Supporting information

Facile nucleophilic substitution of sulfonyl oxime ethers: An easy access to oxime ethers, carbonyl compounds and amines

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1. Instrument and Measurement

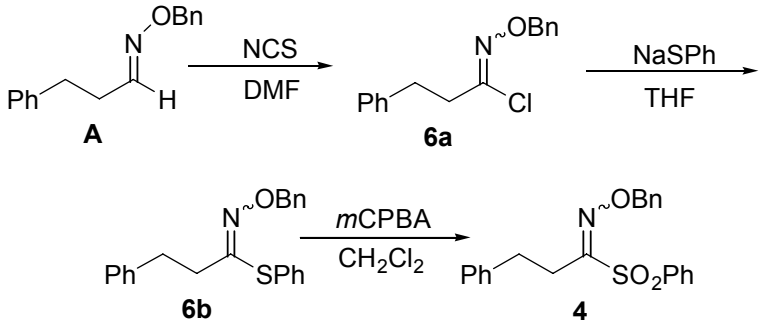
Analytical thin layer chromatography (TLC) was performed on pre-coated glass plates with Kieselgel 60 F254 (0.2 mm, Merck). Flash column chromatography was carried out on Kieselgel 60 (230-400 mesh ASTM, Merck). Proton nuclear magnetic resonance spectroscopy (^{1}H NMR) was recorded on Bruker Fourier Transform AC 300 (300MHz) or Bruker Fourier Transform AM 400 (400MHz) spectrometers. The following abbreviations were used to describe peak patterns when appropriate : s = singlet, bs = broad singlet, d = doublet, bd = broad doublet, dd = doublet of doublet, t = triplet, q = quartet, m = multiplet. Coupling constant, *J*, was reported in Hertz unit (Hz). Carbon -13 nuclear magnetic resonance spectroscopy (^{13}C NMR) was recorded on Bruker Fourier Transform AC 300 (75MHz) or Bruker Fourier Transform AM 400 (100MHz) and was fully decoupled by broad-band decoupling. High resolution mass spectra were obtained on a VG AUTOSPEC Ultma GC/MS system using direct insertion probe (DIP) and electron impact (EI) (70 eV) method.

2. Materials

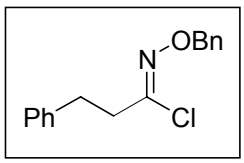
All the commercially available reagent grade chemicals were obtained from Sigma-Aldrich, Fluka, and Tokyo Kasei Chemical company and generally used without further purifications. If necessary, distillation or recrystallization was done before use. Tetrahydrofuran was distilled from sodium-benzophenone system under nitrogen. *N*,*N*-Dimethylformamide was distilled from CaH_2. Solvents including ethyl acetate (EA) and *n*-hexane for column chromatography were technical grade and distilled before use.

3. Experimental procedure and spectral data

Preparation of 3-Phenyl-1-(phenylsulfonyl)propan-1-one *O*-Benzyl Oxime (4)



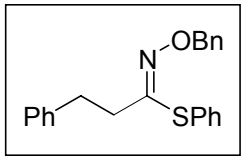
The solution of oxime ether **A** (5.96 g, 25 mmol) and *N*-chlorosuccinimide (4.31 g, 32.3 mmol) in *N*, *N*-dimethylformamide (20 mL) was heated at 40 °C for 3 h. The mixuture was diluted with diethyl ether, washed with brine several times. The organic phase was dried over anhydrous $MgSO_4$, filtered, and evaporated. The residue was purified by silica gel column chromatography using ethyl acetate : *n*-hexane = 1 : 20 as eluent to give **6a** (6.7g, 98%).



^{1}H NMR ($CDCl_3$, 400MHz) δ 2.75~2.80 (m, 2H), 2.92~2.96 (m, 2H), 5.13 (s, 2H), 7.16~7.36 (m, 10H); **^{13}C NMR** ($CDCl_3$, 100MHz) δ 32.8, 38.8, 76.7, 126.5, 128.2, 128.3, 128.6, 128.7, 137.0, 139.2, 140.0; HRMS(ESI): $(M+H)^+$ calcd for $C_{16}H_{16}NO$: 274.1008, found 274.0999

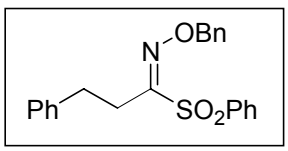
To a slurry of sodium hydride (1.47 g, 36.8 mol) in THF (80 mL) was added benzenethiol (2.5 mL, 24.5 mmol) at 0 °C. The mixture was warmed up to room temperature and stirred for 30 min. The solution of **6a** (6.7 g, 24.5 mmol) in THF (10 mL) was added to the sodium thiophenoxide solution at 0 °C. The mixture was stirred for 4 h at room temperature and diluted with diethyl ether. The organic phase was washed with aqueous NH_4Cl solution and brine. The

organic phase was dried over anhydrous $MgSO_4$, filtered, and evaporated. The residue was purified by passing through a short column of silica gel using ethyl acetate : *n*-hexane = 1 : 10 as eluent to give **6b** (7.9g, 93%).



^{1}H NMR ($CDCl_3$, 400MHz) δ 2.35~2.40 (m, 2H), 2.64~2.68 (m, 2H), 5.21 (s, 2H), 6.74~6.79 (d, *J* = 7.8 Hz, 2H), 7.11~7.18 (m, 3H), 7.32~7.44 (m, 8H), 7.46~7.58 (d, *J* = 7.8 Hz, 2H); **^{13}C NMR** ($CDCl_3$, 100MHz) δ 34.1, 34.6, 76.4, 126.2, 127.9, 128.0, 128.1, 128.4, 128.5, 129.3, 129.5, 129.8, 136.5, 137.9, 140.9, 154.6; HRMS(ESI): $(M+H)^+$ calcd for $C_{22}H_{21}NOS$: 348.1416, found 348.1422

Sodium bicarbonate (2.77 g, 33 mmol) and *m*-chloroperoxybenzoic acid (4.93 g, 22 mmol) were added to the solution of **6b** (3.47 g, 10 mmol) in methylene chloride (100 mL) at 0 ^oC. After being stirred at room temperature for 6 h, the mixture was diluted with methylene chloride and washed with aqueous sodium thiosulfate solution. The organic phase was washed with aqueous sodium bicarbonate solution several times and washed with brine. The combined organic phase was dried over anhydrous $MgSO_4$, filtered, and evaporated. The residue was purified by silica gel column chromatography using ethyl acetate : *n*-hexane (1 : 5) as eluent to give **4** (3.41g, 90%).



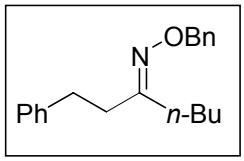
^{1}H NMR ($CDCl_3$, 400MHz) *δ* 2.98~3.04 (m, 4H), 4.97 (s, 2H), 6.92 (d, *J* = 7.4 Hz, 2H), 7.16-7.27 (m, 8H), 7.35 (t, *J* = 7.8 Hz, 2H), 7.56 (t, *J* = 7.8 Hz, 2H), 7.75 (d, *J* = 7.4 Hz, 2H); **^{13}C NMR** ($CDCl_3$, 100MHz) δ 32.5, 33.4, 78.2, 126.5, 128.4, 128.6, 128.8, 128.85, 129.0, 133.9, 135.9, 140.3,

153.7; HRMS(ESI): $(M+H)^+$ calcd for $C_{22}H_{21}NO_3S$: 380.1328, found 380.1320

Typical procedure of nucleophilic substitution reactions of 3-phenyl-1-(phenylsulfonyl) propan-1-one *O*-benzyl oxime (4)

Reaction of 4 with n-butyllithium; Preparation of 1-phenylheptan-3-one *O*-benzyl oxime (5a)

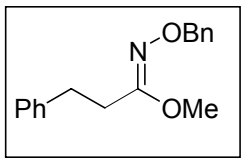
To the solution of **4** (75.9 mg, 0.2 mmol) in THF (2 ml) was added 2.5M *n*-butyllithium solution in hexane (0.096 ml, 0.24 mmol) at -78 °C. After being stirred for 3 h at -78 °C, the reaction mixture was diluted with ethyl acetate and quenched with saturated aqueous ammonium chloride solution. The organic layer was separated and the aqueous layer was further extracted with ethyl acetate. The combined organic layer was dried over anhydrous magnesium sulfate, filtered and evaporated under reduced pressure. The crude product was purified by column chromatography using ethyl acetate : *n*-hexane 1 : 15 as eluent to give **5a** (54 mg, 91%).



^{1}H NMR ($CDCl_3$, 400 MHz) δ 0.88~0.93 (m, 3H), 1.29~1.32 (m, 2H), 1.46~1.48 (m, 2H), 2.12 (t, J = 7.9 Hz, 1H), 2.37 (t, J = 8.0 Hz, 1H), 2.50 (t, J = 7.9 Hz), 2.63 (t, J = 8.0 Hz, 1H), 2.80~2.84 (m, 2H), 5.10 (d, J = 3.7 Hz, 2H), 7.16~7.38 (m, 10H); **^{13}C NMR** ($CDCl_3$, 100 MHz) δ 13.8, 22.4, 22.8, 27.9, 28.3, 28.5, 30.4, 31.8, 32.7, 34.2, 35.9, 75.3, 75.4, 125.9, 126.0, 127.4, 127.5, 127.8, 127.9, 128.19, 128.2, 128.25, 128.3, 128.4, 138.3, 138.4, 141.4, 141.5, 161.0, 161.2; HRMS (M+) calcd for $C_{20}H_{25}NO$: 295.1936, found 295.1940

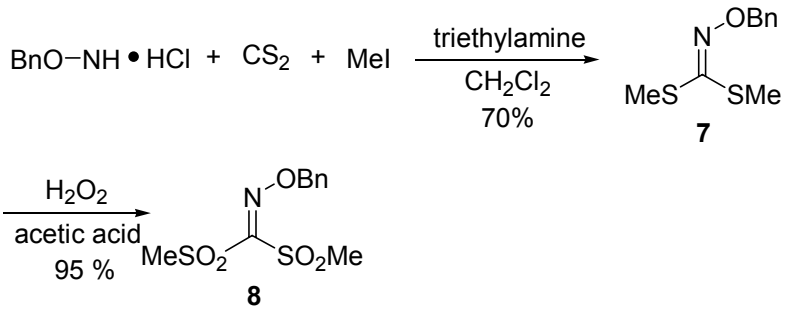
Reaction of 4 with sodium methoxide; Preparation of methyl *N*-benzyloxy-3-phenylpropanimidate (5i)

To the solution of **4** (76 mg, 0.2 mmol) in THF (2 ml) was added sodium methoxide (22 mg, 0.4 mmol) at 0 ^{o}C. After being stirred for 3 h at 0 ^{o}C, the reaction mixture was diluted with ethyl acetate and quenched with saturated aqueous ammonium chloride solution. The organic layer was separated and the aqueous layer was further extracted with ethyl acetate. The combined organic layer was dried over anhydrous magnesium sulfate, filtered and evaporated under reduced pressure. The crude product was purified by column chromatography using ethyl acetate : *n*-hexane 1 : 15 as eluent to give **5i** (50 mg, 93%).



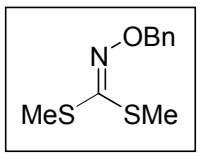
^{1}H NMR ($CDCl_3$, 400 MHz) δ 2.68~2.72 (m, 2H), 2.81~2.85 (m, 2H), 3.64 (s, 3H), 4.92 (s, 2H), 7.16~7.35 (m, 10H); **^{13}C NMR** ($CDCl_3$, 100 MHz) δ 29.30, 31.2, 54.0, 75.7, 126.0, 127.6, 128.2, 128.26, 128.29, 128.3, 138.0, 141.0, 164.8; HRMS (M+) calcd for $C_{17}H_{19}NO_2$: 269.1416, found 269.1414

Preparation of bis-methylsulfonyl methanone *O*-benzyl oxime (8)



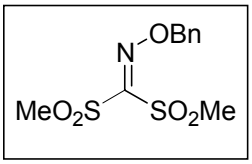
Carbon disulfide (9 mL, 150 mmol) and iodomethane (9.4 mL, 150 mmol) were added to

the solution of *O*-benzyl hydorxyamine hydrochloride (4.8 g, 30 mmol) in methylene chloride (100 mL) at 0 ^{o}C. Triethylamine (21 mL, 150 mmol) was added to the mixture and the mixture was stirred at 0 ^{o}C for 30 min. After being stirred at room temperature for 3 h, the mixture was quenched with aqueous NH_4Cl solution and diluted with methylene chloride. The combined organic phase was dried over anhydrous $MgSO_4$, filtered and evaporated. The residue was purified by silica gel column chromatography with ethyl acetate: *n*-hexane = 1 : 20 as eluent to give **7** (4.80 g, 70%).



^{1}H NMR ($CDCl_3$, 400MHz) δ 2.40 (s, 3H), 2.41 (s, 3H), 5.15 (s, 2H), 7.25~7.39 (m, 5H); **^{13}C NMR** ($CDCl_3$, 100MHz) δ 13.7, 15.4, 76.7, 127.9, 128.3, 128.5, 138.0, 1523.1; HRMS(ESI): $(M+H)^+$ calcd for $C_{10}H_{13}NOS_2$: 228.0511, found 228.0517

Aqueous hydrogen peroxide (35 wt.%, 8.7 mL, 100 mmol) was added to the solution of **7** (4.8 g, 21 mmol) in acetic acid (25 mL). After being stirred at reflux for 5 h, the mixture was quenched with aqueous sodium thiosulfate solution and extracted with methylene chloride three times. After the organic phase was washed with aqueous sodium bicarbonate solution and brine, the combined organic phase was dried over anhydrous $MgSO_4$, filtered, and evaporated. The residue was purified by silica gel column chromatography with ethyl acetate : *n*-hexane = 1 : 2 as eluent to give bis-methylsulfonyl methanone *O*-benzyl oxime (**8**) (5.50 g, 90%).



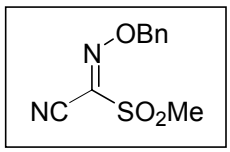
^{1}H NMR ($CDCl_3$, 400MHz) δ 3.21 (s, 3H), 3.30 (s, 3H), 5.50 (s, 2H),

7.38~7.41 (m, 5H); **^{13}C NMR** ($CDCl_3$, 100MHz) δ 43.4, 44.8, 82.1, 129.1, 129.2, 129.7, 134.1, 152.2; HRMS (M+) calcd for $C_{15}H_{15}NO_3S$:289.0773, found 289.0777.

Typical procedure for nucleophilic substitution of 8.

Preparation of *N*-(Benzyloxy)(methylsulfonyl)methanimidoyl cyanide (13)

To the solution of **8** (58.3 mg, 0.2 mmol) in THF (1 ml), potassium cyanide (15.6 mg, 0.24 mmol) was added and further stirred for 2 h at room temperature. The reaction mixture was diluted with ethyl acetate and quenched by the addition of saturated aqueous ammonium chloride solution. The phases were separated and the aqueous layer was further extracted with ethyl acetate. The combined organic layer was dried over $MgSO_4$, filtered and evaporated under reduced pressure. The crude product was purified by column chromatography using ethyl acetate : *n*-hexane 1 : 2 as eluent to give **13** (42.9 mg, 90%).

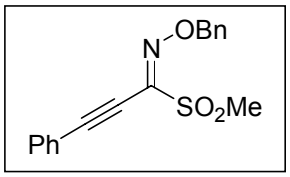


^{1}H NMR ($CDCl_3$, 400 MHz) δ 3.16 (s, 3H), 5.47 (s, 2H), 7.36~7.41 (m, 5H); **^{13}C NMR** ($CDCl_3$, 100 MHz) δ 41.8, 81.7, 105.0, 128.9, 129.1, 129.5, 133.5, 134.1; HRMS (M+) calcd for $C_{10}H_{10}N_2O_3S$: 238.0412, found 238.0414.

Preparation of 1-(Methylsulfonyl)-3-phenylprop-2-yn-1-one *O*-benzyl oxime (10g)

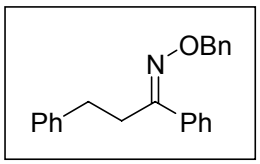
To the solution of phenylacetylene (0.033 ml, 0.3 mmol) in THF (2 ml) was added 2.5 M butyllithium solution in hexane (0.12 ml, 0.3 mmol) at -78 ^{o}C. After being stirred for 10 min, the solution of **7** (58.3 mg, 0.2 mmol) in THF (1 ml) was added by cannula at -78 ^{o}C. After

being stirred at -78 °C for 4 h, the reaction mixture was diluted with ethyl acetate and quenched with saturated aqueous ammonium chloride solution. The phases were separated and the aqueous layer was further extracted with ethyl acetate. The combined organic layer was dried over magnesium sulfate, filtered and evaporated under reduced pressure. The crude product was purified by silica gel column chromatography using ethyl acetate : *n*-hexane 1 : 4 as eluent to give **10g** (47 mg, 72%).



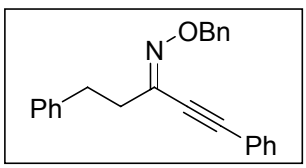
^{1}H NMR ($CDCl_3$, 400 MHz) δ 3.14 (s, 3H), 5.36 (s, 2H), 7.33~7.42 (m, 8H), 7.55~7.57 (m, 2H); **^{13}C NMR** ($CDCl_3$, 100 MHz) δ 40.7, 73.5, 79.2, 107.1, 120.1, 128.5, 128.57, 128.59, 128.6, 130.6, 132.5, 135.6, 143.3; HRMS (M+) calcd for $C_{17}H_{15}NO_3S$: 313.0773, found 313.0773

Additional Spectral data



1,3-Diphenylpropan-1-one *O*-benzyl oxime (5b)

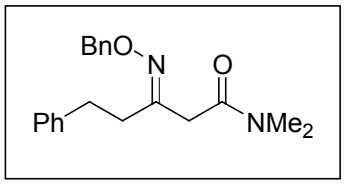
^{1}H NMR ($CDCl_3$, 400 MHz) δ 2.88~2.92 (m, 2H), 3.09~3.13 (m, 2H), 5.28 (s, 2H), 7.21~7.44 (m, 13H), 7.63~7.65 (m, 2H); **^{13}C NMR** ($CDCl_3$, 100 MHz) δ 28.9, 32.4, 76.2, 126.0, 126.3, 127.7, 128.0, 128.3, 128.35, 128.4, 129.0, 135.6, 138.1, 141.4, 158.1; HRMS (M+) calcd for $C_{22}H_{21}NO$: 315.1623, found 315.1624



1,5-Diphenylpent-1-yn-3-one *O*-benzyl oxime (5c)

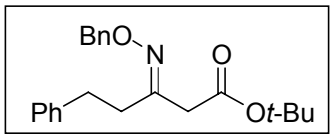
^{1}H NMR ($CDCl_3$, 400 MHz) δ 2.69~2.73 (m, 2H), 2.96~3.00 (m, 2H), 5.20 (s, 1H), 7.18~7.38 (m, 13H), 7.49~7.52 (m, 2H); **^{13}C**

NMR ($CDCl_3$, 100 MHz) δ 33.4, 36.3, 76.4, 80.8, 100.2, 122.0, 126.3, 127.8, 127.9, 128.5, 128.58, 128.6, 128.7, 129.6, 132.3, 138.0, 140.0, 141.8; HRMS (M+) calcd for $C_{24}H_{21}NO$: 339.1623, found 339.1617



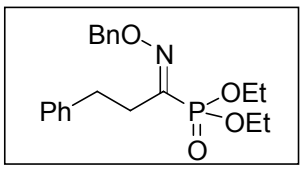
3-(Benzyloxyimino)-*N*,*N*-dimethyl-5-phenylpent-anamide (5d)

^{1}H NMR ($CDCl_3$, 400 MHz) *δ* 2.59~2.63 (m, 2H), 2.82 (s, 3H), 2.88 (s, 3H), 2.88-2.92 (m, 2H), 3.40 (s, 2H), 5.09 (s, 2H), 7.17~7.34 (m, 10H); **^{13}C NMR** ($CDCl_3$, 100 MHz) *δ* 32.4, 34.3, 35.7, 36.1, 37.6, 75.9, 126.1, 128.0, 128.4, 128.5, 128.7, 137.9, 141.5, 154.6, 168.4; HRMS (M+) calcd for $C_{20}H_{24}N_2O_2$: 324.1838, found 324.1837



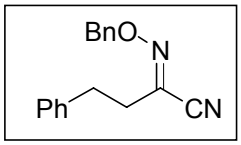
***t*-Butyl 3-(benzyloxyimino)-5-phenylpentanoate (5e)**

1.41 (s, 9H), 2.56~2.60 (m, 2H), 2.85~2.89 (m, 2H), 3.27 (s, 2H), 5.10 (s, 2H), 7.17~7.34 (m, 10H),; **^{13}C NMR** ($CDCl_3$, 100 MHz) *δ* 28.1, 32.5, 36.4, 36.9, 75.8, 81.4, 126.2, 127.8, 128.0, 128.4, 128.5, 128.6, 138.2, 141.4, 153.9, 168.2; HRMS (M+) calcd for $C_{22}H_{27}NO_3$: 353.1991, found 353.1993



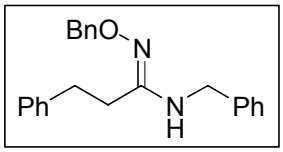
Diethyl 1-(benzyloxyimino)-3-phenylpropylphosphon-ate (5f)

^{1}H NMR ($CDCl_3$, 400 MHz) *δ* 1.24~1.29(t, *J* = 7.1 Hz 6H), 2.70~2.77 (m, 2H), 2.87~2.91 (m, 2H), 4.01~4.15 (m, 4H), 5.21 (s, 2H), 7.16~7.20 (m, 3H), 7.24~7.38 (m, 7H); **^{13}C NMR** ($CDCl_3$, 100 MHz) *δ* 16.4 (d, J_{cp} = 6.7 Hz), 33.5, 35.2, 35.4, 62.6 (d, J_{cp} = 5.8 Hz), 126.2, 128.1, 128.3, 128.5, 128.7, 137.2, 141.1, 151.7, 153.2;HRMS (M+) calcd for $C_{20}H_{26}NO_4P$: 375.1599, found 375.1596



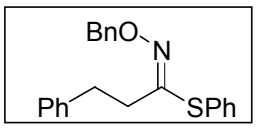
***N*-(Benzyloxy)-3-phenylpropanimidoyl cyanide (5g)**

^{1}H NMR ($CDCl_3$, 400 MHz) δ 2.71~2.81(m, 2H), 2.88~2.95 (m, 2H), 5.20 (d, J = 3.8 Hz, 2H), 7.15~7.36 (m, 10H); **^{13}C NMR** ($CDCl_3$, 100MHz) δ 29.6, 31.3, 32.3, 33.7, 77.8, 78.4, 110.3, 114.4, 126.6, 126.7, 128.1, 128.2, 128.3, 128.4, 128.47, 128.5, 128.57, 128.6, 131.8, 135.7, 136.1, 138.4, 138.9, 139.04; HRMS (M+) calcd for $C_{17}H_{16}N_2O$: 264.1263, found 264.1262



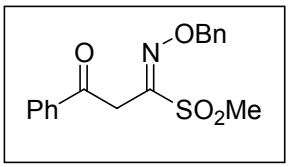
***N*-Benzyl-*N'*-(benzyloxy)-3-phenylpropanimid amide (5h)**

^{1}H NMR ($CDCl_3$, 400MHz) δ 2.45~2.49 (m, 2H), 2.85~2.9 (m, 2H), 4.28~4.29 (d, J = 6.6 Hz, 2H), 5.01 (s, 2H), 5.57 (bs, 1H), 7.13~7.39 (m, 15H); **^{13}C NMR** ($CDCl_3$, 100MHz) δ 30.7, 33.5, 46.2, 75.4, 126.4, 126.9, 127.6, 127.9, 128.5, 128.54, 128.56, 128.6, 128.9, 138.5, 139.4, 141.2, 155.2; HRMS (M+) calcd for $C_{23}H_{24}N_2O$: 344.1889, found 344.1889



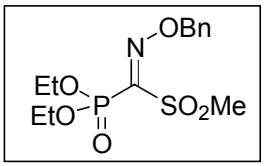
Phenyl *N*-benzyloxy-3-phenylpropanimidothioate (5j)

^{1}H NMR ($CDCl_3$, 400MHz) δ 2.35~2.40 (m, 2H), 2.64~2.68 (m, 2H), 5.21 (s, 2H), 6.74~6.79 (d, J = 7.8 Hz, 2H), 7.11~7.18 (m, 3H), 7.32~7.44 (m, 8H), 7.46~7.58 (d, J = 7.8 Hz, 2H); **^{13}C NMR** ($CDCl_3$, 100MHz) δ 34.1, 34.6, 76.4, 126.2, 127.9, 128.0, 128.1, 128.4, 128.5, 129.3, 129.5, 129.8, 136.5, 137.9, 140.9, 154.6; HRMS (M+) calcd for $C_{22}H_{21}NOS$: 347.1344, found 347.1344



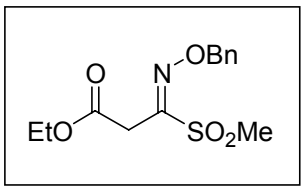
3-(benxyloxyimino)-3-(methylsulfonyl)-1-phenylpropan-1-one (10b)

^{1}H NMR ($CDCl_3$, 400 MHz): δ 3.19 (s, 3H), 4.41 (s, 2H), 5.26 (s, 2H), 7.65~7.27 (m, 8H), 7.93 (d, J = 8.3 Hz, 2 H); **^{13}C NMR** (100 MHz, $CDCl_3$): δ 35.4, 41.2, 78.7, 128.5, 128.7, 129.0, 134.1, 135.7, 135.8, 156.2, 191.7; HRMS (M+) calcd for $C_{17}H_{17}NO_4S$: 332.0957, found 332.0965



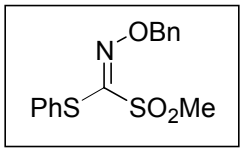
Diethyl(benzyloxyimino)(methylsulfonyl)methylphosphonate (10c)

^{1}H NMR ($CDCl_3$, 400 MHz) δ 1.27 (t, J = 7.1 Hz, 6H), 3.14 (s, 3H), 4.15~4.24 (m, 4H), 5.36 (s, 2H), 7.36 (s, 5H); **^{13}C NMR** ($CDCl_3$, 100 MHz) δ 16.3 (d, J_{cp} = 6.7 Hz), 41.7, 64.8 (d, J_{cp} = 5.7 Hz), 80.3, 128.9, 129.1, 135.1, 153.3, 154.9; HRMS (M+) calcd for $C_{13}H_{20}NO_6PS$: 349.0749, found 349.0745



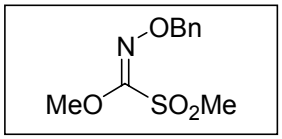
Ethyl 3-(benzyloxyimino)-3-(methylsulfonyl)-propano-ate (10d)

^{1}H NMR ($CDCl_3$, 400 MHz) δ 1.18 (t, J = 7.1 Hz, 3H), 3.11 (s, 3H), 4.11 (q, J = 7.1 Hz, 2H), 5.27 (s, 2H), 7.31~7.35 (m, 5H); **^{13}C NMR** (C_6D_6, 100 MHz) δ 14.1, 30.4, 41.2, 62.1, 77.6, 128.6, 128.7, 128.8, 135.8, 155.0, 166.5; HRMS (M+) calcd for $C_{13}H_{17}NO_5S$: 300.0906, found 300.0907



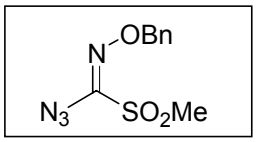
Methanesulfonyl(thiophenyl)methanone O-benzyl oxime (10e)

^{1}H NMR ($CDCl_3$, 400 MHz) δ 3.11 (s, 3H), 5.17 (s, 2H), 7.09~7.11 (m, 2H), 7.26~7.34 (m, 6H), 7.51~7.54 (m, 2H); **^{13}C NMR** ($CDCl_3$, 100 MHz) δ 41.1, 78.9, 127.2, 128.6, 128.8, 129.3, 129.4, 134.1, 135.7; HRMS(ESI) $(M+H)^+$ calcd for $C_{15}H_{15}NO_3S_2$: 322.0570, found 322.0572



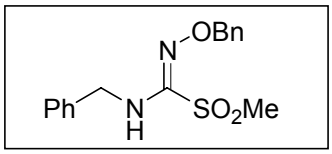
Methyl *N*-benzyloxy(methylsulfonyl)methanimidate (10f)

^{1}H NMR ($CDCl_3$, 400 MHz) δ 3.08 (s, 3H), 4.22 (s, 3H), 5.10 (s, 2H), 7.33-7.38 (m, 5H); **^{13}C NMR** ($CDCl_3$, 100 MHz) δ 41.0, 62.1, 78.4, 128.7, 128.72, 128.8, 136.0, 152.2; HRMS (M+) calcd for $C_{10}H_{13}NO_4S$: 244.0644, found 244.0650



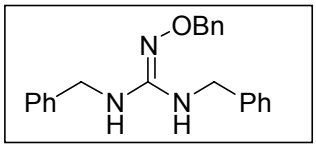
***N′*-(Benzyloxy)(methylsulfonyl)methanimidoyl azide (10g)**

^{1}H NMR ($CDCl_3$, 400 MHz) δ 3.12 (s, 3H), 5.21 (s, 2H), 7.34~7.40 (m, 5H); **^{13}C NMR** ($CDCl_3$, 100 MHz) δ 41.1, 79.2, 128.8, 128.9, 129.1, 135.3, 144.5; HRMS (M+) calcd for $C_9H_{10}N_4O_3S$: 254.0474, found 254.0472.



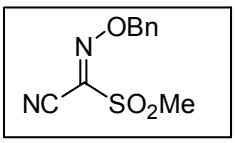
***N*-Benzyl-*N′*-(benzyloxy)(methylsulfonyl) methan-imidamide (11)**

^{1}H NMR ($CDCl_3$, 400 MHz) δ 3.08 (s, 3H), 4.71 (d, J = 6.4 Hz, 2H), 5.01 (s, 2H), 5.27 (s, 1H), 7.28-7.32 (m, 10H); **^{13}C NMR** ($CDCl_3$, 100 MHz) δ 41.3, 48.1, 53.6, 127.8, 127.9, 128.3, 128.5, 128.6, 128.9, 136.9, 138.2, 151.0; HRMS (M+) calcd for $C_{16}H_{18}N_2O_3S$: 318.1038, found 318.1034



1,3-dibenzyl-2-(benzyloxy)guanidine (12)

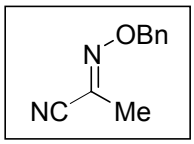
^{1}H NMR ($CDCl_3$, 400MHz): δ 3.26 (s, 1H), 4.18~4.22 (m, 4 H), 4.89 (s, 2H), 5.42 (s, 1H), 7.24~7.37 (m, 15H),; **^{13}C NMR** (100 MHz, $CDCl_3$): δ 45.8, 45.9, 75.7, 126.9, 127.3, 127.6, 127.8, 127.9, 128.4, 128.6, 128.9, 129.0, 138.5, 139.0, 139.3, 155.7; HRMS (M+) calcd for $C_{22}H_{23}N_3O$: 346.1919, found 346.1912.



***N*-(Benzyloxy)(methylsulfonyl)methanimidoyl cyanide (13)**

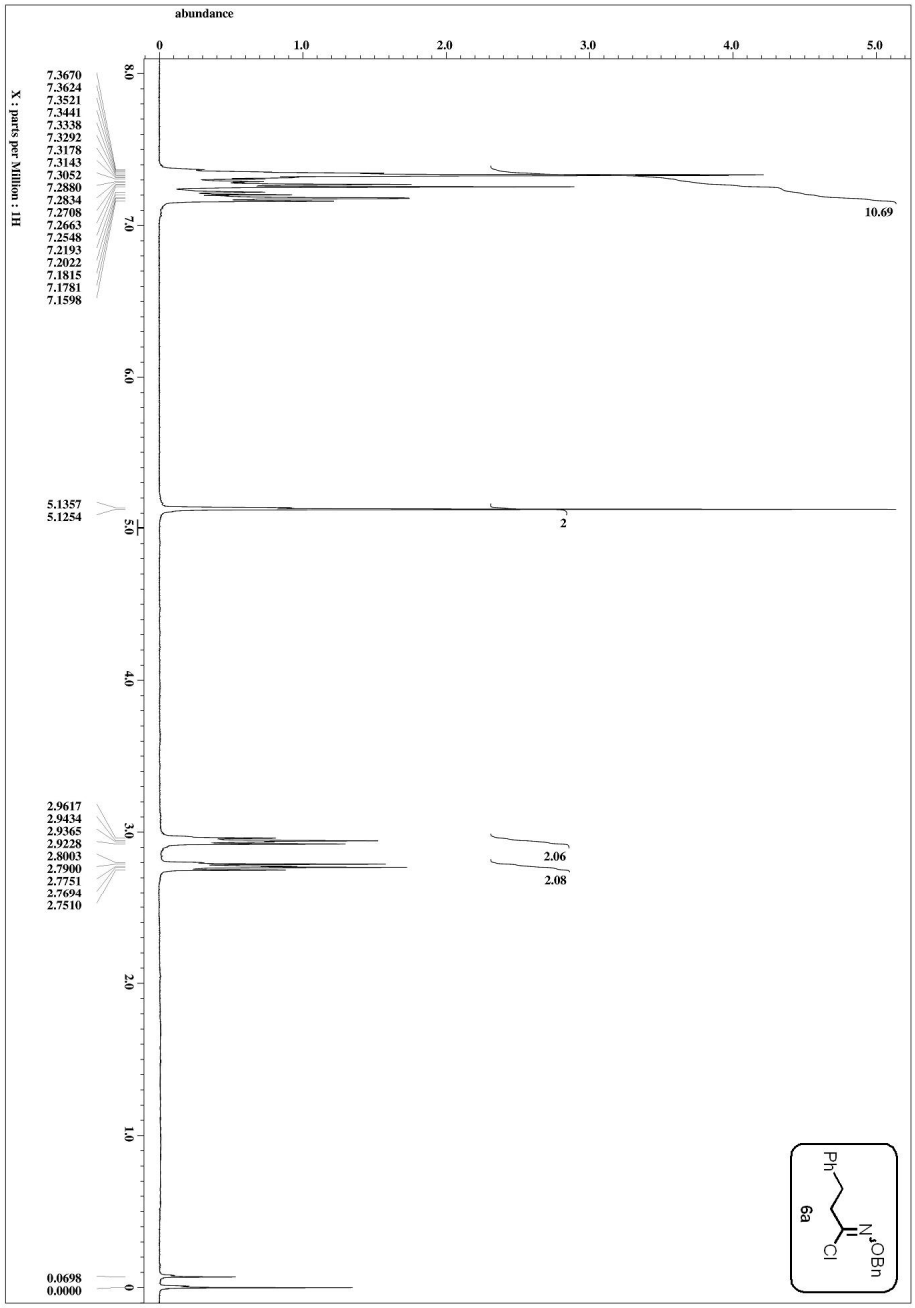
^{1}H NMR ($CDCl_3$, 400 MHz) δ 3.16 (s, 3H), 5.47 (s, 2H), 7.36~7.41 (m,

5H); **^{13}C NMR** ($CDCl_3$, 100 MHz) δ 41.8, 81.7, 105.0, 128.9, 129.1, 129.5, 133.5, 134.1; HRMS (M+) calcd for $C_{10}H_{10}N_2O_3S$: 238.0412, found 238.0414



2-Benzyloxyiminopropionitrile (14)

^{1}H NMR ($CDCl_3$, 400MHz) **major isomer**: δ 2.08 (s, 3H), 5.26 (s, 2H), 7.36~7.38 (m, 5H); **minor isomer**: δ 2.14 (s, 3H), 5.23 (s, 2H), 7.36~7.38 (m, 5H); ; **^{13}C NMR** (100 MHz, $CDCl_3$) major isomer: δ 15.2, 78.6, 115.5, 128.6, 128.8, 134.5, 136.0; minor isomer: 15.5, 77.9, 111.0, 128.4, 128.6, 128.8, 134.5, 136.3; HRMS(ESI) $(M+H)^+$ calcd for $C_{10}H_{10}N_2O$: 175.0870, found 175.0871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7.3143
7.3052
7.2880
7.2834
7.2708
7.2663
7.2548
7.2193
7.2022
7.1815
7.1781
7.1598
5.1357
5.1254
2.9617
2.9434
2.9365
2.9228
2.8003
2.7900
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Ph
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OBn
Cl
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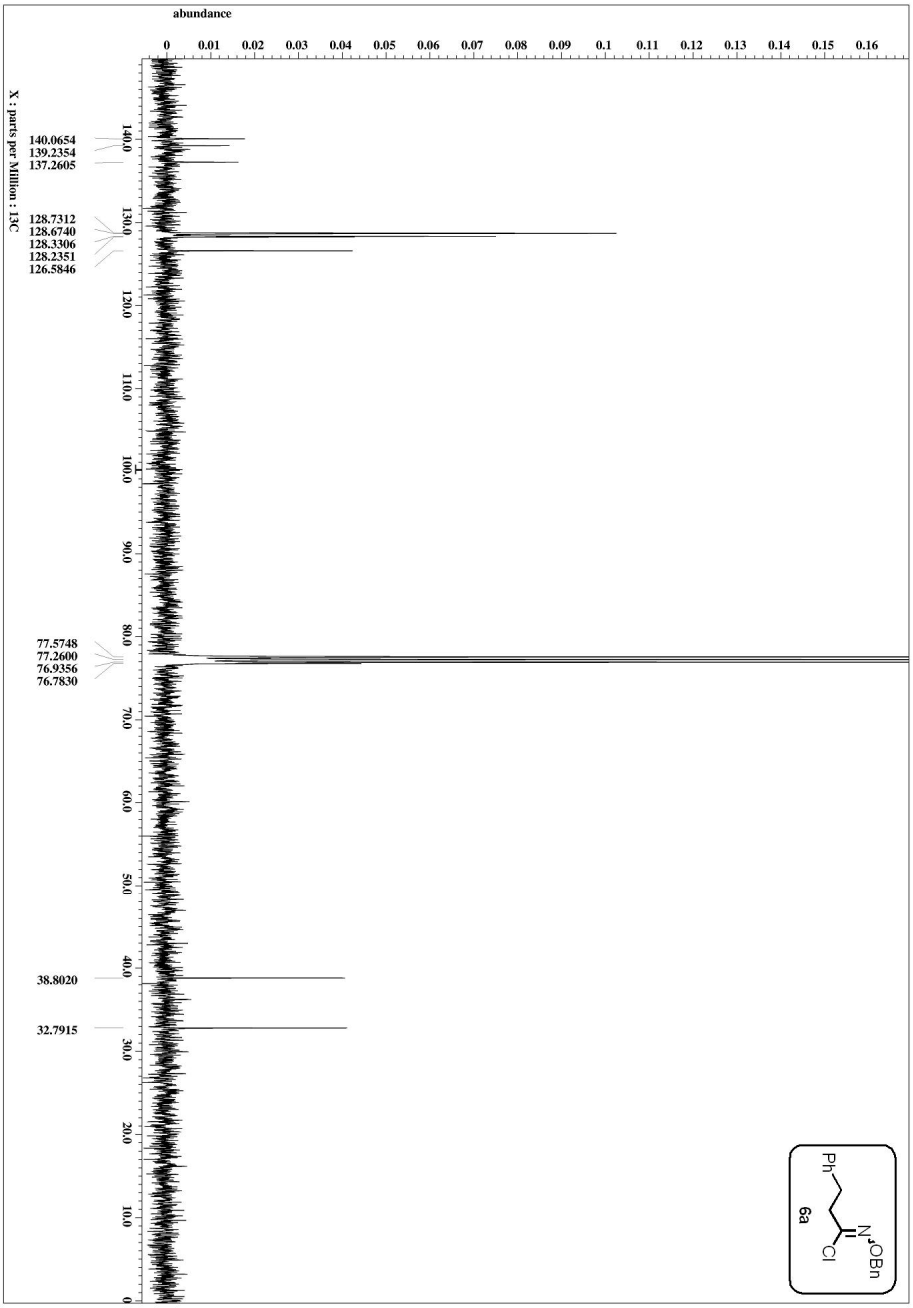
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X : parts per Million : 13C
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128.3306
128.2351
126.5846
77.5748
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76.9356
76.7830
38.8020
32.7915
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Cl
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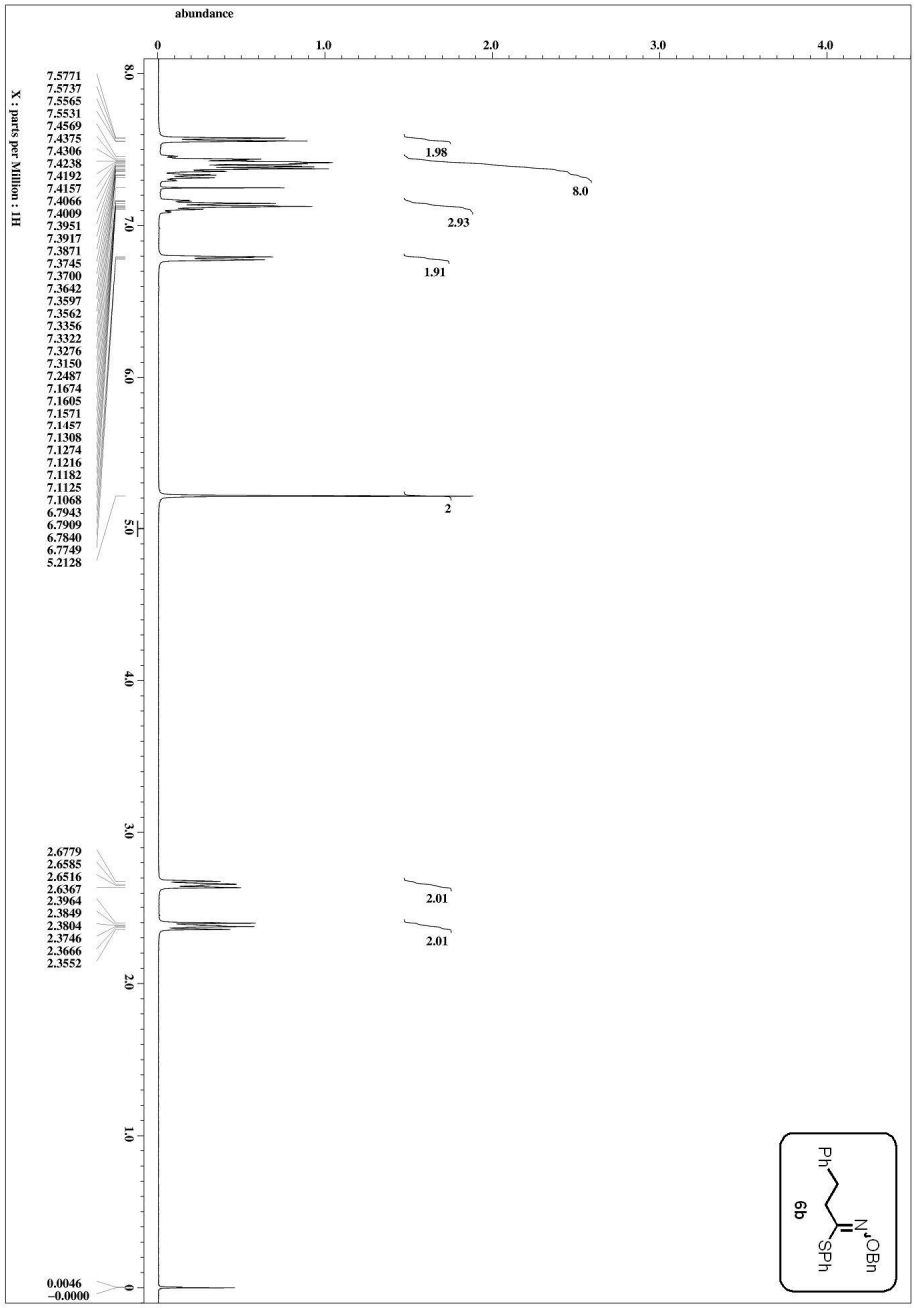
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7.3745
7.3700
7.3642
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7.3322
7.3276
7.3150
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2.3849
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2.01
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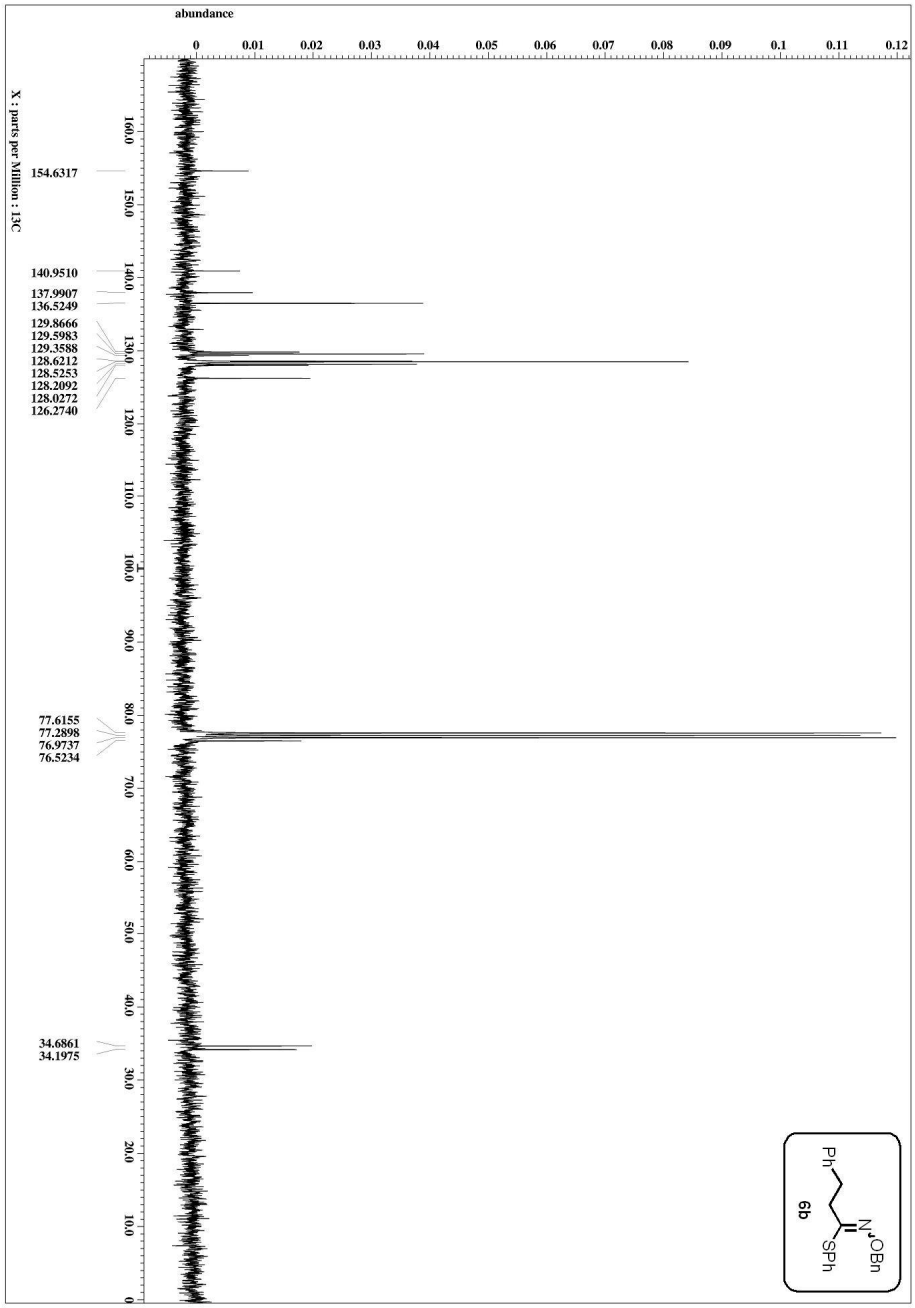
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0.12
X : parts per Million : 13C
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128.0272
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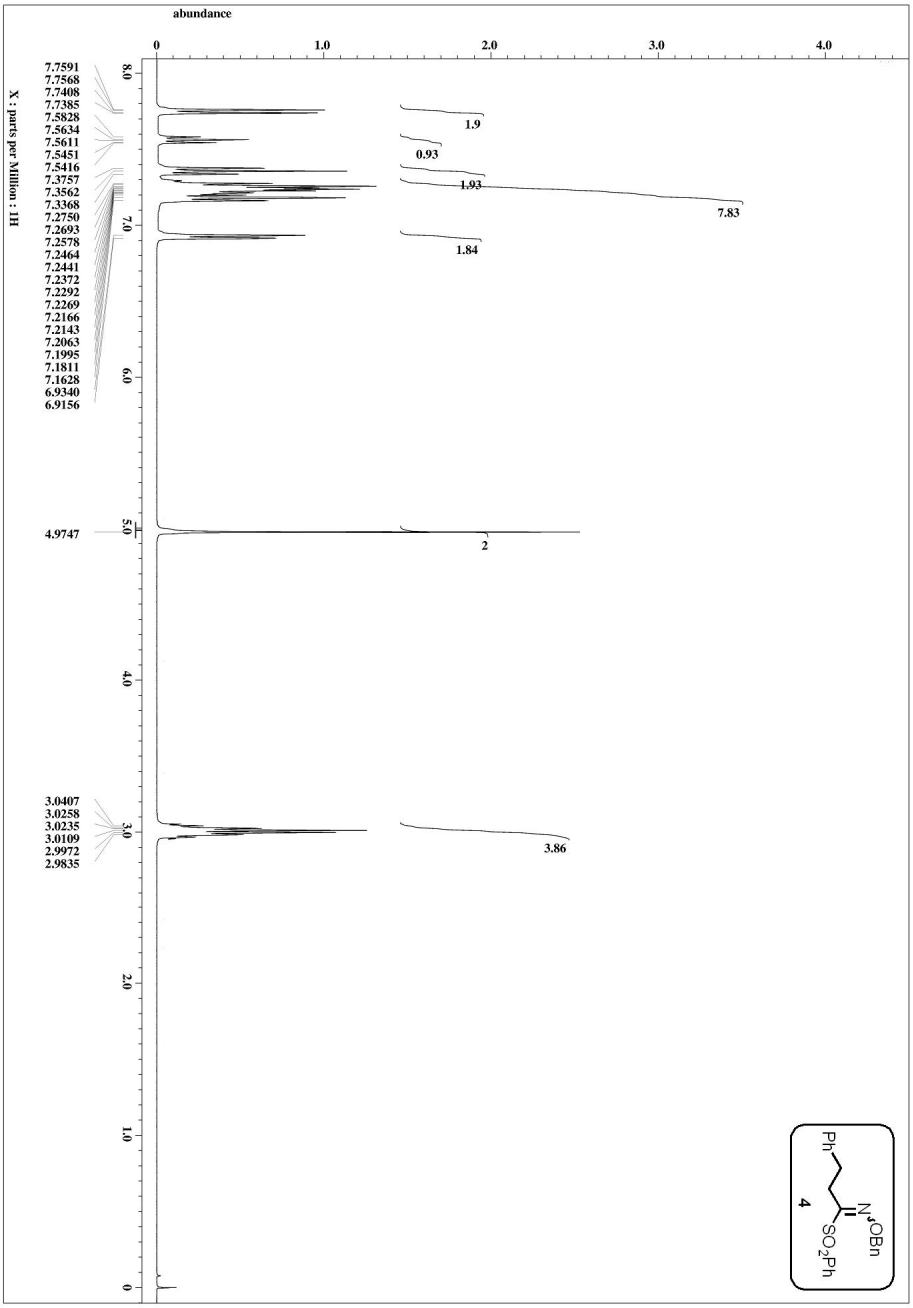
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3.0109
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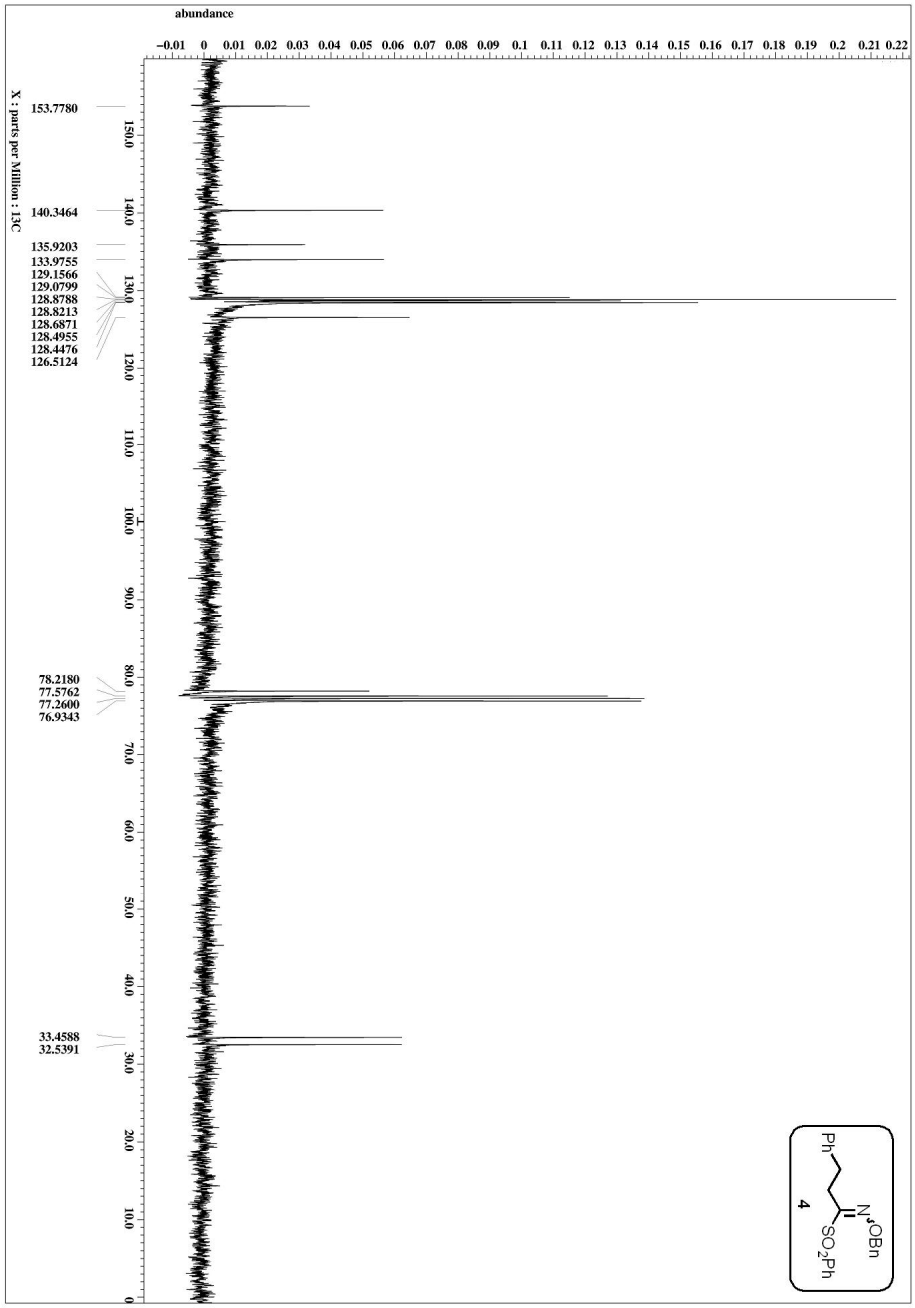
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128.4476
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Ph
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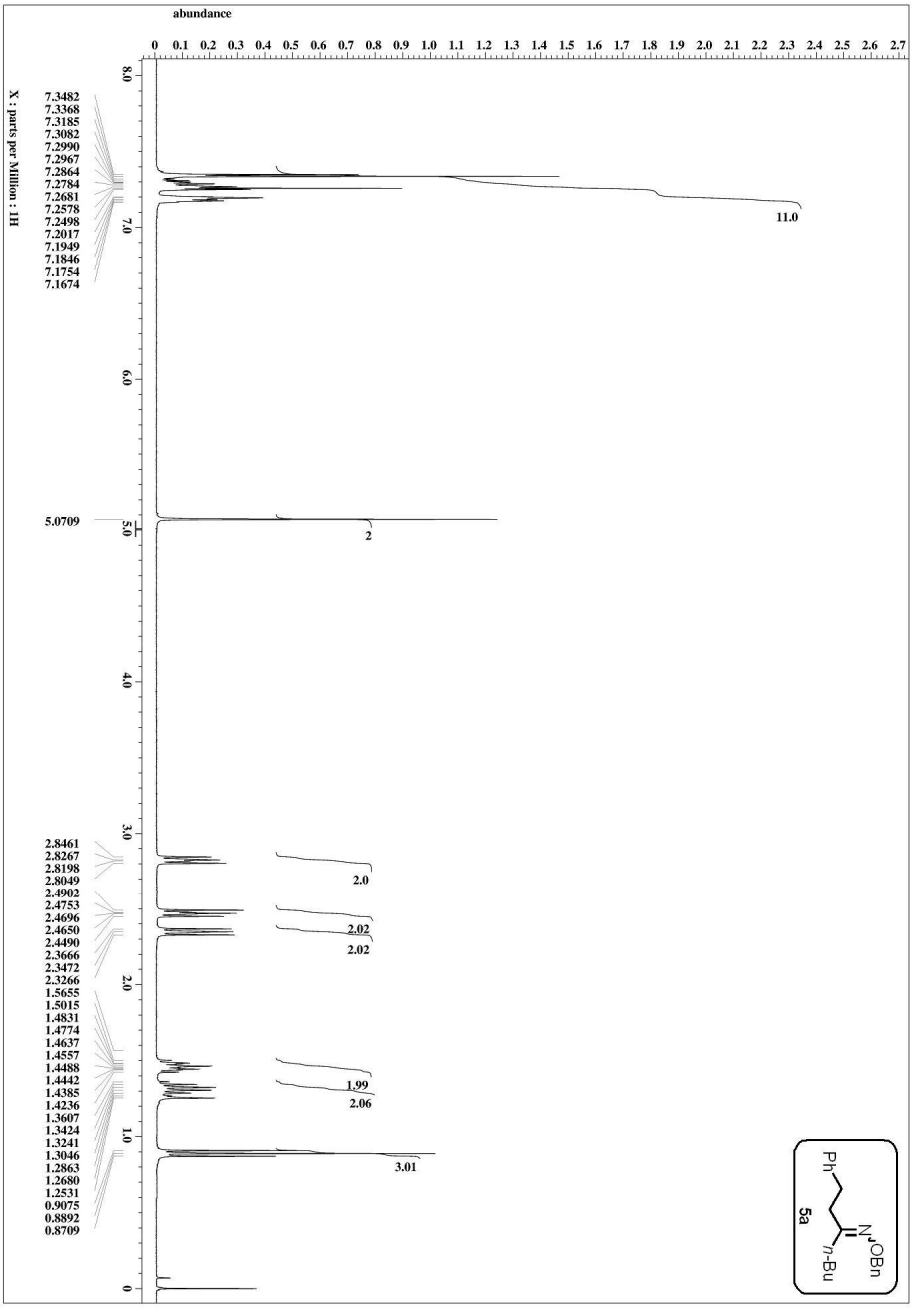
4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7.2681
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7.2017
7.1949
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7.1754
7.1674
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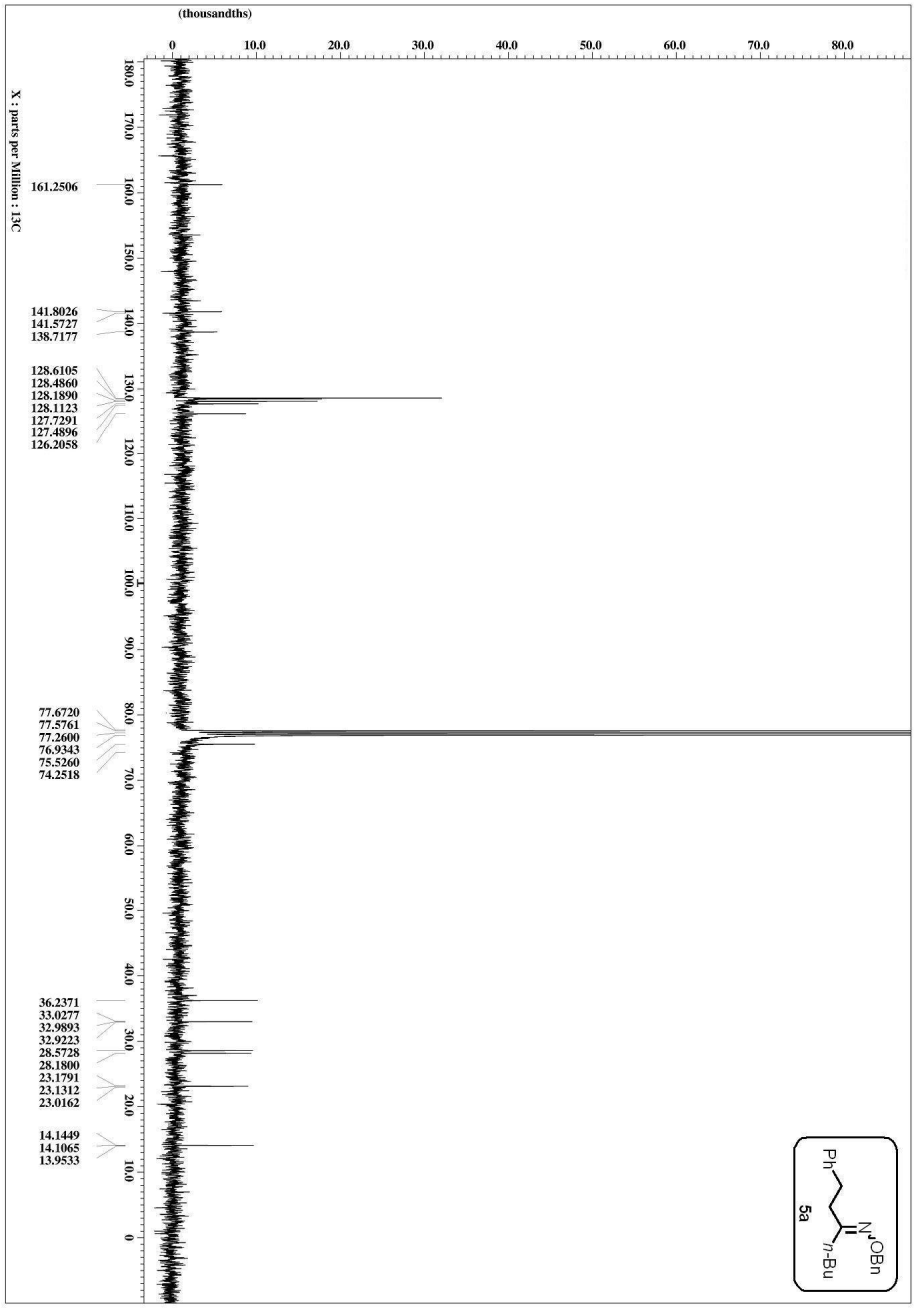
(thousandths)
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126.2058
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77.5761
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76.9343
75.5260
74.2518
36.2371
33.0277
32.9893
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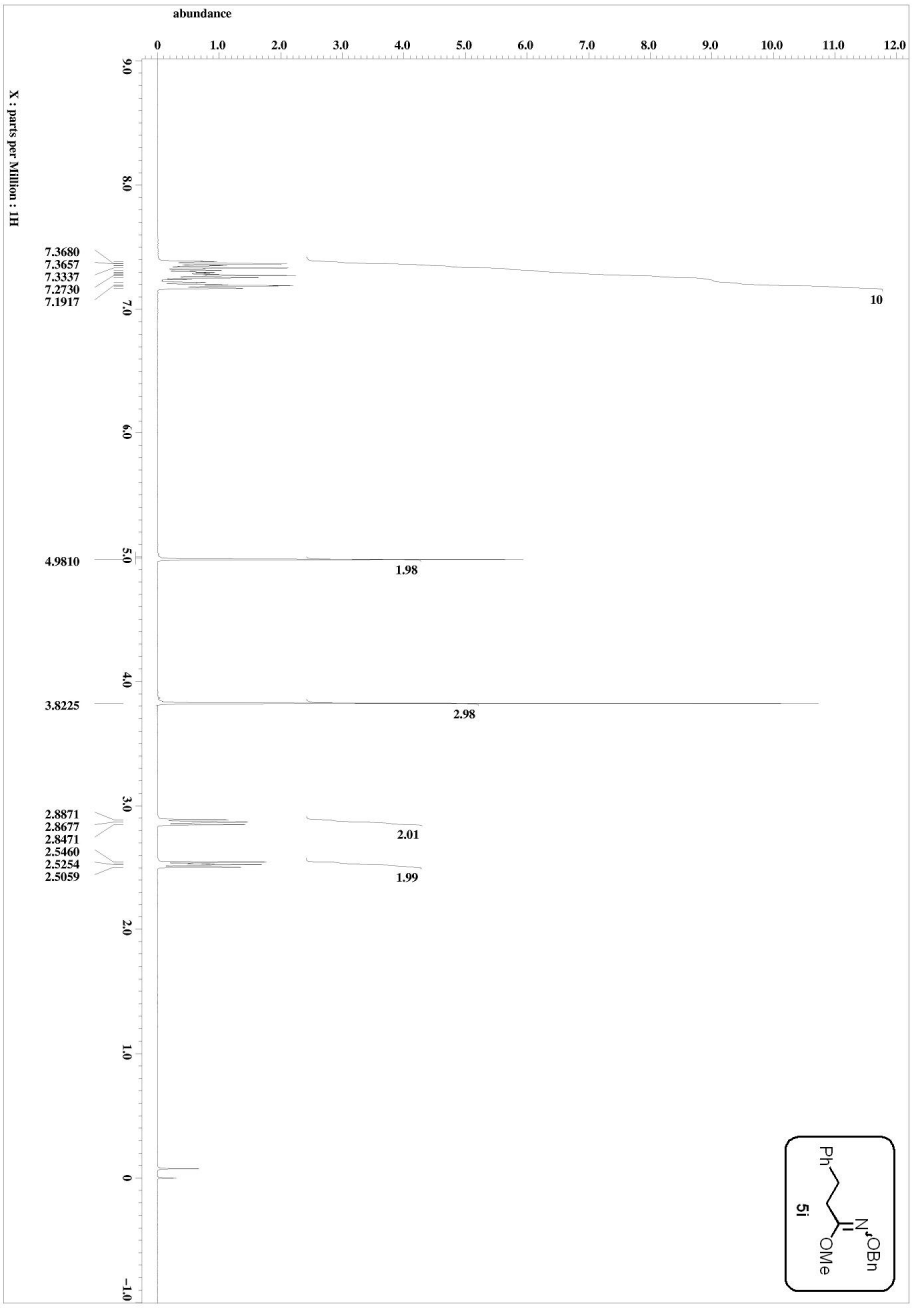
5a


abundance
X : parts per Million : 1H
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2.8471
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1.99
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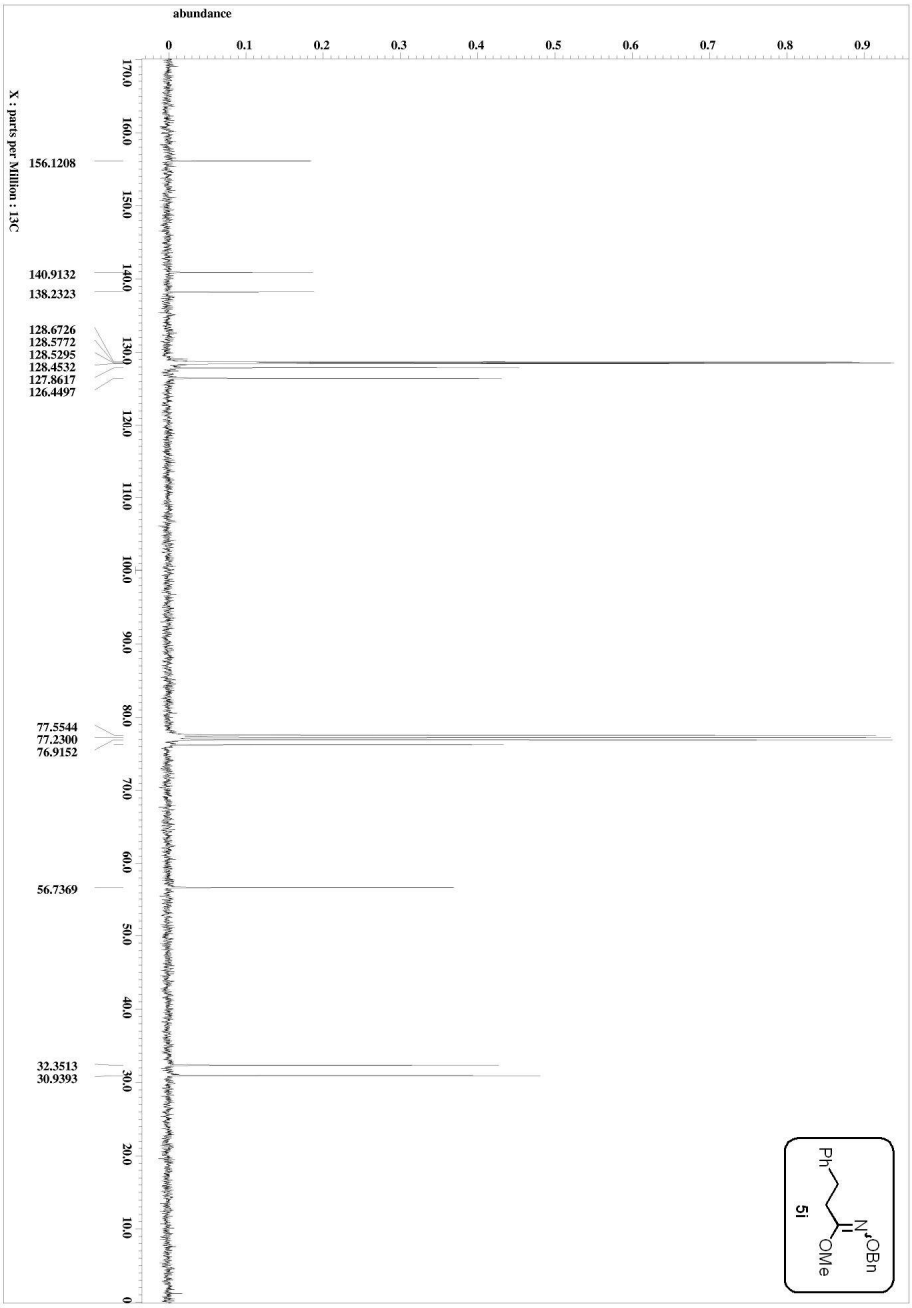
OBn
OMe
5i


abundance
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0.3
0.4
0.5
0.6
0.7
0.8
0.9
X : parts per Million : 13C
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138.2323
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128.5772
128.5295
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OBn
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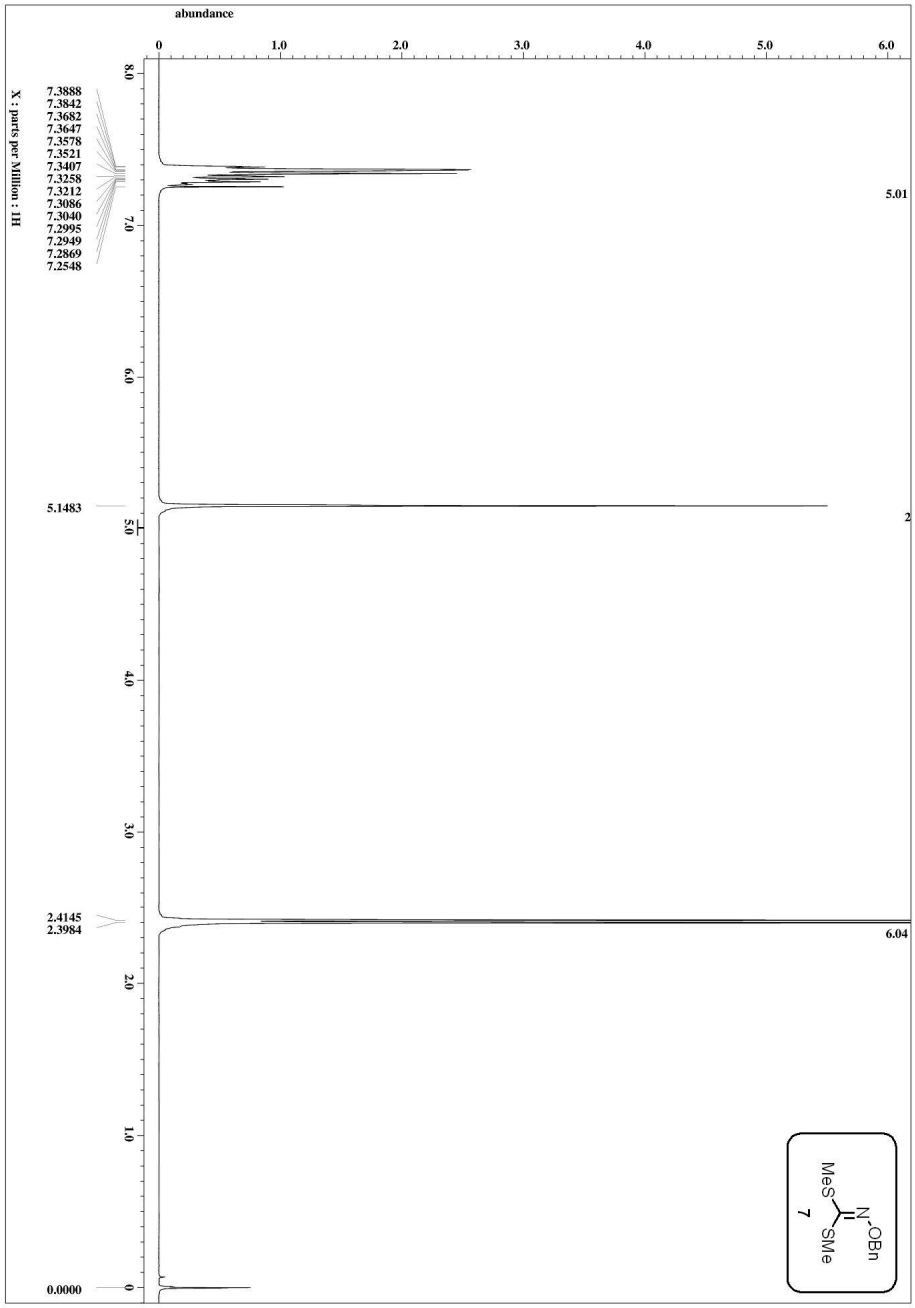
5i


abundance
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2.0
3.0
4.0
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7.3578
7.3521
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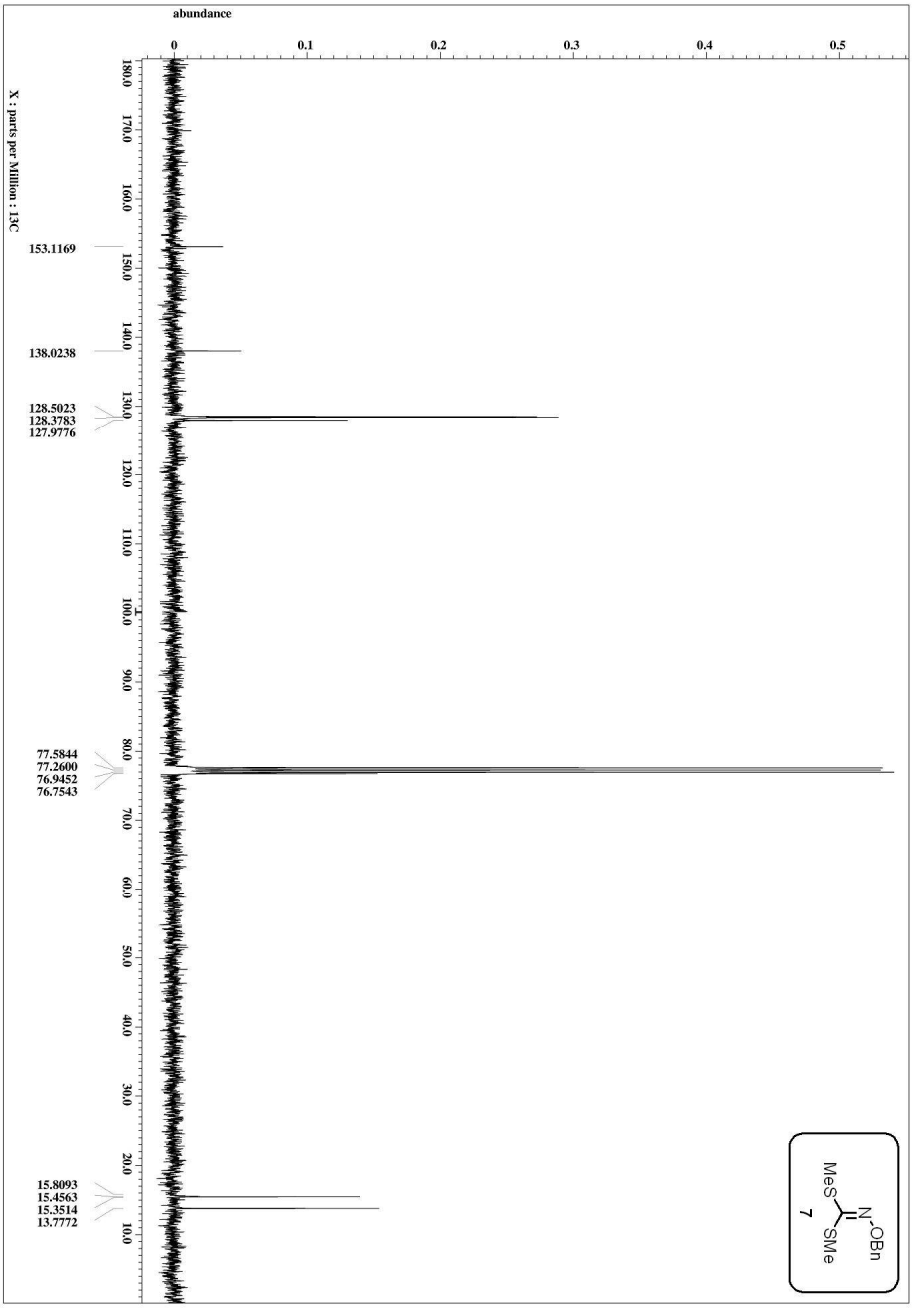
7


abundance
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0.2
0.3
0.4
0.5
X : parts per Million : 13C
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160.0
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
153.1169
138.0238
128.5023
128.3783
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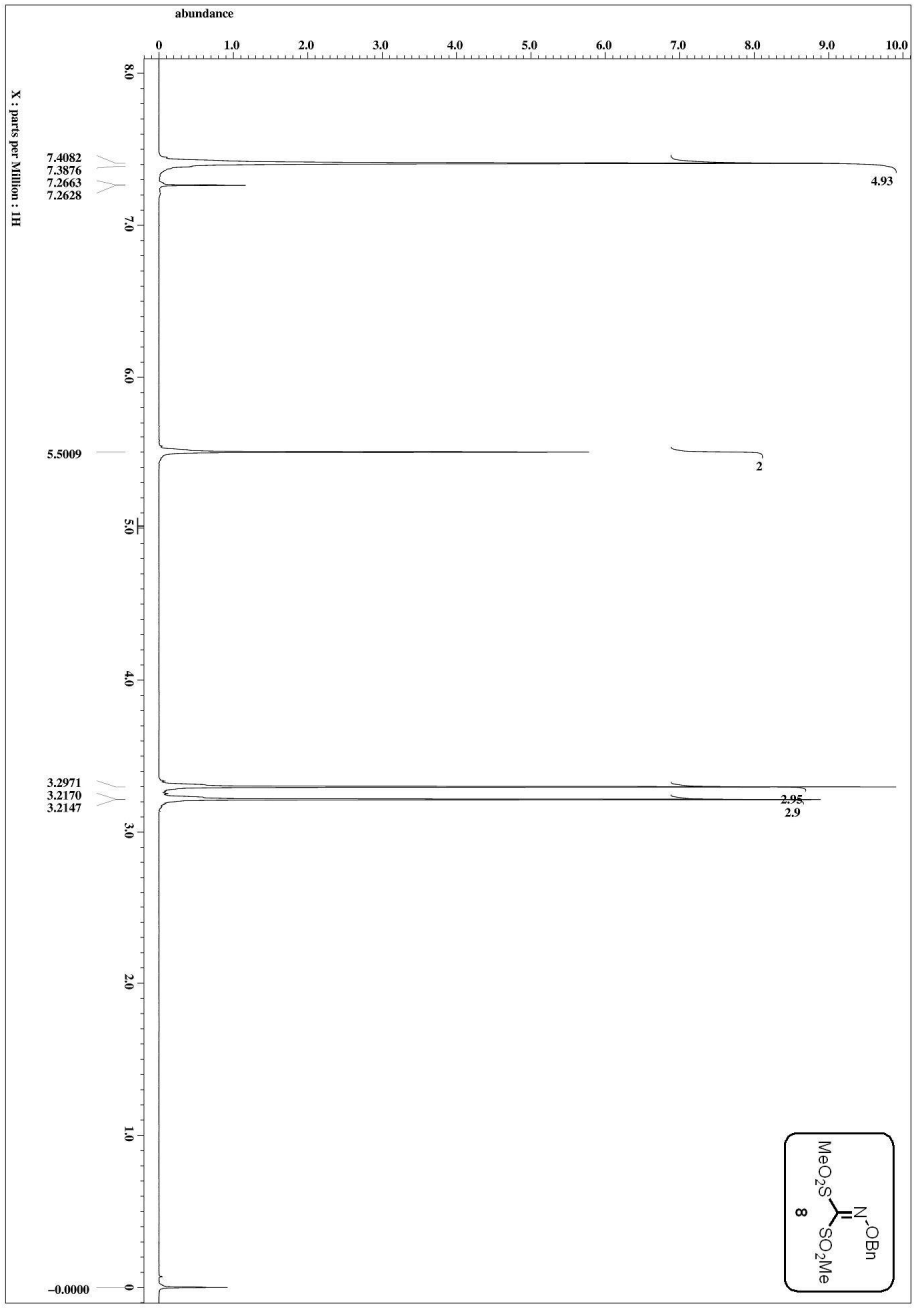
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X : parts per Million : 1H
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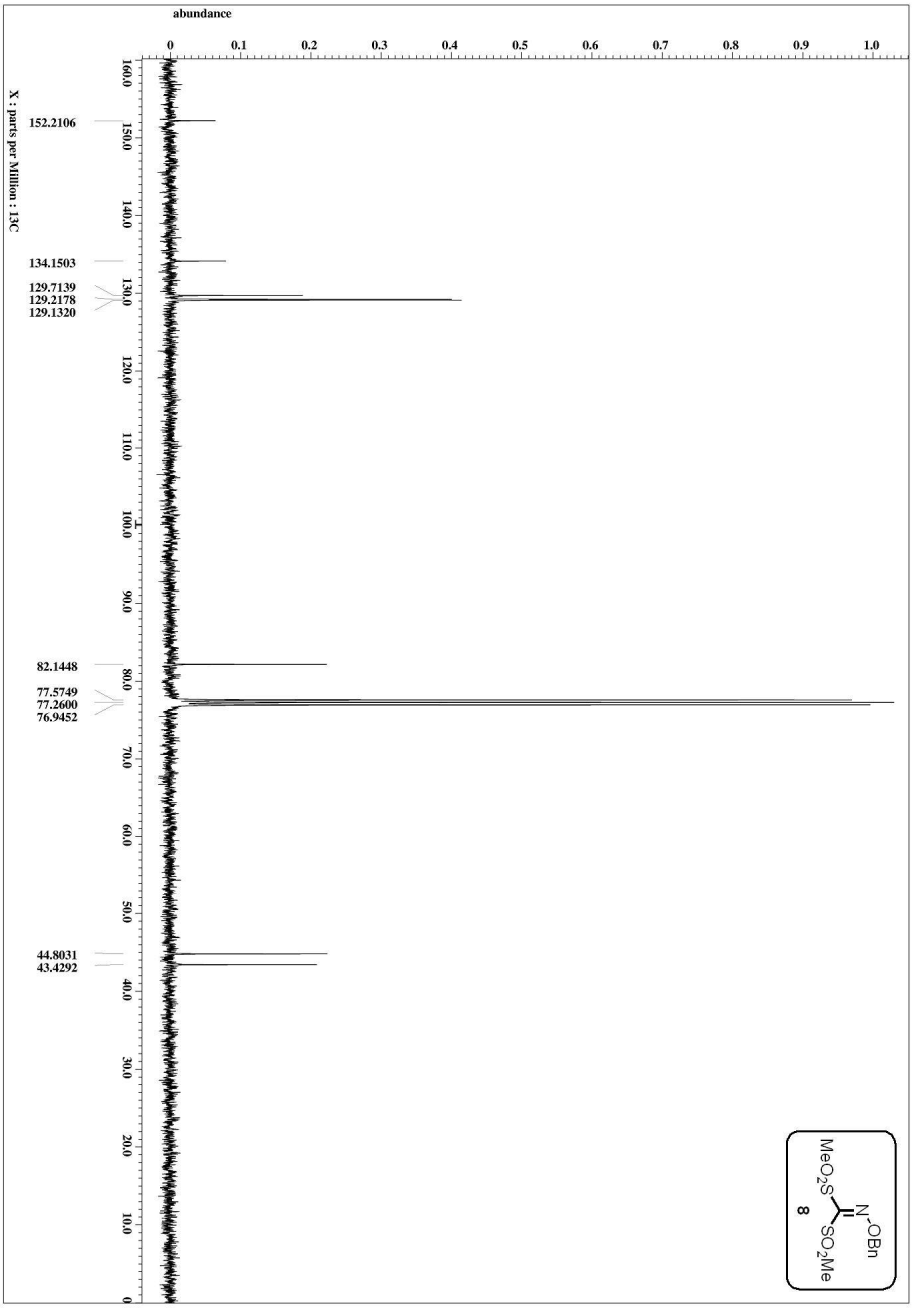
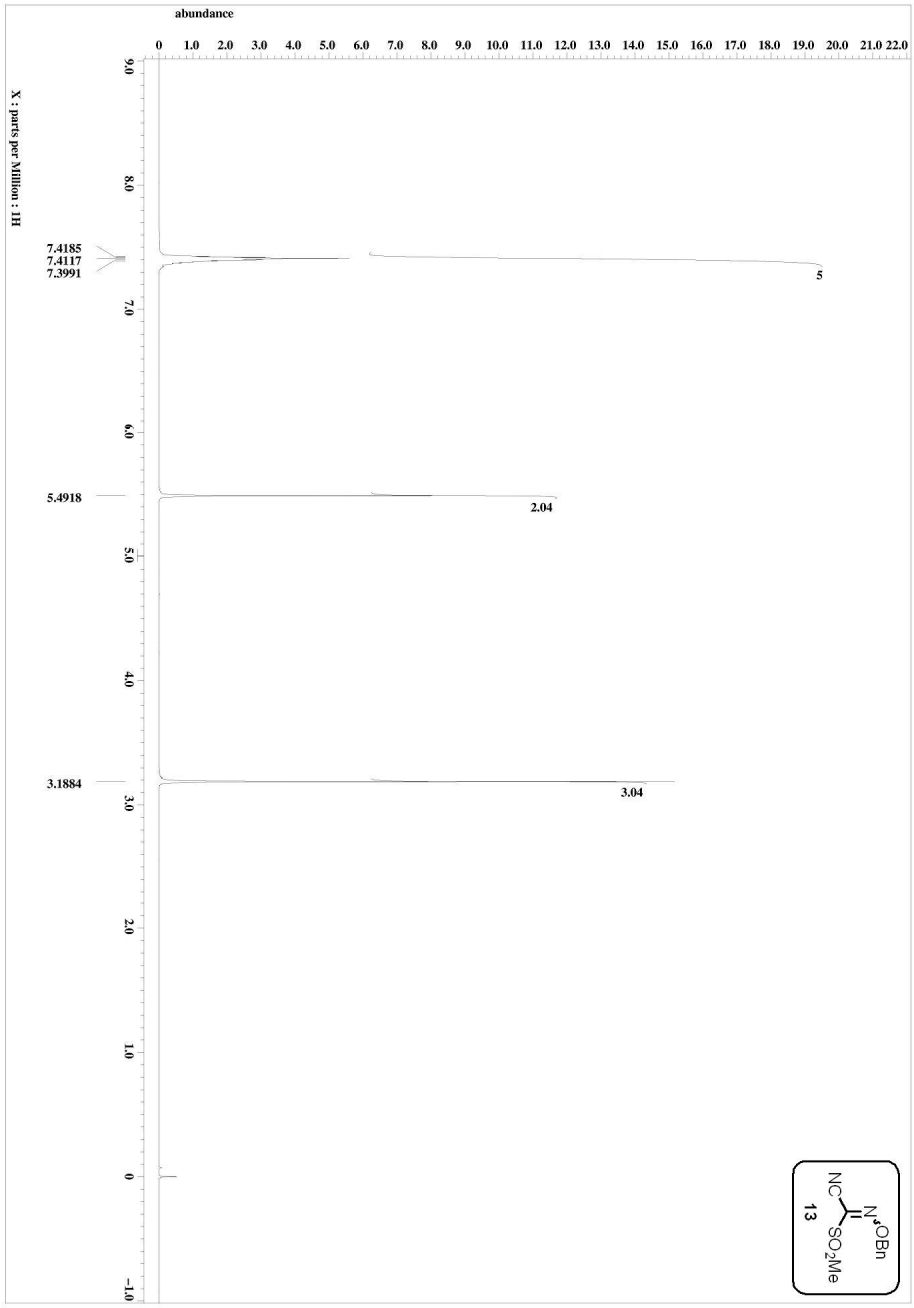
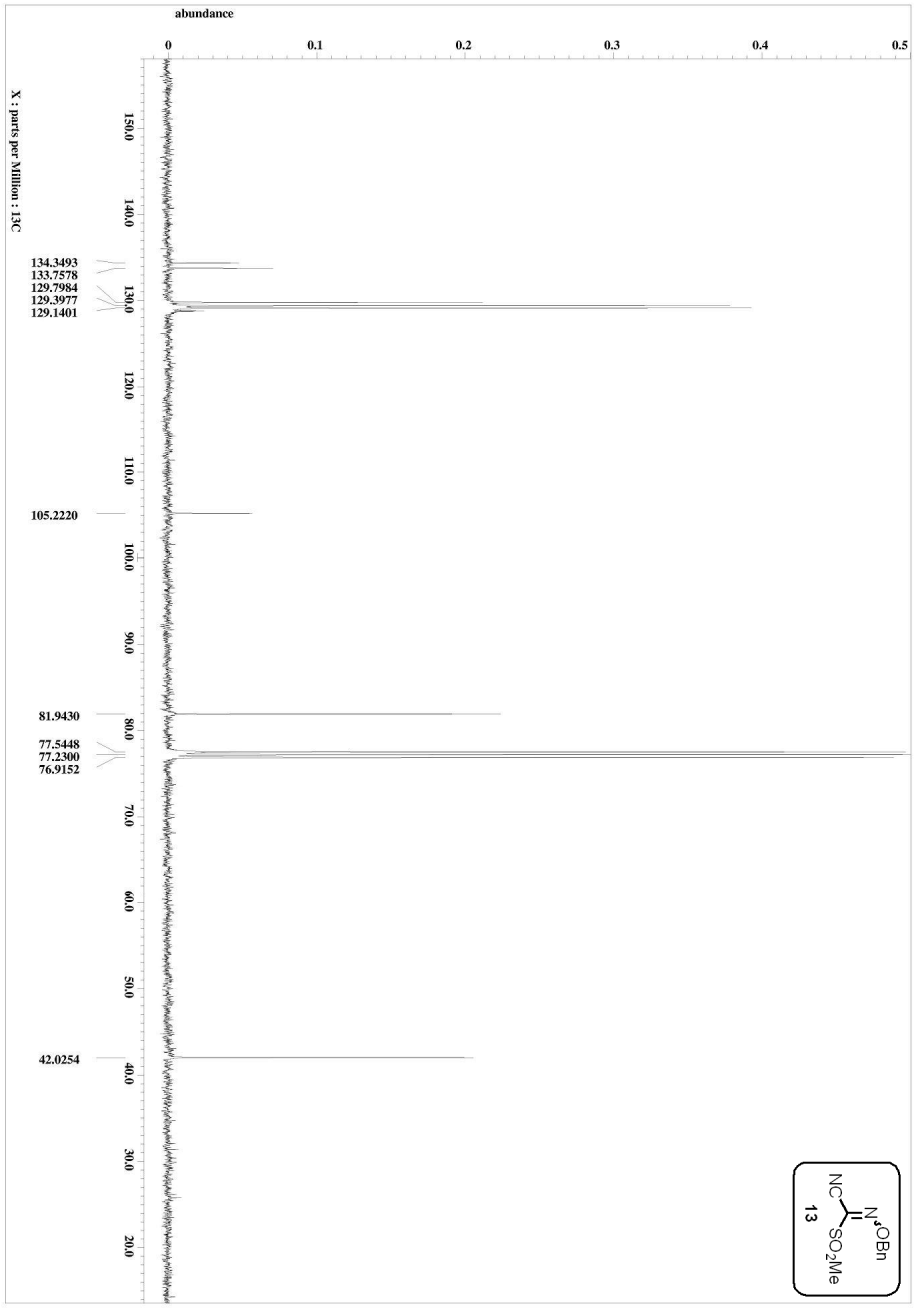
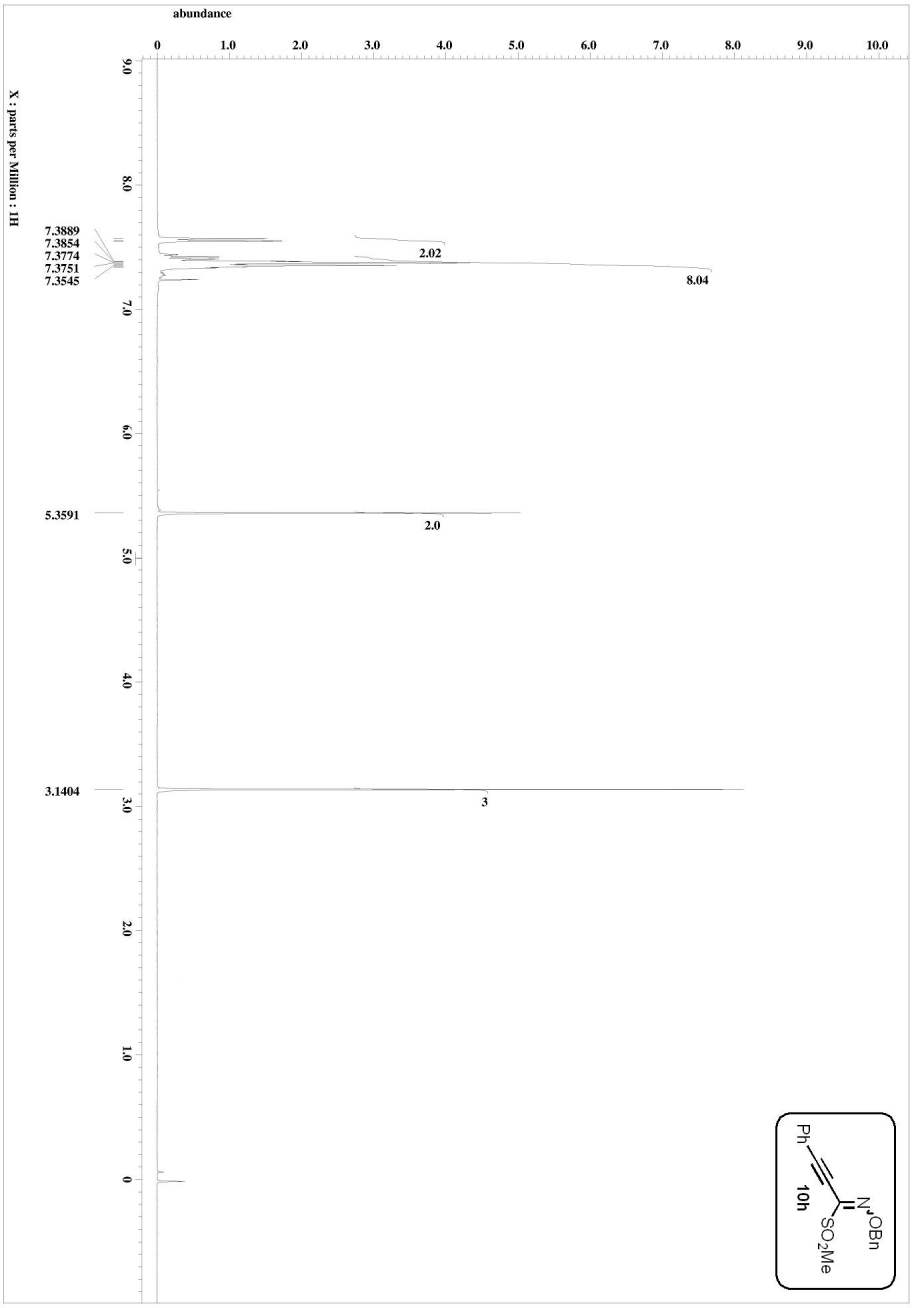
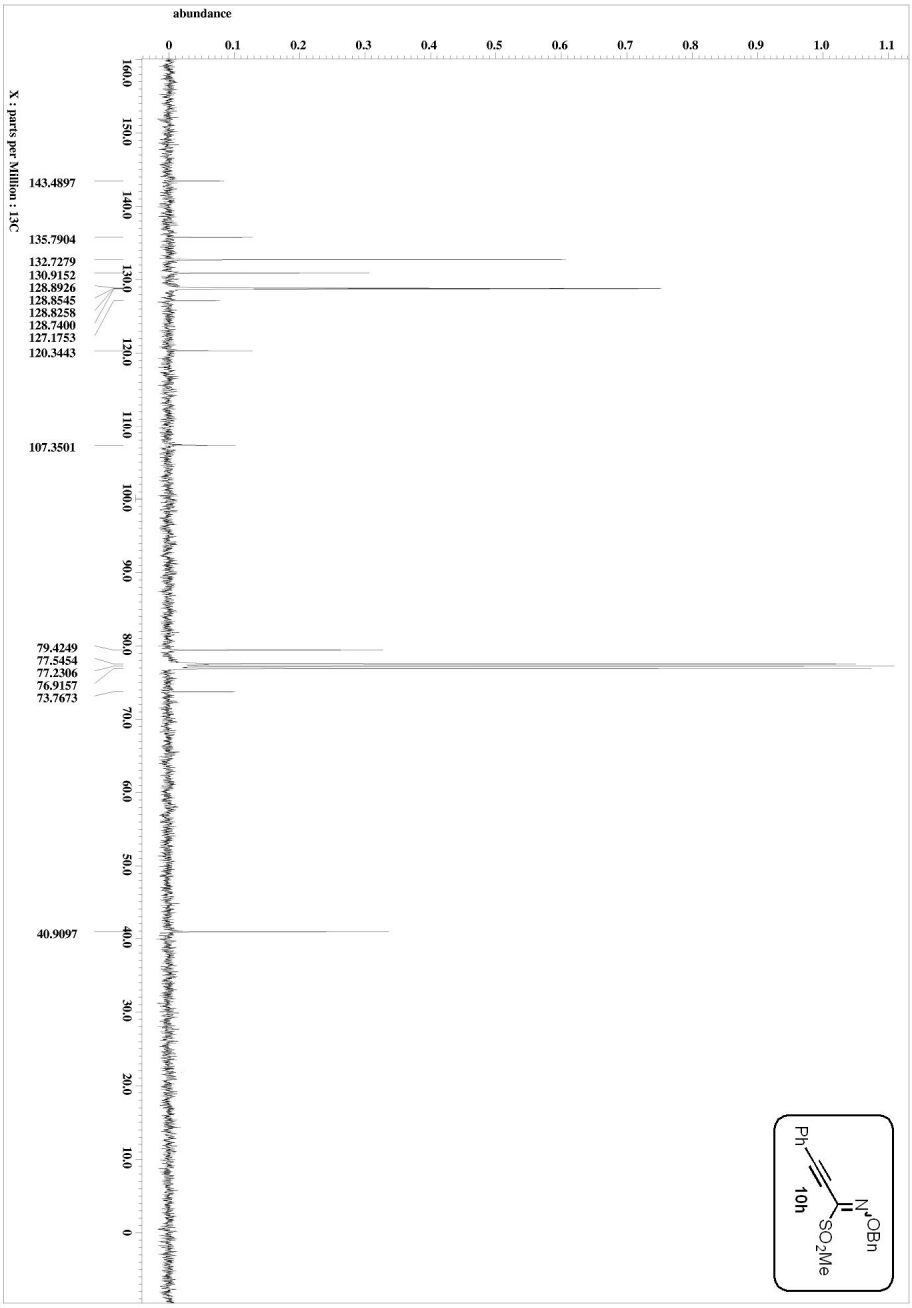
3.2971
3.2170
3.2147
−0.0000
4.93
2
2.95
2.9
8
MeO2S
N
OBn
SO2Me

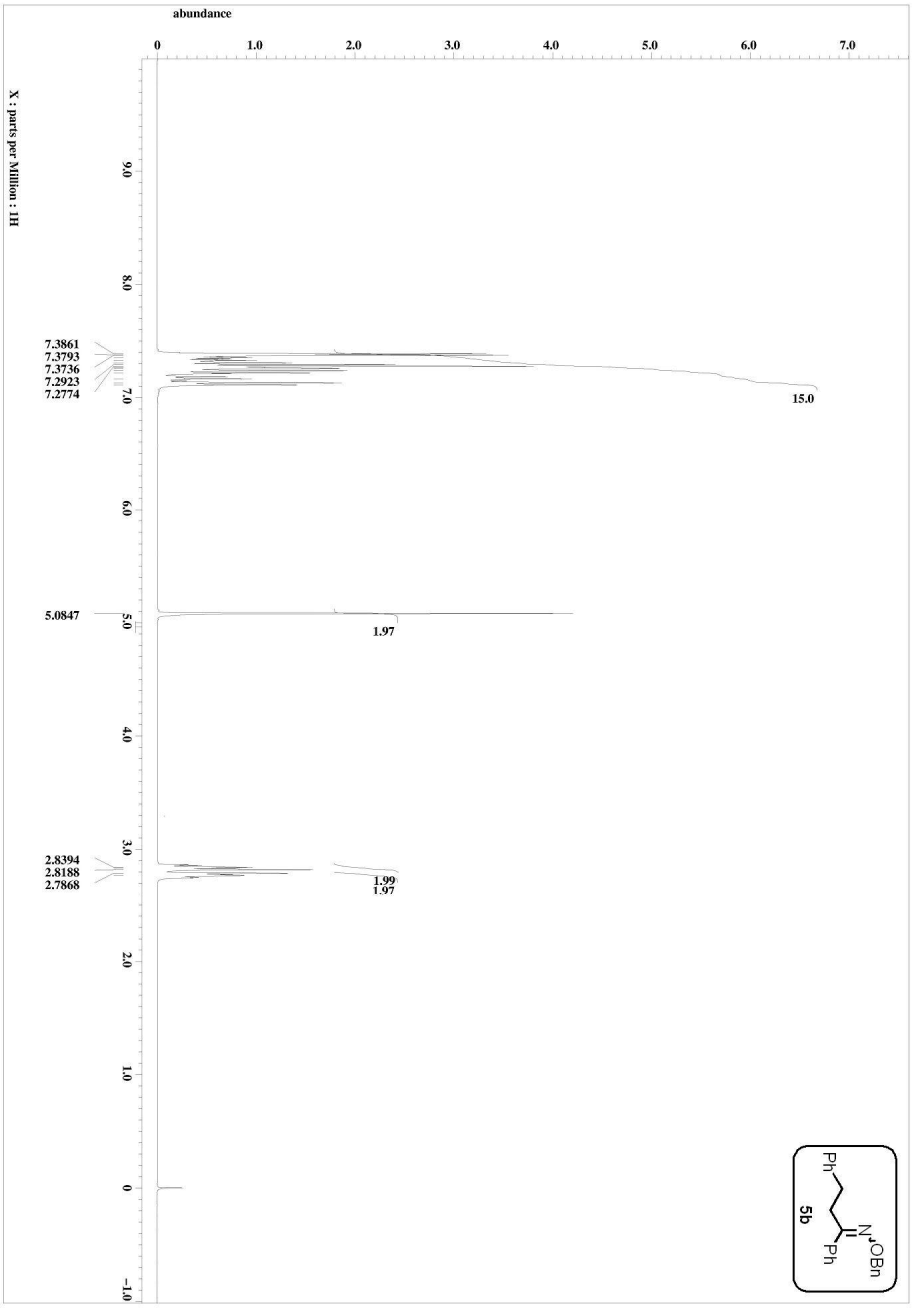

abundance
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
X : parts per Million : 13C
160.0
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
152.2106
134.1503
129.7139
129.2178
129.1320
82.1448
77.5749
77.2600
76.9452
44.8031
43.4292
MeO2S
N
OBn
SO2Me
8

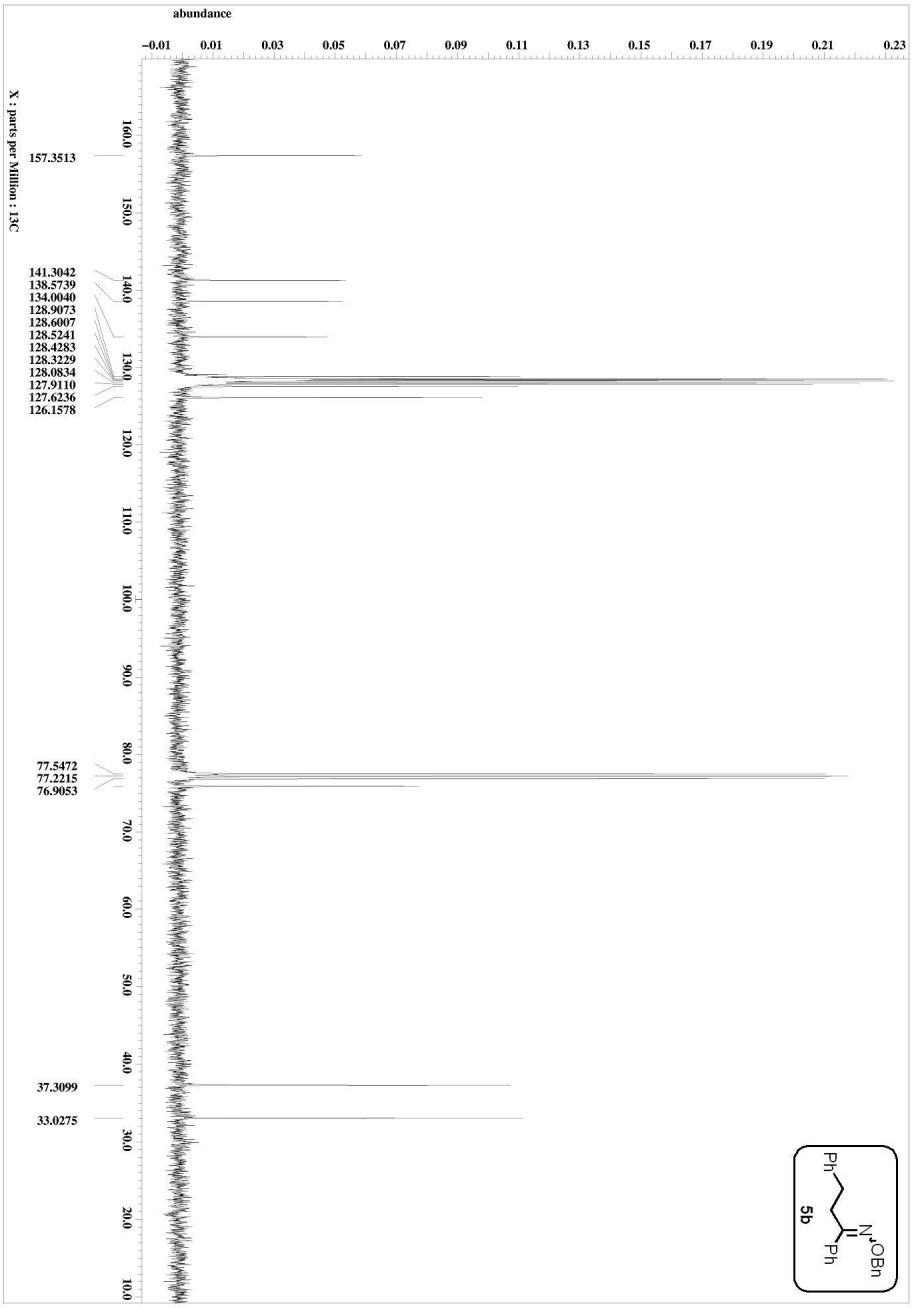

abundance
0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0
X : parts per Million : 1H
9.0 8.0 7.0 6.0 5.0 4.0 3.0 2.0 1.0 0 -1.0
7.4185
7.4117
7.3991
5
5.4918
2.04
3.1884
3.04
NC
N
OBn
SO2Me
13

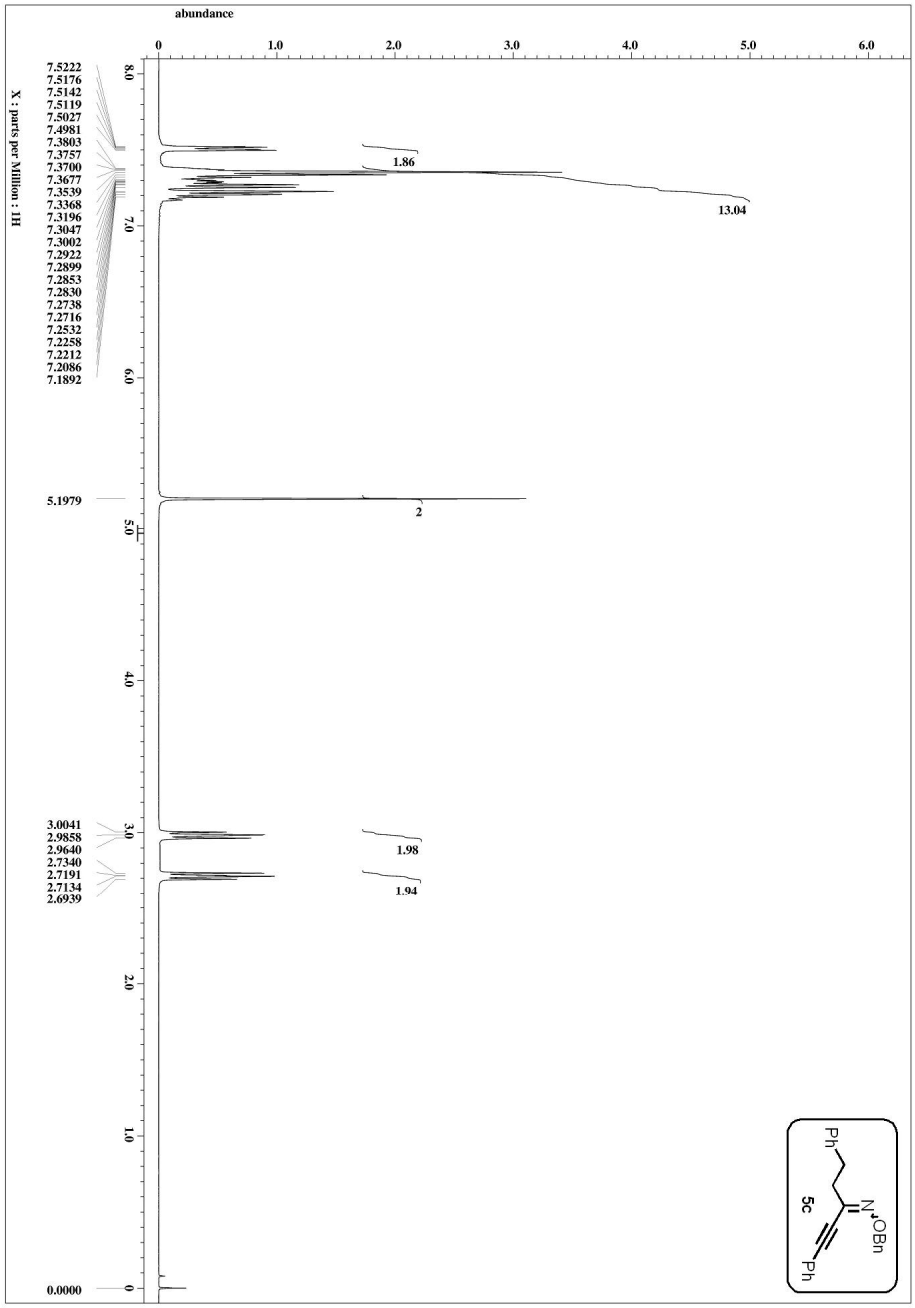

abundance
0
0.1
0.2
0.3
0.4
0.5
X : parts per Million : 13C
150.0
140.0
134.3493
133.7578
129.7984
129.3977
129.1401
130.0
120.0
110.0
105.2220
100.0
90.0
81.9430
80.0
77.5448
77.2300
76.9152
70.0
60.0
50.0
42.0254
40.0
30.0
20.0
NC
N
OBn
SO2Me
13

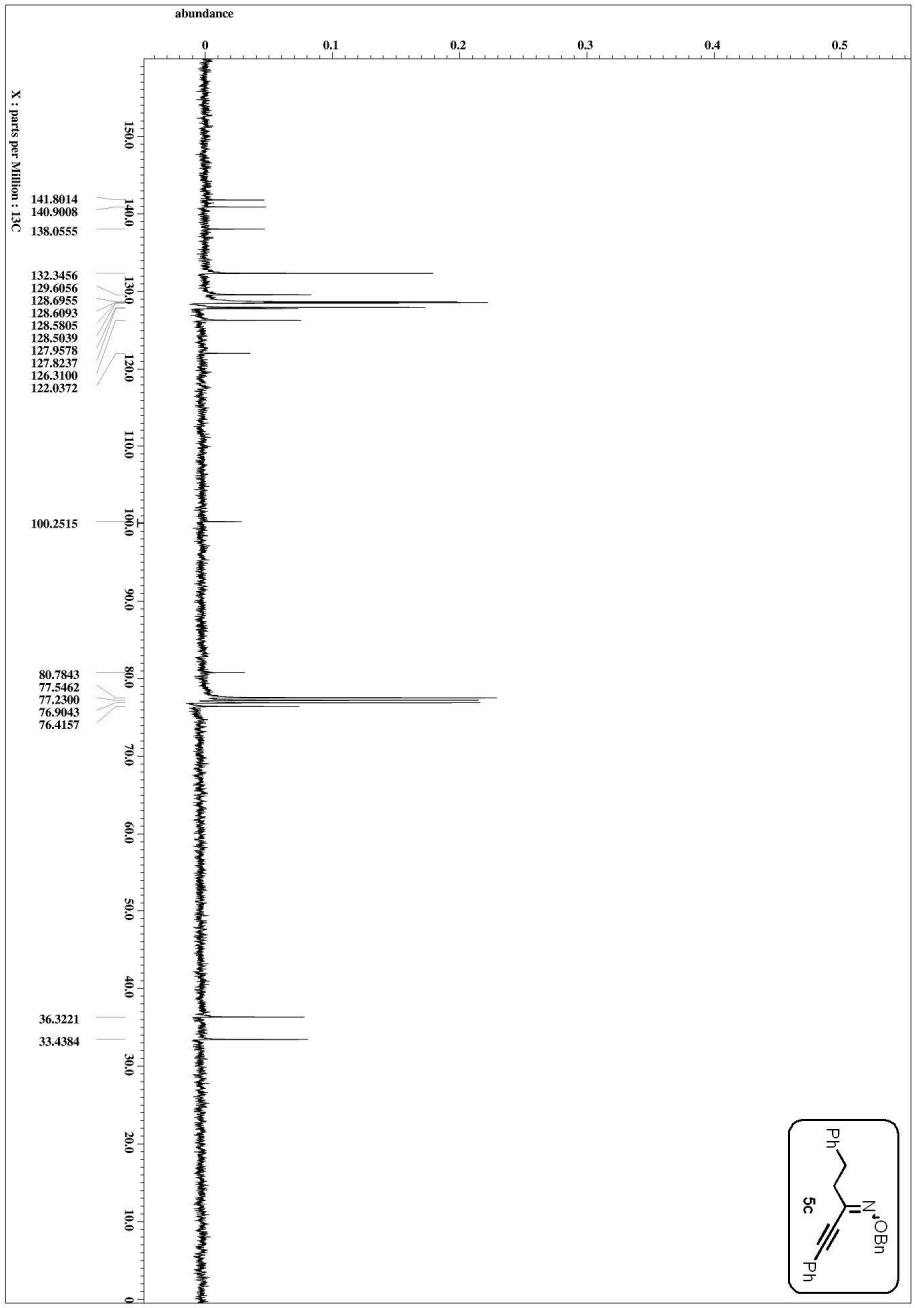

abundance
X : parts per Million : 1H
7.3889
7.3854
7.3774
7.3751
7.3545
2.02
8.04
5.3591
2.0
3.1404
3
Ph
10h
N
OBn
SO2Me

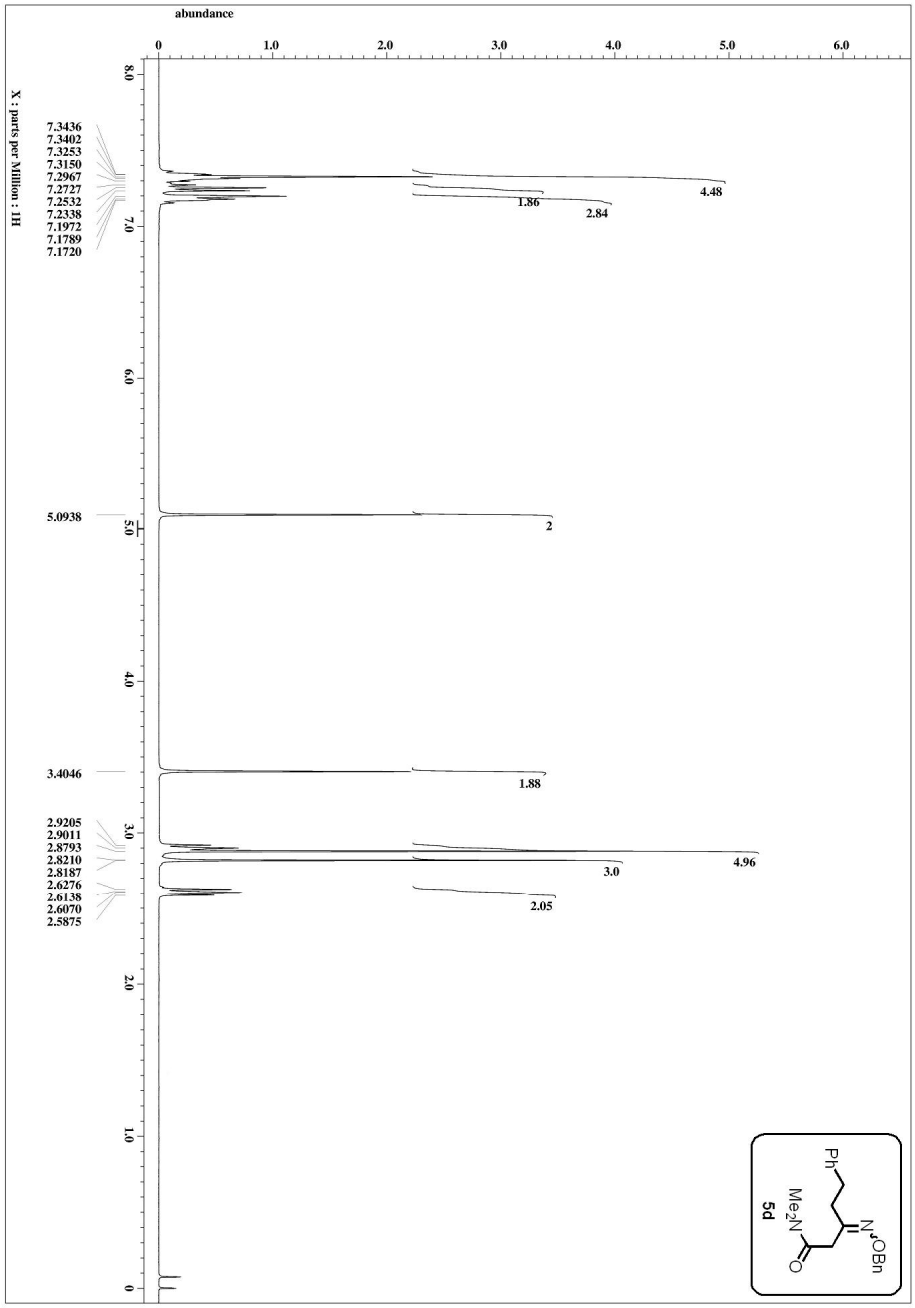

abundance
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
X : parts per Million : 13C
160.0
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
143.4897
135.7904
132.7279
130.9152
128.8926
128.8545
128.8258
128.7400
127.1753
120.3443
107.3501
79.4249
77.5454
77.2306
76.9157
73.7673
40.9097
Ph
10h
N
OBn
SO2Me

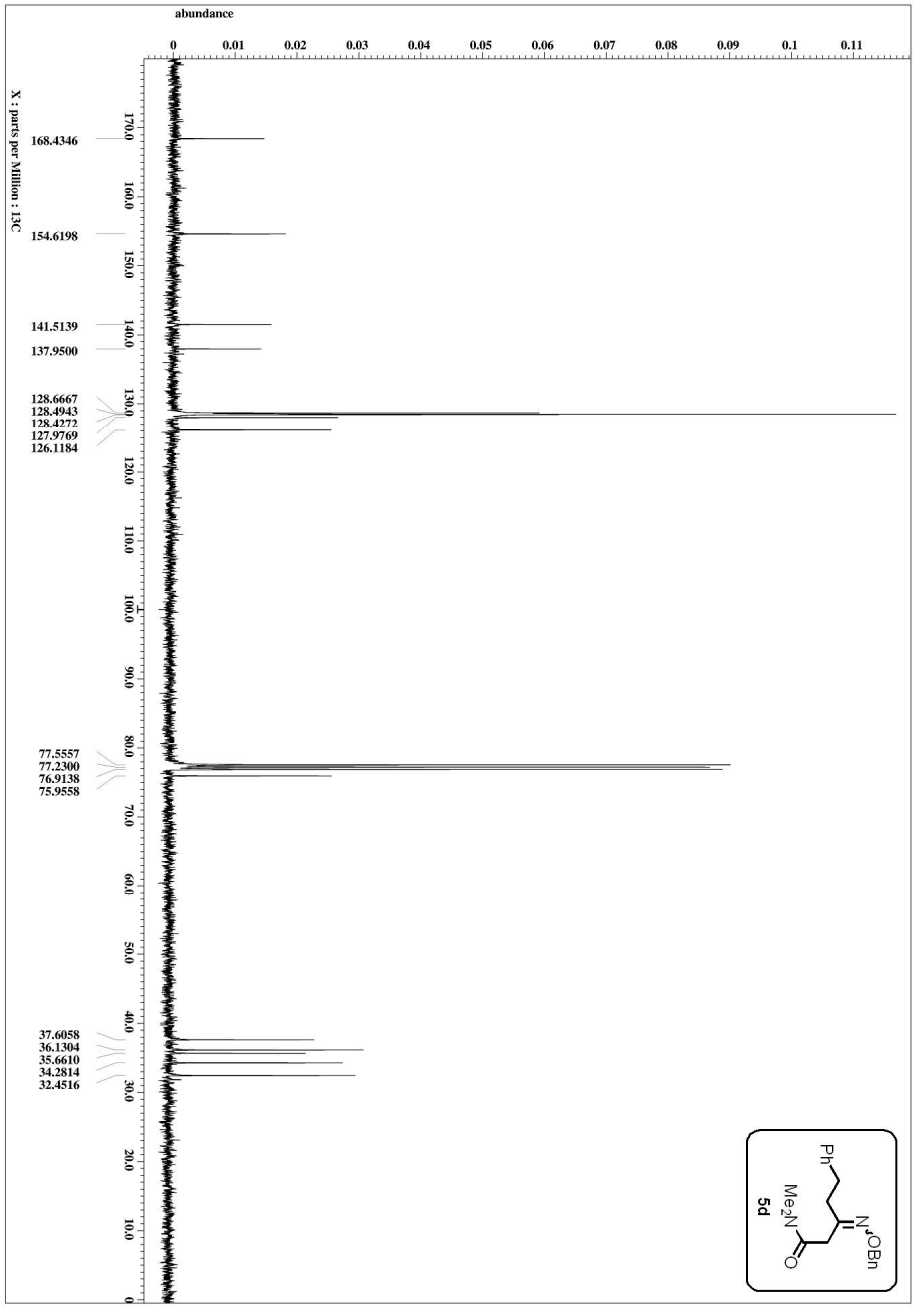

abundance
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
X : parts per Million : 1H
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
-1.0
7.3861
7.3793
7.3736
7.2923
7.2774
15.0
5.0847
1.97
2.8394
2.8188
2.7868
1.99
1.97
Ph
N
OBn
Ph
5b

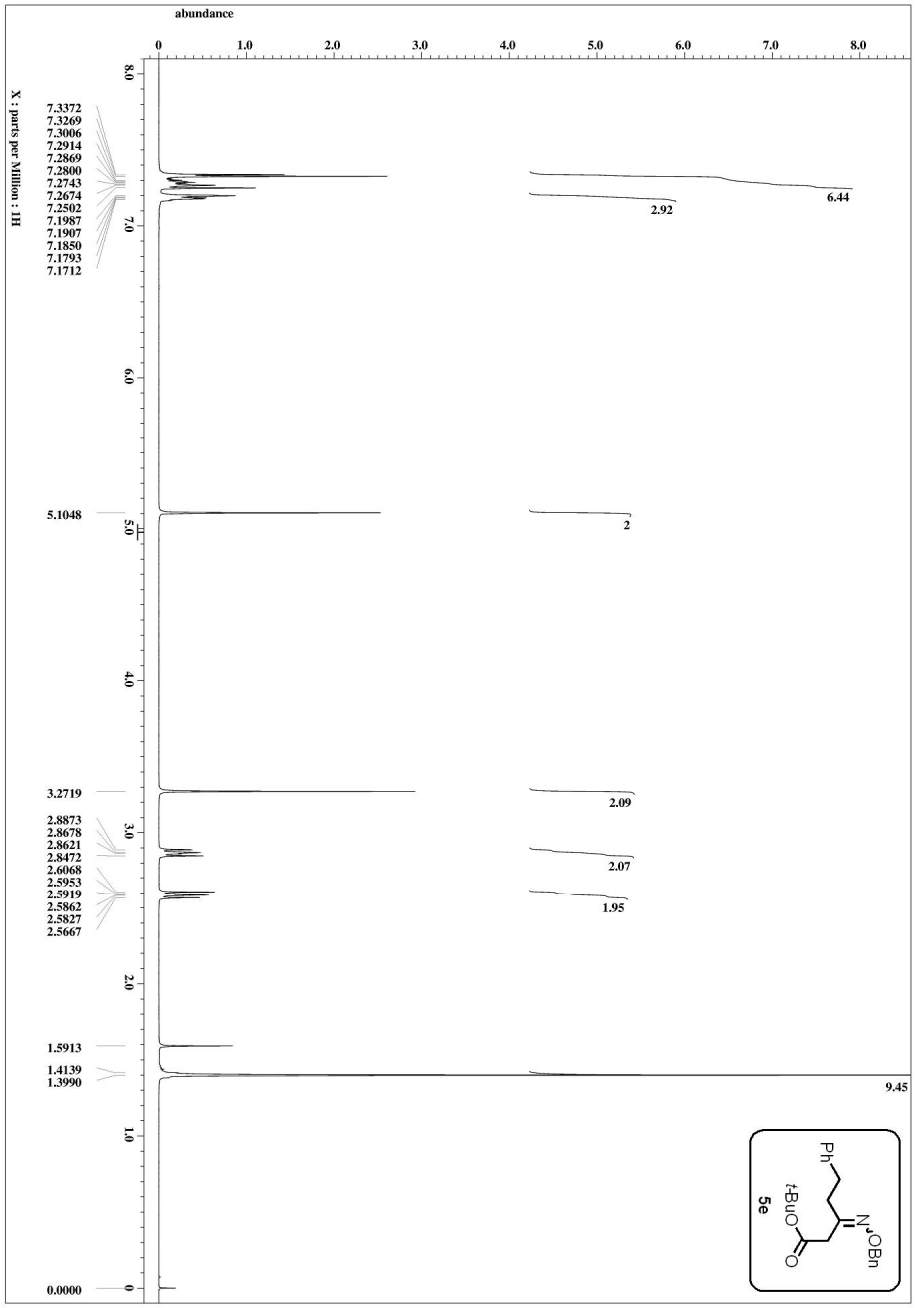

abundance
−0.01
0.01
0.03
0.05
0.07
0.09
0.11
0.13
0.15
0.17
0.19
0.21
0.23
X : parts per Million : 13C
157.3513
141.3042
138.5739
134.0040
128.9073
128.6007
128.5241
128.4283
128.3229
128.0834
127.9110
127.6236
126.1578
77.5472
77.2215
76.9053
37.3099
33.0275
160.0
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
Ph
N
OBn
Ph
5b

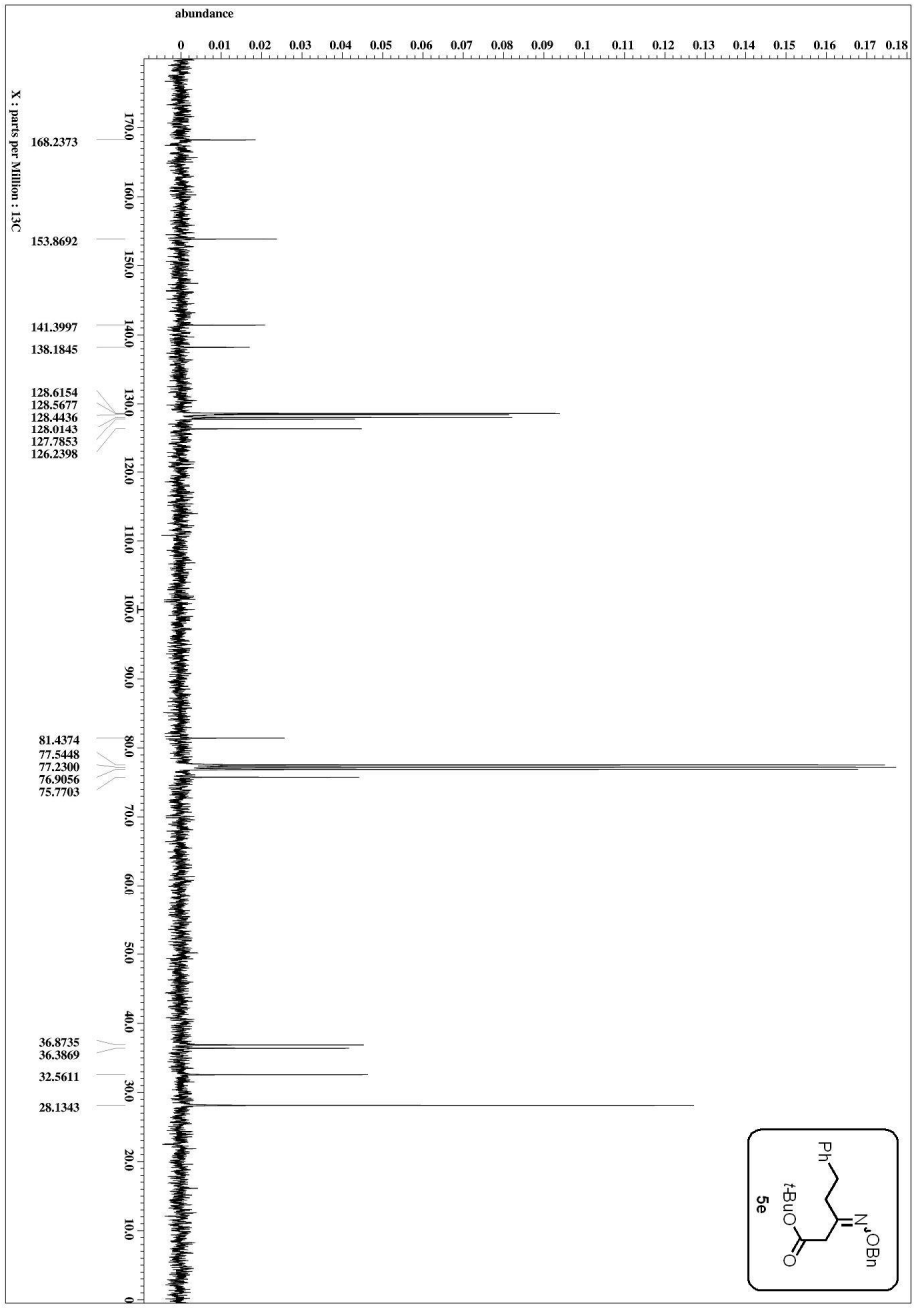

abundance
X : parts per Million : 1H
7.5222
7.5176
7.5142
7.5119
7.5027
7.4981
7.3803
7.3757
7.3700
7.3677
7.3539
7.3368
7.3196
7.3047
7.3002
7.2922
7.2899
7.2853
7.2830
7.2738
7.2716
7.2532
7.2258
7.2212
7.2086
7.1892
5.1979
3.0041
2.9858
2.9640
2.7340
2.7191
2.7134
2.6939
0.0000
1.86
13.04
2
1.98
1.94
Ph
N
OBn
5c
Ph

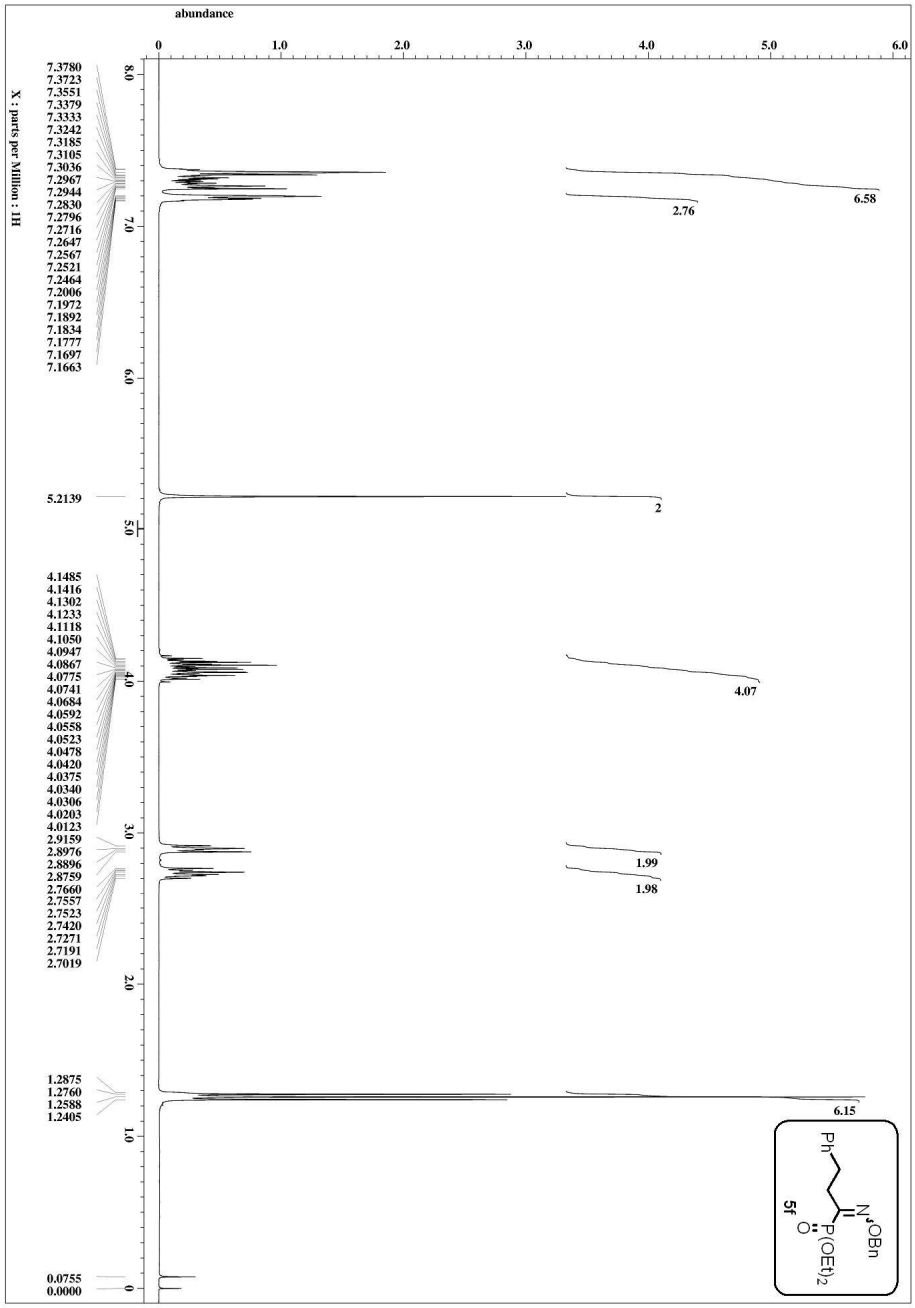

abundance
0
0.1
0.2
0.3
0.4
0.5
X : parts per Million : 13C
141.8014
140.9008
138.0555
132.3456
129.6056
128.6955
128.6093
128.5805
128.5039
127.9578
127.8237
126.3100
122.0372
100.2515
80.7843
77.5462
77.2300
76.9043
76.4157
36.3221
33.4384
Ph
N
OBn
5c
Ph

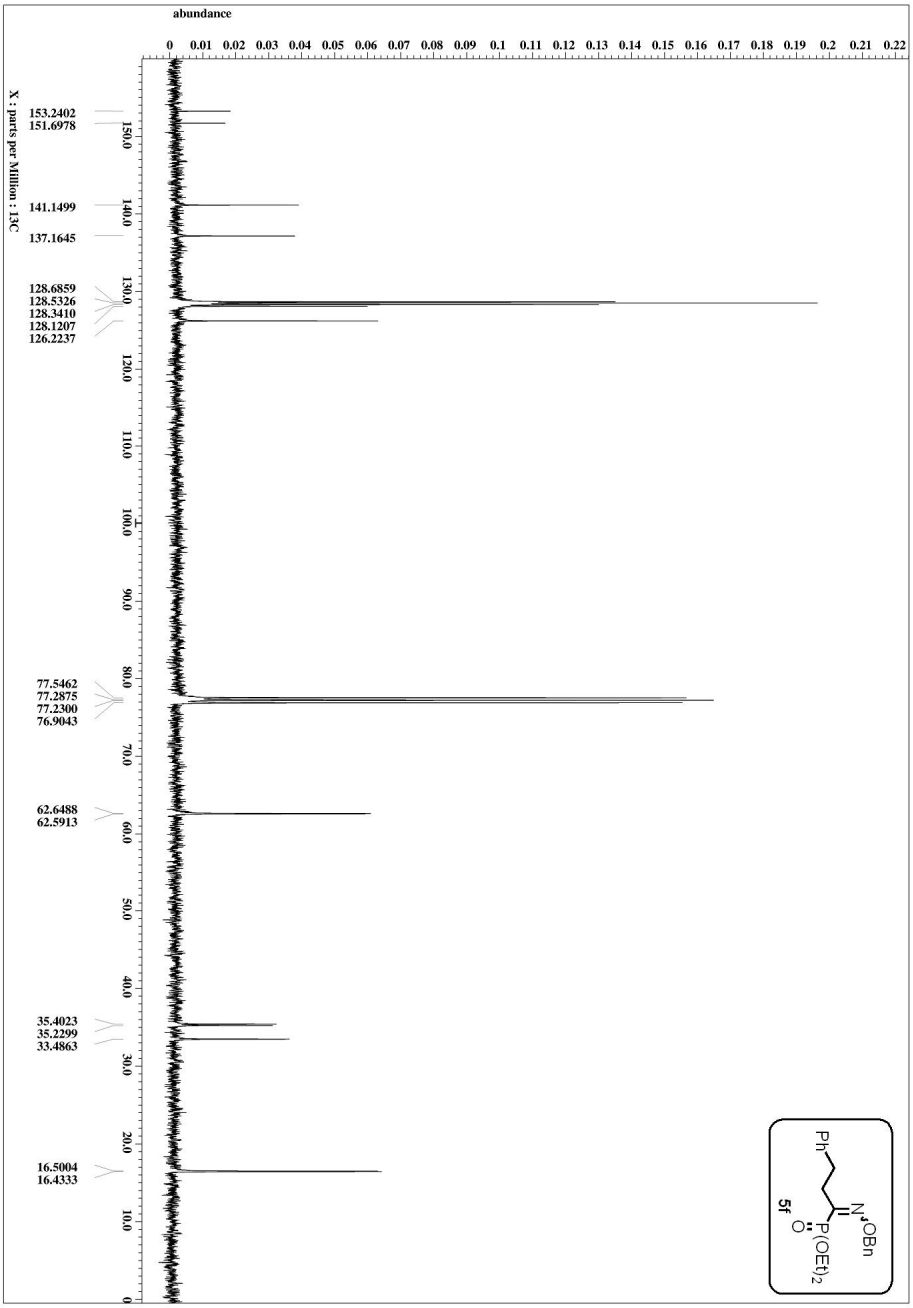

abundance
X : parts per Million : 1H
7.3436
7.3402
7.3253
7.3150
7.2967
7.2727
7.2532
7.2338
7.1972
7.1789
7.1720
5.0938
3.4046
2.9205
2.9011
2.8793
2.8210
2.8187
2.6276
2.6138
2.6070
2.5875
4.48
1.86
2.84
2
1.88
4.96
3.0
2.05
Ph
Me2N
N
OBn
O
5d

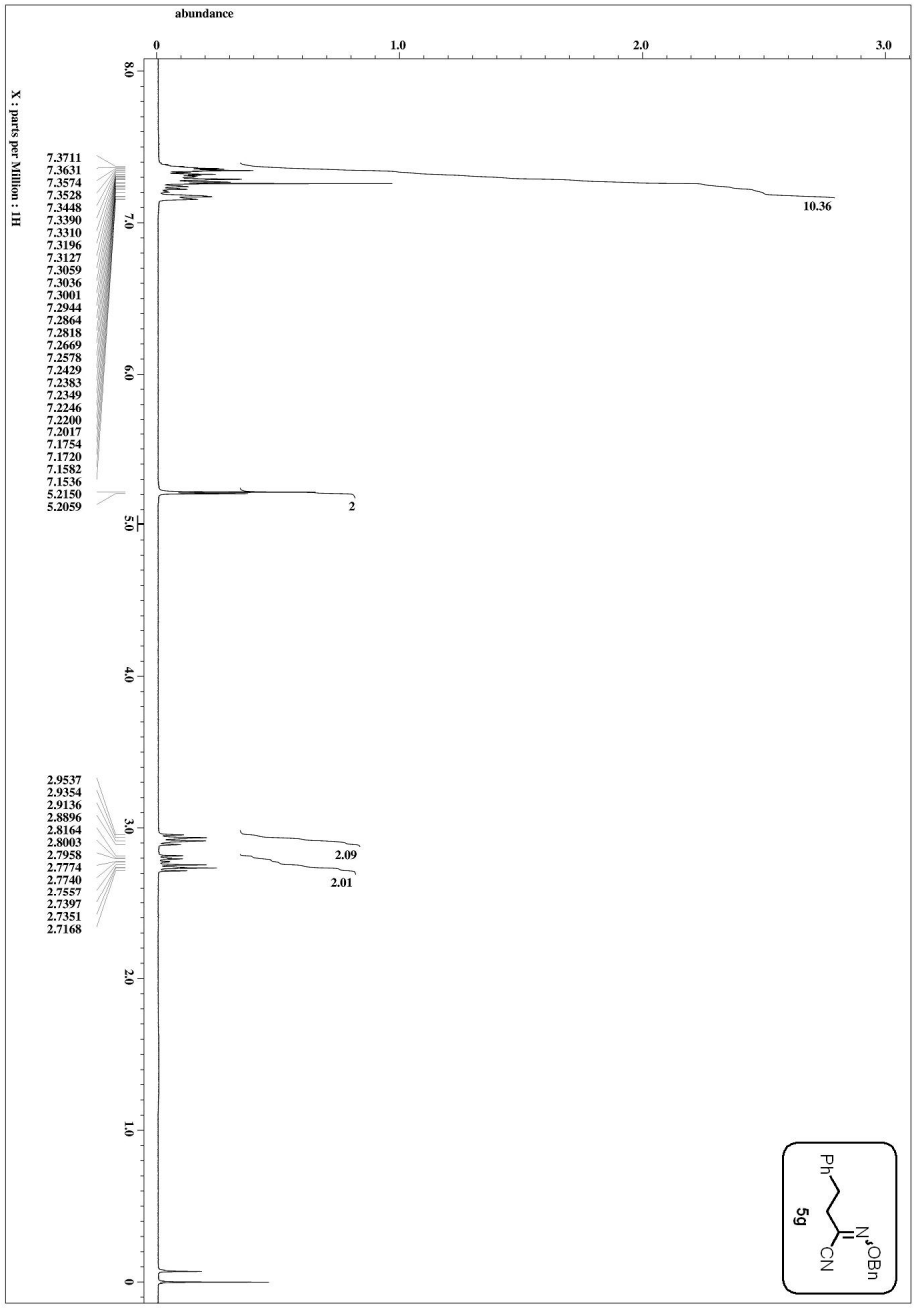

abundance
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
0.11
X : parts per Million : 13C
168.4346
154.6198
141.5139
137.9500
128.6667
128.4943
128.4272
127.9769
126.1184
77.5557
77.2300
76.9138
75.9558
37.6058
36.1304
35.6610
34.2814
32.4516
Ph
Me2N
O
N
OBn
5d

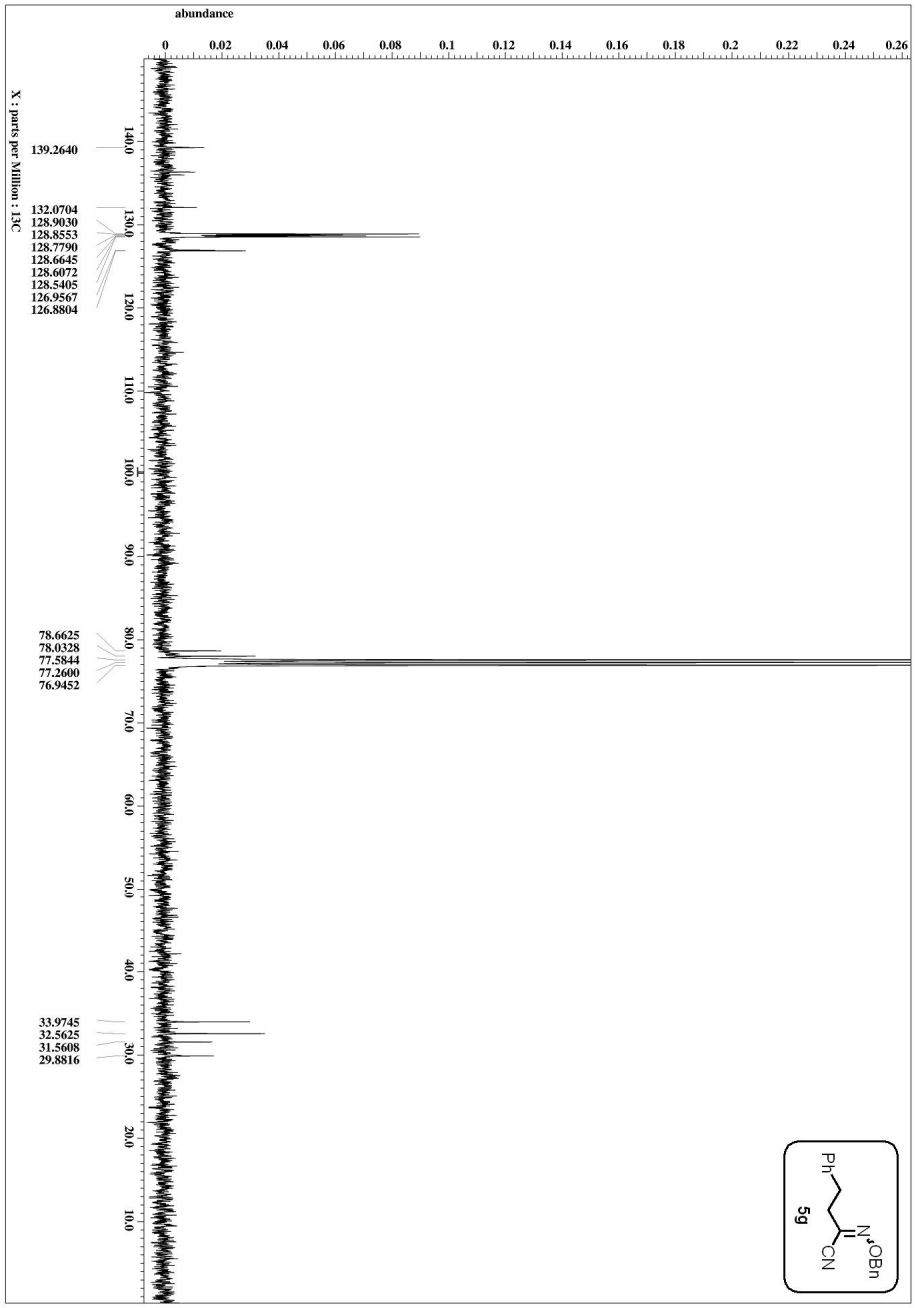

abundance
X : parts per Million : 1H
7.3372
7.3269
7.3006
7.2914
7.2869
7.2800
7.2743
7.2674
7.2502
7.1987
7.1907
7.1850
7.1793
7.1712
5.1048
3.2719
2.8873
2.8678
2.8621
2.8472
2.6068
2.5953
2.5919
2.5862
2.5827
2.5667
1.5913
1.4139
1.3990
0.0000
6.44
2.92
2
2.09
2.07
1.95
9.45
Ph
t-BuO
O
N
OBn
5e

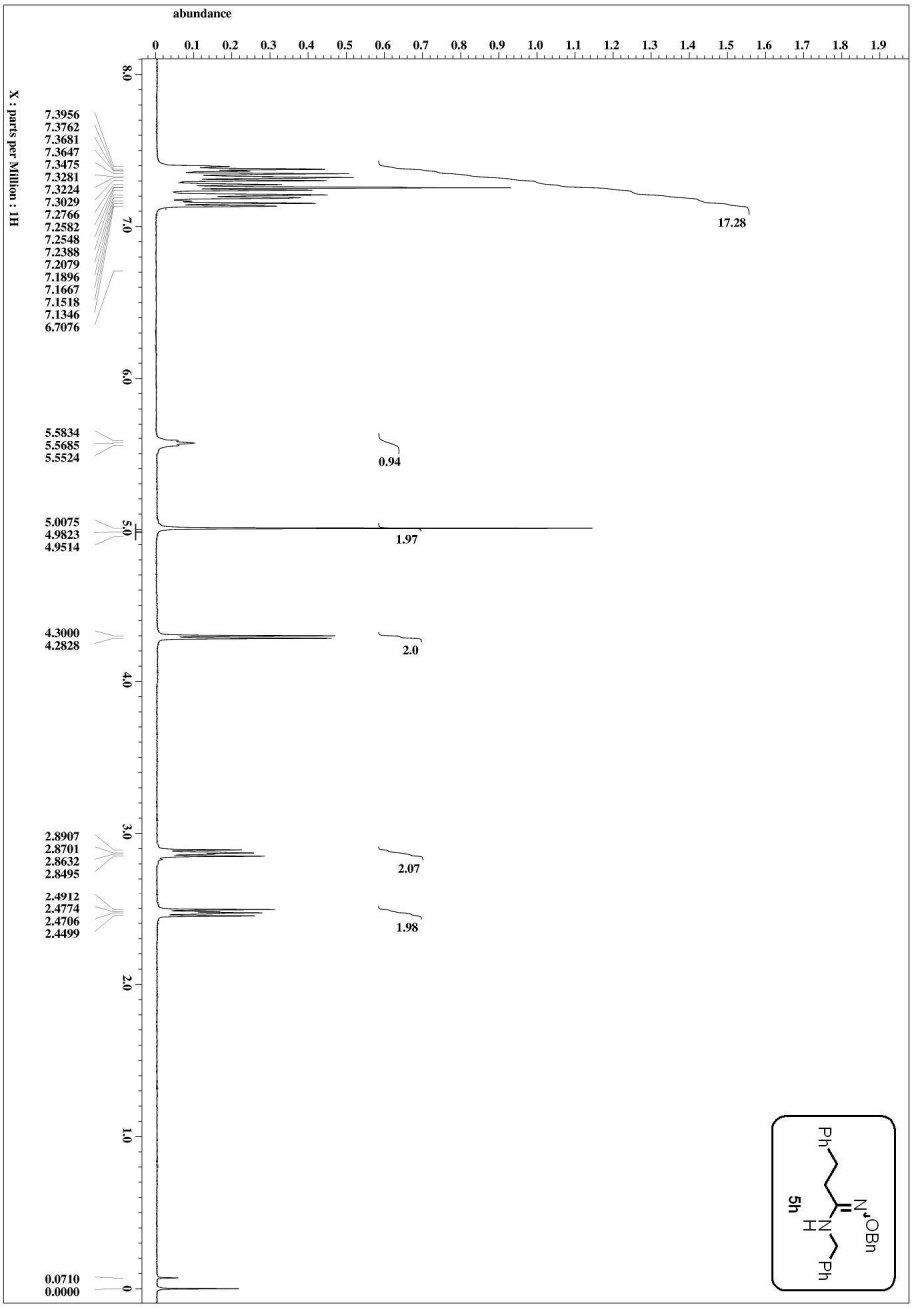

abundance
X : parts per Million : 13C
168.2373
153.8692
141.3997
138.1845
128.6154
128.5677
128.4436
128.0143
127.7853
126.2398
81.4374
77.5448
77.2300
76.9056
75.7703
36.8735
36.3869
32.5611
28.1343
Ph
OBn
tBuO
O
5e

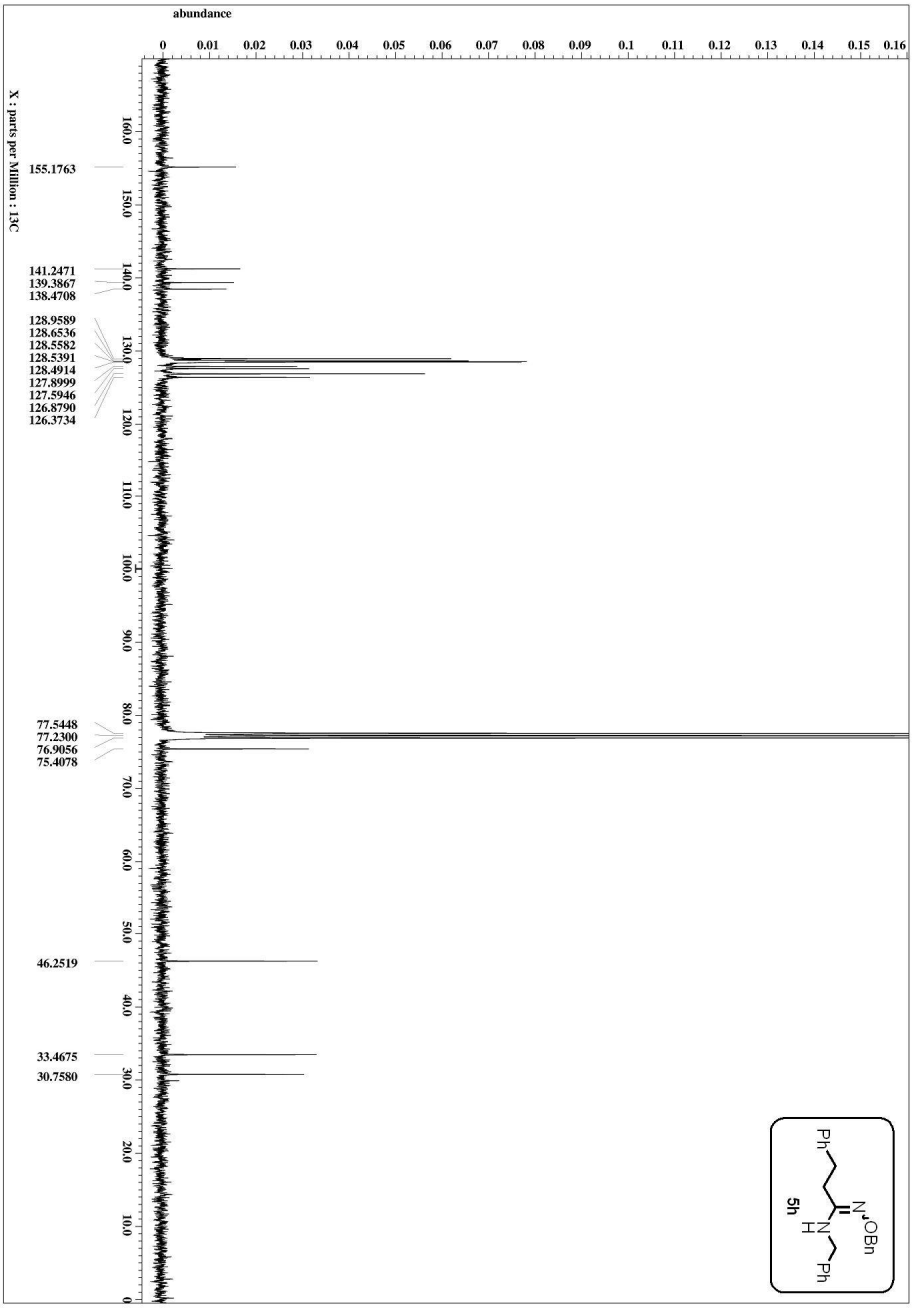

abundance
X : parts per Million : 1H
7.3780
7.3723
7.3551
7.3379
7.3333
7.3242
7.3185
7.3105
7.3036
7.2967
7.2944
7.2830
7.2796
7.2716
7.2647
7.2567
7.2521
7.2464
7.2006
7.1972
7.1892
7.1834
7.1777
7.1697
7.1663
5.2139
4.1485
4.1416
4.1302
4.1233
4.1118
4.1050
4.0947
4.0867
4.0775
4.0741
4.0684
4.0592
4.0558
4.0523
4.0478
4.0420
4.0375
4.0340
4.0306
4.0203
4.0123
2.9159
2.8976
2.8896
2.8759
2.7660
2.7557
2.7523
2.7420
2.7271
2.7191
2.7019
1.2875
1.2760
1.2588
1.2405
0.0755
0.0000
6.58
2.76
2
4.07
1.99
1.98
6.15
Ph
N
OBn
P(OEt)2
O
5f

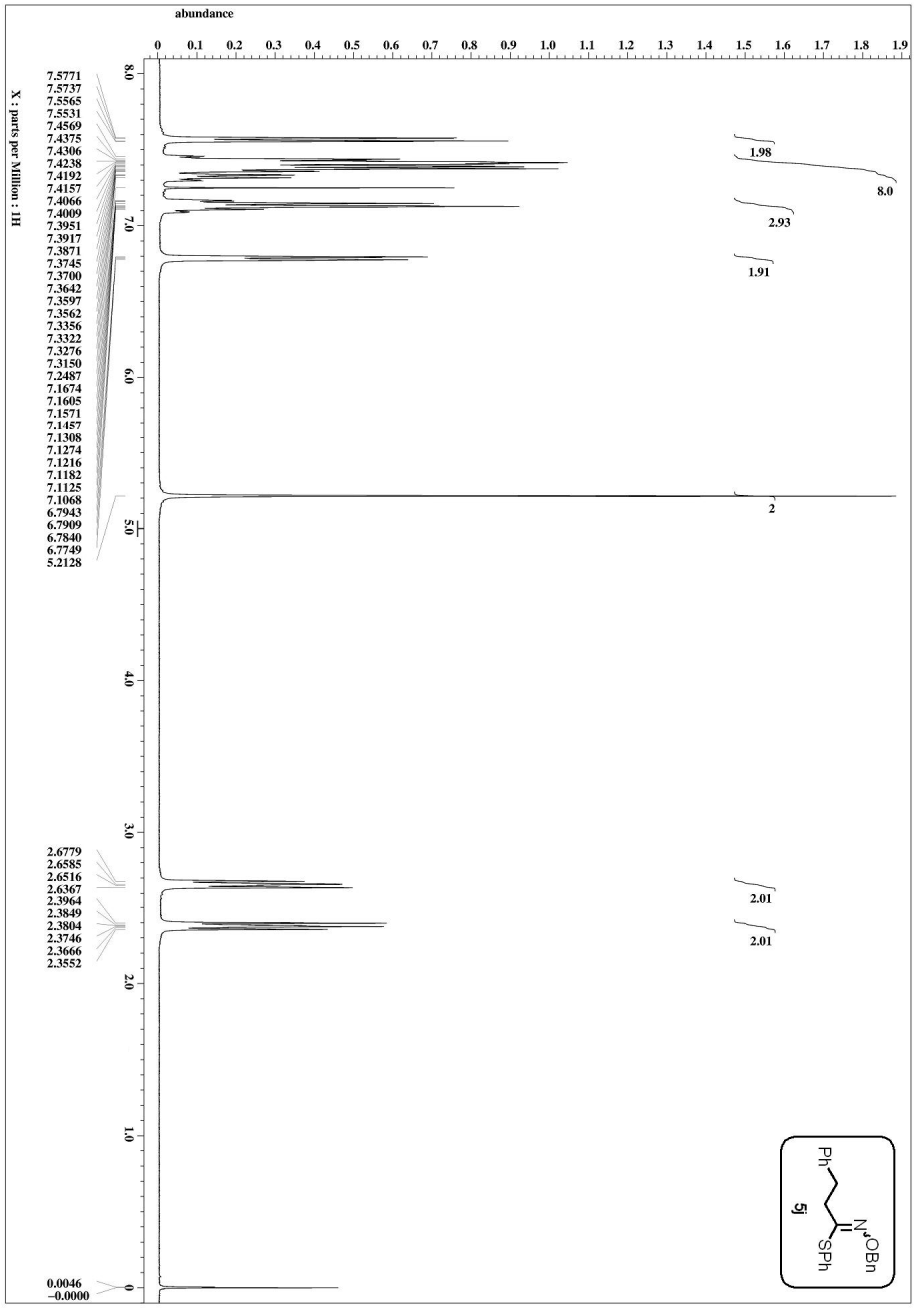

abundance
0 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.1 0.11 0.12 0.13 0.14 0.15 0.16 0.17 0.18 0.19 0.2 0.21 0.22
X : parts per Million : 13C
153.2402
151.6978
141.1499
137.1645
128.6859
128.5326
128.3410
128.1207
126.2237
77.5462
77.2875
77.2300
76.9043
62.6488
62.5913
35.4023
35.2299
33.4863
16.5004
16.4333
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
Ph
N
OBn
P(OEt)2
O
5f

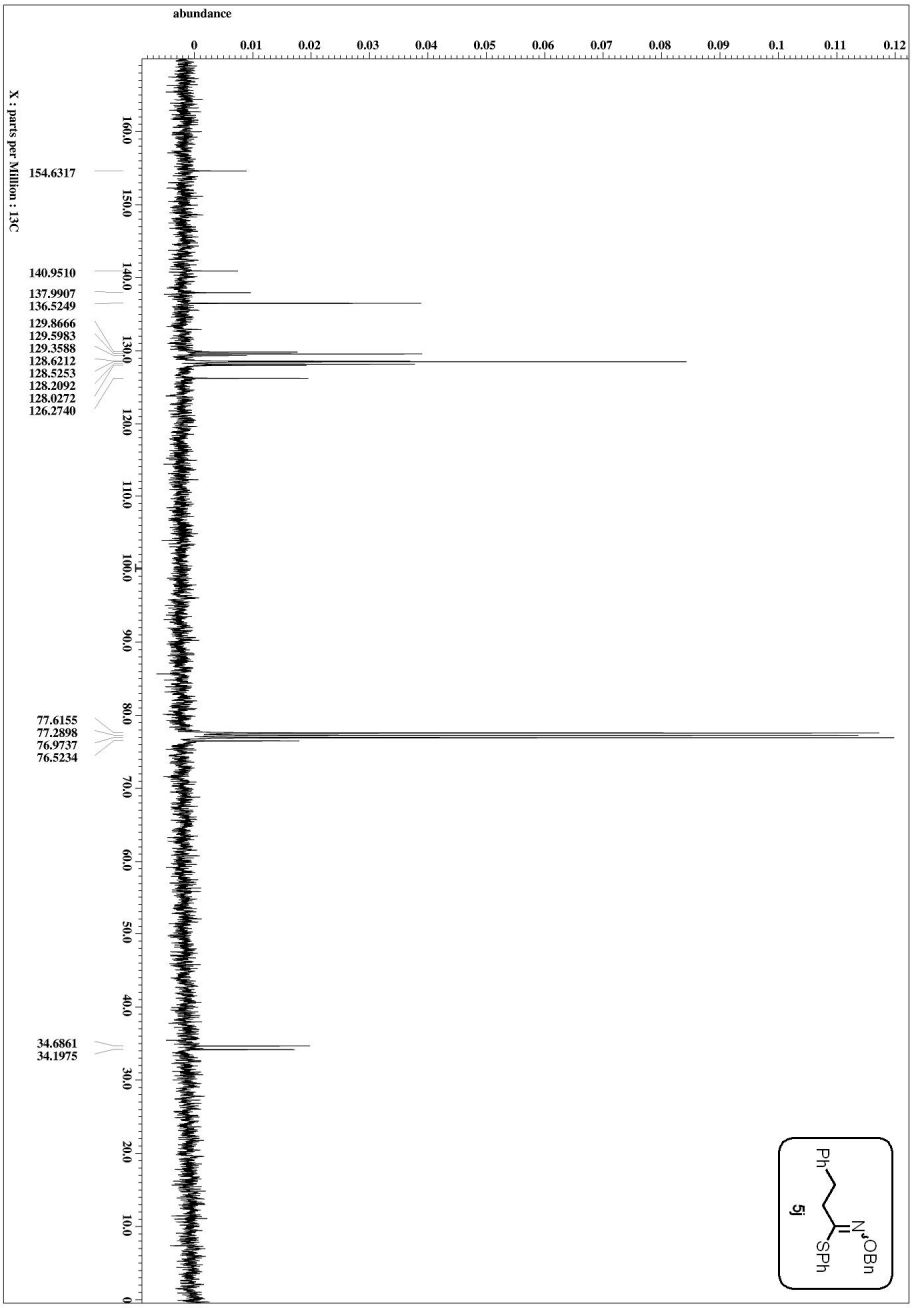

abundance
0
1.0
2.0
3.0
X : parts per Million : 1H
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
7.3711
7.3631
7.3574
7.3528
7.3448
7.3390
7.3310
7.3196
7.3127
7.3059
7.3036
7.3001
7.2944
7.2864
7.2818
7.2669
7.2578
7.2429
7.2383
7.2349
7.2246
7.2200
7.2017
7.1754
7.1720
7.1582
7.1536
5.2150
5.2059
2.9537
2.9354
2.9136
2.8896
2.8164
2.8003
2.7958
2.7774
2.7740
2.7557
2.7397
2.7351
2.7168
10.36
2
2.09
2.01
Ph
N
OBn
CN
5g

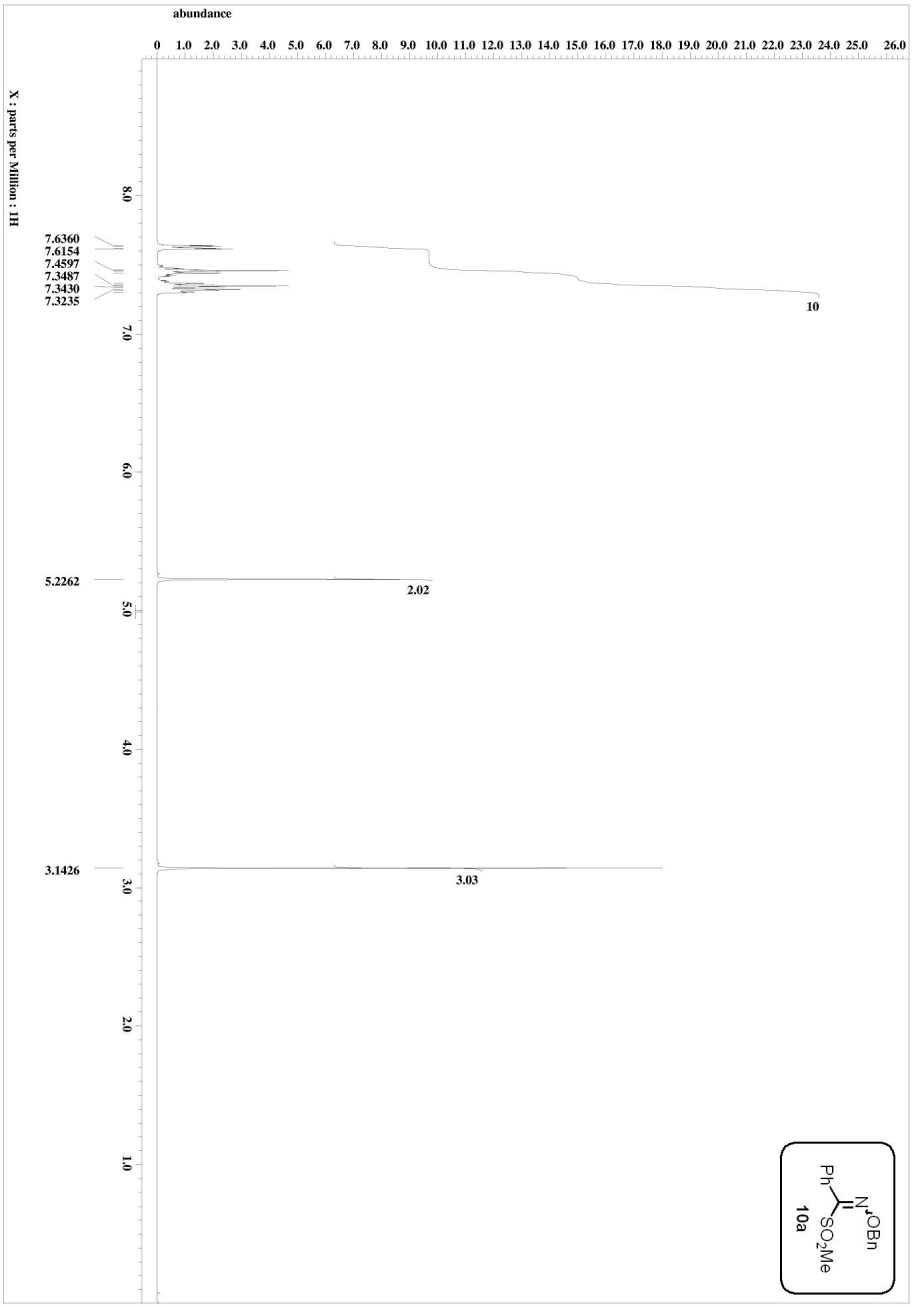

abundance
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
X : parts per Million : 13C
139.2640
132.0704
128.9030
128.8553
128.7790
128.6645
128.6072
128.5405
126.9567
126.8804
78.6625
78.0328
77.5844
77.2600
76.9452
33.9745
32.5625
31.5608
29.8816
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
Ph
N
OBn
CN
5g

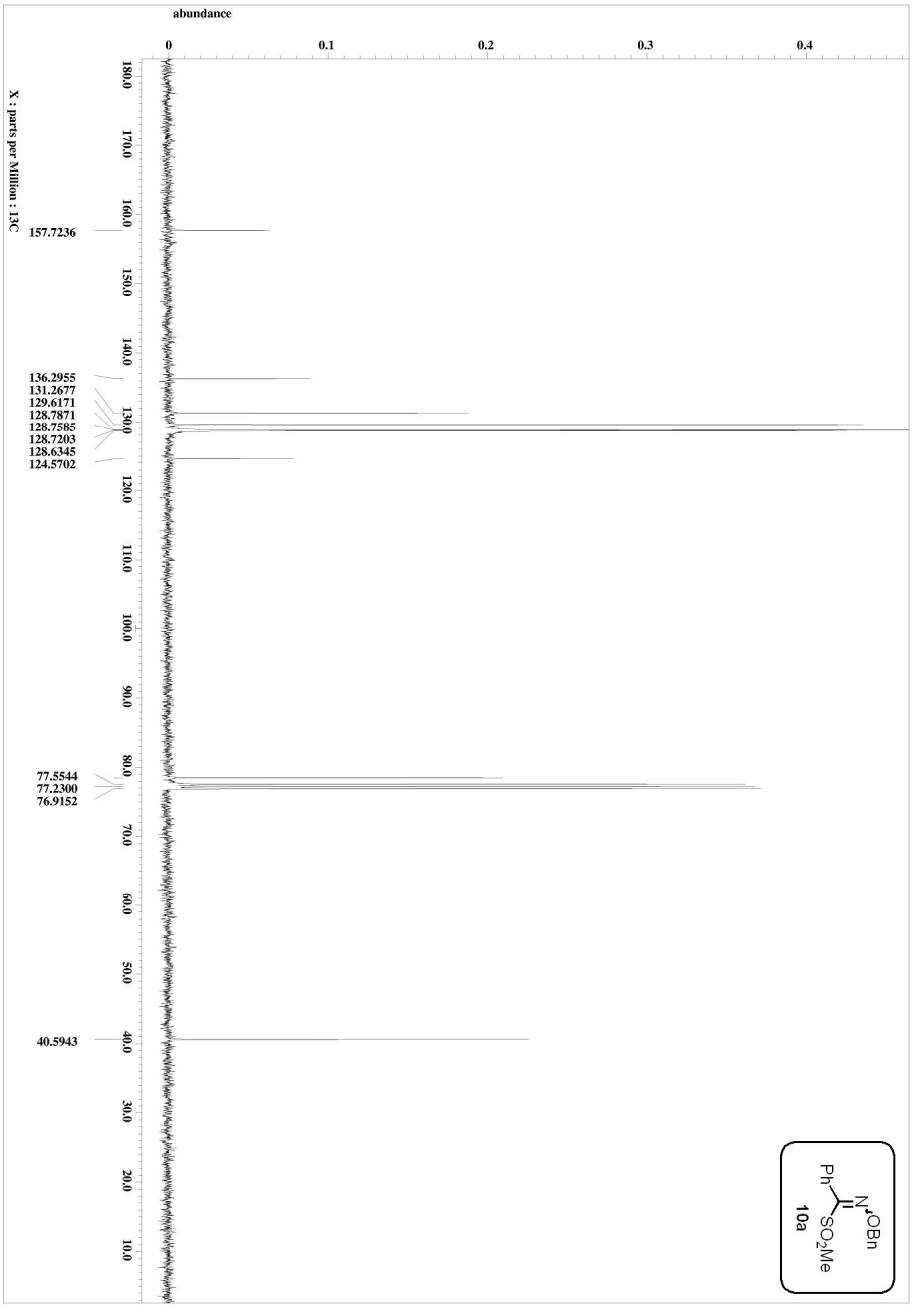

abundance
X : parts per Million : 1H
7.3956
7.3762
7.3681
7.3647
7.3475
7.3281
7.3224
7.3029
7.2766
7.2582
7.2548
7.2388
7.2079
7.1896
7.1667
7.1518
7.1346
6.7076
5.5834
5.5685
5.5524
5.0075
4.9823
4.9514
4.3000
4.2828
2.8907
2.8701
2.8632
2.8495
2.4912
2.4774
2.4706
2.4499
0.0710
0.0000
17.28
0.94
1.97
2.0
2.07
1.98
5h
Ph
N
OBn
H
N
Ph

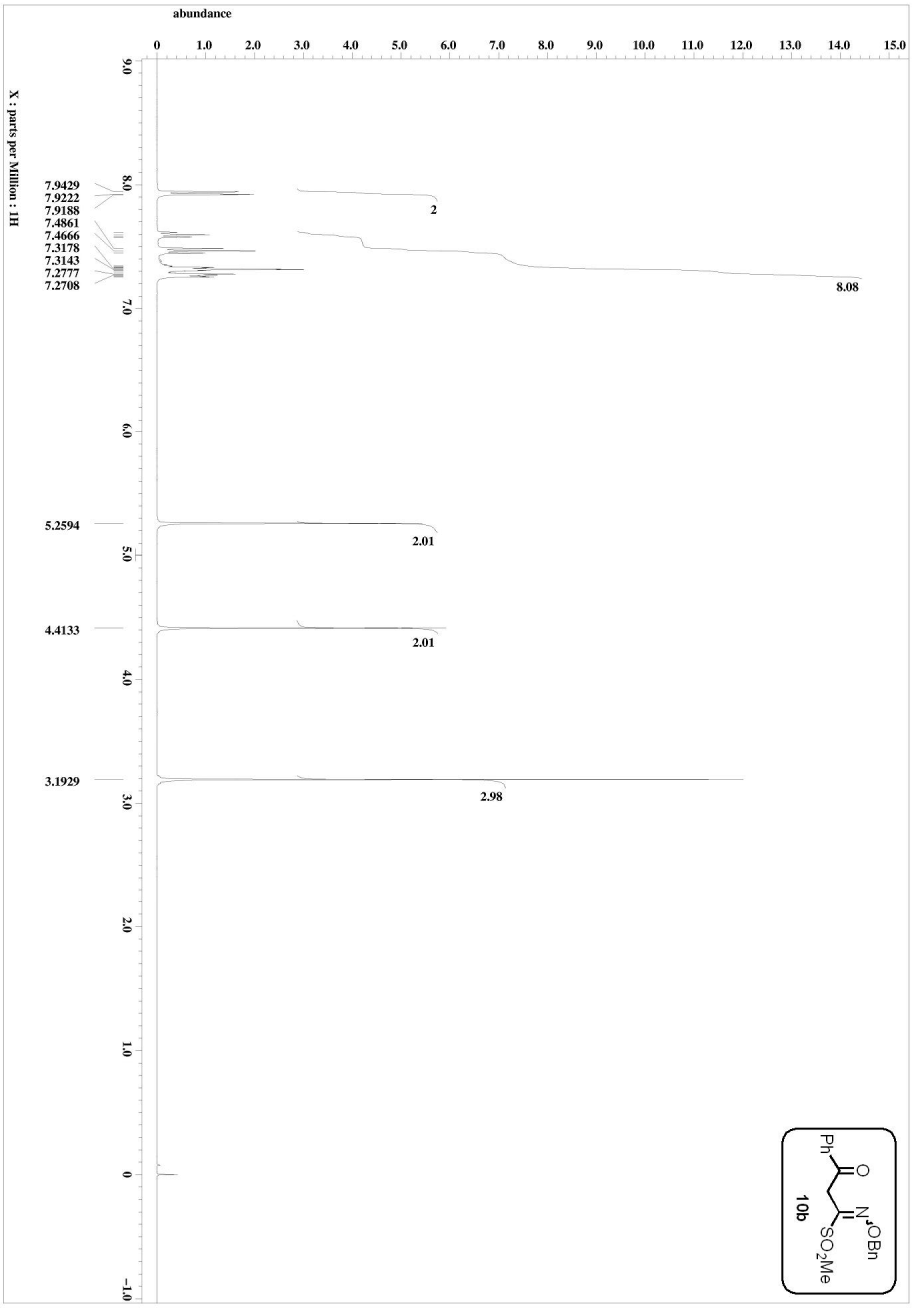

abundance
X : parts per Million : 13C
155.1763
141.2471
139.3867
138.4708
128.9589
128.6536
128.5582
128.5391
128.4914
127.8999
127.5946
126.8790
126.3734
77.5448
77.2300
76.9056
75.4078
46.2519
33.4675
30.7580
5h
Ph
OBn
Ph

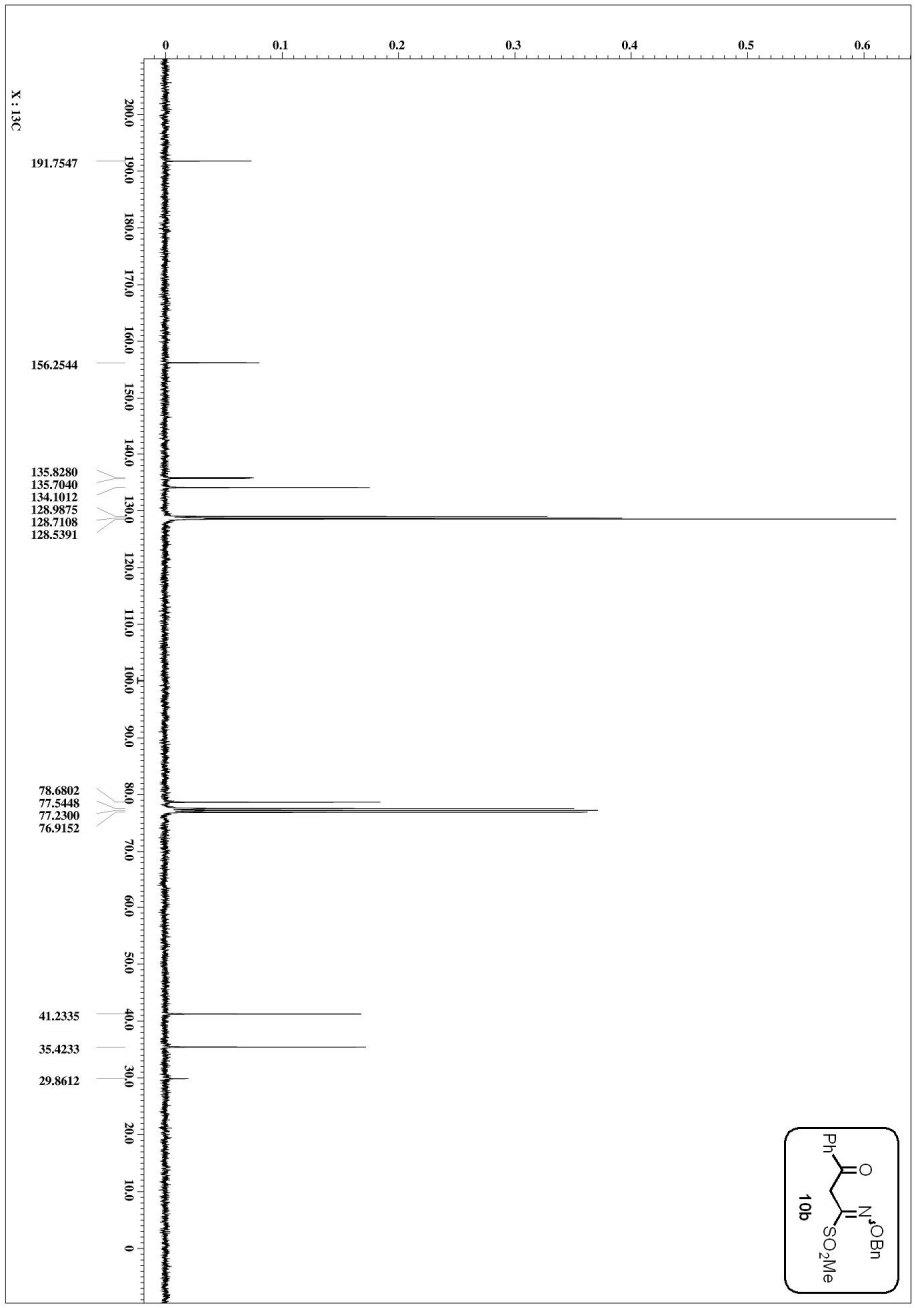

abundance
X : parts per Million : 1H
7.5771
7.5737
7.5565
7.5531
7.4569
7.4375
7.4306
7.4238
7.4192
7.4157
7.4066
7.4009
7.3951
7.3917
7.3871
7.3745
7.3700
7.3642
7.3597
7.3562
7.3356
7.3322
7.3276
7.3150
7.2487
7.1674
7.1605
7.1571
7.1457
7.1308
7.1274
7.1216
7.1182
7.1125
7.1068
6.7943
6.7909
6.7840
6.7749
5.2128
2.6779
2.6585
2.6516
2.6367
2.3964
2.3849
2.3804
2.3746
2.3666
2.3552
0.0046
−0.0000
1.98
8.0
2.93
1.91
2
2.01
2.01
Ph
SPh
OBn
5j

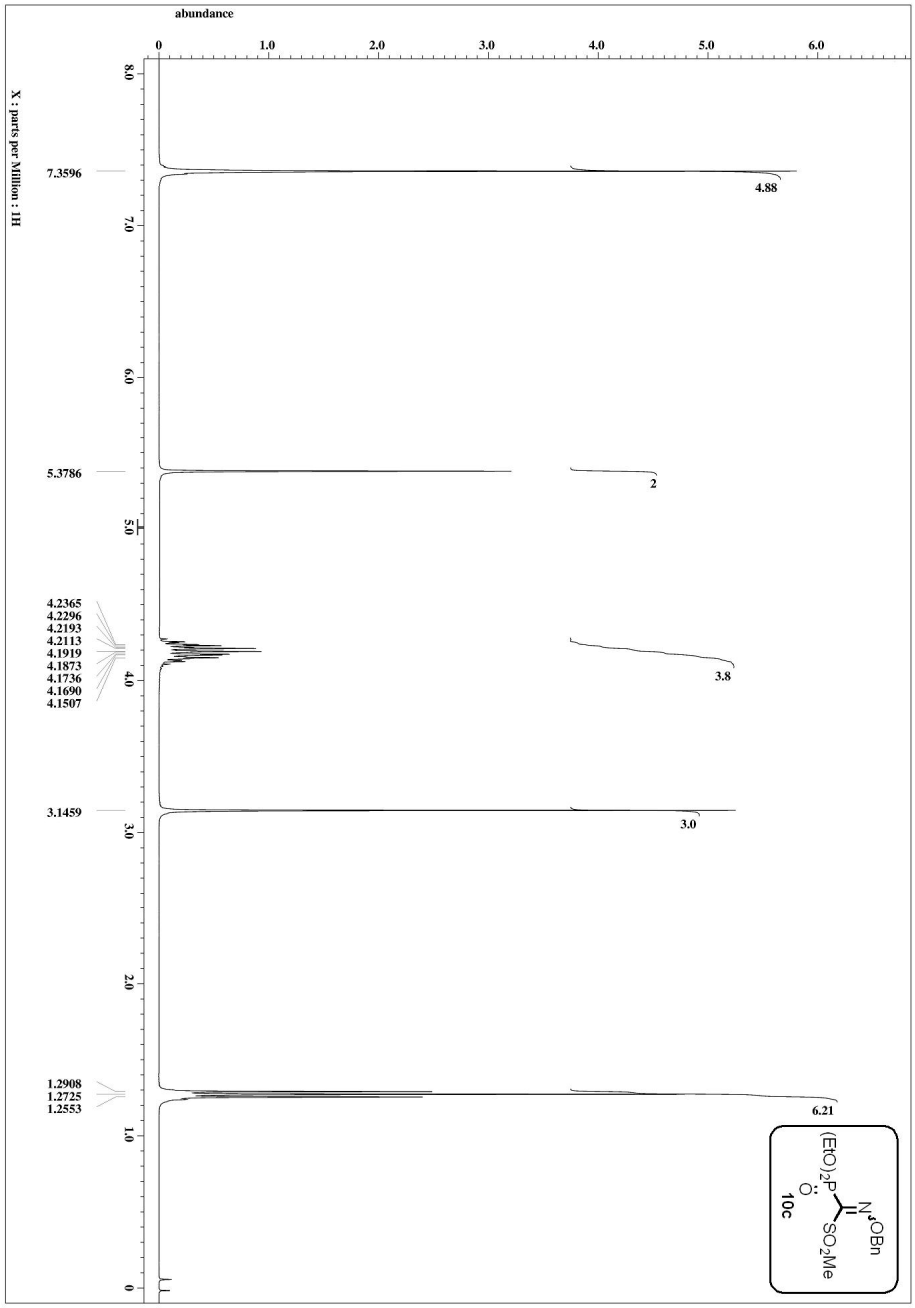

abundance
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
0.11
0.12
X : parts per Million : 13C
154.6317
140.9510
137.9907
136.5249
129.8666
129.5983
129.3588
128.6212
128.5253
128.2092
128.0272
126.2740
77.6155
77.2898
76.9737
76.5234
34.6861
34.1975
5j
Ph
SPh
N
OBn

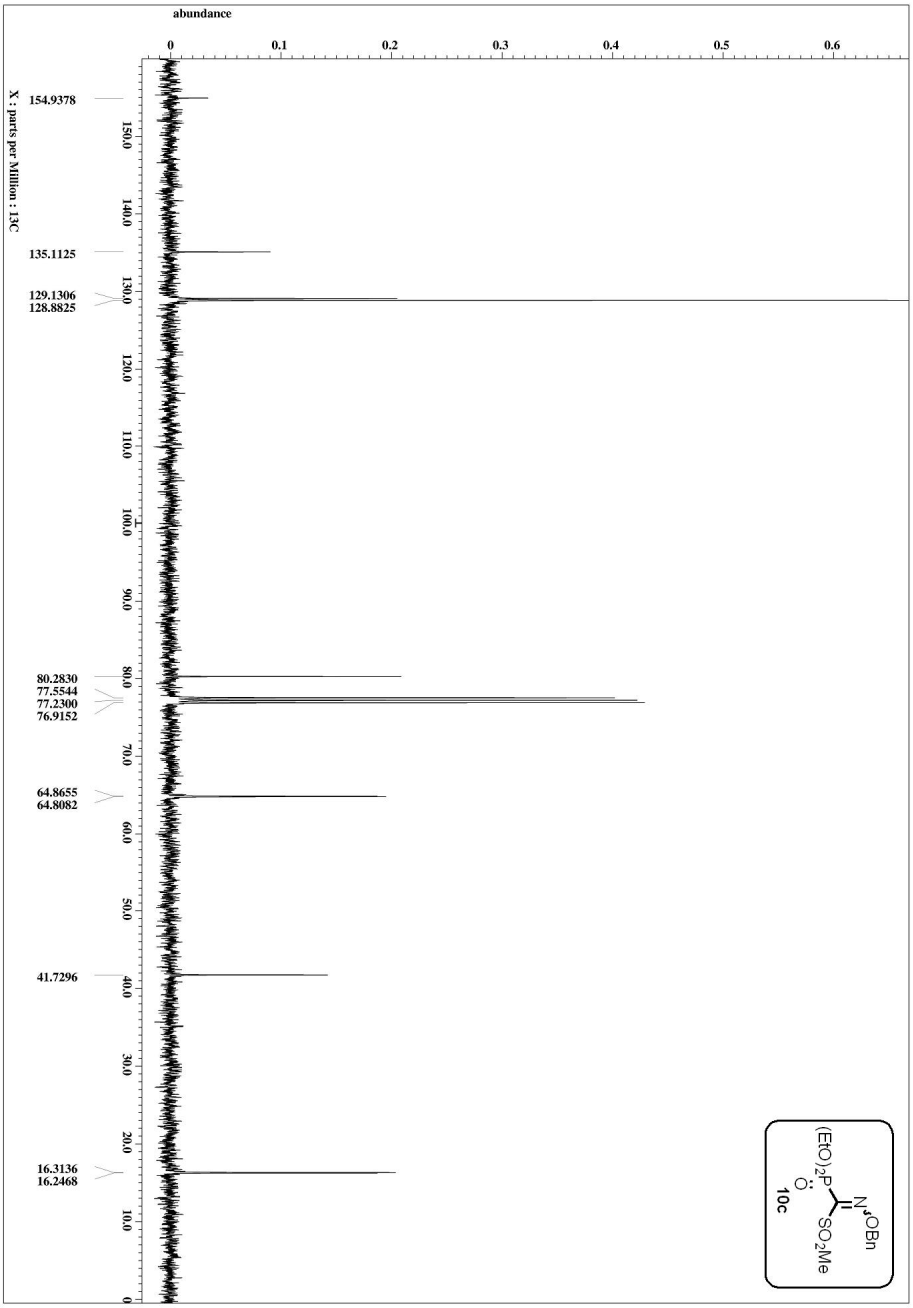

abundance
0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0 23.0 24.0 25.0 26.0
X : parts per Million : 1H
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
7.6360
7.6154
7.4597
7.3487
7.3430
7.3235
10
5.2262
2.02
3.1426
3.03
Ph
N
OBn
SO2Me
10a

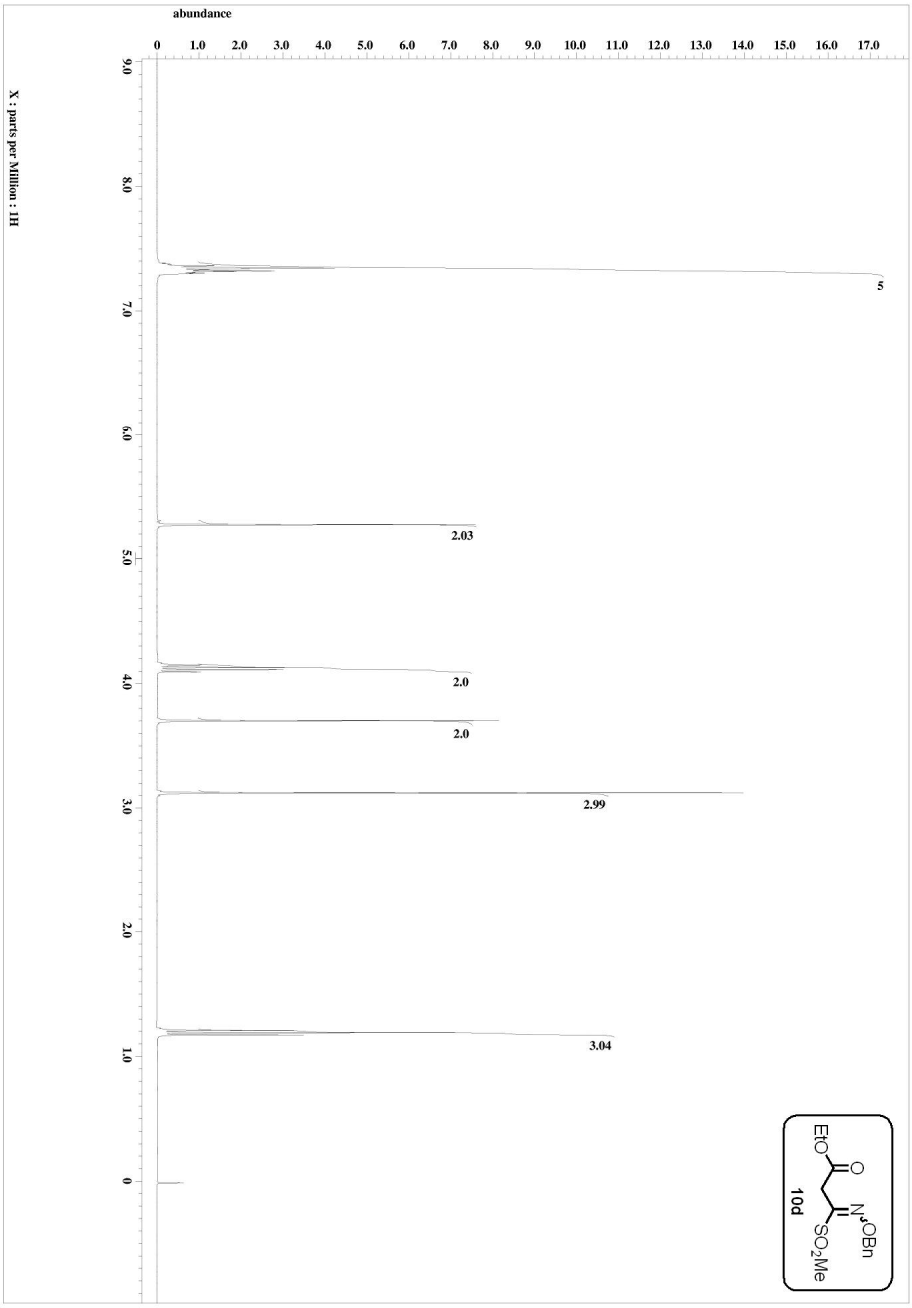

abundance
0
0.1
0.2
0.3
0.4
X : parts per Million : 13C
180.0
170.0
160.0
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
157.7236
136.2955
131.2677
129.6171
128.7871
128.7585
128.7203
128.6345
124.5702
77.5544
77.2300
76.9152
40.5943
Ph
N
OBn
SO2Me
10a

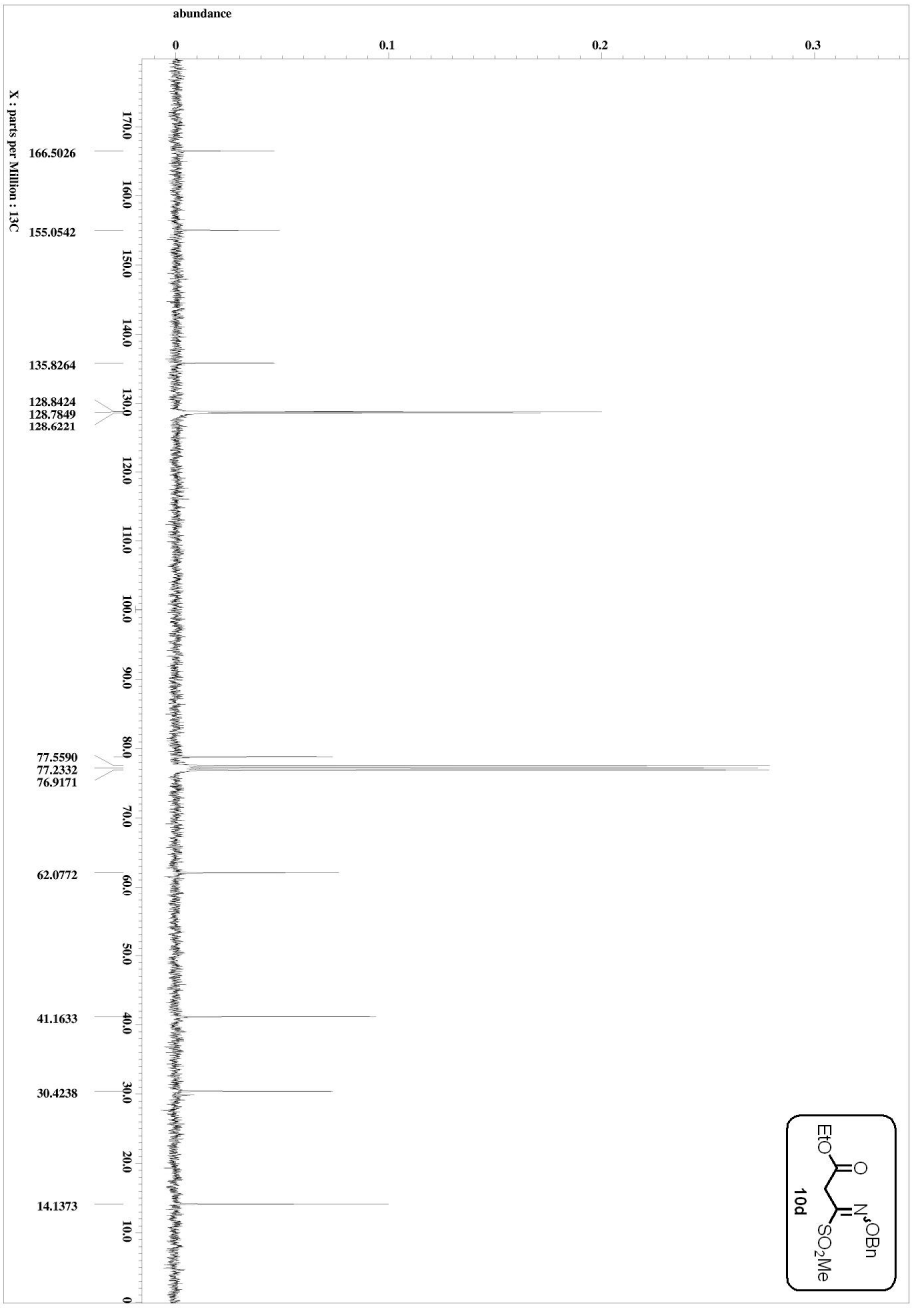

abundance
X : parts per Million : 1H
7.9429
7.9222
7.9188
7.4861
7.4666
7.3178
7.3143
7.2777
7.2708
5.2594
4.4133
3.1929
2
8.08
2.01
2.01
2.98
10b

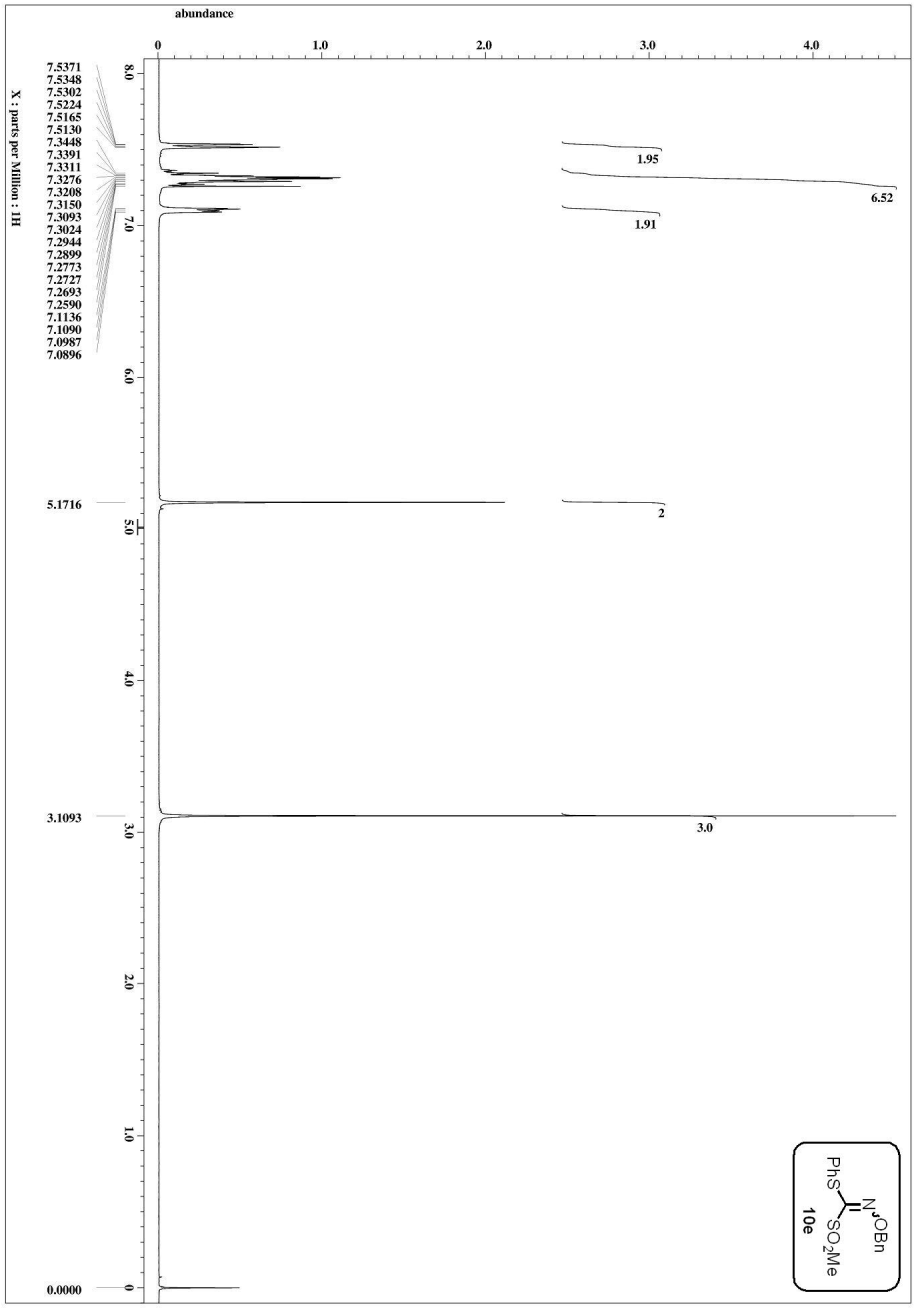

X : 13C
191.7547
156.2544
135.8280
135.7040
134.1012
128.9875
128.7108
128.5391
78.6802
77.5448
77.2300
76.9152
41.2335
35.4233
29.8612
Ph
O
N
OBn
SO2Me
10b

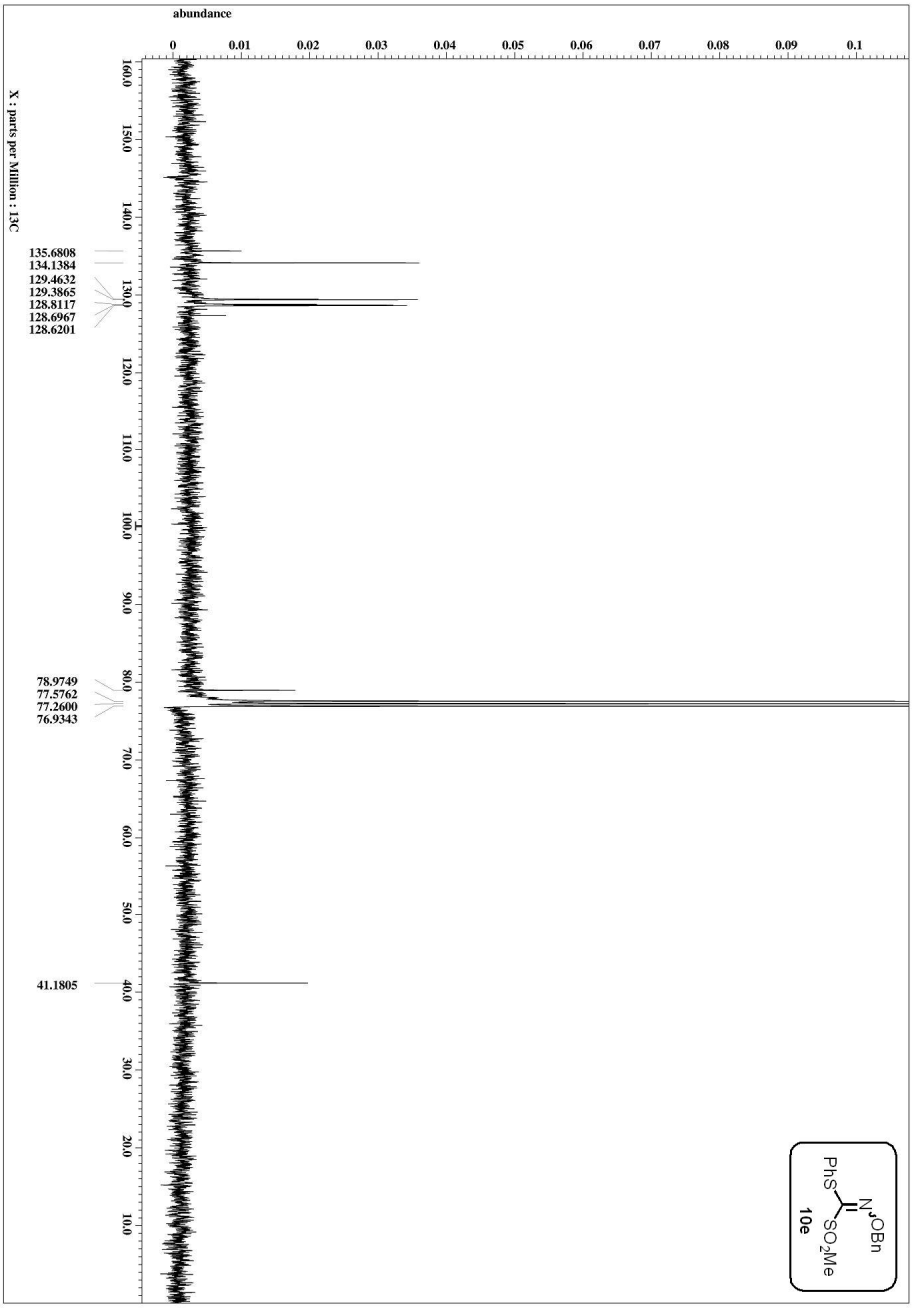

abundance
0
1.0
2.0
3.0
4.0
5.0
6.0
X : parts per Million : 1H
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
7.3596
5.3786
4.2365
4.2296
4.2193
4.2113
4.1919
4.1873
4.1736
4.1690
4.1507
3.1459
1.2908
1.2725
1.2553
4.88
2
3.8
3.0
6.21
(EtO)2P
O
N
OBn
SO2Me
10c

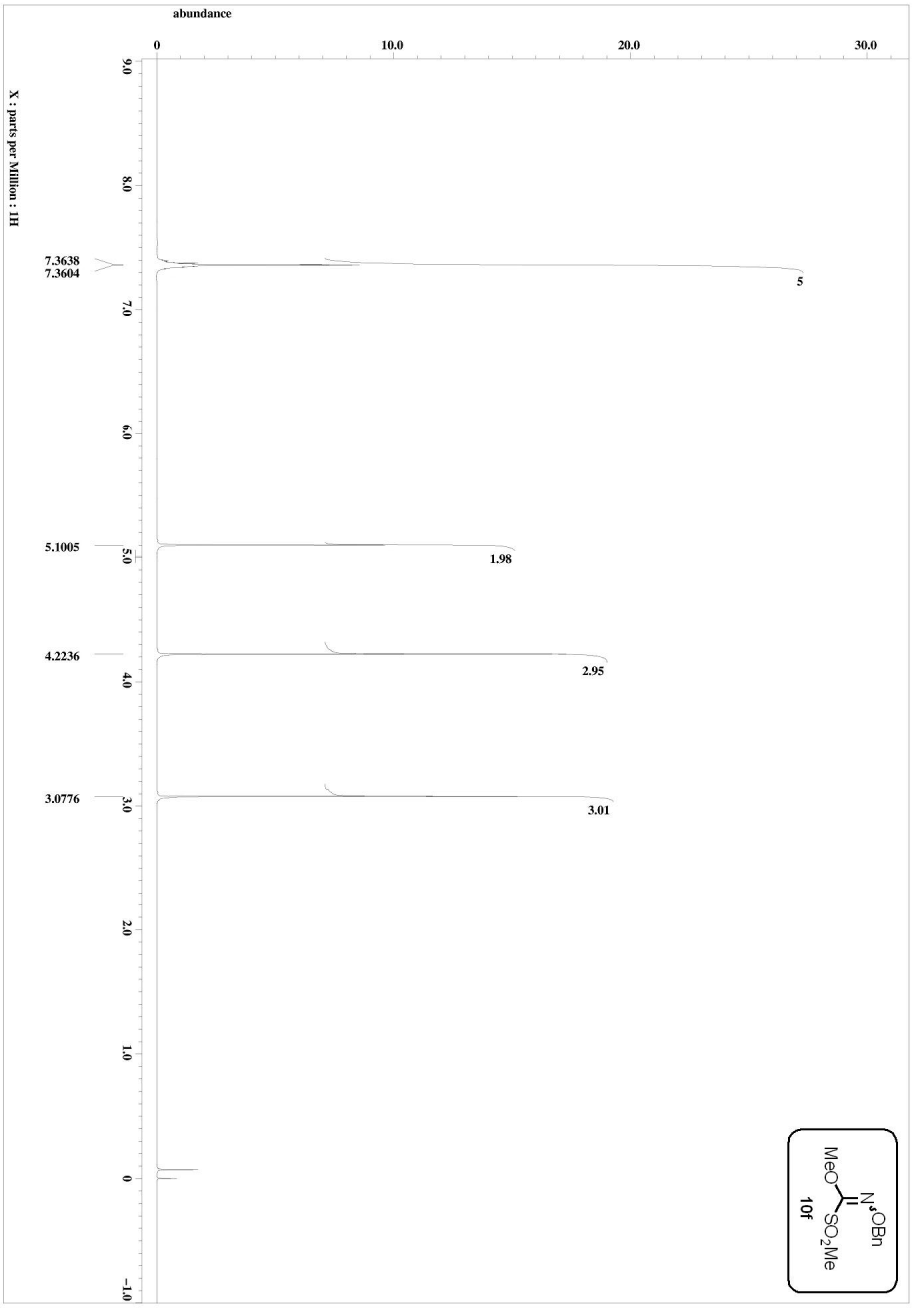

abundance
0
0.1
0.2
0.3
0.4
0.5
0.6
X : parts per Million : 13C
154.9378
135.1125
129.1306
128.8825
80.2830
77.5544
77.2300
76.9152
64.8655
64.8082
41.7296
16.3136
16.2468
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
(EtO)2P
O
N
OBn
SO2Me
10c

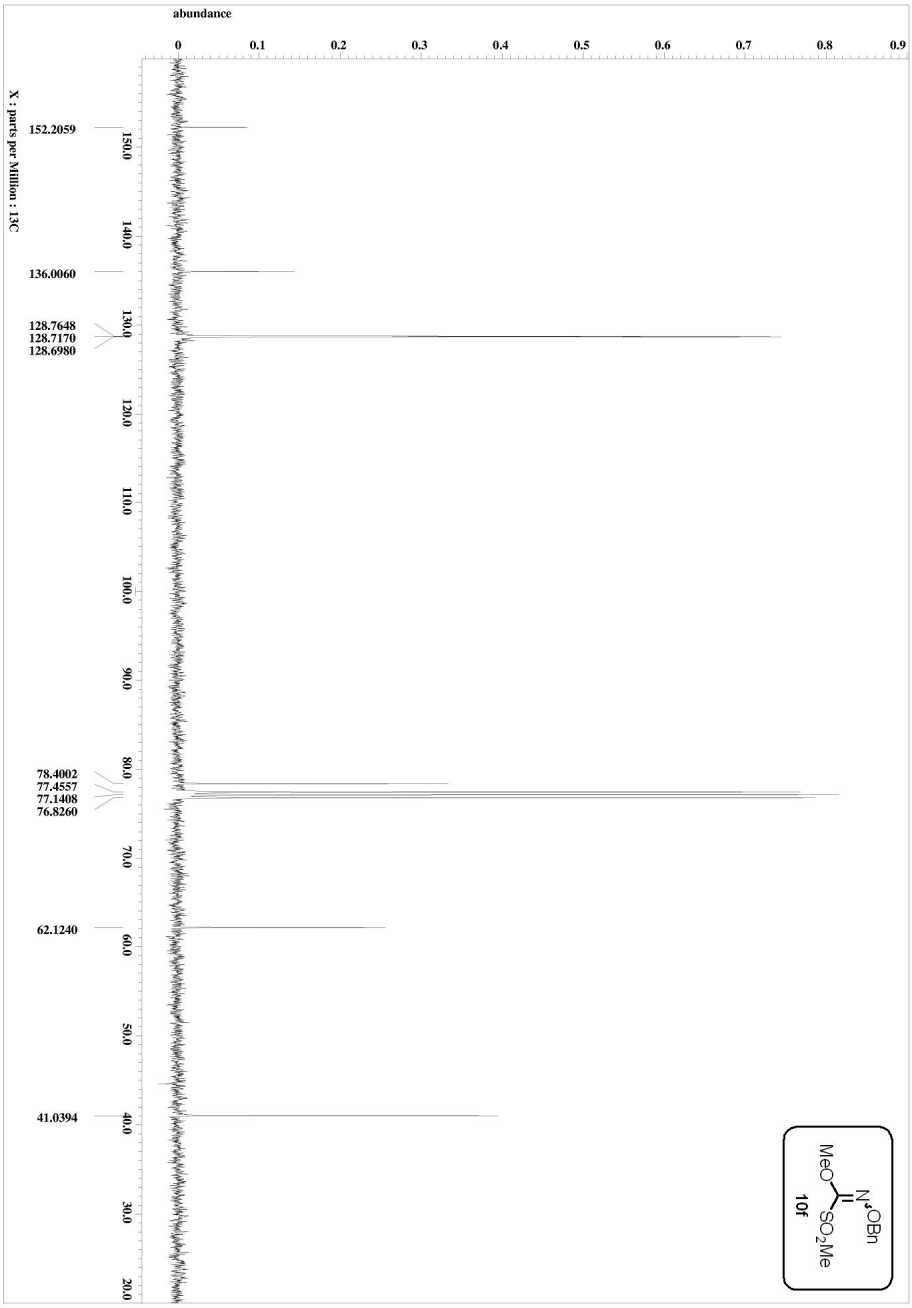

abundance
X : parts per Million : 1H
5
2.03
2.0
2.0
2.99
3.04
EtO
O
N
OBn
SO2Me
10d

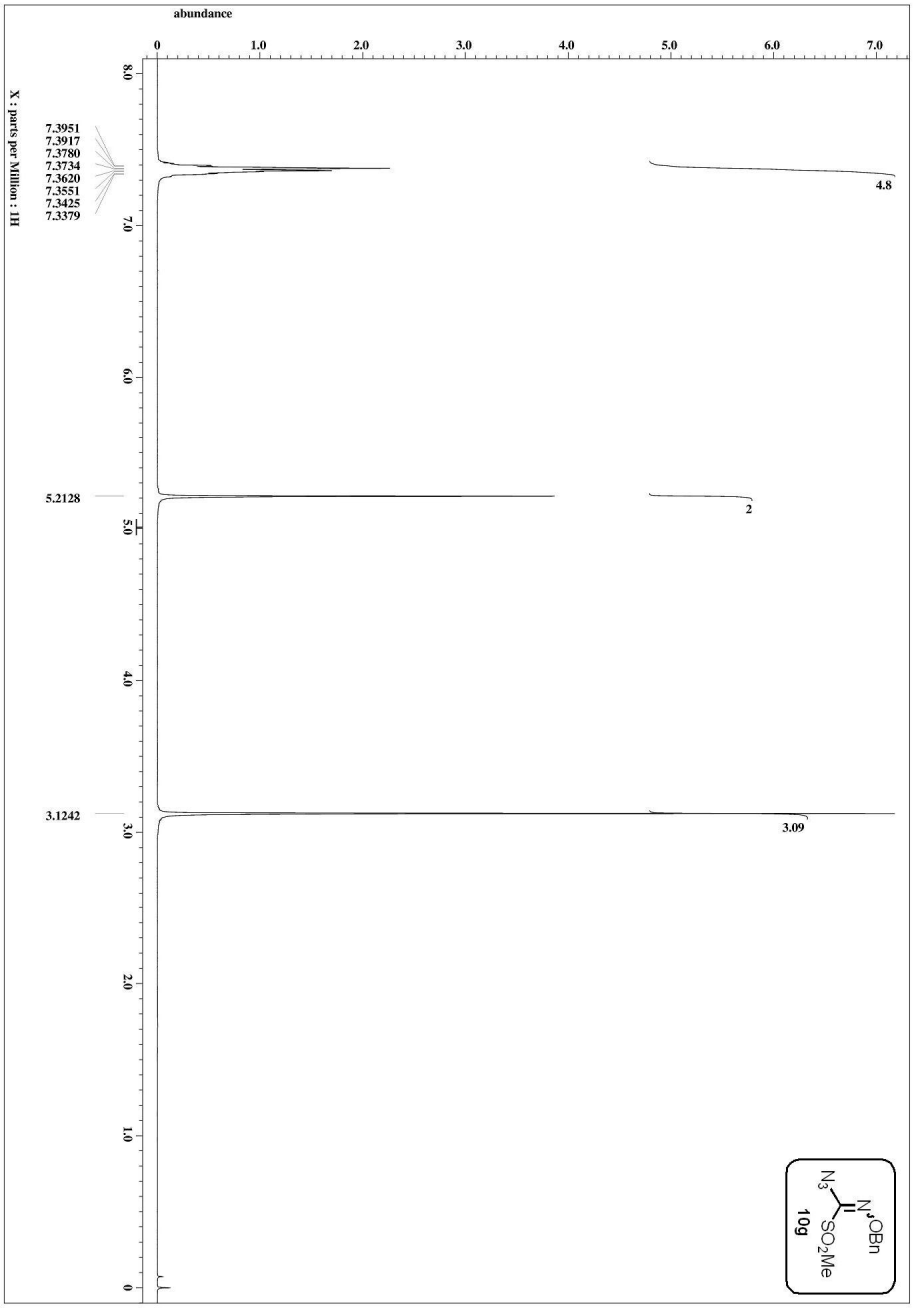

abundance
0
0.1
0.2
0.3
X : parts per Million : 13C
166.5026
155.0542
135.8264
128.8424
128.7849
128.6221
77.5590
77.2332
76.9171
62.0772
41.1633
30.4238
14.1373
EtO
O
N
OBn
SO2Me
10d

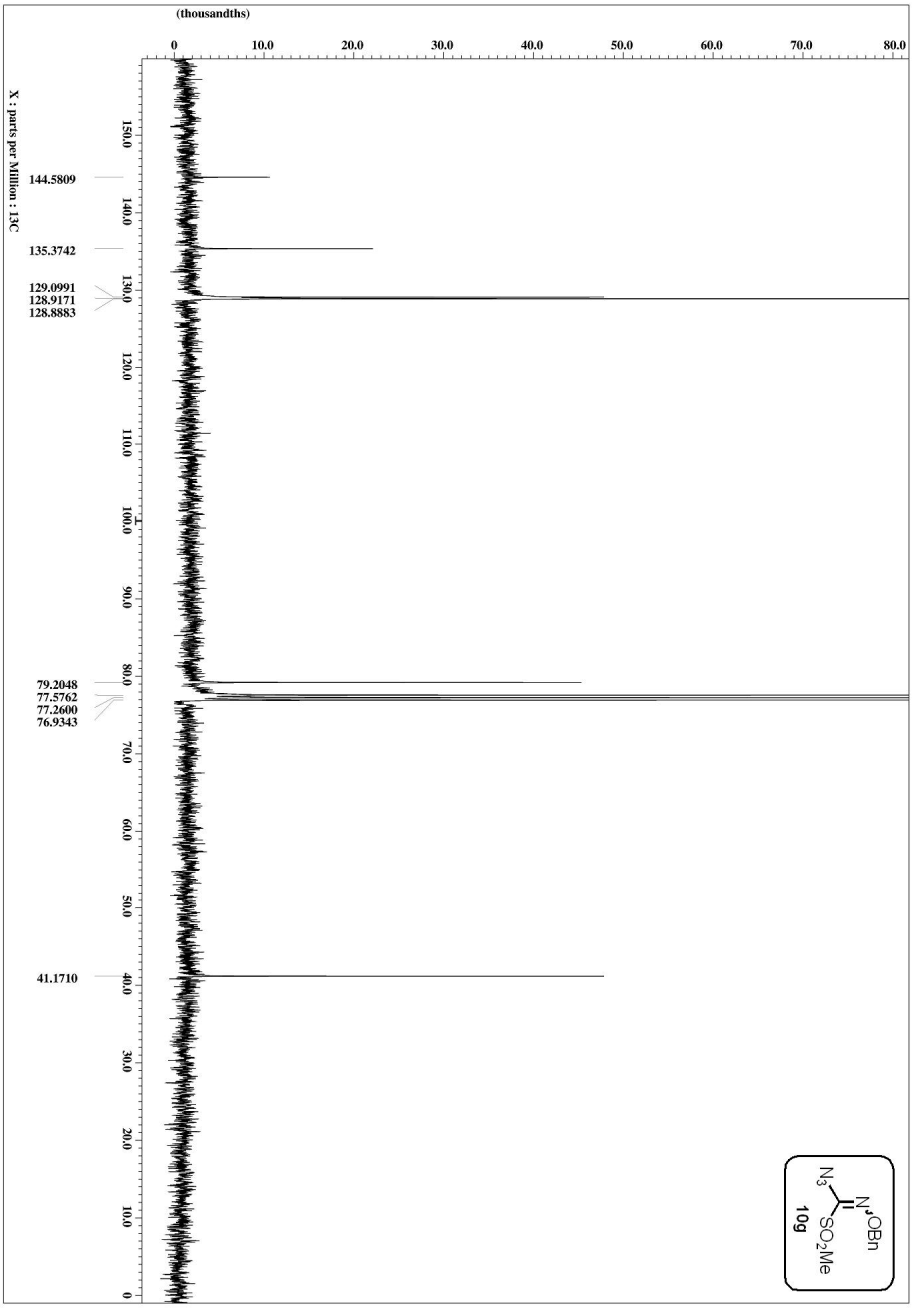

abundance
X : parts per Million : 1H
7.5371
7.5348
7.5302
7.5224
7.5165
7.5130
7.3448
7.3391
7.3311
7.3276
7.3208
7.3150
7.3093
7.3024
7.2944
7.2899
7.2773
7.2727
7.2693
7.2590
7.1136
7.1090
7.0987
7.0896
5.1716
3.1093
0.0000
1.95
6.52
1.91
2
3.0
PhS
SO2Me
NOBn
10e

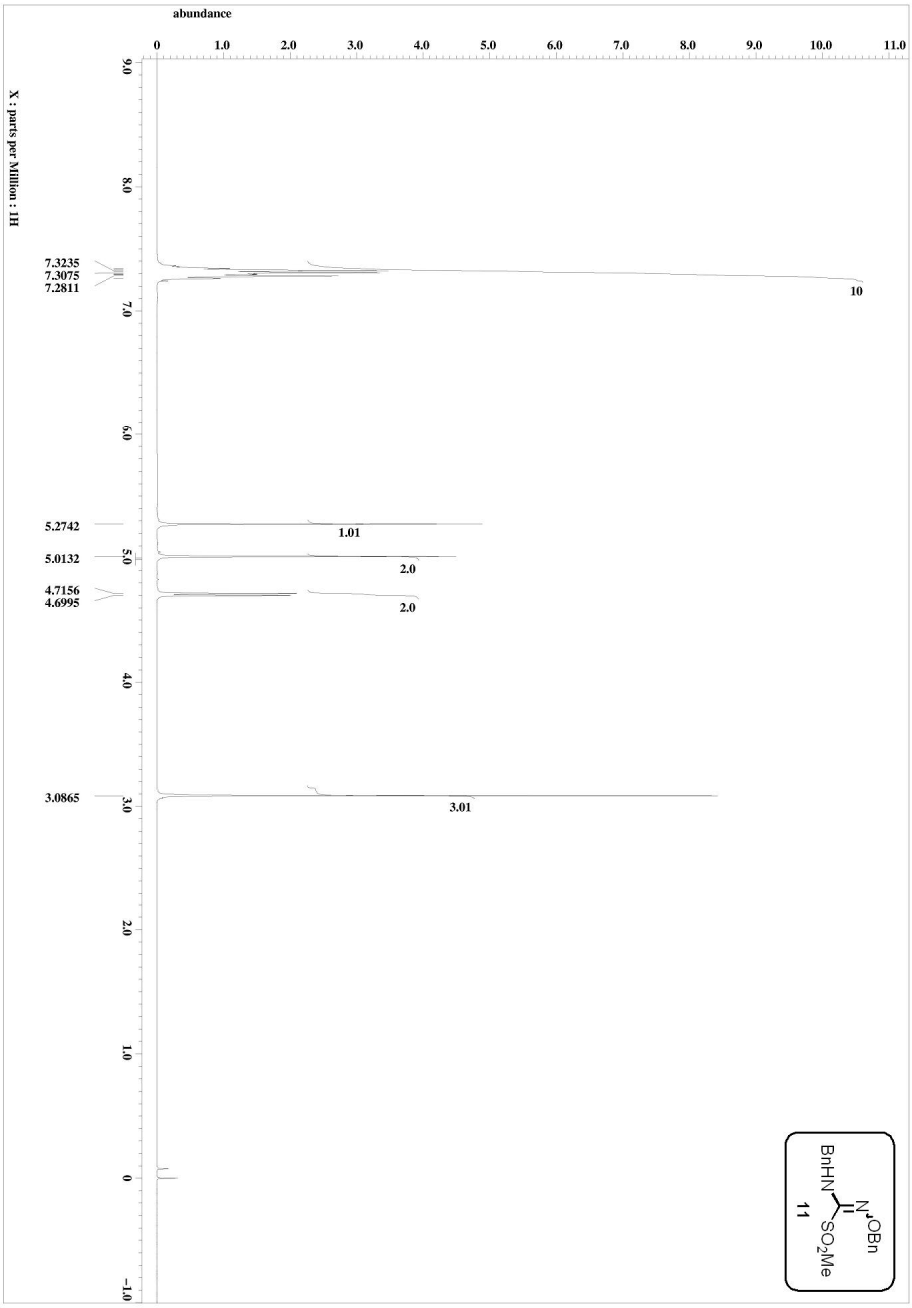

abundance
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
X : parts per Million : 13C
160.0
150.0
140.0
135.6808
134.1384
129.4632
129.3865
128.8117
128.6967
128.6201
130.0
120.0
110.0
100.0
90.0
78.9749
77.5762
77.2600
76.9343
80.0
70.0
60.0
50.0
41.1805
40.0
30.0
20.0
10.0
OBn
PhS
SO2Me
10e

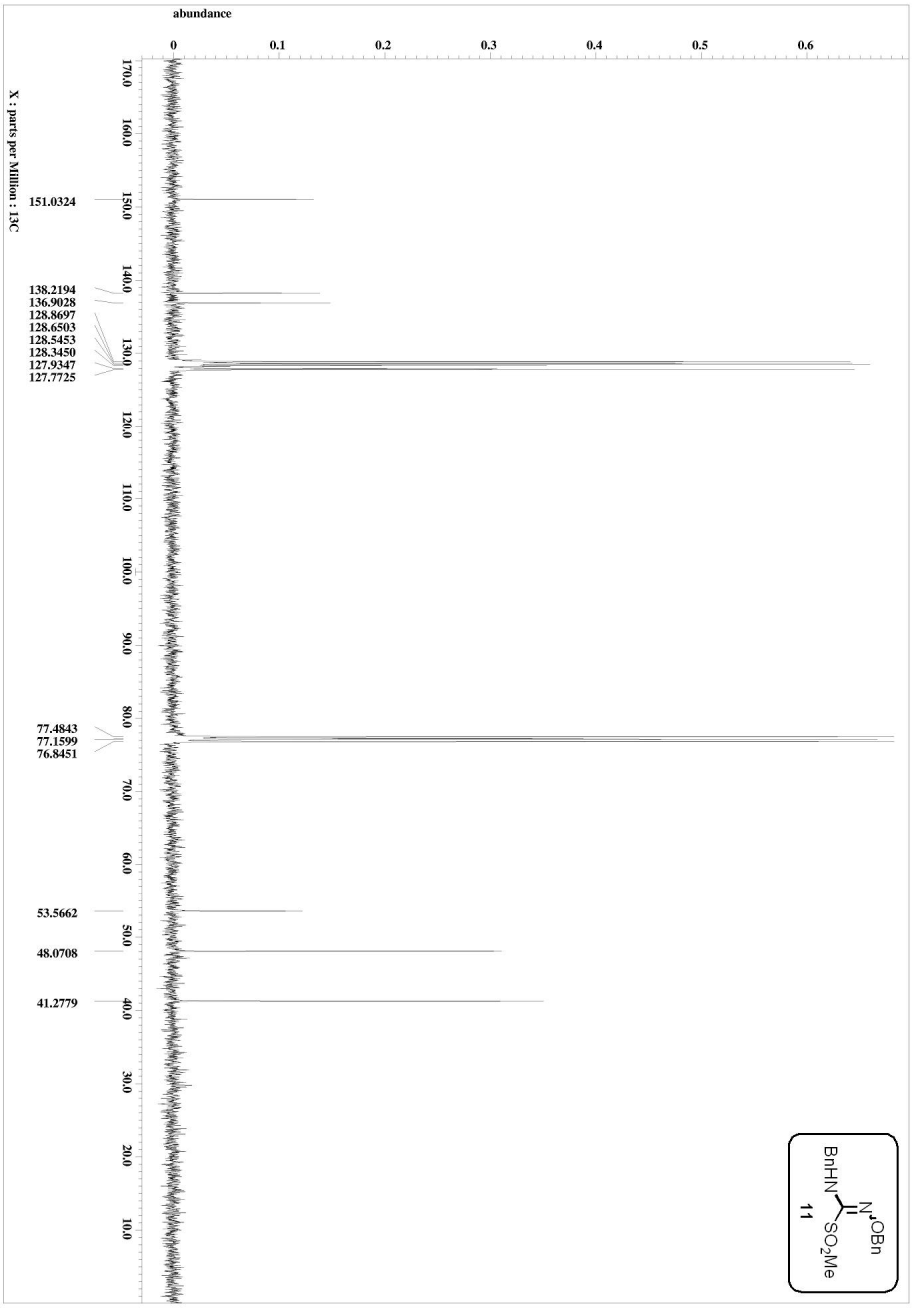

abundance
0
10.0
20.0
30.0
X : parts per Million : 1H
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
-1.0
7.3638
7.3604
5
5.1005
1.98
4.2236
2.95
3.0776
3.01
MeO
N
OBn
SO2Me
10f

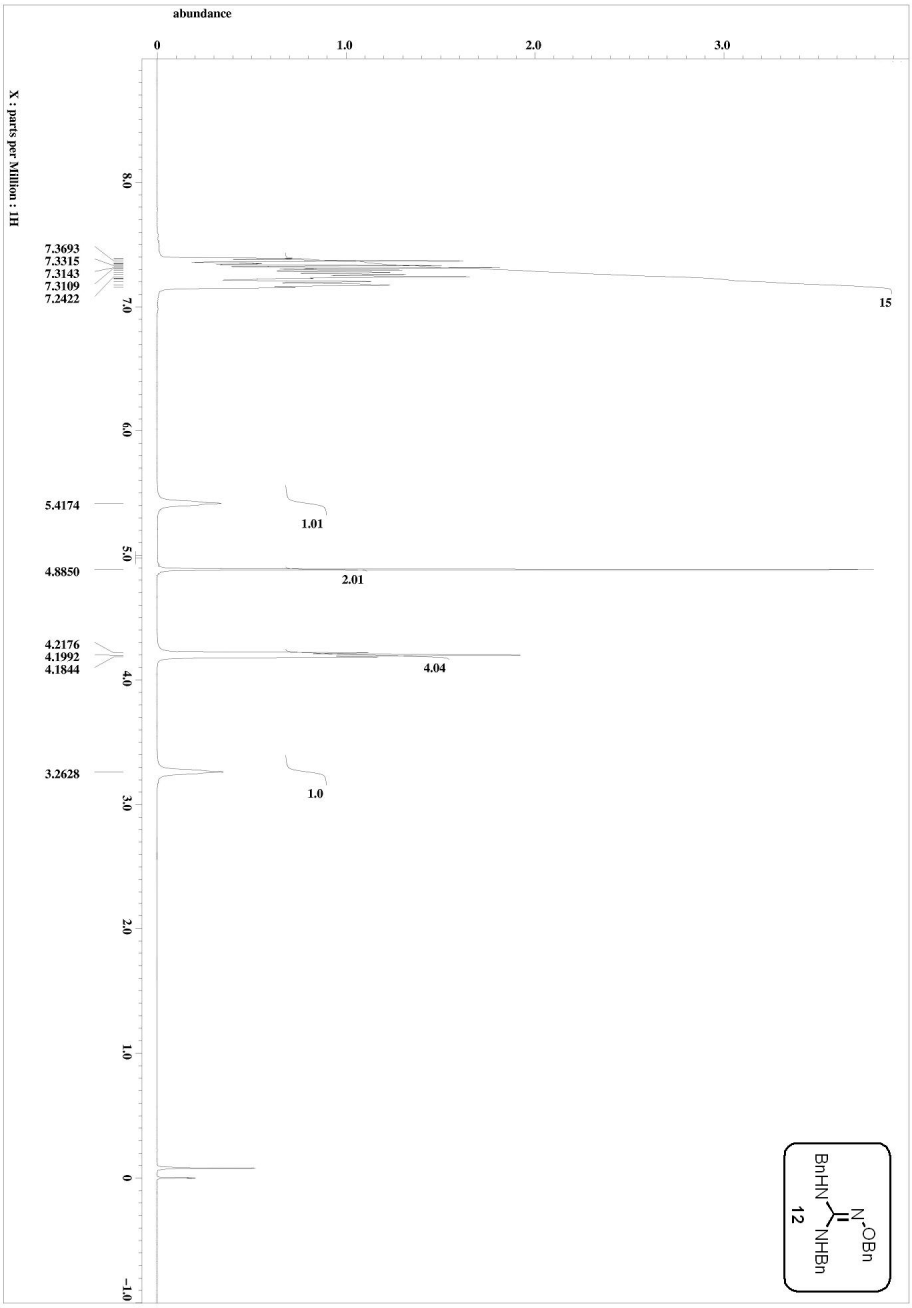

abundance
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
X : parts per Million : 13C
152.2059
136.0060
128.7648
128.7170
128.6980
78.4002
77.4557
77.1408
76.8260
62.1240
41.0394
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
MeO
N
OBn
SO2Me
10f

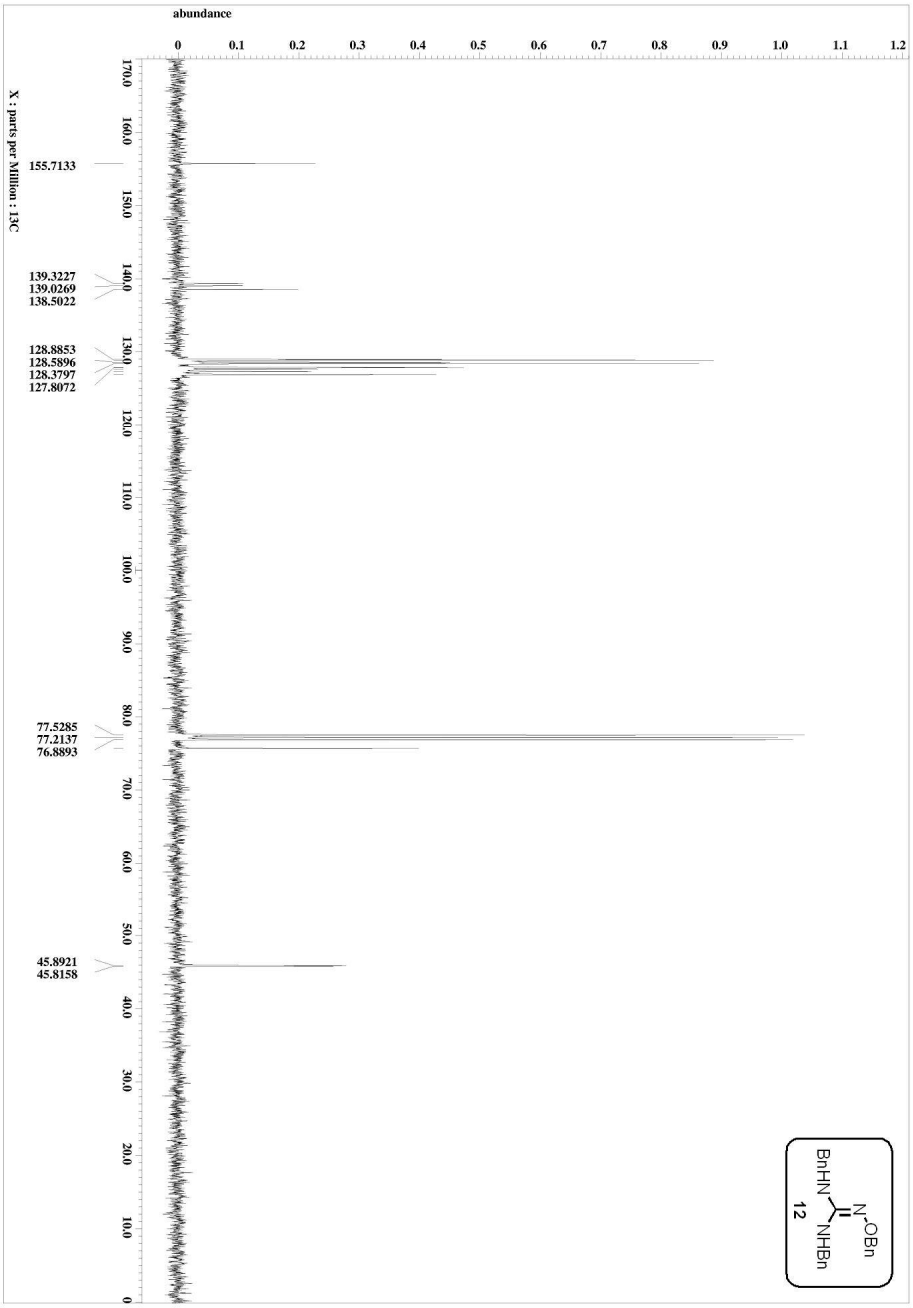

abundance
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
X : parts per Million : 1H
7.3951
7.3917
7.3780
7.3734
7.3620
7.3551
7.3425
7.3379
5.2128
3.1242
4.8
2
3.09
10g

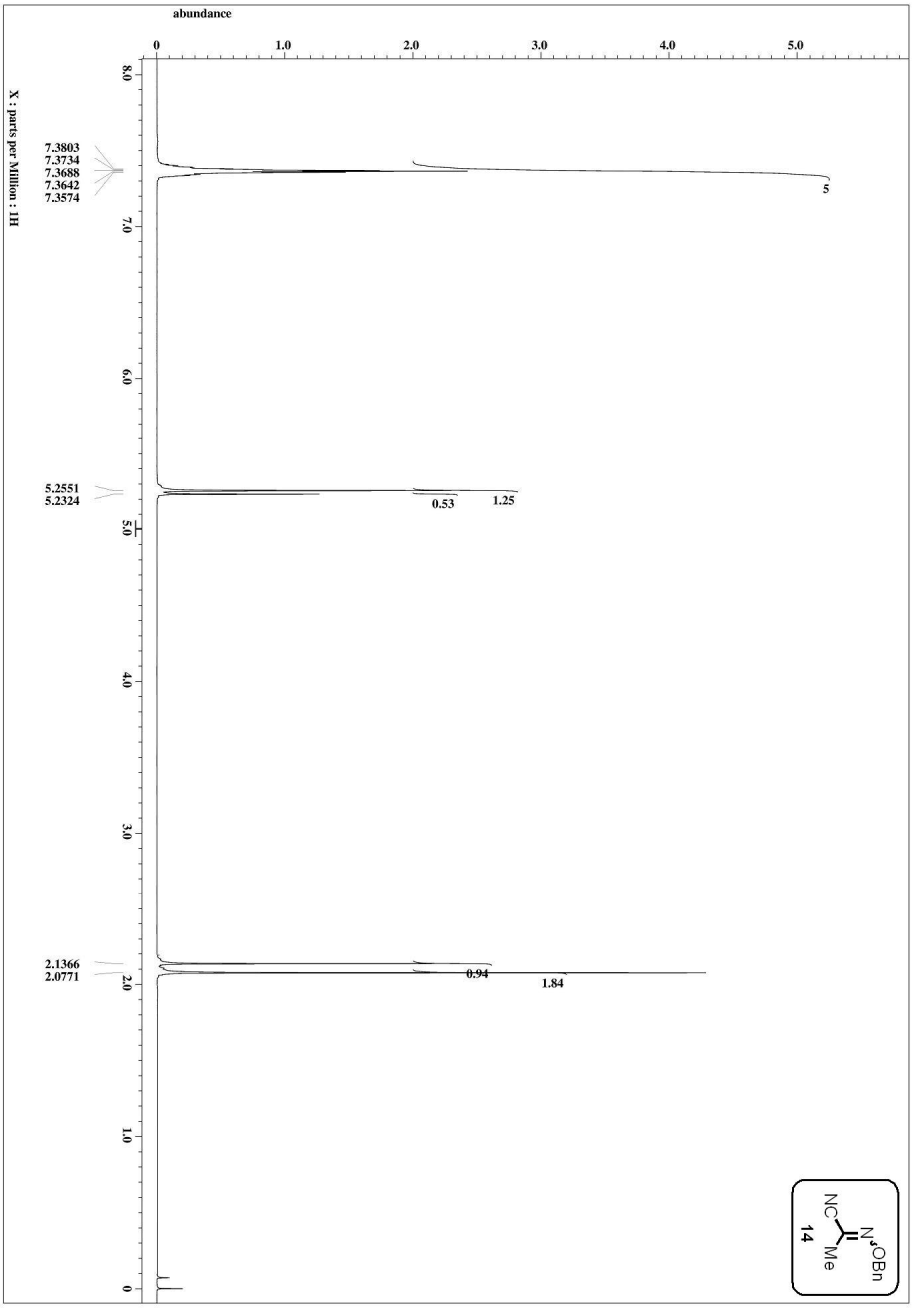

(thousandths)
0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
X : parts per Million : 13C
144.5809
135.3742
129.0991
128.9171
128.8883
79.2048
77.5762
77.2600
76.9343
41.1710
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
N3
N
OBn
SO2Me
10g

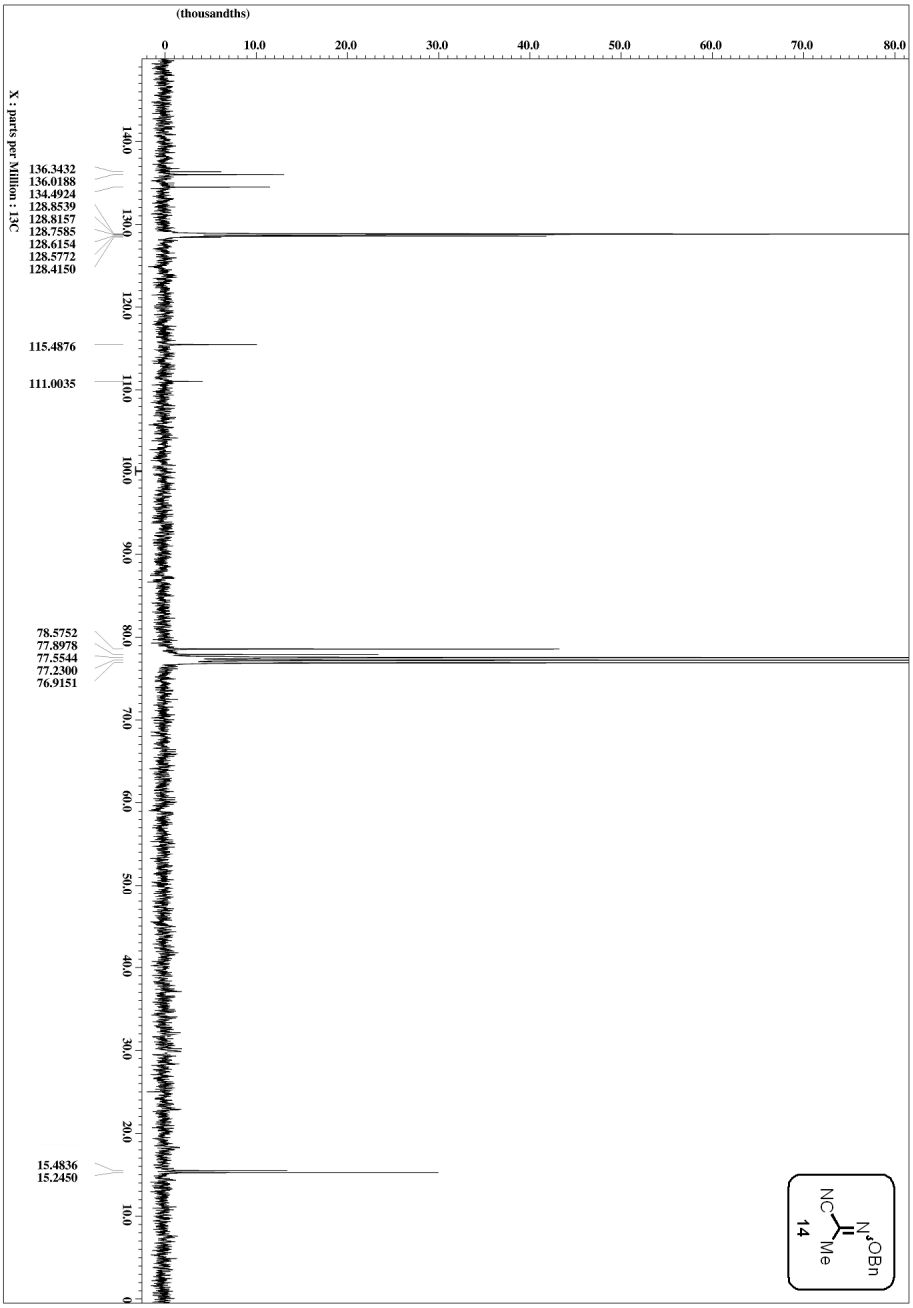

abundance
X : parts per Million : 1H
7.3235
7.3075
7.2811
5.2742
5.0132
4.7156
4.6995
3.0865
10
1.01
2.0
2.0
3.01
BnHN
N
OBn
SO2Me
11


abundance
0
0.1
0.2
0.3
0.4
0.5
0.6
X : parts per Million : 13C
151.0324
138.2194
136.9028
128.8697
128.6503
128.5453
128.3450
127.9347
127.7725
77.4843
77.1599
76.8451
53.5662
48.0708
41.2779
BnHN
N
OBn
SO2Me
11


abundance
0
1.0
2.0
3.0
X : parts per Million : 1H
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
-1.0
7.3693
7.3315
7.3143
7.3109
7.2422
15
5.4174
1.01
4.8850
2.01
4.2176
4.1992
4.1844
4.04
3.2628
1.0
BnHN
N
OBn
NHBn
12


abundance
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2
X : parts per Million : 13C
155.7133
139.3227
139.0269
138.5022
128.8853
128.5896
128.3797
127.8072
77.5285
77.2137
76.8893
45.8921
45.8158
170.0
160.0
150.0
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
BnHN
N
OBn
NHBn
12


abundance
0
1.0
2.0
3.0
4.0
5.0
X : parts per Million : 1H
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
7.3803
7.3734
7.3688
7.3642
7.3574
5
5.2551
5.2324
0.53
1.25
2.1366
2.0771
0.94
1.84
NC
Me
N
OBn
14


(thousandths)
0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
X : parts per Million : 13C
136.3432
136.0188
134.4924
128.8539
128.8157
128.7585
128.6154
128.5772
128.4150
115.4876
111.0035
78.5752
77.8978
77.5544
77.2300
76.9151
15.4836
15.2450
140.0
130.0
120.0
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0
NC
Me
OBn
14