



THE MECHANISM OF NITRATES TRANSFORMATION IN THE PROCESSES OF ELECTROCHEMICAL TREATMENT OF NATURAL WATERS

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Abstract

Pollution of underground waters in the Republic of Moldova has been caused by the intensive use of nitrogen – containing fertilizers. Concentration of nitrate in underground waters varies in limits of 100 – 250 mg/l.

Widespread utilization of water in different areas of human life and activity makes its quality extremely important for human health. Thus, pollution of potable water with nitrates causes such diseases as methemoglobinemia and cancer.

At present, a lot of biological methods of nitrate elimination from polluted water are known, although these methods are too complex to be applied for underground water treatment.

With regard to the above-stated, we propose a new electrochemical method for nitrate-ion reduction in aqueous solutions. The method includes treatment of polluted water in consecutively connected electrochemical cells, one of which contains soluble metallic anode, and another – an insoluble one. The effect of nitrate elimination has been studied as a function of nitrate concentration, time of treatment, current intensity and the nature of metallic anode. The mechanism of NO_3^- elimination from polluted water includes two major stages – reduction of NO_3^- in NO_2^- in electrochemical cell with a soluble anode and reduction of NO_2^- in the second cell with insoluble electrodes.

It was established that the rate of the nitrate-ion reduction depends on the initial concentration of NO_3^- ions and the time of electrochemical treatment. We calculated the reaction order. The reaction of nitrate-ion reduction is proceeding in accordance with the first order equation. The most effectively the nitrate-ion reduction take place within the first 15-16 minutes about the 50%. In the following 15-16 minutes, the amount of the reduced nitrate ions has diminished by 20-25%.

As a result of the research we have concluded that the rate of NO_3^- ions reduction depends on the initial concentration of NO_3^- ions, time of electrochemical treatment, electric current density and the nature of metallic anode, while the process of NO_2^- ions reduction depends only on the time of treatment.

Keywords: nitrate, nitrite, electrochemistry, reduction

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