Maintenance of Heavy Metal Biosorption Systems

Teresa Tavares*, Jacinta Gonçalves and Cláudia Torres
Centro de Engenharia Biológica - IBQF, Universidade do Minho, P- 4700 Braga, Portugal
(ttavares@deb.uminho.pt)

***Keywords**: Biosorption, biofilm, chromium, heavy metals*

Among bioremediation techniques, biosorption seems to present good characteristics to be applied to the recovery of heavy metals in diluted wastewater. For those small and medium size industries, operating with tight budget, classical processes of heavy metal wastewater treatment may turn out to be too expensive to be implemented for solutions with less than 50 to 100 $mg.l^{-1}$. Biosorption, defined as the entrapment of ions by materials of natural origin, retains the metal or metals that may be recovered/recycled and, alternatively, implements the catalytic activity of the support, chosen to be granular activated carbon. This material is able to retain other pollutants, organic ones, which are sometimes present in wastewater in association with heavy metals. The product of this remediation action, which is granular activated carbon / biofilm / metal may, then, be used as catalyst for treatment of gaseous mixtures of noxious compounds.

This work focus special attention on the maintenance of the characteristics of that solid matrix through several cycles of biofilm formation over the activated carbon followed by metal biosorption with enhancement of structural properties which will allow future applications of the biosorbent.

The effect of conditions of biofilm formation, of pellet size, of pH solution, the effect of the presence of a second metal, as well as of the presence of organic compounds were analysed in terms of chromium biosorption. Metal fixation by heat treatment of the biosorbent was also considered in terms of reutilization of the solid in cycles of biofilm formation - metal biosorption. Finally, the effect of the metabolic activity of the biofilm on the metal retention was also considered.

Experiments were carried out with mini-columns partially filled with granular activated carbon over which a biofilm was formed. A metallic solution with pre-established characteristics was, then, passed through the column and retention was determined by quantification of the metal in solution by Atomic Absorption Spectroscopy.