10 R. G. Hurley, W. L. H. Watkins and R. C. Griffis, "Characterisation of Automotive Catalysts Exposed to the Fuel Additive MMT", SAE Paper 890582
11 W. B. Williamson, J. Perry, R. I. Goss, H. S. Gandhi and R. E. Beason, SAE Paper 841406
12 G. C. Joy, F. S. Molinaro and E. H. Homeier, SAE Paper 852099
13 Y. Niura and K. Ohkubo, "Phosphorus Compound Effects on Catalyst Deterioration and Remedies", SAE Paper 852220
14 P. S. Brett, A. L. Neville, W. H. Preston and J. Williamson, "An Investigation into Lubricant Related Poisoning of Automotive Three-way Catalysts and Lambda Sensors", SAE Paper 890490

Protective Coatings for Turbine Components

The effects of platinum metal additions on the properties of coatings used to protect gas turbine components have been considered here previously, most recently in a brief alerting item published last July (1). Further additions to the literature have since appeared.

One of the keynote papers presented at the European Colloquium on the role of active elements in the oxidation behaviour of high temperature metals and alloys, organised by the Commission of the European Communities and held at the Institute of Advanced Materials, Petten, considered the effects of platinum on the oxidation and hot corrosion of coatings. A group of scientists from the University of Pittsburgh presented the results of their investigation of diffusion aluminide coatings on nickel base superalloys (2). Such coatings can be degraded by several different processes, and their aims were to identify the types of degradation that could be retarded by the addition of platinum to the coating, and then to establish the mechanisms by which this advantage was obtained.

They concluded that the addition of platinum to diffusion aluminide coatings improved the resistance of these coatings to the main types of corrosion encountered in high temperature service, namely cyclic oxidation, high temperature hot corrosion and low temperature hot corrosion. In the case of the last of these the addition of platinum was not as effective as for the other two, but it still gave an improvement. For effective protection, the surface of the aluminide coating had to be predominantly platinum and aluminium, and the platinum serves to promote the selective oxidation of the aluminium.

The results of a study undertaken at Solar Turbines Incorporated to evaluate the relative corrosion resistance of a range of commercially available diffusion and overlay coatings, typical of those used to protect the base metal superalloys from which gas turbine components are made, have been reported (3). The evaluation of two nickel base (MAR-M421 and IN-738LC) and one cobalt base (FS-414) superalloys was carried out after furnace testing with synthetic sea salt deposits at 704 and 899°C, temperatures regarded as crucial for low temperature and high temperature hot corrosion, respectively.

The work indicated that a silicon aluminide and platinum-chromium aluminide afforded the best protection. Recommendations for coating selection to provide optimised corrosion resistance under various conditions are tabulated.

References

1 Anon, *Platinum Metals Rev.*, 1989, **33**, (3), 127
2 J. Schaeffer, G. M. Kim, G. H. Meier and F. S. Pettit, "The Effects of Precious Metals on the Oxidation and Hot Corrosion of Coatings", in "The Role of Active Elements in the Oxidation Behaviour of High Temperature Metals and Alloys", ed. E. Lang, Elsevier, London, 1989, pp. 231-267
3 M. van Roode and L. Hsu, *Surf. Coat. Technol.*, 1989, **37**, (4), 461-481

Meter for Food Samples

With the recent application of ohmic heating to food processing, during which an alternating current is passed through the food and sufficient heat is generated in situ to sterilise it, there has arisen a need to establish the electrical conductivity of food samples. For economic reasons, processing is usually carried out at 50 Hz, the frequency of the electricity power supply. However it is known that for foods with a high moisture content the electrical conductivity may be dependent on the frequency.

To support a study of the ohmic heating of foods being undertaken at the University of Cambridge, test equipment has been designed which enables the rapid measurement of the conductivity of food samples (F. R. G. Mitchell and A. A. P. de Alwis, *J. Phys. E: Sci. Instrum.*, 1989, **22**, (8), 554-556). The conductance meter cell and the associated electronic unit are described. Between experiments effective cleaning of the cell is essential, and it incorporates two 10 mm diameter platinised electrodes, between which the food is clamped.