Trace-element signature of pyrite from the Shaumyan gold-base metal deposit, Lesser Caucasus, SE Armenia – preliminary data

Елементи-следи в пирит от златно-полиметалното находище Шаумян, Малък Кавказ, ЮИ Армения – предварителни данни

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Introduction

The Shaumyan deposit (Kapan gold-base metal field), SE Armenia is related to a large Middle Jurassic volcanic edifice (Matveev et al., 2006) developed in island-arc setting (Mederer, Moritz, 2011). All economic ore bodies are hosted by a subvolcanic dacites to andesites in the central part of the volcanic edifice and are dominated by veins (Fig. 1a) and relatively thin veinlets often accompanied by zones of stringer-disseminated mineralization. The main warlock alterations are of phyllic and propylitic types. Typically, the ore veins display intensive sericitic halos. When the composition of the host rock is less siliceous (tends to andesitic) chloritic alteration occurs. The dykes in the southern part of the deposit are strongly carbonatized. Pyrite, sphalerite, chalcopyrite and galena are the main ore minerals with minor fahlore. Gold and silver present in the form of tellurides; Bi and Pb tellurides occur too. The main gang minerals are quartz and calcite, while rhodochrosite and manganese calcite occur at places. The sulfide and sulfosalt mineral assemblages indicate intermediate-sulfidation (IS) environment in the deposit (Hedenequist et al., 2000). At the same time we observed amygdales in dacites filled mainly with milky silica accompanied by pyrite, chalcopyrite, sphalerite, fahlore and gold (Fig. 1b). The silica under optical microscope appears quartz with typical textures, characteristics of the low-sulfidation (LS) deposits: rosettes, spherical shapes of aggregates, chaledony-like extinction (Dong et al., 1995; Marinova et al., 2014).

Material and method

A trace-element study was carried on 2 polished sections: the first one from vein pyrite-chalcopyrite-sphalerite-galena-fahlore-quartz assemblage (Fig. 1a) The other one is presented by amygdales in lava breccia filled with milky quartz, minor pyrite and scarce chalcopyrite, brown sphalerite, fahlore and gold (Fig. 1b). We studied major, minor and trace elements contents by means of LA-ICP-MS in 4 pyrite grains, by two...
in each polished section (designated as Py1 for the first mineralization type and Py2 for the second one). The applied LA-ICP-MS methodology is described in Marinova et al. (2014). The Py2 grains were of 2 types: homogenous (Py2h) and inhomogenous one with submicron-sized ore inclusions (Py2inh). The Fe contents, obtained by EPMA were used as internal standards for pyrite during the LA-ICP-MS determinations. 

\[ \text{Na, Mg, Si, K, Ca, Ti, Mn, Fe, Co, Ni, Cu, Zn, As, Se, Br, Mo, Ag, Cd, In, Sb, Te, Hg, Pb, and Bi} \]

were determined by their isotope contents. The abundances of In, Sb, Hg and Bi on Fig. 2 were multiplied by 10, while these for Au – by 100.

**Results and discussion**

The studied pyrite grains clearly differ by some trace element grades: Py1 appears with higher contents of Te, Au, Ag, Sb, Bi, Pb, Zn and Cu. Both Py2 grains display higher contents of Co, while the inhomogeneous one in addition to higher contents of In. Hg content is slightly higher in Py1 (Fig. 2a, b). The wide content range of the studied trace elements in both pyrite types could be due to mineral inclusions. Cu, Zn, Pb, Au, Ag, Bi, Te, Hg, Sb in Py1 correspond to mineral association of chalcopyrite, sphalerite, galena, Au-, Ag-, Au-Ag-, Bi- and Pb-tellurides, coloradoite (HgTe) and fahlore as known from published data (Matveev et al., 2006; Mederer et al., 2014). The higher variations of Co and In in Py2 could also indicate presence of Co- and In-bearing submicro-inclusions.

**Conclusions**

1. The studied pyrite grains from IS and LS mineralizations in the Shaumyan deposit display specific trace-element signatures as follows: the first one is characterized by higher contents of Au, Ag, Sb, Bi, Pb, Te, Hg, Zn and Cu, while Co and In are higher in the second one; 2. The IS mineralization seems to be a major career of precious metals in the Shaumyan deposit that has also been noted in previous studies.

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**References**


