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REMOVAL OF NI(II) FROM AQUEOUS SOLUTION USING *Tamarindus indica* FRUIT SHELL SUBSTRATE

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ABSTRACT

Tamarindus indica fruit shell substrate was found to have good sorption capacity for Ni(II). Studies indicated that the sorption of Ni(II) increases with the increase in pH and the contact time 90 minute was found to be optimun. The effect of concentration shows that, the sorption are decreases with increase in concentration of metal ion. The presence of Na^{+}, Ca^{+2} and Mg^{+2} interfered with the adsorption of Ni(II).

Key words: Nickel(II), *Tamarindus indica,* fruit shell and substrate.

INTRODUCTION

Modern civilization with its rapidly growing industrial units, increase in economic activities and population explosion has led to an accelerated pollution of the fresh water bodies. With exploding population and increasing industrialization and urbanisation water pollution by agricultural, Municipal and industrial sources has becomes a major concern for the welfare of mankind[2].

Owing to increasing industrialization on one hand and exploding population on the other, the demands of water supply have been increasing tremendously. Moreover, considerable part of this limited quantity of water is polluted by sewage, industrial wastes and wide array of synthetic chemicals. Thus, the quality as well as quantity of clean water supply is of vital significance for the welfare of mankind[1].

Moreover due to the discharge of toxic industrial waste, the problem of water pollution has already become a serious issue in some parts of our country. Unplanned urbanization combined with modern technology, pollution from these sources is also on the increase where as the water supply in rivers is not increasing to any significant extent[3].

The paper deals with the use of *Tamarindus indica* fruit shell substrate for the removal and recovery of Ni(II) from water.

Experimental method

All chemicals used were of analytical grade. All glass wares used were leached with 10% nitric acid washed with distilled water and dried in an oven. Stock solution of Ni(II) were prepared of dissolving requisite nickel sulphate. A standard solution of Ni(II) were prepared by taking different aliquot from stock solution with subsequent dilution with distilled water.

Dried fruit shell of the plant *Tamarindus indica* were procured and crushed to small size in an electric grinder. The powder was shifted and 2 gm of powder were added to a mixture of 20 ml of 0.2 N H_2SO_4 and 5 ml of 39 % HCHO. It was kept in a water bath at 50 ^{0}c for 6 h and occasionally stirred. The powder was washed with distilled water for several times to remove H_2SO_4.

Batch studies

Batch sorption studies were carried out at different temperature with a 100 ml of Ni(II) solution and 1 gm of sorbent. The equilibrating mixture were placed in stoppered glass bottles and agitated in

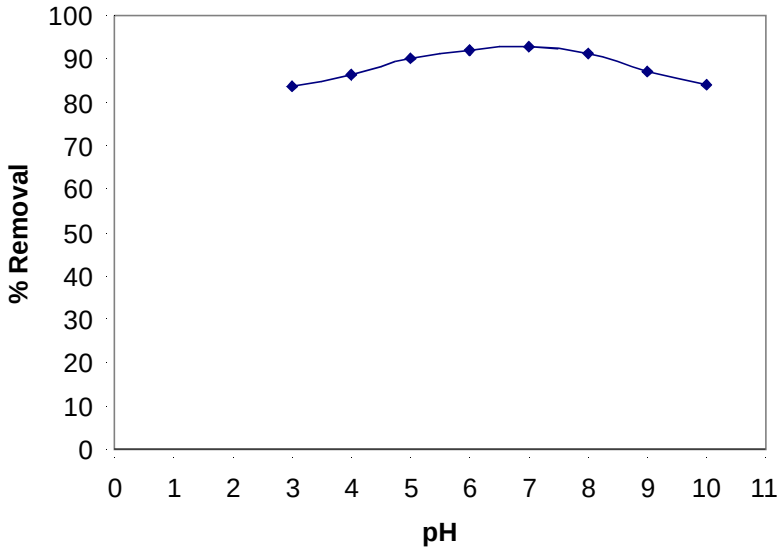

Fig. - 1: Effect of pH on the adsorption of Ni^{+2} using *T. indica* fruit sheel substrate

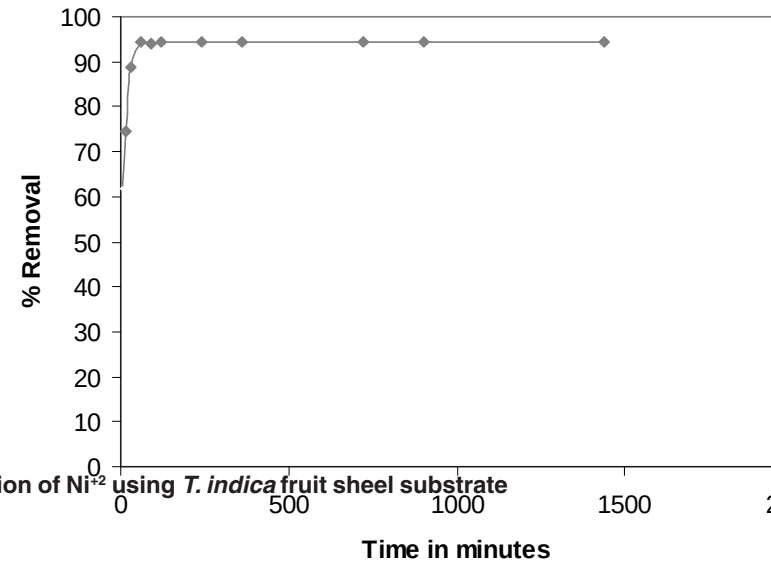

Fig. - 2: Effect of contact time on the adsorption of Ni^{+2} using *T. indica* fruit sheel substrate

temperature controlled shaker for about 60min at a particular temperature. The content were filtered through what man No. 42 filter paper and then analysed for the Ni(II) by spectrophotometry using dimethyl glyoxime solution in dilute ammonia with chloroform and 445 nm was used. The pH of values of the sample solutions were recorded initially and at the end of the experiment using pH meter.

RESULTS AND DISCUSSION

1. pH effect: The metal ion sorption increased with increase in pH of the solution from 3 to 7 and further decreases with increase in pH of the solution represented in Fig. - 1. The pH of the aqueous solution is an important controlling parameter in the adsorption

Concentration, ppm

Fig. - 3: Effect of initial metal ion concentration on the adsorption of Ni^{+2} using *T. indica* fruit sheel substrate

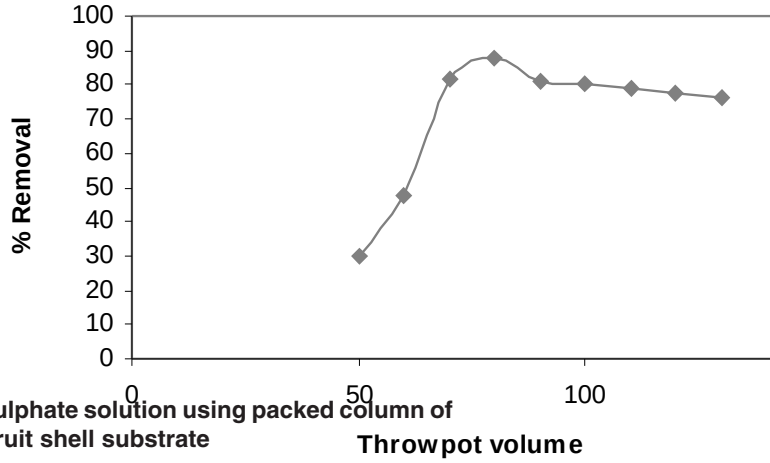

Fig. - 4: Adsorption of Ni^{+2} from Nickel sulphate solution using packed column of *Aegle marmelos* fruit shell substrate

process.

2. Contact time of effect: Tt was observed that Ni (II) ion were removal from solution within 5 min was 61.97 showing that the metal ion sorption on substrate is relatively fast. At about an hour the removal of Ni(II) ion from the solution recorded 94.27 % and the adsorption remains constant even after a contact time for 24 h. shown in Fig. - 2.
3. Effect of initial metal ion concentration: It was observed that the Ni(II) metal ion removal from the solution. The initial metal ion concentration increases, although the sorption of metal ion naturally decreases shown in Fig. - 3.
4. Effect of Temperature: It was found that the removal of metal ion from solution on the substrate decreases with increase in

temperature.

5. Effect of dosages – It was observed that as the dosages of the substrate are increases the sorption of metal ion are also increases.
6. Effect of light metal ions – Light metal ions such as Na^{+}, Ca^{+2} and mg^{+2} have considerable effect on the sorption of Ni(II) of the substrate and it was found that the sorption of metal ions by the substrate gradually decreases in the presence of these light metal ions.
7. Column experiment – A continuous process employing a packed column of *Tamarindus india* fruit shell substrate is expected to be more efficient and economical to operate than the batch process result are shown in Fig. - 4.

Conclusion

It can be seen from the results that the *Tamarindus indica* fruit shell substrate to be very efficient and economical for removing toxic heavy metal ion such as Ni(II) from industrial waste water. The overall performance of the modified fruit shell substrate is an adsorbent for the removal of heavy metal and organics has been found to be satisfactory further. The use of the *Tamarindus indica* fruit shell substrate now prepared offers the advantages of cheapness, easy availability, simple processing and effective removal of toxic heavy metal ion without use of any sophisticated equipment and expert attention.

Finally, it is concluded that, the adsorbent prepared from fruit shell substrate material seems to offer inexpensive but effective alternatives to the expensive commercial ion exchange resin. This adsorbent will certainly go a long way in the tertiary treatment of potable water as well as industrial effluent.

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