

Libya
Ministry of Education
Al-Asmarya Islamic University
Faculty of Engineering



**REMOVAL OF COPPER (II) IONS FROM
AQUEOUS SOLUTION BY USING PINE
ACTIVATED CARBON**

**A graduation project is submitted to the Chemical Engineering
Department in partial fulfillment of the requirements for the degree of
Bachelor of Science in Chemical Engineering**

BY

MOHANNAD BASHER ABD ALNABI

SUPERVISOR

Mr. KHALID ALJFAIRY

Zliten, Libya

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ABSTRACT

The discharge of high amounts of heavy metals into water bodies leads to several environmental and health impacts. To help mitigate the negative impacts of heavy metals (such as copper ions) on the humans and animals health as well as the environment, a variety of remediation processes exists. Adsorption is essential process that can be applied in wastewater treatment. This work aims to investigate the removal of copper ions (II) from aqueous solutions using low-cost and eco-friendly material such as activated carbon (AC). Thermal activated carbon was prepared from Pine trees. The adsorption of Cu(II) ions from aqueous solutions onto Activated Carbon (AC) was investigated. The experiments were performed in a batch system at room temperature (20 ± 0.5 °C), and the copper ions analysis was done after equilibrium was attained. Different experimental parameters (initial Cu (II) concentration, agitation rate, pH, sorbent dosage and contact time) were varied in order to establish the optimum conditions for copper removal using AC with particle diameter ($0.375 > d > 0.5$) mm. About 1g of AC was found to be enough to remove 94.44% of 25 mg/l initial copper ion concentration from 100 ml metal solution. The optimum agitation rate and PH are 200 rpm and 5 respectively. The experimental results were fitted using the Langmuir and Freundlich isotherm models and the characteristic adsorption parameters were determined. Experimental data were also tested using two kinetic models: the pseudo-first-order model and the pseudo-second-order model. Based on these models, the kinetic parameters (rate constant and equilibrium adsorption capacity) for Cu (II) adsorption on AC were calculated.