

Polish journal of science

POLISH JOURNAL OF SCIENCE

№55 (2022)

ISSN 3353-2389

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POLISH JOURNAL OF SCIENCE

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email: editor@poljs.com

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USE OF GLAUCONITE AS A MEMBRANE-FORMING ADDITIVE IN A DYNAMIC MEMBRANE

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DOI: [10.5281/zenodo.7223572](https://doi.org/10.5281/zenodo.7223572)

Анотація

Досліджено використання глауконіту трьох фракцій – 0,4–0,5, 0,16–0,25 і $\leq 0,063$ мм за мембраноутворювальну добавку динамічної мембрани при видаленні надлишкової кількості заліза з водних розчинів. Показано, що з цією метою може бути використана тільки фракція 0,4–0,5 мм; залишковий вміст заліза в цьому випадку становить 0,05 мг/дм³, що значно нижче за регламентовану норму (0,2 мг/дм³).

Abstract

The use of glauconite of three fractions – 0.4–0.5, 0.16–0.25, and ≤ 0.063 mm as a membrane-forming additive of a dynamic membrane when removing excess iron from aqueous solutions was studied. It is shown that only the fraction of 0.4–0.5 mm can be used for this purpose; the residual iron content in this case is 0.05 mg/dm³, which is significantly lower than the regulated norm (0.2 mg/dm³).

Ключові слова: глауконіт, залізовмісні води, динамічна мембрана, мікрофільтр.

Keywords: glauconite, iron-containing waters, dynamic membrane, microfilter.

Вступ. Залізо належить до елементів, які зустрічаються найчастіше і за поширеністю у земній корі посідає друге місце після алюмінію [1]. Це природна домішка, що завжди міститься в природній воді, куди потрапляє внаслідок руйнування та вивітрювання гірських порід, старіння та корозії чавунних та сталевих водопроводів, а також з виробничими стічними водами та дренажними водами муніципальних звалищ [2].

Для води з підвищеним вмістом заліза характерний кислуватий запах, металевий присмак і рудобуре забарвлення. Така вода скорочує термін експлуатації сантехніки та побутових приладів, а також негативно впливає на здоров'я людини. Було виявлено, що тривале вживання води з підвищеним вмістом заліза сприяє збільшенню загальної захворюваності, розвитку хвороб крові, шкіри та підшкірної клітковини, кістково-м'язової системи, органів травлення, сечостатевої системи, алергічних захворювань [3, 4].

Баромембранні методи очищення води (ультрафільтрація, нанофільтрація та зворотний осмос) останнім часом стрімко розвиваються, розширюються сфери їх застосування – у водопостачанні виник цілий напрямок в очищенні поверхневих вод [5]. При цьому все більший інтерес проявляється щодо так званих динамічних мембран (ДМ), які утворюються фільтруванням через пористі підкладки розчинів, що містять спеціальні добавки диспергованих речовин, в результаті відкладення яких на поверхні підкладки утворюється напівпроникний шар.

Баромембранні методи очищення води (ультрафільтрація, нанофільтрація та зворотний осмос) останнім часом стрімко розвиваються, розширюються сфери їх застосування – у водопостачанні виник цілий напрямок в очищенні поверхневих вод [5]. При цьому все більший інтерес проявляється щодо так званих динамічних мембран (ДМ), які утворюються фільтруванням через пористі підкладки розчинів, що містять спеціальні добавки диспергованих речовин, в результаті відкладення яких на поверхні підкладки утворюється напівпроникний шар.

Найважливішою перевагою ДМ є висока продуктивність; термін їх служби не обмежений – мембрани мають напівпроникні властивості до тих пір, поки в розчині, що розділяється, є мікрокількості мембраноутворювальної добавки. У разі механічного пошкодження ДМ можливе її самовідновлення внаслідок відкладення нового напівпроникного шару [6].

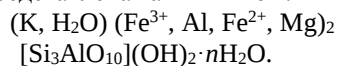
Мета досліджень – вивчення механізму утворення динамічної мембрани з глауконітом за мембраноутворювальної добавки й її ефективності в видалення надлишкової кількості заліза із водних середовищ.

Методи та об'єкти дослідження. Експерименти з утворення ДМ було здійснено в лабораторній комірці фронтального типу з магнітною мішалкою ($Re = 7\ 100$). За мембраноутворювальної добавки використаний глауконіт Карачаївського родовища (Хмельницька обл., Україна) фракцій з розміром частинок $0,4\text{--}0,5$, $0,16\text{--}0,25$ і $\leq 0,063$ мм.

Здатність утвореної ДМ до вторинної затримки оцінювалась за затримуванням нею іонів $Fe(III)$ з розчину його сульфату з концентрацією за іонами заліза 200 мг/дм^3 при рН 2. За підкладку ДМ було використано композитний полівінілспиртовий мікрофільтр (МФ) [7] з максимальним діаметром пор $0,7\text{ мкм}$.

Концентрація загального заліза у вихідних розчинах і пермеаті визначалась фотоколориметричним методом з *o*-фенантраліном [8], каламутність – згідно з фотометричною методикою, використовуючи формазинову суспензію за стандартний завіс [9].

Обговорення результатів досліджень. Глауконіт – складний калійвмісний водний алюмосилікат, який відноситься до групи гідролітів підкласу шаруватих силікатів, що мають непостійний і складний склад [10]. Формула глауконіту може бути представлена таким чином:



Вибір глауконіту за мембраноутворювальної добавки ДМ був обумовлений наявністю у цього мінералу високої сорбційної ємності [10], обумовленої наявністю в його структурі крім слюдяних шарів, які не розбухають, шарів монтморилоніту, що розбухають. Саме останні дозволяють глауконіту спочатку абсорбувати шкідливі рідини та гази з навколишнього середовища, а потім блокувати їх у своєму міжшаровому просторі [11]. При цьому глауконіту притаманні ще деякі цінні якості: він не розчиняється кислотами, не замерзає та не втрачає механічних властивостей, має низьку десорбцію, не виділяє назад поглинені раніше шкідливі речовини, що запобігає вторинному забрудненню [11].

Дослідники відзначають, що склад глауконіту непостійний і залежить від родовища. Склад глауконіту Карачаївського родовища був досліджений авторами [12]. За їх даними, він містить:

SiO_2 – 48,84; Al_2O_3 – 8,45; Fe_2O_3 – 18,08; FeO – 1,80; MgO – 3,76; CaO – 2,03;

Na_2O – 0,31; K_2O – 6,14; TiO_2 – 0,68; H_2O – 4,75 %.

Добавка 200 мг/дм^3 глауконіту до розчину, що очищується, як у випадку фракції $0,4\text{--}0,5$ мм, так і у випадку фракцій $0,16\text{--}0,25$ мм і $\leq 0,063$ мм підвищила затримувальну здатність (R) мікрофільтра (МФ) зі збільшенням конверсії пермеату (k) від 95–97 % до значень 99 % і більше (рис. 1а–3а), при цьому залишкова кількість заліза в пермеаті становила $0,02\text{--}0,05\text{ мг/дм}^3$, тобто була значно нижчою від регламентованої ($0,2\text{ мг/дм}^3$ [12]) практично на порядок.

У всіх трьох випадках питома продуктивність (J_w) зі збільшенням конверсії падала, проте, якщо в присутності фракції $0,4\text{--}0,5$ мм спостерігалось встановлення постійних значень затримувальної здатності після $k = 50$ % – зниження J_w дорівнювало 24 % (рис. 1а), то у разі двох інших фракцій це тривало протягом всього експерименту та становило > 70 % (рис. 2а–3а).

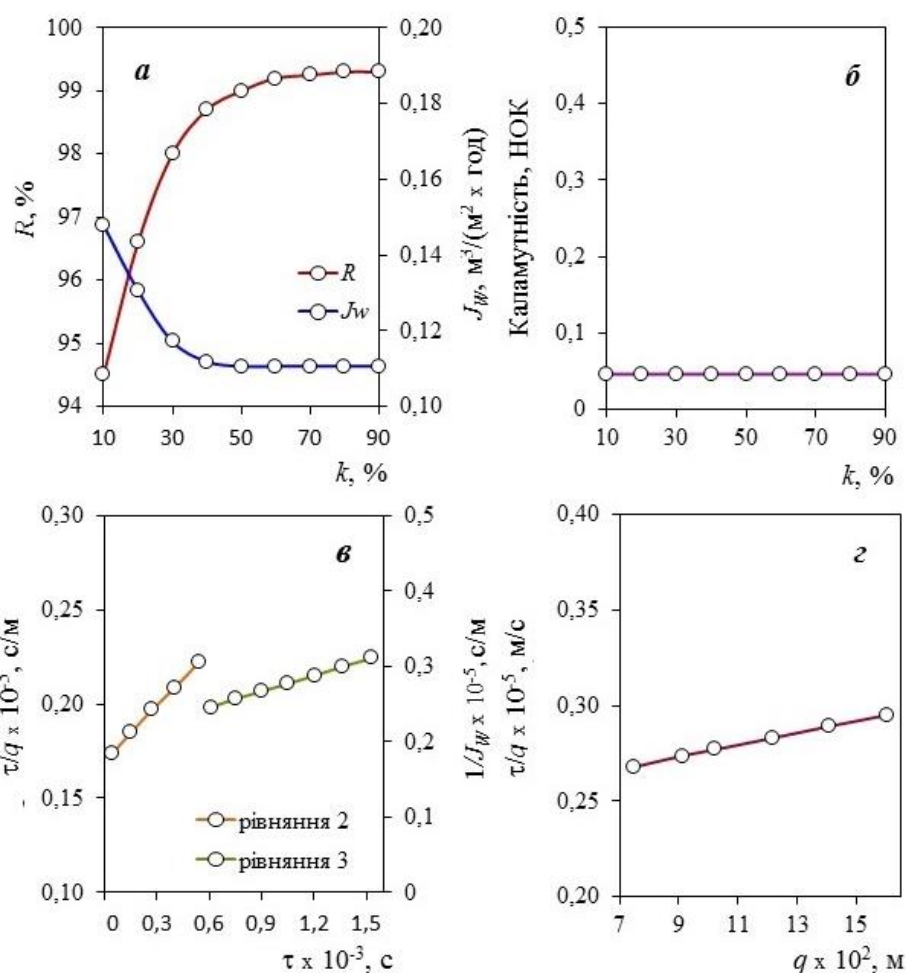


Рис. 1. Залежність затримувальної здатності відносно заліза, питомої продуктивності мікрофільтра (а) і каламутності фільтрату (б) від конверсії; мембраноутворювальна речовина – глауконіт (фракція 0,4–0,5 мм); кінетичні дані процесу фільтрування в координатах рівнянь (2), (3) (в) і рівняння (4) (г). $\Delta P = 0,5$ МПа

Каламутність пермеату, яка в даному випадку може бути обумовленою лише частинками глауконіту, у разі використання фракції 0,4–0,5 мм протягом всього експерименту була нижчою за чутливість методу визначення (0,1 % [9], або 0,058 НОК) (рис. 1б). При використанні фракції 0,16–0,25 мм до $k = 70$ % каламутність пермеату була відносно постійною та становила $\sim 0,3$ НОК, потім

вона зросла до 2,9 НОК (рис. 2б). Каламутність пермеату в третьому випадку (фракція $\leq 0,63$ мм) при $k = 10$ % становила 0,464 НОК, починаючи з $k = 20$ % вона знизилась до 0,174 НОК і протрималась на цьому значенні до $k = 50$ %, потім різко збільшилася до 3,89 НОК (рис. 3б).

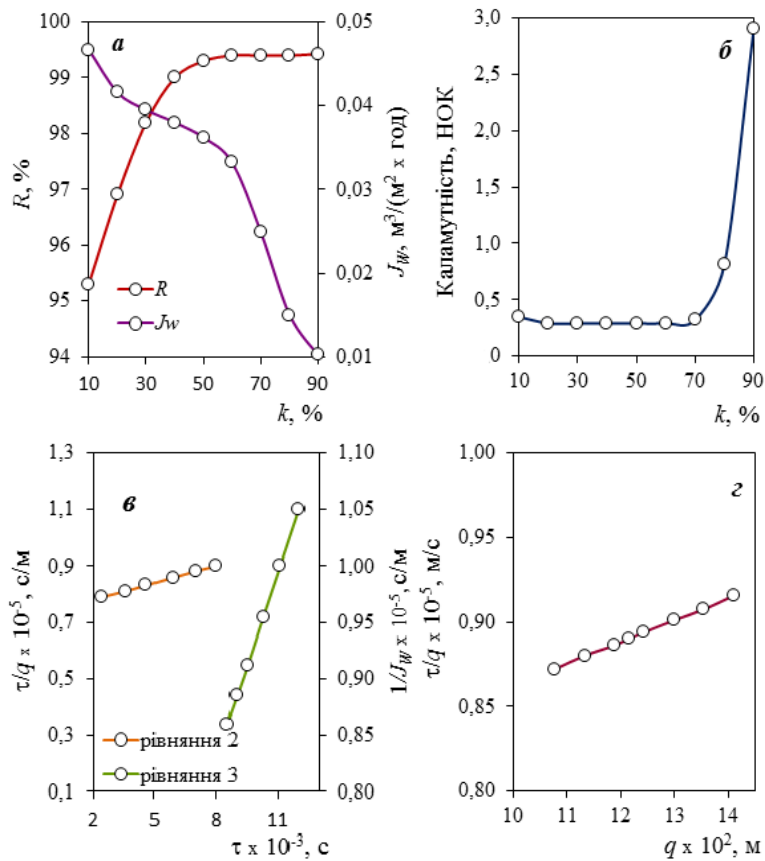


Рис. 2. Залежність затримувальної здатності відносно заліза, питомої продуктивності мікрофільтра (*a*) і каламутності фільтрату (*б*) від конверсії; мембраноутворювальна речовина – глауконіт (фракція 0,16–0,25 мм); кінетичні дані процесу фільтрування в координатах рівнянь (2), (3) (*в*) і рівняння (4) (*з*). $\Delta P = 0,5 \text{ МПа}$

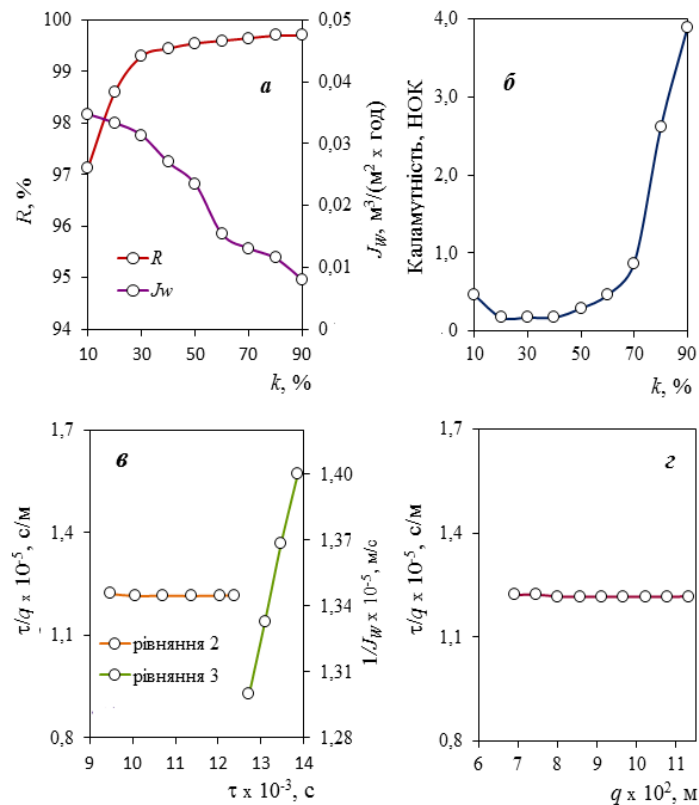


Рис. 3. Залежність затримувальної здатності відносно заліза, питомої продуктивності мікрофільтра (*a*) і каламутності фільтрату (*б*) від конверсії; мембраноутворювальна речовина – глауконіт (фракція $\leq 0,63 \text{ мм}$); кінетичні дані процесу фільтрування в координатах рівнянь (2), (3) (*в*) і рівняння (4) (*з*). $\Delta P = 0,5 \text{ МПа}$

Виходячи з отриманих результатів, можна зробити висновок, що тільки при використанні частинок глауконіту фракції 0,4–0,5 мм утворилась динамічна мембрана, тоді як чим дрібнішими були частинки, тим легше вони проникали до пермеату.

Механізм фільтрування було визначено методом, розробленим на основі аналізу рівнянь Дарсі та Гагена – Пуазейля. При застосуванні цього методу за результатами проведених на фільтрах експериментів при постійному тиску проводиться графічна обробка результатів з метою отримання прямих ліній в координатах, підібраних таким чином, щоб відображалась залежність між двома змінними, тоді як інші параметри повинні залишатися постійними, на підставі чого робиться висновок про механізм фільтрування.

Відомо чотири випадки забруднення фільтрів домішками, що присутні в воді [14]:

– фільтрування із закупорюванням кожної пори однією частинкою за рівнянням:

$$J_w = J_0 - k_1 \cdot q; \quad (1)$$

– фільтрування із поступовим закупорюванням кожної пори багатьма частинками; випадок описується рівнянням:

$$q = 1/J_0 + k_2 \cdot q; \quad (2)$$

– фільтрування за проміжним механізмом, якому відповідає рівняння:

$$1/J_w = 1/J_0 + k_3 \cdot q; \quad (3)$$

– фільтрування із утворенням осаду на поверхні фільтра (рівняння (4)):

$$q = 1/J_w + k_4 \cdot q, \quad (4)$$

де J_w та J_0 – об'ємний потік відповідно в будь-який проміжок часу і на початку процесу;

q – об'єм фільтрату, який пройшов через одиницю площі;

k_1 – k_4 – постійні фільтрування, що характеризують інтенсивність зменшення швидкості фільтрування із збільшенням кількості відфільтрованої води та визначаються як тангенс кута нахилу відповідної прямої до осі абсцис.

Проведені розрахунки показали, що в усіх трьох випадках спостерігались як стадія закупорювання пір (рівняння (2)), так і стадія осадоутворення на поверхні МФ (рівняння (4)), яка починалась після перехідної стадії (рівняння (3)). Але, якщо утворення осаду на поверхні МФ у випадку фракції 0,4–0,5 мм відбувалось вже через 25,5 хв (рис. 1г), то у випадку фракції 0,16–0,25 мм це спостерігалось лише через 3,3 год (рис. 2г), у випадку фракції $\leq 0,063$ мм – через 3,8 год (рис. 3г), тобто набагато пізніше, ніж у першому випадку. До того ж у двох останніх випадках утворений шар глауконіту був порушений (рис. 2б і 3б), і питома продуктивність знижувалась не зупиняючись більш, ніж на 70 % (рис. 2а і 3а).

Висновки. Проведені дослідження показали, що глауконіт придатний як мембраноутворювальна добавка при видаленні заліза з водних розчинів, але з трьох досліджених фракцій – 0,4–0,5, 0,16–0,25 і $\leq 0,063$ мм використана може бути з цією метою тільки фракція 0,4–0,5 мм. Вміст заліза в пермеаті в цьому випадку становить 0,05 мг/дм³, що значно нижче за регламентовану норму (0,2 мг/дм³).

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MEDICAL SCIENCES

EFFECT OF LPS ON CAPSULAR ELEMENTS OF SPINAL GANGLIA AND PERIPHERAL NERVE. COMPARATIVE STUDY ON ANIMAL MODEL

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Abstract

Lipopolysaccharide (LPS) that is the primary component of the outer membrane of Gram-negative bacteria which used to investigate a process - inflammation in nervous system. There is comparative study on specific properties of capsule surrounding spinal ganglia (also named sensory ganglia situated on dorsal root of spinal cord) and perineurial layer of peripheral nerve (sciatic nerve). Here, we investigated the effect of LPS (endotoxin) on capsular elements, as well as on peripheral (sciatic nerve) nerve in a rat model. During experimental research, 20 rats were used. At acute endotoxemia (after 2 hours of administration of LPS) the effect of LPS on structural elements of spinal ganglia first detected feature were formation of edematous fluid, which accumulated on large amount and influenced to covering capsular elements and connective tissue investment of peripheral nerve.

Keywords: LPS, endotoxin, spinal ganglia, capsule, peripheral nerve.

Introductions. Bacterial lipopolysaccharide (LPS) may contribute to the manifestation of inflammatory pain within structures of the afferent somatosensory system (1). Spinal ganglia, the place where situated neuronal cell bodies that give rise to peripheral nociceptive nerve endings. The latter detected different stimuli (pain, mechanical, chemical, thermal and else) and by neurons of spinal ganglia information is forwarded to the central nervous system. Sensory spinal ganglia represent transfer stations between somatosensory signals from the periphery to the brain. Therefore investigation on spinal ganglia useful approaches to combat some of the pathophysiological lesion during inflammation. In this context, we focused LPS-induced effects on covering connective tissue elements of spinal ganglia (capsule) and peripheral nerve.

Aim of research was to comparative study of effect LPS on capsular elements of spinal ganglia and on connective tissue elements of peripheral nerve.

Materials and methods. The material of investigation had been dorsal root ganglia and peripheral (sciatic) nerves were purchased from 20 adult white rats with a weight of 200-220 grams. The all procedures on animals complied with the Principles of Laboratory and Animal Care mounted by the Azerbaijan Medical University. The animals had been bred on pathogen free special a standard laboratory condition. Research rats were divided into 2 groups: control and experimental. In control group into the tail vein of animals was ad-

ministered 0,5 ml physiological salt solution. In experimental groups of animals acute experimental endotoxemia was caused by intravenous administration of LPS from E. coli (Serotype 0111: B4 InvivoGen, San Diego, CA 92121) at a dose of 1,0 mg/kg dissolved in saline. After 2 hours of the intravenous injection the animals decapitated under ketamine anesthesia; the abdominal and thoracic cavity of the rats opened, then was taken out the internal organs and the vertebral bodies were cut. Later by the help of special lancet, a spinal canal opened and spinal ganglions, corresponding nerve and sciatic nerve were removed from the soft tissue in intervertebral foramen level. The all (from both groups) specimens were fixed in a solution containing paraformaldehyde 2%, glutaraldehyde 2%, picric acid 0,1% and a buffer phosphate solution at a pH of 7.4; later postfixed with a solution of 1% osmium tetroxide in 2 hours; at last prepared into Spurr and Araldit-Epon blocks. Obtained thin (0,5 µm thick) and semithin (1-2µm) section were dyed with methylene blue, azure II and basic fuchsin (2), afterwards observed by Latimet (Leitz) microscope. Ultrathin section, 70-80 nanometers thick, were cut from the same blocks on ultratome (LKB -III, Leica EM UC7) and treated with 2% acetate of uranyl solution, as well as 0,6% lead citrate solution (3). After examining of ultrathin sections under 80-120 kV in transmission electron microscope JEM-1400 (Jeol, Japan) taken the electronograms.

Results and discussions. The connective tissue surrounding spinal sensory ganglia known as capsule of

ganglia. Capsule, that regulating homeostasis within organ, isolated ganglion from external environment, as well as composed of outer (epineurium) and inner (perineurium) layer. The composition (fibers, cells) of cap-

sule clearly visible under electron microscope. On figure 1 seen comparison of capsular elements of spinal ganglia with covering connective tissue investment of sciatic nerve.

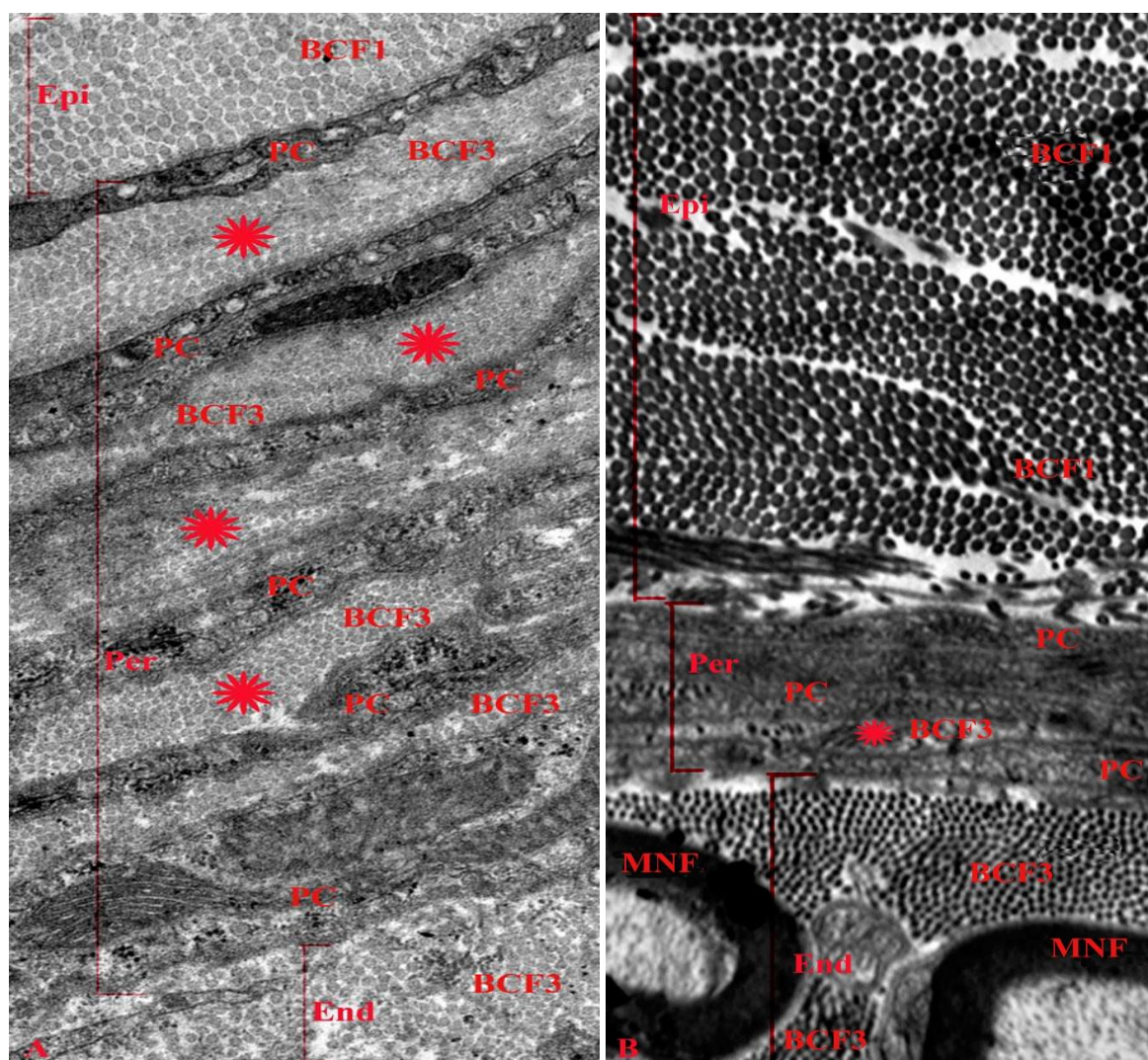


Figure 1. Comparative electronograms of spinal ganglia capsule (A) and connective tissue investment of sciatic nerve (B). TEM. The explanation is given in the text. Stain: uranyl acetate and lead citrate.

Magnification: A 25000 times, B 20000 times. Abbreviation: Epi-epineurium, Per-perineurium, End-endoneurium, PC-perineurial cells, BCF 1-bundle of collagen type 1 fibers, BCF 3-bundle of collagen type 3 fibers, MNF – myelinated nerve fibers.

On electronograms (Fig. 1) shows the cellular and fibrillary elements involving in composition of capsule and connective tissue investment of the sciatic nerve. The capsule of spinal ganglia composed of epineurium, perineurium and endoneurium (fig. 1A). As the same composition are present in sciatic nerve wrapped connective tissue elements. However, the thickness of epineurial layer of sciatic nerve extremely outstanding the same layer of capsule, but perineurium of capsule thicker than in sciatic nerve. Perineurium in both structure (on electronogram) contains perineurial cells, which arranged in 6-7 layer in capsule, also 4-5 layer in sciatic nerve. Within endoneurium visible myelinated nerve fibers in sciatic nerve (fig. 1B). Apparently, within perineurium - between the perineurial cells (located in the inner layer of the capsule), also in the epi- and endoneurium detected mainly bundles of collagen fibers (indicated by stars). It should be noted that the collagen fibers, located in the endoneurium of sciatic

nerves and between perineurial cells of capsule of spinal ganglia are composed of thin reticular fibers, mainly of type III collagen fibrils. Ultrastructurally, the fact appeared that because of the reticular fibers are thinner than the fibers located in the epineurial layer.

The epineurial layer of both the capsule and the sciatic nerves, unlike the endoneurium and perineurium, are composed of dense bundles of collagen fibers formed mainly from type I collagen fibrils, which are resistant to mechanical effects. The fact that the bundles of collagen fibers involved in the organization of epineurial membranes have a compatible structure with each other (the ganglion and sciatic nerve), there is a sharp difference is clearly visible between their morphometric parameters in thickness of layer. The results of the conducted morphometric studies show that nerve bundles with the largest diameter are at least two times less than the diameter of the spinal ganglia, the thickness of the epineurial membrane surrounding them from

the outside is at least 4-5 times greater than the thickness of the epineural membrane of the ganglions capsule (fig.1).

As a result of the effect of LPS on structural elements of spinal ganglia first detected edematous fluid, which in large amount situated around ganglia (indicated by double arrow on fig.2A), under capsular and intraganglionic regions (marked by red star on fig.2C) under light microscope. The structural components of spinal ganglia such as connective tissue element – capsule (shown on Fig.2A, C), extra and

intra ganglionic vessels and nerve elements (neuron, glial cells and nerve fibers) are also exposed to various degrees of deformation, which gives reason to conclude that the amount of the formed edematous fluid is an enormous amount high. On this research we focused on alteration that detected on capsular elements of spinal ganglia. The analysis of the obtained materials shows that the large size of the “perineural windows” (PW) (shown on Fig.2A, 2b by single arrow) revealed during acute endotoxemia in the capsule of spinal ganglia.

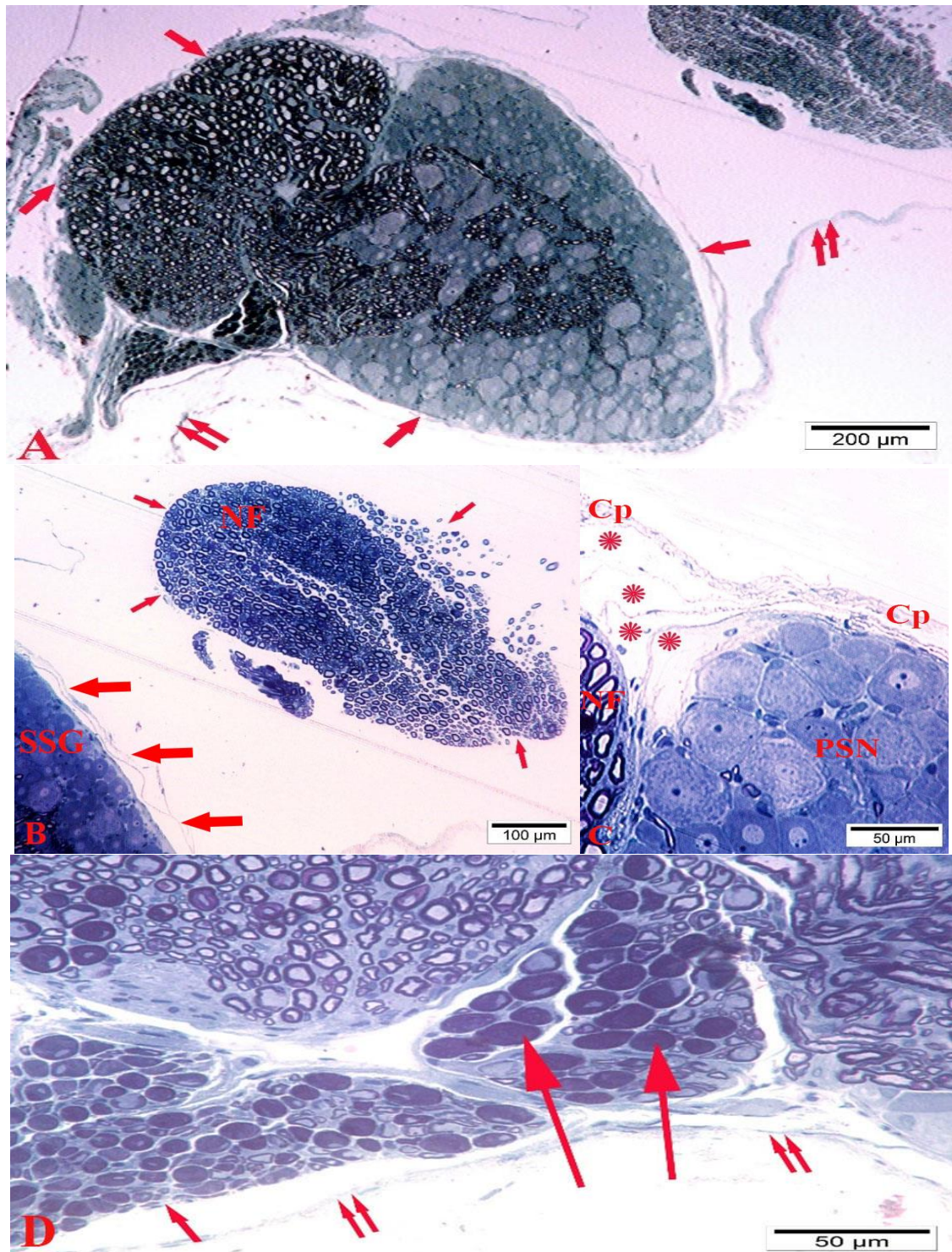


Fig. 2. Microscopic slides of changes in capsular elements of spinal ganglion (A, C) and peripheral nerve, nerve bundles (B, D) during acute endotoxemia. Semithin section. The explanation is given in the text. Stain: methylene blue. Scale bar: A 200 µm, B 100 µm, C, D 50 µm. Abbreviation: Cp capsule, SSG sensory spinal ganglia, NF nerve fibers, PSN primary sensory neuron.

As well as the coming into being the PW in capsule of spinal ganglia, that occupy most of the field of view even under the small magnifications of a light microscope. Also at acute endotoxemia, the PW observed in nerve bundles with an average diameter of 400-600 μm , which participate in the organization of peripheral nerves (fig. 2B, 2D). However the size of latter are much smaller than the previous. The large sized PW on capsule of spinal ganglia can be explained by the following facts:

a) the density of intra and extraganglionic vessels network is more high than peripheral nerve (4); the perimeter of the luminal surface of the vessels of ganglia (the size of the exchange surface) is at least 1.8 times more than the perimeter of the spinal ganglia's capsule, the corresponding indicator is at least two times less in the sciatic nerve bundles (it means the luminal surface of the vessels of peripheral nerve less than perimeter of the nerve bundle);

b) while the diameter of the largest bundles involving in the organization of peripheral nerves does not exceed 600 μm , this indicator is at least twice as large in spinal ganglia;

c) the thickness of the epineural layer of the spinal ganglia's capsule is at least three times thinner than the thickness of the corresponding layer of the sciatic nerves.

Conclusion. The formed large amount edema destructed the structural elements of spinal ganglia, especially its capsule, that the selective permeability functions of the connective tissue elements surrounding the spinal ganglia along with the vessels are completely disrupted. It should be noted that the density of vessels

network within organ, the size of the exchange surface of its vessels and thickness of surrounding connective tissue elements directly influenced to amount of edematous fluid at acute endotoxemia.

This work is implemented basing on financial support of the Science Development Foundation under the President of the Republic of Azerbaijan. Grant № EIF-2011-1(3)-82/44/3-M-6.

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PEDAGOGICAL SCIENCES

USING CLOUD TECHNOLOGIES IN THE PROCESS OF LEARNING A FOREIGN LANGUAGE

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DOI: [10.5281/zenodo.7223642](https://doi.org/10.5281/zenodo.7223642)

Abstract

This article discusses the importance of using cloud technologies in the process of teaching a foreign language. It studied the concept and role of cloud technologies in modern language education. An analysis was also carried out to determine the effectiveness of using cloud technologies in interdisciplinary English language teaching.

Keywords: foreign language, cloud technologies, technology, educational process, teaching.

Nowadays, information technology has firmly entered the educational walls. Modern education can no longer function successfully in the old pedagogical forms. This means that the new school, the education system necessarily requires the use of new technologies, not only pedagogical, but also computer. One of the promising areas of development of modern information technologies is cloud technologies. Cloud technologies are a new digital model, the essence of which is to allow creating and storing applications for users, in our case for teachers and students. With the help of cloud technologies, all data and educational materials are placed on the Internet and are available to teachers and students, providing individuality and mobility in the use of resources for teaching and learning, facilitating collaboration, communication and sharing of resources, as well as the implementation of individual training. The following authors are devoted to the topic of cloud technologies in education: Gordyushin A.V., Lebedeva S.V., Shekerbekova Sh.T., Sukhanova N.T., Tarasov V.A., Kovalenko M.I., Sobol B.V. Stupina M.V., Vergasova O.M., Konishchev A.S., Skleiter N., Akkerman T., Itinson K. S. Batishchev A.V., Riz J., Dukkardt A.N., Sudarkina E.S., Panasenkov E.A., Vorontsov A.A., Martyshkin A.I., Markin E.I., Nesipkaliev U., Adkins S., Belamarik J., Girsh V., Neil Skleiter and others [1].

In the educational process, "cloud technologies" began to develop and be applied in foreign countries since 2008. In our country, cloud services were used in the information and educational environment of an educational institution mainly as hosting free mail services, other cloud technology capabilities were practically not used. This was due to the lack of sufficient information and specialists with practical skills to introduce them into the educational process. Active improvement of hardware, especially processor power, multi-core architecture, disk volume and Internet channel speed, has allowed cloud technologies to develop. The "cloud" is considered not as the Internet itself, but as a set of hardware and software tools that provide processing and execution of client requests [2].

In the modern world, information technologies in the field of education are a necessary condition for the

progressive development of society. The improvement and computerization of educational process technologies is one of the main among the many new directions of education development. The importance of using cloud technologies in education lies in the fact that they not only serve as tools, but also provide qualitatively new learning opportunities, the formation of independent learning skills and contribute to the creation of new forms of learning.

Cloud technologies allow teachers and students to create and store educational information assets in online information repositories and have a number of advantages:

- mobility - you can work not only directly in the classroom, but also in any place where there is Internet access;
- the ability to use the latest versions of programs and at the same time do not need to monitor the release of updates;
- cost-effectiveness - there is no need to purchase licensed software, in addition, it does not matter in which operating system a particular user prefers to work - web services work in the browser of any OS;
- the ability to collaborate with other users on the same document or project;
- access to secure storage at any time from any device with internet access (personal computers, tablets, laptops, phones, etc.) [3].

The directions of using cloud technologies in educational activities include:

1. Collaboration of employees on documents. For example, an educational program or an annual plan. This document is compiled by administration employees and teachers responsible for any direction, for example, a psychologist, a social pedagogue or a person responsible for health care. Everyone is responsible for their own part of the document and cannot make changes to other blocks. To collaborate in the cloud, you need to create or place a document in cloud storage and share it with everyone who has a link or email addresses.

2. Joint project work of students. Students are given topics for projects. Then they are divided into 2 groups. Each group has its own responsibilities. The supervisor creates the document and grants access. These can be links or email addresses. Students work on a project at home or at an educational institution, filling out documents with content. At the end of the work, the teacher is granted access. If necessary, the teacher leaves comments for correction by students. For example, using Google Docs, the main advantage of which is the possibility of joint editing of documents (texts, photos, presentations, tables).

3. Distance education. The teacher offers students a task using an electronic journal. For example, written assignments. The student either creates a document or works with it. The teacher can view the modified document because he has access to it. The introduction of cloud technologies is an irreversible process that goes on as usual. In the near future, "clouds" will become the same widespread technology in our and other countries.

Today, cloud technologies are something that everyone uses almost daily. The rapid spread of cloud technologies sets us the task of integrating cloud services into the system of an educational institution. Cloud technologies have broad prospects for application in the field of education, research and applied development, as well as for distance learning. The use of cloud technologies in the educational process allows you to open an educational space [4].

Today, the information and educational space of universities is analyzed in the context of electronic reflection on the Internet of various aspects of university activities. There are various plans for designing an electronic learning environment that take into account the interests of different groups of Internet users. From a socio-psychological point of view, the role of the electronic educational environment of universities in improving educational technologies, the emergence of new aspects of teachers' activities, conditions for students' self-realization is revealed.

In general, cloud technologies represent a new way of organizing the educational process and offer an alternative to traditional methods. In addition, there is the possibility of personal training, collective training and interactive classes. The use of cloud technologies in the learning process leads to the optimization of the educational and methodological activities of the parties, increasing the effectiveness of communication links, minimizing the costs of the educational institution [5]. The use of cloud services is of great importance when teaching a foreign language, as it combines text, sound, graphic illustrations, video images, animation and, thus, allows you to simultaneously submit linguistic, speech and extralinguistic information in different ways. The systematic use of cloud technologies in English classes helps to increase internal motivation to study the subject and study in general. The motivation of students to study increases, more comfortable conditions for it are created [6].

The use of these technologies contributes to the integration of educational institutions into the global

educational space, promotes the development of relations with foreign partners on an equal basis. This is important for all specialties and areas of training of technical, humanitarian and classical universities and marks the transition of the domestic education system to a new qualitative level. That is, we have long since moved from the post-industrial era to the information one. The essence of cloud technologies is to provide users with remote access to services, computing resources and applications (including operating systems and infrastructure) via the Internet. The development of this direction of hosting (Hosting is a service for placing client equipment on the provider's territory, ensuring its connection to high-speed communication channels) was caused by the need for software and digital services that could be managed from the inside, but which would be more economical and efficient. In other words, we, ordinary users, get an information space — a cloud in which we can create, store and process various documents [7].

A striking example of cloud technologies that can be implemented in teaching foreign languages are the services provided by the Internet giant Google: Google Docs (documents, tables, presentations, forms, diagrams, drawings), Google Calendar (an electronic calendar with large reminders of events), informing a group of people about upcoming events), Google Mail (email with an advanced interface), Google Translate (online translator into all languages of the world), Google Groups (a service offering almost unlimited collaboration on creating, editing and publishing documents), Google Talk (a web client that provides live communication on the Internet), Google Labs (incubator of ideas for new services), etc. [8].

The results of the interaction of the subjects of the pedagogical process of teaching a foreign language are: the possibility of organizing joint activities and interpersonal interaction of the subjects of the educational process using cloud technologies; the ability of students to take into account different opinions and make efforts to coordinate different positions. At the same time, it cannot be argued that cloud technologies are innovative technologies for teaching a foreign language, but they provide an additional tool for the subjects of the learning process, and also introduce the effect of novelty into modern pedagogical technologies [9].

In conclusion, I would like to emphasize that new opportunities for improving the educational process and the educational system as a whole are opened precisely with the use of information and computer technologies that are constantly being introduced into education and contribute to its rise to a new level. These technologies belong to the technologies of the 21st century, and practice shows that with the introduction of new information and communication technologies, the study of foreign languages is moving from the field of research to the field of education and is becoming more widespread [10].

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INTEGRATIVE PROCESS OF TEACHING FOREIGN LANGUAGE CULTURE TO SCHOOLCHILDREN

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Abstract

This article discusses the relevance of the integrative model of teaching foreign language culture to primary school children. Where the role of integration in the process of teaching a foreign language was studied. Also, the issue of foreign language culture in the process of teaching a foreign language with the use of interdisciplinary integration is analyzed.

Keywords: integrative model, foreign language culture, primary school age, foreign language, education.

Today, teaching foreign language communication to younger schoolchildren is one of the most popular areas of modern foreign language education aimed at the comprehensive development of students' personality by means of a foreign language. Since a foreign language is one of the most universal subjects that can enrich primary education, since children of primary school age have an innate and not yet lost ability to master languages, and languages, in turn, can become an effective means of children's development [1]. The activity-based nature of this educational subject, its versatility allow us to build the process of teaching a foreign language in a variety of content and organizational forms and understand it as a means of storing and transmitting various special knowledge, not just language. Within the framework of a positive assessment of the use of interdisciplinary connections in primary school and the undoubted advantages of a foreign language for younger schoolchildren, as well as its ability to integrate with other academic subjects, a prerequisite for building a foreign language course in primary school based on an integrative model [2].

In the modern theory and methodology of teaching foreign languages and the formation of the personality of a younger student, the expediency of using an integrative approach, which contains a huge potential, is emphasized. Therefore, the main advantage of

integration in teaching foreign languages to younger schoolchildren is the creation of conditions for the formation of a child's personality with a broad ideological mindset, capable of actively acting in various fields of activity in solving educational tasks of various directions. Integration makes it possible to improve the quality of knowledge acquisition by students due to the interpenetration of the content of different subjects and consideration of the same subject of study from the point of view of different subjects [3].

A foreign language as a subject creates all the conditions for the effective implementation of the integration model – the knowledge gained in the native language allows you to study a foreign language from different sides. Since it is a foreign language compatible with a large number of subjects, such as the world around us, the history of the country of the language being studied, fine arts, Kazakh/Russian language, literature, mathematics, music, technology in elementary school. Integrated lessons refer to non-standard forms of lessons. They are held rarely, once a quarter, six months or a year. they require the training and creative initiative of a group of teachers of various subjects. A foreign language is a special subject, but it is impossible to cover the full depth and complexity of linguistic phenomena without taking into account their psychological and social aspects [4].

The integrative approach assumes a uniform and equal connection of related topics from all disciplines, the study of which is mutually intertwined at each stage of primary school education. The use of an integrative approach in the educational process aimed at developing the professional competence of schoolchildren by means of a foreign language using inter-subject connections precedes:

- determination of structural and logical connections of academic disciplines of the profile and linguistic cycle;
- selection of components for integration;
- determination of conditions, methods and depth of integration. Integration of several disciplines (foreign language and professional discipline) becomes possible in the process of professionalization of the English language.

In the scientific and pedagogical literature, integrated learning is considered as a didactic tool for the controlled integration of knowledge acquired by students in the process of forming inter-subject skills. Since, inter-subject relations are becoming very relevant at the present stage of the development of school and vocational education, the improvement of which goes along the path of integration of knowledge, which in no way means the elimination of systematic classes in individual subjects. They only contribute to the consolidation of the practical orientation of the subject "foreign language".

A foreign language comes into contact with all other school subjects to one degree or another and opens up the possibility for students to gain additional knowledge in history, geography, literature and other subjects. For younger schoolchildren, foreign language activity is a means not only of learning, but also of playing. For the teacher organizing this activity, it is a goal, and the actions integrated into it are a means of learning. It is important for a child to have an internal, communicative and cognitive motive that fuels interest in the subject "foreign language". To do this, during integration classes, interesting tasks are set for children. The vital need for communication, the need to solve emerging communicative tasks are the main engines of mastering a foreign language [5].

In general, it seems to us very important to note that in the process of integrated teaching of foreign languages, a new final quality of the learning process arises, consisting in a significantly high increase in the efficiency and effectiveness of mastering this subject. What determines your appearance? To answer this question, it is necessary to refer to the concept of "foreign language culture" [6].

Safonova V. V. adheres to the opinion that the culture of a foreign language is based on the fact that in cognitive, educational, educational and developmental aspects it is obliged to give students the process of learning and mastering a foreign language. Foreign culture, being the purpose of teaching, has psychological, linguistic, cultural, socio-pedagogical content, which should be attached to all aspects of cognition and ousted from the domain of the discipline "foreign language". However, in classes of this type,

the culture of a foreign language cannot, in our opinion, become the goal of learning, since it is mastered gradually, and not immediately [7]. Therefore, in a foreign culture, it is necessary to first identify the most important sections, i.e. the components of a specific goal, and then clarify them in the objects of study. In addition, it is very important to solve two problems:

- 1) to establish an ideal correspondence to a group of objects included in the cognitive, educational, educational and developmental aspects;
- 2) highlight the area of subjects that can be learned in the time allotted for learning a foreign language.

E. I. Passov believes that the culture of a foreign language is a part of culture, a spiritual resource that a student should take in the process of learning a foreign language, while using a communicative approach in such aspects as cognitive, educational, developing and teaching, and it is important that the leader directly has an educational aspect.

That is, the culturological task of teaching a foreign language is integrative, since the concept of "culture" means all the diversity of social, historical, ethnographic and national characteristics of the country and its people. The implementation of this educational base, as it seems to us, is nothing more than an important and largely determining factor affecting the development of a child's personality, and therefore is a specific goal of any general education approach. Due to its properties, integrative learning is able to solve the tasks of teaching a foreign language within a specific educational goal [8].

In general, the tasks of linguistic and cultural education in teaching a foreign language to younger schoolchildren consist in acquiring knowledge about the structure of the language, about the cultural characteristics of the language being studied, its system, its differences and similarities with the native language, in addition to solving the educational interests of students in such areas as ethnographic, national, social features in the country of the language being studied [9]. The above-mentioned knowledge, which the child learns as a set of cultural facts, ideas and systems of concepts, serve as the basis for the formation of thinking of younger schoolchildren, as well as regulate their creative activity. Therefore, foreign language culture should be used as one of the main means of forming the basis for teaching foreign language culture, and in particular a foreign language, as an element of spiritual enrichment of a child's personality [10].

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PHILOLOGICAL SCIENCES

ПРОФЕССОР С.БАХАДЫРОВАНЫҢ ИЗЕРТЛЕҰЛЕРИНДЕ ҚАРАҚАЛПАҚ ПРОЗАСЫНЫҢ ҮЙРЕНИЛИҰИ

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STUDY OF KARAKALPAK PROSE IN THE STUDIES OF PROFESSOR S. BAKHADYROV

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DOI: [10.5281/zenodo.7223665](https://doi.org/10.5281/zenodo.7223665)

Аннотация

Бул мақалада Қарақалпақстан Республикасына мийнети сиңген илим ғайраткери, филология илимлериниң докторы, профессор С.Бахадырованың карақалпақ прозасының актуаль мәселелерине арналған айырым мийнетлери анализленген. Илимпаздың мийнетлеринде карақалпақ романларындағы тил көркемлиги, сюжет хәм композиция дүзиў, дәўир хәм қахарман образын жаратыў ҳ.т.б. мәселелер ҳаққында сөз етилген. Изертлеўлерде билдирилген ой пикирлер, келешекте карақалпақ прозасын үйрениўде илимий теориялық дәрек хызметин атқарады деген жуўмақларға келинген.

Abstract

This article analyzes some studies devoted to the current problems of Karakalpak prose of the famous scientist of the Republic of Karakalpakstan, Doctor of Philology S. Bakhadyrova. The scientist's research considers the features of the artistic language of Karakalpak novels, the creation of a plot and composition, the coverage of the era and the image of the hero, etc., problems are discussed. The final conclusions were made that the opinions and comments expressed in the study will serve as a scientific and theoretical source in the further study of Karakalpak prose.

Таяныш сөзлер: карақалпақ прозасы, дөретиўшилик лаборатория, жазыўшы шеберлиги, роман, тил көркемлиги.

Keywords: Karakalpak prose, creative laboratory, writing skills, novel, artistic language.

Ҳазирги карақалпақ әдебияттаныў илиминде көпшилик изертлеўшилердиң мийнетлери көркем шығарманың идея-тематикасы, сюжет хәм композициясы, образлар курамы хәм характер жасаў шеберлиги мәселелерин үйрениў менен шекленип келмекте. Лекин, С.Бахадырова өткен әсирдиң 70-жыллары жазылған «Қарақалпақ романларының тил көркемлиги ҳаққында» [1, 108-115] мақаласында көркем шығарманың, әсиресе кең көлемли романлардың тили мәселесин изертлеўлердиң әҳмийети менен зәрүрлигин бириншилерден болып баслап берди. Мақалада тийкарынан 1950-60-жыллардағы миллий әдебиятымыздың раўажланыўын белгилейтуғын, карақалпақ прозасының табысы болған Ө.Айжановтың «Арал кушағында» (1958), Т.Қайыпбергеновтың «Қарақалпақ қызы» (1960; 1966), К.Султановтың «Ақдәрәя» (1962) романларының тил көркемлиги ҳаққында кеңнен сөз етеди. Мысалы, Ө.Айжановтың «Арал кушағында» романының тили халықтың тынымсыз ҳәрекетте, оқыўшының ойын барқулла гүреске шақырып отыратуғын қайнаған өмирдиң ҳақыйкат тилинен алынған. Жазыўшы қахарманларының ҳәр бириниң тилинде халықтың жанлы, ушқыр, тәсирли сөз тиркеслерин таңлап, олардың ишинен

ең жанлы халық руўхын бере алатуғынларын пайдаланған» [1, 108], деп жазса, Т.Қайыпбергенов пенен К.Султановтың романлары ҳаққында «Халықтың өзлери дөретен юморын «Қарақалпақ қызы», «Ақдәрәя» романларында да кең пайдаланғанлығын билемиз. Бул мәселеде Т.Қайыпбергенов халық юмориның жәрдемінде қахарманлардың ишки дүньясындағы бояўларын, олардың хеш кимге айтылмайтуғын сырларын бере алған. Оның тилинде юморлық күши күтә жақсы, ол арқалы автор өзиниң позициясын жасырын береди» [1, 110], деп көрсетеди.

Романлардың тилиндеги және бир өзгешелик – жазыўшылардың әдебий тилди халық тили менен байытыўында екенлигин көрсетеди. Илимпаздың үш автордың романларының тилин салыстыра отырып «Тил улыўма бир миллий тил болғаны менен оның бир жазыўшыда көриниўи бир-бирине уксамаған тәсири, эстетикалық күши, стили бар. Ө.Айжановтың тили сырттан қарағанда еле қәлиплеспей атырғандай көринеди. Жазыўшы биринши гезекте терең ой, пикир бериўге умтылады, ол тилдиң уйкасығынан гөре, турмыстың күшине, мазмунына кеўил бөледі. Буны жазыўшы өзиниң «стилин» көрсетиў ушын емес, турмыс ҳақыйқатлығын терең, ҳәр тәреплеме

сызыу ушын жаңа сөз, жаңа уйқасық излейди...Т.Қайыпбергенов пенен К.Султановта тилдің заңдары, уйқасығы, оның барлық мәнидегі тәртіби қатал сақланады. Олардың тилинде нызамға сыймай тұрған дизбек, турпайы ерси сөзлер хеш ушыраспайды. Олар халықтың тилин терең пайдалана отырып, тилдің сулыұлығын, мәдениетін бериұди көзде тутады» [1, 113], деп жазыушылардың романларындағы автор сөзі, қахарманның диалоглары хәм монологалары берилген орынлардан мысаллар келтирип жән-жақлама талқылауға умтылады. Ең тийкарғысы романлардағы көркем тилдің шешилиуи тек ғана жазыушының дөретиушилигиниң ержеткенлигин көрсетип қоймастан, халықтың мәдениетиниң, санасының, ақыл-ойының, дүньяға болған көзқарасының өскенлигин көрсетеди, деген тужырымлы жуумаққа келеди.

«Роман - 1989» деген мақаласында илимпаздың дурыс атап өткенидей, 1980 хәм 90-жылларда қарақалпақ әдебияты тарийхында роман жанрының ең гүллеп рауажланған дәуири болды деп айта аламыз. Яғный, усы жылы тек ғана «Әмиўдәрәя» журналы бетлеринде жәрияланған К.Мәмбетовтың «Хұждан», Ж.Сапаровтың «Жупаргүл» романынан үзиндилер, Т.Халмуратовтың «Питне» романынан баплар, Т.Нәжимовтың «Өзиңиз кимсиз» романынан үзинди, К.Султановтың «Өмир дәптери» романынан үзинди жәрияланғаны, ал «Қарақалпақстан» баспасынан Ш.Сейтовтың «Халқабад» атлы романлар циклиниң үшинши хәм төртинши «Өрдек қырғыннан соң», «Атланшап» китаплары, О.Әбдирахмановтың «Босаға» романы ы шыққанлығы менен дәлиллеген. Мақалада тийкарынан 1989-жылы толық түрде басылып шыққан, оқыушыға айтажақ ойын толық жеткизип берген Ш.Сейтовтың «Халқабад» тетралогиасының соңғы еки китабына, К.Мәмбетовтың «Хұждан», О.Әбдирахмановтың «Босаға» романлары хакқында пикирлери менен ортақласады. Ш.Сейтовтың «Халқабад» роман тетралогиасы хакқында: «Биз Т.Қайыпбергеновтың «Қарақалпақ дәстаны» трилогиясын 70-жыллардағы қарақалпақ әдебиятының жаңалығы десек, ал 80-жылларда Ш.Сейтов қарақалпақ әдебиятында биринши рет тууылған тетралогиасы менен жаңалық ашты. Бул еки роман («Өрдек қырғыннан соң» (3-китап), «Атланшап» (4-китап) – Б.З.) урыстың алды хәм урыстан соңғы жылларды өз ишине алады» [2,152], деп жазыу менен еки романның идея-тематикасын, сюжетин, дәуир конфликтин хәм қахарманлардың характерин жасаудағы шеберлигин «Жазыушы хакыйқатлықты бүркеместен, боямастан тууры өзиниң ырғағында ашып береді. Романның бас қахарманларын толықтыруушы екінши дәрежелі образларының байлығы менен көзге түседі. Роман бундай образлар менен бирге бир рет көринип қалатуғын образларға да бай. Барлығы болып романға 200 ден аслам қахарманлар қатнасады. Жазыушы олардың хәр бирин өзиниң атқаратуғын хызметі, сөйлейтуғын сөзі, өзиниң орны менен берген» деп бахалау менен бирге роман

сюжетиндегі айырым кемшиликлерди де орынлы сынға алып өтеді. Изертлеушиниң О.Әбдирахмановтың «Босаға» романы хакқында билдирген пикирлери де дыққатқа ылайық: «Босаға» романы оқыушылар ушын жаңа емеслигин, бул роман 1985-жылы «Әмиўдәрәя» журналының жәрияланып, сол жыллардың жаңалығы сыпатында анализге тартылғанлығын, лекин, роман бойынша бираз тартыслы пикирлер айтылғанлықтан, тоқтап өтиуге туура келгенлигин атап өтеді. «Босаға» негизинде тамамланбаған шығарма. Мениң пикиримше «Босаға» романында жазыушы өзиниң айтажақ идеясын еле толық айтқан жоқ. Оқыушының алдында турмыстан алжасқан, өз орнын турмыстан таппаған бизиң заманласымыздың образы турады. Романның бас қахарманы Назар турмыста қаңбақтай ушып, ийтерген самал бойынша кеткен жаслардың типик ўакили. Оның усындай әззилигин сезген Ғәний аңсат ғана өз мәпине пайдаланады. Мәмлекеттен урлап алған затларын тасытып өзине шерик етеді. Енди урлық әшқараланғанда барып Назардың көзи ашылады, оның Ғәнийге «харама» деген сөзи оларға деген қарсылығы, олардан ажырасыуы. Өмирдің босағасына жаңа келген Назардың өмир жолы енди басланатуғын сыяқлы, бирақ роман усы жерде тамамланады. Хакыйқат романға сүйек болатуғын үшлик Назар, Гүлжан, Лола образлары романның ақырында пайда болады. Бирақ, олар жүрислерин тамам қылмаған шахмат доскасындағы таслар сыяқлы қалып кетеді. Жазыушы романның дауамын жазбай қояды. Қахарманның айтажақ идеясы еле жуумақланбаған, шығарманың әдебиятшылар ортасында үлкен тартысты туудыруы тәбийий нәрсе [2,158], деп оғада дурыс хәм әдил пикир билдиреди. К.Мәмбетовтың «Хұждан» романы менен бүгинги күн темасына «Бозатау», «Посқан ел» сыяқлы ири көлемли романларынан кейин, айланып келиуин қуандырарлық жағдай сыпатында атап көрсетеди. «Хұждан» романы өзиниң атына ылайық бүгинги бизиң қайта қурылыс дәуириндегі адамлар арасында қатнас, бизиң турмысымызға тубалаушылық дәуириниң үлкен «ауырыуларының» бири ретинде усы хұжданның бизиң заманласларымыздың жүрегинен кете баслауы сөз етиледі. Романда ўақыя кеселхана турмысынан алып жазылған. Кеселхана символикалық образ ретинде берилген. Бул тубалаушылық дәуиринде руўхый жақтан кеселленген жарасын бир жағынан врач емлесе, екінши жағынан турмысқа кең түрде енип атырған қайта қурылыс идеясының емлеп атырғанлығын жазыушы шебер ашып береді» [2,158], деп бахалау менен бирге роман сюжетиндегі айырым орынларды «Жазыушы «Посқан ел» романында қарақалпақлардың келип шығуы тарийхы хакқындағы пикирлерин бунда да тәкирарлайды. Бул идея усы шығарма ушын жаңа болғаны менен улыўма жазыушы творчествосында жаңа емес, сонлықтан оқыушыда бир қыйлы тәсир қалдырады» [2,158], деп орынлы сынға алып өтеді.

С.Бахадырованың илимий изертлеулеринин бир бөлегин хәзирги дәуір қарақалпақ әдебиятында роман жанры менен байланысly изертлеулері қурайды. 1970-жыллардың ақырында бурынғы аўқамнын Жоқары аттестациялық комиссиясы қайта дүзиліп, миллий республикаларда жазылатуғын диссертацияларды тек ғана жоқары дәрежедеги рус тилинде жазыўды талап етти. Сол ўақытлары С.Бахадырованың «Хәзирги заман қарақалпақ романы» деген диссертациясы таяр еди. Ол питип турған докторлық диссертациясын жақлаўға усынбастан алдын Москваға, пүткил жәхән институтына тәжирийбе арттырыў ушын кетеди. Бул жерде белгили тюрколог илимпаз, профессор З.Кедринын басшылығында илимий жумыс алып барады. Зоя Кедрина оның докторлық диссертациясынын биринши вариантын қорғаўға қойыўға мәсләхәт береди. Лекин, ол қарақалпақ романының миллий өзгешеликлерин еле де терең ашқысы келеди хәм бул жумысты «Романда миллийлик хәм улыўма адамзатқа тән характер» деген машқалаға бурады. Бул жумыс «Роман хәм дәўир» (Нөкис, Қарақалпақстан. 1978) деген атама менен өз алдына китап болып шықты. Хәмме С.Бахадырова бул мийнетин жақлаўға қояды деп ойлады. Бирақ, ол енди буны фольклор менен байланыстырды. «Фольклор хәм қарақалпақ совет прозасы» темасындағы диссертациясын Москвадағы М.Горький атындағы пүткил жәхән институтының көп миллетли совет әдебияты секторына талқылаўға усынды. Талқылаўда шығып сөйлеген Г.И.Ломидзе, З.Г.Османова, З.С. Кедрина, А.И.Алиева, Залеская, Р.Юсуфов сыяқлы илимпазлар жумысты жоқары баҳалайды хәм сол биринши талқылаўда-ақ теманы жақлаўға усыныс етеди. Соннан кейин ғана Ташкенттеги Тил хәм әдебият институты қасындағы Қәнигелестирилген кеңесте докторлық диссертациясын жақлайды. Оның диссертациясына белгили өзбек алымлары – Иззет Султанов, Азиз Каюмов, Торе Мирза, Эрк Каримов күтә жоқары баҳа берди. Усы докторлық диссертациясы мазмунында «Фольклор и каракалпакская советская проза» атамасындағы монографиясын рус тилинде баспадан шығарды. Монография ҳаққында «Вопросы литературы» журналында Татьяна Давыдованың рецензиясы басылып шығады хәм ол бул жумысты қарақалпақ әдебияттануы илиминде емес, ал бурынғы аўқам илиминде үлкен жетискенлик деп баҳалайды. Усының өзи қарақалпақ илимине берилген күтә жоқары баҳа болып, С.Бахадырованың бурын ҳеш айтылмаған жаңа илимий концепсияларды усынғанлығы атап өтиледі. Дүнья илиминде биринши рет фольклоры раўажланған халықларда халықтың миллий мийрасты ядында сақлаў уқыбынын күшли болғанлығы хәм оның реалистлик әдебияттың қәлиплесиўинде айрықша орны анықланды. Китаптағы изертлеулердин әҳмийети хәм қарақалпақ әдебиятануы илиминде тутқан орны ҳаққында профессор Қ.Жәримбетов былайынша пикир билдиреди: «Қарақалпақ романының миллий көркем сағалары, яғный эпостан романға шекемги эволюциясы, онда миллий характердин жаратылыўы, улыўма

инсанийлық идеялардың берилиўи, баянлаў усыллары, жазыўшылық шеберлик хәм тағы басқа да мәселелер Ө.Айжановтың, Т.Қайыпбергеновтың, К.Султанов хәм басқалардың романлары мысалында оның «Роман хәм дәўир» (1978) монографиясында сәўлеленди. Бул мийнет роман туўралы изертлеулер арасында көрнекли орын ийеледи хәм илимий процессте итибарлы жаңалық болды [5]. Ең тийкарғысы, қарақалпақ әдебиятында роман жанрының пайда болыўына ең биринши гезекте халық аўызеки дәрәтпелеринин, және де бир-бирине жақын туўысқан халықлардың, қала берсе рус әдебиятының тәсири белгили роль атқарғанлығын айта отырып, «Хәр бир халық турмыс шынлығының үлкен картинасын кең планда сүўретлеп беретугын бул жанрда өз халқының турмысын, миллий өзгешелигин беріўге, унамлы қахарман образынан миллеттин идеалын, эстетикалық талғамын сиңириўге умтылады. Бул хәр бир халықтың роман сыяқлы ири дәрәтпелеринин бир-бирине ҳеш бир уксамайтуғын тийкарғы өзгешелиги болып қалады» [3, 7-8], деген пикир билдиреди. Және де, европа әдебиятында романның қәлиплесиўи әсирлер тарийхын өз ишине алған болса, ал, қарақалпақ әдебиятында тез ўақыттың ишинде (1958-1978-жыллар нәзерде тутылады – Б.З.) пайда болып, қәлиплесиў дәуирлерин бастан кеширіп, раўажланыў жолына түскенлигин, сүўретлеў өзгешелиги, тематикалық кеңлиги, жоқары басқышқа көтерилгенлигин айрықша атап көрсетеди.

Алымның және бир кең көлемли фундаменталь мийнетлеринин бири «Фольклор и каракалпакская советская проза» (Нукус, Каракалпақстан. 1984) [4] деп аталады. Бул мийнет Кирисий, Жуўмақтан тысқары үлкен 3 бапка бөлип үйренілген. 1 Бабы «Фольклор хәм қарақалпақ жазба әдебияты» деп аталады. 2 бабы «Фольклор хәм қарақалпақ совет прозасында социалистлик реализмнің қәлиплесиўи» мәселесине, ал 3 бабы болса, «Фольклор хәм хәзирги қарақалпақ прозасы» н үйрениўге арналған.

Қарақалпақ халқының баслы көркем дәстүрлеринин бири ретинде фольклордың роли, усы дәстүр тийкарында миллий әдебият қәлиплескенлиги қарап шығылады, ал әдебияттың нығайыўы, реалистлик принциплердин ислеп шығылыўы, әдебияттың байыўы, көп миллетли халықларымыздың әдебий тәжирийбеси менен байланысады. Ол өз мийнетинде XIV-XV әсирлерден баслап хәзирги күнлеримизге шекемги қарақалпақ жазба әдебиятының пайда болыўын бир пүтин хәм системалы түрде анализ жасаў арқалы қарап шығады, барлық тарийхый аспектлерде фольклорлық әдебий байланысларды анықлайды, халық дәрәтпелеринин жазба әдебиятка өтиўинин генетикалық, мийрасхорлық процесслерин белгилейди.

Илимпаз проза жанрының пайда болыўын ең дәслеп фольклорлық психология менен эстетикадан жеке дәрәтпелілік ойлаўға өтиў менен байланысly түрде қарап шығады, солай

етип, проза жаңадан туғылып атырған көркемлик системаның әхмийетли қурамлық бөлеги екенлиги атап көрсетиледи. Проза жанрының пайда болыуының спецификасын белгилеген уақытта усы жаңа жанрды бинә еткен жағдайларды, яғный миллий әдебиятты дөретиуге мүмкиншилик берген миллий негизде жасалады.

Фольклорлық прозадан реалистлик прозаға өтиуге себепши болған жәмийетлик санада жүз берген өзгерис, жазыушының дөретиуши дара адам ретинде қәлиплесиуи, оның идеялық-эстетикалық позициясының айқынласыуы миллий қарақалпақ әдебиятының пайда болыуындағы ең әхмийетли басқыш ретинде белгиленеди, усы процесстеги фольклордың роли анықланады. Усы өзгеристи анализ жасау барысында миллий көркемлик системаның аумасыуы қарап шығылады. Ал, усы миллий көркемлик системаның аумасыуы дүньяны образлы көркем қабыллауды диалектикалық түрде: олардың бир-биринен өза-ара беziушилиги, әсте ақырын фольклордан әдебиятқа өсип өтиушилик хәм жаңа эстетикалық принциплердин пайда болыуы формасында жүз бергенлигин айтады.

Қарақалпақ прозасының халықлық сөз дөретиушилиги менен өза-ара байланыста рауажланыуының көп жыллық хәм қурамалы тәжирийбесин улыумаластыра отырып С.Бахадырова әдебийяттың миллий спецификасындағы оның интернационаллық көркемлик тәжирийбе яки жақынласыу процессиндеги фольклордың ролин анықлайды.

Сонлықтан да, алымның бул мийнети хәкқында профессор Қ.Жәрімбетов былайынша пикир билдиреди: «С.Бахадырованың изертлеу стилине тән хәм жас изертлеушилер үлги алыуы тийис бир өзгешелик бар. Ол қарақалпақ романларын Орайлық Азияның көрнекли жазыушылары М.Айбек, М.Әўезов, Ә.Нурпейисов,

Ш.Айтматов хәм басқалардың романлары менен хәр тәреплеме салыстырып изертлейди хәм оларды бурынғы аўқам әдебиятаныу илими контекстинде анализлейди. Бундай усыл ой өристиң тереңлигин, жоқары қәнигеликти, көп мийнетти талап етеди. С.Бахадырованың бундай табанлы изертлеулерини оның докторлық диссертациясына (1985) хәм қунлы фундаменталь монографиясына («Фольклор и каракалпакская советская проза» (1984) тийкар болды)» [5].

Усылайынша, биз профессор С.Бахадырованың қарақалпақ әдебиятаныу илими бойынша алып барған илимий изертлеулериниң айырымларына ғана қысқакша мазмунда тоқтап өттик. Бул арқалы, алымның күнделикли әдебий процесске, жаңа шығармаларға хәм айырым шайыр-жазыушылардың дөретиушилигине бийпарқ қарамастан, оларға белсене араласып, өзиниң сын пикирлерини менен усынысларын билдирип барғанлығының айқын гүўасы болдық.

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POLITICAL SCIENCES

AZERBAIJAN-ARMENIA BORDER ISSUE AND EUROPE

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DOI: [10.5281/zenodo.7223683](https://doi.org/10.5281/zenodo.7223683)

Abstract

The de jure Azerbaijani-Armenian border corresponds to the border between the former Azerbaijani SSR and the Armenian SSR. The border between the countries consists of two main parts: In the west between Armenia and the Nakhchivan exclave of Azerbaijan, a longer section between Armenia and "mainland" Azerbaijan in the east. In addition, there are a number of enclaves on both sides of the de jure border, but in fact they are now under the control of the respective states. In fact, the situation on the Azerbaijani-Armenian border is more complicated - the western part of the border, Nakhchivan, is not disputed (except for the Karki enclave), but Azerbaijan does not control part of the eastern border. After the victory of Azerbaijan in the Second Karabakh War, the process of returning the occupied territories to the state to which they belonged began. Along with this victory, it also brought territorial and border issues. The article examines the process of restoring peace between the two countries, the mutual recognition and confirmation of borders, as well as the role of Europe in this process.

Keywords: Azerbaijan, Armenia, border, dispute, Europe.

Brief information about borders. The territory of the Republic of Azerbaijan, located in the east of the South Caucasus, is 86.6 thousand km². The republic borders on land with 5 countries - the Republic of Turkey, the Russian Federation, the Islamic Republic of Iran, the republics of Armenia and Georgia. The Caspian Sea is located in the east of the country and has a water border with Turkmenistan and Kazakhstan. Azerbaijan borders Armenia in the west and southwest. The length of the border with this country is 1007 km. The Karabakh conflict, which began in the early 1990s, resulted in the territorial losses of Azerbaijan. After the escalation of the Karabakh conflict, the official eastern part of the border was formed by the "Line of Contact", which stretched almost halfway and the southern sector of the border inside Azerbaijan, covering not only the mountainous region of Karabakh but also a significant part of Azerbaijan. [10] Armenia occupied twenty percent of Azerbaijan's territories. As a result of the Armenian occupation, the so-called Nagorno-Karabakh Republic was formed in the occupied territory, Azerbaijan lost control of most of its state border with both Armenia and Iran.

Postwar and borders. The issue of demarcation of the border between Azerbaijan and Armenia arose immediately after Armenia was defeated in the Second Karabakh war in 2020 and Azerbaijan regained control over the occupied territories. After the end of the 44-day Patriotic War with the glorious Victory of Azerbaijan, the beginning of new geopolitical processes in the South Caucasus, the foundation of a new era in the history of the region was laid. Until the war of 2020, there was no physical border between Armenia and the regions of Azerbaijan occupied by Armenia, and some Armenian villages were expanding towards the territory of Azerbaijan. In addition, there are other issues related to the border, as Armenia has controlled several villages of Azerbaijan's Gazakh district since the 1990s, including three Azerbaijani enclaves, as well as the Kerki exclave village of the Nakhchivan Autonomous Republic.

The conflict has already ended, and in the post-war period, the parties are trying to find solutions to important issues such as the demarcation of the state border, in addition to opening transport links. This process is of great importance for the future security and stability of the region. Now all the processes in the region are taking place under the clear leadership of Azerbaijan. With the signing of a peace agreement between Azerbaijan and Armenia after the second Karabakh war, a security environment, favorable conditions for lasting stability and peace can be created in the region. [4]

Azerbaijan only restores internationally recognized borders. The Azerbaijani side continues the work of strengthening the border protection system implemented within the framework of the liberated territorial integrity. This process is carried out on the basis of the maps of each of the parties that determine the border line between Armenia and Azerbaijan. Azerbaijan is fully committed to peace, security and regional cooperation based on respect for sovereignty, territorial integrity and the inviolability of internationally recognized borders.

Along with the November 10 agreement signed after the victory of the Azerbaijani army in Karabakh, the process of border demarcation between the two countries has started within the framework of the normalization process. Delimitation and demarcation of the borders between the two countries is the main condition for the realization of many projects, including the establishment of a new cooperation format of the regional states and the creation of the Zangezur corridor. Demarcation of borders is a very necessary process, the number one issue of mutual cooperation and insurance against future conflicts that may occur between the parties in the existing border areas.

According to the terms of the November 10 agreement, the remnants of the Armenian army must leave the lands of Azerbaijan, which are currently under the control of Russian peacekeepers. In the current geopolitical conditions, the Armenian decision-makers, from the government to the opposition, should

understand the necessity of opening the Zangezur corridor.[7] Armenia should shape its policy and prepare for a peace agreement and cooperation with Turkey and Azerbaijan.

Azerbaijan and Armenia are trying to restore their relations after the war. Although a ceasefire has been reached, many outstanding issues remain to be resolved in order to move towards a negotiated, comprehensive and sustainable settlement. Despite the mutual statements of both sides, the tension on the border attracts the attention of the US, the OSCE Chairman-in-Office, the leaders of Russia and France. Despite the calls of two of the three co-chairs of the OSCE Minsk Group - the United States and France, Armenia has not withdrawn its troops from the internationally recognized territory of Azerbaijan. [3] The EU has expressed its readiness to provide expertise and assistance on border delimitation and demarcation, including support for much-needed confidence-building measures, to move towards sustainable peace and prosperity for the South Caucasus. [2]

The role of Europe. After Russia's intervention in Ukraine, this process has accelerated somewhat. International organizations and individual interested countries express their support for the signing of the peace treaty between Azerbaijan and Armenia and the demarcation of borders. The leaders of Azerbaijan and Armenia have already met several times in Russia and Europe. Contacts between Aliyev and Pashinyan took place either through the mediation of Brussels or Russia. The Armenian side insists on continuing the Russia-Azerbaijan-Armenia format in the negotiation process. Because Russia is a strategic ally of Armenia. Another format, that is, the Azerbaijan-Armenia-EU format, does not meet its interests, so it tries to slow down this process as much as it can. Russia is trying to maintain its dominance in the South Caucasus, peace between Azerbaijan and Armenia does not serve Putin's goals.

The main issues reflected in the statement signed during the tripartite meeting in Sochi on November 26, 2021 were the removal of the blockade of transport links and the establishment of a bilateral commission on the determination of the state border between Azerbaijan and Armenia. [9] The resolution of the issues mentioned in the statement, especially the delimitation and demarcation of the state border, is considered an important preparatory stage for the signing of the peace agreement. While Azerbaijan is fully determined to fulfill its obligations, Armenia is deliberately delaying the resolution of these issues. Although Armenian officials often make various statements of reconciliation nature, when it comes to concrete joint work, they refrain from it under various pretexts. Even after the bitter defeat in the war, the Armenian diaspora in the USA and France, as well as some insidious forces in Armenia, continue to poison the point of view of their compatriots and do not want to give up revanchist feelings.

The reason why the border clarifications have not been realized so far is the non-constructive position of the official Yerevan, its inability to digest the real situation in the region, living with utopian ideas such as

the so-called NKR getting the status with the help of international institutions, mainly the Minsk Group of the OSCE. [8]

On March 30, a meeting of high-level representatives of Armenia and Azerbaijan was held in Brussels with the mediation of the EU. Here, they agreed on the necessity of continuing this relationship in order to ensure the adequate continuation of the agreements reached at the level of leaders. [1] On April 6, a working lunch meeting was held between Azerbaijani President Ilham Aliyev, Armenian Prime Minister Nikol Pashinyan and European Union Council President Charles Michel in Brussels. After the meeting, the President of the Council of the European Union Charles Michel said that stability, security and development in the South Caucasus are very important for the European Union. [6] It raises the hope that the meetings of both sides with the mediation of the President of the Council of the European Union will have successful results. The agenda of the Brussels peace meeting is part of the proposals put forward by President Ilham Aliyev for the post-conflict period. President C.Michel called keeping forces at an appropriate distance an important element in preventing incidents and reducing tensions. He once again stressed that the EU is ready to provide advice and support in this matter. For delimitation and demarcation of bilateral borders, in accordance with the Sochi Declaration of November 26, 2021, it was agreed to establish a Joint Border Commission by the end of April. However, due to the delays of the Armenian side, the organization of the commission was postponed until May.

On May 23, the tripartite meeting was held in Brussels with EU Council Chairman Charles Michel, President of Azerbaijan Ilham Aliyev and Prime Minister of Armenia Nikol Pashinyan. According to the information of the Ministry of Foreign Affairs of Azerbaijan, at the meeting, the parties confirmed their readiness to work within the framework of the Commission on delimitation and other issues. [11] President Michel noted that both President Aliyev and Prime Minister Pashinyan expressed their desire to move quickly towards a peace agreement between their countries. For this purpose, the foreign ministers are asked to prepare a future peace agreement that will resolve all the necessary issues. It was agreed to be assigned to work on it. The leaders discussed the restoration of communication infrastructure between Armenia and Azerbaijan, especially in the South Caucasus. President Michel welcomed the steps taken towards the restoration of railway lines, and at the same time encouraged Armenia and Azerbaijan to find effective solutions for the restoration of road connections. The leaders agreed to follow up on the results of their meeting and to continue relations.

The President of the Republic of Azerbaijan, Ilham Aliyev, announced the specific position of Azerbaijan that when defining borders, history should be taken into account, and maps from the period after the Sovietization of the South Caucasus should be used. He noted: *"We should not dwell on only one map, because there are many maps - there is a map of 1918,*

when Irevan was a part of Azerbaijan. There is a map of November 1920 that Zangezur was a part of Azerbaijan at that time. In addition, at that time, Azerbaijanis lived in the territories along the Iran-Armenia border, and those lands had nothing to do with the Armenian people. In November 1920, the Soviet authorities decided to give Zangezur to Armenia. However, when this territory was given to Armenia, it did not have today's area - 42 kilometers, the area was narrower. However, the Armenians expanded the area to 42 kilometers, and today the border with Iran passes through it. Thus, our position is that we will use all the maps - from 1918 and even earlier to maps up to the collapse of the Soviet Union. Of course, this will be part of the negotiations of our joint working groups." [5] President Aliyev expressed his hope that the meeting in the tripartite format will be result-oriented as a continuation of the Brussels peace agenda. The President Michel noted the importance of the dialogue between Armenia and Azerbaijan. He highly appreciated the role played by Azerbaijan in Europe's energy security.

One day after the tripartite meeting, President of Azerbaijan Ilham Aliyev and Prime Minister of Armenia Nikol Pashinyan signed an order on the establishment of border delimitation commissions. Azerbaijani and Armenian Deputy Prime Ministers Shahin Mustafayev and Mher Grigoryan met at the Armenian-Azerbaijani border. At the first meeting, the organizational and procedural issues of the commission's joint activity were discussed. [11] The parties agreed to hold meetings in different places in addition to the meetings at the interstate border. However, recent border clashes are delaying the peace process.

In **conclusion**, starting the process of border delimitation and demarcation in good faith is the only way to resolve all disputes that may arise, which is a key to ensuring peace and security.

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TECHNICAL SCIENCES

NEUROTECHNOLOGY, ARTIFICIAL INTELLIGENCE & BLOCKCHAIN FOR EDUCATION

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DOI: [10.5281/zenodo.7223687](https://doi.org/10.5281/zenodo.7223687)

Abstract

The connection of artificial intelligence with neurotechnology is considered. The problem of scientific validity of transferring the results of studies of the synaptic level of brain activity to the personal; the ethical problem of invasion of personal space; the social and legal problem of storing confidential information are posed and discussed.

Keywords: artificial intelligence, neurotechnology, blockchain, education.

Artificial Intelligence is a very broad field of computer science in which computers model the neuroprocesses of thinking, learning, and perception. The term "artificial intelligence" has been used since 1956, but only in recent years has there been a significant shift in it, with the emergence of Deep Learning, machine learning, that is, machine learning.

Artificial intelligence is already part of the digitalization of our lives. It helps us quickly find the information we need using a search engine, make almost instant translations into other languages, and perform complex calculations.

Neuroscientists (neurobiology, neurophysiology, neurogenetics) are the source of knowledge about the brain. They use different technologies for their discoveries, and first of all, neurotechnologies. Neurotechnologies are tools for studying the brain, consciousness, thinking activity, higher mental functions, in order to treat and rehabilitate patients with neurological problems. Neurotechnologies allow researchers to visualize the brain, to observe how it works right during experiments. For example, magnetic resonance imaging (MRI) makes it possible to build a map of associative connections between different areas and regions of the brain and identify new functional areas and regions. Patients can see in real time how their brain responds to stimuli, thereby receiving visual feedback. The use of functional magnetic resonance imaging has changed the way we look at autonomic patients (coma or minimally conscious patients). As it turned out, they can retain emotions, understand words and even be aware of what is going on around them. This raises the problem of the legitimacy of relatives of patients with severe brain injuries to decide about their life or death. After all, it is not uncommon for such patients, who have been in a vegetative state for a long time, to suddenly recover.

Transcranial magnetic stimulation (TMS) affects the brain with magnetic impulses, affecting the electrical activity of the brain. Positron emission tomography (PET) is an imaging technique that detects brain metabolic processes: thus, problem areas of the brain consume increased amounts of glucose and become "visible" on the screen.

Computed tomography (CT) is a technology for detecting brain activity and damage (injury/disease

such as aneurysms or cancer). Despite their differences, all of these technologies solve primarily medical problems and help improve brain mapping, but they are incredibly far from the practice of education. They have helped develop drugs for depression, insomnia, attention deficit hyperactivity disorder, anti-neurotic drugs, drugs for stroke recovery, reducing the frequency of epilepsy attacks, and relief of phantom pain [2].

However, experts believe that today brain scans are often seen as more accurate and objective than they really are. While neuroimaging technologies are extremely important for diagnosis, the interpretation of brain activity patterns as applied to healthy people can hardly be called perfect.

Nevertheless, the idea of using neurotechnology not on a damaged brain, but on a healthy one, not individually, but massively, in order to optimize brain activity is not only alive, but it is becoming more and more detailed, including scandalous ones. For example, such a form of neurostimulation as microstimulation is being investigated. It uses low-voltage direct current, which is delivered directly to the area of interest in the brain through small electrodes. While previously this technique was used to help patients with brain damage (such as strokes), today experiments are also being conducted on healthy people. Although the results are contradictory, there is already evidence that the technique affects the cognitive abilities of the brain depending on the area it is stimulated (we are talking about language, mathematical abilities, attention, memory, coordination). Not only the ethical side of the use of such technologies is debatable, but also the question of the safety of the object of influence, the interference in privacy and individual psychological space [3,4].

This is also the problem of the use of neuroimplants - the insertion of devices into the cranial cavity that are used to control or regulate brain activity. Their purpose is to improve any parameters of body functioning by deep stimulation of the brain. Implants help with Parkinson's disease, chronic pain, and clinical depression when regular pills don't work. But implants can also affect neighboring areas of the brain, changing a person's perception and behavior. If this leads to negative consequences, who is legally and morally responsible for them? Would it be the patient, the doctor, or the manufacturer of the implant? If the use of implants

for clinical applications (such as Parkinson's disease) is not in doubt, then the possibility of "chipping" a healthy person's brain to control their behavior is now a reality and a major threat to the human rights to freedom and safety [5].

There are also many unresolved issues in the use of neuroimaging data in the criminal justice system, in identifying the connection between brain activity and deliberate deception. It is no coincidence that neurotechnology is an area of focus for intelligence services, from lie detectors to understanding the psyche, reducing "fear" and overcoming post-traumatic stress syndrome. Virtual reality technologies attract the attention of the military. Research in transcranial direct current stimulation, aimed at expanding soldiers' capabilities, is of great interest to the U.S. military.

The progress of neuroscience is unstoppable. The more substantial their results are, the more tempting new areas of their application become. Neuroethics cannot keep up not only with the progress of science and technology, but also with the emergence of more and more types of speculation, deception, manipulation of our consciousness. This situation calls for a deeper study of the ethical implications of introducing the results of scientific research that affect health and safety. Any ethical approach must be based on respect for the individual and for privacy.

However, the possibility of applying the spatial pattern to the theory of education is critical [1]. In addition to the benefits, neuroscience has a flip side, the comprehension of which requires addressing the problem of subjectivity of participants in the inclusive educational process. The results of neuroscience research have different forms: physical (electrical), chemical, spatial, temporal, and pedagogy refers to the behavior of the subject, his relationship to himself and the world, to culture. Education is a form of transmitting culture to a new generation. The neuroimaging methodology used in neurotechnology in its present form is unsuitable for solving pedagogical socio-psychological problems, issues of subjectivity and subject relations of participants of educational process [5,6]. It is obviously premature to declare the emergence of neuropedagogy and neuroeducation only based on the development of neurotechnology means

Many complex issues related to the interaction between the brain and "artificial intelligence" remain unresolved

In addition, there is evidence of the destructive effects of neurotechnology in the unformed digital culture of its participants (neuroculture). Subjectivity is eliminated, put "outside" as a rudiment of "outmoded" human nature. "Transhuman" goals, embedded in neuro-education already at the stage of technology and device design, can destroy a person's normal relationship with himself and the world, block his formation and improvement as a subject.

Since neurotechnologies imply direct intervention into human consciousness, they change human identity, up to the point of forming a "transhuman". Therefore,

the transformations taking place should be studied in the context of changes in human attitudes toward himself and the surrounding world, as well as the evolution of the values and goals, concepts and notions, patterns of behavior and interaction regulating these attitudes. Obviously, without a dialogue between a person and a person (a learner and a mentor, a teacher) no education and training, even "amplified" by digital and neurotechnologies, is possible

The problems of information privacy when using artificial intelligence lead to a discussion of the prospects of combining it with blockchain technology. The use of this technology is often hampered by the fact that it is associated only with cryptocurrency, which is wrong. Blockchain is a big data technology that allows to store information laid down by different people in an unchanged form with an absolute guarantee of confidentiality. Today, this technology is rapidly being implemented in different spheres of life, including education. It can be a portfolio of a person's achievements, his authentic documents, including diplomas of education, an indication of the teachers the person studied with, their qualifications, the names of the courses, the technologies used, including the digitalization of education.

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MODULE FOR SIMULTANEOUS PROCESSING OF DATA FROM MULTI-CHANNEL SENSORS

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DOI: [10.5281/zenodo.7223701](https://doi.org/10.5281/zenodo.7223701)

Abstract

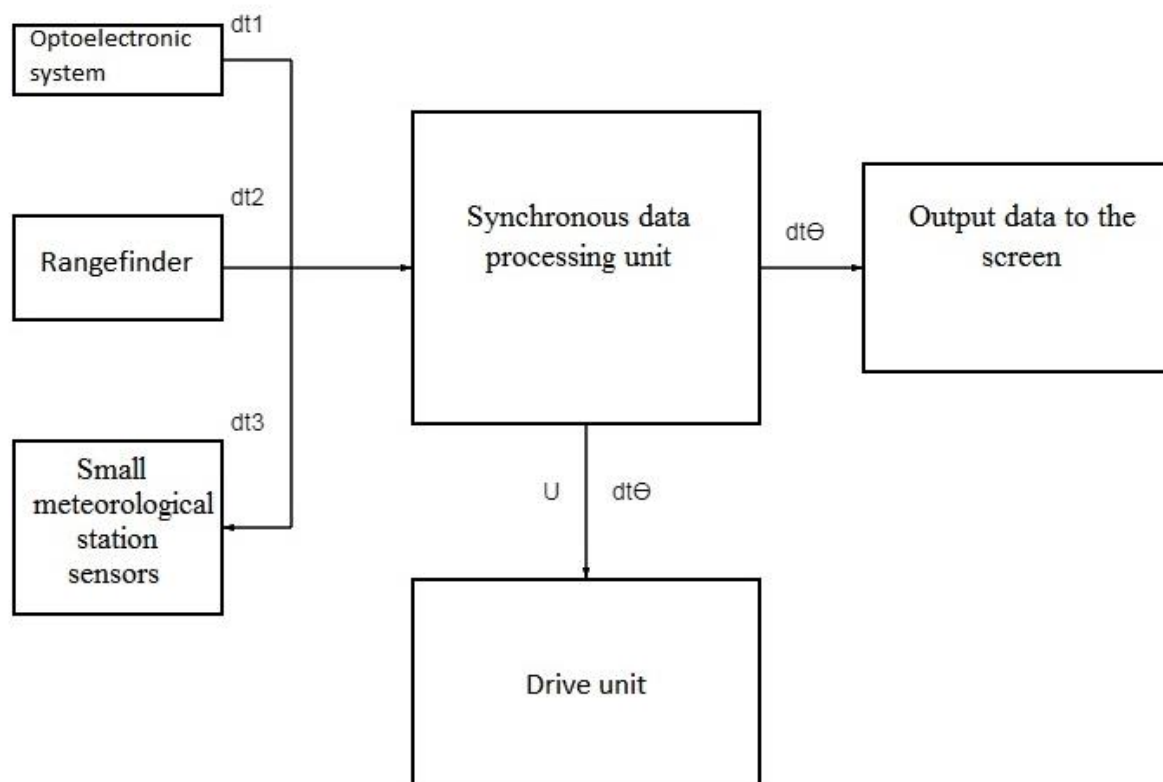
This article presents methods of digital systems processing data from various sensors or sources, synchronization system and algorithm based on the program developed for data processing in the system. Methods of high-speed data processing in systems with multi-channel analog and digital sensors are analyzed. In a digital system, it has been investigated whether data from multi-channel sensors can be delayed in time t or cause errors in calculation due to the time taken for measurement. In order to eliminate the errors of data obtained from multi-channel sensors, a method and model of synchronous processing were developed.

Keywords: Synchronous processing, meteorological station, meteorological data, dalnomer, optoelectronic system.

Introduction. Simultaneous data synchronization from multi-channel sensors is an important part of any system. In weather-related systems, time synchronization is essential for the correct interpretation and accurate calculation of changing meteorological data. It is important to use the time-synchronized meteorological data system, especially for the purpose of performing special tasks in the FVV, hydrometeorological center, and ballistic artillery and aviation of the military sector. An object moving in space is affected by changes in meteorological parameters. Among these parameters, the influence of wind direction and speed is significant, it can change its

direction every minute and there are errors in achieving certain goals [1]. In practice, almost no studies have been conducted on the device model based on the method of obtaining data from many sensors and their simultaneous processing based on targeting an object moving in space and predicting the point of arrival after a certain time t [2].

In order to target an object moving in space, in addition to the parameters such as the object's distance s and its speed v , atmospheric effects are also important. This affects the change of the second coordinate of the object under the influence of air temperature T_v , wind speed w_0 and direction a_w , air pressure H_0 .



Picture 1. Synchronous data processing module

In order to ensure continuous synchronous operation of the presented system, the synchronous data processing module receives data from several sensors and synchronously processes the received data for time t , finding the values of s , v , T_v , a_w , w , H_0 from the specified virtual correction table [3] transmits it to the screen and to the drive unit at time t_0 (Fig. 1).

The optoelectronic system performs the task of determining the moving object at time t and its speed v . Dalnomer is a device that measures the distance s to a moving object. In the small weather station, 4 sensors are placed for measuring special parameters, which transmit data to the synchronous data processing unit (MSQI) at time t according to the specified special

parameters atmospheric temperature T_v , wind speed w_0 and direction a_w , atmospheric pressure H_0 . In the MSQI block, values such as $\Delta\tau_y$ - elimination of ballistic deviation of atmospheric temperature, a_{wy} - directional angle of wind direction, Y_{st} - wind speed at standard heights are calculated based on special formulas and tables.

According to the block diagram of simultaneous data processing of multi-channel sensors (optoelectronic system, dalnomer, measuring sensors - measuring wind speed and direction, atmospheric pressure, atmospheric temperature), its functional algorithm is presented in Fig. 2.

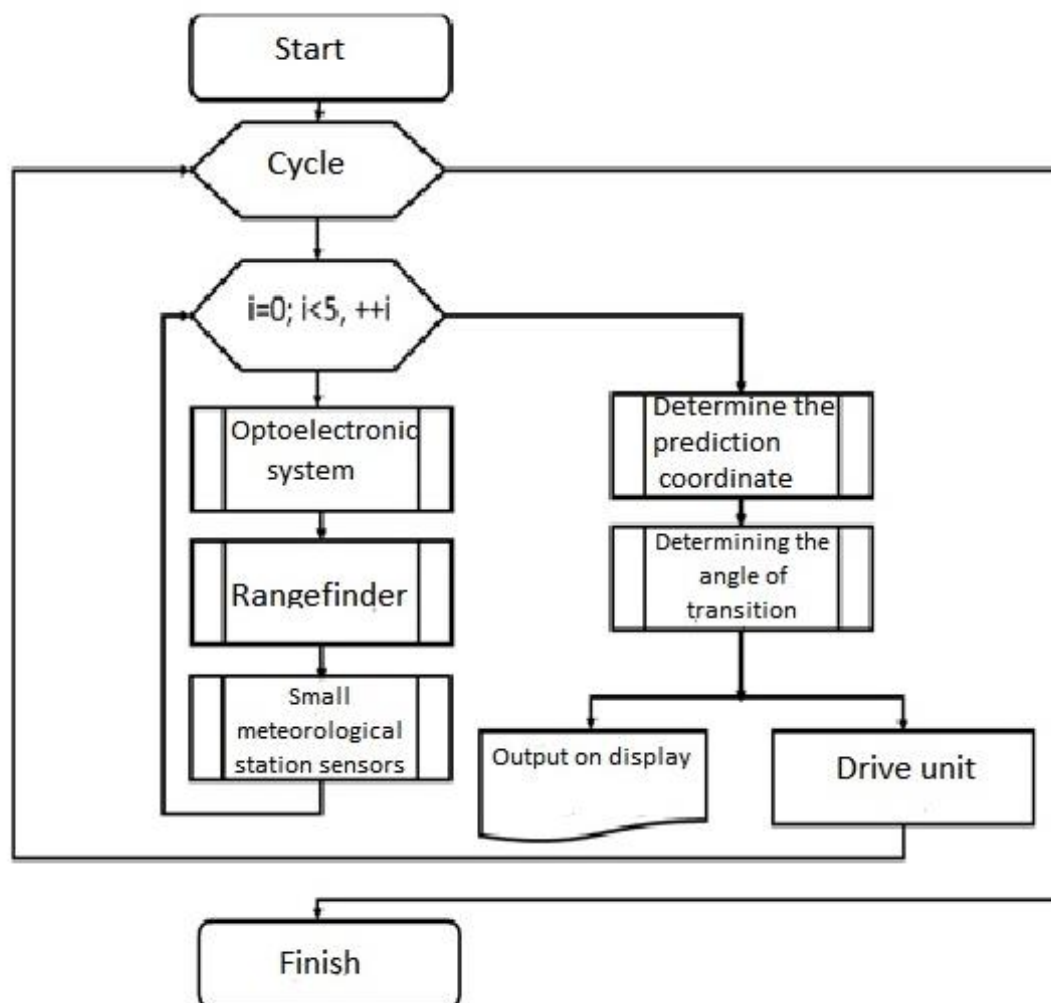


Figure 2. Algorithm for simultaneous processing of data from multi-channel sensors

The algorithm starts with a loop, reads the data of the optoelectronic system, dalnomer, small weather station continuously every 5 seconds. The optoelectronic system and dalnomer continuously measure the speed and distance of the object and send it to the server to determine the coordinates of the object. In the prediction coordinate determination block, the data change differences in a small weather station are determined using the formulas and special tables below.

Atmospheric pressure change difference is determined

$$\Delta H = H_0 - 750 \quad (1)$$

Here it is: ΔH – difference in pressure change;
 H_0 – measured air pressure.

Air temperature change is considered:

$$\sigma_0 = T_v + \Delta t_y \quad (2)$$

T_v – measured air temperature;
 Δt_y – value obtained from virtual corrections of air temperature;
 σ_0 – virtual temperature.

Table 1.

Virtual corrections that eliminate the effects of air temperature							
T_v	below 0	0-5	10-15	20	25	30	40
Δt_y	0	0,5	1,0	1,5	2,0	3,5	4,5

The temperature difference from the normal temperature is determined:

$$\Delta\sigma_0 = \sigma_0 - 15.9$$

(3)

$\Delta\sigma_0$ – difference of temperature from normal temperature;

σ_0 – virtual temperature.

$\Delta\tau_0$ according to the result, it is entered according to table 2 and the temperature deviation values at the standard heights given for each $\Delta\tau_y$ standard heights are found.

Table 2.

The dependence of the average temperature deviation $\Delta\tau_y$ on $\Delta\tau_0$														
Y_M	$\Delta\tau_0$ grad.													
	1	2	3	4	5	6	7	8	9	10	20	30	40	50
200	-1	-2	-3	-4	-5	-6	-7	-8	-8	-9	-20	-29	-39	-49
	1	2	3	4	5	6	7	8	9	10	20	30	-	-
400	-1	-2	-3	-4	-5	-6	-6	-7	-8	-9	-19	-29	-38	-48
	1	2	3	4	5	6	7	8	9	10	20	30	-	-
800	-1	-2	-3	-4	-5	-6	-6	-7	-7	-8	-18	-28	-37	-46
	1	2	3	4	5	6	7	8	9	10	20	30	-	-

here, $\Delta\tau_y$ -values of temperature deviation at standard heights.

To calculate the correction for the direction of the blowing wind, the directions of the wind at standard heights are determined.

When we get the wind direction from the weather station in degree values, we convert it to the direction angle and measure the wind direction in the direction angle.

Wind directions at standard altitudes

Y_M	$\Delta\alpha_{wy}$
200	1-00
400	2-00
800	3-00

Wind directions at standard altitudes are determined by adding the measured wind direction to the values given for standard heights.

$$\alpha_{wy} = \alpha_{w0} + \Delta\alpha_{wy}$$

$\Delta\alpha_{wy}$ – correction for wind direction deviation at standard altitudes;

α_{wy} – wind direction at standard altitudes.

The shooting angle is determined by these formulas. The result is sent to the screen and the drive unit.

Summary. The given model is designed to measure the changing parameters of the atmosphere, to target an object moving in space, and to process data from multi-channel sensors to perform special tasks, to transmit the data obtained from them at time t , to predict the point of the object's arrival trajectory, and to determine the launch angle. The model works in real (online) mode. The time t required for simultaneous processing of data and measurement of meteoroparameters is taken into account.

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ENERGY HARVESTING AND RECHARGING FOR WIRELESS SENSOR NETWORKS

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DOI: [10.5281/zenodo.7223717](https://doi.org/10.5281/zenodo.7223717)

Abstract

Minimizing energy consumption for wireless sensor networks lifetime is one of the main problems in wireless sensor networks. The problem is long term autonomous operation of wireless sensor networks. This implies harvesting and recharging the sensor nodes during its operation by employing the energy harvesting method using the sunlight available. The optimized solar energy harvesting and recharging wireless sensor networks operate for an infinite wireless sensor networks lifetime. The simulation results indicate the highest stability for energy harvesting and recharging the wireless sensor networks that indicates good throughput.

Keywords: wireless sensor network; network lifetime; energy consumption; efficiency energy; energy harvesting.

1. Introduction

The generation of wireless technology is rapidly growing and concurrently demand for power consumption to maintain the network. The wireless sensor network (WSNs) is a self-organizing network and communication function. The WSNs has advantages (e.g., avoid wires, flexibility through physical partitions, easily to add new devices, free, accessible through centralized monitor etc.) The various researchers introduced algorithms and different methods which minimize amount of energy required by WSN during the network communication [1], [2]. Low latency, overcomes the limited factors of each and every sensor node in WSNs. Among suggestive algorithm is Power Efficient Gathering in Sensor Information System (PEGASIS), and energy efficiency using the genetic algorithms suggested [3], [4]. Furthermore, given scarcity of the research onto determinants of implementation in energy harvester and recharging literature [5], [6].

The main contributions of this article are energy harvesting from the available sunlight, recharging the sensor nodes and sensor nodes energy consumption

2. Related Works

The principal indication behind charging batteries for WSN based on energy harvesting technology is to Minimize and eliminate the need for maintaining lifetime for the sensor node. Thus, a common selling argument for energy harvesting is extended lifetime compared to batteries that in turn can enable otherwise, unsustainable network solutions. Recently, simultaneous wireless information and energy harvesting has increased its popularity in modern wireless net-

works. Energy harvesting has attracted a lot of attention, since it can prolong the lifetime of WSN under energy constraints [7]. Energy harvesting refers to a process by which energy is derived from the surrounding environment (e.g., wind, wave, vibration, solar, and thermal energy), captured, and stored for later use [8].

3. System model for energy harvesting using sunlight

A sensor node with an energy harvester and a small battery for temporary storage can operate indefinitely, in theory, by perpetually replenishing its battery using the harvested energy. The energy available to these nodes is intermittent and varying; making power management, i.e., transmit power and energy storage control, a crucial matter for efficient operation.

For energy harvesting nodes, an energy storage device is desirable to provide such a power policy. In practice, however, this storage device would have storage losses, leakage, and capacity fading. These in turn can affect the optimum transmission policy. The information transmission from the source node to the destination node is assumed to occur via several clusters of decode and forward relay nodes. The source and relay nodes have the ability to harvest energy from the environment and use that harvested energy to transmit and forward the information to the next hop. Under such an assumption, the objective is to improve energy optimization over a number of transmission frames subject to constraints on energy causality, battery overflow, and time duration for energy harvesting.

The block diagram of an energy harvesting and recharging sensor node is illustrated in Figure 1. The solar energy harvesting system provides a direct current (DC) power supply on a conversion system to the WSN

node. This voltage is harvested from ambient sunlight by using solar panels [9].

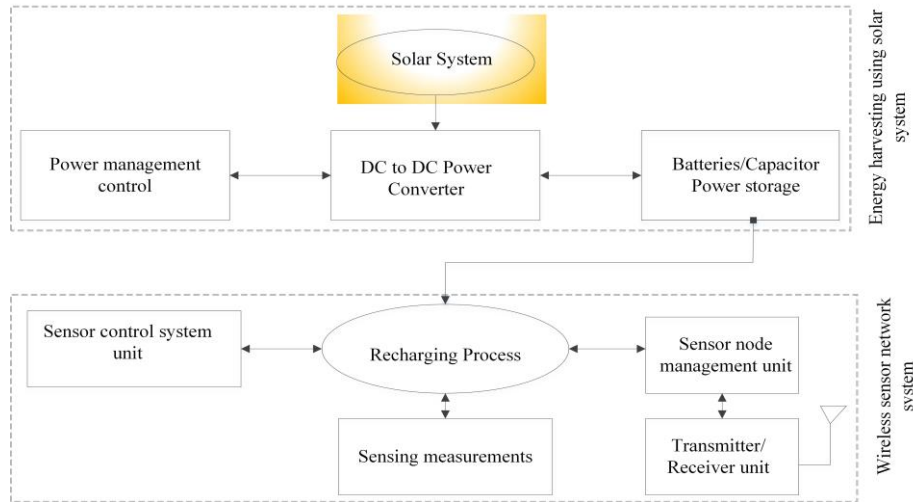


Fig. 1: Block diagram of the energy harvesting and recharging WSN

Furthermore, the technical implementation for the energy harvester and recharging system illustrated Figure 2, a cooperative WSN that consists of one source sensor node denoted as S_0 , one destination node S_k and $k-i$ as a clusters of relay nodes. The energy harvested

in each time frame sequence and recharging the sensor nodes when the energy is below threshold from the sensor nodes. The k th cluster is assumed to be composed as M_k relay sink nodes, $S_{k1}, S_{k2}, S_{k3}, \dots, S_{kmk}$ $k = 1, 2, \dots, K - 1$.

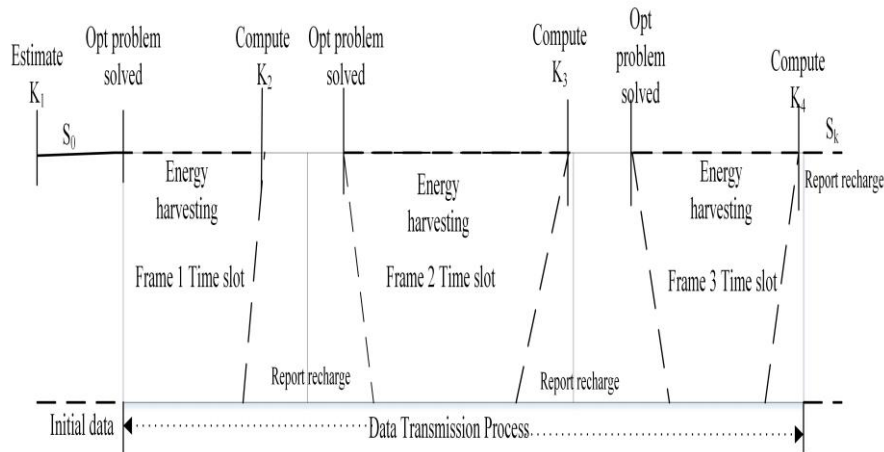


Fig. 2: Energy harvesting optimizing and data processing time frame for WSN

The ' k ' spans frames indexed by $f = 1, 2, \dots, F$ meaning that a lifetime optimization event acts on groups of frames based on each frame time slots. The number of time or time frequency slots in a frame is defined to accommodate the planned number of sensor nodes in the network. The ' F ' is the optimization span. Low mobility or fixed WSN demand less frequent optimization events., large OF 0, while WSN with high mobility nodes will need frequent optimizations, i.e., small ' f ' or even $F = 1$.

The transmission of each node takes place over a time interval consisting of ' N ' transmission blocks frames. As illustrated in Figure 2, each node harvests energy for a fraction $0 \leq \alpha(i) \leq 1$ in the i th frame time slot. The remaining $(1-\alpha(i))/k$ fractional of the time slot is subdivided into ' k ' hop relaying. First phase of operations S_0 sends data signals to all the relay nodes in the

first cluster and each relay node decodes the data. Second phase, the selected relay forwards the decoded data to the relay nodes in the second cluster.

The process is repeated ' k ' times so that the data are delivered to the destination S_k Energy harvested at each node from the surrounding environment can be expressed as [10], [11]. The energy harvesting and recharging method has some parameters and variables for the system model which need to be defined as steps below illustrated:

- **Step 1** The number of sensor nodes is denoted by N , and they are indexed by $n = 1, 2, \dots, N$. A single sink node is assumed.

- **Step 2** Energy harvesting optimization is denoted by $k = 1, 2, \dots, k - 1$ as K spans number of frames indexed by $f = 1, 2, \dots, F$, meaning that an energy harvesting and lifetime optimization event acts on groups of

frames as illustrated in Figure 2. The sensor nodes batteries associated with k -th optimization and are given by residual energy as $S(k) = S1(k), S2(k), \dots, S_{F+1}(k)$.

• **Step 3** The recharge matrix is defined as shown Equation 1 representing the amount of energy delivered to the sensor nodes batteries during recharge process.

$$R(k) = [r_1(k), r_2(k) \dots R_{F+1} \varepsilon R^{N \times F}] \quad (1)$$

• **Step 4** It is defined that the lifetime of a network is the time interval during which all sensor nodes are in full operation. In other words, the instant at which the first sensor node fails with a high probability or fails

$$E_{Frameji}(k) = \int_{E_{consumei}}^{(1-\alpha)i} (k) dk \quad (3)$$

$$E_{Framej}(k) = \int_{E_{receivei}}^{(1-\alpha)(i)} (k) + E_{circuit}(k) dk \quad (4)$$

3.1 Problem formulation process

The objective is to maximize total stability throughput over frame time slot transmission blocks. Based on the relay selection strategy, the capacity of the k th hop can be computed as illustrated in Equation (5). Firstly, i th frame slot the k th node except for the destination harvest energy with rate δk . $B_k(i)$ be the energy available at the battery of the k th node. The total energy

$$C_k(i) = \max \log(1 + \Gamma_{km})(i), (m \in 1, 2, 3, \dots, m_k) \quad (5)$$

$$B_{k-1}(i) = \min(B_{k-i}(i-1) - \frac{(1-\alpha(i-1))T}{K} \quad (6)$$

$E_{k-1}(i-1) + \delta_{k-i}\alpha(i)T, B_{k-1}^{max}, k = 1, 2, 3, \dots, K$, whereas, (B_k^{max}) maximum capacity of the batteries at

the k th node. The total energy for each node must avoid battery overflows [12].

$$f(x) = \begin{cases} \sum_{i=1}^{n+1} (\frac{E_{max} - E_{circuit}}{E_{max}^\delta} E_{k-1}^\delta(i) + E_{circuit}) \alpha(i) T \\ f(x) \leq B_{k-1}^{max}, k = 1, 2, 3, \dots, K, n = 1, 2, 3, \dots, N_1 \end{cases}$$

Comparing Equations (2,3,4,5, and 6) then formulating the energy optimizing problem as expressed hereunder;

$$E = \begin{cases} \text{Max}_\alpha = (\sum_{i=1}^N \frac{1-\alpha(i)}{K} \min_{E_{k-1}} C_k(i)) \\ \text{Subject} \rightarrow \text{to}, \sum_{i=1}^n (\frac{E_{max} - E_{circuit}}{P_{max}^\delta} E_{k-1}^\delta(i) \\ + E_{circuit}) \leq \sum_{i=1}^n \delta_{k-1} \alpha(i) \\ k = 1, 2, 3, \dots, K, n = 1, 2, 3, \dots, N \\ \sum_{i=1}^{n+1} \delta_{k-1} \alpha(i) T - \sum_{i=1}^n (\frac{E_{max} - E_{circuit}}{E_{max}^\delta} E_{k-1}^\delta(i) \\ + E_{circuit}) \alpha(i) T \leq B_{k-1}^{max} \\ k = 1, 2, 3, \dots, K, n = 1, 2, 3, \dots, N-1, \\ \text{where; } 0 \leq \alpha \leq 1, i = 1, 2, 3, \dots, N \\ \& \\ \square 0 \leq E_{k-1}(i) \leq E_{max}, k = 1, 2, 3, \dots, K. \end{cases}$$

permanently due to insufficient energy will determine the network lifetime.

The estimated total energy consumption ($E_{consume}$) in amplification, reception, aggregation and data transmission by any sensor node is calculated using Equation (2)

$$E_{consume} = E_{Transmit} + E_{receive} + E_{circuit} \quad (2)$$

whereas ($E_{Transmit}$) and ($E_{receive}$) is the amount of energy consumed during data transmission and reception respectively and ($E_{circuit}$) is the consumed energy by the electric circuitry of a sensor node. Thus, energy consumption by a node 0N0 within the time based on the frame, starting at time $(1-\alpha)(i)$, in a round k_k+1 period is represented by Equations (3) and (4).

of the $(k-l)$ th node at the beginning of the i th frame slot be equal to the remaining energy from the $(i-l)$, plus the additional energy that node harvests during each frame time slot. However, the amount of energy at the k th node at the $(i-l)$ th frame time slot and the updated value at the i th frame time slot have the relation as illustrated in Equation (6).

3.2 Results and Analysis

Following Equation (7) total work required for only one *MICAz* is about 1.353Joules. Now for the WSN size with 500 sensor nodes will require about 6.7674Joules. Similar formulation calculation can be the same for the *eZ430RF2500* sensor node, which is about 6.041Joules. When considering the action operation is due every one hour for 24 hours a day for a network size, 500sensornodes is 162.410Joules and

144.960Joules for both sensor nodes, respectively. The clarification of formulation calculation is shown in Table I.

$$W(\text{work}) = F(\text{force}) * D(\text{distance}) \quad (7)$$

The minimum energy which can be harvesting in an area of 1m^2 per one day is approximately 48Kilojoules

Table I

Power utilizing wireless *MICAz* and *eZ430RF2500* sensor node

Type	Nodes	Distance(m)	P (mW)	P used (J)
<i>MICAz</i>	1	100	135.35	0.01
<i>MICAz</i>	500	100	67674	6.77
<i>eZ430RF2500</i>	1	100	120.81	0.01
<i>eZ430RF2500</i>	500	100	60405.75	6.04

and maximum approximately 84kilojoules. Therefore, the requirements for the operation of the wireless

MICAz sensor is about 162.41Joules for the network size of 500 in one day,

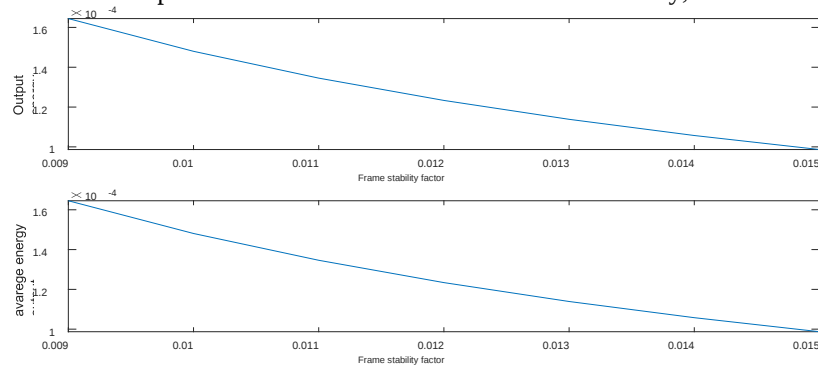


Fig. 3: Residual energy relation with time frame stability

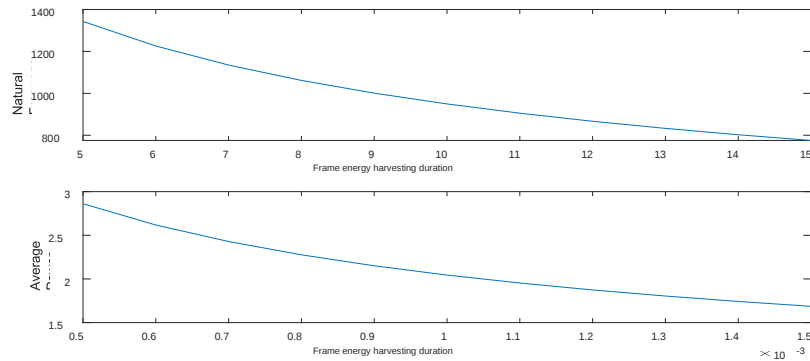


Fig. 4: Average energy harvesting

The distance from the source sensor node S_0 to the destination sink node S_k is denoted as d_0 . Consider the cluster as 3 relays as the frame time and their distance is equal; thus, $dk = d, \forall k$ and energy harvesting for all sensor node; $\partial k = \partial, \forall k$. Energy harvesting and recharging for WSN lifetime, the algorithm indicates that the output energy against average energy for the sensor node are correlated based on the frame stability factor

for the residual energy against time frame duration. The similar indicates on the natural available frequency based on the energy harvesting on the frame per time slot as illustrated on simulation results Figures 3 and 4. However, the good stability for threshold f_0 the harvesting and recharging of the sensor nodes is illustrated in Figure 5.

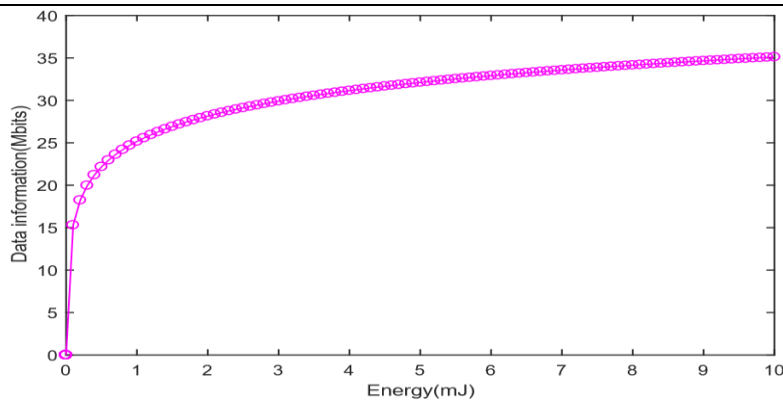


Fig. 5: Threshold energy relationship with data accumulation

Conclusion

The average energy harvesting indicates stable correlated with frame energy harvesting based on average power consumed and natural frequency as shown in Figure 4. Also, the residual energy with time frame stability against the average energy and output consumption energy indicates a decrease with the frames per time slot as shown in Figure 3. Regarding the energy harvesting and recharging investigation, the minimum energy which can be harvested in an area of $1m^2$ per one day is approximately 48 Kilojoules and the maximum approximately 84kilojoules. Therefore, the requirements for the operation of sample sensor nodes MICAz sensor is about 162.41Joules for the network size of 500 in one day.

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RESULTS OF HYDRO AND GAS HYDRODYNAMIC STUDIES OF WELLS AND FORMATIONS FOR DUAL COMPLETION OF WELLS

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DOI: [10.5281/zenodo.7223723](https://doi.org/10.5281/zenodo.7223723)

Abstract

The article presents the results of complex field studies of oil wells and formations of the Altyguyi field in order to establish gas dynamic parameters, as well as to study their gas condensate characteristics. The main attention in the study of wells and reservoirs was paid to a more accurate determination of the initial value of reservoir pressure, temperature, bottom-hole pressure, oil density and pressure recovery curve, which were carried out under various operating modes of wells. Based on the results of the conducted research, the justification for the allocation of operational facilities, their drilling systems, taking into account the need for dual completion (DC) in wells, was carried out.

Keywords: flow rate, pressure gauge, bottom-hole zone, filtration mode, hydroconductivity, separator, oil.

The determination of the initial indicators of wells and formations at the Altyguyi deposit was achieved using the method of steady-state sampling, which, even under steady-state filtration regimes in the bottom-hole zone of the formation, were carried out in order to establish the gas-dynamic parameters of the formation and wells, to study their gas-condensate characteristics.

The filtration mode was changed by selecting the diameter of the fitting at the wellhead.

The duration of operation in oil and gas wells for at least 24 hours and for gas condensate wells in each mode was from 5 to 24 hours. The measurement on each mode began after the full stabilization of the wellhead pressures of P_{buf} and P_{annul} .

The measurement of reservoir and bottom-hole pressures and the recording of the pressure recovery curve were carried out with deep pressure gauges of the MGN2-800kgs/cm² type and MSU-1-100-160 and in some places with electronic geophysical devices "Granite" and "Sakmar".

The necessary indicators for calculating the determination of the daily gas flow rate were carried out using a separator of the PBS-350/64 type with a measuring diaphragm with a diameter of 50 mm.

Measurements of the daily gas flow rate were carried out using a complex field installation equipped with a separator of the "Demag" type and flow meters of the DSP-0.063 and DPS-1.6 types.

The parameters for determining the gas flow rate were calculated using 4- or 2-inch diaphragm meters of

critical gas flow (DICT) [1].

Wellhead pressures (P_{buf} and P_{annul}) were recorded with model pressure gauges of the MO type at 250, 400 and 600 kgf/cm², accuracy class ± 1 , $\pm 0.6\%$ and $\pm 0.4\%$.

Bottom-hole and reservoir temperatures are determined by thermometers with mercury columns of the TP-7 type.

In some facilities, it was not possible to close the well to the reservoir pressure value due to technical reasons. In these circumstances, the reservoir pressure was determined by the experimental method [2].

Application of the method under steady-state filtration conditions of products in the bottom-hole zone of the formation for trial operation (with a change in mode), complex hydrodynamic studies were carried out in 17 objects, 16 wells, in an amount of 22 times. Only on 6 wells (№№12, 19, 107, 108, 111 and 112), measurements of the daily flow rate were carried out, and in 4 wells (№№. 7, 21, 105 and 107), a one-time measurement of reservoir and bottom-hole pressure was carried out. At oil well sites № 2 and №. 7, the study was carried out by the method of normalizing the fluid flow – pressure recovery curve (PRC). As a result of processing the obtained materials, the coefficient of hydroconductivity and permeability of the formation was calculated by the Horner method. The obtained results of the development, measurements and their definition are given in the table. Graphs of the pressure recovery curve are shown in Figures 1 and 2.

Table.

The results of hydrodynamic studies at the wells of the Altyguyi field

Well num-ber	Horizon	Perforation interval (m)	Fitting diameter (m)	Coefficient			Note		
				Capacity (kg/cm ²)	Hydroconductivity (sP)	Permeability (mD)			
Research in order									
1(I)	NK ₉	3670-3680	5	-	-	-			
			6	-	-	-			
			8	-	-	-			
			-	0,1807	4,4	14,52			
			Repeated research						
			6	-	-	-			
			5	-	-	-			
			4,8	-	-	-			
			5,6	-	-	-			
			6,4	0,264	6,43	21,2			
2(I)	NK ₉	3608-3618	4	-	-	-			
			5	-	-	-			
			6	0,9043	10.1 on PRC	34,34 on PRC			
3(I)	NK ₉	3732-3738	4						
			5						
			6	0,171	4,2	23,1			
4	NK ₉	3728-3740	4,8						
			5,6						
			6,4	1,1107	27,1	74,53			
7(II)	NK ₉	3746-3750	4	-	-	-			
			4,8	-	-	-			
			3,1	0,8493	22,03 on PRC	93,4 on PRC			
10(I)	NK ₉	3653-3662	6,3	-	-	-			
			8,0	-	-	-			
			4,8	0,4914	12,00	44,0			
106(I)	NK ₉	3783-3792	4	-	-	-			
			5	-	-	-			
			6	1,3552	33,0	-			

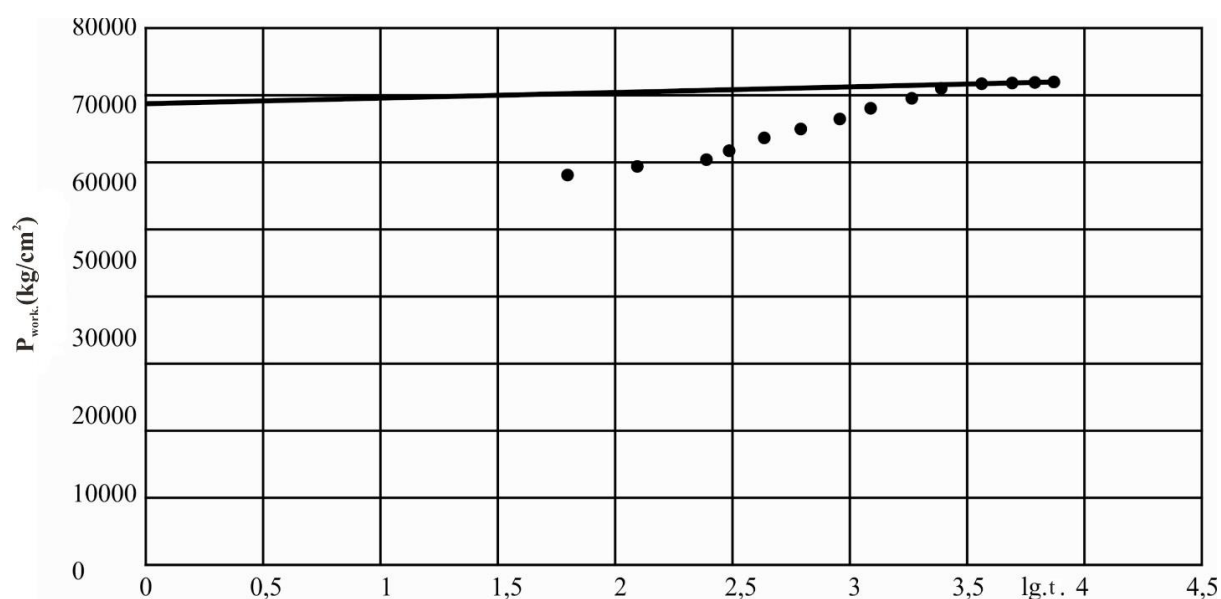


Fig. 1. Graph of the curve of recovery of bottom-hole pressure to reservoir pressure, during the study of production well № 2 of the Altyguyi field

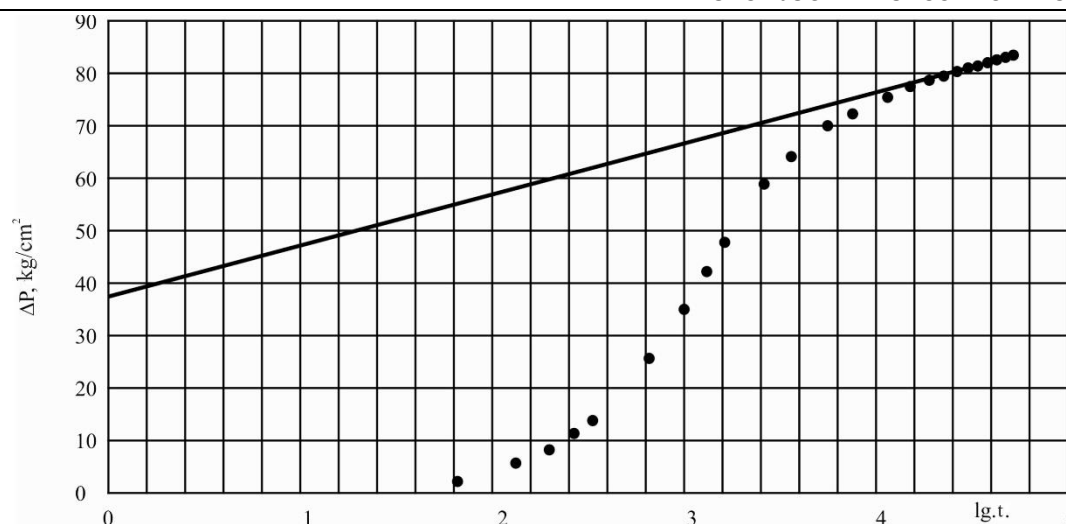


Fig. 2. Graph of the curve of recovery of bottom-hole pressure to reservoir pressure, during the study of the II-th object of the exploration well № 7 of the Altyguyi field

The specific gravity of Altyguyi oil in comparison with the oil of other fields in the Southwestern part of Turkmenistan is very heavy (0.910 g/cm^3) and has a lot of paraffin in its composition. In the process of oil extraction, the paraffin contained in the product freezes due to a decrease in temperature at a depth of 800-1000 meters. In this regard, the freezing of paraffin leads to a decrease in the inner diameter of the tubing, an increase in downhole pressure and a decrease in daily oil production [3]. This phenomenon has the opposite effect on determining the productivity coefficient of the well and the exact calculation of some reservoir indicators.

Before conducting hydro and gas dynamic studies, it is recommended to clean the inner walls of the tubing from the layers of paraffin.

Taking into account the above, the proposed values of the initial reservoir pressure and temperature of the NK₉ oil horizon are assumed to be the values of the accurately performed measurements of the II-th object of well № 7 - 643 kgf/cm^3 and 87°C .

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POLISH JOURNAL OF SCIENCE

№55 (2022)

ISSN 3353-2389

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