Description for general public

Nowadays, there are many information that the electric field (EF) and the magnetic fields (MF) influence on the basic life processes of microorganisms and can effects on their potential. These types of fields can influence on the secretion of hormones, the activity of enzymes, the cell viability and the proliferation, transport of ions, the metabolic activity of cells, the transcription and DNA synthesis. The intensity of impact this physical factor on various biological systems depends on the type of field, the intensity, the voltage and the exposure time. The vast majority of the literature refers to studies on the influence of a static electromagnetic field, overlooking the issue of the rotating electromagnetic field (RMF). In addition, for the enzymes, unfortunately the amount of information indicating for the impact of the MF for their activity is modest. Although it can be assumed that, given the crucial importance of these molecules in the development of the speed and direction of many metabolic pathways, exposure to the magnetic field has an impact on their activity through changes in the structure and the changes in physicochemical properties of substrates present in the reaction catalyzed by them. Results of this study will answer the question to what extent the use of the RMF can affect the performance and efficiency of reactions with using biocatalysts. The proposed project will contribute to broadening the knowledge of enzymology, but also the protection of environment by presenting alternative methods of degradation of lignin and synthetic dyes. Moreover, the development process of valorization of decomposition of lignin, a renewable raw material waste, is an opportunity to reach specific aromatic compounds not through their artificial synthesis, but from the natural source and independent of fluctuations in the price of crude oil .

The aim of this project is to analysis of the potential influence of the rotating magnetic field (RMF) on the enzymatic activity and the decomposition process of the selected kinds of lignin and synthetic dyes. In the proposed research is planned to analysis of the catalytic response of laccase (EC 1.10.3.2) from fungi *Trametes sp.* and Dye-decolourising peroxidases type B (Dyp1B) (EC 1.11.1.19) from bacteria *Pseudomonas fluorescens* Pf-5, in the native and immobilized form on exposition to the RMF. In the project will be tested the influence of the RMF with different frequency, the intensity and the exposure time, on the activity of the enzymes and their ability to the of lignin and selected synthetic dyes decomposition or modification. The following hypothesis will be verified; **i)** the RMF influences on the enzymatic activity of the native and immobilized form of laccase and Dyp1B, **ii)** the changes in enzymes activities altered by different RMF conditions such the frequency; the magnetic induction and the time exposure.

The proposed project will consist methodically of two main parts. The first stage of the study involves: cultivation of microorganisms, isolation and purification of laccase, the analysis of the catalytic properties of both enzymes and synthesis of ferromagnetic matrix and immobilization of oxidoreductases. Whereas, the second part of the project are a studies with using the rotating magnetic field, determining the impact of these physical factor on the enzymatic activity of native and immobilized forms of laccases and peroxidases Dyp1B and its direct impact on the enzymatic reaction on the example of the degradation processes of selected types of lignin and synthetic dyes. Prepared project presents innovative solutions for bioprocess engineering, enzymology and biotechnology.