sodium clinopyroxene - omphacite.

Acidity degree plays an important role for the magmatic rocks. Olivine is the main mineral in the underlying ultramafic rocks (peridotite and olivinites). The fact that they are removed from deep xenoliths (including the mantle) and the centers of volcanic eruptions in the event of kimberlite volcanic pipes indicated the depth formation of these rocks. There are two polymorphs of the same composition - olivine $(MgFe)_2(SiO)_4$ and "spinel" $Si(MgAl)_2O_4$; it is possible that the second modification in deep mantle is more dense. In main medium, acidic rocks, nesosilicates play the role of accessory minerals – these are certain granites, zircon and titanium.

So, all available information on the basalts is associated with geological processes of volcanic eruptions. Analysis of literature on the location of basalt rock deposits in Uzbekistan showed that the main occurrence of basaltic igneous rock can be seen on the ground. This arrangement of basalts occurred after a volcanic oceanic eruptions, during rapid cooling of magma that, along with numerous magmatic rocks, formed basalt.

It was revealed that in basalts, as in all magmatic rocks, $SiO_2$ and $Al_2O_3$ content is emitted, with a noticeable amount of $Fe_2O_3$ and MgO. The latter includes pyroxene, olivine and plagioclase, the share of which in the basalt sometimes reaches up to 90÷95%, which defines the structure, composition, and other physical properties of basalt rocks. Mostly the main component of the basalt mass belong to not crystallized volcanic glass, well impregnated with small particles of magnetite and a mixture of microscopic secretions of basic plagioclase, pyroxene and olivine, less with protease.

## THE STUDY OF THE PROPERTIES OF ELASTOMERS DURING ROUND-TRIP OPERATIONS

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In recent decades, the domestic downhole motors have been passed an evolutional way of the development, turning into an effective technical tool for drilling and repair of the oil and gas wells, which ensure high performance indicators. A great need for the mud motors due to the appearance on the market of a new generation of the low-speed cone-rock bits and the development of the new technologies of drilling — drilling of the directional, horizontal wells and sidetracks.

In every oil region in the intervals of drilling the downhole motors have provided fold increase in penetration over the chiseled compared to the turbo drill with a slight decrease in mechanical speed, which led to a significant increase in scheduled drilling speed and the cost of 1 meter penetration has been reduced. The problem solving of the wells repair of a wide variety of categories has become much easier and cheaper, the technical capabilities of the overhaul have been expanded, which has allowed in some cases to enter in the number of operating the emergency long-term idle wells.

"Working pair" is one of the names of the propulsion section of the hydraulic screw downhole motor, this node determines the basic energy parameters of the downhole motor, as well as its resource and the turnaround time. A disadvantage of the screw downhole motors is quick wear of the motor section, the real operating time of the engine is up to 250 hours relative to the estimated 400-500 hours.

In the process of operation of the downhole mud motor depending on the operation modes, properties, and composition of the fluid, there are different types of wear of the working surfaces of the rotor and the stator. The analysis of the operating conditions and the nature of wear of the working engine related parts demonstrates a combination of not one but several kinds of wear. Mainly the operability of the engine is related to wear of the elastomer plate of the stator.

The frictions of the metal profiled rotor at the mating helical surfaces of the rubber plate of the stator causes the unilateral frictional wear of the surfaces of the working engine related parts — on the left side of the rotor teeth of the right side branch of the profile of the stator, when viewed from the inlet side of the fluid in the working engine related parts. Increasing the load (pressure) and sliding speed (rpm) entails increasing the friction of the wear parts and the scrapping of the motor section.

The normal operation of the elastomer depends on the combination of the stress-strain state of the covering and corrosive properties of the pumped liquid, therefore when operating the downhole mud motor it is necessary to pay special attention to the choice of a suitable drilling mud. The engine design allows to apply various types of the drilling fluids:

1. Water-based (calcium, salt, clay, etc.)
2. Oil-based (with using of crude oil, diesel fuel, products of processing);
3. Polymer drilling fluids having a low viscosity and an enhanced ability to clean from the solid phase.

The elastomer as the technical material must have a low gas — and water-resistance, chemical resistance. However, most elastomers are able to absorb gases and light liquids.

The typical changes, which are elastomers under the influence of the aggressive agents are:

1. Swelling;
2. Shrinkage;
3. Solidification;
4. Softening.

In addition, the downhole temperature is a limiting factor in the operation of the engine. The serial domestic engines are designed for the continuous operation in downhole temperature up to 100 °C. When the temperature of rubber IRP-1226 used in most domestic engines, irreversible changes of the mechanical properties of the elastomer, which lead to increased wear of the elastomer lining of the stator, reduced performance and early failure of the working section of the downhole drilling motor. The base material of the elastomers of the modern mud motors is IRP-1226.

In the view of the above problems it has been decided to conduct the experimental study to assess the stability of samples of rubber IRP-1226 to increase the temperature in the engine when exposed to the different environments. The process of descent of the drill string has been simulated during the experiment, the rate of descent has been estimated to be equal to 1.5 m/s. Taking into account the initial parameters: the design depth of the well is 2670 m, a geothermal gradient of 3 °C per 100 m, the length of the drill candle is relatively 30 m and the duration of the operation by screwing of pipes is equal to 4 min., the time of the experiment has amounted to 384 minutes, the final temperature of the engine is 80 °C.

The dip simulation of the drill string, i.e. the increase in temperature of the drilling mud has been carried out in the desiccator. The prototypes have been made in the form of cylinders with a diameter of 43 mm and a thickness of 11,5 mm, have been kept in the plastic containers with a full immersion into the fluid at the atmospheric pressure. In processing the results of the experiment the weight changes of the sample and its diameter with increasing temperature while in liquid medium have been evaluated.

The initial measurement of the source parameters has been carried out at a temperature of 25 °C and the subsequent measurements have been carried out after each temperature increase of 5 °C, during which the drill string has been lowered to 165 m for 23.5 minutes. When it reaches a depth of 1680 m, the measurement of the samples has been done after each temperature increase of 10 °C, for which the drill pipe is conventionally lowered to 330 m for 50 min. The results of experimental data processing are presented in figures 2. During the processing and analysis of the data the following regularities have been identified:

All the samples placed in the various liquids have shown the reduction of mass by the end of the experiment. However, in the temperature interval from 25 to 50 °C most of the specimens have not had any marked trends in the changing of masses, and showed the most intensive changes in the direction of increasing and decreasing mass. The exception has been the samples immersed in a saline solution, which in the course of the entire experiment tended to decrease in mass. The greatest relative change in mass the specimens immersed in solution-based diesel fuel, oil and organic solvent have been exposed (Table).

− All samples in the various liquids are characterized by a diameter which is increased as approaching to the temperature of 80 °C. Most of the samples in the temperature interval from 25 to 40-50 °C have deviation from the tendency to increase in diameter. It is worth noting a characteristic decrease in the diameter of the samples in a solution of the organic solvent and alkali, in the above temperature range. When approaching temperature of 80 °C, the intensity change of the diameter is reduced, with the exception of the samples in a solution of the organic solvent, which demonstrate, on the contrary, increase the intensity changes. The smallest relative increase in diameter the samples have been exposed placed in the alkaline solution (Table).

− A slight change in the geometric dimensions of the samples due to the static nature of the experiment.

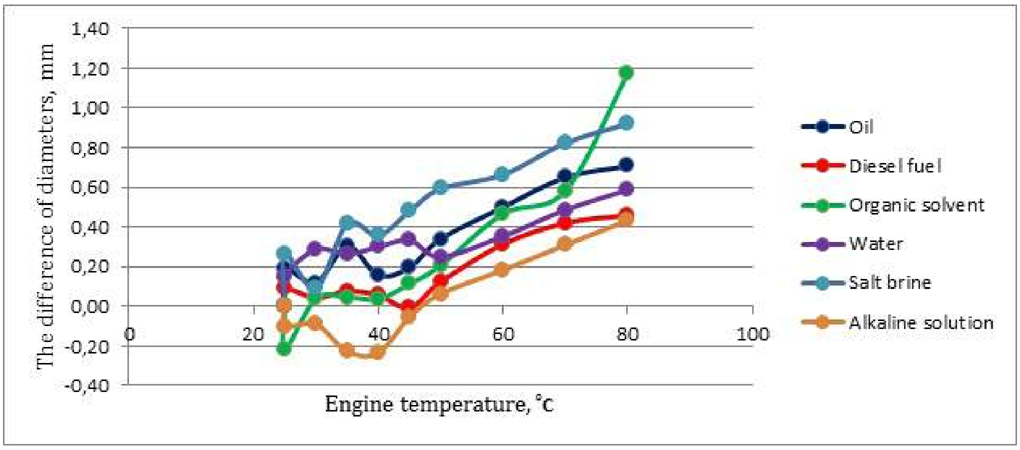


***Fig. Changing the diameter of the samples IRP-1226 with increasing temperature while in liquid media***

***Table***

***The maximum deviations of the mass and volume of the original parameters***

| Solutiom | The maximum deviation from the initial mass, g (the temperature in the engine °C) | The maximum deviation from the original diameter, mm (the temperature in the engine °C) |
|---|---|---|
| Oil | +0,43 (70) | +0,71 (80) |
| Diesel fuel | +0,59 (50) | +0,46 (80) |
| Organic solvent | -0,39 (30) | +1,17 (80) |
| Salt brine | -0,14 (35, 80) | +0,92 (80) |
| Alkaline solution | +0,25 (40) | +0,43 (80) |
| Water | +0,2 (35) | +0,59 (80) |

The analysis of the experimental data has revealed that during the experiment, all the samples experience the active change of the geometrical sizes and masses that may be associated with the actual features of the interaction of IRP-1226 liquid environments, and with not enough well-established experimental technique.

According to the results of the tests the influence of temperature on drilling mud samples IRP-1226 has been confirmed. The experiment has been static in nature, but that have not stopped to determine that the most intense changes occur in the environment of the organic solvent, salt brine, oil and diesel fuel. As it has been expected, the interaction of fluid samples IRP-1226 led to the swelling of the latter, the mass loss of the samples has been caused by the leaching of plasticizer from the elastomer.

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## BERGBAUBETRIEB UND SEINE AUSWIRKUNGEN AUF DIE UMWELT

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Dieser Artikel befasst sich mit den Besonderheiten der Bergbauindustrie und ihren Auswirkungen auf die Umwelt.

Der Bergbau ist ein Teil der Montanindustrie (lateinisch mons, deutsch ‚Berg‘). Man bezeichnet damit Aufsuchung und Erschließung (Exploration), Gewinnung sowie Aufbereitung von Bodenschätzen aus der oberen Erdkruste unter Nutzung von technischen Anlagen und Hilfsmitteln.

Nach der modernen umfassenden Definition gehören zum Bergbau das erforderliche Vermessungswesen (Markscheidewesen), Grubenbewirtschaftungsaufgaben (Bewetterung und Wasserhaltung), soziale Sicherungssysteme (Knappschaftskassen), spezielle Ausbildungsstätten (beispielsweise Bergakademien) sowie Bergaufsichtsbehörden. Als montanistisch bezeichnet man alle auf den Bergbau bezogene Sachverhalte. Im deutschsprachigen Raum waren und sind auch die Bezeichnungen Montanwesen, Gewinnung von Rohstoffen mineralischen und fossilen Ursprungs sowie Berg- und Hüttenwesen üblich. Die Gewinnung von Erdwärme (Geothermie) gehört ebenfalls in den Bereich Bergbau.

Je nachdem, ob die Lagerstätten der Bodenschätze in Bergwerken („unter Tage“; → Bergmannssprache) oder im Tagebau zu erreichen sind, gibt es unterschiedliche Abbauverfahren.

Bergbauliche Aktivitäten werden weltweit durch das jeweilige Bergrecht innerhalb der nationalen Gesetzgebung geregelt.

Ausmaß und Lage der Lagerstätten werden heute meist durch geophysikalische Exploration untersucht. Diese vorbereitende Tätigkeit wird häufig außerhalb des Bergbausektors, durch wissenschaftliche Einrichtungen und Behörden geleistet. Von der Vorgeschichte bis in die Neuzeit sind viele Lagerstätten – zum Beispiel Erzgänge – durch ihre Sichtbarkeit an der Erdoberfläche (Ausbisse) entdeckt worden. Eine künftig zunehmende Bedeutung wird der Abbau von Lagerstätten in der Tiefsee erhalten.

In Deutschland ist der Bergbau grundsätzlich durch das Bundesberggesetz geregelt, in anderen Ländern durch vergleichbare Rechtsvorschriften. Die öffentliche Stelle, der die gesetzliche Kontrolle übertragen ist, heißt Bergamt, in Österreich Montanbehörde. In der Schweiz ist die bergrechtliche Zuständigkeit bei den Kantonen angesiedelt.

Die älteste Form der Rohstoffgewinnung, die als Bergbau bezeichnet wird, geht auf die gelegentliche Nutzung von Feuersteinlagerstätten in der Steinzeit zurück. Kleine Arbeitstrupps begaben sich für einige Tage zu Feuersteinbergwerken, um Rohmaterial für die Herstellung von Geräten zu gewinnen. In steinzeitlichen Kulturen (Nordamerikas, Neuguinea) hielt sich diese Arbeitsweise zum Teil bis in die heutige Zeit. Auch die Ausbeutung mediterraner Obsidianlagerstätten gilt als das Werk von Gelegenheitsbergleuten.

Ein dauerhafter oder saisonaler Bergwerksbetrieb setzt eine Landwirtschaft mit Überschüssen und Handel voraus, da die Bergleute ernährt werden müssen, ohne selbst Nahrung produzieren zu können und selbst mehr Produkte erzeugen, als die Gemeinschaft verwerten kann. Die Voraussetzungen dafür waren in der Regel erst in der Kupfersteinzeit gegeben (Naqada-Kultur/ Kupferbergwerke von Timna in Ägypten). Irans Kupferbergwerke sind bereits steinzeitlich und über 6500 Jahre alt. Die Blütezeit der zyprischen Gruben begann vor 4000 Jahren.

Wahrscheinlich gab es gegen 3000 v. Chr. schon Erzgruben in Indien und China. Ein auf 3000 v. Chr. datiertes Goldbergwerk ist in Georgien belegt. Um 2500 v. Chr. begann die Kupferförderung in Mitteldeutschland. Eisenerz wurde ab etwa 800 v. Chr. in den Alpen abgebaut. In Mitteldeutschland legt ein Ofen aus der La-Tène-Zeit in Wilnsdorf Zeugnis von Bergbau um 500 v. Chr. ab. Der Abbau von Steinkohle ist seit dem 9. Jahrhundert in England bekannt.

Die Blütezeit des mittelalterlichen Bergbaus in Zentraleuropa war das 13. Jahrhundert. Im 14. Jahrhundert ging er zurück, vor allem weil keine neuen Vorkommen entdeckt wurden. Ab Mitte 15. Jahrhundert stellte sich ein neuer