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THE NOVOIHNATIEVIAN DYKE OF ANDESITE PORPHYRITES FOR THE DONBAS AND NEAR-AZOVIAN JUNCTION ZONE: TECTONICS AND PETROLOGY

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The paper represents the large dyke of andesite porphyrites as an indicator of fault-block tectonics and the deep structure of Donbas and Near-Azovian junction zone has been studied. The structural and geological position of Novoignatievien dyke, its features, and conformity with the fault intersection node for the orthogonal and diagonal systems are defined. The possible depths of andesite magma formation are considered.
Key words: dyke, andesite, Donbas, Near-Azovian megablock.

НОВОГНАТІВСЬКА ДАЙКА АНДЕЗИТОВИХ ПОРФІРИТІВ ЗОНИ ЗЧЛЕНУВАННЯ ДОНБАСУ З ПРИАЗОВ'ЯМ: ТЕКТОНІКА І ПЕТРОЛОГІЯ

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Наведені результати вивчення відносно великої дайки андезитових порфіритів та її значення як індикатора розломно-блокової тектоніки та глибинної будови зони зчленування Донбасу з Призов'ям. Визначені закономірності структурно-геологічної позиції Новогнатівської дайки та її локалізації до вузла схрещення розломів ортогональної і діагональної систем. Проаналізовані глибини формування андезитових магм. Наведені петрографічні, петрохімічні і геохімічні особливості порід дайки та андезит-трахіандезитового комплексу регіону.
Ключові слова: дайки, андезити, Донбас, Приазовський мегаблок.

НОВОИГНАТЬЕВСКАЯ ДАЙКА АНДЕЗИТОВЫХ ПОРФИРИТОВ ЗОНЫ СОЧЛЕНЕНИЯ ДОНБАССА С ПРИАЗОВЬЕМ: ТЕКТОНИКА И ПЕТРОЛОГИЯ

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Приведены результаты изучения сравнительно крупной дайки андезитовых порфиритов и ее роли как индикатора разломно-блоковой тектоники и глубинного строения зоны сочленения Донбасса с Приазовьем. Определены закономерности структурно-геологической позиции Новоигнатьевской дайки и ее приуроченности к узлу пересечения разломов ортогональной и диагональной систем. Проанализированы возможные глубины формирования андезитовых магм. Приведены петрографические, петрохимические и геохимические характеристики пород дайки и андезит-трахиандезитового комплекса региона.
Ключевые слова: дайки, андезиты, Донбасс, Приазовский мегаблок.

The study area covers the southern margins of the Donbas and the juncture zone between the last and Near-Azovian megablock of the Ukraian Shield (USh). The regional geological structure is divided in three structural levels (Fig. 1). The low (Precambrian) structural level consists of the old Archean-Proterozoic crystalline rocks, the intermediate (Hercynian) one is represented by Paleozoic sedimentary, sedimentary-volcanogenic and intrusive rocks, and the upper (Alpine) one includes Meso-Cenozoic sedimentary deposit of the platform cover [Бондарчук, 1966; Бутурлинов, Скаржинский, 1970; Лебедев, Собакарь, 1961; Шатский, 1964].

The rather large Novoihnatievian dyke of pyroxene hornblende andesite porphyrites are mapped by the geological and geophysical methods and the drill holes near the mouth of the Khaina-Chokhra gully along the left slope of Mokraia Volnovakha River in a distance of 5.5 km to the east from Novoihnatievka village. The strike azimuth of dyke is NW 290°, the dip azimuth is NE 20°, and the incident angle is 75°. The dyke thickness is varies from 300 to 600 m (Fig. 2). The dyke strike is revealed at a distance to 3 km. The dyke is exposure only on the left slope of Mokraia Volnovakha River. The host rock is sedimentary volcanogenic formations of Dolhinian and Razdolnenian suits from the upper Devonian. Some kinds of rocks (tuffstones, sandstones, conglomerates and others) for the mentioned Devonian suites are opened with 1, 5, 12, 18, 25 wells in the exocontacts of the dyke. They are characterized by dark-brown color, fine- and medium-grained structures, and roughness. The clastic framework shows the predominance of the grains of quartz composition, as far as the piroclastic matter is present in the negligible amount. The latter is represented by the rock debris and limonitized volcanic glass cemented by siliceous-carbonate constitutions. The dyke is of considerable interest as the building material deposits.

Figures 1 and 2 show the Novoihnatievian dyke confined to the intersection node of rupture disturbances for the orthogonal and diagonal systems composed here the microblock structure. The contacts for this system with the host sedimentary-volcanogenic rocks from the Dolhinian and Razdolnenian suits of the upper Devonian are tectonic. Its north-western pinchout causes the strike-slip displacements of the geoblocks along the systems of sublatitudinal and north-east rupture disturbances. The dyke overlapped by thin anthropogenic sediments pulls apart the rocks of the Precambrian crystalline basement and sedimentary-volcanogenic combinations from the Middle and upper Devonian, which are gently sloping to north direction (to 20°). Time of injection for the Novoihnatievian dyke and rocks of andesite-trachyandesite complex are determined quite

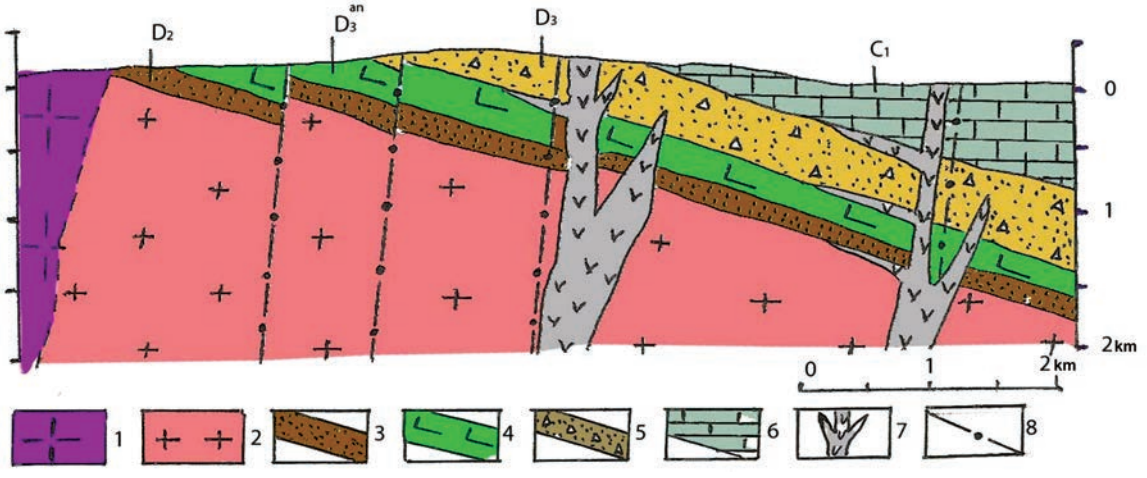

Fig. 1. Schematic geological section through the intrusion area of the Novoihnatievian dyke of andesite porphyrites

1 – amphibolic and amphibol-pyroxene (dubovian) granites; 2 – granosyenites from the eastern Near-Azovian complex; 3 – sandstone, schist of the Nikolaiev suite (D2); 4 – volcanogenic alkali-basaltoid rock (basalts, augites etc.) from the Anton-Taram suite (D3an); 5 – poorly defined formations of Dolgin (sandstone, conglomerations, aleurolite, argillite) and Razdolnian (sandstone, aleurolite, siliceous tuff) suites (D3); 6 – limestone and dolomite from the Tournaisian and Visean stages of carboniferous system (C1); 7– small intrusions and dykes of andesite-trachyandesite complex; 8 – faults

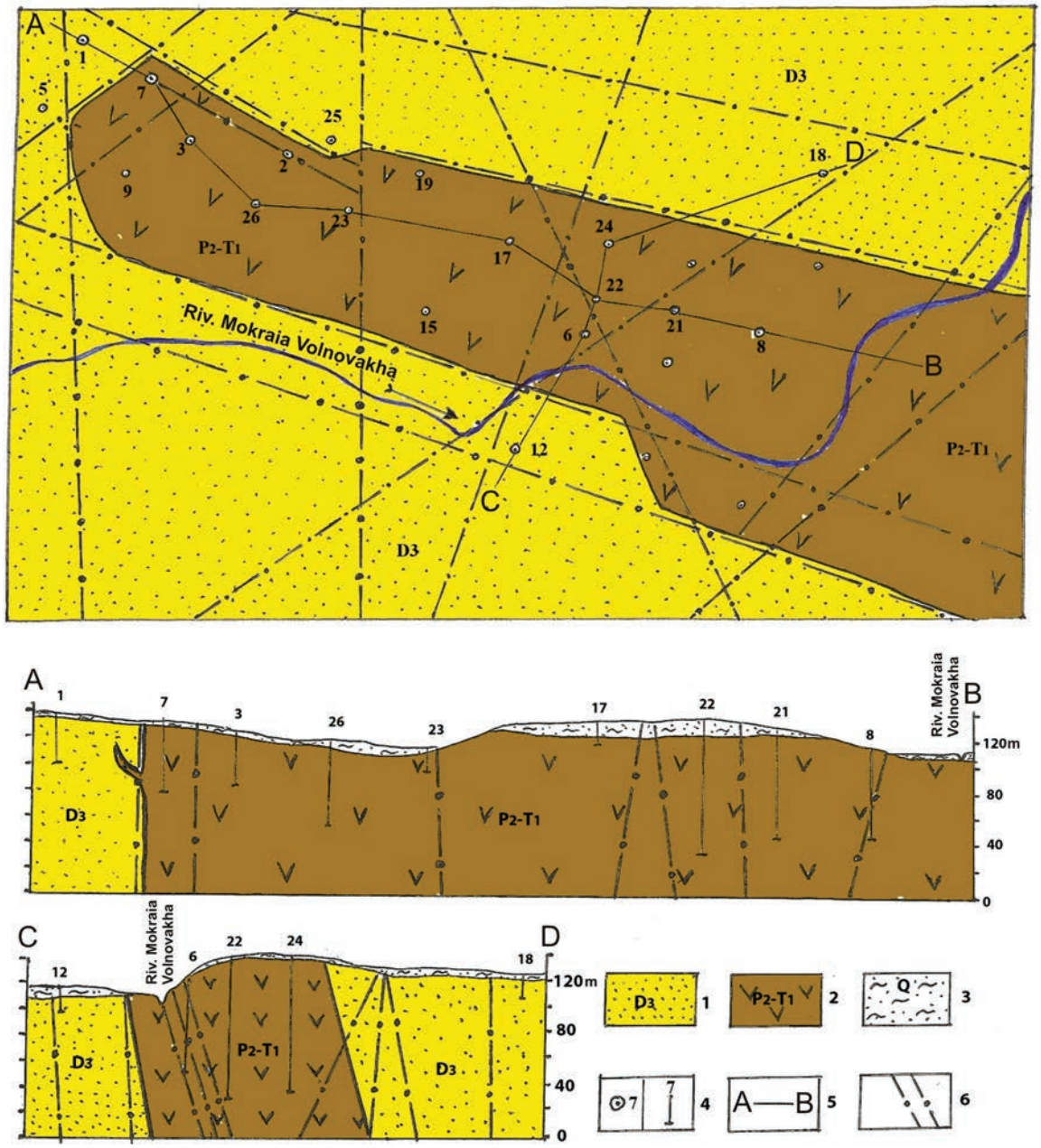

Fig. 2. Outline plan and geological sections (along the A-B and C-D lines) of the Novoihnatievien dyke of andesite porphyrites

1– poorly defined formations of Dolgin (sandstone, conglomerations, aleurolite, argillite) and Razdolnian (sandstone, aleurolite, siliceous tuff) suites (D3); 2 – andesite porphyrite dyke; 3 – anthropogene sedimentary rocks; 4 – boreholes and their numbers; 5 – geological sections along the A-B and C-D lines; 6 – faults

accurately by means of geological-structural and isotopic data. The dykes, stocks, laccoliths and other bodies are intruded into the old rocks of the Precambrian as well as Devonian and Carboniferous. At the left bank of the Don River they cut the sediments of the Upper Carboniferous and their numerous remains are occurred in sandstones of the upper Triassic. The available estimates of age for rocks from the complex obtained by means of the isotopic dating are covered the period of 200-230 Ma. According to these data the forming rocks of the complex is associated with the Pfalzian phase of the Hercynian orogeny appeared in

Donbas at the interface between the Permian and Triassic [Бутурлинов, Соколова, 1964; Скопиченко, Бутурлинов, 1987].

The Novoihnatievian dyke is structurally confined to the junction zone of Donbas with the Near-Azovian megablock of the Ukrainian Shield (USh) [Собакарь, 1961; Чебаненко, 1961; Чекунов, 1994]. This zone is often considered by the research community as the Southern Donets microaulacogen of sublatitudinal strike at the width of 20-30 km and length of 90-100 km or as the Southern Donbas fault zone representing the large suture, separated the Donets deep trough (being the north-south Dnieper-Donets aulacogen or rift-syneclise) and the Near-Azovian megablock of USh [Бондарчук, 1966; Майданович, 1970; Майданович, Дубровный, 1970; Шаталов, 1986]. As to tectonics, the presentational zone to the north and south is restricted by the deep faults along those the abrupt subsidence (slip faults, oblique slip faults) of the rocks from the Precambrian crystalline basement and Phanerozoic volcanogenic sedimentary formations are considered. The Donbas and Near-Azovian junction zone (microaulacogen) formed by this way is characterized by the sharp changes in facies composition and the thickness of the volcanogenic sedimentary formations, complicated fault-block and strike-slip tectonics, active magmatism. Here the amplitudes of the particular faults reach 1-2 km as well as the longitudinal and transverse shears are 4-5 km [Майданович, 1968; Михалев, 1971].

The inception of hors and graben structures in the junction zone of Donbas with the Near-Azovian megablock of the USh occurred in the early Fransnian time due to tectonic movements emerging intensively after forming sedimentary rocks of Nikolaiev suite (middle Devonian). For the Devonian – Anthropogene the lithosphere of the described area have been undergoning the complicated tectonic evolution. The main events in the inception and development of the Southern Donets microaulacogen were the endogenous vertical-horizontal pulsing movements of asthenospheric diaper as the powerful generator of heat, energy, moving magma, fluids, and ore-bearing hydrothermal metasomatic solutions.

The Southern Donets graben terrain with mapped Novoihnatievian dyke of andesite porphyrites here are divided up a number of smaller blocks as the followings: Kamyshevakhsky, Bohdanivsky, Nikolaevsky, Novotroitsky, Olginsky ones. The Novoihnatievian dyke is attracted spatially and structurally to the intersection node of the Horniatsky and Khaina-Chokraksky deep faults undergone the strike-slip character of movements and multiple tectonic-magmatic activation. Along the Khaina-Chokraksky fault of sublatitudinal trend in particular the subsidence of the Precambrian and Devonian volcano-sedimentary rocks have occurred to the north direction. The Horniatsky oblique slip fault of the sub - meridional extension to the west restricts the occurrence of the Novoihnatievian dyke andesite porphyrites. The vertical and horizontal separationts of the Precambrian rocks from crystalline basement and volcanogenic sedimentary of the Devonian and Carboniferous have also passed along the Horniatsky fault.

In the Novoihnatievian dyke andesite porphyrites and their country sedimentary rocks the systems of fissures with strike azimuths of 270°, 290-300°, 330-350°, 355-360°, 20°, 40°, 60°, and 75° are most enveloped. The systems with strike azimuths of NW 290° and 355-360° are the most abundant among the fissures. The breaking disturbances with the strike of NW 355° and NE 20°, 40° and 60° in the dyke are slightly less developed. The series of sub-vertical, sub-horizontal, and inclined fractures cut across the dyke rocks forming the small columnar (block) structures. The field research shows that the andesite porphyrites from the dyke are separated by the fractures generating the columnar jointing with five or six columns, which are sometimes fanning out.

The elongated grains of hornblende and calcite are developed along the major system of fracturing (355-360°). The systems of contraction cracks and tectonic discontinuities of other orientations are often mineralized with calcite, sulfides of iron, copper, lead, and zinc. In addition to the cracks in the dyke consist of radioactive minerals as evidenced by geochemical data and radioactivity measurements by scintillation detector SRP for the well 24. The system of sub-horizontal and inclined (at an angle 40-70°) fractures in dyke rocks are less distributed than sub-vertical ones. It is important to note that rocks from andesite-trachyandesite complex mapped both in the other parts of the conjunction zone between the

Donbas and Near-Azovian as well as in the northern near edge parts of the Near-Azonian megablock of the USh are also separated by multiple sub-vertical, sub-horizontal, and inclined fractures. The field study of the stock, laccolith-shaped bodies from the andesite-trachyandesite complex, which are developed in the mouth of the Kamyshevakha gorge along Sukhaia Volnovakha and Mokraia Volnovakha Rivers and in the quarry near Novotroitskoie village indicate that the character of their fracturing is similar. Here the series of sub-vertical, sub-horizontal, and inclined tectonic and contraction fracture separating complex rocks into the columnar (blocky) joints are developed everywhere. In addition to the sub-vertical fracture system coincides very often with the fracture systems for the joint of sedimentary rocks of Donbas and Near-Azovian megablock.

The Novoihnatievian dyke of andesite porphyrites should be considered in the composition of rocks from the andesite-trachyandesite complex of Donbas, where basaltic andesites, andesites, andesite porphyrites, andesite dacites, dacites, trachyandesites, trachydecites, and quartz latites are distinguished [Бутурлинов, Зарицкий, Глебова, 1972; Грин, Рингвуд, 1968; Дели, 1936]. A great variety of rocks from the andesite-trachyandesite complex localized in the Donbas and Near-Azovian junction zone and the near edge part of the Near-Azovian megablock is induced by the variations of the main rock-forming minerals, i.e. pyroxene, hornblend, plagioclase, potassic feldspar, and quartz.

According to petrographic and petrochemical data the rocks of the Novoihnatievian dyke belong to the group of pyroxene-hornblende andesites (andesite dacites). Considering the structures of these rocks it should be more correct to qualify them as andesite porphyrites. The exterior view shows that these rocks are essentially leucocratic, massive, compact, finely porphyraceous ones with aphanite great bulk of prevalent recent appearance. The colors of rocks are gray, ash-gray and pinky gray, brownish gray for the altered variations as well as sometimes white color for the much carbonatized ones.

Examining under the microscope shows rock texture is fluidal, and the structure is porphyritic, glomeroporphyritic; the structure for the great bulk is changed from microlitic to microprismatically grainy one with the elements of hypidiomorphic-granular texture. The main rock-forming minerals are plagioclase (77%), hornblende (7%), clinopyroxene (5%), and quartz (5%); major minerals are ore ones (1.5%), sphen (signs – 1%), apatite (signs); secondary ones are carbonate (3%), chlorites and zeolites (from signs to 1%) (Table 1). In addition to the crushed samples includes zircon, rutile, anatase, barite, ilmenite, limonite, fluorite, garnet, leucoxene, galenite.

The prevalent hornblende and clinopyroxene are occurred in the phenocrysts alternately. In a number of cases plagioclase and quartz (occasional grains) may be appeared as the phenocrysts. According to the petrographic studies for 2, 6, 21, 24, 26, and 27 boreholes drilling in the upper dyke section as a rule the phenocrysts of hornblende are dominated in the rock. The significance of clinopyroxenes rise at the lower horizons (to 100 m). Here these

Table 1. **Average content of principle rock-forming minerals in the Novoihnatievian dyke andesite porphyrites (%)**

No. of borehole	Number of thin sections	Plagioclase	Hornblende	Pyroxene	Quartz	Ore mineral	Carbonate
2	6	78	5	5	6.5	2.5	2
24	12	76	7	5	5.5	2.5	2.5
27	11	76	7	6	5	2	3.1
6	7	77	7	5	5.3	1.2	3.5
15	4	79	6	6	3	0.8	4
26	4	77	6.5	6	4	1	4
21	4	78	8	5.5	4	2	4
Mean		77.3	7.1	5.5	4.6	1.5	3.3

minerals are often prevailed over hornblende. Certain vertical and lateral differentiations of magmatic melt are identified also by the present variations in the composition of main rock-forming minerals (Table 1) and chemical composition of the rocks (Tables 2 and 3).

Plagioclase (70-85%) composes the greater part of base and rarely forms the phenocrysts in rock. The most rock consists of the microlites and comparative larger prismatic and twinned crystals of plagioclase. The grain sizes of plagioclase reach 0.1 mm. Plagioclase together with quartz form often the granophyric texture of rock. Plagioclase is mainly presented by andesine (№ 30-42). Sometimes plagioclase is pelitized and cericitized.

Hornblende (0-15%) is present as idiomorphic prismatic crystals of greenish-brown

Table 2. **Average chemical composition (for 3 analyses) of andesite porphyrites from the different depths of the Novoihnatievian dyke**

Oxide	Borehole No. 24 Depth 14.0-15.0 m	Borehole No. 24 Depth 35.0-36.0 m	Borehole No.24 Depth 56.0-57.0 m	Borehole No. 24 Depth 77.0-78.0 m	Borehole No. 24 Depth 91.8-98.8 m	Borehole No. 20 Depth 0.2-2.1 m	Borehole No. 20 Depth 2.1-3.1 m
SiO_2	59.97	60.27	59.87	58.92	62.05	63.11	62.69
TiO_2	0.84	0.75	0.61	0.60	0.57	0.53	0.65
Al_2O_3	14.08	13.85	13.75	13.88	13.84	13.33	13.64
Fe_2O_3	4.26	4.14	4.87	4.09	3.73	3.41	4.24
FeO	1.29	1.78	1.39	1.94	1.29	1.97	1.29
MgO	3.37	3.79	4.14	3.36	4.00	3.61	3.83
CaO	7.12	8.17	7.37	9.24	7.49	6.37	5.78
Na_2O	3.86	3.85	3.81	3.86	3.94	3.41	3.68
K_2O	1.66	1.33	1.13	0.79	0.80	0.91	1.19
SO_3	0.07	0.07	0.11	0.40	0.12	0.06	0.06
LOI	4.28	3.25	3.82	4.57	3.27	4.37	3.75
Total	100.80	99.25	99.97	99.39	101.12	101.08	100.90

Table 3. **Comparison between average chemical compositions of the Novoihnatievian dyke andesite porphyrites and andesite-trachyandesite complex rocks**

Oxide	1	2	3	4	5	6	7	8	9	10	11
SiO_2	61.00	59.55	64.35	60.04	51.60	59.32	63.04	65.60	57.56	64.03	62.56
TiO_2	0.65	0.77	1.00	0.71	0.86	0.60	0.61	0.47	0.70	0.44	0.52
Al_2O_3	13.77	17.31	15.11	14.44	14.80	15.00	15.50	15.80	15.28	14.76	16.28
Fe_2O_3	3.07	3.33	2.23	2.62	2.68	2.34	1.40	1.97	2.70	0.98	1.73
FeO	1.56	3.13	1.59	1.82	6.00	3.64	1.84	1.35	3.97	2.00	2.91
MgO	3.72	2.75	2.63	3.88	5.00	2.90	2.48	1.42	2.60	1.22	1.47
CaO	7.41	5.80	4.06	5.62	7.90	5.70	3.95	4.26	5.02	4.35	3.11
Na_2O	3.76	3.53	4.86	3.70	2.97	4.07	4.89	3.48	3.65	2.34	4.25
K_2O	1.12	2.03	2.14	1.03	2.20	1.75	2.17	2.00	3.95	4.52	5.27
SO_3	0.09	-	-	-	0.30	0.18	0.10	0.05	0.20	0.08	0.08
LOI	377	1.70	2.25	5.66	0.45	0.23	0.15	0.13	0.30	0.12	0.12
Total	99.92	100.0	100.2	99.58	99.20	99.55	99.69	100.3	99.75	100.1	99.88

Note: **1** – andesite porphyrite averaged for 21 analyses, the Novoihnatievian dyke; **2** – andesite by R. Dely; **3** – andesit-dacite from a dyke, Kalmius River, above Hrechkin farm; **4** – andesite from a stock, Staroihnatievka village; **5** – andesite-basalt averaged for 12 analyses; **6** – andesite averaged for 18 analyses; **7** - andesit-dacite averaged for 11 analyses; **8** – dacite averaged for 18 analyses; **9** – trachyandesite averaged for 27 analyses; **10** – quartz latite averaged for 4analyses; **11** – trachyandesite averaged for 8 analyses: Chemical analyses are represented according to data by N.V. Buturlinov and N.N. Shatalov [2-4, 17].

color. Hornblende is occurred in rock only as the phenocrysts. There are the grains of common hornblende among the phenocrysts with the irregular forms and sizes between 0.2 and 3 mm. They have pleochroism: along the axes of N*g,* N*p,* N*m* the colors are brownish-green, yellowish-green and green or yellowish-green, respectively. Hornblende is replaced by carbonate and partially chlorite.

Clinopyroxene (0-13%) forms colorless or slightly greenish idiomorphic prismatic or irregular crystals at sizes of 0.5-1 mm. Clinopyroxene is solely occurred in the phenocrysts. It is present by augite. There are the twins and glomeroporphyric aggregations of augite. Some crystals are very corroded. Breaking down augite is replaced by carbonate and chlorite.

Quartz (0-10%) forms the grains of irregular shapes at the size to 0.1 mm. It is located among plagioclase grains distributed disorderly. There are the dipyramidal forms of quartz grains with the ingrown lamellae of K-spar. It has sharp extinction and other optical properties common for quartz.

Ore minerals (0.5-5%) as the pointed impregnation are uniformly disseminated in the groundmass. They are presented by magnetite and sometimes ilmenite or pyrite. The sizes of magnetite grains range from 0.01 to 0.1 mm.

Sphene (signs and to 1%) is presented in rock as the heap accumulation of the pointed grains with the size to 0.2 mm. The crystals are wedge-, envelope- , and lens-shaped and are often twinned. Sphene color is coopery-yellow and dark brown. Sphene is strongly pleochroic, displaing yellow and brown color shades.

Carbonate (0.5-8%) is presented by calcite. It is forming as the pseudomorphs of the dark-colored minerals and plagioclase more rarely. It is also filling the voids and cavities in the rock. According to the petrographic description of well columns the most calcite content (to 6-8%) is found at the sites where andesite porphyrites are dissected by the numerous faults and fractures. These sites are penetrated with the wells of № 6, 15, 21, and 27 at the depths of 30, 8, 7.5, and 80 m, respectively. The Tables 2 and 3 show the chemical compositions for andesite porphyrites from the dyke. As it follows from the comparison between the averaged chemical composition of the Novoihnatievian dyke and andesite composition by R. Dely [Дели, 1936] and some other rocks from the andesite- trachyandesite complex, the common petrochemical features are observed for them, which are clearly defined in the petrochemical characteristics and Zavarnstsky's diagram (Fig. 3). The described andesite porphyrites as well as andesite-basalts, andesites, andesite-dacites of the Southern Donbas belong to the alkaline-earth type with the predominance of sodium over potassium. The rocks from complex are characterized by the most variations in contents of Na_2O and K_2O, as well as the narrow range of SiO_2 differentiation.

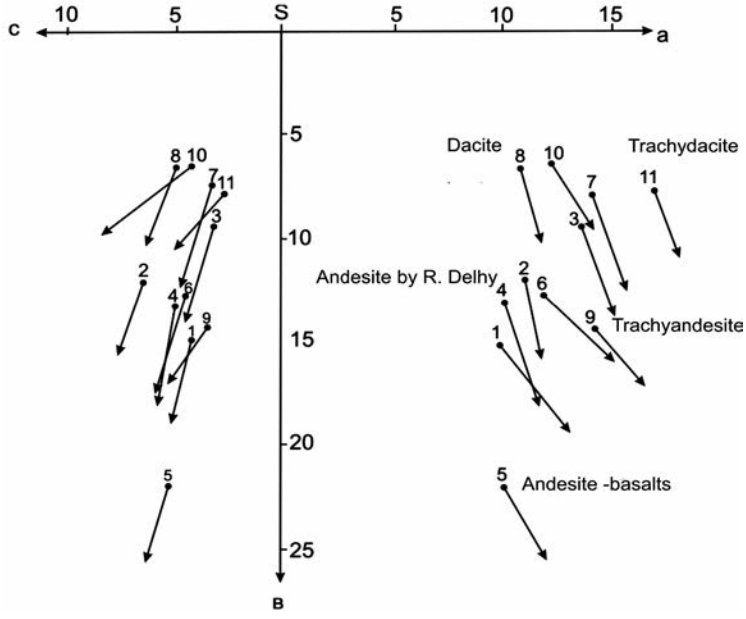

Fig. 3. The petrochemical diagram after A.N. Zavaritsky [Заварицький, 1950] for andesute porphyrites of the Novoihnatievian dyke and rocks from the andesite-trchyandesite complex for the junction zone between the Donbas and Near-Azovian megablock of USh

The Novoihnatievian dyke andesite porphyrites (Table 3, analysis No.1) are close to andesite averaged composition after R. Dely (Table 3, analysis No.2) distinguished slightly higher content of SiO, MgO and CaO and lower content of Al_2O_3, K_2O and FeO from the last. The described rocks are the most close to andesites outcropping at the Staroihnatievke village (Table 3, analysis No.4).

According to the classification after A.N. Zavaritsky [Заварицкий, 1950] these rocks belong to the normal series, to the class of the rocks oversaturated by silicic acid (Q = +16.5 and +18.2), to the group of species alkali – depleted or moderate rich ones more rarely (Table 4). The vector diagram (Fig. 3) shows the vector of averaged andesite porphyrite composition from the Novoihnativian dyke (vector 1) is most closely located to andesites of Staroihnatievka village (vector 4) and to those after R. Dely (vector 2). The different inclinations of these vectors reflect the above mentioned differences in contents of oxides, i.e. calcium and magnesium, on the one hand, and potassium and sodium, on the other hand.

The concentrations of impurity elements (Table 5) in the Novoihnativiane dyke andesite porphyrites are close to those for the rocks of Precambrian granitoids from The Near-Azovian megablock of the USh and andesite-trachyandesite complex of the Donbas. The main rocks of the dyke and andesite-trachyandesite complex don't display the significant variations in microelement content. As to the abundance of chemical elements in the Earth's crust they are depleted in Ni, Cu, Cr, Rb, Cl and are enriched in Mo, Nb, Cs, Zn, Co, Zr and F. The dyke rocks are slightly depleted in Nb, Zn, Co and Pb. In addition to the microelement percentage in the table 5 there are the impurity elements in the Novoihnativian dyke as the follows (g/t): Ba – 400, W – 50, Li – 30, La – 30, Be – 4, Yb – 1, Ag – 1.

These data allow concluding that in the limits of the Southern Donets microavlakogene during Pre-Triassic period the deep split of the Earth's crust with the north-western orientation (NW 290°) was the result of tectonic and magmatic activation of the deep fault systems of diagonal and orthogonal orientations, which was cured with average composition magma in the shortest time. The structural, geological, and petrologic data proved that magma, which formed the Novoihnativiane dyke of andesite porphyrites has arisen at the depth of at least 100-140 km. It was experimentally proved that andesite magma may be formed at these depths [Грин, Рингвуд, 1968]. The deep faults here are also associated with the widespread development of intrusive rocks of alkali-ultrabasic, alkali-basaltoic and other formations [Бутурлинов, Скаржинский,1970; Майданович, 1968]. The suitable conditions (crustal stretching, lateral and vertical movement of geoblocks) facilitated the fast andesitic magma injection through the thickness of the Precambrian basement and Paleozoic sedimentary-volcanogenic rocks.

Table 4. **The numeral characteristics for the Novoihnatievian dyke andesite porphyrites and andesite-trachyandesite complex rocks after A.N. Zavaritsky [Заварицький, 1950]**

Characteristics	1	2	3	4	5	6	7	8	9	10	11
a	10.0	11.1	13.6	10.1	10.2	12.0	14.2	10.9	14.2	12.3	17.1
c	4.3	6.4	3.3	5.0	5.3	4.5	3.5	4.8	3.5	4.2	2.8
b	15.3	12.0	9.4	13.2	22.1	12.6	8.8	6.4	14.3	6.4	7.7
S	70.4	70.5	73.7	71.7	62.4	70.7	73.5	77.9	68.0	77.1	72.4
f	27.0	51.8	36.0	30.6	38.2	44.7	34.7	51.1	44.0	45.0	55.6
m	41.5	40.6	46.8	52.2	40.1	40.2	48.8	38.9	32.0	33.7	32.4
c	31.5	7.6	17.2	17.2	21.7	15.1	16.5	10.0	24.0	21.3	11.8
n	83.5	75.3	78.0	84.5	67.5	78.0	77.5	72.8	58.6	44.1	55.8
	17.1	-	20.1	17.2	-	-	-	-	-	-	-
t	0.8	-	1.2	0.9	1.3	0.8	0.8	0.5	1.0	0.4	0.9
Q	+16.5	+10.4	+16.9	+18.2	-0.9	+12.9	+15.1	+29.2	+4.1	+25.4	+7.8
a/c	2.3	1.7	4.1	2.0	1.9	2.7	4.1	2.3	4.0	2.9	6.1

Note: The numbering of analyses corresponds to one in the Table 3.

Table 5. **Element – impurity contents (g/t) in the rocks form the Novoihnatievian dyke and andesite-trachyandesite complex of the southern Donbas**

Element	Andesite porphyrite from dyke (10)	Andesite -basalts (8)	Andesite (18)	Andesite-dacite (4)	Trachyandesite (9)	Trachydacite (22)
Ti	5000	5150	3590	3590	4200	3100
V	50	150	100	50	100	40
Ni	40	50	26	20	20	20
Co	10	50	20	20	50	30
Cr	50	75	30	20	40	27
Mn	600	1160	390	380	770	310
Sr	900	170	1000	800	200	200
Sc	5	20	18	18	8	10
Ta	2	2.4	1.5	2.4	2.4	1.5
Zr	200	200	180	170	180	160
Rb	90	60	97	60	125	100
Nb	10	35	40	40	50	35
Ga	12	10	10	12	15	15
Th	7	7	8	8	7	10
Cu	60	10	15	10	20	10
Zn	60	200	94	80	200	46
Pb	6	20	16	12	20	3
Mo	2	2	2	2	2	1
Sn	4	2	2	2	2	1
P	600	860	690	1290	990	990
Cl	150	100	200	100	100	100
F	1150	1100	900	1200	900	1300

Note: The numbers of analyses are shown in the brackets. Microelement contents in the Novoihnatievian dyke are represented after the author, others – after I.M. Skopichenko and N.V. Buturlinov [Скопиченко, Бутурлинов, 1987].

Magma, which has given rise to the rocks of andesite-trachyandesite complex are consider as a result of mixing basaltic magma with crustal matter of lithosphere, i.e. the zone melting mechanism has been activated [Скопиченко, Бутурлинов, 1987]. This mechanism and the favorable tectonic conditions leaded to the fast upraise of melt into the upper structural stages of lithosphere and formation of the numerous dykes, stocks and laccolites within the conjunction zone of Donbas with the Near-Azovian area and in the north cutoff part of the Near-Azovian megablock of the USh. Therefore, the comparatively large Novoihnatian dyke of andesite porphyrites may be considered as the indicator of fault-block tectonics and deep structure of the conjunction zone of Donbas with the Near-Azovian area.

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