ABILITY OF DIFFERENT OXIDATION STATES OF IRON-COATED BAMBOO CHARCOAL FOR THE ADSORPTION OF HEAVY METALS IN WASTEWATER

AYU NAZIRAH BINTI AMAN

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ABSTRACT

ABILITY OF DIFFERENT OXIDATION STATES OF IRON-COATED BAMBOO CHARCOAL FOR THE ADSORPTION OF HEAVY METALS IN WASTEWATER

Environmentalists have been quite concerned about wastewater treatment. The majority of these pollutants in wastewater are hazardous and carcinogenic substances. Therefore, before municipal and industrial effluents are released into the environment, the level of heavy metals must be reduced. Adsorption is the process used to remove heavy metals from wastewater. The substance may be employed as an adsorbent to remove copper pollutants from water. Copper was removed from aqueous solutions using activated carbon synthesized from bamboo waste and treated with iron (BC-Fe). By impregnating it simultaneously in Fe and HNO3 solutions, followed by microwave heating, bamboo charcoal (BC) was transformed into iron-impregnated bamboo charcoal (Fe-BC). Fourier transform infrared (FT-IR), SEM and UV-Vis were used to characterize the composites created with Fe molar concentrations of 1.0 and mol/L. UV-Vis spectroscopy assessed the copper adsorption processes of BC, BC-Fe(ii), and BC-Fe(iii). BC-Fe(iii) demonstrated a good capacity for copper adsorption. Solution pH highly influenced copper adsorption, reaching maximum levels at pH 5.0. For BC-Fe, the maximum amount of Cu could be absorbed by 1.968 mg/g (iii). These findings significantly impact the development of efficient and affordable adsorbents for copper removal from wastewater.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Water contaminated by human activity and runoff from the rain is called wastewater. Sewage is another name for it. It is often divided into three categories based on how it is produced: storm sewage, industrial sewage, and home sewage. Residential, commercial, and restaurant water use produces domestic wastewater. Industrial wastewater is produced by the discharges of the chemical and manufacturing sectors. Surface runoff water becomes contaminated by trash, grit, nutrients, and different compounds that rainwater picks up in urban and agricultural regions (Nathanson, J. A. & Ambulkar, A., 2022).

Most lakes and streams worldwide are extensively contaminated with various chemicals, including metals, metalloids, and organic and inorganic materials (Karaouzas et al., 2021, as cited in Bhadoria et al., 2022). Industrial wastewater is primarily a source of heavy metals like zinc (Zn), cadmium (Cd), lead (Pb), copper (Cu), nickel (Ni), mercury (Hg), and chromium (Cr). Among the many different metal contaminants in wastewater, heavy metal poses substantial risks to the environment and human health. For both people and the environment, heavy metals significantly threaten health. These primarily consist of abdominal pain,