



Functionalization of AC-Au Nanocomposites as Potential Nanomaterial for the Photocatalytic Activity of Methylene Blue



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Nowadays, dye contamination is a significant concern for textile industries due to the low biodegradability of dyed wastewater which is a hazardous to the environment. Methylene blue (MB) is a popular cationic toxic, carcinogenic, and mutagenic that should be removed from industrial wastewater. Photocatalysis has been extensively researched in order to reduce the damage caused by organic dye pollution. In this proposed work, activated carbon (AC) derived from corn husk were synthesized and impregnated with gold nanoparticles (AuNPs) to produce AC-Au nanocomposites for photodegradation of MB aqueous solution irradiated with UV light. There were studies conducted using AuNPs for the effective removal of MB via photocatalytic activity. However, AuNPs tend to aggregate resulting in the reduction of the surface area of the nanoparticles which lowers the removal efficiency of the organic dyes. Functionalizing AuNPs to AC might address this gap. Thus, this study provides an easy, low-cost, and environment-friendly synthesis of AC-Au nanocomposites as a potential nanomaterial for the photodegradation of methylene blue in industrial wastewater.

INTRODUCTION



ADVANTAGES

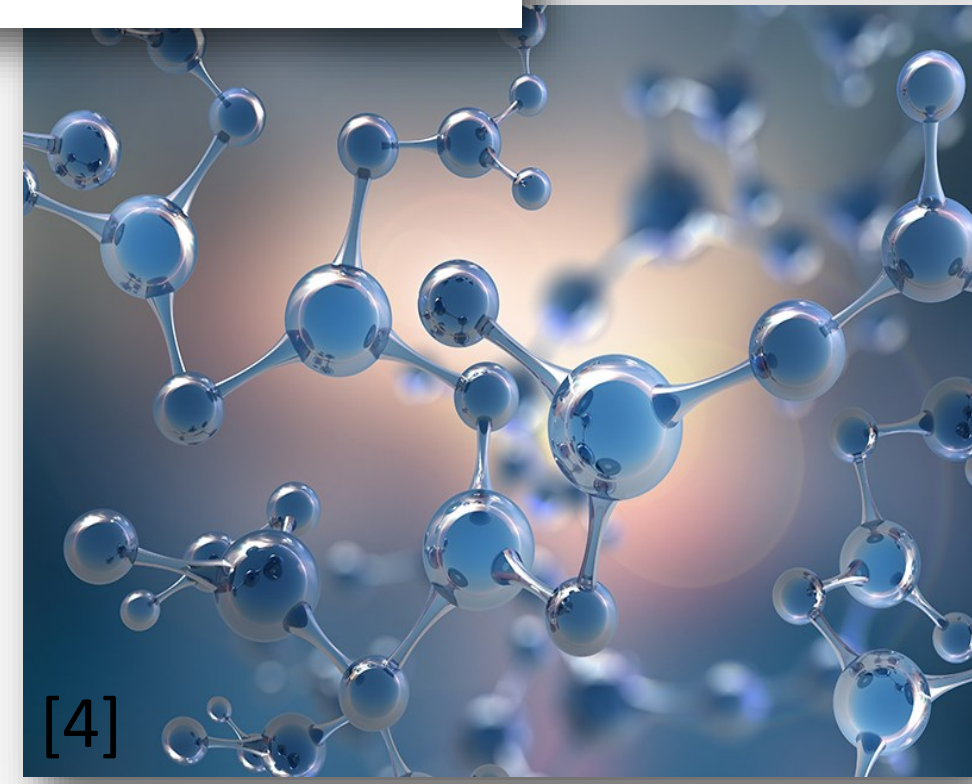
The textile industry is an immense global market that produced thousands of job and is continuously growing. [1]

DISADVANTAGES

Textile manufacturing uses a large amount of water particularly for wet processing of materials, and produces a significant volume of contaminated wastewater. [2]

Methylene Blue (MB) is an industrial dye which is toxic, carcinogenic, and non-biodegradable and can cause a severe threat to human health and environmental safety. [3]

Nanotechnology is mainly used in textile industry for dye capability enhancement, UV and anti static protection, wrinkle resistance and water repellence. [4]



METHODOLOGY



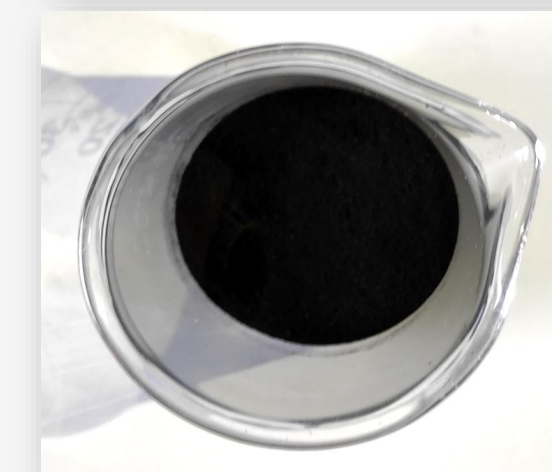
Collection of Materials
(Corn Husk)



Preparation of
Activated Carbon (AC)



Synthesis of Gold
Nanoparticles (AuNPs)



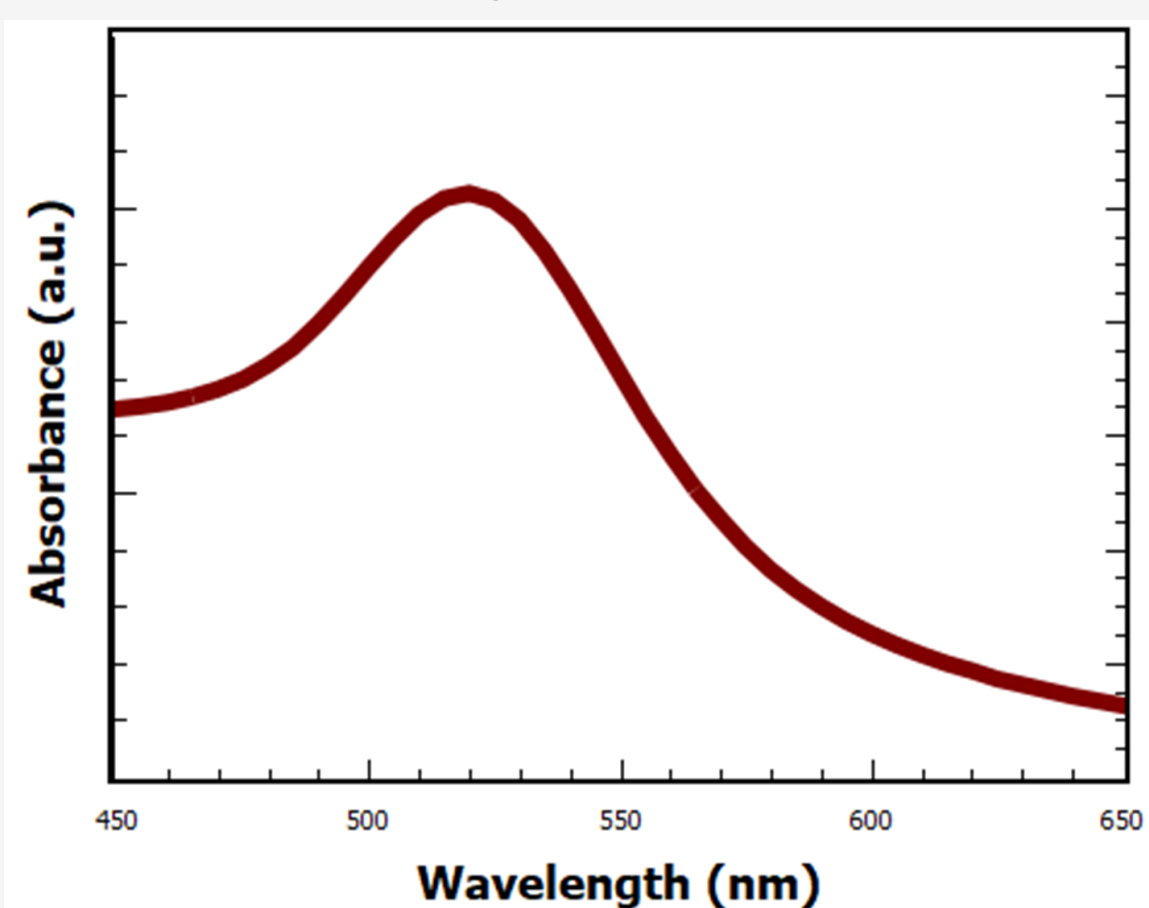
Impregnation of AuNPs to AC
(AC-Au Nanocomposite)



Photodegradation of MB
under UV Light Irradiation

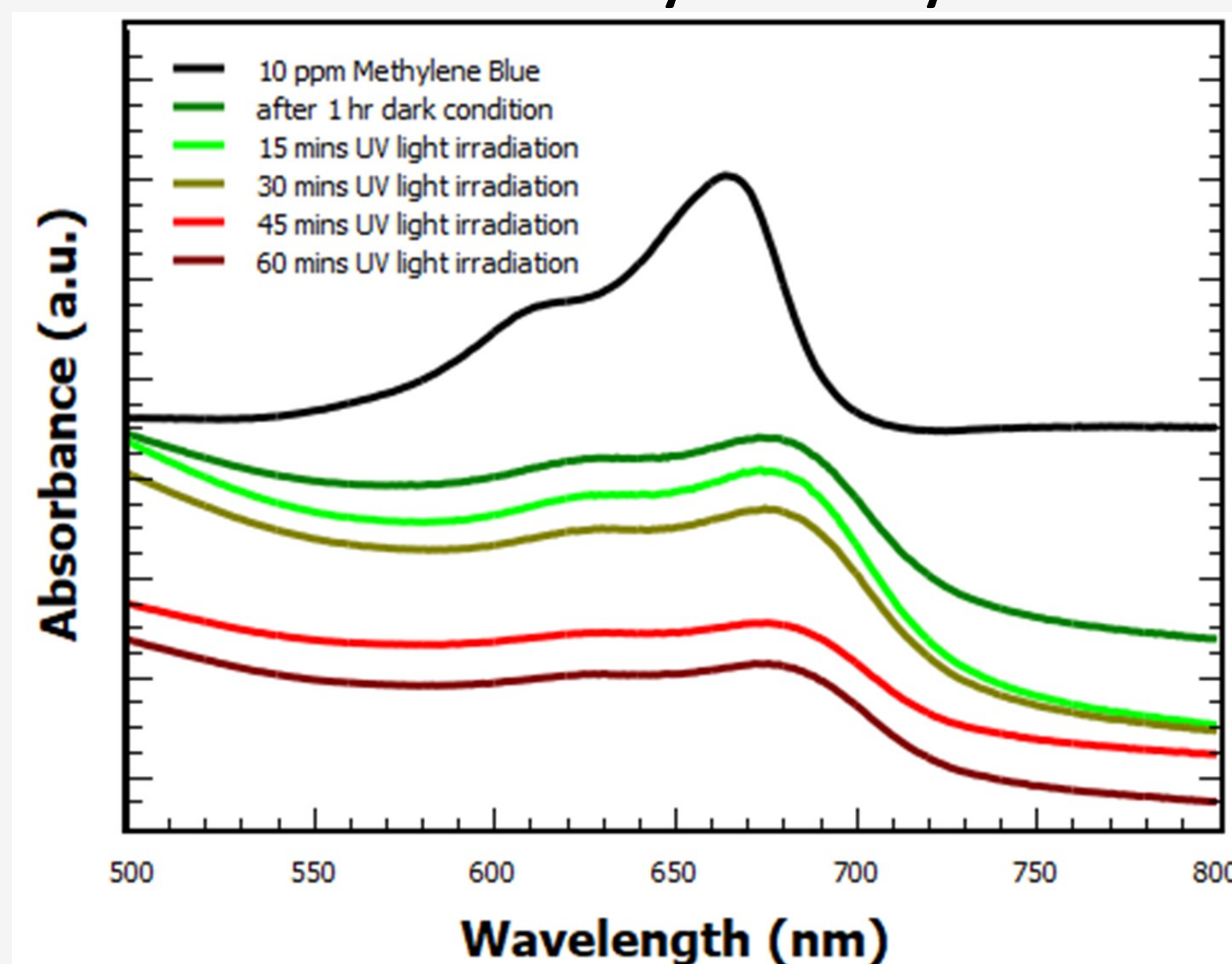
RESULTS AND DISCUSSION

UV-Vis spectrum (AuNPs)



The synthesized AuNPs have an absorbance peak of **525 nm**, which is an SPR peak indicator of gold nanoparticles.

Photocatalytic Activity



The results on photocatalytic activity indicated that the synthesized AC-Au nanocomposites exhibit a degradation efficiency of **81.25%** under UV light after 60 mins.

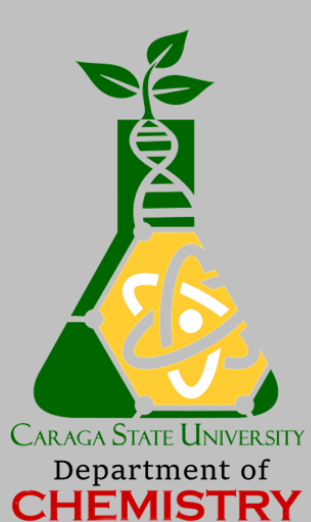
SUMMARY AND RECOMMENDATION

- ⇒ This study examined the preparation, synthesis, and removal of dyes through nanotechnology.
- ⇒ The AC-Au nanocomposite showed potential photocatalytic degradation activity for the removal of dyes in waste water.
- ⇒ The functionalization of the AC-Au nanocomposites in this study was successful since it showed promising result for dye removal of methylene blue.

Recommendation:

- The researchers recommend for further investigation utilizing other characterization equipment like SEM and FTIR.
- The utilization of other waste materials is also recommended.

ACKNOWLEDGMENT



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- [1] Madison, E., *Textile Industry Trends and Growth*, Study.com, 17, September 2022
- [2] Ali, Hasanbeigi et al, *A technical review of emerging technologies for energy and water efficiency and pollution reduction in the textile industry*, Journal of Cleaner Production, Vol. 95 (2015)
- [3] Khan, Idrees, *Review on Methylene Blue: Its Properties, Uses, Toxicity and Photodegradation*. Special Catalytic Issue Efficient Catalytic and Microbial Treatment of Water Pollutant, (2022)
- [4] Safder, Arslan. *Use of Nanotechnology in Textile Industry and its Future*. Nanografi Explains. (2022)