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## Utilization of tannery solid waste as an alternative biosorbent for acid dyes in wastewater treatment

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### Abstract

In this work the cattle hair waste (CHW), a solid waste that is generated in the tannery, was tested as an alternative new biosorbent of acid dyes, in order to add value to this waste that was discarded and suggesting a life cycle extension for this material from leather processing. Commercially activated carbon (CAC) was used to compare the sorption capacity of CHW. The sorption experiments were performed in laboratory scale with aqueous dye solutions of Acid Blue 161 (AB-161) and Acid Black 210 (AB-210) and were carried out under varying operational parameters including initial pH, adsorbent dosage, contact time, dye concentration and temperature. For the adsorption of the AB-161 and AB-210 dyes, the best kinetic model was described by general order kinetic. Liu isotherm model was well fitted with tested temperatures for AB-161 and AB-210 using CHW adsorbent. The maximum amounts of AB-161 dye adsorbed with CHW adsorbent were 104.78 (323 K) and 26.29 mg g<sup>-1</sup> (303 K) for AB-210. From the thermodynamic parameters for the adsorption of AB-161 and AB-210 with CHW and CAC indicated a not spontaneous endothermic process, with a physical reaction that dyes are arranged in orderly manner in the solid phase, resulting in a reduction in the disturbance of system.

**Keywords:** biosorption; tannery solid waste; cattle hair waste; leather dye; wastewater treatment.

### Introduction

Leather industry generates high quantities of wastewater containing dyes and those effluents are difficult to treat by the traditionally physico-chemical and biological processes. Due to high quantities of wastewater and solid wastes generated in the production processes of leather industry there is major environmental concern for proper disposal of this waste and the appropriate treatment of these effluents. Among the several phases of the tanning process the generated effluent has high loads of nitrogen, BOD, COD, sulphide and chromium is due to the need for multistage extraction and chemical treatments of the raw hide (cleaning of the hide in beamhouse operations and chemical/collagen substrate reaction in tanning and post-tanning steps), performed in a batch aqueous system [1].

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