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POSSIBILITY OF PROCESSING OF TUVA MINERAL DEPOSITS BY BIOTECHNOLOGY

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Nowadays in the scientific world biotechnology develops more and more. There is no uniform exact definition of the concept "Biotechnology" among scientists. The biotechnology is told to study methods of reception of substances useful to the humanity and products in operated conditions, using microorganisms, cages of animals and plants or isolated biology structures from cages. Biotechnology is the concept used more wider.

Biotechnology irrupts into the metallurgy and mining industry, an oil recovery, at the same time the new branch – "biogeotechnology" develops.

There is a set of bacteria, microorganisms opening which precious metals promoting extraction.

Raw-material base of Tyva Republic

The Republic of Tyva has the unique unmastered natural-resource potential. Deposits of coal, ferrous, nonferrous, precious and rare metals, nonmetalliferous raw materials, underground drinking and mineral waters are revealed. More than 20 mineral recourses are explored.

The mountain-metallurgical complex is provided by industrial reserves of the complex silver-gold-copper-nickel-cobalt arsenide ores.

The resource potential of a fuel-energy complex is presented by large reserves of coked and power coals.

More than 20 deposits of various building materials are explored in total.

Wood (the general reserves are about 1075,9 million cubic meters).

In our republic basically alluvial gold is extracted. The organizations, the factories extracting gold on the territory of Tyva Republic are the Society with limited liability "Vostok", the Society with limited liability "Tuva geology-prospecting expedition", Gold mining company "Oina", gold mining company "Tyva", the Society with limited liability "Tardan Gold".

Extraction of ores and reception from them nonferrous metals, especially precious, particularly gold and silver prices rise all over the world. Principal causes of such tendency are following:

- the reduction of ore reserves of nonferrous and precious metals, growth of expenses at extraction and manufacture of these metals;

- the expansion of national and international efforts on stabilization and on the control of the prices for raw material sources;

- the necessity of managing by own raw material sources, especially by strategic raw materials;

- the performance of the international and state requirements on preservation of the environment in communication, according to it the removal and burying of wastes become more and more difficult;

- fast increase on the prices at raw materials and energy sources that causes the recycle of the fulfilled products and the equipment more effective, than utilization of primary raw materials.

After ore processing by gold mining companies, tailings of concentration and slags quite rich in content of gold remain in tailing ponds.

For example: the alluvial deposit of the river Black is a part of the Amyl-Sistigkhem auriferous region, which is located in the north of Tyva Republic and in the south of Krasnoyarsk region. This deposit is processing by the gold mining company "Oina"

After enrichment on the vibrating concentrator (VCK) for one cycle in tailing pond № 1 gets tails with the maintenance of gold of 6,5 mg/m^3, and after operational development in tailing pond № 2 gets tails with the maintenance of gold of 2400 mg/m^3. Slag, with the maintenance of 4500 mg/m^3 from fusion of a concentrate of operational development gets into the tailing pond № 2.

For all period of operation of a deposit on the river Black the large quantity of a waste with the sufficient maintenance of gold, for bacterial lixiviation has collected.

Expediently it's better to lixiviate by bacteria (thionic bacteria Thiobacillus ferrooxidans, Bacillus, Bacterium, Chromobacterium) gold with the low maintenance in tubs or to apply compact lixiviation , as it is used in some golf-extraction industrial complexes of Russia and Abroad. (In Olimpiadinsk deposit "the Gold Pole" and a Suzdal deposit in Kazakhstan ("Severstal" is the Northern auriaoriferous company)).

As a result of processing cobalt arsenic-bearing ores at the industrial complex "Tyvacobalt" were formed slime products which have carbonate-silicate composition with the mass maintenance (in recalculation on oxides); SiO2 - ~30-40 %, CaO - ~18 %, Al2O3 - ~8 %, MgO - ~8 %, Fe2O3 - ~10 %. [9]

Prominent feature of a technogenic waste is the high maintenance of arsenic (2,2-5,2 %, an average of 3,5 %) which mainly contain in the kind of less-soluble combinations – Mg (Nh4) 2AsO4*nH2O and Mg3 (AsO4) 2*nH2O, formed as a result of technology application of magnesial purification of arsenic solutions that is it is unsafe for environment. Partially (10-20 %) arsenic is presented as arsenides of the metals which have not decayed in the process of autoclave lixiviation.

It is offered to take selectively arsenic, by bacterial lixiviation.

Slime preliminary passes crushing in cone, cheek lobe crushers and crushing in drum-type mills with metal crushing bodies (spheres, cores).

Further the product arrives on preliminary arsenic lixiviation in tubs. Despite of the relative high cost, the given method possesses of advantages:

–we can supervise and can operate, for fine-crushed products that the process of bacterial oxidation is developing,

–high degree of selectivity accelerates at extraction of valuable mineral products, – it is simple to use the equipment,

–low-temperatured,

–without harmful waste emissions into an atmosphere,

–with the possibility of creation of the closed water turn, i.e. ecologically safe water turn.

Speed of process basically defines the technology of lixiviation and its profitability.

The insoluble residuum which is rich of heavy, nonferrous metals (Co, Cu, Ni, Au, Ag), goes on biolixiviation at the presence of thionic, mutating bacteria, and also by heterotrophic microorganisms.

After that the solution goes on gold and silver extraction, and on the insoluble residuum for cobalt, nickel and copper extraction.

There are bacteria in arsenious solution nourishing arsenic.

The researchers from Geological service of the USA (USGS) have found out the straim of bacteria which use the connections of arsenic as a source of energy.

These bacteria form surface films on a water surface containing considerable concentration of arsenic connections, washed away of rocks by thermal springs.

The formed film goes on arsenic manufacture.

The solution comes back in a turn.

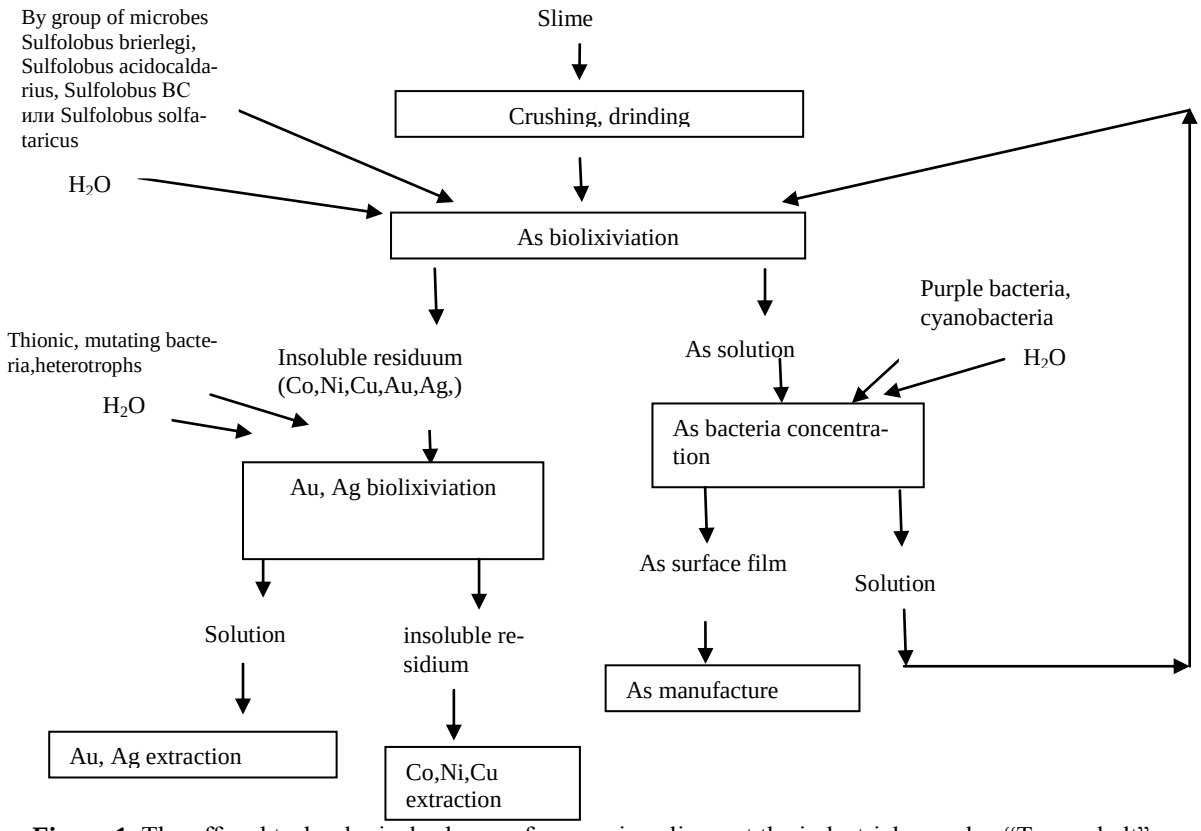

Figure 1. The offered technological scheme of processing slimes at the industrial complex "Tyvacobalt"

Conclusion

The use of biotechnologies is rather perspective for the world. If we even take biogeotechnologies – alluvial gold which is rather easy for extracting, using gravitational receptions, in the world and including in Russia runs low. Another technologies are needed for extraction of precious metals from a scattered condition, from deep-seated and ccompound-structured ore bodies. Nowadays several basic technologies for enrichment of ores of precious metals are used. These are compact lixiviation, gravitatively flotational cycle, coal in a pulp (CIP), biolixiviation. The utilization of metals biolixiviation is simple, effective, non-polluting and the economically cheapest way from existing technologies of processing of ores.

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