

Multicopper oxidases (MCOs) are enzymes produced by both prokaryotic and eukaryotic organisms and playing important roles in many physiological processes. The largest and most widely studied group of MCOs are laccases *sensu stricto*, as well as "laccase-like" MCO. They are characterized by low substrate specificity and can catalyze the oxidation of a wide range of organic and inorganic compounds. Because of this, they have become the focus of researchers and valuable tools in many industrial processes, environmental protection and medicine. For the enzyme to be used it is necessary to develop a method of its production and acquisition from a microbial culture, while maintaining high activity and relatively low process costs. In addition, a number of investigations are needed to indicate the potential areas of its applications.

The Department of Industrial Microbiology and Biotechnology University of Lodz holds in its collection microscopic filamentous fungi capable of producing extracellular laccases. One of them is the *Myrothecium* sp. IM 6443 strain, isolated from contaminated soil taken from the area of the textile dyeing factory. *Myrothecium* sp. IM 6443 laccase production can be significantly increased by modifying the composition of the medium. The enzyme has the ability to oxidize a wide variety of phenolic and non-phenolic substrates. This feature is very desirable in terms of the potential use of the enzyme.

The scientific objective of the project is to characterize conditions for obtaining an active enzyme preparation and to explore potential areas of its use. In the first part of the investigations, conditions of culturing promoting the enzyme production will be established. A number of analyses (e.g. fungal proteome inspection, influence of oxidative stress) will allow us characterizing the process of enzyme biosynthesis in induced conditions. In addition, various methods of isolation and purification of the enzyme will be tested, resulting in a high activity enzyme preparation. The second research objective will be to determine the area of a potential use of the enzyme in the processes of biodegradation of toxic xenobiotics. The possibility of eliminating synthetic dyes (mainly from the group of azo dyes) using the enzyme will be investigated and the parameters determining the process will be characterized. Chromatography and mass spectrometry tools will be used for determining the degradation products of the tested compounds and describing the course of their biodegradation. Importantly, the toxicity of the resulting products will be assessed.

The results obtained during this scientific project realization may contribute to the improvement of the knowledge on the biosynthesis of laccases by filamentous fungi and the possibility of their application to the elimination of toxic compounds. In the future, this information can be used to develop cheap, efficient and environmentally friendly for biodegradation of dyes, mainly from the azo dyes group.