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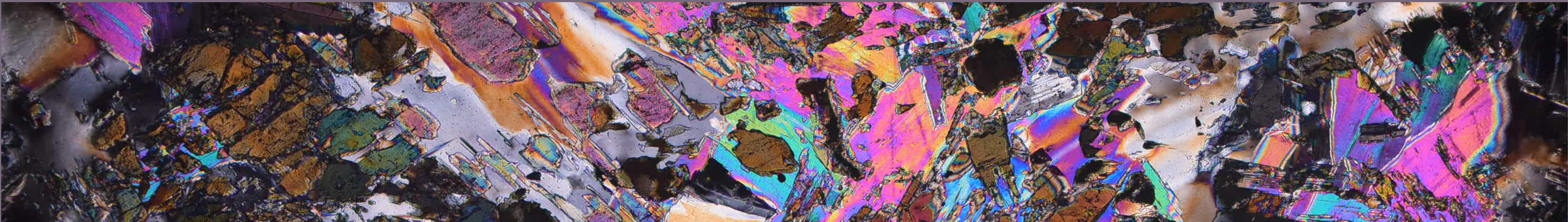
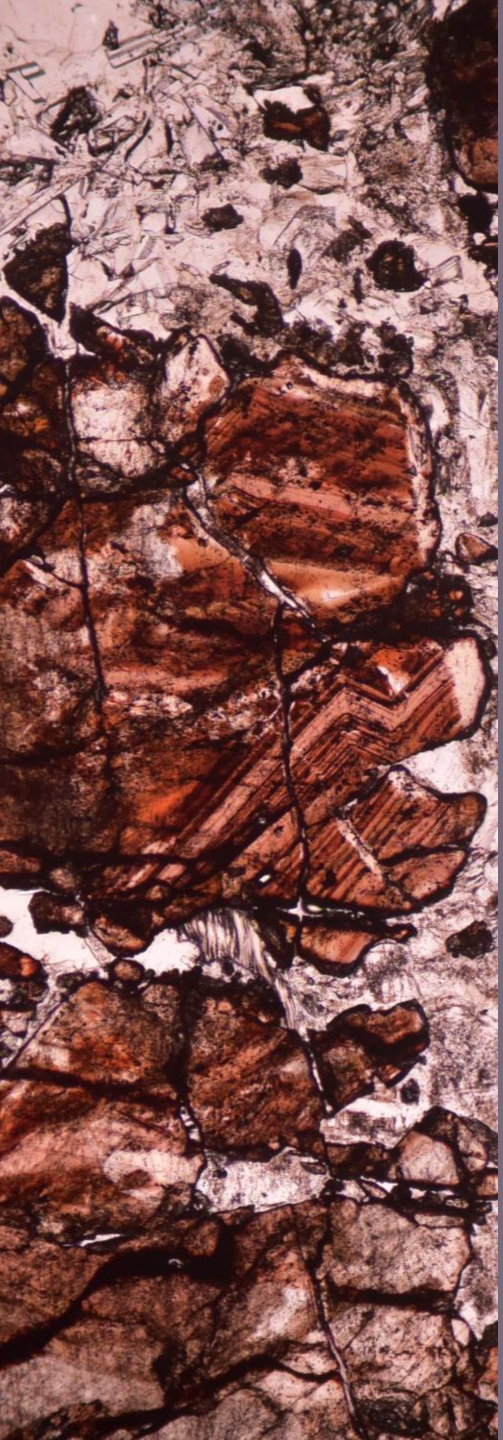
Ore-forming events at the Santa Comba tungsten deposit, NW Spain

Authors: Candela Pita, Fernando Tornos, Iñigo Borrajo, Lluís Boixet & Elena Crespo





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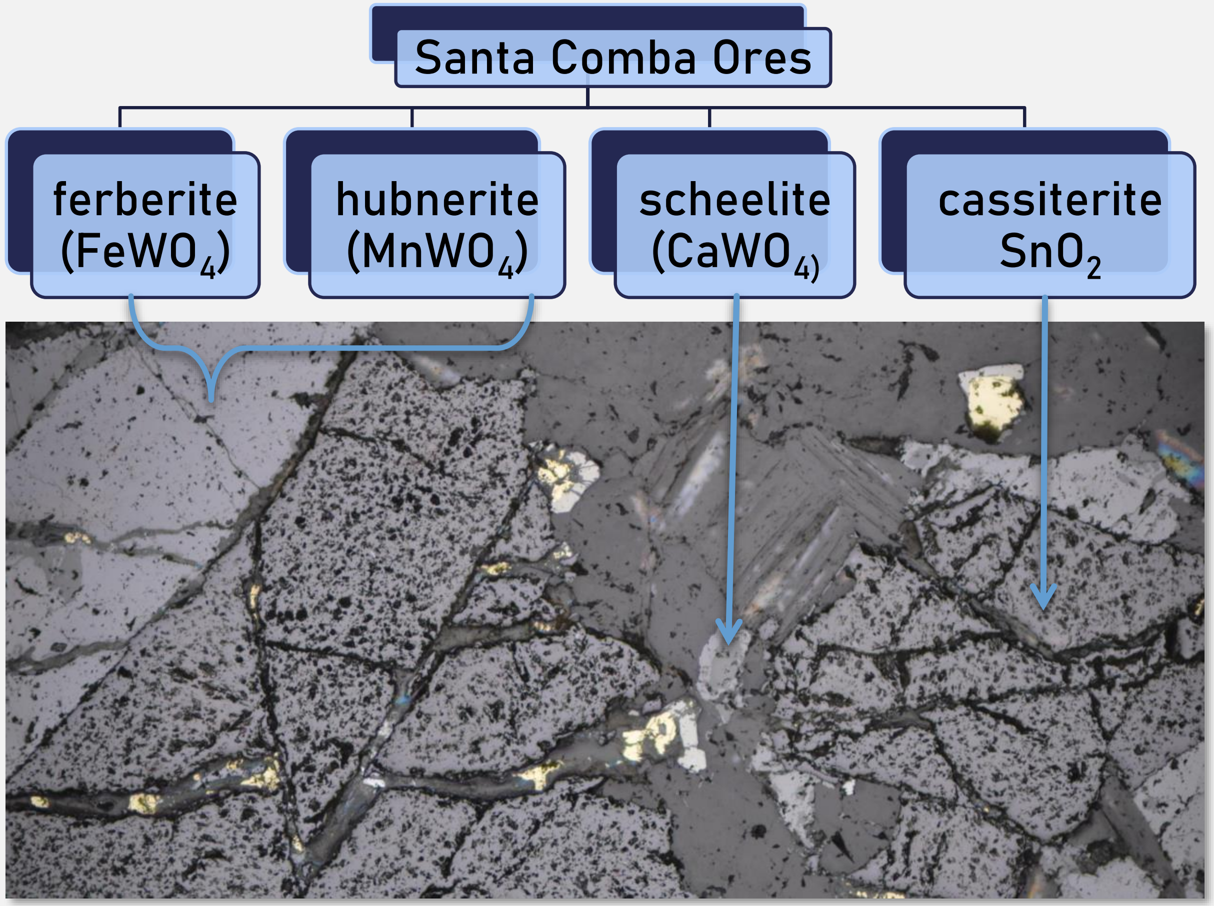
1. Introduction

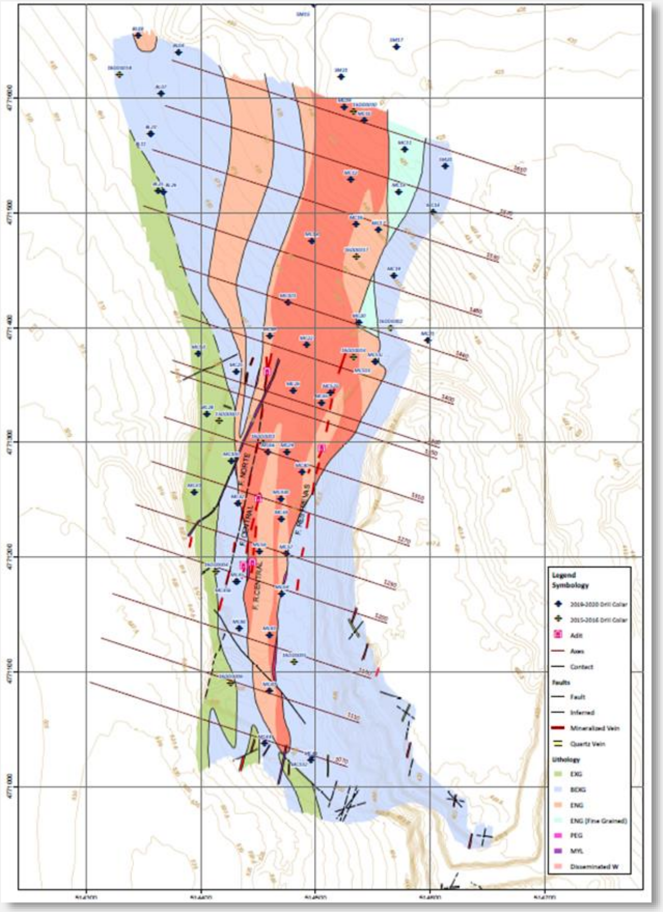
- Santa Comba is a large porphyry-like tungsten deposit in the NW of Iberia.
- There are two types of mineralization, in veins and disseminated in the granite.

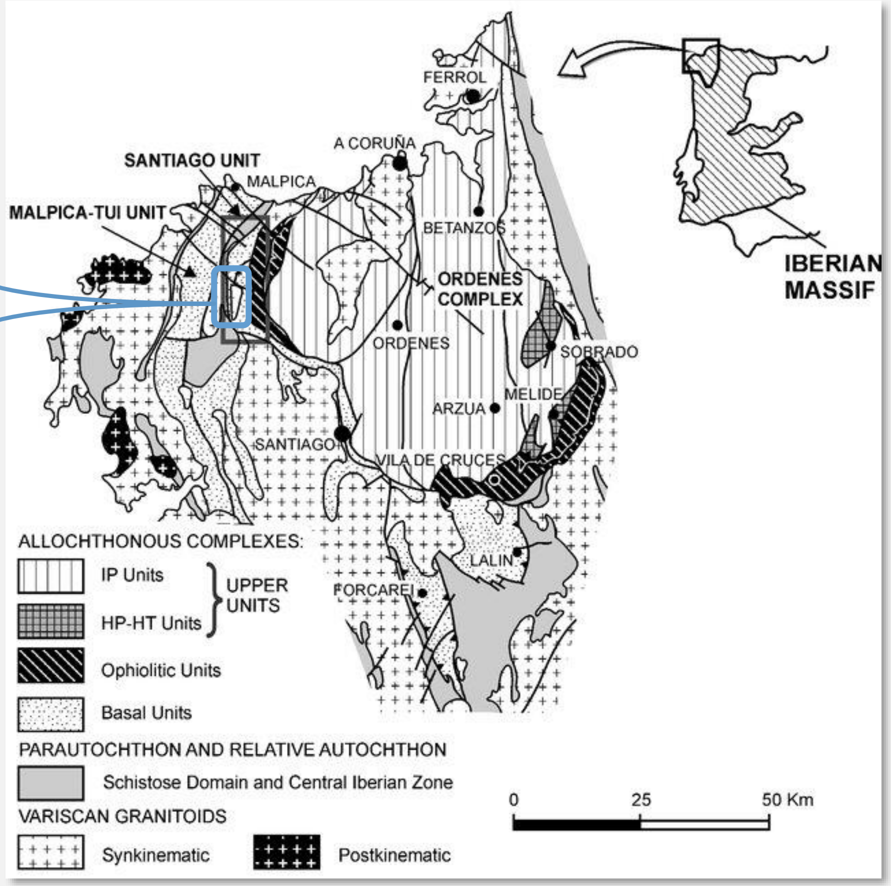


- This is the first study describing the disseminated mineralization.
- Is related to zones of pervasive ↑T° hydrothermal alteration.

2.Geology of Santa Comba

2.1. Geological setting



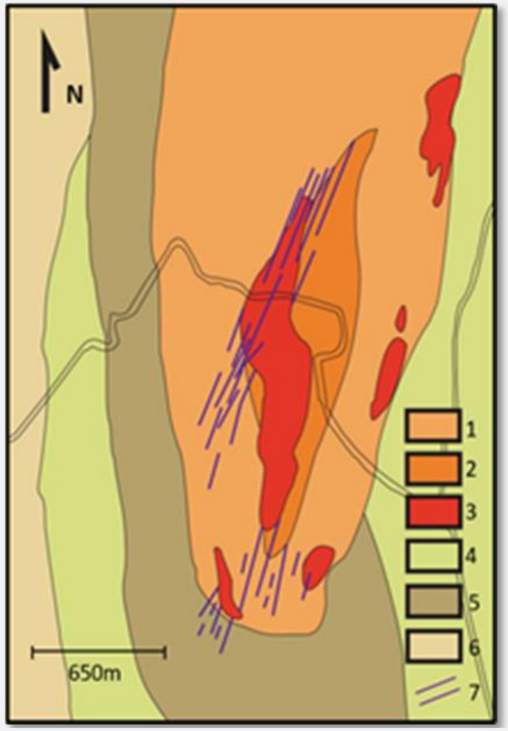


left: geological map of the mine (GTT, 2022 press release)

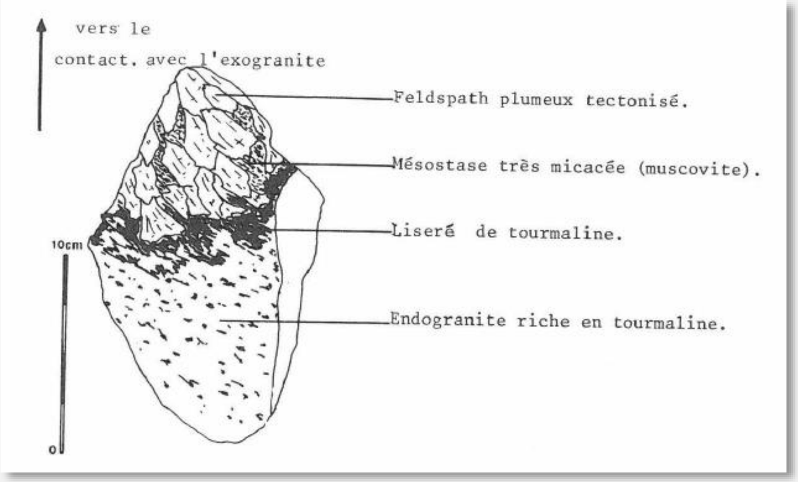
right: regional setting (modified from Rubio-Pascual et al. 2002)

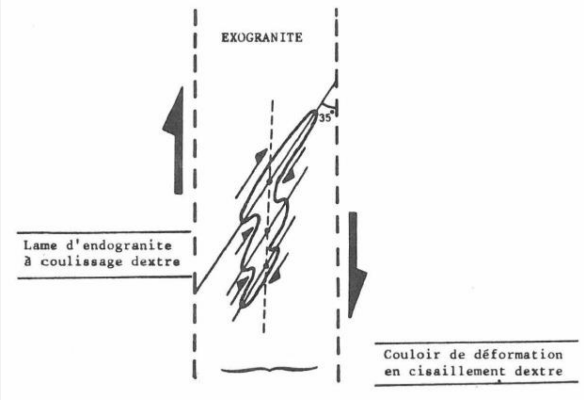
2.2. Geology of the mineralization

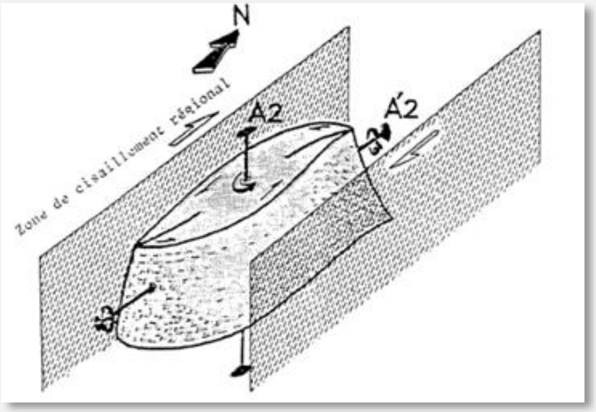
Geological map of Santa Comba (Borrajo et al. 2022). 1-2: exogranite; 3: endogranite; 4: Órdenes Complex; 5: orthogneisses; 6: schists; 7: quartz veins with Sn-W.



Modified from Nessen (1981)



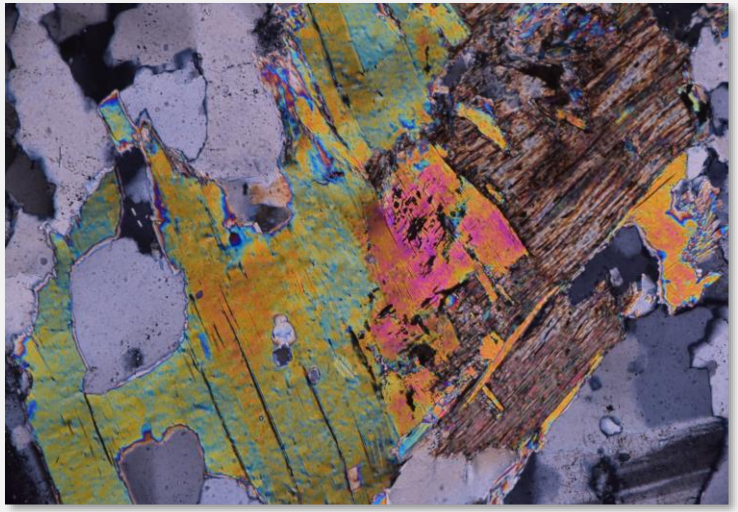




- Regional dextral shear zone controls the intrusion.
- Late Variscan poly-intrusive complex, exogranite-stockscheider-endogranite.

2.3 Hydrothermal alteration

Muscovitization (bt→ms)



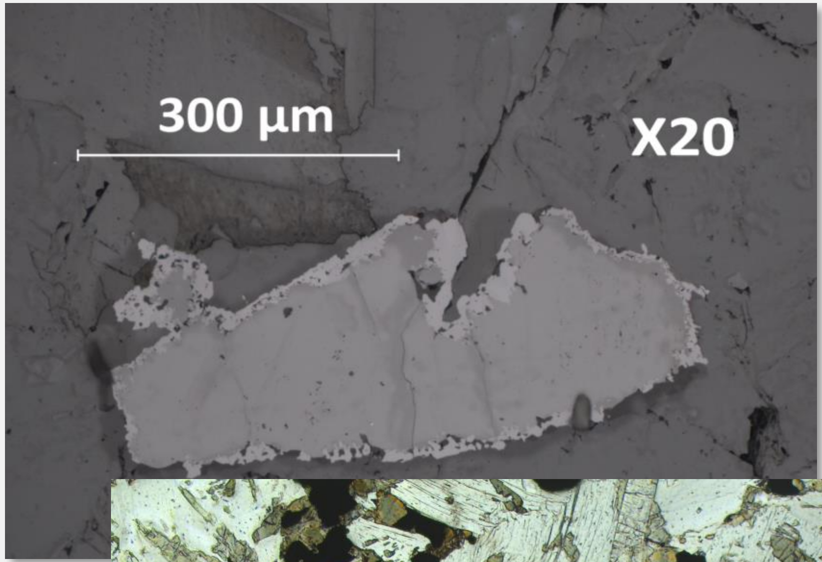
Phyllic alteration (ser)

Early albitization (ol→ab)

Potassic alteration. (ms+ftk)

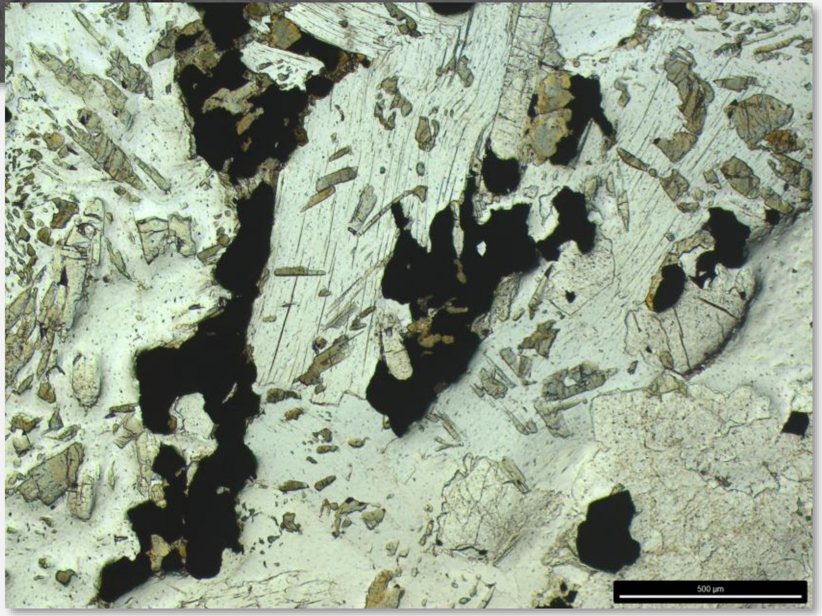
1 | 2.1 | 2.2 | 2.3

3. Mineralization
(disseminated)



Sch disseminated mineralization (sch I)

↔

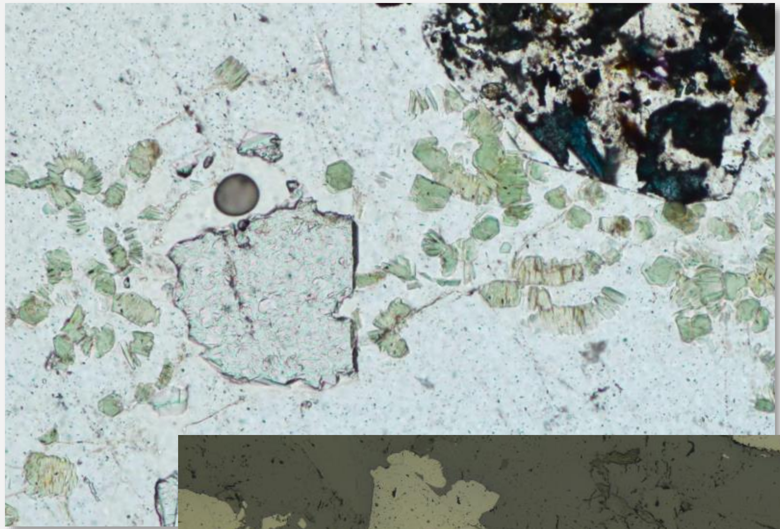


Wf disseminated mineralization (wf I)

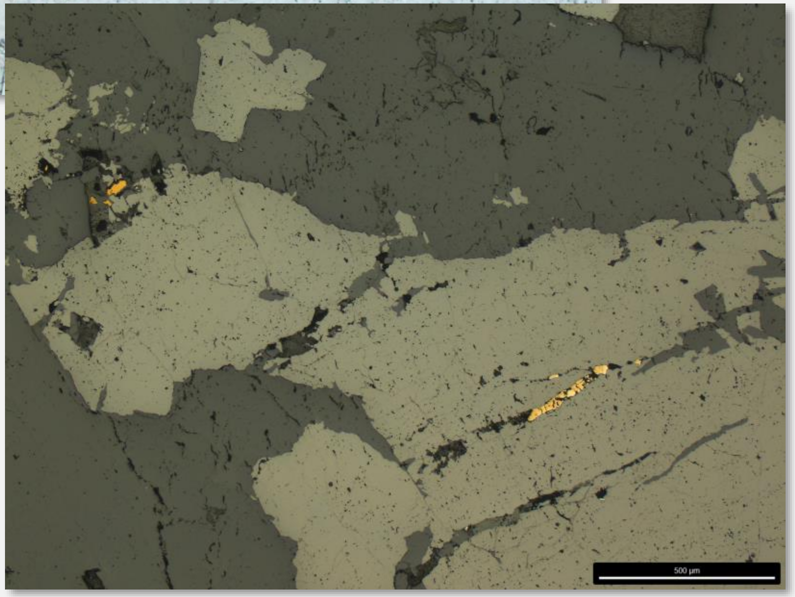
↔

1 | 2.1 | 2.2 | 2.3 | 3

3. Mineralization (vein)



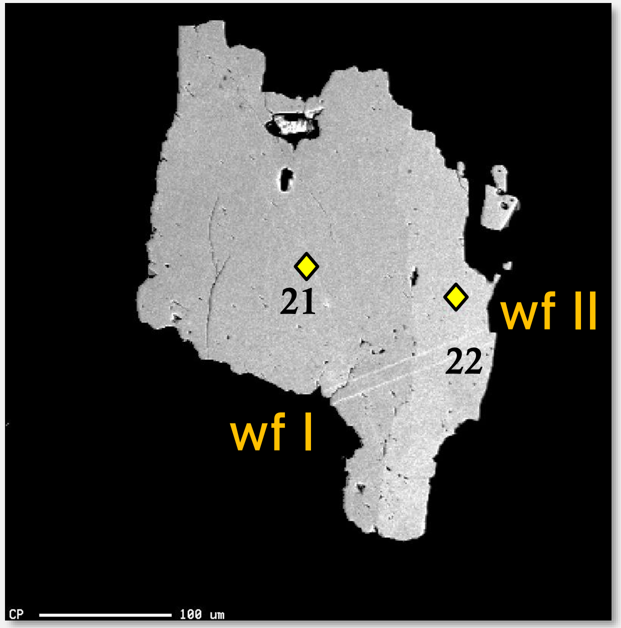
Sch vein mineralization (sch II)



Wf vein mineralization (wf II)

1 | 2.1 | 2.2 | 2.3 | 3

3. Mineralization



Element	Nb2O5	FeO	MnO	MoO3	Ta2O5	WO3	Total
21	0.14	14.40	10.59	0.06	0.07	74.23	99.52
22	0.05	12.79	12.12	0.06	0.00	74.28	99.34

Vein

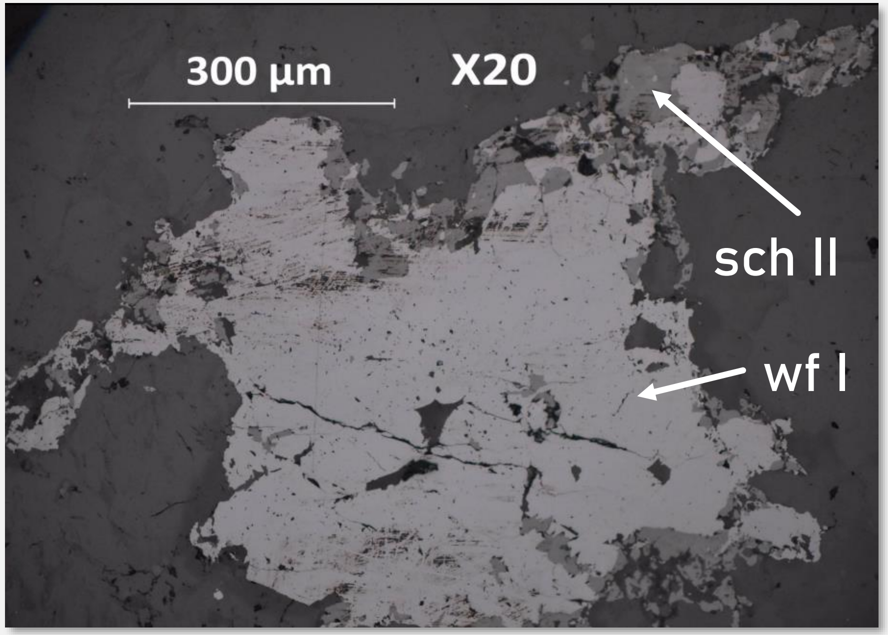
- High-grade
- Low Tonnage
- Sch II & wf II
- Qz veins + apy

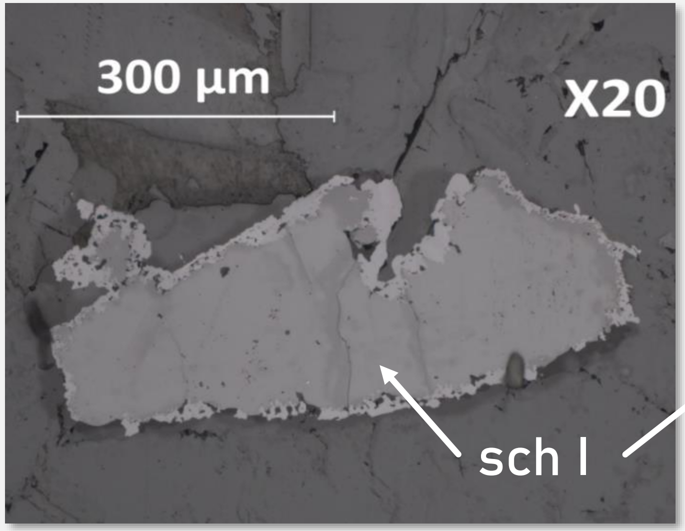
Disseminated

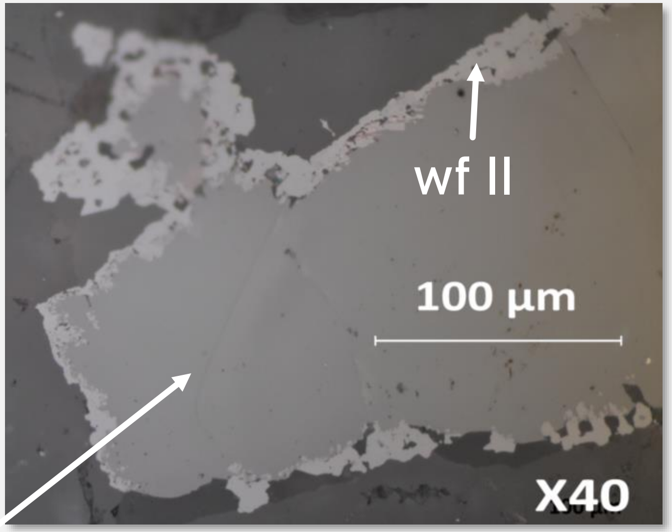
- Low-grade
- High tonnage
- Sch I & wf I
- ↑T° hydrothermal alt.

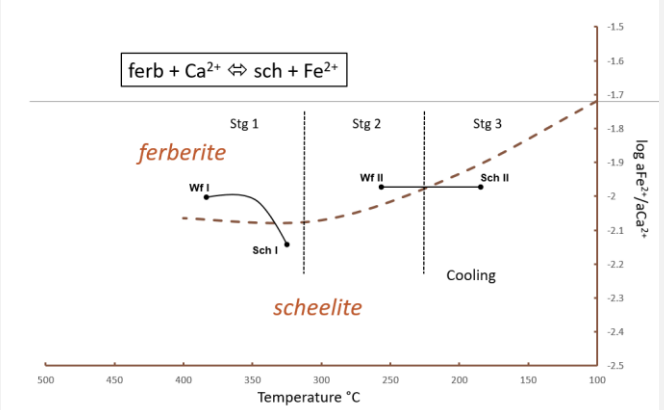
- Wf I has a H/F ratio of ca. 52 and wf II has a H/F of ca. 63.
- Increase in the Mn/Fe ratio of the fluid during the later stages.

4. Discussion





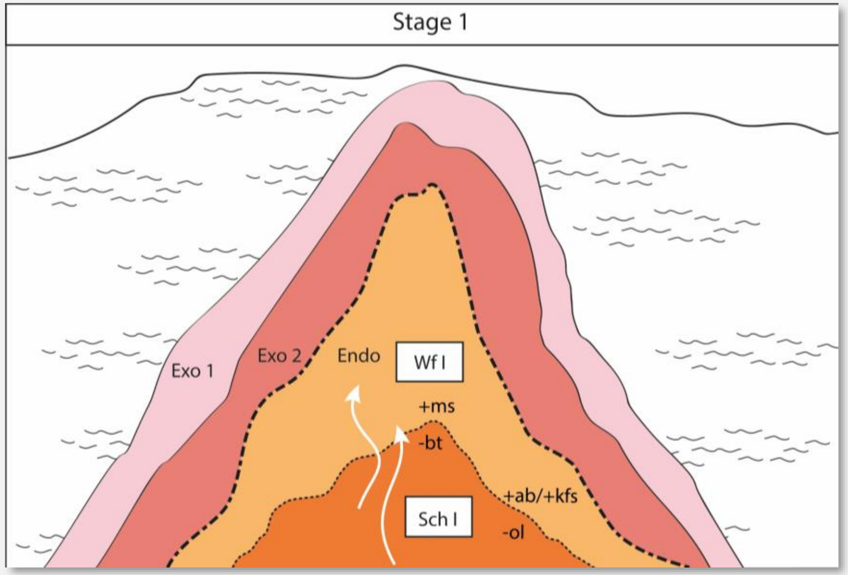




Scheelite stability zones. Data from Dick (2019)

- **Wf I**→ Fe-rich, H/F = 52, Nb-Ta rich
- **Wf II**→ Higher Mn concentration, H/F= 63, Nb-Ta poor
- **Sch I**→ Low Fe-Mn
- **Sch II**→ High Fe-Mn

4. Discussion



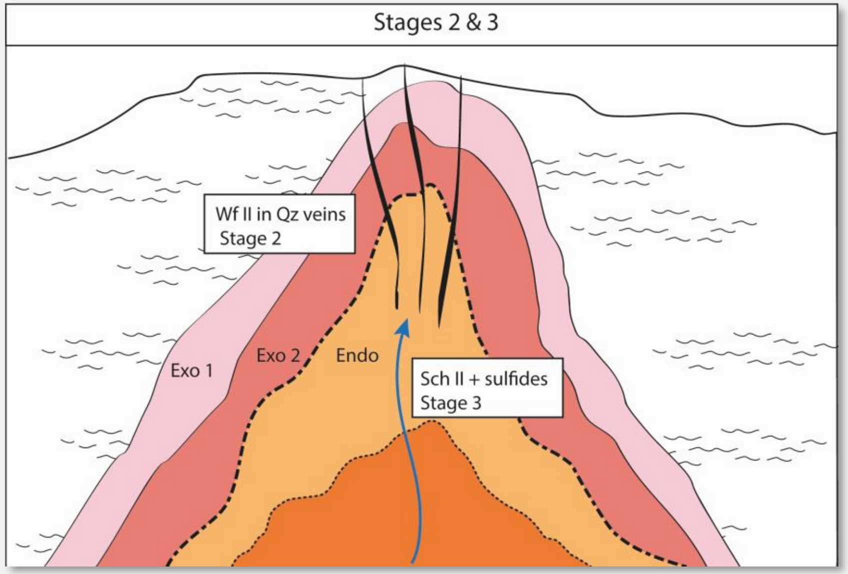
Stage 1

- ↑aFe^{2+}/aH^{+2} = early ferberite, wf I
- ↑ aCa^{2+}/aH^{+2} = early scheelite, sch I

Muscovitization

Albitization

Potassic alt.



Stage 2

- Fluids with higher Mn/Fe and Mn/Ca ratios = wf II (hubneritic)

Stage 3

- Dominant phase at lower T°= sch II

5. Preliminary Conclusions

Impact of Hydrothermal Alteration

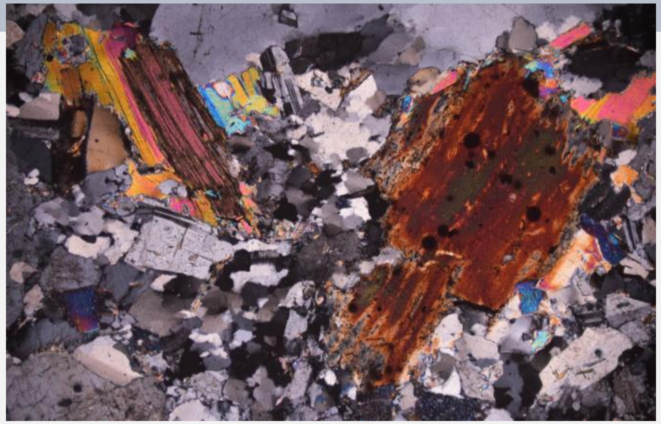
Hydrothermal alteration is key to precipitating tungsten ore.

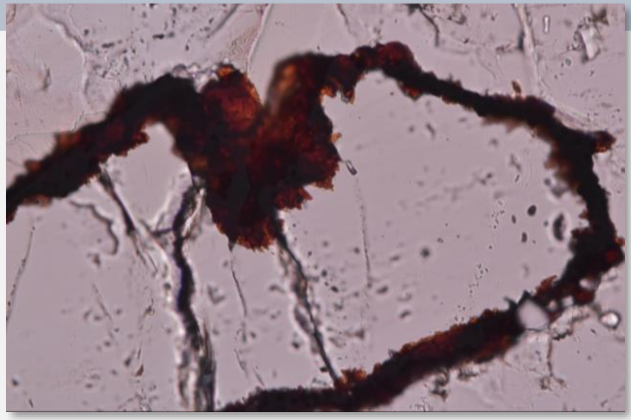
The chemical interplay of Fe, Mn, and Ca affects mineral formation dynamics.

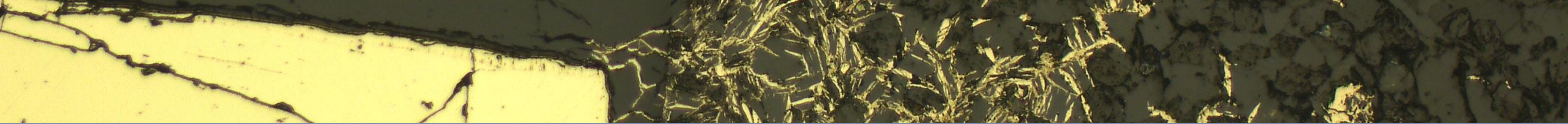
Fe Scarcity in Granitoids

Limited Fe in altered granitoids expands sch and hubnerite stability zones.

Unlike in systems richer in Fe, sch can be the dominant early precipitate.







Thank you

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