

## Supporting Information for

# **Stereospecific Addition of H-P Bond to Alkenes: A Simple Method for the Preparation of (*R<sub>P</sub>*)-Phenylphosphinates**

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## (1) General explanations

(*R<sub>P</sub>*)-(-)-menthyl phenylphosphinate **1** (*R<sub>P</sub>/S<sub>P</sub>* > 99/1) and (*R<sub>P</sub>*)-(-)-menthyl phenylvinylphosphinate **3** (*R<sub>P</sub>/S<sub>P</sub>* > 99/1) were prepared according to a reported procedure (*J. Am. Chem. Soc.* **2002**, *124*, 3842). Other starting materials are commercially available. They were purified by distillation or recrystallization before use. Solvents were dried and purified under nitrogen before use by standard procedure. <sup>1</sup>H, <sup>13</sup>C and <sup>31</sup>P NMR spectra were recorded on a JEOL LA-500 instrument (500 MHz for <sup>1</sup>H, 125.4 MHz for <sup>13</sup>C, and 201.9 MHz for <sup>31</sup>P NMR spectroscopy). Unless otherwise noted, CDCl<sub>3</sub> was used as the solvent. Chemical shift values for <sup>1</sup>H and <sup>13</sup>C are referenced to Me<sub>4</sub>Si (0 ppm), and these for <sup>31</sup>P are referenced to H<sub>3</sub>PO<sub>4</sub> (85% solution in D<sub>2</sub>O, 0 ppm). Melting points were measured on a Yanagimoto Micro Melting Point apparatus (serial no. 331) and were not corrected. Elemental and HRMS analysis were performed by the Analytical Center at the National Institute of Advanced Industrial Science and Technology.

**(2) A list of spectral and analytical data for 2a-e, 2g, 2i-t**

**(R<sub>P</sub>)-(-)-Menthyl phenyloctylphosphinate (2a).** <sup>1</sup>H NMR δ 7.79 (m, 2H), 7.43-7.52 (m, 3H), 4.25 (m, 1H), 2.25 (m, 1H), 1.21-1.95 (m, 20H), 0.73-1.01 (m, 14H); <sup>13</sup>C NMR (C<sub>6</sub>D<sub>6</sub>) δ 135.0 (*J* = 119.9 Hz), 132.0 (*J* = 10.4 Hz), 131.8 (*J* = 2.0 Hz), 128.6 (*J* = 12.4 Hz), 75.8 (*J* = 7.2 Hz), 49.5 (*J* = 5.3 Hz), 43.8, 34.5, 32.3, 31.6, 31.2, 31.1, 31.0 (*J* = 100.3 Hz), 29.5 (*J* = 3.1 Hz), 26.3, 23.3, 23.1, 22.3 (*J* = 3.1 Hz), 22.2, 21.5, 16.3, 14.4; <sup>31</sup>P NMR (C<sub>6</sub>D<sub>6</sub>) δ 40.3. HRMS Calcd for C<sub>24</sub>H<sub>41</sub>O<sub>2</sub>P: 392.2844; found: 392.2856.

**(R<sub>P</sub>)-(-)-Menthyl (6-hydroxyhexyl)phenylphosphinate (2c).** <sup>1</sup>H NMR δ 7.76 (m, 2H), 7.43-7.52 (m, 3H), 4.25 (m, 1H), 3.57 (t, 2H, *J* = 6.6 Hz), 2.23 (m, 1H), 1.24-1.95 (m, 14H), 0.71-1.03 (m, 14H); <sup>13</sup>C NMR δ 133.0 (*J* = 122.9 Hz), 131.9 (*J* = 2.0 Hz), 131.6 (*J* = 10.4 Hz), 128.4 (*J* = 12.4 Hz), 76.3 (*J* = 7.3 Hz), 62.5, 48.8 (*J* = 6.1 Hz), 43.2, 34.0, 32.4, 31.4, 30.4, 30.2 (*J* = 100.2 Hz), 25.7, 25.2, 22.9, 21.9, 21.7 (*J* = 3.0 Hz), 21.1, 15.7; <sup>31</sup>P NMR δ 42.6. HRMS Calcd for C<sub>22</sub>H<sub>37</sub>O<sub>3</sub>P: 380.2480; found: 380.2470.

**(R<sub>P</sub>)-(-)-Menthyl (2-butoxyethyl)phenylphosphinate (2d).** <sup>1</sup>H NMR δ 7.80 (m, 2H), 7.46-7.54 (m, 3H), 4.29 (m, 1H), 3.65 (m, 1H), 3.56 (m, 1H), 3.32 (m, 2H), 2.21-2.33 (m, 3H), 1.60-1.98 (m, 3H), 1.24-1.48 (m, 6H), 0.74-1.06 (m, 15H); <sup>13</sup>C NMR δ 133.1 (*J* = 121.9 Hz), 132.0 (*J* = 3.1 Hz), 131.3 (*J* = 10.4 Hz), 128.3 (*J* = 13.4 Hz), 76.6 (*J* = 7.3 Hz), 70.7, 64.3, 48.8 (*J* = 6.1 Hz), 43.2, 34.1, 31.5, 31.5 (*J* = 98.2 Hz), 31.6, 25.7, 22.9, 21.9, 21.1, 19.2, 15.7, 13.8; <sup>31</sup>P NMR δ 38.97. HRMS Calcd for C<sub>22</sub>H<sub>37</sub>O<sub>3</sub>P: 380.2480; found: 380.2496.

**(R<sub>P</sub>)-(-)-Menthyl (2-phenylthioethyl)phenylphosphinate (2e).** <sup>1</sup>H NMR δ 7.78 (m, 2H), 7.57 (m,

1H), 7.40 (m, 2H), 7.21-7.28 (m, 5H), 4.30 (m, 1H), 3.10 (m, 1H), 3.01 (m, 1H), 2.06-2.31 (m, 3H), 1.61-1.76 (m, 3H), 1.25-1.45 (m, 2H), 0.73-1.05 (m, 12H);  $^{13}\text{C}$  NMR  $\delta$  135.0, 132.5 ( $J = 125.1$  Hz), 132.3 ( $J = 2.1$  Hz), 131.4 ( $J = 10.3$  Hz), 129.8, 129.0, 128.5 ( $J = 12.4$  Hz), 126.5, 76.9 ( $J = 9.3$  Hz), 48.8 ( $J = 6.3$  Hz), 43.2, 34.0, 31.4, 31.0 ( $J = 94.1$  Hz), 26.4, 25.8, 22.8, 21.9, 21.1, 15.7;  $^{31}\text{P}$  NMR  $\delta$  38.9. HRMS Calcd for  $\text{C}_{24}\text{H}_{33}\text{O}_2\text{PS}$ : 416.1939; found: 416.1916.

**(*R<sub>P</sub>*)-(-)-Menthyl (2-diphenylphosphinoylethyl)phenylphosphinate (2g).** White solid; mp 150-152 °C.  $^1\text{H}$  NMR  $\delta$  7.71 (m, 6H), 7.43-7.57 (m, 9H), 4.26 (m, 1H), 2.57 (m, 1H), 2.34 (m, 1H), 1.97-2.18 (m, 3H), 1.59-1.72 (m, 3H), 1.24-1.39 (m, 2H), 0.74-1.05 (m, 12H);  $^{13}\text{C}$  NMR  $\delta$  132.4 ( $J = 3.2$  Hz), 132.2 ( $J = 99.2$  Hz), 132.1 ( $J = 3.1$  Hz), 131.7 ( $J = 94.1$  Hz), 131.4 ( $J = 10.4$  Hz), 130.8 (t,  $J = 8.8$  Hz), 128.8 (dd,  $J = 12.5$  Hz,  $J = 3.6$  Hz), 128.6 ( $J = 12.4$  Hz), 76.9 ( $J = 14.4$  Hz), 48.7 ( $J = 5.1$  Hz), 43.1, 34.0, 31.5, 25.7, 22.8, 22.2 ( $J = 4.0$ , 56.7 Hz), 22.1 ( $J = 3.1$ , 70.9 Hz), 21.9, 21.1, 15.6;  $^{31}\text{P}$  NMR  $\delta$  41.1 (d,  $J = 61.4$  Hz), 32.7(d,  $J = 61.4$  Hz). Anal. Calcd for  $\text{C}_{30}\text{H}_{38}\text{O}_3\text{P}_2$ : C, 70.85; H, 7.53. Found: C, 70.55; H, 7.51. HRMS Calcd for  $\text{C}_{30}\text{H}_{38}\text{O}_3\text{P}_2$ : 508.2296; found: 508.2299.

**(*R<sub>P</sub>*)-(-)-Menthyl (2-Diethoxyphosphinyloylethyl)phenylphosphinate (2h).**  $^1\text{H}$  NMR  $\delta$  7.78 (m, 2H), 7.46-7.57 (m, 3H), 4.29 (m, 1H), 4.06 (m, 4H), 1.93-2.23 (m, 4H), 1.60-1.83 (m, 6H), 1.29 (dt, 6H,  $J = 10.4$  Hz,  $J = 7.1$  Hz), 0.73-1.04 (m, 12H);  $^{13}\text{C}$  NMR  $\delta$  132.3 ( $J = 2.0$  Hz), 132.0 ( $J = 126.0$  Hz), 131.4 ( $J = 10.4$  Hz), 128.6 (t,  $J = 12.4$  Hz), 76.9 ( $J = 7.1$  Hz), 61.9 (dd,  $J = 8.3$  Hz,  $J = 6.1$  Hz), 48.8 ( $J = 6.1$  Hz), 43.1, 34.0, 31.4, 25.8, 23.7 (dd,  $J = 101.6$  Hz,  $J = 6.1$  Hz), 22.9, 21.9, 21.1, 18.3 (dd,  $J = 144.2$  Hz,  $J = 3.1$

Hz), 16.4 (dd,  $J = 5.6$  Hz,  $J = 2.6$  Hz), 15.7;  $^{31}\text{P}$  NMR  $\delta$  40.4 (d,  $J = 75.3$  Hz), 30.3 (d,  $J = 75.3$  Hz).

HRMS Calcd for  $\text{C}_{22}\text{H}_{38}\text{O}_5\text{P}_2$ : 444.2194; found: 444.2171.

**(*R<sub>P</sub>*)-(-)-Menthyl (2-triethoxysilylethyl)phenylphosphinate (2i).** White solid; mp 74-76 °C.  $^1\text{H}$  NMR  $\delta$  7.78 (m, 2H), 7.48 (m, 3H), 4.28 (m, 1H), 3.75 (q, 6H,  $J = 7.0$ ), 2.25 (m, 1H), 1.36-1.95 (m, 7H), 1.18 (dt, 9H,  $J = 5.0$  Hz,  $J = 0.6$  Hz), 0.67-1.02 (m, 14H);  $^{13}\text{C}$  NMR  $\delta$  132.7 ( $J = 122.9$  Hz), 131.8 ( $J = 3.1$  Hz), 131.5 ( $J = 9.3$  Hz), 128.3 ( $J = 12.4$  Hz), 76.3 ( $J = 7.3$  Hz), 58.4, 48.9 ( $J = 6.1$  Hz), 43.2, 34.1, 31.4, 25.7, 23.5 ( $J = 99.3$  Hz), 22.9, 21.9, 21.1, 18.2, 15.7, 1.70 ( $J = 7.3$  Hz);  $^{31}\text{P}$  NMR  $\delta$  42.0 ( $J_{\text{PSi}} = 34.5$  Hz).  
Anal. Calcd for  $\text{C}_{24}\text{H}_{43}\text{O}_5\text{PSi}$ : C, 61.25; H, 9.21. Found: C, 61.13; H, 9.05. HRMS Calcd for  $\text{C}_{24}\text{H}_{43}\text{O}_5\text{PSi}$ : 470.2617; found: 470.2721.

**(*R<sub>P</sub>*)-(-)-Menthyl (2-tributylstannylethyl)phenylphosphinate (2j).**  $^1\text{H}$  NMR  $\delta$  7.77-7.81 (m, 2H), 7.44-7.52 (m, 3H), 4.23-4.32 (m, 1H), 2.15 (m, 1H), 1.52-2.01 (m, 6H), 0.71-1.43 (m, 42H);  $^{13}\text{C}$  NMR  $\delta$  133.5 ( $J = 121.0$  Hz), 132.1 ( $J = 2.0$  Hz), 131.9 ( $J = 9.3$  Hz), 128.7 ( $J = 12.4$  Hz), 76.6 ( $J = 7.1$  Hz), 49.4 ( $J = 6.3$  Hz), 43.7, 34.6, 31.9, 29.5 ( $J_{\text{SnP}} = 20.6$  Hz), 27.8 ( $J_{\text{SnP}} = 52.7$  Hz), 27.7 ( $J = 94.1$  Hz), 26.2, 23.4, 22.3, 21.5, 16.2, 14.1, 9.23 ( $J_{\text{SnP}} = 307.0, 321.4$ ), -1.24 ( $J = 9.3$  Hz);  $^{31}\text{P}$  NMR  $\delta$  43.5 ( $J_{\text{SnP}} = 225.0, 234.3$  Hz). HRMS Calcd for  $\text{C}_{30}\text{H}_{55}\text{O}_2\text{PSn}$ : 598.2962; found: 598.3089.

**(*R<sub>P</sub>*)-(-)-Menthyl (3-diphenylphosphinoylpropyl)phenylphosphinate (2k).**  $^1\text{H}$  NMR  $\delta$  7.40-7.72 (m, 15H), 4.23 (m, 1H), 0.73-2.42 (m, 24H);  $^{13}\text{C}$  NMR  $\delta$  132.7 (dd,  $J = 98.2$  Hz,  $J = 60.9$  Hz), 132.6 ( $J = 112.6$  Hz), 132.0 ( $J = 3.1$  Hz), 131.8 (dd,  $J = 2.1$  Hz,  $J = 5.0$  Hz), 131.3 ( $J = 9.3$  Hz), 130.8 (t,  $J = 9.3$  Hz),

128.7 (dd,  $J = 2.6$  Hz,  $J = 11.3$  Hz), 128.5 ( $J = 12.4$  Hz), 76.6 ( $J = 7.3$  Hz), 48.8 ( $J = 6.1$  Hz), 43.1, 34.0, 31.4, 30.9 (dd,  $J = 99.7$  Hz,  $J = 13.4$  Hz), 30.3 (dd,  $J = 70.7$  Hz,  $J = 11.9$  Hz), 25.7, 22.9, 21.9, 21.1, 15.7, 14.8 (t,  $J = 3.1$ );  $^{31}\text{P}$  NMR  $\delta$  41.1, 32.0. HRMS Calcd for  $\text{C}_{31}\text{H}_{40}\text{O}_3\text{P}_2$ : 522.2453; found: 522.2427.

**( $R_P$ )-(-)-Menthyl (2-cyclohex-3-enylethyl)phenylphosphinate (2l).** White solid; mp 79-81 °C.  $^1\text{H}$  NMR  $\delta$  7.80 (m, 2H), 7.46-7.54 (m, 3H), 5.63 (m, 2H), 4.30 (m, 1H), 2.26 (m, 1H), 1.13-2.08 (m, 16H), 0.72-1.06 (m, 12H);  $^{13}\text{C}$  NMR  $\delta$  133.2 (dd,  $J = 122.9$  Hz,  $J = 3.1$  Hz), 131.8 ( $J = 3.1$  Hz), 131.3 ( $J = 9.3$  Hz), 128.4 ( $J = 12.4$  Hz), 127.0 ( $J = 7.1$  Hz), 126.1 ( $J = 4.1$  Hz), 76.3 ( $J = 7.1$  Hz), 48.9 ( $J = 6.3$  Hz), 43.2, 34.4 ( $J = 15.5$  Hz), 34.1, 31.4, 31.3 ( $J = 4.1$  Hz), 28.3 ( $J = 11.4$  Hz), 28.1 (dd,  $J = 11.3$  Hz,  $J = 3.1$  Hz), 28.0 (dd,  $J = 100.3$  Hz,  $J = 5.0$  Hz), 25.8, 25.1 ( $J = 9.3$  Hz), 22.9, 21.9, 21.1, 15.8;  $^{31}\text{P}$  NMR  $\delta$  42.7. HRMS Calcd for  $\text{C}_{24}\text{H}_{37}\text{O}_2\text{P}$ : 388.2531; found: 388.2540.

**( $R_P$ )-(-)-Menthyl phenyl(tetrahydrofuran-3-)phosphinate (2m) (a 46/54 diastereomer mixture);**  $^1\text{H}$  NMR  $\delta$  7.81 (m, 2H), 7.46-7.58 (m, 3H), 4.34 (m, 1H), 3.71-4.11 (m, 4H), 2.66 (m, 1H), 1.89-2.27 (m, 3H), 1.61-1.73 (m, 3H), 1.31-1.44 (m, 2H), 0.73-1.06 (m, 12H);  $^{31}\text{P}$  NMR  $\delta$  39.9 (minor diastereomer), 38.7 (major diastereomer). HRMS Calcd for  $\text{C}_{20}\text{H}_{31}\text{O}_3\text{P}$ : 350.2011; found: 350.2015.

**( $R_P$ )-(-)-Menthyl phenyl(tetrahydropyran-3-)phosphinate (2n) (a 47/53 diastereomer mixture).** White solid; mp 54-56 °C;  $^1\text{H}$  NMR  $\delta$  7.75 (m, 2H), 7.45-7.56 (m, 3H), 4.28 (m, 1H), 3.86-4.21 (m, 2H), 3.25-3.60 (m, 2H), 2.09-2.32 (m, 3H), 0.73-1.67 (m, 20H);  $^{31}\text{P}$  NMR  $\delta$  39.93 (minor diastereomer), 38.71 (major diastereomer). Anal. Calcd for  $\text{C}_{21}\text{H}_{33}\text{O}_3\text{P}$ : C, 69.21; H, 9.13. Found: C,

69.01; H, 9.00. HRMS Calcd for C<sub>21</sub>H<sub>33</sub>O<sub>3</sub>P: 364.2167; found: 364.2194.

**(R<sub>P</sub>)-(-)-Menthyl (2-acetoxypropyl)phenylphosphinate (2o)** (a 35/65 diastereomer mixture). <sup>1</sup>H NMR δ 7.80 (m, 2H), 7.47-7.55 (m, 3H), 5.04-5.14 (m, 1H), 4.27 (m, 1H), 0.72-2.49 (m, 26H); <sup>31</sup>P NMR δ 37.4 (minor diastereomer), 37.0 (major diastereomer). HRMS Calcd for C<sub>21</sub>H<sub>33</sub>O<sub>4</sub>P: 380.2116; found: 380.2166.

**(R<sub>P</sub>)-(-)-Menthyl (2-*exo*-norbornyl)phenylphosphinate (2p)**. (a 52/48 diastereomer mixture). White solid; mp 71-74 °C; <sup>1</sup>H NMR δ 7.70 (m, 2H), 7.36-7.68 (m, 3H), 4.38 (m, 1H), 0.63-2.52 (m, 29H); <sup>31</sup>P NMR δ 42.9 (minor diastereomer), 42.3 (major diastereomer). Anal. Calcd for C<sub>23</sub>H<sub>35</sub>O<sub>2</sub>P: C, 73.76; H, 9.42. Found: C, 73.38; H, 9.11. HRMS Calcd for C<sub>23</sub>H<sub>35</sub>O<sub>2</sub>P: 374.2375; found: 374.2389.

**(R<sub>P</sub>)-(-)-Menthyl cyclohexylphenylphosphinate (2q)**. <sup>5f</sup> <sup>1</sup>H NMR δ 7.76 (m, 2H), 7.43-7.59 (m, 3H), 4.28 (m, 1H), 2.30 (m, 1H), 2.00 (br, 1H), 0.70-1.88 (m, 27H); <sup>13</sup>C NMR δ 132.3 (*J* = 118.9 Hz), 131.7 (*J* = 2.0 Hz), 132.1 (*J* = 9.3 Hz), 128.1 (*J* = 11.4 Hz), 76.0 (*J* = 7.1 Hz), 49.0 (*J* = 5.3 Hz), 43.1, 39.1 (*J* = 102.3 Hz), 34.1, 31.4, 26.3 (*J* = 4.1 Hz), 26.2 (*J* = 3.1 Hz), 25.5, 24.9 (*J* = 4.1 Hz), 22.8, 21.9, 21.2, 15.6; <sup>31</sup>P NMR δ 41.7.

**(R<sub>P</sub>)-(-)-Menthyl cyclopentylphenylphosphinate (2r)**. White solid; mp 87-89 °C; <sup>1</sup>H NMR δ 7.79 (m, 2H), 7.43-7.51 (m, 3H), 4.30 (m, 1H), 2.27 (m, 2H), 1.88 (m, 2H), 0.71-1.70 (m, 23H); <sup>13</sup>C NMR δ 133.4 (*J* = 119.9 Hz), 131.7 (*J* = 9.3 Hz), 131.6 (*J* = 2.0 Hz), 128.1 (*J* = 12.4 Hz), 76.0 (*J* = 7.3 Hz), 49.0 (*J* = 6.1 Hz), 43.1, 39.1 (*J* = 105.5 Hz), 34.1, 31.4, 26.6 (*J* = 11.4 Hz), 26.2 (*J* = 10.5 Hz), 25.5, 22.8, 21.9,

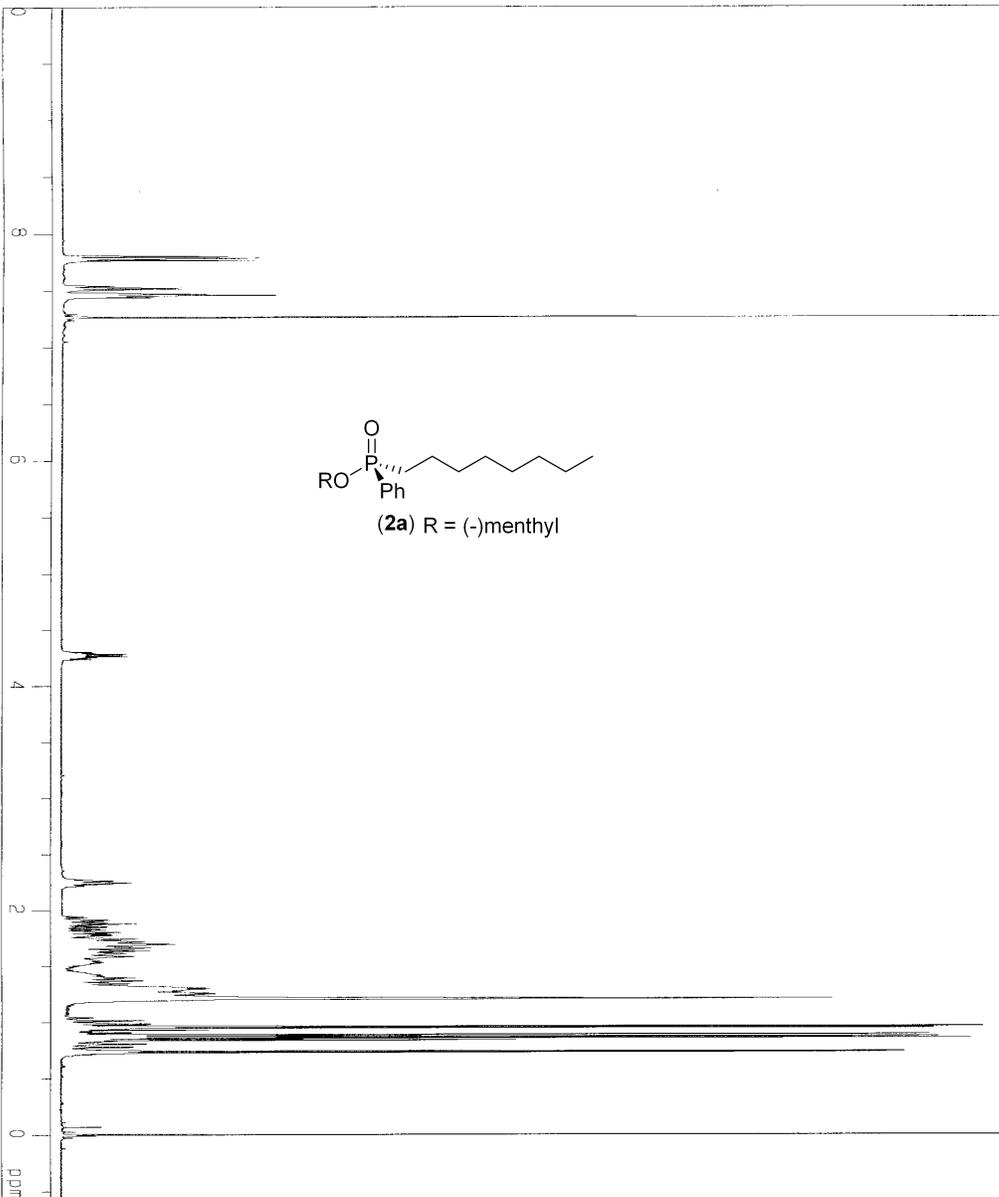
21.2, 15.6;  $^{31}\text{P}$  NMR  $\delta$  42.8. Anal. Calcd for  $\text{C}_{21}\text{H}_{33}\text{O}_2\text{P}$ : C, 72.38; H, 9.55. Found: C, 72.12; H, 9.26.

HRMS Calcd for  $\text{C}_{21}\text{H}_{33}\text{O}_2\text{P}$ : 348.2218; found: 348.2220.

**(*R<sub>P</sub>*)-(-)-Menthyl (2-cyanoethyl)phenylphosphinate (2s).** White solid; mp 64-66 °C;  $^1\text{H}$  NMR  $\delta$  7.78 (m, 2H), 7.54 (m, 3H), 4.29 (m, 1H), 2.62 (m, 1H), 2.48 (m, 1H), 2.10-2.33 (m, 3H) 1.59-1.72 (m, 3H), 1.29-1.42 (m, 2H), 0.75-1.03 (m, 12H);  $^{13}\text{C}$  NMR  $\delta$  132.9, 131.5 ( $J = 10.4$  Hz), 131.2 ( $J = 125.4$  Hz), 128.9 ( $J = 12.4$  Hz), 118.6 ( $J = 25.8$  Hz), 77.6 ( $J = 7.3$  Hz), 48.7, 43.1, 34.0, 31.5, 26.8 ( $J = 100.3$  Hz), 25.9, 22.9, 21.9, 21.1, 15.7, 10.8;  $^{31}\text{P}$  NMR  $\delta$  37.2. Anal. Calcd for  $\text{C}_{19}\text{H}_{28}\text{NO}_2\text{P}$ : C, 68.45; H, 8.46; N, 4.20. Found: C, 68.10; H, 8.31; N, 4.25. HRMS Calcd for  $\text{C}_{19}\text{H}_{28}\text{NO}_2\text{P}$ : 333.1858; found: 333.1779.

**(*R<sub>P</sub>*)-(-)-Menthyl (2-methoxycarbonyl)ethylphosphinate (2t).**  $^1\text{H}$  NMR  $\delta$  7.49 (m, 2H), 7.44-7.53 (m, 3H), 4.27 (m, 1H), 3.61 (s, 3H), 2.56 (m, 1H), 2.44 (m, 1H), 2.11-2.37 (m, 3H) 1.57-1.72 (m, 3H), 1.27-1.38 (m, 2H), 0.73-1.02 (m, 12H);  $^{13}\text{C}$  NMR  $\delta$  172.7 ( $J = 18.6$  Hz), 132.3 ( $J = 126.0$  Hz), 132.2 ( $J = 2.1$  Hz), 131.4 ( $J = 9.4$  Hz), 128.5 ( $J = 13.4$  Hz), 76.8 ( $J = 7.1$  Hz), 51.9, 48.8 ( $J = 6.3$  Hz), 43.1, 34.0, 31.5, 26.7, 25.8, 25.7 ( $J = 103.3$  Hz), 22.8, 21.9, 21.1, 15.7;  $^{31}\text{P}$  NMR  $\delta$  40.4. HRMS Calcd for  $\text{C}_{20}\text{H}_{31}\text{O}_4\text{P}$ : 366.1960; found: 366.1976.

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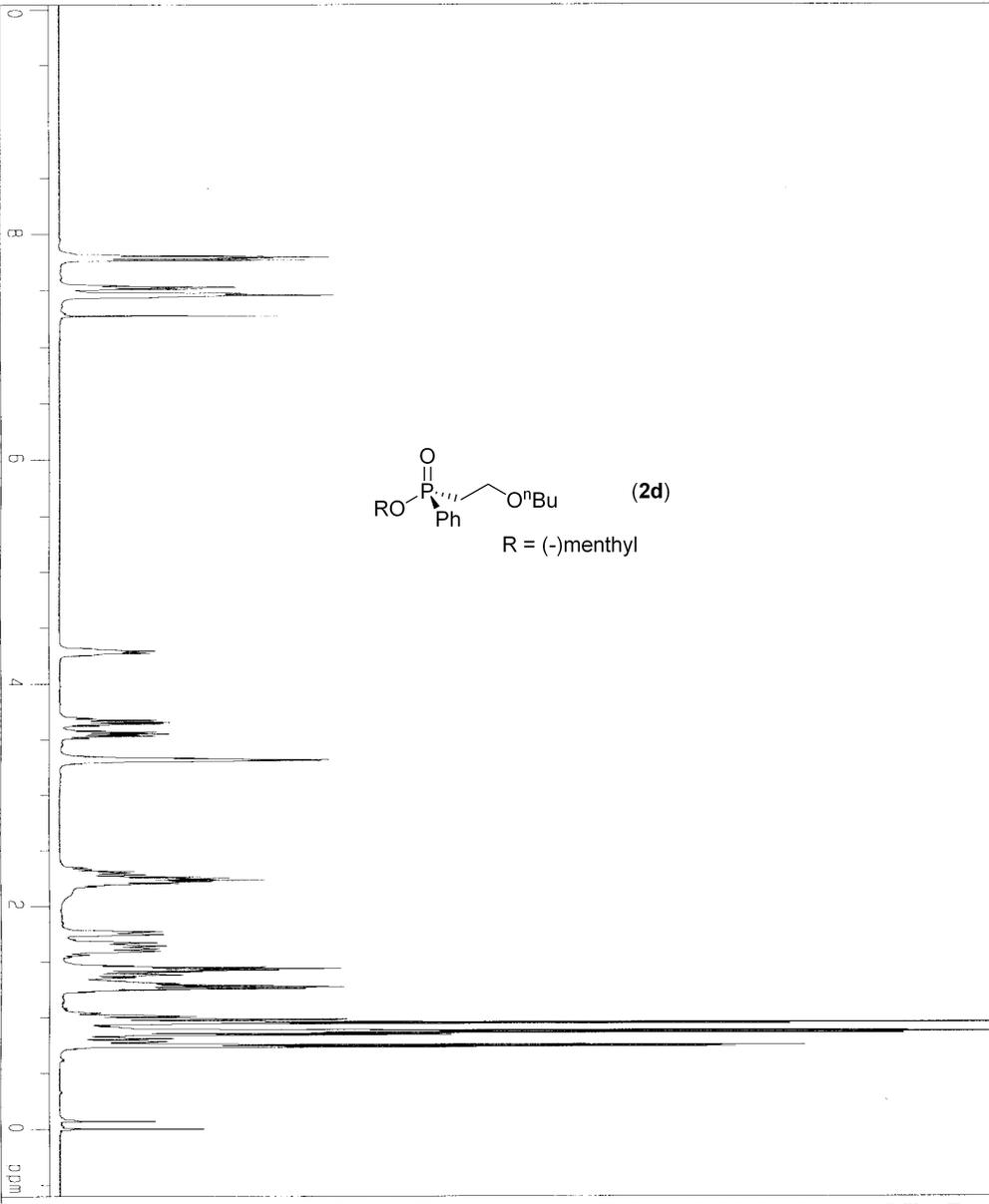
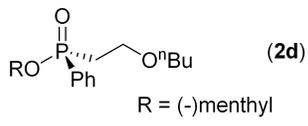
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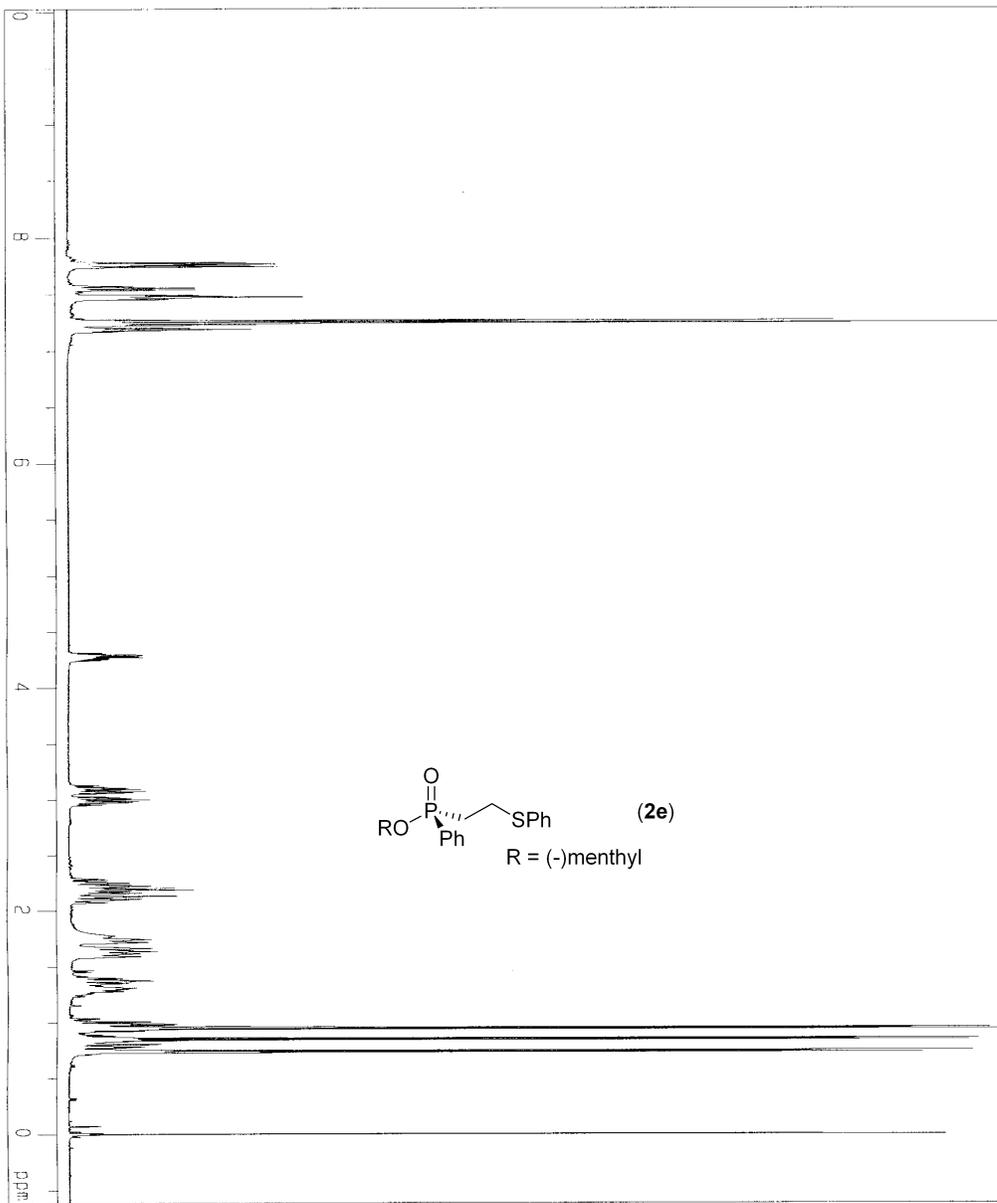
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 INTVL 100.2 usec  
 TIMES 32 times  
 DUMWY 0 times  
 PD 0 times  
 ACQTM 3 7166 sec  
 PREDL 3293.3535 msec  
 INIWT 10.00000 msec  
 RESOL 0.5000 msec  
 PW1 0.30 Hz  
 OBNUC 1H  
 OBFRQ 499.10 MHz  
 OBSET 129250.00 Hz  
 RGA1N 18

SCANS 32 times  
 SLVNT CDCL3  
 SPINNING 10 Hz  
 TEMP 20.5 C

phsc2

2e



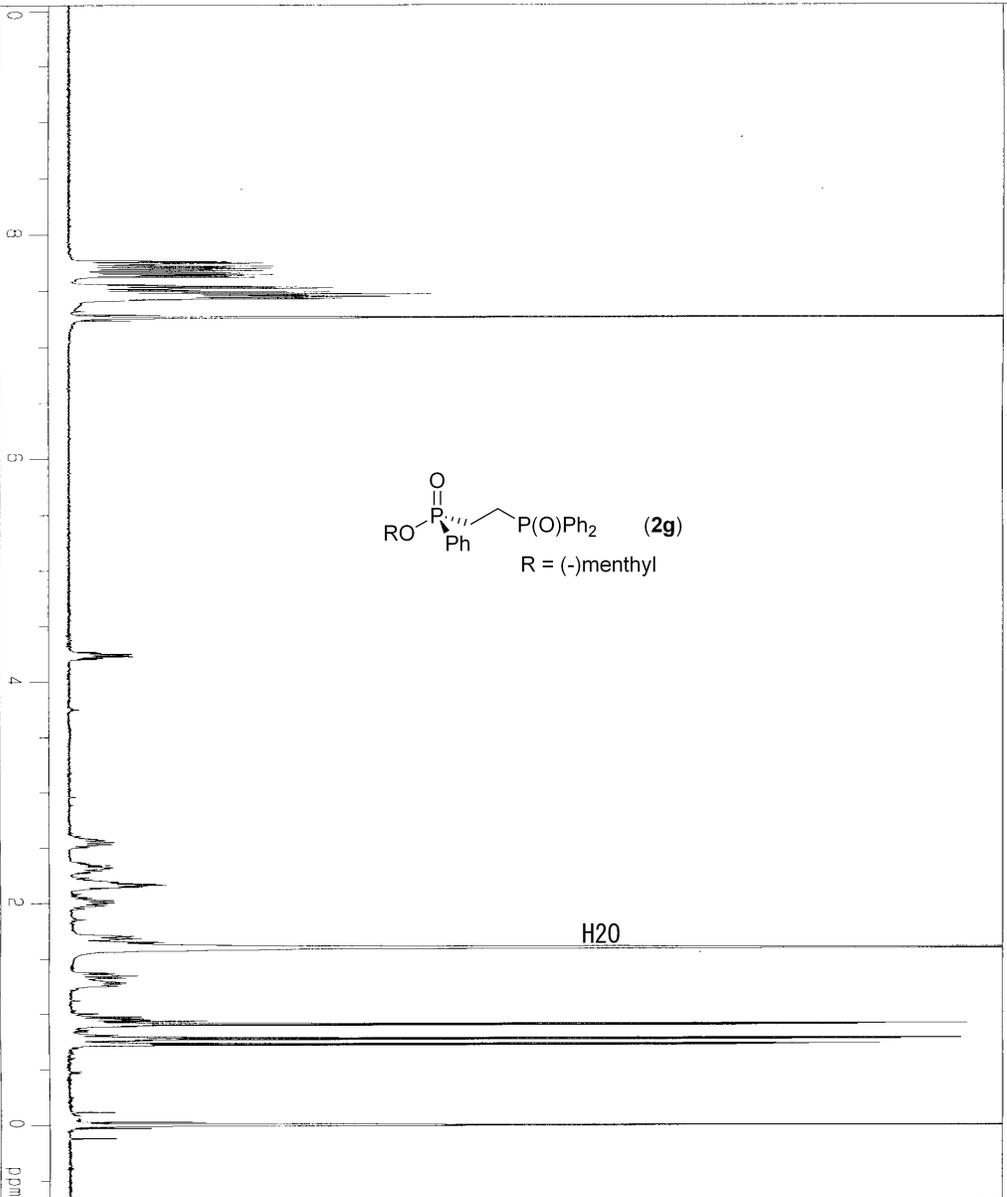
Date : Wed May 19 02: 40: 32 2005

FileName : 0051724\_1h.nmdata  
 Comment : phsc2  
 SliceHistory :  
 EXMODE : non

POINT	32768 points
SAMPD	32768 points
FREQD	9980.0 Hz
FILTR	5000 Hz
DELAY	40.0 usec
DEADT	57.4 usec
INVL	100.2 usec
TIMES	32 times
DUMMY	0 times
PD	3.7166 sec
ACQTM	3293.3535 msec
PREDL	10.00000 msec
INIMT	0.5000 msec
RESOL	0.30 Hz
PW1	5.25 usec
OBNUC	1H
OBFRG	499.10 MHz
OBSET	128250.00 Hz
RGAIN	23
SCANS	32 times
SLVNT	CDCl3
SPINNING	10 Hz
TEMP	21.3 C

PC2PX

13



Date : Tue May 24 11:23:22 2005

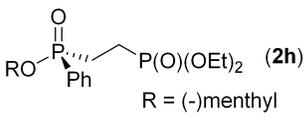
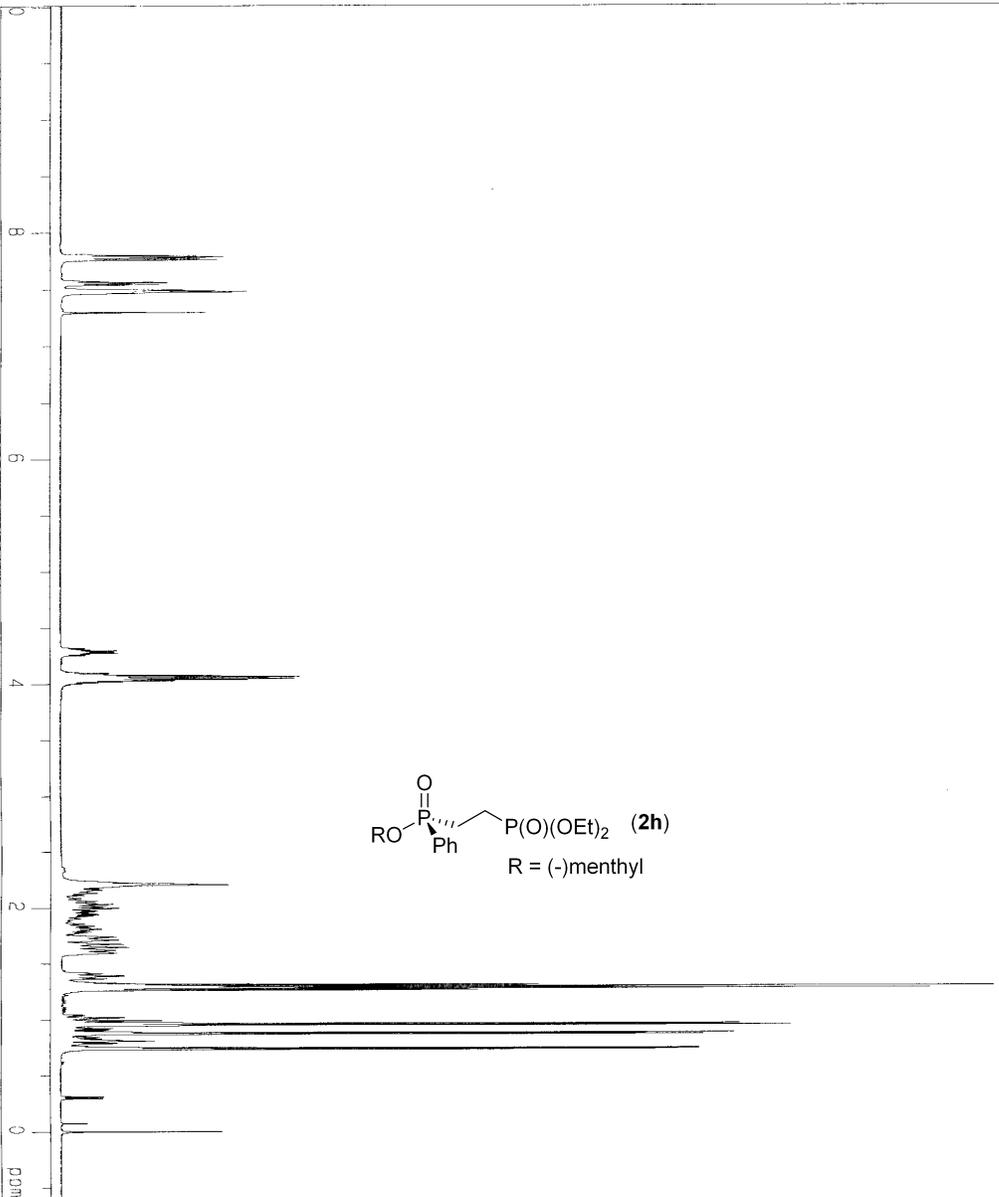
F1JName : 4005201\_1H.nmdata  
 Comment : PC2PX  
 SliceHistory :  
 EXMODE : non

POINT	32768 points
SAMPD	32768 points
FREQU	9980.0 Hz
FILTR	5000 Hz
DELAY	40.0 usec
DEADT	57.4 usec
INVTL	100.2 usec
TIMES	256 times
DUMMY	0 times
PD	3.7166 sec
ACQTM	3283.3535 msec
PREDL	10.00000 msec
INVT	0.5000 msec
RESOL	0.38 Hz
PW1	5.28 usec
OBNUC	<sup>1</sup> H
OBFRQ	499.10 MHz
OBSET	128250.00 Hz
RGAIN	28

SCANS : 256 times  
 SLVNT : CDCL3  
 SPINNING : 12 Hz  
 TEMP : 20.7 C

eto

21

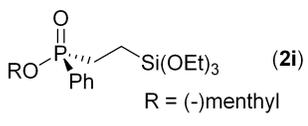
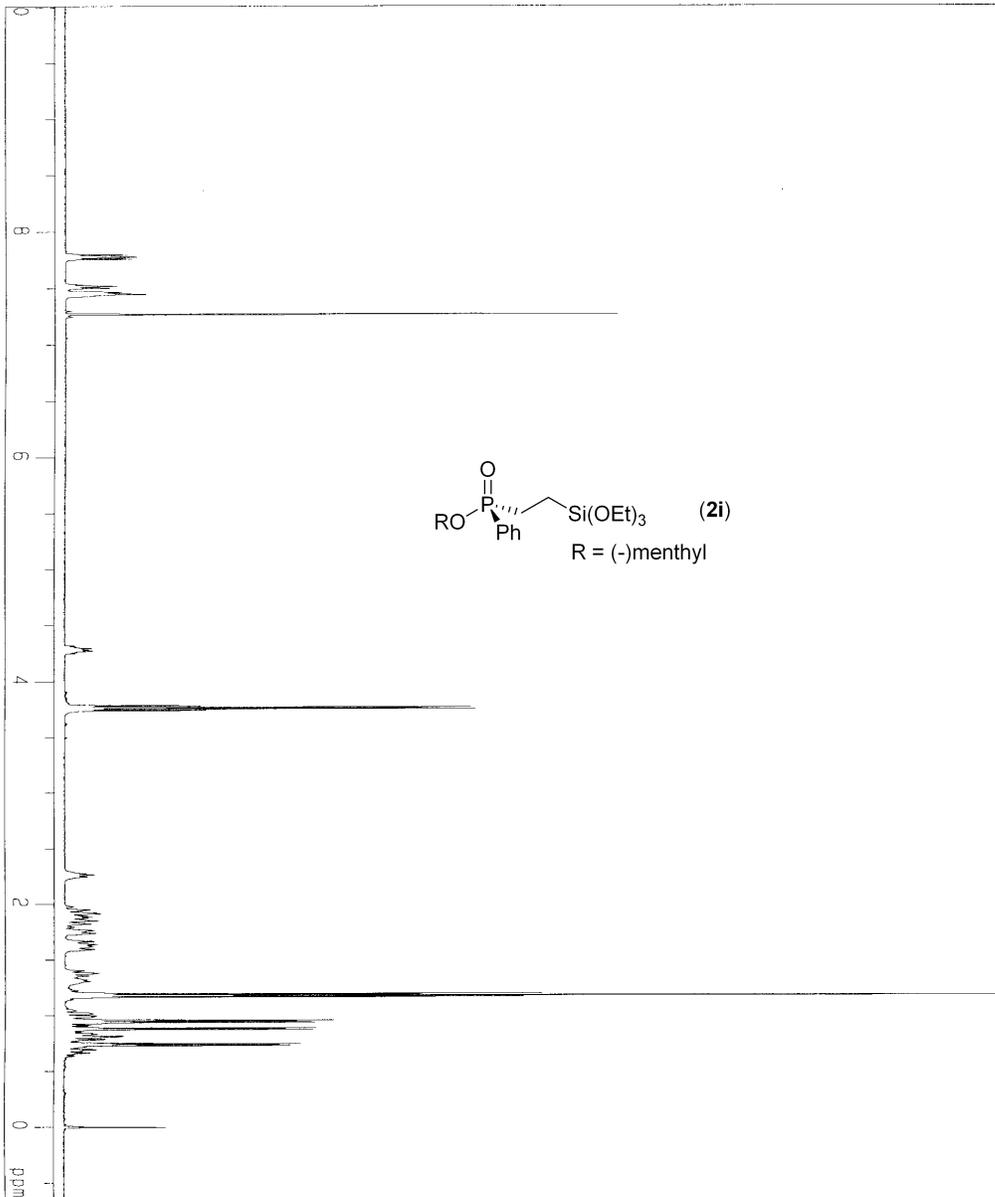


Date : Wed May 18 16:33:13 2005

FileName : 0051813\_1h.nmdata  
 Comment : eto  
 SliceHistory :  
 EXMODE : npr

POINT	32768 points
SAMPD	32768 points
FREQD	9980.0 Hz
FILTR	5000 Hz
DELAY	40.0 usec
DEADT	57.4 usec
INTVL	100.2 usec
TIMES	32 times
DUMWY	0 times
PD	3 7166 sec
ACQTM	3293.3535 msec
PREDL	10.00000 msec
INIMT	0.5000 msec
RESOL	0.30 Hz
PR1	5.25 usec
OBNUC	1H
OBFRQ	499.10 MHz
OBSET	129250.00 Hz
RGAIN	19
SCANS	32 times
SLVNT	CDCL3
SPINNING	12 Hz
TEMP	20.8 C

S1-150



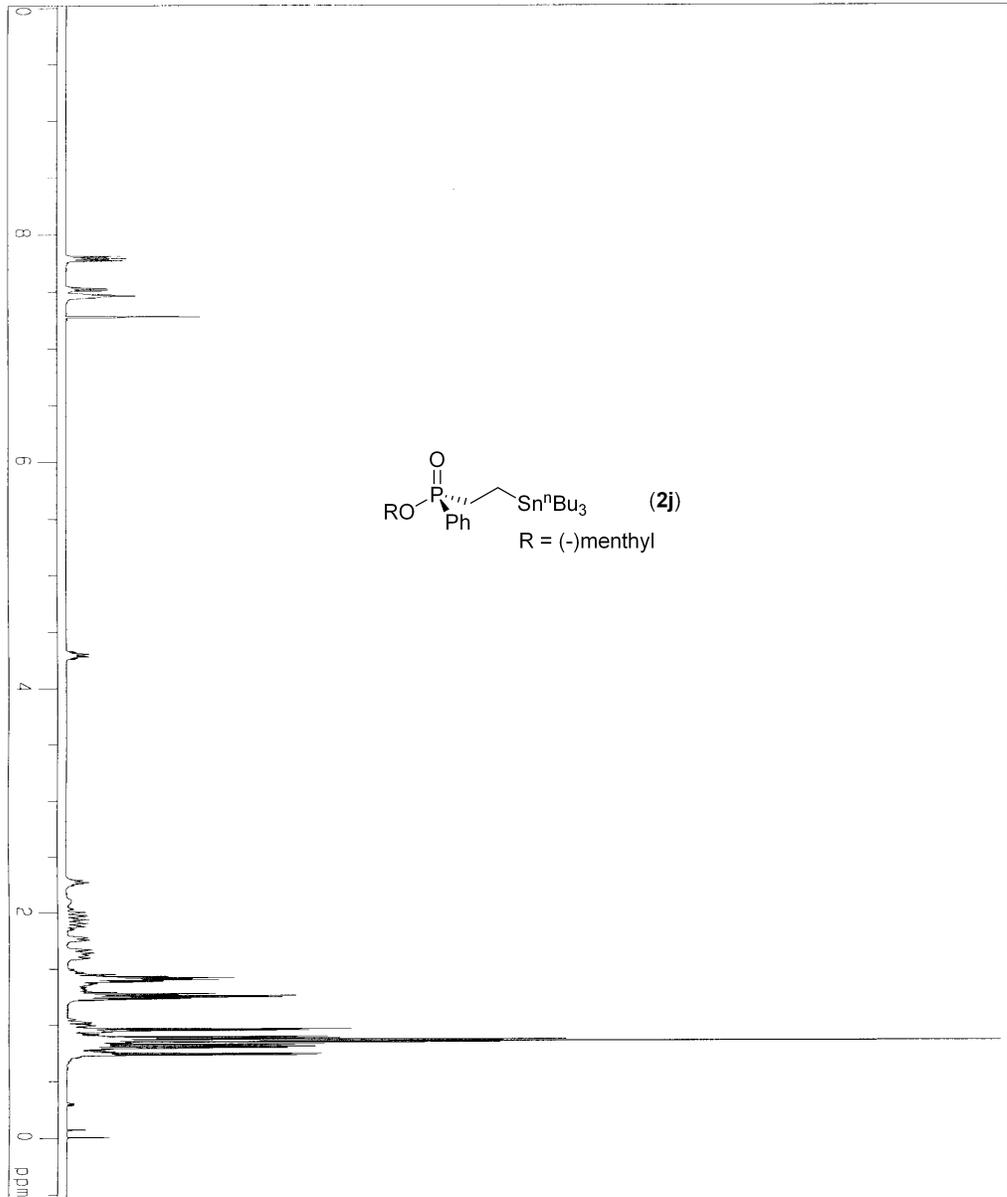
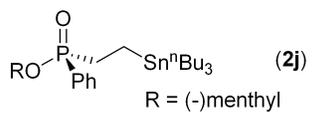
Date : Fri May 13 11:26:57 2005

Filename : 0051302\_1h.nmdata  
Comment : S1-150  
Slicehistory :  
EXMODE : non

POINT : 32768 points  
SAMP0 : 32768 points  
FREQ0 : 9980.0 Hz  
FILTR : 5000 Hz  
DELAY : 40.0 usec  
DEADT : 57.4 usec  
INTVL : 100.2 usec  
TIMES : 32 times  
DUMMY : 0 times  
PD : 3 7166 sec  
ACQTM : 3293.3535 msec  
PREDL : 10.00000 msec  
ININT : 0.5000 msec  
RESOL : 0.30 Hz  
PWT : 5.25 usec  
OBNVJ : 1H  
OBFREQ : 499.10 MHz  
OBSF1 : 128250.00 Hz  
RGAIN : 20  
SCANS : 32 times  
SLVNT : CDCL3  
SPINNING : 11 Hz  
TEMP : 21.2 C

SN

4.2



Date : Thu May 26 22:20:39 2005

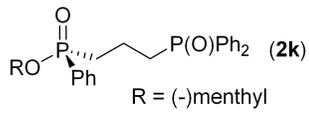
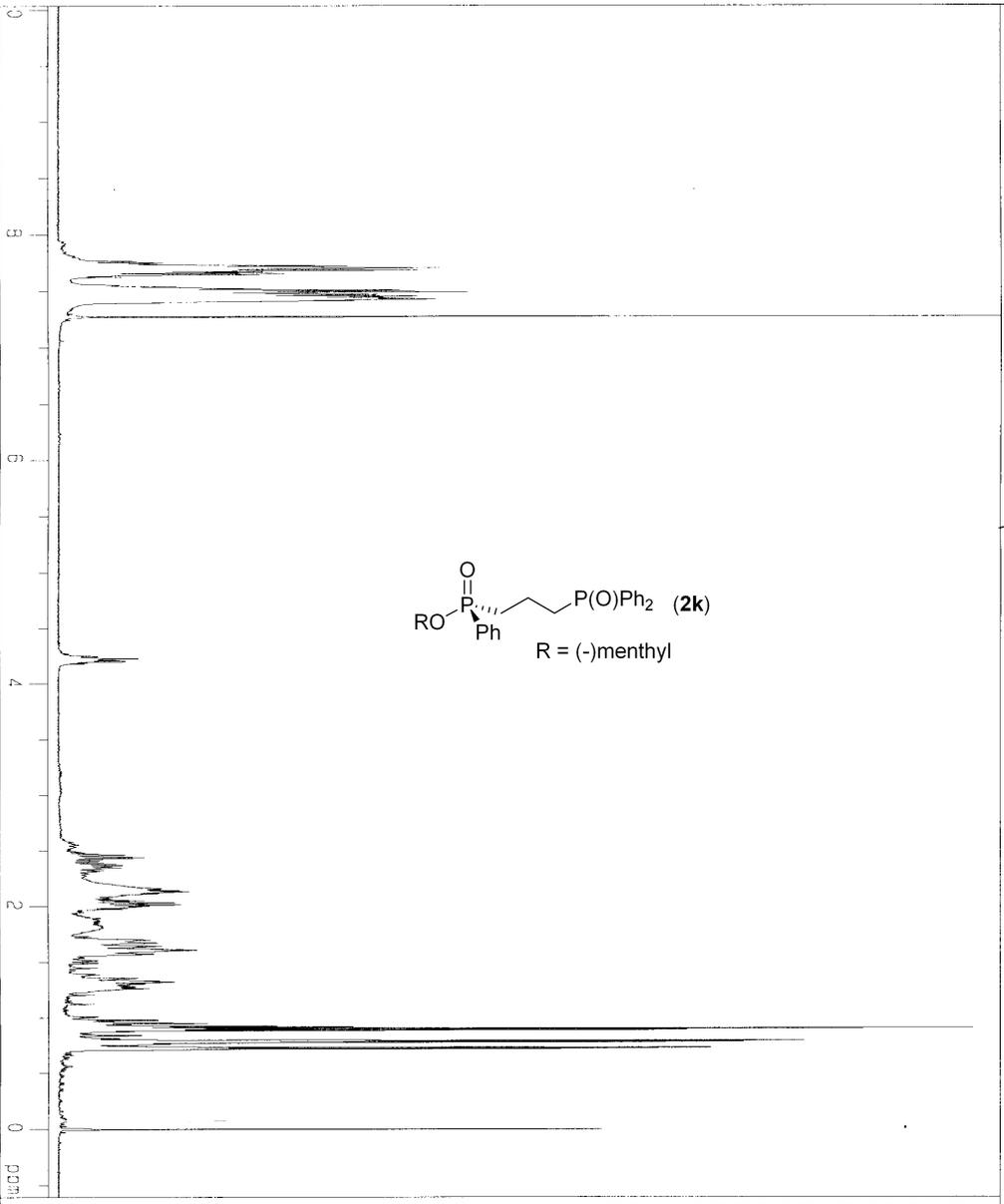
FileName : 0052612\_1H.nmdata  
 Comment : SN  
 SliceHistory : non  
 EXMODE : non

POINT : 32768 points  
 SAMPD : 32768 points  
 FREQD : 9980.0 Hz  
 FILTR : 5000 Hz  
 DELAY : 40.0 usec  
 DEADT : 57.4 usec  
 INTRV : 100.2 usec  
 TIMES : 32 times  
 DUMWY : 0 times  
 PD : 3.7166 sec  
 ACQTM : 3293.3535 msec  
 PREDL : 10.00000 msec  
 INIIT : 0.5000 msec  
 RESOL : 0.39 Hz  
 PW1 : 5.25 usec

1H : 499.10 MHz  
 OBRFQ : 128250.00 Hz  
 OBRFT : 15  
 RGAIN : 15

SCANS : 32 times  
 SLVNT : CDCL3  
 SPINNING : 13 Hz  
 TEMP : 21.2 C

poc3p\*

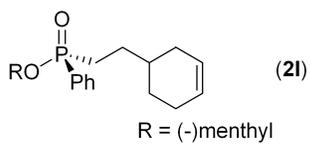
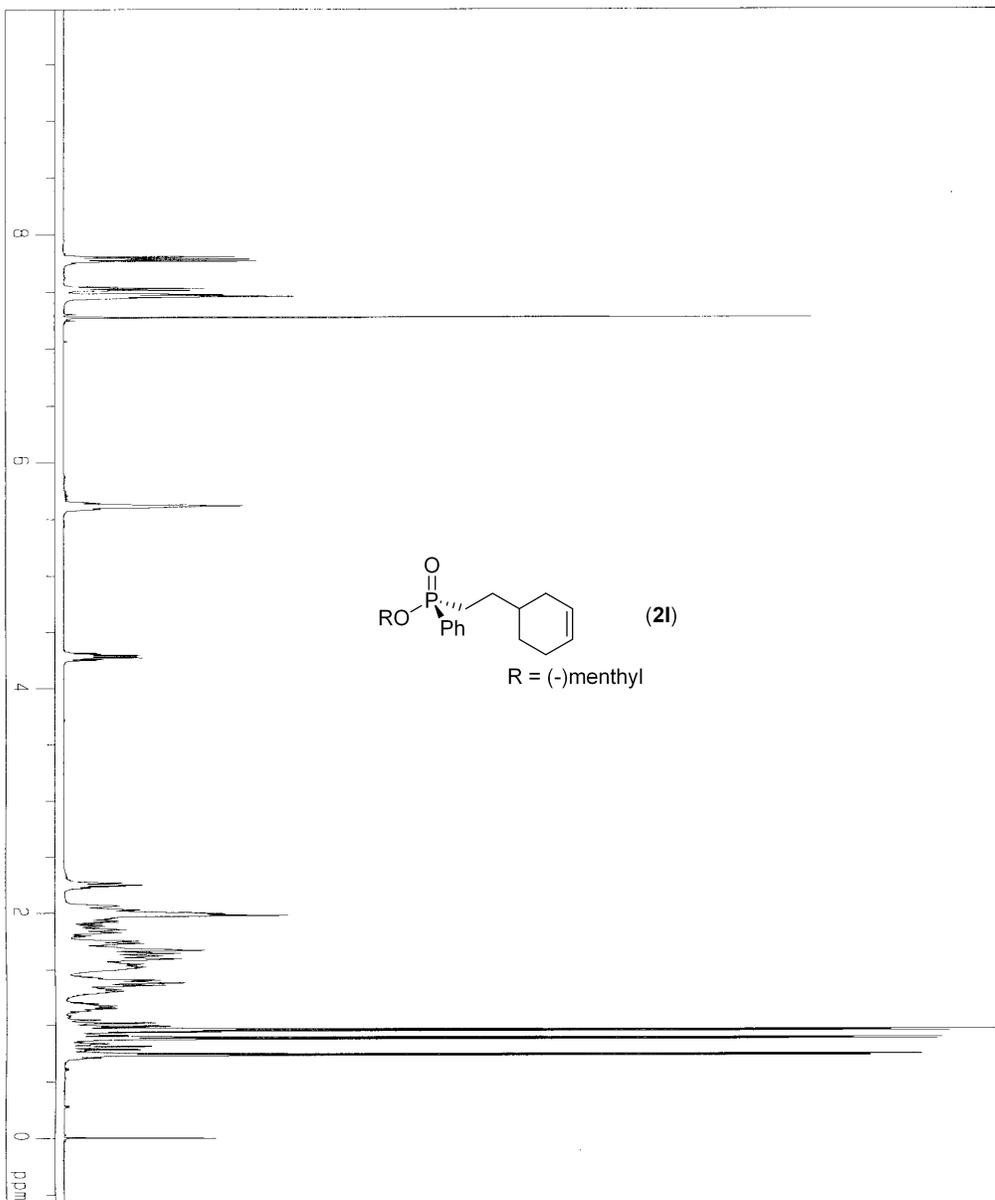


Date : Tue May 17 10:19:09 2005

Filename : 0051703\_1h5.nmdata  
Comment : poc3p  
Slicehistory :  
EXMODE : non

POINT	32768 points
SAMPD	32768 points
FREQD	9980.0 Hz
FILTR	5000 Hz
DELAY	40.0 usec
DEADT	57.4 usec
INTVL	100.2 usec
TIMES	32 times
DUMMY	0 times
PD	3 7166 sec
ACQTM	3293.3535 msec
PREDL	10.00000 msec
INIMT	0 5000 msec
RESOL	0.30 Hz
PW1	5.25 usec
OBNUC	<sup>1</sup> H
OBFRQ	499.10 MHz
CHSET	128250.00 Hz
RGAIN	21
SCANS	32 times
SLVNT	CDCL3
SPINNING	13 Hz
TEMP	20.8 C

cyc2p

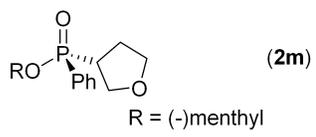
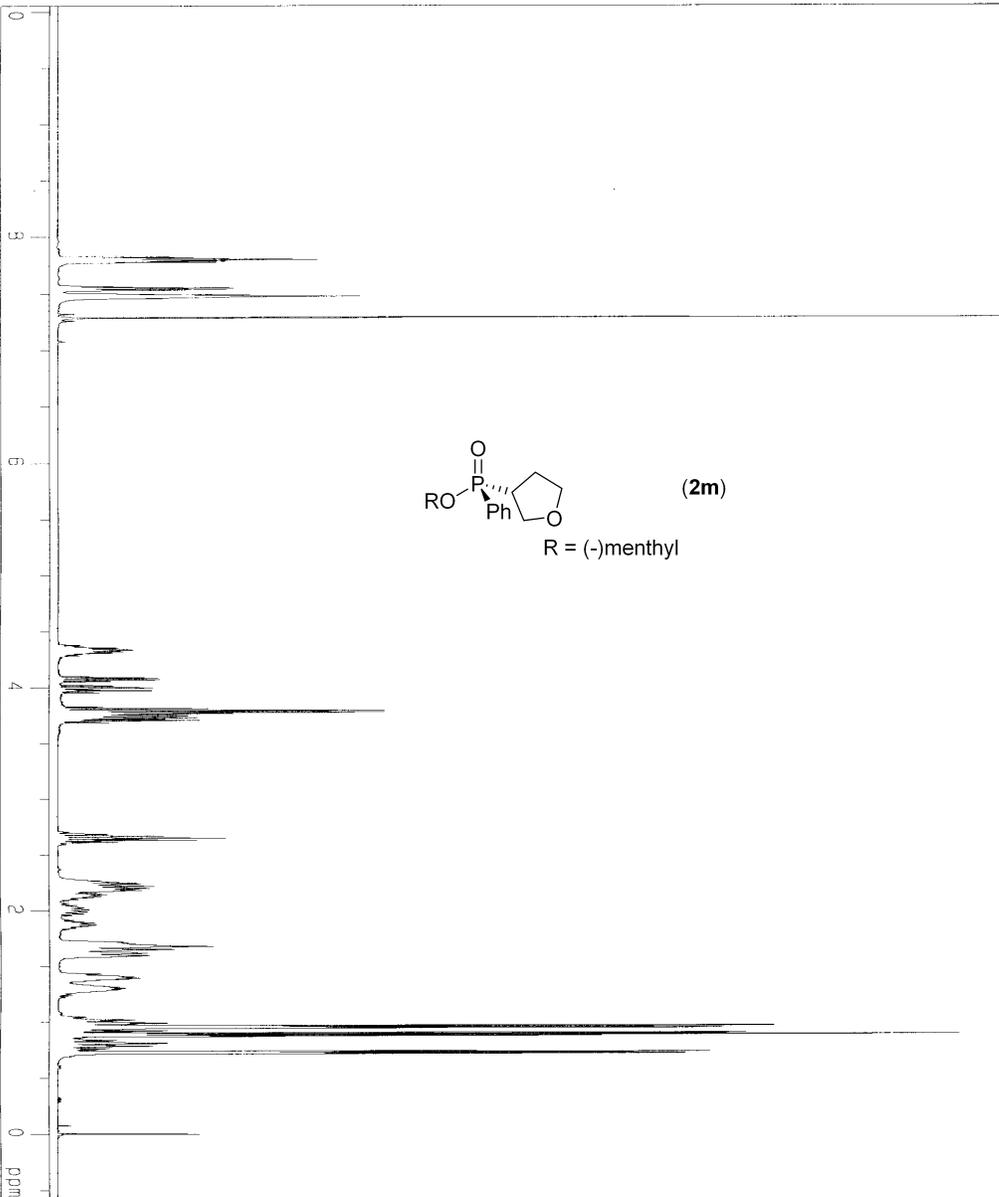


Date : Tue May 31 10:24:00 2005

F1JName : 0053101\_1h.nmdata  
Comment : cyc2p  
S1JceHistory :  
EXMODE : non

POINT : 32768 points  
SAMP0 : 32768 points  
FREQ0 : 9990.0 Hz  
FILTR : 5000 Hz  
DELAY : 40.0 usec  
DEADT : 57.4 usec  
INTVL : 100.2 usec  
TIMES : 32 times  
DUMWY : 0 times  
PD : 3.7165 sec  
ACQTM : 3283.3535 msec  
PREDL : 10.00000 msec  
INWIT : 0.5000 msec  
RESOL : 0.30 Hz  
PW1 : 5.25 usec  
OBNUC : 1H  
OBFRO : 499.10 MHz  
OBSFT : 128250.00 Hz  
RGAIN : 19  
SCANS : 32 times  
SLVNT : CDCL3  
SPINNING : 13 Hz  
TEMP : 20.9 C

C40



Date : Thu May 26 22:48:37 2005

FileName : 0052613\_1h.nmdata  
Comment : C40  
S1: cehistory  
EXMODE : non

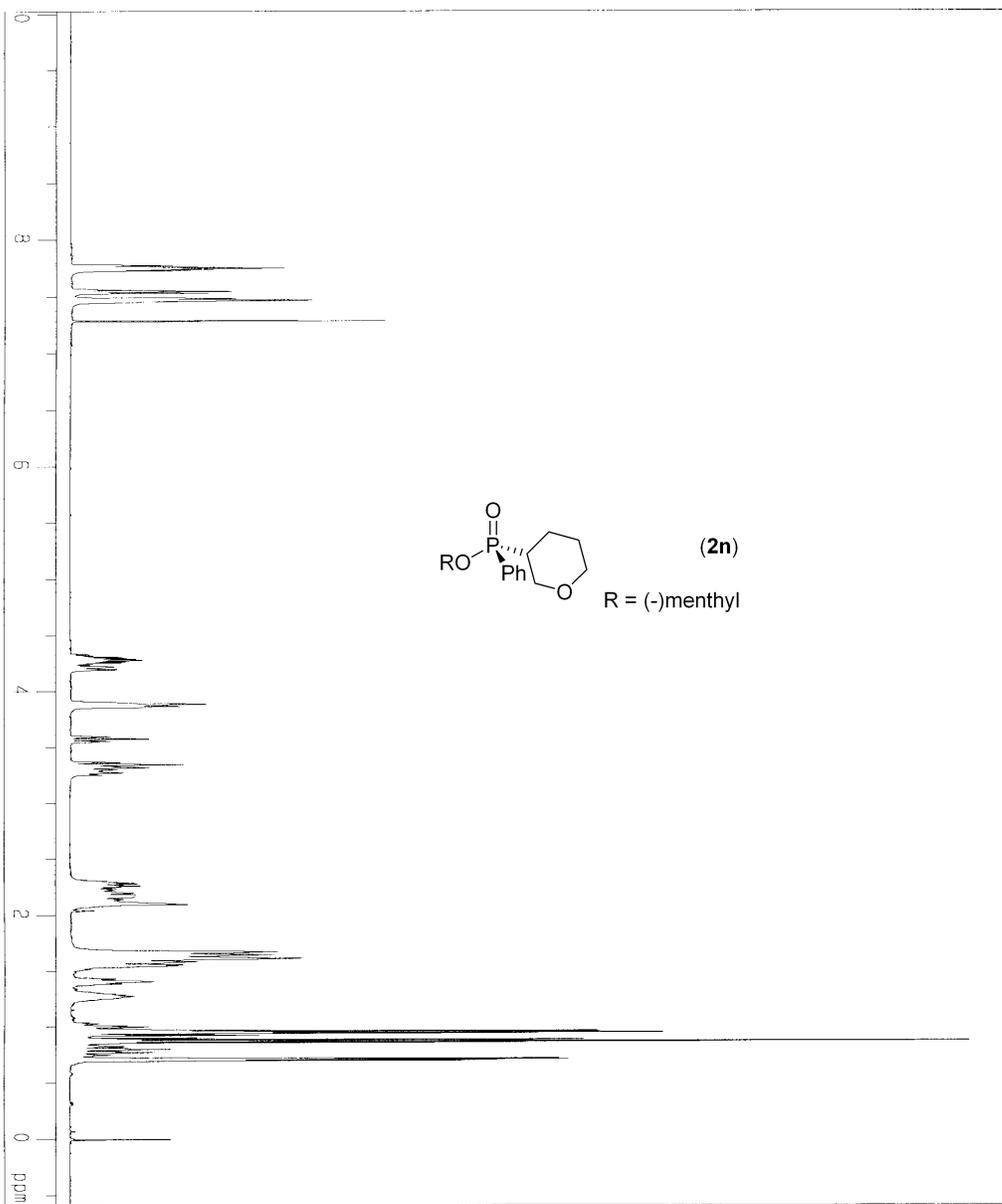
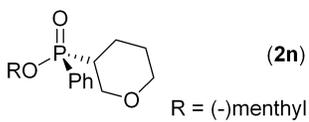
POINT : 32768 points  
SAMP0 : 32768 points  
FREQ0 : 9990.0 Hz  
FILT0 : 5000 Hz  
DELAY : 40.0 usec  
DEAD0 : 57.4 usec  
INIT0 : 100.2 usec  
TIMES : 32 times  
DUMMY : 0 times  
PD : 3.7166 sec  
ACQ00 : 3293.3535 msec  
PRE00 : 10.00000 msec  
IN000 : 0.5000 msec  
RESOL : 0.30 Hz  
PWT : 5.25 usec

1H : 499.10 MHz  
OBSF0 : 128250.00 Hz  
RGAIN : 18

SCANS : 32 times

SLVNT : CDCL3  
SPINNING : 13 Hz  
TEMP : 21.2 C

ph2p



Date : Mon Nov 10 17:24:30 2003

FileName : 111002\_1h.nmdata  
Comment : ph2p  
SliceHistory :  
EXMODE : non

POINT : 32768 points  
SAMP0 : 32768 points  
FREQ0 : 9980.0 Hz  
FILT0 : 5000 Hz  
DELAY : 40.0 usec  
DEAD0 : 57.4 usec  
INVT0 : 100.2 usec  
TIMES : 16 times  
DUMWY : 0 times  
PD : 3 7.66 sec  
ACQTM : 3283.3535 msec  
PREDL : 10.00000 msec  
INVT0 : 0.5000 msec  
RESOL : 0.30 Hz  
PWI : 5.25 usec

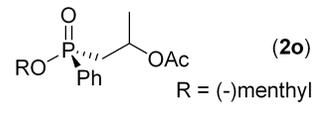
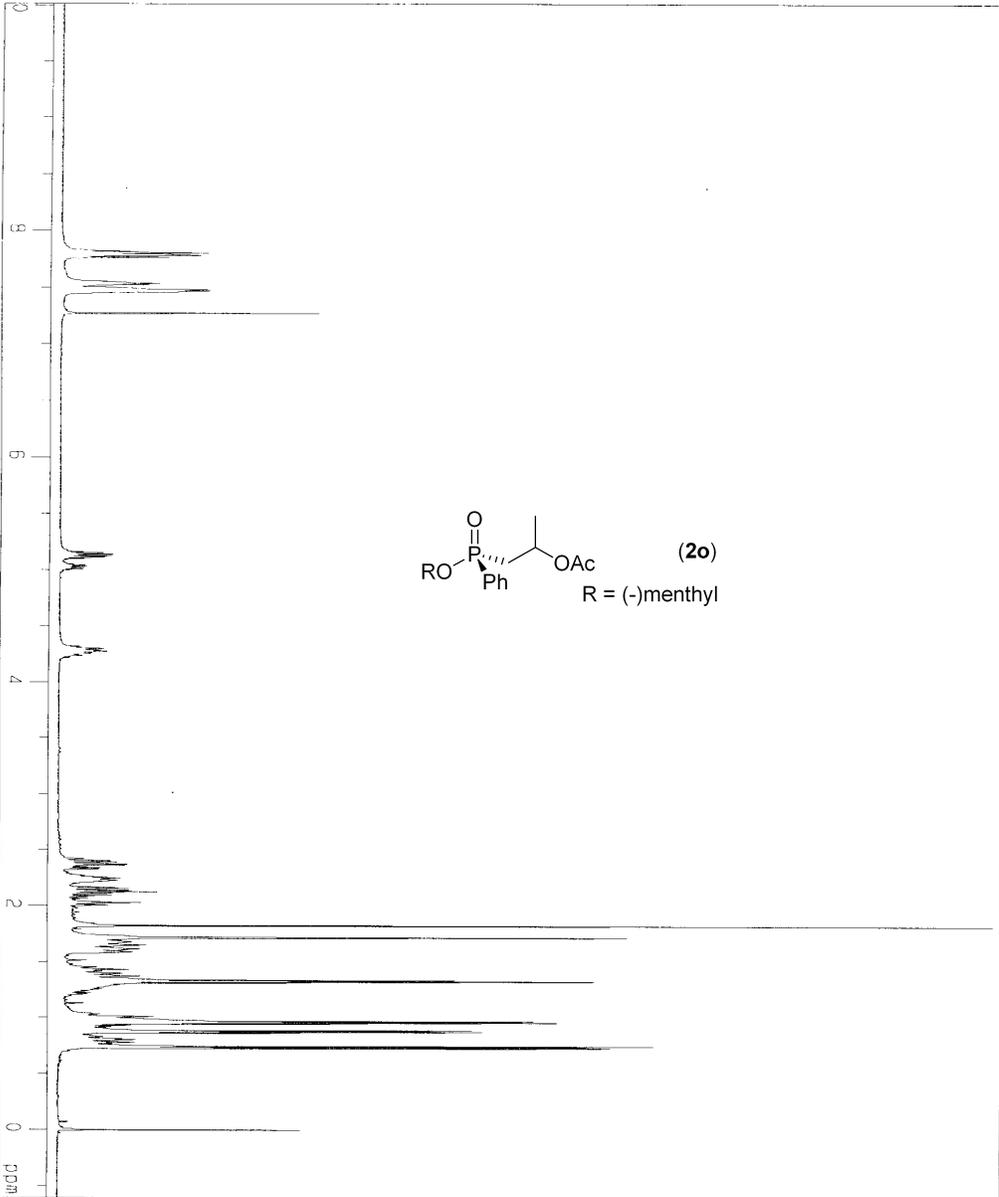
1H : 499.10 MHz  
OBFREQ : 128250.00 Hz  
OBSFT : 18  
RGAIN : 18

SCANS : 16 times

SLVNT : CDCL3  
SPINNING : 13 Hz  
TEMP : 20.5 C

AcO

20



Date : Tue May 17 11:02:56 2005

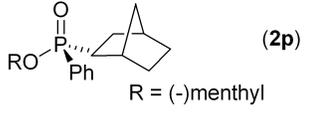
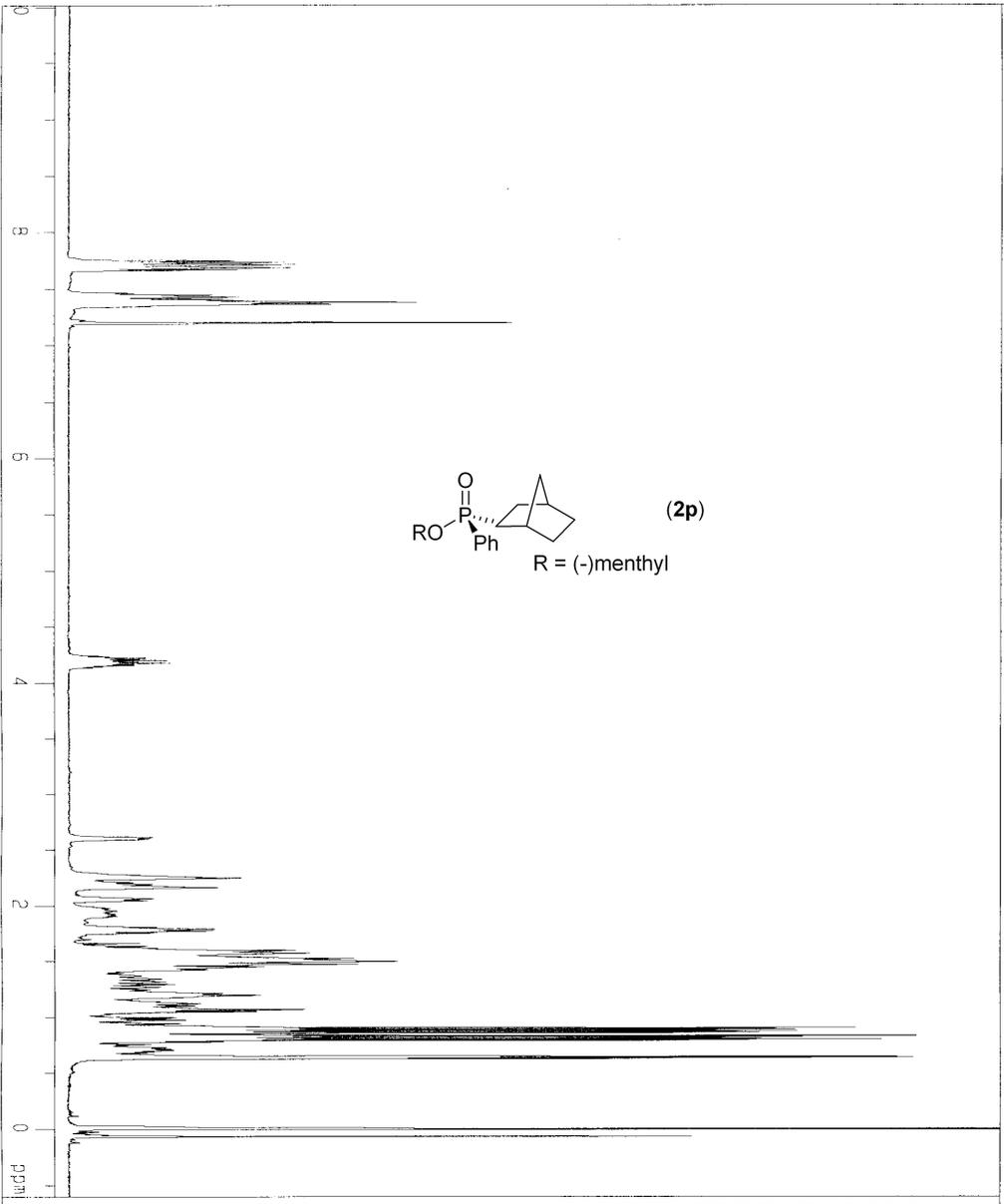
FileName : 0051701\_1H4.mdata  
 Comment : AcO  
 SliceHistory :  
 EXMODE : non

POINT : 32768 points  
 SAMP0 : 32768 points  
 FREQ0 : 9980.0 Hz  
 FILTR : 5000 Hz  
 DELAY : 40.0 usec  
 DEADT : 57.4 usec  
 INTR1 : 100.2 usec  
 TIMES : 32 times  
 DUMWY : 0 times  
 PD : 3.7155 sec  
 ACQTM : 3293.3535 msec  
 PREDI : 10.00000 msec  
 INTR1 : 0.5000 msec  
 RESOL : 0.30 Hz  
 PW1 : 5.25 usec  
 OBNUC : <sup>1</sup>H  
 OBRFQ : 499.10 MHz  
 OBRFQ : 128250.00 Hz  
 RGAIN : 20

SCANS : 32 times  
 SLVNT : CDCL3  
 SPINNING : 12 Hz  
 TEMP : 20.9 C

born

21



Date : Wed May 18 16:07:47 2005

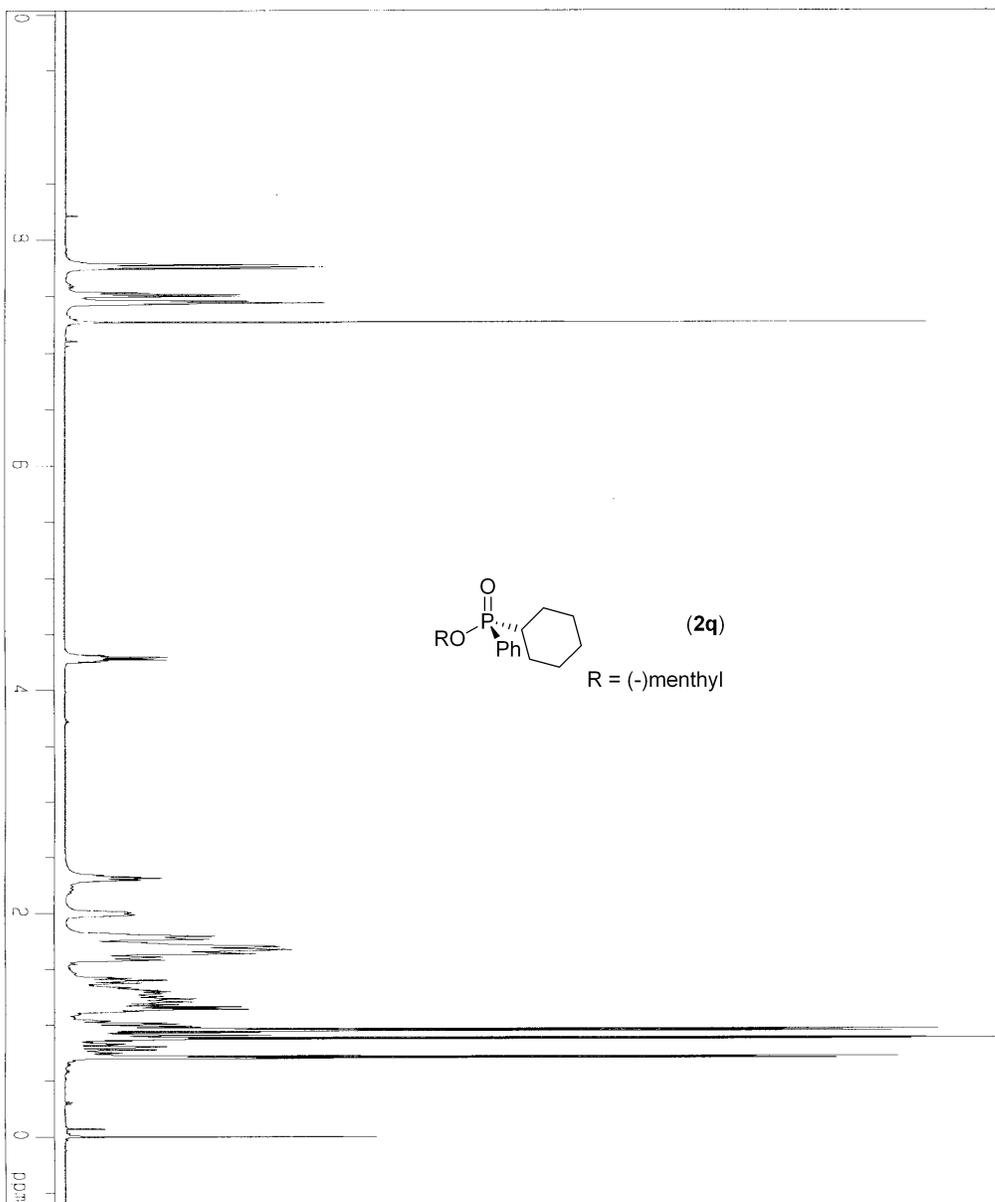
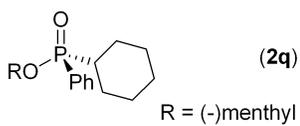
F11Name : 0051811\_1h.mdata  
 Comment : born  
 S11ceHistory :  
 EXMODE : non

POINT : 32768 points  
 SAMP0 : 32768 points  
 FREQ0 : 9980.0 Hz  
 FILTER : 5000 Hz  
 DELAY : 40.0 usec  
 DEAD1 : 57.4 usec  
 IN1VL : 100.2 usec  
 TIMES : 32 times  
 DUMWY : 0 times  
 PD : 3.7166 sec  
 ACQT0 : 3293.3535 msec  
 PREDL : 10.00000 msec  
 IN1WT : 0.5000 msec  
 RESOL : 0.30 Hz  
 PW1 : 5.25 usec  
 OBNUC : 1H  
 OFFR0 : 499.10 MHz  
 OBS0T : 128250.00 Hz  
 RGA1N : 20

SCANS : 32 times  
 SLVNT : CDCL3  
 SP1N1NG : 13 Hz  
 TEMP : 20.9 C

cyn-1s0

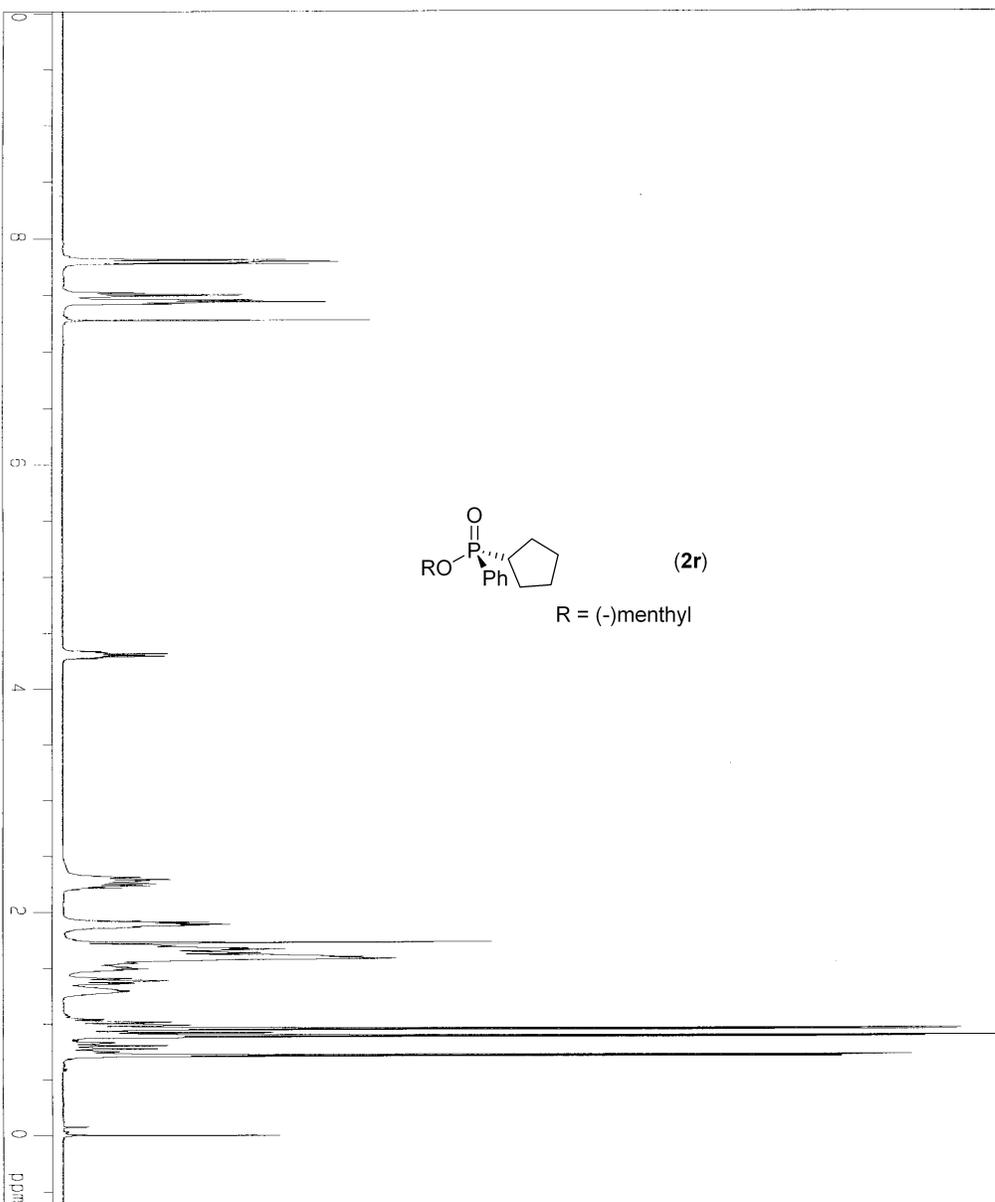
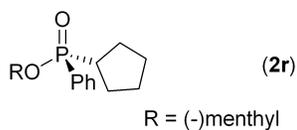
4.1



POINT	32768 points
SAMPD	32768 points
FREQU	9990.0 Hz
FILTR	5000 Hz
DELAY	40.0 usec
DEADT	57.4 usec
INTVL	100.2 usec
TIMES	32 times
DUMWY	0 times
PD	3.7166 sec
ACQTM	3283.3538 msec
PREDL	10.00000 msec
ININT	0.5000 msec
RESOL	0.30 Hz
PW1	5.25 usec
OBNUC	<sup>1</sup> H
OBFRQ	499.10 MHz
OBSET	128250.00 Hz
RGAIN	19
SCANS	32 times
SLVNT	CDCL3
SPINNING	13 Hz
TEMP	20.9 C

CYP-150

2.2



Date : Tue May 24 20: 01: 09 2005

FileName : 0052412\_1H.nmdata  
Comment : cyp-150  
SliceHistory :  
EXMODE : non

POINT : 32768 points  
SAMPD : 32768 points  
FREQD : 9980.0 Hz  
FILTR : 5000 Hz  
DELAY : 40.0 usec  
DEADT : 57.4 usec  
INVL : 100.2 usec  
TIMES : 32 times  
DUMMY : 0 times  
PG : 3 7166 sec  
ACQTM : 3283.3535 msec  
PREDL : 10.00000 msec  
INILT : 0.5000 msec  
RESOL : 0.30 Hz  
PWI : 5.25 usec

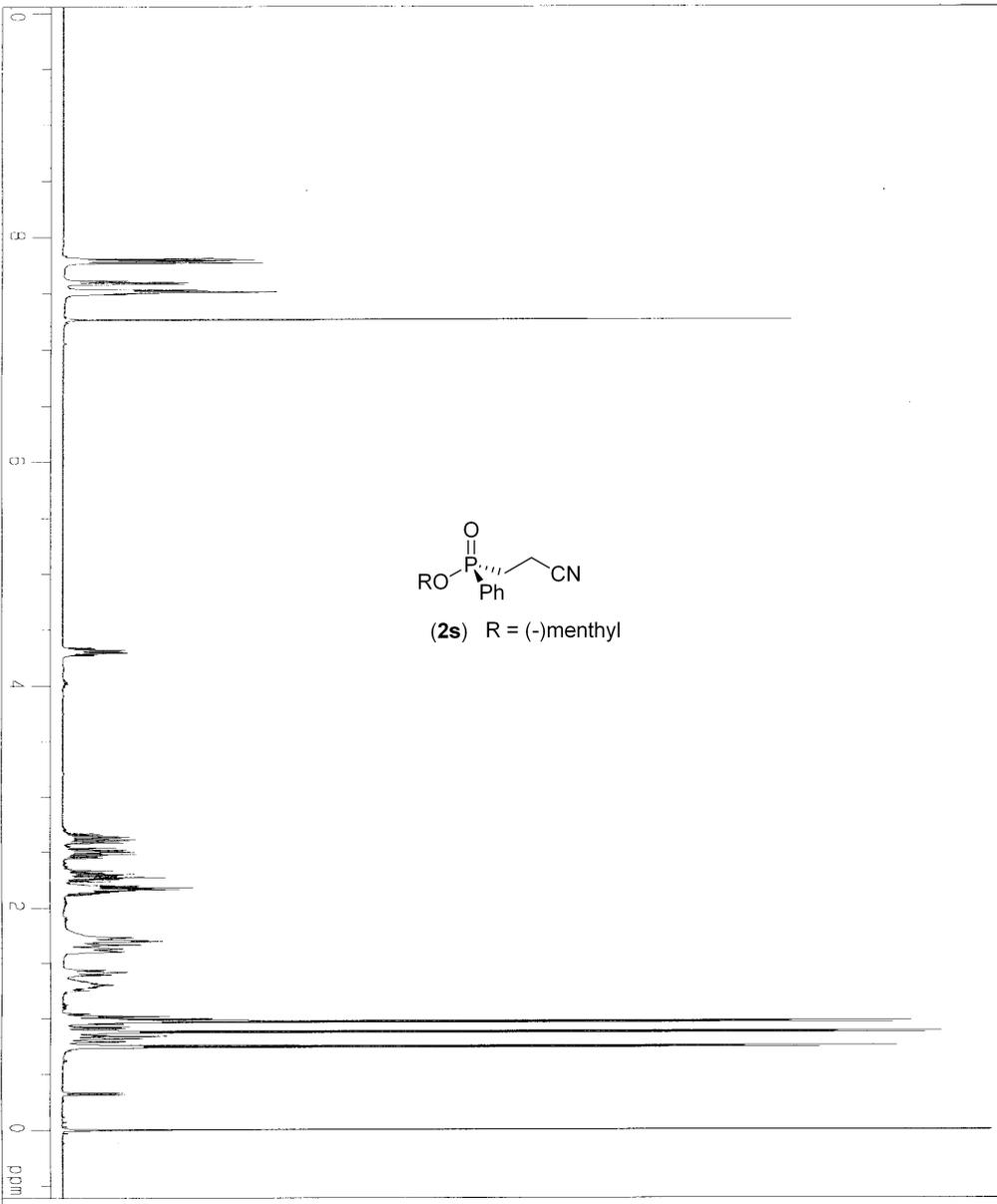
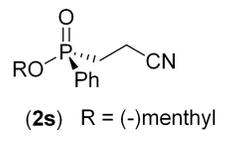
<sup>1</sup>H  
OBNUC : 499.10 MHz  
OBFRO : 128250.00 Hz  
OBSFT : 18  
RGAIN : 18

SCANS : 32 times

SLVNT : CDCL3  
SPINNING : 14 Hz  
TEMP : 21.0 C

CNC2

25



Date : Wed May 18 09:52:34 2005

F1JName : 0051723\_1H.mdata  
 Comment : CNC2  
 SliceHistory :  
 EXMODE : non

POINT : 32768 points  
 SAMPD : 32768 points  
 FREQD : 9980.0 Hz  
 FILTER : 5000 Hz  
 DELAY : 40.0 usec  
 DEADT : 57.4 usec  
 INVTL : 100.2 usec  
 TIMES : 32 times  
 DUMMY : 0 times  
 PD : 3.7166 sec  
 ACQTM : 3283.3535 msec  
 PREDL : 10.00000 msec  
 INIIT : 0.5000 msec  
 RESOL : 0.30 Hz  
 PW1 : 5.25 usec

OBNUC : 1H  
 OBFRQ : 499.10 MHz  
 OBSET : 128250.00 Hz  
 RGAIN : 23

SCANS : 32 times  
 SLVNT : CDCL3  
 SPINNING : 14 Hz  
 TEMP : 20.9 C

