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On the Inexhaustibility of Oil Reserves (Belozerov–Sharov–Minin Hypothesis)

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Abstract—The importance of oil as the most important mineral necessary for the progress of the world economy sharply raises the question of the exhaustion or inexhaustibility of its resources. The answer to this question is closely related to ideas about the origin of oil and hydrocarbons in general. In this article, the question of the origin of hydrocarbons is considered in the light of the proposed hypothesis of the origin and evolution of the Earth as an open system genetically related to the origin of the Universe. According to this hypothesis, the processes of gravitational collapse and the opposite process expansion, including that by an explosion, coexist in unlimited space, prevailing in one or another of its areas. The original substance (core) of the Earth is a fragment of the "dark matter" of an exploding neutron star. The planet Earth has an age corresponding to that of the Big Bang (about 15 billion years). The evolution of the Earth has two stages: pregeological and geological. The beginning of the geological stage of the Earth evolution is determined by the age of the most ancient artifacts in Earth's crust. The core of the Earth emits excess neutrons, some of which decay immediately after separation from the nucleus to form a proton–electron pair or a hydrogen atom. A mixture of neutrons, protons, electrons, and nascent chemical elements is the "broth" in which chemical elements and their isotopes, as well as the simplest gases and complex compounds, are formed as a result of chaotic collisions. Neutron–proton–hydrogen (NPH) transformation, first formulated by I.M. Belozerov is the main process determining the development of the Earth. The formation of chemical elements and their isotopes occurs initially though the combination of two hydrogen nuclei into an α-particle, which is the helium nucleus and an integral part of the nuclei of chemical elements, primarily having a multiple of four. Due to the special features of their structure, hydrogen, oxygen, and carbon are of particular importance for the formation of complex compounds. In the process of synthesis of the simplest gases and complex elements, water, methane, carbon dioxide, hydrogen sulfide, and nitrous oxide are formed. The Belozerov–Sharov– Minin hypothesis proposed and this paper are not intended to intensify the discussion between advocates of the organic and inorganic hypotheses of oil origin. The paper calls for enhancing research, both theoretical and practical, aimed at increasing the source base of oil and other hydrocarbons by discovering new fields at various depths, both on land and in water areas. Oil is inexhaustible as long as neutron fluxes are emitted by the Earth core. The physical basis of the hypothesis under consideration is set out in the monograph by I.M. Belozerov "*Nature through the Physicist Eyes*" and in joint publications of the authors of the hypothesis, including data reported by other researchers. The geological rationale and the geological implications of the hypothesis are based on the results of research of the authors of this paper using information published by other researchers. References to the studies discussed in the above publications are not duplicated. On the basis of the hypothesis in question, particular recommendations on the formulation of forecasting and prospecting works can be given.

Keywords: Big Bang, neutron–proton–hydrogen (NPH) transformation, α-particle, fluids, hydrocarbons, oil

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INTRODUCTION

The question formulated in the title of the article is not only theoretical. Depending on the answer to it are the ways of development of the world economy and the world community as a whole.

The organic and inorganic hypotheses (ideas, concepts) of the origin of hydrocarbons (HCs) and, first of all, petroleum, coexist for a long time.

At present, the leading role in the practice of creating the hydrocarbon resource base is played by the idea of the organic origin of petroleum. Its main provisions are widely used in forecasting, prospecting, and exploration of hydrocarbon deposits.

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The idea of the organic origin of oil implies its formation on the basis of organic substances in the Earth crust. As a result of this process, oil migrates from localized so-called source rocks and is localized in favorable conditions for formation of deposits. The limited amount of organic matter in the crust predetermines the conclusion about the limited amount of hydrocarbons that can be formed in the crust, and about the exhaustion of their resources.

The concept of inorganic origin implies the deep origin of hydrocarbons, their continuous formation and, as a result, the inexhaustibility of resources, including oil, in the foreseeable future.

The authors of the proposed Belozerov–Sharov–Minin hypothesis are Prof. I.M. Belozerov, a staff member at the Novosibirsk branch of the State Specialized Design Institute; G.N. Sharov, a corresponding member of the Russian Academy of Natural Sciences, a research associate at the Institute of Geological and Economic Problems; and V.A. Minin, Ph.D., a staff member at the Sobolev Institute of Geology and Mineralogy, Russian Academy of Sciences (Siberian Branch). Some issues related to this hypothesis were discussed at a number of meetings devoted to petroleum geology, including periodic discussions at conferences dedicated to the memory of N.A. Kudryavtsev.

The Belozerov–Sharov–Minin hypothesis is based on the results of Belozerov's studies [1]. The hypothesis is ingenious, but it is not the only one in the Doctrine of the origin of hydrocarbons and does not claim to be called "theory."

In our opinion, the term "hypothesis" ranks below "theory" regarding certainty (validity), since theory should be more evidentiary. However, a set of 'hypotheses' forms the "paradigm" that is holding sway in the natural sciences today. The Belozerov–Sharov–Minin hypothesis is proposed as a contribution to the creation of a new paradigm corresponding to the modern level of knowledge [2]. Investigating the question posed in the title of the paper, the authors are attempting a kind of solving the direct problem, using together the knowledge accumulated in the field of physics and geology.

Each of the existing hypotheses basically has its own ideas about the phenomena underlying them. This is an accretion in the hypothesis of O.Yu. Schmidt, originally hydride Earth according to V.N. Larin [3], etc. Such a primordial phenomenon for the Belozerov–Sharov–Minin hypothesis is the concept of Big Bang, which resulted in the formation of the Milky Way star system [4].

The authors state the fact of permanent replenishment of the lithosphere, hydrosphere, and atmosphere with chemical elements and their compounds. Their replenishment is due to the influx from the depths of the Earth. At the same time, as a result of dissipation, the Earth loses hydrogen, methane, and other gases and also emits neutrons [5–7].

The interrelation of matter in the physical and chemical states is based on the process of β-decay of free neutrons and the subsequent formation of chemical elements.

The state of the art brings up the questions: what is the origin of the inexhaustible neutron flux [8] from the depths of the Earth; what is the substance that emits these neutrons; what is its origin; and what are the processes that led to the formation of the lithosphere, hydrosphere, and atmosphere around this substance.

ORIGIN OF THE EARTH

The Big Bang age is taken to be about 15 billion years. The age of the most ancient rocks (artifacts) found does not exceed 4.5 billion years. In other words, 4.5 billion years is the geological age of the Earth. Based on this finding, it is assumed that the evolution of the Earth is divided into the pregeological and geological times.

According to the Big Bang hypothesis, an object formed as a result of the gravitational collapse of preexisting matter and having a density close to the nuclear density is supposed to explode. It is assumed that this was an explosion of a neutron or neutron–baryon star.

According to the Big Bang hypothesis, the processes of gravitational collapse and the opposite process expansion, including that by the explosion, coexist in an unlimited space, prevailing in one or another area of the space.

The gravitational collapse is accompanied by the "neutronization" of matter, in which the electron shells of atoms, figuratively speaking, are "pressed" into their nuclei. In the limit, the chemical atomic form of matter in the body "fallen" on the core of the system ceases to exist and is transformed into physical "dark" matter, which becomes neutron-excessive. Today it is believed that up to 90% of all matter is in this "dark" state.

Upon "neutronization", for example, of the protium atom, the linear size of the neutron produced is smaller than that of the atom by more than five orders of magnitude, i.e. by ~200 thousand times (the volumetric size, correspondingly, by almost 16 orders of magnitude). In this case, the density of matter increases to nuclear of values 2×10^{14}–1×10^{15} g/cm^3. For this transformation, the specific energy of 0.75–0.80 MeV per nucleon is absorbed from the system [8].

The growth of neutron entities is not infinite. As the critical state of unstable equilibrium is reached, the onset of the centrifugal decompaction process of the initial neutron giant is assumed and the so-called "Big Bang" occurs.

Over time, smaller systems analogous to our Solar system are formed from the neutron "splashes" (droplets, etc.) that arise in the Big Bang and planets, their satellites, etc. are formed from even smaller fragments.

The entire initial system begins to decompress, expand, and gradually cool.

At the end of the centrifugal loosening cycle, the cooled system awaits a new development cycle, including a gradual centripetal gravitational "concentration" of matter. Next, the physicochemical form of matter is transformed into a purely physical (neutron) form again, with full observance of all the laws of conservation of matter, energy, and momentum that govern nature.

Since processes similar to the Big Bang occur not simultaneously and in an indefinitely large number in the infinite Universe, the emergence of cosmic communities like the solar system and cosmic bodies similar to the Earth is also quite likely [9].

The core of the Earth, therefore, according to the proposed hypothesis, is a fragment of an exploded neutron star, which is a dark matter that constantly emits free neutrons.

EVOLUTION OF THE EARTH IN PREGEOLOGICAL TIME

The dark matter fragment that became the core of the future Earth is a powerful source of neutron radiation. The β-decay of a certain amount of neutrons occurs immediately upon separation from the Earth core; and part of neutrons is emitted into space. This process is continuous and continues in the present, already geological time of the Earth evolution.

The pregeological time of the existence of the Earth ends with the beginning of the formation of its solid shell (lithosphere).

The neutron is known to be stable only in the nuclei of chemical elements or in matter in a state of collapse. In its free form, it decays to form a proton and an electron. The half-life is about 15 to 16 min on average. It is on average indeed, since free neutrons do not decay simultaneously.

The hypothesis in question explains the origin of hydrogen both in the Earth's interior and in the Universe as a whole by its formation via the β-decay of neutrons [10]. The conversion of neutrons during β-decay into protons and electrons and further into hydrogen is accompanied by a significant release of energy, an enormous increase in volume, and a drastic change in the physicochemical situation in the environment.

The so-called "broth" consisting of protons, electrons, neutrons, hydrogen, and newly formed chemical elements and their isotopes is formed on the surface of the planet's core. The peculiarity of the "broth" in the nuclear-physical "cauldron" is the simultaneous existence of not only neutrons that have not been disintegrated, but also protons and electrons and hydrogen atoms. All of them are involved in the synthesis of chemical elements.

At the initial stage, α-particles, which are ultrastrong nuclei (ions) of the chemical element helium (^{4}He) consisting of 2 protons and 2 neutrons and possess an enormous specific binding energy of 28.11 MeV (7.03 MeV per nucleon), "maturate" in the neutron–proton (nucleon) broth. In addition to absorbing huge amounts of energy, this process leads to an almost twofold decrease in pressure (two volumes of hydrogen ions are converted into one volume of helium ions).

At the next stage of the nuclear physical synthesis, the resulting ultrastrong α-particles, as independent particles, enter into nuclei of a significant number of other chemical elements generated, also contributing to a decrease in volume (pressure) and temperature of the medium. These nuclei, first of all, are those of chemical elements with an atomic mass of multiple of four. They include chemical elements that are very common on the Earth, such as carbon (^{12}C) and oxygen (^{16}O).

In the same nuclear physical "cauldron", depending on the actual ratio of nucleons (parent neutrons and daughter protons), various isotopes are also generated (with different numbers of neutrons in the nuclei of chemical elements), including radionuclides with different times of their existence (so-called half-life).

This is a representation of the nuclear physical mechanism for the generation of chemical elements in the neutron–proton "broth." Note that not only chemical elements are formed in the nuclear physical "cauldron", but also their chemical compounds, including oxides, hydrides, and other more complex entities, often and most importantly such as coordination compounds.

The interaction of hydrogen with oxygen leads to the formation of juvenile water, which, in particular, is included in hydration shells and other hydrogen-containing complexes (e.g., carbonic acid H_2CO_3, resulting ultimately in the formation of carbonates and bicarbonates). The interaction of hydrogen with carbon leads to the formation of a huge class of hydrocarbon compounds with very different physicochemical properties.

An essential feature of hydrogen and carbon is polyvalence, which is due to the peculiar structure and, hence, properties of the outer electron shells of the atoms. So, the hydrogen atom can donate or accept only one electron on the outer shell, exhibiting two valences (+1) and (−1), whereas the carbon atom is able to donate or accept up to four electrons on the outer shell, manifesting up to eight different valences from (+4) to (−4), thus forming double and triple carbon–carbon bonds. It is this property that explains the possibility of the formation of a practically infinite number of hydrocarbon compounds, including both

linear and cyclic ones, with different physicochemical properties.

At the cooling periphery of the "broth", the primordial lithosphere was formed, which was saturated with primordial gases and with water that carried the newly formed chemical elements and their compounds.

Being electrically neutral and having extremely small dimensions and enormous energy, the neutron can move almost freely (except for head-on collisions) in any space at a considerable velocity.

Simultaneously with the formation of new and new portions of solid, liquid, and gaseous matter in the "broth", neutrons passing through the crust decay in it to form hydrogen. In connection with this, the volume of the crust and the internal pressure of gases in the interior of the Earth, directed from its center, are growing. The process of increasing the crustal thickness still continues and will continue until the neutron flux emitted by the neutron-rich core of the Earth is exhausted.

These phenomena result in "cracking" of the crust to form rifts, plumes, magma chambers, volcanism, etc.

EVOLUTION OF THE EARTH IN GEOLOGICAL TIME

The geological time of the Earth's existence begins with the formation of a solid lithosphere on the cooling periphery, increasing with an increase in the "broth" thickness. It is the "broth" layer having the properties of a substance in a liquid state that is detected as the external core by geophysical studies.

Primary solid entities were either processed or not available for observation.

Due to the peculiarities of their structure and behavior in chemical reactions, hydrogen, carbon, and oxygen have played a leading role in the formation of the earth crust.

In the geological stage of the earth crust, there is a constant increase in its thickness due to the processes occurring at the core boundary and in the "broth" as a result of the β-decay of neutrons penetrating into the lithosphere. The expansion of the Earth and the emergence of rifts led to the formation of more stable differences (the bases of the continents) and constantly expanding newly formed areas (the bases of the oceans). This process continues, as evidenced by the so-called continental rifts, for example, the Baikal rift. Primordial or simplest gases, methane and its homologues, water with gases, salts, and coordination compounds dissolved in it constantly enter into the crust.

Permeating through the crust, the gases become the basis of the primary atmosphere of the Earth.

Accumulating on the crust surface, water formed the hydrosphere. In the form of various solutions, elements of deep genesis are carried over together with water and accumulate in oceanic waters and rocks composing the crust.

When the pressure of gases in the lower crust or other horizons of the lithosphere became critical, they broke through to the surface, forming explosion tubes carrying kimberlite or carbonatite melts. At present, such accumulations of gases (primarily methane) under the permafrost layer also form explosion tubes, in the craters of which, in turn, rounded lake bowls are formed [11].

In cases of occurrence of slitlike splits of the crust, magma effusions may form (for example, African Dike, traps).

The foci of magmatism are formed at different depths; rocks of different compositions undergo melting under varying *PT* conditions involving various components coming from the "broth."

The formation and accumulation of sedimentary rocks took place in various water basins. These are, first of all, carbonates and other salts (salt domes, the Dead Sea, Kara-Bogaz-gol), as well as gases such as hydrogen sulfide (the Black Sea).

During the geological time of the Earth evolution, the parameters changed, including the chemical composition of the atmosphere, hydrosphere, and lithosphere of the Earth. These changes are discrete in nature, tending to become more complex. Discreteness is confirmed by periodic disaster phenomena associated with critical accumulation of gases under and inside the lithosphere [12].

According to the information, in particular, in a number of official authoritative sources (encyclopedias, reference books, etc.), the total mass of gases in Earth's geospheres (hydrogen H_2; carbon dioxide CO_2; other acid gases H_2S, HCl, HF, CO; etc.) increases in the direction toward the center of the planet. At the same time, the mass (quantity), in particular, of saturated hydrocarbons (methane CH_4 and its homologues) and other hydrocarbon compounds, in contrast, increases markedly as it approaches the surface of the planet.

The evolution of the lithosphere tends to be more complex. Living matter, being a product of this evolution, also develops toward complexity.

It is assumed that life originated in the primordial ocean. Modern sources in the ocean bring to the surface of the lithosphere primary gases, chemical substances, including coordination compounds, that are the closest in composition to those formed directly in the "broth." Temperature conditions near such sources seem to be close to the conditions in which the most ancient protoorganisms were born. Currently, so-called bacterial mats are being formed near modern sources.

The simplest organisms gave two main branches: flora and fauna.

From the remnants of large plant organisms, the most ancient coals (liptobiolithic coal, locally known as Barzas matting, of the Kuznetsk coal basin) formed. In modern oceans, it is algae of the Sargasso Sea.

All coal basins: Kuzbas, Donbas, South Yakutia coal deposits, San Juan, Western Siberia, etc., were formed in active carbon inflow zones, that is, above the most permeable lithosphere structures: To form thick coal seams, long-term carbon inflow was required. These conditions are characterized by spatial alignment of coal, oil, and natural gas deposits [13, 14]. An example can be the San Juan basin. At present, this is the equatorial zone of the Earth with tropical vegetation. Plant gigantism is observed in zones of intensive modern degassing of the Earth [15].

Within the crust, hydrocarbon compounds became more complex with the formation of oils.

All these processes, including the formation of oil, are ongoing. This is evidenced by the restoration of oil reserves in some producing oilfields (for example, the Absheron field). Penetration of mobile substances to the surface occurs primarily through channels where it is the easiest. These are rifts, blast tubes, including diamond-bearing ones (for example, the Udachnaya tube, where gases exploded recently), and crust stretching zones.

During migration, hydrocarbons are easily sorbed when meet carbon-rich formations (coals, carbonaceous shales) and form so-called coal seam gas, shale oil, and source rocks. In the same way, drip oil is formed in carbonates, even in folded areas. Of course, hydrocarbon deposits in the changing natural environment in the crust can change their position, moving not only vertically, but also laterally.

CONCLUSIONS

Hydrocarbons, including oil, are a natural product formed in the Earth evolution process.

Neutron–proton–hydrogen (NPH) transformation on the surface of the neutron-excess core of the Earth is the process by which the Earth lithosphere, hydrosphere, and atmosphere were formed. It is this conversion that originally played the main role in the creation of chemical elements and their compounds including hydrocarbons.

The so-called source rocks are in fact rocks with a structure and composition that facilitate the absorption and accumulation of hydrocarbons, including porous rocks, coal, shale, and peat.

In addition to well-studied typical deposits in various traps, the source rocks themselves are considered as an industrial source of hydrocarbons in some cases. These are shale oil and coal seam methane. Carbonaceous shales and coals are an excellent HC absorbent. Based on the example of the Bazhenovo formation in his speeches at the Kudryavtsev Readings, G.N. Sharov emphasized that the Bazhenovo formation is not productive throughout, but only in those cases when it is transformed by deep fluids. This also applies to shale oil and gas-bearing coals.

A mandatory condition for the formation of ascending flows of deep fluids is the presence of zones of increased permeability of the lithosphere, which occurs in the process of increasing its thickness, the formation of rifts, and explosion tubes in the expanding Earth. The presence of high permeability zones is a predictive search criterion for hydrocarbon fields.

In various geological periods of the Earth's evolution, the influx of deep-seated matter was accompanied by the formation of vegetation on the lithosphere surface, which became a material in the aquatic environment for algal coals (bigheads, Barzas matting) and coal deposits in well-known coal-bearing areas such as Kuzbas, Donbas, South Yakutia, San Juan, etc. All of them were formed in areas of carbon-rich fluid flow, which is the main building material for vegetation.

The presence of lush vegetation, signs of gigantism of plants, both in the past and today, is the second forecasting and exploratory criterion for hydrocarbon deposits.

The third forecasting and search criterion is the presence of reefs in the oceans, direct outflows (as on the continents), asphalts, and gas emissions including methane both in water bodies and on the continents.

REFERENCES

1. I. M. Belozerov, *Nature through Physicist Eyes* (Tomskii Politekhnicheskii Univ., Tomsk, 2013) [in Russian].
2. I. M. Belozerov, G. N. Sharov, and V. A. Minin, in *Proceedings of X International Conference on New Ideas in Earth Sciences* (RGGRU Imeni Ordzhonikidze, Moscow, 2011), Vol. 1, p. 12 [in Russian].
3. V. N. Larin, *Our Earth: Origin, Constitution, Structure, and Development of the Primordially Hydride Earth* (Agar, Moscow, 2005) [in Russian].
4. I. M. Belozerov, V. A. Minin, and G. N. Sharov, in *Proceedings of the 5th All-Russia Symposium on Volcanology and Paleovolcanology* (IGiG UrO RAN, Yekaterinburg, 2011), p. 10 [in Russian].
5. V. V. Adushkin and V. P. Kudryavtsev, Izv. Akad. Nauk, Ser. Fiz. Atm. Okeana **49**, 144 2013).
6. N. N. Volodichev, B. M. Kuzhevskii, O. Yu. Nechaev, and E. A. Sigaeva, Vestn. Mosk. Univ., Ser. 3: Fiz. Astron., No. 5, 69 (2002).
7. I. M. Belozerov, E. A. Kozlovskii, V. A. Minin, et al., in *Proceedings of All-Russia Conference on Abyssal Genesis of Petroleum: The 1st Kudryavtsev Conference (KC-1), October 22–25, 2012, Moscow* (TsGE, Moscow, 2013) p. 9 [in Russian].
8. I. M. Belozerov, L. N. Mezentsev, V. A. Minin, and V. N. Mit'kin, in *Proceedings of International Conference in Memory of V.E. Khain on the Current State of Earth Sciences, February 1–4, 2011* (Geologicheskii Fakul'tet MGU, Moscow, 2011), p. 211 [in Russian].
9. A. A. Kuznetsov, in *Proceedings of International Conference on Earth Degasation: Geofluids, Oil and Gas, and*

Paragenesis in the Fossil Fuel System, October 18–22, 2010 (GEOS, Moscow, 2010), p. 268 [in Russian].

10. G. I. Gritsko, I. M. Belozerov, V. A. Minin, et al., in *Proceedings of Conference on Geodynamics and Stressed State of Earth Interiors, October 5–9, 2015* (IGD Imeni N.A. Chinakala SO RAN, Novosibirsk), p. 8 [in Russian].
11. N. V. Larin, V. N. Larin, and A. V. Gorbatikov, in *Proceedings of International Conference on Earth Degasation: Geofluids, Oil and Gas, and Paragenesis in the Fossil Fuel System, October 18–22, 2010* (GEOS, Moscow, 2010), p. 284 [in Russian].
12. V. L. Syvorotkin, *Abyssal Earth Degasation and Global Disasters* (Geoinformtsentr, Moscow, 2002) [in Russian].
13. V. I. Vyalov, in *Proceedings of International Conference on Earth Degasation: Geofluids, Oil and Gas, and Paragenesis in the Fossil Fuel System, May 30–June 1, 2006* (GEOS, Moscow, 2006), p. 79 [in Russian].
14. Yu. I. Pikovskii, in *Proceedings of International Conference on Earth Degasation: Geofluids, Oil and Gas, and Paragenesis in the Fossil Fuel System, May 30–June 1, 2006* (GEOS, Moscow, 2006), p. 209 [in Russian].
15. V. I. Bgatov, N. M. Kuzhel'nyi, N. A. Lizalek, and N. V. Shalamov, in *Proceedings of International Conference on Earth Degasation: Geofluids, Oil and Gas, and Paragenesis in the Fossil Fuel System, May 30–June 1, 2006* (GEOS, Moscow, 2006), p. 46 [in Russian].

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