WOLLASTONITE

By Robert L. Virta

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 from that of 1996.

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 flatting and suspending agent. In plastics, it improves tensile and flexural strength, reduces resin consumption, and improves thermal and dimensional stability at elevated temperatures. Surface treatments are used to improve the adhesion between the wollastonite and the polymers into which they are added. 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 material; $224 for -325 mesh material; and $248 for -400 mesh material. 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 material and $214 for 325 mesh material (Industrial Minerals, 1997c). 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

The Journal of Commerce (JOC) Port Import/Export Reporting Service indicates that 1,719 tons of wollastonite were imported in 1997, excluding shipments by truck or rail through Canada and Mexico. Wollastonite was imported from China (26.6% of the tonnage), Finland (2.5%), India (70.1%), and Sweden (0.8%). Total imports, including shipments from or through Canada and Mexico were estimated to be less than 3,000 tons. The JOC Port Import/Export Reporting Service indicates that 3,431 tons were exported in 1997, excluding shipments by truck or rail through Canada and Mexico. Major importers were Brazil (27% of the tonnage), China (17%), Japan (16%), and Australia (10%). Other importers of U.S. wollastonite were Argentina, Brazil, Chile, Colombia, the Dominican Republic, Ecuador, Guatemala, Japan, Malaysia, the Netherlands, the Republic of Korea, and Venezuela. With shipments through Canada and Mexico included, exports are estimated to be between 25,000 and 35,000 tons annually.

World Review

Worldwide production of wollastonite is estimated to be between 450,000 and 500,000 tons in 1997. Wollastonite production was estimated to be 23,000 tons in Finland; 80,000 tons in India; and 29,000 tons in Mexico. Production in China is estimated to be between 200,000 and 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.

Canada.—Whitegold Resource Corp., formerly called Super

Twins Resources Ltd., completed a prefeasibility study on its Isk Wollastonite project site in British Columbia and is continuing work necessary to finalize the study (North American Minerals News, 1997). Orleans Resources Inc. completed construction of its mill in Lac St. Jean in Quebec and has initiated production (Industrial Minerals, 1997b).

Mexico.—NYCO Minerals Inc. completed construction of its mill near Hermosillo and began mining wollastonite near Sonora. The mine and mill are located in northwestern Mexico and have a production capacity of 240,000 tons per year (Canadian Pacific, 1997).

Spain.—Gwalia Consolidated Ltd. and Desarollo de Recursos Geologicos S.A. canceled plans to develop a Spanish wollastonite deposit located in the Province of Salamanca after Gwalia withdrew from the project to focus on its core activities. The deposit, however, will continue to be investigated by a joint venture of Pydhesa and Criaderos Minerales y Derivados S.A. There are approximately 4.5 million tons of proven reserves and another 20 million tons of probable reserves in the deposit, which averages 35% wollastonite (Industrial Minerals, 1997a).

Outlook

World wollastonite production has grown from an estimated 150,000 tons in 1982 to 450,000 tons in 1997, an annual average growth of 13%. Production in the United States increased at an annual average rate of approximately 10% during this same time period. This rapid growth reflects the major inroads that wollastonite made into the asbestos substitute, ceramics, paint, and plastics markets. The asbestos substitute, ceramic, and paint markets are approaching mature market status for wollastonite. Therefore, sales for these markets will probably increase at a rate of 3% to 6% per year, following the growth patterns for these particular industries. Plastics, however, will continue to be the major growth market for wollastonite. It would not be unexpected for sales of wollastonite for the plastics market to increase at a rate of 10% per year for the next few years.

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