Supporting Information

Generation of All Carbon Quaternary Centers via Catalytic Asymmetric Hydrovinylation. New Approaches to the Exocyclic Side Chain Stereochemistry Problem

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General methods. Reactions requiring air-sensitive manipulations were conducted under an inert atmosphere of nitrogen by using Schlenk techniques or a Vacuum Atmospheres drybox. Methylene chloride was distilled from calcium hydride under nitrogen and stored over molecular sieves. Tetrahydrofuran was distilled under nitrogen from sodium/benzophenone ketyl. All olefins were made from Wittig reaction of the corresponding ketones with triphenylphosphonium bromide in the presence of *n*-Buli in THF at reflux. Na⁺[[3,5-(CF₃)₂C₆H₃]₄B]⁻ (Na⁺ - BARF)¹, ligands **L1**², **L3**³, **L4**⁴ and **L5**⁴ were prepared according to the literature. Ethylene (99.5%) was purchased from Matheson Inc., and passed through Drierite before use. Analytical TLC was performed on E. Merck precoated (0.25 mm) silica gel 60 F₂₅₄ plates. Flash column chromatography was carried out on silica gel 40 (Scientific Adsorbents Incorporated, Microns Flash). Enantiomeric excesses of chiral compounds were determined by chiral gas chromatographic analyses, which were performed on a Hewlett-Packard 5890 equipped with Cyclodex B (25 m x 0.25 mm, 0.12 μm film thickness) capillary GC column purchased from Chrompack and a FID detector connected to a HP 3396 integrator. Helium was used as the carrier gas. Optical rotations were recorded on a Perkin-Elmer Model 241 polarimeter at the sodium D line in chloroform.

Typical procedure for asymmetric hydrovinylation of substituted vinylarenes: To a solution of [(allyl)NiBr]₂ (1.8 mg, 0.005 mmol, or 4.5 mg, 0.0125 mmol for substrate **8**) in CH₂Cl₂ (1 mL) was added a solution of ligand (0.01 mmol, or 0.025 mmol for substrate **8**) in CH₂Cl₂ (1 mL) at room temperature in the drybox. The resulting solution was added to a suspension of NaBARF (8.9 mg, 0.01 mmol or 22 mg, 0.025 mmol for substrate **8**) in CH₂Cl₂ (1 mL) and the mixture was stirred at room temperature for 1.5 h. Then the catalyst solution was filtered through a short pad of Celite into a flame-dried Schlenk flask and 1 mL of CH₂Cl₂ was used to rinse the Celite. The flask was taken out of drybox and cooled to the designated temperature shown in Table 2. After ethylene was introduced to the flask, a solution of substituted vinylarene (1 mmol, or 0.25 mmol for substrate **8**) in CH₂Cl₂ (3 mL) was added to the catalyst solution. After the mixture was stirred for the designated time shown in Table 2, the flask was disconnected from ethylene and 0.5 mL of saturated aqueous ammonium chloride was added to quench the reaction. The flask was allowed to warm to room temperature and the mixture was extracted with hexanes. The extracts were combined, dried over anhydrous MgSO₄ and concentrated on rotavapor. The residue was redissolved in hexanes and filtered through a short pad of silica gel using hexanes to elute the silica gel. The filtrate was collected and concentrated on rotary evaporator to give the crude products whose NMR spectra were taken without further purification.

(*R*)-3-Methyl-3-phenyl-1-pentene:

¹H NMR (500 MHz, CDCl₃) δ 7.40-7.25 (m, 4H), 7.25-7.15 (m, 1H), 6.03 (dd, *J* = 17.5, 10.5 Hz, 1H), 5.11 (d, *J* = 10.5 Hz, 1H), 5.05 (d, *J* = 17.5 Hz, 1H), 1.90-1.70 (m, 2H), 1.36 (s, 3H), 0.77 (t, *J* = 7.5 Hz, 3H); ¹³C NMR (125.7 MHz, CDCl₃) δ 147.62, 147.07, 128.18, 126.87, 125.84, 111.92, 44.69, 33.57, 24.51, 9.08; Enantiomeric excess: 95%, GC conditions: 40 min at 70°C, 0.5°C/min, 40 min at 90°C, retention time: 65.91 min (*R*), 67.71 min (*S*); [α]_D²⁰ = -20.1 (*c* 1.04, CHCl₃) (Literature⁵: [α]_D²⁰ = -12.5 for 92%ee (*c* 0.8, CHCl₃)).

3-Methyl-3-(4'-methylphenyl)-1-propene:

¹H NMR (500 MHz, CDCl₃) δ 7.21 (d, *J* = 7.5 Hz, 2H), 7.11 (d, *J* = 7.5 Hz, 2H), 6.01 (dd, *J* = 17.5, 11 Hz, 1H), 5.09 (d, *J* = 11 Hz, 1H), 5.03 (d, *J* = 17.5 Hz, 1H), 2.32 (s, 3H), 1.90-1.70 (m, 2H), 1.34 (s, 3H), 0.77 (t, *J* = 6.5 Hz, 3H); ¹³C NMR (125.7 MHz, CDCl₃) δ 147.25, 144.65, 135.25, 128.88, 126.74, 111.70, 44.33, 33.54, 24.53, 21.01, 9.07; HRMS (LCT electrospray) *m/z* 197.1302 ([M+Na]⁺, exact mass calcd for C₁₃H₁₈Na 197.1306); Enantiomeric excess: 90%, GC conditions: 85°C isothermal, retention time: 53.69 min, 55.96 min; [α]_D²⁰ = -22.1 (*c* 1.28, CHCl₃).

3-Methyl-3-(4'-chlorophenyl)-1-propene:

¹H NMR (500 MHz, CDCl₃) δ 7.35-7.20 (m, 4H), 6.00 (dd, *J* = 17.5, 11 Hz, 1H), 5.14 (d, *J* = 11 Hz, 1H), 5.05 (d, *J* = 17.5 Hz, 1H), 1.90-1.70 (m, 2H), 1.36 (s, 3H), 0.78 (t, *J* = 7.5 Hz, 3H); ¹³C NMR (125.7 MHz, CDCl₃) δ 146.57, 146.12, 131.63, 128.38, 128.24, 112.36, 44.46, 33.57, 24.56, 8.98; Enantiomeric excess: 90%, GC conditions: 105°C isothermal, retention time: 57.68 min, 62.15 min; [α]_D²⁰ = -21.5 (*c* 1.25, CHCl₃).

3,4-Dimethyl-3-phenyl-1-propene:

¹H NMR (500 MHz, CDCl₃) δ 7.40-7.25 (m, 3H), 7.25-7.10 (m, 2H), 6.19 (dd, J = 17.5, 11 Hz, 1H), 5.19 (d, J = 11 Hz, 1H), 5.06 (d, J = 17.5 Hz, 1H), 2.25-2.15 (m, 1H), 1.35 (s, 3H), 0.86 (d, J = 7.0 Hz, 3H), 0.78 (d, J = 7 Hz, 3H); ¹³C NMR (125.7 MHz, CDCl₃) δ 148.37, 144.88, 128.11, 126.79, 125.67, 113.28, 47.60, 36.29, 20.66, 18.29, 17.88; Enantiomeric excess: 97%, GC conditions: 60 min at 70°C, 0.5°C/min, 60 min at 90°C, retention time: 101.39 min, 102.99 min.

3-Methyl-3-phenyl-1-octene:

¹H NMR (500 MHz, CDCl₃) δ 7.40-7.28 (m, 4H), 7.25-7.15 (m, 1H), 6.05 (dd, J = 17.5, 10.5 Hz, 1H), 5.10 (d, J = 10.5 Hz, 1H), 5.04 (d, J = 17.5 Hz, 1H), 1.85-1.65 (m, 2H), 1.37 (s, 3H), 1.35-1.10 (m, 6H); 0.88 (t, J = 7.5 Hz, 3H); ¹³C NMR (125.7 MHz, CDCl₃) δ 147.91, 147.36, 128.16, 126.75, 125.79, 111.67, 44.45, 41.28, 32.74, 25.13, 24.29, 22.71, 14.22; HRMS (LCT electrospray) m/z 225.1618 ([M+Na]⁺, exact mass calcd for C₁₅H₂₂Na 225.1619); Enantiomeric excess: 50~55% via Mosher esters of hydroboration product: ¹⁵F NMR (376.5 MHz, CDCl₃) δ -71.30 (one diastereomer), -71.31 (the other diastereomer); ¹³C NMR (125.7 MHz, CDCl₃, inverse-gated decoupling) δ 24.10 (one diastereomer), 24.04 (the other diastereomer); $[\alpha]_D^{20}$ = -6.9 (c 1.06, CHCl₃).

3-Methyl-3-(2'-naphthyl)-1-propene:

¹H NMR (500 MHz, CDCl₃) δ 7.85-7.75 (m, 3H), 7.73 (s, 1H), 7.50-7.40 (m, 3H), 6.12 (dd, J = 17.5, 11 Hz, 1H), 5.16 (d, J = 11 Hz, 1H), 5.09 (d, J = 11 Hz, 1H), 2.00-1.90 (m, 1H), 1.90-1.80 (m, 1H), 1.46 (s, 3H), 0.80 (t, J = 7.5 Hz, 3H); ¹³C NMR (125.7 MHz, CDCl₃) δ 147.03, 144.97, 133.51, 131.98, 128.08, 127.64, 127.50, 125.95, 125.90, 125.50, 125.00, 112.25, 44.87, 33.44, 24.52, 9.09; Enantiomeric excess: 93%, GC conditions: 120°C isothermal, retention time: 130.79min, 132.86 min; HRMS (LCT electrospray) m/z 233.1310 ([M+Na]⁺, exact mass calcd for C₁₆H₁₈Na 233.1306); $[\alpha]_D^{20}$ = -22.9 (c 1.43, CHCl₃).

1-Methyl-1-vinylnaphthalene (10a) and 1-methyl-3,4-dihydronaphthalene:

¹H NMR (500 MHz, CDCl₃) δ 7.25-7.05 (m, aromatic, 4H), 5.96 (dd, J = 17.5, 10.5 Hz, 1H), 5.05 (d, J = 10.5 Hz, 1H), 4.84 (d, J = 17.5 Hz, 1H), 2.85-2.75 (m, 2H), 1.85-1.75 (m, 3H), 1.72-1.65 (m, 1H), 1.41 (s, 3H); Enantiomeric excess: >99%, GC conditions: 100°C isothermal, retention time: 109.34 min, 110.49 min; $[\alpha]_D^{20}$ = -35.4 (c 1.15 CHCl₃). Configuration assigned as (*R*)-(-) by comparison to $[\alpha]_D^{20}$ to closely related compounds.⁶ Example: (*R*)-1-vinyl-1-methyl-7-methoxy-1,2,3,4-tetrahydronaphthalene^{6a}: $[\alpha]_D^{20}$ = -21.1 (c 3.8, CHCl₃); ¹H NMR (500 MHz, CDCl₃) δ 7.25-7.05 (m, aromatic, 4H), 5.87 (t, J = 3 Hz, 1H), 2.85-2.75 (m, 2H), 2.30-2.20 (m, 2H), 2.07 (s, 3H).

References

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 PROCNO 1

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1.738
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1.780
1.791
1.806
1.821
1.833
1.836
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2.349

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5.016
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5.080
5.099
5.102

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6.022
6.043

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7.201
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PROCNO 1

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Current Data Parameters
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EXNO 2
PROCNO 1

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TD 65536
SOLVENT CDCl3
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146.57
146.12

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conditions: Cyclodex B, 105°C isothermal, flow rate: 1mL/min

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oligomers formed at high catalyst loading at r.t.

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PROCNO 1

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101.390	692	PU	.172	1.10825
102.986	61749	PU	.505	98.89174

TOTAL AREA= 62441
MUL FACTOR=1.0000E+00

conditions: Cyclodex B, 60 min at 70°C, 0.5°C/min, 60 min at 90°C, flow rate: 1mL/min

Current Data Parameters
NAME 2AB-4-233
EXPNO 1
PROCNO 1
F2 - Acquisition Parameters
Date_ 20060111
Time 19.35
INSTRUM spect
PROBHD 5 mm Multinucl
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 2
SWH 10330.578 Hz
FIDRES 0.137632 Hz
AQ 3.17372 sec
RG 320
RW 48.400 usec
DE 5.00 usec
TE 300.2 K
D1 1.00000000 sec
PCREST 0.00000000 sec
MCWEX 0.01500000 sec
===== CHANNEL f1 =====
NUC1 1H
P1 14.80 usec
PL1 -1.00 dB
SFO1 500.0230878 MHz
F2 - Processing parameters
SI 32768
SF 500.0230878 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.40

Current Data Parameters
 NAME ZAB-4-233
 EXPNO 2
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 200912
 Time 19:31
 INSTRUM spect
 PROBHD 5 mm MultiPul
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 170
 DS 4
 SWH 30030.049 Hz
 FIDRES 0.458222 Hz
 AQ 1.0312244 sec
 RG 3649.1
 DW 15.650 usec
 DE 6.00 usec
 TE 300.2 K
 D1 2.000000 sec
 d11 0.030000 sec
 DELTA 1.8988998 sec
 MCREST 0.0000000 sec
 MCWRK 0.01500000 sec

***** CHANNEL f1 *****
 NUC1 13C
 P1 13.00 usec
 PL1 3.00 dB
 SFO1 125.7627020 MHz

***** CHANNEL f2 *****
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 100.00 usec
 PL2 -1.00 dB
 PL12 18.80 dB
 PL13 120.00 dB
 SFO2 500.0220001 MHz

F2 - Processing parameters
 SI 32768
 SF 125.7301121 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.00

Signal at delta -71.28 is due to an unidentified impurity

Current Data Parameters
NAME 19F-235
EXPNO 3
PROCNO 1

F2 - Acquisition Parameters
Date_ 20060207
Time_ 9.54
INSTRUM spect
PROBHD 5 mm Multinucl
PULPROG zgpg30
TD 131072
SOLVENT CDCl3
NS 16
DS 4
SWH 75187.969 Hz
FIDRES 0.573639 Hz
AQ 0.8716788 sec
RG 1149.4
DW 6.650 use
TE 299.2 K
D1 1.00000000 sec
d11 0.03000000 sec
d12 0.00002000 sec

===== CHANNEL f1 =====
NUC1 19f
P1 19.50 use
PL1 -4.00 dB
SFO1 376.4983540 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
P2 100.00 use
PL2 -4.00 dB
PL12 18.00 dB
SFO2 400.1316005 MHz

F2 - Processing parameters
SI 65536
SF 376.4982565 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

— -71.31

— -71.29

— -71.28

Signal at delta -71.28 is due to an unidentified impurity

```

Current Data Parameters
NAME      19F-240
EXPNO     3
PROCNO    1

F2 - Acquisition Parameters
Date_     20060207
Time      10.03
INSTRUM   spect
PROBHD    5 mm Multinucl
PULPROG   zgpg30
TD         131072
SOLVENT   CDCl3
NS         16
DS         4
SWH        75187.969 Hz
FIDRES     0.573639 Hz
AQ         0.871678 sec
RG         1149.4
DM         6.650 usec
DE         6.00 usec
TE         299.2 K
D1         1.00000000 sec
d11        0.03000000 sec
d12        0.0002000 sec

===== CHANNEL f1 =====
NUC1       19F
P1         19.50 usec
PL1        -4.00 dB
SFO1       376.4983540 MHz

===== CHANNEL f2 =====
CPDPRG2    waltz16
NUC2       1H
P2         100.00 usec
PL2        -4.00 dB
SFO2       400.1316005 MHz

F2 - Processing parameters
SI         65536
SF         376.4982565 MHz
WDW        EM
SSB        0
LB         0.30 Hz
GB         0
PC         1.00
  
```

Current Data Parameters
 NAME ZAB-4-235
 EXPNO 2
 PROCNO 1
 F2 - Acquisition Parameters
 Date_ 20060207
 Time 11.47
 INSTRUM spect
 PROBD 5 mm Multinucl
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 268
 DS 4
 SWH 30030.024 Hz
 FIDRES 0.458222 Hz
 AQ 1.091244 sec
 RG 2580.3
 DW 16.650 usec
 DE 6.00 usec
 TE 300.2 K
 D1 2.0000000 sec
 d11 0.0300000 sec
 DELTA 1.8999998 sec
 MCREST 0.0000000 sec
 MCWRK 0.0150000 sec
 ===== CHANNEL f1 =====
 NUC1 13C
 P1 13.00 usec
 PL1 3.00 dB
 SFO1 125.7427020 MHz
 ===== CHANNEL f2 =====
 CDDPRG2 wait16
 NUC2 1H
 P2 100.00 usec
 PL2 -1.00 dB
 PL12 18.80 dB
 PL13 120.00 dB
 SFO2 500.0220001 MHz
 F2 - Processing Parameters
 SI 32768
 SF 125.7301130 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME ZAB-4-240
 EXPNO 2
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20060210
 Time 8.18
 INSTRUM spect
 PROBHD 5 mm Multinucl
 PULPROG zgig
 TD 65536
 SOLVENT CDCl3
 NS 638
 DS 4
 SWH 30030.029 Hz
 FIDRES 0.458222 Hz
 AQ 1.0912244 sec
 RG 32768
 DR 16.650 usec
 DE 6.00 usec
 TE 305.2 K
 D1 60.0000000 sec
 d11 0.03000000 sec
 MCOREST 0.0000000 sec
 MCWRR 0.01500000 sec

===== CHANNEL f1 =====
 NUC1 13C
 PL 13.00 usec
 PL1 3.00 dB
 SFO1 125.7452166 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PL2 100.00 usec
 PL12 2.00 dB
 PL12 2.00 dB
 SFO2 500.0223001 MHz

F2 - Processing parameters
 SI 32768
 SF 125.7301110 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME ZAB-4-210
 EXPNO 2
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20060210
 Time 8.18
 INSTRUM spect
 PROBD 5 mm Multinucl
 PULPROG zgig
 TD 65536
 SOLVENT CDCl3
 NS 638
 DS 4
 SWH 30030.029 Hz
 FIDRES 0.450242 Hz
 AQ 1.091224 sec
 RG 32768
 DW 15.650 usec
 DE 6.00 usec
 TE 305.2 K
 D1 60.0000000 sec
 d11 0.0300000 sec
 MCREST 0.0000000 sec
 MCWRA 0.0150000 sec

===== CHANNEL f1 =====
 NUC1 13C
 P1 13.00 usec
 PL1 3.00 dB
 SFO1 125.7452166 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 P2 100.00 usec
 PL2 2.00 dB
 SFO2 500.0225001 MHz

F2 - Processing parameters
 SI 32768
 SF 125.7301110 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40

Current Data Parameters
 NAME ZAB-4-248
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20060208
 Time 9.12
 INSTRUM spect
 PROBD 5 mm Multinucl
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 12
 DS 2
 SWH 10330.576 Hz
 FIDRES 0.157632 Hz
 AQ 3.1719923 sec
 RG 228.1
 DW 48.400 usec
 DE 6.00 usec
 TE 300.2 K
 D1 1.00000000 sec
 MCOREST 0.00000000 sec
 MCNWK 0.01500000 sec

===== CHANNEL f1 =====
 NUC1 1H
 P1 14.80 usec
 PL1 -1.50 dB
 SFO1 500.0230678 MHz

F2 - Processing parameters
 SI 32768
 SF 500.0200118 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.40

Current Data Parameters
NAME ZAB-4-246
EXPNO 2
PROCNO 1

F2 - Acquisition Parameters
Date_ 20060208
Time 9.15
INSTRUM spect
PROBHD 5 mm Multinucl
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 233
DS 4
SWH 30030.029 Hz
FIDRES 0.819224 Hz
AQ 1.051324 sec
RG 38464
DM 16.650 usec
DE 6.00 usec
TE 300.2 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
MCREST 0.00000000 sec
MCWRX 0.01500000 sec

***** CHANNEL f1 *****
NUC1 13C
P1 13.00 usec
PL1 3.00 dB
SFO1 125.7627020 MHz

***** CHANNEL f2 *****
CPDPRG2 waltz16
NUC2 1H
PCPD2 100.00 usec
PL2 -1.00 dB
PL12 18.80 dB
PL13 120.00 dB
SFO2 500.0220001 MHz

F2 - Processing parameters
SI 32768
SF 125.7301121 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.00

Current Data Parameters
 NAME ZAB-4-192
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 200216
 Time 12:13
 INSTRUM spect
 PROBHD 5 mm Multispec
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 2
 SWH 10330.578 Hz
 FIDRES 0.157632 Hz
 AQ 3.171923 sec
 RG 143.7
 DW 48.400 usec
 DE 5.00 usec
 TE 300.2 K
 DI 1.000000 sec
 MCREST 0.000000 sec
 MCMRK 0.0150000 sec

===== CHANNEL f1 =====
 NUC1 1H
 P1 14.80 usec
 PL1 -1.00 dB
 SFO1 500.0210878 MHz

F2 - Processing Parameters
 SI 32768
 SF 500.0200116 MHz
 MDW EM
 SSB 0
 ZS 0
 GB 0.30 Hz
 PC 1.00

Current Data Parameters
 NAME ZAB-4-192
 EXPNO 2
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 2006118
 Time 16.40
 INSTRUM spect
 PROBHD 5 mm Multicore
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 164
 DS 4
 SWH 30030.029 Hz
 FIDRES 0.458222 Hz
 AQ 1.0912244 sec
 RG 3649.1
 DW 16.650 usec
 DE 6.00 usec
 TE 300.2 K
 DELTA 2.0000000 sec
 DELTA 1.8300000 sec
 MCRST 0.0000000 sec
 MCMRK 0.01500000 sec

***** CHANNEL f1 *****
 NUC1 13C
 P1 11.00 usec
 PL1 3.00 dB
 SFO1 125.7427030 MHz

***** CHANNEL f2 *****
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 100.00 usec
 PL2 -1.00 dB
 PL12 18.80 dB
 PL13 120.00 dB
 SFO2 500.0220001 MHz

F2 - Processing parameters
 SI 32768
 SF 125.730130 MHz
 EQ 0
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.00

conditions: Cyclodex B, 100°C isothermal, flow rate: 1mL/min

Closing signal file M:SIGNAL .BNA

RUN# 2680

JAN 17, 2006 11:03:27

SIGNAL FILE: M:SIGNAL.BNA

RT	AREA	TYPE	WIDTH	AREA*
74.065	24904	BU	.572	19.44577
109.337	50012	BU	.552	39.05083
110.485	53153	UU	.707	41.50341

TOTAL AREA= 128069

MUL FACTOR=1.0000E+00

Closing signal file M:SIGNAL .BNC

RUN# 2681

JAN 17, 2006 13:25:34

SIGNAL FILE: M:SIGNAL.BNC

RT	AREA	TYPE	WIDTH	AREA*
73.842	12223	PV	.179	27.04024
110.062	32980	PV	.228	72.95974

TOTAL AREA= 45203

MUL FACTOR=1.0000E+00