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New bio-based immobilization supports for enzymatic removal of micro-pollutants in fluidized-bed reactor

The presence of pharmaceutical pollutants and endocrine disruptors in urban and industrial effluents is becoming an actual problem for environment and public-health. Their presence may come from different sources, such as human drugs and pharmaceutical production which cause contamination in domestic and industrial wastewater, and veterinary drugs which result in soil contamination [1]. Their removal is very difficult because the compounds are generally refractory to classical wastewater treatments and are present at very low concentration ($< \mu\text{g/L}$). The enzymatic treatment of such effluents can be an interesting alternative to classical wastewater treatments, in particular when enzymes are immobilized in beads in order to be reused and increase their stability [2,3]. In this thesis, new immobilization bio-based supports will be designed for laccase immobilization. Firstly, a repeatable process of elaboration of supports needs to be found. Gelatin has been chosen as a support as it is biodegradable, the elaboration process is simple and cheap, and it will also reduce the environmental impact of the project. Then, immobilization of laccase on the beads will be studied using glutaraldehyde as a cross linking agent. Finally, a fluidized-bed reactor will be designed and optimized to study the degradation of a model micro pollutant from wastewater, in which the fluidized bed will be composed of the beads supporting the enzymes.

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[3] Mateo C., Palomo J.M. et al, Improvement of enzyme activity, stability, and selectivity via immobilization techniques, (2007). *Enzyme Microbial Technology*, 40, 1451-1463.