

DEVELOPMENT OF NEW ECO-FRIENDLY SUPPORTS FOR IMMOBILIZATION OF ENZYMES BASED ON CELLULOSE RESIDUES

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Body

The pulp and paper industry generates a high volume of solid wastes that are usually burned to obtain energy, directed to landfills, or incinerated. Among the wastes generated in this process is the paper sludge, a residue rich in cellulose with low lignin content making it a useful raw material to produce high-value products such as cheap immobilization supports.

In the current work, paper sludge was activated using different functional groups (amino, epoxy, and aldehyde). The xylanase GH10 from *Malbranchea pulchella* was used as a model enzyme for the immobilization assays. The enzyme was efficiently immobilized through reversible immobilization on aminated support monoaminoethyl-N-ethyl (MANAE) and polyethyleneimine (PEI), achieving yields of more than 90 %. Furthermore, the yield and activity of the biocatalyst immobilized with paper sludge using groups glyoxyl and epoxy (irreversible immobilization) were higher than the enzyme immobilized on agarose supports. The biocatalyst immobilized on paper sludge-epoxy presented the best results, reaching 12.54 U.g⁻¹ of support. Therefore, the use of paper sludge, such as backbone of different immobilization supports, was an efficient method and promising approach for the immobilization of enzymes such as xylanase. More studies are necessary to optimize the displayed potential for future applications as tests in other enzymes of different characteristics and their behavior with bifunctional reagents as the glutaraldehyde. Furthermore, the valorization of these residues in a biorefinery context holds great socio-economical relevance for Portugal and Brazil. Thus, our perspectives are the development of a hybrid biocatalyst using magnetic nanoparticles and paper sludge.

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References

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