Supporting Information

Racemic but *Tropos* (Chirally Flexible) BIPHEP Ligands for Rh(l)-Complexes: Highly Enantioselective Ene-Type Cyclization of 1,6-Enynes

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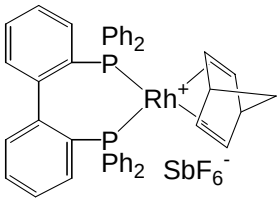
General:

^{1}H NMR, ^{13}C NMR and ^{31}P NMR spectra were measured on Varian GEMINI 300 (300 MHz) and Varian GEMINI 400 (400 MHz) spectrometers. Chemical shifts of ^{1}H NMR were expressed in parts per million downfield from tetramethylsilane as an internal standard (δ = 0) in $CDCl_3$. Chemical shifts of ^{13}C NMR were expressed in parts per million downfield from $CDCl_3$ as an internal standard (δ = 77.1) in $CDCl_3$. Chemical shifts of ^{31}P NMR were expressed in parts per million downfield from 85% H_3PO_4 as an internal standard (δ = 0) in $CDCl_3$. Optical rotations were measured on a JASCO DIP-370. Liquid chromatographic analysis (HPLC) were conducted on a JASCO PU-980, LG-980-02, DG-980-50 AS-950 and CO-966 instrument equipped with model UV-975 spectrometers as an ultra violet light; Peak areas were calculated by JASCO-BORWIN (Windows NT) as an automatic integrator. Capillary gas chromatographic analysis (GC) were conducted on a Shimadzu GC-14B instrument equipped with FID detector by using N_2 (75 kPa) as a carrier gas; Peak area were calculated by a Shimadzu C-R6A as an automatic integrator. Chiral column were CP-Cyclodextrin-β-2,3,6-M-19 (i.d. 0.25 mm x 25 m; CHROMPACK; GL Sciences Inc.); Split ratio was 100 : 1. Analytical thin layer chromatography (TLC) were performed on a glass plates (Merck Kieselgal 60 F_{254}, layer thickness 0.25 and 0.2 mm). Visualization was accomplished by UV light (254 nm), anisaldehyde, $KMnO_4$ and phosphomolybdic acid. Column chromatography was performed on KANTO Silica Gel 60N (spherical, neutral). All experiments were carried out under argon atmosphere otherwise noted.

[Rh(biphep)(nbd)]SbF_6



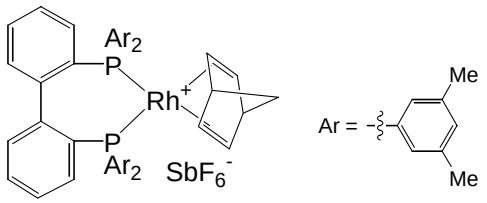
To a mixture of $[Rh(nbd)_2]SbF_6$ and BIPHEP (1.0 eq.) was added dry dichloromethane under Ar atmosphere, and stirred for 1 h at room temperature.. After evaporation under reduced pressure, the resultant residue was washed with a few ml of Et_2O 3 times and dried *in vacuo* to give the titled compound quantitatively as orange powder.

^{1}H NMR (300 MHz, CD_2Cl_2) δ 1.61 (s, 2H), 4.04 (s, 2H), 4.62 (s, 2H), 5.16 (s, 2H), 6.54 (m, 2H), 7.10-7.27 (m, 8H), 7.38-7.56 (m, 14H), 7.81 (m, 4H).

^{31}P NMR (162 MHz, CD_2Cl_2) δ 26.2 (d, J = 156.6 Hz).

X-ray analysis (*vide infra*)

[Rh(dm-biphep)(nbd)]SbF_6



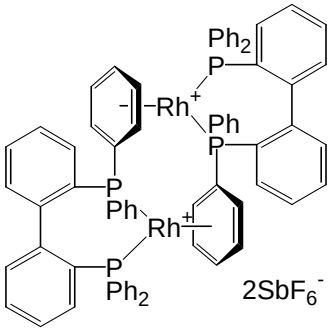
The titled compound was prepared from $[Rh(nbd)_2]SbF_6$ and DM-BIPHEP in a similar manner described above.

^{1}H NMR (300 MHz, $CDCl_3$) δ 1.66 (s, 2H), 2.22 (s, 12H), 2.36 (s, 12H), 4.06 (s, 2H), 4.80 (s, 2H), 4.85 (s, 2H), 6.39-6.42 (m, 2H), 6.87-6.90 (m, 6H), 7.04-7.12 (m, 6H), 7.16-7.20 (m, 4H), 7.29-7.33 (m, 2H).

^{31}P NMR (162 MHz, $CDCl_3$) δ 24.9 (d, J = 154.9 Hz).

Anal. Calcd for $C_{51}H_{52}P_2RhSbF_6{\cdot}CH_2Cl_2$: C, 54.29; H, 4.73%. Found: C, 54.85; H, 4.74%.

[Rh(biphep)]$_2$(SbF_6)$_2$



To a $[Rh(biphep)(nbd)]SbF_6$ complex (19.1 mg, 0.02 mmol) in 10 ml schlenk tube was added dry CH_2Cl_2 (0.5 ml). A mixture was freezed and charged with hydrogen gas using balloon (1 atm),

then stirred for 30 min at room temperature. The titled complex was obtained pure form through quantitative complexation.

^{1}H NMR (300 MHz, CD_2Cl_2) δ 5.04 (brs, 2H), 5.43 (t, *J* = 6.6 Hz, 2H), 6.22 (m, 2H), 6.38 (m, 2H), 6.71 (m, 2H), 6.69-7.02 (m, 12H), 7.14 (m, 2H), 7.19-7.38 (m, 16H), 7.48 (m, 10H), 7.64 (m, 2H), 7.87 (t, *J* = 8.1 Hz, 2H), 8.40 (t, *J* = 6.6 Hz, 2H).

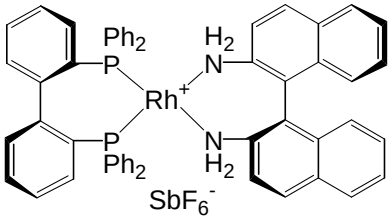
^{31}P NMR (162 MHz, CD_2Cl_2) *hetero-chiral*: δ 39.8 (dd, *J* = 193.3, 51.8 Hz), 43.3 (dd, *J* = 209.5, 49.6 Hz). *homo-chiral*: δ 40.8 (dd, *J* = 192.3, 50.4 Hz), 44.6 (dd, *J* = 209.5, 48.8 Hz). For the *homo-chiral* dimmer (*R*)-BINAP-Rh: ^{31}P NMR (162 MHz, CD_2Cl_2) δ 42.7 (dd, *J* = 195.5, 43.6 Hz), 46.4 (dd, *J* = 211.4, 43.6 Hz).

ESI-MS. 1487.3 $[\{Rh(biphep)\}_2SbF_6]^+$, 625.6 $[Rh(biphep)]^+$.

Preparation of Rh(diphosphine)(diamine) complexes

To a mixture of [Rh(*P*-*P*)(nbd)]SbF_6 (0.02 mmol) and diamine (0.02 mmol) in 10 ml schlenk tube was added dry solvent (0.60 ml, MeOH or CH_2Cl_2) under Ar atmosphere. A mixture was freezed and charged with hydrogen gas using balloon (1 atm), then stirred for 30 min at room temperature. The titled complex was obtained pure form through quantitative complexation. (Figure 1. diastereomeric ratios was confirmed by ^{31}P NMR and ^{1}H NMR analyses under Ar atmosphere).

[Rh{(*R*)-biphep}{(*R*)-dabn}]SbF_6

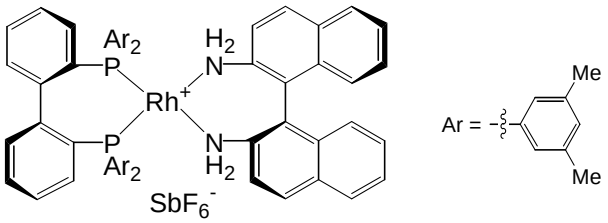


To a mixture of [Rh(biphep)(nbd)]SbF_6 (0.02 mmol) and (*R*)-DABN (0.02 mmol) in 10 ml schlenk tube was added dry dichloroethane (0.60 ml) under Ar atmosphere. A mixture was freezed and charged with hydrogen gas using balloon (1 atm), then stirred for 30 min at room temperature. Then, the diastereomer mixture was heated to 80 °C for 5 h. [Rh{(*R*)-biphep}{(*R*)-dabn}]SbF_6 complex was obtained pure form through quantitative complexation (confirmed by ^{31}P and ^{1}H NMR analyses under Ar atmosphere).

^{1}H NMR (400 MHz, CD_2Cl_2) δ 3.12 (bd, *J* = 7.2 Hz, 2H, N*H*$_2$), 3.32 (bd, *J* = 7.2 Hz, 2H, N*H*$_2$), 6.26 (m, 2H), 6.85-7.71 (m, 34H), 7.96 (d, *J* = 6.3 Hz, 2H), 8.06 (d, *J* = 6.6 Hz, 2H).

^{31}P NMR (162 MHz, CD_2Cl_2) δ 47.3 (d, *J* = 182.4 Hz) (*S*)/(*S*), {46.6 (d, *J* = 181.3 Hz) (*R*)/(*S*)}.

[Rh{(*R*)-dmbiphep}{(*R*)-dabn}]SbF_6



The titled compound was prepared from [Rh(dmbiphep)(nbd)]SbF_6 and (*R*)-DABN in a similar manner described above.

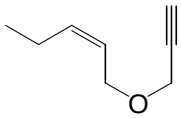
^{31}P NMR (162 MHz, CD_2Cl_2) δ 47.8 (d, J = 182.4 Hz) (*R*)/(*R*), {47.1 (d, J = 179.3 Hz) (*R*)/(*S*)}

Anal. Calcd for $C_{64}H_{60}N_2P_2RhSbF_6{\cdot}CH_2Cl_2{\cdot}H_2O$: C, 57.37; H, 4.74; N, 2.06%. Found: C, 57.48; H, 4.74; N, 2.23%.

Typical Experimental Procedure (Table 3)

To a mixture of [Rh(biphep)(nbd)]SbF_6 (0.02 mmol) and (*R*)-DABN (0.021 mmol) in 10 ml schlenk tube was added dry dichloroethane (0.60 ml) under Ar atmosphere. A mixture was freezed and charged with hydrogen gas using balloon (1 atm), then stirred for 30 min at room temperature. After again charged with Ar atmosphere, the mixture was stirred at 80 ºC for 5 h, and then cooled to 5 ºC. 1,6-Enyne substrate (0.2 mmol) and TfOH (0.04 mmol) was added, the reaction mixture was stirred at 5 ºC for 14 h, directly loaded onto a silica-gel column to give cyclic product as a colorless oil.

1-Prop-2-ynyloxy-pent-2-ene

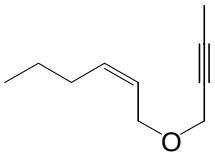


To a fiercely stirring suspension of cis-2-penten-1-ol (1.91 ml, 18.80 mmol), tetra-n-butylammonium iodide (TBAI) (69.4 mg, 0.19 mmol), NaOH (2.26 g, 56.4 mmol)in water (4.8 ml) was added dropwise propargyl bromide (1.42 ml, 18.80 mmol) at 0 ℃. Then the resultihg mixture was warmed up to room temperature, and stirred for 12 h. after the reaction was completed (monitored by TLC), the reaction mixture was diluted with water, extracted with ether, washed with brine and $Na_2S_2O_3$ aq. Then the organic layer was dried over anhydrous magnesium sulfate. After evaporation under reduced pressure (400 mmHg), the resultant residue was distilled under reduced pressure to give the titled compound (1.89 g, 80.4%).

^{1}H NMR (300 MHz, $CDCl_3$) δ 0.99 (t, *J* = 7.5 Hz, 3H), 2.12 (ddq, *J* = 7.5, 1.2, 7.5 Hz, 2H), 2.42 (t, *J* = 2.4 Hz, 1H), 4.12 (s, 2H), 4.14 (d, *J* = 2.1 Hz, 2H), 5.49 (dtt, *J* = 10.8, 6.9, 1.2 Hz, 1H), 5.64 (dtt, *J* = 11.1, 6.9, 1.2 Hz, 1H).

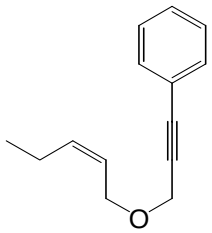
^{13}C NMR (300 MHz, $CDCl_3$) δ 14.17, 20.90, 56.86, 64.96, 74.19, 79.88, 124.37, 136.53.

1-But-2-ynyloxy-hex-2-ene



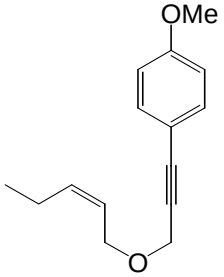
^{1}H NMR (300 MHz, $CDCl_3$) δ 0.90 (dt, *J* = 7.2, 1.2 Hz, 3H), 1.39 (dtq, *J* = 1.5, 7.5, 7.5 Hz, 2H), 1.85 (dt, *J* = 1.5, 1.8, 3H), 2.06 (dt, *J* = 7.2, 7.2 Hz, 2H), 4.05-4.20 (m, 4H), 5.48-5.66 (m, 2H).
^{13}C NMR (300 MHz, $CDCl_3$) δ 3.30, 13.46, 22.48, 29.41, 57.43, 64.96, 75.25, 82.27, 125.73, 134.40.

(3-Pent-2-enyloxy-prop-1-ynyl)-benzene



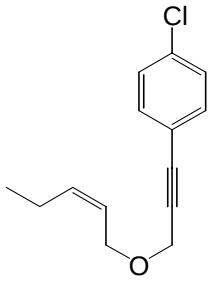
To a suspension of $PdCl_2(PPh_3)_2$ (70.2 mg, 0.10 mmol) and CuI (9.5 mg, 0.05 mmol) was added iodobenzene (1.12 ml, 10.0 mmol), diethylamine (15 ml), and 1-but-2-ynyloxy-hex-2-ene (0.69 ml, 5.0 mmol) under argon atmosphere, and the mixture was refluxed 3 h (monitored by TLC). After cooled to room temperature, the resultant mixture was added ether and filtered by celite. After evaporation under reduced pressure, the resultant residue was purified by neutral silicagel chromatography to give titled compound (0.90 g, 89.9%).
^{1}H NMR (300 MHz, $CDCl_3$) δ 1.00 (t, *J* = 7.2 Hz, 3H), 2.14 (ddq, *J* = 7.5, 7.5, 1.2 Hz, 2H), 4.20 (d, *J* = 6.9, 2H), 4.37 (s, 2H), 5.53 (dtt, *J* = 10.8, 6.9, 1.2 Hz, 1H), 5.66 (dtt, *J* = 10.8, 7.5, 1.2 Hz, 1H), 7.29-7.34 (m, 3H), 7.42-7.48 (m, 2H).
^{13}C NMR (300 MHz, $CDCl_3$) δ 14.19, 20.90, 57.60, 64.95, 85.23, 86.08, 122.70, 124.50, 128.25, 128.36, 131.71, 136.47.

1-Methoxy-4-(3-pent-2-enyloxy-prop-1-ynyl)-benzene



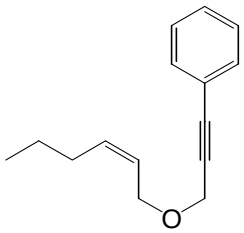
^{1}H NMR (300 MHz, $CDCl_3$) δ 1.00 (t, *J* = 7.8 Hz, 3H), 2.14 (dq, *J* = 7.8, 6.6 Hz, 2H), 3.81 (s, 3H), 4.19 (dd, *J* = 6.3, 0.6 Hz, 2H), 4.35 (s, 2H), 5.48-5.70 (m, 2H), 6.84 (m, 2H), 7.39 (m, 2H).
^{13}C NMR (300 MHz, $CDCl_3$) δ 14.22, 20.92, 55.26, 57.72, 64.92, 83.79, 86.01, 113.88, 114.81, 124.59, 133.21, 136.39, 159.66.

4-(3-Pent-2-enyloxy-prop-1-ynyl)-chlorobenzene



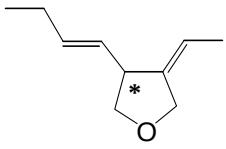
^{1}H NMR (300 MHz, $CDCl_3$) δ 1.00 (t, *J* = 7.5 Hz, 3H), 2.13 (ddq, *J* = 7.2, 1.2, 7.2 Hz, 2H), 4.18 (d, *J* = 6.9 Hz, 2H), 4.35 (s, 2H), 5.52 (dtt, *J* = 10.8, 6.9, 1.2 Hz, 1H), 5.66 (dtt, *J* = 10.8, 7.5, 1.2 Hz, 1H), 7.29 (dt, *J* = 8.7, 2.1 Hz, 2H), 7.37 (dt, *J* = 8.7, 2.1 Hz, 2H).
^{13}C NMR (300 MHz, $CDCl_3$) δ 14.15, 20.90, 57.56, 65.09, 84.94, 86.33, 121.21, 124.46, 128.60, 132.92, 134.44, 136.45.

(3-Hex-2-enyloxy-prop-1-ynyl)-benzene



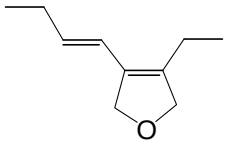
^{1}H NMR (300 MHz, $CDCl_3$) δ 0.91 (t, *J* = 7.2 Hz, 3H), 1.41 (dq, *J* = 7.2, 7.2 Hz, 2H), 2.11 (dt, 6.9, 6.9 Hz, 2H), 4.20 (d, *J* = 6.0, 2H), 4.37 (s, 2H), 5.57 (dt, *J* = 11.1, 6.3 Hz, 1H), 5.66 (dt, *J* = 11.1, 7.2 Hz, 1H), 7.28-7.34 (m, 3H), 7.42-7.47 (m, 2H).
^{13}C NMR (300 MHz, $CDCl_3$) δ 13.65, 22.68, 29.60, 57.62, 65.08, 85.30, 86.08, 122.75, 125.37, 128.22, 128.33, 131.69, 134.57.

3-But-1-enyl-4-ethylidene-tetrahydro-furan



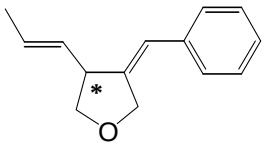
^{1}H NMR (300 MHz, $CDCl_3$) δ 0.99 (t, *J* = 7.2 Hz, 3H), 1.57 (ddt, *J* = 6.6, 2.4, 1.5 Hz, 2H), 2.05 (ddq, *J* = 7.2, 1.5, 7.2 Hz, 3H), 3.12-3.25 (m, 1H), 3.42 (t, *J* = 8.4 Hz, 1H), 4.03 (t, *J* = 7.8, 1H), 4.26-4.44 (m, 2H), 5.12-5.28 (m, 2H), 5.56 (dt, *J* = 15.3, 6.3 Hz, 1H).
^{13}C NMR (300 MHz, $CDCl_3$) δ 13.83, 14.64, 25.56, 47.79, 69.35, 73.75, 115.24, 127.29, 135.01, 142.55.
96% *ee* ($[\alpha]_D^{28}$= -6.6 (c = 2.68 in $CHCl_3$)
Chiral GC column; CP Chirasil Dex CB (0.32 mm x 25 m, CHROMPACK, GL Sciences Inc.; t_R = 41.9 min (minor) 42.4 min (major))

3-But-1-enyl-4-ethyl-2,5-dihydro-furan



^{1}H NMR (300 MHz, $CDCl_3$) δ 1.026 (t, *J* = 7.5 Hz, 3H), 1.033 (t, *J* = 7.8, Hz, 3H), 2.14 (dq, *J* = 7.2, 7.2 Hz, 2H), 2.25 (q, *J* = 7.5 Hz, 2H), 4.66 (m, 2H), 4.75 (m, 2H), 5.43 (dt, *J* = 15.9, 6.3 Hz, 1H), 6.20 (d, *J* = 15.6 Hz, 1H).

3-Benzylidene-4-propenyl-tetrahydro-furan



^{1}H NMR (300 MHz, $CDCl_3$) δ 1.77 (dd, *J* = 1.5, 6.3 Hz, 3H), 3.38-3.52 (m, 2H), 4.09 (m, 1H), 4.67 (ddt, *J* = 41.4, 14.1, 2.1, 2H), 5.34 (ddq, *J* = 15.3, 8.1, 1.5 Hz, 1H), 5.66 (dq, *J* = 15.0, 6.3 Hz, 1H), 6.25 (dd, *J* = 2.1, 2.4 Hz, 1H), 7.15 (d, *J* = 7.2 Hz, 2H), 7.21 (t, *J* = 7.2 Hz, 1H), 7.35 (dd, *J* = 7.2, 7.2 Hz, 2H).

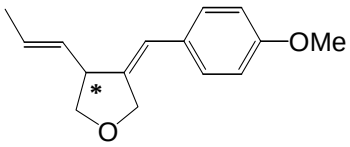
^{13}C NMR (300 MHz, $CDCl_3$) δ 18.04, 49.66, 70.30, 72.60, 121.65, 126.55, 127.89, 128.48, 128.80, 129.17, 137.29, 144.46.

HRMS. Calcd for $C_{14}H_{16}O$ [M^+]: 200.1201, Found: 200.1190.

94% *ee* ($[\alpha]_D^{28}$= -55.1 (c = 0.88 in $CHCl_3$)

HPLC analysis (DAICEL CHIRALCEL OJ-H, eluent, hexane/2-propanol = 98:2, flow rate 0.8 ml/min, detection 254 nm light); t_R of minor-isomer 8.59 min and major-isomer 9.73 min.

3-(4-Methoxy-benzylidene)-4-propenyl-tetrahydro-furan



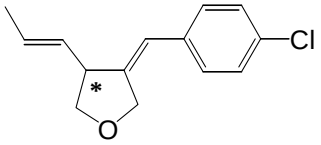
^{1}H NMR (300 MHz, $CDCl_3$) δ 1.76 (dd, *J* = 6.3, 1.5 Hz, 3H), 3.36-3.51 (m, 2H), 3.81 (s, 3H), 4.08 (m, 1H), 4.64 (m, 2H), 5.33 (ddq, *J* = 15.0, 8.1, 1.8 Hz, 1H), 5.65 (dq, *J* = 15.3, 6.3, Hz, 1H), 6.18 (m, 1H), 6.88 (m, 2H), 7.08 (m, 2H).

^{13}C NMR (300 MHz, $CDCl_3$) δ 18.04, 49.55, 55.23, 70.29, 72.63, 113.90, 120.99, 128.59, 129.11, 129.35, 130.16, 142.02, 158.22.

94% *ee* ($[\alpha]_D^{27}$=-46.9 (c = 1.55 in $CHCl_3$)

HPLC analysis (DAICEL CHIRALCEL OJ-H, eluent, hexane/2-propanol = 96:4, flow rate 0.8 ml/min, detection 254 nm light); t_R of minor-isomer 15.93 min and major-isomer 20.58 min.

3-(4-Chloro-benzylidene)-4-Propenyl-tetrahydro-furan



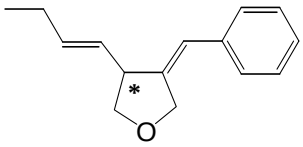
^{1}H NMR (300 MHz, $CDCl_3$) δ 1.76 (dd, *J* = 6.3, 1.5 Hz, 3H), 3.47-3.52 (m, 2H), 4.09 (m, 1H), 4.62 (m, 2H), 5.32 (ddq, *J* = 15.3, 8.1, 1.5 Hz, 1H), 5.66 (dq, *J* = 15.0, 6.3, Hz, 1H), 6.19 (dd, 4.5, 2.4 Hz, 1H), 7.06 (dt, *J* = 4.5, 2.4 Hz, 2H), 7.30 (dt, *J*= 8.7, 2.4 Hz, 2H).

^{13}C NMR (300 MHz, $CDCl_3$) δ 18.00, 49.71, 70.21, 72.62, 120.53, 128.64, 128.99, 129.11, 132.31, 135.80, 145.38, 151.28.

88% *ee* ($[\alpha]_D^{27}$= -71.3 (c = 1.96 in $CHCl_3$)

HPLC analysis (DAICEL CHIRALCEL AD-H, eluent, hexane/2-propanol = 99:1, flow rate 0.8 ml/min, detection 254 nm light); t_R of major-isomer 8.12 min and minor-isomer 8.58 min.

3-Benzylidene-4-butanyl-tetrahydro-furan



^{1}H NMR (300 MHz, $CDCl_3$) δ 1.05 (t, *J* = 7.5 Hz, 3H), 2.13 (ddt, *J* = 7.5, 1.2, 7.5 Hz, 2H), 3.38-3.57 (m, 2H), 4.11 (m, 1H), 4.68 (m, 2H), 5.32 (ddt, *J* = 15.3, 8.1, 1.5 Hz, 1H), 5.70 (dt, *J* = 15.3, 6.6 Hz, 1H), 6.25 (dt, *J* = 2.4, 2.4 Hz, 1H), 7.15 (dd, *J* = 7.2, 1.5 Hz, 2H), 7.23 (tt, *J* = 7.5, 1.2 Hz, 1H), 7.35 (dd, *J* = 7.5, 7.2 Hz, 2H).

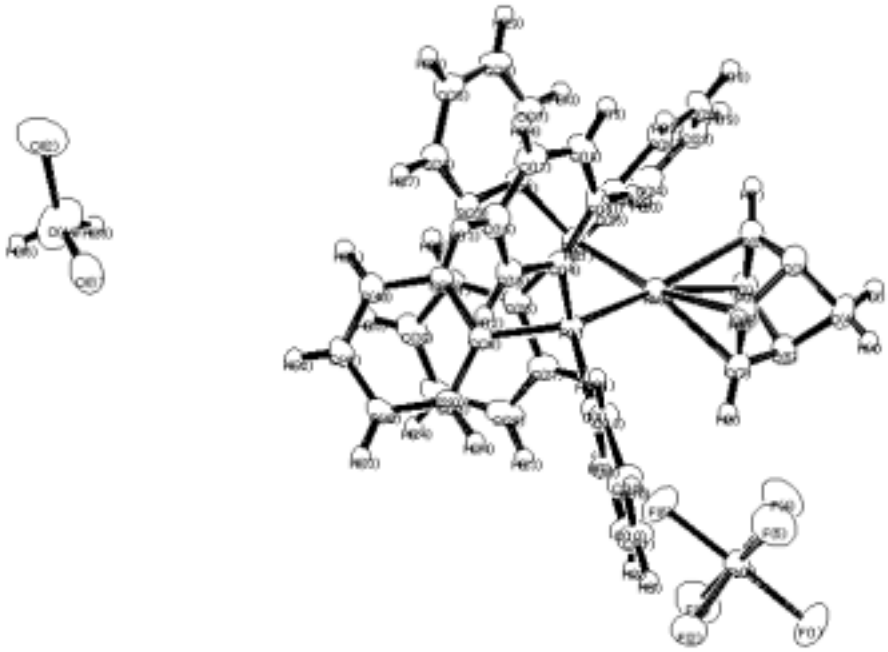
^{13}C NMR (300 MHz, $CDCl_3$) δ 13.81, 25.59, 49.58, 70.32, 72.71, 121.65, 126.53, 127.00, 127.89, 128.46, 135.93, 137.32, 144.57.

89% *ee* ($[\alpha]_D^{27}$= -60.8 (c = 1.72 in $CHCl_3$)

HPLC analysis (DAICEL CHIRALCEL OJ-H, eluent, hexane/2-propanol = 98:2, flow rate 0.8 ml/min, detection 254 nm light); t_R of major-isomer 6.69 min and minor-isomer 7.12 min.

X-ray analysis of [Rh(biphep)(nbd)]SbF_6

Empirical Formula	$C_{46}H_{44}F_6P_2RhSbCl_2$
Formula Weight	1068.35
Crystal System	monoclinic
Lattice Type	Primitive
Lattice Parameters	a = 14.065(4) Å
	b = 13.737(4) Å
	c = 21.407(6) Å
	β = 97.789(4) °
	V = 4097.9(21) $Å^3$
Space Group	$P2_1/n$ (#14)
Z value	4
D_{calc}	1.732 g/cm^3
Detector	Rigaku Saturn
Goniometer	Rigaku AFC10
Radiation	MoKα (λ = 0.71070 Å)
	Graphite monochromated
Temperature	193 K
No. of Reflections Measured	Total: 36865
Structure Solution	Direct Methods (SIR92)
Refinement	Full-matrix least-squares on F^2
Residuals: R	0.076
Residuals: Rw	0.179
Goodness of Fit Indicator	1.084
Max Shift/Error in Final Cycle	0.006



Bond lengths (Å)

atom	atom	distance	atom	atom	distance
Sb(1)	F(1)	1.869(6)	Sb(1)	F(2)	1.874(5)
Sb(1)	F(3)	1.874(5)	Sb(1)	F(4)	1.874(6)
Sb(1)	F(5)	1.866(6)	Sb(1)	F(6)	1.879(5)
Rh(1)	P(1)	2.299(2)	Rh(1)	P(2)	2.307(1)
Rh(1)	C(1)	2.219(7)	Rh(1)	C(2)	2.230(7)
Rh(1)	C(6)	2.215(7)	Rh(1)	C(7)	2.201(6)
Cl(1)	C(44)	1.747(13)	Cl(2)	C(44)	1.749(13)
P(1)	C(8)	1.831(6)	P(1)	C(14)	1.825(6)
P(1)	C(38)	1.835(6)	P(2)	C(20)	1.840(6)
P(2)	C(26)	1.824(6)	P(2)	C(32)	1.825(6)
C(1)	C(2)	1.379(10)	C(1)	C(3)	1.532(10)
C(2)	C(5)	1.544(9)	C(3)	C(4)	1.561(10)
C(3)	C(6)	1.541(11)	C(4)	C(5)	1.532(11)
C(5)	C(7)	1.534(10)	C(6)	C(7)	1.370(11)
C(8)	C(9)	1.390(8)	C(8)	C(13)	1.382(8)
C(9)	C(10)	1.382(9)	C(10)	C(11)	1.376(10)
C(11)	C(12)	1.381(10)	C(12)	C(13)	1.395(9)
C(14)	C(15)	1.390(9)	C(14)	C(19)	1.386(9)
C(15)	C(16)	1.388(10)	C(16)	C(17)	1.382(12)
C(17)	C(18)	1.365(11)	C(18)	C(19)	1.385(10)
C(20)	C(21)	1.397(9)	C(20)	C(25)	1.396(9)
C(21)	C(22)	1.394(10)	C(22)	C(23)	1.395(12)
C(23)	C(24)	1.364(11)	C(24)	C(25)	1.386(10)

C(26)	C(27)	1.401(8)	C(26)	C(31)	1.404(9)
C(27)	C(28)	1.385(10)	C(28)	C(29)	1.381(12)
C(29)	C(30)	1.376(10)	C(30)	C(31)	1.390(10)
C(32)	C(33)	1.427(8)	C(32)	C(37)	1.394(8)
C(33)	C(34)	1.391(9)	C(33)	C(39)	1.501(8)
C(34)	C(35)	1.381(10)	C(35)	C(36)	1.366(11)
C(36)	C(37)	1.388(10)	C(38)	C(39)	1.422(7)
C(38)	C(43)	1.391(9)	C(39)	C(40)	1.392(9)
C(40)	C(41)	1.377(10)	C(41)	C(42)	1.397(9)
C(42)	C(43)	1.385(9)			

Bond lengths involving hydrogens (Å)

atom	atom	distance	atom	atom	distance
C(1)	H(1)	0.950(10)	C(2)	H(2)	0.950(10)
C(4)	H(3)	0.950(12)	C(4)	H(4)	0.950(11)
C(6)	H(5)	0.950(11)	C(7)	H(6)	0.950(10)
C(9)	H(7)	0.950(9)	C(10)	H(8)	0.950(10)
C(11)	H(9)	0.950(9)	C(12)	H(10)	0.950(10)
C(13)	H(11)	0.950(9)	C(15)	H(12)	0.950(10)
C(16)	H(13)	0.950(11)	C(17)	H(14)	0.950(10)
C(18)	H(15)	0.950(12)	C(19)	H(16)	0.950(9)
C(21)	H(17)	0.950(9)	C(22)	H(18)	0.950(11)
C(23)	H(19)	0.950(11)	C(24)	H(20)	0.950(11)
C(25)	H(21)	0.950(10)	C(27)	H(22)	0.950(9)
C(28)	H(23)	0.950(10)	C(29)	H(24)	0.950(11)
C(30)	H(25)	0.950(11)	C(31)	H(26)	0.950(9)
C(34)	H(27)	0.950(10)	C(35)	H(28)	0.950(11)
C(36)	H(29)	0.950(10)	C(37)	H(30)	0.950(10)
C(40)	H(31)	0.950(8)	C(41)	H(32)	0.950(9)
C(42)	H(33)	0.950(9)	C(43)	H(34)	0.950(8)
C(44)	H(35)	0.95(2)	C(44)	H(36)	0.95(2)

Bond angles (^{o})

atom	atom	atom	angle	atom	atom	atom	angle
F(1)	Sb(1)	F(2)	90.3(3)	F(1)	Sb(1)	F(3)	89.4(3)
F(1)	Sb(1)	F(4)	90.6(3)	F(1)	Sb(1)	F(5)	91.7(3)
F(1)	Sb(1)	F(6)	178.8(3)	F(2)	Sb(1)	F(3)	89.7(3)
F(2)	Sb(1)	F(4)	178.6(3)	F(2)	Sb(1)	F(5)	90.2(3)
F(2)	Sb(1)	F(6)	89.2(2)	F(3)	Sb(1)	F(4)	89.3(3)
F(3)	Sb(1)	F(5)	178.9(3)	F(3)	Sb(1)	F(6)	89.4(3)

F(4)	Sb(1)	F(5)	90.7(3)	F(4)	Sb(1)	F(6)	89.8(3)
F(5)	Sb(1)	F(6)	89.4(3)	P(1)	Rh(1)	P(2)	92.02(5)
P(1)	Rh(1)	C(1)	151.6(2)	P(1)	Rh(1)	C(2)	163.6(2)
P(1)	Rh(1)	C(6)	94.9(2)	P(1)	Rh(1)	C(7)	100.2(2)
P(2)	Rh(1)	C(1)	103.2(2)	P(2)	Rh(1)	C(2)	98.8(2)
P(2)	Rh(1)	C(6)	165.5(2)	P(2)	Rh(1)	C(7)	153.8(2)
C(1)	Rh(1)	C(2)	36.1(3)	C(1)	Rh(1)	C(6)	65.6(3)
C(1)	Rh(1)	C(7)	76.4(2)	C(2)	Rh(1)	C(6)	77.5(3)
C(2)	Rh(1)	C(7)	65.1(3)	C(6)	Rh(1)	C(7)	36.1(3)
C(8)	P(1)	C(14)	107.4(3)	C(8)	P(1)	C(38)	104.5(3)
C(8)	P(1)	Rh(1)	111.5(2)	C(14)	P(1)	C(38)	100.9(3)
C(14)	P(1)	Rh(1)	111.4(2)	C(38)	P(1)	Rh(1)	120.0(2)
C(20)	P(2)	C(26)	103.0(3)	C(20)	P(2)	C(32)	108.0(3)
C(20)	P(2)	Rh(1)	111.8(2)	C(26)	P(2)	C(32)	108.0(3)
C(26)	P(2)	Rh(1)	114.2(2)	C(32)	P(2)	Rh(1)	111.3(2)
C(2)	C(1)	C(3)	107.0(6)	C(2)	C(1)	Rh(1)	72.4(4)
C(3)	C(1)	Rh(1)	95.8(5)	C(5)	C(2)	Rh(1)	95.8(4)
C(5)	C(2)	C(1)	106.2(6)	C(1)	C(2)	Rh(1)	71.5(4)
C(4)	C(3)	C(6)	100.5(6)	C(4)	C(3)	C(1)	99.3(6)
C(1)	C(3)	C(6)	102.7(6)	C(5)	C(4)	C(3)	93.7(5)
C(7)	C(5)	C(4)	99.9(6)	C(2)	C(5)	C(7)	101.5(5)
C(2)	C(5)	C(4)	99.9(6)	C(7)	C(6)	Rh(1)	71.4(4)
C(7)	C(6)	C(3)	105.0(6)	C(3)	C(6)	Rh(1)	95.7(4)
C(5)	C(7)	Rh(1)	97.2(4)	C(5)	C(7)	C(6)	108.5(6)
C(6)	C(7)	Rh(1)	72.5(4)	C(9)	C(8)	C(13)	118.9(5)
C(9)	C(8)	P(1)	118.3(4)	C(13)	C(8)	P(1)	122.7(4)
C(10)	C(9)	C(8)	121.1(6)	C(11)	C(10)	C(9)	119.9(6)
C(12)	C(11)	C(10)	119.6(6)	C(13)	C(12)	C(11)	120.7(6)
C(8)	C(13)	C(12)	119.8(6)	C(15)	C(14)	C(19)	119.2(6)
C(15)	C(14)	P(1)	120.1(5)	C(19)	C(14)	P(1)	120.3(5)
C(16)	C(15)	C(14)	120.0(6)	C(17)	C(16)	C(15)	119.8(7)
C(18)	C(17)	C(16)	120.5(7)	C(19)	C(18)	C(17)	120.1(7)
C(14)	C(19)	C(18)	120.4(6)	C(21)	C(20)	C(25)	118.2(6)
C(21)	C(20)	P(2)	120.3(5)	C(25)	C(20)	P(2)	120.9(5)
C(22)	C(21)	C(20)	121.0(6)	C(23)	C(22)	C(21)	119.3(7)
C(24)	C(23)	C(22)	120.2(7)	C(25)	C(24)	C(23)	120.7(7)
C(20)	C(25)	C(24)	120.6(6)	C(27)	C(26)	C(31)	119.5(6)
C(27)	C(26)	P(2)	118.0(5)	C(31)	C(26)	P(2)	122.3(5)
C(28)	C(27)	C(26)	119.8(6)	C(29)	C(28)	C(27)	120.1(6)
C(30)	C(29)	C(28)	120.6(7)	C(31)	C(30)	C(29)	120.4(7)

C(26)	C(31)	C(30)	119.5(6)	C(33)	C(32)	C(37)	117.8(5)
C(33)	C(32)	P(2)	121.5(4)	C(37)	C(32)	P(2)	120.2(5)
C(34)	C(33)	C(39)	117.5(6)	C(34)	C(33)	C(32)	118.5(5)
C(39)	C(33)	C(32)	123.6(5)	C(35)	C(34)	C(33)	122.0(6)
C(36)	C(35)	C(34)	119.7(7)	C(37)	C(36)	C(35)	119.9(7)
C(32)	C(37)	C(36)	121.9(6)	C(39)	C(38)	C(43)	118.8(5)
C(39)	C(38)	P(1)	119.8(4)	C(43)	C(38)	P(1)	121.4(4)
C(40)	C(39)	C(33)	116.0(5)	C(40)	C(39)	C(38)	118.2(5)
C(33)	C(39)	C(38)	125.8(5)	C(41)	C(40)	C(39)	122.6(6)
C(42)	C(41)	C(40)	118.9(6)	C(43)	C(42)	C(41)	119.8(6)
C(38)	C(43)	C(42)	121.6(5)	Cl(1)	C(44)	Cl(2)	113.7(5)

Bond angles involving hydrogens (^{o})

atom	atom	atom	angle	atom	atom	atom	angle
C(2)	C(1)	H(1)	123.3(9)	C(3)	C(1)	H(1)	122.6(8)
H(1)	C(1)	Rh(1)	122.8(6)	C(5)	C(2)	H(2)	123.4(7)
H(2)	C(2)	Rh(1)	123.4(6)	H(2)	C(2)	C(1)	123.1(8)
C(5)	C(4)	H(3)	113.5(9)	C(5)	C(4)	H(4)	113.3(9)
H(3)	C(4)	H(4)	109.5(9)	H(3)	C(4)	C(3)	113.3(9)
H(4)	C(4)	C(3)	112.9(9)	C(7)	C(6)	H(5)	124.0(9)
H(5)	C(6)	Rh(1)	123.6(6)	H(5)	C(6)	C(3)	123.5(8)
H(6)	C(7)	Rh(1)	122.1(6)	H(6)	C(7)	C(5)	121.9(8)
H(6)	C(7)	C(6)	122.3(9)	C(10)	C(9)	H(7)	119.7(7)
H(7)	C(9)	C(8)	119.2(7)	C(11)	C(10)	H(8)	119.9(7)
H(8)	C(10)	C(9)	120.3(8)	C(12)	C(11)	H(9)	119.9(9)
H(9)	C(11)	C(10)	120.5(9)	C(13)	C(12)	H(10)	119.5(8)
H(10)	C(12)	C(11)	119.8(8)	H(11)	C(13)	C(8)	119.9(7)
H(11)	C(13)	C(12)	120.4(7)	C(16)	C(15)	H(12)	120.4(8)
H(12)	C(15)	C(14)	119.6(7)	C(17)	C(16)	H(13)	120.2(8)
H(13)	C(16)	C(15)	119.9(9)	C(18)	C(17)	H(14)	119.8(10)
H(14)	C(17)	C(16)	119.7(9)	C(19)	C(18)	H(15)	120.0(9)
H(15)	C(18)	C(17)	119.9(9)	H(16)	C(19)	C(14)	119.7(7)
H(16)	C(19)	C(18)	120.0(8)	C(22)	C(21)	H(17)	119.7(8)
H(17)	C(21)	C(20)	119.3(8)	C(23)	C(22)	H(18)	120.4(9)
H(18)	C(22)	C(21)	120.3(9)	C(24)	C(23)	H(19)	120.4(9)
H(19)	C(23)	C(22)	119.4(9)	C(25)	C(24)	H(20)	120.2(9)
H(20)	C(24)	C(23)	119.0(9)	H(21)	C(25)	C(20)	119.3(8)
H(21)	C(25)	C(24)	120.0(8)	C(28)	C(27)	H(22)	120.6(7)
H(22)	C(27)	C(26)	119.6(7)	C(29)	C(28)	H(23)	120.2(9)
H(23)	C(28)	C(27)	119.7(9)	C(30)	C(29)	H(24)	119.6(10)

H(24)	C(29)	C(28)	119.8(9)	C(31)	C(30)	H(25)	119.6(8)
H(25)	C(30)	C(29)	120.0(9)	H(26)	C(31)	C(26)	120.2(8)
H(26)	C(31)	C(30)	120.4(8)	C(35)	C(34)	H(27)	119.3(8)
H(27)	C(34)	C(33)	118.7(8)	C(36)	C(35)	H(28)	120.0(9)
H(28)	C(35)	C(34)	120.3(9)	C(37)	C(36)	H(29)	120.0(9)
H(29)	C(36)	C(35)	120.1(9)	H(30)	C(37)	C(32)	119.0(7)
H(30)	C(37)	C(36)	119.1(7)	C(41)	C(40)	H(31)	118.8(8)
H(31)	C(40)	C(39)	118.6(8)	C(42)	C(41)	H(32)	120.5(8)
H(32)	C(41)	C(40)	120.6(7)	C(43)	C(42)	H(33)	120.2(7)
H(33)	C(42)	C(41)	120.0(8)	H(34)	C(43)	C(38)	119.2(7)
H(34)	C(43)	C(42)	119.2(7)	H(35)	C(44)	H(36)	109.5(13)
H(35)	C(44)	Cl(1)	109.0(12)	H(35)	C(44)	Cl(2)	109.1(14)
H(36)	C(44)	Cl(1)	107.5(14)	H(36)	C(44)	Cl(2)	108.0(12)

Torsion Angles(^{0})

atom1	atom2	atom3	atom4	angle	atom1	atom2	atom3	atom4	angle
P(2)	Rh(1)	P(1)	C(8)	146.5(2)	P(2)	Rh(1)	P(1)	C(14)	-93.5(2)
P(2)	Rh(1)	P(1)	C(38)	23.9(2)	C(1)	Rh(1)	P(1)	C(8)	-90.6(2)
C(1)	Rh(1)	P(1)	C(14)	29.4(2)	C(1)	Rh(1)	P(1)	C(38)	146.9(2)
C(2)	Rh(1)	P(1)	C(8)	15.1(3)	C(2)	Rh(1)	P(1)	C(14)	135.1(2)
C(2)	Rh(1)	P(1)	C(38)	-107.5(2)	C(6)	Rh(1)	P(1)	C(8)	-46.3(2)
C(6)	Rh(1)	P(1)	C(14)	73.7(2)	C(6)	Rh(1)	P(1)	C(38)	-168.9(2)
C(7)	Rh(1)	P(1)	C(8)	-10.2(2)	C(7)	Rh(1)	P(1)	C(14)	109.8(2)
C(7)	Rh(1)	P(1)	C(38)	-132.8(2)	P(1)	Rh(1)	P(2)	C(20)	173.0(2)
P(1)	Rh(1)	P(2)	C(26)	-70.5(2)	P(1)	Rh(1)	P(2)	C(32)	52.2(2)
C(1)	Rh(1)	P(2)	C(20)	17.2(2)	C(1)	Rh(1)	P(2)	C(26)	133.7(2)
C(1)	Rh(1)	P(2)	C(32)	-103.7(2)	C(2)	Rh(1)	P(2)	C(20)	-19.3(2)
C(2)	Rh(1)	P(2)	C(26)	97.2(2)	C(2)	Rh(1)	P(2)	C(32)	-140.2(2)
C(6)	Rh(1)	P(2)	C(20)	54.7(3)	C(6)	Rh(1)	P(2)	C(26)	171.2(3)
C(6)	Rh(1)	P(2)	C(32)	-66.2(3)	C(7)	Rh(1)	P(2)	C(20)	-68.7(2)
C(7)	Rh(1)	P(2)	C(26)	47.8(3)	C(7)	Rh(1)	P(2)	C(32)	170.4(2)
P(1)	Rh(1)	C(1)	C(2)	152.6(3)	P(1)	Rh(1)	C(1)	C(3)	46.5(6)
P(2)	Rh(1)	C(1)	C(2)	-86.9(4)	P(2)	Rh(1)	C(1)	C(3)	167.1(4)
C(2)	Rh(1)	C(1)	C(3)	-106.1(5)	C(6)	Rh(1)	C(1)	C(2)	102.8(4)
C(6)	Rh(1)	C(1)	C(3)	-3.3(3)	C(7)	Rh(1)	C(1)	C(2)	66.2(4)
C(7)	Rh(1)	C(1)	C(3)	-39.9(4)	P(1)	Rh(1)	C(2)	C(1)	-129.0(6)
P(1)	Rh(1)	C(2)	C(5)	-23.9(9)	P(2)	Rh(1)	C(2)	C(1)	100.3(4)
P(2)	Rh(1)	C(2)	C(5)	-154.5(4)	C(1)	Rh(1)	C(2)	C(5)	105.1(5)
C(6)	Rh(1)	C(2)	C(1)	-65.4(4)	C(6)	Rh(1)	C(2)	C(5)	39.7(4)
C(7)	Rh(1)	C(2)	C(1)	-101.4(4)	C(7)	Rh(1)	C(2)	C(5)	3.8(3)

P(1)	Rh(1)	C(6)	C(3)	-155.4(4)	P(1)	Rh(1)	C(6)	C(7)	100.7(4)
P(2)	Rh(1)	C(6)	C(3)	-37.3(10)	P(2)	Rh(1)	C(6)	C(7)	-141.3(6)
C(1)	Rh(1)	C(6)	C(3)	3.3(3)	C(1)	Rh(1)	C(6)	C(7)	-100.7(4)
C(2)	Rh(1)	C(6)	C(3)	39.3(4)	C(2)	Rh(1)	C(6)	C(7)	-64.6(4)
C(7)	Rh(1)	C(6)	C(3)	104.0(5)	P(1)	Rh(1)	C(7)	C(5)	168.6(4)
P(1)	Rh(1)	C(7)	C(6)	-84.2(4)	P(2)	Rh(1)	C(7)	C(5)	52.0(7)
P(2)	Rh(1)	C(7)	C(6)	159.2(4)	C(1)	Rh(1)	C(7)	C(5)	-40.3(4)
C(1)	Rh(1)	C(7)	C(6)	67.0(4)	C(2)	Rh(1)	C(7)	C(5)	-3.8(4)
C(2)	Rh(1)	C(7)	C(6)	103.4(4)	C(6)	Rh(1)	C(7)	C(5)	-107.2(5)
Rh(1)	P(1)	C(8)	C(9)	-57.1(6)	Rh(1)	P(1)	C(8)	C(13)	118.7(5)
C(14)	P(1)	C(8)	C(9)	-179.4(5)	C(14)	P(1)	C(8)	C(13)	-3.6(6)
C(38)	P(1)	C(8)	C(9)	73.9(5)	C(38)	P(1)	C(8)	C(13)	-110.2(5)
Rh(1)	P(1)	C(14)	C(15)	176.2(4)	Rh(1)	P(1)	C(14)	C(19)	3.5(5)
C(8)	P(1)	C(14)	C(15)	-61.4(5)	C(8)	P(1)	C(14)	C(19)	125.9(4)
C(38)	P(1)	C(14)	C(15)	47.8(5)	C(38)	P(1)	C(14)	C(19)	-124.9(5)
Rh(1)	P(1)	C(38)	C(39)	-66.8(5)	Rh(1)	P(1)	C(38)	C(43)	114.3(5)
C(8)	P(1)	C(38)	C(39)	167.2(4)	C(8)	P(1)	C(38)	C(43)	-11.6(5)
C(14)	P(1)	C(38)	C(39)	55.8(5)	C(14)	P(1)	C(38)	C(43)	-123.0(5)
Rh(1)	P(2)	C(20)	C(21)	-57.9(5)	Rh(1)	P(2)	C(20)	C(25)	112.3(5)
C(26)	P(2)	C(20)	C(21)	179.0(4)	C(26)	P(2)	C(20)	C(25)	-10.8(5)
C(32)	P(2)	C(20)	C(21)	64.9(5)	C(32)	P(2)	C(20)	C(25)	-124.9(4)
Rh(1)	P(2)	C(26)	C(27)	-27.7(6)	Rh(1)	P(2)	C(26)	C(31)	156.8(5)
C(20)	P(2)	C(26)	C(27)	93.7(5)	C(20)	P(2)	C(26)	C(31)	-81.7(6)
C(32)	P(2)	C(26)	C(27)	-152.1(5)	C(32)	P(2)	C(26)	C(31)	32.4(6)
Rh(1)	P(2)	C(32)	C(33)	-71.1(5)	Rh(1)	P(2)	C(32)	C(37)	101.4(5)
C(20)	P(2)	C(32)	C(33)	165.8(4)	C(20)	P(2)	C(32)	C(37)	-21.7(5)
C(26)	P(2)	C(32)	C(33)	55.1(5)	C(26)	P(2)	C(32)	C(37)	-132.5(5)
Rh(1)	C(1)	C(2)	C(5)	-90.8(5)	C(3)	C(1)	C(2)	Rh(1)	90.8(5)
C(3)	C(1)	C(2)	C(5)	-0.0(7)	Rh(1)	C(1)	C(3)	C(4)	107.5(5)
Rh(1)	C(1)	C(3)	C(6)	4.4(6)	C(2)	C(1)	C(3)	C(4)	34.2(7)
C(2)	C(1)	C(3)	C(6)	-68.9(7)	Rh(1)	C(2)	C(5)	C(4)	-107.4(5)
Rh(1)	C(2)	C(5)	C(7)	-5.0(6)	C(1)	C(2)	C(5)	C(4)	-35.0(7)
C(1)	C(2)	C(5)	C(7)	67.4(7)	C(1)	C(3)	C(4)	C(5)	-52.7(7)
C(6)	C(3)	C(4)	C(5)	52.2(6)	C(1)	C(3)	C(6)	Rh(1)	-4.4(5)
C(1)	C(3)	C(6)	C(7)	67.8(6)	C(4)	C(3)	C(6)	Rh(1)	-106.6(5)
C(4)	C(3)	C(6)	C(7)	-34.4(7)	C(3)	C(4)	C(5)	C(2)	52.8(6)
C(3)	C(4)	C(5)	C(7)	-50.9(6)	C(2)	C(5)	C(7)	Rh(1)	5.1(6)
C(2)	C(5)	C(7)	C(6)	-68.8(7)	C(4)	C(5)	C(7)	Rh(1)	107.5(4)
C(4)	C(5)	C(7)	C(6)	33.6(7)	Rh(1)	C(6)	C(7)	C(5)	91.9(5)
C(3)	C(6)	C(7)	Rh(1)	-91.0(5)	C(3)	C(6)	C(7)	C(5)	0.9(7)

P(1)	C(8)	C(9)	C(10)	177.3(6)	C(13)	C(8)	C(9)	C(10)	1.3(10)
P(1)	C(8)	C(13)	C(12)	-176.9(6)	C(9)	C(8)	C(13)	C(12)	-1.0(10)
C(8)	C(9)	C(10)	C(11)	-0.8(11)	C(9)	C(10)	C(11)	C(12)	0.0(12)
C(10)	C(11)	C(12)	C(13)	0.2(12)	C(11)	C(12)	C(13)	C(8)	0.3(11)
P(1)	C(14)	C(15)	C(16)	-172.0(5)	C(19)	C(14)	C(15)	C(16)	0.8(9)
P(1)	C(14)	C(19)	C(18)	170.9(5)	C(15)	C(14)	C(19)	C(18)	-1.9(9)
C(14)	C(15)	C(16)	C(17)	1.0(10)	C(15)	C(16)	C(17)	C(18)	-1.6(11)
C(16)	C(17)	C(18)	C(19)	0.5(11)	C(17)	C(18)	C(19)	C(14)	1.2(10)
P(2)	C(20)	C(21)	C(22)	170.0(5)	C(25)	C(20)	C(21)	C(22)	-0.6(8)
P(2)	C(20)	C(25)	C(24)	-169.3(5)	C(21)	C(20)	C(25)	C(24)	1.2(9)
C(20)	C(21)	C(22)	C(23)	-1.5(9)	C(21)	C(22)	C(23)	C(24)	3.0(10)
C(22)	C(23)	C(24)	C(25)	-2.5(10)	C(23)	C(24)	C(25)	C(20)	0.3(10)
P(2)	C(26)	C(27)	C(28)	-174.1(6)	C(31)	C(26)	C(27)	C(28)	1.5(10)
P(2)	C(26)	C(31)	C(30)	175.2(6)	C(27)	C(26)	C(31)	C(30)	-0.1(10)
C(26)	C(27)	C(28)	C(29)	-1.8(11)	C(27)	C(28)	C(29)	C(30)	0.7(12)
C(28)	C(29)	C(30)	C(31)	0.7(12)	C(29)	C(30)	C(31)	C(26)	-0.9(11)
P(2)	C(32)	C(33)	C(34)	170.2(5)	P(2)	C(32)	C(33)	C(39)	-17.0(8)
C(37)	C(32)	C(33)	C(34)	-2.4(8)	C(37)	C(32)	C(33)	C(39)	170.3(5)
P(2)	C(32)	C(37)	C(36)	-169.8(6)	C(33)	C(32)	C(37)	C(36)	3.0(9)
C(32)	C(33)	C(34)	C(35)	-0.4(9)	C(39)	C(33)	C(34)	C(35)	-173.6(6)
C(32)	C(33)	C(39)	C(38)	69.8(8)	C(32)	C(33)	C(39)	C(40)	-112.4(7)
C(34)	C(33)	C(39)	C(38)	-117.4(7)	C(34)	C(33)	C(39)	C(40)	60.4(8)
C(33)	C(34)	C(35)	C(36)	2.8(11)	C(34)	C(35)	C(36)	C(37)	-2.3(11)
C(35)	C(36)	C(37)	C(32)	-0.6(11)	P(1)	C(38)	C(39)	C(33)	0.5(8)
P(1)	C(38)	C(39)	C(40)	-177.1(5)	C(43)	C(38)	C(39)	C(33)	179.4(6)
C(43)	C(38)	C(39)	C(40)	1.7(8)	P(1)	C(38)	C(43)	C(42)	-179.8(36)
C(39)	C(38)	C(43)	C(42)	1.3(9)	C(33)	C(39)	C(40)	C(41)	179.0(6)
C(38)	C(39)	C(40)	C(41)	-3.1(10)	C(39)	C(40)	C(41)	C(42)	1.3(11)
C(40)	C(41)	C(42)	C(43)	1.8(10)	C(41)	C(42)	C(43)	C(38)	-3.1(10)

Torsion Angles involving hydrogens(º)

atom1	atom2	atom3	atom4	angle	atom1	atom2	atom3	atom4	angle
P(1)	Rh(1)	C(1)	H(1)	-88.7(9)	P(2)	Rh(1)	C(1)	H(1)	31.9(9)
C(2)	Rh(1)	C(1)	H(1)	118.8(10)	C(6)	Rh(1)	C(1)	H(1)	-138.5(9)
C(7)	Rh(1)	C(1)	H(1)	-175.1(9)	P(1)	Rh(1)	C(2)	H(2)	112.9(8)
P(2)	Rh(1)	C(2)	H(2)	-17.7(8)	C(1)	Rh(1)	C(2)	H(2)	-118.0(9)
C(6)	Rh(1)	C(2)	H(2)	176.5(8)	C(7)	Rh(1)	C(2)	H(2)	140.6(8)
P(1)	Rh(1)	C(6)	H(5)	-18.3(9)	P(2)	Rh(1)	C(6)	H(5)	99.7(11)
C(1)	Rh(1)	C(6)	H(5)	140.3(9)	C(2)	Rh(1)	C(6)	H(5)	176.4(9)
C(7)	Rh(1)	C(6)	H(5)	-119.0(10)	P(1)	Rh(1)	C(7)	H(6)	33.5(9)

P(2)	Rh(1)	C(7)	H(6)	-83.1(10)	C(1)	Rh(1)	C(7)	H(6)	-175.4(9)
C(2)	Rh(1)	C(7)	H(6)	-138.9(9)	C(6)	Rh(1)	C(7)	H(6)	117.7(10)
Rh(1)	C(1)	C(2)	H(2)	118.4(8)	C(3)	C(1)	C(2)	H(2)	-150.9(8)
H(1)	C(1)	C(2)	Rh(1)	-118.2(9)	H(1)	C(1)	C(2)	C(5)	151.0(8)
H(1)	C(1)	C(2)	H(2)	0.2(13)	H(1)	C(1)	C(3)	C(4)	-117.1(9)
H(1)	C(1)	C(3)	C(6)	139.8(9)	H(2)	C(2)	C(5)	C(4)	115.8(9)
H(2)	C(2)	C(5)	C(7)	-141.8(9)	C(1)	C(3)	C(4)	H(3)	64.9(10)
C(1)	C(3)	C(4)	H(4)	-170.0(9)	C(6)	C(3)	C(4)	H(3)	169.8(8)
C(6)	C(3)	C(4)	H(4)	-65.0(10)	C(1)	C(3)	C(6)	H(5)	-141.5(8)
C(4)	C(3)	C(6)	H(5)	116.3(9)	H(3)	C(4)	C(5)	C(2)	-64.6(9)
H(3)	C(4)	C(5)	C(7)	-168.3(8)	H(4)	C(4)	C(5)	C(2)	169.8(8)
H(4)	C(4)	C(5)	C(7)	66.1(9)	C(2)	C(5)	C(7)	H(6)	140.3(9)
C(4)	C(5)	C(7)	H(6)	-117.3(9)	Rh(1)	C(6)	C(7)	H(6)	-117.4(8)
C(3)	C(6)	C(7)	H(6)	151.6(8)	H(5)	C(6)	C(7)	Rh(1)	118.4(9)
H(5)	C(6)	C(7)	C(5)	-149.6(8)	H(5)	C(6)	C(7)	H(6)	1.1(13)
P(1)	C(8)	C(9)	H(7)	-3.6(11)	C(13)	C(8)	C(9)	H(7)	-179.7(36)
P(1)	C(8)	C(13)	H(11)	3.6(11)	C(9)	C(8)	C(13)	H(11)	179.4(8)
C(8)	C(9)	C(10)	H(8)	179.7(51)	H(7)	C(9)	C(10)	C(11)	-179.9(62)
H(7)	C(9)	C(10)	H(8)	0.7(14)	C(9)	C(10)	C(11)	H(9)	179.7(51)
H(8)	C(10)	C(11)	C(12)	179.5(9)	H(8)	C(10)	C(11)	H(9)	-0.8(15)
C(10)	C(11)	C(12)	H(10)	179.8(62)	H(9)	C(11)	C(12)	C(13)	-179.5(36)
H(9)	C(11)	C(12)	H(10)	0.1(16)	C(11)	C(12)	C(13)	H(11)	179.8(62)
H(10)	C(12)	C(13)	C(8)	-179.3(9)	H(10)	C(12)	C(13)	H(11)	0.2(14)
P(1)	C(14)	C(15)	H(12)	7.9(10)	C(19)	C(14)	C(15)	H(12)	-179.3(7)
P(1)	C(14)	C(19)	H(16)	-8.6(10)	C(15)	C(14)	C(19)	H(16)	178.6(7)
C(14)	C(15)	C(16)	H(13)	-179.4(8)	H(12)	C(15)	C(16)	C(17)	-178.9(8)
H(12)	C(15)	C(16)	H(13)	0.7(13)	C(15)	C(16)	C(17)	H(14)	179.8(62)
H(13)	C(16)	C(17)	C(18)	178.8(9)	H(13)	C(16)	C(17)	H(14)	0.2(14)
C(16)	C(17)	C(18)	H(15)	-179.9(88)	H(14)	C(17)	C(18)	C(19)	179.1(9)
H(14)	C(17)	C(18)	H(15)	-1.3(14)	C(17)	C(18)	C(19)	H(16)	-179.3(8)
H(15)	C(18)	C(19)	C(14)	-178.3(8)	H(15)	C(18)	C(19)	H(16)	1.2(13)
P(2)	C(20)	C(21)	H(17)	-10.6(9)	C(25)	C(20)	C(21)	H(17)	178.9(7)
P(2)	C(20)	C(25)	H(21)	11.2(9)	C(21)	C(20)	C(25)	H(21)	-178.4(7)
C(20)	C(21)	C(22)	H(18)	179.4(7)	H(17)	C(21)	C(22)	C(23)	179.0(7)
H(17)	C(21)	C(22)	H(18)	-0.1(12)	C(21)	C(22)	C(23)	H(19)	-178.9(8)
H(18)	C(22)	C(23)	C(24)	-177.9(8)	H(18)	C(22)	C(23)	H(19)	0.3(12)
C(22)	C(23)	C(24)	H(20)	179.3(8)	H(19)	C(23)	C(24)	C(25)	179.4(8)
H(19)	C(23)	C(24)	H(20)	1.2(13)	C(23)	C(24)	C(25)	H(21)	179.9(72)
H(20)	C(24)	C(25)	C(20)	178.5(8)	H(20)	C(24)	C(25)	H(21)	-1.9(12)
P(2)	C(26)	C(27)	H(22)	6.2(11)	C(31)	C(26)	C(27)	H(22)	-178.2(8)

P(2)	C(26)	C(31)	H(26)	-5.3(11)	C(27)	C(26)	C(31)	H(26)	179.3(8)
C(26)	C(27)	C(28)	H(23)	177.9(9)	H(22)	C(27)	C(28)	C(29)	177.9(9)
H(22)	C(27)	C(28)	H(23)	-2.4(14)	C(27)	C(28)	C(29)	H(24)	-179.2(10)
H(23)	C(28)	C(29)	C(30)	-179.0(9)	H(23)	C(28)	C(29)	H(24)	1.1(15)
C(28)	C(29)	C(30)	H(25)	-179.7(36)	H(24)	C(29)	C(30)	C(31)	-179.4(9)
H(24)	C(29)	C(30)	H(25)	0.2(15)	C(29)	C(30)	C(31)	H(26)	179.6(9)
H(25)	C(30)	C(31)	C(26)	179.4(9)	H(25)	C(30)	C(31)	H(26)	-0.1(14)
P(2)	C(32)	C(37)	H(30)	10.1(10)	C(33)	C(32)	C(37)	H(30)	-177.1(7)
C(32)	C(33)	C(34)	H(27)	179.7(7)	C(39)	C(33)	C(34)	H(27)	6.5(10)
C(33)	C(34)	C(35)	H(28)	-176.4(8)	H(27)	C(34)	C(35)	C(36)	-177.2(8)
H(27)	C(34)	C(35)	H(28)	3.5(13)	C(34)	C(35)	C(36)	H(29)	177.1(9)
H(28)	C(35)	C(36)	C(37)	176.9(9)	H(28)	C(35)	C(36)	H(29)	-3.6(14)
C(35)	C(36)	C(37)	H(30)	179.5(8)	H(29)	C(36)	C(37)	C(32)	179.9(88)
H(29)	C(36)	C(37)	H(30)	0.0(14)	P(1)	C(38)	C(43)	H(34)	-0.6(10)
C(39)	C(38)	C(43)	H(34)	-179.4(7)	C(33)	C(39)	C(40)	H(31)	-2.3(11)
C(38)	C(39)	C(40)	H(31)	175.6(8)	C(39)	C(40)	C(41)	H(32)	-177.5(8)
H(31)	C(40)	C(41)	C(42)	-177.4(8)	H(31)	C(40)	C(41)	H(32)	3.8(13)
C(40)	C(41)	C(42)	H(33)	-178.9(8)	H(32)	C(41)	C(42)	C(43)	-179.4(8)
H(32)	C(41)	C(42)	H(33)	-0.1(13)	C(41)	C(42)	C(43)	H(34)	177.6(8)
H(33)	C(42)	C(43)	C(38)	177.6(8)	H(33)	C(42)	C(43)	H(34)	-1.6(12)