New data on Au-Ag mineralization in the Chereshkite ore occurrence, Central Rhodopes, Bulgaria

Нови данни за Au-Ag минерализация в рудопроявление Черешките, Централни Родопи, България

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Introduction

The Chereshkite ore occurrence is located between two small villages – Dolno Chereshkite and Gorno Chereshkite, in the Central Rhodopes, near the Greek border. The Au-Ag mineralization is hosted by small granitoid bodies and partially by gneisses. The ore forming process is accompanied by intensive silicification and sericitization of the wallrock.

During the examination of a series of Au-Ag ore samples from the ore occurrence, a new mineral for Bulgaria and for the occurrence – Te-bearing canfieldite ($Ag_8Sn(S,Te)_6$) and 2 new minerals for the occurrence – Te-bearing polybasite ($Cu(Ag,Cu)_6Ag_9Sb_2(S,Te)_{11}$) and Se-bearing acanthite ($Ag_2(S,Se)$) were found and studied by us. Description of these minerals, including their occurrence, chemical composition and genesis is given in the present report.

Samples and methods

18 polished sections and 18 polished thin sections prepared from 10 ore samples from the ore occurrence are firstly examined on an optical microscope Leitz Orthoplan Pol. Then, the massive polished samples were coated with carbon for backscattered electron (BSE) imaging and chemical composition examination of the phases at 20 kV on a scanning electron microscope ZEISS SEM EVO 25LS equipped with an EDAX Trident analytical system.

General characteristics of the ore mineralization

Pyrite occurring as euhedral crystals grouped in aggregates with size of 1–3 mm, is most abundant mineral in the deposit (to 30 vol%). The pyrite is presented by homogeneous (1) and zonal (2) varieties. In reflected light optical microscope, the zonal pyrite shows alternation of prevailing light-yellow zones and thin zones with pink hue. The latter zones are characterized by increased contents of As (up to 10 wt%) corresponding to arsenian pyrite, and contain inclusions of galena, Ag-bearing tennantite, arsenopyrite, chalcopyrite and bismuthinite. In homogeneous pyrite there are emulsion-like disseminated inclusions of canfieldite, acanthite, polybasite, sphalerite and galena (Fig. 1a). The pyrite is partially replaced by gersdorffite and siegenite. Native silver, electrum (Ag 33.4 wt%) and marcasite are found in quartz aggregates. During the earlier research of the ore occurrence were also described andorite, stromeyerite and krennerite (Bedrinov, 2007).

Chemical composition of emulsion-like disseminated inclusions in pyrite

Canfieldite appears as solitary nonuniformly distributed in the pyrite emulsion-like inclusions with size 2–15 μm and even outlines without any signs of corrosion (Fig. 1a). More rarely canfieldite forms aggregates with Ag-bearing galena (Ag up to 1.1 wt%) or fine intergrowths with a (Ag, Fe, Sn, Te, S)-containing mineral not identified by us because of its very small size (Fig. 1b). The studied canfieldite characterized by high contents of Te 11.6–15.2 wt% (Table 1) which defines the minerals as Te-bearing canfieldite. Beside Te the minerals contains also Fe 1.8–3.9 wt%.

Te-bearing canfieldite $Ag_8Sn(S,Te)_6$ is rarely occurred Ag-Sn sulfide. For the first time, this variety of canfieldite with Te content of 8.69 wt% were described by Harris and Owens (1971) for Pb-Zn-Ag ores from Revelstoke, British Columbia, Canada. Te-bearing canfieldite is found in several localities of the world – in Japan (Tsumo Au-Cu-Pb-Zn hydrothermal postskarn deposit), Argentina (several Ag-Sn deposits), Switzerland (Ag-Sn mineralizations in Lengenbach quarry) and some others (Soeda et al., 1984; Brodtkorb, 2009; Bindi et al., 2012).

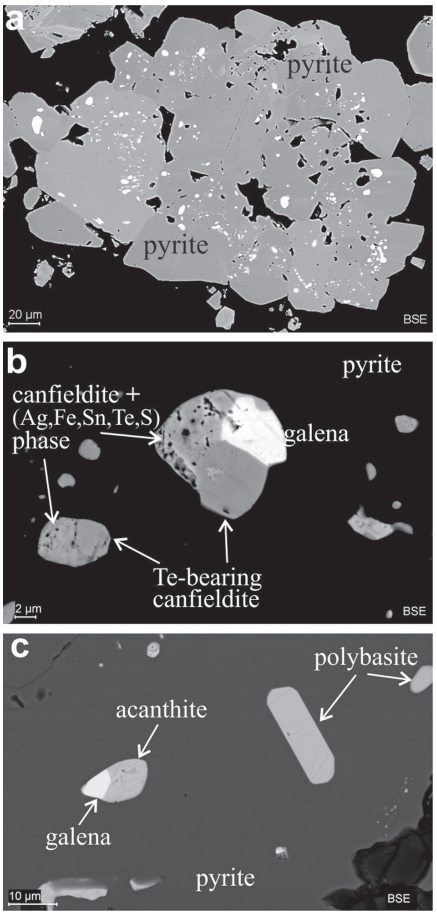

Fig. 1. *a*, pyrite aggregate with emulsion-like disseminated inclusions; *b*, emulsion-like inclusions of Te-bearing canfieldite, Ag-bearing galena and fine intergrowths of Te-bearing canfieldite and (Ag,Fe,Sn,Te,S) containing phase in pyrite; *c*, euhedral and emulsion-like inclusions of Te-bearing polybasite and aggregate of acanthite and Ag-bearing galena in pyrite

Acanthite occurs as individual emulsion-like inclusions or aggregates with galena (Fig. 1c). The studied acanthite contains up to 5.1 wt% of Se (Table 1) which is common isomorphic element in the mineral. Based on its chemical composition the mineral can be specified as Se-bearing acanthite.

Polybasite occurs as emulsion-like inclusions and euhedral crystals in pyrite (Fig. 1c). In some inclusions the mineral is found together with galena or sphalerite. The chemical composition of the mineral (Te content 5.45–5.97 wt%, Table 1) classifies it as Te-bearing polybasite.

Discussion and conclusions

In the present study of the Au-Ag mineralization of the Chereshkite ore occurrence, a new mineral for Bulgaria and for the occurrence – Te-bearing canfieldite ($Ag_8Sn(S,Te)_6$), 2 new minerals for the occurrence – Te-bearing polybasite ($(Cu(Ag,Cu)_6Ag_9Sb_2(S,Te)_{11}$) and Se-bearing acanthite ($Ag_2(S,Se)$) as well as arsenian pyrite are described giving new genetic facts for the deposit and being a good guide of epithermal precious-metal deposits. The authors assume that the described emulsion-like disseminated Ag, Te and Se-containing minerals in the pyrite are result of decomposition of a higher-temperature (FeS_2 dominated) solid solution.

Table 1. Electron probe microanalyses (wt%) of Ag minerals from the Chereshkite ore occurrence

Element	Te-bearing canfieldite		Polybasite	Acanthite
Ag	63.40	63.92	66.92	81.30
Cu	–	–	4.07	1.41
Fe	2.93	1.77	1.53	1.75
Sb	–	–	6.40	–
Sn	9.34	10.06	1.69	–
Se	–	–	–	5.12
Te	13.15	15.18	5.61	–
S	12.27	11.07	13.42	11.83
Total	101.09	102.00	99.64	101.41
		a.p.f.u.		
Ag	7.32	7.58	14.50	1.82
Cu	–	–	1.50	0.05
Fe	0.65	0.40	0.64	0.08
Sb	–	–	1.23	–
Sn	0.98	1.08	0.33	–
Σ M	8.95	9.06	18.20	1.95
Se	–	–	–	0.16
Te	1.28	1.52	1.03	–
S	4.77	4.42	9.78	0.89
Total	6.05	5.94	10.81	1.05
Atoms	15	15	29	3

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