

Abstract

Microorganisms are known as an extremely rich source of natural substances with various properties, which may result in acquisition of the products that are not toxic to the environment. Currently, an important aspect of the studies, is the search for new extracellular polymeric substances that will appear as equally efficient substitutes to harmful, synthetic products. The strains of *Rhodococcus* analysed in this study, have not been tested for their exopolymers, which indicates the pioneering nature of the research. The experiments included selection of bacterial strains from the *Rhodococcus* genus based on flocculating activity measurements and the obtaining of extracellular polymeric substances from bacterial strains of *Rhodococcus opacus* FCL89 and *Rhodococcus rhodochrous* FCL202. Optimal culture conditions (temperature, mixing speed, incubation time) and composition of the medium (carbon and nitrogen source, pH value, addition of metal ions) were selected, which allowed to obtain exopolymers with the highest flocculating activity in the shortest incubation time. Chemical composition, basic atomic composition and functional groups of the tested compounds were analysed, and the impact of exopolymers on flocculation process was verified using selected metal ions and variable conditions (e.g. temperature, pH value, exopolymer concentration). Additionally, the sorption capacity of the extracellular polymeric substances to heavy metals, such as Pb^{2+} , Cd^{2+} , Co^{2+} , Ni^{2+} and Cr^{6+} , was tested. The final result of this study is the comprehensive physico-chemical characterisation of extracellular polymeric substances obtained from *Rhodococcus* strains.

Keywords: *Rhodococcus*, exopolymer, flocculation, sorption, heavy metals