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Covalent immobilization of laccase on citric acid functionalized micro-biochars derived from different feedstock and removal of diclofenac

Linson Lonappan ^a, Yuxue Liu ^{a,b}, Tarek Rouissi ^a, Florent Pourcel ^a, Satinder Kaur Brar ^{a*},
Mausam Verma ^a, Rao Y. Surampalli ^c

^a INRS-ETE, Université du Québec, 490, Rue de la Couronne, Québec, Canada G1K 9A9

^b Institute of Environment Resources, Soil and Fertilizer, Zhejiang Academy of Agricultural Sciences, 198 Shiqiao Road, Hangzhou 310021, P.R China

^c Global Institute for Energy, Environment and Sustainability, P.O. Box 14354, Lenexa, KS 66285, USA

(*Corresponding author, Phone: +1 418 654 3116; Fax: +1 418 654 2600;

E-mail: satinder.brar@ete.inrs.ca)

Abstract

Immobilization of enzymes on the solid supports can improve the stability as well as catalytic properties of enzymes. In this study, biochar derived from various feedstocks were used as immobilization support considering biochars carbon negative as well as sustainable properties. Partially purified (concentrated) crude laccase was covalently immobilized onto pine wood (BC-PW), pig manure (BC-PM) and almond shell (BC-AS) micro-biochars using optimized 5% w/v glutaraldehyde. Moreover, citric acid pretreatment improved the laccase binding capacity of all the micro-biochars and the highest laccase binding of $40.2 \pm 1.8 \text{ U g}^{-1}$ was observed with BC-PM in comparison with raw BC-PM ($34.1 \pm 1.1 \text{ U g}^{-1}$). The enhanced binding of laccase on BC-PM over wood derived biochars was attributed to the higher surface area ($46.1 \text{ m}^2 \text{ g}^{-1}$) of BC-PM.

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