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Summary of PhD thesis: *"Isotopic composition studies of nitrates ($\delta^{15}N$, $\delta^{18}O$), sulfates ($\delta^{34}S$, $\delta^{18}O$) and phosphates ($\delta^{18}O$) in water reservoirs – methods and applications"*

The purpose of my thesis was to develop a new "off-line" method of nitrate preparation to obtain N_2 and CO_2 to $\delta^{15}N$ and $\delta^{18}O$ in NO_3^- analysis, in a single preparation step. The isotopic composition N and O in NO_3^- ions is an important source of information about the origin of nitrates in waters and description of biogeochemical processes in the nitrogen cycle. Both gases, N_2 and CO_2, obtained in single preparation procedure for isotope analysis may reduce the amount of sample required for analysis, costs and time necessary for this preparation. The usefulness of the method, and other isotopic methods, including studies of sulphates ($\delta^{18}O$ and $\delta^{34}S$) and phosphates ($\delta^{18}O$) isotopic composition in environmental studies was intended to demonstrate on example of the Zemborzycki Lagoon research.

The first six chapters describe briefly the theory of isotope effects including information about a nitrogen, sulfur and phosphorus biogeochemical cycles. In this part of my thesis I described briefly the eutrophication process and the studied reservoir, Zemborzycki Lagoon. Subsequent chapters are experimental part of this work, in which the most important chapter is about determining the optimal conditions for a new "off-line" preparation method of nitrates. For this purpose I designed an apparatus for extraction nitrates from water samples, purification and chemical conversion to N_2 and CO_2. I made numerous analysis of isotopic composition of N and O in NO_3^- to verify correctness, reproducibility and efficiency of this method. Only a part of the results are included in this thesis. The main advantages of this method are: (i) smaller amounts of sample required for analysis in comparison to other "off-line" methods, (ii) a low cost of $AgNO_3$ conversion to N_2 and CO_2, (iii) a high efficiency of the method, close to 100%.

In framework of this study I have performed the isotopic analysis of sulfate ($\delta^{34}S$ and $\delta^{18}O$), which enabled the distinction of sources of these compounds and evaluation of processes occurring in analyzed waters. The isotopic analysis of $\delta^{18}O$ in PO_4^{3-} ions extracted from Zemborzycki Lagoon, did not show the usefulness for "off-line" methods due to the very low concentration of phosphates in analyzed waters. The isotopic studies of Zemborzycki Lagoon demonstrated the ability to accurately determine the isotopic composition of nitrate ($\delta^{15}N$ and $\delta^{18}O$) and sulfate ($\delta^{34}S$ and $\delta^{18}O$) in environmental samples, which can be used in further studies of ecosystems.

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