



Supporting Information

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Highly Enantioselective Hydrophosphonylation of Aldehydes Catalyzed by Tridentate Schiff Base-Aluminum(III) Complexes

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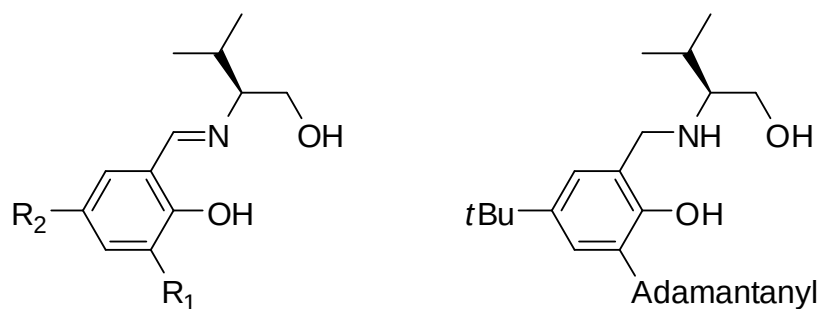
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1. General

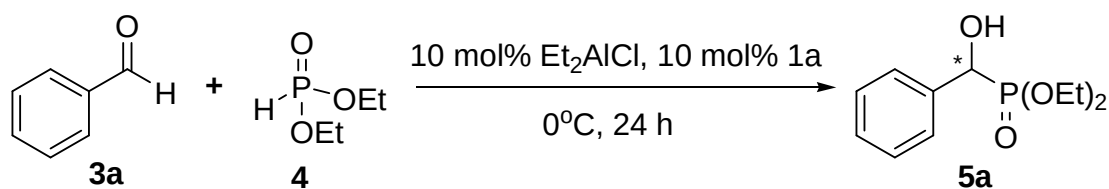
^1H NMR spectra were recorded on commercial instruments (400 MHz). Chemical shifts were reported in ppm from tetramethylsilane with the solvent resonance as the internal standard (CDCl_3 , $\delta = 7.26$). Spectra are reported as follows: chemical shift (δ ppm), multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet), coupling constants (Hz), integration, and assignment. ^{13}C NMR spectra were collected on commercial instruments (100 MHz) with complete proton decoupling. Chemical shifts are reported in ppm from the tetramethylsilane with the solvent resonance as internal standard (CDCl_3 , $\delta = 77.0$). The enantiomeric excesses were determined by HPLC analysis on chiral DAICEL CHIRALCEL AS-H, AD-H, OD-H and AD column at 254 nm unless specially indicated. Optical rotations were measured on a commercial polarimeter and reported as follows: $[\alpha]_D^T$ ($c = \text{g}/100 \text{ mL}$, solvent). Reagents obtained from commercial sources were used without further purification. CH_2Cl_2 and THF were distilled over CaH_2 and Na respectively before use. The chiral ligands **1a-1e** and **2** were prepared according to literature reported.^[1]



- 1a:** $\text{R}_1 = t\text{Bu}$, $\text{R}_2 = t\text{Bu}$
1b: $\text{R}_1 = \text{H}$, $\text{R}_2 = \text{H}$
1c: $\text{R}_1 = \text{H}$, $\text{R}_2 = t\text{Bu}$
1d: $\text{R}_1 = \text{H}$, $\text{R}_2 = \text{NO}_2$
1e: $\text{R}_1 = \text{Adamantanyl}$, $\text{R}_2 = t\text{Bu}$

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Table 1. Solvent Effect on enantioselective hydrophosphonylation of benzaldehyde.^a

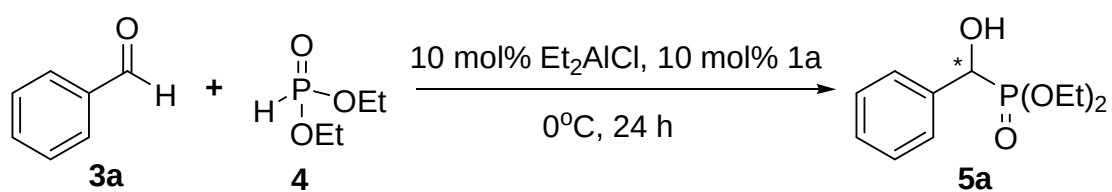


entry	solvent	yield (%) ^b	ee (%) ^c
1	THF	88	86

2	toluene	83	86
3	CH ₂ Cl ₂	59	92
4	Et ₂ O	87	83
5	CHCl ₃	35	88
6	CH ₂ ClCH ₂ Cl	51	77

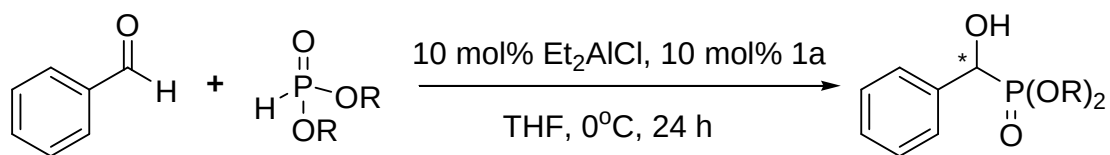
^a All reactions were carried out under nitrogen, diethyl phosphite (0.3 mmol), benzaldehyde (0.25 mmol), and 1.0 mL solvent. ^b Isolated yield. ^c Determined by HPLC.

Table 2. Effect on the amount of diethyl phosphite^a



entry	Amount of 4 (mmol)	yield (%) ^b	ee (%) ^c
1	0.3	94	84
2	0.275	88	83
3	0.25	73	85
4	0.225	71	87
5	0.2	61	86

^a All reactions were carried out under nitrogen, benzaldehyde (0.25 mmol), and 1.0 mL THF. ^b Isolated yield. ^c Determined by HPLC.

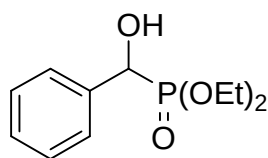
Table 3. Effect on substituent of phosphite^a

entry	R	yield (%) ^b	ee (%) ^c
1	CH ₃	95	85
2	Et	88	85
3	<i>i</i> Pr	43	75
4	Bn	75	71
5	CH ₃	82	90 ^d
6	Et	78	95 ^d

^a All reactions were carried out under nitrogen, benzaldehyde (0.25 mmol), phosphite (0.3 mmol), and 1.0 mL THF. ^b Isolated yield. ^c Determined by HPLC. ^d Reaction was performed under -20°C , using a co-solvent of 0.4 mL CH_2Cl_2 and 0.6 mL THF, catalyst was prepared *in situ* in CH_2Cl_2

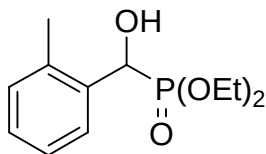
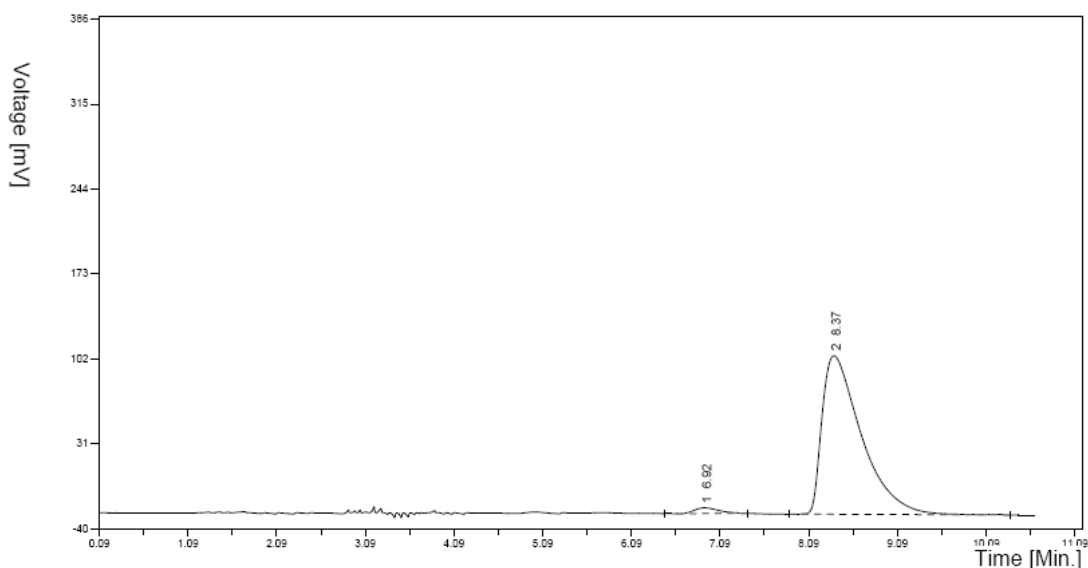
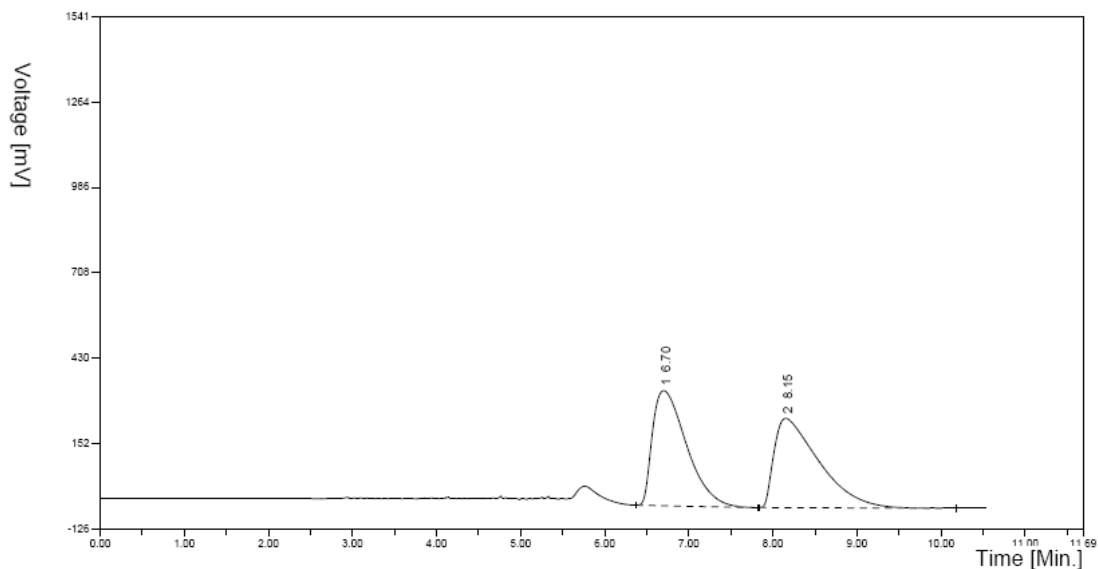
2. Typical procedure for the enantioselective hydrophosphonylation of aldehydes.

To the solution of **1e** (0.025 mmol) in 0.4 mL CH_2Cl_2 , Et_2AlCl (0.025 mmol) was added under nitrogen. After stirring at 30°C for 30 min, aldehyde (0.25 mmol) in 0.3 mL THF was added and stirred for a further 30 min. Then the diethyl phosphite (0.3 mmol) in 0.3 mL THF was added under -15°C and the reaction was stirred for 60 h. The α -hydroxyl phosphonate was direct purified by column chromatography on silica gel (ethyl acetate / petroleum ether 1:1—9:1)



(S)-Diethyl hydroxy(phenyl)methylphosphonate: white solid. The material was determined to be of 96% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min; t_r (minor) = 6.92 min, t_r (major) = 8.37 min]; $[\alpha]_{\text{D}}^{20} = -39.7^\circ$ ($c = 0.39$ in CHCl_3). ^1H NMR (300 MHz, CDCl_3): $\delta =$

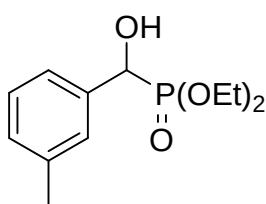
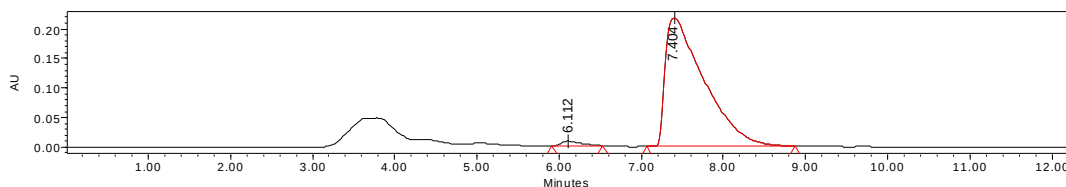
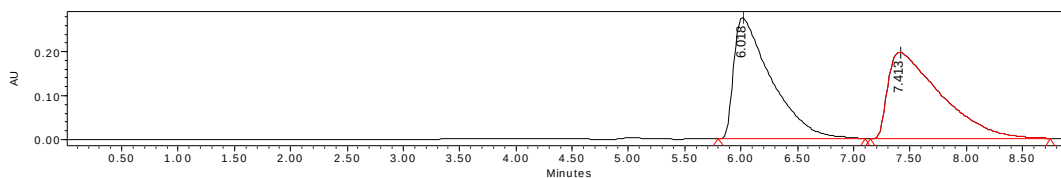
7.46-7.49 (m, 2H), 7.25-7.37 (m, 3H), 5.00 (d, $J = 11.0$ Hz, 1H), 3.94-4.08 (m, 4H), 1.14-1.27 (m, 6H) ppm.



Diethyl hydroxy(o-tolyl)methylphosphonate: white solid.

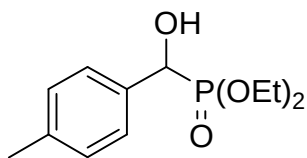
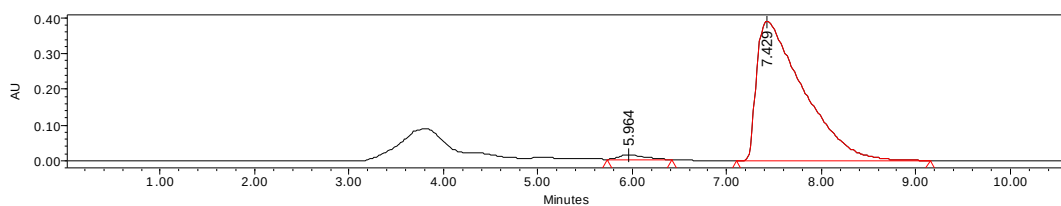
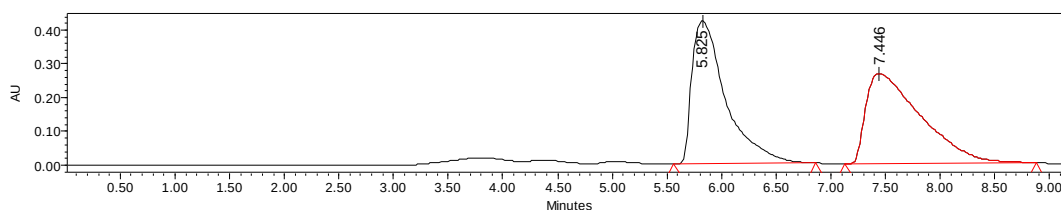
The material was determined to be of 96% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 6.112 min, t_r (major) = 7.404 min]; $[\alpha]_D^{20} = -59.1^\circ$ ($c = 0.53$ in CHCl_3). ^1H NMR (400 MHz,

CDCl_3): $\delta = 7.64$ (d, $J = 7.6$ Hz 1H), 7.16-7.29 (m, 3H), 5.29 (d, $J = 10.8$ Hz, 1H), 3.94-4.15 (m, 4 H), 2.40 (s, 3H), 1.30 (t, $J = 7.2$ Hz, 6H), 1.23 (t, $J = 7.2$ Hz, 6H) ppm. ^{13}C NMR (100 MHz, CDCl_3): $\delta = 135.8$ (d, $J = 7$ Hz), 135.0 (d, $J = 9$ Hz), 130.2, 128.0, 127.3, 126.1 (d, $J = 2$ Hz), 67.1 (d, $J = 159$ Hz), 63.7 (d, $J = 7$ Hz), 63.1 (d, $J = 7$ Hz), 19.5, 16.3 ppm; ESI-HRMS Calcd for $(\text{C}_{12}\text{H}_{19}\text{O}_4\text{P} + \text{Na}^+)$ 281.0913, Found: 281.0915.



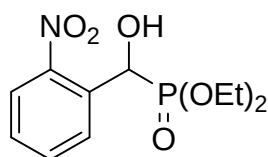
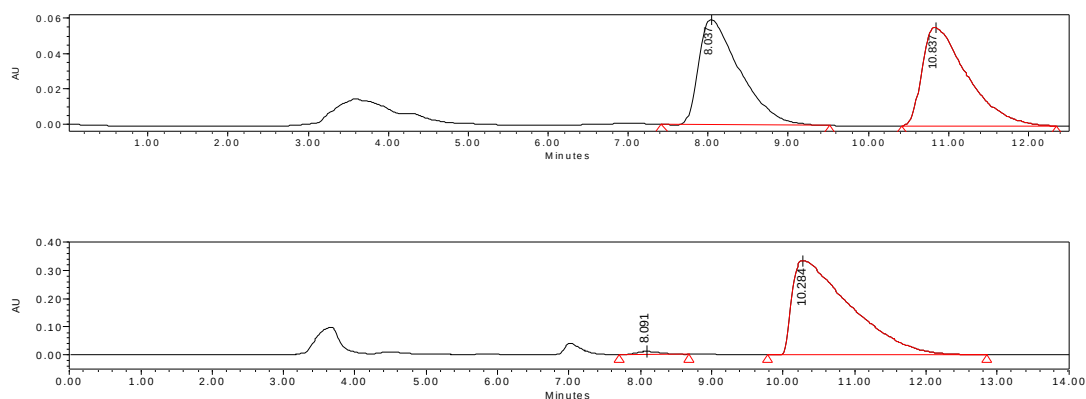
Diethyl hydroxy(*m*-tolyl)methylphosphonate: colorless oil.

The material was determined to be of 96% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 5.964 min, t_r (major) = 7.429 min]; $[\alpha]_D^{20} = -27.5^\circ$ ($c = 0.56$ in CHCl_3). ^1H NMR (400 MHz, CDCl_3): $\delta = 7.13\text{--}7.23$ (m, 3H), 7.03 (d, $J = 7.2$ Hz, 1H), 4.89 (d, $J = 10.8$ Hz, 1H), 3.84–4.02 (m, 4H), 2.28 (s, 3 H), 1.16 (dt, $J = 21.2, 7.2$ Hz, 6H) ppm.

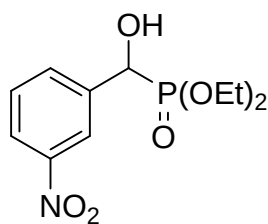
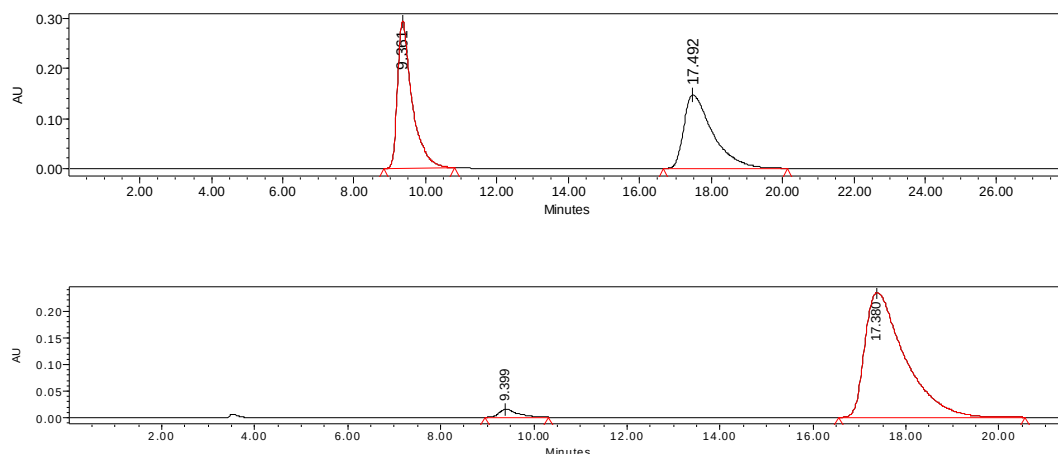


(*S*)-Diethyl hydroxy(*p*-tolyl)methylphosphonate: white solid.

The material was determined to be of 97% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min t_r (minor) = 8.091 min, t_r (major) = 10.284 min]; $[\alpha]_D^{20} = -40.0^\circ$ ($c = 0.81$ in CHCl_3). ^1H NMR (400 MHz, CDCl_3): $\delta = 7.35\text{--}7.38$ (dd, $J = 2.0, 8.0$ Hz, 2H), 7.18 (d, $J = 8.0$ Hz, 2 H), 4.98 (dd, $J = 6.0, 10.4$ Hz, 1H), 3.93–4.10 (m, 4H), 2.35 (d, $J = 1.6$ Hz, 4H), 1.28 (d, $J = 7.2$ Hz, 3H), 1.23 (d, $J = 7.2$ Hz, 3H) ppm.

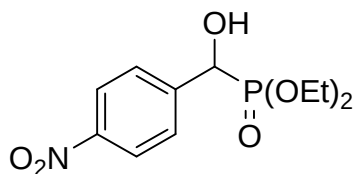
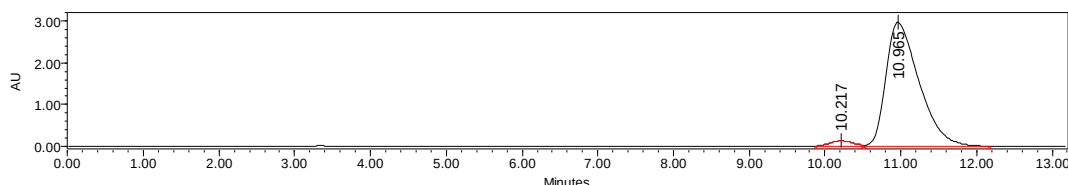
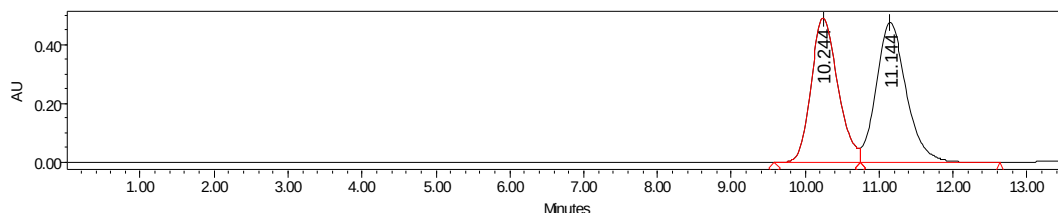


Diethyl hydroxy(2-nitrophenyl)methylphosphonate: black solid. The material was determined to be of 94% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min t_r (minor) = 9.399 min, t_r (major) = 17.380 min]; ^1H NMR (400 MHz, CDCl_3): δ = 8.03 (d, J = 7.2 Hz, 2H), 7.70 (t, J = 8.0 Hz, 1H), 7.48 (t, J = 7.6 Hz, 1H), 6.27 (dd, J = 3.2 Hz, J = 10.8 Hz, 1H), 4.92 (s, 1H), 4.05-4.19 (m, 4H), 1.28 (t, J = 7.2 Hz, 1H), 1.22 (t, J = 7.2 Hz, 1H) ppm. ^{13}C NMR (100 MHz, CDCl_3): δ = 147.6 (d, J = 5 Hz), 133.3 (d, J = 3 Hz), 133.0, 128.9 (d, J = 4 Hz), 128.3 (d, J = 4 Hz), 124.7 (d, J = 2 Hz), 65.5 (d, J = 159 Hz), 64.1 (d, J = 7 Hz), 63.3 (d, J = 7 Hz) 16.2 ppm; ESI-HRMS Calcd for ($\text{C}_{11}\text{H}_{16}\text{NO}_6\text{P} + \text{Na}^+$) 290.0788, Found: 290.0789.



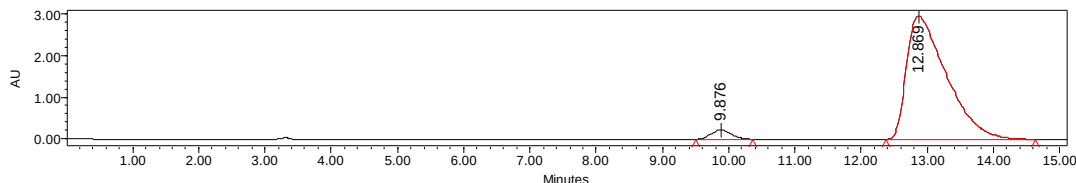
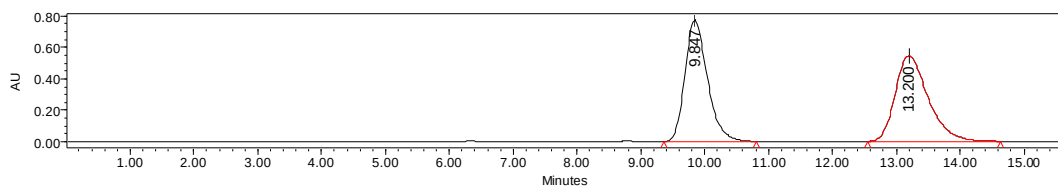
Diethyl hydroxy(3-nitrophenyl)methylphosphonate: white solid. The material was determined to be of 94% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 10.217 min, t_r (major) = 10.965 min]; $[\alpha]_D^{20}$ = -31.1° (c = 0.94 in CHCl_3). ^1H NMR (400 MHz, CDCl_3): δ = 8.40 (d, J = 2.0 Hz, 1H), 8.18 (d, J = 8.0 Hz, 1H), 7.3 (d, J = 7.6 Hz, 1H), 7.55 (t, J = 8.0 Hz, 1H), 5.17 (d, J = 11.2 Hz, 1H), 4.53 (s, 1H), 4.07-4.18 (m, 4H), 1.29 (dt, J = 7.2, 14.0 Hz, 6H) ppm. ^{13}C NMR (100

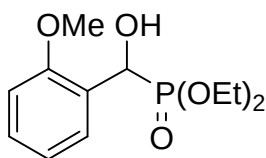
MHz, CDCl₃): δ = 148.2 (d, J = 3 Hz), 139.4 (d, J = 1 Hz), 133.1 (d, J = 5 Hz), 129.0 (d, J = 3 Hz), 122.8 (d, J = 3 Hz), 122.0 (d, J = 6 Hz), 69.8 (d, J = 159 Hz), 64.0 (d, J = 7 Hz), 63.3 (d, J = 7 Hz) 16.3 ppm; ESI-HRMS Calcd for (C₁₁H₁₆NO₆P + Na⁺) 312.0607, Found: 312.0604.



Diethyl hydroxy(4-nitrophenyl)methylphosphonate:

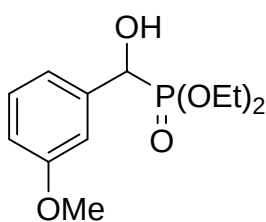
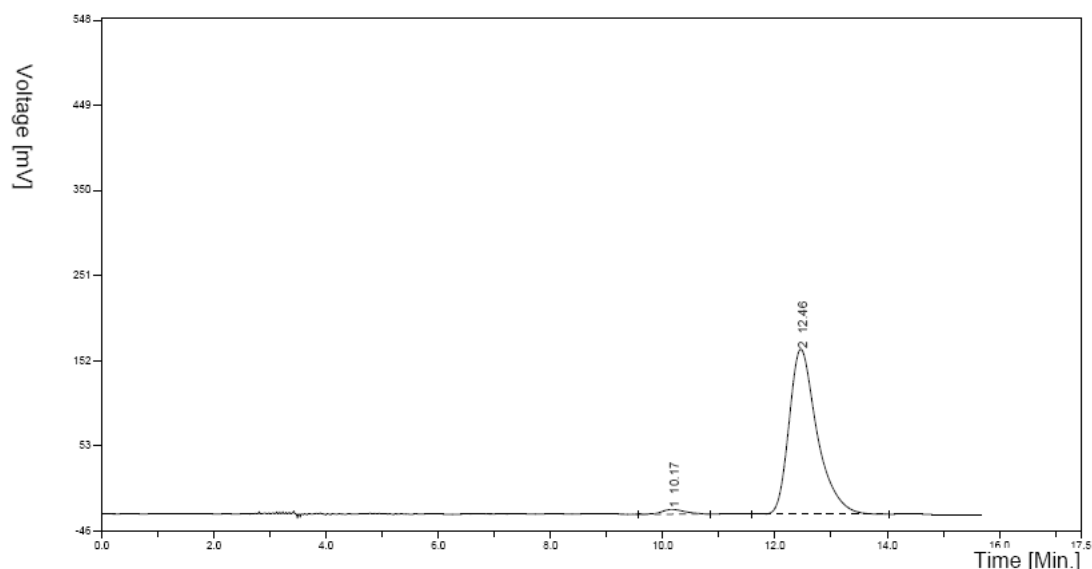
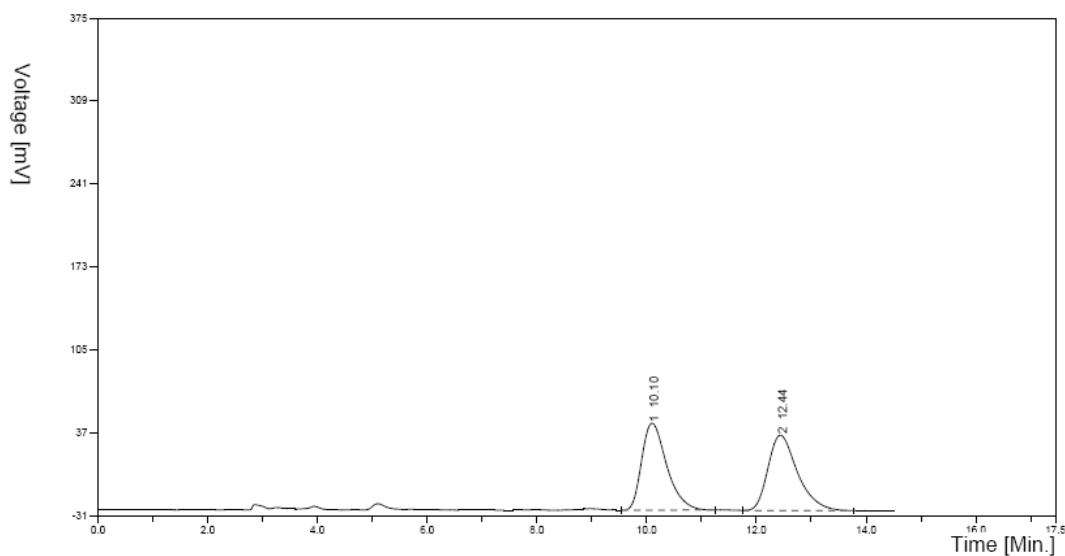
white solid. The material was determined to be of 92% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 9.876 min, t_r (major) = 12.869 min]; $[\alpha]_D^{20}$ = -42.4° (c = 0.78 in CHCl₃). ¹H NMR (400 MHz, CDCl₃). ¹H NMR (400 MHz, CDCl₃): δ = 8.23 (d, J = 8.4 Hz, 2H), 7.67 (dd, J = 2.0, 8.8 Hz, 2H), 5.17 (d, J = 12.0 Hz, 1H), 4.05-4.24 (m, 4H), 1.25-1.31 (m, 6H) ppm. ¹³C NMR (100 MHz, CDCl₃): δ = 147.52, 144.45, 127.7 (d, J = 5 Hz), 123.3, 70.1 (d, J = 158 Hz), 64.0 (d, J = 8 Hz), 63.3 (d, J = 8 Hz) 16.4 ppm; ESI-HRMS Calcd for (C₁₁H₁₆NO₆P + H) 290.0788, Found: 290.0785.





Diethyl hydroxy(2-methoxyphenyl)methylphosphonate:

colorless oil. The material was determined to be of 95% ee by chiral HPLC analysis [Chiralpak AD, 85:15 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 10.17 min, t_r (major) = 12.46 min]; $[\alpha]_D^{20} = -43.4^\circ$ ($c = 0.78$ in CHCl_3). ^1H NMR (400 MHz, CDCl_3): $\delta = 7.46$ (d, $J = 7.6$ Hz, 1H), 7.18 (t, $J = 8.0$ Hz, 1H), 6.89 (t, $J = 7.6$ Hz, 1H), 6.78 (d, $J = 8.0$ Hz, 1H), 5.38 (d, $J = 11.6$ Hz, 1H), 3.78-4.06 (m, 4H), 3.75 (s, 3H), 1.06-1.21 (m, 6H) ppm.

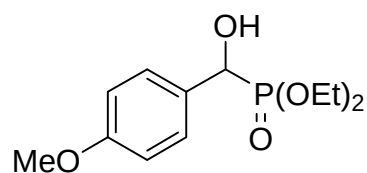
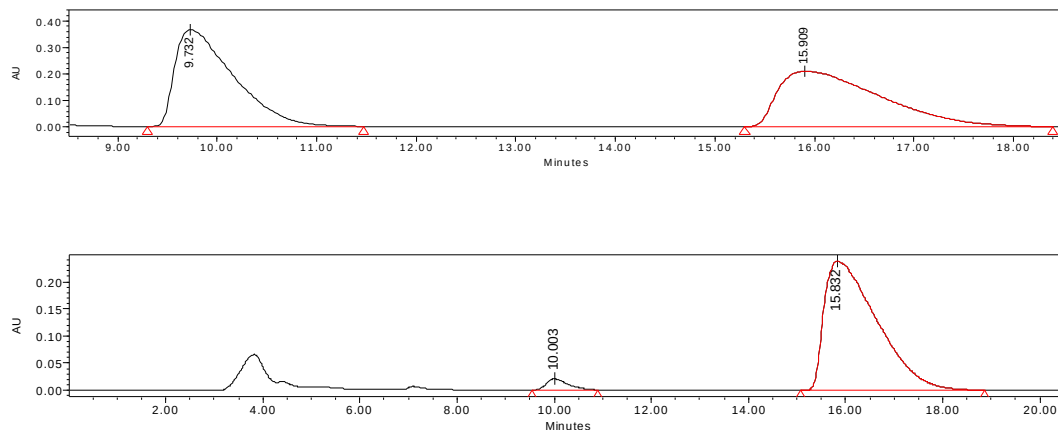


Diethyl hydroxy(3-methoxyphenyl)methylphosphonate:

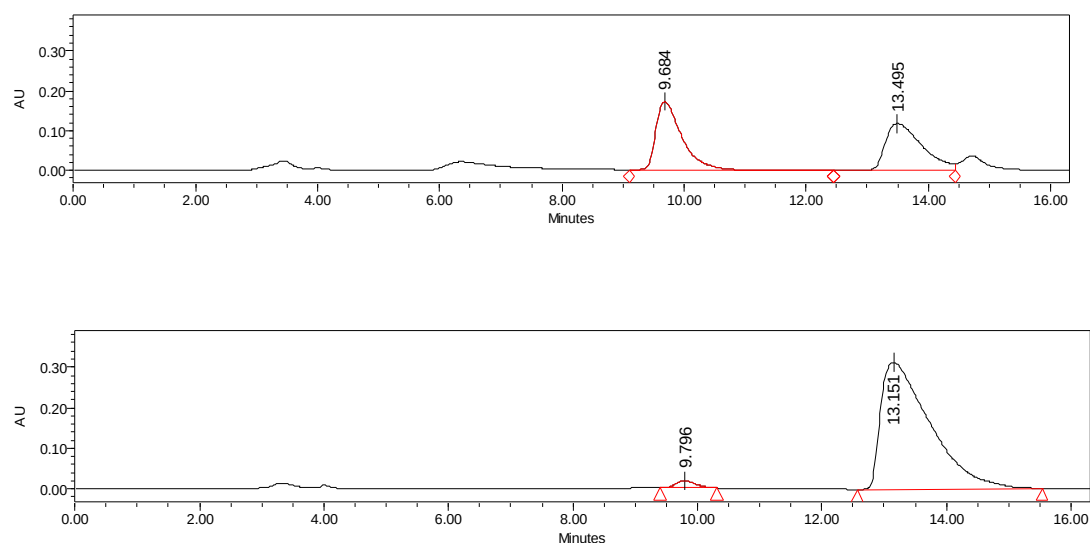
colorless oil. The material was determined to be of 93% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 10.003 min, t_r (major) = 15.832 min]; $[\alpha]_D^{20} = -13.6^\circ$ ($c = 0.50$ in CHCl_3). ^1H

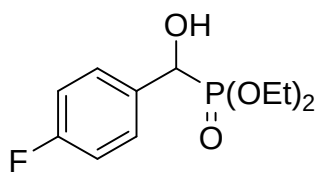
NMR (400 MHz,

CDCl₃): δ = 7.30 (t, J = 7.6 Hz, 1H), 7.08 (d, J = 8.0 Hz, 2H), 6.88 (d, J = 8.4 Hz, 1H), 5.03 (d, J = 10.8 Hz, 1H), 3.99-4.16 (m, 4H), 3.84 (s, 3 H), 1.24-1.39 (dt, J = 20.0, 6.8 Hz, 6H) ppm.



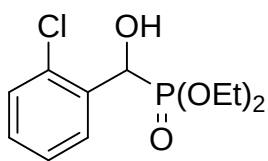
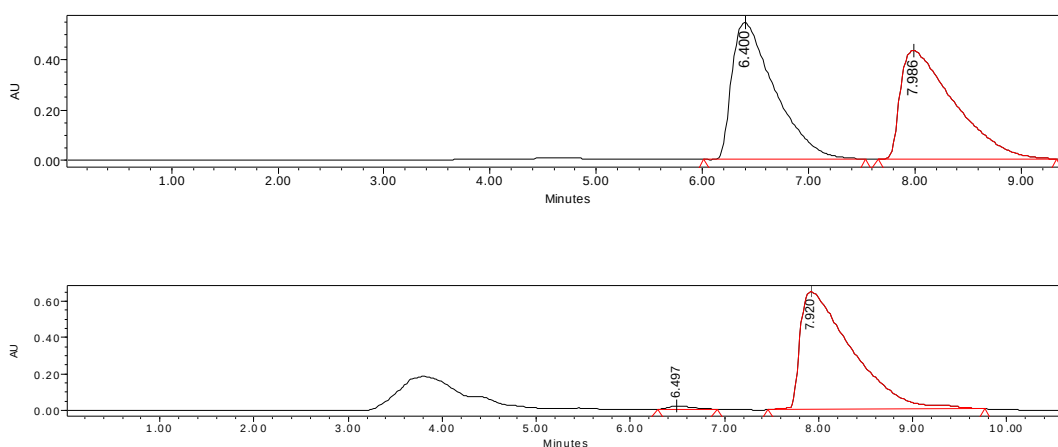
(S)-Diethyl hydroxyl(4-methoxyphenyl)methyl phosphonate: white solid. The material was determined to be of 97% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min t_r (minor) = 9.796 min, t_r (major) = 13.151 min]; $[\alpha]_D^{20}$ = -38.6° (c = 0.76 in CHCl₃). ¹H NMR (400 MHz, CDCl₃): δ = 4.3 (d, J = 6.8 Hz, 2H), 6.93 (t, J = 8.8 Hz, 2H), 4.98 (d, J = 9.6 Hz, 1H), 3.94-4.14 (m, 4H), 3.83 (s, 3H), 1.27 (dt, J = 23.2, 7.2 Hz, 6H) ppm.





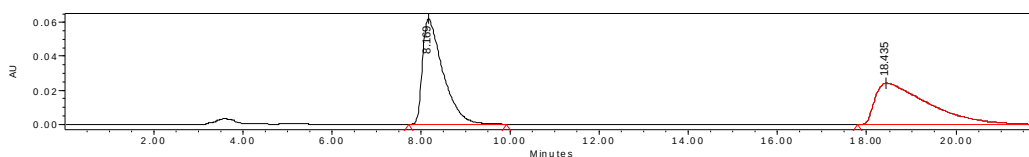
Diethyl (4-fluorophenyl)(hydroxy)methylphosphonate.

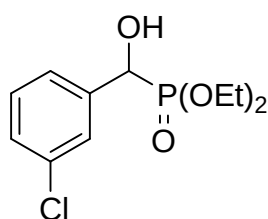
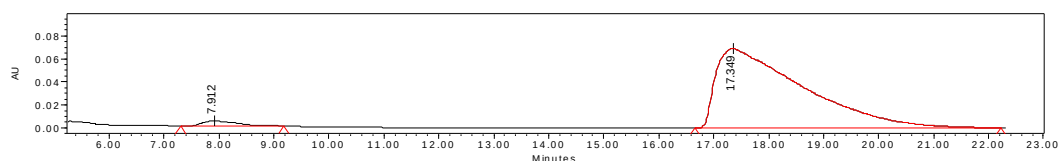
white solid. The material was determined to be of 97% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min t_r (minor) = 6.497 min, t_r (major) = 7.920 min]; $[\alpha]_D^{20} = -29.2^\circ$ ($c = 0.68$ in CHCl_3). ^1H NMR (400 MHz, CDCl_3): $\delta = 6.95$ - 6.98 (m, 2H), 6.56 (t, $J = 8.4$ Hz, 2H), 4.50 (d, $J = 10.4$ Hz, 1H), 3.47 - 3.61 (m, 4H), 0.72 - 0.79 (m, 6H) ppm. ^{13}C NMR (100 MHz, CDCl_3): $\delta = 162.5$ (d, $J = 245$ Hz), 132.6 , 128.8 , 115.1 (d, $J = 22$ Hz), 70.1 (d, $J = 158$ Hz), 63.4 (d, $J = 7$ Hz), 63.0 (d, $J = 7$ Hz), 16.4 (d, $J = 6$ Hz) ppm; ESI-HRMS Calcd for ($\text{C}_{11}\text{H}_{16}\text{FO}_4\text{P} + \text{H}$) 263.0843, Found: 263.0844.



Diethyl (2-chlorophenyl)(hydroxy)methylphosphonate:

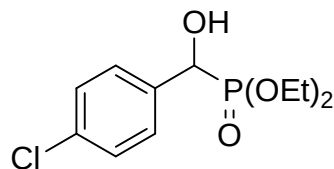
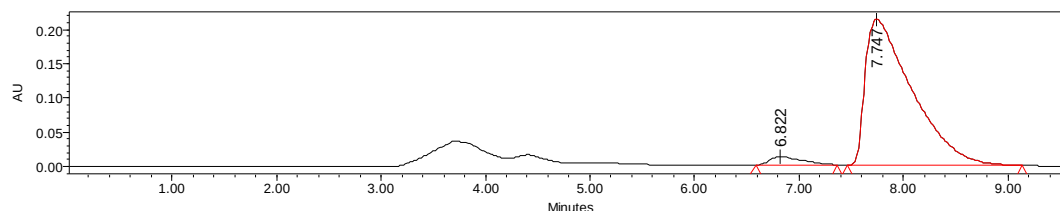
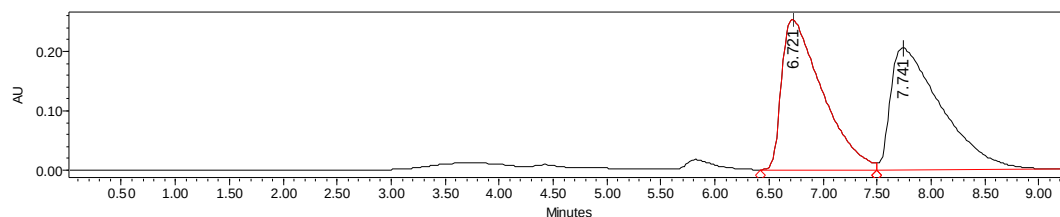
white solid. The material was determined to be of 95% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 7.912 min, t_r (major) = 17.349 min]; $[\alpha]_D^{20} = -58.6^\circ$ ($c = 0.57$ in CHCl_3). ^1H NMR (400 MHz, CDCl_3): $\delta = 7.75$ (d, $J = 7.6$ Hz, 1H), 7.25 - 7.39 (m, 3H), 5.58 (d, $J = 11.6$ Hz, 1H), 3.97 - 4.23 (m, 4H), 1.34 (t, $J = 7.2$ Hz, 3H), 1.23 (t, $J = 7.2$ Hz, 3H) ppm. ^{13}C NMR (100 MHz, CDCl_3): $\delta = 135.0$ (d, $J = 10$ Hz), 132.9 (d, $J = 8$ Hz), 129.3 , 127.0 , 66.9 (dd, $J = 155$, 6 Hz), 63.8 (d, $J = 8$ Hz), 63.2 (d, $J = 7$ Hz), 16.3 ppm; ESI-HRMS Calcd for ($\text{C}_{11}\text{H}_{16}\text{ClO}_4\text{P} + \text{H}$) 279.0547, Found: 279.0547.





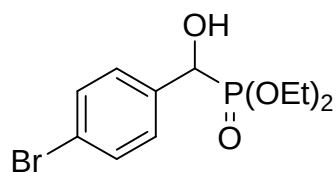
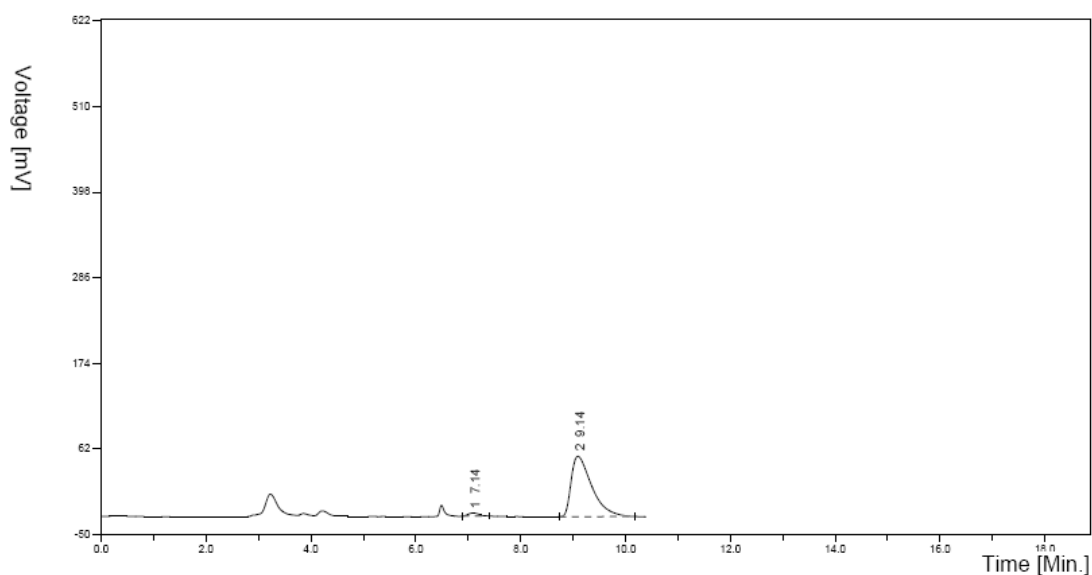
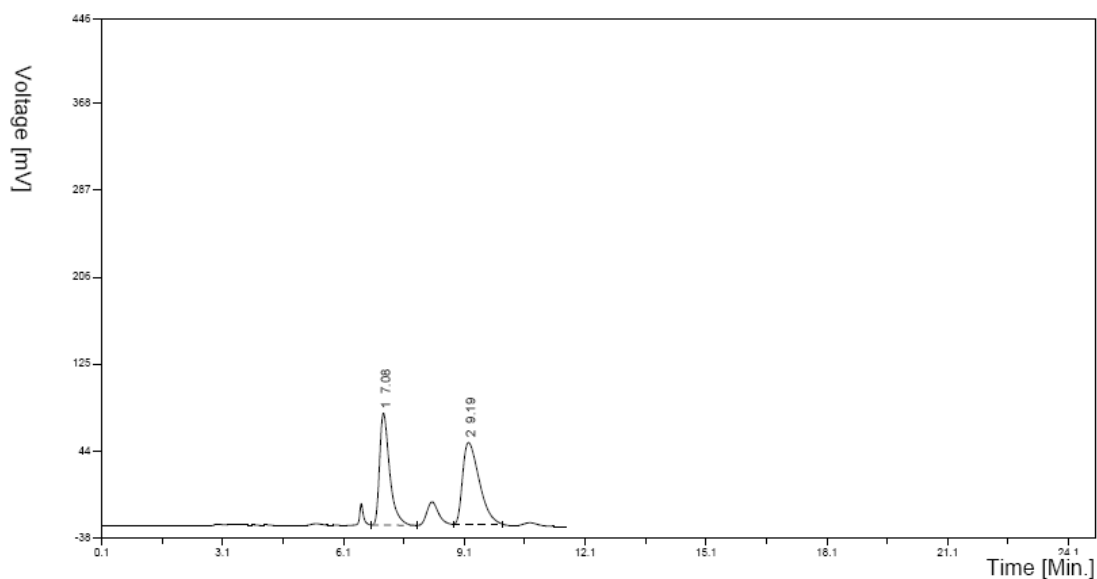
Diethyl (3-chlorophenyl)(hydroxy)methylphosphonate:

white solid. The material was determined to be of 92% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 6.822 min, t_r (major) = 7.747 min]; $[\alpha]_D^{20} = -25.3^\circ$ ($c = 0.46$ in CHCl_3). ^1H NMR (400 MHz, CDCl_3): $\delta = 7.26\text{--}7.37$ (m, 4H), 5.01 (dd, $J = 4.8, 11.2$ Hz, 1H), 4.03–4.13 (m, 4H), 1.27 (dt, $J = 7.2, 12.8.0$ Hz, 6H) ppm. ^{13}C NMR (100 MHz, CDCl_3): $\delta = 139.0$ (d, $J = 2$ Hz), 134.1 (d, $J = 3$ Hz), 129.4 (d, $J = 2$ Hz), 128.0 (d, $J = 3$ Hz), 127.2 (d, $J = 5$ Hz), 125.3 (d, $J = 5$ Hz), 69.6 (d, $J = 159$ Hz), 63.7 (d, $J = 7$ Hz), 63.2 (d, $J = 8$ Hz), 16.4 (d, $J = 6$ Hz) ppm; ESI-HRMS Calcd for $(\text{C}_{11}\text{H}_{16}\text{ClO}_4\text{P} + \text{H})$ 279.0547, Found: 279.0547.

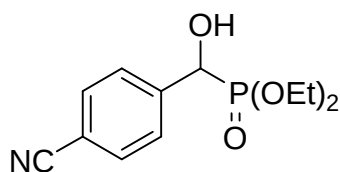
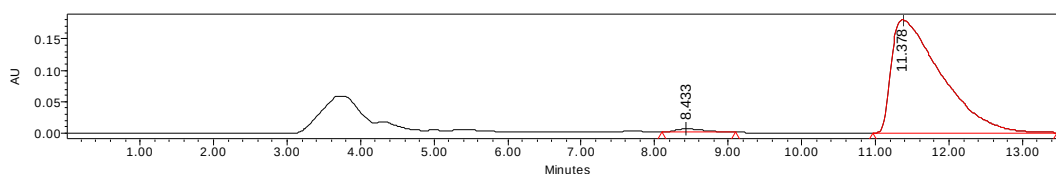
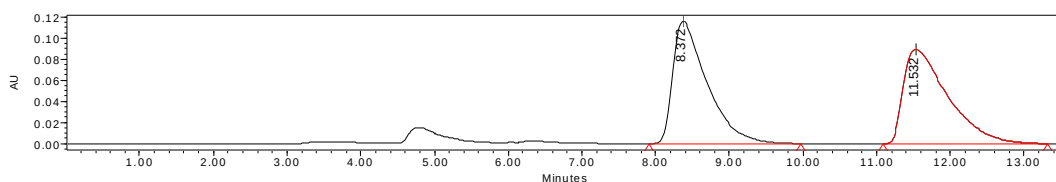


(S)-Diethyl (4-chlorophenyl)(hydroxy)methylphosphonate:

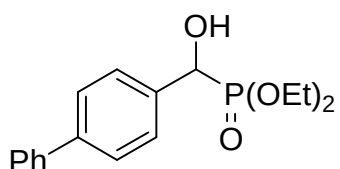
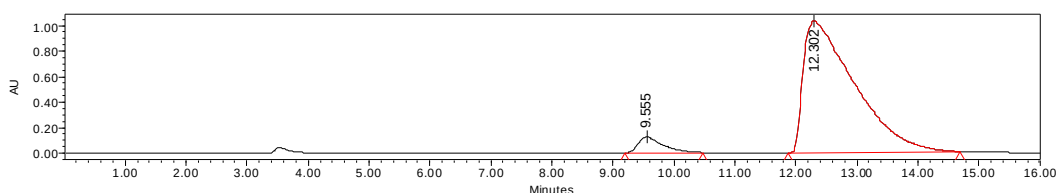
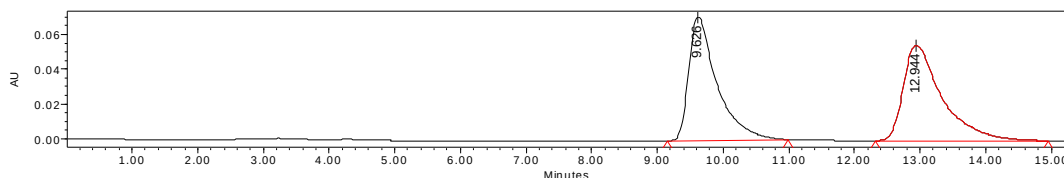
white solid. The material was determined to be of 95% ee by chiral HPLC analysis [Chiralpak AS-H, 85:15 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 7.14 min, t_r (major) = 9.14 min]; $[\alpha]_D^{20} = -43.1^\circ$ ($c = 0.39$ in CHCl_3). ^1H NMR (400 MHz, CDCl_3): $\delta = 7.33\text{--}7.44$ (m, 4H), 5.00 (dd, $J = 4.8, 10.8$ Hz, 1H), 3.99–4.17 (m, 4H), 1.22–1.30 (dt, $J = 6.8, 12.8$ Hz, 6H) ppm.



Diethyl (4-bromophenyl)(hydroxy)methylphosphonate: white solid. The material was determined to be of 97% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, 1.0 mL/min, t_r (minor) = 8.433 min, t_r (major) = 11.378 min]; $[\alpha]_D^{20} = -33.0^\circ$ ($c = 0.46$ in CHCl_3). ^1H NMR (400 MHz, CDCl_3): $\delta = 7.50$ (d, 2H), 7.36 (dd, $J = 2.0, 8.4$ Hz, 2H), 4.98 (d, $J = 10.0$ Hz, 1H), 3.99-4.12 (m, 4H), 1.26 (dt, $J = 7.2, 11.6$ Hz, 6H) ppm. ^{13}C NMR (100 MHz, CDCl_3): $\delta = 135.8$ (d, $J = 2$ Hz), 131.3 (d, $J = 3$ Hz), 128.7 (d, $J = 6$ Hz), 121.9 (d, $J = 5$ Hz), 70.2 (d, $J = 159$ Hz), 63.5 (d, $J = 7$ Hz), 63.1 (d, $J = 7$ Hz), 16.4 (d, $J = 5$ Hz) ppm; ESI-HRMS Calcd for $(\text{C}_{11}\text{H}_{16}\text{BrO}_4\text{P} + \text{H})$ 323.0042, Found: 323.0042.

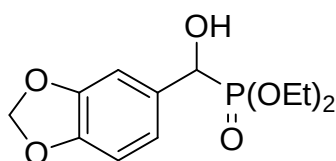
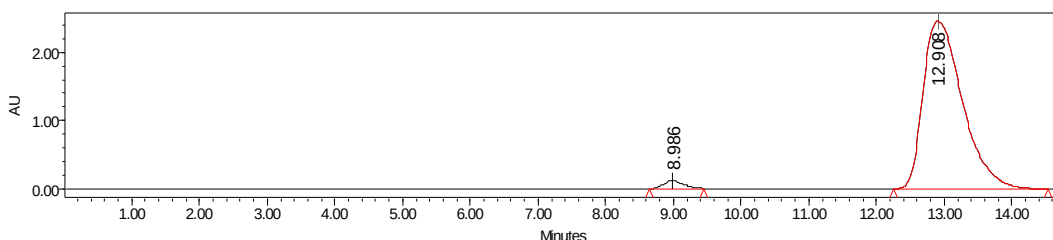
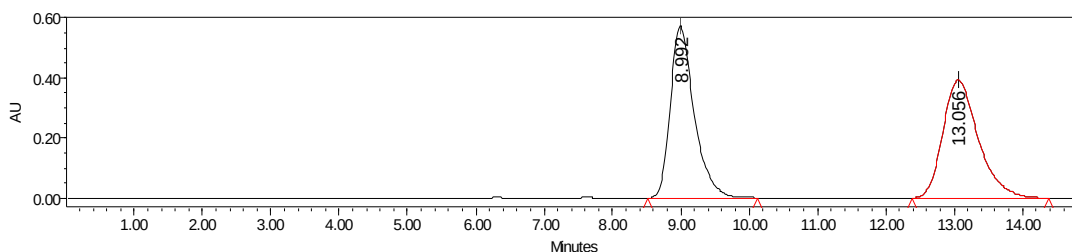


Diethyl (4-cyanophenyl)(hydroxy)methylphosphonate: white solid. The material was determined to be of 89% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 9.555 min, t_r (major) = 12.302 min]; $[\alpha]_D^{20} = -46.2^\circ$ ($c = 0.92$ in CHCl_3). ^1H NMR (400 MHz, CDCl_3): $\delta = 7.59$ -7.68 (m, 4H), 5.10 (d, $J = 12.0$ Hz, 1H), 4.03-4.15 (m, 4H), 1.24-1.30 (m, 6H) ppm. ^{13}C NMR (100 MHz, CDCl_3): $\delta = 142.5$ (d, $J = 2$ Hz), 131.9 (d, $J = 3$ Hz), 127.6 (d, $J = 5$ Hz), 118.7 (d, $J = 2$ Hz), 111.6 (d, $J = 3$ Hz), 70.1 (d, $J = 158$ Hz), 63.9 (d, $J = 7$ Hz), 16.4 (d, $J = 8$ Hz) ppm; ESI-HRMS Calcd for ($\text{C}_{12}\text{H}_{16}\text{NO}_4\text{P} + \text{H}$) 270.0890, Found: 270.0886.



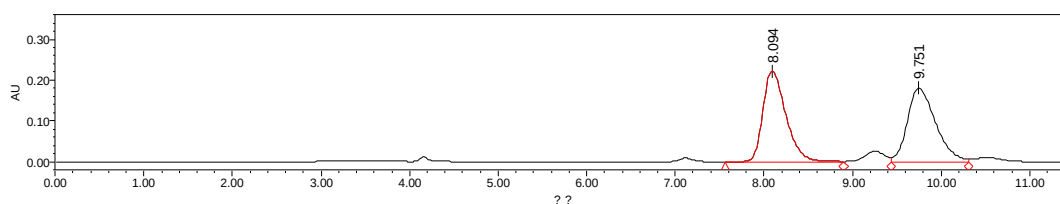
Diethyl(4-phenyl)(hydroxy)methylphosphonate: white solid. The material was determined to be of 95% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 8.986 min, t_r (major) = 12.908 min]; $[\alpha]_D^{20} = -39.9^\circ$ ($c = 0.94$ in CHCl_3). ^1H NMR (400 MHz, CDCl_3): $\delta = 7.54$ -7.63 (m, 4H), 7.44 (t, $J = 7.6$ Hz, 2H), 7.35 (t, $J = 7.6$ Hz, 2H), 7.26 (s, 1H), 5.07 (d, $J = 10.8$ Hz, 1H), 3.99-4.13 (m, 4H),

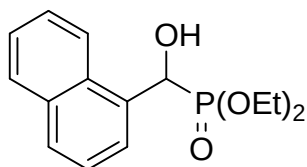
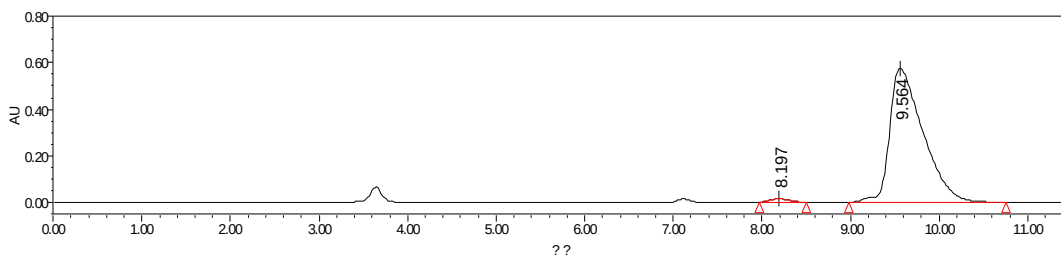
1.27 (dt, $J = 6.8, 16.8$ Hz, 6H) ppm. ^{13}C NMR (100 MHz, CDCl_3): $\delta = 140.8, 140.6, 135.7, 128.8, 127.5$ (d, $J = 6$ Hz), 127.4, 127.1, 126.9, 70.1 (d, $J = 158$ Hz), 63.4 (d, $J = 7$ Hz), 63.1 (d, $J = 7$ Hz), 16.4 ppm; ESI-HRMS Calcd for $(\text{C}_{17}\text{H}_{21}\text{O}_4\text{P} + \text{H})$ 343.1070, Found: 343.1065.



Diethyl benzo[d][1,3]dioxol-5-yl(hydroxy)methyl phosphonate: colorless oil. The material was determined to be of 97% ee by chiral HPLC analysis [Chiralpak OD-H, 90:10 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 8.197 min, t_r (major) = 9.564 min]; $[\alpha]_{\text{D}}^{20} = -21.1^\circ$ ($c =$

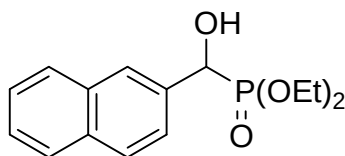
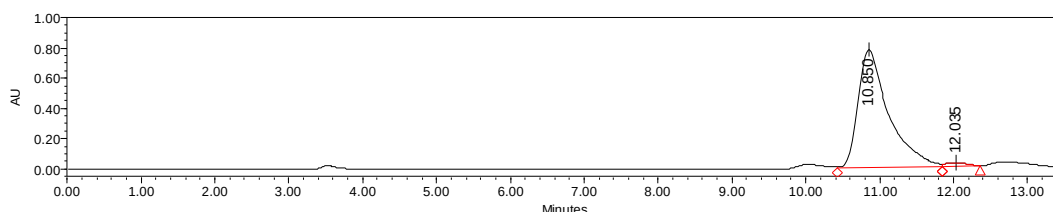
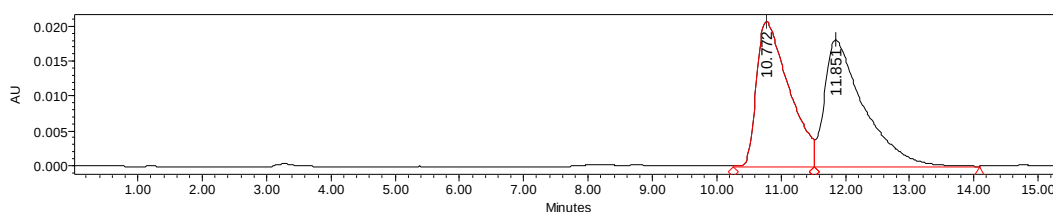
0.67 in CHCl_3). ^1H NMR (300 MHz, CDCl_3): $\delta = 6.94$ (s, 1H), 6.84 (d, $J = 8.0$ Hz, 1H), 6.70 (d, $J = 8.0$ Hz, 1H), 5.88 (s, 2H), 4.83 (d, $J = 10.0$ Hz, 1H), 3.88-4.05 (m, 4H), 1.18 (m, (dt, $J = 18.4, 7.2$ Hz, 6H) ppm.





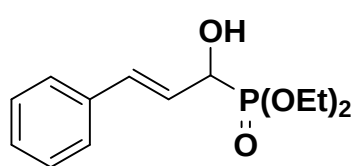
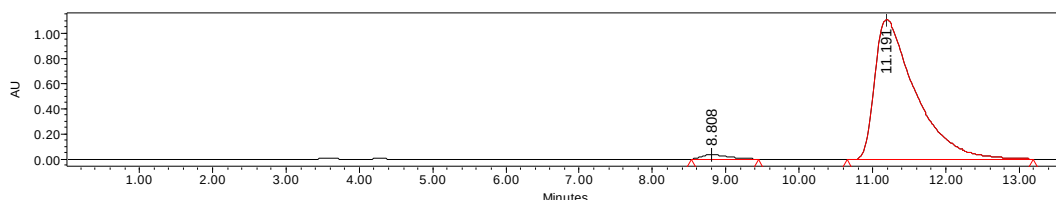
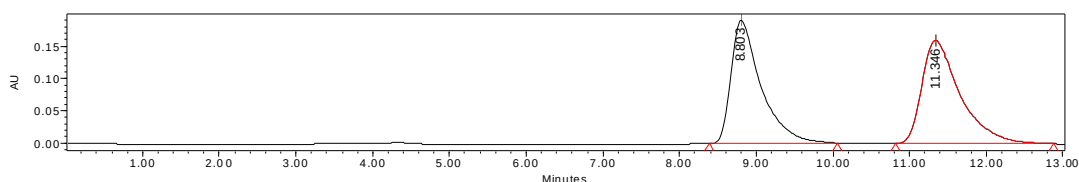
Diethyl hydroxy(naphthalen-1-yl)methylphosphonate: white solid. The material was determined to be of 96% ee by chiral HPLC analysis [Chiralpak AD-H, 90:10 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (major) = 10.850 min, t_r (minor) = 12.035 min]; $[\alpha]_D^{20} = -108.4^\circ$ ($c = 0.80$ in CHCl_3).

^1H NMR (400 MHz, CDCl_3): $\delta = 8.10$ (d, $J = 8.4$ Hz, 1H), 7.82-7.88 (m, 3H), 7.47-7.56 (m, 3H), 5.86 (d, $J = 11.6$ Hz, 1H), 3.92-4.12 (m, 3H), 3.72-3.83 (m, 1H), 3.37, (s, 1H), 1.25 (t, $J = 7.2$ Hz, 3H), 1.06 (t, $J = 7.2$ Hz, 3H) ppm.



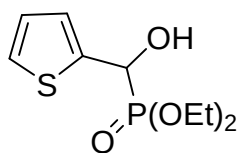
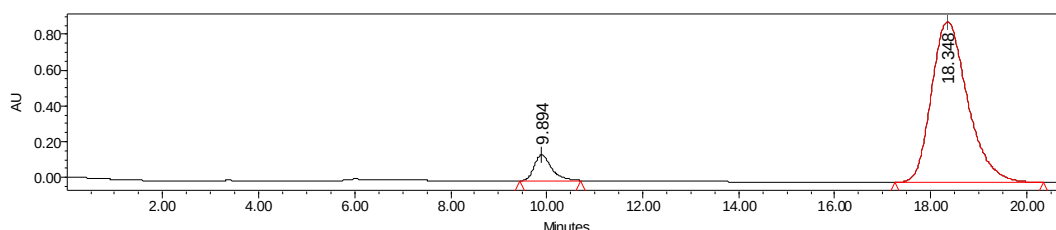
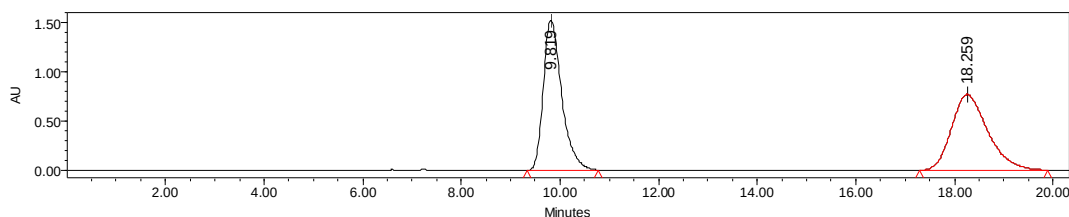
Diethyl hydroxy(naphthalen-2-yl)methylphosphonate: white solid. The material was determined to be of 96% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 8.808 min, t_r (major) = 11.191 min]; $[\alpha]_D^{20} = -31.1^\circ$ ($c = 0.94$ in CHCl_3).

^1H NMR (400 MHz, CDCl_3): $\delta = 7.96$ (s, 1H), 7.81-7.85 (m, 3H), 7.60 (d, $J = 8.8$ Hz, 1 H), 7.46-7.51 (m, 2H), 5.20 (d, $J = 11.2$ Hz, 1H), 3.95-4.10 (m, 4H), 1.24 (dt, $J = 7.2, 21.2$ Hz, 6H) ppm. ^{13}C NMR (100 MHz, CDCl_3): $\delta = 134.2, 133.1$ (d, $J = 2$ Hz), 128.1 (d, $J = 1$ Hz), 127.9, 127.7, 126.1 (d, $J = 7$ Hz), 125.0, 71.0 (d, $J = 158$ Hz), 63.4 (d, $J = 7$ Hz), 63.1 (d, $J = 7$ Hz), 16.4 ppm; ESI-HRMS Calcd for ($\text{C}_{15}\text{H}_{19}\text{O}_4\text{P} + \text{H}$) 295.1094, Found: 295.1091.



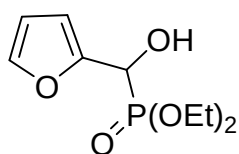
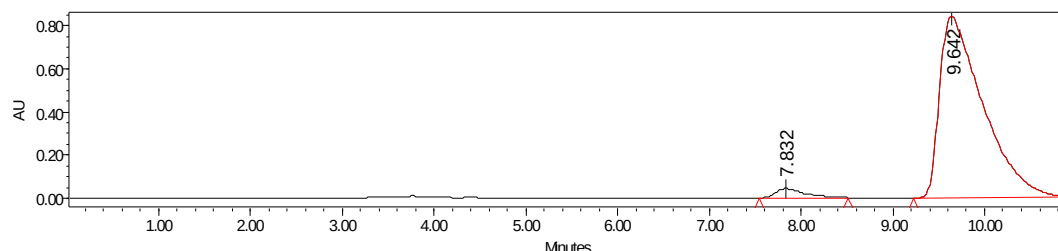
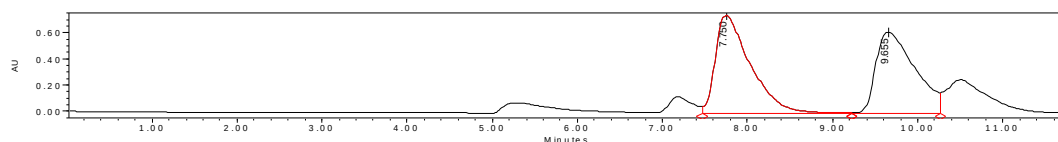
(E)-diethyl 1-hydroxy-3-phenylallylphosphonate: white solid. The material was determined to be of 85% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 9.894 min, t_r (major) = 18.348 min]; $[\alpha]_D^{20} = -11.3^\circ$ ($c = 0.54$ in CHCl_3).

^1H NMR (400 MHz, CDCl_3): $\delta = 7.24\text{--}7.42$ (m, 5 H), 6.78 (dd, $J = 4.8, 11.2$ Hz, 1H), 6.28–6.36 (m, 1H), 4.64–4.69 (m, 1H), 4.16–4.24 (m, 4H), 1.34 (t, $J = 7.2$ Hz, 6H) ppm.

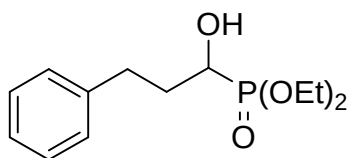
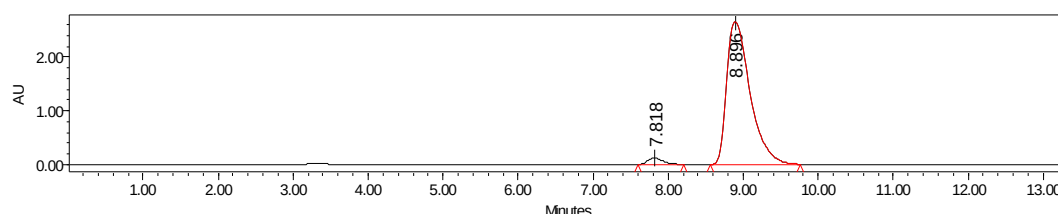
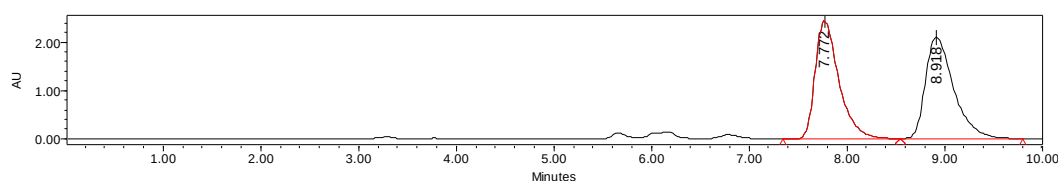


(S)-Diethyl hydroxy(thiophen-2-yl)methylphosphonate: colorless oil. The material was determined to be of 93% ee by chiral HPLC analysis [Chiralpak AS-H, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 7.832 min, t_r (major) = 9.642 min]; $[\alpha]_D^{20} = -11.3^\circ$ ($c = 0.57$ in CHCl_3).

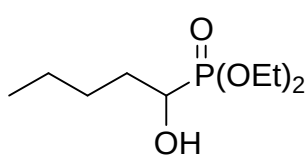
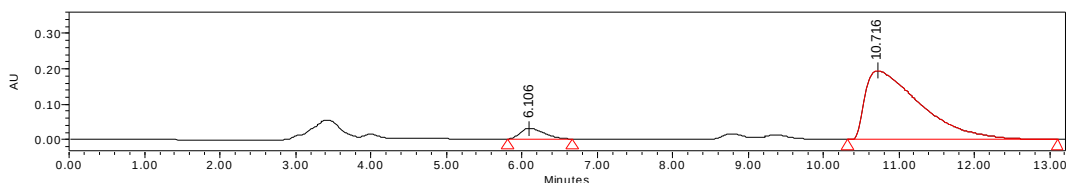
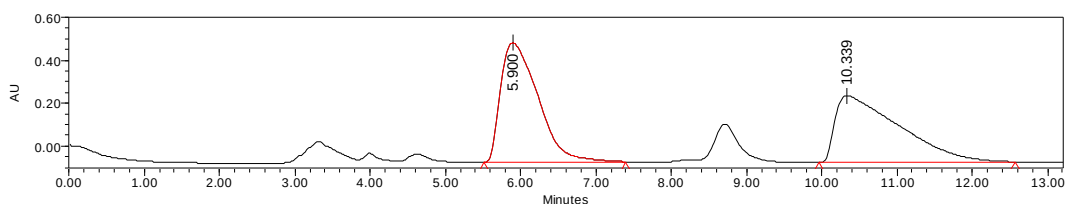
^1H NMR (400 MHz, CDCl_3): $\delta = 7.32$ (dt, $J = 1.2, 5.2$ Hz, 1H), 7.19 (t, $J = 7.2$ Hz, 1H), 7.01 (dd, $J = 4.0, 5.2$ Hz, 1H), 5.24 (d, $J = 10.8$ Hz, 1H), 4.04–4.30 (m, 4H), 1.29 (dt, $J = 6.8, 20.0$ Hz, 6H) ppm.



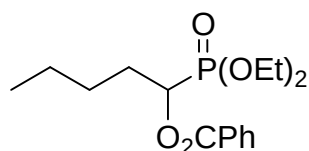
(S)-Diethyl furan-2-yl(hydroxy)methylphosphonate: colorless oil. The material was determined to be of 94% ee by chiral HPLC analysis [Chiralpak AS-H, 220 nm, 80:20 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 7.818 min, t_r (major) = 8.896 min]; $[\alpha]_D^{20} = -17.3^\circ$ ($c = 0.90$ in CHCl_3). ^1H NMR (400 MHz, CDCl_3): $\delta = 7.44$ (s, 1H), 6.51-6.53 (t, 1H), 6.39 (s, 1H), 5.00 (d, $J = 13.2$ Hz, 1H), 4.01-4.23 (m, 4H), 1.36 (t, $J = 7.2$ Hz, 3H), 1.26 (t, $J = 7.2$ Hz, 3H) ppm.



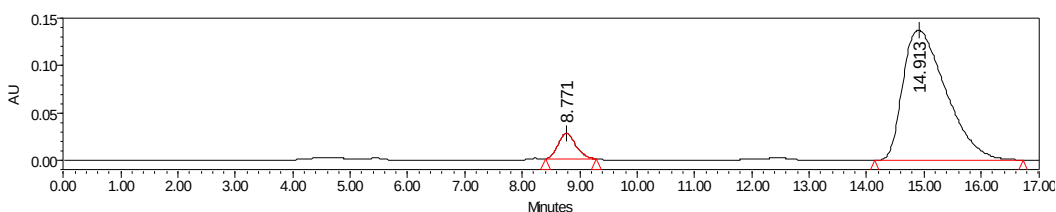
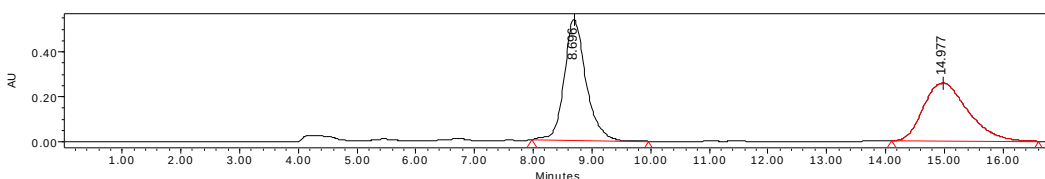
Diethyl 1-hydroxy-3-phenylpropylphosphonate: colorless oil. The material was determined to be of 87% ee by chiral HPLC analysis [Chiralpak AS-H, 90:10 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 6.106 min, t_r (major) = 10.716 min]; $[\alpha]_D^{20} = +16.5^\circ$ ($c = 0.84$ in CHCl_3). ^1H NMR (400 MHz, CDCl_3): $\delta = 7.17$ -7.31 (m, 5H), 4.11-4.21 (m, 4H), 3.82-3.87 (m, 1H), 2.92-2.99 (m, 1H), 2.70-2.78 (m, 1H), 1.99-2.08 (m, 2H), 1.29-1.35 (m, 6H) ppm.

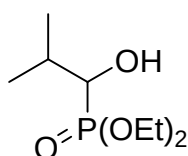


Diethyl 1-hydroxypentylphosphonate: colorless oil. ^1H NMR (400 MHz, CDCl_3): δ = 4.13-4.21 (m, 4H), 3.85 (dt, J = 5.6, 15.6 Hz, 1H), 1.58-1.80 (m, 3H), 1.32-1.41 (m, 9H), 0.82 (t, J = 7.2 Hz, 3H) ppm

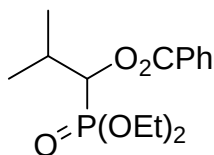


Diethyl 1-(phenylperoxy)pentylphosphonate: colorless oil. The material was determined to be of 85% ee by chiral HPLC analysis [Chiralpak AS-H, 90:10 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 8.771 min, t_r (major) = 14.913 min]; $[\alpha]_D^{20}$ = +16.0° (c = 0.75 in CHCl_3). ^1H NMR (400 MHz, CDCl_3): δ = 8.07-8.10 (m, 2H), 7.60 (t, J = 7.6 Hz, 1H), 7.47 (t, J = 8.0 Hz, 2H), 5.53 (dt, J = 4.8, 12.4 Hz, 1H), 4.13-4.21 (m, 4H), 1.96-2.18 (m, 2H), 1.28-1.44 (m, 10H), 0.89 (t, J = 7.2 Hz, 3H) ppm. ^{13}C NMR (100 MHz, CDCl_3): δ = 165.6 (d, J = 5 Hz), 133.3, 129.8, 129.5, 128.5, 68.4 (d, J = 166 Hz), 62.8 (d, J = 7 Hz), 62.6 (d, J = 6 Hz), 29.2, 27.8, 22.2, 16.5 (d, J = 5 Hz), 16.4 (d, J = 6 Hz), 13.8 ppm; ESI-HRMS Calcd for ($\text{C}_{16}\text{H}_{25}\text{O}_5\text{P} + \text{H}$) 329.1512, Found: 329.1515.

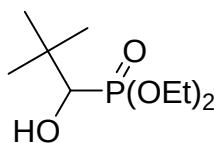
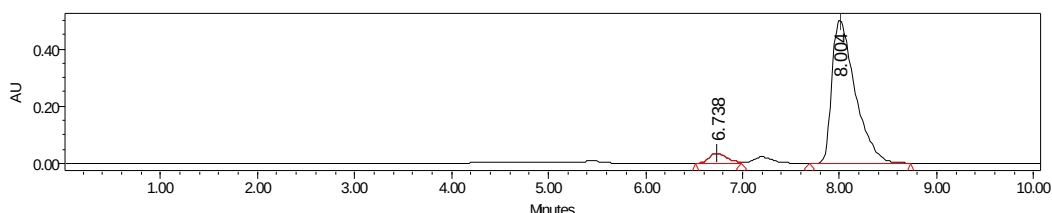
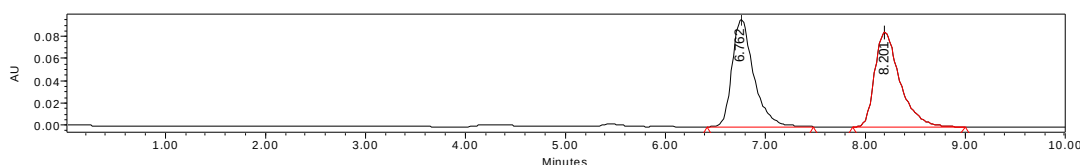




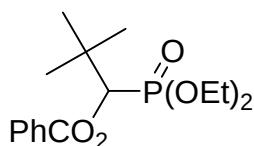
Diethyl 1-hydroxy-2-methylpropylphosphonate: colorless oil. ^1H NMR (400 MHz, CDCl_3): δ = 4.13-4.21 (m, 4 H), 3.65 (t, J = 6.4 Hz, 1H), 2.98 (s, 1H), 2.02-2.13 (m, 1H), 1.34 (t, J = 7.2 Hz, 6H), 1.06 (dd, J = 6.6, 2.4 Hz, 6H) ppm



Diethyl 2-methyl-1-(phenylperoxy)propylphosphonate: colorless oil. The material was determined to be of 90% ee by chiral HPLC analysis [Chiralpak AS-H, 90:10 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (minor) = 6.738 min, t_r (major) = 8.004 min]; $[\alpha]_D^{20}$ = -6.1° (c = 0.54 in CHCl_3). ^1H NMR (400 MHz, CDCl_3): δ = 8.08-8.11 (m, 2 H), 7.60 (t, 1H), 7.45-7.50 (t, J = 7.6 Hz, 2H), 5.37 (dd, J = 13.2, 6.0 Hz, 1H), 4.10-4.20 (m, 4H), 2.35-2.43 (m, 1H), 1.28 (dt, J = 7.2, 11.2 Hz, 6H), 1.10-1.30 (dd, J = 2, 6.8 Hz, 6H) ppm. ^{13}C NMR (100 MHz, CDCl_3): δ = 165.6 (d, J = 5 Hz), 133.3, 129.8, 129.5, 128.5, 72.9 (d, J = 164 Hz), 62.7 (d, J = 7 Hz), 62.4 (d, J = 6 Hz), 29.4 (d, J = 2 Hz), 19.8 (d, J = 9 Hz), 18.4 (d, J = 7 Hz), 16.5 (d, J = 5 Hz), 16.3 (d, J = 6 Hz) ppm; ESI-HRMS Calcd for ($\text{C}_{15}\text{H}_{23}\text{O}_5\text{P}$ + Na) 337.1175, Found: 337.1169.

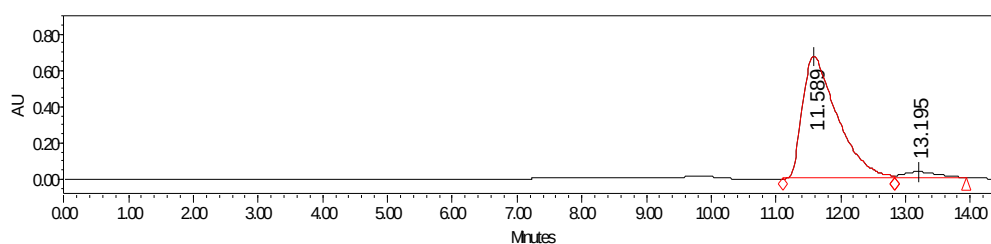
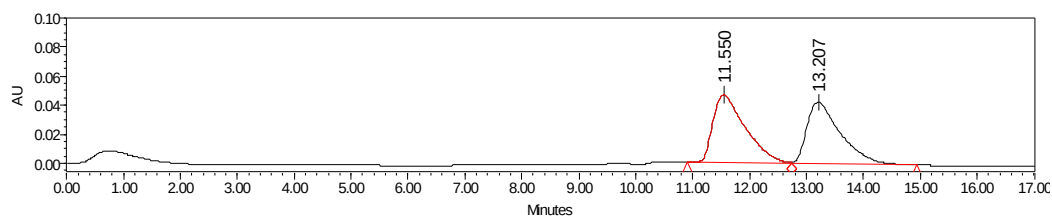


Diethyl 1-hydroxy-2,2-dimethylpropylphosphonate: colorless oil. ^1H NMR (300 MHz, CDCl_3): δ = 4.14-4.20 (m, 4H), 3.57 (t, 1 H), 1.35 (t, J = 7.2 Hz, 6H), 1.09 (s, 9H) ppm

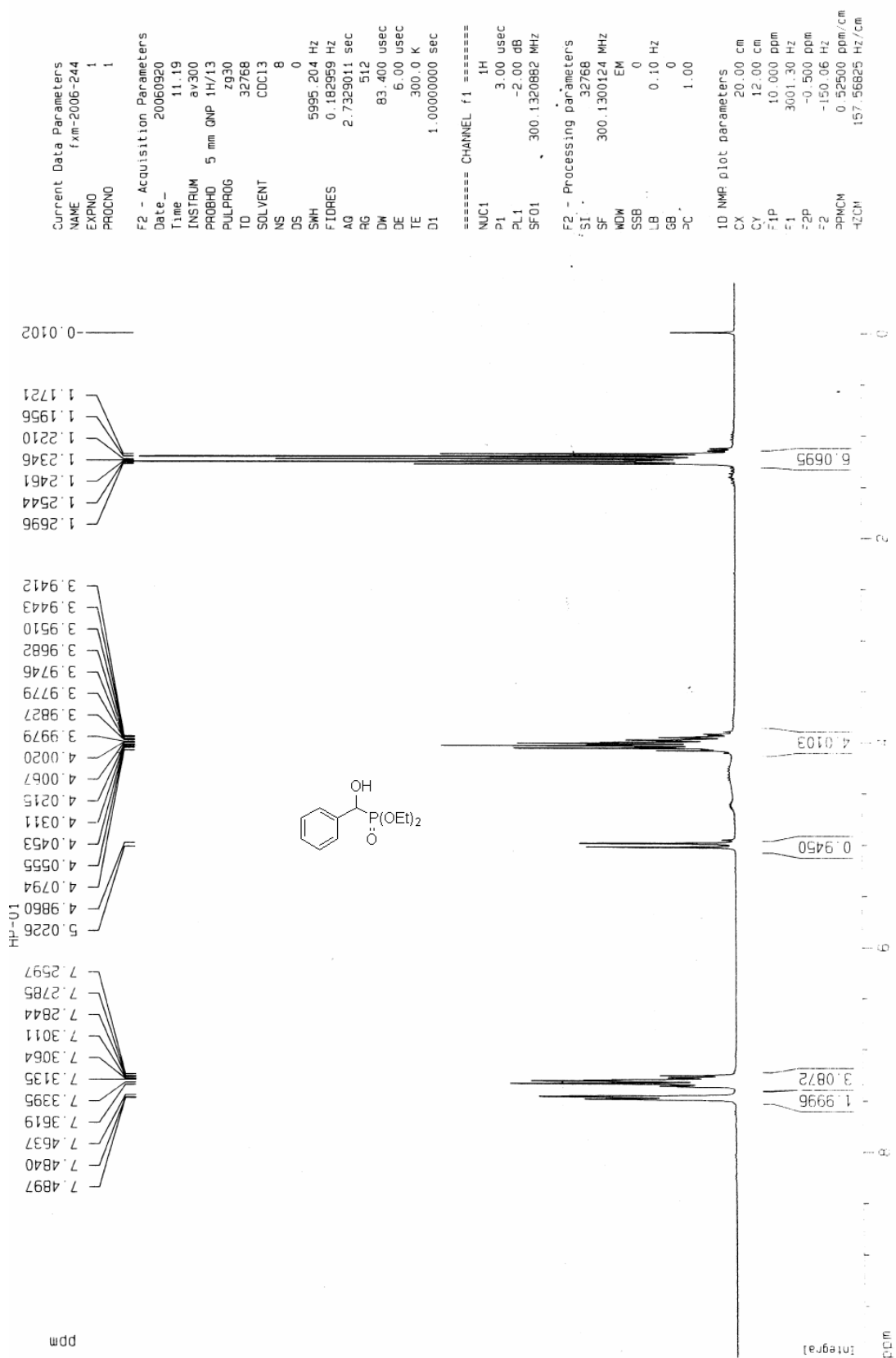


Diethyl 2,2-dimethyl-1-(phenylperoxy)propylphosphonate: colorless oil. The material was determined to be of 91% ee by chiral HPLC analysis [Chiralpak AD-H, 90:10 *n*-hexane/*i*PrOH, 1.0 mL/min, t_r (major) = 11.589 min, t_r (minor) = 13.195 min]; $[\alpha]_D^{20}$ = -4.1° (c = 0.27 in CHCl_3). ^1H NMR (400 MHz, CDCl_3): δ = 8.11 (d, 2H), 7.60 (t, J = 7.6 Hz, 1H), 7.48 (t, J = 8.0 Hz, 2H), 5.34 (d, J = 10.0 Hz, 1 H), 4.02-4.18 (m, 4H), 1.26 (dt, J = 7.2, 27.6 Hz, 6H), 1.18 (s, 9H) ppm. ^{13}C NMR

(100 MHz, CDCl₃): δ = 165.6 (d, J = 5 Hz), 133.3, 129.9, 129.5, 128.5, 72.3 (d, J = 164 Hz), 62.7 (d, J = 7 Hz), 62.4 (d, J = 7 Hz) 38.7, 29.9 (d, J = 8 Hz), 28.4 (d, J = 8 Hz), 26.0, 16.5 (d, J = 5 Hz), 16.3 (d, J = 4 Hz) ppm; ESI-HRMS Calcd for (C₁₆H₂₅O₅P + H) 329.1512, Found: 329.1509.

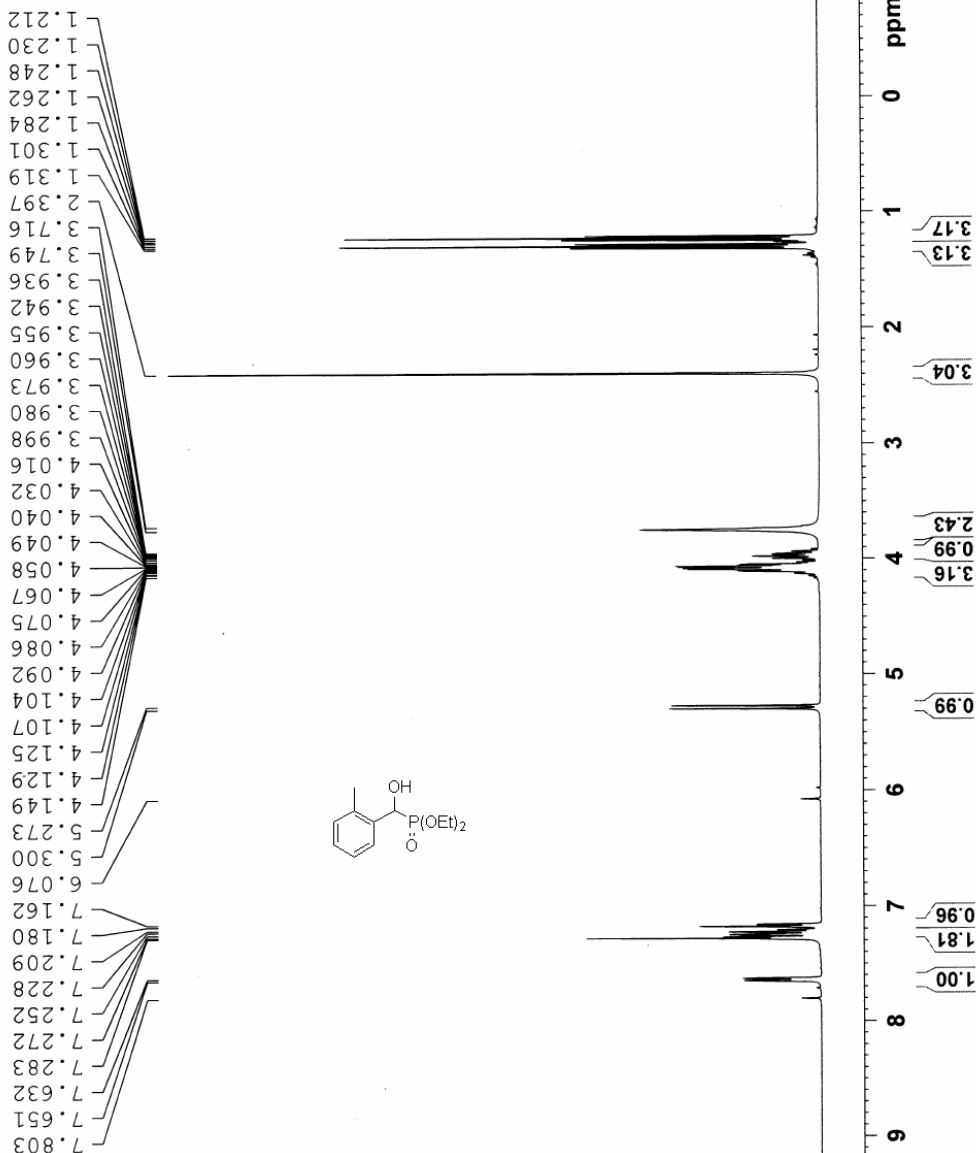


Reference : [1] a) Stirring the 3,5-di-substituted-butylsalicylaldehyde and *L*-valinol in CH₃OH for 1-2 h, remove CH₃OH under reduced pressure, Recrystallization from *n*-hexane and Et₂O afforded the ligands **1a-e**; b) T. D. Nixon, S. Dalgarno, C. V. Ward, M. Jiang, M. A. Halcrow, C. Kilner, M. Thornton-Pett, T. P. Kee, *C. R. Chim.* **2004**, 7, 809.





system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
NAME 2007-08-14 zhouxin hp-2
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20070814
Time 16.45
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8223.685 Hz
FIDRES 0.125483 Hz
AQ 3.9846387 sec
RG 181
DW 60.800 usec
DE 6.00 usec
TE 296.3 K
D1 1.00000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 12.00 usec
PL1 -2.00 dB
SFO1 400.1324710 MHz

F2 - Processing parameters
SI 32768
SF 400.1300000 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

system:AV400 OrderNO.:ZH089905 Customer:SI CHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



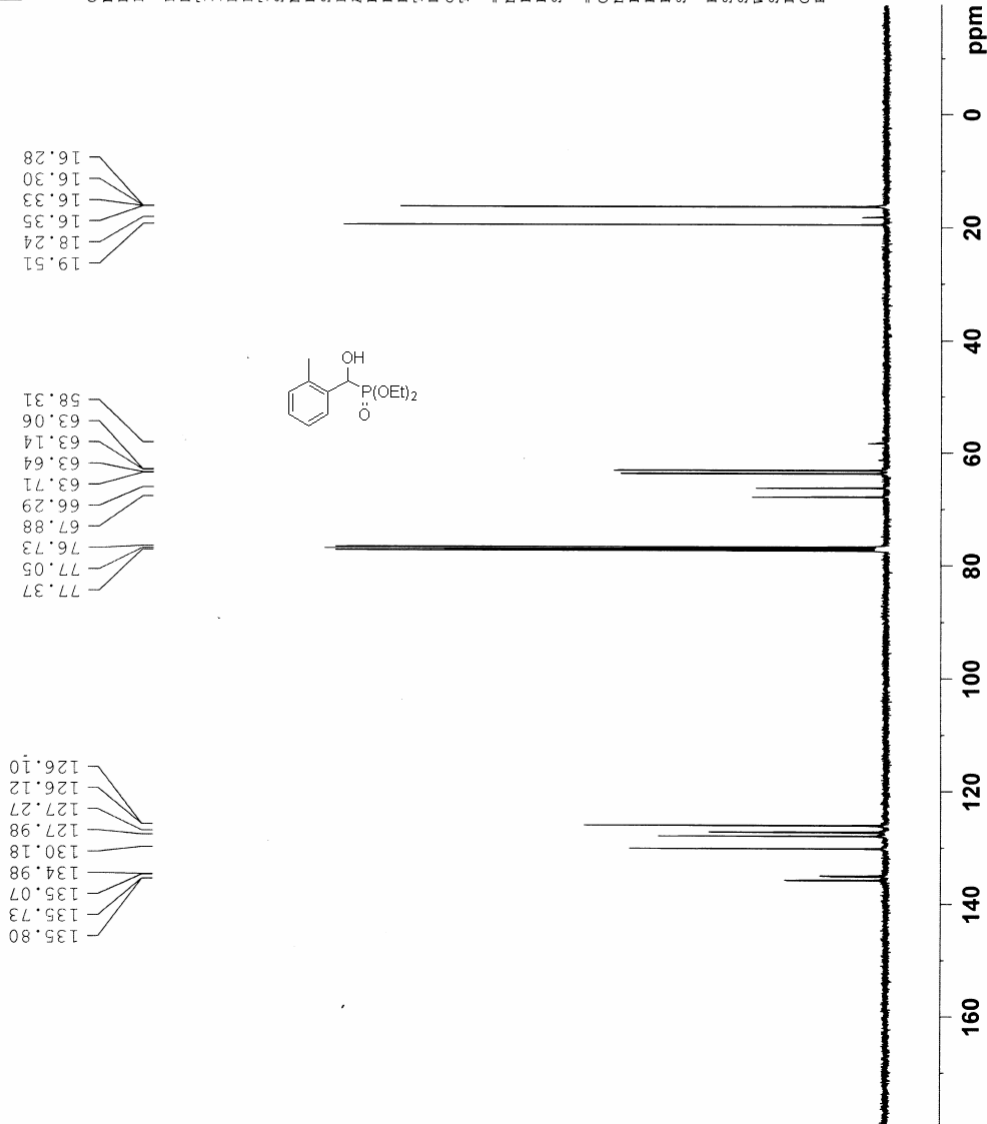
Current Data Parameters
 NAME 2007-08-16 zhouxin HP-2
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
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 Time_ 19.42
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1769
 DS 4
 SWH 24038.461 Hz
 FIDRES 0.366798 Hz
 AQ 1.3631988 sec
 RG 362
 DW 20.800 usec
 DE 6.00 usec
 TE 298.2 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 13C
 P1 15.50 usec
 PL1 1.00 dB
 SF01 100.6228296 MHz

===== CHANNEL f2 =====
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 NUC2 1H
 PCPD2 60.00 usec
 PL2 -2.00 dB
 PL12 12.05 dB
 SF02 400.1316005 MHz

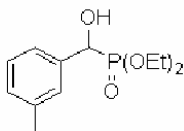
F2 - Processing parameters
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 SF 100.6127690 MHz
 WDW EM
 SSB 0
 LB 0
 GB 0
 PC 1.40



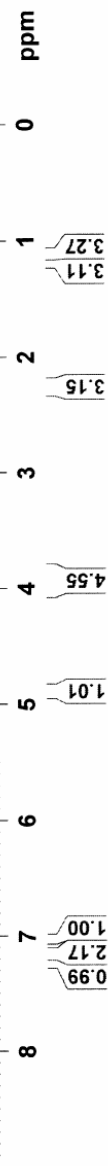


system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

7.223 7.203 7.183 7.181 7.175 7.157 7.138 7.043 7.025
 5.214 4.909 4.882 4.019 4.009 4.001 3.991 3.984 3.973 3.955 3.940 3.922 3.903 3.898 3.885 3.878 3.867 3.859 3.841 3.633 3.616 2.275 2.086 1.960 1.278 1.207 1.189 1.171 1.154 1.136 1.119



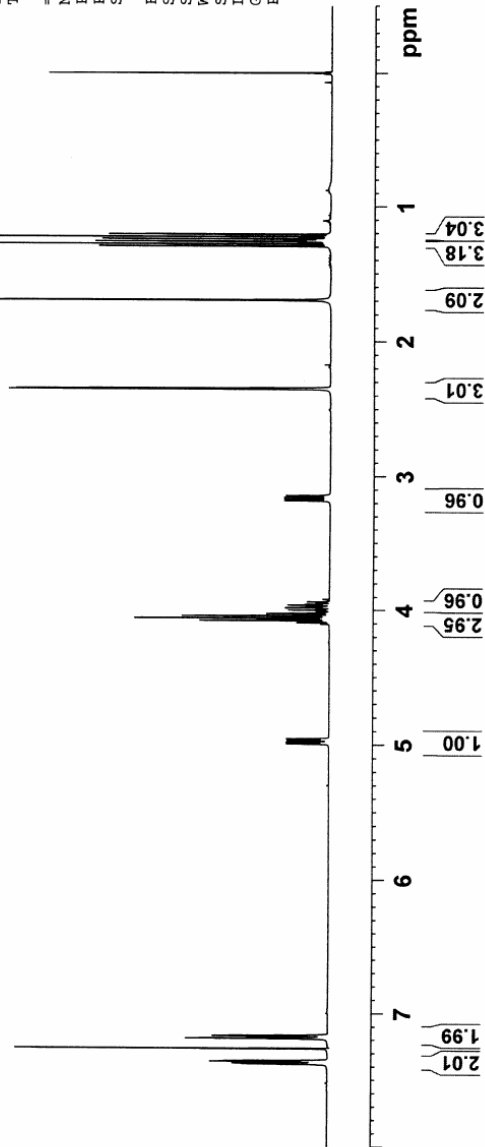
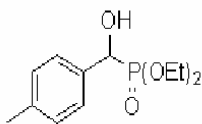
Current Data Parameters
 NAME 2007-08-16 zhouxin HP-3
 EXPNO 1
 PROCNO 1
 F2 - Acquisition Parameters
 Date_ 20070815
 Time_ 19.49
 INSTRUM spect
 PROHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 181
 DW 60.800 usec
 DE 6.00 usec
 TE 297.0 K
 D1 1.00000000 sec
 TD0 1
 ===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SF01 400.1324710 MHz
 F2 - Processing parameters
 SI 32768
 SF 400.1300378 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00





system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

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Current Data Parameters
 NAME 2007-06-21 zhouxin-4
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20070621
 Time 17.48
 INSTRUM spect
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 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
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 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 161
 DW 60.800 usec
 DE 6.00 usec
 TE 295.2 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SFO1 400.1324710 MHz
 F2 - Processing parameters
 SI 32768
 SF 400.1300077 MHz
 WDW GN
 SSB 0
 LB -0.40 Hz
 GB 0.2
 PC 1.00



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

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Current Data Parameters
 NAME 2007-08-14 zhouxin hp-5
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

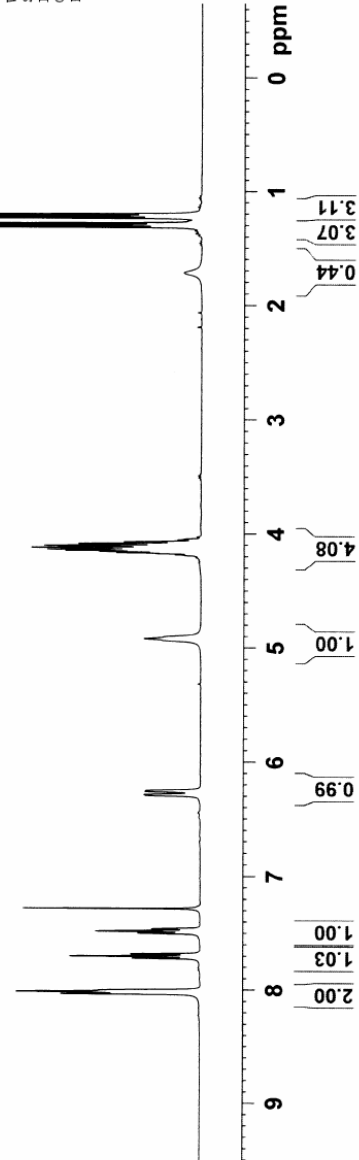
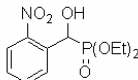
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 Time_ 16.50
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 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 8
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
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 RG 181
 DW 60.800 usec
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 TE 296.4 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====

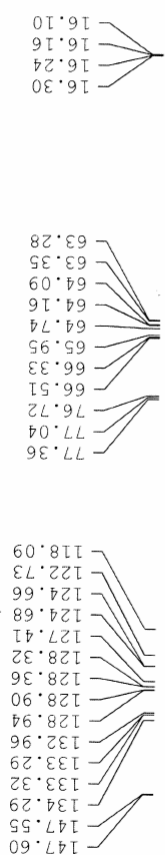
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F2 - Processing parameters

SI 32768
 SF 400.1300000 MHz
 WDW EM
 LB 0
 GB 0.30 Hz
 PC 1.00



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



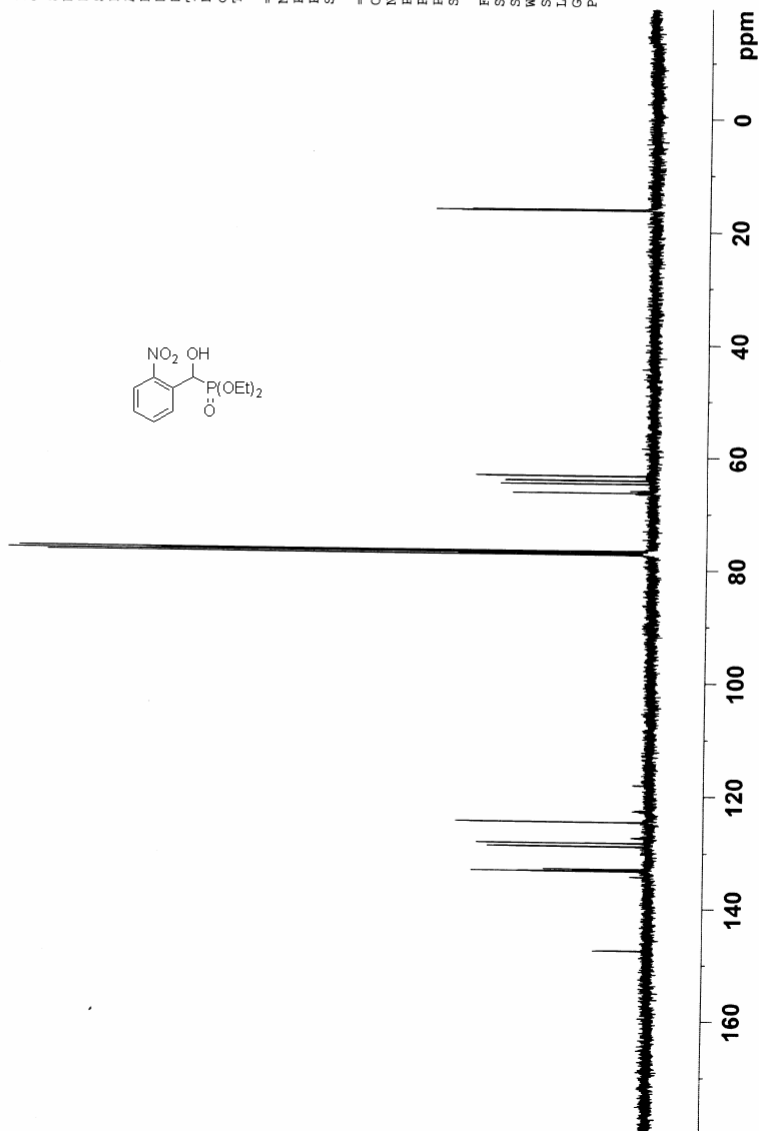
Current Data Parameters
 NAME 2007-08-16 zhouxin HP-5
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20070815
 Time_ 20.20
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 273
 DS 4
 SWH 24038.461 Hz
 FIDRES 0.366798 Hz
 AQ 1.3631988 sec
 RG 362
 DW 20.800 usec
 DE 2.00 usec
 TE 298.2 K
 D1 2.0000000 sec
 d11 0.0300000 sec
 TD0 1

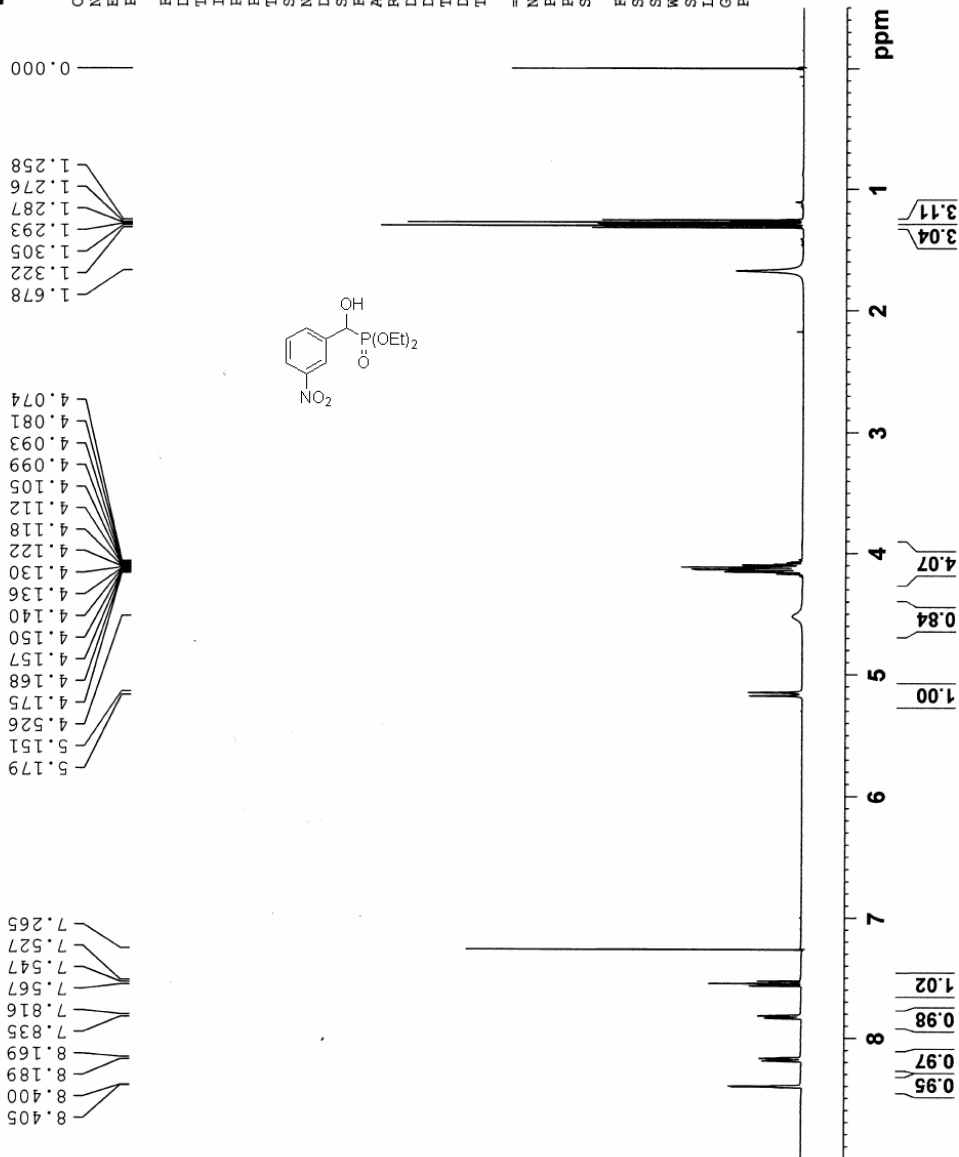
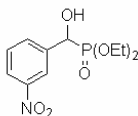
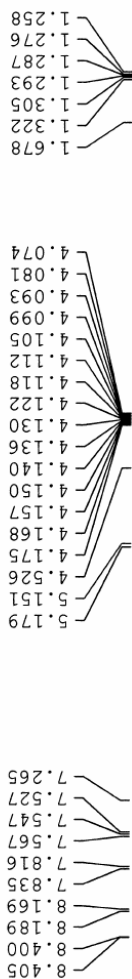
===== CHANNEL f1 =====
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 P1 15.50 usec
 PL1 -1.00 dB
 SFO1 100.6228298 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 P2 60.00 usec
 PL2 -2.00 dB
 PL12 12.05 dB
 SFO2 400.1316005 MHz

F2 - Processing parameters
 SI 32768
 SF 100.6127690 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



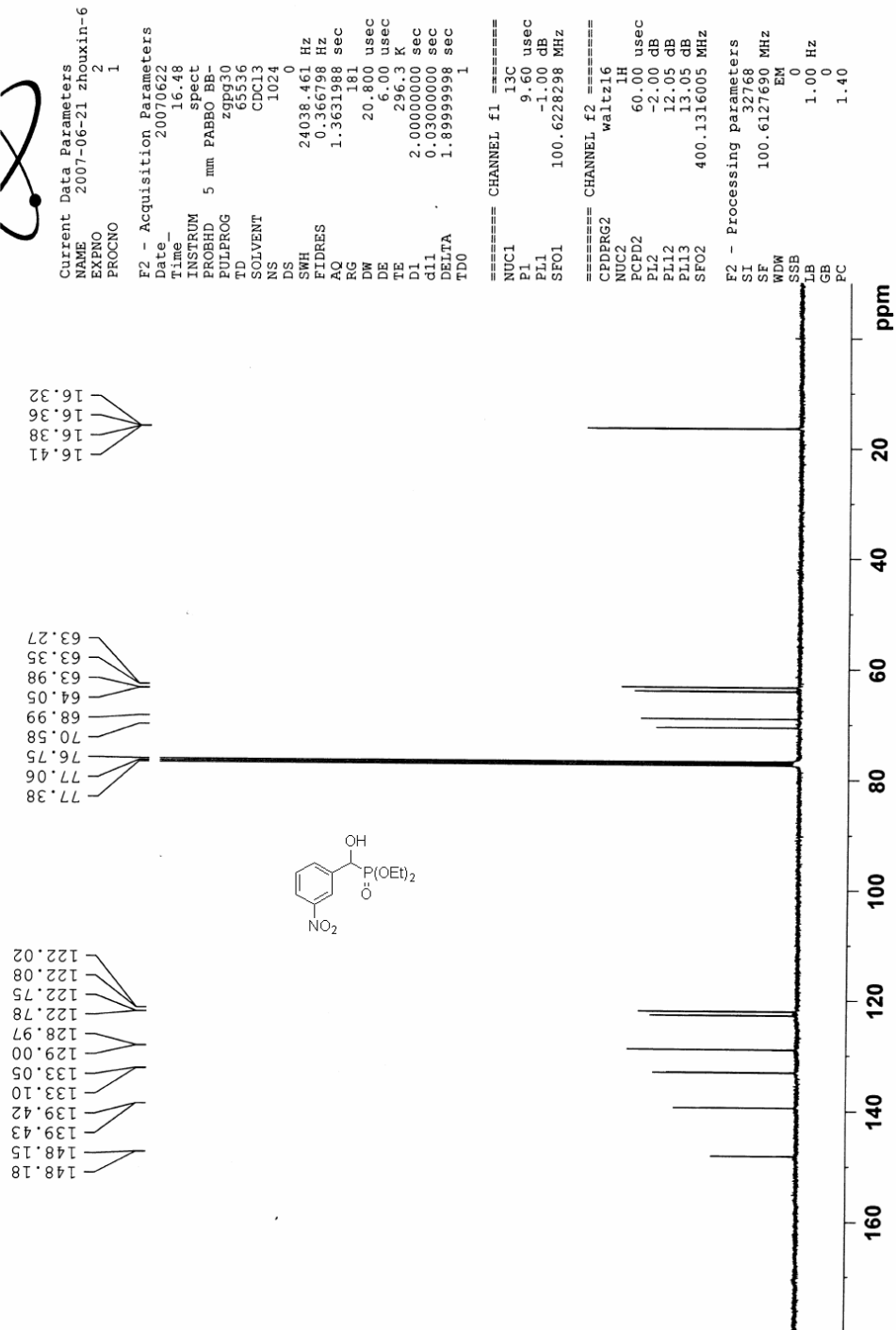
Current Data Parameters
 NAME 2007-06-21 zhouxin-6
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20070621
 Time_ 18.07
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 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 161
 DW 60.800 usec
 DE 6.00 usec
 TE 294.8 K
 D1 1.00000000 sec
 TD0 1

==== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL -2.00 dB
 SF01 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300072 MHz
 GM 0
 WDW 0
 SSB 0
 LB -0.40 Hz
 GB 0.2
 PC 1.00

system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air





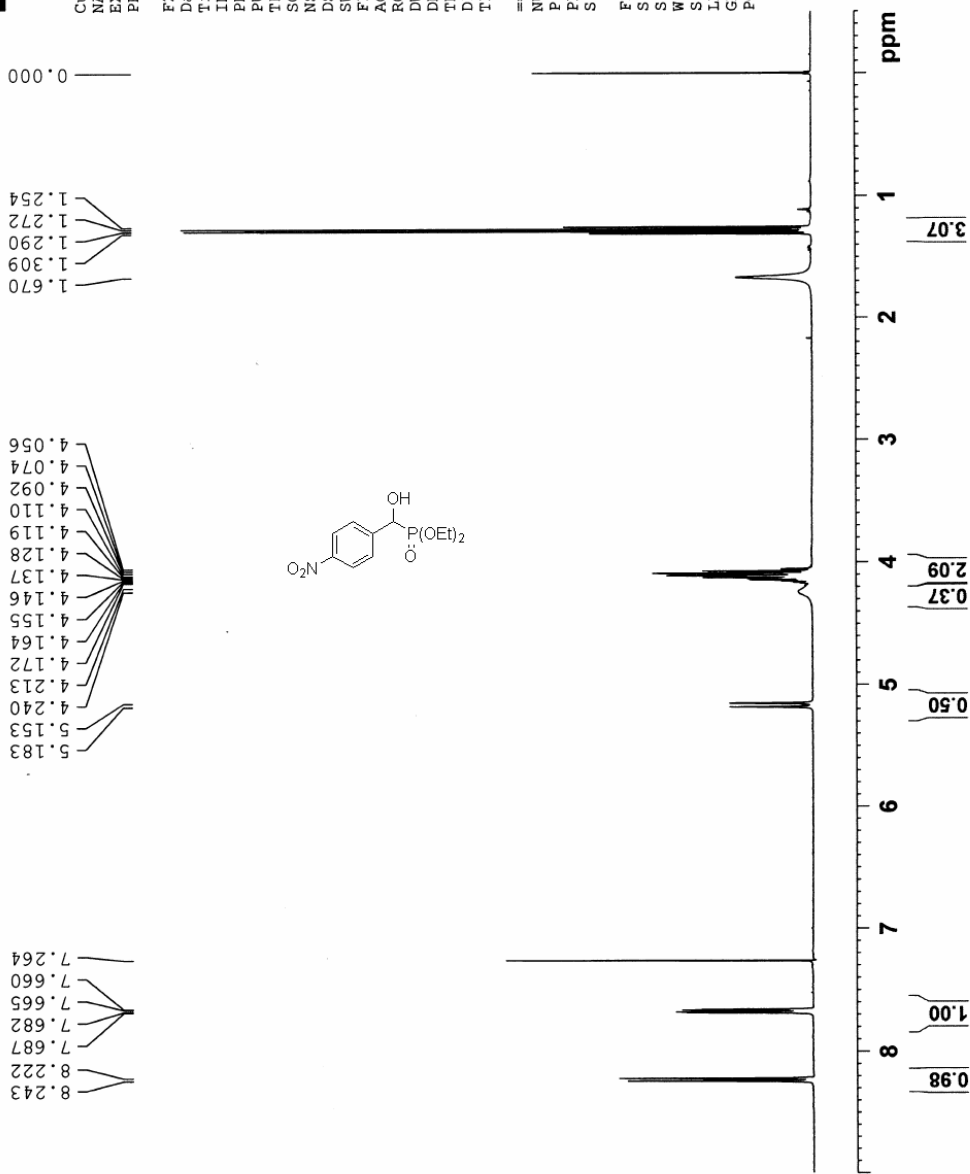
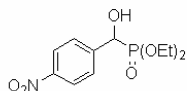
system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

Current Data Parameters
 NAME 2007-06-20 zhouxin-7
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20070620
 Time_ 12.58
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 161
 DW 60.800 usec
 DE 6.00 usec
 TE 298.6 K
 D1 1.00000000 sec
 TD0 1

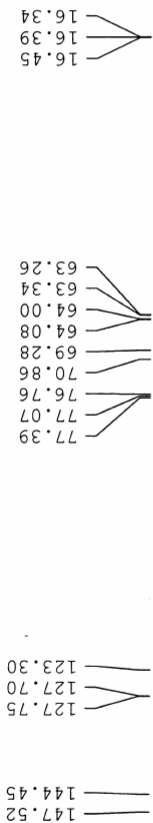
===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SFO1 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300076 MHz
 GM 0
 WDW 0
 SSB 0
 LB -0.30 Hz
 GB 0.2
 PC 1.00





system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
NAME 2007-06-20 zhouxin-7
EXPNO 2
PROCNO 1

F2 - Acquisition Parameters
Date_ 20070621
Time 10.25
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1024
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 2050
DW 20.800 usec
DE 6.00 usec
TE 296.8 K
D1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.89999998 sec
TD0 1

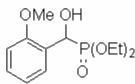
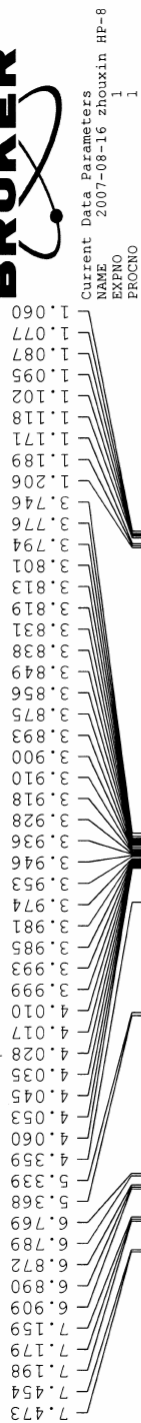
===== CHANNEL f1 =====
NUC1 13C
P1 9.60 usec
PL1 -1.00 dB
SFO1 100.6228298 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 60.00 usec
PL2 -2.00 dB
PL12 12.05 dB
PL13 13.05 dB
SFO2 400.1316005 MHz

F2 - Processing parameters
SI 32768
SF 100.6127670 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

ppm

system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

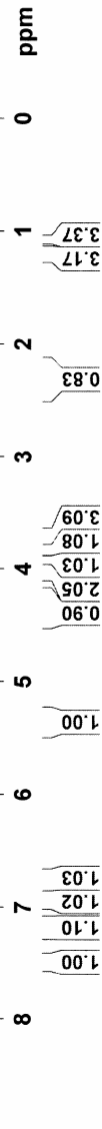


Current Data Parameters
 NAME 2007-08-16 zhouxin HP-8
 EXPNO 1
 PROCNO 1

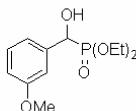
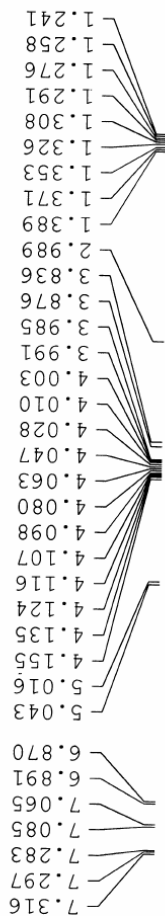
F2 - Acquisition Parameters
 Date_ 20070815
 Time_ 19.59
 INSTRUM spect
 PROBD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 181
 DW 60.800 usec
 DE 6.00 usec
 TE 296.8 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SF01 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300378 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
 NAME 2007-08-14 zhounin hp-9
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20070814
 Time_ 16.54
 INSTRUM spect
 PROBD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDC13
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.425483 Hz
 AQ 3.9846387 sec
 RG 1181
 DW 60.800 usec
 DE 256.9 usec
 TE 286.3 K
 D1 1.0000000 sec
 TD0 1

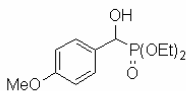
===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SFO1 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300000 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00

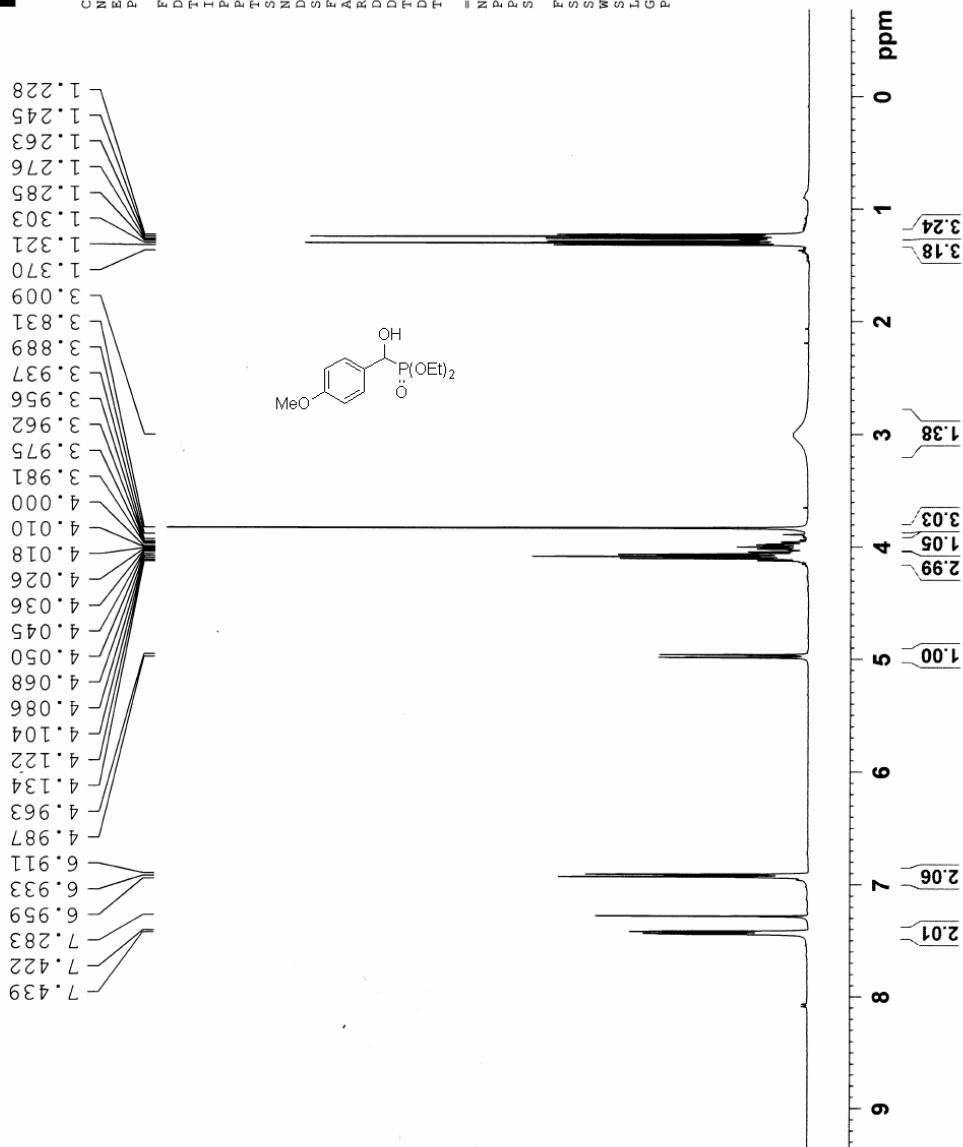


system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

7.439
7.422
7.283
7.259
6.959
6.933
6.911
4.987
4.963
4.134
4.122
4.104
4.086
4.068
4.050
4.045
4.036
4.026
4.018
4.010
4.000
3.981
3.975
3.962
3.956
3.937
3.889
3.831
3.009
3.370
1.321
1.303
1.285
1.276
1.263
1.245
1.228

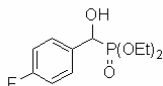
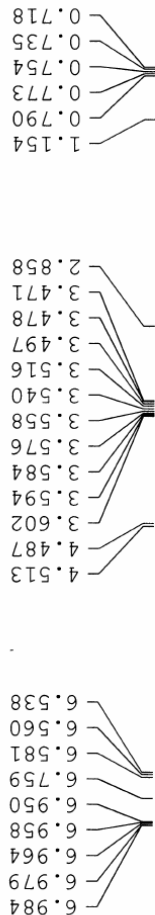


Current Data Parameters
 NAME 2007-08-14 zhouxin hp-10
 EXPNO 1
 PROCNO 1
 F2 - Acquisition Parameters
 Date_ 20070814
 Time 16.59
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.5846387 sec
 RG 1181
 DW 60.800 usec
 DE 2.000 usec
 TE 296.3 K
 D1 1.00000000 sec
 TD0 1
 ===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SF01 400.1324710 MHz
 F2 - Processing parameters
 SI 32768
 SF 400.1300000 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00





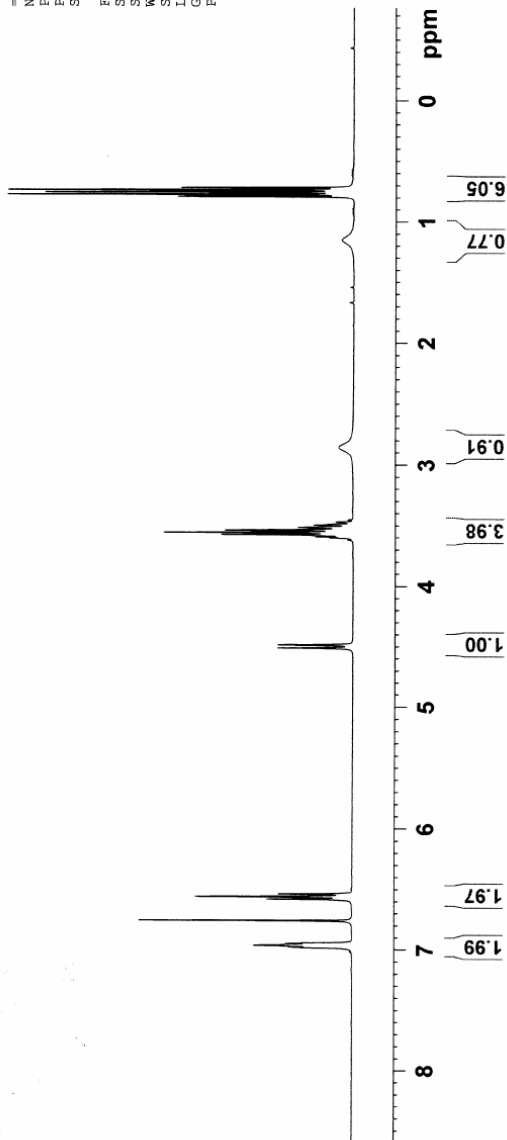
system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
 NAME 2007-08-14 zhouxin hp-11
 EXPNO 1
 PROCNO 1

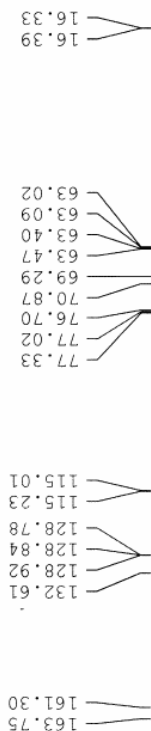
F2 - Acquisition Parameters
 Date_ 20070814
 Time 17.04
 INSTRUM spect
 PROBO 5 mm PABBO BB-1H/D
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 181
 DW 60.800 usec
 DE 6.00 usec
 TE 296.4 K
 D1 1.0000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SFO1 400.1324710 MHz
 F2 - Processing parameters
 SI 32768
 SF 400.1300000 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00





system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
NAME 2007-08-16 zhouxin HP-11
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters

Date_ 20070813
Time 20:29
INSTRUM spect
PROBHD 5 mm PABBO BB-1
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 12389
DS 4
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 362
DW 20.800 usec
DE 6.00 usec
TE 298.7 K
d1 2.0000000 sec
d11 0.0300000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 15.50 usec
PL1 -1.00 dB
SFO1 100.6228298 MHz

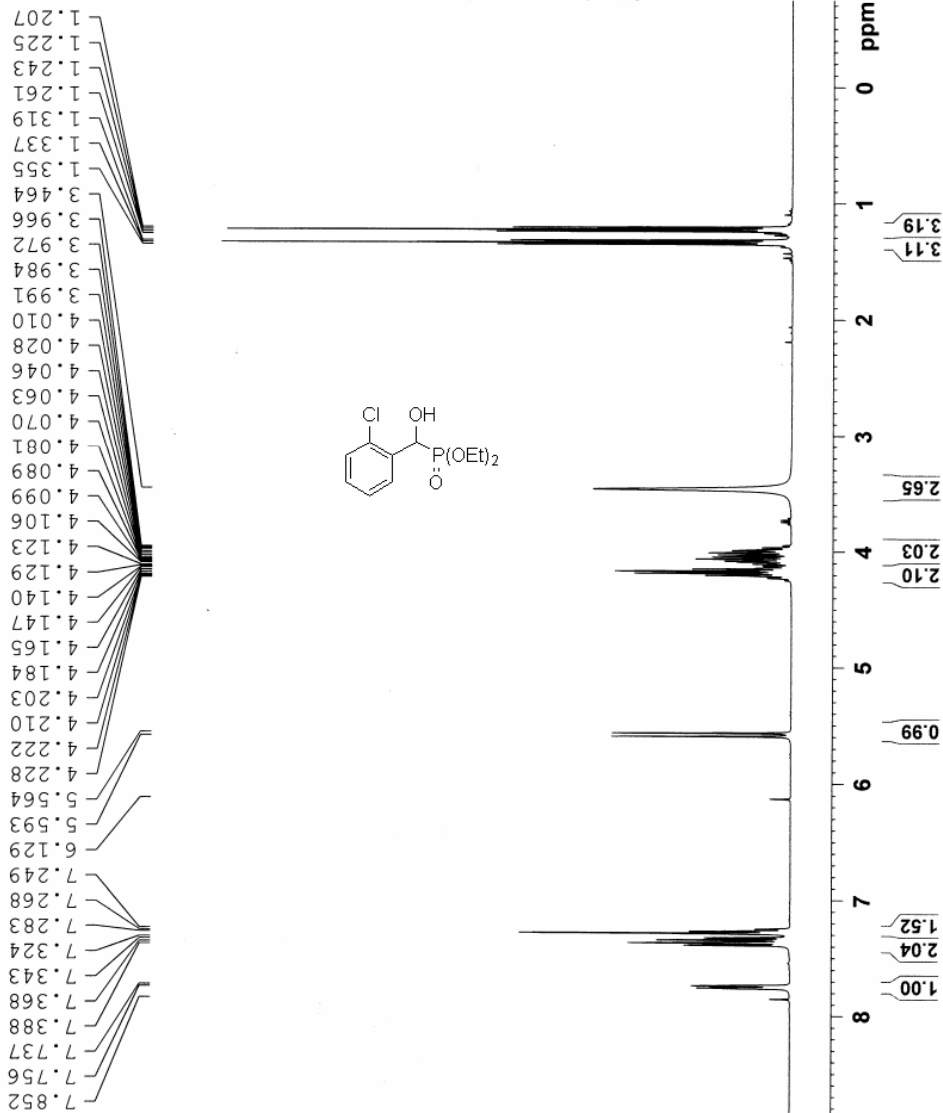
===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 60.00 usec
PL2 -2.00 dB
PL12 12.05 dB
SFO2 400.1316005 MHz

F2 - Processing parameters
SI 32768
SF 100.6127490 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

200 180 160 140 120 100 80 60 40 20 0 ppm



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
 Name 2007-08-14 zhuxin hp-12
 EXPNO 1
 PROCNO 1

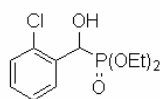
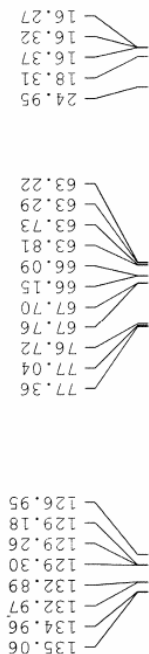
F2 - Acquisition Parameters
 Date_ 20070814
 Time 17.09
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 64
 RW 60.801 usec
 DE 60.800 usec
 TE 296.4 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SFO1 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300000 MHz
 EQ
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



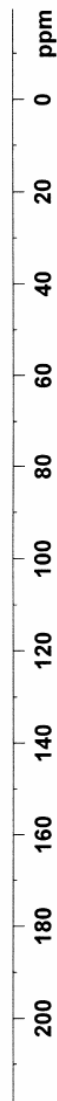
Current Data Parameters
 NAME 2007-08-16 Zhouxin HP-12
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20070816
 Time 13.44
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 4096
 DS 4
 SWH 24038.461 Hz
 FIDRES 0.366798 Hz
 AQ 1.3631988 sec
 RG 362
 DW 20.800 usec
 DE 6.00 usec
 TE 299.0 K
 D1 2.0000000 sec
 d11 0.0300000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 13C
 P1 15.50 usec
 PL1 -1.00 dB
 SFO1 100.628298 MHz

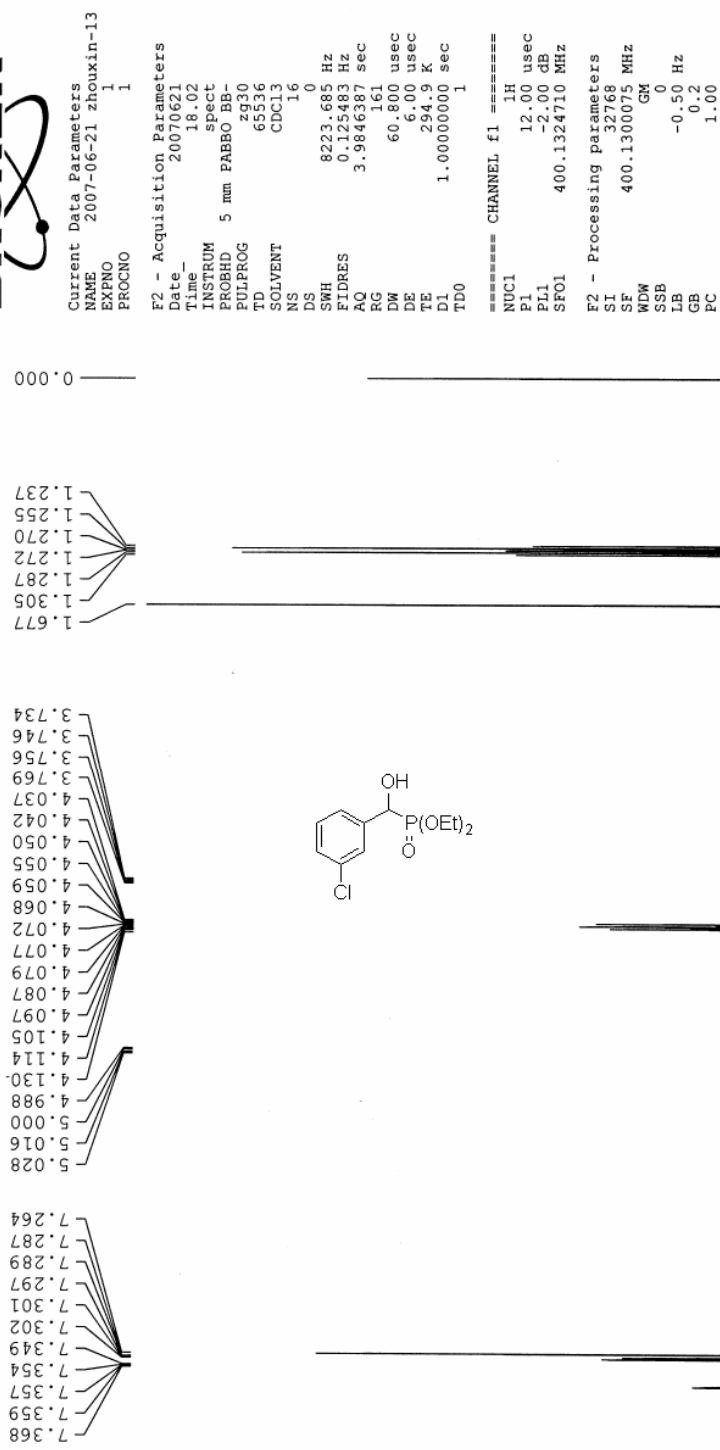
===== CHANNEL f2 =====
 CDPORG2 waltz16
 NUC2 1H
 P2 60.00 usec
 PL2 -2.00 dB
 SFO2 400.1316005 MHz

F2 - Processing parameters
 SI 32768
 SF 100.6127690 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40





system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
 NAME 2007-06-21 zhouxin-13
 EXPNO 2
 PROCNO 1

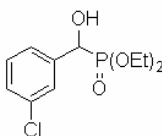
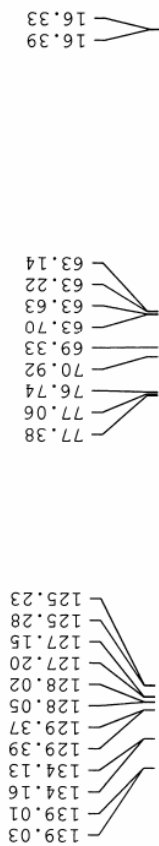
F2 - Acquisition Parameters

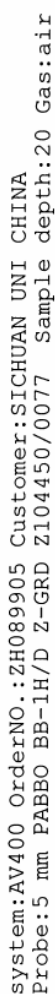
Date_ 20070622
 Time 10.47
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1024
 DS 0
 SWH 24038.461 Hz
 FIDRES 0.366798 Hz
 AQ 1.3631988 sec
 RG 181
 DW 20.800 usec
 DE 6.00 usec
 TE 295.7 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 13C
 P1 9.60 usec
 PL1 -1.00 dB
 SF01 100.6228298 MHz

===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 60.00 usec
 PL2 -2.00 dB
 PL12 12.05 dB
 PL13 13.05 dB
 SF02 400.1316005 MHz

F2 - Processing parameters
 SI 32768
 SF 100.6127690 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40





Days of Rain (x)	Days of Rain (y)
0	1.229
1	1.246
2	1.254
3	1.260
4	1.264
5	1.278
6	1.296
7	1.714
8	3.756
9	3.769
10	3.779
11	3.791
12	3.994
13	4.001
14	4.011
15	4.014
16	4.019
17	4.026
18	4.032
19	4.037
20	4.040
21	4.044
22	4.054
23	4.057
24	4.063
25	4.072
26	4.081
27	4.090
28	4.098
29	4.116
30	4.984
31	4.996
32	5.011
33	5.023
34	7.265
35	7.331
36	7.352
37	7.358
38	7.414
39	7.420
40	7.425
41	7.431
42	7.435
43	7.441

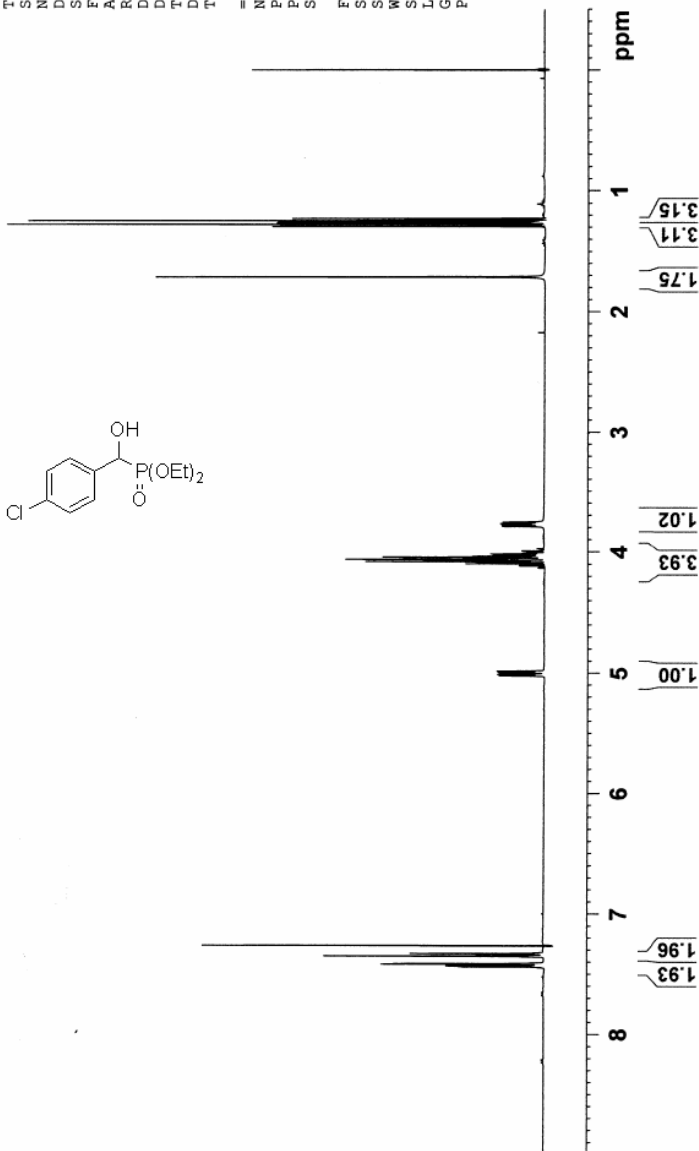
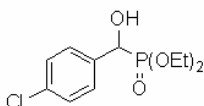
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Current Data Parameters
NAME      2007-06-21 zhouxin-14
EXPNO     1
PROCNO    1
```

F2 - Acquisition Parameters

Parameter	Acquisition Parameters
date_	20070621
time_	17.58
instrum	spect
nmrprog	5 mm PABBO BB-
probf1h	zg30
probf2h	65336
td	CDCL3
solvent	16
ns	0
ds	8223.685 Hz
swh	0.125483 Hz
fidres	3.9846387 sec
aq	161
rg	60.800 usec
dw	6.00 usec
de	295.0 K
te	1.00000000 sec
dd1	1
td0	

```
===== CHANNEL f1 =====
NUC1      1H
P1        12.00 usec
PL1       -2.00 dB
SF01      400.1324710 MHz

FF2 - Processing parameters
SI         32768
SF         400.1300073 MHz
MDW        GM
USB        0
LB         -0.50 Hz
GB         0.2
PC         1.00
```





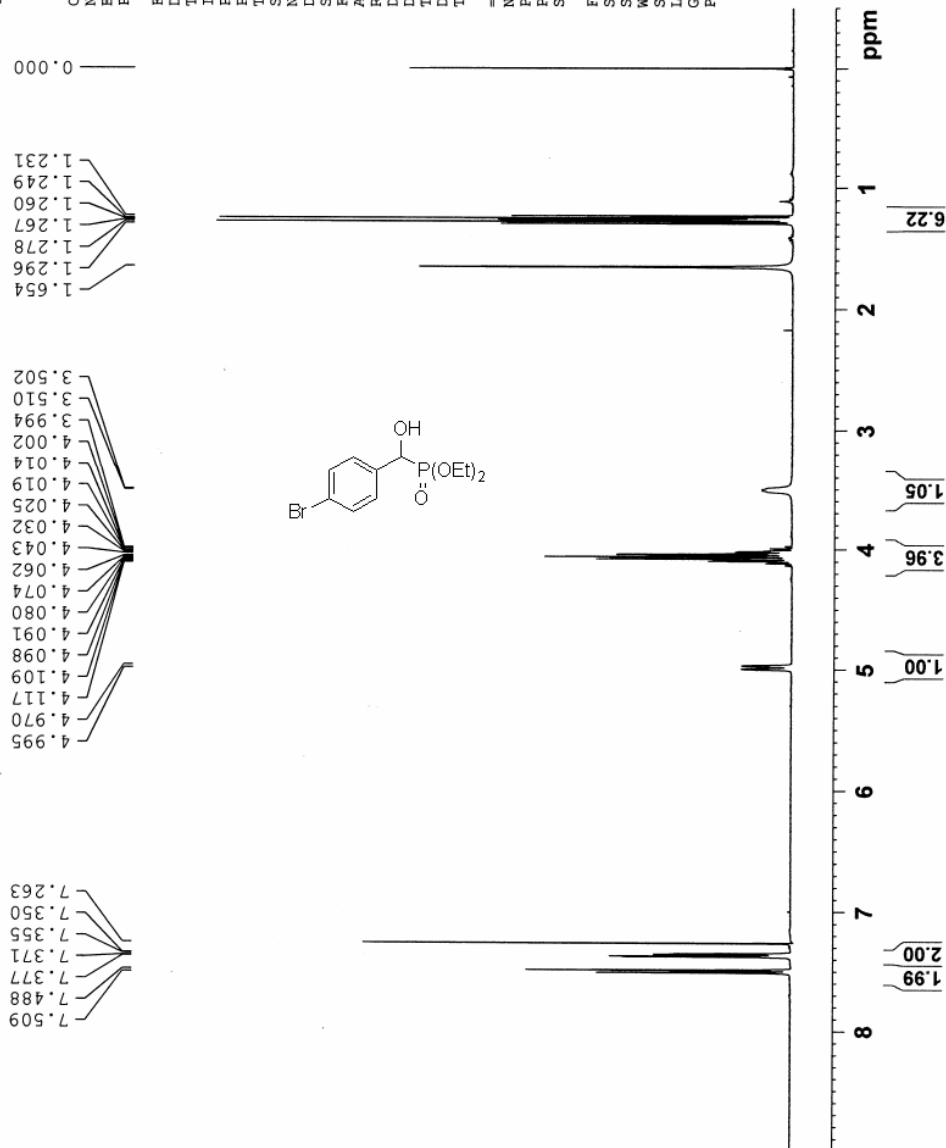
system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

Current Data Parameters
 NAME 2007-06-20 zhousin-15
 EXPNO 1
 PROCNO 1

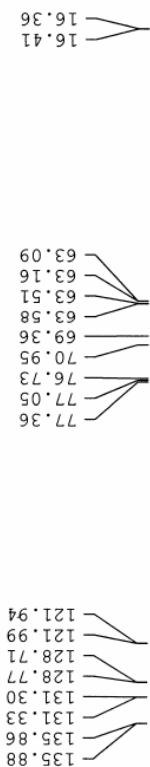
F2 - Acquisition Parameters
 Date_ 20070620
 Time_ 13.17
 INSTRUM spect
 PROBD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 161
 DW 60.800 usec
 DE 6.00 usec
 TE 298.3 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SF01 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300080 MHz
 WDW GM
 SSB 0
 LB -0.30 Hz
 GB 0.2
 PC 1.00



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
 NAME 2007-06-20 zhouxin-15
 EXPNO 2
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20070620
 Time_ 16.35
 INSTRUM spect
 PROBD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1024
 DS 0
 SWH 24038.461 Hz
 FIDRES 0.366798 Hz
 AQ 1.3631988 sec
 RG 181
 DW 20.800 usec
 DE 6.00 usec
 TE 298.2 K
 DI 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 13C
 P1 9.60 usec
 PL1 -1.00 dB
 SFO1 100.6228298 MHz

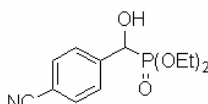
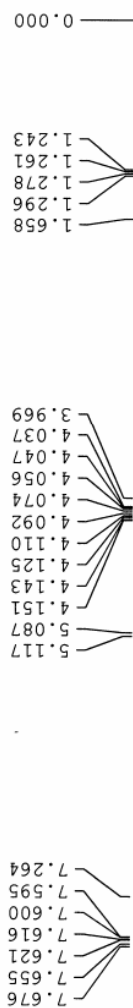
===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 P2 60.00 usec
 PL2 -2.00 dB
 PL12 12.05 dB
 PL13 13.05 dB
 SFO2 400.1316005 MHz

F2 - Processing parameters
 SI 32768
 SF 100.6127690 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 PC 1.40

160 140 120 100 80 60 40 20 ppm



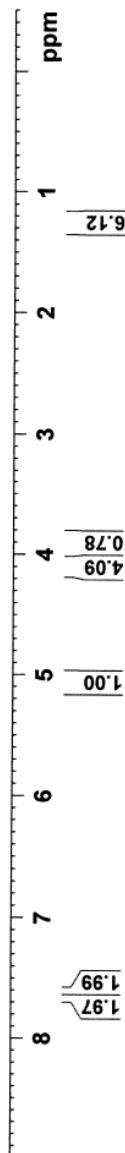
system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
NAME 2007-06-20 zhouxin-19
EXPNO 1
PROCNO 1

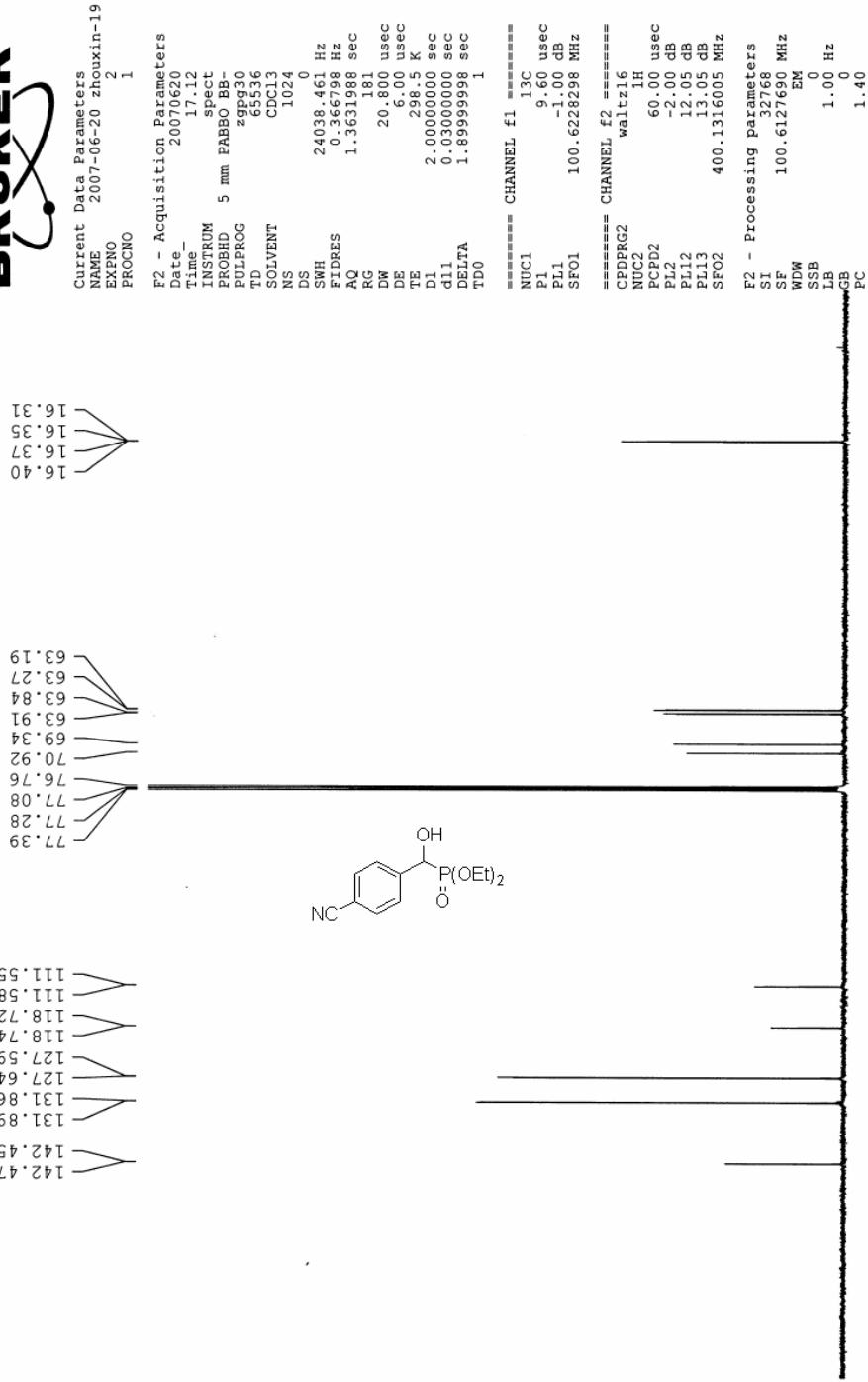
F2 - Acquisition Parameters
Date_ 20070620
Time 13.10
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8223.685 Hz
FIDRES 0.125483 Hz
AQ 3.9846387 sec
RG 161
DW 60.800 usec
DE 6.00 usec
TE 298.3 K
D1 1.0000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 12.00 usec
PL1 -2.00 dB
SF01 400.1324710 MHz
F2 - Processing parameters
SI 32768
SF 400.1300076 MHz
WDW GM
SSB 0
LB -0.30 Hz
GB 0.2
PC 1.00



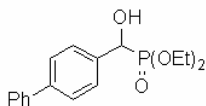
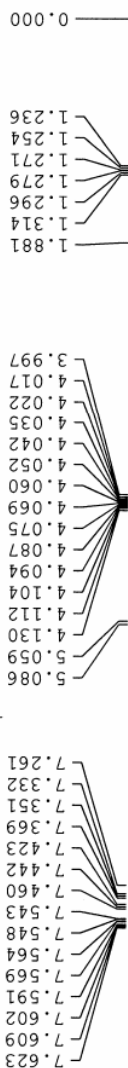


system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air





system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

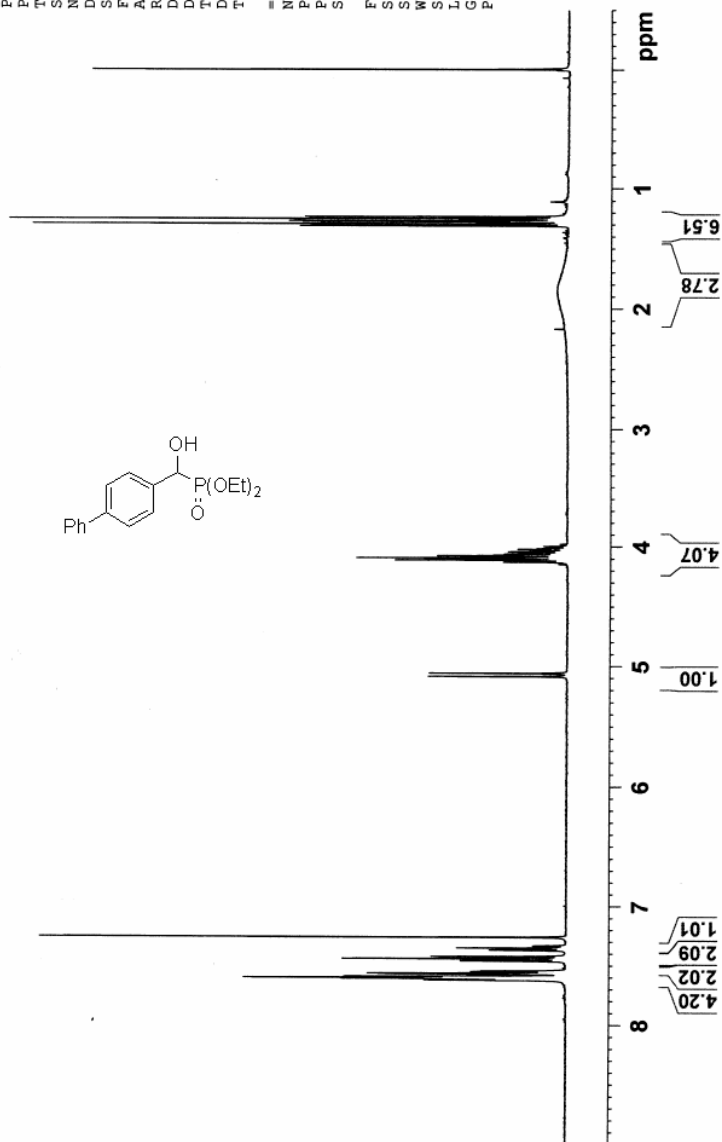


Current Data Parameters
NAME 2007-06-20 zhouxin-28
EXPNO 1
PROCNO 1

F2 - Acquisition Parameters
Date_ 20070620
Time 13.05
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zg30
TD 65536
SOLVENT CDCl3
NS 16
DS 0
SWH 8223.685 Hz
FIDRES 0.125483 Hz
AQ 3.9846387 sec
RG 161
DW 60.800 usec
DE 6.00 usec
TE 298.4 K
D1 1.0000000 sec
TD0 1

===== CHANNEL f1 =====
NUC1 1H
P1 12.00 usec
PL1 -2.00 dB
SFO1 400.1324710 MHz

F2 - Processing parameters
SI 32768
SF 400.1300090 MHz
WDW GM
SSB 0
LB -0.30 Hz
GB 0.2
PC 1.00



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
 NAME 2007-06-20 zhouxin-28
 EXPNO 2
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20070621
 Time_ 9.19
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 1024
 DS 0
 SWH 24038.461 Hz
 FIDRES 0.366798 Hz
 AQ 1.3631988 sec
 RG 32768
 DW 20.800 usec
 DE 6.00 usec
 TE 296.6 K
 D1 2.00000000 sec
 d11 0.03000000 sec
 DELTA 1.89999998 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 13C
 P1 9.60 usec
 PL1 -1.00 dB
 SF01 100.6228298 MHz

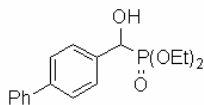
===== CHANNEL f2 =====
 CPDPRG2 waltz16
 NUC2 1H
 PCPD2 60.00 usec
 PL2 -2.00 dB
 PL12 12.05 dB
 PL13 13.05 dB
 SF02 400.1316005 MHz

F2 - Processing parameters
 SI 32768
 SF 100.6127707 MHz
 WDW EM
 SSB 0
 LB 1.00 Hz
 GB 0
 FC 1.40

16.45
16.39
16.36

77.37
77.06
76.74
71.39
69.81
63.47
63.40
63.18
63.11

140.85
140.67
135.75
128.78
127.58
127.52
127.37
127.05
126.95



160 140 120 100 80 60 40 20 ppm

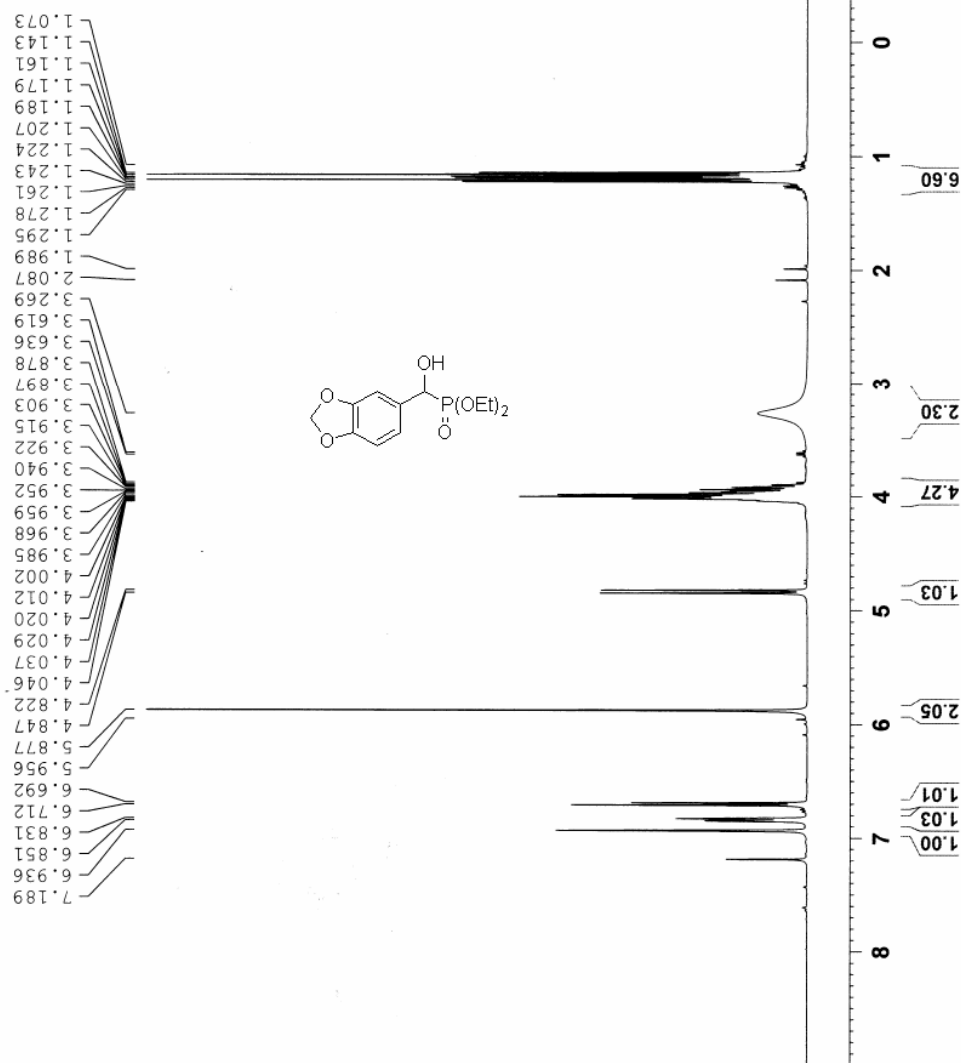
system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
 NAME 2007-08-16 zhouxin HP-18
 EXPNO 1
 PROCNO 1

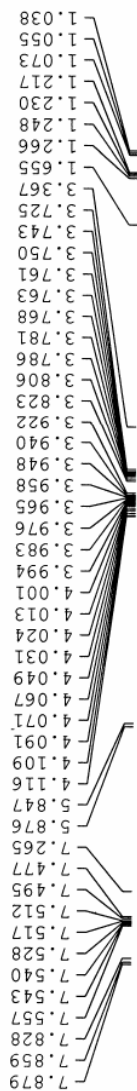
F2 - Acquisition Parameters
 Date_ 20070815
 Time_ 19.54
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 10
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 181
 DW 60.800 usec
 DE 6.00 usec
 TE 297.0 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SFO1 400.1324710 MHz
 F2 - Processing parameters
 SI 32768
 SF 400.13003 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00





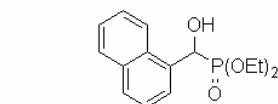
system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
NAME 2007-06-23 zhouxin HP-16
EXPNO 1
PROCNO 1

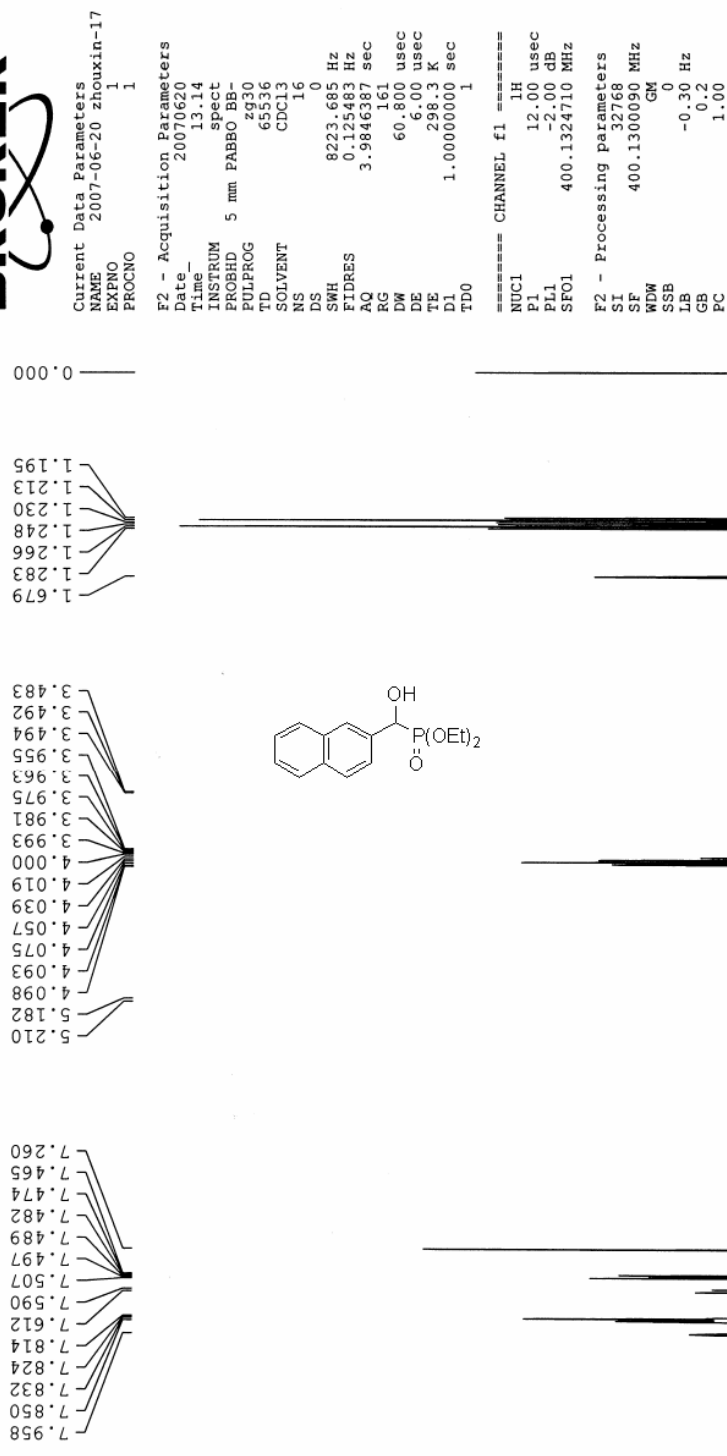
F2 - Acquisition Parameters
Date_ 20070623
Time 18.27
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 16
DS 16
SWH 8223.685 Hz
FIDRES 0.125483 Hz
AQ 3.9846387 sec
RG 181
DW 60.800 usec
DE 6.00 usec
TE 298.7 K
D1 1.0000000 sec
TDO 1

===== CHANNEL f1 =====
NUC1 1H
P1 12.00 usec
PL1 -2.00 dB
SFO1 400.1324710 MHz
F2 - Processing parameters
SI 32768
SF 400.1300075 MHz
WDW EM
SSB 0
LB 0.30 Hz
GB 0
PC 1.00

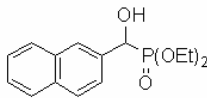




system:AV400 OrderNO.:ZH089905 Customer:SI CHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

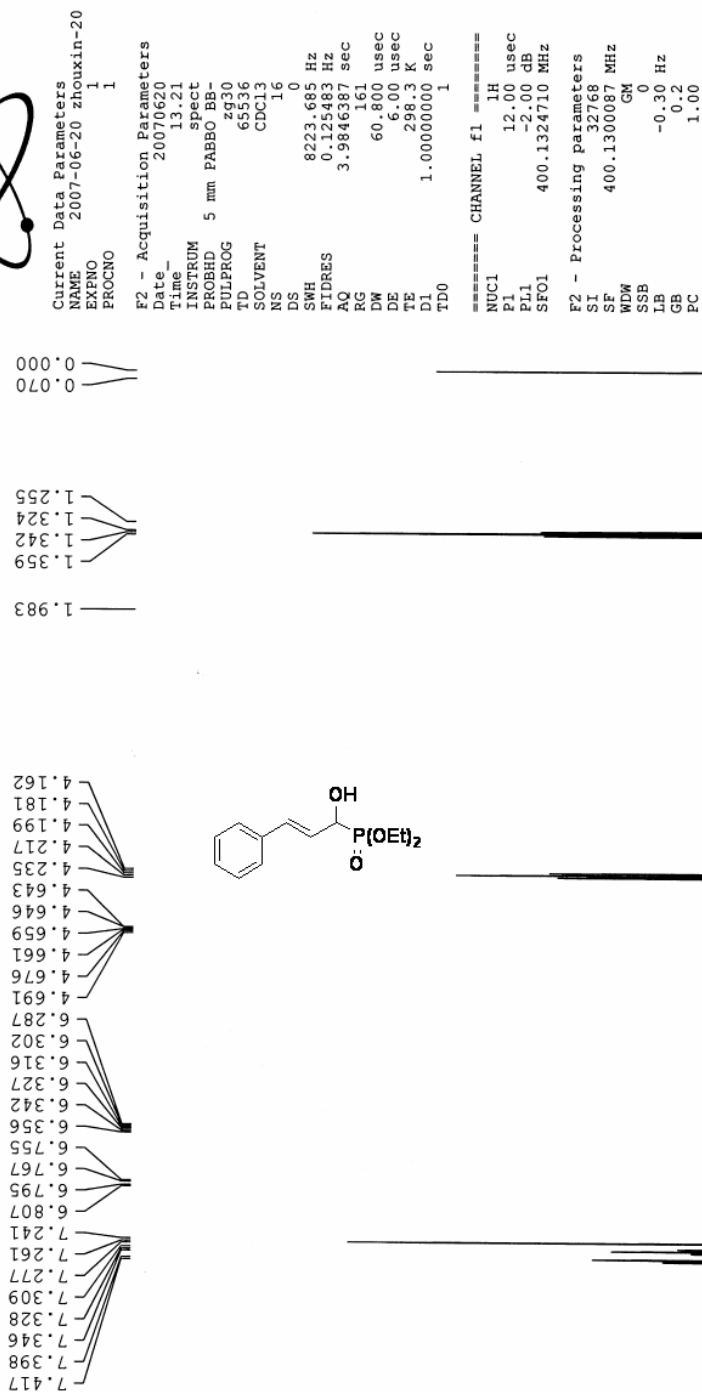


system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



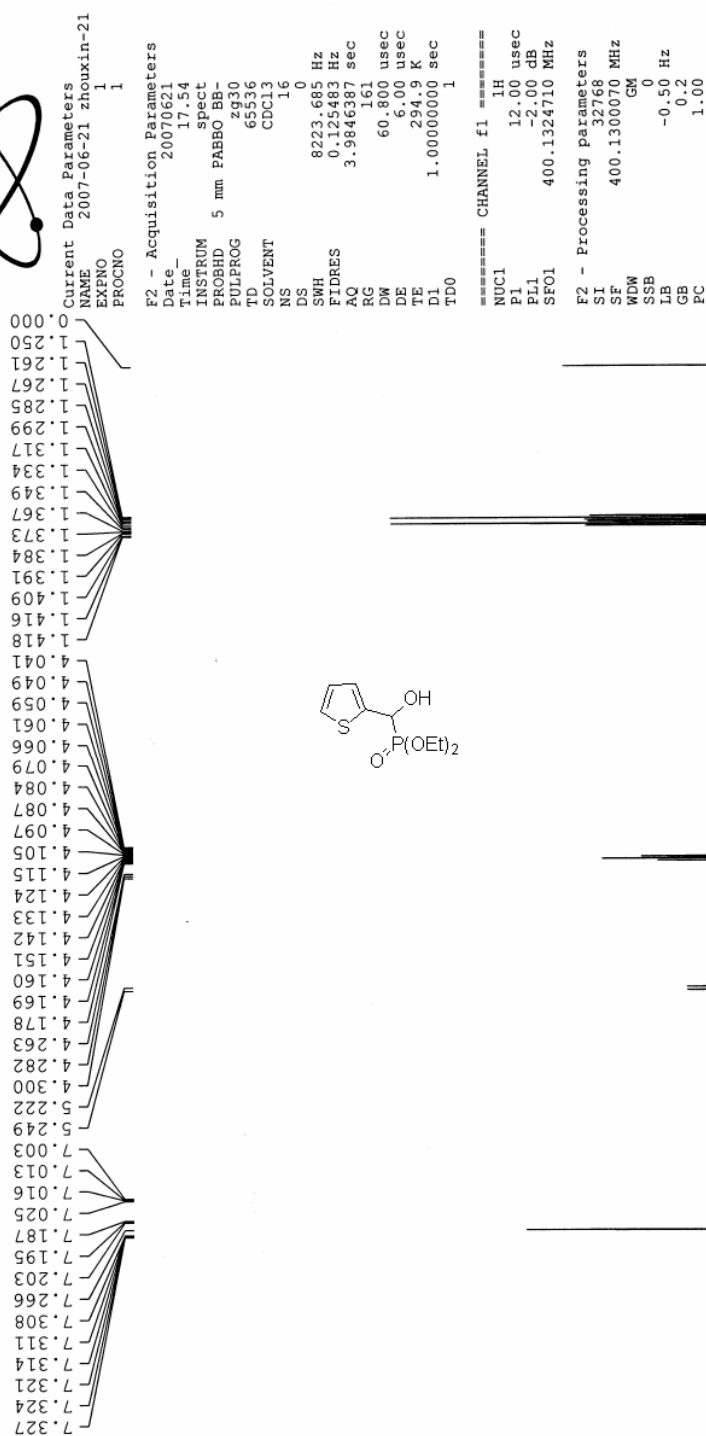


system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air





system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



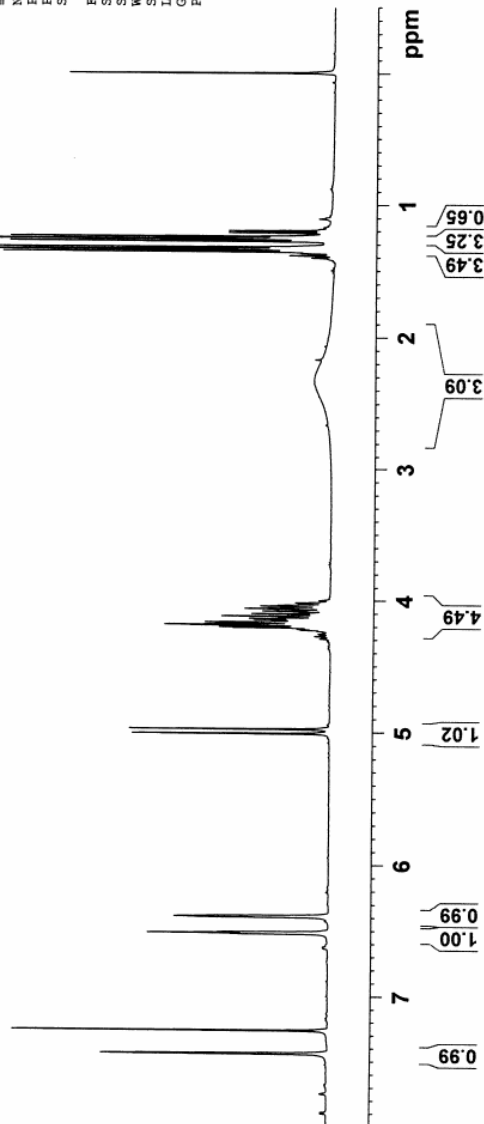
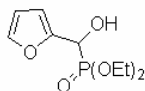
Current Data Parameters
 NAME 2007-06-23 zhousin HP-22
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20070623
 Time_ 18.41
 INSTRUM spect
 PROBRD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 181
 DW 60.800 usec
 DE 6.00 usec
 TE 298.6 K
 D1 1.00000000 sec
 TDO 1

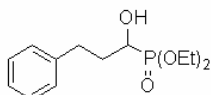
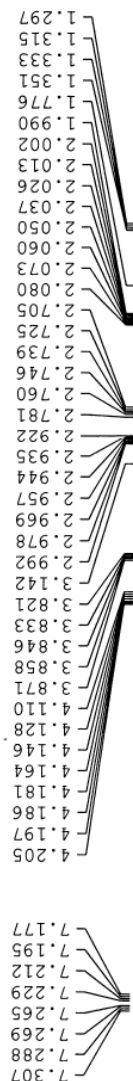
===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SF01 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300075 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 FC 1.00

7.439
 7.264
 6.524
 6.517
 6.510
 6.391
 5.012
 4.979
 4.228
 4.221
 4.210
 4.204
 4.191
 4.186
 4.172
 4.167
 4.156
 4.147
 4.139
 4.128
 4.121
 4.111
 4.103
 4.082
 4.063
 4.044
 4.038
 4.026
 4.019
 2.446
 2.355
 2.327
 2.170
 1.405
 1.387
 1.368
 1.358
 1.340
 1.323
 1.279
 1.261
 1.244
 1.215
 1.200



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

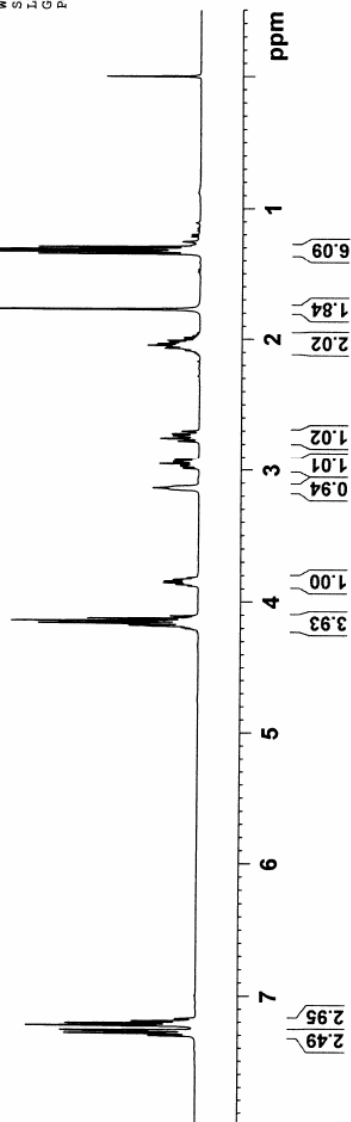


Current Data Parameters
 NAME 2007-06-23 zhouxin HP-23
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20070623
 Time 18.49
 INSTRUM spect
 PROBO 5 mm PABBO BB
 PULPROG zgpg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 181
 DW 60.800 usec
 DE 6.00 usec
 TE 298.6 K
 D1 1.00000000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SFO1 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300075 MHz
 WDW EM
 SSB 0
 LB 0.30 Hz
 GB 0
 PC 1.00



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

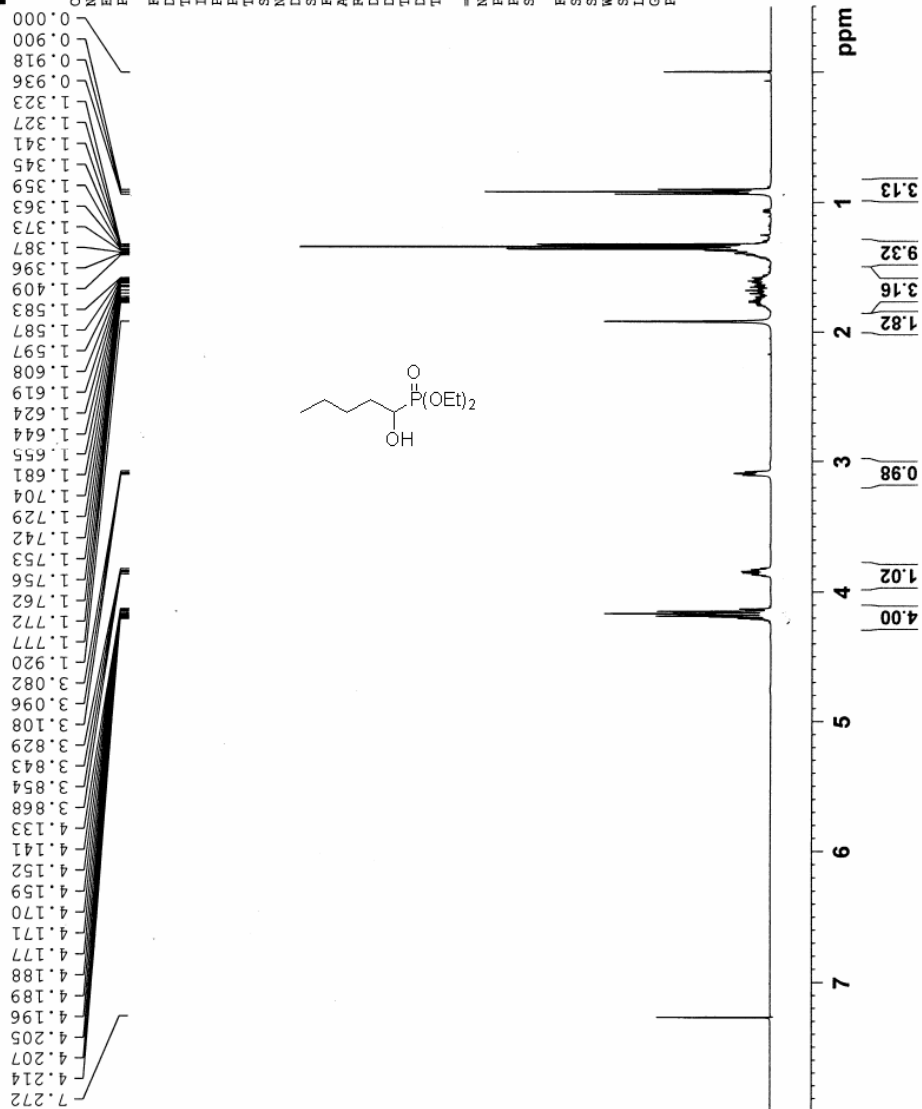


Current Data Parameters
 NAME 2007-06-18 zhoushin-24'
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date_ 20070618
 Time_ 17:51
 INSTRUM spect
 PROBHD 5 mm PABBO B8-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 161
 DW 60.800 usec
 DE 6.00 usec
 TE 296.9 K
 D1 1.00000000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SFO1 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300045 MHz
 GM 0
 WDW 0
 SSB 0
 LB -0.50 Hz
 GB 0.2
 PC 1.00



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

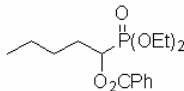


Current Data Parameters
 NAME 2007-06-18 zhousin-24
 EXPNO 1
 PROCNO 1

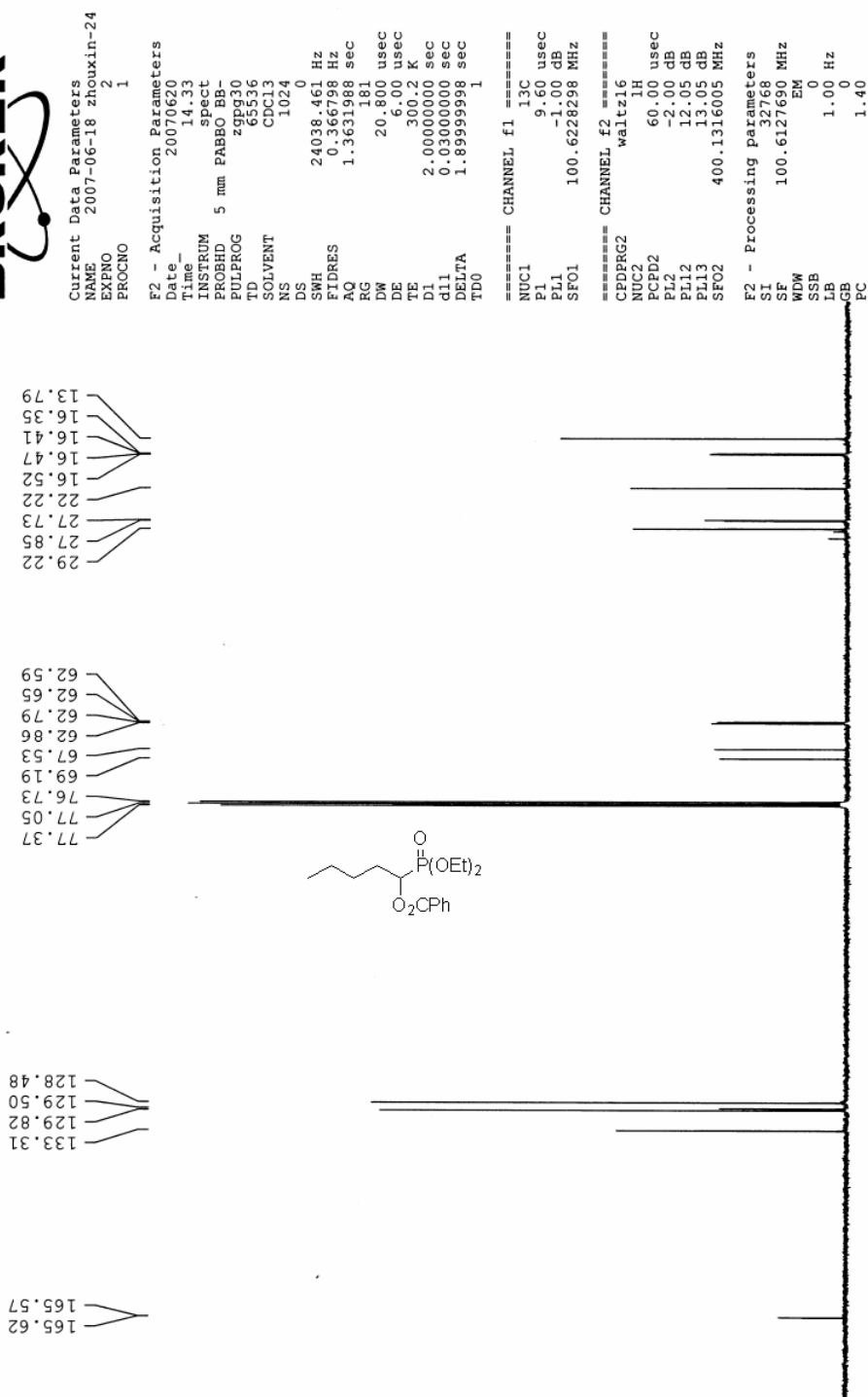
F2 - Acquisition Parameters
 Date_ 20070618
 Time_ 17.25
 INSTRUM Spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 161
 DW 60.800 usec
 DE 6.00 usec
 TE 297.2 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SFO1 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300058 MHz
 WDW GM
 SSB 0
 LB -0.50 Hz
 GB 0.2
 PC 1.00

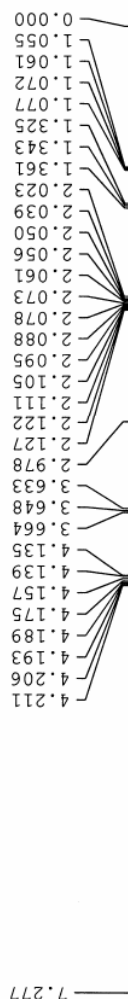


system:AV400 OrderNO.:ZH089905 Customer:SI CHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air





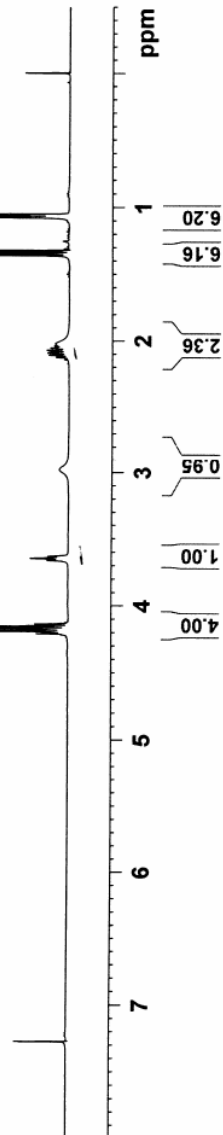
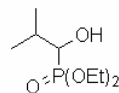
system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



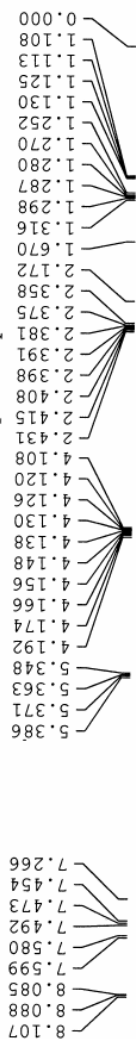
Current Data Parameters
 NAME 2007-06-18 zhouxin-25'
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters
 Date 20070618
 Time 17.56
 INSTRUM spect
 PROBD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 161
 DW 60.800 usec
 DE 6.00 usec
 TE 296.9 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SF01 400.1324710 MHz
 F2 - Processing parameters
 SI 32768
 SF 400.1300025 MHz
 WDW GM
 SSB 0
 LB -0.50 Hz
 GB 0.2
 PC 1.00



system:AV400 OrderNO.:ZH089905 Customer:SIICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
 NAME 2007-06-18 zhouxin-25
 EXPNO 1
 PROCNO 1

F2 - Acquisition Parameters

Date_ 20070618
 Time_ 17:31
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 161
 DW 60.800 usec
 DE 6.00 usec
 TE 297.1 K
 D1 1.0000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SFO1 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300070 MHz
 WDW GM
 SSB 0
 LB -0.50 Hz
 GB 0.2
 PC 1.00

system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air

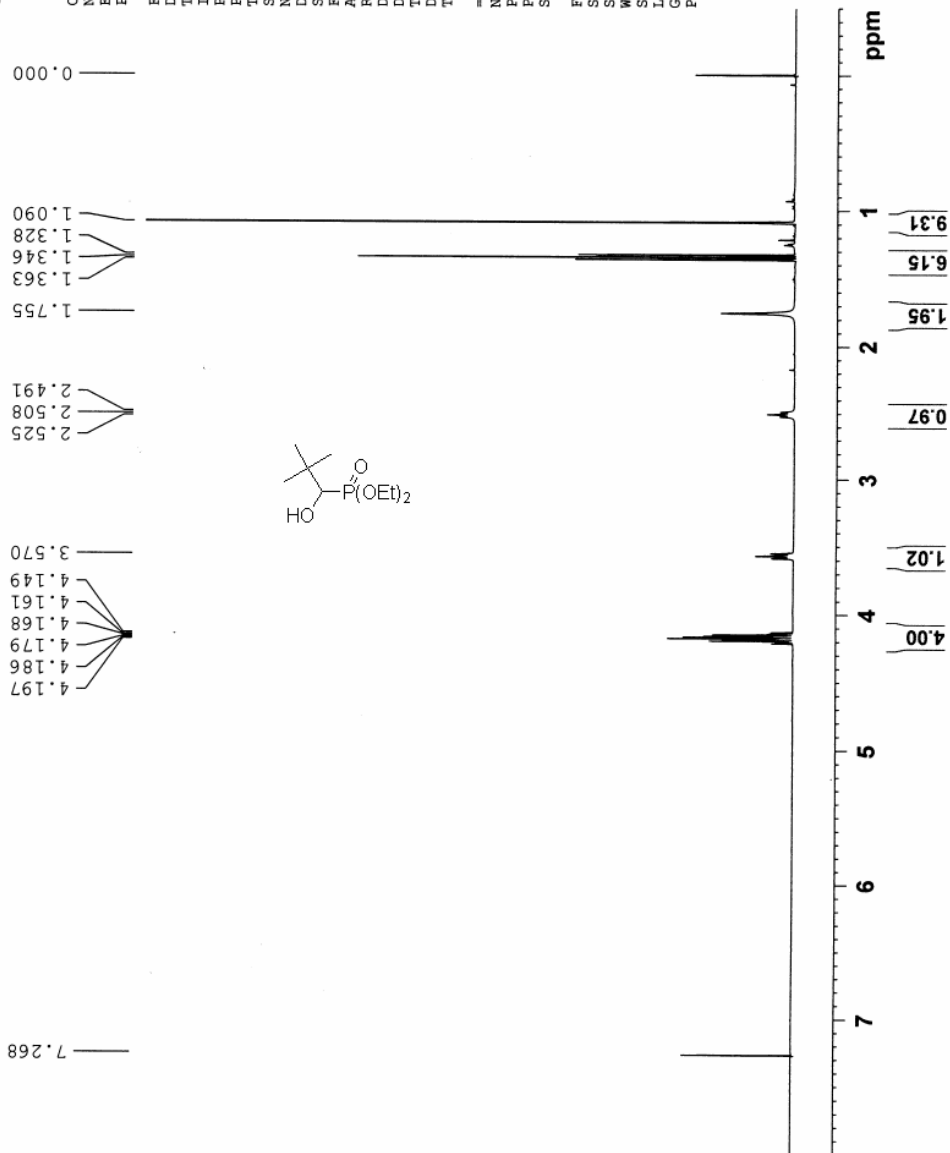


Current Data Parameters
 NAME 2007-06-18 zhouxin-26'
 EXPNO 1
 PROCNO 1

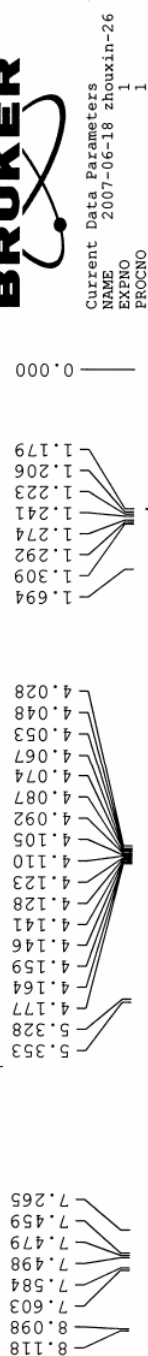
F2 - Acquisition Parameters
 Date_ 20070618
 Time_ 18.02
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 161
 DW 60.800 usec
 DE 6.00 usec
 TE 296.9 K
 D1 1.0000000 sec
 TDO 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SFO1 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300062 MHz
 WDW GM
 SSB 0
 LB -0.50 Hz
 GB 0.2
 PC 1.00



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
 Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
 NAME 2007-06-18 zhouxin-26
 EXNO 1
 PROCNO 1

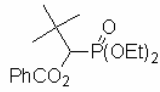
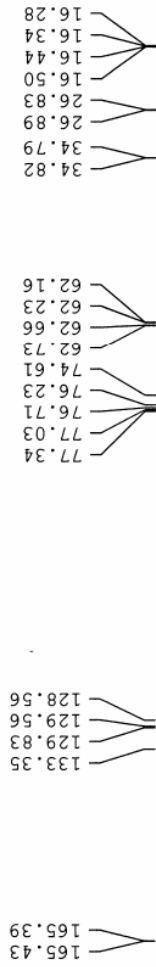
F2 - Acquisition Parameters
 Date_ 20070618
 Time_ 17.38
 INSTRUM spect
 PROBHD 5 mm PABBO BB-
 PULPROG zg30
 TD 65536
 SOLVENT CDCl3
 NS 16
 DS 0
 SWH 8223.685 Hz
 FIDRES 0.125483 Hz
 AQ 3.9846387 sec
 RG 161
 DW 60.800 usec
 DE 6.00 usec
 TE 297.0 K
 D1 1.00000000 sec
 TD0 1

===== CHANNEL f1 =====
 NUC1 1H
 P1 12.00 usec
 PL1 -2.00 dB
 SFO1 400.1324710 MHz

F2 - Processing parameters
 SI 32768
 SF 400.1300069 MHz
 WDW GM
 SSB 0
 LB -0.50 Hz
 GB 0.2
 PC 1.00



system:AV400 OrderNO.:ZH089905 Customer:SICHUAN UNI CHINA
Probe:5 mm PABBO BB-1H/D Z-GRD Z104450/0077 Sample depth:20 Gas:air



Current Data Parameters
NAME 2007-06-18 zhouxin-26
EXPNO 2
PROCNO 1

F2 - Acquisition Parameters
Date_ 20070618
Time_ 20.04
INSTRUM spect
PROBHD 5 mm PABBO BB-
PULPROG zgpg30
TD 65536
SOLVENT CDCl3
NS 1024
DS 0
SWH 24038.461 Hz
FIDRES 0.366798 Hz
AQ 1.3631988 sec
RG 181
DW 20.800 usec
DE 6.00 usec
TE 297.1 K
d1 2.00000000 sec
d11 0.03000000 sec
DELTA 1.8999998 sec
TD0 1

===== CHANNEL f1 =====
NUC1 13C
P1 9.60 usec
PL1 -1.00 dB
SF01 100.6228298 MHz

===== CHANNEL f2 =====
CPDPRG2 waltz16
NUC2 1H
PCPD2 60.00 usec
PL2 12.00 dB
PL12 11.98 dB
PL13 13.05 dB
SF02 400.1316005 MHz

F2 - Processing parameters
SI 32768
SF 100.6127690 MHz
WDW EM
SSB 0
LB 1.00 Hz
GB 0
PC 1.40

