

Enzymatic immobilization on alumina pellets improved the decoloration of synthetic dyes

Johann Osma¹, José L. Toca-Herrera^{1, 2}, Georg Gübitz³ and Susana Rodríguez Couto¹

¹Rovira i Virgili University, 43007 Tarragona, Spain

²Biosurfaces Unit, CIC biomaGUNE, Paseo Miramón 182, 20009 San Sebastián, Spain

³Institute of Environmental Biotechnology, Graz University of Technology, A-8010 Graz, Austria

johann.osma@urv.cat, susana.rodriguez@urv.cat

Laccases (benzenediol: oxygen oxidoreductases; EC 1.10.3.2) have been a field of increasing research, since they catalyze the oxidation of both phenolic and non-phenolic compounds [1] as well as highly recalcitrant environmental pollutants [2]. This makes laccases very useful for their application to wastewater treatment and bioremediation. Nevertheless, laccases are often inactivated during reaction by a wide variety of environmental conditions that characterize effluents (pH, ionic concentrations, inhibitors, reaction system) and which seriously limit their industrial application. Therefore, the obtainment of stable and reusable laccases is a goal of considerable importance. Immobilization of laccases on solid carriers can often improve their stability and allow their reuse. In this study, the decoloration of two different structural dyes, such as the triphenylmethane dye Methyl Green (MG) and the anthraquinonic dye Remazol Brilliant Blue R (RBBR), using free laccase and laccase immobilized on Al₂O₃-pellets was assessed.

Figure 1 shows the micro-photograph of an alumina pellet with laccase immobilized on it. Free laccase decolorized 75% of MG and about 50% of RBBR in 16 h, whereas immobilized laccase totally decolorized MG in 90 min and about 80% of RBBR in 31 h (Figure 2). Therefore, immobilized laccase led to higher decoloration both rate and percentage. Overall, the strategy used in this study seems very promising for the treatment of colored wastewater.

References

- [1] Bourbonnais, R. and Paice, M.G., FEBS Lett., **267** (1990) 99-102.
- [2] Rodríguez, E., Pickard, M.A. and Vázquez-Duhalt, R., Curr. Microbiol., **38** (1999) 27-32.

Figures:

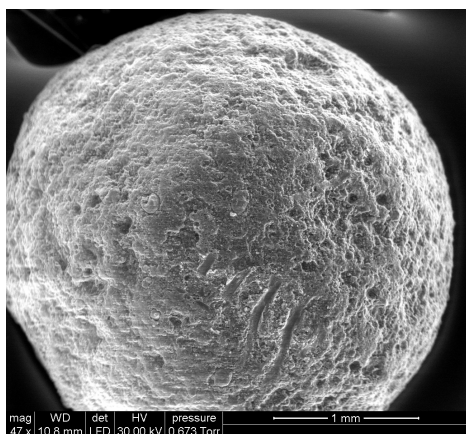


Figure 1.-Laccase immobilized on an alumina pellet

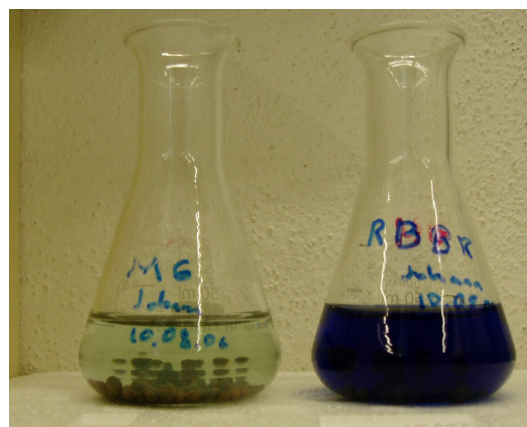


Figure 2.-MG (left) and RBBR (right) decoloration by immobilized laccase after 90 minutes.