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REMOVAL OF COD USING LOW COST ADSORBENT AND BIOSORBENT

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Abstract:
In this study, bark of *Casuarina equisettifolia* activated carbon and water hyacinth were used as a low cost adsorbent and biosorbent to investigate the removal of Chemical Oxygen Demand (COD) from aqueous solution. The experiments mainly focused on the effect of *Casuarina equisettifolia* activated carbon and water hyacinth dosage on removal efficiency of COD. The synthetic solution prepared with initial COD concentration of 600 ppm is subjected to batch study with 10 gm of low cost absorbent on biosorbent of a periodic time interval of 5 minutes for determination COD reduction. The maximum removal efficiency of COD was obtained at the constant time of 55 minutes and 75 minutes for bark of CE wood absorbent and water hyacinth for biosorbent respectively.

Key Words: COD, Water Hyacinth, Bark of *Casuarina Equisettifolia* & Cleaner Production

1. Introduction:

Water is one of the most depleting and demanding natural resources being used in large quantities for the daily demands and other various purposes. The waste water generated from various industries are discharged into water bodies without proper treatment. Dairy industry is considered to be largest source of food processing industries which causes severe environmental problems because of generation of strong wastewater characterized by high BOD and COD [1]. Apart from food processing industries, high COD is contained in the wastewater coming from textile, tannery, paper and pulp industries. Therefore COD is important parameter to be analyzed before being discharged into natural stream or on land. A number of technologies such as coagulation/flocculation process and oxidation process have been developed over the year to remove COD from the industrial wastewater [2]. These methods are expensive, time consuming, complicated and requires skilled persons. Adsorption is a promising technique in the removal of COD, the high cost of commercial activated carbon has diverted the researchers to search for an alternative low cost adsorbent. The application of bio sorption in environmental treatment has become a significant research area in the past 10 years [1]. The bio sorption provides a feasible technique for the removal of pollutants from wastewater. There is continuous search for low cost, high capacity biosorbent for removal of contaminants. Many agricultural products and by products of cellulose organic have been treated for heavy metal removal and color [3]. Low cost and non-conventional adsorbents like activated carbon, Lignite, Fly ash, Neem tree leaves, rice husk and water hyacinth are used as a adsorbents and biosorbents for removing COD of Industrial wastewater [3] [4] [5] [6]. The main objective of the present investigation is to reduce the COD level by using low cost adsorbent and biosorbent by batch process.

2. Materials and Methods:

Preparation of Synthetic Solution: The 50gms of Sodium Chloride of molecular weight 58.44 g/mol is dissolved in 10 liters of deionized water to prepare the synthetic solution. The prepared synthetic solution is used of removal of COD by low cost adsorbent and biosorbent.

Preparation of Bark of Casuarina Equisettifolia Wood Activated Carbon: The bark of *Casuarina equisettifolia* was taken from saw mill. The bark was shredded of sieved using 600 micron sieve. Initially the material is mixed with concentrated sulphuric acid and heated in muffle furnace by slowly rising the temperature upto 108^0 C for 8 hours. During this process the bark of *Casuarina equisettifolia* was converted into char. The char was subsequently washed with distilled water. The washed material is soaked in 1 % of Sodium Bicarbonate solution prepared using distilled water for 8 hours to drive of CO_2, CO and other acetic acid vapour. The material was washed with distilled water to make it free from burnt matter. Then the elemental carbon was dried in oven. Thus the obtained product is called as the sulphonate activated carbon.

Preparation of Biosorbent: The Biosorbent – Water hyacinth (Eichhornia Crassipes) was collected from Vallakulam, Coimbatore. Plant samples were washed and separated in leaves, petioles and roots. Then they were oven dried at 100^0 C for 3 days. The dried samples were pulverized using 300 micron sieve. Biosorbent, thus prepared from each part of the plant were then subjected to characterization and batch adsorption studies.

Batch Study: Batch adsorption studies were conducted using the low cost adsorbent and biosorbent prepared from bark of CE wood activated carbon and water hyacinth. 400 ml of sample was taken in a beaker and 10 gm of low cost absorbent and biosorbent was added and sample were agitated in a floculator subjected to fast mixing for first 5 minutes followed by 15 minutes of medium mixing and 10 minutes of slow mixing to reach equilibrium. The percentage of COD reduction is noted at a periodic interval of 5 minutes using COD analyzer. All the experiments were carried out at the ambient temperature.

3. Results and Discussion:

The synthetic solution prepared with initial COD concentration of 600 ppm is subjected to batch study with 10 gm of low cost absorbent on biosorbent of a periodic time interval of 5 minutes for determination COD reduction. The percentage removal of COD using bark of CE wood activated carbon and water hyacinth in shown in Fig. 1 and Fig. 2 respectively.

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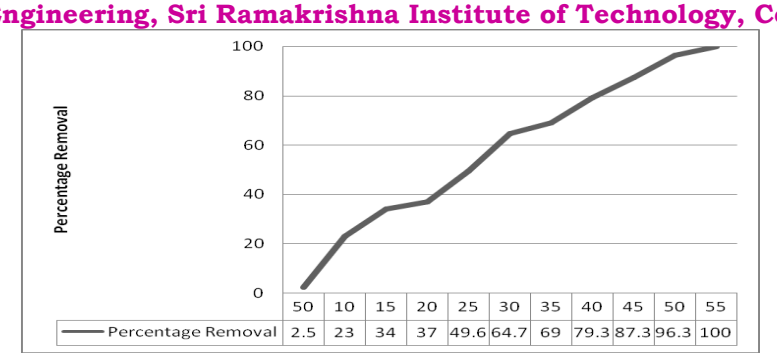

Figure 1: COD Removal Using CE Wood Activated Carbon

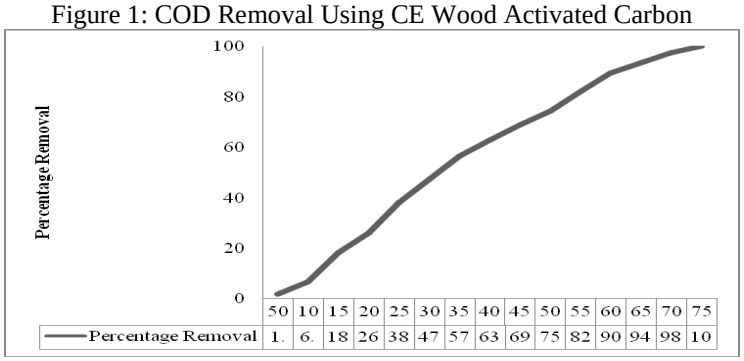

Figure 2: COD Removal Using Water Hyacinth

The maximum removal efficiency of COD was obtained at the constant time of 55 minutes and 75 minutes for bark of CE wood absorbent and water hyacinth for biosorbent respectively.

4. Conclusion:

The present study was aimed at evaluating the potential of Bark of CE wood activated carbon and water hyacinth for COD reduction in synthetic solution. From the present study it is clear that utilization of bark of CE wood activated carbon and water hyacinth have effectively removed the COD content and this is a better solution for achieving cleaner production technology.

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