

defined, but similar relationships are not observed with base metal slidewires. Although low contact resistances are sometimes obtained, load and contact resistance are not uniquely related and a very wide scatter of results is obtained. This scatter is undoubtedly associated with the high noise values generated between sliding contacts and base metal resistors. Noise and uncertainty increase rapidly as the contact load decreases and it is difficult, therefore, to obtain accurate results from low torque potentiometers wound with base metal wires.

Characteristics of Potentiometer Materials

The characteristics of a few of the main important potentiometer wires are summarised in the table. Of those listed the most noble and resistant to corrosion is the 20 per cent iridium-platinum alloy which unfortunately has a temperature coefficient rather higher than

is acceptable in certain precision applications.

Because of their high catalytic activity platinum and palladium alloys sometimes cause difficulty when operated in atmospheres containing high concentrations of organic vapours. A recently developed rhodium-platinum alloy containing 5 per cent of gold does not readily promote low temperature organic reactions and might therefore be of considerable help in those applications where the danger of polymer formation exists.

References

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- 4 E. Kudielka-Artner and B. B. Argent, *Proc. Phys. Soc.*, 1962, **80**, 1143
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Frictional Characteristics of the Refractory Platinum Metals

A recent report by D. H. Buckley of the Lewis Research Centre (NASA Tech. Note TN D-4152, 1967, (Sept.), 1-15) conveys at first glance the impression that osmium and ruthenium, the hexagonal refractory metals, have, when rubbed against themselves, lower coefficients of friction than their cubic counterparts rhodium and iridium, and are therefore to be preferred for sliding electrical contacts. The author states dogmatically that 'from the results of this investigation, it would appear that ruthenium, with its hexagonal crystal structure, would certainly be highly superior to the face centred cubic metal rhodium in sliding electrical contact applications'. Detailed study of the paper, however, shows that this conclusion is based entirely on experiments made under ultra high vacuum conditions. The superiority of ruthenium over rhodium is only apparent at pressures below 10^{-8} torr and results reported show that at higher pressures rhodium has a much lower coefficient of friction than

ruthenium. No information on the frictional characteristics of iridium or osmium at pressures above 10^{-8} torr is given in this report.

Within the context of space applications covered by NASA, it is perhaps logical to assume that atmospheric pressures below 10^{-8} torr constitute a perfectly normal ambient environment. Such clean conditions should certainly help when attempts are made to correlate surface properties such as friction with the crystallographic characteristics of pure metals. It is disappointing, therefore, to find in this report no indication of the purity of the materials studied or the way in which the test specimens were fabricated and prepared for examination. In subsequent publications it is hoped that fuller details will be supplied of the process, whereby the disc and rider specimens were 'finished to a roughness of 4 to 8 micro inches and then fully annealed'.

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