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Palladium-Modified Aluminide Coatings

Over the past decade progress in the development of platinum-modified aluminide coatings suitable for the protection of gas turbine engine components against high temperature oxidation and hot corrosion has been recorded in this journal on a number of occasions (1–3). Such coatings may, however, include a brittle platinum-aluminium phase which could decrease the fatigue life of coated components. There is no brittle phase in the corresponding region of the palladium-aluminium phase diagram and, for this and other reasons, researchers at the Office National d'Etudes et de Recherches Aérospatiales and the Laboratoire de Chimie du Solide Minéral, CNRS, France, have recently reported on an investigation of palladium-modified aluminide coatings as potential low cost, high performance alternatives to platinum-modified aluminides (4).

The diffusion of hydrogen into a palladium coating can result in embrittlement and blistering, but methods of preventing this have been developed. One involves predepositing and diffusion vacuum annealing a palladium-transition metal alloy onto the substrate prior to the aluminising treatment. If the second component is an element, in which the solubility of hydrogen is much lower than in palladium, such as nickel, cobalt or chromium, the predeposited layer produced prevents gas intake during the aluminising process. Alternatively, a duplex predeposit consisting of a 8 μm pure palladium underlayer is coated with 2–3 μm of a suitable transition metal which serves as a barrier to the diffusion of hydrogen. It is suggested that electroless deposition is a possible way of coating complex shaped components.

The results of cyclic oxidation tests at 1100°C and hot corrosion tests at 850°C, carried out on coated Inconel 100 coupons, show that palladium-containing coatings have far better resistance than conventional aluminide coated samples. Field trials are now taking place.

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