Comparison of different wastewater treatments for colour removal of reactive dye baths

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**ABSTRACT**

The generation of high-coloured wastewater is one of the main environmental problems of the textile industry. Reactive dyes are widely used in the dyeing of cellulosic fibres. However, they have low exhaustion degree (70–90%). The degradation of residual dyes by aerobic biological treatment is very poor, being necessary the application of specific treatments. In this work, three different methods for the removal of reactive dyes were compared: electrochemical treatment, coagulation with \textit{Moringa oleifera} waste and enzymatic treatment with laccase. Two azo bifunctional dyes with different reactive groups were selected: C.I. Reactive Black 5 (vinyl sulphone) and C.I. Reactive Red 231 (chlorotriazine). The influence of pH (5 and 9) and dye hydrolysis on the decolourisation yield was studied. The electrochemical treatment was the most efficient, with 95–100% colour removal yield. The coagulation with \textit{M. oleifera} waste also achieved high colour removal efficiency (91–94%). Both methods showed an independent behaviour with respect to pH or dye hydrolysis. The enzymatic treatment should be performed at pH 5. This method was suitable to remove the chlorotriazine dye (92–93% efficiency), whereas the vinyl sulphone one showed a marked dependence on dye hydrolysis: moderately efficient for the hydrolysed dye and highly efficient without hydrolysis. The activity of laccase was not modified by the usual salinity of the reactive dyeing effluent (20 g/L NaCl). Nevertheless, the effluent salinity enhanced the electrochemical and \textit{M. oleifera} treatment yield.

**Keywords:** Colour removal; Reactive dyes; Electrochemical treatment; \textit{Moringa oleifera}; Natural coagulant; Enzymatic treatment; Laccase

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