A COMBINED REMEDIATION TECHNOLOGY FOR THE REDUCTION AND BIOLEACHING OF HEXAVALENT CHROMIUM FROM SOILS USING ACIDITHIOBACILLUS THIOOXIDANS

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Abstract. *Contamination of soils due to the release of effluents or deposition of wastes containing hexavalent chromium has been arising serious environmental problems. Therefore, the development of cost effectiveness but also ecological cleaning techniques is a matter of great concern among the scientific community. Bioremediation is attracting more and more attention due to its efficiency, low impact in the ecosystems and low cost. In particular, this study approaches a bioleaching technique using an Acidithiobacillus thiooxidans DSM504 pure culture to clean a soil contaminated with hexavalent chromium. Eight batch tests were performed in order to evaluate the effect of combined parameters: operational temperature (26ºC and Troom), hexavalent chromium concentration (50 mg kg^{-1} and 100 mg kg^{-1}) and pH of the contaminant solution (2 and pHfree). The bioleaching technique herein exposed presented removal values between 33.3% and 83.3%, undergoing higher deviations due to changes on the contamination pH. Generally, it was more efficient when applied to soils contaminated with acid solutions. The lowest and highest values were both observed for operational temperatures of 26ºC and hexavalent chromium concentrations of 50 mg kg^{-1}. Moreover, the highest value was observed for the soil contaminated with a hexavalent chromium solution of pH 2.*

Key-words: Chromium; Bioleaching; Acidithiobacillus thiooxidans.

Introduction

The release of hexavalent chromium, Cr(VI), into soils due to several anthropogenic activities, is more and more a matter of major concern, as this is a highly mobile, toxic and carcinogenic ion, also designated as a priority pollutant in various countries. Consequently, the development of cleaning technologies aiming its effects attenuation or its elimination has been a challenge for scientific researchers. Several physico-chemical techniques are already being used to decontaminate Cr(VI) polluted soils, but the "green" ones are an increasingly focus of attention, mostly because of their cost effectiveness. It is estimated that bioremediation using microorganisms can reduce total treatment costs in 28%, compared with conventional systems (Loukidou et al., 2004; Jeyasingh and Philip, 2005; Ore and Grennberg,

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