A tale of two ore zones in the East Kemptville granitehosted Sn-Cu-Zn-Ag-In deposit, Nova Scotia, Canada

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The previously mined (1985–1992) East Kemptville Sn-Cu-Zn-Ag-In deposit, southwest Nova Scotia, remains a potential metal resource of value to the technology sector based on recent ore delineation. The deposit is hosted in the East Kemptville muscovite leucogranite, a highlyfractionated portion of the Davis Lake pluton (DLP). The DLP is one of several differentiated granites in the large (7800 km^2) Late Devonian (ca. 375 Ma) South Mountain Batholith (SMB) that intruded Lower Paleozoic meta-sandstone and meta-siltstone/slate. The crustal-derived SMB complex was emplaced during the waning stages of deformation related to the Neoacadian Orogeny.

The deposit consists of two main ore zones: (1) the hightonnage, low-grade, fracture-controlled greisens of the Main Zone; and (2) the low-tonnage but higher grade, pipeshaped greisenized breccia body of the Baby Zone. Both ore zones are interpreted to have been intensely altered to form the Sn-mineralized quartz-topaz-sulphide greisens by F-rich fluids, which also mobilized even generally immobile trace elements (e.g., LREEs). The least altered portion of the Baby Zone is a leucogranite at depth which is inferred, based on its geochemistry, to be like that found in the Main Zone, and is thus feasibly contiguous at depth.

The greisens host cassiterite, sphalerite, chalcopyrite, and stannite, representing the Sn-Cu-Zn-Ag-In resource. Initial findings from ore petrology, SEM-EDS analysis, and fluid inclusion work indicate that the mineralizing fluid was of moderate salinity (25–28 wt.% NaCl-$FeCl_2$) and was exsolved from a highly evolved melt at high pressure and temperature (ca. 3.5–4 kbars and 650°C). These conditions are unusual for typical Sn deposits, which were emplaced at shallower depths (<1 kbar), as well as for the shallow-depth nature of intrusive-hydrothermal breccia observed in the Baby Zone. The massive greisens in the Baby Zone are also markedly more Sn-enriched than the discontinuous, fracturecontrolled greisens of the Main Zone, which are localized by a major sub-vertical fault, the East Kemptville Shear Zone (EKSZ). This study will: (1) constrain the structural evolution of the EKSZ with respect to mineralization; (2) describe the mineralization and alteration in the ore zones and ascertain what controlled ore precipitation; and (3) characterize the fluid evolution of the deposit.

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