temperature regions of the apparatus involved where the mechanical demands imposed will be less severe. Alternative methods of joining such as resistance welding, electron beam welding and high temperature brazing are now being assessed on a laboratory basis.

During most of its working life high temperature platinum and rhodium-platinum apparatus of the normal type operates in the tertiary stages of creep and within such a context it is natural to expect and to tolerate considerable sagging and distortion. Dispersion strengthened platinum does not distort to the same extent. The linear elongations which occur before failure at 1400°C are usually about 1½ per cent and in this respect dispersion strengthened platinum behaves like the more conventional materials of engineering construction.

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Platinum in Austenitic Stainless Steel

The effects of adding 0.1 to 3.0 per cent of platinum to 18–12 austenitic stainless steel on the corrosion behaviour of the steel in superheated steam, normal sulphuric acid, and boiling magnesium chloride solutions have been studied in the course of a U.S./Euratom research and development programme carried out in Paris under the direction of Professor G. Chaudron (1).

Electropolished samples were maintained in an autoclave for 1000 hours in superheated steam at 500°C and 50 kg/cm^2 (710 lb/in.^{2}). Addition of 3 per cent of platinum to a high purity steel containing 20 p.p.m. of carbon reduced the amount of oxide formation in these circumstances dramatically, the gain in weight being reduced from 122 to 9 mg/dm^2. In subsequent tests on an industrial vacuum-cast steel containing 90 to 100 p.p.m. of carbon, maintained for six days in superheated steam at 600°C and 70 kg/cm^2 (995 lb/in.^{2}), the corrosion rate of 125 mg/dm was reduced about 20 per cent by the addition of 1 per cent of platinum.

The corrosion of platinum-containing stainless steels in sulphuric acid has been the subject of several studies in the past and the results of these are broadly confirmed by potentiokinetic observations here reported in air-free normal sulphuric acid at 25°C. The hydrogen overvoltage, although unaffected by the addition of 0.1 per cent of platinum to the steel, is considerably reduced by 1.0 per cent of platinum.

In these environments the increased corrosion resistance of the platinum-bearing steels is accompanied by changes in the character of the surface films. On commercial stainless steels, the films consist of two layers of nearly equal thickness, the outer one being crystallised and relatively soft and the inner being much more compact, harder, and more corrosion resistant. In steels of low carbon content, the inner layer becomes subject to intergranular oxidation, but platinum additions yield a thinner and perhaps tougher and more protective inner film, quite free from a tendency to intergranular oxidation.

In boiling magnesium chloride, the film formation due to platinum additions induces passivation (presumably reducing overall corrosion) but increases the tendency to stress corrosion (perhaps at grain-boundary discontinuities). In samples stressed at 35 kg/mm^2, the life was reduced from six hours to three hours by 0.1 per cent, and to one hour by 1.0 per cent of platinum.

It should perhaps be recorded that a brief note in the report disclaims the implication that the effects of platinum additions are confined to improving the protective nature of the surface films—the possibility that they may also improve the inherent corrosion resistance of austenite is not excluded.

J. C. C.

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