concerned himself with the first commercial export of platinum from the new Republic in its search for foreign credits (14). But by then other sources of the metal had become available nearer home in Russia, and it was not until the end of the nineteenth century that Colombian platinum again became a noticeable feature of the market.

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Properties of Ruthenium, Osmium and Iridium

MELTING POINT AND HARDNESS DETERMINATIONS

The search for metallic materials capable of some degree of useful service at very high temperatures had led to several investigations being undertaken on the more refractory members of the platinum group metals. Among the several organisations that have pursued these studies is the Research Laboratory of Associated Electrical Industries Ltd. at Aldermaston, and a recent report from there by Dr. J. D. Baird (AEI Report No. A.843) gives the results of an investigation of the melting points, hardness and ductility of ruthenium, osmium and iridium.

The melting points of the three metals were determined by taking optical pyrometer readings on the solid-liquid interface of the metal beads in an argon arc furnace. Between fifteen and twenty readings were taken for each metal, and all but one lay within $\pm 10°$ of the mean values. These are as follows, and represent somewhat different values from those formerly accepted, more particularly for ruthenium and osmium.

Melting Points

Ruthenium	2250° C
Osmium	3000° C
Iridium	2410° C

Room temperature hardness measurements on arc-melted specimens using a Vickers pyramid indenter showed a very wide scatter with the two close-packed hexagonal metals. Ruthenium gave results ranging from 200 to 500 VPN, the variation being found to be due to differences in orientation between grains. A similar variation was found in osmium, readings ranging from 300 to 670 VPN.

As would be expected from its face-centred cubic structure, the hardness of iridium did not vary greatly from grain to grain, but some variation between specimens was observed; most specimens had hardness values from 210 to 240.

High temperature hardness measurements were made on individual grains at 900, 1000, 1100 and 1200°C, and again considerable variation was found. The maximum hardness of ruthenium at 1200°C ranged from 40 to 170 VPN. The mean hardness of osmium at 1200°C was found to be about 300, which is thought to be considerably higher than that of any other metal at this temperature. The mean value for iridium at the same temperature lay around 70 VPN.

The ductility of the three metals was measured by rolling or squeezing arc-melted beads with 2 per cent reduction per pass until cracking occurred. At room temperature ruthenium specimens failed after 8 to 12 per cent reduction, osmium after 2 to 5 per cent, and iridium after 9 to 19 per cent. Increasing the rolling temperature to 500 and 900°C had no significant effect on the ductility of ruthenium and iridium.