WOLLASTONITE

By Robert L. Virta

Domestic survey data were prepared by Christopher H. Lindsay, statistical assistant.

Wollastonite, a calcium metasilicate ($CaSiO_3$), has a theoretical composition of 48.3% calcium oxide and 51.7% silicon dioxide but may contain trace to minor amounts of aluminum, iron, magnesium, manganese, potassium, and sodium. It occurs as prismatic crystals that cleave into massive-to-acicular fragments. It is usually 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 typically 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 are in Inyo, Kern, and Riverside Counties, were mined between 1930 and 1970. These operations were limited in size, producing only a few thousand metric tons per year for ceramics, decorative stone, paint, and mineral wool production.

In New York, deposits in Essex and Lewis Counties have been mined for more than 40 years. Two companies currently are mining wollastonite—NYCO Minerals Inc., a subsidiary of Fording 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 to improve its performance in a variety of products. The Vanderbilt deposit in Lewis County contains wollastonite, calcite, and diopside. The ore is processed at its Balmat plant.

Domestic wollastonite production and sales decreased slightly from those of 1998. While data collected by the U.S. Geological Survey are concealed to avoid revealing proprietary data, industry experts estimate U.S. production to be on the order of 150,000 metric tons per year (t/yr) (Ceramic Bulletin, 1996). Domestic production data for wollastonite were collected by means of a voluntary survey of the two domestic mining operations, representing 100% of the production data.

Consumption

The major domestic uses of wollastonite are in plastics (37%), ceramics (28%), metallurgy (10%), paint (10%), friction products (9%), and miscellaneous (6%) (Industrial Minerals, 1999e). Wollastonite also is used in adhesives, joint compounds, refractories, rubber, and wallboard applications. In ceramics, it decreases shrinkage and gas evolution during firing, increases green and fired strength, permits fast firing, and reduces crazing, cracking, and glaze defects. In metallurgical applications, wollastonite serves as a flux for welding and controlling casting speed during continuous casting of steel. As a filler in paint, it 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 to which it is 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.

Prices

Prices per metric ton for U.S. wollastonite, exworks, and acicular were $209 for -200 mesh, $258 for -325 mesh, and $284 for -400 mesh. The prices per ton, exworks, were $350 for acicular, high-aspect-ratio wollastonite and $694 for ground (10-micrometer) wollastonite. Prices per ton for wollastonite, f.o.b. plant, bulk, were $209 for 200 mesh and $253 for 325 mesh (Industrial Minerals, 1999d). Prices per ton for wollastonite from China, f.o.b. plant, acicular, were $80 to $100 for -200 mesh and $90 to $110 for -325 mesh (Mineral Pricewatch, 1999). 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

Imports of wollastonite were estimated to be between 2,500 metric tons (t) and 5,000 t. Most of the wollastonite was imported from China, Finland, and India. Exports were estimated to be between 18,000 t and 23,000 t.

World Review

Worldwide production of wollastonite was estimated to be between 575,000 t and 625,000 t in 1999. China accounted for approximately 300,000 t. Production for Finland, India, and Mexico was estimated to be 18,000 t, 80,000 t, and 40,000 t, respectively. Although a fledgling industry, Canadian wollastonite production is estimated at 3,000 to 5,000 t/yr. Small tonnages probably were produced in Chile, North Korea, Pakistan, South Africa, and Turkey.

Canada.—Orleans Resources Inc. announced plans to reopen its mine and mill in Quebec in 2000, following a restructuring of its debt under the Bankruptcy and Insolvency Act. The company expects to produce six grades of acicular wollastonite and possibly four grades of surface-modified wollastonite (North American Minerals News, 1999).

China.—Lishu Wollastonite Mining Corp. announced the opening of a new wollastonite mine 22 kilometers from its Lishu plant in Jilin. Proven reserves are 1.5 million tons, with inferred reserves of 5 million tons. Lishu anticipates production of 20,000 t/yr of low iron, high whiteness wollastonite, beginning in 2000. The ore will be processed at the Lishu plant for domestic and export markets (Industrial Minerals, 1999b).

Russia.—The governments of the Altay Republic and Moscow entered into an agreement to produce wollastonite from a deposit near Veselaya, Altay Republic, in southeastern Russia. The city of Moscow will commit $2.6 to $3 million and supply equipment for the plant. Production will be about 20,000 t/yr and will begin in 2000. The wollastonite will be sold mainly to Moscow and export markets (Industrial Minerals, 1999a).

South Africa.—Western Investment Co. Pty. Ltd. announced plans to sell its Namaqua Wollastonite Pty. Ltd. subsidiary. The company operates a 12,000-t/yr capacity plant in Northern Cape Province, producing a high-aspect-ratio wollastonite for domestic markets. The deposit contains proven reserves of 3 million tons (Industrial Minerals, 1999c).

Outlook

Worldwide sales of wollastonite should continue to increase because the U.S. economy remains strong and Southeast Asian economies are recovering. Most of the U.S. markets are mature with prospects only for slow growth. U.S. plastics markets, however, continue to increase rapidly, providing good growth potential for wollastonite and other mineral fillers and extenders. As in the United States, overseas plastics markets also will offer the greatest growth potential. Asbestos substitute markets may offer considerable short-term growth in some countries that have not already banned the use of asbestos and for which other asbestos substitutes are not already available.

References Cited

Ceramic Bulletin, 1996, Wollastonite: Ceramic Bulletin, v. 75, no. 6, June, p. 161.

Industrial Minerals, 1999a, First Russian wollastonite project: Industrial Minerals, no. 379, April, p. 118.

——— 1999b, Lishu opens new wollastonite mine: Industrial Minerals, no. 376, January, p. 13.

———1999c, Namaqua wollastonite for sale: Industrial Minerals, no. 384, September, p. 13.

———1999d, Prices: Industrial Minerals, no. 387, December, p. 71.

———1999e, Wollastonite: Industrial Minerals, no. 379, April, p. 19.

Mineral Pricewatch, 1999, Wollastonite: Mineral Pricewatch, no. 51, March, p. 5-6.

North American Minerals News, 1999, Orleans Resources set to re-open wollastonite processing plant: North American Minerals News, no. 55, December, p. 2.

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publication

Pigments and fillers. Ch. in United States Mineral Resources, Professional Paper 820, 1973.

Other

American Ceramic Society.
Ceramic Industry.
Chemical Market Reporter.
Mining Engineering.
Mining Journal.
Paint and Coatings Journal.
Roskill Information Services Ltd., The Economics of Wollastonite, 4th ed., 1990.