Pouring lava can be viscous and dense, if the gases from it remain in the crater of the volcano, and porous when it is saturated with gas. When lava cools, supersaturated gases form rock called pumice. According to composition volcanic eruptions are dominated by basaltic lava.

The most common products are facies volcanic lava, pyroclastic and subvolcanic. As raw materials for the building materials industry the most interesting are the first two types.

The rocks of lava facies occur in the form of streams and covers. Streams are elongated in shape up to several tens of kilometers.

Volcanic tuffs (pyroclastic rock facies) are composed of clastic material formed during volcanic eruptions. They occur as lenses or layers that fill the surface topography; they have a rather volatile capacity, reaching a few hundred meters. Tuffs are very variable in composition and structure.

Thus, when cooling fluid silicate melts (magma) depending on their composition and cooling conditions are transformed into complex natural mineral aggregates, characterized by mineral composition, structure and texture. There are several approaches to the classification of igneous rocks, depending on goals.

It seems that to accomplish various tasks the construction industry uses the most appropriate classification, which takes into account the mineral and chemical composition of rocks and the conditions of their formation.

In the ultrabasic - basic - intermediate and acid rock series the structure of silicates gets complicated, from silicon-oxygen tetrahedra isolated olivine and other orthosilicates to tetrahedra chains in pyroxenes, amfmbolah tapes, mica sheets and skeletons in feldspars. This decrease corresponds to the sequence of the crystal lattice energy minerals, calculated "per unit of the skeleton".

With the increase in the SiO_2 content of the rocks, cationic composition changes as well: role of divalent cations decreases - Mg^{2+}, Ca^{2+}, Fe^{2+} and the role monovalent - Na^{+}, K^{+}. Thus, ionic radii grow, which indicates a decrease in the ionic potential.

In the abyssal to effusive rock series increasing disorder of the atomic structure of minerals can be observed. For plutonic rocks holocrystalline grain structure is typical; effusive rocks are characterized by aphyric or porphyritic structure with glass wool, not holocrystalline, and rarely with the main mass of fine-grained, porous, or amygdaloidal fluidal texture flow.

In astenosphere source rock occur at high temperature (several hundreds, sometimes up to 1000 ° C), but in the solid state, due to high pressure. When lifting fluids or heating mantle heat flow enhances, temperature rises, and hence the free internal energy of source rocks rises too. The maximum value is reached at the last stage of rock transition from solid to liquid. The melting of the rocks can also be carried out by reducing the pressure at the depth of penetration of faults in the atmosphere.

Magma, therefore, is the most energy-releasing phase in the evolution of rock. Moving to the surface of the Earth, the fiery liquid silicate melt gradually loses energy on heating and melting of the surrounding rocks.

It appears that the crystallization of rocks is accompanied by a reduction in their energy potential. Large supply of free internal energy is characteristic of the rocks, ceteris paribus, formed as a result of the rapid cooling in a low fluid pressure at a correspondingly higher temperature. These rocks are characterized by a highly disordered atomic structure of minerals, and the imperfection of the crystal lattice defects, the presence of a large number of often not-crystallized mass. All this is typical for volcanic rocks.

Intrusive rocks crystallize for a longer time at a significantly higher fluid pressure, and fluid composition, lower temperature. The degree of crystallization, the perfection of the crystals is significantly higher, and the free internal energy is lower.

Volcanic-sedimentary rocks have significant energy potential. By origin they are intermediate between magmatic and sedimentary rocks, but closer to effusive ones according to material composition. They are characterized by the presence of such volatile components as volcanic glass, fragments of volcanic rocks, and others.

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APPLICATION OF REMOTE SENSING TECHNIQUES TO THE STUDY OF TECHNOGENIC CATASTROPHES

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At present, a huge number of different disasters occur, causing massive losses of life. These disasters include technogenic catastrophes, i.e. large-scale industrial accidents bringing about massive losses of life, ecological disasters and etc. After catastrophes, people are not normally informed enough on catastrophe consequences. Applying remote-sensing techniques gives a broad picture of the whole situation.

Remote sensing (RS) is a process via object (area or phenomenon) information can be achieved, according to measurements made at a distance from the object, without immediate contact with it [1]. Earth remote sensing (ERS) has a wide area of application. For example, monitoring and assessment of environmental conditions, global change and replenishable natural resources as well as agriculture monitoring are being carried out through remote sensing. Besides, remote sensing is used for military reconnaissance, the media, cartography [5, 7].

For emergency and disaster response and prevention a multi-purpose and effective Earth monitoring is required carried out only by remote sensing. The received satellite data on natural resources destination allow carrying out monitoring at the federal, regional and local levels at intervals not less than twenty four hours [8, 9].

There are two types of remote sensing: satellite acquisition and aerial photography.

Aerial photography is photographic recording of the area at a height of hundreds of meters to several tens of kilometers applying the special digital aerial camera set at the atmospheric aircraft (e.g. a plane, a helicopter, an airship etc) [1]. There are vertical aerial photography and oblique aerial photography.

Vertical aerial photography is photographing of an area by one or two cameras at a deviation of the optical axis at an angle of not more than 3 degrees in relation to the vertical axis. Vertical aerial photography is applied for town and territory planning; land use, forestry and agriculture monitoring; environmental monitoring as well as disaster areas and emergency operational monitoring.

Oblique aerial photography is photographing of the area with one or two cameras at a deviation of the optical axis required angles (>3 degrees) in relation to the vertical axis. Therefore, oblique aerial photography is normally used to obtain general topographical forms/data at a glance. Due to the terrain nature, time-lapse aerial, strip aerial and general coverage photographs are distinguished.

Time-lapse aerial photography is photographing series of shots of separate terrain objects.

Strip aerial photography is photographing a terrain strip by random course, sequential aerial photographs of which at the set value of longitudinal overlap are normally 56-60% [8]. General coverage photography is photographing of the area along several overlapping routes. To achieve relief effect, the aerial photography is carried out with longitudinal overlap of the closely-spaced aerial photographs [5]

Due to the technological development of satellite positioning, GPS and GLONASS systems are in great use for aerial photography [4].

Complex and effective monitoring of the Earth, which is carried out only by remote sensing, is necessary for emergency incident responses and their prevention. For this, the space crafts data related to natural and resource purpose are applied [8, 9]. There are two ways to obtain spatial data on the Earth surface: photographing via optoelectronic systems and photographing in centimeter radio frequency range (radar systems) [3].

The case study of technogenic catastrophes via ERS is the accident occurred on October 4, 2010 in Hungary at the major aluminum plant in the town Ajka. The dam, holding the toxic waste storage tank, was destroyed. Consequently, there was a leak of about 1.1 million cubic meters of toxic substance - red mud.

Fig. The image from SPOT 4, 10.10.2010 [2]

The satellite image SPOT 4 (October 9-10) (Fig.) shows that the area of the settlement Devecher is flooded with toxic waste, and the total visible length of flood exceeds for 15 km (at a width more than 50 m) [2]. Significant differences can be observed when comparing images obtained after and before accident. Firstly, the territory flooded with toxic waste was painted in red color, which led to pollution of the soil and "red mud" infiltration in ground waters. Secondly, houses within the settlements "disappeared". Thirdly, territories of agricultural and forest areas were burnt down. Also, toxic waste penetrated into the basin of Danube.

Through remote sensing, a great deal of information on various scale incidents as well as their consequences can be obtained. In this regard, due to satellite images we can evaluate environmental conditions and compare the situation of the accident territory before and after a technogenic catastrophe.

When monitoring technogenic catastrophes, application of current remote sensing methods and systems is extremely important. This is directly and immediately related to human life and health, safety of human activity as well as sustainable economic development [3].

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NEW TECHNOLOGIES IN OIL AND DRILLING WASTE DISPOSAL

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Due to the increase of oil production volumes, oil and petrochemicals are recognized as the planet's priority pollutants. With the expansion of oil-contaminated soil areas, conditions of soil cover deteriorate and the balance of the ecosystem is disturbed. New biotechnologies for petroleum industry waste disposal represent a new ecological method of restoration of the natural balance.

At the present moment, greening is a developing trend in the petroleum industry. The increase in well drilling and the sophistication of drilling fluids bring about new combinations of chemical agents that can interact or react with earth materials in downhole conditions, which can result in formation of toxic compounds. This is why development of toxicity test techniques for oil and drilling fluids and petroleum industry waste disposal are the tasks of vital importance [1].

One of the priority areas in restoration of oil-contaminated ecosystems is the use of biotechnology. Use of these technologies for waste disposal is the friendliest towards natural environment.

Mechanical and physical techniques cannot ensure the complete removal of oil and petrochemicals from the soil, while the natural process of waste degradation in the soil is extremely time-consuming [4].

Remediation of oil-contaminated soil is currently carried out using techniques that are, as a rule, inadequate and lack sufficient scientific justification. Current procedures of response to oil spills in soils frequently lead to irreversible destruction of the topsoil, for example, during oil burning, covering contaminated areas with earth, and disposal of contaminated soil in landfills.

In order to facilitate bioremediation of ecosystems with various degree of contamination in different climatic zones, microbial bio-products are introduced into ecosystems, and technologies of producing these bio-products and using them to remediate water and soil resources contaminated by petrochemicals and other waste are being developed.

Eco-biotechnology is represented by bio-products for environmental protection and remediation: *biosorbents*, *biocatalysts*, *bioremediation agents*, and technologies for bioremediation of contaminated environments and processing of waste and byproducts in industry and agriculture [3].

There are two types of *bioremediation* agents: universal (suitable for specific tasks and specific contaminations) and authentic (highly efficient, especially composed of native microbial strains of particular epitope, and bioengineered if required) [2].

In general, it is possible to accelerate the remediation of oil-contaminated soil by microorganisms in two ways: increasing the metabolic activity of the soil's natural microflora by changing the relevant physical and chemical parameters of the environment (some well-known agricultural practices are used for this purpose), or introducing active oil-degrading bacteria that are specially selected from the natural microflora into the contaminated soil.

According to their purpose, bioremediation agents are divided into biostimulants (native microorganisms), bio-additives (decomposer organisms), and photostimulators (rhizospheric bacteria).

Biological treatment (bioremediation) of contaminated terrestrial and aquatic ecosystems can be performed using biological products and biosorbents produced both in Russia and abroad.

Biosorbents are active substances used for removing oil spills.

Their main parameters are oil biosorption capacity (oil, kg./sorbent, kg.), flotability per month, and propensity for reduction of interfacial tension.

Biosorbents allow to completely remediating soils and bodies of water of oil pollution without any harm to the environment while ensuring active decomposition of petroleum hydrocarbons by microorganisms both on the surface of water and below it, as well as in bottom deposits and coastal zones.