Immobilization of *Myceliophthora thermophila* laccase onto Immobead 150P epoxy support: Characterization and application for wood hydrophobization

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Abstract

Nowadays, extensive attention has been focused on laccases due to their broad substrate range which make them robust enzymes for application in different sectors. In the present study, *Myceliophthora thermophila* laccase was immobilized on both native and modified Immobead 150. Moreover, immobilizations were performed on both supports by one point and multipoint covalent attachment. From the different immobilized derivatives, the multipoint covalently immobilized laccase on the modified Immobead 150 (A_{multi}) showed the best results concerning the different immobilization parameters. Therefore, A_{multi} was evaluated for thermal and pH stabilities and was successfully applied for grafting a hydrophobic compound onto beech wood.

A_{multi} has optimum temperature and pH at 70 °C and 3.0, and retained 98 and 60% of activity after 2 h of exposure at 60 and 70 °C, respectively. At alkaline conditions, A_{multi} has shown a remarkable stability, with 95% of initial activity at pH 9.0 after 3 h, although only 15% of initial activity could be recovered at pH 5.0 after 3 h. In addition, the immobilized laccase also showed good operational stability, maintaining 95% of its initial activity after 10 cycles of ABTS oxidation. The grafting of lauryl gallate (LG) with the assistance of A_{multi} was assessed by measuring the water contact angle. Grafted wood showed a relative contact angle of 81.1%, whereas the control (LG only) showed 28.6% after 4 min of water addition on the wood surface. The results obtained make the immobilized laccase to be a promising tool for further biotechnological applications, especially in lignocellulosics modification.

Keywords: Laccase, covalent immobilization, Immobead 150P, Lauryl gallate, wood hydrophobization.

Image

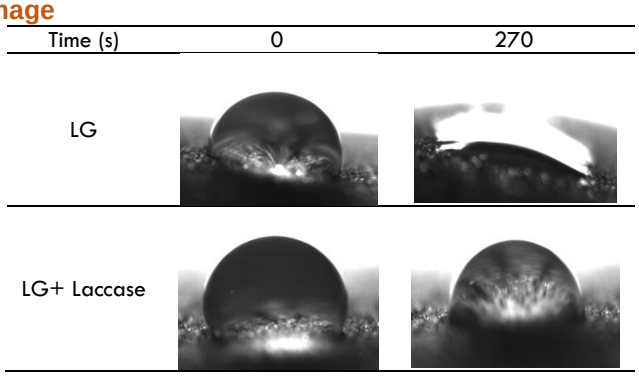


Figure. Beech wood hydrophobization by Multipoint immobilized laccase-assisted grafting of lauryl gallate.

Recent Publications

1. Othman, A.M., González-Domínguez, E., Sanromán, Á., Correa-Duarte, M., Moldes, D., 2016. Immobilization of laccase on functionalized multiwalled carbon nanotube membranes and application for dye decolorization. RSC Advances 6, 114690–114697. https://doi.org/10.1039/C6RA18283F
2. González-Domínguez, E., Comesaña-Hermo, M., Mariño-Fernández, R., Rodríguez-González, B., Arenal, R., Salgueiriño, V., Moldes, D., Othman, A.M., Pérez-Lorenzo, M., Correa-Duarte, M.A., 2016. Hierarchical Nanoplatforms for High-Performance Enzyme Biocatalysis under Denaturing Conditions. ChemCatChem 8, 1264–1268. https://doi.org/10.1002/cctc.201501401
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Biography (150 word limit)

Abdelmageed M. Othman (A.M. Othman) has completed his PhD in science (Microbiology) from Al-Azhar University (Cairo, Egypt) in 2012. He has got three postdoctoral studies for stabilization and enhancement of laccase activity and its environmental applications, two of them (2013-2015) were at Bioengineering and

Sustainable Processes Research Group, Chemical Engineering Department, Vigo University (Vigo, Spain), and one (2016) at Department of Molecular Enzymology, Institute of Biochemistry and Biology, University of Potsdam, (Potsdam-Golm, Germany). He has participated in several Egyptian and international research projects and currently he is the Egyptian principal investigator of the Egyptian Science & Technology Development Fund (STDF) project in cooperation with Potsdam University, Germany. Nowadays, he is interested in production, purification and characterization of microbial enzymes and its stabilization through immobilization for different eco-friendly applications. He has published many of research papers in reputable journals and has been serving as a reviewer for different International Journals.

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Notes/Comments: