

WOLLASTONITE

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Wollastonite is a calcium metasilicate (CaSiO_3). It has a theoretical composition of 48.3% CaO and 51.7% SiO_2 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 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. Wollastonite was mined in California between 1930 and 1970 from deposits in Inyo, Kern, and Riverside Counties. These operations were limited in size, producing only a few thousand tons of wollastonite per year for ceramics, decorative stone, paint, and mineral wool production.

Mining in New York began in the 1950's and has continued to the present day from deposits in Essex and Lewis Counties. 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 its Willsboro plant where the diopside and garnet are removed using high-intensity magnetic separators. NYCO also chemically modifies the surfaces of some of its wollastonite products. The R. T. Vanderbilt deposit in Lewis County contains wollastonite, calcite, and diopside. The company processes its ore at its Balmat plant. Domestic wollastonite sales increased 3% from that of 1994.

Consumption

Wollastonite is used in adhesives, ceramics, friction products (brakes and clutches), joint compounds, metallurgical applications, paint, plastic composites, refractories, and wallboard. The major uses are in ceramics, paint, and plastics. In ceramics, wollastonite decreases the shrinkage and gas evolution during firing, increases the green and fired strength of

the ceramic, permits fast firing of the ceramic body, 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, wollastonite improves the tensile and flexural strength, reduces the consumption of expensive resins, and improves thermal and dimensional stability at elevated temperatures. Wollastonite used in plastics may be surface treated to improve the adhesion between the wollastonite and the polymers, thereby improving the characteristics of the finished product. In Europe, another major use is in metallurgical applications. Wollastonite is used as a flux for welding and for controlling casting speed during continuous casting of steel.

Wollastonite also is used as an asbestos substitute. It is acicular when ground so it is a good reinforcer in paint and plastics. Wollastonite is resistant to chemical attack, relatively inert, and stable at high temperatures, making it a good replacement for asbestos in plastics, paint, and insulating board. Wollastonite has been used in insulating boards and panels, floor tiles, plastics, roofing, and friction products.

Prices

Prices from Industrial Minerals, December 1995, for wollastonite, exworks, acicular, were \$180 per metric ton for minus 200 mesh; \$224 for minus 325 mesh; and \$248 for minus 400 mesh. The price, exworks, for acicular, high-aspect-ratio material was \$308 per ton, and for ground (10 micron) material, \$620 per ton. Prices per ton for wollastonite, f.o.b. plant, bulk, were \$170 for 200 mesh and \$214 for 325 mesh. Quoted prices should be used only as a guideline because actual prices depend on the terms of the contract between seller and buyer.

World Review

Worldwide production of wollastonite was estimated to be between 350,000 and 375,000 tons in 1995. Estimates for wollastonite production in individual countries were 100,000 tons for China; 28,000 tons for Finland (reported as 27,757 tons in 1994); and 80,000 tons for India (reported as 78,648 tons in 1994). Production in Mexico was reported to be 29,000 tons in 1995. Reported production in Namibia and the Czech Republic was 1,309 tons and 800 tons, respectively, in 1995. Industry experts estimated U.S. production to be 130,000 tons. Production in Chile, North Korea, Pakistan, South Africa, and Turkey accounted for the remainder.

NYCO Minerals Inc. continued developmental work on its

deposit in Sonora, Mexico, while Super Twins Resources Ltd. continued sampling of its deposits in British Columbia. NYCO Minerals also is evaluating wollastonite produced in China. Gwalia Consolidated Ltd. worked with Desarrollo de Recursos Geologicos S.A. to evaluate a wollastonite deposit in Spain.

Outlook

Worldwide production has increased significantly in recent years. Production has increased from an estimated 120,000 tons in the mid-1980's to its current level of 350,000 to 375,000 tons. Markets for wollastonite should continue to grow and production should exceed 400,000 tons by the turn of the century.

OTHER SOURCES OF INFORMATION

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