

Geology and Age of the Granite Related Metasomatic Overprinting of the Rosebery VHMS Deposit

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The Rosebery deposit in western Tasmania is the oldest continuously mined volcanic-hosted massive sulfide deposit in the Mount Read Volcanics VHMS province. Syn-volcanic mineralisation occurred during the Cambrian in a submarine setting. Extensive replacement of the southern baritic and massive sulfide lenses by magnetite and pyrrhotite bodies has been linked either to Middle Devonian regional metamorphism or to Upper Devonian granite-related hydrothermal event. Here, we describe the metasomatic overprint of the U and V ore lenses, at the southern end of the deposit, and provide the first U-Pb ages for the event based on in-situ LA-ICP-MS dating of hydrothermal monazites and xenotime. Baritic orebodies at V lens were partially replaced by hematite and magnetite bodies whereas the Zn-Pb rich massive sulfides in U and V lenses were partially replaced by pyrrhotite-pyrite-chalcopyrite. Devonian metasomatism results in depletion of Zn-Pb from the ore lenses but enrichment in Cu and Au in the pyrrhotite bodies. The metasomatic overprint was accompanied by local biotite + chlorite alteration overprint. At U lens, above the massive sulfide lens, occurrences of tourmaline-quartz breccias host significant gold, which is interpreted to have been remobilised from the massive sulfides. Hydrothermal monazite and xenotime give U-Pb ages ranging from 369 ± 2 Ma to 356 ± 4 Ma with a distinct age concentration at ca. 360 Ma. Our ages overlap crystallization ages for Sn granites and cassiterite ages in western Tasmania, confirming the genetic link between these events. Together with previous geochronological results the history of major alteration events at Rosebery have been constrained from 500 Ma to 350 Ma. Significant amounts of Zn-Pb were remobilised in the Devonian and Cu may have been added during the Devonian metasomatic event, which has important implications for exploration at Rosebery and elsewhere in western Tasmania.