

GARNET

By Gordon T. Austin

Technical-grade industrial garnet from the United States is a solid solution of almandite and pyrope that, when under pressure, breaks into sharp chisel-edged plates. Industry uses this garnet as an abrasive powder and to manufacture coated abrasives. Low-quality industrial garnet found uses primarily as airblasting or hydroblasting media and as filtration media.

Production.—In 1994, five U.S. firms produced 51,000 tons of crude garnet concentrate worth \$6.1 million. The firms were Barton Mines Corp., Warren County, NY; NYCO Div. of Processed Minerals Inc., Essex County, NY; Patterson Materials Corp., Wingdale, NY; International Garnet Abrasive Inc., Clinton County, NY; and Emerald Creek Garnet Co., Benewah County, ID. All five firms were surveyed by the U.S. Bureau of Mines in its production of garnet (industrial) survey, a voluntary survey to determine U.S. production and sales of industrial garnet. Four of the five firms responded to the survey, the responding firms accounted for about 99% of the production of crude garnet concentrate.

Consumption and Uses.—In 1994, the quantity of garnet sold or used by producers was 40,600 tons valued at \$15.1 million. (*See table 1.*)

The major industrial use for high-quality, high-value garnet since before 1880 has been as loose-grain abrasive for applications such as optical lens grinding and plate-glass grinding. In recent years, its applications included the high-quality, scratch-free lapping of semiconductor materials and other metals. The finishing of wood, leather, hard rubber, felt, and plastics often requires the use of garnet-coated abrasive papers and cloths.

The aluminum aircraft and shipbuilding industries in California and the Pacific Northwest use lower quality, lower cost alluvial garnet, primarily from Idaho, for sandblasting. Similar uses in the Eastern United States are for the cleaning and conditioning of aluminum and other soft metals and for cleaning of metal by structural steel fabrication shops. Mixed-media water filtration, using a mixture of sand, anthracite, and garnet, has displaced older filtration methods because it is more reliable and gives a better quality of water. Garnet also is used in hydrojet cutting; it is entrained in a high-pressure stream of water to cut many

different materials. Demand for these uses has increased greatly. The manufacturers of nonskid floor paint also use alluvial and other low-cost garnets.

Garnet has obtained an intermediate place in the coated-abrasive field between low-cost quartz sand and more costly synthetic abrasives (silicon carbide and fused alumina). Garnet is reportedly more efficient based on unit production costs than quartz sand. It also produces a more desirable finish on items made of wood, leather, hard rubber, felt, and plastic.

Garnet, especially the lower grades, cannot compete with synthetic abrasives for most metalworking applications requiring substantial metal removal because of its friable nature and lower hardness.

Prices.—The average value per ton of crude garnet concentrates was \$120. In 1994, the average value per ton of garnet sold or used was \$372.

Foreign Trade.—Garnet exports, as reported to the USBM, by producers were about 10,000 tons. Export data on garnet were not available from the Bureau of the Census (Department of Commerce). Producers have reported export quantities to the USBM for the past 8 years.

Mineral brokers and other garnet importers reported to the USBM about 6,000 tons of imported garnet. Import data for garnet also were not available from the Bureau of the Census.

World Review.—The United States was the dominant world producer and consumer of garnet, accounting for approximately 45% of the estimated world output and nearly 40% of estimated world consumption. Studies are underway on two garnet deposits, an almandite deposit in Arizona and an andradite deposit in New Mexico.

Target Mines Ltd. (a subsidiary of the U.S. producer Barton Mines) continued to produce at near capacity from its Australian garnet sand operation.

The Chinese mines continued to increase production of garnet for the domestic and world market. Two mineral-sand mining operations in India continued to produce garnet as a byproduct of mineral sands production. Turkey and the Newly Independent States (formerly the U.S.S.R.) primarily produce for local markets.

Outlook

The U.S. production and consumption of industrial garnet during the next 5 years will be a function of the installed capacity and imports. Currently the industry is operating at or near capacity. If economics allow additional capacity to be added, production and consumption could increase to approximately 80,000 tons per year by 1999. If garnet were not available, other abrasives could be used in its place, but in many cases with some sacrifices in work volume, quality of work, or cost.

Substitution of other natural and synthetic material is present to some extent for all major end uses of garnet. Fused alumina and staurolite compete with garnet as a sandblasting material in the transportation equipment industries. Ilmenite and plastics compete as filtration media. Diamond, corundum, and fused alumina compete for lens grinding and for many lapping operations. Finally, sand, silicon carbide, and fused alumina compete for grinding and finishing of plastics, wood furniture, and other products.

OTHER SOURCES OF INFORMATION

U.S. Bureau of Mines Publications

Garnet Chapter of Mineral Commodity Summaries, 1995.

Abrasive Materials Annual Report, 1993.

Mineral Facts and Problems, 1985.

TABLE 1
SALIENT U.S. GARNET STATISTICS 1/

Year	Crude production		Sold or used	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
1990	47,000	\$6,940	45,900	\$11,800
1991	50,900	7,530	48,100	13,000
1992	54,100	4,840	46,100	13,000
1993	44,000	4,440	55,800	15,400
1994	51,000	6,100	40,600	15,100

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits.