

Platinum

Jewellery

After 16 years of continuous growth, demand for platinum in jewellery fell back 1 per cent in 2000, due to a sharp decline in the market in Japan. In contrast, consumption of platinum jewellery continued to grow elsewhere in the world, with demand in China exceeding 1 million oz for the first time. In the final quarter of the year, as the price of platinum rose over \$600, signs of price sensitivity began to appear in the low-value sector in all jewellery markets.

Europe

In Europe, demand for platinum in jewellery continued to rise steadily, with fabrication up 15,000 oz to 200,000 oz in 2000. There was strong growth in platinum jewellery fabrication in the UK, and an increase in the use of platinum in watch-making in Switzerland. Fabrication in the two other major manufacturing nations, Italy and Germany, was little changed.

The export market has always been important for Italian jewellery makers and the strength of the US market in particular led to increased demand for platinum from Italy, notably for the manufacture of lightweight chain products. Domestic sales are traditionally more significant for German manufacturers; last year consumer confidence was low in Germany and retail sales of jewellery fell. As a result, despite some increase in exports of platinum products, especially rings, there was a small decline in platinum demand in Germany in 2000.

Growth in the UK market was reflected in a 28 per cent increase in the weight of platinum pieces submitted for hallmarking last year. Since 1994, manu-

facturers have enjoyed strong growth in demand for platinum jewellery from local consumers, and most production is for sale in the domestic market. Platinum has become established as a premium metal for bridal jewellery, which continues to account for virtually all fabrication demand. However, some retailers have recently started to offer non-bridal products, such as lightweight platinum chain imported from Italy, and this may encourage local manufacturers to expand their product ranges.

Platinum demand in Switzerland is heavily influenced by the fortunes of the premium watch sector. The market was depressed in 1998 and 1999 in the wake of the economic crisis in developing Asian nations, which affected demand for luxury goods from Europe. The situation improved sharply last year, in line with economic recovery in South East Asia, combined with growth in the US market. As a result, production of platinum watches in Switzerland rose by 43 per cent.

Japan

Demand for platinum from the Japanese jewellery sector fell by 20 per cent to 1.06 million oz in 2000. The decline was mainly due to manufacturers meeting part of their platinum requirements by recycling old stocks of finished jewellery, thereby reducing their fresh purchases of platinum. We believe that high metal prices stimulated reductions in stocks held by wholesalers and retailers and also tempted some consumers to sell back unwanted jewellery items bought in earlier years.

Although retail sales of platinum jewellery items increased during the first quarter, the market contracted from April

Platinum Demand: Jewellery

'000 oz

	1999	2000
Europe	185	200
Japan	1,320	1,060
North America	330	380
Rest of the World	1,045	1,200
Total	2,880	2,840



onwards, as retailers and manufacturers adjusted their price tags in response to higher bullion prices. At the same time, the fragility of Japan's economy prompted consumers to reduce their spending on luxury products. Demand for fashion jewellery was most severely affected, with sales of neckchain, bracelets and earrings falling by at least 15 per cent. In contrast, there was growth in the bridal ring sector, largely due to a millennium-related boom in the number of marriages. For the year as a whole, unit sales of platinum jewellery fell by 4 per cent compared to 1999.

White metal jewellery remains extremely popular in Japan but, with the rise in bullion prices, it has become more difficult for platinum to compete in lower-price segments of the market. White gold and even silver have become increasingly acceptable to young consumers who desire white jewellery products but do not want to pay the premium for platinum. In addition, the attraction of other consumer products, such as the popular WAP phones with internet connections, may have drawn money away from the jewellery market.

Japan's economic situation worsened during the first quarter of 2001, and with platinum prices remaining high there seems little prospect of a recovery in demand this year. Although platinum remains firmly entrenched in higher-value segments of the market, especially bridal and diamond-set products, its share of the inexpensive fashion jewellery market is likely to be further eroded in 2001 and we expect retail sales to decline again this year. Purchases of platinum by jewellery manufacturers are, however, forecast to stabilise, due to a decrease in recycling as industry stocks of old jewellery become depleted.

North America

Demand for platinum from US jewellery makers rose by 15 per cent to 380,000 oz in 2000. Sales of upmarket jewellery products were fuelled by strong economic growth, while the fashion trend towards white metal jewellery continued.

Platinum is firmly established in the bridal sector, and there was further growth in consumer demand for platinum wedding bands last year. US manufacturers continue to increase their ranges of platinum bridal jewellery, and some are now introducing very lightweight platinum rings in order to meet the price targets set by mass market retailers.

While demand remained concentrated in the bridal sector, the increasing popularity of white metal jewellery also helped to expand platinum's presence in the fashion jewellery market. A number of domestic manufacturers expanded production of pendants, mainly diamond-set, for use with lightweight platinum chain. Although US manufacture of chain is increasing, much of this product is still imported from Europe.

The outlook for 2001 is mixed. The deceleration of the US economy is expected to have a sharp impact on consumer spending on luxury items this year. At the same time, high bullion prices are likely to restrict manufacturers'

ability to offer inexpensive platinum jewellery, and may also encourage a shift to lighter-weight designs or to lower-priced white gold. On the other hand, we expect platinum to gain additional share in the bridal sector and to make further inroads into the market for upscale fashion jewellery. Demand for platinum jewellery fabrication is therefore expected to expand again, although the rate of growth is likely to be lower than in recent years.

Rest of the World

Sales of platinum to Chinese jewellery makers rose by 16 per cent to 1.1 million oz in 2000, outstripping Japan for the first time. This figure was achieved despite a slowdown in platinum purchases towards the year end, when higher metal prices reduced manufacturers' profitability and tax inspections further inhibited their activity.

Demand for platinum was extremely strong, at both the manufacturing and retail levels, in the periods leading up to the Chinese New Year in February 2000 and the May holidays, two of the key jewellery seasons in China. However, as the year progressed, the price of platinum rose faster than retail jewellery prices and this began to squeeze manufacturing margins. By the fourth quarter margins

had been sufficiently eroded for many manufacturers to cut back production and retailers were forced to live off stocks. This situation was exacerbated by a series of government inspections to verify payment of sales taxes, which also interrupted production during the period.

Consumers' demand for white metal jewellery was maintained, with the most popular products being lightweight rings and pendant chains. As platinum has become less profitable some manufacturers have started to produce white gold jewellery in similar styles as cheaper substitutes. There has also been an increase in imports of white gold jewellery, principally lightweight chain from Italy.

Changes last year in the regulations covering the assay standards for jewellery alloys in China established that platinum alloys should contain not less than 95 per cent platinum plus palladium. With the current high price of palladium, this is likely to result in most alloys containing 95 per cent platinum; jewellery made from these alloys will be marked Pt950 rather than Pt900, as before. Although the regulation only came into effect in Shanghai in February 2001, and will apply later in other cities, manufacturers and retailers may have been reluctant to build stocks of products last year that would not meet the new standard.



The hallmarking of platinum jewellery pieces continues to rise in the UK.

An easing of platinum bullion prices and a gradual increase in retail jewellery prices, combined with the depletion of retail stocks during the Chinese New Year, led to a recovery in fabrication demand during the first quarter of 2001. If this level of activity were to be maintained, consumption of platinum in China this year would exceed that of 2000. Manufacturing profit margins will be the key factor, for there appears to be no slackening in consumer demand for platinum jewellery.

Fabrication in other Asian countries is largely for export to Japan, China and the USA, although there is a small domestic market for platinum jewellery in Taiwan. Excluding China, platinum demand in the Rest of the World was up slightly at 100,000 oz in 2000, with only India showing significant growth.

Jewellery manufacturers in India have long been established as important suppliers of gem-set gold jewellery to developed markets. The growing popularity of white metal jewellery, combined with the availability of a skilled and inexpensive workforce, has stimulated development of platinum fabrication over the last two to three years. Most production is rings, pendants and bracelets for export to the USA. Small amounts of platinum jewellery are also being bought by wealthy domestic consumers.

Elsewhere in Asia, platinum jewellery manufacturers have traditionally relied on Japan as their principal export market. The downturn in Japanese demand has therefore had a negative effect on fabrication, although the impact has been softened by increased exports to China and the USA.

Autocatalyst

After three years of decline, demand for platinum in autocatalysts recovered by 14 per cent to total 1.84 million oz in 2000. In Europe, tighter emissions legislation stimulated a sharp rise in the use of platinum on

diesel vehicles, while Japanese auto makers began to switch from palladium to platinum on domestic gasoline models. There was also an increase in sales of platinum to car companies in North America, but this was mainly due to additional purchasing for stock; actual consumption on catalysts declined slightly.

Europe

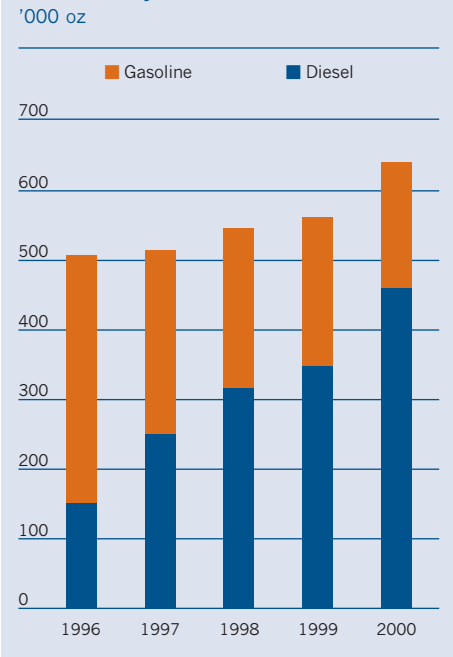
Sales of platinum to European auto makers rose by 80,000 oz to reach 640,000 oz in 2000, setting a new record for this region. A sharp increase in consumption of platinum in the diesel sector greatly outweighed a further switch to palladium-rich technology on gasoline cars.

While total passenger car sales in western Europe declined by 2 per cent last year, the diesel sector enjoyed strong consumer demand. High gasoline prices and improved engine technology helped to lift sales of fuel-efficient diesel vehicles by 14 per cent to take nearly a third of the total market. At the same time, there was a significant increase in average platinum loadings on diesel catalysts, following the imposition of Stage III EU emissions legislation on new models from January 2000. Together, these factors lifted total platinum consumption on diesel vehicles by around a third last year.

In contrast, use of platinum in the gasoline sector declined by around 20 per cent. Although high palladium prices have encouraged car companies to review their catalyst strategies, this had little impact on the pgm mix in 2000. The development and testing of new catalysts is a lengthy process, and manufacturers therefore continued to implement earlier plans to adopt palladium-rich catalysts on gasoline cars.

European demand for platinum is expected to rise strongly in 2001. In the gasoline sector, most auto makers intend to make greater use of platinum, and some will start to re-introduce platinum-rich technology this year. As a result, the

European Demand for Platinum in Autocatalysts 1996-2000



use of platinum on catalysts for gasoline vehicles will increase for the first time since 1995. There will also be a further increase in loadings on diesel catalysts, with Stage III legislation applying to all new vehicles from January 2001.

Japan

Higher vehicle production, the introduction of stricter emissions legislation and changes in the pgm mix on autocatalysts contributed to an increase in sales of platinum to Japanese car companies last year. Demand rose by 40,000 oz to reach 290,000 oz, the highest level since 1994.

Despite weak economic conditions, the Japanese auto market made a modest recovery in 2000. Passenger car production rose by around 5 per cent, largely due to higher domestic sales. There was also a small increase in exports, with higher sales to North America and Asia offsetting a steep dip in shipments to Europe.

Japanese Low Emission Vehicle (JLEV) regulations came into force for new models from October 2000, and will apply to all new vehicles from 2002. In practice, most auto makers have moved



Growing markets for platinum: autocatalysts for heavy duty trucks (above) and motorcycles (below)

quickly to comply with the new legislation, and a significant proportion of cars sold in Japan last year met JLEV limits. The Japanese Environmental Agency has issued guidelines providing a framework for further reductions of between 25 and 75 per cent in NOx and HC emissions. Manufacturers are meeting these lower limits voluntarily on some domestic models.

Concerns about the price and availability of palladium have already begun to have an impact on the pgm mix in Japan. Where possible, car companies have chosen to increase platinum loadings in order to meet JLEV regulations. As a result, demand for platinum on domestic vehicles was up sharply last year and is expected to grow substantially in the next two to three years.

In contrast, the use of platinum on export models was little changed in 2000. Many of these vehicles, especially those sold in North America, carry highly-loaded, palladium-rich catalysts in order to meet strict HC emissions standards. While Japanese auto makers are expected to add some platinum to the catalyst systems used on exports, the change is likely to be less rapid and less

significant than on vehicles for sale in the domestic market.

North America

Purchases of platinum by auto makers in North America rose by 85,000 oz to total 620,000 oz in 2000. This increase was mainly due to additions to stocks. Actual consumption in autocatalysts declined by around 4 per cent, following further adoption of palladium-rich technology on low emission vehicles.

Light duty vehicle sales rose by 3 per cent to 19 million units in 2000. However, production fell by 2 per cent due to a sharp increase in imports, which took 17 per cent of the North American market last year. The popularity of foreign-designed vehicles was also reflected in a higher market share for cars produced at US transplant factories owned by Japanese and European auto makers. Since these companies tend to make greater use of platinum-rhodium technology than their US competitors, this shift was positive for platinum demand.

The gradual tightening of emissions legislation continued to be the most important influence on pgm consumption. Last year, a large majority of vehicles sold in

the USA met LEV limits, with a smaller number attaining ULEV standards. Most models were fitted with highly-loaded, palladium-rich catalyst systems in order to meet LEV regulations, so this led to a small decline in total use of platinum and another jump in palladium consumption.

Soaring palladium prices have provided a strong incentive for manufacturers to reconsider their catalyst strategies. Those companies that had moved most heavily towards palladium have already begun to reintroduce platinum-rhodium technology in a limited number of applications, and this will have a positive impact on demand for platinum in 2001. Over the next few years, we expect all companies to increase the proportion of platinum in the pgm mix.

Tightening emissions legislation will also add to platinum demand over the next few years. In December 1999, the Environmental Protection Agency announced Tier 2 legislation, which will result in the gradual tightening of emissions limits between 2004 and 2009. Gasoline cars may be able to meet the stricter standards through the use of new, cleaner engines and more advanced catalyst systems without needing to add extra pgm. However, we expect this legislation to trigger the widespread use of catalysts on heavy duty vehicles for the first time; since many of these are diesel, this should make a significant contribution to platinum demand.

Platinum Demand: Autocatalyst

'000 oz

	1999	2000
Europe	560	640
Japan	250	290
North America	535	620
Rest of the World	265	290
Total	1,610	1,840



Rest of the World

In the Rest of the World, the use of platinum on autocatalysts reached 290,000 oz last year, an increase of 25,000 oz compared with 1999. This gain was mainly due to a substantial expansion of vehicle production in South America. Stricter emissions legislation in Korea, India and China also had a small impact on demand.

Brazil and Argentina enjoyed a strong recovery in vehicle production last year, following a slump in 1999. Platinum consumption also benefited from the introduction of new catalyst technology by some car companies. With no significant changes in emissions legislation on the horizon, manufacturers have been able to reduce average pgm loadings by upgrading to more advanced catalyst formulations. In some cases, they have also taken the opportunity to increase their use of platinum-based technology at the expense of palladium.

In contrast, Mexican demand for platinum declined last year, despite record vehicle output. Around three quarters of vehicles built in Mexico are for export, mainly to North America, and platinum consumption was affected by the adoption of palladium-based systems to meet US LEV standards.

There was a small increase in sales of platinum to Korean auto makers in 2000, following a revision of the Korean Clean Air Act and the implementation of tighter standards based on California's LEV legislation. The new regulations will be phased in over the period to 2005, and will make Korean emissions legislation among the strictest in the world. The main impact will be on palladium, although we also expect further modest increases in platinum demand.

In China, standards equivalent to European Stage I regulations were introduced during 2000, although in practice there is likely to be some delay in compliance, since unleaded fuel is not yet universally available. We estimate

that about half the new cars sold in China last year carried a pgm catalyst. Indian emissions regulations continued to tighten: new Bharat II limits, equivalent to EU Stage II, were introduced in seven cities during 2000 and will be extended to cover a wider area of the country this year. Indian manufacturers are generally adopting platinum-rich systems to meet the new limits.

Autocatalyst Recovery

The recovery of platinum from scrapped autocatalysts rose by 50,000 oz to 470,000 oz last year. Most of this growth occurred in North America, where higher pgm prices encouraged an increase in the percentage of catalysts recovered from scrapped vehicles.

The USA has the world's most developed network for the recovery of pgm from spent autocatalysts, and the majority of scrap yards systematically remove catalytic converters from scrapped vehicles. However, until recently some smaller vehicle dismantlers considered it uneconomic to collect the catalyst. With the rise in pgm prices, many of these began to remove the catalytic converter for the first time in 2000, and this contributed to an increase in the amount of platinum recovered.

Most of the vehicles scrapped in the USA last year were built before the use of palladium technology became widespread, and therefore carried platinum-rich catalysts. Average platinum loadings on autocatalyst scrap increased again, reflecting changes in US Federal emissions legislation which took place in the early 1990s.

In Europe, there was modest growth in the recovery of platinum from spent autocatalysts. The collection of catalytic converters is still mainly confined to Germany and some northern European countries, but catalyst recycling networks are expected to develop across the region over the next few years. This will be encouraged by EU regulations which

Platinum Demand: Autocatalyst Recovery '000 oz

	1999	2000
Europe	(30)	(40)
Japan	(60)	(60)
North America	(315)	(350)
Rest of the World	(15)	(20)
Total	(420)	(470)



state that by 2005 no less than 85 per cent of a car's weight must be recycled.

The recovery of pgm in Japan did not grow last year, with the gloomy economic outlook encouraging consumers to keep their vehicles longer before scrapping them. In the Rest of the World region, only small numbers of scrapped autocatalysts are collected, although the market is gradually developing, especially in countries such as Korea and Mexico, where catalyst-forcing legislation has been in place since 1991.

Chemical

Demand for platinum from the chemical industry totalled 270,000 oz in 2000, a decline of 50,000 oz compared with the previous year. This fall was mainly due to lower sales of process catalysts used in the production of benzene and paraxylene. In the nitric acid sector, weak demand for nitrogen fertilisers led to a number of plant closures in the USA and Europe.

Following significant investment in paraxylene production in 1999, additions to capacity were more modest last year. This resulted in a significant decline in demand for platinum in process catalysts, especially in the Rest of the World region. Losses of platinum in this process are small, so demand occurs mainly when new plants are constructed.

In contrast, there was an increase in

Platinum Demand: Chemical '000 oz

	1999	2000
Europe	80	85
Japan	20	20
North America	95	90
Rest of the World	125	75
Total	320	270



the use of platinum in catalysts for silicones production. These silicones are used mainly in the manufacture of pressure-release adhesives, and are also in increasing demand for a variety of construction and consumer applications, including waterproof sealants, speciality rubbers, and cosmetics such as lipstick. Since most of the platinum is lost in the production process, increasing output of silicones has been reflected in higher platinum consumption.

Sales of platinum to the nitric acid industry were weak last year. European producers were affected by reduced demand for fertilisers, due to an increase in the proportion of land set aside from agricultural production in 1999, and the availability of cheap imports. The resulting erosion of fertiliser prices contributed to the closure of nitric acid plants in the UK, Sweden, France and the Netherlands. In North America, grain stocks were at high levels following four years of good harvests. This led to a downturn in fertiliser sales and triggered a series of rationalisations in the nitric acid industry.

Electrical

Consumption of platinum in electrical applications jumped by 85,000 oz to reach 455,000 oz in 2000. This was largely due to a significant increase in the average platinum content of hard disks,

which outweighed a decline in worldwide disk production. Demand for platinum in thermocouples was also strong, reflecting increases in world steel production and investment in semiconductor and speciality glass plants.

The typical storage capacity of a computer's hard disk has risen rapidly in recent years, from around 250 megabytes in the mid 1990s to 30 gigabytes or more by the end of last year - a thousand-fold increase. Platinum has played an important role in this development. Its addition to the magnetic alloy layer on which data is recorded improves the strength of the magnetic field, and hence the storage capacity of the disk. As a result, during the last three to four years, manufacturers have adopted platinum in an increasing proportion of their disks. We estimate that over 90 per cent of disks produced in 2000 contained platinum, up from about 75 per cent the previous year.

Last year also saw a significant increase in the average weight of platinum per disk, which in turn contributed to a sharp improvement in the density at which data could be recorded. This had both positive and negative implications for platinum demand. Higher storage capacity has enabled manufacturers to reduce the average number of disks per hard drive - until recently, hard drives contained at least two disks, but single-disk devices are now becoming increasingly common. As a result, the number of hard disks produced in 2000 fell by 7 per cent, despite an increase in PC shipments of more than 14 per cent.

A further rise in the average platinum content per disk is expected to boost demand in 2001, despite industry forecasts of a slowdown in computer sales. Platinum demand will also benefit from the application of hard disk technology to other electronics goods, such as video recorders and auto navigation systems.

Platinum's second major application

in the electrical industry is in thermocouples, used to monitor temperatures in the production of steel, semiconductors and glass. All three sectors generated strong demand for thermocouples last year. Steel production rose by 6 per cent, while there was a surge of capacity additions in the semiconductor and LCD glass industries.

Fuel cells currently make only a small contribution to platinum consumption in the electrical sector, but the prospects of significant demand in the longer term continue to improve. Last year saw further progress towards the commercialisation of proton exchange membrane (PEM) fuel cells for transport applications. Several major auto companies demonstrated fuel cell cars; most of these were powered by hydrogen gas stored in tanks, but some carried on-board reformers capable of generating hydrogen from a liquid fuel such as gasoline or methanol.

The Californian legislation that requires zero emission vehicles to be sold in the State from 2005 continues to provide momentum for the development of fuel cell cars. The growing membership of the California Fuel Cell Partnership (an industry body for research, development and promotion) illustrates the extent to which fuel cells have been embraced by the automotive and associated industries. This organisation now encompasses eight major car

Platinum Demand: Electrical '000 oz

	1999	2000
Europe	70	80
Japan	75	90
North America	120	145
Rest of the World	105	140
Total	370	455





Zero Emission Vehicle legislation is stimulating rapid progress in the development of fuel cell cars

companies, together with several government bodies concerned with transport and the environment, fuel cell manufacturers, and a number of energy and fuel-infrastructure suppliers.

The source of hydrogen for the fuel cell remains the principal technological barrier to commercialisation. To date, most prototypes have been powered by hydrogen gas stored in tanks, but for ease and safety of refuelling, a liquid fuel such as methanol or gasoline is preferable. These can be transformed into hydrogen gas by means of an on-board reformer, but there remain some technical issues to be resolved. The most significant of these is the time taken for the reformer to reach operating temperature. As a result, it can take several minutes before sufficient hydrogen gas is generated, and therefore it is likely that early fuel cell vehicles will carry a store of pure hydrogen as well as a reformer.

Although the automotive sector is the largest potential market for fuel cells, in the short term most platinum demand will come from stationary power generation. Phosphoric acid fuel cells (PAFC) already play a small role in this market, and during 2000 the world's largest PAFC plant, rated at 1 MW, was

installed in Alaska. Meanwhile, PEM fuel cells are showing considerable promise for smaller-scale power generation. Last year, over one hundred small cells were produced for testing, mainly in residential applications. Commercial production of these units - which typically have a power output of between 2 and 7 kW - is expected to start within the next two years. Larger PEM fuel cells, with a power rating of up to 250 kW, are also undergoing field testing but are still several years from commercialisation.

Glass

The use of platinum in glass production rose strongly in 2000, largely due to the construction of new capacity for high-quality glass used in liquid crystal displays (LCDs). There was also some investment in other sectors of the glass industry. Overall sales to glass makers rose by 55,000 oz to reach 255,000 oz.

In the LCD sector, demand for platinum glass-making equipment is being driven by the increasing use of flat-screen displays in a wide range of electronic applications, including desktop and portable computers, televisions, digital

cameras and mobile phones. Industry expectations are that world requirements for LCD glass will more than double in the period to 2003. This has brought significant investment in new capacity; last year, new plants were constructed in North America, Korea and Japan, and all major LCD glass manufacturers are planning further expansions. Although some of these plans may be scaled back in the light of the current slowdown in the electronics market, demand for platinum is expected to remain strong in the near future.

The glass market has also benefited from another aspect of growth in the electronics market, since the majority of desktop PC displays are still based on traditional cathode-ray tubes. These are manufactured with the same technology used for television tubes, which employs significant quantities of rhodium-platinum alloys in the glass forming process. Investment has also been encouraged by consumer demand for televisions in developing Asian economies, with new television glass plants being constructed in China and India last year.

Conditions were positive in the glass fibre market in 2000. The industry has seen growing use of glass-reinforced composites in the construction and transport sectors. To satisfy consumer demand for fuel-efficient vehicles, car makers are using more lightweight, glass-reinforced thermoplastics in place of steel. In the

Platinum Demand: Glass

'000 oz

	1999	2000
Europe	20	20
Japan	65	65
North America	25	50
Rest of the World	90	120
Total	200	255



construction industry, glass fibre composites provide more resistance to corrosion than traditional materials, plus longer life and lower maintenance costs.

Petroleum Refining

Demand for platinum in petroleum refining declined slightly to 105,000 oz last year, its lowest level since 1994. A limited amount of investment in reforming capacity in Asia was insufficient to offset the impact of refinery closures in the USA and Europe.

Over the last few years, there has been a trend towards rationalisation of refinery capacity in mature markets, with new investment taking place mainly in developing markets in Asia and Latin America, where demand for petroleum products is growing and environmental regulations are less strict. During 2000, there were further refinery closures in North America and Europe, leading to a decline in platinum consumption.

Although rationalisation in these regions is now thought to be largely complete, there is unlikely to be a significant recovery in demand for platinum. Investment in reforming capacity seems certain to be limited while refiners concentrate on making the changes necessary to meet new limits on the sulphur content of gasoline and diesel. The European Commission has already mandated a maximum sulphur

content of 50 ppm for both gasoline and diesel, which will be enforced from 2005, and is considering further reductions.

In the USA, the Environmental Protection Agency has proposed new sulphur limits, although the precise requirements and timing of the legislation have not yet been settled.

In the rest of the world, platinum demand was steady last year. While there were no major new projects requiring large purchases of platinum, there were some incremental increases in reforming and isomerisation capacity at existing refineries.

Other

Demand for platinum in other applications continues to rise steadily, with consumption up 30,000 oz to 365,000 oz in 2000. There were gains across a range of applications, including spark plugs, oxygen sensors, medical devices, dental alloys and turbine blades.

Tighter emissions legislation continued to influence demand for platinum in oxygen sensors last year. Stage III European emissions legislation, which came into effect for new models from January 2000, made on-board diagnostic (OBD) systems compulsory on passenger cars for the first time. While all catalysed vehicles carry at least one oxygen sensor to monitor the engine's air:fuel ratio, the introduction of OBD regulations has resulted in the use of additional sensors to verify that emissions remain within legislated limits.

In North America, vehicles have carried OBD systems for some years. However, the number of sensors per car is gradually increasing as low emission vehicles account for an increasing proportion of sales. This trend has been partly offset by a slight reduction in the average weight of platinum in each sensor.

There was further growth in the use of platinum in spark plugs last year. North America is the principal market for

Platinum Demand: Other

'000 oz

	1999	2000
Europe	90	100
Japan	35	35
North America	190	210
Rest of the World	20	20
Total	335	365



this application; in 2000, we estimate that around 95 per cent of vehicles sold in the USA carried platinum-tipped plugs, up from 90 per cent the previous year. The use of platinum plugs is less widespread in Europe, although demand continues to increase gradually. In contrast, there was a decline in consumption in Japan, where some car manufacturers have begun to use iridium-based alloys in place of platinum.

Platinum's use in biomedical applications expanded again in 2000. The use of catheters in minimally-invasive treatments for arterial disease continues to grow, with better, smaller devices enabling the treatment of patients who would previously have required invasive surgery. Technical developments are also encouraging the use of pacemakers and similar devices to treat a wider range of heart conditions.

Dental applications consumed more platinum last year. The combination of low prices for gold and record prices for palladium has resulted in greater use of high-gold alloys, which often contain a small percentage of platinum as a hardening agent.

Demand for platinum in the coating of turbine blades rose modestly in 2000. Platinum coatings have traditionally been used only on blades closest to the jet engine, since these are subject to the highest temperatures and therefore require the greatest thermal resistance. In line

Platinum Demand: Petroleum Refining

'000 oz

	1999	2000
Europe	15	10
Japan	5	5
North America	40	35
Rest of the World	55	55
Total	115	105



with the development of engines which run at higher temperatures, there is a trend towards using platinum to improve the durability of so-called "second-stage" blades, further from the engine.

Investment

Net demand for platinum coins and small bars more than halved to 40,000 oz in 2000, mainly as a result of rising bullion prices. While sales of new coins amounted to some 65,000 oz, we believe that around 25,000 oz of platinum was supplied back to the market through the melting of old bars and coins. Most of this recovered metal was consumed in the US jewellery industry. In Japan, the steady rise in the yen price of platinum encouraged investors to sell a net 100,000 oz of large investment bars back to the market in 2000.

The US Mint's platinum Eagle series continues to dominate the small investment market, despite a steep fall in sales from a high of over 150,000 oz in 1998. Although consumer demand for high-quality proof Eagles was stable at just

under 23,000 oz, sales of the bullion coin plunged by over 60 per cent to 27,000 oz in 2000. This decline was probably due to a combination of factors, including the strong performance of alternative investment media such as equities, as well as the higher price of platinum.

In February 2000, it was reported that the Defense Logistics Agency (DLA) had requested the return of the 196,000 oz of platinum which had been loaned to the US Mint in support of its platinum Eagle programme, in order to sell the metal as part of its stockpile disposal programme. In December it was announced that the DLA had formally transferred to the US Mint 50,000 oz of platinum and this should enable the Mint to continue its proof Eagle programme, currently scheduled to run until 2002, and to produce a limited number of bullion coins. The fate of the remaining 146,000 oz held by the Mint is unclear. At present, we expect minting levels for the Eagle this year to be similar to those in 2000, although demand for bullion coins could benefit from the sharp decline in world stock markets that occurred during March 2001.

Platinum Demand: Investment '000 oz		
	1999	2000
Coins and small bars		
Europe	5	0
Japan	20	5
North America	60	35
Rest of the World	5	0
	90	40
Large bars in Japan	90	(100)
Total	180	(60)

In Japan, the price of platinum in yen terms doubled from a low of just over ¥1,200 per gram in September 1999 to over ¥2,400 per gram in January 2001. This rise encouraged many investors to take profits by selling back 500g and 1kg bars bought at lower prices in earlier years. We estimate a net sellback of 100,000 oz last year and, if prices remain well above ¥2,000 per gram, expect further disinvestment in 2001.

