

New exploration potential for orogenic gold mineralizations in Greece

C. Michael (1), N. Arvanitidis (2), K. Papavasileiou (3), A. Iliadis (4), and C. Christidis (5)

(1) Institute of Geology and Mineral Exploration, Regional Division of East Macedonia-Thrace, Xanthi, Greece (conmichael@hotmail.gr), (2) Institute of Geology and Mineral Exploration, Regional Division of Central Macedonia, Thessaloniki, Greece (narvanitidis@thes.igme.gr), (3) Institute of Geology and Mineral Exploration, Headquarter, Athens, Greece (dirgen@igme.gr), (4) Institute of Geology and Mineral Exploration, Division of Central Macedonia, Thessaloniki, Greece (iliadis@thes.igme.gr), (5) Aristotle University of Thessaloniki, Thessaloniki, Greece (christidisc@hotmail.com)

Gold and base metal mineralizations occur throughout the Rhodope and Serbomacedonian zones in northern Greece at a range of spatial scales and geological environments. Important epithermal gold deposits are found in Tertiary volcanosedimentary basins to the east and economic fault-controlled-igneous replacement Pb-Zn deposits to the west.

Orogenic gold deposits are present in various metamorphic terrains displaying variable types of mineralization. In general there is a strong structural control of the ore forming processes and potential deposition takes place near large scale compressional structures (thrust faults). The controlling structures are mainly related to major faults and associated brittle deformation characterized by silicified fracture zones, ductile shear zones, and breccias and foliated zones.

Three styles of orogenic gold-base metal mineralizations have been defined.

a. Orogenic gold in high metamorphic terrains

This is well developed in western Rhodope zone. The deposits are normally controlled by second order structures near the compressional thrust fault between Serbomacedonian and Rhodope zones. Various types of primarily sulphide mineralizations were superimposed by supergene oxidation to form vein (Koronouda, Metagitsi, Stenolakkos, Aghios Georgios, Gorizo Lofos, Aghio Pnevma), (Mesoropi), thrust-related (Kokkinochoma), foliated (Orini), and lensoid bodies (Myriophyto, Alistrati, Kallithea), as well as irregular pods (Potokas-Kataphyto). The common characteristic of these mineralizations is mainly the Fe-rich oxide mineral gossanous concentrations which extend for several tens of meters. The host rocks are varying with marbles and schists to be the most common. The contact zones between marbles and schists appear to be the most favorable sites for ore deposition. There are generally two mineral assemblages observed, the Fe-rich oxide minerals one hosting gold and the parts of Pb-Zn sulphide minerals with pyrrhotite, arsenopyrite, pyrite, bismuthinite, and chalcopyrite.

b. Orogenic gold associated with serpentinites

It is mainly located in eastern Rhodope within the overthrusting zone of ophiolite rocks onto metamorphic basement. From the structural point of view the mineralization is related to shearing and major regional faults. The host rocks are serpentinites and talc-carbonate rocks. The orogenic gold-base metal mineralization forms lensoid bodies which are elongated in NE-SE direction within shear zones. There is a gradual transition from serpentinite, serpentinite-carbonate rocks, talc-carbonates to quartz-carbonate rocks (listwaenites) Carbonatization (Fe-Mn carbonates) is a typical alteration sub-zone within a wider envelope of silicification (chalcedony, quartz) zone. Quartz, chalcedony, calcite, braunnerite, pistomezite, Fe-dolomite and lizardite are the common gangue minerals. Sphalerite, galena, chalcopyrite, gold, tennantite, tetrahedrite, Zn-chromite, herzophrite, bravoite and pyrite are the mineral association of this type of mineralization.

c. Orogenic gold deposits in low grade metamorphic rocks

This type of mineralization occurs in Circum Rhodope belt (eastern Rhodope zone). The mineralization is thrust-related, shear-controlled and hosted by brecciated greenschists and calcschists e.g. Kommaros deposit. The shear-zone follows the contact between greenschists and calcschists. Albite, carbonate minerals, chlorite, sericite, epidote and barite are common gangue minerals (proximal mineral assemblage) in host rocks of greenschist facies metamorphism. Au, Ag, Cu, Pb, Zn, As is the characteristic metal association. Based on geological data and some laboratory studies it is indicated that the orogenic gold-bearing base metals sulphide mineralizations are controlled by processes involving remobilization and concentration of metals during metamorphic activities, folding, faulting and intrusion of igneous rocks.