В МИРЕ КНИГ

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Unique monograph about natural nanogold

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In the monograph of professor of Mineralogy and Petrography Department B.M. Osovetsky "Natural nanogold", a mineral-concentrators of nanogold, aggregates of gold nanoparticles, "aggregate" gold on the nanoscale, genesis of natural nanogold and the problems of nanogold development are described.
Key words: *natural nanogold, mineralogical methods, genesis of gold.*
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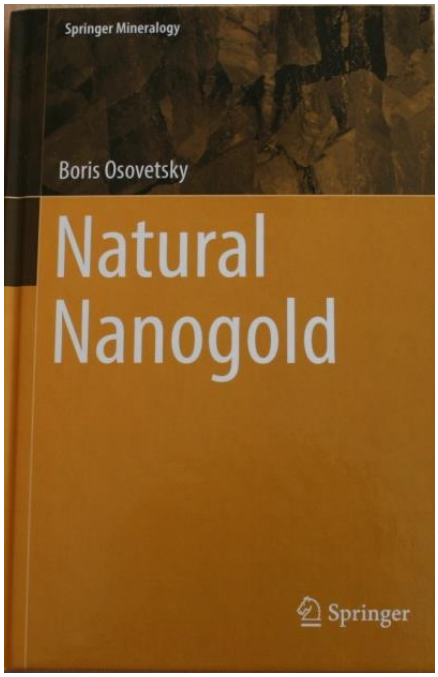

Until the last decade of the previous century, nanogold of natural formations has not been systematically studied. The attention of researchers to the study of nanogold in deposits has significantly increased in recent years. The significant progress in the study of natural nanogold was facilitated by the discovery of the so-called unconventional deposits (Carlin, Vorontsovskoe, Svetlinskoe, Olimpiadinskoe, etc.). The improvement of analytical techniques, especially high-resolution electron microscopy, has created the necessary conditions for penetration into the nano-world of gold. At the same time, the experimental methods were developed for use gold nanoparticles in nanotechnologies. It can be argued that a significant portion of nanogold is captured by the mineral–concentrators (primarily sulfides and quartz) during their crystallization in igneous melts and hydrothermal solutions.

Besides, similar resources may be found in sedimentary ores. During the processes of weathering, nanogold can be released from sulfides. The prevailing mass of gold nanoparticles remains in the weathered rocks in a buried state, and this resource of gold, unlike such primary sources, almost never has been used. Currently it is recognized that the thin-dispersed (invisible) gold is typical for the rocks of gold-sulfide and gold-sulfide-quartz formations. The conclusion is that nanogold should concentrate in weathered rocks (iron hats), formed on these deposits.

The main problem set by the author of the monograph is the study of nanogold occurrences in natural objects and mechanisms of their formation. To solve these problems at the first stage, it is enough to apply the methods of high-resolution scanning electron microscopy in combination with microprobe definitions of the chemical composition of gold nanoparticles. The main experimental data were obtained using field scanning electron microscope with cool emission JSM

7500F ("JEOL"). Determinations of the chemical composition of gold nanoparticles were performed on energy-dispersive (INCA ENERGY 350) and wave (INCA Wave) spectrometers by "Oxford Instruments" as the prefixes to a scanning electron microscope JSM 6390LV ("JEOL").

The preservation and concentration of nanogold particles in sediments also contribute to the processes of their aggregation. Some of the formed aggregates of nanoparticles are quite stable both in chemical and in mechanical respect. Further consolidation of aggregates and increase of their stability is influenced by the processes of natural amalgamation and authigenic mineralization, under the influence of which the gold nanoparticles are cemented by unstructured secondary (colloidal) metal or amalgams. Such gold can be recovered even by the gravitational methods of sample enrichment.

Practice shows that there is certain continuity in the study of very small, thin, powder, dispersed and, finally, nanoscale gold. The transition to the study of nanogold was prepared by long previous experience of specialists, including scientists and staff of Perm State University. In particular, the study of objects with very small, fine and powder gold has been becoming the part of the research program of the Laboratory of Sedimentary Mineral Resources (head B. Lunyov) and Department of Mineralogy and Petrography for several decades.

Many gold deposits and ore bodies in the territories of Urals, Western Siberia, Yakutia, Kuzbass, Transbaikalia, Pre-Amur region, Ukraine, Uzbekistan, Tadzhikistan, Kazakhstan have been studied. New methods for quick processing of samples with small metal particles were developed and implemented. Nanomineralogy studies of gold are performed in the framework of the development of Perm State National Research University (2010–2019). They are an integral part of fundamental research of Nanomineralogy Sector, created in the structure of the Perm State University (2010).

References

*Osovetsky B.M.*2017. Natural Nanogold. Springer Mineralogy. 145 p.

Уникальная монография о природном нанозолоте

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В монографии профессора кафедры минералогии и петрографии Пермского государственного национального исследовательского университета Б.М. Осовецкого «Природное нанозолото» описаны минералы-концентраторы частиц золота наноразмерного уровня, скопления наночастиц, «агрегатное» золото наноразмерности, генезис природного нанозолота, в том числе в продуктивных рудных формациях. В завершающей главе обрисованы перспективы развития исследований в области наноминералогии золота.

Ключевые слова: *природное нанозолото, наноминералогия, золоторудные месторождения.*

Библиографический список

Osovetsky B.M. 2017. Natural Nanogold. Springer Mineralogy, 145 p.