

TALC AND PYROPHYLLITE

By Robert L. Virta

The mineral talc is a hydrous magnesium silicate. A massive talcose rock is called steatite and an impure massive variety is referred to as soapstone. Talc is used commercially because of its softness, purity, fragrance retention, whiteness, luster, moisture content, oil and grease adsorption, chemical inertness, low electrical conductivity, high dielectric strength, and high thermal conductivity. Major markets for talc include ceramics, paint, and paper.

Pyrophyllite is a hydrous aluminum silicate with a structure similar to talc. Properties such as softness, whiteness, chemical inertness, high melting point, low electrical conductivity, and high dielectric strength make pyrophyllite useful for ceramic and refractory applications.

Domestic production and sales data for talc and pyrophyllite are developed by the U.S. Bureau of Mines (USBM) from a voluntary survey of U.S. mines and mills. Survey forms were sent to 15 companies. Twelve companies that account for approximately 95% of the domestic production responded to the survey. Production data for the nonrespondents were estimated from reported prior-year production levels adjusted by trends in the industry and other guidelines. (See table 1.)

Legislation and Government Programs

The Mine Safety and Health Administration (MSHA) continued to review its proposed revisions to its air quality, chemical substances, and respiratory protection standards. The proposed permissible 8-hour time-weighted average exposure limit is 2.5 milligrams per cubic meter (mg/m^3) of air for talc (containing no asbestos), 3 mg/m^3 for respirable soapstone, and 6 mg/m^3 for total soapstone dust. The nonasbestiform varieties of tremolite, anthophyllite, and actinolite would be covered under the proposed respirable mine dust standard.¹

MSHA continued reviewing its proposed rule that would create a hazard communication standard. Mine operators would be required to provide information to their employees through labeling, material safety data sheets, and employee training if hazardous chemicals were produced or used on the premises.

Production

Talc.—Twelve companies operating 16 mines in 7 States produced talc, soapstone, and steatite. These companies generally were structured to cover all aspects of talc production, from mining to processing. Only a few companies hired custom grinders to mill the ore. The largest domestic producers, ranked in decreasing order, were Luzenac America Inc., Gouverneur Talc Co., Barretts Minerals Inc., and Dal Minerals.

U.S. mine production of crude talc was 935,000 tons, valued at \$30.4 million in 1994. (See tables 1 and 2.) Production in Montana and New York increased while that of California, Texas, Vermont, and Virginia decreased. Mines that operated in Montana, New York, Texas, and Vermont accounted for 96% of domestic talc production. Montana led all States in the tonnage and value of talc produced, followed by Texas, Vermont, New York, California, Virginia, and Oregon, in decreasing order of production.

Luzenac America Inc. purchased Montana Talc Co., a subsidiary of Costain PLC. Luzenac America closed Montana Talc's mine but will continue to operate the mill at Sappington, MT.²

Zemex Corp. (Canada) purchased the Pioneer Talc Co. talc mining and milling operation in Van Horn, Texas. Pioneer Talc was owned by Whittaker, Clark, and Daniels Inc.³

Pyrophyllite.—Pyrophyllite was mined by two companies operating three mines in North Carolina and one company operating one mine in California. U.S. mine production of crude pyrophyllite increased 20% from that of 1993.

Consumption

Talc.—Domestic producers reported that overall sales (including exports by producers) was 923,000 tons, valued at \$116 million in 1994. (See table 1.) Domestic markets for talc were in ceramics (pottery, sanitaryware, tiles, etc.), paint, paper, plastics, roofing, cosmetics, rubber, insecticides, and refractories, in decreasing order of consumption. (See table 3.)

Consumption of talc in ceramics and paper increased slightly from that of 1993. The cosmetic and paint markets remained stable.

Small decreases were reported for insecticide and rubber markets. The use of talc in plastics continued to grow, with consumption approaching levels last observed in 1990. A large decrease was reported for roofing applications, where competition from competing minerals affected the markets.

Approximately 97,000 tons of talc were reported under the "Other" category by respondents. Of this amount, 8,000 tons were used in automobile body fillers, food or medicines, and sculpture media and 70,000 tons were used in caulks, joint compounds, paint, and putties, and vinyl sheet and tile flooring. Approximately 19,000 tons of talc were used in applications that were not identified by respondents.

More than 90% of the data presented in table 3 was reported by the companies, the remainder was estimated from reported prior-year data adjusted according to industry trends.

An additional 155,000 tons of imported talc were not included in the end-use breakdown shown in table 3. The imported talc was purchased primarily by mineral brokers who do not participate in the USBM survey. A large percentage of the imported talc was believed to have been used in plastics. Imports amount to 17% of the total domestic consumption.

Pyrophyllite.—Domestic consumption of pyrophyllite increased 20% from that of 1993. The largest portion of domestically produced ground pyrophyllite was used in ceramics, followed by refractories, paint, plastics, insecticides, and rubber, in decreasing order of consumption.

Prices

Talc prices varied depending on the quality and on the degree and method of processing. The unit value of crude talc based on data reported by producers was \$33 per ton. The average reported unit value of processed talc was \$126 per ton. The average unit value of crude and processed pyrophyllite was essentially unchanged from that of 1993.

Unit values for imported crude and ground talc ranged from \$42 per ton to \$815 per ton for shipments exceeding 100 tons. Unit values for cut or sawed talc ranged from \$416 per ton to \$805 per ton for shipments exceeding 100 tons. The average unit value for all shipments,

including those of 100 tons or less, was \$80 per ton for crude talc; \$82 per ton for ground talc; and \$1,172 per ton for cut or sawed talc. The average unit value for cut or sawed talc was extremely high because of the large number of low tonnage-high value shipments made during the year. The average unit value for all imported talc was \$96 per ton.

Unit values for exported talc ranged from \$71 per ton to \$499 per ton for shipments exceeding 100 tons and averaged \$180 per ton for unground talc and \$195 per ton for ground talc. The average value for all exported talc was \$194 per ton for all exports. The unit values for the crude and unground talc categories for imports and exports were greater than expected because of several low tonnage-high value (\$237 to \$5,000 per ton) shipments made during the year. These shipments were probably sculpture-grade steatite, surface-treated talc, and/or talcum powder products.

Prices, quoted by the American Paint & Coatings Journal, December 28, 1994, in U.S. dollars per metric ton for paint-grade talc in carload lots ranged from \$99 to \$220. Approximate equivalents, in dollars per metric ton, of price ranges quoted in Industrial Minerals (London), December 1994, for talc, c.i.f. main European ports, ranged from \$92 to \$330. (See table 4.) Quoted prices should be used only as a guideline because they depend on the terms of the contract between seller and buyer.

Foreign Trade

Talc exports increased 14% in tonnage from 135,000 tons to 154,000 and 10% in value from \$27.2 million to \$29.8 million. Canada was the largest importer of talc, followed by Mexico, Belgium-Luxembourg, Japan, the Republic of Korea (7,637 tons), and Germany (5,475 tons). (See table 5.) Talc imports increased 55% in tonnage from 100,000 tons to 155,000 tons and increased 38% in value from \$10.8 million to \$14.9 million. Canada, China, and Japan supplied 85% of all talc imports. (See table 6.) Most of the talc imported from Japan was likely to have been transshipments from other Southeast Asian countries.

World Review

China is the world's largest producer of talc, followed by the United States and Finland, in decreasing order of production. Japan was the largest producer of pyrophyllite, followed by the Republic of Korea and Brazil. China, Japan, and the United States produced 55% of the world's talc and pyrophyllite. (See table 7.) Among the activities taking place in 1994 was

the purchase of Finnminerals Oy by United Paper Mills and expansion of Haicheng Talc Mines Co.'s operations in Liaoning province.

Outlook

Domestic consumption of talc should grow slowly as the economy improves. Ceramics will continue to be the major domestic end use for talc, followed by paper, paint, roofing, plastics, and cosmetics, in descending order. For pyrophyllite, the major domestic end uses will continue to be in ceramics and refractories.

¹Federal Register. Mine Safety and Health Administration. Air Quality, Chemical Substances, and Respiratory Protection Standards. V. 56, No. 39, Feb. 27, 1991, pp. 8168-8171.

²Montana Standard (Bozeman). Luzenac Buys, Then Closes, Talc Mine. May 26, 1994, p. 1.

³Chemical Marketing Reporter. Talc Purchase Completed. V. 246, No. 25, Dec. 19, 1994, p. 7.

OTHER SOURCES OF INFORMATION

U.S. Bureau of Mines Publications

Talc and Pyrophyllite. Ch. in Mineral Facts & Problems, 1985.

Talc and Pyrophyllite. Ch. in Mineral Commodity Summaries, annual. (Also available by FaxBack by dialing 202-219-3644 and ordering document 650395).

Talc and Pyrophyllite. Ch. in Mineral Yearbook, annual.

Talc and Pyrophyllite. Directory of Companies Mining Talc and Pyrophyllite in the United States in 1994. (Also available by FaxBack by dialing 202-219-3644 and ordering document 650294).

Information Circular 9220, 1989.

Other Sources

Company annual reports.

Industrial Minerals, monthly.

Engineering and Mining Journal, monthly.

Mining Engineering, monthly.

Mining Journal (London), monthly.

TABLE 1
SALIENT TALC AND PYROPHYLLITE STATISTICS 1/

(Thousand metric tons and thousand dollars)

	1990	1991	1992	1993	1994
United States:					
Mine production, crude:					
Talc	1,190	1,040	997	968	935
Pyrophyllite	82	W	W	W	W
Total	1,270	1,040	997	968	935
Value					
Talc	\$31,100	\$32,100	\$31,300	\$27,800	\$30,400
Pyrophyllite	W	W	W	W	W
Total	\$31,100	\$32,100	\$31,300	\$27,800	\$30,400
Sold by producers, crude and processed:					
Talc	1,020	864	817	900	923
Pyrophyllite	80	W	W	W	W
Total	1,100	864	817	900	923
Value					
Talc	W	\$82,600	\$94,700	\$104,000	\$116,000
Pyrophyllite	W	W	W	W	W
Total	\$111,000	\$82,600	\$94,700	\$104,000	\$116,000
Exports 2/ (talc)	200	178	175	135	154
Value	\$29,200	\$30,100	\$30,100	\$27,200	\$29,800
Imports for consumption	65	67	80	100	155
Value	\$11,100	\$11,900	\$12,400	\$10,800	\$14,900
Apparent consumption	1,050	926	902 3/	933 3/	936 3/
World: Production	9,370 r/	9,070 r/	8,760 r/	8,700 r/	7,890 e/

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data; not included in "Total."

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Excludes powders--talcum (in package), face, and compact.

3/ Production, plus imports, minus exports, plus adjustments in Government and industry stock. Does not include pyrophyllite.

TABLE 2
CRUDE TALC PRODUCED IN THE UNITED STATES, BY STATE 1/ 2/

(Thousand metric tons and thousand dollars)

State	1993		1994	
	Quantity	Value	Quantity	Value
Montana	350	11,900	W	W
Texas	236	5,660	225	5,860
Oregon	(3/)	67	W	W
Other 4/	382	10,200	710	24,600
Total	968	27,800	935	30,400

W Withheld to avoid disclosing company proprietary data; not included in "Total."

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Excludes pyrophyllite.

3/ Less than 1/2 unit.

4/ Includes Arkansas (1993), California, Montana (1994), New York, Oregon (1994), Vermont, and Virginia.

TABLE 3
END USES FOR GROUND TALC AND PYROPHYLLITE 1/

(Thousand metric tons)

Use	1993			1994		
	Talc	Pyrophyllite	Total	Talc	Pyrophyllite	Total
Ceramics	253	W	253	265	W	265
Cosmetics 2/	31	--	31	31	--	31
Insecticides	7	W	7	6	W	6
Paint	141	W	141	142	W	142
Paper	110	W	110	121	W	121
Plastics	27	W	27	45	W	45
Refractories	--	W	--	(3/)	W	(3/)
Roofing	68	--	68	38	--	38
Rubber	21	W	21	19	W	19
Other 4/	114	W	114	97	W	97
Total	770	W	770	764	W	764

W Withheld to avoid disclosing company proprietary data.

1/ Data rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Incomplete data. Some cosmetic talc known to be included in "Other."

3/ Less than 1/2 unit.

4/ Includes art sculpture, asphalt filler, auto body filler, construction caulks, joint compounds, flooring, food additives, and other uses not specified.

TABLE 4
PRICE OF TALC

(U.S. dollars per metric ton)

	Value
Canada: Fine micron, Hegman No. 6	205
Montana: Ultrafine grind. Hegman No. 6	220
New York:	
Bags, mill:	
98% through 325 mesh	99
99.6% through 325 mesh	115
Trace retained on 325 mesh	180
Italian, cosmetic-grade	263
Chinese, normal (ex-store):	
UK 200 mesh	285-323
UK 350 mesh	300-330

Sources: American Paint & Coatings Journal, Dec. 27, 1994, and Industrial Minerals (London), Dec. 1994.

TABLE 5
U. S. EXPORTS OF TALC 1/ 2/

(Thousand metric tons and thousand dollars)

Country	1993		1994	
	Quantity	Value	Quantity	Value
Belgium	10	\$2,080	10	\$1,210
Canada 3/	47	8,740	54	9,930
Japan	7	958	8	1,330
Mexico	12	1,770	13	2,210
Other 4/	59	13,600	69	15,200
Total	135	27,200	154	29,800

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Excludes powder--talcum (in package), face, and compact.

3/ Probably includes shipments in transit through Canadian ports.

4/ Includes 67 countries in 1993 and 62 countries in 1994.

Source: Bureau of the Census.

TABLE 6
U.S.IMPORTS FOR CONSUMPTION OF TALC, BY COUNTRY 1/

Country	Not crushed or powdered		Crushed or powdered		Cut and sawed		Total unmanufactured	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
1993:								
Brazil	--	--	114	\$25	264	\$155	378	\$179
Canada	38	\$11	27,900	4,480	918	888	28,900	5,380
China	36,800	1,650	2,120	257	675	360	39,600	2,270
France	--	--	2,940	288	(2/)	3	2,940	290
Japan	--	--	20,300	706	1	2	20,300	708
Other 3/	6,670	604	554	283	441	1,050	7,660	1,940
Total	43,500	2,270	54,000	6,040	2,300	2,460	99,800	10,800
1994:								
Brazil	3	3	97	25	250	164	350	192
Canada	272	49	31,000	5,280	600	598	31,900	5,930
China	50,200	2,140	5,360	452	705	346	56,200	2,940
France	620	505	3,090	314	10	5	3,720	824
Japan	8	171	43,200	745	2	4	43,200	920
Other 4/	14,200	2,340	4,510	330	647	1,470	19,300	4,140
Total	65,200	5,210	87,300	7,150	2,210	2,590	155,000	14,900

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Less than 1/2 unit.

3/ Includes 21 countries.

4/ Includes 24 countries.

Source: Bureau of the Census.

TABLE 7
TALC AND PYROPHYLLITE: WORLD PRODUCTION, BY COUNTRY AND PRODUCT 1/ 2/

(Metric tons)

Country 3/	1990	1991	1992	1993	1994 e/
Argentina:					
Pyrophyllite	-- r/	-- r/	-- r/	-- r/	--
Steatite	200 r/	274 r/	425 r/	840 r/	500
Talc	17,800 r/	22,800 r/	21,200 r/	17,200 r/	17,300
Australia: e/					
Pyrophyllite	5,000	6,000	5,000	5,000	5,000
Talc	200,000	210,000	210,000	210,000	210,000
Austria: Steatite	134,000	161,000	146,000	137,000 r/	130,000
Brazil:					
Pyrophyllite	165,000	186,000	144,000	150,000 e/	150,000
Talc	280,000	292,000	286,000	290,000 e/	290,000
Canada: Pyrophyllite, soapstone, talc e/	148,000	123,000	104,000	108,000 r/	130,000 4/
Chile: Talc	898	536	1,490 r/	5,060 r/	3,000
China: Unspecified e/	2,550,000	2,600,000	2,650,000	2,700,000	2,400,000
Colombia: Pyrophyllite, soapstone, talc	10,100	11,100	13,300	19,600 r/	20,000
Egypt: Pyrophyllite, soapstone, steatite, talc	6,340	9,090	9,000 e/	2,090 r/	2,000
Finland: Talc	385,000	361,000	371,000	399,000 r/	400,000
France: Talc e/	328,000 4/	310,000	300,000	280,000 r/	275,000
Germany: Talc (marketable)	21,400	22,600	23,500	21,200 r/	20,000
Greece: Steatite	1,440	790	700 e/	700 e/	500
Hungary: Talc e/	10,000	10,000	10,000	10,000	10,000
India:					
Pyrophyllite	80,000 e/	84,600	85,000 e/	81,600 r/	82,000
Steatite e/	406,000	424,000	425,000	360,000 r/ 4/	360,000
Iran: Talc 5/	31,100	6,680	23,700	18,000 r/	18,000
Italy: Steatite and talc	152,000	161,000	184,000 r/	165,000 e/	150,000
Japan:					
Pyrophyllite	1,210,000	1,230,000	1,060,000	1,030,000 r/	936,000 4/
Talc	61,600	65,600	61,000	57,200 r/	63,100 4/
Korea, North: Unspecified e/	170,000	170,000	170,000	180,000	180,000
Korea, Republic of:					
Pyrophyllite	658,000	573,000	603,000	645,000 r/	650,000
Talc	182,000	171,000	150,000	53,900 r/	60,000
Macedonia: Talc e/ 6/	XX	XX	15,000	10,000	10,000
Mexico: Talc	13,500	11,900	19,600	14,400 r/	15,000
Nepal: Talc 7/	1,800	3,170 r/	3,820 r/	1,340 r/	1,500
Norway: Talc e/	100,000	80,000	60,000	50,000	50,000
Pakistan: Pyrophyllite	30,200	33,600	23,700	46,800 r/	45,000
Paraguay: Unspecified e/	200	200	200	200	200
Peru: e/					
Pyrophyllite	7,500	8,000	8,000	8,000	8,000
Talc	1,500	2,100	2,000	2,000	2,000
Portugal: Talc	7,930	8,000 e/	9,170 r/	9,350 r/	9,000
Romania: Talc e/	20,000	10,000	6,330 4/	6,500	6,500
Russia: Talc	XX	XX	150,000 e/	132,000	100,000
South Africa, Republic of:					
Pyrophyllite	2,760	4,450	3,050	4,290 r/	4,110 4/
Talc	11,200	8,240	13,900	8,800 r/	6,850 4/
Spain: Steatite e/	70,000	70,000	70,000	65,000	65,000
Sweden: Talc	15,000	19,200	10,000 r/ e/	-- r/ e/	--
Taiwan: Talc	22,100	18,500	6,090	5,020 r/	5,000
Thailand:					
Pyrophyllite	29,300	43,000	34,600	43,400 r/	38,000
Talc	4,360	5,580	4,790	7,010 r/	5,000
Turkey	5,560	6,120	3,920	4,000 e/	4,000
U.S.S.R.: Talc e/ 8/	500,000	450,000	XX	XX	XX

See footnotes at end of table.

TABLE 7--Continued
TALC AND PYROPHYLLITE: WORLD PRODUCTION, BY COUNTRY AND PRODUCT 1/ 2/

(Metric tons)

Country 3/	1990	1991	1992	1993	1994 e/
United Kingdom: Talc, soapstone, pyrophyllite	14,800	10,800	5,220	5,320 r/	5,500
United States:					
Pyrophyllite	82,000	W	W	W	W
Talc	1,190,000	1,040,000	997,000	968,000	935,000 4/
Uruguay: Talc, soapstone, pyrophyllite e/	1,500	1,500	1,500	1,500	1,500
Yugoslavia: Talc 6/ 9/	18,000	17,000 e/	XX	XX	XX
Zambia: Talc	160	89	336	350 e/	350
Zimbabwe: Talc	1,790	1,680	2,200	1,350 r/	1,500
Total	9,370,000 r/	9,070,000 r/	8,510,000 r/	8,340,000 r/	7,880,000
Of which:					
Pyrophyllite	2,270,000 r/	2,170,000	1,970,000 r/	2,010,000 r/	1,920,000
Steatite	612,000 r/	656,000	642,000	564,000 r/	556,000
Talc	3,430,000 r/	3,150,000 r/	2,760,000 r/	2,580,000 r/	2,510,000
Unspecified	3,060,000	3,090,000	3,140,000 r/	3,190,000 r/	2,890,000

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data; not included in "Total." XX Not applicable.

1/ Previously published and 1994 data are rounded by the U.S. Bureau of Mines to three significant digits; may not add to totals shown.

2/ Table includes data available through May 15, 1995.

3/ In addition to the countries listed, the former Czechoslovakia produces talc, but information is inadequate to make reliable estimates of output levels.

4 /Reported figure.

5/ Data based on Iranian fiscal year beginning Mar. 21 of year stated.

6/ All production in Yugoslavia from 1990-91 came from Macedonia.

7/ Data based on Nepalese fiscal year beginning mid-July of year stated.

8/ Dissolved in Dec. 1991; however, information is inadequate to formulate reliable estimates for individual countries, except Russia.

9/ Dissolved in Apr. 1992.