Integrated Optical, Micro-Raman, and Compositional Analysis of Rock Samples from Former Talc Mines in the Gouverneur Mining District, New York

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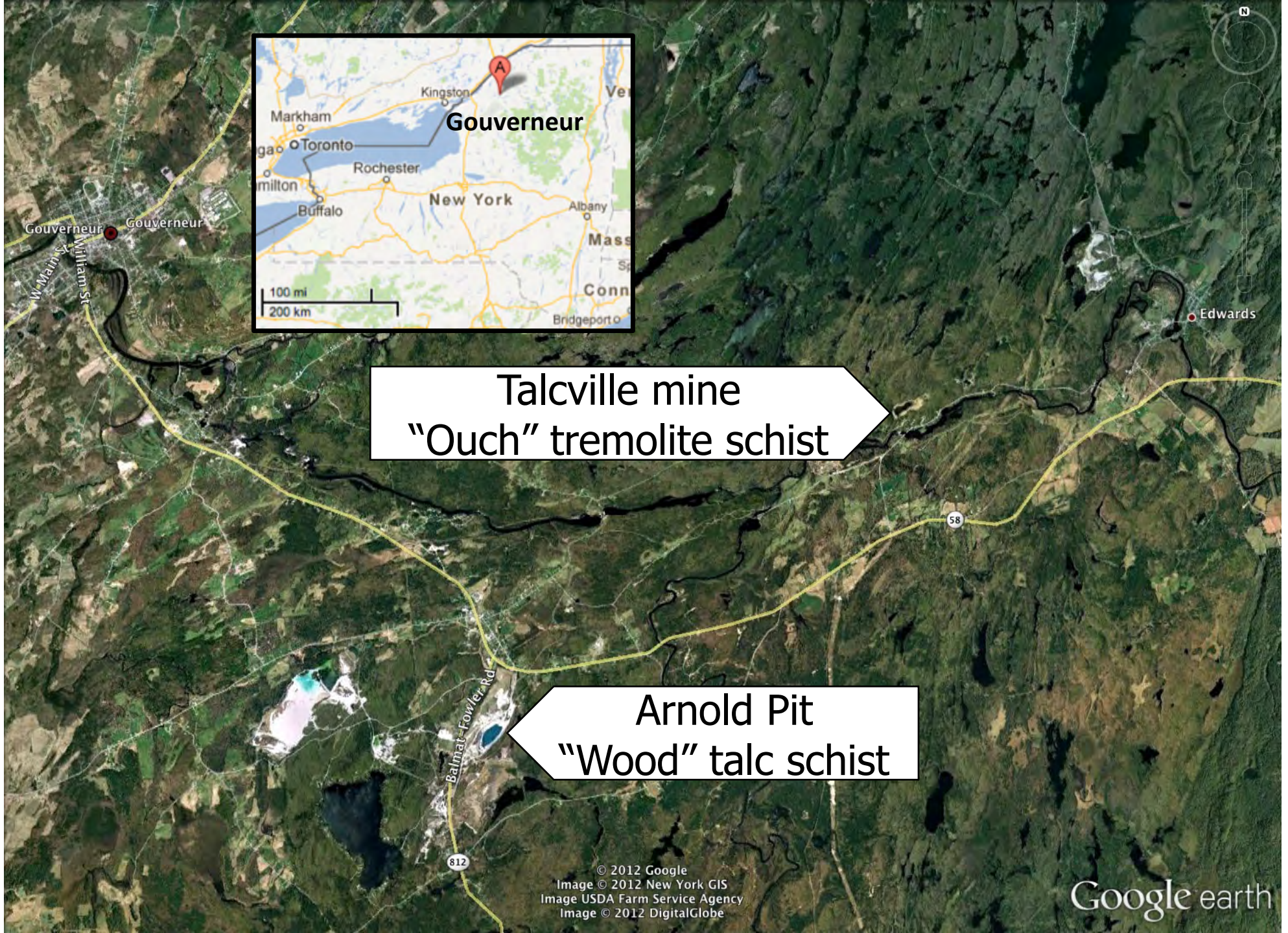
Gouverneur Talc District

- Talc mined since 1948 primarily for fillers in ceramics, paper, and paint.
- Metamorphosed dolomite marbles and quartzites with Ca-Mg silicates.
- Purported asbestos particles found in children’s crayons in 2000.

Project Goals

- Characterize minerals of interest:
  - tremolite $Ca_2Mg_5Si_8O_{22}(OH)_2$ $SiO_2/MgO = 2.4$
  - anthophyllite $Mg_7Si_8O_{22}(OH)_2$ $SiO_2/MgO = 1.7$
  - talc $Mg_3Si_4O_{10}(OH)_2$ $SiO_2/MgO = 2.0$
- Compare electron microprobe analyses with Micro-Raman of the same polished thin section and both methods have been used with similar mineral samples.


Kingston
Markham
Toronto
Rochester
New York
Buffalo
Albany
Gouverneur
100 mi
200 km
Bridgeport
Gouverneur
Gouverneur
W Main St
William St
Edwards
Talcville mine
"Ouch" tremolite schist
58
Balmat-Fowler Rd
Arnold Pit
"Wood" talc schist
812
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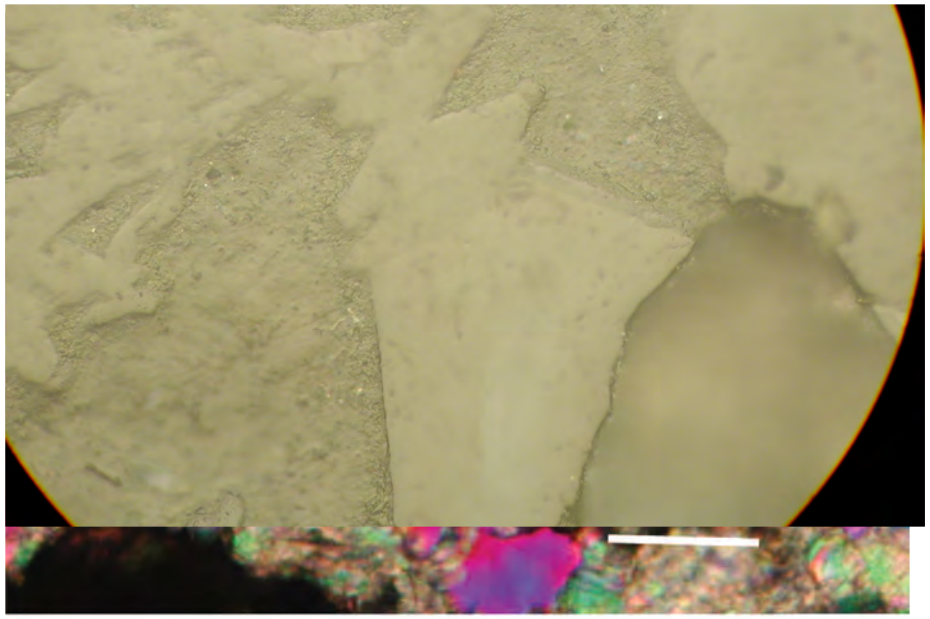
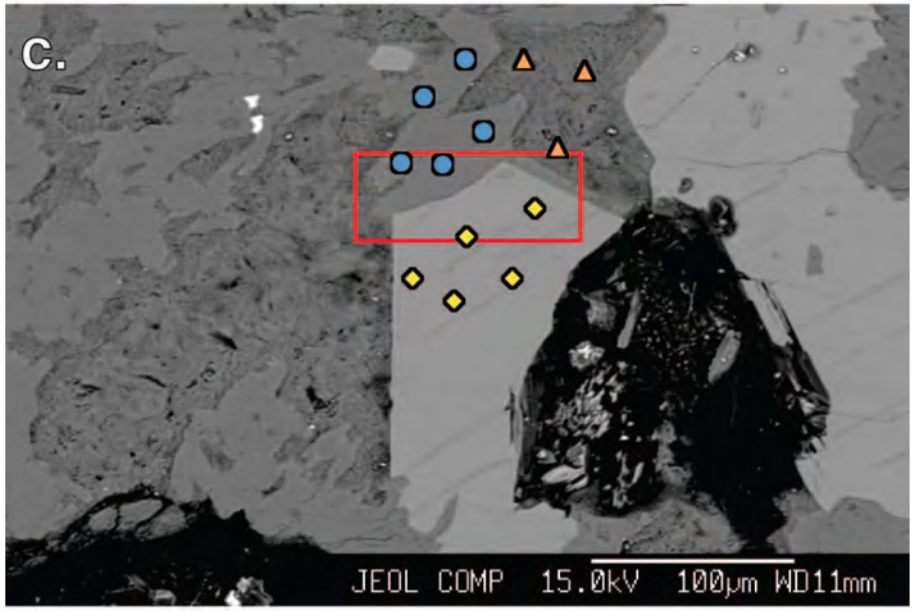
Google earth

"Wood" C1

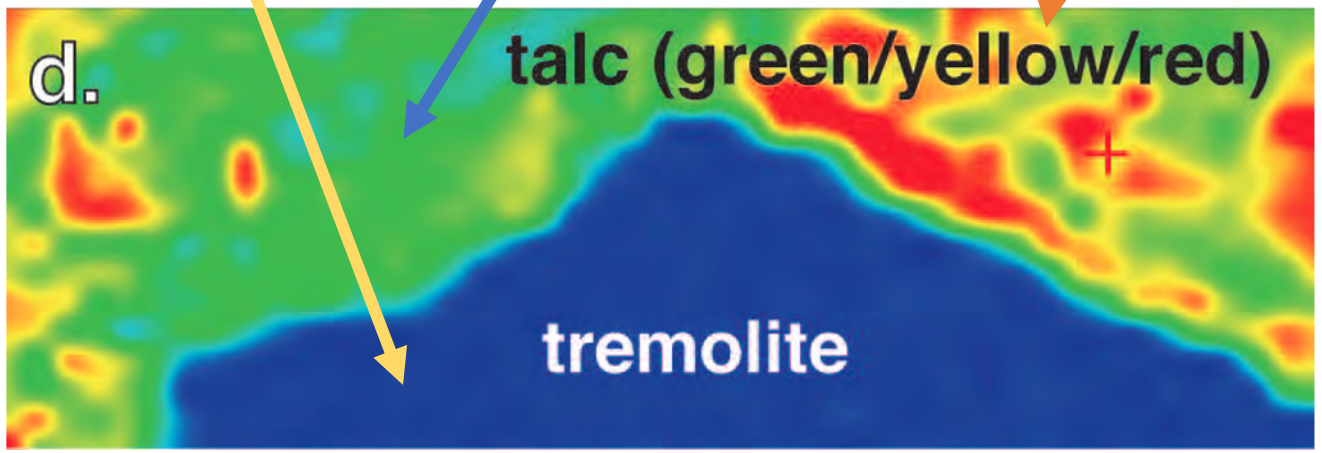




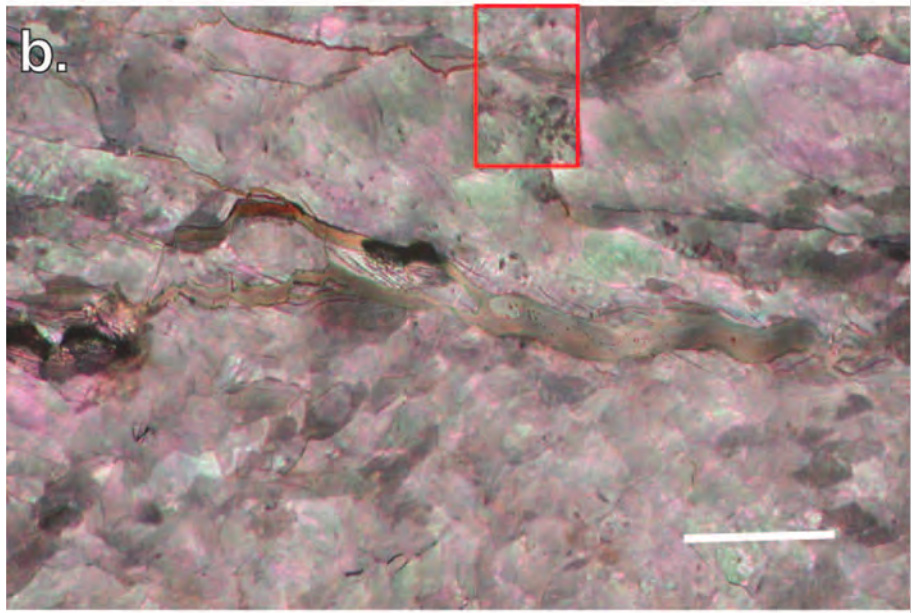
fine-grained talc
SiO_2/MgO 1.96
MnO 0.02; CaO 0.12

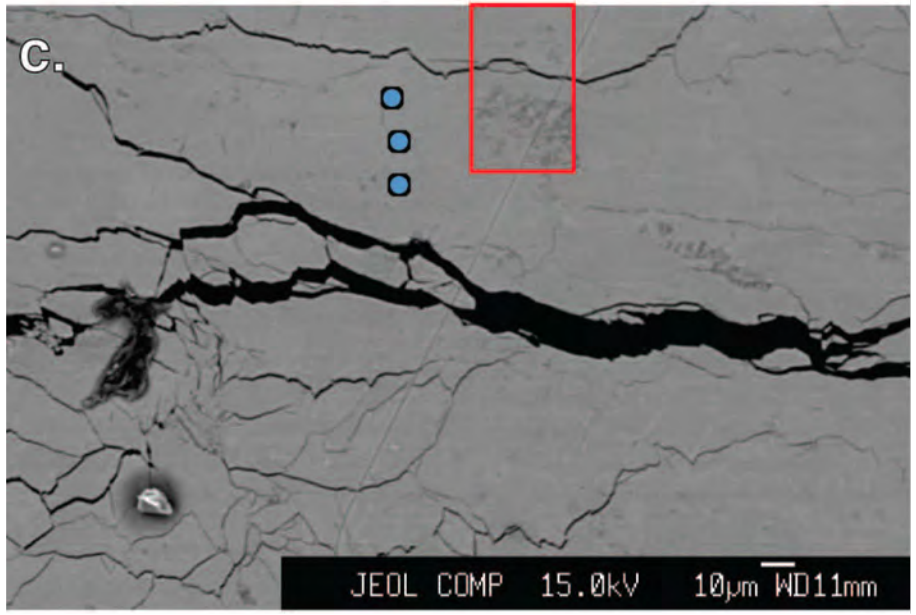
platy talc
SiO_2/MgO 1.80
MnO 0.48; CaO 0.56

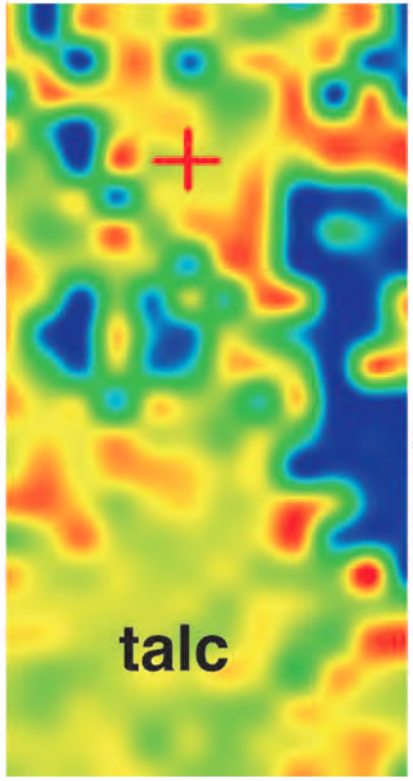
tremolite
SiO_2/MgO 2.25
MnO 0.05



“Wood” C2



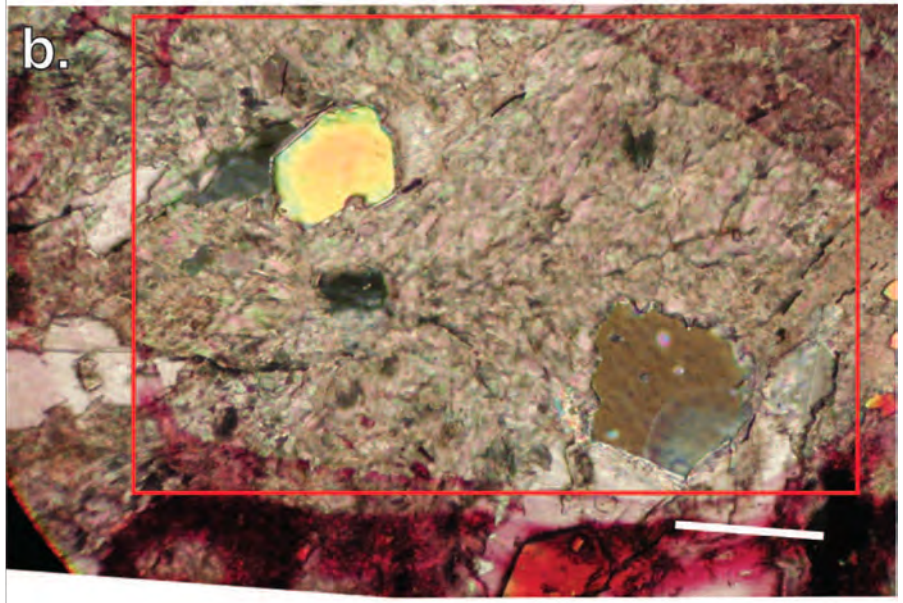


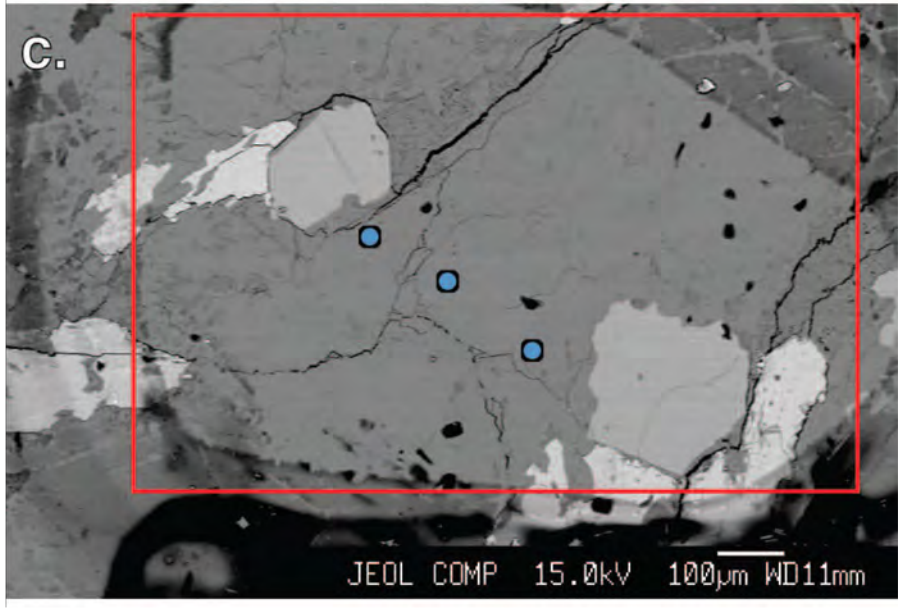


platy talc
SiO_2/MgO 1.82
MnO 0.50; CaO 0.56

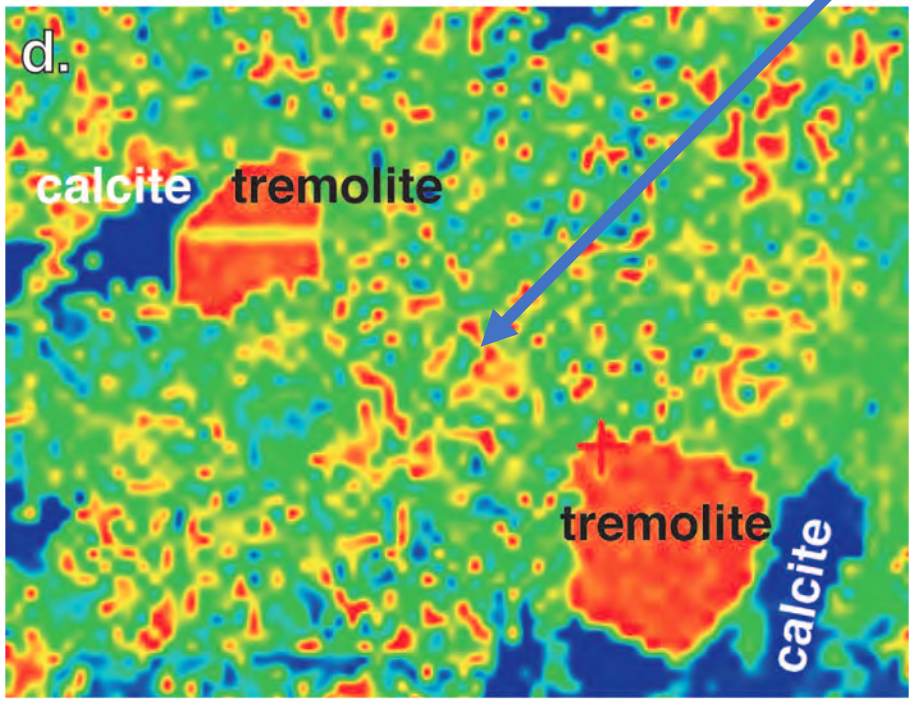
talc
(w/ poor polish)

"Wood" C3

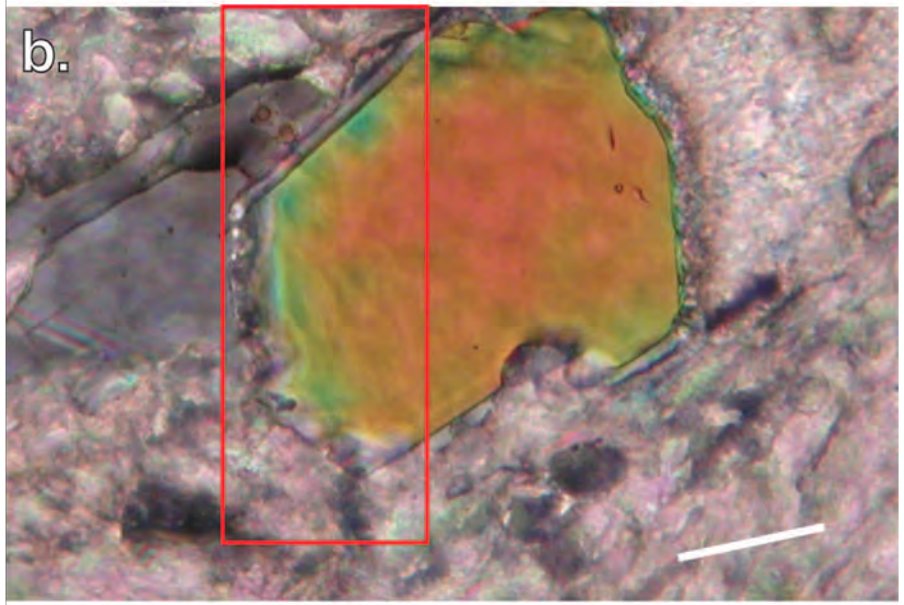


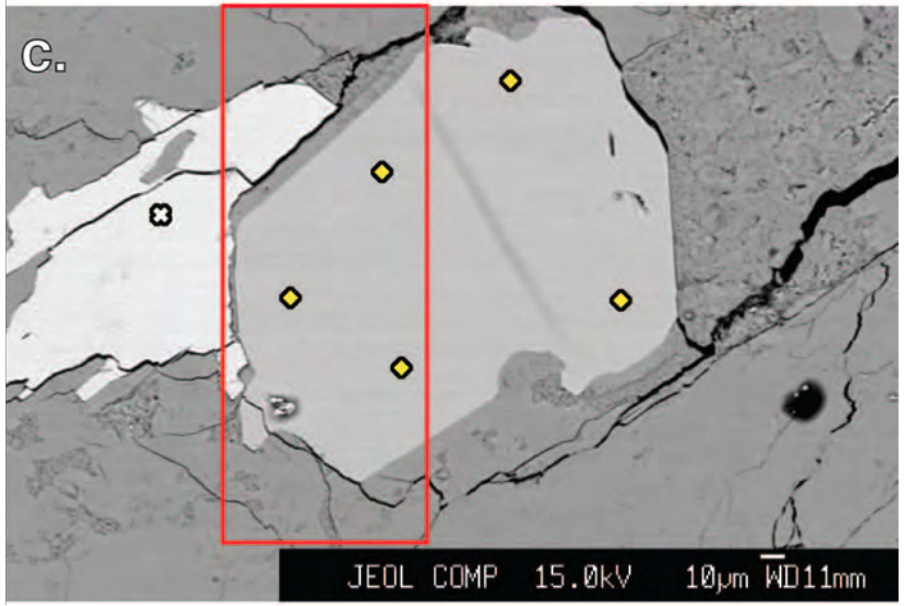


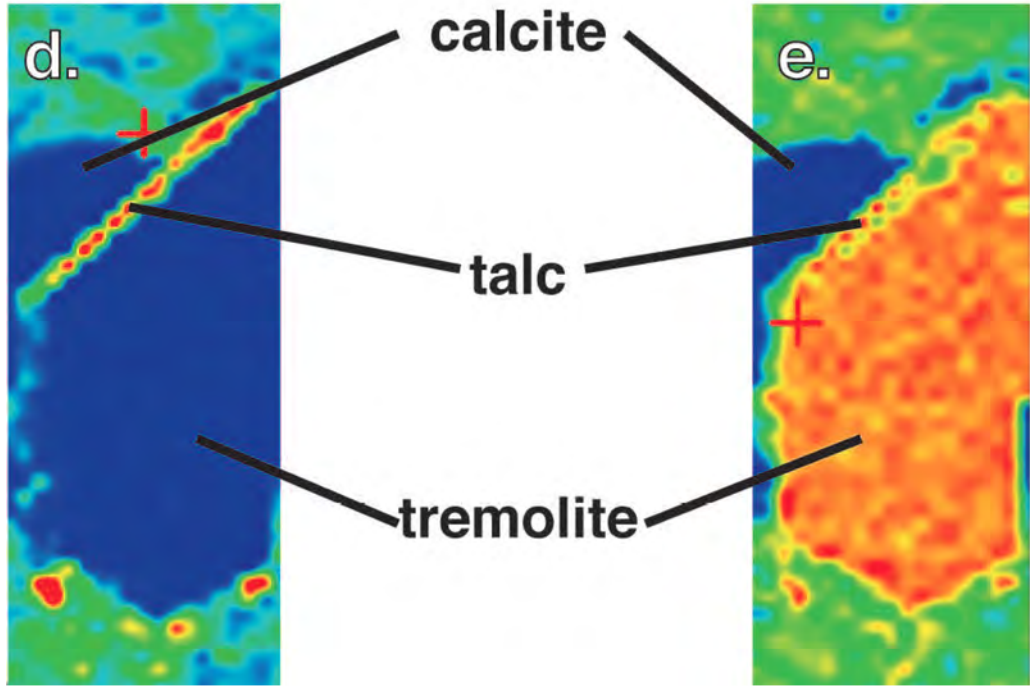
platy talc
SiO_2/MgO 1.82
MnO 0.43; CaO 0.39



"Wood" C3
close up on the tremolite

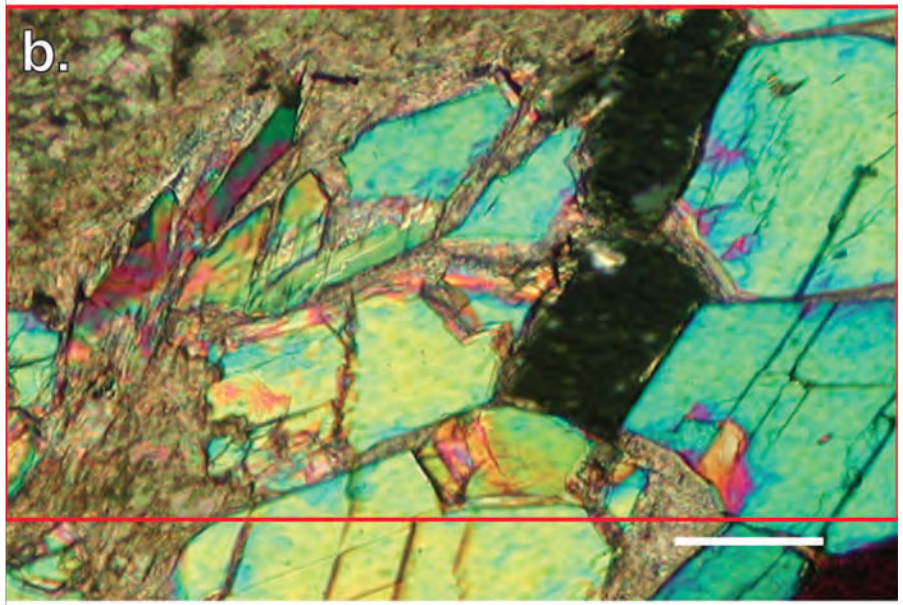


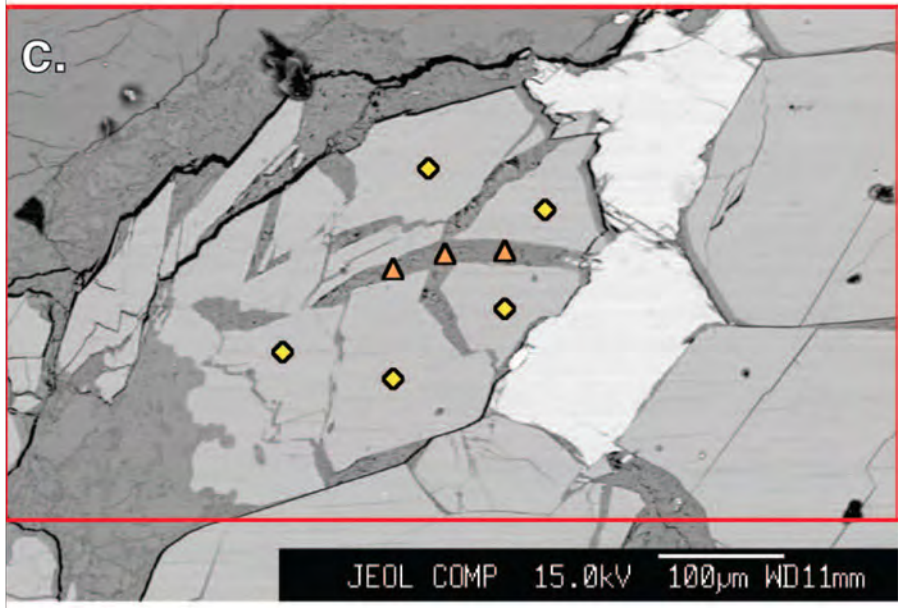




tremolite
SiO_2/MgO 2.24
MnO 0.05

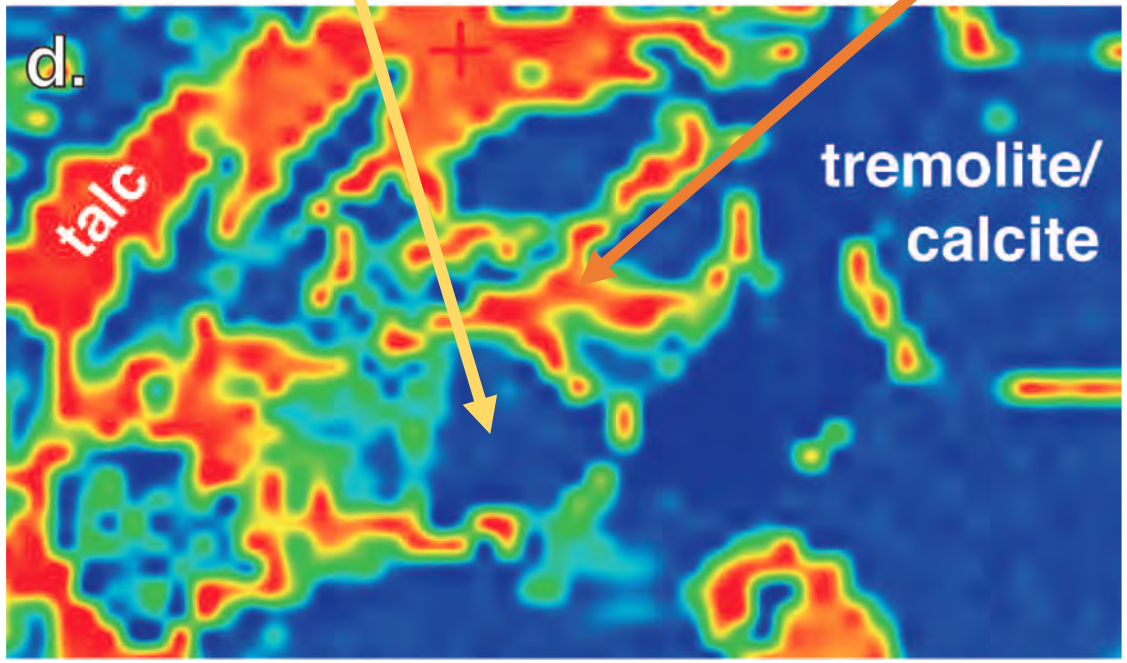
"Wood" C4



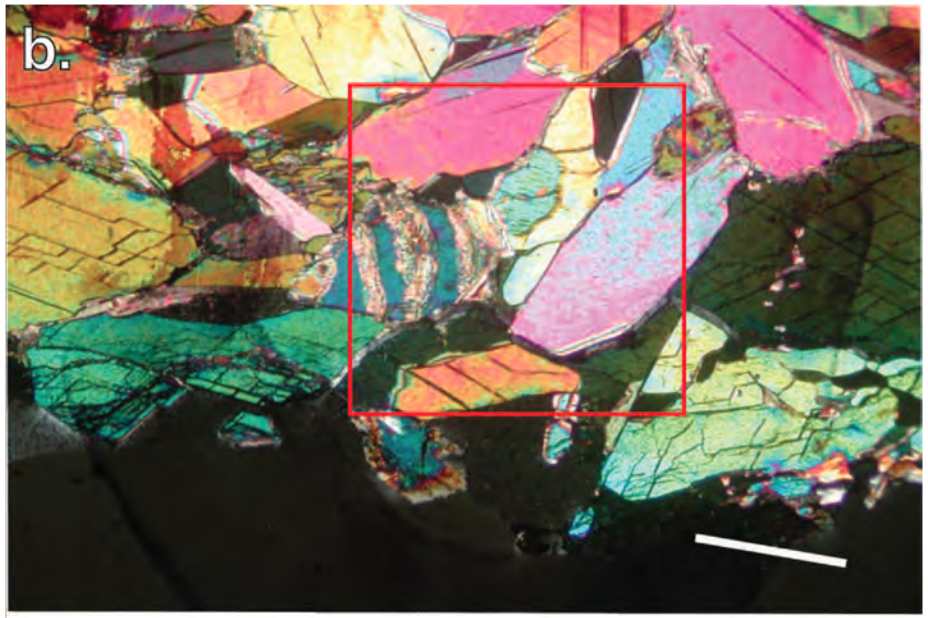


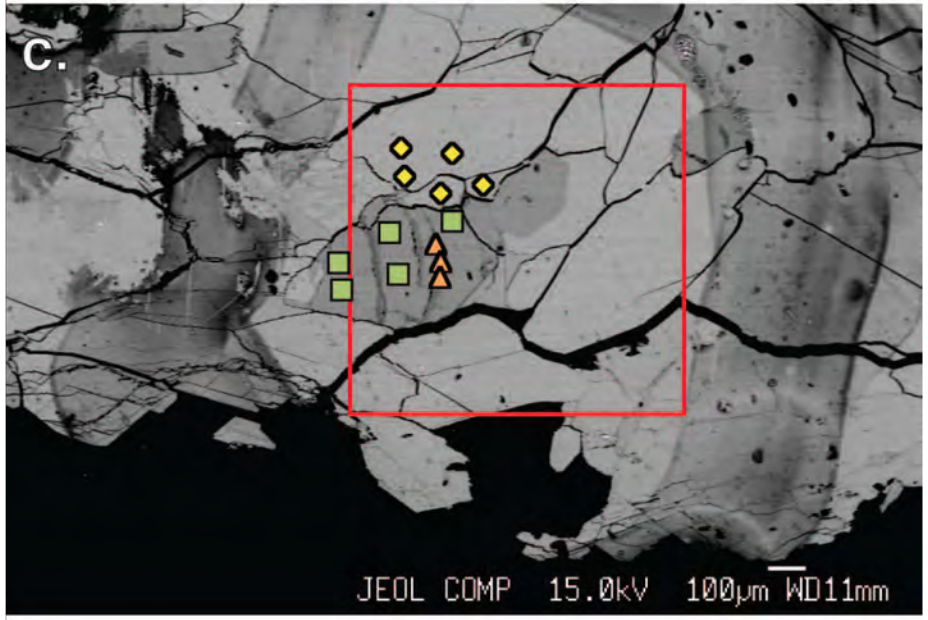
fine-grained talc
SiO_2/MgO 1.88
MnO 0.02; CaO 0.19

tremolite
SiO_2/MgO 2.22
MnO 0.06



"Ouch" C3

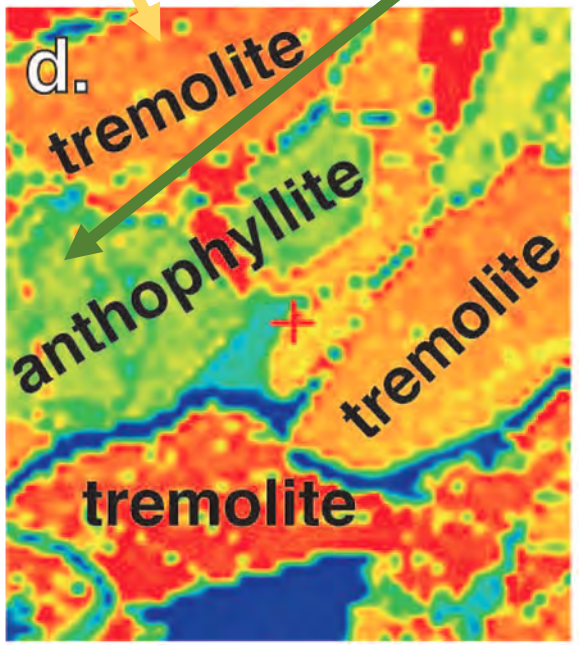


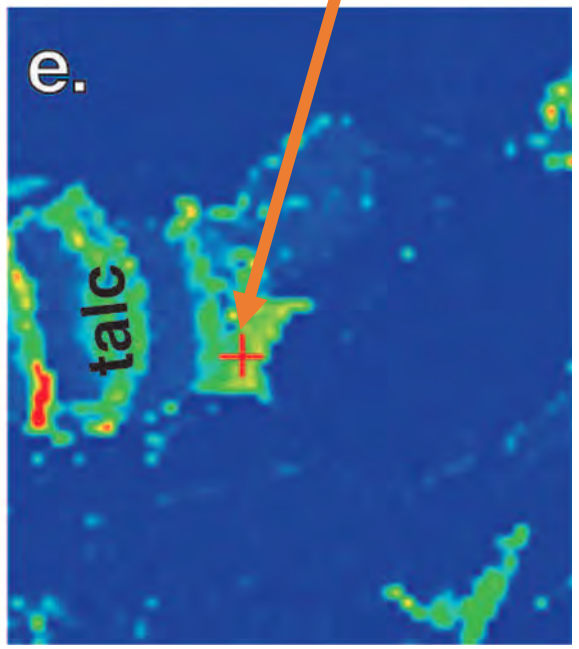


tremolite
SiO_2/MgO 2.25
MnO 0.53

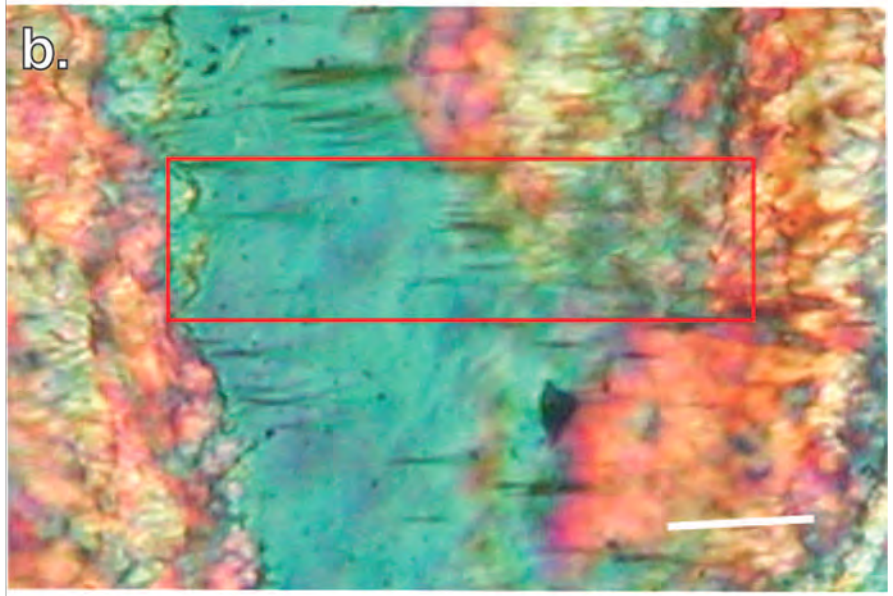
anthophyllite
SiO_2/MgO 1.73
MnO 1.50; CaO 0.45

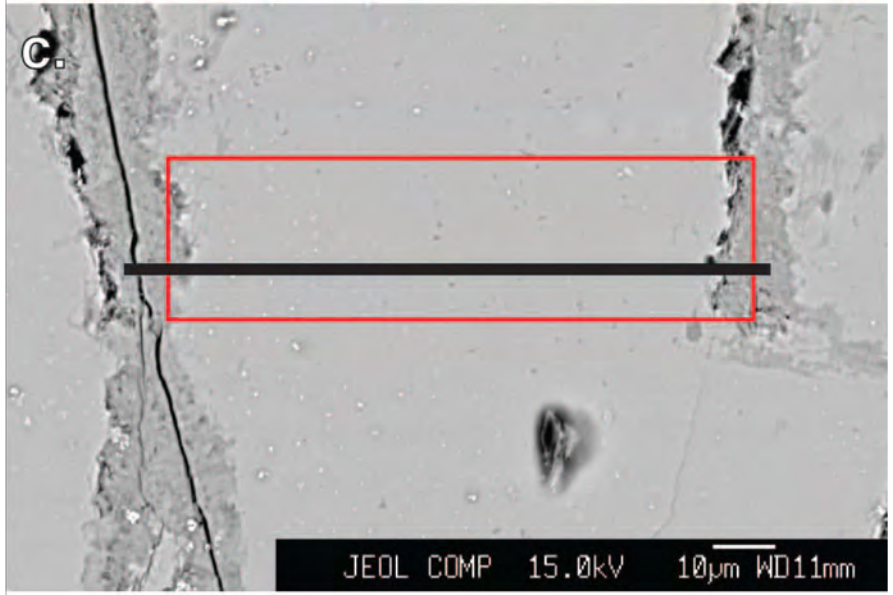
fine-grained talc
SiO_2/MgO 2.25
MnO 0.40; CaO 0.11

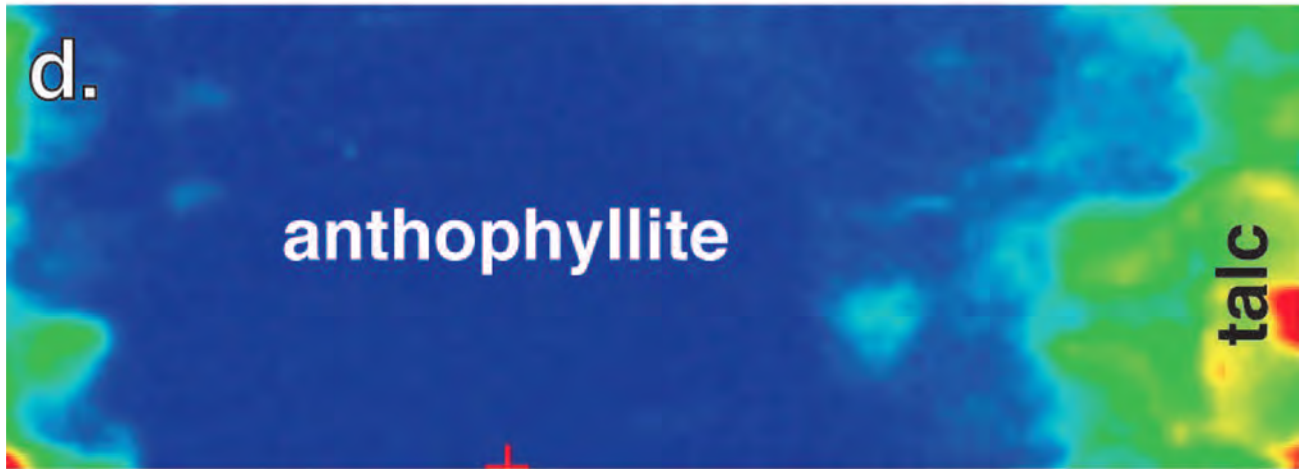




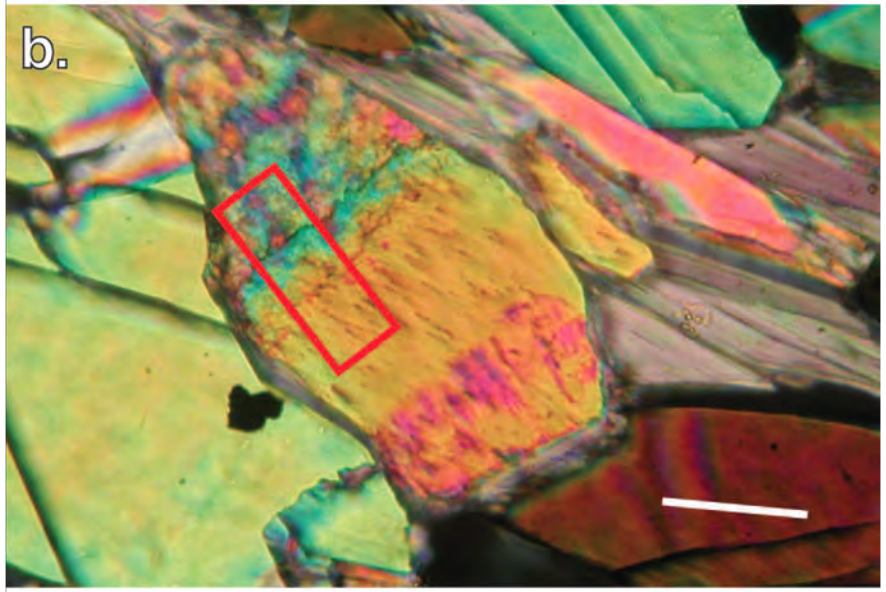
“Ouch” C3 anth fracture

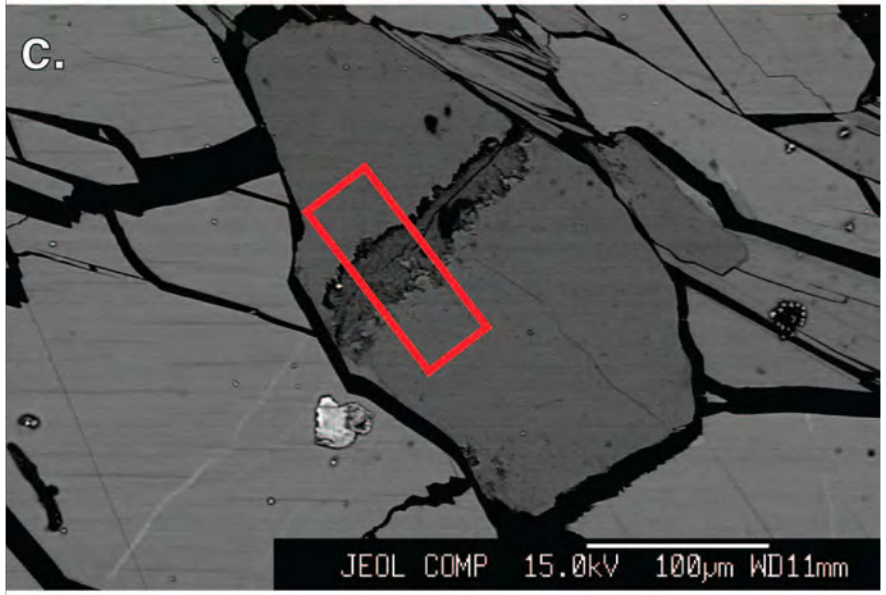


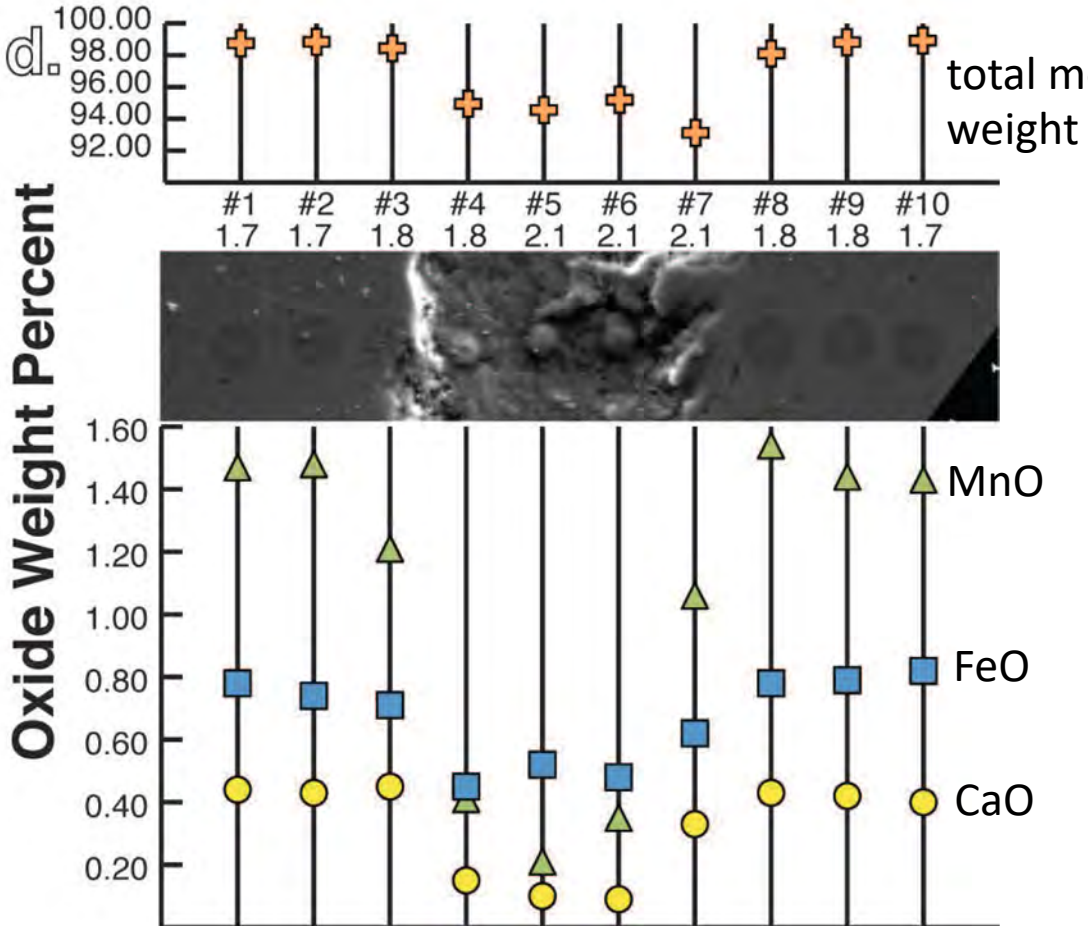




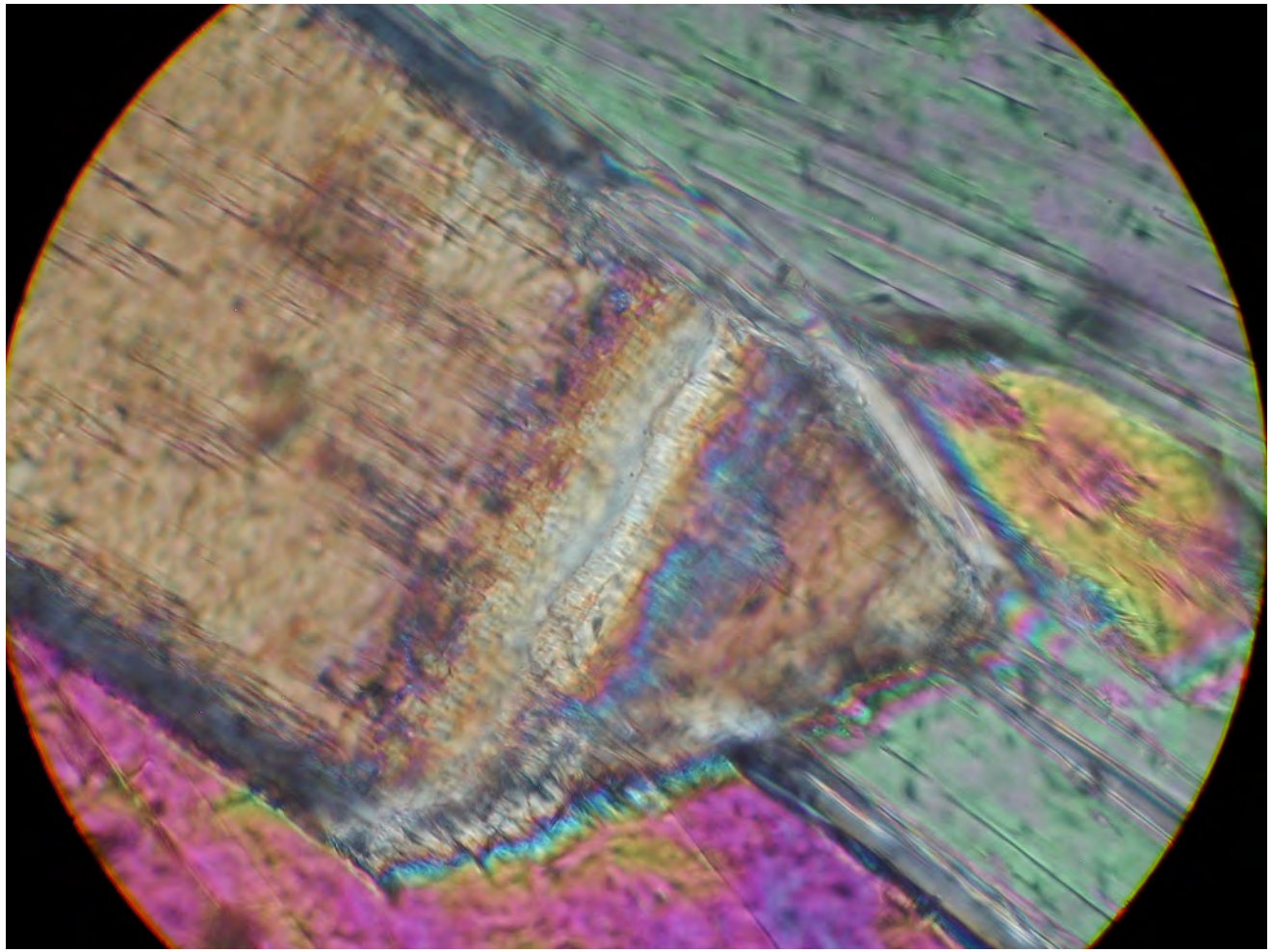
"Ouch" outside C2







“Ouch” tlc fracture in ath



Conclusions: Mineral Characterizations

- Asbestiform talc forms from acicular anthophyllite. No other asbestiform minerals found.
- Subtle differences in trace elements found in different talc morphologies suggests multiple formations of talc.
- Interactions between talc and anthophyllite occur at such fine scales, both phases could be included in WDS analyses.

Conclusions: Micro-Raman

- Allows for comparison of microprobe analyses and Raman spectroscopy of the sample polished thin section.
- Varying intensities of Raman peaks may be due to multiple orientations, especially with fine-grained talc.
- No matter the orientation, the peaks in the Raman spectra collected for talc grains still plotted in the same position, just with varying intensities.

Thank you!
Questions?