PLAINTIFF'S EXHIBIT WRG-1441

JUL 14 1983

GRACE

Construction Products Division

TO: H. C. Duecker

DATE: July 13, 1983

FROM: J. C. Yang

SUBJECT: Tremolite Analysis in Grace Vermiculite Ore Concentrates and Zonolite Products

CC: R. J. Bettacchi
J. A. Danneker
R. C. Ericson
H. A. Eschenbach
O. M. Favorito
R. M. Vining
R. C. Walsh
J. W. Wolter

In 1977, we analyzed the tremolite content of all sizes of Libby and South Carolina ore concentrates, expanded vermiculites, and all Zonolite products containing vermiculite at E. S. Wood's request. Two memos were issued on April 19 and May 16, 1977 respectively describing the analytical procedure and the results of these analyses. Summarized tremolite analyses are attached with this memo.

Since then, various Zonolite products were analyzed from time to time. The results are tabulated by product in Tables 1, 2 and 3.

The tremolite content of Libby head feeds and ore concentrates were monitored monthly since October 1977. The yearly plots of this data are shown in Figures 1 through 5, and a running plot of each size is given in Figure 6. Only a few sets of ore concentrates were analyzed prior to October 1977. The results and analysis, other than monthly composites, are shown in Table 4. Yearly averages of the tremolite content of each size of Libby ore concentrates are tabulated in Table 5.

These data cover all the analyses of tremolite fibers in Libby ore concentrate and Zonolite products to date. The analyses of Libby head feeds and ore concentrates were reported under individual RFTS' with designated numbers in the block of 675XX to 68499. These reports are kept in the library.

Julie C. Yang

JCY/ph

Attachments

Table 1

Tremolite Fiber Content of Zonolite Products Using Expanded L-1 & L-2

Date	Reference	Material	Location	(%) Tremolite Content
(a)				
3/14/78	RFTS 69515 S	Attic Fill	W. Chicago	0.02
6/7/78	RFTS 69530	L-1	Hanna Furnace, Buffalo	0.013
8/19/80	RFTS 69622	CMC Coated L-1	Aldrich	.005
4/24/81	RFTS 69755	+14M, L-1	Weedsport	.56 ± 0.13*
6/25/81	RFTS 65538	SS L-1, + 14M Attic Ins.		
		CMC Coated		0.44
		Uncoated		0.79
5/4/83	Memo to J. Wolter	L-1	Easthampton	.003
(b)				
2/27/79	RFTS 69545	Ind. L-2	Pyro Engineering, Ca.	.008
5/5/80	RFTS 67583	+14M Ind. L-2	W. Chicago	.002
	RFTS 67589	+14M Ind. L-2	Ventron, Alpha	.021
2/3/82	RFTS 69755	+14M, L-2	Weedsport	.10 ± 0.02*
5/4/83	Memo to J. Wolter	L-2	Easthampton	.002

* average value of 6 determinations

Table 2

Tremolite Fiber Content of Zonolite Products Using Expanded L-3 & L-4

Date	Reference	Material	Location	(%) Tremolite Content
(a)				
7/22/77	RFTS 50110	L-3	W. Chicago (O-18)	.076
3/1/78	RFTS 69512	L-3	W. Chicago	.0036
5/16/83	RFTS 67016	L-3	A. H. Hoffman	.002
8/7/78	RFTS 69534	Screened, + 14M L-3	J. D. Brush Co.	.010
5/4/83	Memo to J. Wolter	L-3	Easthampton	.001
(b)				
7/22/77	RFTS 50110	L-4	W. Chicago	.062
1/31/78	RFTS 67012	L-4	Agway, NY	.032
1/31/78	RFTS 67013	L-4	Voluntary Purchasing Group, Texas	.008
4/28/78	RFTS 67015	L-4 Unscreened Unscreened	QC	.16 .003
5/16/78	RFTS 67016	L-4	Rockland Chemicals	.007
5/16/78	RFTS 67016	L-4	Sea Coat Lab Screened Unders	1.5
5/78	RFTS 67020	L-4	Dallas D-18 (dry) D-18 (wet)	.0099 .0025
1/19/79	RFTS 67026	L-4 Agricultural Grade	Wilder (D-18)	.039
2/27/79	RFTS 69544	L-4, Roof Deck	Gem Tel Bldg., CA	.61
3/6/79	RFTS 69543	L-4	Sinclair Paint Bldg.,CA	0.15
5/8/83	Memo to J. Wolter	L-4	Easthampton	.002

Table 3

Tremolite Fiber Content in Monokote

Date	Reference	Source	Analyst	Tremolite Content
6/25/76	RFTS 49189 & A. D. Little	Santa Ana, CA Newark, CA	J. C. Yang* E. T. Peters	<1.7 ppm <4.1 ppm
3/4/80	A. D. Little	Prudential Bldg. Morristown, N.J.	E. T. Peters	<1 ppm
6/27/83	A. D. Little	Easthampton	E. T. Peters Confirmed Possible	 1-3 ppm 7-30 ppm
7/11/83	A. D. Little	Trenton, Lot 2F1 Mt. Sinai "wipe-out" technique	E. T. Peters Found Estimated detection limit	 none 10 ppm

* J. C. Yang has concentrated the tremolite containg fine portion by dissolving the plaster of Paris binder burning off the cellulosic fiber and organic matters and floatings off the vermiculite and submitted to ADL for electron microscopic analysis.

PRODUCT	CONCENTRATE GRADE	DATE OF LAST MSDS	TREMOLITE CONTENT (%) PER MSDS	ACTUAL	DATE OF TEST (Most Recent)
Attic Insulation	L-1	NA	NA	0.003	5/4/83
Agriculture	L-3	NA	NA	0.001	5/4/83
Agricultural	L-4	5/19/77	<0.5	0.002	5/4/83
Agricultural	SC-4	5/20/77	<5.0*	7.9	5/17/77
Concrege Aggregate	L-4	5/19/77	<0.5	0.002	5/4/83
Concrete Aggregate	SC-4	5/19/77	<5.0*	7.9	5/17/77
Dealer Concrete Aggregate	L-4	SEE CONCRETE AGGREGATES ABOVE			
Dealer Concrete Aggregate	SC-4	"	"	"	"
Industrial	L-1	6/10/77	<0.1	0.003	5/4/83
Industrial	L-2	6/10/77	<0.1	0.002	5/4/83
Industrial	L-3	6/10/77	<0.1	0.001	5/4/83
Industrial	L-4	7/19/77	<0.5	0.002	5/4/83
Industrial	SC-3	7/19/77	<5.0*	1.6	5/17/77
Industrial	SC-4	7/19/77	<5.0*	7.9	5/17/77
Masonry Insulation	L-3	5/19/77	<0.5	0.001	5/4/83
Masonry Insulation	L-4	5/19/77	<0.5	0.001	5/4/83
Masonry Insulation	SC-3	5/19/77	<5.0*	1.6	5/17/77
Monokote	MK-4 & 5 (L-3)	1/29/82	No Mention	0-20ppm 0-10ppm	7/11/83
Monokote	MK-5 (SC-3)	1/29/82	No Mention	NA	NA
Plaster Aggregate	L-3	NA	NA	0.001	5/4/83
Plaster Aggregate	SC-3	NA	NA	1.6	5/17/77
Terra-Lite	L-2	NA	NA	NA	NA
Terra-Lite	L-3	NA	NA	NA	NA
Terra-Lite	L-4	NA	NA	NA	NA

AIR SAMPLING DATA (f/cc)				
TWA	MAX EXP	AVG MAX	DATE OF TEST (Most Recent)	WARNING LABEL
0.29	1.54	1.17	5/5/83	
0.26	1.85	1.11	5/3/83	Caution: Dust/Ventilation/Respirator
NA	NA	NA	NA	" " " "
0.10	0.72	0.20	6/8/83	" " " "
NA	NA	NA	NA	" " " "
0.06	0.13	0.07	3/17/83	" " " "
0.02	0.14	NA	5/12/77	" " " "
NA	NA	NA	NA	" " " "
NA	NA	NA	NA	" " " "
NA	NA	NA	NA	" " " "
0.04	0.06	0.04	6/1/83	" " " "
0.06	0.22	0.12	6/1/83	" " " "
NA	NA	NA	NA	" " " "
NA	NA	NA	NA	" " " "
NA	NA	NA	NA	" " " "
0.08	0.83	0.63	4/27/83	" " " "
0.02	0.33	0.13	6/27/83	" " " "
0.03	0.21	NA	5/12/77	" " " "
0.01	0.09	0.04	4/26/83	" " " "
≤0.10	≤0.25	NA	5/12/77	" " " "
NA	NA	NA	NA	" " " "
NA	NA	NA	NA	" " " "
NA	NA	NA	NA	" " " "
0.10	0.82	0.19	6/20/83	" " " "
0.10	0.72	0.20	6/20/83	" " " "

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Construction Products Division

TO: J. W. Wolter

DATE: May 4, 1983

FROM: R. C. Howard

SUBJECT: Tremolite Content in Expanded Vermiculite

CC: H. C. Duecker
R. C. Ericson
R. C. Walsh
J. C. Yang
File: 1000

Introduction:

This memorandum is being issued in response to your verbal request for quantitative tremolite determination in our expanded Libby products. Samples L-1, L-2, L-3, and L-4 were received in four cubic foot bags from Easthampton and the L-5 sample in a five gallon bucket from Libby. Each sample was quartered using a large plastic sheet until portions weighing 1500.00 g or more were obtained. Samples so obtained were separated on the basis of density using:

a. Water floatation to separate the bulk of the expanded vermiculite from any heavy particles or "sink",

b. Heavy liquid (density = 2.7 g/mL) to further separate any vermiculite fines from the sink.

After separation both fractions were dried and reweighed. The sink portions were then pulverized for quantitative analysis of their tremolite contents via X-ray Diffraction.

Results:

The mean tremolite content, based upon duplicate analyses for each sample, have been summarized in Table 1.

Table 1 - Mean Tremolite Content of Expanded Vermiculite

Sample	Wt. % Tremolite Content
L-1	0.003
L-2	0.002
L-3	0.001
L-4	0.002
L-5*	0.04

*based on only one determination.

Comments:

As seen in Table 1 the total tremolite contents of these samples are all in the range of 0.001 - 0.003% or ten to 30 ppm with the exception of L-5.

I suspect this difference between L-5 and the others to be a result of:

a. Expansion of L-5 at Libby in an assay furnace without baghouse trapping of airborne tremolite,

b. Not subjugating the expanded product to stoner treatment.

Material expanded at Easthampton is done in a Model A furnace equipped with a baghouse and stoner. As such tremolite levels are reduced for two reasons; the baghouse isolates airborne tremolite while the stoner removes a substantial portion of heavy particle in which tremolite is concentrated.

Reference: Notebook: 1514-23
Notebook: 1562-18
XRD File: 1000-242.

R. C. Howard

RCH:jrs

To: E.S.Wood
From: J.C.Yang
Date: May 16, 1977

Tremolite & Vermiculite Content in Libby & Kearney Ore Deposits and Expanded Vermiculite

TABLE 2

Tremolite Content of Expanded Vermiculite

ID No.	Description	Date Collected	% Vermiculite	% Tremolite
99952-39	L-1	3/18/77	97.7	0.074
99952-40	L-2	3/18/77	97.1	0.028
99952-48	L-3	3/9/77	97.7	0.049
99952-41	K-3	3/3/77	91.0	1.6*
99952-42	K-4	3/3/77	79.4	7.9*
99952-43	K-5	3/3/77	48.7	interference

*Includes all amphibole minerals.

To: E. S. Wood
From: J. C. Yang
April 20, 1977

Tremolite Content
in ZONOLITE® Products

Libby

ID No.	Product Description	% Tremolite	
10	MK-4 (L-3) West Chicago	< 0.10	
6	Masonry Fill (L4D-18) West Chicago	0.01	
19	Terra-Lite, W. Chicago	0.035	
25	Attic Fill (L-2) W.Chicago	.013	
28	Redi-Earth (L) Santa Ana	(as rec'd) .031	(dried) .051
14	Redi-Earth (L) W. Chicago	< 0.02	
15	Metro-Mix 200 (L) W. Chicago	(as rec'd) 0.034	(dried) <.043
12	Zonolite 3300 (L-3) W. Chicago	<0.007	
3	Concrete Aggregate (L4D-18) W. Chicago	0.344	
16	Scott Turf Builder (L) Dark	≈0.009	
22	Scott Turf Builder (L) Light	<0.009	

B. Tremolite Content in Zonolite Job-site Samples

ID No.	Product Description	Location	% Tremolite
8	ZK Roof Deck (K 4/5 B)	Montgomery, Ala.	2.828
9	Masonry Fill (K-3)	Columbus, Ohio	0.050
28	Redi-Earth (L-4)	Forest Service, Santa Ana	0.031 (.051)*
51	Monokote-5 (L-3)	San Diego	<0.106
54	Masonry Fill (K-4)	W.Palm Beach, Fla.	2.86
55	ZIC (K-4)	Edison H.S., Miami, Fla.	0.476
58	Masonry Fill (L-3)	Mashburn & Coe Bldg., Oklahoma	0.250
57	Monokote-4 (L-3)	Hyatt Regency, Dallas	0 240

*oven-dried basis