Au-PORPHYRY MINERALIZATION IN BELUJ (ŠTIAVNICA STRATOVOLCANO, SLOVAKIA)

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The studied area is located in the Central Slovakia Volcanic Field, in the mantle of the Neogene Štiavnica stratovolcano. Au-porphyry systems in this part of the stratovolcano are connected to intrusive andesite and diorite porphyry bodies, related to early stage of evolution of the stratovolcano. This porphyry system was recently explored by EMED – Slovakia, Ltd. including two inclined drill holes down to 254 m depth, discovering uneconomic potential of 58.4 Mt at 0.3 ppm Au ore (BAKOS *et al.,* 2010).

The host rock of the mineralisation is a medium grained andesite porphyry body. The intrusion is affected by Ca-Na silicate alteration in the form of actinolitisation of mafic minerals and replacement of rock forming feldspar by alkaline plagioclase (albite-anorthite) accompanied by minor titanite and apatite. K-silicate alteration is represented by biotitisation and magnetitisation of mafic minerals (amphibole) and replacement of plagioclases by K-feldspar. Later intermediate argillization is represented by illite, smectite, chlorite (diabantite, brunsvigite), epidote and pyrite. A post mineralization advanced argillic alteration occurs in elongated NW-SE trending zones up to several tens of meters thick, formed by argillised and silicified breccias with vuggy texture. The phyllic alteration locally appears on the margins of the intrusive centre. Broad surrounding of the centre is propylitized (BAKOS *et al.,* 2010).

Gold mineralisation is spatially connected to stockwork of quartz veinlets. Some of the veinlets are banded, while banding results from high content of vapour rich fluid inclusions and tiny grains of magnetite and ilmenite. Banded quartz veins are accompanied by Fe-rich smectite (nontronite, saponite) and chlorite. Relatively younger are quartz-calcite veins with chlorite, smectite, and chalcopyrite veins sporadically with sphalerite. Veinlets with cubic shaped zeolite (chabazite?) and clay minerals (smectite) are younger than quartz veins, and are dominant in the middle section of the studied drill core (from 136 to 172 meters), where Mn has a positive anomaly with an average of 875 ppm. Brecciation occurred from 118 to 140 meters in the form of a fine grained breccia pebble-dyke that cuts through the host rock. The breccia-dyke is affected by silicification and biotitisation and contains older fragments of quartz veins. Brecciation from 218 to 230 meters is affected by intense silicification, biotitisation, and argillization (illite, smectite). The main ore mineral is magnetite and ilmenite disseminated in veins and as grains in the host rock. Pyrite replaces magnetite and ilmenite and is disseminated in the rock and in quartz veins. Chalcopyrite, galena, sphalerite and molybdenite are less frequent. Gold forms isometric grains or grain clusters up to 5–10 μm (BAKOS *et al.,* 2010). Au is increased in the sections rich in banded quartz veinlets and in the brecciated zones, with a maximum of 1.2 ppm. Rare zoned garnet (andradite) was also found in the host rock, with outer rim enriched in grossular component. Tourmaline was found in the matrix with biotite, plagioclase and K-feldspar, and therefore it might be related to K silicate alteration. Other accessory minerals are monazite, allanite, thorite, xenotime and zircon (BAKOS *et al.,* 2010). According to geochemical analyses of drill core (provided by EMED) Cu has an average of 245 ppm, and is more enriched in the sections of banded quartz veinlets and in brecciated zones. Pb and Zn are enriched in zones of K-silicate alteration, and veins with zeolite with an average of 40 ppm for Pb and 250 ppm for Zn. Slight Mo enrichment occurs in the zone of a breccia dyke from 118 to 140 meters with an average of 7 ppm. Ag is always under detection limit (max. 0.9 ppm Ag).

Quartz veins contain predominantly vapour-rich fluid inclusions, both primary and secondary, sometimes forming irregular band of inclusions. Locally, trails of secondary vapour-rich inclusions with green anisotropic solid phases are present, interpreted as salt-melt bearing inclusions (by analogy with the Biely vrch Au porphyry; KODĚRA *et al.,* 2011). Quartz also hosts rare trails of oval opaque inclusions, possibly representing sulphide melt inclusions and secondary two-phase liquid-rich and vapour-rich inclusions, probably related to later stages of alteration processes. Plagioclase crystals contain rare secondary vapour rich fluid inclusions. Oxygen isotopes were measured on quartz from veinlets. Isotopic composition showed a narrow range of data from 9.0 to 9.6‰ $\delta^{18}O$, and show similar values measured to that measured on quartz from the Biely vrch Au porphyry deposit in the Javorie stratovolcano (7.6 to 12.4‰ $\delta^{18}O$; KODĚRA *et al*., 2011). Both localities also share similar mineralisation and alteration styles and fluid inclusion properties, indicating similar genesis despite location in different stratovolcanoes.

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References

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