

# **Salt and copper in iron oxide-copper-gold systems, Cloncurry district, Australia**

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Proterozoic rocks of the Cloncurry district in NW Queensland, Australia, are host to regional scale (tens to hundreds km) hydrothermal systems that include barren sodic-calcic alteration, granite-hosted systems that developed at the magmatic-hydrothermal transition, and iron oxide-copper-gold (IOCG) deposits. Fluid inclusion studies including Proton Induced X-ray Emission (PIXE) have been carried out to distinguish barren from mineralized systems and identify the sources of fluids.

Four main fluid inclusion types are recognised: (1) multisolid inclusions (Th ~200 and >550 °C, ~30 to >60 wt. % total salts), (2) three-phase halite-bearing inclusions (Th ~120 and 350°C, ~30 to 40 wt. % NaCl equiv.), (3) two-phase aqueous inclusions (Th ~100 to 250 °C, <5 to 35 wt. % NaCl equiv.), and (4) carbon dioxide (± solid phases) inclusions.

Multisolid inclusions occur primarily in IOCG and granite-hosted environments but are mostly absent in barren sodic-calcic alteration. PIXE analyses indicate that these inclusions contain the highest copper concentrations (>300 ppm) particularly in inclusions in granite-hosted settings and/or with Br/Cl ratios consistent with a possible magmatic origin. Br/Cl ratios also indicate an important role for evaporite-related fluids. Fluid mixing between Cu-rich (volumetrically minor?), magmatic fluids, and evaporite-related fluids with lower Cu contents, may have been an important ore deposition mechanism within the IOCG deposits.