Origin of gem and ore minerals obtained in gold sluicing in Finnish Lapland

P. TUISKU[1]*, A. KANGAS[2] AND K. LAHTINEN[3]

[1]*Oulu Mining School, P.O. Box 3000, 90014 University of Oulu, FINLAND (*pekka.tuisku@oulu.fi)*
[2]*Boliden Kylylahti, Kaivostie 9, 83700 Polvijärvi, FINLAND*

[3]*Nordic Mines, Laivakankaantie 503, 92230 Mattilanperä, FINLAND*

Corundum, garnet and dense ore minerals are obtained as side product of gold panning and sluicing in the gold rush areas of Ivalojoki and Lemmenjoki. Several types of corundum were observed including some rubies and sapphires. The chemistry of corundum varies from pure Al_2O_3 to Cr and Fe bearing varieties. Inclusions vary from monazite and zircon grains to irregular, epidote, zoisite, margarite, granular and fibrous hematite etc. Thermodynamic modelling of a polycrystalline ruby bearing amphibole rock sample indicates clockwise PT-evolution from ~14 kbar and 600 °C to ~7-9 kbar and 800 °C. U-Pb ages from monazite inclusion give monotonous 1.9 Ga age population regardless of the type of corundum host. This and the PT-evolution suggest that most corundum grains are derived from unknown host rocks in marginal zone of Lapland granulite belt (LGB), which suffered high grade metamorphism during tectonic juxtaposing of the granulite units.

More than 5000 heavy mineral grains were analysed by SEM-EDS from 12 black sluicing sand samples, further enriched by Spiral Gold Panning Machine. Some concentrates were enriched in PGMs or REE-, Nb- and Ta-minerals. Pure gold showed no correlation with other minerals apart from electrum. Sperrylite rich samples also contained other PGMs but the amount of individual mineral grains was too low to demonstrate statistically significant correlation. The same applies also to columbite-tantalite group minerals and other minerals typically occurring in complex pegmatite. Monazite, zircon, rutile and garnet seem to correlate with each other suggesting their major provenance from khondalitic bedrock of the LGB. The results suggest that bedrock source for placer gold did not contain significant amounts of other weathering resistant heavy minerals thus excluding basic igneous rock provenance for gold. Occurrence of several PGM species in certain samples and several Nb-, Ta-, Th-, REE-, W-, Sn- etc. minerals in others, indicates that till samples probably have drifted material from PGE-deposits and complex pegmatite deposits, accordingly. This suggests, combined with recent knowledge on ice movement directions and composition of the bedrock in the area that the marginal zone of the LGB is potential for PGE and complex pegmatite deposits, as well as gemstone occurrences.