First finding of barite in the Sarnak deposit, Kroumovgrad goldfield, SE Bulgaria. Preliminary data

Първа находка на барит в находище Сърнак, Крумовградско златорудно поле, ЮИ България. Предварителни данни

Aleksandar Gadzhalov, Irina Marinova

Institute of Mineralogy and Crystallography, Bulgarian Academy of Sciences, Acad. G. Bonev Str., Bl. 107, 1113 Sofia; E-mail: alexsandar.gadzhalov@yahoo.es

Keywords: barite, Sarnak gold deposit, Kroumovgrad goldfield, SE Bulgaria.

Introduction

Sarnak deposit is known from geological exploration carried out in the early 90s of 20th century. It is considered as a part of the Kroumovgrad goldfield (Fig. 1a) and is defined as an epithermal, low-sulfidation deposit (adularia-sericite type). Three main ore associations have been identified as well as the temperature and salinity of the hydrothermal solutions (low salinity and Na-K-Cl composition) (Kunov et al., 1999). These are the mineral associations and their respective temperature and salinity: quartz, pyrite and marcasite (240–160 °C; 0.9–2.1% NACl eq.); quartz, pyrite and arsenopyrite (240–210 °C; 0.7–1.2% NACl eq.); quartz, sphalerite, galena and gold; quartz and carbonate (220–150 °C; 1.9–2.1% NACl eq.). Mutafchiev and Gergelechov (1999) have given a different scheme of mineral formation; they have determined galena-sphalerite-chalcopyrite (sporadic), pyrite-marcasite, quartz-specularitic (main ore), quartz-gold (main ore with adularia, pyrite, pentlandite, marcasite, arsenopyrite, gold), quartz-carbonate (quartz, calcite, ankerite, gold, pyrite, nickel-bearing pyrite and acanthite?) and melnikovite-pyrite paragenetic associations. These authors define Sarnak as a gold-jasperoid deposit. Marton (2009) has identified electrum, pyrite, arsenic-rich pyrite (mainly in the form of distinct arsenic-rich zones in pyrite), arsenopyrite, sphalerite and sulfosalts (tetrachloride).

The subject of this scientific communication is preliminary data on the presence of barite in the Sarnak deposit. Barite is a typical mineral of epithermal gold deposits ±Pb, Zn, Cu of low sulfidation, intermediate sulfidation and high sulfidation classes (White, Hedenquist, 1995; Wang et al., 2019). Barite, together with some sulfides, is an indicator of a more oxidized state of the hydrothermal fluid in intermediate and high sulfidation deposits compared to the slightly reduced fluids characteristic of the low sulfidation deposits (Hedenquist, Arribas, 2017). Therefore, the presence of barite, along with a number of other indicators, is important in the classifying of Sarnak deposit, which influences the exploration models and ultimately the exploration strategy (Hedenquist, Arribas, 2017).

Material and methods

Samples taken from surface outcrops and drill hole cores within the Sarnak deposit appear material used in this study. Powder samples were prepared from them and examined by powder X-ray diffraction. The diffractograms were taken with a D2 Phaser Bruker AXS Bragg-Bertrano diffractometer in a step mode in the interval 3–70° 2Θ, CuKα radiation at 30 kV, 10 mA, step 0.005° and time 1 sec/step.

Results and discussion

Barite was found in a surface outcrop, to the west of the Piperitsa neighborhood of Sarnak village, about 65 m from the westernmost houses (Fig. 1a). The sample has geographical coordinates X=384267.00 m (North) and Y=4587646.00 m (East) [planar coordinate system WGS84 (UTM), zone 35]. It is taken from a steep tectonic zone of clear contacts, of North-South strike, and around 50 cm thick, which cross-cuts silicified gravel breccia-conglomerate. The zone is filled with parallel veins each of a thickness few centimeters (Fig. 1b). The barite vein is white, seemingly monomineral (without visible ore
Fig. 1. Characteristics of barite from the Sarnak deposit: a, location of the barite-bearing sample on the surface; inset – location of the Kroumovgrad goldfield (KG) within the Bulgarian territory and the Rhodope metallogenic province (RMP) (Georgiev, 2007); b, view of the tectonic zone (indicated by arrows), which comprises the barite vein; c, barite (Brt) vein cross-cutting silicified gravel breccia-conglomerate and a quartz vein (Qz); d, photograph of barite crystals from (c) under stereomicroscope; e, powder X-ray diffraction pattern of barite with d-spaces.
or other non-ore minerals) and cross-cuts a quartz vein, also visibly monomineral. The maximal thickness of the barite vein is 2 cm and the minimal one 0.5 cm, whereas the quartz vein thickness is more constant and is about 1 cm (Fig. 1c). Under a stereomicroscope, barite forms randomly oriented water clear white platy crystals to 1.5 cm long, and without visible presence of other minerals (Fig. 1d). The powder X-ray diffraction pattern shows the presence of only barite (Fig. 1e). The barite was unambiguously confirmed by a comparison with the reference card in the ICDD database (PDF no. 24–1035: PDF-2 Data Base, 2001). In terms of mineral composition, the Sarnak deposit shows significant differences with the neighboring Khan Krum deposit (Adatepe), which is 3.5 km along a straight line to the E–NE. No barite has been found in Khan Krum. In addition, there the amount of sulfides (exclusively pyrite) is less than 1 vol.% and apparently rarely reaches 3–5 vol.% (Marinova et al., 2014). Similar is the situation in the neighboring Kuklitsa deposit (Marinova, 2019). In contrast, in the Sarnak deposit in drill hole cores, where the amount of gold is over 1 ppm, the amount of sulfides (visibly pyrite) usually predominates over the gangue minerals (mainly quartz and/or carbonate) (unpublished data of the authors). At the same time, with these features of the mineral composition, the Sarnak deposit is close to the Sedefche deposit, which is situated about 6 km to the West along a straight line. Tetrahedrite, arsenic pyrite and arsenopyrite, marcasite and late barite have been found there (Mladenova, 1989; Strashimirov et al., 2005; Lyutov, 2016). The forthcoming studies on the mineral composition of collected drill hole cores will provide new information on this issue.

Conclusion

Barite has been discovered in the Sarnak deposit for the first time. It comes in the form of a vein cross-cutting a quartz vein and hosted by silicified gravel breccia-conglomerate. Barite is represented by water clear white platy crystals up to 1.5 cm long. Its presence has been proven by powder X-ray diffraction. Barite has formed after the auriferous quartz veins, similarly to the next Sedefche deposit.

Acknowledgements: The authors thank to Dundee Precious Metals Kroumovgrad for permission to sample and to publish the results presented here. Thanks are due to Y. Tzvetanova (IMC-BAS) for X-ray analysis.

References