Non-Volatile Oxides

Since the mechanism of failure had been shown to involve a volatile oxide of molybdenum, experiments were made to confirm that improved results could be obtained by using niobium as a core, this metal having an oxide of low vapour pressure (3).

Specimens sealed with an internal pressure of 2 Torr exhibited lives which were 2 to 3 times as high as those which would be expected from similar specimens containing a molybdenum core. The results obtained on loosely encapsulated specimens did, in fact, confirm the beneficial effects of low vapour pressure oxides as the evidence for vapour transport of niobium to the platinum sheath was very limited indeed. Failures in the main were caused by diffusion which occurred where the sheath and core were in direct metallic contact.

The violent bursts caused by the accumulation of niobium oxide in the failure area were rather more spectacular than those in platinum-clad molybdenum, however, and niobium was found to have other disadvantages which would restrict its application as a core material for platinum-clad apparatus in the glass industry. Any failure which occurred would have serious effects upon both the glass and the glass tank refractories and few barrier layers can be envisaged which would be completely inert with respect to both niobium and platinum at high temperatures. For this reason attention was concentrated upon the problem of ensuring that the residual gas pressure in the platinum-clad molybdenum apparatus was kept at a very low level. A convenient way of achieving this desirable objective is to use zirconium as a getter (3).

The results of some tests in which the zirconium was added to the molybdenum core as an alloying constituent and as a sprayed deposit are presented in the table. This shows that lives in excess of 2300 hours at 1400°C can be obtained even when the platinum sheath is only half a millimetre thick.

References

1 G. L. Selman, *Platinum Metals Rev.*, 1967, **11**, (4), 132

2 A. S. Darling, *Metals and Materials*, 1968, **2**, (1), 28

3 Johnson Matthey B.P. Application No. 17306/66

Properties and Uses of Palladium

Palladium: Recovery, Properties and Uses, by Edmund M. Wise. Pp. xii and 187 Academic Press, New York and London, $11 (102*s*.)

Although it is probably better known for its catalytic uses and its selective transmission of hydrogen, palladium, the cheapest of the platinum metals and the second most abundant, has an unusual ability to form workable alloys with an extremely wide range of other metals. For this reason palladium has a number of commercial uses in the electrical contact field, in special purpose brazing alloys and in dentistry and jewellery, and these applications are all dealt with briefly in the present volume. Perhaps the most valuable part of the book to the metallurgist, however, is the lengthy compilation of binary and ternary equilibrium diagrams that forms the longest chapter, in each case full properties of the alloys being given as far as they are established.

Palladium plating is also of growing interest, particularly in the telecommunications field, and several suitable electrolytes are described in a short chapter on this subject, but it is a little unfortunate that the obsolescent tetrammino-palladous nitrate bath (giving matte deposits) is featured and that no reference is made to the diammino-palladous nitrite bath yielding bright deposits.

Although the title of the book includes the word "Recovery", little or no reference is made to the mineralogy, extraction or refining of palladium, while the substantial output from South Africa also escapes mention.

A final chapter contributed by P. N. Rylander surveys the many types of reactions in which palladium serves as a catalyst.

L. B. H.