PLATINUM-GROUP METALS

(Platinum, palladium, rhodium, ruthenium, iridium, osmium) (Data in kilograms, unless otherwise noted)

<u>Domestic Production and Use</u>: The United States has only one active platinum-group metals (PGM) mine. The mine, located near Nye, MT, processed about 430,000 metric tons of ore and recovered about 13,600 kilograms of PGM (primarily palladium) in 1998. Small quantities of PGM were also recovered as byproducts of copper refining by two companies in Texas and Utah. The automotive industry is the principal consumer of PGM as oxidation catalysts in catalytic converters to treat automobile exhaust emissions. Oxidation catalysts are also used in many air pollution abatement processes to remove organic vapors, odors, or carbon monoxide. Chemical uses include catalysts for organic synthesis, e.g., in hydrogenation, dehydrogenation, and isomerization. Platinum alloys, in cast or wrought form, are commonly used for jewelry. Platinum, palladium, and a variety of complex gold-silver-copper alloys are used as dental restorative materials. The primary medical use of PGM is in cancer chemotherapy. Other medical uses include platinum-iridium alloys in prosthetic and biomedical devices.

Salient Statistics—United States:	<u>1994</u>	<u> 1995</u>	<u>1996</u>	<u> 1997</u>	<u>1998°</u>
Mine production: ¹ Platinum	1,960	1,590	1,840	2,610	3,500
Palladium	6,440	5,260	6,100	8,400	10,500
Imports for consumption, refined:					
Platinum	56,500	71,500	75,800	77,300	82,000
Palladium	92,500	124,000	146,000	148,000	151,000
Rhodium	7,820	9,600	9,650	14,400	8,600
Ruthenium	9,880	7,520	15,600	11,500	10,200
Iridium	926	1,450	1,810	1,860	1,000
Osmium	55	73	329	54	75
Exports, refined:					
Platinum	15,500	15,000	12,700	23,000	8,460
Palladium	29,900	26,000	26,700	43,800	37,400
Rhodium	791	741	187	282	898
Price ² , dollars per troy ounce:					
Platinum	411.30	425.36	397.97	396.58	406.00
Palladium	156.20	153.35	130.39	184.14	290.00
Rhodium	636.00	463.30	300.00	298.99	300.00
Employment, mine, number	445	500	500	550	600

Recycling: An estimated 65 metric tons of PGM was recovered from new and old scrap in 1998.

Import Sources (1994-97): Platinum: South Africa, 60%; United Kingdom, 12%; Germany, 6%; Russia, 6%; and other, 16%. Palladium: Russia, 46%; South Africa, 18%; Belgium, 10%; United Kingdom, 6%; and other, 20%.

Tariff: All unwrought and semimanufactured PGM can be imported duty free.

Depletion Allowance: 22% (Domestic), 14% (Foreign).

Government Stockpile:

Stockpile Status—9-30-98³

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1998	Disposals FY 1998
Platinum	13,700	_		_	_
Palladium	38,800	_	_	_	_
Iridium	920		_	_	_

PLATINUM-GROUP METALS

Events, Trends, and Issues: Short-term concerns about supplies from Russia pushed the price of palladium from \$198 per troy ounce (ounce) at the beginning of the year to \$417 per ounce on May 18, 1998, overtaking the price of platinum(\$407 per ounce) for the first time. The price surge was driven by the lack of imports from Russia, the world's largest producer, during the first 4 months of 1998. The sharp price increase was only temporary, falling to \$285 per ounce on May 29, as Russian shipments began to reach the market. The price on September 30, 1997, was only \$280 per ounce, but still significantly higher than at the beginning of the year.

The only domestic primary PGM mine produced a record 3,732 kilograms of palladium and platinum in the second quarter of 1998. This was 54% higher than second quarter 1997 production of 2,426 kilograms. Cash cost per ounce, \$147 per ounce, was 22% lower than the 1997 cash costs or \$189 per ounce. Production for the 6 months ending on June 30, 1998, was 6,843 kilograms of palladium and platinum, 40% more than the 4,883 kilograms of metal produced in the same period in 1997. In the third quarter of 1998, a tunnel-boring machine was put into operation as part of an expansion project that is scheduled for completion in 2002 and expected to be at full capacity of about 15,600 kilograms of PGM annually by 2003.

World supplies of PGM are expected to increase substantially in the next 5 years, according to plans laid out by major non-South African PGM mining companies. About 62,200 kilograms of additional output could come from projects under development in Canada, the United States, and Zimbabwe. All were either expanding production or developing new mines.

World Mine Production, Reserves, and Reserve Base:

·	Mine production				PGM		
	Platinum		Palladium		Reserves⁴	Reserve base⁴	
	<u> 1997</u>	<u> 1998°</u>	<u> 1997</u>	<u>1998°</u>			
United States ²	2,610	3,500	8,400	10,500	730,000	810,000	
Canada	7,550	7,300	4,810	4,800	310,000	380,000	
Russia	17,000	17,500	47,000	47,000	6,200,000	6,600,000	
South Africa	125,000	125,000	55,900	60,000	63,000,000	69,000,000	
Other countries	<u>1,840</u>	2,000	2,890	3,500	700,000	750,000	
World total (rounded)	154,000	155,000	119,000	125,000	71,000,000	78,000,000	

<u>World Resources</u>: World resources of PGM in mineral concentrations currently or potentially economic to mine are estimated to be more than 100 million kilograms. The greatest reserves are in South Africa. Currently there are 10 producing mines in the Bushveld Complex. Of these, nine are producing from the Merensky Reef and UG2 Chromite Layer and one is producing from the Platreef, located on the northern limb of the Complex.

<u>Substitutes</u>: Some automotive companies have substituted palladium for the higher priced platinum in catalytic converters. Although palladium is less resistant to poisoning by sulfur and lead than platinum, it may be useful in controlling emissions from diesel-powered vehicles.

Electronics consumers are reducing the average palladium content of the conductive pastes used to form the electrodes of multi-layer ceramic capacitors, substituting palladium materials with palladium-silver pastes containing up to 70% silver. Other substitution plans include using nickel and copper.

eFstimated

¹Estimates from published sources.

²Handy & Harman quotations.

³See Appendix C for definitions.

⁴See Appendix D for definitions.