

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 (PGM) production sites in the United States. Stillwater milled about 1,000,000 metric tons of ore and recovered more than 18,000 kilograms of palladium and platinum in 2004. Small quantities of PGM 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 PGM. In the United States, more than 100,000 kilograms of PGM 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:	2000	2001	2002	2003	2004^e
Mine production: ¹					
Platinum	3,110	3,610	4,390	4,170	4,200
Palladium	10,300	12,100	14,800	14,000	14,200
Imports for consumption:					
Platinum	93,700	84,200	160,000	88,500	75,000
Palladium	181,000	160,000	117,000	105,000	119,000
Rhodium	18,200	12,400	9,890	12,000	10,000
Ruthenium	20,900	8,170	10,800	15,900	13,000
Iridium	2,700	3,110	2,100	2,200	3,900
Osmium	133	77	36	53	70
Exports:					
Platinum	25,000	31,300	27,800	22,200	16,000
Palladium	57,900	37,000	42,700	22,300	33,000
Rhodium	797	982	348	479	600
Price, ² dollars per troy ounce:					
Platinum	549.30	533.29	542.56	694.44	852.00
Palladium	691.84	610.71	339.68	203.00	252.00
Rhodium	1,990.00	1,598.67	838.88	530.28	736.00
Ruthenium	129.76	130.67	66.33	35.43	57.00
Employment, mine, number	1,290	1,320	1,420	1,600	1,500
Net import reliance as a percentage of apparent consumption: ^e					
Platinum	78	90	93	92	91
Palladium	84	87	69	81	81

Recycling: An estimated 8,000 kilograms of PGM was recovered from new and old scrap in 2004.

Import Sources (2000-03): Platinum: South Africa, 44%; United Kingdom, 14%; Germany, 13%; Canada, 7%; Russia, 4%; and other, 18%. Palladium: Russia, 40%; South Africa, 18%; United Kingdom, 12%; Belgium, 8%; Germany, 4%; and other, 18%.

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

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

Government Stockpile:

Stockpile Status—9-30-04³

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 2004⁴	Disposals FY 2004
Platinum	649	—	649	778	—
Palladium	756	—	756	6,220	1,070
Iridium	501	21	501	187	108

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Events, Trends, and Issues: Palladium prices, which declined sharply at the end of 2001 and continued to fall almost unabated through 2003, recovered in 2004 to a high of \$273 per ounce and averaged \$252 per ounce, up 24% from the full-year 2003 average. Prices increased as consumers returned to the market after drawing down large stocks that were accumulated during 2001 and 2002. Meanwhile, the platinum price averaged \$852 per ounce, 23% higher than the 2003 average and 57% higher than the 2002 average.

U.S. palladium producers joined with other palladium producers and processors to form the Palladium Council (PdC). PdC is a nonprofit research foundation organized for the purpose of conducting research and promoting the use of palladium. PdC research and development are intended to cover most major areas of palladium use, including hydrogen generation, purification, sensing and storage, as well as palladium in fuel cells.

The desire to develop an alternative fuel for automobiles is a large public and private effort around the world. In 2004 alone, governments worldwide appropriated funds for research and development in this area exceeding \$825 million. Private companies were spending as well, bringing annual investment in fuel-cell technology to more than \$1 billion to advance this effort. Platinum is the catalyst used by fuel cells to convert hydrogen and oxygen to electricity. Palladium will likely also play a role in the fuel cell as well.

World Mine Production, Reserves, and Reserve Base:

	Mine production				Reserves ⁵	PGM Reserve base ⁵
	Platinum		Palladium			
	2003	2004 ^e	2003	2004 ^e		
United States	4,170	4,200	14,000	14,200	900,000	2,000,000
Canada	7,400	8,600	11,500	13,400	310,000	390,000
Russia	36,000	36,000	74,000	74,000	6,200,000	6,600,000
South Africa	151,000	163,000	72,800	78,200	63,000,000	70,000,000
Other countries	6,430	6,500	9,700	10,400	800,000	850,000
World total (rounded)	205,000	218,000	182,000	190,000	71,000,000	80,000,000

World Resources: World resources of PGM 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 2004, there were 10 producing mines in the Bushveld Complex; of these, 9 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 platinum for the more expensive palladium in catalytic converters. 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.

¹Estimates from published sources.

²Handy & Harman quotations.

³See [Appendix B](#) for definitions.

⁴Actual quantity will be limited to remaining sales authority or inventory.

⁵See [Appendix C](#) for definitions.