

# Johnson Matthey Technology Worldwide

## PLATINUM METALS FULFIL EVOLVING INDUSTRIAL NEEDS

An exhibition held at the Johnson Matthey Research Centre in May included demonstrations of recent research in advanced areas of technology. Some 400 visitors, mainly leading industrialists, academics and government advisors from the U.K. and overseas, attended. Appropriately for the organisation that is the sole marketing agent for the Rustenburg Platinum Mines, many of the activities involved the application of the platinum metals and a selection of these are featured below.

While there is no shortage of platinum metals within the earth's crust their concentration in ore bodies is generally low, and the Bushveld Igneous Complex is the only major area in the world where platinum is mined as the primary product. With a growing understanding of the mineralogy of these platinum-bearing rocks, and of the refining operations, the efficiencies of the extraction and separation processes are being improved and lead times reduced in collaboration with Rustenburg Platinum Mines. In addition novel methods of secondary refining are being investigated, particularly for emission control catalysts and electronic scrap.

### Instantaneous Electricity

One of the most spectacular exhibits was a demonstration of a fuel cell on loan from United Technologies International, the leading organisation in fuel cell development. This unit was the precursor to the power plants used on the recent U.S. Space Shuttle flights, and it produces 12 kW of electricity by combining hydrogen and oxygen at platinum catalysed electrodes. A major advantage of this means of power generation is its high efficiency of conversion of chemical energy to electricity, and its ability to respond very quickly to large changes in load. It is also pollution free and silent in operation. These properties have led to the development in the U.S.A. and Japan of larger fuel cells for grid electricity generation

(megawatt scale), particularly in high population areas, and combined heat and power systems (kilowatt scale) for on-site applications.

Many platinum metals catalytic systems and their application in energy conservation, pollution control and chemical processing are being examined. Following the successful control of emissions from automobiles fuelled with lead-free gasoline, current work is continuing on the development of both lead tolerant and diesel exhaust control catalysts. A concept that combines the economic use of fuel with low emission of exhaust pollutants is a catalytic engine where combustion is achieved on a platinum catalyst sited in the combustion chamber of an internal combustion engine. Another feature of this engine is that it can run on a variety of fuels including methanol, a product of the chemical industry rather than the oilfields.

A continuing requirement for improved structural materials is resulting in further developments of alloys containing, or coated with, platinum metals. Judiciously employed, the platinum metals can enhance the corrosion resistance of base metals thereby extending their application and durability in hostile environments, and a variety of materials and processes are currently under investigation. While the platinum metals increasingly account for only a small part of the total material used in a particular product, there are still situations where a platinum metal alone can serve. A large iridium crucible 20 cm diameter and 20 cm high, to be used during the melting of semiconductor materials for the electronics industry, ably illustrated this point.

The platinum metals are also being actively investigated for a growing number of important medical applications.

Clearly, the Johnson Matthey commitment to progress in platinum technology is thriving, in keeping with the foreseen needs of industry throughout the world.

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