

5/13/74



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EXAMINATION OF TALC ORES AND
PRODUCTS FROM THE
ARGONAUT ORE BODY

Date: 9 May 1974

MA Number: 3295

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PLAINTIFF'S
EXHIBIT
CAM-303

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Examination of Talc Ores and Products from the Argonaut Ore Body

I. INTRODUCTION

In connection with the development of a new ore body, the Argonaut Ore Body, Windsor Minerals, Inc. have requested Walter C. McCrone Associates, Inc. to carry out an extensive examination of 6 samples of talc ores and talc products produced from these ores using the methods of light microscopy and transmission electron microscopy. This report records the results of these examinations.

II. MATERIALS AND METHODS OF CONDUCTING TESTS

Six samples were received identified as follows:

AR-X-66-10 ore
AR-X-66-10 product

AR-X-66-14 ore
AR-X-66-14 product

AR-X-66-22 ore
AR-X-66-22 product

For light microscopical examination the samples were prepared by mounting a small portion of the talc powder in Aroclor 5442 on a glass slide and were examined on a Zeiss G. F. L. polarizing microscope at magnifications in the range of 50X to 400X. Photomicrographs were taken of the samples showing representative areas at magnifications of 55X and 140X on Kodachrome A color film, using slightly uncrossed polars (12°). Accompanying this report are prints prepared from these color transparencies at magnifications of 165X and 420X.

For examination by transmission electron microscopy, samples were prepared as follows: Approximately 0.1 g of powder was suspended in about 25 ml of isopropyl alcohol, shaken manually, then held in an ultrasonerater

for a few minutes. During this time some of the larger flakes settle toward the bottom of the tube. The remainder of the suspension was immediately placed on a standard 3 mm diameter transmission electron microscope grid which had previously been coated with a carbon support film and which was supported on a glass slide. This glass slide was then transferred to a hot plate where the isopropanol carrier was evaporated and the dried specimen grid was examined in a JEM-200 transmission electron microscope at 150 kV. A considerable number of grid squares was examined for each sample. Representative electron micrographs were taken and prints are included with this report.

III. RESULTS

Sample AR-X-66-10 ore — Light microscopical examination showed this ore sample to consist of approximately 50% talc and 50% carbonate with the talc plates showing variable thicknesses. Although the plates themselves were mostly quite flat, some crumpled plates were observed. The fibrous content, which consisted of talc rolls and shards, constituted about 2-5% of the total sample but no asbestos minerals were observed. Electron microscopical examination showed the talc as platy material with the blocky carbonate phase evident. No asbestos minerals were observed by electron microscopy.

Sample AR-X-66-10 product — Light microscopical examination of this product showed the talc present mainly as flat plates with no apparent increase in plate deformation as a result of the beneficiation process. The fibrous content, however, appeared slightly higher than in the ore sample although, again, this fibrous content consisted entirely of talc rolls and shards with no asbestos minerals observed.

Electron microscopical examination confirmed that the sample consisted mainly of thin platy material of all sizes with comparatively few fibers in evidence. No asbestos minerals were detected in this sample.

Sample AR-X-66-14 ore — Light microscopical examination indicated quite a high carbonate content for this sample and also a large amount of very small talc plates less than about 10-15 μm across. No asbestos minerals were detected by light microscopical examination.

Electron microscopical examination confirmed the wide range of particle sizes observed for the talc plates in this sample. Most of the carbonate phase appeared as blocky material which was too thick to produce electron diffraction patterns. Nine small chrysotile fibers were found in this sample, these fibers all had lengths of less than $1/3 \mu\text{m}$. No asbestiform amphiboles were observed.

Sample AR-X-66-14 product — Light microscopical examination indicated that this was a very uniform product as regards both thickness of the plates and also the diameter of the talc plates. The greatest percentage by weight fell in the size range approximately 10-100 μm with the very small fraction considerably reduced by the beneficiation process. The fibrous fraction, too, showed a substantial reduction over that which had been observed in the ore. Again, no asbestos minerals were observed by light microscopy.

Electron microscopical examination showed 3 fibers which bore an exact resemblance to chrysotile but no conclusive electron diffraction pattern could be obtained from them. In addition, 3 other small chrysotile fibers were found which did give diffraction patterns. No asbestiform amphiboles were observed.

Sample AR-X-66-22 ore — Light microscopical examination showed this material to be extremely similar to the previous sample except that the fibrous fraction observed in AR-X-66-22 was very low, less than 1% of the total sample. No asbestos minerals were observed by light microscopy.

Electron microscopical examination confirmed that the talc was predominately platy with ribbons of talc and rolled talc also present. No asbestos minerals were detected by electron microscopy.

Sample AR-X-66-22 product — Just as the AR-X-66-22 ore, bore very close resemblance to the AR-X-66-14 ore, so the product bore a very close resemblance to the -14 product. There were not very many small plates present nor were there very many fibers. The product looked extremely uniform both in size and thickness of its plates. A few carbonate grains were observed which had survived the beneficiation process. No asbestos minerals were detected by light microscopy.

Electron microscopical examination showed the sample to consist almost entirely of platy talc, although again some blocky grains, too thick for diffraction but believed to be carbonate, were observed. The fibrous fraction in this sample was lower than in most of the other samples and consisted entirely of talc rolls and shards. No asbestos minerals were detected.

IV. SUMMARY

The results of an extensive light and electron microscopical examination of 3 Argonaut talc ore samples and 3 product samples produced from these ores show that the Argonaut ore body in general produces a good quality platy talc with low content of rolled talc "fibers". Only the AR-X-66-14 ore and product showed any evidence of asbestos contamination which is estimated at less than 1-2 ppm for the ore and less than 1/2-1 ppm for the resulting product. The other 2 ores examined, AR-X-66-10 and AR-X-66-22 and their resulting products were free of any asbestos minerals. The product from AR-X-66-22 was an especially high quality product with a very low total fiber content and a very uniform talc thickness.