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DETERMINATION OF NICKEL IONS CONTENT IN WATER BODIES OF KHOROSHIV DISTRICT, ZHYTOMYR REGION

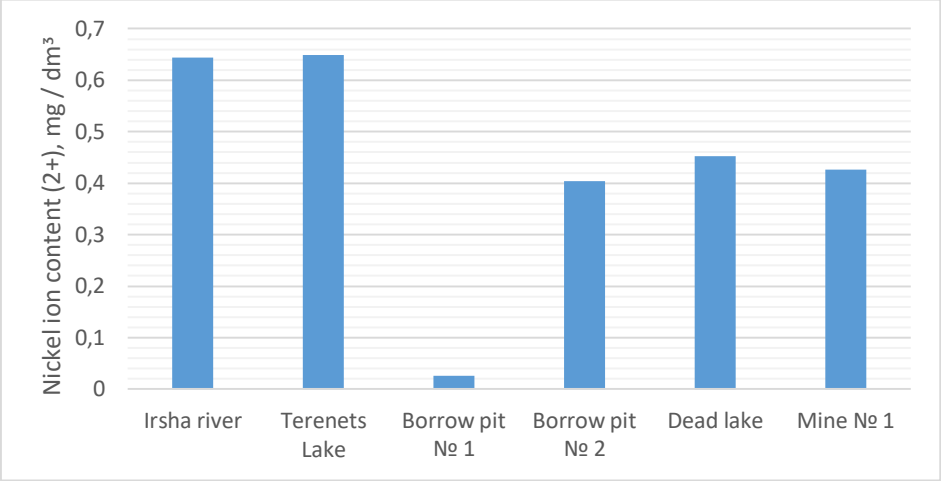
Nickel is a fairly common chemical element in the environment. Its content in the earth's crust is about $5{,}8 \cdot 10^{-3}$%. Due to weathering and leaching of rocks and minerals nickel can enter the aquatic environment from the earth's crust. Man-made pollution is also possible. Therefore, it is very important to determine the content of Nickel ions (2+) in surface waters. Thus, water bodies located in the Khoroshiv district of Zhytomyr region were selected for the analysis of natural water. This area has a unique geological characteristic, namely, a great variety of minerals and rocks of the Volyn deposit. The peculiarities of the rocks chemical composition in this region make it possible to predict natural inflow of nickel into water bodies. At the same time, on the territory of the district there are mining enterprises that carry out man-caused load on the environment of the region. Therefore, the hydrochemical composition of water bodies can be determined not only by natural origin but also by man-made loads. Some of the water bodies in the area were created artificially, these are quarries flooded with water. Water samples were taken from six water bodies, four of which were of anthropogenic origin and two of natural origin. These are the following objects: 1) Irsha river (natural object); 2) Terenets Lake (natural object; 3) quarry №1; 4) quarry №2; 5) Dead Lake; 6) mine № 3. Water samples were taken into plastic bottles according to standard methods. Samples were signed, transported to the chemical research laboratory for further processing during the day.

Ni^{2+} ions were determined qualitatively and quantitatively by methods of analytical chemistry according to standard methods. According to the acid-base classification, Nickel ions (2+) belong to the sixth analytical group of cations. The group reagent for the cations of analytical group VI is the action of excess ammonia solution, which converts the nickel cation into the ammonia complex $[Ni(NH3)6]^{2+}$. Chlorides, sulfates and nitrates of nickel cation are well soluble in water. The aqueous solution of nickel salts (2+) is green, due to the formation of the aqua complex. At the beginning of the study, qualitative reactions were performed for the presence of Ni2 + ion in all samples of water. Qualitative reaction on nickel cations (2+) in water is the reaction with dimethylglyoxime (Chugaev's reagent) which forms a bright pink precipitate of complex salt with nickel cation in ammonia medium.

$$NiSO_4 + 2C_4H_8N_2O_2 + 2NH_4OH \rightarrow Ni(C_4H_7N_2O_2)_2\downarrow + (NH_4)_2SO_4 + 2H_2O$$

The results of the study showed the presence of Nickel ions in all water samples.

Quantitative determination of nickel cations (2+) in water was performed by volumetric analysis, namely, inverse titration, leading to the transition from blue color to red in the presence of the indicator erychrome black. $ZnSO_4$ solution was used as the working solution. According to the law of equivalents, the content of Nickel ions (2+) in studied samples was calculated. The obtained results were compared with the values of MPC (Maximum Permitted Concentration) for surface waters (MPC - 100 mg / dm^3). The results of the study are shown in the figure.



Studies have shown: 1) MPC does not exceed the limit of Nickel ions content in all samples of water bodies; 2) the content of Nickel ions in natural water bodies is 1.5 times higher than in artificial ones. This can be explained by the geochemical method of nickel entering the water, which is explained by the geological environment of the formation of natural water bodies.