Lithiation-Electrophilic Trapping of *N*-Sulfonyl-activated Ethylene Aziridines

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Supporting Information Available: Full experimental procedures and characterisation data.

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General

Water is distilled water. Et_2O and THF were freshly distilled from sodium and benzophenone whereas CH_2Cl_2 was freshly distilled from CaH_2. *s*-BuLi was titrated against *N*-benzylbenzamide before use. Petrol refers to the fraction of petroleum ether with a boiling point range of 40-60 °C. PMDETA and diamines used in lithiation reactions were distilled before use. All reactions were carried out under O_2-free N_2 or Ar using oven-dried and/or flame dried glassware. Flash column chromatography was carried out using Fluka Silica gel 60 (0.035-0.070 mm particle size). Thin layer chromatography was carried using Merck F_{254} aluminium-backed silica plates.

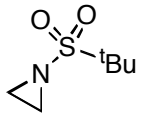
Proton (400 MHz) and carbon (100.6 MHz) NMR spectra were recorded on a Jeol ECX-400 instrument using an internal deuterium lock. All samples were recorded in $CDCl_3$. Chemical shifts are quoted in parts per million and referenced to $CHCl_3$ (7.27 for ^{1}H NMR and 77.0 for ^{13}C NMR spectroscopy). Carbon NMR spectra were recorded with broadband proton decoupling and were assigned using DEPT and HSQC experiments. Infra-red spectra were recorded on an ATI Matteson Genesis FT-IR spectrometer. Chemical ionisation and high resolution mass spectra were recorded on a Fisons Analytical (VG) Autospec spectrometer. Electrospray ionisation low and high resolution mass spectra were recorded on a Bruker Daltronics micrOTOF spectrometer. Melting points were measured on a Gallenkamp melting point apparatus.

Experimental procedures and characterisation data

General procedure A: Lithiation-trapping of *N*-sulfonyl aziridines (external)

sec-BuLi (1.2-3.0 eq) was added dropwise to a stirred solution of PMDETA (pentamethyldiethylenetriamine), TMEDA or (–)-sparteine (1.2-3.0 eq) in THF or Et_2O (2 mL) at –78 °C under N_2. After stirring for 15 min at –78 °C, the solution was added dropwise *via* canula to a stirred solution of aziridine (0.30 mmol) in THF or Et_2O (3 mL) at –78 °C under N_2. After stirring for 1 min at –78 °C, freshly distilled electrophile (0.90 mmol, 3.0 eq) was added and stirred at –78 °C for a further 1 h. Then, saturated $NH_4Cl_{(aq)}$ (10 mL) was added. The layers were separated and the aqueous layer was extracted with Et_2O (3 x 10 mL). The combined Et_2O extracts were dried ($MgSO_4$) and evaporated under reduced pressure to give the crude product.

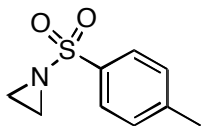
1-(*tert*-Butylsulfonyl)aziridine 7



7

tert-Butylsulfinyl chloride (2.54 g, 18.0 mmol) was added to a stirred solution of ethanolamine (500 mg, 8.2 mmol) and Et_3N (2.85 mL, 16.4 mmol) in 5:1 MeCN-DMF (25 mL) at 0 °C under N_2. The resulting solution was allowed to warm to rt and stirred at rt for 16 h. Then, the reaction mixture was washed with 5% $NaHCO_{3(aq)}$ (2 x 20 mL), dried ($MgSO_4$) and evaporated under reduced pressure to give the crude sulfinamido sulfinate. Then, *m*-CPBA (4.45 g, 18.0 mmol) was added to a stirred solution of the crude sulfinamido sulfinate in CH_2Cl_2 (60 mL) at 0 °C under N_2. After stirring at rt for 16 h, 20% $Na_2SO_{3(aq)}$ (20 mL) was added and the mixture was stirred for 20 min. The layers were separated and the aqueous layer was extracted with CH_2Cl_2 (2 x 20 mL). The combined organic extracts were washed with 20% $Na_2SO_{3(aq)}$ (20 mL) and saturated $NaHCO_{3(aq)}$ (20 mL), dried ($MgSO_4$) and evaporated under reduced pressure to give the crude sulfonamide. A stirred mixture of crude sulfonamide and K_2CO_3 (2.26 g, 16.4 mmol) in MeCN (60mL) was heated at 45 °C under N_2 for 16 h. After cooling, the reaction mixture was diluted with CH_2Cl_2 (20 mL). The mixture was washed with water (20 mL) and brine (20 mL), dried ($MgSO_4$) and evaporated under reduced pressure to give the crude product. Purification by flash chromatography on silica with petrol-Et_2O (1:1) as eluent gave aziridine **7** (584 mg, 48%) as a colourless oil, R_F (1:1 petrol-Et_2O) 0.3; $\nu_{max}(CH_2Cl_2)/cm^{-1}$ 1305 (SO_2) and 1128 (SO_2); δ_H (400 MHz, $CDCl_3$) 2.30 (4 H, s, CH_2N) and 1.45 (9 H, s, CMe_3); δ_C (100.6 MHz; $CDCl_3$) 59.3 (*C*Me_3), 26.7 (CH_2N) and 24.0 (*CMe*$_3$); *m*/*z* (CI; NH_3) 181 [100%, $(M + NH_4)^+$] and 164 (10) [Found $(M + NH_4)^+$ 181.1006 $C_6H_{13}NO_2S$ requires $M + NH_4$, 181.1011]. Spectroscopic data are identical with those reported in the literature.[1]

1-(4-Methyphenylsulfonyl) aziridine 8



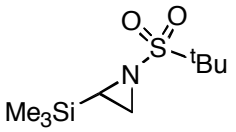
8

p-Toluenesulfonyl chloride (1.15 g, 6.0 mmol) was added to a stirred solution of ethanolamine (366 mg, 6.0 mmol) and Et_3N (1.68 mL, 2.0 mmol) in CH_2Cl_2 (10 mL) at 0 °C under N_2. The resulting solution was

allowed to warm to rt and stirred at rt for 16 h. Then, the reaction mixture was washed with 5% $NaHCO_{3(aq)}$ (2 x 10 mL), dried ($MgSO_4$) and evaporated under reduced pressure to give the crude sulfonamido alcohol. Then, pyridine (2.74 mL, 30.0 mmol) was added dropwise to a stirred solution of methanesulfonyl chloride (2.54 mL, 30.0 mmol) in CH_2Cl_2 (70 mL) at 0 °C under N_2. After stirring for 20 min, a solution of the crude sulfonamido alcohol in CH_2Cl_2 (5 mL) was added and the resulting solution was stirred for 20 min. Then, the solution was heated at reflux for 16 h. The solution was allowed to cool to rt and washed with brine (20 mL), dried ($MgSO_4$) and evaporated under reduced pressure to give the crude sulfonamido mesylate. A stirred mixture of the crude sulfonamido mesylate and K_2CO_3 (3.32 g, 24.0 mmol) in MeCN (70 mL) was heated at 45 °C under N_2 for 16 h. After cooling, the reaction mixture was diluted with CH_2Cl_2 (20 mL). The mixture was washed with water (20 mL) and brine (20 mL), dried ($MgSO_4$) and evaporated under reduced pressure to give the crude product. Purification by flash chromatography on silica with petrol-EtOAc (1:1) as eluent gave aziridine **8** (587 mg, 53%) as a colourless oil, δ_H (400 MHz, $CDCl_3$) 7.78 (2 H, d, *J* 8.0, *o*-$C_6H_4SO_2$), 7.31 (2 H, d, *J* 8.0, *m*-$C_6H_4SO_2$), 2.40 (3 H, s, Me) and 2.32 (4 H, br s, CH_2N). Spectroscopic data are identical with those reported in the literature.[2]

1-(*tert*-Butylsulfonyl)-2-(trimethylsilyl)aziridine 10

(Table 1, entry 1)



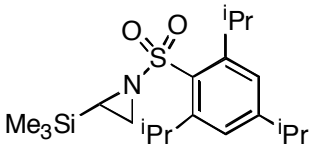
10

sec-BuLi (0.92 mL of a 1.0 M solution in cyclohexane, 0.92 mmol) was added dropwise to a stirred solution of PMDETA (0.19 mL, 0.92 mmol) in THF (3 mL) at –78 °C under N_2. After stirring for 15 min at –78 °C, the solution was added dropwise *via* a canula to a stirred solution of aziridine **7** (50 mg, 0.31 mmol) and trimethylsilyl chloride (0.11 mL, 0.93 mmol) in THF (2 mL) at –78 °C under N_2. After stirring for 1 h at –78 °C, saturated $NH_4Cl_{(aq)}$ (10 mL) was added. The layers were separated and the aqueous layer was extracted with Et_2O (3 x 10 mL). The combined Et_2O extracts were dried ($MgSO_4$) and evaporated under reduced pressure to give the crude product. Purification by flash chromatography on silica with petrol-Et_2O (10:1) as eluent gave silyl aziridine **10** (26 mg, 36%) as a colourless oil, R_F (1:1 petrol-Et_2O) 0.3; $\nu_{max}(CH_2Cl_2)/cm^{-1}$ 1310 (SO_2), 1212 ($SiMe_3$) and 1130 (SO_2); δ_H (400 MHz, $CDCl_3$) 2.58 (1 H, d, *J*

8.0, CHNSi), 2.03 (1 H, d, *J* 5.5, CH_2N), 1.96 (1 H, dd, *J* 8.0 and 5.5, CH_2N), 1.48 (9 H, s, CMe_3) and 0.09 (9 H, s, $SiMe_3$); δ_C (100.6 MHz; $CDCl_3$) 59.2 (*C*Me_3), 31.1 (CH_2N), 27.5 (CHN), 24.3 (*CMe*$_3$) and –3.4 ($SiMe_3$); *m*/*z* (CI; NH_3) 236 [100%, $(M + H)^+$] and 116 (30) [Found $(M + H)^+$ 236.1150. $C_9H_{21}NO_2SiS$ requires *M* + H, 236.1141] and starting aziridine **7** (25 mg, 50%). Spectroscopic data are identical with those reported in the literature.[1]

1-(2,4,6-Triisopropylphenylsulfonyl)-2-(trimethylsilyl)aziridine 12

(Table 1, entry 4)

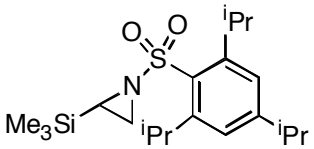


12

sec-BuLi (0.8 mL of a 1.2 M solution in cyclohexane, 0.96 mmol) was added dropwise to a stirred solution of (–)-sparteine (0.22 mL, 0.96 mmol) in THF (3 mL) at –78 °C under N_2. After stirring for 15 min at –78 °C, the solution was added dropwise *via* a canula to a stirred solution of aziridine **9** (100 mg, 0.32 mmol) and trimethylsilyl chloride (0.12 mL, 0.96 mmol) in THF (2 mL) at –78 °C under N_2. After stirring for 1 h at –78 °C, saturated $NH_4Cl_{(aq)}$ (10 mL) was added. The layers were separated and the aqueous layer was extracted with Et_2O (3 x 10 mL). The combined Et_2O extracts were dried ($MgSO_4$) and evaporated under reduced pressure to give the crude product. Purification by flash chromatography on silica with petrol-Et_2O (10:1) as eluent gave silyl aziridine **12** (81 mg, 12%) and starting aziridine **9** (15 mg, 52%).

1-(2,4,6-Triisopropylphenylsulfonyl)-2-(trimethylsilyl)aziridine 12

(Table 1, entry 5)



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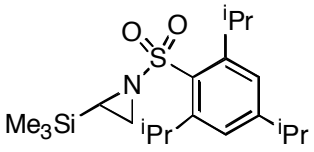
sec-BuLi (0.8 mL of a 1.2 M solution in cyclohexane, 0.96 mmol) was added dropwise to a stirred solution of PMDETA (0.2 mL, 0.96 mmol) in THF (3 mL) at –78 °C under N_2. After stirring for 15 min at

–78 °C, the solution was added dropwise *via* a canula to a stirred solution of aziridine **9** (100 mg, 0.32 mmol) and trimethylsilyl chloride (0.12 mL, 0.96 mmol) in THF (2 mL) at –78 °C under N_2. After stirring for 4 h at –78 °C, saturated $NH_4Cl_{(aq)}$ (10 mL) was added. The layers were separated and the aqueous layer was extracted with Et_2O (3 x 10 mL). The combined Et_2O extracts were dried ($MgSO_4$) and evaporated under reduced pressure to give the crude product. Purification by flash chromatography on silica with petrol-Et_2O (10:1) as eluent gave silyl aziridine **12** (77 mg, 63%) and starting aziridine **9** (30 mg, 30%).

1-(2,4,6-Triisopropylphenylsulfonyl)-2-(trimethylsilyl)aziridine 12

(Table 1, entry 6)

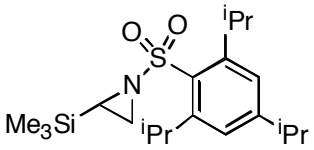


12

sec-BuLi (0.8 mL of a 1.2 M solution in cyclohexane, 0.96 mmol) was added dropwise to a stirred solution of PMDETA (0.2 mL, 0.96 mmol) in THF (3 mL) at –78 °C under N_2. After stirring for 15 min at –78 °C, the solution was added dropwise *via* a canula to a stirred solution of aziridine **9** (100 mg, 0.32 mmol) and trimethylsilyl chloride (0.12 mL, 0.96 mmol) in THF (2 mL) at –78 °C under N_2. After stirring for 1 h at –78 °C and allowing the mixture to warm to rt over 3 h, saturated $NH_4Cl_{(aq)}$ (10 mL) was added. The layers were separated and the aqueous layer was extracted with Et_2O (3 x 10 mL). The combined Et_2O extracts were dried ($MgSO_4$) and evaporated under reduced pressure to give the crude product. Purification by flash chromatography on silica with petrol-Et_2O (10:1) as eluent gave silyl aziridine **12** (71 mg, 58%) and starting aziridine **9** (18 mg, 18%).

1-(2,4,6-Triisopropylphenylsulfonyl)-2-(trimethylsilyl)aziridine 12

(Table 1, entry 7)

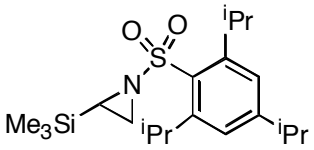


12

sec-BuLi (0.32 mL of a 1.2 M solution in cyclohexane, 0.38 mmol) was added dropwise to a stirred solution of PMDETA (0.08 mL, 0.38 mmol) in THF (3 mL) at –78 °C under N_2. After stirring for 15 min at –78 °C, the solution was added dropwise *via* a canula to a stirred solution of aziridine **219** (100 mg, 0.32 mmol) and trimethylsilyl chloride (0.12 mL, 0.96 mmol) in THF (2 mL) at –78 °C under N_2. After stirring for 1 h at –78 °C, the solution was left in the dry-ice bath and allowed to warm slowly over 16 h and then saturated $NH_4Cl_{(aq)}$ (10 mL) was added. The layers were separated and the aqueous layer was extracted with Et_2O (3 x 10 mL). The combined Et_2O extracts were dried ($MgSO_4$) and evaporated under reduced pressure to give the crude product. Purification by flash chromatography on silica with petrol-Et_2O (10:1) as eluent gave silyl aziridine **12** (34 mg, 28%) and starting aziridine **9** (59 mg, 59%).

1-(2,4,6-Triisopropylphenylsulfonyl)-2-(trimethylsilyl)aziridine 12

(Table 2, entry 2)

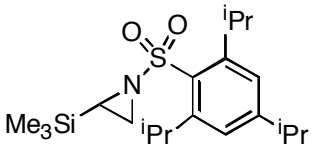


12

Using general procedure A, *sec*-BuLi (0.67 mL of a 1.2 M solution in cyclohexane, 0.80 mmol, 2.5 eq), PMDETA (0.17 mL, 0.80 mmol, 2.5 eq) in THF (2 mL), aziridine **9** (100 mg, 0.32 mmol) in THF (3 mL) and trimethylsilyl chloride (0.12 mL, 0.96 mmol) gave the crude product. Purification by flash chromatography on silica with petrol-Et_2O (10:1) as eluent gave silyl aziridine **12** (56 mg, 46%) and starting aziridine **9** (40 mg, 40%).

1-(2,4,6-Triisopropylphenylsulfonyl)-2-(trimethylsilyl)aziridine 12

(Table 2, entry 3)

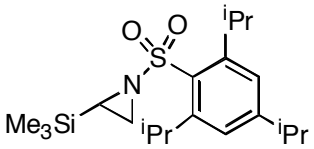


12

Using general procedure A, *sec*-BuLi (0.32 mL of a 1.2 M solution in cyclohexane, 0.38 mmol, 1.2 eq), PMDETA (0.08 mL, 0.38 mmol, 1.2 eq) in THF (2 mL), aziridine **9** (100 mg, 0.32 mmol) in THF (3 mL) and trimethylsilyl chloride (0.12 mL, 0.96 mmol) gave the crude product. Only starting material was observed in the ^{1}H NMR spectrum of the crude product.

1-(2,4,6-Triisopropylphenylsulfonyl)-2-(trimethylsilyl)aziridine 12

(Table 2, entry 4)

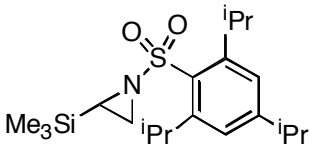


12

sec-BuLi (0.8 mL of a 1.2 M solution in cyclohexane, 0.96 mmol) was added dropwise to a stirred solution of PMDETA (0.2 mL, 0.96 mmol) in THF (3 mL) at –78 °C under N_2. After stirring for 15 min at –78 °C, the solution was added dropwise *via* a canula to a stirred solution of aziridine **219** (100 mg, 0.32 mmol) in THF (2 mL) at –78 °C under N_2. After stirring for 15 min at –78 °C, trimethylsilyl chloride (0.12 mL, 0.96 mmol) was added dropwise. After stirring for 1 h at –78 °C, saturated $NH_4Cl_{(aq)}$ (10 mL) was added. The layers were separated and the aqueous layer was extracted with Et_2O (3 x 10 mL). The combined Et_2O extracts were dried ($MgSO_4$) and evaporated under reduced pressure to give the crude product. Purification by flash chromatography on silica with petrol-Et_2O (10:1) as eluent gave 2,4,6-tri-*iso*-propylsulfonamide **13** (70 mg, 78%) as a white solid.

1-(2,4,6-Triisopropylphenylsulfonyl)-2-(trimethylsilyl)aziridine 12

(Table 2, entry 5)

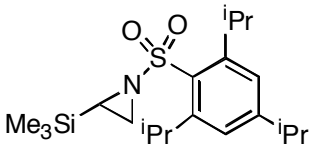


12

Using general procedure A, *sec*-BuLi (0.87 mL of a 1.1 M solution in cyclohexane, 0.96 mmol), TMEDA (0.15 mL, 0.96 mmol) in THF (2 mL), aziridine **9** (100 mg, 0.32 mmol) and trimethylsilyl chloride (0.12 mL, 0.96 mmol) gave the crude product. Purification by flash chromatography on silica with petrol-Et_2O (10:1) as eluent gave silyl aziridine **12** (42 mg, 34%) and 2,4,6-tri-*iso*-propylsulfonamide **13** (57 mg, 62%).

1-(2,4,6-Triisopropylphenylsulfonyl)-2-(trimethylsilyl)aziridine 12

(Table 2, entry 6)

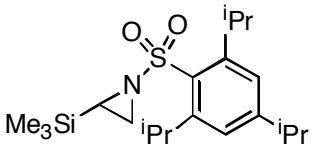


12

Using general procedure A, *sec*-BuLi (0.8 mL of a 1.0 M solution in cyclohexane, 0.8 mmol, 2.5 eq), TMEDA (0.12 mL, 0.8 mmol, 2.5 eq) in THF (2 mL), aziridine **9** (100 mg, 0.32 mmol) in THF (3 mL) and trimethylsilyl chloride (0.12 mL, 0.96 mmol) gave the crude product. Purification by flash chromatography on silica with petrol-Et_2O (10:1) as eluent gave silyl aziridine **12** (27 mg, 22%) and 2,4,6-tri-*iso*-propylsulfonamide **13** (49 mg, 54%).

1-(2,4,6-Triisopropylphenylsulfonyl)-2-(trimethylsilyl)aziridine 12

(Table 2, entry 7)



12

Using general procedure A, *sec*-BuLi (0.46 mL of a 1.05 M solution in cyclohexane, 0.48 mmol, 1.5 eq), TMEDA (0.08 mL, 0.48 mmol, 1.5 eq) in THF (2 mL), aziridine **9** (100 mg, 0.32 mmol) in THF (3 mL) and trimethylsilyl chloride (0.12 mL, 0.96 mmol) gave the crude product. Only starting material was observed in the ^{1}H NMR spectrum of the crude product.

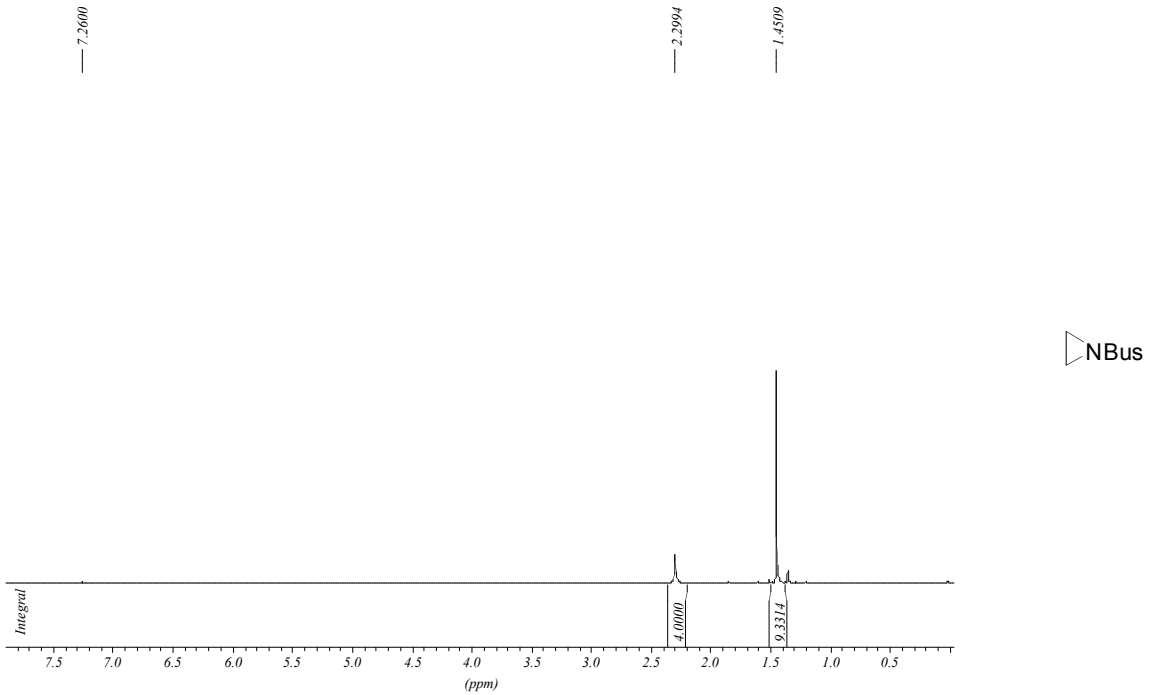
References for supporting information:

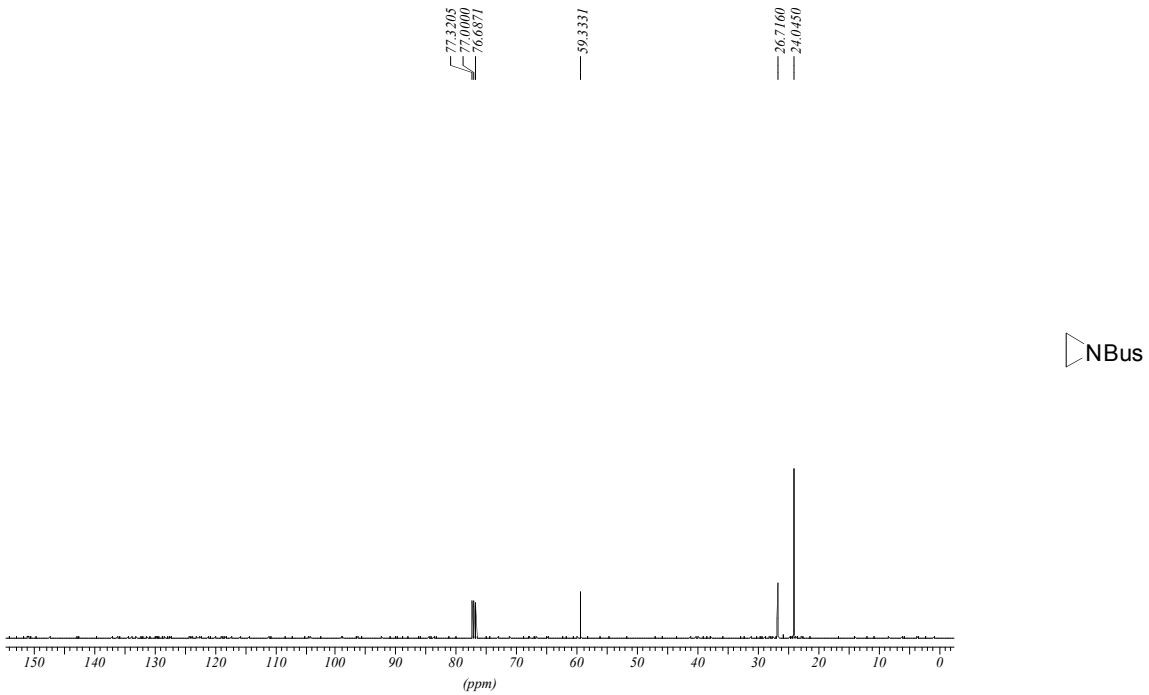
(1) D. M. Hodgson, S. P. Hughes, A. L. Thompson and T. D. Heightman, *Org. Lett.* 2008, **10**, 3453.

(2) R. Herges, A. Dikmans, U. Jana, F. Köhler, P. G. Jones, I. Dix, T. Fricke and D. König, *Eur. J. Org. Chem.* 2002, 3004.

$^{1}H/^{13}C$ NMR spectra:

Compound 7





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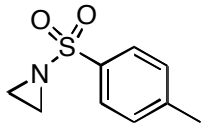

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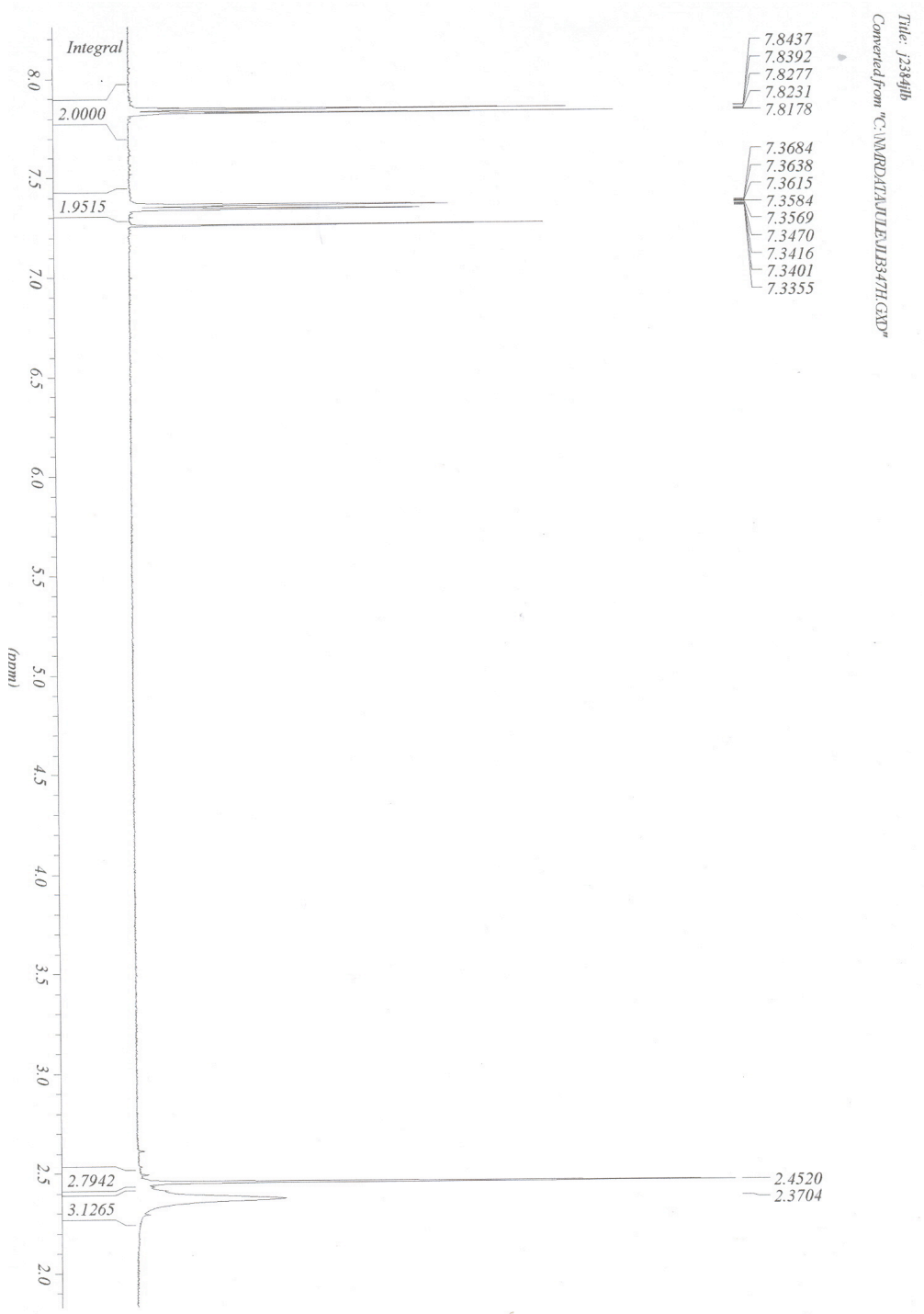
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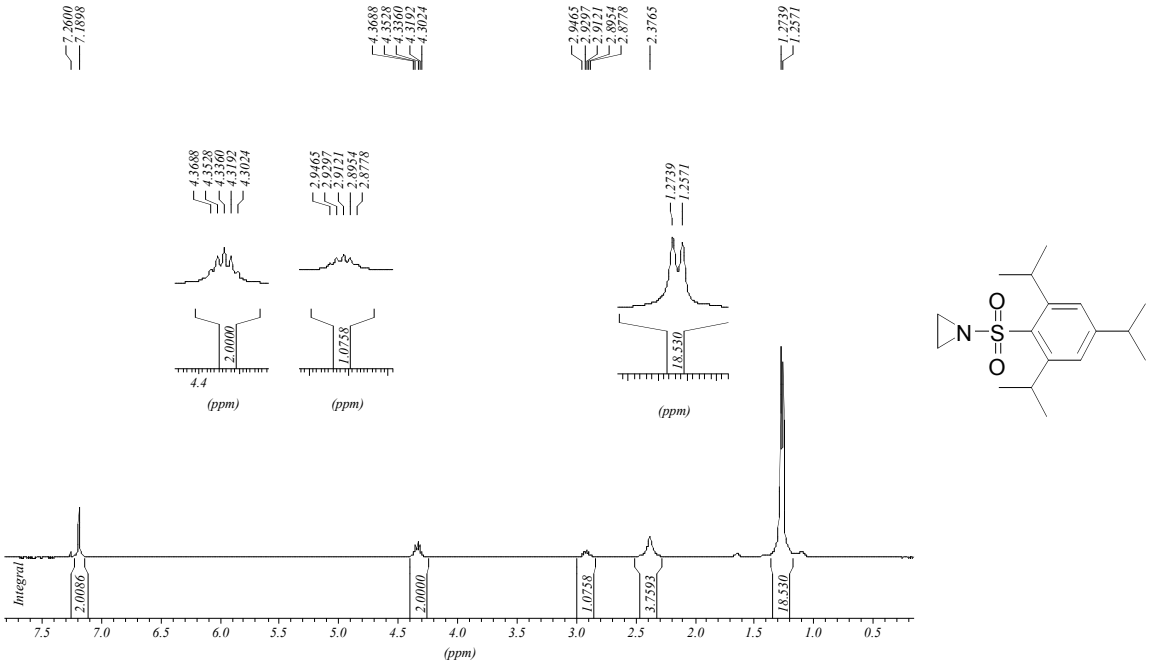
Compound 9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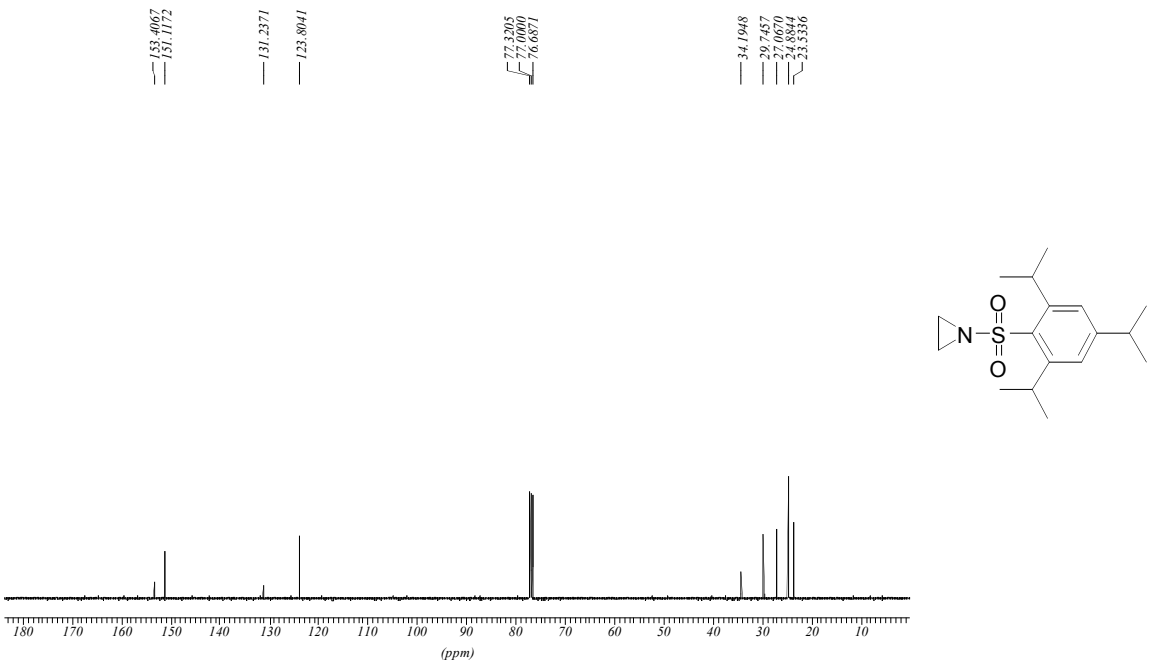
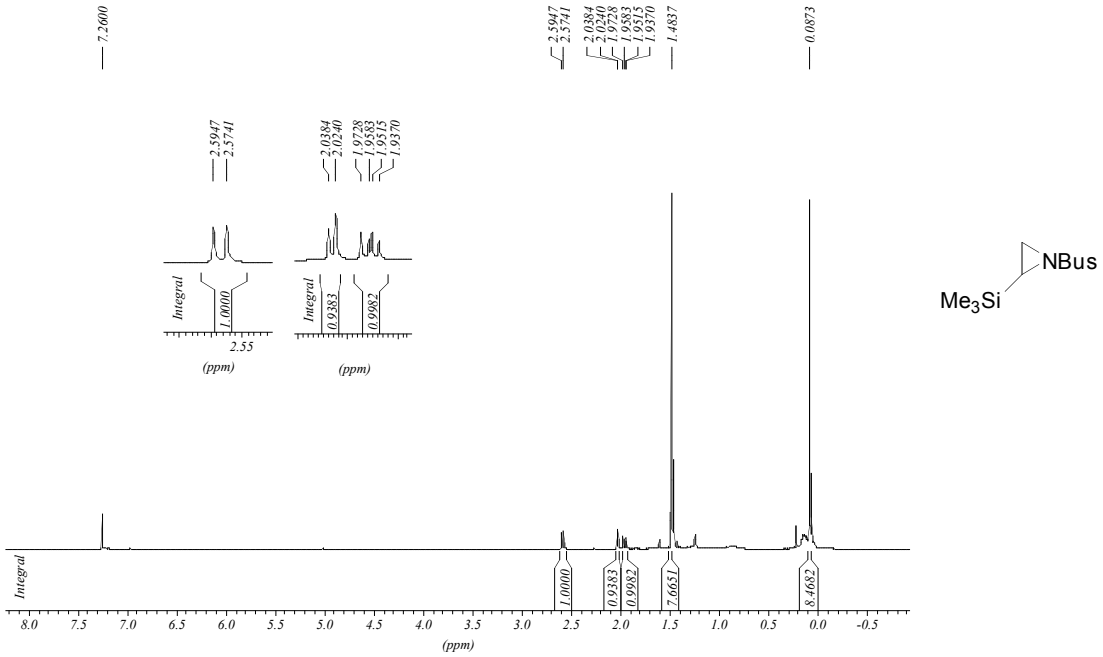
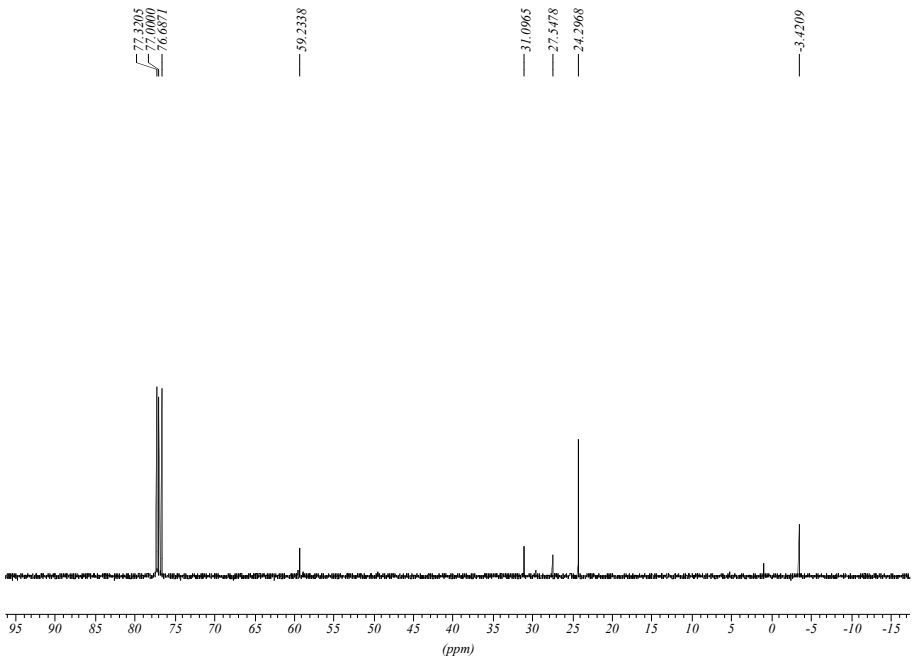
(ppm)

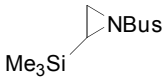

153.4067
151.1172
131.2371
123.8041
77.3205
77.0000
76.6871
34.1948
29.7457
27.0670
24.8844
23.5336
(ppm)

Compound 10

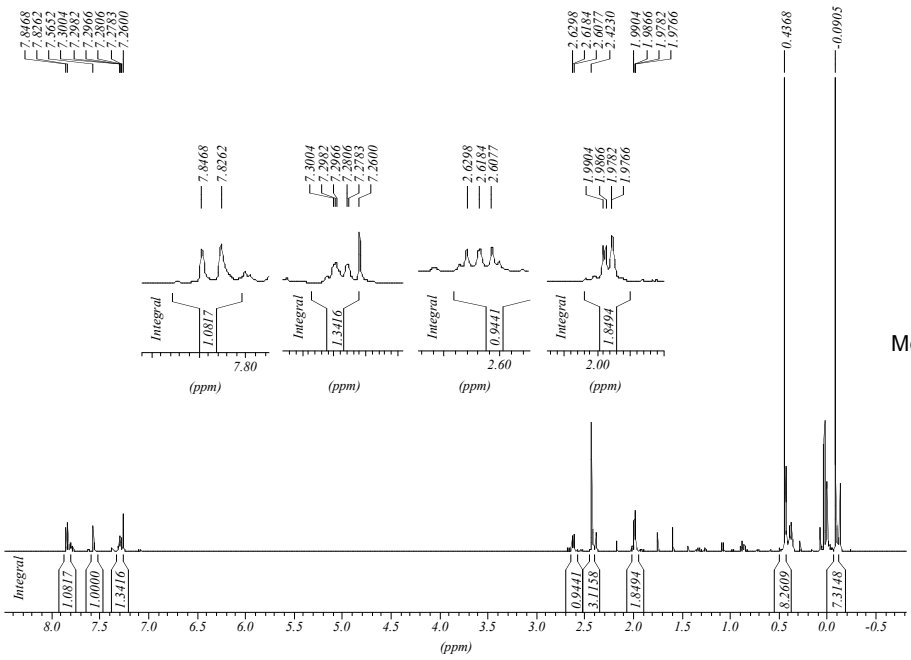

7.2600
2.5947
2.5741
2.0384
2.0240
1.9728
1.9583
1.9515
1.9370
1.4837
0.0873
Integral
1.0000
0.9383
0.9982
7.6651
8.4682
(ppm)

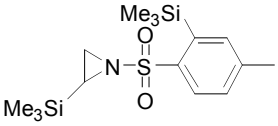
NBus
Me3Si

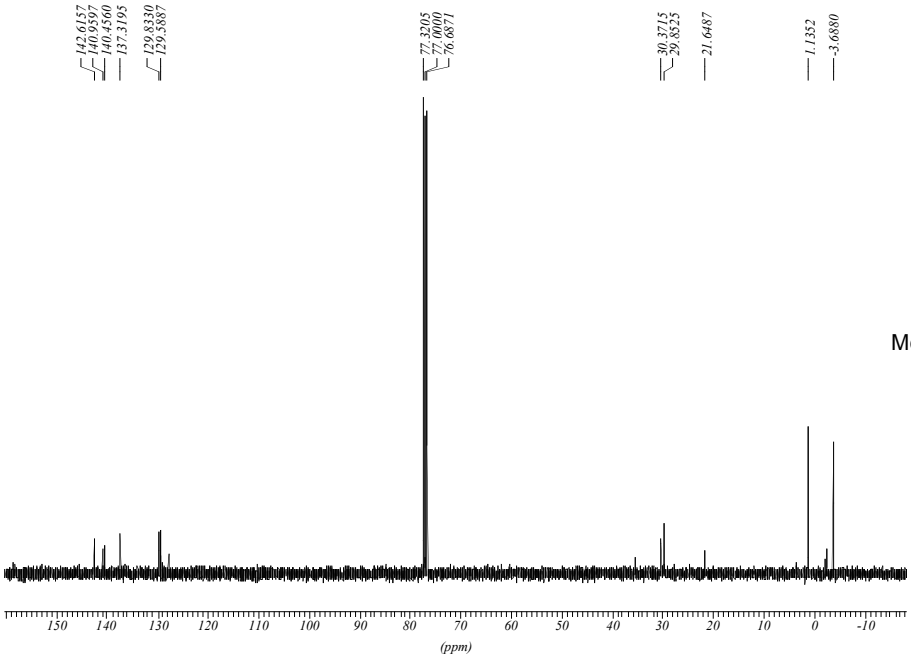

77.3205
77.0000
76.6871
59.2338
31.0965
27.5478
24.2968
-3.4209
(ppm)

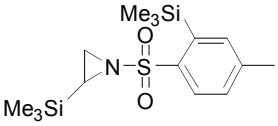

NBus
Me3Si

Compound 11

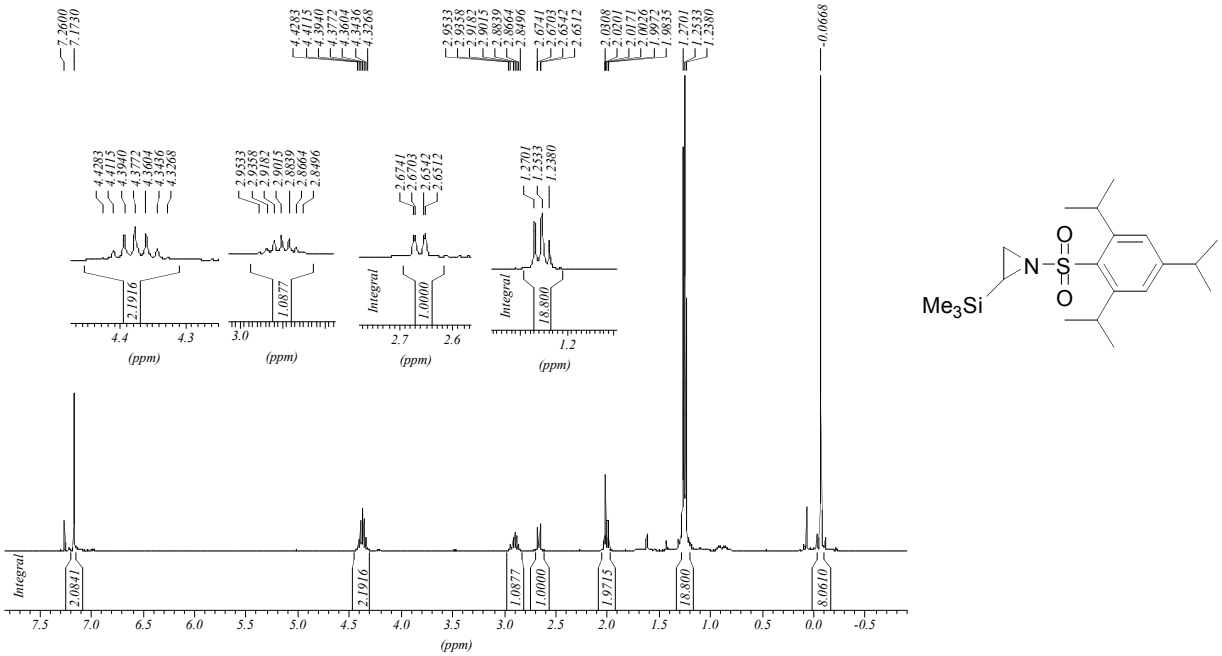

7.8468
7.8262
7.3004
7.2982
7.2966
7.2816
7.2783
7.2600
2.6298
2.6184
2.6077
2.4230
1.9904
1.9866
1.9782
1.9766
0.4368
-0.0905
Integral
1.0817
1.0000
1.3416
0.9441
3.1158
1.8494
8.2609
7.3148
(ppm)

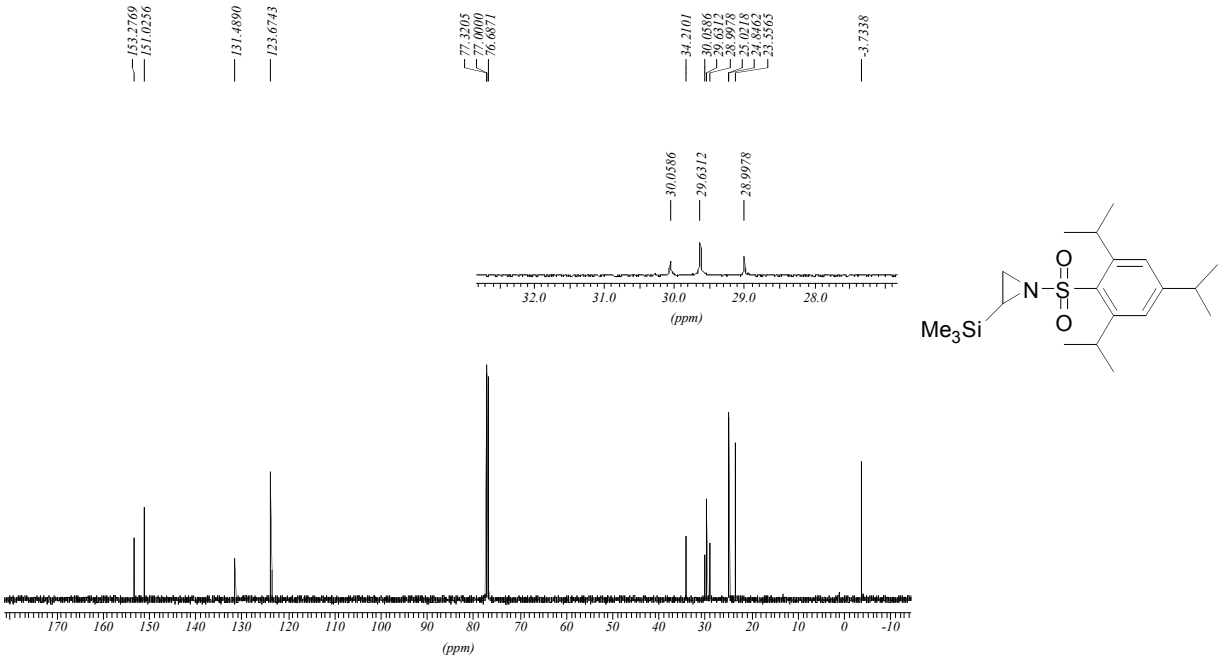

Me3Si
O
N
S
O
Me3Si


142.6157
140.9397
140.4560
137.3195
129.8330
129.5887
77.3205
77.0000
76.6871
30.3715
29.8525
21.6487
1.1352
-3.6880
(ppm)

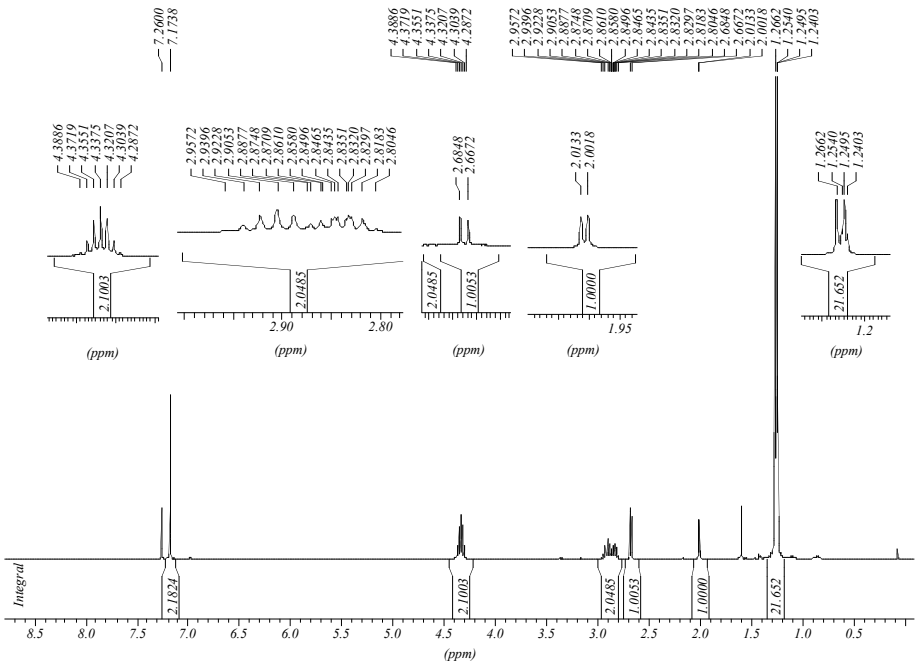

Me3Si
O
N
S
O
Me3Si

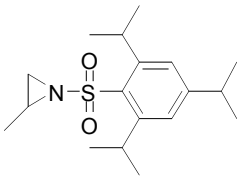
Compound 12

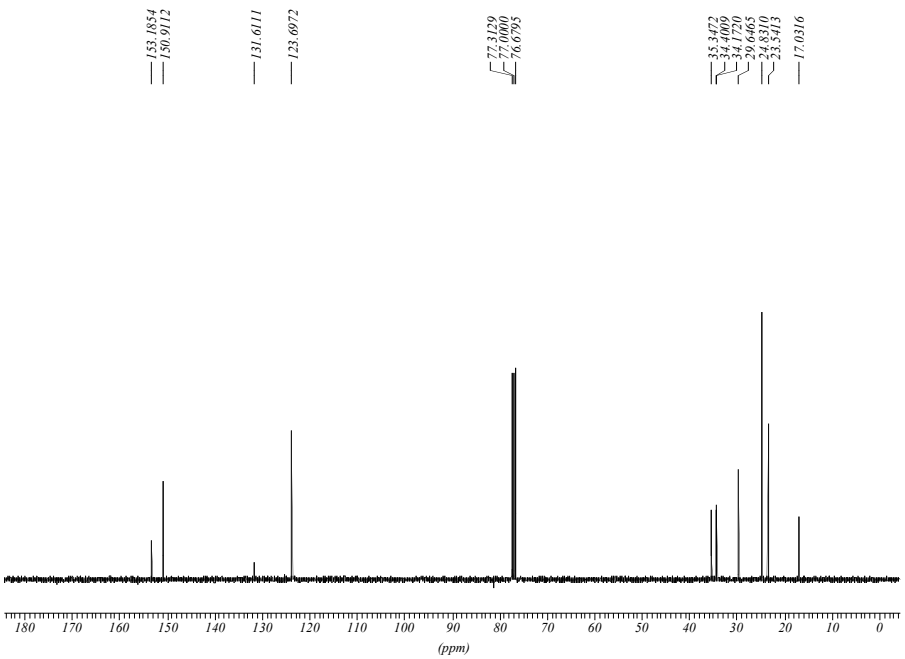

7.2600
7.1730
4.4283
4.4115
4.3940
4.3772
4.3604
4.3436
4.3268
2.9533
2.9358
2.9182
2.9015
2.8839
2.8664
2.8496
2.6741
2.6703
2.6542
2.6512
2.0308
2.0201
2.0171
2.0026
1.9972
1.9835
1.2701
1.2533
1.2380
-0.0668
Integral
2.0841
2.1916
1.0877
1.0000
1.9715
18.800
8.0610
(ppm)
Me3Si
N
S
O

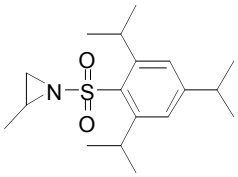

153.2769
151.0256
131.4890
123.6743
77.3205
77.0000
76.6871
34.2101
30.0586
29.6312
28.9978
25.0218
24.8462
23.5565
-3.7338
(ppm)
Me3Si
N
S
O

Compound 14

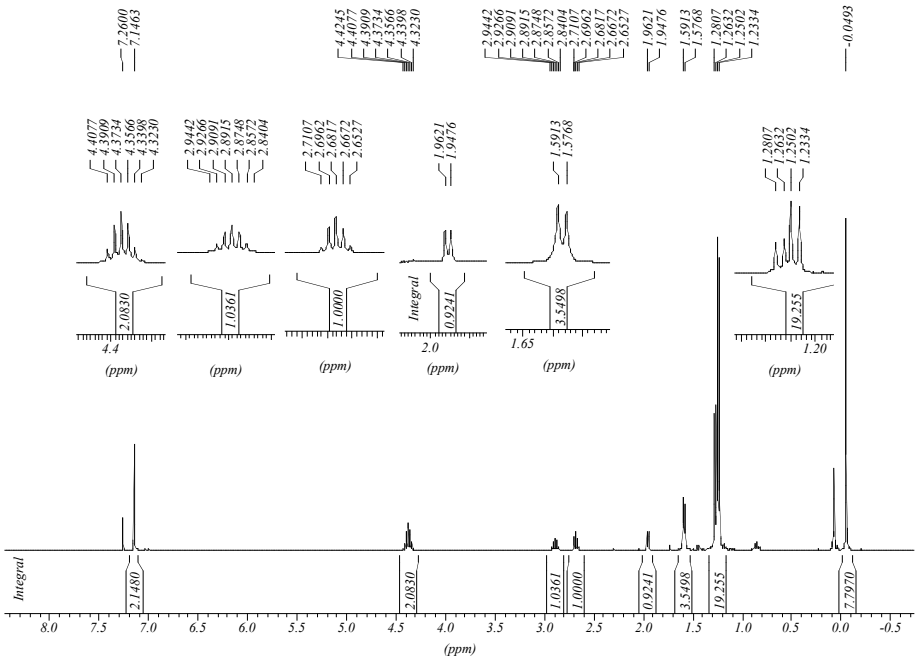

7.2600
7.1738
4.3886
4.3719
4.3551
4.3375
4.3207
4.3039
4.2872
2.9572
2.9396
2.9228
2.9053
2.8877
2.8748
2.8709
2.8610
2.8580
2.8496
2.8445
2.8351
2.8320
2.8297
2.8183
2.8046
2.6848
2.6672
2.0133
2.0018
1.2662
1.2540
1.2495
1.2403
Integral
2.1824
2.1003
2.0485
1.0053
1.0000
21.652
(ppm)

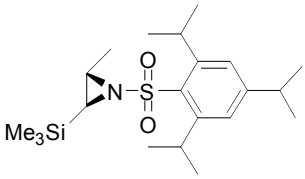


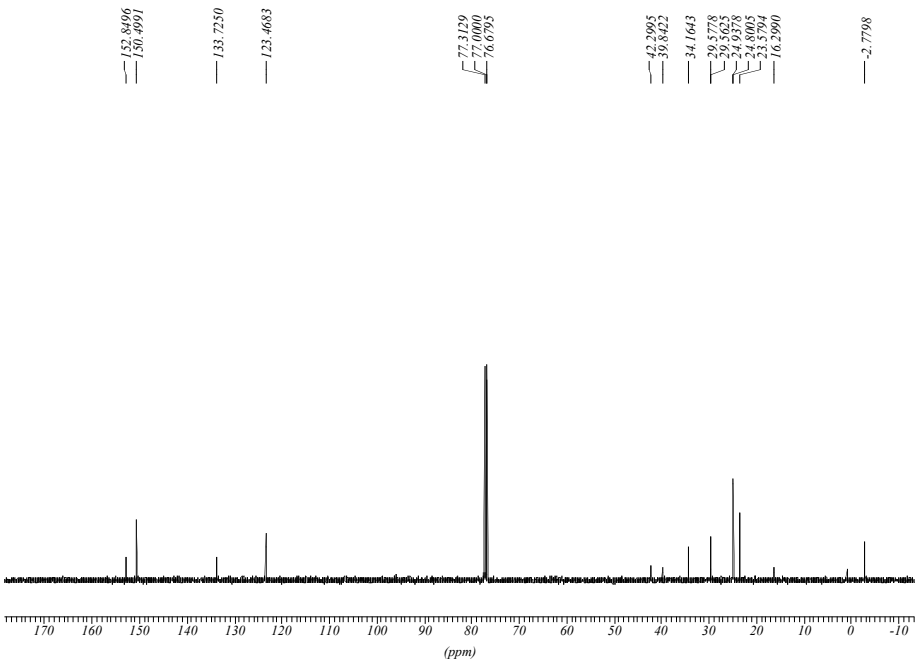

153.1654
150.9112
131.6111
123.6972
77.3129
77.0000
76.6795
35.3472
34.4009
34.1720
29.6465
24.8310
23.5413
17.0316
(ppm)

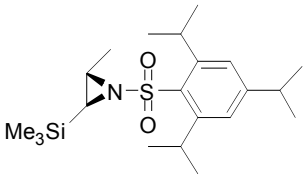


Compound 15

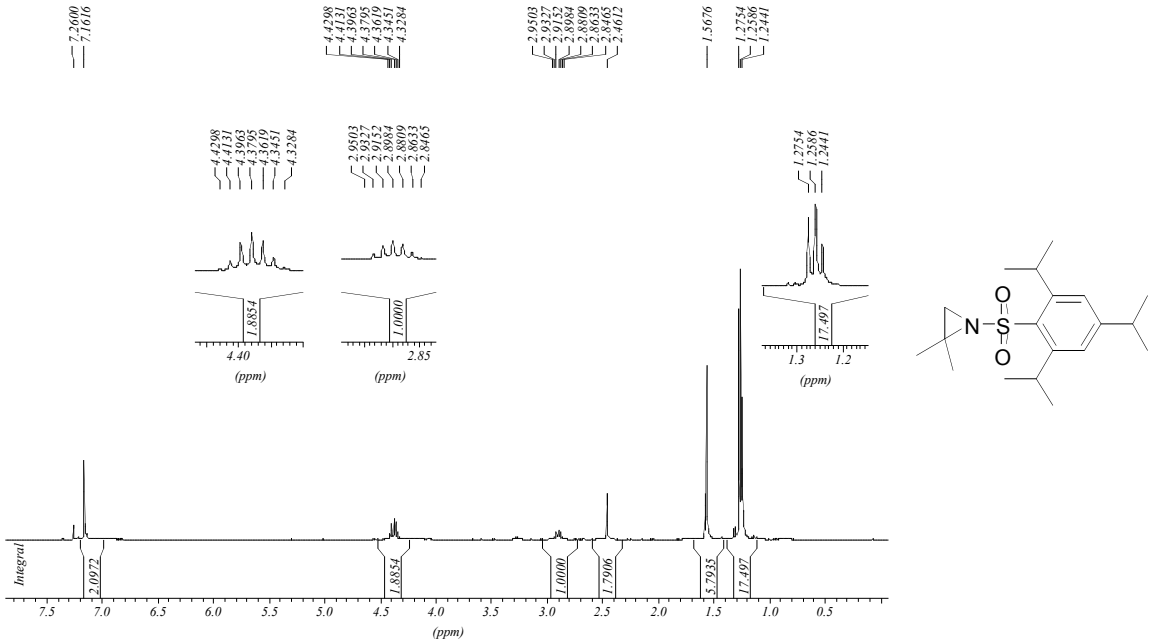


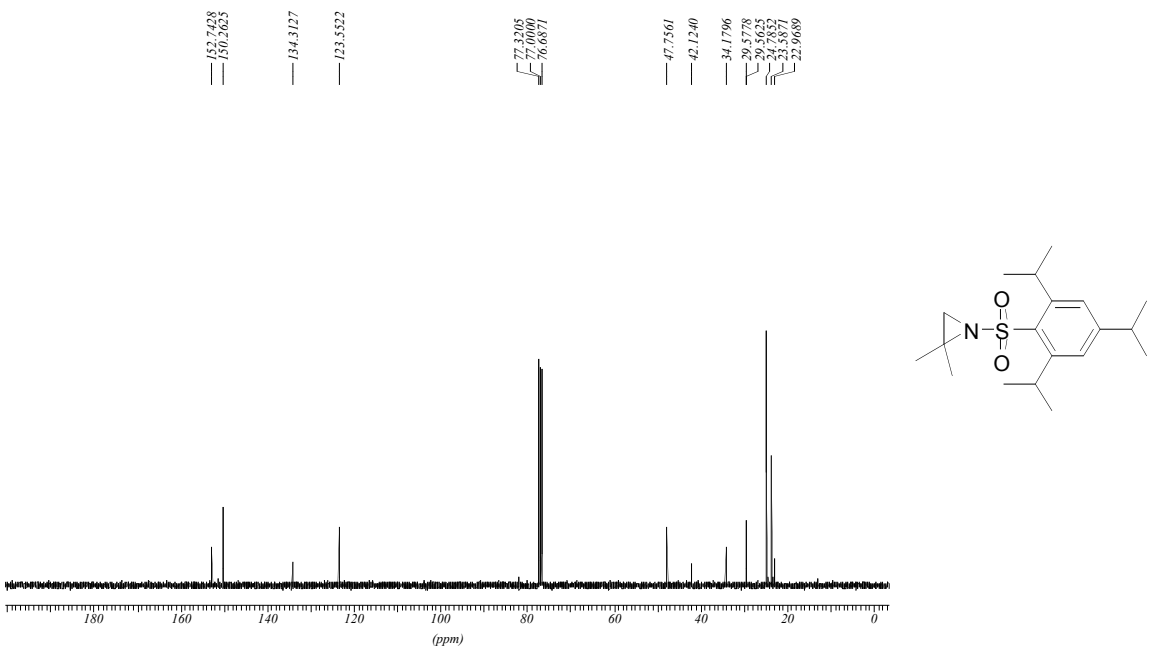




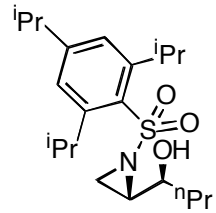


Compound 16

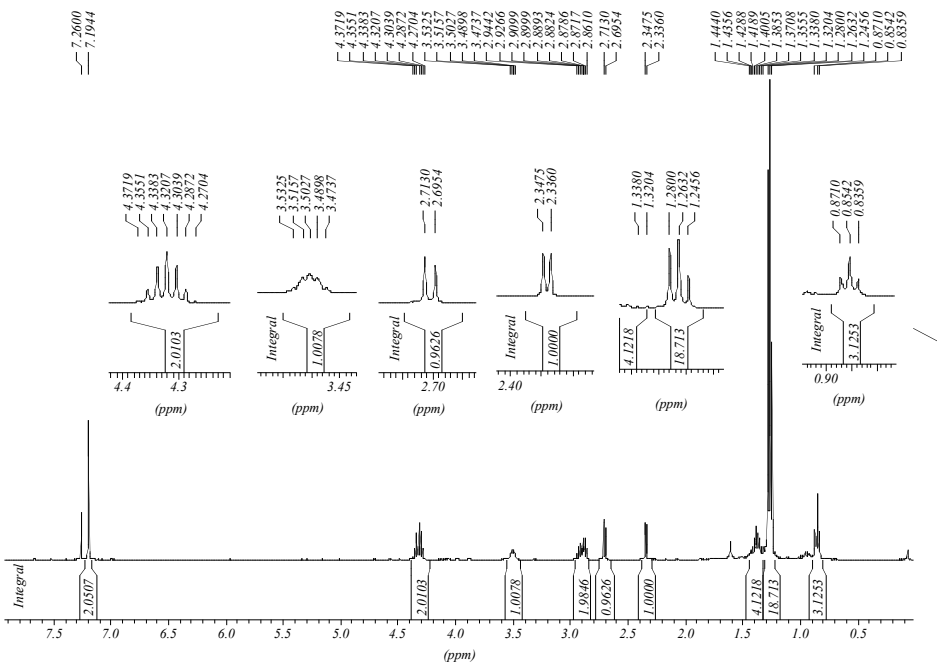

7.2600
7.1616
4.4298
4.4131
4.3963
4.3795
4.3619
4.3451
4.3284
2.9503
2.9327
2.9152
2.8984
2.8809
2.8633
2.8465
2.4612
1.5676
1.2754
1.2586
1.2441
1.8854
1.0000
17.497
Integral
2.0972
1.8854
1.0000
1.7906
5.7935
17.497
(ppm)

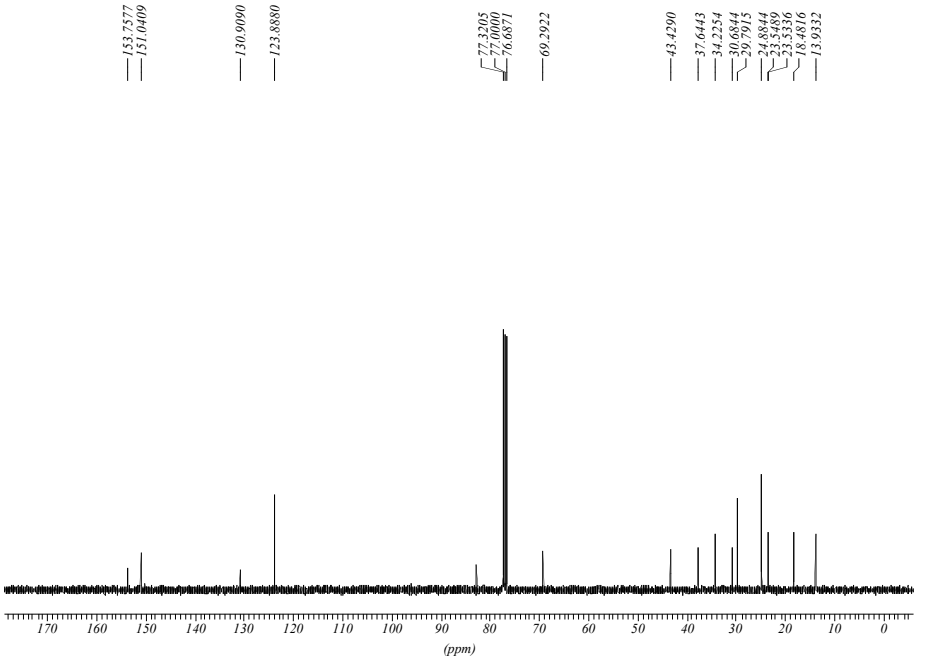

152.7428
150.2625
134.3127
123.5522
77.3205
77.0000
76.6871
47.7561
42.1240
34.1796
29.5778
29.5625
24.7852
23.5871
22.9689
(ppm)

Compound *syn*-17

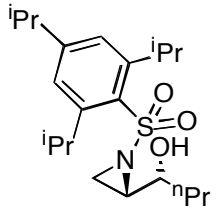


syn-**17**

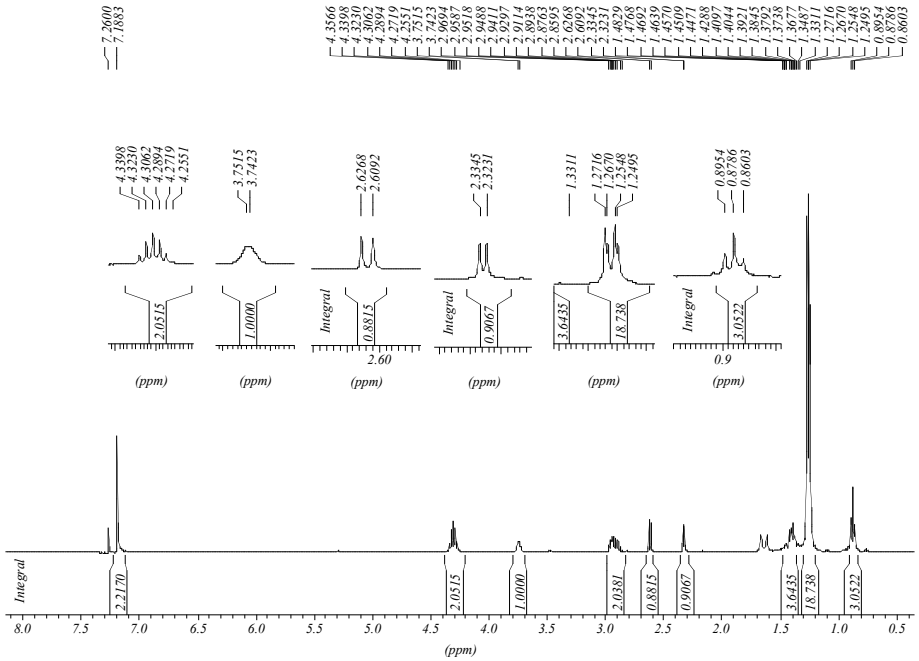


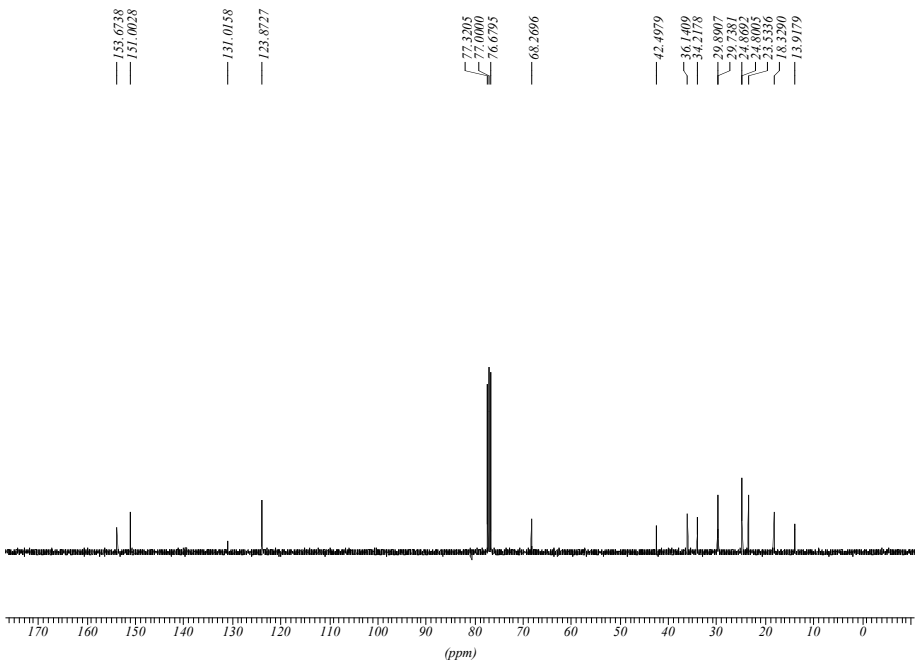


Compound *anti*-17

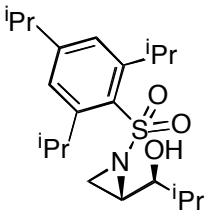


anti-**17**

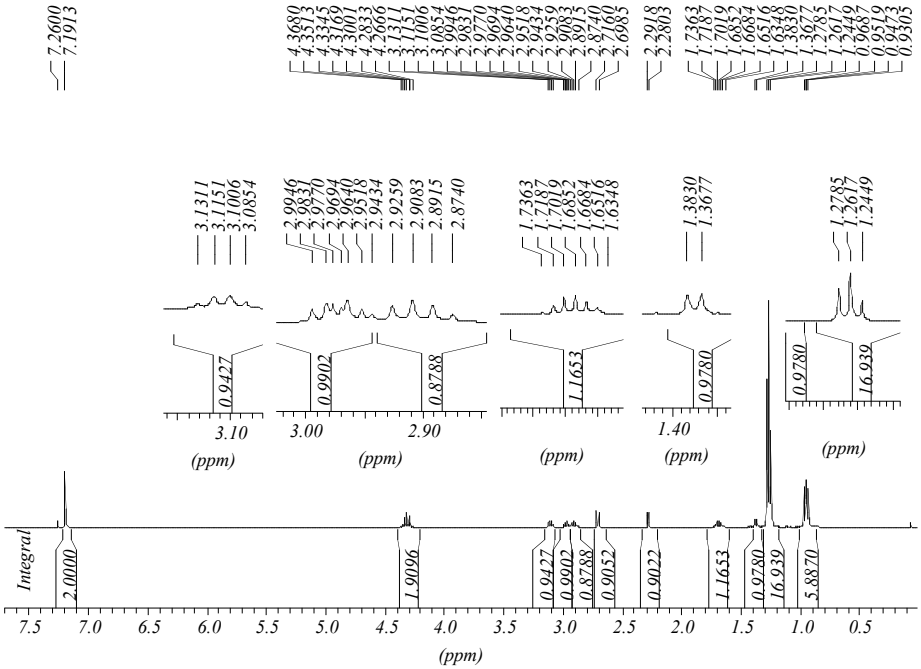


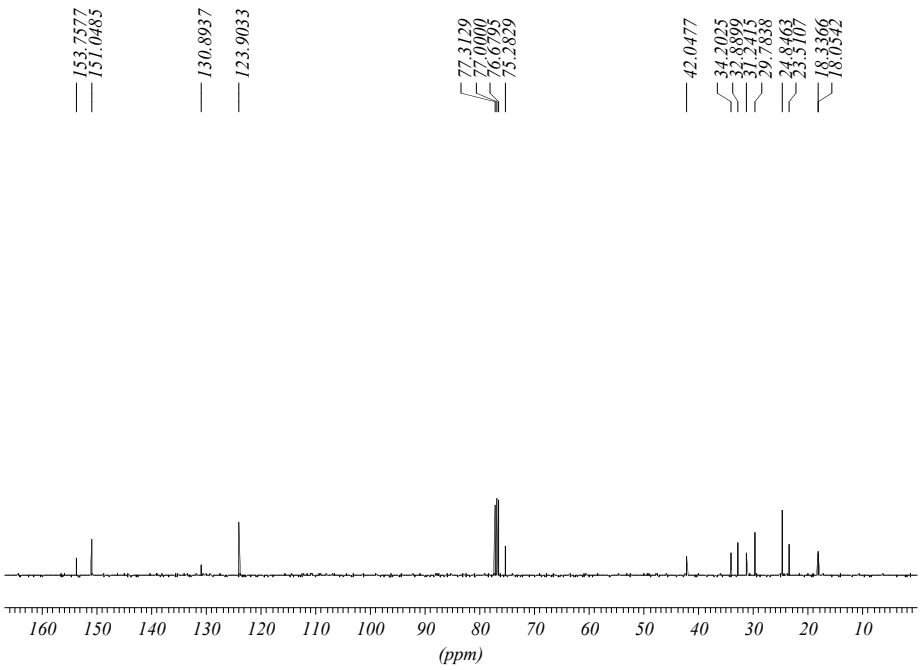


Compound *syn*-18

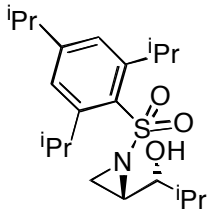


syn-**18**

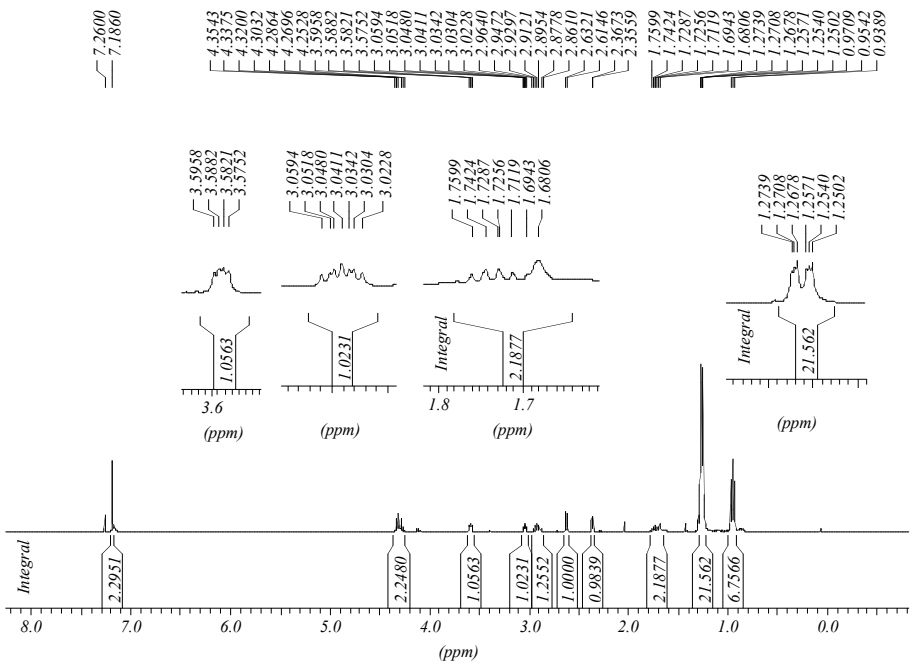


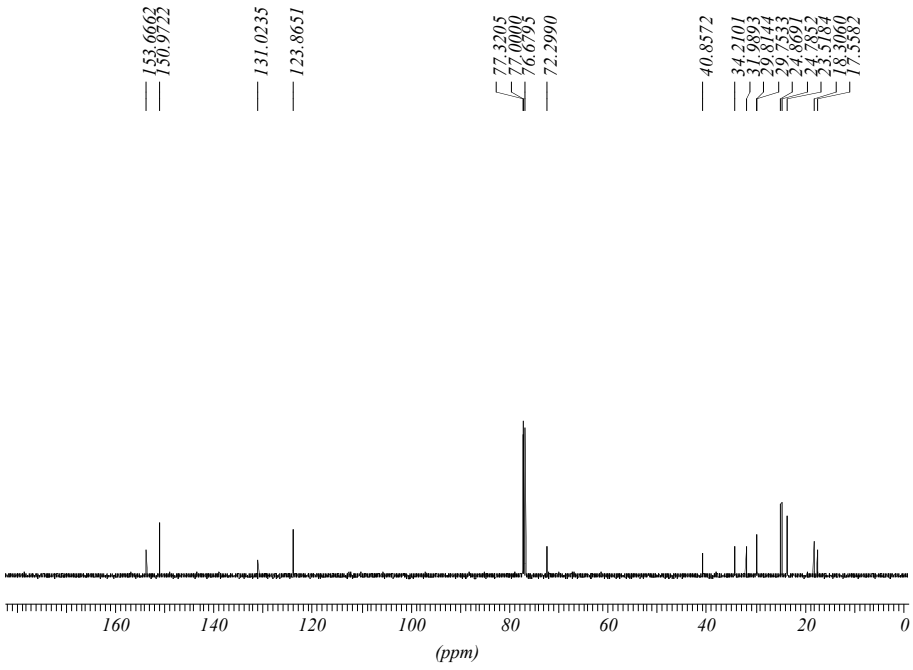


Compound *anti*-18

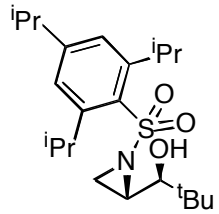


anti-**18**

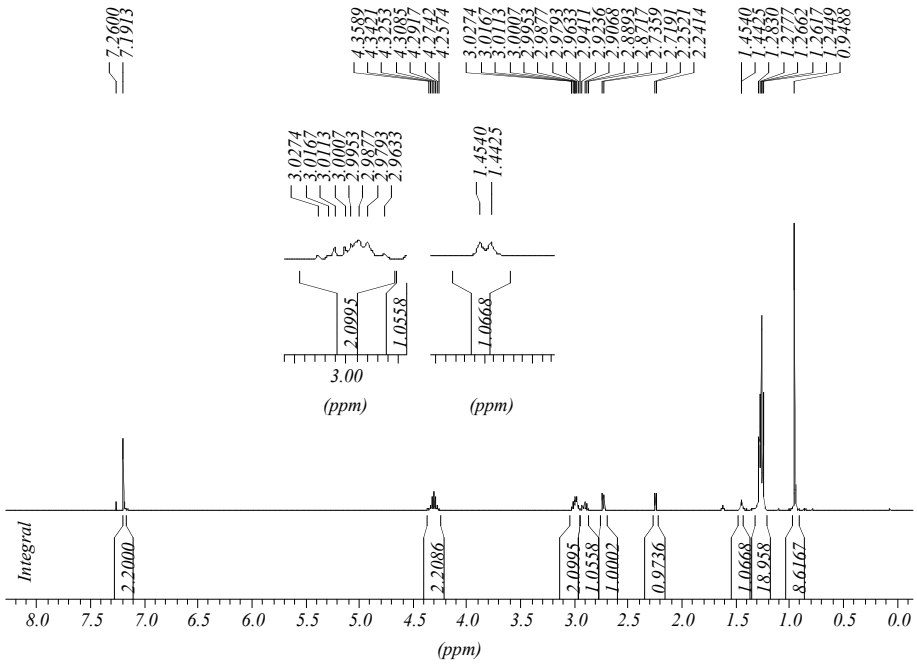


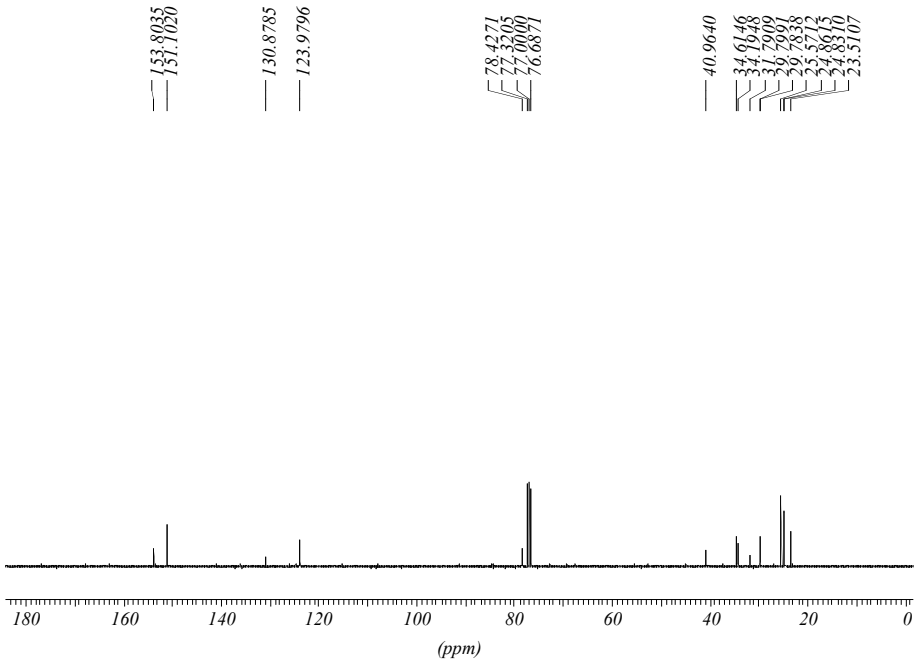


Compound *syn*-19

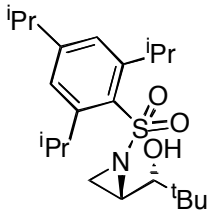


syn-**19**

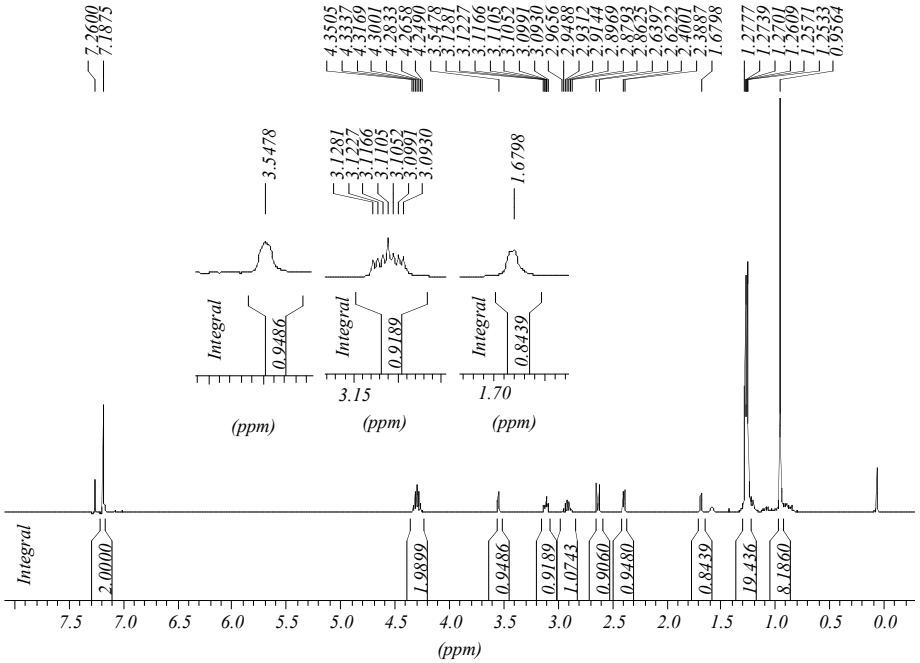


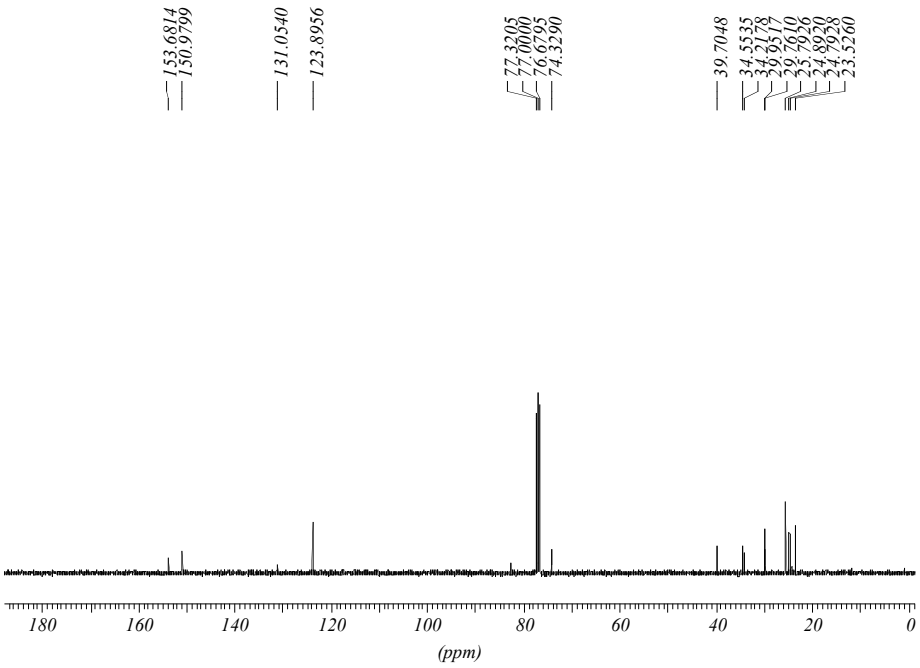


Compound *anti*-19

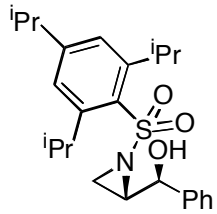


anti-**19**

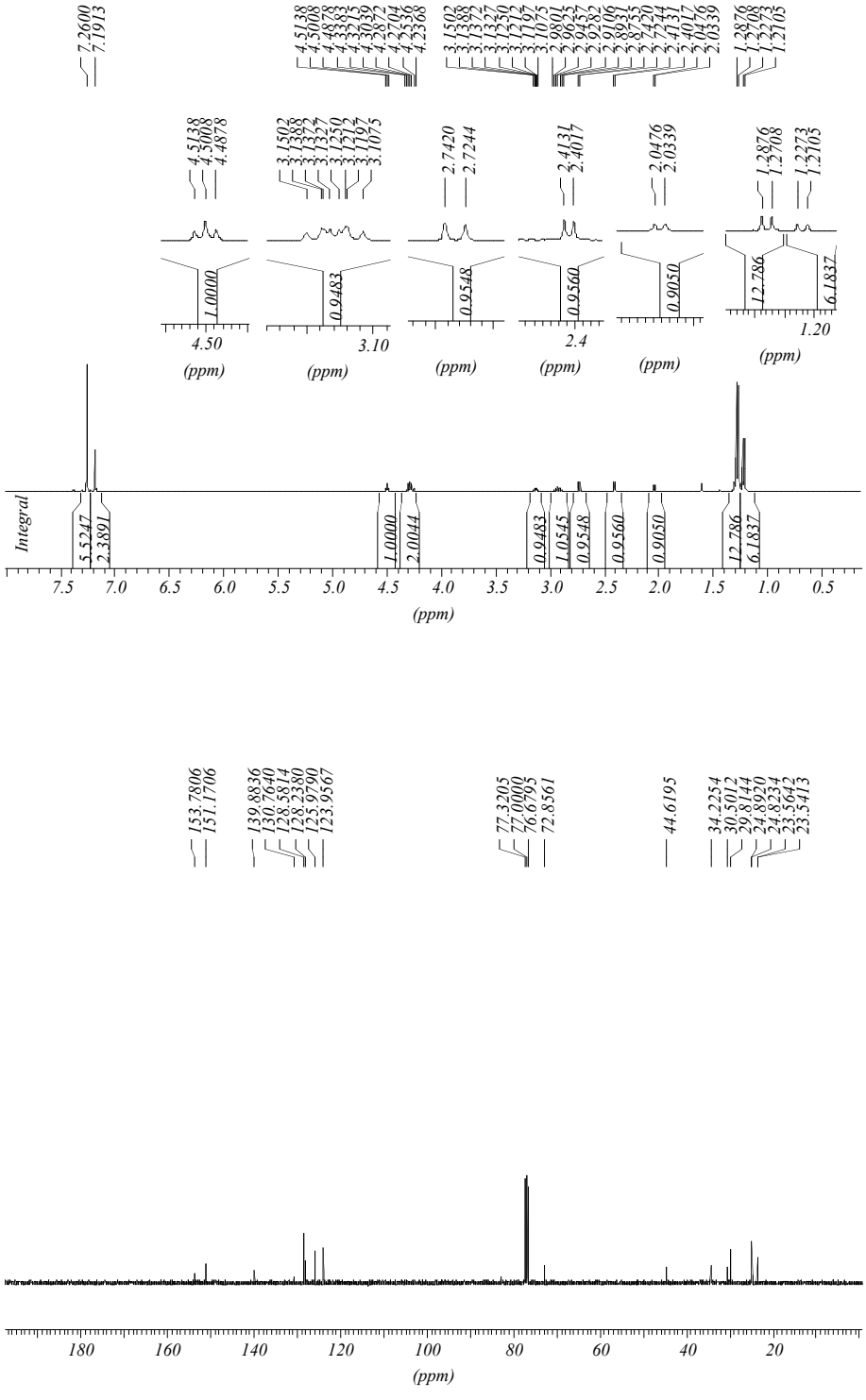




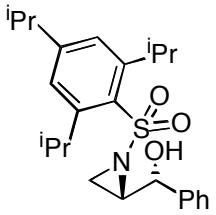
Compound *syn*-20



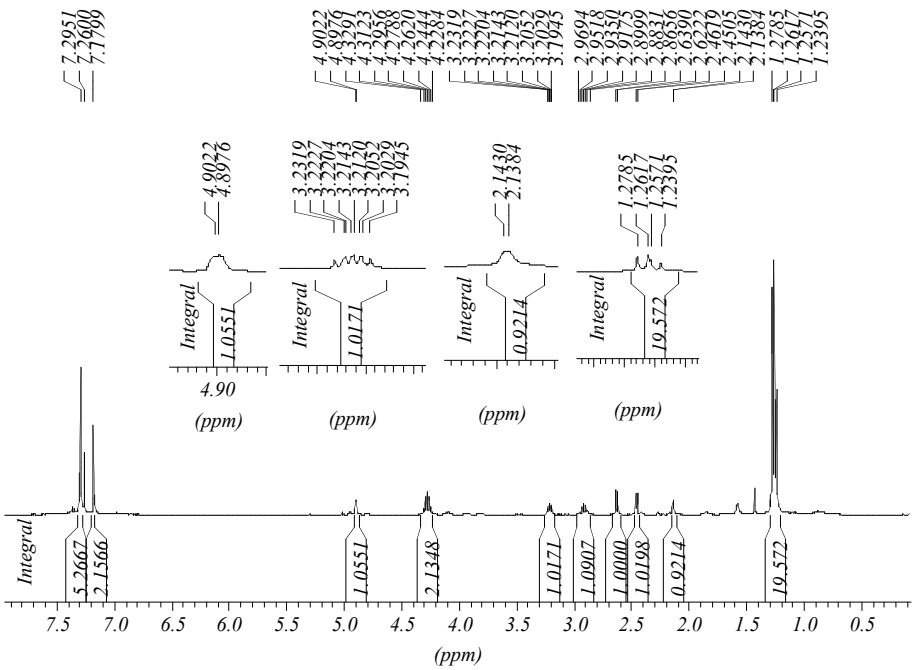
syn-**20**

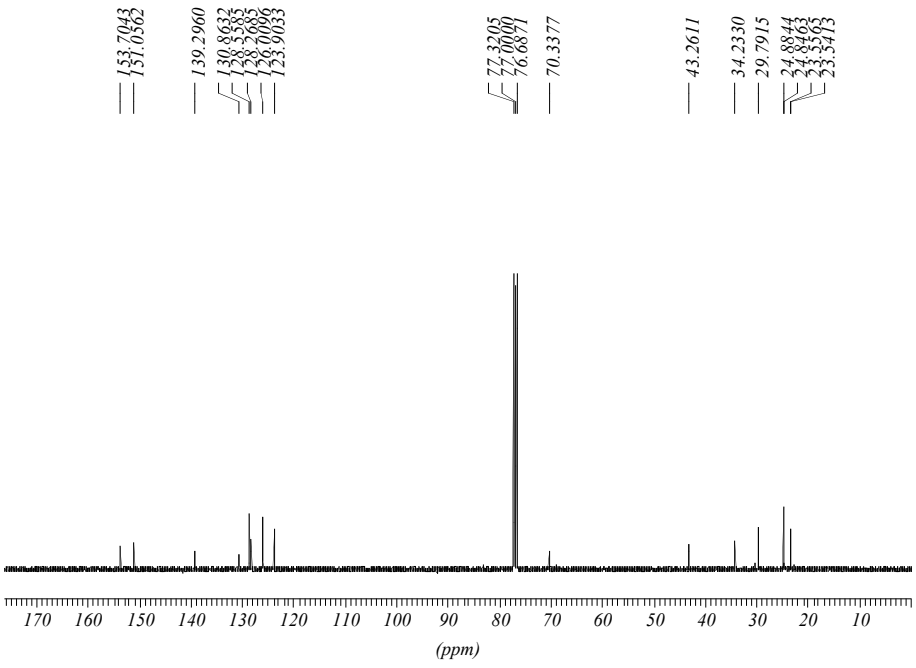


Compound *anti*-20

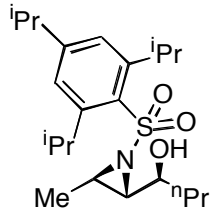


anti-**20**

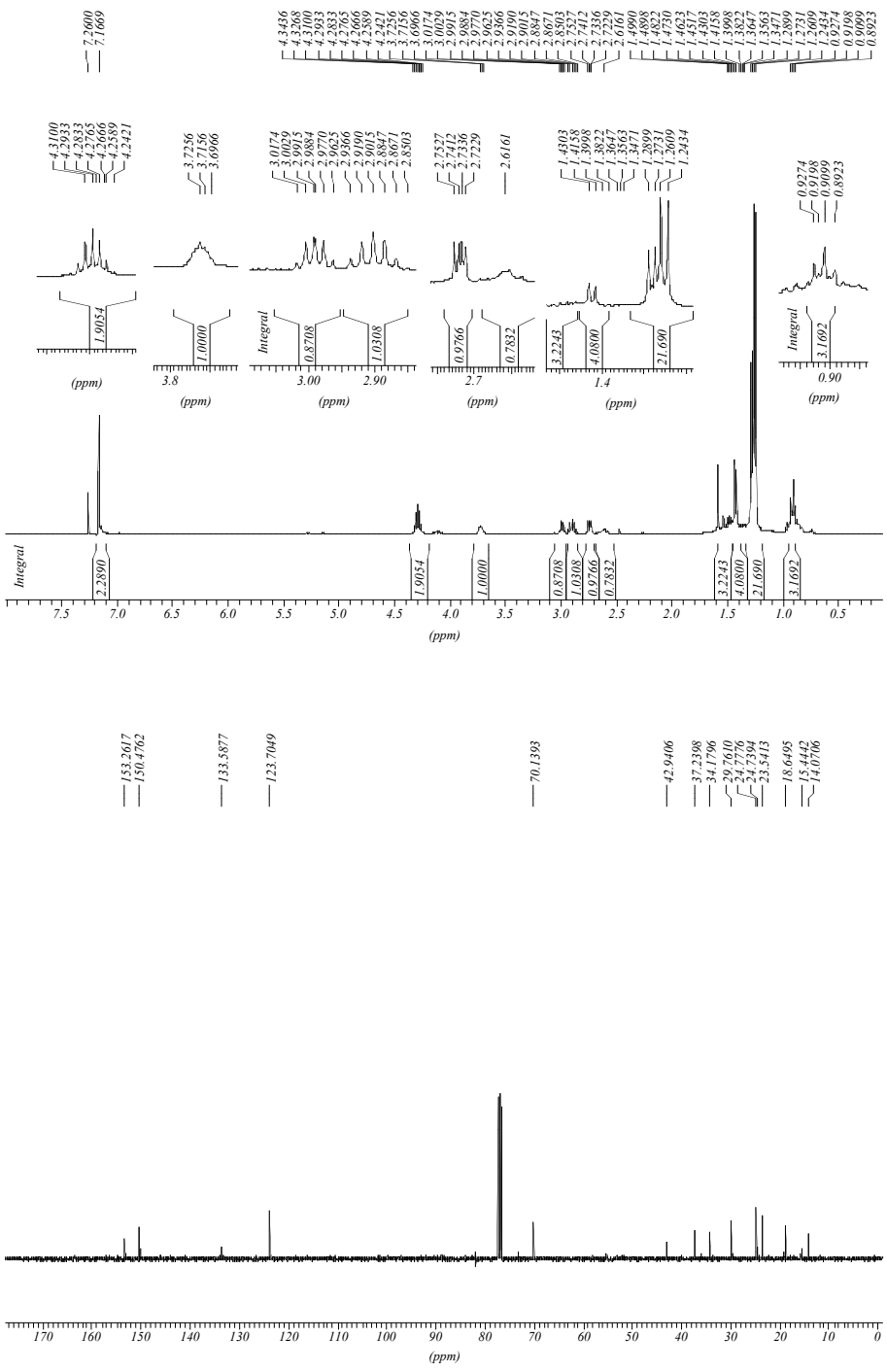




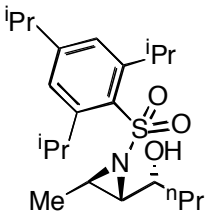
Compound *syn*-21



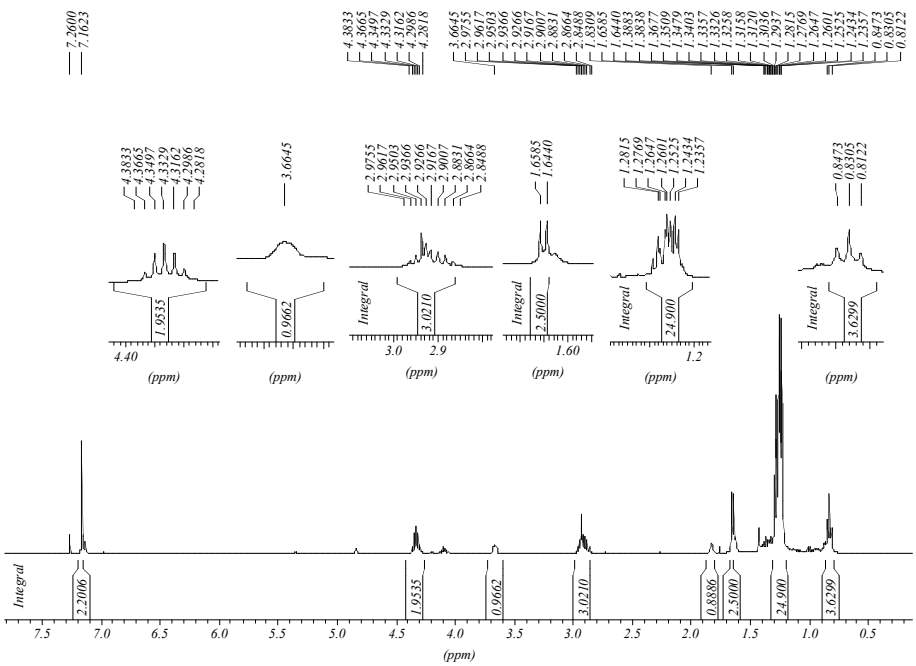
syn-**21**

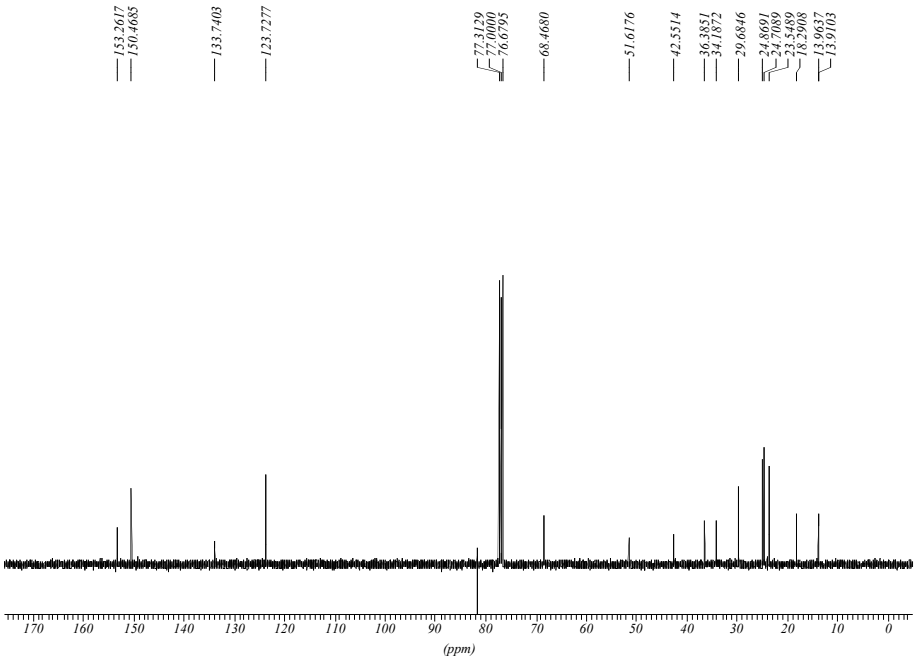


Compound *anti*-21

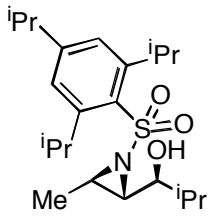


anti-**21**

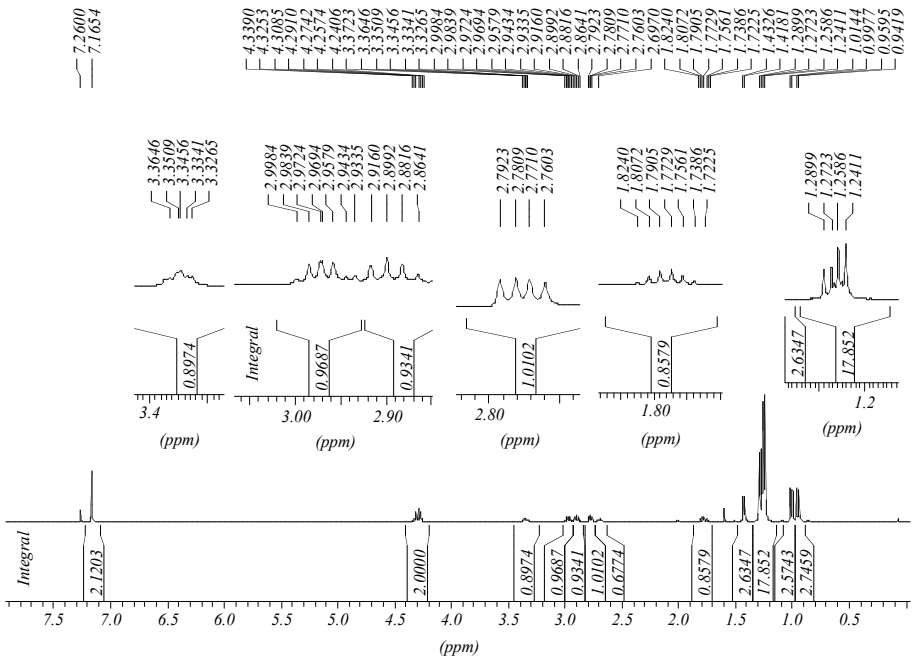


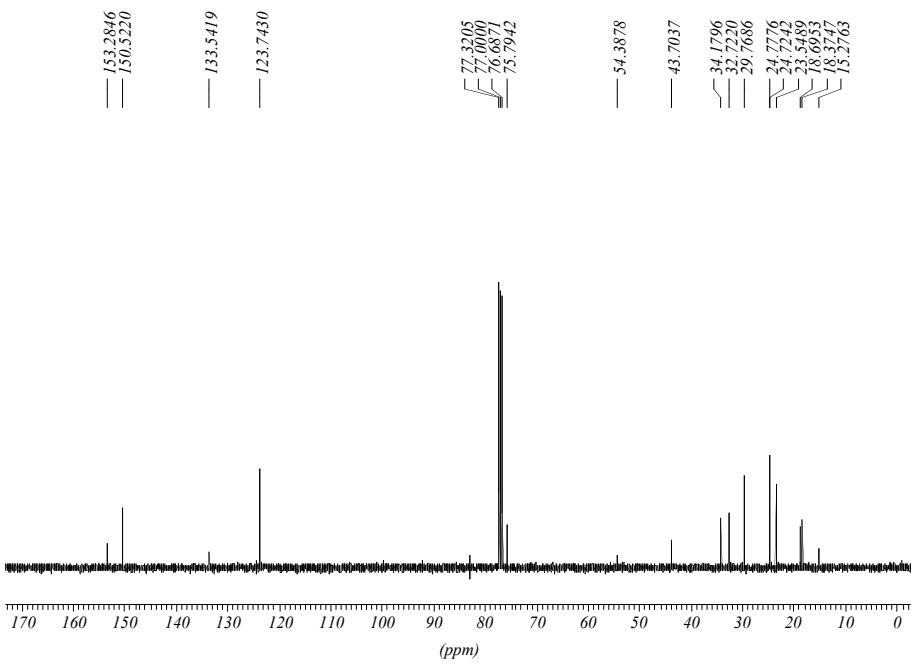


Compound *syn*-22

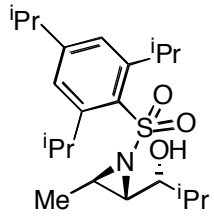


***syn*-22**





Compound *anti*-22



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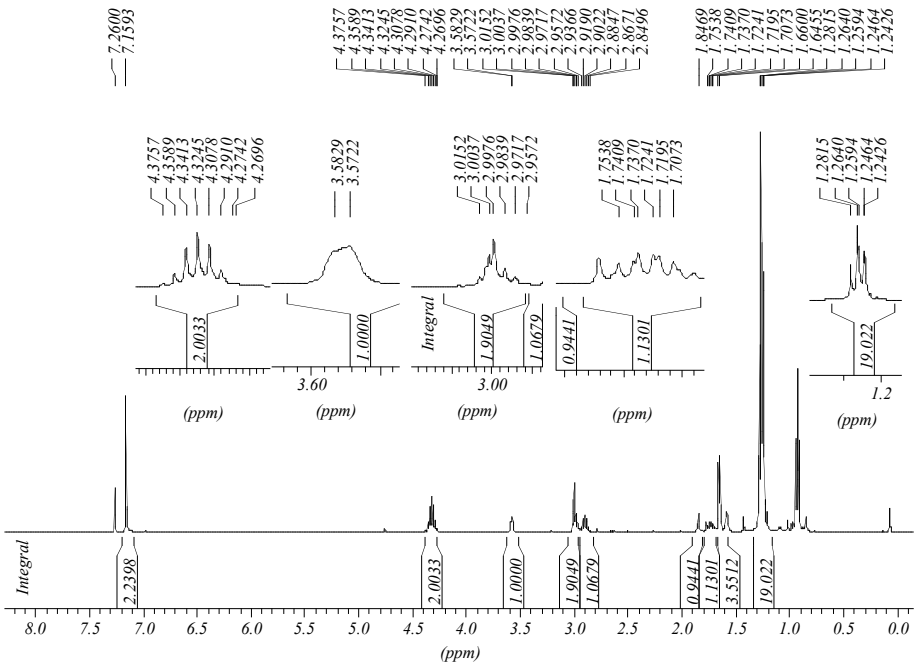

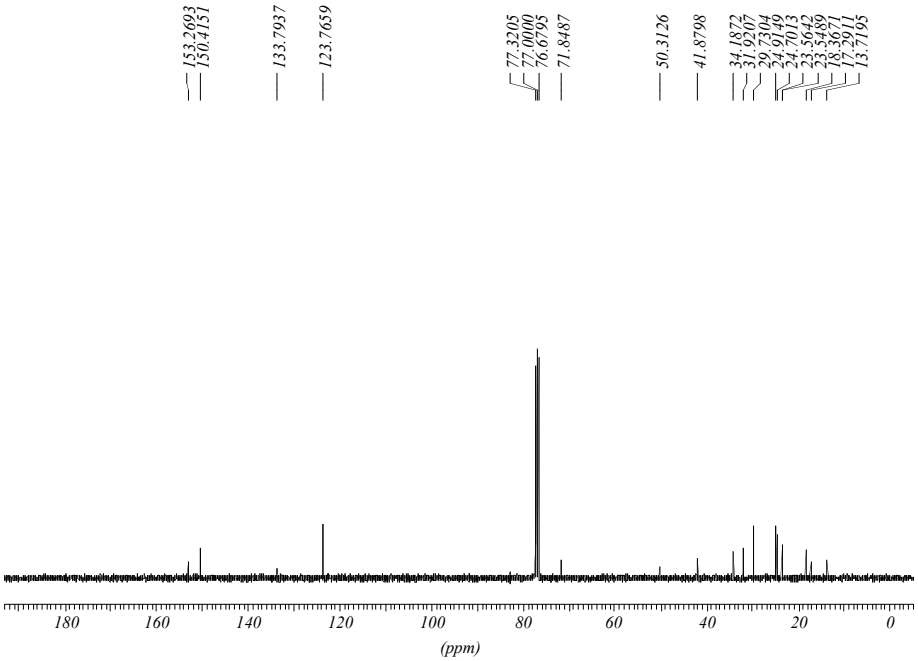

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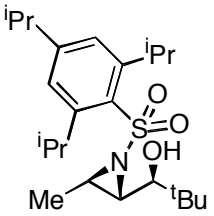

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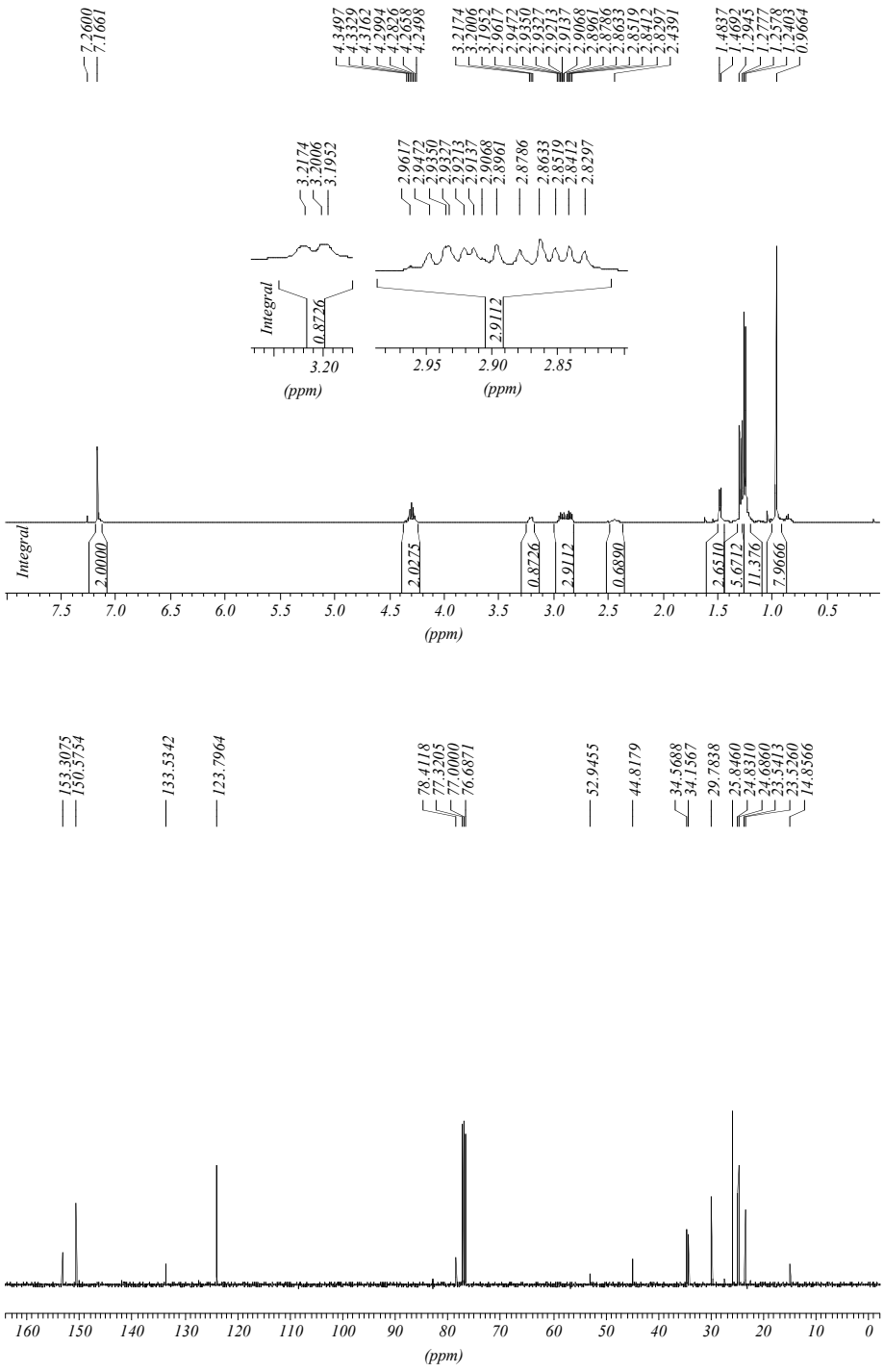
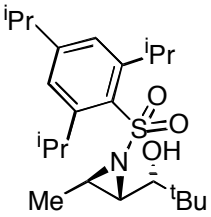


Compound *anti*-23



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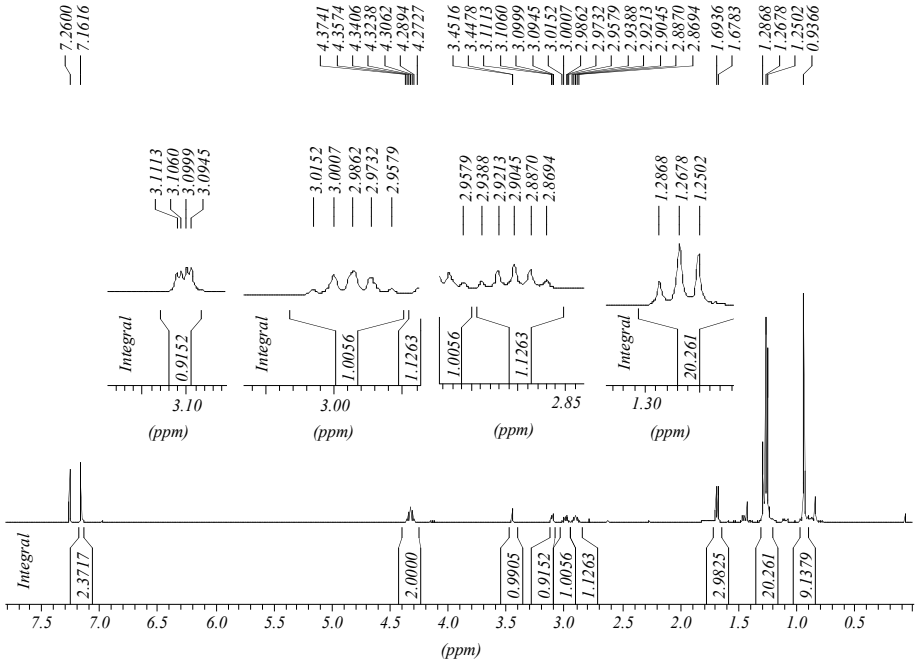
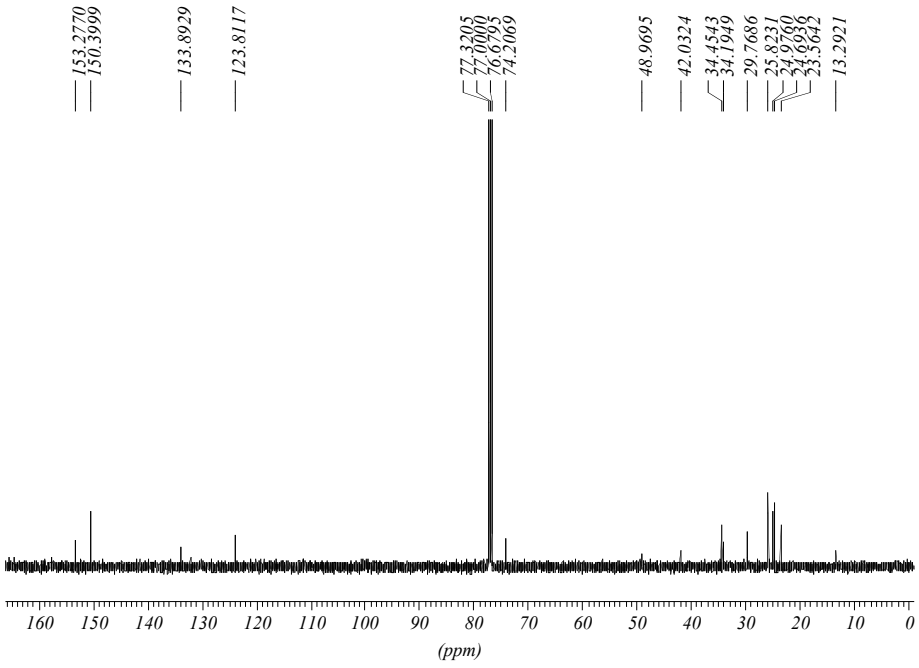
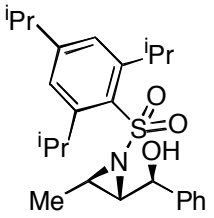
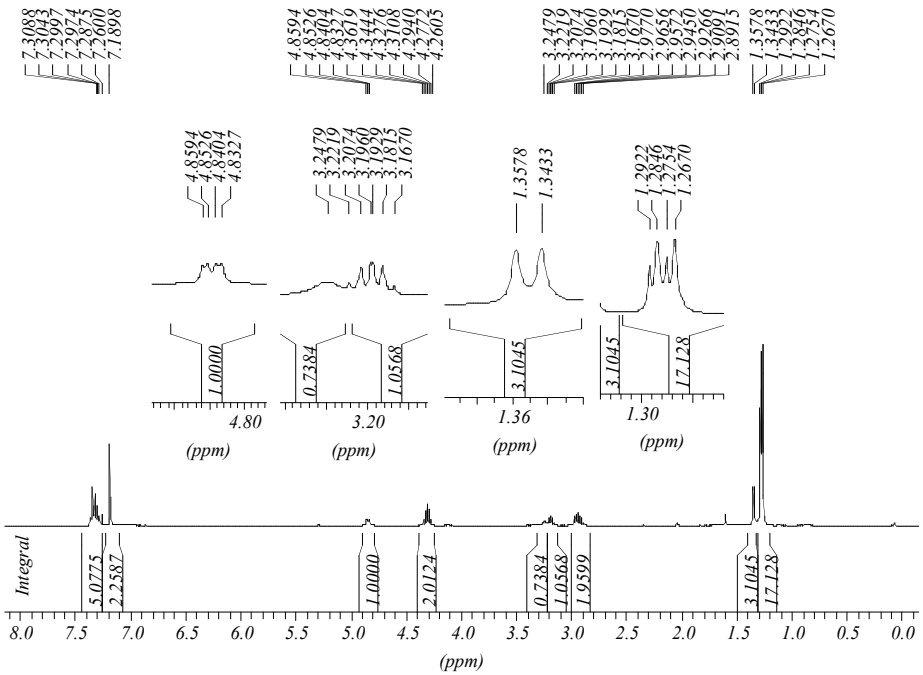


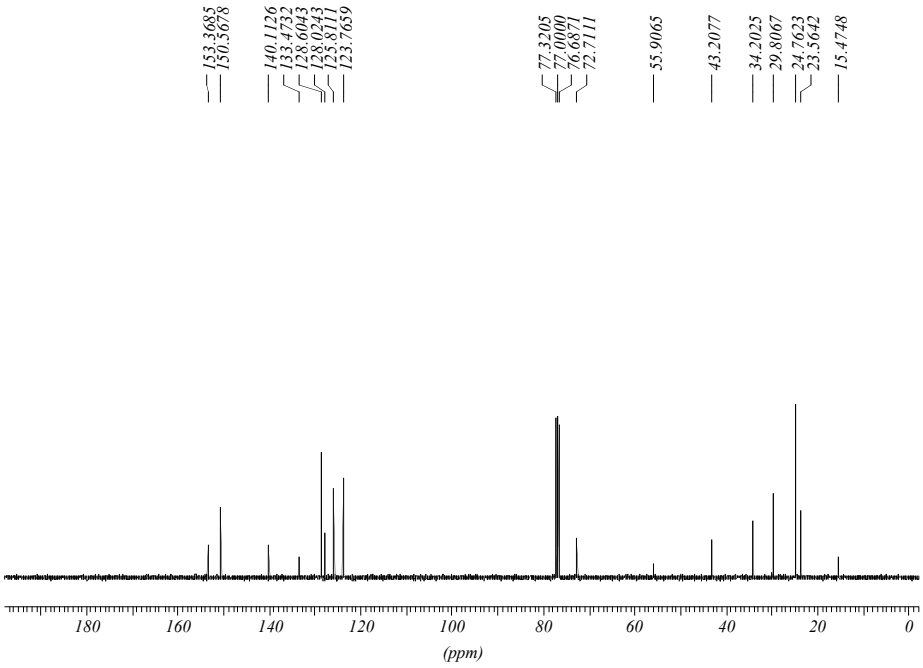


Compound *syn-24*

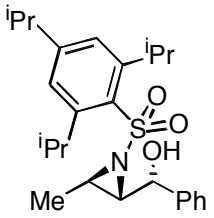


syn-**24**

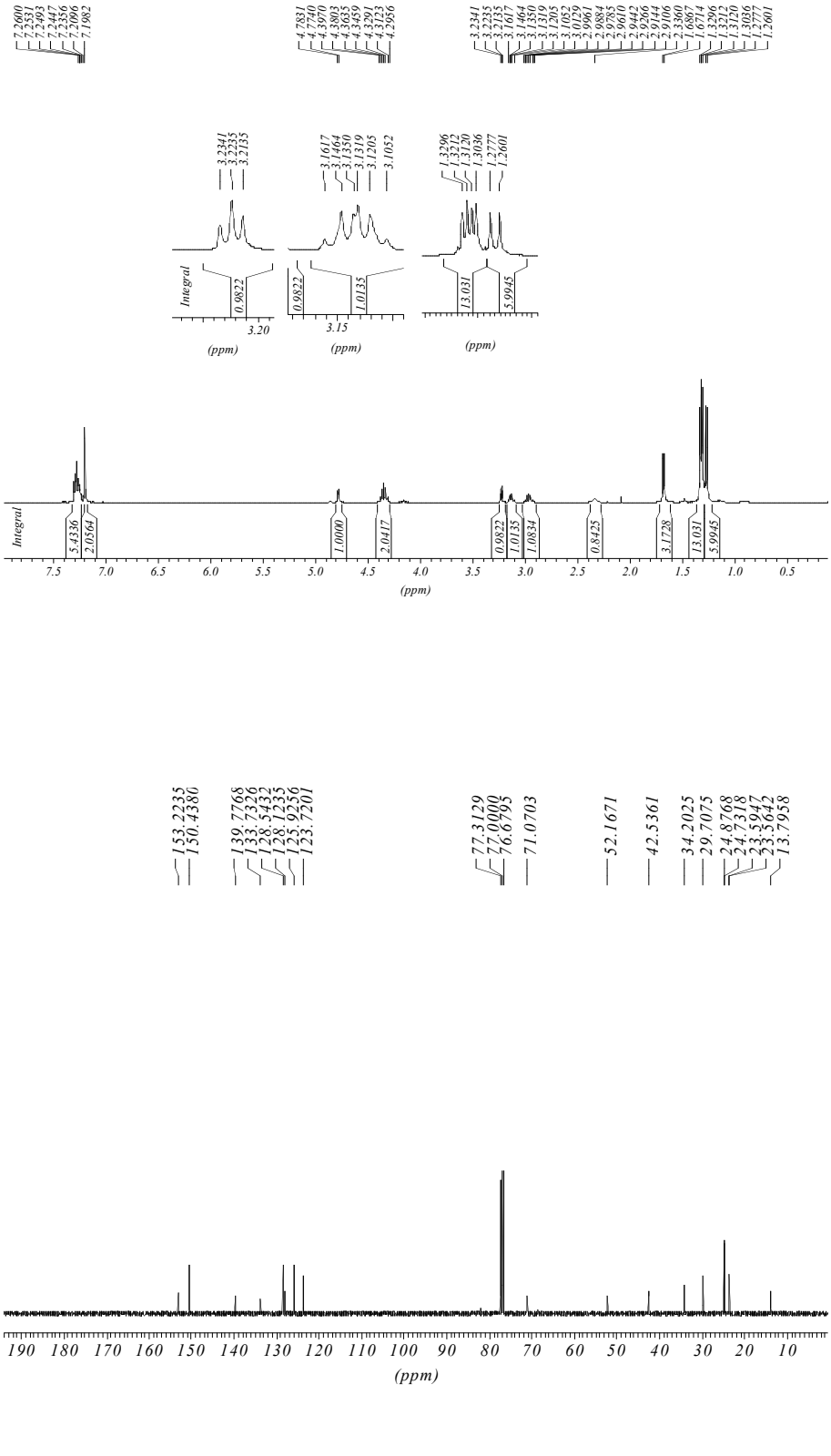




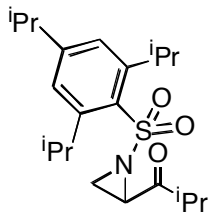
Compound *anti*-24



anti-**24**



Compound 25



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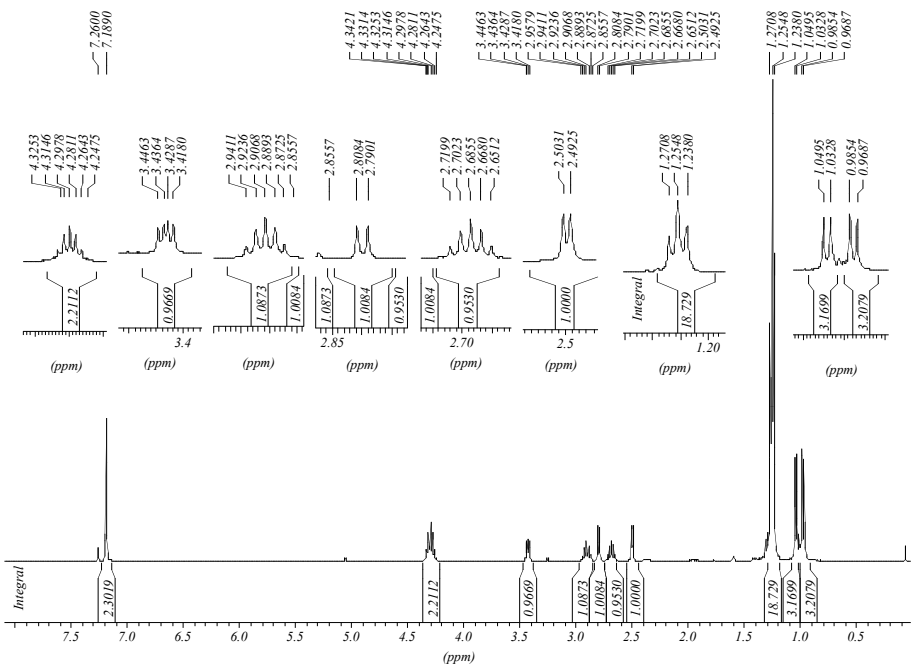

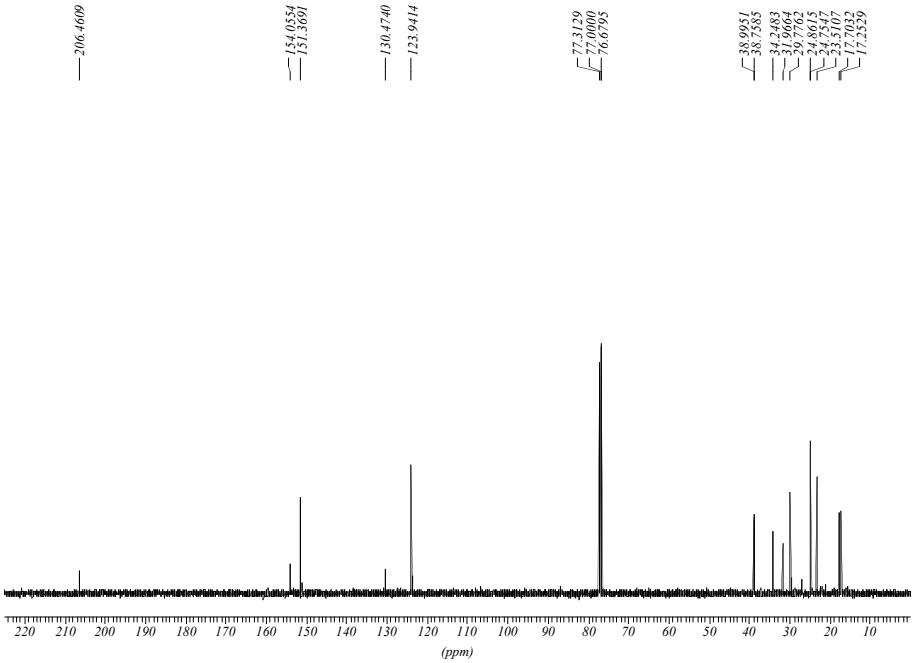

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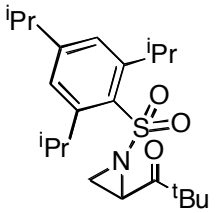

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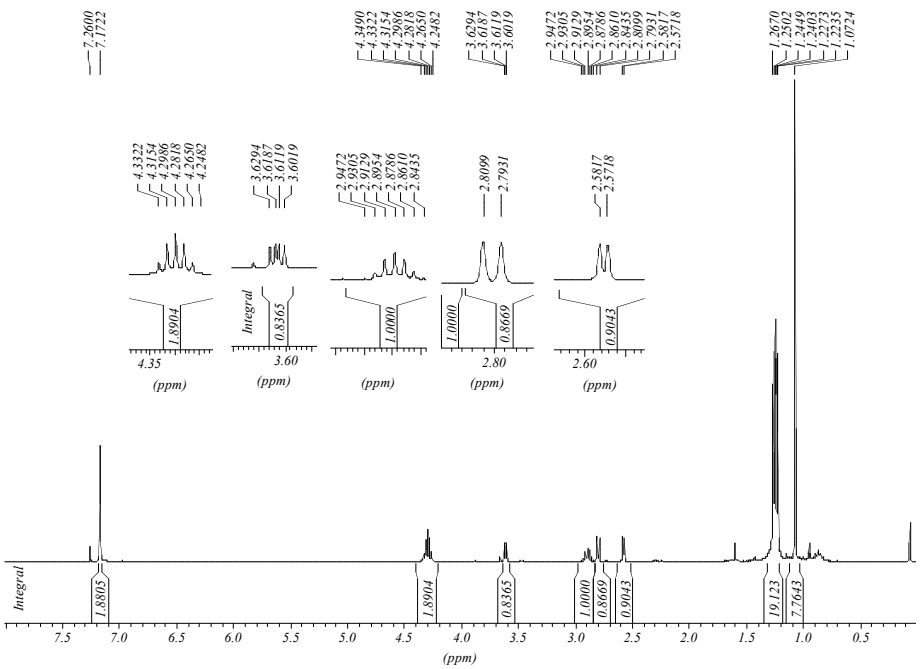

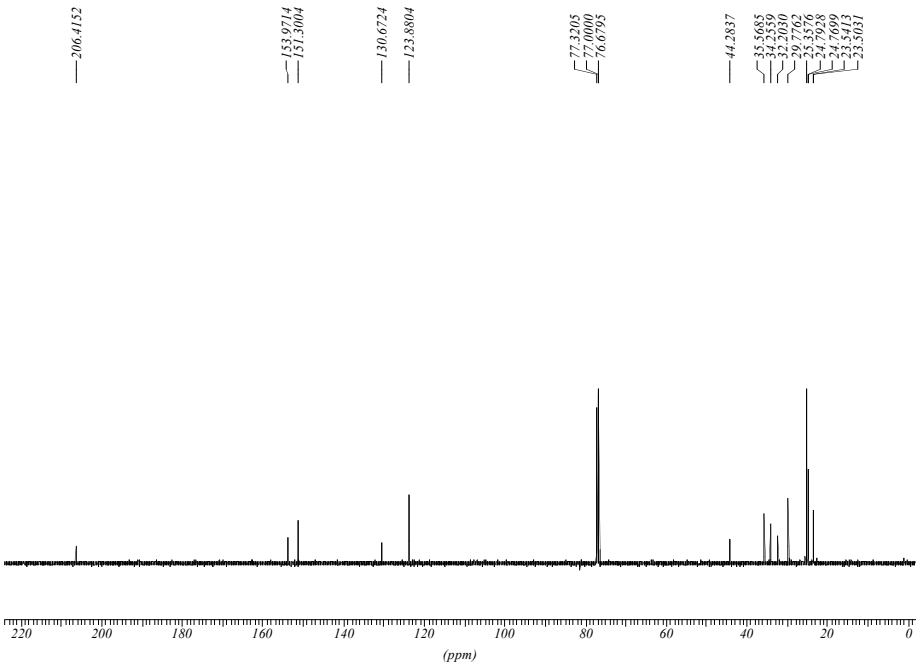

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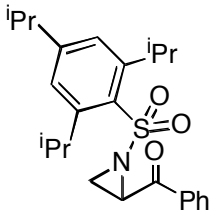

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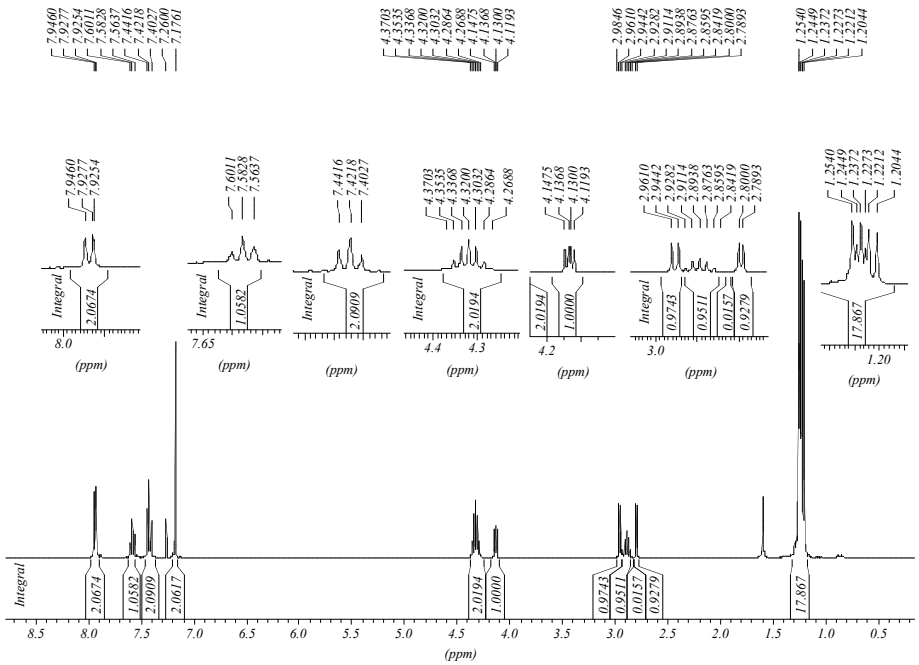
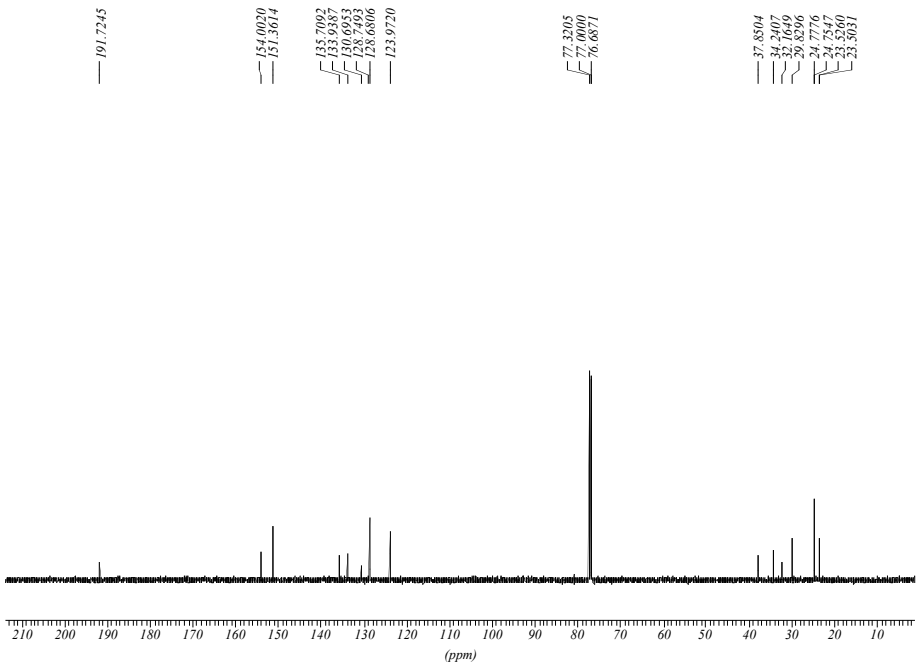
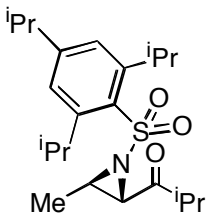




Compound 28



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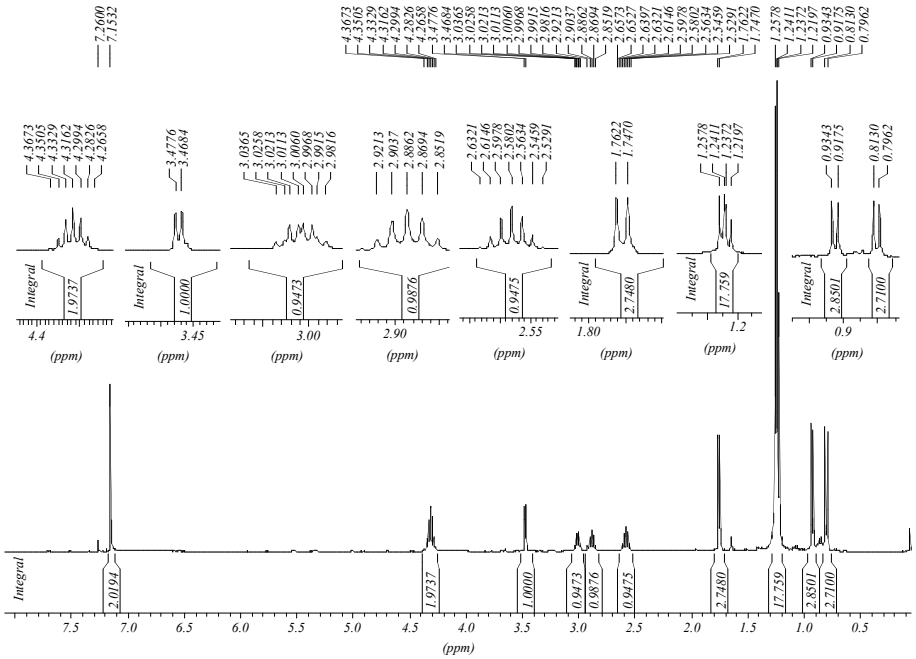

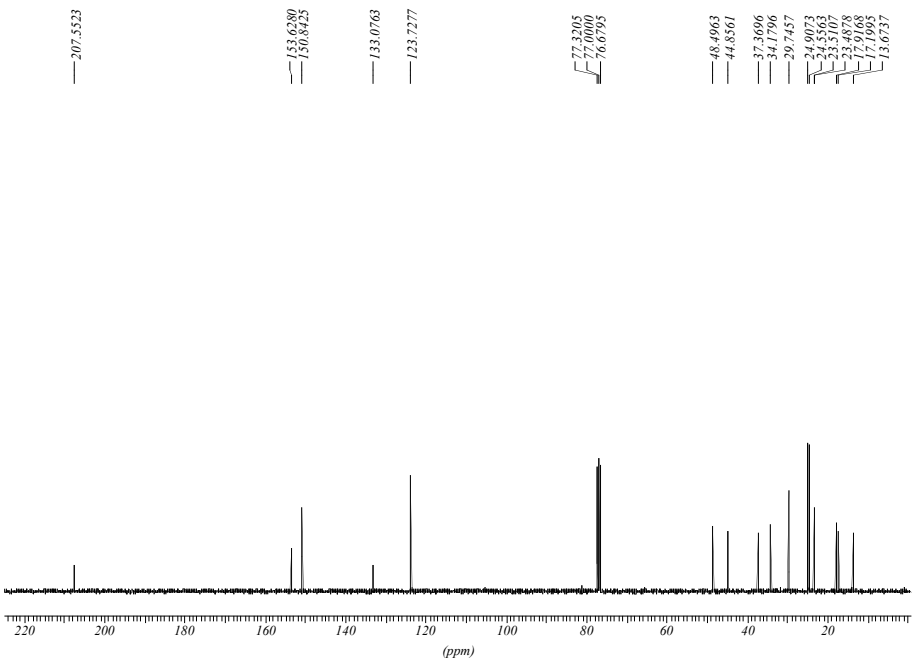

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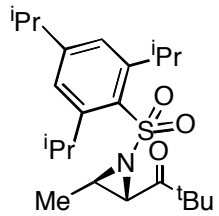

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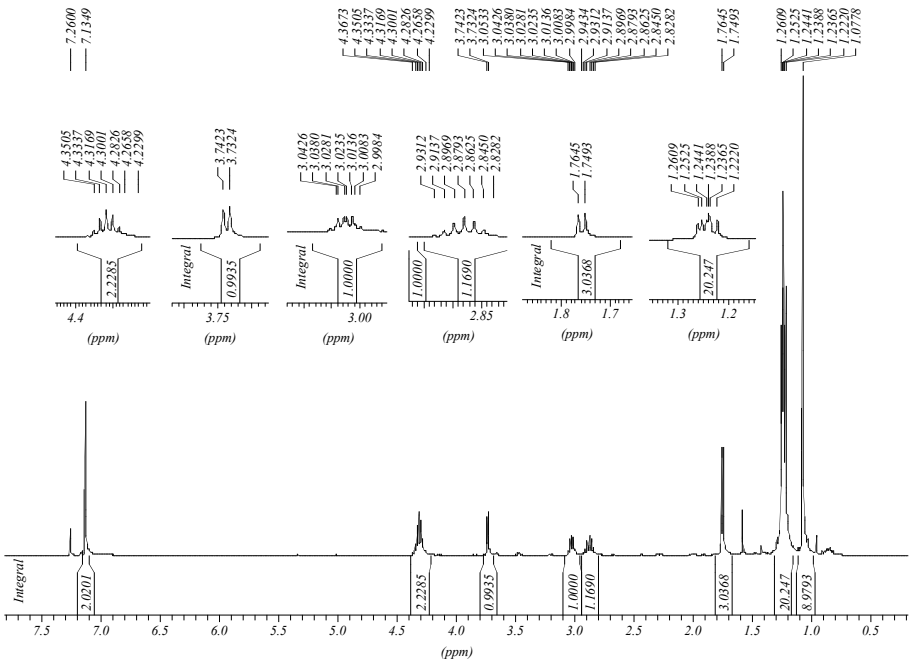

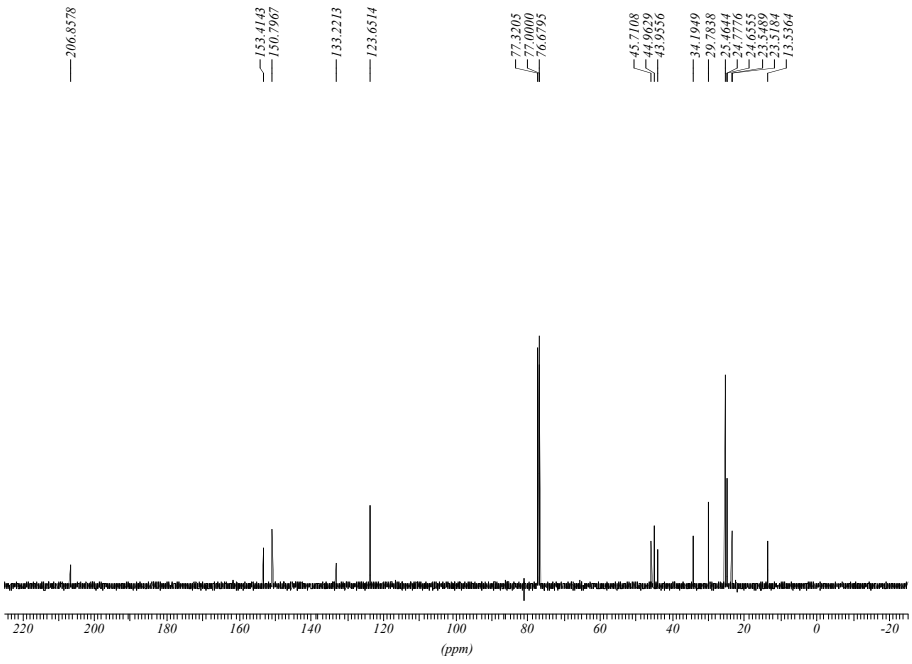

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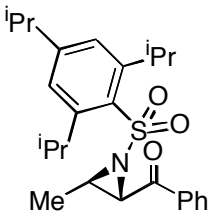

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