

Biosorption of Cr(VI) by an *E. coli* Biofilm Supported on GAC

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The increasing concern with environmental pollution significantly motivates the investigation and development of safe remediation technologies. The retention of contaminants by a biofilm supported on granular activated carbon is one of the promising technologies.

This study aims the investigation and development of an innovative process for the removal of chromium (VI) from wastewater. The effect of the initial concentration of metal was tested, the polysaccharide and polymeric net of the *E.Coli* biofilm were quantified and the application of this system to a real effluent was made. The industrial effluent was provided by tannery factories.

The support used for the biofilm formation was granular activated carbon (GAC) from MERCK with an average particle size of 2.5 mm, characterised by N₂ adsorption (77K) with an ASAP Micromeritics 2001 which indicated a Langmuir area of 1270 m²g⁻¹ and an average pore diameter of 2 nm. The use of activated carbon as a support is justified by the fact that this material is a versatile adsorbent due to its high surface area, porous structure, high adsorption capacity and surface chemical nature. The role of the biofilm was evaluated considering that microorganisms are quite adequate for heavy metals biosorption due to their ability to sorb metal ions, suitability for natural environments and low cost.

Minicolumns (internal diameter = 2 cm, ht = 30 cm) were used for open systems studies, partially filled with GAC (15 g). The metal solutions were passed in upflow through the column with a flow rate of 5 ml/min (residence time of 19 min). Samples (5 ml) were taken, centrifuged and analyzed for metals using atomic absorption spectrophotometry, AAS.

The results showed uptake values of 0.19 mg/g_{biosorbent}, 3.60 mg/g_{biosorbent} and 4.61 mg/g_{biosorbent}, respectively for the initial concentration of 10, 50 and 100 mg/l. The quantification of polysaccharides and polymeric net revealed a value of 4.77 mg/g_{biosorbent} for the polysaccharides and 142 mg/g_{biosorbent}, for the polymeric net. The polysaccharide and polymeric net give important information about the capacity of biofilm formation by the microorganism. The studies made with the industrial effluent showed values of Cr uptake of 0.093 mg/g_{biosorbent}, for an initial concentration of 4.2 mg/l. The value obtained for the removal percentage with the most diluted solution used (10 mg/l) was of 18% (after 10 hours of experiment) and the value of removal percentage obtained with the industrial effluent was of 9%, for the same period of time. This can be explained by the fact that other compounds present in the industrial effluent than Cr (VI) can compete for the same active sites.

KEY words: activated carbon, biofilm, biosorption, chromium (VI), *E. coli*

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