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Mineral assemblages and textures of granite-hosted veins in the Hemerdon W-Sn deposit: constraints from scanning electron microscope chemical X-ray mapping

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We report the results of a petrological and mineralogical microscopy study of granite-hosted greisen-bordered veins within granite of the Hemerdon W-Sn deposit, Devon, one of the five largest W deposits in the World. The deposit is currently mined at the Drakelands Mine. The Hemerdon granite is a satellite intrusion of the larger Dartmoor pluton of the post-Variscan Cornubian granitoid batholith. Using a range of microscopy techniques, including fast large-area chemical mapping by means of energy dispersive x-ray spectrometry (EDS) on a scanning electron microscope, we identified three types of mineralised veins in drill core material: W-only veins, Sn-only veins and polymetallic $W \pm Sn \pm$ sulphide veins. We also found that wolframite is also fully confined to veins, whereas cassiterite is often found within greisen, particularly at vein selvages. Based on the mineralogical analysis of the veins, we recognised two end-member ore mineral associations: wolframite-apatite- rutile (\pm monazite) and cassiterite-arsenopyrite-fluorite. We also found a close association between tourmaline and cassiterite. EDS imagery indicated that apatite, fluorite and rutile are pervasive phases in the veins, greisen-borders and altered wall rock. These petrographic observations suggest that W and Sn mineralisation are at least in part decoupled, where wolframite crystallised from phosphate-rich hydrous melts or magmatic fluids, and cassiterite from (later?) boron- and fluorine-enriched fluids. Our results can be scaled up and used to classify veins in the Hemerdon deposit and establish overprinting relations in order to improve our understanding of the petrogenesis of this important mineral deposit, and to constrain the timing of the formation of the ore (Figure 1 and 2).

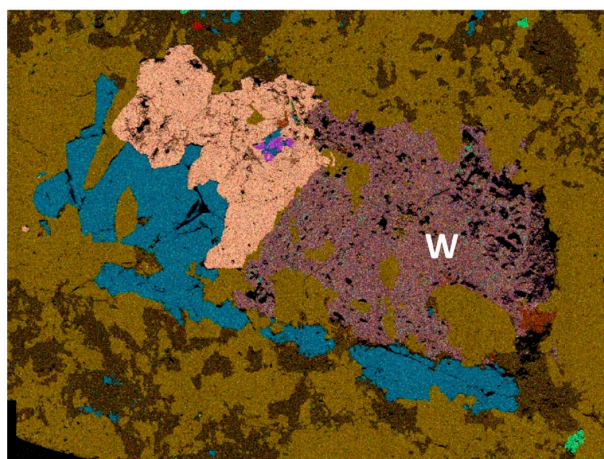


Figure 1. Figure 1. Wolframite (W), cassiterite (purple) in arsenopyrite (pink), with fluorite (blue) and apatite (bright green) in a poly-metallic vein. Extract from large-area EDS map. Horizontal field of view c. 1.5 cm.

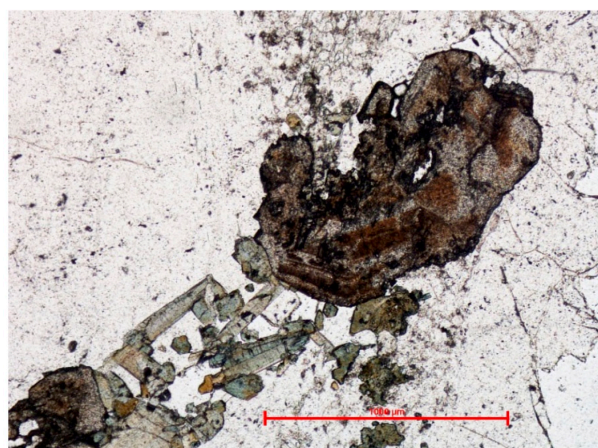


Figure 2. Cassiterite (brown) and tourmaline (blue-green) surrounded by quartz and K-feldspar in a Sn-only vein (PPL). Horizontal field of view c. 2 mm.