(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 595 937 A1

(12) EUROPEAN PATENT APPLICATION
published in accordance with Art. 158(3) EPC

(43) Date of publication:
16.11.2005 Bulletin 2005/46

(21) Application number: **03750181.4**

(22) Date of filing: **29.09.2003**

(51) Int Cl.[7]: **C10G 1/00**, C10L 3/08

(86) International application number:
PCT/BY2003/000010

(87) International publication number:
WO 2004/063311 (29.07.2004 Gazette 2004/31)

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(30) Priority: **16.01.2003 BY 20030033**

(71) Applicant: **Veraksa, Ivan Grigorievich**
Soligorsk, Minskaya obl., 223710 (BY)

(72) Inventor: **Veraksa, Ivan Grigorievich**
Soligorsk, Minskaya obl., 223710 (BY)

(74) Representative: **von Füner, Nicolai**
v. Füner Ebbinghaus Finck Hano
Patentanwälte
Mariahilfplatz 2&3
81541 München (DE)

(54) METHOD FOR IN SITU FORMATION OF ARTIFICIAL HYDROCARBON FUEL FROM ORGANIC-FREE DRY BLACK EARTH, BLACK CHALES AND DARK-GREY MARLS

(57) The invention relates to the fuel-producing industry, more specifically to the oil and gas industry and can be used for artificially forming a hydrocarbon fuel in bottom sediments. The aim of said invention is to provide the humanity with a novel method for forming artificial fuel. The earth shell contains 5.8 % iron. Iron oxides (III) are contained in oxygen-rich soils of the earth surface. The earth surface is transformed into mountains or sunken by tectonic forces, whereby placing iron (III) in low-oxygen areas where it is transformed into iron (II) When water is introduces in such an area through a well chemical reactions including the transformation of iron (III) into iron (II) are initiated. A main reaction is carried out according to a formula:

$$8FeO+CaCO_3 +15H_2O \rightarrow 4(Fe_2O_3 \bullet 3H2O) + Ca(OH_2) +CH_4\uparrow$$

The final stage of a hydrocarbon fuel formation in terms of ion is expressed as follows:

$$CO_3^{2-} + 3H_2O \rightarrow CH_4\uparrow+2OH^-+2O_2$$

The inventive method for forming and accumulating the hydrocarbon fuel in situ technologically varies according to a geological state of formations. Said fuel can be formed and accumulated under hermetic rock salt layers which are not damaged by tectonic forces and under undamaged natural protective areas in the form of a chalk deposit whose layers are cemented by sandstone nature. In places where the natural protection areas are damaged by tectonic forces, the fuel is formed and accumulated by the formation of an artificial cover on the Earth surface.

EP 1 595 937 A1

Description

[0001] The invention relates to fuel-producing industry, in particular to oil and gas industry and can be used for artificially forming of a hydrocarbon fuel from dry black earth, black chales and dark grey marls formed as bottom sand-chalk sediments and which are organic-free.

[0002] It is known that during of millions of years the Earth surface placed above the sea level can be sunken at depths of many kilometres underneath the surface or raised up forming mountains due to tectonic Earth forces. If the Earth surface placed above sea surface has collected many organic materials and then has sunken at great depths, the organic materials, which are contained in rocks up to 30%, under the influence of many natural factors are transformed in oil and gases [1-3]. At the initial stage of the natural formation of hydrocarbon fuel from organic material, e. g. from the pressure at a depth of 2800 m, when some conditions for an independent natural process are missing (e. g. impermeability), people try to create these conditions due to a purposeful search of impermeable areas and then artificially form hydrocarbon fuel due to injection of a compound medium into the formation zone, thereby initiating the beginning of the chemical reaction of fuel formation [1,2].

[0003] A disadvantage of this method of the artificial hydrocarbon fuel formation is that this method is based on the reserves of organic materials already concentrated and collected in bitumized clays and sands, shale oils and bogenites. These rocks are placed at great depths and are as if prepared by nature for the hydrocarbon fuel formation. People only accelerate the natural process of hydrocarbon fuel delivery. Moreover, this method requires natural underground sealed depots for the fuel to be formed, which are not enough presented in the nature for fuel formation from organic materials. People have not yet learned to form the underground sealed depots for the artificial formed hydrocarbon fuel obtained from the organic materials [2].

[0004] The object of the proposed invention is to provide the humanity with another method for formation of artificial hydrocarbon fuel, wherein this method is based not on the already formed organic materials with high hydrocarbons content in a rock, but on other natural phenomena of the planet Earth of transformation of inorganic compounds into organic ones. It is known that the sun by its radiation continuously supplies the Earth with energy at a rate of 1,36 kW/m^2 in high layers of the atmosphere, that amounts to 175 trillion kW on the Earth projection. According to Coulon's law a charge of one solid, e.g. the sun, exerts influence on a charge of another solid, e.g. the Earth, with a force in direct proportion to the quantity of their charges. In order to provide the Earth with its electric charge, the nature has taken care of that the most part of the radiation and heat energy is transformed by the sand, more specifically by the complex compound of silicon dioxide and metal oxides, thereby the latter fulfils have the function of electron donors and provide for the transformation of the radiation and heat energy of the sun into electricity. The main metal in such transformation is iron. According to the last update of the US Geology Service the percentage of iron with respect to the whole Earth crust mass amounts to 5,8%. The complex compound of silicium is the ordinary sand which is red-coloured in case of a small contents of iron and has dark-red clay colour in case of a percentage amounting to 15-20%. Iron is an obligatory element on the planet Earth according to the law of the Universe for interconnection of planets with each other. On the very surface of the earth and in an area containing a lot of oxygen, e.g. in the moist sand, iron is chemically stable only in the form of iron (III). It is contained in such minerals as magnetite Fe_3O_4, haematite Fe_2O_3, brown iron-ore - limonite $2Fe_2O_3 \cdot 3H_2O$. Part of the sun radiation energy at a power rate of 175 trill. kW is transformed into gelioelectricity and goes into the superconductivity Moho-layer situated at a depth of 24-45 km underneath the surface between the Earth mantle and the Earth crust. Moving ahead on layers of the Earth rocks this electricity creates the effect of a linear electric motor. Due to this effect the whole crust of the Earth is splitted into tectonic plates having different speeds of movement, and thus, the Earth crust is continuously moving in horizontal and vertical directions invisibly for a human eye. So, rock profiles in a well at a depth of 1000 m underneath the surface. It is said that the ground surface in the valley of the river Pripjat (Republic of Byelorussia) has raised and sunken with respect to the sea level 27 times during the last extended period of time. During a regular ground surface sinking iron (III), which was placed in sand on the Earth surface in a high oxygen percentage zone, has been moved to a zone, in which the oxygen percentage is decreasing. Since above it a sea had appeared and this sea has formed chalk sediments which are good sealing materials against moisture penetration into the lower layers, where sands with iron (III) are located now. In such a zone with the reduced oxygen percentage minerals containing iron (III) are transformed in iron (II) [3, page 117] - $FeCO_3$; FeO; FeS etc., where siderite $FeCO_3$ of the white colour is placed in dolomites, marls, and FeO has the black colour and paints everything and dry earth in black. The grade of blackness of the bottom sediments characterizes the degree of iron (II) - FeO saturation. All bottom sediments comprising dolomite, marl, argelite, dry black earth are basically carbonate and silica sediments with different percentages of these elements depending on the rock name. If in a zone with a low oxygen percentage and containing iron (II) a medium with a high oxygen percentage, i.e. the water, is injected, a transformation from iron (III) to iron (II) will begin. Bottom sediments consist of some said sediments and comprise different chemical elements. If water is supplied into such environment, different chemical reactions will occur in many directions, thereby forming small quantities of gases. This is confirmed by the analysis of gas samples taken in a shaft in a zone of black dry earth. The main chemical element taking part in this difficult reaction is iron (II) delivering the

fuel. The main reaction in which iron (II) takes part happens according to the following formula in the molecular form:

$$8FeO + CaCO_3 + 15H_2O \rightarrow 4(Fe_2O_3 \cdot 3H_2O) + Ca(OH_2)\downarrow + CH_4\uparrow$$

[0005] In an aqueous medium in which iron (II) takes part, occurs a carbon reduction process from CO_3^2 and hydrogen reduction process from H_2O to hydrocarbons. Thereby, released oxygen reacts with iron (II) and produces iron (III). For the producion of one mole of CH_4 only 3 moles of H_2O are expended, and 12 moles of H_2O are part of limonite ($4Fe_2O_3 \cdot 3H_2O$). The final stage of the hydrocarbon fuel formation on the ion level is:

$$CO_3^{2} + 3H_2O \rightarrow CH_4\uparrow + 2OH^{-} + 2O_2$$

[0006] As end products not only CH_4 but also a wide scale of hydrocarbons can be produced.

[0007] The set aim when forming artificial hydrocarbon fuel form organic-free dry black earth, black chales and dark grey marls in places of their deposition with an average statistical percentage of iron of 5,8% is achieved by supply of calculated water quantity into the deposition beds of these rocks and depending on the features of geological deposition beds the method of formation of artificial hydrocarbon fuel has technological distinctions. Thus, if underneath the water-bearing sand bed of the upper layer of the ground surface a chalk bed is located having good sealing properties, and if underneath this bed a sandstone bed is located cemented by carbonates and iron and these are not damaged by the tectonic forces, then chalk and cemented sandstone practically fully separate the water-bearing bed from the laminated sediments, which is confirmed by the presence of iron (II) in sediments and by the experience in the extraction of potassium ores in the zone of these beds. This bed will hold the gases and allow to direct the gas to the desired direction for its collection. The method of formation of artificially hydrocarbon fuel on the bottom sediment of the valley of the river Pripjat is presented on Fig.1 as an example with a well having a depth of 1000 m. Underneath a sand bed 1 a chalk bed 2 and a sandstone bed 3 is placed cemented by carbonates and iron. Further placed are multibed sediments of dolomite, marl, black chales and black dry earth 4. Salt sediments 5 alternate with bottom sediments 6. In order to receive the fuel by a pump 7, water is injected through the borehole 8 in a bed and is distributed by a wash-out device 9 in the bed to the well intended for release of gases 10 through a collecting device 11. A receiving device 12 receives the gases. The gases will enter the receiving device 11 as the salt bed is not damaged by the tectonic forces and, therefore, is sealed against losses. During the transformation of iron (III) into iron (II) a partially intermediate transformation state is formed in form of ferriferous gels of different colours is formed. The gels do not require great volumes in the bed. After the completion of the transformation the gels will dry out and the rock layer will have micro pores between the layers, which assists water to penetrate into the layer. To form the fuel is not only possible by pumping the water through the bed by means of a central well 8 and periphery wells 10 for gas collection, but also by means of a single well 13. Water is injected in the well 13 by a pump 14 up to the determinated pressure value and then the injection is stopped. When the pressure exceeds the planned rate of the iron transformation reaction, a safety valve will be opened and the gas will exit in the receiving device 12. Such cycles are repeated periodically. As a sealing material preventing the free and uncontrolled exit of the gas to the ground surface, which are formed in the bottom sediments placed in the upper salt beds, cemented sandstone 3 and chalk sediments 2 can be used. If the chalk sealing bed 2, the sandstone 3 and the salt beds are damaged by tectonic forces and earthquakes and the lower bottom sediments contain a lot of iron (II), the gases forming by the water injection can be collected due to the placing of a film cover below the productive layer (Fig. I-I).

[0008] Since the volume of the expected gases is calculated in dependency on the iron (II) percentage in the rock and on the bed thickness, the whole ground surface of the collecting place can be sealed by placing a sealing material 16 on the plane ground surface during the collection time. Tectonic forces of the Earth can sink the bottom sediments with iron (II) not only to a depth of 1 to 2 km., but also to a depth of 5 to 7 km. The technology of the formation of artificially hydrocarbon fuel in such depths is the same.

Bibliographic data.

[0009] 1. Nesterov I.I., "Artificial formation of oil and gas deposits"; Vestnik RAN, 1994, vol. 64, No. 2, pages 115-127, Prototype.

[0010] 2. Nesterov I.I., "Oil of black shales"; Oil and gas 97/5, pages 46-52. Prototype.

[0011] 3. Skinner B.; "Are the resources of the Earth enough for the mankind?", "Mir", 1989.

Claims

1. Method for in situ formation of artificial hydrocarbon fuel from organic-free dry black earth, black chales and dark grey marls in places of their deposition, comprising well-boring and injection of water into beds **characterized in that**
calculated quantity of water is injected into organic-free bottom sediment beds with reduced oxygen content and with iron (II) to convert iron (II) into iron (III), and
due to this reaction artificial hydrocarbon fuel is obtained which is formed and accumulated at fuel collecting places due to natural sealing materials in the form of rock salt undamaged through tectonic forces, natural sealing material in form of chalk deposits and sandstone cemented by nature, and also due to formation of an artificial cover on the ground surface in places where the natural sealing material is damaged by tectonic forces.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/BY 2003/000010

A. CLASSIFICATION OF SUBJECT MATTER

C10G 1/00, C10L 3/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C10G 1/00, C10L 3/08, E21B 43/27, 56A

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Gurevich I.L., Tekhnologiya pererabotki nefti i gaza. Obschie svoistva i pervichnye metody pererabotki nefti i gaza, ch. 1, izdanie 3, Khimya, Moscow, 1972, str. 17	1
Y	Khimia nefti i gaza, pod ped. Proskuryakova V.A. et al., Khimya, Leningrad, 1981, pages 27-28	1
A	RU 2102591 C1 (KURTOV BENIAMIN DMITRIEVICH) 20.01.1998 pages 7-8 (on line)(naideno 2003-12-15). Naideno iz rossiscoy bazy dannykh RUPAT.	1
A	GB 296536 (STANDARD DEVELOPMENT COMPANY) Sept. 6, 1928	1

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
16 December 2003 (16.12.2003)	15 January 2004 (15.01.2004)
Name and mailing address of the ISA/ RU Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)