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## ANALYSIS OF THE CHLORIDE IONS CONTENT IN MINERAL WATER OF VARIOUS MANUFACTURERS

Water is one of the most important factors in the environment that affects all processes of the body's life. The quality of drinking water raises certain requirements, since poor-quality water can cause diseases both of infectious and non-infectious nature. It is connected with a certain chemical composition or pollution of water reservoirs by various harmful substances. Bottled mineral water has different chemical composition. To compare the ionic composition of mineral soda water, samples of different manufacturers were taken (Table 1).

Table 1

Chemical composition of mineral water samples of various manufacturers

Name of water	Indexes	Number, mg/dm <sup>3</sup>
«Morshynska»	HCO <sub>3</sub> <sup>-</sup> SO <sub>4</sub> <sup>2-</sup> Cl <sup>-</sup>	30-200 <100 <60
«Mirgorodska»	HCO <sub>3</sub> <sup>-</sup> SO <sub>4</sub> <sup>2-</sup> Cl <sup>-</sup>	350-500 <50 <50
«Borjomi»	HCO <sub>3</sub> <sup>-</sup> SO <sub>4</sub> <sup>2-</sup> Cl <sup>-</sup>	3500-5000 - 250-500
«Poliana Kvasova»	HCO <sub>3</sub> <sup>-</sup> SO <sub>4</sub> <sup>2-</sup> Cl <sup>-</sup>	4500-8000 <25 300-600

The data show that all samples contain Cl<sup>-</sup> and its concentration varies from 25 to 600 mg / dm<sup>3</sup> depending on the brand of water. Therefore, control of the chloride content in mineral waters is an actual issue.

Chlorine is needed for a normal functioning of the human body. The daily rate of chlorine is from 800 mg to 7 g (adults); for children up to one year – from 0.18 to 0, 57 g. But chlorine excess is capable of causing health problems, such as: high blood pressure, cardiovascular diseases, irritation of the mucous membranes, dry skin, and hair fragility. In order to avoid negative health consequences, the content of chlorine in mineral water should not exceed the norm, which is not more than 250 mg /l.

Today, chemical, physico-chemical and physical methods of analysis are used to determine chlorine ions in water. Namely, the definition of chlorides is carried out using the following methods: titrimetry (chemical), potentiometry, nephelometry, conductometry (physical and chemical).

Titrimetric determination is based on the formation of low-soluble sediments. The reaction should take place according to the equation. The precipitate formed should be virtually insoluble and fall fast enough. The method involves formation of Cl-precipitation under the reaction with argentum (I) nitrate solution ( $\text{AgNO}_3$ ). A solution of potassium chromate ( $\text{K}_2\text{CrO}_4$ ) is used as an indicator. When titrating, a precipitate of argentum chloride is formed by the following reaction:  $\text{Ag}^+ + \text{Cl}^- = \text{AgCl}$ . When the deposition of chlorine ions ends, an excess of argentum nitrate reacts with an indicator, forming argentum chromate precipitation of orange-red color:  $2\text{Ag}^+ + \text{CrO}_4^{2-} = \text{Ag}_2\text{CrO}_4$ . The differences between the results of parallel definitions should not exceed 0.1%. This method gives inflated results. Thus, the definition of chloride ions is better to carry out by instrumental methods of analysis such as potentiometric titration.

Potentiometric titration under other equal conditions has a number of advantages in comparison with visual titrimetric methods of analysis. The chemical reactions used in this method meet the same requirements as in titrimetric analysis. In contrast to the described method based on the use of color indicators, the potentiometric titration method uses an electrode indicator for ions involved in indicator electrochemical reaction. The potential jump at the point of equivalence is taken as an indicator of the reaction completion. In further studies, the determination of the content of chloride ions in mineral water will be carried out with the help of the specified method.

## REFERENCES

1. Визначення мінерального складу природних вод: Методичні вказівки та інструкція до лабораторної роботи з курсів “Теоретичні основи хімії і технології води”, “Хімія води і мікробіологія” для студентів базових напрямів 6.051301 “Хімічна технологія”, 6.060103 “Гідротехніка (водні ресурси)”. Укл.: Л.В.Савчук, З.О.Знак, Р.Р.Оленич – Львів: Видавництво Національного університету “Львівська політехніка”, 2012. – 8 с.
2. Сегеда А.С. Лабораторний практикум з аналітичної хімії. Якісний і кількісний аналіз.– К.: ЦУЛ, Фітосоціоцентр. 2004 – 148, 151 с.
3. Фарус О.А. Физический и физико-химические методы анализа. Лабораторный практикум : учебно-методическое пособие / О.А. Фарус, Г.И. Якушева.– М.-Берлин: Директ-Медиа, 2015.– 29-30 с.