

OTHER PLATINUM GROUP METALS

RHODIUM

Net rhodium demand grew by 1.2 per cent in 2006 to a record level of 837,000 oz, boosted by increasing uptake of the metal for use in automotive exhaust catalysts. Demand for rhodium from other applications, principally its use in the manufacturing of glass, rose marginally too. Although supply from South Africa climbed by 10 per cent and more rhodium was recovered from end-of-life vehicles than in 2005, the rhodium market remained in deficit.

Autocatalyst

Demand for rhodium in autocatalyst production rose to 868,000 oz in 2006; a significant increase in Asian demand outweighed decreases in metal purchases

in Europe and North America. We believe that a small number of manufacturers also added to their rhodium stocks, boosting demand to this level.

Rhodium consumption in the European autocatalyst sector dropped to 167,000 oz last year. 2006 saw the introduction of the new Euro IV emissions legislation to all new light duty vehicles, something which might have been expected to raise rhodium use. However, high metal prices encouraged a wary attitude towards this metal and the industry worked hard to reduce loadings. As importantly, the diesel engine's success continued to squeeze the number of gasoline-fuelled vehicles being

made. The number of rhodium-containing three-way catalysts being produced decreased, dragging rhodium consumption 4.5 per cent lower.

The North American market saw a similar contraction in rhodium purchases. Weak final quarter production saw manufacturing volumes fall slightly over the year. Average catalyst size fell too with the consequence that rhodium demand dropped to 287,000 oz.

Significant growth in rhodium purchases in Asia offset this. Japanese light duty vehicle production rose in 2006. Many of these automobiles were destined for export and had larger engines on average than those built for domestic sale. The growing number of catalysts and the rise in their average size increased rhodium demand by 18 per cent to 260,000 oz.

In other regions, vehicle production grew at a much faster rate than in the traditional manufacturing areas, forcing rhodium consumption higher. Double digit growth in China, now a major market in its own right, continued to draw in more rhodium for autocatalyst manufacture. Tighter legislation in other markets also raised rhodium autocatalyst loadings.

The amount of rhodium recovered from spent autocatalysts increased by a quarter to 170,000 oz in 2006. Although a high rhodium price is financially attractive to recyclers, the prices seen in 2006 had only a small positive effect on rhodium recovery. Other factors were more important: the number of vehicles recycled and the rhodium content of the catalysts on these vehicles both increased compared to 2005.

The scale of recovery of autocatalysts in Japan continues to be limited by the export of second-hand vehicles to other Asian countries. However, the amount of rhodium reclaimed in Europe and North America is rising, largely due to higher catalyst loadings on cars built in the mid-to-late 1990s. The net effect was an increase of 33,000 oz in metal returned to the market.

Other Demand

Demand from the glass industry was stronger in 2006 than we had previously expected, rising by 3,000 oz to 60,000 oz. This was for flat panel display glass and although there appears to be overcapacity for LCD glass manufacture, 2006 still saw significant expansions with new plants being constructed in Asia, driving rhodium demand higher. The market share of flat panel displays for televisions and computers continues to increase and we expect further commissioning of glass furnaces for these products in 2007, adding to rhodium demand.

In the chemical sector, rhodium is used as a catalyst, including in the manufacture of acetic acid, a commodity chemical used in the production of a number of polymers and other products. 2006 saw some limited expansion, adding slightly to demand.

Rhodium Supply and Demand		2005	2006
		'000 oz	
Supply			
South Africa		627	690
Russia		90	95
North America		20	20
Others		17	19
Total Supply		754	824
Demand			
Autocatalyst:	gross	829	868
	recovery	(137)	(170)
Chemical		48	48
Electrical		10	9
Glass		57	60
Other		20	22
Total Demand		827	837
Movements in Stocks		(73)	(13)



RUTHENIUM & IRIIDIUM

Following a year of strong growth in 2005, ruthenium demand grew again in 2006, rising 45 per cent to a record level of 1.29 million oz. The iridium market was rather slower moving and demand only grew by 2 per cent to 131,000 oz.

The electronics industry generated most of the increase in ruthenium demand, with substantial uptake for use in chip resistors, flat screen displays and hard

disks. Net electronics demand for metal shot 78 per cent higher to 689,000 oz as a result.

Ruthenium paste is used in chip resistors and also in flat screen plasma display panels (PDP). Although sales of the latter have been growing rapidly, manufacturers have moved to minimise ruthenium usage,

leaving metal consumption lower.

In contrast, the use of ruthenium in the manufacture of hard disks has become significant. Although ruthenium has been used in disks before, it is deposited on newer types of hard disks to increase memory storage capacity. The major producers switched much of their production over to this new technology in 2006, leading to a surge in demand for ruthenium.

A large proportion of the metal used in the hard disk manufacturing process is recycled for re-supply to the hard disk producer and our demand estimate takes account of this. More information on the use of ruthenium in computer hard disks can be found in the special feature on pages 40-41.

We have upgraded chemical sector demand to reflect usage in a small number of processes including acetic acid manufacture and polymer production.

Demand rose from 164,000 oz in 2005 to 222,000 oz last year.

In other applications, there has been sensitivity to the increased price of ruthenium. It is used as a minor component in some platinum jewellery alloys and the high price encouraged North American manufacturers to minimise the use of this metal,

particularly at a time of record platinum prices.

Iridium demand rose slightly during 2006. Its use in process catalysts, again including the production of acetic acid, climbed to 33,000 oz. In contrast, purchases for a range of electrochemical processes were flat. Demand for iridium crucibles to produce high-quality crystals for electronics fell back to 28,000 oz.

Outside these major segments, the use of iridium in automotive spark plugs continued to rise, sending demand in this application slowly higher as iridium took an increasing share of the top end of the market. The use of iridium in a range of other minor end uses, including thermocouples, fell slightly in 2006.

Ruthenium Demand by Application '000 oz		
	2005	2006
Chemical	164	222
Electrochemical	96	137
Electronics	582	874
Other	49	55
Total Demand	891	1,289



RHODIUM SUPPLIES

Global rhodium supplies grew by 9 per cent in 2006, reaching 824,000 oz. Most of the increase in primary production was due to the expansion last year in South Africa. A greater proportion of platinum extraction was from the exploitation of UG2 ore which typically has a higher rhodium and minor pgm content than Merensky reef. This growth came despite the significant release of pipeline stock by Anglo Platinum in late 2005, which added to that year's rhodium supplies.

We believe that production of rhodium at Norilsk rose marginally, in line with the increasing amounts of palladium produced in 2006. There are strong indications that this total was augmented further by some sales of Russian State stocks to give an annual supply of 95,000 oz of rhodium from Russia, 5,000 oz above the 2005 figure. Rhodium supply from other regions including Zimbabwe rose marginally too.

RUTHENIUM & IRIIDIUM SUPPLIES

The increasing output of platinum from South Africa was accompanied by a rise in primary ruthenium and iridium production. Although not all primary producers report production or sales figures for these metals, it is clear that some of the ruthenium currently being supplied is from stockpiles built-up over previous years. Primary production of iridium, by comparison, is sufficient to meet industrial demand and price increases may have been due to speculative activity.

Iridium Demand by Application '000 oz		
	2005	2006
Chemical	26	33
Electrochemical	28	34
Electronics	32	28
Other	42	36
Total Demand	128	131

