made by stoichiometric reactions that involve a noble metal salt or organometallic complex, the volume is small. A wide variety of chemical reactions employed in the production of large volume chemicals are, however, dependent on the use of solid or supported heterogeneous or homogeneous platinum metals catalysts. Despite the reluctance of catalyst users and suppliers to discuss present operations and future developments, it is believed that the drive for lower cost routes to existing products, new processes to yield new products, and the need for all processes to be environmentally compatible, will result in further growth in platinum metals catalysis.

Environmental Protection

The importance of environmental considerations was addressed in a session devoted to traction and stationary engine emissions. J. J. Mooney of Engelhard discussed the contribution that platinum metals catalysts could now make to the clean-up of diesel engine emissions from heavy duty trucks and buses. An overview of the origin, type and catalytic control of emissions from diesel powered cars was then presented by B. H. Engler of Degussa who suggested that forty-five per cent of diesel engined cars registered in 1992 will be fitted with a flow-through oxidation catalyst based upon the platinum metals.

Increasingly stringent emission control legislation is again being pioneered by the State of California. With others expected to follow, industry is preparing for the new situation. The requirement for new platinum catalyst formulations for gasoline-fuelled vehicles, in order to achieve faster light-off, survive hotter running conditions and achieve cost-effective emissions control over longer periods of time, were highlighted by B. J. Cooper of Johnson Matthey. Before the end of this decade the emission control requirements of two-stroke and flexible fuelled traction engines will have to be addressed.

The reduction of anthropogenic emissions from stationary sources was considered by J. Wiehl of W. C. Heraeus. These sources may be classified into combustion and non-combustion processes, but within each group there are a variety of sources and of noxious pollutants. Platinum metals have demonstrated success in converting such harmful gases into environmentally compatible products but the many different processes and types of emission necessitate careful design of the catalyst and the emission control system.

No conference considering uses of the platinum metals over the next decade would be complete without a major contribution on fuel cells, a topic that is covered frequently in this journal. The many benefits that can result from the use of fuel cells, the crucial role of platinum in fuel cell technology and forecasts of potential requirements for platinum were presented and discussed by M. A. B. Nurdin of the International Platinum Association. Remarkable technical achievements have already been demonstrated by fuel cells; their general acceptance will depend, however, on many social, economic and environmental factors. The World Fuel Cell Council has been established to ensure that opinion formers and decision takers become better informed of the many benefits that fuel cells offer, so creating a situation favourable to fuel cell commercialisation.

The success of this meeting, the first precious metals conference to be held under the auspices of the European Association of Metals, will encourage the organisers to repeat the event in future years.

Ruthenium Dioxide Thermometers

The use of ruthenium dioxide based thick-film resistors as secondary thermometers at temperature below 1 K is well known, but to-date their sensitivities have been less than those of comparable commercial germanium thermometers. Now researchers at the Institute of Experimental Physics and at the Technical University Košice, Slovakia, report the development of ruthenium dioxide thermometers suitable for temperatures in the millikelvin range (I. Bat'ko, M. Somora, D. Vanicky and K. Flachbart, *Cryogenics*, 1992, **32**, (12), 1167–1168).

Films about 15μm thick were screen printed onto alumina substrates using commercially available ruthenium dioxide pastes. Provided they are designed for the purpose and a suitable paste is used, stable thermometers of high sensitivity and with a temperature reproducibility of within 1 per cent can be prepared from ruthenium dioxide films, for use at temperatures below 1 K.