

Paper E/198/B4

Received 1st October 1984

Dicationic 2-[(Dimethylamino)methyl]phenylgold(III)
Complexes. Crystal and Molecular Structure of
 $[\text{Au}(2\text{-C}_6\text{H}_4\text{CH}_2\text{NMe}_2)(\text{py})_2](\text{BF}_4)_2 \cdot \text{CH}_3\text{COCH}_3$.

By José Vicente,^{a *} María-Teresa Chicote,^a María-Dolores
Bermúdez,^a Peter G. Jones,^{b *} and George M. Sheldrick^b

^aDepartamento de Química Inorgánica, Universidad de Murcia,
30001 Murcia, Spain. ^bInstitut für Anorganische Chemie der
Universität, Tammannstrasse 4, 3400 Göttingen, Federal Republic
of Germany).

The reactions between $[\text{Au}(\text{damp})(\text{Ac})_2]$ [damp = 2-[(dimethylamino)methyl]phenyl; Ac = CH_3COO] and $[\text{Hpy}]^+$ salts ($[\text{Hpy}]^+$ = pyridinium) in 1:1 or 1:2 molar ratios give cationic complexes $[\text{Au}(\text{damp})(\text{Ac})(\text{py})]^+$ or $[\text{Au}(\text{damp})(\text{py})_2]^{2+}$, respectively. The last complex reacts with bidentate ligands to give $[\text{Au}(\text{damp})(\text{LL})]^{2+}$ [LL = 1,10-phenanthroline (phen), 2,2'-bipyridine (bipy), tetramethylethylenediamine (Me_4en), ortho-phenylenediamine (phenen)]. These are the first dicationic organogold complexes. The crystal structure of $[\text{Au}(\text{damp})(\text{py})_2](\text{BF}_4)_2 \cdot \text{CH}_3\text{COCH}_3$ shows a square-planar co-ordination around the cation and the greater trans-influence of the phenyl group with respect to the Me_2N group [Au-C, 2.028(11); Au-N Me_2 , 2.069(7); Au-N trans to C, 2.155(9); Au-N trans to Me_2N , 2.016(7)].

Introduction

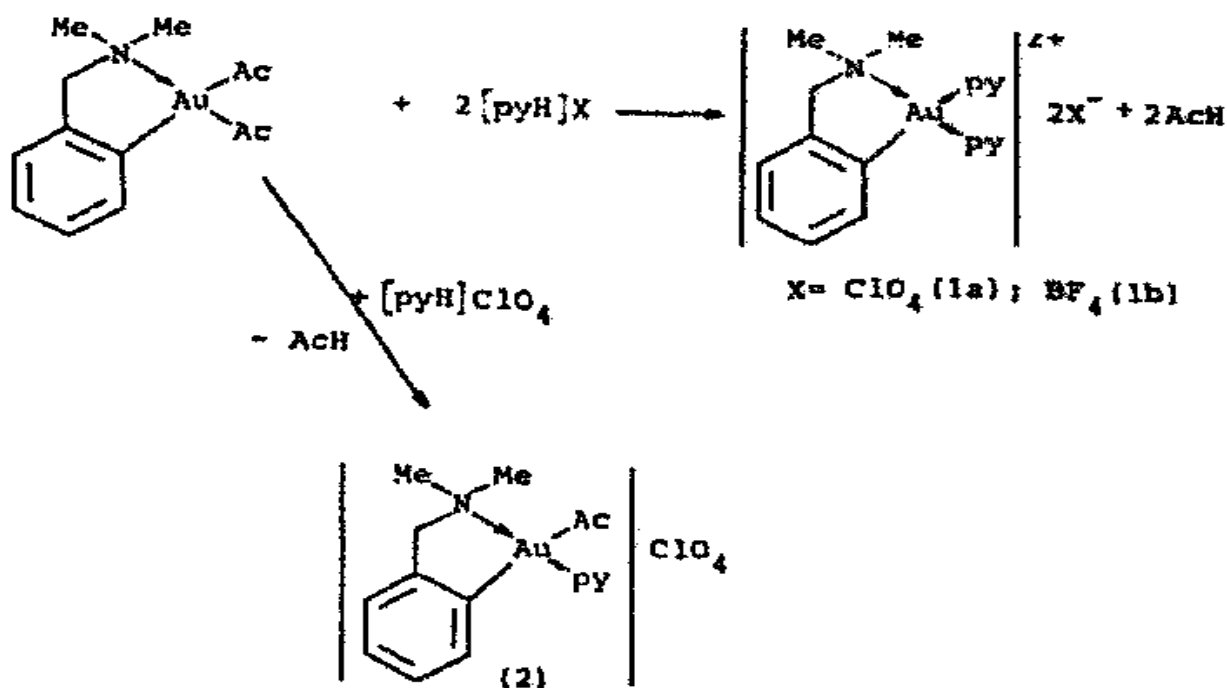
CYCLOMETALLATED complexes are well known for many transition elements. Most of them have been obtained by ortho-metallation reactions.¹ This type of reaction has never been observed in the chemistry of gold² and this explains the small number of cyclometallated gold complexes.

We have recently used organomercuric compounds for the synthesis of aryl gold(I)³ and (III)⁴ complexes including cyclometallated 2-(phenylazo)phenyl⁵ and 2-[(dimethylamino)methyl]phenylgold(III)⁶ derivatives. Of the last type we have reported neutral $[\text{Au}(\text{damp})\text{X}_2]$ [damp = 2[(dimethylamino)methyl]phenyl, X = Cl, Br, I, Ac] and cationic $[\text{Au}(\text{damp})\text{ClL}]^+$ complexes [L = PPh_3 , AsPh_3 , py, tetrahydrothiophen], but attempts to obtain dicationic $[\text{Au}(\text{damp})\text{L}_2]^{2+}$ failed. Thus reactions between $[\text{Au}(\text{damp})\text{Cl}_2]$ and PPh_3 (1:2) or pyridine (in excess) in the presence of NaClO_4 (1:2) gave only the corresponding $[\text{Au}(\text{damp})\text{ClL}]^+$ complexes. This paper reports the results obtained trying i) to develop the chemistry of cyclometallated gold(III) complexes and ii) to open a route for the preparation of the first dicationic organogold(III) complexes. As far as we know the only gold(III) dicationic complexes are a few of general formula $[\text{Au}(\text{dien})\text{X}]^{2+}$ [dien = di(ethylenediamine); X = OH, Br, Cl].⁷

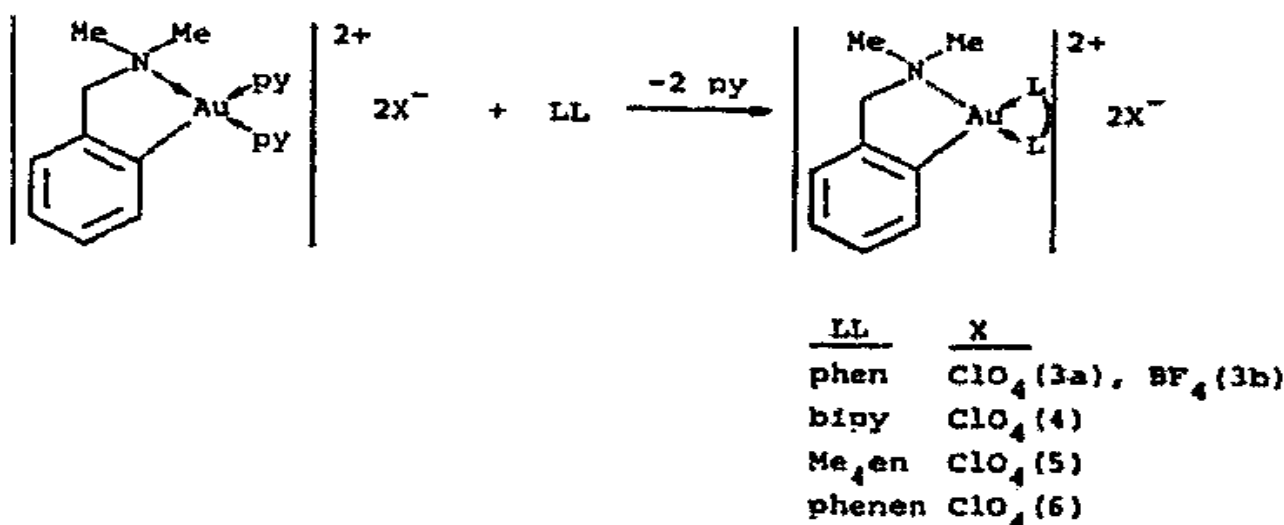
Results and Discussion

Dicationic $[\text{Au}(\text{damp})\text{L}_2]^{2+}$ can be prepared i) by reacting $[\text{Au}(\text{damp})(\text{Ac})_2]$ with $[\text{pyH}]^+$ salts in 1:2 molar ratio (when the

References: see frame 0963.



molar ratio was 1:1 the cationic complex $[\text{Au}(\text{damp})(\text{Ac})(\text{py})]^+$ (2) was obtained) or (1) by reacting $[\text{Au}(\text{damp})(\text{py})_2]^{2+}$ with bidentate ligands LL = 1,10-phenanthroline (phen), 2,2'-bipyridine (bipy), tetramethylethylenediamine (Me_4en), ortho-phenylenediamine (phenen). We have prepared perchlorate and tetrafluoroborate salts of some of these complexes.



All complexes were isolated in high yields (>70%) except (6) (40%) due to its low stability in solution. At room temperature and in the solid state complexes (1)-(4) are stable, (5) decomposing slowly. The molar conductivities are in the range expected for 1:1 [complex (2)] or 1:2 [(1), (3)-(6)] electrolytes (see Experimental).

We have unsuccessfully attempted to isolate dicationic complexes containing the ligands NH_3 , ethylenediamine or PPh_3 . The reaction between $[\text{Au}(\text{damp})(\text{Ac})_2]$ and NH_4ClO_4 (1:2) or between $[\text{Au}(\text{damp})(\text{py})_2](\text{BF}_4)_2$ and excess of ethylenediamine gave a complex too unstable to be characterized or an immediate reduction to metallic gold, respectively. By reacting $[\text{Au}(\text{damp})(\text{Ac})_2]$ or $[\text{Au}(\text{damp})(\text{py})_2](\text{BF}_4)_2$ with $[\text{HPPH}_3]\text{ClO}_4$ (1:2 or 1:3) or PPh_3 (1:2 or 1:3), respectively, we always isolated species containing, respectively, acetate or pyridine ligands (by i.r.) but we could not get analytically pure samples for any reasonable formulation. It is possible that two mutually cis PPh_3 ligands were difficult to co-ordinate to a gold(III) cation for steric reasons.

Of the two possible isomeric formulations for complex (2), $[\text{Au}(\text{damp})(\text{Ac})(\text{py})]\text{ClO}_4$, we tentatively assign to it the one in which the acetate ligand is trans to the aryl group, based on its i.r. spectrum and also because all the reported⁶ $[\text{Au}(\text{damp})\text{ClL}]^+$ complexes have the anionic ligand trans to the phenyl group. Instead of the two $\nu_{\text{asym}}(\text{CO}_2)$ bands appearing in $[\text{Au}(\text{damp})(\text{Ac})_2]$ at 1670 and 1620 cm^{-1} , complex (2) shows only one at 1610 cm^{-1} (overlapped with ring stretching bands of pyridine). Similar spectra from 1700-1600 cm^{-1} have been obtained for the related 2-(phenylazophenyl)derivatives. In addition we have been able to prepare $[\text{Au}(\text{2-C}_6\text{H}_4\text{N}=\text{NC}_6\text{H}_5)\text{Cl}(\text{Ac})]$
Reference: see frame 0962.

which shows $\nu_{\text{asym}}(\text{CO}_2)$ at 1670 cm^{-1} and $\nu(\text{AuCl})$ at 305 cm^{-1} . The last band corresponds to $\nu(\text{AuCl})$ trans to the phenyl group⁵ therefore the bands appearing at 1670 and 1610 cm^{-1} in the acetato complexes can be assigned to $\nu_{\text{asym}}(\text{CO}_2)$ trans to NMe_2 and phenyl group, respectively.

X-Ray Crystal Structure of complex (1b)

0965 The crystal structure of complex (1b), $[\text{Au}(\text{damp})(\text{py})_2](\text{BF}_4)_2$, shows a square planar co-ordination around the gold atom (Fig. 1). The greater trans-influence of the phenyl group is shown by the longer $\text{Au}(1)-\text{N}(11)$ distance [$2.155(9)\text{\AA}$] compared with $\text{Au}(1)-\text{N}(21)$ [$2.016(7)\text{\AA}$]. The $\text{Au}(1)-\text{N}(11)$ distance is similar to other $\text{Au}^{\text{III}}-\text{N}(\text{sp}^2)$ bond lengths trans to carbon donor ligands.^{5b,9}

0966 The packing diagram (Fig. 2) shows that the solvent molecules occupy the region $x = 0$.

References: see frames 0963 and 0964.

Experimental

I.r. spectra were recorded on a Perkin-Elmer 457 spectrophotometer using Nujol mulls between polyethylene sheets. Conductivities were measured in 5×10^{-4} M solutions with a Philips 9501 conductimeter. Melting points were determined on a Reichert apparatus and are uncorrected. C, H and N analyses were carried out with a Perkin-Elmer 240C microanalyser. Au was determined by ashing the samples with an aqueous solution of hydrazine. Solvents were distilled before use. All the reactions were carried out at room temperature. The analytical data are reported as found (calcd.) \pm 0.05%. Molar conductivities (Λ_M) are given in $\Omega^{-1}\text{cm}^2\text{mol}^{-1}$; m.p. in °C.

[Au(damp)(py)₂]₂X [X= ClO₄ (1a), BF₄ (1b)]

To a suspension of [Au(damp)(Ac)₂] (60 mg, 0.14 mmol) in acetone (2 ml) solid [pyH]ClO₄ or [pyH]BF₄ (0.28 mmol) was added, giving a solution. After 2 or 5 min., respectively a white precipitate appears. The suspension was stirred for 30 min. or 14 h., respectively, filtered off and the resulting white solid washed with acetone (5 ml) and diethyl ether (2x5 ml) to give (1a) or (1b). (1a): Yield, 95%. M.p. 180(d). $\Lambda_M = 230$ (C = 2.8×10^{-4} M in acetonitrile). Analytical data: C, 33.50 (33.15); H, 3.35 (3.20); N, 6.00 (6.10); Au, 28.30 (28.60). (1b): Yield, 82%. M.p. 170(d). $\Lambda_M = 236$ (4×10^{-4} M in acetonitrile). Analytical data: C, 34.10 (34.40); H, 3.25 (3.35); N, 6.20 (6.35); Au, 29.45 (29.70).

[Au(damp)(Ac)(py)]ClO₄ (2)

To a solution of [Au(damp)(Ac)₂] (38 mg, 0.08 mmol) in acetone (10 ml) solid [pyH]ClO₄ (15 mg, 0.08 mmol) was added, the resulting solution stirred for 1 h and then concentrated

[Au(damp) (phenen)] (ClO₄)₂ (6)

To a suspension of (1a) (37 mg, 0.06 mmol) in acetone (10 ml) solid phenen (6.2 mg, 0.06 mmol) was added. The resulting yellow solution slowly changed to violet in which moment the solution was concentrated to dryness. The residue was extracted with dichloromethane (3x5 ml) and filtered off over anhydrous MgSO₄. The solution was concentrated (1 ml) and diethyl ether added to give (6), which was recrystallized from dichloromethane/diethyl ether. Yield, 40%. M.p. 168(d). Λ_M^{∞} 176 (2.3×10^{-4} M in acetone). Analytical data: C, 21.00(21.55); H, 2.50(2.40); N, 4.80(5.05); Au, 23.30(23.60).

0967
0968

to 1 ml. Addition of diethyl ether (10 ml) caused precipitation of a white solid, which was filtered off and recrystallized from acetone/diethyl ether. Yield, 88%. M.p. 177(d). $\Lambda_M = 113$ (2.8×10^{-4} M in acetone). Analytical data: C, 33.40(33.80); H, 3.05(3.55); N, 4.70(4.90); Au, 34.20(34.65).

[Au(damp)(LL)] 2X [LL=phen, X=ClO₄ (3a), BF₄ (3b); LL=bipy, X=ClO₄ (4)]

To a suspension of (1a) or (1b) (approx. 0.1 mmol) in dichloromethane (10 ml) an equimolar amount of solid LL was added. After 4 h the resulting suspension was filtered off and the white solid washed with dichloromethane (3 ml) and diethyl ether (2x5 ml). (3a): Yield, 70%. M.p. 140(d). $\Lambda_M = 226$ (4×10^{-4} M in acetonitrile). Analytical data: C, 35.40(35.50); H, 2.70 (2.85); N, 5.40(5.90); Au, 27.20(27.75). (3b): Yield, 95%. M.p. 210(d). $\Lambda_M = 220$ (3.7×10^{-4} M in acetonitrile). Analytical data: C, 36.45(36.80); H, 2.90(2.95); N, 6.05(6.15); Au, 28.50(28.75). (4): Yield, 73%. M.p. 165(d). $\Lambda_M = 215$ (1.4×10^{-4} M in acetonitrile). Analytical data: C, 32.80(33.25); H, 3.00(2.95); N, 5.75(6.20); Au, 28.60(28.70).

[Au(damp)(Me₄en)](ClO₄)₂ (5)

To a suspension of (1a) (60 mg, 0.09 mmol) in acetone (6 ml) Me₄en (40 mg, 0.2 mmol) was added. The resulting yellow solution was stirred for 30 min. and then concentrated to 1 ml. Addition of diethyl ether (10 ml) caused precipitation of a pale yellow solid, which was filtered off, washed with diethyl ether (2x5 ml) and recrystallized from acetone/diethyl ether to give (5). Yield, 86%. M.p. 150(d). $\Lambda_M = 175$ (2.3×10^{-4} M in acetone). Analytical data: C, 28.20(27.90); H, 4.25(4.35); N, 6.35(6.50); Au, 30.05(30.50).

Crystal Data for (1b). - $C_{19}H_{22}AuN_3^{2+} \cdot 2BF_4^- \cdot C_3H_6O$, $M_r = 721.05$, monoclinic, $P2_1/c$, $a = 17.433(7)$, $b = 10.317(4)$, $c = 15.948(6)$ Å, $\beta = 107.04(4)^\circ$, $V = 2742$ Å³, Mo $K\alpha$ radiation ($\lambda = 0.71069$ Å), $Z = 4$, $D_x = 1.75$ g cm⁻³, $\mu = 5.4$ mm⁻¹, $F(000) = 1400$. Colourless equidimensional crystals were obtained by diffusion of a concentrated acetone solution of $[Au(damp)(Ac)_2]$ through an acetone buffer layer into a concentrated acetone solution of $[Hpy]BF_4$. The crystals lose acetone to the air and were therefore sealed in glass capillaries.

Data Collection and Processing. - Stoe-Siemens four-circle diffractometer, monochromated Mo $K\alpha$ radiation, 6484 profile-fitted¹⁰ reflections measured ($2\theta_{max} 50^\circ$, $\pm h \pm k \pm l$ and also, for the weak reflection class $k \pm 1$ odd, $\pm h - k \pm l$), 4821 unique, 3558 with $F > 4\sigma(F)$ used for all calculations. Absorption correction based on ψ -scans; transmissions 0.55-0.86, No crystal decay. Crystal size 0.5 x 0.3 x 0.3 mm.

Structure Solution and Refinement. - Au atom from Patterson function, other non-H atoms from difference syntheses. Anisotropic least-squares refinement on F to R 0.048, R_w 0.049 (isotropic H atoms incorporated using a riding model; weighting scheme $w^{-1} = \sigma^2(F) + 0.0003F^2$; 311 parameters). Program system SHELXTL (written by G.M.S.). Final atomic coordinates and derived parameters are given in Tables 1 & 2.

Additional crystallographic information (structure factors, H atom coordinates, temperature factors) can be ordered from the Fachinformationszentrum Energie Physik Mathematik, D-7514 Eggenstein-Leopoldshafen 2, F.R.G. Please quote reference number CSD 51175, the names of the authors and the title of the paper.

Reference: see frame 0964. 0962

We thank the Comisión Asesora de Investigación Científica y Técnica (proyecto nº 1387) for financial support.

References

- ¹ I. Omas, Chem. Rev., 1979, 79, 207; J. Dehand and M. Pfeffer, Coord. Chem. Rev., 1976, 18, 327.
- ² R. Hüttel, and A. Konietzny, Chem. Ber., 1973, 106, 2098; F. Calderazzo, and D.B. Dell'Amico, J. Organomet. Chem., 1974, 76, C59; P.K. Monaghan, and R.J. Puddephatt, Inorg. Chim. Acta, 1975, 15, 231; P.W.J. de Graaf, J. Boersma, and G.J.M. van der Kark, J. Organomet. Chem., 1976, 105, 399.
- ³ J. Vicente, A. Arcas, and M.T. Chicote, J. Organomet. Chem., 1983, 252, 257.
- ⁴ J. Vicente, M.T. Chicote, A. Arcas, M. Artigao, and R. Jimenez, J. Organomet. Chem., 1983, 247, 123; J. Vicente, M.T. Chicote, A. Arcas, and M. Artigao, Inorg. Chim. Acta, 1982, 65, L251.
- ⁵ a) J. Vicente, and M.T. Chicote, Inorg. Chim. Acta, 1981, 54, L259; J. Vicente, M.T. Chicote, and M.D. Bermúdez, Inorg. Chim. Acta, 1982, 63, 35; b) J. Vicente, M.T. Chicote, M.D. Bermúdez, X. Soláns, and M. Font-Altaba, J. Chem. Soc. Dalton Trans., 1984, 557.
- ⁶ J. Vicente, M.T. Chicote, and M.D. Bermúdez, J. Organomet. Chem., 1984, 268, 191.
- ⁷ W.H. Baddley, F. Basolo, H.B. Gray, C. Nolting, and A.J. Poë, Inorg. Chem., 1963, 2, 921.
- ⁸ J. Vicente, M.T. Chicote, and M.D. Bermúdez, to be published.

9 P.C. Jones, Gold Bull., 1931, 14, 184; R. Kahn, J. Vincent,
H.T. Choate, P.C. Jones, and G.M. Sheldon, J. Chem. Eng.
Polym. Eng., 1931, 1117.

10 W. Clegg, Acids and Alkalis, Anal. A., 1931, 27, 22.

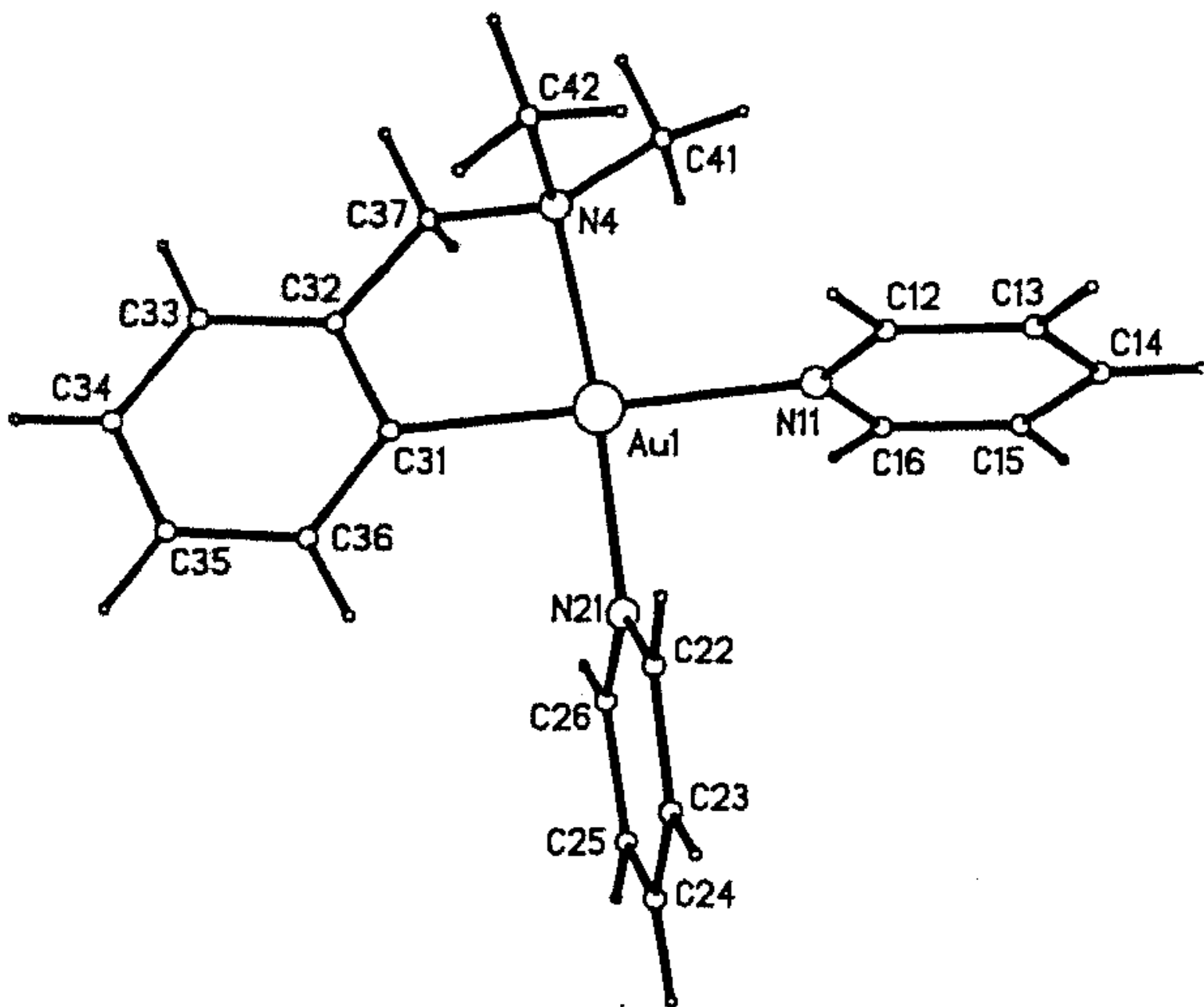


Fig. 1. The cation of (1b) in the crystal, showing the atom numbering scheme.

TABLE 1.

Atom coordinates ($\times 10^4$) and isotropic temperature factors ($\text{\AA}^2 \times 10^3$) for (Ib).

	x/a	y/b	z/c	U
As(1)	2980(1)	4930(1)	5763(1)	42(1)*
N(11)	2946(5)	4796(6)	7100(5)	56(3)*
C(12)	3466(6)	5487(9)	7720(6)	60(6)*
C(13)	3406(7)	5533(10)	8556(7)	75(4)*
C(14)	2832(7)	4868(8)	8776(7)	74(5)*
C(15)	2298(7)	4186(12)	8138(7)	101(6)*
C(16)	2369(6)	4149(9)	7288(6)	74(5)*
N(21)	2075(4)	6222(6)	5556(4)	50(3)*
C(22)	2235(5)	7446(8)	5835(6)	62(4)*
C(23)	1621(7)	8326(10)	5700(8)	83(5)*
C(24)	858(7)	7989(10)	5289(7)	82(6)*
C(25)	702(6)	6720(10)	4988(8)	88(5)*
C(26)	1327(5)	5892(9)	5123(7)	69(4)*
C(31)	3023(6)	5065(7)	4509(6)	53(4)*
C(32)	3424(5)	4015(7)	4280(5)	52(4)*
C(33)	3522(6)	4008(9)	3451(6)	69(4)*
C(34)	3224(8)	4986(9)	2870(7)	89(6)*
C(35)	2828(6)	6019(10)	3113(6)	78(5)*
C(36)	2732(5)	6069(9)	3949(6)	62(4)*
C(37)	3721(5)	3030(8)	4944(5)	56(4)*
N(4)	3894(4)	3610(6)	5854(4)	50(3)*
C(41)	3944(6)	2577(8)	6524(6)	67(4)*
C(42)	4672(5)	4322(9)	6073(7)	64(4)*
N(1)	4380(8)	8328(11)	6116(8)	72(3)
P(11)	4222(4)	7430(7)	6646(5)	129(4)*
P(12)	3808(5)	9198(7)	5827(6)	155(5)*
P(13)	5060(6)	8850(13)	6529(7)	262(7)*
P(14)	4499(6)	7747(9)	5403(6)	189(6)*
N(2)	1502(9)	3094(14)	125(9)	86(4)
P(21)	1006(5)	3895(7)	-401(6)	171(5)*
P(22)	2171(4)	3645(9)	508(7)	197(6)*
P(23)	1652(8)	2131(9)	-286(9)	265(9)*
P(24)	1143(5)	2627(17)	646(6)	271(9)*
C(100)	9955(12)	4180(20)	2713(13)	192(8)
C(101)	10652(14)	4128(24)	2477(15)	246(10)
C(102)	9317(11)	3269(18)	2415(12)	194(7)
C(100)	9788(10)	4939(10)	3197(11)	201(7)

* Equivalent isotropic U calculated from anisotropic U.

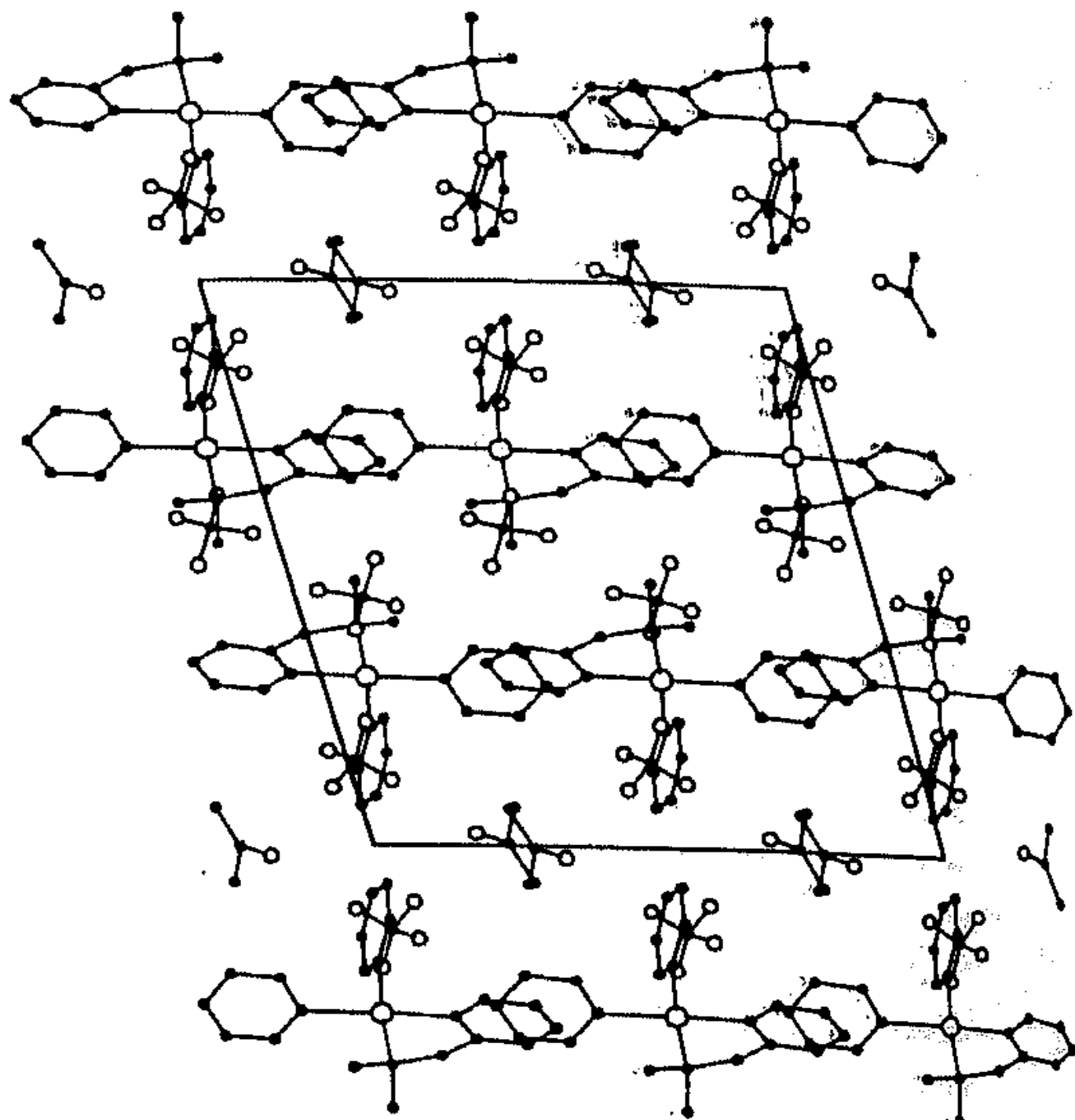


Fig. 2. Packing diagram of (1b) projected down the b axis. Atom key : open circles, Au (large), F or O (small) ; all other atoms shown as black dots.

TABLE 2.

Bond lengths (Å) and angles (deg.) for (Ib).

Au(1)-N(11)	2.155(9)	Au(1)-N(21)	2.016(7)
Au(1)-C(31)	2.028(11)	Au(1)-N(4)	2.069(7)
C(12)-N(11)	1.336(12)	C(12)-C(13)	1.367(17)
C(13)-C(14)	1.342(18)	C(14)-C(15)	1.358(15)
C(15)-C(16)	1.397(18)	C(16)-N(11)	1.313(15)
C(22)-N(21)	1.341(11)	C(22)-C(23)	1.371(15)
C(23)-C(24)	1.345(17)	C(24)-C(25)	1.393(16)
C(25)-C(26)	1.351(15)	C(26)-N(21)	1.329(11)
C(31)-C(32)	1.395(14)	C(31)-C(36)	1.364(13)
C(32)-C(33)	1.381(15)	C(32)-C(37)	1.450(12)
C(33)-C(34)	1.366(15)	C(34)-C(35)	1.385(18)
C(35)-C(36)	1.393(16)	C(37)-N(4)	1.516(11)
C(41)-N(4)	1.494(12)	C(42)-N(4)	1.491(12)
B(1)-F(11)	1.336(16)	B(1)-F(12)	1.320(15)
B(1)-F(13)	1.294(17)	B(1)-F(14)	1.355(18)
B(2)-F(21)	1.308(16)	B(2)-F(22)	1.280(17)
B(2)-F(23)	1.258(20)	B(2)-F(24)	1.274(22)
C(100)-C(101)	1.375(36)	C(100)-C(102)	1.426(28)
C(100)-O(100)	1.194(28)		

N(11)-Au(1)-N(21)	87.6(4)	N(11)-Au(1)-C(31)	179.4(4)
N(21)-Au(1)-C(31)	92.7(4)	N(11)-Au(1)-N(4)	97.6(4)
N(21)-Au(1)-N(4)	174.8(4)	C(31)-Au(1)-N(4)	82.2(4)
Au(1)-N(11)-C(12)	119.3(8)	Au(1)-N(11)-C(16)	120.2(7)
C(12)-N(11)-C(16)	120.1(10)	N(11)-C(12)-C(13)	120.7(11)
C(12)-C(13)-C(14)	120.9(10)	C(13)-C(14)-C(15)	118.0(12)
C(14)-C(15)-C(16)	120.3(13)	N(11)-C(16)-C(15)	120.0(10)
Au(1)-N(21)-C(22)	119.5(6)	Au(1)-N(21)-C(26)	121.1(7)
C(22)-N(21)-C(26)	119.3(8)	N(21)-C(22)-C(23)	119.7(9)
C(22)-C(23)-C(24)	121.3(10)	C(23)-C(24)-C(25)	118.4(11)
C(24)-C(25)-C(26)	118.2(10)	N(21)-C(26)-C(25)	122.9(10)
Au(1)-C(31)-C(32)	111.8(7)	Au(1)-C(31)-C(36)	125.7(8)
C(32)-C(31)-C(36)	122.5(10)	C(31)-C(32)-C(33)	117.8(9)
C(31)-C(32)-C(37)	116.9(9)	C(33)-C(32)-C(37)	125.3(9)
C(32)-C(33)-C(34)	121.0(11)	C(33)-C(34)-C(35)	120.0(12)
C(34)-C(35)-C(36)	120.4(10)	C(31)-C(36)-C(35)	118.2(10)
C(32)-C(37)-N(4)	110.6(8)	Au(1)-N(4)-C(37)	105.0(5)
Au(1)-N(4)-C(41)	113.8(7)	C(37)-N(4)-C(41)	110.9(7)
Au(1)-N(4)-C(42)	108.7(6)	C(37)-N(4)-C(42)	109.3(8)
C(41)-N(4)-C(42)	109.0(7)	F(11)-B(1)-F(12)	114.7(13)
F(11)-B(1)-F(13)	107.2(11)	F(12)-B(1)-F(13)	112.4(12)
F(11)-B(1)-F(14)	109.6(11)	F(12)-B(1)-F(14)	107.1(11)
F(13)-B(1)-F(14)	105.5(13)	F(21)-B(2)-F(22)	111.3(13)
F(21)-B(2)-F(23)	111.3(13)	F(22)-B(2)-F(23)	107.5(15)
F(21)-B(2)-F(24)	107.4(14)	F(22)-B(2)-F(24)	114.3(14)
F(23)-B(2)-F(24)	105.0(15)	C(101)-C(100)-C(102)	123.2(21)
C(101)-C(100)-O(100)	127.2(21)	C(102)-C(100)-O(100)	109.6(21)