Environment and Ecology 40 (1) : 70—72, January—March 2022
ISSN 0970-0420

Chromium (VI) Removal from Wastewater of Electroplating Industry by Using Natural Adsorbents

Mallikarjun S. Dengi, Shashikant R. Mise

Received 10 January 2022, Accepted 8 February 2022, Published on 10 March 2022

ABSTRACT

Adsorption technique is one of the most technologies being used for treatment of water and waste water and the object of study is to select the low cost adsorbent. This work focus on the chromium (VI) adsorption from wastewater using naturally available adsorbents. Influence on superlative time, superlative dosage and superlative on removal of chromium (VI) is found out. It was found that 10 minutes contact time at pH 1 and dosage 400 mg with efficiency of 96% removal by Red soil similarly 10 minutes contact time at pH 1 and dosage 200 mg with efficiency of 96.3% by Regur soil and 15 minutes contact time at pH 1.5 and dosage 600 mg with efficiency of 95.6% by bleaching clay.

Keywords Adsorption, Chromium, Contact time, Dosage, pH.

Mallikarjun S. Dengi*
PhD Research Scholar, Environmental Engg, Dept, PDA College of Engineering, Kalaburagi 585102, India

Dr Shashikant R. Mise
Professor, PG Environmental Engineering Course PDA College of Engineering, Kalaburagi 585102, Karnataka, India
Email: mallikarjun.sdengi@gmail.com
*Corresponding author

INTRODUCTION

Discharge from industry incorporates numerous organic and inorganic pollutants. Among those pollution are heavy metals which may be poisonous and or carcinogenic and which are dangerous to people and different dwelling species. There are many sources of chromium contamination entering the water stream, including chromium containing waste disposal and electroplating. Wastes from the electroplating, leather tanning, fabric dyeing, paint, ink and aluminium industries are sources of chromium (VI) wastes. Consequently, the elimination of Cr would be necessary to enhance the satisfactory of water and the existence of humanity. In keeping with minimizing the unfavorable effect on human health these days, there are several Cr removal mechanisms. For the elimination of chromium from wastewater, adsorption is fantastically powerful in comparison to different conventional techniques. Adsorption is a manner that happens while a gasoline or liquid or solute (referred to as adsorbate) accumulates on the surface of a strong or extra rarely a liquid (adsorbent) forming a molecular or atomic film. Adsorption process can be influenced through quite a number of things such as pH, adsorbate attention, adsorbent dosage and other elements. Soil is a prime source of reservoir for contaminants as it owns an ability to bind to numerous chemical substances. This chemical exits in numerous forms in soil and one of kind forces bound them to soil particles. It's far very vital to look at the interactions due to the fact the toxicity of chemical can also strongly depend upon the bureaucracy which

Table 1. The physico-chemical characteristics of adsorbents.

Sl. No.	Characteristics	Units	Red soil	Regur	Bleaching clay
1	Moisture content	%	3.6	6	5.6
2	pH	---	7	7.2	6.7
3	Specific gravity	---	2.46	2.54	1.88
4	Bulk density	g/cc	1.38	1.21	0.96
5	Surface area	m^2/g	453	520	750
6	Color		Red	Black	Light grey

Table 2. The physico-chemical characteristics of waste sample from electroplating industry.

Sl. No.	Characteristics	Units	Value
1	pH	----	1.3
2	Alkalinity	mg/L	64
3	Chloride	mg/L	25992
4	Dissolved solids	mg/L	31800
5	Hardness in total	mg/L	720
6	Calcium hardness	mg/l	360
7	Mag hardness	mg/L	360

exist in surroundings. Chromium is a heavy metallic decided on this look at as an adsorbate, due to its relevance in electroplating, coating, tanning industries. The effluents from these industries may incorporate unfavorable concentrations of chromium.

MATERIALS AND METHODS

Red soil

It is a type of soil and rocks that contain iron and aluminium and is frequently considered to have formed in humid warm climates. Because high iron oxide content material is present in red soils, the soil typically appears rusty red in color, as shown by Fig.1 below.

They become more pronounced as the weathering of the underlying discernible rocks takes place in depth and over time. This is a process of chemical weathering that varies in thickness, grade, chemistry and ore mineralogy of the soil produced by tropics.

Regur soil

Typically, regur is observed in the imperative, western and southern states of India, including Karnataka. Regur is one in all essential soil deposits of India. They're very tenacious of moisture and fantastically sticky, whilst wet. Because of widespread contraction on drying big and deep cracks are shaped. These soils contain plentiful iron and excessive portions of lime, magnesia and alumina as shown in Fig. 2 below. Regur soils are bad in nitrogen, phosphorus and natural count numbers.

Bleaching clay

Its miles a clay material that has the functionality to decolorize oil or different liquids without chemical treatment. Bleaching clay generally consists of palygorskite (attapulgite) or bentonite as proven in Fig. 3 below. Cutting-edge makes use of bleaching clay encompass absorbents for oil, grease and animal waste (cat liter) and as a provider for pesticides and fertilizers. Minor makes use of consist of filtering, clarifying and decolorizing; active and inactive aspect in beauty merchandise and as filler in paint, plaster, adhesives and prescription drugs.

The physico-chemical characteristics of natural adsorbent and physico-chemical characteristics of waste from electroplating industry are as shown in Tables 1 and 2 below.

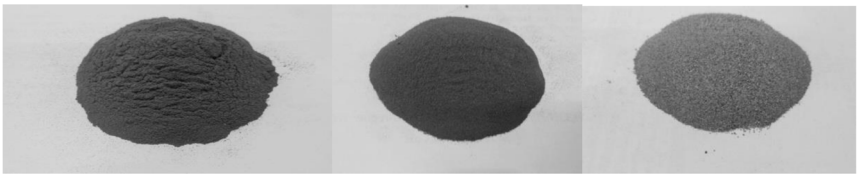

Fig. 1. Red soil.

Fig. 2. Regur soil.

Fig. 3. Bleaching clay.

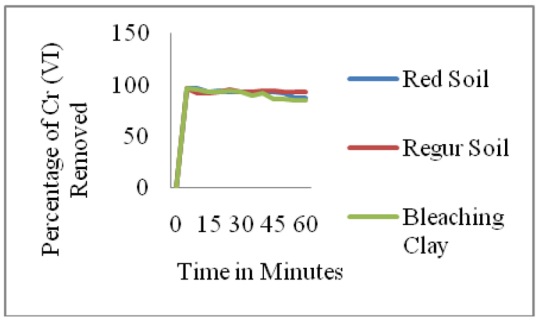

Fig. 4. Influence of contact time on Red soil, Regur soil and Bleaching clay.

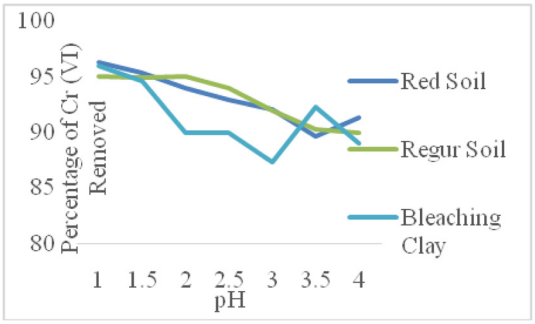

Fig. 6. Influence of pH on Red soil, Regur soil and Bleaching clay .

RESULTS AND DISCUSSION

The efficiency of naturally available adsorbent in removing chromium (VI) as a function of : Contact time, Dosage, pH.

The influence of contact time, dosage and pH on Red soil, Regur soil and Bleaching clay for selected adsorbate is shown in Figs. 4, 5 and 6 below.

From the above study, it is analyzed that the adsorption of chromium (VI) from wastewater sample of electroplating industry is mainly dependent of pH, as a consequence, as pH decreases, the removal efficiency of the adsorbent increases. It is been absorbed that maximum adsorption takes place in the acidic medium at pH of 1.5.

The adsorption kinetic study showed that the superlative contact time for removal of chromium (VI) by Red soil, Regur soil and Bleaching clay are found to be 10 mins, 10 mins and 15 mins with removal efficiency of 96.6%, 97.3% and 96.3% respectively.

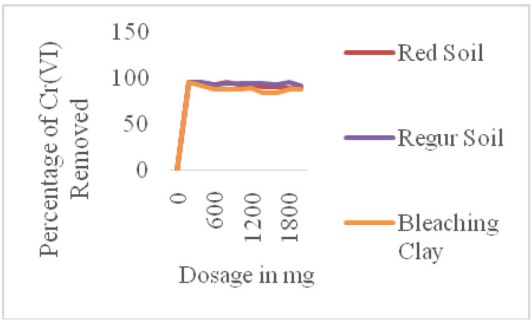

Fig. 5. Influence of Dosage on Red soil, Regur soil and Bleaching clay.

The superlative dosage for removal of Cr (VI) removal by Red soil, Regur and Bleaching clay 400 mg, 200 mg, 600 mg with the removal efficiency of 96.1%, 96.3% and 96% respectively.

The superlative pH for removal Cr (VI) by Red soil, Regur and Bleaching clay are 1, 1 and 1.5 with the removal efficiency of 96 % , 96.3% and 95.6% respectively.

Adsorbing capacity of Red soil, Regur and Bleaching clay are 1.2 mg/g, 0.8 mg/g and 1.3 mg/g respectively.

ACKNOWLEDGEMENT

The above carried work is supported by the PDA College of Engineering, Kalaburgi, Karnataka, India and I thank our guide for the support for accomplishing this research article.

REFERENCES

Aderonke A Okaya, Abinimbola B Akinyele *et al*. (2014) " Adsorption of heavy metals ion onto chitosan grafted cocao husk char". *Afr J Pure Appl Chem*.(In press)

Ali SM, Khalid AR, Majid RM (2014) "The removal of zinc, chromium and nickel from industrial waste water using corn cobs". *Iraqi J Sci*. (In press)

Jonas Bayuo, Kenneth Bayetimani Pelig, Mosws Abdullai Abukari (2019) " Adsorptive removal of chromium from aqueous solution into groundnut shell". *Appl Water Sci* 9: 107.