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# Removal of 4-chlorophenol in a continuous membrane bioreactor using different commercial peroxidases

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**ABSTRACT**

Three commercial plant peroxidases, the commonly used soybean (SBP) and horseradish (HRP) and a cheap alternative, artichoke (AKPC), have been tested for the removal of 4-chlorophenol in a continuous tank reactor associated to an ultrafiltration membrane module. An important conversion fall over time was observed both in the reactor and permeate samples with AKPC. For the other peroxidases, this conversion decrease occurred in the reactor only, as a result of the enzyme retention on the membrane, and was rather insignificant in the case of SBP. Supplementary addition of enzyme in the feed stream allowed maintaining high conversions in the case of HRP. Consequently, SBP and HRP were selected as the most appropriate peroxidases. Using them, it was observed that conversion values increased when higher substrate concentrations were used and that the influence of the molar ratio $H_2O_2$:chlorophenol and the spatial time was negligible. In all cases, higher 4-chlorophenol conversions were attained with SBP, reaching almost 100% in the permeate. SBP was chosen to test the activity of the enzyme retained on the membrane surface, proving that the peroxidase retains its activity and reaches some kind of equilibrium between reactor and membrane module, allowing the continuous 4-chlorophenol removal for longer times.

*Keywords:* 4-chlorophenol; Wastewater treatment; Ultrafiltration membrane reactor; Soybean peroxidase; Horseradish peroxidase; Artichoke peroxidase

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