On the basis of thermodynamic calculations, the following characteristics (Table 2) were found: adiabatic combustion temperature (T_{ad}), specific impulse (I_{sp}), combustion products outflow velocity (W), average molar mass of the gas phase (MM_g), combustion products composition and mass fraction of condensed phases (z). Calculations were conducted by using thermodynamic software "Astra-4" (Moscow State Technical university) under pressure ratio p_k/p_a=40/1, where p_k and p_a – pressure in gas generator and at the nozzle exit respectively.

Calculation results show high energy performance of investigated fuel systems. Moreover, combustion products contain considerable quantity of chlorine that increases efficiency of such fuels by the active chemical effect on the bank.

Aluminum and mixed metal fuel Al/B significantly increase energy characteristics (compounds 1, 2). These compositions are characterized by high values of adiabatic combustion temperature, specific impulse and combustion products flow rate. Compositions 1, 2 have the highest mass fraction of condensed phases. Simultaneous mechanical, thermal and physicochemical impact of combustion products onto rocks, saturating fluids and solid deposits in the wellbore zone and cracks will increase oil production. Total or particular replacement of Al by Ti, Al_2O_3, Pb decreases adiabatic temperature, specific impulse, combustion products flow rate and mass fraction of condensed phases (compounds 3 – 7). It should be taken into account, that well fluid is a mixture of oil, soft or saline water. Moreover, acid treatments of adjacent layers are possible. Replacement of aluminum by titanium powder provides generation during burning process oxides TiO_2 and Ti_4O_7, forming low-melting systems with siliceous and calcium rock base and having sufficient acid resistance, that is notably for water production isolation in oil wells. Partial replacement of aluminum powder by lead one saves sufficiently high energy characteristics for this kind of fuel and allows forming fusible compounds based on PbO that react with rock components and form strong acid-resistant adherence substance.

Thermodynamic calculations demonstrate the possibility of component optimal ratio selecting. Reliable performance of gas generators used in oil&gas industry is provided by; a) improving of propellant/fuel energy properties: b) combustion products temperature increasing; c) high burning rate ensuring, d) generating in combustion products metal oxide condensates that are able to form low-temperature eutectic melt with rocks. Results of this research may be useful in further studies fuel combustions based of ammonium perchlorate and an inert binder.

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LIGHTWEIGHT VERMICULITE-CONTAINING GROUTING MORTAR

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On a number of oilfields well drilling is complicated by the presence of high-permeable layers and layers with low formational pressure. Implementation of lightweight grouting mortars is one of the most effective technological solutions to improve well cementing quality significantly [1].

In order to reduce grouting mortat density for well cementing in complex geological conditions vermiculite air-entraining admixture can be applied. Vermiculite is hydromica group mineral, has low thermal conductivity and considerable absorbency, is not susceptible to biological decomposition, acid and alkalis action. It should be noted that vermiculite is non-toxic environmentally friendly material [2]. Efficiency of lightweight vermiculite-containing grouting mortars is caused by vermiculite and cement physicochemical interaction that leads to new hydrated phase formation reinforcing composite material structure. In comparison with widespread gel-cement slurry vermiculite-containing grouting mortar has better plugging ability, lower thermal conductivity providing better facilities for cement hardening, and relaxing ability increasing frost resistance and fracture strength [3, 4].

At the first stage of this study the selection of grouting mortar receipt providing the lowest density while maintaining the required flowability of cement slurry in accordance with the requirements of GOST 1581-96 was carried out. ПЦТ-IG-CC-1 was used as the cement component. Experimental results are shown in Table1.

Table 1

Density and flowability of cement slurry

Parameters	Composition I (90% cement, 10% vermiculite)			Composition II (87,5% cement, 12,5% vermiculite)			Composition III (85% cement, 15% vermiculite)			GOST 1581-96
	water-cement ratio			water-cement ratio			water-cement ratio			
	0.65	0.75	0.8	0.65	0.75	0.8	0.65	0.75	0.8	
Density, g/cm^3	1.6	1.55	1.5	1.57	1.53	1.48	-	1.46	1.44	1.4-1.5
Flowability, mm	145	170	250	120	150	210	-	<90	165	>180

In accordance with experimental results, composition I (90% cement, 10% vermiculite, water-cement ratio about 0.8) is accepted to be optimal.

At the second stage thecomposition of lightweight grouting was tested for compliance with GOST 1581-96. Experimental results are shown in Table 2.

Table 2

Test results for composition I

Parameters	Composition I	GOST 1581-96 requirements
Density, g/cm^3	1.5	1.4-1.5
Flowability, mm	250	> 180
Jelling time, min - 30Bc (75ºC)	110	>90
Jelling time, min (room temperature)	>430	Unregulated
Flexural strength after two days, MPa (30ºC)	2.4	1.0
Flexural strength after two days, MPa (60ºC)	2.3	Unregulated
Dehydration, cm^3	1.4	<7.5

Test results presented in Table 2 show that developed composition of lightweight vermiculite-containing grouting mortar complies with GOST 1581-96 requirements. It should be noted that cement stone strength of worked out composition is twice more than regulated.

Comparative study of volumetric shrinkage of developed composition I, ПЦТ-I-G-CC-1 and PTM-75 also was carried out in the framework of this research. Results are presented in Figure.

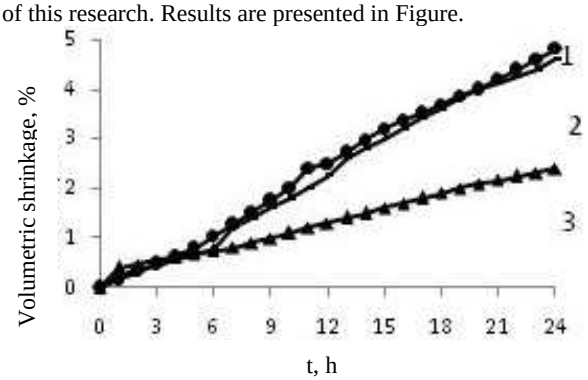

Fig. Volumetric shrinkage vs time
1 – Composition I; 2 - *ПЦТ*-I-G-CC-1; 3 – PTM-75

It is obvious, that volumetric shrinkage of developed vermiculite-containing composition is twice less than shrinkage of cement stone based on ПЦТ-I-G-CC-I and PTM-75.

As a result of research following conclusions could be done:

1. Optimal composition of grouting mortar based on vermiculite is found;
2. Developed composition of grouting mortar has twice less volumetric shrinkage of cement stone in comparison with ПЦТ-I-G-CC-1 and PTM-75.

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MAGMATIC ROCKS OF NIKOLAYEV HILL (ENVIRONS OF THE KRASNOYARSK CITY)

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There are lots of different magmatic bodies in environs of Krasnoyarsk city. They consist of rocks with different composition, structure and genesis. The later Ordovic is a period of one of the most intensive volcanic activity, and a Long Mane (a ridge of Ordovician volcanic rocks) is its result in present-day geological structure. The easternmost hill of the Long Mane is Nikolayev (First) Hill, it is also the highest peak of the ridge. Nikolayev Hill consists of genetically different magmatic rocks - there are effusive rocks and subvolcanic rocks that compose laccoliths and dikes.

Purpose of the work: identification of differences and similarities between the rocks of different geological bodies of Nikolaev Hill and its surroundings using a method of microscopic description of rocks.