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Synthetic Grey Water Treatment Through FeCl3-Activated Carbon Obtained from Cotton Stalks and River Sand

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Abstract

The research objective was to reclaim greywater through simple, easily available, and cost-effective methods. For this purpose, an activated charcoal was prepared from biomass (cotton stalk) through the pyrolysis process and sand collected from river Indus. Both materials were subjected to separate columns and applied as filters. Whereas, the efficiency of both materials as filter media was analyzed on the synthetic grey water (SGW). The formulation of synthetic greywater was a complicated process because the selection of ingredients and their amount should not exceed from the real grey water. So, for the presence of fecal contamination, a small amount (10 ml L^{-1}) of settled sewage was added to the distilled water, while to mimic the organic load, several chemical products of technical grade were also added. The physicochemical and microbiological characteristics of this SGW were tested before and after treatment. The results show that both mediums (AC and river sand) were very effective in the greywater treatment. The removal efficiency for BOD and COD was up to 91.2%, and 70% respectively. Similarly, the removal measure for turbidity was 91.3%. While the pH showed that the synthetic grey water was alkaline in nature with a value of 10 because the washing detergents used during the preparation of SGW, but after passing through both filter columns, pH was observed in between 7 and 8 units. Furthermore, the removal value examined after passing SGW from both columns for total coliforms was 46.87 CFU/100 ml from1500 CFU/100 ml.

Keywords: Synthetic Grey Water (SGW); Activated Carbon (AC); Cotton Stalk; Sand Filter.

1. Introduction

Dissolved pollutants (organic and inorganic) of water can be removed through an effective adsorption technique. Activated carbon (AC) is very familiar with all types of adsorbents due to high adsorption capacity. The adsorption frequency of activated charcoal relates to its great surface area, high pores distribution, and rapid grade of external reactivity [1]. Activated carbons are mostly extracted from raw carbon-rich resources in an oxygen-tight atmosphere through carbonization and followed by the activation process of the charcoaled material. The activation process can be carried out by means of chemical or physical activation [2]. Iron salts allow the preparation of activated carbons having a high specific surface area (965 m^2 g^{-1}) and very small pores by activation at temperatures far below those used for activators generally described in the literature. Characterization studies have shown that the components present in the iron-impregnated material are completely pyrolyzed at a temperature of 280 °C [3]. Agro-industry produce millions of tons of lignocellulosic waste every year all over the world, additionally, usage of such wastes for activated carbon production will also help in reducing solid waste disposal issue [4]. Subsequently, an extensive range of agro wastes has been explored in Pakistan to produce activated carbon [5]. The cotton stalk is the fourth largest crop of Pakistan and

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