



# Other Platinum Group Metals

## Rhodium

Global demand for rhodium is forecast to rise by 6 per cent in 2003, reaching a total of 641,000 oz. Use of the metal in autocatalysts in the USA will grow as average rhodium loading levels increase. Demand will also rise in China and elsewhere in Asia in line with escalating car production. However, the growth rate will be tempered by continued use of rhodium stocks by some US-based auto companies. Recovery of rhodium from recycled autocatalysts will also climb. Chemical industry demand is expected to soften slightly.

## Autocatalyst

Auto manufacturers are projected to purchase 673,000 oz of rhodium in 2003, a rise of 64,000 oz on 2002. The underlying use of the metal on autocatalysts will be considerably higher than this as some US auto companies have continued to run down rhodium inventories in lieu of purchasing metal this year. The rate of stock use, however, is expected to fall compared with 2002.

Much of the growth in demand will be due to tightening emissions standards that have necessitated a rise in average rhodium loadings in some regions. In addition, thrifting of platinum and palladium by auto manufacturers has been achieved in part by increasing the use of rhodium in some catalyst formulations. Rising light vehicle sales and production in developing car markets such as China and India will also contribute to the overall expansion of the market.

Several North American-based auto manufacturers have been making strenuous efforts to reduce total pgm loading levels in their catalyst systems for a number of years, and these thrifting programmes have continued throughout 2003. In many instances reductions in platinum and palladium loadings can be achieved by increasing rhodium loadings. This is cost-effective as rhodium is used in much smaller proportions than platinum and palladium. The fall in the price of rhodium from over \$1,000 per oz at the beginning of 2001 to around \$500 by the third quarter of 2003 reinforced its cost-effectiveness.

Tier 2 emissions regulations will start to be phased in on new light-duty vehicles in the USA from 2004 onwards. The regulations require a substantial reduction in NOx emissions. To meet the new NOx standards, particularly on heavier vehicles, some

manufacturers have increased the proportion of rhodium used in their catalyst systems.

In Japan, rhodium loadings have also increased as auto manufacturers have implemented tighter voluntary emissions standards ahead of legislation due to take effect in 2005. The effect on rhodium demand, however, will be moderated somewhat in 2003 by lower light vehicle production.

In Europe, as in the USA, thrifting of palladium and platinum by some manufacturers has been achieved in part by boosting average rhodium loadings. The introduction of Euro IV compliant vehicles, which are required to meet substantially lower NOx emissions standards than their predecessors, has also had a small but positive impact on metal loadings. However, these increases will be offset by the forecast 7 per cent fall in gasoline car production in 2003 and so the net result is expected to be little change in total autocatalyst rhodium demand in the region.

Elsewhere, the spread of more stringent vehicle emissions legislation in China and India, coupled with strong growth in car production throughout much of Asia, is forecast to drive a 14 per cent increase in autocatalyst demand for rhodium.

Recovery of rhodium from recycled autocatalysts is projected to increase by approximately 21 per cent in 2003 to 120,000 oz. Recovery will grow as autocatalyst collection and recycling rates improve in Europe and North America. In addition, overall rhodium loadings increased in the mid-1990s as auto makers in Europe and the USA worked to comply with more stringent NOx emissions limits. As increasing numbers of cars from that period are being scrapped, rhodium recovery levels are rising.

## Other Demand

Demand for rhodium catalysts in the manufacture of bulk chemical intermediates, such as oxo-alcohols and acetic acid, is forecast to drop by 10 per cent this year to 36,000 oz. The year-on-year decline will result from a reduced rate of capacity expansion in the Rest of the World region, coupled with the conversion of a number of acetic acid plants from rhodium-based catalyst technology to iridium-ruthenium catalysts.

Global demand for rhodium-containing alloys used in the glass industry is expected to be little changed in 2003. Similarly, purchases of rhodium-platinum gauze by nitric acid producers, and sales of rhodium-platinum thermocouple wire are also forecast to be stable.

Rhodium Supply and Demand '000 oz		
	2002	2003
<b>Supply</b>		
South Africa	490	520
Russia	90	100
North America	25	21
Others	9	14
<b>Total Supply</b>	<b>614</b>	<b>655</b>
<b>Demand</b>		
Autocatalyst: gross	609	673
recovery	(99)	(120)
Chemical	40	36
Electrical	6	6
Glass	37	36
Other	11	10
<b>Total Demand</b>	<b>604</b>	<b>641</b>
<b>Movements in Stocks</b>	<b>10</b>	<b>14</b>





Other PGM

## Ruthenium & Iridium

Ruthenium demand is forecast to jump by 14 per cent to 461,000 oz in 2003. Strong chemical industry demand for catalysts containing ruthenium will be responsible for much of the increase, while demand for ruthenium pastes from the electronics sector will also improve. Purchases of iridium are forecast to rise by 17 per cent overall to 96,000 oz. Again the growth will be driven by increasing use of the metal in chemical process catalysts; it will also benefit from an upturn in orders for iridium crucibles.

Demand for ruthenium from the chemical process catalyst sector is forecast to surge from 101,000 oz in 2002 to 139,000 oz in 2003, a rise of over 37 per cent. The construction of new acetic acid manufacturing capacity based on the Cativa® process, which utilises an iridium-ruthenium catalyst, and the conversion of existing plants to the technology will boost demand in Europe, North America and Asia. The process offers a number of benefits compared to older technologies, including high selectivity, high reaction rates and reduced output of by-products.

Consumption of ruthenium in electronic components such as resistors is projected to improve by 10 per cent in 2003, rising to 153,000 oz. The overhang of surplus component inventories, which had affected demand for ruthenium pastes in 2002, has been eliminated and both corporate and consumer demand for electronic products have shown signs of improvement.

At 102,000 oz, electrochemical demand for ruthenium is not expected to change significantly in 2003. Capacity utilisation in the chloralkali industry, in which both ruthenium and iridium are used to coat electrodes, edged up during the first half of the year but this had no impact on electrode recoating programmes.

Demand for ruthenium-titanium alloys used in the manufacture of corrosion-resistant pipes has continued to be stable in 2003. Consumption of ruthenium in other industrial alloys and jewellery alloys is also expected to be in line with the previous year.

The use of iridium in fabricating crucibles for the electronics industry is forecast to improve in 2003 as demand for high purity crystals rises and overcapacity in the sector declines. This will contribute to an overall increase in electronics demand for iridium of 5,000 oz to a total of 26,000 oz.

As with ruthenium, demand for iridium from chloralkali manufacturers will be stable. The automotive industry is expected to consume less iridium overall in 2003 than the previous year – use of the metal in autocatalysts was phased out by the end of 2002. This fall in demand, however, will be partially offset by growing use of iridium in high performance spark plugs.

The spread of the Cativa® acetic acid technology will give a substantial boost to chemical catalyst demand for iridium in 2003. Consumption in most other applications, such as cathodic protection and jewellery alloys, is forecast to be flat.

**Ruthenium Demand by Application**  
'000 oz

	2002	2003
Chemical	101	139
Electrochemical	100	102
Electronics	140	153
Other	63	67
<b>Total Demand</b>	<b>404</b>	<b>461</b>



## Supplies

### Rhodium

Total rhodium supplies are expected to rise by just under 7 per cent in 2003 to 655,000 oz. Growth in supplies from South Africa will lead the increase as output of platinum rises and UG2 ore, which is enriched with rhodium compared to the Merensky Reef, accounts for an increased proportion of mine production. Russian sales of rhodium in 2003 are forecast to reach 100,000 oz – slightly higher than the previous year. Production in North America will slip lower due to reduced output from Inco's strike-hit operations at Sudbury but this will be outweighed by higher output from the expanding pgm mines in Zimbabwe.

### Ruthenium & Iridium

Ruthenium demand is forecast to rebound by 14 per cent in 2003 but the price of the metal fell to settle at \$33 during the first nine months of the year. The price of iridium also dropped, bottoming out at \$90, even though demand improved from the very weak conditions of 2002. This reflects the fact that, despite the upturn in industrial use of both metals, there is no lack of physical availability. As with rhodium, South African output of ruthenium and iridium is rising as more UG2 ore is mined. UG2 generally has a higher minor pgm content than the Merensky Reef, particularly on the Eastern Bushveld, where several major new mines are being developed.

**Iridium Demand by Application**  
'000 oz

	2002	2003
Chemical	10	20
Electrochemical	23	23
Electronics	21	26
Other	28	27
<b>Total Demand</b>	<b>82</b>	<b>96</b>

