

U–Pb of hydrothermal phosphates by LA–ICP–MS: Dating episodic mineralisation along the Kiistala Shear Zone, Central Lapland Greenstone Belt

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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 dated at ~ 1.91 Ga (Re-Os isochron; Wyche et al., 2015). The timing of Svecofennian orogenic deformation events (1.92–1.77 Ga; Korja et al., 2006) and associated mineralisation remains enigmatic as evidence rests on limited hydrothermal age data. Monazite and xenotime are ideal candidates for U–Pb dating due to high U and Th as well as minimal common Pb content. By undertaking *in-situ* U–Pb of hydrothermal phosphates, with strict control on textural setting, 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 (KSZ), 14 km north of the Suurikuusikko deposit. It has three consecutive mineralisation stages dominated by arsenopyrite, pyrite and pyrrhotite + native Bi with quartz–ankerite veinlets/breccias. Gold is refractory in arsenopyrite and pyrite but occurs as free grains with pyrrhotite mineralisation. Vein-hosted monazite, co-genetic with pyrite, gives a U–Pb concordia age of 1862 ± 14 Ma (2σ ; $n = 6$). Pyrrhotite breccia-hosted xenotime forms two populations with upper intercept ages of 1853 ± 12 Ma ($n = 14$) and 1763 ± 7 Ma ($n = 45$).

In-situ U–Pb dating of hydrothermal monazite and xenotime provides evidence for two distinct mineralising events. In tandem with previous data, this study highlights episodic orogenic gold mineralisation along the KSZ over 150 Ma. This work was supported by the Academy of Finland, project No. 281670 to F. Molnár.

References:

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