



work it is necessary to carry out a second deposition to calibrate the crystal. In modern equipment an evaporation technique is used, and both base coating and frequency calibration can be performed in the same apparatus and in the same vacuum cycle.

In thin film integrated circuits the inter-connections to the resistors and capacitors are produced by the evaporation of gold. This method gives stable contact surfaces readily capable of being soldered or welded. Similarly a number of semiconductor devices have their inter-connection layers or contacts provided by vacuum deposition of gold.

One further device based upon the vacuum evaporation of gold is a high sensitivity strain gauge

developed by the Electrical Research Association. This consists of a thin film of gold with two thick planar electrodes, deposited on to a polished metal plate. The gold film forming the strain gauge element has a discontinuous or "island" structure as shown in the photomicrograph, the electrical resistance of the film lying mainly in the gaps between the particles. Conduction across these gaps is by quantum mechanical tunnelling and is very sensitive to small changes in gap width brought about by applied mechanical strains. This device is therefore highly sensitive, it eliminates the use of adhesives between the gauge and the structural member under test, and is small and of low cost.

## Organo-Gold Hydrides?

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Industrial usage of organometallic compounds as both catalytic and synthetic reagents has necessitated that the chemistry of a large number of compounds be examined. Many of these studies have led to the isolation and eventual characterisation of new and novel compounds. Among some of the most interesting of these, apart from those possibly capable of fixing molecular nitrogen and oxygen, are the transition metal hydride complexes. A number have been found capable of activating molecular hydrogen in homogeneous solutions, for example,  $\text{RhCl}(\text{PPh}_3)_3$ , operating by formation of a dihydro species with *cis*-hydrogens. Even apart from these in solution, a large number of solid hydride complexes have also been prepared. In the transition group of metals, apart from niobium, only the copper triad shows inability to form complex molecules or ions containing metal-hydrogen bonds.

One might question why gold should behave so differently in this respect from the other transition elements. The tremendous stability of the element itself naturally results in some loss in activity, and this is usually attributed to its overall percentage loss of *d* character. Thus it may be better to classify the metal as a borderline transition metal, in line with its hydride

$\text{Au-H}$ , although the actual existence of the latter is still uncertain. With an electronic configuration of  $6s^25d^9$  and a preference for the trivalent state in compound formation its most usual coordination number is four, with a square planar geometry. However, in certain circumstances higher coordination numbers are possible, i.e., five and six, with such stabilising ligands as diarsine for example.

Thus it may be pertinent to consider whether organo-gold (III) hydride complexes may be capable of existence possibly through ligand stabilisation of the metal atom. In normal gold alkyls, e.g.,  $\text{R}_3\text{Au}$ , stabilisation is brought about by using nitrogen and phosphorus donors where the coordination stability achieved by bridging with halogen atoms, for example, is not possible. One would suspect a similar situation to hold for a compound such as  $\text{R}_2\text{HAu}$ ; in this case donor stabilisation must also be possible. The real question then arises: are such compounds really non-existent? Considering the appreciable catalytic activity recently found for gold and its compounds in the areas of dehydrogenation and oxidation, little attention seems to have been given as yet to this other possible area of application.