Acta Crystallographica Section E
Structure Reports Online
ISSN 1600-5368

[(1,10-Phenanthrolin-5-yl)ethynyl]-(triphenylposphine-κP)gold(I)

Heng-Yun Ye,* Feng-Rong Dai and Zhong-Ning Chen

State Key Laboratory of Structural Chemistry, Fujian Institute of Research on the Structure of Matter, Fuzhou, Fujian 350002, People's Republic of China
Correspondence e-mail: czngroup@fjirsm.ac.cn

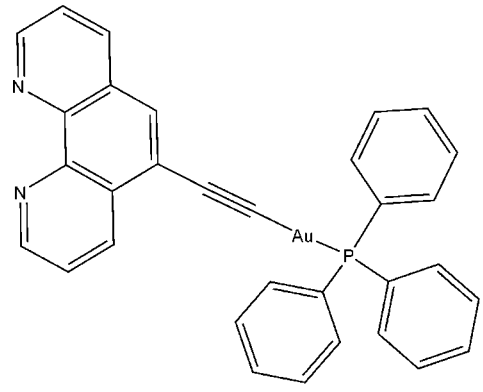
Received 24 April 2007; accepted 25 April 2007

Key indicators: single-crystal X-ray study; T = 293 K; mean σ(C–C) = 0.009 Å; R factor = 0.038; wR factor = 0.094; data-to-parameter ratio = 17.9.

The title compound, [Au($C_{14}H_7N_2$)($C_{18}H_{15}P$)], was synthesized by the reaction of [AuCl(PPh_3)] and 5-ethynyl-1,10-phenanthroline. The coordination geometry of gold(I) is two-coordinate (linear) and no intermolecular Au···Au interactions are observed.

Related literature

For related literature, see: McAuliffe *et al.* (1979); Pomestchenko *et al.* (2005); Xu *et al.* (2006); Yam *et al.* (1999); Ziessel *et al.* (1996, 1998).



Experimental

Crystal data

[Au($C_{14}H_7N_2$)($C_{18}H_{15}P$)]
M_r = 662.45
Monoclinic, $P2_1/n$
a = 8.6927 (7) Å
b = 18.9137 (11) Å
c = 16.0457 (13) Å
β = 104.512 (4)°
V = 2553.9 (3) Å^3
Z = 4
Mo $K\alpha$ radiation
μ = 5.85 mm^{-1}
T = 293 (2) K
0.46 × 0.35 × 0.20 mm

Data collection

Rigaku Mercury 70 CCD diffractometer
Absorption correction: multi-scan (*CrystalClear*; Rigaku, 2000)
T_{min} = 0.461, T_{max} = 1.000
(expected range = 0.143–0.311)
18982 measured reflections
5803 independent reflections
4969 reflections with $I > 2\sigma(I)$
R_{int} = 0.028

Refinement

$R[F^2 > 2\sigma(F^2)]$ = 0.038
$wR(F^2)$ = 0.094
S = 1.10
5803 reflections
325 parameters
H-atom parameters constrained
$\Delta\rho_{max}$ = 1.18 e Å^{-3}
$\Delta\rho_{min}$ = −1.75 e Å^{-3}

Data collection: *CrystalClear* (Rigaku, 2000); cell refinement: *CrystalClear*; data reduction: *CrystalClear*; program(s) used to solve structure: *SHELXS97* (Sheldrick, 1997); program(s) used to refine structure: *SHELXL97* (Sheldrick, 1997); molecular graphics: *SHELXTL/PC* (Sheldrick, 1999); software used to prepare material for publication: *SHELXL97*.

We acknowledge financial support from the NSF of Fujian Province (grant No. E0420002).

Supplementary data and figures for this paper are available from the IUCr electronic archives (Reference: BT2351).

References

McAuliffe, C. A., Parish, R. V. & Randall, P. D. (1979). *J. Chem. Soc. Dalton Trans.* pp. 1730–1735.
Pomestchenko, I. E., Polyansky, D. E. & &Castellano, F. N. (2005). *Inorg. Chem.* **44**, 3412–3421.
Rigaku (2000). *CrystalClear*. Version 1.3.6. Rigaku Corporation, Tokyo, Japan.
Sheldrick, G. M. (1997). *SHELXS97* and *SHELXL97*. University of Göttingen, Germany.
Sheldrick, G. M. (1999). *SHELXTL/PC*. Version 5.1. Bruker AXS Inc., Madison, Wisconsin, USA.
Xu, H.-B., Shi, L.-X., Ma, E., Zhang, L.-Y., Wei, Q.-H. & Chen, Z.-N. (2006). *Chem. Commun.* pp. 1601–1603.
Yam, V. W. W., Lo, K. K. W. & Wong, K. M. C. (1999). *J. Organomet. Chem.* **578**, 3–30.
Ziessel, R., Hissler, M., El-ghayoury, A. & Harriman, A. (1998). *Coord. Chem. Rev*. **178–180**, 1251–1298.
Ziessel, R., Suffert, J. & Youinou, M.-T. (1996). *J. Org. Chem.* **61**, 6535–6546.

  doi:10.1107/S1600536807020661

supplementary materials

Acta Cryst. (2007). E**63**, m1576 [**doi:10.1107/S1600536807020661**]

[(1,10-Phenanthrolin-5-yl)ethynyl](triphenylposphine-*κP*)gold(I)

H.-Y. Ye, F.-R. Dai and Z.-N. Chen

Comment

Acetylide-functionalized diimines have been used widely in the design of multi-component transition metal complexes composed of discrete redox and/or photoactive sub-units. (Pomestchenko *et al.*, 2005; Ziessel *et al.*, 1998) We have focused on such bridging ligands for the design of d–f bimetallic arrays by introducing d-block chromophores and f-block luminophores bound to acetylide and bipyridine/phenanthroline, respectively.

As shown in Fig. 1, the coordination geometry of Gold(I) is two-coordinate (linear), the Gold(I) atom is bound to (1,10-phenothrolin-5-yl)ethynyl as well as coordinated to P atom from triphenylposphine. The bond distance [2.013 (5) Å] of gold(I)–alkynyl is comparable to those observed in other Gold (I) acetylide complexes (Yam *et al.*, 1999). The structure of (1,10-phenothrolin-5-yl)ethynyl is normal compared to the platinum compound (Xu *et al.*, 2006). Unlike some Gold (I) acetylide complexes (Yam *et al.*,1999), no intermolecular Au···Au interaction is observed.

Experimental

[AuCl(PPh_3)] (McAuliffe *et al.*, 1979) (100 mg, 0.202 mmol)and 5-Ethynyl-1,10-phenanthroline (Ziessel *et al.*, 1996) (40.4 mg, 0.02 mmol) were stirred in a solution of CH_3ONa in MeOH (0.1 *M*, 15 ml) for 8 h. After filtration, the solid precipitate was washed with 2 ml MeOH and recrystallized by diffusion of n-hexane into its dichloromethane solution. Yellow crystals suitable for single-crystal X-ray analysis were obstained after 5 days.

Refinement

All H atoms were included in calculated positions with C—H = 0.93 Å and with $U_{iso}(H) = 1.2U_{eq}(C)$.

Figures

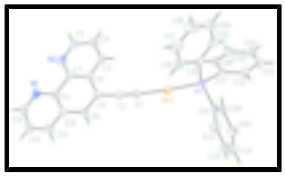


Fig. 1. A view of the compound with the atomic numbering scheme. Displacement ellipsoids were drawn at the 30% probability level.

[(1,10-Phenanthrolin-5-yl)ethynyl](triphenylposphine-κ*P*)gold(I)

Crystal data

[Au($C_{14}H_7N_2$)($C_{18}H_{15}P$)]	F_{000} = 1288
M_r = 662.45	D_x = 1.723 Mg m^{-3}

Monoclinic, $P2_1/n$	Mo $K\alpha$ radiation $\lambda = 0.71073$ Å
Hall symbol: -P 2yn	Cell parameters from 5853 reflections
$a = 8.6927$ (7) Å	$\theta = 3.0$–27.5°
$b = 18.9137$ (11) Å	$\mu = 5.85$ mm^{-1}
$c = 16.0457$ (13) Å	$T = 293$ (2) K
$\beta = 104.512$ (4)°	Prism, yellow
$V = 2553.9$ (3) Å^3	0.46 × 0.35 × 0.20 mm
$Z = 4$	

Data collection

Rigaku Mercury 70 CCD diffractometer	5803 independent reflections
Radiation source: fine-focus sealed tube	4969 reflections with $I > 2\sigma(I)$
Monochromator: graphite	$R_{int} = 0.028$
Detector resolution: 14.6306 pixels mm^{-1}	$\theta_{max} = 27.5^\circ$
$T = 293$(2) K	$\theta_{min} = 3.0^\circ$
ω scans	$h = -11 \rightarrow 11$
Absorption correction: multi-scan (CrystalClear; Rigaku, 2000)	$k = -24 \rightarrow 24$
$T_{min} = 0.461$, $T_{max} = 1.000$	$l = -20 \rightarrow 11$
18982 measured reflections	

Refinement

Refinement on F^2	Secondary atom site location: difference Fourier map
Least-squares matrix: full	Hydrogen site location: inferred from neighbouring sites
$R[F^2 > 2\sigma(F^2)] = 0.038$	H-atom parameters constrained
$wR(F^2) = 0.094$	$w = 1/[\sigma^2(F_o^2) + (0.0401P)^2 + 4.4814P]$ where $P = (F_o^2 + 2F_c^2)/3$
$S = 1.10$	$(\Delta/\sigma)_{max} = 0.001$
5803 reflections	$\Delta\rho_{max} = 1.18$ e Å^{-3}
325 parameters	$\Delta\rho_{min} = -1.74$ e Å^{-3}
Primary atom site location: structure-invariant direct methods	Extinction correction: none

Special details

Geometry. All e.s.d.'s (except the e.s.d. in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell e.s.d.'s are taken into account individually in the estimation of e.s.d.'s in distances, angles and torsion angles; correlations between e.s.d.'s in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell e.s.d.'s is used for estimating e.s.d.'s involving l.s. planes.

Refinement. Refinement of F^2 against ALL reflections. The weighted R-factor wR and goodness of fit S are based on F^2, conventional R-factors R are based on F, with F set to zero for negative F^2. The threshold expression of $F^2 > \sigma(F^2)$ is used only for calculating R-

factors(gt) *etc*. and is not relevant to the choice of reflections for refinement. *R*-factors based on F^2 are statistically about twice as large as those based on *F*, and *R*- factors based on ALL data will be even larger.

Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å^2)

	x	*y*	*z*	U_{iso}*/U_{eq}
Au1	0.89976 (2)	0.047965 (11)	0.329679 (12)	0.04690 (8)
P1	0.94614 (14)	0.01607 (7)	0.20171 (8)	0.0399 (3)
N1	0.5643 (6)	0.2381 (3)	0.7534 (3)	0.0597 (12)
N2	0.3701 (6)	0.1515 (2)	0.6332 (3)	0.0568 (11)
C1	0.8451 (6)	0.0855 (3)	0.4361 (3)	0.0482 (12)
C2	0.8054 (7)	0.1118 (3)	0.4934 (3)	0.0505 (12)
C3	0.2785 (7)	0.1123 (3)	0.5744 (4)	0.0597 (14)
H3A	0.1747	0.1047	0.5780	0.072*
C4	0.3268 (7)	0.0810 (3)	0.5065 (4)	0.0576 (14)
H4A	0.2562	0.0541	0.4656	0.069*
C5	0.4785 (7)	0.0907 (3)	0.5011 (3)	0.0486 (12)
H5A	0.5133	0.0699	0.4566	0.058*
C6	0.5826 (6)	0.1320 (2)	0.5627 (3)	0.0425 (11)
C7	0.5225 (6)	0.1622 (3)	0.6278 (3)	0.0446 (11)
C8	0.7466 (6)	0.1438 (3)	0.5600 (3)	0.0447 (11)
C9	0.8397 (7)	0.1859 (3)	0.6210 (3)	0.0518 (12)
H9A	0.9449	0.1933	0.6198	0.062*
C10	0.7807 (7)	0.2192 (3)	0.6868 (3)	0.0500 (12)
C11	0.6247 (7)	0.2078 (3)	0.6917 (3)	0.0484 (12)
C12	0.8761 (8)	0.2647 (3)	0.7469 (4)	0.0635 (15)
H12A	0.9801	0.2741	0.7448	0.076*
C13	0.8153 (9)	0.2951 (3)	0.8081 (4)	0.0682 (17)
H13A	0.8767	0.3254	0.8487	0.082*
C14	0.6605 (9)	0.2801 (3)	0.8090 (4)	0.0676 (17)
H14A	0.6208	0.3010	0.8518	0.081*
C15	0.8246 (5)	0.0706 (3)	0.1168 (3)	0.0438 (11)
C16	0.8142 (7)	0.1420 (3)	0.1320 (5)	0.0646 (16)
H16A	0.8686	0.1611	0.1846	0.077*
C17	0.7230 (8)	0.1852 (3)	0.0693 (6)	0.085 (2)
H17A	0.7166	0.2333	0.0798	0.102*
C18	0.6428 (9)	0.1581 (4)	−0.0075 (5)	0.089 (2)
H18A	0.5856	0.1880	−0.0502	0.106*
C19	0.6458 (8)	0.0874 (4)	−0.0221 (4)	0.0752 (19)
H19A	0.5861	0.0688	−0.0738	0.090*
C20	0.7374 (7)	0.0429 (3)	0.0393 (4)	0.0560 (14)
H20A	0.7403	−0.0054	0.0286	0.067*
C21	1.1503 (5)	0.0309 (3)	0.1981 (3)	0.0396 (10)
C22	1.2703 (6)	0.0017 (3)	0.2625 (4)	0.0552 (13)
H22A	1.2441	−0.0255	0.3052	0.066*
C23	1.4268 (6)	0.0123 (4)	0.2641 (4)	0.0643 (16)
H23A	1.5061	−0.0082	0.3072	0.077*
C24	1.4665 (7)	0.0532 (3)	0.2022 (5)	0.0638 (16)

H24A	1.5727	0.0611	0.2037	0.077*
C25	1.3492 (7)	0.0825 (4)	0.1377 (4)	0.0600 (14)
H25A	1.3764	0.1096	0.0952	0.072*
C26	1.1918 (6)	0.0719 (3)	0.1359 (3)	0.0486 (12)
H26A	1.1130	0.0925	0.0926	0.058*
C27	0.9016 (6)	−0.0739 (3)	0.1666 (3)	0.0435 (11)
C28	0.7915 (6)	−0.1114 (3)	0.1980 (3)	0.0505 (12)
H28A	0.7497	−0.0915	0.2405	0.061*
C29	0.7427 (7)	−0.1780 (3)	0.1673 (4)	0.0626 (15)
H29A	0.6688	−0.2027	0.1890	0.075*
C30	0.8047 (9)	−0.2073 (3)	0.1041 (4)	0.0710 (18)
H30A	0.7712	−0.2517	0.0821	0.085*
C31	0.9150 (8)	−0.1712 (3)	0.0740 (4)	0.0646 (16)
H31A	0.9572	−0.1915	0.0318	0.078*
C32	0.9650 (7)	−0.1052 (3)	0.1049 (4)	0.0532 (13)
H32A	1.0417	−0.0815	0.0843	0.064*

Atomic displacement parameters (Å^2)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Au1	0.03953 (11)	0.06034 (14)	0.04452 (12)	−0.00352 (9)	0.01742 (8)	−0.00830 (8)
P1	0.0296 (6)	0.0527 (7)	0.0398 (6)	−0.0021 (5)	0.0129 (5)	−0.0041 (5)
N1	0.070 (3)	0.065 (3)	0.051 (3)	0.012 (2)	0.028 (2)	−0.003 (2)
N2	0.055 (3)	0.055 (3)	0.066 (3)	0.008 (2)	0.026 (2)	0.003 (2)
C1	0.039 (3)	0.057 (3)	0.055 (3)	−0.007 (2)	0.023 (2)	−0.007 (2)
C2	0.057 (3)	0.049 (3)	0.049 (3)	0.003 (2)	0.019 (2)	−0.001 (2)
C3	0.045 (3)	0.056 (3)	0.081 (4)	0.005 (2)	0.022 (3)	0.009 (3)
C4	0.056 (3)	0.054 (3)	0.061 (3)	0.000 (3)	0.009 (3)	0.003 (3)
C5	0.058 (3)	0.043 (3)	0.046 (3)	0.008 (2)	0.015 (2)	0.006 (2)
C6	0.052 (3)	0.037 (2)	0.040 (2)	0.008 (2)	0.014 (2)	0.0074 (18)
C7	0.050 (3)	0.042 (3)	0.046 (3)	0.009 (2)	0.019 (2)	0.006 (2)
C8	0.055 (3)	0.042 (2)	0.042 (3)	0.007 (2)	0.020 (2)	0.0054 (19)
C9	0.051 (3)	0.056 (3)	0.050 (3)	0.001 (2)	0.016 (2)	−0.001 (2)
C10	0.063 (3)	0.044 (3)	0.043 (3)	0.004 (2)	0.012 (2)	0.001 (2)
C11	0.061 (3)	0.042 (3)	0.043 (3)	0.013 (2)	0.016 (2)	0.004 (2)
C12	0.067 (4)	0.062 (3)	0.057 (3)	0.001 (3)	0.007 (3)	−0.007 (3)
C13	0.084 (5)	0.063 (4)	0.051 (3)	0.004 (3)	0.004 (3)	−0.013 (3)
C14	0.094 (5)	0.063 (4)	0.047 (3)	0.020 (3)	0.020 (3)	−0.004 (3)
C15	0.028 (2)	0.054 (3)	0.053 (3)	−0.0031 (19)	0.015 (2)	−0.001 (2)
C16	0.045 (3)	0.057 (3)	0.086 (4)	−0.006 (3)	0.005 (3)	−0.004 (3)
C17	0.066 (4)	0.048 (3)	0.135 (7)	−0.002 (3)	0.014 (4)	0.010 (4)
C18	0.079 (5)	0.077 (5)	0.097 (6)	−0.002 (4)	−0.002 (4)	0.037 (4)
C19	0.068 (4)	0.090 (5)	0.059 (4)	0.015 (4)	−0.001 (3)	0.010 (3)
C20	0.053 (3)	0.062 (3)	0.049 (3)	0.006 (3)	0.006 (2)	−0.002 (2)
C21	0.032 (2)	0.050 (3)	0.039 (2)	−0.0022 (19)	0.0126 (18)	−0.0030 (19)
C22	0.038 (3)	0.071 (4)	0.058 (3)	0.006 (2)	0.015 (2)	0.011 (3)
C23	0.035 (3)	0.075 (4)	0.080 (4)	0.010 (3)	0.008 (3)	0.003 (3)
C24	0.031 (3)	0.082 (4)	0.082 (4)	−0.003 (3)	0.020 (3)	−0.013 (3)

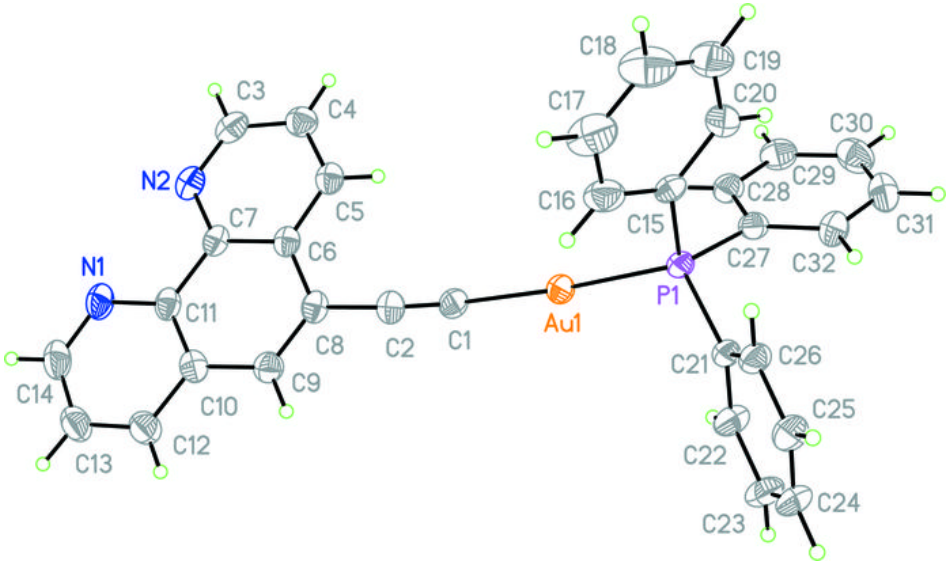
C25	0.048 (3)	0.079 (4)	0.062 (4)	−0.011 (3)	0.029 (3)	−0.003 (3)
C26	0.037 (2)	0.070 (3)	0.042 (3)	0.002 (2)	0.014 (2)	0.001 (2)
C27	0.038 (2)	0.053 (3)	0.039 (2)	−0.001 (2)	0.008 (2)	0.002 (2)
C28	0.041 (3)	0.063 (3)	0.050 (3)	−0.005 (2)	0.017 (2)	0.000 (2)
C29	0.050 (3)	0.064 (4)	0.073 (4)	−0.010 (3)	0.014 (3)	0.004 (3)
C30	0.081 (5)	0.053 (3)	0.070 (4)	−0.004 (3)	0.002 (4)	−0.005 (3)
C31	0.084 (5)	0.058 (3)	0.054 (3)	0.008 (3)	0.021 (3)	−0.006 (3)
C32	0.056 (3)	0.054 (3)	0.055 (3)	0.004 (2)	0.025 (3)	0.003 (2)

Geometric parameters (Å, °)

Au1—C1	2.013 (5)	C16—C17	1.382 (9)
Au1—P1	2.2710 (13)	C16—H16A	0.9300
P1—C27	1.804 (5)	C17—C18	1.355 (11)
P1—C21	1.812 (5)	C17—H17A	0.9300
P1—C15	1.821 (5)	C18—C19	1.360 (10)
N1—C14	1.324 (8)	C18—H18A	0.9300
N1—C11	1.359 (7)	C19—C20	1.386 (8)
N2—C3	1.302 (8)	C19—H19A	0.9300
N2—C7	1.364 (7)	C20—H20A	0.9300
C1—C2	1.170 (7)	C21—C26	1.382 (7)
C2—C8	1.430 (7)	C21—C22	1.386 (7)
C3—C4	1.394 (9)	C22—C23	1.369 (8)
C3—H3A	0.9300	C22—H22A	0.9300
C4—C5	1.355 (8)	C23—C24	1.370 (9)
C4—H4A	0.9300	C23—H23A	0.9300
C5—C6	1.400 (7)	C24—C25	1.373 (9)
C5—H5A	0.9300	C24—H24A	0.9300
C6—C7	1.401 (7)	C25—C26	1.376 (7)
C6—C8	1.454 (7)	C25—H25A	0.9300
C7—C11	1.458 (8)	C26—H26A	0.9300
C8—C9	1.360 (7)	C27—C32	1.380 (7)
C9—C10	1.431 (7)	C27—C28	1.384 (7)
C9—H9A	0.9300	C28—C29	1.379 (8)
C10—C11	1.395 (8)	C28—H28A	0.9300
C10—C12	1.399 (8)	C29—C30	1.379 (9)
C12—C13	1.354 (9)	C29—H29A	0.9300
C12—H12A	0.9300	C30—C31	1.361 (9)
C13—C14	1.379 (10)	C30—H30A	0.9300
C13—H13A	0.9300	C31—C32	1.373 (8)
C14—H14A	0.9300	C31—H31A	0.9300
C15—C16	1.380 (8)	C32—H32A	0.9300
C15—C20	1.386 (7)		
C1—Au1—P1	173.59 (16)	C15—C16—H16A	120.0
C27—P1—C21	105.7 (2)	C17—C16—H16A	120.0
C27—P1—C15	105.1 (2)	C18—C17—C16	120.6 (6)
C21—P1—C15	106.1 (2)	C18—C17—H17A	119.7
C27—P1—Au1	117.42 (17)	C16—C17—H17A	119.7
C21—P1—Au1	112.66 (16)	C17—C18—C19	120.1 (6)

C15—P1—Au1	108.97 (17)	C17—C18—H18A	119.9
C14—N1—C11	116.8 (6)	C19—C18—H18A	119.9
C3—N2—C7	117.8 (5)	C18—C19—C20	120.5 (7)
C2—C1—Au1	174.1 (5)	C18—C19—H19A	119.8
C1—C2—C8	176.3 (6)	C20—C19—H19A	119.8
N2—C3—C4	123.9 (6)	C15—C20—C19	119.7 (6)
N2—C3—H3A	118.0	C15—C20—H20A	120.2
C4—C3—H3A	118.0	C19—C20—H20A	120.2
C5—C4—C3	118.8 (6)	C26—C21—C22	118.6 (5)
C5—C4—H4A	120.6	C26—C21—P1	123.1 (4)
C3—C4—H4A	120.6	C22—C21—P1	118.3 (4)
C4—C5—C6	119.8 (5)	C23—C22—C21	121.0 (5)
C4—C5—H5A	120.1	C23—C22—H22A	119.5
C6—C5—H5A	120.1	C21—C22—H22A	119.5
C5—C6—C7	117.3 (5)	C22—C23—C24	119.9 (5)
C5—C6—C8	122.0 (5)	C22—C23—H23A	120.0
C7—C6—C8	120.8 (5)	C24—C23—H23A	120.0
N2—C7—C6	122.4 (5)	C23—C24—C25	120.0 (5)
N2—C7—C11	118.3 (5)	C23—C24—H24A	120.0
C6—C7—C11	119.3 (5)	C25—C24—H24A	120.0
C9—C8—C2	121.7 (5)	C24—C25—C26	120.3 (6)
C9—C8—C6	118.7 (5)	C24—C25—H25A	119.9
C2—C8—C6	119.6 (5)	C26—C25—H25A	119.9
C8—C9—C10	122.0 (5)	C25—C26—C21	120.3 (5)
C8—C9—H9A	119.0	C25—C26—H26A	119.8
C10—C9—H9A	119.0	C21—C26—H26A	119.8
C11—C10—C12	118.3 (5)	C32—C27—C28	118.5 (5)
C11—C10—C9	120.4 (5)	C32—C27—P1	122.4 (4)
C12—C10—C9	121.3 (6)	C28—C27—P1	119.0 (4)
N1—C11—C10	122.3 (5)	C29—C28—C27	121.2 (6)
N1—C11—C7	118.9 (5)	C29—C28—H28A	119.4
C10—C11—C7	118.8 (5)	C27—C28—H28A	119.4
C13—C12—C10	119.2 (7)	C30—C29—C28	119.2 (6)
C13—C12—H12A	120.4	C30—C29—H29A	120.4
C10—C12—H12A	120.4	C28—C29—H29A	120.4
C12—C13—C14	118.7 (6)	C31—C30—C29	120.0 (6)
C12—C13—H13A	120.6	C31—C30—H30A	120.0
C14—C13—H13A	120.6	C29—C30—H30A	120.0
N1—C14—C13	124.7 (6)	C30—C31—C32	121.0 (6)
N1—C14—H14A	117.7	C30—C31—H31A	119.5
C13—C14—H14A	117.7	C32—C31—H31A	119.5
C16—C15—C20	118.9 (5)	C31—C32—C27	120.1 (6)
C16—C15—P1	118.2 (4)	C31—C32—H32A	119.9
C20—C15—P1	122.8 (4)	C27—C32—H32A	119.9
C15—C16—C17	120.1 (6)		

Fig. 1


C18
C19
C17
C20
C30
C3
C4
N2
C29
C16
C28
C31
C7
C5
C15
C27
C32
N1
C6
P1
C11
Au1
C8
C2
C1
C21
C26
C14
C9
C25
C10
C22
C12
C13
C24
C23