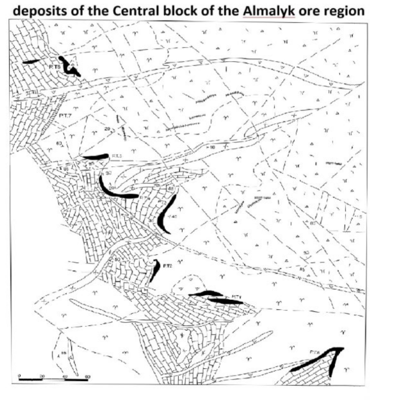
Geological positions of gold occurrences in terrigenous-carbonate deposits of the Central block of the Almalyk ore region



1 - Quaternary deposits; 2 - syenite-porphyry, felsite-porphyry; 3 - granodiorityporphyry of the Almalyks type; 4 - lower Akchinsky subcomplex: basalt layers, calcareous conglobreccias, sandstones, siltstones; 5 - andesite-dacite porphyries, tuffs, breccias; 6 - quartz porphyry, andesite porphyry; 7 - limestone, dolomite; 8 - ore bodies; 9 - quartz veins; 10 - tectonic faults.

FEATURES OF BITUMINOUS DOLOMITES, BLACK (COMBUSTIBLE) SHELLS, THEIR METAL POTENTIAL AND BIOTECHNOLOGICAL RESEARCHES IN THE REPUBLIC OF UZBEKISTAN

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ANNOTATION

Black shales are represented by thin, but extended in the area layers, alternating with other differences of shales, limestones, dolomites of siliceous rocks and bentonites. Black, organic shale was deposited under very calm conditions, on tectonically stable continental blocks or near them. Some of the richest and largest deposits probably formed on the outskirts of these blocks, obviously in an environment of Pre-Orogenic stability. Uranium, apparently, accumulated syngenetically with sediment.

It should be noted that the presence of organic matter, ore and non-metallic minerals in shales contributes to the distribution of metals over all these components. In the inorganic part of the shale are present: silicates and alluminosilicates, sulfides, oxides and other minerals. In addition, a significant part of metals is also part of the organometallic complexes.

Such a multicomponent distribution of metals leads to the fact that during the pyrolysis of the initial shale, a significant part of them sublimate and enter the liquid and gas phases, which significantly complicates the use of the latter and leads to significant environmental problems. In order to solve the problems of shale processing, we propose to enter the stage of bacterial action on the initial shale material crushed to a size class of 3 mm 100% before the pyrolysis operation.

The forecast resources of the oil shale in Uzbekistan allow the development of deposits with the associated extraction of uranium-rare metal substances from the crystalline Lower Paleozoic black shale strata with the U-REE-Y-Sc deposits known on the territory of the Kyzyl Kum: Rudnoye, Koschecka, Jantuaar, etc. The most representative among them are genetic features the Koschek deposit (Figure 1).

Keywords: black oil shales, uranium, processing technology, dispersed impregnation, limestones, uranium-rare metal substances, black shale formations.

INTRODUCTION

As we have already seen, the history of exploration and development of shale deposits is quite complicated. If at the end of the 19th century significant development of shale deposits was carried out in many countries, then in the 1960s, the extraction of shales, except for the USSR and the China People's Republic, was almost completely stopped. The seventieth years of XX century were the beginning of a new stage of studying of oil shales practically on all continents; Experimental and pilot-industrial plants for the processing of oil shale are being built, and many new deposits have been discovered.

Combustible shales are a fairly serious source of carbohydrates. In the future, they will be able to meet a certain part of humanity's needs for energy, motor fuel and raw materials for the chemical industry. If we take into account the fact that it is possible to produce products from shales that can not be obtained from coal, oil and gas, their significance will increase even more. There are many problems in the shale business, and not all of them, of course, will be resolved in a short time. However, for many decades scientists of all countries have scrupulously studied this species truly, an amazing mineral. "They are guided partly by curiosity, partly by stubbornness and partly by selflessness," writes the well-known Australian scientist R.F. Kane. The problem of oil shale is one of the most complex and does not arise in the case of other minerals. Probably, the time when oil shale will become a reliable source of energy is not far off. In any case, today's interest in this mineral is quite natural and justified.

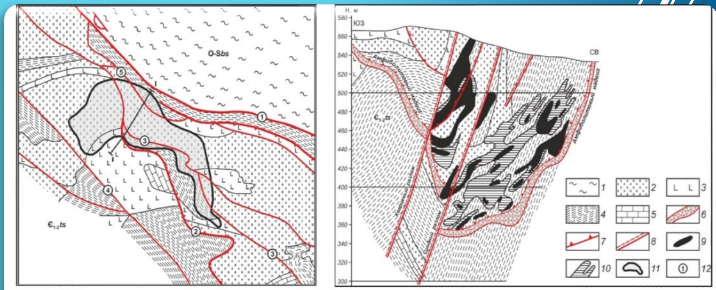
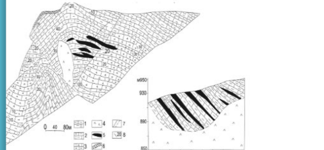


Figure 1. Schematic geological map and line along line I - I uranium-vanadium Koscheka deposit (Sim L.A., 2010). Retinues; 1 - Bezpanskaya, O-S bs (phyllite slates): Taskazgan Є1-2ts, slates; 2 - carbonaceous siliceous; 3 - phyllite; 4 - metabasites (diabase phorphyrites); 5 - limestone and dolomites (tectonic disturbences); 6 - large - block crushing zone; 7 - thrusts; 8 - steeply dipping faults; 9 - uranium deposits (%) U - 0.075 V - 0.38, Mo - 0.015; 10 - mineralization zones; 11 - contour of deposit; 12- faults on a map: 1- North - Koschekinskiy 2 - amphibolite thrust 3 - quartz 4 green 5 – middle

Features of the occurrences of ore-forming systems in the black shale formation

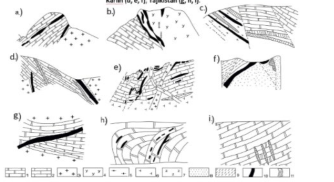
Metallic black (combustible) shales of marine origin, due to their unusual coloring. Due to the high content of sapropelic organic matter; they are characterized by an abundance of pyrite or marcasite in the form of thin lenses, bonds or scattered dissemination and small amounts of calcium and magnesium carbonates. Shales are distinguished by high concentrations of a number of other metals: Mn, Ti, V, Cu, Cr, Mo, P, U, Co, R3E. Most of them are dispersed in the silicate mass of shales, but phosphorus can be concentrated in the form of concretions or phosphate-enriched interlayers.

«Geological scheme of gold bodies in carbonate formations D3-C1 of the Seraya Skala area» (Composed by: M.A.Munduzova)



1-Balykta horizon, dolomites, calcareous dolomites with interlayers of argillaceous, silty-argillaceous and sandy varieties; 2-Karatagatinsky horizon, massive black "sparkling" dolomites; 3-Kulatinsky productive horizon, black bituminous dolomites; 4-syenite diorite of the Almalik type EoC₃; 5-ore bodies; 6-contact changes: skinning, silicification; 7-breaking violations: a) reliable, b) expected; 8-elements of occurrence.

Structural and morphological features of the location of ore bodies on the example of Almalyk (a, b, c); Karlin (d, e, f); Tajikistan (g, h, i).



1-Dolomites; 2-limestones; 3-granodiorites; 4-andesite-dacite; 5-quartz porphyry; 6-tuffs with subordinate conglomerates, sandstones, limestones; 7-rhyolites; 8-formation Robert Mountain; 9-shale; 10-ore bodies; 11-zone of silicification, jasperoids.

Black shales, as a rule, are represented by comparatively thin, but extended in area layers, alternating with other differences of shales, limestones, siliceous rocks and bentonites. Some black shales are members of cyclically constructed packs consisting of shales, sandstones and limestones, others are characterized by siliceous composition and may later become silicic volcanic rocks. Most of the black shales are uniformly layered and dense rocks with a wrinkled fracture on freshly cleaved.

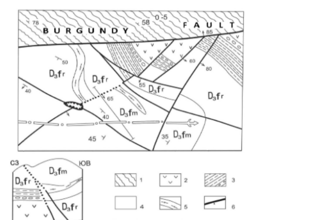
In recent years, more attention has been paid to shale as a reservoir of uranium deposits of the future.

All black shale formations are characterized by higher uranium contents than its average for sedimentary rocks, but only "uranium-bearing black shales" contain differences that contain more than 0.005% U3O8. The contents of uranium vary from interlayer to interlayer, but in each specific layer they are very monotonous and can easily be predicted for very large areas. The highest uranium content appears to be characteristic of thin-layered strata, and in them the most fine-grained formations; while the content of uranium increases with the increase in the amount of organic matter. Phosphorite nodules are usually more enriched in uranium compared to host shales, but there are exceptions to this rule. In the shales, there is no reliable uranium minerals; probably, uranium is adsorbed in shales by organic or phosphate molecules, or clay substance.

It is believed that black, organic shale was deposited under very calm conditions, on tectonically stable continental blocks or near them. Some of the richest and largest deposits probably formed on the margins of these blocks, obviously in an environment of Pre-Orogenic stability. Uranium, apparently, accumulated syngenetically with sediment. Sea waters could be largely enriched with dissolved uranium due to the occurrences of nearby volcanic activity or as a result of intensive weathering in oxidizing conditions of granites that served as a source of uranium. Uranium could also be extracted (under reducing conditions) from sea water by organic matter, phosphate minerals, pyrite or colloidal clays.

All of the largest and most high-grade deposits of uranium-bearing black shales are of Paleozoic age, some smaller deposits, for example Canada, are Precambrian, but the vast majority of the world's deposits are to the Mesozoic and Cenozoic. The most well-known black shales are the Cambrian colm of Sweden, the Devonian and the coal shales of Chattanooga (USA). Paleozoic shales are also known in Brazil, Canada, France, Norway, Portugal, Russia, Germany, Uzbekistan.

Scheme of the geological structure of the central part of the Burgundy ore field



1-Ordovician-Sillurian shale; 2-tuffs and porphyry tuff breccias of the lower Devonion; 3-arkose sandstones with conglomerates at the base; 4-limestones, dolomites and sandy limestones of the fransian and Famennian stages; 5-quartz porphyry; 6-tectonic disturbances; 7-ore bodies (a), ancient workings (b); 8-elements of bedding of rocks; 9-axis of the Burgundian brachy-syncline

TECHNOLOGICAL RESEARCHES

The most important requirement for today's advanced technologies for the processing of mineral raw materials is the complexity of its use - the extraction with the greatest completeness of the maximum quantity of all valuable components present in minerals already mined. On the territory of Uzbekistan, many of their deposits contain a wide range of metals forming part of various mineral compounds. This applies not only to deposits of sulphide ores (Kalmakar, Khandiza), but also to many types of so-called non-metallic raw materials. Sands, dolomites, brucites, talc - magnesites, serpentinites, phosphorites, etc. contain, in one or another quantity, many rare, ore, radioactive and rare-earth elements. Particularly, from the point of view of metalliferousness, it is necessary to distinguish black oil shales widely distributed in Uzbekistan, the beds of which were formed during the Eocene time. Shales are a mixture of organic matter, pulverized sulphides and hydromica-montmorillonite clay mass. Thus, the relatively low yield of tar in pyrolysis (8-12% of the initial), associated with a low content of organic matter in the starting material (up to 35%), against the backdrop of high metallicity of shales in Uzbekistan, makes it necessary to take into account in processing technologies the need for extraction from raw materials, along with hydrocarbons and as many metals as possible. It should be borne in mind that the presence of organic matter, ore and non-metallic minerals in shales contributes to the distribution of metals over all these components. In the inorganic part of the shale are present: silicates and alluminosilicates, sulfides, oxides and hydroxides, carbonates, sulfates, phosphates, tungstates and other minerals. In addition, a significant part of metals is also part of the organometallic complexes.

Such a multicomponent distribution of metals leads to the fact that during pyrolysis (firing) of the initial shale, a significant part of them sublimate and enter the liquid and gas phases, which significantly complicates the use of the latter and leads to significant environmental problems. In order to solve the problems of shale processing, we propose to enter the stage of bacterial action on the initial shale material crushed to a size class of 3 mm 100% before the pyrolysis operation.

The effect itself is proposed to be carried out with the help of natural associations of acidophilic autotrophic microorganisms, the main species of which is Asiditigdacilus ferrooxidans in the mode of heap or reservoir (basin) cultivation. The effect of the introduction of the bacterial stage is associated with the active oxidation of sulfides present in shales, which translates metals from sulfides to solution, and in bacterial cakes the content of reduced sulfur forms decreases. The obtained additional effect of the introduction of bacterial action in the technology of shale processing is determined with partial splitting of shale kerogen under the influence of an aggressive leaching medium (pH 1.5-1.8, the presence of a strong oxidant in the form of Fe^{3+} ions, high concentrations of other metals - uranium, molybdenum, vanadium .). There is a kind of biological cracking of the organic constituent of shales, which in turn leads to an increase in the yield of shale resin by 40-60% with the subsequent pyrolysis of the bacterial cake and sharply reduces the removal of metals into volatile fractions. Closed water circulation at the biological stage allows one-time inoculation of the association of microorganisms at the start of the process and does not require additional seeding in the future. Sulphides in shales serve as an energy source for the processes of life of bacterial cells, and the elements of mineral nutrition require only the introduction of ammonium nitrogen at a level of 50-100 mg / l (ammonium).

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