

Adsorptive Removal of Zinc from Electroplating Effluent by Using Banana Peels as Bio-Sorbent

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Abstract - Effluent of electroplating industry is a major contributor for heavy metal pollution in surface water. Pollution due to electroplating industry leads to eutrophication of surface water and bioaccumulation of heavy metals in aquatic animals. Zinc is the main heavy metal found in electroplating effluent which can be removed by various methods. Adsorption is effective and efficient method for removal of heavy metals from effluent. Banana peel is abundantly found material which can be used as bio-sorbent. The present study aims to investigate efficiency of banana peel as an adsorbent for removal of zinc from effluent with the help of banana peels by batch study. This study focuses on optimization of contact time, pH and adsorbent dosage of banana peel for removal of heavy metal from effluent of electroplating industry.

Key Words: Adsorption, Zinc, Banana Peel, Electroplating industry.

1. INTRODUCTION

Removal of heavy metals from industrial waste water is important because they are not only contaminating water bodies but also toxic to human being and animals. Electroplating industrial waste water is one of the major contributors to heavy metal pollution in surface water. The traditional heavy metal treatment includes activated carbon adsorption, reverse osmosis, ion exchange, chemical precipitation and electro-dialysis. For the removal of heavy metals from industrial waste water streams the bi-sorption process is used with use of natural, alternative and cheaper adsorbents. The purpose of this study is to check feasibility of bio-sorbent for removal of zinc ion from electroplating industrial waste water.

Problem Statement:

At present scenario industries directly discharge their effluent into municipal waste water because there is lack of regulations regarding disposal of such effluent and also due to costlier treatment techniques available. Objective of the study is to suggest economical and environment friendly technique by use of banana peels which is easily available as bio-sorbent for removal of zinc from electroplating industrial effluent.

2. EXPERIMENTAL ANALYSIS

Preparation of Adsorbent from Banana Peel:

The banana peels used to prepare adsorbent in form of powder. This adsorbent used for removal of zinc from the electroplating effluent. These are collected from various fruit juice centers. Firstly Banana peels washed with distilled water 3-4 times to remove other soluble substances. Then banana peels dried in sun light for 5 days. Then this banana peels dried in an oven at 90°C for 10 hrs. Afterward's this product again dried in an oven at 100°C for 5 hrs. This banana peel product cooled at room temperature and grinded to powder.

Sampling:

The effluent samples were collected from the Electroplating industry, Super Auto Plating Pvt. Ltd, Bhosari Pune, Maharashtra, India.

Batch Adsorption:

All experiments are carried out at room temperature (25-30°C) in batch method. Batch method was selected because of its simplicity and reliability. The experiments were carried out by taking 100ml effluent sample in a flask and after pH adjustment a 1gm of dried adsorbent was added. The flask was agitated at near about 60 to 70 rpm for 60 minutes using a mechanical stirrer. After shaking, the suspension was allowed to settle. The residual biomass adsorbed with metal ion was filtered using whatman-1 filter paper. Metal ion estimation using Atomic adsorption spectrophotometer. The percent removal of metals from the solution was calculated by the following equation. Percent removal of metals from the solution was calculated by the following equation.

$$\% \text{removal} = \frac{(C_o - C_e)}{C_o} \times 100$$

Where,

C_o = is the metal ion concentration (mg/l)

C_e = is the final ion concentration (mg/l)

