Ore Mineralogy and U-Pb and Re-Os Geochronology in the Ikkari Gold Camp, Central Lapland Belt, Northern Finland

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The Paleoproterozoic Central Lapland belt, part of the Fennoscandian Shield, has proven to be the most prospective area for large mineral deposit discoveries during the last century. One of the recent discovery highlights is the Ikkari gold deposit, part of the more extensive Ikkari Gold Camp (IGC), comprising multiple gold deposits and occurrences hosted by intensely strained metasedimentary rocks and metakomatiites. The most recent combined resource estimation yields >4 Moz Au with potential for growth. In this study, we present mineralogical relationships along with geochronology using in situ LA-SC-ICP-MS U-Pb dating of monazite and xenotime, and Re-Os dating of molybdenite related to the mineralization in the Ikkari and Heinä Central gold deposits within the IGC. At Ikkari, gold is strongly associated with pyrite within carbonate-rich intervals and occurs as native gold, filling fractures in pyrite or forming adjacent to pyrite. Locally, mineralized rocks show elevated Co content where common Co-(and Ni)-rich minerals enclosed by pyrite include siegenite with millerite exsolution lamellae. In contrast to Ikkari, the Heinä Central deposit is characterized by abundant pyrrhotite and chalcopyrite in carbonate-rich breccias. Pyrite is subordinate and focused within local pyrite-rich intervals. Gold is found as native grains associated with pyrrhotite, Bi-Te phases, or intergrown with molybdenite in sulfide-carbonate-quartz breccias.

At Ikkari, hydrothermal monazite and xenotime from Au-rich mineralized intervals show a distribution of ages between ca. 1.83 and 1.75 Ga. Similarly at Heinä Central, hydrothermal xenotime related to gold-rich intervals shows ages between ca. 1.83 and 1.75 Ga. In addition, Re-Os dating of molybdenite intergrown with native gold yields ages of 1802 ± 7 Ma. These results suggest a prolonged mineralizing system during the late-orogenic stages of the Svecofennian orogeny and reflect complex periods of re-activation of major fluid-channeling structures in the Central Lapland belt.