Poster

BIOELECTROCHEMICAL REMOVAL OF INDIGO DYE IN WASTEWATER

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Keywords: Textile wastewater; Bioelectrochemical treatment; Puple Phototrophic Bacteria (PPB); Indigo dye.

ABSTRACT

Motivation: Textile sector is one of the main industrial consumers of water and, consequently, is generating a significant amount of wastewater loaded with metals, salts, acids, nitrate and organic pollutants such as dyes. Such dyes are carcinogenic and exhibit toxicity for plants and microorganism after disccharge [1]. Indeed, indigo dye is broadly commercialised as blue dye in the denim industry. It has a very strong blue colour and its complex structure make it difficult to degrade.

Microbial electrochemical technologies (MET) are a promising option for the treatment of different organic pollutants present in wastewater. These technologies exploit the ability of some microorganisms (electroactive bacteria) to exchange electrons with electroconductive material in order to stimulate the oxidative metabolism [2]. Among the electroactive bacteria reported so far , Purple Phototrophic Bacteria (PPB) are one of the most versatile and diverse group of microorganisms that are capable of tdegrading complex structures as well [3].

In this work we propose a electrobioremediation strategy based on activating PPB by means of electrodes to degrade indigo dye present in textile wastewater. Besides, the influence of the electrode in the microbial population will also be studied to evaluate the polarization effect in the wastewater treatment.

Methods: We used a PPB culture enriched from brewery wastewater. To simulate real wastewater conditions we made a synthetic textile wastewater with indigo as the sole carbon source. The PPB were grown heterotrophically at 30ºC and illuminated with infrared light. Firstly, we study the response of PPBs to indigo dye in two different reactors with 0.1 g/L and 0.5 g/L of dye. Secondly, we compared the impact of i) open circuit polarization (ocp) and ii) polarization at +0.4V (vs. Ag/AgCl) using a electrochemical cell in media supplemented with 0.1 g/L of indigo. The working electrode was graphite, a platinized titanium was used as counter electrode and a Ag/AgCl as reference electrode. We carried a polarized negative control with the synthetic wastewater and 0,1 g/L of indigo without PPB.

We measured the optical density (A590) of the culture of PPB, variations in the colour of the indigo dye (A610) and the chemical oxygen demand (COD). The electrochemical analyses consisted in chronoamperometries and cyclic voltammetries during the course of the assay.

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