

Apatite Geochemistry and Geochronology to Distinguish Between the Fluids Responsible for the Formation of Eloise ISCG Deposit, Australia

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The processes and fluids involved in the formation of IOCG and ISCG deposits are highly debated. Compositional analyses and isotopic studies of accessory phases are becoming an important tool to decipher these processes and distinguish between different fluid types. We plan to use apatite as a tracer for these purposes. Given that not all IOCG and ISCG deposits are enriched in REE, this is necessary to understand the processes responsible for the selective enrichment of REE in some deposits.

Eloise is an ISCG deposit in Mount Isa Inlier, northwest Queensland, Australia. Previous studies of the deposit have reported a distinct LREE depleted pattern at Eloise. Using a combination of EPMA for major element analysis, and LA-ICP-MS for the trace element analyses and U-Pb dating of apatite and titanite. The major element analysis will focus mainly on F-, Cl-, and OH- given their importance as complexing ligands transporting the REE. On the other hand, the trace element analysis will focus on REE to understand their abundance, along with Arsenic given its concentration in apatite can be used as a proxy for the redox conditions.

Our preliminary results show at least two stages of apatite mineralization. First, an early F-rich stage, represented as core of coarse apatite with relatively constant, LREE depleted patterns. Whereas, the second stage, represented by the rims of coarse apatite, and disseminated fine apatite grains, show a comparatively OH- rich composition with significant variation in LREE compared to the cores. The variation in the As concentration suggest an increase in oxidation conditions in the later event. Preliminary U-Pb geochronology of apatite provides an age of 1558 ± 18 Ma, although the results require careful analyses as Pb-mobility is common in the apatite grains.