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THE HYPOTHESIS ABOUT THE ORIGIN OF NON-CONVENTIONAL DEPOSITS OF HYDROCARBONS ON THE BASIS OF THE TECTONIC MOBILITY CONCEPT OF TECTONICS

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Abstract. Given the significant depletion of classical oil and gas fields, which include most hydrocarbon resources of Ukraine, the search for additional alternative energy deposits is relevant. In connection with the development and improvement of technologies for drilling wells to great depths, one of the promising potential sources of oil and gas in Ukraine, within the Dnipro-Donetsk Structure (DDS), can be crystalline basement rocks, volcanic-sedimentary strata of the Devonian and Lower Carboniferous.

The purpose of the study is to assess the prospects for the search and exploration potential sources of unconventional hydrocarbons in the Donbas and DDS from the standpoint of the tectonic mobility concept of tectonics.

It is supposed that the periodic replacement of the African plate under the East-European Platform (Phanerozoe), contributed to the formation of various by the degree disturbances and composition of the lithosphere areas under DDS, lifting, and multiple fluctuations of fluids (H_2O, CO_2, CH_4, etc.), which migrated in a free or water-dissolved state along raptures and cracks in the Palaeozoic volcanogenic rocks and the basement layers to the overlying sediments and accumulated in reservoirs, in the presence of fluid seal. Within DDS, zones adjacent (adjoining) to deep faults (or decompacted areas) could be the paths of migration of deep fluids, can be considered the most promising areas of hydrocarbon accumulations.

In order to solve the problem of searching for nonconventional hydrocarbons in Ukraine, it is advisable to carry out preliminary scientific-research projects to evaluate the prospects in the detection of industrial accumulations in DDS. At the first stage, projects should be aimed at selecting promising areas that may contain natural reservoirs with improved filtration-capacitive properties under impermeable cap rock that are capable of preventing the upward stream of deep gases. In particular, powerful deposits of the Devonian salt can be such cap rocks. At the next stage, it is expedient to carry out geophysical works to confirm the presence of potential reservoirs at large depths. In the case of positive results, the final stage should include the drilling of deep exploration wells in the decompression zone.

Keywords: hydrocarbons, nonconventional fields, Dniprovsko-Donetsk Structure, mobilist tectonic concept, crystalline rocks, volcanic-sedimentary rocks.

1. Introduction

For a long time, the main attention of prospector geologists was focused on detecting anticlinal structures of the sedimentary cover, in which most of the classic oil and gas deposits were located. However, at the present time, the possibilities of these objects are practically exhausted in Ukraine, therefore there is a need to study alternative structures and unconventional hydrocarbon fields.

In connection with the development and improvement of technologies for drilling wells to great depths, one of the promising potential sources of oil and gas in Ukraine, within the Dnipro-Donetsk Structure (DDS), can be crystalline rocks of the basement, volcanic-sedimentary strata of the Devonian and Lower Carboniferous. Hydrocarbon fields in such sediments were found in many regions of the world. For example, in the Indian sector of the Bay of Bengal, the "PY-1" gas field was discovered, the reserves of which (almost 3.5 billion m^3 of natural gas and 185 thousand m^3 of condensate) lie in the basement [1]. However, the sedimentary strata itself does not contain oil or natural gas [2]. The experience of global oil and gas exploration shows that industrial deposits of oil and gas can be located in the crystalline basement even when they are not present in the overlying sedimentary cover.

Magmatic reservoirs are unconventional oil reservoirs found on Earth. These oil reservoirs consist of reservoir rocks that store fluids in rock pores which accumulate water, gas, and oil. Magmatic reservoirs are considered secondary ones for oil and gas exploration compared to the more common sandstone and carbonate reservoirs. Magmatic reservoirs make up a small percentage of explored reservoirs, but they can still be a viable option for oil production. There are significant magmatic reservoirs in Vietnam, Indonesia, Japan, Venezuela, Argentina, Russia, California and China [3].

Works [4, 5] emphasize that volcanic reservoirs are widespread in more than 40 basins in 13 countries and have become important objects with large reserves for the development of oil and gas – the exploration and study of volcanic reservoirs is becoming an actual topic for research. In general, gas and oil deposits, as well as oil in magmatic intervals with oil and gas, which are found in more than 300 basins or blocks in more than 50 countries of the world [5, 6]. According to [7], there are more than 200 oil fields in the world only in the cracked basement.

After decades of research, especially in recent years, numerous advances have been made, including the study of void space, petrophysical characteristics, distribution patterns, and reservoir provenance. Currently, fields associated with volcanogenic rocks are being successfully developed [8, 9, 10, 11, 12, 13, 14]: the Conejo oil fields (Ventura County, California, USA) and Tupungato (Argentina), the Rattlesnake gas field (Washington State, USA).

Looking at the possible migration of non-biogenic oil and natural gas to the Earth's surface, the authors of [15] note that the first on this path are granites, gneisses, amphibolites, quartzites, and other eruptive and metamorphic crystalline rocks in two such main structural positions as the Precambrian shield and crystalline basement (CB) of sedimentary basins. According to [15], fifty-two sedimentary basins extract oil and natural gas from the CB. Among almost 500 such fields, fifty-five are giant and super-giant. The total initial produced reserves of only these fifty-five giants and super-giants are calculated at 7.768 billion m^3 of natural gas and 32.728.6 million tons of oil, making CB an important oil and gas exploration site. Most often, oil and gas production is carried out from the upper part of the CB, where the thickness of oil deposits in granite can reach 450 m, as in the Libyan fields of Amal and Aujila-Nafura, or 500 m, as in the Indonesian fields of Durian Mabok and Suban, where the length of the gas deposit in granites is 70 km [15].

Previously, the basement was believed to be a rock that is incapable of accumulating oil and gas, and has very low primary porosity and/or permeability; however, under certain conditions, when the basement is too weathered, secondary porosity and very good permeability may develop [7]. The "White Tiger" oil field on the Vietnam shelf is well known, where oil is found in granites [2, 7, 16]. The typical granite basement rock at the "White Tiger" field has turned into a high-quality oil-bearing rock with a porosity of up to 10% and a permeability of up to thousands of mD (millidarcy) [7]. Granites have undergone significant changes as a result of tectonic, hydrothermal and surface weathering processes. The reservoirs are associated with cavernous fracturing in deep basement zones and "pore-cavernous" fracturing at shallower levels. The total capacity of the reservoir exceeds 1 km, and the water-oil contact has not yet been localized. Debits reach 2000 cubic meters per day [16].

Several tens of oil and gas deposits have been recorded in the volcanic rocks of China [4, 5, 17, 18]. Moreover, andesites can also be productive reservoirs [11]. The age of the volcanic rocks in which the fields are located varies in a wide range – from the Precambrian to the Cenozoic; oil reserves are estimated at several hundred million tons.

It should be noted that in the Dnipro-Donetsk Depression (DDD), influxes of gas, water, and signs of oil were detected in volcanic rocks, mainly tuffs, in the following wells: Hrybovorudnianska – 217, Talalaivska – 6, Ladynska – 1, etc. The Sahaidatske and Shkurupiivske gas fields and minor manifestations of oil and gas in forty-two areas are confined to the Devonian sedimentary-volcanic rocks [19]. The work [20] describes the Khukhrianska area, where the oil deposit is confined to rocks of the crystalline basement. The industrial influx of oil and gas was obtained in the interval of 320 –3280 m.

The results of the research [19, 21, 22] about the properties of the filtration capacity in effusive-pyroclastic rocks showed that these rocks are a complex reservoir consisting of areas with different porosity and permeability. Effective capacity in volcanic rocks are pores, caverns, and a branched fracture network [22]. Pores in these rocks are formed as a result of the dissolution of individual grains or cement and are free from solid components. Among the collectors, fractured rocks of medium and basic composition prevail: andesites, basalts, diabases, and occasionally, granitoids. Most often, deposits are localized in fractured zones associated with faults or unconformity surfaces, which are fluid migration pathways and are located next to high-quality oil-and-gas source strata (Table 1).

Thus, to the present day, we have a lot of information about the oil and gas potential of magmatic and metamorphic rocks, both in different regions of the world and within the boundaries of the DDS. Industrial fields are found in rocks of different ages and compositions. The filtration properties of the basement rocks and volcanic-sedimentary strata are mainly provided by micro- and macro-fractures, the formation of which is connected with the local features in the formation of areas under the chemical and tectonic processes impact. Therefore, the study and development of hydrocarbon sediments at great depths is an live problem.

The purpose of the work is to evaluate the prospects for the search and exploration in the Donbas and DDS of potential sources of unconventional hydrocarbons from the standpoint of the tectonic mobility concept of tectonics.

Let us **c**onsider the Middle Paleozoic volcanic-sedimentary sediments of the DDS. In the central, deep-sunk part of the DDS and, especially in Donbas, there are no wells that would reveal the entire section of Phanerozoic sediments in the axial part. In 1990, the first ultra-deep well – SG-9 – was drilled on the southeastern side of the Zhdanivska depression (the axial part of the DDS).

Table 1– Features of the lithologic-and-facies conditions of Paleozoic sediment accumulation in the Pripiat-Dnipro-Donetsk structure [19, 23]

Donbas	Dnipro-Donetsk depression	Prypiat depression
Middle Devonian		
Sandy - clay strata with subordinate salt layers	Sandy - clay and sulfate-carbonate strata; along the northern side there are volcanic rocks	Clays, mudstones, siltstones, sandstones, organogenic limestones
450 m	200 m	120 m
Upper Devonian		
Sandy-clay shales, limestones interlayered with thick paleobasalts	Saline, volcanic (tuffs and effusives of the keratophyre formation), carbonate and sandy-clay deposits	Marls, limestones, dolomites, sandstones, with interlayers of salts and clays; reef massifs
600 m	10000* m	2500 м
Lower Carboniferous		
Algal bituminous limestones and dolomites interlayered with terrigenous rocks and coal interlayers.	Limestones, sandstones, coal interlayers	Sandstones, clays (iron-rich); sands with interlayers of clay; kaolin clays with interlayers of quartz and single interlayers of coal (LF-B grade)
3000 m	2000 m (up to 5000*m)	1300 m
Medium carbon		
Argillites, siltstones, limestones, sandstones, beds, and interbeds of coal	Argillites, siltstones, sandstones, limestones, coal beds in the middle and upper parts of the strata	Sandstones, clays, limestones (plant remains and fauna are absent)
1200 – 6900 m	1900 м	250 м
Upper Carboniferous		
Very weak coal-bearing capacity; disappearance of carbonate rocks, red colored sandstones	Multicolored sandstones, clays, sands	There are no sediments (inversion of the geotectonic regime)
2300 м	1500 м	–
* according to geophysical data		

2. Methods

The design depth of the well was 8 km, but the thickness of the discovered sediments was only 4655 m. The most ancient sediments uncovered by the well are Lower Carboniferous rocks. (498 m), so the data of different researchers regarding the thickness of Devonian sediments, the time of magmatic activity, and the rock of the crystalline basement differ [19–26].

3. Theoretical and experimental parts

The analysis of the available geological data [19, 24, 25] made it possible to compare and note the common features and differences in the conditions of accumulation of volcanic rocks in the Devonian and Lower Carboniferous of the DDS and Donbas (Table 2).

Table 2 – Parameters characterizing the reservoir properties of effusive-pyroclastic rocks [19, 23]

Rock	Sampling area	Geological age	Porosity effectiveness, %
Tufogen is green	Tbiliskyi	Tertiary period	21.81
Tufolava	Artyk, Virmeniia	Quaternary period	52.48
Tuffs of different composition	DDD, Leninakan, Virmeniia	Phanerozoic	11.36–34.38
Andesitic-trachytic tuff is compacted	Nyzhnii Tahil, Ural	Mesozoic	1.03
Tuff breccias	Unal River (North Caucasus), Kandor River (Georgia)	Mesozoic	0.70–1.13
Granite	Oimasha	Phanerozoic	0.18-7.47
Andesites-	DDD	Devonian period	13.9–25.6
Basalts	"	"	0.14–23.4
Trachytes	"	"	2.7-20.9
Diabases	"	"	0.0.6-9.3
Rocks of alkaline vein series	"	"	4.42
Basement rocks	DDD	Phanerozoic	0.0.18–7.47

A feature of the DDD is the presence of two types of sediments: volcanic sediments without salts are characteristic for the side areas, and volcanic-chemogenic sediments are characteristic for the graben depressions. On the borders of the DDD, crusts of weathering, washouts, and unconformities are documented as well as characteristic layers of conglomerates and conglomerate-breccias of volcanomictic composition with fragments of magmatic rocks that underlie them. A large number of multi-colored sediments are recorded in the sandy and sandy-siltstone strata of the Lower Carboniferous, which indicates the alternation of oxidizing and reducing environments; carbonate sediments are practically absent.

In contrast to the DDD, low-power volcanic-sedimentary sediments of the Upper Devonian were discovered only on the southern side of the Donetsk basin. In areas where they are absent, Visean limestones lie transgressively on the crystalline basement. The greatest thickness of Devonian deposits – 600 m – was recorded in the area of Mokra Volnovakha. However, according to the geological-geophysical interpretation of seismic profiles [27] and the "Dobre" profile, the thickness of the Upper Devonian deposits in the central part of Donbas is approximately 10 km. The presence of Devonian sediments in the central part is evidenced by pieces of Upper Devonian limestone found in the breccias of the salt domes.

Therefore, it can be assumed that in the Devonian and Lower Carboniferous, due to the tilt of the structure to the southeast towards the Paleothetis, the thickness of the volcanic-sedimentary sediments of Donbas was greater (but not less) than in the DDD. The change of transgressions and regressions of the Paleothetis caused the creation of a structure like a "layered pie", consisting of thick strata of limestones of the Middle and Upper Devonian, Lower Carboniferous, which are interlayered with sandy-clay (saturated with iron), saline and volcanic deposits, saturated with organic matter. It is obvious that the organic matter accumulated in these sediments during further submersion under the impact of chemical and thermodynamic processes was transformed into carbon, oxygen, and various fluids, which rose upward and, under certain conditions, accumulated in the reservoirs.

According to [19, 24, 25], two effusive-pyroclastic stratum corresponding to the Late Frasnian and Late Famennian phases (Upper Devonian) of the Hercynian orogeny were identified in the DDS. In the DDD, the first strata is represented by alkaline-ultrabasic, basic, and acidic (from picrite porphyrite to liparite) rocks; the second – by basic and acidic (from diabase to trachyliparite). The total thickness of volcanic sediments reaches 1000–1500 m, and near paleovolcanoes is up to 2700 m. In the Donetsk basin, volcanogenic rocks of the first strata are represented by lavas of basic and ultrabasic composition (basalts), and of the second one by acidic composition (orthophyres, quartz porphyries). Common forms of terrestrial volcanic formations are lava flows, tuff layers, pyroclastic agglomerate flows, and explosion tubes. The entire structure is characterized by magmatic bodies (stocks and dikes) confined to submeridional faults. Underwater manifestations are characteristic of the northern near-border zone.

Porosity values of effusive-pyroclastic rocks in DDD [19] are similar to the reservoir properties of volcanic rocks in known hydrocarbon fields. Thus, the average values of open porosity of tuffs and tuffites are approximately 12% (2.4–28.5%), andesites – 11.72%, effusives and clastolaves of basalts – about 10%, ophiolites, diabases, syenites, augites, and rocks of alkaline vein series is less than 6%. In general, the researchers assigned the volcanic rocks of the DDD mainly to low- and medium-class reservoirs and, importantly, their porosity does not decrease with depth.

Therefore, the DDS is characterized by a significant thickness of volcanic-sedimentary sediments (which are enriched with organic matter), a layered structure of Middle and Lower Paleozoic sediments, and reservoir properties of volcanic rocks, which allow us to consider them as promising (in the presence of structures-traps and rock-caps) on hydrocarbon deposits.

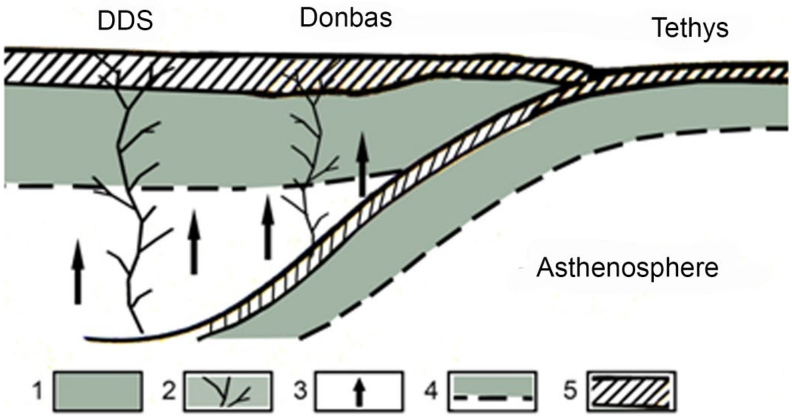
A number of hypotheses are proposed to explain the possibility of the field formation in the crystalline basement and volcanic-sedimentary rocks of the Lower Devonian Carboniferous. One of the most widespread is the abiogenic concept, which is based on the idea of the formation of hydrocarbon fields as a result of the migration of matter from the deep interior (mantle, asthenosphere) [26, 28, 29].

Authors Sorokhtin O., Ushakov S., Fedynskyi V. [28, 29] proposed an organic hypothesis concerning the origin of oil and gas, based on the mobilist concept of tectonics. According to their opinion, hydrocarbons are formed as a result of sublimation and thermolysis of organic matter of oceanic sediments in the subduction zone of lithosphere plates. The authors assumed that the subduction zone with a plate inclination angle (subducting) of up to 45º can reach a depth of 700 km and the impending plate can heat up in a section of 700–3000 km long. The authors calculated that when the oceanic plate is submerged at a depth of 100 km within the Kuril island arc, up to 2640 J is released for each gram of matter in the layer. This heat is enough not only to heat the oceanic crust (800–1000°C), but also to heat sedimentary sediments of the entire rock strata up to a temperature of 450°C above the Benioff zone [29].

4. Results and discussion

Since in the south of the East European Plate (EEP), where the DDS was located, starting from the Devonian, a gradual uneven convergence in space and time of Gondwana and its fragments with Eurasia took place – the closure of the Paleotethys, that is why this idea is considered as the basis for the proposed hypothesis about the origin of unconventional hydrocarbon deposits in DDS.

The DDS in the Paleozoic-Mesozoic was an intracontinental wedge-shaped sea bay of the Tethys Ocean, in which marine, coastal, lagoon-continental sediments accumulated (Fig. 1).



1 – lithosphere, 2 – deep fault zones, 3 – fluid flows, 4 – boundary of mantle and asthenosphere, 5 – sedimentary sediments

Figure 1 – Geodynamic situation in the south of the EEP in the Devonian-Permian period

It should be noted that similar sediments were accumulated and similar tectonic processes took place in the Caspian Depression (to the east) and the Near-Dobrudzhyn Trough (to the west), between which the DDS was located [30, 23]. Both of these structures contain explored hydrocarbon fields [31, 32].

Exactly in the boundary zones of plates (subduction zones) of the lithosphere a huge amount of mechanical and thermal energy is released. In the accumulated thick stratum of sediments rich in organic matter, as they submerged and reached a certain temperature (more than 80°C), due to the catagenetic transformation of organic matter and the action of anaerobic bacteria, there was the generation of some chemical compounds (water, methane, nitrogen, carbon dioxide, hydrogen etc.).

These processes are also observed in modern seas and oceans. Thus, in the Black Sea, various types are described in detail: fountains, streams, and seeps; many mud volcanoes were discovered, which are accompanied by the release of water, gases, various elements, etc. All these phenomena are mainly confined to fault zones (especially active ones) or localized in zones of tectonic plates interaction. Convergent environments are characterized by volcanism, activation of deep faults, and intensification of thermodynamic processes.

The alternation of stretching and compression deformations (Triassic – rifting, Permian, Jurassic, Cretaceous – subduction) led to periodic changes in pressure and temperature values acting on the sedimentary strata of the DDS.

Fluctuations in temperatures and pressures, which were periodically repeated, led to multiple circulation of fluids. Due to the high pressure, the resulting heated fluid migrated through raptures and cracks in a free or water-dissolved state into the overlying sediments, accumulating (in the presence of traps and fluid seals) in poorly permeable fractured rocks of basement or volcanic-sedimentary sediments of the Devonian and Lower Carboniferous.

Despite the low permeability of the basement rocks and volcanic-sedimentary sediments, exactly the unstable thermodynamic conditions created zones that served as channels for unloading fluid flows. Disturbed zones which are genetically associated with deep faults, are not so much conductors as natural "pumps" pumping fluids from areas of generation crosswise and along the beds into accumulation zones.

The existence of such movements can be traced on the example of coal beds, which in their undisturbed state are considered gas-impermeable, but thanks to a well-developed system of cleavage and tectonic fracturing, they can, under certain conditions, serve as fluid migration pathways. Figure 2 shows that part of the liquid phase of the fluid is solidified on the interlayer surface (the main artery of movement of fluids in coal beds) in the form of a shiny film up to 200 μm thick.

Figure 2 – Fluid solidified on the interlayer surface (bed m_3, O.F. Zasyadko mine)

Figure 3 shows the image of the surface of a coal petrographic preparation (briquette polished section) made from this solidified film of fluid. Its composition is absolutely homogeneous, in contrast to the coal itself, which contains up to 4% of liptinite and 13% of inertinite indicating that before solidification it was a liquid (a part of the fluid).

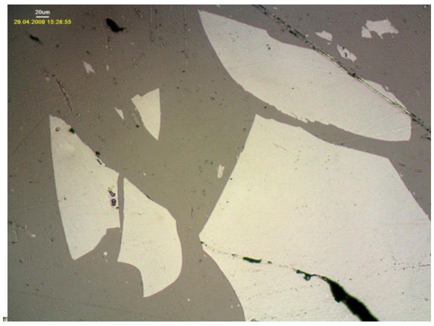


Figure 3 – Photomicrograph of the surface of the briquette polished section made from a film of solidified fluid

A similar film can be observed (Fig. 4) on the walls of traces of the gas-generating process in coal [33]: here the fluid itself is clearly of biogenic origin, while the film on the interlayer surfaces is the result of the migration of the fluid from the underlying rocks. Fluids migrate to the interlayer surfaces along vertical cracks, and traces of this process on are also left on these walls (Fig. 5).

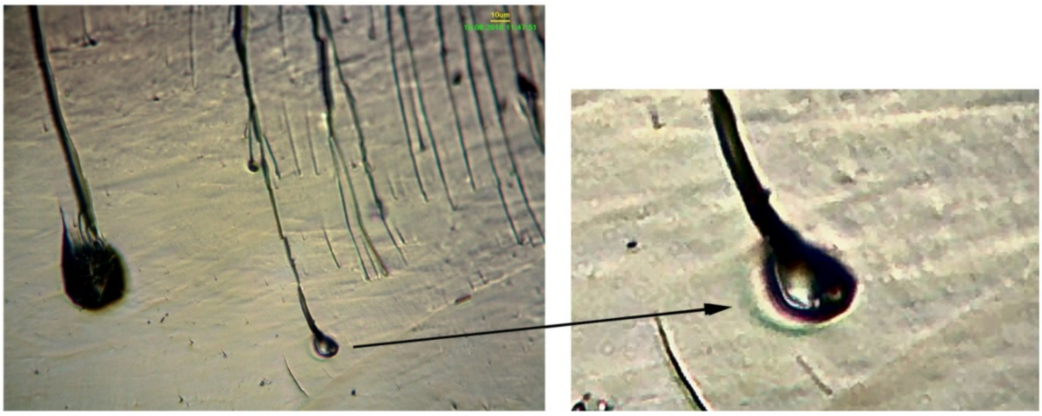


Figure 4 – Solidified fluid on the walls of "gas bubbles"

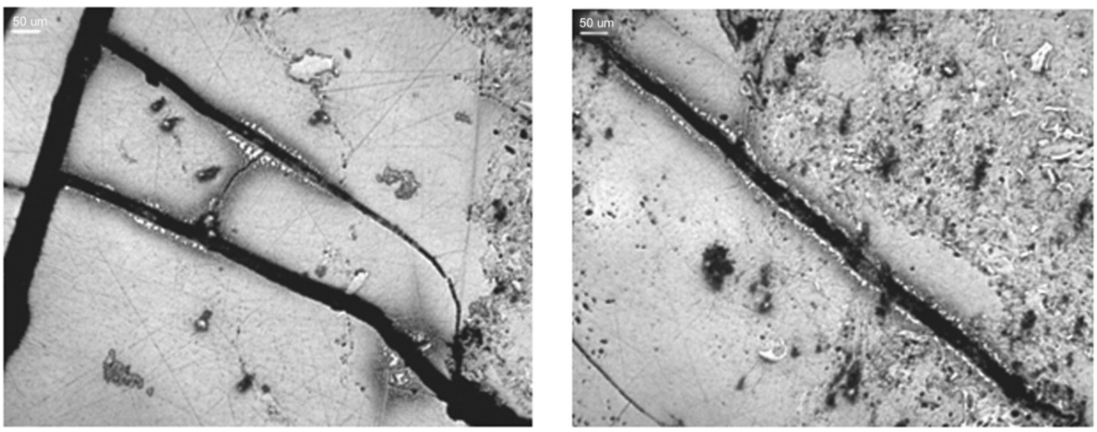


Figure 5 – Traces of fluid movement along vertical cracks in coal (layer $h_{10}^{в}$, "Ilovaiska" mine)

The fluid can penetrate both along the entire length of the crack and locally. The initial parent coal matter (in this case, it is vitrinite) is transformed both with a decrease in reflectance due to perforation by numerous gas channels – the GI indicator is 102 - and with an increase to values comparable to inertinite – the GI is 191. The GI indicator is the shade intensity of gray [34], which characterizes the degree of coalification, with an average value of 182 for initial vitrinite (Fig. 6). This indicates a significant increase in temperature, probably due to leaking from the deep layers of the coal-bearing stratum.

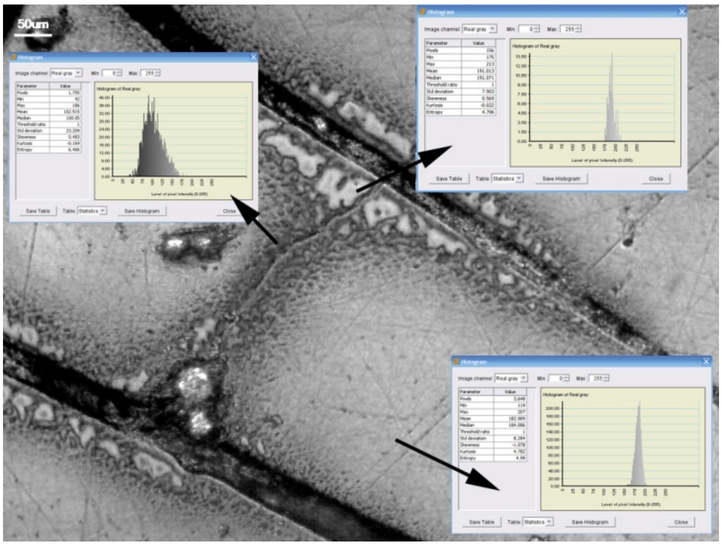


Figure 6 – Transformation of vitrinite due to the heat of the migrating fluid

So, over millions of years, sediments rich in organic matter have accumulated in Tethys. During periodic subduction, organic matter, which submerged to significant depths under high temperatures and pressures, generated fluids that were squeezed upwards into the higher rocks. Deep fault zones were migration routes, the role of which in the gas-generating process can be of two kinds. On the one hand, tectonic pulses contribute to the "pumping" of heated solutions, which activates the processes of interaction of fluids with rocks and coal and promotes the involvement of host rocks in the process of gas generation and accumulation. On the other hand, under the impact of mechanical loads at low temperatures, the molecular structure and chemical composition of sediments change due to chemical, mechanochemical, electrochemical, and physicochemical processes.

Structural transformations in the coal matter can take place in two directions – the destruction of the aliphatic component of the coal matter and the polycondensation of the aromatic component. Destruction occurs with the transformation of carbon macromolecules into simpler molecular compounds and the accumulation of reaction products resistant to this thermodynamic situation. One such stable hydrocarbon component is methane. Repeating stress fields of varying magnitude and direction contribute to the multiple circulations of gas-water flows in the layered coal-bearing stratum and, as a result, to the strengthening of structural transformations of the coal matter. The geological conditions of bedding affect the localization of the component composition of gases and the intensity of their release.

5. Conclusions

The periodic subduction of the African plate under the EEP (Phanerozoic) contributed to the formation of lithospheric sections of different degrees of disturbance and composition under the DDS, the rise and multiple circulation of fluids (H_2O, CO_2, CH_4, etc.). These fluids migrated through raptures and cracks in Paleozoic volcanogenic rocks and basement layers in a free or water-dissolved state into the upper sediments and accumulated in separate reservoirs (in the presence of appropriate fluid seals).

Within the DDS, the most promising areas for searching of the hydrocarbon accumulations can be zones adjacent (adjoining) to deep faults (or decompacted areas), which could be migration routes for deep fluids.

To solve the problem of searching for unconventional hydrocarbons in Ukraine, it is advisable to conduct preliminary research projects to assess the prospects of identifying industrial accumulations in the DDS. At the first stage, the projects should be aimed at selecting promising areas, in particular in the above-mentioned zones, which may contain natural reservoir systems with improved filtration-capacity properties under impermeable rock caps, which are able to prevent the upward flow of deep gases. In particular, thick sediments of Devonian salt can serve as such rock caps. The next stage requires geophysical works to confirm the presence of potential reservoirs at great depths. In case of positive results, the final stage of the project should involve the drilling of deep exploratory wells in the decompactification zones.

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ГІПОТЕЗА ПОХОДЖЕННЯ НЕТРАДИЦІЙНИХ РОДОВИЩ ВУГЛЕВОДНІВ НА ЗАСАДАХ МОБІЛІСТСЬКОЇ КОНЦЕПЦІЇ ТЕКТОНІКИ

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Анотація. З огляду на значне виснаження класичних родовищ нафти і газу, до яких належить більшість вуглеводневих ресурсів України, актуальним є пошук додаткових альтернативних покладів енергоносіїв. У зв'язку з розробкою та вдосконаленням технологій буріння свердловин на великі глибини, одним з перспективних потенційних джерел нафти і газу в Україні, в межах Дніпровсько-Донецької структури (ДДС), можуть служити кристалічні породи фундаменту, вулканогенно-осадові товщі девону та нижнього карбону.

Метою роботи є оцінка перспектив пошуку і розвідки в Донбасі і ДДС потенційних джерел вуглеводнів нетрадиційного типу з позиції мобілістської концепції тектоніки.

Передбачається, що періодичний підсув Африканської плити під Східно-Європейську платформу (фанерозой), сприяв формуванню різних за ступенем порушеності і складу ділянок літосфери під Дніпровсько-Донецькою структурою (ДДС), підйому та багатократній циркуляції флюїдів (H_2O, CO_2, CH_4 та ін.), які по розривах та тріщинах у вулканогенних породах палеозою і верствах фундаменту мігрували у вільному або водорозчиненому стані у вищерозміщені відклади, накопичуючись, за наявності флюїдоупорів, в колекторах. В межах ДДС найбільш перспективними ділянками пошуку скупчень вуглеводнів можуть вважатися прилеглі (суміжні) до глибинних розломів (або розущільнених ділянок) зони, які могли бути шляхами міграції глибинних флюїдів.

Для вирішення проблеми пошуків нетрадиційних вуглеводнів в Україні доцільно проведення попередніх науково-дослідних проектів для оцінки перспектив виявлення промислових скупчень у ДДС. На першій стадії проекти мають бути спрямовані на вибір перспективних ділянок, які можуть містити природні системи резервуарів з покращеними фільтраційно-ємнісними властивостями під непроникними покришками, які здатні перешкоджати висхідному потоку глибинних газів. Такими покришками можуть слугувати, зокрема, потужні відклади девонської солі. На наступній стадії доцільно проведення геофізичних робіт для підтвердження наявності потенційних резервуарів на великих глибинах. У випадку позитивних результатів завершальна стадія має передбачати буріння глибоких розвідувальних свердловин у зони розущільнення.

Ключові слова: вуглеводні, нетрадиційні родовища, Дніпровсько-Донецька структура, мобілістська тектонічна концепція, кристалічні породи, вулканогенно-осадові породи.