

OTHER PLATINUM GROUP METALS

RHODIUM

Rhodium demand is forecast to climb by 2 per cent to 844,000 oz in 2006. Purchases of rhodium for exhaust catalysts by auto manufacturers will increase, due to growing production of vehicles in the Rest of the World region and to the continuing tightening of global emissions legislation. The glass industry is expected to consume less metal in 2006 than in 2005, due to an easing of the pace of construction of LCD glass manufacturing facilities.

Autocatalyst

Global autocatalyst demand for rhodium is forecast to rise by 44,000 oz to 874,000 oz in 2006. Although there have been some indications of strategic stock building this year, it has been at a low level, and usage will be close to the headline demand figure. We expect rhodium use on vehicles to be near 2005 levels in Europe and North America but to grow elsewhere.

Although new Euro IV emissions limits were only implemented in early 2006, many gasoline vehicles in Europe were already being fitted with catalysts to meet these regulations in 2005. On average, rhodium levels per car are not expected to change over the year.

North American rhodium consumption will also be virtually unchanged in 2006. Rhodium is used to reduce emissions of oxides of nitrogen (NOx) but the auto makers continue to work on cutting engine-out emissions of this pollutant, and therefore limiting or even decreasing the amount of rhodium required.

Japanese manufacturers are expected to increase their level of rhodium demand this year. The amount of metal needed for the domestic market will not change but the rhodium content of many models manufactured for export will increase, reflecting stricter environmental legislation around the world. Likewise, rising production in the Rest of

the World region and some new emissions regulations will increase rhodium uptake. A few manufacturers have bought metal for strategic inventory despite the high rhodium price, but overall additions to stock are likely to be relatively low for the year.

Rhodium recovery from scrapped autocatalysts will increase again in 2006, by 16 per cent, to 159,000 oz. Much of this growth will come from the increasing volumes and loadings of catalysts being recycled in North America. Although recycling rates will increase in Europe, the net benefit in terms of rhodium recovery will be small due to a greater proportion of diesel vehicles entering the recycling chain. Volumes of metal recovered elsewhere are forecast to be flat.

Other Demand

Demand for rhodium from the glass industry is expected to fall by 11,000 oz in 2006 to 49,000 oz. Much of this metal is being used in the manufacture of glass for flat panel displays (LCD and plasma screens). Although the market share of television and computer screens which is taken by these technologies is expanding rapidly, production capacity has run ahead of consumer demand. This has meant that fewer glass furnaces (the location where rhodium is used) are scheduled to be commissioned this year than in 2005 and metal demand will be lower in 2006.

There will be little change in consumption of rhodium in the chemical industry this year. A main use of the metal is in a catalyst for acetic acid manufacture. Although 2006 has not seen significant expansion of global acetic acid production capacity, this industry is predicted to resume its growth in 2007.

RUTHENIUM & IRIDIUM

Demand for ruthenium is expected to climb by 13 per cent in 2006, to 940,000 oz. This increase will be driven by growing requirements from the electronics industry. Ruthenium demand in chemical and electrochemical end uses will be stable. Iridium demand for 2006 will rise marginally to 136,000 oz compared to 134,000 oz for the previous year, with growth coming from the chemical sector.

After a 33 per cent jump in the use of ruthenium in the electronics industry last year, demand will rise a

Rhodium Supply and Demand '000 oz		
	2005	2006
Supply		
South Africa	628	702
Russia	90	60
North America	20	20
Others	17	19
Total Supply	755	801
Demand		
Autocatalyst: gross	830	874
recovery	(137)	(159)
Chemical	47	48
Electrical	9	9
Glass	60	49
Other	19	23
Total Demand	828	844
Movements in Stocks	(73)	(43)



further 15 per cent to 595,000 oz in 2006.

Ruthenium demand is being driven by developments in computer hard disks. It is used as a thin layer, in addition to platinum, in some high storage capacity hard disks in order to improve their performance. The growth in demand for this technology is therefore raising ruthenium consumption sharply in 2006.

Demand for chip resistors and hybrid integrated circuits (HIC) is growing. Use of these components, in which ruthenium pastes are a key ingredient, is

Ruthenium Demand by Application '000 oz		
	2005	2006
Chemical	152	151
Electrochemical	96	95
Electronics	517	595
Other	69	99
Total Demand	834	940

being boosted by increases in the functionality and computing power of a variety of devices and automotive electronics. Ruthenium use in the production of flat screen plasma display panels will also be higher this year, as this technology further penetrates the displays market. Outside the electronics industry, ruthenium demand from chemical and electrochemical applications is forecast to be flat in 2006 at 246,000 oz. While ruthenium use in process catalysts remains substantial, demand is mainly dependent on construction of new chemical plant capacity. The acetic acid industry has been a good source of demand for ruthenium catalysts in recent years but with fewer acetic acid production facilities being built in 2006, demand will edge lower.

Global iridium demand is forecast to grow to 136,000 oz, boosted by strong demand from a range of chemical and electrochemical applications. Iridium's use in vehicular spark plugs will also rise by 7 per cent in 2006. This technology offers significantly improved performance over other metals and its market share is increasing steadily in many sectors.

Iridium Demand by Application '000 oz		
	2005	2006
Chemical	25	33
Electrochemical	28	29
Electronics	31	28
Other	50	46
Total Demand	134	136

Offsetting this, the use of iridium by the electronics

industry to make crucibles for crystal growing is expected to dip to 28,000 oz from 31,000 oz. After heavy expansion of production capacity in recent years, growth is slowing, resulting in a decrease in iridium requirements, despite high demand for crystals in a range of electronic applications.

OTHER PGM SUPPLIES

Rhodium

Total rhodium supply will grow by 6 per cent to 801,000 oz in 2006. This gain of 46,000 oz will arise mainly from an increase in rhodium produced in South Africa. Platinum production is expanding, and rhodium output has risen accordingly. Much of this year's expansion in South Africa has come from increased exploitation of UG2 ore, which generally has a higher rhodium content than Merensky reef.

After last year's changes in Anglo Platinum's refining circuit released metal, first half rhodium production was down by 15 per cent to 147,000 oz. Output is expected to pick up again over the rest of the year. The increase in UG2 ore mined at the Impala Platinum lease area also supported rhodium output there despite a drop in platinum production.

To date, there has been no indication that sales of Russian rhodium have been made from stock, and we expect shipments for the full year to be in line with Norilsk Nickel's estimated production of 60,000 oz, a third lower than total sales in 2005.

With consumption of rhodium concentrated in only a relatively small number of end uses, further growth in autocatalyst rhodium demand has offset much of the increased supply and the market is set to remain in deficit in 2006. Continued purchases by the automotive industry and by LCD glass manufacturers have supported the price throughout most of the year to date, lifting the Johnson Matthey base price from \$3,000 at the start of the year to above \$6,000 in May, ending September at \$4,800.

Ruthenium & Iridium

The expansion of platinum production in South Africa continues to increase output of the minor pgms. Much of the growth in mining is in UG2 ore which is richer in these metals than Merensky reef. As demand for both iridium and ruthenium has continued rising, supply and demand remain finely balanced; prices of both have doubled in 2006.

Further information on prices can be found on pages 22 & 23 of this review.