



# 2015 Minerals Yearbook

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**WOLLASTONITE [ADVANCE RELEASE]**

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# WOLLASTONITE

By Daniel M. Flanagan

**Domestic survey data were prepared by Molly L. Reid, statistical assistant.**

Wollastonite was mined by two companies in the United States during 2015. Domestic production and sales data collected by the U.S. Geological Survey (USGS) were withheld to avoid disclosing company proprietary data. U.S. exports and imports of wollastonite were thought to have declined, with exports estimated to be less than 10,000 metric tons (t) and imports estimated at no more than 4,000 t. Worldwide sales of refined wollastonite products were likely in the range of 800,000 to 850,000 t, unchanged from those in 2014 (revised).

Wollastonite, a calcium metasilicate ( $\text{CaSiO}_3$ ), has an ideal composition of 51.7% silicon dioxide and 48.3% calcium oxide but can also contain trace to minor amounts of aluminum, iron, magnesium, manganese, potassium, sodium, or strontium substituting for calcium. It is usually white but also may be gray, cream, brown, pale green, or red depending on the impurities and grain size. Economically valuable resources of wollastonite form as a result of thermal metamorphism of siliceous limestone and (or) chemical alteration of limestone by siliceous hydrothermal fluids (Robinson and others, 2006). Within the United States, such deposits predominantly occur in northern New York. Wollastonite is used primarily in automobile brakes, ceramics, metallurgical processing, paint, and plastics. Some of the properties that make it useful are high brightness and whiteness, low moisture and oil absorption, low volatile content, and the acicular (needlelike) nature of some wollastonite varieties.

The history of the wollastonite industry in the United States has been short in comparison to other minerals. Small-scale mining in California began in the 1930s and continued until 1970. Annual production from these deposits was on the order of a few thousand metric tons, with major markets being ceramics, landscape rock, mineral wool, and paint. In the 1950s, the development of a large deposit in New York enabled large-scale mining of wollastonite to begin. The high demand for housing following World War II resulted in the expansion of construction-related markets and provided a ready outlet for the increased production capacities. Between 1960 and 1990, U.S. sales of wollastonite increased steadily from 35,000 t to 110,000 t (estimated) as existing markets expanded and new applications were developed. Sales received a boost in the 1980s when asbestos substitute markets opened, for which wollastonite was well-suited. Sales peaked at an estimated 150,000 t from 1996 to 1999 and then decreased slightly, owing in part to increased competition from foreign companies. The decline in activity of domestic construction and manufacturing sectors during the recession of 2008–09 further affected the wollastonite industry, with production falling by 46% from 2006 to 2009. Since the end of the recession, domestic wollastonite production and sales have increased.

## Production

In 2015, NYCO Minerals, Inc. (a subsidiary of Imerys S.A., France) operated a mine and processing plant near Willsboro in Essex County, NY, and Vanderbilt Minerals, LLC (a division of R.T. Vanderbilt Holding Co., Inc.) operated a mine and processing plant near Balmat in Lewis County, NY. The NYCO deposit contains diopside and garnet, which are removed using high-intensity magnetic separators, and up to 60% wollastonite. Vanderbilt Minerals' deposit is highly differentiated, with large regions of wollastonite separated from gangue zones, and consists primarily of wollastonite (up to 90%) and minor amounts of calcite, diopside, and prehnite. NYCO and Vanderbilt Minerals chemically modify the surfaces of some wollastonite products to improve their performance (Robinson and others, 2006).

Domestic data for wollastonite were collected by means of a voluntary survey of the two U.S. mining operations; a response was received from one company. Production of wollastonite in the United States was estimated to have decreased and the quantity sold was estimated to have increased in 2015 (production and sales numbers were withheld to avoid disclosing company proprietary data). The rise in sales was a result of increased construction activity and overall growth in manufacturing sectors that use wollastonite, whereas the decline in production likely was a reflection of the fact that the Lewis Mine, operated by NYCO, was nearing the end of its current reserves.

In late 2014, NYCO began an exploratory drilling program on an 81-hectare parcel of land in the Adirondack Forest Preserve adjacent to the Lewis Mine. The company finished drilling in May 2015 and expected to conclude its evaluation of the quality and size of the wollastonite deposit by yearend. If the exploration yields favorable results, NYCO will acquire the property by swapping land of equal value with the State of New York (Esch, 2015). Previous estimates indicated that the tract may contain 1.2 to 1.5 million metric tons (Mt) of wollastonite reserves, sufficient to extend NYCO's operations at the Lewis Mine by an additional 10 years (Torrissi, 2014).

## Consumption

The USGS does not collect apparent consumption or end use data for wollastonite. Based on general overview articles, U.S. manufacturing trends, and previously published consumption estimates, the domestic market distribution for wollastonite in 2015 was probably similar to that of 2014. Plastics and rubber applications were estimated to account for more than 25% of wollastonite sales in the United States, followed by ceramics, paint, metallurgical applications, friction products,

and miscellaneous uses. Worldwide, ceramic applications were estimated to represent approximately one-third of wollastonite sales, followed by polymers (plastics and rubber) and paint. Minor global markets for wollastonite include construction materials, friction products, and metallurgy.

The Board of Governors of the Federal Reserve System (2016) reported that U.S. industrial production of plastics and rubber increased by 3.2% in 2015 compared with that in 2014, and fabrication of motor vehicles and parts (which contain wollastonite in friction products and plastic and rubber components) rose by 7.1%. Wollastonite sales likely increased in these markets as well as for the manufacture of products such as adhesives, caulks, ceramics, paints, stucco, and roof coatings owing in part to a nearly 11% increase in U.S. housing starts in 2015 (U.S. Census Bureau, 2016). Consumption of wollastonite for metallurgical applications likely decreased because the output of the primary iron and steel industry in the United States declined by nearly 12% (Board of Governors of the Federal Reserve System, 2016).

In ceramics, wollastonite decreases shrinkage and gas evolution during firing; increases green and fired strength; maintains brightness during firing; permits fast firing; and reduces crazing, cracking, and other glaze defects. In metallurgical applications, wollastonite serves as a flux for welding, a source for calcium oxide, a slag conditioner, and a protective agent for the surface of molten metal during the continuous casting of steel. As an additive in paint, it improves the durability of the paint film, acts as a pH buffer, improves resistance to weathering, reduces gloss and pigment consumption, and acts as a flattening and suspending agent. In plastics, wollastonite 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 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 improves flexural and tensile strength and is resistant to chemical attack, inert, and stable at high temperatures (Feytis, 2009; Roskill Information Services Ltd., 1996, p. 58–59, 78–81, 104–107, 119, 123–128).

## Prices

At yearend 2015, reported prices for domestically produced acicular wollastonite, ex-works, were \$231 to \$265 per metric ton for 200-mesh, \$243 to \$276 per metric ton for 325-mesh, and \$485 to \$491 per metric ton for wollastonite with an aspect ratio of 15:1 to 20:1. Prices for wollastonite from China, free on board, in bulk, were \$80 to \$100 per metric ton for 200-mesh and \$90 to \$105 per metric ton for 325-mesh (Syrett, 2015). Domestic prices were identical to those at the end of 2014, and prices for wollastonite from China increased slightly. 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

Comprehensive trade data were not available for wollastonite because it is imported and exported under generic U.S. Census Bureau Harmonized Tariff Schedule code 2530.90.8050 (mineral substances not elsewhere specified or included) and code 2521.00.0000 (limestone flux, limestone, and other calcareous stone). U.S. exports in 2015 were thought to have decreased from those in 2014 and were estimated to be less than 10,000 t. Shipments documented in a commercial trade database totaled 506 t and were transported to Russia, Belgium, France, China, the United Kingdom, India, Thailand, Lebanon, Italy, the Dominican Republic, Poland, and Colombia, in decreasing order by tonnage (IHS Inc., 2016). Additional quantities likely were exported by truck or train to Canada.

U.S. imports also likely declined in 2015 and were estimated to be less than 4,000 t. Documented imports transported by ship totaled 825 t and were received from China, India, Finland, Mexico, and Canada, in decreasing order by tonnage (IHS Inc., 2016). Additional quantities of wollastonite likely were imported by rail or truck from Canada and Mexico.

## World Review

Many countries either do not publish wollastonite production or production is reported with a 2- to 3-year lag time. Therefore, data in this section were estimated unless otherwise noted.

In 2015, global sales of refined wollastonite were thought to be in the range of 800,000 to 850,000 t, unchanged from those in 2014 (revised). China produced an estimated 1.0 Mt of crude wollastonite ore in 2015 compared with 1.1 Mt in 2014 (reported), corresponding to an estimated 450,000 t of refined wollastonite in 2015 and 495,000 t in 2014. India ranked second in production with 190,000 t of refined wollastonite in 2015 and 145,000 t in 2014, followed by the United States (production data withheld), Mexico with 57,500 t in 2015 and 54,600 t in 2014 (both years reported), Finland with 10,000 t in each year, and Canada with 5,600 t in 2015 and 3,000 t in 2014 (both years reported). Small quantities of wollastonite (approximately 5,000 t or less) also were produced by Namibia, South Africa, Spain, and possibly other countries, but output was not officially reported and the available general information was inadequate for the formulation of reliable output estimates.

## Outlook

The International Monetary Fund (2016, p. 2) predicted that the U.S. economy will grow by 2.4% in 2016, suggesting that U.S. wollastonite production may increase. Domestic industrial output (Board of Governors of the Federal Reserve System, 2016) and housing starts (U.S. Census Bureau, 2016) were higher in 2015 than in 2014, implying that sales of wollastonite will rise for construction-related products (such as adhesives, caulks, ceramic tile glazes and bodies, paints, roof coatings, sanitaryware, sealants, stucco, and wallboard), friction products, plastics, and rubber. The International

Monetary Fund (2016, p. 2) also projected that the global economy will grow by 3.2% in 2016, with 7.5% and 2.4% growth predicted for India and Mexico, respectively, but global production and sales of wollastonite will likely remain relatively unchanged or increase just slightly in 2016 owing to economic uncertainty in China and Europe.

## References Cited

- Board of Governors of the Federal Reserve System, 2016, Data download program—Industrial production and capacity utilization (G.17): Washington, DC, Board of Governors of the Federal Reserve System, June 15. (Accessed June 17, 2016, via <https://www.federalreserve.gov/datadownload/Choose.aspx?rel=G17>.)
- Esch, Mary, 2015, Mining company finishes drilling tests in Adirondacks: Oneida [NY] Daily Dispatch, May 12. (Accessed May 28, 2016, at <http://www.oneidadispatch.com/general-news/20150512/mining-company-finishes-drilling-tests-in-adirondacks>.)
- Feytis, Alexandra, 2009, Wollastonite's pins and needles: *Industrial Minerals*, no. 506, November, p. 26–35.
- IHS Inc., 2016, PIERS: Englewood, Colorado, IHS Inc. (Accessed May 28, 2016, via <https://login.piers.com>.)
- International Monetary Fund, 2016, World economic outlook—Too slow for too long: Washington, DC, International Monetary Fund, April, 208 p. (Accessed June 17, 2016, at <http://www.imf.org/external/pubs/ft/weo/2016/01/>.)
- Robinson, S.M., Santini, Ken, and Moroney, Jay, 2006, Wollastonite, in Kogel, J.E., Trivedi, N.C., Barker, J.M., and Krukowski, S.T., eds., *Industrial minerals and rocks (7th ed.)*: Littleton, CO, Society for Mining, Metallurgy, and Exploration, Inc., p. 1027–1037.
- Roskill Information Services Ltd., 1996, *The economics of wollastonite (6th ed.)*: London, United Kingdom, Roskill Information Services Ltd., 131 p.
- Syrett, Laura, 2015, IM January price movements: *Industrial Minerals*, December 21, 15 p. (Accessed July 5, 2016, via <http://www.indmin.com>.)

Torrise, Antonio, 2014, Wollastonite—An important but controversial search for more sources: *Industrial Minerals*, no. 562, July, p. 28–31.

U.S. Census Bureau, 2016, New residential construction—Historical data: Washington, DC, U.S. Census Bureau. (Accessed June 17, 2016, via [http://www.census.gov/construction/nrc/historical\\_data/index.html](http://www.census.gov/construction/nrc/historical_data/index.html).)

## GENERAL SOURCES OF INFORMATION

### U.S. Geological Survey Publications

- Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.
- Pigments and Fillers. Ch. in *United States Mineral Resources*, Professional Paper 820, 1973.
- Wollastonite—A Versatile Industrial Mineral. Fact Sheet FS–002–01, 2001.

### Other

- American Ceramic Society.
- Ceramic Industry, monthly.
- Paint and Coatings Industry, monthly.
- The Economics of Wollastonite (6th ed.). Roskill Information Services Ltd., 1996.
- Wollastonite. Ch. in *Industrial Minerals and Rocks (7th ed.)*. Society for Mining, Metallurgy, and Exploration Inc., 2006.
- Wollastonite. Energy, Mines, and Resources Canada Summary Report No. 18, 1993.