BIOSORPTION OF HEAVY METALS FROM AQUEOUS SOLUTIONS BY AN *E. COLI* BIOFILM SUPPORTED ON ZEOLITE NAY

Cristina Quintelas, Zélia Rocha, Bruna Silva, Bruna Fonseca, Hugo Figueiredo and TeresaTavares

The increasing concern with the environmental pollution motivates the development of new technologies for the treatment of heavy metals pollution. Several heavy metals can seriously damage the environment with hazardous effects on the human health. Aiming a solution for this problem, various efforts have been made towards research and implementation of an economic and easily adaptable process for any system for removal of heavy metals. The ability of a biofilm of *Escherichia coli* supported on zeolite NaY to biosorb Cr(VI), Cd(II), Fe(III) and Ni(II) was investigated in batch studies aiming the treatment of low metal concentration wastewater. The effect of heavy metal initial concentrations was analysed. Adsorption characteristics of a biosorbent can be depicted

from an adsorption isotherm. Langmuir, Sips and Toth models are commonly used for the description of adsorption data and were applied to the experimental results described herein. The presence of functional groups in the suspended biomass that may have a role in the biosorption process was confirmed by FTIR.

The results show that the biofilm of *E. coli* supported on NaY zeolite is able to remove Cr (VI), Cd (II), Ni (II) and Fe (III) from aqueous solutions. The isotherms were fitted and the best fit for chromium was obtained with the Toth model isotherm and for cadmium and nickel the best fit was the obtained with the Sips model. In terms of removal percentage, the results showed 100% of removal for iron for the whole range of concentrations tested. For nickel, the removal percentage remains approximately the same for all the initial concentrations tested (between 82.5% and 85.5%) and is higher than the obtained for cadmium and chromium. The analyses by FTIR showed that functional groups on the biomass such as hydroxyl, carboxyl and phosphate groups, would be the main binding sites for biosorption of the studied heavy metals by *E. coli*. Finally, the metal affinity to the biofilm was found to be in the order of Fe > Ni > Cd > Cr and the preference of a sorbent for a metal may be explained on the basis of the electronegativity of the metal ions and on the basis of the cation/anion oxidation state.