drives development activities. This was highlighted by the papers which considered improved cold-start performance and in the attention given to catalyst deactivation mechanisms, by temperature and/or poisoning.

The application of noble metal catalysts for diesel emissions control continues to be a major part of the Congress, as are papers considering the substitution of platinum or rhodium by palladium. C.J., R.D.O'S.

# Platinum Group Metals in 1991

**The Ayrton Metals Platinum Yearbook 1992**

BY B. H. NATHAN, Woodhead Publishing, Cambridge, 1992, 195 pages,
ISBN 1–85573–084–7, £45.00

Following in the footsteps of the "Platinum Yearbook 1991", this new publication sets out to present a panorama of the many events that influenced the market for platinum group metals during 1991. These are covered in general terms, and in considerable detail in Chapters 1 and 2, respectively, both being supported by statistical data. A number of these events were industrial announcements or scientific reports, but most were not, and the whole makes fascinating reading, perhaps especially for those whose involvement with the platinum group metals does not embrace metal dealing.

While the detailed review of 1991 occupies ninety-nine pages, the prospects for the six platinum group metals in 1992 are contained in some five pages. It is suggested that of these metals, "platinum has the best prospects for a sound and widely-based recovery in 1992".

A chapter on the Tokyo Commodity Exchange by Kazuhiko Noma is complemented by two further chapters by Brian Nathan, in which the dealing arrangements for the London Platinum and Palladium Market and the New York Mercantile Exchange are considered.

An interesting overview of fuel cells and their state of development for stationary and transportation applications is given by Jocelyn Cloete. Once again, it is concluded that proof of phosphoric acid fuel cell technology will be provided in the imminent future, from the results of on-going field tests.

In the penultimate chapter Peter Gaylard outlines the lengthy, complex and expensive processes that are necessary to extract the platinum group metals from the limited number of major ore bodies in which they occur, in minute quantities, and to then refine them to the required high purity levels. In response to the needs of the market, and to a greater awareness of environmental considerations, improved recovery processes have been introduced in recent years.

A brief chapter on the history of platinum and the platinum group metals, based in part upon "A History of Platinum and its Allied Metals" by D. McDonald and L. B. Hunt, concludes this informative and interesting book which will serve as more than a record of the events of the past year. I.E.C.

# Platinum Improves Protective Coatings

Gas turbine engines are widely used for both stationary and mobile applications, and the turbine blades, which are highly stressed during service, are required to operate at high temperatures in oxidising atmospheres which may be contaminated with corrosive fuel residues and ingested salts. To some extent nickel-based superalloy turbine components can be protected against both oxidation and hot corrosion by nickel aluminide diffusion coatings, but in more severe environments the protective coating may break down, reducing service life.

The development of platinum-containing coating systems has been reported here on several occasions over the past decade as materials scientists have sought both to improve the protection given by such coatings and to establish the precise role of the platinum in the process.

A further contribution on the subject has been published recently (H. M. Tawancy, N. M. Abbas and T. N. Rhys-Jones, *Surf. Coat. Technol.*, 1991, **49**, (1–3), 1–7).

Following an investigation of the microstructure of platinum-modified aluminide coatings on selected nickel-based superalloys, the authors identify a number of ways by which the platinum improves the protective ability of the coating. Oxidation behaviour depends upon the composition of the superalloy substrate, especially on its rare earth content.