

GEOCHEMISTRY OF HYPERSALINE FLUID INCLUSIONS FROM THE
STARRA (Fe OXIDE)-Au-Cu DEPOSIT, CLONCURRY DISTRICT, QUEENSLAND

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Abstract

Studies of liquid-vapor-multisolid (L-V-nS) and liquid-vapor ± halite fluid inclusions suggest that at least three fundamentally different brines were involved in the genesis of the Proterozoic ironstone-hosted Starra Au-Cu deposit. Element concentrations determined from proton-induced X-ray emission (PIXE) analysis of groups of L-V-nS inclusions from the early barren magnetite ironstone stage (400°–550°C) and the younger mineralization stage (220°–360°C) covary over concentration ranges greater than the deduced analytical errors. The L-V-nS inclusions in the two stages are very different, with higher ratios of Fe and K to Ca, Mn, Cu, Zn, Sr, Ba, and Pb in the ironstone stage. Quite distinct, pseudosecondary NaCl-CaCl₂-H₂O inclusions are abundant in mineralization-stage quartz, calcite, and anhydrite. High concentrations of Cu (ca. >1,000 ppm) are present in some L-V-nS inclusions of both stages, and the data suggest that large amounts of Cu, Mn, Zn, As, Ba, and Pb passed through the Starra system as it evolved. Cl/Br ratios in the inclusions are mostly less than 0.002 and clearly different from those of ore fluids of the giant sedimentary-hosted copper orebody at Mount Isa. This could reflect a major magmatic contribution to the salinity at Starra that is consistent with the preferred origin of the water in published stable isotope studies. Ba concentrations of at least several wt percent in some mineralization-stage L-V-nS inclusions are associated with oxidized sulfur-bearing mineral parageneses. Given the low solubility of barite this suggests that a_{S2}-f_{O2} relationships varied during mineralization.