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Paragenetic Evolution of Sn-dominant Lode Systems in the Pool Mining District, Cornwall

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SW England hosts a world-class, W-Sn-Cu-As-Zn-Pb-Li ore field associated with the Early Permian granites of the Cornubian Batholith. In the Pool Mining district, which includes South Crofty Mine, magmatic-hydrothermal mineralisation is largely associated with steeply dipping ENE-WSW striking extensional fault systems. Recent drilling by Cornish Metals Inc. has included boreholes that intercept the principal South Crofty lodes and the Great Flat lode. This study provides an updated and in depth paragenetic sequence through core logging and optical microscopy, QEMSCAN imagery, hot cathodoluminescence, and microthermometry. These new data discoveries combined with historic descriptions provide a re-evaluation and new geological model of tin lode systems within the region.

These lode systems are hosted by the Carn Brea Granite and the overlying Devonian metasedimentary and metabasic igneous rocks of the Mylor Slate Formation. The paragenetic sequence is split into six main episodes: (1) felsic sheet intrusions, (2) feldspar and quartz veins (floors), (3) quartz-tourmaline breccias and veins, (4) quartz-chlorite veins, (5) fluorite veins, and (6) cross-course quartz veins. Cassiterite was predominantly associated with the quartz-tourmaline paragenesis (reflecting deeper sampling levels) but, in some cases with the quartz-chlorite paragenesis. The quartz-tourmaline paragenesis is multiphase and includes examples of cassiterite precipitating before, during, or after tourmaline. In contrast the Great Flat lode has minimal occurrences of stage (2) with the quartz veins showing high degrees of sheering and stage (5) fluorite veins. Additionally, although the Great flat lode has numerous occurrences of tourmaline breccias they have no associated cassiterite, unlike in historic reports. Instead, cassiterite occurs within cassiterite only or cassiterite-fluorite veins which cut through early tourmaline breccias and host rock. Hot cathodoluminescence and microthermometry of cassiterite within the Great Flat lode indicates the lodes were formed by multiple generations of fluids.