

SELECTION OF A POTENTIAL BIOSORBENT FOR Ni(II)/Cr(VI) BINARY SYSTEM AND INVESTIGATION INTO THE COMPETITIVE ION EFFECT ON BIOSORPTION

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Water is a natural resource that is vital to all living organisms. With the rapid progression of various industries, water pollution has become a worldwide environmental problem. Untreated waste effluent containing various organic, inorganic, and metallic compounds are released to aquatic eco-systems by many industries. Among the pollutants from industrial wastewater, heavy metals occupy a significant place in aquatic pollution because of their toxicity and non-degradability by biological or chemical agents.

Biosorption is a promising and an effective process for the removal of heavy metals from aqueous solutions. This process is greatly affected by the other ions present in the aqueous solution / wastewater. The presence of a single metal ion in wastewater is rare. Wastewater contain multiple metal ions. These co-existing metal ions are more likely to cause interactions depending on the number of metal ions and the levels of initial concentrations of metal ions present in wastewater. In order to achieve a successful biosorption process, it is very important to select a potential biosorbent which can biosorb many metals simultaneously. Furthermore, it is important to know about the affinity of the selected biosorbent for metal ions present in the wastewater and to study the interaction between metal ions present in the wastewater

In this study, adsorption batch experiments were carried out to investigate a potential biosorbent for Ni(II)/Cr(VI) binary system using used tea leaves, peanut husks, rice hull, straw, saw dust, burnt coconut shell, *Cabomba caroliniana*, *Hydrilla verticillata*, *Ceratophyllum demersum*, *Salvinia molesta*, *Lemna minor* and seashells. *Lemna minor* did not show adsorption of either Ni(II) or Cr(VI). Peanut husk, rice hull and straw effectively biosorbed Ni(II) from the binary system. *Cabomba caroliniana* adsorbed only Cr(VI) from the binary system. Used tea leaves and sawdust adsorbed both Ni(II) and Cr(VI) simultaneously from the binary system.

The competitive ion effect on adsorption of both Ni(II) and Cr(VI) in the binary system was investigated by keeping the total metal ions concentration fixed to 10 mg/L using the biomass used tea leaves. The binding sites in the biomass of used tea leaves have a greater affinity for chromium (adsorption capacity, $q_e = 4.3$ mg/g) than nickel ($q_e = 1.6$ mg/g). The percentage adsorption of Cr(VI) by the biomass of used tea leaves was approximately 40% in the single system. The percentage adsorption of Cr(VI) was not affected by the increasing concentration of Ni(II) ions in the binary system. This shows that there is no interaction

between the metals studied. When Cr(VI) concentration was increased in the binary system, the percentage adsorption of Ni(II) was influenced by the presence of Cr(VI) ions.

Keywords: Biosorption, used tea leaves, binary system, competitive ion effect

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