Supporting Information for

Modular Monodentate Phosphoramidite Ligands for Rhodium Catalyzed Enantioselective Hydrogenation

Yan Liu and Kuiling Ding*

State Key Laboratory of Organometallic Chemistry, Shanghai Institute of Organic Chemistry,
Chinese Academy of Sciences, 354 Fenglin Road, Shanghai 200032, P. R. China

EXPERIMENT SECTION

General Methods. NMR spectra were recorded on a Varian Mercury 300 (^1H 300 MHz; ^{13}C 75 MHz) spectrometer in CDCl_3 . Chemical shifts were expressed in ppm with TMS as an internal standard ($\delta = 0$ ppm) for ^1H NMR. Coupling constants, J , are listed in hertz. ^{31}P NMR spectra were referenced with an external H_3PO_4 sample. The IR spectra were measured on Rio-Rad FTS-185 spectrometer in KBr pellets. EI mass (70 eV) and ESI spectra were obtained on HP5989A and Mariner LC-TOF spectrometers respectively. ESI mass spectra were obtained on Mariner LC-TOF spectrometer. HRMS were determined on a IonSpect 4.7 TESLA FTMS. Elemental analyses were performed with an Elemental VARIO EL apparatus. Optical rotations were measured on a Perkin-Elmer 341 automatic polarimeter. HPLC analyses were carried out on a JASCO 1580 liquid chromatograph with a JASCO CD-1595 detector and AS-1555 autosampler. GC analyses were measured on Agilent 6890N network system. Dichloromethane, chloroform and tetrachloromethane were freshly distilled from calcium hydride and THF, diethyl ether and toluene from sodium benzophenone ketyl. All manipulations involving air- and moisture-sensitive organometallic compounds were carried out using standard Schlenk technique under argon atmosphere.

Ligand Synthesis

1. (*R,R*)-4,5-Bis-(2-methoxyphenyl)-imidazolidin-2-one (*R,R*)-I-2).

(*R,R*)-**I-1** (5.4 g, 20 mmol) was added by portion to a solution of (Boc)₂O (12.5 g, 60 mmol), DMAP (0.25 g, 2 mmol) in CH₃CN (50 mL) under stirring at room temperature. After stirring for 20 min, the reaction was quenched by addition of water (10 mL). The mixture was extracted with Et₂O (50 mL x 3). The combined organic phase was washed with brine and dried over MgSO₄. After removal of the solvent, the residue was dissolved in CH₂Cl₂ (100 mL) and CF₃COOH (20 mL) was added to the solution. The mixture was stirred at room temperature for 30 min, and then water (8 mL) was added to quench the reaction. After separation of organic phase, the aqueous phase was extracted with CH₂Cl₂ (50 mL X 3). The combined organic layer was washed with aqueous NaHCO₃ solution and brine, dried over Na₂SO₄. Evaporation of the solvent afforded (*R,R*)-**I-2** as the white solid, which was further purified by recrystallization from hexane/EtOAc. (5.72 g, 96 % yield); m.p. = 175-176°C, [α]_D²⁰ = -16.5 (c = 0.5 in CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 7.52 (dd, *J* = 1.8, 7.5 Hz, 2 H), 7.23-7.29 (m, 2 H), 6.96-7.01 (m, 2 H), 6.83 (d, *J* = 8.1 Hz, 2 H), 5.59 (s, 2 H), 5.03 (s, 2 H), 3.64 (s, 6 H); ¹³C NMR (75.4 MHz, CDCl₃): δ = 54.92, 57.50, 110.11, 120.46, 126.60, 128.58, 129.80, 156.71, 163.37; FT-IR (KBr): ν = 3206, 2925, 2835, 1697, 1493, 1464, 1246, 1236, 1103, 1029, 764, 746 cm⁻¹; EIMS (70 ev) (*m/z*): 298 (*M*⁺, 63), 255 (10), 136 (100), 121 (16), 104 (13), 91 (13), 77 (10); Anal. calcd. for C₁₇H₁₈N₂O₃: C, 68.44; H, 6.08; N, 9.39%. Found: C, 68.50; H, 6.07; N, 9.36%.

2. General procedure for *N*-alkylation of (*R,R*)-**I-2**

A solution of (*R,R*)-**I-2** (715 mg, 2.4 mmol) in THF (2 mL) was added to a suspension of NaH (60% in mineral oil, 250 mg, 6.25 mmol) in THF (5 mL) at 0°C, and the resultant mixture was stirred at room temperature for 30 min. Alkyl halide (RX) (5 mmol) was then added to the above reaction mixture at 0°C. The reaction mixture was warmed to room temperature and stirred for 5-10 h until the complete conversion of the starting material. The reaction was quenched by addition of water (5 mL), and the resultant mixture was extracted with Et₂O (10 mL X 3). The combined organic layer was washed with brine, and then dried over MgSO₄. After

removal of the solvent, the residue was purified by column chromatography on silica (eluent: ethyl/hexane = 1:10-1:5) to give corresponding (*R,R*)-**I-3** in good yields.

(*R,R*)-**I-3a**: RX = EtI; oil, 89 % yield; $[\alpha]_D^{20} = +58.6$ ($c = 0.5$ in CHCl_3); ^1H NMR (300 MHz, CDCl_3): $\delta = 7.23\text{--}7.30$ (m, 4 H), 6.97 (t, $J = 7.5$ Hz, 2 H), 6.86 (d, $J = 8.4$ Hz, 2 H), 4.83 (s, 2 H), 3.59–3.65 (m, 8 H), 2.75–2.82 (m, 2 H), 0.98 (t, $J = 6.6$ Hz, 6 H); ^{13}C NMR (75.4 MHz, CDCl_3): $\delta = 12.03, 35.94, 54.65, 59.13, 110.15, 120.18, 127.19, 128.10, 128.34, 157.10, 160.02$; FT-IR (neat): $\nu = 2971, 2932, 1695, 1601, 1492, 1465, 1247, 1050, 823, 756\text{ cm}^{-1}$; EIMS (70 ev) (m/z): 354 (M^+ , 64), 339 (68), 325 (100), 268 (23), 247 (42), 240 (52), 162 (39), 134 (41), 119 (37), 91 (45), 77 (11), 56 (10); HRMS calcd. for $\text{C}_{21}\text{H}_{26}\text{N}_2\text{O}_3$: 354.1943. Found: 354.1930.

(*R,R*)-**I-3b**: RX = BnBr, oil, 95 % yield; $[\alpha]_D^{20} = +2.3$ ($c = 0.5$ in CHCl_3); ^1H NMR (300 MHz, CDCl_3): $\delta = 7.13\text{--}7.24$ (m, 12 H), 7.01–7.03 (m, 2 H), 6.80–6.85 (m, 2 H), 6.72 (d, $J = 8.4$ Hz, 2 H), 4.97 (d, $J = 15.0$ Hz, 2 H), 4.66 (s, 2 H), 3.65 (d, $J = 15.0$ Hz, 2 H), 3.34 (s, 6 H); ^{13}C NMR (75.4 MHz, CDCl_3): $\delta = 45.35, 54.67, 59.90, 110.46, 120.24, 127.17, 127.97, 128.11, 128.23, 128.54, 128.75, 137.22, 157.50, 160.06$; FT-IR (neat): $\nu = 3030, 2924, 1694, 1494, 1247, 1029, 754, 701\text{ cm}^{-1}$; EIMS (70 ev) (m/z): 478 (M^+ , 25), 387 (16), 296 (6), 240 (100), 162 (20), 91 (62), 77 (4), 65 (5), 56 (5); HRMS calcd. for $\text{C}_{31}\text{H}_{30}\text{N}_2\text{O}_3$: 478.2256. Found: 478.2285.

(*R,R*)-**I-3c**: RX = 3,5-(Me)₂BnBr, oil, 92 % yield; $[\alpha]_D^{20} = +2.7$ ($c = 0.5$ in CHCl_3); ^1H NMR (300 MHz, CDCl_3): $\delta = 6.98\text{--}7.08$ (m, 4 H), 6.59–6.76 (m, 10 H), 4.81 (d, $J = 15.0$ Hz, 2 H), 4.53 (s, 2 H), 3.49 (d, $J = 15.0$ Hz, 2 H), 3.26 (s, 6 H), 2.07 (s, 12 H); FT-IR (neat): $\nu = 3063, 2922, 1701, 1688, 1484, 1441, 1287, 1200, 1130, 1095, 993, 779, 747, 704\text{ cm}^{-1}$; EIMS (70 ev) (m/z): 534 (M^+ , 14), 415 (33), 240 (100), 162 (17), 91 (44); Anal. calcd. for $\text{C}_{35}\text{H}_{38}\text{N}_2\text{O}_3$: C, 78.62; H, 7.16; N, 5.24 %; Found: C, 78.41; H, 7.62; N, 5.03 %.

(*R,R*)-**I-3d**: RX = 3,5-(*t*Bu)₂BnBr, oil, 97 % yield; $[\alpha]_D^{20} = +2.5$ ($c = 0.5$ in CHCl_3); ^1H NMR (300 MHz, CDCl_3): $\delta = 7.18\text{--}7.27$ (m, 4 H), 6.74–7.04 (m, 10 H), 4.96 (d, $J = 15.0$ Hz, 2 H), 4.61 (s, 2 H), 3.69 (d, $J = 15.0$ Hz, 2 H), 3.38 (s, 6 H), 1.25 (s, 36 H); ^{13}C NMR (75.4 MHz, CDCl_3): $\delta = 31.33, 34.56, 46.21, 54.85, 58.04, 110.35, 120.49, 120.70, 122.84, 128.32, 128.49, 136.38, 150.38, 160.29$; FT-IR (neat): $\nu = 3294, 2963, 2927, 1702, 1686, 1481, 1459, 1363, 1262, 1226, 1207, 1094, 877, 803, 769\text{ cm}^{-1}$; EIMS (70 ev) (m/z): 702 (M^+ , 6), 499 (16), 240 (100); HRMS calcd. for $\text{C}_{47}\text{H}_{62}\text{N}_2\text{O}_3$: 702.4760. Found: 702.4841.

3. General procedure for the preparation of compound (*R,R*)-**4**

A solution of (*R,R*)-**I-3** (0.5 mmol) in dry CH_2Cl_2 (3 mL) was cooled to -78°C and then BBr_3 (0.2 mL, 2 mmol) was added. After the mixture was stirred for 30 min at -78°C , the cooling bath was removed and the stirring was continued for additional 24 h. The reaction was quenched by addition of water (3 mL), and CH_2Cl_2 was removed under the reduced

pressure. The aqueous solution was neutralized by addition of aqueous NaOH, and then extracted with EtOAc (10 mL X 3). The organic layer was washed with brine, and dried over Na₂SO₄. After removal of the solvent, the residue was purified by column chromatography on silica with ethyl acetate / hexane (1/3-1/1) as eluent to give corresponding (*R,R*)-**1-4**.

(*R,R*)-**4a**: 70 % yield, 96 % yield; m.p. = 246°C (sublimation), $[\alpha]_D^{20} = -79.3$ (c = 0.45 in CH₃OH); ¹H NMR (300 MHz, DMSO-d₆): δ = 7.32 (dd, *J* = 1.5, 7.5 Hz, 2 H), 7.06-7.11 (m, 2 H), 6.83 (t, *J* = 7.2 Hz, 2 H), 6.77 (d, *J* = 7.5 Hz, 2 H), 4.77 (s, 2 H); ¹³C NMR (75.4 MHz, CD₃OD): δ = 60.40, 115.23, 119.51, 126.73, 128.37, 128.53, 154.85, 171.89; FT-IR (neat): ν = 3427, 3400, 3259, 1702, 1457, 1280, 1248, 758, 753; EIMS (70 ev) (*m/z*): 270 (*M*⁺, 6), 210 (5), 122 (100), 93 (10), 77 (22), 66 (13), 51 (7), HRMS calcd. for C₁₅H₁₄N₂O₃: 270.1004. Found: 270.1061.

(*R,R*)-**4c**: 85 % yield; m.p. = 226°C (sublimation); $[\alpha]_D^{20} = -113.6$ (c = 0.5 in CH₃OH); ¹H NMR (300 MHz, CD₃OD): δ = 7.09-7.14 (m, 4 H), 6.77-6.84 (m, 4 H), 4.94 (s, 2 H), 3.41-3.53 (m, 2 H), 2.71-2.83 (m, 2 H), 1.00 (t, *J* = 6.9 Hz, 6 H); ¹³C NMR (75.4 MHz, CD₃OD): δ = 11.73, 36.24, 59.69, 115.42, 119.42, 125.95, 128.23, 128.91, 155.96, 160.96; FT-IR (KBr): ν = 3238, 2928, 1645, 1456, 1291, 1251, 1208, 1091, 1071, 758, 700 cm⁻¹; EIMS (70 ev) (*m/z*): 261 (100), 248 (49), 241 (85), 226 (48), 199 (18), 191 (39), 149 (40), 59 (41), 41 (2); Anal. calcd. for C₁₉H₂₂N₂O₃: C, 69.92; H, 6.79; N, 8.58 %. Found: C, 69.99; H, 6.81; N, 8.56 %.

(*R,R*)-**4d**: 93 % yield; m.p. = 210 °C (sublimation); $[\alpha]_D^{20} = -136.6$ (c = 0.5 in CH₃OH); ¹H NMR (300 MHz, CD₃OD): δ = 7.15-7.25 (m, 10 H), 7.02-7.08 (m, 2 H), 6.64-6.80 (m, 6 H), 4.85 (d, *J* = 15.0 Hz, 2 H), 3.70 (d, *J* = 15.0 Hz, 2 H); ¹³C NMR (75.4 MHz, CD₃OD): δ = 45.32, 60.08, 115.40, 119.32, 124.97, 127.06, 128.13, 128.16, 128.25, 129.05, 137.26, 156.02, 161.02; IR (KBr): 3225, 2985, 2878, 1631, 1596, 1458, 1263, 1200, 1098, 843, 805, 755 cm⁻¹; EIMS (70 ev) (*m/z*): 450 (*M*⁺, 28), 359 (62), 212 (81), 148 (9), 106 (21), 91 (100), 77 (9), 65 (9); Anal. calcd. for C₂₉H₂₆N₂O₃: C, 77.31; H, 5.82; N 6.22 %. Found: C, 77.29; H, 5.92; N, 6.13 %.

(*R,R*)-**4e**: 84 % yield; m.p. = 225 °C (sublimation); $[\alpha]_D^{20} = -18.9$ (c = 0.42 in CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 8.45 (B₂, 2 H), 7.13-7.22 (m, 4 H), 6.92 (d, *J* = 8.1 Hz, 4 H), 6.68 (s, 2 H), 6.56 (s, 2 H), 5.04 (d, *J* = 15.3 Hz, 2 H), 4.55 (s, 2 H), 3.72 (d, *J* = 15.6 Hz, 2 H), 2.02 (s, 12 H); ¹³C NMR (75.4 MHz, CDCl₃): δ = 20.96, 45.24, 59.24, 117.34, 120.61, 125.10, 125.22, 128.74, 129.33, 136.43, 137.78, 153.98, 161.09; IR (neat): ν = 3400, 2924, 1700, 1600, 1585, 1488, 1435, 1233, 1211, 1095, 881, 754, 743, 695 cm⁻¹; EIMS (70 ev) (*m/z*): 506 (*M*⁺, 10), 387 (25), 212 (20), 134 (33), 119 (100); HRMS calcd. for C₃₃H₃₄N₂O₃ 506.2642. Found: 506.2650.

(*R,R*)-**4f**: 77 % yield; m.p. = 275°C (sublimation); $[\alpha]_D^{20} = -19.3$ (c = 0.45 in CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 7.12-7.27 (m, 6 H), 6.84-6.89 (m, 8 H), 5.04 (d, *J* = 12.0 Hz, 2 H), 4.40 (s, 2 H), 3.87 (d, *J* = 15.0 Hz, 2 H), 1.19 (s, 36 H); ¹³C NMR (75.4 MHz, CD₃OD): δ = 32.00, 35.64, 47.40, 60.02, 116.36, 120.74, 122.13, 123.92, 127.28, 129.0, 129.82, 137.58, 151.95, 156.79, 162.17; FT-IR (neat): ν = 3194, 2964, 1671, 1601, 1480, 1458, 1363, 1261, 1250, 1095, 803, 752 cm⁻¹; EIMS (70 ev) (*m/z*): 674 (*M*⁺, 13.92), 471 (66), 218 (77), 203 (100); HRMS calcd. for C₄₅H₅₈N₂O₃ 674.4520. Found: 674.4536.

4. The procedure for the preparation of compound (*R,R*)-**4b**

A solution of *(R,R)*-**4a** (135 mg, 0.5 mmol) in THF/DMF(3/1, 2 mL) was added to a suspension of NaH (60% in mineral oil, 40 mg, 1 mmol) in THF (2mL) at 0°C, and the resultant mixture was stirred for 30 min. To this reaction mixture was added methoxymethyl chloride (80 μ L, 1.0 mmol) at 0°C and the reaction temperature was warmed to 20 °C. After stirring for 12 h at room temperature, the reaction was quenched by addition of water (2 mL). The resulting mixture was extracted with EtOAc (10 mL x 3) and the combined organic layer was washed with brine and dried over MgSO₄. After removal of the solvent, the residue was purified by column chromatography on silica with ethyl acetate / hexane (1/3) as eluent to *(R,R)*-**I-4** as an oil in 86% yield, $[\alpha]_D^{20} = -23.0$ ($c = 0.5$ in CHCl₃); ¹H NMR (300 MHz, CDCl₃): $\delta = 7.56\text{--}7.59$ (m, 2 H), 7.22–7.26 (m, 2 H), 7.03–7.08 (m, 4 H), 5.16 (s, 2 H), 4.90–4.97 (m, 4 H), 3.24 (s, 6 H); ¹³C NMR (75.4 MHz, CDCl₃): $\delta = 56.13, 58.49, 94.65, 114.28, 122.18, 127.59, 129.17, 130.26, 155.14, 163.64$; FT-IR (neat): $\nu = 3273, 2972, 2934, 1685, 1484, 1432, 1271, 1204, 858, 819, 778, 673$ cm⁻¹; ESI-MS (m/z): 359.2 ($M^+ + H$); HRMS calcd. for C₁₉H₂₂N₂O₅: 358.1529. Found: 358.1547.

The synthesis of compound *(R,R)*-I-5

A solution of *(R,R)*-**I-4** (179 mg, 0.5 mmol) in THF (1 mL) was added to a suspension of NaH (60% in mineral oil, 40 mg, 1 mmol) in THF (1 mL) at 0°C, and the resultant mixture was stirred at room temperature for 40 min. To this reaction mixture was added MeI (75 μ L, 1.2 mmol) at 0°C. The reaction mixture was warmed to room temperature and stirred for additional 12 h until the complete conversion of starting material. After addition of water (2 mL) to quench the reaction, the aqueous phase was extracted with Et₂O (10 mL X 3). The combined organic layer was washed with brine and dried over MgSO₄. After evaporation of the solvent, the residue was purified by column chromatography on silica with ethyl acetate /

hexane (1/10) as eluent to give (*R,R*)-**1-5** as an oil in 90% yield: $[\alpha]_D^{20} = +54.2$ ($c = 0.5$ in CHCl_3); ^1H NMR (300 MHz, CDCl_3): $\delta = 7.36\text{--}7.40$ (m, 2 H), $7.20\text{--}7.23$ (m, 2 H), $7.02\text{--}7.07$ (m, 4 H), $4.79\text{--}4.85$ (m, 4 H), 4.70 (s, 2 H), 3.16 (s, 6 H), 2.69 (s, 6 H); ^{13}C NMR (75.4 MHz, CDCl_3): $\delta = 25.98, 52.07, 58.91, 90.63, 110.48, 118.31, 124.10, 124.35, 125.25, 151.96, 158.19$; FT-IR (neat): $\nu = 3315, 3209, 2912, 1687, 1675, 1482, 1454, 1225, 1205, 1090, 859, 801, 771, 698, 673\text{ cm}^{-1}$; ESI-MS (m/z): 387.2 ($M^+ + \text{H}$); HRMS calcd. for $\text{C}_{21}\text{H}_{26}\text{N}_2\text{O}_5$: 386.1842. Found: 386.1858.

6. The synthesis of compound (*R,R*)-**4b**

To a solution of (*R,R*)-**1-5** (77 mg, 0.2 mmol) in CH_3OH (1 mL) and CH_2Cl_2 (2 mL) was added aqueous HCl (6N, 0.3 mL). The resultant mixture was heated to reflux for 24 h. The mixture was then evaporated to remove the organic solvent and then water (2 mL) was added. The solution was extracted with EtOAc (10 mL x 3) and the combined organic layer was washed with brine, and dried over MgSO_4 . After evaporation of the solvent, the residue was purified by column chromatography on silica with ethyl acetate / hexane (1/1) as eluent to give (*R,R*)-**4b** (59 mg, 99% yield) as white solids: m.p. = 212°C (sublimation); $[\alpha]_D^{20} = -91.0$ ($c = 0.5$ in CH_3OH); ^1H NMR (300 MHz, $\text{C}_3\text{D}_6\text{O}$): $\delta = 8.40$ (s, 1 H), $7.21\text{--}7.24$ (m, 2 H), $7.10\text{--}7.16$ (m, 2 H), $6.83\text{--}6.89$ (m, 4 H), 4.77 (s, 2 H), 2.61 (s, 6 H); ^{13}C NMR (75.4 MHz, $\text{C}_3\text{D}_6\text{O}$): $\delta = 29.97, 62.45, 115.80, 119.90, 125.68, 128.43, 129.00, 156.02, 161.34$; FT-IR (KBr): $\nu = 3264, 2976, 2930, 1686, 1482, 1472, 1269, 1203, 1093, 861, 769, 678\text{ cm}^{-1}$; EI-MS (70 eV) (m/z): 298 (M^+ , 3), 134 (21), 86 (40), 84 (63), 49(100); HRMS calcd. for $\text{C}_{17}\text{H}_{18}\text{N}_2\text{O}_3$: 298.1390. Found: 298.1366.

7. General procedure for the synthesis of (*R,R*)-**3a-f**

A solution of (*R,R*)-**4** (0.8 mmol), hexamethylphosphorotriamide (0.2 mL, 1 mmol) in dry

toluene (2 mL) was heated at 100°C under nitrogen for 3-5 h until the complete conversion of substrate (monitored by TLC). After cooling to room temperature, the mixture was concentrated under vacuum and the residue was purified by a flash column chromatography on silica gel with ethyl acetate / hexane (1/1-1/8) as eluent to give the corresponding monodentate phosphoramidite ligand (*R, R*)-**3**.

(*R, R*)-**3a** (R = H, R' = Me), 55 % yield; m.p = 172-175°C; $[\alpha]_D^{20} = -412.2$ (c = 0.45 in CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 7.57-7.59 (m, 2 H), 7.17-7.35 (m, 5 H), 6.92 (d, *J* = 6.9 Hz, 1 H), 5.62 (s, 1 H), 5.13 (s, 1 H), 4.98 (s, 1 H), 4.80 (d, *J* = 2.4 Hz, 1 H), 2.63 (d, *J* = 9.3 Hz, 6 H); ¹³C NMR (75.4 MHz, DMSO-d₆): δ = 35.56, 35.82, 57.54, 57.65, 121.11, 121.24, 122.84, 124.23, 124.61, 124.79, 125.38, 128.62, 135.74, 136.05, 149.17, 149.33, 150.01, 161.82; ³¹P NMR (121 MHz, CDCl₃): δ = 131.28; IR (KBr): 3208, 2847, 1700, 1486, 1456, 1227, 1209 cm⁻¹; FT-IR (KBr): ν = 3208, 2847, 1700, 1486, 1456, 1227, 1209 cm⁻¹; EI-MS (70 ev) (*m/z*): 343 (*M*⁺, 14), 298 (35), 279 (5), 235 (21), 150 (100), 104 (33), 91 (11), 77 (53), 65 (22), 60 (56), 51 (28), 44 (61); HRMS calcd. for C₁₇H₁₈N₃O₃P: 343.1086. Found: 343.1100.

(*R, R*)-**3b** (R = Me, R' = Me): 75 % yield, oil, $[\alpha]_D^{20} = -77.9$ (c = 0.5, CH₃OH); ¹H NMR (300 MHz in CDCl₃): δ = 7.19-7.26 (m, 7 H), 6.92-6.95 (m, 1 H), 4.59 (d, *J* = 3.9 Hz, 1 H), 4.47 (d, *J* = 3.6 Hz, 1 H), 2.92 (s, 3 H), 3.69 (s, 3 H), 3.63 (d, *J* = 8.7 Hz, 6 H); ³¹P NMR (121 MHz, CDCl₃): δ = 131.76; FT-IR (KBr): ν = 3275, 2923, 2852, 1684, 1482, 1453, 1262, 1093 cm⁻¹; EI-MS (70 ev) (*m/z*): 299 (3.97), 180 (100), 136 (82.98), 57 (56.91). Anal. calcd. for C₁₉H₂₂N₃O₃P: C, 61.45; H, 5.97; N 11.31%. Found: C, 61.27; H, 5.98; N, 10.89%.

(*R, R*)-**3c** (R = Et, R' = Me): 65 % yield, m.p = 120-122°C, $[\alpha]_D^{20} = -106.6$ (c = 0.5 in CH₃OH); ¹H NMR (300 MHz, CDCl₃): δ = 7.17-7.31 (m, 7 H), 6.90-6.93 (m, 1 H), 4.55 (dd, *J* = 3.6, 12.0 Hz, 2 H), 3.79-3.86 (m, 1 H), 3.60-3.67 (m, 1 H), 2.87-2.94 (m, 1 H), 2.67-2.74 (m, 1 H), 2.62 (d, *J* = 9.3 Hz, 6 H), 1.02 (t, *J* = 7.5 Hz, 3 H), 0.86 (t, *J* = 7.2 Hz, 3 H); ¹³C NMR (75.4 MHz, CDCl₃): δ = 12.68, 12.80, 36.13, 36.35, 36.40, 36.98, 58.90, 59.19, 121.66, 121.80, 123.27, 123.31, 124.38, 124.41, 124.68, 124.69, 125.10, 125.57, 125.59, 128.62, 128.73, 128.74, 133.50, 133.51, 133.88, 133.91, 150.29, 150.46, 151.08, 151.22, 159.73; ³¹P NMR (121 MHz, CDCl₃): δ = 131.75; IR (KBr): 2973, 2928, 2804, 1699, 1600, 1585, 1484, 1228, 1205, 1068, 985, 857, 817, 773 cm⁻¹; FT-IR (KBr): ν = 2973, 2928, 1699, 1600, 1585, 1484, 1228, 1205 cm⁻¹; EI-MS (70 ev) (*m/z*): 399 (*M*⁺, 0.67), 342 (44), 324 (24), 298 (36), 190 (12), 162 (48), 136 (28), 91 (24), 77 (7), 57 (100), 41 (31); Anal. calcd. for C₂₁H₂₆N₃O₃P: C, 63.15; H, 6.56; N 10.52%. Found: C, 63.11; H, 6.85; N, 10.03%.

(*R, R*)-**3d** (R = Bn, R' = Me), 89 % yield; m.p = 119-120°C; $[\alpha]_D^{20} = -394.5$ (c = 0.5 in CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 7.03-7.28 (m, 17 H), 6.80 (d, *J* = 7.5 Hz, 1 H), 5.24 (d, *J* = 15.0 Hz, 1 H), 5.08 (d, *J* = 15.3 Hz, 1 H), 4.50 (d, *J* = 3.6 Hz, 1 H), 4.34 (d, *J* = 3.3 Hz, 1 H), 3.79 (d, *J* = 15.0 Hz, 1 H), 3.64 (d, *J* = 15.0 Hz, 1 H), 2.41 (d, *J* = 9.0 Hz, 6 H); ³¹P NMR (121 MHz, CDCl₃): δ = 132.62; IR (KBr): 2803, 1700, 1452, 1223, 1207 cm⁻¹; FT-IR (KBr): ν = 2935, 2803, 1700, 1452, 1223, 1207, 1095, 979, 860, 778, 699, 677 cm⁻¹; EI-MS (70 ev) (*m/z*): 523 (*M*⁺, 5), 432 (40), 387 (28), 150 (11), 91 (100), 77 (3), 65 (6), 44 (3); Anal. calcd. for C₃₁H₃₀N₃O₃P: C, 71.12; H, 5.78; N, 8.03 %. Found: C, 70.87; H, 5.90; N, 7.80 %.

(*R, R*)-**3e** (R = 3,5-Me₂Bn, R' = Me), 86 % yield; m.p = 136-138°C; $[\alpha]_D^{20} = -365$ (c = 0.59 in

CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 7.12-7.37 (m, 8 H), 6.81-6.82 (m, 1 H), 6.75 (s, 4 H), 6.65 (s, 2 H), 5.22 (d, *J* = 15.6 Hz, 1 H), 5.09 (d, *J* = 15.6 Hz, 1 H), 4.52 (d, *J* = 3.6 Hz, 1 H), 4.34 (d, *J* = 3.3 Hz, 1 H), 3.71 (d, *J* = 15.3 Hz, 1 H), 3.57 (d, *J* = 15.6 Hz, 1 H), 2.42 (d, *J* = 9.9 Hz, 6 H), 2.16 (d, *J* = 3.9 Hz, 12 H); ³¹P NMR (121 MHz, CDCl₃) δ = 132.45; FT-IR (KBr): ν = 3014, 2920, 2803, 1701, 1604, 1585, 1482, 1457, 1226, 1206, 1094, 981, 859, 772 cm⁻¹; EI-MS (70 ev) (*m/z*): 579 (*M*⁺, 3), 460 (37), 415 (21), 119 (100). HRMS calcd. for C₃₅H₃₈N₃O₃P: 579.2724. Found: 579.2709.

(*R,R*)-**3f** (R = 3,5-*t*Bu₂Bn, R' = Me), 74 % yield; m.p = 145-147°C; [α]_D²⁰ = -209 (c = 0.145 in CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 7.04-7.27 (m, 8 H), 6.92 (d, *J* = 1.8 Hz, 2 H), 6.76-6.83 (m, 4 H), 5.24 (d, *J* = 14.7 Hz, 1 H), 5.05 (d, *J* = 15.0 Hz, 1 H), 4.40 (d, *J* = 3.0 Hz, 1 H), 4.33 (d, *J* = 3.6 Hz, 1 H), 3.86 (d, *J* = 14.7 Hz, 1 H), 3.69 (d, *J* = 15.3 Hz, 1 H), 2.40 (d, *J* = 8.7 Hz, 6 H), 2.18 (d, *J* = 3.6 Hz, 36 H); ³¹P NMR (121 MHz, CDCl₃): δ = 131.66; FT-IR (KBr): ν = 3066, 2965, 1704, 1601, 1481, 1458, 1363, 1206, 1094, 982, 877, 859, 771 cm⁻¹; EI-MS (70 ev) (*m/z*): 747 (*M*⁺, 2), 544 (46), 499 (11), 203 (100). HRMS calcd. for C₄₇H₆₂N₃O₃P: 747.4602. Found: 747.4601.

(*R,R*)-**3g** (R = Bn, R' = Et): 36 % yield, m.p = 122-124°C; [α]_D²⁰ = -87.2 (c = 0.5 in CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 7.03-7.28 (m, 17 H), 6.91 (d, *J* = 7.5 Hz, 1 H), 5.25 (d, *J* = 15.0 Hz, 1 H), 5.06 (d, *J* = 15.0 Hz, 1 H), 4.46 (d, *J* = 3.0 Hz, 1 H), 4.34 (d, *J* = 3.6 Hz, 1 H), 3.80 (d, *J* = 14.7 Hz, 1 H), 3.60 (d, *J* = 15.3 Hz, 1 H), 2.74-2.82 (m, 4 H), 0.98 (t, *J* = 7.2 Hz, 6 H); ³¹P NMR (121 MHz, CDCl₃): δ = 135.18; IR (KBr): 3062, 2974, 2932, 1691, 1452, 1441, 1225, 1205 cm⁻¹; FT-IR (KBr): ν = 3026, 2974, 2932, 1691, 1452, 1441, 1225, 1205, 1093, 1025, 877, 746, 707 cm⁻¹; EI-MS (70 ev) (*m/z*): 551 (*M*⁺, 9), 460 (51), 387 (29), 91 (100), 77 (2), 74 (15), 65 (6), 43 (2). Anal. calcd. for C₃₃H₃₄N₃O₃P: C, 71.85; H, 6.21; N, 7.62%. Found: C, 71.84; H, 6.28; N, 7.61%. Additional information was obtained from the X-ray crystal structure:

Crystal structural data of (*R,R*)-3g**:** C₃₃H₃₄N₃O₃P, *M_r* = 551.60, orthorhombic, *P*2₁2₁2₁, *a* = 9.7676(9) Å, *b* = 10.8554(13) Å, *c* = 28.256(3) Å; *V* = 2996.0(5) Å³; 4.02 < 2θ < 56.58 degree; ρ_{calc} = 1.223 g cm⁻³, *Z* = 4, *R*_{int} = 0.1021. Goodness of fit indicator = 0.867, Final *R*1 = 0.0499, *wR*2 = 0.0734 on *F*² for observed data, *P*_{max}, *P*_{min} = 0.892, -0.912 Å⁻³; Absolute structure parameter was -0.04(10). CCDC-260655 contains the supplementary crystallographic data for this paper. These data can be obtained free of charge via www.ccdc.cam.ac.uk/conts/retrieving.html (or from the Cambridge CB21EZ, UK; fax: (+44) 1223-336-033; or e-mail: deposit@ccdec.cam.ac.uk).

(*R, R*)-**3h** (*R* = Et, *R'* = Et): 39 % yield; m.p = 119-120°C; $[\alpha]_D^{20} = -87.5$ (*c* = 0.5 in CHCl₃); ¹H NMR (300 MHz, CDCl₃): δ = 7.17-7.32 (m, 7 H), 7.03-7.05 (m, 1 H), 4.64 (d, *J* = 3.9 Hz, 1 H), 4.54 (d, *J* = 3.0 Hz, 1 H), 3.82-3.89 (m, 1 H), 3.58-3.65 (m, 1 H), 3.03-3.13 (m, 2H), 2.87-2.98 (m, 3 H), 2.67-2.74 (m, 1 H), 1.02-1.14 (m, 9 H), 0.86 (t, *J* = 7.8 Hz, 3H); ³¹P NMR (121 MHz, CDCl₃): δ = 133.95; FT-IR (KBr): ν = 2967, 2929, 2871, 1701, 1483, 1434, 1206, 1067, 1025, 879, 857, 821, 778 cm⁻¹; EI-MS (70 ev) (*m/z*): 427 (*M*⁺, 94), 354 (100), 308 (49), 291 (36), 240 (31), 104 (25), 77 (15), 74 (78), 65 (5), 44 (23); HRMS calcd. for C₂₃H₃₀N₃O₃P: 427.2025. Found: 427.2053.

Crystal structural data of [(*R,R*)-4e]₂Rh(cod)]⁺[OH]⁻: C₇₈H₈₉N₆O₇P₂Rh, crystal grows from dichloromethane/hexane, *M_r* = 1387.40, orthorhombic, *P*2₁2₁2₁, *a* = 17.456(5), *b* = 19.105(5), *c* = 23.294(7) Å; *V* = 7768(4) Å³, 2.76 < 2θ < 51.00 degree; ρ_{calc} = 1.186 gcm⁻³, *Z* = 4, *R*_{int} = 0.1970. Goodness of fit indicator = 0.961, Final *R*1 = 0.1230, *wR*2 = 0.3006 on *F*² for observed data, *P*_{max}, *P*_{min} = 2.277, -0.833 Å⁻³; Absolute structure parameter was 0.12(8). CCDC-260656 contains the supplementary crystallographic data for this paper. These data can be obtained free of charge via www.ccdc.cam.ac.uk/conts/retrieving.html (or from the Cambridge CB21EZ, UK; fax: (+44) 1223-336-033; or e-mail: deposit@ccdec.cam.ac.uk).

General procedure for catalytic asymmetric hydrogenation

[Rh(cod)₂]BF₄ (2.0 mg, 0.005 mmol), (*R,R*)-**3** (0.011 mmol) were dissolved in CH₂Cl₂ (3 mL) under nitrogen and the solution was stirred at room temperature for 10 min. The substrate (0.5 mmol) in CH₂Cl₂ (2 mL) was added to the above catalyst solution. The mixture was then transferred to a stainless steel autoclave under nitrogen atmosphere, and then sealed. After purging with hydrogen for 6 times, final H₂ pressure was adjusted to the value shown in Table 1. After stirring at room temperature for a period of time shown in Table 1, H₂ was released. After removal of the solvent under the reduced pressure, the residue of the product was

passed through a pad of Celite and submitted to ^1H NMR analysis to assess the conversion of the starting materials. The enantiomeric excess of the product was determined by chiral HPLC or GC.

Table S1. The influence of H_2 pressure on the enantioselectivity of Rh-catalyzed hydrogenation of **5c**.

5c **6c**

entry	$\text{PH}_2(\text{Atm})$	ee [%]	Config
1	5	97.9	S
2	10	98.5	S
3	20	99.6	S

Table S2. The influence of H_2 pressure on the enantioselectivity of Rh-catalyzed hydrogenation of **7a**.

7a **8a**

entry	$\text{PH}_2(\text{Atm})$	ee [%]	Config
1	10	86.0	S
2	20	90.0	S
3	40	95.5	S

GC,b120,110□,1.0

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area [pA*s]	Height [pA]	Area %
1	21.116	VV	0.1911	704.07434	44.01360	49.99239
2	21.618	VB	0.1645	704.28882	53.68674	50.00761

Totals : 1408.36316 97.70034

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area [pA*s]	Height [pA]	Area %
1	21.122	BV	0.1748	687.62225	50.83649	99.68248
2	21.455	VV	0.1117	2.19030	2.34043e-1	0.31752

Totals : 689.81255 51.07053

GC,g225,130□,1.0

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area [pA*s]	Height [pA]	Area %
1	17.982	VB	0.2355	634.78503	32.99442	49.90522
2	19.444	VV	0.2806	637.19611	27.67326	50.09478

Totals : 1271.98114 60.66769

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area [pA*s]	Height [pA]	Area %
1	18.209	MM	0.1270	21.43066	2.81171	0.76671
2	18.709	MM	0.7101	2773.70312	65.10014	99.23329

Totals : 2795.13379 67.91184

File name : ly-a-ph-raci008.CH2

#	Name	RT	Area[μ V.Sec]	%Area
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1		9.217	1549129.631	49.927
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2		11.950	1553674.853	50.073
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Total Area of Peak = 3102804.484 [μ V.Sec]

File name : ly-a-ph007.CH2

#	Name	RT	Area[μ V.Sec]	%Area
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1		9.425	30384.500	0.199
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2		12.175	15260285.791	99.801
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Total Area of Peak = 15290670.291 [μ V.Sec]

File name : ly-10-a-p-br-raci002.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
1		10.500	2578162.813	49.497
2		12.475	2630609.203	50.503

Total Area of Peak = 5208772.015 [$\mu V \cdot Sec$]

File name : ly-10-a-p-br001.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
1		11.225	36480.500	0.148
2		13.242	24691816.897	99.852

Total Area of Peak = 24728297.397 [$\mu V \cdot Sec$]

File name : ly-a-m-br-r012.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
1		9.883	11528257.661	49.167
2		11.592	11919017.274	50.833

Total Area of Peak = 23447274.935 [$\mu V \cdot Sec$]

File name : ly-a-m-br-r013.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
1		9.867	165328.000	0.466
2		11.617	35291829.750	99.534

Total Area of Peak = 35457157.750 [$\mu V \cdot Sec$]

File name : ly-a-ph-o-br-raci010.CH2

#	Name	RT	Area[μ V.Sec]	%Area
1		9.617	6714585.064	49.168
2		13.258	6941942.771	50.832

Total Area of Peak = 13656527.835 [μ V.Sec]

File name : ly-a-ph-o-br011.CH2

#	Name	RT	Area[μ V.Sec]	%Area
1		9.658	151749.000	0.891
2		13.100	16872837.185	99.109

Total Area of Peak = 17024586.185 [μ V.Sec]

File name : ly-a-ph-p-cl-raci012.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
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1		10.792	10476454.000	49.097
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2		12.858	10861740.136	50.903
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Total Area of Peak = 21338194.136 [$\mu V \cdot Sec$]

File name : ly-a-ph-p-cl013.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
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1		10.783	114101.500	0.496
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2		12.775	22906080.500	99.504
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Total Area of Peak = 23020182.000 [$\mu V \cdot Sec$]

File name : ly-a-ph-m-cl-raci014.CH2

#	Name	RT	Area[μ V.Sec]	%Area
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1		9.083	2698200.818	49.885
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2		10.700	2710687.034	50.115
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Total Area of Peak = 5408887.852 [μ V.Sec]

File name : ly-a-ph-m-cl015.CH2

#	Name	RT	Area[μ V.Sec]	%Area
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1		9.083	67335.241	0.680
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2		10.683	9832689.648	99.320
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Total Area of Peak = 9900024.888 [μ V.Sec]

File name : ly-a-o-cl-r007.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
1		10.433	2709681.364	49.458
2		14.475	2769037.599	50.542

Total Area of Peak = 5478718.963 [$\mu V \cdot Sec$]

File name : ly-a-o-cl008.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
1		10.292	145267.750	0.820
2		14.083	17571008.540	99.180

Total Area of Peak = 17716276.290 [$\mu V \cdot Sec$]

File name : ly-10-a-p-ome-raci002.CH2

#	Name	RT	Area[μ V.Sec]	%Area
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1		9.100	2813114.750	50.413
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2		10.750	2767014.656	49.587
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Total Area of Peak = 5580129.406 [μ V.Sec]

File name : ly-10-a-p-ome003.CH2

#	Name	RT	Area[μ V.Sec]	%Area
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1		8.967	197279.500	1.354
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2		10.567	14377272.750	98.646
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Total Area of Peak = 14574552.250 [μ V.Sec]

File name : ly-a-ph-m-ome-raci016.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
1		12.117	20636648.011	49.240
2		14.483	21273687.500	50.760

Total Area of Peak = 41910335.511 [$\mu V \cdot Sec$]

File name : ly-a-ph-m-ome017.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
1		12.126	165251.000	0.770
2		14.367	21300026.000	99.230

Total Area of Peak = 21465277.000 [$\mu V \cdot Sec$]

File name : ly-a-m-f-r009.CH2

#	Name	RT	Area[μ V.Sec]	%Area
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1		9.625	3370027.025	49.669
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2		11.975	3414905.047	50.331
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Total Area of Peak = 6784932.072 [μ V.Sec]

File name : ly-a-m-f011.CH2

#	Name	RT	Area[μ V.Sec]	%Area
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1		9.500	4707.981	0.148
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2		11.775	3174616.811	99.852
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Total Area of Peak = 3179324.793 [μ V.Sec]

File name : ly-10-p-no2-r004.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
1		29.450	20316041.239	49.962
2		36.042	20346592.708	50.038

Total Area of Peak = 40662633.947 [$\mu V \cdot Sec$]

File name : ly-10-p-no2005.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
1		31.942	212642.413	0.434
2		36.092	48797381.919	99.566

Total Area of Peak = 49010024.332 [$\mu V \cdot Sec$]

File name : ly-10-o-no2-r001.CH2

#	Name	RT	Area[μ V.Sec]	%Area
1		54.442	15802916.062	49.643
2		61.900	16029923.170	50.357

Total Area of Peak = 31832839.232 [μ V.Sec]

File name : ly-10-o-no2002.CH2

#	Name	RT	Area[μ V.Sec]	%Area
1		52.133	41781.551	0.036
2		59.725	116831405.810	99.964

Total Area of Peak = 116873187.370 [μ V.Sec]

File name : ly-10-di-ome-raci001.CH2

#	Name	RT	Area[μ V.Sec]	%Area
1		16.340	77548.1	49.5463
2		17.767	995452.8	50.4537

Total Area of Peak = 1973000.9 [μ V.Sec]

File name : ly-10-di-ome002.CH2

#	Name	RT	Area[μ V.Sec]	%Area
1		16.293	49941.1	0.44963
2		17.293	11058750.8	99.5504

Total Area of Peak = 11108691.9[μ V.Sec]

File name : ly-10-a-oac-raci009.CH2

#	Name	RT	Area[μ V.Sec]	%Area
1		23.283	8599150.217	47.854
2		26.167	9370452.393	52.146

Total Area of Peak = 17969602.610 [μ V.Sec]

File name : ly-10-a-oac010.CH2

#	Name	RT	Area[μ V.Sec]	%Area
1		25.800	73843.225	0.445
2		27.292	16511821.591	99.555

Total Area of Peak = 16585664.816 [μ V.Sec]

File name : ly-10-17-raci003.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
1		12.900	11515689.362	49.675
2		17.183	11666233.206	50.325

Total Area of Peak = 23181922.568 [$\mu V \cdot Sec$]

File name : ly-10-17-2002.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
1		12.408	62071.303	1.503
2		16.733	4066992.750	98.497

Total Area of Peak = 4129064.053 [$\mu V \cdot Sec$]

File name : ly-enomide-raci002.CH2

#	Name	RT	Area[μ V.Sec]	%Area
1		12.558	9690977.695	49.087
2		14.850	10051616.870	50.913

Total Area of Peak = 19742594.566 [μ V.Sec]

File name : ly-enomide003.CH2

#	Name	RT	Area[μ V.Sec]	%Area
1		12.667	68049.000	1.166
2		14.875	5765640.111	98.834

Total Area of Peak = 5842180.611 [μ V.Sec]

File name : ly-enomide-p-cl-raci032.CH2

#	Name	RT	Area[μ V.Sec]	%Area
1		13.850	18725021.103	49.615
2		17.892	19015317.820	50.385

Total Area of Peak = 37740338.924 [μ V.Sec]

File name : ly-enomide-p-cl033.CH2

#	Name	RT	Area[μ V.Sec]	%Area
1		14.633	13292.442	0.052
2		18.558	25609122.959	99.948

Total Area of Peak = 25622415.401 [μ V.Sec]

File name : ly-enomide-p-ome-raci006.CH2

#	Name	RT	Area[μ V.Sec]	%Area
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1		16.017	7464601.000	49.397
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2		21.383	7646932.935	50.603
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Total Area of Peak = 15111533.935 [μ V.Sec]

File name : ly-enomide-p-ome001.CH2

#	Name	RT	Area[μ V.Sec]	%Area
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1		16.300	370728.072	1.218
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2		21.325	30057283.413	98.782
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Total Area of Peak = 30428011.485 [μ V.Sec]

File name : ly-enomide-p-me-raci001.CH2

#	Name	RT	Area[$\mu V \cdot \text{Sec}$]	%Area
1		10.267	6125407.739	49.039
2		13.933	6365363.576	50.961

Total Area of Peak = 12490771.315 [$\mu V \cdot \text{Sec}$]

File name : ly-enomide-p-me002.CH2

#	Name	RT	Area[$\mu V \cdot \text{Sec}$]	%Area
1		10.500	19957.453	0.311
2		14.042	6390490.779	99.689

Total Area of Peak = 6410448.232 [$\mu V \cdot \text{Sec}$]

File name : ly-enomide-p-f-raci002.CH2

#	Name	RT	Area[μ V.Sec]	%Area
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1		12.675	21435825.563	48.054
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2		16.167	23172284.000	51.946
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Total Area of Peak = 4968099.313 [μ V.Sec]

File name : ly-enomide-p-f035.CH2

#	Name	RT	Area[μ V.Sec]	%Area
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1		13.667	44842.500	0.386
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2		16.825	11575916.341	99.614
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Total Area of Peak = 11620758.841 [μ V.Sec]

File name : ly-enomide-p-br-raci003.CH2

Name RT Area[μ V.Sec] %Area

1 11.808 1278337.000 50.063

2 16.108 1275120.556 49.937

Total Area of Peak = 2553457.556 [μ V.Sec]

File name : ly-enomide-p-br002.CH2

Name RT Area[μ V.Sec] %Area

1 12.008 13105.330 0.125

2 15.967 10432826.000 99.875

Total Area of Peak = 10445931.330 [μ V.Sec]

File name : ly-enomide-m-br-raci003.CH2

#	Name	RT	Area[$\mu V \cdot \text{Sec}$]	%Area
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1		9.083	4323410.877	49.638
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2		11.758	4386556.296	50.362
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Total Area of Peak = 8709967.173 [$\mu V \cdot \text{Sec}$]

File name : ly-enomide-m-br001.CH2

#	Name	RT	Area[$\mu V \cdot \text{Sec}$]	%Area
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1		9.167	79670.583	1.929
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2		11.767	4049505.500	98.071
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Total Area of Peak = 4129176.083 [$\mu V \cdot \text{Sec}$]

File name : ly-enomide-2-nap-raci004.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
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1		13.417	14484186.158	48.328
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2		21.058	15486688.000	51.672
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Total Area of Peak = 29970874.158 [$\mu V \cdot Sec$]

File name : ly-enomide-2-nap005.CH2

#	Name	RT	Area[$\mu V \cdot Sec$]	%Area
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1		13.450	88811.672	0.780
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2		20.975	11295897.078	99.220
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Total Area of Peak = 11384708.750 [$\mu V \cdot Sec$]

GC, Gamma225, 130,

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area [pA*s]	Height [pA]	Area %
1	13.962	BB	0.1629	662.02618	53.66928	50.18151
2	14.758	PB	0.1880	657.23706	45.63980	49.81849

Totals : 1319.26324 99.30907

Signal 1: FID1 A,

Peak #	RetTime [min]	Type	Width [min]	Area [pA*s]	Height [pA]	Area %
1	14.125	BB	0.1418	2.05257	1.76354e-1	1.43335
2	14.900	PB	0.1581	141.14772	11.50706	98.56665

Totals : 143.20029 11.68341