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СУ ЭЛЕКТР ТӘРТІБІНІҢ ТЕРМАЛДЫҚ ӨҢДЕУІНІҢ ӘСЕРІ

Сартин С.А., Леонтьев П.И., Нуракай Г.К., Бухонина А.А., Маркова А.Г., Гололобова Е.Г.
М. Қозыбаев ат. СҚУ, Петропавл, Қазақстан

Аңдатпа

Су біздің планетамыздың биологиялық қабығының ажырамас бөлігі болып табылады. Су "біздің" әлемнің ең таралған зат, бірақ оның қасиеттері әлі күнге дейін зерттелмеген. Солтүстік Қазақстан мемлекеттік университеті жанындағы сұйық орталарды наноқұрылымдау зертханасында М. Қозыбаев түрлі су үлгілерінің электр өткізгіштігін анықтау бойынша эксперимент жүргізілуде. Көптеген ғалымдар жалпы қабылданған агрегаттық күйлерден басқа, кем дегенде, судың сұйық фазасында бірқатар аралық бар, олардың қасиеттері бойынша кейбір айырмашылықтары бар. Бұл жұмыста судың екі түрінің электр өткізгіштігін зерттеу нәтижелері Берілген: ағынды және қайнатылған. Эксперимент термиялық өңделген суды тұндыру уақытының азаюымен қайталанды, бұл микроорганизмдердің су құрамына әсерін болдырмас үшін. Эксперимент барысында қайнаған судың электр өткізгіштігі ағынды судың электр өткізгіштігінен жоғары екені анықталды. Өлшеулер нәтижелері сыртқы артық қысымның әсерінен су көлемінде полярлық емес монопластерлік құрылымдардың пайда болуы туралы теорияның бар екендігіне дәлел бола алады.

Кілт сөздер: электр өткізгіштігі, ағынды су, қайнатылған су, судың қасиеті, судың электр өткізгіштігі.

ВЛИЯНИЕ ТЕРМИЧЕСКОЙ ОБРАБОТКИ НА ЭЛЕКТРОПРОВОДНОСТЬ ВОДЫ

Сартин С.А., Леонтьев П.И., Нуракай Г.К., Бухонина А.А., Маркова А.Г., Гололобова Е.Г.
СКУ им. М. Козыбаева, Петропавловск, Казахстан

Аннотация

Вода является неотъемлемой составляющей биологической оболочки нашей планеты. Вода наиболее распространённое вещество «нашего» мира, однако её свойства до конца до сих пор не изучены. В лаборатории наноструктурирования жидких сред при Северо-Казахстанском государственном университете им. М. Козыбаева проводится эксперимент по определению электропроводности различных образцов воды. Многие учёные отмечают, что кроме общепринятых агрегатных состояний у, по крайней мере, жидкой фазы воды имеется ряд промежуточных, которые по своим свойствам имеют некоторые отличия. В данной работе представлены результаты исследований электропроводности двух видов воды: проточной и кипячёной. Эксперимент был повторён с уменьшением времени отстаивания термически обработанной воды, что бы исключить воздействие микроорганизмов на состав воды. В ходе эксперимента было обнаружено, что электропроводность кипячёной воды выше электропроводности проточной воды. Результаты измерений могут послужить доказательством существования теории о возникновении не полярных монокластерных структур в объеме воды под воздействием внешнего избыточного давления.

Ключевые слова: электропроводность, проточная вода, кипяченая вода, свойство воды, электропроводность воды.

THE INFLUENCE OF THERMAL PROCESSING ON WATER ELECTRICAL CONDUCTIVITY

Sartin S., Leontyev P., Nurakay G., Buhonina A., Markova A., Gololobova E.
M. Kozybayev NKU, Petropavlovsk, Kazakhstan
(E-mail: sartin78@mail.ru)

Аннотация

Water is an essential part of the biological shell of our planet. Water is the most common substance of "our" world, but its properties have not yet been fully studied. In the laboratory of liquids nanostructuring at the North Kazakhstan State University named after M. Kozybayev an experiment to determine the electrical conductivity of various water samples is carried out. Many scientists note, that in addition to the generally accepted aggregate states, at least the liquid phase of water has a number of intermediate ones, which have some differences in their properties. This paper presents the results of electrical conductivity studies of two tap water types: unboiled and boiled. The experiment was repeated with a decrease in the settling time of thermally treated water to eliminate the influence of microorganisms on the composition of water. During the experiment it was found that the electrical conductivity of boiled water above the electrical conductivity of unboiled water. The results of measurements can serve as one of the evidence of nonpolar monocluster structures appearance in the volume of water under the external influence.

Key words: water, physical properties of water, electrical conductivity of water, boiled water.

Introduction

Water in its pure form (the distillate) is essentially a dielectric. If there are impurities in the water, such as salt, it molecules dissociate into ions, which are charge carriers. Thus, the electrical conductivity of water increases with increasing salt concentration. There is the assumption [1], that in the water there are nonpolar monoclusters, the conductivity of which is small or even zero. If such structures exist in fact, the electrical conductivity of water should increase with different methods of its processing, reducing the number of these monoclusters. Previously, studies have been done which showed an increase in the electrical conductivity of water after its mechanical processing [2]. In this research, the process of heat treatment of water for its electrical conductivity was studied. Conductivity measurements were carried out a day after heat treatment, so there was doubt associated with the influence of microorganisms. For more convincing evidence, the experiments are repeated with a decrease in the time between the cooling process of the water after heat treatment and measurements of the ohmic resistance of the water layer. The time was reduced to a value sufficient for the samples to take the room (20°C) temperature.

In recent years, the creation and research of nanomaterials is one of the most promising and popular scientific and technical areas. Despite the noted practical relevance, nanostructured materials in comparison with massive materials of similar compositions have definitely not been studied enough, or not at all, which fully relates to the study of the electrical conductivity of nanostructured liquid media.

Nanostructured objects are already being found or have high prospects for application in such rapidly developing types of human activity as microelectronics, catalysis, biosensorics, medicine, etc.

Main part

The experiment was carried out in the laboratory of liquid nanostructuring at the North Kazakhstan State University named after Manash Kozybayev. Two tap water types: 1) boiled water, 2) unboiled water, electrodes, multimeters (ammeter, voltmeter), a source of alternating current with a frequency of 50 Hz, two glass vessels with a volume of 700 ml were used for the experiments.

At the first stage, samples of tap water (boiled and unboiled), placed in different vessels, were obtained. Water after heat treatment was given time to cool down until the temperature reaches a value of 20°C. The same temperature 20° was established in a vessel with unboiled water. At the same time, the vessels were at a distance of at least three meters from each other and were isolated from sunlight. The process of removing the current-voltage characteristics was as follows. In the sample vessel were placed the electrodes connected to the current source and measurement instruments. Gradually changing from 2 V to 20 V AC voltage of 50 Hz, the current was measured. By means of these data and the Ohm's law the ohmic resistance of the water layer was determined.

For the accuracy of the experiment, measurements were carried out several times, and after each sample, to exclude mixing, time to dry the electrodes was given, and only then the following measurements were made. After placing the electrodes in the sample, they waited for about 30 seconds for the electrodes to wet. The obtained data were processed using Excel. Examples of measurements are given below in Tables 1 and 2.

Table 1. Values of the ohmic resistance of the water layer.
The measurements 22.02.19.

Number of measurement	The voltage across the electrodes, V	The measurements 22.02.19.	
		Ohmic resistance, Ohm (boiled water)	Ohmic resistance, Ohm (unboiled water)
1	2	25,00	28,57
2	3	25,00	29,03
3	4	25,53	27,91
4	5	25,00	28,85
5	6	25,00	27,69
6	7	25,00	27,63
7	8	25,00	27,27
8	9	25,23	27,27
9	10	25,21	27,52
10	11	24,81	26,61
11	12	25,17	26,87
12	13	25,00	26,71
13	14	24,71	26,58
14	15	24,73	26,79
15	16	24,49	26,52
16	17	24,40	26,42

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17	18	24,43	26,34
18	19	25,00	28,57
19	20	24,19	29,03

Table 2. Values of the ohmic resistance of the water layer.
The measurements 27.02.19.

Number of measurement	**The voltage across the electrodes, V**	**The measurements 27.02.19.**	
		Ohmic resistance, Ohm (boiled water)	**Ohmic resistance, Ohm (unboiled water)**
1	2	23,08	28,57
2	3	22,50	26,47
3	4	21,05	26,67
4	5	20,55	26,32
5	6	20,69	26,09
6	7	20,00	25,93
7	8	20,69	25,81
8	9	20,30	26,21
9	10	20,55	26,09
10	11	20,37	25,58
11	12	20,34	25,71
12	13	20,10	25,83
13	14	20,10	25,77
14	15	20,09	25,71
15	16	19,75	25,53
16	17	19,77	25,50
17	18	19,71	25,47
18	19	19,72	25,45
19	20	19,67	25,32

According to the data obtained during the experiment, graphs were constructed (Fig.1, 2).

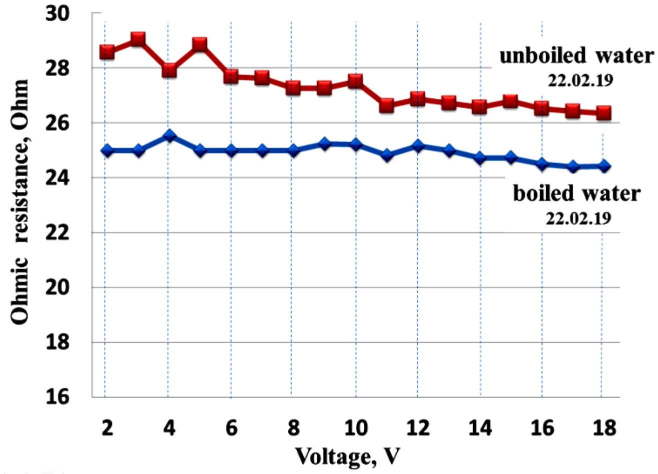

Figure 1 – The dependence of the water layer ohmic resistance on the voltage for unboiled and boiled water. The measurements 22.02.19.

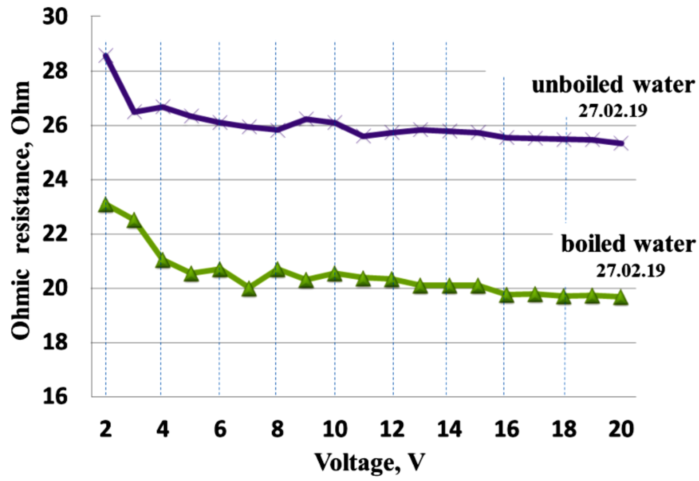

Figure 2 – The dependence of the water layer ohmic resistance on the voltage for unboiled and boiled water. The measurements 27.02.19.

Conclusion

The graphs show the dependence of the water layer ohmic resistance on the voltage for unboiled and boiled water. Differences in their electrical conductivity are clearly visible.

Similar measurements were carried out more than twenty times, with at least thirty samples participating in each experiment, and there was always a deviation of values within 10÷15%. The data obtained show that the electrical conductivity of water increases after boiling. This suggests the possibility of the existence in the water of neutral monocluster structures that decrease the electric current and are destroyed by heat treatment.

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