

Oscillatory-zoned hematite: a reliable U-Pb mineral geochronometer

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Uranium-bearing oscillatory-zoned hematite has previously been proposed as a U-Pb geochronometer [1,2]. The presence of lattice bound U-W-Sn-Mo-Pb bearing hematite featuring oscillatory zonation was shown across the 6 km strike and 2 km vertical extent of the Iron Oxide Copper Gold (IOCG) deposit at Olympic Dam, South Australia [3]. LA-ICP-MS dating of these U-W-Sn-Mo oscillatory-zoned hematites displays a common ²⁰⁷Pb/²⁰⁶Pb upper intercept age of ~1.6 Ga. However the reliability of LA-ICP-MS U-Pb data is difficult to assess without a matrix-matched standard and poorly constrained matrix-effects.

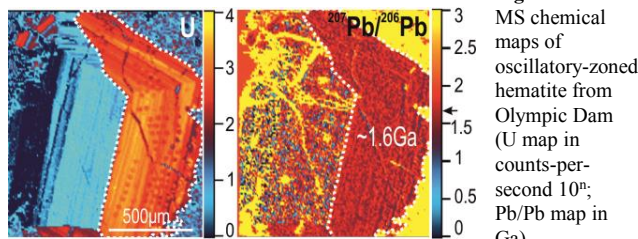


Fig. 1: LA-ICP-MS chemical maps of oscillatory-zoned hematite from Olympic Dam (U map in counts-per-second 10⁸; Pb/Pb map in Ga).

LA-ICP-MS mapping of zoned grains show consistent ~1.6 Ga ²⁰⁷Pb/²⁰⁶Pb ages within the higher U domains (Fig. 1). Further assessment of the U-Pb systematics has been conducted using SHRIMP and ID-TIMS micro-sampled domain analysis. The data confirm the presence of low common Pb, near-closed system crystals domains and zero-age open-system behaviour. Results show: (i) oscillatory zoning traps radiogenic daughter isotopes in hematite; and (ii) such hematite, confirmed in IOCGs worldwide [2], marks the onset of mineralisation.

[1] Ciobanu, C.L. et al. (2013), *Precamb. Res.* 238,129-147 [2] Courtney-Davies, L. et al. (2016), *Minerals* 6(3), 85 ; doi:10.3390/min6030085 [3] Verdugo-Ihl, M. et al. (2017) Extended abstract, SGA-2017, Quebec.