



# Preparation of Kenaf based nanobiocomposite as sustainable adsorbent for the removal of organic, inorganic and pathogenic contaminants

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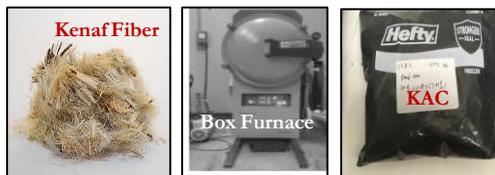
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## Abstract

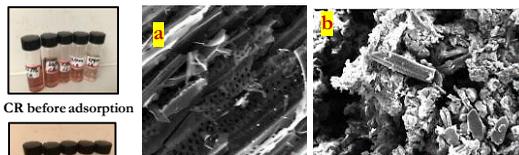
Adsorption is an effective method for the removal of pollutants from wastewater. Kenaf (*Hibiscus cannabinus*) promises eco-friendly, abundant, and diverse adsorbent<sup>(1)</sup>. In this research, kenaf based activated carbon (KAC) was first prepared by the self-activation process. KAC was used as a bio adsorbent for the removal of toxic Congo red (CR), an anionic dye, and hazardous divalent metal lead (Pb) from aqueous solution. Adsorption study of Pb and CR was carried out using atomic absorption spectroscopy (AAS) and UV Vis Spectroscopy. The effect of experimental conditions like pH and concentrations were investigated. Finally, KAC was impregnated with silver nanoparticles and the optical and chemical properties of nanobiocomposite was characterized extensively by UV Vis Spectroscopy and ESEM. The antibacterial efficacy of the nanobiocomposite was then explored for the inhibitions of *Escherichia coli*. Results demonstrated that nanobiocomposite is a low cost and sustainable choice for the remediation of Pb (II), CR, and can be utilized as an antimicrobial means to inhibit the growth of pathogenic bacteria.

## Objective

## Preparation and Characterization of KAC

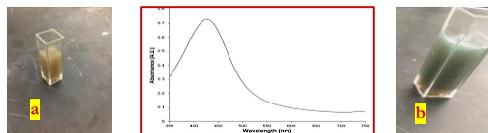


BET surface area KAC = 1,861.89 m<sup>2</sup>/g  
Pore diameter = 3.9012 nm  
Pore volume = 0.162177 cm<sup>3</sup>/g



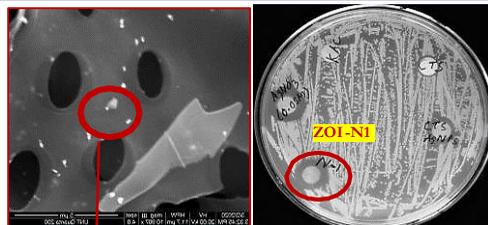
SEM images (a) KAC (b) Spent KAC after the adsorption of Pb(II) and CR dye

## Synthesis of Nanobiocomposite (N1)



Photoirradiation (a) 15 min (b) 35 min

## Bactericidal activity of N1 on *E. Coli*

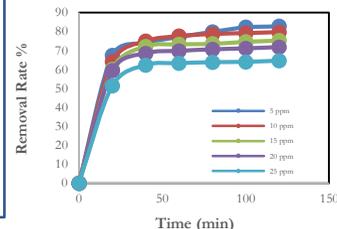


AgNps

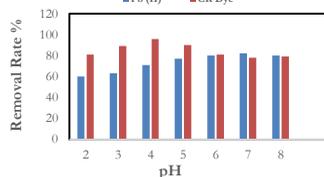
ZOI=Zone of Inhibition

## Adsorption study

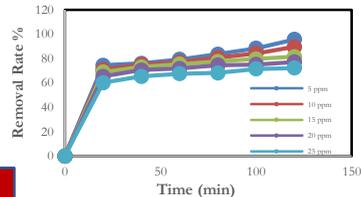
### Effect of concentration & contact time on Pb (II) removal



### Effect of pH on Pb(II) and CR removal



### Effect of concentration & contact time on CR dye removal



## Conclusion

- As the concentration of Pb (II) and CR dye was increased from 5 mg/L to 25 mg/L, the removal rate was reduced from 82.8% -64.8% for Pb (II) and 95.3% - 72.3% for CR.
- When pH was varied from 2 -8 there was a gradual rise in removal of Pb (II) from 60% to 82%. For CR dye the maximum removal was 95.6% at pH 4 and then it gradually decreased to 79% at pH 8.
- E. Coli* was highly inhibited with 7.18 mm inhibitory zone using 0.01 M AgNO<sub>3</sub>.

## Reference

(1)Sichipurov, Y. (2012). Biocomposites: Green sustainable materials for the near future. *Pure and Applied Chemistry*, 84(12), 2579-2607.

(2) Chuah, T. G., Jumariah, A., Azni, I., Katayon, S., & Choong, S. T. (2005). Rice husk as a potentially low-cost biosorbent for heavy metal and dye removal: an overview. *Desalination*, 175(3), 305-316.

## Acknowledgement

Dr. Omary, Dr. Calderon- UNT-CHEM Department  
Roxana Hughes, Microbiology lab UNT BIO Department

