

***In-situ* U–Pb dating of hydrothermal xenotime by LA–ICP–MS: A chronological insight into Finnish Lapland orogenic gold**

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The Central Lapland Greenstone Belt (CLGB) hosts orogenic gold deposits along the Sirkka and Kiistala Shear Zones, including the world class Suurikuusikko deposit (>2Moz at >5g/t; [1]). Despite numerous studies, the timing of Svecofennian orogenic deformation events (1.90–1.77 Ga) and associated mineralisation remains speculative with evidence resting on cross-cutting relations and single-grain analyses [2]. Xenotime is an ideal candidate for U–Pb dating by LA–ICP–MS due to its high U but minimal common Pb content. By undertaking *in-situ* U–Pb of hydrothermal xenotime, with strict control on its textural settings, this study provides better temporal constraints on mineralisation of orogenic gold in the CLGB.

The Iso-Kuotko deposit is located on a bifurcating fault intersection along the Kiistala Shear Zone, 20 km north of the Suurikuusikko deposit. It is characterised by two phases of gold mineralisation including arsenopyrite+pyrrhotite-rich quartz-carbonate breccia zones (A₁) and high-grade carbonate-quartz veins with minor disseminated sulphides and native bismuth (A₂). Xenotime hosted by A₁ gives an age range from 1740–1884 Ma. Assuming two periods of mineralisation, gaussian deconvolution of this range produces error-weighted ²⁰⁷Pb/²⁰⁶Pb age populations of 1772 ± 4 Ma and 1840 ± 5 Ma. However, xenotime grains from A₂ give a ²⁰⁷Pb/²⁰⁶Pb age, consistent with xenotime from A₁, of 1759 ± 10 Ma (2σ; n = 23) reflecting the second period of fluid flow and high-grade Au mineralisation.

In-situ U–Pb dating of hydrothermal xenotime by LA–ICP–MS produced distinct ages attributed to repeated fluid flow along the same shear zone during Svecofennian tectonism. An age of 1840 ± 5 Ma is coincident with collision of Fennoscandia and Laurentia, while an age of 1759 ± 10 Ma is consistent with voluminous post-orogenic granitoid magmatism across Fennoscandia [3]. This work was supported by the Academy of Finland, project No. 281670.

[1] Patison (2007) *Geol Surv Finl Spec Pap* **44**, 107–125. [2] Mänttari (1995) *Geol S Finl Bull* **391**, 70. [3] Korja et al. (2006) *Geo Soc Mem* **32**, 561–578.