

PLATINUM-GROUP METALS

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

Domestic Production and Use: The United States has only one active platinum-group metals (PGM) mine. The mine, located near Nye, MT, processed more than 400,000 metric tons of ore and recovered 10,200 kilograms of palladium and 3,200 kilograms of platinum in 1999. Small quantities of PGM were also recovered as byproducts of copper refining by two companies in Texas and Utah. Automobile catalysts continued to be the largest demand sector for PGM. In the United States, more than 110,000 kilograms of PGM were used by the automotive industry in the manufacture of catalysts. Oxidation catalysts are also used in other 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:	1995	1996	1997	1998	1999^e
Mine production: ¹ Platinum	1,590	1,840	2,610	3,240	3,200
Palladium	5,260	6,100	8,400	10,600	10,200
Imports for consumption, refined:					
Platinum	71,500	75,800	77,300	97,200	75,300
Palladium	124,000	146,000	148,000	176,000	195,000
Rhodium	9,600	9,650	14,400	13,400	14,500
Ruthenium	7,520	15,600	11,500	9,230	9,500
Iridium	1,450	1,810	1,860	2,060	2,600
Osmium	73	329	54	71	20
Exports, refined:					
Platinum	15,000	12,700	23,000	14,300	19,800
Palladium	26,000	26,700	43,800	36,700	38,900
Rhodium	741	187	282	811	100
Price, ² dollars per troy ounce:					
Platinum	425.36	397.97	396.58	372.50	365.00
Palladium	153.35	130.39	184.14	290.00	320.00
Rhodium	463.30	300.00	298.99	620.00	900.00
Employment, mine, number	500	500	550	620	620

Recycling: An estimated 70 metric tons of PGM was recovered from new and old scrap in 1999.

Import Sources (1995-98): Platinum: South Africa, 59%; United Kingdom, 14%; Russia, 9%; Germany, 5%; and other, 13%. Palladium: Russia, 48%; South Africa, 18%; United Kingdom, 9%; Belgium, 8%; and other, 17%.

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

Depletion Allowance: 23% (Domestic), 15% (Foreign).

Government Stockpile:

Stockpile Status—9-30-99³

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 1999	Disposals FY 1999
Platinum	10,649	—	10,649	—	3,113
Palladium	34,196	—	18,729	—	4,668
Iridium	784	3.11	2.18	—	136

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Events, Trends, and Issues: In 1998, the lone U.S. primary PGM producer completed expansion construction work at its mine which increased its milling rate to 3,000 tons per day. In 1999, the company focused on increasing underground development in the mine to support the added capacity. Advancement of its East Boulder Project, near Big Timber, MT, began with the arrival of a 4.6-meter diameter tunnel-boring machine (TBM). At the end of February 1999, the TBM had advanced more than one-third of the distance to the J-M Reef. The tunneling process was projected to reach the ore body, about 18,500 feet from the portal entrance, by the end of 1999. A second TBM also began excavating a second parallel tunnel. Completion of the second tunnel will allow underground infrastructure construction, providing additional access and ventilation. East Boulder will be Stillwater's second producing mine, located on the western end of the J-M Reef and 13 miles west of the Stillwater Mine. The project is permitted for 2,000 tons per day and is expected to produce between 14,000 and 15,600 kilograms of palladium and platinum at a cost of production of \$140 to \$160 per ounce.

The operator of the Stillwater mine was granted a Record of Decision by the Montana Department of Environmental Quality which removed tonnage limitations at the mine and authorized construction of a long-term tailings facility.

The price of rhodium rose sharply in 1999, as demand by industrial users was reinforced by investor buying.

World supplies of PGM are expected to increase substantially in the next 5 years, according to the plans of major non-South African PGM mining companies. More than 50,000 kilograms of additional output could come from projects underway in Canada and the United States.

World Mine Production, Reserves, and Reserve Base:

	Mine production				PGM	
	Platinum		Palladium		Reserves ⁴	Reserve base ⁴
	1998	1999 ^e	1998	1999 ^e		
United States ²	3,240	3,200	10,600	10,200	730,000	810,000
Canada	7,570	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	117,000	120,000	57,300	60,000	63,000,000	69,000,000
Other countries	1,550	2,100	2,930	3,000	700,000	750,000
World total (may be rounded)	146,000	150,000	123,000	125,000	71,000,000	78,000,000

World Resources: World resources of PGM in mineral concentrations currently or potentially economic to mine are estimated to total more than 100 million kilograms. The largest reserves are located in the Bushveld Complex 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.

Substitutes: Some motor vehicle manufacturers 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.

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.

¹Estimates from published sources.

²Handy & Harman quotations.

³See Appendix B for definitions.

⁴See Appendix C for definitions.