

REPORT ON NEPHRITE SAMPLES FROM POOR BOY CLAIM  
Provided by Nathaniel Cook  
Analyzed May 5, 2024

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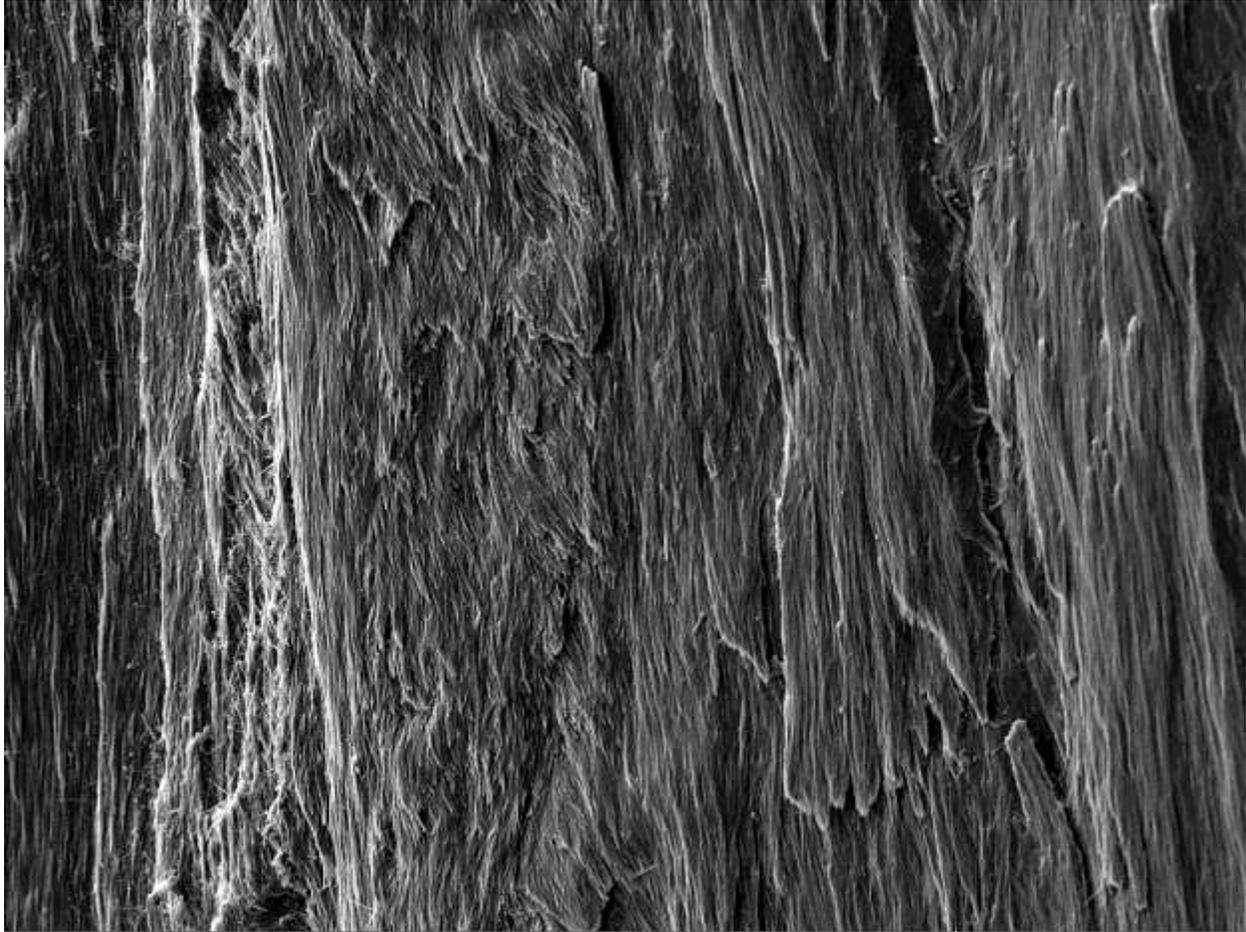
Analytical Method: SEM samples were prepared by using epoxy adhesive to attach a small specimen to a 1 cm diameter aluminum sample stub. Images are from fractured surfaces. Specimens were thinly sputter coated with palladium to provide electrical conductivity. The instrument used was a Tescan Vega III SEM equipped with an Oxford EDS X-ray spectrometer running AzTek software. SEM beam voltage was 10.0 KeV. All images were made using the secondary electron detector.

**SAMPLE 1. – SEM stub 344.**

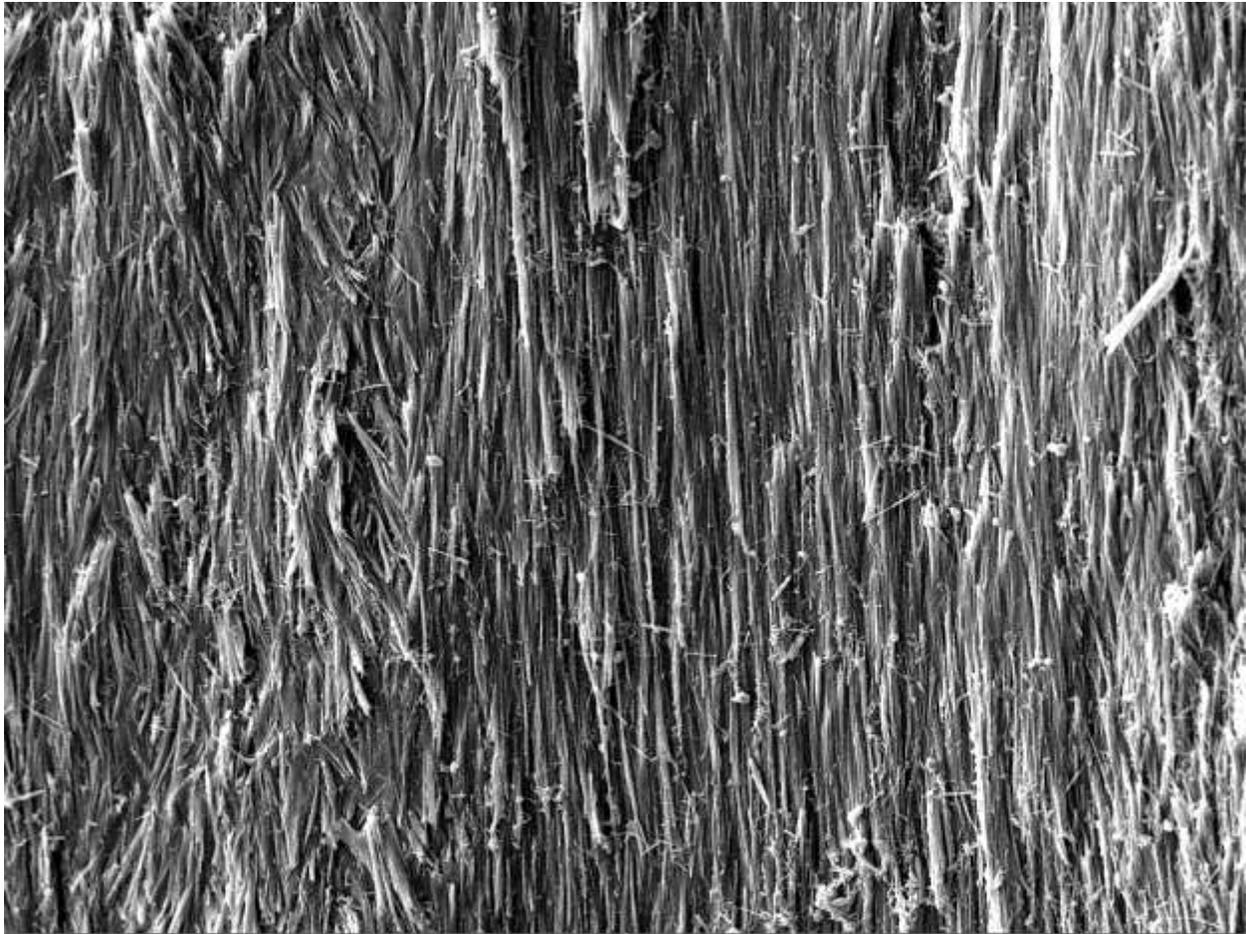
Label: Poor Boy Blue Nephrite, strong chatoyance, highly directional.

Evidence from SEM images:

The material primarily consists of amphibole microcrystals having strong parallel alignment, explaining the chatoyance. Local zones show distortion in the crystal alignment. The small diameter of the individual fibers is characteristic of true nephrite. X-ray fluorescence spectrum shows that the composition of the amphibole lies on the tremolite/actinolite continuum; the atomic ratios of Ca and Fe suggest that the nephrite is nearer to the tremolite end member (Ca =4.5, Fe = 2.3). The blue color may be related to the trace level of Ni; Cr is typically the cause of green color, though elevated Fe contributes to the dark green color characteristic of actinolitic nephrite.



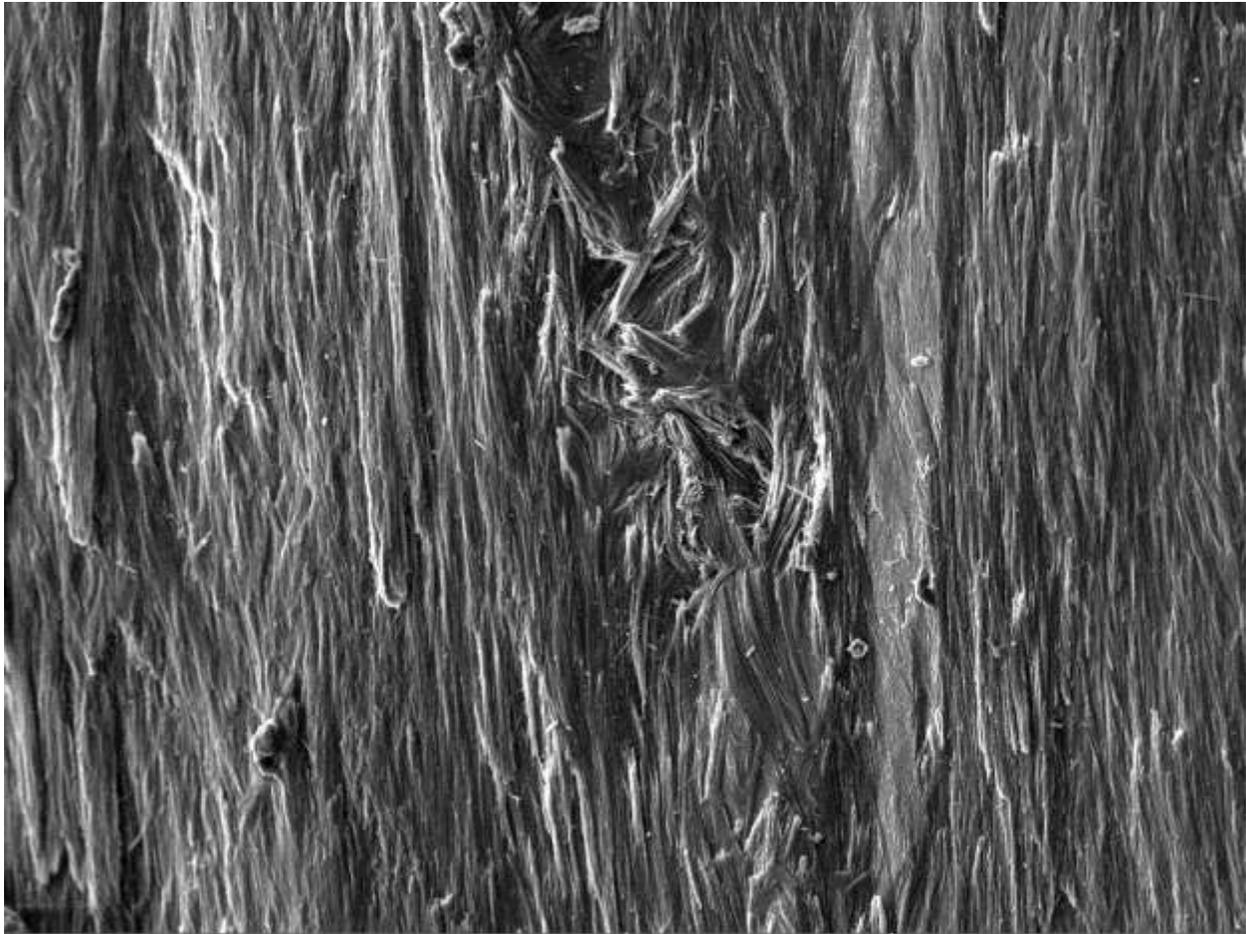
SEM HV: 10.0 kV	SEM MAG: 736 x	VEGA3 TESCAN
Det: SE	View field: 376 $\mu$ m	100 $\mu$ m
Date(m/d/y): 05/05/24	Estimated Beam: ---	WWU



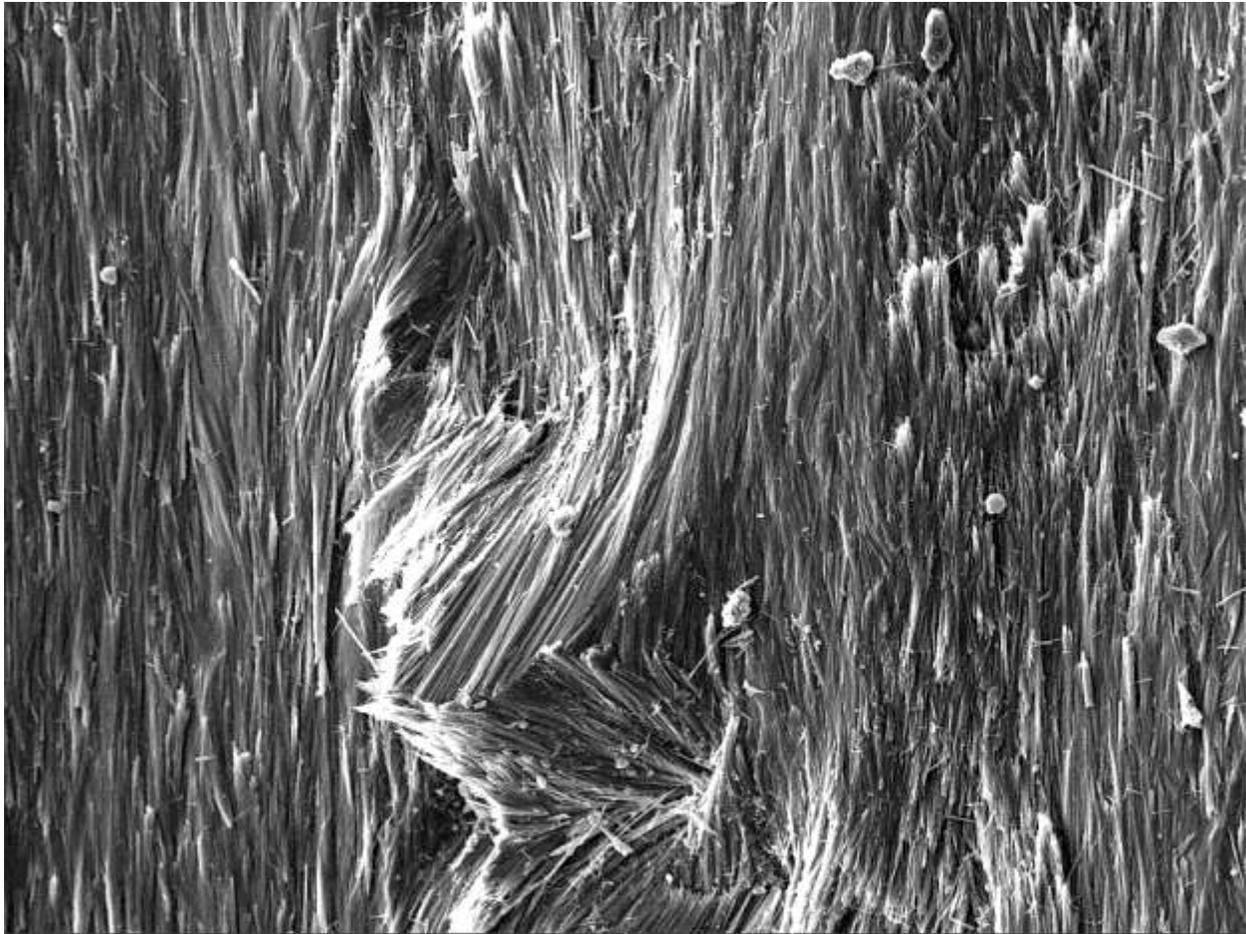
SEM HV: 10.0 kV	SEM MAG: 1.87 kx		VEGA3 TESCAN
Det: SE	View field: 148 $\mu\text{m}$	20 $\mu\text{m}$	
Date(m/d/y): 05/05/24	Estimated Beam: ---		



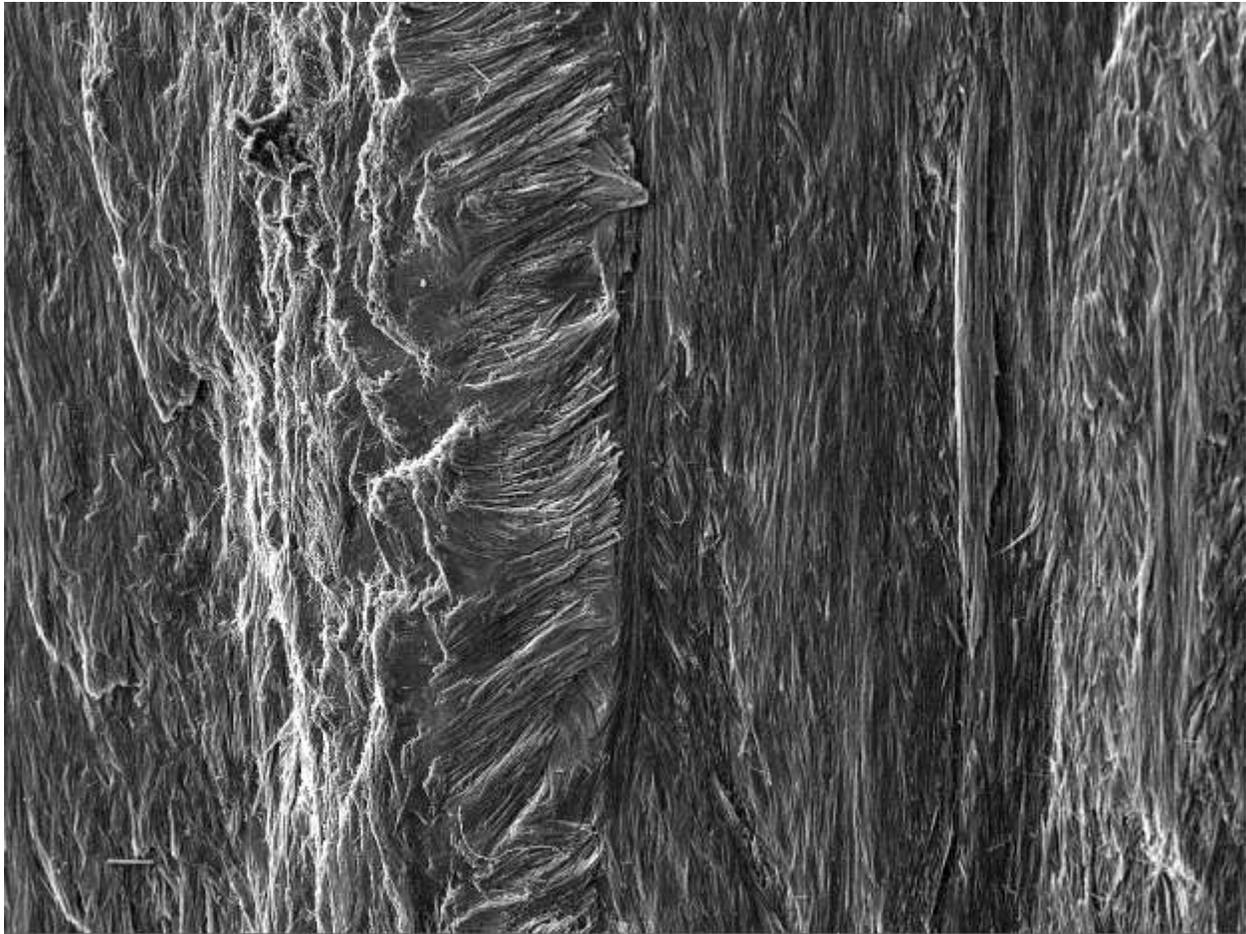
SEM HV: 10.0 kV	SEM MAG: 2.36 kx	VEGA3 TESCAN
Det: SE	View field: 117 $\mu$ m	20 $\mu$ m
Date(m/d/y): 05/05/24	Estimated Beam: ---	WWU



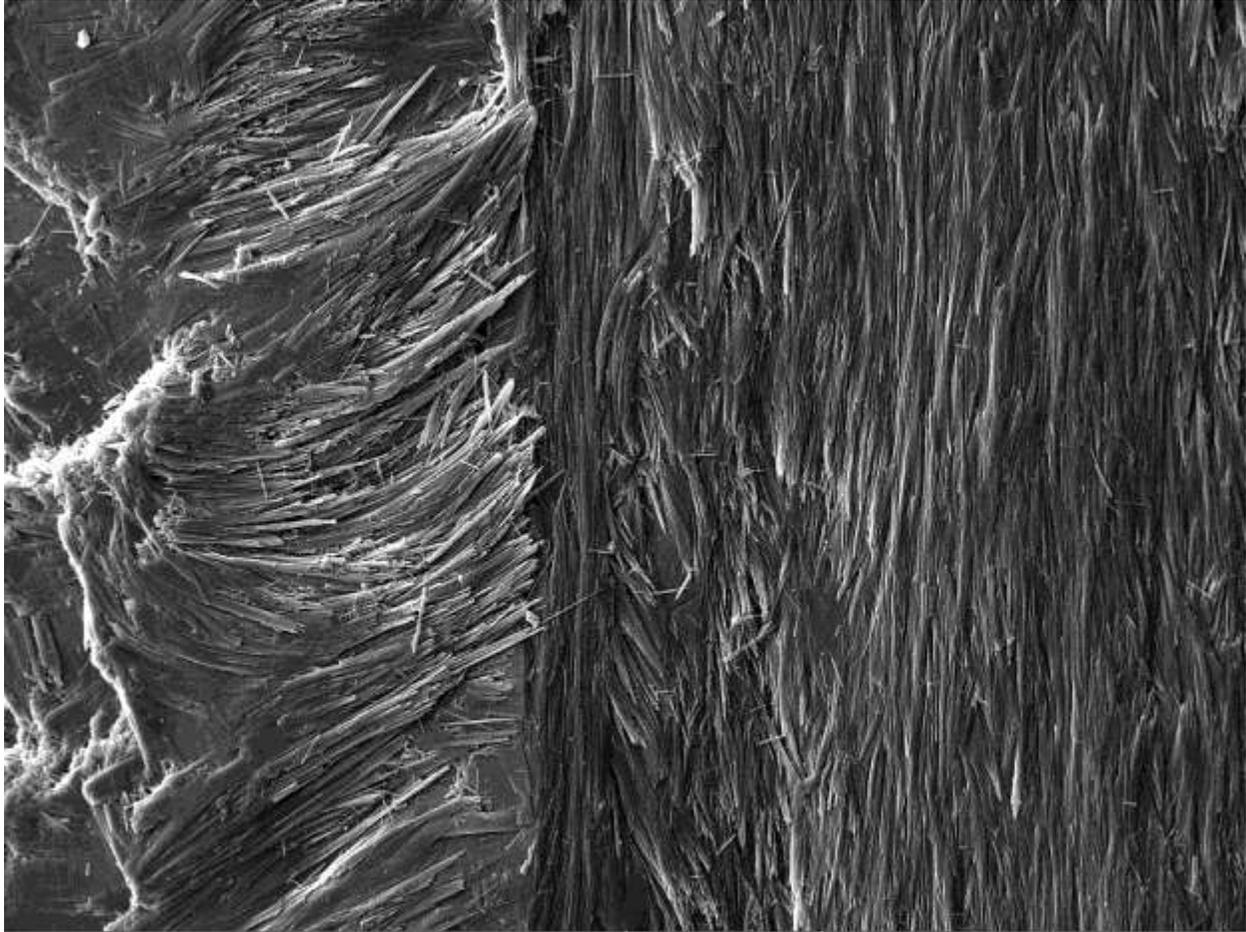
SEM HV: 10.0 kV	SEM MAG: 1.18 kx	VEGA3 TESCAN
Det: SE	View field: 234 $\mu$ m	50 $\mu$ m
Date(m/d/y): 05/05/24	Estimated Beam: ---	WWU



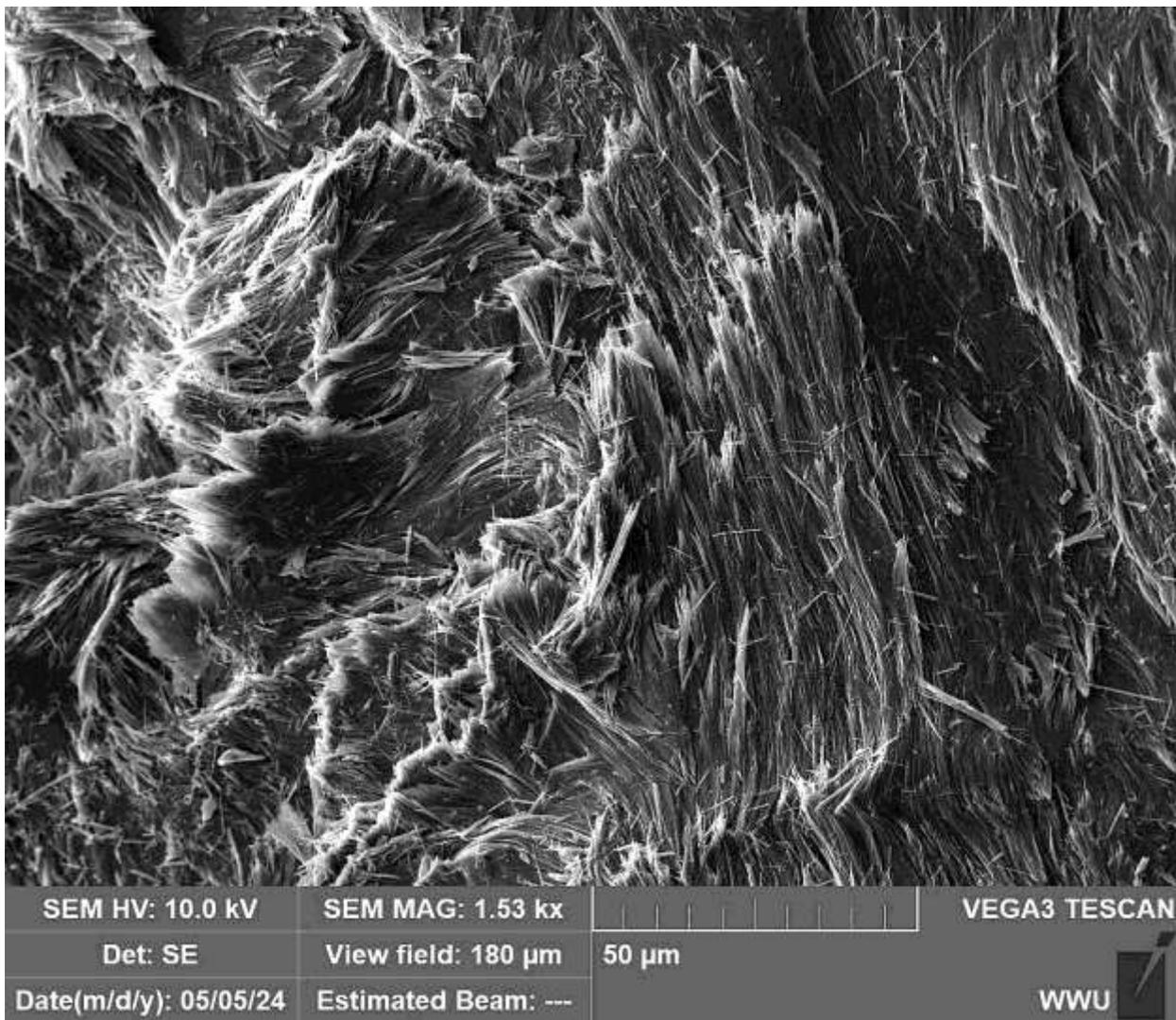
SEM HV: 10.0 kV	SEM MAG: 1.85 kx		VEGA3 TESCAN
Det: SE	View field: 150 $\mu\text{m}$	20 $\mu\text{m}$	
Date(m/d/y): 05/05/24	Estimated Beam: ---		



SEM HV: 10.0 kV	SEM MAG: 945 x	VEGA3 TESCAN
Det: SE	View field: 293 $\mu\text{m}$	50 $\mu\text{m}$
Date(m/d/y): 05/05/24	Estimated Beam: ---	WWU



SEM HV: 10.0 kV	SEM MAG: 2.18 kx		VEGA3 TESCAN
Det: SE	View field: 127 $\mu\text{m}$	20 $\mu\text{m}$	
Date(m/d/y): 05/05/24	Estimated Beam: ---		WWU 



Elemental composition of Sample 1 as determined by SEM/EDS

	Element wt. %	Atomic %	Oxide wt. %	
O	44.3	60.2		
Na	0.0	0.0	0.0	Na <sub>2</sub> O
Mg	13.2	11.8	21.9	MgO
Al	0.09	0.07	0.17	Al <sub>2</sub> O <sub>3</sub>
Si	26.2	20.3	56.0	SiO <sub>2</sub>
K	0.05	0.03	0.06	K <sub>2</sub> O
Ca	8.3	4.5	11.6	CaO
Ti	0.3	0.13	0.5	TiO <sub>2</sub>
Fe	7.4	2.3	9.5	FeO*
Ni	0.20	0.08	0.26	NiO

\*Total iron calculated as FeO

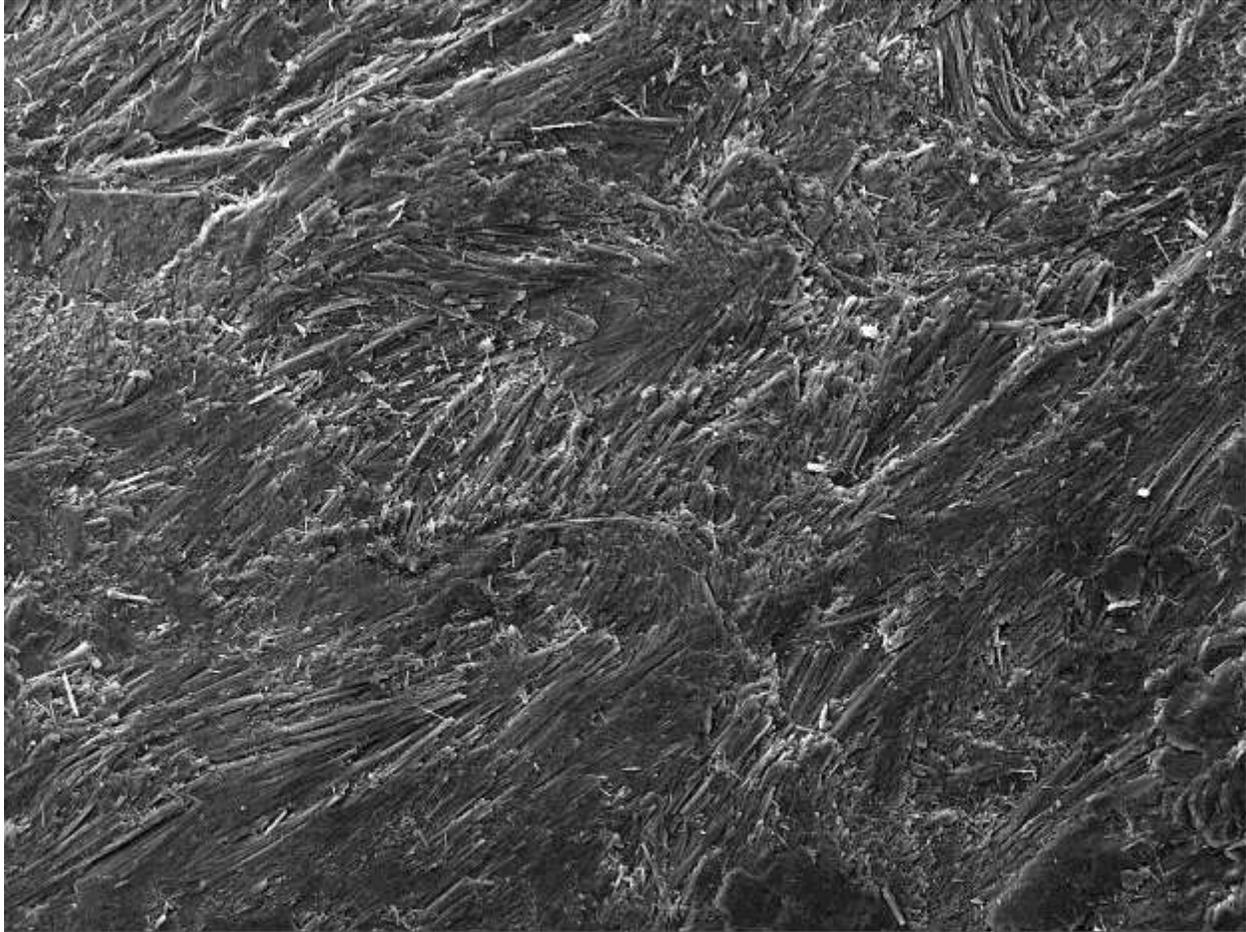
## **SAMPLE 2: SEM Stub 345**

Label: Poor Boy blue nephrite, moderate “swirly” chatoyance, moderately directional

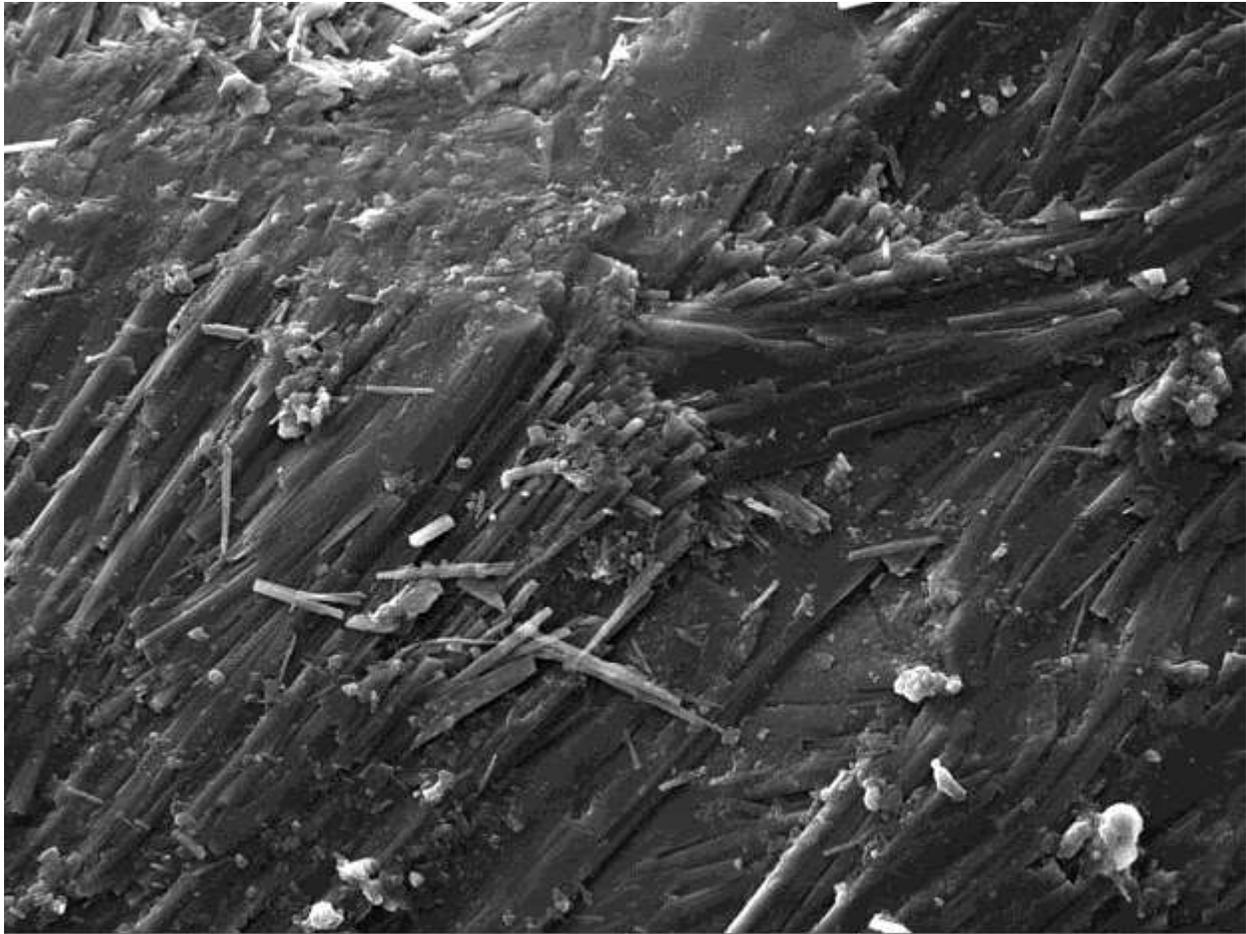
Evidence from SEM images:

The material primarily consists of elongate prismatic crystals of amphibole, coarser in texture than the fine fibers found in specimen 1. Locally the crystals show parallel alignment, explaining the observed chatoyancy. However, these crystal domains are not aligned in consistent directions, causing the “swirly” chatoyance. The material has some heterogeneity, with regions that show a chaotic arrangement of small fibers.

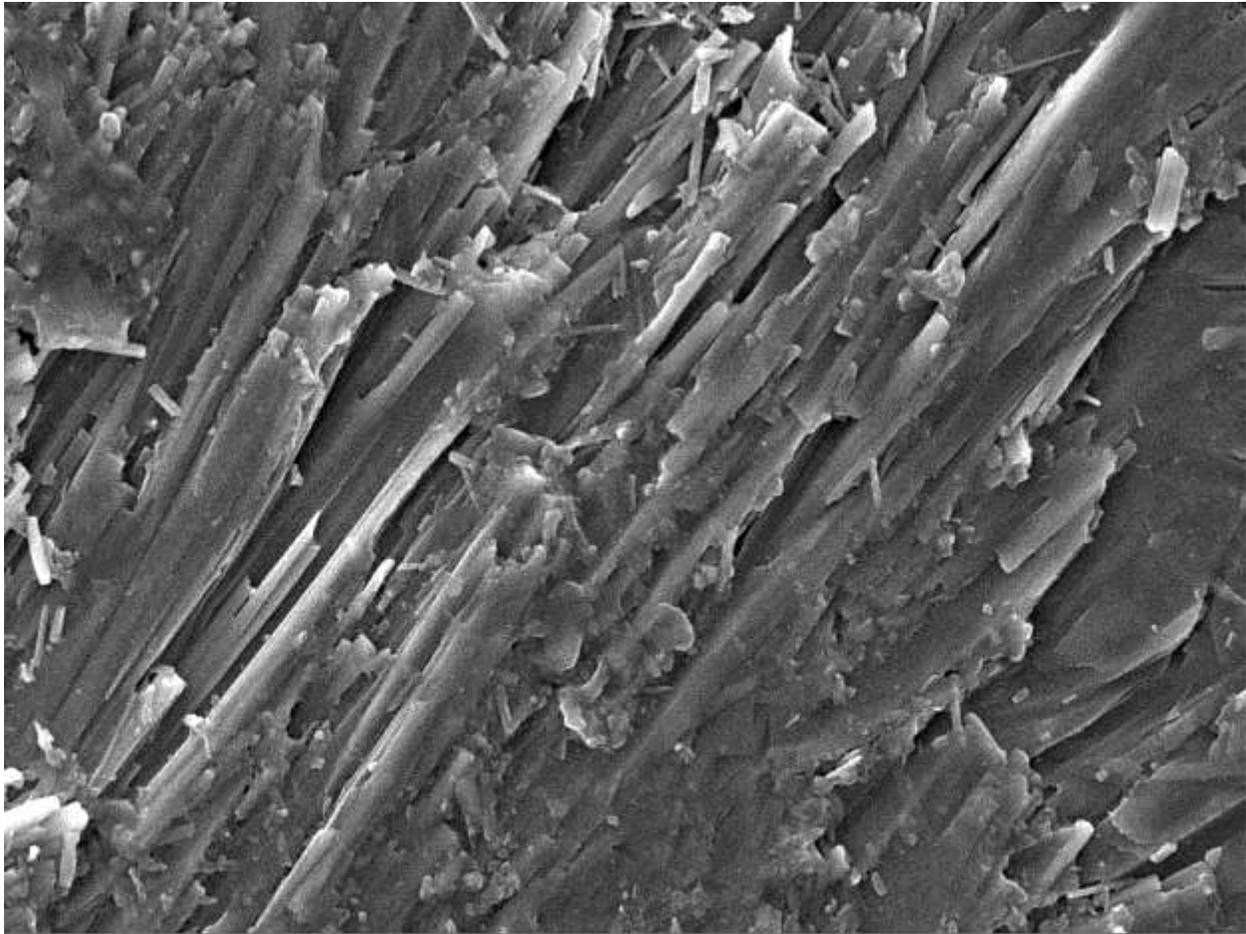
X-ray fluorescence spectrum shows that the composition of the amphibole lies on the tremolite/actinolite continuum; the atomic ratios of Ca and Fe suggest that the nephrite is nearer to the tremolite end member (Ca = 4.2, Fe = 1.9). The blue color may be related to the trace level of Ni; Cr is typically the cause of green color, though elevated Fe contributes to the dark green color characteristic of actinolitic nephrite.



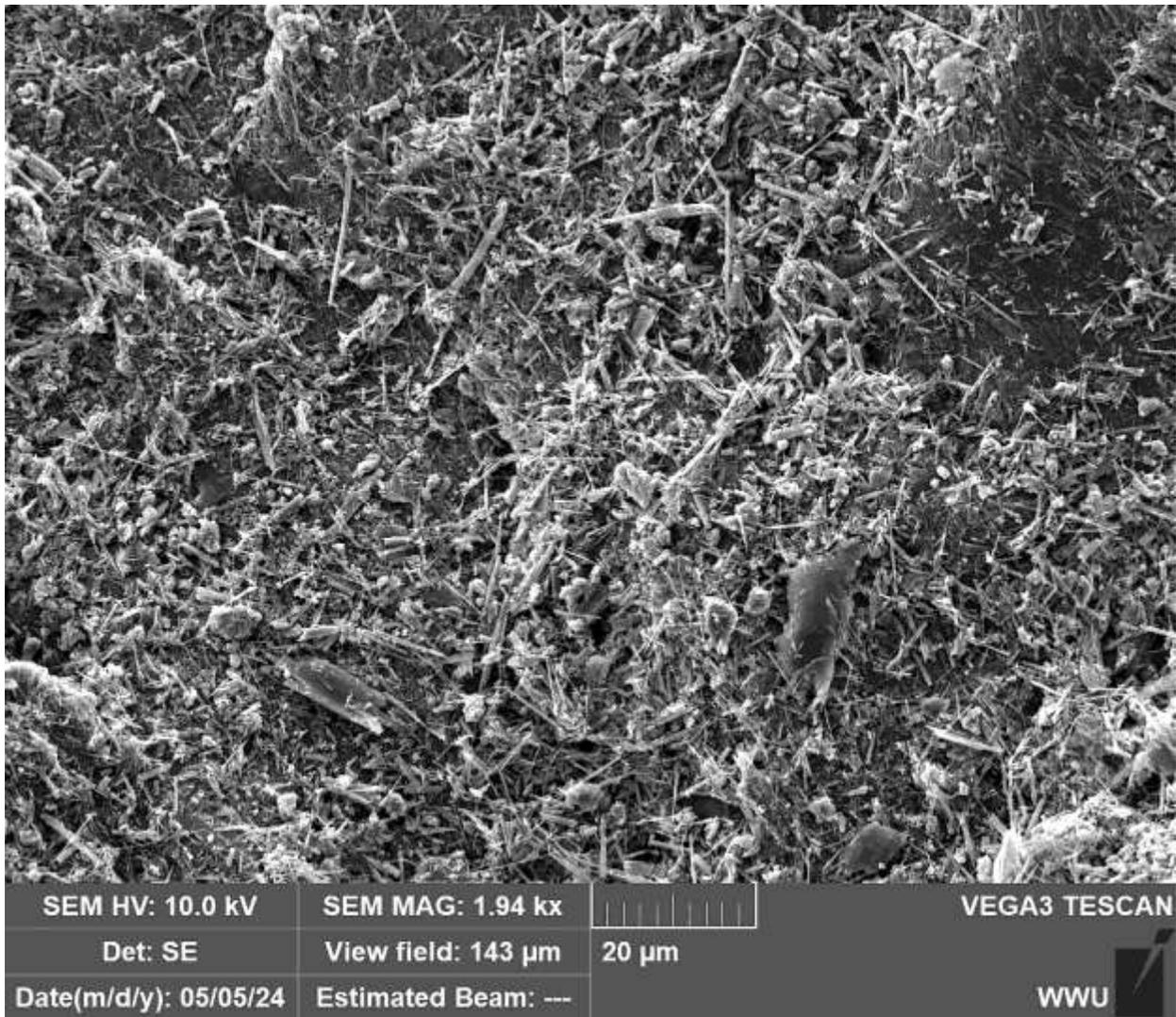
SEM HV: 10.0 kV	SEM MAG: 1.64 kx		VEGA3 TESCAN
Det: SE	View field: 169 $\mu\text{m}$	50 $\mu\text{m}$	
Date(m/d/y): 05/05/24	Estimated Beam: ---		WWU 



SEM HV: 10.0 kV	SEM MAG: 5.18 kx	VEGA3 TESCAN
Det: SE	View field: 53.4 µm	10 µm
Date(m/d/y): 05/05/24	Estimated Beam: ---	WWU



SEM HV: 10.0 kV	SEM MAG: 9.42 kx		VEGA3 TESCAN
Det: SE	View field: 29.4 $\mu\text{m}$	5 $\mu\text{m}$	
Date(m/d/y): 05/05/24	Estimated Beam: ---		



Elemental composition of sample 2 as determined by SEM/EDS

	Element wt. %	Atomic %	Oxide wt. %	
O	45.0	60.2		
Na	0.05	0.04	0.06	Na <sub>2</sub> O
Mg	14.4	12.7	23.8	MgO
Al	1.2	1.0	2.3	Al <sub>2</sub> O <sub>3</sub>
Si	26.1	19.9	55.7	SiO <sub>2</sub>
K	0.05	0.03	0.06	K <sub>2</sub> O
Ca	7.9	4.2	11.0	CaO
Ti	0.16	0.07	0.26	TiO <sub>2</sub>
Fe	5.0	1.9	6.4	FeO*
Ni	0.26	0.10	0.33	NiO

\*Total iron calculate as FeO

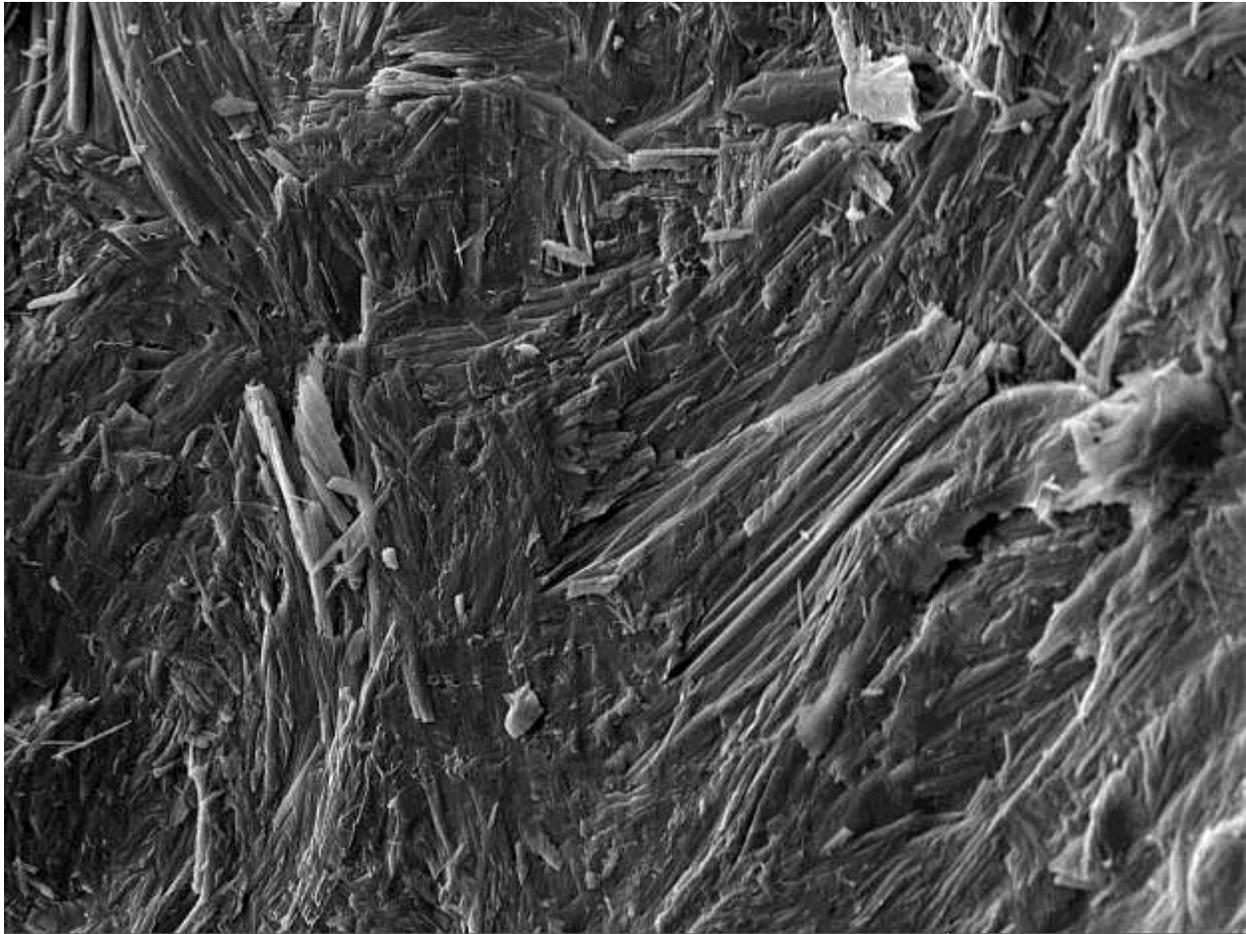
### **SAMPLE 3: SEM stub 346**

Label: Poor Boy green nephrite, minimal chatoyance, little/no directionality (orientation of fibers)

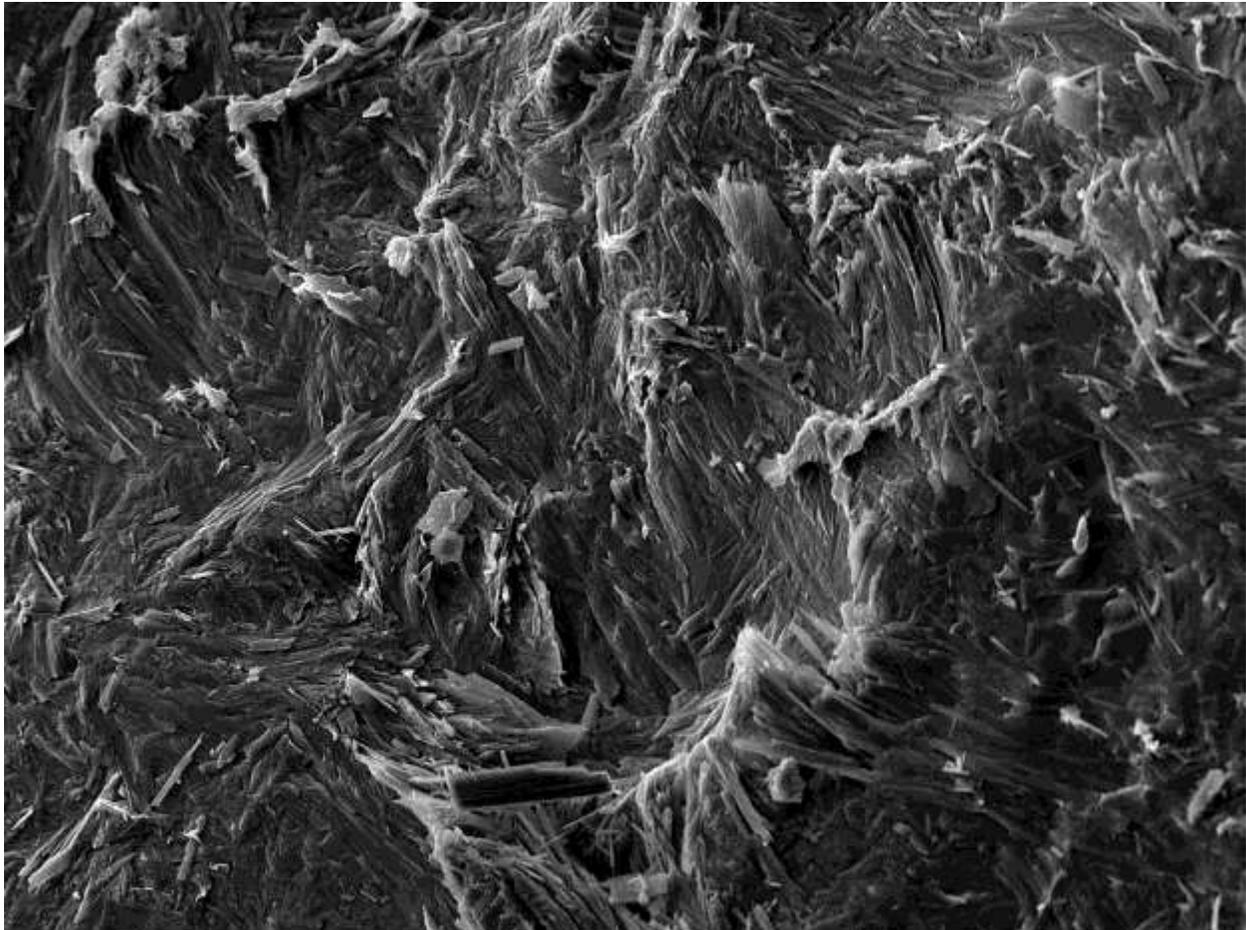
Evidence from SEM images:

The material consists of elongate prismatic amphibole crystals, lacking the felted fiber structure characteristic of true nephrite. Some crystals occur in parallel bundles, but in general the orientation is somewhat random.

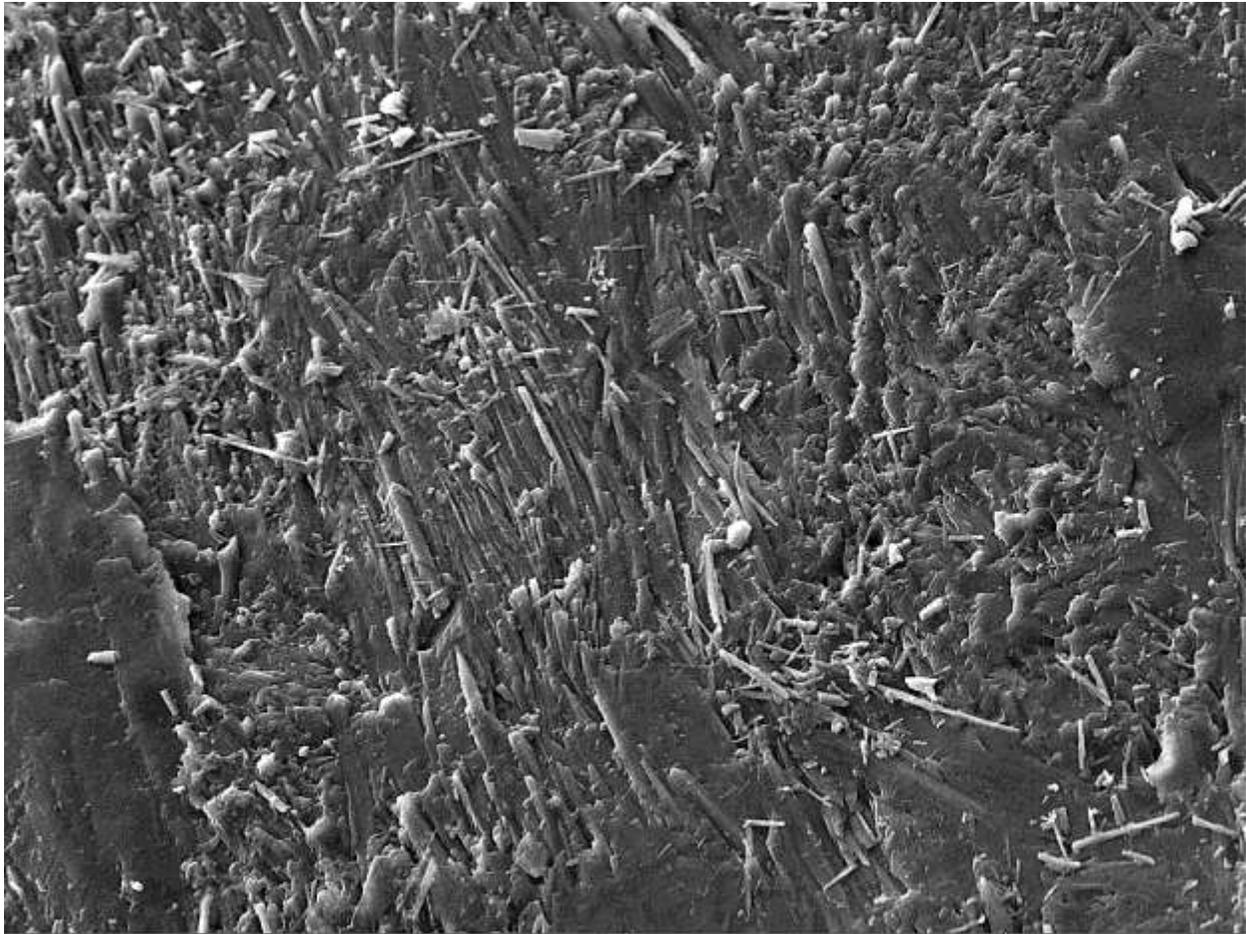
X-ray fluorescence spectrum shows that the composition of the amphibole lies on the tremolite/actinolite continuum; the atomic ratios of Ca and Fe suggest that the nephrite is nearer to the tremolite end member (Ca = 4.1, Fe = 2.4). The green color may be evidence of Cr as the primary pigment. Ni levels are lower in this specimen compared to samples 1 and 2. Very small Cr peaks were observed in the EDS spectrum, but they were not quantifiable.



SEM HV: 10.0 kV	SEM MAG: 3.59 kx		VEGA3 TESCAN
Det: SE	View field: 77.2 $\mu\text{m}$	20 $\mu\text{m}$	
Date(m/d/y): 05/05/24	Estimated Beam: ---		WWU



SEM HV: 10.0 kV	SEM MAG: 2.65 kx		VEGA3 TESCAN
Det: SE	View field: 105 $\mu\text{m}$	20 $\mu\text{m}$	
Date(m/d/y): 05/05/24	Estimated Beam: ---		



SEM HV: 10.0 kV	SEM MAG: 4.24 kx	VEGA3 TESCAN	
Det: SE	View field: 65.3 $\mu\text{m}$	20 $\mu\text{m}$	
Date(m/d/y): 05/05/24	Estimated Beam: ---	WWU	

	Element wt. %	Atomic %	Oxide wt. %	
O	44.8	60.2		
Na	0.09	.09	0.04	Na <sub>2</sub> O
Mg	14.3	12.6	23.6	MgO
Al	0.9	0.7	1.6	Al <sub>2</sub> O <sub>3</sub>
Si	26.2	20.0	56.0	SiO <sub>2</sub>
K	0.0	0.0	0.0	K <sub>2</sub> O
Ca	7.6	4.1	10.9	CaO
Ti	0.0	0.0	0.0	TiO <sub>2</sub>
Fe	6.2	2.4	8.0	FeO*
Ni	0.05	0.01	0.06	NiO

\*Total iron calculated as FeO