



CYPRUS
Industrial Minerals

Cyprus Technical Center
8985 East Nichols, Suite 300
Englewood, Colorado 80112
303-643-5000

September 23, 1991

TOM LANDELS
CYPRUS WESTERN SOURCE

BHC-2 TALC
Project No. 91-308

ISSUE

Talc produced at Western Source from Beaverhead Mine tailings may have properties which are competitive for the California low-cost ceramics market. This ore is attractive for Western Source since it is available for reasonably low shipping costs from Montana, and can be sold for an attractive margin.

This report provides data for characterization of this product milled from Beaverhead Mine tailings, referred to herein as BHC-2.

CONCLUSIONS

BHC-2 contains a higher percentage of talc than Western Source products currently targeted toward low-cost ceramics markets in California.

BHC-2 was found to contain 0.1% hornblende. Hornblende is one of several varieties of amphibole minerals which are *not* regulated by the Federal Government.

DISCUSSION

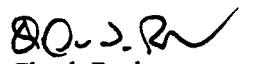
Refer to the attached table for characterization data. A sedigraph curve is also attached.

Plate I presents SEM/EDS photomicrographs and chemistry of two hornblende grains found in this talc. Hornblende (which is *not* regulated) differs from amphiboles of the actinolite/tremolite series (which are regulated) in that hornblende contains more aluminum than actinolite/tremolite. The presence of the aluminum cation leads to differences in crystal structure that further differentiate hornblende from actinolite/tremolite.

If you have further questions, please don't hesitate to phone.

Best regards,


Michael Clark
Quality Assurance
and Technical Support


Chuck Pugh
Coatings Technologist

Copies to: Francois Beyl, Jack Buettner, Ed McCarthy, Bill Sevy, Rich Zazenski, files

PLAINTIFF'S
EXHIBIT
CAM-43

ITA-Alfaro000186

DATA TABLE

BHC-2	
Mineralogy	
Talc	78 %
Chlorite	5
Dolomite	5
Magnesite	10
Quartz	1.6
Hornblende	0.1
LOI @ 1000°C	12.1%
Mean Particle Size	
Sedigraph	10.5 microns
Granulometer	12.5 microns
GE Brightness	77.7
Hunter Color	
L	91.1
a	-1.3
b	3.4
X	80.8
Y	82.4
Z	92.9
Hegman	-0-
Oil Adsorption SRO	33.8 grams/100 grams
Loose Density	24.5 lbs/ft ³
Surface Area	6.7 m ² /gram
% passing 200 mesh	99.3
% passing 325 mesh	96.0

PARTICLE SIZE DISTRIBUTION

SAMPLE IDENTIFICATION Steawhite 200, Western Source

DATE 9-19-91

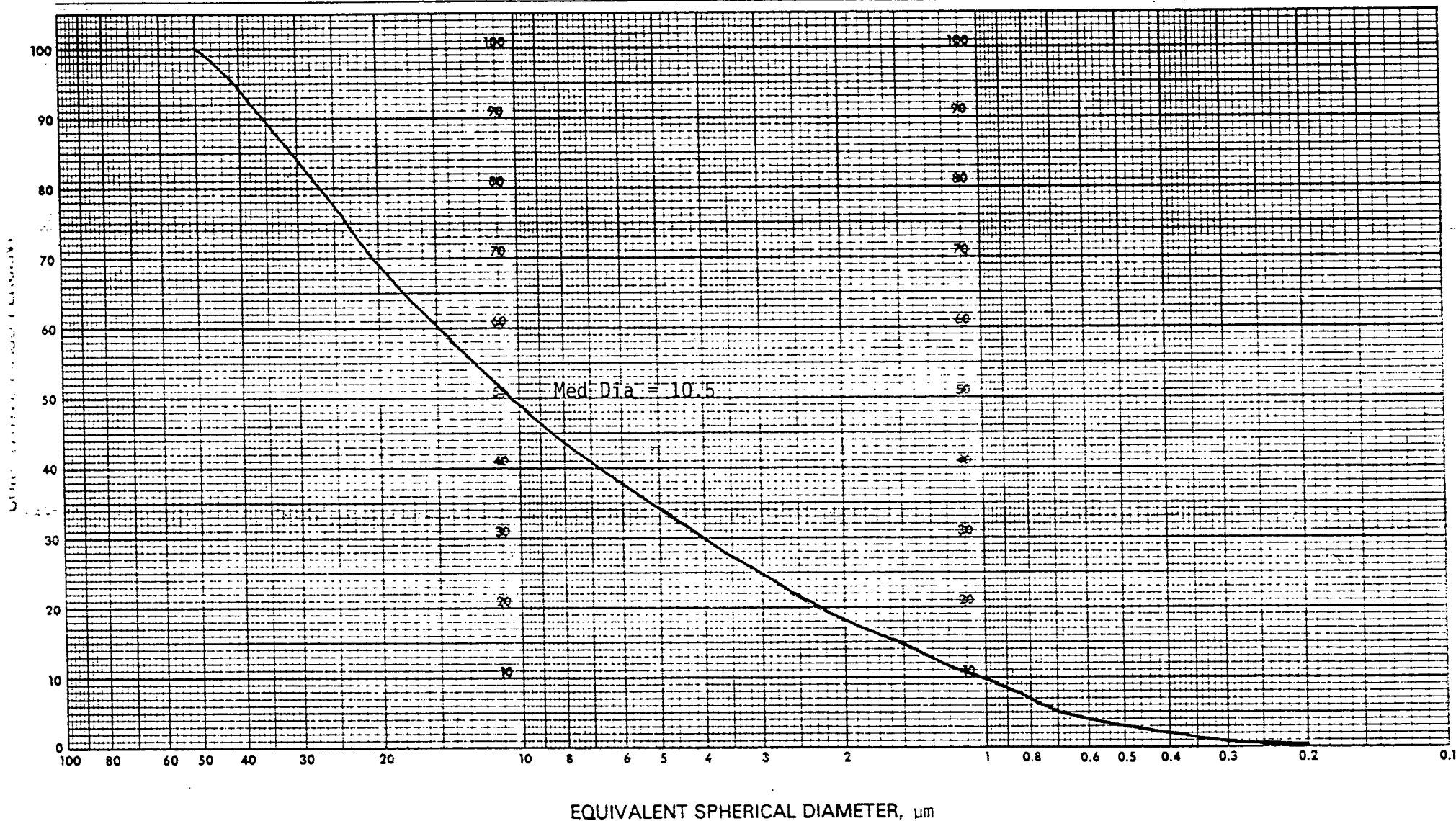
Density 2.75 g/cc LIQUID Water Density 9944 g/cc Viscosity 7371 cp

BY CLP

Preparation 5 gms sample triturated with 5 mls 4% Calgon, 2% Daxad solution

TEMPERATURE 33 °C

RATE 483 START DIA. 50 μm



CYPRUS

ITA-Alfaro000188

Form 500/42701

BHC-2 TALC
Project No. 91-308

Plate I
SEM/EDS ANALYSES

Cyprus Technical Center
September 23, 1991
Michael Clark



SEM/EDS chemistry:

Na ₂ O	=	1.5%
MgO	=	11.5
Al ₂ O ₃	=	8.6
SiO ₂	=	47.3
K ₂ O	=	1.1
CaO	=	10.4
TiO ₂	=	1.5
MnO	=	0.6
Fe ₂ O ₃	=	17.4



SEM/EDS chemistry:

Na ₂ O	=	1.6%
MgO	=	11.7
Al ₂ O ₃	=	12.0
SiO ₂	=	46.0
K ₂ O	=	0.8
CaO	=	10.7
TiO ₂	=	1.3
MnO	=	0.4
Fe ₂ O ₃	=	15.4

CYPRUS TECHNICAL CENTER--SERVICE REQUEST

REQUESTED BY: TOM LANDELS
Western Source

PROJECT NO.: 91-108
 ANALYST(S): MLC

DATE SUBMITTED: 9-6-91

C Hunter Pugh

Nature of Project: ☐ Customer Complaint ☐ Competitive Product Evaluation
☐ Customer Assistance ☒ Other NEW PROJECT
☐ Intralab Project

MARKET AREA: CERAMICS, CUSTOMER: WESTERN SOURCE

PRIORITY: ☐ Urgent, ☐ 1 week, ☒ 2 weeks, ☐ other _____

DESCRIPTION OF PROJECT

Background: WESTERN SOURCE STEAWHITE 200 IS
BEING MILLED FROM BEAVERHEAD SCREENINGS/TAILINGS

Purpose: THIS PRODUCT SHOULD SUPPLANT PREVIOUS WESTERN
SOURCE PRODUCTS IN CERAMICS WHERE A CESSER
LOI IS NEEDED

Samples: Number of 1, Sample Description 2 QUANT CANS OF THE
SAME MATERIAL

ANALYSES REQUIRED

GENERAL TESTING

- ☒ XRD mineralogy
- ☒ 1000C LOI
- ☐ 400C Ash
- ☐ 105C Moisture
- ☒ XRD/PLM Asbestos
- ☐ PLM Qualitative
- ☐ SEM EDS Chemistry
- ☒ SEM Photomicrography
- ☐ Major Element Chemistry
- ☐ Trace Element Chemistry
- ☐ FTIR Spectrometry
- ☐ Acid Solubles
- ☐ Acid Insolubles
- ☐ pH

- ☒ Sedigraph PSD
- ☒ Granulometre PSD
- ☒ Dry Sieve Analyses
 sizes: +200, +325
- ☐ Wet Sieve Analyses
 sizes: _____
- ☒ Hegman
- ☒ Oil Absorption
- ☒ Loose Bulk Density
- ☐ Tapped Bulk Density
- ☐ Pynometer Density
- ☒ Surface Area

- ☒ Technidyne GEB
- ☒ Hunter Color
- ☒ Lab
- ☒ XYZ
- ☐ Brightness

OTHER

COMMENTS: MIGHT BE A GOOD PRODUCT FOR PLASTICS.

DISPOSITION OF SAMPLE: ☐ Return, ☒ Retain, ☐ Dispose.

COPY REPORT TO:

_____, _____, _____, _____, _____,
 _____, _____, _____, _____, _____, Files

ITA-Alfaro000190

DATE: 7-19-91

ANALYST: MLC

XRD MINERALOGIES

SAMPLE ID Western SOURCE STEARNSITE 200 / PROJECT 91-308

REF No. 91308L

	BKG	PEAK	NET	%	2θ
Talc				78	
CHLORITE	22	131	109	5	12.46
QUARTZ				1.6	
MICA					
DOLomite	41	601	560	5	
MAGNESITE	41	1154	1113	10	
CALCITE					
HORNBLende				0.1	
AMPHIBOLAE					
SERPENTINE					

* SHORT SCAN

LOI 12.1 % GEB

PLM

XRD SYSTEM

SCAN CONDITIONS:

MICROSCOPIC ANALYSES FOR AMPHIBOLES AND CHRYSOTILE

SAMPLE DESCRIPTION WESTERN SOURCE STEARHITE 200 REF. No. 91308
from BVH TAILINGS Product Certification _____
 DATE 9/13/91 ANALYST(S) MLC Other Proj. 91-708

POLARIZED LIGHT MICROSCOPY (photos, if any, are on other side)

SAMPLE PREPARATION

Sample subjected to 10%-HCL treatment _____ NO _____ YES
 Heated NO / _____ YES for _____ min. @ 70C. _____ % recovered

Approximately 0.2 grams of sample suspended in 15ml of 70% IPA. 6 drops of sample are placed with a disposable transfer pipet onto labeled glass slide and allowed to dry in air at room temperature. 1 drop of appropriate Cargille liquid is applied to the dried sample and covered with a coverslip.

ANALYTICAL PROCEDURE

The preparation is examined with polarized light microscopy with dispersion staining and, as needed, phase contrast techniques. Each prep is traversed at least 5 times for the approximate length of the cover slip each time. Amphibole grains, if present, are noted. Amphibole grains are counted if amphibole population is less than approximately 0.5%

ANALYSES FOR AMPHIBOLE

TRAVERSE	# OF AMPHIBOLE GRAINS
1	0
2	0
3	0
4	0
5	0
_____	_____
_____	_____

☒ AMPHIBOLE NOT DETECTED
☐ AMPHIBOLE DETECTED
 _____ % Amphibole
 (corroborated by XRD)
 Dispersion Staining colors
 N-parallel _____
 N-perpend. _____
 Extinction: _____
 Other: _____

COMMENTS

ANALYSES FOR CHRYSOTILE

TRAVERSE	# OF CHRYSOTILE GRAINS
1	_____
2	_____
3	_____
4	_____
5	_____
_____	_____
_____	_____

☐ CHRYSOTILE NOT DETECTED
☐ CHRYSOTILE DETECTED
 _____ % Chrysotile (approx)
 Dispersion Staining colors
 N-parallel _____
 N-perpend. _____
 Extinction: _____
 Other: _____

COMMENTS

ITA-Alfaro000192

MICROSCOPIC ANALYSES FOR AMPHIBOLES AND CHRYSOTILE

SAMPLE DESCRIPTION Western Source Steatite 200 REF. No. 91308
from BVH TAILINGS Product Certification _____
 DATE 9-20-91 ANALYST(S) MLC Other Proj. 91-308

POLARIZED LIGHT MICROSCOPY (photos, if any, are on other side)

SAMPLE PREPARATION
 Sample subjected to 10%-HCL treatment ☒ NO ☐ YES
 Heated ☐ NO / ☐ YES for _____ min. @ 70C. _____ % recovered

Approximately 0.2 grams of sample suspended in 15ml of 70% IPA. 6 drops of sample are placed with a disposable transfer pipet onto labeled glass slide and allowed to dry in air at room temperature. 1 drop of appropriate Cargille liquid is applied to the dried sample and covered with a coverslip.

ANALYTICAL PROCEDURE
 The preparation is examined with polarized light microscopy with dispersion staining and, as needed, phase contrast techniques. Each prep is traversed at least 5 times for the approximate length of the cover slip each time. Amphibole grains, if present, are noted. Amphibole grains are counted if amphibole population is less than approximately 0.5%

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SLIDE 1

☒ **ANALYSES FOR AMPHIBOLE**

TRAVERSE	# OF AMPHIBOLE GRAINS
1	<u>0</u>
2	<u>0</u>
3	<u>0</u>
4	<u>0</u>
5	<u>0</u>
_____	_____
_____	_____

☒ AMPHIBOLE NOT DETECTED
☐ AMPHIBOLE DETECTED
 _____ % Amphibole
 (corroborated by XRD)
 Dispersion Staining colors
 N-parallel _____
 N-perpend. _____
 Extinction: _____
 Other: _____

COMMENTS

 =====

ANALYSES FOR CHRYSOTILE

TRAVERSE	# OF CHRYSOTILE GRAINS
1	_____
2	_____
3	_____
4	_____
5	_____
_____	_____
_____	_____

☐ CHRYSOTILE NOT DETECTED
☐ CHRYSOTILE DETECTED
 _____ % Chrysotile (approx)
 Dispersion Staining colors
 N-parallel _____
 N-perpend. _____
 Extinction: _____
 Other: _____

COMMENTS

ITA-Alfaro000193

MICROSCOPIC ANALYSES FOR AMPHIBOLES AND CHRYSOTILE

SAMPLE DESCRIPTION Western Slope Steatite 200 REF. No. 91708
from BVH Tailings Product Certification _____
 Other Proj. 91-708
 DATE 9-20-91 ANALYST(S) MLC

POLARIZED LIGHT MICROSCOPY (photos, if any, are on other side)

SAMPLE PREPARATION

Sample subjected to 10%-HCL treatment ☒ NO ☐ YES
 Heated ☐ NO / ☐ YES for _____ min. @ 70C. _____ % recovered

Approximately 0.2 grams of sample suspended in 15ml of 70% IPA. 6 drops of sample are placed with a disposable transfer pipet onto labeled glass slide and allowed to dry in air at room temperature. 1 drop of appropriate Cargille liquid is applied to the dried sample and covered with a coverslip.

ANALYTICAL PROCEDURE

The preparation is examined with polarized light microscopy with dispersion staining and, as needed, phase contrast techniques. Each prep is traversed at least 5 times for the approximate length of the cover slip each time. Amphibole grains, if present, are noted. Amphibole grains are counted if amphibole population is less than approximately 0.5%

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(Slide #2)

☒ **ANALYSES FOR AMPHIBOLE**

TRAVERSE	# OF AMPHIBOLE GRAINS
1	1
2	0
3	0
4	0
5	0
_____	_____
_____	_____

☐ AMPHIBOLE NOT DETECTED
☐ AMPHIBOLE DETECTED
 _____ % Amphibole
 (corroborated by XRD)
 Dispersion Staining colors
 N-parallel _____
 N-perpend. _____
 Extinction: _____
 Other: _____

COMMENTS

ACTINOLITE: 1 VERY LARGE GRAIN -- REFER TO
PHOTOMICROGRAPH

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ANALYSES FOR CHRYSOTILE

TRAVERSE	# OF CHRYSOTILE GRAINS
1	_____
2	_____
3	_____
4	_____
5	_____
_____	_____
_____	_____

☐ CHRYSOTILE NOT DETECTED
☐ CHRYSOTILE DETECTED
 _____ % Chrysotile (approx)
 Dispersion Staining colors
 N-parallel _____
 N-perpend. _____
 Extinction: _____
 Other: _____

COMMENTS

ITA-Alfaro000194

MICROSCOPIC ANALYSES FOR AMPHIBOLES AND CHRYSOTILE

SAMPLE DESCRIPTION Western Source STEARHITE 200 REF. No. 91708
from IVH TAILINGS Product Certification _____
 DATE 4-20-91 ANALYST(S) MLC Other Proj. 91-708

POLARIZED LIGHT MICROSCOPY (photos, if any, are on other side)

SAMPLE PREPARATION

Sample subjected to 10%-HCL treatment ☒ NO ☐ YES
 Heated ☐ NO / ☐ YES for _____ min. @ 70C. _____ % recovered

Approximately 0.2 grams of sample suspended in 15ml of 70% IPA. 6 drops of sample are placed with a disposable transfer pipet onto labeled glass slide and allowed to dry in air at room temperature. 1 drop of appropriate Cargille liquid is applied to the dried sample and covered with a coverslip.

ANALYTICAL PROCEDURE

The preparation is examined with polarized light microscopy with dispersion staining and, as needed, phase contrast techniques. Each prep is traversed at least 5 times for the approximate length of the cover slip each time. Amphibole grains, if present, are noted. Amphibole grains are counted if amphibole population is less than approximately 0.5%

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PR SLIDE # 3

☒ **ANALYSES FOR AMPHIBOLE**

TRAVERSE	# OF AMPHIBOLE GRAINS
1	<u>0</u>
2	<u>0</u>
3	<u>0</u>
4	<u>0</u>
5	<u>0</u>
6	<u>1</u>
7	<u>0</u>

☐ AMPHIBOLE NOT DETECTED
☐ AMPHIBOLE DETECTED
 _____ % Amphibole
 (corroborated by XRD)
 Dispersion Staining colors
 N-parallel _____
 N-perpend. _____
 Extinction: _____
 Other: _____

COMMENTS

=====

ANALYSES FOR CHRYSOTILE

TRAVERSE	# OF CHRYSOTILE GRAINS
1	_____
2	_____
3	_____
4	_____
5	_____
_____	_____
_____	_____

☐ CHRYSOTILE NOT DETECTED
☐ CHRYSOTILE DETECTED
 _____ % Chrysotile (approx)
 Dispersion Staining colors
 N-parallel _____
 N-perpend. _____
 Extinction: _____
 Other: _____

COMMENTS

MICROSCOPIC ANALYSES FOR AMPHIBOLES AND CHRYSOTILE

SAMPLE DESCRIPTION _____

REF. No. _____

Product Certification _____

Other Proj. _____

DATE _____

ANALYST(S) _____

POLARIZED LIGHT MICROSCOPY (photos, if any, are on other side)

SAMPLE PREPARATION

Sample subjected to 10%-HCL treatment _____ NO _____ YES

Heated _____ NO / _____ YES for _____ min. @ 70C. _____ % recovered

Approximately 0.2 grams of sample suspended in 15ml of 70% IPA. 6 drops of sample are placed with a disposable transfer pipet onto labeled glass slide and allowed to dry in air at room temperature. 1 drop of appropriate Cargille liquid is applied to the dried sample and covered with a coverslip.

ANALYTICAL PROCEDURE

The preparation is examined with polarized light microscopy with dispersion staining and, as needed, phase contrast techniques. Each prep is traversed at least 5 times for the approximate length of the cover slip each time. Amphibole grains, if present, are noted. Amphibole grains are counted if amphibole population is less than approximately 0.5%

ANALYSES FOR AMPHIBOLE

TRAVERSE # OF AMPHIBOLE GRAINS

1	0
2	1
3	1111
4	0
5	1111
6	1111
7	1111

_____ AMPHIBOLE NOT DETECTED

_____ AMPHIBOLE DETECTED

_____ % Amphibole
(corroborated by XRD)

Dispersion Staining colors

N-parallel YELLOW

N-perpend. YELLOW

Extinction: OBlique

Other: _____

COMMENTS

33/5 53/24 21/8 51/21 30/20 65/20 31/15
30/10 25/7 30/9 21/8 26/11 , , ,

Maybe HUMBLING & D.S. colors do NOT significantly from H to L

ANALYSES FOR CHRYSOTILE

TRAVERSE # OF CHRYSOTILE GRAINS

1	_____
2	_____
3	_____
4	_____
5	_____
_____	_____
_____	_____

_____ CHRYSOTILE NOT DETECTED

_____ CHRYSOTILE DETECTED

_____ % Chrysotile (approx)

Dispersion Staining colors

N-parallel _____

N-perpend. _____

Extinction: _____

Other: _____

COMMENTS

ITA-Alfaro000196

MICROSCOPIC ANALYSES FOR AMPHIBOLES AND CHRYSOTILE

SAMPLE DESCRIPTION W. SOURCE FEA WHITE 200
FROM RVH TAILINGS

REF. No. 91308
Product Certification _____
Other Proj. 91-708

DATE 9/24/91 ANALYST(S) MLC

POLARIZED LIGHT MICROSCOPY (photos, if any, are on other side)

SAMPLE PREPARATION

Sample subjected to 10%-HCL treatment _____ NO ☒ YES
Heated _____ NO / ☒ YES for 90 min. @ 70C. _____ % recovered

Approximately 0.2 grams of sample suspended in 15ml of 70% IPA. 6 drops of sample are placed with a disposable transfer pipet onto labeled glass slide and allowed to dry in air at room temperature. 1 drop of appropriate Cargille liquid is applied to the dried sample and covered with a coverslip.

ANALYTICAL PROCEDURE

The preparation is examined with polarized light microscopy with dispersion staining and, as needed, phase contrast techniques. Each prep is traversed at least 5 times for the approximate length of the cover slip each time. Amphibole grains, if present, are noted. Amphibole grains are counted if amphibole population is less than approximately 0.5%

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☒ **ANALYSES FOR AMPHIBOLE**

Slide 1

TRAVERSE	# OF AMPHIBOLE GRAINS
1	111
2	111
3	0
4	1
5	11
_____	_____
_____	_____

____ AMPHIBOLE NOT DETECTED
☒ AMPHIBOLE DETECTED
_____ % Amphibole
_____ (corroborated by XRD)
Dispersion Staining colors
N-parallel _____
N-perpend. _____
Extinction: _____
Other: _____

COMMENTS

Aspect Ratios 41/9 , 2/2 , 41/22 , 48/40 , 37/22 , 42/16 ,
ACTINOLITE

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ANALYSES FOR CHRYSOTILE

TRAVERSE	# OF CHRYSOTILE GRAINS
1	_____
2	_____
3	_____
4	_____
5	_____
_____	_____
_____	_____

____ CHRYSOTILE NOT DETECTED
____ CHRYSOTILE DETECTED
____ % Chrysotile (approx)
Dispersion Staining colors
N-parallel _____
N-perpend. _____
Extinction: _____
Other: _____

COMMENTS

ITA-Alfaro000197