

587. *Metallic Complexes of Dimethyl-*o*-methylthiophenylarsine. Part II.*<sup>1</sup> *Complexes of Copper, Silver, and Gold.*

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The complexes formed by univalent copper, silver, and gold with dimethyl-*o*-methylthiophenylarsine (As-S) are described. Copper forms soluble complexes of two types: (a)  $\text{Cu(As-S)X}$  ( $\text{X} = \text{Cl, Br, I}$ ) and (b)  $\text{Cu(As-S)}_2\text{X}$  ( $\text{X} = \text{Cl, Br, I, ClO}_4$ ); an insoluble complex,  $\text{Cu(As-S)SCN}$ , was also isolated. Silver forms insoluble complexes,  $\text{Ag(As-S)}_2\text{X}$  ( $\text{X} = \text{Cl, Br, I}$ ). Gold forms soluble complexes of two types: (i)  $\text{Au(As-S)X}$  ( $\text{X} = \text{Cl, Br, I}$ ) and (ii)  $\text{Au(As-S)}_3\text{ClO}_4$ .

COMPLEXES of bivalent nickel and palladium with the chelate compound, dimethyl-*o*-methylthiophenylarsine (I), have been described.<sup>1</sup> This paper reports the complexes formed by univalent copper, silver, and gold with this ligand. It is of interest to compare these complexes with those of *o*-phenylenebisdimethylarsine (II) with copper<sup>2</sup> and gold,<sup>3</sup> and those of *o*-diethylphosphinophenyldiethylarsine (III) with copper, silver, and gold.<sup>4</sup>

With the arsine (I) copper forms colourless complexes which are of two types: (a)  $\text{Cu(As-S)X}$  (As-S = dimethyl-*o*-methylthiophenylarsine;  $\text{X} = \text{Cl, Br, I, SCN}$ ), and (b)  $\text{Cu(As-S)}_2\text{X}$  ( $\text{X} = \text{Cl, Br, I, ClO}_4$ ). The former were prepared by treating an aqueous

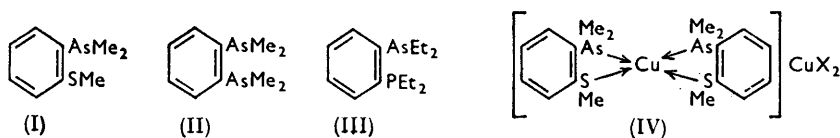
<sup>1</sup> Livingstone, *Chem. and Ind.*, 1957, 143; Part I, *J.*, 1958, 4222.

<sup>2</sup> Kabesh and Nyholm, *J.*, 1951, 38.

<sup>3</sup> Harris and Nyholm, *J.*, 1957, 63.

<sup>4</sup> Cochran, Hart, and Mann, *J.*, 1957, 2816.

solution of cuprous halide in an excess of the corresponding potassium halide with an alcoholic solution of the arsine (I). The compounds  $\text{Cu}(\text{As-S})_2\text{X}$  ( $\text{X} = \text{Cl}, \text{Br}, \text{I}$ ) can be obtained if an excess of arsine is added to the cuprous halide solution and the mixture is heated under reflux. The perchlorate,  $\text{Cu}(\text{As-S})_2\text{ClO}_4$ , is precipitated when an aqueous



solution of copper sulphate containing perchloric acid is treated with an alcoholic solution of the arsine (I). The cuprous compounds which were prepared and their conductivities in nitrobenzene are listed in Table 1.

TABLE 1. *Molecular conductivities of cuprous complexes of dimethyl-o-methylthio-phenylarsine.*

Compounds	Concn. ( $10^{-3}\text{M}$ )	Mol. condy. in $\text{Ph}\cdot\text{NO}_2$ at $25^\circ$ (mho)	Compounds	Concn. ( $10^{-3}\text{M}$ )	Mol. condy. in $\text{Ph}\cdot\text{NO}_2$ at $25^\circ$ (mho)
$[\text{Cu}(\text{As-S})_2][\text{CuCl}_2]$ .....	1.00	22.2	$[\text{Cu}(\text{As-S})_2]\text{ClO}_4$	1.64	26.2
$[\text{Cu}(\text{As-S})_2][\text{CuBr}_2]$ ...	1.08	25.8	$[\text{Cu}(\text{As-S})_2]\text{Cl}$ ...	1.31	14.1
$[\text{Cu}(\text{As-S})_2][\text{CuI}_2]$ .....	2.04	30.4	$[\text{Cu}(\text{As-S})_2]\text{Br}$ ...	1.46	10.4
$[\text{Cu}(\text{As-S})_2][\text{Cu}(\text{SCN})_2]$	Insol. in $\text{Ph}\cdot\text{NO}_2$	—	$[\text{Cu}(\text{As-S})_2]\text{I}$ ...	2.08	4.1

Conductivity measurements in nitrobenzene solution show that the compounds  $\text{Cu}(\text{As-S})\text{X}$  ( $\text{X} = \text{Cl}, \text{Br}, \text{I}$ ) are uni-univalent electrolytes and that their formulæ should be doubled, *viz.*,  $[\text{Cu}(\text{As-S})_2][\text{CuX}_2]$ . If the arsine (I) is acting as a chelate group, which seems most likely, the copper atom in the cation is quadricovalent and probably tetrahedral. The compounds would then have the structure (IV). The dithiocyanato-cuprate(I) complex is insoluble in nitrobenzene, alcohol, and water. This insolubility suggests that its structure may differ from that of the halogenocuprate(I) complexes  $[\text{Cu}(\text{As-S})_2][\text{CuX}_2]$ . Consequently, the infrared absorption spectrum of the compound was obtained in order to ascertain whether the compound has a polymeric structure in which the thiocyanato-groups are bridging. For a number of thiocyanato-complexes of bivalent palladium and platinum it has been shown<sup>5</sup> that those complexes which contain bridging  $-\text{SCN}$  groups display an absorption maximum at  $2154\text{--}2182\text{ cm}^{-1}$ , while those in which the  $-\text{SCN}$  group is terminal have maxima in the range  $2105\text{--}2120\text{ cm}^{-1}$ . Silver thiocyanate, which contains bridging  $-\text{SCN}$  groups,<sup>6</sup> has a maximum<sup>7</sup> at  $2149\text{ cm}^{-1}$ . The thiocyanato-complex with the arsine (I) displays a maximum at  $2103\text{ cm}^{-1}$ , suggesting that the  $-\text{SCN}$  group is terminal and not bridging. The infrared absorption spectra of some other compounds which contain terminal  $-\text{SCN}$  groups were examined in this region and the maxima are listed in Table 2.

TABLE 2. *Thiocyanate stretching frequencies ( $\text{cm}^{-1}$ ).*

$\text{Cu}(\text{As-S})(\text{SCN})$ .....	2103	$\text{K}_2[\text{Pt}(\text{SCN})_4]$ .....	2116
$[\text{Pd}(\text{As-S})_2]$ .....	2094	$\text{K}_2[\text{Pt}(\text{SCN})_6]$ .....	2118
$\text{K}_2[\text{Pd}(\text{SCN})_4]$ .....	{ 2115		
	{ 2090		

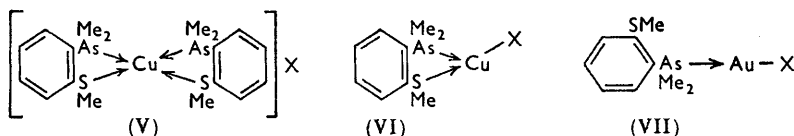
The perchlorate,  $\text{Cu}(\text{As-S})_2\text{ClO}_4$ , behaves as a uni-univalent electrolyte in nitrobenzene and possesses the same cation,  $[\text{Cu}(\text{As-S})_2]^+$ , as the halogenocuprate(I) complexes. In nitrobenzene solution the compounds  $\text{Cu}(\text{As-S})_2\text{X}$  ( $\text{X} = \text{Cl}, \text{Br}, \text{I}$ ) have conductivities

<sup>5</sup> Chatt and Duncanson, *Nature*, 1956, **178**, 997.

<sup>6</sup> Lindqvist, *Acta Cryst.*, 1957, **10**, 29.

<sup>7</sup> Chatt, Duncanson, Hart, and Owston, *Nature*, 1958, **181**, 43.

which decrease in the order  $\text{Cl} > \text{Br} > \text{I}$  and are less than that expected for uni-univalent electrolytes (20–30 mho). A molecular-weight determination for the iodo-complex gave the value 284 (theor., 646). This result precludes any dimeric bridged structure. A tentative suggestion is that the compounds exist in the ionic form (V) in the solid state, but in nitrobenzene solution there is an equilibrium between the ionic form (V) and the structure



(VI), where one molecule of ligand has split off. The structure (VI) does not necessarily imply tervalent copper since the fourth co-ordination position could be occupied by a molecule of solvent. This splitting off of the chelate group, dimethyl-*o*-methylthiophenylarsine, in nitrobenzene solution is known to occur with palladium complexes containing two molecules of this ligand.<sup>1</sup> An iodo-complex of silver with *o*-diethylphosphinophenyldiethylarsine (III) has been postulated by Cochran, Hart, and Mann<sup>4</sup> as existing in nitrobenzene and chloroform solutions partly in a form with a structure analogous to (VI).

With copper dimethyl-*o*-methylthiophenylarsine behaves similarly to *o*-phenylenebisdimethylarsine (As-As) and *o*-diethylphosphinophenyldiethylarsine (As-P). The last two chelate groups form complexes  $[\text{Cu}(\text{As}-\text{As})_2]\text{Y}$  ( $\text{Y} = \text{Br}, \text{I}, \text{ClO}_4, \text{CuCl}_2, \text{CuBr}_2, \text{CuI}_2$ ) and  $[\text{Cu}(\text{As}-\text{P})_2]\text{Z}$  ( $\text{Z} = \text{Cl}, \text{Br}, \text{I}, \text{CuCl}_2, \text{CuBr}_2$ ), respectively.

The silver complexes which were isolated in this investigation have the general formula  $\text{Ag}(\text{As}-\text{S})_2\text{X}$  ( $\text{X} = \text{Cl}, \text{Br}, \text{I}$ ). They were prepared by treating a solution of the silver halide in aqueous potassium halide with an alcoholic solution of the arsine (I). All are insoluble in water and organic solvents. When warmed with alcohol, benzene, or nitrobenzene the complexes decompose, leaving a residue of silver halide. Their insolubility makes it unlikely that they are salts of the type  $[\text{Ag}(\text{As}-\text{S})_2]\text{X}$  or  $[\text{Ag}(\text{As}-\text{S})_4][\text{AgX}_2]$  since *o*-diethylphosphinophenyldiethylarsine (III) forms soluble complexes of general formula  $[\text{Ag}(\text{As}-\text{P})_2]\text{Y}$  ( $\text{Y} = \text{I}, \text{AgCl}_2, \text{AgI}_2$ ).<sup>4</sup> With diphenylmethylarsine silver iodide forms a complex,  $\text{Ag}(\text{AsPh}_2\text{Me})_2\text{I}$ , which is also insoluble in water and organic solvents and is decomposed on being warmed with alcohol or benzene. These complexes differ from those formed by silver iodide with certain other tertiary arsines  $\text{AsR}_3$  ( $\text{R} = \text{Et}, \text{Pr}^n$ ). These compounds  $\text{AsR}_3\cdot\text{AgI}$  are readily soluble in organic solvents and are tetrameric in solution and in the solid state.<sup>8</sup> The insolubility of the silver halide complexes of dimethyl-*o*-methylthiophenylarsine suggests that they have a polymeric structure, but otherwise their structure is unknown.

The reaction of sodium tetrachloroaurate(III) with dimethyl-*o*-methylthiophenylarsine in alcohol, containing hypophosphorous acid, gives a colourless solution. The addition of halide ions causes deposition of aurous complexes, which can be recrystallised from alcohol and have the general formula  $\text{Au}(\text{As}-\text{S})\text{X}$  ( $\text{X} = \text{Cl}, \text{Br}, \text{I}$ ). Treatment of the above solution with perchloric acid precipitates a perchlorate,  $\text{Au}(\text{As}-\text{S})_3\text{ClO}_4$ . The halogeno-complexes are non-electrolytes in nitrobenzene solution, while the perchlorate is a uni-univalent electrolyte in this solvent. The iodo-complex,  $\text{Au}(\text{As}-\text{S})\text{I}$ , is monomeric in freezing nitrobenzene. It is probable that in the halogeno-complexes the ligand is unidentate (structure VII) and the gold atom has a covalency of two. Nothing definite can be said about the structure of the perchlorate,  $\text{Au}(\text{As}-\text{S})_3\text{ClO}_4$ .

While the cuprous complexes of dimethyl-*o*-methylthiophenylarsine are similar to those of the diarsine (II) and the phosphine-arsine (III), the aurous complexes differ from those of these ligands, and the argentous complexes from those formed by (III).

<sup>8</sup> Mann, Wells, and Purdie, *J.*, 1937, 1828.

## EXPERIMENTAL

*Bisdimethyl-o-methylthiophenylarsinecopper*(I) *Dichlorocuprate*(I).—Freshly prepared cuprous chloride (2 g.) was dissolved in saturated aqueous potassium chloride solution (30 ml.) containing concentrated hydrochloric acid (1 drop), and the solution was filtered. To the filtrate was added dimethyl-*o*-methylthiophenylarsine (1.5 g.) dissolved in alcohol (90 ml.). A precipitate, which was at first oily, was formed. The mixture was evaporated to half its volume, cooled, and filtered. The crystalline product was washed with hot water, then alcohol, and recrystallised from alcohol. The white crystals of the *compound* (0.6 g.) were dried over phosphorus pentoxide (Found: C, 32.5; H, 3.8; Cl, 10.4; Cu, 19.8.  $C_{18}H_{26}Cl_2S_2As_2Cu_2$  requires C, 33.0; H, 4.0; Cl, 10.8; Cu, 19.4%).

*Bisdimethyl-o-methylthiophenylarsinecopper*(I) *Dibromocuprate*(I).—Dimethyl-*o*-methylthiophenylarsine (1.5 g.) in alcohol (90 ml.) was added to the solution obtained by dissolving cuprous bromide (1 g.) in saturated aqueous potassium bromide solution (30 ml.) containing concentrated hydrobromic acid (1 drop). The resultant oily precipitate was rendered crystalline by boiling and concentration of the solution to remove most of the alcohol. The solution was cooled and the white crystalline *product* was filtered off, washed with saturated potassium bromide solution, then with water, and finally with a small amount of alcohol (yield, 0.7 g.) (Found: C, 29.0; H, 3.4; Br, 21.5; Cu, 17.1.  $C_{18}H_{26}Br_2S_2As_2Cu_2$  requires C, 29.1; H, 3.5; Br, 21.5; Cu, 17.1%).

*Bisdimethyl-o-methylthiophenylarsinecopper*(I) *Di-iodocuprate*(I).—Dimethyl-*o*-methylthiophenylarsine (1.2 g.) in alcohol (20 ml.) was added to a solution of cuprous iodide (2 g.) in saturated aqueous potassium iodide (20 ml.). The white crystalline product was filtered off and washed well with water. Recrystallisation from alcohol gave the pure *compound* as a white powder (1.4 g.) (Found: C, 25.7; H, 3.1; I, 30.4; Cu, 14.9.  $C_{18}H_{26}I_2S_2As_2Cu_2$  requires C, 25.8; H, 3.1; I, 30.3; Cu, 15.2%).

*Bisdimethyl-o-methylthiophenylarsinecopper*(I) *Dithiocyanatocuprate*(I).—Freshly prepared cuprous chloride was dissolved in a saturated aqueous solution (50 ml.) of potassium thiocyanate. The solution was filtered and then treated with an alcoholic solution (50 ml.) of dimethyl-*o*-methylthiophenylarsine (1.5 g.). The *compound* was precipitated as a white powder, which was filtered off, and washed with water, then alcohol (yield, 1.5 g.) (Found: C, 34.3; H, 3.9; N, 4.0; Cu, 17.9.  $C_{20}H_{26}N_2S_4As_2Cu_2$  requires C, 34.4; H, 3.7; N, 4.0; Cu, 18.2%).

*Bisdimethyl-o-methylthiophenylarsinecopper*(I) *Perchlorate*.—Copper sulphate pentahydrate (0.65 g.) was dissolved in water (20 ml.) containing 70% perchloric acid (5 ml.). To the filtered solution was added an alcoholic solution (40 ml.) of dimethyl-*o*-methylthiophenylarsine (1.5 g.). The mixture was shaken for 5 min. and the white crystalline *perchlorate* separated. It was filtered off, washed with water, then alcohol, and dried over phosphorus pentoxide (yield, 1.2 g.) (Found: C, 35.1; H, 4.1; Cu, 10.3.  $C_{18}H_{26}O_4ClS_2As_2Cu$  requires C, 34.9; H, 4.2; Cu, 10.3%).

*Bisdimethyl-o-methylthiophenylarsinecopper*(I) *Chloride*.—Cuprous chloride (0.12 g.), dissolved in saturated aqueous potassium chloride solution (15 ml.), was mixed with dimethyl-*o*-methylthiophenylarsine (0.5 g.) in alcohol (50 ml.) and the mixture was heated under reflux for 2 hr. Water (20 ml.) was then added and the solution was evaporated to 30 ml. On cooling, the solution deposited white crystals, which were filtered off and washed with water. The product was dissolved in alcohol (10 ml.) and reprecipitated by the addition of water (50 ml.). The precipitate was filtered off, washed with water, followed by a little alcohol, and dried *in vacuo* ( $P_2O_5$ ), yielding the *copper chloride complex* (0.3 g.) (Found: C, 38.1; H, 4.5; Cl, 6.4; Cu, 11.7.  $C_{18}H_{26}ClS_2As_2Cu$  requires C, 38.9; H, 4.7; Cl, 6.4; Cu, 11.5%).

*Bisdimethyl-o-methylthiophenylarsinecopper*(I) *Bromide*.—Cuprous bromide (0.15 g.), dissolved in saturated aqueous potassium bromide solution (15 ml.), was mixed with dimethyl-*o*-methylthiophenylarsine (0.5 g.) in alcohol (50 ml.). Treatment as in the previous case, finishing with washing with saturated aqueous potassium bromide solution, then water, and recrystallisation twice from 50% alcohol, gave the white *bromide* (0.2 g.) (Found: C, 37.0; H, 4.4; Br, 13.0; Cu, 10.4.  $C_{18}H_{26}BrS_2As_2Cu$  requires C, 36.0; H, 4.4; Br, 13.3; Cu, 10.6%).

*Bisdimethyl-o-methylthiophenylarsinecopper*(I) *Iodide*.—Cuprous iodide (0.2 g.), in saturated potassium iodide solution (15 ml.), and the arsine (0.5 g.) in alcohol (50 ml.), similarly gave an oil which became crystalline overnight. It was filtered off, washed with saturated potassium iodide solution, then with water, and recrystallised from 50% alcohol and dried ( $P_2O_5$ ) to give the white *iodide* (0.3 g.) (Found: C, 33.1; H, 3.8; I, 19.2; Cu, 9.5%; *M*, cryoscopically in

0.91% nitrobenzene solution, 284.  $C_{18}H_{26}IS_2As_2Cu$  requires C, 33.4; H, 4.1; I, 19.6; Cu, 9.8%; *M*, 646).

*Iodobisdimethyl-*o*-methylthiophenylarsinesilver(I)*.—Freshly prepared silver iodide (1.5 g.) was dissolved in saturated potassium iodide solution (50 ml.); a solution of dimethyl-*o*-methylthiophenylarsine (1.5 g.) in alcohol (50 ml.) was added, and the mixture was vigorously shaken for 15 min. and kept for 2 hr. The resulting white precipitate was filtered off, washed with saturated potassium iodide solution, then several times with water, and finally with acetone, and dried over phosphoric oxide. The yield of *silver complex* was 1.5 g. (Found: C, 30.2; H, 3.5; I, 18.5; Ag, 15.8.  $C_{18}H_{26}S_2As_2IAg$  requires C, 31.2; H, 3.8; I, 18.4; Ag, 15.6%). The compound is insoluble in water, alcohol, acetone, and nitrobenzene.

*Bromobisdimethyl-*o*-methylthiophenylarsinesilver(I)*.—By a procedure similar to that used for the iodo-complex, silver bromide (1 g.), dimethyl-*o*-methylthiophenylarsine (1.2 g.), saturated potassium bromide solution (50 ml.), and alcohol (50 ml.) gave a precipitate, which was washed free from potassium bromide. The off-white precipitate was boiled with alcohol, filtered off, washed with alcohol, and dried, to give the *bromo-complex* (1.6 g.) (Found: C, 32.4; H, 3.7; Br, 12.5; Ag, 16.9.  $C_{18}H_{26}BrS_2As_2Ag$  requires C, 33.6; H, 4.1; Br, 12.4; Ag, 16.8%).

*Chlorobisdimethyl-*o*-methylthiophenylarsinesilver(I)*.—Freshly prepared silver chloride (0.7 g.), in saturated aqueous potassium chloride solution (50 ml.), was treated with an alcoholic solution (40 ml.) of dimethyl-*o*-methylthiophenylarsine (1.2 g.). The mixture was shaken for 30 min. while an oil separated. When washed with water the *product* became crystalline. It was then heated with alcohol and filtered off, washed with alcohol, and dried ( $P_2O_5$ ) (yield, 1 g.) (Found: C, 35.7; H, 4.5; Cl, 6.1; Ag, 18.2.  $C_{18}H_{26}ClS_2As_2Ag$  requires C, 36.0; H, 4.4; Cl, 5.9; Ag, 18.0%).

*Iododimethyl-*o*-methylthiophenylarsinegold(I)*.—A solution of sodium tetrachloroaurate(III) (0.8 g.) in alcohol (10 ml.) was added with stirring to dimethyl-*o*-methylthiophenylarsine (1 g.) in alcohol (20 ml.) containing 30% hypophosphorous acid (4 ml.). On being heated the solution became colourless and deposited a small amount of reddish metallic gold. After filtration, the solution was treated with water (20 ml.), then heated to boiling, and sodium iodide (2 g.) in alcohol (30 ml.) was added. Upon cooling, the solution deposited a greyish-white product, which was recrystallised from alcohol to give the white, pure *compound* (0.8 g.) (Found: C, 19.5; H, 2.5; I, 23.1; Au, 35.8%; *M*, cryoscopically in 1.07% nitrobenzene solution, 569.  $C_9H_{13}ISAsAu$  requires C, 19.6; H, 2.4; I, 23.0; Au, 35.7%). The compound decomposes when heated. Its molecular conductance ( $\Lambda_{1000}$ ) in nitrobenzene at 25° was 0.1 mho cm.<sup>-2</sup>.

*Bromodimethyl-*o*-methylthiophenylarsinegold(I)*.—The arsine (1 g.) and 30% hypophosphorous acid (4 ml.) in alcohol (40 ml.) were treated with sodium tetrachloroaurate(III) dihydrate (0.8 g.) in alcohol (10 ml.) as above and the mixture was boiled and filtered. The filtrate was diluted with water (20 ml.), treated with 34% hydrobromic acid, and kept 1 hr. The white crystalline *compound*, which was deposited, was filtered off and recrystallised from alcohol (yield, 1 g.) (Found: C, 21.6; H, 2.8; Br, 15.8; Au, 39.4.  $C_9H_{13}BrSAsAu$  requires C, 21.4; H, 2.6; Br, 15.8; Au, 39.0%). The molecular conductance ( $\Lambda_{1000}$ ) in nitrobenzene at 25° was 0.1 mho cm.<sup>-2</sup>.

*Chlorodimethyl-*o*-methylthiophenylarsinegold(I)*.—A solution of sodium tetrachloroaurate(III) dihydrate (0.4 g.) in alcohol (10 ml.) was added quickly, with stirring, to dimethyl-*o*-methylthiophenylarsine (0.5 g.) in alcohol (10 ml.). A white product started to crystallise after the addition was complete. After 2 hr. the crystalline *product* was filtered off, washed with water until free from sodium chloride, then with a small amount of alcohol, followed by ether, and dried ( $P_2O_5$ ) (yield, 0.2 g.) (Found: C, 23.7; H, 2.6; Cl, 7.6; Au, 42.6.  $C_9H_{13}ClSAsAu$  requires C, 23.5; H, 2.8; Cl, 7.7; Au, 42.8%). The molecular conductance ( $\Lambda_{1000}$ ) in nitrobenzene at 25° was 0.1 mho cm.<sup>-2</sup>.

*Trisdimethyl-*o*-methylthiophenylarsinegold(I) Perchlorate*.—A solution of sodium tetrachloroaurate(III) dihydrate (0.8 g.) in alcohol (10 ml.) was added with stirring to dimethyl-*o*-methylthiophenylarsine (1 g.) in alcohol (20 ml.) containing hypophosphorous acid (4 ml.). The solution was boiled, filtered, and treated with 60% perchloric acid (10 ml.). The resulting brownish precipitate was recrystallised twice from 50% aqueous alcohol to give the off-white *perchlorate* (Found: C, 33.0; H, 4.0; Au, 20.0.  $C_{27}H_{39}O_4ClS_3As_3Au$  requires C, 33.0; H, 4.0; Au, 20.1%),  $\Lambda_{1000}$  in nitrobenzene at 25°, 28.6 mho cm.<sup>-2</sup>.

*Iodobisdiphenylmethylarsinesilver(I)*.—Diphenylmethylarsine (0.6 g.) in alcohol (10 ml.) was added to a solution of silver iodide (0.25 g.) in saturated aqueous potassium iodide (30 ml.).

The mixture was shaken for 5 min. and kept for 1 hr. The resulting white precipitate was filtered off, washed with saturated potassium iodide solution, followed by water, then alcohol, and dried, to yield the *compound* as a white powder (0.5 g.) (Found: C, 42.5; H, 3.4; I, 17.5; Ag, 14.9.  $C_{26}H_{26}IAs_2Ag$  requires C, 43.2; H, 3.6; I, 17.5; Ag, 14.9%).

*Infrared Spectra.*—The spectra were obtained from Nujol mulls, sodium chloride optics being used.

Microanalyses for carbon, hydrogen, and nitrogen were carried out by Dr. E. Challen of the microanalytical laboratory of this university.

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