Biosorption of Chromium

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For small scale industries as local electroplating units and tanneries, operating at relative tight budgets, instalation and maintenance of conventional pollution abatement technology may be very expensive. Besides, discharges of these units may be unacceptable at local and cumulative scale. Therefore, at the moment there is still a world-wide market for robust and low cost heavy metal removal systems.

A research effort is being made to develop and optimize biosorption systems for heavy metals by growing biofilms over granular activated carbon, GAC. Metals in waste streams too dilute to recover usefully, may be economically removed by enhancing activated carbon surfaces for futher applications. Polluting organic compounds may also be remediated usefully.

After a selection procedure, biosorption studies were carried out with *Arthrobacter viscosus* supported on GAC, in mini-columns with an expanded bed. Concentration values of Cr (VI), measured by Atomic Absorption Spectroscopy, were considered with a maximum of 100 mg/l and the achieved values of uptake were determined for the some volume of metallic solution passed through the columns.

The effect of the following parameters on the performance of the biosorption system, metabollically active, was considered: pH, presence of lactose, acetic acid and EDTA. Best performances were achieved at pH 2.6, with an uptake of 32 mg Cr/g_{GAC}, and the presence of other compounds does not affect the metal removal process.

Particular attention was payed to the effect of a competing metal, cadmium, on the biosorption of hexavalent chromium and, in fact, this was severely affected by the existance of the other metal in solution as the uptake was reduced to half of the original value, for identical initial metal concentration.

The survival of the biofilm demands subtoxic levels of metal concentration in the original solution and inactivated supported biomass was also considered as a biosorption matrix. Lower uptakes were reached, 20 mg Cr/g_{GAC}, although the system mantained a higher fixation capacity over more cycles of biofilm formation-biosorption-metal fixation by heat treatment. Again the presence of a competing biosorbate, Cd, reduces the uptake of Cr (VI).

Similar studies with Cr (III) indicated that this ion does not biosorb, probably as it precipitates at the original pH of the solution, rapidly covering the fixation sites of the biofilm.