Toward the application of Ni and Ag isotopes as indicators of the genesis of cobalt in orogenic gold systems, Finnish Lapland

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A wide range of gold deposit types has been recognized in Finland, all of which can be related to diverse episodes of continental evolution. Not all of them, such as the Rompas-type Au-U deposit on the Peräpohja schist belt [1], fit the conventional genetic framework, however, and this points to varying origins of metals and/or different trap conditions.

Stable transition metal isotopes provide a powerful yet rather undeveloped tool for studying cobalt deposits. Fractionation of transition metal isotopes is highly sensitive to ambient redox conditions and source regions of metals also leave their footprint in the isotope ratios. Stable isotopes of Ni and Ag have substantial potential to yield novel information on the origin and enrichment processes of cobalt in gold deposits, in particular as they are associated with a large group of cobalt minerals with varying fractionation properties.

We are developing new analytical techniques to analyze stable isotopes of Ni and Ag to model cobalt behavior in orogenic gold deposits. Ni for the analyses is eluted from pyrrhotite and/or pentlandite extracted from thick sections using micro drilling method, whereas Ag is eluted from free gold. Following the separation of Ni and Ag from the matrix with ion exchange chromatography, the isotopic composition is measured by MC-ICPMS. Obtained $Ni^{60/58}Ni$ ratio is corrected for instrumental mass bias by using a $^{61}Ni/^{62}Ni$ double-spike method, where $^{109}Ag/^{107}Ag$ ratio is corrected by using a combination of Pd-spike and standard bracketing. The latest advancements in the study will be presented.

[1] Ranta, Molnár, Hanski & Cook (2018), *Bulletin of the Geological Society of Finland* **90**, 69–108.