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ORIGIN OF HYDROCARBONS IN THE BACH HO FIELD (THE VIETNAMESE SHELF)

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A b s t r a c t

This article presents the results of a geochemical study of oil on the Vietnam shelf (Cuu Long basin), including those in the crystalline basement. The Bach Ho field oils in the basement have a hydrocarbon distribution that is no different than oil of numerous accumulations in Oligocene and Miocene sedimentary sequences. Similar to the organic origin oils of the world, oils from the Bach Ho field lack regular isoprenanes C_{12} and C_{17} and cheilanthanes (tri-cyclic terpanes) C_{22} and C_{27}. A distinctive feature of these oils is a large amount of cheilanthanes C_{19}-C_{29}, and large neo-adiantane to adiantane and hopanes to steranes ratios. All these parameters indicate a large bacterial contribution in the generation of these oils. Studies have shown the similarity between oil biomarker parameters and the organic matter of sedimentary rocks, which supports the organic nature of the oils in the basement fields on the Vietnam shelf. It is shown that the hydrocarbon accumulations in the basement complexes of the Cuu Long basin are in a secondary occurrence, and their origin was the organic matter of the sedimentary source rocks.

Keywords:

Bach Ho;
Biomarkers;
Origin of hydrocarbons;
Basement.

1. Introduction

Only an analysis of the material composition of organic matter within the oil and host rock may elucidate the nature of oil. It is impossible to interpret the geochemical environment oil formation without knowledge of the hydrocarbon composition distribution patterns at the molecular level [1].

This article reflects presents results for the hydrocarbon biomarker distribution in the oil fields of the Cuu Long basin (fig.1, 2), including those in the crystalline basement. A study of oils in the Bach Ho field showed that the oils in this field is of organic nature.

As of 2017, 18 oil and gas fields have been discovered in the Cuu Long basin. Of those, 15 fields including the largest Bach Ho oil field are under development with a total cumulative production on the order of 410 MMT of oil [2-3]. Major reserves of the Bach Ho field are concentrated in the crystalline basement, in a horst of Mesozoic fractured-cavernous granitoids (Upper Jurassic – Upper Cretaceous) at a depth of over 3000 m.

The objective of this study was the identification of additional criteria (not studied until now) for determining the origin of the oil in the Bach Ho field, to be used to interpret the origin of the organic matter. For this purpose, a distribution of saturated hydrocarbons-biomarkers (n-alkanes, isoprenanes, steranes and terpanes) were studied on the molecular level, as well as the group composition (saturated hydrocarbons, mono-, bi- and poly-aromatic hydrocarbons, resins and asphaltenes).

2. Materials and methods

Hydrocarbon analysis was conducted using capillary gas-liquid chromatography and chromatography-mass spectrometry. The group composition was determined using high-performance liquid chromatography.

Determination of oil n-alkanes and isoprenanes using gas-liquid chromatography.

N-alkanes and isoprenanes were determined using capillary gas-liquid chromatography with a flame ionization detector with linear programming of the thermostat temperature on a Bruker device.

Hydrocarbon separation was conducted in a quartz capillary column with a OV-101 graft silicon phase, 30 m long and with a 0.25 mm internal diameter. The thermostat temperature programming was as follows: beginning at 80 °C, the temperature was increased at a rate of 4°/min until the end of the programme was reached at 320 °C. The carrier-gas was hydrogen.

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Fig.1. Location map of Cuu Long basin [21]

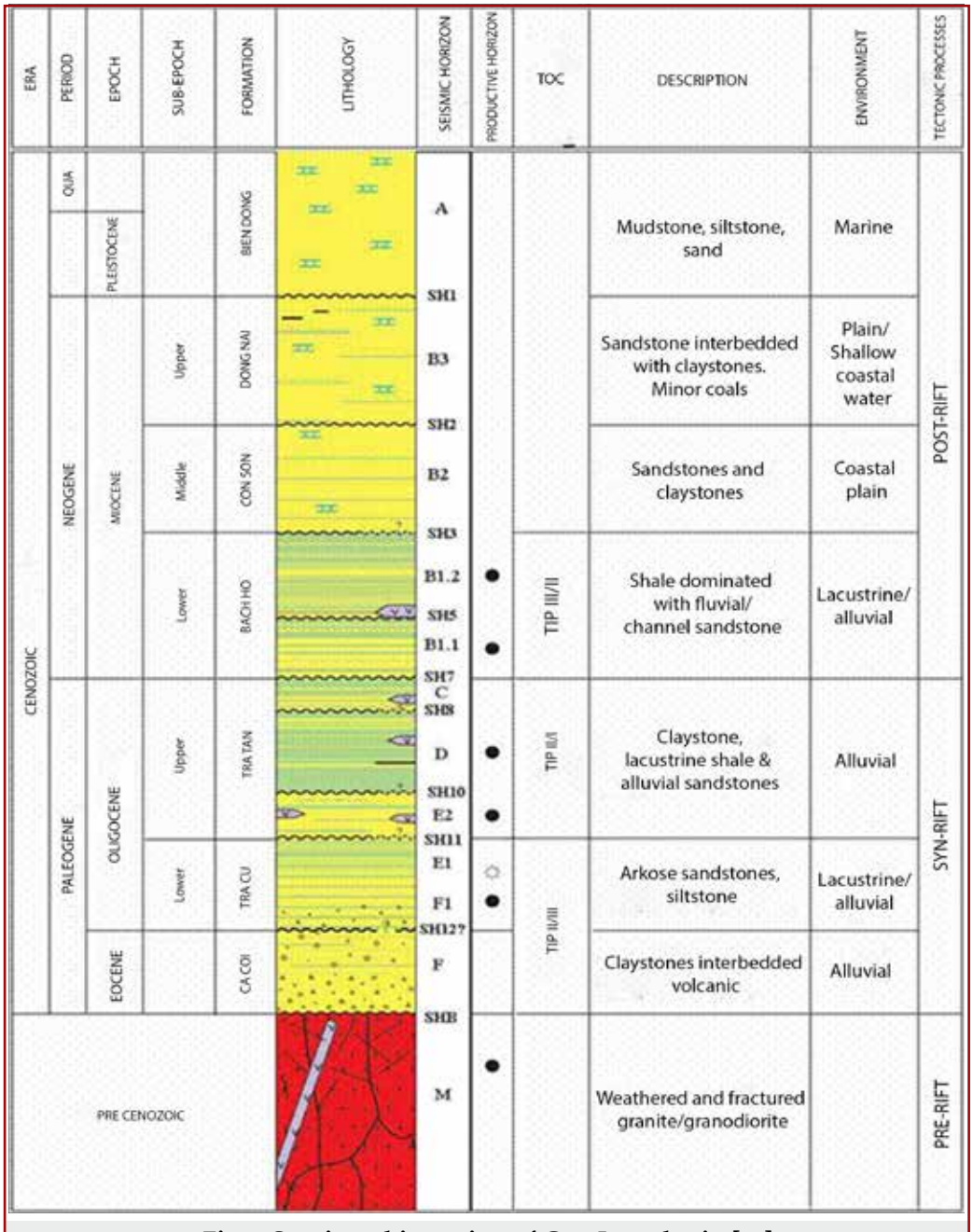

Fig.2. Stratigraphic section of Cuu Long basin [21]

Determination of oil hydrocarbon composition using chromatography mass spectrometry.

The chromatography mass spectrometry study was implemented using a device manufactured by «Hewlett Packard» NR-5975C with the application of the computer data processing system under the Sim regime with the recording of ions m/z 191, 177 for the terpenes and m/z 217 for the steranes and diasteranes, m/z 71 for the n-alkanes and isoprenoids. Hydrocarbon separation was conducted in a quartz capillary column with the OV-101 grafted silicon phase. The chromatography was conducted under a scanning regime with a 2 sec interval. Then, the temperature linear programming was performed as follows: the beginning temperature was 40 °C, the temperature was increased at 4°/min until reaching the end of programme at 290 °C. The spectra were recorded under a regime of computer chromatograms that were reconstructed by fragmentary ions that were characteristic for various groups of hydrocarbons. All spectra were collected at 70 ev ionization energy.

Determination of the oil group composition (saturated HC, aromatic HC, resins and asphaltenes) using high-performance liquid chromatography.

The analysis was conducted using a device by a Waters refractometric detector (Massachusetts, USA). The separation was conducted in the column «Energy Analysis (NH_2)». The eluent was n-hexane (preliminarily distilled and filtered through a filter 0.5 micron Vullex-SR). The eluent rate was 1.5 ml/min. The asphaltenes were preliminarily separated using oil dilution in 40-fold volume of

Table 1

The n-alkane and isoprenane distribution (based on gas-liquid chromatography) in the Bach Ho oil field, well 402

Number of «C» atoms in n-alkane	%	Number of «C» atoms in n-alkane	%
9	6.0	28	2.9
10	8.3	29	2.1
11	7.5	30	1.6
12	6.6	31	1.3
13	6.0	32	1.0
14	5.5	33	0.8
15	5.4	34	0.5
16	4.6	35	0.3
17	4.4	36	0.2
18	3.8	37	0.2
19	3.7	38	0.1
20	3.5	39	0.1
21	3.4	40	0.1
22	3.3	41	< 0.1
23	3.4	42	< 0.1
24	3.0	43	< 0.1
25	2.9	44	< 0.1
26	2.8	pristane	1.4
27	2.9	phytane	0.6

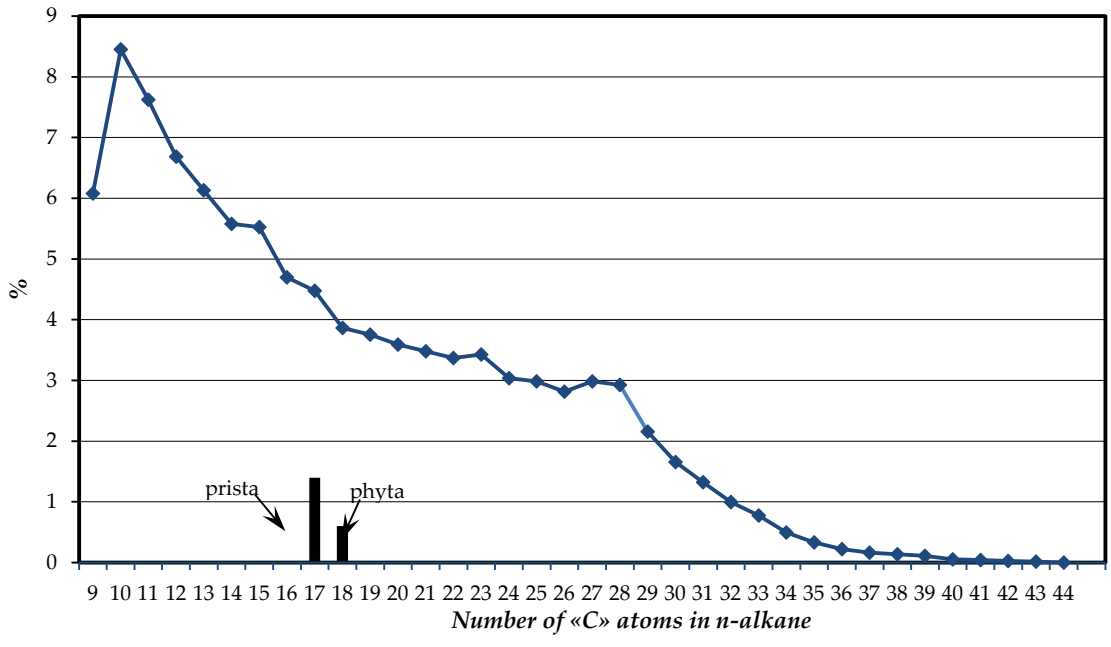

Fig.3. The n-alkane and isoprenane distribution (based on gas-liquid chromatography) in the oil of the Bach Ho field (well 402)

Table 2

The regular isoprenane (C_{11}-C_{20}) distribution (based on gas-liquid chromatography) in the oil of the Bach Ho field (well 402)

Number of «C» atoms in regular isoprene	%
11	17.2
13	12.7
14	12.8
15	10.2
16	15.9
18	8.3
19 (pristane)	15.9
20 (phytane)	7.0

Note: Regular isoprenanes of C_{12} and C_{17} composition are absent.

the n-hexane and were run through a filter (0.5 micron Millex Filter).

3. Results

Geochemical characteristics of the oil based on n-alkanes and isoprenanes.

Table 1 and figure 3 display the distribution of n-alkanes of C_{19}-C_{44} composition in the oil of the Bach Ho field (well 402). A monomodal n-alkane distribution is observed with a rather large relative n-alkane concentration in the composition of C_{17}-C_{33} and a small concentration of n-C_{23}, n-C_{27} and n-C_{28}.

The value of the ratio $\frac{n\text{-}C_{25}+n\text{-}C_{27}}{2n\text{-}C_{26}}$ (oddity coefficient) is slightly greater than a one. This indicates an insignificant influence by continental organic matter on the oil composition.

The absence of regular isoprenes is obvious with the composition C_{12}-C_{17} in the distribution of regular isoprenes with the composition C_{11}-C_{20} (tabl.2, fig.4), which are not found in oil anywhere in the world. As reflected of the phytol decay scheme (fig.5), the regular isoprenes formed from the phytol (a side chain of the chlorophyll) by a simultaneous

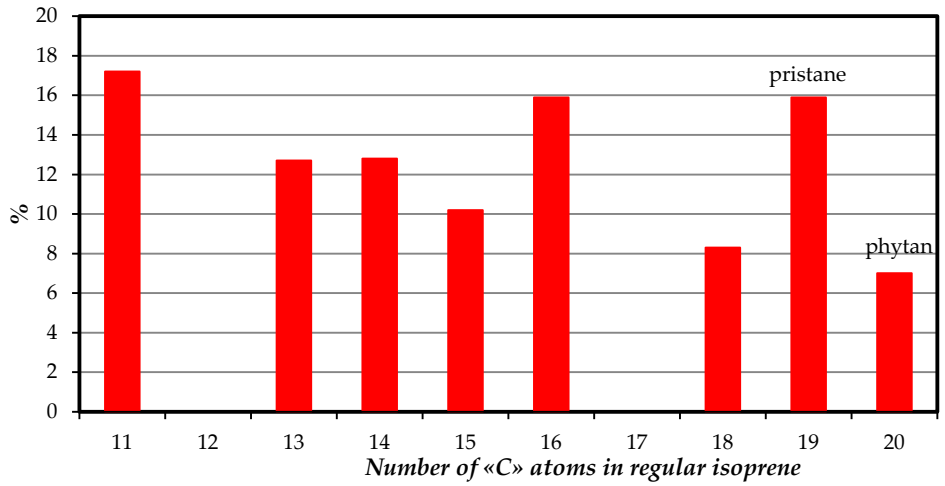

Fig.4. The regular isoprenane C_{11}-C_{20} distribution (based on gas-liquid chromatography) in the oil of the Bach Ho field (well 402)

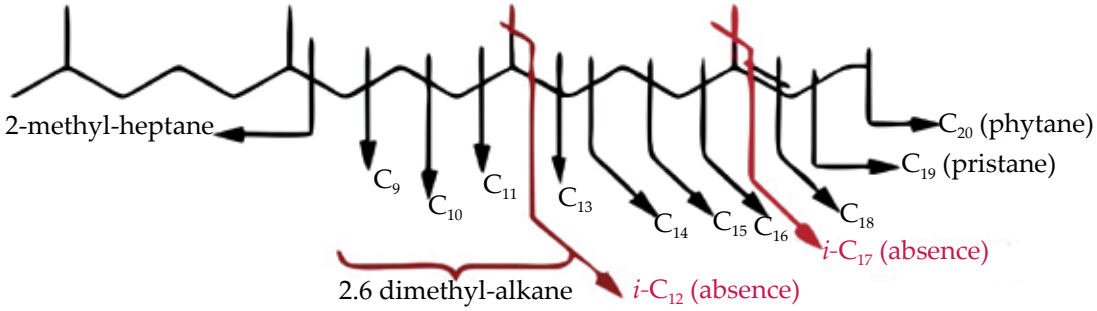

Fig.5. Phytol decay scheme

Table 3

Geochemical characteristics (based on gas-liquid chromatography) of the oil of the Bach Ho field (well 402) based on normal alkanes and isoprenanes

Pristan / Phytane	Pristan / n - C_{17}	Pristan / n - C_{18}	Pristan + Phytane / n - C_{17} + n - C_{18}	n - C_{25} + n - C_{27} / 2n - C_{26}
2.27	0.31	0.16	0.24	1.06

Table 4

Geochemical characteristics (based on gas-liquid chromatography) of the Bach Ho field oil (well 402) based on steranes

Regular steranes			Maturity s C_{29}		Steranes C_{27}
C_{27}/C_{29}	C_{28}/C_{29}	$C_{27}: C_{28}: C_{29}$	C^1 maturity	C^2 maturity	diasteranes / regular steranes
0.92	0.68	35:26:39	0.56	0.78	0.37

Table 5

Geochemical characteristics (based on gas-liquid chromatography) of the Bach Ho field oil (well 402) based on terpanes

Ts/ Tm	H_{29}/ H_{30}	M/ H_{30}	$H_{27}: H_{29}: H_{30}: H_{31}$	Three / Penta	Tetra / Three	$NeoH_{29}/ H_{29}$	$H_{30}/$ Sterane C_{29}
2.1	0.67	0.11	27:23:36:14	0.84	0.40	1.0	6.87

breakage of two bonds of the tertiary carbon atom is impossible [3, 4].

The absence of the regular isoprenanes of C_{12} and C_{17} composition in oils is direct proof of the organic origin of the Bach Ho oil (well 402).

The genetic parameter is the pristane (2,6,10,14-tetramethyl pentadecane) / phytane (2,6,10,14- tetramethyl hexadecane) ratio. It is equal to 2.27, which is characteristic of a nearshore marine origin for the oils.

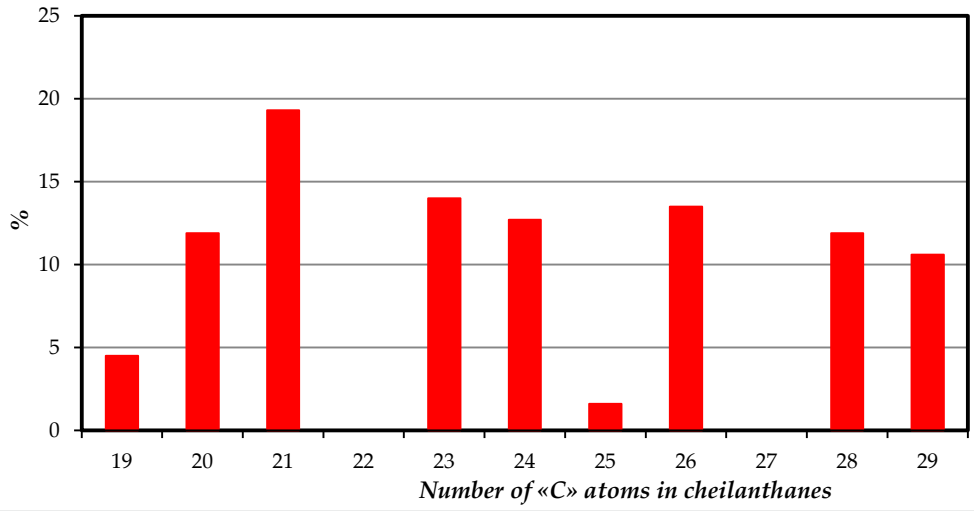

Fig.6.The distribution (based on gas-liquid chromatography) of cheilanthanes C_{19}-C_{29} in the oil of the Bach Ho field (well 402)

Table 6

The distribution (based on gas-liquid chromatography) of cheilanthanes (tri-cyclical terpanes) C_{19}-C_{29} in the oil of the Bach Ho field (well 402)

Number of «C» atoms in cheilanthanes	Cheilanthanes (stereochemical indication) *	%
19	13β	4.5
20	13β, 14α	11.9
21	13β, 14α	19.3
23	13β, 14α	14.0
24	13β, 14α	12.7
25	13β, 14α	1.6
26	13β, 14α; 22S+22R	13.5
28	13β, 14α; 22S+22R	11.9
29	13β, 14α; 22S+22R	10.6

*Note: The cheilanthanes of C_{22} and C_{27}composition are absent. *The orientation (H) is shown everywhere.*

Table 7
The group composition (based on high-performance liquid chromatography) of the Bach Ho field oil (well 402)

Compound	%
Paraffins-cyclo-paraffins (saturated HC)	77.0
Mono-aromatic HC	8.6
Bi-aromatic HC	4.4
Tri-/poly-aromatic HC	1.4
Resins	6.6
Asphaltenes	2.0

Geochemical characteristics of the oil based on steranes and terpanes.

Tables 4 and 5 display the geochemical characteristics of the Bach Ho field oil (well 402) based on steranes and terpanes.

A distinctive feature of this oil is its elevated contents of cheilanthanes (X_{19-29} / (X_{19-29} + H_{27-35}) = 75.4 is the cheilanthanes index; Ch is cheilanthane, H is hopane) and neoaditant ($NeoH_{29}$ / H_{29} = 1.0). It is also important to note that the terpane contents significantly prevail over the steranes (H_{30} / Sterane C_{29} = 6.87). This significant terpane/sterane ratio indicates that the participation of bacteria was important in the formation of this oil [5-8].

A relative distribution of C_{19}-C_{29} composition cheilanthanes (tri-cyclic terpanes) is displayed in table 6 and figure 4. It is easy to see the absence of C_{22} and C_{27} composition cheilanthanes. This is an indication that the side chain is the isoprenane radical and a simultaneous breakage of bonds of the tertiary carbon atom (similar to the phytol decay) is impossible (fig.6). The absence of C_{22} and C_{27} composition cheilanthanes also indicates the rectitude of the organic hypothesis for the origin of the Bach Ho field oil (well 402).

It is known that the hydrocarbons of the cheilanthane series may form as a result of microbiological processes and in an environment characterized by significant katagenesis of the source organic matter. We suspect that the most likely method of cheilanthane formation is microbiological. According to our studies, in the stratigraphic range from the Triassic to the Ordovician with increasing depth, and also with temperature, we observe a

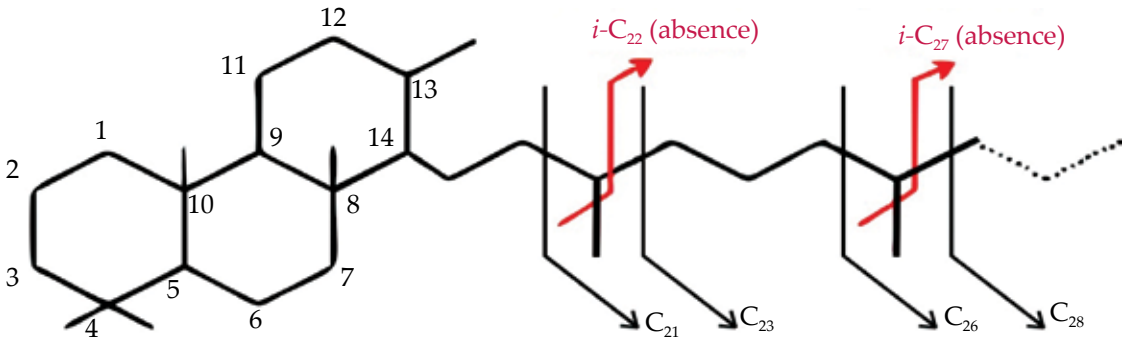

Fig.7. The cheilanthane decay scheme

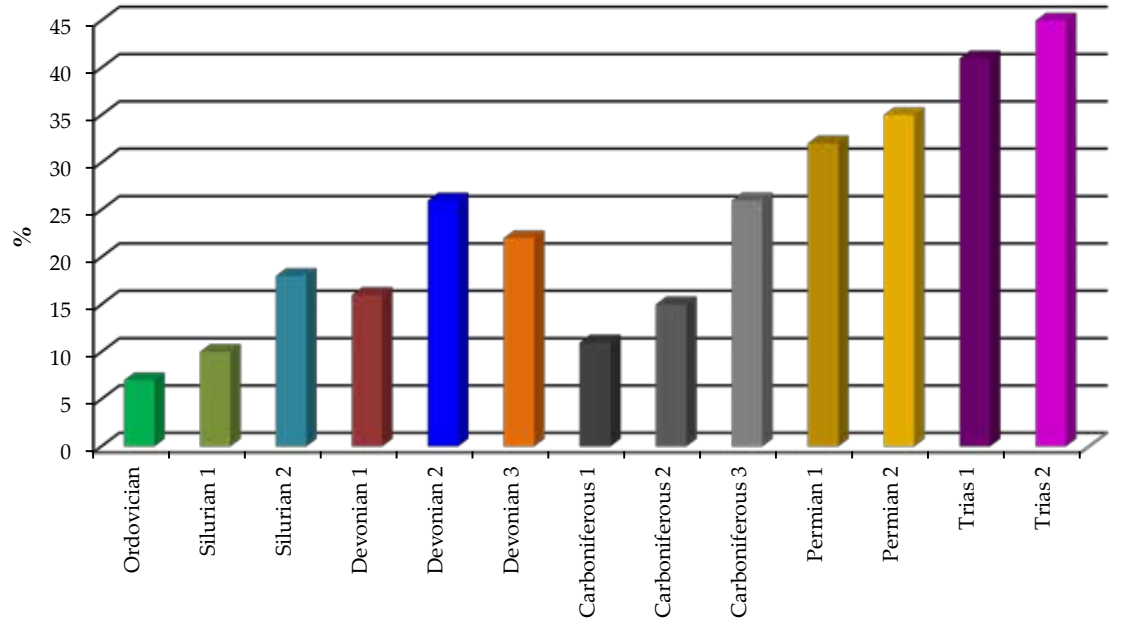

Fig.8. The cheilanthane contents (cheilanthane index) in oils depending on the age of the host sediments (average values) (Lukin 2017) [1, 9]

continuous decline in the relative concentration of cheilanthanes, whereas based on thermo-catalytic patterns the inverse correlation should exist. According to the cheilanthane index, the Bach Ho field oil (well 402) is younger than Triassic (fig.8).

Table 7 displays the group composition of the Bach Ho field oil (well 402), which is close to the distribution of near-shore marine oils.

4. Discussion

The results of our biomarker study showed that the comparative steranes C_{27}-C_{28}-C_{29} correlation allowed the establishment of a connection between the oil from basement and the Oligocene -Miocene age source rocks (fig.9, 10). Based on the results, the Cuu Long basin oil is normal, and not yet altered (fig.11, 12). The Pr/Ph coefficient in oil samples of the Cuu Long basin assumes values below 3, which indicates a weakly oxidizing to a weakly reducing depositional environment.

The oil fields discovered on the shelf of Vietnam contain numerous oil accumulations, not only in the Oligocene and Miocene sedimentary rocks but also in fractured basement granitoids. This facilitated the development of the concept of their inorganic nature by a number of scientists [10, 11]. However, detailed studies of biomarker- hydrocarbons showed similarity between the oil biomarker parameters and organic matter of the sedimentary rocks. This demonstrates the organic nature of the oil in the basement on the Vietnam shelf. The Bach Ho field oils in the basement are no different in hydrocarbon

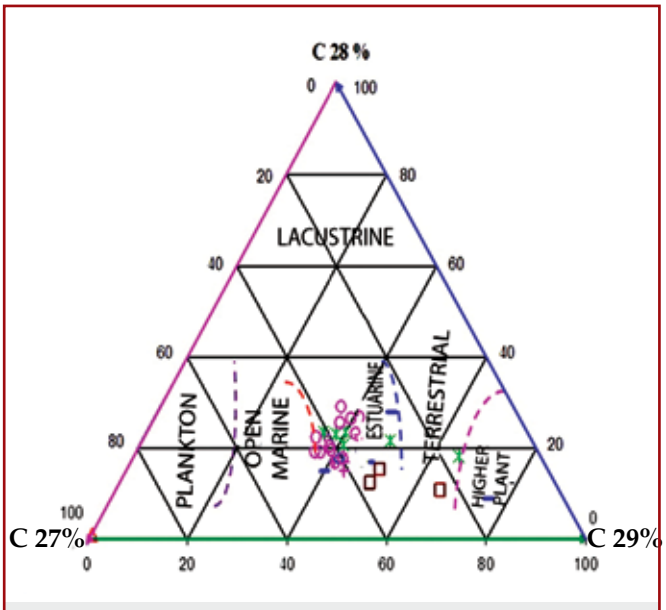

Fig.9. A triple diagram of the steranes C_{27}-C_{28}-C_{29} interrelations in rock samples [19-20]

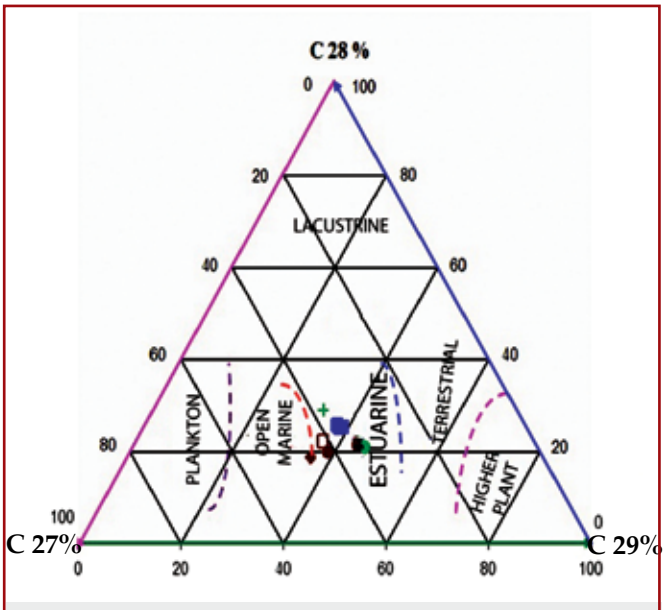

Fig.10. A triple diagram of the steranes C_{27}-C_{28}-C_{29} interrelations in oil samples [19-20]

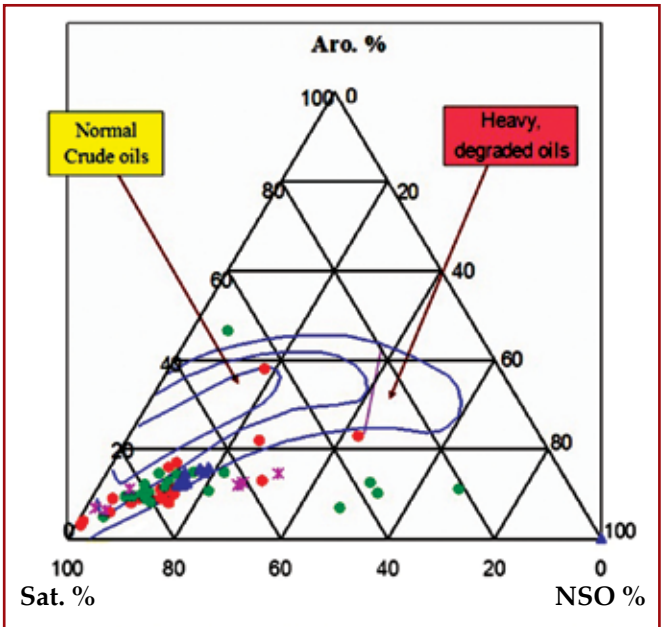

Fig.11. A triple diagram of the C_{15} chemical composition in the Cuu Long basin oil samples [19-20]

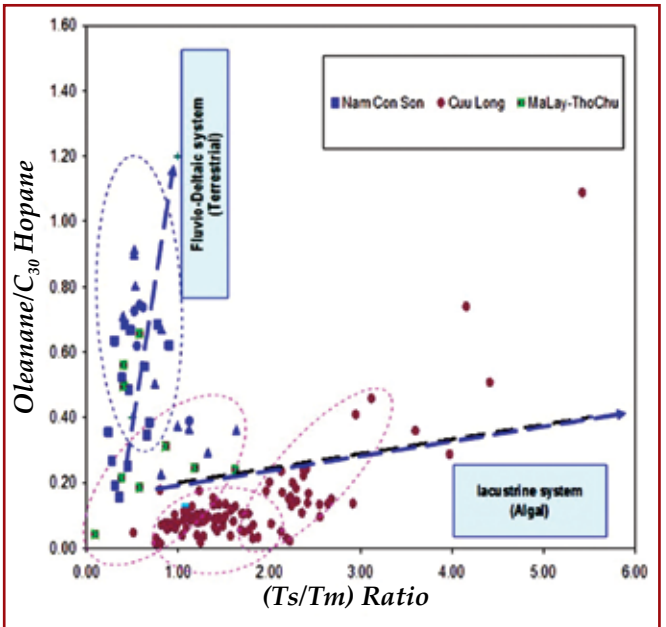

Fig.12. The origin of oil in three basins: Cuu Long, Nam Con Son and Ma Lay-Tho Chu [19-20]

distribution from oils in numerous accumulations in the Oligocene and Miocene sedimentary sequences. Similar to all oils of organic origin in the world, oil in the Bach Ho field lacks the regular isoprenanes C_{12} and C_{17} and cheilanthanes (tri-cyclic terpanes) C_{22} and C_{27}. A distinctive feature of these oils is a large amount of cheilanthanes C_{19}-C_{29}, large values of the neo-adiantane vs. adiantane and hopanes vs. steranes. All these parameters indicate a large bacterial contribution to the generation of these oils.

A widespread contact between Pre-Cenozoic crystalline basement massifs and Cenozoic sedimentary cover is typical for the Cuu Long basin. This stratigraphy predetermined the lateral oil migration through contact zones from the Oligocene and Miocene source rocks into the voids and elevated fracturing zones of the crystalline massifs. The sediment cover junction zones with basement rocks form distinctive geological boundaries through which the evolution of migration processes may be suggested due to a difference in the geological structure, permeability-porosity properties, etc. On the other hand, the Cuu Long basin is characterized by laminated-block structure and a wide development of faults that differ in formation age and history as well as strike directions. In these connections, migration processes and the formation of hydrocarbon accumulations are associated, along with lateral migration, also with inter-formational (inter-stage) subvertical migration along the surfaces of conducting faults formed synchronously with the activation of neo-tectonic processes, to the zones of elevated fracturing, decompaction and other disruptions of rock integrity. Thus, hydrocarbon accumulation emergence in the crystalline basement is connected to descending hydrocarbon migration from oil and gas source rocks. The manifestation mechanism of such migration is associated with the decline in hydrodynamic potential with depth. A result of such decline is the «ejector» effect that is caused by the fluid displacement. The action of this manifestation is based on kinetic energy transfer from one medium to another. As a manifestation of this effect, the fluid suction occurs in the body of crystalline massifs from the sediment complex along the surfaces of conducting faults. This results in des cending hydrocarbon migration. The emergence of descending hydrocarbon migration is one of the stages in a general geo-fluid-dynamic history of one region or another. In summary, this supports a view that oil and gas hydrocarbon accumulations in the Cenozoic basement of the Cuu Long basin are in a secondary occurrence and their source are hydrocarbons that were generated by and migrated from the oil source rocks in the Oligocene-Miocene sedimentary complex.

A possible explanation of the emergence of oil accumulations in the crystalline basement [12-17] is the study of Earth's known electric fields that are closely tied with active tectonic processes, which allowed exposure of the geo-electric mechanism of oil hydrocarbons migrating from the sediment cover accumulations in the crystalline basement. The physical foundation of this process is in that during the phase of forming deep-seated faults, for the first time breaking the basement, the active stream flow occurred from the oil source rock sequences and from oil and gas accumulations of the sedimentary cover to the crystalline basement voids. This stream flow occurred through zones of fault deformation under the action of high-tension electric fields. The electric fields were caused by the piezoelectric effect and electrization of the crystalline rocks in the process of fracturing. This mechanism of oil and gas accumulation provides a reason to believe that the oil and gas hydrocarbon accumulations are in the secondary occurrence in the basement and that the source of their formation is the organic matter of overlying sedimentary complexes [18-26].

5. Conclusions

This study showed the similarity of biomarker parameters in the oil and organic matter of sedimentary rocks. This supports the organic nature of oil fields in the basement on the Vietnam shelf. The Bach Ho field oils in the basement are no different in their hydrocarbon distribution than numerous accumulations in overlying Oligocene and Miocene sedimentary sequences. Similar to the organic origin oils of the world, oils from the Bach Ho field oils lack regular isoprenanes C_{12} and C_{17} and cheilanthanes (tri-cyclic terpanes) C_{22} and C_{22}. A distinctive feature of these oils is a large amount of cheilanthanes C_{19}-C_{29} and large neo-adiantane to adiantane and hopanes to steranes ratios. All these parameters indicate a large bacterial contribution in the generation of these oils.

Therefore, the hydrocarbon accumulations in the basement of the Cuu Long basin are in a secondary occurrence and were sourced by organic matter from Oligocene and Miocene sedimentary productive complexes.

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References

1. Gordadze, G. N. (2015). Uglevodorody v neftyanoj geohimii. Teoriya i praktika. *Moscow: Rossijskij gosudarstvennyj universitet nefti i gaza imeni I.M. Gubkina.*

2. Kerimov, V. Y., Gordadze, G. N., Lapidus, A. L., et al. (2018). Physicochemical properties and genesis of the asphaltites of Orenburg oblast. *Solid Fuel Chemistry,* 52(2), 128–137.

3. Hai, V. N. Mustaev, R. N., Sericova, U. S., Leonova, E. A. (2016). Exploration of the generating potential of the sedimentary complex in the Kyulong basin based on the basin modelling (Vietnam). In: *18th Science and Applied Research Conference on Oil and Gas Geological Exploration and Development, Geomodel*-2016.

4. Gordadze, G. N., Giruc, M. V., Poshibaeva, A. R., Koshelev, V. N. (2016). Osobennosti obrazovaniya regulyarnyh izoprenanov nefti sostava S10-S20. *Neftekhimiya*, 56(5), 443–447.

5. Blumenberg, M., Oppermann, B., Guyoneaud, R., Michaelis, W. (2009). Hopanoid-production by Desulfovibrio bastinii isolated from oilfield formation water. *FEMS Microbiology Letters,* 293, 73-78.

6. Flesch, G., Rohmer, M. (1989). Prokaryotic triterpenoids: A novel hopanoid from the ethanol-producing bacterium Zymomonas mobilis. *Biochemical Journal*, 262, 673-675.

7. Stroeva, A. R., Giruc, M. V., Koshelev, V. N., Gordadze, G. N. (2014). Modeling of formation of petroleum biomarker hydrocarbons by thermolysis and thermocatalysis of bacterium biomass. *Petroleum Chemistry*, 54(5), 352–359.

8. Poshibaeva, A. R., Giruc, M. V., Perevalova, A. A., et al. (2017). Neftyanye uglevodorody-biomarkery v produktah termoliza nerastvorimoj chasti biomassy arhej Thermoplasma sp. *Materialy 1-go Rossijskogo mikrobiologicheskogo kongressa.*

9. Matveeva, I. A., Gordadze, G. N. (2001). Pregnanes and cheilantanes as indicators of the geological age of oil: the example of oils from the Timan-Pechora province. *Geochemistry*,4, 455-460.

10. Lukin, A. E. (2017). Degazaciya Zemli, naftidogenez i neftegazonosnost'. *Zbirnik naukovih prac'* UkrDGRI, 1–2, 142-164.

11. Savinyh, Yu. V., Lukin, A. E., Doncov, V. V. (2010). Rol' glubinnyh flyuidov v obrazovanii mestorozhdenij nefti v kollektorah fundamenta. *Degazaciya zemli: geotektonika, geodinamika, geoflyuidy; neft' i gaz; uglevodorody i zhizn*'. GEOS, 476—478.

12. Kerimov, V. Yu., Rachinsky, M. Z., Mustaev, R. N., Osipov A. V. (2017). Groundwater dynamics forecasting criteria of oil and gas occurrences in alpine mobile belt basins. *Doklady Earth Sciences*, 476(1), 1066–1068.

13. Mustaev, R. N., Hai, W. N., Kerimov, V. Y., Leonova, E. A. (2015). Generation and Conditions Formation of Hydrocarbon Deposits in Kyulong Basin by Simulation Results Hydrocarbon Systems. In: *17th Science and Applied Research Conference on Oil and Gas Geological Exploration and Development, Geomodel*- 2015.

14. Guliev, I. S., Kerimov, V. Yu., Mustaev, R. N. (2016). Fundamental challenges of the location of oil and gas in the South Caspian basin. *Doklady Earth Sciences,* 471(1), 1109–1112.

15. Kerimov, V. Y., Rachinsky, M. Z. (2016). Geofluid dynamic concept of hydrocarbon accumulation in natural reservoirs. *Doklady Earth Sciences,* 471(1), 1123–1125.

16. Rachinsky, M. Z., Kerimov, V. Y. (2015). Fluid dynamics of oil and gas reservoirs. *MA, USA: Scrivener Publishing Wiley.*

17. Guliyev, I. S., Kerimov, V. Y., Osipov, A. V., Mustaev, R. N. (2017). Generation and accumulation of hydrocarbons at great depths under the earth's crust. *SOCAR Proceedings,* 1, 4-16.

18. Kukuruza, V. D. (2003). Geoehlektricheskie faktory v processah formirovaniya neftegazonosnosti nedr. *Monografiya. Kiev: Karbon-Ltd.*

19. Report. (2004). Geochemical and fluid analyses of well 09-3-soi-2x. *Vung Tau: JV «Vietsovpetro» – NIPImorneftegas.*

20. Report. (2004). Geochemical modeling for block 01 and 02 – Cuulong basin. *Hanoi: Vietnam Petroleum institute.*

21. Report. (2009). Geology and petroleum resources Vietnam. *Hanoi: Vietnam National Oil and Gas Group (Petrovietnam).*

22. Kerimov, V. Yu., Gordadze, G. N., Mustaev, R. N., Bondarev, A. V. (2018). Formation conditions of hydrocarbon systems on the Sakhalin shelf of the sea of okhotsk based on the geochemical studies and modeling. *Oriental Journal of Chemistry,* 34(2), 934-947.

23. Kerimov, V. Y., Leonov, M. G., Osipov, A. V., et al. (2019). Hydrocarbons in the basement of the South China Sea (Vietnam) shelf and structural -tectonic model of their formation. *Geotectonics,* 53(1), 42 -59.

24. Kerimov, V., Rachinsky, M., Mustaev, R., Serikova, U. (2018). Geothermal conditions of hydrocarbon formation in the South Caspian basin. *Iranian Journal of Earth Sciences,* 10, 78-89.

25. Kerimov, V. Y., Mustaev, R. N., Osipov, A. V. (2018). Peculiarities of hydrocarbon generation at great depths in the crust. *Doklady Earth Sciences,* 483(1), 1413 -1417.

26. Kerimov, V. Yu., Bondarev, A. V., Mustaev, R. N., Khoshtaria, V. N. (2017). Estimation of geological risks in searching and exploration of hydrocarbon deposits. *Oil Industry,* 8, 36-41.

Происхождение углеводородов месторождения «Белый Тигр» (шельф Вьетнама)

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Реферат

В статье освещены результаты геохимических исследований нефтей шельфа Вьетнама (Кыулонгский бассейн), в том числе и залегающих в кристаллическом фундаменте. Нефти месторождения «Белый Тигр», залегающие в фундаменте по распределению углеводородов ничем не отличаются от нефтей многочисленных залежей нефти в осадочных толщах олигоцена и миоцена. Аналогично всем нефтям органического происхождения мира в нефти месторождения «Белый Тигр» отсутствуют регулярные изопренаны C_{12} и C_{17} и хейлантаны (трициклические терпаны) C_{22} и C_{27}. Отличительной чертой этих нефтей являются большое количество хейлантанов C_{19}-C_{29}, большие величины отношения неоадиантана к адиантану и гопанов к стеранам. Все эти показатели свидетельствуют о большом бактериальном вкладе в генерацию этих нефтей. Проведенные исследования показали сходство биомаркерных параметров нефтей и органического вещества осадочных отложений, что подтверждает органическую природу нефтей месторождений фундамента на шельфе Вьетнама. Показано, что скопления углеводородов находятся в фундаменте Кыулонгского бассейна во вторичном залегании и источником их образования служит органическое вещество осадочных нефтематеринских комплексов олигоценового и миоценового возрастов.

Ключевые слова: «Белый Тигр»; биомаркеры; происхождение УВ; фундамент.

«Ağ Pələng» yatağının karbohidrogenlərinin mənşəyi (Vyetnam selfi)

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Xülasə

Məqalədə Vyetnam şelfinə (Kyulong hövzəsi) məxsus, o cümlədən kristallik fundamentdə yerləşən neftlərin geokimyəvi tədqiqinin nəticələrinə baxılmışdır. Karbohidrogenlərin paylanması fundamentində yerləşən «Ağ Pələng» yatağının neftləri Oliqosen və Miosenin çöküntü laylarının çoxsaylı neft yataqlarının neftlərindən heç bir şəkildə fərqlənmir. Bütün dünyadakı üzvi mənşəli neftlərdə olduğu kimi, «Ağ Pələng» yatağındakı neftlərdə də müntəzəm C_{12} və C_{17} izoprenanları və C_{22} və C_{27} xeylantanları (trisiklik terpanlar) olmur. Bu neftləri fərqləndirən xüsusiyyət C_{19}-C_{29} xeylantanlarının miqdarının çox olması, neoadiantanın adiantana və hopanların steranlara nisbətinin yüksək olmasıdır. Bütün bu göstəricilər həmin neftlərin generasiyasında bakteriyaların böyük rol oynadığını göstərir. Aparılan tədqiqatlar çöküntülərin üzvi maddələrinin və neftlərin biomarker parametrlərinin oxşar olduğunu göstərmişdir ki, bu da Vyetnam şelfindəki fundament yataqlarına məxsus neftlərin üzvi mənşəyini təsdiqləyir. Göstərilmişdir ki, karbohidrogen yığılmaları Kyulong Hövzəsinin fundamentində ikinci dəfəki yatımdır və onların əmələ gəlmə mənbəyinə Oligosen və Miosen dövrülərinə aid çöküntü ana neft komplekslərinin üzvi maddəsi xidmət göstərmişdir.

Açar sözlər: «Ağ Pələng»; biomarker; karbohidrogenin mənşəyi; fundament.