

Au-Ag-Te-Se deposits

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Gold-telluride associations in the Lower Paleozoic Sauljak deposit, Ukrainian Carpathians

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Abstract. Sauljak is one of the most prospective gold deposit in Ukraine, and is located in the northeastern part of the Marmarosh Massif. The area of the Sauljak deposit comprises two metamorphic complexes, Belotop and Delovetsk, which are different in age. Gold mineralization is confined to the basal horizon of Delovetsk complex and occurs within the zone of thrust dislocations. Tellurides are mostly confined to gold-rich orebodies (116 g/t Au). Altaite is the most abundant telluride; hessite and tellurobismuthite are also identified.

Key words: gold-telluride mineralization, altaite, Ukrainian Carpathians, Sauljar gold deposit

Introduction

Sauljak is one of the most attractive gold deposits in Ukraine and it is currently under exploitation. The deposit is located in the NE part of the Maramures (Marmarosh) Massif, the majority of which is on Romanian territory.

Geology

The area around the Sauljak deposit is structurally located within two different plates, comprised by the Belotop and Delovetsk metamorphic complexes, the ages of which have been estimated as Riphean and Lower Paleozoic, respectively. The Belotop Complex includes mica-bearing plagiogneisses and layers of schist intercalated with layers of amphibolites and amphibolitic shists. The Delovetsk Complex is characterized by abundant basic orthoschists and gneisses formed from acid volcanic rocks, intercalated

with layers of limestone and marble. Some units within the geological sequence at Sauljak display a striking similarity with those of the Tulghes Group in the Maramures Massif, Romania, which contains numerous Lower Paleozoic VMS and associated gold deposits.

Gold mineralization is mostly confined to the basal horizon of the Delovetsk complex and occurs within a zone of thrust dislocations. This zone comprises intensively silicified schists and lens-shaped segregations of quartz-carbonate bodies, within which the gold-telluride mineralization has been discovered. Ore bodies occur as complex folded structures which dip SW (215-230°) at angles of 15-45°.

Ore mineralogy

Ore minerals include pyrite, pyrrhotite, sphalerite, arsenopyrite, native gold (fineness 840-920), altaite, hessite and tellurobismuthite. The hinge areas of the folds show the highest gold concentrations and significant quantities

of tellurides commonly found in the richest orebodies (116 g/t Au).

Altaite (PbTe) is the most abundant of the telluride minerals. As a rule, altaite forms fine (10-200 μm) inclusions in galena (products of disintegration of a high temperature solid solution). Less commonly, altaite occurs as fine aggregates intergrown with gold and hessite. Microprobe investigation gives the following composition (wt.%): Pb 58.89, Te 38.10, Sb 1.3, Ag 0.45, Bi 0.56, S 0.06.

Hessite (Ag_2Te) is much less abundant. The paragenetic position is similar to that of altaite. The composition of altaite resembles ideal values: (wt.%) Ag 61.84, Te 37.06, Au 0.14, Fe 0.07 (total 99.11).

Tellurobismuthite (Bi_2Te_3) was found in single grains that display intergrowths with

other tellurides. Microprobe analysis of tellurobismuthite gives: (wt.%) Bi 37.13, Pb 13.45, Te 37.28, Sb 6.01.

Deposit genesis

The genesis of the gold-telluride mineralization within the Sauljak deposit has not yet been fully established, due to the presence of a whole range of superimposed geological processes of different ages. Oxygen isotopic data has shown that Au-bearing quartz is characterized by heavy isotopic compositions ($\delta^{18}\text{O}$ 16‰). $^{87}\text{Sr}/^{86}\text{Sr}$ values of 0.7348 in barite testify to the active involvement of crustal material in formation of the ore-bearing facies.

Fig 1. Geological map of the Transcarpathian Region of Ukraine

