

PLATINUM-GROUP METALS

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

Domestic Production and Use: The Stillwater Mine is the only primary platinum-group metals (PGM) producer in the United States. The mine, located near Nye, MT, processed more than 400,000 metric tons of ore and recovered more than 13,000 kilograms of palladium and platinum in 2000. 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; for example, 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:		1996	1997	1998	1999	2000^e
Mine production: ¹	Platinum	1,840	2,610	3,240	2,920	3,050
	Palladium	6,100	8,400	10,600	9,800	10,000
Imports for consumption:						
	Platinum	75,800	77,300	96,700	129,000	72,000
	Palladium	146,000	148,000	176,000	189,000	147,000
	Rhodium	9,650	14,400	13,500	10,500	19,900
	Ruthenium	15,600	11,500	8,880	11,400	16,600
	Iridium	1,810	1,860	1,950	2,270	2,640
	Osmium	NA	54	71	23	46
Exports:						
	Platinum	12,700	23,000	14,300	19,400	32,572
	Palladium	26,700	43,800	36,700	44,000	54,900
	Rhodium	187	282	811	114	764
Price, ² dollars per troy ounce:						
	Platinum	398.07	396.59	374.61	378.94	390.94
	Palladium	130.39	184.14	289.76	363.20	590.00
	Rhodium	308.30	298.00	619.83	904.35	1,800.00
Employment, mine, number		500	550	620	815	820
Net import reliance as a percent of apparent consumption: ^e						
	Platinum	NA	NA	94	96	83
	Palladium	NA	NA	90	92	89

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

Import Sources (1996-99): Platinum: South Africa, 56%; United Kingdom, 11%; Russia, 10%; Germany, 5%; and other, 18%. Palladium: Russia, 51%; South Africa, 18%; United Kingdom, 8%; Belgium, 7%; and other, 16%.

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

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

Government Stockpile:

Stockpile Status—9-30-00³

Material	Uncommitted inventory	Committed inventory	Authorized for disposal	Disposal plan FY 2000	Disposals FY 2000
Platinum	6,745	—	6,745	3,888	3,904
Palladium	26,191	673	26,190	—	8,006
Iridium	784	—	2.18	—	—

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Events, Trends, and Issues: The lone U.S. primary PGM producer experienced a number of operating setbacks at its Stillwater Mine that prevented it from reaching its target production rate of 3,000 metric tons per day. The setbacks were caused by difficulties associated with a lack of sufficiently developed working faces, increased dilution resulting from narrower ore width, and lower mine productivity. The operator of the Stillwater Mine expects to expand production to a minimum of 16,300 kilograms of palladium and platinum by the end of 2001.

As of April 30, 2000, the East Boulder and Stillwater Mines had proven and probable reserves of 36.3 million metric tons at a grade of 22.1 grams per ton containing 799,360 kilograms of recoverable palladium and platinum. With the ongoing expansion project that will increase the Stillwater Mine's capacity to 3,000 tons of ore per day and construction of the 2,000-ton-per-day East Boulder Project, these reserves equate to 20 years of production with both projects producing at capacity. The proven and probable reserves are contained in a 4,500-meter-long deposit along the J-M Reef, in southern Montana. The average palladium to platinum ratio in the deposit is about 3:1.

The price of palladium rose sharply in 1999 from \$337 per troy ounce at the beginning of January to a record high of \$454 per ounce at the end of the year. In the first 6 months of 2000, new highs of more than \$700 per ounce were reached. Platinum prices rose more slowly but began to increase at the end of 1999 and have continued to increase through the first half of 2000.

The world's largest platinum producer plans to increase its annual production by 75% during the next 6 years. The increase, from 62,200 kilograms in 1999 to more than 100,000 kilograms in 2006, will be produced from a number of new mines, as well as the expansion of mines in South Africa's Bushveld complex.

World Mine Production, Reserves, and Reserve Base:

	Mine production				PGM	
	Platinum		Palladium		Reserves ⁴	Reserve base ⁴
	1999	2000 ^e	1999	2000 ^e		
United States	2,920	3,050	9,800	10,000	800,000	890,000
Canada	5,442	5,500	8,592	8,800	310,000	390,000
Russia	27,000	26,000	85,000	86,000	6,200,000	6,600,000
South Africa	131,000	140,000	63,600	65,000	63,000,000	70,000,000
Other countries	2,600	3,450	7,000	7,200	700,000	850,000
World total (rounded)	169,000	178,000	174,000	177,000	71,000,000	79,000,000

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. In 2000, there were 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 platinum for the now 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. NA Not available.

¹Estimates from published sources.

²Handy & Harman quotations.

³See Appendix B for definitions.

⁴See Appendix C for definitions.