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 were 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 made pyrophyllite useful for ceramic and refractory applications.

Legislation and Government Programs

The Department of Defense authorized the disposal of 980 metric tons of block and lump talc and 988 tons of ground talc from the National Defense Stockpile.

Production

Talc.—Nine companies operating 14 mines in six 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., Barretts Minerals Inc., Dal Minerals, and Gouverneur Talc Co.

U.S. mine production of crude talc was 1.06 million tons, valued at $31.7 million in 1995. *(See tables 1 and 2.)* Production in California, Montana, and Texas increased, while that of New York and Vermont decreased slightly. Mines that operated in Montana, New York, Texas, and Vermont accounted for 98% of domestic talc production. Montana led all States in the tonnage and value of talc produced, followed by Texas, Vermont, New York, California, and Oregon, in decreasing order of production.

Domestic production data for talc were developed by the U.S. Geological Survey (USGS) from a voluntary survey of U.S. mines and mills. Survey forms were sent to nine companies. All companies responded to the survey.

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 slightly from that of 1994.

Domestic production for pyrophyllite was developed by the USGS from a voluntary survey of U.S. mines and mills. Survey forms were sent to three companies. Two companies that account for 99% of the domestic production responded to the survey. Production data for the nonrespondent was estimated from reported prior-year production levels adjusted by trends in the industry and other guidelines.

Consumption

Talc.—Domestic producers reported that overall sales (including exports by producers) was 901,000 tons, valued at $100 million in 1995. Domestically produced talc was used in ceramics (pottery, sanitaryware, tiles, etc.), paint, paper, roofing, plastics, cosmetics, rubber, and insecticides in decreasing order of consumption. *(See table 3.)*

Consumption of talc in ceramics, insecticides, paint, paper, and roofing increased from that of 1994. The largest increase in sales was in the paper market, corresponding to increased production of paper products in 1995. Sales to the roofing industry recovered slightly in 1995 after suffering market loses to competing minerals prior to 1995.

Sales of domestic talc to the cosmetics, plastics, and refractory industries decreased in 1995. The domestic talc industry faced increased competition from imports for cosmetics and plastics applications. In some cases, domestic producers chose to use imported talc to supplement their own products while in others, the competition was from talc imported by mineral brokers and/or processors.

Approximately 94,000 tons of talc were reported under the "Other" category by respondents. Of this amount, 7,480 tons were used in automobile body fillers, food or medicines, and sculpture media; and 82,400 tons were used in caulks, joint compounds, paint and putties, vinyl sheet flooring, and tile flooring. The remainder of the "Other" category (4,320 tons) was used in applications that were not identified by respondents. More than 99% 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 146,000 tons of imported talc were not included in the domestic end-use data shown in table 3. The imported talc was purchased primarily by mineral brokers who do not participate in the USGS canvass. An estimate of the end-use breakdown based on countries of origin, ports of entry, regional end-use patterns, purchasers, etc. is ceramics, 29,000 tons; cosmetics, 9,000 tons; paint, 20,000 tons; paper, 16,000 tons; plastics, 49,000 tons; roofing, 1,000 tons; rubber, 4,000 tons; and other, 18,000 tons.

Pyrophyllite.—Domestic consumption of pyrophyllite was essentially unchanged from that of 1994. There was a slight

decrease in the use of pyrophyllite in refractories and an increase in its use in insecticides. The other end use categories remained unchanged. The largest portion of domestically produced ground pyrophyllite was used in ceramics, followed by refractories, paint, insecticides, plastics, and rubber in decreasing order of consumption. Ceramic and refractory uses accounted for well over 50% of the pyrophyllite sales.

Prices

Talc prices varied depending on the quality and on the degree and method of processing. The unit value of crude talc was estimated to be $30 per ton. Over 50% of the crude ore value included in table 1 was estimated because most producers do not sell crude talc and could not provide a crude ore value. The average reported unit value of processed talc was $111 per ton. The average unit value of crude and processed pyrophyllite was essentially unchanged from that of 1994.

Unit values for imported crude and ground talc ranged from $11 per ton to $713 per ton for shipments exceeding 100 tons. Unit values for cut or sawed talc ranged from $513 per ton to $1,134 per ton for shipments exceeding 100 tons. The average unit value for all shipments, including those of 100 tons or less, was $86 per ton for crude talc; $84 per ton for ground talc; and $1,052 per ton for cut or sawed talc. The average unit value for all imported talc was $102 per ton.

Unit values for exported talc ranged from $23 per ton to $598 per ton for shipments exceeding 100 tons and averaged $238 per ton for unground talc and $201 per ton for ground talc. The average value for all exported talc was $202 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 ($569 to $6,643 per ton) shipments made during the year. These shipments probably were sculpture-grade steatite, surface-treated talc, and/or talcum powder products.

Prices, quoted by the American Paint & Coatings Journal, December 18, 1995, 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 1995, for talc, c.i.f. main European ports, ranged from $92 to $420. *(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 19% in tonnage from 154,000 tons to 183,000 tons and 24% in value from $29.8 million to $37.1 million. Canada was the largest importer of U.S. talc, followed by Singapore (18,500 tons), Brazil (14,400 tons), Mexico, Japan, the Philippines (9,880 tons), and the Republic of Korea (7,500 tons). *(See table 5.)* Talc imports decreased 6% in tonnage from 155,000 tons to 146,000 tons and decreased slightly in value from $14.9 million to $14.8 million. Canada, China, and Japan supplied 82% 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 or Australia.

World Review

China remained the world's largest producer of talc, followed by the United States, Finland, India, France, and Brazil in decreasing order of production. Japan was the largest producer of pyrophyllite, followed by the Republic of Korea and Brazil. China, Japan, the Republic of Korea, and the United States produced 72% of the world's talc and pyrophyllite. *(See table 7.)*

Outlook

Large changes in domestic talc markets are not anticipated in the next few years. Domestic consumption should follow the trend of the past 10 years with any fluctuations in sales corresponding to the overall state of the economy. Imports should stabilize following the 3 years of rapid growth between 1991 and 1994, while export markets should remain strong. Ceramics will continue to be the major domestic end use for talc, followed by paint, paper, plastics, roofing, cosmetics, and rubber, in descending order. For pyrophyllite, the major domestic end uses will continue to be in ceramics and refractories.

OTHER SOURCES OF INFORMATION

U.S. Geological Survey Publications

Talc and Pyrophyllite. Ch. in Mineral Facts and Problems, 1985.
Talc and Pyrophyllite. Ch. in Mineral Commodity Summaries, annual.
Talc and Pyrophyllite. Directory of Companies Mining Talc and Pyrophyllite in the United States in 1994.
Talc. Information Circular 9220, 1989.
Talc. Ch. in USGS Prof. Paper 820, 1973.

Other Sources

Company annual reports.
Industrial Minerals (London), monthly.
Engineering and Mining Journal, monthly.
Mining Engineering, monthly.
Mining Journal (London), monthly.

TABLE 1
SALIENT TALC AND PYROPHYLLITE STATISTICS 1/

(Thousand metric tons unless otherwise specified)

		1991	1992	1993	1994	1995
United States:						
Mine production, crude:						
Talc		1,040	997	968	935	1,060
Pyrophyllite		W	W	W	W	W
Total		1,040	997	968	935	1,060
Value:						
Talc	thousands.	$32,100	$31,300	$27,800	$30,400	$31,700
Pyrophyllite	do.	W	W	W	W	W
Total	do.	$32,100	$31,300	$27,800	$30,400	$31,700
Sold by producers, crude and processed:						
Talc		864	817	900	923	901
Pyrophyllite		W	W	W	W	W
Total		864	817	900	923	901
Value:						
Talc	thousands.	$82,600	$94,700	$104,000	$116,000	$99,900
Pyrophyllite	do.	W	W	W	W	W
Total	do.	$82,600	$94,700	$104,000	$116,000	$99,900
Exports 2/ (talc)		178	175	135	154	183
Value	thousands.	$30,100	$30,100	$27,200	$29,800	$37,100
Imports for consumption		67	80	100	155	146
Value	thousands.	$11,900	$12,400	$10,800	$14,900	$14,800
Apparent consumption		926	902	933 3/	936 3/	1,020
World: Production		9,060 r/	8,440 r/	8,370 r/	8,030 r/	7,150 e/

e/ Estimated. r/ Revised. W Withheld to avoid disclosing company proprietary data.
1/ Data are rounded 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)

	1994		1995	
State	Quantity	Value	Quantity	Value
Texas	225	5,860	294	5,840
Other 3/	710	24,600	765	25,800
Total	935	30,400	1,060	31,700

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ Excludes pyrophyllite.
3/ Includes California, Montana, New York, Oregon, Vermont, and Virginia (1994).

TABLE 3
END USES FOR GROUND TALC 1/

(Thousand metric tons)

Use	1994	1995
Ceramics	265	270
Cosmetics 2/	31	23
Insecticides	6	7
Paint	142	146
Paper	121	139
Plastics	45	33
Refractories	(3/)	--
Roofing	38	43
Rubber	19	18
Other 4/	97	94
Total	764	772

1/ Excludes pyrophyllite.
2/ Incomplete data. Some cosmetic talc known to be included in "Other."
3/ Less than 1/2 unit.
4/ Includes art sculpture, asphalt filler, autobody filler, construction caulks, joint compounds, flooring, food additives, and other uses not specified.

TABLE 4
PRICE OF TALC

(U.S. dollars per metric ton)

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
UK350 mesh	300-330

Sources: American Paint & Coatings Journal, Dec. 18, 1995, and Industrial Minerals (London), Dec. 1995.

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

(Thousand metric tons and thousand dollars)

	1994		1995	
Country	Quantity	Value	Quantity	Value
Belgium	10	1,210	2	323
Canada 3/	54	9,930	61	10,800
Japan	8	1,330	10	1,600
Mexico	13	2,210	11	1,600
Other 4/	69	15,200	99	22,800
Total	154	29,800	183	37,100

1/ Data are rounded 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 62 countries in 1994 and 70 countries in 1995.

Source: Bureau of the Census.

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

	Not crushed or powdered		Crushed or powdered		Cut and sawed		Total unmanufactured	
Country	Quantity (metric tons)	Value (thou-sands)	Quantity (metric tons)	Value (thou-sands)	Quantity (metric tons)	Value (thou-sands)	Quantity (metric tons)	Value (thou-sands)
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 2/	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
1995:								
Brazil	--	--	80	24,750	324	270,787	404	295,537
Canada	137	27,367	25,374	4,750,934	499	375,211	26,010	5,153,512
China	48,708	3,848,653	2,127	288,865	643	363,176	51,478	4,500,694
France	6,020	594,768	6,526	328,297	602	584,098	13,148	1,507,163
Japan	--	--	42,113	792,139	55	14,371	42,168	806,510
Other 2/	10,924	1,160,196	879	258,279	509	1,160,832	12,312	2,579,307
Total	65,789	5,630,984	77,099	6,443,264	2,632	2,768,475	145,520	14,842,723

1/ Data are rounded to three significant digits; may not add to totals shown.
2/ 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/	1991	1992	1993	1994	1995 e/
Argentina:					
Steatite	274	425	840	500 e/	500
Talc	22,786	21,155	17,244	17,300 e/	17,300
Australia: e/					
Pyrophyllite	6,000	5,000	5,000	5,000	5,000
Talc	210,000	210,000	210,000	210,000	210,000
Austria: Steatite	161,425	145,664	136,640	130,602 r/	130,000
Brazil:					
Pyrophyllite	186,000	169,000 r/ e/	170,000 r/	170,000 r/ e/	170,000
Talc	292,270	261,000 r/	290,000	290,000	290,000
Canada: Pyrophyllite, soapstone, talc e/	123,000	104,000	108,000	130,000 4/	116,000 4/
Chile: Talc	538 r/	1,493	5,058	5,351 r/	5,000
China: Unspecified e/	2,600,000	2,650,000	2,700,000	2,400,000	2,400,000
Colombia: Pyrophyllite, soapstone, talc	11,064	13,340	19,550	18,000 r/	20,000
Egypt: Pyrophyllite, soapstone, steatite, talc	9,091	8,319 r/	4,746 r/	4,125 r/	4,000
Eritrea: Talc 5/	XX	XX	XX	3	--
Finland: Talc	361,000	371,000	399,000	453,000 r/	450,000
France: Talc	310,000 e/	300,000 e/	282,000 r/	306,300 r/	300,000
Germany: Talc (marketable)	22,626	23,509	21,152	11,583 r/	12,000
Greece: Steatite e/	790 4/	700	700	500	500
Hungary: Talc e/	10,000	10,000	10,000	10,000	10,000
India:					
Pyrophyllite	84,577	79,197 r/	82,269 r/	86,160 r/	86,000
Steatite	424,000 e/	368,003 r/	385,121 r/	371,580 r/	370,000
Iran: Talc 6/	6,676	23,707	18,000	18,000 e/	20,000
Italy: Steatite and talc	161,200	183,530	142,000 r/ e/	139,000 r/ e/	130,000
Japan:					
Pyrophyllite	1,228,896	1,055,897	1,028,399	934,007 r/	939,000
Talc	65,633	61,120 r/	57,229	56,120 r/	54,500
Korea, North: Unspecified e/	170,000	170,000	180,000	180,000	180,000
Korea, Republic of:					
Pyrophyllite	573,208	602,580	644,890	707,951 r/	700,000
Talc	170,563	149,862	53,923	35,340 r/	30,000
Macedonia: Talc e/ 7/	XX	15,000	10,000	10,000	10,000
Mexico: Talc	11,883	19,559	14,400	15,000 e/	15,500
Nepal: Talc 8/	3,170	3,820	1,340	1,500 e/	1,500
Norway: Talc e/	80,000	60,000	50,000	50,000	50,000
Pakistan: Pyrophyllite	33,643	23,676	46,846	45,000 e/	40,000
Paraguay: Unspecified e/	200	200	200	200	200
Peru: e/					
Pyrophyllite	8,000	8,000	8,000	8,000	8,000
Talc	2,100	2,000	1,200 r/	1,200 r/	1,200
Portugal: Talc	8,000 e/	9,166	9,349	9,000 e/	9,000
Romania: Talc	10,000 e/	6,330	9,000 r/	8,952 r/	9,976
Russia: Talc	XX	150,000 e/	131,688	100,000 e/	100,000
South Africa					
Pyrophyllite	4,448	3,053	4,287	5,507 r/	5,500
Talc	8,235	13,882	8,798	8,202 r/	8,500
Spain: Steatite e/	70,000	70,000	65,000	65,000	65,000
Sweden: Talc e/	19,159 4/	10,000	--	--	--
Taiwan: Talc	18,518	6,085	5,015	4,290 r/	4,000
Thailand:					
Pyrophyllite	42,960	34,638	43,404	55,326 r/	50,000
Talc	5,575	4,786	7,007	8,950 r/	8,000
Turkey	6,122	3,918	4,000 e/	4,000 e/	4,000
U.S.S.R.: Talc e/ 9/	450,000	XX	XX	XX	XX
United Kingdom: Talc, soapstone, pyrophyllite	10,818	5,216	5,317	5,500 e/	5,000
United States:					
Pyrophyllite	W	W	W	W	W
Talc	1,040,000	997,000	968,000	935,000	1,060,000 4/
Uruguay: Talc, soapstone, pyrophyllite e/	1,500	1,500	1,500	1,500	1,000
Yugoslavia: Talc 7/ 10/	17,000 e/	XX	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/	1991	1992	1993	1994	1995 e/
Zambia: Talc	89	366 r/	62 r/	76 r/	70
Zimbabwe: Talc	1,676	2,203	1,349	2,049 r/	2,000
Grand total	9,060,000 r/	8,440,000 r/	8,370,000 r/	8,030,000 r/	7,150,000
Of which:					
Pyrophyllite	2,170,000	1,980,000 r/	2,030,000 r/	2,020,000 r/	2,000,000
Steatite	656,000	585,000 r/	588,000 r/	568,000 r/	566,000
Talc	3,140,000 r/	2,730,000 r/	2,580,000	2,570,000 r/	1,720,000
Unspecified	3,090,000	3,140,000	3,170,000 r/	2,880,000 r/	2,860,000

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

1/ World totals, U.S. data, and estimated data are rounded to three significant digits; may not add to totals shown.

2/ Table includes data available through May 28, 1996.

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/ Eritrea became independent from Ethiopia in May 1993; however, information is inadequate to formulate reliable estimates prior to 1994.

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

7/ All production in Yugoslavia from 1991 came from Macedonia.

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

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

10/ Dissolved in Apr. 1992.