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Issue Article

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HIDROCHEMICAL ANALYSIS OF SOME FRESH WATERS OF LEJOKHE, LETANE AND MIKAWA VILLAGES OF TSALENJIKHA MUNICIPALITY

Abstract: *In the studied spring waters of Lejokhe, Letane and Mikawa villages of Tsalenjikha municipality, the content of* Mg^{2+}, Ca^{2+}, HCO_3^-, Cl^-, SO_4^{2-}, CO_2, *permanganate oxidizability, oxygen and dry balance is within the norm and its use for drinking and economic purposes is appropriate.*

Key words: *water, titration, equivalent, hardness, Gravimetry.*

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Introduction

Water has no taste, no color, no smell, it is necessary for life. Water is the greatest wealth of this country. There is no pure water in nature. Water is a good solvent and dissolves the substances it touches in its circulation. Gases are mainly transferred from the air into it, and solid substances from rocks and minerals. Many substances that are insoluble in water are mechanically mixed with it and adhere to a suspended or colloidal state. When water reaches the deep layers of the earth, it is affected by high temperature and pressure, which helps to dissolve substances.

Air plays a major role in the formation of the water composition of the soil, which causes atmospheric precipitation to enter the water. The surface cover of the water layer, on which the penetration of atmospheric precipitation depends, is of great importance. The composition of soil water is influenced by the sanitary condition of its upper horizon. Many substances are mixed with industrial effluents and enrich its composition. As a result of such processes, many solid, liquid and gaseous substances accumulate in water [1, p.3-10].

As water moves through the earth's crust, it touches various rocks and minerals, which are accompanied by chemical transformations. At this

time, the ions exchange and the ions present in the water move into the rocks, instead, other ions of the same charge are dissolved from the rocks into the water [2, p. 120-122; 3 p.1].

In the transformations taking place in water, free oxygen plays a big role, which enters it from the air and participates in oxidation processes both directly and with the presence of microorganisms. Different waters touch different substances and therefore they differ in chemical composition. When groundwater rises to the surface, gases are released from it as a result of the pressure drop. For example, as a result of the release of carbon dioxide from water, the carbonic acid-carbonate balance is disturbed. At this time, calcium and magnesium hydrocarbonates are transferred to hard-to-dissolve compounds and precipitate [4, p. 35].

Tsalenjikha is bordered by Mestia to the north, Gali to the west, Zugdidi to the southwest, and Chkhorotsku to the southeast.

The northern part of the district is wide and mountainous, the southern is a narrow, plateau-like plain, the mountainous part includes the ridges and deep valleys of the southern slopes of the Egrisi and Kodori ridges. The mountainous part of the district is surrounded by numerous tributaries of Egrisi and Chanistkali, numerous tributaries with deep canyon-like valleys.

The district is located in the coastal climatic district, at the same time, due to the mountainous area, high-altitude climatic zones are expressed here, in the plains and in the hilly foothills there is humid, subtropical weather, with warm winters and hot long summers. Enguri and its numerous tributaries are Chkhina, Eitsi, Olori, Khuberi and Magana. Rivers Jumi and Ochkhomuri also flow in the territory of the district. Rivers are fed by rain, snow and groundwater. Flooding is known in spring and autumn, water scarcity in winter. There is a lake in the district - Tobavarchkhili. Among the mineral waters, the most important is Skuri

Purpose. We aimed to study the hydrochemical composition of some fresh waters of Lejokhe, Letane and Mikawa villages of Tsalenjikha municipality. We consider the importance of magnesium and calcium ions in managing the life processes of human, animal and plant organisms. The aim of our research was to study the content of Mg^{2+}, Ca^{2+}, HCO^{3-}, $SO4^{2-}$, CO_2, oxygen and biogenic elements in the waters of some springs of Lejokhe, Letane and Mikawa of Tsalenjikh municipality. The relevance of the issue lies in the fact that the content of the above-mentioned ions was determined for the first time in these waters, for which highly sensitive methods were selected [5, p.124-126; 6, p.128-129].

Experimental part. Methodology for determination of chemical elements in water

The analyzes were carried out in the Analytical Chemistry Laboratory of Kutaisi Akaki Tsereteli State University. Methods tested in hydrochemical practice were used for the analysis [7, p.310-311].

The acidity rate was measured by the potentiometric method (Potentiometer pH 673-M).

The mercurimetric method was used to determine chlorides (titrant 0.01 $Hg(NO_3)_2$ indicator (diphenyl carbazole).

Hydrocarbons were determined by the acidimetric method (titrant 0.1-0.01 N HCl indicator methyl orange. The content of calcium and magnesium, as well as the total hardness of the water under investigation, was determined by the complexonometric method (titrant 0.01N complexon III. To determine the magnesium ion content, we used eriochrome as an indicator, we created the recommended area with an ammonia buffer, and to determine the calcium ion, Merexide was used as an indicator. We created an alkaline area with 2N sodium alkali.

Sulfate ions and dry balance were determined by the classical gravimetric method, representing a sedimentary form $BaSO_4$.

Carbonic acid gas was determined by the alkalimetric method. Titrant 0.1-0.01N $NaOH$. Indicator Phenophthalein.

Oxidability was determined by the permanganatometric method (oxidizing agent 0.01 N $KMnO_4$, in acidic area. Titrant 0.01 N $H_2C_2O_4$).

The content of oxygen and JBM5 was determined by the iodometric method (titrant 0.01 N. $Na_2S_2O_3$ In an alkaline environment, $Mn(OH)_2$ is oxidized by oxygen dissolved in water and transferred to a tetravalent manganese compound, which is formed when the solution KI is acidified in excess I_2).

Biogenic substances were determined by photometric method: NO_2^- shell reagent, NO_3^- sodium salicylate, $NH4^+$ - Nessler's reagent, PO_4^{3-} - ammonium phosphorolybdate.

Photometric determination of NO_2^- using Gries's reagent in the acid zone is based on the formation reaction of a reddish-brick colored azo dye as a result of the interaction of sulfanilic acid, nitrite ion and alpha-naphthylamine.

NO_3^- was determined by photocolorimetric method using sodium salicylate. The method is based on the interaction between nitrate ions and sodium salicylate ions, in the presence of sulfuric acid, during which the resulting yellow coloration is directly proportional to the nitrate ion concentration.

The determination of NH4+ is based on the interaction between the ammonium ion and Nessler's reagent (mercury tetraiodide) in the alkaline zone, during which the resulting yellow coloration is

directly proportional to the concentration of the ammonium ion.

PO_4^{3-} was determined by the photocolorimetric method, which is based on the interaction of orthophosphoric acid and ammonium molybdate in the acid zone, during which the blue color formed is directly proportional to the phosphate concentration.

Results and discussion

Thus, for the first time, the hydrochemical composition of the waters of the villages of Lejokhe, Letane and Mikawa of the municipality of Tsalenjikha was determined. The content of magnesium, calcium, hydrocarbonate, chloride, sulfate ions, nitrogen dioxide and oxygen was determined. Permanganate oxidizability, JBM5, dry balance and biogenic elements were also studied - by chemical and photometric methods. The results of the analysis are given in Table N 1.

Table N 1. Results of hydrochemical analysis of some fresh waters of Lejokhe, Letane and Mikawa villages of Tsalenjikha Municipality

N	Regional names of spring waters	*pH*	Mg/L									
			SO_4^{2-}	Ca^{2+}	Mg^{+}	HCO_3^{-}	Cl^{-}	Dissolved oxygen	JBM_5	Permanganatometric oxidizabilit	CO_2	Dry balance
1	Tsalenjikha	6,81	0.082	2,32	0,18	3,08	3,50	7,86	2,52	0,24	1,08	1,57
2	Beka's	7,42	0.120	3.11	0,32	3,62	2,48	6,45	2,22	0,64	1,62	1,60
3	Kostia's	6,54	0,164	0,44	0,12	0,78	2,24	5,81	1,66	1,26	0,38	1,25
4	Borisi's	6,04	0,081	0,64	0,13	0,64	1,82	7,08	1,88	0,16	0,31	1,16
5	Lado's	5,93	0,206	0,48	0.61	0,28	2,38	9,22	3,52	2,64	0,18	1,19
6	Berdia's	7,15	0,241	2.34	0,08	2,16	2,48	3,17	2,112	1,52	1,16	1,33

In the spring waters we have examined, the *pH* varies in the range of 5.93-7.42.

The highest amount of magnesium ion is contained in the Lado spring at 0.64 mg/l. Its content is the smallest in Berdiya spring at 0.08 mg/l.

TheCa^{2+} ion content is also variable. A relatively large amount of it was recorded in the spring of Beka at 3.11 mg/l, while its content was low at 0.44 mg/l in the spring of Kostya.

The HCO_3^- ion content is the largest in the Beka spring at 3.62 mg/l, the content of hydrocarbonate ions is the smallest in the Lado spring at 0.28 mg/l.

A high SO_4^{2-} ion concentration is recorded in the Berdia spring at 0.241 mg/l. A small amount of sulfate ions is contained in the Borys spring at 0.081 mg/l.

Chloride ions are contained in a relatively large amount in the Beka spring, 3.50 mg/l. And its mass content is small in Borys spring at 1.82 mg/l.

The content of carbonic acid gas is the highest in the spring of Beka, 1.62 mg/l. The Lado spring contains a small amount of carbonic acid gas, 0.18 mg/l.

Permanganate oxidizability is relatively high in the Lado spring at 2.64 mg/l, its small amount is recorded in the Tsalenjikha spring at 0.24 mg/l.

The oxygen content is high in the Tsalenjikha spring at 7.86 mg/l. A relatively low concentration of oxygen is recorded in the Berdia spring at 3.17 mg/l.

The dry balance is the highest in the Beka spring at 1.60 mg/l. Its content is the smallest in the source of Kostya at 1.66 mg/l.

JBM_5 is the highest in Lado spring at 3.52 mg/l, the lowest in Kostya spring water at 9.46 mg/l.

The content of biogenic elements NO_2^-, NO_3^-, NH_3, PO_4^3 is lower than the detection limit, and their content is not recorded in the investigated fresh water of Lejokhe, Letane and Mikawa villages of Tsalendzhikha municipality.

Conclusion

In the studied spring waters of Lejokhe, Letane and Mikawa villages of Tsalenjikha municipality, the content of Mg^{2+}, Ca^{2+}, HCO_3^-, Cl^-, SO_4^{2-}, CO_2, permanganate oxidizability, oxygen and dry balance is within the norm and its use for drinking and economic purposes is appropriate.

References:

1. Bregvaze, U., Natidze, M., & Mamulashvili, Z. (1997). *"Water chemistry and microbiology*. "Education" Publishing House, p. 303.
2. Supatashvili, G. (2009). *"Environmental chemistry"*. Tbilisi University Publish ing House. p. 188.
3. Chikovani, M., Megrelisvili, N., & Kvastiani, A. (2022). Hydrochemikal examination of Muasi and Lentekhi mineral Water of Lentekh district. *RS Global Jurnals. World Science*, V.4, N 76, pp. 1-3
4. Supatashvili, G. (2003). *"Hydrochemistry of Georgia"*. (p.399). Tbilisi, TSU.
5. Chikovani, M., Kupatashvili, N., & Kurasbediani, M. (2019). "Hydrochemical analysis of some mineral waters". *European Sciences review Scientific journal*, N. 5, pp. 123-127.
6. Chikovani, M., Gabelashvili, M., Zarkva, M., & Megrelishvili, N. (2020). "Hidrochemikal and Sanitary Mikrobiologikal research of the Elena Hill spring Waters in the Nakhunao Community of Martvili Municipality". *RS Global*, Volume 1, N 6, pp. 27-31.
7. Chikovani, M., Gabelashvili, M., Kupatasvili, N., Gambashidze, A., & Zedashidze, l. (2022), Hudrochimikal and sanitary Mikrobiological examination of spring Waters of Nakhunao community of Martvil Municipality. *Theoretical & Applied Science*, V. 8, N 112, pp. 308-313.