centrated at the grain boundaries and it is very probable that most of the iridium migration was concentrated in these regions.

Diffusion Between Base and Noble Metals

Diffusion studies showed that in general the tantalum base alloy was not compatible with the noble metals, which reacted strongly with it to form liquid phases at temperatures ranging from 1750°C for pure rhodium to 1975°C for pure iridium. The best results were obtained with couples of rhenium-tungsten and the noble metals. In general, the rate of interdiffusion which occurred at any temperature decreased with increasing quantity of iridium in the noble metal alloy.

The best combination of oxidation resistance and diffusion compatibility was displayed by the 30 and 50 per cent iridium-rhodium alloys. Fig. 2 illustrates a microhardness curve obtained by scanning the interdiffusion zone of a test couple annealed for four hours at 1800°C. The diffusion affected zone extends for 60 microns and a line of porosity has developed on the noble metal side of the interface.

Attempts to minimise diffusion effects by the use of a refractory barrier layer were largely unsuccessful, although a plasma-sprayed layer of yttria-stabilised zirconia sandwiched between 25 per cent rhenium-tungsten and 50 per cent iridium-rhodium retained its integrity for four hours. The oxide layer was of no value in contact with the tantalum base alloy and since none of the tests was carried out for periods longer than four hours, the true efficiency of the barrier layer was not established.

Although the results presented in these reports provide much food for thought, they also leave many questions unanswered. It has been established that iridium-rhodium alloys are reasonably compatible with rhenium-tungsten alloys for short periods in vacuum at temperatures up to 2000°C. The degree of oxidation protection conferred by such alloys has not, however, been investigated. After exposure to flowing air at 1200°C for 145 hours, the 50 per cent iridium-rhodium alloy displayed considerable internal cavitation even at a distance 0.005 inch below the original specimen surface, and in view of the severe grain boundary attack at this temperature it seems most unlikely that this alloy would completely prevent access of oxygen to the surface of a refractory transition metal for any length of time.

Confirmatory tests of this sort have no doubt been included in the continuing "Poodle" research programme and we shall look forward, therefore, to reading the results of this work in due course.

A. S. D.

Reference

1 Radioisotope Propulsion Technology Program (Poodle), Quarterly Progress Reports for the period October 1st – December 31st, 1965 and January 1st – March 31st, 1966, Contract AT(04–3)–517 for United States Atomic Energy Commission.

Tungsten-Platinum Alloy Strain Gauges

Earlier studies on dynamic strain gauges for use at high temperatures have shown the advantages of a tungsten-platinum alloy in terms of stability, low temperature coefficient of resistance and high gauge factor, and this alloy—normally containing 8 per cent tungsten—has found considerable use in gauges of the wire type. An interesting further development in this field is the provision of foil type gauges in the same alloy. The illustration shows a typical precision die-cut foil gauge (magnified approximately five times) from a range produced by Dentronics Inc. of Hackensack, New Jersey, from tungsten-platinum alloy foil made by Sigmund Cohn of New York. Gauges of this type are stable at temperatures up to 800°C.