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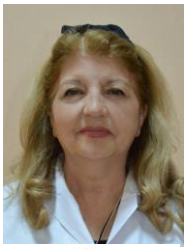
ANTHROPOGENIC IMPACT OF MINING SOLID WASTE ON ENVIRONMENTAL POLLUTION AND WAYS TO RESTORE THE ECOLOGICAL BALANCE



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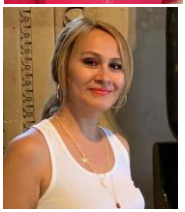

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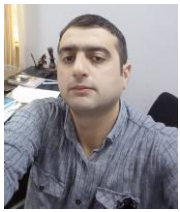

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“All objects in nature have power and people resist in different ways what to win them, a person places otherobjects among them nature"
Georg Wilhelm Friedrich Hegel

The presented work highlights and summarizes the issues of the negative impact of solid industrial waste from a number of industries. It is noted that as a result of human activity, the structure of the biosphere has changed dramatically i.e. atmosphere, relief, living world, etc. of the earth's surface. The historical facts of the occurrence of anthropogenic impact on the environment are analyzed. The main sources of pollution of the ecosphere are shown, such as oil, oil refining, non-ferrous metallurgy enterprises and a number of other industries. It is noted that the irrational use of natural resources has a particularly acute effect on the change in flora and fauna, the destruction, and sometimes the complete disappearance of many species of plants and animals, on unwanted nutrients in the environment (soil, water, air), on the spread of pathogens of infectious and parasitic diseases and pests of agricultural plants and animals, microbiological contamination, etc. It is shown that the metallurgical industry is one of the main polluting industries and accounts for about 40% of the total emissions of the entire industry. On the example of the Dashkesan mining deposit, the questions of the expediency of determining regularities of acid washing of economically valuable metals in mineral waste during iron ore processing. It is concluded that it is necessary to carry out a number of measures to prevent environmental pollution.

Introduction

As a result of human economic activity, there was an anthropogenic impact on the biosphere, i.e. the relief, chemical composition, atmosphere and living world of the earth's surface has changed [1,16]. It should be noted that the emergence of anthropogenic impact is historical, up to the industrial era (18th century), but then environmental pollution did not spread locally and covered large areas. The population of the globe was least quantity, natural resources were in abundance, as a result of which the results of anthropogenic impact were not significantly noticeable [2,18,20]. With the advent of agriculture and animal husbandry, the impact on the biosphere increased, and as a result of grazing over large areas, deforestation and plowing of meadows, and the expansion of agricultural land, natural ecosystems were destroyed and the balance in the biosphere was disturbed.

The industrial period of anthropogenic impact reached its peak in the 20th century, and at this stage all ecological components of the biosphere were subjected to strong anthropogenic impact and global ecological contrasts arose, although until the 17th century the ecolog-

ical balance in the biosphere was prevent globally, and environmental pollution was of a local one. Since the 17th century, the rapid development of industry has become the main factor destabilizing the biosphere [3,42-47]. At the Davos Economic Forum (2002), American scientists presented about rating of ecological purity of 142 countries of the world, where experts analyzed data on a set of parameters (the state of the environment, the degree of exposure of the country's inhabitants to environmental threats, the ability of the country's government to withstand eco-catastrophes, etc.) and came to the conclusion that the anthropogenic impact on the biosphere manifests itself in the following forms: - changing the structure of the lithosphere, planting greenery in damp lands, steppes and meadows, clearing large areas through the destruction of forest cover, desertification, land reclamation and irrigation works, creation of artificial reservoirs and lakes, etc. In January 2003, the UN once again proclaimed that strategic environmental assessment should be the basis of political and legislative actions, and human health should be an integral part of this assessment [4,15,19]. In the process of economic development, humanity has become directly dependent on the level of energy consumption, in the maximum and full use of hydrocarbon resources, oil and gas, which consists in the discovery and development of new deposits and an increase in the flow rate of previously operated oil wells. The development of oil and gas fields at sea and on land, in turn, required the development of significant problems - organizational, technical, environmental, legal, technological and many others, with a special place given to environmental protection.

Currently, the main sources of pollution of the natural environment are waste oil, oil refining, energy, non-ferrous metallurgy enterprises and a rain of other fields industries. In this aspect, environmental pollution by industrial waste accurate during the development, processing and use of natural resources is an environmental consequence of anthropogenic impact on the biosphere, therefore the biosphere is polluted by initial and secondary waste. Anthropogenic pollution of the biosphere is estimate due to industry: energy and transport (76% in total), of which the share of industry is 38%, energy - 22%, vehicles - 16%, agriculture - 14%, household waste - 7% ,

other sources - 3% [5, 24-28]. It should be noted that up to 200 natural resources are currently used.

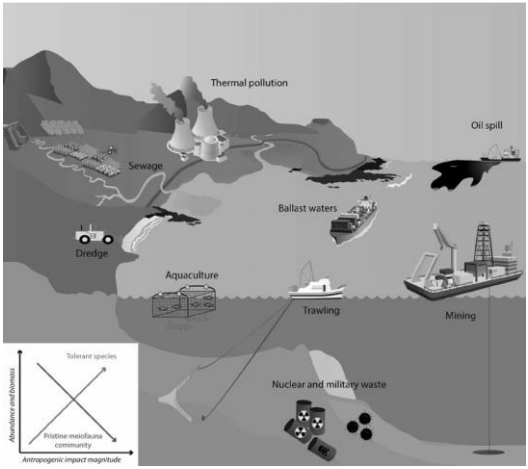

Fig. 1. Anthropogenic impact on the ecosphere

The lack of improvement of modern technology does not ensure the complete processing and use of mineral raw materials. Most of it is returned to nature as waste. According to some reports, the produced product is only 1-2% of the raw materials used, and the rest goes to waste [6, 31-37]. This fact, in addition to confirming environmental pollution, indicates an attitude towards the irrational use of natural resources and the absence of a cost-effective approach. The consequence of this was a change in biota (a set of flora and fauna), the destruction, and sometimes complete disappearance of many species of plants and animals, the creation of new breeds of animals and plant varieties, the loss of biological diversity, unwanted nutrients in the environment (soil, water, air) and the appearance new organisms in a certain area, the spread of pathogens of infectious and parasitic diseases and pests of agricultural plants and animals, microbiological contamination, etc. [7,17,18]. According to the World Health Organization, about 500,000 chemical compounds are currently used in practice, about 40,000 of them harmful to humans, and 12,000 are toxic [8, 53-57].

Environmental problems of mining

The oil and metallurgical industries are one of the significantly polluting field environment [9, 20-23]. So, the share of metallurgy in

the total amount of emissions of the entire industry of Russia accounts for about 40% of gross emissions of harmful substances, of which about 34% for gaseous substances, about 26% for solids, then in general, the energy industry in terms of emissions into the atmosphere accounts for 26,6%, non- ferrous metallurgy can be considered one of the leaders in environmental pollution. Large non-ferrous metallurgy enterprises are not only powerful pollutants of the air basin, but also of soil cover, both in terms of intensity and variety of pollutants [10, 38-41].

Fig. 2. Dirty solid waste effluents

Intensive mining and processing of natural resources contributes to an increase in waste and the emergence of a number of environmental problems, i.e. to an increase in solid waste [11,29,30]. It is a fact that the main sources of environmental pollution are concentrated in megacities - industry, energy and transport, which directly affect the ecological situation in the field of environmental pollution and degradation of the biosphere. Sources polluting the biosphere are very diverse (industry, energy, transport, household waste, agriculture, etc.) in composition a large number of chemical compounds, heavy metals, electromagnetic and radioactive radiation, solid waste.

Fig. 3. Main water pollutants

The results and scale of the anthropogenic affect on the biosphere during one year are as follows: 300 billion are mined in minerals, including 100 billion tons of iron ore; during construction and mining operations, 4 thousand km3 of soil and rocks are transported; 800 million rubles tons of various metals are melted down; 50-70 thousand km^2 of land becomes unusable (desertification, salinization, construction, etc.) 18 million rubles. A hectare of forest land is being destroyed; about a thousand species of plants and animals are being lost;

Fig. 4. Ways to eliminate anthropogenic pollution

In particular, the characteristic polluting elements of both wastewater and soil are heavy metal ions and various organic substances that are part of oil and oil products. Such the extraction, processing and transportation of oil and products of its processing also create the risk of man-made accidents and disasters associated with the pollution of waste areas. Accidents on oil pipelines, due to oil

spills, through holes formed due to corrosion, lead to losses of transported oil, causing great harm to the environment. An analysis of the research conducted in this area indicates the presence in this area of a number of unresolved fundamental problems in the field of petroleum chemistry associated with the cost-effective and economical operation of oil and gas wells [12, 50-52]. Minimization of the negative anthropogenic impact on water bodies is possible with the improvement of existing, the development of new methods and technologies for the treatment of polluted wastewater from various pollutants. The accumulation of industrial waste leads to local environmental disasters and global problems such as the greenhouse effect, acid rain.

Deciding the problem of environmental pollution with industrial waste is a complex of serious problems that require systemic and urgent ones. In the direction, special attention should be paid to ensuring the safe handling of waste, initially more hazardous. Storage of some wastes under the ground layer is not always safe, which is due to the need for the disposal of man-made wastes and the integrated use of processed products [13,48,49], deposits of natural resources in the Republic of Azerbaijan, and some of them contain a large number of precious metals. For example, since the beginning of XVIII, more than 90 million tons of iron ore have been processed at the deposit of the Azerbaijan Rocks and Processing Plant, and as a result of the processing of this or 46,5 million tons of waste have been obtained. Solid wastes from the processing of mineral raw materials (alunites, bauxites, polymetallic ores) accumulate in large quantities in dumps, which leads to the loss of valuable components, causing significant damage to the state. Several types of mineral waste have been identified: such as quarry rocks, rocks of loose ore layers, waste from an iron ore processing plant, waste from cobalt and alunite deposits containing a significant amount of heavy and non-ferrous metals (Co, Cu, Mn, Zn, Cd, Pb, Fe, Al, Cr, V, etc.). The extraction of related components in non-ferrous metallurgy remains at the level of 10-30%, rarely 50%, although their cost is about 30% of the cost of all marketable products [1, p.323]. The largest waste generated during the production of aluminum is called red clay, which got its name because of its color, acquired due to a large amount of iron oxides (up to 60 wt.%).

An analysis of the literature review showed that a sufficient number of studies have been carried out on the purification of technogenic solutions from metal ions.

The issues of processing waste from metallurgical production remain very relevant for the domestic metallurgy. It is inexpedient to process these difficultly enriched wastes using the existing methods of chemical processing. At the same time, the mineral and chemical composition of the wastes of the Dashkesan ore basin is completely different from the enrichment products found in foreign countries. In this aspect, the question arises of bringing to the fore the development of new processing methods that expand the raw material base for the production of valuable components and rationally use natural resources.

The initial task for the Dashkesan field was to determine patterns of acid washing of economically viable metals in mineral waste from iron ore processing and prevention of environmental pollution. Was defined granulometric, chemical and mineralogical composition of wastes and factors that ensure the transition of metals from wastes into solution and a technological scheme for the extraction of valuable metals (Co, Cu, Zn, Mn) is proposed, about ensuring the protection of the environment, which is one of the most global problems of our time and allowing for the complex processing of waste. Research in this direction were aimed at solving problems from priority areas aimed at for the complex processing of ore processing waste.

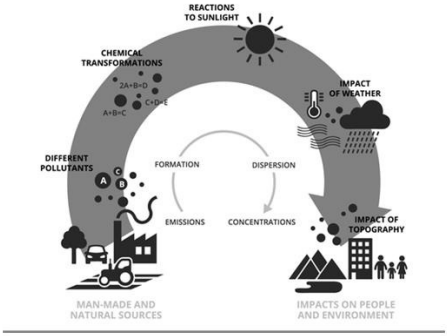

Fig. 5. Industrial pollution of the ecosphere

The problem of processing solid waste - red shlam - is especially acute for enterprises located on fertile lands (Gyanja, Azerbaijan), due to the withdrawal of these lands from agricultural use.

The chemical composition of red mud, depending on the processing method and the type of bauxite and their deposits, is presented in Table 1.

Table 1

The chemical composition of solid waste (red mud) from various fields

Company name (country)	Bauxite deposit	Chemical composition, wt.%					
		Al_2O_3	Fe_2O_3	SiO_2	Ca O	Na_2O	TiO_2
alumina plant -(Azerbaijan)	Dashkesan	14,0	40,0	9,4	14,2	3,8	4,1
clay plant (Ukraine)	Guinean	12,2	56,1	4,6	7,7	2,1	5,4

Analysis of these tables shows that red mud contains a large amount of aluminum and iron oxides.

Research into the recycling of red mud is being conducted around the world and hundreds of methods have now been developed for its disposal. One of the ways in which sludge is used in metallurgy is as additives to the charge, as well as as a raw material for the extraction of iron by the non-domain method and as catalyst-forming masses, catalysts and adsorbents [14].

Wastes received from the processing of the Dashkesan ore basin, from the enrichment of iron ore located in the valley of the Goshgar River, which pose a great threat to the ecological state of its waters.

Table 1 shows the characteristics of the oxen of the river Goshkar on the territory of the field.

Table 2

Characteristics of the water of the Goshkar River

Water indicators		
Name of analyzes	Test results	units of measurement
pH	6	
EC25 _	0,9	ms/sm
Nitrogen (N)	0,01	%
Phosphorus (P_2O_5) mq/kq	8	ppm
Potassium (K_2O) mq/kq	thirty	ppm
Calcium, Ca mq/kq	177	ppm
Magnesium, Mq, mq/kq	24	ppm
Sodium, Na, mq/kq	33	ppm

Iron, Fe, mq/kq	0,05	ppm
copper Cu mq/kq	0,02	ppm
Zinc, Zn, mq/kq	0,045	ppm
Manganese, Mn, mq/kq	2	ppm
Aluminum Al mq/kq	0,12	ppm
Silicon, Si mq/kq	0,09	ppm
CO_3	2	Meq/l
HCO_3	4	Meq/l
NaCl	2,7	%
SO_4	3,4	Meq/l

As can be seen from the results of the table, the waters of the river are also clogged with heavy metal ions.

Conclusion

As a result, it was concluded that the maximum use of technogenic industrial waste is the main direction of resource saving in the production of building materials. The use of waste from the mining, metallurgical and energy industries can reduce the need for natural materials by 20-40%. Secondary raw materials of non-ferrous metallurgy are a large reserve for the production of building materials. Studies have shown the possibility of making brick products from a mixture of waste products such as red bauxite mud, bleaching clay used in the purification of edible oils, and household waste. Based on the generalization of voluminous literary and scientific material, it can be concluded that red mud can be used as an additive that increases the mechanical strength of concrete. The use of solid waste from alumina production will expand the range of concretes, practically without changing existing technologies for the manufacture of small-piece wall materials, and will also contribute to the environmental improvement of the environment through the disposal of harmful substances contained in man-made products. The considered aspects of the processing of non-ferrous metallurgy solid waste showed that they can serve as a raw material for obtaining a number of promising materials, in particular, effective catalysts, since it contained iron and aluminum, which are the main components of catalysts.

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