

Decolourization of textile dyes by fenton-like reaction with iron impregnated biochar catalyst from bamboo (*Bambusa vulgaris*)

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Treatment of textile wastewater containing reactive dyes is highly important as dyes and their breakdown products are toxic. Fenton oxidation is widely used to decolorize textile wastewater. Formation of Iron containing sludge and the requirement of an excessive amount of Fe(II) salt are the disadvantages of homogeneous Fenton process. Therefore alternative treatment method is required. In this study, catalytic activity of iron impregnated bamboo biochar as a heterogeneous catalyst for removing reactive Black 5 dye was investigated. Iron impregnated biochar catalyst was successfully prepared and characterized by X-Ray Diffraction (XRD), FT-IR and SEM imaging. SEM images showed comparatively low porosity after the Fe impregnated. The FT-IR spectrum of activated biochar clearly showed a characteristic broad peak at 1010 cm^{-1} which was assigned to PO_4^{3-} stretching. An iron loading of 0.85 wt% on activated bio-char was achieved in the catalytic preparation. Decolourization studies were performed with bamboo biochar, activated bamboo biochar, iron impregnated bamboo biochar and the results were compared. Optimum Fenton reaction conditions for the decolourization of 100 mL of 100 ppm RB5 solution was determined as 0.5 g of the catalyst with an initial pH of 3.0, $[\text{H}_2\text{O}_2]$ of 6.42 mM at 30 °C. Under these conditions, 90.8% colour reduction and 55.2% COD reduction was achieved within 60 min reaction time. Re-usage studies showed the applicability of the catalyst over 5 cycles with more than 80% colour reduction. Results of the current study indicate the suitability of bamboo biochar catalytic system as a heterogeneous catalyst for decolourization of RB5 in textile wastewater.

Keywords: Fenton reaction, Heterogeneous catalyst, Iron impregnated bamboo biochar and RB5

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