

WOLLASTONITE

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Wollastonite is a calcium metasilicate (CaSiO_3). It has a theoretical composition of 48.3% calcium oxide and 51.7% silicon dioxide but it may contain trace to minor amounts of aluminum, iron, magnesium, manganese, potassium, and sodium. Wollastonite occurs as massive or short prismatic crystals that cleave into massive to acicular fragments. It usually is white but also may be gray, brown, or red depending on its composition.

Wollastonite forms when either impure limestones are metamorphosed (subjected to heat and pressure) or silica-bearing fluids are introduced into calcareous sediments during metamorphic processes. In both cases, calcite reacts with silica to produce wollastonite and carbon dioxide.

Deposits of wollastonite have been found in Arizona, California, Idaho, Nevada, New Mexico, New York, and Utah. These deposits are typical skarns containing wollastonite as the major component and calcite, diopside, garnet, idocrase, and/or quartz as minor components.

Production

Wollastonite has been mined commercially in California and New York. The California deposits, which were in Inyo, Kern, and Riverside Counties, were mined between 1930 and 1970. These operations were limited in size, producing only a few thousand tons per year for ceramics, decorative stone, paint, and mineral wool production.

In New York, deposits in Essex and Lewis Counties have been mined since the 1950's. Two companies currently are mining wollastonite. NYCO Minerals Inc. operates a mine in Essex County, and R.T. Vanderbilt Co. Inc. operates a mine in Lewis County. The NYCO deposit contains wollastonite, garnet, and diopside. The ore is processed at the Willsboro plant where the diopside and garnet are removed by using high-intensity magnetic separators. NYCO also chemically modifies the surfaces of some of its wollastonite products. The Vanderbilt deposit in Lewis County contains wollastonite, calcite, and diopside. The ore is processed at the Balmat plant.

Domestic wollastonite sales increased slightly from that of 1995.

Consumption

The major uses of wollastonite are in ceramics, paint, and plastics and as a substitute for asbestos. It also is used in adhesives, friction products (brakes and clutches), joint compounds, refractories, wallboard, and metallurgical applications. In ceramics, wollastonite decreases shrinkage and

gas evolution during firing, increases green and fired strength, permits fast firing, and reduces crazing, cracking, and glaze defects. As a filler in paint, wollastonite reinforces the paint film, acts as a pH buffer, improves its resistance to weathering, reduces pigment consumption, and acts as a flattening and suspending agent. In plastics, it improves tensile and flexural strength, reduces resin consumption, and improves thermal and dimensional stability at elevated temperatures, and, when surface treated, improves the adhesion with polymers. As a substitute for asbestos in floor tiles, friction products, insulating board and panels, paint, plastics, and roofing products, wollastonite is resistant to chemical attack, inert, stable at high temperatures, and a good reinforcer. In Europe, another major use is as a flux for welding and controlling casting speed during continuous casting of steel.

Prices

Prices per metric ton, for wollastonite, exworks, acicular, were \$180 for -200 mesh; \$224 for -325 mesh; and \$248 for -400 mesh. The prices per ton, exworks, were \$308 for acicular, high-aspect-ratio material and \$620 for ground (10 micron) material. Prices per ton for wollastonite, f.o.b. plant, bulk, were \$170 for 200 mesh and \$214 for 325 mesh (Industrial Minerals, 1996b). Quoted prices should be used only as a guideline because actual prices depend on the terms of the contract between seller and buyer.

Foreign Trade

About 1,380 tons of wollastonite was imported and 4,080 tons was exported in 1996, according to the Journal of Commerce (JoC) Port Import/Export Reporting Service. Most of the wollastonite was imported from India, only small tonnages were imported from China and Japan. A large percentage of the wollastonite exports went to Japan. Other major markets were the South Pacific region, South America, and Central America. The JoC data do not include wollastonite imported from or exported to Canada and Mexico.

World Review

Worldwide production of wollastonite is estimated to be between 500,000 and 550,000 tons in 1996. Wollastonite production was 22,300 tons in Finland; 90,000 tons (estimated) in India; and 29,000 tons (estimated) in Mexico. Wollastonite production in China is more difficult to ascertain. Although industry experts place production between 100,000 tons and

250,000 tons, it is more likely to be nearer 250,000 tons. Chile, the Czech Republic, Namibia, North Korea, Pakistan, South Africa, and Turkey also produce small amounts of wollastonite. Industry experts place U.S. production at 150,000 tons.

Brazil.—The Instituto de Pesquisas Tecnológicas do Estado de Sao Paulo (IPT) began accepting bids for mineral rights to a wollastonite deposit located near Itaoca. The deposit consists of two ore bodies. One ore body contains 800,000 tons of fine-grained skarn that comprises 48% wollastonite, 23% garnet, 8% diopside, and 21% plagioclase and other minerals. The other contains 50,000 tons of ore that comprises more than 60% wollastonite, 13% garnet, and 9% diopside, as well as various amounts of calcite, feldspar, and vesuvianite (Industrial Minerals, 1996c).

Canada.—Super Twins Resources Ltd. completed a mine feasibility study at its Isk Wollastonite project site in British Columbia. The company contracted for mine and mill site design (North American Minerals News, 1996c). Orleans Resources Inc. received financing for development of its St. Ludger de Milot, Quebec, deposit and began construction of the processing facility (North American Minerals News, 1996a).

Cuba.—In Cuba, Geominera SA was looking into a joint wollastonite venture at Ariamo, Cienfuegos (North American Minerals News, 1996b).

Kazakstan.—The private Kazakstan mining company, Olva, mines wollastonite in the Zhezkazgan region where reserves are estimated to be 14.5 million tons. Mine capacity is reported to be 150,000 tons per year. Olva is looking to expand its markets. In the past, wollastonite sales were limited to small defense markets (Industrial Minerals in the CIS, 1996).

Mexico.—NYCO Minerals Inc. continued construction of its mill near Hermosillo. The plant will have a capacity of 200,000 tons per year. The mine supplying the mill has reserves of 82 million tons of high-aspect-ratio wollastonite; the average grade is 60%. Flotation will be used to separate calcite. The wollastonite will be sold to plastics, ceramics, asbestos replacements, metallurgy, and various other markets. Primary markets will be in Europe, Asia, and South America. (Industrial Minerals, 1996a).

Outlook

The outlook for wollastonite looks good as existing markets expand and new markets are developed. With the opening of NYCO's plant in Mexico in late 1997, aggressive marketing of industrial minerals by the Chinese, and the anticipated development of Canadian deposits in the next year or two, wollastonite markets will be much more competitive than in the past.

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