ADA TEPE AND NEIGHBOURING GOLD PROSPECTS: SEDIMENTARY-HOSTED, EPITHERMAL DEPOSITS AND OCCURRENCES IN THE EASTERN RHODOPES, BULGARIA

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The epithermal gold mineralization with a low-sulfidation character at Ada Tepe and surrounding prospects are dominantly hosted by syn-detachment sedimentary rocks of Maastrichtian-Paleocene age. The associated dominant structure is a low angle normal fault, named Tokachka detachment fault, which is a major lithological and structural contact between the metamorphic basement and the Maastrichtian-Paleocene sedimentary rocks (BONEV *et al.*, 2005). These newly discovered deposits are economically significant and open up new exploration possibilities in this part of the Tethyan Metallogenic Belt. There is presently the potential open pit mining at the Ada Tepe deposit with high grade ore (5.2 Mt @ 5.0 g/t Au), with a total of 835000 ounces of gold indicated by Balkan Mineral and Mining (Dundee Precious Metals Inc., Report on Feasibility Study, 2005). Another prospect at Rosino has been developed up to the feasibility level with a 6.07 Mt of ore but at a lower grade (2.3 g/t Au) estimated by Cambridge Mineral Resources Plc. (Press Release, 2005).

The Ada Tepe deposit is located along the northern part of the N-NE-oriented Kessebir-Kardamos dome, which is a prominent geological feature in the Eastern Rhodopes. Geologic structures around the Ada Tepe deposit and adjacent prospects can generally be modelled by domino-style rotational normal faulting in the upper plate above the detachment fault. The importance of structural and lithological controls is reflected by the geometry of the ore bodies. They include: (a) strongly faulted rocks of the highly permeable Shavar Formation that offered a favorable channel-way for fluid circulation generating open space filling bonanza type mineralization in veins with a general E-W direction; (b) in contrast, the deformed metamorphic rocks with a ductile fabric and the cataclastic deformed detachment zone were the loci for focused fluid flow, toward lower pressure areas, where a massive, tabular ore body, named the "Wall" was formed immediately above the detachment fault. These zones consist of strongly altered rocks, replaced by silica minerals, adularia, sericite, pyrite and carbonate minerals. They formed through total replacement of the original metamorphic minerals included as clasts in conglomerates, and are associated with relict quartz and muscovite.

The ore mineralogy is simple, and consists of electrum (~75% Au), subordinate pyrite (more abundant in Surnak) and traces of galena and tellurides. The gangue is comprised of chalcedony, fine-grained quartz-adularia intergrowths and carbonates displaying typical colloform banded textures. Bladed texture is also abundant with quartz pseudomorphs replacing platy calcite (MARCHEV *et al.*, 2004). Evolution of the intensity of silica alteration can be observed in many places, starting with an initial network of small quartz veins along fractures, followed by either a total silica replacement of the host rock or leaching of the host rock, resulting in extreme cases of leaching, in a network of small quartz veins with no host rock left between them.

On the basis of the alteration mineralogy and textural relationships, it is possible that gold may have been deposited as a consequence of different physical-chemical processes in the various prospects. The abundant bladed quartz pseudomorphs replacing platy calcite suggest boiling in different prospects, including at Ada Tepe, Kuklitsa and Kupel. However, in cases of other prospects, such as Surnak, Kremenitz and Skalak, boiling textures are scarce to absent, and intense fluid-rock interaction may be responsible for gold mineralization, possibly due to pH and Eh variations of the gold-transporting fluid. In two prospects, *i.e.* Ada Tepe and Surnak, areas enriched in organic carbon can be identified which correlate with high Au grades, due probably to the intense reduction locally of the hydrothermal fluids. The intensive altered, tabular silica bodies (e.g. the "Wall" zone in Ada Tepe and Kuklitza) possibly overlap with fluid mixing areas.

According to preliminary stable isotope analyses the $\delta^{18}O$ values (*vs.* V-SMOW) range from 11.2-13.5‰ in quartz samples and 9.2‰ and 10.0‰ in adularia dominated samples from the Ada Tepe deposit. Assuming a low temperature deposition of about 150-200 °C (MARCHEV *et al.*, 2004), the calculated oxygen isotopic compositions of water in equilibrium with both minerals are about 0 to 4‰. The Ada Tepe and Surnak pyrite samples have comparable $\delta^{34}S$ values (vs. CDT) between –3.7‰ and 0.2‰. The stable isotope compositions can be interpreted as typical for dominantly magmatic/metamorphic mineralizing fluids, but does not allow us to exclude a meteoric or sedimentary input, especially if we consider extensive fluid-rock interactions.

References:

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