A Role for Hydrothermal Fluids in Ta-Li Mineralization in the Marginal Pegmatite of the Yichun Deposit, SE China

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The Yichun granite-hosted Ta-Li-Cs deposit, located in western Jiangxi Province, SE China, is the largest Ta deposit and producer in China, hosting approximately 77 Mt. of Ta ore at an average grade of 0.015 wt % Ta_2O_5. The mineralization comprises columbite-group minerals (CGM) and microlite disseminated in the apical portions of the Yashan granite complex (YGC). Lithium is extracted from lepidolite; lesser Cs is extracted from pollucite and Cs-rich lepidolite from the same ores. Previous work has focused on the YGC, whereas the marginal pegmatite (MP), at the roof of YGC, has received little attention.

Textural and chemical analyses of CGM, lepidolite, molybdenite, and triplite from the MP and YGC demonstrate that CGM hosted by the MP have different textural and chemical characteristics than those hosted by the YGC. The latter occur as prismatic grains with a columbite-(Mn) core and a tantalite-(Mn) rim; whereas the former form acicular aggregates of columbite-(Mn) and have a higher Fe content. The MP-hosted CGM are commonly associated with aggregates of fibrous molybdenite, most of which have grown on Fe-rich lepidolite. Lepidolite in the MP also exhibits higher Fe contents than its granite-hosted counterpart; a late, Cs-rich variety, common in the granite, is not present in the MP. Round blebs of native bismuth occur in the interstices between, and on surfaces of, molybdenite and triplite crystals. Triplite in the MP hosts abundant primary fluid inclusions, and is rimmed by fluorapatite.

As closed-system fractional crystallization will have caused CGM to evolve from columbite-(Fe) to tantalite-(Mn), CGM in the MP can not have resulted from fractional crystallization of the YGC magma. The presence of Fe-rich columbite-(Mn), Fe-rich lepidolite, bismuth blebs associated with molybdenite, apatite rims on triplite, and primary fluid inclusions in triplite, is most consistent with a model that involves an Fe-bearing hydrothermal fluid in the formation of this assemblage.