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Characterization Studies On Adsorption Behaviour Of Basic Fuchsine And Cresol Red Dye From Biomass Waste

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Abstract: ***The paper presents results of potential feasibility of Albizzia Lebbeck Seed (ALS) for removal of Basic Fuchsin (BF) and Cresol red (CR) dye from aqueous solution was investigated. The plant was abundatly found in tropical area. Hence, the activated carbon prepared from the seed of ALS possessed well-developed porosities, which were verified by FTIR (Fourier Transform Infrared Spectroscopy), SEM (Scanning Electron Microscopy) and SEM-EDX .The present investigation confirmed that ALS can be successfully employed as a good adsorbent for the removal of dye from waste water.***

Keywords: FTIR, SEM, Basic fuchsine, Cresol red and ALS

I. INTRODUCTION

Synthetic dyes are effectively used in many spheres of our everyday life and their application are continuously growing in various industries like textile, leather, medicinal, cosmetics, food processing and paper making industries[1]. Today researches various techniques have been used removal of dyes in waste water one of the easiest method for adsorption. Various techniques have used removal of dyes in waste water but one of the easiest methods for adsorption. In this literature survey , it is revealed that a number of adsorbents have investigated for removing dyes including wood, rice hull[2]., leaves , lemon peel etc., In this present to remove dyes in wastewater using cheap and low-cost adsorbent ALS and Basic fuchsine and Cresol red dye as an adsorbate to removed unwanted impurities present in industrial wastewater and it can be proven by different characterization techniques like FTIR, SEM and SEM-EDX studies were carried out by ALS as an adsorbent for dye removal.

II. MATERIAL REQUIRED

- ✓ ALS (Albizzia Lebbeck Seed)
- ✓ Cresol red (CR) and Basic Fuchsine (BF)dyes
- ✓ Glass wares and chemicals required (NaOH, HCl)
- ✓ UV- Visible spectrophotometer (Shimaz), Centrifuge (Remi)
- ✓ P^H meter(Hanna –RI02895), orbital shaker (Scigencis biotech orbitech)
- ✓ FTIR (Bruker/OPUS-7.5.15) and SEM-EDX (TIQUIP)

III. METHODS OF PREPARATION

The ALS was used as an adsorbent were collected from Ennore. The unwanted impurities were removed by tap water. It was followed by washing with distilled water. The material was dried under sunlight and it was ground in mixer then transferred to beaker again dried in air oven at 50^0C for 1 days. ALS dried powder weighed accurately in beaker than soak with 1:1 H_2SO_4 poured in beaker soak for 2 days then

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washed with distilled water pH level attain neutral. Then transferred to beaker dried in muffle furnace at 450^0C for 3hours dried well we get coal (black powder powdered) obtained. It's called an activated carbon. Then used for further analysis. The CR and BF solution of dyes were purchased from Kevin laboratories. The solution of dyes were prepared by dissolving appropriate amount of dry powdered dye in diluted with distilled water with 100mg/L. The maximum absorbance wave length λ_{max} for CR and BF dyes were 570nm and 540nm respectively; it was measured using optima UV-visible spectrophotometer. The experimental solutions were obtained by dilution and were made to obtain the working solution at desired concentration.

IV. RESULTS AND DISCUSSION

A. FTIR – FOURIER TRANSFORM INFRARED SPECTROSCOPY

The FTIR spectrum of ALS biomass before and after adsorption of Cresol red dye and basic fuchsine dye were analyzed to determine the vibrational and rotational frequency change in their functional groups for ALS biomass after adsorption various peaks at 500-3500cm^{-1}

Fig.1 Shows ALS spectrum of before adsorption of raw activated carbon. It can identified by various functional groups present in FTIR spectroscopy there functional groups are Hydroxyl group (-OH) was found to be 3776.27cm^{-1}, phosphite ester group (-P-H_{str}) was found to be 2345.50cm^{-1}, Aromatic compounds (-C-O_{str}) was found to be 1585.58cm^{-1}, Alkane and Alkyl group(-C-H_{str}) was found to be 1381.80cm^{-1}, Aldehyde and Ketone group(-C-H_{def}) was found to be (1039.05cm^{-1} & 863.88cm^{-1}),Amines (R-NH_2)found to be 755.44cm^{-1} and Aryl halide (-Ar-X) found to be (667.85 & 580.44cm^{-1}).

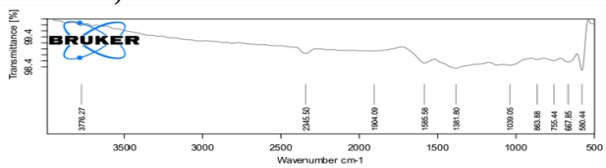


Figure 1: FTIR Spectrum of ALSAC (Before Adsorption)

Fig.2 Shows FTIR spectrum of after adsorption of chemically modified activated carbon (ALSAC BF) can be identified by different vibrational changes in spectrum of compounds presents to be Amino acids (-NH3$^+$) was found to be 2129.44cm^{-1}, Ammonium salts of Carboxylic acids (-C-O_{str}) was found to be 1549.77cm^{-1}, Aldehyde (-C-H_{def}) found to be 1023.60cm^{-1}.Aryl halide (-Ar-X) found to be (559.61cm^{-1}) respectively.

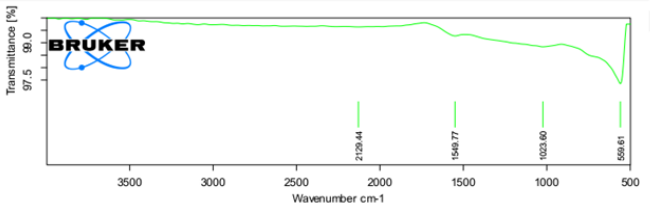


Figure 2: FTIR Spectrum of ALSAC BF (After Adsorption)

Fig.3 Shows ALSCR spectrum of after adsorption of chemically modified activated carbon (ALSAC CR) It can followed by various functional groups present in FTIR spectroscopy Hydroxyl group (-OH) was found to be (3902.82& 3590.92cm^{-1}), phosphite ester group (-P-H_{str}) was found to be 2353.95cm^{-1}, Amino sulfonic acids groups (-NH_3……SO^{3-}) was found to be 1589.50cm^{-1}, Nitro compounds (-NO_2) was found to be 660.68cm-1 and Aryl halide (-Ar-X) found to be 579.56cm^{-1} respectively. Finally above three figures indicates the groups for cresol red and basic fuchsine was binding to ALSAC.

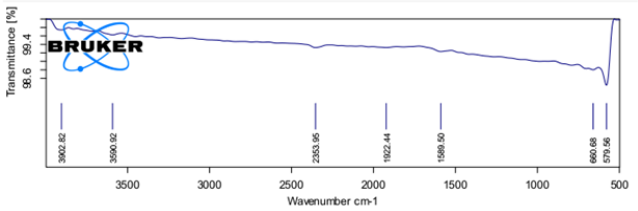
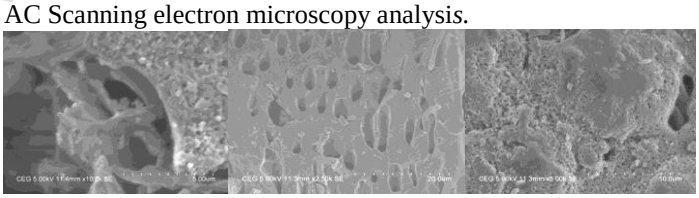


Figure 3: FTIR Spectrum of ALSAC CR (After Adsorption)

B. SEM - SCANNING ELECTRON MICROSCOPY

In SEM analysis, the production of magnified images is due to electrons instead of light waves which also provides SEM images with characteristic three dimensional appearance and useful for judging the surface structure of the sample.

The SEM diagrams of raw activated Cresol red and Basic fuchsine dye adsorbed activated ALS AC are shown in Fig.4 The bright spots, shows the presence of tiny holes on the ALS AC, after treatment with dye the bright spots become black shows the adsorption of the dyes on the surface of the ALS AC Scanning electron microscopy analysis.



a. ALS AC *b. ALS AC CR* *c. ALSAC BF*

Figure 4: SEM micro graph image for before and after adsorption of dye uptake

The SEM image of ALS AC before adsorption in Fig.5 shows the presence of significant number of pores providing a suitable position for dyes to be adsorbed. SEM images after Cresol red and basic fuchsine adsorption in Fig. 4 demonstrated that the pores and cavities of adsorbent were efficiently packed with dye. The dispersive EDX image Fig.5 further supports the occurrences of dye adsorption on the adsorbent surface of the dye compound appears along with the constituent peaks such as C, N, O, K, Mg, Ca, Fe, Ni, Zn and Cl after adsorption.

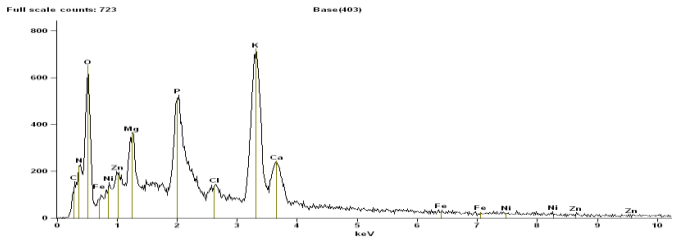


Figure 5: SEM-EDX image of ALS AC

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Element	Net Counts	Weight %	Atom %
C	739	4.43	6.89
N	2167	25.55	34.07
O	5708	34.90	40.74
Mg	2846	3.09	2.38
P	5339	6.17	3.72
Cl	1204	1.63	0.86
K	11363	18.42	8.80
Ca	2408	4.84	2.26
Fe	29	0.16	0.05
Fe	4	---	---
Ni	7	0.06	0.02
Ni	280	---	---
Zn	44	0.75	0.21
Zn	1029	---	---
Total		100.00	100.00

Table 1: Quantitative Results for: Base (403) ALS AC

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