

PLATINUM-GROUP METALS

(Platinum, palladium, rhodium, ruthenium, iridium, osmium)

(Data in kilograms unless otherwise noted)

Domestic Production and Use: The Stillwater and East Boulder Mines in south-central Montana are the only primary platinum-group metals (PGMs) producers in the United States and were owned by Stillwater Mining Company. Stillwater and East Boulder Mines milled more than 1,200,000 metric tons of ore and recovered more than 18,400 kilograms of palladium and platinum in 2005.¹ Small quantities of PGMs were also recovered as byproducts of copper refining by companies in Texas and Utah. Catalysts for air pollution abatement continued to be the leading demand sector for PGMs. In the United States, more than 90,000 kilograms of PGMs was used by the automotive industry in the manufacture of catalytic converters. Catalysts were also used in other air-pollution-abatement processes to remove organic vapors, odors, and carbon monoxide. Chemical uses include catalysts for organic synthesis, production of nitric acid, and fabrication of laboratory equipment. 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.

Salient Statistics—United States:	2001	2002	2003	2004	2005^e
Mine production: ²					
Platinum	3,610	4,390	4,170	4,040	4,200
Palladium	12,100	14,800	14,000	13,700	14,200
Imports for consumption:					
Platinum	84,200	84,700	88,500	86,400	89,000
Palladium	160,000	117,000	105,000	127,000	103,000
Rhodium	12,400	8,630	12,000	13,200	14,000
Ruthenium	8,170	9,890	15,900	18,800	24,000
Iridium	3,110	2,100	2,200	3,230	3,600
Osmium	77	36	53	75	50
Exports:					
Platinum	29,300	27,800	22,200	20,000	21,000
Palladium	36,800	42,700	22,300	31,400	25,000
Rhodium	982	349	479	311	300
Other PGMs	252	94	145	677	700
Price, ³ dollars per troy ounce:					
Platinum	533.29	542.56	694.44	848.76	890.00
Palladium	610.71	339.68	203.00	232.93	190.00
Rhodium	1,600.00	838.88	530.28	983.24	2,000.00
Ruthenium	130.67	66.33	35.43	64.22	70.00
Iridium	415.25	294.62	93.02	185.33	160.00
Employment, mine, number ²	1,620	1,580	1,540	1,580	1,600
Net import reliance as a percentage of apparent consumption: ^e					
Platinum	92	91	91	92	91
Palladium	88	82	82	83	78

Recycling: An estimated 9,800 kilograms of PGMs was recovered from new and old scrap in 2005.

Import Sources (2001-04): Platinum: South Africa, 45%; United Kingdom, 16%; Germany, 12%; Canada, 6%; and other, 21%. Palladium: Russia, 33%; South Africa, 22%; United Kingdom, 15%; Belgium, 8%; and other, 22%.

Tariff: All unwrought and semimanufactured forms of PGMs can be imported duty free.

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

Government Stockpile:

Material	Stockpile Status—9-30-05 ⁴				
	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 2005	Disposals FY 2005
Platinum	261	—	⁵ 3,110	388	388
Palladium	—	—	⁵ 778	756	756
Iridium	282	56	186	254	219

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Events, Trends, and Issues: After recovering in 2004, palladium prices fell in 2005 because of weak demand and oversupply. Meanwhile, the platinum price continued to climb for the fourth year in a row owing to a perceived imbalance in the supply and demand. With a short supply, the price of rhodium surged to a 5-year high.

An increase in diesel car sales in Europe can be expected to cause a strong increase in use of platinum in the region in 2005 and beyond. The tightening of emissions regulations in China, Europe, Japan, and other parts of the world is also expected to lead to higher average platinum loadings on catalysts, especially on light-duty diesel vehicles, as particulate matter emissions become more closely controlled. In the United States, thrifting is continuing at most manufacturers and is likely to lead to a reduction in the use of platinum in autocatalysts. The price differential of more than \$600 per troy ounce between platinum and palladium has led to the assumption that automobile manufacturers will change PGMs ratios on gasoline-engine vehicles in favor of palladium, reversing the trend of the past 4 years. Many U.S. automobile manufacturers have yet to make the switch because of the history of high and volatile prices in the past. The sales of platinum jewelry are expected to drop worldwide as the price continues to be high and white gold and palladium are substituted for platinum.

In 2005, there were about nine potential PGMs projects in some stage of development in South Africa. Many of the current mines in South Africa were also expanding capacity to compensate for lower grade ore. The continuing strengthening of the South African rand could, however, raise the cost of future PGMs projects.

The desire for an alternative fuel for automobiles has led to a large global public and private effort to develop fuel-cell technology. Platinum is the catalyst used by fuel cells to convert hydrogen and oxygen to electricity. Palladium will also likely play a role in the fuel cell.

World Mine Production, Reserves, and Reserve Base:

	Mine production				PGMs	
	Platinum		Palladium		Reserves ⁶	Reserve base ⁶
	2004	2005 ^e	2004	2005 ^e		
United States	4,040	4,200	13,700	14,200	900,000	2,000,000
Canada	7,000	9,000	12,000	13,500	310,000	390,000
Russia	36,000	27,000	74,000	96,000	6,200,000	6,600,000
South Africa	160,000	170,000	78,500	81,700	63,000,000	70,000,000
Other countries	7,400	7,600	9,900	10,400	800,000	850,000
World total (rounded)	214,000	218,000	188,000	216,000	71,000,000	80,000,000

World Resources: World resources of PGMs in mineral concentrations that can be mined economically are estimated to total more than 100 million kilograms. The largest reserves are in the Bushveld Complex in South Africa. In 2005, there were 17 producing mining areas in the Bushveld Complex; of these 12 produced from the Merensky Reef and the UG2 Chromite Layer, and 1 produced from the Platreef on the northern limb of the Complex.

Substitutes: Some motor vehicle manufacturers have substituted palladium for the more expensive platinum in catalytic converters. Until recently, only platinum could be used in diesel catalytic converters; however, new technologies allow palladium to be used. For most other end uses, PGMs can be substitute for other PGMs, with some losses in efficiency. In addition, electronic parts manufacturers are reducing the average palladium content of the conductive pastes used to form the electrodes of multilayer ceramic capacitors by substituting base metals or silver-palladium pastes that contain significantly less palladium.

^eEstimated. — Zero.

¹Stillwater Mining Company, 2005, Annual report—2004: Billings, MT, Stillwater Mining Company, 100 p.

²Estimates from published sources.

³Engelhard Corporation unfabricated metal.

⁴[See Appendix B for definitions.](#)

⁵Actual quantity will be limited to remaining monetary sales authority or inventory.

⁶[See Appendix C for definitions.](#)