



Other PGM

Other Platinum Group Metals

Rhodium

Net purchases of rhodium rose by 6 per cent in 2003 to 627,000 oz. Overall use of the metal in autocatalysts grew strongly as average rhodium levels increased ahead of tighter emissions legislation. The level of purchases made by auto makers, however, was dampened by the continued use of rhodium stocks. Demand from the glass industry fell as the rate of capacity expansion slowed and manufacturers reduced their overall pgm holdings. Demand for rhodium-based chemical catalysts softened.

Autocatalyst

The global auto industry purchased a total of 665,000 oz of rhodium in 2003, an increase of 11 per cent (66,000 oz) compared with the year before. Actual use of the metal in autocatalyst manufacture, however, was higher than this as certain US auto companies continued to deplete their rhodium inventories, consequently cutting their purchasing requirements.

The growth in use of rhodium in autocatalysts was greatest in the USA and Japan. Tighter emissions regulations are due to be introduced in each country (from 2004 onwards in the USA and in 2005 in Japan), and in both cases the permissible levels of NOx emissions will be cut substantially. Rhodium is a particularly effective catalyst for the conversion of NOx to nitrogen and so auto makers have increased average rhodium loading levels in many instances.

The increase in average rhodium loading levels in the USA in 2003 was also a result of the intensive platinum and palladium thrifting programmes that US car companies adopted. In many catalyst systems a small rise in the rhodium content can help to maintain emissions conversion rates when platinum or palladium loadings are reduced. This is cost-effective as rhodium is used in much smaller proportions than platinum and palladium. The advantage of using rhodium was reinforced by the fall in the price of the metal from over \$2,000 per oz in 2001 to \$500 in 2003.

European auto manufacturers also increased average gasoline vehicle rhodium loading levels in 2003, both to meet the Euro IV emissions standards that come into force from 2005 vehicle models onwards, and to enable thrifting of platinum and palladium. However, the effects of higher loadings on rhodium demand were outweighed by a 7 per cent drop in production of gasoline cars in 2003 – the net

result being that purchases of rhodium by car companies weakened.

Demand for rhodium in the Rest of the World increased by 8 per cent in 2003, primarily driven by the rapid expansion of car manufacturing and sales in China and India.

The recovery of rhodium from scrapped autocatalysts jumped by 24 per cent to 123,000 oz in 2003. In common with platinum and palladium, the largest rise was seen in the USA, where the volume of rhodium recovered surged by 30 per cent. The rapid rise in the platinum price helped to boost overall collection and recycling rates for scrapped catalysts. In addition, the average rhodium content of catalysts being recycled increased, a reflection of the move towards higher rhodium loading levels that occurred during the mid-1990s as new emissions legislation (targeting NOx in particular) was introduced.

Recovery of rhodium in Europe also grew strongly in 2003, albeit from a much smaller base. The increase was due to a rise in recovery rates, driven by the imminent introduction of new recycling legislation, as well as a similar rise in average rhodium loading levels as was seen in the USA.

Other

Purchases of rhodium for use in chemical, glass and other applications weakened by 7,000 oz to 85,000 oz in 2003. Demand for the metal for the manufacture of catalysts for the chemicals industry and platinum alloys for the glass industry fell, while use of rhodium in electrical and other applications was little changed.

Demand for rhodium from the chemicals industry slipped by 5 per cent to 37,000 oz in 2003. The decline was largely due to a reduced rate of capacity expansion for bulk chemicals such as oxo-alcohols and the conversion of a number of acetic acid plants from rhodium-based catalyst technology to iridium-ruthenium catalysts. Consumption of rhodium in platinum alloys for use in nitric acid gauze softened.

Glass manufacturers purchased approximately 31,000 oz of rhodium in 2003, 16 per cent less than the year before. Demand for rhodium was affected by the high price of platinum, which led glass companies to minimise their holding of rhodium-platinum alloy components, and to increase their sales of scrap items back to refiners. In addition, although new glass manufacturing capacity continued to be added in Asia, the rate of expansion was lower than in 2002.

Rhodium Supply and Demand '000 oz		
	2002	2003
Supply		
South Africa	490	545
Russia	90	140
North America	25	20
Others	10	15
Total Supply	615	720
Demand		
Autocatalyst: gross	599	665
recovery	(99)	(123)
Chemical	39	37
Electrical	6	6
Glass	37	31
Other	10	11
Total Demand	592	627
Movements in Stocks	23	93



The manufacture of hard disks provided a growing market for ruthenium in 2003.





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Ruthenium Demand by Application '000 oz		
	2002	2003
Chemical	101	141
Electrochemical	116	120
Electronics	140	157
Other	63	78
Total	420	496



Ruthenium & Iridium

Purchases of ruthenium surged by 18 per cent in 2003 to 496,000 oz. Use of the metal in chemical catalyst applications jumped by 40,000 oz and demand from the electronics industry also grew strongly. Demand for iridium also recovered rising by 30 per cent to 103,000 oz. The growth was driven by increased use of iridium-based catalysts in the chemicals industry and a turn-around in orders for iridium crucibles from the electronics sector.

Demand for ruthenium for use in chemical process catalysts jumped by almost 40 per cent in 2003 to 141,000 oz. Much of the increase was driven by expansion of acetic acid manufacturing capacity. The relatively new Cativa® acetic acid manufacturing technology utilises an iridium-ruthenium catalyst. Because the technology offers a number of technical benefits, it was installed in several new plants and was also retrofitted in some existing facilities. Demand for ruthenium-based products used in proprietary chemical applications also increased in 2003.

Consumption of ruthenium in resistors and other electronic components improved by 12 per cent last year, rising to 157,000 oz. In 2002 an overhang of component inventories and excess stocks of ruthenium pastes dampened purchases of the metal but these had been depleted by 2003. During the year demand for consumer and automotive electronics increased significantly, driving a rebound in component manufacturing rates.

Electronic demand for ruthenium also benefited from growing use of the metal in hard disk drives. The addition of a very thin layer of ruthenium to the magnetic coating of hard disks can substantially increase data storage density. As the technology began

to penetrate the hard disk sector in 2003, demand for ruthenium sputtering targets increased.

Electrochemical demand for ruthenium increased moderately in 2003 to 120,000 oz. Ruthenium is used as an electrode coating in older chlor-alkali plants utilising the mercury or diaphragm process. Electrode recoating programmes at several of these large plants boosted ruthenium demand last year. Over the longer term, however, ruthenium demand is expected to weaken as more plants switch to modern membrane technology that uses ruthenium-iridium electrode coatings rather than ruthenium only.

Demand for ruthenium-titanium alloys used in the manufacture of corrosion-resistant pipes was little changed in 2003, and consumption of ruthenium in jewellery alloys was also broadly stable.

As with ruthenium, the spread of the Cativa® acetic acid manufacturing technology boosted demand for iridium in 2003, total chemical industry demand doubling to 20,000 oz. Electrochemical demand for iridium, however, was unchanged as electrode recoating programmes at plants using membrane technology progressed steadily.

Total electronics demand for iridium increased to 32,000 oz in 2003 as the upturn in the global electronics industry began to feed through to improved demand for iridium crucibles, particularly in Asia. The crucibles are used in the manufacture of high purity crystals, which form the basis of components used in applications such as mobile telecommunications hardware, and medical lasers and scanners.

Consumption of iridium in the manufacture of high performance spark plugs grew but the sector remains small in volume terms. Use of the metal in most other applications, such as jewellery alloys and cathodic protection, was broadly flat.

Iridium Demand by Application '000 oz		
	2002	2003
Chemical	10	20
Electrochemical	23	23
Electronics	21	32
Other	25	28
Total	79	103



Other PGM Supplies

Supplies of rhodium climbed by 17 per cent in 2003 to 720,000 oz. South African shipments of the metal expanded by more than 11 per cent to 545,000 oz, reflecting both increased mine production of pgm ore, plus an increase in the proportion of UG2 ore mined. The average rhodium grade of UG2 is typically double that of the Merensky Reef. Russian sales of rhodium also grew substantially in 2003, rising by 50,000 oz to an estimated 140,000 oz.

The increase in availability of rhodium outstripped the rise in demand for the metal and the market moved further into surplus during the year. This was reflected in the price, which fell from a peak of \$650 in January to \$500 by the middle of the year.

The situation was similar for both iridium and ruthenium; rising supplies from South Africa were more than sufficient to meet improved demand for the two metals.