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CONTROL OF QUALITY BOTTLED POTABLE WATER

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One of the main problems of the XXI century, in the opinion of the majority of environmental scientists, will be the quality of drinking water. Water spring, giving the majority of Russia's population a life-giving moisture, to date, conforms the accepted standards of quality only in large cities. Over the past 5 years in the domestic market was no less than fifty brands of bottled water.

Mineral water has a right to be called “mineral” only if the total salinity (the amount of hydrocarbonate, sulfate, calcium chloride, magnesium, sodium and potassium) is greater than 1 gram per liter of volume. If rate is less - in front of you is drinking water, if more - Mineral.

Drinking water should be estimated on more than 90 indicators, rather than 54, created to test the tap water. Water of high quality differs from the first category on the two main criteria: first - in relation to pollutants, substances that are not useful for the organism (requirements are stricter, than the waters of the first category). The second difference: the use of not only the maximum permissible levels of substances, but the minimum number or their overdoses before extraordinary values.

The criteria on which all the waters are estimated: organoleptic properties (transparency, lack of smell, etc.), indicators of toxic, harmful chemical composition, radiation safety (domestic demands in this regard, are stricter: they are 5.5 times as one indicator and to 1.8 times as other lower than other European). There is also a criterion for epidemiological safety - water should not contain pathogens of infectious diseases (diphtheria, hepatitis, parasitic diseases).

A relatively new test - a physiological validity of the water. According to him parameters of water shall be governed by the terms of taste characteristics, and effects of water on the body. The water should ideally be not just safe, but also physiologically complete, to give the body necessary elements.

Unfortunately, the falsification of bottled water today can be found literally at every turn.

According to NII of soft drinks industry, only 1 out of 10 water bottles bought in various points of Moscow with the label «Borjomi» turned out to be real. According to the Standard Inspection of Russian Federation, which held a check for the whole country, it was rejected 30% of the inspected quantity of mineral and artificial mineral waters.

In this regard, the development of effective techniques for rapid control of elemental composition of bottled water is very relevant. In this paper we observe the modified photo-color control method of toxicological indicators of drinking water, especially those elements that can cause toxic effects at concentrations exceeding the MPC (aluminum, barium, beryllium, iron, copper, zinc, manganese, etc.) [1].

Basically this method contains a main law of colormetric, which may be formulated as follows: optical density of solutions, other things being equal, is proportional to the concentration of the substance and the thickness of the absorbing layer, ie

$$D_\lambda = \alpha_\lambda \cdot d \cdot c$$

Where α_λ - the rate of absorption, c - concentration of the substance, d - thickness of the layer.

The rate of absorption of the substance α_λ for light with a wavelength λ is determined from the equation

$$\alpha_\lambda = -d^{-1} \ln \tau_\lambda$$

where τ_λ - the transmittance of a substance with a layer thickness d (mm), which can be determined from the equation

$$\tau_\lambda = (I_\lambda / I_{\lambda_0}) \cdot 100\%$$

Where I_λ - the intensity of light passed through the solution,

I_{λ_0} - Intensity of light passed through the reference solution.

To determine all the elements in the bottled water according to the label, for each element create a sample, adding a reagent and determine the absorption band, suggesting the presence of these elements. Additional elements also can be identified in accordance with GOST, determining water quality. The concentration of the elements listed on the label, is determined by the prior measured concentration dependencies, using the state standards, such as an aqueous solution of iron ions Fe^{3+} (GSO 8032-94). The standard model is in a sealed glass ampoule with a known concentration of ions Fe^{3+}. Concentration dependence (see Fig. 1) are recorded by 2-3 dilution of sample from a standard sample of distilled water. Concentration dependence are stored in computer memory for each element.

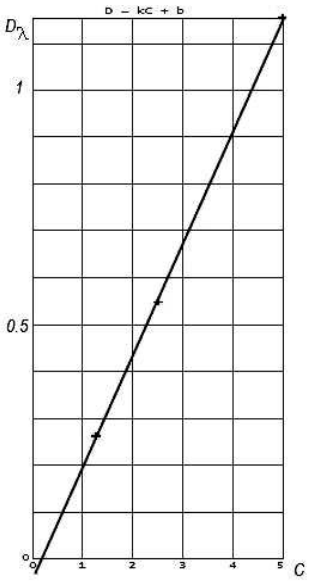

Fig. 1. Concentration dependence

Developed methodology allows qualitatively and quantitatively determine the elemental composition of bottled drinking water and the concentrations compared to the MPC (maximum permissible concentration of iron for drinking water 0.3 mg / l) [3], which avoids getting into the trading network of low production.

Literature

1. Alekseev A.I. Chemistry of water / A.I. Alekseev, A.A. Alekseev. - SPb.: Himizdat, Part 2, 2007 .- 453 pp.
2. The portable photometer for water analysis. Lovibond MultiDirect. www.tintometer.de, verkauf@tintometer.de
3. GOST 2874-82 «Drinking water. Hygiene requirements and quality control ».