Talc and Pyrophyllite

G. P. Tomaino, Minerals Technologies Inc.

Talc is a layered, hydrous magnesium silicate mineral. Talc has a soft, soapy feel and typically a smooth texture. Talc is also known for its insulation, heat resistance, chemical stability, oil absorption, and strong covering quality. Talc, $Mg_3Si_4O_{10}(OH)_2$, has a theoretical chemical composition of MgO at 31.7%, SiO_2 at 63.5%, and H2O at 4.8%. However, talc's chemical and mineralogical composition can vary depending on its geological history/parent rock association. These mineral associations and variable levels are usually chlorite and carbonates (magnesite, calcite, and dolomite). Two key elemental substitutions that can occur in the talc crystal structure are iron for magnesium and fluorine for hydroxyl. These compositional differences may limit or enhance the talc's usage in specific market niches. The United States, still, remains self-sufficient in most grades of talc.

Pyrophyllite is also a layered hydrous aluminum silicate mineral. Pyrophyllite has similar physical properties as talc. Pyrophyllite, $Al_2Si_4O_{10}(OH)_2$, has a theoretical chemical composition of Al_2O_3 at 28.3%, SiO_2 at 66.7%, and H_2O at 5.0 %. Pyrophyllite has minimal elemental substitution compared to talc.

Production and Consumption

For pyrophyllite, Piedmont Minerals Company and Standard Mineral Company are the primary producers that are located in the state of North Carolina. Piedmont Minerals is a subsidiary of Resco Products Inc. In 2005, Pyrophyllite production increased slightly with markets of refractory products, ceramics, and paint in decreasing order. In 2004, the USGS indicated that Standard Industrial Minerals Inc. was a third producer of pyrphyllite but this company is not represented in this year's compilation. One reason for its absence this year could be that the Standard Indutrial Minerals deposit consists mostly of the mica mineral sericite not pyrophyllite as communicated by Keith Papke. Also, last year it was erroneously communicated that Standard Industrial Minerals was a subsidiary of RT Vandebilt but this company is a private company previously of the Standard Slag Company, again, as communicated by Keith Papke.

For talc, there are eleven talc-producing mines located in six states that account for the domestic production in 2005. Crude ore value estimates at $23.5 million as compiled by the USGS producer survey. Domestic production is basically open pit mining. Luzenac America, a subsidiary of Luzenac Group-France, remains the top domestic as well as the world leader of talc production with mines and processing plants in Europe, Australia, Canada, Mexico, and North America. Gouverneur Talc Co., a subsidiary of R.T. Vanderbilt Company, has mining and processing in New York. Milwhite Inc. has mining and processing in Texas. Suzorite Mineral Products, a subsidiary of Zemex Corporation-Canada, has mining and processing in Texas. Barretts Minerals, a subsidiary of Specialty Minerals Inc. has mining and processing in Montana, Indiana, and Ohio. Unimin Texas Co. L.P has domestic and international mining and processing operations. CalTalc Co. has operations in southern California. Alberene Soapstone Company, formerly the New World Stone Co. has operations in Virginia. Wold Talc Company has mining and processing in Texas. Steatite of Southern Oregon has operations in Oregon.

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Talc production (842,000 Mt estimated) decreased by ≈2% and talc sold by the producers (827,000 Mt estimated) decreased slightly by ≈1% from 2004 levels. Apparent consumption of talc (868,000 Mt estimated) decreased by 15% from 2004 levels. The average-price of a processed ton of product estimates at ≈$83 US dollars for 2005 and would represent a decrease of ≈6% from 2004 levels. Previously reported 20004 estimated values were different than actual and are accounted for in the various seven year trend Figures. The seven-year trend data for production and apparent consumption from the USGS are provided in Figure 1.

For 2005, the dominant domestic producers listed in decreasing order of production are as follows: Luzenac, Wold Talc, Barretts, Gouverneur Talc, Milwhite, Suzorite, and Steatite.

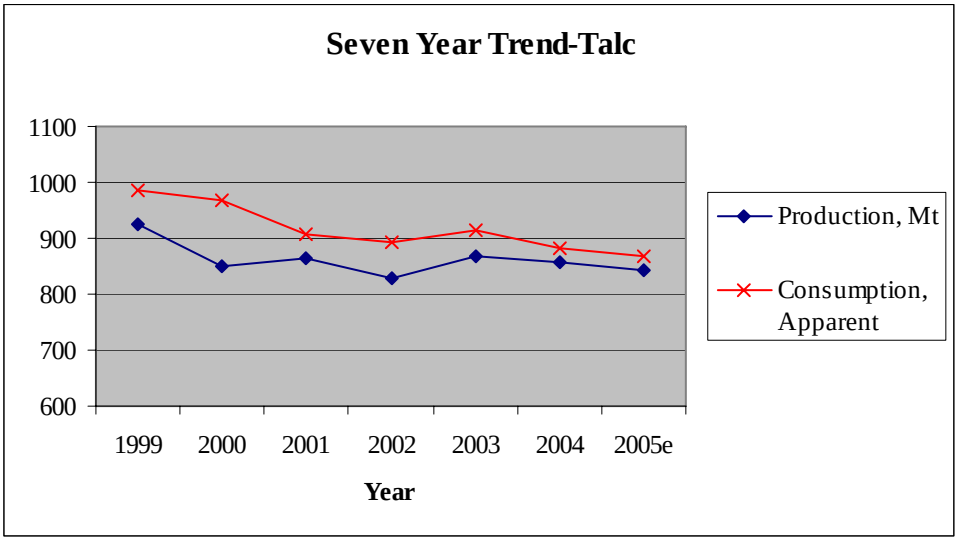

Figure 1. Seven Year Trend Data for Talc Production and Consumption, 1999 to 2005e

Exports/Imports

Talc exports (208,000 Mt, estimated) increased by ≈3% where Canada remains the primary destination representing ≈45% of the export tonnage. Talc imports (234,000 Mt) increased by ≈4%. China continues as the leading importer at ≈48% of the tonnage. Canada follows China at ≈34%, France at ≈4%, Japan at ≈1% and other importers at ≈13%. The key markets areas for imported talc are plastics, paint, ceramics, paper, cosmetics, and rubber. SEVEN-year trend data for Import Consumption and Exports taken from the USGS are provided in Figure 2.

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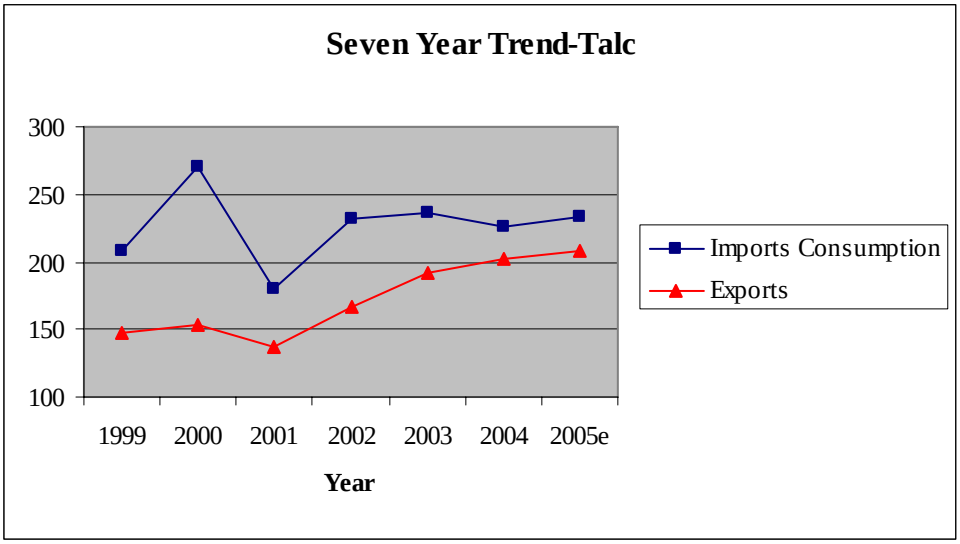

Figure 2. Seven Year Trend Data for Import Consumption and Exports; 1999-2005e

Marketing/Industry News/Economics

The ceramics sector accounted for approximately 33% of sales. The other market sectors were paint (20%), paper (16%), roofing (6%), plastics (4%), rubber (2%), cosmetics (1%), and other (18%). The "other" section includes a variety of applications for pharmaceuticals, agricultural products, roofing, animal feed, sealant, sculpturing, food, and polishing.

In China, increased freight costs and continued signs that future governmental mandates that its domestic talc producers should start to decrease the exportation of high quality raw talc ore and to implement the processing of "added value" talc products will most likely have some dramatic impact to the US talc companies that presently supplement their present domestic production with the Chinese talc ore. This trend in lower volume of raw talc ore could impact present domestic talc producers with their short and long term planning from sales and marketing perspective and any new product introduction based on specific imported Chinese talc. US talc companies may need to explore new non-Chinese worldwide sources through exploration or re-emphasis to beneficiate lower grade domestic sources. Other potential avenues are to start joint venture with Chinese producers on the processing of an intermediate or finished good or start-up wholly owned manufacturing facilities within China.

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Marketing/Industry News/Economics

In 2005, the employment scene at the mine and mill remained stable in personnel (470 estimated) from 2004. Based on actual figures for 2004 versus estimated numbers a year ago, there has been a slight increase since 2003 in the number of people employed in the talc mining and processing industry. Seven-year trend data for production and employment from the USGS are in Figure 3.

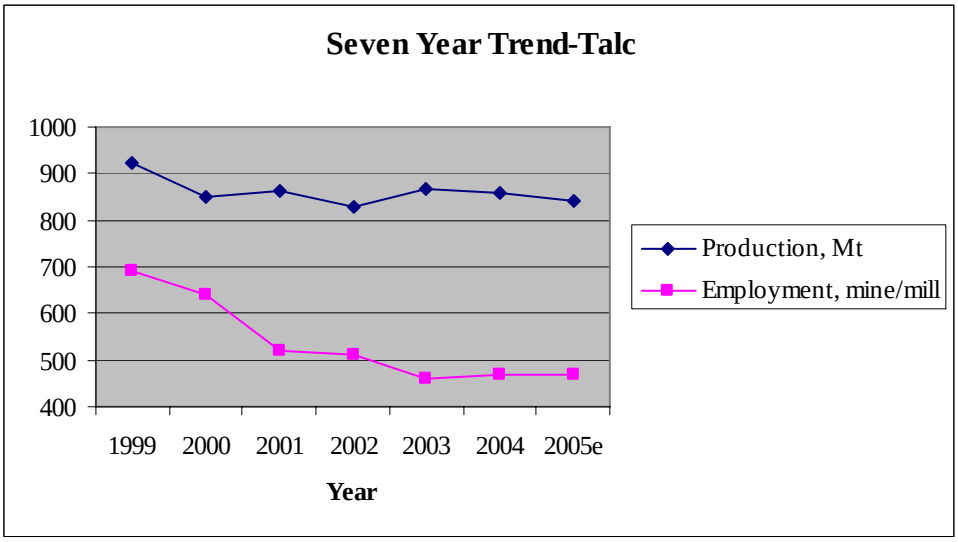

Figure 3. Seven-year Trend Data for talc production and employment, 1999-2005e

Uses, New Applications, Processing Technology, Future Trends

Talc producers must continue to provide a functional and high performance mineral additive that can increase the value of their products to the end use customer. In specific cases, unique properties can be achieved by employing proprietary coatings or processing products to increase aspect ratio by delaminating or to increase the overall talc purity by beneficiation. Silane/siloxane based and directed surface treatments are common place. Nano-talc products (10 to 100 nanometers in one dimension) continue to be explored for their uses in various applications.

There are a multitude of uses for talc such as plastics, cosmetics, flooring, health care, catalytic converters, animal feed, caulks, sealants, gaskets, belts, hoses, specialty anti-blocking/anti-hazing in plastic films, auto body putty, asphalt shingles, joint compounds, pharmaceuticals, ceramics, dimension stone bodies (Steatite).

In ceramic applications of dinnerware, sanitary ware, hobby ceramics, talc provides low shrinkage as well as high brightness upon firing at various temperatures. In other applications, high quality calcined-talc blends can be tailored to each individual customer's specifications that impart a controlled shrinkage and reduce firing time. The reduced firing time aids in processing and energy costs for the customer. In dimension stone applications, talc is used for countertops, sinks, mantels, fireplace surrounds, pavers, and tile brick.

Another high end use of talc is as a major component in the processing and manufacture of cordierite bodies for catalytic converters in vehicles. The competitive products in this field are SiC or metal-based catalytic converters.

In paints, talc is an economic extender and filler while providing brightness and durability to paint coatings. In rubber applications, talc provides reinforcement, UV radiation resistance, and can be used as a processing aid for good extrusion rates, impermeability, and improved surface finish.

The plastics market continues to offer some potential growth opportunities especially in polypropylene. It is projected that increases in talc usage for lightweight and recyclable product are the needs for the automotive market. Here, the desire for compacted and sub-micron talc products provide high performance end use products.

Talc continues to face competition in the paper filler and niche paper coating sectors from precipitated and ground calcium carbonates. However, Talc will continue to be used in the paper making process as a pitch control agent. In ceramics, talc competes with clays and pyrophyllite; in paint, plastics, and rubber with with kaolin and mica.

Environmental and Regulatory

The final acceptance and printing of the new Pharmacopeia monograph that harmonized the European, Japanese, and United States Pharmacopoeia talc monographs was completed in June 2005.

In 2005, the board for the 12th NTP-Report on Carcinogens undertook talc, as a cancer-causing substance with an intended listing under two separate categories of cosmetic and non-cosmetic. Many industry representatives and associations provided written correspondence to the NTP board on both issues. Additionally, IARC also evaluated the carcinogenetic attributes of talc under similar categories with draft findings on inhalable exposure of talc as a Group 3, non-classifiable, while that for perinea exposure of talc as a Group 2B, possible carcinogen.

In 2005, ASTM Committee D22.07 [On Sampling and Analysis of Atmospheres] held another Johnson Conference titled “Critical Issues in Monitoring Asbestos” with some 40 papers covering various topics was held in mid-July in Burlington, VT. There is continued work planned on terminology and characterization of regulated asbestos minerals or the identification of “transitional structures” within a talc deposit or product.