

PLAINTIFF'S
EXHIBIT
CAM-391

VANDERBILT-GRANTHAM ACTION PLAN

ASBESTOS-TALC STUDY

PROJECT NO. 9790-4

CYPRUS INDUSTRIAL MINERALS
RESEARCH LABORATORY

April 11, 1975

05210003

CAMC-Abbott-000247

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ABSTRACT

In recent action, the R. T. Vanderbilt Company has issued a letter of certification for their talc products with respect to the Occupational Safety and Health Administration, Asbestos Regulation 1910.93a. This letter of certification is based on Vanderbilt's claim that their talcs do not contain fibrous asbestos.

This report is the result of the Vanderbilt-Grantham Action plan and concerns the X-ray and microscopic study of talc products from Cyprus Industrial Minerals Company and its competitors, checking for the presence of fiber-form asbestos.

Based on the results of this study, the claim by Vanderbilt that their talcs contain non-fibrous tremolite, actinolite, and anthophyllite, has been proven totally false.

The talc products from California crudes, marketed by Cyprus Industrial Minerals and competitors, have been shown to contain fibrous tremolite asbestos. These results are in contradiction to the Certification of Compliance letter issued by Cyprus Industrial Minerals Company.

05210008

INTRODUCTION

A major issue, and the reason for this study is the claim by Vanderbilt¹ that their talcs contain non-fibrous asbestos. This claim is apparently the basis for their letter of certification², based on OSHA Asbestos Regulation 1910.92a³.

This project was initiated by the drafting of an Action plan, dated January 18, 1975, concerning Vanderbilt and Grantham talcs⁴. The objectives of this study were to;

- 1) Establish whether any current CYMIN production talc products contain asbestos.
- 2) To confirm the presence of asbestos fibers in competitor talcs.

The information resulting from this study is to be used in Sales programs and also as backup material for a letter to be sent to Mr. John Stender, Assistant Secretary of labor.

This project was completed in stages as follows;

- 1) Analyses of current Cyprus Industrial Minerals products for asbestos fiber.
- 2) Analyses of competitor talc products for asbestos fiber.
- 3) Airborne dust monitoring and analyses of samples from plants using competitor talc products.

EXPERIMENTAL

The methods used for the identification of asbestos minerals and fibers were as follow:

Crystal and Chemical Analyses

X-ray Analysis

X-ray diffraction

- a) A $1^\circ/\text{min}$ 2θ scan from 3° to 38° 2θ was made of the specimen in a powder holder.
- b) A pressed pellet of the sample was prepared and the 2θ region from 10° to 11° was scanned at a 2θ scan speed of $1/8^\circ/\text{min}$, checking for tremolite presence. (indicated by a peak at 10.4° , 27.2° , 30.2° and 35.5° 2θ). Peak intensities on the recorded chart were compared to tremolite standards to estimate percentages.

X-ray fluorescence

A back-up method to "b" above, was CaCO_3 to acid treat the powder sample to remove CaO and CaCO_3 calculated to correlate to percent tremolite.

This method has been shown to be extremely accurate and has been accepted as the method for tremolite analysis, by the CTFA Talc sub committee.

The instrument used for this work was a combined Norelco X-ray diffractometer-spectrometer with constant potential power source.

Morphological Analyses

- 1) Investigation of the Vanderbilt and Grantham talc samples by polarized light microscopy revealed that fibrous tremolite asbestos was present in all samples in which a positive reading was indicated by X-ray analyses. Minimal non-fibrous tremolite forms were noted, as evidenced by refractive indices $(\alpha \text{ and } \gamma) > n_d^{25} 1.596$ and the majority of tremolite detected was of fiber-form, as defined in the recent OSHA criteria³. Both phase-contrast and polarizing microscopy were via a Nikon L-KE microscope.

EXPERIMENTAL

(Continued)

Morphological Analyses (continued)

- 2) Morphological analyses of the talc samples were performed by secondary electron-SEM. The resultant observations were, that even the blocky, or non-fibrous tremolite forms were seen to exist with parallel striations and partial defibrillation occurring. Fibers were observed in both rigid and flexible forms, with the latter, a more serpentine-form of fiber.

The samples were examined at varying magnifications and angles of tilt using an I.S.I. MS-2 SEM.

- 3) Transmission Electron Microscopy with Selected Area Electron Diffraction.

The above techniques were used in combination to obtain both morphological and crystal structure analyses. The identification of asbestos fiber by these methods results in positive and conclusive scientific evidence. The Vanderbilt products were studied via these techniques in order to identify the flexible or serpentine-form fibers.

Magnifications used ranged from 6K to 70K times, with electron diffraction analysis being performed on individual fibers.

The samples were prepared for study by applying an aliquot of an ultrasonerated, aqueous dispersion onto a collodion filmed specimen grid and allowing the prep. to air dry. A vacuum evaporated layer of Al and carbon were applied to enhance contrast, and aid in the topographical interpretation by show projection, and also aid as a support film. The thin layer of Al (111 reflection) was used as an internal camera constant for each diffraction pattern indexed. The d spacings of the fiber were compared to ASTM X-ray powder data for closest match, and used in conjunction with morphological data for fiber identification.

The instrument used for this work was a Hitachi HS-7S with a liquid N₂ cooling stage.

ANALYSIS OF CURRENT CYMIN PRODUCTION TALCS
FOR ASBESTOS FIBER

The results of XRD, TEM, and SEM analyses of 10 current production talc products have been previously reported in memos dated January 22, 27, and March 7, 1975. Four samples, all from California crude ore, were found to contain tremolite asbestos fibers; These samples were C-400, T076, Furnace Creek, and Supreme 325 products. The asbestos was detectable by XRD in the C-400 and T076 samples and although XRD showed negative results for Furnace Creek and Supreme 325 products, both SEM and TEM revealed a few tenths of a percent of fibrous tremolite present.

Additionally, a trace amount ($<0.1\%$) of possible tremolite was observed in the Yellowstone screenings products, although further work is called for in order to confirm this observation.

The presence of attapulgite fiber has been observed in talcs from both Montana and California crude ores and although attapulgite mineral is not considered or classified as an asbestos mineral, it is likely to be confused with various forms of asbestos.

The results of X-ray diffraction analyses are listed in table No. 1; Scanning electron micrographs, Figures No. 1 through 4; and Transmission electron micrographs, figures No. 5 through 9.

Table No. 1

<u>CYMIN Production Talcs</u>		<u>XRD Analysis</u>
<u>Product</u>	<u>Lot No.</u>	<u>Tremolite%</u>
Glacier 325	457T	0
Glacier 200	469	0
Steawhite 200	466	0
Yellowstone Crude 67% Yellowstone 33% Screening	115	0
Yellowstone Crude Blend	467	0
F.C. (Panamint 100%)	180	0
T706 4 Panamint 1 Samson	687	0.5
C-400 4 Panamint 1 Samson	182	0.5
Supreme 325 (Keeler)	465K	0
White Eagle Screenings	-	0.5
Trinity Super fine	N.A.	0

ANALYSIS OF COMPETITOR TALCS FOR ASBESTOS
FIBER

Analyses by XRD/XRS, TEM, SEM, and optical microscopy was undertaken with emphasis on the Vanderbilt and Grantham products. A total of sixteen competitor talc samples were investigated for fibrous asbestos and the majority of work was devoted to identifying and illustrating asbestos fibers present in the Vanderbilt talc products.

TEM with selected area electron diffraction analysis was used for the bulk of this work, with the results of these techniques being positive, undisputable scientific evidence. Through these techniques, the presence of fibrous tremolite asbestos in Vanderbilt talcs was identified and illustrated.

The results are indicated in table No. 2, which reveals that the Vanderbilt products contain substantial fibrous, asbestos minerals. The only sample in which the presence of fibrous asbestos could not be proven, was Pfizer's Montana talc (MP-1252).

Phase contrast optical micrographs are illustrated by figures No. 10-14; the observations by SEM are illustrated in figures No. 15 through 44; TEM and SAED patterns micrographs of the Vanderbilt products are included; figure No. 45 through No. 63.

Each one of these micrographs illustrates the fibrous asbestos evident in the respective talcs, and may serve to disprove any claims that the asbestos is non-fibrous.

Asbestos Analyses of Competitor Talcs 3/12/75

TABLE NO. 2

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Sample	Identification	Date Received	XRD/XRS	SEM	TEM
Pfizer CP-1040	Flecto #4	1/31/75	~3% tremolite, fibers	1-2 tremolite	5% tremolite
Windsor Minerals low grade	Samples #1 and #2 Illinois	2/20/75	~1% tremolite	<1% tremolite serpentine fiber forms	<1% tremolite serpentine fiber forms
Oregon Talc	Sunray Mine Eastern Oregon (G. Pence)	2/25/75	~95% serpentine	~95% chrysotile, short fibers	~95% Chrysotile
Pfizer MP 1252	Nekoosa, Port Edwards	2/24/75	N.D.	fiber form laths	N.D. (fiber form laths)
Cyclobrite	GJG Northwest Potlatch	2/24/75	~11% tremolite	~30% tremolite, massive and Fiber	20-30% tremolite
Cyclofil	GJG Northeast Potlatch	2/24/75	~9% tremolite	~10% tremolite	~10% tremolite fiber & massive
Cyclosorb	GJG Northeast Potlatch	2/24/75	~1.5% tremolite	~2% tremolite, traces attapulgite?	~1% tremolite fiber traces of attapulgite
Nytal 200	H. B. Fuller/ Palatine, Illinois	2/24/75	~56% tremolite, serpentine, anthophyllite	40-50% tremolite, massive & fiber form. 5% serpentine-form fiber (anthophyllite).	40-50% fibrous tremolite, serpentine form fiber = tremolite and/or anthophyllite
Nytal 300	FN918 Phelan P faust 1/27/75	2/28/75	~55% tremolite, serpentine, anthophyllite	~30% tremolite massive fiber, serpentine-form fibers (anthophyllite)	Major tremolite fiber, serpentine fiber forms (anthophyllite) possible antigorite plates
Nytal 300	F-65	3/5/75	~55% tremolite, serpentine, anthophyllite	major tremolite massive fibrous minor anthophyllite	*
Nytal 300	Valspar	3/5/75	~51% tremolite, serpentine, anthophyllite	Major tremolite, minor anthophyllite	.

CAMBERT 10

Nytal 300	170-421	3/5/75	54% tremolite + serpentine (anthophyllite)	major tremolite minor anthophyllite	*
Nytal 400	170-420	3/5/75	52% tremolite + serpentine (anthophyllite)	major tremolite minor anthophyllite	*
Asbestine 3"	F-79 Mortell	3/10/75	49% tremolite, ~15% serpentine, (~2% anthophyllite)	~10% free fiber. anthophyllite, mainly massive tremolite	*
Asbestine 325	F-80 Mortel	3/10/75	49% tremolite, ~25% serpentine (antogorite or lizardite) ~1% anthophyllite	massive and fibrous tremolite; anthophyllite; poorly crystalline talc?	
Talc-No. 1 Fiber	F-75 Mortell	3/10/75	37% tremolite + serpentine ~5% anthophyllite	major fibrous tremolite + substantial serpentine form fibers as anthophyllite	*
Hi-fine 80	Sherwin Williams Calumet	4/1/75	14% Tremolite	major fibrous tremolite	

* These samples have not been investigated at this date.

! . None detected

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AIRBORNE ASBESTOS FIBER MONITORING

Seven different industrial plants were visited during the week of March 24, 1975. The purpose of these visits was to obtain airborne dust samples where Vanderbilt or Grantham talcs were being used, and to analyze these samples for asbestos fiber. By illustrating the presence of airborne fibers resulting from the use of Vanderbilt talcs, the viability of Vanderbilts claim is proven. These results are undeniable testimony to refute or substantiate claims of asbestos containing talcs not being hazardous due to their non-asbestiform tremolite content.

Table No. 3 lists the data obtained from the airborne samples. These samples were of a minimal sampling time, and during analyses many of the filters were observed with an extremely low, particle population density. The accurate method (NIOSH) of accessing the airborne asbestos fiber concentration is to gauge the length of sampling time in order to obtain sufficient material on the filter for satisfactory counting, and then take a few samples with varied sampling times. A minimal sampling time would approximate 30 minutes. This was not possible during the trip due to scheduling and a lack of a sufficient number of sampling pumps to take more than one sample simultaneously.

The results listed in table No. 3, (as fibers/cc) are listed for general information only and not considered to represent a time weighed average or a maximum fiber concentration ("C" limit).

The purpose of obtaining these samples was to illustrate the airborne asbestos fiber which results from the use of the competitor talcs. In all cases, the results listed would represent a minimum value at best, due to the short sampling times.

The majority of plants visited were operating with dust control equipment in operation, some more efficient than others. The workers technique had considerable influence upon the dust levels and observations indicated empty bag disposal was the major cause of dust liberation.

The plants in which the dust control was not effective, are illustrated by the fibers/cc result listed in table No. 3 and again it is stressed that these results are minimum values.

During the plant visits, at no time were any bags of competitor talc observed with the "Asbestos-Warning" label.

Phase contrast micrographs, figures No. 64 to No. 66, and SEM micrographs, figures No. 67 to No. 82, illustrate the presence of airborne asbestos fibers resulting from the use of the talcs indicated.

AIRBORNE ASBESTOS FIBER MONITORING

Company Code*	Filter No.	Time @ Vol.	(Phase Contrast)fibers/cc	Talc product	Comments
MT	MP-28	6min@2 l/min	0.52 0.50	Asbestine 3X	General area sample no visible dust.
HBF	MP-29	2min@2 l/min.	1.55	Asbestine 3X	Charging cowles no visible dust
SWC	MP-22	9min@2 l/min.	2.20	Hi-fine 80	Charging cowles #C-15 clean worker

(SEM)fibers/cc

SWC	NP-4	7min@2 l/min.	3.56	Hi-fine 80	Charging mix tank #C-15 no visible dust
HBF	NP-1	5min@2 l/min.	3.95	Asbestine 3X	Charging mix tank general area sample
SWC	NP-3	5min@2 l/min.	2.80	Hi-fine 80	Charging mix tank#C-15 general area sample
PD	NP-5	4min@2 l/min.	13.00	Nyral 200	Charging mix tank and compacting bags
PD	NP-6	17min@2 l/min.	9.60	Nyral 200	Charging mix tank and compacting bags
	NP-7	2min@2 l/min.	168.00	Nyral 300	**Charging #12 pebble mill, no respirator
HN	NP-8	2min@2 l/min.	98.00	Nyral 300	**Charging #12 pebble mill, no respirator
SWG	NP-12	8min@2 l/min.	5.51	Nyral 300	Charging ball mill, empty bag

Results listed as fibers/cc are only those fibers which conform to the recent OSHA criteria; length to width ratio of 5:1 (or more), maximum diameter 3µm, and maximum length of 30µm

*Company names are listed on a master sheet, we were asked that names be kept confidential.

**Poor dust control

05210017

OBSERVATIONS

The main issue, and the reason for this study is the claim by Vanderbilt that their talcs contain non-fibrous tremolite, actinolite, and anthophyllite. Based on this claim, they have requested relief from the OSHA asbestos standard, and issued a letter of certification that their talcs are asbestos free. The scientific evidence incorporated within this report has shown Vanderbilts basis for certification to be completely erroneous in that their products have been shown to contain substantial amounts of asbestos fibers.

Mr. Stenders letter to Mr. H.B. Vanderbilt¹ is contradictory, as he states that; scientific evidence proving that naturally occurring talcs, prior to processing by milling or crushing do not contain fibrous asbestos is the basis for certifying asbestos free talc. He then goes on defining fibrous asbestos as naturally occurring asbestiform minerals which prior to or after crushing and processing, contain fibers made up of fibrils.

The crystal structure of tremolite, actinolite, and anthophyllite are such that natural cleavage planes are in the "C" axis or long dimension. This results in a block form breaking down into smaller particles with an increasing length to width/thickness ratio. Normal bagging or handling procedures are sufficient to cause this fiber formation. For as long as the talc is handled, fibers will continue to be generated, until incorporation into the final end application. Sometimes even handling of the end product will generate airborne fibers.

SUMMARY

The results of X-ray and microscopic analyses of various talc samples have revealed that the Vanderbilt products contain substantial (37 to 56%) amounts of fibrous tremolite, with a few percent of anthophyllite asbestos also present.

Industrial plant atmosphere dust samples, have shown that the use of the Vanderbilt or Grantham talc, results in the liberation of airborne asbestos fibers.

The claim by Vanderbilt that their talcs contain non-fibrous tremolite, actinolite and anthophyllite has been proven totally false, based on the scientific evidence incorporated within this report.

The talc products from California ores, marketed by Cyprus Industrial Minerals and its competitors, have been shown to contain fibrous -tremolite asbestos.

It is recommended that the California talc products be deleted from the certification of compliance letter^s issued by Cyprus Industrial Minerals.

On the following pages are figures No. 1-82 which are optical, scanning and transmission electron micrographs. Selected-area electron diffraction patterns are also illustrated and supplement the morphological analyses with crystal identification.

Figures No. 1-4

These scanning electron micrographs illustrate the presence of fibrous asbestos (tremolite) in Cyprus Industrial Mineral's product from California ores.

5um



C-450 Mistran L# 88 200 40 5 SEM mag x 2900 4:25:05

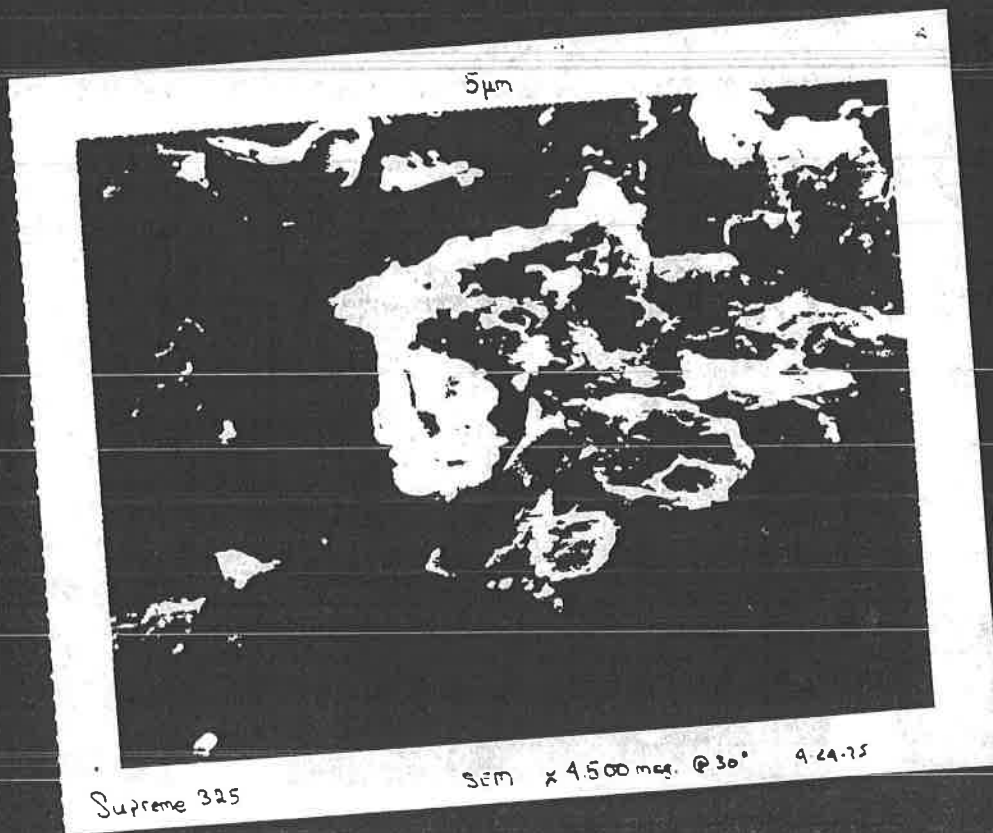
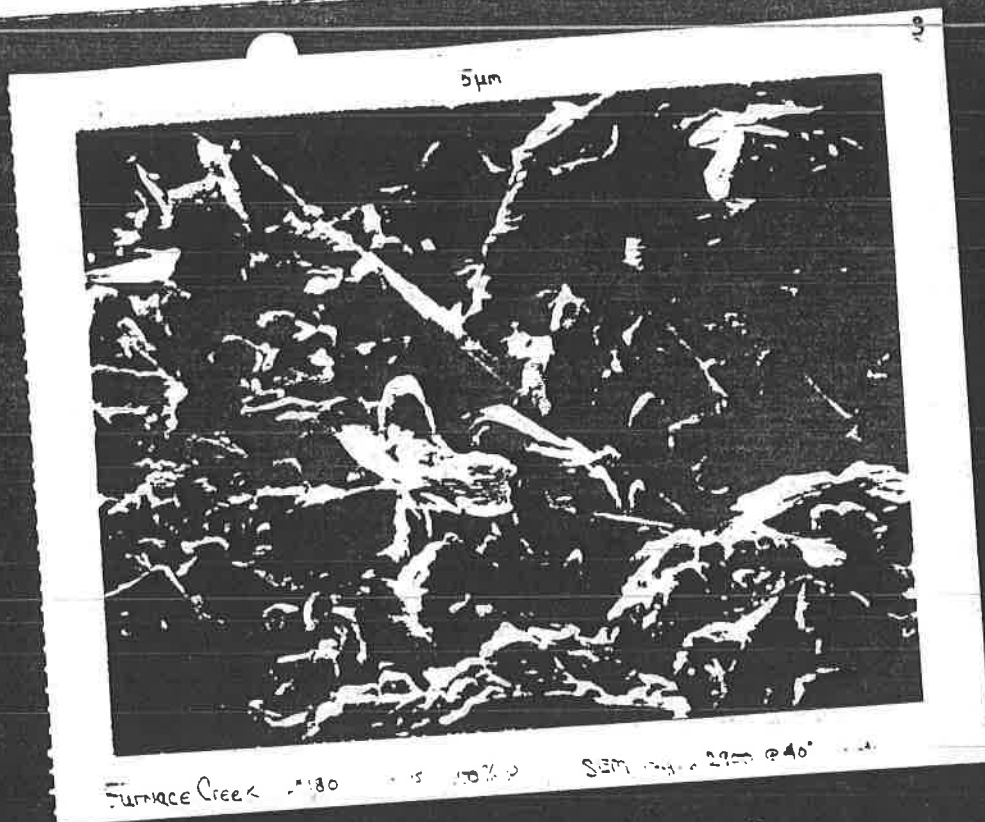
5um



Mistran T076, L# 87 140-70 491112 SEM mag x 2900 4:40 4:25:05

05210022

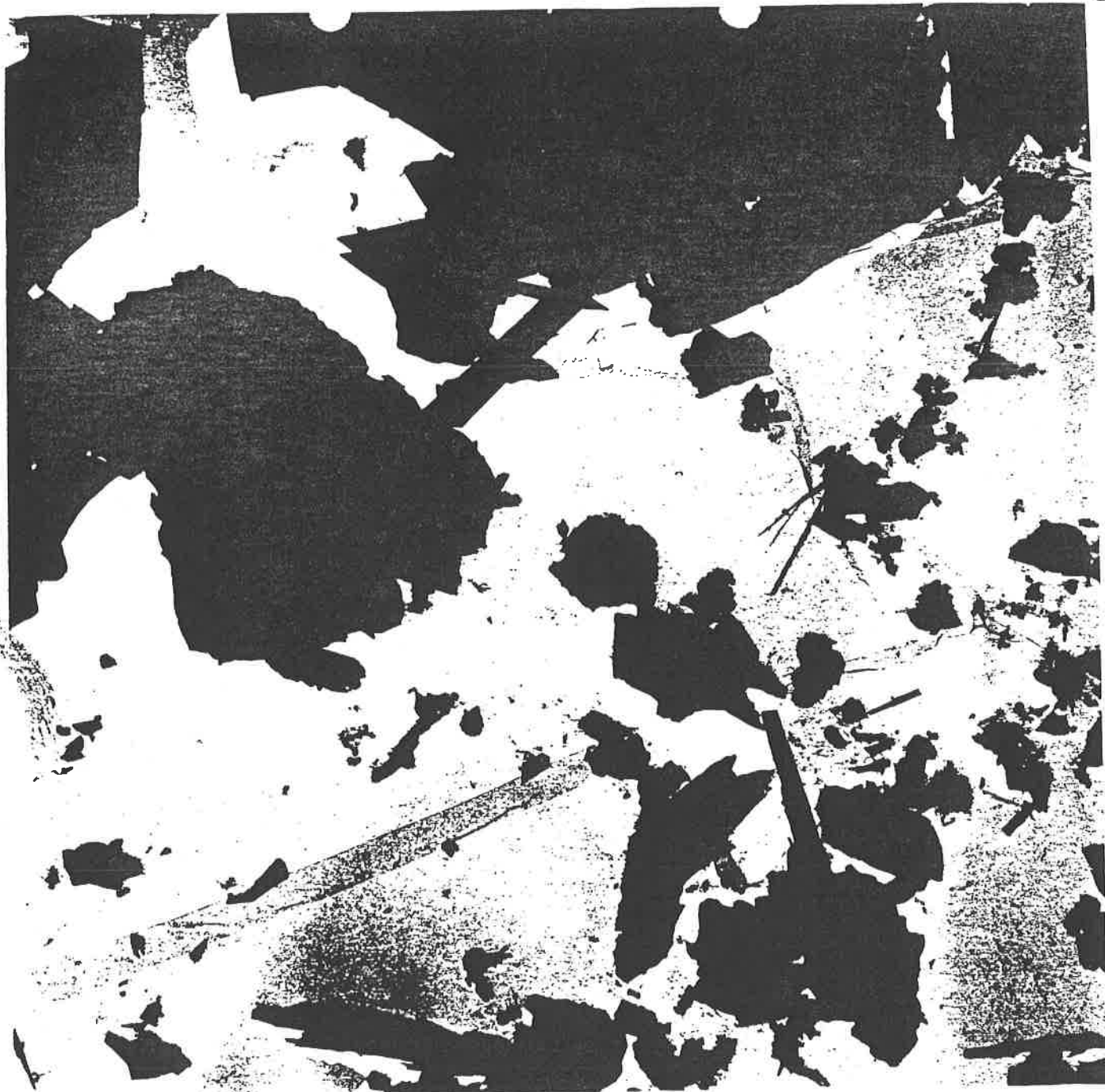
page 15



Figures No. 5-9

The following illustrations are transmission electron micrographs (TEM).

CAMPBELL TOLSON STATIONERS 879-4101 - 4/9 4321 ()
CAMPBELL TOLSON STATIONERS 879-4161 - 4/9 4321 ()



5μm

C-400 Lot#182

Cyprus Mines Research Lab

EM: #012775-2

Proj:

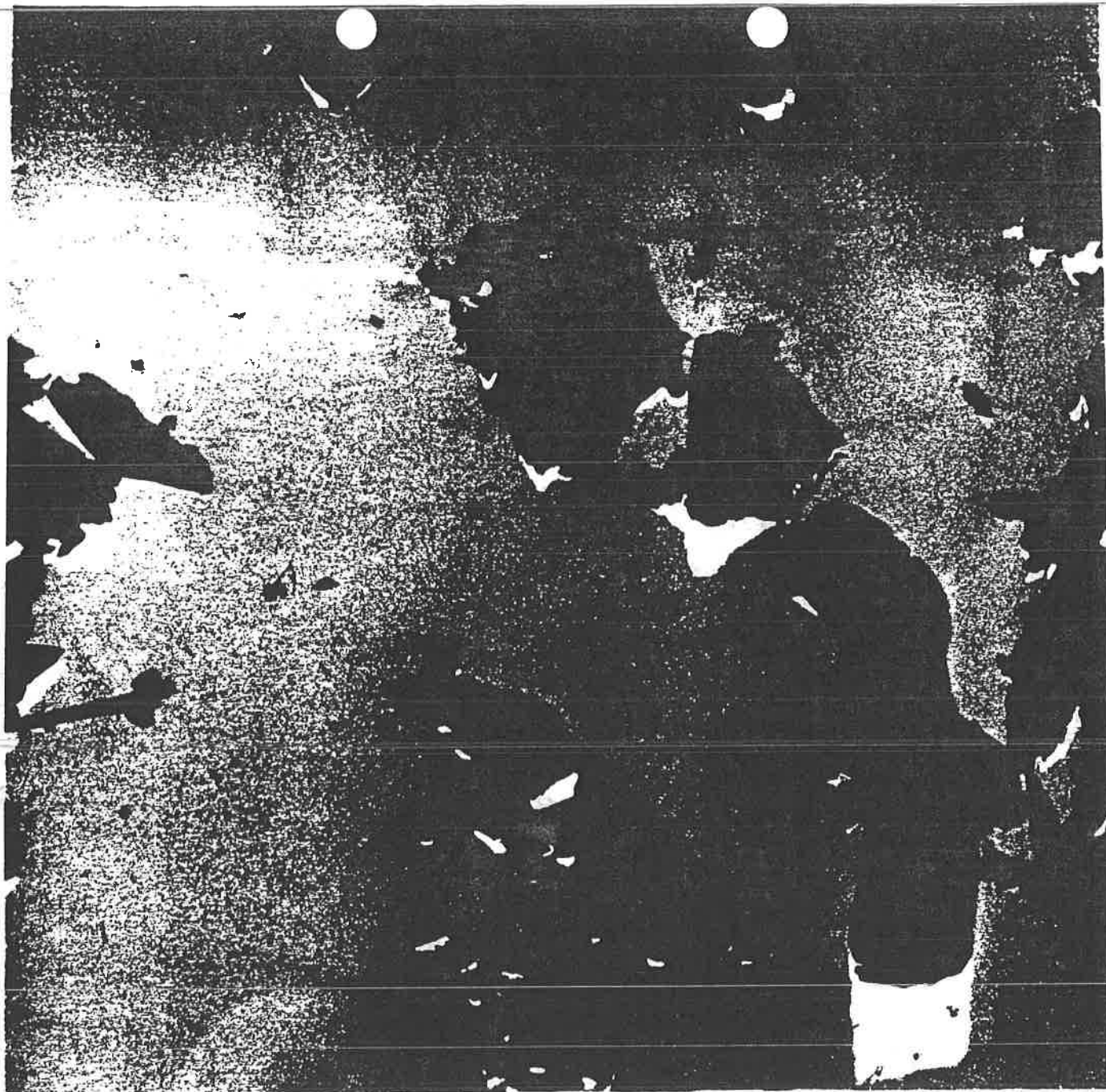
Mag: X6, 000

Date: 3/7/75

Prep: Aqueous disp. Al@34°C

05210025

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5 μ m

Mistron T076

Lot#687

Cyprus Mines Research Lab

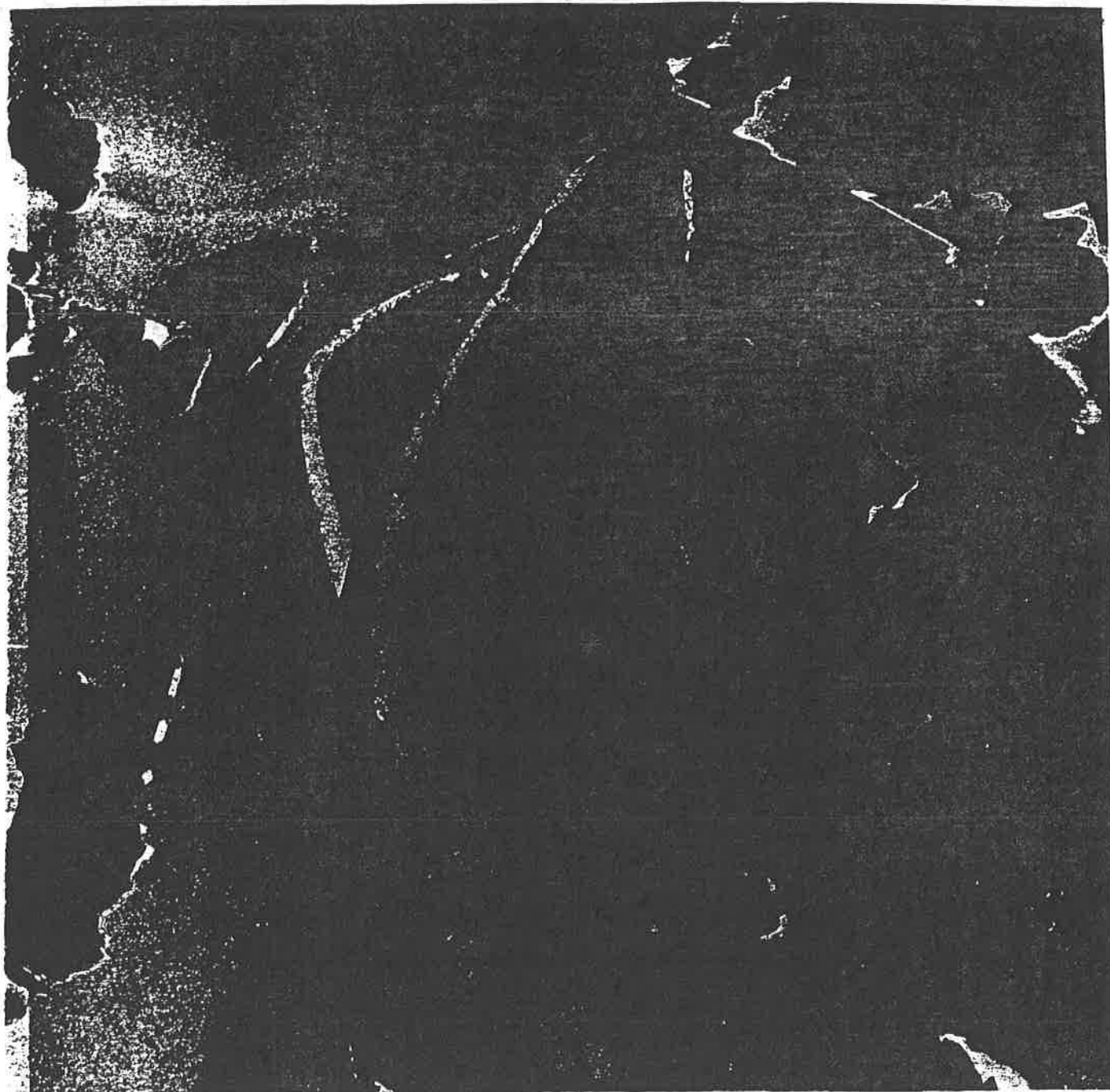
EM #012775-1

Proj:

Mag: X6, 000

Date: 1/30/75

Prep: Aqueous Disp. Al@30 +C



1μm

Furnace Creek (100%P)
Lot#180

Cyprus Mines Research Lab

EM: 012575-11

Proj: Verbal

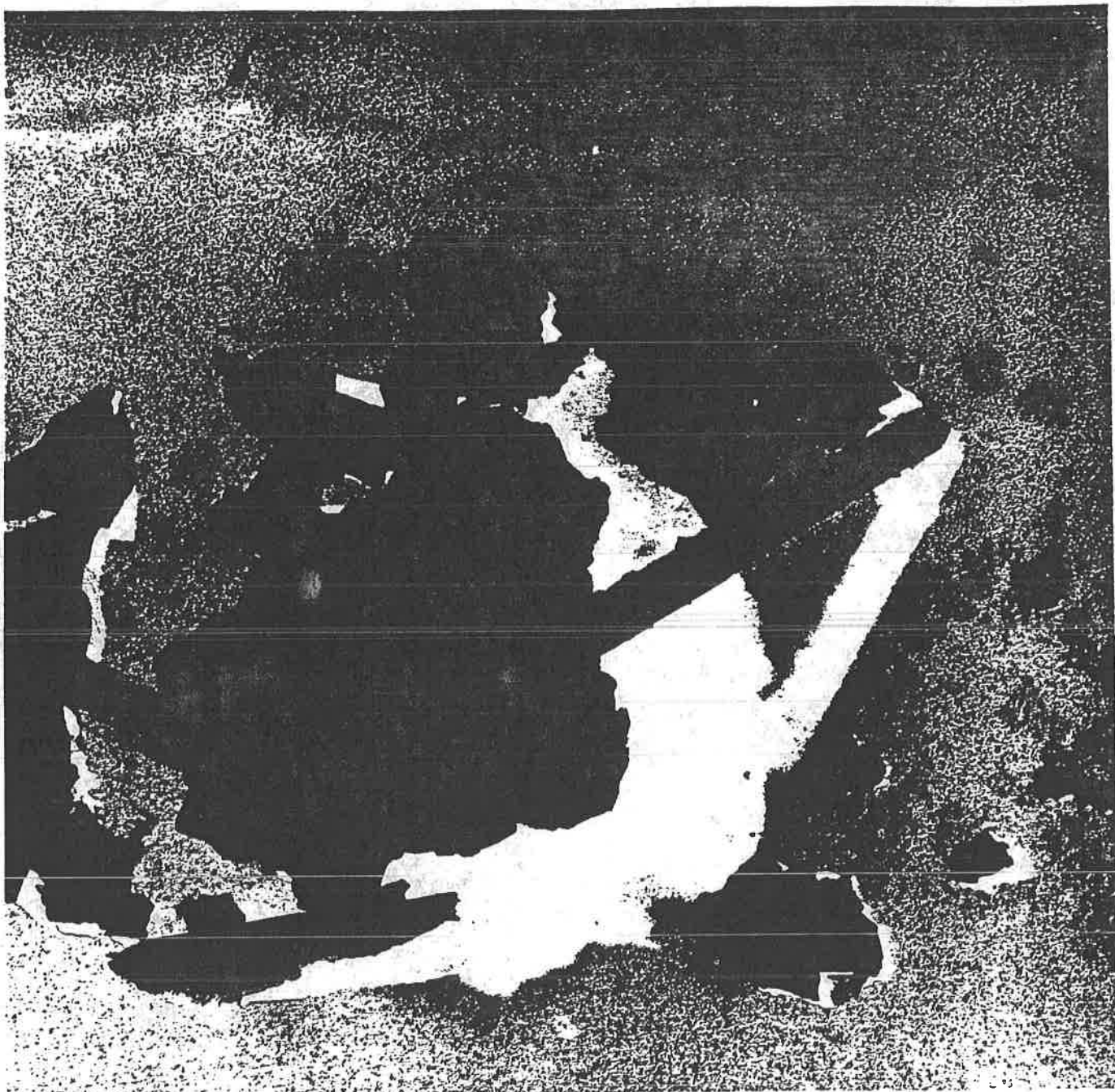
Mag: X18, 000

Date: 1/30/75

Prep: Aqueous disp. Al@30°C

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05210027



1 μ m

Supreme 325
Lot#465K

Cyprus Mines Research Lab

05210028

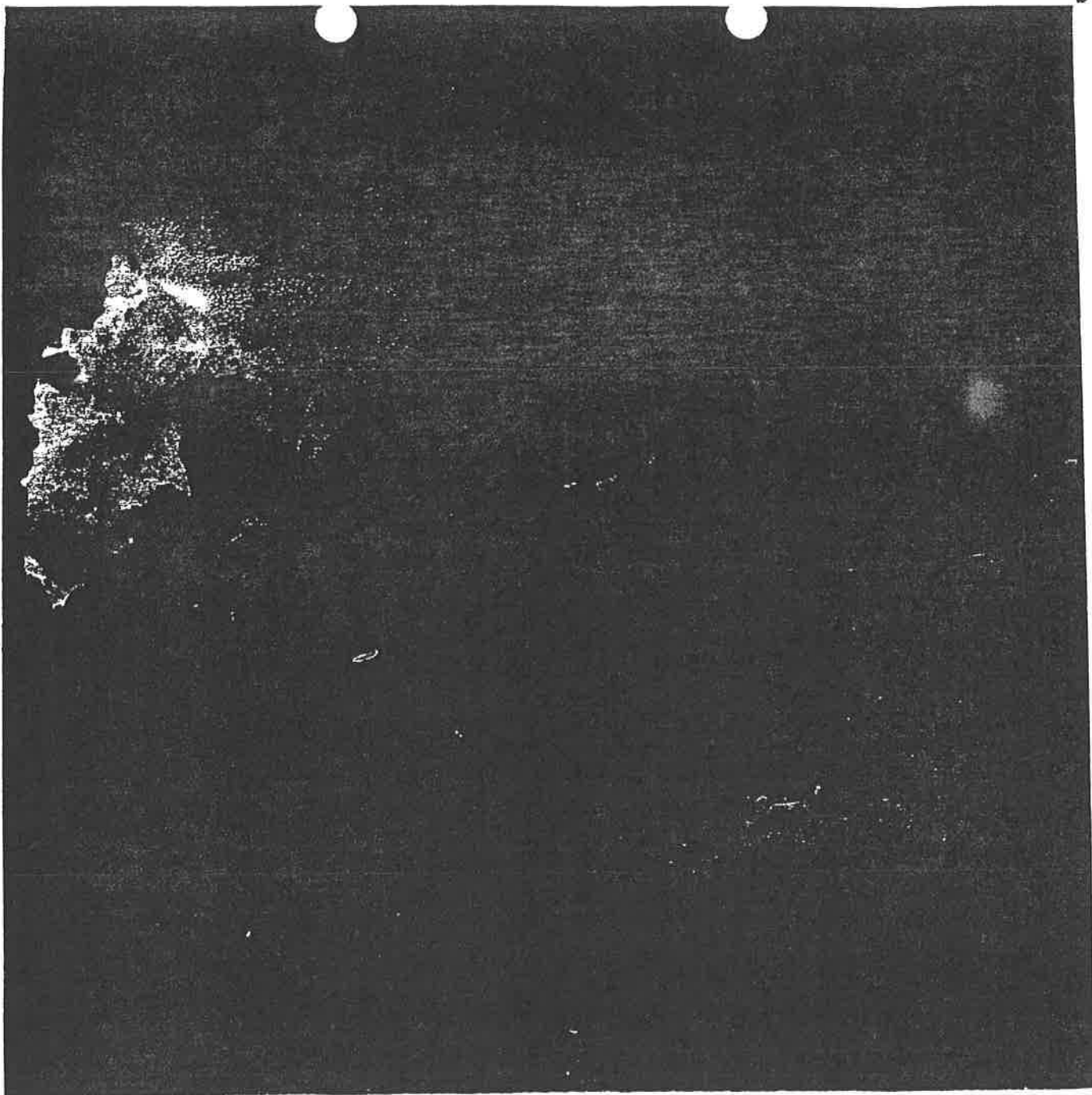
EM: 012575-14

Proj: Verbal

Mag: X18, 000

Date: 1/30/75

Prep: Aqueous Disp. Al@34°C.



lum

White Eagle Screenings
Cyprus Mines Research Lab

EM #020575-4

Proj:

Mag: X34, 000

Date: 1/5/75

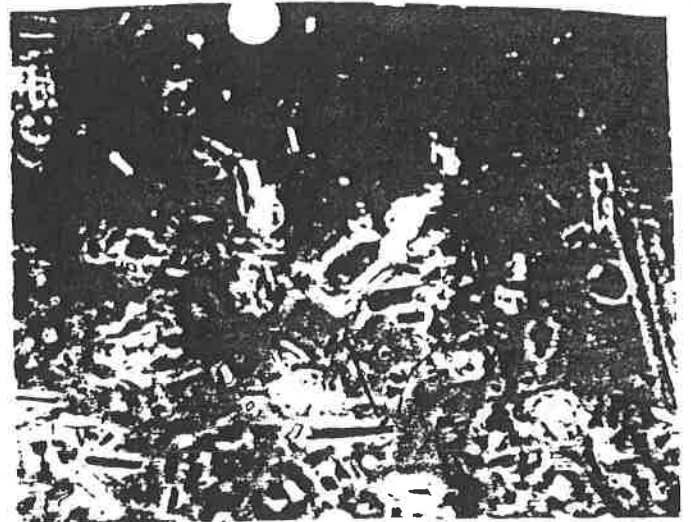
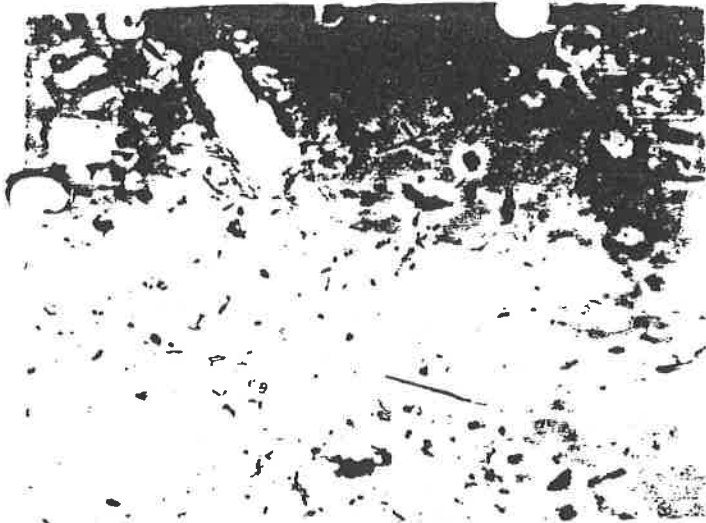
Prep: Aqueous Dispersion

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Figures No. 10-14

These micrographs were taken using phase contrast, optical microscopy, and are included to illustrate the fact that fibrous asbestos is readily apparent in the Vanderbilt products using optical microscopy.



NYTAL 300 70-411

P.C. x 520

3-20-75

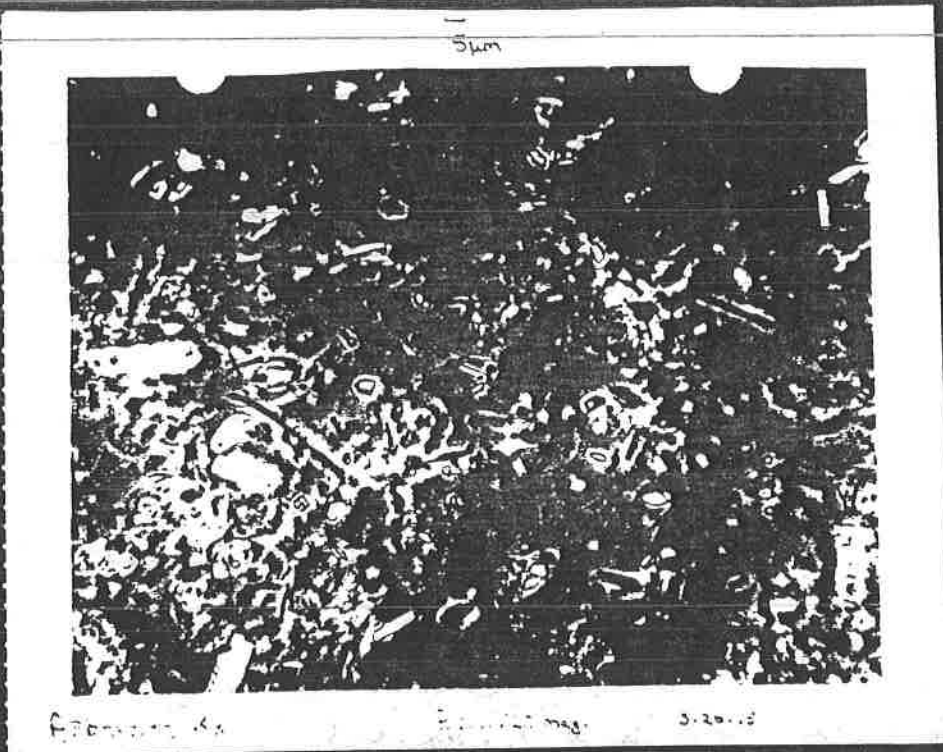


Talc. 00.1 Fiber (F15) P.C. x 200

3-20-75

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CAMPBELL TOLSTAD STATIONERS 879 4161 - 479 4321
479 4321

Figures No. 15-44

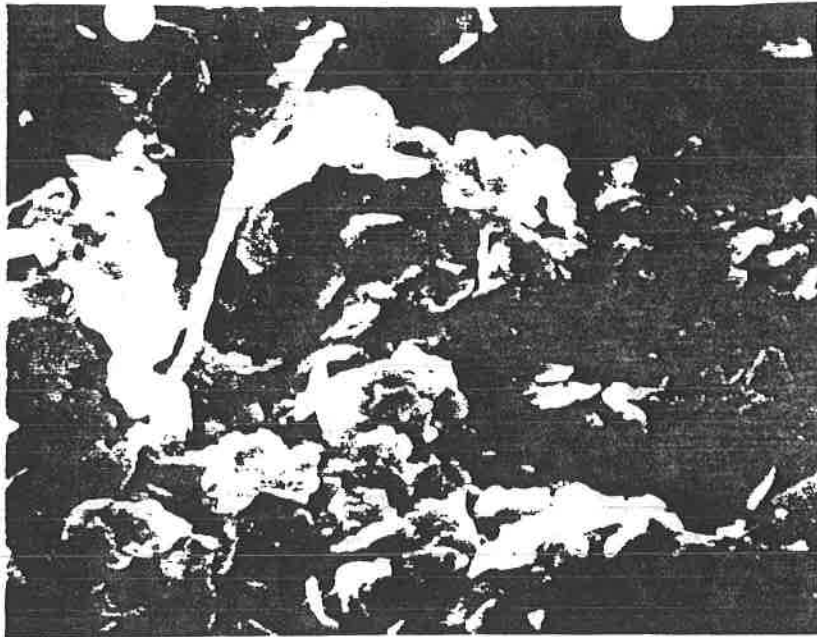
The following micrographs were prepared using scanning electron microscopy and are included to illustrate, in greater detail, the presence of fibrous asbestos. In that this form of microscopy renders also the particle topography visible, the defibrillation of non-asbestiform tremolite and anthophyllite is illustrated.



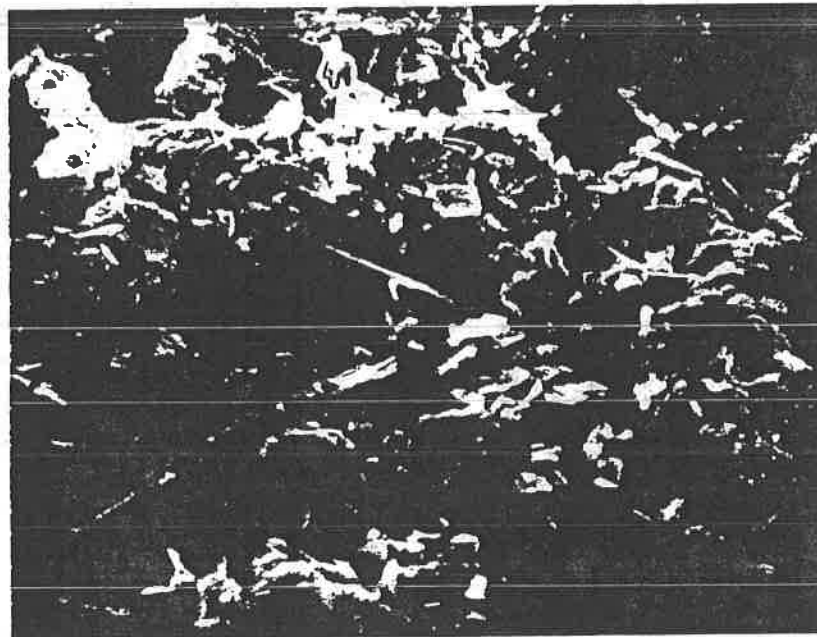
PFIZER MP 1252 Lot# 840 SEM x 2900 mag @ 40° 2-25-75

05210034

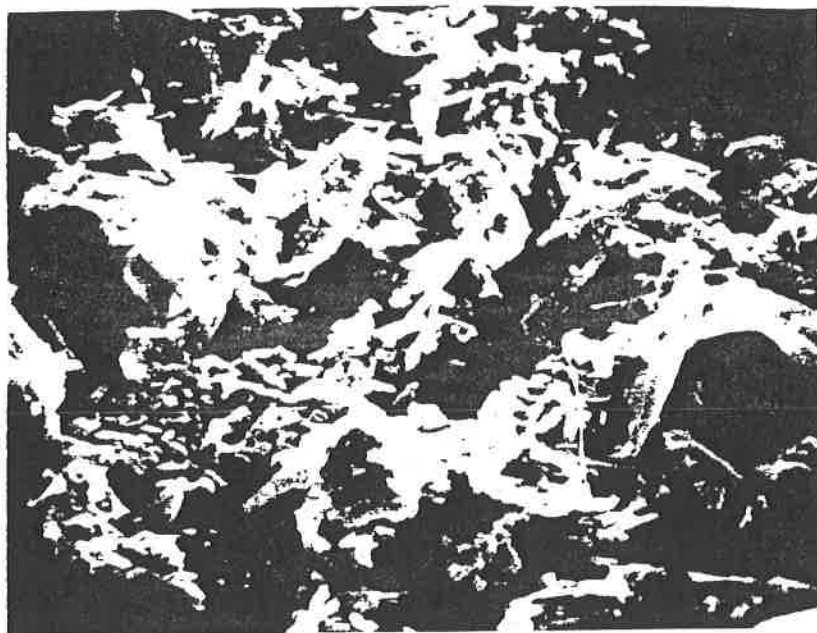
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SEM #890 SEI mag x 4800 @ 40° 2.10.75



CYCLOBRIT- SEM x 2900 mag. @ 40° 2.16.75



CycloFIL

SEM x 2900 mag. @ 40°

2-25-75

5µm



CYCLOFIL

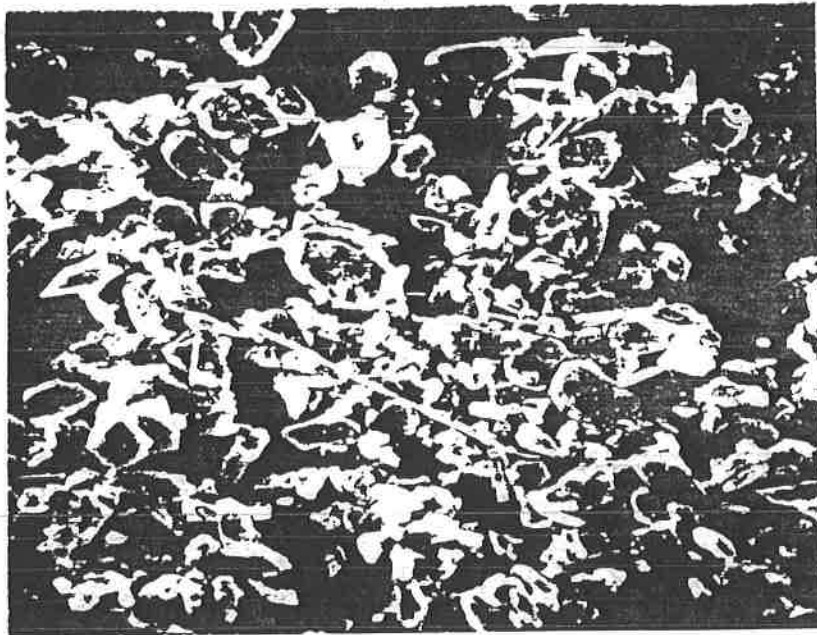
SEM x 6800 mag. @ 40°

2-25-75

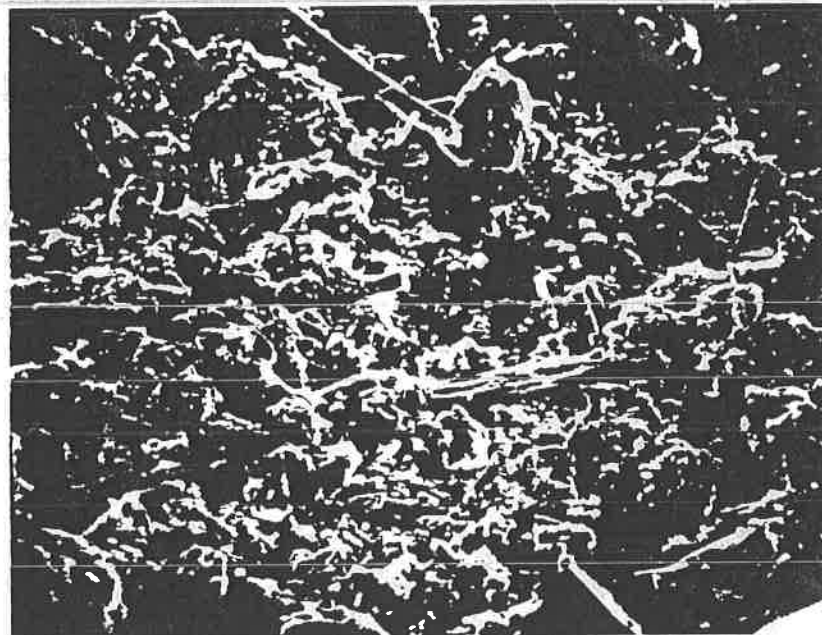
05210036

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5 μ m



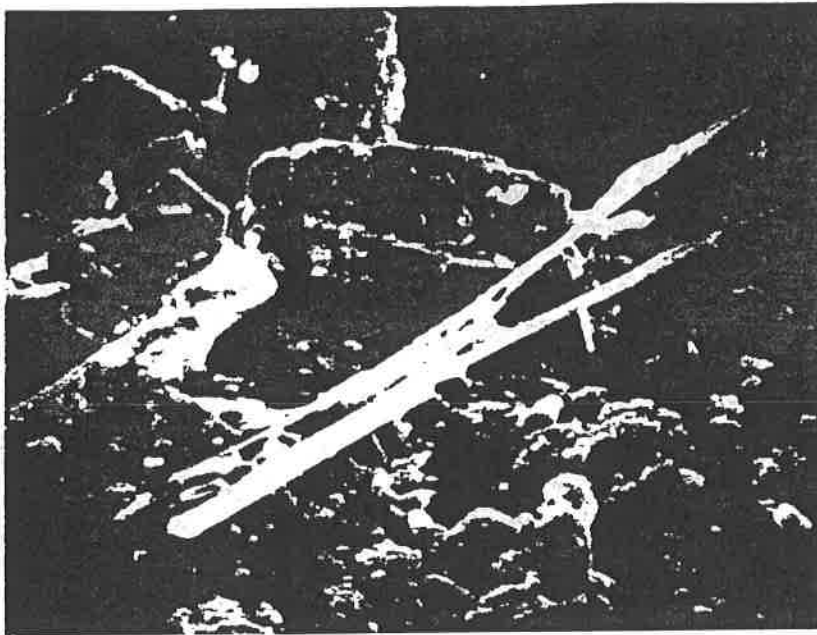
5 μ m



NYTAL 200 (N.B. Fuller) SEM x 680 mag. @ 40°

2-27-75

5µm



NY 742-200 (H.C. Fuchs)

BGM x 1000 @ 46° 2-25-75

5µm



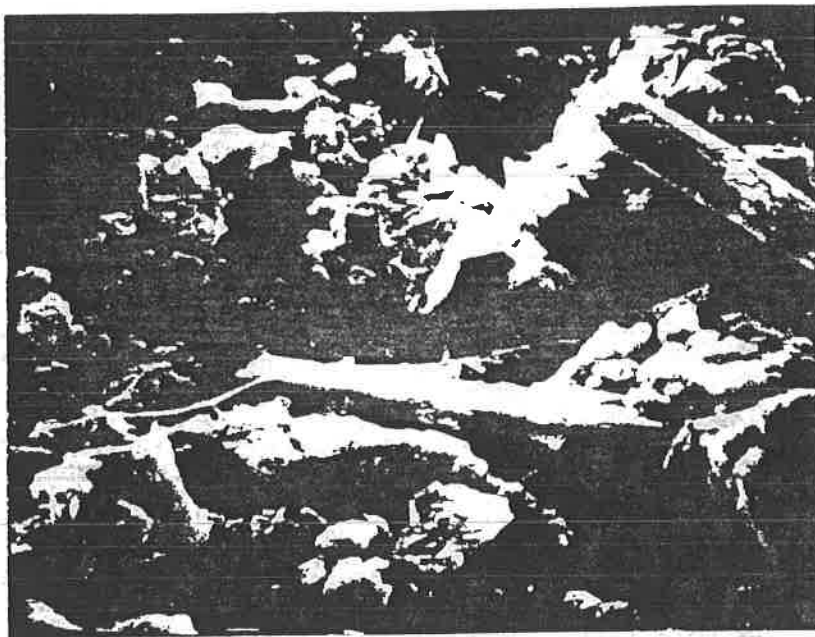
NY 742-200 (H.C. Fuchs)

BGM x 1000 @ 46° 2-25-75

05210038

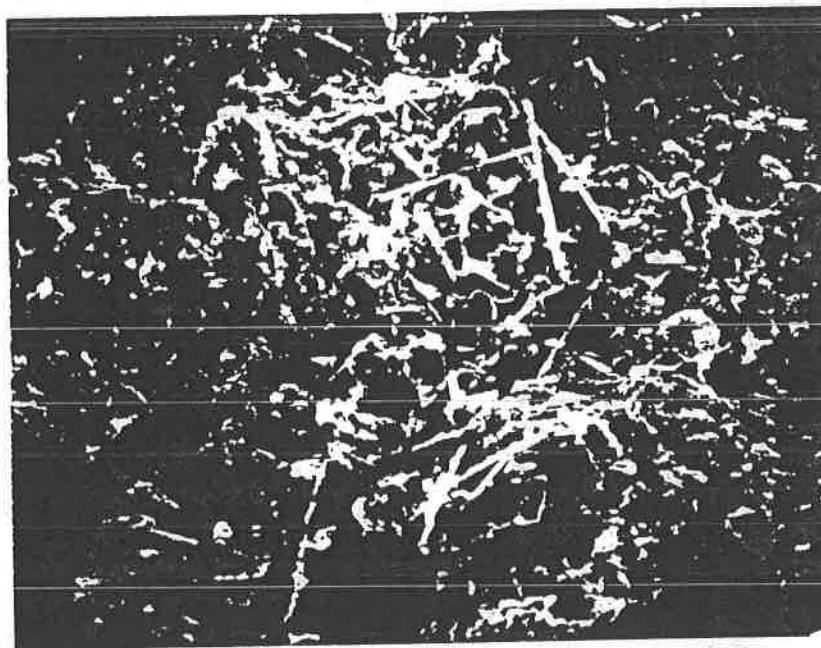
page 33

5µm

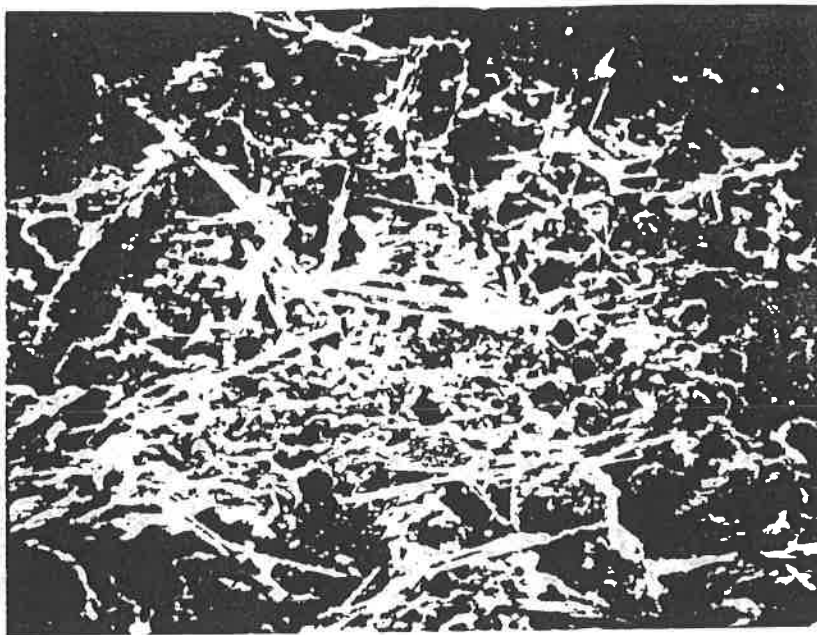


NYTAL 200 (H.B. Fuller) SEM x 4800 mag. @ 40° 2-27-75

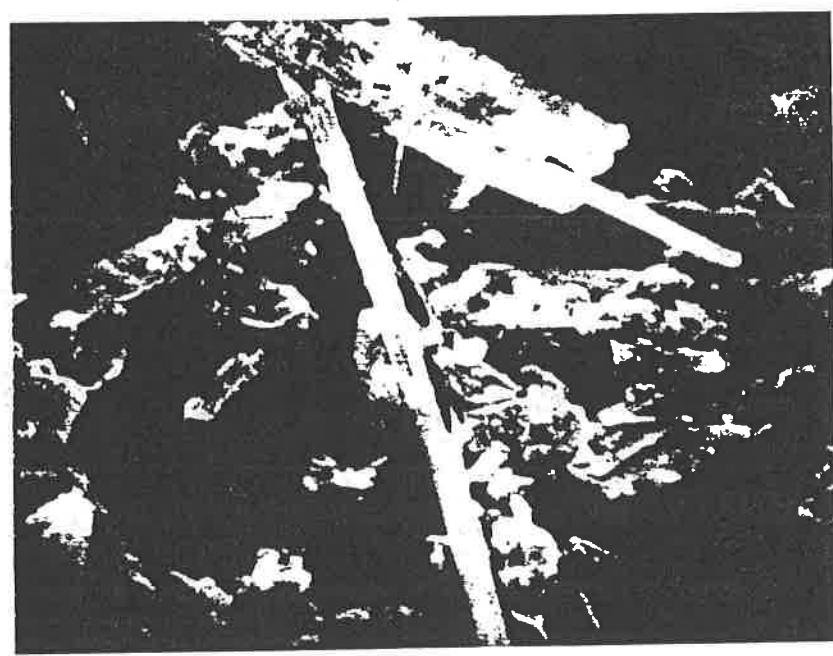
5µm



NYTAL 300 170-421 Reliance Univ. Louis. SEM x 1500 @ 32° 1-6-75



NYTAL 300 F-65 SEM x 950 mag. @ 40° 2-6-75

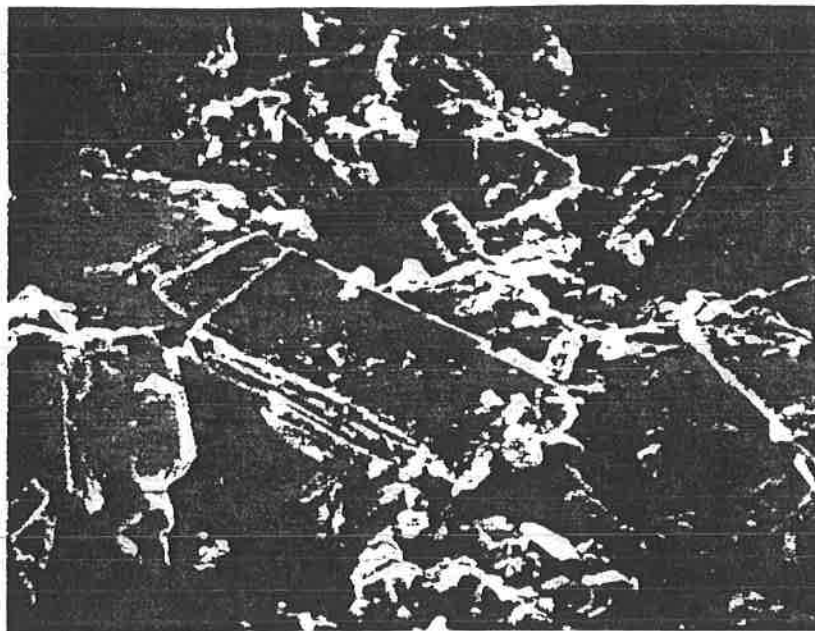


5µm
NYTAL 300 SEM x 4800 mag. @ 40° 3-5-75

05210040

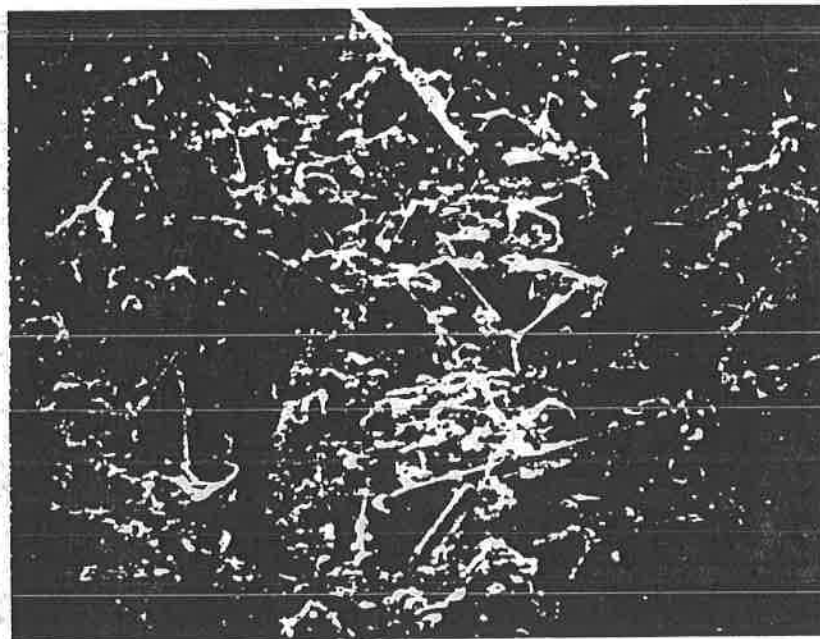
page 35

5 μ m



NYTAL 300 SEM $\times 1900 @ 48^\circ$ 3-7-75

5 μ m



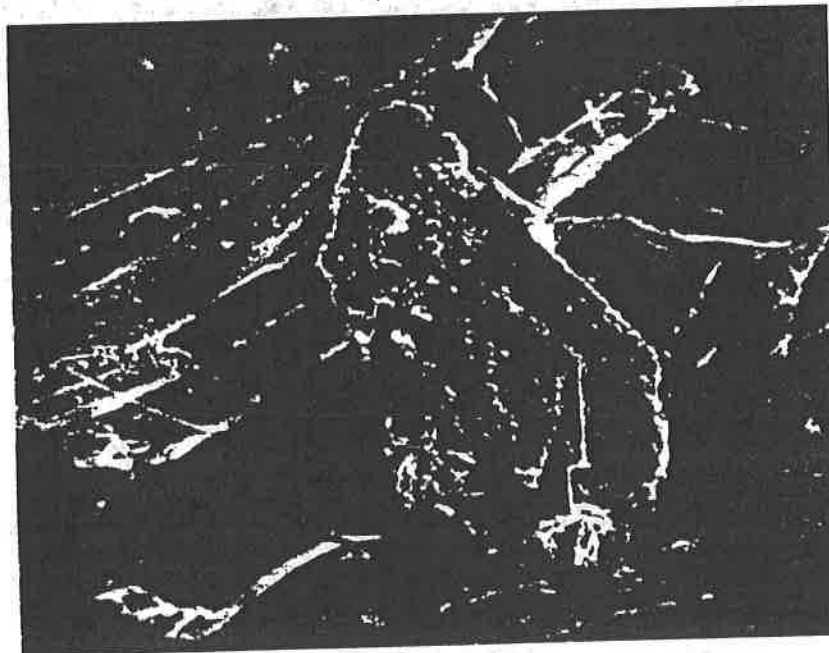
NYTAL 300 SEM $\times 680 \text{ mag.} @ 40^\circ$ 3-7-75

5 μ m



NYTAL 300 SEM $\times 4800 @ 40^\circ$ 8-7-75

5 μ m

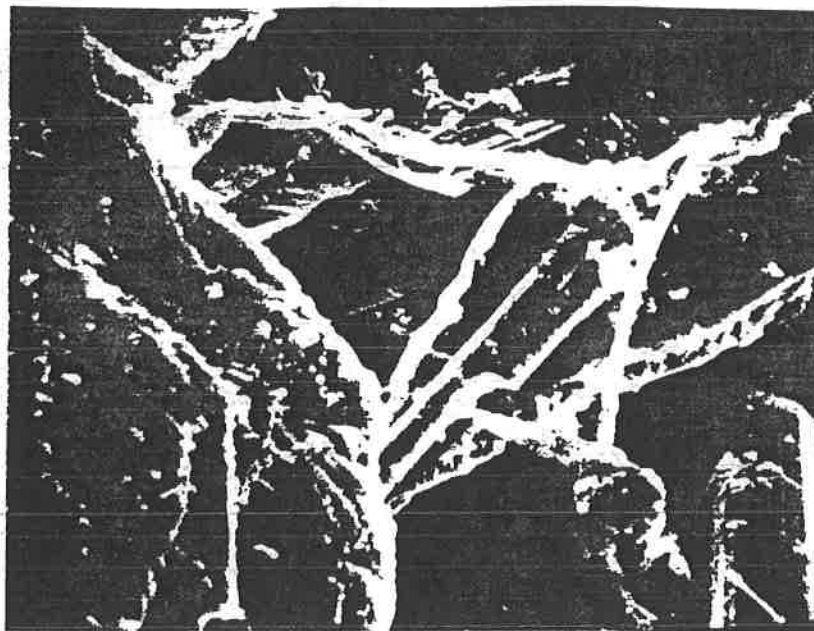


NYTAL 300, "F.65

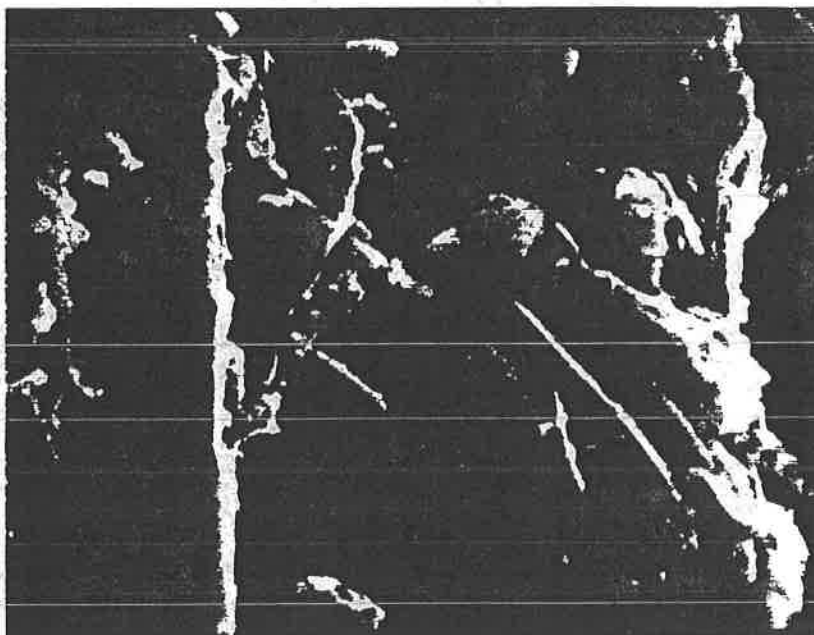
SEM mag $\times 950 @ 55^\circ$ 3-11-75

05210042

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NYTAL 300 F.65, Torpedo (sclerite) SEM x 1900 @ 60° 3-14-75



NYTAL 300, F.65 Tele, Torpedo (sclerite) SEM mag. x 6800 @ 60° 3-14-75



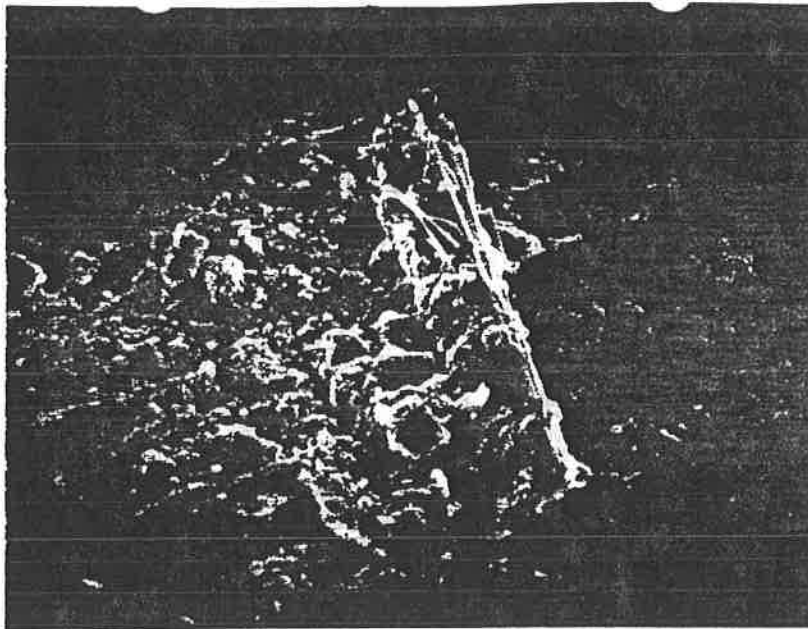
NYTAL 400 170-420 SEM x2900mag. @ 40° 3-6-75



NYTAL 400 (170420) SEM x2900mag. @ 40° 3-7-75

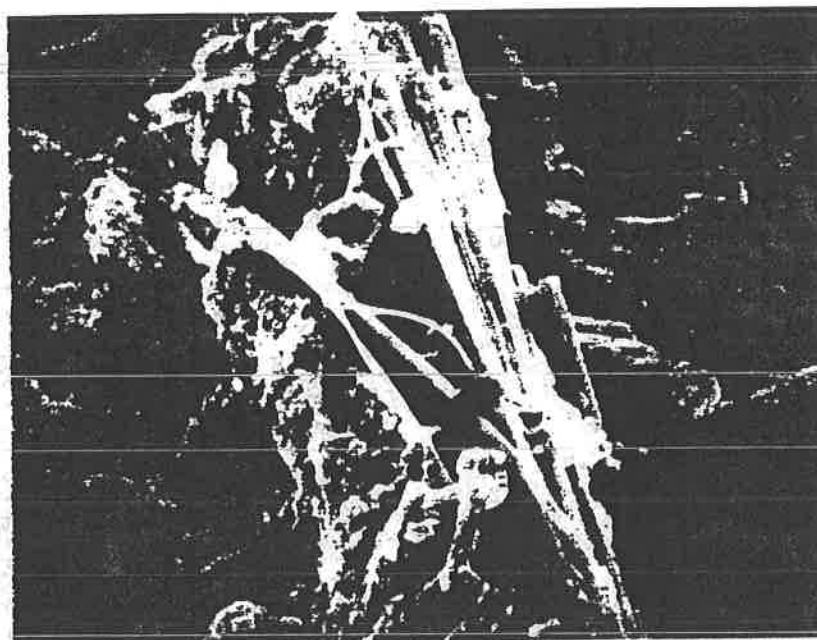
05210044

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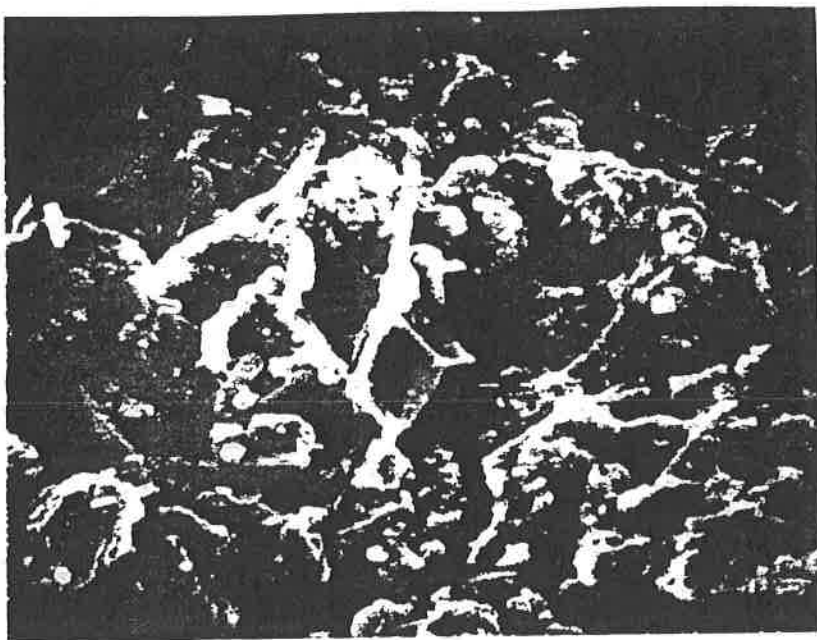


Asbestos 3x (F-79) SEM x 950 mag. @ 40° 3-11-75

5 μ m

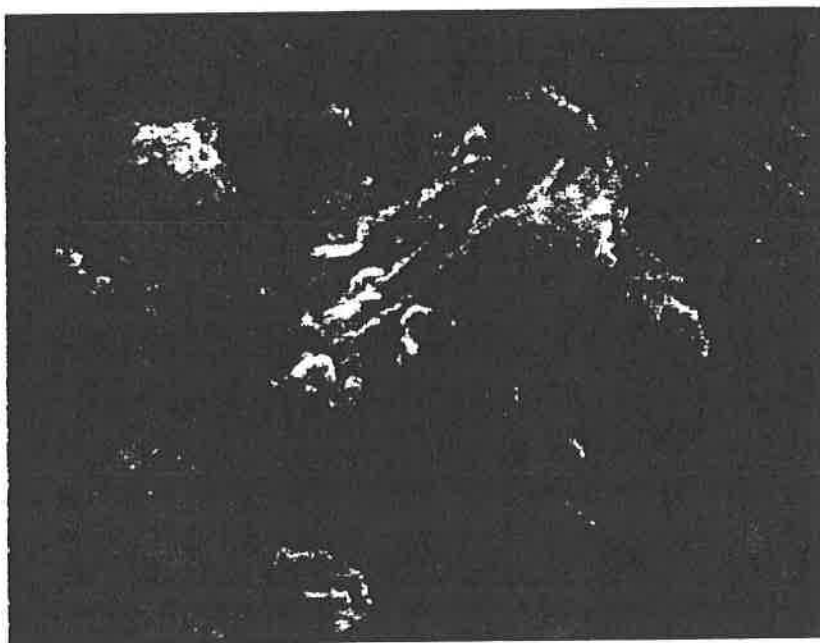


Asbestos 3x (F-79) SEM x 2900 mag. @ 40° 3-11-75

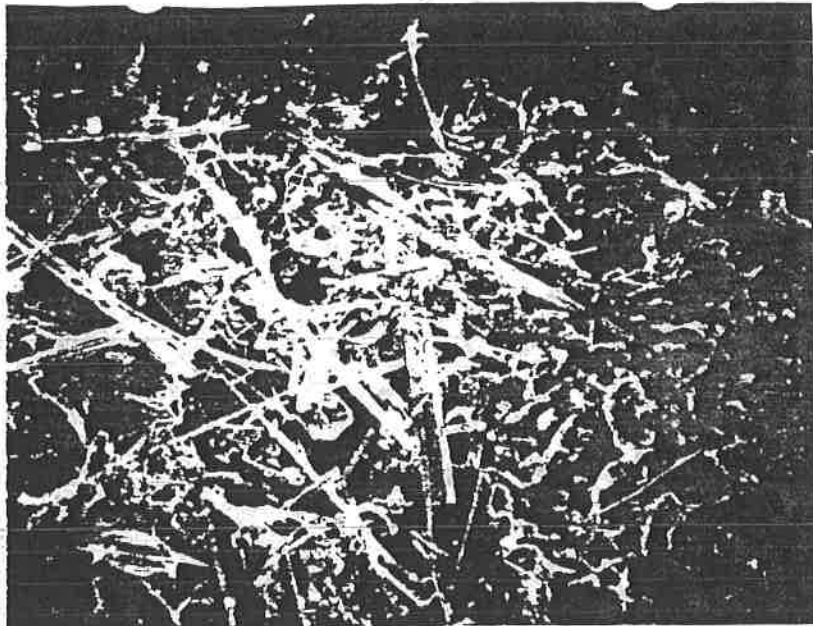


Asbestine 325 (F-80) SEM x 2900 mag. @ 40° 3-11-75

5μm

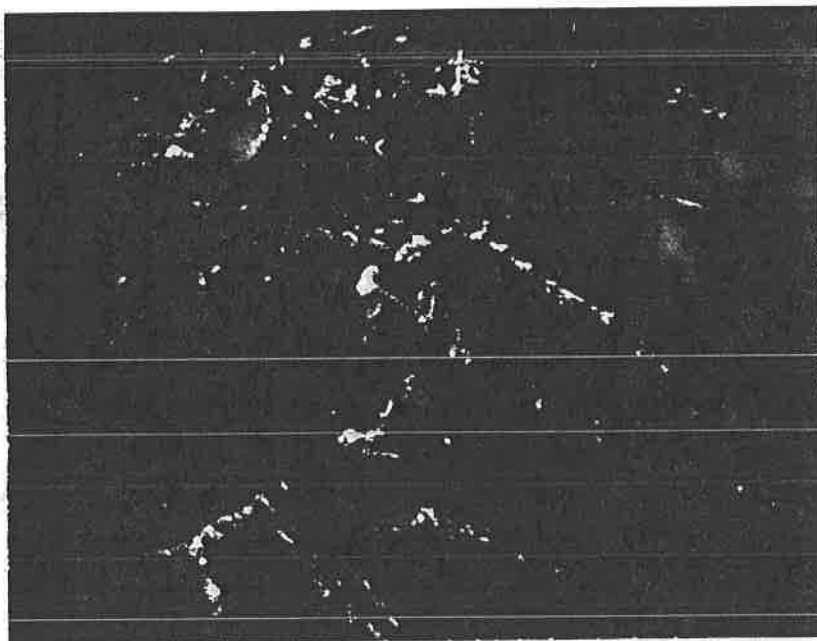


Asbestine 325 (F-80) SEM x 6800 mag. @ 40° 3-11-75

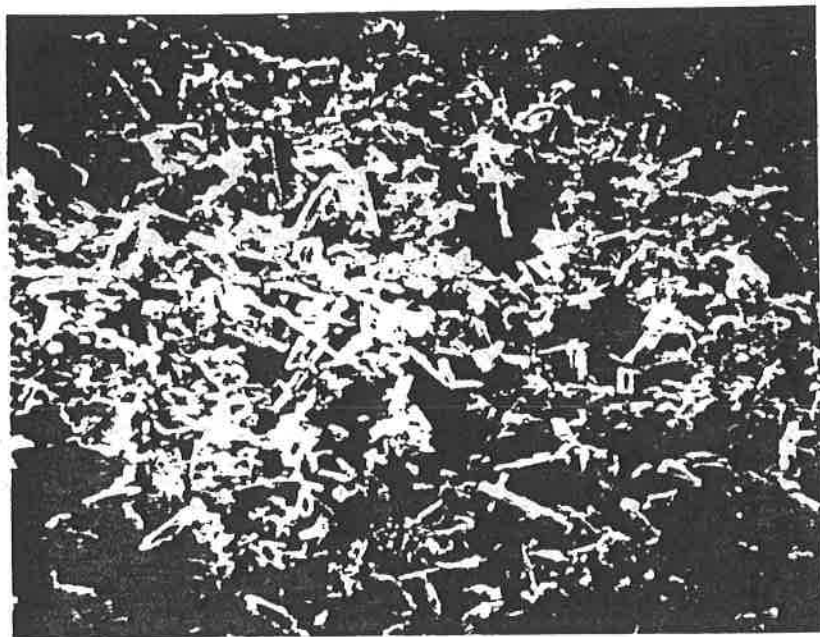


Talc No. 1 Fiber (F-75) SEM x 680 mag @ 30° 3-11-75

5µm



Talc No. 1 Fiber (F-75) SEM x 1900 mag @ 40° 3-11-75



Hi Fine-8-

5 μ m



Hi Fine 8C

SEM x2800 mag. @ 30°

4-1-75

05210048

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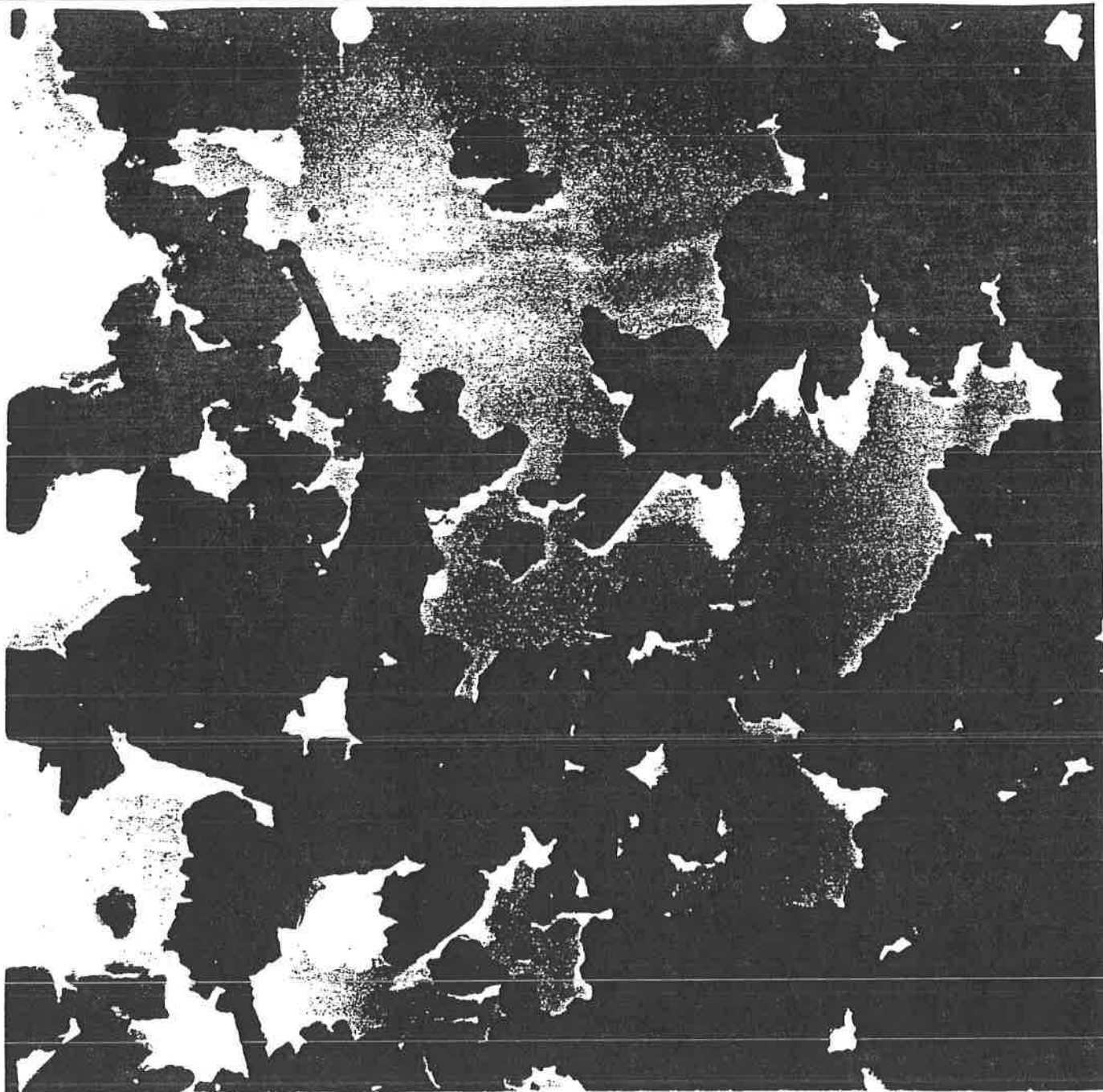
CAMPBELL-TOLSTAD STATIONERS 879 4101 -- 879 4321 TT 3 CAMPBELL-TOLSTAD STATIONERS 879 4107 -- 879 4321 CT 3

Figures No. 45-63

The following micrographs were taken with TEM, and also serve to illustrate the presence of asbestos fiber in competitor talcs.

05210049

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1.7

Pfizer
Sample CP1040

Cyprus Mines Research Lab

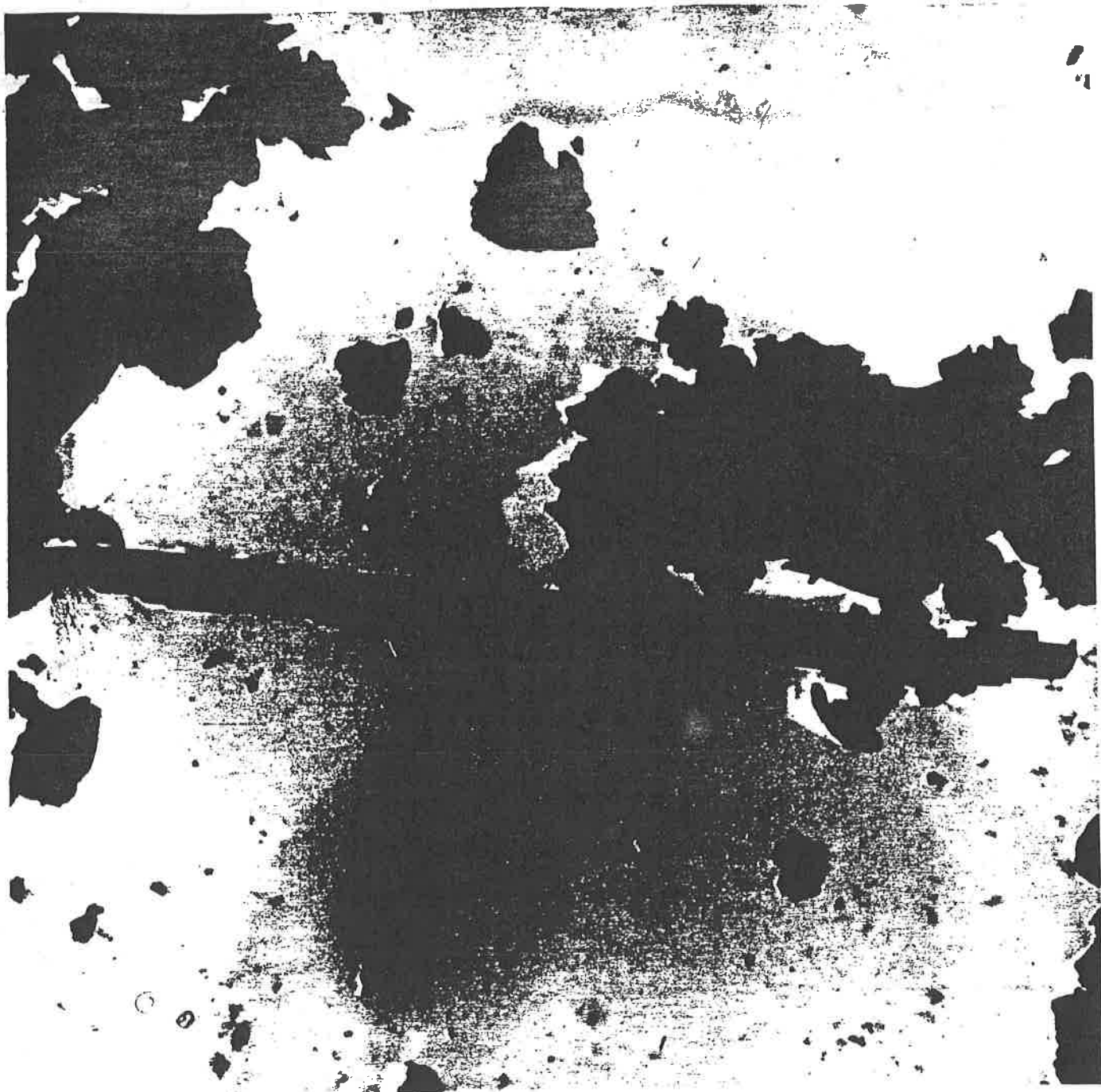
EM: #022775-6

Proj:

Mag: X18, 000

Date: 3/7/75

Prep: Aqueous disp. A1@34°C



1.1m

Pfizer MP 1252

Lot#840

Cyprus Mines Research Laboratory

E#030175-1

Date:3/7/75

Prep: Aqueous Disp.

Unidentified Fiber

Mag: x 8900

05210051

page 47



5um

Cyclobrite

Cyprus Mines Research Lab

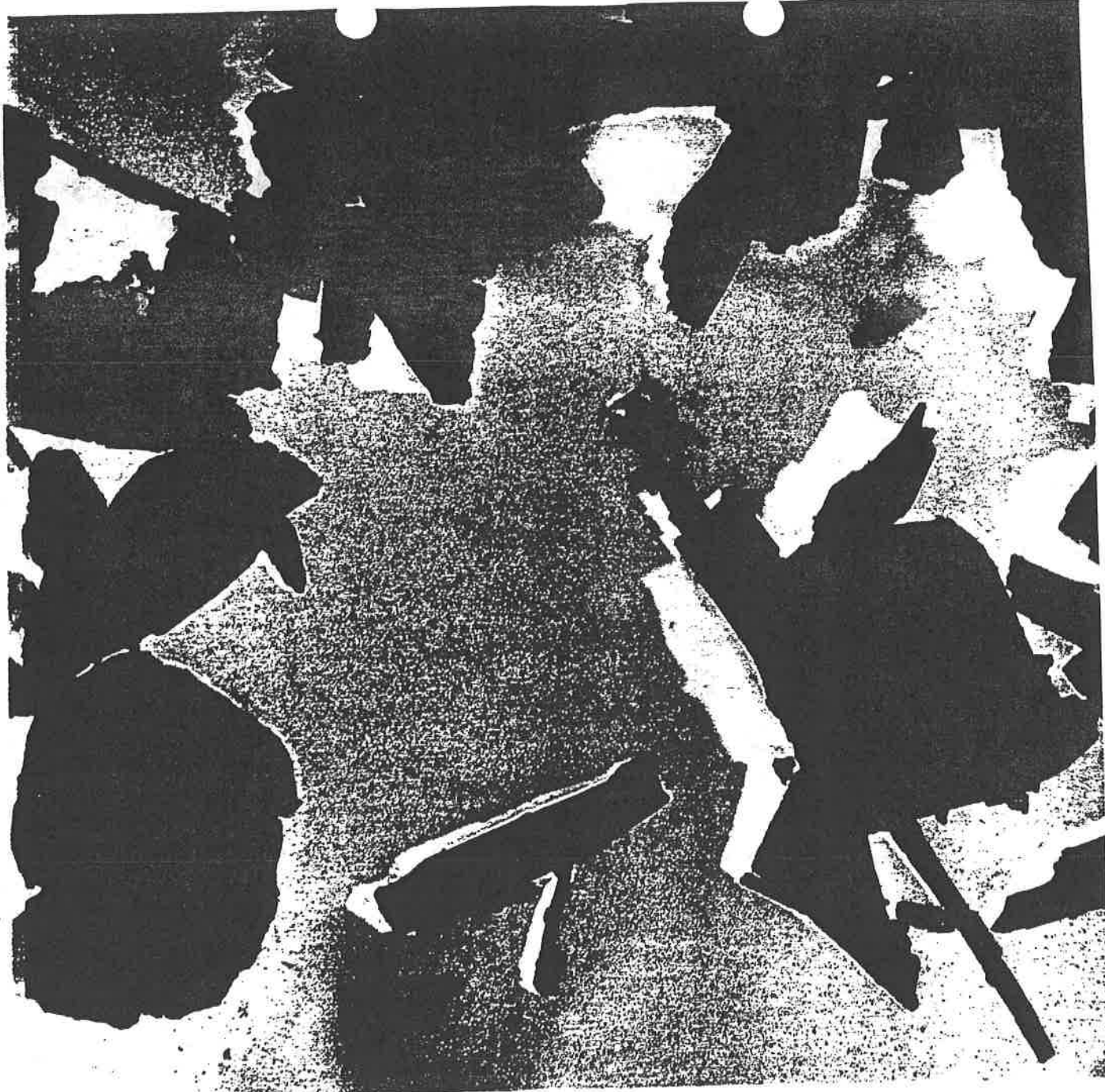
EM: #022575-17

Proj:

Mag: X6, 000

Date: 3/7/75

Prep: Aqueous disp. Al@34°C



1cm

Cyclofil

Cyprus Mines Research Lab

EM: #022675-3

Proj:

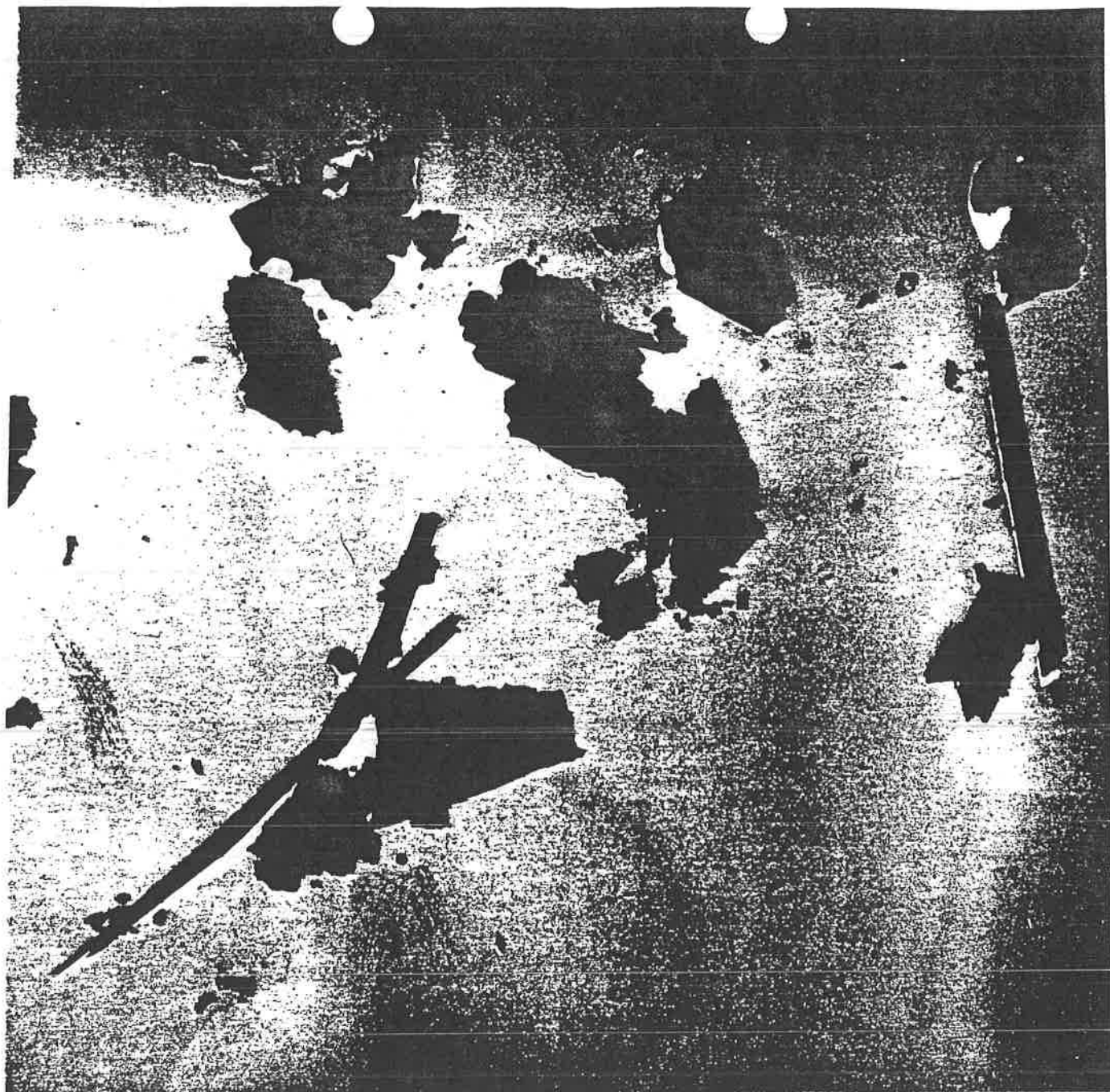
Mag: X18, 000

Date: 3/7/75

Prep: Aqueous disp. Al@34°C

05210053

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5-11

Cyclosorb

Cyprus Mines Research Lab

EM: #022775-9

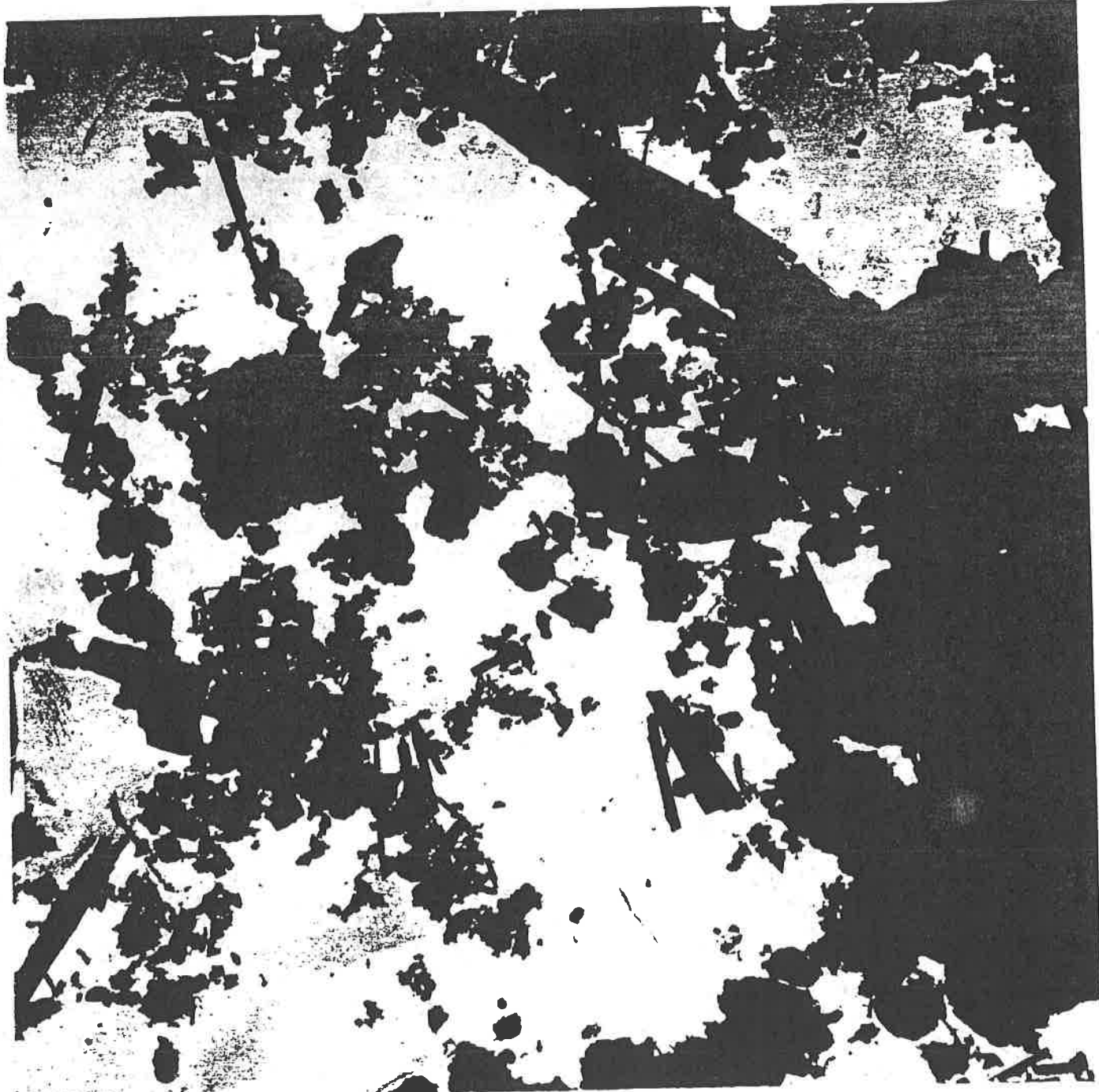
Proj:

Mag: X6, 000

Date: 3/7/75

Prep: Aqueous disp. Al@34°C

05210054



5um

Nytal 200

Cyprus Mines Research Lab

EM: #030475-13

Proj:

Mag: X6, 000

Date: 3/7/75

Prep: Aqueous disp. Al@34°C

05210055

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0.11m

Nyral 200

Cyprus Mines Research Lab

EM: 030475-11

Proj:

Mag: X104, 500

Date: 3/7/75

Prep: Aqueous disp. Al@34°C

05210056

These micrographs illustrate the end of a fiber, and the corresponding electron diffraction pattern which identifies the fiber as tremolite.

020
8.93d

Nyral 200

Cyprus Mines Research Lab

EM: #030475-10

Proj:

Mag:

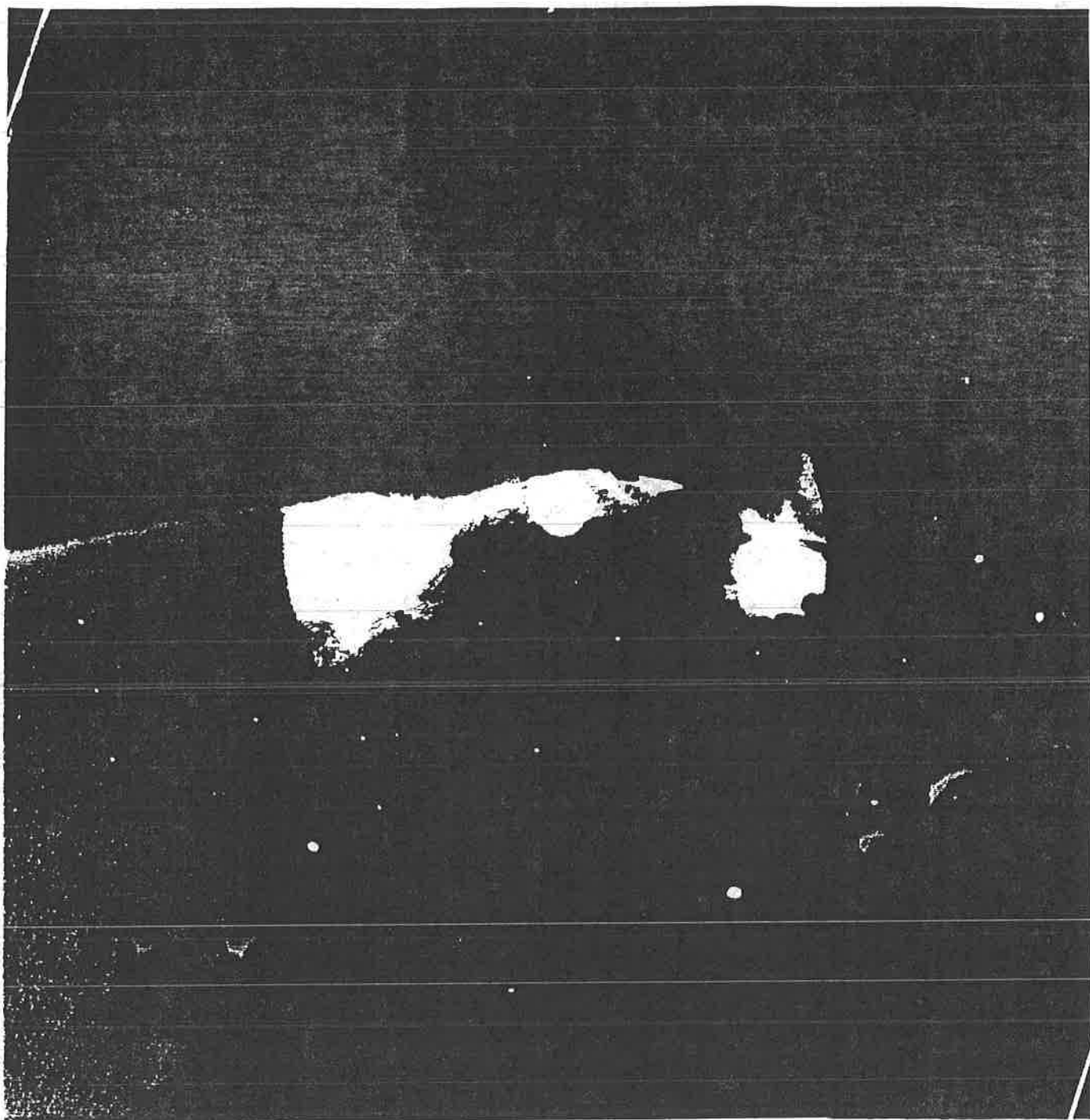
Date: 3/7/75

Prep: HMDP of #11

05210057

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CAMC-Abbott-000305



0.5um

Nyral 200

Cyprus Mines Research Lab

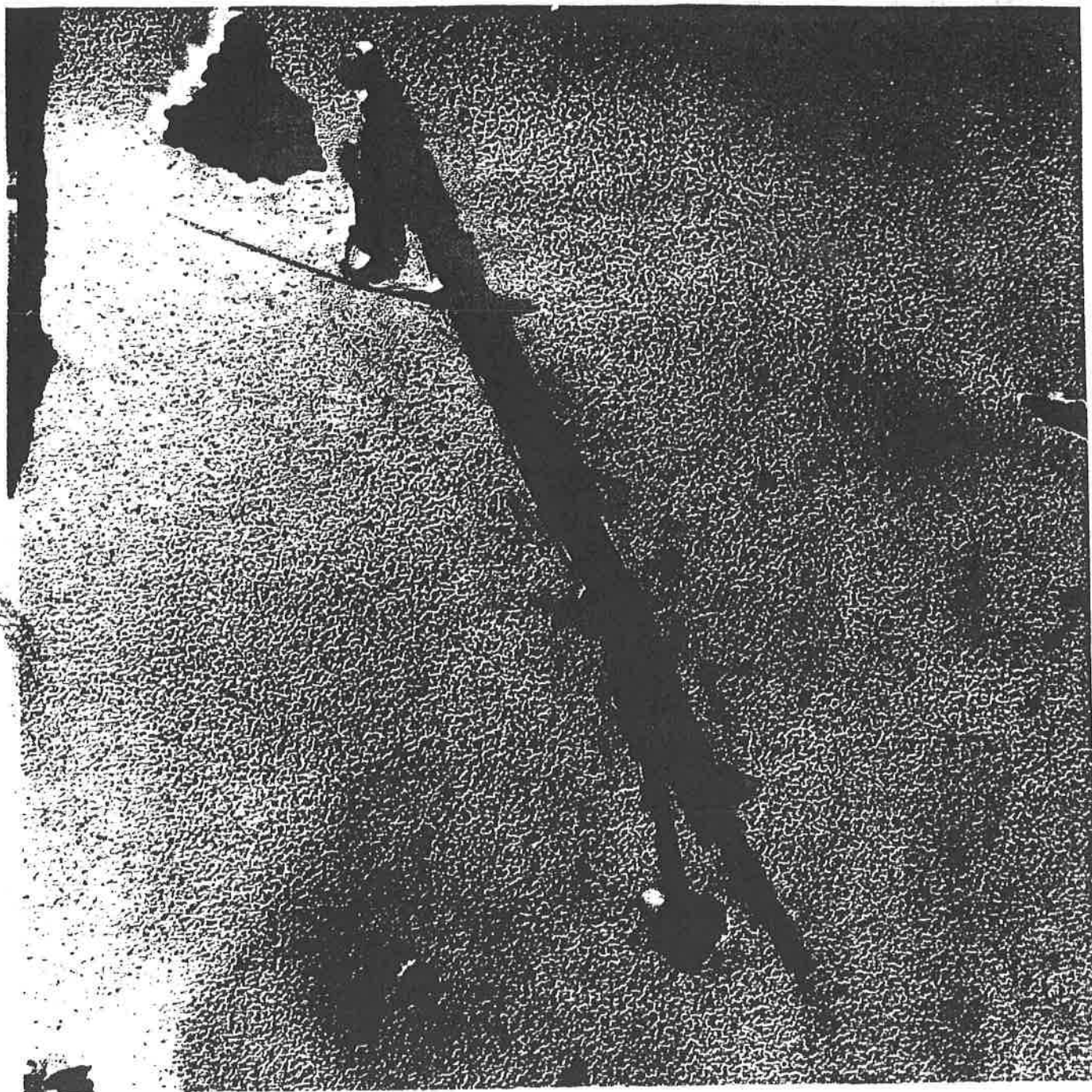
EM: #030575-15

Proj;

Mag: X58, 000

Date: 3/7/75

Prep: Aqueous disp. Al@34°C



0.5um

Nytal 200

Cyprus Mines Research Lab

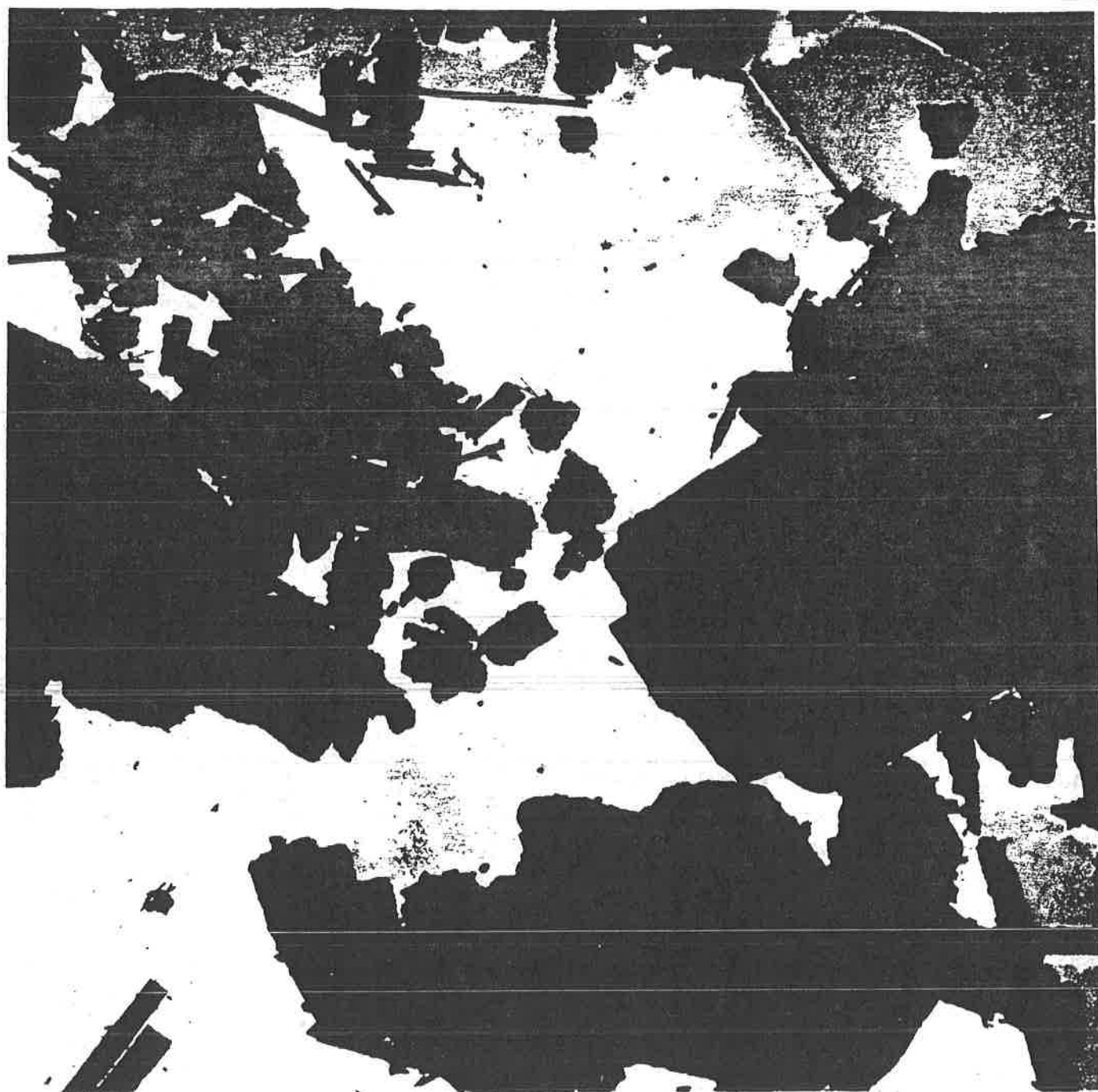
EM: #030475-9

Proj:

Mag: X56, 000

Date: 3/7/75

Prep: Aqueous disp. Al₂O₃+C



5um

Nyral 300

Cyprus Mines Research Lab

EM: #022975-11

Proj:

Mag: X6, 000

Date: 3/7/75

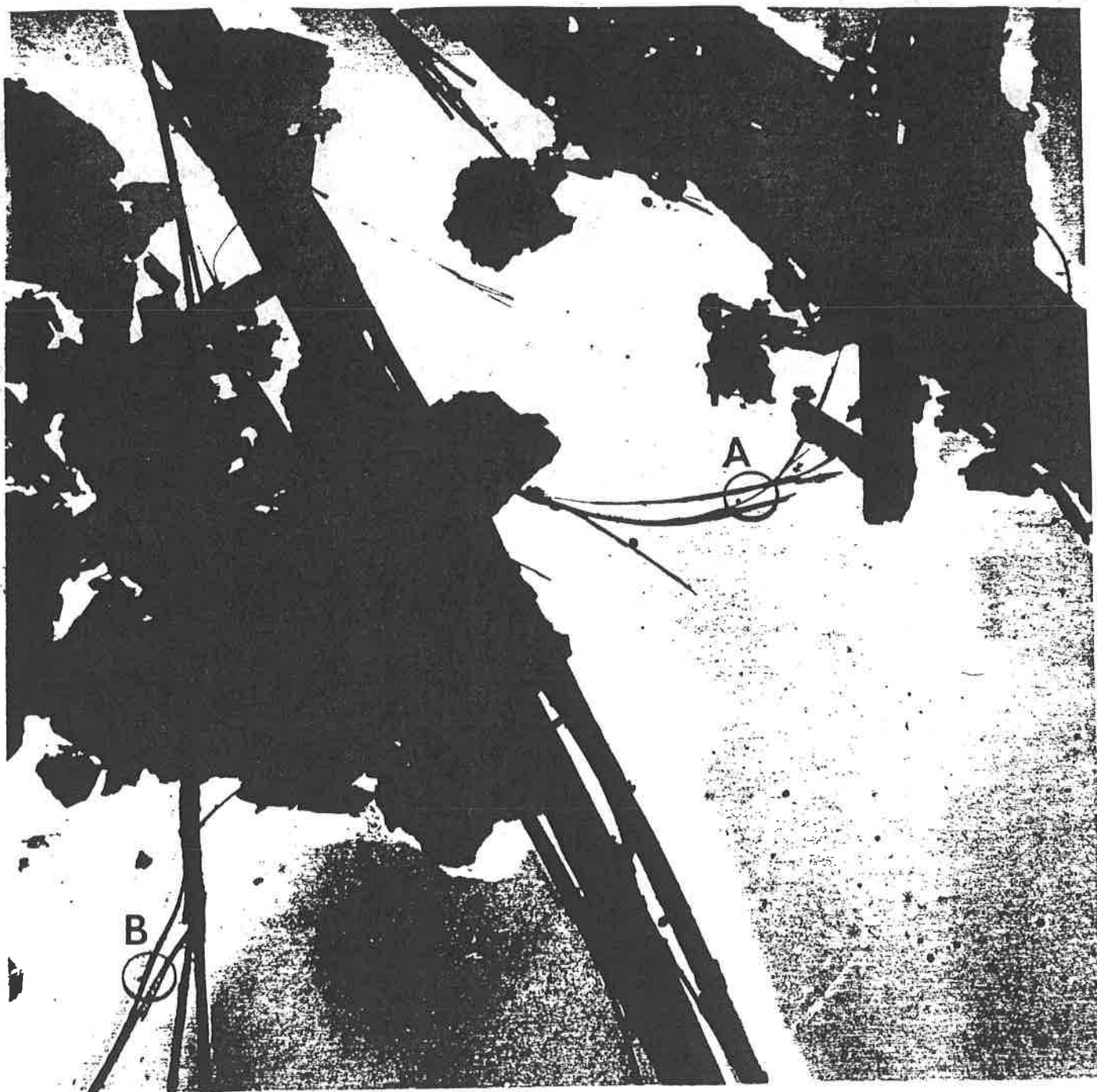
Prep: Aqueous disp. Al@34°C

Figure No. 56

This micrograph illustrates the typical fibrous nature of Nyltal 300. The defibrillization is readily apparent, as both rigid and flexible fibers.

Two fiber areas are circled and higher magnification and electron diffraction patterns of these areas A and B, are included in subsequent figures: No. 57 - fiber A at high magnification and figure No. 58 - the corresponding electron diffraction pattern, which indexed to tremolite.

Fiber B is illustrated at higher magnification with its corresponding electron diffraction pattern superimposed in figure No. 59.



5um

Nyral 300

Cyprus Mines Research Lab

EM: #022975-18

Proj:

Mag: X6, 000

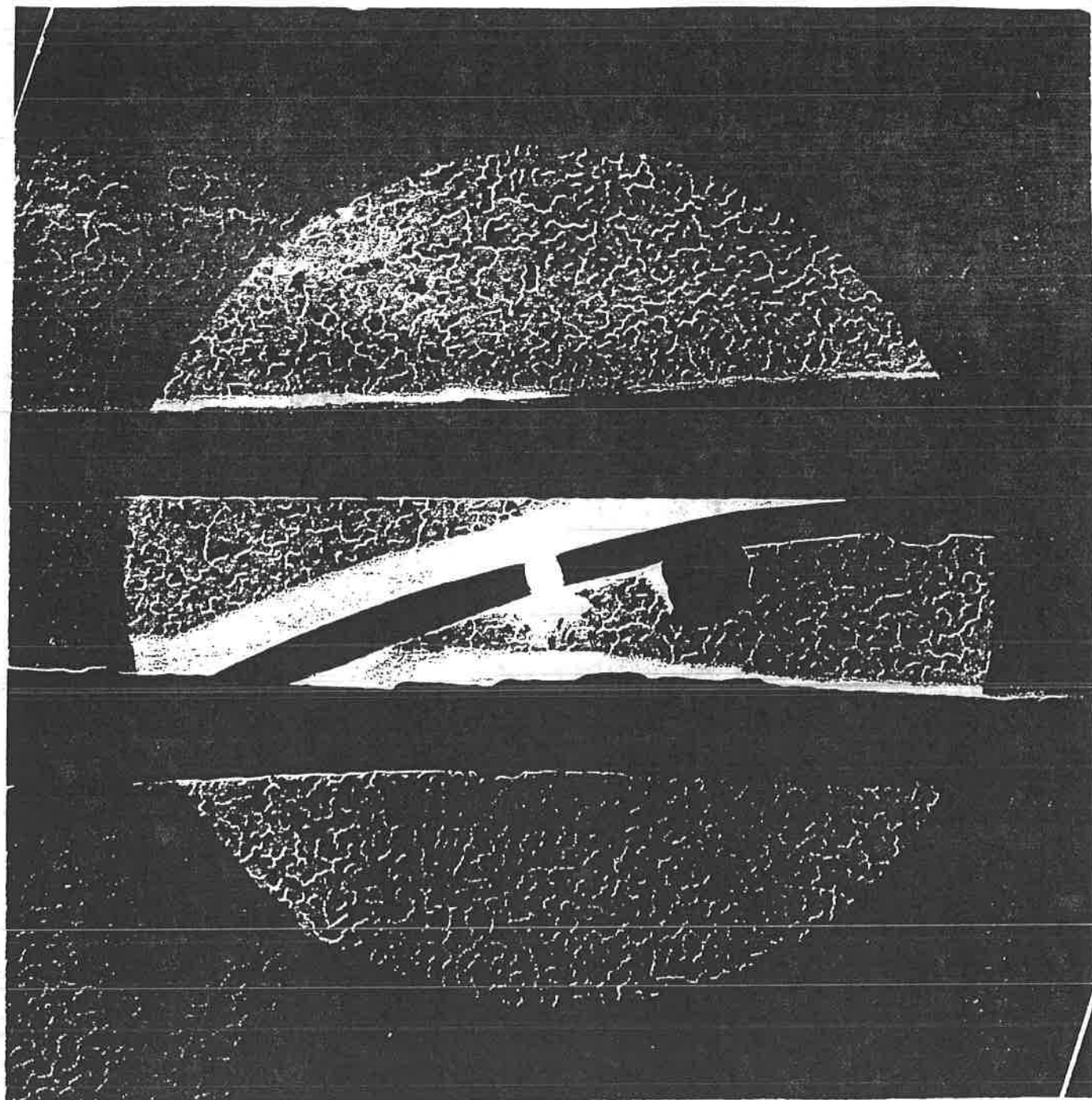
Date: 3/7/75

Prep: Aqueous disp. Al@34°C

05210062

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CAMC-Abbott-000311



Nyral 300

Cyprus Mines Research Lab

EM: #022875-5

Proj: 3/7/75

Mag: X99, 500

Date: 3/7/75

Prep: Aqueous disp. Al@34°C

Nytaal 300

Cyprus Mines Research Lab

EM: #022875-4

Proj:

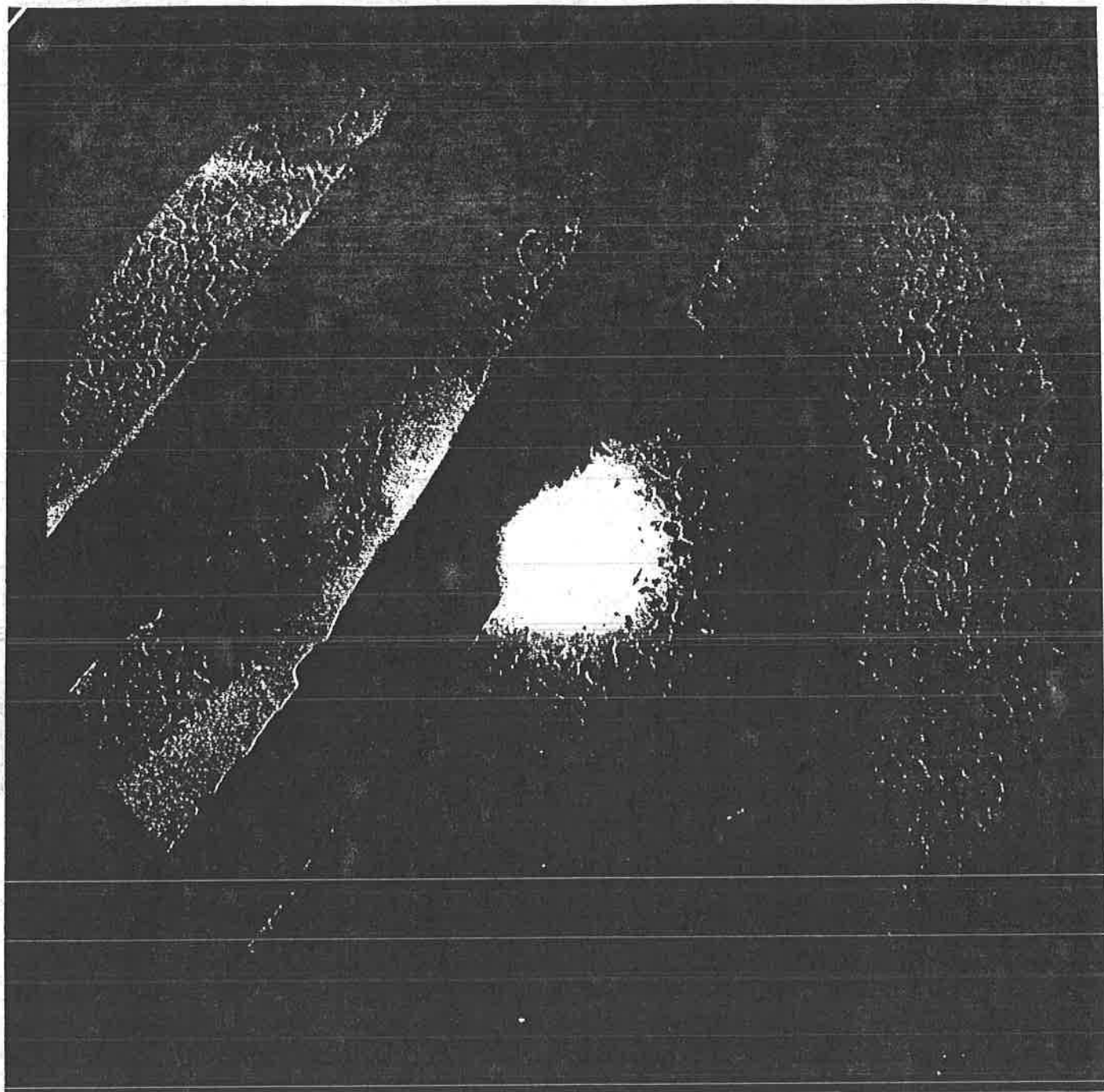
Mag:

Date: 3/7/75

Prep: HMDP of #022875-5

05210064

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0.1um

Nytal 300

Cyprus Mines Research Lab

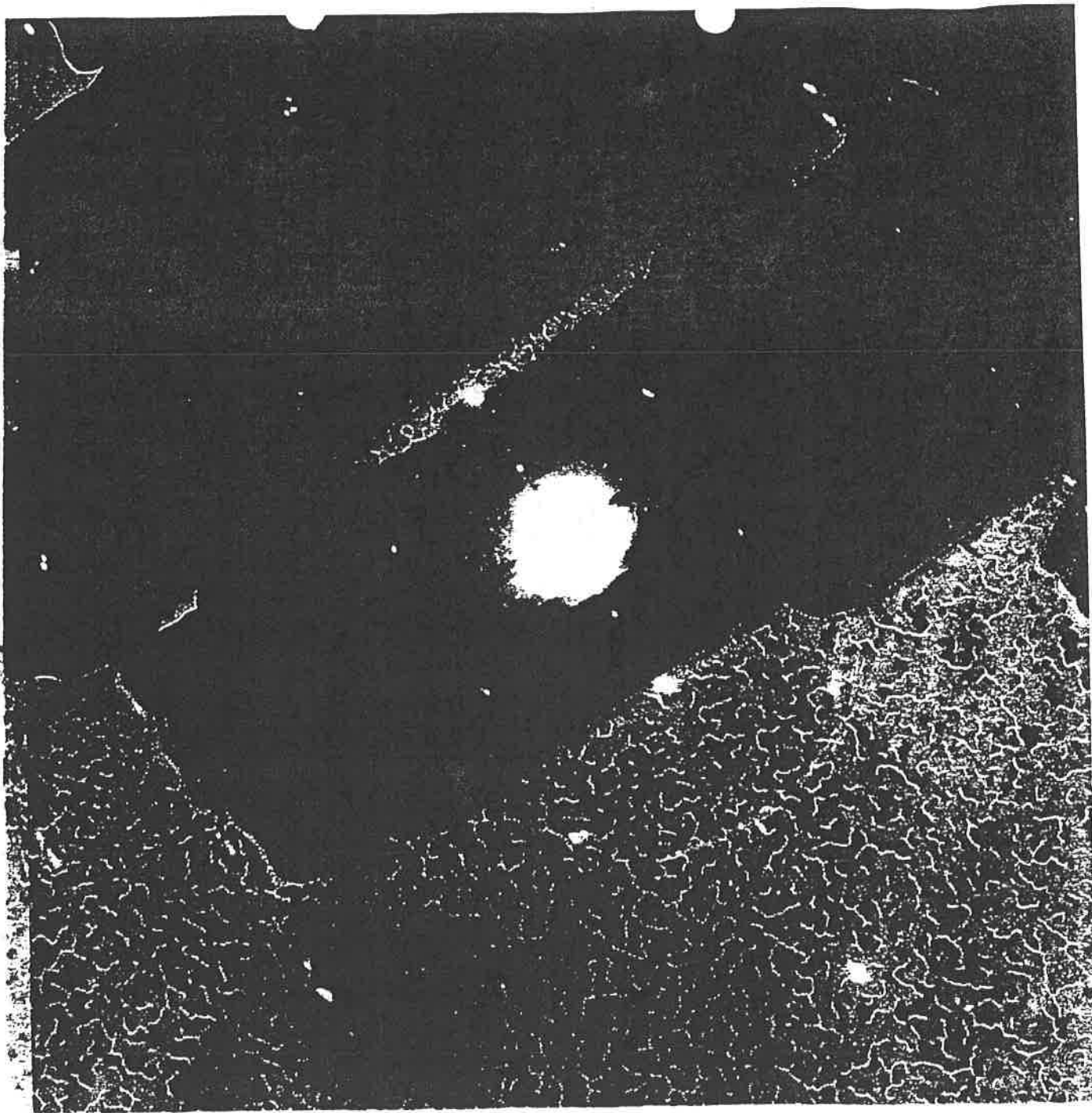
EM: #022875-2

Proj:

Mag: X114, 000

Date: 3/7/75

Prep: Aqueous disp. Al@34°C



0.1μm

Nyral 300

Cyprus Mines Research Lab

EM: #022975-16

Proj:

Mag: X124, 000

Date: 3/7/75

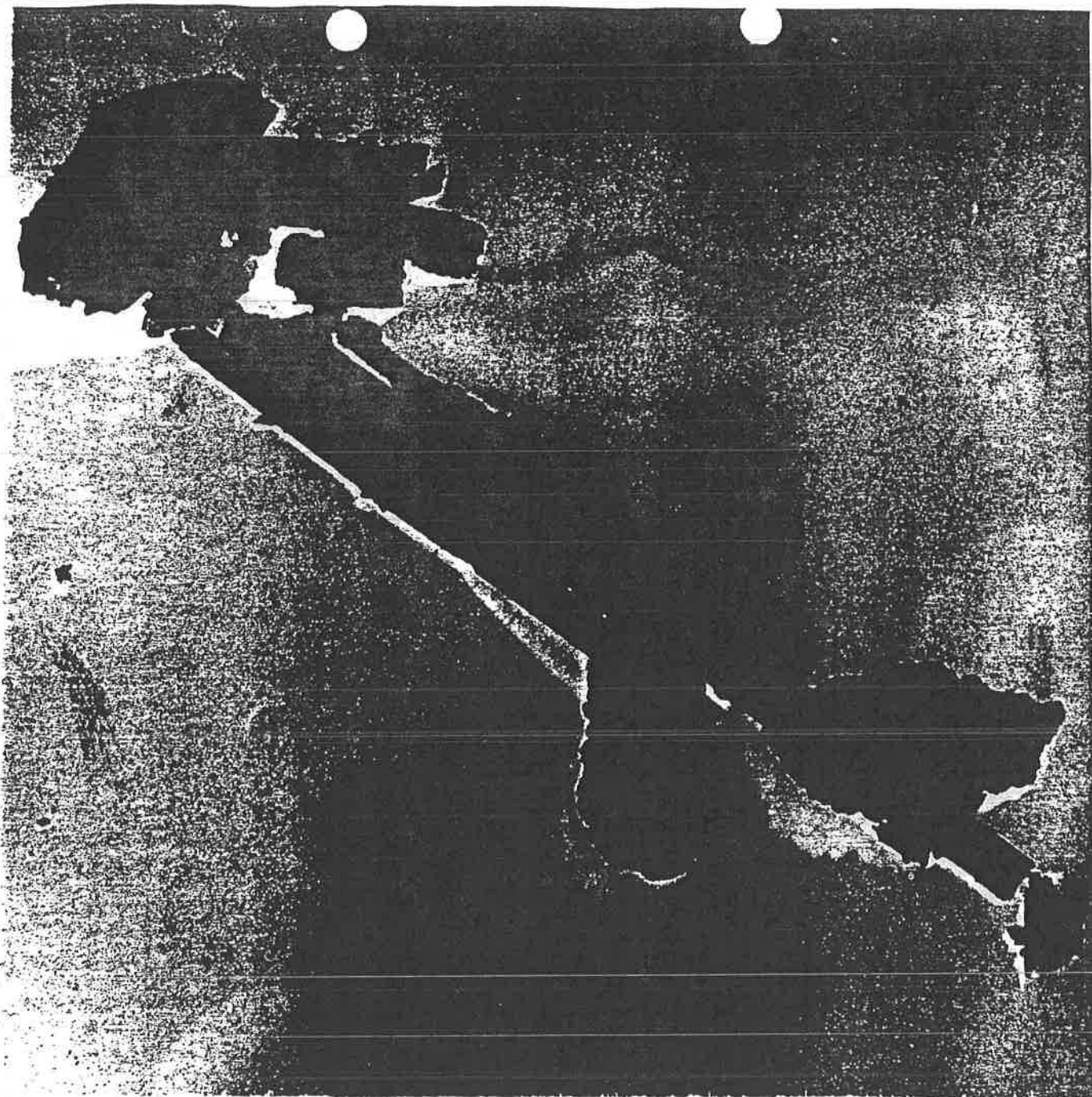
Prep: Aqueous disp. Al@34°C

05210066

Figure No. 60

page 63

This micrograph illustrates the superimposed tremolite electron diffraction pattern, over the corresponding fibers which were analyzed. The ultimate diameter of these tremolite fibers appear to be well below 1000Å.



1um

Nyral 300

Cyprus Mines Research Lab

EM: #022875-12

Proj:

Mag: X16, 500

Date: 3/7/75

Prep: Aqueous disp. Al@34°C

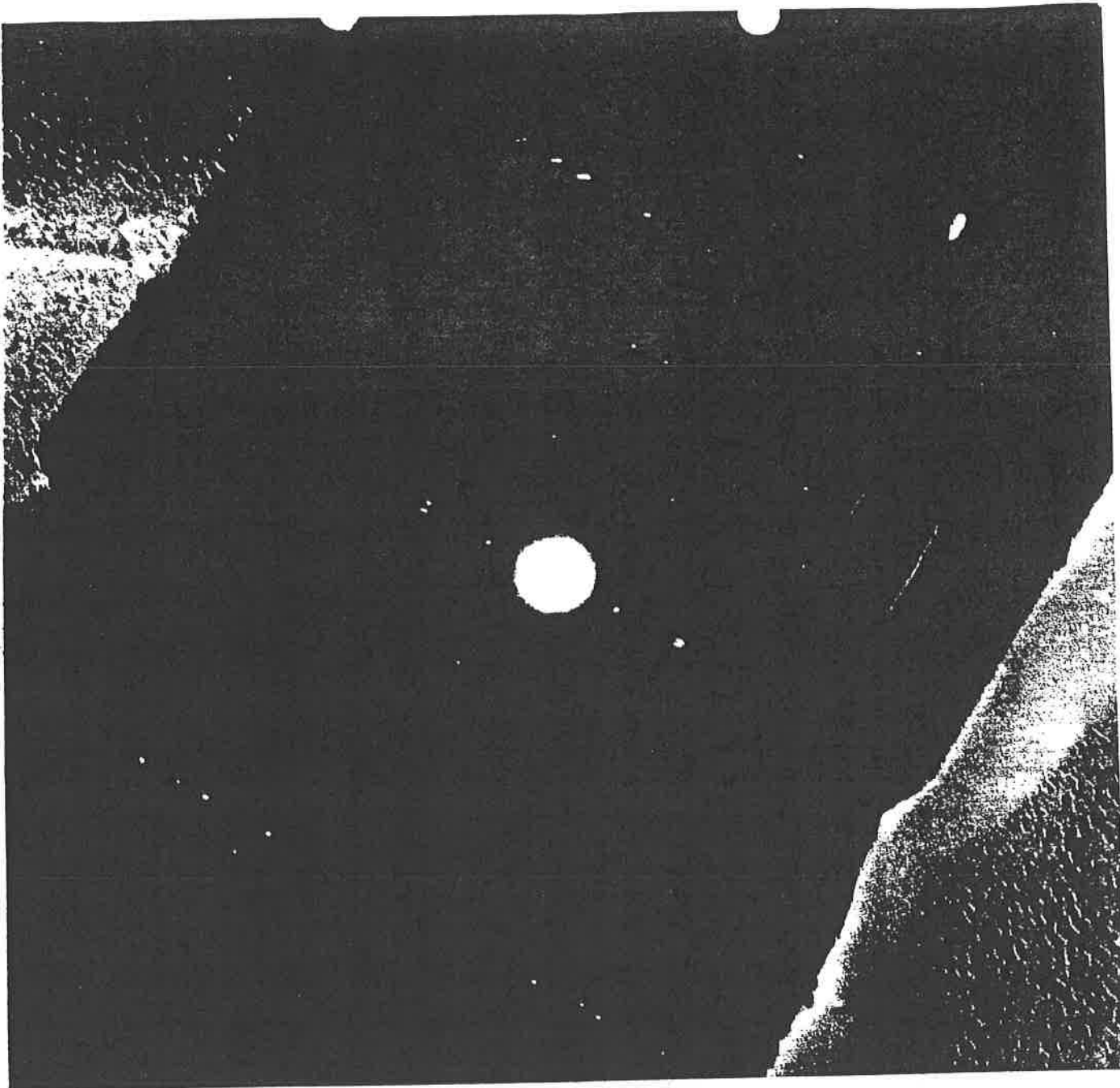
05210067

Figure No. 61

page 64

The micrograph illustrates a lath like fiber with defibrillization occurring along the parallel striations. This fiber has been identified by electron diffraction of the selected area indicated by arrows.

Higher magnification of this selected area with its corresponding diffraction pattern is illustrated by figure No. 62.



0.127

Nytal 300

Cyprus Mines Research Lab

EM: #022875-11

Proj:

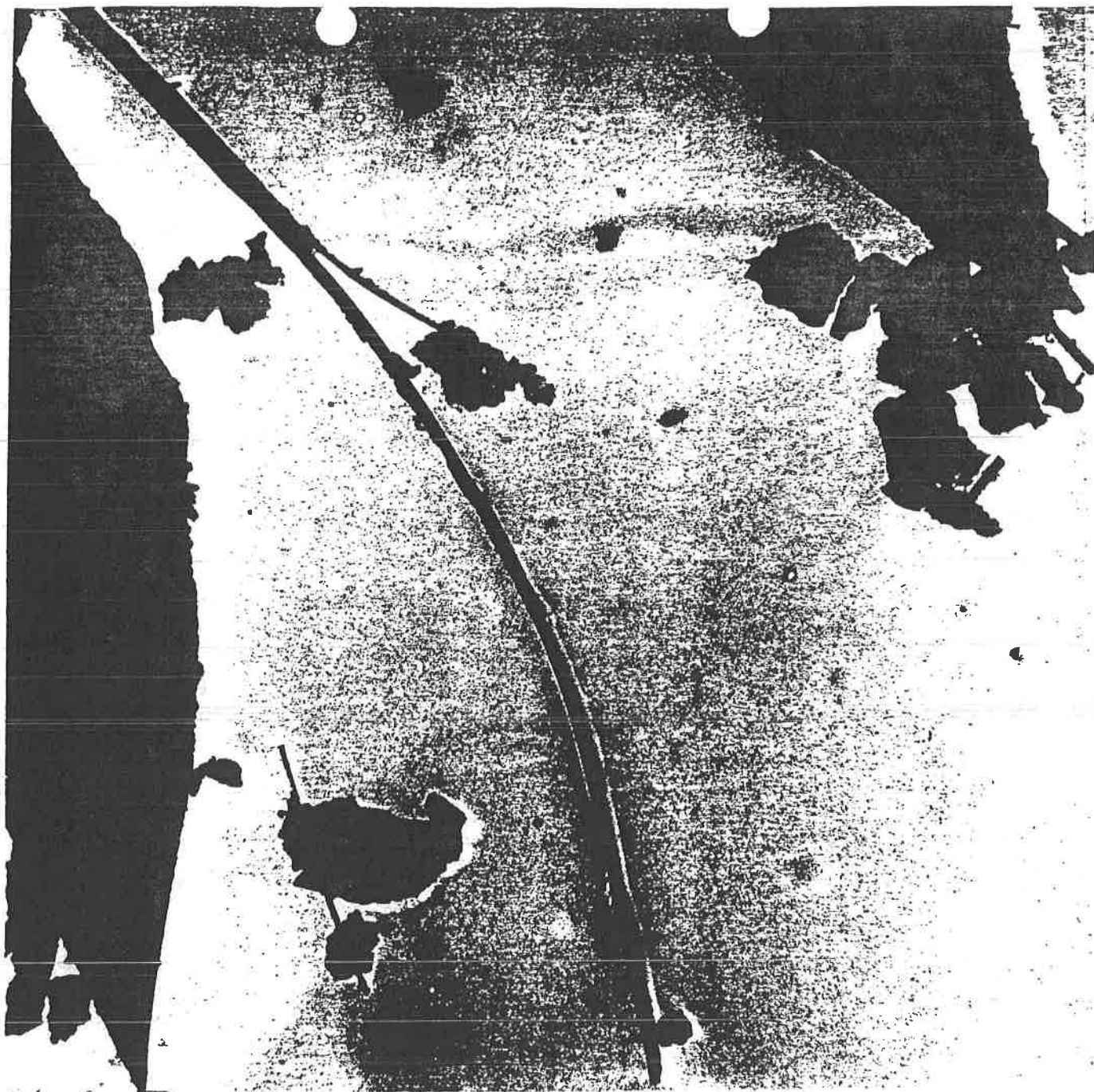
Mag: X98, 000

Date: 3/7/75

Prep: Aqueous disp. Al@34°C

05210068

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1um

Nytal 300

Cyprus Mines Research Lab

EM: #022975-13

Proj:

Mag: X15, 000

Date: 3/7/75

Prep: Aqueous disp. Al@34°C

05210069

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Figure No. 63

Revealed by this micrograph is the defibrillization of a tremolite fiber, which is readily apparent. The flexible nature of this fiber also is evident.

Airborne Dust Samples

The micrographs on the following pages illustrate the presence of airborne asbestos fiber which resulted from the use of Vanderbilt or Grandham talcs. These micrographs also disprove the validity of Vanderbilt's claim and letter of certification, that the talcs indicated do not contain fibrous asbestos.

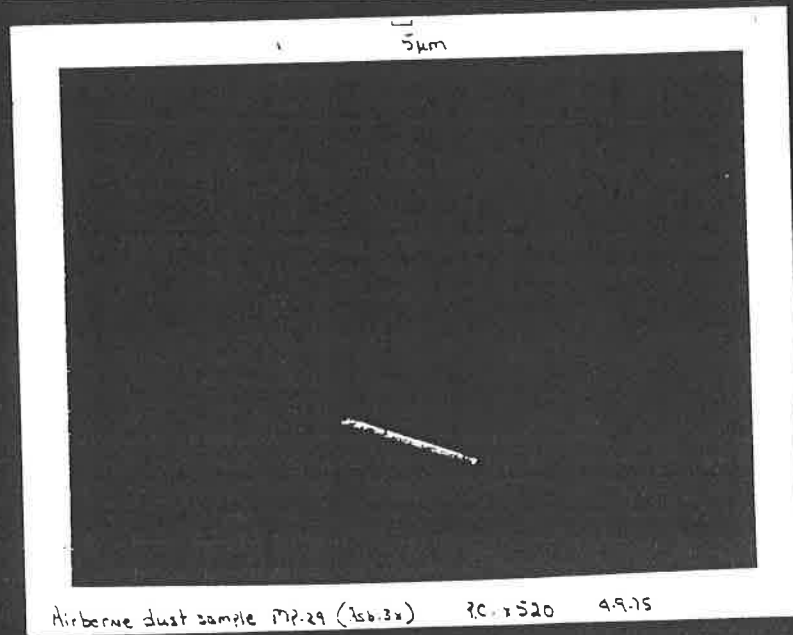
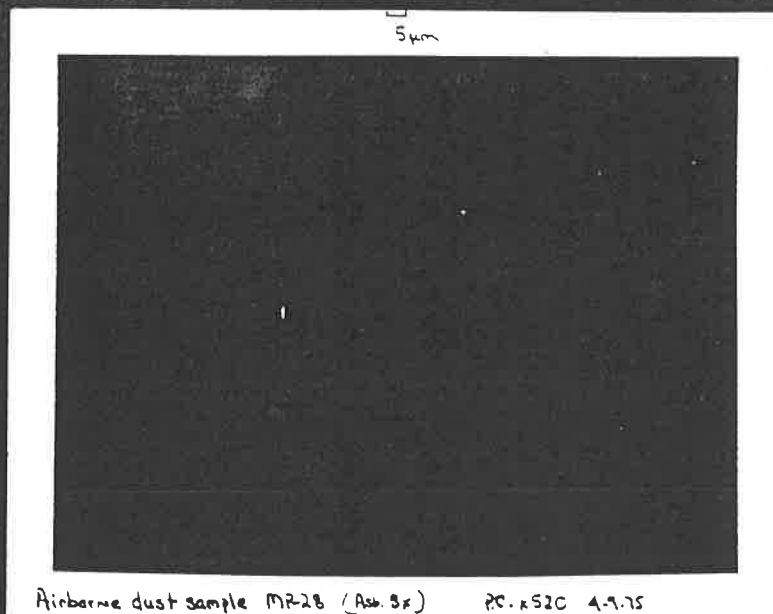
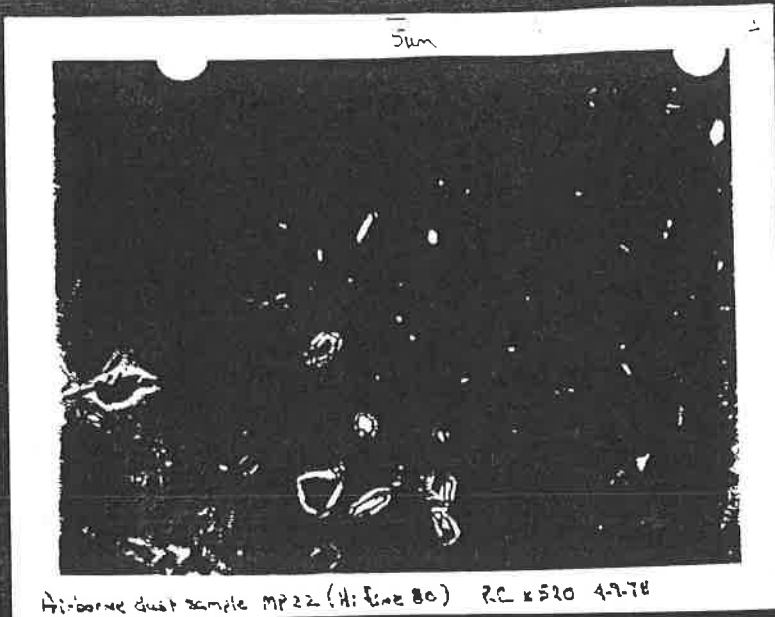
05210070

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Figures No. 64-66

These micrographs are random microscope field areas of air-born dust samples, taken via phase contrast optical microscopy. The fibers which are blurred, are out of the plane of focus of the system and to represent an accurate count of a single field area would require a micrograph taken at each plane of focus.

05210071

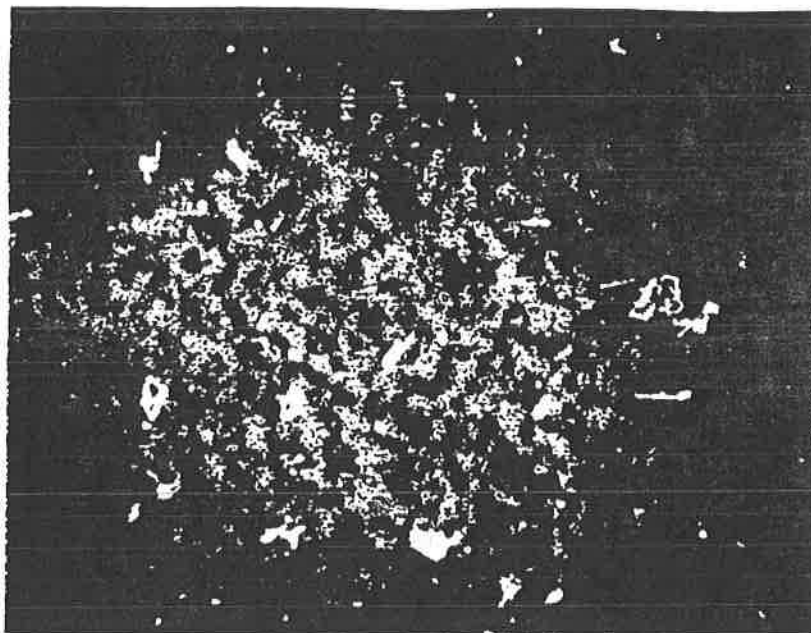


05210072

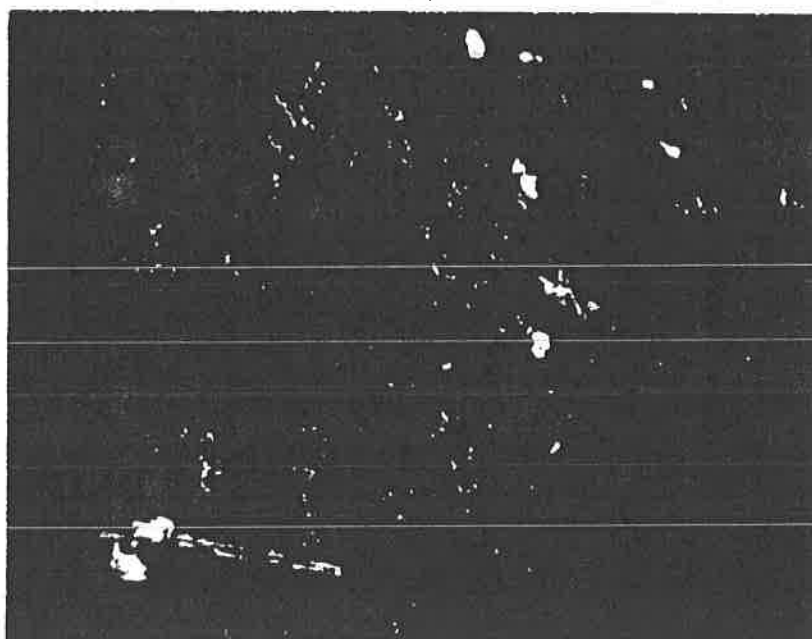
Figures No. 67-82

These micrographs are also random microscope field areas of airborne dust samples, but scanning electron microscopy was used for these illustrations. The depth of focus is such that all particles, whether thick or thin, will be in focus. Selected micrographs taken at higher magnification are to illustrate the fibrous nature of the particles.

05210073

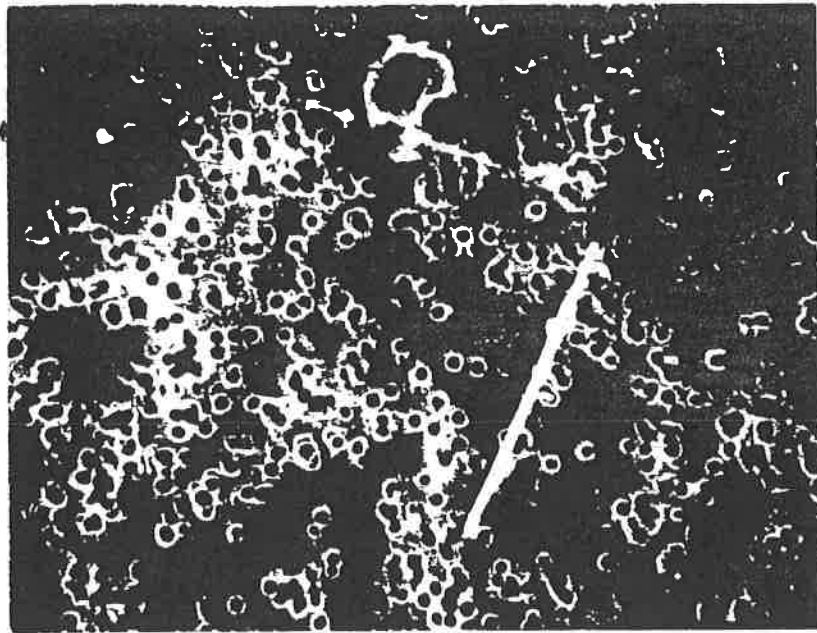


Airborne dust sample NFI (Asbestos) SEM x410 4-6-75



Airborne dust sample NFI, HBF Asbestos SEM mag. x800 4-24-75

5 μ m



Micrograph of a sample, likely a biological or geological specimen, showing a dense, porous structure. The image is labeled "Micrograph of a sample, likely a biological or geological specimen, showing a dense, porous structure." and "SEM image, 1000x magnification.".

5 μ m



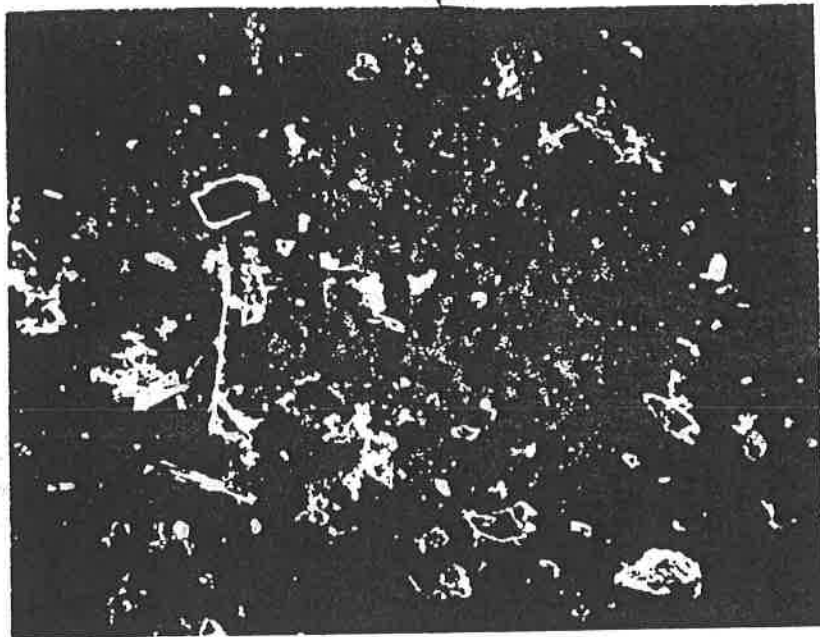
Airborne Dust Sample N24, Hi-Fine 80 SEM x490 mag. 4-7-75

05210075

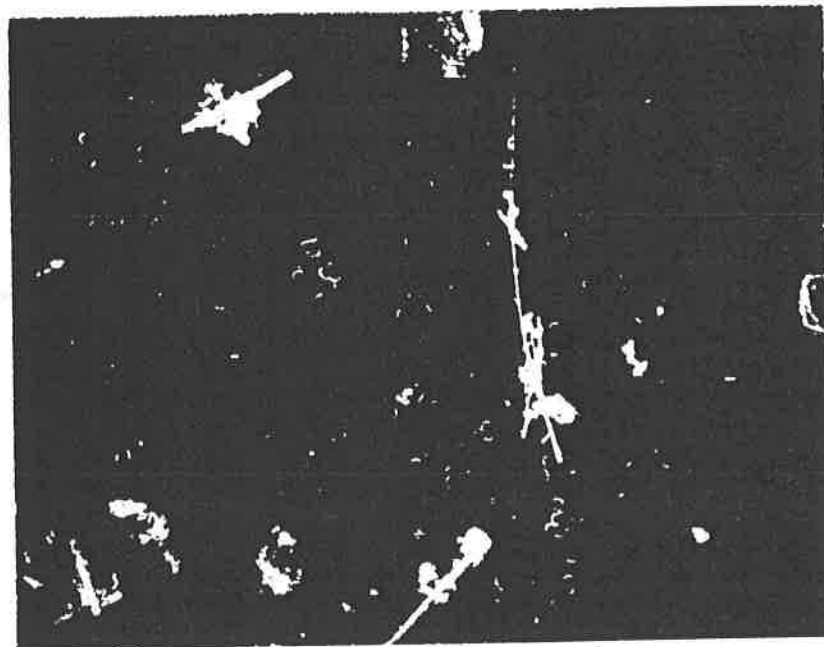
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A high-contrast, black and white photograph showing a dense, textured surface, possibly a microscopic view of a material or a close-up of a rough, crystalline structure. The image is heavily degraded with noise and artifacts, including a prominent diagonal streak near the top center.

CAMC-Abbott-000326



Airborne Dust sample NP-5 PD-Nytal 200 SEM mag. x 490 4-25-75

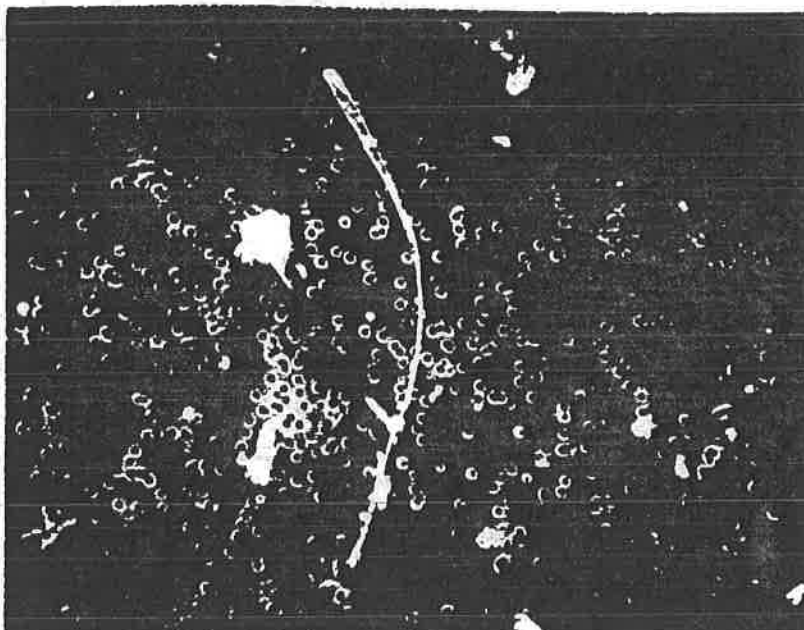


Airborne Dust sample NP-5 PD-Nytal 200 SEM mag. x1800 4-24-75

05210077

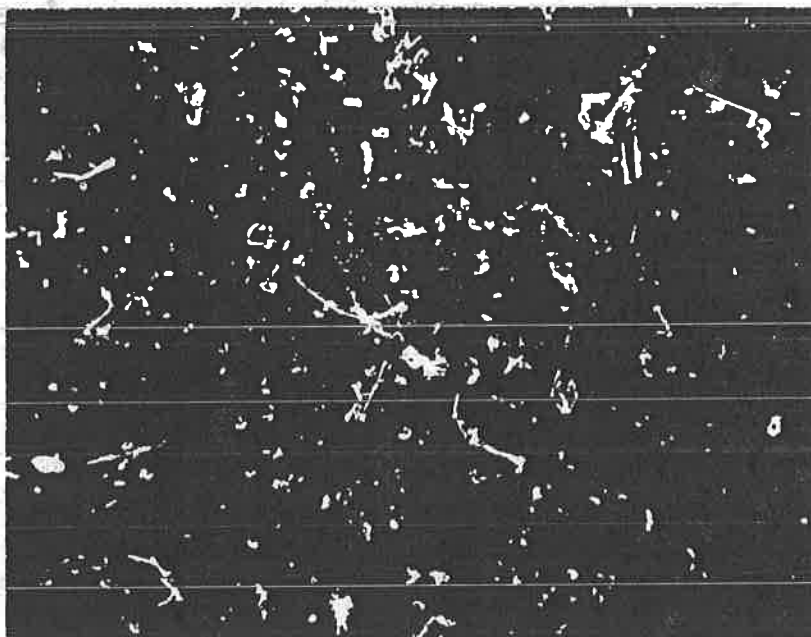
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5 μ m



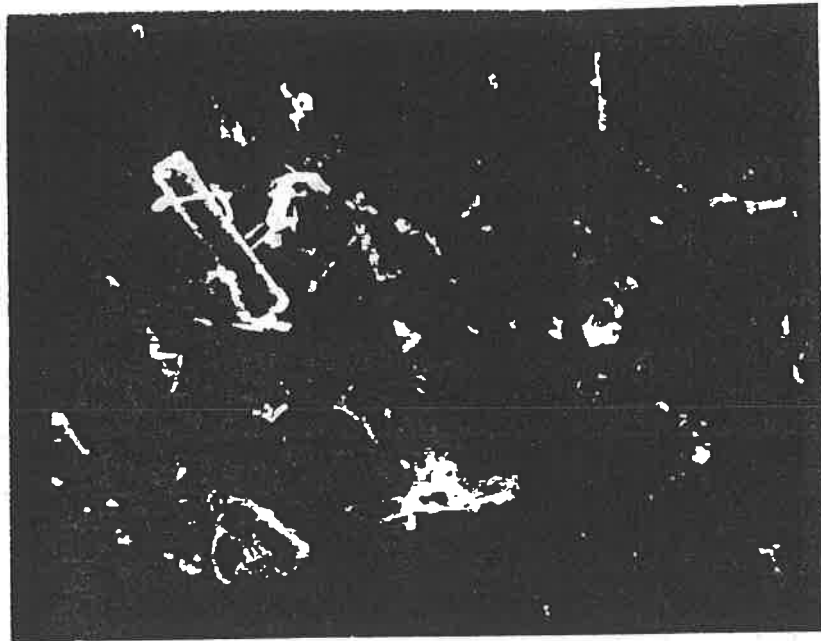
Piriforme dust sample NP-5 PD-Ny 200 SEM mag. 1800 4-4-75

5 μ m



Piriforme dust sample NP-8 HN-Ny 200 SEM mag. x490 4-5-75

5 μ m



Airborne Dust sample NP-8, HN Nyal 300 S. 1300 1-75

5 μ m



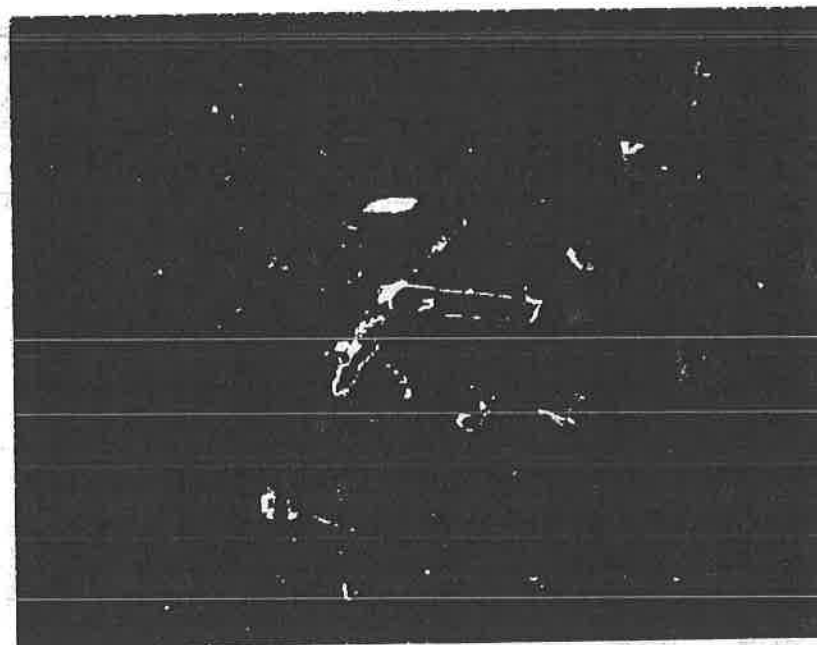
Airborne Dust sample NP-8, HN Nyal 300 SEM mag. X 2800 4-24-75

05210079

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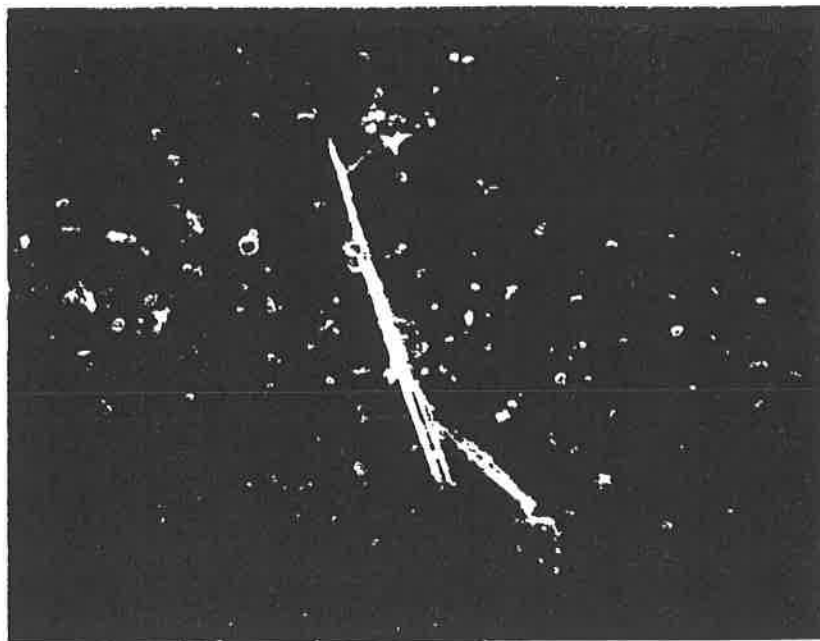


Airborne Dust Sample NP-12, SWG-Mytel 300 SEM mag x490



Airborne Dust Sample NP-12 SWG-Mytel 300 SEM mag. x1800 4-24-75

5 μ m



Airborne Dust Sample MP-28, MT-Asbestine 3x SEM mag. x 1,800 4-24-75

5 μ m



Airborne Dust Sample MP-28, MT-Asbestine 3x, SEM mag. x 2800 4-24-75

05210081

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REFERENCES

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U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration
WASHINGTON, D.C. 20210



Office of the Assistant Secretary

OCT 9 1974

Mr. H. B. Vanderbilt
President
Chief Executive Officer
R. T. Vanderbilt Company, Inc.
30 Winfield Street
Norwalk, Connecticut 08855

Dear Mr. Vanderbilt:

This is in reply to your letter of September 26, concerning your request for relief from the asbestos standard for your talcs containing non-fibrous tremolite, actinolite, and anthophyllite.

My letter of August 6 stated that non-fibrous or non-asbestiform minerals such as non-asbestiform tremolite are not within the scope of the asbestos standard and, therefore, the provisions of that standard do not apply to talc containing non-asbestiform minerals.

NIOSH is currently conducting a thorough investigation into the exact minerals to which talc workers were exposed in those studies where asbestosis or other adverse medical effects were found.

Pending the receipt and evaluation by OSHA of the report by NIOSH on this investigation, if you have scientific evidence that the naturally occurring talcs, prior to processing by milling or crushing, do not contain fibrous or asbestiform tremolite, anthophyllite, actinolite or other asbestiform minerals; you may certify to your customers that the talc does not contain asbestos.

Fibrous, asbestiform minerals such as fibrous tremolite means naturally occurring asbestiform minerals which prior to or after crushing and processing, contain fibers made up of fibrils.

Sincerely,

John H. Stender
Assistant Secretary of Labor

05210083

page 80

R.T. VANDERBILT COMPANY, INC.
30 WINFIELD STREET
NORWALK, CONNECTICUT 06855

CABLE ADDRESS
"BILTVAN" NORWALK, CONNECTICUT
TWE 710-400-2940
(KOR) 853-1400

January 2, 1975

Gentlemen:

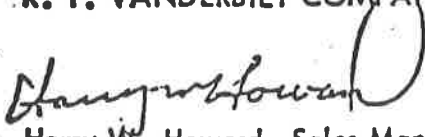
Effective January 2, 1975, in accordance with procedures laid down by the Occupational Safety and Health Administration of the U.S. Department of Labor in a letter of October 9, 1974, to the R. T. Vanderbilt Company, Inc. (copy attached), we hereby certify the following grades of talc:

NYTAL 99	X	425
NYTAL 100	3X	10A
NYTAL 100HR	151A	10AC
NYTAL 200	5X	HDT
NYTAL 300 916P	FT	1R
NYTAL 400	MSK	1C
	325	

Please keep this certification with your permanent records. If you are inspected by OSHA, please show the inspector this letter, if he questions any of the above products.

Very truly yours,

R. T. VANDERBILT COMPANY, INC.


Harry W. Howard, Sales Manager
Paint and Paper Department

HWH:ld

enc.

05210084

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ROUTE TO
Department

Finance	
Administration	
Sales	
Technical	
Production	

No. 20
December 5, 1974

TALC AND THE
OSHA ASBESTOS STANDARD 1910.93a

Executive Synopsis

The OSHA Asbestos Regulation 1910.93a includes, in its definition of asbestos, a mineral form (tremolite) that is found in some talcs, but is not generally considered an asbestiform material (see Safety and Health Bulletin No. 15, "Asbestos Handling Guidelines" dated October 30, 1973). Through the extensive efforts of several NPCA members, a clarification of the regulation was obtained from OSHA. This now allows talc manufacturers to certify their material is "asbestos free" and the user of that talc is then exempt from regulation under 1910.93a.

ACTION REQUIRED BY YOU - Forward this Bulletin to the person or persons responsible for your safety and health operations.

ACTION TAKEN BY NPCA - Through the efforts of NPCA members and the Occupational Health Task Force a clarification of the standard was accomplished.

OPERATIONS AFFECTED IN YOUR COMPANY - Manufacturing, safety and health.

STAFF CONTACT AT NPCA - Richard W. Murry, Assistant Technical Director

05210085

BACKGROUND

With the promulgation of the asbestos Standard 1910.93a in July 1972 the possibility of certain talc materials being regulated as asbestos was created. According to the regulation, asbestos is defined as the following mineral forms: chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite. While some talcs are indeed marketed as containing asbestiform minerals and noted for their fibrous properties, the standard also encompassed other talcs not previously considered to be fibrous or considered to contain asbestiform materials. These are the tremolite (or more correctly non-asbestiform tremolite) containing talcs.

Since late 1972 the R. T. Vanderbilt Company Inc. and the International Talc Company (later purchased by Vanderbilt) have had numerous meetings with OSHA officials to obtain a clarification on the regulation of the talcs under 1910.93a.

RECENT DEVELOPMENTS

On October 9, 1974 in a letter to Mr. H. B. Vanderbilt, President of R. T. Vanderbilt Company, Inc., Mr. John Stender, Assistant Secretary of Labor, stated in part:

"...if you (the talc manufacturer) have scientific evidence that the naturally occurring talcs, prior to processing by milling or crushing, do not contain fibrous or asbestiform tremolite, anthophyllite, actinolite or other asbestiform minerals, you may certify to your customers that the talc does not contain asbestos." (A copy of the letter is attached to this bulletin.)

Also a directive to such effect has been issued to OSHA field personnel as a guide in making inspections. This directive indicates that if a talc user, i.e., a paint and coatings manufacturer, is monitored for asbestos the person behind the microscope counting fibers should use the following identification criteria:

- A. Particles must appear to be fibrous rather than as crystals or slivers.
- B. The maximum diameter of a fiber to be counted is 3 microns.
- C. The maximum length of a fiber to be counted is 30 microns.
- D. The length to width ratio must be 5 or more to 1, that is, 5 times or more longer than wide.
- E. The separate or individual fibers must contain fibrils or the "bundle of sticks" effect, unless they are at a nondivisible stage. A fibril cannot be subdivided and would be counted, if it meets the other criteria. The electron microscope may be used to prove the fibrous nature of the particles. The length to width ratio of 5 or more to 1 is not meant to imply that other particles are not hazardous.

The directive further states that if the talc is of the non-asbestiform or non-fibrous variety the time weighted average (TWA) of 20 millions of particles per cubic foot of air (mppcf) will be used.

If monitoring of your operations using talc is done by the OSHA inspector you should retain a sample of the talc material being used in the event a discrepancy may arise.

RECOMMENDATION

If you have been using talc products that have been questionable regarding asbestos content, request certification from the manufacturer that they do not contain asbestos.

Retain this certification to show to an OSHA inspector if he questions the asbestos content of the talc. If it is however determined that a talc does contain true asbestiform minerals, that material will not be certified and is subject to the provisions of the regulation.

ACTION CONCERNING Vanderbilt and Grantham

Typed
1-17-75

- PURPOSE: 1) Confirming presence of asbestos fibers in competitive talc.
2) Establish whether any current CYMIN contain asbestos

INFORMATION

USE: 1) OSHA - Stender

2) Customers

- ACTION: 1) Secure ^{Commercial} samples from customer
Identity by Lot# if possible:

Vanderbilt - NYTAL 300 - 400 LDM 1/20/75
Asbestine 325 - 3x

Grantham - Cyclofil GJG 1/20/75
Cyclosorb

CYMIN - own samples from mills continuously CJP Set up program

2) Secure samples from mills:

Montana - Mistron Vapor, Yellowstone JDM 1/18/75
Glacier 200 & 325 S. Dea White Rec 1-20 & 1-21

Calif. - C400, T-076, Furnace HS 1/21/75
Creek Supreme 325

3) Complete electron Microscopy CJP

SEM, TEM

1 week from receipt

4) Arrange to monitor air of a plant using Nyal 300

LDM 1/20/75

5) Monitor Plant

6) Complete dust testing

CJP 1 week for receipt

7) Write Stender inquiring re new OSHA directive offering assistance

HTM 1/25/75

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CYPRUS

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Cyprus Industrial Minerals Company

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TECHNICAL BULLETIN

CERTIFICATION OF COMPLIANCE
OSHA ASBESTOS STANDARD 1910.93a

This is to advise that all Montana and California talcs produced by Cyprus Industrial Minerals Company meet the criteria for asbestos established by Mr. John Stender, Assistant Secretary of Labor, as outlined in the National Paint & Coatings Association, Bulletin #20 dated December 5, 1974.

This certification should become part of your permanent records and is effective March 1, 1975.

This compliance is assured by the use of X-ray diffraction, electron diffraction, transmitting electron microscopy, scanning electron microscopy and the most modern techniques in optical microscopy.

Attachment: Bulletin #20,
National Paint & Coatings Ass'n.

CYPRUS 05210089

