PLATINUM GROUP METALS (PGM)

A. Commodity Summary

The platinum-group metals refer to six metals: platinum, palladium, rhodium, ruthenium, iridium, and osmium. Commercially, the two most important metals are platinum and palladium. All of the platinum-group metals are valued for their corrosion resistance and their catalytic activity.[1] According to the U.S. Bureau of Mines, ore containing the platinum-group metals is mined, concentrated, and smelted in Montana. The resulting platinum-group matte is sent to Belgium to be refined and separated. Additionally, platinum-group metals are recovered as byproducts of copper refining by two companies in Texas and Utah. Approximately 30 firms refine secondary metal domestically. Platinum-group metals are used by the following industries: automotive, electrical and electronic, chemical, dental, and medical. The metals are primarily used as catalysts in the automotive and petroleum refining industries.[2] Domestic production was reported as 60,000 kilograms in 1994 (sales as reported to industry) and apparent domestic consumption was estimated at 127,000 kilograms during the same period.[3] Exhibit 1 presents the names and locations of all the facilities involved in the production and refining of platinum-group metals.

The six platinum-group metals can be separated into three pairs: platinum and palladium, ruthenium and osmium, and rhodium and iridium. Each pair exhibits similar physical and metallurgical properties. Platinum and palladium are corrosion resistant and the most malleable. Ruthenium and osmium have the strongest abrasion resistance. Osmium alloys are used as pen tips and ruthenium is used as an electrical contact and as a titanium coating alloy. Rhodium and iridium are the least abrasion resistant and often used as alloying elements for platinum. Rhodium, palladium, and platinum are also used as an automotive catalyst for NO_x reduction[4], and platinum is used in both automobile oxygen sensors and spark plugs.[5]

EXHIBIT 1

SUMMARY OF PLATINUM-GROUP METALS PROCESSING FACILITIES

Facility Name	Location	Type of Operations (source)
Stillwater Mine	Nye, MT	Mining and Beneficiation[a]
Allied Signal	Tulsa, OK	Secondary (spent automotive catalysts)
Allied Precious Metals	Tucson, AZ	Secondary (solutions and sludges)
ASARCO	Amarillo, TX	Secondary
AT & T Metals	Staten Island, NY	Secondary (electronic scrap)
Colonial Metals	MD	Secondary (spent industrial catalysts)
Degussa Corp.	South Plainfield, NJ	Secondary (solutions, electronic scrap, catalysts)
Eastern Smelting and Refining Corp.	Lynn, MA	Secondary (solutions, sludges, catalysts)
Engelhard Corp	Iselin, NJ	Secondary (spent industrial catalysts, electronic scrap)

[1] J. Roger Loebenstein, "Platinum-Group Metals," from Minerals Yearbook Volume 1. Metals and Minerals, U.S. Bureau of Mines, 1992, p. 995.

[2] J. Roger Loebenstein, "Platinum-Group Metals," from Mineral Commodity Summaries, 1995, pp. 126-127.

[3] J. Roger Loebenstein, 1995, Op. Cit., p. 126.

[4] U.S. Environmental Protection Agency, "Platinum-Groups Metals," from 1988 Final Draft Summary Report of Mineral Industry Processing Wastes, Office of Solid Waste, p. 3-159.

[5] J. Roger Loebenstein, 1992, Op. Cit., p. 997.

EXHIBIT 1

SUMMARY OF PLATINUM-GROUP METALS PROCESSING FACILITIES (CONTINUED)

Facility Name	Location	Type of Operations (source)
Gemini Industries	Santa Ana, CA	Secondary (spent industrial catalysts, petroleum catalysts)
Handy and Harman	Fairfield, CT	Secondary
Handy and Harman	South Windsor, CT	Secondary (filter cake, metallic scrap, spent automotive catalysts)
Hauser & Miller	St. Louis, MO	Secondary
JM Ney Co	Bloomfield, CT	Secondary
Johnson Matthey	West Deptford, NJ	Secondary (filter cake, spent automotive catalysts, solutions, unrefined ingot)
Kinsbursky Brothers	Anaheim, CA	Secondary (solutions, electronic scrap, spent automotive catalysts)
Kennecott Copper	Salt Lake City, UT	Secondary
Leach and Garner	Attleboro, MA	Secondary
Leytess Metal and Chemical	New York, NY	Secondary
LG Balfour CO	Attleboro, MA	Secondary
Martin Metals	Los Angeles, CA	Secondary (electronic scrap, solid scrap)
McRilley Mark Co.	CA	Secondary
Multimetco, Inc.	Anniston, AL	Secondary (spent automotive catalysts)
Noranda/Micrometallics Corp.	San Jose, CA	Secondary (electronic scrap, filter cakes, sludges, solutions, catalysts, filter media)
Noranda Sampling	Providence, RI	Secondary (electronic scrap, solid scrap)
PGP Industries, Inc.	Santa Fe, CA	Secondary (spent industrial catalysts, sludges, electronic scrap)
Sabin Metals	Rochester , NY	Secondary (electronic scrap, filter cakes, solid scrap)
Sipi Metals	Chicago, IL	Secondary (electronic scrap)
Southwest Smelter & Refining	Dallas, TX	Secondary
Stern Metals	Attleboro, MA	Secondary
Techamet, Inc.	Houston, TX	Secondary (spent automotive catalysts, petroleum catalysts)
Technic, Inc.	Providence, RI	Secondary
Texas Instruments	MA	Secondary
Trifari, Krussman	Providence, RI	Secondary

EXHIBIT 1

SUMMARY OF PLATINUM-GROUP METALS PROCESSING FACILITIES (CONTINUED)

Facility Name	Location	Type of Operations (source)
William Gold Refining	Buffalo, NY	Secondary