

Bob French - Adventurer:

For nearly 30 years, Bob French, President, Principle, and Project Manager of EHS Alaska in Anchorage, has been at the forefront of industrial hygiene and built-environment projects in Alaska. Mr. French has experience as a mechanical design engineer specializing in hazards identification, hazards abatement design, and indoor air quality.

Adventure for Bob includes professional activities north at Prudhoe Bay and as a consultant and engineer for the Friends of Nike Site Summit (FONSS) in conjunction with the US Army and State and Federal Historical Building Commissions.

Bob's other adventures include open ocean kayaking, hiking in all kinds of Alaskan weather (somewhere I have an image of Bob at an old asbestos pit with a large wolf paw print in the snow), and adventures throughout the Rocky Mountain region.



Bob is an active member of ASTM D2207 on Asbestos Sampling and Analysis and a frequent contributor and presenter at conferences and symposium.



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Grand Canyon Asbestos Adventure

A few months ago, Bob French of EHS Alaska ventured down the Colorado River through the Grand Canyon. Bob, as a member of the Mineralogical Society of America, and always interested in the geology when traveling (ask him about the gravel parking lot in Vermont), collected three rock specimens for characterization. Always fun for the lab!

Geologic Source

The Chain of Custody listed the location as "Stone Creek, above 1st waterfall, 36.347325 N, -112.451580 W". These coordinates are consistent with known geologic sources of asbestos mineral from Coconino County, Arizona, along the Grand Canyon near the Kaibab National Forest. Micro-photography with PLM and subsequent TEM/EDS analysis document the findings.

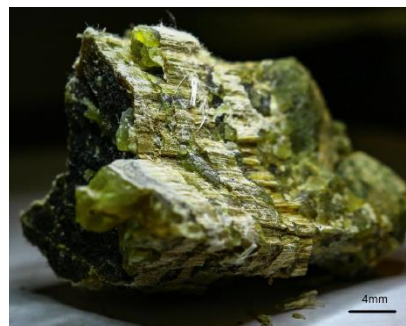


Figure 1: Rock 1, green olive colored with obvious 1-12mm long fibrous light green to white mineral veins.

Stereoscopic observation confirmed prior notes on the rock samples' general characteristics. They all bear asbestiform veins which blend into the soft, waxy green/yellow rock. The host rock has a massive habit with individual crystals that cannot be discerned.

Prior to analysis by PLM (listed below) it was assumed that these samples were likely going to be an amphibole variety of asbestos, due to the apparent straightness of the fibers observed.

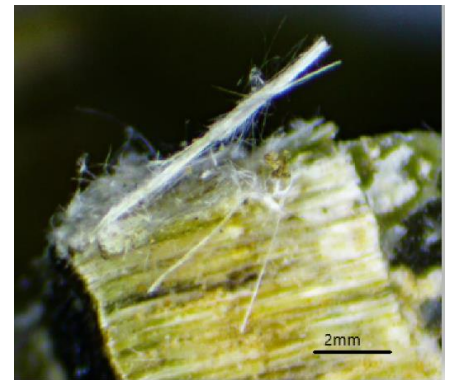


Figure 2: Rock 1, close-up of fibrous veins.



Figure 3: Rock 3, close-up of fibrous veins

The following page will give some examples of the optical light microscopy analysis, the geological source information, and some interpretation of USGS sources.

Context:

Will Riffe, Senior PLM Analyst and Geologic and Mineral Investigator at iATL managed and reported on this investigation.

Basic information was compiled using the Mineral Resource Data System (MRDS), and the United States Geologic Survey (USGS). Both organizations have compiled useful mapping and technical information regarding geologic units. The satellite imagery with geologic overlay has been provided on the previous page.

The local geology is mostly rock of marine deposition, with areas along the Colorado river which reveal igneous and metamorphic basement rock. Two existing mines are visible, both have the name "Bass" attached to them, and are certainly related to the same prospector or company. The higher of the two "Bass Asbestos" is also higher in reported grade (grade B quality) despite being located in a primarily sedimentary host rock.

Given the distance between these mining locations - 6 km and hundreds of meters in elevation—and considerable difference in host rock, it is likely that these asbestos deposits are the results of metasomatism; the alteration of mafic basement rock (Early Proterozoic) by hydrothermal fluid transport during an island collision with the North American continent.

In other words, there are probably many occurrences of asbestos in that area which have simply not been plotted out because they were not economically viable for someone's purpose at the time.

Ask your iATL customer service representative about sample submittals for mineral characterization.

Figure 4: Gross image of Rock 3, note yellowish color and platy/blocky assemblages.



Analysis

iATL employed one of its Olympus BX41 Polarized Light Microscopes with WH 10x Ocular Lens, and Olympus WH 10x Objective Lenses with Olympus Plan C 10x, Olympus Plan C N 20x with a McCrone 10x CSDS Objective for the analysis.

PLM analysis was primarily performed by preparing fiber picks of the rock. Initial preps were set in 1.680 RI liquid (RIL), but it quickly became obvious that the RI of the fibers were well below 1.680, and certain aspects of morphology, such as kinks and wavy fibers suggested switching to 1.550 RIL.

The fibers most closely resemble chrysotile, with some unusual relief effects – suspected as locality specific cations that might suggest a transitional serpentine or related mineral such as picrolite. TEM analysis will be published in the following Next Level edition.



Figure 5: Rock 1 fibers 1.550 RI liquid, ~100x Cross-Polarized with 530nm waveplate.

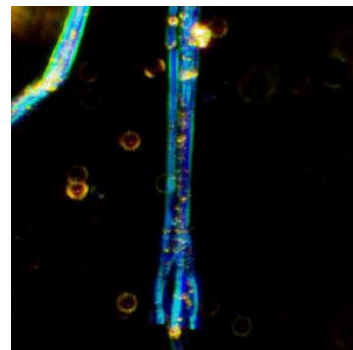


Figure 5: Rock 1 fibers in 1.550 RI liquid perpendicular orientated, chrysotile ~100x CSDS lens with plane polarized light - no 530nm waveplate. RI is estimated to be 1.548.

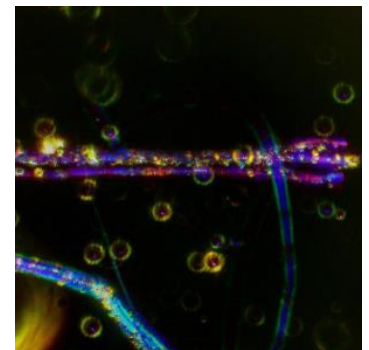


Figure 7: Rock 1 fibers from Figure 6 in 1.550 RI liquid, horizontally orientated, chrysotile ~100x CSDS lens plane polarized light no 530nm waveplate. RI is estimated to be 1.554.

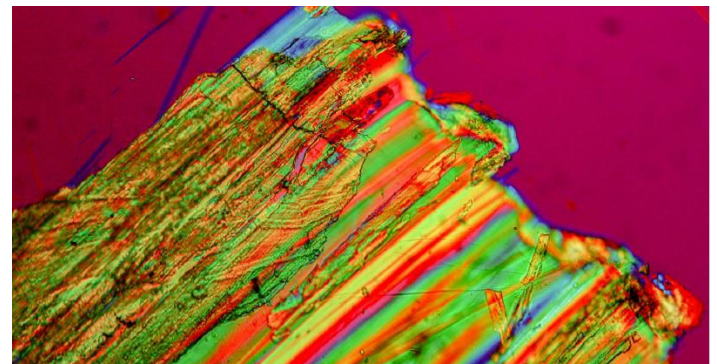


Figure 8: Rock 3 fibers in 1.550 RI liquid, ~100x Cross-Polarized with 530nm waveplate. The focus is on the portion of suspected chrysotile which was connected to the host rock. Broken ends and splintering sections can be seen to be more prismatic or acicular.

Interested parties may request a copy of this research paper – please contact CustomerService@iatl.com.



"Nephrite Ornament," boy on a buffalo, Qing Dynasty, China, by Pascal3012. Licensed under CC BY-SA 3

Mineral Exposure Study

Republished in 2022 after initial literature publication in 2013, Dr. Yang and his colleagues at the Department of Occupational Medicine, Buddhist Tzu Chi General Hospital, Hualien, in Taiwan worked with iATL from 2009-2016. iATL provided a full array of mineral characterization services from XRD, PLM, and TEM (EDS/SAED) on various amphiboles, pyroxenes, and serpentine minerals.

The study is listed as "[Carving of Non-asbestiform Tremolite and the Risk of Lung Cancer: a follow-up Mortality Study in a Historical Nephrite Processing Cohort](#)" (DOI Listing Below). The study looked at the long history of ornamental stone carving industry and the skilled and un-skilled occupational exposures to tremolite and a range of similar polymorphs such as jadeite and nephrite.

Mineral Composition

Nephrite is a variety of the calcium, magnesium, and iron-rich amphibole minerals tremolite or actinolite. The chemical formula for nephrite is $\text{Ca}_2(\text{Mg, Fe})_5\text{Si}_8\text{O}_{22}(\text{OH})_2$. It is one of two different mineral species called jade. The other mineral species known as jade is jadeite, which is a variety of pyroxene.

Like many minerals, swap out some of the cations in slightly different ratios, and things like color, crystalline lattice structure, fibrous growth habit, and toxicity may change. This is why careful laboratory classification was required. The data below and graph above speak for themselves.

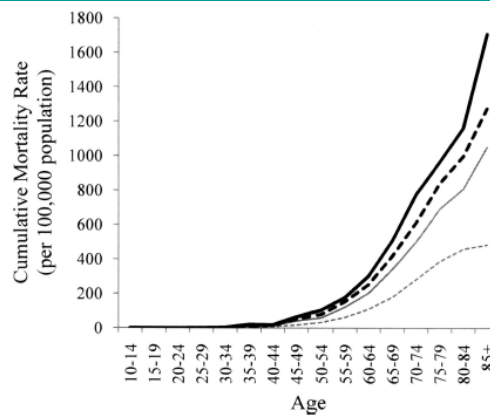


Figure 2 Age-specific cumulative mortality rates from lung cancer in Fengtian and Taiwan. Age-specific curves are shown for four groups: females in Fengtian (bold solid line), females in Taiwan (bold broken line), males in Fengtian (fine solid line) and males in Taiwan (fine broken line).

Size / Shape Breakdown.

Long the domain of geologists, the definitions of mineral designations has drifted to a shared, and often contentious, province of lab professionals, regulators, risk assessors, epidemiologists, and toxicologists. The health risks associated with exposure to non-asbestiform asbestos minerals, including nephrite, are unclear. In 1965 nephrite processing began in the town of Fengtian in Taiwan, and the majority of inhabitants were involved in the industry from 1970 until 1980. The objectives of this study were to examine lung cancer deaths and assess the carcinogenic effects of nephrite carving.

- ▶ Nephrite is a non-asbestiform asbestos mineral composed of microcrystalline tremolite asbestos, so carving will release intact asbestiform tremolite fibers into the air.
- ▶ A significantly increased risk of lung cancer was observed in this study of the inhabitants of Fengtian used as a historical cohort sharing a given exposure due to the carving of nephrite.
- ▶ As the carving of nephrite may increase the risk of lung cancer, appropriate medical monitoring is warranted for workers exposed to similar materials.

Next Level Next Issue...

iATL data and photomicrographs...

EYE ON IT

ASTM Johnson/Rook

Delayed twice by the global pandemic, ASTM International's five-day conference in Vermont will once again be the focal point of all things asbestos when the international audience gathers at the end of July 2022. This year, a transition towards re-naming the conference after long-time ASTM D22 Chairman Dr. Harry Rook. The conference will cover - Medical Research, Exposure and Risk Assessment, Regulatory Perspectives, Analytical Methods, Soils, Talc, NOA, Legal Aspects Analytical QA, Mineralogy and Hazardous Elongate Particles

iATL Customer Resources

Because you asked...

Respirable Crystalline Silica (RCS) pump and ancillary sampling equipment rental availability. Contact CustomerService@iatl.com and ask for a project quote.



Table 2 Asbestos fibre concentrations at a nephrite processing factory analysed by PCM and TEM

Location	Procedure	Sample time (min)	Air volume (L)	Concentration (f/cm ³)			Asbestos type
				PCM	TEM Length ≥ 0.5 μm	TEM Length ≥ 5 μm	
Worker	Cutting	20	60.084	0.44	12.1	1.0	Tremolite, actinolite
	Rough grinding	20	60.084	4.70	24	2.9	Tremolite, actinolite
	Fine grinding	20	60.084	0.18	0.098	0.05	Tremolite
	Polishing	16.1	48.368	<0.059	<0.062	<0.062	None detected
Environment	Ambient air	76	225.963	0.11	2.1	0.34	Tremolite

The samples are grouped by location and procedure. PCM, phase contrast microscopy; TEM, transmission electron microscopy.

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