

# OTHER PLATINUM GROUP METALS

## RHODIUM

**Demand for rhodium is forecast to increase by almost 9 per cent to 790,000 oz in 2005. Most of this growth will be due to greater purchases of metal for use in autocatalysts, in turn driven by tightening vehicle emissions limits world-wide. Demand from the glass industry for rhodium is also expected to be strong again this year, with further expansion of LCD glass manufacturing capacity in Asia.**

### Autocatalyst

The use of rhodium in autocatalysts is forecast to rise by 3 per cent in 2005. However, purchases of rhodium by auto makers are projected to climb by 8 per cent to reach 820,000 oz, an increase of 62,000 oz compared with 2004. The difference is explained by year-to-year

changes in stocks within the auto industry.

Much of the expansion in autocatalyst demand for rhodium this year will come from the US auto industry. Growth in demand in 2004 was muted by the draw down of metal from stocks but with no further inventory reductions expected this year, purchases are forecast to jump by 30 per cent to 291,000 oz.

The use of rhodium on autocatalysts in the USA is trending slowly upwards in response to tighter emissions limits that are currently being phased in under the Tier II regulations. In particular, rhodium benefits from the strong focus on reducing NOx

emissions as it is highly effective at catalysing the reduction of NOx to nitrogen.

At 184,000 oz, European autocatalyst demand for rhodium in 2005 is forecast to be only marginally higher than in the previous year. A small increase in average rhodium loading levels will be largely offset by the expected fall in production of gasoline light vehicles.

Japanese demand for rhodium in autocatalysts is

likely to slip from 229,000 oz in 2004 to 211,000 oz this year. The underlying use of rhodium on autocatalysts in Japan is projected to be broadly stable but the auto industry is expected to purchase less metal for inventories. In China and the Rest of the World, however, rhodium demand is on course to increase by more than 12 per cent to reach 134,000 oz in 2005, in line with greater production of gasoline light vehicles.

Recovery of rhodium from autocatalysts is forecast to increase by 6 per cent to 150,000 oz this year. The growth in recovery will be concentrated in North America and Europe, and will reflect the changing mix of vehicle models and catalyst systems entering the recycling chain. Vehicle recycling and catalyst recovery rates are also increasing in Europe in response to new end-of-life vehicle legislation.

### Other Demand

Demand for rhodium from the glass industry is forecast to rise by 6 per cent to reach 50,000 oz in 2005. The majority of demand will originate from Asia, where manufacturers of flat panel display glass have continued to invest heavily in new production capacity.

Purchases of rhodium for use in catalysts for the chemicals industry are expected to climb by 7 per cent to 45,000 oz this year. The construction of new plants for the manufacture of oxo-alcohols and acetic acid in Asia will be the source of much of the growth in demand.

Demand for rhodium in most other minor applications is also projected to grow moderately in 2005, including use of the metal in jewellery plating solutions and thermocouple wire.

## RUTHENIUM & IRIIDIUM

**Demand for ruthenium is forecast to rise by 9 per cent in 2005 to 734,000 oz, as rapid growth in the use of the metal in electronics applications outweighs weaker demand from the chemicals industry. Purchases of iridium for chemical catalyst applications, on the other hand, are projected to increase, contributing to a 10 per cent rise in demand for the metal to 131,000 oz.**

Growth in demand for ruthenium from the electronics sector was robust during the first nine months of 2005. Over the year as a whole demand is forecast to

Rhodium Supply and Demand '000 oz		
	2004	2005
<b>Supply</b>		
South Africa	576	616
Russia	105	90
North America	17	21
Others	16	17
<b>Total Supply</b>	<b>714</b>	<b>744</b>
<b>Demand</b>		
Autocatalyst: gross	758	820
recovery	-141	-150
Chemical	42	45
Electrical	7	9
Glass	47	50
Other	14	16
<b>Total Demand</b>	<b>727</b>	<b>790</b>
<b>Movements in Stocks</b>	<b>(13)</b>	<b>(46)</b>

UJMI

Ruthenium Demand by Application '000 oz		
	2004	2005
Chemical	123	93
Electrochemical	96	94
Electronics	388	474
Other	68	73
<b>Total Supply</b>	<b>675</b>	<b>734</b>



products and increased demand for automobile electronics.

Demand for ruthenium from manufacturers of hard disks is also forecast to climb in 2005. The inclusion of ruthenium within the platinum-cobalt alloy layer used in hard disks has enabled substantial increases in data storage capacity to be achieved. The proportion of disks manufactured using this technology is rising.

In contrast, demand for ruthenium for use in chemical process catalysts is projected to fall by 24 per cent to 93,000 oz in 2005. The decline reflects a reduced rate of capacity expansion in several sectors of the chemicals industry. In particular, after several years of rapid growth, less acetic acid manufacturing capacity based on the Cativa process is scheduled to be constructed this year.

Consumption of ruthenium in the electrochemical market is forecast to soften slightly in 2005, edging down to 94,000 oz. Purchases of metal by chlor-alkali manufacturers in North America are expected to be stable, whereas European demand will weaken as producers continue to switch to membrane technology (which uses iridium-ruthenium anode coatings, rather than ruthenium alone). Conversely, this trend will lead to an increase in iridium demand from the electrochemical market, which is projected to reach 28,000 oz.

Iridium Demand by Application '000 oz		
	2004	2005
Chemical	25	31
Electrochemical	26	28
Electronics	29	31
Other	39	41
<b>Total Supply</b>	<b>119</b>	<b>131</b>



climb by 22 per cent to 474,000 oz, with electronic applications accounting for two-thirds of total ruthenium demand. Use of ruthenium-based pastes in the manufacture of resistor chips and similar components is rising strongly, in line with higher production of mobile phones, computers, other consumer

Purchases of iridium for the manufacture of crucibles, which are used to grow high purity crystals for a range of specialised applications, are forecast to improve in 2005 on the back of good demand from the electronics industry. However, use of the metal in electronic components (FRAM

memory chips, for example), is likely to slip lower. Total electronics demand for iridium is expected to increase marginally to 31,000 oz.

Demand for iridium-based catalysts from the chemicals industry is forecast to climb by 6,000 oz to reach 31,000 oz, driven by rising production rates and investment in new capacity for a number of speciality chemicals. The production of iridium-tipped spark plugs is also expected to grow in 2005, as use of the high-performance plugs by auto makers expands.

## OTHER PGM SUPPLIES

Total supplies of rhodium are forecast to rise by 4 per cent (30,000 oz) in 2005 to reach 744,000 oz. South African output is expected to increase by 7 per cent to 616,000 oz as production expands in tandem with higher platinum output. In addition, changes to the rhodium refining circuit at Anglo Platinum's precious metals refinery resulted in the release of metal from the process pipeline during the first half of the year.

Russian sales of rhodium, however, are projected to slip to 90,000 oz, down from 105,000 oz the previous year. Norilsk Nickel is expected to sell its full production of the metal, but shipments from central stocks during the first nine months of the year fell behind the rate of sales seen in 2004.

With growth in demand for rhodium increasing faster than supplies this year, the market is projected to show a deficit of 46,000 oz. At the same time speculators have been active, bidding for spot metal and withdrawing rhodium that was previously on loan. The effect on the price has been considerable, the Johnson Matthey base price for rhodium climbing from \$1,330 at the beginning of the year to a peak of \$3,000 in October.

## Ruthenium & Iridium

South African output of ruthenium and iridium continues to rise on the back of expanding platinum production. The availability of refined metal, however, was insufficient to prevent the price of both metals from strengthening during the second and third quarters of 2005 in the face of good industrial demand.