

## **U-Pb beyond zircon: a thousand degrees of freedom**

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Zircon, due to its chemical and physical resilience and excellent capability as a compositional archive, is the 'gold standard' geochronometer. The compositional information it hosts is dominated by high-temperature melt-related processes. Beyond zircon, an abundance of alternative minerals provide U-Pb chronometry, with formation covering a thousand degrees in temperature. These mineral chronometers range from high-temperature melt-dominated processes (e.g. baddeleyite), to low-temperature fluid-only processes (e.g calcite). Critically, it is becoming increasingly recognised that fluid-related processes effect the compositional archive of nearly all geochronometers. An extreme view of this, is that most petrochronometers can be classified as hygrochronometers<sup>1</sup>.

Two significant advances in the last decade within U-Pb geochronology include the petrochronology movement – the ethos that petrogenetic information and context are as important as the dates themselves. Second, is the development of mineral chronometers beyond the usual suspects. These include minerals critical to our understanding of ore systems, e.g columbite, cassiterite, hematite, bastnesite and skarn garnet. They also include low-temperature minerals that allow us to place constraints on fluid-flow and deformation in the brittle field – carbonate, fluorite, opal and hydrothermal monazite.

This presentation will review some of the recent methodological advances and applications. Covering both high and low temperature mineral chronometers, including including monazite, garnet and calcite.

<sup>1</sup>Bosse, V. & Villa, I. M., 2019, Gondwana Research 71, 76-90.