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Adsorption of lead from Industrial Waste Water by *acidified neem saw dust*

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ABSTRACT

The major changeling problem in recent times is dealing with environmental pollution. The water pollution caused due to high percentage of toxic heavy metals like lead, chromium, nickel etc. Due to which removal of lead is an important criteria to maintain healthy environment. Lead removal is more efficient using adsorption method with acidified saw dust. The removed lead is evaluated using various parameters like pH, contact time, temperature. The highest removal percentage of lead i.e 94.02% can be identified at optimum agitation time of 90 mis, optimum adsorption dosage of 1gm/ml, optimum initial concentration of 40 ppm, optimum pH of 3, optimum temperature of 303K. Finally, The results of the work concludes that high efficiency of removal is observed in adsorption process by acidified neem saw dust.

Keywords: Lead, Adsorption, Neem saw dust, Optimization process , Atomic Absorption Spectrophotometer.

INTRODUCTION:

Water pollution is considered to be a major criteria for various health problem[1]. Mostly non-carcinogenic toxic effects of several metals include arsenic, cadmium, chromium, nickel, zinc, lead[2], mercury and barium. Lead accumulated in the environment, produces both high acute and chronic effects on biological system (i.e. plants, animal and microorganism). Lead is a problematic metal which is available highly abundant in e-waste. Because of the lead chronic effects, the removal of lead is important for the sack of environmental protection[3]. Chronic toxicity of lead occurs at blood Lead levels of about 40–60 µg / dL. Lead interferes with a variety of body processes and is toxic to many organs and tissues including the cardio, reproductive, urinary, nervous systems. . The source of the contamination was attributed to "a combination of dilapidated drinking water infrastructure, including lead jointed pipelines, end-of-life polyvinyl chloride pipes and household plumbing"[4]. The conventional treatment methods like adsorption, biosorption, filtration, electrodialysis[5] etc. The main reason for selection of adsorption [6] technique is because it is a potential alternative treatment method and an economically viable method, especially when lead is present in minor quantities[7]. The aim of this research work is to remove the lead content above toxic level using adsorption with acidified saw dust[8]

.MATERIALS AND METHOD:

COLLECTION OF ADSORBENT:

Saw dust (Fig.1) was collected from the local saw mill of large quantity

Fig.1 Crude neem saw dust

ACIDIFICATION OF ADSORBENT

Crude neem saw dust of 175gm is gathered from the saw mill and it is dried and the clean saw dust is kept in a plate and add 1N H_2SO_4 of 500ml to it and took into consideration 24hr for acidification process and it is dried in a hot air stove at 100℃ temperature for 2hr, and the dried powder is sieved utilizing 150 mesh size for consistency of the adsorbent[10,11].

COLLECTION OF WATER SAMPLE:

Industrial wastewater(Fig.2) was collected from beach area of Visakhapatnam, Andhra Pradesh.

Fig.2: Waste water containing Lead

Fig.3: Atomic Absorption Spectrophotometer

EXPERIMENTAL PROCEDURE:

Lead containing waste water of 1000 ppm is collected from local area, From this stock solution 30 ppm of initial lead concentration is prepared. Then, Adsorption of lead is carried out by varying different parameters. After adsorption, the samples are analyzed by Atomic Absorption Spectrophotometer[12].

RESULTS AND DISSCUSION:

Optimization of parameters like pH, Contact time, Initial concentration, Dosage, Temperature plays a key role after the removal of lead to determine the level of rate efficiency removed from industrial wastewater by acidified neem saw dust[13,14].

EFFECT OF AGITATION TIME:

50 mL of Lead sample solution having 30 ppm concentration was taken in 13numbers of 250 mL capacity Erlenmeyer flask. At pH 5,mesh size 200 μm ,temperature 30℃ and 0.5g of acidified neem saw dust was added to Erlenmeyer flask and it was kept in an orbital shaker and agitated at 100 rpm. For different agitation time like 1, 3, 5, 10, 15, 20, 25, 30, 40, 50, 60, 90, 120, 150 and 180 min. Fig.4 shows the effect of agitation time on adsorption of lead. The highest removal percentage of lead 87.39% is observed at optimum time 90 min.

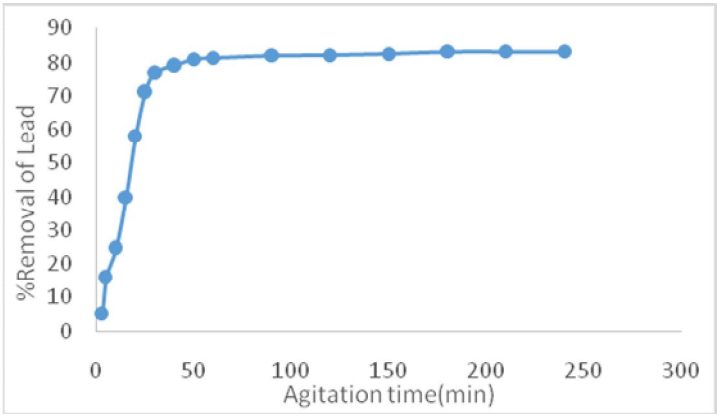

Fig.4 EFFECT OF AGITATION TIME

EFFECT OF DOSAGE

The effect of dosage can be determined by considering 50ml of lead solution from 30 ppm concentration into 5 numbers of 250 ml capacity Erlenmeyer flask at pH 4, mesh size 200 μm, temperature 30℃, and 0.5 mg of acidified neem

saw dust is added to each flasks ranging (0.25,0.5,1,1.5,2) and agitated at 100 rpm, Fig.5 shows the effect of dosage on adsorption of lead. The highest % removal of lead is found to be 86.29at optimum dosage of 1gm/l.

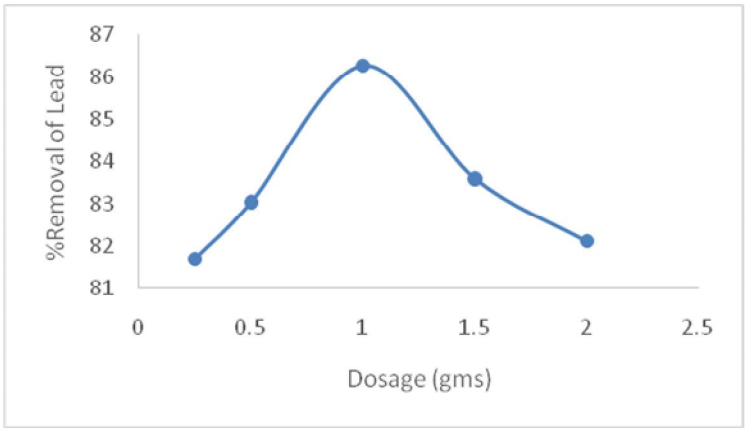

Fig.5 EFFECT OF DOSAGE

EFFECT OF INITIAL CONCENTRATION

50 mL of Lead test solution having 30 ppm concentration was taken in 5 numbers of 250 mL capacity Erlenmeyer flask. At pH 4 ,mesh size 200 µm ,temperature 30℃ and 0.5g of acidified neem saw clean was included to Erlenmeyer flask and it was kept in an orbital shaker and agitated at 100 rpm. For different initial concentrations like 10, 20, 30, 40, 50 ppm , Fig.6 shows the effect of initial concentrations on adsorption of lead. The highest removal percentage 89.90% of lead is identified at ideal concentration at 40 ppm.

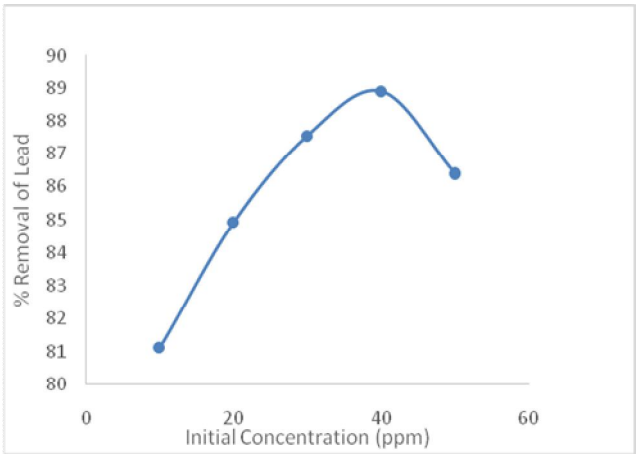

Fig.6 EFFECT OF INITIAL CONCENTRATION

Effect of pH

Effect of pH is a important criteria for determination of various parameters like contact time, initial concentration, temperature. The effect of pH can be determined by considering 50ml of lead solution from 30ppm concentration into 8 numbers of 250 ml capacity Erlenmeyer flask. At pH 4,mesh measure 200 µm ,temperature 30℃ and 0.5g of acidified neem saw clean was included to Erlenmeyer flask. The pH of lead solution in the flask at different pH values like 2, 4, 6 and 8 using 0.1N H_2SO_4 and 0.1 N NaOH solution and agitated at 100 rpm for 90 mins. In Fig .7 shows the effect of pH in adsorption process of lead. The high removal percentage of 87.55% at optimum pH 4.

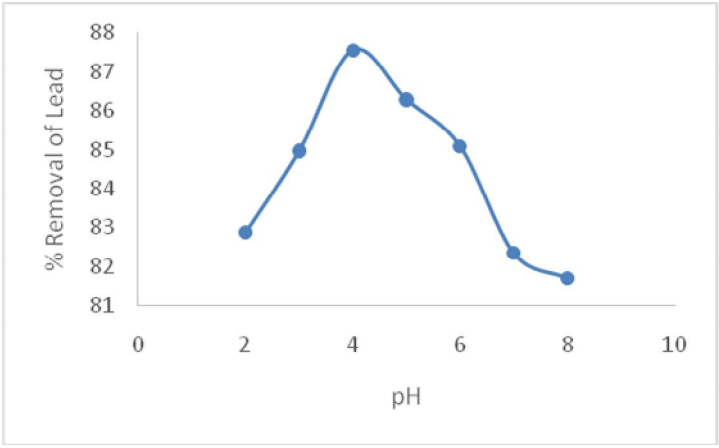

Fig.7 EFFECT OF pH

EFFECT OF TEMPERATURE

The effect of Temperature can be determined by considering 50ml of lead solution from 30 ppm concentration into 5 numbers of 250 ml capacity Erlenmeyer flask. At pH 4,mesh size 200 µm ,temperature 30 □ and 0.5g of acidified neem saw clean was included to Erlenmeyer flask and agitated at 100 rpm for 30 mins at different temperature intervals like 283, 293, 303, 313 & 323 K. Fig.7 shows effect of temperature in adsorption of lead. The maximum removal percentage 90.76%. is identified at optimum temperature 313 k.

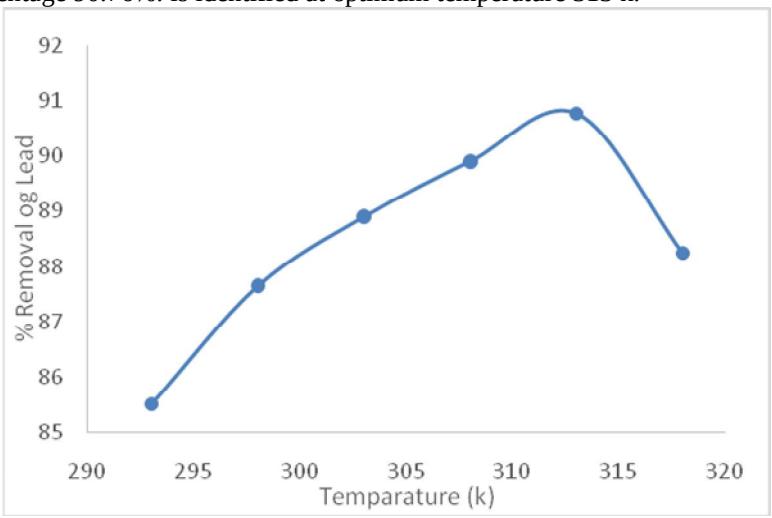

Fig.7 EFFECT OF TEMPERATURE

CONCLUSION:

According to recent survey of environmental pollution, Lead at high concentration is considered to be poisonous metals affecting animals, plants and humans. Because of the lead chronic effects, the removal of lead is important for the sack of environmental protection. The present work of lead removal using acidified neem saw dust is performed and the evaluation of various parameters are determined. The highest removal percentage of lead i.e 94.02% can be identified at optimum agitation time of 90 mis, optimum adsorption dosage of 1gm/ml, optimum initial concentration of 40 ppm, optimum pH of 3, optimum temperature of 303K. The result obtained indicates that the high removal percentage of lead using acidified saw dust is observed and concluded as it is a best preferable method in compared to previous literature study.

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