POPULAR SCIENCE SUMMARY

Hydrogen is the most abundant element on Earth and in the Universe. It has three isotopes: protium (^{1}H), deuterium (^{2}H or D) and tritium (^{3}H or T). The third one is radioactive. The relative mass difference between the first two stable isotopes of hydrogen is about 1, and this is the biggest difference that occurs in nature. This situation causes the molecules containing any of hydrogen stable isotopes to behave differently in the course of chemical reactions and physical processes. The example of such differences is higher boiling point D_2O than the bonding H_2O, as well as more stronger bond C-D than C-H in organic chemistry. Autotrophic organisms are one of the main components of marine and lacustrine sediments. They absorb the water and build in the hydrogen into its structure. The analysis of stable hydrogen isotopes in organic matter dispersed in the rocks allow to reconstruct the hydrological cycle, and paleoclimate. The study of organic matter in the geological material is the key to a better understanding of the processes occurring in the sedimentation basin. Biomarkers - molecular fossils, are the organic compounds, which despite some modifications to the structure can be managed to reproduce a group of precursor organisms. The analysis of biomarkers creates new opportunities in the deliberations on paleoenvironmental reconstruction. However, the combination of organic and inorganic geochemistry in the deliberations concerning the study of processes and changes taking place in different environments seems to be the ideal solution.

In this research, it is planned to compare the hydrogen isotopic composition from organic matter and the surrounding rocks, in this case it will be deposits of evaporates. Gypsum from Nida Basin are one of the most interesting evaporitic deposits in Poland. These formations are of Miocene age (23.03 million - 5,333 million years ago). Miocene deposits of gypsum are filling parts of the Carpathian foredeep, which extends north along the southern shore of Holy Cross Mountains. The project involves carrying out interdisciplinary research involving the analysis of biomarkers and isotopes of carbon and hydrogen in particular organic compounds and the measurement of stable isotope ratios of hydrogen and oxygen in crystallization water from gypsum and the measurement of stable isotope ratios of sulphur and oxygen in gypsum. The isotope geochemistry is one of the fundamental research areas of sedimentary rocks, including evaporates. Using this method in combination with the organic geochemistry will allow for more accurate tracing the processes that take place in hypersalinary environments, especially including the development of organic matter and microbial sulphate reduction and the processes of dissolution and precipitation of evaporates. The isotopic composition can be the indicator of environmental elements such as hydrological cycle, carbon cycle, temperature, salinity, productivity and availability of oxygen.

Paleoenvironmental studies are one of the most important branches of research currently being conducted in many scientific centers of the world. Understanding the mechanisms controlling changes in environmental conditions in the past gives us a chance to better comprehend the changes taking place now. The analysis of the proposed evaporitic formations in the project can not only enrich the knowledge of hypersalinary environments but also expand the research workshop of geochemists.