FILE NAME: RT Vanderbilt (RTV)

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Affidavit (in Opposition) of Arthur N. Rohl sworn to May 12, 1993 with exhibits A-C
(Pages 1752-1755)

SUPREME COURT
STATE OF NEW YORK ST. LAWRENCE COUNTY

LEONARD GAUMES, et al

Plaintiffs,

v.

R.T. VANDERBILT COMPANY, INC., GOUVERNEUR TALC COMPANY, INC., ST. JOE MINERALS CORP., and FLUOR CORP.,

Index No. ____

Defendants.

AFFIDAVIT

STATE OF NEW YORK)
COUNTY OF ONONDAGA) SS:

I, Arthur N. Rohl, being duly sworn, deposes and says:

1. I am a mineralogist. My fields of study, experience and activity involve the minerals which are the building blocks of stone.

2. My more specialized interest in the field of mineralogy has been working with, teaching about and studying minerals which cause disease, most importantly asbestos minerals.

3. Attached is my *Curriculum Vitae* (Exhibit A) and also my bibliography (Exhibit B).

4. Concerning talc, which is the commonly used word describing the rock that is mined in the Gouverneur talc mines owned by the defendant, R. T. Vanderbilt Company, Inc, as can been seen by referring to the publications at paragraphs 4, 5, 10, 16, 21 and so forth of my bibliography, I have been intimately involved with the study of talc.

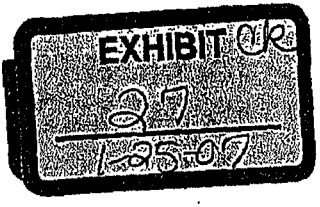
5. Scientifically, talc can be defined as a separate mineral by itself. In the talc mines of Saint Lawrence County, it is mixed with asbestiform minerals, which, by definition, are chrysotile, (serpentine), amosite (cummingtonite-grunerite), crocidolite (riebeckite) tremolite, anthophyllite and actinolite. The definition of talc that I have used is set forth in Section 901, Subdivision (2) of the New York State Labor Law, a definition with which I concur as do most scientific authorities and government agencies and bodies charged with investigation of asbestos.

6. My studies and investigations concerning the Gouverneur mines, reveal that up to sixty percent of the ore that is mined there is tremolite and anthophyllite with a minor amount of chrysotile. Therefore, by definition, what Gouverneur Talc Mines, and International Talc before it, has been mining in the Gouverneur mines is up to sixty percent asbestos and asbestiform minerals.

7. A commonly accepted method of defining and identifying a fiber is its aspect ratio - that is the ratio of length to width. The commonly accepted definition of the aspect ratio of fibrous asbestos (if it is in the other respects an asbestos mineral) is if its aspect ratio exceeds 3 in length to 1 in diameter (3:1).

8. I have studied samples of the talc ore, and also the milled talc ore, taken from the Gouverneur talc mine owned by R. T. Vanderbilt, in and around Gouverneur and have determined by both optical and electro-microscopic means that the aspect ratio of the mineral fibers of tremolite and anthrophyllite and chrysotile, found in the R. T. Vanderbilt mines often exceed the aspect ratio definition outlined in item 7. above.

9. I have read the affidavit of C. S. Thompson which I am informed is in support of a motion to dismiss the personal injury actions brought by the talc miners against R. T. Vanderbilt. I note that in his affidavit, he places much emphasis on the distinction between asbestiform and non-asbestiform minerals and makes the categorical and unsupported statement that there are no asbestiform minerals in the Gouverneur talc. That is not so, by definition, since it is an indisputable fact that up to sixty percent of the composition of the talc ore from Gouverneur is, by definition, asbestos and asbestiform minerals, as I have already alluded to previously. Therefore, even by Mr. Thompson's definition, they are asbestiform minerals. Also, concerning the aspect ratio, again, by any definition, even Mr. Thompson's, (with which I do not agree), the minerals in the talc ore, since they exceed the aspect ratio as I have explained, are, to use part of Mr. Thompson's phrase, asbestiform.



10. Not only did I and my associates at Mount Sinai School of Medicine study R. T. Vanderbilt talc and other talc from around the country and around the world, but parts of the same samples from the R. T. Vanderbilt talc that I and my associates examined were also examined by McCrone Research Institute of Chicago. Attached as Exhibit C are the published results of the McCrone Research Institute of Chicago, which reached the same conclusions, essentially, that I reached in my investigations of the *same* ore samples

11. When rock from the mines is ground up, there is no difference between the physical, structural and chemical properties of the R. T. Vanderbilt ground ore and the physical and chemical properties of the asbestos minerals from so-called "commercial asbestos deposits" found, for instance, in Korea, Italy and China.

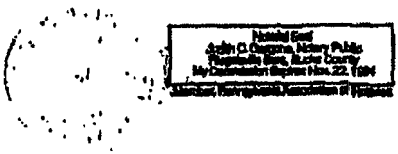
12. On the basis of my examination of the ore and the basis of my experience in dealing with asbestos in general, and talc in particular, I can say with certainty that, the R. T. Vanderbilt talc that is mined, both before it is milled and after it is milled to its commercially used forms, is, by all the extant definitions, asbestos.

19. I understand this affidavit will be submitted to the court as a part of the plaintiffs' opposition to R. T. Vanderbilt's motion to dismiss these lawsuits.

Arthur N. Rohl

Signed and Sworn to before me this
13 of May, 1993

Notary Public



A - Curriculum Vitae (Pages 1756-1758)

Dr. Arthur Rohl
Box 455
Durham, PA 18039
([redacted]) 258-5965

Date of Birth: May 11, 1930

Social Security Number: 119-24-7193

Education:

Columbia College, New York City B.A. 1953-1957
Columbia University, New York City M.A. Mineralogy 1957-1958
Columbia University, New York City Ph.D. Mineralogy 1958-1985
degree requirements completed 1973;
degree awarded 1985

Work Experience:

December 1985	Consultant/Arthur N. Rohl Assoc., Inc.
1976 - 12/1985	Assistant Professor of Mineralogy Department of Community Medicine Mount Sinai School of Medicine
1969 - 1978	Research Associate Department of Community Medicine Mount Sinai School of Medicine
1962 - 1969	Director Research and Development Fuel Engineering Company Thornwood, New York
1960 - 1962	Research Assistant in Mineralogy Columbia University
1958 - 1960	Teaching Assistant in Mineralogy Columbia University
1958 - 1959	Research Mineralogist Union Carbide Nuclear Corporation
1957 - 1958	Consulting Mineralogist, Columbia University for: Union Carbide Nuclear New Jersey Zinc Exxon Corporation American Petroleum Institute
1956 - 1957	Research Chemist Galvanic Products Valley Stream, New York

Professional Activities (continued):

1986-Present	Expert Consultant National Heart, Lung and Blood Institute
1988	Expert Consultant United States Attorney Southern District of New York

Post Graduate Education Courses:

1980-January	Co-Director, Management and Control of Asbestos in Public Buildings
1979-October	Asbestos Associated Diseases
1978-March	Occupational and Environmental Pulmonary Diseases
1978-January	Asbestos Carcinogenesis
1978-Present	Page and Black Post Graduate Courses (Mount Sinai Medical Center)

Recent Seminars and Lectures:

New York Mineralogical Society, American Museum of Natural History, New York City, October 15, 1981 "Endemic Pleural Disease in Relation to Mixed Fibrous Dust Exposure in Turkey"

40th Annual AMA Congress on Occupational Health September 11-12, 1980, Salt Lake City, Utah. "Mesothelioma and Pleural Disease with Zeolite Exposure in Turkey"

National Workshop on Substitutes for Asbestos, USEPA and CPSC Washington, D.C., July 14-16, 1980 "Environmental Pleural Disease Associated with Fibrous Disease Exposure"

Honors and Awards:

1963	Sigma Xi, Scientific Research Society Kappa Chapter
1959-1962	Union Carbide Nuclear Corporation Stipend
1957-1959	U.S. Atomic Energy Commission Stipend
1957	Columbia University Graduate Teaching Award

Scientific Societies:

Mineralogical Society of America
American Association for the Advancement of Science
Sigma Xi, Kappa Chapter

Professional Activities:

1976-1985	Expert Consultant-Government of Irish Republic Department of Public Health
1980-Present	Consultations to the Philadelphia Board of Education
1979-1985	Consultations to the New Jersey Department of Environmental Protection
1978-1985	Consultations to the New York City Department of Health
1978-1985	Consultations to the New York City Board of Education
1978-1985	Consultations to the Connecticut State Department of Health
1977-1985	Consultations to Liberty Mutual Insurance Company
1975-1985	Consultations to the New York City Fire and Sanitation Departments
1975-1985	Consultations to the New York City Department of Environmental Protection
1977-1988	Expert Consultant-Environmental Protection Agency
1980-1986	Expert Consultant-Government of Bermuda Department of Public Health
1978-1986	Expert Consultant National Institute for Occupational Safety and Health
1977-1986	Expert Consultant Occupational Safety and Health Administration

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C - Examination of Talc Ore Samples from Gouverneur District, NY
by McCrone Research Institute of Chicago (Pages 1764-1775)

Report to

Dr. John Dement

NIOSH

Cincinnati, Ohio 45202

EXAMINATION OF TALCS FROM

GOUVERNEUR DISTRICT — NEW YORK

Date: 18 December 1975

MA Number: 4800

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2820 SOUTH MICHIGAN AVENUE • CHICAGO, ILLINOIS 60616

TABLE OF CONTENTS

EXAMINATION OF SEVEN TALCS FROM THE GOUVERNEUR DISTRICT, NEW YORK

SUMMARY

An extensive examination has been carried out of seven talcs submitted by the National Institute of Occupational Safety and Health, to determine their asbestos content. These talcs all originated from the Gouverneur District of New York State and were identified by number code in the series 83775-83781.

Examination was carried out by a combination of light microscopy, using both polarized light and dispersion staining, x-ray diffraction, and electron microscopy combining electron diffraction and elemental analysis.

The results of the examination showed the presence of asbestiform amphibole in all seven samples. The amounts of the total amphibole and of the fibrous amphibole differed between the various samples. In all cases the principal asbestiform amphibole was identified as tremolite, but this was of a low calcium variety, containing approximately 2-3% calcium.

In Sample 83787, x-ray diffraction examination suggested that a small percentage of anthophyllite was also present. Examination by light microscopy, however, could not conclusively differentiate between anthophyllite and tremolite in this sample. The identification of tremolite rather than a calcium bearing anthophyllite in all samples was based on the extinction angle, observed under crossed polars, of the fibrous amphibole.

INTRODUCTION

The National Institute of Occupational Safety and Health is currently sponsoring a study of occupationally related disease in the talc industry. As part of this study, Walter C. McCrone Associates, Inc., has been contracted to study and characterize the raw talc ores. The present work is related to this major program and is concerned with a study of seven specific samples from the Gouverneur talc ore body.

Material and Method of Conducting Tests

Seven talc samples were submitted to Walter C. McCrone Associates, by John Dement of NIOSH. These samples were identified by numbers running in sequence from 33785-33791. No indication was given of the sample locations within the Gouverneur talc body. The samples were examined by light microscopy using both polarized light and dispersion staining, x-ray diffraction, and transmission electron microscopy combined with electron diffraction and elemental analysis.

Light microscopy

Permanent mounts were prepared for all seven samples, using Aroclor 5442 as a mounting medium. These preparations were examined under partially uncrossed polars to obtain a general indication of the mineral types present together with their shapes and sizes. Samples for examination by dispersion staining were prepared using Cargille high dispersion refractive index liquids with n values of 1.550 and 1.605. The lower refractive index was used to examine the serpentine content of the talcs; the higher value was chosen to enable identification of the amphibole present. Examination by dispersion staining was at a magnification of approximately 200X in plane polarized light.

X-ray diffraction

For x-ray diffraction examination, samples of the powders were packed into aluminum cup holders and placed in the Norelco diffractometer. The samples were rotated around an axis perpendicular to the axis of the diffractometer which was scanned through a 2θ range from approximately 6° to approximately

60° with a scanning speed of 1° per minute and a chart speed of 1/2 inch per minute. Cu radiation, nickel filtered, was used at an accelerating voltage of 42 kV, and a current of 25 milliamps. The quartz content of the samples was determined by step scanning through the 3.35 Å line for quartz and comparing the resulting data with that for "spiked" standards of quartz in talc. The step increment was 0.01°, 2θ with a counting time per step of 50 secs., an 8 sec. time constant and a chart speed of 1/8 inch per minute.

Electron microscopy

For electron microscopic examination samples of the powder were suspended in isopropanol and lightly ultrasonerated. A drop of this suspension was placed on carbon coated Nylon grids. Examination of the samples was carried out in a combined electron-microscope-microprobe-analyzer, EMMA-IV. The samples were examined and photographed at several different magnifications, electron diffraction patterns were obtained from typical fibers present and energy dispersive x-ray analysis was performed on these fibers.

RESULTS

1) Light microscopy

The following general statements can be made:

All the samples contained a serpentine which, on the basis of dispersi staining and morphology, has been identified as lizardite. Chrysotile (the asbestiform variety of serpentine) and antigorite were not detected.

All the samples contain tremolite identified by dispersion staining and polarized light microscopy and, although it would be possible to miss a small percentage of anthophyllite particles, since most anthophyllites give nearly the same dispersion staining colors as tremolite, appreciable amounts of anthophyllit would not be missed because a significant number of particles would lie in the proper orientation for positive identification. With the exception of an occasional particle in Sample 83757, all the particles which showed the tremolite/anthophyllite dispersion colors showed oblique extinction under crossed polars ($\gamma^{\wedge}c$ = 17-18°), thus identifying them as tremolite.

All samples contain talc in a form which looks like fibers. These give typical talc colors by dispersion staining. The majority of these talc fibers are apparently long talc rods. These talc fibers are especially long in Sample 83757.

Most samples are believed to contain a little quartz on the basis of the light microscopical examination. It is difficult to put an accurate value to the amount of quartz present, since it is extremely difficult to distinguish between quartz and lizardite under dispersion staining conditions.

A calculation of the percentage of amphibole present and of the portion of this amphibole which was fibrous was made as follows. First the portion by volume of the total tremolite present as fibers was estimated taking cognizance of both particle size and numbers present. Subsequently, 30 fields in each sample were examined in detail and the percentage by area of the total particle area occupied by amphibole particles was estimated.

Table 1 summarizes the observations made by light microscopy.

X-ray diffraction

All samples showed the presence of talc, an amphibole and a serpentine. Inconclusive evidence of quartz was detected by x-ray diffraction on the normal scan. By step scanning, however, low levels of quartz were found. The quartz data are presented in Table 2 and Figure 1.

The serpentine minerals are difficult to distinguish from each other by x-ray diffraction. A paper by Mumpton[1] indicates certain lines which may be used to distinguish the three serpentine polymorphs provided that the samples are relatively monomineralic. Specifically, Mumpton mentions that lizardite is characterized by a strong doublet at 1.531 Å. This doublet has indeed been observed on our x-ray diffraction trace, thereby confirming the light microscopi identification of lizardite by dispersion staining.

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1 Characterization of chrysotile asbestos and other members of the serpentine group of minerals, Siemens review XLI (1974) 7th special issue, X-ray and Electron Microscopy News.

Table I
Summary of Light Microscopical Data

Sample	83755	83756	83757	83758	83759	83760	83761
Total tremolite (% of sample by area)	15	24	27	24	40-50	25-30	30-35
	25-30	15-20	20-25	25-30	25-30	15-20	25-30
Fibrous tremolite (estimated % by vol. of total tremolite)	5	25	5-10	5	1	25	20
Quartz	+	+ possible	+	+	+?	+?	+?
Serpentine	+	?	-	+?	+	probable	probable
Talc "fibers" (rolls, sheets etc.)	+	+	+	+	+(long)	+	+
Comments				large tremolite plates	large particle size	small particle size	

Table II
Tremolite and Quantity Content of Talc Samples

Sample	83755	83756	83757	83758	83759	83760	83761
Quartz Content**	2%	1/2-1%	~1 1/2%	~1 1/2%	<1.2%	below detection limit	1/2-1%
Content tremolite	15	24	27	24	40-50	25-30	30-35
	40-50%	50-60%*?	40-50%*	~60%	>50-60%*	50-60%	40-50%

** Step scanning data.

* Indicates possible anthophyllite present in addition to tremolite.

This leaves only the amphibole to be characterized in all seven samples. The primary amphibole observed is tremolite. The diffraction lines observed are consistent with ASTM Card 13-437 for tremolite and with published data for tremolites from the Gouverneur district. In one sample, however, Sample 83757, a distinct side peak on the tremolite 8.410 line is observed and it is believed that this side peak is due to the presence of some anthophyllite. Less distinct evidence of this side peak is also present on Sample 83756 and possibly also 83759 (see Figures 2-3 for a comparison of the 6°-12°, 2θ range on these samples). As is clear from these figures, in addition to the side peak attributed to anthophyllite there is considerable variation in the ratio of talc to amphibole in these samples. An attempt to quantitate this relationship in terms of percentage of amphibole present is also given in Table 2.

Electron microscopical examination

Electron microscopical examination showed that all seven samples contain substantial amounts of fibrous material. This was highest in Sample 83757 and lowest for Samples 83756 and 83761. Several typical electron micrographs showing general areas of the samples are appended to this report (Figures 9-17). The electron microscopical examination concentrated on the fibrous material and an attempt was made to estimate how much of this materia was in fact asbestiform, that is, a fibrous amphibole as distinct from the fiber forms of talc consisting of ribbons, shards, rolls, etc. This examination was conducted both by electron diffraction and by elemental analysis using energy dispersive x-ray. The results of these examinations are summarized in Table the estimated percentages being based on occluded area. Some typical electr micrographs, diffraction patterns and energy dispersive x-ray spectra are appended. In none of these fibers examined was there a particularly high percentage of calcium noted; however, calcium was observed at the level of the order of 1-3% in all the amphibole fibers examined. The only conclusion whic

Table III
Electron Microscopical Estimates of Fiber Content

Sample	83755	83756	83757	83758	83759	83760	8376
Total fibers	~10%	~10%	~40%	~30%	~5-10%	~20%	~10%
Fibrous amphibole (as % of total sample)	<5%	<5%	15-20%	10-15%	<5%	~5%	<5%