PalArch's Journal of Archaeology of Egypt / Egyptology

PHYSICAL PROPERTIES OF ROCKS OF THE SOUTH-BUKANTAUSKAYA AND NORTHERN - BUKANTAUSKAYA STRUCTURAL-FORMATION SUBZONE.

Yusupov Rustam Yunusovich.[1], Khaidarov Botir Khaidarovich.[2], Yusupov Valijon Rustamovich.[3]

[1]Head of the Department of the Tashkent State Technical University.
[2]Associate professor of the Tashkent State Technical University.
[3]Associate professor of the Tashkent State Technical University.

Yusupov Rustam Yunusovich.[1], Khaidarov Botir Khaidarovich.[2], Yusupov Valijon Rustamovich.[3], PHYSICAL PROPERTIES OF ROCKS OF THE SOUTH-BUKANTAUSKAYA AND NORTHERN - BUKANTAUSKAYA STRUCTURAL-FORMATION SUBZONE. – Palarch's Journal of Archaeology of Egypt/Egyptology 17(9) ISSN 1567-214X.

Key words: Rocks, mountain range, physical properties, minerals, mountain zone

ABSTRACT:
This article examines the physical properties of rocks and ores of the North Bukantau structural-formational subzone of the Bukantau mountains to use the information obtained in geophysical prospecting and exploration of ore deposits. In the Central Bukantau subzone, the Late Proterozoic meta-hyperbasic intrusive complex is conditionally distinguished, which is characteristic inclusive of the entire zone of the Bukantau deep fault. It is represented by foliated serpentinite, listvenite and products of their further transformation - birbirat, which are located in the axial part of the deep fault zone, in the form of small bodies, among the tectonic mixture. South Bukantau structural-formational subzone. In this subzone, the most ancient rocks are represented by formations of the Cholcharatau Formation of the Upper Proterozoic. This is a volcanic-sedimentary intensely metamorphosed stratum, consisting of gabbro-diabases, diabases and their tuffs, transformed into amphibolites, amphibole and various crystalline schists, with an apparent thickness of more than 400 m. the position of this area in the marginal resonance-tectanic system of the Kuramino-Fergana median massif. The Yuzhno-Bukantauskaya is built more complexly. Terrigenous deposits of various formational composition, carbonate rocks are developed here. Sedimentary formations are interrupted by numerous felsic intrusions, both exposed on the day surface and not reaching the level of the erosional cut.

Introduction.

Today in the world practice of research on prospecting and exploration of mineral deposits, quantitative interpretation of the physical properties of the subsoil is one of the urgent tasks. In this regard, the assessment of the state of the subsoil, the identification, prevention and elimination of changes in the subsoil under the influence of natural and man-made factors that threaten economic activity, the life and health of the population, play an important role in the socio-economic development of the country.

RELEVANCE.

Currently, a number of scientific studies are being carried out in the world to identify the physical properties of rocks and analyze them. In particular, in the USA, Russia, China, India and the states of Central Asia, special attention is paid to the conduct of extensive comprehensive geological and geophysical research to meet the demand for minerals. This scientific approach serves to improve the methodology for solving problems of quantitative interpretation of the physical properties of minerals in the exploration and prospecting of mineral deposits.

Geological exploration. The Kyzylkumo-Nurata region is in first place among the gold-ore regions of Uzbekistan. The region is distinguished by its complex metallogeny. The tectonic position of the region is determined by the development of a large continental riftogenic structure with the accumulation of thick terrigenous - flyschoid strata (Dzhetimtau Formation) with abundant carbonaceous matter (up to 18%), accompanied by the development of trachybasaltic volcanism (R-V). The high sulfide content of the ores is apparently due to a large-scale volcanic process, with the release of large amounts of iron and sulfur [1].

Most of the endogenous gold deposits in Uzbekistan fall on the Paleozoic era. According to I.Kh. Khamrabaeva gold deposits in Western Uzbekistan form concentrates in the central parts of which large and super-large deposits are localized, and on the periphery - smaller ones. An example is the Central Kyzylkum Concentrate (CCC) with a giant Muruntau field in the center and a galaxy of fields (Mutenbai, Triada, Besapantau, Amantaytau, Daugyz, Bolpantau, Kokpatas, etc.) around [1].

The study area is poorly studied in geological terms compared to other regions of the Bukantau mountain range. One of the reasons is the poor exposure of the pre-Mesozoic folded basement in the area [1].

In 1968-71. in the Bukantau mountains A.A. Rubanov et al. (1971) carried out case studies to identify the patterns of placement of endogenous mineralization. Within the outcrops of pre-Mesozoic formations on the Dzhetymtau area, zones of near-ore (for gold) metasomatically altered rocks of feldspar-mica-quartz, mica-quartz-carbonate composition, zones of increased sulfidization were mapped, an ore occurrence of gold in the Dzhetymtau area was identified, two promising areas were identified (for gold) and gold-quartz mineralization [2].

In 1974-1976. the northwestern part of the explored area was covered by general prospecting for gold and other minerals, carried out on the basis of a geological survey at a scale of 1: 500000 using a complex of geophysical methods [3]. As a result of these works, weakly anomalous secondary geochemical aureoles of gold and arsenic and a placer aureole of cassiterite were found in the rock outcrops of the Koksai Formation south of the Dzhetymtau-1 Upland. EP anomalies were identified, interpreted as zones of sulfide mineralization. This site was put forward by the authors as potentially gold ore [3].

Geological structure. The geological structure of the area is attended by two rock complexes corresponding to the geosynclinal and platform stages of development: folded, formed by sedimentary-metamorphic and igneous rocks and cover-sedimentary, represented by weakly dislocated Mesozoic and Cenozoic sediments.

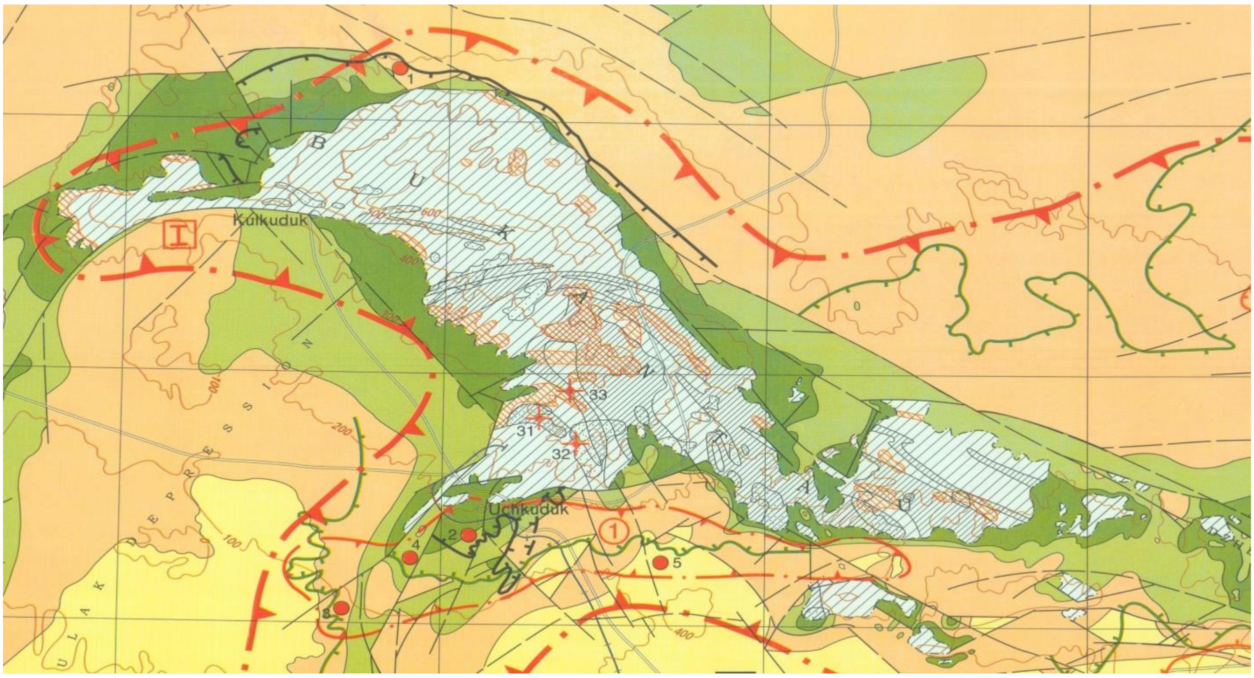

Figure 1. Tectonic map of the Bukantau mountains.

Formations of the folded complex have a limited area of exposure to the day surface (no more than 20%). They are exposed within the mountain heights of Toktynyktau, Kiiktau, Dzhetymtau-2, Dzhartas tract, in the northwestern part of Dzhetymtau-1. Large outcrops of pre-Mesozoic rocks were also noted on the foothill plain: south of the Dzhetymtau-1 height (Kosbulak outcrops) and in the Katyrtas tract in the southwestern part of the area (Katyrtass outcrops). The depth of the buried basement surface within the area does not exceed 300-350 m. [5].

In accordance with the accepted tectonic zoning of the territory of Western Uzbekistan, the study area is located at the junction of two structural-formational zones of northwestern strike - Severobukantau and Yuzhnobukantau, which are conjugated along the Bukantau deep fault zone. The zones differ in the nature of the stratigraphic section, the specifics of the manifestation of magmatism, the age of folding, and the features of metallogeny.

The Bukantau mountain range is an arched-horst uplift of the Paleozoic basement, which arose as a result of alpine movements. In geotectonic terms, the region under consideration belongs to two large Hercynian structural elements: the Kuramino - Fergana median massif and the South Tien Shan geosynclinal - fold system (M. Akhmedzhanov, O. M. Borisov, I. A. Fuzailov, 1977). Their border runs along the Bukantau-Balyklinsky deep fault. The Kuramino-Fergana middle massif within the considered territory is represented by the North Bukantau structural-formational subzone, the South Tien Shan geosynclinal system of the South Bukantau. I WOULD. Aisanov identifies the Bukantau-Balyklinsky fault zone as the Central Bukantau structural-formational subzone (1985).

The stratigraphic subdivision of the section is based on the materials of M.A. Akhmedzhanov, E.B.Bazarbaev (4), Ya.B. Aisanov, L. Egorov (1985), etc.

The geological structure of the Bukantau mountain structure is a concept based on the analysis of the gravity field, magnetic field, distribution field of radioactive elements and the results of their geological interpretation.

RESULTS OF STUDIES.

Comprehensive analysis of geological and geophysical information, volumetric density and magnetic models (on a PC) made it possible to draw some conclusions about the deep geological structure of the Bukantau mountains (to a depth of 3-4 km), as well as to clarify the structural features of the area, including the spatial position of ore zones and their connection with the features of the geological structure.

The Bukantau mountains are composed of terrigenous and carbonate rocks, forming successive formations (from bottom to top); terrigenous-carbonate-siliceous, slate, flyschoid, volcanic (including metavolcanic), carbonate, gray molasse (marine), variegated molasses (continental). The age of the formations is from the Cambrian to the Upper Carboniferous inclusive. At the boundary of the carbonate formation and the lower molasse within the Okzhetpes-Kokpatas-Boztau antiform, the Karashakh stratum is developed, which is a melange formed as a result of the shaving of the Kokpatas formation on limestones. Fragments and blocks of limestones, sandstones and gravelstones of gray molasse, volcanic rocks and quartzites of the Kokpatas Formation are randomly displaced in the melange. On the surface of blocks and debris, friction clays are sometimes observed. The parent rock of boulders and debris is completely tectonized shales and siltstones.

The density and magnetic properties of terrigenous-carbonate-siliceous, slate and flyschoid formations are close, therefore, it is impossible to separate them in physical fields. However, volcanic carbonate rocks and the upper variegated molasse have enhanced properties and stand out well in the gravity field.

Terrigenous-siliceous-carbonate flyschoid, slate, carbonate formations and lower molasses are developed in South Bukantau and belong to the South Bukantau structural-formation zone. Metavolcanic and volcanic formations and variegated (upper) molasses make up the North Bukantau structural-formation zone. Accordingly, the South Bukantau and North Bukantau zones are well expressed in physical fields, especially in the field of gravity.

The North Bukantau interzonal fault serves as the boundary of the SFZ; on the maps of physical fields, it is confidently distinguished by a sharp change in fields. However, it should be noted that in the extreme west the position of the fault in the physical fields and mapped during geological surveys does not coincide; in the physical fields it is somewhat displaced to the south, to the border of the mountain structure with the Minbulak depression. This is due to the fact that the sharp gravitational gradient corresponds to this very boundary.

To the east, within the exposed pre-Mesozoic basement, the position of the fault in physical fields and on geological maps coincides. The North Bukantau SFZ is composed of upper (variegated) molasse and underlying metavolcanics and volcanics of the basic composition of the Kulbulak and Tubabergen formations. The rocks are collected in a series of sublatitudinal and northwestern striking folds. In the cores of the anticlinal folds, the basaltoids of the Tubabergen Formation are close to the day surface, which causes an increase in the level of the gravity field (this is especially clearly expressed in the local component of the gravity field).

A characteristic feature of the North Bukantau SFZ is the almost complete absence of granitoid intrusions. Only in the northwestern part of the Bukantau mountains is the Bokalinsky intrusive of tonolite-tromdhjemite composition known.

The main structural features of the North Bukantau SFZ are the presence of basic metavolcanics and volcanic rocks, the wide distribution of variegated molasse brings it closer to North Tamdytau.

The South Bukantau SFZ is built more complexly. Terrigenous deposits of various formational composition, carbonate rocks are developed here. Sedimentary formations are interrupted by numerous felsic intrusions, both outcropping on the day surface and not reaching the level of the erosional cut.

Physical properties of rocks. In the Kyzylkum region, intensive petrophysical research has been carried out for 30-40 years. In this area, more than 200,000 samples from natural outcrops and well cores were selected and studied by various geological organizations.

In the study area, sediments of the Meso-Cenozoic are widespread. This complex of rocks is non-magnetic or weakly magnetic (0-30 · 10-6 CGS units), therefore, it practically does not distort the characteristics of the magnetic field of the pre-Mesozoic basement.

The density of the complex varies from 1.8-2.0 to 2.16-2.7 g / cm3 and in general, if the thickness of the Meso-Cenozoic sediments is constant, then the density has strictly consistent average values. Since the rocks of the Meso-Cenozoic complex are practically non-magnetic, the nature of the magnetic anomalies can be associated only with the rocks of the pre-Mesozoic basement. Table 2 shows information about the physical properties of rocks in the Bukantau mountains [3]

According to P.G. Akhmatov, M.M. Melkanovitsky, A.P. Smelyants and other researchers, sedimentary rocks of the Paleozoic complex, represented by limestones, marbles, sandstones and various shales, are practically non-magnetic, their magnetic susceptibility is æ = 20-30 · 10-6 CGS units, the remanent magnetization is low, with the exception of quartzites and shales with magnetite mineralization , skarns, hornfelses. The density of Paleozoic formations, equal to 2.6-2.7 g / cm3, is due to the composition, age and degree of metamorphism of rocks. In the region as a whole, it is 2.67 g / cm3. Shales, sandstones, conglomerates are characterized by these values (table 2). Higher density values are possessed by carbonate rocks - limestone, dolomite, marble δ = 2.71 g / cm3, mineralized formations, effusive rocks of average and basic composition δ = 2.7, -2.98 g / cm3, dolomite δ = 2.76 g / cm3 [3].

Mesozoic sedimentary-metamorphogenic formations and metamorphic rocks of the Paleozoic crystalline basement are divided into two parts according to the magnetic susceptibility: the upper part is non-magnetic, the lower one has high magnetic properties (up to 1200 10-6 CGS units and more).

The rocks of the first group include sandstones, shales, quartzites, dolomites of the Tazazgan, Kokpatass, Besapan formations and their analogues. They have a magnetic susceptibility of 0 to 100 10-6 CGS units.

The second group, which has values of magnetic susceptibility from 1200 10-6 units. SGS and more, rocks of the Kumbulak, Uzunkuduk, Uchkuduk formations, as well as the Lower Kazan subformation of the Southern Tamdytau, Auminzatau and their analogues are assigned.

Physical properties of the rocks of the Bukantau mountains [3]
Table №1

Name of the suite, rocks	Density (G , g / cm3)	Magnetic susceptibility (æ × 10-6 SGS)
1	2	3
Kumbulak Formation:		
terrigenous formations	2,56-2,68	0-5
volcanic formations	2,67-2,80	58-78
Tubabergen Formation:		
volcanics	2,86	82,0

intrusive bodies of diabases	2,55-2,67	1479-2273
Arkharskaya suite:		
terrigenous formations	2,63-2,67	11-47
Tokhtatauskaya suite:		
Bokalinsky intrusive massif (granodiorites, adamellites)	2,65-2,68	692-1350
Koksay Formation:		
terrigenous formations	2,57-2,62	21
Kokpatasskaya suite:		
volcanic-siliceous-terrigenous formations	2,58-2,65	10-21
Karashakh suite:		
volcanic-sedimentary formations	2,63-2,84	11-47
Dzhuskuduk suite:		
carbonate rocks	2,62-2,73	0
granites and adamellites	2,60-2,63	5-9
Kokpatas granitoid intrusion	2,66-2,74	11
lamprophyre dikes (spessartites and kersantites)	2,69-2,84	10-40
lamprophyre dikes (spessartites and kersantites)	2,76-2,94	21-38

Epidote, quartzite and chlorite-actinolite-epidote schists of the Nizhnetazgan (Auminzin) formations have a magnetic susceptibility of up to 2950 10-6 CGS units. Rocks in the zone of active contact with igneous rocks, mineralized varieties enriched in ferromagnetic minerals, have a very high magnetic susceptibility, reaching many thousands of CGS units.

For the upper part of the Precambrian - the Tazazgan, Kokpatass, Besapan formations and their analogues, the rock density is determined by a value equal to δ = 2.68 g / cm3.

For the lower part, which includes the most ancient formations that make up the crystalline base, the density reaches 2.78 g / cm3.

For igneous rocks of the Central Kyzyl Kum, a regular increase in magnetization with an increase in their basicity is observed. Table 3 shows the density and magnetic susceptibility of rocks in the Southern Tien Shan [3].

Effusives of acidic composition are weakly magnetic. Diabases, syenites, basalts, attributed to the Tubabergen, Yelemesashchinskaya, Sangruntau and Bandskaya formations, have a magnetic susceptibility reaching 1200 10-6 units. SGS and more.

North Bukantau structural-formational subzone. The geological structure of Northern Bukantau includes formations of various ages: from Archaea - Early Proterozoic (?) To Quaternary. In the pre-Mesozoic geological section, a number of structural floors have been established (4).

The lower structural level composes an ancient crystalline basement and is represented by metamorphosed rocks of the Kumbulak Formation (AR-PR1 km), which is subdivided into two subformations. The lower subformation is composed of crystalline schists, metabasites, quartzites, epidosites, and gneisses. Metabasites occur among terrigenous material in the form of lenses, interstratal bodies, and large blocks. The density of the metaterrigenous part of the section is σ_{av} = 2.75 g / cm3, the rocks are weakly magnetic. Metabasites have significant densities (σ_{av} = 2.95 g / cm3), magnetic susceptibility ($æ_{av}$ = 30x10-5 SI units), longitudinal wave velocity (V_p = 6000-6200 m / sec) and electrical resistance ($\rho_к$ = 900- 1600 ohm). The upper subformation is represented by metasandstones, meta-siltstones, schists, blasted siltstones, and quartzites with radish lenses of marbleized limestones. The rocks of the subformation have a density σ_{av} = 2.75 g / cm3, are practically non-magnetic, have a longitudinal wave velocity V_p = 5800-6000 m / sec., An electrical resistance $\rho_к$ = 1500-2000 ohm.

The formations of the Kumbulak Formation in general have a density of σ_{av} = 2.85 g / cm3, the apparent thickness of the formation is up to 800 m.In addition to outcrops, according to geophysical data and storms, outcrops of these rocks to the pre-Mesozoic surface in geologically closed areas (Karamurun, etc.) where they have the form of small angular blocks confined to the deep fault zone.

The eroded surface of the Kumbulak Formation is overlain by Paleozoic formations represented by the Hercynian structural stage.

The bottom of the section is composed of vise limestones (C1V), the thickness of which reaches 500 m. They are practically nonmagnetic and have a density σ_{av} = 2.72 g / cm3, a longitudinal wave velocity V_p = 5800 ÷ 5900 m / s and an electrical resistance ρc = 1500 ÷ 5000 ohm

Rocks of the Tubabergen Formation (C1-2tb), represented by volcanogenic formations of basic, intermediate, and less often felsic composition (basaltic and diabase porphyrites, almond-stone basalts, leucobasalts, lavbreccias, tuff gravelites, valolites and their tuffs), lie on have a thickness of 300 to 800 m. The physical properties of the rocks of the formation vary within wide limits. So the density of these rocks fluctuates in the range of 2.85 ÷ 3.03 g / cm3 (σ_{av} = 2.93 g / cm3), magnetic susceptibility æ = 10x10-5 units. SI, Vr = 5000 ÷ 6000 m / s, ρ_k = 900 ÷ 2100 ohm.

On the rocks of the Tubabergen Formation, the Orkhar (C2ar) and Tochtatau (C3tt) formations are not consistently overlain, which are mainly low-lossal (sandstones, siltstones, conglomerates, shales, with lenses of gravelites and gyrus) formations. Their thickness reaches 1650 and 2000 m, respectively. The range of density changes is 2.48 ÷ 2.84 g / cm3 (σ_{av} = 2.67 g / cm3), æ_$_{av}$ = 4x10-5 units. SI, V_p = 5300 ÷ 5500 m / s, electrical resistance $\rho_к$ = 400 ÷ 700 ohm.

Mesokainazoic rocks, occurring on the eroded surface of the Paleozoic and represented by Cretaceous, Paleogene, Neogene, Quaternary sediments, are composed of clays, sandstones, siltstones, gravelstones, have a density σ = 1.8-2.3 g / cm3 (σ_{av} = 2.2 g / cm3), practically non-magnetic, V_p = 2800-3500 m / s, $\rho_к$ = 50 ÷ 300 ohm. The total thickness of these deposits is from 0 to 1000 m and more (in the Minbulak depression).

In the Kyzylkum mountains (I.Kh. Khamrabaev, Z.A. Yudalevich) a number of magmatic complexes - pre-Poleozoic, Caledonian, Hercynian. The bulk of the magmatic manifestations are confined to the Paleozoic era, especially to the Hercynian tectonic-magmatic cycle. Intrusive rocks of acidic, intermediate, basic and ultrabasic composition have been identified within Bukantau. The most widely represented is the Upper Paleozoic (C2, C3 - P1) complex of granitoids, composed of large massifs of granites and granodiorites, as well as smaller bodies of deorites, syenite-diorites, quartz and calcite veins.

On the territory of Northern Bukantau, the presence of intrusive rocks of variegated petrographic composition was established, which is due to the position of this area in the marginal resonance tectanic system of the Kuramino-Fergana median massif (Fuzailov, 1997).

The largest of the outcrops is the Bokalinsky intrusion, composed of granodiorites and tonalites, and in the southern and western near-contact parts - quartz diorites, passing into microdiorites or leucocratic plagiogranites. The intrusive is oval in plan, elongated in a northeastern direction (2.6-6 km); in vertical section, according to our data, it has a funnel shape, the thickness in the largest section is 8 ÷ 9 km. The massif is characterized by a density somewhat increased for granodiorites (2.62 ÷ 2.67 g / cm3, σ_{av} = 2.64 g / cm3), high magnetic susceptibility (up to 100x10-5 SI units, average values of the velocity of longitudinal waves Vp = 5300 -500 m / sec. And specific electrical resistance ρк = 800-2000 ohm.

Smaller (subvolcanic, partially extrusive) bodies, consisting of diabases, gabbro-diabases, variolite and diabase porphyrites, occurring within the Northern Bukantau, are spatially and structurally related to the formations of the Tubabergen Formation.

In terms of material composition and degree of metamorphism, they are very close to effusive and comagmatic to them, differing mainly in structural and textural features. Diabases, gabbro-diabases, and diabase porphyrites are found in the form of small necco-like bodies, strata and dikes. The host rocks are the Kumbulak and Tubabergen formations.

South Bukantau structural-formational subzone. In this subzone, the most ancient rocks are represented by the Upper Proterozoic Cholcharatau Formation (Rf1 cl). This is a volcanic-sedimentary intensively metamorphosed stratum, consisting of gabbro-diabases, diabases and their tuffs, transformed into amphibolites, amphibole and various crystalline schists, with an apparent thickness of more than 400 m.The density of the formation rocks as a whole is σ_{av} = 2.78 g / cm3 (volcanogenic part - σ_{av} = 2.93 g / cm3), magnetic susceptibility æav = 25x10-5 units. SI, V_r = 6000 ÷ 6100 m / s. and ρ_k = 1100-1600 ohm.

The rocks of the Cholcharatau suite are overlain by the formations of the Kokpatas suite (PR2 - Vcr) with a thickness of 1500 ÷ 5000 m, which are represented by carbonaceous microquartzites, with interlayers of crystalline shales, dolomites, limestones. The density of these rocks σ_{av} = 2.68 g / cm3, magnetic susceptibility $æ_{av}$ = 1x10-5 units. SI, V_p = 5500 ÷ 5700 m / s, $\rho_к$ = 1350-1520 ohm.

Deposits of the Koksai Formation (V3-O2 ks) (the relationship between the rocks of the Kokpatas and Koksai Formations is not clear) according to the lithological composition and the nature of alternation are subdivided into two sequences. The lower stratum is distinguished by a rather coarse rhythmicity of one-component members of schists, phyllites, and feldspar-quartz siltstones. The upper sequence consists predominantly of metamorphosed polymictic sandstones, often lenticular interlayers of gravelstones. The density of the formation rocks varies from 2.52 to 2.78 g / cm3 (σ_{av} = 2.67 g / cm3), the hornfels differences have σ_{av} = 2.70 g / cm3 (2.62 ÷ 2.80 g / cm3) magnetic susceptibility $æ_{av}$ = 2.5x10-5 units. SI, (1 ÷ 26x10-5 SI units), V_p = 5300 ÷ 5500 m / sec., $P_к$ = 400-600 ohm. The thickness of the rocks of the Koksai Formation is from 500 to 2000 m.

On the sandy-shale strata of the Koksai Formation, deposits of the Baimen Formation of the Silurian (S1bm) overlap with stratigraphic unconformity. They are represented by sandstones, siltstones, mudstones, gravelstones, and flint. The thickness of the formation is 500 ÷ 700 m. The density of rocks is σ_{av} = 2.67 g / cm3, the magnetic susceptibility is $æ_{av}$ = 2x10-5 units. SI, V_p = 4500 ÷ 5300 m / s, $\rho_к$ = 500-600 ohm.

Above, the section is composed of Middle-Upper Devonian and Lower Carboniferous limestones (D2-3, C1, C1 dz). Their density σ_{av} = 2.72 g / cm3, the rocks are practically non-magnetic, V_p = 5700 ÷ 6000 m / s, $\rho_к$ = 1520 ohm. The thickness of these formations is 600 ÷ 1000 m.

Further, the section is represented by the formations of the Tubabergen Formation (C1-2tb), up to 300 m thick, which were slightly developed in the deep fault zone, the characteristics of which are described above. The relationship of the rocks of the Tububergen Formation with the above and underlying sediments is not clear.

The rocks of the Moscow Stage (C2m1), according to the deposition of the Lower Carboniferous and having a thickness of 100 ÷ 300 m., Are represented by limestones with fauna, sandstones, gravelstones, conglomerates, have a density σ_{av} = 2.67 g / cm3, low magnetic susceptibility,
These formations are overlain by conglomerates, gravelstones, sandstones with interlayers of shales and limestones of the Sardar Formation (C1-3sd), which have a density σav = 2.68 g / cm3, magnetic susceptibility æav = 1x10-5 units. SI, V_r = 5000 ÷ 5300 m / s, ρ_k = 500 ÷ 1000 ohm. The formation is up to 200 m thick.
The zone of the Bukantau-Balyklinsky deep fault (up to 10 km wide, more than 300 km long) was identified by Ya.B. Aisanov into an independent structural-formational subzone. As expected, the formations of the Northern and Southern Bukantau are involved in its geological standing. Here, the crystalline basement is represented by the formations of the Kumbulak (AR-PR1km) and Cholcharatau (Rf1cl) formations discussed above.
They are overlain by deposits of the Bozdontau Formation (Rf3b2), represented by dolomites, limestones, cherts. The formation thickness is 50–200 m. The rocks are practically non-magnetic, have a density σ_{av} = 2.70 g / cm3, longitudinal wave velocity V_p = 5800–5900 m / s, ρ_c = 800–1200 ohm.
Above, there are sandstones, siltstones, Ordovician mudstones, up to 250 m thick. They are non-magnetic, density, σ_{av} = 2.6 g / cm3, V_r = 5350 ÷ 5600 m / sec, ρ_c = 350 ÷ 500 ohm.
The Ordovician formations are overlain by the Silurian Baimen Formation (S1bm). The petrophysical characteristics and composition of which are discussed above.
Throughout the Bukantau mountains, along the entire Irlir ridge, accompanying a deep fault, deposits of the Devonian and Devonian - Carboniferous (D1, D_ (1) ^ 2- D2b, D3 fm - C1t) are traced, represented by dolomites with inclusions of siliceous rocks, limestones with interlayers of dolomites ... The thickness of individual formations and members is 80 ÷ 200 m, the total thickness reaches 900 m. These carbonate formations are characterized by a density of 2.62 to 2.75 g / cm3 (σav = 2.72 g / cm3), practically non-magnetic ($æ_{av}$ = 0.2x10-5 SI units), V_p = 5900 ÷ 6000 m / s, $\rho_к$ = 1300 ÷ 2700 ohm.
Rocks of the Moscow Stage (C1m1) are exposed to the north of the Irlir carbonate ridge, forming separate outcrops and overlapping, as a rule, with unconformity, all Paleozoic formations. They are represented by limestones, sandstones, gravelstones, conglomerates, have a density of σ av = 2.67 g / cm3, magnetic susceptibility æav = (0 ÷ 4) x10-5 units. SI. Longitudinal wave velocity Vp = 5100 ÷ 5600 m / s, ρк = 500 ÷ 580 ohm. The thickness of these rocks is 10 ÷ 150 m.

Conclusion

In the Central Bukantau subzone, Z.A. Yudalevich (1981) conditionally identified the Late Proterozoic metahyperbasic intrusive complex, which is characteristic inclusive of the entire zone of the Bukantau deep fault. It is represented by foliated serpentinites, listvenites and products of their further transformation - birbirates, which are in the form of small (50 ÷ 200 m long, 5 ÷ 10 m wide) bodies located in the axial part of the deep fault zone, among the tectonic mixture. In terms of physical properties, they differ little or are the same as the similar intrusive rocks of the above described subzones and are characterized by a density of 2.60 ÷ 2.68 g / cm3, increased magnetization (up to 80x10-5 SI units), average velocities of longitudinal waves Vp = 5200 ÷ 5500 m / sec, ρ_k = 800 ÷ 2000 ohm. A distinctive feature is their high magnetization, but due to their small size, they can be recorded only with detailed geophysical studies.

The largest of the outcrops is the Bokalinsky intrusion, composed of granodiorites and tonalites, and in the southern and western near-contact parts - quartz diorites, passing into microdiorites or leucocratic plagiogranites. The intrusive is oval in plan, elongated in a northeastern direction (2.6-6 km); in vertical section, according to our data, it has a funnel shape, the thickness in the largest section is 8 ÷ 9 km. The massif is characterized by a density somewhat increased for granodiorites (2.62 ÷ 2.67 g / cm3, σ_{av} = 2.64 g / cm3), high magnetic susceptibility (up to 100x10-5 SI units, average values of the velocity of longitudinal waves V_p = 5300 -500 m / sec. And specific electrical resistance $\rho_к$ = 800-2000 ohm.
Within the South Bukantau subzone, acidic varieties of granitoids are widely developed: granites, alaskites, etc. They differ from the North Bukantau subzone in lower physical properties: density 2.55 ÷ 2.61 g / cm3, (σ_{av} = 2.60 g / cm3), magnetic susceptibility from 0.2 to 2.0x10-5 units. SI, low speed of longitudinal waves V_p = 5100 ÷ 5300 m / s, but high specific electrical resistance $\rho_к$ = 1500 ÷ 2500 ohm. These are Altyntau, Kokpatassky, Turbaysky granite intrusions.

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