

Enrichment of U-Y-Zr in basinal brines of the Athabasca Basin – implications for U and REE mineralization

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The Proterozoic Athabasca Basin (Canada) is known for its large endowment in high-grade, unconformity-related U deposits. The U ores, however, also contain significant concentrations of REE, and some hydrothermal REE mineralization has been found within the basin. It is, therefore, important to determine the concentrations of HFSE in the basinal fluids in order to understand the relationship between the U and REE mineralization.

LA-ICP-MS analyses of fluid inclusions entrapped in quartz overgrowths (Fig. 1a) in sandstones display prominent peaks of Cl, Na, Ca, Mg, K, U, Y and Zr (Fig. 1b). There is a positive correlation between U-Y-Zr and Cl (Fig. 1c) as well as with Na+Ca (main solutes in the fluid inclusions) (Fig. 1d). These results suggest that large amounts of U and REE were carried by basinal brines, and were precipitated together or separately, depending on local physicochemical conditions.

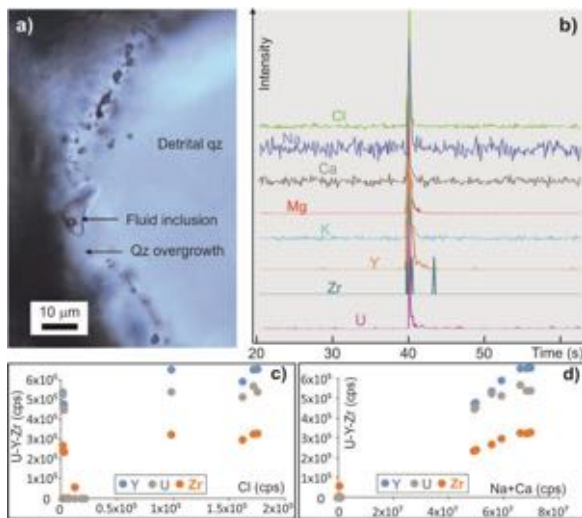


Fig. 1 a) Fluid inclusion in quartz overgrowth; b) LA-ICP-MS signal of a fluid inclusion; c-d) correlation between U-Y-Zr and Cl (cps), and between U-Y-Zr and Na+Ca (cps).