Gold in Huittinen, Southern Finland

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Introduction
The Jokisivu gold mine and Ritakallio, Palokallio and Unimäki gold occurrences are located in the Svecofennian gabbroic bedrock close to the terrain boundary between Häme and Pirkanmaa belts, about 140 km NW of Helsinki at Huittinen (Fig. 1). The Jokisivu area and the Unimäki prospect are part of the Häme belt and the Palokallio and the Ritakallio gold occurrences are situated in the Pirkanmaa belt (Sipilä et al. 2011). All four gold occurrences are situated in the late Proterozoic Paatsjoki belt (1.88 Ga (Suominen 1988, Kilpeläinen 1998). Gold in the Huittinen area, Southern Finland, is the result of numerous mineralized boulders and gold grains in till during a follow-up survey (Huhta 2004). A quartz dioritic to gabbroic intrusion, similar to the Jokisivu, hosts NE- to NNE-dipping gold-rich quartz veins in shear zones (Fig. 2). Gold is associated with alteration that is characterised by the presence of sulphides, sericite, K-feldspar and quartz. Gold occurs as native free grains between silicate-gangue and within sulphides, with the grain size ranging from ≤0.01 to 1 mm (Lehtinen 2005). Gold also forms composite grains with Bi-, Sb- and Te-rich minerals. Dragon Mining has drilled numerous mineralized boulders and gold grains in till during a follow-up survey (Huhta 2004). Gold also forms composite grains with Bi-, Sb- and Te-rich minerals. Dragon Mining has also drilled numerous mineralized boulders and gold grains in till during a follow-up survey (Huhta 2004).

The Ritakallio gold occurrence
The Ritakallio gold occurrence was found by the Geological Survey of Finland when drilling geological and geophysical anomalies in 2002 (Vuori et al. 2005). The first indications of gold were slightly elevated (21 ppm) gold concentration in till in a regional geochronological survey, and discovery of numerous mineralized boulders and gold grains in till during a follow-up survey (Huhta 2004). A quartz dioritic to gabbroic intrusion, similar to the Jokisivu, hosts NE- to NNE-dipping gold-rich quartz veins in shear zones (Fig. 2). Gold is associated with alteration that is characterised by the presence of sulphides, sericite, K-feldspar and quartz. Gold occurs as native free grains between silicate-gangue and within sulphides, with the grain size ranging from ≤0.01 to 1 mm (Lehtinen 2005). Gold also forms composite grains with Bi-, Sb- and Te-rich minerals. Dragon Mining has explored the area and has obtained promising results, including a narrow high-grade intercept of 1.10 m at 49.80 ppm Au (Dragon Mining 2011).

The Palokallio gold occurrence
The Geological Survey of Finland investigated the Palokallio gold occurrence during 2006–2009. The gold mineralisation is hosted by shear zones some centimetres wide in a dioritic gabbro (Fig. 3). The gabbro is penetrated by mafic and pegmatitic dykes and quartz veins and is surrounded by more gneisses and graphite-bearing sulphide schists. The best gold grade detected by drilling has been 41.8 ppm/0.9 m Au. Gold grades in drill core samples are usually under 1 ppm/1 m. Arsenopyrite (Fig. 4), bilinite, pyrrhotite and scheelite are the most abundant ore minerals (Voipio 2008, Grönholm & Voipio 2012).

The Unimäki gold occurrence
The Unimäki gold prospect was discovered during 2009 by drilling a heavy mineral gold and scheelite anomaly in a till sample. The till sample was taken close to a shear zone located using mapping gold critical mafic intrusions in the Huittinen area. Geophysically and lithologically Unimäki is similar to Ritakallio. The gabbro includes broken and brecciated zones composed of fine grained epidote, chlorite, quartz and carbonate, thin quartz vein network, and locally sulphides (Fig. 5). The gabbro is heterogeneous, and outside the fault zones only faintly deformed. In drill holes there are Au-enriched zones, typically 2 to 5 m at 2–3 ppm Au. The highest grade detected is 15 ppm Au in one metre section. High Au grades are met both in the altered breccia zones and within seemingly non-altered gabbro. Typical ore minerals are locally abundant pyrrhotite, and minor chalcopyrite, arsenopyrite and ilmenite. There is a clear IP anomaly in the Au critical area.

Summary
The gabbro and quartz dykes hosting gold mineralisations in the Huittinen area do not clearly stand out from the surrounding bedrock in the magnetic, electromagnetic or radiometric maps (Fig. 6). Typically the only magnetic mineral is monochromatic pyrrhotite, and the susceptibilities of these rocks usually remain low (Huuskonen 2009, Mertanen 2012). In the gravimetric data, NW-SE-trending gold potential zones seem to be related to gravity minima (Vuori et al. 2007). Gold-critical major shear zones are also recognized in aeromagnetic maps as ambiguous non-magnetic and locally gently twisted lineaments. These four gold occurrences demonstrate that shear zones in mafic intrusions are of high gold potential in the Huittinen area, and likely also elsewhere in the Svecofennian area, as shown by Kaapelinkaluna and Laiavangas gold deposits.

References

Geological Survey of Finland
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