

Natural nanotechnologies

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Abstract

Some of the processes occurring in the environment and associated with migration of nanoparticles of metals can be considered as the natural nanotechnologies. Their detailed study will contribute to the future development of the industrial technologies, which are especially important for scarce and precious metals. As a priority it should highlight the problems of development of objects with nano gold. The discovery in Russia of a number of major gold deposits with so-called refractory ores (Olimpiadinskoe, Maiskoe, and Nezhdaninskoe) requires significant improvement in the technology of their development. Presumably, some of the gold in them is represented by nanometer-sized forms of occurrence. One of directions of solving this problem is the study of natural processes of nano gold concentration. It turned out that it is directly connected with the problem of “new” gold origin. We have shown growths of the newly formed metal on placer gold surface represent aggregates of nanoparticles deposited from ionic or colloidal solutions. Conditions required for mass deposition of “new” gold are favorable geological environment (weathering rocks of sulfide ore bodies with an abundance of nano-gold minerals-concentrators: Aspyrite, arsenopyrite, etc., tailings of the excavation of alluvial deposits, buried placers, etc.), uneven gold surface with numerous micro- and nano-defects, etc. As another option we can consider the natural process of amalgamation, which leads to the formation of aggregate grains composed of nanoparticles of mercury-bearing gold and cementing their amalgams. Finally, the natural processes of nano gold concentration

can be implemented in environments where gold-bearing solutions migrate in the rocks containing natural sorbents of metal (carbonaceous substance, chlorides, ferriferous compounds, etc.). Natural nanotechnologies can be the basis for the creation of industrial technologies of development of deposits with nanoscale gold or recycling their wastes. Besides, the experimental studies play an important role. They confirm the high sorption capacity of gold nanoparticles and their tendency to aggregate.

Image

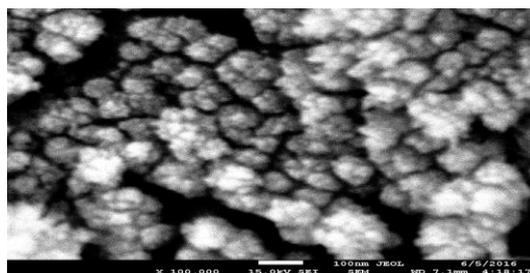


Figure 1: Nano gold aggregates on the surface of placer gold.

Recent Publications

1. Naumov V A, Osovetsky B M (2013) Mercuriferous gold and amalgams in Mesozoic-Cenozoic rocks of the Vjatka-Kama depression. *Lithology and Mineral Resources* 48(3):237-253.
2. Osovetsky B M (2016) Aggregation of nanogold particles in the environment. *Natural Resources Research* 25(2):241-253.



Biography

Osovetsky Boris M is a Professor of Mineralogy and Petrography department, the Leader of Nano-mineralogy Sector of Perm State University (with 2010). He deals with the problems of gold, platinum and diamond prospecting, as well as sedimentology, geo-environment, mineralogy, etc. He is the author of many books on Nanomineralogy of gold (“*Nanosculpture of gold surface*”, 2012; “*Natural Nanogold*”, 2013; and “*Fine diamonds and their prospecting role*”, 2014).

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