nitrogen oxide formation. From an environmental point of view it is now clear that the performance of an engine must be evaluated for all the emissions it produces under all operating conditions.

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References

1 For example: G. J. K. Acres and B. J. Cooper, *Platinum Metals Rev.*, 1972, **16**, (3), 74; G. J. K. Acres, B. S. Cooper and G. L. Matlack, ibid., 1973, **17**, (3), 82; M. Shelef and H. S. Gandhi, ibid., 1974, **18**, (1), 2; B. J. Cooper, E. Shutt and P. Oser, ibid., 1976, **20**, (2), 38; A. F. Diwell and B. Harrison, ibid., 1981, **25**, (4), 142

2 M. P. Walsh, *Platinum Metals Rev.*, 1986, **30**, (3), 106

3 House of Lords Select Committee on the European Communities, "Lead in Petrol and Vehicle Emissions", February 1985

Monitoring Impurities in Water

A TECHNIQUE BASED UPON THE HIGH ADSORPTIVITY OF PLATINUM

The widespread pollution of water, be it in the form of rain, groundwater, rivers, lakes, coastal waters or the oceans, is one of the most important environmental challenges facing the world today. A complete solution will only come about when major changes are made to the many contributing factors, which include: mineral extraction and processing, energy conversion and use, industrial manufacturing, intensive methods of farming and sewage disposal. In the meantime many immediate problems must be faced and none, perhaps, is more urgent than the need to analyse accurately and rapidly the impurities in reservoirs, to determine if the water is fit to drink.

A recent communication from researchers at the A. N. Frumkin Institute of Electrochemistry, of the Academy of Sciences of the U.S.S.R., considers in some detail three electrochemical methods of determining impurities in water, and compares them with established methods (V. E. Kazarinov, V. S. Bagotzky, Yu. B. Vassiliev and O. A. Khazova, *J. Appl. Electrochem.*, 1988, **18**, (3), 347–356).

The most suitable of the methods tested is based upon the fact that platinum readily adsorbs organic and toxic metals. Thus the amount of such impurities can be calculated from the degree of poisoning they cause, as determined from the decrease in the hydrogen adsorption capability of a platinum microelectrode. Measurements were made using a conventional three-electrode cell, the working electrode being 2 to 3 mm of 0.5 mm diameter platinum wire and the auxiliary electrode a 1 cm square of platinum gauze. In acid solutions a mercuric sulphate reference electrode may be used. Quantitative determination of individual substances is only possible in limited instances, but organic impurities may be differentiated according to their oxidisability into easy-, medium- and difficult-to-oxidise categories.

The proposed electrochemical method of impurity determination is highly suitable for automatic water monitoring systems, and a number of analysers have been devised.

Oxidation Resistant Iridium Alloys

A requirement for aerospace components which are capable of serving for sustained periods of time at high temperatures has continued to focus attention on the need for suitable materials, and a recently reported study by K. N. Lee and W. L. Worrell of the University of Pennsylvania has identified iridium-containing alloys as promising high temperature oxidation resistant materials. ("The Oxidation of Iridium-Aluminum and Iridium-Hafnium Alloys at 1550°C and 1640°C", Extended Abstracts, Electrochemical Society, Spring Meeting 1988, Vol. **88–1**, Abstr. No. 281, p. 423)

It has long been known that iridium loses weight at a significant rate when it is heated to temperatures in excess of about 1100°C. Now the oxidation behaviour of arc melted iridium alloys containing 5 to 80 atomic per cent aluminium or hafnium has been examined and it has been shown that the formation of gaseous iridium oxides can be restricted on appropriate alloys by the development of a protective oxide scale on the surface. However, if the amount of the second element is too low, any oxide scale which forms is porous and permits the passage of both oxygen and gaseous iridium oxides.

Iridium-aluminium alloys containing 60 to 80 atomic per cent aluminium form a continuous non-porous oxide layer which shows protective oxidation behaviour even when the alloy is exposed to oxygen at a temperature of 1550°C.