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New discovery of porphyry gold-copper occurrence in Eastern Rhodopes, Bulgaria – general overview

Ново златно-меднопорфирно рудопроявление в Източни Родопи, България – общи сведения

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Introduction

The Eastern Rhodopes region in Bulgarian and Greece has traditionally been viewed as an epithermal gold belt, however, recent exploration success in the metallogenic belt by a number of companies suggests the region as an emerging porphyry copper-gold camp. The area of the study is located in the Eastern Rhodope mountains of Southern Bulgaria, approximately 12 kilometres north of the new Ada Tepe gold mine (6.9 Mt at 2.99 g/t Au, 2.22 g/t Ag) and 12 km NW of the Rozino low-sulphidation gold deposit currently in resource evaluation stage (17 Mt at 1.15 g/t Au). More than a dozen historic mineral occurrences are scattered across the region, most containing Au, Ag, Cu and Pb ± Cr, Co, Zn. Reconnaissance mapping and sampling campaigns confirmed the presence of a porphyry environment as well.

Geological settings

The studied area is underlain by metamorphic basement rocks of the Byala Reka Metamorphic Dome that are unconformably overlain by sedimentary rocks of the Krumovgrad Group (KgG) – this group typically forms units ranging from coarse conglomerates to interbedded sandstone, siltstone, marl and limestone (Sarov et al., 2008). The dome is separated from the East Rhodopian Paleogene Depression by Bryagovets-Brusino detachment fault (Ivanov, 1998). Tertiary intermediate to felsic intrusive rocks are intruded into the metamorphic basement and sedimentary cover as their extrusive products overlie the KgG (Sarov et al., 2008).

Several Au-polymetallic occurrences and hydrothermal alteration zones observed in the studying area appear to be associated with the N-S striking subvolcanic diorite porphyry stocks and dykes and their intersection with NW-SE striking felsic rhyolite dykes emplaced in and cross-cutting both the metamorphic basement and the overlying sedimentary and volcanic rocks. These intrusive bodies have been considered part of the regional Tertiary magmatic belt that hosts well-known porphyry and epithermal deposits in Greece and Western Turkey.

An extensive hydrothermal alteration zonation that extends almost 2500 m NE-SW and comprises silica ledges ("secondary quartzite") at the core with concentric halos of sericitic, argillic and propylitic mineral assemblages has been observed south of Karaburun peak. The 2.2 km^2 alteration zone overprints all host lithological units – metamorphic, sedimentary and volcanoclastic rocks. In the center of the system several subvolcanic quartz diorite porphyritic intrusions and dykes are outcropping.

These intermediate porphyry rocks have a grey greenish medium grained texture with phenocrysts comprising crowded, tabular feldspar (andesine) and lesser amounts of completely altered euhedral to subhedral, tabular mafic minerals, inferred to be hornblende and biotite. Groundmass is composed of a fine granular mosaic dominated by feldspar with

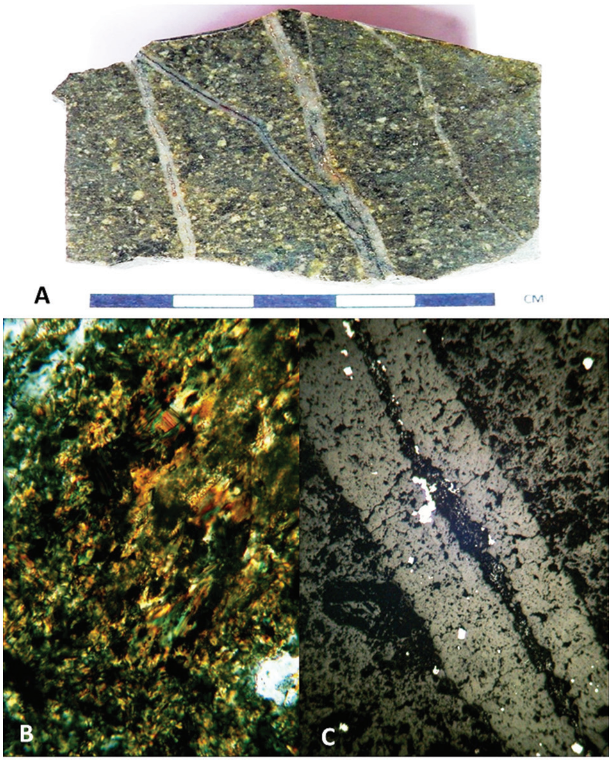

Fig. 1. *A*, quartz diorite porphyry cut by quarz-sulphide veins; *B*, quartz diorite porphyry – part of intensely biotite altered hornblende phenocryst. NA 0.25 mm, cross-polarized light; *C,* magnetite centre line in quartz vein with later disseminated pyrite overgrowing quartz and magnetite. NA 2.5 mm, reflective light

subordinate altered mafic minerals and fine granular quartz. Some of this quartz is possibly secondary related to fine quartz veinlets. Strong smothering of the groundmass by secondary biotite prevents a realistic estimate of amount of K-feldspar but XRD analysis indicates total K-feldspar in sample quite low i.e. $<7\%$.

Strong hydrothermal alteration has overprinted the quartz diorite porphyry rocks. Feldspar is generally only weakly to partly altered by K-feldspar alteration veinlets and/or with biotite and calcite flecking. Microcrystalline clay selectively replaces compositional zoning in some phenocrysts. Mafic minerals as phenocrysts and in groundmass are completely replaced by 1) fine-grained biotite masses and magnetite grains or less commonly by 2) calcite-magnetite±chlorite. Some fine granular quartz may be secondary. Biotite is locally replaced by chlorite or clay. There is minor disseminated pyrite, with trace of very fine chalcopyrite in some altered mafic minerals and in the groundmass. Magnetite is commonly partly replaced by hematite. Several weakly developed quartz veinlets host minor biotite, K-feldspar and magnetite or chlorite, calcite and pyrite.

The quartz diorite porphyry rocks have been cut by quartz veins with magnetite and pyrite centre lines (Fig. 1). Trace chalcopyrite is observed within the pyrite centrelines. The rock is cut by several regular quartz veinlets 0.25 to 2 cm wide comprising 10% of section. The veinlets are characterised by centre line fill comprising magnetite with overgrowing pyrite or by pyrite and minor overgrowing chalcopyrite.

The samples are weakly overprinted by lower temperature assemblage of chlorite-calcite-pyrite and by supergene Fe-montmorillonite (nontronite). The alteration mineralogy and veining show characteristics typically associated with porphyry-style mineralisation.

Further investigations are required for better understanding of the local geology.

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