ABSTRACT FOR THE GENERAL PUBLIC

The presence of heavy metals in the environment is largely associated with human activity, although their small amounts occur naturally in rocks, soil, and water. Heavy metal contamination of the water and soil environments leads to a reduction in biodiversity and microbial activity and worsens crop yield and quality. Heavy metals are removed from the environment through precipitation, coagulation, flocculation, reverse osmosis, and adsorption. Currently, in line with the idea of sustainable management, there is growing interest in the use of natural biosorbents for heavy metal removal from the water and soil environments. Extracellular polymers are non-toxic and biodegradable and exhibit high metal removal potential. Therefore, they may turn out to be effective materials to be used in bioremediation. Additionally, the use of extracellular polymers can be a measure in the management of microalgal cultivation by-product, i.e. the post-culture substrate. However, the process of binding heavy metals by extracellular polymers synthesised by green algae is still poorly explored; therefore, it is extremely important to broaden the knowledge in this field, especially in terms of the contact time, NH_4^+ concentration and temperature.

The aim of the proposed research project is to determine the sorption capacity of extracellular polymers synthesised by unicellular green algae growing in mixotrophic conditions. Extracellular polymers will be isolated from microalgal cultures with two methods: precipitation-dialysis-lyophilisation and precipitation-drying. Isolated expolymers will be characterized in terms of productivity, chemical composition, functional groups and molecular weight. Sorption tests will include the impact of Pb(II) ion concentration and contact time on the effectiveness of lead ion removal from the tested system. In the next stage, the influence of ammonium ions and temperature on the efficiency of the Pb(II) sorption process will be investigated.

Understanding the process of lead ion sorption in the presence of ammonium ions with the participation of an extracellular polymer produced by unicellular algae will allow to assess its application possibilities in the process of removing metal ions from water and wastewater containing ammonium ions.