-col-C



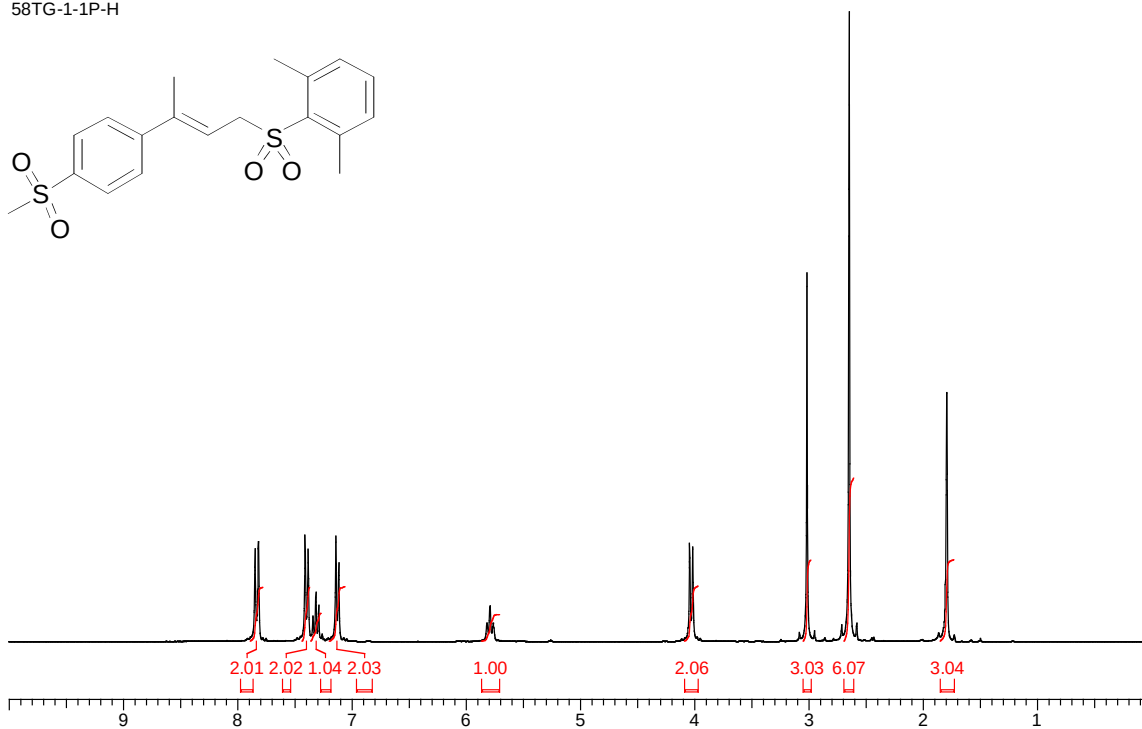
63TG-1-1P.esp



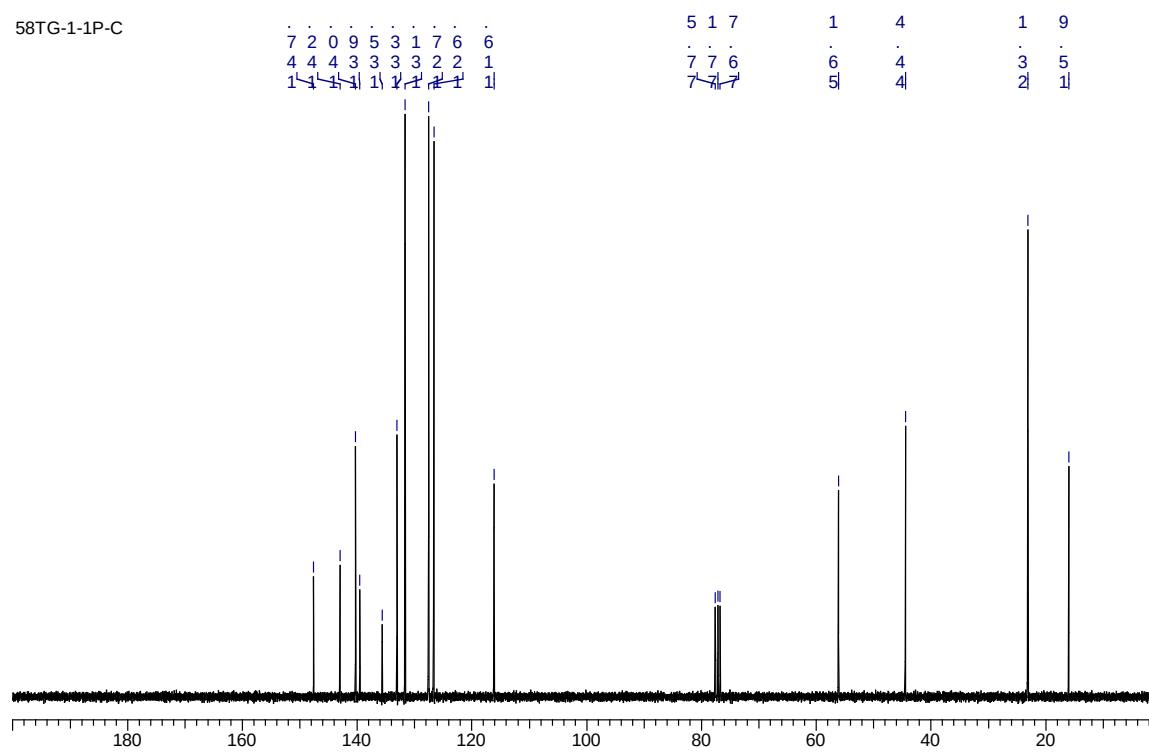
63TG-1-1P_13C



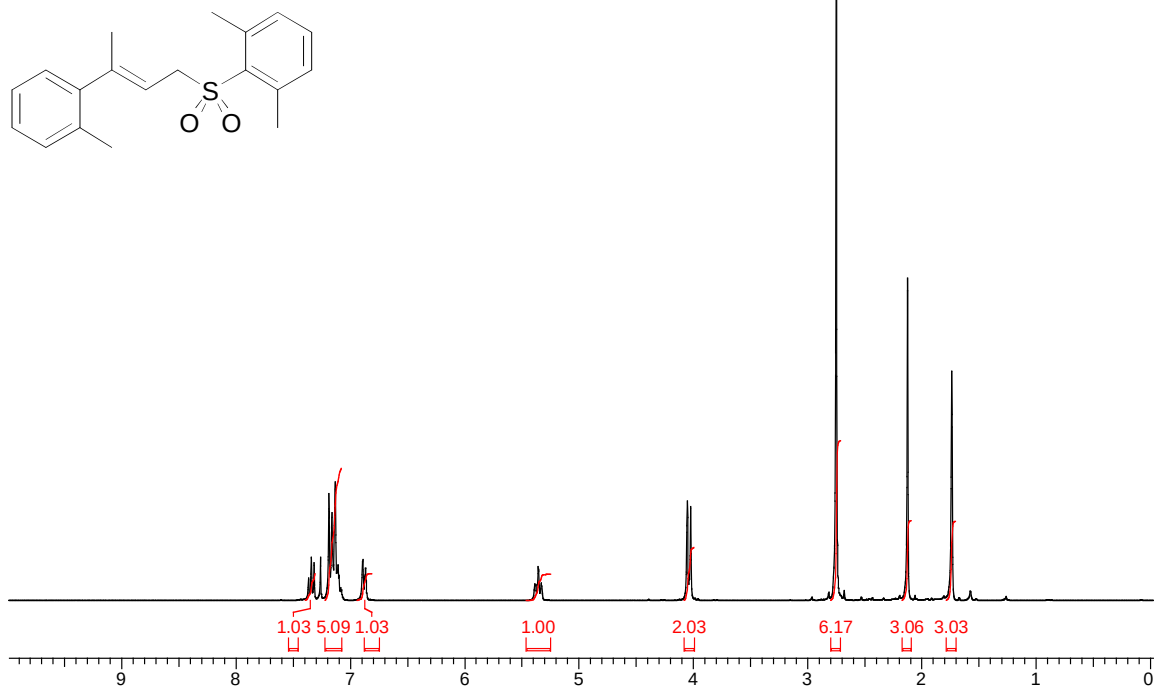
58TG-1-1P-H



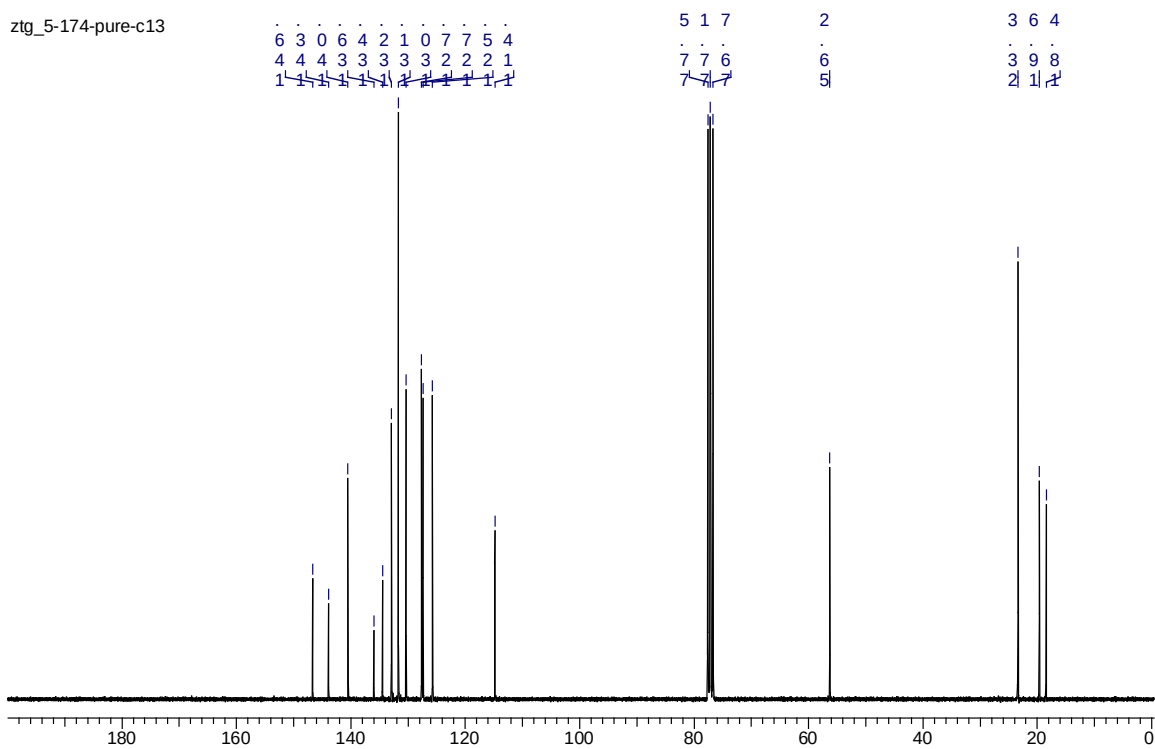
58TG-1-1P-C



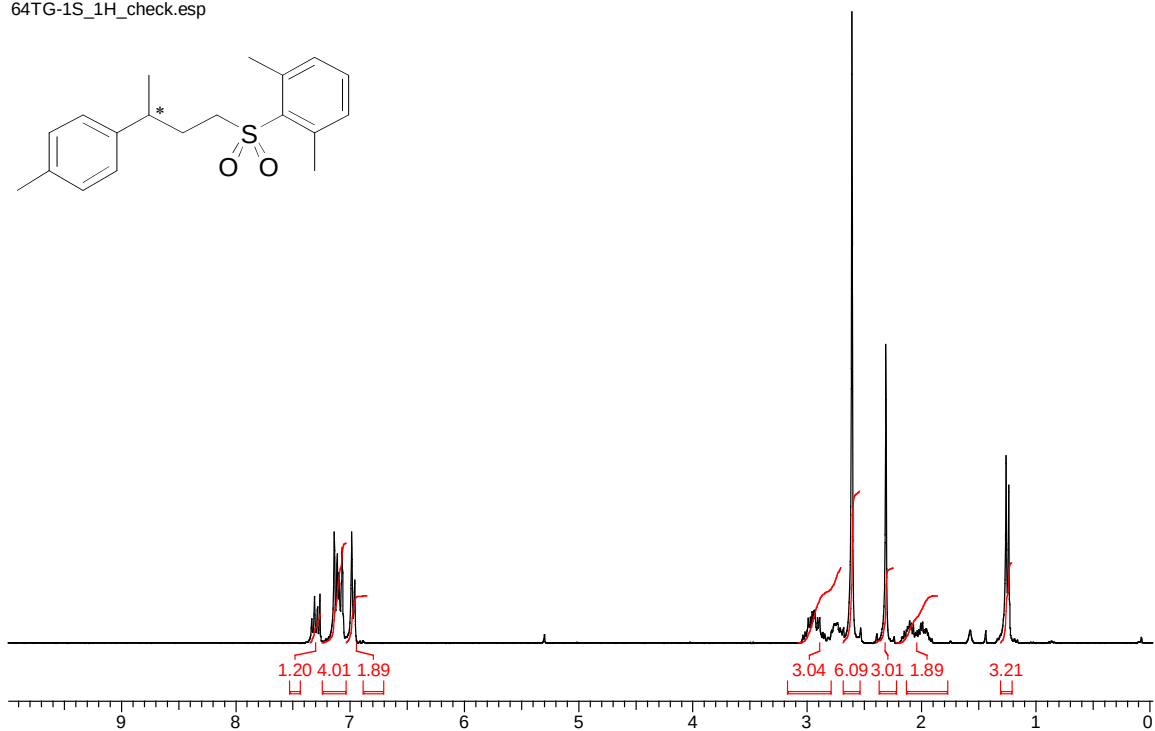
ztg_5-174-pure-h1



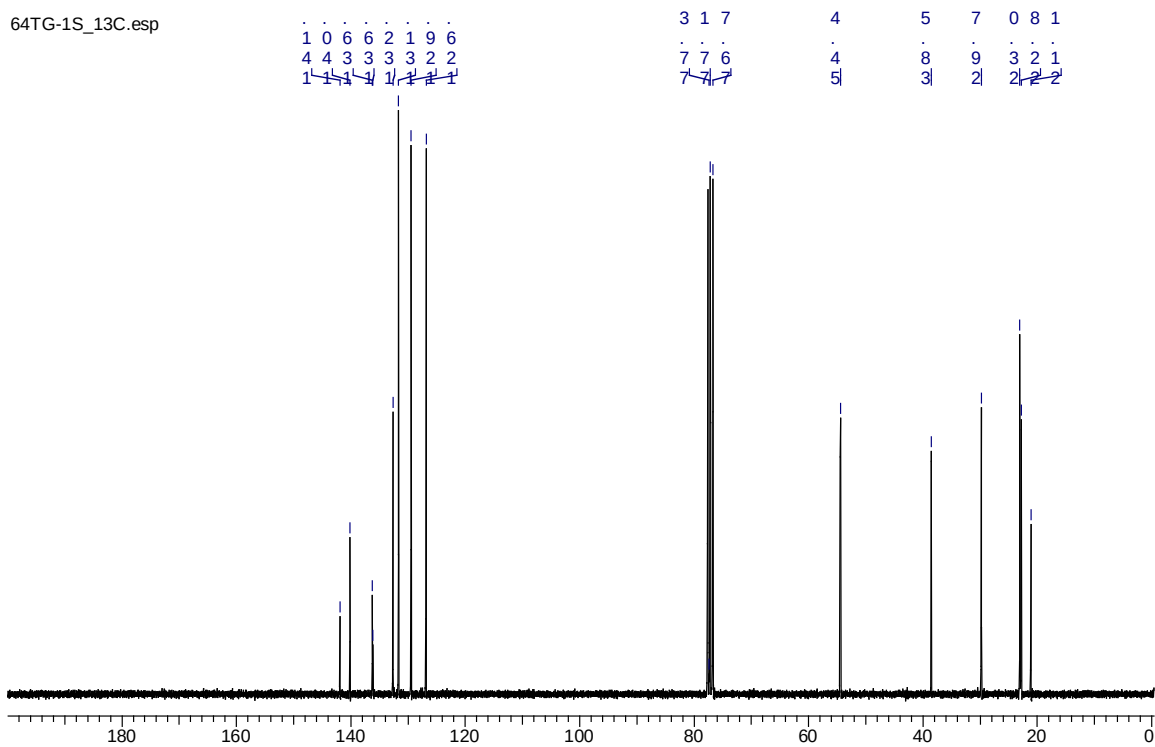
ztg_5-174-pure-c13



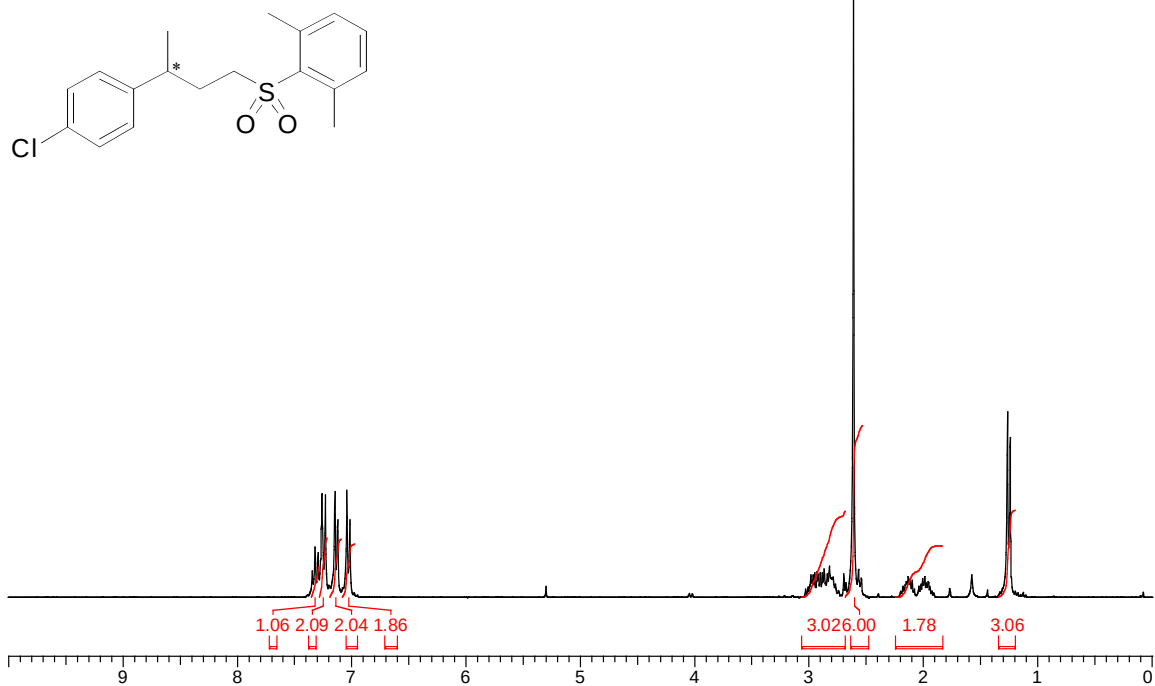
64TG-1S_1H_check.esp



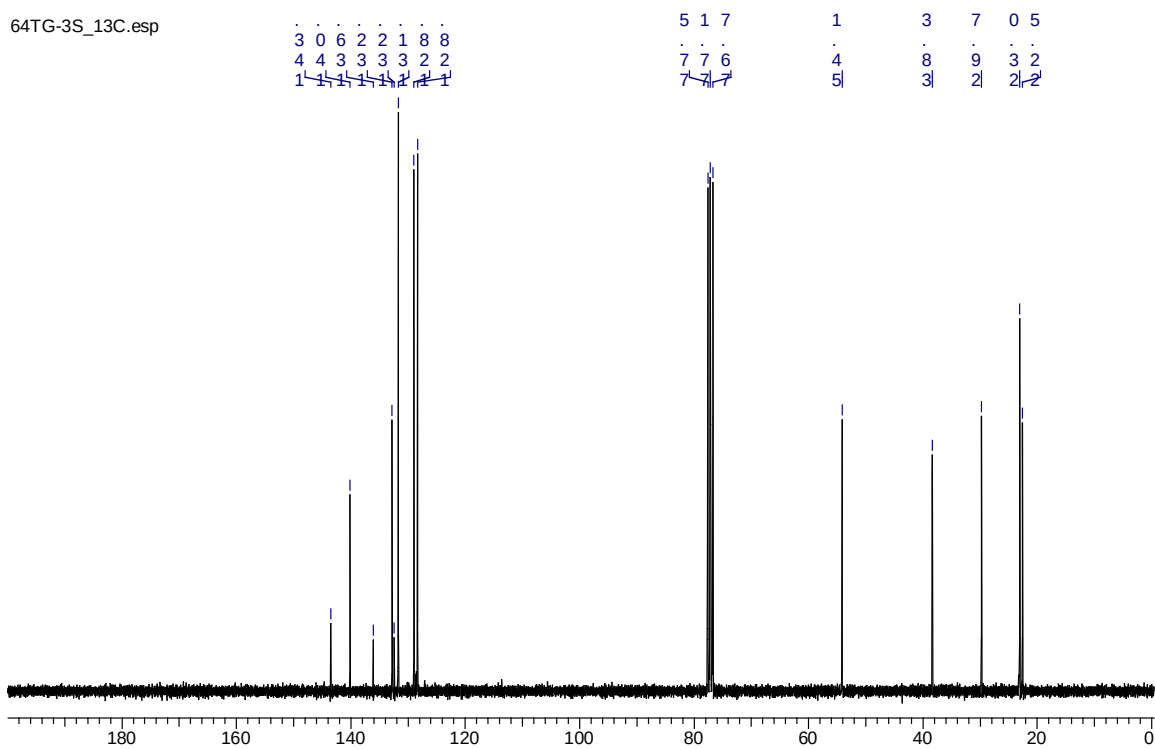
64TG-1S_13C.esp



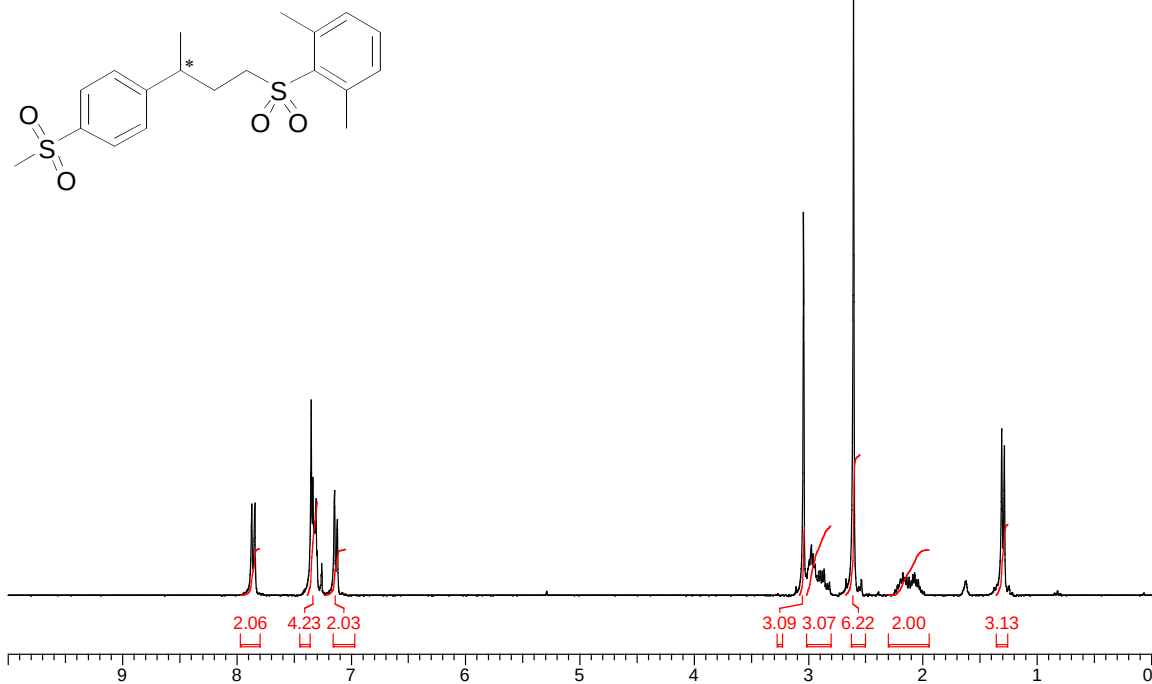
64TG-3S_1H_check.esp



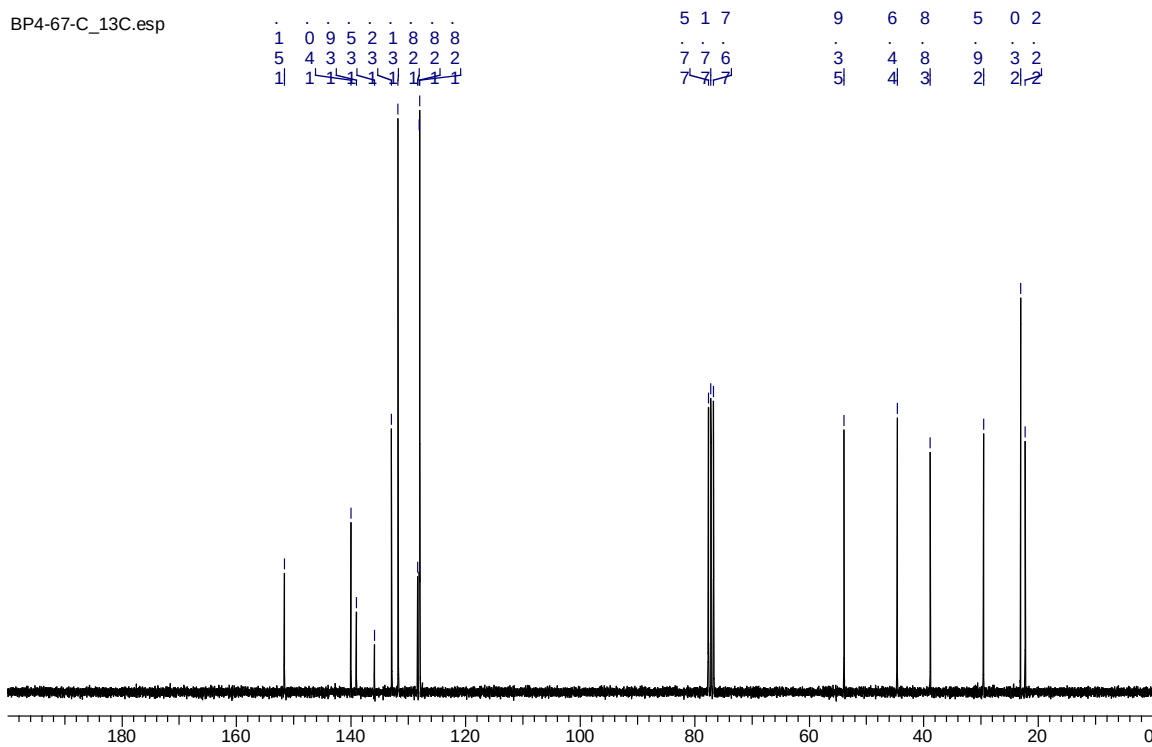
64TG-3S_13C.esp



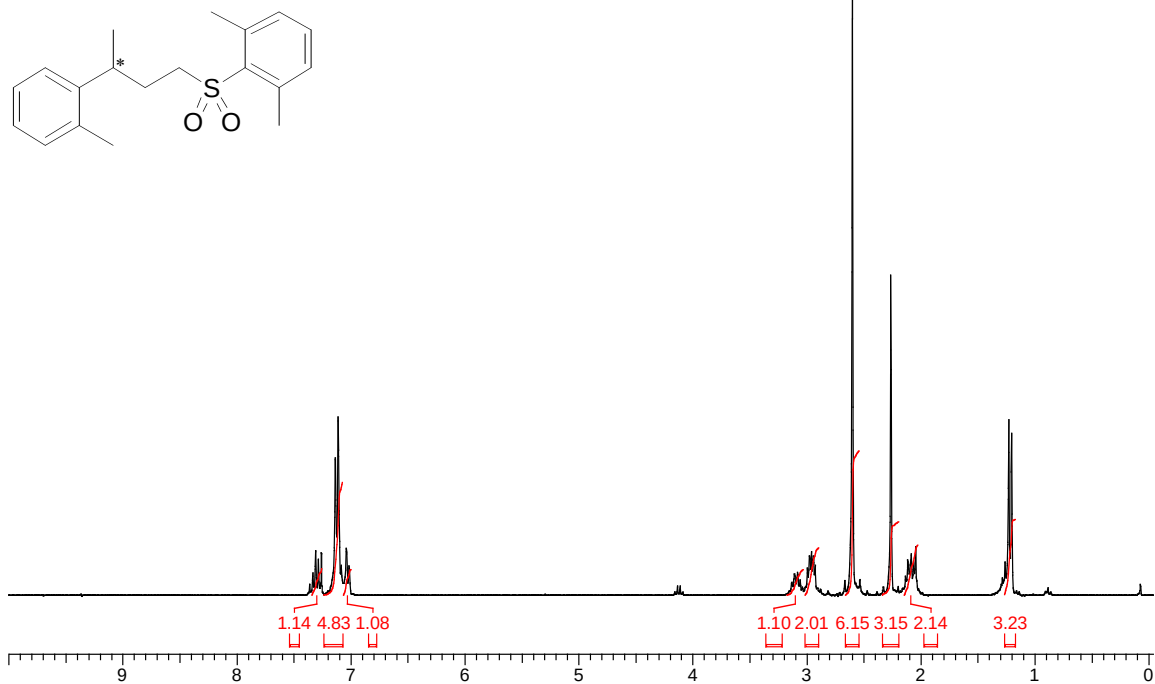
BP4-67-C_1H_check.esp



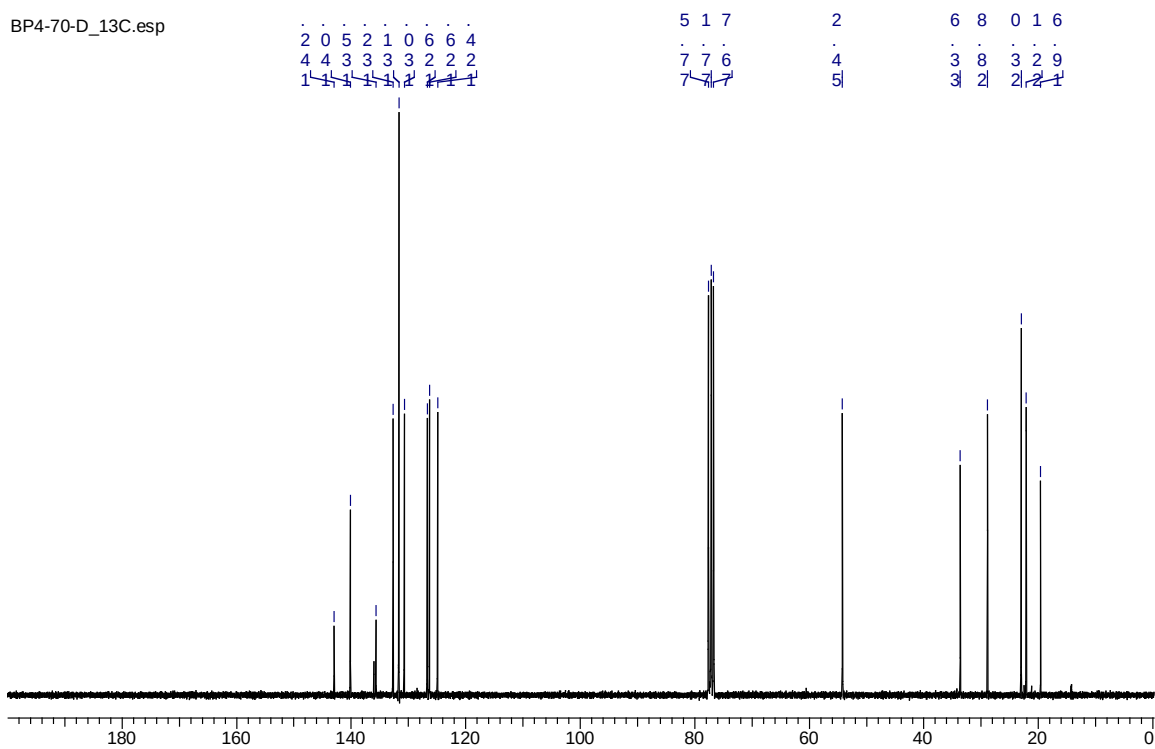
BP4-67-C_13C.esp



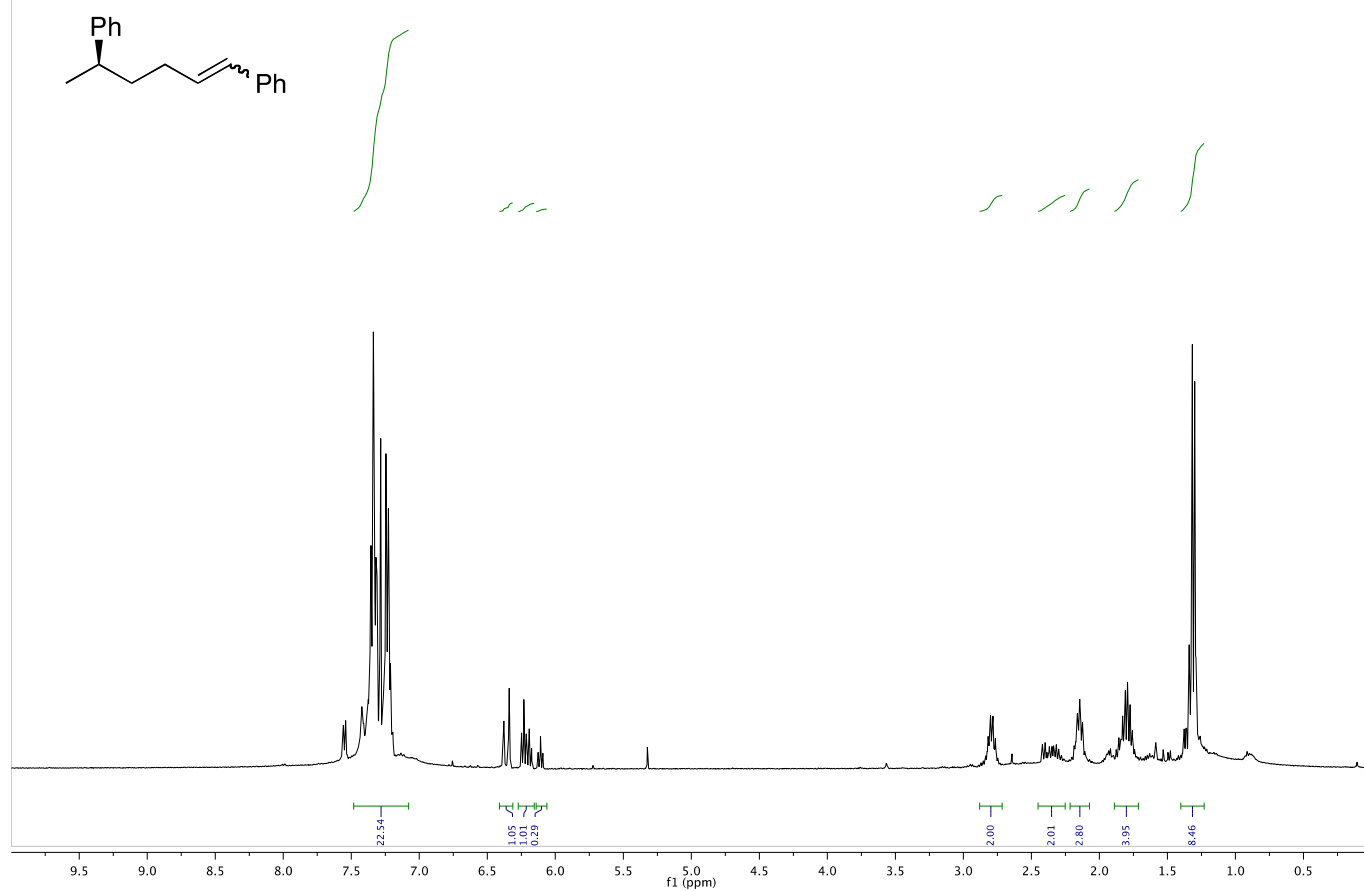
BP4-70-D_1H.esp



BP4-70-D_13C.esp



BP-130709-BP4-79-B/10
BP4-79-B



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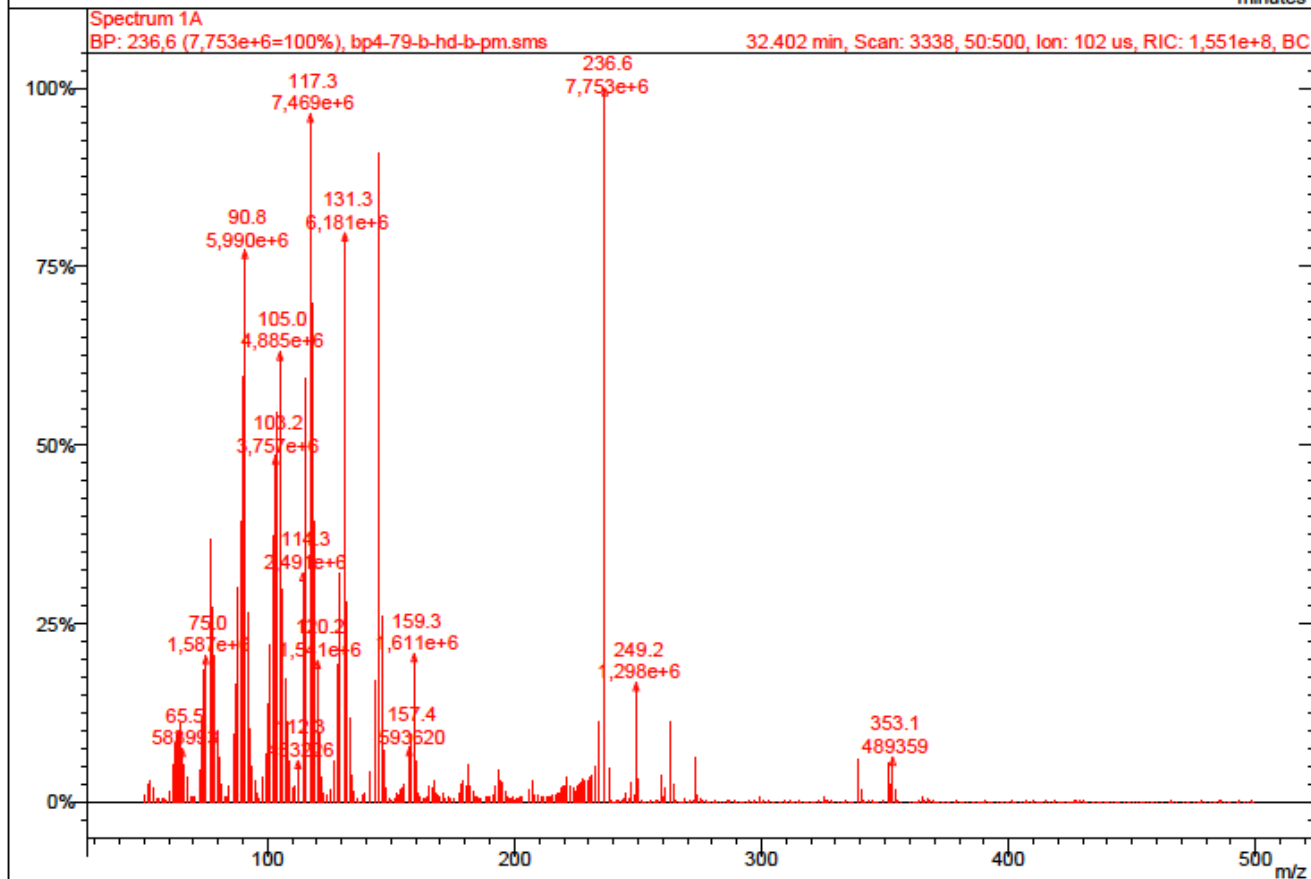
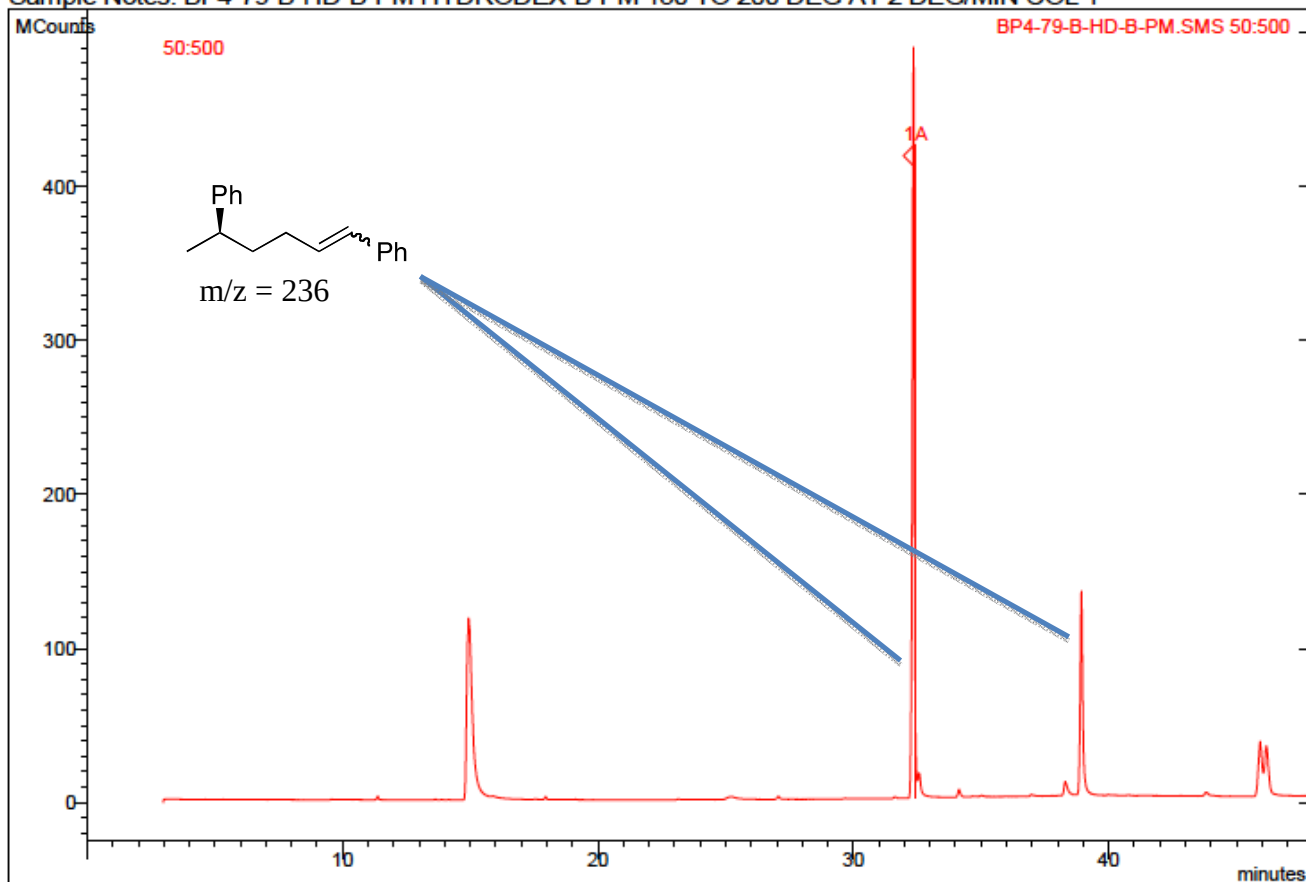
Sample: BP4-79-B-HD-B-PM

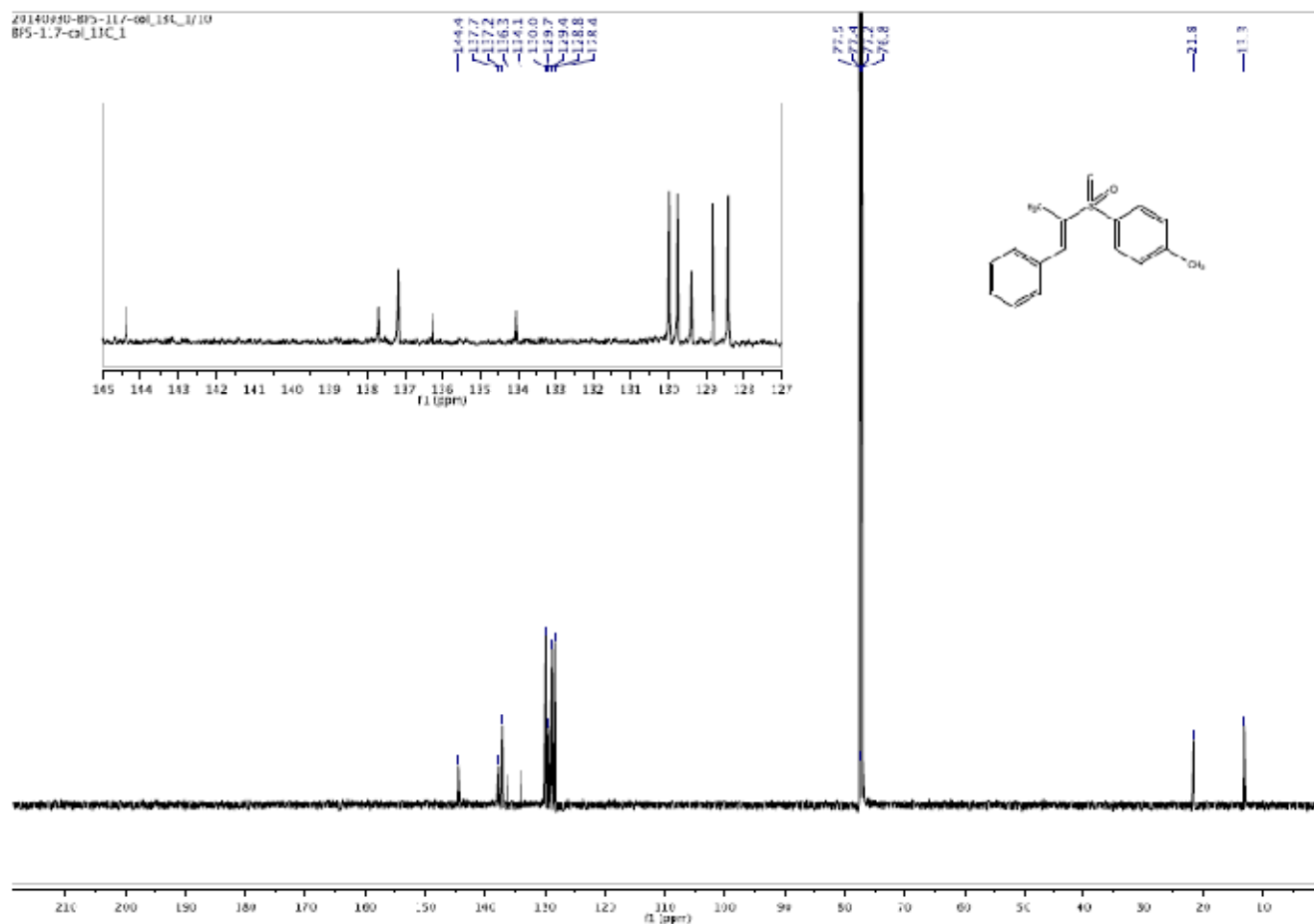
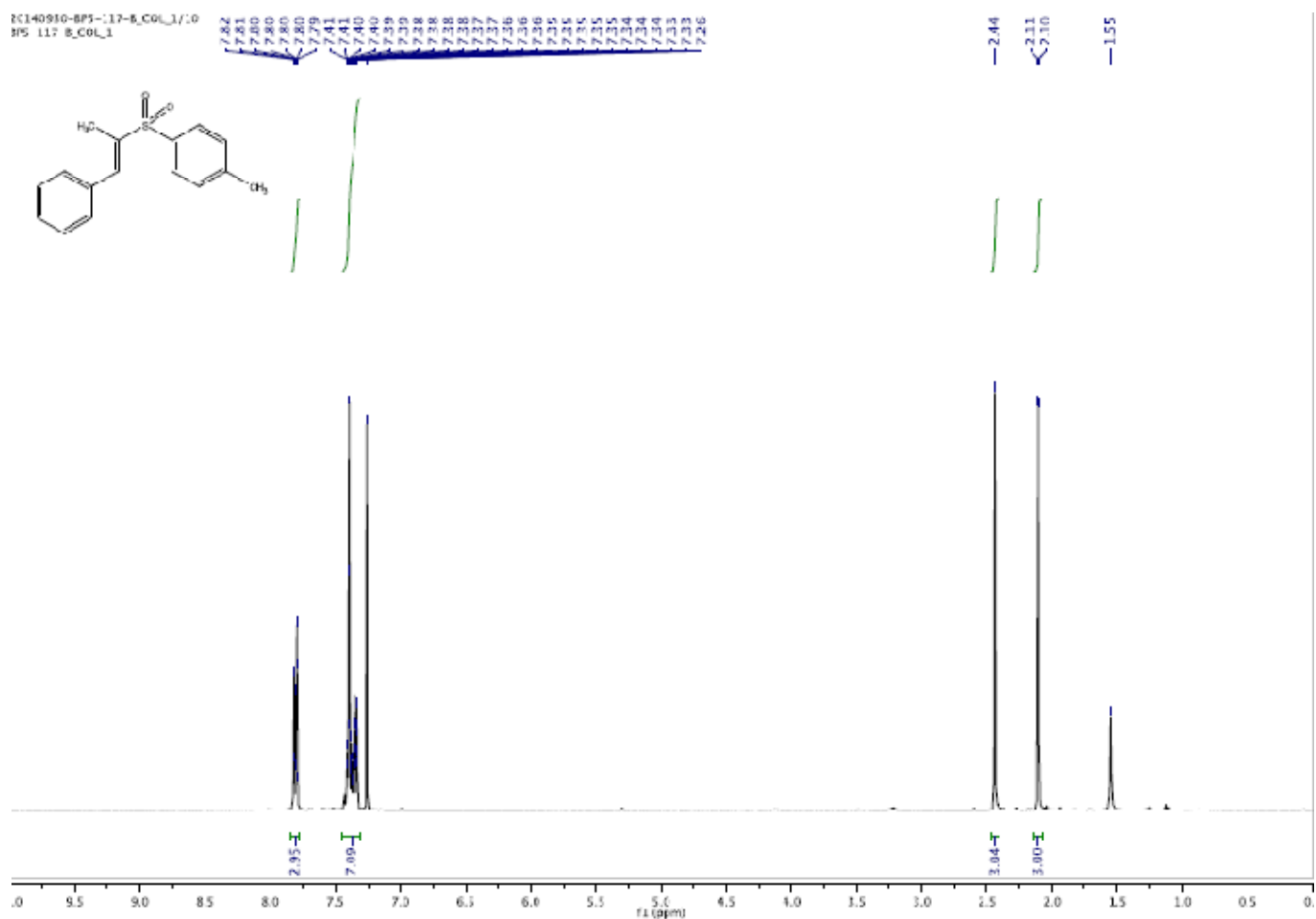
Scan Range: 1 - 4969 Time Range: 0.00 - 47.98 min.

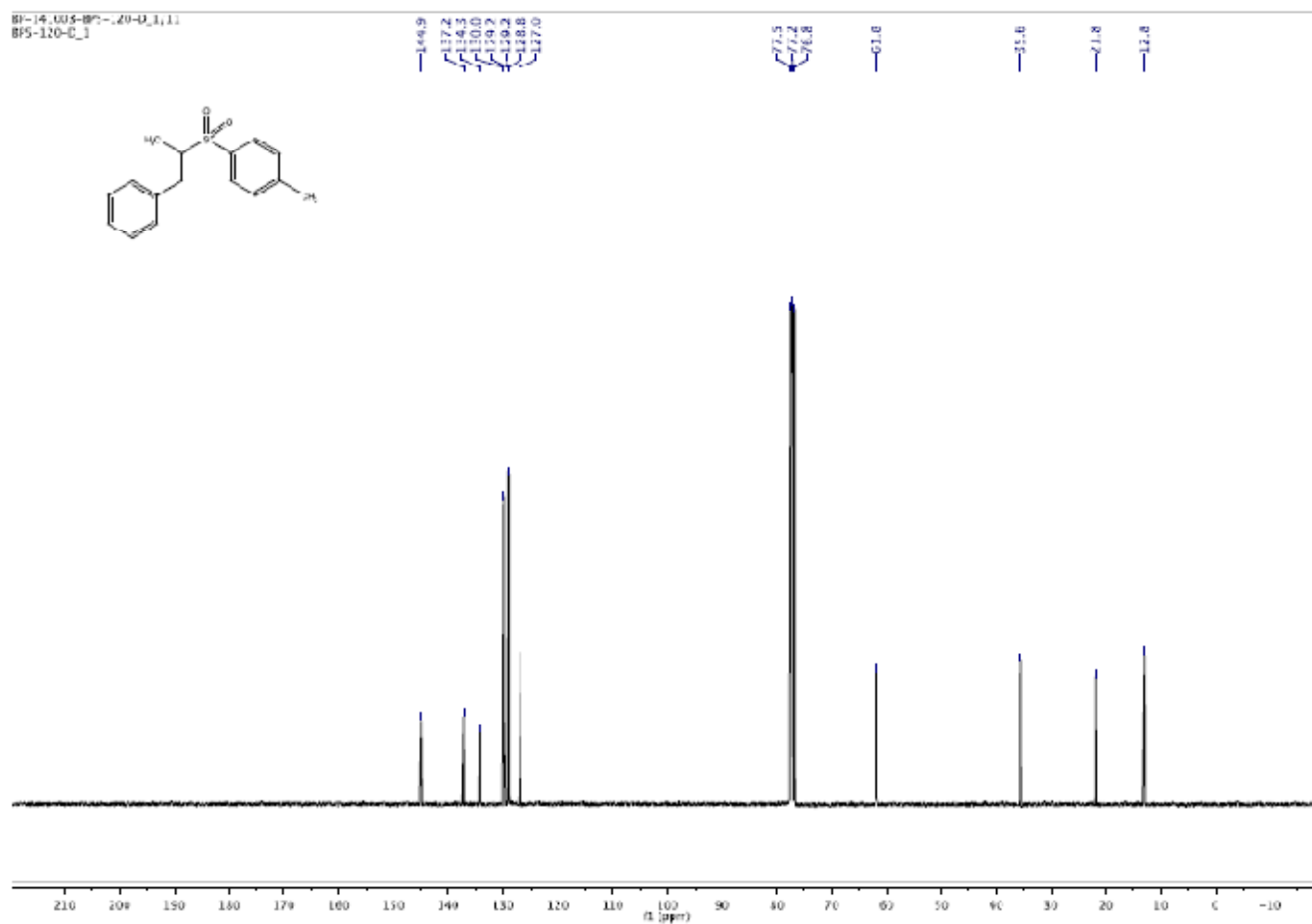
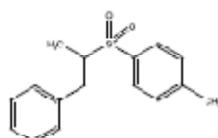
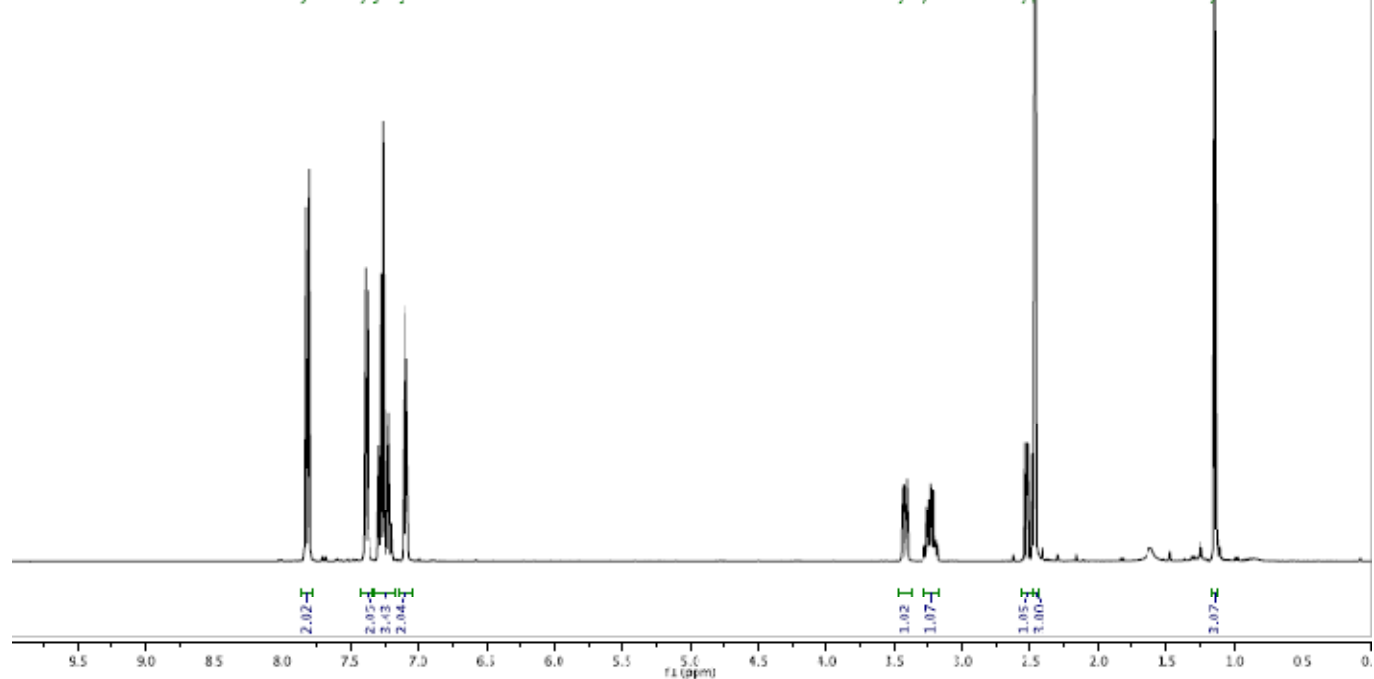
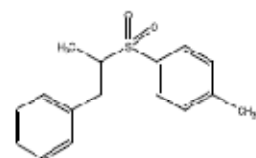
Sample Notes: BP4-79-B-HD-B-PM HYDRODEX-B-PM 130 TO 200 DEG AT 2 DEG/MIN COL 1

Operator: Johan

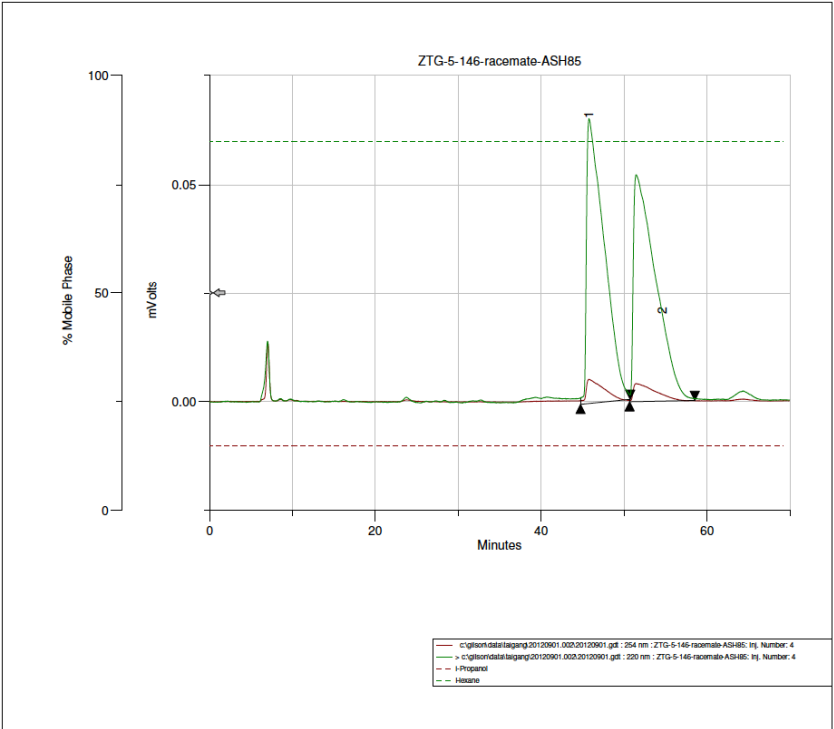
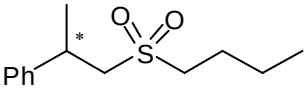
Date: 12/16/2006 12:20 AM





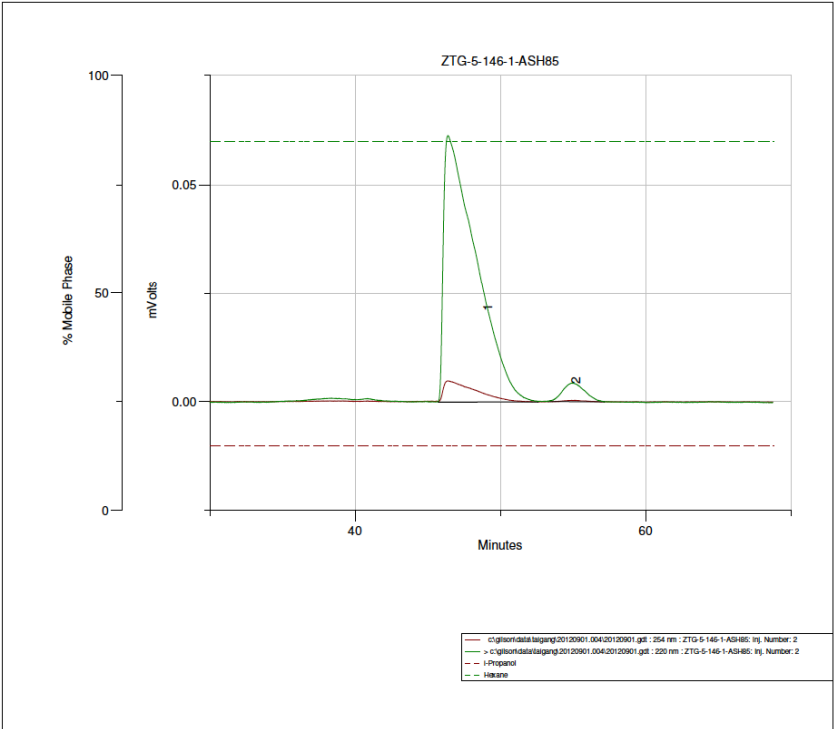
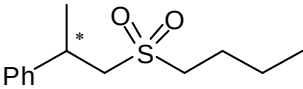


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Created on Fri Oct 07 2005 12:20:29 \ Last Modified Fri Nov 13 2009 09:12:18
(Internal)
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Created on Fri Aug 27 2004 11:38:20 \ Last Modified Fri Aug 27 2004 11:42:48
(Internal)
C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ZTG-5-146-racemate-ASH85 Injection Number: 4 "Unknown"



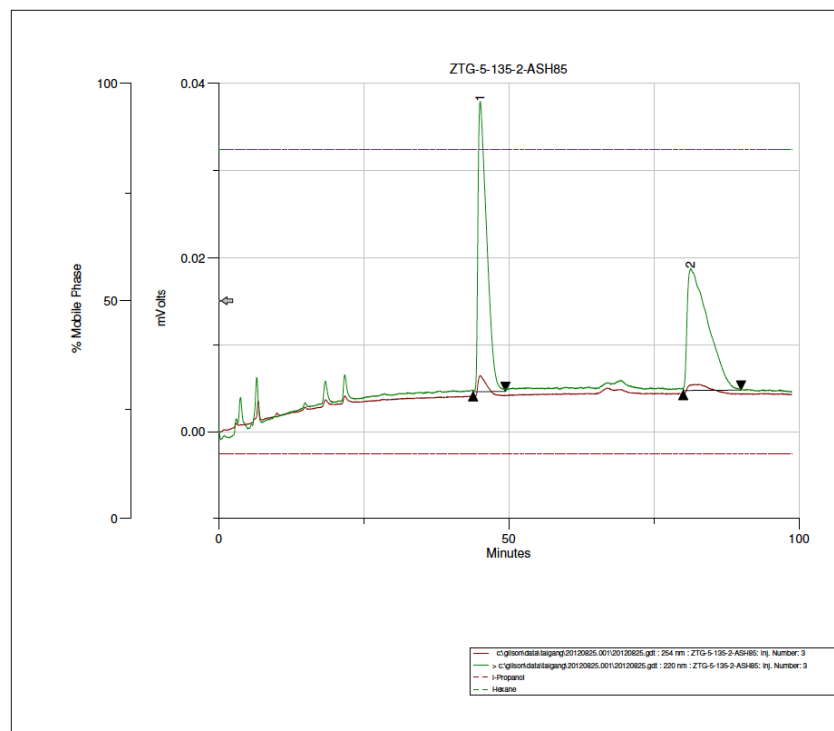
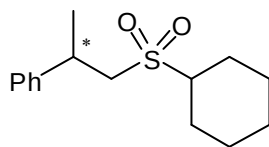
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
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2	4.00	*2	51.52	162318464.00	50.12	146-racemate					

Data File: c:\gilson\data\taigang\20120901.004\20120901.gdt
Date acquired: Sun Sep 02 2012 02:03:44
c:\gilson\data\taigang\20120901.004\20120901.gdt
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(Internal)
C:\GILSON\METHODS\DAD\IAD03.GCT
Created on Mon Apr 24 2006 09:54:48 \ Last Modified Fri Nov 13 2009 09:11:52
(Internal)
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Created on Fri Aug 27 2004 11:38:20 \ Last Modified Fri Aug 27 2004 11:42:48
(Internal)
C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ZTG-5-146-1-ASH85 Injection Number: 2 "Unknown"



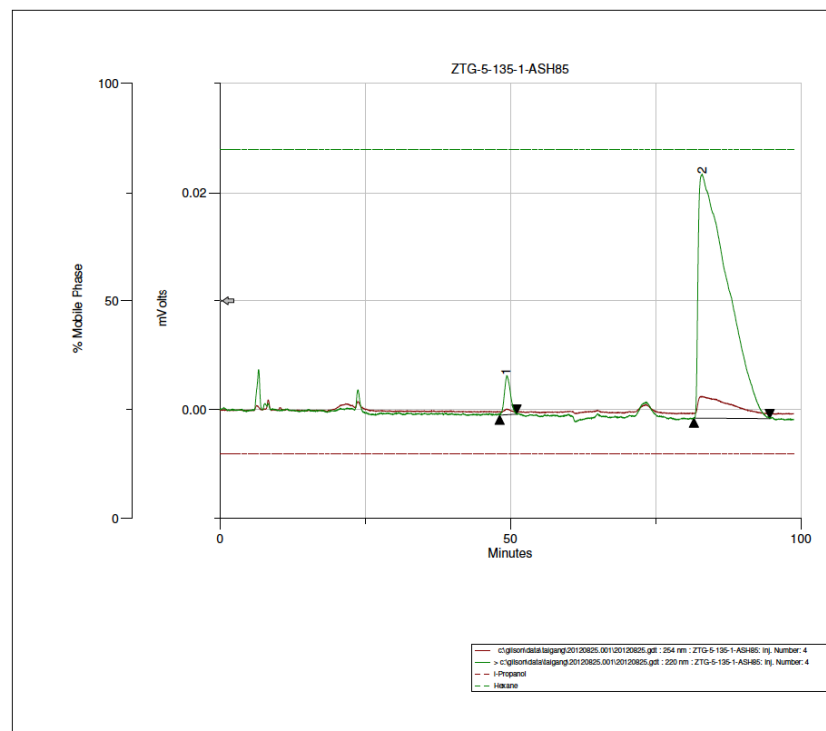
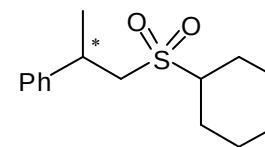
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2	2.00	*2	54.97	7776589.00	4.66	3-5-146-1-AS					

Data File: c:\gilson\data\taigang\20120825.001\20120825.gdt
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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ZTG-5-135-2-ASH85 Injection Number: 3 *Unknown*



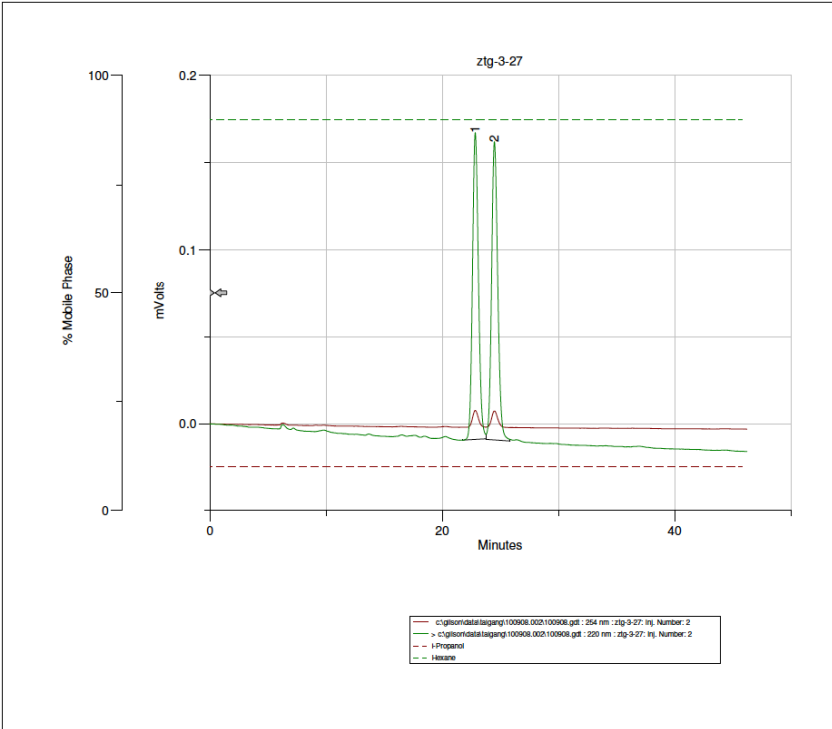
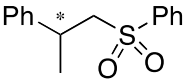
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
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2	3.00	*2	81.40	58457536.00	50.14	3-5-135-2-AS				

Data File: c:\gilson\data\taigang\20120825.001\20120825.gdt
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Created on Fri Aug 24 2012 15:51:22 \ Last Modified Fri Aug 24 2012 15:51:22
(Internal)
C:\GILSON\METHODS\ADAD\AD100.GCT
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c:\internal>
Created on Fri Aug 27 2004 11:38:20 \ Last Modified Fri Aug 27 2004 11:42:48
(Internal)
C:\GILSON\FC\LEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ZTG-5-135-1-ASH85 Injection Number: 4 *Unknown*



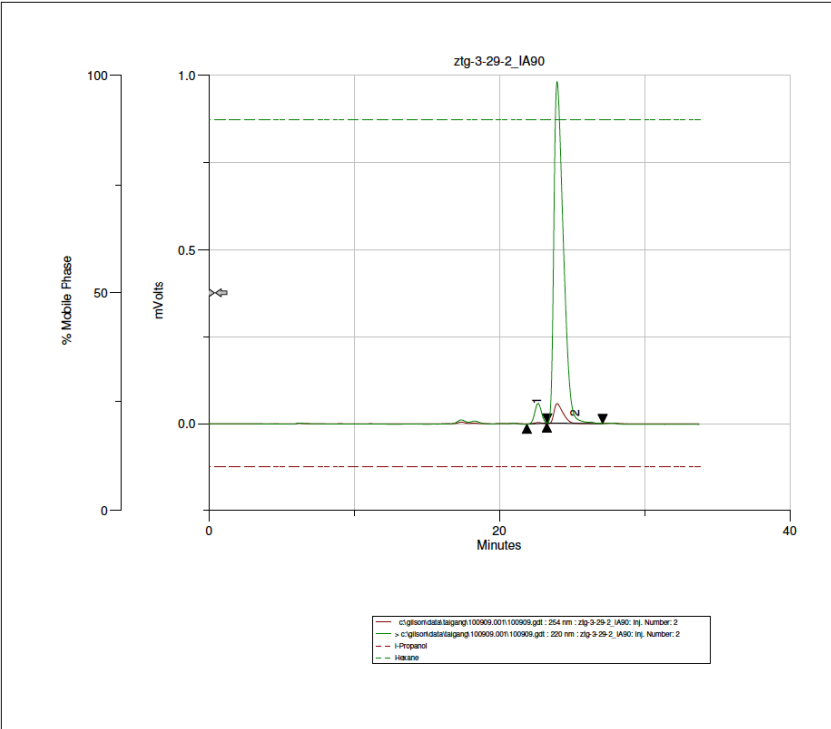
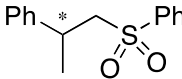
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	4.00	*1	49.44	4287411.50	3.19	3-5-135-1-AS				
2	4.00	*2	82.98	129975560.00	96.81	3-5-135-1-AS				

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(Internal)
C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ztg-3-27 Injection Number: 2 "Unknown"



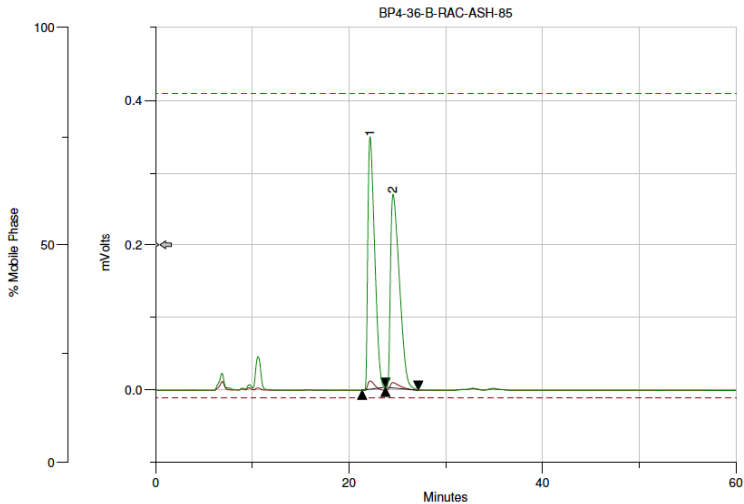
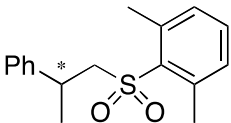
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1	2.00	*1	22.85	104039152.00	49.67	ztg-3-27					
2	2.00	*2	24.50	105407240.00	50.33	ztg-3-27					

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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ztg-3-29-2_IA90 Injection Number: 2 "Unknown"



	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	2.00	*1	22.67	30998250.00	4.01	tg-3-29-2_IA9					
2	2.00	*2	23.99	741096960.00	95.99	tg-3-29-2_IA9					

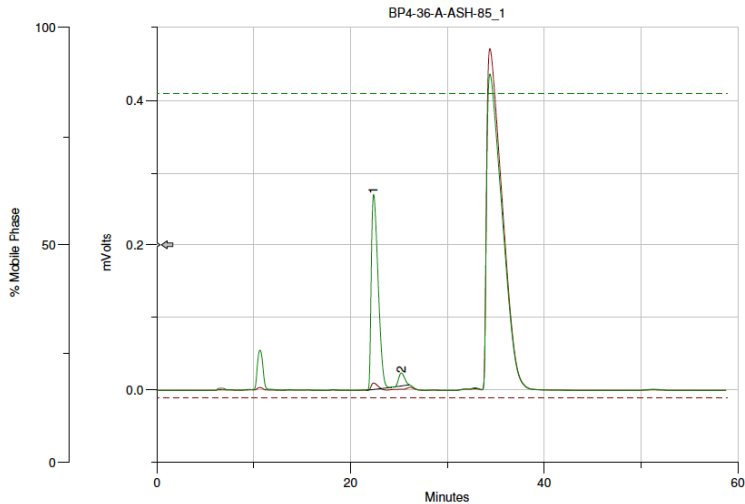
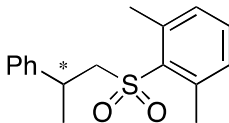
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-36-B-RAC-ASH-85 Injection Number: 2 *Unknown*



c:\gilson\data\byron\20130207.001\20130207.gdt : 254 nm : BP4-36-B-RAC-ASH-85; Inj. Number: 2
c:\gilson\data\byron\20130207.001\20130207.gdt : 220 nm : BP4-36-B-RAC-ASH-85; Inj. Number: 2
- Proprietary
- Heptane

	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	2.00	*1	22.19	283937056.00	49.65	36-B-RAC-AS				
2	2.00	*2	24.59	287919616.00	50.35	36-B-RAC-AS				

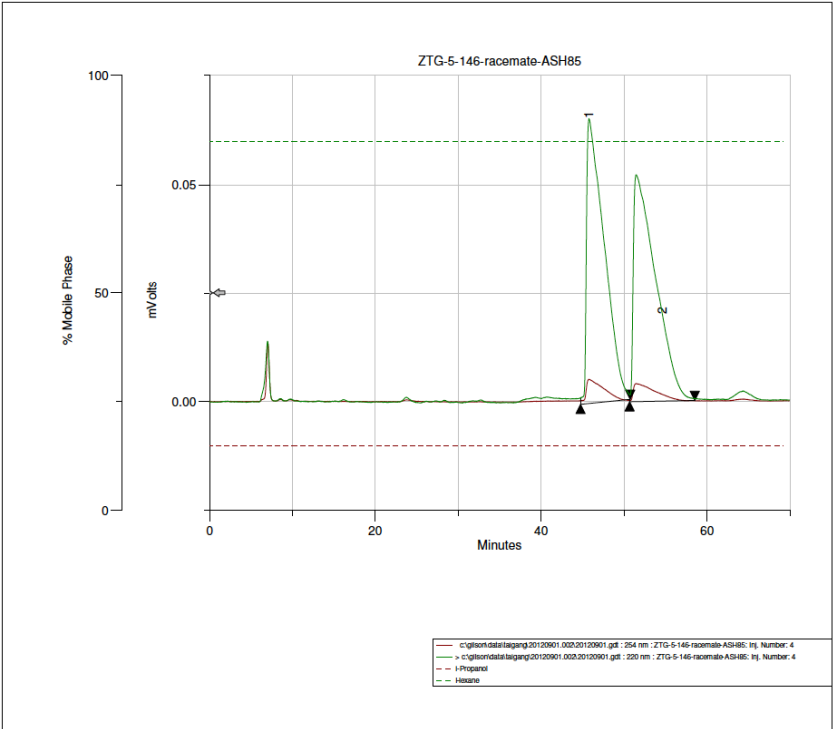
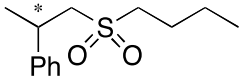
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(Internal)
C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-36-A-ASH-85_1 Injection Number: 4 *Unknown*



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c:\gilson\data\byron\20130207.001\20130207.gdt : 220 nm : BP4-36-A-ASH-85; 1; Inj. Number: 4
- Proprietary
- Heptane

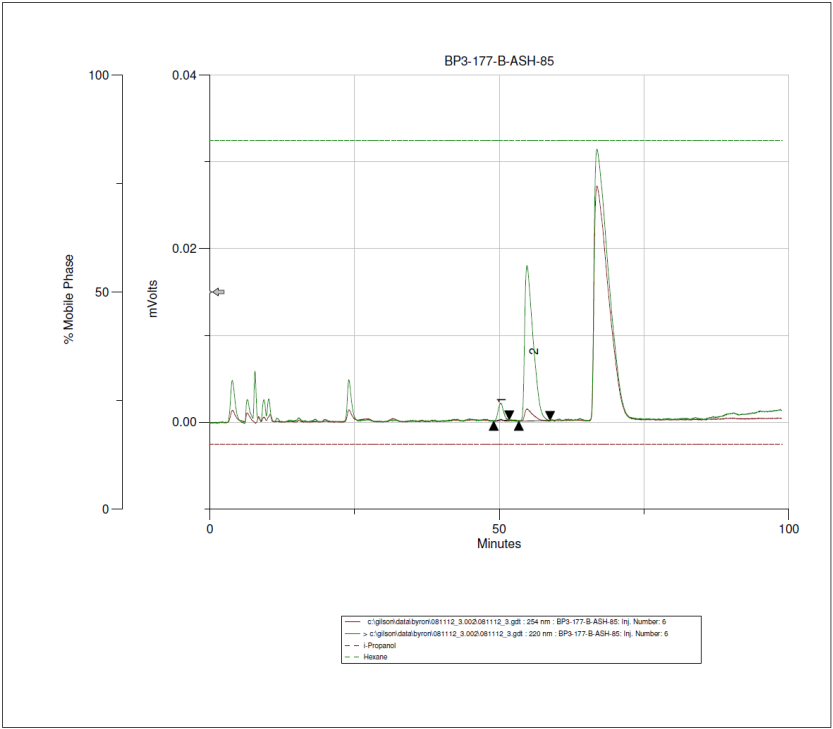
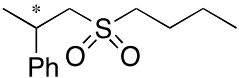
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1	4.00	*1	22.41	221387840.00	94.42	4-36-A-ASH-8				
2	4.00	*2	25.25	13080942.00	5.58	4-36-A-ASH-8				

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ZTG-5-146-racemate-ASH85 Injection Number: 4 "Unknown"



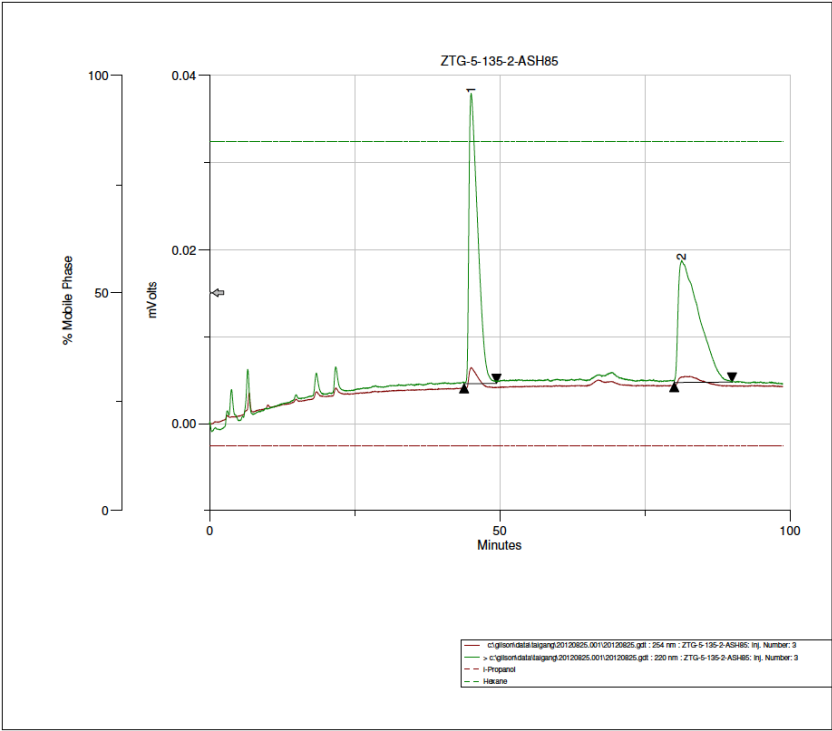
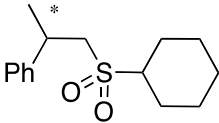
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1	4.00	*1	45.82	161524416.00	49.88	146-racemate					
2	4.00	*2	51.52	162318464.00	50.12	146-racemate					

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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3-177-B-ASH-85 Injection Number: 6 "Unknown"



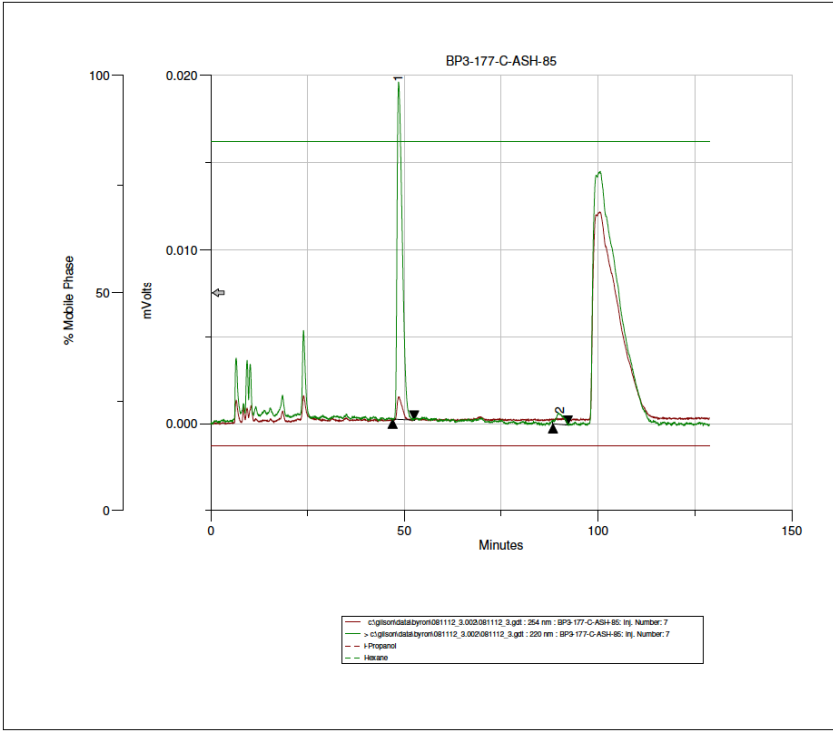
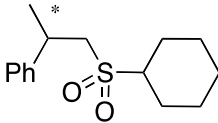
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	6.00	*1	50.23	2174136.75	6.72	3-177-B-ASH					
2	6.00	*2	54.80	30193292.00	93.28	3-177-B-ASH					

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ZTG-5-135-2-ASH85 Injection Number: 3 "Unknown"



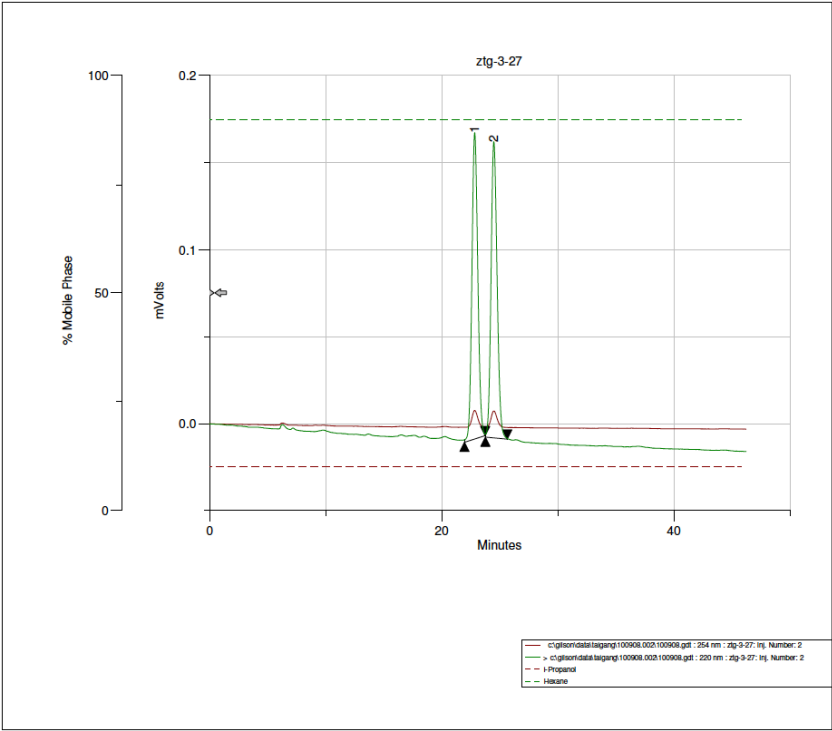
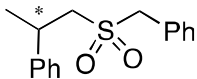
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	3.00	*1	45.11	58130140.00	49.86	3-5-135-2-ASH					
2	3.00	*2	81.40	58457536.00	50.14	3-5-135-2-ASH					

Data File: c:\gilson\data\byron\081112_3.002\081112_3.gdt
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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3-177-C-ASH-85 Injection Number: 7 "Unknown"



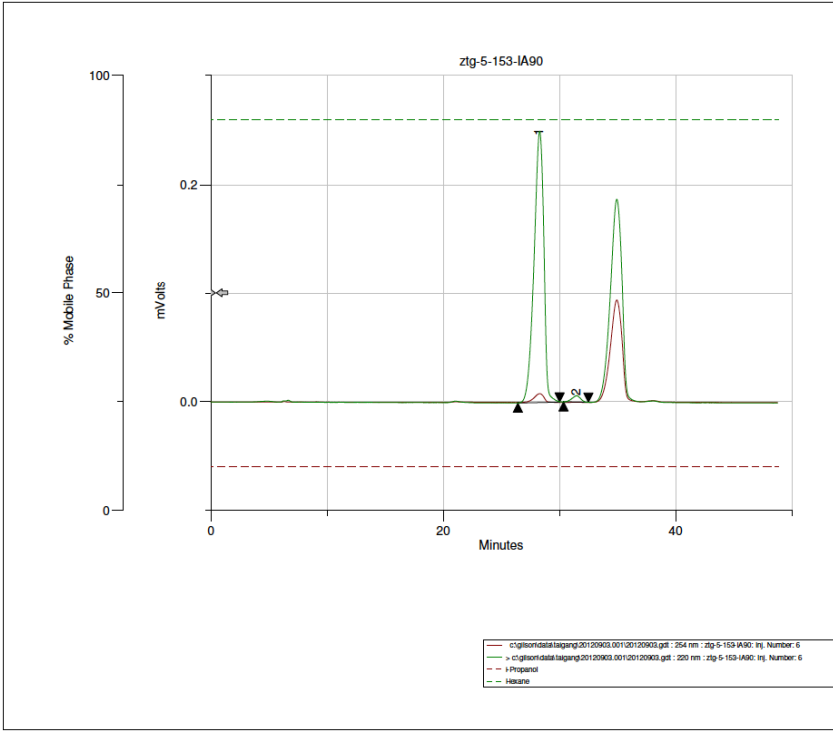
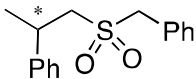
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	7.00	*1	48.54	29942720.00	95.25	3-177-C-ASH					
2	7.00	*2	89.77	1494300.12	4.75	3-177-C-ASH					

Data File: c:\gilson\data\tagang\100908.002\100908.gdt
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C:\GILSON\FLEVEL\GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ztg-3-27 Injection Number: 2 "Unknown"



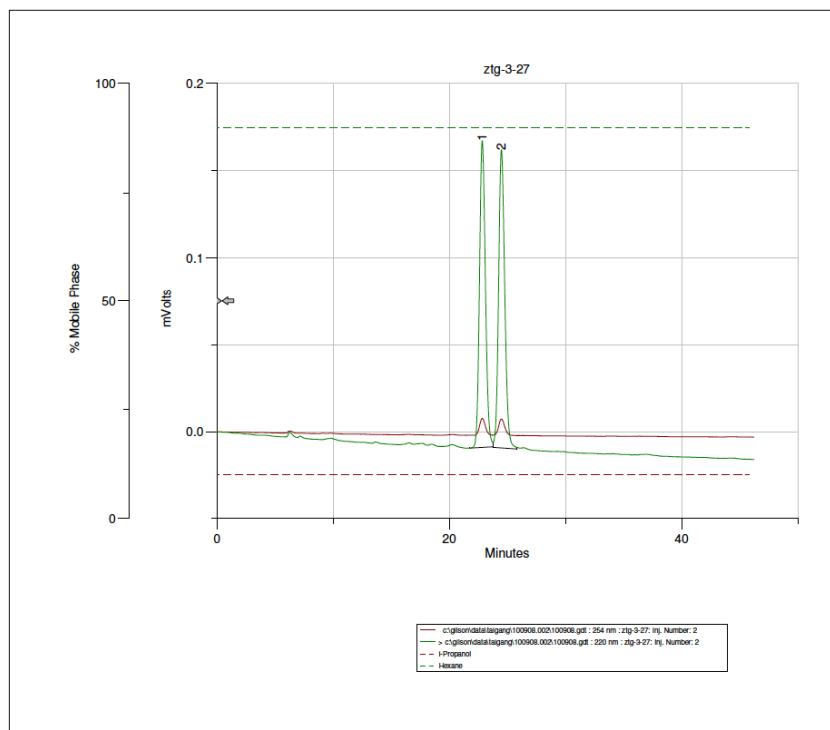
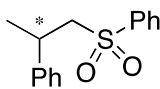
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1	2.00	*1	22.85	103523080.00	50.14	ztg-3-27				
2	2.00	*2	24.50	102964000.00	49.86	ztg-3-27				

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(Internal)
c:\internals
Created on Fri Aug 27 2004 11:38:20 \ Last Modified Fri Aug 27 2004 11:42:48
(Internal)
C:\GILSON\FLEVEL\GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ztg-5-153-IA90 Injection Number: 6 "Unknown"



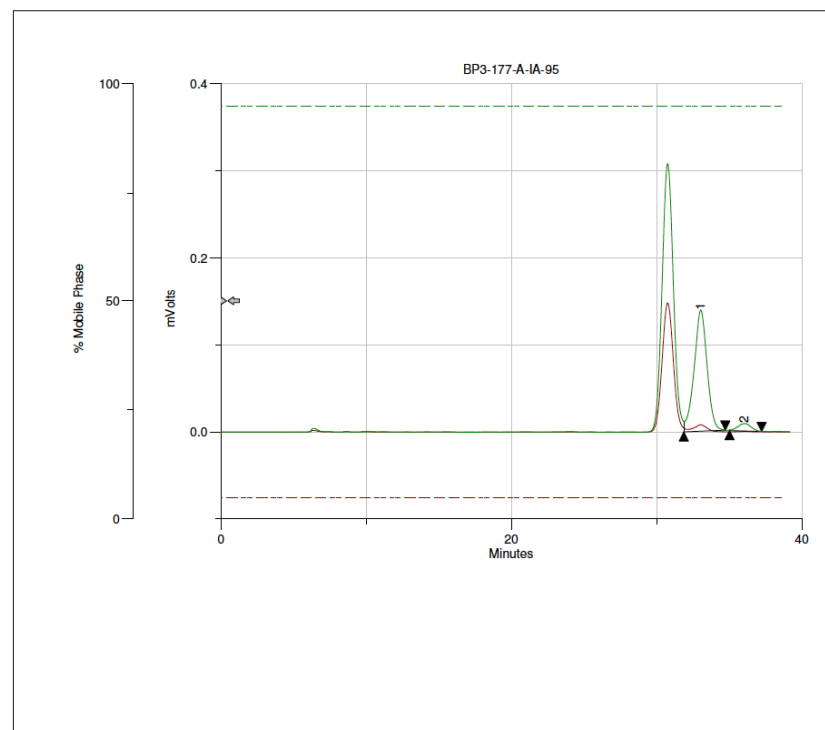
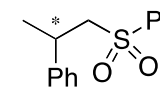
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1	6.00	*1	28.29	244818656.00	97.86	ztg-5-153-IA90				
2	6.00	*2	31.48	5346101.00	2.14	ztg-5-153-IA90				

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ztg-3-27 Injection Number: 2 "Unknown"



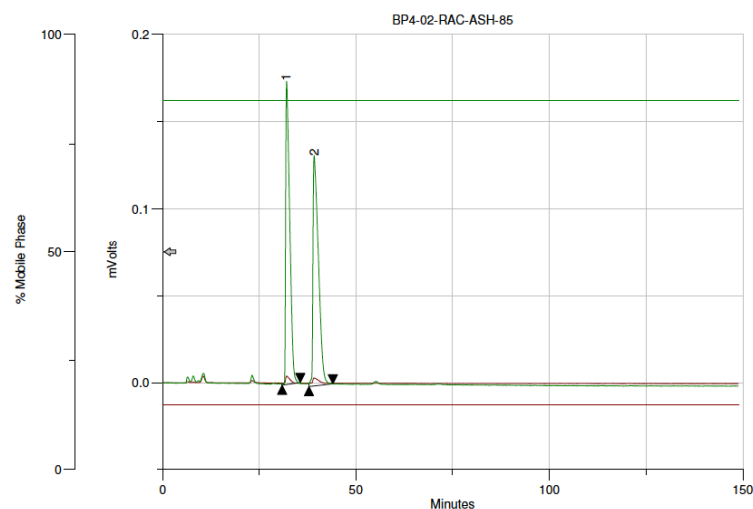
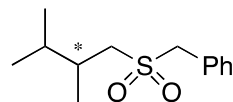
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	2.00	*1	22.85	104039152.00	49.67	ztg-3-27					
2	2.00	*2	24.50	105407240.00	50.33	ztg-3-27					

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3-177-A-IA-95 Injection Number: 1 "Unknown"



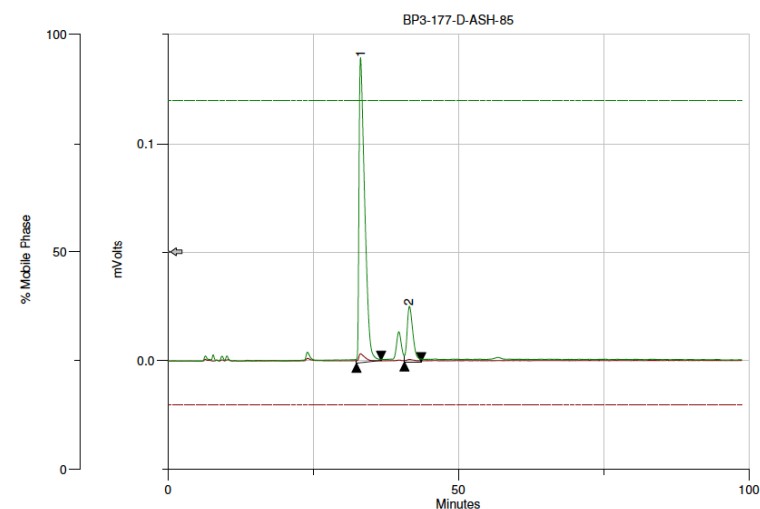
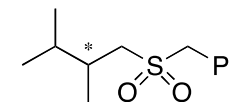
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1	1.00	*1	33.04	143907920.00	93.87	P3-177-A-IA-95					
2	1.00	*2	36.07	9400427.00	6.13	P3-177-A-IA-95					

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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-02-RAC-ASH-85 Injection Number: 2 "Unknown"



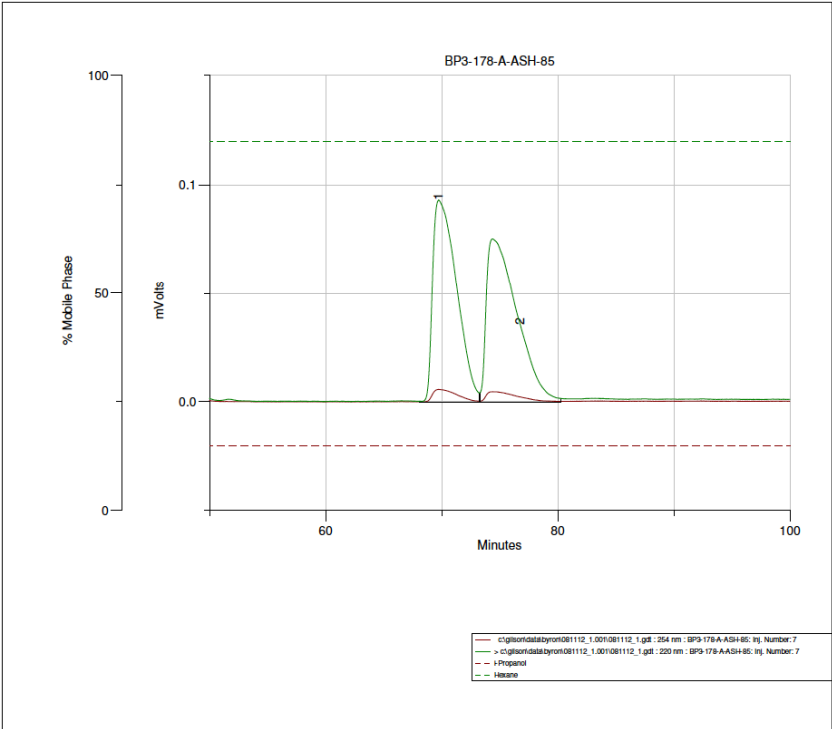
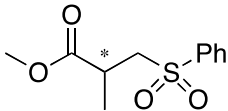
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1	2.00	*1	32.10	212069536.00	49.43	-02-RAC-ASH				
2	2.00	*2	39.23	217001696.00	50.57	-02-RAC-ASH				

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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3-177-D-ASH-85 Injection Number: 8 "Unknown"



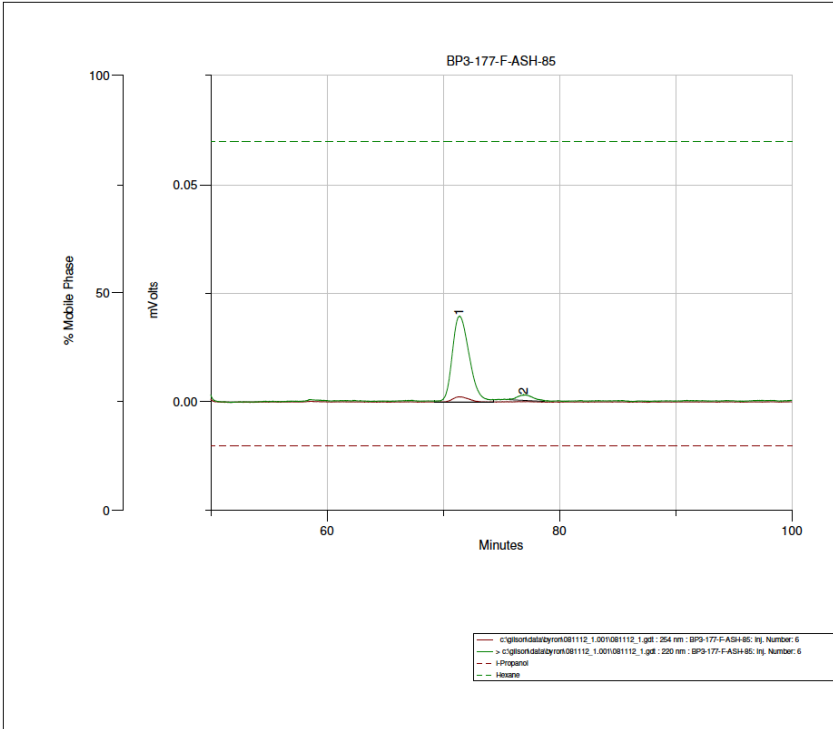
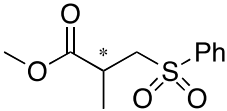
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1	8.00	*1	33.20	160080320.00	84.23	3-177-D-ASH				
2	8.00	*2	41.60	29981902.00	15.77	3-177-D-ASH				

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(Internal)
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3-178-A-ASH-85 Injection Number: 7 *Unknown*



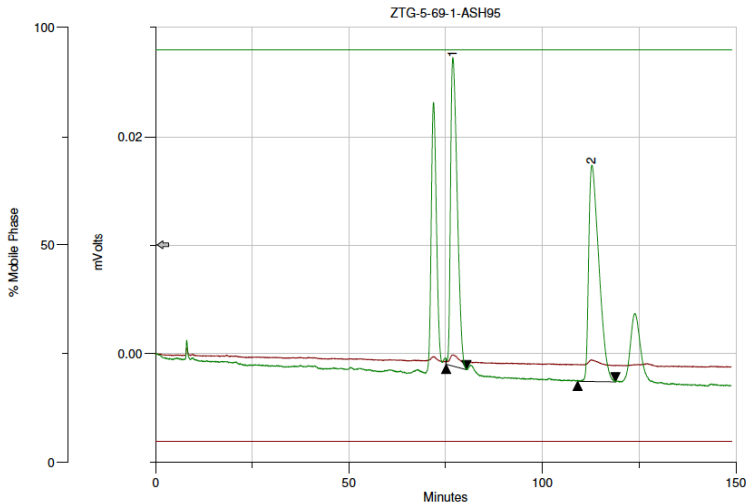
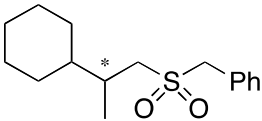
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1	7.00	*1	69.80	222185488.00	49.10	3-178-A-ASH				
2	7.00	*2	74.44	230334656.00	50.90	3-178-A-ASH				

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(Internal)
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3-177-F-ASH-85 Injection Number: 6 *Unknown*



	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	6.00	*1	71.41	34217684.00	93.94	3-177-F-ASH				
2	6.00	*2	77.14	2206734.00	6.06	3-177-F-ASH				

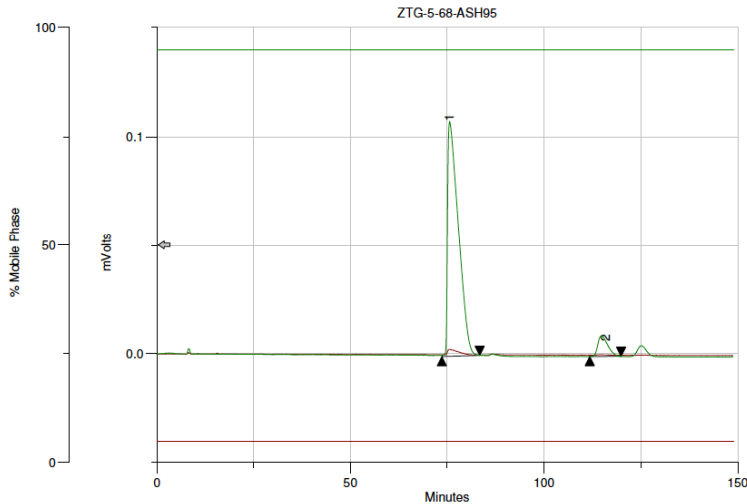
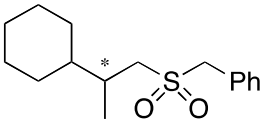
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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ZTG-5-69-1-ASH95 Injection Number: 1 "Unknown"



c:\gilson\data\taigang\20120525.002\20120525.gdt : 354 nm : ZTG-5-69-1-ASH95; Inj. Number: 1
c:\gilson\data\taigang\20120525.002\20120525.gdt : 220 nm : ZTG-5-69-1-ASH95; Inj. Number: 1
- Propagand
- Heptane

	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	1.00	*1	76.87	56469028.00	48.01	G-5-69-1-ASH				
2	1.00	*2	112.80	61157116.00	51.99	G-5-69-1-ASH				

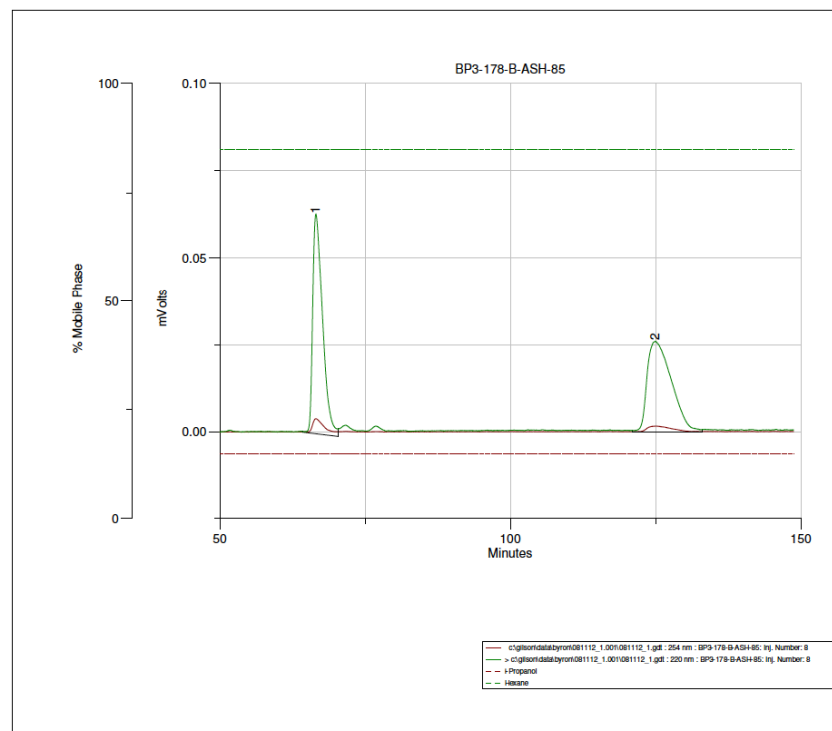
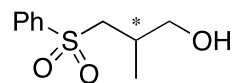
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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ZTG-5-68-ASH95 Injection Number: 2 "Unknown"



c:\gilson\data\taigang\20120525.002\20120525.gdt : 354 nm : ZTG-5-68-ASH95; Inj. Number: 2
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- Propagand
- Heptane

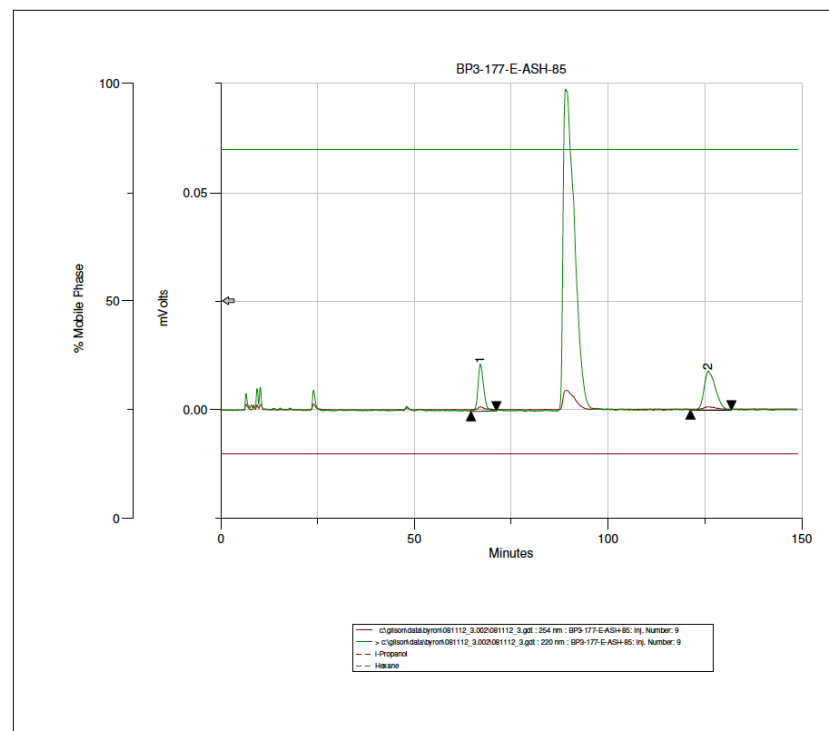
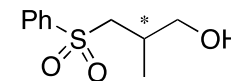
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1	2.00	*1	75.65	348490560.00	92.34	G-5-68-ASH				
2	2.00	*2	114.82	28920638.00	7.66	G-5-68-ASH				

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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3-178-B-ASH-85 Injection Number: 8 "Unknown"



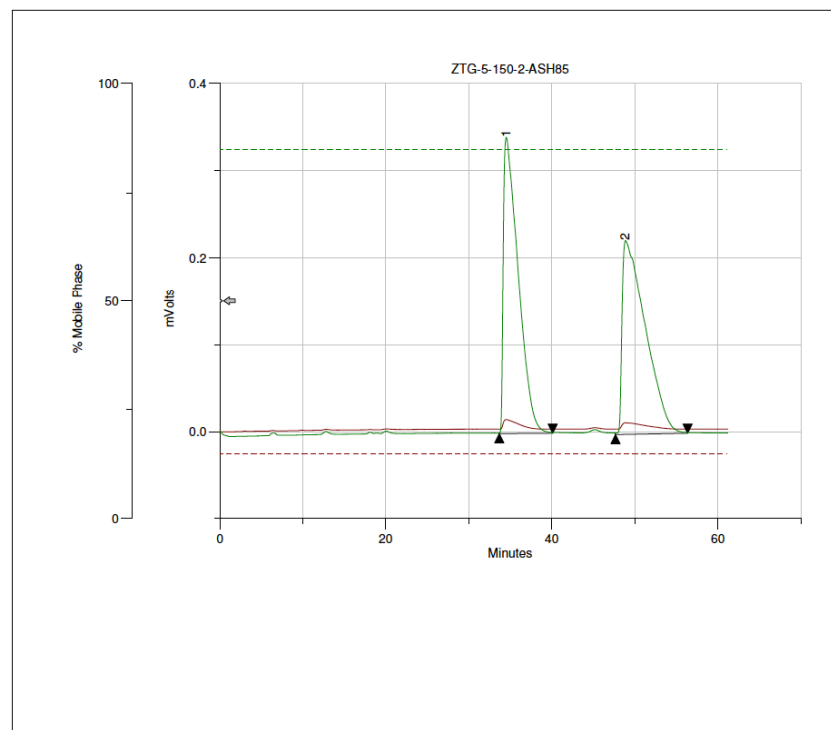
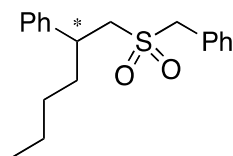
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	8.00	*1	66.57	124438712.00	49.46	3-178-B-ASH					
2	8.00	*2	124.93	127178144.00	50.54	3-178-B-ASH					

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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3-177-E-ASH-85 Injection Number: 9 "Unknown"



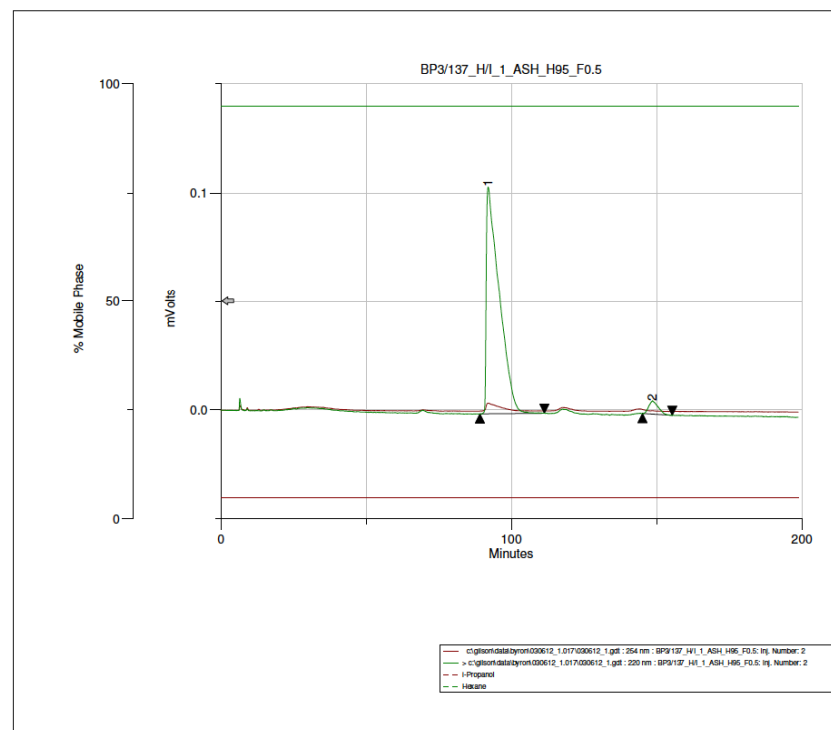
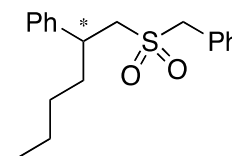
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	9.00	*1	67.03	18616124.00	37.82	3-177-E-ASH					
2	9.00	*2	125.84	30613040.00	62.18	3-177-E-ASH					

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(Internal)
-- c:\gilson\data\taigang\20120901.001\20120901.gdt : 254 nm : ZTG-5-150-2-ASH85; Inj. Number: 3
-- i-Propanol
-- Heptane
Sample name: ZTG-5-150-2-ASH85 Injection Number: 3 "Unknown"



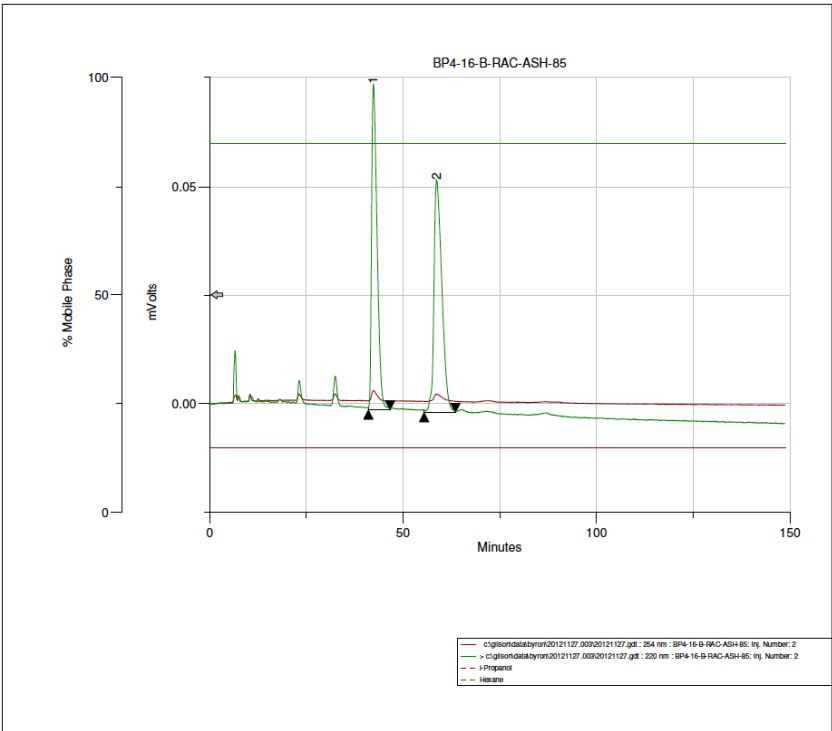
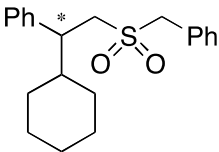
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1	3.00	*1	34.56	709637568.00	49.51	3-5-150-2-AS				
2	3.00	*2	48.95	723606720.00	50.49	3-5-150-2-AS				

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Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3\137_H\1_1_ASH_H95_F0.5 Injection Number: 2 "Unknown"



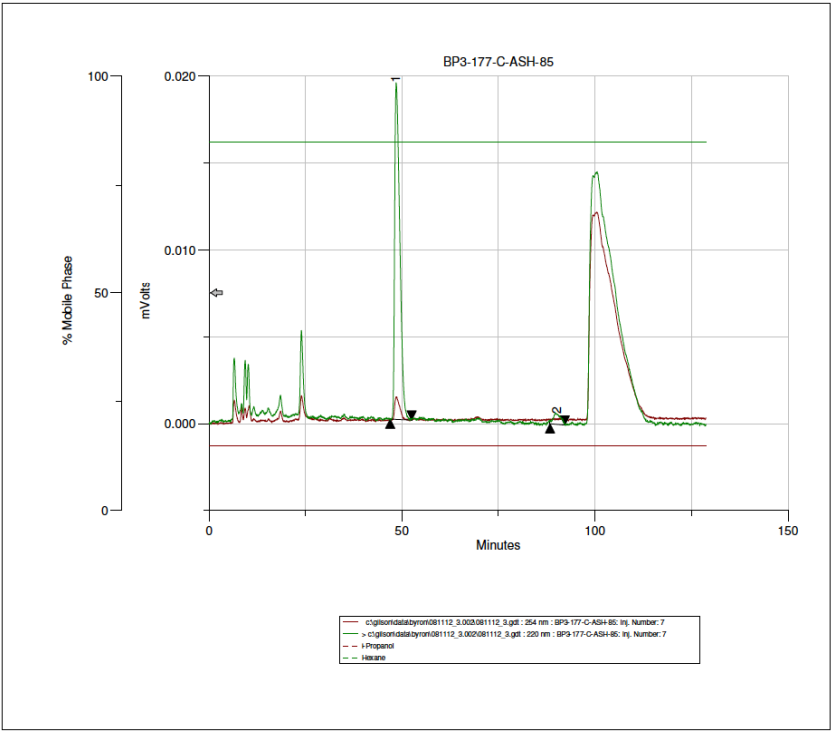
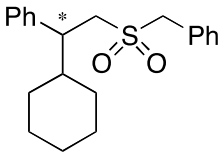
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1	2.00	*1	92.07	539321152.00	95.89	H\1_1_ASH_H				
2	2.00	*2	148.63	23104506.00	4.11	H\1_1_ASH_H				

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-16-B-RAC-ASH-85 Injection Number: 2 "Unknown"



	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	2.00	*1	42.39	123541440.00	49.14	16-B-RAC-AS					
2	2.00	*2	58.72	127850288.00	50.86	16-B-RAC-AS					

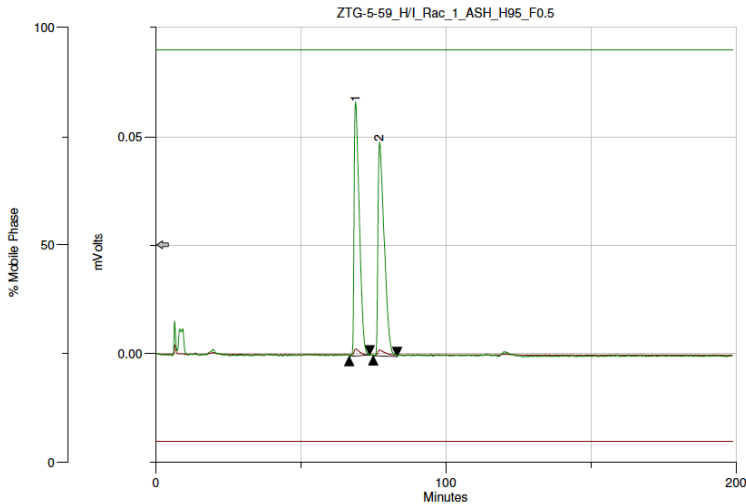
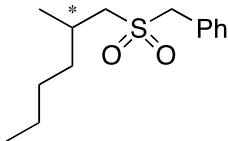
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Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3-177-C-ASH-85 Injection Number: 7 "Unknown"



	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	7.00	*1	48.54	29942720.00	95.25	3-177-C-ASH					
2	7.00	*2	89.77	1494300.12	4.75	3-177-C-ASH					

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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
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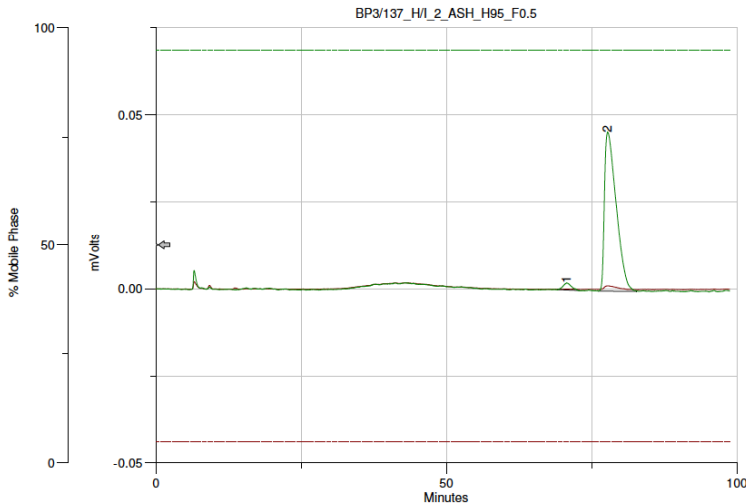
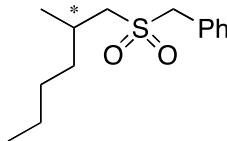


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c:\gilson\data\byron\030612_1.020\030612_1.gdt : 220 nm : ZTG-5-59_H/I_Rac_1_ASH_H95_F0.5; Inj. Number: 3
i-Propanol
Hexane

	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	3.00	*1	68.97	122464392.00	49.79	/I_Rac_1_AS				
2	3.00	*2	77.27	123475320.00	50.21	/I_Rac_1_AS				

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Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN

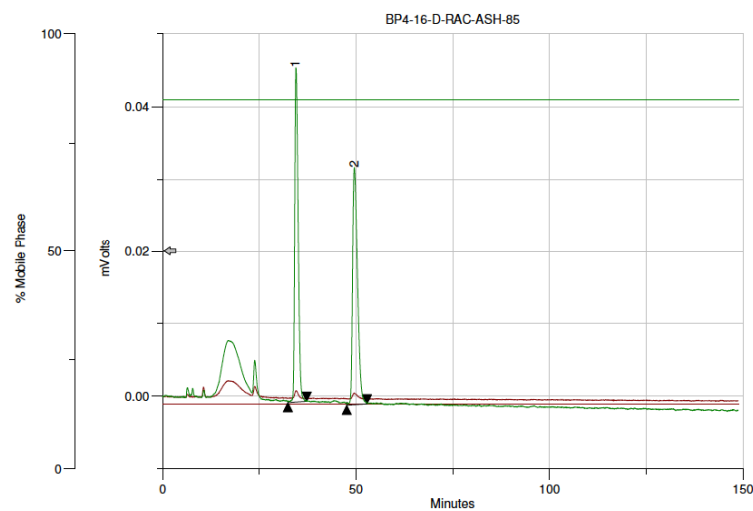
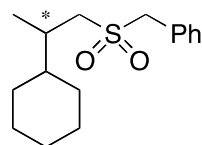
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c:\gilson\data\byron\030612_1.020\030612_1.gdt : 220 nm : BP3/137_H/I_2_ASH_H95_F0.5; Inj. Number: 2
i-Propanol
Hexane

	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	2.00	*1	70.78	3526478.50	3.17	H/I_2_ASH_H				
2	2.00	*2	77.81	107549096.00	96.83	H/I_2_ASH_H				

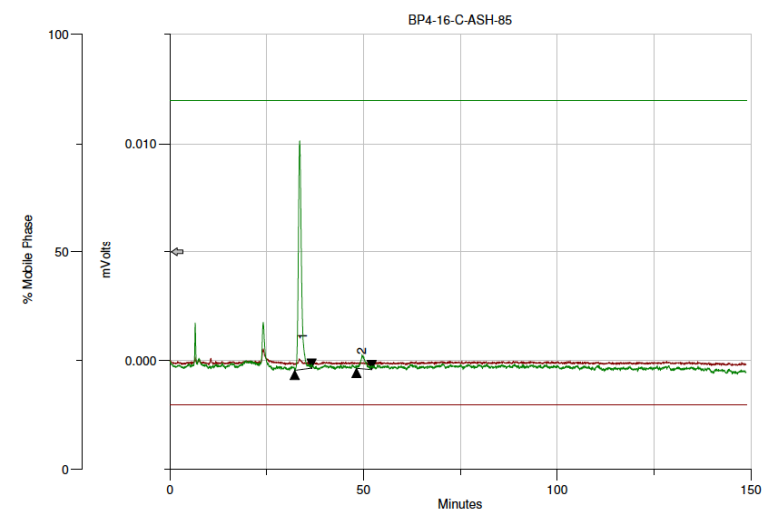
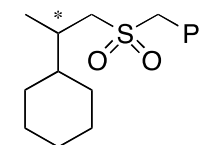
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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-16-D-RAC-ASH-85 Injection Number: 3 "Unknown"



--- c:\gilson\data\byron\20121127.003\20121127.gdt : 254 nm : BP4-16-D-RAC-ASH-85; Inj. Number: 3
--- c:\gilson\data\byron\20121127.003\20121127.gdt : 220 nm : BP4-16-D-RAC-ASH-85; Inj. Number: 3
--- i-Propanol
--- Hexane

	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	3.00	*1	34.52	47577548.00	49.57	16-D-RAC-AS					
2	3.00	*2	49.61	48397072.00	50.43	16-D-RAC-AS					

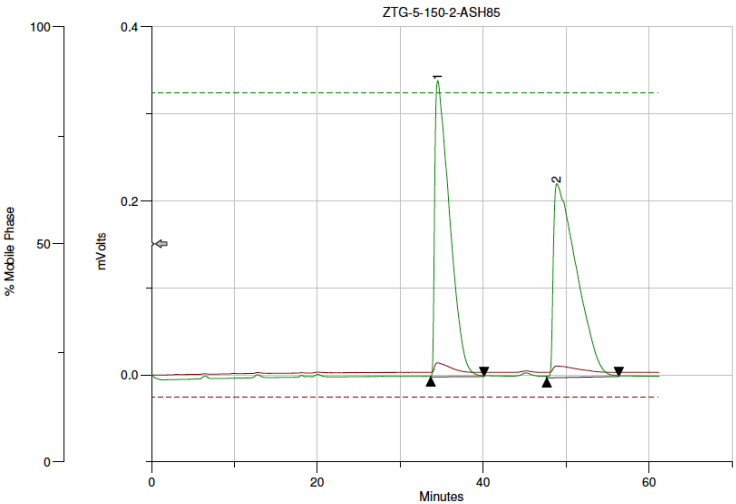
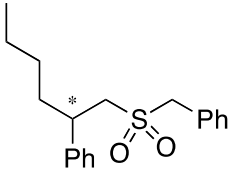
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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-16-C-ASH-85 Injection Number: 5 "Unknown"



--- c:\gilson\data\byron\20121127.003\20121127.gdt : 254 nm : BP4-16-C-ASH-85; Inj. Number: 5
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--- i-Propanol
--- Hexane

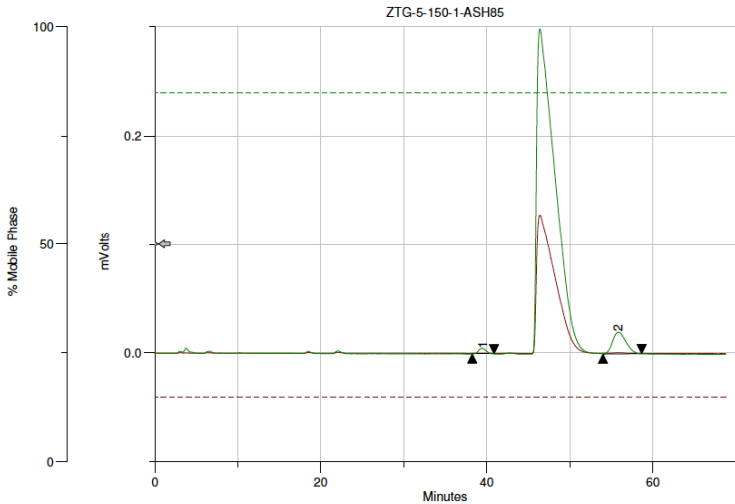
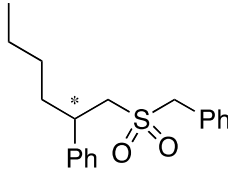
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	5.00	*1	33.54	9727560.00	90.68	16-C-ASH-					
2	5.00	*2	49.67	999553.31	9.32	16-C-ASH-					

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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--> c:\gilson\data\taigang\20120901.001\20120901.gdt : 220 nm : ZTG-5-150-2-ASH85; Inj. Number: 3
-- i-Propanol
-- Hexane
Sample name: ZTG-5-150-2-ASH85 Injection Number: 3 "Unknown"



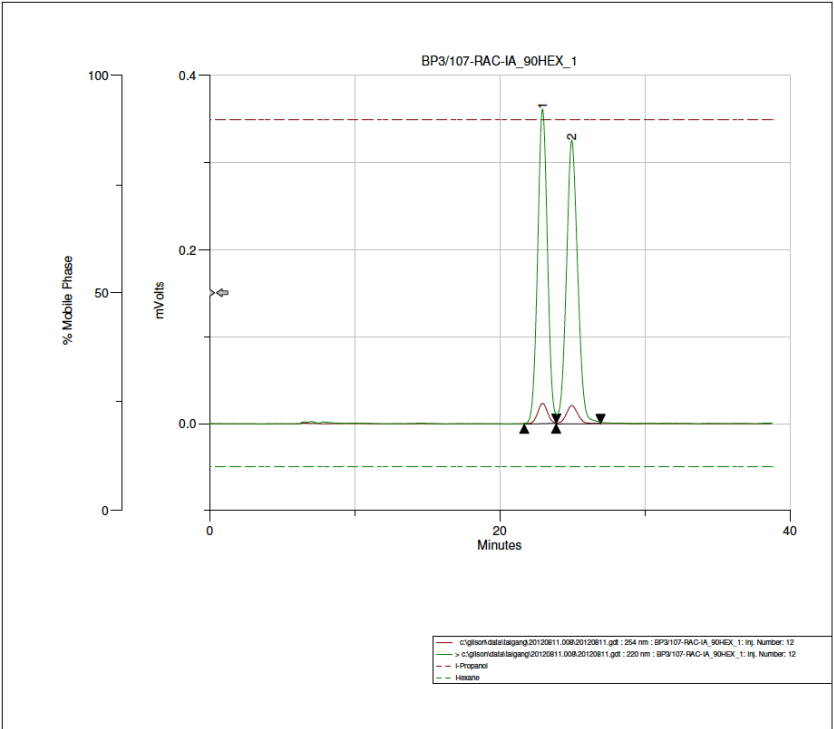
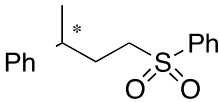
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	3.00	*1	34.56	709637568.00	49.51	3-5-150-2-AS				
2	3.00	*2	48.95	723606720.00	50.49	3-5-150-2-AS				

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
(Internal)
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ZTG-5-150-1-ASH85 Injection Number: 2 "Unknown"



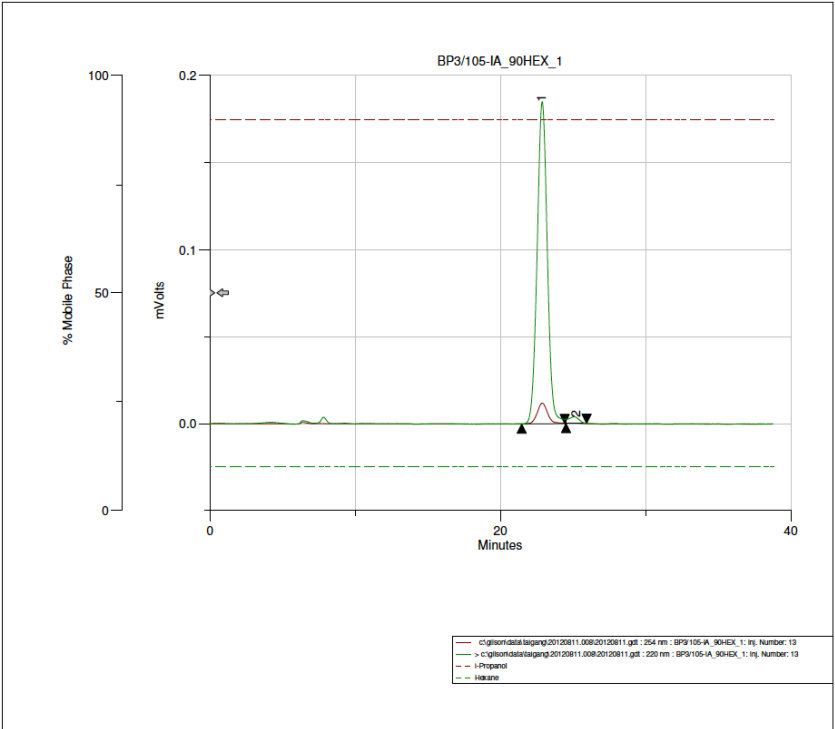
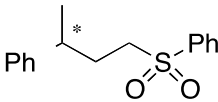
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	2.00	*1	39.45	5830597.00	13.28	3-5-150-1-AS				
2	2.00	*2	55.86	38061184.00	86.72	3-5-150-1-AS				

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(Internal)
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C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3/107-RAC-IA_90HEX_1 Injection Number: 12 "Unknown"



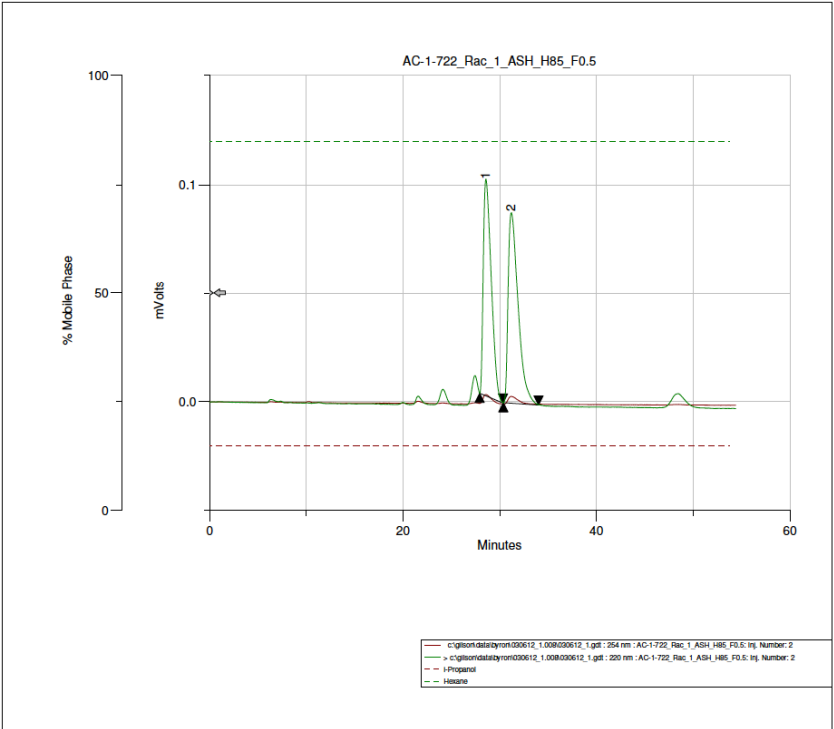
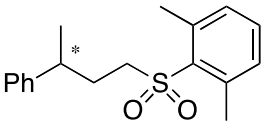
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	12.00	*1	22.95	283862464.00	49.02	7-RAC-IA_90					
2	12.00	*2	24.97	295209440.00	50.98	7-RAC-IA_90					

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3/105-IA_90HEX_1 Injection Number: 13 "Unknown"



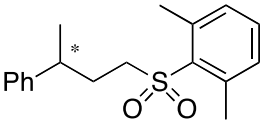
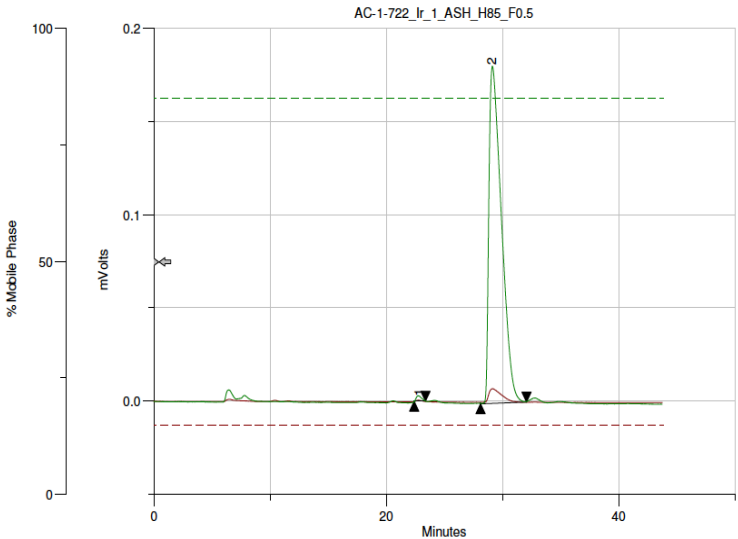
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	13.00	*1	22.88	150120576.00	97.88	/105-IA_90HE					
2	13.00	*2	25.08	3253163.75	2.12	/105-IA_90HE					

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(Internal)
c:\internal-
Created on Fri Aug 27 2004 11:38:20 \ Last Modified Fri Aug 27 2004 11:42:48
(Internal)
C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: AC-1-722_Rac_1_ASH_H85_F0.5 Injection Number: 2 "Unknown"



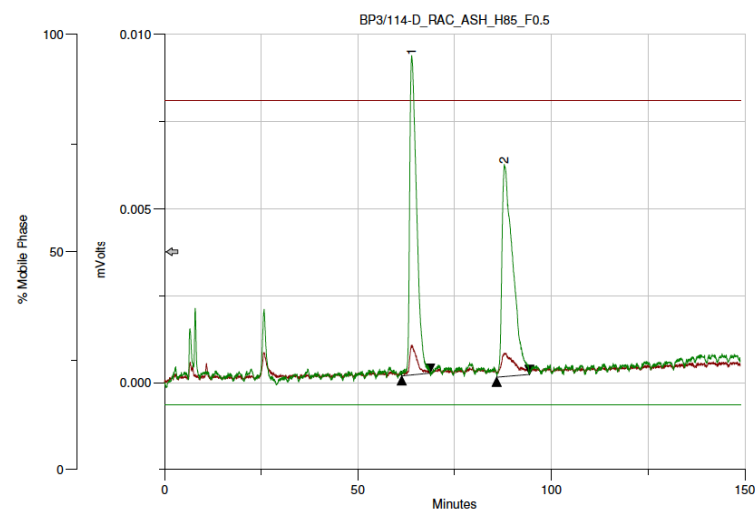
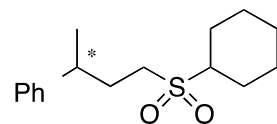
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	2.00	*1	28.59	94979160.00	47.47	Rac_1_ASH				
2	2.00	*2	31.23	105114120.00	52.53	Rac_1_ASH				

Data File: c:\gilson\data\byron\030612_1.009\030612_1.gdt
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Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: AC-1-722_Ir_1_ASH_H85_F0.5 Injection Number: 1 "Unknown"



	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	1.00	*1	22.77	1596888.75	0.70	2_Ir_1_ASH				
2	1.00	*2	29.16	226270480.00	99.30	2_Ir_1_ASH				

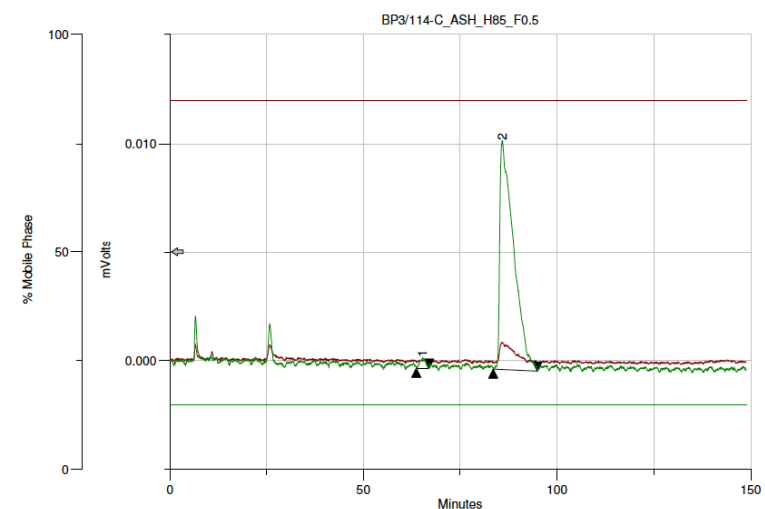
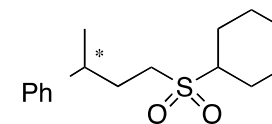
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(Internal)
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Created on Fri Aug 27 2004 11:38:20 \ Last Modified Fri Aug 27 2004 11:42:48
(Internal)
C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3\114-D_RAC_ASH_H85_F0.5 Injection Number: 2 "Unknown"



c:\gilson\data\byron\280512_1.005\280512_2.gdt: 254 nm: BP3\114-D_RAC_ASH_H85_F0.5; Inj. Number: 2
c:\gilson\data\byron\280512_1.005\280512_2.gdt: 220 nm: BP3\114-D_RAC_ASH_H85_F0.5; Inj. Number: 2
- Propand
- Heptane

	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	2.00	*1	63.93	19043832.00	49.03	D_RAC_ASH_					
2	2.00	*2	87.95	19800194.00	50.97	D_RAC_ASH_					

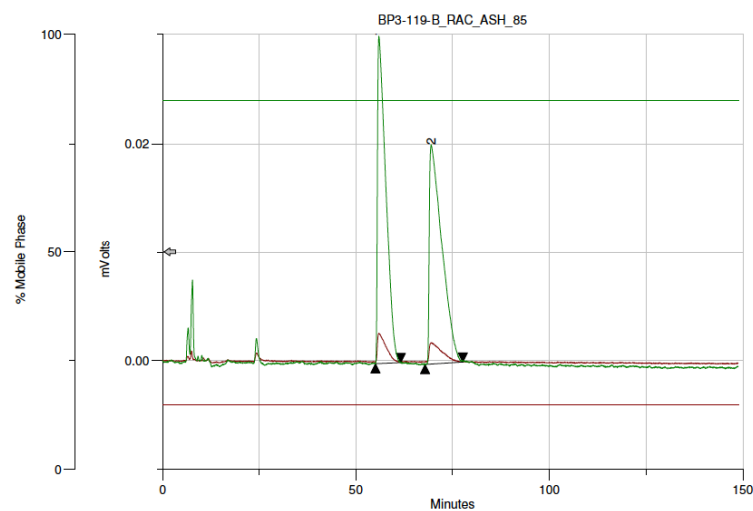
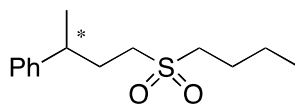
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(Internal)
C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3\114-C_ASH_H85_F0.5 Injection Number: 4 "Unknown"



c:\gilson\data\byron\280512_1.005\280512_2.gdt: 254 nm: BP3\114-C_ASH_H85_F0.5; Inj. Number: 4
c:\gilson\data\byron\280512_1.005\280512_2.gdt: 220 nm: BP3\114-C_ASH_H85_F0.5; Inj. Number: 4
- Propand
- Heptane

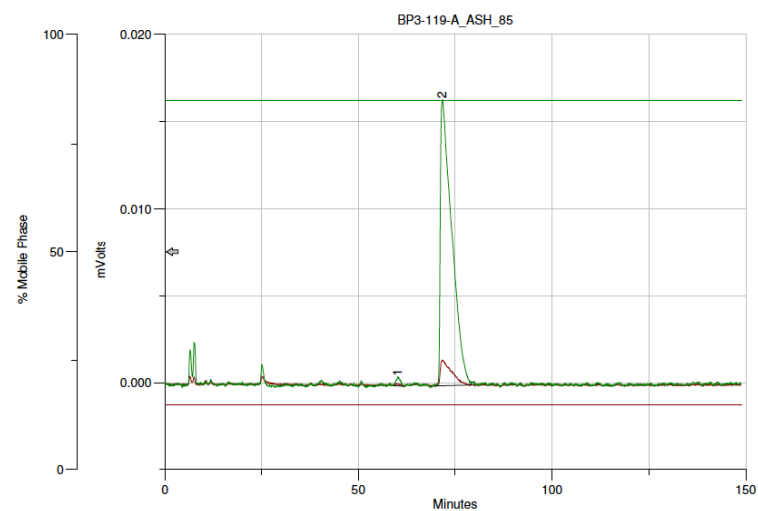
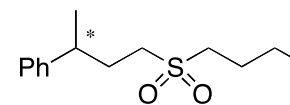
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	4.00	*1	65.30	812064.50	1.83	4-C_ASH_H8					
2	4.00	*2	85.84	43458376.00	98.17	4-C_ASH_H8					

Data File: c:\gilson\data\taigang\20120816.002\20120816.gdt
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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3-119-B_RAC_ASH_85 Injection Number: 3 "Unknown"



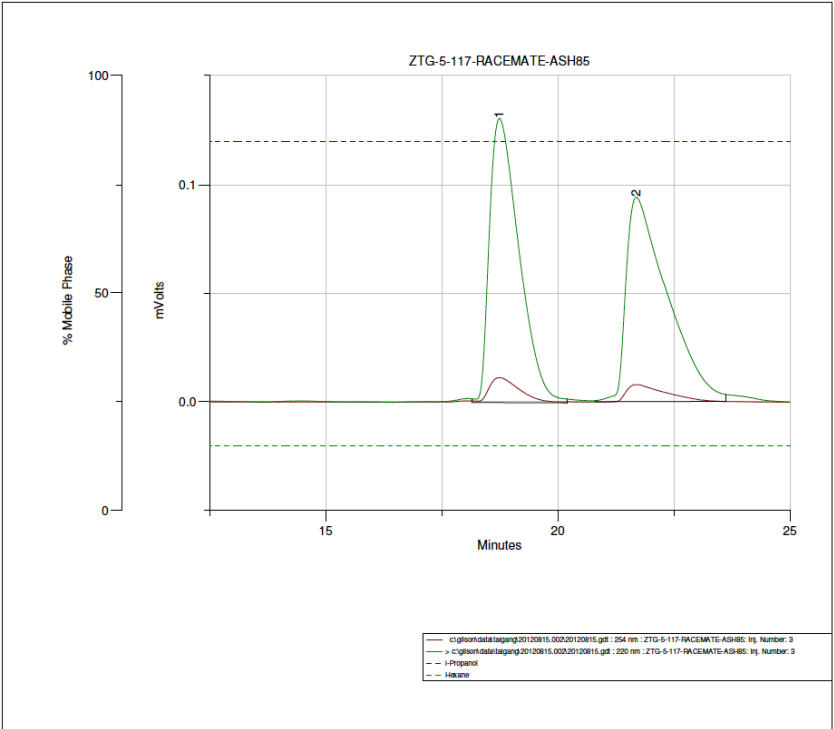
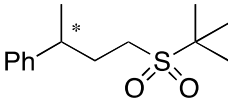
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	3.00	*1	55.97	75146176.00	49.75	19-B_RAC_A				
2	3.00	*2	69.49	75904472.00	50.25	19-B_RAC_A				

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Created on Fri Aug 27 2004 11:38:20 \ Last Modified Fri Aug 27 2004 11:42:48
(Internal)
C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3-119-A_ASH_85 Injection Number: 4 "Unknown"



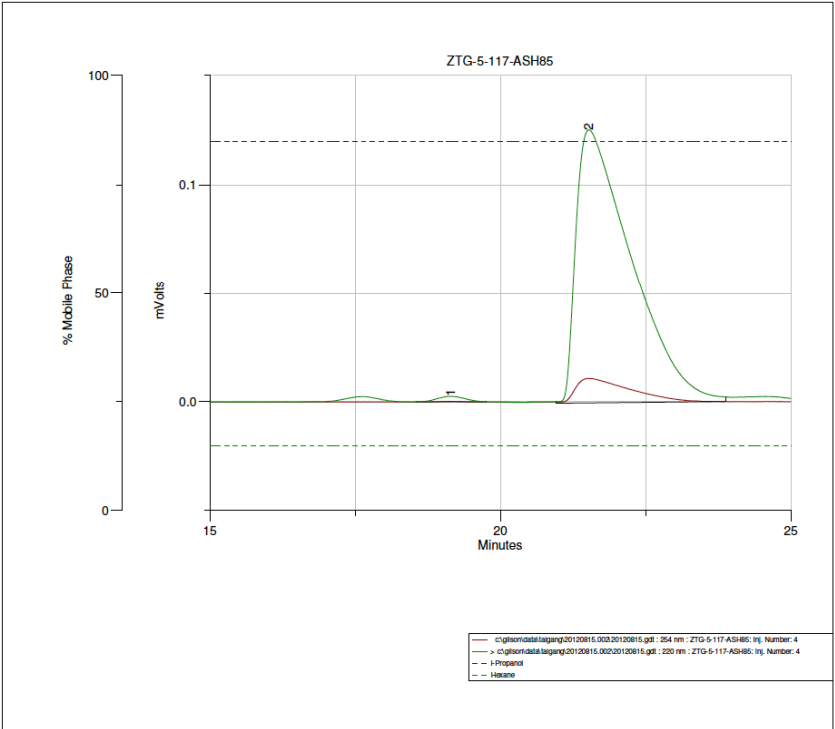
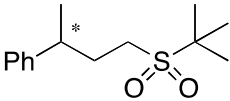
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	4.00	*1	60.07	708870.31	1.24	3-119-A_ASH				
2	4.00	*2	71.69	56294364.00	98.76	3-119-A_ASH				

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Created on Fri Aug 27 2004 11:38:20 \ Last Modified Fri Aug 27 2004 11:42:48
(Internal)
C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ZTG-5-117-RACEMATE-ASH85 Injection Number: 3 *Unknown*



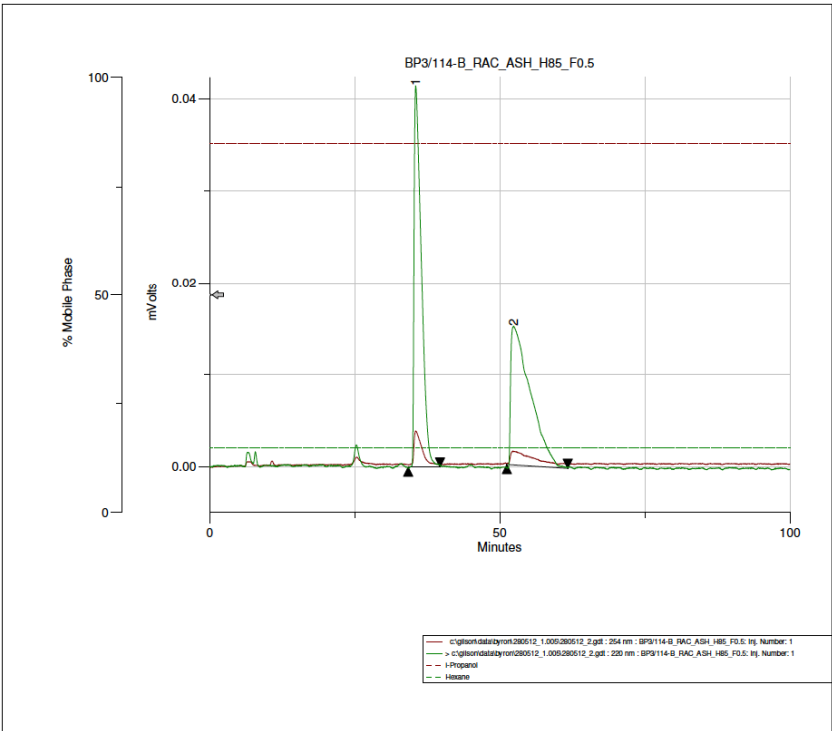
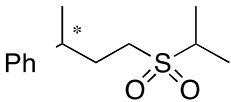
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	3.00	*1	18.76	96677360.00	49.87	7-RACEMAT					
2	3.00	*2	21.71	97161992.00	50.13	7-RACEMAT					

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(Internal)
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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: ZTG-5-117-ASH85 Injection Number: 4 *Unknown*



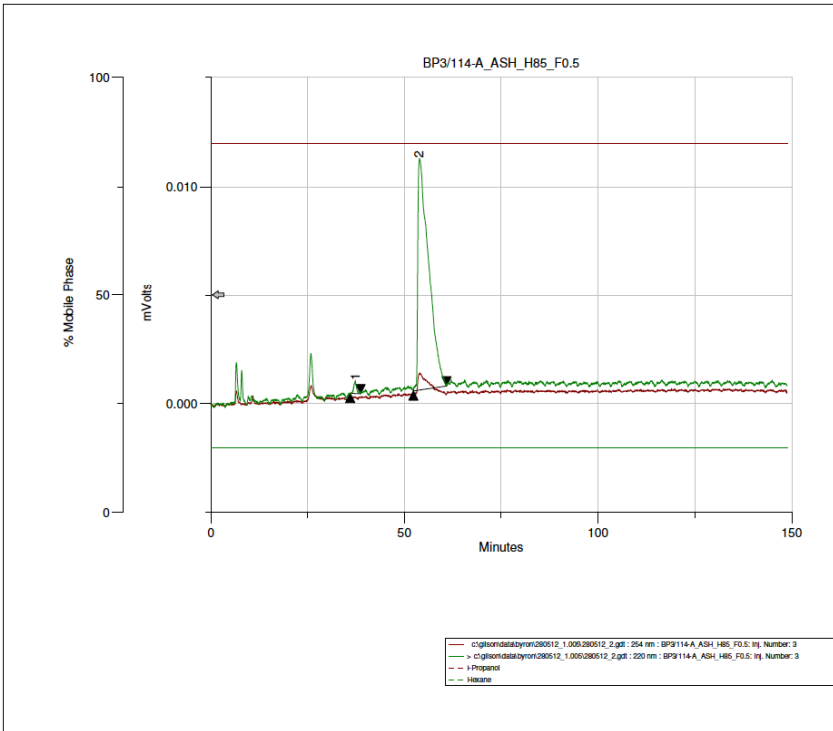
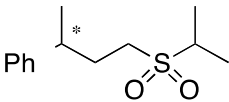
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	4.00	*1	19.15	1464759.62	1.04	G-5-117-ASH					
2	4.00	*2	21.55	138897728.00	98.96	G-5-117-ASH					

Data File: c:\gilson\data\byron\280512_1.005\280512_2.gdt
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(Internal)
C:\GILSON\FCLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3\114-B_RAC_ASH_H85_F0.5 Injection Number: 1 "Unknown"



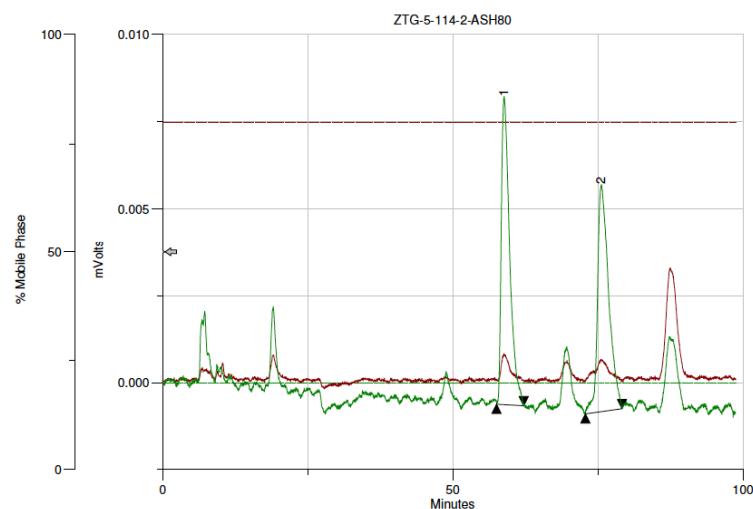
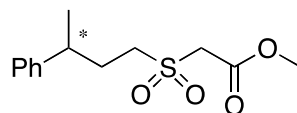
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	1.00	*1	35.56	60093228.00	50.61	3_RAC_ASH_					
2	1.00	*2	52.43	58647184.00	49.39	3_RAC_ASH_					

Data File: c:\gilson\data\byron\280512_1.005\280512_2.gdt
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C:\GILSON\FCLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP3\114-A_ASH_H85_F0.5 Injection Number: 3 "Unknown"



	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	3.00	*1	37.29	493841.91	1.41	4-A_ASH_H8					
2	3.00	*2	53.96	34618552.00	98.59	4-A_ASH_H8					

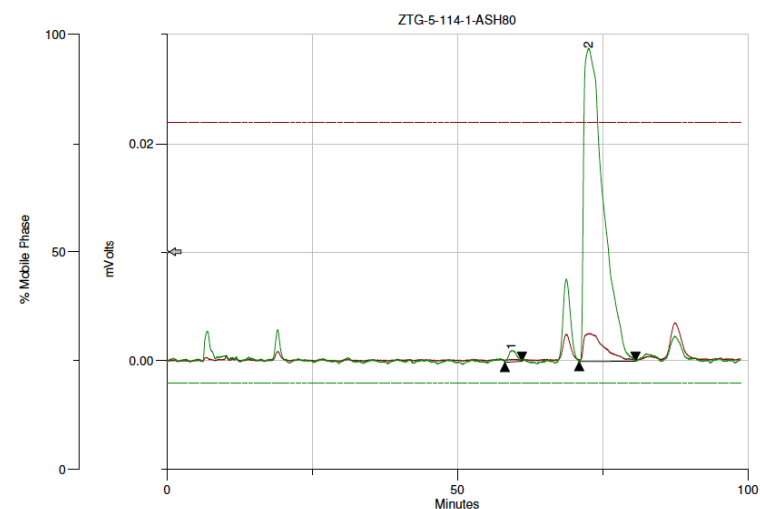
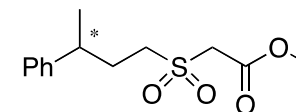
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 Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
 Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
 Created on Wed Apr 05 2000 13:32:01 \ Last Modified
 Sample name: ZTG-5-114-2-ASH80 Injection Number: 14 "Unknown"



c:\gilson\data\taigang\20120811.008\20120811.gdt : 254 nm : ZTG-5-114-2-ASH80; Inj. Number: 14
 c:\gilson\data\taigang\20120811.008\20120811.gdt : 220 nm : ZTG-5-114-2-ASH80; Inj. Number: 14
 -- i-Propanol
 -- Hexane

	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	14.00	*1	58.88	14795620.00	50.42	3-5-114-2-AS					
2	14.00	*2	75.61	14548981.00	49.58	3-5-114-2-AS					

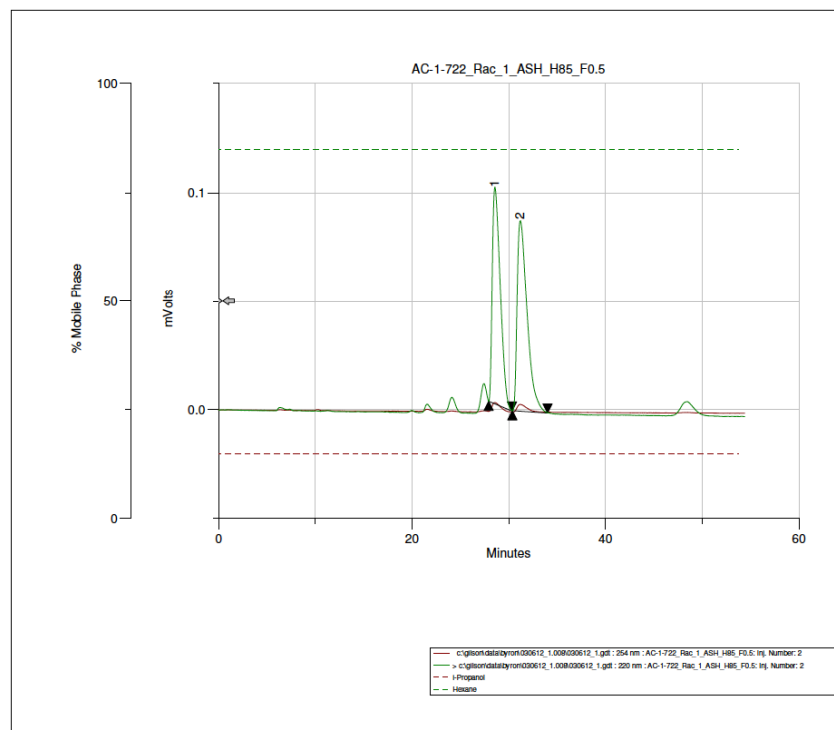
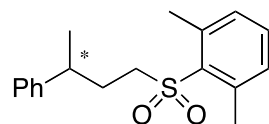
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 Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
 Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
 Created on Wed Apr 05 2000 13:32:01 \ Last Modified
 Sample name: ZTG-5-114-1-ASH80 Injection Number: 15 "Unknown"



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 -- i-Propanol
 -- Hexane

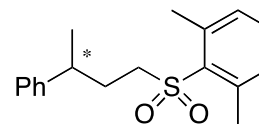
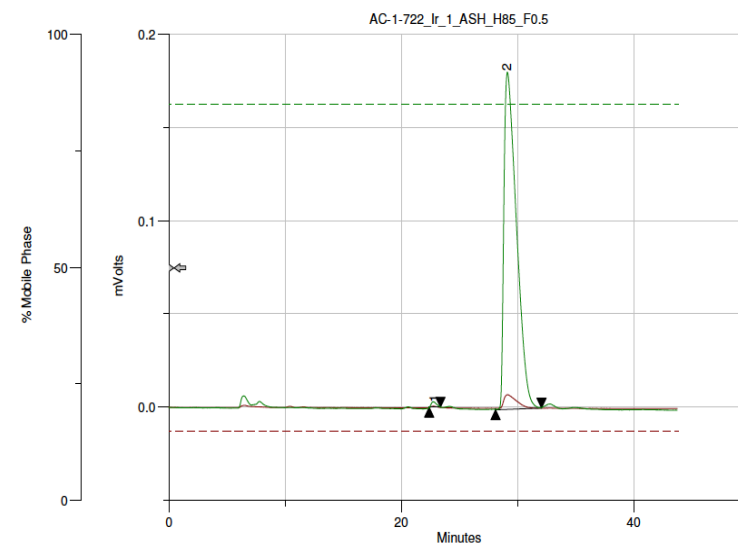
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1	15.00	*1	59.43	1738670.38	1.53	3-5-114-1-AS					
2	15.00	*2	72.61	111637080.00	98.47	3-5-114-1-AS					

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: AC-1-722_Rac_1_ASH_H85_F0.5 Injection Number: 2 "Unknown"



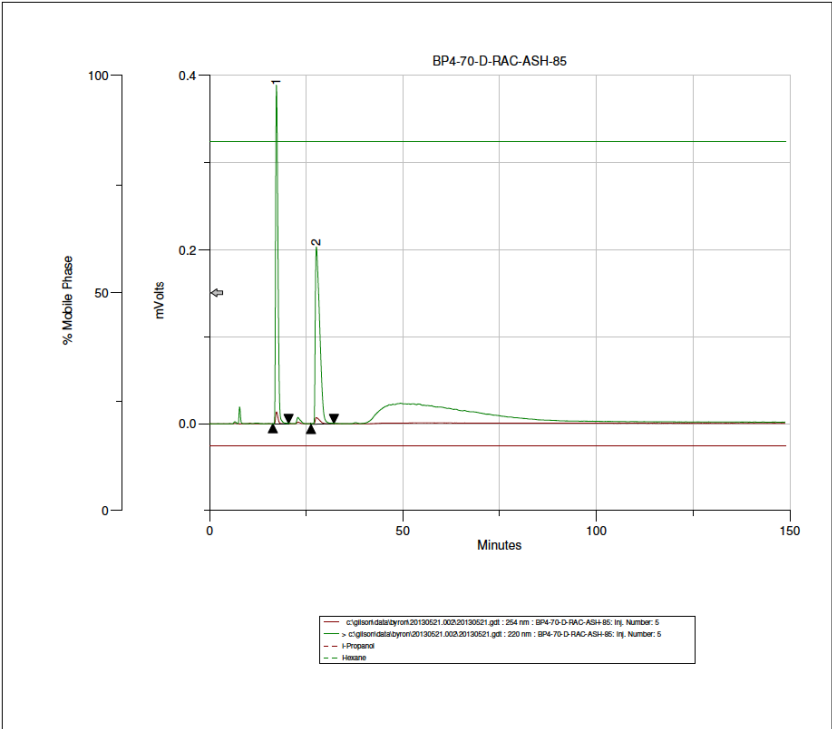
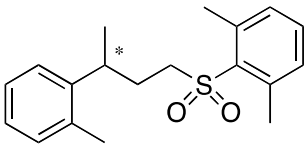
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	2.00	*1	28.59	94979160.00	47.47	Rac_1_ASH					
2	2.00	*2	31.23	105114120.00	52.53	Rac_1_ASH					

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Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: AC-1-722_Ir_1_ASH_H85_F0.5 Injection Number: 1 "Unknown"



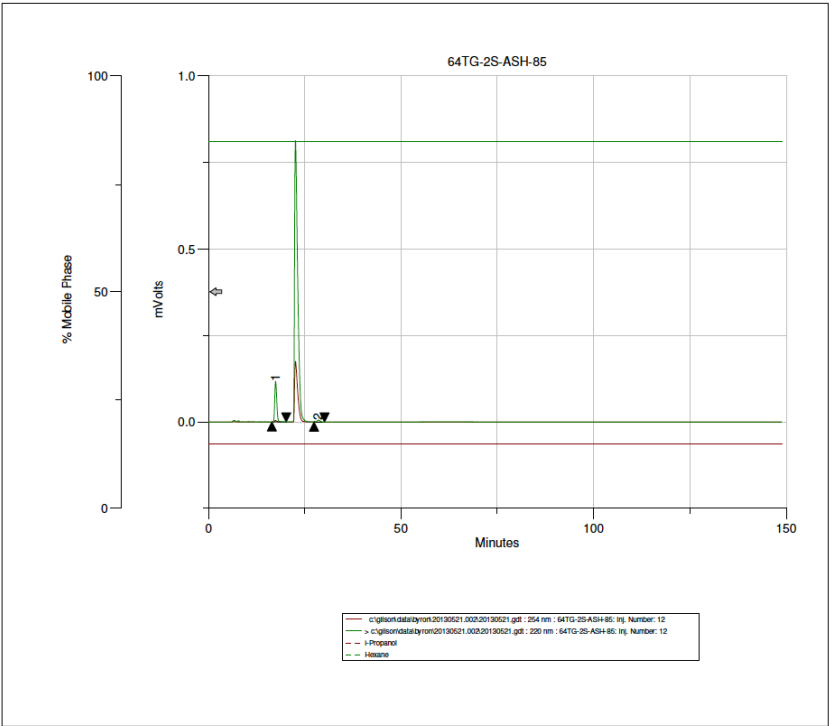
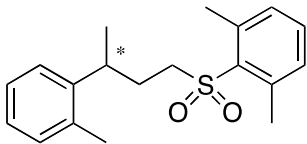
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	1.00	*1	22.77	1596888.75	0.70	2_Ir_1_ASH_H					
2	1.00	*2	29.16	226270480.00	99.30	2_Ir_1_ASH_H					

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-70-D-RAC-ASH-85 Injection Number: 5 *Unknown*



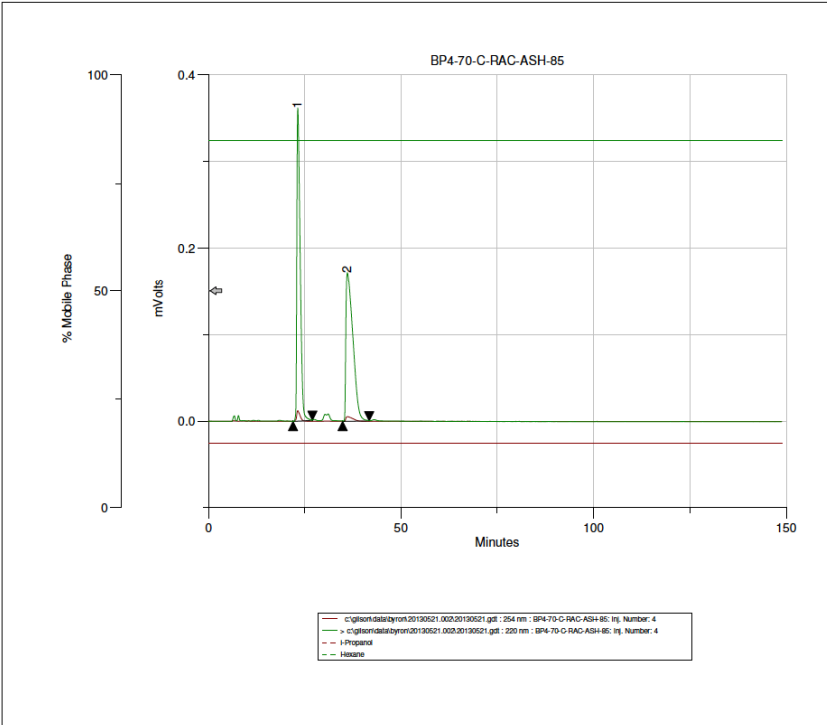
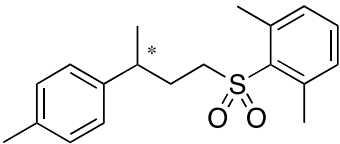
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	5.00	*1	17.32	266252416.00	49.57	70-D-RAC-AS					
2	5.00	*2	27.65	270914880.00	50.43	70-D-RAC-AS					

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: 64TG-2S-ASH-85 Injection Number: 12 *Unknown*



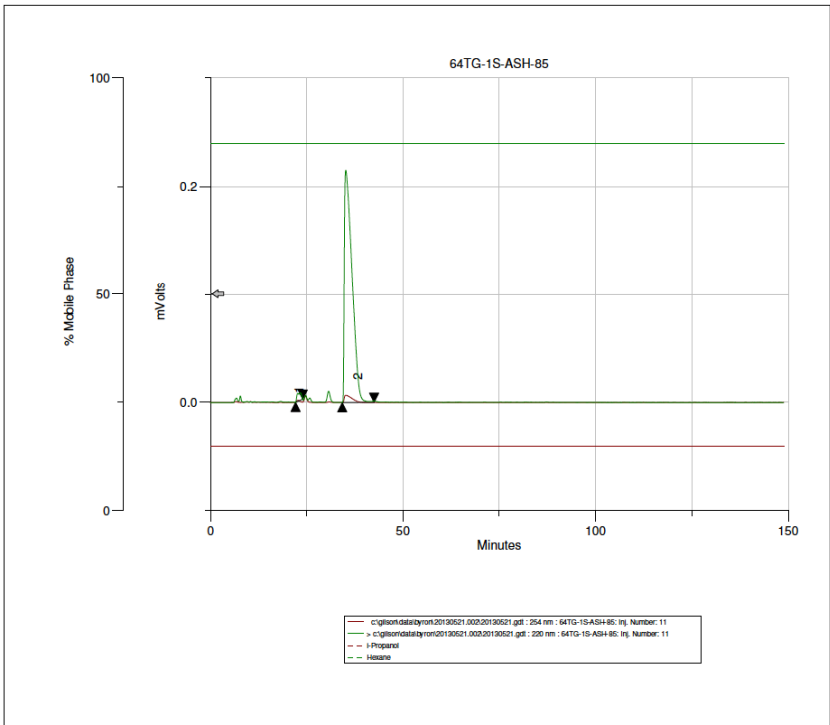
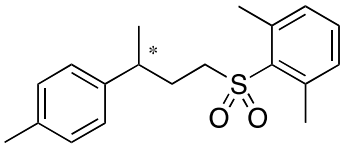
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	12.00	*1	17.44	72242848.00	91.92	TG-2S-ASH-4					
2	12.00	*2	28.57	6350981.00	8.08	TG-2S-ASH-4					

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(Internal)
C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-70-C-RAC-ASH-85 Injection Number: 4 "Unknown"



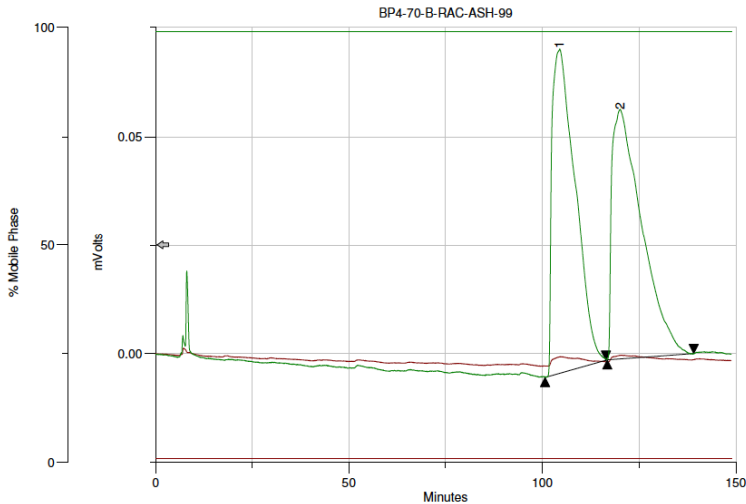
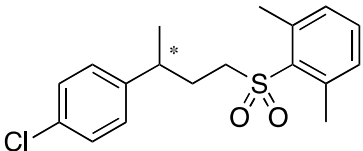
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	4.00	*1	23.23	363180704.00	49.91	70-C-RAC-AS				
2	4.00	*2	36.13	364476384.00	50.09	70-C-RAC-AS				

Data File: c:\gilson\data\byroni\20130521.002\20130521.gdt
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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: 64TG-1S-ASH-85 Injection Number: 11 "Unknown"



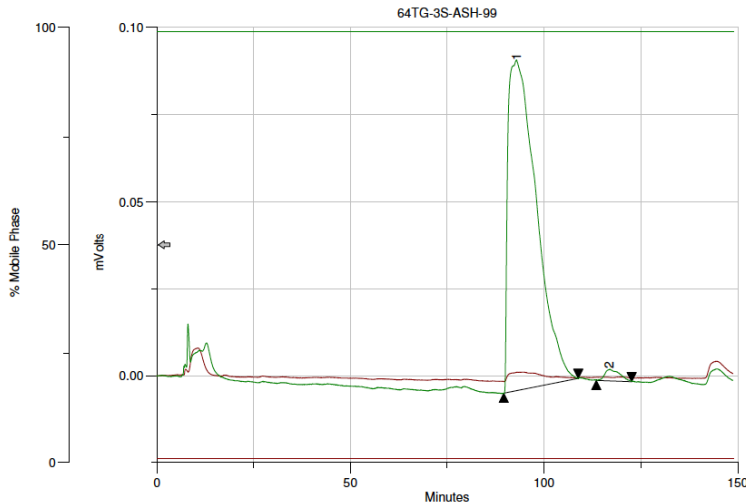
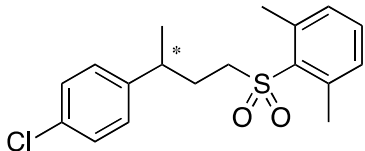
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	11.00	*1	22.67	9559086.00	1.88	TG-1S-ASH-85				
2	11.00	*2	35.20	98288960.00	98.12	TG-1S-ASH-85				

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-70-B-RAC-ASH-99 Injection Number: 2 *Unknown*



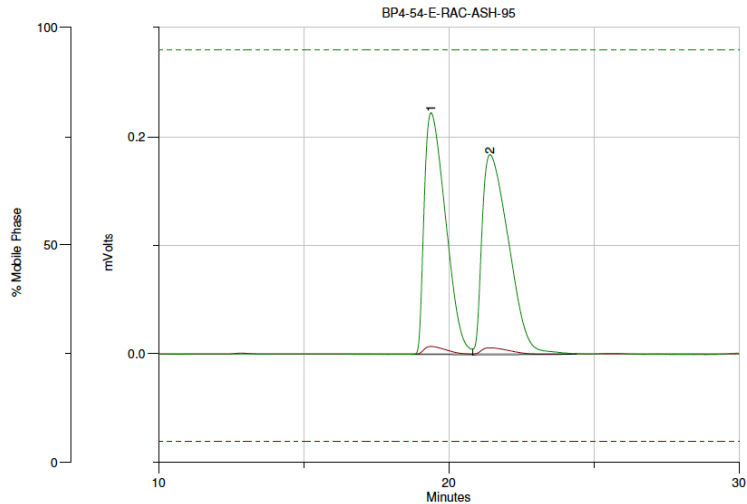
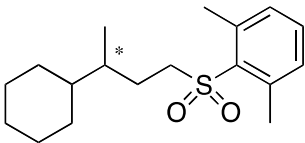
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	2.00	*1	104.42	516134816.00	50.19	70-B-RAC-AS					
2	2.00	*2	120.04	512196096.00	49.81	70-B-RAC-AS					

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: 64TG-3S-ASH-99 Injection Number: 3 *Unknown*



	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	3.00	*1	92.81	302583040.00	98.14	TG-3S-ASH-99					
2	3.00	*2	116.94	15235801.00	1.86	TG-3S-ASH-99					

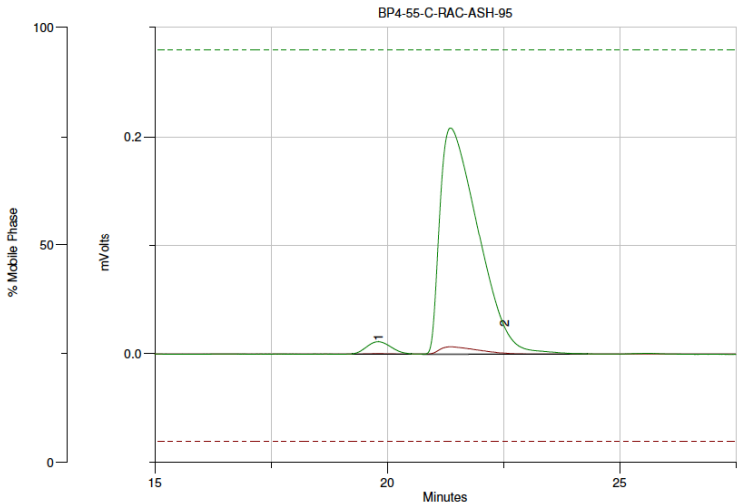
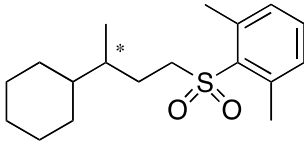
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(Internal)
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-54-E-RAC-ASH-95 Injection Number: 3 *Unknown*



--- c:\gilson\data\byron\20130421.001\20130421.gdt : 254 nm : BP4-54-E-RAC-ASH-95, Inj. Number: 3
--- c:\gilson\data\byron\20130421.001\20130421.gdt : 220 nm : BP4-54-E-RAC-ASH-95, Inj. Number: 3
--- I-Propanol
--- Hexane

	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	3.00	*1	19.41	191047392.00	49.16	54-E-RAC-AS					
2	3.00	*2	21.45	197553264.00	50.84	54-E-RAC-AS					

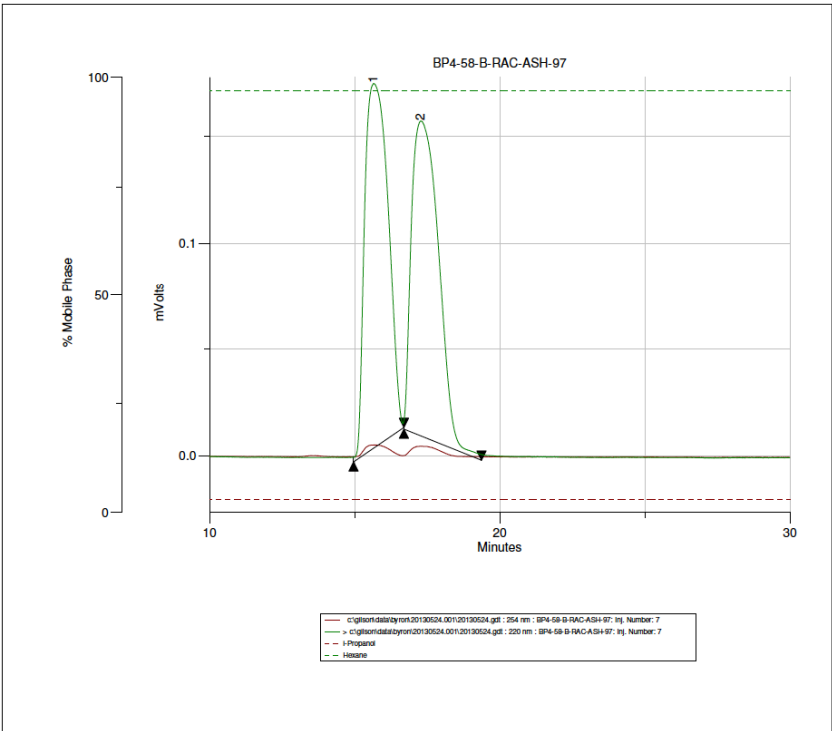
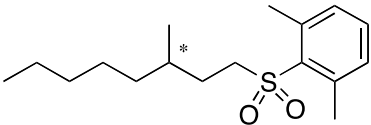
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-55-C-RAC-ASH-95 Injection Number: 2 *Unknown*



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--- c:\gilson\data\byron\20130421.001\20130421.gdt : 220 nm : BP4-55-C-RAC-ASH-95, Inj. Number: 2
--- I-Propanol
--- Hexane

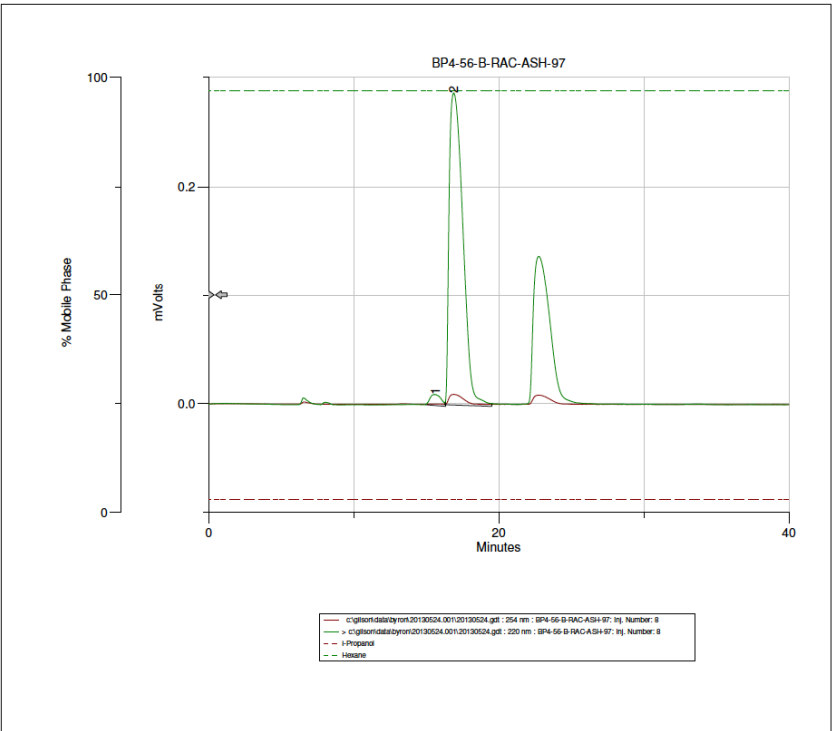
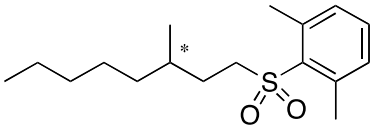
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1	2.00	*1	19.81	7173896.50	3.45	55-C-RAC-AS					
2	2.00	*2	21.38	200728112.00	96.55	55-C-RAC-AS					

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-56-B-RAC-ASH-97 Injection Number: 7 *Unknown*



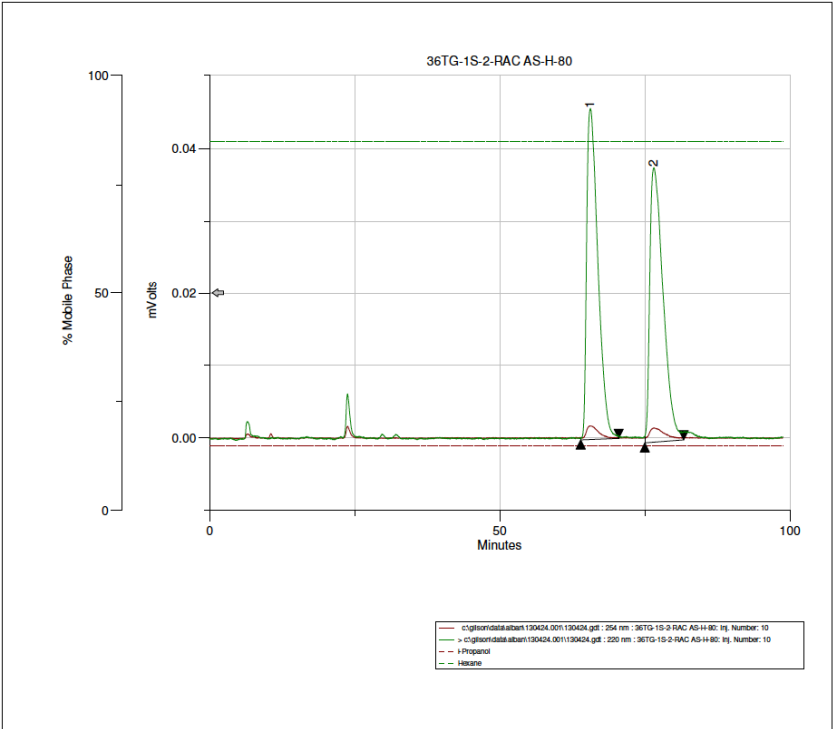
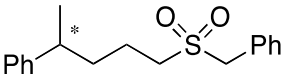
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	7.00	*1	15.68	159634816.00	49.87	58-B-RAC-AS				
2	7.00	*2	17.34	160437472.00	50.13	58-B-RAC-AS				

Data File: c:\gilson\data\byron\20130524.001\20130524.gdt
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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-56-B-RAC-ASH-97 Injection Number: 8 *Unknown*



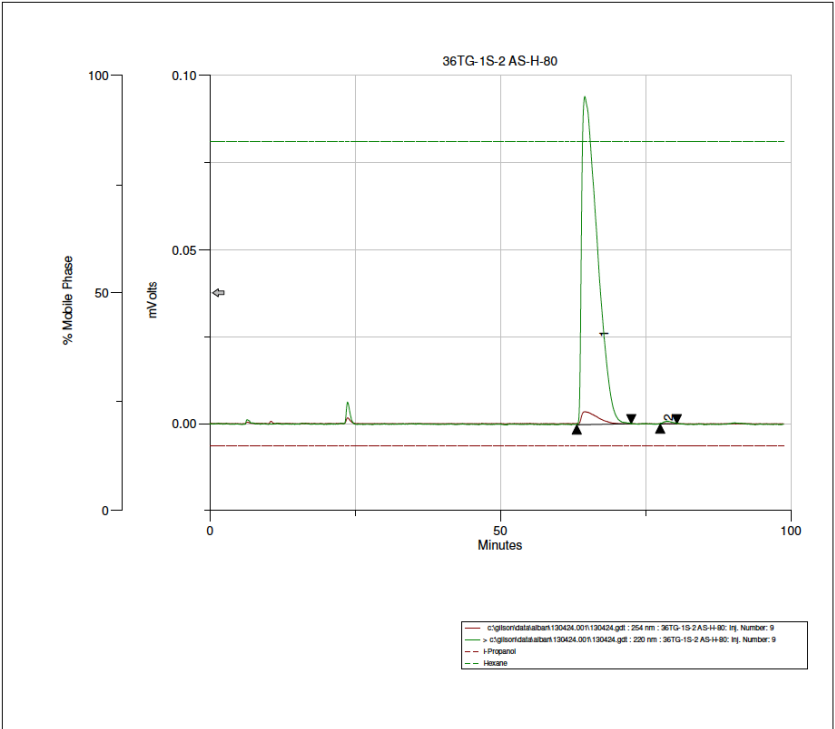
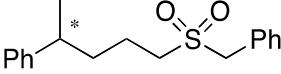
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	8.00	*1	15.62	9156683.00	2.83	56-B-RAC-AS				
2	8.00	*2	16.93	313867104.00	97.17	56-B-RAC-AS				

Data File: c:\gilson\data\alban\130424.001\130424.gdt
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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
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Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: 36TG-1S-2-RAC AS-H-80 Injection Number: 10 "Unknown"



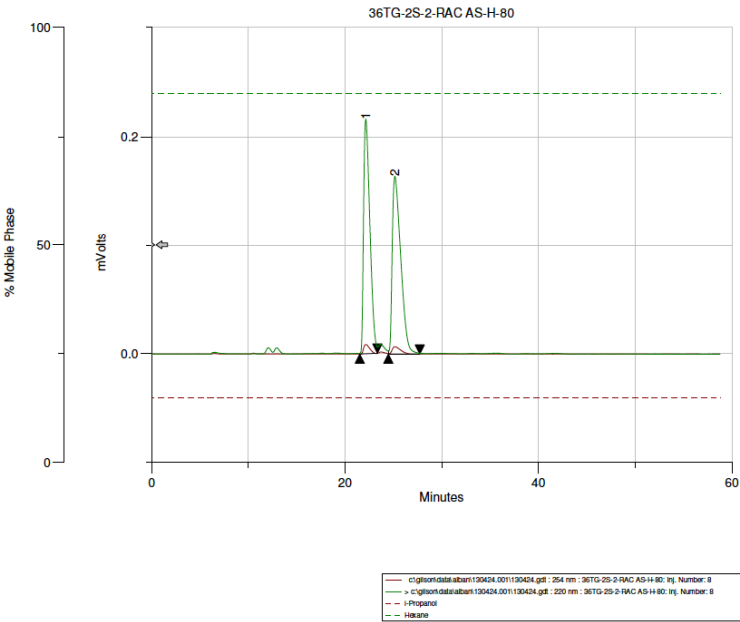
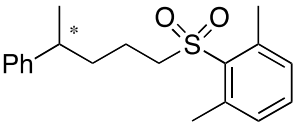
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	10.00	*1	65.62	102454840.00	50.40	1S-2-RAC AS				
2	10.00	*2	76.57	100820096.00	49.60	1S-2-RAC AS				

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: 36TG-1S-2 AS-H-80 Injection Number: 9 "Unknown"



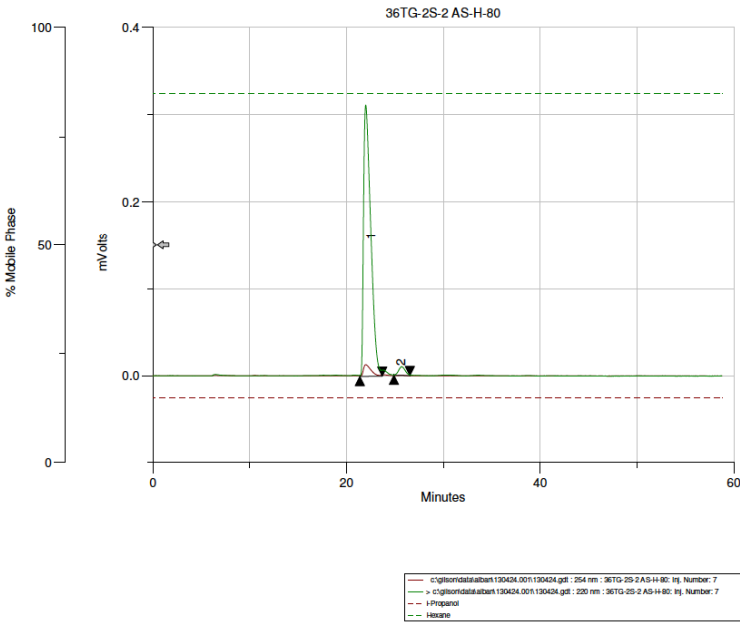
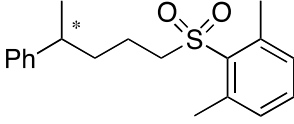
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	9.00	*1	64.59	292856448.00	99.49	G-1S-2 AS-H				
2	9.00	*2	78.70	1490085.25	0.51	G-1S-2 AS-H				

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: 36TG-2S-2-RAC AS-H-80 Injection Number: 8 *Unknown*



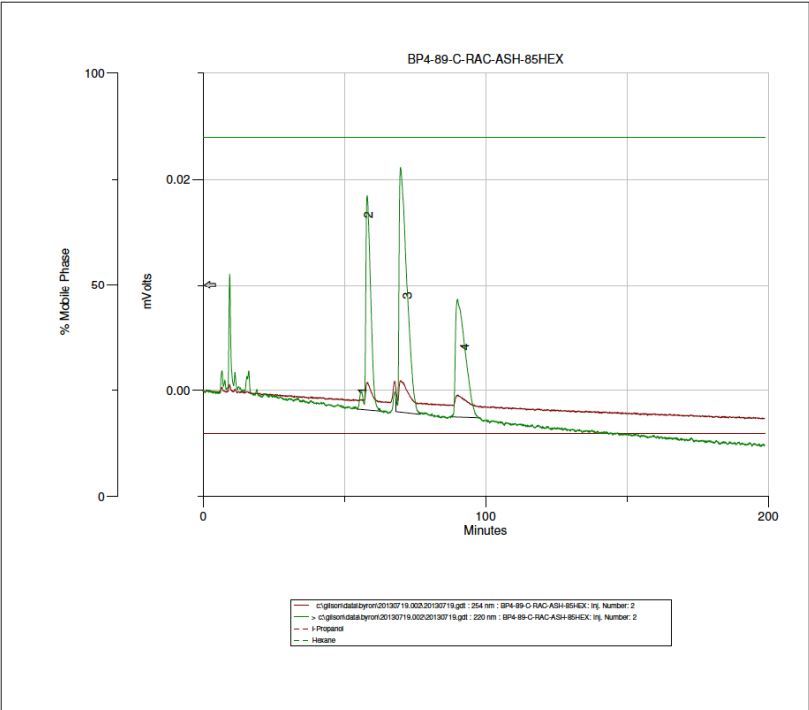
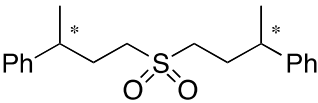
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	8.00	*1	22.16	164081616.00	49.47	2S-2-RAC AS				
2	8.00	*2	25.18	167582816.00	50.53	2S-2-RAC AS				

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C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: 36TG-2S-2 AS-H-80 Injection Number: 7 *Unknown*



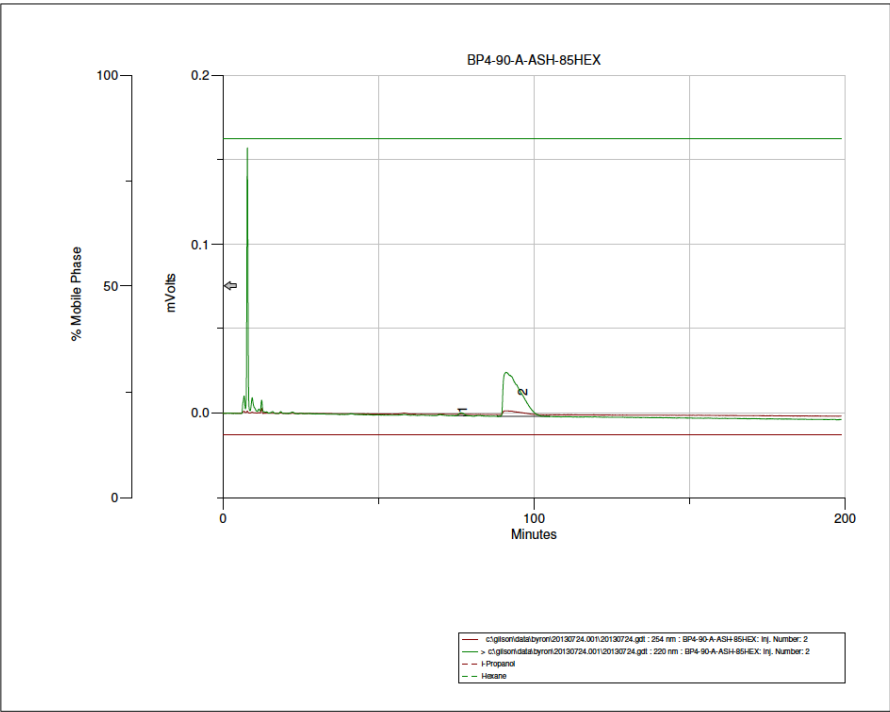
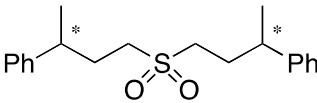
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	7.00	*1	22.01	271168928.00	97.05	G-2S-2 AS-H				
2	7.00	*2	25.71	8236547.50	2.95	G-2S-2 AS-H				

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Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-89-C-RAC-ASH-85HEX Injection Number: 2 "Unknown"



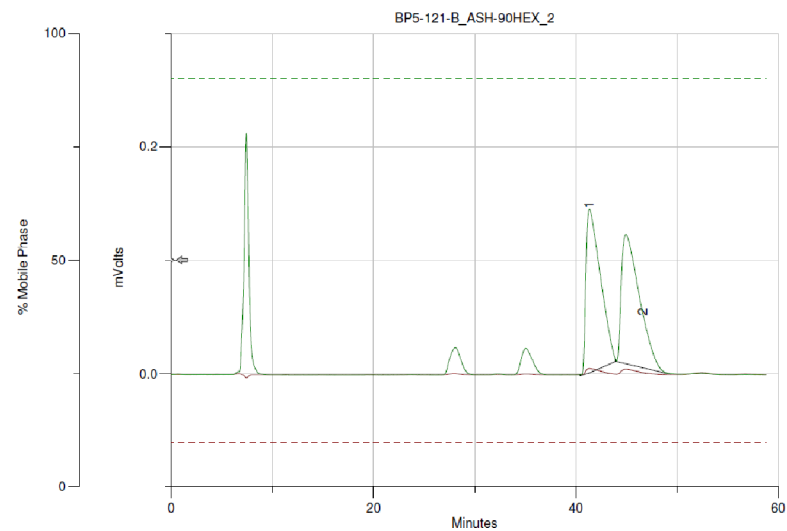
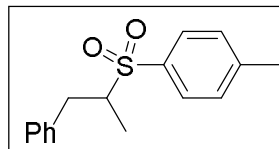
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	2.00	*2	58.14	42158268.00	26.38	C-RAC-ASH					
2	2.00	*3	69.96	73301728.00	45.87	C-RAC-ASH					
3	2.00	*4	90.05	44345448.00	27.75	C-RAC-ASH					

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(Internal)
C:\GILSON\FLEVEL.GGP
Created on Fri Aug 27 2004 11:49:06 \ Last Modified Tue Nov 30 2004 13:54:19
Analysis Method: C:\GILSON\METHODS\ANALYT-1\KOLTEST.GAN
Created on Wed Apr 05 2000 13:32:01 \ Last Modified
Sample name: BP4-90-A-ASH-85HEX Injection Number: 2 "Unknown"



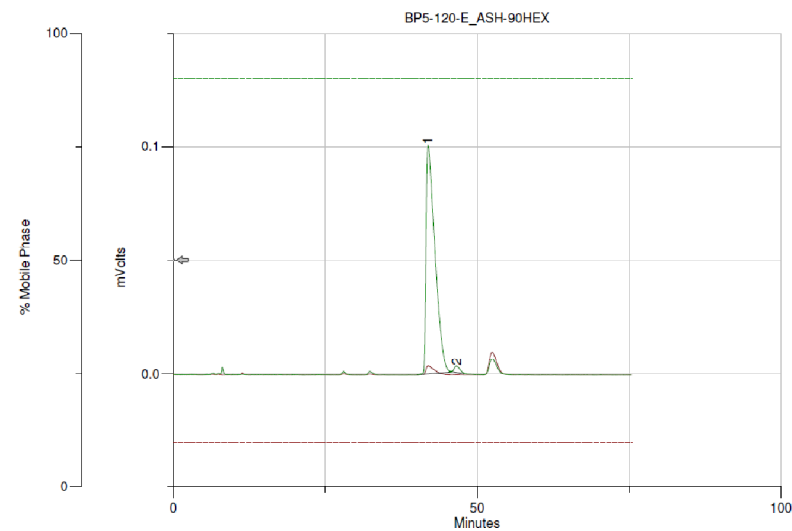
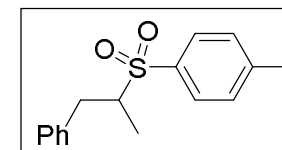
	Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.					
1	2.00	*1	76.55	3664625.25	2.18	90-A-ASH-85					
2	2.00	*2	91.07	64156288.00	97.82	90-A-ASH-85					

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 (Internal)
 C:\GILSON\FLEVEL.GGP
 Created on Fri Aug 27 2004 11:49:06 \ Last Modified Fri Sep 13 2013 14:09:14
 Analysis Method: C:\GILSON\METHODS\ANALY-1\KOLTEST.GAN
 Created on Wed Apr 05 2000 13:32:01 \ Last Modified
 Sample name: BP5-121-B_ASH-90HEX_2 Injection Number: 2 "Unknown"



Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	*1	41.38	238694336.00	50.22	21-B_ASH-90				
2	*2	45.00	236574016.00	49.78	21-B_ASH-90				

Data File: c:\gilson\data\byron\20141002\004\20141002.gdt
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 (Internal)
 C:\GILSON\FLEVEL.GGP
 Created on Fri Aug 27 2004 11:49:06 \ Last Modified Fri Sep 13 2013 14:09:14
 Analysis Method: C:\GILSON\METHODS\ANALY-1\KOLTEST.GAN
 Created on Wed Apr 05 2000 13:32:01 \ Last Modified
 Sample name: BP5-120-E_ASH-90HEX Injection Number: 1 "Unknown"



Inj. Number	Peak Name	R. Time	Area	Area %	Sample Descrip.				
1	*1	41.98	169859088.00	98.29	120-E_ASH-90				
2	*2	46.63	2946973.75	1.71	120-E_ASH-90				

