

WOLLASTONITE

By Robert L. Virta

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.¹

Wollastonite forms when impure limestones are metamorphosed (subjected to heat and pressure) or silica-bearing fluids are introduced into calcareous sediments during the metamorphic process. In both cases, calcite reacts with silica to produce wollastonite and carbon dioxide.¹²

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.¹²

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.²³

Mining in New York began in the 1940's and has continued to the present day from deposits in Essex and Lewis Counties.²³ Two companies currently are mining wollastonite. NYCO, a division of NYCO Minerals Inc., operated a mine in Essex County and R. T. Vanderbilt Co. Inc. operated a mine in Lewis County. The NYCO deposit contains about 60% wollastonite, 30% garnet, and 10% diopside. The ore is processed at their Willsboro plant where the diopside and garnet are removed using magnetic separators. Besides its ground products, NYCO also produces surface-treated wollastonite. The R. T. Vanderbilt deposit in Lewis County is relatively pure with only minor amounts of calcite and diopside. The company processes its ore at its Balmat plant.²³ Domestic wollastonite sales increased 16% from that of 1993.

Consumption

Wollastonite is used in abrasive products, adhesives, brake linings, ceramics, friction products (brakes and clutches), glass insulation, glazes, metallurgical applications, paint, plasters, refractories, and wallboard. The major uses are in ceramics, plastics, and paint. In ceramics, wollastonite acts as a flux, reduces lamination during pressing of tiles, protects against thermal shock, decreases shrinkage during firing, increases strength, reduces moisture expansion of the fired body, permits fast firing, and reduces crazing. 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, increases the electrical resistance, and improves thermal and dimensional stability at elevated temperatures. Wollastonite used in paints and 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.²³⁴

Wollastonite also is used as an asbestos substitute. It is acicular when ground so it is a good reinforcer in paints and plastics. Wollastonite is resistant to chemical attack, relatively inert, and stable at high temperatures, making it a good replacement for asbestos in plastics, paints, and insulating board. Wollastonite has been used in insulating boards and panels, floor tiles, plastics, roofing, and friction products.³⁵

Prices

Prices from Industrial Minerals, December 1994, for wollastonite, ex-works, acicular, were \$198 per metric ton for minus 200 mesh; \$247 for minus 325 mesh; and \$273 for minus 400 mesh. The price, ex-works, 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 365,000 tons in 1993.⁶ Production for 1994 should be slightly higher, possibly approaching 400,000 tons, based on industry reports. Estimates for wollastonite production in individual countries in 1993 were 150,000 tons for China, 27,000 tons for Finland, 80,000 tons for India, and 36,000 tons for Mexico. Industry experts estimated U.S. production to exceed 100,000 tons. Production in Chile, North Korea, Pakistan, the Republic of South Africa, and Turkey accounted for the remainder.

NYCO Minerals Inc. continued work on its project in Sonora, Mexico, and Orleans Resources Inc. continued its testing of ore from its St. Onge, Quebec deposit. Ram Petroleum Ltd. announced plans to produce wollastonite from its Olden Township deposit in Ontario and Sociedad Minera San Albin SA continued with its plans to mine wollastonite from a deposit near Madrid, Spain. Gwalia Consolidated Ltd. began examining wollastonite deposits in Queensland, Australia. Partners were being sought for testing and/or developing wollastonite deposits in Brazil, New Zealand, and Spain.

Lishu Wollastonite Mining Industry Co. began mining wollastonite at the Shijianfang location in northeast China. The site contains 2 million tons of wollastonite reserves. Mine production capacity is 20,000 tons per year. The ore was processed at Lishu's Dadingshan mill. Markets for the wollastonite include building materials and rubber.⁷

Outlook

Industry experts are optimistic about the future of wollastonite, predicting that the worldwide production will approach 700,000 tons by the year 2000. Major markets for wollastonite will continue to be in ceramics, plastics, and paints. The use of wollastonite as an asbestos substitute should remain steady.

¹Hurlbut, C. S. Dana's Manual of Mineralogy, 18th ed. John Wiley & Sons, Inc., 1971, p. 416.

Deer, W. R. Howie, and J. Zussman. An Introduction to the Rock-Forming Minerals. Longman Group Ltd., 1976, pp. 140-143.

²Bauer, R., J. Copeland, and K. Santini. Wollastonite. Ch. in Industrial Minerals and Rocks, 6th ed, ed. by D. Carr et al. SME, 1994, pp. 1119-1128.

Andrews, R. W. Wollastonite. Natural Environment Research Council, 1970, 114 pp.

³Anon., The Economics of Wollastonite, 4th ed. Roskill Information Services Ltd., 1990, 172 pp.

⁴Sollman, K. J. The Many Faces of Wollastonite. Soc. Min. Eng. AIME preprint 93-225, 1993, 7 pp.

⁵Hodgson, A.A. Alternatives to Asbestos and Asbestos Products. Anjalena Publications Ltd., 1985, pp. 121-122.

⁶Fattah, H. Wollastonite. Ind. Miner. (London), No. 326, Nov. 1994, pp. 21-42.

⁷Industrial Minerals (London). New Wollastonite Mine for Lishu. No. 322, July 1994, pp. 8-9.

OTHER SOURCES OF INFORMATION

Bureau of Mines Publications

Annual Reviews, annual (Also available by FAX by dialing 202-219-3644 and ordering document 860100).

Other Publications

American Paint and Coatings Journal, weekly

Chemical Marketing Reporter, weekly.

Company annual reports.

Industrial Minerals (London), monthly.

Mining Engineering, monthly.

Mining Journal, weekly.