Abstract

In recent years, the market for the production of microalgae biomass has been developing. The biomass of unicellular algae is used primarily in the production of food, dietary supplements and feed due to the content of nutrients (proteins, carbohydrates, lipids), as well as carotenoids (including astaxanthin and β-carotene), vitamins and polyunsaturated fatty acids (DHA and EPA), the biomass of algae is used primarily in the production of food, dietary supplements and fodder. Moreover, unicellular algae also synthesize many valuable metabolites, including extracellular polymers, which are then secreted into the culture medium. The physiological role of extracellular polymers is to protect cells from adverse environmental conditions. Extracellular polymers are characterized by great diversity in terms of physico-chemical and biological properties, which is why it is important to conduct research that will contribute to the practical application of EPS. Another important aspect of the research undertaken as part of this dissertation is the management of the substrate after algae cultivation and biomass separation. Synthetic polymers are often used in sorption and flocculation processes. Due to the increasing awareness of environmental pollution caused by microplastics, it is extremely important to search for new, effective, and at the same time non-toxic and biodegradable materials that will replace the currently used synthetic polymers with sorption properties. The research presented in this dissertation focuses on two species of green algae: *Chlorella vulgaris* and *Parachlorella kessleri* with high application potential resulting from the high growth rate and attractive chemical composition of the biomass. The third species – *Vischeria magna* (Ochrophyta), which has not been analysed so far for EPS synthesis, however, it is a potential source of β-carotene and fatty acids. As part of this thesis, the conditions for EPS synthesis were determined (nitrogen source, nitrogen source concentration, light intensity, mixotrophic growth conditions). Then, the chemical composition of EPS obtained under autotrophic and mixotrophic conditions and their sorption properties towards heavy metal ions were determined. The influence of time and pH value of the system on the efficiency of the sorption process was determined. The flocculating activity of the tested EPSs was also determined.

Key words: extracellular polymers (EPS), unicellular algae, sorption, cadmium, lead, flocculation