Supporting Information for

2,6-Bis(3,5-dimethylpyrazol-1-yl)pyridine: A Useful *Pseudo* N₃ Ligand in Efficient Ruthenium(II)-Catalyzed Transfer Hydrogenation of Ketones

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1. Experimental Section

General procedure for catalytic transfer hydrogenation of ketones, Method A:

Under nitrogen atmosphere, a mixture of ketone (2 mmol), the catalyst **1** (2.8 mg, 0.004 mmol), and 2-propanol (19 mL) was stirred at 82 °C for 10 minutes. 1.0 mL of 0.1 M *i*PrOK (0.1 mmol) solution in 2-propanol was then introduced. The mixture was stirred at the refluxing temperature and the reaction was monitored by gas chromatography. After the reaction was complete, the mixture was condensed and subject to flash column chromatography on silica gel to afford the alcohol product. Acetone and the corresponding alcohols were detected as the products in all cases. The alcohol products were identified by comparison with the authentic samples and/or by proton NMR measurements.

General procedure for catalytic transfer hydrogenation of ketones, Method B:

Under nitrogen atmosphere, a mixture of ketone (2 mmol), the catalyst **1** (2.8 mg, 0.004 mmol), 1.0 mL of 0.1 M *i*PrOK solution in 2-propanol, and 2-propanol (2 mL) was stirred at room temperature for 10 minutes. The mixture was then stirred at 82 °C and the reaction was monitored by gas chromatography. The alcohol products were isolated and identified by the procedure mentioned above.

2. X-Ray Crystal structure information for complex $\text{RuCl}_2(\text{PPh}_3)(\text{Me}_4\text{BPPy})$ 1.

Table 1. Crystal data and structure refinement for complex $\text{RuCl}_2(\text{PPh}_3)(\text{Me}_4\text{BPPy})$ 1.

Identification code	cd24521
Empirical formula	$\text{C}_{34}\text{H}_{34}\text{Cl}_2\text{N}_5\text{P}\text{Ru}$
Formula weight	786.50
Temperature	293(2) K
Wavelength	0.71073 Å
Crystal system, space group	Monoclinic, $P2(1)/c$
Unit cell dimensions	$a = 11.7563(9)$ Å $\alpha = 90$ deg. $b = 17.1373(14)$ Å $\beta = 93.152(2)$ deg. $c = 17.3475(13)$ Å $\gamma = 90$ deg.
Volume	$3489.7(5)$ Å ³
Z, Calculated density	4, 1.497 Mg/m ³
Absorption coefficient	0.834 mm ⁻¹
F(000)	1600
Crystal size	0.307 x 0.241 x 0.150 mm
Theta range for data collection	1.67 to 26.00 deg.
Limiting indices	$-14 \leq h \leq 12$, $-19 \leq k \leq 21$, $-20 \leq l \leq 21$
Reflections collected / unique	18802 / 6849 [R(int) = 0.0952]
Completeness to theta = 26.00	99.9 %
Absorption correction	Empirical
Max. and min. transmission	1.00000 and 0.71478
Refinement method	Full-matrix least-squares on F ²
Data / restraints / parameters	6849 / 0 / 410
Goodness-of-fit on F ²	0.806
Final R indices [I > 2σ(I)]	R1 = 0.0509, wR2 = 0.0782
R indices (all data)	R1 = 0.0958, wR2 = 0.0885
Largest diff. peak and hole	0.829 and -0.572 e.Å ⁻³

Table 2. Atomic coordinates ($\times 10^4$) and equivalent isotropic displacement parameters ($\text{\AA}^2 \times 10^3$) for $\text{RuCl}_2(\text{PPh}_3)(\text{Me}_4\text{BPPy})$ **1**. $U(\text{eq})$ is defined as one third of the trace of the orthogonalized U_{ij} tensor.

	x	y	z	$U(\text{eq})$
Ru	1724(1)	1005(1)	8130(1)	31(1)
Cl(1)	1850(1)	2202(1)	7362(1)	46(1)
Cl(2)	-349(1)	1189(1)	8248(1)	45(1)
Cl(3)	2239(2)	8416(2)	4172(2)	173(1)
Cl(4)	2434(3)	9947(2)	3532(2)	203(1)
P(1)	3615(1)	794(1)	7941(1)	37(1)
N(1)	1537(3)	57(2)	8738(2)	31(1)
N(2)	1886(3)	1448(2)	9246(2)	37(1)
N(3)	1809(3)	848(2)	9790(2)	38(1)
N(4)	1272(3)	220(2)	7275(2)	35(1)
N(5)	1226(3)	-546(2)	7564(2)	37(1)
C(1)	1562(4)	100(3)	9505(3)	36(1)
C(2)	1363(5)	-555(3)	9951(3)	52(2)
C(3)	1153(5)	-1239(3)	9575(3)	64(2)
C(4)	1102(5)	-1295(3)	8782(3)	55(2)
C(5)	1296(4)	-624(3)	8373(3)	38(1)
C(6)	1887(4)	2108(3)	9653(3)	37(1)
C(7)	1878(4)	1944(3)	10437(3)	49(2)
C(8)	1826(4)	1165(3)	10527(3)	45(1)
C(9)	1888(4)	2888(3)	9272(3)	50(2)
C(10)	1818(5)	693(3)	11255(3)	69(2)
C(11)	930(4)	-1062(3)	6981(3)	45(1)
C(12)	791(5)	-627(3)	6329(3)	54(2)
C(13)	987(4)	163(3)	6527(3)	42(1)
C(14)	923(5)	849(3)	5999(3)	60(2)
C(15)	857(5)	-1912(3)	7077(3)	64(2)
C(16)	4238(4)	-116(3)	8336(3)	42(1)
C(17)	4117(5)	-253(3)	9120(3)	59(2)
C(18)	4570(6)	-929(4)	9467(4)	79(2)
C(19)	5154(7)	-1447(4)	9058(5)	90(2)
C(20)	5316(7)	-1321(4)	8306(5)	99(3)
C(21)	4860(5)	-659(3)	7945(3)	70(2)
C(22)	3892(4)	740(3)	6912(3)	39(1)
C(23)	3565(4)	80(3)	6486(3)	46(1)
C(24)	3661(5)	51(3)	5703(3)	57(2)
C(25)	4106(5)	688(3)	5328(3)	60(2)
C(26)	4437(5)	1341(3)	5742(3)	56(2)
C(27)	4333(5)	1362(3)	6519(3)	50(2)

C(28)	4695(5)	1500(3)	8295(3)	38(1)
C(29)	5849(5)	1309(3)	8355(3)	52(2)
C(30)	6657(5)	1845(4)	8609(3)	66(2)
C(31)	6335(5)	2584(4)	8809(3)	67(2)
C(32)	5219(6)	2792(3)	8742(3)	67(2)
C(33)	4393(5)	2252(3)	8495(3)	56(2)
C(34)	2333(7)	8968(7)	3367(4)	160(4)

Table 3. Bond lengths [Å] and angles [deg] for RuCl₂(PPh₃)(Me₄BPPy) **1**.

Ru-N(1)	1.955(3)
Ru-N(4)	2.051(4)
Ru-N(2)	2.078(4)
Ru-P(1)	2.2927(14)
Ru-Cl(1)	2.4546(12)
Ru-Cl(2)	2.4771(13)
Cl(3)-C(34)	1.695(9)
Cl(4)-C(34)	1.704(10)
P(1)-C(22)	1.835(5)
P(1)-C(28)	1.836(5)
P(1)-C(16)	1.839(5)
N(1)-C(1)	1.331(5)
N(1)-C(5)	1.352(5)
N(2)-C(6)	1.333(5)
N(2)-N(3)	1.402(4)
N(3)-C(8)	1.388(5)
N(3)-C(1)	1.399(5)
N(4)-C(13)	1.325(5)
N(4)-N(5)	1.407(4)
N(5)-C(11)	1.374(5)
N(5)-C(5)	1.409(5)
C(1)-C(2)	1.390(6)
C(2)-C(3)	1.356(6)
C(2)-H(2)	0.9300
C(3)-C(4)	1.377(7)
C(3)-H(3)	0.9300
C(4)-C(5)	1.376(6)
C(4)-H(4)	0.9300
C(6)-C(7)	1.390(6)
C(6)-C(9)	1.491(6)
C(7)-C(8)	1.346(6)
C(7)-H(7)	0.9300
C(8)-C(10)	1.500(6)

C(9)-H(9A)	0.9600
C(9)-H(9B)	0.9600
C(9)-H(9C)	0.9600
C(10)-H(10A)	0.9600
C(10)-H(10B)	0.9600
C(10)-H(10C)	0.9600
C(11)-C(12)	1.356(6)
C(11)-C(15)	1.469(6)
C(12)-C(13)	1.412(6)
C(12)-H(12)	0.9300
C(13)-C(14)	1.490(6)
C(14)-H(14A)	0.9600
C(14)-H(14B)	0.9600
C(14)-H(14C)	0.9600
C(15)-H(15A)	0.9600
C(15)-H(15B)	0.9600
C(15)-H(15C)	0.9600
C(16)-C(21)	1.384(7)
C(16)-C(17)	1.395(6)
C(17)-C(18)	1.398(7)
C(17)-H(17)	0.9300
C(18)-C(19)	1.349(8)
C(18)-H(18)	0.9300
C(19)-C(20)	1.345(8)
C(19)-H(19)	0.9300
C(20)-C(21)	1.390(7)
C(20)-H(20)	0.9300
C(21)-H(21)	0.9300
C(22)-C(27)	1.381(6)
C(22)-C(23)	1.395(6)
C(23)-C(24)	1.369(6)
C(23)-H(23)	0.9300
C(24)-C(25)	1.388(7)
C(24)-H(24)	0.9300
C(25)-C(26)	1.375(7)
C(25)-H(25)	0.9300
C(26)-C(27)	1.361(6)
C(26)-H(26)	0.9300
C(27)-H(27)	0.9300
C(28)-C(33)	1.385(6)
C(28)-C(29)	1.394(7)
C(29)-C(30)	1.376(7)
C(29)-H(29)	0.9300
C(30)-C(31)	1.373(7)

C(30)-H(30)	0.9300
C(31)-C(32)	1.358(7)
C(31)-H(31)	0.9300
C(32)-C(33)	1.391(7)
C(32)-H(32)	0.9300
C(33)-H(33)	0.9300
C(34)-H(34A)	0.9700
C(34)-H(34B)	0.9700

N(1)-Ru-N(4)	79.25(15)
N(1)-Ru-N(2)	78.94(15)
N(4)-Ru-N(2)	156.97(15)
N(1)-Ru-P(1)	94.87(11)
N(4)-Ru-P(1)	90.45(11)
N(2)-Ru-P(1)	98.68(11)
N(1)-Ru-Cl(1)	176.97(12)
N(4)-Ru-Cl(1)	100.12(11)
N(2)-Ru-Cl(1)	101.26(11)
P(1)-Ru-Cl(1)	88.09(5)
N(1)-Ru-Cl(2)	85.44(11)
N(4)-Ru-Cl(2)	85.75(11)
N(2)-Ru-Cl(2)	85.24(11)
P(1)-Ru-Cl(2)	176.06(5)
Cl(1)-Ru-Cl(2)	91.56(4)
C(22)-P(1)-C(28)	101.6(2)
C(22)-P(1)-C(16)	103.4(2)
C(28)-P(1)-C(16)	100.4(2)
C(22)-P(1)-Ru	111.84(16)
C(28)-P(1)-Ru	120.41(17)
C(16)-P(1)-Ru	116.74(17)
C(1)-N(1)-C(5)	120.5(4)
C(1)-N(1)-Ru	119.8(3)
C(5)-N(1)-Ru	119.5(3)
C(6)-N(2)-N(3)	105.2(4)
C(6)-N(2)-Ru	143.2(3)
N(3)-N(2)-Ru	110.7(3)
C(8)-N(3)-C(1)	132.5(4)
C(8)-N(3)-N(2)	109.6(4)
C(1)-N(3)-N(2)	117.0(4)
C(13)-N(4)-N(5)	105.5(4)
C(13)-N(4)-Ru	143.0(3)
N(5)-N(4)-Ru	111.5(3)
C(11)-N(5)-N(4)	110.6(4)
C(11)-N(5)-C(5)	132.1(4)

N(4)-N(5)-C(5)	116.3(4)
N(1)-C(1)-C(2)	121.1(5)
N(1)-C(1)-N(3)	113.3(4)
C(2)-C(1)-N(3)	125.6(5)
C(3)-C(2)-C(1)	117.5(5)
C(3)-C(2)-H(2)	121.2
C(1)-C(2)-H(2)	121.2
C(2)-C(3)-C(4)	122.5(5)
C(2)-C(3)-H(3)	118.8
C(4)-C(3)-H(3)	118.8
C(5)-C(4)-C(3)	117.2(5)
C(5)-C(4)-H(4)	121.4
C(3)-C(4)-H(4)	121.4
N(1)-C(5)-C(4)	121.1(4)
N(1)-C(5)-N(5)	112.5(4)
C(4)-C(5)-N(5)	126.3(5)
N(2)-C(6)-C(7)	110.4(4)
N(2)-C(6)-C(9)	121.7(4)
C(7)-C(6)-C(9)	127.9(4)
C(8)-C(7)-C(6)	108.4(4)
C(8)-C(7)-H(7)	125.8
C(6)-C(7)-H(7)	125.8
C(7)-C(8)-N(3)	106.2(4)
C(7)-C(8)-C(10)	129.4(5)
N(3)-C(8)-C(10)	124.4(5)
C(6)-C(9)-H(9A)	109.5
C(6)-C(9)-H(9B)	109.5
H(9A)-C(9)-H(9B)	109.5
C(6)-C(9)-H(9C)	109.5
H(9A)-C(9)-H(9C)	109.5
H(9B)-C(9)-H(9C)	109.5
C(8)-C(10)-H(10A)	109.5
C(8)-C(10)-H(10B)	109.5
H(10A)-C(10)-H(10B)	109.5
C(8)-C(10)-H(10C)	109.5
H(10A)-C(10)-H(10C)	109.5
H(10B)-C(10)-H(10C)	109.5
C(12)-C(11)-N(5)	105.9(4)
C(12)-C(11)-C(15)	129.4(5)
N(5)-C(11)-C(15)	124.7(5)
C(11)-C(12)-C(13)	108.3(5)
C(11)-C(12)-H(12)	125.9
C(13)-C(12)-H(12)	125.9
N(4)-C(13)-C(12)	109.7(5)

N(4)-C(13)-C(14)	123.0(4)
C(12)-C(13)-C(14)	127.2(5)
C(13)-C(14)-H(14A)	109.5
C(13)-C(14)-H(14B)	109.5
H(14A)-C(14)-H(14B)	109.5
C(13)-C(14)-H(14C)	109.5
H(14A)-C(14)-H(14C)	109.5
H(14B)-C(14)-H(14C)	109.5
C(11)-C(15)-H(15A)	109.5
C(11)-C(15)-H(15B)	109.5
H(15A)-C(15)-H(15B)	109.5
C(11)-C(15)-H(15C)	109.5
H(15A)-C(15)-H(15C)	109.5
H(15B)-C(15)-H(15C)	109.5
C(21)-C(16)-C(17)	116.8(5)
C(21)-C(16)-P(1)	126.7(4)
C(17)-C(16)-P(1)	116.5(4)
C(16)-C(17)-C(18)	120.1(6)
C(16)-C(17)-H(17)	119.9
C(18)-C(17)-H(17)	119.9
C(19)-C(18)-C(17)	120.8(6)
C(19)-C(18)-H(18)	119.6
C(17)-C(18)-H(18)	119.6
C(20)-C(19)-C(18)	120.5(7)
C(20)-C(19)-H(19)	119.8
C(18)-C(19)-H(19)	119.8
C(19)-C(20)-C(21)	119.8(7)
C(19)-C(20)-H(20)	120.1
C(21)-C(20)-H(20)	120.1
C(16)-C(21)-C(20)	121.9(6)
C(16)-C(21)-H(21)	119.1
C(20)-C(21)-H(21)	119.1
C(27)-C(22)-C(23)	117.7(5)
C(27)-C(22)-P(1)	122.2(4)
C(23)-C(22)-P(1)	119.9(4)
C(24)-C(23)-C(22)	121.3(5)
C(24)-C(23)-H(23)	119.4
C(22)-C(23)-H(23)	119.4
C(23)-C(24)-C(25)	119.4(5)
C(23)-C(24)-H(24)	120.3
C(25)-C(24)-H(24)	120.3
C(26)-C(25)-C(24)	119.8(5)
C(26)-C(25)-H(25)	120.1
C(24)-C(25)-H(25)	120.1

C(27)-C(26)-C(25)	120.1(5)
C(27)-C(26)-H(26)	119.9
C(25)-C(26)-H(26)	119.9
C(26)-C(27)-C(22)	121.6(5)
C(26)-C(27)-H(27)	119.2
C(22)-C(27)-H(27)	119.2
C(33)-C(28)-C(29)	117.5(5)
C(33)-C(28)-P(1)	121.0(4)
C(29)-C(28)-P(1)	121.5(4)
C(30)-C(29)-C(28)	121.3(5)
C(30)-C(29)-H(29)	119.3
C(28)-C(29)-H(29)	119.3
C(31)-C(30)-C(29)	120.1(6)
C(31)-C(30)-H(30)	120.0
C(29)-C(30)-H(30)	120.0
C(32)-C(31)-C(30)	119.9(6)
C(32)-C(31)-H(31)	120.0
C(30)-C(31)-H(31)	120.0
C(31)-C(32)-C(33)	120.5(6)
C(31)-C(32)-H(32)	119.8
C(33)-C(32)-H(32)	119.8
C(28)-C(33)-C(32)	120.7(6)
C(28)-C(33)-H(33)	119.6
C(32)-C(33)-H(33)	119.6
Cl(3)-C(34)-Cl(4)	114.7(4)
Cl(3)-C(34)-H(34A)	108.6
Cl(4)-C(34)-H(34A)	108.6
Cl(3)-C(34)-H(34B)	108.6
Cl(4)-C(34)-H(34B)	108.6
H(34A)-C(34)-H(34B)	107.6

Table 4. Anisotropic displacement parameters ($\text{\AA}^2 \times 10^3$) for $\text{RuCl}_2(\text{PPh}_3)(\text{Me}_4\text{BPPy})$ **1**.

The anisotropic displacement factor exponent takes the form:

$$-2 \pi^2 [h^2 a^{*2} U_{11} + \dots + 2 h k a^* b^* U_{12}]$$

	U11	U22	U33	U23	U13	U12
Ru	40(1)	25(1)	28(1)	1(1)	5(1)	0(1)
Cl(1)	63(1)	36(1)	41(1)	7(1)	8(1)	0(1)
Cl(2)	45(1)	39(1)	52(1)	9(1)	9(1)	6(1)
Cl(3)	152(3)	205(3)	158(2)	16(2)	-35(2)	-34(2)
Cl(4)	229(4)	173(3)	196(3)	-32(2)	-69(3)	-7(3)
P(1)	43(1)	31(1)	38(1)	1(1)	6(1)	0(1)

N(1)	37(3)	28(2)	28(2)	5(2)	1(2)	3(2)
N(2)	43(3)	39(3)	28(2)	2(2)	2(2)	3(2)
N(3)	43(3)	41(3)	30(2)	4(2)	4(2)	5(2)
N(4)	41(3)	30(2)	35(2)	0(2)	4(2)	-3(2)
N(5)	39(3)	32(2)	39(3)	1(2)	8(2)	-4(2)
C(1)	37(3)	30(3)	42(3)	8(2)	5(3)	7(2)
C(2)	67(4)	48(4)	43(3)	14(3)	13(3)	2(3)
C(3)	82(5)	39(4)	72(4)	24(3)	16(4)	1(3)
C(4)	73(5)	38(3)	56(4)	0(3)	14(4)	-12(3)
C(5)	36(3)	37(3)	43(3)	4(3)	11(3)	4(2)
C(6)	40(3)	42(3)	29(3)	-9(2)	2(3)	3(3)
C(7)	56(4)	55(4)	36(3)	-15(3)	-2(3)	6(3)
C(8)	49(4)	53(4)	34(3)	2(3)	6(3)	5(3)
C(9)	58(4)	41(3)	50(3)	-12(3)	1(3)	6(3)
C(10)	98(6)	73(4)	37(3)	3(3)	-1(3)	0(4)
C(11)	44(4)	34(3)	56(4)	-12(3)	8(3)	-12(3)
C(12)	61(4)	52(4)	47(3)	-15(3)	-4(3)	-10(3)
C(13)	42(4)	45(3)	40(3)	-7(3)	0(3)	-1(3)
C(14)	83(5)	65(4)	32(3)	5(3)	3(3)	-8(3)
C(15)	72(5)	41(4)	79(4)	-20(3)	6(4)	-15(3)
C(16)	37(3)	41(3)	47(3)	3(3)	0(3)	-4(3)
C(17)	38(4)	82(5)	56(4)	14(3)	4(3)	2(3)
C(18)	83(6)	84(5)	71(5)	36(4)	3(4)	-1(4)
C(19)	110(7)	50(5)	108(6)	26(5)	-26(6)	5(4)
C(20)	137(8)	44(4)	114(6)	-3(4)	-19(6)	36(4)
C(21)	97(6)	50(4)	63(4)	-8(3)	-7(4)	11(4)
C(22)	36(3)	39(3)	43(3)	0(3)	10(3)	7(2)
C(23)	53(4)	39(3)	47(3)	-5(3)	9(3)	-1(3)
C(24)	63(5)	61(4)	49(4)	-19(3)	11(3)	2(3)
C(25)	69(5)	71(4)	40(3)	-3(3)	11(3)	17(4)
C(26)	82(5)	44(3)	45(4)	7(3)	21(3)	13(3)
C(27)	69(4)	43(3)	39(3)	-1(3)	12(3)	0(3)
C(28)	48(4)	37(3)	31(3)	-3(2)	6(3)	-3(3)
C(29)	52(4)	46(4)	58(4)	3(3)	-1(3)	5(3)
C(30)	38(4)	71(5)	88(5)	7(4)	-3(4)	-10(3)
C(31)	51(5)	84(5)	65(4)	-6(4)	8(4)	-23(4)
C(32)	66(5)	59(4)	77(5)	-24(3)	17(4)	-14(4)
C(33)	51(4)	52(4)	66(4)	-11(3)	5(3)	-4(3)
C(34)	121(8)	305(14)	51(5)	-41(8)	-12(5)	23(9)

Table 5. Hydrogen coordinates ($\times 10^4$) and isotropic displacement parameters ($\text{\AA}^2 \times 10^3$) for $\text{RuCl}_2(\text{PPh}_3)(\text{Me}_4\text{BPPy})$ **1**.

	x	y	z	U(eq)
H(2)	1373	-526	10487	63
H(3)	1039	-1686	9864	77
H(4)	944	-1766	8534	66
H(7)	1902	2311	10833	59
H(9A)	1699	2829	8730	75
H(9B)	2631	3119	9346	75
H(9C)	1336	3219	9496	75
H(10A)	1842	1037	11693	104
H(10B)	2471	356	11289	104
H(10C)	1136	384	11250	104
H(12)	600	-816	5837	64
H(14A)	372	1213	6172	90
H(14B)	701	679	5485	90
H(14C)	1656	1096	6000	90
H(15A)	1526	-2096	7362	96
H(15B)	801	-2157	6579	96
H(15C)	195	-2037	7353	96
H(17)	3734	107	9413	70
H(18)	4468	-1022	9987	95
H(19)	5447	-1896	9297	109
H(20)	5731	-1676	8029	119
H(21)	4977	-577	7425	85
H(23)	3276	-350	6738	55
H(24)	3430	-391	5426	69
H(25)	4180	673	4797	72
H(26)	4732	1769	5491	68
H(27)	4565	1806	6793	60
H(29)	6077	810	8221	63
H(30)	7423	1705	8646	79
H(31)	6880	2943	8989	80
H(32)	5005	3298	8862	80
H(33)	3629	2397	8464	68
H(34A)	1667	8870	3026	192
H(34B)	2996	8802	3101	192

Table 6. Torsion angles [deg] for RuCl₂(PPh₃)(Me₄BPPy) **1**.

N(1)-Ru-P(1)-C(22)	121.5(2)
N(4)-Ru-P(1)-C(22)	42.3(2)
N(2)-Ru-P(1)-C(22)	-159.0(2)
Cl(1)-Ru-P(1)-C(22)	-57.85(17)
Cl(2)-Ru-P(1)-C(22)	27.1(7)
N(1)-Ru-P(1)-C(28)	-119.3(2)
N(4)-Ru-P(1)-C(28)	161.4(2)
N(2)-Ru-P(1)-C(28)	-39.8(2)
Cl(1)-Ru-P(1)-C(28)	61.30(18)
Cl(2)-Ru-P(1)-C(28)	146.2(6)
N(1)-Ru-P(1)-C(16)	2.7(2)
N(4)-Ru-P(1)-C(16)	-76.5(2)
N(2)-Ru-P(1)-C(16)	82.2(2)
Cl(1)-Ru-P(1)-C(16)	-176.66(19)
Cl(2)-Ru-P(1)-C(16)	-91.7(7)
N(4)-Ru-N(1)-C(1)	-171.1(4)
N(2)-Ru-N(1)-C(1)	1.5(4)
P(1)-Ru-N(1)-C(1)	99.4(4)
Cl(1)-Ru-N(1)-C(1)	-93(2)
Cl(2)-Ru-N(1)-C(1)	-84.6(4)
N(4)-Ru-N(1)-C(5)	3.8(3)
N(2)-Ru-N(1)-C(5)	176.4(4)
P(1)-Ru-N(1)-C(5)	-85.7(3)
Cl(1)-Ru-N(1)-C(5)	82(2)
Cl(2)-Ru-N(1)-C(5)	90.4(3)
N(1)-Ru-N(2)-C(6)	-165.3(6)
N(4)-Ru-N(2)-C(6)	-146.4(5)
P(1)-Ru-N(2)-C(6)	101.3(6)
Cl(1)-Ru-N(2)-C(6)	11.6(6)
Cl(2)-Ru-N(2)-C(6)	-79.1(6)
N(1)-Ru-N(2)-N(3)	1.7(3)
N(4)-Ru-N(2)-N(3)	20.6(6)
P(1)-Ru-N(2)-N(3)	-91.6(3)
Cl(1)-Ru-N(2)-N(3)	178.6(3)
Cl(2)-Ru-N(2)-N(3)	87.9(3)
C(6)-N(2)-N(3)-C(8)	-3.2(5)
Ru-N(2)-N(3)-C(8)	-175.2(3)
C(6)-N(2)-N(3)-C(1)	167.5(4)
Ru-N(2)-N(3)-C(1)	-4.5(5)
N(1)-Ru-N(4)-C(13)	171.6(6)
N(2)-Ru-N(4)-C(13)	152.6(5)
P(1)-Ru-N(4)-C(13)	-93.6(6)

Cl(1)-Ru-N(4)-C(13)	-5.4(6)
Cl(2)-Ru-N(4)-C(13)	85.4(6)
N(1)-Ru-N(4)-N(5)	-7.5(3)
N(2)-Ru-N(4)-N(5)	-26.4(6)
P(1)-Ru-N(4)-N(5)	87.4(3)
Cl(1)-Ru-N(4)-N(5)	175.5(3)
Cl(2)-Ru-N(4)-N(5)	-93.6(3)
C(13)-N(4)-N(5)-C(11)	1.1(5)
Ru-N(4)-N(5)-C(11)	-179.5(3)
C(13)-N(4)-N(5)-C(5)	-169.0(4)
Ru-N(4)-N(5)-C(5)	10.4(5)
C(5)-N(1)-C(1)-C(2)	1.2(7)
Ru-N(1)-C(1)-C(2)	176.1(4)
C(5)-N(1)-C(1)-N(3)	-179.2(4)
Ru-N(1)-C(1)-N(3)	-4.3(6)
C(8)-N(3)-C(1)-N(1)	173.8(5)
N(2)-N(3)-C(1)-N(1)	5.8(6)
C(8)-N(3)-C(1)-C(2)	-6.6(8)
N(2)-N(3)-C(1)-C(2)	-174.6(5)
N(1)-C(1)-C(2)-C(3)	0.6(8)
N(3)-C(1)-C(2)-C(3)	-179.0(5)
C(1)-C(2)-C(3)-C(4)	-1.8(9)
C(2)-C(3)-C(4)-C(5)	1.2(9)
C(1)-N(1)-C(5)-C(4)	-1.9(7)
Ru-N(1)-C(5)-C(4)	-176.7(4)
C(1)-N(1)-C(5)-N(5)	175.7(4)
Ru-N(1)-C(5)-N(5)	0.8(5)
C(3)-C(4)-C(5)-N(1)	0.7(8)
C(3)-C(4)-C(5)-N(5)	-176.5(5)
C(11)-N(5)-C(5)-N(1)	-174.9(5)
N(4)-N(5)-C(5)-N(1)	-7.6(6)
C(11)-N(5)-C(5)-C(4)	2.4(9)
N(4)-N(5)-C(5)-C(4)	169.8(5)
N(3)-N(2)-C(6)-C(7)	3.3(5)
Ru-N(2)-C(6)-C(7)	170.8(4)
N(3)-N(2)-C(6)-C(9)	-176.2(4)
Ru-N(2)-C(6)-C(9)	-8.8(9)
N(2)-C(6)-C(7)-C(8)	-2.3(6)
C(9)-C(6)-C(7)-C(8)	177.2(5)
C(6)-C(7)-C(8)-N(3)	0.2(6)
C(6)-C(7)-C(8)-C(10)	178.8(5)
C(1)-N(3)-C(8)-C(7)	-166.9(5)
N(2)-N(3)-C(8)-C(7)	1.8(6)
C(1)-N(3)-C(8)-C(10)	14.5(9)

N(2)-N(3)-C(8)-C(10)	-176.8(5)
N(4)-N(5)-C(11)-C(12)	0.0(6)
C(5)-N(5)-C(11)-C(12)	167.9(5)
N(4)-N(5)-C(11)-C(15)	177.0(4)
C(5)-N(5)-C(11)-C(15)	-15.1(8)
N(5)-C(11)-C(12)-C(13)	-1.0(6)
C(15)-C(11)-C(12)-C(13)	-177.9(5)
N(5)-N(4)-C(13)-C(12)	-1.7(5)
Ru-N(4)-C(13)-C(12)	179.3(4)
N(5)-N(4)-C(13)-C(14)	179.7(4)
Ru-N(4)-C(13)-C(14)	0.6(9)
C(11)-C(12)-C(13)-N(4)	1.8(6)
C(11)-C(12)-C(13)-C(14)	-179.6(5)
C(22)-P(1)-C(16)-C(21)	5.7(6)
C(28)-P(1)-C(16)-C(21)	-99.1(5)
Ru-P(1)-C(16)-C(21)	128.9(5)
C(22)-P(1)-C(16)-C(17)	-177.7(4)
C(28)-P(1)-C(16)-C(17)	77.5(4)
Ru-P(1)-C(16)-C(17)	-54.5(4)
C(21)-C(16)-C(17)-C(18)	-2.8(8)
P(1)-C(16)-C(17)-C(18)	-179.7(5)
C(16)-C(17)-C(18)-C(19)	1.7(10)
C(17)-C(18)-C(19)-C(20)	0.3(12)
C(18)-C(19)-C(20)-C(21)	-1.2(12)
C(17)-C(16)-C(21)-C(20)	1.9(9)
P(1)-C(16)-C(21)-C(20)	178.5(5)
C(19)-C(20)-C(21)-C(16)	0.0(11)
C(28)-P(1)-C(22)-C(27)	-29.2(5)
C(16)-P(1)-C(22)-C(27)	-133.0(4)
Ru-P(1)-C(22)-C(27)	100.6(4)
C(28)-P(1)-C(22)-C(23)	156.3(4)
C(16)-P(1)-C(22)-C(23)	52.5(5)
Ru-P(1)-C(22)-C(23)	-74.0(4)
C(27)-C(22)-C(23)-C(24)	-1.0(8)
P(1)-C(22)-C(23)-C(24)	173.8(4)
C(22)-C(23)-C(24)-C(25)	0.9(8)
C(23)-C(24)-C(25)-C(26)	-0.5(9)
C(24)-C(25)-C(26)-C(27)	0.3(9)
C(25)-C(26)-C(27)-C(22)	-0.5(9)
C(23)-C(22)-C(27)-C(26)	0.8(8)
P(1)-C(22)-C(27)-C(26)	-173.9(4)
C(22)-P(1)-C(28)-C(33)	107.2(4)
C(16)-P(1)-C(28)-C(33)	-146.6(4)
Ru-P(1)-C(28)-C(33)	-17.0(5)

C(22)-P(1)-C(28)-C(29)	-71.3(5)
C(16)-P(1)-C(28)-C(29)	34.9(5)
Ru-P(1)-C(28)-C(29)	164.6(3)
C(33)-C(28)-C(29)-C(30)	0.4(8)
P(1)-C(28)-C(29)-C(30)	179.0(4)
C(28)-C(29)-C(30)-C(31)	-0.1(9)
C(29)-C(30)-C(31)-C(32)	-1.2(9)
C(30)-C(31)-C(32)-C(33)	2.0(10)
C(29)-C(28)-C(33)-C(32)	0.4(8)
P(1)-C(28)-C(33)-C(32)	-178.2(4)
C(31)-C(32)-C(33)-C(28)	-1.6(9)