**New Developments in Geochronology to Place Mineralisation Processes into Better Constrained Tectonic and Geodynamic Context.**

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Mineral deposit formation and modification is one of the most chemically complex processes that occurs in the Earth's crust and presents significant challenges for geochronology methods applied to constrain timing. It is well demonstrated that traditional geochronological methods such as U-Pb and Ar-Ar can provide high fidelity age constraints on the timing of mineralisation. However, these methods can also have significant limitations, for example significant common Pb in U-Pb systems, and time consuming methodology in the case and difficulties with in situ targeting in the of Ar-Ar.

An alternative approach to the geochronologic interrogation of mineral deposits is with beta-decay geochronology analysed via reaction cell laser ablation. The method combines the rapidity and spatial precision of laser-ablation geochronology with a wide range of isotope systems and minerals relevant to ore deposit formation.

At the University of Adelaide, the use of reaction cell technology is routine for beta-decay geochronology applications, with more than 200,000 analyses in the last 4 years. The analytical techniques developed and optimised at the University of Adelaide provide fast, high-volume analysis of Rb-Sr, Lu-Hf and Re-Os radiogenic systems that constrain age in combination with trace element compositions of a range of minerals typically associated with mineralization (molybdenite, apatite, muscovite/sericite, carbonates, fluorite) in their paragenetic context.

Laser ablation reaction cell beta-decay age-dating methods offer a flexible portfolio of approaches to interrogate the timing of mineral deposit formation and modification.  The spatial precision of laser-based data acquisition puts the petrographer back into a central position to inform the targeting process. The trace element information that accompanies age acquisition creates a nexus between geochemists, tectonicians and geodynamists that will better illuminate when, how and why mineral deposits form.

In this presentation we demonstrate the utility of reaction cell beta-decay geochronology to augment the understanding of mineral deposit formation.