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Removal of Heavy Metals from Waste Water using Low Cost Natural Adsorbents

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ABSTRACT

The main objective of the present work is the synthesis of adsorbent by using natural mustard and fenugreek seeds which is low cost adsorbent . the synthesis is carried out by chemical treatment followed by carbonization at 60°C . the synthesis adsorbent is studied for adsorption of Cr(VI) from industrial waste water for various concentration and doses. It is concluded that the adsorbent developed in the work fairly effective for removing Cr(VI) from industrial waste water.

Keywords : Adsorption, Heavy Metals, Adsorbent, Natural Seeds.

I. INTRODUCTION

Pollution is the one of the serious problem now days. Environmental problems are increasing day by day and are threatening the survival of mankind of earth. Discharge of industrial wastewater has increased, with rapid increase in population and growth of industrialization, quality of both surface and ground water is changing day by day. Waste water contains so many metal ions which are harmful for human being. The most common heavy metals are Cd,Cr,Cu,Hg etc. Chromium is one of the major metal ions hazardous for human; it causes skin ulcers, lung, nasal and sinus cancer. When Chromium is inhaled its compounds are respiratory track irritants and can cause sensitization. Several treatments are used for removing metals from waste water includes Reduction, precipitation, ion exchange, electrochemical reduction and reverse osmosis. These are very expensive, not to ecofriendly, high power requirement and incomplete metal removal.

Adsorption technique is successively alternative process that utilized for removing heavy metals from industrial waste water, which can be performed in batch mode or continuous process. Adsorption processes have offered flexibility in design and operation in design and operation and in many cases will produce high quality treated effluent. activated mustard, fenugreek seed and Kulta seed. This work is an overview of these low-cost alternative adsorbents (LCAs) comprising natural, industrial as well as synthetic materials wastes and their application for heavy metal removal. In view of its efficiency, simplicity, low cost, and reliability, this technique has very good potential for heavy metals removal from high-volume industrial wastewaters.

II. METHODS AND MATERIAL

Material for adsorbent : The conversion of seeds into adsorbent has been carried out using chemical treatment. The material used for the adsorbent

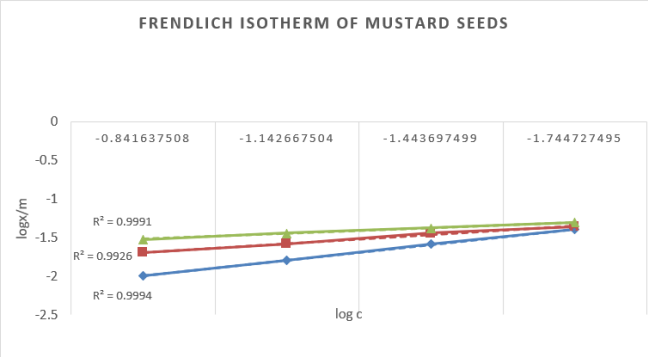
synthesis is mustard seeds/fenugreek seed/ kulta seeds,etc.

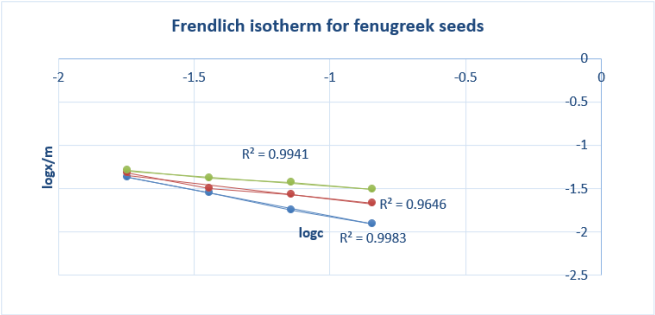
- Naturals seeds firstly washed and dried and crushed into fine size using grinder.
- The crushed material had given a chemical treatment by dilute acids like sulphuric acid, dilute nitric acid,dilute hydrochloric acid, etc. Then stirred for 6 hours on magnetic stirrer at room temperature.
- Filtered and several time washing with distilled water anf then carbonised in a oven at 250 °C for 2 hours.
- Adsorbents stored in air tight containers.The adsorbents obtained is used for the further analysis and experimentation.

Analysis methodology:

The concentration of chromium (VI) in indusrial wastewater is determined by colorimeter. The standradization of colorimeter is carried out by observing the colorimeter readings for various water solution containing different concentration .

Adsorption study:





ADSORPTION EXPERIMENT:

The adsorption capacities of Cr from industrial wastewater solution of the Activated carbon were investigated by a batch method. Activated carbon with was thoroughly mixed conical flask, and the suspensions was shaken by an automatic shaker in a water bath at room temperature (25 ± 2 °C). Adsorption experiments were conducted by varying the pH (1-6 or 1-8), contact time (12 min to 8 h or 12 h), sorbent dosage (0.1-1.3g). The pH of each solution was adjusted by using 0.1N NaOH and 0.1N HNO_3.

Adsorption isotherms of Cr(VI) onto Activated carbon were measured at varying initial Cr concentration.

Following each adsorption experiment, the suspension containing Activated carbon and the above standard solution was filtered through Whattman filter paper to remove Cr(III) or Cr(VI) that have been adsorbed into the Activated carbon. Then the concentration of this metal in the filtrate was determined using calorimeter.

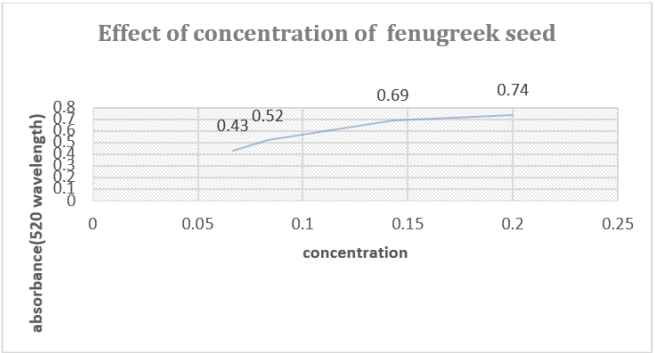


Fig 7: Effect of dosage of fenugreek seed at Chromium solution

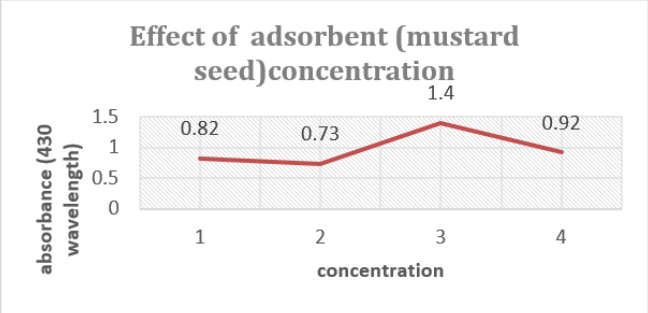


Fig 8: Effect of dosage of mustard seed at Chromium solution

III.CONCLUSION

The adsorption studies have indicated that 30% o Cr(VI) can be removed effectively . The yield of mustard/fenugreek/ kulta seed adsorbent in present work is 36% having surface area is satisfactory which is resembles with literature value for similar materials.Thus it can be concluded that the present work has demonstrated effectively that the snythesised adsorbent from seeds has potential as a low cost adsorbent and can be used effectively to adsorb heavy metal ion Cr(VI) from industrial wastewater.

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