

ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫ
Satbayev University

Х А Б А Р Л А Р Ы

ИЗВЕСТИЯ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН
Satbayev University

N E W S

OF THE ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN
Satbayev University

SERIES
OF GEOLOGY AND TECHNICAL SCIENCES

1 (451)

JANUARY – FEBRUARY 2022

THE JOURNAL WAS FOUNDED IN 1940

PUBLISHED 6 TIMES A YEAR

ALMATY, NAS RK

NAS RK is pleased to announce that News of NAS RK. Series of geology and technical sciences scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of News of NAS RK. Series of geology and technical sciences in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential content of geology and engineering sciences to our community.

Қазақстан Республикасы Ұлттық ғылым академиясы «ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы» ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Web of Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді геология және техникалық ғылымдар бойынша контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Известия НАН РК. Серия геологии и технических наук» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Известия НАН РК. Серия геологии и технических наук в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному контенту по геологии и техническим наукам для нашего сообщества.

Бас редактор

ЖҰРЫНОВ Мұрат Жұрынұлы, химия ғылымдарының докторы, профессор, ҚР ҰҒА академигі, Қазақстан Республикасы Ұлттық Ғылым академиясының президенті, АҚ «Д.В. Сокольский атындағы отын, катализ және электрохимия институтының» бас директоры (Алматы, Қазақстан) Н = 4

Редакциялық алқа:

ЖӘРМЕНОВ Әбдірәсіл Алдашұлы, техника ғылымдарының докторы, профессор, ҚР ҰҒА академигі, ҚР минералдық шикізатты кешенді қайта өңдеу жөніндегі Ұлттық орталығының бас директоры (Алматы, Қазақстан) Н = 4

КҮЛДЕЕВ Ержан Итеменұлы, геология-минералогия ғылымдарының кандидаты, қауымдастырылған профессор, Қ.И. Сатпаев атындағы ҚазҰТЗУ Корпоративтік даму жөніндегі проректоры, (Алматы, Қазақстан) Н = 3

ӘБСАМЕТОВ Мәліс Құдысұлы, геология-минералогия ғылымдарының докторы, профессор, ҚР ҰҒА академигі, «У.М. Ахмедсафина атындағы гидрогеология және геоэкология институтының» директоры (Алматы, Қазақстан) Н = 2

ЖОЛТАЕВ Герой Жолтайұлы, геология-минералогия ғылымдарының докторы, профессор, Қ.И. Сатпаев атындағы геология ғылымдары институтының директоры (Алматы, Қазақстан) Н=2

СНОУ Дэниел, Ph.D, қауымдастырылған профессор, Небраска университетінің Су ғылымдары зертханасының директоры (Небраска штаты, АҚШ) Н = 32

ЗЕЛЬТМАН Реймар, Ph.D, табиғи тарих мұражайының Жер туралы ғылымдар бөлімінде петрология және пайдалы қазбалар кен орындары саласындағы зерттеулердің жетекшісі (Лондон, Англия) Н = 37

ПАНФИЛОВ Михаил Борисович, техника ғылымдарының докторы, Нанси университетінің профессоры (Нанси, Франция) Н=15

ШЕН Пин, Ph.D, Қытай геологиялық қоғамының тау геологиясы комитеті директорының орынбасары, Американдық экономикалық геологтар қауымдастығының мүшесі (Пекин, Қытай) Н = 25

ФИШЕР Аксель, Ph.D, Дрезден техникалық университетінің қауымдастырылған профессоры (Дрезден, Берлин) Н = 6

КОНТОРОВИЧ Алексей Эмильевич, геология-минералогия ғылымдарының докторы, профессор, РҒА академигі, А.А. Трофимука атындағы мұнай-газ геологиясы және геофизика институты (Новосибирск, Ресей) Н = 19

АБСАДЫКОВ Бахыт Нарикбайұлы, техника ғылымдарының докторы, профессор, ҚР ҰҒА корреспондент-мүшесі, А.Б. Бектұров атындағы химия ғылымдары институты (Алматы, Қазақстан) Н = 5

АГАБЕКОВ Владимир Енокович, химия ғылымдарының докторы, Беларусь ҰҒА академигі, Жаңа материалдар химиясы институтының құрметті директоры (Минск, Беларусь) Н = 13

КАТАЛИН Стефан, Ph.D, Дрезден техникалық университетінің қауымдастырылған профессоры (Дрезден, Берлин) Н = 20

СЕЙТМҰРАТОВА Элеонора Юсуповна, геология-минералогия ғылымдарының докторы, профессор, ҚР ҰҒА корреспондент-мүшесі, Қ.И. Сатпаев атындағы Геология ғылымдары институты зертханасының меңгерушісі (Алматы, Қазақстан) Н=11

САҒЫНТАЕВ Жанай, Ph.D, қауымдастырылған профессор, Назарбаев университеті (Нұр-Сұлтан, Қазақстан) Н = 11

ФРАТТИНИ Паоло, Ph.D, Бикокк Милан университеті қауымдастырылған профессоры (Милан, Италия) Н = 28

«ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы».

ISSN 2518-170X (Online),

ISSN 2224-5278 (Print)

Меншіктеуші: «Қазақстан Республикасының Ұлттық ғылым академиясы» РҚБ (Алматы қ.).

Қазақстан Республикасының Ақпарат және қоғамдық даму министрлігінің Ақпарат комитетінде 29.07.2020 ж. берілген № **KZ39VPY00025420** мерзімдік басылым тіркеуіне қойылу туралы куәлік.

Тақырыптық бағыты: *геология, мұнай және газды өңдеудің химиялық технологиялары, мұнай химиясы, металдарды алу және олардың қосындыларының технологиясы.*

Мерзімділігі: жылына 6 рет.

Тиражы: 300 дана.

Редакцияның мекен-жайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., тел.: 272-13-19

<http://www.geolog-technical.kz/index.php/en/>

© Қазақстан Республикасының Ұлттық ғылым академиясы, 2022

Типографияның мекен-жайы: «Аруна» ЖК, Алматы қ., Мұратбаев көш., 75.

Главный редактор

ЖУРИНОВ Мурат Журинович, доктор химических наук, профессор, академик НАН РК, президент Национальной академии наук Республики Казахстан, генеральный директор АО «Институт топлива, катализа и электрохимии им. Д.В. Сокольского» (Алматы, Казахстан) Н = 4

Редакционная коллегия:

ЖАРМЕНОВ Абдурасул Алдашевич, доктор технических наук, профессор, академик НАН РК, генеральный директор Национального центра по комплексной переработке минерального сырья РК (Алматы, Казахстан) Н= 4

КУЛЬДЕЕВ Ержан Итеменович, кандидат геолого-минералогических наук, ассоциированный профессор, проректор по корпоративному развитию КазННТУ им. К.И. Сатпаева (Алматы, Казахстан) Н = 3

АБСАМЕТОВ Малис Кудысович, доктор геолого-минералогических наук, профессор, академик НАН РК, директор Института гидрогеологии и геоэкологии им. У.М. Ахмедсафина (Алматы, Казахстан) Н = 2

ЖОЛТАЕВ Герой Жолтаевич, доктор геолого-минералогических наук, профессор, директор Института геологических наук им. К.И.Сатпаева (Алматы, Казахстан) Н=2

СНОУ Дэниел, Ph.D, ассоциированный профессор, директор Лаборатории водных наук университета Небраски (штат Небраска, США) Н = 32

ЗЕЛЬТМАН Реймар, Ph.D, руководитель исследований в области петрологии и месторождений полезных ископаемых в Отделе наук о Земле Музея естественной истории (Лондон, Англия) Н = 37

ПАНФИЛОВ Михаил Борисович, доктор технических наук, профессор Университета Нанси (Нанси, Франция) Н=15

ШЕН Пин, Ph.D, заместитель директора Комитета по горной геологии Китайского геологического общества, член Американской ассоциации экономических геологов (Пекин, Китай) Н = 25

ФИШЕР Аксель, ассоциированный профессор, Ph.D, технический университет Дрезден (Дрезден, Берлин) Н = 6

КОНТОРОВИЧ Алексей Эмильевич, доктор геолого-минералогических наук, профессор, академик РАН, Институт нефтегазовой геологии и геофизики им. А.А. Трофимука СО РАН (Новосибирск, Россия) Н = 19

АБСАДЫКОВ Бахыт Нарикбаевич, доктор технических наук, профессор, член-корреспондент НАН РК, Институт химических наук им. А.Б. Бектурова (Алматы, Казахстан) Н = 5

АГАБЕКОВ Владимир Енокович, доктор химических наук, академик НАН Беларуси, почетный директор Института химии новых материалов (Минск, Беларусь) Н = 13

КАТАЛИН Стефан, Ph.D, ассоциированный профессор, Технический университет (Дрезден, Берлин) Н = 20

СЕЙТМУРАТОВА Элеонора Юсуповна, доктор геолого-минералогических наук, профессор, член-корреспондент НАН РК, заведующая лабораторией Института геологических наук им. К.И. Сатпаева (Алматы, Казахстан) Н=11

САГИНТАЕВ Жанай, Ph.D, ассоциированный профессор, Назарбаев университет (Нурсултан, Казахстан) Н = 11

ФРАТТИНИ Паоло, Ph.D, ассоциированный профессор, Миланский университет Бикокок (Милан, Италия) Н = 28

«Известия НАН РК. Серия геологии и технических наук».

ISSN 2518-170X (Online),

ISSN 2224-5278 (Print)

Собственник: Республиканское общественное объединение «Национальная академия наук Республики Казахстан» (г. Алматы).

Свидетельство о постановке на учет периодического печатного издания в Комитете информации Министерства информации и общественного развития Республики Казахстан № **KZ39VPY00025420**, выданное 29.07.2020 г.

Тематическая направленность: *геология, химические технологии переработки нефти и газа, нефтехимия, технологии извлечения металлов и их соединений.*

Периодичность: 6 раз в год.

Тираж: 300 экземпляров.

Адрес редакции: 050010, г. Алматы, ул. Шевченко, 28, оф. 219, тел.: 272-13-19

<http://www.geolog-technical.kz/index.php/en/>

© Национальная академия наук Республики Казахстан, 2022

Адрес типографии: ИП «Аруна», г. Алматы, ул. Муратбаева, 75.

Editor in chief

ZHURINOV Murat Zhurinovich, doctor of chemistry, professor, academician of NAS RK, president of the National Academy of Sciences of the Republic of Kazakhstan, general director of JSC “Institute of fuel, catalysis and electrochemistry named after D.V. Sokolsky» (Almaty, Kazakhstan) H = 4

Editorial board:

ZHARMENOV Abdurasul Aldashevich, doctor of Technical Sciences, Professor, Academician of NAS RK, Director General of the National Center for Integrated Processing of Mineral Raw Materials of the Republic of Kazakhstan (Almaty, Kazakhstan) H=4

KULDEEV Yerzhan Itemenovich, Candidate of Geological and Mineralogical Sciences, Associate Professor, Vice-Rector for Corporate Development, Satbayev University (Almaty, Kazakhstan) H = 3

ABSAMETOV Malis Kudysovich, doctor of geological and mineralogical sciences, professor, academician of NAS RK, director of the Akhmedsafin Institute of hydrogeology and hydrophysics (Almaty, Kazakhstan) H = 2

ZHOLTAEV Geroy Zholtaevich, doctor of geological and mineralogical sciences, professor, director of the institute of geological sciences named after K.I. Satpayev (Almaty, Kazakhstan) H=2

SNOW Daniel, Ph.D, associate professor, director of the laboratory of water sciences, Nebraska University (Nebraska, USA) H = 32

Zeltman Reymar, Ph.D, head of research department in petrology and mineral deposits in the Earth sciences section of the museum of natural history (London, England) H = 37

PANFILOV Mikhail Borisovich, doctor of technical sciences, professor at the Nancy University (Nancy, France) H=15

SHEN Ping, Ph.D, deputy director of the Committee for Mining geology of the China geological Society, Fellow of the American association of economic geologists (Beijing, China) H = 25

FISCHER Axel, Ph.D, associate professor, Dresden University of technology (Dresden, Germany) H = 6

KONTOROVICH Aleksey Emilievich, doctor of geological and mineralogical sciences, professor, academician of RAS, Trofimuk Institute of petroleum geology and geophysics SB RAS (Novosibirsk, Russia) H = 19

ABSADYKOV Bakhyt Narikbaevich, doctor of technical sciences, professor, corresponding member of NAS RK, Bekturov Institute of chemical sciences (Almaty, Kazakhstan) H = 5

AGABEKOV Vladimir Enokovich, doctor of chemistry, academician of NAS of Belarus, honorary director of the Institute of chemistry of new materials (Minsk, Belarus) H = 13

KATALIN Stephan, Ph.D, associate professor, Technical university (Dresden, Berlin) H = 20

SEITMURATOVA Eleonora Yusupovna, doctor of geological and mineralogical sciences, professor, corresponding member of NAS RK, head of the laboratory of the Institute of geological sciences named after K.I. Satpayev (Almaty, Kazakhstan) H=11

SAGINTAYEV Zhanay, Ph.D, associate professor, Nazarbayev University (Nursultan, Kazakhstan) H = 11

FRATTINI Paolo, Ph.D, associate professor, university of Milano-Bicocca (Milan, Italy) H = 28

News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technology sciences.

ISSN 2518-170X (Online),

ISSN 2224-5278 (Print)

Owner: RPA «National Academy of Sciences of the Republic of Kazakhstan» (Almaty).

The certificate of registration of a periodical printed publication in the Committee of information of the Ministry of Information and Social Development of the Republic of Kazakhstan **No. KZ39VPY00025420**, issued 29.07.2020.

Thematic scope: *geology, chemical technologies for oil and gas processing, petrochemistry, technologies for extracting metals and their connections.*

Periodicity: 6 times a year.

Circulation: 300 copies.

Editorial address: 28, Shevchenko str., of. 219, Almaty, 050010, tel. 272-13-19

<http://www.geolog-technical.kz/index.php/en/>

© National Academy of Sciences of the Republic of Kazakhstan, 2022

Address of printing house: ST «Aruna», 75, Muratbayev str, Almaty.

NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

SERIES OF GEOLOGY AND TECHNICAL SCIENCES

ISSN 2224-5278

Volume 1, Number 451 (2022), 46-52

<https://doi.org/10.32014/2022.2518-170X.139>

УДК 553.982:2(575.146)

Xayitov O.G.*, Zokirov R.T., Agzamov O.O., Gafurov Sh.O., Umirzoqov A.A.

Tashkent State Technical University named after Islam Karimov, Tashkent, Uzbekistan.

E-mail: odiljon.hayitov@tdtu.uz

CLASSIFICATION OF HYDROCARBON DEPOSITS IN THE SOUTH-EASTERN PART OF THE BUKHARA-KHIVA REGION, JUSTIFICATION OF ITS METHODOLOGY AND ANALYSIS OF THE RESULTS

Abstract. This article is devoted to the analysis of the classification of hydrocarbon deposits in the southeastern part of the Bukhara-Khiva region, the justification and methodology and the results obtained. It is shown that according to the complexity of the structure, deposits are divided into such types as simple structures. In addition, their characteristics are given. The description of single-phase and two-phase deposits and the division of the latter in relation to the volume of the oil-saturated part of the deposit to the volume of the entire deposit is given. Along with this, the classification of deposits by the complexity of the geological structure into deposits of a folded geological structure and simple, by the number of productive horizons – into single – layer and multi – layer, by the number of objects-into single-object and multi-object, by the presence or absence of condensate-into gas and gas condensate. Other types of deposits considered by classification and their characteristic features are described. Various geological, technological and mathematical methods of classification of hydrocarbon deposits are proposed. The results of calculations on the classification of hydrocarbon deposits in the fields of the southeastern part of the Bukhara-Khiva region are analyzed.

Key words: classification, field, southeastern part, Bukhara-Khiva region, method, analysis, calculation, condensate, hydrocarbons, oil saturation.

Introduction. At present, in the study of the geological structure of deposits and their development, numerous classifications of hydrocarbon deposits are proposed. As their main features, genetic ones are used according to the conditions of formation of hydrocarbon deposits; by type of fluids (gas, gas condensate, oil and gas condensate) and reservoirs; morphological (according to the conditions of occurrence of hydrocarbon deposits) according to the industrial value of the deposits [1; P. 199].

All work carried out in the process of prospecting and exploration, development of hydrocarbon deposits aimed at rational exploitation of deposits and maximum recovery of oil and gas from productive formations. With this in mind, let us consider the classification of hydrocarbon deposits adopted in the current guidance documents for the development of oil and gas deposits [2; P. 5-7].

Materials and methods. According to the guidance document, according to the complexity of the structure of the field (deposits) are divided into the following types [3; P. 6]:

Simple structure, confined to tectonically undisturbed or weakly disturbed structures, the productive layers of which are characterized by consistency of thicknesses and reservoir properties over the area and section;

A complex structure, characterized by inconsistent thicknesses and reservoir properties of productive strata in area and section, or by the presence of lithological replacements or tectonic disturbances, dividing single deposits into separate blocks;

A very complex structure, characterized by both the presence of lithological replacements or tectonic disturbances, dividing the reservoir into separate blocks, and the inconsistency of the thickness of the reservoir properties of productive strata within these blocks.

The categories of a complex and very complex structure should also include gas-oil and oil-and-gas deposits, in which oil in the gas cap zones underlain by bottom water and is contained in thin rims of heterogeneous formations.

Results and discussion. According to the initial phase state and the composition of the main hydrocarbon compounds in the depths, the deposits are subdivided into single-phase and two-phase [2; P. 5].

Single-phase include:

- a) Oil deposits confined to reservoirs containing oil saturated to varying degrees with gas;
- b) Gas or gas condensate deposits confined to reservoirs containing gas or gas with hydrocarbon condensate.

Two-phase reservoirs include reservoirs confined to reservoirs containing oil with dissolved gas and free gas above the oil (an oil reservoir with a gas cap or a gas reservoir with an oil rim). In some cases, the free gas of such deposits may contain hydrocarbon condensate [1-6]. According to the ratio of the volume of the oil-saturated part of the reservoir to the volume of the entire reservoir ($\bar{v}_H = \frac{V_H}{V_H + V_r}$) two-phase deposits are subdivided into [2; P. 5]:

- a) Oil with gas or gas condensate cap ($\bar{v}_H > 0,75$);
- б) Gas or gas condensate oil ($0,75 < \bar{v}_H < 0,75$);
- в) Oil and gas or oil and gas condensate ($0,25 < \bar{v}_H < 0,5$);
- г) Gas or gas condensate with oil rim ($\bar{v}_H \leq 0,25$).

In terms of recoverable oil reserves and balance gas reserves, oil and oil and gas fields are subdivided into [2; P. 6–7]:

- Unique, containing more than 300 million tons of oil or more than 500 billion cubic meters of gas;
- Large, containing from 30 to 300 million tons of oil or from 30 to 500 billion cubic meters of gas;
- Medium, containing from 10 to 30 million tons or from 10 to 30 billion cubic meters of gas;
- Small, containing less than 10 million tons of oil or less than 10 billion cubic meters of gas.

Based on the tasks of developing gas and gas condensate fields, the following classification criteria are adopted in the “Rules for the development of gas and gas condensate fields in the Republic of Uzbekistan” [2; P. 7].

According to the complexity of the geological structure of productive horizons, gas and gas, condensate fields are divided into two main groups [2; P. 7]:

- a) deposits of a complex geological structure, divided by tectonic disturbances into a number of blocks and zones that have a variable nature of productive horizons - lithological composition, reservoir properties, etc.;
- b) Deposits of a simple geological structure, the productive layers on them characterized by the relative consistency of the lithological composition, reservoir properties and productive horizons over the entire area of the deposit.

The number of productive horizons (deposits) subdivides into the deposits into [2; P. 7]:

- a) Single-layer;
- b) Multi-layer.

The number of development objects subdivides into the deposits into [2; P. 7]:

- a) single-site, when there is only one deposit, or all deposits combined into one development site;
- b) Multi-object, when several development objects selected.

According to the presence or absence of condensate, the deposits are subdivided into [2; P. 7]:

- a) Gas, from the gas of which, with a decrease in pressure and temperature, the release of liquid hydrocarbons does not occur;
- b) Gas condensate, from the gas of which, with a decrease in pressure and temperature, liquid hydrocarbons released.

Gas condensate fields (deposits) by the content of stable condensate are divided into the following groups [2; P. 7-8]:

- Group I with an insignificant content – up to 10 cm³/m³;
- Group II with low content - from 10 to 150 cm³/m³;
- Group III with an average content - from 150 to 300 cm³/m³;
- Group IV with a high content - from 300 to 600 cm³/m³;
- Group V with a very high content - over 600 cm³/m³.

Gas condensate fields are developed depending on the content of stable condensate, thermodynamic characteristics and geological conditions [2; P. 8];

The following images:

- a) Without maintaining reservoir pressure (as purely gas fields);
- b) Maintaining reservoir pressure.

According to the presence or absence of oil in the reservoir, gas and gas condensate deposits are subdivided into [2; P. 8]:

- a) Deposits without an oil rim or with an oil rim of non-commercial significance;
- b) Deposits with an oil rim of industrial importance.

According to the flow rate (maximum possible working flow rate) of wells, gas and gas, condensate fields (deposits, development objects) are divided into the following groups [2; P. 8]:

- a) low-flow rate – up to 25 thousand m³ / day;
- b) Marginal – from 25 thousand to 100 thousand m³ /day;
- c) Average production rates – from 100 thousand to 500 thousand m³/day;
- d) High-flow rate – from 500 thousand to 1 million m³ / day;
- e) Super high-rate – over 1 million m³ / day.

According to the value of the initial reservoir pressure, deposits are distinguished [2; P.8]:

- a) Low pressure – up to 6 MPa;
- b) Medium pressure – from 6 to 10 MPa;
- c) High pressure – from 10 to 30 MPa;
- d) Ultra-high pressure – over 30 MPa.

According to the above criteria, hydrocarbon deposits in the southeastern part of the Bukharo-Khiva region are classified as [2; P.8]:

- Complex and very complex structure;
- Single-phase (gas, gas condensate, oil) and two-phase (oil and gas condensate);
- Mostly small and medium-sized;
- From low-rate to high-rate;
- From low to ultra-high pressure.

The analyzed classifications of hydrocarbon deposits mainly use one or two parameters. Therefore, it becomes necessary to clarify the validity of the parameters adopted in the classification based on the use of a complex of geological and physical factors [7-12].

Nowadays, various geological, technological and mathematical methods of classification of hydrocarbon deposits are widely used [3; P. 232], [4; P. 48], [5; P. 145], [6; P. 185], [7; P. 112], [8; P. 120–129], [9; P. 28-51], [10; P. 113-119], [11; P. 202–204], [12; P. 114-115], [13; P. 79–84], [14; P. 40–43], [15; P. 584-588]. Most of them make it possible to single out homogeneous objects only because of qualitative characteristics.

Since three-dimensional methods of geological and hydrodynamic modeling are widely used in the geology of oil and gas, there is a need to express the similarity of objects in quantitative terms. One of the ways to solve this problem is the widely used method for constructing dendrograms [16; P.161-168] which is as follows.

Let there be a class of objects $A_i, i=1, 2, n$, characterized by a set of geological and commercial attributes $a_{ip}, p=1, 2, k$. The main idea of the method is to build a hierarchical system that unites groups of similar objects. In this case, the correlation coefficient given a geometric meaning, which consists in interpreting it as the cosine of the angle between two vectors in a multidimensional Euclidean space. Arcos of the correlation coefficient is considered as a measure of the distance between vectors, and therefore, as a measure of the similarity between objects. The correlation coefficient calculated by the formula [16; P. 161]

$$\sqrt{A_i, A_j} = \frac{\sum_{p=1}^k (a_{ip} - \bar{a}_i) * (a_{jp} - \bar{a}_j)}{\sqrt{\sum_{p=1}^k (a_{ip} - \bar{a}_i)^2 * \sum_{p=1}^k (a_{jp} - \bar{a}_j)^2}}, \quad (1)$$

where \bar{a}_i – are arithmetic means determined by the set of values a_{ip} and a_{jp} . It should be borne in mind that signs can have a completely different nature and a characteristic interval of change. Therefore, it is necessary to preliminarily normalize them, for example, by bringing them to a single change interval. The basis for the application of any method of grouping objects into mutually related groups is the symmetric matrix S_j , whose elements S_{ij} are the distances between the objects A_i, A_j :

$$S_{ij} = \arccos \sqrt{A_i A_j}. \quad (2)$$

The construction of dendrograms is a sequential procedure of combining the nearest elements or groups into a new group.

At the first stage, two objects A_i, A_j , combined, which correspond to the minimum element (distance) of the matrix S^l . The value of the measure of proximity of the two most similar objects remembered and considered in the future as a value that characterizes the hierarchical level of the first stage of grouping.

At each subsequent stage, it is necessary to re-select the two closest objects, combine them and remember the value of the hierarchical level formed by the groups. Obviously, with the initial number of elements equal to n , the whole procedure ends at the $(n - 1) - m$ step.

When combining two objects containing several elements, the arithmetic mean distance between the elements of the combined groups taken as the measure of group similarity.

To carry out calculations on the classification of hydrocarbon deposits, the following parameters selected, which are reliably justified when objects exit from geological exploration:

Conditions of occurrence of hydrocarbon deposits (depth of oil-water and gas-water contacts, reservoir temperature, reservoir pressure);

Sizes of hydrocarbon deposits (areas of gas and oil content, total thickness of the productive horizon, oil and gas-saturated thickness of the productive horizon);

Reservoir properties of reservoirs (porosity, oil and gas saturation);

Properties of gas and formation fluids (density of oil, gas, water, potential condensate content).

It was found that hydrocarbon deposits in the southeastern part of the Bukhara-Khiva region are more homogeneous in terms of such parameters as the mark of gas-water and water-oil contacts, reservoir temperature, porosity, oil and gas saturation, oil, gas and water density. At the same time, they differ greatly in terms of oil and gas content, total and effective thicknesses of productive horizons, reservoir pressure and potential condensate content in gas.

Based on the results of calculations based on expressions, a dendrogram of the classification of deposits in the southeastern part of the Bukhara-Khiva region built, according to which, at the hierarchical level of 0.64, the following four groups of deposits identified. According to the phase state of hydrocarbons, they subdivided into oil, oil and gas condensate, gas condensate and gas. At a lower hierarchical level of about 0.2 of these groups, the type of deposit distinguishes deposits: massive, reservoir-vaulted, reservoir-massive, which in some cases complicated by lithological replacements and screened tectonic faults [13-18].

It was revealed that in the southeastern part of the Bukhara-Khiva region, two qualifications of the fields are combined, in which the criteria are the phase state of hydrocarbons and the geological structure of the deposits.

Conclusion. The results of the classification of hydrocarbon deposits in the southeastern part of the Bukhara-Khiva region recommended using when:

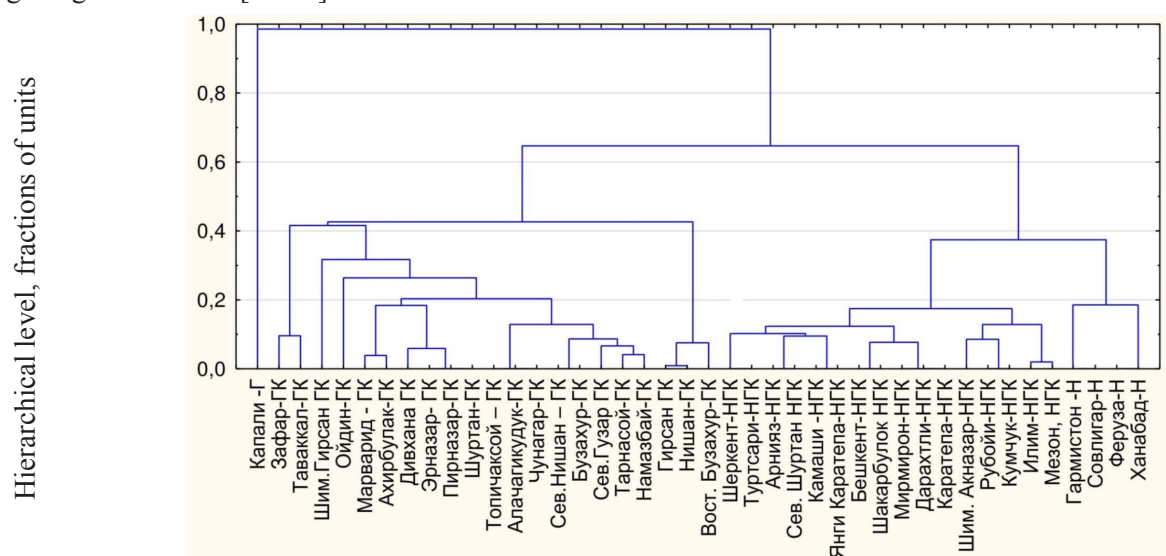
Justification of the choice of analog objects;

Using the experience of developing long-term exploited fields in the process of drawing up projects for new discovered objects;

Substantiation of the effectiveness of geological and technical measures and new technologies;

Solving various problems of a geological and technological nature.

The proposed classifications of hydrocarbon deposits in the southeastern part of the Bukhara-Khiva region will contribute to the discovery of new deposits, an increase in production and the degree of extraction of geological reserves [19-25].



Dendrogram of the classification of deposits in the southeastern part of the Bukhara-Khiva region (O. G. Khayitov, 2020)

Хайитов О.Ж.*, Закиров Р.Т., Агзамов О.О., Гафуров Ш.О., Умирзоков А.А.

Ташкент мемлекеттік техникалық университети, Ташкент, Ўзбекистан.

E-mail: odiljon.hayitov@tdtu.uz

БУХАРА-ХИУА АЙМАҒЫНЫҢ ОҢТҮСТІК-ШЫҒЫС БӨЛГІНДЕГІ КӨМІРСУТЕКТЕР КЕН ОРЫНДАРЫН ЖІКТЕУ, ӘДІСТЕМЕСІН НЕГІЗДЕУ ЖӘНЕ НӘТИЖЕЛЕРІН ТАЛДАУ

Хайитов О.Г.*, Зокиров Р.Т., Агзамов О.О., Гафуров Ш.О., Умирзоков А.А.

Ташкентский государственный технический университет, Ташкент, Узбекистан.

E-mail: odiljon.hayitov@tdtu.uz

КЛАССИФИКАЦИЯ МЕСТОРОЖДЕНИЙ УГЛЕВОДОРОДОВ ЮГО-ВОСТОЧНОЙ ЧАСТИ БУХАРО-ХИВИНСКОГО РЕГИОНА, ОБОСНОВАНИЕ ЕЕ МЕТОДИКИ И АНАЛИЗ РЕЗУЛЬТАТОВ

Аннотация. Данная статья посвящена анализу классификации месторождений углеводородов юго-восточной части Бухаро-Хивинского региона, обоснованию и методике и получаемых результатов. Показано, что месторождения по сложности строения подразделяются на такие типы, как простого строения. И дана их характеристика. Приведено описание однофазных и двухфазных залежи и подразделение последних по отношению объема нефтенасыщенной части залежи к объему всей залежи. Наряду с этим осуществлена классификация месторождений по сложности геологического строения на месторождения сложенного геологической строения и простого, по числу продуктивных горизонтов – на однопластовые и многопластовые, по числу объектов – на однообъектные и многообъектные, по наличию или отсутствию конденсата – на газовые и газоконденсатные. Рассмотрены и другие типы классификацией месторождений и изложены их характерные особенности. Предложены различные геологические, технологические и математические методы классификации месторождений углеводородов. Проанализированы результаты расчетов по классификации месторождений углеводородов месторождений юго-восточной части Бухаро-Хивинского региона.

Ключевые слова: классификация, месторождение, юго-восточная часть, Бухаро-Хивинский регион, метод, анализ расчет, конденсат, углеводороды, нефтеносность.

Information about authors:

Khaitov Odiljon Gafurovich – Doctor of geological-mineralogical sciences, academician of the Turan Academy of Sciences, head of the Mining Department, Tashkent State Technical University, Uzbekistan; odiljon.hayitov@tdtu.uz, <https://orcid.org/0000-0002-7735-5980>;

Zakirov Ravshan Tulkunovich – PhD in Geology and Mineralogy, Head of the Department of Oil and Fields Geology, Tashkent, Uzbekistan; r.t_zakirov@mail.ru; <https://orcid.org/0000-0001-5426-9134>;

Agzamov Otabek Avazovich – Candidate of Technical Sciences, Associate Professor of Mining and Exploitation, Tashkent State Technical University, atabekagzamov@mail.ru;

Gafurov Shuxrat Odiljon ugli – Assistant at Tashkent State Technical University;

Umirzoqov Azamat Abdurashidovich – doctoral student at Tashkent State Technical University, Tashkent, Uzbekistan; azamat.umirzoqov@tdtu.uz; <https://orcid.org/0000-0002-9609-179X>.

REFERENCES

[1] Abidov A., Ergashev Y., Kodirov M. Oil and gas of geology. Russian-Uzbek explanatory dictionary.- T.: Uzbekistan encyclopedia. 2000. - 528 g.b

[2] Khayitov O.G. Evolution Of Petroleum Stratum Efficiency By – Multi-Factor Regression Analysis // The American Journal of Engineering and Technology. Vol. 02I. 2020 – N2(08). 79-84 DOI.10.37547/tajet.-C.79–84.

[3] Samigulina G.A., Samigulina Z.I., Lukmanova Z.S. COGNITIVE SMART-TECHNOLOGY OF DISTANCE LEARNING OF EXPERION PKS DISTRIBUTED CONTROL SYSTEM FOR OIL AND GAS INDUSTRY USING ONTOLOGICAL APPROACH. OF GEOLOGY AND TECHNICAL SCIENCES. 2020 Jan: 23. <https://doi.org/10.32014/2020.2518-170X.3>.

[4] Baytasovna K.Z., Gennadievna B.E., Sadyrovna A.Z., Utku A.A., Mikhailovich K.S., Kudysovich A.M., Vladimirovich B.S. SORPTION METHODS OF PROCESSING OF HYDROMINERAL LITHIUM RAW MATERIAL OF KAZAKHSTAN. News of NAS RK. Series of geology and technical sciences. 2019 Jul 22(4):172-80.

[5] Statsyuk V.N., Bold A., Zhurinov M.Z., Fogel L.A., Sassykova L.R., Vagramyan T.A., Abrashov A.A. Using cyclic voltammetry to determine the protective ability of phosphate coatings. *Funct. Mater.* 2020; 27:605-10.

[6] Zh.ZM., Teltayev B.B., Kalybay A.A., Rossi C.O. COMPARATIVE ANALYSIS OF LOW TEMPERATURE RESISTANCE FOR NANOCARBON AND OTHER BITUMENS. News of NAS RK. Series of geology and technical sciences. 2020 Oct 14(5):89-96. <https://doi.org/10.32014/2020.2518-170X.108>.

[7] Kassenov A.K., Syzdykov A.H., Spirin V.I., Moldabekov M.S., Bukenova M.S. METHODS FOR CALCULATING CAVITATORS FOR DEVICES DESIGNED BY SATBAYEV UNIVERSITY FOR CLEANING OIL AND GAS WELLS. News of NAS RK. Series of geology and technical sciences. 2020 Apr 13(2):81-6. <https://doi.org/10.32014/2020.2518-170X.34>.

[8] Alexey R., Zhanar K., Genadiy R., Kanat A., Rossitza M. GEOLOGICAL STRUCTURE OF SOILS AND RICE YIELD IN THE ILI RIVER BASIN. News of NAS RK. Series of geology and technical sciences. 2020 Oct 14(5):165-71. <https://doi.org/10.32014/2020.2518-170X.117>.

[9] Sudaba N., Elmira Q. POSSIBILITY OF VORTEX SEPARATION EJECTOR APPLICATION IN THE COLLECTION AND SEPARATION OF GAS. News of NAS RK. Series of geology and technical sciences. 2020 Oct 14(5):150-5. <https://doi.org/10.32014/2020.2518-170X.115>.

[10] Kuangaliev Z.A., Kursina M.M., Aukhadieva G.H., Zhakupov A.S. ANALYSIS OF RECOMMENDED MEASURES AIMED AT OPTIMISING AND IMPROVING THE DEVELOPMENT PROCESS AT THE PRORVA OIL DEPOSIT. News of NAS RK. Series of geology and technical sciences. 2020 Dec 15(6):154-61. <https://doi.org/10.32014/2020.2518-170X.142>.

[11] Akhmetov S.M., Diarov M., Akhmetov N.M., Bizhanov D.T., Zaidemova Z.K. VIBRATIONS AND STABILITY OF A GEOMETRICALLY NONLINEAR WEIGHTY DRILL STRING FOR DRILLING OIL AND GAS WELLS. News of NAS RK. Series of geology and technical sciences. 2021 Apr 15(2):6-14. <https://doi.org/10.32014/2021.2518-170X.28>.

[12] Hayitov O.G., Yusupkhodzhaeva E.N., Abdurakhmanova S.P., Halmatova G.N. ON THE STATE OF HYDROCARBON RESOURCE BASE IN THE BESHKENT TROUGH On the state of hydrocarbon resource base in the Beshkent trough.-P-23272331.

[13] Ryskulovna S.H., Kabykenovna M.B., Dzhanyzbekovna A.R., Gennadievna T.I., Nurlybaevna N.A., Sabetbekovna D.A., Kairoldayevna Y.L., Abdimanapovich B.A., Kanatkyzy S.A. PREPARATION OF CARBON NANOCOMPOSITES ON THE BASIS OF SILICON-TIN CONTAINING SUBSTANCES. News of NAS RK. Series of geology and technical sciences. 2019 Jul 22(4):158-66. <https://doi.org/10.32014/2019.2518-170X.110>.

[14] Tileuberdi N., Ma H.D. COMMON AND DIFFERING GEOLOGICAL FEATURES OF THE ALAKOL AND CHINESE DZUNGARIAN TROUGHS IN VIEW OF THEIR OIL-AND-GAS PROSPECTS. News of NAS RK. Series of geology and technical sciences. 2019 Jul 22(4):6-11. <https://doi.org/10.32014/2019.2518-170X.92>.

[15] Zh.ZM., Kalybay A.A., Teltayev B.B. CHARACTERISTICS AND PROPERTIES OF PHYSICAL AND QUANTUM FIELDS OF NANOCARBON AND THEIR APPLICATIONS. News of NAS RK. Series of geology and technical sciences. 2019 Oct 14(5):229-36. <https://doi.org/10.32014/2019.2518-170X.147>.

[16] Toleukhanuly Y.B., Kuttybaevna K.M., Vasilyevich B.A., Turlanovna N.A., Kamzievna Z.A., Dautetovna A.L. SYNTHESIS OF CARBON NANOTUBES BY THE CVD METHOD ON THE SURFACE OF THE HYDROPHOBIC SHALE ASH. News of NAS RK. Series of geology and technical sciences. 2019 Oct 14(5):177-88. DOI: [10.32014/2019.2518-170X.140](https://doi.org/10.32014/2019.2518-170X.140).

[17] Kedelbaev B.S., Turabzhanov S.M., Lakhanova K.M., Tashkaraev R.A., Makhatov Z.B., Batirov B.M. CONTINUOUS HYDROGENATION OF BENZENE ON PROMOTED SKELETARY NICKEL CATALYSTS. NEWS OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN-SERIES OF GEOLOGY AND TECHNICAL SCIENCES. 2018 Jan 1(3):84-9.

[18] Hayitov O.G., Yusupkhodzhaeva E.N., Abdurakhmanova S.P., Halmatova G.N. ON THE STATE OF HYDROCARBON RESOURCE BASE IN THE BESHKENT TROUGH On the state of hydrocarbon resource base in the Beshkent trough.-P-23272331.

[19] Zhurinov M.Z., Abilmagzhanov A.Z., Ivanov N.S., Teltayev B.B., Nurtazina A.E. TITANIUM OXIDE-OXIFLUORIDE SYNTHESIS AND STUDY OF ITS PHOTOCATALYTIC PROPERTIES.

[20] Zhurinov M.Z., Teltayev B.B., Amirbayev E.D. MAIN STANDARD INDICATORS OF POLYMER ASPHALT CONCRETES. News of NAS RK. Series of geology and technical sciences. 2021 Feb 1(1):194-202. <https://doi.org/10.32014/2021.2518-170X.27>.

[21] Nasirov U.F., Ochilov S.A., Umirzoqov A.A. Theoretical calculation of the optimal distance between parallel-close charges in the explosion of high ledges. Journal of Advanced Research in Dynamical and Control Systems, 2020; 12(7 Special Issue): pp. 2251–2257.

[22] Nasirov U.F., Zairov Sh.Sh., Ochilov Sh.A., Ravshanova M.Kh., Ergashev O.S. Method to make a shielding slot in pit wall rock mass using non-explosive destructive mixture. Mining Informational and Analytical Bulletin, 2021; (3):72–82.

[23] Norov Y.D., Nasirov U.F., Ochilov S.A. Investigation and development of high-bench blasting method with parallel close-spaced holes and wedging stemming. Gornyi Zhurnal, 2018; (9):pp. 42–45.

[24] Odiljon Hayitov, A.X. Qarshiyev, B.Sh. Xamroyev Analyzing efficiency of drilling horizontal borehole in South Kemachi deposit//Mining informational and analytical bulletin(scientific and technical journal) DOI: 10.25018/0236-1493-2018-8-0-71-76.

[25] Baimakhanov O., Saukhimov A., Ceylan O., Shokolakova Sh. REDUCING POWER AND VOLTAGE LOSSES IN ELECTRIC NETWORKS OF OIL FIELDS USING THE MOTH FLAME OPTIMIZATION ALGORITHM. News of NAS RK. Series of geology and technical sciences. 2021 Oct 15(5):103-12. <https://doi.org/10.32014/2021.2518-170X.104>.

CONTENTS

Absametov M.K., Itemen N.M., Murtazin Ye.Zh., Zhexembayev E.Sh., Toktaganov T.Sh. FEATURES OF THE ISOTOPIC COMPOSITION OF GROUNDWATER IN THE MANGYSTAU REGION.....	6
Akimbek G.A., Aliyarov B.K., Badaker V.C., Akimbekova Sh.A. METHODOLOGY AND EXPERIMENTAL SETUP FOR THE STUDY OF RELATIVE ABRASIVENESS OF BULK SOLIDS.....	14
Baibolov K., Artykbaev D., Aldiyarov Zh., Karshyga G. EXPERIMENTAL INVESTIGATIONS OF THE COARSE-GRAINED SOIL IN THE DAM OF THE PSKEM HEP.....	21
Bolatova A., Kutybayev A., Kainazarov A., Hryhoriev Yu., Lutsenko S. USE OF MINING AND METALLURGICAL WASTE AS A BACKFILL OF WORKED-OUT SPACES.....	33
Hajiyeva G.N., Hajiyeva A.Z., Dadashova Kh.D. IMPACT OF URBAN LANDSCAPE POLLUTION ON HUMAN HEALTH.....	39
Hayitov O.G., Zokirov R.T., Agzamov O.O., Gafurov Sh.O., Umirzoqov A.A. CLASSIFICATION OF HYDROCARBON DEPOSITS IN THE SOUTH-EASTERN PART OF THE BUKHARA-KHIVA REGION, JUSTIFICATION OF ITS METHODOLOGY AND ANALYSIS OF THE RESULTS.....	46
Kabylbekov K.A., Abdrakhmanova Kh.K., Kuatbekova R.A., Makhanov T.S., Urmashiev B. COMPUTER SIMULATION OF RADIONUCLIDE ISOTOPE SEPARATION USED IN NUCLEAR ENERGY AND MEDICINE.....	53
Kassenov A.Zh., Abishev K.K., Absadykov B.N., Yessaulkov V.S., Bolatova A.B. ANALYSIS AND JUSTIFICATION OF THE LAYOUT OF A MULTIPURPOSE MACHINE FOR THE DEVELOPMENT OF MINERAL DEPOSITS.....	63
Kaumetova D.S., Koizhanova A.K., Toktar.G., Magomedov D.R., Abdyldaev N.N. STUDY OF THE FINELY-DISPERSED GOLD RECOVERY PARAMETERS.....	69
Rakhmanova S.N., Umirova G.K., Ablessenova Z.N. STUDY OF THE GREATER KARATAU'S SOUTH-WEST BY RANGE OF GEOPHYSICAL SURVEYS IN SEARCH OF THE CRUST-KARST TYPE POLYMETALLIC MINERALISATION.....	76
Oitseva T.A., D'yachkov B.A., Kuzmina O.N., Bissatova A.Y., Ageyeva O.V. LI-BEARING PEGMATITES OF THE KALBA-NARYM METALLOGENIC ZONE (EAST KAZAKHSTAN): MINERAL POTENTIAL AND EXPLORATION CRITERIA.....	83
Sarmurzina R.G., Boiko G.I., Lyubchenko N.P., Karabalin U.S., Demeubayeva N.S. ALLOYS FOR THE PRODUCTION OF HYDROGEN AND ACTIVE ALUMINUM OXIDE.....	91
Suleyev D.K., Uzbekov N.B., Sadykova A.B. MODERN APPROACHES TO SEISMIC HAZARD ASSESSMENT OF THE TERRITORY OF KAZAKHSTAN.....	99
Temirbekova M.N., Temirbekov N.M., Wojcik W., Aliyarova M.B., Elemanova A.A. THE USE OF ORGANIC FRACTION OF SOLID HOUSEHOLD WASTE TO GENERATE ETHANOL AND BIOGAS USING A SIMULATION MODEL.....	105

Tulegulov A.D., Yergaliyev D.S., Bazhaev N.A., Keribayeva T.B., Akishev K.M. METHODS FOR IMPROVING PROCESS AUTOMATION IN THE MINING INDUSTRY.....	115
Tulemisova G., Abdinov R., Amangosova A., Batyrbaeva G. STUDY OF THE BOTTOM SEDIMENTS OF RESERVOIRS OF URAL-CASPIAN BASIN.....	126
Turgazinov I.K. Mukanov D.B. ANALYSIS OF FLUID FILTRATION MECHANISMS IN FRACTURED RESERVOIRS.....	135
Uakhitova B., Ramatullaeva L.I., Imangazin M.K., Taizhigitova M.M., Uakhitov R.U. ANALYSIS OF THE LEVEL OF OCCUPATIONAL INJURIES ON THE EXAMPLE OF AN INDUSTRIAL ENTERPRISE OF A METALLURGICAL CLUSTER.....	145
Yurii Feshchuk, Vadym Nizhnyk, Valeriia Nekora, Oleksandr Teslenko IMPROVING THE SYSTEM FOR RESPONDING TO FIRE IN AREAS CONTAMINATED BY THE CHERNOBYL DISASTER.....	152
Sherov A.K., Myrzakhmet B., Sherov K.T., Absadykov B.N., Sikhimbayev M.R. METHOD FOR SELECTING THE LOCATION OF THE CLEARANCE FIELDS OF THE LANDING SURFACES OF GEAR PUMP PARTS WITH A BIAXIAL CONNECTION.....	159
Khamroyev J.Kh., Akmalaiuly K., Fayzullayev N. MECHANICAL ACTIVATION OF NAVBAHORSK BENTONITE AND ITS TEXTURAL AND ADSORPTION CHARACTERISTICS.....	167
Zhurinov M.Zh., Teltayev B.B., Aitbayev K.A., Loprencipe G., Tileu K.B. MODELING OF NON-STATIONARY TEMPERATURE MODE OF A MULTI-LAYER ROAD STRUCTURE.....	175

Publication Ethics and Publication Malpractice in the journals of the National Academy of Sciences of the Republic of Kazakhstan

For information on Ethics in publishing and Ethical guidelines for journal publication see <http://www.elsevier.com/publishingethics> and <http://www.elsevier.com/journal-authors/ethics>.

Submission of an article to the National Academy of Sciences of the Republic of Kazakhstan implies that the described work has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis or as an electronic preprint, see <http://www.elsevier.com/postingpolicy>), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder. In particular, translations into English of papers already published in another language are not accepted.

No other forms of scientific misconduct are allowed, such as plagiarism, falsification, fraudulent data, incorrect interpretation of other works, incorrect citations, etc. The National Academy of Sciences of the Republic of Kazakhstan follows the Code of Conduct of the Committee on Publication Ethics (COPE), and follows the COPE Flowcharts for Resolving Cases of Suspected Misconduct (http://publicationethics.org/files/u2/New_Code.pdf). To verify originality, your article may be checked by the Cross Check originality detection service <http://www.elsevier.com/editors/plagdetect>.

The authors are obliged to participate in peer review process and be ready to provide corrections, clarifications, retractions and apologies when needed. All authors of a paper should have significantly contributed to the research.

The reviewers should provide objective judgments and should point out relevant published works which are not yet cited. Reviewed articles should be treated confidentially. The reviewers will be chosen in such a way that there is no conflict of interests with respect to the research, the authors and/or the research funders.

The editors have complete responsibility and authority to reject or accept a paper, and they will only accept a paper when reasonably certain. They will preserve anonymity of reviewers and promote publication of corrections, clarifications, retractions and apologies when needed. The acceptance of a paper automatically implies the copyright transfer to the National Academy of Sciences of the Republic of Kazakhstan.

The Editorial Board of the National Academy of Sciences of the Republic of Kazakhstan will monitor and safeguard publishing ethics.

Правила оформления статьи для публикации в журнале смотреть на сайтах:

[www:nauka-nanrk.kz](http://www.nauka-nanrk.kz)

<http://www.geolog-technical.kz/index.php/en/>

ISSN 2518-170X (Online),

ISSN 2224-5278 (Print)

Редакторы: *М.С. Ахметова, А. Ботанқызы, Д.С. Аленов, Р.Ж. Мрзабаева*
Верстка на компьютере *Г.Д.Жадыранова*

Подписано в печать 14.02.2022.
Формат 60x881/8. Бумага офсетная. Печать – ризограф.
11,5 п.л. Тираж 300. Заказ 1.