

# Utilization of Xylan Extracted from Black Liquor of Pulp and Paper Industry for Production of Value Added Products

Sehanat Prasongsuk\*, Wichanee Bankeeree, Pongtharin Lotrakul and Hunsa Punnapayak

Plant Biomass Utilization Research Unit, Department of Botany, Faculty of Science, Chulalongkorn University,  
Tel: 02-218-5493, e-mail: sehanat.p@chula.ac.th

**Abstract:** This study is the first report to develop hydrogel beads from waste xylan recovered from black liquor of pulp and paper effluent with synthetic polymer, and to enhance its application for laccase immobilization and dye decolorization in wastewater treatment. Xylan was prepared from the black liquor of pulp and paper industry in Thailand, and it was esterified with citric acid prior to cross-linking with polyvinyl alcohol. In an attempt to find the efficient technique for laccase immobilization with this blended polymer, three factors including enzyme dosage and concentration of modified xylan and polyvinyl alcohol were investigated and evaluated using response surface methodology. The optimum composition for the immobilized laccase bead formation consisted of 4 % (w/v) modified xylan, 10 % (w/v) polyvinyl alcohol, and 15 U.mL<sup>-1</sup> crude laccase. The maximum decolorization of reactive black 5 (98.45 %) was obtained within the first cycle (6 h) at 40 °C. In the eighth cycle, the reused beads were able to decolorize 55.35 ± 2.46 % of the reactive black 5. Moreover, the xylan- polyvinyl alcohol beads extended the optimum pH range of laccase activity from 6 to 10 and tolerated a temperature up to 10 °C higher than that of the free enzyme. These results suggest that the xylan- polyvinyl alcohol bead has great potential as the polymer matrix for enzyme immobilization, which has applications in wastewater treatment.

**Keywords:** Reactive Black 5; Laccase; Immobilization; Hydrogel