in a solid platinum matrix are, however, notoriously unstable, and this appears to suggest a high affinity of solid platinum for the refractory metal.

Differences in geometry could also be involved in these apparent anomalies as platinum, when held molten against a refractory wall, might prevent complete removal of gaseous reaction products such as water vapour.

The experimental results and interpretations given in this recent group of papers will undoubtedly lead to a great deal of further work, and should moreover encourage detailed constitutional studies on platinum metal alloys.

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Brazing Graphite to Metals

A NEW PALLADIUM-BASE BRAZING ALLOY FOR NUCLEAR ENERGY APPLICATIONS

The development of advanced molten-salt reactors posed a problem of making mechanically strong and pressure-tight joints between graphite and refractory metals and alloys for service in contact with fused fluorides at elevated temperatures. According to a report recently released from Oak Ridge National Laboratory (USAEC Report ORNL-3970, 1966), a satisfactory solution to this problem was found in brazing with a new palladium-base brazing alloy.

The new material, melting below 1250°C, is based on the well-known 60 per cent Pd-40 per cent Ni brazing alloy to which 5 per cent chromium was added at the expense of nickel. Palladium was chosen as the basis of the new alloy because of its relatively low thermal neutron cross section (eight barns) and its good resistance to the corrosive action of molten salts; chromium, which is one of the carbide forming elements, was added to make the alloy capable of wetting graphite.

As was to be expected, the 60 Pd-35Ni-5 Cr alloy exhibited good wetting properties on graphite, molybdenum and tungsten. Lap joints made with this alloy between graphite and molybdenum parts in a vacuum furnace at 1250°C were defect-free not only in the as-brazed condition but also after thermal cycling tests (ten cycles between 700°C and room temperature). A 1000 hours test in a molten LiF-Be_2F_2-ZrF_4-ThF_4-UF_4 mixture at 700°C produced only a slight surface roughening of the brazing alloy.

Surprisingly, no cracking – which often occurs in graphite-metal brazed joints due to differential thermal expansion/contraction of the metallic and non-metallic parts – was observed in this case. This was attributed to the fact that the thermal expansion coefficient of molybdenum is only slightly larger than that of graphite. It is claimed, in fact, that by using molybdenum inserts, or so-called 'transition' pieces, crack-free joints can be made with the Pd-Ni-Cr alloy between graphite and metals with high thermal expansion coefficients.

Although the new alloy was developed as a special purpose material, there is no doubt that palladium-base alloys of this kind would prove useful in general engineering applications in which a high strength and good resistance to corrosion and oxidation at both room and elevated temperatures are important considerations.

M.H.S.